Prepared by

Renew Harbor Island

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4th Quarter 2023 Annual Groundwater Monitoring Report

For Michigan Part 115 CCR Solid Waste Regulations

Former J.B. Sims Generating Station

January 31, 2024

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1.0 Introduction

The U.S. Environmental Protection Agency's (EPA) final Coal Combustion Residuals (CCR) Rule 40 CFR §257 and Michigan's Part 115 Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451 (Part 115), establish comprehensive requirements for the management and disposal of CCR (or coal ash) in surface impoundments by electric utilities. The former J.B. Sims Generating Station (facility or Site) was a coal-fired power generation facility operated by Grand Haven Board of Light & Power (GHBLP) that ceased operations in February 2020. The facility is located at 1231 North 3rd Street, on Harbor Island, in Grand Haven, Michigan (**Figure 1**). The CCR generated at the former generating station were stored in two CCR units that are subject to the CCR Rule and Part 115 Solid Waste regulations: (1) the inactive Units 1/2 Impoundment and (2) the Unit 3A/B Impoundments (**Figure 2**).

The inactive CCR Units 1/2 Impoundment was a depression in the ground where sluiced ash was disposed and ceased receiving CCR material in 2012. The former Unit 3A/B Impoundments were engineered, clay-lined, above-ground units and ceased receiving CCR material in July 2020. Excavation of CCR material from Unit 3A/B Impoundments was conducted in December 2020. In 2017, the *Groundwater Monitoring System Certification* was developed for the 3A/B Impoundments, which consisted of one background well (MW-07), four (4) downgradient detection monitoring wells (MW-01R, MW-02, MW-03, and MW-04), and an additional assessment monitoring well (MW-09) (ERM, 2017). Groundwater monitoring conducted in 2017 by GHBLP identified statistically significant increases (SSI) of constituents in groundwater, and therefore the GHBLP implemented assessment monitoring (Golder, 2018a). Assessment monitoring identified statistically significant levels (SSLs) of constituents over groundwater protection standards (GPS) at the Site, and therefore GHBLP stated that they were initiating an assessment of corrective measures for the Site; however, that document was completed prior to the inclusion of Units 1/2 Impoundment and therefore represents the status only of Unit 3A/B Impoundments (Golder, 2018b). On July 22, 2021, the *Updated Notice of Groundwater Protection Standard Exceedance* was issued to document SSLs over GPS for both Units 1/2 Impoundment and Unit 3A/B Impoundments.

In 2021, to better understand the groundwater flow around the entire Island, and verify that the monitoring network in place at the time was adequate, 22 piezometers, six (6) staff gauges, and 3 stilling wells were installed. With this larger scale understanding of groundwater flow, the *Field Summary Report of Results from Approved Work Plan - Piezometer Installation and Additional Data Collection* suggested that MW-07 may be an inappropriate location for a background well due to the potential for groundwater to flow from Units 1/2 Impoundment towards MW-07 (Golder, 2022b). Therefore, a new groundwater monitoring network has been selected for the CCR units, including new background wells. Background data collection began in November 2022 and is continuing, as described in the 2022 CCR Work Plan that was submitted to the EPA and Michigan Department of Environment, Great Lakes, and Energy (EGLE) on June 23, 2022 (HDR, 2022).

The status of the groundwater monitoring program for both Units is assessment monitoring, and evaluation of potential remedies based on the GPS exceedances identified in 2019; however, the monitoring conducted from November 2022 through August 2023 represents background monitoring due to the revised monitoring well network. The background monitoring events were conducted on a five-week rotation to evaluate background groundwater quality and develop background threshold values (BTVs). The first detection/assessment monitoring event was conducted in October 2023, and assessment monitoring will continue on a quarterly basis through 2024.

This Groundwater Monitoring Report presents the activities completed in the fourth quarter 2023.

1.1 Background and Program Status

In 2017, the Groundwater Monitoring System Certification was developed for the 3A/B Impoundments, which consisted of 1 background well (MW-07), four (4) downgradient detection monitoring wells (MW-1R, MW-02, MW-03, and MW-04), and an additional assessment monitoring well (MW-09) (ERM, 2017). Groundwater monitoring conducted in 2017 by GHBLP identified statistically significant increases (SSI) of constituents in groundwater, and therefore the GHBLP implemented assessment monitoring (Golder, 2018a). Assessment monitoring identified statistically significant levels (SSLs) of constituents exceeding groundwater protection standards at the Site and, therefore, GHBLP initiated an assessment of corrective measures for the Site for both CCR units (Golder, 2018b).

On July 22, 2021, the Updated Notice of Groundwater Protection Standard Exceedance was issued to document SSLs over GPS for both Units 1/2 impoundment and Unit 3A/B Impoundments. In 2021, to better understand the groundwater flow around the entire Island and verify that the monitoring network that was in place at the time was adequate, 22 piezometers, six (6) staff gauges, and three (3) stilling wells were installed. The Field Summary Report of Results from Approved Work Plan - Piezometer Installation and Additional Data Collection suggested that MW-07 may be an inappropriate location for a background well due to the potential for groundwater to flow from Units 1/2 impoundment towards MW-07 (Golder, 2022). Therefore, a new groundwater monitoring network has been selected for the CCR units, including new background groundwater wells. Background data collection began in November 2022 and is continuing, as described in the 2022 CCR Work Plan for CCR Compliance that was submitted to the EPA and Michigan Department of Environment, Great Lakes, and Energy (EGLE) on June 23, 2022 (HDR, 2022).

Figure 1 | Site Vicinity Map

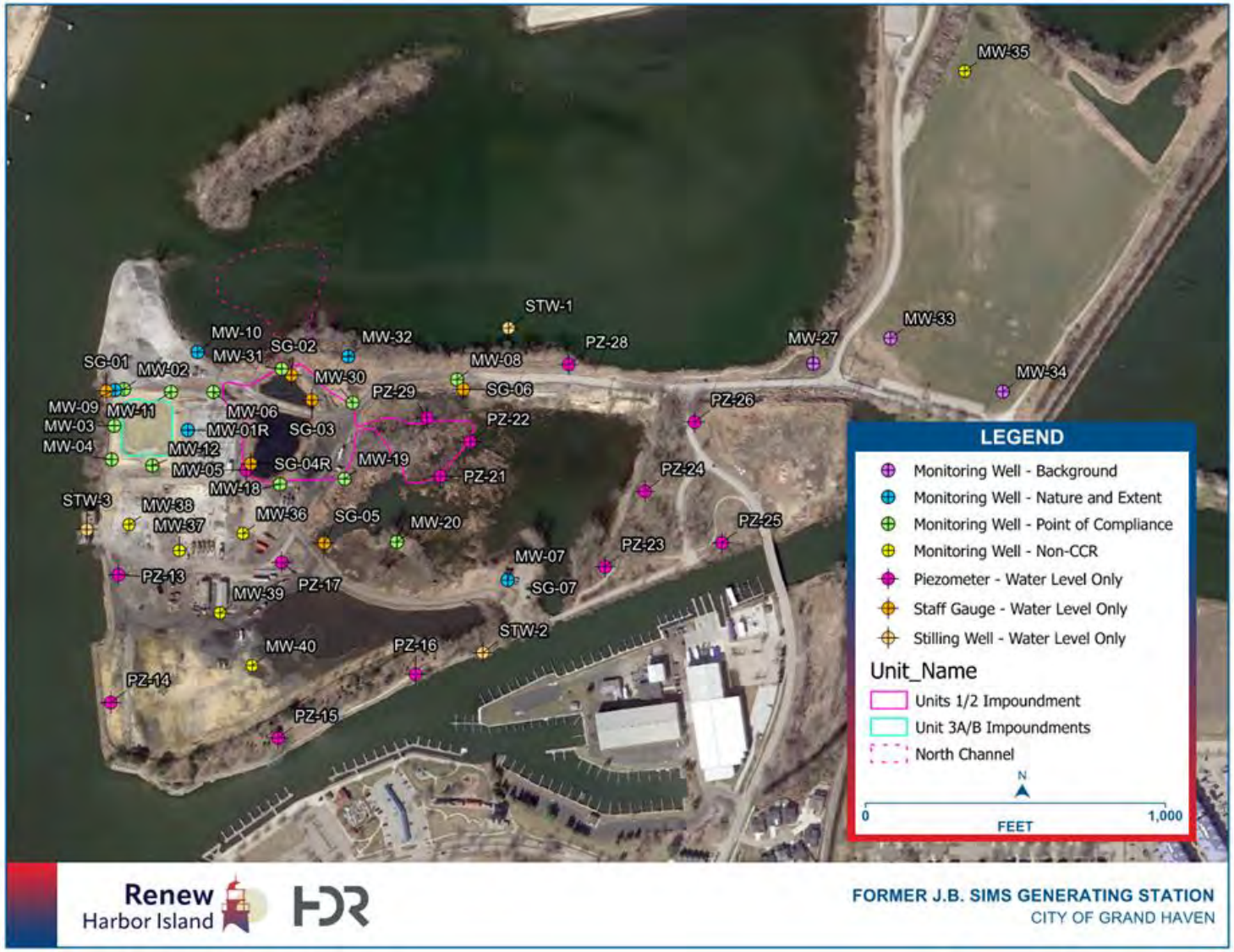

Figure 2 | Former J.B. Sims CCR Units and Monitoring Wells

2.0 Facility Description

The former CCR Unit 3A/B Impoundments were engineered, clay-lined, above-ground units built over a field of ash from Boiler Units 1 & 2. Although the former coal-fired power generation facility ceased operations in February 2020, the Site continued to use the Unit 3A/B Impoundments to clean out the hoppers, vessels, etc. prior to demolition of the buildings. In July 2020, following the facility clean out, the Site ceased accepting CCR materials in the Unit 3A/B Impoundments. CCR materials were cleaned from the Unit 3A/B impoundments in December 2020.

The inactive CCR Units 1/2 Impoundment was a depression in the ground where sluiced ash wasdisposed. The inactive Units1/2 Impoundment ceased receiving CCR materials in 2012. The monitoring network for the Units 1/2 impoundment consisted of one background monitoring well (MW-07), four (4) downgradient detection monitoring wells (MW-1R, MW-05, MW-06, MW-08), and an additional five (5) assessment monitoring wells (MW-02, MW-03, MW-04, MW-09, and MW-10). Based on information provided to HDR, it appears that GHBLP, EPA, and EGLE discussed the boundary for the inactive Units 1/2 Impoundment on January 14, 2021. During that discussion, a boundary of the Units 1/2 Impoundment was agreed upon that includes an area of sluiced ash disposal further to the east than the original boundary (**Figure 2**). It was also agreed between all parties that the former northern outlet channel from the Units 1/2 Impoundment would be evaluated for potential inclusion in the revised boundary for the Units 1/2 Impoundment (**Figure 2**).

2.1 Hydrogeology

The uppermost aquifer across Harbor Island consists of fine sand with gravel and silt lenses, clay, peat, ash, and municipal solid waste located between the surface and 39 feet below surface. The bottom of the aquifer is believed to consist of a continuous clay observed between 20.8 – 39.0 feet below surface. The clay and dense silt are observed in borings MW-12, MW-17, PZ-16, PZ-26, PZ-24, PZ-25, MW-30.

The regional general direction of groundwater flow across the Harbor Island is west to southwest towards Lake Michigan (Western Michigan University, 1981). The Grand River is located on the northern and western side of the Site, and the South Channel is located on the south side of Harbor Island. Internal to the Island there are several influences to groundwater flow and direction. Specifically, the following features:

- Various fill materials observed in boring logs,
- Surface water features, such as the inactive Units 1/2 Impoundment and internal wetland,
- Former coal yard area which may have lower infiltration rates due to compaction from heavy equipment and stockpiling (HDR, 2022).

These features influence the groundwater velocity and direction and are very localized. Boring logs contained in the *Field Summary Report of Results from Approved Work Plan - Piezometer*

Installation and Additional Data Collection show the observed fill materials encountered during well installation (Golder, 2022b).

During the water level monitoring events conducted between September 2022 and June 2023, groundwater mounding is shown around monitoring well MW-01R, consistent with observations made by Golder between October and December 2021 (Golder, 2022b). Groundwater flow in the area east of the internal wetland is consistent with regional groundwater flow and the flow of the Grand River toward the west. Groundwater contour maps from the Q1 2023 Groundwater Monitoring Report (HDR, 2023), Q2 2023 Groundwater Monitoring Report (HDR, 2023b), Q3 2023 Groundwater Monitoring Report (HDR, 2023c) as well as the October 2023 detection monitoring event are shown in **Appendix A**. The maps show groundwater flow beneath Unit 3A/B Impoundments is consistently west toward the Grand River. Groundwater flow beneath Units 1/2 Impoundment is seasonably and spatially variable; flow is generally northward toward near the North Channel (**Figure 2**), east from the ponds of Units 1/2 Impoundment toward the wetland, and potentially south near MW-05. The presence of the wetland east of the Units 1/2 Impoundment appears to provide a hydraulic sink between the CCR impoundments and the wells situated to the east (PZ-23 through PZ-26, MW-27, MW-33, and MW-34).

Groundwater was encountered between 5 and 15 feet below ground surface within the unconsolidated fill material. As described in the *Groundwater Monitoring System Certification*, (ERM, 2017), the fine sand has an estimated hydraulic conductivity of 27 to 53 feet per day. This wide range of variability is the result of the varying fill materials that form Harbor Island. In 2021, Golder performed slug tests at monitoring wells MW-01R, MW-02, MW-04, MW-05, MW-07, MW-08, PZ-17, PZ-20, PZ-26, and MW-31. Consistent results were observed in 25 of the 29 tests performed. Hydraulic conductivity values observed across the Site range from 0.19 ft per day at MW-02 to 18.76 feet per day at MW-05. Higher than average conductivity values were observed in tests completed at 172.51 feet per day at PZ-17 and 242.25 feet per day at PZ-20 (Golder, 2022b). In 2024 additional slug testing will be conducted.

2.2 Monitoring Well Network

The original Groundwater Monitoring System Certification was developed for the 3A/B Impoundments, which consisted of 1 background well (MW-07), four (4) downgradient detection monitoring wells (MW-1R, MW-02, MW-03, and MW-04), and an additional assessment monitoring well (MW-09) (Golder, 2022). Golder completed a groundwater flow study based on piezometers and stilling wells installed in August 2021. This Golder (2022) study is called the *Field Summary Report of Results from Approved Work Plan - Piezometer Installation and Additional Data Collection*. Based on the study results, a new groundwater monitoring network was included in the 2022 CCR Work Plan for CCR Compliance that was submitted to the EPA and EGLE on June 23, 2022.

The CCR Rule requires, at a minimum, one upgradient and three downgradient monitoring wells per CCR unit to be completed in the uppermost aquifer. Section §257.90 of the Rule states that the operator: "…may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit." In addition, the Rule states that

downgradient monitoring wells should be installed to: "accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer." The groundwater monitoring network for both CCR units is in compliance with CCR Rule Section §257.90 and Michigan R 299.4906 consisting of a sufficient number of monitoring wells such that if contaminants were to pass the waste boundary, they would be detected, and background monitoring locations are unimpacted by leakage from a CCR unit.

The monitoring well network is based on the groundwater flow monitoring conducted after the installation of 22 piezometers and 3 stilling wells in August 2021 to further evaluate the groundwater flow under the CCR units and the Island (Golder, 2022). The monitoring well network consists of the monitoring wells (MW-#) and piezometers (PX-#) listed in **Table 1** and shown in **Figure 2**. The monitoring wells are sampled for water quality and water levels are monitored. The piezometers are monitored only for water levels. As of November 2022, the monitoring network is composed of the following:

Background

The following three (3) wells are proposed as the background monitoring well network for the Units 1/2 Impoundment and Unit 3A/B Impoundments. Potentiometric contour maps provided in **Appendix A** indicate the groundwater flow direction across the Site is complex. Background monitoring well locations are MW-27, MW-33 and MW-34, all located on the eastern side of the Island in or near the soccer fields. A review of groundwater contour maps indicates groundwater does not flow from the CCR units towards the background wells. Therefore, the groundwater monitored at these locations appears to represent groundwater at Harbor Island that has not been impacted by CCR materials.

- MW-27
- MW-33
- MW-34

Inactive Units 1/2 Impoundment

The following seven (7) wells are proposed as the downgradient monitoring well network for the Units 1/2 Impoundment. The compliance well locations are spaced along the waste boundary such that if contaminants were present in the groundwater passing the waste boundary, they would be detected by one or more of the wells. (**Figure 2**):

- MW-06
- MW-08
- MW-18
- MW-19
- MW-20
- MW-30
- MW-31

Former Unit 3A/B Impoundments

The following five (5) wells are proposed as the monitoring well network for the former Unit 3A/B. Downgradient compliance well locations are spaced along the waste boundary such that if contaminants were present in the groundwater passing the waste boundary, they would be detected by one or more of the wells (**Figure 2**):

- MW-02
- MW-03
- MW-04
- MW-11
- MW-12

Nature and Extent Wells

The following five (5) wells have been part of the monitoring network at the Island for the last several years (**Figure 2**). These wells will not be used to determine if there is an SSI at an individual CCR unit; however, these wells will continue to be included in the water quality data set used to evaluate groundwater flow and transport at the Island, and therefore are considered nature and extent wells.

Unit 3A/B	**Units 1/2**
• MW-01R	• MW-07
• MW-09	• MW-10
• MW-10	• MW-32

Water Level Wells

The following monitoring wells and piezometers will be monitored for water levels to continue to monitor the groundwater flow across the island (**Figure 2**):

- PZ-13
- PZ-14
- PZ-15
- PZ-16
- PZ-17
- PZ-21
- PZ-22
- PZ-23
- PZ-24
- PZ-25
- PZ-26
- PZ-28
- PZ-29
- MW-36
- MW-37
- MW-38
- MW-39
- MW-40

The following piezometers surround the Units 1/2 impoundment on the east side. Since they were installed in an area of standing water within the wetland that often requires a boat for access, these piezometers may be sampled less frequently:

- PZ-21
- PZ-22

- PZ-29

Monitoring wells MW-35, MW-36, MW-37, MW-38, MW-39, and MW-40 were installed in January 2023 as a part of a non-CCR groundwater monitoring investigation. These well locations were chosen based on the sampling results from the non-CCR investigation and are monitored for water levels in order to provide additional information related to groundwater flow direction.

A groundwater flow study, consisting of 17 dedicated pressure transducers to monitor hourly groundwater measurements in select wells, staff gauges, and stilling wells, was proposed and approved. Installation of the transducers began December 21, 2023. Due to weather conditions, however, the installation has yet to be completed and no data has been collected but is anticipated for February 2024. The purpose of the flow study is to collect data from paired surface water and groundwater locations to study the groundwater-surface water interaction on the sides of the island.

The Hydrogeologic Monitoring Plan will be updated in 2024 to reflect the revised monitoring network under the assumption that the new background monitoring wells (MW-33 and MW-34), installed in November 2022, remain upgradient of the CCR units and the groundwater flow directions around the CCR units will be captured by the monitoring network proposed in the *2022 Harbor Island Work Plan for CCR Compliance* (HDR, 2022).

3.0 Monitoring

3.1 Groundwater Monitoring

Background groundwater sample collection was conducted between November 2022 and August 2023 on a 5-week sample interval to achieve statistical strength in the water quality data. Following completion of background monitoring, the sampling data was used to develop updated background values for the Site. The first sampling event following background monitoring is considered Detection Monitoring and Initial Assessment Monitoring as the site was in Assessment Monitoring. **Table 1** provides well identification numbers, well locations, the dates samples were collected, and whether a sample was required by the CCR Rule for the background sampling, detection monitoring or assessment monitoring programs. Deviation in sample collection from the *2022 Harbor Island Work Plan for CCR Compliance* are outlined in **Section 3.3**.

Table 1. Dates of Groundwater Monitoring in Fourth Quarter 2023		
Monitoring Well I.D.	**Date Monitored**	**Monitoring Purpose**
Background Monitoring Wells		
MW-27	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
MW-33	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
MW-34	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
Units 1/2 Compliance Monitoring Wells		
MW-06	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-08	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-18	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-19	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-20	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-30	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
MW-31	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
Unit 3A/B Compliance Monitoring Wells		
MW-02	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-03	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-04	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-11	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-12	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
Nature and Extent Wells		
MW-01R	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-07	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-09	10/24/2023	Detection Monitoring/Initial Assessment Monitoring
MW-10	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
MW-32	10/23/2023	Detection Monitoring/Initial Assessment Monitoring
Water Level Only Wells		
MW-05	10/23/2023	Water Level Only
PZ-13	10/23/2023	Water Level Only
PZ-14	10/23/2023	Water Level Only
PZ-15	10/23/2023	Water Level Only
PZ-16	10/23/2023	Water Level Only
PZ-17	10/23/2023	Water Level Only
PZ-21	10/23/2023	Water Level Only
PZ-22	10/23/2023	Water Level Only
PZ-23	10/23/2023	Water Level Only
PZ-24	10/23/2023	Water Level Only
PZ-25	10/23/2023	Water Level Only
PZ-26	1/5/2023	Water Level Only
PZ-28	10/23/2023	Water Level Only
PZ-29	8/7/2023	Water Level Only
MW-35	10/23/2023	Water Level Only
MW-37	10/23/2023	Water Level Only

Table 1. Dates of Groundwater Monitoring in Fourth Quarter 2023		
Monitoring Well I.D.	**Date Monitored**	**Monitoring Purpose**
MW-38	10/23/2023	Water Level Only
MW-39	10/23/2023	Water Level Only
MW-40	10/23/2023	Water Level Only

3.2 Surface Water Monitoring

Surface water monitoring coincides with the groundwater sampling. Stilling wells (STW-1, STW-2, and STW-3) and SG-01 are monitored for water levels. Staff gauges (SG-02, SG-03 SG-04R SG-05, and SG-06) are monitored for water levels and a surface water sample is collected at these locations (**Figure 2**). Surface water elevations are mapped with the groundwater elevations to evaluate the flow of groundwater under the Island and in connection with the Grand River and wetland surface waters. Surface water monitoring dates are shown in **Table 2**. Deviations from the work plan are outlined in **Section 3.3**.

Table 2. Dates of Surface Water Monitoring in Fourth Quarter 2023		
Well ID	**Water Level Date**	**Sample Date**
SG-01[1]	10/24/2023[2]	Water Level Only
SG-02	10/24/2023	10/24/2023
SG-03	10/24/2023	10/24/2023
SG-04R	10/24/2023	10/24/2023
SG-05	10/24/2023[2]	10/24/2023
SG-06	10/24/2023[2]	10/24/2023
STW-1[1]	10/24/2023	Water Level Only
STW-2[1]	10/24/2023	Water Level Only
STW-3[1]	10/24/2023	Water Level Only

1 – Location is not sampled under Work Plan.
2 – Monitoring location was dry, no surface water sample or water level was collected.

3.3 Water Level and Sample Collection

Water elevations are provided in **Table 3** pursuant to the *2022 Harbor Island Work Plan for CCR Compliance* (HDR, 2022). Monitoring wells were purged with a peristaltic pump until field parameters (pH, turbidity, conductivity, dissolved oxygen, temperature, and oxidation reduction potential) stabilized. The results of field measurements were recorded on a field data form, which is maintained as part of the field records. After water quality parameters stabilized, samples were collected and tested for the parameters listed in **Table 4**. For quality control, one field duplicate sample was collected for each CCR unit per sampling event (two duplicate samples total per event). The following deviations from *the 2022 Harbor Island Work Plan for CCR Compliance* were noted during the 2023 sampling events:

October 2023:

- Water levels were not collected from PZ-21, PZ-22, or PZ-23 due to deep water limiting access.

- Water levels were not collected from SG-01, SG-05, or SG-06 due to low surface water conditions leaving the gauges dry and no water level was collected.
- A surface water samples was collected at SG-05 but low water levels did not allow for sample collection at the gauge location. The sample located was 25 feet north of the original sampling location.
- A surface water samples was collected at SG-06 but low water levels did not allow for sample collection at the gauge location. The sample located was 340 feet east of the original sampling location off an existing dock.

Surface water samples were collected using a clean container affixed to a pole. Before samples were collected, the following water quality parameters were measured: pH, turbidity, conductivity, dissolved oxygen, temperature, and oxidation reduction potential. The results of field measurements were recorded on a field data form, which is maintained as part of the field records. Surface water samples were delivered under Chain of Custody to Trace Analytical Laboratories in Muskegon, Michigan.

Table 3. Groundwater and Surface Water Elevations in Q4 2023

Well ID	Groundwater Elevation (10/23/2023)
MW-01R	581.27
MW-02	579.91
MW-03	579.83
MW-04	580.04
MW-05	580.68
MW-06	580.82
MW-07	579.86
MW-08	579.92
MW-09	579.89
MW-10	580.04
MW-11	580.71
MW-12	580.81
PZ-13	580.06
PZ-14	580.31
PZ-15	580.25
PZ-16	579.81
PZ-17	580.48
MW-18	580.24
MW-19	580.10
MW-20	579.97
PZ-21[1]	--
PZ-22[1]	--
PZ-23	580.02
PZ-24	579.98
PZ-25	579.88
PZ-26	580.24

Table 3. Groundwater and Surface Water Elevations in Q4 2023	
MW-27	580.45
PZ-28	579.90
PZ-29[1]	--
MW-30	580.30
MW-31	580.56
MW-32	580.33
MW-33	580.11
MW-34	579.75
MW-35	580.52
MW-36	--
MW-37	580.53
MW-38	580.47
MW-39	580.54
MW-40	581.21
SG-01	--
SG-02	579.41
SG-03	580.47
SG-04R	580.37
SG-05	--
SG-06	DRY
STW-1	580.40
STW-2	579.71
STW-3	579.62

Note: "- - "denotes no measurement was taken.
[1]Deep water prevented access to well to collect measurement.

3.4 Analytical Testing

Samples from the wells listed in **Table 1** were analyzed for the constituents listed in **Table 4**.

Table 4. Constituents of Interest	
Constituents for Assessment Monitoring	
Antimony	Mercury
Arsenic	Molybdenum
Barium	Nickel
Beryllium	Radium-226
Boron	Radium-226/228
Cadmium	Radium-228
Calcium	Selenium
Chloride	Silver
Chromium	Sulfate
Cobalt	Thallium
Copper	Total Dissolved Solids (TDS)

Fluoride	Vanadium
Iron	Zinc
Lead	**Additional Parameters**
Lithium	Total Suspended Solids (TSS)

3.5 Data Validation and Management

Data validation and data management tasks were performed per the *2022 Harbor Island Work Plan for CCR Compliance* (HDR, 2022). Data validation was performed for sampling dates provided in **Table 1**. Data validation was conducted to eliminate any data that did not meet validation criteria and designate a data qualifier for any data quality limitation discovered.

Samples and quality control (QC) data for the reporting period were reviewed and evaluated, and no samples were rejected. Most QC analyses were within reportable limits; however, when QC was outside control limits, samples were reported as estimated. Data analyses required minimal qualifications, and the data were usable, even when qualified. Data validation reports are contained in **Appendix B**.

4.0 Monitoring Results

4.1 Water Levels and Groundwater Flow Direction

The water levels are provided in **Table 3**. Potentiometric surface maps were developed for each sampling event. The map displays the groundwater elevations as well as the potentiometric contours, the map is provided in **Appendix A**. Groundwater was observed between 1.11 to 12.19 feet below ground surface near the impoundments or between 580.14 to 581.47 feet amsl. Non-CCR monitoring program wells MW-35 through MW-40 are included on the provided potentiometric contour map to provide additional data points to increase accuracy.

Potentiometric contours created from the groundwater elevations in **Table 3** show north and northwestern flow beneath Unit 3A/B Impoundments toward the Grand River, consistent with previous observations. Flow beneath Units 1/2 Impoundment is generally eastward toward the internal wetland, with the exception of flow near the North Channel outlet where groundwater flow is south from MW-31 toward SG-02. The internal wetland has consistently shown to be a sink for Harbor Island.

Groundwater flow observed at background wells MW-27, MW-33, and MW-34 was consistent with previous observations. Flow is southward from MW-35, in the northern corner of the eastern island, toward MW-33 and MW-34. The potentiometric contours indicate groundwater from under the CCR impoundments does not flow toward background monitoring wells and are determined to be appropriate background monitoring locations.

4.2 Water Quality

The eighth background sampling event was completed in August 2023 and the first detection monitoring event was completed in October 2023. The October 2023 sample events is considered both a detection and assessment monitoring event. During each background and detection monitoring event, the monitoring well network shown in **Table 1**, was sampled for COIs contained in **Table 4**. The water quality data collected to date is in tabular form presented in **Appendix C**, and laboratory reports are provided in **Appendix D**.

Following the completion of background sampling, as specified under CCR Rule Part §257.94 and Michigan R 299.4440(8), the *Background Water Quality Statistical Certification* was submitted (HDR, 2024). The document outlines the approach and selection of the statistical method for each Appendix III and IV constituent of interest (COI) for each CCR unit. The water quality data collected from the monitoring wells located upgradient of the CCR units has been compiled and statistically analyzed to develop the original background threshold values (BTVs) for the impoundments. The statistical method chosen to represent background water quality is the upper prediction limit (UPL) and is one of the methods described in the CCR Rule Part §257.93 (f)(3) and Michigan Part 115 at 324.11511a(3).

4.2.1 Identification of Statistically Significant Increases

Following the submission of the *Background Water Quality Statistical Certification*, the memo *Former J.B. Sims Generating Station Determination of Statistically Significant Increases over Background per §257.93(h)(2) and R 299.4440(8) of the Michigan Part 115 Rules* was published (HDR, 2024a). The document outlines the process undertaken to compare groundwater samples collected in October 2023 against Upper Prediction Limits (UPLs). The resulting exceedances are considered Statistically Significant Increases (SSIs) (HDR, 2024a). The SSIs identified for Units 1/2 are contained in **Table 5**, and include boron, calcium, fluoride, sulfate, and total dissolved solids (TDS). SSIs identified for Unit 3A/B are contained in **Table 6**, and include boron, calcium, chloride, fluoride, sulfate, and TDS. The following list of Appendix III SSIs that were identified after the October 2023 sample event are considered “new” SSIs because they were not previously identified in 2019. Note monitoring well MW-05 is not sampled as a part of the updated network and monitoring wells MW-11 through MW-40 were not yet installed at the time of the 2019 SSI memorandum:

- Boron observed in MW-03, MW-04, MW-06, MW-08, MW-11, and MW-31
- Calcium observed in MW-18, MW-19, MW-30.
- Chloride observed in MW-08, MW-19, MW-30.
- Fluoride observed in MW-08, MW-11, MW-18, MW-19, MW-30, MW-31.
- Sulfate observed in MW-11, MW-18, MW-19, MW-30.
- TDS observed in MW-11, MW-18, MW-19, MW-30.

Table 5. SSIs for Units 1/2 Impoundment

Well ID	Constituent	October 2023 Concentration (mg/L)	Federal and State Program BTV (UPL) (mg/L)
MW-06	Boron	11	4.0

Table 5. SSIs for Units 1/2 Impoundment

Well ID	Constituent	October 2023 Concentration (mg/L)	Federal and State Program BTV (UPL) (mg/L)
MW-08		4.1	
MW-31		5.1	
MW-18	Calcium	360	250
MW-19		470	
MW-30		390	
MW-06	Fluoride	1.2	0.44
MW-08		0.55	
MW-18		4.5	
MW-19		2.0	
MW-30		1.2	
MW-31		4.6	
MW-18	Sulfate (as SO4)	800	100
MW-19		1,100	
MW-30		610	
MW-06	Total Dissolved Solids	1,100	940
MW-18		1,400	
MW-19		1,900	
MW-30		1,800	

Table 6. SSIs for Unit 3A/B Impoundments

Well ID	Constituent	October 2023 Sampling Result (mg/L)	Federal and State Program BTV (UPL) (mg/L)
MW-02	Boron	110	4.0
MW-03		4.3	
MW-04		4.7	
MW-11		12	
MW-03	Calcium	380	250
MW-04		360	
MW-02	Chloride (as Cl)	140	120
MW-03		180	
MW-04		150	
MW-02	Fluoride	9.7	0.44
MW-03		0.60	
MW-04		1.9	
MW-11		1.2	
MW-03	Sulfate (as SO4)	380	100
MW-04		630	
MW-12		130	
MW-02	Total Dissolved Solids	1,600	940
MW-03		2,200	

Table 6. SSIs for Unit 3A/B Impoundments			
Well ID	**Constituent**	**October 2023 Sampling Result (mg/L)**	**Federal and State Program BTV (UPL) (mg/L)**
MW-04		1,800	
MW-11		1,800	

4.2.2 Calculation of Groundwater Protection Standards

As stated in *Notice of Initiating Assessment of Corrective Measures 40 CFR §257.95(g)(3)(i) and 40 CFR §257.95(g)(5)*, both Units 1/2 Impoundment and Unit 3A/B Impoundments entered assessment monitoring on February 2, 2019 (Golder, 2019). Under the assessment monitoring program, the Unified Guidance recommends the upper tolerance limit (UTL) to represent the background concentration for this purpose. The limits can be considered as statistically equivalent BTVs to an MCL or other health-based numbers. As required in Michigan Rule R 299.4441(9), the CCR owner must establish GPS for each constituent detected in the groundwater. The GPS for the State Part 115 compliance program shall be defined as the lowest of the following:

- U.S. EPA Maximum Contaminant Level (MCL) for constituents for which an MCL has been established;
- The applicable cleanup criteria for that constituent for groundwater as established pursuant to section 20120a of the act.
- For constituents which the background level (UTL) is higher than the MCL or applicable cleanup criteria for groundwater, the background value.

The background value (UTL), maximum contaminant level (MCLs), applicable state cleanup criteria, and site groundwater protections standards (GPS) for both CCR units are provided in **Table 7**.

Table 7. Background Values and State Program Groundwater Protection Standards for Units 1/2 and Unit 3A/B					
Parameter	**Site-Specific Background Level (UTL)**	**MCL**	**State Non-Res. Drinking Water Cleanup Criteria for Groundwater***	**GSI***	**State GPS**
Unit	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Boron	4.0	NV	0.50	7.2	4.0
Calcium	250	NV	N/A	N/A	250
Chloride	120	NV	250	50	120
Fluoride	0.45	4.0	2.0	NV	2.0
Sulfate	100	NV	250	NV	250
Total Dissolved Solids	950	500	NV	NV	950
Antimony	0.0012	0.0060	0.0060	0.13	0.0060
Arsenic	0.0040	0.010	0.010	0.010	0.010
Barium	0.58	2.0	2.0	1.3[1]	1.3
Beryllium	0.000059	0.0040	NV	0.036[1]	0.0040
Cadmium	0.00015	0.0050	0.0050	0.0025[1]	0.0025[1]

Table 7. Background Values and State Program Groundwater Protection Standards for Units 1/2 and Unit 3A/B

Parameter	Site-Specific Background Level (UTL)	MCL	State Non-Res. Drinking Water Cleanup Criteria for Groundwater*	GSI*	State GPS
Unit	mg/L	mg/L	mg/L	mg/L	mg/L
Chromium	0.042	0.10	0.10	0.12[1]	0.10
Cobalt	0.0021	0.0060	0.10	0.10	0.0060
Fluoride	0.45	4.0	2.0	NV	2.0
Lead	0.0016	0.0015	0.0040	0.014[1]	0.0016
Lithium	0.10	0.040	0.35	0.44	0.10
Mercury	0.00016	0.0020	0.0020	0.0013	0.0013
Molybdenum	0.0093	0.10	0.210	3.2	0.10
Radium 226 and 228 combined	2.6	5.0	NV	NV	5.0
Selenium	0.00089	0.050	0.050	0.0050	0.0050
Thallium	0.000075	0.0020	0.0020	0.0037	0.0020
Copper	0.020	1.3	1.0	0.021[1]	0.021[1]
Iron	83	0.30	0.30	NV	83
Nickel	0.023	NV	0.10	0.12[1]	0.10
Silver	0.00011	0.10	0.0098	0.00020	0.00020
Vanadium	0.00093	NV	0.0062	0.027	0.0062
Zinc	0.038	5.00	5.00	0.27[1]	0.27[1]

*Cleanup Criteria Requirements for Response Activity (Formerly the Part 201 Generic Cleanup Criteria and Screening Levels) found in R 299.44 Generic groundwater cleanup criteria.

NV=no value

[1]Per Footnote G of Table 1 Cleanup Criteria Requirements for Response Activity (Formerly the Part 201 Generic Cleanup Criteria and Screening Levels) of the Groundwater Surface Water (GSI) criteria list, values noted are calculated based on the hardness (expressed as $CaCO_3$) of the receiving waters. Surface water sample from the Grand River (SG-01) had a hardness of 270 mg/L was used in the calculation of specific GSI values. The Grand River discharges into Lake Michigan, thus the GSI Criteria for Surface Water Protected for Drinking Water Use, is provided above.

4.2.3 Identification of Groundwater Protection Standard (GPS) Exceedances

The October 2023 sampling data from compliance wells was compared to the GPS values provided in **Table 7**, and several COIs were found to exceed GPS at both CCR units. To determine if an exceedance of a GPS value was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells. The statistical output files are in **Appendix E**. Analytical data tables showing comparison raw sampling data to GPS values is contained in **Appendix C**.

Units 1/2 Impoundment

Concentrations that exceeded GPS at statistically significant levels (SSLs) are provided in **Table 8** for Units 1/2 Impoundment. SSLs identified in 2019 for the Units 1/2 Impoundments included lithium at MW-06, this is consistent with the updated SSLs. The October 2023 SSLs for Units 1/2 are shown in comparison to 2021 SSLs below. Chromium and Cobalt were previously identified but are not identified as SSLs for Units 1/2 as of October 2023. Lead was identified as an SSL in MW-20 which was not yet installed at the time of the 2021 Annual Report. Excluding

the COIs above, the SSLs identified in October 2023 are generally consistent with previous observations. Note monitoring well MW-05 is not included as a compliance monitoring location for the current groundwater network. Also wells MW-11 through MW-40 were installed after the *2021 Annual Groundwater Monitoring & Corrective Action Report* and therefore were not sampled (Golder, 2022).

2021 Identified SSLs (Golder, 2022)	October 2023 SSLs
• Arsenic – MW-05 • Boron – MW-01R, MW-02, MW-10 • Calcium –MW-09 • Chloride – MW-01R, MW-10 • Chromium – MW-02 • Cobalt – MW-01R • Fluoride – MW-01R, MW-10 • Lithium –MW-01R, MW-06, MW-09, MW-10 • Lead – No SSL • Sulfate – MW-01R • TDS – MW-01R, MW-05, MW-06, MW-10	• Arsenic – MW-08, MW-18 • Boron –MW-06, MW-07, MW-08, MW-10, MW-31 • Calcium –MW-18, MW-19, MW-30 • Chloride – MW-10 • Chromium – No SSL • Cobalt – No SSL • Fluoride –MW-10, MW-18, MW-31 • Lithium –MW-06, MW-10, MW-30, MW-32 • Lead – MW-20 • Sulfate – MW-10, MW-18, MW-19, MW-30 • TDS –MW-06, MW-10, MW-18, MW-19, MW-30

Table 8. October 2023 LCLs that Exceed GPS for the Units 1/2 Impoundment

Well	Constituent	Unit	95% LCL	State GPS
MW-06	Boron	mg/L	8.9	4.0
	Lithium	mg/L	0.18	0.10
	Total Dissolved Solids	mg/L	1200	950
MW-07	Boron	mg/L	11	4.0
MW-08	Arsenic	mg/L	0.022	0.010
	Boron	mg/L	4.9	4.0
MW-10	Boron	mg/L	12	4.0
	Chloride (as Cl)	mg/L	150	120
	Fluoride	mg/L	4.7	2.0
	Lithium	mg/L	0.81	0.10
	Sulfate (as SO4)	mg/L	310	250
	Total Dissolved Solids	mg/L	1700	950
MW-18	Arsenic	mg/L	0.020	0.010
	Calcium	mg/L	290	250
	Fluoride	mg/L	3.6	2.0
	Sulfate (as SO4)	mg/L	650	250
	Total Dissolved Solids	mg/L	1300	950
MW-19	Calcium	mg/L	450	250
	Sulfate (as SO4)	mg/L	890	250
	Total Dissolved Solids	mg/L	1800	950
MW-20	Lead	mg/L	0.0018	0.0016

Table 8. October 2023 LCLs that Exceed GPS for the Units 1/2 Impoundment				
Well	Constituent	Unit	95% LCL	State GPS
MW-30	Calcium	mg/L	400	250
	Lithium	mg/L	0.11	0.10
	Sulfate (as SO4)	mg/L	790	250
	Total Dissolved Solids	mg/L	2100	950
MW-31	Boron	mg/L	4.1	4.0
	Fluoride	mg/L	4.7	2.0
MW-32	Lithium	mg/L	0.11	0.10

Unit 3A/B Impoundments

Concentrations that exceeded GPS at statistically significant levels (SSLs) are provided in **Table 9** for Unit 3A/B Impoundments. The SSLs identified in the 2021 Annual Groundwater & Corrective Action Report included arsenic, chromium, and cobalt which are no longer SSLs as of October 2023. Similar to Units 1/2, lead was previously not identified as an SSL but is currently at MW-02. Excluding the COIs above, the SSLs identified in October 2023 are generally consistent with previous observations. Note monitoring well MW-05 is not included as a monitoring location for the current well network. Also wells installed after MW-10 (MW-11 through MW-40) were not yet installed at the time of the *2021 Annual Groundwater Monitoring & Corrective Action Report* and therefore were not sampled (Golder, 2022).

Identified SSLs (Golder, 2022)	Current SSLs (2023)
• Arsenic – MW-05 • Boron – MW-01R, MW-02, MW-10 • Calcium – MW-03, MW-04, MW-05, MW-09 • Chloride – MW-01R, MW-03, MW-04, MW-10 • Chromium – MW-02 • Cobalt – MW-01R • Fluoride – MW-01R, MW-02, MW-10 • Lead – No SSL • Lithium –MW-01R, MW-02, MW-05, MW-06, MW-09, MW-10 • Sulfate – MW-01R, MW-03, MW-04 • TDS – MW-01R, MW-02, MW-03, MW-04, MW-05, MW-06, MW-10	• Arsenic – No SSL • Boron – MW-01R, MW-02, MW-09, MW-10 • Calcium – MW-03, MW-04, MW-09 • Chloride – MW-02, MW-03, MW-04, MW-10 • Chromium – No current SSL • Cobalt – No SSL • Fluoride – MW-01R, MW-02, MW-09, MW-10 • Lead – MW-02 • Lithium – MW-01R, MW-02, MW-09, MW-10 • Sulfate – MW-03, MW-04, MW-10 • TDS – MW-01R, MW-02, MW-03, MW-04, MW-09, MW-10

Table 9. October 2023 LCLs that Exceed GPS for Unit 3A/B Impoundments				
Well I.D.	Constituent	Unit	95% LCL	State GPS
MW-02	Boron	mg/L	88	4.0
	Chloride (as Cl)	mg/L	130	120
	Fluoride	mg/L	8.7	2.0
	Lead	mg/L	0.0019	0.0016

Table 9. October 2023 LCLs that Exceed GPS for Unit 3A/B Impoundments				
Well I.D.	Constituent	Unit	95% LCL	State GPS
	Lithium	mg/L	1.2	0.10
	Total Dissolved Solids	mg/L	1700	950
MW-03	Calcium	mg/L	350	250
	Chloride (as Cl)	mg/L	160	120
	Sulfate (as SO4)	mg/L	320	250
	Total Dissolved Solids	mg/L	2200	950
MW-04	Calcium	mg/L	340	250
	Chloride (as Cl)	mg/L	180	120
	Sulfate (as SO4)	mg/L	410	250
	Total Dissolved Solids	mg/L	1800	950
MW-10	Boron	mg/L	12	4.0
	Chloride (as Cl)	mg/L	150	120
	Fluoride	mg/L	4.7	2.0
	Lithium	mg/L	0.81	0.10
	Sulfate (as SO4)	mg/L	310	250
	Total Dissolved Solids	mg/L	1700	950
MW-01R	Boron	mg/L	89	4.0
	Fluoride	mg/L	8.8	2.0
	Lithium	mg/L	2.0	0.10
	Total Dissolved Solids	mg/L	2300	950
MW-09	Boron	mg/L	5.5	4.0
	Calcium	mg/L	300	250
	Fluoride	mg/L	2.4	2.0
	Lithium	mg/L	0.29	0.10
	Total Dissolved Solids	mg/L	1100	950

5.0 Summary

The following observations are based on groundwater monitoring program development during fourth quarter 2023:

- One groundwater sampling event was conducted in fourth quarter 2023. The first detection/assessment monitoring event following the update to the background water quality was conducted in October 2023.
- Background values were calculated in the fourth quarter of 2023 and published in the Background Statistical Certification (HDR, 2024).
- Groundwater Protection Standards have been calculated. The values will also be published in the Hydrogeologic Monitoring Plan, anticipated in the first quarter of 2024.

- Groundwater flow measured in the fourth quarter beneath Units 1/2 Impoundment flowed generally eastward toward the wetland and south near MW-31 toward SG-02.
- Groundwater flow measured in the fourth quarter beneath Unit 3A/B Impoundments is primarily west northwest toward the Grand River.
- No monitoring locations were installed or abandoned or repaired in fourth quarter 2023.
- The proposal to install 17 dedicated pressure transducers to monitor hourly groundwater measurements in select wells, staff gauges, and stilling wells was approved and installation began December 21, 2023. Due to weather conditions, the installation has yet to be completed and no data has been collected but is anticipated for February 2024.
- October 2023 data was compared to detection monitoring UPLs and SSIs were identified in *Former J.B. Sims Generating Station Determination of Statistically Significant Increases over Background per §257.93(h)(2) and R 299.4440(8) of the Michigan Part 115 Rules* (HDR, 2024a).
    - SSIs identified for Units 1/2 Impoundments after the October 2023 sample event include:
        - Boron - MW-06, MW-08, MW-31
        - Calcium - MW-18, MW-19, MW-30
        - Chloride - MW-08, MW-19, MW-30
        - Chloride - MW-08, MW-18, MW-19, MW-30, MW-31
        - Sulfate - MW-18, MW-19, MW-30
        - TDS - MW-18, MW-19, MW-30
    - SSIs identified for Unit 3A/B Impoundments after the October 2023 sample event include:
        - Boron - MW-03, MW-04, MW-06
        - Chloride - MW-11
        - Sulfate - M-11
        - TDS - MW-11
- The LCLs were calculated after the October 2023 assessment monitoring event and were compared to GPS values. The following SSLs were identified for Units 1/2 Impoundment:
    - Arsenic - MW-08, MW-18
    - Boron - MW-06, MW-07, MW-08, MW-10, MW-31
    - Calcium - MW-18, MW-19, MW-30
    - Fluoride - MW-10, MW-18, MW-31
    - Lead - MW-20
    - Lithium - MW-06, MW-10, MW-30, MW-32
    - Sulfate - MW-10, MW-18, MW-19, MW-30
    - TDS - MW-06, MW-10, MW-19, MW-19, MW-30

An SSL memorandum, *Determination of Statistically Significant Levels over Groundwater Protection Standards per §257.95(g) and Michigan Rule R 299.4441*, documenting the selection of GPS values and determination of SSLs will be published in January 2024.

- The LCLs were calculated after the October 2023 assessment monitoring event and were compared to GPS values. The following SSLs were identified for the Unit 3A/B Impoundments:
    - Boron - MW-01R, MW-02, MW-09, MW-10
    - Calcium - MW-03, MW-04, MW-09
    - Chloride - MW-02, MW-03, MW-04, MW-10
    - Fluoride - MW-01R, MW-02, MW-09, MW-10
    - Lead - MW-02
    - Lithium - MW-01R, MW-02, MW-09, MW-10,
    - Sulfate - MW-03, MW-04, MW-10
    - TDS - MW-01R, MW-02, MW-03, MW-04, MW-09, MW-10

An SSL memorandum, *Determination of Statistically Significant Levels over Groundwater Protection Standards per §257.95(g) and Michigan Rule R 299.4441*, documenting the selection of GPS values and determination of SSLs will be published in January 2024.

6.0 References

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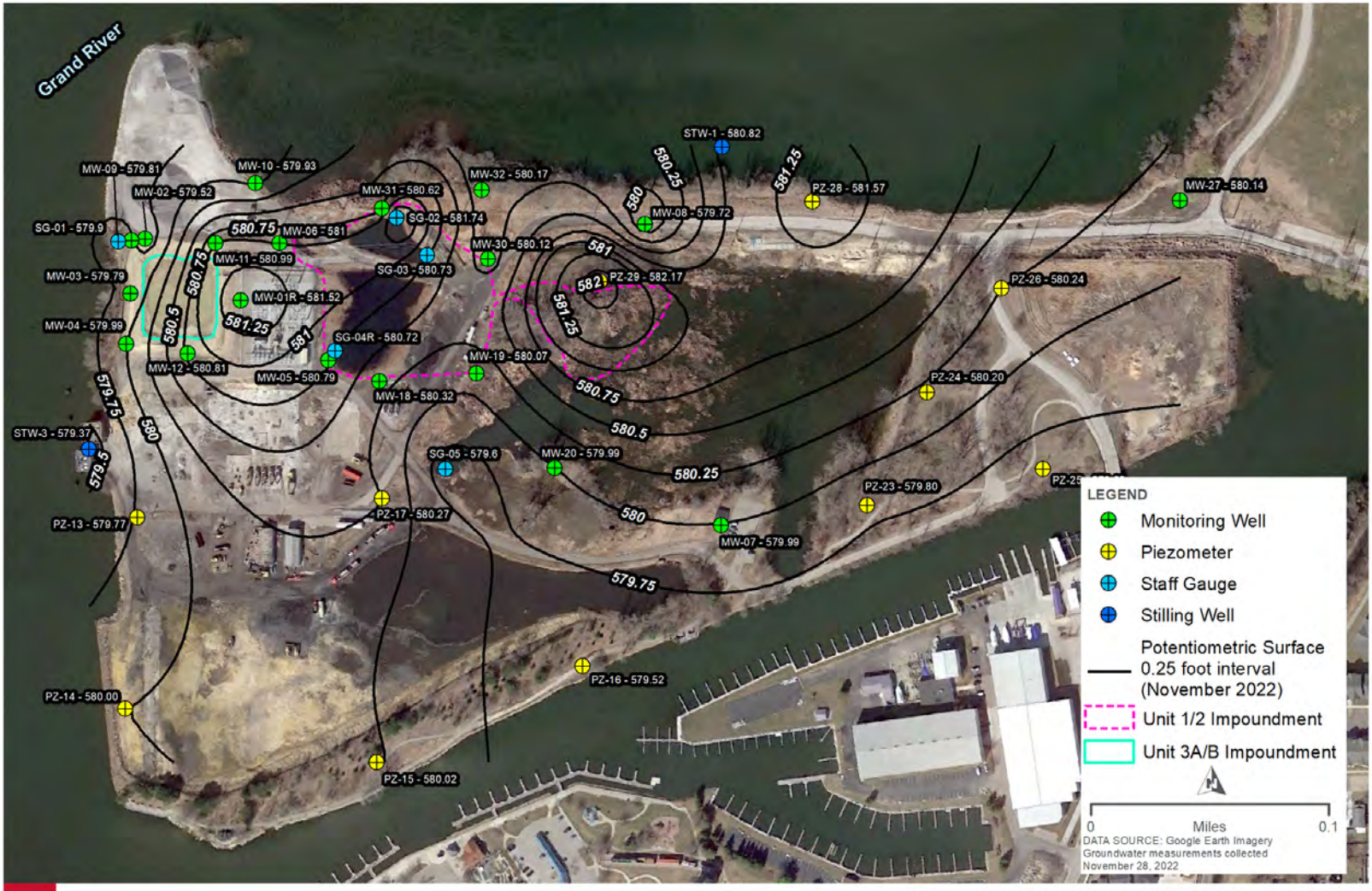
Appendix A

Potentiometric Surface Maps



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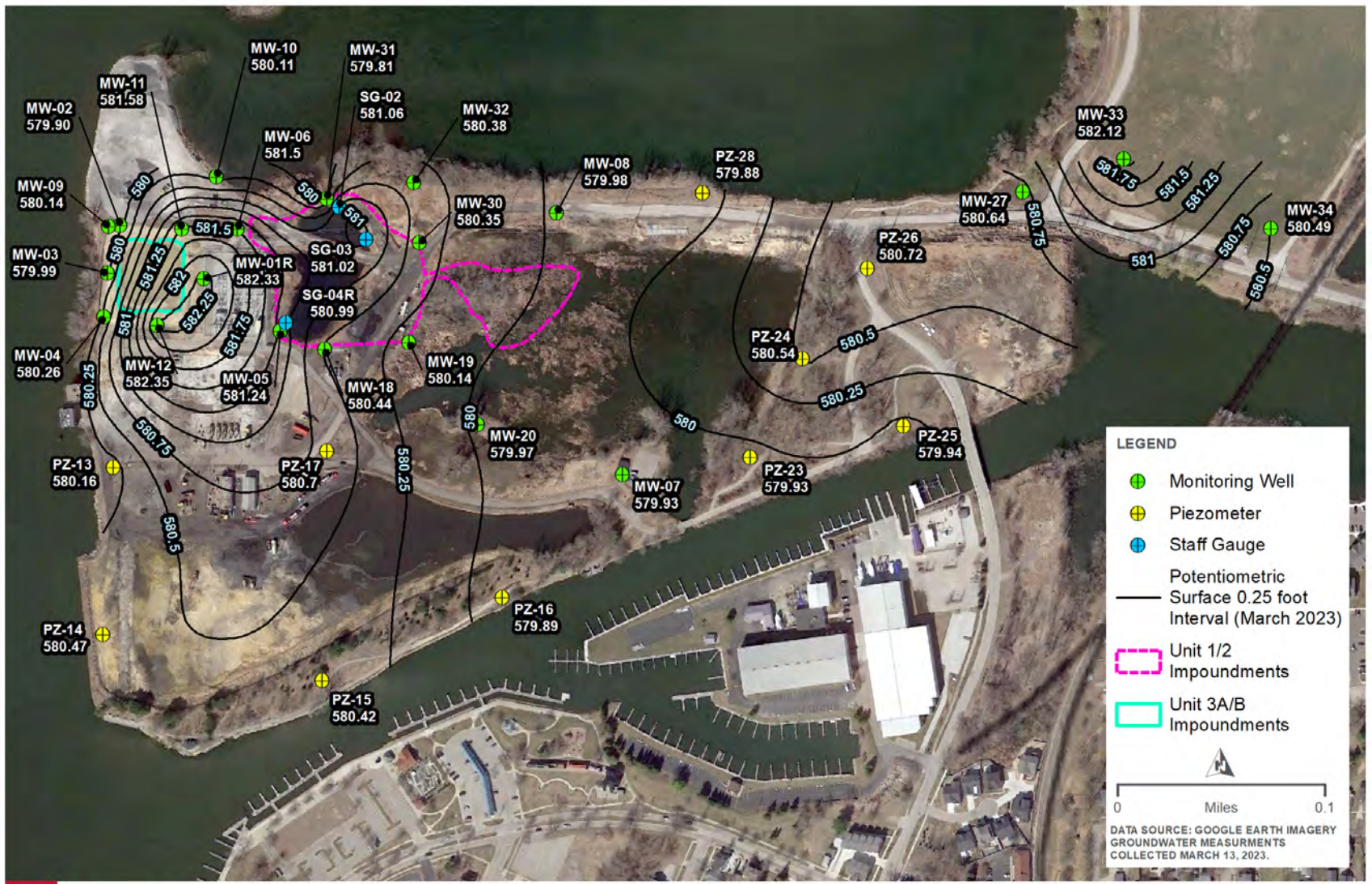

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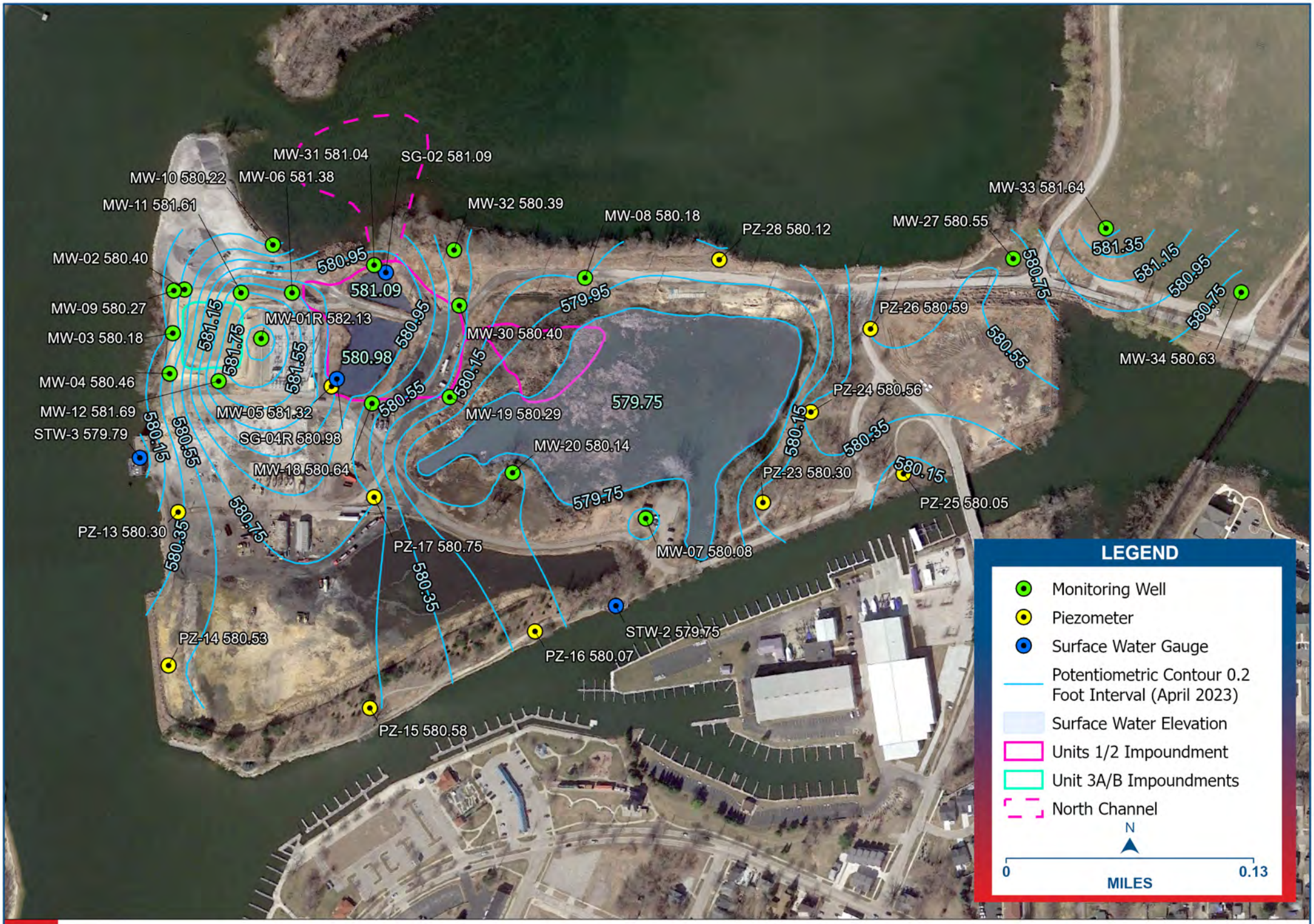

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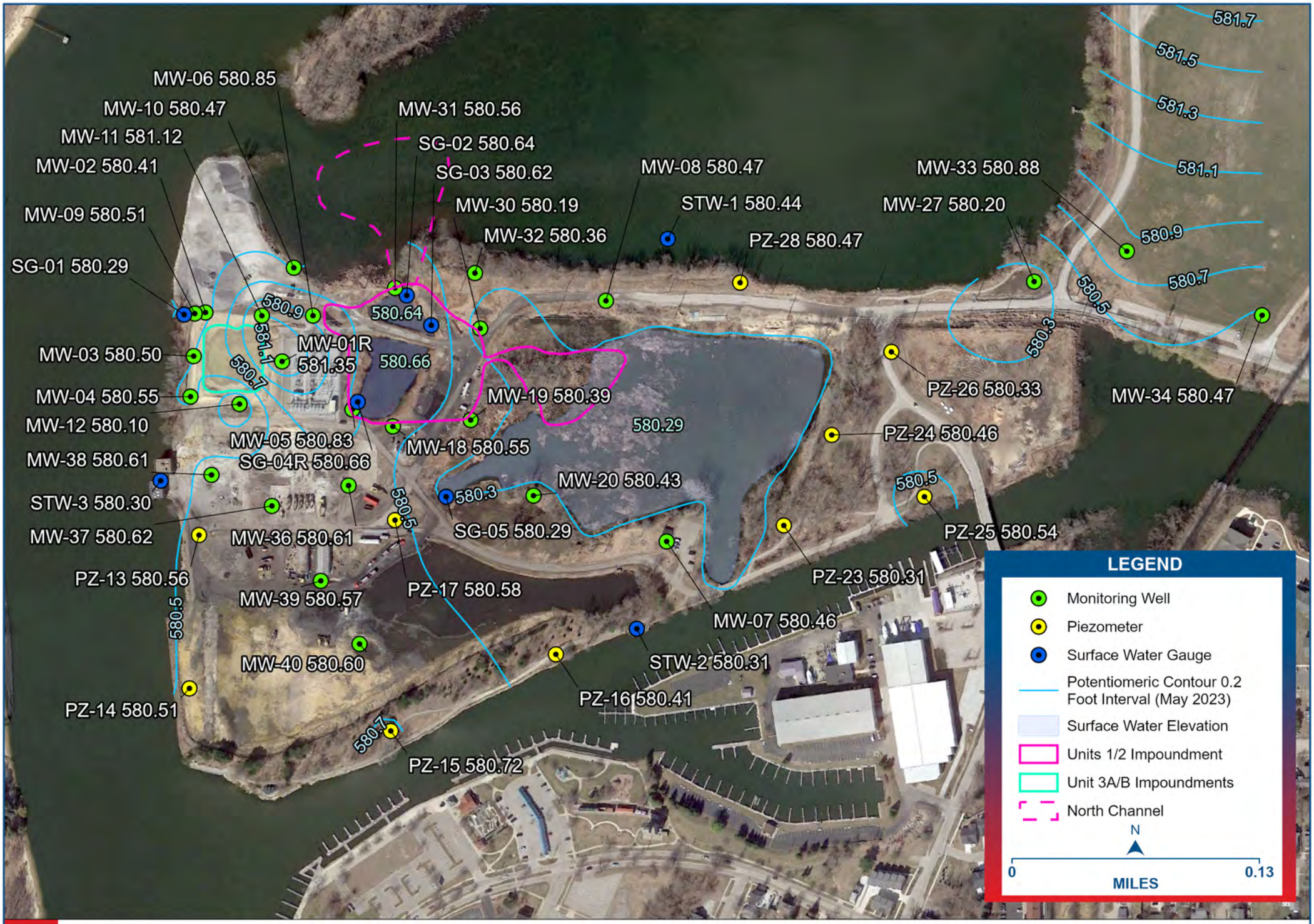

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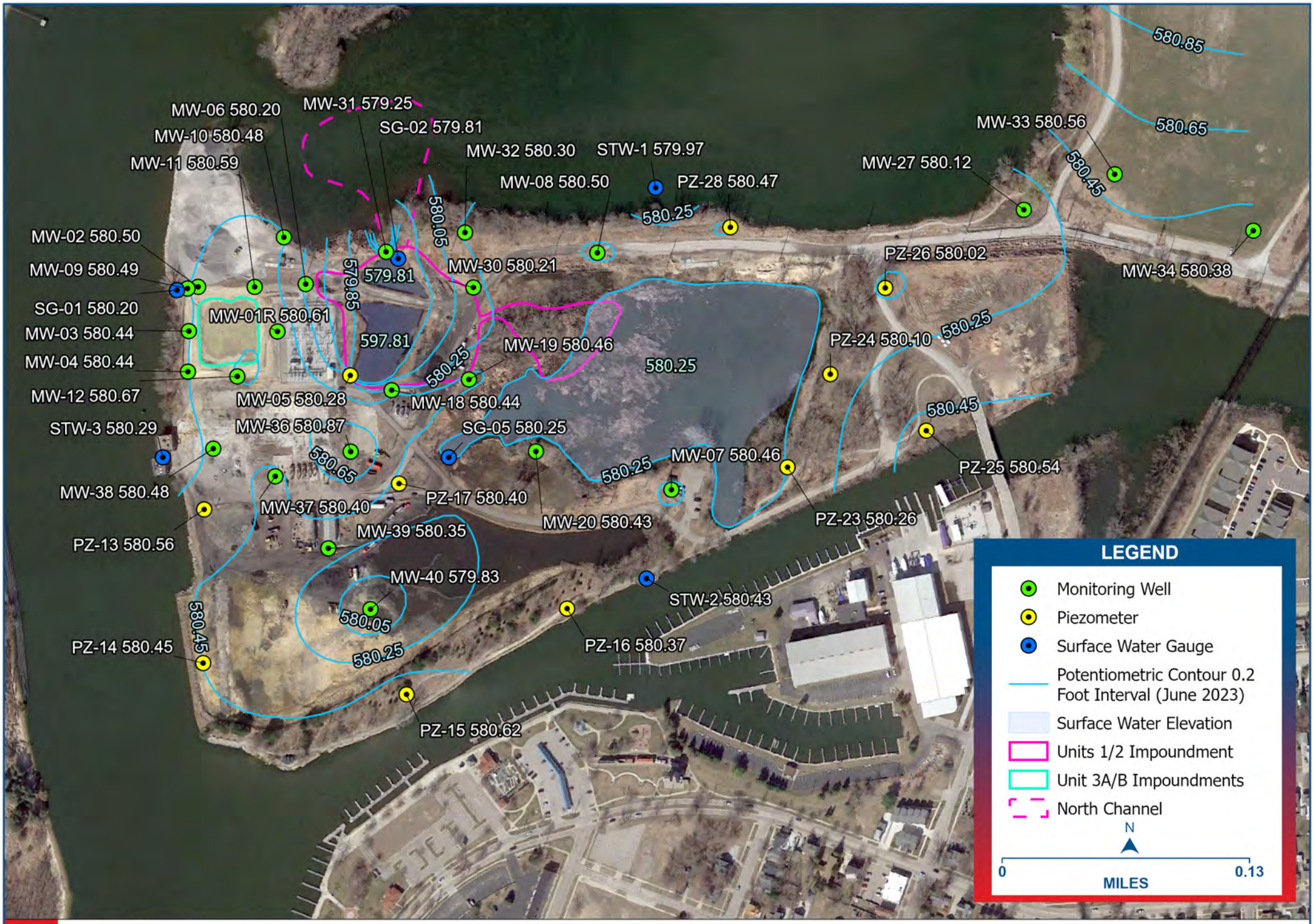

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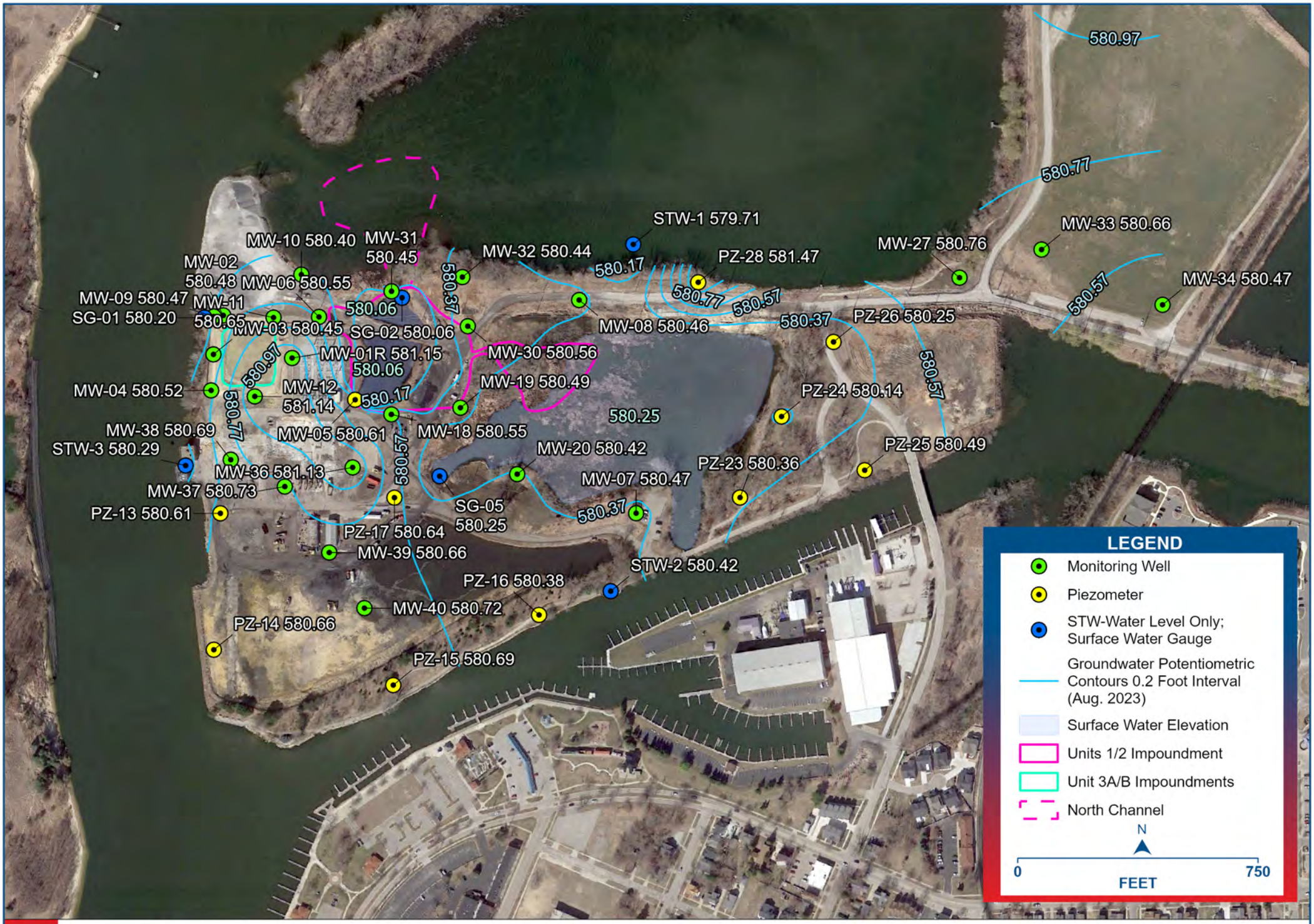

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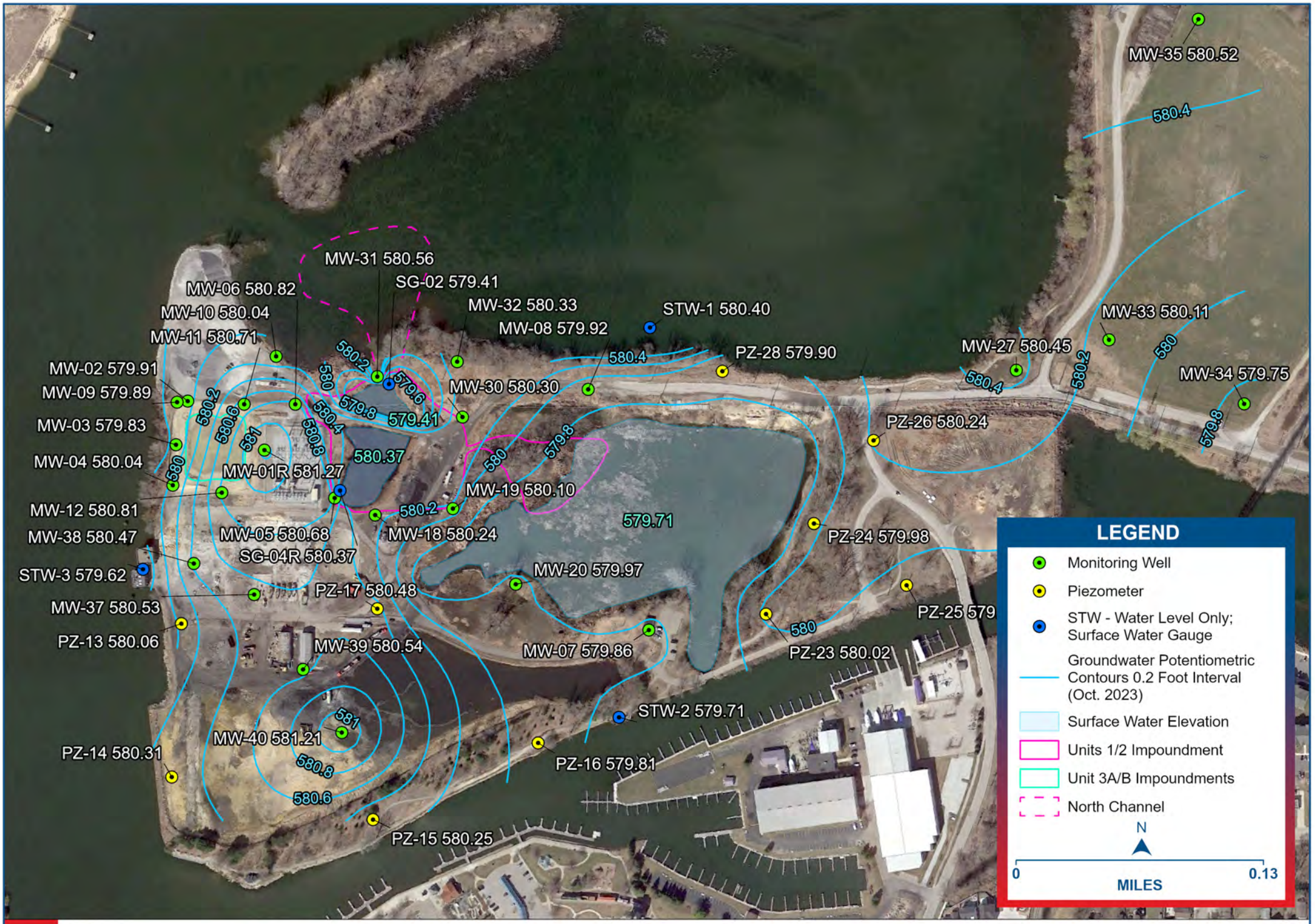

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Appendix B

Data Validation Reports

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 1 – November/December 2022

Data Package Number: 22L0089
Data Validator: Aryka Thomson

Lab Report Date: 12/27/2022
Data Validation Completion Date: 03/07/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-1R	GW	22L0089-01	11/29/2022	X	X	X	X	X	X	
MW-2	GW	22L0089-03	11/28/2022	X	X	X	X	X	X	
MW-03	GW	22L0089-19	11/28/2022	X	X	X	X	X	X	
MW-04	GW	22L0089-21	11/28/2022	X	X	X	X	X	X	
MW-6	GW	22L0089-04	11/29/2022	X	X	X	X	X	X	
MW-07	GW	22L0089-22	11/30/2022	X	X	X	X	X	X	
MW-8	GW	22L0089-06	12/01/2022	X	X	X	X	X	X	
MW-9	GW	22L0089-05	11/28/2022	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	22L0089-07	11/29/2022	X	X	X	X	X	X	
MW-11	GW	22L0089-08	11/29/2022	X	X	X	X	X	X	
MW-12	GW	22L0089-09	11/28/2022	X	X	X	X	X	X	
MW-18	GW	22L0089-10	11/30/2022	X	X	X	X	X	X	
MW-19	GW	22L0089-11	11/30/2022	X	X	X	X	X	X	
MW-20	GW	22L0089-20	11/30/2022	X	X	X	X	X	X	
MW-27	GW	22L0089-18	11/30/2022	X	X	X	X	X	X	
MW-30	GW	22L0089-12	11/30/2022	X	X	X	X	X	X	
MW-31	GW	22L0089-14	12/01/2022	X	X	X	X	X	X	
MW-32	GW	22L0089-15	11/30/2022	X	X	X	X	X	X	
MW-33	GW	22L0089-16	12/01/2022	X	X	X	X	X	X	
MW-34	GW	22L0089-17	12/01/2022	X	X	X	X	X	X	
SG-02	SW	22L0089-23	12/02/2022	X	X	X	X	X	X	
SG-03	SW	22L0089-24	12/02/2022	X	X	X	X	X	X	
SG-04R	SW	22L0089-25	12/02/2022	X	X	X	X	X	X	
SG-05	SW	22L0089-26	12/02/2022	X	X	X	X	X	X	
MW-1RD	QC	22L0089-02	11/29/2022	X	X	X	X	X	X	
MW-30D	QC	22L0089-13	11/30/2022	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness (not requested on COC but requested after samples were received)

Any planned sampling or analysis NOT completed? If yes, explain: SG-06 was not sampled because "area near SG-06 is dry, nearest water approximately 50-60 feet SE".

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records		X	Field instruments calibrated daily according to manufacturer specifications			X	Field calibration documentation not stored for record. Field samplers have been notified to do so for future events.
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		TDS in MW-1R, MW-1RD, MW-03, MW-19, and MW-

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
							30 were analyzed outside the 7-day hold time
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for Ca and Fe were not met
			MDLs<RLs		X		RL=MDL for Ag, Zn
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for B, Ca, Mg, and Na
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Cu was detected in MW-1R and not detected in MW-1RD. Combined Radium RPD was 61% in MW-1R/MW-1RD pair and 38% in MW-30/MW-30D pair
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	TSS duplicate RPDs outside control limits affecting one project sample; TDS duplicate RPDs outside control limits affecting one project sample
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Boron, calcium, and sodium matrix spikes were outside control limits in T130269-MS1. Boron, calcium, and potassium matrix spikes were outside control limits in T130269-MS2. Calcium matrix spikes were outside control limits in T130418-MS1. Calcium and magnesium matrix spikes were outside control limits in T130418-MS2. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

Comments:

TDS in MW-1R, MW-1RD, MW-03, MW-19, and MW-30 were analyzed outside the 7-day hold time and required qualification as estimated with low bias (J-).

Cu was detected in parent sample MW-1R and not detected in field duplicate MW-1RD. Cu in MW-1R required qualification as estimated with high bias (J+) and as estimated but not detected (UJ) in the MW-1RD.

The TSS results in laboratory duplicate T130210-DUP1 had RPD outside control limits. TSS in MW-11 required qualification as estimated (J).

The TDS results in laboratory duplicate T130291-DUP1 had RPD outside control limits. TDS in MW-33 required qualification as estimated (J).

pH in all samples required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

Combined radium RPD was outside control limits in both parent/field duplicate pairs. The RPD between combined radium in MW-1R and MW-1RD was 61%. The RPD between combined radium in MW-30 and MW-30D was 38%. Rad-226, Rad-228, and Combined Rad 226+228 required qualification as estimated (UJ) in MW-1R, MW-1RD, MW-30, and MW-30D.

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 2 – January 2023

Data Package Number: 23A0179
Data Validator: Aryka Thomson

Lab Report Date: 01/26/2023
Data Validation Completion Date: 03/07/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23A0179-07	01/03/2023	X	X	X	X	X	X	
MW-02	GW	23A0179-09	01/04/2023	X	X	X	X	X	X	
MW-03	GW	23A0179-12	01/04/2023	X	X	X	X	X	X	
MW-04	GW	23A0179-11	01/04/2023	X	X	X	X	X	X	
MW-06	GW	23A0179-06	01/03/2023	X	X	X	X	X	X	
MW-07	GW	23A0179-23	01/04/2023	X	X	X	X	X	X	
MW-08	GW	23A0179-24	01/05/2023	X	X	X	X	X	X	
MW-09	GW	23A0179-10	01/04/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	23A0179-08	01/04/2023	X	X	X	X	X	X	
MW-11	GW	23A0179-05	01/03/2023	X	X	X	X	X	X	
MW-12	GW	23A0179-04	01/03/2023	X	X	X	X	X	X	
MW-18	GW	23A0179-17	01/05/2023	X	X	X	X	X	X	
MW-19	GW	23A0179-03	01/03/2023	X	X	X	X	X	X	
MW-20	GW	23A0179-22	01/04/2023	X	X	X	X	X	X	
MW-27	GW	23A0179-25	01/05/2023	X	X	X	X	X	X	
MW-30	GW	23A0179-01	01/03/2023	X	X	X	X	X	X	
MW-31	GW	23A0179-13	01/04/2023	X	X	X	X	X	X	
MW-32	GW	23A0179-14	01/04/2023	X	X	X	X	X	X	
MW-33	GW	23A0179-15	01/05/2023	X	X	X	X	X	X	
MW-34	GW	23A0179-16	01/05/2023	X	X	X	X	X	X	
SG-02	GW	23A0179-21	01/05/2023	X	X	X	X	X	X	
SG-03	GW	23A0179-20	01/05/2023	X	X	X	X	X	X	
SG-04R	GW	23A0179-19	01/05/2023	X	X	X	X	X	X	
SG-05	GW	23A0179-18	01/05/2023	X	X	X	X	X	X	
MWT-27	QC	23A0179-26	01/05/2023	X	X	X	X	X	X	
MWT-30	QC	23A0179-02	01/03/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness (not requested on COC but requested after samples were received)

Any planned sampling or analysis NOT completed? If yes, explain: SG-06 was not sampled because "Area is dry; nearest surface water ~50-60 ft away".

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records		X	Field instruments calibrated daily according to manufacturer specifications			X	Field calibration documentation not stored for record. Field samplers have been notified to do so for future events.
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 13 samples

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met B – 4 samples (results>RL) Ca – all samples (results>RL) Cl^- – 1 sample (results>RL) Fe – all samples (results>RL) SO4 – 14 samples (results>RL) TDS – 14 samples (results>RL)
			MDLs<RLs		X		RL=MDL for Ag, Zn
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for Na
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Cu was detected in MW-30 and not detected in MWT-30. Combined radium had RPD > 20% in both parent/field duplicate pairs
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	TDS duplicate RPDs outside control limits affecting one project sample.

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Sodium matrix spikes were outside control limits in T131230-MS1. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

Vanadium matrix spikes were outside control limits in T131230-MS1. Because there was no positive result in the non-spiked version of the sample, no data required qualification.

“The LCS recovered at (135%). The limits in our LIMS system at 75-125 reflect the requirements of a regulatory agency that represents a large amount of our work. However the samples associated with this LCS are not from this agency and are therefore held to our in-house statistical limits of (62-148%) per method requirements. The LCS passes, no further action is required (LCS 160-598535/2-A).” No qualification was required.

“The LCS recovered at (128%). The limits in our LIMS system at 75-125 reflect the requirements of a regulatory agency that represents a large amount of our work. However the samples associated with this LCS are not from this agency and are therefore held to our in-house statistical limits of (62-148%) per method requirements. The LCS passes, no further action is required (LCS 160-598539/2-A).” No qualification was required.

Comments:

Cu was detected in parent sample MW-30 and not detected in field duplicate MWT-30. Cu in MW-30 required qualification as estimated with high bias (J+) and as estimated but not detected (UJ) in the MWT-30.

The TDS results in laboratory duplicate T131189-DUP1 had RPD outside control limits. TDS in MW-31 required qualification as estimated (J).

pH in samples MW-01R, MW-06, MW-07, MW-10, MW-11, MW-12, MW-18, MW-19, MW-20, MW-30, MWT-30, MW-31, and MW-32 required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

Rad-228 MB 160-598539/1-A was detected above the MDC but below the RL. Rad-228 and consequently combined radium required qualification as estimated with high bias (J+) in associated samples MW-07, MW-08, MW-20, MW-27, MWT-27, and SG-02.

Combined radium had an RPD of 37% in the MW-27/MWT-27 parent/field duplicate pair. Rad-228 and combined radium in both MW-27 and MWT-27 required qualification as estimated (J). The J+ qualifier resulting from the MB detection has been replaced by estimated with no bias (J).

Combined radium had an RPD of 31% in the MW-30/MWT-30 parent/field duplicate pair. Rad-226, Rad-228, and combined radium in both MW-30 and MWT-30 required qualification as estimated (J) or (UJ) if non-detect.

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 3 – February 2023

Data Package Number: 23B0260
Data Validator: Aryka Thomson

Lab Report Date: 03/20/2023
Data Validation Completion Date: 04/10/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23B0260-19	02/08/2023	X	X	X	X	X	X	
MW-02	GW	23B0260-20	02/08/2023	X	X	X	X	X	X	
MW-03	GW	23B0260-13	02/07/2023	X	X	X	X	X	X	
MW-04	GW	23B0260-12	02/07/2023	X	X	X	X	X	X	
MW-06	GW	23B0260-11	02/06/2023	X	X	X	X	X	X	
MW-07	GW	23B0260-06	02/07/2023	X	X	X	X	X	X	
MW-08	GW	23B0260-07	02/07/2023	X	X	X	X	X	X	
MW-09	GW	23B0260-01	02/06/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	23B0260-10	02/06/2023	X	X	X	X	X	X	
MW-11	GW	23B0260-21	02/08/2023	X	X	X	X	X	X	
MW-12	GW	23B0260-14	02/07/2023	X	X	X	X	X	X	
MW-18	GW	23B0260-17	02/08/2023	X	X	X	X	X	X	
MW-19	GW	23B0260-16	02/08/2023	X	X	X	X	X	X	
MW-20	GW	23B0260-05	02/07/2023	X	X	X	X	X	X	
MW-27	GW	23B0260-09	02/07/2023	X	X	X	X	X	X	
MW-30	GW	23B0260-03	02/06/2023	X	X	X	X	X	X	
MW-31	GW	23B0260-08	02/07/2023	X	X	X	X	X	X	
MW-32	GW	23B0260-15	02/08/2023	X	X	X	X	X	X	
MW-33	GW	23B0260-18	02/08/2023	X	X	X	X	X	X	
MW-34	GW	23B0260-22	02/08/2023	X	X	X	X	X	X	
MWT-09	QC	23B0260-02	02/06/2023	X	X	X	X	X	X	
MWT-30	QC	23B0260-04	02/06/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness

Any planned sampling or analysis NOT completed? If yes, explain: SG-02, SG-03, and SG-04R were not sampled because the surface water was frozen solid. SG-05 was not sampled because the area was dry with the nearest surface water ~20-30 feet northeast. SG-06 was not sampled because the area was dry with the nearest surface water ~50-60 ft away.

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 11 samples

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met B – 3 samples (results > RL) Be – 4 samples (ND) Ca – 22 samples (results > RL) Fe – 20 samples (results > RL except 1 sample) Mo – 4 samples (ND except 1 sample) Ni – 4 samples (ND) SO4 – 15 samples (results < RL) TDS – 2 samples (results > RL) V – 4 samples (ND) Zn – 4 samples (ND)
			MDLs<RLs		X		RL=MDL for Ag, Zn
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for F
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Zn was not detected in MW-09 and detected in MWT-09. TSS was not detected in MW-30 and detected in MWT-30. Combined radium had RPD > 20% in both parent/field duplicate pairs
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Reporting limits were raised on the following samples and constituents due to sample matrix interferences with the internal standards. No qualification was required.

Constituent	**Samples**
Antimony	MW-30, MWT-30, MW-10, MW-06, MW-04, MW-03, MW-19, MW-18, MW-01R, MW-02
Arsenic	MW-30, MWT-30
Beryllium	MW-30, MWT-30, MW-03, MW-19
Cadmium	MW-30, MWT-30, MW-10, MW-06, MW-04, MW-03, MW-19, MW-18, MW-01R, MW-02
Chromium	MW-19
Copper	MW-30, MWT-30, MW-03, MW-19
Lead	MW-09, MWT-09, MW-30, MWT-30, MW-10, MW-06, MW-04, MW-03, MW-19, MW-18, MW-01R, MW-02, MW-11
Molybdenum	MW-30, MWT-30, MW-03, MW-19
Nickel	MW-30, MWT-30, MW-03, MW-19
Silver	MW-30, MWT-30, MW-10, MW-06, MW-04, MW-03, MW-19, MW-18, MW-01R, MW-02
Thallium	MW-09, MWT-09, MW-30, MWT-30, MW-10, MW-06, MW-04, MW-03, MW-19, MW-18, MW-01R, MW-02, MW-11

Fluoride matrix spike was outside control limits in T132475-MS1. Fluoride in MW-33 required qualification as estimated (J).

Calcium matrix spikes were outside control limits in T132721-MS2 and T132722-MS1. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

Vanadium matrix spikes were outside control limits in T132722-MS1. Because there was no positive result in the non-spiked version of the sample, no data required qualification.

Boron was found in the method blank T132722-BLK1. Because the concentration in the blank was less than 10% of the sample concentration, no qualification was required.

Comments:

Zinc was not detected in parent sample MW-09 and detected in field duplicate MWT-09. Zinc in MW-09 required qualification as estimated but not detected (UJ) and MWT-09 required qualification as estimated with high bias (J+).

TSS was not detected in parent sample MW-30 and detected in field duplicate MWT-30. TSS in MW-30 required qualification as estimated but not detected (UJ) and MWT-30 required qualification as estimated with high bias (J+).

pH in samples MW-02, MW-09, MWT-09, MW-10, MW-11, MW-18, MW-19, MW-20, MW-30, MWT-30, and MW-32 required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

Combined radium had an RPD of 37% in the MW-09/MWT-09 parent/field duplicate pair. Rad-226 required qualification as estimated with low bias (J-) in MW-09 and as estimated with high bias (J+) in MWT-09. Rad-228 required qualification as estimated with high bias (J+) in MW-09 and as estimated with low bias (J-) in MWT-09. Combined radium required qualified as estimated (J) in both MW-09 and MWT-09. Since all results were non-detect, these qualifiers have been resolved to estimated but not detected (UJ).

Combined radium had an RPD of 35% in the MW-30/MWT-30 parent/field duplicate pair. Rad-226, Rad-228, and combined radium required qualification as estimated with low bias (J-) in MW-30 and with high bias (J+) in MWT-30. MW-30 results and Rad-226 in MWT-30 were non-detect, so required qualifiers have been resolved to estimated but not detected (UJ).

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 4 – March 2023

Data Package Number: 23C0625
Data Validator: Andrew Byks

Lab Report Date: 04/20/2023
Data Validation Completion Date: 04/21/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23C0625-01	03/14/2023	X	X	X	X	X	X	
MW-02	GW	23C0625-02	03/14/2023	X	X	X	X	X	X	
MW-03	GW	23C0625-03	03/14/2023	X	X	X	X	X	X	
MW-04	GW	23C0625-04	03/14/2023	X	X	X	X	X	X	
MW-06	GW	23C0625-05	03/14/2023	X	X	X	X	X	X	
MW-07	GW	23C0625-06	03/13/2023	X	X	X	X	X	X	
MW-08	GW	23C0625-07	03/14/2023	X	X	X	X	X	X	
MW-09	GW	23C0625-08	03/14/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	23C0625-09	03/14/2023	X	X	X	X	X	X	
MW-11	GW	23C0625-10	03/14/2023	X	X	X	X	X	X	
MW-12	GW	23C0625-11	03/13/2023	X	X	X	X	X	X	
MW-18	GW	23C0625-12	03/13/2023	X	X	X	X	X	X	
MW-19	GW	23C0625-13	03/13/2023	X	X	X	X	X	X	
MW-20	GW	23C0625-14	03/13/2023	X	X	X	X	X	X	
MW-27	GW	23C0625-15	03/13/2023	X	X	X	X	X	X	
MW-30	GW	23C0625-16	03/13/2023	X	X	X	X	X	X	
MW-31	GW	23C0625-17	03/14/2023	X	X	X	X	X	X	
MW-32	GW	23C0625-18	03/14/2023	X	X	X	X	X	X	
MW-33	GW	23C0625-25	03/15/2023	X	X	X	X	X	X	
MW-34	GW	23C0625-26	03/15/2023	X	X	X	X	X	X	
MWT-12	QC	23C0625-19	03/13/2023	X	X	X	X	X	X	
MWT-27	QC	23C0625-20	03/13/2023	X	X	X	X	X	X	
SG-02	SW	23C0625-21	03/14/2023	X	X	X	X	X	X	
SG-03	SW	23C0625-22	03/14/2023	X	X	X	X	X	X	
SG-04R	SW	23C0625-23	03/14/2023	X	X	X	X	X	X	
SG-05	SW	23C0625-24	03/14/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness

Any planned sampling or analysis NOT completed? If yes, explain: SG-06 was not sampled because the area was dry.

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 18 samples

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met B – 7 samples (results > RL) Ca – 26 samples (results > RL) Fe – 26 samples (results > RL except 2 samples) Li – 5 samples (results > RL) Mg – 21 samples (results > RL) Na – 19 samples (results > RL) K – 9 samples (results > RL except 2 samples) SO4 – 17 samples (results < RL) Tl – 4 samples (results < RL)
			MDLs<RLs		X		RL=MDL for Ag, Zn
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for B, Ca, Mg, K, Na, SO4
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		LCS recoveries outside control limits for Rad-228
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Combined radium had RPD > 20% in both parent/field duplicate pairs; Li was detected in a parent sample and non-detect in the field duplicate
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Reporting limits were raised on the following samples and constituents due to sample matrix interferences with the internal standards. No qualification was required.

Constituent	Samples
Lead	MW-03, MW-10, MW-19, MW-30
Thallium	MW-03, MW-10, MW-19, MW-30

Sulfate matrix spike was outside control limits in T133757-MS1. Sulfate in sample SG-05 required qualification as estimated (J).

Boron, calcium, magnesium, potassium, and sodium matrix spikes were outside of control limits in T133771-MS1 and T133771-MS2. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

“The Ra-228 laboratory control sample and/or laboratory control sample duplicate (LCS) associated with the following samples recovered at 68%: (LCS 160-604779/2-A). The limits in our LIMS system at (75-125%) reflect the requirements of a regulatory agency that represents a large amount of our work. However the samples associated with this LCS are not from this agency and are therefore held to our in-house statistical limits of (62-148%) per method requirements. The LCS is within criteria and no further action is required.” No qualification was required.

Comments:

pH in samples MW-02, MW-03, MW-04, MW-07, MW-08, MW-11, MW-12, MW-18, MW-19, MW-20, MW-27, MW-30, MW-31, MW-32, MWT-12, MWT-27, SG-02 and SG-03 required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

Lithium was detected in parent sample MW-12 and non-detect in field duplicate MWT-12. Parent sample MW-12 required qualification as estimated with high bias (J+) and field duplicate MWT-12 required qualification as estimated but not detected (UJ).

Rad-228 in MB 160-604804/1-A was detected above the MDC but below the RL. Rad-228 and consequently combined radium required qualification as estimated with high bias (J+) or estimated but non detect (UJ) is associated samples MW-01R, MW-02, MW-03, MW-04, MW-06, MW-07, MW-08, MW-09, MW-10, MW-11, MW-12, MW-18, MW-19, MW-20, and MW-27.

Radium 228 and combined radium had RPDs of 44% and 25%, respectively in the MW-27/MWT-27 parent/field duplicate pair. Rad-228 and combined radium required qualification as estimated but non detect (UJ) in the parent/field duplicate pair.

Rad-226, Rad-228, and combined radium had RPDs of 34%, 121%, and 77%, respectively in the MW-12/MWT-12 parent/field duplicate pair. Rad-226, Rad-228, and combined radium required qualification as estimated but non detect (UJ) in the parent/field duplicate pair.

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 5 – April 2023

Data Package Number: 23D0863
Data Validator: Aryka Thomson

Lab Report Date: 06/02/2023
Data Validation Completion Date: 06/12/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23D0863-01	04/18/2023	X	X	X	X	X	X	
MW-02	GW	23D0863-02	04/18/2023	X	X	X	X	X	X	
MW-03	GW	23D0863-03	04/18/2023	X	X	X	X	X	X	
MW-04	GW	23D0863-04	04/19/2023	X	X	X	X	X	X	
MW-06	GW	23D0863-05	04/18/2023	X	X	X	X	X	X	
MW-07	GW	23D0863-06	04/18/2023	X	X	X	X	X	X	
MW-08	GW	23D0863-07	04/18/2023	X	X	X	X	X	X	
MW-09	GW	23D0863-08	04/18/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	23D0863-09	04/18/2023	X	X	X	X	X	X	
MW-11	GW	23D0863-11	04/18/2023	X	X	X	X	X	X	
MW-12	GW	23D0863-12	04/19/2023	X	X	X	X	X	X	
MW-18	GW	23D0863-13	04/18/2023	X	X	X	X	X	X	
MW-19	GW	23D0863-14	04/18/2023	X	X	X	X	X	X	
MW-20	GW	23D0863-15	04/18/2023	X	X	X	X	X	X	
MW-27	GW	23D0863-17	04/18/2023	X	X	X	X	X	X	
MW-30	GW	23D0863-18	04/18/2023	X	X	X	X	X	X	
MW-31	GW	23D0863-19	04/18/2023	X	X	X	X	X	X	
MW-32	GW	23D0863-20	04/18/2023	X	X	X	X	X	X	
MW-33	GW	23D0863-21	04/18/2023	X	X	X	X	X	X	
MW-34	GW	23D0863-22	04/18/2023	X	X	X	X	X	X	
MWT-10	QC	23D0863-10	04/18/2023	X	X	X	X	X	X	
MWT-20	QC	23D0863-16	04/18/2023	X	X	X	X	X	X	
SG-02	SW	23D0863-23	04/19/2023	X	X	X	X	X	X	
SG-03	SW	23D0863-24	04/19/2023	X	X	X	X	X	X	
SG-04R	SW	23D0863-25	04/19/2023	X	X	X	X	X	X	
SG-05	SW	23D0863-26	04/19/2023	X	X	X	X	X	X	
SG-05	SW	23D0863-27	04/19/2023							X

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness

Any planned sampling or analysis NOT completed? If yes, explain: SG-06 was not sampled because the area was dry.

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 7 samples 07, 13, 17, 19, 20, 21, 22

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met B – 3 samples (results > RL) Be – 7 samples (results < RL) Ca – 27 samples (results > RL) Cr – 27 samples (results < RL in 18 samples) Fe – 27 samples (results < RL in 1 sample) Li – 1 sample (results > RL) Mo – 17 samples (results < RL in 10 samples) Ni – 7 samples (results < RL in 6 samples) SO4 – 17 samples (results > RL) V – 7 samples (results < RL in 7 samples) Zn – 7 samples (results < RL in 3 samples)
			MDLs<RLs	X			
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for B, Ca, K, Na
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Combined radium had RPD 72% in one parent/field duplicate pair; TSS had RPD 23% in one parent/field duplicate pair
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Reporting limits were raised on the following samples and constituents due to sample matrix interferences with the internal standards. No qualification was required.

Constituent	Samples
Antimony	MW-02, MW-03, MW-04, MW-06, MW-09, MW-10, MWT-10, MW-11, MW-19, MW-30
Cadmium	MW-01R, MW-02, MW-03, MW-04, MW-06, MW-09, MW-10, MWT-10, MW-11, MW-19, MW-30
Lead	MW-01R, MW-02, MW-03, MW-04, MW-06, MW-09, MW-10, MWT-10, MW-11, MW-19, MW-30
Molybdenum	MW-01R, MW-03, MW-04, MW-06, MW-10, MWT-10, MW-30
Thallium	MW-01R, MW-02, MW-03, MW-04, MW-06, MW-09, MW-10, MWT-10, MW-11, MW-19, MW-30

Boron, calcium, and sodium matrix spikes were outside of control limits in T135349-MS1 and T135349-MS2. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

Potassium was outside of control limits in T135349-MS1. MW-01R required qualification as estimated (J).

Comments:

pH in samples MW-08, MW-18, MW-27, MW-31, MW-32, MW-33, and MW-34 required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

TSS had an RPD of 23% in the MW-10/MWT-10 parent/field duplicate pair. Parent sample MW-10 required qualification as estimated with high bias (J+) and field duplicate MWT-10 required qualification as estimated with low bias (J-).

Rad-226, Rad-228, and combined radium had RPDs of 62%, 72%, and 72%, respectively in the MW-10/MWT-10 parent/field duplicate pair. Rad-226, Rad-228, and combined radium required qualification as estimated but non detect (UJ) in MW-10, Rad-226 required qualification as estimated but non detect (UJ) in MWT-10 and Rad-228 and combined radium required qualification as estimated with high bias (J+).

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 6 – May 2023

Data Package Number: 23E1107
Data Validator: Aryka Thomson

Lab Report Date: 07/05/2023
Data Validation Completion Date: 07/08/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23E1107-22	05/23/2023	X	X	X	X	X	X	
MW-02	GW	23E1107-19	05/23/2023	X	X	X	X	X	X	
MW-03	GW	23E1107-15	05/23/2023	X	X	X	X	X	X	
MW-04	GW	23E1107-08	05/23/2023	X	X	X	X	X	X	
MW-06	GW	23E1107-18	05/23/2023	X	X	X	X	X	X	
MW-07	GW	23E1107-13	05/23/2023	X	X	X	X	X	X	
MW-08	GW	23E1107-16	05/23/2023	X	X	X	X	X	X	
MW-09	GW	23E1107-17	05/23/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	23E1107-21	05/23/2023	X	X	X	X	X	X	
MW-11	GW	23E1107-20	05/23/2023	X	X	X	X	X	X	
MW-12	GW	23E1107-07	05/23/2023	X	X	X	X	X	X	
MW-18	GW	23E1107-05	05/22/2023	X	X	X	X	X	X	
MW-19	GW	23E1107-12	05/22/2023	X	X	X	X	X	X	
MW-20	GW	23E1107-14	05/23/2023	X	X	X	X	X	X	
MW-27	GW	23E1107-02	05/22/2023	X	X	X	X	X	X	
MW-30	GW	23E1107-04	05/22/2023	X	X	X	X	X	X	
MW-31	GW	23E1107-10	05/22/2023	X	X	X	X	X	X	
MW-32	GW	23E1107-11	05/22/2023	X	X	X	X	X	X	
MW-33	GW	23E1107-03	05/22/2023	X	X	X	X	X	X	
MW-34	GW	23E1107-01	05/22/2023	X	X	X	X	X	X	
MWT-04	QC	23E1107-09	05/23/2023	X	X	X	X	X	X	
MWT-18	QC	23E1107-06	05/22/2023	X	X	X	X	X	X	
SG-02	SW	23E1107-23	05/23/2023	X	X	X	X	X	X	
SG-03	SW	23E1107-24	05/23/2023	X	X	X	X	X	X	X
SG-04R	SW	23E1107-25	05/23/2023	X	X	X	X	X	X	
SG-05	SW	23E1107-26	05/23/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness

Any planned sampling or analysis NOT completed? If yes, explain: SG-06 was not sampled because the area was dry.

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 20 samples

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met B – all samples (results > RL) Cd – 14 samples (results < RL in 14 samples) Ca – 1 sample (results > RL) Fe – all samples (results < RL in 1 sample) Li – 20 samples (results > RL) SO4 – 17 samples (results > RL)
			MDLs<RLs	X			
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for B and Ca
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		Combined radium had RPD 38% in one parent/field duplicate pair; chromium was detected in the parent and non-detect in the field duplicate of one parent/field duplicate pair
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Reporting limits were raised on the following samples and constituents due to sample matrix interferences with the internal standards. No qualification was required.

Constituent	**Samples**
Antimony	MW-01R, MW-02, MW-03, MW-04, MWT-04, MW-06, MW-09, MW-10, MW-11, MW-18, MWT-18, MW-19, MW-30, SG-04R
Cadmium	MW-01R, MW-02, MW-03, MW-04, MWT-04, MW-06, MW-09, MW-10, MW-11, MW-18, MWT-18, MW-19, MW-30, SG-04R
Lead	MW-01R, MW-03, MW-04, MWT-04, MW-06, MW-09, MW-10, MW-11, MW-18, MWT-18, MW-19, MW-30, SG-04R
Silver	MW-01R, MW-02, MW-03, MW-04, MWT-04, MW-06, MW-09, MW-10, MW-11, MW-18, MWT-18, MW-19, MW-30, SG-04R
Thallium	MW-01R, MW-02, MW-03, MW-04, MWT-04, MW-06, MW-09, MW-10, MW-11, MW-18, MWT-18, MW-19, MW-30, SG-04R

Boron and calcium matrix spikes were outside of control limits in T136871-MS1 and T136809-MS2. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

TSS had an RPD of 12% in the laboratory duplicate of MW-08. The RPD falls within the project RPD limit of 20%, so no qualification was required.

Comments:

pH in samples MW-02, MW-03, MW-04, MWT-04, MW-06, MW-07, MW-08, MW-09, MW-11, MW-12, MW-18, MWT-18, MW-19, MW-20, MW-27, MW-30, MW-31, MW-32, MW-33, and MW-34 required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

Chromium was detected in parent sample MW-18 and non-detect in field duplicate MWT-18. MW-18 required qualification as estimated with high bias (J+) and MWT-18 required qualification as estimated but not detected (UJ).

Rad-226, Rad-228, and combined radium had RPDs of 34%, 43%, and 38%, respectively in the MW-18/MWT-18 parent/field duplicate pair. Rad-226, Rad-228, and combined radium required qualification as estimated but non detect (UJ) in MW-18 and MWT-18.

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 7 – June 2023

Data Package Number: 23F1319
Data Validator: Aryka Thomson

Lab Report Date: 07/28/2023*
Data Validation Completion Date: 09/18/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23F1319-01	06/28/2023	X	X	X	X	X	X	
MW-02	GW	23F1319-02	06/27/2023	X	X	X	X	X	X	
MW-03	GW	23F1319-03	06/28/2023	X	X	X	X	X	X	
MW-04	GW	23F1319-04	06/28/2023	X	X	X	X	X	X	
MW-06	GW	23F1319-05	06/28/2023	X	X	X	X	X	X	
MW-07	GW	23F1319-06	06/27/2023	X	X	X	X	X	X	
MW-08	GW	23F1319-07	06/27/2023	X	X	X	X	X	X	
MW-09	GW	23F1319-08	06/27/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	23F1319-09	06/27/2023	X	X	X	X	X	X	
MW-11	GW	23F1319-10	06/28/2023	X	X	X	X	X	X	
MW-12	GW	23F1319-11	06/27/2023	X	X	X	X	X	X	
MW-18	GW	23F1319-12	06/27/2023	X	X	X	X	X	X	
MW-19	GW	23F1319-13	06/28/2023	X	X	X	X	X	X	
MW-20	GW	23F1319-14	06/28/2023	X	X	X	X	X	X	
MW-27	GW	23F1319-15	06/27/2023	X	X	X	X	X	X	
MW-30	GW	23F1319-16	06/27/2023	X	X	X	X	X	X	
MW-31	GW	23F1319-17	06/27/2023	X	X	X	X	X	X	
MW-32	GW	23F1319-18	06/27/2023	X	X	X	X	X	X	
MW-33	GW	23F1319-19	06/27/2023	X	X	X	X	X	X	
MW-34	GW	23F1319-20	06/27/2023	X	X	X	X	X	X	
MWT-12	QC	23F1319-21	06/27/2023	X	X	X	X	X	X	
MWT-30	QC	23F1319-22	06/27/2023	X	X	X	X	X	X	
SG-02	SW	23F1319-23	06/28/2023	X	X	X	X	X	X	
SG-03	SW	23F1319-24	06/28/2023	X	X	X	X	X	X	
SG-04R	SW	23F1319-25	06/28/2023	X	X	X	X	X	X	
SG-05	SW	23F1319-26	06/28/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness

Any planned sampling or analysis NOT completed? If yes, explain: SG-06 was not sampled because the area was dry.

*Report was revised 9/6/23 to include the definition of the 'J' flag used in the report.

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples for Sb, Ba, B, Ca, Cl, F, Pb, Li, SO4, Th, TDS,
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 18 samples
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met B – all samples (results > RL) Ca – 5 samples (results > RL) Li – 8 samples (results > RL except 1 sample)
			MDLs<RLs	X			
			MDLs<MCLs	X			
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for B, Ca, K, Mg, Na, and Se
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		TSS non-detect in parent and detected in field duplicate; Rad-228 and combined radium had RPDs 88% and 69% Rad-226, Rad-228, and combined radium had RPD 30%, 37%, 36% in one parent/field duplicate pair
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Even after multiple heating cycles, the sample was unable to reach a constant weight. TDS in MW-30 required qualification as estimated (J).

Boron, calcium, potassium, magnesium, and sodium recovered outside control limits in matrix spikes T138479-MS1 and T138479-MS2. Associated samples MW-01R and MW-02 required qualification as estimated (J) for these parameters. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required except for potassium in MW-02, which required qualification as estimated (J).

Selenium recovered outside control limits in matrix spike T138479-MS1. Associated sample MW-01R required qualification as estimated (J) for selenium.

The RPD between T138109-DUP1 and MW-02 was outside control limits for TDS. TDS in MW-02 required qualification as estimated (J).

Comments:

pH in samples MW-01R, MW-02, MW-04, MW-07, MW-08, MW-09, MW-10, MW-12, MWT-12, MW-18, MW-20, MW-27, MW-30, MWT-30, MW-31, MW-32, MW-33, and MW-34 required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

Boron was detected above the reporting limit in method blanks T138479-BLK1 and T138527-BLK1. All samples required qualification as estimated with high bias (J+).

Arsenic, beryllium, cadmium, cobalt, molybdenum, lead, selenium, and thallium were detected above the reporting limit in method blank T138479-BLK1. These constituents required qualification as estimated with high bias (J+) or as estimated but not detected (UJ) in samples MW-01R, MW-02, MW-03, MW-04, MW-06, MW-07, MW-08, MW-09, MW-10, MW-11, MW-12, MW-18, MW-19, MW-20, MW-27, MW-30, MW-31, MW-32, MW-33, and MW-34.

TSS was not detected in parent sample MW-12 and detected in field duplicate MWT-12. MW-12 required qualification as estimated but not detected (UJ) and MWT-12 required qualification as estimated with high bias (J+).

pH had an RPD of 54% in the MW-30/MWT-30 parent/field duplicate pair. pH required qualification as estimated with low bias (J-) in MW-30 and with high bias (J+) in MWT-30. It is possible that there was nitric acid in the MW-30 bottle that would result in a low pH.

Rad-228 and combined radium had RPDs of 88% and 69%, respectively in the MW-12/MWT-12 parent/field duplicate pair. Rad-228 and combined radium required qualification as estimated but non-detect (UJ) in MW-12 and MWT-12.

Rad-226, Rad-228, and combined radium had RPDs of 30%, 37%, and 36%, respectively in the MW-30/MWT-30 parent/field duplicate pair. Rad-228 in MW-30 and Rad-226, Rad-228, and combined radium

in MWT-30 required qualification as estimated but non detect (UJ). Rad-226 and combined radium in MW-30 required qualification as estimated with high bias (J+).

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Background Round 8 – August 2023

Data Package Number: 23H0444
Data Validator: Andrew Byks

Lab Report Date: 08/22/2023
Data Validation Completion Date: 9/19/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23H0444-01	08/08/2023	X	X	X	X	X	X	
MW-02	GW	23H0444-02	08/08/2023	X	X	X	X	X	X	
MW-03	GW	23H0444-03	08/07/2023	X	X	X	X	X	X	
MW-04	GW	23H0444-04	08/07/2023	X	X	X	X	X	X	
MW-06	GW	23H0444-05	08/08/2023	X	X	X	X	X	X	
MW-07	GW	23H0444-06	08/07/2023	X	X	X	X	X	X	
MW-08	GW	23H0444-07	08/08/2023	X	X	X	X	X	X	
MW-09	GW	23H0444-08	08/08/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-10	GW	23H0444-09	08/08/2023	X	X	X	X	X	X	
MW-11	GW	23H0444-10	08/08/2023	X	X	X	X	X	X	
MW-12	GW	23H0444-11	08/07/2023	X	X	X	X	X	X	
MW-18	GW	23H0444-12	08/08/2023	X	X	X	X	X	X	
MW-19	GW	23H0444-13	08/07/2023	X	X	X	X	X	X	
MW-20	GW	23H0444-14	08/07/2023	X	X	X	X	X	X	
MW-27	GW	23H0444-15	08/07/2023	X	X	X	X	X	X	
MW-30	GW	23H0444-16	08/08/2023	X	X	X	X	X	X	
MW-31	GW	23H0444-17	08/08/2023	X	X	X	X	X	X	
MW-32	GW	23H0444-18	08/08/2023	X	X	X	X	X	X	
MW-33	GW	23H0444-19	08/07/2023	X	X	X	X	X	X	
MW-34	GW	23H0444-20	08/07/2023	X	X	X	X	X	X	
MWT-04	QC	23H0444-21	08/07/2023	X	X	X	X	X	X	
MWT-12	QC	23H0444-22	08/07/2023	X	X	X	X	X	X	
SG-02	SW	23H0444-23	08/08/2023	X	X	X	X	X	X	
SG-03	SW	23H0444-24	08/08/2023	X	X	X	X	X	X	
SG-04R	SW	23H0444-25	08/08/2023	X	X	X	X	X	X	
SG-05	SW	23H0444-26	08/08/2023	X	X	X	X	X	X	
SG-06	SW	23H0444-27	08/08/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness

Any planned sampling or analysis NOT completed? If yes, explain: N/A

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 13 samples

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met B – all samples (results > RL) Ca – 26 samples (results > RL) Co – all samples (results > RL in all but 5 samples where results > MDL) Fe – all samples (results > RL) Mg – 21 samples (results > RL) K – 9 samples (results > RL) Na – 22 samples (results > RL) SO4 – 15 samples (results > RL) TDS – all samples (results > RL)
			MDLs<RLs	X			
			MDLs<GPS			X	Background sampling (no GPS to compare against)
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for Ca, Na, K
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		LCSD recovery outside control limits for Rad-226 (5 samples)
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		MW-04/MWT-04: TSS and Zn non-detect in parent sample and detected in FD; Sb detected in parent sample and non-detect in FD; Se and Rad 226 RPDs of 24% and 33%, respectively MW-12/MWT-12: TSS detect in parent sample and non-detect in FD; Rad 226, Rad 228, and Combined Rad RPDs of 40%, 91% and 65%, respectively
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							
Verify Instrument Calibration & Analytical Process							

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Reporting limits were raised on the following samples and constituents due to sample matrix interferences with the internal standards. No qualification was required.

Constituent	**Samples**
Lead	MW-03, MW-30
Thallium	MW-01R, MW-03, MW-30, SG-04R

Calcium in the sample collected from SG-04R was estimated due to the amount of the constituent detected being above the linear range of the calibration curve. No qualification was required.

Calcium, potassium, and sodium matrix spikes were outside of control limits in T140107-MS1. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

Potassium and sodium matrix spikes were outside of control limits in T140104-MS2. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

Comments:

pH in samples MW-02, MW-03, MW-04, MW-07, MW-09, MW-12, MW-19, MW-20, MW-30, MW-33, MW-34, MWT-04, and MWT-12 required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

TSS and zinc were not detected in parent sample MW-04 and detected in field duplicate MWT-04. TSS and zinc required qualification in parent sample MW-04 as estimated but not detected (UJ) and in field duplicate MWT-04 as estimated with high bias (J+).

Antimony was not detected in parent sample MW-04 and detected in field duplicate MWT-04. Antimony required qualification in parent sample MW-04 as estimated but not detected (UJ) and in field duplicate MWT-04 as estimated with high bias (J+).

Selenium had a RPD of 24% in the MW-04/MWT-04 parent/field duplicate pair. Selenium required qualification as estimated with high bias (J+) in parent sample MW-04 and as estimated with low bias (J-) in field duplicate MWT-04.

Radium 226 had a RPD of 33% in the MW-04/MWT-04 parent/field duplicate pair. Radium 226 required qualification as estimated with low bias (J-) in parent sample MW-04 and as estimated with high bias (J+) in field duplicate MWT-04.

TSS was detected in parent sample MW-12 and non-detect in field duplicate MWT-12. TSS required qualification in parent sample MW-12 as estimated with high bias (J+) and as estimated but not detected in field duplicate MWT-12.

Radium 226, Radium 228, and combined radium had RPDs of 40%, 91% and 65%, respectively in the MW-12/MWT-12 parent/field duplicate pair. Radium 226 required qualification as estimated but non detect in all parent/field duplicate pair MW-12/MWT-12.

The LCS/LCSD associated with radium-226 prep batch 160-624323 recovered outside of control limits. Radium 226 in affected samples MW-30, MW-31, MW-32, MW-33, and MW-34 required qualification as estimated with high bias (J+) or estimated but non-detect (UJ).

Data Verification & Validation Report

Grand Haven-Harbor Island

Sampling Event (dates and purpose): Detection Monitoring / Quarterly Assessment Monitoring – October 2023

Data Package Number: 23J1216
Data Validator: Andrew Byks

Lab Report Date: 12/4/2023
Data Validation Completion Date: 12/5/2023

General Overall Assessment:
_____ Data are usable without qualification.
__X__ Data are usable with qualification (as noted below).
_____ Some or all data are unusable (as noted below).

Wells planned for sampling:

Unit 3A/B	Unit 1/2	Well Designation	Well ID	Planned for Sampling
✓	✓	Nature & Extent	MW-01R	X
✓		Point of Compliance	MW-02	X
✓		Point of Compliance	MW-03	X
✓		Point of Compliance	MW-04	X
	✓	Point of Compliance	MW-06	X
✓	✓	Nature & Extent	MW-07	X
	✓	Point of Compliance	MW-08	X
✓	✓	Nature & Extent	MW-09	X
✓	✓	Nature & Extent	MW-10	X
✓		Point of Compliance	MW-11	X
✓		Point of Compliance	MW-12	X
	✓	Point of Compliance	MW-18	X
	✓	Point of Compliance	MW-19	X
	✓	Point of Compliance	MW-20	X
✓	✓	Background	MW-27	X
	✓	Point of Compliance	MW-30	X
	✓	Point of Compliance	MW-31	X
✓	✓	Nature & Extent	MW-32	X
✓	✓	Background	MW-33	X
✓	✓	Background	MW-34	X
✓	✓	Surface Water	SG-02	X
✓	✓	Surface Water	SG-03	X
✓	✓	Surface Water	SG-04R	X
✓	✓	Surface Water	SG-05	X
✓	✓	Surface Water	SG-06	X

Data Summary

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-01R	GW	23J1216-01	08/08/2023	X	X	X	X	X	X	
MW-02	GW	23J1216-02	08/08/2023	X	X	X	X	X	X	
MW-03	GW	23J1216-03	08/07/2023	X	X	X	X	X	X	
MW-04	GW	23J1216-04	08/07/2023	X	X	X	X	X	X	
MW-06	GW	23J1216-05	08/08/2023	X	X	X	X	X	X	
MW-07	GW	23J1216-06	08/07/2023	X	X	X	X	X	X	
MW-08	GW	23J1216-07	08/08/2023	X	X	X	X	X	X	

Sample ID	Matrix	Lab ID	Date Collected	App III Metals	App IV Metals	Part 115 Metals	Anions	TDS TSS	Rad-226 Rad-228	Diss. Metals
MW-09	GW	23J1216-08	08/08/2023	X	X	X	X	X	X	
MW-10	GW	23J1216-09	08/08/2023	X	X	X	X	X	X	
MW-11	GW	23J1216-10	08/08/2023	X	X	X	X	X	X	
MW-12	GW	23J1216-11	08/07/2023	X	X	X	X	X	X	
MW-18	GW	23J1216-12	08/08/2023	X	X	X	X	X	X	
MW-19	GW	23J1216-13	08/07/2023	X	X	X	X	X	X	
MW-20	GW	23J1216-14	08/07/2023	X	X	X	X	X	X	
MW-27	GW	23J1216-15	08/07/2023	X	X	X	X	X	X	
MW-30	GW	23J1216-16	08/08/2023	X	X	X	X	X	X	
MW-31	GW	23J1216-17	08/08/2023	X	X	X	X	X	X	
MW-32	GW	23J1216-18	08/08/2023	X	X	X	X	X	X	
MW-33	GW	23J1216-19	08/07/2023	X	X	X	X	X	X	
MW-34	GW	23J1216-20	08/07/2023	X	X	X	X	X	X	
MWT-10	QC	23J1216-21	08/07/2023	X	X	X	X	X	X	
MWT-33	QC	23J1216-22	08/07/2023	X	X	X	X	X	X	
SG-02	SW	23J1216-23	08/08/2023	X	X	X	X	X	X	
SG-03	SW	23J1216-24	08/08/2023	X	X	X	X	X	X	
SG-04R	SW	23J1216-25	08/08/2023	X	X	X	X	X	X	
SG-05	SW	23J1216-26	08/08/2023	X	X	X	X	X	X	
SG-06	SW	23J1216-27	08/08/2023	X	X	X	X	X	X	

Other analytes requested for analysis: Na, Mg, K, HCO_3, CO_3, hardness

Any planned sampling or analysis NOT completed? If yes, explain: N/A

Data Verification & Validation Checklist

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Field Data							
Sample Collection Field Forms	X		Purging performed as required in the Groundwater Monitoring Plan	X			
Field Calibration Records	X		Field instruments calibrated daily according to manufacturer specifications	X			
Chain of Custody	X		Accurately reflect samples, collection dates/times, analyses, bottles, etc.	X			
Field decontamination documentation	N/A		Record of decontamination for non-dedicated sampling equipment			X	
Drilling logs	X		N/A	-	-	-	
Well construction logs	X		N/A	-	-	-	
Well development field forms	X		N/A	-	-	-	
Analytical Data Package							
Cover Sheet	X		N/A	-	-	-	
Case Narrative	X		Summarizes sample receipt and any exceptions to QC acceptance criteria	X			
Internal Laboratory Chain of Custody forms	X		Analyses as requested; accurate transcription of field COC	X			
Sample Chronology and Consistency	X		Accurate representation of dates, times of receipt, preparation, and analysis	X			
Communication Records with Lab	X		N/A	-	-	-	
EDD Format Consistency	X		EDD format and content as requested	X			
Sample Identification, Results Nomenclature, and Data Qualifier Consistency	X		All included in final report	X			
Method Detection Limit Consistency	X		MDLs consistent between samples		X		Dilution varies between samples
Instrument Calibration Records	X		Present and no nonconformance noted	X			
Laboratory Report Complete	X		Includes QC component	X			
Holding Times	X		Analyses performed within allowed holding time		X		pH required qualification in 17 samples

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Method	X		Method as requested	X			
Reporting Limits	X		RLs as requested		X		RLs for the following were not met Bicarbonate alkalinity – 25 samples (results > RL) B – all samples (results > RL) Ca – all samples (results > RL) Carbonate alkalinity – 25 samples (results > RL) Chloride – 6 samples (results > RL) Fe – all samples (results > RL) Li – 15 samples (results > RL) Mg – 21 samples (results > RL) K – 24 samples (results > RL) Na – all samples (results > RL) SO4 – 12 samples (results > RL) Total alkalinity – 25 samples (results > RL) TDS – all samples (results > RL)
			MDLs<RLs	X			
			MDLs<GPS	X			
QC Validation							
Evaluate Accuracy							
Matrix Spike (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table		X		MS recoveries outside control limits for B, Ca, Mg
Laboratory Control Sample (Recovery)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Evaluate Precision							
Matrix Spike Duplicate (RPD)	X		See "Minimum QC Procedures for Project Parameters" table	X			
Field Duplicate (RPD)	X		RPD ≤ 20%		X		MW-10/MWT-10: Sb and Hg non-detect in parent sample and detected in FD; Be, Co, Cu, Ni, Zn, Rad RPDs >20% MW-33/MWT-33: Hg non-detect in parent sample and detect in FD; Rad 226 and Rad 228 RPDs > 20%
Evaluate Representativeness							
Equipment Blanks (if applicable)	N/A		Non-detect (<RL)			X	
QC Verification							

Review Category	Verify Complete		Validation Criteria	Criteria Met?			Description of Nonconformance and Qualification (if applicable)
	Yes	No		Yes	No	N/A	
Verify Instrument Calibration & Analytical Process							
Initial Calibration Verification	X		Laboratory-determined	-	-	-	
Continuing Calibration Verification	X		Laboratory-determined	-	-	-	
Initial Calibration Blank	X		Laboratory-determined	-	-	-	
Continuing Calibration Blank	X		Laboratory-determined	-	-	-	
Serial Dilutions	X		Laboratory-determined	-	-	-	
Post-Digestion Spikes	X		Laboratory-determined	-	-	-	
Internal Standards	X		Laboratory-determined	-	-	-	
Laboratory Duplicate (RPD)	X		Laboratory-determined	-	-	-	
Method Blanks	X		Laboratory-determined	-	-	-	
Evaluate Completeness (# usable measurements/ # unusable measurements)							
Completeness	X		100%	X			

Other instances of nonconformance to QC control limits noted on case narrative:

Boron, calcium, and magnesium matrix spikes were outside of control limits in T143162-MS1. Boron in associated sample MW-04 required qualification as estimated with high bias. The background concentration of calcium and magnesium was greater than four times the spike amount, additional qualification was not required.

Boron and calcium matrix spikes were outside of control limits in T143162-MS2. Because the background concentration of these analytes was greater than four times the spike amount, qualification was not required.

Comments:

pH in samples seventeen required qualification as estimated (J) due to analysis outside the EPA-established 24-hour hold time.

Antimony and mercury were not detected in parent sample MW-10 and detected in field duplicate MWT-10. Antimony and mercury required qualification in parent sample MW-10 as estimated but not detected (UJ) and in field duplicate MWT-10 as estimated with high bias (J+).

Beryllium, cobalt, copper, nickel, and zinc had RPDs > 20% in the MW-10/MWT-10 parent/field duplicate pair. All analytes required qualification as estimated with low bias (J-) in parent sample MW-10 and as estimated with high bias (J+) in field duplicate MWT-10.

Radium 226, Radium 228, and combined radium had RPDs >20% MW-10/MWT-10 parent/field duplicate pair. Radium 226 required qualification as estimated with high bias (J+) in parent sample MW-10 and as estimated with low bias (J-) in field duplicate MWT-10. Radium 228 and combined radium required qualification as estimated with low bias (J-) in parent sample MW-10 and as estimated with high bias (J+) in field duplicate MWT-10.

Mercury was non-detect in parent sample MW-33 and detected in field duplicate MWT-33. Mercury required qualification in parent sample MW-33 as estimated but not detected (UJ) and as estimated with high bias (J+) in MWT-33.

Radium 226 and Radium 228 had RPDs > 20% in the MW-33/MWT-33 parent/field duplicate pair. Radium 226 required qualification as estimated with low bias (J-) in parent sample MW-33 and as estimated with high bias (J+) in field duplicate MWT-33. Radium 228 required qualification as estimated with high bias (J+) in parent sample MW-33 and as estimated with low bias (J-) in field duplicate MWT-33.

Appendix C

Analytical Data Reporting Tables

			Sample Location:	MW-01R								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/29/2022	1/3/2023	2/8/2023	3/14/2023	4/18/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	2.39	3.06	2.731	2.595	3	3.1	3.23	3.22	3.13
Dissolved Oxygen	mg/L	N	--	0.08	0.05	0.07	0.28	0.11	0.03	0.01	0.01	0.03
Oxidation Reduction Potential	mV	N	--	42.3	3.6	-155.6	-185.5	-202.3	-210.1	-163.8	-165.1	-126.2
pH	su	N	--	7.74	6.02	7.75	7.76	7.75	7.8	7.81	7.68	7.71
Temperature	deg c	N	--	12.5	9	6.9	5.9	7.2	10.7	13.5	17.2	16.1
Turbidity	NTU	N	--	0.02	0.26	0.17	0.02	0.02	0.02	0.02	1.33	0.95
Appendix III												
Boron	mg/L	T	4.0	**100**	**110**	**73**	**70**	**78**	**110**	**150 J+**	**140 D**	**160 D**
Calcium	mg/L	T	250	240	200	**290**	**310**	**280**	240	210 D	160 D	130 D
Chloride	mg/L	T	120	**150**	**160**	52	**120**	**130**	**150**	**170 D**	**180 D**	**210 D**
Fluoride	mg/L	T	2.0	**14**	**14**	**9.5**	**8.1**	**8.8**	**10**	**15 D**	**14 D**	**14 D**
Sulfate (as SO4)	mg/L	T	250	**590**	**400**	**350**	**780**	**780**	**540**	**290 D**	110 D	8.8 D
Total Dissolved Solids	mg/L	T	950	**2400 J-**	**2300**	**2200**	**2100**	**2400**	**2400**	**2400 D**	**2400 D**	**2600 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.00033	0.00023 J	< 0.00025 U	0.00034	0.0012	< 0.00050 U	0.00071 JD	0.00025	0.00022 J
Arsenic	mg/L	T	0.010	0.0020	0.0015	0.0013	0.0013	0.00077	0.00073	0.0019 J+	0.0017	0.0013
Barium	mg/L	T	1.3	0.30	0.30	0.25	0.22	0.21	0.29	0.29 D	0.38	0.56
Beryllium	mg/L	T	0.0040	0.00021 J	0.00032	0.00020 J	0.00020 J	0.00012 J	0.00020 J	0.00036 J+	0.00035	0.00026
Cadmium	mg/L	T	0.0025	0.00011 J	0.000062 J	< 0.00016 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	0.00034 J+	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.0013	0.0024	0.0016	0.0016	0.0013	0.0019	0.0043	0.0037	0.0022
Cobalt	mg/L	T	0.0060	0.0011	0.0012	0.0011	0.0023	0.0017	0.00081	0.0045 J+	0.0016	0.001
Fluoride	mg/L	T	2.0	**14**	**14**	**9.5**	**8.1**	**8.8**	**10**	**15 D**	**14 D**	**14 D**
Lead	mg/L	T	0.0016	0.0014	0.00082	< 0.0011 U	0.00044 J	< 0.0011 U	0.00080 J	**0.0053 J+**	0.0010 JD	0.00074
Lithium	mg/L	T	0.10	**2.2**	**2.8**	**1.6**	**1.7**	**1.5**	**2.3**	**3.2 D**	**3.3**	**3.4 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0011 J	0.00062 J	0.00076 J	0.0020	< 0.0031 U	0.00033 J	0.00077 J+	0.00082 J	0.00074 J
Radium 226 and 228	pCi/L	T	5.0	< 0.656 UJ	< 0.828 U	1.06	1.28	< 0.737 U	< 1.1 U	0.601	1.26	< 0.674 U
Radium-226	pCi/L	T	--	< 0.176 UJ	< 0.125 U	< 0.139 U	< 0.212 U	< 0.233 U	< 0.322 U	< 0.164 U	0.152	< 0.182 U
Radium-228	pCi/L	T	--	< 0.656 UJ	< 0.828 U	0.982	1.23	< 0.737 U	< 1.1 UJ	< 0.534 U	1.11	< 0.674 U
Selenium	mg/L	T	0.0050	0.00060	0.00059	0.00058	0.00097	0.00056	0.00030 J	0.00076 J+	0.00066	0.00073
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.00038 UJ	< 0.00038 UD	< 0.000075 U
Total Suspended Solids	mg/L	T	--	3.0 J	2.0 J	5.0	2.0 J	2.0 J	< 4.0 U	2.0 J	3.0 J	< 4 UD
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00027	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.0013 B	0.00045	0.00029
Iron	mg/L	T	83	0.75	1.1	0.55	0.50	0.59	0.79	0.48	0.16	0.22
Nickel	mg/L	T	0.10	0.0015	0.0025	0.0016	0.0026	0.0018	0.0013	0.0053	0.0027	0.0021
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	0.00069 J	0.00067 J	< 0.00062 U	< 0.00062 U	0.0013	0.0016	0.0046	0.0035	0.0018
Zinc	mg/L	T	0.27	0.014	0.0012	0.0012	0.0018	0.013	< 0.0012 U	0.0085	0.0012	0.0013
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	1100	1200	870	830	920	1100	1300 D	1400	1700 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 U	< 0.31 UD	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	110	92	110	110	120	110	100 D	96 D	100 D
Potassium	mg/L	T	--	69	66	50	43	60 J	65	89 D	90 D	98 D
Sodium	mg/L	T	--	330	370	250	240	280	380	430 D	430 D	500 D
Total Alkalinity	mg/L	T	--	1100	1200	870	830	920	1100	1300 D	1400	1700 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-02								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/28/2022	1/4/2023	2/8/2023	3/14/2023	4/18/2023	5/23/2023	6/27/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	3.36	4.1	3.07	2.616	3.66	3.524	4.17	4.07	4.21
Dissolved Oxygen	mg/L	N	--	0.28	0.49	0.2	0.41	0.08	0.06	0.07	0.1	0.03
Oxidation Reduction Potential	mV	N	--	89.4	-215.7	-185.2	-169.9	-135.7	-138.9	-137.4	-133.8	-166.8
pH	su	N	--	7.11	7.06	7.33	7.35	7.13	7.45	7.29	7.21	7.11
Temperature	deg c	N	--	12.8	12	11.2	9.6	10.2	11.7	12.1	14	15
Turbidity	NTU	N	--	0.02	0.02	0.02	0.49	3.66	5.05	6.89	3.3	8.78
Appendix III												
Boron	mg/L	T	4.0	**88**	**86**	**100**	**98**	**73**	**95**	**110 J+**	**99 D**	**110 D**
Calcium	mg/L	T	250	210	180	210	240	190	210	210 D	180 D	190 D
Chloride	mg/L	T	120	**150**	**140**	67	**140**	**150**	**140**	**140 D**	**130 D**	**140 D**
Fluoride	mg/L	T	2.0	**9.2**	**10**	**4.5**	**9.4**	**8.7**	**9.2**	**10 D**	**9.7 D**	**9.7 D**
Sulfate (as SO4)	mg/L	T	250	0.86 J	2.2 J	< 0.41 U	1.1 J	< 0.41 U	< 0.41 U	< 0.41 UD	0.93 JD	< 0.41 UD
Total Dissolved Solids	mg/L	T	950	**1700**	**1800**	**1900**	**1700**	**1700**	**1800**	**2100 J**	**1900 D**	**1600 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.00015 J	0.00016 J	< 0.00025 U	0.00019 J	0.00063 J	< 0.00050 U	0.00024 J	0.00018 J	0.00029
Arsenic	mg/L	T	0.010	0.0082	0.0076	0.0086	0.0078	0.0083	**0.012**	0.0096 J+	0.0086	0.0074
Barium	mg/L	T	1.3	0.51	0.53	0.55	0.51	0.38	0.48	0.47	0.45	0.42
Beryllium	mg/L	T	0.0040	0.00028	0.00034	0.00042	0.00029	0.00015 J	0.00021 J	0.00032 J+	0.00043	0.00052
Cadmium	mg/L	T	0.0025	< 0.000032 U	0.000046 J	< 0.00016 U	0.000041 J	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	0.00049
Chromium, Total	mg/L	T	0.10	0.022	**0.054**	**0.057**	**0.046**	0.019	0.030	**0.068**	**0.054**	0.032
Cobalt	mg/L	T	0.0060	0.0038	**0.0060**	**0.0080**	**0.0066**	0.0031	0.0039	**0.0089 J+**	**0.0076**	**0.0063**
Fluoride	mg/L	T	2.0	**9.2**	**10**	**4.5**	**9.4**	**8.7**	**9.2**	**10 D**	**9.7 D**	**9.7 D**
Lead	mg/L	T	0.0016	0.0010	**0.0024**	**0.0030**	**0.0027**	**0.0018 J**	**0.0041**	**0.0039 J+**	**0.0017**	**0.002**
Lithium	mg/L	T	0.10	**1.2**	**1.5**	**1.5**	**1.6**	**0.87**	**1.2**	**1.7**	**1.4**	**1.2 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0052	0.0062	0.011	0.011	0.0088	0.0064	0.0062 J+	0.0052	0.0051
Radium 226 and 228	pCi/L	T	5.0	< 2.18 U	< 2.8 U	3.35	1.56	< 0.686 U	1.67	1.67	2.45	1.16
Radium-226	pCi/L	T	--	< 0.547 U	0.781	0.642	0.398	< 0.302 U	0.58	0.714	0.743	< 0.354 U
Radium-228	pCi/L	T	--	< 2.18 UJ	< 2.8 UG	< 3.21 UG	< 1.24 UG	< 0.686 U	< 1.2 UJ	0.957	1.71 G	< 0.897 U
Selenium	mg/L	T	0.0050	0.0010	0.0012	0.0012	0.00095	0.00050	0.0010	0.0014 J+	0.0012	0.0018
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	0.00062
Total Suspended Solids	mg/L	T	--	67	58	58	56	100	90	20 D	16 D	6.1 D
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00081	0.0018	0.0025	0.0020	0.0011	0.0014	0.0026 B	0.0018	0.0025
Iron	mg/L	T	83	23	22	24	30	27	27	24	20	18 D
Nickel	mg/L	T	0.10	0.015	0.023	0.042	0.035	0.017	0.014	0.025	0.022	0.018
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	0.0014	0.0036	0.0035	0.0032	0.0013	0.0026	**0.0067**	0.0049	0.0044
Zinc	mg/L	T	0.27	0.023	0.0030	0.0033	0.0022	0.025	0.0019	0.0027	0.0041	0.0036
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	1900	2000	1900	1800	1800	1900	460	2100	2300
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 1.6 U	< 0.16 U	< 0.16 U	< 0.31 U	< 0.31 U	< 0.16 U	< 0.16 U	< 0.16 U
Magnesium	mg/L	T	--	63	59	70	78	68	71	62	58 D	57 D
Potassium	mg/L	T	--	50	44	53	45	41	44	56 J	46 D	47 D
Sodium	mg/L	T	--	250	250	260	260	220	280	320 D	310 D	310 D
Total Alkalinity	mg/L	T	--	1900	2000	1900	1800	1800	1900	460	2100	2300

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-03								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/28/2022	1/4/2023	2/7/2023	3/14/2023	4/18/2023	5/23/2023	6/28/2023	8/7/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	0.344	3.52	3.43	2.459	3.15	3.08	3.19	3.19	3.03
Dissolved Oxygen	mg/L	N	--	0.16	0.26	0.2	0.21	0.03	0.01	0.05	0.09	0.06
Oxidation Reduction Potential	mV	N	--	-180	-139.7	-212.9	-184.2	-92.8	-194.3	-129.6	-110.7	-116.1
pH	su	N	--	7.31	7.32	7.2	7.45	7.26	7.59	7.44	7.31	7.28
Temperature	deg c	N	--	13.3	11.4	9.2	7.3	9.3	11.8	12.5	14.9	14.9
Turbidity	NTU	N	--	0.02	0.68	2.4	0.02	1.4	0.02	0.02	0.21	0.26
Appendix III												
Boron	mg/L	T	4.0	**4.4**	3.3	**4.2**	**4.3**	3.9	**4.1**	**4.3 J+**	**4.1**	**4.3 D**
Calcium	mg/L	T	250	**390**	**290**	**400**	**410**	**360**	**400**	**430 D**	**350 D**	**380 D**
Chloride	mg/L	T	120	**300**	**190**	**240**	**190**	**150**	**140**	**160 D**	**170 D**	**180 D**
Fluoride	mg/L	T	2.0	0.65	1.6	0.62	0.52	0.60	0.54	0.54 D	0.61 D	0.6 D
Sulfate (as SO4)	mg/L	T	250	42	**460**	230	**550**	**760**	**690**	**510 D**	**480 D**	**380 D**
Total Dissolved Solids	mg/L	T	950	**2200 J-**	**1700**	**2300**	**2300**	**2300**	**2300**	**2300 D**	**2300 D**	**2200 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.000087 J	0.000092 J	< 0.00025 U	0.00011 J	0.00045 J	< 0.00050 U	< 0.00050 UD	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.00084	0.0011	0.0012 J	0.0011	0.00050 J	0.00049 J	0.00091 J+	0.00076	0.0011
Barium	mg/L	T	1.3	0.43	0.13	0.50	0.30	0.34	0.43	0.38 D	0.38	0.41
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.00026 U	0.000053 J	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	0.00015 J
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	0.00011 J
Chromium, Total	mg/L	T	0.10	0.0046	0.0061	0.0049	0.0073	0.0033	0.0037	0.0060	0.0053	0.003
Cobalt	mg/L	T	0.0060	0.00088	0.00044 J	0.00081 J	0.00097	0.00044 J	0.00050 J	0.0012 J+	0.0011	0.0013
Fluoride	mg/L	T	2.0	0.65	1.6	0.62	0.52	0.60	0.54	0.54 D	0.61 D	0.6 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.0011 U	< 0.0011 U	< 0.00050 U	< 0.00050 UJ	< 0.00050 UD	0.00022 J
Lithium	mg/L	T	0.10	0.044	0.065	0.039	0.045	0.037	0.035	0.050	0.041	0.035
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	0.00024
Molybdenum	mg/L	T	0.10	< 0.00062 U	0.00072 J	< 0.0031 U	< 0.00062 U	< 0.0031 U	< 0.00025 U	< 0.00025 UJ	< 0.00025 U	0.00085 J
Radium 226 and 228	pCi/L	T	5.0	1.92	< 1.32 U	0.75	1.76	0.81	1.38	1.26	0.996	1.34
Radium-226	pCi/L	T	--	0.583	0.526	0.242	< 0.217 U	0.268	0.574	< 0.209 U	0.417	< 0.312 U
Radium-228	pCi/L	T	--	1.34	< 1.32 UG	< 0.67 U	1.55	< 0.767 U	< 1.15 UJ	1.18	< 0.763 U	1.08
Selenium	mg/L	T	0.0050	0.00042 J	< 0.00022 U	< 0.0011 U	0.00040 J	< 0.00022 U	0.00017 J	0.00042 J+	0.00034 J	0.00053
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.00038 UJ	< 0.00038 UD	0.00018 J
Total Suspended Solids	mg/L	T	--	4.0	15	4.0	1.0 J	< 4.0 U	< 4.0 U	< 4.0 U	3.0 JD	< 4 U
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.0010 U	< 0.00020 U	< 0.00020 U	0.00025	0.00030 B	0.00024 J	0.00091
Iron	mg/L	T	83	3.7	5.9	2.5	1.6	2.0	0.78	0.31	0.28	0.43
Nickel	mg/L	T	0.10	0.0016	0.015	< 0.0032 U	0.0018	0.00085 J	0.00087 J	0.0016	0.0015	0.0017
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.0031 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	0.0012
Zinc	mg/L	T	0.27	0.019	< 0.0012 U	< 0.0059 U	< 0.0012 U	0.018	< 0.0012 U	0.0019	< 0.0012 U	0.002
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	1800	690	1600	1200	1100	1100	1300 D	1300	1400 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 U	< 0.31 UD	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	210	91	220	220	210	220	210 D	200 D	200 D
Potassium	mg/L	T	--	20	18	20	15	20	17	20	18 D	18 D
Sodium	mg/L	T	--	130	74	120	110	100	110	100 D	110 D	100 D
Total Alkalinity	mg/L	T	--	1800	690	1600	1200	1100	1100	1300 D	1300	1400 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-04								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/28/2022	1/4/2023	2/7/2023	3/14/2023	4/19/2023	5/23/2023	6/28/2023	8/7/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	0.237	2.47	2.56	2.044	2.81	2.82	2.81	2.74	2.52
Dissolved Oxygen	mg/L	N	--	0.15	0.1	0.07	0.79	0.15	0.06	0.05	0.16	0.14
Oxidation Reduction Potential	mV	N	--	-137.4	-113.2	-175.9	-126.6	43.2	-91.9	-113.3	-130.1	-133.3
pH	su	N	--	7.34	7.39	7.23	7.45	7.35	7.66	7.43	7.34	7.26
Temperature	deg c	N	--	13.1	10.5	8.7	6.5	7.2	10.5	13.1	16.4	16.1
Turbidity	NTU	N	--	1.95	0.02	0.02	0.02	0.02	0.02	0.28	2.98	1.42
Appendix III												
Boron	mg/L	T	4.0	**4.0**	3.9	3.8	3.8	3.5	**4.3**	**4.1 J+**	**4.0**	**4.7 DJ**
Calcium	mg/L	T	250	**310**	**360**	**350**	**390**	**340**	**400**	**410 D**	**330 D**	**360 D**
Chloride	mg/L	T	120	**180**	**300**	**200**	**220**	**220**	**200**	**190 D**	**160 D**	**150 D**
Fluoride	mg/L	T	2.0	1.2	0.76	1.3	1.4	1.3	1.3	1.2 D	1.4 D	1.9 D
Sulfate (as SO4)	mg/L	T	250	**410**	1.8 J	**530**	**580**	**700**	**690**	**610 D**	**610 D**	**630 D**
Total Dissolved Solids	mg/L	T	950	**1700**	**2100**	**1700**	**1800**	**1900**	**2100**	**2000 D**	**1900 D**	**1800 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.000071 J	< 0.000050 U	< 0.00025 U	< 0.000050 U	0.00041 J	< 0.00050 U	< 0.00050 UD	0.00012 J+	< 0.0001 U
Arsenic	mg/L	T	0.010	0.0012	0.00078	0.0012	0.0012	0.00060	0.00047 J	0.00092 J+	0.00088	0.001
Barium	mg/L	T	1.3	0.11	0.46	0.13	0.12	0.10	0.12	0.15 D	0.12	0.12
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.0027	0.0060	0.0047	0.0049	0.0026	0.0031	0.0046	0.0044	0.0027
Cobalt	mg/L	T	0.0060	0.00035 J	0.00093	0.00062	0.00065	0.00031 J	0.00036 J	0.00074 J+	0.00062	0.00045 J
Fluoride	mg/L	T	2.0	1.2	0.76	1.3	1.4	1.3	1.3	1.2 D	1.4 D	1.9 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.00022 U	< 0.0011 U	< 0.00050 U	< 0.00050 UJ	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	0.10	0.067	0.047	0.061	0.074	0.054	0.061	0.074	0.074	0.066 D
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0013	< 0.00062 U	0.00074 J	0.00086 J	< 0.0031 U	0.00041 J	0.00044 J+	0.0012	0.0015
Radium 226 and 228	pCi/L	T	5.0	1.43	1.08	1.55	1.23	< 0.752 U	1.49	1.2	1.29	1.2
Radium-226	pCi/L	T	--	< 0.206 U	0.159	0.175	< 0.198 U	< 0.189 U	< 0.214 U	0.232	0.152 J-	0.275
Radium-228	pCi/L	T	--	1.28	0.916	1.38	1.16	< 0.752 U	1.33 J	0.963	1.14	0.924
Selenium	mg/L	T	0.0050	< 0.00022 U	0.00041 J	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00010 U	0.00017 J+	0.00021 J+	0.00024 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.00038 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	10	8.0	11	10	11	12	8.1 D	< 4.0 UJ	8
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.00027
Iron	mg/L	T	83	4.7	6.3	5.6	6.3	6.1	6.8	6.8	5.0	5.6 D
Nickel	mg/L	T	0.10	0.012	0.0019	0.018	0.019	0.011	0.013	0.022	0.019	0.013
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.0044	< 0.0012 U	< 0.0012 U	< 0.0012 U	0.0059	< 0.0012 U	< 0.0012 U	< 0.0012 UJ	0.0015
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	800	1800	720	690	720	740	730	750	780
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U
Magnesium	mg/L	T	--	96	200	110	120	120	140	130 D	120 D	120 D
Potassium	mg/L	T	--	21	20	20	18	21	24	26	23 D	24 D
Sodium	mg/L	T	--	83	110	84	83	89	100	93 D	87 D	83 D
Total Alkalinity	mg/L	T	--	800	1800	720	690	720	740	730	750	780

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

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J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

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R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-06								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/29/2022	1/3/2023	2/6/2023	3/14/2023	4/18/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.78	2.13	2.16	1.973	2	2.05	2.04	2	2.02
Dissolved Oxygen	mg/L	N	--	0.1	0.6	0.07	0.14	0.35	0.08	0.24	0.38	0.24
Oxidation Reduction Potential	mV	N	--	38.1	-139	-193.2	-148.9	-173.5	-184.3	-182.7	-80.3	-176.8
pH	su	N	--	7.33	7.26	6.42	7.21	7.28	7.36	7.27	7.17	7.26
Temperature	deg c	N	--	13.9	10.9	7.6	8.1	8.4	11.2	13.4	16.8	16.6
Turbidity	NTU	N	--	0.02	1.13	2.02	0.02	0.02	0.02	0.02	0.02	0.02
Appendix III												
Boron	mg/L	T	4.0	**12**	**9.5**	**10**	**9.5**	**7.5**	**8.6**	**9.7 J+**	**9.9**	**11 D**
Calcium	mg/L	T	250	220	230	**250**	**310**	**250**	**270**	**290 D**	230 D	240 D
Chloride	mg/L	T	120	**160**	**120**	110	82	57	73	71 D	76 D	79 D
Fluoride	mg/L	T	2.0	1.3	1.4	1.1	1.0	1.1	1.0	1.1 D	1.4 D	1.2 D
Sulfate (as SO4)	mg/L	T	250	16	9.6	20	7.3	9.4	20	16 D	0.98 JD	< 0.41 UD
Total Dissolved Solids	mg/L	T	950	**1300**	**1200**	**1300**	**1200**	**1200**	**1200**	**1300 D**	**1200 D**	**1100 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.000075 J	< 0.000050 U	< 0.00025 U	< 0.000050 U	0.00036 J	< 0.00050 U	< 0.00010 U	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.00080	0.00065	0.00058	0.00054 J	0.00047 J	0.00065	0.00062 J+	0.00082	0.001
Barium	mg/L	T	1.3	**1.5**	**1.5**	**1.6**	**1.4**	0.99	**1.3**	**1.4 D**	**1.4 D**	**1.5 D**
Beryllium	mg/L	T	0.0040	< 0.000054 U	< 0.000052 U	0.000052 J	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.0015	0.0021	0.0021	0.0030	0.0014	0.0012	0.0020	0.0023	0.0015
Cobalt	mg/L	T	0.0060	0.00048 J	0.00057	0.00067	0.00073	0.00050 J	0.00046 J	0.00080 J+	0.00067	0.00047 J
Fluoride	mg/L	T	2.0	1.3	1.4	1.1	1.0	1.1	1.0	1.1 D	1.4 D	1.2 D
Lead	mg/L	T	0.0016	0.00035 J	0.00025 J	< 0.0011 U	< 0.00022 U	< 0.0011 U	< 0.00050 U	0.00027 J+	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	0.10	**0.23**	**0.22**	**0.20**	**0.23**	**0.15**	**0.15**	**0.19**	**0.22**	**0.19 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	< 0.00064 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.0031 U	0.00026 J	0.00027 J+	< 0.00025 U	0.00025 J
Radium 226 and 228	pCi/L	T	5.0	0.864	0.637	< 0.715 U	1.91	< 0.646 U	0.92	0.824	0.938	1.58
Radium-226	pCi/L	T	--	0.419	0.238	0.24	< 0.212 U	0.402	0.259	0.331	0.465	0.432
Radium-228	pCi/L	T	--	< 0.449 U	< 0.631 U	< 0.715 U	1.7	< 0.646 U	< 0.772 U	< 0.606 U	< 0.735 U	1.15
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00020 J	0.00022 J+	0.00019 J	0.0002 J
Thallium	mg/L	T	0.0020	< 0.000076 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	36	45	42	65	53	43	41 D	37 D	48
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.0002 U
Iron	mg/L	T	83	15	17	16	26	19	18	18	14	19 D
Nickel	mg/L	T	0.10	0.0011 J	0.0011 J	0.0012	0.00092 J	< 0.00065 U	< 0.00065 U	0.0010 J	0.00090 J	0.00079 J
Silver	mg/L	T	0.00020	< 0.000051 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00064 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.060	0.0019	0.0018	0.0012	0.094	< 0.0012 U	0.0018	0.0013	0.0018
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	1100	1100	1000	1100	1100	990	1100 D	1100	1000 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 U	< 0.31 UD	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	110	95	100	96	90	100	100 D	90 D	89 D
Potassium	mg/L	T	--	32	24	23	20	20	23	26	24 D	26 D
Sodium	mg/L	T	--	110	78	84	69	63	82	87	77 D	71 D
Total Alkalinity	mg/L	T	--	1100	1100	1000	1100	1100	990	1100 D	1100	1000 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-07								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/30/2022	1/4/2023	2/7/2023	3/13/2023	4/18/2023	5/23/2023	6/27/2023	8/7/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	0.46	1.21	1.206	1.209	1.25	1.24	1.25	1.25	1.23
Dissolved Oxygen	mg/L	N	--	0.12	0.3	0.08	0.21	0.03	0.23	0.43	0.72	0.22
Oxidation Reduction Potential	mV	N	--	57.2	-88	-103.1	-143.9	-68	-109.4	-140.5	-15.7	-141
pH	su	N	--	6.88	7.04	6.93	6.58	6.86	6.93	6.88	6.65	6.88
Temperature	deg c	N	--	12.2	11	10	8.6	9.6	11.3	13	14.8	14.6
Turbidity	NTU	N	--	5.89	4.2	4.07	0.02	2.94	1.5	0.02	0.72	0.74
Appendix III												
Boron	mg/L	T	4.0	**13**	**11**	**12**	**11**	**10**	**12**	**11 J+**	**11**	**12 D**
Calcium	mg/L	T	250	140	140	140	150	130	150	160 D	120 D	150 D
Chloride	mg/L	T	120	15	15	14	14	14	13	13 D	13 D	14 D
Fluoride	mg/L	T	2.0	0.14	0.070 J	0.12	< 0.055 U	0.14	0.11	0.080 JD	0.083 JD	0.14 D
Sulfate (as SO4)	mg/L	T	250	29	30	33	20	17	15	18 D	19 D	26 D
Total Dissolved Solids	mg/L	T	950	660	470	650	500	620	660	720 D	620 D	620 D
Appendix IV												
Antimony	mg/L	T	0.0060	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	0.000071 J	< 0.00010 U	< 0.00010 U	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.00023 J	0.00021 J	0.00023 J	0.00018 J	0.00013 J	0.00023 J	0.00020 J+	0.00020 J	0.00029 J
Barium	mg/L	T	1.3	0.33	0.34	0.36	0.30	0.25	0.34	0.35	0.34	0.38
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	0.000062 J	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	0.000066 J	0.000055 J
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00038	0.00030	0.00037	0.00042	0.00028	0.00029	0.00033	0.00032	0.00036
Cobalt	mg/L	T	0.0060	0.00071	0.00088	0.00099	0.00099	0.00087	0.00095	0.0011 J+	0.00098	0.00098
Fluoride	mg/L	T	2.0	0.14	0.070 J	0.12	< 0.055 U	0.14	0.11	0.080 JD	0.083 JD	0.14 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00010 U	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	0.10	0.0054	0.0070	0.0052	0.0067	0.0083	0.0055	0.010	0.0042	0.0062
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00025 U	< 0.00025 UJ	< 0.00025 U	< 0.00025 U
Radium 226 and 228	pCi/L	T	5.0	1.12	1.26 J+	1.03	1.12	0.674	< 0.928 U	< 0.697 U	2.36	1.76
Radium-226	pCi/L	T	--	0.444	0.53	0.333	0.38	0.475	0.309	0.341	0.665	0.475
Radium-228	pCi/L	T	--	0.676	0.729 J+	0.693	< 0.835 U	< 0.559 U	< 0.928 U	< 0.697 U	1.7	1.28
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00010 J	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	44	36	35	33	33	39	39	41 D	38
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.00027
Iron	mg/L	T	83	16	13	13	15	14	19	17	14	18 D
Nickel	mg/L	T	0.10	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.016	< 0.0012 U	< 0.0012 U	< 0.0012 U	0.025	< 0.0012 U	< 0.0012 U	< 0.0012 U	0.0035
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	660	580	630	610	640	630	620	620	600 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	37	37	37	38	38	40	36	35 D	38 D
Potassium	mg/L	T	--	5.4	5.4	5.2	5.7	4.8	4.4	4.7	5.1	4.9
Sodium	mg/L	T	--	53	47	47	47	59	57	56	48 D	51 D
Total Alkalinity	mg/L	T	--	660	580	630	610	640	630	620	620	600 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-08								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/1/2022	1/5/2023	2/7/2023	3/14/2023	4/18/2023	5/23/2023	6/27/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.06	1.13	1.133	0.787	1.03	0.99	1.03	1.02	0.87
Dissolved Oxygen	mg/L	N	--	0.2	0.09	0.05	0.55	0.06	0.09	0.04	0.09	1.53
Oxidation Reduction Potential	mV	N	--	-159.3	-119.3	-133.9	-149.9	-121.2	-145.3	-103.6	-127.6	-180.6
pH	su	N	--	7.17	6.21	7.16	7.51	7.25	7.33	7.24	7.26	7.27
Temperature	deg c	N	--	9.6	6.9	6.2	5.2	7.3	11.6	14	16.7	14.7
Turbidity	NTU	N	--	0.02	0.02	0.66	0.02	1.04	0.02	2.11	5.63	0.02
Appendix III												
Boron	mg/L	T	4.0	2.5	**4.4**	**9.3**	**7.1**	**6.6**	**7.0**	**7.8 J+**	**7.1**	**4.1 D**
Calcium	mg/L	T	250	150	160	150	150	130	140	150 D	120 D	130 D
Chloride	mg/L	T	120	17	23	35	30	28	25	29 D	30 D	17 D
Fluoride	mg/L	T	2.0	0.40	0.56	1.1	1.3	1.1	0.92	1.0 D	1.0 D	0.55 D
Sulfate (as SO4)	mg/L	T	250	13	25	5.3	26	2.0 J	< 0.41 U	< 0.41 UD	< 0.41 UD	1.7 JD
Total Dissolved Solids	mg/L	T	950	560	480	630	480	560	550	610 D	530 D	440 D
Appendix IV												
Antimony	mg/L	T	0.0060	0.000095 J	0.000054 J	0.00020 J	0.00016 J	0.00028	< 0.00010 U	0.00011 J	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.0069	**0.021**	**0.049**	**0.045**	**0.050**	**0.041**	**0.038 J+**	**0.029**	**0.011**
Barium	mg/L	T	1.3	1.2	**1.3**	**1.5**	**1.4**	1.1	1.2	**1.4 D**	1.2 D	0.98
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00067	0.00093	0.0015	0.0011	0.00084	0.0011	0.00094	0.00087	0.00061
Cobalt	mg/L	T	0.0060	0.00034 J	0.00045 J	0.00070	0.00060	0.00051 J	0.00059	0.00062 J+	0.00058	0.00034 J
Fluoride	mg/L	T	2.0	0.40	0.56	1.1	1.3	1.1	0.92	1.0 D	1.0 D	0.55 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	0.00086	< 0.00022 U	0.00022 J	< 0.00010 U	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	**0.10**	0.063	**0.11**	**0.14**	**0.14**	**0.11**	**0.11**	**0.13**	**0.12**	0.076 D
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0024	0.0018	0.0015	0.0028	0.00095 J	0.00068 J	0.00039 J+	0.00036 J	0.0016
Radium 226 and 228	pCi/L	T	5.0	1.43	1.62 J+	< 0.836 U	1.13	1.18	1.14	< 0.606 U	2.1	0.891
Radium-226	pCi/L	T	--	0.277	0.31	0.286	< 0.255 U	0.32	0.396	0.19	0.358	< 0.234 U
Radium-228	pCi/L	T	--	1.16	1.31 J+	< 0.836 U	< 1 UG	0.858	< 0.835 U	< 0.606 U	1.74 G	< 0.744 U
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00016 J	0.00014 J+	0.00014 J	0.00015 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	62	55	49	42	36	31	30	20	43
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	0.00043	< 0.00020 U	0.00045	0.00034	< 0.00020 U	< 0.00020 U	0.00021 J
Iron	mg/L	T	83	32	30	21	22	18	18	15	13	22 D
Nickel	mg/L	T	0.10	0.00093 J	0.0013	0.0015	0.0013	0.0011 J	0.0011 J	0.0011 J	0.0010 J	0.00085 J
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.054	< 0.0012 U	0.0040	0.0013	0.12	0.0014	0.0018	< 0.0012 U	0.0025
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	540	510	560	470	510	490	480	480	460 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	27	30	33	27	29	28	26	26 D	22 D
Potassium	mg/L	T	--	8.8	12	14	7.6 J	12	11	12	12	8.6 D
Sodium	mg/L	T	--	21	27	38	33	35	35	40	36 D	23 D
Total Alkalinity	mg/L	T	--	540	510	560	470	510	490	480	480	460 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

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J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-09								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/28/2022	1/4/2023	2/6/2023	3/14/2023	4/18/2023	5/23/2023	6/27/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.33	1.49	1.593	1.472	2.02	1.95	1.95	1.92	1.63
Dissolved Oxygen	mg/L	N	--	0.19	0.2	1.89	0.35	0.08	0.07	0.05	0.17	0.07
Oxidation Reduction Potential	mV	N	--	42	-183.9	-138.4	-131.5	-112.3	-107.1	-117	-114.7	-69.3
pH	su	N	--	7.2	7.22	7.22	7.4	7.22	7.52	7.28	7.21	7.16
Temperature	deg c	N	--	12.7	10.5	8.5	6.8	7.7	10.6	12.1	15	15.7
Turbidity	NTU	N	--	0.02	0.02	1.04	0.02	0.55	0.66	0.71	2.01	0.49
Appendix III												
Boron	mg/L	T	4.0	**6.0**	**5.8**	**6.1**	**5.1**	**4.9**	**5.9**	**6.3 J+**	**5.7**	**6.9 D**
Calcium	mg/L	T	250	**270**	230	**300**	**400**	**390**	**410**	**430 D**	**330 D**	**310 D**
Chloride	mg/L	T	120	15	17	18	16	12	11	11 D	12 D	12 D
Fluoride	mg/L	T	2.0	**2.1**	**2.4**	**2.6**	**2.5**	**2.5**	**2.7**	**2.9 D**	**2.9 D**	**2.8 D**
Sulfate (as SO4)	mg/L	T	250	110	83	210	**480**	**650**	**580**	**500 D**	**450 D**	210 D
Total Dissolved Solids	mg/L	T	950	**960**	740	**1100**	**1400**	**1600**	**1600**	**1500 D**	**1400 D**	**1100 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.000073 J	< 0.000050 U	0.00023 J	0.000092 J	0.00037 J	< 0.00050 U	< 0.00010 U	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.0025	0.0023	0.0023	0.0023	0.0013	0.0013	0.0027 J+	0.0024	0.0023
Barium	mg/L	T	1.3	0.59	**2.4**	0.36	0.38	0.18	0.20	0.17	0.20	0.28
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	0.000058 J	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.0022	0.0028	0.0032	0.0030	0.0018	0.0019	0.0031	0.0027	0.0018
Cobalt	mg/L	T	0.0060	0.00035 J	0.00046 J	0.00058	0.00099	0.00053	0.00037 J	0.00069 J+	0.00075	0.00024 J
Fluoride	mg/L	T	2.0	**2.1**	**2.4**	**2.6**	**2.5**	**2.5**	**2.7**	**2.9 D**	**2.9 D**	**2.8 D**
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.00022 U	< 0.0011 U	< 0.00050 U	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	0.10	**0.29**	**0.34**	**0.33**	**0.31**	**0.26**	**0.29**	**0.34**	**0.33**	**0.29 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	**0.0024**
Molybdenum	mg/L	T	0.10	0.028	0.033	0.029	0.021	0.020	0.012	0.019 J+	0.019	0.021
Radium 226 and 228	pCi/L	T	5.0	0.789	< 0.678 U	< 0.642 UJ	< 0.796 U	< 0.688 U	< 0.912 U	< 0.742 U	< 0.821 U	< 0.688 U
Radium-226	pCi/L	T	--	< 0.16 U	< 0.0959 U	< 0.125 UJ	< 0.223 U	< 0.184 U	< 0.22 U	< 0.186 U	< 0.163 U	< 0.237 U
Radium-228	pCi/L	T	--	0.69	< 0.678 U	< 0.642 UJ	< 0.796 U	< 0.688 U	< 0.912 U	< 0.742 U	< 0.821 U	< 0.688 U
Selenium	mg/L	T	0.0050	0.00026 J	< 0.00022 U	0.00028 J	0.00024 J	< 0.00022 U	0.00012 J	0.00027 J+	0.00026 J	0.00023 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	45	51	52	50	56	52	46	48	39
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.00043	< 0.0002 U
Iron	mg/L	T	83	17	19	19	24	25	25	19	16	15 D
Nickel	mg/L	T	0.10	0.00088 J	0.0020	0.0020	0.0033	0.0018	0.0010 J	0.0012	0.0012	0.00072 J
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.025	0.0015	< 0.0012 UJ	< 0.0012 U	0.018	< 0.0012 U	< 0.0012 U	< 0.0012 U	< 0.0012 U
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	750	710	750	620	610	400	720	660	780 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	38	36	44	50	53	53	47	46 D	41 D
Potassium	mg/L	T	--	13	16	16	10 J	15	14	16	17	15 D
Sodium	mg/L	T	--	29	28	26	26	26	29	30	27 D	27 D
Total Alkalinity	mg/L	T	--	750	710	750	620	610	400	720	660	780 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-10								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/29/2022	1/4/2023	2/6/2023	3/14/2023	4/18/2023	5/23/2023	6/27/2023	8/8/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.96	2.48	2.34	2.16	2.51	2.18	2.83	3.19	2.68
Dissolved Oxygen	mg/L	N	--	0.08	0.04	0.07	0.05	0.02	0.03	0.11	0.02	0.07
Oxidation Reduction Potential	mV	N	--	-20.3	-245.6	-222.9	-200.2	-189.2	-197.6	-216.2	-168	-149.1
pH	su	N	--	7.85	7.79	7.05	8.19	7.96	8.81	7.85	7.74	7.47
Temperature	deg c	N	--	11.1	7.7	5.9	4.6	6.5	10.3	13.4	17	14.8
Turbidity	NTU	N	--	0.02	0.02	0.65	0.02	0.29	2.21	0.02	1.01	0.02
Appendix III												
Boron	mg/L	T	4.0	**25**	**14**	**9.7**	**4.5**	**9.2**	**17**	**26 J+**	**28 D**	**23 D**
Calcium	mg/L	T	250	220	220	**280**	**460**	**280**	210	210 D	160 D	190 D
Chloride	mg/L	T	120	**220**	**170**	**130**	92	**140**	**160**	**320 D**	**430 D**	**310 D**
Fluoride	mg/L	T	2.0	**7.1**	**5.7**	**4.0**	**2.7**	**4.6**	**6.5**	**7.3 D**	**7.7 D**	**6 D**
Sulfate (as SO4)	mg/L	T	250	**490**	**620**	**880**	**360**	**950**	**410**	200 D	140 D	**330 D**
Total Dissolved Solids	mg/L	T	950	**1700**	**1800**	**1800**	**2400**	**1900**	**1500**	**1700 D**	**1900 D**	**1600 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.00013 J	< 0.000050 U	< 0.00025 U	< 0.000050 U	0.00034 J	< 0.00050 U	0.00011 J	0.00011 J	< 0.0001 UJ
Arsenic	mg/L	T	0.010	0.00049 J	0.00034 J	0.00038 J	0.00037 J	0.00020 J	0.00055	0.00073 J+	0.0011	0.00094
Barium	mg/L	T	1.3	0.32	0.57	0.28	0.23	0.14	0.16	0.23	0.28	0.46
Beryllium	mg/L	T	0.0040	< 0.000054 U	0.000071 J	< 0.000052 U	0.000054 J	< 0.000052 U	0.00022 J	0.000092 J+	0.00015 J	0.000052 J-
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.0040	0.0050	0.0026	0.0018	0.0019	0.0042	0.0070	0.0085	0.0042
Cobalt	mg/L	T	0.0060	0.00038 J	0.00040 J	0.00041 J	0.00053	0.00030 J	0.0018	0.00068 J+	0.00090	0.00038 J-
Fluoride	mg/L	T	2.0	**7.1**	**5.7**	**4.0**	**2.7**	**4.6**	**6.5**	**7.3 D**	**7.7 D**	**6 D**
Lead	mg/L	T	0.0016	< 0.00023 U	< 0.00022 U	< 0.0011 U	< 0.0011 U	< 0.0011 U	< 0.00050 U	< 0.00010 UJ	0.00012 J	0.00017 J
Lithium	mg/L	T	0.10	**0.92**	**0.83**	**0.54**	**1.6**	**0.99**	**0.83**	**1.1**	**1.2**	**0.94 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 UJ
Molybdenum	mg/L	T	0.10	0.0072	0.0033	0.0048	0.0036	0.0035 J	0.0056	0.0019 J+	0.0028	0.0027
Radium 226 and 228	pCi/L	T	5.0	< 0.775 U	< 0.645 U	1.36	< 1.09 U	< 0.605 UJ	< 0.801 U	< 0.752 U	< 0.736 U	< 0.897 UJ
Radium-226	pCi/L	T	--	< 0.171 U	< 0.119 U	< 0.121 U	< 0.231 U	< 0.155 UJ	< 0.248 U	< 0.179 U	< 0.142 U	< 0.229 UJ
Radium-228	pCi/L	T	--	< 1 U	< 0.645 U	1.31	< 1.09 UG	< 0.605 UJ	< 0.801 U	< 0.752 U	< 0.736 U	< 0.897 UJ
Selenium	mg/L	T	0.0050	0.00031 J	0.00028 J	0.00031 J	0.00046 J	< 0.00022 U	0.00039 J	0.00036 J+	0.00041 J	0.00036 J
Thallium	mg/L	T	0.0020	< 0.000076 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	4.0	4.0	1.0 J	9.0	8.0 J+	2.0 J	< 4.0 U	2.0 J	< 4 U
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00049	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.0013	< 0.00020 U	< 0.00020 U	0.00038 J-
Iron	mg/L	T	83	3.7	3.7	3.9	7.2	7.3	6.2	4.5	3.2	2.4 D
Nickel	mg/L	T	0.10	0.00089 J	0.00087 J	< 0.00065 U	< 0.00065 U	< 0.00065 U	0.0018	0.00088 J	0.0012	0.00076 J-
Silver	mg/L	T	0.00020	< 0.000051 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00064 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	0.0013	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.014	0.0012	< 0.0012 U	< 0.0012 U	0.013	0.0018	0.0012	0.0014	0.0025 J-
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	680	580	320	140	340	540	720	770	700 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	85	86	91	95	76	63	59	58 D	61 D
Potassium	mg/L	T	--	44	33	31	40	42	36	46	48 D	45 D
Sodium	mg/L	T	--	220	160	120	140	160	190	310 D	390 D	300 D
Total Alkalinity	mg/L	T	--	680	580	320	140	340	540	720	770	700 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-11								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/29/2022	1/3/2023	2/8/2023	3/14/2023	4/18/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.38	1.4	1.9	1.413	1.77	1.76	1.85	1.68	1.4
Dissolved Oxygen	mg/L	N	--	0.1	0.31	0.25	0.19	0.23	0.09	0.13	0.22	0.31
Oxidation Reduction Potential	mV	N	--	76.8	-142.4	-161.7	-121	-157.9	-136.5	-64.7	-27.6	-179.4
pH	su	N	--	7.28	7.32	7.4	7.47	7.33	7.34	7.31	7.22	7.44
Temperature	deg c	N	--	13.6	11.7	9.9	7.5	7.8	10.6	13.2	15.3	15.9
Turbidity	NTU	N	--	0.02	1.53	0.02	0.02	0.02	1.25	5.01	0.02	0.02
Appendix III												
Boron	mg/L	T	4.0	**8.5**	**13**	**4.8 B**	2.8	1.5	2.0	3.0 J+	**7.2**	**12 D**
Calcium	mg/L	T	250	240	130	**300**	**380**	**320**	**320**	**350 D**	240 D	150 D
Chloride	mg/L	T	120	95	84	78	62	52	53	72 D	73 D	88 D
Fluoride	mg/L	T	2.0	0.81	1.4	0.37	0.32	0.21	0.22	0.25 D	0.69 D	1.2 D
Sulfate (as SO4)	mg/L	T	250	13 J	10	42	180	210	87	17 D	1.8 JD	< 0.41 UD
Total Dissolved Solids	mg/L	T	950	**970 J-**	680	**1200**	**1100**	**1200**	**1200**	**1100 D**	930 D	**1800 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.000082 J	0.00069	< 0.000050 U	< 0.000050 U	0.00028 J	< 0.00050 U	< 0.00010 U	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.0017	0.0041	0.0016	0.0011	0.00061	0.0010	0.0012 J+	0.0019	0.0023
Barium	mg/L	T	1.3	0.74	1.2	0.59	0.60	0.36	0.41	0.50	0.57	0.87
Beryllium	mg/L	T	0.0040	< 0.000052 U	0.000091 J	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	0.00073	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00080	0.0086	0.0010	0.00087	0.00045	0.00052	0.0012	0.0018	0.00063
Cobalt	mg/L	T	0.0060	0.00036 J	0.0012	0.00061	0.00072	0.00040 J	0.00040 J	0.00066 J+	0.00061	0.00023 J
Fluoride	mg/L	T	2.0	0.81	1.4	0.37	0.32	0.21	0.22	0.25 D	0.69 D	1.2 D
Lead	mg/L	T	0.0016	**0.0025**	**0.068**	**0.0018 J**	< 0.00022 U	< 0.0011 U	< 0.00050 U	**0.0038 J+**	0.00017 J	0.00036 J
Lithium	mg/L	T	0.10	**0.10**	**0.22**	0.052	0.028	0.0059	0.0084	0.022	0.095	**0.15 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0017	0.0029	0.0015	< 0.00062 U	< 0.00062 U	0.00043 J	0.00066 J+	0.0013	0.0015
Radium 226 and 228	pCi/L	T	5.0	1.19	1.32	< 0.91 U	1.07	1.67	0.812	< 1 U	1.76	0.764
Radium-226	pCi/L	T	--	0.445	0.422	0.352	0.304	0.406	0.228	0.243	0.409	0.469
Radium-228	pCi/L	T	--	0.75	0.903	< 0.91 U	< 0.84 U	1.26	< 0.721 U	< 1 U	1.35	< 0.624 U
Selenium	mg/L	T	0.0050	0.00022 J	0.00031 J	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00014 J	0.00016 J+	0.00021 J	0.0002 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	21	35	10	11	4.0	< 4.0 U	4.0	6.0	19
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00043	0.019	0.00047	< 0.00020 U	< 0.00020 U	0.00024 J	0.00056 B	0.0016	< 0.0002 U
Iron	mg/L	T	83	8.7	10	4.9	6.1	3.6	3.8	4.2	6.7	11 D
Nickel	mg/L	T	0.10	0.0013	0.0094	0.0015	0.0012	0.00065 J	0.00068 J	0.0013	0.0018	0.0015
Silver	mg/L	T	0.00020	< 0.000050 U	0.00014	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	0.00062 J	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.032	0.10	0.0085	< 0.0012 U	0.033	< 0.0012 U	0.0049	0.0031	0.0018
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	840	600	860	810	800	840	890	800	660 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	60	55	63	67	60	55	55	56 D	52 D
Potassium	mg/L	T	--	15	19	11	8.5	5.7	5.5	8.1	14	18 D
Sodium	mg/L	T	--	57	70	37	25	21	26	38	50 D	67 D
Total Alkalinity	mg/L	T	--	840	600	860	810	800	840	890	800	660 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-12								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/28/2022	1/3/2023	2/7/2023	3/13/2023	4/19/2023	5/23/2023	6/27/2023	8/7/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B	Unit 3A/B
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	0.459	0.387	0.542	0.311	0.52	0.44	0.55	0.67	0.64
Dissolved Oxygen	mg/L	N	--	1.62	8.72	8.46	10.31	1.03	2.93	0.12	0.08	0.16
Oxidation Reduction Potential	mV	N	--	93.4	47.4	-14.8	87.6	26.2	131	54.9	-30.1	-118.7
pH	su	N	--	7.67	7	7.8	8.16	7.92	7.77	7.52	7.47	7.46
Temperature	deg c	N	--	8.8	3.3	1.3	3	9.7	13.9	17.5	20.9	15.9
Turbidity	NTU	N	--	0.02	0.02	0.02	0.02	0.02	1.92	0.02	0.02	0.31
Appendix III												
Boron	mg/L	T	4.0	0.39	0.24	0.26	0.19	0.20	0.27	0.33 J+	0.36	0.42 D
Calcium	mg/L	T	250	77	46	78	77	55	63	64	95 D	95 D
Chloride	mg/L	T	120	24	16	27	18	16	15	17 D	22 D	26 D
Fluoride	mg/L	T	2.0	0.54	0.43	0.23	0.48	0.23	0.22	0.26 D	0.28 D	0.26 D
Sulfate (as SO4)	mg/L	T	250	180	130	180	120	110	99	110 D	130 D	130 D
Total Dissolved Solids	mg/L	T	950	360	210	340	200	260	270	330 D	420	200
Appendix IV												
Antimony	mg/L	T	0.0060	0.00071	0.0011	0.00076	0.00053	0.00094	0.00092	0.00064	0.00040	0.00041
Arsenic	mg/L	T	0.010	0.0028	0.0019	0.0018	0.0014	0.0019	0.0024	0.0029 J+	0.0034	0.0031
Barium	mg/L	T	1.3	0.030	0.017	0.024	0.025	0.022	0.032	0.043	0.053	0.06
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	0.00067	0.00078	0.0014	0.00062	0.0012	0.0016	0.0024 J+	0.0022	0.0011
Chromium, Total	mg/L	T	0.10	0.00034	0.00048	0.00046	0.00067	0.00054	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.0002 U
Cobalt	mg/L	T	0.0060	0.00019 J	< 0.00010 U	0.00014 J	< 0.00010 U	< 0.00010 U	0.00026 J	0.00050 J+	0.00053	0.00038 J
Fluoride	mg/L	T	2.0	0.54	0.43	0.23	0.48	0.23	0.22	0.26 D	0.28 D	0.26 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00015 J	0.00014 J+	0.00021 J	0.00021 J
Lithium	mg/L	T	0.10	0.0037	0.0033	0.0022 J	0.0025 J+	0.0037	0.0043	0.0064	0.0042	0.0048
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	0.00016 J
Molybdenum	mg/L	T	0.10	0.0087	0.0072	0.0067	0.0056	0.0057	0.0069	0.0082 J+	0.0088	0.0096
Radium 226 and 228	pCi/L	T	5.0	< 0.543 U	< 0.459 U	< 0.685 U	< 0.619 U	0.809	1.09	< 0.59 UJ	< 0.578 UJ	< 0.517 U
Radium-226	pCi/L	T	--	< 0.13 U	< 0.0702 U	< 0.0727 U	< 0.126 U	< 0.129 U	< 0.136 U	< 0.124 U	< 0.106 UJ	< 0.212 U
Radium-228	pCi/L	T	--	< 0.543 U	< 0.459 U	< 0.685 U	< 0.619 U	0.793	1.07	< 0.59 UJ	< 0.578 UJ	< 0.517 U
Selenium	mg/L	T	0.0050	0.0015	0.0022	0.0023	0.00093	0.0017	0.00076	0.00021 J+	0.00013 J	0.00029 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	< 4.0 U	< 4.0 U	2.0 J	< 4.0 U	1.0 J	< 4.0 U	< 4.0 UJ	0.98 J+	< 4 U
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00055	0.00092	0.0010	0.0010	0.0015	0.0016	0.0012 B	0.00094	0.00071
Iron	mg/L	T	83	< 0.26 U	< 0.026 U	0.033 J	0.027 J	< 0.026 U	< 0.026 U	0.051	0.064	0.037 J
Nickel	mg/L	T	0.10	0.0025	0.0023	0.0035	0.0016	0.0021	0.0025	0.0031	0.0035	0.0026
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	0.00085 J	0.0013	0.0012	0.00095 J	< 0.00062 U
Zinc	mg/L	T	0.27	0.0068	0.0080	0.0095	0.0037	0.0090	0.0074	0.0085	0.010	0.008
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	86	55	52	46	85	95	140	140	190 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	17	12	2.4	12	13	15	14	19	22 D
Potassium	mg/L	T	--	1.3	0.70	0.74	0.82	1.0	1.3	1.3	1.8	1.7
Sodium	mg/L	T	--	13	11	14	9.9	9.4	11	11	14	16 D
Total Alkalinity	mg/L	T	--	86	55	52	46	85	95	140	140	190 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-18								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/30/2022	1/5/2023	2/8/2023	3/13/2023	4/18/2023	5/22/2023	6/27/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.54	2.06	1.788	1.554	1.4	1.52	1.62	1.46	1.6
Dissolved Oxygen	mg/L	N	--	0.09	0.19	0.72	0.22	0.34	0.15	0.29	0.05	0.3
Oxidation Reduction Potential	mV	N	--	66.8	-126.8	-70.8	-69.8	-31.3	-22.1	-88.4	-92.8	-80
pH	su	N	--	7.05	7.02	7.2	7.12	7.19	7.16	7.16	7.25	7.16
Temperature	deg c	N	--	9.9	6.5	5.2	3.8	6.3	11.3	17.2	17.8	15.3
Turbidity	NTU	N	--	0.02	0.02	0.09	0.02	0.52	0.02	0.02	7.06	0.59
Appendix III												
Boron	mg/L	T	4.0	2.2	2.0	2.3	1.9	1.8	2.6	2.7 J+	2.3	3 D
Calcium	mg/L	T	250	**450**	**410**	**380**	**330**	**270**	**340**	240 D	**250 D**	**360 D**
Chloride	mg/L	T	120	28	26	22	19	16	19	24 D	27 D	22 D
Fluoride	mg/L	T	2.0	**3.5**	**3.3**	**3.5**	**3.8**	**3.8**	**3.9**	**4.4 D**	**5.1 D**	**4.5 D**
Sulfate (as SO4)	mg/L	T	250	**1200**	**1200**	**480**	**740**	**660**	**780**	**760 D**	**620 D**	**800 D**
Total Dissolved Solids	mg/L	T	950	**1800**	**1700**	**1600**	**1200**	**1200**	**1400**	**1400 D**	**1100 D**	**1400 D**
Appendix IV												
Antimony	mg/L	T	0.0060	0.00012 J	0.00013 J	0.00032 J	0.00014 J	0.00030	< 0.00050 U	0.00012 J	< 0.00010 U	0.00013 J
Arsenic	mg/L	T	0.010	**0.029**	**0.020**	**0.023**	**0.019**	**0.021**	**0.015**	**0.029 J+**	**0.030**	**0.041**
Barium	mg/L	T	1.3	0.021	0.018	0.015	0.012	0.013	0.023	0.024	0.023	0.025
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	0.00022 J	0.00030	< 0.00016 U	0.00018 J	0.00018 J	0.00044 J	0.00030 J+	0.000089 J	< 0.000075 U
Chromium, Total	mg/L	T	0.10	< 0.00018 U	< 0.00018 U	< 0.00018 U	< 0.00018 U	< 0.00018 U	0.00025 J+	< 0.00020 U	< 0.00020 U	< 0.0002 U
Cobalt	mg/L	T	0.0060	**0.0060**	0.0054	0.0048	0.0032	0.0020	0.0019	0.0032 J+	0.0023	0.0017
Fluoride	mg/L	T	2.0	**3.5**	**3.3**	**3.5**	**3.8**	**3.8**	**3.9**	**4.4 D**	**5.1 D**	**4.5 D**
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.00022 U	< 0.00022 U	< 0.00050 U	0.00016 J+	0.00032 J	0.00014 J
Lithium	mg/L	T	0.10	0.044	0.042	0.029	0.027	0.026	0.029	0.041	0.045	0.039 D
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.013	0.012	0.011	0.013	0.014	0.0090	0.019 J+	0.021	0.02
Radium 226 and 228	pCi/L	T	5.0	0.618	< 0.478 U	< 0.501 U	< 0.592 U	1.27	< 0.701 UJ	< 0.872 U	0.73	< 0.625 U
Radium-226	pCi/L	T	--	< 0.131 U	< 0.0981 U	< 0.083 U	< 0.202 U	< 0.137 U	< 0.122 UJ	< 0.124 U	< 0.105 U	< 0.209 U
Radium-228	pCi/L	T	--	0.584	< 0.478 U	< 0.501 U	< 0.592 U	1.24	< 0.701 UJ	< 0.872 U	0.713	< 0.625 U
Selenium	mg/L	T	0.0050	0.00031 J	0.00041 J	0.00034 J	0.00086	0.00079	0.00016 J	0.00018 J+	0.00016 J	0.00082
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	12	4.0	13	2.0 J	6.0	6.0	11	7.9 D	11 D
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00043	0.00043	0.00043	0.00043	0.00062	0.00055	0.00088 B	0.0015	0.00047
Iron	mg/L	T	83	10	8.6	6.8	5.4	4.3	5.3	5.8	4.9	7 D
Nickel	mg/L	T	0.10	0.011	0.011	0.0094	0.0074	0.0051	0.0050	0.0075	0.0049	0.0047
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.074	0.088	0.060	0.068	0.043	0.038	0.061	0.028	0.054
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	160	110	100	130	140	130	150	200	200 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	37	36	33	26	22	29	28	21	30 D
Potassium	mg/L	T	--	11	12	11	9.4	8.7	10	11	11	11 D
Sodium	mg/L	T	--	21	20	21	17	15	18	20	20	20 D
Total Alkalinity	mg/L	T	--	160	110	100	130	140	130	150	200	200 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-19								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/30/2022	1/3/2023	2/8/2023	3/13/2023	4/18/2023	5/22/2023	6/28/2023	8/7/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.91	2.56	2.493	2.196	2.31	2.29	1.98	20.4	2.2
Dissolved Oxygen	mg/L	N	--	0.12	0.41	1.03	0.13	0.02	0.09	0.32	0.4	0.26
Oxidation Reduction Potential	mV	N	--	68.7	-134.8	-70.2	-77.1	-7.9	-118.4	-112.9	-36.8	-109.1
pH	su	N	--	7	6.39	6.98	6.9	6.92	7.07	6.9	6.82	6.88
Temperature	deg c	N	--	9.2	7.3	6.3	5.7	8	11.4	13.9	16.7	15.8
Turbidity	NTU	N	--	0.02	1.6	2.27	0.02	2.59	0.02	0.02	0.02	0.02
Appendix III												
Boron	mg/L	T	4.0	2.6	2.0	2.2	1.5	1.6	1.8	2.3 J+	1.9	2.6 D
Calcium	mg/L	T	250	**530**	**510**	**550**	**510**	**450 E**	**480**	**460 D**	**360 D**	**470 D**
Chloride	mg/L	T	120	75	64	66	46	42	40	37 D	38 D	50 D
Fluoride	mg/L	T	2.0	**2.2**	**2.3**	1.9	1.7	1.8	1.9	1.9 D	**2.2 D**	**2 D**
Sulfate (as SO4)	mg/L	T	250	**1300**	**1300**	**600**	**1100**	**1200**	**1100**	**800 D**	**830 D**	**1100 D**
Total Dissolved Solids	mg/L	T	950	**2200 J-**	**2200**	**2200**	**2100**	**2000**	**2000**	**1600 D**	**1600 D**	**1900 D**
Appendix IV												
Antimony	mg/L	T	0.0060	< 0.000050 U	< 0.000050 U	< 0.00025 U	< 0.000050 U	0.00072 J	< 0.00050 U	< 0.00010 U	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.0061	0.0055	0.0055	0.0043	0.0032	0.0031	0.0069 J+	0.0073	0.0067
Barium	mg/L	T	1.3	0.046	0.050	0.047	0.036	0.030	0.040	0.040	0.037	0.044
Beryllium	mg/L	T	0.0040	< 0.000052 U	0.000063 J	< 0.00026 U	0.000061 J	0.000057 J	0.000071 J	0.000077 J+	0.000072 J	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00027	0.00053	< 0.00088 U	0.00037	< 0.00018 U	< 0.00020 U	0.00031	0.00029	< 0.0002 U
Cobalt	mg/L	T	0.0060	0.00046 J	0.00069	0.00078 J	0.00096	0.00069	0.00042 J	0.00050 J+	0.00044 J	0.00013 J
Fluoride	mg/L	T	**2.0**	**2.2**	**2.3**	1.9	1.7	1.8	1.9	1.9 D	**2.2 D**	**2 D**
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.0011 U	< 0.0011 U	< 0.00050 U	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	**0.10**	0.099	**0.11**	0.099	0.090	**0.11**	0.085	0.090	0.098	0.089 D
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.013	0.011	0.0095	0.011	0.0090	0.0051	0.012 J+	0.013	0.01
Radium 226 and 228	pCi/L	T	5.0	< 0.589 U	0.626	1.03	1.08	0.933	0.904	< 0.561 U	1.17	< 1.13 U
Radium-226	pCi/L	T	--	0.235	0.222	0.266	0.171	< 0.183 U	0.216	< 0.129 U	0.179	< 0.156 U
Radium-228	pCi/L	T	--	< 0.589 U	< 0.503 U	0.761	0.911	0.818	0.688	< 0.561 U	0.993	< 1.13 UG
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.00022 U	< 0.00022 U	< 0.00010 U	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	27	25	16	6.0	23	19	29	33	26
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.0010 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.0002 U
Iron	mg/L	T	83	15	18	16	13	12	13	16	15	24 D
Nickel	mg/L	T	0.10	0.0024	0.0028	< 0.0032 U	0.0024	0.0017	0.0011 J	0.0015	0.0015	0.0012
Silver	mg/L	T	**0.00020**	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.0031 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.0023	< 0.0012 U	< 0.0059 U	< 0.0012 U	0.0042	< 0.0012 U	< 0.0012 U	< 0.0012 U	< 0.0012 U
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	330	340	310	280	240	260	340	330	270 D
Carbonate Alkalinity	mg/L	T	--	< 1.6 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	49	42	45	38	43	45	32	30 D	39 D
Potassium	mg/L	T	--	18	22	16	20	16	16	15	17	16 D
Sodium	mg/L	T	--	48	40	44	37	38	38	36	31 D	37 D
Total Alkalinity	mg/L	T	--	330	340	310	280	240	260	340	330	270 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-20								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/30/2022	1/4/2023	2/7/2023	3/13/2023	4/18/2023	5/23/2023	6/28/2023	8/7/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.2	1.24	1.232	1.218	1.37	1.41	1.17	1.18	1.26
Dissolved Oxygen	mg/L	N	--	0.24	0.1	0.02	0.12	0.16	0.05	0.32	0.26	0.72
Oxidation Reduction Potential	mV	N	--	-142	-148.2	-153.3	-153	-162.4	-159.7	-174.4	-105.9	-179.7
pH	su	N	--	7.23	7.5	7.29	7.2	7.44	7.45	7.3	7.14	7.33
Temperature	deg c	N	--	9.7	7.2	6.7	5.7	7.2	10.8	13.1	19.6	14.8
Turbidity	NTU	N	--	0.02	0.02	1.91	0.02	0.02	0.02	0.02	0.02	0.02
Appendix III												
Boron	mg/L	T	4.0	1.1	0.83	0.87	0.82	0.80	0.92	1.1 J+	1.1	1.1 D
Calcium	mg/L	T	250	130	120	140	170	130	130	58	110 D	130 D
Chloride	mg/L	T	120	70	66	62	60	88	92	71 D	70 D	70 D
Fluoride	mg/L	T	2.0	0.55	0.26	0.24	0.26	0.21	0.21	0.22 D	0.23 D	0.23 D
Sulfate (as SO4)	mg/L	T	250	42	78	120	110	85	76	30 D	19 D	33 D
Total Dissolved Solids	mg/L	T	950	660	660	690	680	760	770	650 D	570 D	650 D
Appendix IV												
Antimony	mg/L	T	0.0060	0.000096 J	0.000054 J	0.000066 J	0.000062 J	0.00016 J	< 0.00010 U	0.00011 J	0.00014 J	< 0.0001 U
Arsenic	mg/L	T	0.010	0.0015	0.0012	0.0012	0.0012	0.0013	0.0015	0.0016 J+	0.0017	0.0017
Barium	mg/L	T	1.3	0.94	0.61	0.47	0.37	0.31	0.42	0.43	0.49	0.53
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00019 J	< 0.00018 U	0.00025	0.00029	0.00021 J	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.0002 U
Cobalt	mg/L	T	0.0060	0.0013	0.0013	0.0016	0.0016	0.0014	0.0013	0.0014 J+	0.0011	0.00095
Fluoride	mg/L	T	2.0	0.55	0.26	0.24	0.26	0.21	0.21	0.22 D	0.23 D	0.23 D
Lead	mg/L	T	0.0016	**0.0023**	**0.0016**	**0.0016**	**0.0016**	**0.0028**	**0.0023**	**0.0028 J+**	**0.0023**	**0.0018**
Lithium	mg/L	T	0.10	0.074	0.065	0.049	0.055	0.060	0.062	0.083	0.079	0.071 D
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0041	0.0039	0.0041	0.0038	0.0036	0.0048	0.0048 J+	0.0051	0.0047
Radium 226 and 228	pCi/L	T	5.0	1.47	0.822 J+	< 0.499 U	< 0.536 U	0.591	< 0.59 U	< 0.467 U	1.08	< 0.581 U
Radium-226	pCi/L	T	--	< 0.153 U	0.198	0.134	0.161	< 0.166 U	0.193	< 0.122 U	0.118	< 0.19 U
Radium-228	pCi/L	T	--	1.32	0.624 J+	< 0.499 U	< 0.536 U	0.541	< 0.59 U	< 0.467 U	0.958	< 0.581 U
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00013 J	0.00011 J+	0.00010 J	0.00011 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	40	42	33	37	44	42	37 D	37	38 D
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00034	0.00023 J	0.00023 J	< 0.00020 U	0.00024 J	0.00029	0.00036 B	0.00053	0.00025
Iron	mg/L	T	83	21	19	18	19	21	22	18	16	20 D
Nickel	mg/L	T	0.10	0.0091	0.0091	0.0095	0.0099	0.0092	0.0094	0.0098	0.0078	0.0066
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.071	0.024	0.028	0.029	0.060	0.028	0.030	0.025	0.024
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	540	470	470	460	520	540	470	460	560 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	57	53	52	56	57	62	47	48 D	53 D
Potassium	mg/L	T	--	13	13	11	12	13	12	13	13	12 D
Sodium	mg/L	T	--	65	59	57	56	63	79	67	57 D	61 D
Total Alkalinity	mg/L	T	--	540	470	470	460	520	540	470	460	560 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-27								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/30/2022	1/5/2023	2/7/2023	3/13/2023	4/18/2023	5/22/2023	6/27/2023	8/7/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	2.46	2.01	1.651	1.047	1.04	1.65	2.5	2.57	2.99
Dissolved Oxygen	mg/L	N	--	1.35	0.17	0.24	0.93	0.07	0.19	0.04	0.23	0.05
Oxidation Reduction Potential	mV	N	--	-87.3	-137.6	-79.1	-134.3	-52.1	-80.9	-89	-104.5	-191.3
pH	su	N	--	6.86	6.92	6.81	6.95	6.81	6.77	6.86	6.78	6.77
Temperature	deg c	N	--	8.7	6.7	5	4.5	7.2	11.7	16.5	20.8	15.2
Turbidity	NTU	N	--	0.02	0.73	1.33	0.02	4.08	3.32	3.55	8.15	9.71
Appendix III												
Boron	mg/L	T	4.0	0.31	0.17	0.16	0.14	0.14	0.20	0.45 J+	0.44	0.32 D
Calcium	mg/L	T	250	200	180	180	180	100	130	180 D	150 D	190 D
Chloride	mg/L	T	120	**120**	84	69	60	38	52	110 D	100 D	110 D
Fluoride	mg/L	T	2.0	0.37	0.29	0.31	0.41	0.42	0.35	0.36 D	0.41 D	0.43 D
Sulfate (as SO4)	mg/L	T	250	6.8	41	58	47	14	1.8 J	0.56 JD	3.0 D	2.4 JD
Total Dissolved Solids	mg/L	T	950	920	710	790	620	460	590	790 D	690 D	870 D
Appendix IV												
Antimony	mg/L	T	0.0060	0.00013 J	0.000075 J	0.000099 J	0.000060 J	0.00028	< 0.00010 U	< 0.00010 U	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.00086	0.00070	0.00069	0.00069	0.00095	0.00096	0.0010 J+	0.0012	0.0011
Barium	mg/L	T	1.3	0.21	0.17	0.16	0.12	0.074	0.15	0.25	0.25	0.31
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.018	0.016	0.0097	0.0099	0.0083	0.025	0.027	0.034	0.028
Cobalt	mg/L	T	0.0060	0.00063	0.00056	0.00052	0.00043 J	0.00024 J	0.00063	0.00092 J+	0.00083	0.00075
Fluoride	mg/L	T	2.0	0.37	0.29	0.31	0.41	0.42	0.35	0.36 D	0.41 D	0.43 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00010 U	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	0.10	0.0086	0.0088	0.0067	0.0073	0.0075	0.0073	0.017 D	0.0093	0.0099
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	0.00041 J	< 0.00025 UJ	< 0.00025 U	< 0.00025 U
Radium 226 and 228	pCi/L	T	5.0	0.823	< 0.639 UJ	< 0.729 U	< 0.889 U	1.15	1.61	0.84	1.76	< 0.857 U
Radium-226	pCi/L	T	--	0.367	0.23	< 0.127 U	< 0.197 U	< 0.171 U	< 0.325 U	0.458	0.477	0.464
Radium-228	pCi/L	T	--	< 0.679 U	< 0.639 UJ	< 0.729 U	< 0.889 U	1.03	1.47 J	< 0.578 U	1.28	< 0.857 U
Selenium	mg/L	T	0.0050	0.00023 J	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00016 J	0.00021 J+	0.00022 J	0.0002 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	34	27	22	14	5.0	11	19 D	11	22
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00030	< 0.00020 U	0.0016	< 0.00020 U	0.00022 J	0.00032	< 0.00020 U	0.00023 J	0.00024 J
Iron	mg/L	T	83	13	11	11	8.3	5.5	7.6	9.4	8.0	11 D
Nickel	mg/L	T	0.10	0.00077 J	0.0010 J	0.0010 J	0.00077 J	< 0.00065 U	0.00087 J	0.00067 J	0.00075 J	< 0.00065 U
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	0.00082 J	0.00093 J	< 0.00062 U
Zinc	mg/L	T	0.27	0.0096	< 0.0012 U	0.0016	< 0.0012 U	0.0079	0.0013	< 0.0012 U	< 0.0012 U	< 0.0012 U
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	1200	880	800	590	480	770	1100 D	1100	1400 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	45	45	47	44	26	31	33	35 D	40 D
Potassium	mg/L	T	--	7.6	7.3	6.2	5.8	4.1	6.5	11	12	11 D
Sodium	mg/L	T	--	92	68	59	61	41	52	75	80 D	82 D
Total Alkalinity	mg/L	T	--	1200	880	800	590	480	770	1100 D	1100	1400 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certai criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-30								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/30/2022	1/3/2023	2/6/2023	3/13/2023	4/18/2023	5/22/2023	6/27/2023	8/8/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	2.26	3.18	3.025	2.273	2.73	2.66	2.85	2.67	2.21
Dissolved Oxygen	mg/L	N	--	0.12	0.39	0.04	0.35	0.29	0.05	0.01	0.12	0.41
Oxidation Reduction Potential	mV	N	--	-55.7	-281.2	-134.9	-148.7	-151.8	-86.8	-105.6	-92.7	-301.7
pH	su	N	--	7.07	6.48	7.16	7.25	7.17	7.16	7.21	6.94	7.05
Temperature	deg c	N	--	10.1	7.2	6.4	4.8	6.6	10.7	13.6	17	15
Turbidity	NTU	N	--	0.02	0.02	1.21	0.02	0.02	0.5	0.02	0.02	0.02
Appendix III												
Boron	mg/L	T	4.0	2.2	1.7	2.1	3.5	1.7	1.9	1.9 J+	1.8	2.1 D
Calcium	mg/L	T	250	**470**	**460 E**	**480**	**960**	**430**	**430**	**460 D**	**400 D**	**390 D**
Chloride	mg/L	T	120	**190**	**190**	**190**	**140**	**120**	98	110 D	98 D	97 D
Fluoride	mg/L	T	2.0	1.0	1.4	1.0	1.2	1.1	1.1	0.91 D	1.1 D	1.2 D
Sulfate (as SO4)	mg/L	T	250	**780**	**1000**	**830**	**940**	**970**	**850**	**940 D**	**860 D**	**610 D**
Total Dissolved Solids	mg/L	T	950	**2200 J**	**2400**	**2000**	**2300**	**2200**	**2100**	**2800 J**	**2300 D**	**1800**
Appendix IV												
Antimony	mg/L	T	0.0060	< 0.000050 U	< 0.000050 U	< 0.00025 U	< 0.000050 U	0.00040 J	< 0.00050 U	< 0.00050 UD	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.00046 J	0.00070	< 0.00050 U	0.00039 J	< 0.00010 U	0.00012 J	0.00027 J+	0.00043 J	0.00063
Barium	mg/L	T	1.3	0.10	0.089	0.10	0.045	0.047	0.058	0.066 D	0.048	0.058
Beryllium	mg/L	T	0.0040	< 0.000052 U	0.000053 J	< 0.00026 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.014	0.012	0.0087	0.010	0.0058	0.0052	0.012	0.013	0.0081
Cobalt	mg/L	T	0.0060	0.00091	0.0044	0.00096 J	0.0028	0.0011	0.00054	0.0013 J+	0.0011	0.00053
Fluoride	mg/L	T	2.0	1.0	1.4	1.0	1.2	1.1	1.1	0.91 D	1.1 D	1.2 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.0011 U	< 0.0011 U	< 0.00050 U	< 0.00050 UJ	< 0.00050 UD	< 0.0001 U
Lithium	mg/L	T	0.10	**0.13**	**0.15**	**0.12**	**0.27**	**0.11**	**0.11**	**0.12 D**	**0.14**	**0.12 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	< 0.00062 U	0.0036	< 0.0031 U	0.0017	< 0.0031 U	0.00032 J	0.00082 J+	0.0011 J	0.00061 J
Radium 226 and 228	pCi/L	T	5.0	< 0.873 UJ	0.445 J	< 0.624 UJ	< 0.659 U	0.875	< 0.783 U	0.586 J+	0.911	< 0.526 U
Radium-226	pCi/L	T	--	< 0.238 UJ	0.139 J	< 0.0915 UJ	< 0.2 U	< 0.141 U	< 0.194 U	0.0986 J+	< 0.163 UJ	< 0.228 U
Radium-228	pCi/L	T	--	< 0.873 UJ	< 0.443 UJ	< 0.624 UJ	< 0.659 U	0.844	< 0.783 U	< 0.566 UJ	0.82	< 0.526 U
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.0011 U	< 0.00022 U	< 0.00022 U	< 0.00010 U	0.00011 J+	0.00012 J	0.00013 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.00038 U	< 0.00038 UJ	< 0.00038 UD	< 0.000075 U
Total Suspended Solids	mg/L	T	--	4.0	11	< 4.0 UJ	5.0	6.0	4.0	< 4.0 UD	5.0	4 D
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	0.00037 J+	< 0.0010 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.00054
Iron	mg/L	T	83	0.87	3.6	0.99	8.8	4.1	2.4	2.9	2.9	1.4 D
Nickel	mg/L	T	0.10	0.00080 J	0.0045	< 0.0032 U	0.0041	0.0018	0.00070 J	0.0021	0.0011 J	< 0.00065 U
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	**< 0.00025 U**	< 0.000050 U	**< 0.00025 U**	**< 0.00025 U**	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.0031 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.0053	< 0.0012 U	< 0.0059 U	< 0.0012 U	0.0049	< 0.0012 U	< 0.0012 U	< 0.0012 U	< 0.0012 U
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	930	760	880	660	630	640	< 0.16 U	690	780 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	110	120	120	250	120	110	120 D	100 D	95 D
Potassium	mg/L	T	--	12	15	16	17	12	9.6	11	13	10 D
Sodium	mg/L	T	--	120	110	120	220	98	95	95 D	88 D	82 D
Total Alkalinity	mg/L	T	--	930	760	880	660	630	640	< 0.16 U	690	780 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-31								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/1/2022	1/4/2023	2/7/2023	3/14/2023	4/18/2023	5/22/2023	6/27/2023	8/8/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2	Unit 1/2
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.35	1.4	1.327	1.23	1.28	1.21	1.24	1.41	1.23
Dissolved Oxygen	mg/L	N	--	1.65	0.09	0.21	0.11	0.11	0.09	1.39	0.05	0.15
Oxidation Reduction Potential	mV	N	--	-150	-262.2	-129.3	-214.9	-274.4	-220	-113.9	-55.8	-82.4
pH	su	N	--	7.84	7.7	7.85	7.76	7.87	7.85	8	7.78	7.67
Temperature	deg c	N	--	8.7	7.6	6.3	4	6.5	13.2	14.4	17.8	14.9
Turbidity	NTU	N	--	2.61	0.02	1.27	0.02	0.02	0.02	0.02	0.02	0.02
Appendix III												
Boron	mg/L	T	4.0	**4.8**	3.8	**4.2**	**4.0**	3.6	**4.5**	**5.4 J+**	**4.8**	**5.1 D**
Calcium	mg/L	T	250	180	190	170	200	170	160	130 D	150 D	170 D
Chloride	mg/L	T	120	**120**	100	110	97	94	92	110 D	110 D	100 D
Fluoride	mg/L	T	2.0	**4.6**	**4.9**	**4.7**	**4.6**	**5.1**	**5.2**	**4.7 D**	**5.1 D**	**4.6 D**
Sulfate (as SO4)	mg/L	T	250	180	**250**	200	**250**	**250**	160	120 D	100 D	72 D
Total Dissolved Solids	mg/L	T	950	850	940 J	780	860	810	760	760 D	860 D	730 D
Appendix IV												
Antimony	mg/L	T	0.0060	0.000069 J	< 0.000050 U	0.000080 J	0.00012 J	0.00013 J	< 0.00010 U	< 0.00010 U	0.00012 J	< 0.0001 U
Arsenic	mg/L	T	0.010	0.0018	0.0013	0.0012	0.0010	0.0011	0.0014	0.0016 J+	0.0016	0.0012
Barium	mg/L	T	1.3	0.21	0.14	0.19	0.15	0.12	0.13	0.23	0.16	0.16
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.0021	0.0018	0.0024	0.0019	0.0019	0.0029	0.0023	0.0023	0.0025
Cobalt	mg/L	T	0.0060	0.00015 J	0.00015 J	0.00020 J	0.00018 J	0.00016 J	0.00021 J	0.00018 J+	0.00018 J	0.00013 J
Fluoride	mg/L	T	2.0	**4.6**	**4.9**	**4.7**	**4.6**	**5.1**	**5.2**	**4.7 D**	**5.1 D**	**4.6 D**
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00031 J	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	0.10	0.052	0.048	0.052	0.054	0.046	0.053	0.056 D	0.054	0.049
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0021	0.0013	0.0013	0.0011 J	0.0011 J	0.0012	0.0018 J+	0.0011 J	0.0013
Radium 226 and 228	pCi/L	T	5.0	0.753	< 0.641 U	0.717	< 0.725 U	0.592	1.14	0.58	1.23	< 0.497 U
Radium-226	pCi/L	T	--	0.187	0.203	0.187	< 0.189 U	0.254	0.184	0.27	0.262 J+	< 0.208 U
Radium-228	pCi/L	T	--	0.566	< 0.641 U	0.53	< 0.725 U	< 0.527 U	0.959	< 0.489 U	0.97	< 0.497 U
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00011 J	0.00012 J+	0.00015 J	0.00014 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	2.0 J	4.0	< 4.0 U	< 4.0 U	< 4.0 U	< 4.0 U	< 4.0 U	1.0 J	< 4 U
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.00027	< 0.00020 U	< 0.00020 U	< 0.0002 U
Iron	mg/L	T	83	2.5	1.4	1.5	1.1	0.77	1.2	0.92	0.21	0.13
Nickel	mg/L	T	0.10	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U	< 0.00065 U
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.0082	< 0.0012 U	< 0.0012 U	< 0.0012 U	0.010	0.0014	< 0.0012 U	< 0.0012 U	< 0.0012 U
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	410	340	350	320	290	320	340	410	440 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	37	36	38	42	36	33	34	38 D	35 D
Potassium	mg/L	T	--	9.9	11	11	11	10	9.9	12	12	11 D
Sodium	mg/L	T	--	60	46	51	48	50	53	64	56 D	56 D
Total Alkalinity	mg/L	T	--	410	340	350	320	290	320	340	410	440 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-32								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	11/30/2022	1/4/2023	2/8/2023	3/14/2023	4/18/2023	5/22/2023	6/27/2023	8/8/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent	Nature and Extent
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.29	1.29	1.258	1.175	1.29	1.2	1.05	0.99	1.14
Dissolved Oxygen	mg/L	N	--	0.07	0.08	0.08	0.1	0.1	0.33	0.12	0.13	0.29
Oxidation Reduction Potential	mV	N	--	-184.5	-222.8	-184.7	-188.5	-199.5	-221.7	-209.8	-141.4	-186.3
pH	su	N	--	7.69	7.5	7.57	7.53	7.67	7.75	7.65	7.52	7.53
Temperature	deg c	N	--	10.2	8.3	6.6	6.3	7.4	11.1	13	15.9	14.9
Turbidity	NTU	N	--	0.02	0.02	2.17	0.02	0.02	0.02	0.02	0.02	0.02
Appendix III												
Boron	mg/L	T	4.0	3.8	3.0	3.0	2.9	2.6	3.1	3.9 J+	3.7	**5 D**
Calcium	mg/L	T	250	200	180	190	220	190	190	150 D	130 D	150 D
Chloride	mg/L	T	120	47	50	50	50	45	42	41 D	44 D	47 D
Fluoride	mg/L	T	2.0	1.5	1.5	1.4	1.6	1.4	1.5	1.4 D	1.6 D	1.8 D
Sulfate (as SO4)	mg/L	T	250	100	110	54	170	190	140	48 D	17 D	17 D
Total Dissolved Solids	mg/L	T	950	790	700	730	770	800	790	600 D	550 D	640 D
Appendix IV												
Antimony	mg/L	T	0.0060	0.000067 J	< 0.000050 U	< 0.000050 U	0.000072 J	0.00014 J	< 0.00010 U	< 0.00010 U	< 0.00010 U	< 0.0001 U
Arsenic	mg/L	T	0.010	0.00061	0.00045 J	0.00052 J	0.00047 J	0.00044 J	0.00055	0.00058 J+	0.00062	0.00058
Barium	mg/L	T	1.3	0.62	0.60	0.57	0.41	0.29	0.34	0.37	0.41	0.85
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00046	0.00065	0.00057	0.00055	0.00039	0.00038	0.00032	0.00031	0.00031
Cobalt	mg/L	T	0.0060	0.00034 J	0.00036 J	0.00039 J	0.00041 J	0.00031 J	0.00037 J	0.00068 J+	0.00058	0.00038 J
Fluoride	mg/L	T	2.0	1.5	1.5	1.4	1.6	1.4	1.5	1.4 D	1.6 D	1.8 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	0.00012 J	0.00014 J+	< 0.00010 U	< 0.0001 U
Lithium	mg/L	T	0.10	**0.15**	**0.14**	**0.12**	**0.11**	0.094	**0.10**	**0.13 D**	**0.14**	**0.19 D**
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0051	0.0043	0.0038	0.0032	0.0034	0.0045	0.0047 J+	0.0046	0.0045
Radium 226 and 228	pCi/L	T	5.0	0.614	< 0.497 U	< 0.601 U	< 0.732 U	0.877	0.847	< 0.607 U	0.985	< 0.589 U
Radium-226	pCi/L	T	--	< 0.184 U	0.219	0.152	< 0.195 U	< 0.164 U	0.206	< 0.0916 U	0.403 J+	< 0.18 U
Radium-228	pCi/L	T	--	0.492	< 0.497 U	< 0.601 U	< 0.732 U	0.773	0.641	< 0.607 U	< 0.848 U	< 0.589 U
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00010 U	< 0.00010 UJ	< 0.00010 U	< 0.0001 U
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	42	43	39	40	39	31	29 D	11	23
Michigan CCR Part 115												
Copper	mg/L	T	0.021	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	< 0.00020 U	0.00020 J	< 0.00020 U	< 0.00020 U	0.00041
Iron	mg/L	T	83	20	18	18	19	18	17	15	11	11 D
Nickel	mg/L	T	0.10	0.0013	0.0016	0.0012	0.0012	0.00096 J	0.00088 J	0.0012	0.00086 J	0.00077 J
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.031	0.0022	0.0026	0.0025	0.030	0.0037	0.0026	0.0030	0.0035
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	560	490	500	450	440	430	440	440	520 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	38	34	35	37	34	34	28	28 D	30 D
Potassium	mg/L	T	--	13	13	12	11	9.8	9.7	12	13	13 D
Sodium	mg/L	T	--	36	29	29	30	27	30	33	32 D	35 D
Total Alkalinity	mg/L	T	--	560	490	500	450	440	430	440	440	520 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

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J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-33								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/1/2022	1/5/2023	2/8/2023	3/15/2023	4/18/2023	5/22/2023	6/27/2023	8/7/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.1	0.99	0.949	0.859	0.91	0.92	0.901	0.98	1
Dissolved Oxygen	mg/L	N	--	0.81	1.02	0.75	0.2	0.23	0.06	0.05	0.01	0.02
Oxidation Reduction Potential	mV	N	--	-28.5	-72.8	-61.2	-37.4	-63.6	-86.2	-106.6	-121.9	-107.1
pH	su	N	--	7.12	6.49	7.14	6.96	7.04	7.02	7.03	6.98	6.86
Temperature	deg c	N	--	8.3	4.8	2.4	3.6	8.8	10.7	13.7	17.2	15.8
Turbidity	NTU	N	--	0.02	0.02	1.17	0.02	3.44	0.55	0.02	1.07	3.25
Appendix III												
Boron	mg/L	T	4.0	0.18	0.091	0.086	0.067	0.082	0.085	0.11 J+	0.12	0.16 D
Calcium	mg/L	T	250	200	170	170	190	150	160	150 D	150 D	180 D
Chloride	mg/L	T	120	58	51	50	39	27	17	20 D	23 D	45 D
Fluoride	mg/L	T	2.0	0.29	0.24	0.21 J	0.23	0.28	0.25	0.26 D	0.27 D	0.24 D
Sulfate (as SO4)	mg/L	T	250	100	58	65	42	23	1.9 J	4.3 D	1.6 JD	69 D
Total Dissolved Solids	mg/L	T	950	750 J	630	680	590	580	600	600 D	570 D	690 D
Appendix IV												
Antimony	mg/L	T	0.0060	0.00098	0.00088	0.00079	0.00059	0.0012	0.00017 J	0.00020 J	0.00015 J	0.00048
Arsenic	mg/L	T	0.010	0.0031	0.0014	0.0016	0.0017	0.0040	0.0038	0.0032 J+	0.0027	0.0027
Barium	mg/L	T	1.3	0.084	0.086	0.092	0.076	0.073	0.095	0.088	0.098	0.09
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.00026 U	< 0.000052 U	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	0.000049 J	0.00010 J	0.00014 J	0.00015 J	< 0.00016 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	0.00023 J
Chromium, Total	mg/L	T	0.10	0.0021	0.0028	0.0029	0.0027	0.0029	0.0039	0.0050	0.0059	0.0029
Cobalt	mg/L	T	0.0060	0.00075	0.00049 J	0.00082	0.0017	0.0020 J	0.00083	0.00039 J+	0.00041 J	0.00053
Fluoride	mg/L	T	2.0	0.29	0.24	0.21 J	0.23	0.28	0.25	0.26 D	0.27 D	0.24 D
Lead	mg/L	T	0.0016	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.00022 U	< 0.0011 U	0.00026 J	0.00015 J+	0.00015 J	0.00037 J
Lithium	mg/L	T	0.10	0.0051	0.0069	0.0043	0.0047	0.0061	0.0052	< 0.0094 UD	0.0041	0.0054
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 UJ
Molybdenum	mg/L	T	0.10	0.0047	0.0037	0.0031	0.0031	0.0060 J	0.0026	0.00068 J+	0.00052 J	0.0032
Radium 226 and 228	pCi/L	T	5.0	0.825	< 0.587 U	0.949	< 0.852 U	< 0.815 U	1.61	0.828	1.15	< 0.621 U
Radium-226	pCi/L	T	--	< 0.267 U	< 0.14 U	< 0.125 U	< 0.204 U	< 0.232 U	< 0.256 U	0.154	0.276 J+	< 0.282 UJ
Radium-228	pCi/L	T	--	0.794	< 0.587 U	0.833	< 0.852 U	< 0.815 U	1.48 J	< 0.768 U	0.875	< 0.621 UJ
Selenium	mg/L	T	0.0050	0.00089	0.00076	0.00055	0.00038 J	< 0.0011 U	0.00033 J	0.00033 J+	0.00029 J	0.00059
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	2.0 J	5.0	10	1.0 J	9.0	17	21	22	10
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.0079	0.016	0.016	0.020	0.0067	0.0017	0.0011 B	0.00079	0.0032
Iron	mg/L	T	83	1.2	2.5	2.8	2.5	4.6	7.4	7.7	8.7	4.4 D
Nickel	mg/L	T	0.10	0.020	0.016	0.017	0.019	0.023	0.014	0.0081	0.0049	0.0077
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	0.00011	< 0.00025 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.0031 U	< 0.00062 U	0.00065 J	0.00079 J	< 0.00062 U
Zinc	mg/L	T	0.27	0.0071	0.0036	0.0050	0.0053	0.012	0.0014	< 0.0012 U	< 0.0012 U	0.018
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	460	430	400	390	440	480	440	480	420 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	22	19	18	17	16	18	16	16	19 D
Potassium	mg/L	T	--	3.8	5.4	4.6	4.1	4.0	4.1	4.4	5.1	4.9
Sodium	mg/L	T	--	38	25	24	26	22	22	23	22	30 D
Total Alkalinity	mg/L	T	--	460	430	400	390	440	480	440	480	420 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	MW-34								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/1/2022	1/5/2023	2/8/2023	3/15/2023	4/18/2023	5/22/2023	6/27/2023	8/7/2023	10/23/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well	Background Well
			Sample Matrix:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	2.14	1.07	1.96	1.49	1.86	1.89	2.05	2.05	1.93
Dissolved Oxygen	mg/L	N	--	0.87	1.19	0.29	0.45	1.05	2.73	0.09	0.97	0.7
Oxidation Reduction Potential	mV	N	--	-120.5	-104.4	-119.7	-95	-63.4	-100.5	-113.8	-124.6	-163.1
pH	su	N	--	6.65	7.66	6.78	6.68	6.53	6.6	6.75	6.69	6.62
Temperature	deg c	N	--	12.9	4.9	9.4	7.8	8	10.3	12.4	14.6	14.8
Turbidity	NTU	N	--	4.96	0.02	5.58	2.11	5.87	0.02	0.02	3.15	1.77
Appendix III												
Boron	mg/L	T	4.0	3.2	2.7	1.9 B	1.8	1.6	2.5	4.0 J+	3.6	4.1 D
Calcium	mg/L	T	250	220	190	220	210	210	210	220 D	190 D	220 D
Chloride	mg/L	T	120	33	27	24	23	23	22	23 D	24 D	25 D
Fluoride	mg/L	T	2.0	0.35	0.20	0.23	0.24	0.21	0.23	0.26 D	0.29 D	0.28 D
Sulfate (as SO4)	mg/L	T	250	2.5 J	1.9 J	< 0.41 U	0.87 J	0.56 J	< 0.41 U	< 0.41 UD	< 0.41 UD	< 0.41 UD
Total Dissolved Solids	mg/L	T	950	820	750	800	790	700	760	820 D	770 D	800 D
Appendix IV												
Antimony	mg/L	T	0.0060	0.00023 J	0.00011 J	0.000095 J	0.00013 J	0.00091 J	0.00010 J	0.00016 J	0.00015 J	0.00014 J
Arsenic	mg/L	T	0.010	0.0016	0.0010	0.00088	0.00090	0.00089 J	0.0010	0.0013 J+	0.0012	0.0013
Barium	mg/L	T	**1.3**	0.54	0.54	**0.58**	0.50	0.17	0.49	0.53	0.49	0.52
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.00026 U	0.000059 J	< 0.000052 UJ	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	0.000036 J	< 0.000032 U	< 0.000032 U	< 0.000032 U	< 0.00016 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.024	0.022	0.025	0.029	< 0.00088 U	0.027	0.034	0.028	0.019
Cobalt	mg/L	T	0.0060	0.0015	0.0013	0.0013	0.0013	< 0.00050 U	0.0014	0.0018 J+	0.0016	0.0013
Fluoride	mg/L	T	2.0	0.35	0.20	0.23	0.24	0.21	0.23	0.26 D	0.29 D	0.28 D
Lead	mg/L	T	0.0016	0.0069	0.0016	0.00059	0.00094	< 0.0011 U	0.00074	0.00087 J+	0.00091	0.00063
Lithium	mg/L	T	0.10	0.077	0.086	0.053	0.012	0.046	0.065	0.088 D	0.10	0.099 D
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0018	0.00081 J	< 0.00062 U	< 0.00062 U	0.0079	0.0018	0.00030 J+	< 0.00025 U	< 0.00025 U
Radium 226 and 228	pCi/L	T	5.0	2.02	1.15	1.28	1.34	1.99	1.81	2.79	1.24	2.4
Radium-226	pCi/L	T	--	0.57	0.534	0.654	0.558	0.396	0.561	0.357	0.637 J+	0.699
Radium-228	pCi/L	T	--	1.45	< 0.849 U	< 0.918 U	0.78	1.59	1.25 J	2.44	< 0.862 U	1.7
Selenium	mg/L	T	0.0050	0.00034 J	0.00025 J	0.00027 J	0.00023 J	< 0.0011 U	0.00029 J	0.00030 J+	0.00027 J	0.00031 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.000075 UJ	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	110	52	83	44	160	160	170 D	130	150
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.0034	0.00075	0.00033	0.0085	< 0.0010 U	0.00069	0.00045 B	0.00043	0.00045
Iron	mg/L	T	83	73	70	83	78	75	77	77	64 D	70 D
Nickel	mg/L	T	0.10	0.0016	0.0013	0.0012	0.0013	< 0.0032 U	0.0016	0.0020	0.0018	0.0015
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00025 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.00062 U	< 0.0031 U	0.00065 J	0.00069 J	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	0.031	0.0019	0.0023	0.0023	0.020	0.0015	0.0018	0.0017	0.0021
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	1100	950	920	890	880	950	970 D	970	1000 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	< 0.31 UD	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	30	23	22	21	20	24	27	26 D	29 D
Potassium	mg/L	T	--	11	13	9.5	8.5	8.4	8.9	12	13	13 D
Sodium	mg/L	T	--	34	30	28	22	23	30	38	33 D	38 D
Total Alkalinity	mg/L	T	--	1100	950	920	890	880	950	970 D	970	1000 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	SG-02								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/2/2022	1/5/2023	2/6/2023	3/14/2023	4/19/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
			Sample Matrix:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.42	1.0	--	0.898	0.93	1.03	1.56	1.66	1.47
Dissolved Oxygen	mg/L	N	--	5.28	9.57	--	4.27	10.32	7.83	8.9	9.54	8.29
Oxidation Reduction Potential	mV	N	--	147.3	-25.2	--	131.1	13.3	16.1	25.6	69.3	-44.9
pH	su	N	--	8.02	8.38	--	8	8.23	9.14	8.52	8.7	8.15
Temperature	deg c	N	--	2.8	3.5	--	2.7	8.9	26.6	26.2	29.6	17.5
Turbidity	NTU	N	--	1.62	0.02	--	1.2	2.41	6.62	4.2	3.26	6.09
Appendix III												
Boron	mg/L	T	4.0	4.0	2.2	--	2.1	2.0	2.8	5.6 J+	6.9	7 D
Calcium	mg/L	T	250	210	140	--	140	130	150	210 D	170 D	180 D
Chloride	mg/L	T	120	75	46	--	41	37	40	86 D	120 D	99 D
Fluoride	mg/L	T	2.0	2.6	1.9	--	2.3	2.6	3.3	4.6 D	5.1 D	3.6 D
Sulfate (as SO4)	mg/L	T	250	620	360	--	350	400	430	620 D	640 D	530 D
Total Dissolved Solids	mg/L	T	950	1100	660	--	580	680	740	1200 D	1400 D	1100
Appendix IV												
Antimony	mg/L	T	0.0060	0.00051	0.00043	--	0.00066	0.00058 J	0.0012	0.00085	0.0011	0.00061
Arsenic	mg/L	T	0.010	0.0019	0.0012	--	0.0018	0.0017 J	0.0032	0.0037	0.0091	0.0023
Barium	mg/L	T	1.3	0.049	0.033	--	0.034	0.22	0.080	0.13	0.11	0.06
Beryllium	mg/L	T	0.0040	0.000060 J	< 0.000052 U	--	< 0.000052 U	< 0.00027 U	< 0.000052 U	0.00029	0.00014 J	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	--	< 0.000032 U	< 0.00017 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00038	0.00024 J	--	0.00057	< 0.00091 U	0.00046	0.00091	0.00080	0.00036
Cobalt	mg/L	T	0.0060	0.00021 J	0.00022 J	--	0.00028 J	< 0.00052 U	0.00035 J	0.00040 J	0.00057	0.00015 J
Fluoride	mg/L	T	2.0	2.6	1.9	--	2.3	2.6	3.3	4.6 D	5.1 D	3.6 D
Lead	mg/L	T	0.0016	0.0013	0.00081	--	0.0012	0.0020 J	0.0011	0.00050 J	0.0012	0.00064
Lithium	mg/L	T	0.10	0.046	0.032	--	0.035	0.038	0.053	0.067	0.085	0.058
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	--	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	0.00022
Molybdenum	mg/L	T	0.10	0.0069	0.0060	--	0.011	0.0062 J	0.016	0.0072	0.012	0.0081
Radium 226 and 228	pCi/L	T	5.0	< 0.342 U	0.712 J+	--	< 0.551 U	1.42	1.49	1.44	1.28	< 0.532 U
Radium-226	pCi/L	T	--	0.151	< 0.121 U	--	< 0.177 U	0.266	0.229	0.456	0.329	< 0.265 U
Radium-228	pCi/L	T	--	< 0.342 U	0.627 J+	--	< 0.551 U	1.15	1.26	0.981	0.954	< 0.532 U
Selenium	mg/L	T	0.0050	0.00073	0.00059	--	0.0010	< 0.0011 U	0.0013	0.0013	0.0014	0.0008
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	--	< 0.000075 U	< 0.00039 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	< 4.0 U	3.0 J	--	1.0 J	0.99 J	1.0 J	30	14	< 3.9 UD
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.0010	0.00085	--	0.011	0.0011 J	0.0014	0.0012	0.0010	0.00047
Iron	mg/L	T	83	0.20	0.15	--	0.20	0.23	0.16	0.27	0.48	0.28
Nickel	mg/L	T	0.10	0.0023	0.0020	--	0.0023	< 0.0034 U	0.0027	0.0036	0.0040	0.0034
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	--	< 0.000050 U	< 0.00026 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	--	< 0.00062 U	< 0.0032 U	0.0019	0.0014	0.0052	0.00072 J
Zinc	mg/L	T	0.27	0.0041	0.0031	--	0.0029	0.029	0.0014	0.0024	0.0028	0.005
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	96	76	--	62	71	35	73	65	130 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	19	< 0.31 UD
Magnesium	mg/L	T	--	48	31	--	28	28	33	53	63 D	57 D
Potassium	mg/L	T	--	13	9.1	--	8.0	7.3	6.8	18	21 D	16 D
Sodium	mg/L	T	--	40	24	--	22	21	27	52	62 D	58 D
Total Alkalinity	mg/L	T	--	96	76	--	62	71	35	73	83	130 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	SG-03								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/2/2022	1/5/2023	2/6/2023	3/14/2023	4/19/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
			Sample Matrix:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.45	1.0	--	0.896	1.15	1.05	1.53	1.66	1.49
Dissolved Oxygen	mg/L	N	--	5.23	9.58	--	3.98	9.77	7.37	8.71	9.56	8.26
Oxidation Reduction Potential	mV	N	--	138.3	-32.4	--	-50.1	8	10	17	71.4	-42.1
pH	su	N	--	8	8.42	--	7.82	6.24	8.91	8.63	8.67	8.14
Temperature	deg c	N	--	2	3.3	--	0.9	8.3	28.6	25.9	29.5	17.7
Turbidity	NTU	N	--	1.2	0.36	--	0.02	4.45	38.1	5.36	4.27	5.56
Appendix III												
Boron	mg/L	T	4.0	3.9	2.0	--	2.1	2.0	2.9	5.8 J+	7.5	6.9 D
Calcium	mg/L	T	250	200	120	--	150	140	160	220 D	180 D	180 D
Chloride	mg/L	T	120	72	42	--	43	37	41	86 D	120 D	100 D
Fluoride	mg/L	T	2.0	2.5	1.8	--	2.5	2.7	3.6	4.6 D	5.0 D	3.6 D
Sulfate (as SO4)	mg/L	T	250	600	350	--	350	400	450	620 D	640 D	550 D
Total Dissolved Solids	mg/L	T	950	1100	480	--	630	660	740	1200 D	1400 D	1100
Boron	mg/L	D	4.0	--	--	--	--	--	2.7	--	--	--
Calcium	mg/L	D	250	--	--	--	--	--	150	--	--	--
Appendix IV												
Antimony	mg/L	T	0.0060	0.00049	0.00038	--	0.00067	0.0010 J	0.0013	0.00088	0.0012	0.00063
Arsenic	mg/L	T	0.010	0.0018	0.0011	--	0.0020	0.0016 J	0.0041	0.0040	0.0094	0.0024
Barium	mg/L	T	1.3	0.049	0.031	--	0.036	0.027	0.097	0.13	0.13	0.061
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	--	0.000078 J	< 0.00026 U	0.00056	0.00040	0.000091 J	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	--	0.000038 J	< 0.00016 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00043	0.00025	--	0.00092	< 0.00088 U	0.0025	0.0012	0.00069	0.00049
Cobalt	mg/L	T	0.0060	0.00017 J	0.00017 J	--	0.00033 J	0.00050 J	0.00058	0.00043 J	0.00055	0.0003 J
Fluoride	mg/L	T	2.0	2.5	1.8	--	2.5	2.7	3.6	4.6 D	5.0 D	3.6 D
Lead	mg/L	T	0.0016	0.0012	0.00060	--	0.0020	< 0.0011 U	0.0033	0.00076	0.00091	0.00066
Lithium	mg/L	T	0.10	0.046	0.028	--	0.0056	0.037	0.051	0.067	0.090	0.059
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	--	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0066	0.0052	--	0.010	0.0097	0.020	0.0069	0.013	0.0083
Radium 226 and 228	pCi/L	T	5.0	< 0.443 U	< 0.506 U	--	< 0.531 U	1.21	< 0.658 U	< 0.653 U	0.969	0.594
Radium-226	pCi/L	T	--	0.14	0.129	--	< 0.193 U	0.199	0.363	0.353	0.253	< 0.236 U
Radium-228	pCi/L	T	--	< 0.443 U	< 0.506 U	--	< 0.531 U	1.01	< 0.658 U	< 0.653 U	< 0.842 U	< 0.58 U
Selenium	mg/L	T	0.0050	0.00070	0.00056	--	0.0010	0.0021 J	0.0018	0.0012	0.0016	0.00081
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	--	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	9.0	1.0 J	--	6.0	3.0 J	33	34	16	< 4 U
Antimony	mg/L	D	0.0060	--	--	--	--	--	< 0.000038 U	--	--	--
Arsenic	mg/L	D	0.010	--	--	--	--	--	0.0035	--	--	--
Barium	mg/L	D	1.3	--	--	--	--	--	0.073	--	--	--
Beryllium	mg/L	D	0.0040	--	--	--	--	--	< 0.000078 U	--	--	--
Cadmium	mg/L	D	0.0025	--	--	--	--	--	< 0.000018 U	--	--	--
Chromium, Total	mg/L	D	0.10	--	--	--	--	--	< 0.00012 U	--	--	--
Cobalt	mg/L	D	0.0060	--	--	--	--	--	< 0.000028 U	--	--	--
Lead	mg/L	D	0.0016	--	--	--	--	--	< 0.00012 U	--	--	--
Lithium	mg/L	D	0.10	--	--	--	--	--	0.039	--	--	--
Molybdenum	mg/L	D	0.10	--	--	--	--	--	0.018	--	--	--
Selenium	mg/L	D	0.0050	--	--	--	--	--	0.0020	--	--	--
Thallium	mg/L	D	0.0020	--	--	--	--	--	< 0.000015 U	--	--	--
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00093	0.00067	--	0.016	< 0.0010 U	0.0030	0.0013	0.0010	0.00051
Iron	mg/L	T	83	0.18	0.15	--	0.35	0.20	0.66	0.31	0.48	0.29
Nickel	mg/L	T	0.10	0.0022	0.0017	--	0.0026	0.0032 J	0.0039	0.0036	0.0039	0.0035
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	--	< 0.000050 U	< 0.00025 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	--	0.00092 J	< 0.0031 U	0.0049	0.0020	0.0053	0.0007 J
Zinc	mg/L	T	0.27	0.0042	0.0037	--	0.0047	< 0.0059 U	0.0060	0.0029	0.0024	0.0069
Copper	mg/L	D	0.021	--	--	--	--	--	< 0.00012 U	--	--	--
Iron	mg/L	D	83	--	--	--	--	--	0.10	--	--	--
Nickel	mg/L	D	0.10	--	--	--	--	--	< 0.00018 U	--	--	--
Silver	mg/L	D	0.00020	--	--	--	--	--	< 0.000038 U	--	--	--
Vanadium	mg/L	D	0.0062	--	--	--	--	--	< 0.00024 U	--	--	--
Zinc	mg/L	D	0.27	--	--	--	--	--	< 0.0017 U	--	--	--
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	110	71	--	73	71	41	73	69	120 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	16	< 0.31 UD
Magnesium	mg/L	T	--	47	26	--	30	29	37	56	67 D	57 D
Potassium	mg/L	T	--	13	8.1	--	8.3	7.2	7.1	19	22 D	17 D
Sodium	mg/L	T	--	38	20	--	23	21	28	57	66 D	58 D
Total Alkalinity	mg/L	T	--	110	71	--	73	71	41	73	85	120 D
Magnesium	mg/L	D	--	--	--	--	--	--	34	--	--	--
Potassium	mg/L	D	--	--	--	--	--	--	6.7	--	--	--
Sodium	mg/L	D	--	--	--	--	--	--	25	--	--	--

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	SG-04R								
			Compliance Phase:	Background Monitoring								Initial Assessment Montioring
			Sample Date:	12/2/2022	1/5/2023	2/6/2023	3/14/2023	4/19/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
			Sample Matrix:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	1.0	1.64	--	1.404	1.96	1.79	2.56	2.56	2.12
Dissolved Oxygen	mg/L	N	--	6.42	9.64	--	10.26	10.46	7.17	6.62	8.21	8.36
Oxidation Reduction Potential	mV	N	--	125.3	-34.8	--	-34	91.5	29.9	368	58.7	-33.8
pH	su	N	--	8.03	8.44	--	8.05	8.21	8.3	8.24	8.68	8.36
Temperature	deg c	N	--	3.3	4	--	5.9	8.2	25.6	25.9	23.8	17.1
Turbidity	NTU	N	--	7.25	1.1	--	3.22	1.04	5.27	10.6	2.28	5.92
Appendix III												
Boron	mg/L	T	4.0	3.0	2.1	--	2.6	2.4	3.2	5.0 J+	5.4	5.4 D
Calcium	mg/L	T	250	430	300	--	370	310	390	600 D	580 DE	500 D
Chloride	mg/L	T	120	27	22	--	21	20	22	33 D	38 D	35 D
Fluoride	mg/L	T	2.0	2.6	2.0	--	2.3	2.7	3.5	5.0 D	5.3 D	3.7 D
Sulfate (as SO4)	mg/L	T	250	1200	890	--	750	880	1000	1600 D	1800 D	820 D
Total Dissolved Solids	mg/L	T	950	1800	1200	--	1200	1400	1600	2500 D	2700 D	2200
Appendix IV												
Antimony	mg/L	T	0.0060	0.00059	0.00052	--	0.00069	0.0011 J	0.00064 J	0.0013 D	0.0011	0.00089
Arsenic	mg/L	T	0.010	0.00099	0.00091	--	0.0016	0.0026 J	0.0012	0.0043	0.0058	0.0017
Barium	mg/L	T	1.3	0.022	0.019	--	0.023	0.040	0.039	0.040 D	0.029	0.029
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	--	< 0.000052 U	< 0.00026 U	< 0.000052 U	0.00012 J	0.000066 J	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	--	< 0.000032 U	< 0.00016 U	< 0.00038 U	< 0.000075 U	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	0.00019 J	0.00028	--	0.00035	< 0.00088 U	0.00040	0.0010	0.00028	0.00063
Cobalt	mg/L	T	0.0060	0.00024 J	0.00028 J	--	0.00037 J	< 0.00050 U	0.00032 J	0.0011	0.00083	0.00063
Fluoride	mg/L	T	2.0	2.6	2.0	--	2.3	2.7	3.5	5.0 D	5.3 D	3.7 D
Lead	mg/L	T	0.0016	0.00033 J	0.00027 J	--	0.00047 J	0.0011 J	0.0013 J	0.0025 JD	0.00054 JD	0.00022 J
Lithium	mg/L	T	0.10	0.044	0.039	--	0.0089	0.043	0.056	0.072	0.084	0.064
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	--	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U
Molybdenum	mg/L	T	0.10	0.0078	0.0066	--	0.0073	0.010	0.0072	0.013	0.016	0.016
Radium 226 and 228	pCi/L	T	5.0	< 0.408 U	< 0.497 U	--	< 0.672 U	< 0.809 U	< 0.803 U	1.82	< 0.788 U	< 0.641 U
Radium-226	pCi/L	T	--	< 0.11 U	< 0.109 U	--	< 0.167 U	< 0.213 U	0.264	0.233	< 0.133 U	< 0.2 U
Radium-228	pCi/L	T	--	< 0.408 U	< 0.497 U	--	< 0.672 U	< 0.809 U	< 0.803 U	1.59	< 0.788 U	< 0.641 U
Selenium	mg/L	T	0.0050	0.0015	0.0014	--	0.0016	0.0013 J	0.0012	0.0023	0.0028	0.0024
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	--	< 0.000075 U	< 0.00038 U	< 0.00038 U	< 0.00038 UD	< 0.00038 UD	< 0.000075 U
Total Suspended Solids	mg/L	T	--	5.0	< 4.0 U	--	3.0 J	1.0 J	5.0	23	9.0	< 4 U
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00047	0.00048	--	0.012	0.0012	0.00056	0.0018	0.00071	0.00086
Iron	mg/L	T	83	0.055	0.11	--	0.11	0.13	0.19	0.31	0.089	0.05
Nickel	mg/L	T	0.10	0.0025	0.0028	--	0.0027	< 0.0032 U	0.0022	0.0055	0.0041	0.0035
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	--	< 0.000050 U	< 0.00025 U	< 0.00025 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	--	< 0.00062 U	< 0.0031 U	0.00094 J	0.0041	0.0065	< 0.00062 U
Zinc	mg/L	T	0.27	0.0037	0.0023	--	0.0033	0.0061 J	0.0012	0.0070	0.0019	0.0086
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	110	87	--	98	100	62	50	30	61 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	--	< 0.16 U	< 0.16 U	< 0.16 U	< 0.16 U	13	< 0.31 UD
Magnesium	mg/L	T	--	41	30	--	33	29	35	53	62 D	57 D
Potassium	mg/L	T	--	15	10	--	9.8	9.1	10	17	21	12 D
Sodium	mg/L	T	--	24	20	--	21	19	22	39	40 D	34 D
Total Alkalinity	mg/L	T	--	110	87	--	98	100	62	50	43	61 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

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J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

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J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	SG-05								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/2/2022	1/5/2023	2/6/2023	3/14/2023	4/19/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
			Sample Matrix:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	0.731	0.98	--	0.742	1.11	0.75	0.61	0.359	0.91
Dissolved Oxygen	mg/L	N	--	6.85	13.1	--	15.74	6.77	7.83	11.25	11.39	11.73
Oxidation Reduction Potential	mV	N	--	142	-44.6	--	6.4	18.3	16.3	153.3	39.2	-28.7
pH	su	N	--	7.44	8.02	--	8.28	7.88	8.31	6.73	9.19	7.87
Temperature	deg c	N	--	4.1	4	--	9.8	7.6	27.8	23.4	28.9	19.5
Turbidity	NTU	N	--	9.38	8.02	--	9.83	26.6	6.8	7.84	4.36	29.3
Appendix III												
Boron	mg/L	T	4.0	0.59	0.60	--	0.48	0.57	0.36	0.46 J+	0.39	0.72 D
Calcium	mg/L	T	250	140	120	--	120	120	81	34	34	120 D
Chloride	mg/L	T	120	79	51	--	61	50	54	64 D	29 D	54 D
Fluoride	mg/L	T	2.0	0.73	0.98	--	0.94	0.69	0.30	0.42 D	0.45 D	0.79 D
Sulfate (as SO4)	mg/L	T	250	8.4 J	150	--	38 J	110	43	38 D	11 D	12 D
Total Dissolved Solids	mg/L	T	950	620	630	--	460	570	400	320 D	210 D	510 D
Boron	mg/L	D	4.0	--	--	--	--	0.68	--	--	--	--
Calcium	mg/L	D	250	--	--	--	--	120	--	--	--	--
Appendix IV												
Antimony	mg/L	T	0.0060	0.00018 J	0.000093 J	--	0.00030	0.0010 J	0.00029	0.0010	0.00044	0.00016 J
Arsenic	mg/L	T	0.010	0.00084	0.00056	--	0.00071	0.0026 J	0.0017	0.0024	0.0013	0.00088
Barium	mg/L	T	1.3	0.58	0.23	--	0.35	0.039	0.20	0.11	0.16	0.51
Beryllium	mg/L	T	0.0040	< 0.000052 U	< 0.000052 U	--	< 0.000052 U	< 0.00026 U	< 0.000052 U	< 0.000052 U	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0025	< 0.000032 U	< 0.000032 U	--	< 0.000032 U	< 0.00016 U	< 0.000075 U	0.00011 J	0.00075	0.000094 J
Chromium, Total	mg/L	T	0.10	0.00036	0.00024 J	--	0.00048	< 0.00088 U	0.00035	0.00049	0.0017	0.00039
Cobalt	mg/L	T	0.0060	0.00037 J	0.00025 J	--	0.00029 J	< 0.00050 U	0.00025 J	0.00032 J	0.00033 J	0.00027 J
Fluoride	mg/L	T	2.0	0.73	0.98	--	0.94	0.69	0.30	0.42 D	0.45 D	0.79 D
Lead	mg/L	T	0.0016	0.00023 J	0.00038 J	--	0.00045 J	0.0012 J	0.0022	0.0040	0.0095	0.0031
Lithium	mg/L	T	0.10	0.038	0.033	--	0.0045	0.029	0.016	0.022	0.027	0.039
Mercury	mg/L	T	0.0013	< 0.00016 U	< 0.00016 U	--	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	< 0.00016 U	0.00017 J
Molybdenum	mg/L	T	0.10	0.00077 J	0.0029	--	0.0013	0.0090	0.0083	0.0087	0.0015	0.00085 J
Radium 226 and 228	pCi/L	T	5.0	0.851	< 0.537 U	--	< 0.776 U	0.858	< 0.758 U	< 0.818 U	< 0.82 U	< 0.771 U
Radium-226	pCi/L	T		0.308	< 0.122 U	--	< 0.188 U	0.306	< 0.219 U	< 0.154 U	< 0.147 U	< 0.286 U
Radium-228	pCi/L	T		0.543	< 0.537 U	--	< 0.776 U	< 0.798 U	< 0.758 U	< 0.818 U	< 0.82 U	< 0.771 U
Selenium	mg/L	T	0.0050	< 0.00022 U	< 0.00022 U	--	< 0.00022 U	0.0013 J	0.00022 J	0.00038 J	0.00027 J	0.00017 J
Thallium	mg/L	T	0.0020	< 0.000075 U	< 0.000075 U	--	< 0.000075 U	< 0.00038 U	< 0.000075 U	< 0.000075 U	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T		5.0	7.9	--	8.0	17	6.0	14	73	12
Antimony	mg/L	D	0.0060	--	--	--	--	0.00047 J	--	--	--	--
Arsenic	mg/L	D	0.010	--	--	--	--	0.00063 J	--	--	--	--
Barium	mg/L	D	1.3	--	--	--	--	0.37	--	--	--	--
Beryllium	mg/L	D	0.0040	--	--	--	--	< 0.00026 U	--	--	--	--
Cadmium	mg/L	D	0.0025	--	--	--	--	< 0.00016 U	--	--	--	--
Chromium, Total	mg/L	D	0.10	--	--	--	--	0.025	--	--	--	--
Cobalt	mg/L	D	0.0060	--	--	--	--	0.0012 J	--	--	--	--
Lead	mg/L	D	0.0016	--	--	--	--	< 0.0011 U	--	--	--	--
Lithium	mg/L	D	0.10	--	--	--	--	0.032	--	--	--	--
Mercury	mg/L	D	0.0013	--	--	--	--	< 0.00016 U	--	--	--	--
Molybdenum	mg/L	D	0.10	--	--	--	--	< 0.0031 U	--	--	--	--
Selenium	mg/L	D	0.0050	--	--	--	--	< 0.0011 U	--	--	--	--
Thallium	mg/L	D	0.0020	--	--	--	--	< 0.00038 U	--	--	--	--
Michigan CCR Part 115												
Copper	mg/L	T	0.021	0.00029	0.00036	--	0.0089	0.0011 J	0.00084	0.0028	0.0066	0.0012
Iron	mg/L	T	83	3.0	1.5	--	2.7	3.2	1.1	0.74	1.1	2.9 D
Nickel	mg/L	T	0.10	0.0013	0.0015	--	0.0012	< 0.0032 U	0.0026	0.0034	0.0026	0.0012
Silver	mg/L	T	0.00020	< 0.000050 U	< 0.000050 U	--	0.000053	< 0.00025 U	< 0.000050 U	< 0.000050 U	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	< 0.00062 U	< 0.00062 U	--	< 0.00062 U	< 0.0031 U	< 0.00062 U	0.0012	0.00069 J	< 0.00062 U
Zinc	mg/L	T	0.27	0.030	0.0018	--	0.0022	0.0060 J	0.0024	0.0090	0.019	0.043
Copper	mg/L	D	0.021	--	--	--	--	< 0.0010 U	--	--	--	--
Iron	mg/L	D	83	--	--	--	--	0.12	--	--	--	--
Nickel	mg/L	D	0.10	--	--	--	--	< 0.0032 U	--	--	--	--
Silver	mg/L	D	0.00020	--	--	--	--	< 0.00025 U	--	--	--	--
Vanadium	mg/L	D	0.0062	--	--	--	--	< 0.0031 U	--	--	--	--
Zinc	mg/L	D	0.27	--	--	--	--	0.043	--	--	--	--
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	490	270	--	290	290	240	65	96	400 D
Carbonate Alkalinity	mg/L	T	--	< 0.16 U	< 0.16 U	--	< 0.16 U	< 0.16 U	< 0.16 U	46	16	< 0.31 UD
Magnesium	mg/L	T	--	27	23	--	26	26	25	21	12	24 D
Potassium	mg/L	T	--	8.1	6.5	--	7.9	6.8	4.3	0.31	0.79	8.5 D
Sodium	mg/L	T	--	43	30	--	38	34	37	44	21	40 D
Total Alkalinity	mg/L	T	--	490	270	--	290	290	240	110	110	400 D
Magnesium	mg/L	D	--	--	--	--	--	26	--	--	--	--
Potassium	mg/L	D	--	--	--	--	--	7.4	--	--	--	--
Sodium	mg/L	D	--	--	--	--	--	34	--	--	--	--

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

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J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

			Sample Location:	SG-06								
			Compliance Phase:	Background Monitoring								Initial Assessment Monitoring
			Sample Date:	12/2/2022	1/5/2023	2/6/2023	3/13/2023	4/19/2023	5/23/2023	6/28/2023	8/8/2023	10/24/2023
			Sample Type:	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
			Unit:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
			Sample Matrix:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Constituent	Unit	Fraction	Groundwater Protection Standard	Result	Result	Result	Result	Result	Result	Result	Result	Result
Field Parameters												
Conductivity	mS/cm	N	--	--	--	--	--	--	--	--	0.69	0.74
Dissolved Oxygen	mg/L	N	--	--	--	--	--	--	--	--	4.93	6.01
Oxidation Reduction Potential	mV	N	--	--	--	--	--	--	--	--	60.2	-40.4
pH	su	N	--	--	--	--	--	--	--	--	7.37	7.98
Temperature	deg c	N	--	--	--	--	--	--	--	--	24.3	19.1
Turbidity	NTU	N	--	--	--	--	--	--	--	--	7.35	4.89
Appendix III												
Boron	mg/L	T	4.0	--	--	--	--	--	--	--	0.21	0.24 D
Calcium	mg/L	T	250	--	--	--	--	--	--	--	69 D	82 D
Chloride	mg/L	T	120	--	--	--	--	--	--	--	53 D	56 D
Fluoride	mg/L	T	2.0	--	--	--	--	--	--	--	0.18 D	0.18 D
Sulfate (as SO4)	mg/L	T	250	--	--	--	--	--	--	--	15 D	30 D
Total Dissolved Solids	mg/L	T	950	--	--	--	--	--	--	--	380 D	410 D
Appendix IV												
Antimony	mg/L	T	0.0060	--	--	--	--	--	--	--	< 0.00010 U	0.00014 J
Arsenic	mg/L	T	0.010	--	--	--	--	--	--	--	0.0016	0.0016
Barium	mg/L	T	1.3	--	--	--	--	--	--	--	0.10	0.092
Beryllium	mg/L	T	0.0040	--	--	--	--	--	--	--	< 0.000052 U	< 0.000052 U
Cadmium	mg/L	T	0.0013	--	--	--	--	--	--	--	< 0.000075 U	< 0.000075 U
Chromium, Total	mg/L	T	0.10	--	--	--	--	--	--	--	0.00088	0.00044
Cobalt	mg/L	T	0.0060	--	--	--	--	--	--	--	0.00019 J	0.00018 J
Fluoride	mg/L	T	2.0	--	--	--	--	--	--	--	0.18 D	0.18 D
Lead	mg/L	T	0.0016	--	--	--	--	--	--	--	0.00071	0.00053 J
Lithium	mg/L	T	0.10	--	--	--	--	--	--	--	0.0061	0.0087
Mercury	mg/L	T	0.0013	--	--	--	--	--	--	--	< 0.00016 U	0.0002
Molybdenum	mg/L	T	0.10	--	--	--	--	--	--	--	0.00039 J	0.0034
Radium 226 and 228	pCi/L	T	5.0	--	--	--	--	--	--	--	< 0.926 U	< 0.838 U
Radium-226	pCi/L	T	--	--	--	--	--	--	--	--	< 0.16 U	< 0.288 U
Radium-228	pCi/L	T	--	--	--	--	--	--	--	--	< 0.926 U	< 0.838 U
Selenium	mg/L	T	0.0050	--	--	--	--	--	--	--	0.00015 J	0.00012 J
Thallium	mg/L	T	0.0020	--	--	--	--	--	--	--	< 0.000075 U	< 0.000075 U
Total Suspended Solids	mg/L	T	--	--	--	--	--	--	--	--	120	< 4 UD
Michigan CCR Part 115												
Copper	mg/L	T	0.021	--	--	--	--	--	--	--	0.00089	0.00054
Iron	mg/L	T	83	--	--	--	--	--	--	--	0.55	0.23
Nickel	mg/L	T	0.10	--	--	--	--	--	--	--	0.00084 J	0.0011 J
Silver	mg/L	T	0.00020	--	--	--	--	--	--	--	< 0.000050 U	< 0.00005 U
Vanadium	mg/L	T	0.0062	--	--	--	--	--	--	--	< 0.00062 U	< 0.00062 U
Zinc	mg/L	T	0.27	--	--	--	--	--	--	--	0.0045	0.008
Additional Parameters												
Bicarbonate Alkalinity	mg/L	T	--	--	--	--	--	--	--	--	230	270 D
Carbonate Alkalinity	mg/L	T	--	--	--	--	--	--	--	--	< 0.16 U	< 0.31 UD
Magnesium	mg/L	T	--	--	--	--	--	--	--	--	21	25 D
Potassium	mg/L	T	--	--	--	--	--	--	--	--	0.78	5 D
Sodium	mg/L	T	--	--	--	--	--	--	--	--	29 D	35 D
Total Alkalinity	mg/L	T	--	--	--	--	--	--	--	--	230	270 D

Notes:

ug/l - micrograms per liter.

mg/l = milligrams per liter.

su - standard pH units (pH is a field parameter)

pCi/L = picocuries per liter.

All metals were analyzed as total unless otherwise indicated.

Qualifiers:

U The analyte was analyzed for, but was not detected at, a level greater than or equal to the level of the adjusted reporting limit (RL) for the sample and method.

J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or to the concentration of the analyte being below the RL).

J+ Same as J, and the reported concentration is potentially biased high.

J– Same as J, and the reported concentration is potentially biased low.

UJ The analyte was not detected at a level greater than or equal to the adjusted method detection limit (MDL). However, the reported adjusted MDL is approximate and might be inaccurate or imprecise.

R The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte might or might not be present in the sample.

D The sample was diluted before analysis, this does not effect results.

Appendix D

Laboratory Reports

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE
ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
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January 26, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

RE: Trace Project 23A0179
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAP Accreditation, Trace certifies that these test results meet all requirements of the NELAP Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAP at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

NELAP ACCREDITED TNI LABORATORY

NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23A0179-01	MW-30	Ground Water	TB	01/03/23 17:20	01/04/23 16:07
23A0179-02	MWT-30	Ground Water	TB	01/03/23 17:40	01/04/23 16:07
23A0179-03	MW-19	Ground Water	TB	01/03/23 15:30	01/04/23 16:07
23A0179-04	MW-12	Ground Water	TB	01/03/23 12:20	01/04/23 16:07
23A0179-05	MW-11	Ground Water	TB	01/03/23 18:10	01/04/23 16:07
23A0179-06	MW-06	Ground Water	TB	01/03/23 13:30	01/04/23 16:07
23A0179-07	MW-01R	Ground Water	TB	01/03/23 15:25	01/04/23 16:07
23A0179-08	MW-10	Ground Water	TB	01/04/23 09:30	01/04/23 16:07
23A0179-09	MW-02	Ground Water	TB	01/04/23 11:40	01/04/23 16:07
23A0179-10	MW-09	Ground Water	TB	01/04/23 13:30	01/04/23 16:07
23A0179-11	MW-04	Ground Water	TB	01/04/23 13:00	01/04/23 16:07
23A0179-12	MW-03	Ground Water	TB	01/04/23 15:10	01/04/23 16:07
23A0179-13	MW-31	Ground Water	TB	01/04/23 17:00	01/05/23 18:45
23A0179-14	MW-32	Ground Water	TB	01/04/23 19:20	01/05/23 18:45
23A0179-15	MW-33	Ground Water	TB	01/05/23 16:20	01/05/23 18:45
23A0179-16	MW-34	Ground Water	TB	01/05/23 13:10	01/05/23 18:45
23A0179-17	MW-18	Ground Water	TB	01/05/23 09:00	01/05/23 18:45
23A0179-18	SG-05	Ground Water	TB	01/05/23 14:00	01/05/23 18:45
23A0179-19	SG-04R	Ground Water	TB	01/05/23 14:25	01/05/23 18:45
23A0179-20	SG-03	Ground Water	TB	01/05/23 14:50	01/05/23 18:45
23A0179-21	SG-02	Ground Water	TB	01/05/23 15:20	01/05/23 18:45
23A0179-22	MW-20	Ground Water	TB	01/04/23 17:20	01/05/23 18:45
23A0179-23	MW-07	Ground Water	TB	01/04/23 19:20	01/05/23 18:45
23A0179-24	MW-08	Ground Water	TB	01/05/23 10:00	01/05/23 18:45
23A0179-25	MW-27	Ground Water	TB	01/05/23 12:10	01/05/23 18:45
23A0179-26	MWT-27	Ground Water	TB	01/05/23 12:10	01/05/23 18:45

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the laboratory is not accredited by NELAP for this compound
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: 23A0179-01

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pH : The pH was analyzed at 9:37

Trace ID: 23A0179-02

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHb : The pH was analyzed at 9:41

Trace ID: 23A0179-03

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHc : The pH was analyzed at 9:42

Trace ID: 23A0179-04

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

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pH	Note pHd : The pH was analyzed at 9:43

Trace ID: 23A0179-05

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHe : The pH was analyzed at 9:45

Trace ID: 23A0179-06

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHf : The pH was analyzed at 9:46

Trace ID: 23A0179-07

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHg : The pH was analyzed at 9:47

Trace ID: 23A0179-08

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHh : The pH was analyzed at 9:48

Trace ID: 23A0179-09

Analysis: SM 4500-H+ B-11

pH	Note pHi : The pH was analyzed at 9:49

Trace ID: 23A0179-10

Analysis: SM 4500-H+ B-11

pH	Note pHi : The pH was analyzed at 9:49

Trace ID: 23A0179-11

Analysis: SM 4500-H+ B-11

pH	Note pHj : The pH was analyzed at 9:50

Trace ID: 23A0179-12

Analysis: SM 4500-H+ B-11

pH	Note pHk : The pH was analyzed at 9:51

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Trace ID: 23A0179-13

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHd : The pH was analyzed at 9:43

Trace ID: 23A0179-14

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHe : The pH was analyzed at 9:45

Trace ID: 23A0179-15

Analysis: SM 4500-H+ B-11

pH	Note pHf : The pH was analyzed at 9:46

Trace ID: 23A0179-16

Analysis: SM 4500-H+ B-11

pH	Note pHg : The pH was analyzed at 9:47

Trace ID: 23A0179-17

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHh : The pH was analyzed at 9:48

Trace ID: 23A0179-18

Analysis: SM 4500-H+ B-11

pH	Note pHi : The pH was analyzed at 9:49

Trace ID: 23A0179-19

Analysis: SM 4500-H+ B-11

pH	Note pHj : The pH was analyzed at 9:50

Trace ID: 23A0179-20

Analysis: SM 4500-H+ B-11

pH	Note pHk : The pH was analyzed at 9:51

Trace ID: 23A0179-21

Analysis: SM 4500-H+ B-11

pH	Note pHl : The pH was analyzed at 9:52

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Trace ID: 23A0179-22

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHm : The pH was analyzed at 9:53

Trace ID: 23A0179-23

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHn : The pH was analyzed at 9:54

Trace ID: 23A0179-24

Analysis: SM 4500-H+ B-11

pH	Note pHo : The pH was analyzed at 9:55

Trace ID: 23A0179-25

Analysis: SM 4500-H+ B-11

pH	Note pHp : The pH was analyzed at 9:56

Trace ID: 23A0179-26

Analysis: SM 4500-H+ B-11

pH	Note pHq : The pH was analyzed at 9:57

Trace ID: T131186-DUP1

Analysis: SM 4500-H+ B-11

pH	Note pHa : The pH was analyzed at 9:38

Trace ID: T131189-DUP1

Analysis: SM 2540 C-15

Total Dissolved Solids	Note 623 : The relative percent difference between the sample and sample duplicate is out of control. The sample result should be considered estimated.

Trace ID: T131191-DUP1

Analysis: SM 4500-H+ B-11

pH	Note pHd : The pH was analyzed at 9:43

Trace ID: T131230-MS1

Analysis: EPA 200.7 Rev. 4.4

Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-01 Matrix: Ground Water Date Collected: 01/03/23 17:20
Sample ID: MW-30 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**1.7**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**460**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.15**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**120**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**15**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**110**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.00070**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.089**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.012**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.0044**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0036**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-01 Matrix: Ground Water Date Collected: 01/03/23 17:20
Sample ID: MW-30 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**190**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**1000**	**mg/L**	**60**	**100**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131086										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**760**	**mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**760**	**mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15										
Batch: T131107										
Total Dissolved Solids	**2400**	**mg/L**	**20**	**2**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T131087										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131186										
pH	**7.02**	**pH Units**		**1**	**01/03/23**	**kb**	**01/05/23**	**kb**	**503, pH, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-02 Matrix: Ground Water Date Collected: 01/03/23 17:40
Sample ID: MWT-30 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**1.7**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**460**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.15**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**120**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**15**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**110**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.00068**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.086**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.011**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.0041**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0030**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-02 Matrix: Ground Water Date Collected: 01/03/23 17:40
Sample ID: MWT-30 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**1.3 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**200 mg/L**	**15**	**100**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Sulfate as SO4	**1000 mg/L**	**60**	**100**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**750 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**750 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**2300 mg/L**	**38**	**3.846154**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131087									
Total Suspended Solids	**13 mg/L**	**4.0**	**1**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.03 pH Units**		**1**	**01/03/23**	**kb**	**01/05/23**	**kb**	**503, pHb, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-03 Matrix: Ground Water Date Collected: 01/03/23 15:30
Sample ID: MW-19 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**2.0**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**510**	**mg/L**	**6.4**	**25**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.11**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**42**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**22**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**40**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.0055**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.050**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.00053**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.00069**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.011**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-03 Matrix: Ground Water Date Collected: 01/03/23 15:30
Sample ID: MW-19 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**2.3**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**64**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**1300**	**mg/L**	**60**	**100**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131086										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15										
Batch: T131107										
Total Dissolved Solids	**2200**	**mg/L**	**100**	**10**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T131087										
Total Suspended Solids	**25**	**mg/L**	**4.0**	**1**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131186										
pH	**6.92**	**pH Units**		**1**	**01/03/23**	**kb**	**01/05/23**	**kb**	**511, pHc, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-04 Matrix: Ground Water Date Collected: 01/03/23 12:20
Sample ID: MW-12 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**0.24**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**46**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.0033**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**12**	**mg/L**	**0.10**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**0.70**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**11**	**mg/L**	**0.12**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	**0.0011**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Arsenic	**0.0019**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.017**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	**0.00078**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Chromium	**0.00048**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0072**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	**0.0022**	**mg/L**	**0.00050**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-04 Matrix: Ground Water Date Collected: 01/03/23 12:20
Sample ID: MW-12 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**0.43 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**16 mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**130 mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**55 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**55 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**210 mg/L**	**20**	**2**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131087									
Total Suspended Solids	<4.0 mg/L	4.0	1	01/05/23	aeo	01/05/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.56 pH Units**		**1**	**01/03/23**	**kb**	**01/05/23**	**kb**	**511, pHd, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-05 Matrix: Ground Water Date Collected: 01/03/23 18:10
Sample ID: MW-11 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**13**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**130**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.22**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**55**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**19**	**mg/L**	**2.5**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**70**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	**0.00069**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Arsenic	**0.0041**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**1.2**	**mg/L**	**0.012**	**5**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	**0.00073**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Chromium	**0.0086**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.0012**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	**0.068**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Molybdenum	**0.0029**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-05 Matrix: Ground Water Date Collected: 01/03/23 18:10
Sample ID: MW-11 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**84**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**10**	**mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131086										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**600**	**mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**600**	**mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15										
Batch: T131107										
Total Dissolved Solids	**680**	**mg/L**	**40**	**4**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T131087										
Total Suspended Solids	**35**	**mg/L**	**4.0**	**1**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131186										
pH	**7.30**	**pH Units**		**1**	**01/03/23**	**kb**	**01/05/23**	**sb**	**503, pHe, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-06 Matrix: Ground Water Date Collected: 01/03/23 13:30
Sample ID: MW-06 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**9.5**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**230**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.22**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**95**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**24**	**mg/L**	**2.5**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**78**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.00065**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**1.5**	**mg/L**	**0.012**	**5**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0021**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.00057**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-06 Matrix: Ground Water Date Collected: 01/03/23 13:30
Sample ID: MW-06 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**120**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**9.6**	**mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131086										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<50	mg/L	50	10	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15										
Batch: T131107										
Total Dissolved Solids	**1200**	**mg/L**	**40**	**4**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T131087										
Total Suspended Solids	**45**	**mg/L**	**4.0**	**1**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131186										
pH	**7.14**	**pH Units**		**1**	**01/03/23**	**kb**	**01/05/23**	**sb**	**511, pHf, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-07 Matrix: Ground Water Date Collected: 01/03/23 15:25
Sample ID: MW-01R Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**110**	**mg/L**	**0.088**	**10**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**200**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**2.8**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**92**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**66**	**mg/L**	**2.5**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**370**	**mg/L**	**3.1**	**25**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.0015**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.30**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	**0.00032**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0024**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.0012**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	**0.00082**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Molybdenum	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Selenium	**0.00059**	**mg/L**	**0.00050**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-07 Matrix: Ground Water Date Collected: 01/03/23 15:25
Sample ID: MW-01R Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**14 mg/L**	**0.50**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**160 mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**400 mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1200 mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<50 mg/L	50	10	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**1200 mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**2300 mg/L**	**40**	**4**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131087									
Total Suspended Solids	<4.0 mg/L	4.0	1	01/05/23	aeo	01/05/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.70 pH Units**		**1**	**01/03/23**	**kb**	**01/05/23**	**sb**	**511, pHg, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-08 Matrix: Ground Water Date Collected: 01/04/23 09:30
Sample ID: MW-10 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**14**	**mg/L**	**0.088**	**10**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**220**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.83**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**86**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**33**	**mg/L**	**2.5**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**160**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Barium	**0.57**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0050**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0033**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-08 Matrix: Ground Water Date Collected: 01/04/23 09:30
Sample ID: MW-10 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**5.7 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**170 mg/L**	**7.5**	**50**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Sulfate as SO4	**620 mg/L**	**30**	**50**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**580 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**580 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**1800 mg/L**	**20**	**2**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131142									
Total Suspended Solids	**4.0 mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.84 pH Units**		**1**	**01/04/23**	**kb**	**01/05/23**	**sb**	**503, pHh, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-09 Matrix: Ground Water Date Collected: 01/04/23 11:40
Sample ID: MW-02 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**86**	**mg/L**	**0.088**	**10**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**180**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**1.5**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**59**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**44**	**mg/L**	**6.2**	**25**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**250**	**mg/L**	**3.1**	**25**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.0076**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.53**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	**0.00034**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.054**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.0060**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	**0.0024**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Molybdenum	**0.0062**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	**0.0012**	**mg/L**	**0.00050**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-09 Matrix: Ground Water Date Collected: 01/04/23 11:40
Sample ID: MW-02 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**10 mg/L**	**0.50**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**140 mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	<3.0 mg/L	3.0	5	01/06/23	ans	01/07/23	ans		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**2000 mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<50 mg/L	50	10	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**2000 mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**1800 mg/L**	**100**	**10**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131142									
Total Suspended Solids	**58 mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.09 pH Units**		**1**	**01/04/23**	**kb**	**01/05/23**	**sb**	**pHi, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-10 Matrix: Ground Water Date Collected: 01/04/23 13:30
Sample ID: MW-09 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**5.8**	**mg/L**	**0.088**	**10**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**230**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.34**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**36**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**16**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**28**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.0023**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**2.4**	**mg/L**	**0.012**	**5**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0028**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.033**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-10 Matrix: Ground Water Date Collected: 01/04/23 13:30
Sample ID: MW-09 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**2.4 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**17 mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**83 mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**710 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**710 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**740 mg/L**	**40**	**4**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131142									
Total Suspended Solids	**51 mg/L**	**4.0**	**0.990099**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.07 pH Units**		**1**	**01/04/23**	**kb**	**01/05/23**	**sb**	**pHi, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-11 Matrix: Ground Water Date Collected: 01/04/23 13:00
Sample ID: MW-04 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**3.9**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**360**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.047**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**200**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**20**	**mg/L**	**2.5**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**110**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.00078**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.46**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0060**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.00093**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-11 Matrix: Ground Water Date Collected: 01/04/23 13:00
Sample ID: MW-04 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**0.76 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**300 mg/L**	**7.5**	**50**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Sulfate as SO4	<3.0 mg/L	3.0	5	01/06/23	ans	01/07/23	ans		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1800 mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<50 mg/L	50	10	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**1800 mg/L**	**50**	**10**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**2100 mg/L**	**40**	**4**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131142									
Total Suspended Solids	**8.0 mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.19 pH Units**		**1**	**01/04/23**	**kb**	**01/05/23**	**sb**	**pHj, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-12 Matrix: Ground Water Date Collected: 01/04/23 15:10
Sample ID: MW-03 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**3.3**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**290**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.065**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**91**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**18**	**mg/L**	**2.5**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**74**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.13**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0061**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-12 Matrix: Ground Water Date Collected: 01/04/23 15:10
Sample ID: MW-03 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**1.6 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**190 mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**460 mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131086									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**690 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/05/23	jh	01/05/23	jh	N	
Total Alkalinity as CaCO3 at pH 4.5	**690 mg/L**	**5.0**	**1**	**01/05/23**	**jh**	**01/05/23**	**jh**		
Analysis Method: SM 2540 C-15									
Batch: T131107									
Total Dissolved Solids	**1700 mg/L**	**40**	**4**	**01/05/23**	**aeo**	**01/05/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T131142									
Total Suspended Solids	**15 mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131186									
pH	**7.27 pH Units**		**1**	**01/04/23**	**kb**	**01/05/23**	**sb**	**pHk, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-13 Matrix: Ground Water Date Collected: 01/04/23 17:00
Sample ID: MW-31 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131157										
Mercury	<0.00020	mg/L	0.00020	1	01/11/23	bjv	01/12/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**3.8**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**190**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.048**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**36**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**11**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**46**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.14**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0018**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0013**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-13 Matrix: Ground Water Date Collected: 01/04/23 17:00
Sample ID: MW-31 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**4.9**	**mg/L**	**0.50**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**100**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**250**	**mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**940**	**mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**4.0**	**mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**7.69**	**pH Units**		**1**	**01/04/23**	**kb**	**01/06/23**	**kb**	**511, pHd, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-14 Matrix: Ground Water Date Collected: 01/04/23 19:20
Sample ID: MW-32 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T131391									
Mercury	<0.00020 mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T131230									
Boron	**3.0 mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**180 mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.14 mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**34 mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**13 mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**29 mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T131230									
Antimony	<0.00025 mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	<0.00055 mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Barium	**0.60 mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025 mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025 mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.00065 mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052 mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055 mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0043 mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050 mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038 mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-14 Matrix: Ground Water Date Collected: 01/04/23 19:20
Sample ID: MW-32 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**1.5**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**50**	**mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**110**	**mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**490**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**490**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**700**	**mg/L**	**40**	**4**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**43**	**mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**7.29**	**pH Units**		**1**	**01/04/23**	**kb**	**01/06/23**	**kb**	**511, pHe, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-15 Matrix: Ground Water Date Collected: 01/05/23 16:20
Sample ID: MW-33 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**0.091**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**170**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.0069**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**19**	**mg/L**	**0.10**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**5.4**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**25**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	**0.00088**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Arsenic	**0.0014**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.086**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.0028**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0037**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	**0.00076**	**mg/L**	**0.00050**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-15 Matrix: Ground Water Date Collected: 01/05/23 16:20
Sample ID: MW-33 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**0.24**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**51**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**58**	**mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**430**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**430**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**630**	**mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**5.0**	**mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**7.11**	**pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHf, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-16 Matrix: Ground Water Date Collected: 01/05/23 13:10
Sample ID: MW-34 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**2.7**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**190**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.086**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**23**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**13**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**30**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.0010**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.54**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.022**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	**0.0016**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Molybdenum	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-16 Matrix: Ground Water Date Collected: 01/05/23 13:10
Sample ID: MW-34 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**0.20**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**27**	**mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	<3.0	mg/L	3.0	5	01/06/23	ans	01/07/23	ans		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**950**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**950**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**750**	**mg/L**	**40**	**4**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**52**	**mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**6.61**	**pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHg, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-17 Matrix: Ground Water Date Collected: 01/05/23 09:00
Sample ID: MW-18 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**2.0**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**410**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.042**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**36**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**12**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**20**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.020**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.018**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	**0.00030**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Chromium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cobalt	**0.0054**	**mg/L**	**0.00052**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.012**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-17 Matrix: Ground Water Date Collected: 01/05/23 09:00
Sample ID: MW-18 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**3.3**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**26**	**mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**1200**	**mg/L**	**60**	**100**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**110**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**110**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**1700**	**mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**4.0**	**mg/L**	**4.0**	**1.010101**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**6.94**	**pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**503, pHh, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-18 Matrix: Ground Water Date Collected: 01/05/23 14:00
Sample ID: SG-05 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**0.60**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**120**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.033**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**23**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**6.5**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**30**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Arsenic	**0.00056**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.23**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0029**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/12/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-18 Matrix: Ground Water Date Collected: 01/05/23 14:00
Sample ID: SG-05 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**0.98 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**51 mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**150 mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131187									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**270 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**270 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15									
Batch: T131189									
Total Dissolved Solids	**630 mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15									
Batch: T131154									
Total Suspended Solids	**7.9 mg/L**	**4.0**	**0.990099**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131191									
pH	**7.77 pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHi, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-19 Matrix: Ground Water Date Collected: 01/05/23 14:25
Sample ID: SG-04R Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**2.1**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**300**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.039**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**30**	**mg/L**	**0.10**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**10**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**20**	**mg/L**	**0.12**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	**0.00052**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Arsenic	**0.00091**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.019**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.00028**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/12/23	bjv	01/17/23	acs		
Molybdenum	**0.0066**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	**0.0014**	**mg/L**	**0.00050**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-19 Matrix: Ground Water Date Collected: 01/05/23 14:25
Sample ID: SG-04R Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131167										
Fluoride	**2.0**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**22**	**mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**890**	**mg/L**	**30**	**50**	**01/06/23**	**ans**	**01/09/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**87**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**87**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**1200**	**mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	<4.0	mg/L	4.0	1	01/06/23	aeo	01/06/23	aeo		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**7.70**	**pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHj, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-20 Matrix: Ground Water Date Collected: 01/05/23 14:50
Sample ID: SG-03 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Boron	**2.0**	**mg/L**	**0.0088**	**1**	**01/12/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**120**	**mg/L**	**2.6**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.028**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**	**N**	
Magnesium	**26**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**8.1**	**mg/L**	**0.25**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Sodium	**20**	**mg/L**	**1.2**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Antimony	**0.00038**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.031**	**mg/L**	**0.0025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Chromium	**0.00025**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/12/23	bjv	01/17/23	acs		
Lead	**0.00060**	**mg/L**	**0.00055**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Molybdenum	**0.0052**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Selenium	**0.00056**	**mg/L**	**0.00050**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-20 Matrix: Ground Water Date Collected: 01/05/23 14:50
Sample ID: SG-03 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131167									
Fluoride	**1.8 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**42 mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**350 mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131187									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**71 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**71 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15									
Batch: T131189									
Total Dissolved Solids	**480 mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15									
Batch: T131154									
Total Suspended Solids	<4.0 mg/L	4.0	1	01/06/23	aeo	01/06/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T131191									
pH	**7.77 pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHk, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-21 Matrix: Ground Water Date Collected: 01/05/23 15:20
Sample ID: SG-02 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Boron	**2.2**	**mg/L**	**0.0088**	**1**	**01/13/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**140**	**mg/L**	**2.6**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.032**	**mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**	**N**	
Magnesium	**31**	**mg/L**	**0.50**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**9.1**	**mg/L**	**0.25**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Sodium	**24**	**mg/L**	**1.2**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Antimony	**0.00043**	**mg/L**	**0.00025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.033**	**mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Chromium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cobalt	<0.00052	mg/L	0.00052	1	01/13/23	bjv	01/17/23	acs		
Lead	**0.00081**	**mg/L**	**0.00055**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Molybdenum	**0.0060**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Selenium	**0.00059**	**mg/L**	**0.00050**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-21 Matrix: Ground Water Date Collected: 01/05/23 15:20
Sample ID: SG-02 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131168									
Fluoride	**1.9 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**46 mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**360 mg/L**	**15**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131187									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**76 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**76 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15									
Batch: T131189									
Total Dissolved Solids	**660 mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15									
Batch: T131154									
Total Suspended Solids	<4.0 mg/L	4.0	1	01/06/23	aeo	01/06/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T131191									
pH	**7.54 pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHI, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-22 Matrix: Ground Water Date Collected: 01/04/23 17:20
Sample ID: MW-20 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Boron	**0.83**	**mg/L**	**0.0088**	**1**	**01/13/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**120**	**mg/L**	**2.6**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.065**	**mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**	**N**	
Magnesium	**53**	**mg/L**	**0.50**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**13**	**mg/L**	**0.25**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Sodium	**59**	**mg/L**	**1.2**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Antimony	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.61**	**mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Chromium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Lead	**0.0016**	**mg/L**	**0.00055**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Molybdenum	**0.0039**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/13/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-22 Matrix: Ground Water Date Collected: 01/04/23 17:20
Sample ID: MW-20 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131168										
Fluoride	**0.26**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**66**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**78**	**mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**470**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**470**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**660**	**mg/L**	**40**	**4**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**42**	**mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**7.17**	**pH Units**		**1**	**01/04/23**	**kb**	**01/06/23**	**kb**	**511, pHm, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-23 Matrix: Ground Water Date Collected: 01/04/23 19:20
Sample ID: MW-07 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T131391									
Mercury	<0.00020 mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T131427									
Boron	**11 mg/L**	**0.0088**	**1**	**01/13/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**140 mg/L**	**2.6**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.0070 mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**	**N**	
Magnesium	**37 mg/L**	**0.50**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**5.4 mg/L**	**0.25**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Sodium	**47 mg/L**	**1.2**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T131427									
Antimony	<0.00025 mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Arsenic	<0.00055 mg/L	0.00055	1	01/13/23	bjv	01/17/23	acs		
Barium	**0.34 mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025 mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cadmium	<0.00025 mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Chromium	**0.00030 mg/L**	**0.00025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.00088 mg/L**	**0.00052**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055 mg/L	0.00055	1	01/13/23	bjv	01/17/23	acs		
Molybdenum	<0.0012 mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Selenium	<0.00050 mg/L	0.00050	1	01/13/23	bjv	01/17/23	acs		
Thallium	<0.00038 mg/L	0.00038	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-23 Matrix: Ground Water Date Collected: 01/04/23 19:20
Sample ID: MW-07 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131168									
Fluoride	<0.10 mg/L	0.10	5	01/06/23	ans	01/07/23	ans		
Chloride	**15 mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**30 mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131187									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**580 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**580 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15									
Batch: T131189									
Total Dissolved Solids	**470 mg/L**	**40**	**4**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15									
Batch: T131154									
Total Suspended Solids	**36 mg/L**	**4.0**	**0.990099**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131191									
pH	**6.95 pH Units**		**1**	**01/04/23**	**kb**	**01/06/23**	**kb**	**511, pHn, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-24 Matrix: Ground Water Date Collected: 01/05/23 10:00
Sample ID: MW-08 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Boron	**4.4**	**mg/L**	**0.0088**	**1**	**01/13/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**160**	**mg/L**	**2.6**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.11**	**mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**	**N**	
Magnesium	**30**	**mg/L**	**0.50**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**12**	**mg/L**	**0.25**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Sodium	**27**	**mg/L**	**1.2**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Antimony	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Arsenic	**0.021**	**mg/L**	**0.00055**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Barium	**1.3**	**mg/L**	**0.012**	**5**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Chromium	**0.00093**	**mg/L**	**0.00025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	01/13/23	bjv	01/17/23	acs		
Lead	<0.00055	mg/L	0.00055	1	01/13/23	bjv	01/17/23	acs		
Molybdenum	**0.0018**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	01/13/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-24 Matrix: Ground Water Date Collected: 01/05/23 10:00
Sample ID: MW-08 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131168										
Fluoride	**0.56**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**23**	**mg/L**	**0.75**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**25**	**mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**510**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**510**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**480**	**mg/L**	**40**	**4**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**55**	**mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**6.95**	**pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHo, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-25 Matrix: Ground Water Date Collected: 01/05/23 12:10
Sample ID: MW-27 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T131391									
Mercury	<0.00020 mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T131427									
Boron	**0.17 mg/L**	**0.0088**	**1**	**01/13/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**180 mg/L**	**2.6**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Lithium	**0.0088 mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**	**N**	
Magnesium	**45 mg/L**	**0.50**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**7.3 mg/L**	**0.25**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Sodium	**68 mg/L**	**1.2**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T131427									
Antimony	<0.00025 mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Arsenic	**0.00070 mg/L**	**0.00055**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.17 mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025 mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cadmium	<0.00025 mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Chromium	**0.016 mg/L**	**0.00025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.00056 mg/L**	**0.00052**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055 mg/L	0.00055	1	01/13/23	bjv	01/17/23	acs		
Molybdenum	<0.0012 mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Selenium	<0.00050 mg/L	0.00050	1	01/13/23	bjv	01/17/23	acs		
Thallium	<0.00038 mg/L	0.00038	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-25 Matrix: Ground Water Date Collected: 01/05/23 12:10
Sample ID: MW-27 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T131168										
Fluoride	**0.29**	**mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**84**	**mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**41**	**mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11										
Batch: T131187										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**880**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**880**	**mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15										
Batch: T131189										
Total Dissolved Solids	**710**	**mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15										
Batch: T131154										
Total Suspended Solids	**27**	**mg/L**	**4.0**	**0.990099**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T131191										
pH	**6.84**	**pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHp, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-26 Matrix: Ground Water Date Collected: 01/05/23 12:10
Sample ID: MWT-27 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T131391										
Mercury	<0.00020	mg/L	0.00020	1	01/17/23	bjv	01/19/23	acs	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Boron	**0.16**	**mg/L**	**0.0088**	**1**	**01/13/23**	**bjv**	**01/24/23**	**jma**		
Calcium	**180**	**mg/L**	**2.6**	**10**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Lithium	**0.0094**	**mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**	**N**	
Magnesium	**45**	**mg/L**	**0.50**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Potassium	**7.5**	**mg/L**	**0.25**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Sodium	**68**	**mg/L**	**1.2**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Antimony	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Arsenic	**0.00069**	**mg/L**	**0.00055**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Barium	**0.17**	**mg/L**	**0.0025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Chromium	**0.016**	**mg/L**	**0.00025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Cobalt	**0.00058**	**mg/L**	**0.00052**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	01/13/23	bjv	01/17/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	01/13/23	bjv	01/17/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-26 Matrix: Ground Water Date Collected: 01/05/23 12:10
Sample ID: MWT-27 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T131168									
Fluoride	**0.27 mg/L**	**0.10**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Chloride	**83 mg/L**	**3.8**	**25**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Sulfate as SO4	**43 mg/L**	**3.0**	**5**	**01/06/23**	**ans**	**01/07/23**	**ans**		
Analysis Method: SM 2320 B-11									
Batch: T131187									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**880 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	01/09/23	mr	01/09/23	mr	N	
Total Alkalinity as CaCO3 at pH 4.5	**880 mg/L**	**5.0**	**1**	**01/09/23**	**mr**	**01/09/23**	**mr**		
Analysis Method: SM 2540 C-15									
Batch: T131189									
Total Dissolved Solids	**810 mg/L**	**20**	**2**	**01/09/23**	**jh**	**01/09/23**	**jh**		
Analysis Method: SM 2540 D-15									
Batch: T131154									
Total Suspended Solids	**26 mg/L**	**4.0**	**1**	**01/06/23**	**aeo**	**01/06/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T131191									
pH	**6.84 pH Units**		**1**	**01/05/23**	**kb**	**01/06/23**	**kb**	**pHq, N**	

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QUALITY CONTROL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131157
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T131157-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T131157-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00204	102	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T131157-MSD1

Original: **23A0179-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00242	0.00200	121	100	76-123	19	20	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131391
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T131391-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T131391-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00192	96	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T131391-MSD1

Original: **23A0179-14**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00194	0.00195	97	98	76-123	0.8	20	

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Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131230
QC Batch Method: EPA 200.2
Analysis Description: Calcium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T131230-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.050	0.050	
Calcium	mg/L	<1.0	1.0	
Potassium	mg/L	<1.0	1.0	
Lithium	mg/L	<0.025	0.025	
Magnesium	mg/L	<1.0	1.0	
Sodium	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T131230-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.49	93	85-115	
Calcium	mg/L	16.0	18.0	112	85-115	
Potassium	mg/L	16.0	16.2	101	85-115	
Lithium	mg/L	1.60	1.67	104	85-115	
Magnesium	mg/L	16.0	16.4	103	85-115	
Sodium	mg/L	16.0	16.0	100	85-115	

MATRIX SPIKE: T131230-MS1 Original: **23A0179-03**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	1.99	1.60	3.49	94	70-130	
Calcium	mg/L	512	16.0	529	106	70-130	
Potassium	mg/L	22.1	16.0	37.4	96	70-130	
Lithium	mg/L	0.112	1.60	1.97	116	70-130	
Magnesium	mg/L	42.4	16.0	58.8	102	70-130	
Sodium	**mg/L**	**40.0**	**16.0**	51.0	**69**	**70-130**	**243**

MATRIX SPIKE: T131230-MS2 Original: **23A0179-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	0.239	1.60	1.73	93	70-130	
Calcium	mg/L	46.3	16.0	63.4	107	70-130	
Potassium	mg/L	0.702	16.0	17.5	105	70-130	
Lithium	mg/L	0	1.60	1.68	105	70-130	

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MATRIX SPIKE: T131230-MS2 Original: **23A0179-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Magnesium	mg/L	12.1	16.0	28.4	102	70-130	
Sodium	mg/L	10.8	16.0	27.1	102	70-130	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131427
QC Batch Method: EPA 200.2
Analysis Description: Sodium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T131427-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.050	0.050	
Calcium	mg/L	<0.26	0.26	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.050	0.050	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T131427-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.51	95	85-115	
Calcium	mg/L	16.0	17.5	109	85-115	
Potassium	mg/L	16.0	15.8	99	85-115	
Lithium	mg/L	1.60	1.61	101	85-115	
Magnesium	mg/L	16.0	15.9	99	85-115	
Sodium	mg/L	16.0	15.6	98	85-115	

MATRIX SPIKE: T131427-MS1 Original: **23A0179-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	2.20	1.60	3.67	92	70-130	
Calcium	mg/L	141	16.0	155	85	70-130	
Potassium	mg/L	9.09	16.0	25.6	103	70-130	
Lithium	mg/L	0.0318	1.60	1.72	105	70-130	
Magnesium	mg/L	30.8	16.0	44.4	85	70-130	
Sodium	mg/L	23.6	16.0	41.3	111	70-130	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T131230
QC Batch Method: EPA 200.2

Analysis Description: Thallium, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T131230-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.0022	0.0022	
Barium	mg/L	<0.050	0.050	
Beryllium	mg/L	<0.0040	0.0040	
Cadmium	mg/L	<0.0010	0.0010	
Cobalt	mg/L	<0.010	0.010	
Chromium	mg/L	<0.0050	0.0050	
Molybdenum	mg/L	<0.010	0.010	
Lead	mg/L	<0.0030	0.0030	
Antimony	mg/L	<0.0020	0.0020	
Selenium	mg/L	<0.0020	0.0020	
Thallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T131230-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.0965	97	85-115	
Barium	mg/L	1.60	1.60	100	85-115	
Beryllium	mg/L	0.200	0.195	98	85-115	
Cadmium	mg/L	0.0500	0.0505	101	85-115	
Cobalt	mg/L	1.60	1.56	98	85-115	
Chromium	mg/L	0.0500	0.0494	99	85-115	
Molybdenum	mg/L	1.60	1.64	103	85-115	
Lead	mg/L	0.100	0.0985	99	85-115	
Antimony	mg/L	0.100	0.0974	97	85-115	
Selenium	mg/L	0.100	0.0924	92	85-115	
Thallium	mg/L	0.100	0.0974	97	85-115	

MATRIX SPIKE: T131230-MS1 Original: **23A0179-03**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00553	0.100	0.108	103	70-130	
Barium	mg/L	0.0502	1.60	1.73	105	70-130	
Beryllium	mg/L	0	0.200	0.198	99	70-130	
Cadmium	mg/L	0	0.0500	0.0476	95	70-130	
Cobalt	mg/L	0.000693	1.60	1.72	108	70-130	
Chromium	mg/L	0	0.0500	0.0618	124	70-130	

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MATRIX SPIKE: T131230-MS1 Original: **23A0179-03**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Molybdenum	mg/L	0.0114	1.60	1.77	110	70-130	
Lead	mg/L	0	0.100	0.0861	86	70-130	
Antimony	mg/L	0	0.100	0.0958	96	70-130	
Selenium	mg/L	0	0.100	0.0920	92	70-130	
Thallium	mg/L	0	0.100	0.0884	88	70-130	

MATRIX SPIKE: T131230-MS2 Original: **23A0179-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00191	0.100	0.0996	98	70-130	
Barium	mg/L	0.0168	1.60	1.64	102	70-130	
Beryllium	mg/L	0	0.200	0.191	95	70-130	
Cadmium	mg/L	0.000782	0.0500	0.0505	99	70-130	
Cobalt	mg/L	0	1.60	1.61	100	70-130	
Chromium	mg/L	0	0.0500	0.0511	102	70-130	
Molybdenum	mg/L	0.00718	1.60	1.69	105	70-130	
Lead	mg/L	0	0.100	0.0971	97	70-130	
Antimony	mg/L	0.00110	0.100	0.0976	97	70-130	
Selenium	mg/L	0.00221	0.100	0.0942	92	70-130	
Thallium	mg/L	0	0.100	0.0976	98	70-130	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131427
QC Batch Method: EPA 200.2

Analysis Description: Molybdenum, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T131427-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.0022	0.0022	
Barium	mg/L	<0.050	0.050	
Beryllium	mg/L	<0.0040	0.0040	
Cadmium	mg/L	<0.0010	0.0010	
Cobalt	mg/L	<0.010	0.010	
Chromium	mg/L	<0.0050	0.0050	
Molybdenum	mg/L	<0.010	0.010	
Lead	mg/L	<0.0030	0.0030	
Antimony	mg/L	<0.0020	0.0020	
Selenium	mg/L	<0.0020	0.0020	

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METHOD BLANK: T131427-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Thallium	mg/L	<0.0020	0.0020	

LABORATORY CONTROL SAMPLE: T131427-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.0947	95	85-115	
Barium	mg/L	1.60	1.64	102	85-115	
Beryllium	mg/L	0.200	0.177	88	85-115	
Cadmium	mg/L	0.0500	0.0508	102	85-115	
Cobalt	mg/L	1.60	1.47	92	85-115	
Chromium	mg/L	0.0500	0.0449	90	85-115	
Molybdenum	mg/L	1.60	1.60	100	85-115	
Lead	mg/L	0.100	0.101	101	85-115	
Antimony	mg/L	0.100	0.0993	99	85-115	
Selenium	mg/L	0.100	0.0939	94	85-115	
Thallium	mg/L	0.100	0.100	100	85-115	

MATRIX SPIKE: T131427-MS1 Original: **23A0179-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00122	0.100	0.0975	96	70-130	
Barium	mg/L	0.0327	1.60	1.68	103	70-130	
Beryllium	mg/L	0	0.200	0.170	85	70-130	
Cadmium	mg/L	0	0.0500	0.0499	100	70-130	
Cobalt	mg/L	0	1.60	1.49	93	70-130	
Chromium	mg/L	0	0.0500	0.0477	95	70-130	
Molybdenum	mg/L	0.00595	1.60	1.68	105	70-130	
Lead	mg/L	0	0.100	0.0986	99	70-130	
Antimony	mg/L	0.000431	0.100	0.100	100	70-130	
Selenium	mg/L	0	0.100	0.0903	90	70-130	
Thallium	mg/L	0	0.100	0.0984	98	70-130	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131167
QC Batch Method: IC Prep W

Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

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METHOD BLANK: T131167-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T131167-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	5.26	105	90-110	
Fluoride	mg/L	1.00	0.974	97	90-110	
Sulfate as SO4	mg/L	5.00	5.42	108	90-110	

MATRIX SPIKE: T131167-MS1 Original: **23A0179-13**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	100	125	225	100	80-120	
Fluoride	mg/L	4.86	25.0	28.7	95	80-120	
Sulfate as SO4	mg/L	249	125	385	109	80-120	

MATRIX SPIKE: T131167-MS2 Original: **23A0179-16**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	26.6	25.0	52.4	103	80-120	
Fluoride	mg/L	0.198	5.00	5.23	101	80-120	
Sulfate as SO4	mg/L	1.89	25.0	28.2	105	80-120	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131168
QC Batch Method: IC Prep W
Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T131168-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T131168-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes

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LABORATORY CONTROL SAMPLE: T131168-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	5.26	105	90-110	
Fluoride	mg/L	1.00	0.974	97	90-110	
Sulfate as SO4	mg/L	5.00	5.42	108	90-110	

MATRIX SPIKE: T131168-MS1 Original: **23A0179-23**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	15.1	25.0	40.7	102	80-120	
Fluoride	mg/L	0.0698	5.00	4.91	97	80-120	
Sulfate as SO4	mg/L	30.2	25.0	57.2	108	80-120	

MATRIX SPIKE: T131168-MS2 Original: **23A0179-24**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	23.1	25.0	48.4	101	80-120	
Fluoride	mg/L	0.563	5.00	5.51	99	80-120	
Sulfate as SO4	mg/L	25.4	25.0	50.9	102	80-120	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131086
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T131086-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	93.8	94	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	90.8	91	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	93.8	94	88-112	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131187
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Total
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T131187-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes

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LABORATORY CONTROL SAMPLE: T131187-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	91.8	92	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	91.8	92	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	91.8	92	88-112	

LABORATORY CONTROL SAMPLE: T131187-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	90.7	91	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	90.7	91	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	90.7	91	88-112	

LABORATORY CONTROL SAMPLE: T131187-BS3

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	92.0	92	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	92.0	92	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	92.0	92	88-112	

LABORATORY CONTROL SAMPLE: T131187-BS4

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	90.6	91	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	90.6	91	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	90.6	91	88-112	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131107
QC Batch Method: SM 2540 C-15

Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T131107-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes

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METHOD BLANK: T131107-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T131107-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	569	114	80-120	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131189
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T131189-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T131189-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	496	99	80-120	

SAMPLE DUPLICATE: T131189-DUP1 Original: **23A0179-13**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	**mg/L**	**942**	**764**	**21**	**10**	**623**

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131087
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T131087-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T131087-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes

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LABORATORY CONTROL SAMPLE: T131087-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	92.2	92	85-115	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131142
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T131142-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T131142-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	86.9	87	85-115	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131154
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T131154-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T131154-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	86.0	86	85-115	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131186
QC Batch Method: *** DEFAULT PREP ***
Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

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SAMPLE DUPLICATE: T131186-DUP1 Original: **23A0179-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.02**	**7.04**	**0.3**	**20**	**pHa**

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131191
QC Batch Method: *** DEFAULT PREP ***
Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T131191-DUP1 Original: **23A0179-13**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.69**	**7.70**	**0.1**	**20**	**pHd**

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Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Page 1 of 2

Trace ID No. 23A0179

Report Results To:

Company Name: HDR Inc.
Report To: Molly Reeves
Mailing Address:
City, State, Zip Code:
Office Phone: Cell Phone: 734 263 7138
Email Address: Molly.Reeves@HDRinc.com

Bill To:

PO #:
Contact Name: Lara Zawaideh
Billing Address (if different): On File
City, State, Zip Code:
Phone Number: 734 332 6405
Billing Email Address: Lara.Zawaideh@HDRinc.com

Trace Use:

Logged By: NC
Checked By: SB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Tanner Buszka

Analysis Requested

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Total Metals	TSS, TDS, F, Cl, SO4, pH	Rad 226/228	~~Alkalinity~~ Alk	Remarks/Notes	Possible Health Hazards?
1	1/3/23	17:20	MW-30	N	GW	6	1		S												
2	1/3/23	17:40	MWT-30	N	GW	6	1		S												
3	1/3/23	15:30	MW-19	N	GW	6	1		S												
4	1/3/23	12:20	MW-12	N	GW	6	1		S												
5	1/3/23	18:10	MW-11	N	GW	6	1		S												
6	1/3/23	15:30	MW-06	N	GW	6	1		S												
7	1/3/23	15:35	MW-01R	N	GW	6	1		S												
8	1/4/23	9:30	MW-10	N	GW	6	1		S												
9	1/4/23	11:40	MW-02	N	GW	6	1		S												
10	1/4/23	13:30	MW-09	N	GW	6	1		S												

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	1/4/23	16:07	2) [signature]	[signature]	1/4/23	17:00
	3)				4)			

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TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

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Trace ID No. 23A0179

Report Results To:

Company Name: HDR inc
Report To: Molly Reeves
Mailing Address: On File
City, State, Zip Code:
Office Phone:
Cell Phone: 734 263 7138
Email Address: Molly.Reeves@HDRinc.com

Bill To:

PO #:
Contact Name: Lara Zawaideh
Billing Address (if different): On File
City, State, Zip Code:
Phone Number: 734 332 6405
Billing Email Address: Lara.Zawaideh@HDRinc.com

Trace Use:

Logged By: NC
Checked By: SB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Analysis Requested: Total Metals	TSS, TDS, F, Cl, SO4, pH	Ra 226/228	Alk	Remarks/Notes	Possible Health Hazards?
11	1/4/23	13:00	MW-04	N	GW	6	1			S						1	1	1	1		
12	1/4/23	15:10	MW-03	N	GW	6	1			S						1	1	1	1		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	1/4/23	16:07	2) [signature]	[signature]	1/4/23	17:00
	3)				4)			

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Phone 231.773.5998
Fax 888.979.4469
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Trace ID No. 23A0179

Report Results To:

Company Name:	HDR Inc
Report To:	Molly Reeves
Mailing Address:	On File
City, State, Zip Code:	
Office Phone:	Cell Phone: 734 263 7138
Email Address:	molly.Reeves@HDRinc.com

Bill To:

PO #:	
Contact Name:	Laura Zawaideh
Billing Address (if different):	On File
City, State, Zip Code:	
Phone Number:	734 332 6405
Billing Email Address:	Laura.Zawaideh@HDRinc.com

Trace Use:

Logged By: NG
Checked By: KB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Analysis Requested: Total Metals	TSS, TDS, Fl, Cl, SO4, pH	Rad 226/228	Alk	Remarks/Notes	Possible Health Hazards?
13	1/4/23	17:00	MW-31	N	GW	6	Y		S												
14	1/4/23	19:20	MW-32																		
15	1/5/23	16:20	MW-33																		
16	1/5/23	13:10	MW-34																		
17	1/5/23	9:00	MW-18																		
18	1/5/23	14:00	SG-05																		
19	1/5/23	14:25	SG-04R																		
20	1/5/23	14:50	SG-03																		
21	1/5/23	15:20	SG-02																		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	1/5/23	18:45	2) [signature]	[signature]	1/6/23	8:00
	3)				4)			

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CHAIN-OF-CUSTODY RECORD

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Phone 231.773.5998
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Trace ID No. 23A0179

Report Results To:

Company Name:	HDR Inc
Report To:	Molly Reeves
Mailing Address:	On File
City, State, Zip Code:	
Office Phone:	Cell Phone: 734 263 7138
Email Address:	Molly.Reeves@HDRinc.com

Bill To:

PO #:	
Contact Name:	Lara Zawaideh
Billing Address (if different):	On File
City, State, Zip Code:	
Phone Number:	734 332 6405
Billing Email Address:	Lara.Zawaideh

Trace Use:

Logged By:	NC
Checked By:	KB
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- ☑ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print): Tanten Beseka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Analysis Requested: Total Metals	TSS, TDS, Fl, Cl, SO4, PO4	Raw 200/228	Alk								Remarks/Notes	Possible Health Hazards?
22	1/4/23	17:20	MW-20	N	GW	6	1		3																			
23	1/4/23	19:20	MW-07																									
24	1/5/23	10:00	MW-08																									
25	1/5/23	12:10	MW-27																									
26	1/5/23	12:10	MWT-27																									

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	1/5/23	18:45	2) [signature]	[signature]	1/6/23	8:00
	3)				4)			

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Sample Log In Checklist

23A0179
HDR Michigan Inc.
Project Manager: Jon Mink

	Original Observation	Corrected Temperature	IR-9 (CF: +0.1°C)	IR-10 (CF: 0.0°C)	IR-11 (CF: -0.7°C)	SR1 (CF: -0.2°C)	SR2 (CF: 0.0°C)	Temp Blank	Client Sample
Date: 1/5/23									
Time: 8:59									
Logged by: SB									
Package Description: Cooler									
Package Temp °C	1.6	1.6		✓					
Representative Sample Temp °C	3.4	3.2				✓		✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☑ ☐ ☐ Samples preserved at Trace ~~NaOH~~ SB 1/5/23 HNO3 added 1/5/23 @ 9:11
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes:

Form 70-A.45
Effective 1/2/23

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23A0179
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: +0.1°C)	IR-10 (CF: 0.0°C)	IR-11 (CF: -0.7°C)	SR1 (CF: -0.2°C)	SR2 (CF: 0.0°C)	Temp Blank	Client Sample
Date: 1/6/23									
Time: 9:31									
Logged by: KB									
Package Description: Cooler									
Package Temp °C	-0.9	-0.9		✓					
Representative Sample Temp °C	3.4	3.2				✓		✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☑ ☐ ☐ Samples preserved at Trace HNO3 added at 10:05 on 1/6/23
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes:

Form 70-A.45
Effective 1/2/23

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ANALYTICAL LABORATORIES, INC.

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888-979-4469 Fax
www.trace-labs.com

January 26, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

RE: Trace Project 23A0179
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAP Accreditation, Trace certifies that these test results meet all requirements of the NELAP Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAP at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23A0179-01	MW-30	Ground Water	TB	01/03/23 17:20	01/04/23 16:07
23A0179-02	MWT-30	Ground Water	TB	01/03/23 17:40	01/04/23 16:07
23A0179-03	MW-19	Ground Water	TB	01/03/23 15:30	01/04/23 16:07
23A0179-04	MW-12	Ground Water	TB	01/03/23 12:20	01/04/23 16:07
23A0179-05	MW-11	Ground Water	TB	01/03/23 18:10	01/04/23 16:07
23A0179-06	MW-06	Ground Water	TB	01/03/23 13:30	01/04/23 16:07
23A0179-07	MW-01R	Ground Water	TB	01/03/23 15:25	01/04/23 16:07
23A0179-08	MW-10	Ground Water	TB	01/04/23 09:30	01/04/23 16:07
23A0179-09	MW-02	Ground Water	TB	01/04/23 11:40	01/04/23 16:07
23A0179-10	MW-09	Ground Water	TB	01/04/23 13:30	01/04/23 16:07
23A0179-11	MW-04	Ground Water	TB	01/04/23 13:00	01/04/23 16:07
23A0179-12	MW-03	Ground Water	TB	01/04/23 15:10	01/04/23 16:07
23A0179-13	MW-31	Ground Water	TB	01/04/23 17:00	01/05/23 18:45
23A0179-14	MW-32	Ground Water	TB	01/04/23 19:20	01/05/23 18:45
23A0179-15	MW-33	Ground Water	TB	01/05/23 16:20	01/05/23 18:45
23A0179-16	MW-34	Ground Water	TB	01/05/23 13:10	01/05/23 18:45
23A0179-17	MW-18	Ground Water	TB	01/05/23 09:00	01/05/23 18:45
23A0179-18	SG-05	Ground Water	TB	01/05/23 14:00	01/05/23 18:45
23A0179-19	SG-04R	Ground Water	TB	01/05/23 14:25	01/05/23 18:45
23A0179-20	SG-03	Ground Water	TB	01/05/23 14:50	01/05/23 18:45
23A0179-21	SG-02	Ground Water	TB	01/05/23 15:20	01/05/23 18:45
23A0179-22	MW-20	Ground Water	TB	01/04/23 17:20	01/05/23 18:45
23A0179-23	MW-07	Ground Water	TB	01/04/23 19:20	01/05/23 18:45
23A0179-24	MW-08	Ground Water	TB	01/05/23 10:00	01/05/23 18:45
23A0179-25	MW-27	Ground Water	TB	01/05/23 12:10	01/05/23 18:45
23A0179-26	MWT-27	Ground Water	TB	01/05/23 12:10	01/05/23 18:45

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the laboratory is not accredited by NELAP for this compound
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: T131230-MS1

Analysis: EPA 200.8 Rev. 5.4

Vanadium	Note 242 : The MS was out of control high. Because there was no positive result in the non-spiked version of the sample, no data require qualification.

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-01 Matrix: Ground Water Date Collected: 01/03/23 17:20
Sample ID: MW-30 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**3.6**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.00037**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0045**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		

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www.trace-labs.com

ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-02 Matrix: Ground Water Date Collected: 01/03/23 17:40
Sample ID: MWT-30 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**3.8**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	**0.0044**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-03 Matrix: Ground Water Date Collected: 01/03/23 15:30
Sample ID: MW-19 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**18**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	**0.0028**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-04 Matrix: Ground Water Date Collected: 01/03/23 12:20
Sample ID: MW-12 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	<0.050	mg/L	0.050	1	01/12/23	bjv	01/18/23	jma		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.00092**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0023**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0080**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-05 Matrix: Ground Water Date Collected: 01/03/23 18:10
Sample ID: MW-11 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T131230									
Iron	**10 mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T131230									
Copper	**0.019 mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0094 mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	**0.00014 mg/L**	**0.000050**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Vanadium	<0.0012 mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.10 mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-06 Matrix: Ground Water Date Collected: 01/03/23 13:30
Sample ID: MW-06 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**17**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0019**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-07 Matrix: Ground Water Date Collected: 01/03/23 15:25
Sample ID: MW-01R Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**1.1**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	**0.0025**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0012**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-08 Matrix: Ground Water Date Collected: 01/04/23 09:30
Sample ID: MW-10 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**3.7**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0012**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-09 Matrix: Ground Water Date Collected: 01/04/23 11:40
Sample ID: MW-02 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**22**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.0018**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.023**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	**0.0036**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Zinc	**0.0030**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-10 Matrix: Ground Water Date Collected: 01/04/23 13:30
Sample ID: MW-09 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**19**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	**0.0020**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0015**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-11 Matrix: Ground Water Date Collected: 01/04/23 13:00
Sample ID: MW-04 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**6.3**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	**0.0019**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-12 Matrix: Ground Water Date Collected: 01/04/23 15:10
Sample ID: MW-03 Date Received: 01/04/23 16:07

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**5.9**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	**0.015**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-13 Matrix: Ground Water Date Collected: 01/04/23 17:00
Sample ID: MW-31 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**1.4**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-14 Matrix: Ground Water Date Collected: 01/04/23 19:20
Sample ID: MW-32 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**18**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	<0.00025	mg/L	0.00025	1	01/12/23	bjv	01/17/23	acs		
Nickel	**0.0016**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0022**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-15 Matrix: Ground Water Date Collected: 01/05/23 16:20
Sample ID: MW-33 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**2.5**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.016**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.016**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0036**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-16 Matrix: Ground Water Date Collected: 01/05/23 13:10
Sample ID: MW-34 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**70**	**mg/L**	**0.50**	**10**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.00075**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0013**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0019**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-17 Matrix: Ground Water Date Collected: 01/05/23 09:00
Sample ID: MW-18 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**8.6**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.00043**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.011**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.088**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-18 Matrix: Ground Water Date Collected: 01/05/23 14:00
Sample ID: SG-05 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**1.5**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.00036**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-19 Matrix: Ground Water Date Collected: 01/05/23 14:25
Sample ID: SG-04R Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**0.11**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.00048**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0028**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0023**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-20 Matrix: Ground Water Date Collected: 01/05/23 14:50
Sample ID: SG-03 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131230										
Iron	**0.15**	**mg/L**	**0.050**	**1**	**01/12/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131230										
Copper	**0.00067**	**mg/L**	**0.00025**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0017**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/12/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/12/23	bjv	01/17/23	acs		
Zinc	**0.0037**	**mg/L**	**0.0012**	**1**	**01/12/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-21 Matrix: Ground Water Date Collected: 01/05/23 15:20
Sample ID: SG-02 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Iron	**0.15**	**mg/L**	**0.050**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Copper	**0.00085**	**mg/L**	**0.00025**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Nickel	**0.0020**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/13/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Zinc	**0.0031**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-22 Matrix: Ground Water Date Collected: 01/04/23 17:20
Sample ID: MW-20 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Iron	**19**	**mg/L**	**0.050**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Copper	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Nickel	**0.0091**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/13/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Zinc	**0.024**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-23 Matrix: Ground Water Date Collected: 01/04/23 19:20
Sample ID: MW-07 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Iron	**13**	**mg/L**	**0.050**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Copper	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Silver	<0.000050	mg/L	0.000050	1	01/13/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-24 Matrix: Ground Water Date Collected: 01/05/23 10:00
Sample ID: MW-08 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Iron	**30**	**mg/L**	**0.50**	**10**	**01/13/23**	**bjv**	**01/18/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Copper	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Nickel	**0.0013**	**mg/L**	**0.0012**	**1**	**01/13/23**	**bjv**	**01/17/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	01/13/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-25 Matrix: Ground Water Date Collected: 01/05/23 12:10
Sample ID: MW-27 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Iron	**11**	**mg/L**	**0.050**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Copper	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Silver	<0.000050	mg/L	0.000050	1	01/13/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23A0179-26 Matrix: Ground Water Date Collected: 01/05/23 12:10
Sample ID: MWT-27 Date Received: 01/05/23 18:45

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T131427										
Iron	**11**	**mg/L**	**0.050**	**1**	**01/13/23**	**bjv**	**01/18/23**	**acs**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T131427										
Copper	<0.00025	mg/L	0.00025	1	01/13/23	bjv	01/17/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Silver	<0.000050	mg/L	0.000050	1	01/13/23	bjv	01/17/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	01/13/23	bjv	01/17/23	acs		

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QUALITY CONTROL RESULTS

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131230
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T131230-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.20	0.20	

LABORATORY CONTROL SAMPLE: T131230-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	16.6	103	85-115	

MATRIX SPIKE: T131230-MS1 Original: **23A0179-03**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	17.8	16.0	33.9	101	70-130	

MATRIX SPIKE: T131230-MS2 Original: **23A0179-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	0	16.0	16.5	103	70-130	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131427
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T131427-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.050	0.050	

LABORATORY CONTROL SAMPLE: T131427-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	15.7	98	85-115	

MATRIX SPIKE: T131427-MS1 Original: **23A0179-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes

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MATRIX SPIKE: T131427-MS1 Original: **23A0179-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	0.150	16.0	16.0	99	70-130	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131230
QC Batch Method: EPA 200.2
Analysis Description: Nickel, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T131230-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.00020	0.00020	
Copper	mg/L	<0.0010	0.0010	
Nickel	mg/L	<0.0050	0.0050	
Vanadium	mg/L	<0.010	0.010	
Zinc	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T131230-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0492	98	85-115	
Copper	mg/L	1.60	1.53	96	85-115	
Nickel	mg/L	1.60	1.62	101	85-115	
Vanadium	mg/L	1.60	1.66	104	85-115	
Zinc	mg/L	1.60	1.59	99	85-115	

MATRIX SPIKE: T131230-MS1 Original: **23A0179-03**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0453	91	70-130	
Copper	mg/L	0	1.60	1.51	94	70-130	
Nickel	mg/L	0.00277	1.60	1.68	105	70-130	
Vanadium	**mg/L**	**0**	**1.60**	2.14	**134**	**70-130**	**242**
Zinc	mg/L	0	1.60	1.45	91	70-130	

MATRIX SPIKE: T131230-MS2 Original: **23A0179-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0483	97	70-130	
Copper	mg/L	0.000920	1.60	1.53	96	70-130	
Nickel	mg/L	0	1.60	1.61	101	70-130	

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MATRIX SPIKE: T131230-MS2 Original: **23A0179-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Vanadium	mg/L	0	1.60	1.72	107	70-130	
Zinc	mg/L	0.00798	1.60	1.58	98	70-130	

Trace Project ID: 23A0179
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T131427
QC Batch Method: EPA 200.2
Analysis Description: Copper, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T131427-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.00020	0.00020	
Copper	mg/L	<0.0010	0.0010	
Nickel	mg/L	<0.0050	0.0050	
Vanadium	mg/L	<0.010	0.010	
Zinc	mg/L	<0.010	0.010	

LABORATORY CONTROL SAMPLE: T131427-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0477	95	85-115	
Copper	mg/L	1.60	1.41	88	85-115	
Nickel	mg/L	1.60	1.50	94	85-115	
Vanadium	mg/L	1.60	1.51	94	85-115	
Zinc	mg/L	1.60	1.51	95	85-115	

MATRIX SPIKE: T131427-MS1 Original: **23A0179-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0462	92	70-130	
Copper	mg/L	0.000854	1.60	1.38	86	70-130	
Nickel	mg/L	0	1.60	1.48	93	70-130	
Vanadium	mg/L	0	1.60	1.63	102	70-130	
Zinc	mg/L	0	1.60	1.46	92	70-130	

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CHAIN-OF-CUSTODY RECORD

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Page 1 of 2

Trace ID No. 23A0179

Report Results To:

Company Name: HDR Inc.
Report To: Molly Reeves
Mailing Address:
City, State, Zip Code:
Office Phone: Cell Phone: 734 263 7138
Email Address: Molly.Reeves@HDRinc.com

Bill To:

PO #:
Contact Name: Lara Zawaideh
Billing Address (if different): On File
City, State, Zip Code:
Phone Number: 734 332 6405
Billing Email Address: Lara.Zawaideh@HDRinc.com

Trace Use:

Logged By: NC
Checked By: SB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Tarren Buszka

Analysis Requested

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above ↑	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Total Metals	TSS, TDS, F, Cl, SO4, pH	Rad 226/228	~~Acidity~~ Alk	Remarks/Notes	Possible Health Hazards?
1	1/3/23	17:20	MW-30	N	GW	6	1			S											
2	1/3/23	17:40	MWT-30	N	GW	6	1			S											
3	1/3/23	15:30	MW-19	N	GW	6	1			S											
4	1/3/23	12:20	MW-12	N	GW	6	1			S											
5	1/3/23	18:10	MW-11	N	GW	6	1			S											
6	1/3/23	15:30	MW-06	N	GW	6	1			S											
7	1/3/23	15:35	MW-01R	N	GW	6	1			S											
8	1/4/23	9:30	MW-10	N	GW	6	1			S											
9	1/4/23	11:40	MW-02	N	GW	6	1			S											
10	1/4/23	13:30	MW-09	N	GW	6	1			S											

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	1/4/23	16:07	2) [signature]	[signature]	1/4/23	17:00
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

- [ ] Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

Form 70-Z.2

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Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Page 2 of 2

Trace ID No. 23A0179

Report Results To:

Company Name: HDR inc
Report To: Molly Reeves
Mailing Address: On File
City, State, Zip Code:
Office Phone:
Cell Phone: 734 263 7138
Email Address: Molly.Reeves@HDRinc.com

Bill To:

PO #:
Contact Name: Lara Zawaideh
Billing Address (if different): On File
City, State, Zip Code:
Phone Number: 734 332 6405
Billing Email Address: Lara.Zawaideh@HDRinc.com

Trace Use:

Logged By: NC
Checked By: SB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Analysis Requested: Total Metals	TSS, TDS, F, Cl, SO4, pH	Ra 226/228	AIL								Remarks/Notes	Possible Health Hazards?
11	1/4/23	13:00	MW-04	N	GW	6	1			S						1	1	1	1									
12	1/4/23	15:10	MW-03	N	GW	6	1			S						1	1	1	1									

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	1/4/23	16:07	2) [signature]	[signature]	1/4/23	17:00
	3)				4)			

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CHAIN-OF-CUSTODY RECORD

Page 1 of 2

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2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23A0179

Report Results To:

Company Name:	HDR Inc
Report To:	Molly Reeves
Mailing Address:	On File
City, State, Zip Code:	
Office Phone:	Cell Phone: 734 263 7138
Email Address:	molly.Reeves@HDRinc.com

Bill To:

PO #:	
Contact Name:	Laura Zawaideh
Billing Address (if different):	On File
City, State, Zip Code:	
Phone Number:	734 332 6405
Billing Email Address:	Laura.Zawaideh@HDRinc.com

Trace Use:

Logged By:	NG
Checked By:	KB
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Analysis Requested: Total Metals	TSS, TDS, Fl, Cl, SO4, pH	Rad 226/228	Alk								Remarks/Notes	Possible Health Hazards?
13	1/4/23	17:00	MW-31	N	GW	6	Y		S																			
14	1/4/23	19:20	MW-32																									
15	1/5/23	16:20	MW-33																									
16	1/5/23	13:10	MW-34																									
17	1/5/23	9:00	MW-18																									
18	1/5/23	14:00	SG-05																									
19	1/5/23	14:25	SG-04R																									
20	1/5/23	14:50	SG-03																									
21	1/5/23	15:20	SG-02																									

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
1) [signature]	[signature]	1/5/23	18:45	2) [signature]	[signature]	1/6/23	8:00
3)				4)			

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CHAIN-OF-CUSTODY RECORD

Page 2 of 2

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23A0179

Report Results To:

Company Name:	HDR Inc
Report To:	Molly Reeves
Mailing Address:	On File
City, State, Zip Code:	
Office Phone:	Cell Phone: 734 263 7138
Email Address:	Molly.Reeves@HDRinc.com

Bill To:

PO #:	
Contact Name:	Lara Zawaideh
Billing Address (if different):	On File
City, State, Zip Code:	
Phone Number:	734 332 6405
Billing Email Address:	Lara.Zawaideh

Trace Use:

Logged By:	NC
Checked By:	KB
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- ☑ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print): Tanten Beseka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	Analysis Requested: Total Metals	TSS, TDS, Fl, Cl, SO4, PO4	Raw 200/228	Alk								Remarks/Notes	Possible Health Hazards?
22	1/4/23	17:20	MW-20	N	GW	6	1		3																			
23	1/4/23	19:20	MW-07																									
24	1/5/23	10:00	MW-08																									
25	1/5/23	12:10	MW-27																									
26	1/5/23	12:10	MWT-27																									

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	1/5/23	18:45	2) [signature]	[signature]	1/6/23	8:00
	3)				4)			

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TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23A0179
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: +0.1°C)	IR-10 (CF: 0.0°C)	IR-11 (CF: -0.7°C)	SR1 (CF: -0.2°C)	SR2 (CF: 0.0°C)	Temp Blank	Client Sample
Date: 1/5/23									
Time: 8:59									
Logged by: SB									
Package Description: Cooler									
Package Temp °C	1.6	1.6		✓					
Representative Sample Temp °C	3.4	3.2				✓		✓	

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [x] Trace Courier [ ] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace ~~NaOH~~ SB 1/5/23 HNO3 added 1/5/23 @ 9:11
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC291593) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

Form 70-A.45
Effective 1/2/23

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Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23A0179
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: +0.1°C)	IR-10 (CF: 0.0°C)	IR-11 (CF: -0.7°C)	SR1 (CF: -0.2°C)	SR2 (CF: 0.0°C)	Temp Blank	Client Sample
Date: 1/6/23									
Time: 9:31									
Logged by: KB									
Package Description: Cooler									
Package Temp °C	-0.9	-0.9		✓					
Representative Sample Temp °C	3.4	3.2				✓		✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☑ ☐ ☐ Samples preserved at Trace HNO3 added at 10:05 on 1/6/23
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes:

Form 70-A.45
Effective 1/2/23

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eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Jon Mink
Trace Analytical Laboratories
2241 Black Creek Road
Muskegon, Michigan 49444

Generated 3/7/2023 11:48:34 AM

JOB DESCRIPTION

23A0180

JOB NUMBER

810-49458-1

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend IN 46617

See page two for job notes and contact information.

my EOL

Eurofins Eaton Analytical South Bend

Job Notes

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Eaton Analytical, LLC Project Manager.

Authorization

Generated
3/7/2023 11:48:34 AM

Authorized for release by
Karen Fullmer, Project Manager
Karen.Fullmer@et.eurofinsus.com
(574)233-4777

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Definitions/Glossary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Qualifiers

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 810-49458-1

Laboratory: Eurofins Eaton Analytical South Bend

Narrative

Job Narrative
810-49458-1

Comments
No additional comments.

Receipt
The samples were received on 1/6/2023 8:45 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice.

Receipt Exceptions

The reference method requires samples to be preserved to a pH of <2 SU. The following samples were received with insufficient preservation at a pH of >2 SU: MW-30 (810-49458-1), MWT-30 (810-49458-2), MW-19 (810-49458-3), MW-12 (810-49458-4), MW-11 (810-49458-5), MW-06 (810-49458-6), MW-01R (810-49458-7), MW-10 (810-49458-8), MW-02 (810-49458-9), MW-09 (810-49458-10), MW-04 (810-49458-11), MW-03 (810-49458-12), MW-31 (810-49458-13), MW-32 (810-49458-14), MW-33 (810-49458-15), MW-34 (810-49458-16), MW-18 (810-49458-17), SG-05 (810-49458-18), SG-04R (810-49458-19), SG-03 (810-49458-20), SG-02 (810-49458-21), MW-20 (810-49458-22), MW-07 (810-49458-23), MW-08 (810-49458-24), MW-27 (810-49458-25) and MWT-27 (810-49458-26). 810-49458-A-12, D-12, C-16, and D-16. The samples were preserved to the appropriate pH in the laboratory.

RAD
Method 903.0: Radium-226 batch 598532
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.
MW-30 (810-49458-1), MWT-30 (810-49458-2), MW-19 (810-49458-3), MW-12 (810-49458-4), MW-11 (810-49458-5), MW-06 (810-49458-6), MW-01R (810-49458-7), MW-10 (810-49458-8), MW-02 (810-49458-9), MW-09 (810-49458-10), MW-04 (810-49458-11), MW-03 (810-49458-12), MW-31 (810-49458-13), MW-32 (810-49458-14), MW-33 (810-49458-15), MW-34 (810-49458-16), MW-18 (810-49458-17), SG-05 (810-49458-18), SG-04R (810-49458-19), SG-03 (810-49458-20), (LCS 160-598532/2-A), (MB 160-598532/1-A) and (810-49458-B-19-A DU)

Method 903.0: Radium 226 batch 598538
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.
SG-02 (810-49458-21), MW-20 (810-49458-22), MW-07 (810-49458-23), MW-08 (810-49458-24), MW-27 (810-49458-25), MWT-27 (810-49458-26), (LCS 160-598538/2-A), (MB 160-598538/1-A) and (810-49458-B-22-A DU)

Method 904.0: Radium-228 batch 598535
The detection goal was not met for the following sample(s). Samples were prepped at a reduced volume due to the presence of matrix interferences: MW-02 (810-49458-9) and MW-03 (810-49458-12). Analytical results are reported with the detection limit achieved.

Method 904.0: Radium-228 batch 598535
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

MW-30 (810-49458-1), MWT-30 (810-49458-2), MW-19 (810-49458-3), MW-12 (810-49458-4), MW-11 (810-49458-5), MW-06 (810-49458-6), MW-01R (810-49458-7), MW-10 (810-49458-8), MW-02 (810-49458-9), MW-09 (810-49458-10), MW-04 (810-49458-11), MW-03 (810-49458-12), MW-31 (810-49458-13), MW-32 (810-49458-14), MW-33 (810-49458-15), MW-34 (810-49458-16), MW-18 (810-49458-17), SG-05 (810-49458-18), SG-04R (810-49458-19), SG-03 (810-49458-20), (LCS 160-598535/2-A), (MB 160-598535/1-A) and (810-49458-B-19-B DU)

Job ID: 810-49458-1 (Continued)

Laboratory: Eurofins Eaton Analytical South Bend (Continued)

Method 904.0: Radium-228 batch 598539
Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.
SG-02 (810-49458-21), MW-20 (810-49458-22), MW-07 (810-49458-23), MW-08 (810-49458-24), MW-27 (810-49458-25), MWT-27 (810-49458-26), (LCS 160-598539/2-A), (MB 160-598539/1-A) and (810-49458-B-22-B DU)

Method PrecSep_0:

Method PrecSep_0:

Method PrecSep-21:

Method PrecSep-21:

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-30

Date Collected: 01/03/23 17:20
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-1
Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.139**		0.0795	0.0805	1.00	0.109	pCi/L	01/27/23 10:29	02/20/23 15:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:40*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.307	U	0.280	0.281	1.00	0.443	pCi/L	01/27/23 10:52	02/02/23 12:05	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:05*	*1*
Y Carrier	*84.1*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:05*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.445**		0.291	0.292	5.00	0.443	pCi/L		02/21/23 15:39	1

Client Sample ID: MWT-30

Date Collected: 01/03/23 17:40
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-2
Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0668	U	0.0688	0.0690	1.00	0.109	pCi/L	01/27/23 10:29	02/20/23 15:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.3*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:40*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.168	U	0.312	0.312	1.00	0.541	pCi/L	01/27/23 10:52	02/02/23 12:08	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.3*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:08*	*1*
Y Carrier	*82.2*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:08*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.235	U	0.319	0.320	5.00	0.541	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-19

Date Collected: 01/03/23 15:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-3

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.222**		0.0816	0.0840	1.00	0.0776	pCi/L	01/27/23 10:29	02/20/23 15:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.7*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:42*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.404	U	0.325	0.327	1.00	0.503	pCi/L	01/27/23 10:52	02/02/23 12:08	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.7*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:08*	*1*
Y Carrier	*84.5*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:08*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.626**		0.335	0.338	5.00	0.503	pCi/L		02/21/23 15:39	1

Client Sample ID: MW-12

Date Collected: 01/03/23 12:20
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-4

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0319	U	0.0154	0.0156	1.00	0.0702	pCi/L	01/27/23 10:29	02/20/23 15:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.3*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:42*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.172	U	0.269	0.269	1.00	0.459	pCi/L	01/27/23 10:52	02/02/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.3*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*
Y Carrier	*84.5*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.172	U	0.269	0.269	5.00	0.459	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-11

Date Collected: 01/03/23 18:10
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-5

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.422		0.127	0.133	1.00	0.104	pCi/L	01/27/23 10:29	02/20/23 15:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.1*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:42*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.903		0.468	0.476	1.00	0.636	pCi/L	01/27/23 10:52	02/02/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.1*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*
Y Carrier	*81.9*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.32		0.485	0.494	5.00	0.636	pCi/L		02/21/23 15:39	1

Client Sample ID: MW-06

Date Collected: 01/03/23 13:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-6

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.238		0.104	0.106	1.00	0.115	pCi/L	01/27/23 10:29	02/20/23 15:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.7*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:42*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.399	U	0.394	0.396	1.00	0.631	pCi/L	01/27/23 10:52	02/02/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.7*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*
Y Carrier	*84.5*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.637		0.407	0.410	5.00	0.631	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-01R

Date Collected: 01/03/23 15:25
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-7

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0961	U	0.0832	0.0837	1.00	0.125	pCi/L	01/27/23 10:29	02/20/23 15:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:42*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.360	U	0.494	0.496	1.00	0.828	pCi/L	01/27/23 10:52	02/02/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*
Y Carrier	*86.0*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.456	U	0.501	0.503	5.00	0.828	pCi/L		02/21/23 15:39	1

Client Sample ID: MW-10

Date Collected: 01/04/23 09:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-8

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.00581	U	0.0552	0.0552	1.00	0.119	pCi/L	01/27/23 10:29	02/20/23 15:44	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.6*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:44*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.319	U	0.390	0.391	1.00	0.645	pCi/L	01/27/23 10:52	02/02/23 12:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.6*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:10*	*1*
Y Carrier	*86.4*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:10*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.319	U	0.394	0.395	5.00	0.645	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-02

Date Collected: 01/04/23 11:40
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-9

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.781**		0.326	0.333	1.00	0.306	pCi/L	01/27/23 10:29	02/20/23 15:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.6*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:45*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.58	U G	1.71	1.72	1.00	2.80	pCi/L	01/27/23 10:52	02/02/23 12:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.6*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:10*	*1*
Y Carrier	*84.5*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:10*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	2.36	U	1.74	1.75	5.00	2.80	pCi/L		02/21/23 15:39	1

Client Sample ID: MW-09

Date Collected: 01/04/23 13:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-10

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0598	U	0.0619	0.0621	1.00	0.0959	pCi/L	01/27/23 10:29	02/20/23 15:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.9*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:45*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.161	U	0.387	0.387	1.00	0.678	pCi/L	01/27/23 10:52	02/02/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.9*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*
Y Carrier	*86.0*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.221	U	0.392	0.392	5.00	0.678	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-04

Date Collected: 01/04/23 13:00
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-11

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.159		0.0886	0.0897	1.00	0.109	pCi/L	01/27/23 10:29	02/20/23 15:45	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	98.3		40 - 110	01/27/23 10:29	02/20/23 15:45	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.916		0.499	0.507	1.00	0.716	pCi/L	01/27/23 10:52	02/02/23 12:13	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	98.3		40 - 110	01/27/23 10:52	02/02/23 12:13	1
Y Carrier	81.1		40 - 110	01/27/23 10:52	02/02/23 12:13	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.08		0.507	0.515	5.00	0.716	pCi/L		02/21/23 15:39	1

Client Sample ID: MW-03

Date Collected: 01/04/23 15:10
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-12

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.526		0.217	0.222	1.00	0.242	pCi/L	01/27/23 10:29	02/20/23 15:45	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	70.3		40 - 110	01/27/23 10:29	02/20/23 15:45	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.766	U G	0.811	0.814	1.00	1.32	pCi/L	01/27/23 10:52	02/02/23 12:13	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	70.3		40 - 110	01/27/23 10:52	02/02/23 12:13	1
Y Carrier	85.2		40 - 110	01/27/23 10:52	02/02/23 12:13	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.29	U	0.840	0.844	5.00	1.32	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-31

Date Collected: 01/04/23 17:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-13

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.203**		0.0878	0.0897	1.00	0.0895	pCi/L	01/27/23 10:29	02/20/23 15:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.3*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:45*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.302	U	0.386	0.387	1.00	0.641	pCi/L	01/27/23 10:52	02/02/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.3*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*
Y Carrier	*84.5*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.505	U	0.396	0.397	5.00	0.641	pCi/L		02/21/23 15:39	1

Client Sample ID: MW-32

Date Collected: 01/04/23 19:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-14

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.219**		0.0799	0.0823	1.00	0.0696	pCi/L	01/27/23 10:29	02/20/23 15:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.4*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:45*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.142	U	0.287	0.287	1.00	0.497	pCi/L	01/27/23 10:52	02/02/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.4*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*
Y Carrier	*87.9*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.361	U	0.298	0.299	5.00	0.497	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-33

Date Collected: 01/05/23 16:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-15

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0182	U	0.0637	0.0637	1.00	0.140	pCi/L	01/27/23 10:29	02/20/23 15:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.1*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:37*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0625	U	0.313	0.313	1.00	0.587	pCi/L	01/27/23 10:52	02/02/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.1*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*
Y Carrier	*82.2*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0625	U	0.319	0.319	5.00	0.587	pCi/L		02/21/23 15:39	1

Client Sample ID: MW-34

Date Collected: 01/05/23 13:10
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-16

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.534**		0.186	0.192	1.00	0.187	pCi/L	01/27/23 10:29	02/20/23 15:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.6*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.619	U	0.544	0.547	1.00	0.849	pCi/L	01/27/23 10:52	02/02/23 12:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.6*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*
Y Carrier	*90.5*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.15**		0.575	0.580	5.00	0.849	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-18

Date Collected: 01/05/23 09:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-17

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0460	U	0.0590	0.0591	1.00	0.0981	pCi/L	01/27/23 10:29	02/20/23 15:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.9*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0486	U	0.261	0.261	1.00	0.478	pCi/L	01/27/23 10:52	02/02/23 12:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.9*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*
Y Carrier	*87.9*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0946	U	0.268	0.268	5.00	0.478	pCi/L		02/21/23 15:39	1

Client Sample ID: SG-05

Date Collected: 01/05/23 14:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-18

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0960	U	0.0800	0.0805	1.00	0.122	pCi/L	01/27/23 10:29	02/20/23 15:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:52*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.103	U	0.277	0.277	1.00	0.537	pCi/L	01/27/23 10:52	02/02/23 12:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*
Y Carrier	*96.4*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0960	U	0.288	0.288	5.00	0.537	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: SG-04R

Date Collected: 01/05/23 14:25
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-19

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0711	U	0.0692	0.0695	1.00	0.109	pCi/L	01/27/23 10:29	02/20/23 15:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.3*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.315	U	0.309	0.311	1.00	0.497	pCi/L	01/27/23 10:52	02/02/23 12:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.3*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*
Y Carrier	*87.9*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:14*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.386	U	0.317	0.319	5.00	0.497	pCi/L		02/21/23 15:39	1

Client Sample ID: SG-03

Date Collected: 01/05/23 14:50
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-20

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.129**		0.0723	0.0733	1.00	0.0907	pCi/L	01/27/23 10:29	02/20/23 15:35	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:35*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.128	U	0.289	0.289	1.00	0.506	pCi/L	01/27/23 10:52	02/02/23 12:15	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:15*	*1*
Y Carrier	*92.0*		*40 - 110*	*01/27/23 10:52*	*02/02/23 12:15*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.257	U	0.298	0.298	5.00	0.506	pCi/L		02/21/23 15:39	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: SG-02

Date Collected: 01/05/23 15:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-21

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0853	U	0.0774	0.0778	1.00	0.121	pCi/L	01/27/23 11:15	02/20/23 18:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.3*		*40 - 110*	*01/27/23 11:15*	*02/20/23 18:10*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.627**		0.366	0.370	1.00	0.530	pCi/L	01/27/23 11:24	02/02/23 11:57	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.3*		*40 - 110*	*01/27/23 11:24*	*02/02/23 11:57*	*1*
Y Carrier	*79.3*		*40 - 110*	*01/27/23 11:24*	*02/02/23 11:57*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.712**		0.374	0.378	5.00	0.530	pCi/L		02/21/23 15:48	1

Client Sample ID: MW-20

Date Collected: 01/04/23 17:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-22

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.198**		0.0785	0.0805	1.00	0.0826	pCi/L	01/27/23 11:15	02/20/23 18:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*01/27/23 11:15*	*02/20/23 18:10*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.624**		0.361	0.365	1.00	0.521	pCi/L	01/27/23 11:24	02/02/23 11:57	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*01/27/23 11:24*	*02/02/23 11:57*	*1*
Y Carrier	*77.0*		*40 - 110*	*01/27/23 11:24*	*02/02/23 11:57*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.822**		0.369	0.374	5.00	0.521	pCi/L		02/21/23 15:48	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-07

Date Collected: 01/04/23 19:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-23

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.530		0.137	0.145	1.00	0.117	pCi/L	01/27/23 11:15	02/20/23 18:10	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110	01/27/23 11:15	02/20/23 18:10	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.729		0.406	0.412	1.00	0.562	pCi/L	01/27/23 11:24	02/02/23 11:58	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110	01/27/23 11:24	02/02/23 11:58	1
Y Carrier	81.1		40 - 110	01/27/23 11:24	02/02/23 11:58	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.26		0.428	0.437	5.00	0.562	pCi/L		02/21/23 15:48	1

Client Sample ID: MW-08

Date Collected: 01/05/23 10:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-24

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.310		0.113	0.116	1.00	0.113	pCi/L	01/27/23 11:15	02/20/23 19:40	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110	01/27/23 11:15	02/20/23 19:40	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.31		0.484	0.499	1.00	0.590	pCi/L	01/27/23 11:24	02/02/23 11:58	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110	01/27/23 11:24	02/02/23 11:58	1
Y Carrier	83.4		40 - 110	01/27/23 11:24	02/02/23 11:58	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.62		0.497	0.512	5.00	0.590	pCi/L		02/21/23 15:48	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-27

Lab Sample ID: 810-49458-25
Matrix: Ground Water

Date Collected: 01/05/23 12:10
Date Received: 01/09/23 08:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.230		0.109	0.111	1.00	0.131	pCi/L	01/27/23 11:15	02/20/23 19:40	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.6		40 - 110	01/27/23 11:15	02/20/23 19:40	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.230	U	0.374	0.374	1.00	0.639	pCi/L	01/27/23 11:24	02/02/23 11:58	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.6		40 - 110	01/27/23 11:24	02/02/23 11:58	1
Y Carrier	84.5		40 - 110	01/27/23 11:24	02/02/23 11:58	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.460	U	0.390	0.390	5.00	0.639	pCi/L		02/21/23 15:48	1

Client Sample ID: MWT-27

Lab Sample ID: 810-49458-26
Matrix: Ground Water

Date Collected: 01/05/23 12:10
Date Received: 01/09/23 08:30

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.180		0.116	0.117	1.00	0.165	pCi/L	01/27/23 11:15	02/20/23 19:40	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	96.0		40 - 110	01/27/23 11:15	02/20/23 19:40	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.811		0.435	0.442	1.00	0.608	pCi/L	01/27/23 11:24	02/02/23 11:58	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	96.0		40 - 110	01/27/23 11:24	02/02/23 11:58	1
Y Carrier	87.1		40 - 110	01/27/23 11:24	02/02/23 11:58	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.991		0.450	0.457	5.00	0.608	pCi/L		02/21/23 15:48	1

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	**Client Sample ID**	**Ba (40-110)**							
LCS 160-598532/2-A	Lab Control Sample	96.6							
LCS 160-598538/2-A	Lab Control Sample	102							
MB 160-598532/1-A	Method Blank	101							
MB 160-598538/1-A	Method Blank	102							

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 903.0 - Radium-226 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	**Client Sample ID**	**Ba (40-110)**							
810-49458-1	MW-30	101							
810-49458-2	MWT-30	84.3							
810-49458-3	MW-19	95.7							
810-49458-4	MW-12	94.3							
810-49458-5	MW-11	93.1							
810-49458-6	MW-06	95.7							
810-49458-7	MW-01R	89.7							
810-49458-8	MW-10	92.6							
810-49458-9	MW-02	84.6							
810-49458-10	MW-09	96.9							
810-49458-11	MW-04	98.3							
810-49458-12	MW-03	70.3							
810-49458-13	MW-31	76.3							
810-49458-14	MW-32	97.4							
810-49458-15	MW-33	87.1							
810-49458-16	MW-34	94.6							
810-49458-17	MW-18	94.9							
810-49458-18	SG-05	89.4							
810-49458-19	SG-04R	96.3							
810-49458-19 DU	SG-04R	95.1							
810-49458-20	SG-03	91.4							
810-49458-21	SG-02	96.3							
810-49458-22	MW-20	101							
810-49458-22 DU	MW-20	101							
810-49458-23	MW-07	101							
810-49458-24	MW-08	101							
810-49458-25	MW-27	94.6							
810-49458-26	MWT-27	96.0							

Tracer/Carrier Legend

Ba = Ba Carrier

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Method: 904.0 - Radium-228 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
LCS 160-598535/2-A	Lab Control Sample	96.6	86.4
LCS 160-598539/2-A	Lab Control Sample	102	83.4
MB 160-598535/1-A	Method Blank	101	84.5
MB 160-598539/1-A	Method Blank	102	84.9

Percent Yield (Acceptance Limits)

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
810-49458-1	MW-30	101	84.1
810-49458-2	MWT-30	84.3	82.2
810-49458-3	MW-19	95.7	84.5
810-49458-4	MW-12	94.3	84.5
810-49458-5	MW-11	93.1	81.9
810-49458-6	MW-06	95.7	84.5
810-49458-7	MW-01R	89.7	86.0
810-49458-8	MW-10	92.6	86.4
810-49458-9	MW-02	84.6	84.5
810-49458-10	MW-09	96.9	86.0
810-49458-11	MW-04	98.3	81.1
810-49458-12	MW-03	70.3	85.2
810-49458-13	MW-31	76.3	84.5
810-49458-14	MW-32	97.4	87.9
810-49458-15	MW-33	87.1	82.2
810-49458-16	MW-34	94.6	90.5
810-49458-17	MW-18	94.9	87.9
810-49458-18	SG-05	89.4	96.4
810-49458-19	SG-04R	96.3	87.9
810-49458-19 DU	SG-04R	95.1	90.1
810-49458-20	SG-03	91.4	92.0
810-49458-21	SG-02	96.3	79.3
810-49458-22	MW-20	101	77.0
810-49458-22 DU	MW-20	101	75.1
810-49458-23	MW-07	101	81.1
810-49458-24	MW-08	101	83.4
810-49458-25	MW-27	94.6	84.5
810-49458-26	MWT-27	96.0	87.1

Percent Yield (Acceptance Limits)

Tracer/Carrier Legend

Ba = Ba Carrier
Y = Y Carrier

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-598532/1-A
Matrix: Drinking Water
Analysis Batch: 601020

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 598532

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.004686	U	0.0327	0.0327	1.00	0.0740	pCi/L	01/27/23 10:29	02/20/23 15:40	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*101*		*40 - 110*	*01/27/23 10:29*	*02/20/23 15:40*	*1*

Lab Sample ID: LCS 160-598532/2-A
Matrix: Drinking Water
Analysis Batch: 601020

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 598532

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	11.21		1.14	1.00	0.0693	pCi/L	99	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*96.6*		*40 - 110*

Lab Sample ID: 810-49458-19 DU
Matrix: Ground Water
Analysis Batch: 601021

Client Sample ID: SG-04R
Prep Type: Total/NA
Prep Batch: 598532

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.0711	U		0.03640	U	0.0502	1.00	0.0845	pCi/L			0.29	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*95.1*		*40 - 110*

Lab Sample ID: MB 160-598538/1-A
Matrix: Drinking Water
Analysis Batch: 601026

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 598538

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.02755	U	0.0480	0.0481	1.00	0.0844	pCi/L	01/27/23 11:15	02/20/23 18:10	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*102*		*40 - 110*	*01/27/23 11:15*	*02/20/23 18:10*	*1*

Lab Sample ID: LCS 160-598538/2-A
Matrix: Drinking Water
Analysis Batch: 601026

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 598538

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.84		1.10	1.00	0.0743	pCi/L	96	75 - 125		

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-598538/2-A
Matrix: Drinking Water
Analysis Batch: 601026

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 598538

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	102		40 - 110

Lab Sample ID: 810-49458-22 DU
Matrix: Ground Water
Analysis Batch: 601026

Client Sample ID: MW-20
Prep Type: Total/NA
Prep Batch: 598538

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.198			0.2190		0.0857	1.00	0.0890	pCi/L			0.12	1

Carrier	DU %Yield	DU Qualifier	Limits
Ba Carrier	101		40 - 110

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-598535/1-A
Matrix: Drinking Water
Analysis Batch: 599059

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 598535

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.6508		0.340	0.345	1.00	0.478	pCi/L	01/27/23 10:52	02/02/23 12:00	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110	01/27/23 10:52	02/02/23 12:00	1
Y Carrier	84.5		40 - 110	01/27/23 10:52	02/02/23 12:00	1

Lab Sample ID: LCS 160-598535/2-A
Matrix: Drinking Water
Analysis Batch: 599059

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 598535

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.23	11.13		1.41	1.00	0.492	pCi/L	135	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	96.6		40 - 110
Y Carrier	86.4		40 - 110

Lab Sample ID: 810-49458-19 DU
Matrix: Ground Water
Analysis Batch: 598940

Client Sample ID: SG-04R
Prep Type: Total/NA
Prep Batch: 598535

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.315	U		0.1499	U	0.218	1.00	0.368	pCi/L			0.31	1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: 810-49458-19 DU
Matrix: Ground Water
Analysis Batch: 598940

Client Sample ID: SG-04R
Prep Type: Total/NA
Prep Batch: 598535

Carrier	DU %Yield	DU Qualifier	Limits
Ba Carrier	95.1		40 - 110
Y Carrier	90.1		40 - 110

Lab Sample ID: MB 160-598539/1-A
Matrix: Drinking Water
Analysis Batch: 598940

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 598539

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.08228	U	0.221	0.221	1.00	0.444	pCi/L	01/27/23 11:24	02/02/23 12:17	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110	01/27/23 11:24	02/02/23 12:17	1
Y Carrier	84.9		40 - 110	01/27/23 11:24	02/02/23 12:17	1

Lab Sample ID: LCS 160-598539/2-A
Matrix: Drinking Water
Analysis Batch: 598940

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 598539

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.23	10.49		1.35	1.00	0.496	pCi/L	128	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	102		40 - 110
Y Carrier	83.4		40 - 110

Lab Sample ID: 810-49458-22 DU
Matrix: Ground Water
Analysis Batch: 599059

Client Sample ID: MW-20
Prep Type: Total/NA
Prep Batch: 598539

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.624			0.4803	U	0.353	1.00	0.533	pCi/L			0.20	1

Carrier	DU %Yield	DU Qualifier	Limits
Ba Carrier	101		40 - 110
Y Carrier	75.1		40 - 110

QC Association Summary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Rad

Prep Batch: 598532

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-49458-1	MW-30	Total/NA	Ground Water	PrecSep-21	
810-49458-2	MWT-30	Total/NA	Ground Water	PrecSep-21	
810-49458-3	MW-19	Total/NA	Ground Water	PrecSep-21	
810-49458-4	MW-12	Total/NA	Ground Water	PrecSep-21	
810-49458-5	MW-11	Total/NA	Ground Water	PrecSep-21	
810-49458-6	MW-06	Total/NA	Ground Water	PrecSep-21	
810-49458-7	MW-01R	Total/NA	Ground Water	PrecSep-21	
810-49458-8	MW-10	Total/NA	Ground Water	PrecSep-21	
810-49458-9	MW-02	Total/NA	Ground Water	PrecSep-21	
810-49458-10	MW-09	Total/NA	Ground Water	PrecSep-21	
810-49458-11	MW-04	Total/NA	Ground Water	PrecSep-21	
810-49458-12	MW-03	Total/NA	Ground Water	PrecSep-21	
810-49458-13	MW-31	Total/NA	Ground Water	PrecSep-21	
810-49458-14	MW-32	Total/NA	Ground Water	PrecSep-21	
810-49458-15	MW-33	Total/NA	Ground Water	PrecSep-21	
810-49458-16	MW-34	Total/NA	Ground Water	PrecSep-21	
810-49458-17	MW-18	Total/NA	Ground Water	PrecSep-21	
810-49458-18	SG-05	Total/NA	Ground Water	PrecSep-21	
810-49458-19	SG-04R	Total/NA	Ground Water	PrecSep-21	
810-49458-20	SG-03	Total/NA	Ground Water	PrecSep-21	
MB 160-598532/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-598532/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	
810-49458-19 DU	SG-04R	Total/NA	Ground Water	PrecSep-21	

Prep Batch: 598535

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-49458-1	MW-30	Total/NA	Ground Water	PrecSep_0	
810-49458-2	MWT-30	Total/NA	Ground Water	PrecSep_0	
810-49458-3	MW-19	Total/NA	Ground Water	PrecSep_0	
810-49458-4	MW-12	Total/NA	Ground Water	PrecSep_0	
810-49458-5	MW-11	Total/NA	Ground Water	PrecSep_0	
810-49458-6	MW-06	Total/NA	Ground Water	PrecSep_0	
810-49458-7	MW-01R	Total/NA	Ground Water	PrecSep_0	
810-49458-8	MW-10	Total/NA	Ground Water	PrecSep_0	
810-49458-9	MW-02	Total/NA	Ground Water	PrecSep_0	
810-49458-10	MW-09	Total/NA	Ground Water	PrecSep_0	
810-49458-11	MW-04	Total/NA	Ground Water	PrecSep_0	
810-49458-12	MW-03	Total/NA	Ground Water	PrecSep_0	
810-49458-13	MW-31	Total/NA	Ground Water	PrecSep_0	
810-49458-14	MW-32	Total/NA	Ground Water	PrecSep_0	
810-49458-15	MW-33	Total/NA	Ground Water	PrecSep_0	
810-49458-16	MW-34	Total/NA	Ground Water	PrecSep_0	
810-49458-17	MW-18	Total/NA	Ground Water	PrecSep_0	
810-49458-18	SG-05	Total/NA	Ground Water	PrecSep_0	
810-49458-19	SG-04R	Total/NA	Ground Water	PrecSep_0	
810-49458-20	SG-03	Total/NA	Ground Water	PrecSep_0	
MB 160-598535/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-598535/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	
810-49458-19 DU	SG-04R	Total/NA	Ground Water	PrecSep_0	

QC Association Summary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Rad

Prep Batch: 598538

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-49458-21	SG-02	Total/NA	Ground Water	PrecSep-21	
810-49458-22	MW-20	Total/NA	Ground Water	PrecSep-21	
810-49458-23	MW-07	Total/NA	Ground Water	PrecSep-21	
810-49458-24	MW-08	Total/NA	Ground Water	PrecSep-21	
810-49458-25	MW-27	Total/NA	Ground Water	PrecSep-21	
810-49458-26	MWT-27	Total/NA	Ground Water	PrecSep-21	
MB 160-598538/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-598538/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	
810-49458-22 DU	MW-20	Total/NA	Ground Water	PrecSep-21	

Prep Batch: 598539

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-49458-21	SG-02	Total/NA	Ground Water	PrecSep_0	
810-49458-22	MW-20	Total/NA	Ground Water	PrecSep_0	
810-49458-23	MW-07	Total/NA	Ground Water	PrecSep_0	
810-49458-24	MW-08	Total/NA	Ground Water	PrecSep_0	
810-49458-25	MW-27	Total/NA	Ground Water	PrecSep_0	
810-49458-26	MWT-27	Total/NA	Ground Water	PrecSep_0	
MB 160-598539/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-598539/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	
810-49458-22 DU	MW-20	Total/NA	Ground Water	PrecSep_0	

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-30
Date Collected: 01/03/23 17:20
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-1
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:40
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:05
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MWT-30
Date Collected: 01/03/23 17:40
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-2
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:40
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:08
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-19
Date Collected: 01/03/23 15:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-3
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:42
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:08
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-12
Date Collected: 01/03/23 12:20
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-4
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:42
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-11
Date Collected: 01/03/23 18:10
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-5
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:42
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-06
Date Collected: 01/03/23 13:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-6
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:42
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-01R
Date Collected: 01/03/23 15:25
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-7
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:42
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-10
Date Collected: 01/04/23 09:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-8
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:44
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:10
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-02
Date Collected: 01/04/23 11:40
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-9
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:45
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	599058	FLC	EET SL	02/02/23 12:10
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-09
Date Collected: 01/04/23 13:30
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-10
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:45
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-04
Date Collected: 01/04/23 13:00
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-11
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:45
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-03
Date Collected: 01/04/23 15:10
Date Received: 01/06/23 08:45

Lab Sample ID: 810-49458-12
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:45
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-31
Date Collected: 01/04/23 17:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-13
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:45
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-32
Date Collected: 01/04/23 19:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-14
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601020	FLC	EET SL	02/20/23 15:45
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-33
Date Collected: 01/05/23 16:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-15
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 15:37
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: MW-34
Date Collected: 01/05/23 13:10
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-16
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 15:36
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:14
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-18
Date Collected: 01/05/23 09:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-17
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 15:36
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:14
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: SG-05
Date Collected: 01/05/23 14:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-18
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 15:52
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:14
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: SG-04R
Date Collected: 01/05/23 14:25
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-19
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 15:36
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:14
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Client Sample ID: SG-03
Date Collected: 01/05/23 14:50
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-20
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598532	DJP	EET SL	01/27/23 10:29
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 15:35
Total/NA	Prep	PrecSep_0			598535	DJP	EET SL	01/27/23 10:52
Total/NA	Analysis	904.0		1	598940	FLC	EET SL	02/02/23 12:15
Total/NA	Analysis	Ra226_Ra228 Pos		1	601091	SCB	EET SL	02/21/23 15:39

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: SG-02
Date Collected: 01/05/23 15:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-21
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598538	DJP	EET SL	01/27/23 11:15
Total/NA	Analysis	903.0		1	601026	FLC	EET SL	02/20/23 18:10
Total/NA	Prep	PrecSep_0			598539	DJP	EET SL	01/27/23 11:24
Total/NA	Analysis	904.0		1	599059	FLC	EET SL	02/02/23 11:57
Total/NA	Analysis	Ra226_Ra228 Pos		1	601092	SCB	EET SL	02/21/23 15:48

Client Sample ID: MW-20
Date Collected: 01/04/23 17:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-22
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598538	DJP	EET SL	01/27/23 11:15
Total/NA	Analysis	903.0		1	601026	FLC	EET SL	02/20/23 18:10
Total/NA	Prep	PrecSep_0			598539	DJP	EET SL	01/27/23 11:24
Total/NA	Analysis	904.0		1	599059	FLC	EET SL	02/02/23 11:57
Total/NA	Analysis	Ra226_Ra228 Pos		1	601092	SCB	EET SL	02/21/23 15:48

Client Sample ID: MW-07
Date Collected: 01/04/23 19:20
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-23
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598538	DJP	EET SL	01/27/23 11:15
Total/NA	Analysis	903.0		1	601026	FLC	EET SL	02/20/23 18:10
Total/NA	Prep	PrecSep_0			598539	DJP	EET SL	01/27/23 11:24
Total/NA	Analysis	904.0		1	599059	FLC	EET SL	02/02/23 11:58
Total/NA	Analysis	Ra226_Ra228 Pos		1	601092	SCB	EET SL	02/21/23 15:48

Client Sample ID: MW-08
Date Collected: 01/05/23 10:00
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-24
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598538	DJP	EET SL	01/27/23 11:15
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 19:40
Total/NA	Prep	PrecSep_0			598539	DJP	EET SL	01/27/23 11:24
Total/NA	Analysis	904.0		1	599059	FLC	EET SL	02/02/23 11:58
Total/NA	Analysis	Ra226_Ra228 Pos		1	601092	SCB	EET SL	02/21/23 15:48

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Client Sample ID: MW-27

Date Collected: 01/05/23 12:10
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-25

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598538	DJP	EET SL	01/27/23 11:15
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 19:40
Total/NA	Prep	PrecSep_0			598539	DJP	EET SL	01/27/23 11:24
Total/NA	Analysis	904.0		1	599059	FLC	EET SL	02/02/23 11:58
Total/NA	Analysis	Ra226_Ra228 Pos		1	601092	SCB	EET SL	02/21/23 15:48

Client Sample ID: MWT-27

Date Collected: 01/05/23 12:10
Date Received: 01/09/23 08:30

Lab Sample ID: 810-49458-26

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			598538	DJP	EET SL	01/27/23 11:15
Total/NA	Analysis	903.0		1	601021	FLC	EET SL	02/20/23 19:40
Total/NA	Prep	PrecSep_0			598539	DJP	EET SL	01/27/23 11:24
Total/NA	Analysis	904.0		1	599059	FLC	EET SL	02/02/23 11:58
Total/NA	Analysis	Ra226_Ra228 Pos		1	601092	SCB	EET SL	02/21/23 15:48

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-23
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-23
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-23
HI - RadChem Recognition	State	n/a	06-30-23
Illinois	NELAP	200023	11-30-23
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-23
Kentucky (DW)	State	KY90125	12-31-23
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-23
Louisiana (All)	NELAP	04080	06-30-23
Louisiana (DW)	State	LA011	12-31-23
Maryland	State	310	09-30-23
MI - RadChem Recognition	State	9005	06-30-23
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	02-26-23
New Jersey	NELAP	MO002	06-30-23
New York	NELAP	11616	04-01-23
North Carolina (DW)	State	29700	07-31-23
North Dakota	State	R-207	06-30-23
Oklahoma	NELAP	9997	08-31-23
Oregon	NELAP	4157	09-01-23
Pennsylvania	NELAP	68-00540	02-28-23
South Carolina	State	85002001	06-30-23
Texas	NELAP	T104704193	07-31-23
US Fish & Wildlife	US Federal Programs	058448	07-31-23
USDA	US Federal Programs	P330-17-00028	03-11-23
Utah	NELAP	MO000542021-14	07-31-23
Virginia	NELAP	10310	06-14-24
Washington	State	C592	08-30-23
West Virginia DEP	State	381	10-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	EET SL
904.0	Radium-228 (GFPC)	EPA	EET SL
Ra226_Ra228 Pos	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Trace Analytical Laboratories
Project/Site: 23A0180

Job ID: 810-49458-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
810-49458-1	MW-30	Ground Water	01/03/23 17:20	01/06/23 08:45
810-49458-2	MWT-30	Ground Water	01/03/23 17:40	01/06/23 08:45
810-49458-3	MW-19	Ground Water	01/03/23 15:30	01/06/23 08:45
810-49458-4	MW-12	Ground Water	01/03/23 12:20	01/06/23 08:45
810-49458-5	MW-11	Ground Water	01/03/23 18:10	01/06/23 08:45
810-49458-6	MW-06	Ground Water	01/03/23 13:30	01/06/23 08:45
810-49458-7	MW-01R	Ground Water	01/03/23 15:25	01/06/23 08:45
810-49458-8	MW-10	Ground Water	01/04/23 09:30	01/06/23 08:45
810-49458-9	MW-02	Ground Water	01/04/23 11:40	01/06/23 08:45
810-49458-10	MW-09	Ground Water	01/04/23 13:30	01/06/23 08:45
810-49458-11	MW-04	Ground Water	01/04/23 13:00	01/06/23 08:45
810-49458-12	MW-03	Ground Water	01/04/23 15:10	01/06/23 08:45
810-49458-13	MW-31	Ground Water	01/04/23 17:00	01/09/23 08:30
810-49458-14	MW-32	Ground Water	01/04/23 19:20	01/09/23 08:30
810-49458-15	MW-33	Ground Water	01/05/23 16:20	01/09/23 08:30
810-49458-16	MW-34	Ground Water	01/05/23 13:10	01/09/23 08:30
810-49458-17	MW-18	Ground Water	01/05/23 09:00	01/09/23 08:30
810-49458-18	SG-05	Ground Water	01/05/23 14:00	01/09/23 08:30
810-49458-19	SG-04R	Ground Water	01/05/23 14:25	01/09/23 08:30
810-49458-20	SG-03	Ground Water	01/05/23 14:50	01/09/23 08:30
810-49458-21	SG-02	Ground Water	01/05/23 15:20	01/09/23 08:30
810-49458-22	MW-20	Ground Water	01/04/23 17:20	01/09/23 08:30
810-49458-23	MW-07	Ground Water	01/04/23 19:20	01/09/23 08:30
810-49458-24	MW-08	Ground Water	01/05/23 10:00	01/09/23 08:30
810-49458-25	MW-27	Ground Water	01/05/23 12:10	01/09/23 08:30
810-49458-26	MWT-27	Ground Water	01/05/23 12:10	01/09/23 08:30

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810-49458 Chain of Custody

110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order #

Batch # _____

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CHAIN OF CUSTODY RECORD

Page _____ of _____

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REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998			MI		23A0180
BILL TO: Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444	COMPLIANCE MONITORING: Yes X / No	POPULATION SERVED	SOURCE WATER		

LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	01/03/23	17:20		X	MW-30	Radium 226/228				4	GW	SW
2	01/03/23	17:40		X	MWT-30	Radium 226/228				4	GW	SW
3	01/03/23	15:30		X	MW-19	Radium 226/228				4	GW	SW
4	01/03/23	12:20		X	MW-12	Radium 226/228				4	GW	SW
5	01/03/23	18:10		X	MW-11	Radium 226/228				4	GW	SW
6	01/03/23	13:30		X	MW-06	Radium 226/228				4	GW	SW
7	01/03/23	15:25		X	MW-01R	Radium 226/228				4	GW	SW
8	01/04/23	9:30	X		MW-10	Radium 226/228				4	GW	SW
9	01/04/23	11:40	X		MW-02	Radium 226/228				4	GW	SW
10	01/04/23	13:30		X	MW-09	Radium 226/228				4	GW	SW
11	01/04/23	13:00		X	MW-04 (Only received 3 Bottles)	Radium 226/228				4	GW	SW
12	01/04/23	15:10		X	MW-03 *Per Client the 4th bottle was full of Sediment 01/16/23 per KF	Radium 226/228				4	GW	SW
13												
14												

RELINQUISHED BY:(Signature)	DATE	TIME AM PM	RECEIVED BY:(Signature)	DATE	TIME AM PM
			Fedex		
RELINQUISHED BY:(Signature) Fedex			RECEIVED BY:(Signature) Kameron Williams	01/16/23	8:45
RELINQUISHED BY:(Signature)			RECEIVED FOR LABORATORY BY:		

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

pH Acceptable

CONDITIONS UPON RECEIPT (check one):

____ Iced: Wet/Blue ____ Ambient _____ °C Upon Receipt____ N/A

MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0%
RV* = Rush Verbal: (5 working days) 50%
RW* = Rush Written: (5 working days) 75%
IV* = Immediate Verbal: (3 working days) 100%
IW* = Immediate Written: (3 working days) 125%
SP* = Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

eurofins

Eaton Analytical

110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order #

Batch # _____

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CHAIN OF CUSTODY RECORD

Page _____ of _____

REPORT TO:
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998

BILL TO:
Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444

SAMPLER (Signature):

COMPLIANCE MONITORING	Yes	No
	X	

PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
	MI		23A0180

POPULATION SERVED	SOURCE WATER

LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	01/04/23	17:00		X	MW-31	Radium 226/228				4	GW	SW
2	01/04/23	19:20		X	MW-32	Radium 226/228				4	GW	SW
3	01/05/23	16:20		X	MW-33	Radium 226/228				4	GW	SW
4	01/05/23	13:10		X	MW-34	Radium 226/228				4	GW	SW
5	01/05/23	9:00	X		MW-18	Radium 226/228				4	GW	SW
6	01/05/23	14:00		X	SG-05	Radium 226/228				4	GW	SW
7	01/05/23	14:25		X	SG-04R	Radium 226/228				4	GW	SW
8	01/05/23	14:50		X	SG-03	Radium 226/228				4	GW	SW
9	01/05/23	15:20		X	SG-02	Radium 226/228				4	GW	SW
10	01/04/23	17:20		X	MW-20	Radium 226/228				4	GW	SW
11	01/04/23	19:20		X	MW-07	Radium 226/228				4	GW	SW
12	01/05/23	10:00	X		MW-08	Radium 226/228				4	GW	SW
13	01/05/23	12:10		X	MW-27	Radium 226/228				4	GW	SW
14	1/5/23	12:10		X	MWT-27	Radium 226/228				4	GW	SW

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
[signature]	1/6/23	17:00 AM PM	Fedex		AM PM
RELINQUISHED BY:(Signature) Fedex	DATE	TIME AM PM	RECEIVED BY:(Signature) Kameron Williams	DATE 01/09/23	TIME 8:30 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME AM PM	RECEIVED FOR LABORATORY BY: Penny Pehlig Wright	DATE 01-09-2023	TIME 0830 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one):
____ Iced: Wet/Blue ✓ Ambient _____ °C Upon Receipt____ N/A

MATRIX CODES:
DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days)	0%	IV* = Immediate Verbal: (3 working days)	100%
RV* = Rush Verbal: (5 working days)	50%	IW* =Immediate Written: (3 working days)	125%
RW* = Rush Written: (5 working days)	75%	SP* = Weekend, Holiday	CALL
		STAT* = Less than 48 hours	CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-12638 1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-49458-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 2/2/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23A0180	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calculation	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MW-30 (810-49458-1)	1/3/23	17:20 Eastern		Drinking Wate			X	4	
MWT-30 (810-49458-2)	1/3/23	17:40 Eastern		Drinking Wate			X	4	
MW-19 (810-49458-3)	1/3/23	15:30 Eastern		Drinking Wate			X	4	
MW-12 (810-49458-4)	1/3/23	12:20 Eastern		Drinking Wate			X	4	
MW-11 (810-49458-5)	1/3/23	18:10 Eastern		Drinking Wate			X	4	
MW-06 (810-49458-6)	1/3/23	13:30 Eastern		Drinking Wate			X	4	
MW-01R (810-49458-7)	1/3/23	15:25 Eastern		Drinking Wate			X	4	
MW-10 (810-49458-8)	1/4/23	09:30 Eastern		Drinking Wate			X	4	
MW-02 (810-49458-9)	1/4/23	11:40 Eastern		Drinking Wate			X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Penny Pehling Wright FED EX	01/09/23 1600	EEA	FED EX		
				JAN 10 2023 0846	ETASTL

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-12638.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-49458-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 2/2/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23A0180	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calculation	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MW-09 (810-49458-10)	1/4/23	13:30 Eastern		Drinking Wate			X	4	
MW-04 (810-49458-11)	1/4/23	13:00 Eastern		Drinking Wate			X	3	
MW-03 (810-49458-12)	1/4/23	15:10 Eastern		Drinking Wate			X	4	
MW-31 (810-49458-13)	1/4/23	17:00 Eastern		Drinking Wate			X	4	
MW-32 (810-49458-14)	1/4/23	19:20 Eastern		Drinking Wate			X	4	
MW-33 (810-49458-15)	1/5/23	16:20 Eastern		Drinking Wate			X	4	
MW-34 (810-49458-16)	1/5/23	13:10 Eastern		Drinking Wate			X	4	
MW-18 (810-49458-17)	1/5/23	09:00 Eastern		Drinking Wate			X	4	
SG-05 (810-49458-18)	1/5/23	14:00 Eastern		Drinking Wate			X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Penny Pehling Wright	01/09/23 11:00	EEA	FED EX		
Relinquished by: FED EX	Date/Time:	Company:	Received by:	JAN 10 2023 0846	Company: EAJFL
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-12638.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-49458-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 2/2/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23A0180	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calculation	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
SG-04R (810-49458-19)	1/5/23	14:25 Eastern		Drinking Wate			X	4	
SG-03 (810-49458-20)	1/5/23	14:50 Eastern		Drinking Wate			X	4	
SG-02 (810-49458-21)	1/5/23	15:20 Eastern		Drinking Wate			X	4	
MW-20 (810-49458-22)	1/4/23	17:20 Eastern		Drinking Wate			X	4	
MW-07 (810-49458-23)	1/4/23	19:20 Eastern		Drinking Wate			X	4	
MW-08 (810-49458-24)	1/5/23	10:00 Eastern		Drinking Wate			X	4	
MW-27 (810-49458-25)	1/5/23	12:10 Eastern		Drinking Wate			X	4	
MWT-27 (810-49458-26)	1/5/23	12:10 Eastern		Drinking Wate			X	4	

Note: Since laboratory accreditations are subject to change. Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by: Penny Pehling Wright	Date/Time: 01/09/23 1600	Company: EEA	Received by: FED EX	Date/Time:	Company:
Relinquished by: FED EX	Date/Time:	Company:	Received by:	Date/Time: JAN 10 2023 0646	Company: ETASTL
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-12638.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-49458-1
Address: 13715 Rider Trail North,	Due Date Requested: 2/2/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23A0180	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calculation	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MW-30 (810-49458-1)	1/3/23	17:20 Eastern		Drinking Wate			X	4	
MWT-30 (810-49458-2)	1/3/23	17:40 Eastern		Drinking Wate			X	4	
MW-19 (810-49458-3)	1/3/23	15:30 Eastern		Drinking Wate			X	4	
MW-12 (810-49458-4)	1/3/23	12:20 Eastern		Drinking Wate			X	4	
MW-11 (810-49458-5)	1/3/23	18:10 Eastern		Drinking Wate			X	4	
MW-06 (810-49458-6)	1/3/23	13:30 Eastern		Drinking Wate			X	4	
MW-01R (810-49458-7)	1/3/23	15:25 Eastern		Drinking Wate			X	4	
MW-10 (810-49458-8)	1/4/23	09:30 Eastern		Drinking Wate			X	4	
MW-02 (810-49458-9)	1/4/23	11:40 Eastern		Drinking Wate			X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: Penny Pehling Wright	Date/Time: 01/09/23 1600	Company: EEA	Received by: FED EX	Date/Time:	Company:
Relinquished by: FED EX	Date/Time:	Company:	Received by:	Date/Time: JAN 10 2023 0846	Company: EAJTL
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks

Ver: 06/08/2021

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-12638.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-49458-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 2/2/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23A0180	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calculation	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MW-09 (810-49458-10)	1/4/23	13:30 Eastern		Drinking Wate			X	4	
MW-04 (810-49458-11)	1/4/23	13:00 Eastern		Drinking Wate			X	3	
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MW-32 (810-49458-14)	1/4/23	19:20 Eastern		Drinking Wate			X	4	
MW-33 (810-49458-15)	1/5/23	16:20 Eastern		Drinking Wate			X	4	
MW-34 (810-49458-16)	1/5/23	13:10 Eastern		Drinking Wate			X	4	
MW-18 (810-49458-17)	1/5/23	09:00 Eastern		Drinking Wate			X	4	
SG-05 (810-49458-18)	1/5/23	14:00 Eastern		Drinking Wate			X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by	Date:	Time	Method of Shipment

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Penny Pehling Wright	01/09/23 11:00	EEA	FED EX		
Relinquished by: FED EX	Date/Time	Company	Received by	JAN 10 2023 0846	EEA JTL
Relinquished by	Date/Time	Company	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins Environment Testing

Client Information (Sub Contract Lab)	Sampler	Lab PM: Fullmer, Karen	Carrier Tracking No(s)	COC No: 810-12638.3
Client Contact: Shipping/Receiving	Phone	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-49458-1
Address: 13715 Rider Trail North,	Due Date Requested: 2/2/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23A0180	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
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K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calculation	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
SG-04R (810-49458-19)	1/5/23	14:25 Eastern		Drinking Wate			X	4	
SG-03 (810-49458-20)	1/5/23	14:50 Eastern		Drinking Wate			X	4	
SG-02 (810-49458-21)	1/5/23	15:20 Eastern		Drinking Wate			X	4	
MW-20 (810-49458-22)	1/4/23	17:20 Eastern		Drinking Wate			X	4	
MW-07 (810-49458-23)	1/4/23	19:20 Eastern		Drinking Wate			X	4	
MW-08 (810-49458-24)	1/5/23	10:00 Eastern		Drinking Wate			X	4	
MW-27 (810-49458-25)	1/5/23	12:10 Eastern		Drinking Wate			X	4	
MWT-27 (810-49458-26)	1/5/23	12:10 Eastern		Drinking Wate			X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2

Special Instructions/QC Requirements

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Perry Pehling Wright	01/09/23 1600	EEA	FED EX		
Relinquished by: FED EX	Date/Time	Company	Received by	Date/Time: JAN 10 2023 0546	Company: ETA-STL
Relinquished by	Date/Time	Company	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-49458-1

Login Number: 49458
List Number: 1
Creator: Williams, Kameron

List Source: Eurofins Eaton Analytical South Bend

Question	Answer	Comment
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
Samples were received on ice.	True	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	False	Thermal preservation not required.
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Samples do not require splitting or compositing.	True	
Container provided by EEA	True	

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-49458-1

Login Number: 49458
List Number: 2
Creator: Bohlmann, Jessica M

List Source: Eurofins St. Louis
List Creation: 01/10/23 12:31 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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February 27, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

RE: Trace Project 23B0260
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAP Accreditation, Trace certifies that these test results meet all requirements of the NELAP Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAP at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

NELAP ACCREDITED TNI LABORATORY

NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23B0260-01	MW-09	Ground Water	Client	02/06/23 14:40	02/07/23 15:53
23B0260-02	MWT-09	Ground Water	Client	02/06/23 14:40	02/07/23 15:53
23B0260-03	MW-30	Ground Water	Client	02/06/23 16:35	02/07/23 15:53
23B0260-04	MWT-30	Ground Water	Client	02/06/23 16:35	02/07/23 15:53
23B0260-05	MW-20	Ground Water	Client	02/07/23 09:00	02/07/23 15:53
23B0260-06	MW-07	Ground Water	Client	02/07/23 10:00	02/07/23 15:53
23B0260-07	MW-08	Ground Water	Client	02/07/23 11:15	02/07/23 15:53
23B0260-08	MW-31	Ground Water	Client	02/07/23 12:35	02/07/23 15:53
23B0260-09	MW-27	Ground Water	Client	02/07/23 14:20	02/07/23 15:53
23B0260-10	MW-10	Ground Water	Client	02/06/23 15:30	02/07/23 15:53
23B0260-11	MW-06	Ground Water	Client	02/06/23 17:10	02/07/23 15:53
23B0260-12	MW-04	Ground Water	Client	02/07/23 09:40	02/07/23 15:53
23B0260-13	MW-03	Ground Water	Client	02/07/23 11:10	02/07/23 15:53
23B0260-14	MW-12	Ground Water	Client	02/07/23 14:40	02/07/23 15:53
23B0260-15	MW-32	Ground Water	Client	02/08/23 08:55	02/08/23 15:47
23B0260-16	MW-19	Ground Water	Client	02/08/23 09:55	02/08/23 15:47
23B0260-17	MW-18	Ground Water	Client	02/08/23 11:25	02/08/23 15:47
23B0260-18	MW-33	Ground Water	Client	02/08/23 13:05	02/08/23 15:47
23B0260-19	MW-01R	Ground Water	Client	02/08/23 14:45	02/08/23 15:47
23B0260-20	MW-02	Ground Water	Client	02/08/23 09:30	02/08/23 15:47
23B0260-21	MW-11	Ground Water	Client	02/08/23 10:40	02/08/23 15:47
23B0260-22	MW-34	Ground Water	Client	02/08/23 14:20	02/08/23 15:47

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the laboratory is not accredited by NELAP for this compound
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: 23B0260-01

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHn : The pH was analyzed at 17:11

Trace ID: 23B0260-02

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHm : The pH was analyzed at 17:08

Trace ID: 23B0260-03

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Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Arsenic	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Beryllium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Copper	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Nickel	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHp : The pH was analyzed at 17:14

Trace ID: 23B0260-04

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Arsenic	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Beryllium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Copper	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Nickel	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

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Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHo : The pH was analyzed at 17:13

Trace ID: 23B0260-05

Analysis: SM 4500-H+ B-11

	Note pH : The pH was analyzed at 10:35
pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.

Trace ID: 23B0260-06

Analysis: SM 4500-H+ B-11

pH	Note pHs : The pH was analyzed at 17:17

Trace ID: 23B0260-07

Analysis: SM 4500-H+ B-11

pH	Note pHu : The pH was analyzed at 17:21

Trace ID: 23B0260-08

Analysis: SM 4500-H+ B-11

pH	Note pHt : The pH was analyzed at 17:18

Trace ID: 23B0260-09

Analysis: SM 4500-H+ B-11

pH	Note pHr : The pH was analyzed at 17:16

Trace ID: 23B0260-10

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

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Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHk : The pH was analyzed at 17:06

Trace ID: 23B0260-11

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHl : The pH was analyzed at 17:07

Trace ID: 23B0260-12

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHw : The pH was analyzed at 17:24

Trace ID: 23B0260-13

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Beryllium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

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Copper	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Nickel	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Analysis: SM 4500-H+ B-11	
pH	Note pHv : The pH was analyzed at 17:23

Trace ID: 23B0260-14

Analysis: SM 4500-H+ B-11

pH	Note pHq : The pH was analyzed at 17:15

Trace ID: 23B0260-15

Analysis: SM 4500-H+ B-11

	Note pHb : The pH was analyzed at 11:29
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23B0260-16

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Beryllium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Chromium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Copper	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Nickel	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

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Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Analysis: SM 4500-H+ B-11	
	Note pHd : The pH was analyzed at 11:32
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23B0260-17

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Analysis: SM 4500-H+ B-11	
	Note pHe : The pH was analyzed at 11:33
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23B0260-18

Analysis: SM 4500-H+ B-11

	Note pHf : The pH was analyzed at 11:34

Trace ID: 23B0260-19

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Analysis: SM 4500-H+ B-11	

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	Note pHg : The pH was analyzed at 11:36

Trace ID: 23B0260-20

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

	Note pHh : The pH was analyzed at 11:37
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23B0260-21

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

	Note pHi : The pH was analyzed at 11:38
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23B0260-22

Analysis: SM 4500-H+ B-11

	Note pHj : The pH was analyzed at 11:39

Trace ID: T132475-MS1

Analysis: EPA 300.0 Rev. 2.1

Fluoride	Note 240 : The MS recovery was out of control high. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.

Trace ID: T132517-DUP2

Analysis: SM 4500-H+ B-11

pH	Note pHv : The pH was analyzed at 17:23

Trace ID: T132532-DUP1

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Analysis: SM 4500-H+ B-11

Note pHc : The pH was analyzed at 11:31

Trace ID: T132592-DUP1

Analysis: SM 4500-H+ B-11

Note pHa : The pH was analyzed at 10:36

Trace ID: T132721-MS2

Analysis: EPA 200.7 Rev. 4.4

Calcium — Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Trace ID: T132722-BLK1

Analysis: EPA 200.7 Rev. 4.4

Boron — Note 630 : A positive result for this analyte was found in the method blank. Because the concentration in the blank was less than 10% of the sample concentration, no qualification of data is necessary.

Trace ID: T132722-MS1

Analysis: EPA 200.7 Rev. 4.4

Calcium — Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Analysis: EPA 200.8 Rev. 5.4

Vanadium — Note 242 : The MS was out of control high. Because there was no positive result in the non-spiked version of the sample, no data require qualification.

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-01 Matrix: Ground Water Date Collected: 02/06/23 14:40
Sample ID: MW-09 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**6.1**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**300**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**19**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.33**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**44**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**16**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**26**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.0023**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.36**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.0032**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00058**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.0028	mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	**0.029**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0020**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-01 Matrix: Ground Water Date Collected: 02/06/23 14:40
Sample ID: MW-09 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**2.6**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**18**	**mg/L**	**0.75**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**210**	**mg/L**	**15**	**25**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**750**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**750**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**1100**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**52**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.09**	**pH Units**		**1**	**02/06/23**	**kb**	**02/07/23**	**sb**	**511, pHn, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-02 Matrix: Ground Water Date Collected: 02/06/23 14:40
Sample ID: MWT-09 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**5.9**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**280**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**20**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.31**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**42**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**16**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**25**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.0023**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.35**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.0031**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00062**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.0028	mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	**0.029**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0024**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0019**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-02 Matrix: Ground Water Date Collected: 02/06/23 14:40
Sample ID: MWT-09 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**2.5**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**18**	**mg/L**	**0.75**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**210**	**mg/L**	**15**	**25**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**730**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**730**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**1000**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**53**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.09**	**pH Units**		**1**	**02/06/23**	**kb**	**02/07/23**	**sb**	**511, pHm, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-03 Matrix: Ground Water Date Collected: 02/06/23 16:35
Sample ID: MW-30 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T132424									
Mercury	<0.00020 mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T132721									
Boron	**2.1 mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**480 mg/L**	**6.4**	**25**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**0.99 mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.12 mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**120 mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**16 mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**120 mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T132721									
Antimony	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Barium	**0.10 mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Cadmium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.0087 mg/L**	**0.0012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	<0.0026 mg/L	0.0026	5	02/17/23	bjv	02/22/23	acs		
Copper	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Lead	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs	402.5	
Nickel	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs	402.5	
Selenium	<0.0025 mg/L	0.0025	5	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025 mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019 mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-03 Matrix: Ground Water Date Collected: 02/06/23 16:35
Sample ID: MW-30 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**1.0**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**190**	**mg/L**	**3.8**	**25**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**830**	**mg/L**	**30**	**50**	**02/13/23**	**mr**	**02/13/23**	**mr**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**880**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**880**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**2000**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	<4.0	mg/L	4.0	1	02/08/23	drm	02/08/23	drm		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.10**	**pH Units**		**1**	**02/06/23**	**kb**	**02/07/23**	**sb**	**511, pHp, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-04 Matrix: Ground Water Date Collected: 02/06/23 16:35
Sample ID: MWT-30 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T132424									
Mercury	<0.00020 mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T132721									
Boron	**2.1 mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**490 mg/L**	**6.4**	**25**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**1.1 mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.12 mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**120 mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**16 mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**130 mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T132721									
Antimony	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Barium	**0.10 mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Cadmium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.0088 mg/L**	**0.0012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	<0.0026 mg/L	0.0026	5	02/17/23	bjv	02/22/23	acs		
Copper	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Lead	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs	402.5	
Nickel	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs	402.5	
Selenium	<0.0025 mg/L	0.0025	5	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025 mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019 mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-04 Matrix: Ground Water Date Collected: 02/06/23 16:35
Sample ID: MWT-30 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**1.0**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**200**	**mg/L**	**3.8**	**25**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**840**	**mg/L**	**30**	**50**	**02/13/23**	**mr**	**02/13/23**	**mr**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**890**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**890**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**2400**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**4.0**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.03**	**pH Units**		**1**	**02/06/23**	**kb**	**02/07/23**	**sb**	**511, pHo, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-05 Matrix: Ground Water Date Collected: 02/07/23 09:00
Sample ID: MW-20 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**0.87**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**140**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**18**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.049**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**52**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**11**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**57**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.47**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.00025**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.0016**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	**0.0016**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Molybdenum	**0.0041**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0095**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.028**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-05 Matrix: Ground Water Date Collected: 02/07/23 09:00
Sample ID: MW-20 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**0.24**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**62**	**mg/L**	**0.75**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**120**	**mg/L**	**15**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**470**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**470**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**690**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**33**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132592										
pH	**7.24**	**pH Units**		**1**	**02/07/23**	**bsv**	**02/13/23**	**bsv**	**503, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-06 Matrix: Ground Water Date Collected: 02/07/23 10:00
Sample ID: MW-07 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**12**	**mg/L**	**0.088**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**140**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**13**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.0052**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**37**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**5.2**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**47**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Barium	**0.36**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.00037**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00099**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-06 Matrix: Ground Water Date Collected: 02/07/23 10:00
Sample ID: MW-07 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**0.12**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**14**	**mg/L**	**0.75**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**33**	**mg/L**	**3.0**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**630**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**630**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**650**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**35**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**6.92**	**pH Units**		**1**	**02/07/23**	**kb**	**02/07/23**	**sb**	**pHs, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-07 Matrix: Ground Water Date Collected: 02/07/23 11:15
Sample ID: MW-08 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**9.3**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**150**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**21**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.14**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**33**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**14**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**38**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.049**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**1.5**	**mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/27/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.0015**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00070**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	**0.00043**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	**0.00086**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Molybdenum	**0.0015**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0040**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-07 Matrix: Ground Water Date Collected: 02/07/23 11:15
Sample ID: MW-08 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T132325									
Fluoride	**1.1 mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**35 mg/L**	**0.75**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**5.3 mg/L**	**3.0**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T132352									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**560 mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**560 mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15									
Batch: T132425									
Total Dissolved Solids	**630 mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15									
Batch: T132344									
Total Suspended Solids	**49 mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11									
Batch: T132517									
pH	**7.02 pH Units**		**1**	**02/07/23**	**kb**	**02/07/23**	**sb**	**pHu, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-08 Matrix: Ground Water Date Collected: 02/07/23 12:35
Sample ID: MW-31 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**4.2**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**170**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**1.5**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.052**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**38**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**11**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**51**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.19**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.0024**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	02/17/23	bjv	02/22/23	acs		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Molybdenum	**0.0013**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-08 Matrix: Ground Water Date Collected: 02/07/23 12:35
Sample ID: MW-31 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**4.7**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**110**	**mg/L**	**3.8**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Sulfate as SO4	**200**	**mg/L**	**15**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**350**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**350**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**780**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	<4.0	mg/L	4.0	1	02/08/23	drm	02/08/23	drm		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.78**	**pH Units**		**1**	**02/07/23**	**kb**	**02/07/23**	**sb**	**pHt, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-09 Matrix: Ground Water Date Collected: 02/07/23 14:20
Sample ID: MW-27 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**0.16**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**180**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**11**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.0067**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**47**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**6.2**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**59**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.00069**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.16**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.0097**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00052**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	**0.0016**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0016**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-09 Matrix: Ground Water Date Collected: 02/07/23 14:20
Sample ID: MW-27 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**0.31**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**69**	**mg/L**	**0.75**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**58**	**mg/L**	**3.0**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**800**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**800**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**790**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**22**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**6.85**	**pH Units**		**1**	**02/07/23**	**kb**	**02/07/23**	**sb**	**pHr, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-10 Matrix: Ground Water Date Collected: 02/06/23 15:30
Sample ID: MW-10 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**9.7**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**280**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**3.9**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.54**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**91**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**31**	**mg/L**	**2.5**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**120**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Barium	**0.28**	**mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.0026**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	02/17/23	bjv	02/22/23	acs		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.0028	mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	**0.0048**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025	mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-10 Matrix: Ground Water Date Collected: 02/06/23 15:30
Sample ID: MW-10 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**4.0**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**130**	**mg/L**	**3.8**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Sulfate as SO4	**880**	**mg/L**	**30**	**50**	**02/13/23**	**mr**	**02/13/23**	**mr**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**320**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**320**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**1800**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	<4.0	mg/L	4.0	1	02/08/23	drm	02/08/23	drm		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.59**	**pH Units**		**1**	**02/06/23**	**kb**	**02/07/23**	**sb**	**511, pHk, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-11 Matrix: Ground Water Date Collected: 02/06/23 17:10
Sample ID: MW-06 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**10**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**250**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**16**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.20**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**100**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**23**	**mg/L**	**2.5**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**84**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	**0.00058**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**1.6**	**mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.0021**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00067**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.0028	mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025	mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-11 Matrix: Ground Water Date Collected: 02/06/23 17:10
Sample ID: MW-06 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**1.1**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**110**	**mg/L**	**3.8**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Sulfate as SO4	**20**	**mg/L**	**3.0**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132630										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1000**	**mg/L**	**5.0**	**1**	**02/15/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/15/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**1000**	**mg/L**	**5.0**	**1**	**02/15/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**1300**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**42**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.20**	**pH Units**		**1**	**02/06/23**	**kb**	**02/07/23**	**sb**	**pHI, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-12 Matrix: Ground Water Date Collected: 02/07/23 09:40
Sample ID: MW-04 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T132424									
Mercury	<0.00020 mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T132721									
Boron	**3.8 mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**350 mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**5.6 mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.061 mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**110 mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**20 mg/L**	**2.5**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**84 mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T132721									
Antimony	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	**0.0012 mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.13 mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025 mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.0047 mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00062 mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	<0.00025 mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	<0.0012 mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Nickel	**0.018 mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050 mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025 mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019 mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012 mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0012 mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-12 Matrix: Ground Water Date Collected: 02/07/23 09:40
Sample ID: MW-04 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**1.3**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**200**	**mg/L**	**3.8**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Sulfate as SO4	**530**	**mg/L**	**30**	**50**	**02/13/23**	**mr**	**02/14/23**	**mr**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**1700**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.22**	**pH Units**		**1**	**02/07/23**	**kb**	**02/07/23**	**sb**	**pHw, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-13 Matrix: Ground Water Date Collected: 02/07/23 11:10
Sample ID: MW-03 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T132424									
Mercury	<0.00020 mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T132721									
Boron	**4.2 mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**400 mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**2.5 mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.039 mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**220 mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**20 mg/L**	**2.5**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**120 mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T132721									
Antimony	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs		
Barium	**0.50 mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Cadmium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.0049 mg/L**	**0.0012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	<0.0026 mg/L	0.0026	5	02/17/23	bjv	02/22/23	acs		
Copper	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Lead	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs	402.5	
Nickel	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs	402.5	
Selenium	<0.0025 mg/L	0.0025	5	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025 mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019 mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-13 Matrix: Ground Water Date Collected: 02/07/23 11:10
Sample ID: MW-03 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**0.62**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**240**	**mg/L**	**3.8**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Sulfate as SO4	**230**	**mg/L**	**15**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132630										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1600**	**mg/L**	**5.0**	**1**	**02/15/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/15/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**1600**	**mg/L**	**5.0**	**1**	**02/15/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**2300**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	**4.0**	**mg/L**	**4.0**	**1**	**02/08/23**	**drm**	**02/08/23**	**drm**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.17**	**pH Units**		**1**	**02/07/23**	**kb**	**02/07/23**	**sb**	**pHv, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-14 Matrix: Ground Water Date Collected: 02/07/23 14:40
Sample ID: MW-12 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**0.26**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**78**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	<0.050	mg/L	0.050	1	02/17/23	bjv	02/23/23	jma		
Lithium	<0.0025	mg/L	0.0025	1	02/17/23	bjv	02/23/23	jma	N	
Magnesium	**2.4**	**mg/L**	**0.10**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**0.74**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**14**	**mg/L**	**0.12**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	**0.00076**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Arsenic	**0.0018**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.024**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	**0.0014**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Chromium	**0.00046**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	02/17/23	bjv	02/22/23	acs		
Copper	**0.0010**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Molybdenum	**0.0067**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0035**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	**0.0023**	**mg/L**	**0.00050**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0095**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-14 Matrix: Ground Water Date Collected: 02/07/23 14:40
Sample ID: MW-12 Date Received: 02/07/23 15:53

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132325										
Fluoride	**0.23**	**mg/L**	**0.10**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Chloride	**27**	**mg/L**	**0.75**	**5**	**02/08/23**	**jh**	**02/09/23**	**jh**		
Sulfate as SO4	**180**	**mg/L**	**15**	**25**	**02/08/23**	**jh**	**02/10/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132352										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**52**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/08/23	aeo	02/09/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**52**	**mg/L**	**5.0**	**1**	**02/08/23**	**aeo**	**02/09/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**340**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132344										
Total Suspended Solids	<4.0	mg/L	4.0	1	02/08/23	drm	02/08/23	drm		
Analysis Method: SM 4500-H+ B-11										
Batch: T132517										
pH	**7.76**	**pH Units**		**1**	**02/07/23**	**kb**	**02/07/23**	**sb**	**pHq, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-15 Matrix: Ground Water Date Collected: 02/08/23 08:55
Sample ID: MW-32 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**3.0**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**190**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**18**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.12**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**35**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**12**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**29**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Barium	**0.57**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.00057**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	02/17/23	bjv	02/22/23	acs		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Molybdenum	**0.0038**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0026**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-15 Matrix: Ground Water Date Collected: 02/08/23 08:55
Sample ID: MW-32 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**50**	**mg/L**	**0.75**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	**54**	**mg/L**	**30**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132562										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**500**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/14/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**500**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132425										
Total Dissolved Solids	**730**	**mg/L**	**20**	**2**	**02/09/23**	**jlh**	**02/09/23**	**jlh**		
Analysis Method: SM 2540 D-15										
Batch: T132449										
Total Suspended Solids	**39**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**6.83**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**511, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-16 Matrix: Ground Water Date Collected: 02/08/23 09:55
Sample ID: MW-19 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL									
Analysis Method: EPA 7470A									
Batch: T132424									
Mercury	<0.00020 mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL									
Analysis Method: EPA 200.7 Rev. 4.4									
Batch: T132721									
Boron	**2.2 mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**550 mg/L**	**6.4**	**25**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**16 mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.099 mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**45 mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**16 mg/L**	**2.5**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**44 mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4									
Batch: T132721									
Antimony	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	**0.0055 mg/L**	**0.0028**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.047 mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Cadmium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Cobalt	<0.0026 mg/L	0.0026	5	02/17/23	bjv	02/22/23	acs		
Copper	<0.0012 mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Lead	<0.0028 mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	**0.0095 mg/L**	**0.0062**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**	**402.5**	
Nickel	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs	402.5	
Selenium	<0.0025 mg/L	0.0025	5	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025 mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019 mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		
Zinc	<0.0062 mg/L	0.0062	5	02/17/23	bjv	02/22/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-16 Matrix: Ground Water Date Collected: 02/08/23 09:55
Sample ID: MW-19 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**1.9**	**mg/L**	**0.10**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**66**	**mg/L**	**0.75**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	**600**	**mg/L**	**30**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132562										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**310**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/14/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**310**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132660										
Total Dissolved Solids	**2200**	**mg/L**	**40**	**4**	**02/15/23**	**ljs**	**02/15/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T132449										
Total Suspended Solids	**16**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**7.09**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**511, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-17 Matrix: Ground Water Date Collected: 02/08/23 11:25
Sample ID: MW-18 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**2.3**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**380**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**6.8**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.029**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**33**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**11**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**21**	**mg/L**	**0.12**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	**0.023**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.015**	**mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cobalt	**0.0048**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	**0.00043**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	<0.0028	mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	**0.011**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0094**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.00025	mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.060**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-17 Matrix: Ground Water Date Collected: 02/08/23 11:25
Sample ID: MW-18 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**3.5**	**mg/L**	**0.10**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**22**	**mg/L**	**0.75**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	**480**	**mg/L**	**30**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132562										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**100**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/14/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**100**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132516										
Total Dissolved Solids	**1600**	**mg/L**	**10**	**1**	**02/13/23**	**ljs**	**02/13/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T132450										
Total Suspended Solids	**13**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**7.03**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**511, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-18 Matrix: Ground Water Date Collected: 02/08/23 13:05
Sample ID: MW-33 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**0.086**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**170**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**2.8**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.0043**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**18**	**mg/L**	**0.10**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**4.6**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**24**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	**0.00079**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.092**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.0029**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00082**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	**0.016**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	02/17/23	bjv	02/22/23	acs		
Molybdenum	**0.0031**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.017**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	**0.00055**	**mg/L**	**0.00050**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0050**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-18 Matrix: Ground Water Date Collected: 02/08/23 13:05
Sample ID: MW-33 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**0.21**	**mg/L**	**0.10**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**50**	**mg/L**	**0.75**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	**65**	**mg/L**	**3.0**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132562										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**400**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/14/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**400**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132516										
Total Dissolved Solids	**680**	**mg/L**	**10**	**1**	**02/13/23**	**ljs**	**02/13/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T132450										
Total Suspended Solids	**10**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**6.99**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-19 Matrix: Ground Water Date Collected: 02/08/23 14:45
Sample ID: MW-01R Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**73**	**mg/L**	**0.088**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**290**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**0.55**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**1.6**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**110**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**50**	**mg/L**	**2.5**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**250**	**mg/L**	**3.1**	**25**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.25**	**mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.0016**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Lead	<0.0028	mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Nickel	**0.0016**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	**0.00058**	**mg/L**	**0.00050**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Silver	<0.00025	mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0012**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-19 Matrix: Ground Water Date Collected: 02/08/23 14:45
Sample ID: MW-01R Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**9.5**	**mg/L**	**0.10**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**52**	**mg/L**	**7.5**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	**350**	**mg/L**	**30**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132562										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**870**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/14/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**870**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132660										
Total Dissolved Solids	**2200**	**mg/L**	**40**	**4**	**02/15/23**	**ljs**	**02/15/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T132450										
Total Suspended Solids	**5.0**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**7.58**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-20 Matrix: Ground Water Date Collected: 02/08/23 09:30
Sample ID: MW-02 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132424										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132721										
Boron	**100**	**mg/L**	**0.088**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**210**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**24**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**1.5**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**70**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**53**	**mg/L**	**2.5**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**260**	**mg/L**	**3.1**	**25**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132721										
Antimony	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Arsenic	**0.0086**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.55**	**mg/L**	**0.012**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	**0.00042**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cadmium	<0.0012	mg/L	0.0012	5	02/17/23	bjv	02/22/23	acs	402.5	
Chromium	**0.057**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.0080**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	**0.0025**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	**0.0030**	**mg/L**	**0.0028**	**5**	**02/17/23**	**bjv**	**02/22/23**	**acs**	**402.5**	
Molybdenum	**0.011**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.042**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	**0.0012**	**mg/L**	**0.00050**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Silver	<0.00025	mg/L	0.00025	5	02/17/23	bjv	02/22/23	acs	402.5	
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	**0.0035**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Zinc	**0.0033**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-20 Matrix: Ground Water Date Collected: 02/08/23 09:30
Sample ID: MW-02 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**4.5**	**mg/L**	**1.0**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**67**	**mg/L**	**7.5**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	<3.0	mg/L	3.0	5	02/10/23	jh	02/11/23	jh		
Analysis Method: SM 2320 B-11										
Batch: T132630										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1900**	**mg/L**	**5.0**	**1**	**02/15/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/15/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**1900**	**mg/L**	**5.0**	**1**	**02/15/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132516										
Total Dissolved Solids	**1900**	**mg/L**	**20**	**2**	**02/13/23**	**ljs**	**02/13/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T132450										
Total Suspended Solids	**58**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**7.09**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**511, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-21 Matrix: Ground Water Date Collected: 02/08/23 10:40
Sample ID: MW-11 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132581										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132722										
Boron	**4.8**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**300**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**4.9**	**mg/L**	**0.050**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.052**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**63**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**11**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**37**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132722										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.59**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.0010**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.00061**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	**0.00047**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	<0.0028	mg/L	0.0028	5	02/17/23	bjv	02/22/23	acs	402.5	
Molybdenum	**0.0015**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.0019	mg/L	0.0019	5	02/17/23	bjv	02/22/23	acs	402.5	
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0085**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-21 Matrix: Ground Water Date Collected: 02/08/23 10:40
Sample ID: MW-11 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**0.37**	**mg/L**	**0.10**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**78**	**mg/L**	**0.75**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	**42**	**mg/L**	**30**	**50**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T132562										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**860**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/14/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**860**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132516										
Total Dissolved Solids	**1200**	**mg/L**	**20**	**2**	**02/13/23**	**ljs**	**02/13/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T132450										
Total Suspended Solids	**10**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**7.08**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**511, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-22 Matrix: Ground Water Date Collected: 02/08/23 14:20
Sample ID: MW-34 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T132581										
Mercury	<0.00020	mg/L	0.00020	1	02/20/23	bjv	02/21/23	jma	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T132722										
Boron	**1.9**	**mg/L**	**0.0088**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Calcium	**220**	**mg/L**	**2.6**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Iron	**83**	**mg/L**	**0.50**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Lithium	**0.053**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**	**N**	
Magnesium	**22**	**mg/L**	**0.10**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Potassium	**9.5**	**mg/L**	**0.25**	**1**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Sodium	**28**	**mg/L**	**1.2**	**10**	**02/17/23**	**bjv**	**02/23/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T132722										
Antimony	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Arsenic	**0.00088**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Barium	**0.58**	**mg/L**	**0.0025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	02/17/23	bjv	02/22/23	acs		
Chromium	**0.025**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Copper	**0.00033**	**mg/L**	**0.00025**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Lead	**0.00059**	**mg/L**	**0.00055**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Molybdenum	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	02/17/23	bjv	02/22/23	acs		
Silver	<0.000050	mg/L	0.000050	1	02/17/23	bjv	02/22/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	02/17/23	bjv	02/22/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	02/17/23	bjv	02/22/23	acs		
Zinc	**0.0023**	**mg/L**	**0.0012**	**1**	**02/17/23**	**bjv**	**02/22/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23B0260-22 Matrix: Ground Water Date Collected: 02/08/23 14:20
Sample ID: MW-34 Date Received: 02/08/23 15:47

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T132475										
Fluoride	**0.23**	**mg/L**	**0.10**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Chloride	**24**	**mg/L**	**0.75**	**5**	**02/10/23**	**jh**	**02/11/23**	**jh**		
Sulfate as SO4	<3.0	mg/L	3.0	5	02/10/23	jh	02/11/23	jh		
Analysis Method: SM 2320 B-11										
Batch: T132562										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**920**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	02/14/23	aeo	02/16/23	aeo	N	
Total Alkalinity as CaCO3 at pH 4.5	**920**	**mg/L**	**5.0**	**1**	**02/14/23**	**aeo**	**02/16/23**	**aeo**		
Analysis Method: SM 2540 C-15										
Batch: T132516										
Total Dissolved Solids	**800**	**mg/L**	**20**	**2**	**02/13/23**	**ljs**	**02/13/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T132450										
Total Suspended Solids	**83**	**mg/L**	**4.0**	**1**	**02/10/23**	**jlh**	**02/10/23**	**jlh**		
Analysis Method: SM 4500-H+ B-11										
Batch: T132532										
pH	**6.53**	**pH Units**		**1**	**02/08/23**	**bsv**	**02/09/23**	**bsv**	**N**	

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QUALITY CONTROL RESULTS

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132424
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T132424-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T132424-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00198	99	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T132424-MSD1

Original: **23B0260-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00191	0.00198	95	99	76-123	4	20	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132581
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T132581-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T132581-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00210	105	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T132581-MSD1

Original: **23B0260-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00198	0.00202	99	101	76-123	2	20	

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Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132721
QC Batch Method: EPA 200.2
Analysis Description: Boron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T132721-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.0088	0.0088	
Calcium	mg/L	<0.26	0.26	
Iron	mg/L	<0.050	0.050	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T132721-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.60	100	85-115	
Calcium	mg/L	16.0	17.1	107	85-115	
Iron	mg/L	16.0	15.2	95	85-115	
Potassium	mg/L	16.0	14.1	88	85-115	
Lithium	mg/L	1.60	1.54	96	85-115	
Magnesium	mg/L	16.0	15.3	95	85-115	
Sodium	mg/L	16.0	14.4	90	85-115	

MATRIX SPIKE: T132721-MS1 Original: **23B0260-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	6.06	1.60	7.33	79	70-130	
Calcium	mg/L	297	16.0	313	104	70-130	
Iron	mg/L	19.2	16.0	34.2	94	70-130	
Potassium	mg/L	16.3	16.0	30.3	88	70-130	
Lithium	mg/L	0.326	1.60	1.96	102	70-130	
Magnesium	mg/L	43.9	16.0	56.4	78	70-130	
Sodium	mg/L	26.3	16.0	44.1	111	70-130	

MATRIX SPIKE: T132721-MS2 Original: **23B0260-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	5.89	1.60	7.48	100	70-130	

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MATRIX SPIKE: T132721-MS2 Original: **23B0260-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Calcium	**mg/L**	**283**	**16.0**	317	**215**	**70-130**	**243**
Iron	mg/L	19.7	16.0	35.5	99	70-130	
Potassium	mg/L	15.8	16.0	30.8	94	70-130	
Lithium	mg/L	0.313	1.60	1.97	104	70-130	
Magnesium	mg/L	42.3	16.0	58.2	99	70-130	
Sodium	mg/L	25.4	16.0	45.4	125	70-130	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132722
QC Batch Method: EPA 200.2
Analysis Description: Magnesium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T132722-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	**mg/L**	**0.0141**	**0.0088**	**630**
Calcium	mg/L	<0.26	0.26	
Iron	mg/L	<0.050	0.050	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T132722-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.61	101	85-115	
Calcium	mg/L	16.0	16.9	105	85-115	
Iron	mg/L	16.0	15.0	94	85-115	
Potassium	mg/L	16.0	14.3	90	85-115	
Lithium	mg/L	1.60	1.58	99	85-115	
Magnesium	mg/L	16.0	15.2	95	85-115	
Sodium	mg/L	16.0	15.0	94	85-115	

MATRIX SPIKE: T132722-MS1 Original: **23B0260-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	4.84	1.60	6.41	98	70-130	
Calcium	**mg/L**	**303**	**16.0**	330	**174**	**70-130**	**243**

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MATRIX SPIKE: T132722-MS1 Original: **23B0260-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	4.93	16.0	20.3	96	70-130	
Potassium	mg/L	10.6	16.0	26.2	98	70-130	
Lithium	mg/L	0.0518	1.60	1.74	106	70-130	
Magnesium	mg/L	63.5	16.0	77.5	87	70-130	
Sodium	mg/L	37.4	16.0	52.9	97	70-130	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132721
QC Batch Method: EPA 200.2
Analysis Description: Thallium, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T132721-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Copper	mg/L	<0.00050	0.00050	
Molybdenum	mg/L	<0.0012	0.0012	
Nickel	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T132721-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0509	102	85-115	
Arsenic	mg/L	0.100	0.101	101	85-115	
Barium	mg/L	1.60	1.68	105	85-115	
Beryllium	mg/L	0.200	0.194	97	85-115	
Cadmium	mg/L	0.0500	0.0453	91	85-115	

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LABORATORY CONTROL SAMPLE: T132721-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Cobalt	mg/L	1.60	1.62	101	85-115	
Chromium	mg/L	0.0500	0.0506	101	85-115	
Copper	mg/L	1.60	1.56	97	85-115	
Molybdenum	mg/L	1.60	1.63	102	85-115	
Nickel	mg/L	1.60	1.64	103	85-115	
Lead	mg/L	0.100	0.101	101	85-115	
Antimony	mg/L	0.100	0.0982	98	85-115	
Selenium	mg/L	0.100	0.0987	99	85-115	
Thallium	mg/L	0.100	0.0985	99	85-115	
Vanadium	mg/L	1.60	1.69	106	85-115	
Zinc	mg/L	1.60	1.67	105	85-115	

MATRIX SPIKE: T132721-MS1 Original: **23B0260-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0498	100	70-130	
Arsenic	mg/L	0.00231	0.100	0.105	103	70-130	
Barium	mg/L	0.360	1.60	2.14	111	70-130	
Beryllium	mg/L	0	0.200	0.206	103	70-130	
Cadmium	mg/L	0	0.0500	0.0439	88	70-130	
Cobalt	mg/L	0.000582	1.60	1.67	104	70-130	
Chromium	mg/L	0.00316	0.0500	0.0588	111	70-130	
Copper	mg/L	0	1.60	1.51	94	70-130	
Molybdenum	mg/L	0.0293	1.60	1.74	107	70-130	
Nickel	mg/L	0	1.60	1.64	102	70-130	
Lead	mg/L	0	0.100	0.0951	95	70-130	
Antimony	mg/L	0.000229	0.100	0.103	103	70-130	
Selenium	mg/L	0	0.100	0.0953	95	70-130	
Thallium	mg/L	0	0.100	0.0949	95	70-130	
Vanadium	mg/L	0	1.60	1.95	122	70-130	
Zinc	mg/L	0	1.60	1.53	96	70-130	

MATRIX SPIKE: T132721-MS2 Original: **23B0260-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0495	99	70-130	
Arsenic	mg/L	0.00227	0.100	0.105	103	70-130	
Barium	mg/L	0.352	1.60	2.18	114	70-130	

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MATRIX SPIKE: T132721-MS2 Original: **23B0260-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Beryllium	mg/L	0	0.200	0.202	101	70-130	
Cadmium	mg/L	0	0.0500	0.0439	88	70-130	
Cobalt	mg/L	0.000621	1.60	1.68	105	70-130	
Chromium	mg/L	0.00307	0.0500	0.0593	112	70-130	
Copper	mg/L	0	1.60	1.52	95	70-130	
Molybdenum	mg/L	0.0292	1.60	1.76	108	70-130	
Nickel	mg/L	0	1.60	1.65	103	70-130	
Lead	mg/L	0	0.100	0.0948	95	70-130	
Antimony	mg/L	0	0.100	0.103	103	70-130	
Selenium	mg/L	0	0.100	0.0949	95	70-130	
Thallium	mg/L	0	0.100	0.0946	95	70-130	
Vanadium	mg/L	0	1.60	1.98	123	70-130	
Zinc	mg/L	0	1.60	1.54	96	70-130	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132722
QC Batch Method: EPA 200.2
Analysis Description: Silver, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T132722-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Copper	mg/L	<0.00050	0.00050	
Molybdenum	mg/L	<0.0012	0.0012	
Nickel	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

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LABORATORY CONTROL SAMPLE: T132722-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0485	97	85-115	
Arsenic	mg/L	0.100	0.0979	98	85-115	
Barium	mg/L	1.60	1.73	108	85-115	
Beryllium	mg/L	0.200	0.182	91	85-115	
Cadmium	mg/L	0.0500	0.0424	85	85-115	
Cobalt	mg/L	1.60	1.57	98	85-115	
Chromium	mg/L	0.0500	0.0493	99	85-115	
Copper	mg/L	1.60	1.50	94	85-115	
Molybdenum	mg/L	1.60	1.54	96	85-115	
Nickel	mg/L	1.60	1.60	100	85-115	
Lead	mg/L	0.100	0.0921	92	85-115	
Antimony	mg/L	0.100	0.100	100	85-115	
Selenium	mg/L	0.100	0.0976	98	85-115	
Thallium	mg/L	0.100	0.0907	91	85-115	
Vanadium	mg/L	1.60	1.70	106	85-115	
Zinc	mg/L	1.60	1.57	98	85-115	

MATRIX SPIKE: T132722-MS1 Original: **23B0260-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0492	98	70-130	
Arsenic	mg/L	0.00162	0.100	0.106	104	70-130	
Barium	mg/L	0.590	1.60	2.49	119	70-130	
Beryllium	mg/L	0	0.200	0.203	101	70-130	
Cadmium	mg/L	0	0.0500	0.0443	89	70-130	
Cobalt	mg/L	0.000606	1.60	1.69	105	70-130	
Chromium	mg/L	0.00105	0.0500	0.0593	116	70-130	
Copper	mg/L	0	1.60	1.51	94	70-130	
Molybdenum	mg/L	0	1.60	1.70	107	70-130	
Nickel	mg/L	0	1.60	1.64	103	70-130	
Lead	mg/L	0.00175	0.100	0.0923	91	70-130	
Antimony	mg/L	0	0.100	0.107	107	70-130	
Selenium	mg/L	0	0.100	0.0958	96	70-130	
Thallium	mg/L	0	0.100	0.0900	90	70-130	
Vanadium	**mg/L**	**0**	**1.60**	2.09	**131**	**70-130**	**242**
Zinc	mg/L	0.00845	1.60	1.53	95	70-130	

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Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132325
QC Batch Method: IC Prep W
Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T132325-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T132325-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	4.82	96	90-110	
Fluoride	mg/L	1.00	0.988	99	90-110	
Sulfate as SO4	mg/L	5.00	4.91	98	90-110	

MATRIX SPIKE: T132325-MS2 Original: **23B0260-06**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	14.3	25.0	40.9	106	80-120	
Fluoride	mg/L	0.124	5.00	5.10	100	80-120	
Sulfate as SO4	mg/L	32.6	25.0	60.7	113	80-120	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132475
QC Batch Method: IC Prep W
Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T132475-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T132475-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	<10	97	90-110	

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LABORATORY CONTROL SAMPLE: T132475-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Fluoride	mg/L	1.00	0.990	99	90-110	
Sulfate as SO4	mg/L	5.00	4.92	98	90-110	

MATRIX SPIKE: T132475-MS1 Original: **23B0260-18**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	49.9	25.0	77.5	110	80-120	
Fluoride	**mg/L**	**0.210**	**5.00**	6.83	**133**	**80-120**	**240**
Sulfate as SO4	mg/L	65.1	25.0	92.4	109	80-120	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132545
QC Batch Method: IC Prep W
Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T132545-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T132545-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Sulfate as SO4	mg/L	5.00	5.29	106	90-110	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132352
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T132352-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	102	102	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	102	102	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	102	102	88-112	

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SAMPLE DUPLICATE: T132352-DUP1 Original: **23B0260-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	746	740	0.8	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<5.0		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	746	740	0.8	20	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132562
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Carbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T132562-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	95.6	96	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	95.6	96	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	95.6	96	88-112	

SAMPLE DUPLICATE: T132562-DUP1 Original: **23B0260-17**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	101	102	0.3	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	101	102	0.3	20	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132630
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Carbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T132630-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	107	107	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	107	107	88-112	

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LABORATORY CONTROL SAMPLE: T132630-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	107	107	88-112	

SAMPLE DUPLICATE: T132630-DUP1 Original: **23B0260-11**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	1040	1050	1	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	1040	1050	1	20	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132425
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T132425-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T132425-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	522	104	80-120	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132516
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T132516-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T132516-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes

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2241 Black Creek Road
Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

LABORATORY CONTROL SAMPLE: T132516-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	491	98	80-120	

LABORATORY CONTROL SAMPLE: T132516-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	499	100	80-120	

LABORATORY CONTROL SAMPLE: T132516-BS3

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	504	101	80-120	

LABORATORY CONTROL SAMPLE: T132516-BS4

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	509	102	80-120	

SAMPLE DUPLICATE: T132516-DUP1 Original: **23B0260-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	1190	1220	3	10	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132660
QC Batch Method: SM 2540 C-15

Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T132660-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T132660-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	498	100	80-120	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T132344
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T132344-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T132344-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	97.0	97	85-115	

SAMPLE DUPLICATE: T132344-DUP1 Original: **23B0260-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Suspended Solids	mg/L	52.0	53.0	2	10	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132449
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T132449-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T132449-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	96.0	96	85-115	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132450
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T132450-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

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LABORATORY CONTROL SAMPLE: T132450-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	103	103	85-115	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132517
QC Batch Method: *** DEFAULT PREP ***
Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T132517-DUP2 Original: **23B0260-07**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.02**	**7.02**	**0**	**20**	**pHv**

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132532
QC Batch Method: *** DEFAULT PREP ***
Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T132532-DUP1 Original: **23B0260-15** **pHc**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	pH Units	6.83	6.85	0.3	20	

Trace Project ID: 23B0260
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T132592
QC Batch Method: *** DEFAULT PREP ***
Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T132592-DUP1 Original: **23B0260-05** **pHa**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	pH Units	7.24	7.24	0	20	

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Phone 231.773.5998
Fax 888.979.4469
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Trace ID No. 23B0260

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: SB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	See attached list.	Remarks/Notes	Possible Health Hazards?
1	2/6/23	1440	MW-09	N	GW	6	6		5						1	X	X	X	X	X		
2	2/6/23	1440	MWT-09	N	GW	6	6		5						1	X	X	X	X	X		
3	2/6/23	1635	MW-30	N	GW	6	6		5						1	X	X	X	X	X		
4	2/6/23	1635	MWT-30	N	GW	6	6		5						1	X	X	X	X	X		
5	2/7/23	900	MW-20	N	GW	6	6		5						1	X	X	X	X	X		
6	2/7/23	1000	MW-07	N	GW	6	6		5						1	X	X	X	X	X		
7	2/7/23	1115	MW-08	N	GW	6	6		5						1	X	X	X	X	X		
8	2/7/23	1235	MW-31	N	GW	6	6		5						1	X	X	X	X	X		
9	2/7/23	1420	MW-27	N	GW	6	6		5						1	X	X	X	X	X		
																					AB	

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	2/7/23	15:21	2) [signature]	[signature]	2/7/23	15:54
	3)				4)			

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Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23B0260

Report Results To:

Company Name:	HDR, Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	
Cell Phone:	734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	
City, State, Zip Code:	
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By:	BV
Checked By:	SB
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Analysis Requested

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	See attached list.	Remarks/Notes	Possible Health Hazards?
10	2/6/23	15:30	MW-10	N	GW	6	6		5						1	X	X	X	X	X		
11	2/6/23	17:10	MW-06	N	GW	6	6		5						1	X	X	X	X	X		
12	2/7/23	09:40	MW-04	N	GW	6	6		5						1	X	X	X	X	X		
13	2/7/23	11:10	MW-03	N	GW	6	6		5						1	X	X	X	X	X		
	2/7/23	14:40	MW-12	N	GW	6	6		5						1	X	X	X	X	X		
																					KT	

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1)		2/7/23	15:54	2)			
	3)				4)			

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Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. ~~23B0370~~ BV 2/9/23

Trace Use: 23B0260

Report Results To:		Bill To:
Company Name: HDR, Inc.		PO #: 10337505.006
Report To: Molly Reeves		Contact Name: Lara Zawaideh
Mailing Address: 1000 Oakbrook Drive, Suite 200		Billing Address (if different):
City, State, Zip Code: Ann Arbor, MI 48104		City, State, Zip Code:
Office Phone:	Cell Phone: 734.263.7138	Phone Number: 734.223.9074
Email Address: molly.reeves@hdrinc.com		Billing Email Address: lara.zawaideh@hdrinc.com

Logged By:	BV
Checked By:	NC
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	See attached list.							Remarks/Notes	Possible Health Hazards?
15	2/8/23	0855	MW-32	N	GW	6	6		5						1	X	X	X	X	X								
16	2/8/23	0955	MW-19	N	GW	6	6		5						1	X	X	X	X	X								
17	2/8/23	1125	MW-18	N	GW	6	6		5						1	X	X	X	X	X								
18	2/8/23	1305	MW-33	N	GW	6	6		5						1	X	X	X	X	X								
19	2/8/23	1445	MW-01R	N	GW	6	6		5						1	X	X	X	X	X								

AB

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	[signature]	2/8/23	15:47	2)			
	3)				4)			

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Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23B0260

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: NC
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above ↑	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	See attached list.							Remarks/Notes	Possible Health Hazards?
20	2/8/23	9:30	MW-02	N	GW	6	6		5						1	X	X	X	X	X								
21	2/8/23	10:40	MW-11	N	GW	6	6		5						1	X	X	X	X	X								
22	2/8/23	14:20	MW-34	N	GW	6	6		5						1	X	X	X	X	X								
																											KT	

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Kim Turk	Ann J Bu	2/8/23	1521	2) Ann J Bu	[illegible]	2/8/23	15:47
	3)				4)			

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888-979-4469 Fax
www.trace-labs.com

23B0260
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 2/7/23									
Time: 16:49									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	2.8	2.8		✓					
Representative Sample Temp °C	6.2	6.2		✓					✓

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☑	☐	☐	Samples preserved at Trace Nitric added @ 16:52 to Sample MW-27 2/7/23 @ 1420
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☐	☐	All bottle labels agree with COC
☐	☐	COC filled out properly
☐	☐	COC signed by client

Notes:

Cooler Contains monitoring well 12 Samples and Monitoring well 27 Samples

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Effective 2/6/23

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Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23B0260
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 2/7/23									
Time: 16:49									
Logged by: SB									
Package Description: cooler									
Package Temp °C	3.0	3.0		✓					
Representative Sample Temp °C	6.2	6.2		✓					✓

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☒ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

2/7/23SB

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☑ ☐ ☐ Samples preserved at Trace HNO3 added 2/7/23 @ 16:51 to MW-3
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes:

This cooler contained MW-31, MW-4, MW-3, MW-8

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Effective 2/6/23

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2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23B0260
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 2/7/23									
Time: 16:53									
Logged by: DH									
Package Description: Cooler									
Package Temp °C	-0.6	-0.6		✓					
Representative Sample Temp °C	1.3	1.3		✓					✓

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
			Samples preserved at Trace _____
			Chemical preservation verified, check EMD pH test strip used (if applicable)
			☐ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
		✓	Air bubbles absent from VOAs _____

Chain of Custody (COC)

Yes	No	
		All bottle labels agree with COC
		COC filled out properly
		COC signed by client

Notes:

Contains MW-9, MWT-9, MW-30, MWT-30

Form 70-A.46
Effective 2/6/23

TRACE Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS

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HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 2/7/23									
Time: 16:54									
Logged by: SB									
Package Description: cooler									
Package Temp °C	0.2	0.2		✓	✓				
Representative Sample Temp °C	2.6	2.6		✓					✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [ ] [x] [ ] Samples preserved at Trace
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC291593) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [ ] [ ] All bottle labels agree with COC
- [ ] [ ] COC filled out properly
- [ ] [ ] COC signed by client

Notes:
This cooler contains MW-10, MW-6, MW-20, MW-7

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Effective 2/6/23

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23B0260
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 2/9/23									
Time: 11:12									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	5.6	5.6		✓					
Representative Sample Temp °C	7.5	7.5		✓					✓

Sample Receipt

Yes	No	
	✓	Received on ice or other coolant
	✓	Ice still present upon receipt
	✓	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
	✓		Samples preserved at Trace
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
		✓	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

MW-32
MW-19
MW-33
MW-18

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23B0260
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 2/9/23									
Time: 11:15									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	7.9	7.9		✓					
Representative Sample Temp °C	7.5	7.5		✓					✓

Sample Receipt

Yes	No	
	✓	Received on ice or other coolant
	✓	Ice still present upon receipt
	✓	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
✓			Samples preserved at Trace HNO3 added 2/9/23 @ 11:15
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

MW-01R
MW-02
MW-34
MW-11

Form 70-A.46
Effective 2/6/23

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ANALYTICAL REPORT

PREPARED FOR

Attn: Jon Mink
Trace Analytical Laboratories
2241 Black Creek Road
Muskegon MI 49444

Generated 3/17/2023 5:57 PM

JOB DESCRIPTION

23B0271

JOB NUMBER

810-53631-1

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend IN 46617

See page two for job notes and contact information.

my EOL

Eurofins Eaton Analytical South Bend

Job Notes

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Eaton Analytical, LLC Project Manager.

Authorization

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Authorized for release by
Karen Fullmer, Project Manager
Karen.Fullmer@et.eurofinsus.com
574 233-4777

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Qualifiers

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job Narrative
810-53631-1

Receipt
The samples were received on 2/16/2023 4:00 PM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice.

Gas Flow Proportional Counter
Method 903.0: Radium-226 Prep Batch 160-601054The following samples were prepared at a reduced aliquot due to Matrix: MW-09 (810-53631-1), MWT-09 (810-53631-2), MW-30 (810-53631-3), MWT-30 (810-53631-4), MW-07 (810-53631-6), MW-08 (810-53631-7), MW-27 (810-53631-9), MW-10 (810-53631-10), MW-06 (810-53631-11), MW-04 (810-53631-12), MW-03 (810-53631-13), MW-33 (810-53631-18) and MW-01R (810-53631-19). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method 903.0: Radium-226 Prep Batch 160-601054Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-20 (810-53631-5), MW-31 (810-53631-8), MW-12 (810-53631-14), MW-32 (810-53631-15), MW-19 (810-53631-16) and MW-18 (810-53631-17). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method 903.0: Radium-226 Prep Batch 160-601083The following samples were prepared at a reduced aliquot due to Matrix: MW-02 (810-53631-20), MW-11 (810-53631-21) and MW-34 (810-53631-22). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method 903.0: Radium-226 batch 601054Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-09 (810-53631-1), MWT-09 (810-53631-2), MW-30 (810-53631-3), MWT-30 (810-53631-4), MW-20 (810-53631-5), MW-07 (810-53631-6), MW-08 (810-53631-7), MW-31 (810-53631-8), MW-27 (810-53631-9), MW-10 (810-53631-10), MW-06 (810-53631-11), MW-04 (810-53631-12), MW-03 (810-53631-13), MW-12 (810-53631-14), MW-32 (810-53631-15), MW-19 (810-53631-16), MW-18 (810-53631-17), MW-33 (810-53631-18), MW-01R (810-53631-19), (LCS 160-601054/2-A), (LCSD 160-601054/3-A) and (MB 160-601054/1-A)

Method 903.0: Radium-226 batch 601083Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-02 (810-53631-20), MW-11 (810-53631-21), MW-34 (810-53631-22), (LCS 160-601083/2-A), (LCSD 160-601083/3-A) and (MB 160-601083/1-A)

Method 904.0: Radium-228 Prep Batch 160-601055The following samples were prepared at a reduced aliquot due to Matrix: MW-09 (810-53631-1), MWT-09 (810-53631-2), MW-30 (810-53631-3), MWT-30 (810-53631-4), MW-07 (810-53631-6), MW-08 (810-53631-7), MW-27 (810-53631-9), MW-10 (810-53631-10), MW-06 (810-53631-11), MW-04 (810-53631-12), MW-03 (810-53631-13), MW-33 (810-53631-18) and MW-01R (810-53631-19). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method 904.0: Radium-228 Prep Batch 160-601055Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-20 (810-53631-5), MW-31 (810-53631-8), MW-12 (810-53631-14), MW-32 (810-53631-15), MW-19 (810-53631-16) and MW-18 (810-53631-17). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method 904.0: Radium-228 Prep Batch 160-601084The following samples were prepared at a reduced aliquot due to Matrix: MW-02 (810-53631-20), MW-11 (810-53631-21) and MW-34 (810-53631-22). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method 904.0: Radium-228 prep batch 160-601055:Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-09 (810-53631-1), MWT-09 (810-53631-2), MW-30 (810-53631-3), MWT-30 (810-53631-4), MW-20 (810-53631-5), MW-07 (810-53631-6), MW-08 (810-53631-7), MW-31 (810-53631-8), MW-27 (810-53631-9), MW-10 (810-53631-10), MW-06 (810-53631-11), MW-04 (810-53631-12), MW-03 (810-53631-13), MW-12 (810-53631-14), MW-32 (810-53631-15), MW-19 (810-53631-16), MW-18 (810-53631-17), MW-33 (810-53631-18), MW-01R (810-53631-19), (LCS 160-601055/2-A), (LCSD 160-601055/3-A) and (MB 160-601055/1-A)

Method 904.0: Radium-228 prep batch 160-601084:Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-02 (810-53631-20), MW-11 (810-53631-21), MW-34 (810-53631-22), (LCS 160-601084/2-A), (LCSD 160-601084/3-A) and (MB 160-601084/1-A)

Method 904.0: Radium-228 prep batch 160-601804:The following sample(s) did not meet the requested limit (RL) due to the reduced sample volume attributed to the presence of matrix interference. During preparation the analyst visually noted matrix effects. The data have been reported with this narrative. MW-02 (810-53631-20)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Rad

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-09 — Lab Sample ID: 810-53631-1

No Detections.

Client Sample ID: MWT-09 — Lab Sample ID: 810-53631-2

No Detections.

Client Sample ID: MW-30 — Lab Sample ID: 810-53631-3

No Detections.

Client Sample ID: MWT-30 — Lab Sample ID: 810-53631-4

No Detections.

Client Sample ID: MW-20 — Lab Sample ID: 810-53631-5

No Detections.

Client Sample ID: MW-07 — Lab Sample ID: 810-53631-6

No Detections.

Client Sample ID: MW-08 — Lab Sample ID: 810-53631-7

No Detections.

Client Sample ID: MW-31 — Lab Sample ID: 810-53631-8

No Detections.

Client Sample ID: MW-27 — Lab Sample ID: 810-53631-9

No Detections.

Client Sample ID: MW-10 — Lab Sample ID: 810-53631-10

No Detections.

Client Sample ID: MW-06 — Lab Sample ID: 810-53631-11

No Detections.

Client Sample ID: MW-04 — Lab Sample ID: 810-53631-12

No Detections.

Client Sample ID: MW-03 — Lab Sample ID: 810-53631-13

No Detections.

Client Sample ID: MW-12 — Lab Sample ID: 810-53631-14

No Detections.

Client Sample ID: MW-32 — Lab Sample ID: 810-53631-15

No Detections.

Client Sample ID: MW-19 — Lab Sample ID: 810-53631-16

No Detections.

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Trace Analytical Laboratories
Job ID: 810-53631-1
Project/Site: 23B0271

Client Sample ID: MW-18 — Lab Sample ID: 810-53631-17

No Detections.

Client Sample ID: MW-33 — Lab Sample ID: 810-53631-18

No Detections.

Client Sample ID: MW-01R — Lab Sample ID: 810-53631-19

No Detections.

Client Sample ID: MW-02 — Lab Sample ID: 810-53631-20

No Detections.

Client Sample ID: MW-11 — Lab Sample ID: 810-53631-21

No Detections.

Client Sample ID: MW-34 — Lab Sample ID: 810-53631-22

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-09

Lab Sample ID: 810-53631-1

Date Collected: 02/06/23 14:40

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.00353	U	0.0586	0.0586	1.00	0.125	pCi/L	02/21/23 09:39	03/15/23 09:27	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:27*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.293	U	0.384	0.385	1.00	0.642	pCi/L	02/21/23 09:56	02/27/23 12:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*
Y Carrier	*86.4*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.293	U	0.388	0.389	5.00	0.642	pCi/L		03/15/23 16:55	1

Client Sample ID: MWT-09

Lab Sample ID: 810-53631-2

Date Collected: 02/06/23 14:40

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.00260	U	0.0574	0.0574	1.00	0.119	pCi/L	02/21/23 09:39	03/15/23 09:27	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.3*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:27*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.134	U	0.348	0.349	1.00	0.620	pCi/L	02/21/23 09:56	02/27/23 12:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.3*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*
Y Carrier	*87.5*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.136	U	0.353	0.354	5.00	0.620	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-30

Lab Sample ID: 810-53631-3

Date Collected: 02/06/23 16:35

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0250	U	0.0505	0.0505	1.00	0.0915	pCi/L	02/21/23 09:39	03/15/23 09:27	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.1*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:27*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.345	U	0.381	0.383	1.00	0.624	pCi/L	02/21/23 09:56	02/27/23 12:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.1*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*
Y Carrier	*82.2*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.370	U	0.384	0.386	5.00	0.624	pCi/L		03/15/23 16:55	1

Client Sample ID: MWT-30

Lab Sample ID: 810-53631-4

Date Collected: 02/06/23 16:35

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.101	U	0.0741	0.0747	1.00	0.108	pCi/L	02/21/23 09:39	03/15/23 09:33	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.9*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:33*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.666**		0.367	0.372	1.00	0.513	pCi/L	02/21/23 09:56	02/27/23 12:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.9*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*
Y Carrier	*83.0*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.767**		0.374	0.379	5.00	0.513	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-20

Lab Sample ID: 810-53631-5

Date Collected: 02/07/23 09:00

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.134**		0.0781	0.0791	1.00	0.105	pCi/L	02/21/23 09:39	03/15/23 09:33	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:33*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.324	U	0.313	0.314	1.00	0.499	pCi/L	02/21/23 09:56	02/27/23 12:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*
Y Carrier	*83.7*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.458	U	0.323	0.324	5.00	0.499	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-07

Lab Sample ID: 810-53631-6

Date Collected: 02/07/23 10:00

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.333**		0.131	0.135	1.00	0.151	pCi/L	02/21/23 09:39	03/15/23 09:33	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.3*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:33*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.693**		0.431	0.435	1.00	0.616	pCi/L	02/21/23 09:56	02/27/23 12:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.3*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*
Y Carrier	*84.5*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:17*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.03**		0.450	0.455	5.00	0.616	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-08

Lab Sample ID: 810-53631-7

Date Collected: 02/07/23 11:15

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.286**		0.125	0.127	1.00	0.142	pCi/L	02/21/23 09:39	03/15/23 09:33	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.0*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:33*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.498	U	0.517	0.519	1.00	0.836	pCi/L	02/21/23 09:56	02/27/23 12:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*80.0*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*
Y Carrier	*84.9*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.784	U	0.532	0.534	5.00	0.836	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-31

Lab Sample ID: 810-53631-8

Date Collected: 02/07/23 12:35

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.187**		0.0868	0.0884	1.00	0.105	pCi/L	02/21/23 09:39	03/15/23 09:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.9*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:34*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.530**		0.347	0.350	1.00	0.506	pCi/L	02/21/23 09:56	02/27/23 12:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.9*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*
Y Carrier	*80.7*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.717**		0.358	0.361	5.00	0.506	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-27

Lab Sample ID: 810-53631-9

Date Collected: 02/07/23 14:20

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.103	U	0.0848	0.0853	1.00	0.127	pCi/L	02/21/23 09:39	03/15/23 09:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.1*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:34*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.355	U	0.440	0.441	1.00	0.729	pCi/L	02/21/23 09:56	02/27/23 12:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.1*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*
Y Carrier	*82.2*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.458	U	0.448	0.449	5.00	0.729	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-10

Lab Sample ID: 810-53631-10

Date Collected: 02/06/23 15:30

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0533	U	0.0719	0.0721	1.00	0.121	pCi/L	02/21/23 09:39	03/15/23 09:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:34*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.31**		0.576	0.589	1.00	0.765	pCi/L	02/21/23 09:56	02/27/23 12:18	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*
Y Carrier	*81.1*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:18*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.36**		0.580	0.593	5.00	0.765	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-06

Lab Sample ID: 810-53631-11

Date Collected: 02/06/23 17:10

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.240		0.116	0.118	1.00	0.147	pCi/L	02/21/23 09:39	03/15/23 09:34	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.9		30 - 110	02/21/23 09:39	03/15/23 09:34	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.343	U	0.431	0.432	1.00	0.715	pCi/L	02/21/23 09:56	02/27/23 12:19	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	94.9		30 - 110	02/21/23 09:56	02/27/23 12:19	1
Y Carrier	80.7		30 - 110	02/21/23 09:56	02/27/23 12:19	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.583	U	0.446	0.448	5.00	0.715	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-04

Lab Sample ID: 810-53631-12

Date Collected: 02/07/23 09:40

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.175		0.103	0.105	1.00	0.134	pCi/L	02/21/23 09:39	03/15/23 09:35	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	82.3		30 - 110	02/21/23 09:39	03/15/23 09:35	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.38		0.676	0.687	1.00	0.951	pCi/L	02/21/23 09:56	02/27/23 12:19	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	82.3		30 - 110	02/21/23 09:56	02/27/23 12:19	1
Y Carrier	82.6		30 - 110	02/21/23 09:56	02/27/23 12:19	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.55		0.684	0.695	5.00	0.951	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-03

Lab Sample ID: 810-53631-13

Date Collected: 02/07/23 11:10

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.242**		0.108	0.110	1.00	0.121	pCi/L	02/21/23 09:39	03/15/23 09:35	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:35*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.508	U	0.431	0.434	1.00	0.670	pCi/L	02/21/23 09:56	02/27/23 12:19	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:19*	*1*
Y Carrier	*83.0*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:19*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.750**		0.444	0.448	5.00	0.670	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-12

Lab Sample ID: 810-53631-14

Date Collected: 02/07/23 14:40

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0110	U	0.0277	0.0277	1.00	0.0727	pCi/L	02/21/23 09:39	03/15/23 09:30	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.1*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:30*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.358	U	0.416	0.417	1.00	0.685	pCi/L	02/21/23 09:56	02/27/23 12:19	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.1*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:19*	*1*
Y Carrier	*84.9*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:19*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.358	U	0.417	0.418	5.00	0.685	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-32

Lab Sample ID: 810-53631-15

Date Collected: 02/08/23 08:55

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.152**		0.0731	0.0744	1.00	0.0811	pCi/L	02/21/23 09:39	03/15/23 09:30	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.7*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:30*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.178	U	0.347	0.348	1.00	0.601	pCi/L	02/21/23 09:56	02/27/23 12:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.7*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:21*	*1*
Y Carrier	*75.5*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:21*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.330	U	0.355	0.356	5.00	0.601	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-19

Lab Sample ID: 810-53631-16

Date Collected: 02/08/23 09:55

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.266**		0.0970	0.0999	1.00	0.0994	pCi/L	02/21/23 09:39	03/15/23 09:30	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.6*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:30*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.761**		0.495	0.500	1.00	0.741	pCi/L	02/21/23 09:56	02/27/23 14:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.6*		*30 - 110*	*02/21/23 09:56*	*02/27/23 14:28*	*1*
Y Carrier	*85.2*		*30 - 110*	*02/21/23 09:56*	*02/27/23 14:28*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.03**		0.504	0.510	5.00	0.741	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-18

Lab Sample ID: 810-53631-17

Date Collected: 02/08/23 11:25

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0292	U	0.0474	0.0475	1.00	0.0830	pCi/L	02/21/23 09:39	03/15/23 09:30	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:30*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.185	U	0.234	0.234	1.00	0.501	pCi/L	02/21/23 09:56	02/27/23 12:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:22*	*1*
Y Carrier	*89.0*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:22*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0292	U	0.239	0.239	5.00	0.501	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-33

Lab Sample ID: 810-53631-18

Date Collected: 02/08/23 13:05

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.116	U	0.0881	0.0887	1.00	0.125	pCi/L	02/21/23 09:39	03/15/23 09:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.0*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:28*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.833**		0.510	0.516	1.00	0.744	pCi/L	02/21/23 09:56	02/27/23 12:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.0*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:22*	*1*
Y Carrier	*87.1*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:22*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.949**		0.518	0.524	5.00	0.744	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-01R

Lab Sample ID: 810-53631-19

Date Collected: 02/08/23 14:45

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0796	U	0.0864	0.0867	1.00	0.139	pCi/L	02/21/23 09:39	03/15/23 09:27	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.6*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:27*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.982**		0.497	0.505	1.00	0.689	pCi/L	02/21/23 09:56	02/27/23 12:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.6*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:22*	*1*
Y Carrier	*86.4*		*30 - 110*	*02/21/23 09:56*	*02/27/23 12:22*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.06**		0.504	0.512	5.00	0.689	pCi/L		03/15/23 16:55	1

Client Sample ID: MW-02

Lab Sample ID: 810-53631-20

Date Collected: 02/08/23 09:30

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.642**		0.378	0.382	1.00	0.482	pCi/L	02/21/23 13:53	03/16/23 11:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.7*		*30 - 110*	*02/21/23 13:53*	*03/16/23 11:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.71	U G	2.09	2.10	1.00	3.21	pCi/L	02/21/23 14:30	02/28/23 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*67.7*		*30 - 110*	*02/21/23 14:30*	*02/28/23 12:23*	*1*
Y Carrier	*80.7*		*30 - 110*	*02/21/23 14:30*	*02/28/23 12:23*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**3.35**		2.12	2.13	5.00	3.21	pCi/L		03/17/23 18:43	1

Client Sample ID: MW-11

Lab Sample ID: 810-53631-21

Date Collected: 02/08/23 10:40

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.352**		0.127	0.131	1.00	0.123	pCi/L	02/21/23 13:53	03/16/23 11:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.9*		*30 - 110*	*02/21/23 13:53*	*03/16/23 11:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.417	U	0.546	0.547	1.00	0.910	pCi/L	02/21/23 14:30	02/28/23 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.9*		*30 - 110*	*02/21/23 14:30*	*02/28/23 12:23*	*1*
Y Carrier	*82.6*		*30 - 110*	*02/21/23 14:30*	*02/28/23 12:23*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.769	U	0.561	0.562	5.00	0.910	pCi/L		03/17/23 18:43	1

Client Sample ID: MW-34

Lab Sample ID: 810-53631-22

Date Collected: 02/08/23 14:20

Matrix: Ground Water

Date Received: 02/16/23 16:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.654**		0.159	0.170	1.00	0.122	pCi/L	02/21/23 13:53	03/16/23 11:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.6*		*30 - 110*	*02/21/23 13:53*	*03/16/23 11:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.630	U	0.573	0.576	1.00	0.918	pCi/L	02/21/23 14:30	02/28/23 12:23	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.6*		*30 - 110*	*02/21/23 14:30*	*02/28/23 12:23*	*1*
Y Carrier	*83.7*		*30 - 110*	*02/21/23 14:30*	*02/28/23 12:23*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.28**		0.595	0.601	5.00	0.918	pCi/L		03/17/23 18:43	1

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-09 — Lab Sample ID: 810-53631-1

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.293	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MWT-09 — Lab Sample ID: 810-53631-2

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.136	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-30 — Lab Sample ID: 810-53631-3

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.370	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MWT-30 — Lab Sample ID: 810-53631-4

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.767		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-20 — Lab Sample ID: 810-53631-5

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.458	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-07 — Lab Sample ID: 810-53631-6

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.03		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-08 — Lab Sample ID: 810-53631-7

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.784	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-31 — Lab Sample ID: 810-53631-8

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.717		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-27 — Lab Sample ID: 810-53631-9

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.458	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-10 — Lab Sample ID: 810-53631-10

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.36		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-06 — Lab Sample ID: 810-53631-11

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.583	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-04 — Lab Sample ID: 810-53631-12

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.55		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-03 — Lab Sample ID: 810-53631-13

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.750		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-12 — Lab Sample ID: 810-53631-14

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.358	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-32 — Lab Sample ID: 810-53631-15

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.330	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-19 — Lab Sample ID: 810-53631-16

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.03		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-18 — Lab Sample ID: 810-53631-17

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.0292	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-33 — Lab Sample ID: 810-53631-18

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.949		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-01R — Lab Sample ID: 810-53631-19

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.06		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-02 — Lab Sample ID: 810-53631-20

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	3.35		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-11 — Lab Sample ID: 810-53631-21

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.769	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-34 — Lab Sample ID: 810-53631-22

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.28		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Ba (30-110)							
LCS 160-601054/2-A	Lab Control Sample	91.1							
LCS 160-601083/2-A	Lab Control Sample	92.3							
LCSD 160-601054/3-A	Lab Control Sample Dup	93.1							
LCSD 160-601083/3-A	Lab Control Sample Dup	88.6							
MB 160-601054/1-A	Method Blank	91.4							
MB 160-601083/1-A	Method Blank	95.1							

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 903.0 - Radium-226 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Ba (30-110)							
810-53631-1	MW-09	89.7							
810-53631-2	MWT-09	94.3							
810-53631-3	MW-30	87.1							
810-53631-4	MWT-30	88.9							
810-53631-5	MW-20	92.9							
810-53631-6	MW-07	90.3							
810-53631-7	MW-08	80.0							
810-53631-8	MW-31	88.9							
810-53631-9	MW-27	89.1							
810-53631-10	MW-10	89.7							
810-53631-11	MW-06	94.9							
810-53631-12	MW-04	82.3							
810-53631-13	MW-03	90.0							
810-53631-14	MW-12	91.1							
810-53631-15	MW-32	93.7							
810-53631-16	MW-19	90.6							
810-53631-17	MW-18	89.4							
810-53631-18	MW-33	86.0							
810-53631-19	MW-01R	92.6							
810-53631-20	MW-02	67.7							
810-53631-21	MW-11	86.9							
810-53631-22	MW-34	92.6							

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Ba (30-110)	Y (30-110)						
LCS 160-601055/2-A	Lab Control Sample	91.1	85.6						
LCS 160-601084/2-A	Lab Control Sample	92.3	84.5						
LCSD 160-601055/3-A	Lab Control Sample Dup	93.1	86.4						

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Job ID: 810-53631-1
Project/Site: 23B0271

Method: 904.0 - Radium-228 (GFPC) (Continued)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(30-110)	(30-110)
LCSD 160-601084/3-A	Lab Control Sample Dup	88.6	80.7
MB 160-601055/1-A	Method Blank	91.4	86.0
MB 160-601084/1-A	Method Blank	95.1	83.0

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(30-110)	(30-110)
810-53631-1	MW-09	89.7	86.4
810-53631-2	MWT-09	94.3	87.5
810-53631-3	MW-30	87.1	82.2
810-53631-4	MWT-30	88.9	83.0
810-53631-5	MW-20	92.9	83.7
810-53631-6	MW-07	90.3	84.5
810-53631-7	MW-08	80.0	84.9
810-53631-8	MW-31	88.9	80.7
810-53631-9	MW-27	89.1	82.2
810-53631-10	MW-10	89.7	81.1
810-53631-11	MW-06	94.9	80.7
810-53631-12	MW-04	82.3	82.6
810-53631-13	MW-03	90.0	83.0
810-53631-14	MW-12	91.1	84.9
810-53631-15	MW-32	93.7	75.5
810-53631-16	MW-19	90.6	85.2
810-53631-17	MW-18	89.4	89.0
810-53631-18	MW-33	86.0	87.1
810-53631-19	MW-01R	92.6	86.4
810-53631-20	MW-02	67.7	80.7
810-53631-21	MW-11	86.9	82.6
810-53631-22	MW-34	92.6	83.7

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-601054/1-A — **Client Sample ID: Method Blank**
Matrix: Drinking Water — **Prep Type: Total/NA**
Analysis Batch: 603703 — **Prep Batch: 601054**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0006718	U	0.0598	0.0598	1.00	0.119	pCi/L	02/21/23 09:39	03/15/23 09:26	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*30 - 110*	*02/21/23 09:39*	*03/15/23 09:26*	*1*

Lab Sample ID: LCS 160-601054/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Drinking Water — **Prep Type: Total/NA**
Analysis Batch: 603703 — **Prep Batch: 601054**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	11.14		1.14	1.00	0.102	pCi/L	98	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*91.1*		*30 - 110*

Lab Sample ID: LCSD 160-601054/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Drinking Water — **Prep Type: Total/NA**
Analysis Batch: 603703 — **Prep Batch: 601054**

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	11.88		1.21	1.00	0.108	pCi/L	105	75 - 125	0.32	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*93.1*		*30 - 110*

Lab Sample ID: MB 160-601083/1-A — **Client Sample ID: Method Blank**
Matrix: Drinking Water — **Prep Type: Total/NA**
Analysis Batch: 603871 — **Prep Batch: 601083**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.05683	U	0.0521	0.0523	1.00	0.0781	pCi/L	02/21/23 13:53	03/16/23 11:34	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.1*		*30 - 110*	*02/21/23 13:53*	*03/16/23 11:34*	*1*

Lab Sample ID: LCS 160-601083/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Drinking Water — **Prep Type: Total/NA**
Analysis Batch: 603871 — **Prep Batch: 601083**

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	11.84		1.20	1.00	0.0676	pCi/L	104	75 - 125		

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-601083/2-A
Matrix: Drinking Water
Analysis Batch: 603871

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 601083

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	92.3		30 - 110

Lab Sample ID: LCSD 160-601083/3-A
Matrix: Drinking Water
Analysis Batch: 603870

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 601083

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	12.10		1.23	1.00	0.0902	pCi/L	107	75 - 125	0.11	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	88.6		30 - 110

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-601055/1-A
Matrix: Drinking Water
Analysis Batch: 601724

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 601055

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1188	U	0.299	0.299	1.00	0.527	pCi/L	02/21/23 09:56	02/27/23 12:16	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.4		30 - 110	02/21/23 09:56	02/27/23 12:16	1
Y Carrier	86.0		30 - 110	02/21/23 09:56	02/27/23 12:16	1

Lab Sample ID: LCS 160-601055/2-A
Matrix: Drinking Water
Analysis Batch: 601724

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 601055

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.16	9.543		1.31	1.00	0.617	pCi/L	117	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	91.1		30 - 110
Y Carrier	85.6		30 - 110

Lab Sample ID: LCSD 160-601055/3-A
Matrix: Drinking Water
Analysis Batch: 601724

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 601055

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.16	10.17		1.34	1.00	0.495	pCi/L	125	75 - 125	0.23	1

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCSD 160-601055/3-A
Client Sample ID: Lab Control Sample Dup
Matrix: Drinking Water
Prep Type: Total/NA
Analysis Batch: 601724
Prep Batch: 601055

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	93.1		30 - 110
Y Carrier	86.4		30 - 110

Lab Sample ID: MB 160-601084/1-A
Client Sample ID: Method Blank
Matrix: Drinking Water
Prep Type: Total/NA
Analysis Batch: 601857
Prep Batch: 601084

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.7744		0.381	0.388	1.00	0.522	pCi/L	02/21/23 14:30	02/28/23 12:20	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	95.1		30 - 110	02/21/23 14:30	02/28/23 12:20	1
Y Carrier	83.0		30 - 110	02/21/23 14:30	02/28/23 12:20	1

Lab Sample ID: LCS 160-601084/2-A
Client Sample ID: Lab Control Sample
Matrix: Drinking Water
Prep Type: Total/NA
Analysis Batch: 601857
Prep Batch: 601084

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.16	9.631		1.31	1.00	0.508	pCi/L	118	75 - 125		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	92.3		30 - 110
Y Carrier	84.5		30 - 110

Lab Sample ID: LCSD 160-601084/3-A
Client Sample ID: Lab Control Sample Dup
Matrix: Drinking Water
Prep Type: Total/NA
Analysis Batch: 601819
Prep Batch: 601084

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			8.16	8.602		1.24	1.00	0.586	pCi/L	105	75 - 125	0.40	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	88.6		30 - 110
Y Carrier	80.7		30 - 110

QC Association Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Rad

Prep Batch: 601054

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-53631-1	MW-09	Total/NA	Ground Water	PrecSep-21	
810-53631-2	MWT-09	Total/NA	Ground Water	PrecSep-21	
810-53631-3	MW-30	Total/NA	Ground Water	PrecSep-21	
810-53631-4	MWT-30	Total/NA	Ground Water	PrecSep-21	
810-53631-5	MW-20	Total/NA	Ground Water	PrecSep-21	
810-53631-6	MW-07	Total/NA	Ground Water	PrecSep-21	
810-53631-7	MW-08	Total/NA	Ground Water	PrecSep-21	
810-53631-8	MW-31	Total/NA	Ground Water	PrecSep-21	
810-53631-9	MW-27	Total/NA	Ground Water	PrecSep-21	
810-53631-10	MW-10	Total/NA	Ground Water	PrecSep-21	
810-53631-11	MW-06	Total/NA	Ground Water	PrecSep-21	
810-53631-12	MW-04	Total/NA	Ground Water	PrecSep-21	
810-53631-13	MW-03	Total/NA	Ground Water	PrecSep-21	
810-53631-14	MW-12	Total/NA	Ground Water	PrecSep-21	
810-53631-15	MW-32	Total/NA	Ground Water	PrecSep-21	
810-53631-16	MW-19	Total/NA	Ground Water	PrecSep-21	
810-53631-17	MW-18	Total/NA	Ground Water	PrecSep-21	
810-53631-18	MW-33	Total/NA	Ground Water	PrecSep-21	
810-53631-19	MW-01R	Total/NA	Ground Water	PrecSep-21	
MB 160-601054/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-601054/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	
LCSD 160-601054/3-A	Lab Control Sample Dup	Total/NA	Drinking Water	PrecSep-21	

Prep Batch: 601055

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-53631-1	MW-09	Total/NA	Ground Water	PrecSep_0	
810-53631-2	MWT-09	Total/NA	Ground Water	PrecSep_0	
810-53631-3	MW-30	Total/NA	Ground Water	PrecSep_0	
810-53631-4	MWT-30	Total/NA	Ground Water	PrecSep_0	
810-53631-5	MW-20	Total/NA	Ground Water	PrecSep_0	
810-53631-6	MW-07	Total/NA	Ground Water	PrecSep_0	
810-53631-7	MW-08	Total/NA	Ground Water	PrecSep_0	
810-53631-8	MW-31	Total/NA	Ground Water	PrecSep_0	
810-53631-9	MW-27	Total/NA	Ground Water	PrecSep_0	
810-53631-10	MW-10	Total/NA	Ground Water	PrecSep_0	
810-53631-11	MW-06	Total/NA	Ground Water	PrecSep_0	
810-53631-12	MW-04	Total/NA	Ground Water	PrecSep_0	
810-53631-13	MW-03	Total/NA	Ground Water	PrecSep_0	
810-53631-14	MW-12	Total/NA	Ground Water	PrecSep_0	
810-53631-15	MW-32	Total/NA	Ground Water	PrecSep_0	
810-53631-16	MW-19	Total/NA	Ground Water	PrecSep_0	
810-53631-17	MW-18	Total/NA	Ground Water	PrecSep_0	
810-53631-18	MW-33	Total/NA	Ground Water	PrecSep_0	
810-53631-19	MW-01R	Total/NA	Ground Water	PrecSep_0	
MB 160-601055/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-601055/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	
LCSD 160-601055/3-A	Lab Control Sample Dup	Total/NA	Drinking Water	PrecSep_0	

Prep Batch: 601083

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-53631-20	MW-02	Total/NA	Ground Water	PrecSep-21	

Rad (Continued)

Prep Batch: 601083 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-53631-21	MW-11	Total/NA	Ground Water	PrecSep-21	
810-53631-22	MW-34	Total/NA	Ground Water	PrecSep-21	
MB 160-601083/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-601083/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	
LCSD 160-601083/3-A	Lab Control Sample Dup	Total/NA	Drinking Water	PrecSep-21	

Prep Batch: 601084

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-53631-20	MW-02	Total/NA	Ground Water	PrecSep_0	
810-53631-21	MW-11	Total/NA	Ground Water	PrecSep_0	
810-53631-22	MW-34	Total/NA	Ground Water	PrecSep_0	
MB 160-601084/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-601084/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	
LCSD 160-601084/3-A	Lab Control Sample Dup	Total/NA	Drinking Water	PrecSep_0	

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-09

Lab Sample ID: 810-53631-1

Date Collected: 02/06/23 14:40
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603703	FLC	EET SL	03/15/23 09:27
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:17
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MWT-09

Lab Sample ID: 810-53631-2

Date Collected: 02/06/23 14:40
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603703	FLC	EET SL	03/15/23 09:27
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:17
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-30

Lab Sample ID: 810-53631-3

Date Collected: 02/06/23 16:35
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603703	FLC	EET SL	03/15/23 09:27
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:17
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MWT-30

Lab Sample ID: 810-53631-4

Date Collected: 02/06/23 16:35
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:33
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:17
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-20

Lab Sample ID: 810-53631-5

Date Collected: 02/07/23 09:00
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:33
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:17
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-07

Lab Sample ID: 810-53631-6

Date Collected: 02/07/23 10:00
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:33
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:17
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-08

Lab Sample ID: 810-53631-7

Date Collected: 02/07/23 11:15
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:33
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:18
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-31

Lab Sample ID: 810-53631-8

Date Collected: 02/07/23 12:35
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:34
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:18
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-27

Lab Sample ID: 810-53631-9

Date Collected: 02/07/23 14:20
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:34
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:18
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-10

Lab Sample ID: 810-53631-10

Date Collected: 02/06/23 15:30
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:34
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:18
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-06

Lab Sample ID: 810-53631-11

Date Collected: 02/06/23 17:10
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:34
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:19
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-04

Lab Sample ID: 810-53631-12

Date Collected: 02/07/23 09:40
Matrix: Ground Water
Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:35
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:19
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-03

Lab Sample ID: 810-53631-13

Date Collected: 02/07/23 11:10

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603704	FLC	EET SL	03/15/23 09:35
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:19
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-12

Lab Sample ID: 810-53631-14

Date Collected: 02/07/23 14:40

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603705	FLC	EET SL	03/15/23 09:30
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601724	SCB	EET SL	02/27/23 12:19
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-32

Lab Sample ID: 810-53631-15

Date Collected: 02/08/23 08:55

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603705	FLC	EET SL	03/15/23 09:30
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601725	FLC	EET SL	02/27/23 12:21
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-19

Lab Sample ID: 810-53631-16

Date Collected: 02/08/23 09:55

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603705	FLC	EET SL	03/15/23 09:30
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601725	FLC	EET SL	02/27/23 14:28
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-18

Lab Sample ID: 810-53631-17

Date Collected: 02/08/23 11:25

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603705	FLC	EET SL	03/15/23 09:30
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601725	FLC	EET SL	02/27/23 12:22
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-33

Lab Sample ID: 810-53631-18

Date Collected: 02/08/23 13:05

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603703	FLC	EET SL	03/15/23 09:28
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601725	FLC	EET SL	02/27/23 12:22
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-01R

Lab Sample ID: 810-53631-19

Date Collected: 02/08/23 14:45

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601054	DJP	EET SL	02/21/23 09:39
Total/NA	Analysis	903.0		1	603703	FLC	EET SL	03/15/23 09:27
Total/NA	Prep	PrecSep_0			601055	DJP	EET SL	02/21/23 09:56
Total/NA	Analysis	904.0		1	601725	FLC	EET SL	02/27/23 12:22
Total/NA	Analysis	Ra226_Ra228 Pos		1	603753	EMH	EET SL	03/15/23 16:55

Client Sample ID: MW-02

Lab Sample ID: 810-53631-20

Date Collected: 02/08/23 09:30

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601083	DJP	EET SL	02/21/23 13:53
Total/NA	Analysis	903.0		1	603870	FLC	EET SL	03/16/23 11:36
Total/NA	Prep	PrecSep_0			601084	DJP	EET SL	02/21/23 14:30
Total/NA	Analysis	904.0		1	601819	SCB	EET SL	02/28/23 12:23
Total/NA	Analysis	Ra226_Ra228 Pos		1	604049	EMH	EET SL	03/17/23 18:43

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Client Sample ID: MW-11

Lab Sample ID: 810-53631-21

Date Collected: 02/08/23 10:40

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601083	DJP	EET SL	02/21/23 13:53
Total/NA	Analysis	903.0		1	603870	FLC	EET SL	03/16/23 11:36
Total/NA	Prep	PrecSep_0			601084	DJP	EET SL	02/21/23 14:30
Total/NA	Analysis	904.0		1	601819	SCB	EET SL	02/28/23 12:23
Total/NA	Analysis	Ra226_Ra228 Pos		1	604049	EMH	EET SL	03/17/23 18:43

Client Sample ID: MW-34

Lab Sample ID: 810-53631-22

Date Collected: 02/08/23 14:20

Matrix: Ground Water

Date Received: 02/16/23 16:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			601083	DJP	EET SL	02/21/23 13:53
Total/NA	Analysis	903.0		1	603870	FLC	EET SL	03/16/23 11:36
Total/NA	Prep	PrecSep_0			601084	DJP	EET SL	02/21/23 14:30
Total/NA	Analysis	904.0		1	601819	SCB	EET SL	02/28/23 12:23
Total/NA	Analysis	Ra226_Ra228 Pos		1	604049	EMH	EET SL	03/17/23 18:43

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-23
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-23
Connecticut	State	PH-0241	03-31-23
Florida	NELAP	E87689	06-30-23
HI - RadChem Recognition	State	n/a	06-30-23
Illinois	NELAP	200023	11-30-23
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-23
Kentucky (DW)	State	KY90125	12-31-23
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-23
Louisiana (All)	NELAP	04080	06-30-23
Louisiana (DW)	State	LA011	12-31-23
Maryland	State	310	09-30-23
MI - RadChem Recognition	State	9005	06-30-23
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	07-31-23
New Jersey	NELAP	MO002	06-30-23
New York	NELAP	11616	04-01-23
North Carolina (DW)	State	29700	07-31-23
North Dakota	State	R-207	06-30-23
Oklahoma	NELAP	9997	08-31-23
Oregon	NELAP	4157	09-01-23
Pennsylvania	NELAP	68-00540	02-28-24
South Carolina	State	85002001	06-30-23
Texas	NELAP	T104704193	07-31-23
US Fish & Wildlife	US Federal Programs	058448	07-31-23
USDA	US Federal Programs	P330-17-00028	06-11-23
Utah	NELAP	MO000542021-14	07-31-23
Virginia	NELAP	10310	06-14-24
Washington	State	C592	08-30-23
West Virginia DEP	State	381	10-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	EET SL
904.0	Radium-228 (GFPC)	EPA	EET SL
Ra226_Ra228 Pos	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Trace Analytical Laboratories
Project/Site: 23B0271

Job ID: 810-53631-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
810-53631-1	MW-09	Ground Water	02/06/23 14:40	02/16/23 16:00
810-53631-2	MWT-09	Ground Water	02/06/23 14:40	02/16/23 16:00
810-53631-3	MW-30	Ground Water	02/06/23 16:35	02/16/23 16:00
810-53631-4	MWT-30	Ground Water	02/06/23 16:35	02/16/23 16:00
810-53631-5	MW-20	Ground Water	02/07/23 09:00	02/16/23 16:00
810-53631-6	MW-07	Ground Water	02/07/23 10:00	02/16/23 16:00
810-53631-7	MW-08	Ground Water	02/07/23 11:15	02/16/23 16:00
810-53631-8	MW-31	Ground Water	02/07/23 12:35	02/16/23 16:00
810-53631-9	MW-27	Ground Water	02/07/23 14:20	02/16/23 16:00
810-53631-10	MW-10	Ground Water	02/06/23 15:30	02/16/23 16:00
810-53631-11	MW-06	Ground Water	02/06/23 17:10	02/16/23 16:00
810-53631-12	MW-04	Ground Water	02/07/23 09:40	02/16/23 16:00
810-53631-13	MW-03	Ground Water	02/07/23 11:10	02/16/23 16:00
810-53631-14	MW-12	Ground Water	02/07/23 14:40	02/16/23 16:00
810-53631-15	MW-32	Ground Water	02/08/23 08:55	02/16/23 16:00
810-53631-16	MW-19	Ground Water	02/08/23 09:55	02/16/23 16:00
810-53631-17	MW-18	Ground Water	02/08/23 11:25	02/16/23 16:00
810-53631-18	MW-33	Ground Water	02/08/23 13:05	02/16/23 16:00
810-53631-19	MW-01R	Ground Water	02/08/23 14:45	02/16/23 16:00
810-53631-20	MW-02	Ground Water	02/08/23 09:30	02/16/23 16:00
810-53631-21	MW-11	Ground Water	02/08/23 10:40	02/16/23 16:00
810-53631-22	MW-34	Ground Water	02/08/23 14:20	02/16/23 16:00

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins St. Louis Job No.: 810-53631-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
Ba carrier_00120	12/07/23	12/19/22	DI Water, Lot N/A	1000 mL	BaCl2_00010	35.544 g	Ba Carrier	35.544 mg/mL
							Barium Chloride	35.544 mg/mL
					Nitric Acid_01773	5 mL	Nitric acid	0.08 mg/mL
.BaCl2_00010	11/03/26	ThermoScientific, Lot A0433573			(Purchased Reagent)		Ba Carrier	100 %
							Barium Chloride	100 %
.Nitric Acid_01773	12/07/23	Fisher Chemical, Lot 222845			(Purchased Reagent)		Nitric acid	16 mol/L
Ra-226_00022	12/06/19	08/24/16	1M HNO3, Lot n/a	100 mL			Ra	7534.61 dpm/mL
					Ra-226_00021	5.0595 g	Radium-226	7534.61 dpm/mL
							Rn-222	7534.61 dpm/mL
							Total Alpha Emitting Radium Isotopes	7534.61 dpm/mL
.Ra-226_00021	09/01/53	NIST, Lot 4967A			(Purchased Reagent)		Radium-226	2482 Bq/g
							Rn-222	2482 Bq/g
							Total Alpha Emitting Radium Isotopes	2482 Bq/g
Ra-226_00025	09/18/22	12/08/16	0.1M HCl, Lot N/A	100 mL	Ra-226_00024	4.9774 g	Ra	8409.79 dpm/mL
							Radium-226	8409.79 dpm/mL
							Rn-222	8409.79 dpm/mL
							Total Alpha Emitting Radium Isotopes	8409.79 dpm/mL
.Ra-226_00024	12/05/66	Eckert & Ziegler, Lot 104858			(Purchased Reagent)		Ra	2815.99 Bq/g
							Radium-226	2815.99 Bq/g
							Rn-222	2815.99 Bq/g
							Total Alpha Emitting Radium Isotopes	2815.99 Bq/g
Ra-226_00041	09/15/23	09/15/22	0.1M HCl, Lot N/A	500 mL	Ra-226_00025	15 mL	Ra	252.294 dpm/mL
							Radium-226	252.294 dpm/mL
							Rn-222	252.294 dpm/mL
							Total Alpha Emitting Radium Isotopes	252.294 dpm/mL
.Ra-226_00025	09/18/22	12/08/16	0.1M HCl, Lot N/A	100 mL	Ra-226_00024	4.9774 g	Ra	8409.79 dpm/mL
							Radium-226	8409.79 dpm/mL
							Rn-222	8409.79 dpm/mL
							Total Alpha Emitting Radium Isotopes	8409.79 dpm/mL
..Ra-226_00024	12/05/66	Eckert & Ziegler, Lot 104858			(Purchased Reagent)		Ra	2815.99 Bq/g

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins St. Louis Job No.: 810-53631-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Radium-226	2815.99 Bq/g
							Rn-222	2815.99 Bq/g
							Total Alpha Emitting Radium Isotopes	2815.99 Bq/g
Ra-228_00046	03/17/23	03/17/22	0.1M HCl, Lot N/A	100 mL	Ra-228_00045	4.9727 g	Radium-228	219.902 dpm/mL
.Ra-228_00045	04/27/71	Eckert & Ziegler, Lot 118370			(Purchased Reagent)		Radium-228	73.7031 Bq/g
Sr-90_00004	09/17/59	06/21/11	0.1M HCL, Lot 0	100 mL	Sr-90_00001	5.0139 g	Gross Beta	45120.6 dpm/mL
							Sr	22560.3 dpm/mL
							Sr-90	22560.3 dpm/mL
.Sr-90_00001	09/17/59	Eckert & Ziegler, Lot 80573-334			(Purchased Reagent)		Gross Beta	14998.5 Bq/g
							Sr	7499.25 Bq/g
							Sr-90	7499.25 Bq/g
Sr-90_00018	06/03/22	11/28/12	0.1M HCL, Lot 0	100 mL	Sr-90_00017	4.9997 g	Gross Beta	44774.2 dpm/mL
							Sr-90	22387.1 dpm/mL
.Sr-90_00017	11/29/62	Analytics, Lot 92352			(Purchased Reagent)		Gross Beta	14925.6 Bq/g
							Sr-90	7462.82 Bq/g
Th-230_00052	11/12/22	11/15/19	0.5 M HNO3, Lot n/a	100 mL	Th-230_00051	5.0493 g	Gross Alpha	2254.57 dpm/mL
							Th-230	2254.57 dpm/mL
.Th-230_00051	11/15/20	Eckect & Ziegler, Lot 114474			(Purchased Reagent)		Gross Alpha	744.187 Bq/g
							Th-230	744.187 Bq/g
Th-230_00056	01/07/22	11/15/19	0.5 M HNO3, Lot n/a	100 mL	Th-230_00054	5.0402 g	Gross Alpha	2289.58 dpm/mL
							Th-230	2289.58 dpm/mL
.Th-230_00054	11/15/20	Eckect & Ziegler, Lot 114475			(Purchased Reagent)		Gross Alpha	757.106 Bq/g
							Th-230	757.106 Bq/g
Y Carrier_00076	12/05/23	CPI, Lot 1319464			(Purchased Reagent)		Y Carrier	50000 mg/L

Reagent

Ba carrier_00120

Standardization of Carrier

Carrier Reagent ID: Ba Carrier_00120
ID from TALS or lot number

#	Tare Wght (g)	Gross Wght (g)	Net Wght (g)	Z Score
1	8.8070	8.8418	0.0348	1.9267
2	8.7953	8.8304	0.0351	0.5505
3	8.8382	8.8733	0.0351	0.5505
4	8.8138	8.8489	0.0351	0.5505
5	8.8155	8.8505	0.0350	0.2752
6	8.8068	8.8419	0.0351	0.5505

Average: 0.0350 Standardized value
StDev: 0.0001
StDev %: 0.35%

Record the Reagent IDs of all chemicals used to create this carrier in the spaces below.

Reagent ID: Sulfuric Acid - 2348243
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:

SOP Reference: ST-RC-0002, ST-RC-0041
SOP reference containing prep procedure must be documented

Minimum Criteria:

- Z Score must be within 3 sigma (**2.58**) and no more than one score outside of 2 sigma (**1.96**)
- 4 points required
- Any criteria stipulated in the above referenced SOP must be satisfied in addition.

Carrier: 0 **Standardized Value:** 0.0350 Carrier Reagent or Lot ID: Ba Carrier_00120

Approved By: CMM Date Approved: 12/22/2022

Reagent

Ra-226_00021

National Institute of Standards & Technology

Certificate

Standard Reference Material® 4967A

Radium-226 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive radium-226 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4967A consists of approximately 5 mL of a hydrochloric acid and barium chloride solution, whose composition is specified in Table 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **radium-226** massic activity value, at a **Reference Time of 1200 EST, 01 September 2003**, is:

$$(2482 \pm 30)\ \mathrm{Bq \cdot g^{-1}}$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Table 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analyses.

Expiration of Certification: The certification of **SRM 4967A** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterweger, Group Leader of the Radioactivity Group. The overall production, technical direction, and physical measurement leading to certification were provided by R. Collé and P. Volkovitsky of the NIST Radiation Physics Division, Radioactivity Group. Statistical consultation was provided by S.D. Leigh of the NIST Statistical Engineering Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Lisa R. Karam, Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 03 September 2013
See Certificate Revision History on Last Page

Robert L. Watters, Jr., Director
Office of Reference Materials

Table 3. Uncertainty Evaluation for the Massic Activity of SRM 4967A

	Uncertainty component	Assessment Type[a]	Relative standard uncertainty contribution on massic activity of ^{226}Ra (%)
1	Calibration of the "1947 (1967 recalibrated) series" of radium-226 solution standards in terms of mass of radium-226[b]	B	0.34
2	Ratio of the mass of radium-226 in SRM 4967A to the mass of radium-226 in the "1947 (1967 recalibrated) series" of radium-226 solution standards. Weighted mean of the ratios obtained using seven different comparisons.	B	0.15
3	Corrections for the decay of radium-226. Standard uncertainty of the radium-226 half-life.	A	0.007
4	Gravimetric measurements	B	0.10
5	Conversion of radium-226 mass to activity. Standard uncertainty of the radium-226 half-life.[c]	A	0.44
6	Photon emitting impurities. Limit of detection.	B	0.01
Relative combined standard uncertainty			**0.6**
Relative expanded uncertainty ($k = 2$)			**1.2**

[a] Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

[b] For further details on NBS/NIST radium series calibrations refer to reference [8]. The 1967 recalibrations of the "1947 series" and of the "1957 series" were made using pressurized "4π"γ ionization chamber (PIC) "A". The master solution for SRM 4967A was directly compared with the "1947 (1967 recalibrated) series" of radium-226 solution standards using PIC "A", and was compared with the solutions of the "1992 series" of radium solution standards (SRM 4967) using PIC "A", pulse-ionization-chamber radon analyses (see references [9] and [10]), and germanium photon spectrometry. The radium-226 in SRM 4967A was chemically purified approximately 55 years from the reference time. The lead-210 and its daughter radionuclides are still not in equilibrium as of the 2013 certificate issue date.

[c] The U.S National Standards for radium-226 are certified in terms of mass of radium-226, as were all radium-226 SRMs prior to the "1992 series". Beginning with "1992 series", radium-226 solution SRMs are now certified in terms of the massic activity of radium-226. The relative standard uncertainty of the activity of radium-226 per unit mass of radium-226 is determined by the relative standard uncertainty of λ (i.e., of the half-life). The relative standard uncertainties of the atomic weight of radium-226 and of Avogadro's number are negligible.

Table 1. Certified Massic Activity of SRM 4967A

Radionuclide	**Radium-226**
Reference time	**1200 EST, 01 September 2003**
Massic activity of the solution	**2482 Bq•g^{-1}**
Relative expanded uncertainty ($k = 2$)	**1.20 %**

Table 2. Uncertified Information of SRM 4967A

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	1.0 mol•L^{-1} HCl with 80µg of $BaCl_2$ per gram of solution
Solution density	(1.017 ± 0.002) g•mL^{-1} at 21 °C[(a)]
Solution mass	(5.086 ± 0.003) g[(a)]
Photon-Emitting Impurities	None detected[(b)]
Half-lives used	^{226}Ra: (1600 ± 7) a [6][(c)] ^{222}Ra: (3.8235 ± 0.0003) d [7][(c)]
Calibration methods (and instruments)	Gravimetric dilution of SRM 4963, confirmed by comparison with solution standards, and derivatives thereof, from the NBS/NIST "1947 (1967 recalibrated) series" of radium-226 solution standards. The mass of radium-226 in these solution standards had previously been determined by comparison with the U.S. National Standards for radium-226. Conversion from mass of radium-226 to activity of radium-226 was done using the half-life of radium-226 shown above.[(d)]

[(a)] The stated uncertainty is two times the standard uncertainty. See reference 5.

[(b)] The estimated lower limits of detection for photon-emitting impurities, as of September 2003, expressed as massic photon mission rate, are:

6×10^{0} s^{-1}•g^{-1} for energies between 22 keV and 182 keV,
3×10^{0} s^{-1}•g^{-1} for energies between 190 keV and 347 keV,
8×10^{-1} s^{-1}•g^{-1} for energies between 356 keV and 1455 keV, and
3×10^{-1} s^{-1}•g^{-1} for energies between 1465 keV and 2750 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ^{226}Ra and progeny.

[(c)] The stated uncertainty is the standard uncertainty. See reference 5.

[(d)] For further details on NBS/NIST radium series calibrations refer to reference [8]. The 1967 recalibrations of the "1947 series" and of the "1957 series" were made using pressurized "4π"γ ionization chamber (PIC) "A". The master solution for SRM 4967A was directly compared with the "1947 (1967 recalibrated) series" of radium-226 solution standards using PIC "A", and was compared with the solutions of the "1992 series" of radium solution standards (SRM 4967) using PIC "A", pulse-ionization-chamber radon analyses (see references [9] and [10]), and germanium photon spectrometry. The radium-226 in SRM 4967A was chemically purified approximately 55 years from the reference time. The lead-210 and its daughter radionuclides are still not in equilibrium as of the 2013 certificate issue date.

INSTRUCTIONS FOR HANDLING AND STORAGE

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. Only persons qualified to handle both radioactive material and alkaline and/or acidic solutions should open the ampoule. To minimize personnel exposure, appropriate shielding and/or distance should be used. Refer to the SDS for further information.

Storage: SRM 4967A should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

REFERENCES

[1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*, available at http://www.nist.gov/pml/div682/grp04/srm.cfm (accessed Sep 2013). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.

[2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 19 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Sep 2013).

[3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 18 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Sep 2013).

[4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement;* (GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France (2008); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Sep 2013).

[5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://www.nist.gov/pml/pubs/index.cfm (accessed Sep 2013).

[6] Chisté, V; Bé, M.M.; *January 2007, ^{226}Ra*; LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-226_tables.pdf (accessed Sep 2013).

[7] Chisté, V; Bé, M.M.; *July 2010, ^{222}Rn*; LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Rn-222_tables.pdf (accessed Sep 2013).

[8] Mann, W.B.; Stockman, L.L.; Youden, W.J.; Schwebel, A.; Mullen, P.A.; Garfinkel, S.B.; Preparation of New Solution Standards of Radium, *Journal of Research of the National Bureau of Standards* 62 (1959) 21-26.

[9] Collé, R.; Hutchinson, J.M.R.; Unterweger, M.P.; The NIST Primary Radon-222 Measurement System, *Journal of Research of the National Institute of Standards and Technology* 95 (1990) 155-165.

[10] Hutchinson J.M.R; Cessna, J.; Collé R.; Hodge P.; An International Radon-In-Air Measurement Intercomparison Using a New Transfer Standard, *Applied Radiation Isotopes* 43 (1992) 175-189.

Certificate Revision History: September 2013 (Text and expiration date revised); December 2004 (Original certification date).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.

Reagent

Ra-226_00024

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 104858
Source Description: 5 mL Liquid in Flame Sealed Vial
Product Code: 8226
Customer: TestAmerica St. Louis
P.O. Number: 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 05-December-2016 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty u_A, %	u_B, %	U, %*	Calibration Method**
Ra-226	5.844E+05	1.408E+04	1.0	2.1	4.7	HPGe

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 104858

Comments:

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

Impurities:

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

Reagent

Ra-226_00025

SRS Number: 104858

Comments:

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

Impurities:

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 104858
Source Description: 5 mL Liquid in Flame Sealed Vial
Product Code: 8226
Customer: TestAmerica St. Louis
P.O. Number: 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 05-December-2016 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty u_A, %	u_B, %	U, %*	Calibration Method**
Ra-226	5.844E+05	1.408E+04	1.0	2.1	4.7	HPGe

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Reagent

Ra-226_00041

Standard ID Number: a-226_00041 (2309057/2309058
True Value = 113650 pCi/L or g
Date Analyzed: 9/15/2022

Radionuclide: Ra-226

	Replicates	
#1	107700	pCi/L or g
#2	110200	pCi/L or g
#3	105600	pCi/L or g

Mean = 107833.33

1 sigma = 2302.8967

1.96 sigma = 4513.678

True Value minus 10% = 102285 (True Value - 10%)
True Value plus 10% = 125015 (True Value + 10%)

Accuracy:
Mean value within 10% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

1st Reviewed By/Date: MichaKoniringer 9/15/2022

2nd Reviewed By/Date: Sarah C. Beusen 9/16/22

MANUAL DATA ENTRY REQUIRED AT INSTRUMENT? (circle one) YES NO
If YES, data entry MUST be 2nd reviewed

1st Reviewed By/Date: _____

2nd Reviewed By/Date: _____

eurofins | Environment Testing America

Ra - 226 _ 00039

Reagent ID: Ra-226_00039

		Expiration Date:	09/18/2022
Description:	Ra-226 Spike	Laboratory:	Eurofins St. Louis
No. of Bottles:	2	Prepared By:	Mazariegos, Chelsea M
Storage Location:	RAD Separations Reagents - Rm 131	Solvent:	0.1M HCl
Reagent Volume:	500.000 mL	Solvent Lot:	N/A
Creation Date:	09/16/2021		
Open Date:			
Container(s):	2131808, 2131809		
Comment:	standard split into (2) 250 mL bottles		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Ra	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Ra-226	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Rn-222	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Total Alpha Emitting Radium Isotopes	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Ra-226_00025	Ra-226 Parent		09/18/22				15.00000	mL

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	12/5/2022 0:00		
Decayto Date/Time (t):	9/15/22 0:00		
Initial Activity (A_0):	252.29	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	252.29	dpm/mL	
***Soln. Density:**		g/mL	
Nuclide:	Ra-226		
Half-Life (days):	584400	decay days	fraction
****Decay Factor:**	1.0001	-81.00	-0.00014
Decay Corr Activity:	2.5231E+02	dpm	
Decay Corr Conc:	2.5231E+02	dpm/mL	

Conversion/Calculations

Final Activity Unit:	pCi	
Activity Unit Factor:	0.45045	
Final Volume Unit:	L	
Volume Unit Factor:	0.001	
Final Concentration:	1.1365E+05	pCi/L
Aliquot Volume:	1.0000E+00	L
Final Activity (A):	1.1365E+05	pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

eurofins Environment Testing TestAmerica

Analysis Report for Total Alpha-Emitting Radium

Batch: 581978 **Operator:**

SampID / Analyte	WRKNO	Ts	Aliquot Tb	Cs	Ba Mass Cb	Ba Yield CPMs	Trunc Yield CPMb	Ingrowth	Ba Precip Time	InstrID	Eff	Cal Type	Cnt Date Time	Sigma
160-46998-A-2-B	160-46998-A-2-B		0.1000mL		0.0385	96.01%	False	1.0149	9/15/22 11:00	Red13	0.1937	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	462	108	4.62	0.11	1.077E+005pCi/L	5.137E+003	7.062E+003	3.423E+003	1.917E+003	7061.9826	
160-46998-A-3-B	160-46998-A-3-B		0.1000mL		0.0395	98.58%	False	1.0150	9/15/22 11:00	Red14	0.1920	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	480	103	4.80	0.10	1.102E+005pCi/L	5.145E+003	7.146E+003	3.302E+003	1.840E+003	7145.9155	
160-46998-B-1-B	160-46998-B-1-B		0.1000mL		0.0371	97.52%	False	1.0149	9/15/22 11:00	Red10	0.1993	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	446	72	4.46	0.07	1.056E+005pCi/L	5.088E+003	6.963E+003	2.951E+003	1.578E+003	6962.8945	

SampID / Analyte	UncCount	UncTotal	MDA	DLC	MQO

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

SampID	SampDupID	Analyte	Activity	DupActivity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	WRKNO	Analyte	Activity	MSActivity	StdAdded	Recovery	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal

Radium-226 Standard Verification

Std #: Ra-226_00039 (2131809)
Activity: 252.2935552dpm/mL
Reference Date: 12/05/2016

Ver#	D.I. H2O	Barium Carrier mL	Ra-226 Spike mL	18M Sulfuric mL	EDTA mL	Ammonium Sulfate mL	Acetic Acid mL
Ra-226_00039	*N/A*	*2179499*	*2131809*	*2285368*	*2291818*	*2291233*	*2300893*
1	10	1	0.1	1	15	1	2
2	10	1	0.1	1	15	1	2
3	10	1	0.1	1	15	1	2

In a clean centrifuge tube add the following:

- 10mL D.I.
- 0.1mL Radium-226 standard
- 1mL Barium Carrier
- 1mL 18M Sulfuric Acid

Heat in hot bath for 30mins **agitate every 10 mins**
Centrifuge/Decant and wash with 10mL D.I. H2O
Dissolve in 15mL EDTA
Add 1mL Ammonium Sulfate and 2mL Acetic Acid
Heat in hot bath for 30mins **agitate every 10 mins**
Centrifuge/Decant and wash with 10mL D.I. H2O
Plate with minimal D.I. H2O onto a tared planchet

Prepared by: Micha Korrinhizer
Date: 9/15/2022

PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-581978

Analyst: Korrinhizer, Micha L

Batch Open: 9/13/2022 5:11:00PM

Batch End: 9/13/2022 6:00:00PM

Preparation, Precipitate Separation

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments JB 9/15/22	Output Sample Lab ID
1	160-46998-B-1 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION Red 10	160-46998-B-1-B
2	160-46998-A-2 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION 13	160-46998-A-2-B
3	160-46998-A-3 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION 14	160-46998-A-3-B

Reagent

Ra-228_00045

Eckert & Ziegler
Analytics

Kalibrierschein / Calibration Certificate

erstellt durch das Kalibrierlaboratorium

issued by the calibration laboratory

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-K-19023-01-00

Eckert & Ziegler Analytics, Inc.
1380 Seaboard Industrial Blvd.
Atlanta, GA 30318, USA
Tel 1-404-352-8677
Fax 1-404-352-2837

Kalibrierzeichen
Calibration mark

001741
D-K-19023-01-00
2021-07

Gegenstand *Object*	**5 mL Liquid in 5 mL Flame Sealed Ampoule**
Hersteller *Manufacturer*	**Eckert & Ziegler Analytics, Inc.**
Typ *Type*	**8328-5FSA-370BQ-D**
Serien-Nr. *Serial number*	**118370**
Auftraggeber *Customer*	**Test America Laboratories- St. Louis**
Auftragsnummer *Order No.*	**CO-049790**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**19-Jul-2021 1200 EST (1700 UTC)**

Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the metrological traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine sind bei Nennung des für die Freigabe Verantwortlichen in Klarschrift auch ohne Unterschrift gültig.
This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates with the full name of the approval responsible person are valid without signature.

Datum der Ausstellung *Date of issue*	Freigabe des Kalibrierscheins durch *Approval of the certificate of calibration by*
16-Jul-21	Levan Tkavadze

001741
D-K-19023-01-00
2021-07

- **Customer Purchase Order No.**:
  US1131311550, Item 1

- **Calibration Results**:

Nuclide	Half-Life *, d	Activity, Bq	Uncertainty, %	Calibration Method
Ra-228	2.100E+03	3.692E+02	4.9	HPGe

- **Calibration Method(s)**:
  This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty**:
  The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with EA-4/02 M. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability**:
  Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

- **Impurities**:
  α-impurities: Ra-226 6.4E+00 Bq, other α-impurities (other than decay products) < 0.1 %
  γ-impurities (other than decay products) < 0.1 %

- **Expiration Date**:
  No expiration date has been given for this source.

- **Wipe Test ***:
  This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information**:
  - 5.00929 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.
  - Separation date: 01-March-2018
  - *Values not calibrated by EZA (i.e. published nuclear data, uncertified values, etc.)
  - Date of Calibration corresponds to Reference Date for this source.
  - Expiration Date refers to useful life of this source.

End of Certificate

Reagent

Sr-90_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

80573-334

5 mL Liquid in Flame Sealed Vial

Customer: Test America St. Louis
P.O. No.: 2324797, Item 1

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Sr-90	10515.5	3.782E+04	0.1	0.9	1.8	09/17/2009

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities <0.1%. 5.04317 grams 0.1M HCl solution with approximately 30 microg/g each of Sr and Y carriers. NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total beta emission rate for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 9-22-09
D. M. Montgomery, QA Manager

ACCREDITED SOURCE CALIBRATION LABORATORY
HEALTH PHYSICS SOCIETY
FOUNDED 1958

Corporate Office
Laboratory
1380 Seaboard Industrial Blvd., Atlanta, Georgia 30318

Reagent

Sr-90_00017

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

92352

Sr-90 5 mL Liquid in Flame Sealed Vial

Customer: TestAmerica St. Louis
P.O. No.: 2502682, Item 1 Product Code: 8090-5FSA-37kBq

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Sr-90	1.052E+04	3.749E+04	0.1	0.9	1.8	11/29/2012

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities<0.1%.
5.02357 g 0.1M HCl solution with approximately 30 μg/g each Sr and Y carriers.

NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 26 NOV 12
J.D. McCorvey, Counting Room Manager

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

RAD12-0042
Sr-90
hursts
None
Prep/Opened: 11/28/2012
Exp(1): 11/29/2062
Exp(2): 11/29/2062

51511
ID Sr-90_00017
Sr-90 Ampoule

Single Isotope Certificate Rev 3, 23 August 2012

Reagent

Sr-90_00018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sr-90_00018

Reagent ID: Sr-90_00018

		Expiration Date:	11/29/2062
Description:	Sr-90 Calibration STD	Laboratory:	TestAmerica St. Louis
No. of Bottles:	1	Prepared By:	Hurst, Sarah
Storage Location:	RAD Separations Reagents - 1	Solvent:	0.1M HCL
Reagent Volume:	100.000 mL	Solvent Lot:	0
Creation Date:	11/28/2012		
Container(s):	51512		
Comment:	Rad12-0043		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Gross Beta	Sr-90_00017	11/29/2062	14925.64000	Bq/g	44774.23338	dpm/mL
Sr-90	Sr-90_00017	11/29/2062	7462.82000	Bq/g	22387.11669	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Sr-90_00017	Sr-90 Ampoule	ASTD	11/29/62	Analytics	92352		4.99970	g

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1976.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Low mass)

	Replicates	
#1	1935	pCi/sample or g
#2	1941	pCi/sample or g
#3	1924	pCi/sample or g

Mean = 1933.333

1 sigma = 8.621678 1.96 sigma = 16.89849

True Value minus 5% = 1877.913 (True Value - 5%)
True Value plus 5% = 2075.588 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1948.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Medium mass)

	Replicates	
#1	1911	pCi/sample or g
#2	1945	pCi/sample or g
#3	1893	pCi/sample or g

Mean = 1916.333

1 sigma = 26.40707 1.96 sigma = 51.75786

True Value minus 5% = 1851.313 (True Value - 5%)
True Value plus 5% = 2046.188 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1992 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (High mass)

	Replicates	
#1	1907	pCi/sample or g
#2	1930	pCi/sample or g
#3	1937	pCi/sample or g

Mean = 1924.667

1 sigma = 15.69501 1.96 sigma = 30.76222

True Value minus 5% = 1892.4 (True Value - 5%)
True Value plus 5% = 2091.6 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

Protean Beta ICV-ACV recoveries from March 2013			
Protean Detector	**Low** pCi/sample	**Medium** pCi/sample	**High** pCi/sample
0	1962	1945	1971
1	2003	1947	1995
2	1960	1965	1998
3	1988	1942	1995
4	1977	1940	1997
5	1969	1949	2013
6	1986	1938	1986
7	1969	1964	1981
Average pCi/sample	1976.75	1948.75	1992

Protean Beta ICV-ACV recoveries from February 2014			
Protean Detector	**Low** pCi/sample	**Medium** pCi/sample	**High** pCi/sample
4	1935	1911	1907
5	1941	1945	1930
6	1924	1893	1937
Average pCi/sample	1933.33	1916.33	1924.67

Standard ID
Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean4	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	49	0.00	0.000E+000	4.900E-002	0.1157	**-1.908E-001**	pCi/sample	5.869E-002	5.452E-002	3.382E+000	8.968E-001
	Gross Beta	9072	417	0.00	1.814E+003	4.170E-001	0.4224	**1.935E+003**	pCi/sample	1.977E+002	4.063E+001	1.594E+000	7.165E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean4	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	1	49	0.00	2.000E-001	4.900E-002	0.0830	**8.194E-001**	pCi/sample	2.174E+000	2.172E+000	4.713E+000	1.250E+000
	Gross Beta	8432	417	0.00	1.686E+003	4.170E-001	0.3973	**1.911E+003**	pCi/sample	1.956E+002	4.164E+001	1.694E+000	7.616E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean4	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	1	49	0.00	2.000E-001	4.900E-002	0.0540	**1.260E+000**	pCi/sample	3.343E+000	3.340E+000	7.248E+000	1.922E+000
	Gross Beta	8054	417	0.00	1.611E+003	4.170E-001	0.3804	**1.907E+003**	pCi/sample	1.954E+002	4.251E+001	1.770E+000	7.956E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean5	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	43	0.00	0.000E+000	4.300E-002	0.1145	-1.692E-001 pCi/sample		5.510E-002	5.161E-002	3.337E+000	8.490E-001
	Gross Beta	9111	398	0.00	1.822E+003	3.980E-001	0.4228	1.941E+003 pCi/sample		1.983E+002	4.068E+001	1.569E+000	6.992E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean5	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	43	0.00	0.000E+000	4.300E-002	0.0823	-2.353E-001 pCi/sample		7.661E-002	7.176E-002	4.639E+000	1.180E+000
	Gross Beta	8552	398	0.00	1.710E+003	3.980E-001	0.3960	1.945E+003 pCi/sample		1.990E+002	4.207E+001	1.675E+000	7.465E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean5	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	2	43	0.00	4.000E-001	4.300E-002	0.0532	3.022E+000 pCi/sample		4.802E+000	4.790E+000	7.178E+000	1.826E+000
	Gross Beta	8046	398	0.00	1.609E+003	3.980E-001	0.3755	1.930E+003 pCi/sample		1.977E+002	4.304E+001	1.766E+000	7.873E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts / Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean6	2/10/14 23:19		5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.1165	-3.362E-001 pCi/sample	8.166E-002	7.210E-002	3.776E+000	1.186E+000
	Gross Beta	8992	520	0.00	1.798E+003	5.200E-001	0.4209	1.924E+003 pCi/sample	1.966E+002	4.059E+001	1.718E+000	8.029E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean6	2/10/14 23:04		5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.0842	-4.657E-001 pCi/sample	1.131E-001	9.985E-002	5.230E+000	1.642E+000
	Gross Beta	8356	520	0.00	1.671E+003	5.200E-001	0.3976	1.893E+003 pCi/sample	1.937E+002	4.142E+001	1.819E+000	8.499E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean6	2/10/14 22:54		5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.0559	-7.014E-001 pCi/sample	1.703E-001	1.504E-001	7.877E+000	2.474E+000
	Gross Beta	8127	520	0.00	1.625E+003	5.200E-001	0.3778	1.937E+003 pCi/sample	1.985E+002	4.300E+001	1.914E+000	8.945E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica St. Louis

Standards Preparation Logbook Record

Nov-28-2012

Logbook: \\Qstlmo01\Stdslog\RAD_STD.std

RAD12-0042, Sr-90 Sr-90-00017 #51511 Analyst: hursts

Vendor: Analytics Lot No.: 92352
Solvent: None
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)
Cert: 92352 Activity: 37490Bq Mass: 5.02357 Ref. Date: 11/29/12

Component	Initial Conc (dpm/g)	Final Conc (dpm/g)
Sr-90	447,769	447,769

RAD12-0043, Sr-90 Calibration STD Sr-90-00018 #51512 Analyst: hursts

Solvent: None Volume (ml): 100.00
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)

Parent Std No.: RAD12-0042, Sr-90 Aliquot Amount (g): 4.9997
Parent Date Expires(1): 11-29-2062 Parent Date Expires(2): 11-29-2062

Component	Initial Conc (dpm/g)	Final Conc (dpm/mL)
Sr-90	447,769	22,387

Reviewed By: SB

Page 1 of 1

St. Louis Radiological Standard Reverification Form

Standard ID Number: Rad12-0043
True Value = 2016.7 pCi/L or g
Date Analyzed: 11/30/2012

Radionuclide: Sr90

	Replicates	
#1	1964	pCi/L or g
#2	1958	pCi/L or g
#3	2015	pCi/L or g

Mean = 1979

1 sigma = 31.32092 1.96 sigma = 61.389

True Value minus 5% = 1915.865 (True Value - 5%)
True Value plus 5% = 2117.535 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: 11/30/12

SOP Reference: STL-QA-0002, Current Revision

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122629 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC
verification-1b	NA	1.000E+000	sample	0.0536 g	Purple16	11/30/12 10:42		8.00	1000.00	1.00	1.00	
	Gross Alpha	123	175	0.00	1.538E+001	1.750E-001	0.4314	1.587E+001 pCi/sample	1.707E+000	1.448E+000	8.638E-001	3.593E-001
	Gross Beta	14954	485	0.00	1.869E+003	4.850E-001	0.4285	1.964E+003 pCi/sample	9.953E+001	1.607E+001	1.211E+000	6.021E-001
verification-2b	NA	1.000E+000	sample	0.0529 g	Purple17	11/30/12 10:43		8.00	1000.00	1.00	1.00	
	Gross Alpha	53	87	0.00	6.625E+000	8.700E-002	0.1306	2.254E+001 pCi/sample	3.391E+000	3.138E+000	2.356E+000	8.365E-001
	Gross Beta	15152	362	0.00	1.894E+003	3.620E-001	0.4356	1.958E+003 pCi/sample	9.919E+001	1.591E+001	1.077E+000	5.117E-001
verification-3b	NA	1.000E+000	sample	0.0528 g	Purple18	11/30/12 10:43		8.00	1000.00	1.00	1.00	
	Gross Alpha	85	62	0.00	1.063E+001	6.200E-002	0.1313	3.624E+001 pCi/sample	4.462E+000	3.954E+000	2.160E+000	7.027E-001
	Gross Beta	15378	395	0.00	1.922E+003	3.950E-001	0.4296	2.015E+003 pCi/sample	1.020E+002	1.625E+001	1.125E+000	5.420E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Prep Report for Gross Alpha/Beta

Batch: M122629 **Prep Analyst:** 250

SampID	WRKNO	Aliquot		Gross	Tare	Mass	Dilution
verification-1b	NA	1.000E+000	sample	8.7067 g	8.6531 g	0.0536 g	1.00
verification-2b	NA	1.000E+000	sample	8.6615 g	8.6086 g	0.0529 g	1.00
verification-3b	NA	1.000E+000	sample	8.6935 g	8.6407 g	0.0528 g	1.00

purple 16

17

18

Spike Information

Sample ID	Standard ID	Analyte	Std Conc	Aliquot	Ref Date	StdAdded
	Rad12-0043	SR-90	22.387 dpm/mL	0.1 mL	11-29-12	

MS — Spiked By

LM — Spike Verified By

11-28-12 — Spike Date

Standard Operating Procedures

SOPNumber	Title	Revision

Reviewed By — 11/30/12 Review Date

MS — Analyst/Relenquished By — 11/28/12 Release Date — Received By — 11/28/12 Receipt Date

MS 11-30-12 ~~112~~ 1123433897/MS/11-28-12

Balance ID / Initials / Date

Reagent

Th-230_00051

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 114474
Source Description: 5 mL Liquid in Flame Sealed Ampoule
Product Code: 8230
Customer: Test America Laboratories- St. Louis
P.O. Number: 3053229, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-October-2019 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A, %	u_B, %	U, %*	
Th-230	2.753E+07	3.786E+03	0.2	1.0	2.0	4π LS

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Th-230-00051

Reagent

Th-230_00052

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

St. Louis Radiological Standard Verification

Printed: 11/18/2019 12:43 PM

Standard ID Number: Th-230_00053
True Value = 20311 pCi/L or g
Date Analyzed: 11/16/2019

Radionuclide: Th-230

	Replicates	
#1	19840	pCi/L or g
#2	20910	pCi/L or g
#3	19879	pCi/L or g

Mean = 20209.667

1 sigma = 606.81985

1.96 sigma = 1189.367

True Value minus 5% = 19295.45 (True Value - 5%)
True Value plus 5% = 21326.55 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: TJR 11/18/19

2nd Reviewed By/Date: 11/18/19

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	10/29/2019 0:00		
Decayto Date/Time (t):	11/16/19 0:00		
Initial Activity (A_0):	45.09 dpm		
Initial Aliquot:	1 mL		
Initial Conc:	45.0915 dpm/mL		
***Soln. Density:**	1 g/mL		
Nuclide:	Th-230		
Half-Life (days):	27539850	decay days	fraction
****Decay Factor:**	1.0000	18.00	0.00000
Decay Corr Activity:	4.5091E+01 dpm		
Decay Corr Conc:	4.5091E+01 dpm/mL		

Conversion/Calculations

Final Activity Unit:	pCi
Activity Unit Factor:	0.45045
Final Volume Unit:	L
Volume Unit Factor:	0.001
Final Concentration:	2.0311E+04 pCi/L
Aliquot Volume:	1.0000E+00 L
Final Activity (A):	2.0311E+04 pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:37:53AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-A Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-A
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246263
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

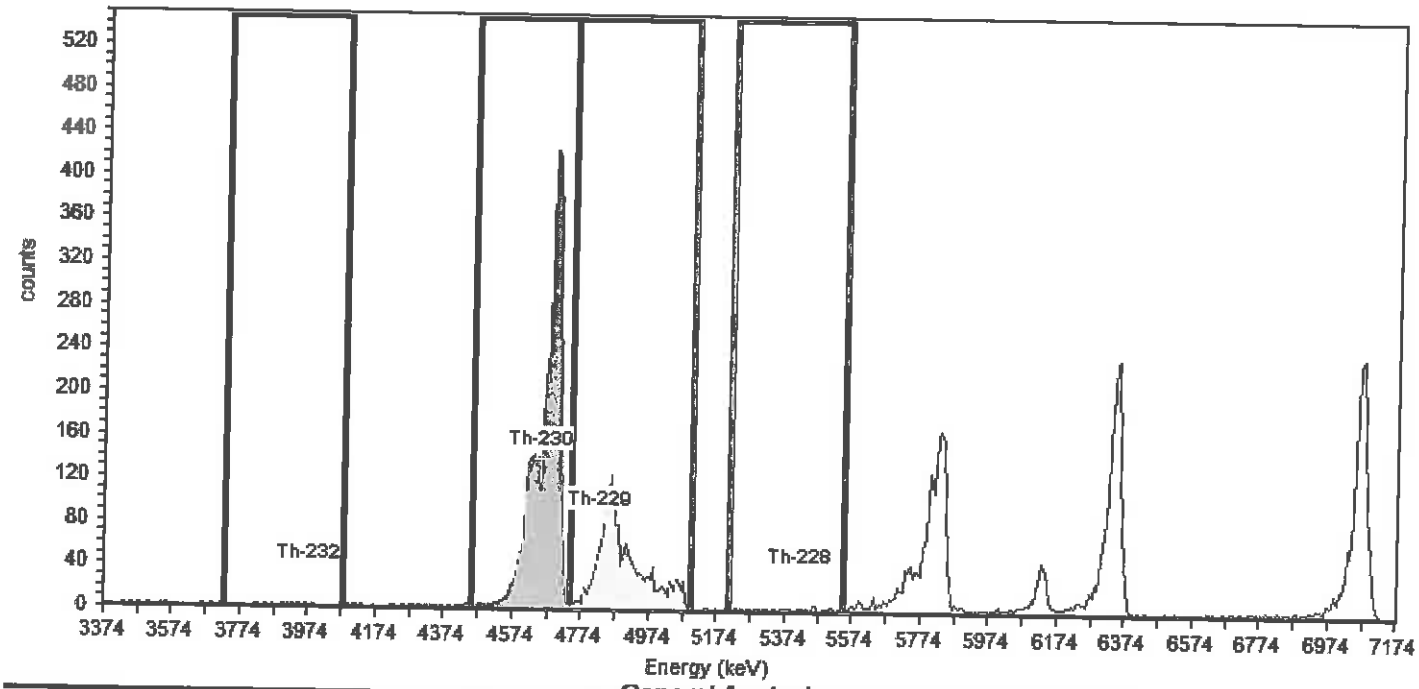
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 92.98%

Acquisition

Detector: AV244 SN: 51-005EE3
Acquisition Start Date: 11/16/2019 1:40:35PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV244; Det: AV244; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-1370619;AV244-11152018
Efficiency Calibration:IC-1370619;AV244-11152018
Calibration Date: 11/15/2018 10:58:47PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 28.89% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	.3	100.2	11	2.0000	9.00	5.229E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4739.1	34.6	99.7	3399	1.0000	3398.00	1.984E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4739.1	5097.1	73.2	99.6	1706	6.0000	1700.00	9.237E+003	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	.9	99.8	45	19.0000	26.00	1.517E+002	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:28:03AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-B Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-B
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246269
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

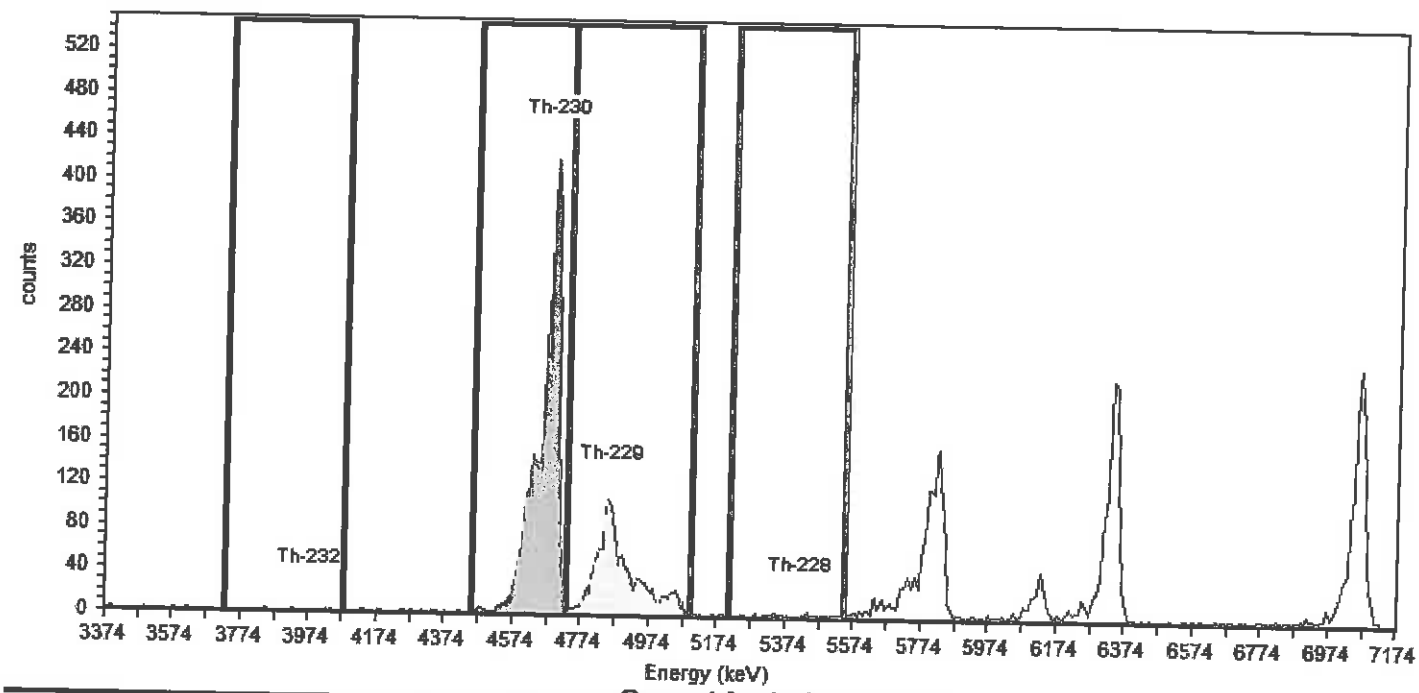
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 94.23%

Acquisition

Detector: AV245 SN: 49-037W4
Acquisition Start Date: 11/16/2019 1:40:35PM
Live Time: 960.00 min.
Real Time: 960.04 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV245; Det: AV245; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-1370620;AV245-11152018
Efficiency Calibration:IC-1370620;AV245-11152018
Calibration Date: 11/15/2018 10:58:51PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.18% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	10.5	100.2	4	0.0000	4.00	2.531E+001	pCi/L
Th-230	4686.9	4,687.5	-0.6	4455.8	4731.7	30.4	99.7	3292	4.0000	3288.00	2.091E+004	pCi/L
Th-229	4858.5	4,845.3	13.2	4731.7	5097.1	80.2	99.6	1567	6.0000	1561.00	9.361E+003	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	227.6	99.8	38	16.0000	22.00	1.398E+002	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:08:38AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-C Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-C
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246265
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

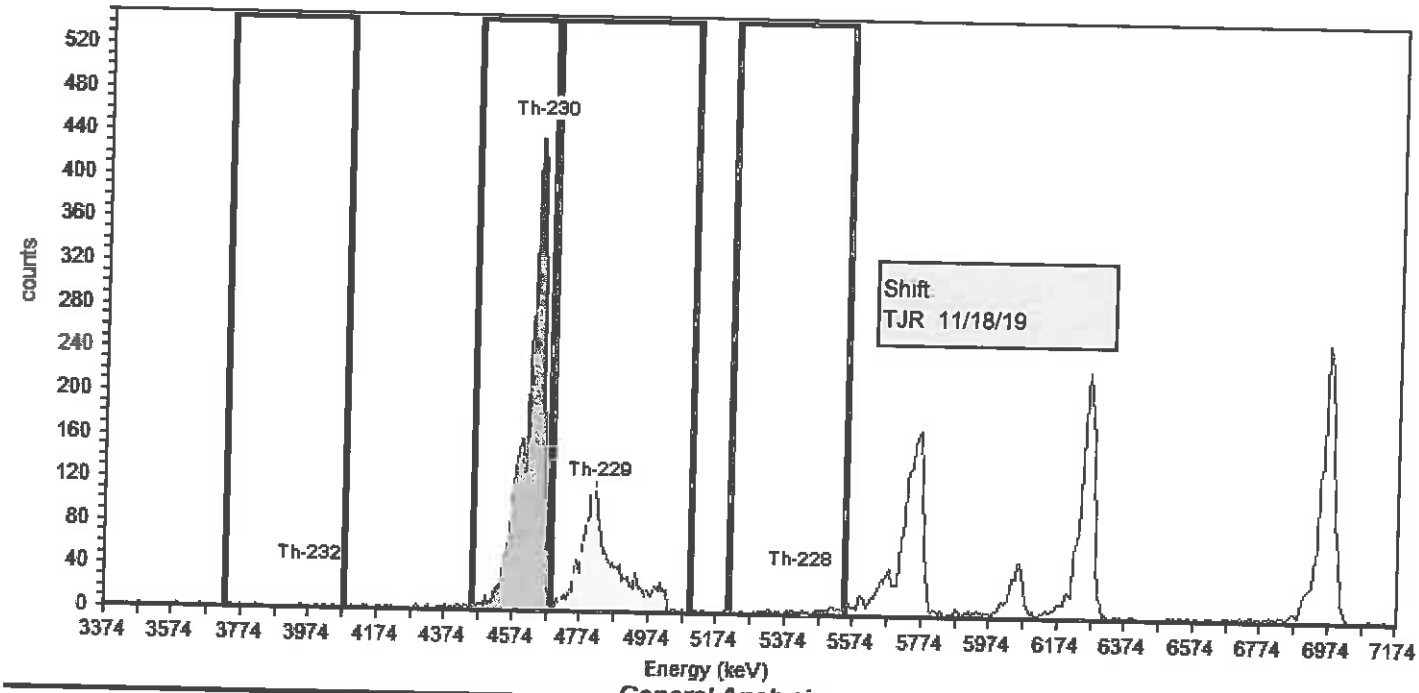
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 102.72%

Acquisition

Detector: AV246 SN: 51-005Q2
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV246; Det: AV246; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-7107;AV246-11152018
Efficiency Calibration:IC-7107;AV246-11152018
Calibration Date: 11/15/2018 10:58:54PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.21% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	29.9	100.2	8	2.0000	6.00	3.479E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4679.5	46.7	~~23.4~~ 99.7	3412	1.0000	3411.00	~~8.470E+004~~	pCi/L
Th-229	4828.6	4,845.3	-16.7	4686.9	5097.1	70.6	99.8	1711	5.0000	1706.00	1.020E+004	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	.0	99.8	84	14.0000	70.00	4.077E+002	pCi/L

TJR 11/18/19

$84700 \cdot \frac{.234}{.997} = 19879$

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:35:47AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-D Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-D
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246266
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

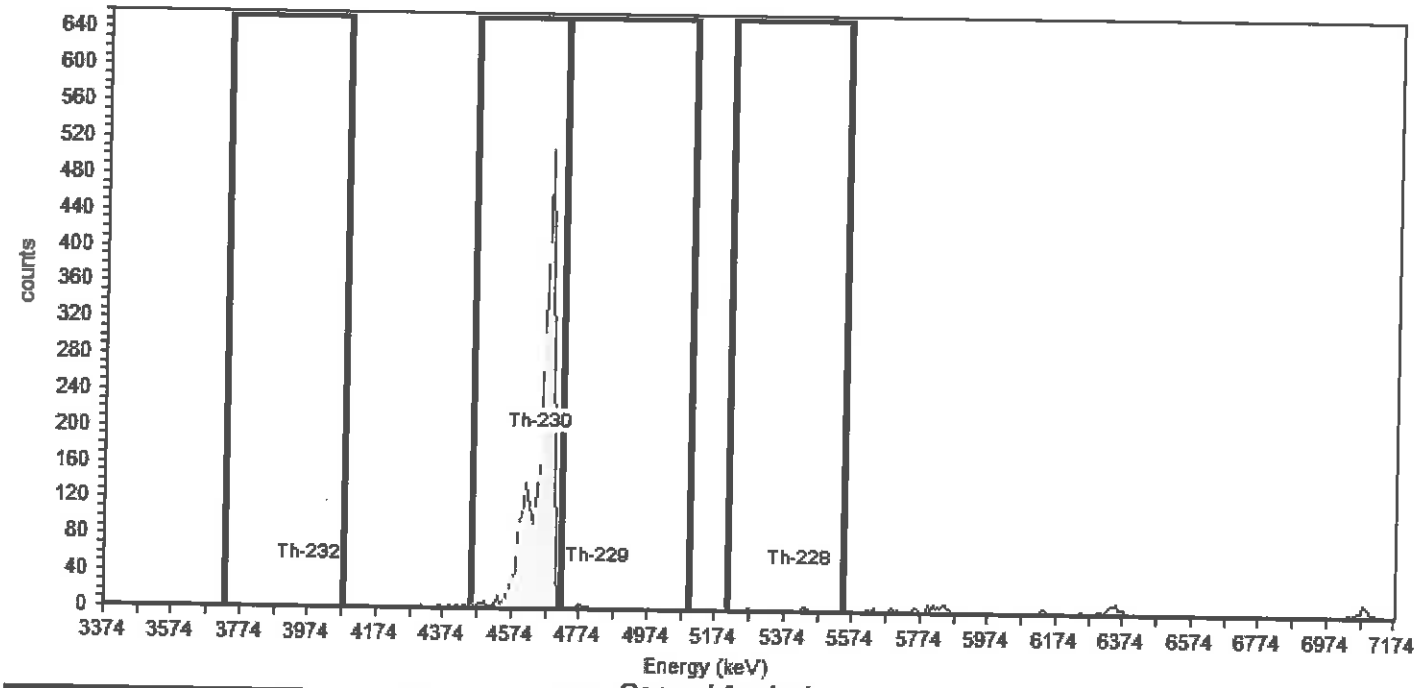
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 94.74%

Acquisition

Detector: AV247 SN: 51-027F3
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV247; Det: AV247; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-8874;AV247-11152018
Efficiency Calibration:IC-8874;AV247-11152018
Calibration Date: 11/16/2018 11:45:39AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.31% +/- 0.37% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	32.5	100.2	4	0.0000	4.00	2.505E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	19.6	99.7	3227	0.0000	3227.00	1.924E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	42.6	99.6	19	9.0000	10.00	6.298E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	43.0	99.8	22	12.0000	10.00	6.290E+001	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:36:27AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-E Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-E
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246267
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

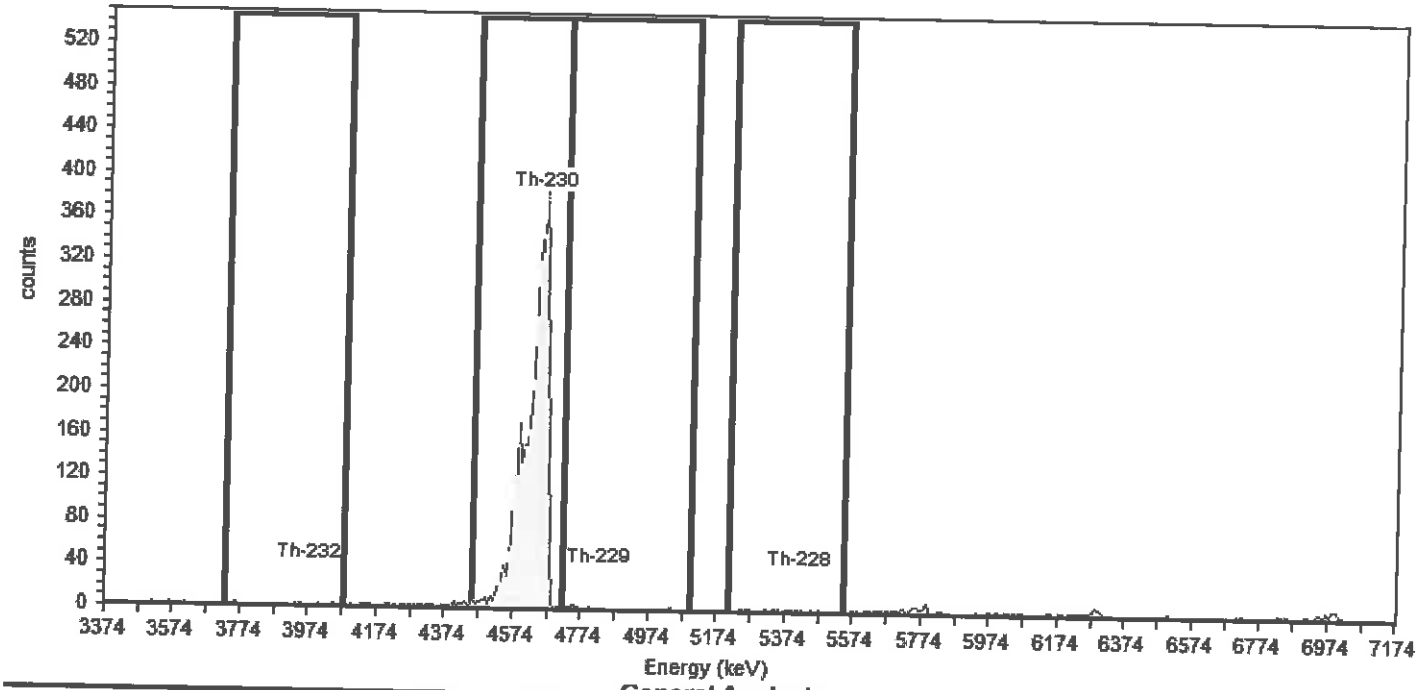
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 110.62%

Acquisition

Detector: AV249 SN: 51-005EE5
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:28PM
Bkgd Info: Sample: ICB;AV249; Det: AV249; Spectrum #1; 11/9/2019 2:31:28 PM

Energy Calibration: IC-9520;AV249-11152018
Efficiency Calibration:IC-9520;AV249-11152018
Calibration Date: 11/15/2018 10:59:03PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 23.81% +/- 0.34% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	9.5	100.2	5	1.0000	4.00	2.371E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	65.6	99.7	3411	1.0000	3410.00	2.247E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	39.7	99.6	19	7.0000	12.00	7.152E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	186.1	99.8	17	13.0000	4.00	2.381E+001	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:37:05AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-F Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-F
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246268
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

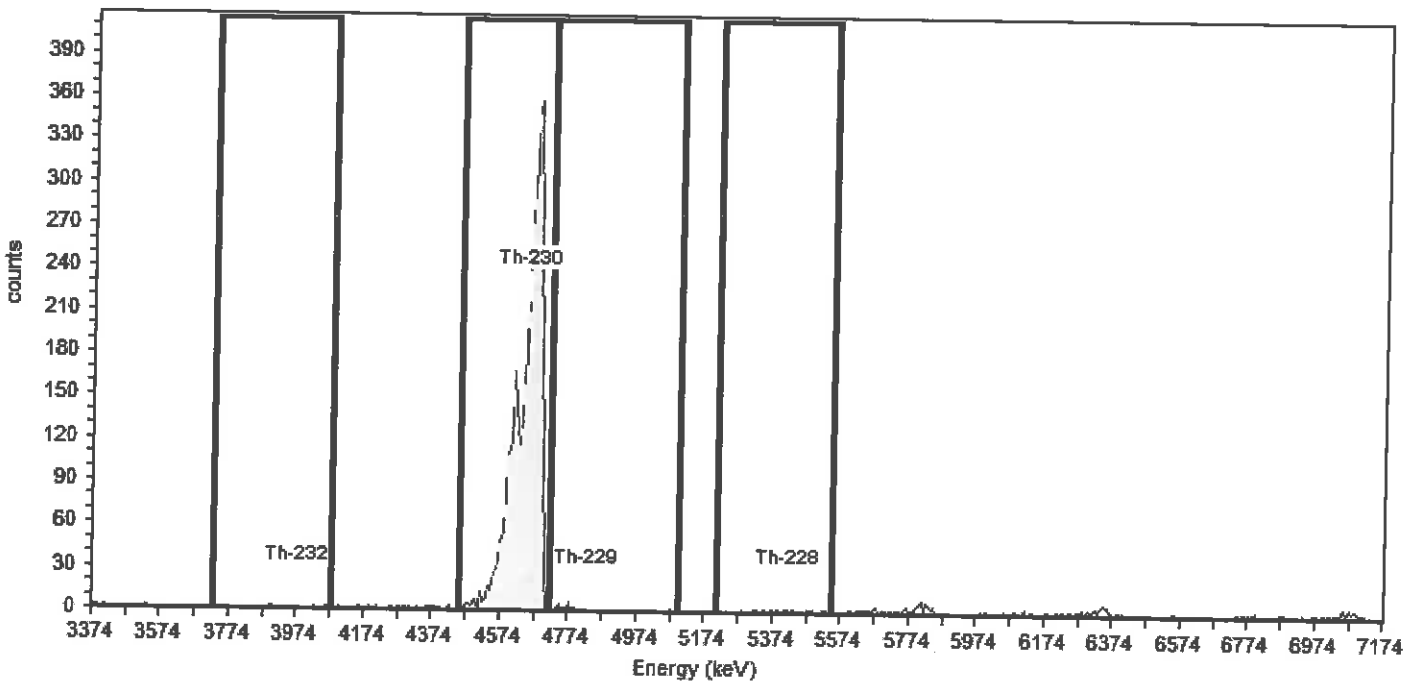
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 107.83%

Acquisition

Detector: AV250 SN: 47-052x7
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 11/9/2019 2:31:28PM
Bkgd Info: Sample: ICB;AV250; Det: AV250; Spectrum #1; 11/9/2019 2:31:28 PM

Energy Calibration: IC-9792;AV250-11152018
Efficiency Calibration:IC-9792;AV250-11152018
Calibration Date: 11/15/2018 10:59:07PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 22.66% +/- 0.28% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	10.4	100.2	3	7.0000	-4.00	2.556E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	19.5	99.7	3168	5.0000	3163.00	2.190E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	51.0	99.6	20	7.0000	13.00	8.353E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	134.4	99.8	17	16.0000	1.00	6.418E+000	pCi/L

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Radiochemistry Data Review Checklist

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Review Item	Yes	No	N/A	2 Rvw
Rad Prep				
1 Are all samples on batch sheet present or removed from batch?	☑	☐	☐	☐
2 Are all samples, QC and methods in compliance with client requirements?	☑	☐	☐	☐
3 Were forms checked for transcription errors?	☑	☐	☐	☐
4 Are all TALS entries complete? (End Dates and appropriate worksheet fields completed)	☑	☐	☐	☐
5 Are all problems and deviations documented? (NCM printed and attached with paperwork)	☐	☐	☑	☐
6 Does this batch contain re-extracts?	☐	☑	☐	☐
Sample Analysis				
1 Are carrier/tracer yields within acceptance limits? 183818	☐	☑	☐	☐
2 Were all sample holding times met?	☑	☐	☐	☐
3 If alpha or LSC, were samples analyzed using normal ROI's, and were spectra evaluated for interferences? 183815	☑	☐	☐	☐
QC Samples				
1 Is the blank activity <= MDA	☐	☐	☑	☐
2 Is the blank activity <= client CRDL?	☐	☐	☑	☐
3 If blank activity exceeds limit, is sample activity >= 5X blank activity?	☐	☐	☑	☐
4 Is LCS recovery within acceptance limits?	☐	☐	☑	☐
5 Is duplicate precision (e.g. RPD/RER/DER/z-score) within acceptance limits?	☐	☐	☑	☐
6 Is MS/MSD recovery within acceptance limits?	☐	☐	☑	☐
7 Do samples meet CRDL?	☐	☐	☑	☐
8 Is the absolute value of any negative result < 3sigma uncert.?	☐	☐	☑	☐
Other				
1 Are all nonconformances documented and noted? 183819, 183821	☑	☐	☐	☐
2 Were manual data entries and/or calculations checked?	☐	☐	☑	☐
Data Packaging				
1 Run logs included?	☐	☐	☐	☐
2 Daily checks included?	☐	☐	☐	☐
3 Backgrounds included?	☐	☐	☐	☐
4 Calibrations included?	☐	☐	☐	☐

Lot Number	Analytical Due Date
160-36383-A-1-A	
160-36383-A-1-B	
160-36383-A-1-C	
160-36383-A-1-D	
160-36383-A-1-E	
160-36383-A-1-F	
160-36383-A-2-A	
160-36383-A-2-B	
160-36383-A-2-C	
160-36383-A-2-D	
160-36383-A-2-E	
160-36383-A-2-F	

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Comments:

Prep Analyst: cmm Date: 11/15/2019

Analyst: Date:

Second Level Reviewer Date:

Date Uploaded:

Date Verified:

Date Review Released:

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

960min
~~240min~~ KR 11/16/19

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Preparation, Extraction Chromatography Resin Actinide Separation

TA 1.00 ml/L

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments	Output Sample Lab ID
1	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ adjust 244	160-36383-A-1-A
2	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	adjust / 245	160-36383-A-1-B
3	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 246 Swift	160-36383-A-1-C
4	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 247	160-36383-A-1-D
5	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 249	160-36383-A-1-E
6	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 250	160-36383-A-1-F
7	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	1	160-36383-A-2-A
8	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	3	160-36383-A-2-B
9	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	4	160-36383-A-2-C
10	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	14 6	160-36383-A-2-D
11	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	15 7	160-36383-A-2-E
12	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	16 8 KR 11/16/19	160-36383-A-2-F

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Isotopic Thorium (Alpha Spectrometry)

	Input Sample Lab ID (Analytical Method)	(Sub-List)	Analytes
1	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
2	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
3	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
4	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
5	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
6	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
7	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
8	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
9	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
10	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
11	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
12	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Batch Notes

Balance ID	N/A
Analyst ID - Reagent Drop	CMM
Analyst ID - Reagent Drop Witness	KLH per CMM
Pipette ID	RAD104
Analyst ID - Column	N/A
Column Date	N/A
Analyst ID - CoPrecipitation	CMM
CoPrecipitation Date	11/15/2019
SOP Number	ST-RC-0100
Batch Comment	

Comments

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Reagent Additions Worksheet

Lab ID	Reagent Code	Amount Added	Final Amount	By	Witness
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

160-36383-A-2	Th-230_00057	0.3 mL			

Other Reagents:

Reagent	Amount/Units	Lot#:

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

Reagent

Th-230_00054

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 114475
Source Description: 5 mL Liquid in Flame Sealed Ampoule
Product Code: 8230
Customer: Test America Laboratories- St. Louis
P.O. Number: 3053229, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-October-2019 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A, %	u_B, %	U, %*	
Th-230	2.753E+07	3.843E+03	0.2	1.0	2.0	4π LS

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Reagent

Th-230_00056

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

St. Louis Radiological Standard Verification

Printed: 11/18/2019 11:25 AM

Standard ID Number: Th-230_00057
True Value = 20627 pCi/L or g
Date Analyzed: 11/16/2019

Radionuclide: Th-230

	Replicates	
#1	19791	pCi/L or g
#2	20695	pCi/L or g
#3	18802	pCi/L or g

Mean = 19762.667

1 sigma = 946.818

1.96 sigma = 1855.763

True Value minus 5% = 19595.65 (True Value - 5%)
True Value plus 5% = 21658.35 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: TJR 11/18/19

2nd Reviewed By/Date: 11/18/19

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	10/29/2019 0:00		
Decayto Date/Time (t):	11/16/19 0:00		
Initial Activity (A_0):	45.79 dpm		
Initial Aliquot:	1 mL		
Initial Conc:	45.7916 dpm/mL		
***Soln. Density:**	1 g/mL		
Nuclide:	Th-230		
Half-Life (days):	27539850	decay days	fraction
****Decay Factor:**	1.0000	18.00	0.00000
Decay Corr Activity:	4.5792E+01 dpm		
Decay Corr Conc:	4.5792E+01 dpm/mL		

Conversion/Calculations

Final Activity Unit:	pCi
Activity Unit Factor:	0.45045
Final Volume Unit:	L
Volume Unit Factor:	0.001
Final Concentration:	2.0627E+04 pCi/L
Aliquot Volume:	1.0000E+00 L
Final Activity (A):	2.0627E+04 pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
5:43:23AM 11/17/2019

Sample

Sample Name: 160-36383-A-2-A
SampleType: Sample
: 160-36383-A-2-A
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775471

Analyst: 60040

Tracer

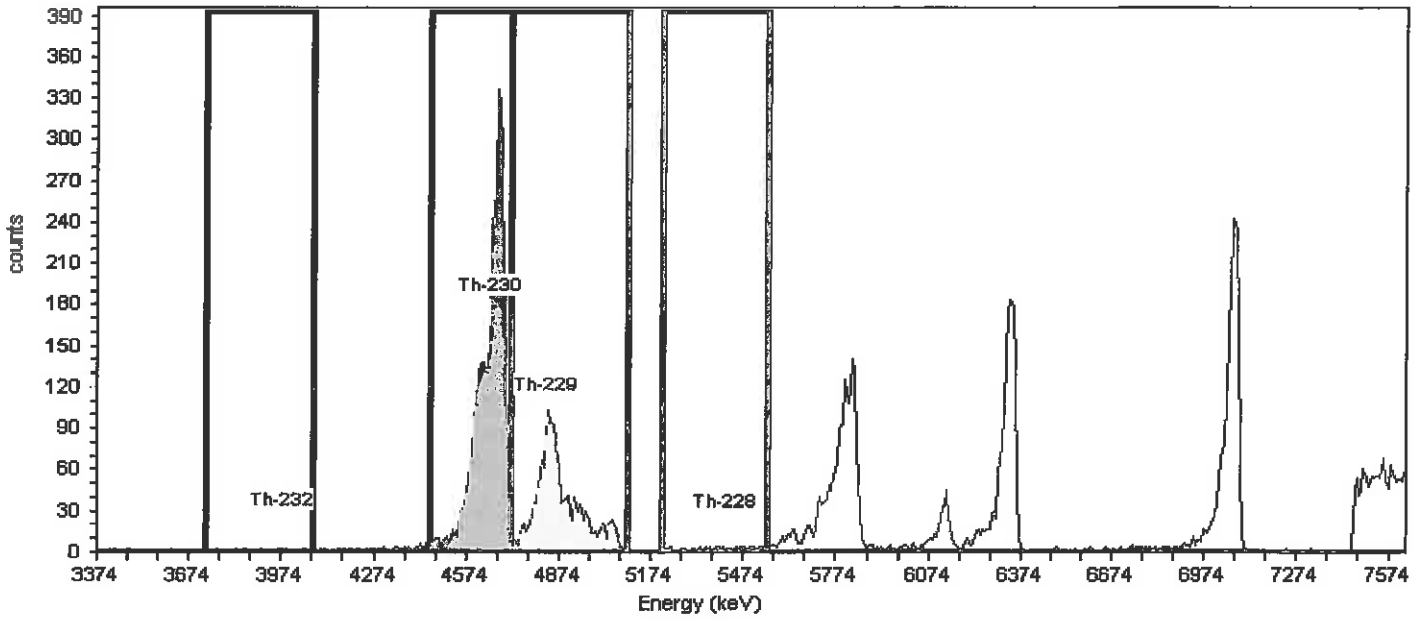
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 101.73%

Acquisition

Detector: AV1
Serial Number: 49-188 AA4
Acquisition Start Date: 11/16/2019 1:42:29PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:56:34PM
Background Info: Sample: ICB;AV1; Det: AV1; Spectrum #2; Nov-13-2019 13:56

Calibration Name: IC-7107;AV1-05142018
Calibration Date: 5/14/2018 6:23:45PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 24.36% +/- 0.28% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	32.5	100.2	9	4.0000	5.00	31.497	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	23.5	99.7	3137	11.0000	3126.00	19,790.970	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	78.3	99.6	1571	3.0000	1568.00	10,105.280	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	27.5	99.8	51	7.0000	44.00	278.400	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:51:27AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-B
SampleType: Sample
: 160-36383-A-2-B
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775566

Analyst: 60040

Tracer

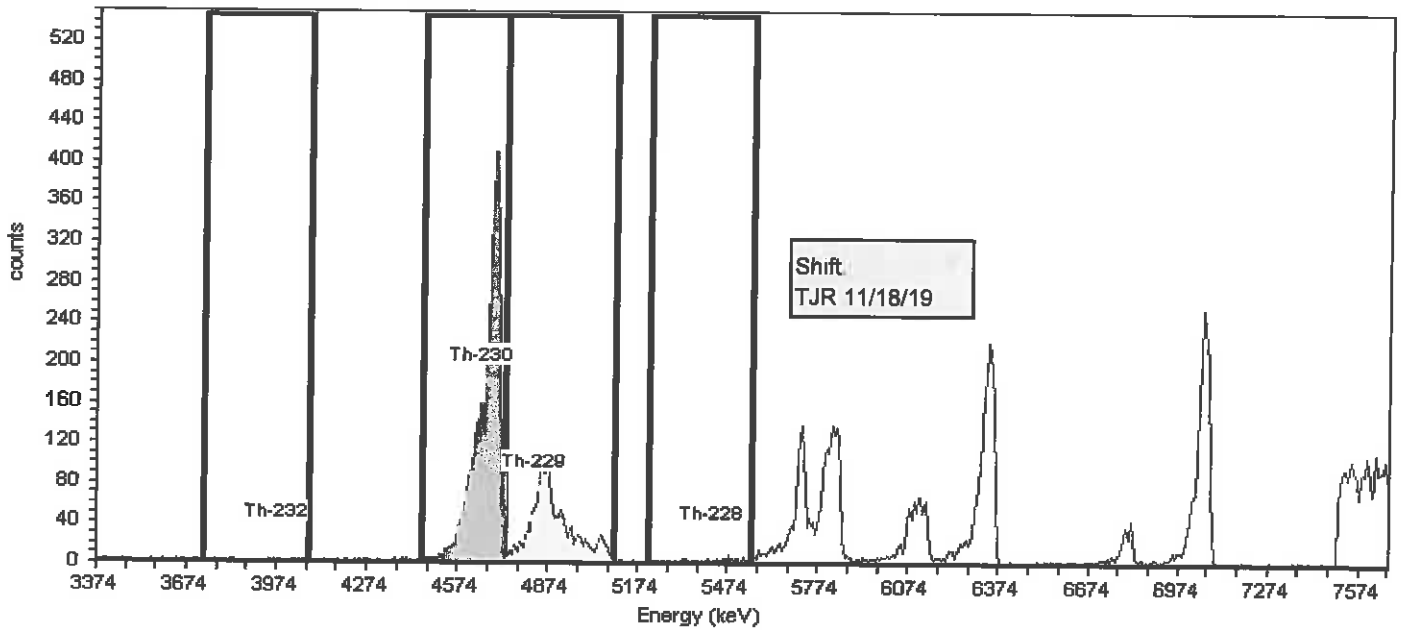
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 102.38%

Acquisition

Detector: AV3
Serial Number: 49-202 FF7
Acquisition Start Date: 11/16/2019 1:42:31PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:56:37PM
Background Info: Sample: ICB;AV3; Det: AV3; Spectrum #2; Nov-13-2019 13:56

Calibration Name: IC-8877;AV3-05142018
Calibration Date: 5/14/2018 6:25:15PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 24.44% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	12.1	100.2	14	16.0000	-2.00	-12.480	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4731.7	22.3	99.7	3313	13.0000	3300.00	20,694.600	pCi/L
Th-229	4828.6	4,845.3	-16.7	4731.7	5097.1	82.4	99.6	1591	8.0000	1583.00	10,169.700	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	18.4	99.8	79	4.0000	75.00	470.050	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
5:42:33AM 11/17/2019

Sample

Sample Name: 160-36383-A-2-C
SampleType: Sample
: 160-36383-A-2-C
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775467

Analyst: 60040

Tracer

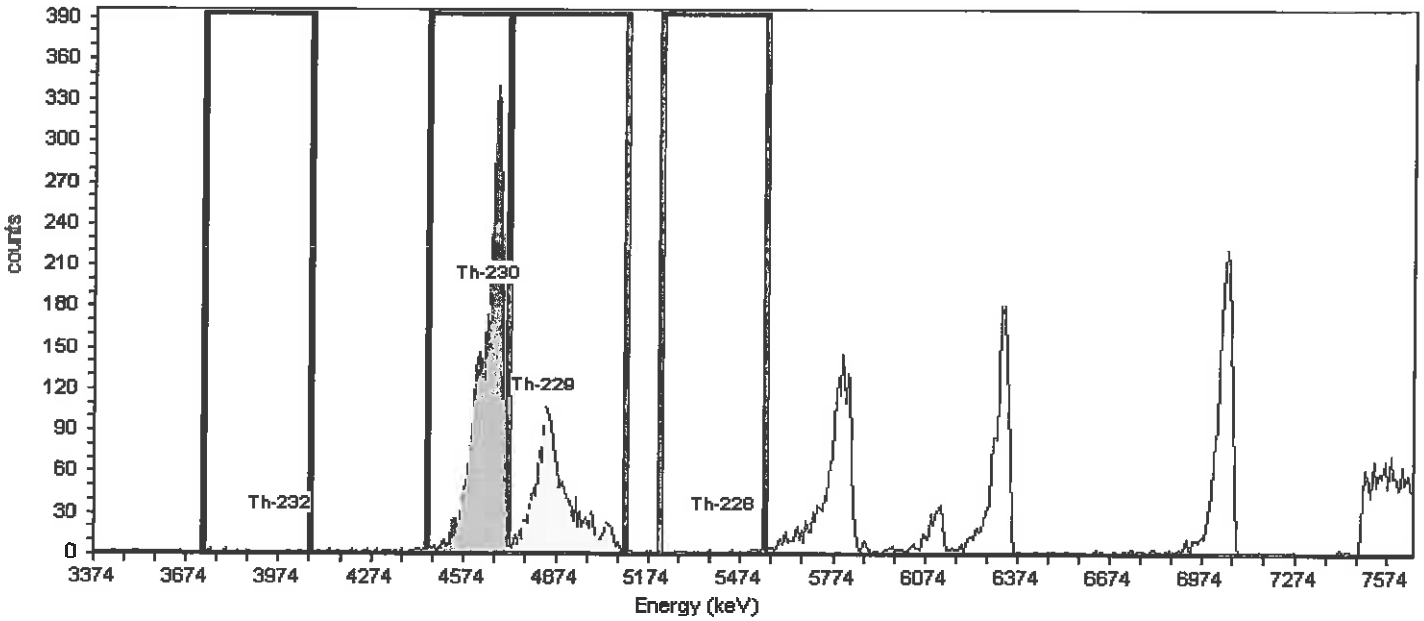
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 116.50%

Acquisition

Detector: AV4
Serial Number: 46-033Q4
Acquisition Start Date: 11/16/2019 1:42:33PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:54:23PM
Background Info: Sample: ICB;AV4; Det: AV4; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-9520;AV4-05142018
Calibration Date: 5/14/2018 6:25:34PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 22.79% +/- 0.33% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	305.2	100.2	9	7.0000	2.00	11.759	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	24.7	99.7	3184	2.0000	3182.00	18,802.470	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	87.4	99.6	1685	5.0000	1680.00	11,572.560	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	29.2	99.8	33	7.0000	26.00	153.542	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:42:35AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-D
SampleType: Sample
: 160-36383-A-2-D
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775571

Analyst: 60040

Tracer

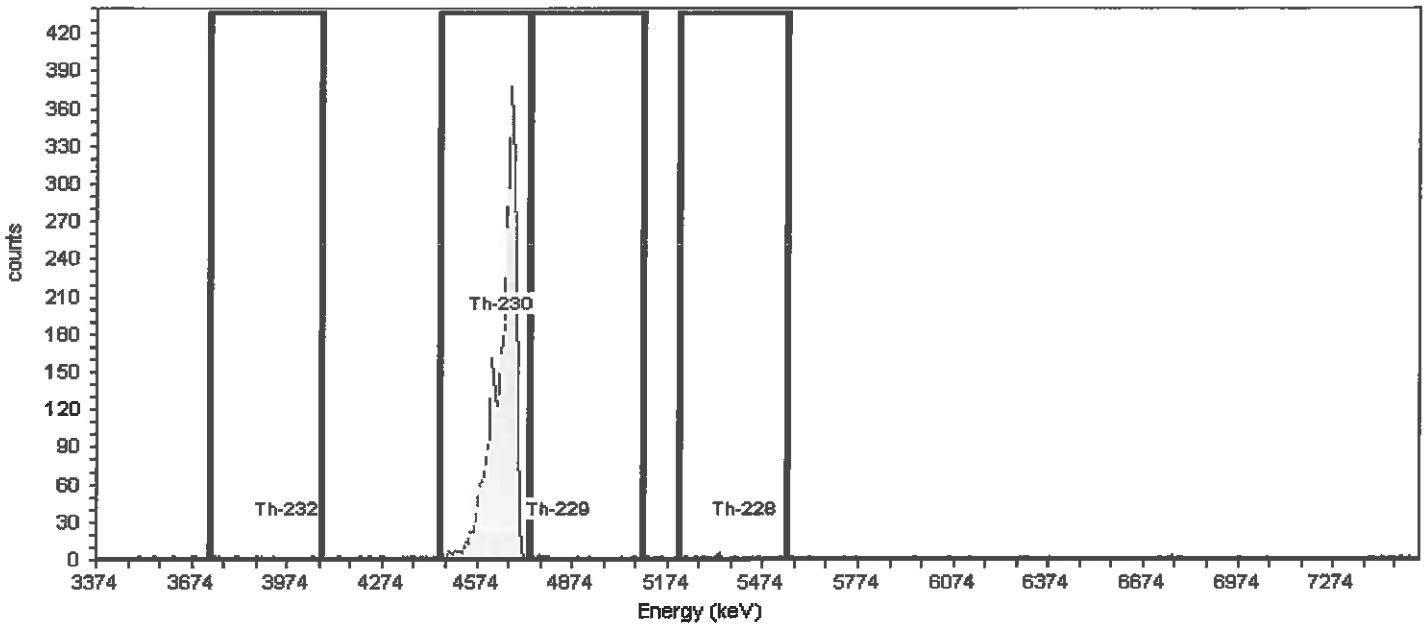
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 89.46%

Acquisition

Detector: AV14
Serial Number: 50-060W4
Acquisition Start Date: 11/16/2019 1:42:42PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:35PM
Background Info: Sample: ICB;AV14; Det: AV14; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-1370622;AV14-05142018
Calibration Date: 5/14/2018 6:27:53PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.40% +/- 0.23% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	15.9	100.2	9	2.0000	7.00	46.270	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4739.1	63.3	99.7	3108	3.0000	3105.00	18,452.200	pCi/L
Th-229	4828.6	4,845.3	-16.7	4739.1	5097.1	306.2	99.6	18	3.0000	15.00	99.700	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	223.9	99.8	14	11.0000	3.00	19.917	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:42:50AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-E
SampleType: Sample
: 160-36383-A-2-E
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775569

Analyst: 60040

Tracer

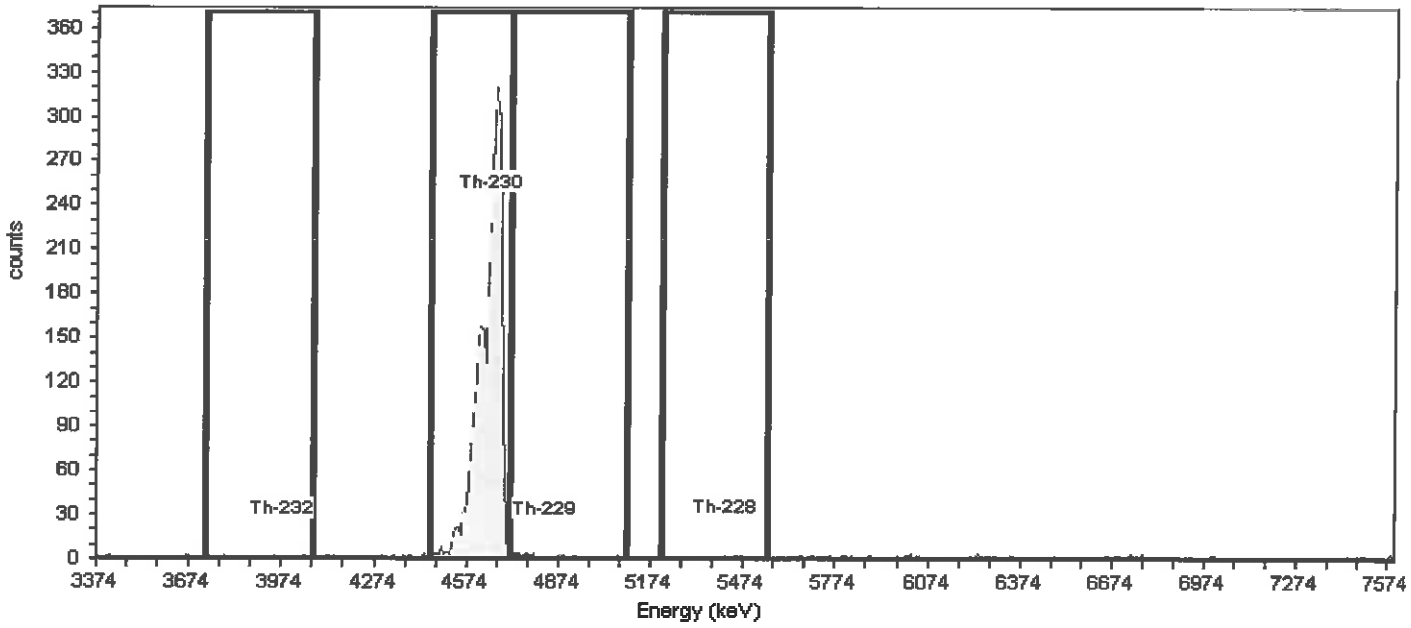
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 86.22%

Acquisition

Detector: AV15
Serial Number: 41-172C5
Acquisition Start Date: 11/16/2019 1:42:43PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:37PM
Background Info: Sample: ICB;AV15; Det: AV15; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-1370619;AV15-05142018
Calibration Date: 5/14/2018 6:28:04PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 27.26% +/- 0.23% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	29.5	100.2	5	5.0000	0.00	0.000	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	33.0	99.7	3098	8.0000	3090.00	17,785.010	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	60.9	99.6	19	9.0000	10.00	66.789	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	55.9	99.8	4	6.0000	-2.00	-13.343	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:43:04AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-F
SampleType: Sample
: 160-36383-A-2-F
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775570

Analyst: 60040

Tracer

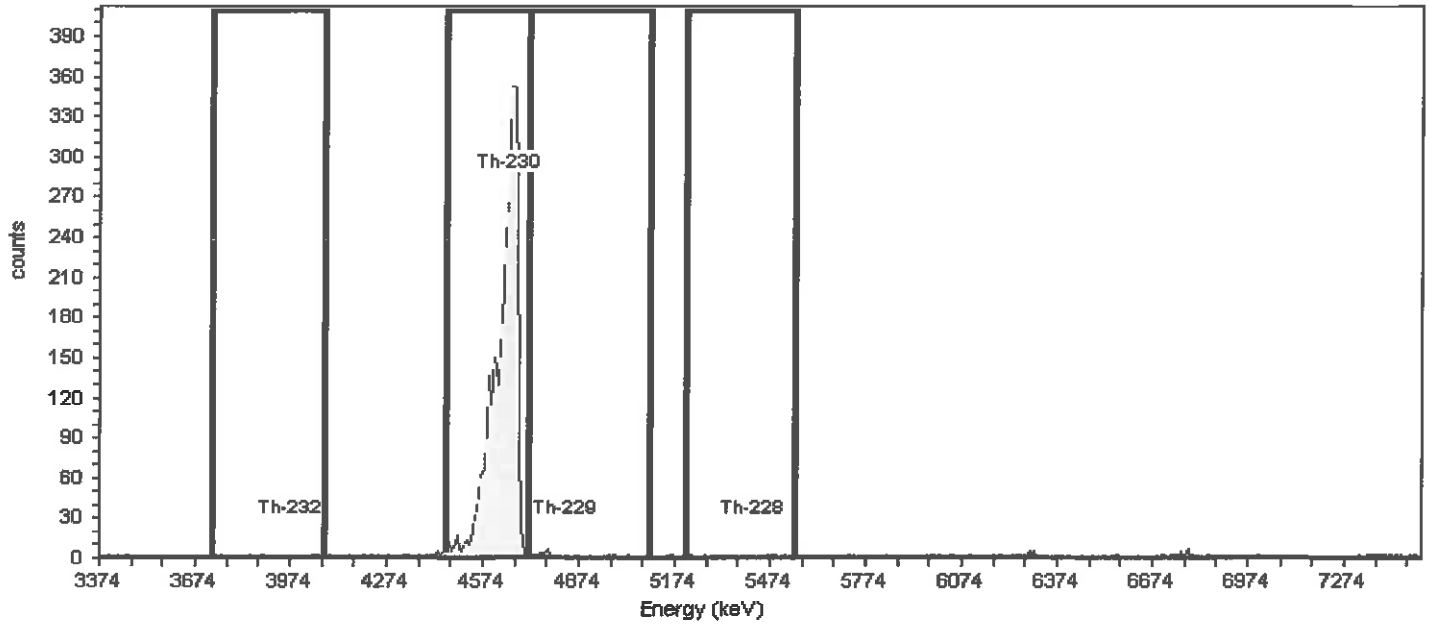
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 93.47%

Acquisition

Detector: AV16
Serial Number: 51-082B6
Acquisition Start Date: 11/16/2019 1:42:45PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:38PM
Background Info: Sample: ICB;AV16; Det: AV16; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-137620;AV16-05142018
Calibration Date: 5/14/2018 6:28:17PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.96% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	23.8	100.2	7	1.0000	6.00	37.170	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	42.4	99.7	3321	8.0000	3313.00	19,279.790	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	.0	99.6	28	6.0000	22.00	137.046	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	10.3	99.8	6	5.0000	1.00	6.222	pCi/L

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Radiochemistry Data Review Checklist

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Review Item	Yes	No	N/A	2 Rvw
Rad Prep				
1 Are all samples on batch sheet present or removed from batch?	☑	☐	☐	☐
2 Are all samples, QC and methods in compliance with client requirements?	☑	☐	☐	☐
3 Were forms checked for transcription errors?	☑	☐	☐	☐
4 Are all TALS entries complete? (End Dates and appropriate worksheet fields completed)	☑	☐	☐	☐
5 Are all problems and deviations documented? (NCM printed and attached with paperwork)	☐	☐	☑	☐
6 Does this batch contain re-extracts?	☐	☑	☐	☐
Sample Analysis				
1 Are carrier/tracer yields within acceptance limits? 183818	☐	☑	☐	☐
2 Were all sample holding times met?	☑	☐	☐	☐
3 If alpha or LSC, were samples analyzed using normal ROI's, and were spectra evaluated for interferences? 183815	☑	☐	☐	☐
QC Samples				
1 Is the blank activity <= MDA	☐	☐	☑	☐
2 Is the blank activity <= client CRDL?	☐	☐	☑	☐
3 If blank activity exceeds limit, is sample activity >= 5X blank activity?	☐	☐	☑	☐
4 Is LCS recovery within acceptance limits?	☐	☐	☑	☐
5 Is duplicate precision (e.g. RPD/RER/DER/z-score) within acceptance limits?	☐	☐	☑	☐
6 Is MS/MSD recovery within acceptance limits?	☐	☐	☑	☐
7 Do samples meet CRDL?	☐	☐	☑	☐
8 Is the absolute value of any negative result < 3sigma uncert.?	☐	☐	☑	☐
Other				
1 Are all nonconformances documented and noted? 183819, 183821	☑	☐	☐	☐
2 Were manual data entries and/or calculations checked?	☐	☐	☑	☐
Data Packaging				
1 Run logs included?	☐	☐	☐	☐
2 Daily checks included?	☐	☐	☐	☐
3 Backgrounds included?	☐	☐	☐	☐
4 Calibrations included?	☐	☐	☐	☐

Lot Number	Analytical Due Date
160-36383-A-1-A	
160-36383-A-1-B	
160-36383-A-1-C	
160-36383-A-1-D	
160-36383-A-1-E	
160-36383-A-1-F	
160-36383-A-2-A	
160-36383-A-2-B	
160-36383-A-2-C	
160-36383-A-2-D	
160-36383-A-2-E	
160-36383-A-2-F	

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Comments:

Prep Analyst: cmm Date: 11/15/2019

Analyst: Date:

Second Level Reviewer Date:

Date Uploaded:

Date Verified:

Date Review Released:

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

960min
~~240min~~ KR 11/16/19

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Preparation, Extraction Chromatography Resin Actinide Separation

TA 1.00 pi/L

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments	Output Sample Lab ID
1	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ adjust 244	160-36383-A-1-A
2	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	adjust / 245	160-36383-A-1-B
3	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 246 Shift	160-36383-A-1-C
4	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 247	160-36383-A-1-D
5	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 249	160-36383-A-1-E
6	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 250	160-36383-A-1-F
8	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	1	160-36383-A-2-A
9	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	3	160-36383-A-2-B
10	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	4	160-36383-A-2-C
11	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	14 6	160-36383-A-2-D
12	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	15 7	160-36383-A-2-E
									16 8 KR 11/16/19	160-36383-A-2-F

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Isotopic Thorium (Alpha Spectrometry)

	Input Sample Lab ID (Analytical Method)	(Sub-List)	Analytes
1	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
2	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
3	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
4	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
5	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
6	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
7	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
8	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
9	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
10	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
11	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
12	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Batch Notes

Balance ID	N/A
Analyst ID - Reagent Drop	CMM
Analyst ID - Reagent Drop Witness	KLH per CMM
Pipette ID	RAD104
Analyst ID - Column	N/A
Column Date	N/A
Analyst ID - CoPrecipitation	CMM
CoPrecipitation Date	11/15/2019
SOP Number	ST-RC-0100
Batch Comment	

Comments

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Reagent Additions Worksheet

Lab ID	Reagent Code	Amount Added	Final Amount	By	Witness
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

160-36383-A-2	Th-230_00057	0.3 mL			

Other Reagents:

Reagent	Amount/Units	Lot#:

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

Reagent

Y Carrier_00076

Packing Slip

5580 Skylane Blvd
Santa Rosa CA 95403
United States

Order Date	11/9/2022
Order #	56033474
Ship Date	11/21/2022
Tracking #	
Ship Via	F-EX GRND
Comment 2	
CPI Rep	Clairisse Daniels
Order Type	Standard
Special Instructions	
PO #	US1132380639

Ship To

Attn: Jane Wheeler
TestAmerica St. Louis
13715 Rider Trail North
Earth City MO 63045-1205
United States

Item	Description	Ordered	Units	Back Ordered	Shipped	Lot Number
Z-067074-05-1L	Yttrium Oxide 50,000 mg/L ± 0.3% in 10% HNO3, 1000 mL	1	Ea		1	

SDS available online at http://sds.cpiinternational.com.
Thank you for your business.

CPI International

Ship Returns To

5580 Skylane Blvd
Santa Rosa CA 95403
United States

Customer Return Form

Customer	Eurofins TestAmerica St. ...
Order #	56033474
R.A. #	

Item	Quantity	Reason for Returning

56033474

Subcontract Data

Shipping and Receiving Documents

eurofins | Eaton Analytical

810-53631 Chain of Custody

110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order #

Batch #

03/17/2023

www.EurofinsUS.com/Eaton

CHAIN OF CUSTODY RECORD

Page _____ of _____

Shaded area for EEA use only

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998			MI	23B0271	23B0271
BILL TO: Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444	COMPLIANCE MONITORING: Yes X / No	POPULATION SERVED	SOURCE WATER		

LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	02/06/23	14:40			MW-09	Radium 226/228				4	GW	SW
2	02/06/23	14:40			MWT-09	Radium 226/228				4	GW	SW
3	02/06/23	16:35			MW-30	Radium 226/228				4	GW	SW
4	02/06/23	16:35			MWT-30	Radium 226/228				4	GW	SW
5	02/07/23	9:00			MW-20	Radium 226/228				4	GW	SW
6	02/07/23	10:00			MW-07	Radium 226/228				4	GW	SW
7	02/07/23	11:15			MW-08	Radium 226/228				4	GW	SW
8	02/07/23	12:35			MW-31	Radium 226/228				4	GW	SW
9	02/07/23	14:20			MW-27	Radium 226/228				4	GW	SW
10	02/06/23	15:30			MW-10	Radium 226/228				4	GW	SW
11	02/06/23	17:10			MW-06	Radium 226/228				4	GW	SW
12	02/07/23	9:40			MW-04	Radium 226/228				4	GW	SW
13	02/07/23	11:10			MW-03	Radium 226/228				4	GW	SW
14	02/07/23	14:40			MW-12	Radium 226/228				4	GW	SW

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
Beverly Vaughn	02/08/23	AM PM	Fedex	02/08/23	AM PM
RELINQUISHED BY:(Signature) Fedex	DATE	AM PM	RECEIVED BY:(Signature) Kameron Williams	DATE 02/14/23	TIME 9:30 AM PM
RELINQUISHED BY:(Signature)	DATE	AM PM	RECEIVED FOR LABORATORY BY:	DATE	TIME AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one): ____ Iced: Wet/Blue ____ Ambient X °C Upon Receipt ____ N/A

MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0%
RV* = Rush Verbal: (5 working days) 50%
RW* = Rush Written: (5 working days) 75%
IV* = Immediate Verbal: (3 working days) 100%
IW* = Immediate Written: (3 working days) 125%
SP* = Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

eurofins | Eaton Analytical

110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order #
Batch # _____

www.EurofinsUS.com/Eaton

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CHAIN OF CUSTODY RECORD

Page _____ of _____

REPORT TO:
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998

BILL TO:
Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444

SAMPLER (Signature):

COMPLIANCE MONITORING	Yes	No
	x	

PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
	MI	23B0271	23B0271

POPULATION SERVED	SOURCE WATER

LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	02/08/23	8:55			MW-32	Radium 226/228				4	GW	SW
2	02/08/23	9:55			MW-19	Radium 226/228				4	GW	SW
3	02/08/23	11:25			MW-18	Radium 226/228				4	GW	SW
4	02/08/23	13:05			MW-33	Radium 226/228				4	GW	SW
5	02/08/23	14:45			MW-01R	Radium 226/228				4	GW	SW
6	02/08/23	9:30			MW-02	Radium 226/228				4	GW	SW
7	02/08/23	10:40			MW-11	Radium 226/228				4	GW	SW
8	02/08/23	14:20			MW-34							
9												
10												
11												
12												
13												
14												

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
Beverly Vaughn	11/08/22	AM PM	Fedex	11/08/22	AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
Fedex		AM PM	Kameron Williams	02/14/23	9:30 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
		AM PM			AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one):
Iced: Wet/Blue ____ Ambient X °C Upon Receipt ____ N/A

MATRIX CODES:
DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0%
RV* = Rush Verbal: (5 working days) 50%
RW* = Rush Written: (5 working days) 75%
IV* = Immediate Verbal: (3 working days) 100%
IW* = Immediate Written: (3 working days) 125%
SP* = Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-15002.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-53631-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 3/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23B0271	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-09 (810-53631-1)	2/6/23	14:40 Eastern		Drinking Wate			X	X	X	4	
MWT-09 (810-53631-2)	2/6/23	14:40 Eastern		Drinking Wate			X	X	X	4	
MW-30 (810-53631-3)	2/6/23	16:35 Eastern		Drinking Wate			X	X	X	4	
MWT-30 (810-53631-4)	2/6/23	16:35 Eastern		Drinking Wate			X	X	X	4	
MW-20 (810-53631-5)	2/7/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MW-07 (810-53631-6)	2/7/23	10:00 Eastern		Drinking Wate			X	X	X	4	
MW-08 (810-53631-7)	2/7/23	11:15 Eastern		Drinking Wate			X	X	X	4	
MW-31 (810-53631-8)	2/7/23	12:35 Eastern		Drinking Wate			X	X	X	4	
MW-27 (810-53631-9)	2/7/23	14:20 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Lameesa Williams	02/16/23 16:00				

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:
	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

03/17/2023

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins Environment Testing

03/17/2023

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-15002.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-53631-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 3/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23B0271	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-10 (810-53631-10)	2/6/23	15:30 Eastern		Drinking Wate			X	X	X	4	
MW-06 (810-53631-11)	2/6/23	17:10 Eastern		Drinking Wate			X	X	X	4	
MW-04 (810-53631-12)	2/7/23	09:40 Eastern		Drinking Wate			X	X	X	4	
MW-03 (810-53631-13)	2/7/23	11:10 Eastern		Drinking Wate			X	X	X	4	
MW-12 (810-53631-14)	2/7/23	14:40 Eastern		Drinking Wate			X	X	X	4	
MW-32 (810-53631-15)	2/8/23	08:55 Eastern		Drinking Wate			X	X	X	4	
MW-19 (810-53631-16)	2/8/23	09:55 Eastern		Drinking Wate			X	X	X	4	
MW-18 (810-53631-17)	2/8/23	11:25 Eastern		Drinking Wate			X	X	X	4	
MW-33 (810-53631-18)	2/8/23	13:05 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Kameron Williams	02/16/23 16:00				
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	Date/Time	Company	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins Environment Testing

03/17/2023

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-15002.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-53631-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 3/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23B0271	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-01R (810-53631-19)	2/8/23	14:45 Eastern		Drinking Wate			X	X	X	4	
MW-02 (810-53631-20)	2/8/23	09:30 Eastern		Drinking Wate			X	X	X	4	
MW-11 (810-53631-21)	2/8/23	10:40 Eastern		Drinking Wate			X	X	X	4	
MW-34 (810-53631-22)	2/8/23	14:20 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Kameron Williams	02/16/23 16:00				
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	Date/Time	Company	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-15002.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-53631-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 3/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23B0271	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-09 (810-53631-1)	2/6/23	14:40 Eastern		Drinking Wate			X	X	X	4	
MWT-09 (810-53631-2)	2/6/23	14:40 Eastern		Drinking Wate			X	X	X	4	
MW-30 (810-53631-3)	2/6/23	16:35 Eastern		Drinking Wate			X	X	X	4	
MWT-30 (810-53631-4)	2/6/23	16:35 Eastern		Drinking Wate			X	X	X	4	
MW-20 (810-53631-5)	2/7/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MW-07 (810-53631-6)	2/7/23	10:00 Eastern		Drinking Wate			X	X	X	4	
MW-08 (810-53631-7)	2/7/23	11:15 Eastern		Drinking Wate			X	X	X	4	
MW-31 (810-53631-8)	2/7/23	12:35 Eastern		Drinking Wate			X	X	X	4	
MW-27 (810-53631-9)	2/7/23	14:20 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: Kameron Williams	Date/Time: 02/16/23 16:00	Company	Received by: FEDEX	Date/Time:	Company
Relinquished by: FEDEX	Date/Time:	Company	Received by: Bayana Sharkey-Hazzard	Date/Time: 2/17/23 0910	Company: ETASTL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-15002.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-53631-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 3/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23B0271	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-10 (810-53631-10)	2/6/23	15:30 Eastern		Drinking Wate			X	X	X	4	
MW-06 (810-53631-11)	2/6/23	17:10 Eastern		Drinking Wate			X	X	X	4	
MW-04 (810-53631-12)	2/7/23	09:40 Eastern		Drinking Wate			X	X	X	4	
MW-03 (810-53631-13)	2/7/23	11:10 Eastern		Drinking Wate			X	X	X	4	
MW-12 (810-53631-14)	2/7/23	14:40 Eastern		Drinking Wate			X	X	X	4	
MW-32 (810-53631-15)	2/8/23	08:55 Eastern		Drinking Wate			X	X	X	4	
MW-19 (810-53631-16)	2/8/23	09:55 Eastern		Drinking Wate			X	X	X	4	
MW-18 (810-53631-17)	2/8/23	11:25 Eastern		Drinking Wate			X	X	X	4	
MW-33 (810-53631-18)	2/8/23	13:05 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by: Kameron Williams	Date/Time: 02/16/23 16:00	Company	Received by: FEDEX	Date/Time:	Company
Relinquished by: FEDEX	Date/Time:	Company	Received by: Briana Sharkey-Gonzalez	Date/Time: 2/17/23 0910	Company: ETASTL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

South Bend, IN
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-15002.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-53631-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 3/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23B0271	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-01R (810-53631-19)	2/8/23	14:45 Eastern		Drinking Wate			X	X	X	4	
MW-02 (810-53631-20)	2/8/23	09:30 Eastern		Drinking Wate			X	X	X	4	
MW-11 (810-53631-21)	2/8/23	10:40 Eastern		Drinking Wate			X	X	X	4	
MW-34 (810-53631-22)	2/8/23	14:20 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by: Kameron Williams	Date/Time: 02/16/23 16:00	Company: FEDEX	Received by: Briana Sharkey-Gazaway	Date/Time: 2/17/23 0910	Company: ETASTL
Relinquished by: FEDEX	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-53631-1

Login Number: 53631

List Source: Eurofins Eaton Analytical South Bend

List Number: 1

Creator: Williams, Kameron

Question	Answer	Comment
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
Samples were received on ice.	False	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	False	Thermal preservation not required.
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Samples do not require splitting or compositing.	True	
Container provided by EEA	True	

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-53631-1

Login Number: 53631
List Number: 2
Creator: Sharkey-Gonzalez, Briana L

List Source: Eurofins St. Louis
List Creation: 02/17/23 03:42 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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March 29, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

RE: Trace Project 23C0625
Client Project Grand Haven Board of Light and Power

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAP Accreditation, Trace certifies that these test results meet all requirements of the NELAP Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAP at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

NJDEP Accreditation No. MI008

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SAMPLE SUMMARY

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23C0625-01	MW-01R	Ground Water	Client	03/14/23 16:20	03/15/23 11:16
23C0625-02	MW-02	Ground Water	Client	03/14/23 10:50	03/15/23 11:16
23C0625-03	MW-03	Ground Water	Client	03/14/23 09:45	03/15/23 11:16
23C0625-04	MW-04	Ground Water	Client	03/14/23 08:45	03/15/23 11:16
23C0625-05	MW-06	Ground Water	Client	03/14/23 14:40	03/15/23 11:16
23C0625-06	MW-07	Ground Water	Client	03/13/23 14:40	03/15/23 11:16
23C0625-07	MW-08	Ground Water	Client	03/14/23 12:00	03/15/23 11:16
23C0625-08	MW-09	Ground Water	Client	03/14/23 13:50	03/15/23 11:16
23C0625-09	MW-10	Ground Water	Client	03/14/23 16:10	03/15/23 11:16
23C0625-10	MW-11	Ground Water	Client	03/14/23 15:00	03/15/23 11:16
23C0625-11	MW-12	Ground Water	Client	03/13/23 11:35	03/15/23 11:16
23C0625-12	MW-18	Ground Water	Client	03/13/23 17:10	03/15/23 11:16
23C0625-13	MW-19	Ground Water	Client	03/13/23 17:30	03/15/23 11:16
23C0625-14	MW-20	Ground Water	Client	03/13/23 16:00	03/15/23 11:16
23C0625-15	MW-27	Ground Water	Client	03/13/23 13:35	03/15/23 11:16
23C0625-16	MW-30	Ground Water	Client	03/13/23 15:30	03/15/23 11:16
23C0625-17	MW-31	Ground Water	Client	03/14/23 10:30	03/15/23 11:16
23C0625-18	MW-32	Ground Water	Client	03/14/23 12:00	03/15/23 11:16
23C0625-19	MWT-12	Ground Water	Client	03/13/23 11:35	03/15/23 11:16
23C0625-20	MWT-27	Ground Water	Client	03/13/23 13:35	03/15/23 11:16
23C0625-21	SG-02	Surface Water	Client	03/14/23 08:20	03/15/23 11:16
23C0625-22	SG-03	Surface Water	Client	03/14/23 09:00	03/15/23 11:16
23C0625-23	SG-04R	Surface Water	Client	03/14/23 17:40	03/15/23 11:16
23C0625-24	SG-05	Surface Water	Client	03/14/23 18:00	03/15/23 11:16
23C0625-25	MW-33	Ground Water	Client	03/15/23 10:00	03/15/23 11:16
23C0625-26	MW-34	Ground Water	Client	03/15/23 08:30	03/15/23 11:16

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-01 Matrix: Ground Water Date Collected: 03/14/23 16:20
Sample ID: MW-01R Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**70**	**mg/L**	**0.44**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**310**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**1.7**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**110**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**43**	**mg/L**	**12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**240**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	**0.00034**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.22**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0016**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.0023**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	**0.0020**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.00097**	**mg/L**	**0.00050**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-01 Matrix: Ground Water Date Collected: 03/14/23 16:20
Sample ID: MW-01R Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**8.1 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**120 mg/L**	**7.5**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	**780 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**830 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**830 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**2100 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.63 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**pHa, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-02 Matrix: Ground Water Date Collected: 03/14/23 10:50
Sample ID: MW-02 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**98**	**mg/L**	**0.44**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**240**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**1.6**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**78**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**45**	**mg/L**	**12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**260**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0078**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.51**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	**0.00029**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.046**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.0066**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	**0.0027**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Molybdenum	**0.011**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.00095**	**mg/L**	**0.00050**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-02 Matrix: Ground Water Date Collected: 03/14/23 10:50
Sample ID: MW-02 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**9.4**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**140**	**mg/L**	**7.5**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	<3.0	mg/L	3.0	5	03/16/23	jh	03/16/23	jh		
Analysis Method: SM 2320 B-11										
Batch: T133830										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1800**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**1800**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**1700**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	**56**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**7.11**	**pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHb, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-03 Matrix: Ground Water Date Collected: 03/14/23 09:45
Sample ID: MW-03 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**4.3**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**410**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.045**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**220**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**15**	**mg/L**	**12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**110**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.30**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0073**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00097**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.0028	mg/L	0.0028	5	03/19/23	bjv	03/23/23	acs	402.5	
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.0019	mg/L	0.0019	5	03/19/23	bjv	03/23/23	acs	402.5	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-03 Matrix: Ground Water Date Collected: 03/14/23 09:45
Sample ID: MW-03 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**0.52**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**190**	**mg/L**	**7.5**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	**550**	**mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133830										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1200**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**1200**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**2300**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	<4.0	mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**7.24**	**pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHc, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-04 Matrix: Ground Water Date Collected: 03/14/23 08:45
Sample ID: MW-04 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**3.8**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**390**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.074**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**120**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**18**	**mg/L**	**12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**83**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.12**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0049**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00065**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-04 Matrix: Ground Water Date Collected: 03/14/23 08:45
Sample ID: MW-04 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**1.4 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**220 mg/L**	**7.5**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	**580 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**690 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**690 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**1800 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	**10 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.25 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHd, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-05 Matrix: Ground Water Date Collected: 03/14/23 14:40
Sample ID: MW-06 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**9.5**	**mg/L**	**0.44**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**310**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.23**	**mg/L**	**0.12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**96**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**20**	**mg/L**	**12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**69**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Barium	**1.4**	**mg/L**	**0.012**	**5**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0030**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00073**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-05 Matrix: Ground Water Date Collected: 03/14/23 14:40
Sample ID: MW-06 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**1.0 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**82 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	**7.3 mg/L**	**3.0**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133830									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**1100 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**1200 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	**65 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.11 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**pHe, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-06 Matrix: Ground Water Date Collected: 03/13/23 14:40
Sample ID: MW-07 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**11**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**150**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0067**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**38**	**mg/L**	**0.10**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**5.7**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**47**	**mg/L**	**0.12**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Barium	**0.30**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.00042**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00099**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-06 Matrix: Ground Water Date Collected: 03/13/23 14:40
Sample ID: MW-07 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	<0.10 mg/L	0.10	5	03/16/23	jh	03/16/23	jh		
Chloride	**14 mg/L**	**0.75**	**5**	**03/20/23**	**drm**	**03/20/23**	**drm**		
Sulfate as SO4	**20 mg/L**	**3.0**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**610 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**610 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133831									
Total Dissolved Solids	**500 mg/L**	**20**	**2**	**03/17/23**	**aeo**	**03/17/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	**33 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**6.96 pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHf, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-07 Matrix: Ground Water Date Collected: 03/14/23 12:00
Sample ID: MW-08 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**7.1**	**mg/L**	**0.44**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**150**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.14**	**mg/L**	**0.12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**27**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	<12	mg/L	12	50	03/19/23	bjv	03/24/23	jma		
Sodium	**33**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.045**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**1.4**	**mg/L**	**0.012**	**5**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0011**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00060**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	**0.0028**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-07 Matrix: Ground Water Date Collected: 03/14/23 12:00
Sample ID: MW-08 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**1.3 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**30 mg/L**	**0.75**	**5**	**03/20/23**	**drm**	**03/20/23**	**drm**		
Sulfate as SO4	**26 mg/L**	**3.0**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**470 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**470 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**480 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	**42 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.10 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHg, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-08 Matrix: Ground Water Date Collected: 03/14/23 13:50
Sample ID: MW-09 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**5.1**	**mg/L**	**0.44**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**400**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.31**	**mg/L**	**0.12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**50**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	<12	mg/L	12	50	03/19/23	bjv	03/24/23	jma		
Sodium	**26**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0023**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.38**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0030**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00099**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	**0.021**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-08 Matrix: Ground Water Date Collected: 03/14/23 13:50
Sample ID: MW-09 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**2.5 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**16 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	**480 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**620 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**620 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**1400 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	**50 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.01 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**pHh, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-09 Matrix: Ground Water Date Collected: 03/14/23 16:10
Sample ID: MW-10 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**4.5**	**mg/L**	**0.44**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**460**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**1.6**	**mg/L**	**0.12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**95**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**40**	**mg/L**	**12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**140**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Barium	**0.23**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0018**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00053**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.0028	mg/L	0.0028	5	03/19/23	bjv	03/23/23	acs	402.5	
Molybdenum	**0.0036**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.0019	mg/L	0.0019	5	03/19/23	bjv	03/23/23	acs	402.5	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-09 Matrix: Ground Water Date Collected: 03/14/23 16:10
Sample ID: MW-10 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**2.7 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**92 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	**360 mg/L**	**60**	**100**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**140 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**140 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**2400 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	**9.0 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.41 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**pHi, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-10 Matrix: Ground Water Date Collected: 03/14/23 15:00
Sample ID: MW-11 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**2.8**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**380**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.028**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**67**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**8.5**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**25**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.60**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.00087**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00072**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-10 Matrix: Ground Water Date Collected: 03/14/23 15:00
Sample ID: MW-11 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**0.32**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Chloride	**62**	**mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Sulfate as SO4	**180**	**mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/16/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133743										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**810**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**810**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**1100**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**7.23**	**pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**pHj, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-11 Matrix: Ground Water Date Collected: 03/13/23 11:35
Sample ID: MW-12 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**0.19**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**77**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0025**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**12**	**mg/L**	**0.10**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**0.82**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**9.9**	**mg/L**	**0.12**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	**0.00053**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.0014**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.025**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	**0.00062**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Chromium	**0.00067**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/19/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	**0.0056**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.00093**	**mg/L**	**0.00050**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-11 Matrix: Ground Water Date Collected: 03/13/23 11:35
Sample ID: MW-12 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**0.48 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**18 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**120 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**46 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**46 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**200 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.81 pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHk, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-12 Matrix: Ground Water Date Collected: 03/13/23 17:10
Sample ID: MW-18 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**1.9**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**330**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.027**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**26**	**mg/L**	**0.10**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**9.4**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**17**	**mg/L**	**0.12**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.019**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.012**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cobalt	**0.0032**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	**0.013**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.00086**	**mg/L**	**0.00050**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-12 Matrix: Ground Water Date Collected: 03/13/23 17:10
Sample ID: MW-18 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**3.8 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**19 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**740 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**130 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**130 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**1200 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.18 pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHI, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-13 Matrix: Ground Water Date Collected: 03/13/23 17:30
Sample ID: MW-19 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**1.5**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**510**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.090**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**38**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**20**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**37**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0043**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.036**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.00037**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.00096**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.0028	mg/L	0.0028	5	03/19/23	bjv	03/23/23	acs	402.5	
Molybdenum	**0.011**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.0019	mg/L	0.0019	5	03/19/23	bjv	03/23/23	acs	402.5	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-13 Matrix: Ground Water Date Collected: 03/13/23 17:30
Sample ID: MW-19 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**1.7**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**46**	**mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**1100**	**mg/L**	**60**	**100**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133743										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**280**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**280**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**2100**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	**6.0**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**6.91**	**pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHm, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-14 Matrix: Ground Water Date Collected: 03/13/23 16:00
Sample ID: MW-20 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**0.82**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**170**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.055**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**56**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**12**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**56**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.37**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.00029**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.0016**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	**0.0016**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Molybdenum	**0.0038**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-14 Matrix: Ground Water Date Collected: 03/13/23 16:00
Sample ID: MW-20 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**0.26**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**60**	**mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**110**	**mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133743										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**460**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**460**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**680**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	**37**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**7.11**	**pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHn, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-15 Matrix: Ground Water Date Collected: 03/13/23 13:35
Sample ID: MW-27 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**0.14**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**180**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0073**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**44**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**5.8**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**61**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.00069**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.12**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0099**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/19/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-15 Matrix: Ground Water Date Collected: 03/13/23 13:35
Sample ID: MW-27 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**0.41**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**60**	**mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**47**	**mg/L**	**3.0**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133743										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**590**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**590**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**620**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	**14**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**6.95**	**pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHn, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-16 Matrix: Ground Water Date Collected: 03/13/23 15:30
Sample ID: MW-30 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**3.5**	**mg/L**	**0.44**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**960**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.27**	**mg/L**	**0.12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**250**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**17**	**mg/L**	**12**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**220**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Barium	**0.045**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.010**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.0028**	**mg/L**	**0.00052**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.0028	mg/L	0.0028	5	03/19/23	bjv	03/23/23	acs	402.5	
Molybdenum	**0.0017**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.0019	mg/L	0.0019	5	03/19/23	bjv	03/23/23	acs	402.5	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-16 Matrix: Ground Water Date Collected: 03/13/23 15:30
Sample ID: MW-30 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**1.2 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**140 mg/L**	**7.5**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**940 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**660 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**660 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**2300 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	**5.0 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.10 pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHo, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-17 Matrix: Ground Water Date Collected: 03/14/23 10:30
Sample ID: MW-31 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**4.0**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**200**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.054**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**42**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**11**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**48**	**mg/L**	**0.12**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.0010**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.15**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0019**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/19/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-17 Matrix: Ground Water Date Collected: 03/14/23 10:30
Sample ID: MW-31 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**4.6 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**97 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**250 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**320 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**320 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**860 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.77 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHp, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-18 Matrix: Ground Water Date Collected: 03/14/23 12:00
Sample ID: MW-32 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**2.9**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**220**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.11**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**37**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**11**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**30**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Barium	**0.41**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.00055**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/19/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	**0.0032**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-18 Matrix: Ground Water Date Collected: 03/14/23 12:00
Sample ID: MW-32 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**1.6**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**50**	**mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**170**	**mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133743										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**450**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**450**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**770**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	**40**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**7.37**	**pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHq, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-19 Matrix: Ground Water Date Collected: 03/13/23 11:35
Sample ID: MWT-12 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**0.18**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**60**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	<0.0025	mg/L	0.0025	1	03/19/23	bjv	03/24/23	jma	N	
Magnesium	**12**	**mg/L**	**0.10**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**0.77**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**9.5**	**mg/L**	**0.12**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	**0.00051**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.0014**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.023**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	**0.00062**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Chromium	**0.00062**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/19/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	**0.0053**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.00086**	**mg/L**	**0.00050**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-19 Matrix: Ground Water Date Collected: 03/13/23 11:35
Sample ID: MWT-12 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133755									
Fluoride	**0.66 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**19 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**110 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133743									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**47 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**47 mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133717									
Total Dissolved Solids	**200 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133708									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.86 pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHr, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-20 Matrix: Ground Water Date Collected: 03/13/23 13:35
Sample ID: MWT-27 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133774										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Boron	**0.13**	**mg/L**	**0.0088**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**130**	**mg/L**	**13**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0067**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**32**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**5.3**	**mg/L**	**0.25**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**46**	**mg/L**	**6.2**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Antimony	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Arsenic	**0.00062**	**mg/L**	**0.00055**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.11**	**mg/L**	**0.0025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Chromium	**0.0091**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/19/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/19/23	bjv	03/23/23	acs		
Molybdenum	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/19/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-20 Matrix: Ground Water Date Collected: 03/13/23 13:35
Sample ID: MWT-27 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133755										
Fluoride	**0.59**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**61**	**mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**47**	**mg/L**	**3.0**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133743										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**600**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/16/23	ljs	03/16/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**600**	**mg/L**	**5.0**	**1**	**03/16/23**	**ljs**	**03/16/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133717										
Total Dissolved Solids	**620**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133708										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**6.95**	**pH Units**		**1**	**03/13/23**	**nc**	**03/15/23**	**bsv**	**511, pHs, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-21 Matrix: Surface Water Date Collected: 03/14/23 08:20
Sample ID: SG-02 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133776										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Boron	**2.1**	**mg/L**	**0.0088**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**140**	**mg/L**	**13**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.035**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**28**	**mg/L**	**2.5**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**8.0**	**mg/L**	**0.25**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**22**	**mg/L**	**0.12**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Antimony	**0.00066**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.0018**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.034**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Chromium	**0.00057**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/22/23	bjv	03/23/23	acs		
Lead	**0.0012**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Molybdenum	**0.011**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.0010**	**mg/L**	**0.00050**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/22/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-21 Matrix: Surface Water Date Collected: 03/14/23 08:20
Sample ID: SG-02 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133757									
Fluoride	**2.3 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**41 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**350 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133816									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**62 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**62 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133718									
Total Dissolved Solids	**580 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133710									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.28 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHt, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-22 Matrix: Surface Water Date Collected: 03/14/23 09:00
Sample ID: SG-03 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133776										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Boron	**2.1**	**mg/L**	**0.0088**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**150**	**mg/L**	**13**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0056**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**30**	**mg/L**	**2.5**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**8.3**	**mg/L**	**0.25**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**23**	**mg/L**	**6.2**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Antimony	**0.00067**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.0020**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.036**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Chromium	**0.00092**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/22/23	bjv	03/23/23	acs		
Lead	**0.0020**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Molybdenum	**0.010**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.0010**	**mg/L**	**0.00050**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/22/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-22 Matrix: Surface Water Date Collected: 03/14/23 09:00
Sample ID: SG-03 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133757										
Fluoride	**2.5**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**43**	**mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**350**	**mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133816										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**73**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**73**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133718										
Total Dissolved Solids	**630**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133710										
Total Suspended Solids	**6.0**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**7.85**	**pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**511, pHu, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-23 Matrix: Surface Water Date Collected: 03/14/23 17:40
Sample ID: SG-04R Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133776										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Boron	**2.6**	**mg/L**	**0.0088**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**370**	**mg/L**	**13**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0089**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**33**	**mg/L**	**2.5**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**9.8**	**mg/L**	**0.25**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**21**	**mg/L**	**0.12**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Antimony	**0.00069**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.023**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Chromium	**0.00035**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/22/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/22/23	bjv	03/23/23	acs		
Molybdenum	**0.0073**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Selenium	**0.0016**	**mg/L**	**0.00050**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Thallium	<0.00038	mg/L	0.00038	1	03/22/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-23 Matrix: Surface Water Date Collected: 03/14/23 17:40
Sample ID: SG-04R Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133757									
Fluoride	**2.3 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**21 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	**750 mg/L**	**30**	**50**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133816									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**98 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**98 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133718									
Total Dissolved Solids	**1200 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133710									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.92 pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**pHv, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-24 Matrix: Surface Water Date Collected: 03/14/23 18:00
Sample ID: SG-05 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133776										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Boron	**0.48**	**mg/L**	**0.0088**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**120**	**mg/L**	**13**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0045**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**26**	**mg/L**	**2.5**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**7.9**	**mg/L**	**0.25**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**38**	**mg/L**	**6.2**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Antimony	**0.00030**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.00071**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.35**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Chromium	**0.00048**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	<0.00052	mg/L	0.00052	1	03/22/23	bjv	03/23/23	acs		
Lead	<0.00055	mg/L	0.00055	1	03/22/23	bjv	03/23/23	acs		
Molybdenum	**0.0013**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/22/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/22/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-24 Matrix: Surface Water Date Collected: 03/14/23 18:00
Sample ID: SG-05 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T133757										
Fluoride	**0.94**	**mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**61**	**mg/L**	**0.75**	**5**	**03/20/23**	**drm**	**03/20/23**	**drm**		
Sulfate as SO4	**38**	**mg/L**	**3.0**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11										
Batch: T133816										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**290**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0	mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**290**	**mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15										
Batch: T133718										
Total Dissolved Solids	**460**	**mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15										
Batch: T133710										
Total Suspended Solids	**8.0**	**mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11										
Batch: T133769										
pH	**8.22**	**pH Units**		**1**	**03/14/23**	**nc**	**03/15/23**	**bsv**	**pHw, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-25 Matrix: Ground Water Date Collected: 03/15/23 10:00
Sample ID: MW-33 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133776										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Boron	**0.067**	**mg/L**	**0.0088**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**190**	**mg/L**	**13**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.0047**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**17**	**mg/L**	**0.10**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**4.1**	**mg/L**	**0.25**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**26**	**mg/L**	**6.2**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Antimony	**0.00059**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Arsenic	**0.0017**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.076**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Chromium	**0.0027**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.0017**	**mg/L**	**0.00052**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Lead	<0.00055	mg/L	0.00055	1	03/22/23	bjv	03/23/23	acs		
Molybdenum	**0.0031**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Selenium	<0.00050	mg/L	0.00050	1	03/22/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/22/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-25 Matrix: Ground Water Date Collected: 03/15/23 10:00
Sample ID: MW-33 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133757									
Fluoride	**0.23 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**39 mg/L**	**0.75**	**5**	**03/20/23**	**drm**	**03/20/23**	**drm**		
Sulfate as SO4	**42 mg/L**	**3.0**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Analysis Method: SM 2320 B-11									
Batch: T133816									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**390 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**390 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133718									
Total Dissolved Solids	**590 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133710									
Total Suspended Solids	<4.0 mg/L	4.0	1	03/15/23	aeo	03/15/23	aeo		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**7.34 pH Units**		**1**	**03/15/23**	**nc**	**03/15/23**	**bsv**	**pHx, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-26 Matrix: Ground Water Date Collected: 03/15/23 08:30
Sample ID: MW-34 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T133776										
Mercury	<0.00020	mg/L	0.00020	1	03/24/23	ckd	03/24/23	ckd	N	
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Boron	**1.8**	**mg/L**	**0.0088**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Calcium	**210**	**mg/L**	**13**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Lithium	**0.012**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**	**N**	
Magnesium	**21**	**mg/L**	**2.5**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Potassium	**8.5**	**mg/L**	**0.25**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Sodium	**22**	**mg/L**	**6.2**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Antimony	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Arsenic	**0.00090**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Barium	**0.50**	**mg/L**	**0.0025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Beryllium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Cadmium	<0.00025	mg/L	0.00025	1	03/22/23	bjv	03/23/23	acs		
Chromium	**0.029**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Lead	**0.00094**	**mg/L**	**0.00055**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Molybdenum	<0.0012	mg/L	0.0012	1	03/22/23	bjv	03/23/23	acs		
Selenium	<0.00050	mg/L	0.00050	1	03/22/23	bjv	03/23/23	acs		
Thallium	<0.00038	mg/L	0.00038	1	03/22/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-26 Matrix: Ground Water Date Collected: 03/15/23 08:30
Sample ID: MW-34 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T133757									
Fluoride	**0.24 mg/L**	**0.10**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Chloride	**23 mg/L**	**0.75**	**5**	**03/16/23**	**jh**	**03/17/23**	**jh**		
Sulfate as SO4	<3.0 mg/L	3.0	5	03/16/23	jh	03/17/23	jh		
Analysis Method: SM 2320 B-11									
Batch: T133816									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**890 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**	**N**	
Carbonate Alkalinity as CaCO3 at pH 8.2	<5.0 mg/L	5.0	1	03/17/23	ljs	03/17/23	ljs	N	
Total Alkalinity as CaCO3 at pH 4.5	**890 mg/L**	**5.0**	**1**	**03/17/23**	**ljs**	**03/17/23**	**ljs**		
Analysis Method: SM 2540 C-15									
Batch: T133718									
Total Dissolved Solids	**790 mg/L**	**20**	**2**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 2540 D-15									
Batch: T133710									
Total Suspended Solids	**44 mg/L**	**4.0**	**1**	**03/15/23**	**aeo**	**03/15/23**	**aeo**		
Analysis Method: SM 4500-H+ B-11									
Batch: T133769									
pH	**6.61 pH Units**		**1**	**03/15/23**	**nc**	**03/15/23**	**bsv**	**pHy, N**	

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QUALITY CONTROL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133774
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T133774-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T133774-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00210	105	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T133774-MSD1

Original: **23C0625-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00202	0.00204	101	102	76-123	1	20	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133776
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T133776-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T133776-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00208	104	77-122	

LABORATORY CONTROL SAMPLE: T133776-BS2

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00206	103	77-122	

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LABORATORY CONTROL SAMPLE: T133776-BS3

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00208	104	77-122	

LABORATORY CONTROL SAMPLE: T133776-BS4

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00206	103	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T133776-MSD1 Original: **23C0625-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00212	0.00204	106	102	76-123	4	20	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133771
QC Batch Method: EPA 200.2
Analysis Description: Boron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T133771-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.0088	0.0088	
Calcium	mg/L	<0.26	0.26	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T133771-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.61	101	85-115	
Calcium	mg/L	16.0	17.3	108	85-115	
Potassium	mg/L	16.0	15.0	94	85-115	
Lithium	mg/L	1.60	1.53	96	85-115	
Magnesium	mg/L	16.0	15.3	95	85-115	
Sodium	mg/L	16.0	15.5	97	85-115	

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MATRIX SPIKE: T133771-MS1 Original: **23C0625-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**69.7**	**1.60**	66.9	**-175**	**70-130**	**243**
Calcium	**mg/L**	**312**	**16.0**	309	**-18**	**70-130**	**243**
Potassium	**mg/L**	**43.0**	**16.0**	50.3	**45**	**70-130**	**243**
Lithium	mg/L	1.71	1.60	3.32	101	70-130	
Magnesium	**mg/L**	**114**	**16.0**	122	**50**	**70-130**	**243**
Sodium	**mg/L**	**235**	**16.0**	224	**-70**	**70-130**	**243**

MATRIX SPIKE: T133771-MS2 Original: **23C0625-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**97.6**	**1.60**	88.6	**-560**	**70-130**	**243**
Calcium	**mg/L**	**240**	**16.0**	234	**-35**	**70-130**	**243**
Potassium	**mg/L**	**44.9**	**16.0**	<50	**27**	**70-130**	**243**
Lithium	mg/L	1.61	1.60	3.07	91	70-130	
Magnesium	**mg/L**	**77.6**	**16.0**	83.9	**40**	**70-130**	**243**
Sodium	**mg/L**	**264**	**16.0**	251	**-83**	**70-130**	**243**

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133772
QC Batch Method: EPA 200.2
Analysis Description: Magnesium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T133772-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.0088	0.0088	
Calcium	mg/L	<0.26	0.26	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T133772-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.66	103	85-115	
Calcium	mg/L	16.0	17.9	112	85-115	
Potassium	mg/L	16.0	15.1	95	85-115	
Lithium	mg/L	1.60	1.57	98	85-115	

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LABORATORY CONTROL SAMPLE: T133772-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Magnesium	mg/L	16.0	15.7	98	85-115	
Sodium	mg/L	16.0	15.9	99	85-115	

MATRIX SPIKE: T133772-MS1 Original: **23C0625-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	2.09	1.60	3.79	106	70-130	
Calcium	mg/L	142	16.0	154	76	70-130	
Potassium	mg/L	7.97	16.0	24.1	101	70-130	
Lithium	mg/L	0.0352	1.60	1.66	101	70-130	
Magnesium	mg/L	27.7	16.0	42.8	95	70-130	
Sodium	mg/L	21.9	16.0	38.9	107	70-130	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133771
QC Batch Method: EPA 200.2
Analysis Description: Thallium, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T133771-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	

LABORATORY CONTROL SAMPLE: T133771-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.0950	95	85-115	
Barium	mg/L	1.60	1.57	98	85-115	
Beryllium	mg/L	0.200	0.199	99	85-115	

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LABORATORY CONTROL SAMPLE: T133771-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Cadmium	mg/L	0.0500	0.0424	85	85-115	
Cobalt	mg/L	1.60	1.59	99	85-115	
Chromium	mg/L	0.0500	0.0488	98	85-115	
Molybdenum	mg/L	1.60	1.57	98	85-115	
Lead	mg/L	0.100	0.0973	97	85-115	
Antimony	mg/L	0.100	0.0989	99	85-115	
Selenium	mg/L	0.100	0.0904	90	85-115	
Thallium	mg/L	0.100	0.0959	96	85-115	

MATRIX SPIKE: T133771-MS1 Original: **23C0625-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00125	0.100	0.0939	93	70-130	
Barium	mg/L	0.220	1.60	1.77	97	70-130	
Beryllium	mg/L	0	0.200	0.201	101	70-130	
Cadmium	mg/L	0	0.0500	0.0388	78	70-130	
Cobalt	mg/L	0.00229	1.60	1.61	100	70-130	
Chromium	mg/L	0.00164	0.0500	0.0544	105	70-130	
Molybdenum	mg/L	0	1.60	1.68	105	70-130	
Lead	mg/L	0	0.100	0.0890	89	70-130	
Antimony	mg/L	0.000339	0.100	0.0988	98	70-130	
Selenium	mg/L	0.000965	0.100	0.0825	81	70-130	
Thallium	mg/L	0	0.100	0.0890	89	70-130	

MATRIX SPIKE: T133771-MS2 Original: **23C0625-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00777	0.100	0.101	93	70-130	
Barium	mg/L	0.511	1.60	2.04	96	70-130	
Beryllium	mg/L	0.000285	0.200	0.206	103	70-130	
Cadmium	mg/L	0	0.0500	0.0397	79	70-130	
Cobalt	mg/L	0.00657	1.60	1.67	104	70-130	
Chromium	mg/L	0.0461	0.0500	0.0872	82	70-130	
Molybdenum	mg/L	0.0113	1.60	1.68	105	70-130	
Lead	mg/L	0.00267	0.100	0.0919	89	70-130	
Antimony	mg/L	0	0.100	0.0974	97	70-130	
Selenium	mg/L	0.000952	0.100	0.0829	82	70-130	
Thallium	mg/L	0	0.100	0.0899	90	70-130	

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Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133772
QC Batch Method: EPA 200.2
Analysis Description: Thallium, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T133772-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	

LABORATORY CONTROL SAMPLE: T133772-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.0953	95	85-115	
Barium	mg/L	1.60	1.66	103	85-115	
Beryllium	mg/L	0.200	0.198	99	85-115	
Cadmium	mg/L	0.0500	0.0439	88	85-115	
Cobalt	mg/L	1.60	1.52	95	85-115	
Chromium	mg/L	0.0500	0.0488	98	85-115	
Molybdenum	mg/L	1.60	1.53	95	85-115	
Lead	mg/L	0.100	0.0926	93	85-115	
Antimony	mg/L	0.100	0.0924	92	85-115	
Selenium	mg/L	0.100	0.0954	95	85-115	
Thallium	mg/L	0.100	0.0912	91	85-115	

MATRIX SPIKE: T133772-MS1 Original: **23C0625-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00184	0.100	0.0970	95	70-130	
Barium	mg/L	0.0336	1.60	1.65	101	70-130	
Beryllium	mg/L	0	0.200	0.192	96	70-130	
Cadmium	mg/L	0	0.0500	0.0416	83	70-130	

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MATRIX SPIKE: T133772-MS1 Original: **23C0625-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Cobalt	mg/L	0	1.60	1.57	98	70-130	
Chromium	mg/L	0	0.0500	0.0504	101	70-130	
Molybdenum	mg/L	0.0108	1.60	1.66	103	70-130	
Lead	mg/L	0.00122	0.100	0.0922	91	70-130	
Antimony	mg/L	0.000664	0.100	0.0945	94	70-130	
Selenium	mg/L	0.00105	0.100	0.0897	89	70-130	
Thallium	mg/L	0	0.100	0.0913	91	70-130	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133755
QC Batch Method: IC Prep W
Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T133755-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T133755-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	5.15	103	90-110	
Fluoride	mg/L	1.00	0.988	99	90-110	
Sulfate as SO4	mg/L	5.00	4.90	98	90-110	

MATRIX SPIKE: T133755-MS1 Original: **23C0625-07**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Fluoride	mg/L	1.31	5.00	6.41	102	80-120	
Sulfate as SO4	mg/L	25.7	25.0	48.6	92	80-120	

MATRIX SPIKE: T133755-MS2 Original: **23C0625-06**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Fluoride	mg/L	0	5.00	5.48	110	80-120	
Sulfate as SO4	mg/L	19.8	25.0	42.4	91	80-120	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

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QC Batch: T133757
QC Batch Method: IC Prep W

Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T133757-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T133757-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	<10	103	90-110	
Fluoride	mg/L	1.00	0.988	99	90-110	
Sulfate as SO4	mg/L	5.00	4.90	98	90-110	

MATRIX SPIKE: T133757-MS1 Original: **23C0625-24**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Fluoride	mg/L	0.939	5.00	5.72	96	80-120	
Sulfate as SO4	**mg/L**	**38.1**	**25.0**	57.6	**78**	**80-120**	**241**

MATRIX SPIKE: T133757-MS2 Original: **23C0625-25**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Fluoride	mg/L	0.230	5.00	5.15	98	80-120	
Sulfate as SO4	mg/L	42.3	25.0	64.8	90	80-120	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133900
QC Batch Method: IC Prep W

Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T133900-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	

LABORATORY CONTROL SAMPLE: T133900-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	<10	105	90-110	

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Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133743
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T133743-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	101	101	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	101	101	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	101	101	88-112	

SAMPLE DUPLICATE: T133743-DUP1 Original: **23C0625-11**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	46.3	46.7	0.9	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	46.3	46.7	0.9	20	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133816
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Carbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T133816-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	100	100	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	100	100	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	100	100	88-112	

SAMPLE DUPLICATE: T133816-DUP1 Original: **23C0625-22**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	73.4	74.2	1	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	

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SAMPLE DUPLICATE: T133816-DUP1 Original: **23C0625-22**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Alkalinity as CaCO3 at pH 4.5	mg/L	73.4	74.2	1	20	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133830
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T133830-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	105	105	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	105	105	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	105	105	88-112	

SAMPLE DUPLICATE: T133830-DUP1 Original: **23C0625-02**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	1780	1750	2	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	1780	1750	2	20	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133717
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T133717-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T133717-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	486	97	80-120	

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SAMPLE DUPLICATE: T133717-DUP1 Original: **23C0625-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	2100	2170	3	10	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133718
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T133718-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T133718-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	494	99	80-120	

SAMPLE DUPLICATE: T133718-DUP1 Original: **23C0625-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	582	592	2	10	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133831
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T133831-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T133831-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	502	100	80-120	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

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QC Batch: T133708
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T133708-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T133708-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	98.0	98	85-115	

SAMPLE DUPLICATE: T133708-DUP1 Original: **23C0625-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Suspended Solids	mg/L	2.00	2.00	0	10	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133710
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T133710-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T133710-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	102	102	85-115	

SAMPLE DUPLICATE: T133710-DUP1 Original: **23C0625-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Suspended Solids	mg/L	1.00	1.00	0	10	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133769
QC Batch Method: *** DEFAULT PREP ***

Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

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SAMPLE DUPLICATE: T133769-DUP1 Original: **23C0625-20**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**6.95**	**7.35**	**6**	**20**	**pH**

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the laboratory is not accredited by NELAP for this compound
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: 23C0625-01

Analysis: SM 4500-H+ B-11

pH	Note pHa : The pH was analyzed at 11:55

Trace ID: 23C0625-02

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHb : The pH was analyzed at 11:57

Trace ID: 23C0625-03

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHc : The pH was analyzed at 11:58

Trace ID: 23C0625-04

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Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHd : The pH was analyzed at 11:59

Trace ID: 23C0625-05

Analysis: SM 4500-H+ B-11

pH	Note pHe : The pH was analyzed at 12:00

Trace ID: 23C0625-06

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHf : The pH was analyzed at 12:01

Trace ID: 23C0625-07

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHg : The pH was analyzed at 12:04

Trace ID: 23C0625-08

Analysis: SM 4500-H+ B-11

pH	Note pHh : The pH was analyzed at 12:05

Trace ID: 23C0625-09

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHi : The pH was analyzed at 12:07

Trace ID: 23C0625-10

Analysis: SM 4500-H+ B-11

pH	Note pHj : The pH was analyzed at 12:08

Trace ID: 23C0625-11

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

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pH	Note pHk : The pH was analyzed at 12:09

Trace ID: 23C0625-12

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHl : The pH was analyzed at 12:12

Trace ID: 23C0625-13

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHm : The pH was analyzed at 12:13

Trace ID: 23C0625-14

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHn : The pH was analyzed at 12:15

Trace ID: 23C0625-15

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHn : The pH was analyzed at 12:15

Trace ID: 23C0625-16

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHo : The pH was analyzed at 12:17

Trace ID: 23C0625-17

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Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHp : The pH was analyzed at 12:18

Trace ID: 23C0625-18

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHq : The pH was analyzed at 12:19

Trace ID: 23C0625-19

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHr : The pH was analyzed at 12:22

Trace ID: 23C0625-20

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHs : The pH was analyzed at 12:30

Trace ID: 23C0625-21

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHt : The pH was analyzed at 12:34

Trace ID: 23C0625-22

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHu : The pH was analyzed at 12:35

Trace ID: 23C0625-23

Analysis: SM 4500-H+ B-11

pH	Note pHv : The pH was analyzed at 12:36

Trace ID: 23C0625-24

Analysis: SM 4500-H+ B-11

pH	Note pHw : The pH was analyzed at 12:38

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Trace ID: 23C0625-25

Analysis: SM 4500-H+ B-11

pH	Note pHx : The pH was analyzed at 12:39

Trace ID: 23C0625-26

Analysis: SM 4500-H+ B-11

pH	Note pHy : The pH was analyzed at 12:40

Trace ID: T133757-MS1

Analysis: EPA 300.0 Rev. 2.1

Sulfate as SO4	Note 241 : The MS recovery was out of control low. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.

Trace ID: T133769-DUP1

Analysis: SM 4500-H+ B-11

pH	Note pH : The pH was analyzed at 10:11

Trace ID: T133771-MS1

Analysis: EPA 200.7 Rev. 4.4

Boron	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Magnesium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Potassium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Trace ID: T133771-MS2

Analysis: EPA 200.7 Rev. 4.4

Boron	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Magnesium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

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Potassium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

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2241 Black Creek Road
Muskegon, MI 49444-2673
231-773-5998 Phone
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www.trace-labs.com

TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23C0625

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By:	KB
Checked By:	BV
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab	
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

* *Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
1	3/14/23	1620	MW-01R	N	GW	6	6		5						1	X	X	X	X	X		
2	3/14/23	1050	MW-02	N	GW	6	6		5						1	X	X	X	X	X		
3	3/14/23	945	MW-03	N	GW	6	6		5						1	X	X	X	X	X		
4	3/14/23	845	MW-04	N	GW	6	6		5						1	X	X	X	X	X		
5	3/14/23	1440	MW-06	N	GW	6	6		5						1	X	X	X	X	X		
6	3/13/23	1440	MW-07	N	GW	6	6		5						1	X	X	X	X	X		
7	3/14/23	1200	MW-08	N	GW	6	6		5						1	X	X	X	X	X		
8	3/14/23	1350	MW-09	N	GW	6	6		5						1	X	X	X	X	X		
9	3/14/23	1610	MW-10	N	GW	6	6		5						1	X	X	X	X	X		
10	3/14/23	1500	MW-11	N	GW	6	6		5						1	X	X	X	X	X		

Analysis Requested

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Byls	[signature]	3/15/23	1116	2)			
	3)				4)			

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- [ ] Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

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Page 2 of 3

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23C0625

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	Cell Phone: 734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By: LB
Checked By: BV
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air, DW = Drinking Water, WI = Wipes, U = Unknown, GW = Groundwater, S = Solid, LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
11	3/13/23	1135	MW-12	N	GW	6	6		5						1	X	X	X	X	X		
12	3/13/23	1710	MW-18	N	GW	6	6		5						1	X	X	X	X	X		
13	3/13/23	1730	MW-19	N	GW	6	6		5						1	X	X	X	X	X		
14	3/13/23	1600	MW-20	N	GW	6	6		5						1	X	X	X	X	X		
15	3/13/23	1335	MW-27	N	GW	6	6		5						1	X	X	X	X	X		
16	3/13/23	1530	MW-30	N	GW	6	6		5						1	X	X	X	X	X		
17	3/14/23	1030	MW-31	N	GW	6	6		5						1	X	X	X	X	X		
18	3/14/23	1200	MW-32	N	GW	6	6		5						1	X	X	X	X	X		
19	3/13/23	1135	MWT-12	N	GW	6	6		5						1	X	X	X	X	X		
20	3/13/23	1335	MWT-27	N	GW	6	6		5						1	X	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andy J Byl	[signature]	3/15/23	1116	2)			
	3)				4)			

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Page 3 of 3

Trace ID No. 23C0625

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By: KB
Checked By: BV
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
21	3/14/23	820	SG-02	N	SW	6	6		5						1	X	X	X	X	X		
22	3/14/23	900	SG-03	N	SW	6	6		5						1	X	X	X	X	X		
23	3/14/23	1740	SG-04R	N	SW	6	6		5						1	X	X	X	X	X		
24	3/14/23	1800	SG-05	N	SW	6	6		5						1	X	X	X	X	X		

AB

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Byr	[signature]	3/15/23	1116	2)			
	3)				4)			

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Page 1 of 1

Trace ID No. 23C0625

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By:

Checked By:

Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab

Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
25	3/15/23	1000	MW-33	N	GW	6	6		5						1	X	X	X	X	X		
26	3/15/23	830	MW-34	N	GW	6	6		5						1	X	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Bu	[illegible]	3/15/23	1116	2)			
	3)				4)			

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2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23C0625
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 3/15/23									
Time: 11:16									
Logged by: KB									
Package Description: Cooler									
Package Temp °C	-1.2	-1.2	✓						
Representative Sample Temp °C	5.0	4.8				✓		✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☑ ☐ ☐ Samples preserved at Trace HNO3 added at 12:43 on 3/15/23
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes:

Form 70-A.46
Effective 2/6/23

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Muskegon, MI 49444-2673

TRACE
ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

March 29, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

RE: Trace Project 23C0625
Client Project Grand Haven Board of Light and Power

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAP Accreditation, Trace certifies that these test results meet all requirements of the NELAP Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAP at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

NJDEP Accreditation No. MI008

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Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

SAMPLE SUMMARY

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23C0625-01	MW-01R	Ground Water	Client	03/14/23 16:20	03/15/23 11:16
23C0625-02	MW-02	Ground Water	Client	03/14/23 10:50	03/15/23 11:16
23C0625-03	MW-03	Ground Water	Client	03/14/23 09:45	03/15/23 11:16
23C0625-04	MW-04	Ground Water	Client	03/14/23 08:45	03/15/23 11:16
23C0625-05	MW-06	Ground Water	Client	03/14/23 14:40	03/15/23 11:16
23C0625-06	MW-07	Ground Water	Client	03/13/23 14:40	03/15/23 11:16
23C0625-07	MW-08	Ground Water	Client	03/14/23 12:00	03/15/23 11:16
23C0625-08	MW-09	Ground Water	Client	03/14/23 13:50	03/15/23 11:16
23C0625-09	MW-10	Ground Water	Client	03/14/23 16:10	03/15/23 11:16
23C0625-10	MW-11	Ground Water	Client	03/14/23 15:00	03/15/23 11:16
23C0625-11	MW-12	Ground Water	Client	03/13/23 11:35	03/15/23 11:16
23C0625-12	MW-18	Ground Water	Client	03/13/23 17:10	03/15/23 11:16
23C0625-13	MW-19	Ground Water	Client	03/13/23 17:30	03/15/23 11:16
23C0625-14	MW-20	Ground Water	Client	03/13/23 16:00	03/15/23 11:16
23C0625-15	MW-27	Ground Water	Client	03/13/23 13:35	03/15/23 11:16
23C0625-16	MW-30	Ground Water	Client	03/13/23 15:30	03/15/23 11:16
23C0625-17	MW-31	Ground Water	Client	03/14/23 10:30	03/15/23 11:16
23C0625-18	MW-32	Ground Water	Client	03/14/23 12:00	03/15/23 11:16
23C0625-19	MWT-12	Ground Water	Client	03/13/23 11:35	03/15/23 11:16
23C0625-20	MWT-27	Ground Water	Client	03/13/23 13:35	03/15/23 11:16
23C0625-21	SG-02	Surface Water	Client	03/14/23 08:20	03/15/23 11:16
23C0625-22	SG-03	Surface Water	Client	03/14/23 09:00	03/15/23 11:16
23C0625-23	SG-04R	Surface Water	Client	03/14/23 17:40	03/15/23 11:16
23C0625-24	SG-05	Surface Water	Client	03/14/23 18:00	03/15/23 11:16
23C0625-25	MW-33	Ground Water	Client	03/15/23 10:00	03/15/23 11:16
23C0625-26	MW-34	Ground Water	Client	03/15/23 08:30	03/15/23 11:16

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-01 Matrix: Ground Water Date Collected: 03/14/23 16:20
Sample ID: MW-01R Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**0.50**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0026**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-02 Matrix: Ground Water Date Collected: 03/14/23 10:50
Sample ID: MW-02 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**30**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	**0.0020**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.035**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	**0.0032**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Zinc	**0.0022**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-03 Matrix: Ground Water Date Collected: 03/14/23 09:45
Sample ID: MW-03 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**1.6**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0018**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-04 Matrix: Ground Water Date Collected: 03/14/23 08:45
Sample ID: MW-04 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**6.3**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.019**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-05 Matrix: Ground Water Date Collected: 03/14/23 14:40
Sample ID: MW-06 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**26**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.0012**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-06 Matrix: Ground Water Date Collected: 03/13/23 14:40
Sample ID: MW-07 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**15**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-07 Matrix: Ground Water Date Collected: 03/14/23 12:00
Sample ID: MW-08 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**22**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0013**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.0013**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-08 Matrix: Ground Water Date Collected: 03/14/23 13:50
Sample ID: MW-09 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**24**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0033**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-09 Matrix: Ground Water Date Collected: 03/14/23 16:10
Sample ID: MW-10 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**7.2**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-10 Matrix: Ground Water Date Collected: 03/14/23 15:00
Sample ID: MW-11 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**6.1**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-11 Matrix: Ground Water Date Collected: 03/13/23 11:35
Sample ID: MW-12 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	<0.050	mg/L	0.050	1	03/19/23	bjv	03/24/23	jma		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	**0.0010**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0016**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.0037**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-12 Matrix: Ground Water Date Collected: 03/13/23 17:10
Sample ID: MW-18 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**5.4**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	**0.00043**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0074**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.068**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-13 Matrix: Ground Water Date Collected: 03/13/23 17:30
Sample ID: MW-19 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**13**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0024**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-14 Matrix: Ground Water Date Collected: 03/13/23 16:00
Sample ID: MW-20 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**19**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0099**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.029**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-15 Matrix: Ground Water Date Collected: 03/13/23 13:35
Sample ID: MW-27 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**8.3**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-16 Matrix: Ground Water Date Collected: 03/13/23 15:30
Sample ID: MW-30 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**8.8**	**mg/L**	**2.5**	**50**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0041**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-17 Matrix: Ground Water Date Collected: 03/14/23 10:30
Sample ID: MW-31 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**1.1**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-18 Matrix: Ground Water Date Collected: 03/14/23 12:00
Sample ID: MW-32 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**19**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.0025**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-19 Matrix: Ground Water Date Collected: 03/13/23 11:35
Sample ID: MWT-12 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	<0.050	mg/L	0.050	1	03/19/23	bjv	03/24/23	jma		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	**0.00090**	**mg/L**	**0.00025**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0016**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	**0.0036**	**mg/L**	**0.0012**	**1**	**03/19/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-20 Matrix: Ground Water Date Collected: 03/13/23 13:35
Sample ID: MWT-27 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133771										
Iron	**7.7**	**mg/L**	**0.050**	**1**	**03/19/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133771										
Copper	<0.00025	mg/L	0.00025	1	03/19/23	bjv	03/23/23	acs		
Nickel	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Silver	<0.000050	mg/L	0.000050	1	03/19/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		
Zinc	<0.0012	mg/L	0.0012	1	03/19/23	bjv	03/23/23	acs		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-21 Matrix: Surface Water Date Collected: 03/14/23 08:20
Sample ID: SG-02 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Iron	**0.20**	**mg/L**	**0.050**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Copper	**0.011**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0023**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/22/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/22/23	bjv	03/23/23	acs		
Zinc	**0.0029**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-22 Matrix: Surface Water Date Collected: 03/14/23 09:00
Sample ID: SG-03 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Iron	**0.35**	**mg/L**	**0.050**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Copper	**0.016**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0026**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/22/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/22/23	bjv	03/23/23	acs		
Zinc	**0.0047**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-23 Matrix: Surface Water Date Collected: 03/14/23 17:40
Sample ID: SG-04R Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Iron	**0.11**	**mg/L**	**0.050**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Copper	**0.012**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0027**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/22/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/22/23	bjv	03/23/23	acs		
Zinc	**0.0033**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-24 Matrix: Surface Water Date Collected: 03/14/23 18:00
Sample ID: SG-05 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Iron	**2.7**	**mg/L**	**0.050**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Copper	**0.0089**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Silver	**0.000053**	**mg/L**	**0.000050**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Vanadium	<0.0012	mg/L	0.0012	1	03/22/23	bjv	03/23/23	acs		
Zinc	**0.0022**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-25 Matrix: Ground Water Date Collected: 03/15/23 10:00
Sample ID: MW-33 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Iron	**2.5**	**mg/L**	**0.050**	**1**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Copper	**0.020**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.019**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Silver	**0.00011**	**mg/L**	**0.000050**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Vanadium	<0.0012	mg/L	0.0012	1	03/22/23	bjv	03/23/23	acs		
Zinc	**0.0053**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		

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ANALYTICAL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

Trace ID: 23C0625-26 Matrix: Ground Water Date Collected: 03/15/23 08:30
Sample ID: MW-34 Date Received: 03/15/23 11:16

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T133772										
Iron	**78**	**mg/L**	**2.5**	**50**	**03/22/23**	**bjv**	**03/24/23**	**jma**		
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T133772										
Copper	**0.0085**	**mg/L**	**0.00025**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Nickel	**0.0013**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		
Silver	<0.000050	mg/L	0.000050	1	03/22/23	bjv	03/23/23	acs		
Vanadium	<0.0012	mg/L	0.0012	1	03/22/23	bjv	03/23/23	acs		
Zinc	**0.0023**	**mg/L**	**0.0012**	**1**	**03/22/23**	**bjv**	**03/23/23**	**acs**		

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QUALITY CONTROL RESULTS

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133771
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T133771-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.050	0.050	

LABORATORY CONTROL SAMPLE: T133771-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	16.1	101	85-115	

MATRIX SPIKE: T133771-MS1 Original: **23C0625-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	0.503	16.0	16.0	97	70-130	

MATRIX SPIKE: T133771-MS2 Original: **23C0625-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	30.1	16.0	43.8	86	70-130	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133772
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T133772-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.050	0.050	

LABORATORY CONTROL SAMPLE: T133772-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	16.6	104	85-115	

MATRIX SPIKE: T133772-MS1 Original: **23C0625-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes

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MATRIX SPIKE: T133772-MS1 Original: **23C0625-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	0.196	16.0	16.4	101	70-130	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133771
QC Batch Method: EPA 200.2
Analysis Description: Nickel, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T133771-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Copper	mg/L	<0.00025	0.00025	
Nickel	mg/L	<0.0012	0.0012	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T133771-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0489	98	85-115	
Copper	mg/L	1.60	1.53	96	85-115	
Nickel	mg/L	1.60	1.61	101	85-115	
Vanadium	mg/L	1.60	1.70	106	85-115	
Zinc	mg/L	1.60	1.62	101	85-115	

MATRIX SPIKE: T133771-MS1 Original: **23C0625-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0448	90	70-130	
Copper	mg/L	0	1.60	1.43	89	70-130	
Nickel	mg/L	0	1.60	1.56	97	70-130	
Vanadium	mg/L	0	1.60	1.93	120	70-130	
Zinc	mg/L	0	1.60	1.46	91	70-130	

MATRIX SPIKE: T133771-MS2 Original: **23C0625-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0452	90	70-130	
Copper	mg/L	0.00196	1.60	1.49	93	70-130	
Nickel	mg/L	0.0352	1.60	1.65	101	70-130	

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Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

MATRIX SPIKE: T133771-MS2 Original: **23C0625-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Vanadium	mg/L	0.00320	1.60	1.95	122	70-130	
Zinc	mg/L	0	1.60	1.49	93	70-130	

Trace Project ID: 23C0625
Client Project ID: Grand Haven Board of Light and Power

QC Batch: T133772
QC Batch Method: EPA 200.2
Analysis Description: Copper, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T133772-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Copper	mg/L	<0.00025	0.00025	
Nickel	mg/L	<0.0012	0.0012	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T133772-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0441	88	85-115	
Copper	mg/L	1.60	1.43	89	85-115	
Nickel	mg/L	1.60	1.52	95	85-115	
Vanadium	mg/L	1.60	1.69	105	85-115	
Zinc	mg/L	1.60	1.57	98	85-115	

MATRIX SPIKE: T133772-MS1 Original: **23C0625-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0367	73	70-130	
Copper	mg/L	0.0111	1.60	1.45	90	70-130	
Nickel	mg/L	0	1.60	1.65	103	70-130	
Vanadium	mg/L	0	1.60	1.80	113	70-130	
Zinc	mg/L	0	1.60	1.50	94	70-130	

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the laboratory is not accredited by NELAP for this compound
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

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TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

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Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
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Page 1 of 3

Trace ID No. 23C0625

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By: KB
Checked By: BV
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

* *Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
1	3/14/23	1620	MW-01R	N	GW	6	6		5						1	X	X	X	X	X		
2	3/14/23	1050	MW-02	N	GW	6	6		5						1	X	X	X	X	X		
3	3/14/23	945	MW-03	N	GW	6	6		5						1	X	X	X	X	X		
4	3/14/23	845	MW-04	N	GW	6	6		5						1	X	X	X	X	X		
5	3/14/23	1440	MW-06	N	GW	6	6		5						1	X	X	X	X	X		
6	3/13/23	1440	MW-07	N	GW	6	6		5						1	X	X	X	X	X		
7	3/14/23	1200	MW-08	N	GW	6	6		5						1	X	X	X	X	X		
8	3/14/23	1350	MW-09	N	GW	6	6		5						1	X	X	X	X	X		
9	3/14/23	1610	MW-10	N	GW	6	6		5						1	X	X	X	X	X		
10	3/14/23	1500	MW-11	N	GW	6	6		5						1	X	X	X	X	X		

Analysis Requested

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Byls	Keen	3/15/23	1116	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

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Page 2 of 3

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2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23C0625

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	Cell Phone: 734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By:	KB
Checked By:	BV
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
11	3/13/23	1135	MW-12	N	GW	6	6		5						1	X	X	X	X	X		
12	3/13/23	1710	MW-18	N	GW	6	6		5						1	X	X	X	X	X		
13	3/13/23	1730	MW-19	N	GW	6	6		5						1	X	X	X	X	X		
14	3/13/23	1600	MW-20	N	GW	6	6		5						1	X	X	X	X	X		
15	3/13/23	1335	MW-27	N	GW	6	6		5						1	X	X	X	X	X		
16	3/13/23	1530	MW-30	N	GW	6	6		5						1	X	X	X	X	X		
17	3/14/23	1030	MW-31	N	GW	6	6		5						1	X	X	X	X	X		
18	3/14/23	1200	MW-32	N	GW	6	6		5						1	X	X	X	X	X		
19	3/13/23	1135	MWT-12	N	GW	6	6		5						1	X	X	X	X	X		
20	3/13/23	1335	MWT-27	N	GW	6	6		5						1	X	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andy J Byl	[signature]	3/15/23	1116	2)			
	3)				4)			

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Trace Analytical Laboratories, Inc.
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Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Page 3 of 3

Trace ID No. 23C0625

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By: KB
Checked By: BV
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

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LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
21	3/14/23	820	SG-02	N	SW	6	6		5						1	X	X	X	X	X		
22	3/14/23	900	SG-03	N	SW	6	6		5						1	X	X	X	X	X		
23	3/14/23	1740	SG-04R	N	SW	6	6		5						1	X	X	X	X	X		
24	3/14/23	1800	SG-05	N	SW	6	6		5						1	X	X	X	X	X		

AB

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Byr	[signature]	3/15/23	1116	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

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TRACE ANALYTICAL LABORATORIES, INC.

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Page 1 of 1

Trace ID No. 23C0625

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By:

Checked By:

Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab

Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
25	3/15/23	1000	MW-33	N	GW	6	6		5						1	X	X	X	X	X		
26	3/15/23	830	MW-34	N	GW	6	6		5						1	X	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Bu	[illegible]	3/15/23	1116	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

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Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23C0625
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 3/15/23									
Time: 11:16									
Logged by: KB									
Package Description: Cooler									
Package Temp °C	-1.2	-1.2	✓						
Representative Sample Temp °C	5.0	4.8				✓		✓	

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
✓			Samples preserved at Trace — HNO3 added at 12:43 on 3/15/23
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

☑ pH 0-2.5 (Lot: HC291593) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

Form 70-A.46
Effective 2/6/23

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Appendix C

Laboratory Reports

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TRACE
ANALYTICAL LABORATORIES, INC.

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888-979-4469 Fax
www.trace-labs.com

July 28, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

Phone: (734) 263-7138

RE: Trace Project 23D0863
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

Wisconsin Accreditation No. FID: 998044080

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Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

SAMPLE SUMMARY

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23D0863-01	MW-01R	Ground Water	Client	04/18/23 19:30	04/19/23 11:35
23D0863-02	MW-02	Ground Water	Client	04/18/23 17:40	04/19/23 11:35
23D0863-03	MW-03	Ground Water	Client	04/18/23 19:15	04/19/23 11:35
23D0863-04	MW-04	Ground Water	Client	04/19/23 08:45	04/19/23 11:35
23D0863-05	MW-06	Ground Water	Client	04/18/23 16:30	04/19/23 11:35
23D0863-06	MW-07	Ground Water	Client	04/18/23 13:25	04/19/23 11:35
23D0863-07	MW-08	Ground Water	Client	04/18/23 11:45	04/19/23 11:35
23D0863-08	MW-09	Ground Water	Client	04/18/23 16:50	04/19/23 11:35
23D0863-09	MW-10	Ground Water	Client	04/18/23 15:35	04/19/23 11:35
23D0863-10	MWT-10	Ground Water	Client	04/18/23 15:35	04/19/23 11:35
23D0863-11	MW-11	Ground Water	Client	04/18/23 18:00	04/19/23 11:35
23D0863-12	MW-12	Ground Water	Client	04/19/23 09:20	04/19/23 11:35
23D0863-13	MW-18	Ground Water	Client	04/18/23 12:35	04/19/23 11:35
23D0863-14	MW-19	Ground Water	Client	04/18/23 14:25	04/19/23 11:35
23D0863-15	MW-20	Ground Water	Client	04/18/23 15:20	04/19/23 11:35
23D0863-16	MWT-20	Ground Water	Client	04/18/23 15:30	04/19/23 11:35
23D0863-17	MW-27	Ground Water	Client	04/18/23 10:45	04/19/23 11:35
23D0863-18	MW-30	Ground Water	Client	04/18/23 14:00	04/19/23 11:35
23D0863-19	MW-31	Ground Water	Client	04/18/23 11:40	04/19/23 11:35
23D0863-20	MW-32	Ground Water	Client	04/18/23 12:50	04/19/23 11:35
23D0863-21	MW-33	Ground Water	Client	04/18/23 09:35	04/19/23 11:35
23D0863-22	MW-34	Ground Water	Client	04/18/23 08:30	04/19/23 11:35
23D0863-23	SG-02	Surface Water	Client	04/19/23 11:00	04/19/23 11:35
23D0863-24	SG-03	Surface Water	Client	04/19/23 10:45	04/19/23 11:35
23D0863-25	SG-04R	Surface Water	Client	04/19/23 09:55	04/19/23 11:35
23D0863-26	SG-05	Surface Water	Client	04/19/23 10:15	04/19/23 11:35
23D0863-27	SG-05 Dissolved Metals	Surface Water	Client	04/19/23 10:15	04/19/23 11:35

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
LOQ	Limit of Quantitation
LOD	Limit of Detection
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: 23D0863-01

Analysis: EPA 200.7 Rev. 4.4

Potassium	Note 241 : The MS recovery was out of control low. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.
Sodium	Note 605 : The result for this analyte was quantitated from the initial calibration, but is estimated due to the amount found being above the linear range of the calibration curve.

Analysis: EPA 200.8 Rev. 5.4

Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pH : The pH was analyzed at 12:50

Trace ID: 23D0863-02

Analysis: EPA 200.8 Rev. 5.4

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Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHb : The pH was analyzed at 12:52

Trace ID: 23D0863-03

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHc : The pH was analyzed at 12:53

Trace ID: 23D0863-04

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

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pH	Note pHd : The pH was analyzed at 12:54

Trace ID: 23D0863-05

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHe : The pH was analyzed at 12:55

Trace ID: 23D0863-06

Analysis: SM 4500-H+ B-11

pH	Note pHf : The pH was analyzed at 12:56

Trace ID: 23D0863-07

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHg : The pH was analyzed at 12:57

Trace ID: 23D0863-08

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHh : The pH was analyzed at 12:58

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Trace ID: 23D0863-09

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHi : The pH was analyzed at 12:59

Trace ID: 23D0863-10

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHj : The pH was analyzed at 13:00

Trace ID: 23D0863-11

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

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Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Analysis: SM 4500-H+ B-11	
pH	Note pHk : The pH was analyzed at 13:01

Trace ID: 23D0863-12

Analysis: SM 4500-H+ B-11	
pH	Note pHl : The pH was analyzed at 13:02

Trace ID: 23D0863-13

Analysis: SM 4500-H+ B-11	
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHm : The pH was analyzed at 13:03

Trace ID: 23D0863-14

Analysis: EPA 200.8 Rev. 5.4	
Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Analysis: SM 4500-H+ B-11	
pH	Note pHn : The pH was analyzed at 13:04

Trace ID: 23D0863-15

Analysis: SM 4500-H+ B-11	
pH	Note pHo : The pH was analyzed at 13:05

Trace ID: 23D0863-16

Analysis: SM 4500-H+ B-11	
pH	Note pHo : The pH was analyzed at 13:05

Trace ID: 23D0863-17

Analysis: SM 4500-H+ B-11	
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

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pH	Note pHp : The pH was analyzed at 13:06

Trace ID: 23D0863-18

Analysis: EPA 200.8 Rev. 5.4

Antimony	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Cadmium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Molybdenum	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Silver	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHq : The pH was analyzed at 13:08

Trace ID: 23D0863-19

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHr : The pH was analyzed at 13:09

Trace ID: 23D0863-20

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHs : The pH was analyzed at 13:10

Trace ID: 23D0863-21

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHt : The pH was analyzed at 13:13

Trace ID: 23D0863-22

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHv : The pH was analyzed at 13:15

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Trace ID: 23D0863-23

Analysis: SM 4500-H+ B-11

pH	Note pHw : The pH was analyzed at 13:16

Trace ID: 23D0863-24

Analysis: SM 4500-H+ B-11

pH	Note pHx : The pH was analyzed at 13:17

Trace ID: 23D0863-25

Analysis: SM 4500-H+ B-11

pH	Note pHy : The pH was analyzed at 13:18

Trace ID: 23D0863-26

Analysis: SM 4500-H+ B-11

pH	Note pHz : The pH was analyzed at 13:19

Trace ID: T135349-MS1

Analysis: EPA 200.7 Rev. 4.4

Boron	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Potassium	Note 241 : The MS recovery was out of control low. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.

Trace ID: T135349-MS2

Analysis: EPA 200.7 Rev. 4.4

Boron	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Trace ID: T135350-MS1

Analysis: EPA 200.7 Rev. 4.4

Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Analysis: EPA 200.8 Rev. 5.4

Zinc	Note 241 : The MS recovery was out of control low. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.

Trace ID: T135373-DUP1

Analysis: SM 4500-H+ B-11

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pH	Note pHa :	The pH was analyzed at 12:51

Trace ID: T135373-DUP2

Analysis: SM 4500-H+ B-11

pH	Note pHu :	The pH was analyzed at 13:14

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-01 | Date Collected: 04/18/23 19:30 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**78**	**mg/L**	**0.088**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Calcium	**280**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**0.59**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**1.5**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**120**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**60**	**mg/L**	**2.5**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**241**	**0.36**
Sodium	**280**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**605**	**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.0012**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00025**
Arsenic	**0.00077**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.21**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	**0.00012**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000052**
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0013**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.0017**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs	402.5	0.0031
Nickel	**0.0018**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	**0.00056**	**mg/L**	**0.00050**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00022**
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	**0.0013**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00062**
Zinc	**0.013**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-01 | Date Collected: 04/18/23 19:30 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**8.8**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**130**	**mg/L**	**7.5**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**6.0**
Sulfate as SO4	**780**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**920**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**920**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**2400**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**2.0**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.62**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pH, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-02 | Date Collected: 04/18/23 17:40 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**73**	**mg/L**	**0.088**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Calcium	**190**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**27**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Lithium	**0.87**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**68**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**41**	**mg/L**	**2.5**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.36**
Sodium	**220**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00063**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.0083**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.38**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	**0.00015**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000052**
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.019**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.0031**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	**0.0011**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00020**
Lead	**0.0018**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.0011**
Molybdenum	**0.0088**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0031**
Nickel	**0.017**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	**0.00050**	**mg/L**	**0.00050**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00022**
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	**0.0013**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00062**
Zinc	**0.025**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-02 | Date Collected: 04/18/23 17:40 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**8.7**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**150**	**mg/L**	**7.5**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**6.0**
Sulfate as SO4	<0.41	mg/L	3.0	5	04/19/23	drm	04/19/23	drm		0.41
Analysis Method: SM 2320 B-11										
Batch: T135134										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1800**	**mg/L**	**10**	**2**	**04/20/23**	**ans**	**04/24/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	04/20/23	ans	04/24/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1800**	**mg/L**	**10**	**2**	**04/20/23**	**ans**	**04/24/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**1700**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**100**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.13**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHb, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-03 | Date Collected: 04/18/23 19:15 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**3.9**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**360**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**2.0**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.037**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**210**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**20**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**100**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00045**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.00050**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Barium	**0.34**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0033**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00044**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs	402.5	0.0031
Nickel	**0.00085**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.018**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-03 | Date Collected: 04/18/23 19:15 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.60**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**150**	**mg/L**	**7.5**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**6.0**
Sulfate as SO4	**760**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**2300**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	<	mg/L	4.0	1	04/20/23	ra	04/20/23	ra		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.26**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHc, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-04 | Date Collected: 04/19/23 08:45 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**3.5**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**340**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**6.1**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.054**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**120**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**21**	**mg/L**	**2.5**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.36**
Sodium	**89**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00041**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.00060**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.10**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0026**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00031**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs	402.5	0.0031
Nickel	**0.011**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.0059**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-04 | Date Collected: 04/19/23 08:45 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**1.3**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**220**	**mg/L**	**7.5**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**6.0**
Sulfate as SO4	**700**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**1900**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.27**	**pH Units**		**1**	**04/19/23**	**mj**	**04/19/23**	**sb**	**pHd, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-05 | Date Collected: 04/18/23 16:30 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**7.5**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**250**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**19**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.15**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**90**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**20**	**mg/L**	**2.5**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.36**
Sodium	**63**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00036**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.00047**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Barium	**0.99**	**mg/L**	**0.062**	**25**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.017**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0014**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00050**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs	402.5	0.0031
Nickel	<0.00065	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00065
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.094**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-05 | Date Collected: 04/18/23 16:30 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135056										
Fluoride	**1.1**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**57**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**9.4**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**1200**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**53**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.15**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHe, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-06 | Date Collected: 04/18/23 13:25 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**10**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**130**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**14**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.0083**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**38**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**4.8**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**59**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.000071**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000050**
Arsenic	**0.00013**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Barium	**0.25**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.000032	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000032
Chromium	**0.00028**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00087**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.00022	mg/L	0.00055	1	04/26/23	bjv	04/28/23	acs		0.00022
Molybdenum	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Nickel	<0.00065	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00065
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.025**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-06 | Date Collected: 04/18/23 13:25 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.14**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**14**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**17**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**640**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**640**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**620**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**33**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**6.92**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHf, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-07 | Date Collected: 04/18/23 11:45 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**6.6**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**130**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**18**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.11**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**29**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**12**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**35**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00028**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.000050**
Arsenic	**0.050**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**1.1**	**mg/L**	**0.062**	**25**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.017**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.000032	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000032
Chromium	**0.00084**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00051**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	**0.00045**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00020**
Lead	**0.00022**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00022**
Molybdenum	**0.00095**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00062**
Nickel	**0.0011**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.12**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-07 | Date Collected: 04/18/23 11:45 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**1.1**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**28**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**2.0**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**	**J**	**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**510**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**510**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**560**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**36**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**6.89**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**511, pHg, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-08 | Date Collected: 04/18/23 16:50 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**4.9**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**390**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**25**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Lithium	**0.26**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**53**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**15**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**26**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00037**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.18**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0018**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00053**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	**0.020**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0031**
Nickel	**0.0018**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.018**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-08 | Date Collected: 04/18/23 16:50 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**2.5**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**12**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**650**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**610**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**610**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**1600**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**56**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.12**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHh, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-09 | Date Collected: 04/18/23 15:35 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**9.2**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**280**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**7.3**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.99**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**76**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**42**	**mg/L**	**2.5**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.36**
Sodium	**160**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00034**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.00020**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Barium	**0.14**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0019**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00030**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	**0.0035**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.0031**
Nickel	<0.00065	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00065
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.013**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-09 | Date Collected: 04/18/23 15:35 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**4.6**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**140**	**mg/L**	**7.5**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**6.0**
Sulfate as SO4	**950**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**1900**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**8.0**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.05**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHi, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-10 | Date Collected: 04/18/23 15:35 | Matrix: Ground Water
Sample ID: MWT-10 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**9.9**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**270**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**6.5**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.97**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**75**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**41**	**mg/L**	**2.5**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.36**
Sodium	**160**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	<0.00025	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Arsenic	**0.00016**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Barium	**0.14**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0020**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00029**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	**0.0034**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.0031**
Nickel	<0.00065	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00065
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.013**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-10 | Date Collected: 04/18/23 15:35 | Matrix: Ground Water
Sample ID: MWT-10 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**4.8**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**130**	**mg/L**	**7.5**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**6.0**
Sulfate as SO4	**880**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**360**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**360**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**1900**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**5.0**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.58**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHj, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-11 | Date Collected: 04/18/23 18:00 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**1.5**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**320**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**3.6**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.0059**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**60**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**5.7**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**21**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00028**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.00061**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.36**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.00045**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00040**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Nickel	**0.00065**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.033**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-11 | Date Collected: 04/18/23 18:00 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.21**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**52**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**210**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**800**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**800**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**1200**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**4.0**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.69**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHk, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-12 | Date Collected: 04/19/23 09:20 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**0.20**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**55**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	<0.026	mg/L	0.050	1	04/26/23	bjv	04/27/23	jma		0.026
Lithium	**0.0037**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**13**	**mg/L**	**0.10**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Potassium	**1.0**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**9.4**	**mg/L**	**0.12**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00094**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.000050**
Arsenic	**0.0019**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.022**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	**0.0012**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.000032**
Chromium	**0.00054**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	<0.00010	mg/L	0.00052	1	04/26/23	bjv	04/28/23	acs		0.00010
Copper	**0.0015**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00020**
Lead	<0.00022	mg/L	0.00055	1	04/26/23	bjv	04/28/23	acs		0.00022
Molybdenum	**0.0057**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00062**
Nickel	**0.0021**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	**0.0017**	**mg/L**	**0.00050**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00022**
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	**0.00085**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00062**
Zinc	**0.0090**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-12 | Date Collected: 04/19/23 09:20 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.23**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**16**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**110**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**85**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**85**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**260**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**1.0**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.32**	**pH Units**		**1**	**04/19/23**	**mj**	**04/19/23**	**sb**	**pHl, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-13 | Date Collected: 04/18/23 12:35 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**1.8**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**270**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**4.3**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.026**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**22**	**mg/L**	**0.10**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Potassium	**8.7**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**15**	**mg/L**	**0.12**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00030**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.000050**
Arsenic	**0.021**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.013**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	**0.00018**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000032**
Chromium	<0.00018	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00018
Cobalt	**0.0020**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	**0.00062**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00020**
Lead	<0.00022	mg/L	0.00055	1	04/26/23	bjv	04/28/23	acs		0.00022
Molybdenum	**0.014**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00062**
Nickel	**0.0051**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	**0.00079**	**mg/L**	**0.00050**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00022**
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.043**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-13 | Date Collected: 04/18/23 12:35 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**3.8**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**16**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**660**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/19/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**1200**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135103										
Total Suspended Solids	**6.0**	**mg/L**	**4.0**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.86**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**511, pHm, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-14 | Date Collected: 04/18/23 14:25 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**1.6**	**mg/L**	**0.088**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Calcium	**450**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**12**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Lithium	**0.11**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.019**
Magnesium	**43**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**16**	**mg/L**	**2.5**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.36**
Sodium	**38**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00072**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	**0.0032**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.030**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	**0.000057**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000052**
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	<0.00018	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00018
Cobalt	**0.00069**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	**0.0090**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0031**
Nickel	**0.0017**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.0042**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-14 | Date Collected: 04/18/23 14:25 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**1.8**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.055**
Chloride	**42**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/19/23**	**drm**		**0.60**
Sulfate as SO4	**1200**	**mg/L**	**60**	**100**	**04/19/23**	**drm**	**04/20/23**	**drm**		**8.2**
Analysis Method: SM 2320 B-11										
Batch: T135034										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**240**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/19/23	mr	04/19/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**240**	**mg/L**	**5.0**	**1**	**04/19/23**	**mr**	**04/19/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**2000**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**23**	**mg/L**	**4.0**	**0.9803922**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.29**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHn, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-15 | Date Collected: 04/18/23 15:20 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**0.80**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**130**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**21**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.060**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**57**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**13**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**63**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00016**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000050**
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.31**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.000032	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000032
Chromium	**0.00021**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00018**
Cobalt	**0.0014**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	**0.00024**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00020**
Lead	**0.0028**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00022**
Molybdenum	**0.0036**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00062**
Nickel	**0.0092**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.060**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-15 | Date Collected: 04/18/23 15:20 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.21**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**88**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**85**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**520**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**520**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135090										
Total Dissolved Solids	**760**	**mg/L**	**10**	**1**	**04/20/23**	**ra**	**04/20/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**44**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**6.97**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHo, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-16 | Date Collected: 04/18/23 15:30 | Matrix: Ground Water
Sample ID: MWT-20 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**0.79**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**140**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**21**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.059**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**60**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**12**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**66**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00016**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000050**
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.31**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.000032	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000032
Chromium	**0.00020**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00018**
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	**0.00024**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00020**
Lead	**0.0026**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00022**
Molybdenum	**0.0034**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00062**
Nickel	**0.0090**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.057**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-16 | Date Collected: 04/18/23 15:30 | Matrix: Ground Water
Sample ID: MWT-20 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.21**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**89**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**86**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**520**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**520**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135263										
Total Dissolved Solids	**770**	**mg/L**	**20**	**2**	**04/24/23**	**ljs**	**04/24/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**42**	**mg/L**	**4.0**	**0.9803922**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.15**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHo, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-17 | Date Collected: 04/18/23 10:45 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**0.14**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**100**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**5.5**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.0075**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**26**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**4.1**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**41**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00028**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.000050**
Arsenic	**0.00095**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.074**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.000032	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000032
Chromium	**0.0083**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00024**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	**0.00022**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00020**
Lead	<0.00022	mg/L	0.00055	1	04/26/23	bjv	04/28/23	acs		0.00022
Molybdenum	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Nickel	<0.00065	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00065
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.0079**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-17 | Date Collected: 04/18/23 10:45 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.42**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**38**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**14**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**460**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**5.0**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.16**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**511, pHp, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-18 | Date Collected: 04/18/23 14:00 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**1.7**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**430**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**4.1**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.11**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**120**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**12**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**98**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00040**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**402.5, J**	**0.00025**
Arsenic	<0.00010	mg/L	0.00055	1	04/26/23	bjv	04/28/23	acs		0.00010
Barium	**0.047**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs	402.5	0.00016
Chromium	**0.0058**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs	402.5	0.0011
Molybdenum	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs	402.5	0.0031
Nickel	**0.0018**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs	402.5	0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.0049**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-18 | Date Collected: 04/18/23 14:00 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**1.1**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**120**	**mg/L**	**7.5**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**6.0**
Sulfate as SO4	**970**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**630**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**630**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**2200**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**6.0**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.00**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**pHq, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-19 | Date Collected: 04/18/23 11:40 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**3.6**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**170**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**0.77**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.046**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**36**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**10**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**50**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00013**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000050**
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00010**
Barium	**0.12**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.000032	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000032
Chromium	**0.0019**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00016**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.00022	mg/L	0.00055	1	04/26/23	bjv	04/28/23	acs		0.00022
Molybdenum	**0.0011**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00062**
Nickel	<0.00065	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00065
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.010**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-19 | Date Collected: 04/18/23 11:40 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**5.1**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**94**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**250**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**290**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**290**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**810**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	<	mg/L	4.0	1	04/21/23	ra	04/24/23	ra		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.14**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**503, pHr, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-20 | Date Collected: 04/18/23 12:50 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135280										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135349										
Boron	**2.6**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**190**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**18**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.094**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**34**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**9.8**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**27**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135349										
Antimony	**0.00014**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.000050**
Arsenic	**0.00044**	**mg/L**	**0.00055**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Barium	**0.29**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.000052	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000052
Cadmium	<0.000032	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.000032
Chromium	**0.00039**	**mg/L**	**0.00025**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00018**
Cobalt	**0.00031**	**mg/L**	**0.00052**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	04/26/23	bjv	04/28/23	acs		0.00020
Lead	<0.00022	mg/L	0.00055	1	04/26/23	bjv	04/28/23	acs		0.00022
Molybdenum	**0.0034**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00062**
Nickel	**0.00096**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00065**
Selenium	<0.00022	mg/L	0.00050	1	04/26/23	bjv	04/28/23	acs		0.00022
Silver	<0.000050	mg/L	0.000050	1	04/26/23	bjv	04/28/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	04/26/23	bjv	04/28/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	04/26/23	bjv	04/28/23	acs		0.00062
Zinc	**0.030**	**mg/L**	**0.0012**	**1**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-20 | Date Collected: 04/18/23 12:50 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**45**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**190**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**800**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**39**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.79**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**503, pHs, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-21 | Date Collected: 04/18/23 09:35 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135281										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135350										
Boron	**0.082**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**150**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**4.6**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.0061**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**16**	**mg/L**	**0.10**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Potassium	**4.0**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**22**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135350										
Antimony	**0.0012**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00025**
Arsenic	**0.0040**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00050**
Barium	**0.073**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.00026	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00026
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00016
Chromium	**0.0029**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00088**
Cobalt	**0.0020**	**mg/L**	**0.0026**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Copper	**0.0067**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0010**
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs		0.0011
Molybdenum	**0.0060**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0031**
Nickel	**0.023**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0032**
Selenium	<0.0011	mg/L	0.0025	5	04/26/23	bjv	04/28/23	acs		0.0011
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs		0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs		0.00038
Vanadium	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0031
Zinc	**0.012**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0059**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-21 | Date Collected: 04/18/23 09:35 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135056										
Fluoride	**0.28**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**27**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**23**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**580**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**9.0**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.04**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**511, pHt, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-22 | Date Collected: 04/18/23 08:30 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135281										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135350										
Boron	**1.6**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**210**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**75**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Lithium	**0.046**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**20**	**mg/L**	**0.10**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Potassium	**8.4**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**23**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135350										
Antimony	**0.00091**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00025**
Arsenic	**0.00089**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Barium	**0.17**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.00026	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00026
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00016
Chromium	<0.00088	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00088
Cobalt	<0.00050	mg/L	0.0026	5	04/26/23	bjv	04/28/23	acs		0.00050
Copper	<0.0010	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.0010
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs		0.0011
Molybdenum	**0.0079**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0031**
Nickel	<0.0032	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0032
Selenium	<0.0011	mg/L	0.0025	5	04/26/23	bjv	04/28/23	acs		0.0011
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs		0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs		0.00038
Vanadium	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0031
Zinc	**0.020**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0059**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-22 | Date Collected: 04/18/23 08:30 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135056										
Fluoride	**0.21**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**23**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**0.56**	**mg/L**	**3.0**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**	**J**	**0.41**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**880**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**880**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**700**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**160**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**6.61**	**pH Units**		**1**	**04/18/23**	**mj**	**04/19/23**	**sb**	**511, pHv, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-23 | Date Collected: 04/19/23 11:00 | Matrix: Surface Water
Sample ID: SG-02 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135281										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135350										
Boron	**2.0**	**mg/L**	**0.0091**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0038**
Calcium	**130**	**mg/L**	**2.7**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.073**
Iron	**0.23**	**mg/L**	**0.052**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.027**
Lithium	**0.038**	**mg/L**	**0.0026**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0020**
Magnesium	**28**	**mg/L**	**0.52**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.27**
Potassium	**7.3**	**mg/L**	**0.26**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.037**
Sodium	**21**	**mg/L**	**0.13**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.092**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135350										
Antimony	**0.00058**	**mg/L**	**0.0013**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00026**
Arsenic	**0.0017**	**mg/L**	**0.0029**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00052**
Barium	**0.22**	**mg/L**	**0.013**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0035**
Beryllium	<0.00027	mg/L	0.0013	5	04/26/23	bjv	04/28/23	acs		0.00027
Cadmium	<0.00017	mg/L	0.0013	5	04/26/23	bjv	04/28/23	acs		0.00017
Chromium	<0.00091	mg/L	0.0013	5	04/26/23	bjv	04/28/23	acs		0.00091
Cobalt	<0.00052	mg/L	0.0027	5	04/26/23	bjv	04/28/23	acs		0.00052
Copper	**0.0011**	**mg/L**	**0.0013**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0010**
Lead	**0.0020**	**mg/L**	**0.0029**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0012**
Molybdenum	**0.0062**	**mg/L**	**0.0065**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0032**
Nickel	<0.0034	mg/L	0.0065	5	04/26/23	bjv	04/28/23	acs		0.0034
Selenium	<0.0011	mg/L	0.0026	5	04/26/23	bjv	04/28/23	acs		0.0011
Silver	<0.00026	mg/L	0.00026	5	04/26/23	bjv	04/28/23	acs		0.00026
Thallium	<0.00039	mg/L	0.0020	5	04/26/23	bjv	04/28/23	acs		0.00039
Vanadium	<0.0032	mg/L	0.0065	5	04/26/23	bjv	04/28/23	acs		0.0032
Zinc	**0.029**	**mg/L**	**0.0065**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0061**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-23 | Date Collected: 04/19/23 11:00 | Matrix: Surface Water
Sample ID: SG-02 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135056										
Fluoride	**2.6**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**37**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**400**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**71**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**71**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135160										
Total Dissolved Solids	**680**	**mg/L**	**20**	**2**	**04/21/23**	**ra**	**04/21/23**	**ra**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**0.99**	**mg/L**	**4.0**	**0.990099**	**04/21/23**	**ra**	**04/24/23**	**ra**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.47**	**pH Units**		**1**	**04/19/23**	**mj**	**04/19/23**	**sb**	**pHw, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-24 | Date Collected: 04/19/23 10:45 | Matrix: Surface Water
Sample ID: SG-03 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135281										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135350										
Boron	**2.0**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**140**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**0.20**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.037**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**29**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**7.2**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**21**	**mg/L**	**0.12**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135350										
Antimony	**0.0010**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00025**
Arsenic	**0.0016**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Barium	**0.027**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.00026	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00026
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00016
Chromium	<0.00088	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00088
Cobalt	**0.00050**	**mg/L**	**0.0026**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Copper	<0.0010	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.0010
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs		0.0011
Molybdenum	**0.0097**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0031**
Nickel	**0.0032**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0032**
Selenium	**0.0021**	**mg/L**	**0.0025**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0011**
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs		0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs		0.00038
Vanadium	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0031
Zinc	<0.0059	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0059

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-24 | Date Collected: 04/19/23 10:45 | Matrix: Surface Water
Sample ID: SG-03 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135056										
Fluoride	**2.7**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**37**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**400**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**71**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**71**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135364										
Total Dissolved Solids	**660**	**mg/L**	**20**	**2**	**04/26/23**	**ljs**	**04/26/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**3.0**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.90**	**pH Units**		**1**	**04/19/23**	**mj**	**04/19/23**	**sb**	**pHx, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-25 | Date Collected: 04/19/23 09:55 | Matrix: Surface Water
Sample ID: SG-04R | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135281										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135350										
Boron	**2.4**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**310**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**0.13**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.043**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**29**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**9.1**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**19**	**mg/L**	**0.12**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135350										
Antimony	**0.0011**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00025**
Arsenic	**0.0026**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Barium	**0.040**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.00026	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00026
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00016
Chromium	<0.00088	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00088
Cobalt	<0.00050	mg/L	0.0026	5	04/26/23	bjv	04/28/23	acs		0.00050
Copper	**0.0012**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0010**
Lead	**0.0011**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0011**
Molybdenum	**0.010**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0031**
Nickel	<0.0032	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0032
Selenium	**0.0013**	**mg/L**	**0.0025**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0011**
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs		0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs		0.00038
Vanadium	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0031
Zinc	**0.0061**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0059**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-25 | Date Collected: 04/19/23 09:55 | Matrix: Surface Water
Sample ID: SG-04R | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135056										
Fluoride	**2.7**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**20**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**880**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**100**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**100**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135364										
Total Dissolved Solids	**1400**	**mg/L**	**20**	**2**	**04/26/23**	**ljs**	**04/26/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**1.0**	**mg/L**	**4.0**	**1**	**04/21/23**	**ra**	**04/24/23**	**ra**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**8.01**	**pH Units**		**1**	**04/19/23**	**mj**	**04/19/23**	**sb**	**pHy, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-26 | Date Collected: 04/19/23 10:15 | Matrix: Surface Water
Sample ID: SG-05 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135281										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135350										
Boron	**0.57**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**120**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**3.2**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.029**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**26**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**6.8**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**34**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135350										
Antimony	**0.0010**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00025**
Arsenic	**0.0026**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Barium	**0.039**	**mg/L**	**0.012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0034**
Beryllium	<0.00026	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00026
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00016
Chromium	<0.00088	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00088
Cobalt	<0.00050	mg/L	0.0026	5	04/26/23	bjv	04/28/23	acs		0.00050
Copper	**0.0011**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0010**
Lead	**0.0012**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0011**
Molybdenum	**0.0090**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0031**
Nickel	<0.0032	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0032
Selenium	**0.0013**	**mg/L**	**0.0025**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0011**
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs		0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs		0.00038
Vanadium	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0031
Zinc	**0.0060**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.0059**

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-26 | Date Collected: 04/19/23 10:15 | Matrix: Surface Water
Sample ID: SG-05 | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T135055										
Fluoride	**0.69**	**mg/L**	**0.10**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.055**
Chloride	**50**	**mg/L**	**0.75**	**5**	**04/19/23**	**drm**	**04/20/23**	**drm**		**0.60**
Sulfate as SO4	**110**	**mg/L**	**30**	**50**	**04/19/23**	**drm**	**04/20/23**	**drm**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T135093										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**290**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	04/20/23	mr	04/20/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**290**	**mg/L**	**5.0**	**1**	**04/20/23**	**mr**	**04/20/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T135364										
Total Dissolved Solids	**570**	**mg/L**	**20**	**2**	**04/26/23**	**ljs**	**04/26/23**	**ljs**		
Analysis Method: SM 2540 D-15										
Batch: T135183										
Total Suspended Solids	**17**	**mg/L**	**4.0**	**0.990099**	**04/21/23**	**ra**	**04/24/23**	**ra**		
Analysis Method: SM 4500-H+ B-11										
Batch: T135373										
pH	**7.78**	**pH Units**		**1**	**04/19/23**	**mj**	**04/19/23**	**sb**	**pHz, N**	

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ANALYTICAL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23D0863-27 | Date Collected: 04/19/23 10:15 | Matrix: Surface Water
Sample ID: SG-05 Dissolved Metals | Date Received: 04/19/23 11:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T135281										
Mercury	<0.00016	mg/L	0.00020	1	04/25/23	bjv	04/26/23	jma	N	0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T135350										
Boron	**0.68**	**mg/L**	**0.0088**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.0036**
Calcium	**120**	**mg/L**	**2.6**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.070**
Iron	**0.12**	**mg/L**	**0.050**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.026**
Lithium	**0.032**	**mg/L**	**0.0025**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**	**N**	**0.0019**
Magnesium	**26**	**mg/L**	**0.50**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.26**
Potassium	**7.4**	**mg/L**	**0.25**	**1**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.036**
Sodium	**34**	**mg/L**	**1.2**	**10**	**04/26/23**	**bjv**	**04/27/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T135350										
Antimony	**0.00047**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00025**
Arsenic	**0.00063**	**mg/L**	**0.0028**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Barium	**0.37**	**mg/L**	**0.025**	**10**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0068**
Beryllium	<0.00026	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00026
Cadmium	<0.00016	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.00016
Chromium	**0.025**	**mg/L**	**0.0012**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.00088**
Cobalt	**0.0012**	**mg/L**	**0.0026**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**	**J**	**0.00050**
Copper	<0.0010	mg/L	0.0012	5	04/26/23	bjv	04/28/23	acs		0.0010
Lead	<0.0011	mg/L	0.0028	5	04/26/23	bjv	04/28/23	acs		0.0011
Molybdenum	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0031
Nickel	<0.0032	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0032
Selenium	<0.0011	mg/L	0.0025	5	04/26/23	bjv	04/28/23	acs		0.0011
Silver	<0.00025	mg/L	0.00025	5	04/26/23	bjv	04/28/23	acs		0.00025
Thallium	<0.00038	mg/L	0.0019	5	04/26/23	bjv	04/28/23	acs		0.00038
Vanadium	<0.0031	mg/L	0.0062	5	04/26/23	bjv	04/28/23	acs		0.0031
Zinc	**0.043**	**mg/L**	**0.0062**	**5**	**04/26/23**	**bjv**	**04/28/23**	**acs**		**0.0059**

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QUALITY CONTROL RESULTS

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135280
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T135280-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T135280-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00193	96	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T135280-MSD1

Original: **23D0863-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00193	0.00193	97	96	76-123	0.4	20	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135281
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T135281-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T135281-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00191	95	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T135281-MSD1

Original: **23D0863-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00192	0.00193	96	96	76-123	0.4	20	

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Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135349
QC Batch Method: EPA 200.2
Analysis Description: Calcium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T135349-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.0088	0.0088	
Calcium	mg/L	<0.26	0.26	
Iron	mg/L	<0.050	0.050	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T135349-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.48	93	85-115	
Calcium	mg/L	16.0	15.7	98	85-115	
Iron	mg/L	16.0	15.2	95	85-115	
Potassium	mg/L	16.0	15.5	97	85-115	
Lithium	mg/L	1.60	1.61	101	85-115	
Magnesium	mg/L	16.0	15.1	94	85-115	
Sodium	mg/L	16.0	15.4	96	85-115	

MATRIX SPIKE: T135349-MS1 Original: **23D0863-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**77.5**	**1.60**	71.6	**-371**	**70-130**	**243**
Calcium	**mg/L**	**279**	**16.0**	284	**34**	**70-130**	**243**
Iron	mg/L	0.586	16.0	15.9	95	70-130	
Potassium	**mg/L**	**60.1**	**16.0**	66.9	**43**	**70-130**	**241**
Lithium	mg/L	1.50	1.60	3.16	103	70-130	
Magnesium	mg/L	120	16.0	133	81	70-130	
Sodium	mg/L	282	16.0	295	80	70-130	

MATRIX SPIKE: T135349-MS2 Original: **23D0863-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**73.2**	**1.60**	69.9	**-206**	**70-130**	**243**

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MATRIX SPIKE: T135349-MS2 Original: **23D0863-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Calcium	mg/L	191	16.0	210	118	70-130	
Iron	mg/L	27.0	16.0	42.3	96	70-130	
Potassium	mg/L	41.4	16.0	52.8	71	70-130	
Lithium	mg/L	0.866	1.60	2.50	102	70-130	
Magnesium	mg/L	68.4	16.0	85.9	109	70-130	
Sodium	**mg/L**	**220**	**16.0**	246	**158**	**70-130**	**243**

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135350
QC Batch Method: EPA 200.2
Analysis Description: Boron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T135350-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	mg/L	<0.0088	0.0088	
Calcium	mg/L	<0.26	0.26	
Iron	mg/L	<0.050	0.050	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T135350-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.52	95	85-115	
Calcium	mg/L	16.0	16.3	102	85-115	
Iron	mg/L	16.0	15.6	97	85-115	
Potassium	mg/L	16.0	15.9	99	85-115	
Lithium	mg/L	1.60	1.65	103	85-115	
Magnesium	mg/L	16.0	15.4	96	85-115	
Sodium	mg/L	16.0	15.7	98	85-115	

MATRIX SPIKE: T135350-MS1 Original: **23D0863-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	0.0816	1.60	1.61	96	70-130	
Calcium	**mg/L**	**148**	**16.0**	171	**140**	**70-130**	**243**

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MATRIX SPIKE: T135350-MS1 Original: **23D0863-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	4.57	16.0	20.1	97	70-130	
Potassium	mg/L	3.97	16.0	20.1	101	70-130	
Lithium	mg/L	0	1.60	1.65	103	70-130	
Magnesium	mg/L	15.9	16.0	30.5	92	70-130	
Sodium	mg/L	22.1	16.0	37.2	95	70-130	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135349
QC Batch Method: EPA 200.2
Analysis Description: Nickel, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T135349-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Copper	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Nickel	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	**mg/L**	**0.000151**	**0.00025**	**J**
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T135349-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0510	102	85-115	
Arsenic	mg/L	0.100	0.105	105	85-115	
Barium	mg/L	1.60	1.36	85	85-115	
Beryllium	mg/L	0.200	0.208	104	85-115	
Cadmium	mg/L	0.0500	0.0504	101	85-115	

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LABORATORY CONTROL SAMPLE: T135349-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Cobalt	mg/L	1.60	1.53	96	85-115	
Chromium	mg/L	0.0500	0.0494	99	85-115	
Copper	mg/L	1.60	1.52	95	85-115	
Molybdenum	mg/L	1.60	1.58	99	85-115	
Nickel	mg/L	1.60	1.55	97	85-115	
Lead	mg/L	0.100	0.101	101	85-115	
Antimony	mg/L	0.100	0.0980	98	85-115	
Selenium	mg/L	0.100	0.109	109	85-115	
Thallium	mg/L	0.100	0.0994	99	85-115	
Vanadium	mg/L	1.60	1.56	97	85-115	
Zinc	mg/L	1.60	1.46	91	85-115	

MATRIX SPIKE: T135349-MS1 Original: **23D0863-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0465	93	70-130	
Arsenic	mg/L	0.000773	0.100	0.105	105	70-130	
Barium	mg/L	0.206	1.60	1.55	84	70-130	
Beryllium	mg/L	0	0.200	0.183	91	70-130	
Cadmium	mg/L	0	0.0500	0.0468	94	70-130	
Cobalt	mg/L	0.00166	1.60	1.45	90	70-130	
Chromium	mg/L	0.00134	0.0500	0.0491	95	70-130	
Copper	mg/L	0	1.60	1.37	85	70-130	
Molybdenum	mg/L	0	1.60	1.68	105	70-130	
Nickel	mg/L	0	1.60	1.40	88	70-130	
Lead	mg/L	0.000957	0.100	0.0939	93	70-130	
Antimony	mg/L	0.00124	0.100	0.0992	98	70-130	
Selenium	mg/L	0	0.100	0.100	100	70-130	
Thallium	mg/L	0	0.100	0.0934	93	70-130	
Vanadium	mg/L	0	1.60	1.57	98	70-130	
Zinc	mg/L	0.0132	1.60	1.29	80	70-130	

MATRIX SPIKE: T135349-MS2 Original: **23D0863-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0497	99	70-130	
Arsenic	mg/L	0.00825	0.100	0.120	112	70-130	
Barium	mg/L	0.380	1.60	1.74	85	70-130	

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MATRIX SPIKE: T135349-MS2 Original: **23D0863-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Beryllium	mg/L	0	0.200	0.189	95	70-130	
Cadmium	mg/L	0	0.0500	0.0550	110	70-130	
Cobalt	mg/L	0.00311	1.60	1.51	94	70-130	
Chromium	mg/L	0.0193	0.0500	0.0722	106	70-130	
Copper	mg/L	0.00112	1.60	1.43	89	70-130	
Molybdenum	mg/L	0.00883	1.60	1.71	106	70-130	
Nickel	mg/L	0.0172	1.60	1.50	93	70-130	
Lead	mg/L	0.00184	0.100	0.0955	94	70-130	
Antimony	mg/L	0.000626	0.100	0.122	121	70-130	
Selenium	mg/L	0	0.100	0.101	101	70-130	
Thallium	mg/L	0	0.100	0.0946	95	70-130	
Vanadium	mg/L	0	1.60	1.62	101	70-130	
Zinc	mg/L	0.0248	1.60	1.37	84	70-130	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135350
QC Batch Method: EPA 200.2
Analysis Description: Vanadium, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T135350-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Copper	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Nickel	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	**mg/L**	**0.000226**	**0.00025**	**J**
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

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LABORATORY CONTROL SAMPLE: T135350-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0521	104	85-115	
Arsenic	mg/L	0.100	0.105	105	85-115	
Barium	mg/L	1.60	1.39	87	85-115	
Beryllium	mg/L	0.200	0.198	99	85-115	
Cadmium	mg/L	0.0500	0.0564	113	85-115	
Cobalt	mg/L	1.60	1.52	95	85-115	
Chromium	mg/L	0.0500	0.0476	95	85-115	
Copper	mg/L	1.60	1.49	93	85-115	
Molybdenum	mg/L	1.60	1.57	98	85-115	
Nickel	mg/L	1.60	1.50	94	85-115	
Lead	mg/L	0.100	0.103	103	85-115	
Antimony	mg/L	0.100	0.111	111	85-115	
Selenium	mg/L	0.100	0.113	113	85-115	
Thallium	mg/L	0.100	0.0986	99	85-115	
Vanadium	mg/L	1.60	1.52	95	85-115	
Zinc	mg/L	1.60	1.42	89	85-115	

MATRIX SPIKE: T135350-MS1 Original: **23D0863-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0515	103	70-130	
Arsenic	mg/L	0.00402	0.100	0.110	106	70-130	
Barium	mg/L	0.0727	1.60	1.45	86	70-130	
Beryllium	mg/L	0	0.200	0.199	99	70-130	
Cadmium	mg/L	0	0.0500	0.0553	111	70-130	
Cobalt	mg/L	0.00197	1.60	1.52	95	70-130	
Chromium	mg/L	0.00286	0.0500	0.0523	99	70-130	
Copper	mg/L	0.00673	1.60	1.45	90	70-130	
Molybdenum	mg/L	0.00600	1.60	1.63	101	70-130	
Nickel	mg/L	0.0225	1.60	1.49	92	70-130	
Lead	mg/L	0	0.100	0.100	100	70-130	
Antimony	mg/L	0.00121	0.100	0.123	122	70-130	
Selenium	mg/L	0	0.100	0.108	108	70-130	
Thallium	mg/L	0	0.100	0.0969	97	70-130	
Vanadium	mg/L	0	1.60	1.60	100	70-130	
Zinc	**mg/L**	**0.0117**	**1.60**	1.11	**68**	**70-130**	**241**

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Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135055
QC Batch Method: IC Prep W

Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T135055-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T135055-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	**mg/L**	**5.00**	**<10**	**100**	**90-110**	**J**
Fluoride	mg/L	1.00	1.09	109	90-110	
Sulfate as SO4	mg/L	5.00	4.99	100	90-110	

MATRIX SPIKE: T135055-MS1 Original: **23D0863-03**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Fluoride	mg/L	0.597	5.00	5.64	101	80-120	

MATRIX SPIKE: T135055-MS2 Original: **23D0863-03**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	149	250	398	100	80-120	
Sulfate as SO4	mg/L	758	250	986	91	80-120	

MATRIX SPIKE: T135055-MS3 Original: **23D0863-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Fluoride	mg/L	1.28	5.00	6.53	105	80-120	

MATRIX SPIKE: T135055-MS4 Original: **23D0863-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	215	250	465	100	80-120	
Sulfate as SO4	mg/L	700	250	935	94	80-120	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T135056
QC Batch Method: IC Prep W

Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T135056-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T135056-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	**mg/L**	**5.00**	**<10**	**100**	**90-110**	**J**
Fluoride	mg/L	1.00	1.10	110	90-110	
Sulfate as SO4	mg/L	5.00	5.03	101	90-110	

MATRIX SPIKE: T135056-MS1 Original: **23D0863-05**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	57.0	25.0	81.4	97	80-120	
Fluoride	mg/L	1.06	5.00	6.21	103	80-120	
Sulfate as SO4	mg/L	9.37	25.0	34.5	100	80-120	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135034
QC Batch Method: SM 2320 B-11

Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T135034-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	97.5	97	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	97.5	97	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	97.5	97	88-112	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135093
QC Batch Method: SM 2320 B-11

Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

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LABORATORY CONTROL SAMPLE: T135093-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	97.0	97	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	97.0	97	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	97.0	97	88-112	

SAMPLE DUPLICATE: T135093-DUP1 Original: **23D0863-19**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	293	303	4	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	293	303	4	20	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135134
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Carbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T135134-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	97.5	97	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	97.5	97	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	97.5	97	88-112	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135090
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T135090-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

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LABORATORY CONTROL SAMPLE: T135090-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	496	99	80-120	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135160
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T135160-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T135160-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	505	101	80-120	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135263
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T135263-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T135263-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	518	104	80-120	

SAMPLE DUPLICATE: T135263-DUP1 Original: **23D0863-16**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	774	766	1	10	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T135364
QC Batch Method: SM 2540 C-15

Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T135364-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T135364-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	510	102	80-120	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135103
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T135103-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T135103-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	91.0	91	85-115	

Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135183
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T135183-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T135183-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	91.0	91	85-115	

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Trace Project ID: 23D0863
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T135373
QC Batch Method: *** DEFAULT PREP ***

Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T135373-DUP1 Original: **23D0863-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.04**	**7.67**	**9**	**20**	**pHa**

SAMPLE DUPLICATE: T135373-DUP2 Original: **23D0863-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.62**	**7.10**	**7**	**20**	**pHu**

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Trace ID No. 23D0863

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By: NC
Checked By: MJ
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above ↑	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
1	4/18/23	1930	MW-01R	N	GW	6	6		5						1	X	X	X	X	X		
2	4/18/23	1740	MW-02	N	GW	6	6		5						1	X	X	X	X	X		
3	4/18/23	1915	MW-03	N	GW	6	6		5						1	X	X	X	X	X		
4	4/19/23	0845	MW-04	N	GW	6	6		5						1	X	X	X	X	X		
5	4/18/23	1630	MW-06	N	GW	6	6		5						1	X	X	X	X	X		
6	4/18/23	1325	MW-07	N	GW	6	6		5						1	X	X	X	X	X		
7	4/18/23	1145	MW-08	N	GW	6	6		5						1	X	X	X	X	X		
8	4/18/23	1650	MW-09	N	GW	6	6		5						1	X	X	X	X	X		
9	4/18/23	1535	MW-10	N	GW	6	6		5						1	X	X	X	X	X		
10	4/18/23	1535	MWT-10	N	GW	6	6		5						1	X	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Byr	[signature]	4/19/23	1133	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

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Trace ID No. 23D0863

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	Cell Phone: 734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By:	NC
Checked By:	MJ
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Analysis Requested

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above ↑	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List							Remarks/Notes	Possible Health Hazards?
11	4/18/23	1800	MW-11	N	GW	6	6		5						1	X	X	X	X	X								
12	4/19/23	920	MW-12	N	GW	6	6		5						1	X	X	X	X	X								
13	4/18/23	1235	MW-18	N	GW	6	6		5						1	X	X	X	X	X								
14	4/18/23	1425	MW-19	N	GW	6	6		5						1	X	X	X	X	X								
15	4/18/23	1520	MW-20	N	GW	6	6		5						1	X	X	X	X	X								
16	4/18/23	1530	MWT-20	N	GW	6	6		5						1	X	X	X	X	X								
17	4/18/23	1045	MW-27	N	GW	6	6		5						1	X	X	X	X	X								
18	4/18/23	1400	MW-30	N	GW	6	6		5						1	X	X	X	X	X								
19	4/18/23	1140	MW-31	N	GW	6	6		5						1	X	X	X	X	X								
20	4/18/23	1250	MW-32	N	GW	6	6		5						1	X	X	X	X	X								

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andy J Bu	[signature]	4/19/23	1133	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

☐ Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

Form 70-Z.2

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Muskegon, MI 49444-2673
231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Page 3 of 3

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23D0863

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By: NC
Checked By: MJ
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	See Attached List	Remarks/Notes	Possible Health Hazards?
21	4/18/23	935	MW-33	N	GW	6	6		S						1	X	X	X	X	X		
22	4/18/23	830	MW-34	N	GW	6	6		S						1	X	X	X	X	X		
23	4/19/23	1100	SG-02	N	SW	6	6		S						1	X	X	X	X	X		
24	4/19/23	1045	SG-03	N	SW	6	6		S						1	X	X	X	X	X		
25	4/19/23	955	SG-04R	N	SW	6	6		S						1	X	X	X	X	X		
26	4/19/23	1015	SG-05	N	SW	6	6		S						1	X	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Ann J Bn	[signature]	4/19/23	1133	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

☐ Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

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TRACE ANALYTICAL LABORATORIES, INC.

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888-979-4469 Fax
www.trace-labs.com

23D0863
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/19/23									
Time: 12:43									
Logged by: SB									
Package Description: Bucket									
Package Temp °C	1.3	1.3		✓					
Representative Sample Temp °C	7.9	7.9		✓					✓

Sample Receipt

Yes No
- [x] Received on ice or other coolant
- [x] Ice still present upon receipt
- [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] All sample containers arrived unbroken and labeled
- [x] Sufficient sample to run requested analyses
- [x] Correct chemical preservative added to samples
- [x] Samples preserved at Trace HNO3 added 4/19/23 @ 13:15
- [x] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] All bottle labels agree with COC
- [x] COC filled out properly
- [x] COC signed by client

Notes:

SG02, SG03

HNO3 added to SG02 & SG03 @ 13:15 on 4/19/23

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Effective 3/30/23

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888-979-4469 Fax
www.trace-labs.com

23D0863
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/19/23									
Time: 12:00									
Logged by: SB									
Package Description: Cooler									
Package Temp °C	-0.9	-0.9		X					
Representative Sample Temp °C	4.1	4.1		X					X

Sample Receipt

Yes	No	
☒	☐	Received on ice or other coolant
☒	☐	Ice still present upon receipt
☐	☒	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☒ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☒	☐	☐	All sample containers arrived unbroken and labeled
☒	☐	☐	Sufficient sample to run requested analyses
☒	☐	☐	Correct chemical preservative added to samples
☒	☐	☐	Samples preserved at Trace HNO3 added 4/19/23 @ 13:15
☒	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☒ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☒	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☒	☐	All bottle labels agree with COC
☒	☐	COC filled out properly
☒	☐	COC signed by client

Notes:

MW01R, MW06, MW11, MW20

HNO3 added to MW01R, MW06, MW11, & MW20 @ 13:15 on 4/19/23

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23D0863
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/19/23									
Time: 1207									
Logged by: SB									
Package Description: cooler									
Package Temp °C	-1.4	-1.4		X					
Representative Sample Temp °C	5.7	5.7		X					X

Sample Receipt

Yes No
- [x] Received on ice or other coolant
- [x] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] All sample containers arrived unbroken and labeled
- [x] Sufficient sample to run requested analyses
- [x] Correct chemical preservative added to samples
- [x] Samples preserved at Trace HNO3 added 4/19/23 @ 15:13
- [x] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] All bottle labels agree with COC
- [x] COC filled out properly
- [x] COC signed by client

Notes:

MW12, MW04, SG-04R, SG-05

HNO3 added to MW12, MW04, SG-04R, & SG-05 @ 13:15 on 4/19/23

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Effective 3/30/23

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888-979-4469 Fax
www.trace-labs.com

23D0863
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/19/23									
Time: 12:16									
Logged by: SB									
Package Description: cooler									
Package Temp °C	-1.4	-1.4							
Representative Sample Temp °C	1.7	1.6					x	x	

Sample Receipt

Yes No
- [x] Received on ice or other coolant
- [x] Ice still present upon receipt
- [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)

[ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] All sample containers arrived unbroken and labeled
- [x] Sufficient sample to run requested analyses
- [x] Correct chemical preservative added to samples
- [x] Samples preserved at Trace HNO3 added 4/19/23 @ 13:15
- [x] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [ ] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] All bottle labels agree with COC
- [x] COC filled out properly
- [x] COC signed by client

Notes:

MW18, MW19, MW07, MW10

HNO3 added to MW18, MW19, MW07, MW10 @ 13:15 on 4/19/23

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888-979-4469 Fax
www.trace-labs.com

23D0863

HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/19/23									
Time: 12:28									
Logged by: SB									
Package Description: cooler									
Package Temp °C	-0.8	-0.8							
Representative Sample Temp °C	7.0	7.0							

Sample Receipt

Yes No
- [x] Received on ice or other coolant
- [x] Ice still present upon receipt
- [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)

[ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] All sample containers arrived unbroken and labeled
- [x] Sufficient sample to run requested analyses
- [x] Correct chemical preservative added to samples
- [x] Samples preserved at Trace HNO3 added 4/19/23 @ 13:15
- [x] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] All bottle labels agree with COC
- [x] COC filled out properly
- [x] COC signed by client

Notes:

MW09, MWT10, MW02, MW03

HNO3 added to MW09, MWT10, MW02, MW03 @ 13:15 on 4/19/23

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888-979-4469 Fax
www.trace-labs.com

23D0863
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/19/23									
Time: 12:19									
Logged by: JB									
Package Description: Cooler									
Package Temp °C	-0.9	-0.9		Y					
Representative Sample Temp °C	4.2	4.1					Y	Y	

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace HNO3 added @ 13:15 on 4/19/23
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [ ] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

MW30, MW32, MW31, MW20

HNO3 added to MW30, MW32, MW31, MW20 @ 13:15 on 4/19/23

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Effective 3/30/23

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231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23D0863
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.2°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 4/19/23									
Time: 12:41									
Logged by: SB									
Package Description: Cooler									
Package Temp °C	-1.2	-1.2		✓					
Representative Sample Temp °C	3.1	3.0					✓	✓	

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace HNO3 added @ 13:15 on 4/19/23
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

MW08, MW33, MW34, MW27

HNO3 added to MW08, MW33, MW34, MW27 @ 13:15 on 4/19/23

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Effective 3/30/23

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Appendix D

Laboratory Reports

Trace Analytical Laboratories, Inc.
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TRACE
ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

September 06, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

Phone: (734) 263-7138

RE: Trace Project 23F1319
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

Wisconsin Accreditation No. FID: 998044080 / TNI EL V1:2016

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SAMPLE SUMMARY

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23F1319-01	MW-01R	Ground Water	Client	06/28/23 08:50	06/29/23 08:33
23F1319-02	MW-02	Ground Water	Client	06/27/23 16:05	06/29/23 08:33
23F1319-03	MW-03	Ground Water	Client	06/28/23 11:00	06/29/23 08:33
23F1319-04	MW-04	Ground Water	Client	06/28/23 09:55	06/29/23 08:33
23F1319-05	MW-06	Ground Water	Client	06/28/23 12:00	06/29/23 08:33
23F1319-06	MW-07	Ground Water	Client	06/27/23 12:00	06/29/23 08:33
23F1319-07	MW-08	Ground Water	Client	06/27/23 17:20	06/29/23 08:33
23F1319-08	MW-09	Ground Water	Client	06/27/23 14:45	06/29/23 08:33
23F1319-09	MW-10	Ground Water	Client	06/27/23 17:30	06/29/23 08:33
23F1319-10	MW-11	Ground Water	Client	06/28/23 12:10	06/29/23 08:33
23F1319-11	MW-12	Ground Water	Client	06/27/23 09:00	06/29/23 08:33
23F1319-12	MW-18	Ground Water	Client	06/27/23 11:00	06/29/23 08:33
23F1319-13	MW-19	Ground Water	Client	06/28/23 10:30	06/29/23 08:33
23F1319-14	MW-20	Ground Water	Client	06/28/23 09:00	06/29/23 08:33
23F1319-15	MW-27	Ground Water	Client	06/27/23 12:05	06/29/23 08:33
23F1319-16	MW-30	Ground Water	Client	06/27/23 13:40	06/29/23 08:33
23F1319-17	MW-31	Ground Water	Client	06/27/23 14:30	06/29/23 08:33
23F1319-18	MW-32	Ground Water	Client	06/27/23 15:40	06/29/23 08:33
23F1319-19	MW-33	Ground Water	Client	06/27/23 10:25	06/29/23 08:33
23F1319-20	MW-34	Ground Water	Client	06/27/23 11:10	06/29/23 08:33
23F1319-21	MWT-12	Ground Water	Client	06/27/23 09:00	06/29/23 08:33
23F1319-22	MWT-30	Ground Water	Client	06/27/23 13:40	06/29/23 08:33
23F1319-23	SG-02	Surface Water	Client	06/28/23 13:35	06/29/23 08:33
23F1319-24	SG-03	Surface Water	Client	06/28/23 13:25	06/29/23 08:33
23F1319-25	SG-04R	Surface Water	Client	06/28/23 13:10	06/29/23 08:33
23F1319-26	SG-05	Surface Water	Client	06/28/23 12:50	06/29/23 08:33

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
LOQ	Limit of Quantitation
LOD	Limit of Detection
J	Estimated result greater than the LOD but less than the LOQ
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: 23F1319-01

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pH : The pH was analyzed at 10:19

Trace ID: 23F1319-02

Analysis: EPA 200.7 Rev. 4.4

Potassium	Note 241 : The MS recovery was out of control low. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.

Analysis: SM 2540 C-15

Total Dissolved Solids	Note 623 : The relative percent difference between the sample and sample duplicate is out of control. The sample result should be considered estimated.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHa : The pH was analyzed at 10:20

Trace ID: 23F1319-03

Analysis: SM 4500-H+ B-11

pH	Note pHn : The pH was analyzed at 10:39

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Trace ID: 23F1319-04

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHb : The pH was analyzed at 10:21

Trace ID: 23F1319-05

Analysis: SM 4500-H+ B-11

pH	Note pHc : The pH was analyzed at 10:22

Trace ID: 23F1319-06

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHo : The pH was analyzed at 10:41

Trace ID: 23F1319-07

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHc : The pH was analyzed at 10:22

Trace ID: 23F1319-08

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHd : The pH was analyzed at 10:23

Trace ID: 23F1319-09

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHd : The pH was analyzed at 10:23

Trace ID: 23F1319-10

Analysis: SM 4500-H+ B-11

pH	Note pHk : The pH was analyzed at 10:35

Trace ID: 23F1319-11

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

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pH	Note pHl : The pH was analyzed at 10:36

Trace ID: 23F1319-12

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHl : The pH was analyzed at 10:36

Trace ID: 23F1319-13

Analysis: SM 4500-H+ B-11

pH	Note pHe : The pH was analyzed at 10:24

Trace ID: 23F1319-14

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHf : The pH was analyzed at 10:25

Trace ID: 23F1319-15

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHg : The pH was analyzed at 10:26

Trace ID: 23F1319-16

Analysis: SM 2540 C-15

Total Dissolved Solids	Note 900 : Even after multiple heating cycles, the sample was unable to reach a constant weight. The result should be considered estimated.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHh : The pH was analyzed at 10:27

Trace ID: 23F1319-17

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHi : The pH was analyzed at 10:29

Trace ID: 23F1319-18

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

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pH	Note pHj : The pH was analyzed at 10:30

Trace ID: 23F1319-19

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHm : The pH was analyzed at 10:38

Trace ID: 23F1319-20

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHn : The pH was analyzed at 10:39

Trace ID: 23F1319-21

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHp : The pH was analyzed at 10:43

Trace ID: 23F1319-22

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHr : The pH was analyzed at 10:46

Trace ID: 23F1319-23

Analysis: SM 4500-H+ B-11

pH	Note pHr : The pH was analyzed at 10:46

Trace ID: 23F1319-24

Analysis: SM 4500-H+ B-11

pH	Note pHs : The pH was analyzed at 10:47

Trace ID: 23F1319-25

Analysis: SM 4500-H+ B-11

pH	Note pHt : The pH was analyzed at 10:48

Trace ID: 23F1319-26

Analysis: SM 4500-H+ B-11

pH	Note pHt : The pH was analyzed at 10:48

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Trace ID: T138106-DUP1

Analysis: SM 4500-H+ B-11

pH	Note pHa : The pH was analyzed at 10:20

Trace ID: T138106-DUP2

Analysis: SM 4500-H+ B-11

pH	Note pHq : The pH was analyzed at 10:44

Trace ID: T138109-DUP1

Analysis: SM 2540 C-15

Total Dissolved Solids	Note 623 : The relative percent difference between the sample and sample duplicate is out of control. The sample result should be considered estimated.

Trace ID: T138479-MS1

Analysis: EPA 200.7 Rev. 4.4

Boron	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Magnesium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Potassium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Analysis: EPA 200.8 Rev. 5.4

Selenium	Note 241 : The MS recovery was out of control low. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.

Trace ID: T138479-MS2

Analysis: EPA 200.7 Rev. 4.4

Boron	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Potassium	Note 241 : The MS recovery was out of control low. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.
Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-01 | Date Collected: 06/28/23 08:50 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**150**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**210**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**3.2**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0094**
Magnesium	**100**	**mg/L**	**0.50**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.10**
Potassium	**89**	**mg/L**	**1.2**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.18**
Sodium	**430**	**mg/L**	**1.2**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00071**	**mg/L**	**0.0012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00050**
Arsenic	**0.0019**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.29**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0034**
Beryllium	**0.00036**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000052**
Cadmium	**0.00034**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000075**
Chromium	**0.0043**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0045**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.0053**	**mg/L**	**0.0028**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00050**
Molybdenum	**0.00077**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00076**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Thallium	<0.00038	mg/L	0.0019	5	07/14/23	fs	07/21/23	acs		0.00038

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-01 | Date Collected: 06/28/23 08:50 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**15**	**mg/L**	**0.50**	**25**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.28**
Chloride	**170**	**mg/L**	**3.8**	**25**	**06/29/23**	**mr**	**06/29/23**	**mr**		**3.0**
Sulfate as SO4	**290**	**mg/L**	**15**	**25**	**06/29/23**	**mr**	**06/29/23**	**mr**		**2.1**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1300**	**mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	07/06/23	mr	07/06/23	mr	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1300**	**mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**2400**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	**2.0**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.61**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**503, pH**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-02 | Date Collected: 06/27/23 16:05 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**110**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**210**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**1.7**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**62**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**56**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**241**	**0.036**
Sodium	**320**	**mg/L**	**1.2**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00024**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0096**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.47**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	**0.00032**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.068**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0089**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.0039**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Molybdenum	**0.0062**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.0014**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-02 | Date Collected: 06/27/23 16:05 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**10**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**140**	**mg/L**	**3.8**	**25**	**06/29/23**	**mr**	**06/29/23**	**mr**		**3.0**
Sulfate as SO4	<0.41	mg/L	3.0	5	06/29/23	mr	06/29/23	mr		0.41
Analysis Method: SM 2320 B-11										
Batch: T138399										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**460**	**mg/L**	**5.0**	**1**	**07/11/23**	**ljs**	**07/11/23**	**ljs**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/11/23	ljs	07/11/23	ljs	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**460**	**mg/L**	**5.0**	**1**	**07/11/23**	**ljs**	**07/11/23**	**ljs**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138109										
Total Dissolved Solids	**2100**	**mg/L**	**20**	**1.960784**	**06/30/23**	**mr**	**06/30/23**	**mr**	**623, N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	**20**	**mg/L**	**4.0**	**1.010101**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.10**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHa**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-03 | Date Collected: 06/28/23 11:00 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**4.3**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**430**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.050**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**210**	**mg/L**	**0.50**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.10**
Potassium	**20**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**100**	**mg/L**	**1.2**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00050	mg/L	0.0012	5	07/14/23	fs	07/21/23	acs		0.00050
Arsenic	**0.00091**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.38**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0060**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0012**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00050	mg/L	0.0028	5	07/14/23	fs	07/21/23	acs		0.00050
Molybdenum	<0.00025	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00025
Selenium	**0.00042**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.00038	mg/L	0.0019	5	07/14/23	fs	07/21/23	acs		0.00038

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-03 | Date Collected: 06/28/23 11:00 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.54**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**160**	**mg/L**	**7.5**	**50**	**06/29/23**	**mr**	**06/29/23**	**mr**		**6.0**
Sulfate as SO4	**510**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/29/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1300**	**mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	07/06/23	mr	07/06/23	mr	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1300**	**mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**2300**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	<	mg/L	4.0	1	06/29/23	mr	06/29/23	mr		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.18**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHn**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-04 | Date Collected: 06/28/23 09:55 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**4.1**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**410**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.074**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**130**	**mg/L**	**0.50**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.10**
Potassium	**26**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**93**	**mg/L**	**1.2**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00050	mg/L	0.0012	5	07/14/23	fs	07/21/23	acs		0.00050
Arsenic	**0.00092**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.15**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0046**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00074**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00050	mg/L	0.0028	5	07/14/23	fs	07/21/23	acs		0.00050
Molybdenum	**0.00044**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00017**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.00038	mg/L	0.0019	5	07/14/23	fs	07/21/23	acs		0.00038

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-04 | Date Collected: 06/28/23 09:55 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**1.2**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**190**	**mg/L**	**7.5**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**6.0**
Sulfate as SO4	**610**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**730**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**730**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**2000**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	**8.1**	**mg/L**	**4.0**	**1.010101**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.14**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**503, pHb**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-05 | Date Collected: 06/28/23 12:00 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**9.7**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**290**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.19**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**100**	**mg/L**	**0.50**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.10**
Potassium	**26**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**87**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.00062**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**1.4**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/25/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0020**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00080**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.00027**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.00027**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00022**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-05 | Date Collected: 06/28/23 12:00 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T138062									
Fluoride	**1.1 mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**71 mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**16 mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.41**
Analysis Method: SM 2320 B-11									
Batch: T138223									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100 mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	07/06/23	mr	07/06/23	mr	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1100 mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T138141									
Total Dissolved Solids	**1300 mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T138052									
Total Suspended Solids	**41 mg/L**	**4.0**	**1.010101**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11									
Batch: T138106									
pH	**7.14 pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHc**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-06 | Date Collected: 06/27/23 12:00 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**11**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**160**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.010**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**36**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**4.7**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**56**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.00020**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Barium	**0.35**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.00033**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	07/14/23	fs	07/21/23	acs		0.00010
Molybdenum	<0.00025	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00025
Selenium	<0.00010	mg/L	0.00050	1	07/14/23	fs	07/21/23	acs		0.00010
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-06 | Date Collected: 06/27/23 12:00 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.080**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**J, N**	**0.055**
Chloride	**13**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**18**	**mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**620**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**620**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138109										
Total Dissolved Solids	**720**	**mg/L**	**20**	**1.960784**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	**39**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**6.89**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHo**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-07 | Date Collected: 06/27/23 17:20 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**7.8**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**150**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.13**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**26**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**12**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**40**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00011**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Arsenic	**0.038**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**1.4**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/25/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.00094**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00062**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	07/14/23	fs	07/21/23	acs		0.00010
Molybdenum	**0.00039**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00014**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-07 | Date Collected: 06/27/23 17:20 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**1.0**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**29**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	<0.41	mg/L	3.0	5	06/29/23	mr	06/29/23	mr		0.41
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138109										
Total Dissolved Solids	**610**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	**30**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.10**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHc**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-08 | Date Collected: 06/27/23 14:45 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**6.3**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**430**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.34**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**47**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**16**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**30**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.0027**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.17**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0031**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00069**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	07/14/23	fs	07/21/23	acs		0.00010
Molybdenum	**0.019**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00027**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-08 | Date Collected: 06/27/23 14:45 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**2.9**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**11**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**500**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138109										
Total Dissolved Solids	**1500**	**mg/L**	**20**	**1.960784**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	**46**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**6.96**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHd**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-09 | Date Collected: 06/27/23 17:30 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**26**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**210**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**1.1**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**59**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**46**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**310**	**mg/L**	**1.2**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00011**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Arsenic	**0.00073**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.23**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	**0.000092**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0070**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00068**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	07/14/23	fs	07/21/23	acs		0.00010
Molybdenum	**0.0019**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00036**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-09 | Date Collected: 06/27/23 17:30 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**7.3**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**320**	**mg/L**	**7.5**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**6.0**
Sulfate as SO4	**200**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**720**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138109										
Total Dissolved Solids	**1700**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138052										
Total Suspended Solids	<	mg/L	4.0	1	06/29/23	mr	06/29/23	mr		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.63**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHd**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-10 | Date Collected: 06/28/23 12:10 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**3.0**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**350**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.022**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**55**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**8.1**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**38**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.50**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0012**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00066**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.0038**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Molybdenum	**0.00066**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00016**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-10 | Date Collected: 06/28/23 12:10 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.25**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**72**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**17**	**mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**890**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**890**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**1100**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**4.0**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.20**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHk**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-11 | Date Collected: 06/27/23 09:00 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**0.33**	**mg/L**	**0.0088**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0016**
Calcium	**64**	**mg/L**	**0.26**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.076**
Lithium	**0.0064**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**14**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**1.3**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**11**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00064**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Arsenic	**0.0029**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.043**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	**0.0024**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000075**
Chromium	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Cobalt	**0.00050**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Lead	**0.00014**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0082**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00021**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-11 | Date Collected: 06/27/23 09:00 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.26**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**17**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**110**	**mg/L**	**6.0**	**10**	**06/29/23**	**mr**	**06/30/23**	**mr**		**0.82**
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**330**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	<	mg/L	4.0	0.9803922	06/29/23	mr	06/29/23	mr		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.62**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHI**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-12 | Date Collected: 06/27/23 11:00 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**2.7**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**240**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.041**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**28**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**11**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**20**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00012**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Arsenic	**0.029**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.024**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	**0.00030**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000075**
Chromium	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Cobalt	**0.0032**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.00016**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.019**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00018**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-12 | Date Collected: 06/27/23 11:00 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**4.4**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**24**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**760**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138140										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**150**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/05/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**150**	**mg/L**	**5.0**	**1**	**07/05/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**1400**	**mg/L**	**19**	**1.886792**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.08**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHI**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-13 | Date Collected: 06/28/23 10:30 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**2.3**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**460**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.090**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**32**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**15**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**36**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.0069**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.040**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	**0.000077**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.00031**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00050**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	07/14/23	fs	07/21/23	acs		0.00010
Molybdenum	**0.012**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	<0.00010	mg/L	0.00050	1	07/14/23	fs	07/21/23	acs		0.00010
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-13 | Date Collected: 06/28/23 10:30 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**1.9**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**37**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**800**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**1600**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**29**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**6.93**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHe**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-14 | Date Collected: 06/28/23 09:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**1.1**	**mg/L**	**0.0088**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0016**
Calcium	**58**	**mg/L**	**0.26**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.076**
Lithium	**0.083**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**	**N**	**0.0019**
Magnesium	**47**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**13**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**67**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00011**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.43**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Cobalt	**0.0014**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.0028**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Molybdenum	**0.0048**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00011**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-14 | Date Collected: 06/28/23 09:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.22**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**71**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**30**	**mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**470**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**470**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**650**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**37**	**mg/L**	**4.0**	**1.010101**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.10**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**503, pHf**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-15 | Date Collected: 06/27/23 12:05 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**0.45**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**180**	**mg/L**	**1.3**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.38**
Lithium	**0.017**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0094**
Magnesium	**33**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**11**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**75**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.0010**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.25**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.027**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00092**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	07/14/23	fs	07/21/23	acs		0.00010
Molybdenum	<0.00025	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00025
Selenium	**0.00021**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-15 | Date Collected: 06/27/23 12:05 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.36**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**110**	**mg/L**	**1.5**	**10**	**06/29/23**	**mr**	**06/30/23**	**mr**		**1.2**
Sulfate as SO4	**0.56**	**mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**J**	**0.41**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	07/06/23	mr	07/06/23	mr	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**790**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**19**	**mg/L**	**4.0**	**1.010101**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**6.80**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHg**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-16 | Date Collected: 06/27/23 13:40 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**1.9**	**mg/L**	**0.088**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.016**
Calcium	**460**	**mg/L**	**5.1**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**1.5**
Lithium	**0.12**	**mg/L**	**0.025**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.019**
Magnesium	**120**	**mg/L**	**1.0**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.20**
Potassium	**11**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**95**	**mg/L**	**2.5**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**1.8**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00050	mg/L	0.0012	5	07/14/23	fs	07/21/23	acs		0.00050
Arsenic	**0.00027**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Barium	**0.066**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.012**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00050	mg/L	0.0028	5	07/14/23	fs	07/21/23	acs		0.00050
Molybdenum	**0.00082**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00011**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.00038	mg/L	0.0019	5	07/14/23	fs	07/21/23	acs		0.00038

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-16 | Date Collected: 06/27/23 13:40 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.91**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**110**	**mg/L**	**7.5**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**6.0**
Sulfate as SO4	**940**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr		0.16
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**2800**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**900, N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	<	mg/L	4.0	1.010101	06/29/23	mr	06/29/23	mr		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**2.08**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHh**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-17 | Date Collected: 06/27/23 14:30 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**5.4**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**130**	**mg/L**	**2.6**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.76**
Lithium	**0.056**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0094**
Magnesium	**34**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**12**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**64**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.23**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0023**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00018**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	07/14/23	fs	07/21/23	acs		0.00010
Molybdenum	**0.0018**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00012**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-17 | Date Collected: 06/27/23 14:30 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**4.7**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**110**	**mg/L**	**1.5**	**10**	**06/29/23**	**mr**	**06/30/23**	**mr**		**1.2**
Sulfate as SO4	**120**	**mg/L**	**6.0**	**10**	**06/29/23**	**mr**	**06/30/23**	**mr**		**0.82**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**340**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**760**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	<	mg/L	4.0	1	06/29/23	mr	06/29/23	mr		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.57**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHi**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-18 | Date Collected: 06/27/23 15:40 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**3.9**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**150**	**mg/L**	**2.6**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.76**
Lithium	**0.13**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0094**
Magnesium	**28**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**12**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**33**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	<0.00010	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00010
Arsenic	**0.00058**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.37**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.00032**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00068**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.00014**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0047**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	<0.00010	mg/L	0.00050	1	07/14/23	fs	07/21/23	acs		0.00010
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-18 | Date Collected: 06/27/23 15:40 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**41**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**48**	**mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**600**	**mg/L**	**19**	**1.886792**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**29**	**mg/L**	**4.0**	**0.9803922**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.34**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHj**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-19 | Date Collected: 06/27/23 10:25 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**0.11**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**150**	**mg/L**	**2.6**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.76**
Lithium	<0.0094	mg/L	0.012	5	07/14/23	fs	07/27/23	ckd	N	0.0094
Magnesium	**16**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**4.4**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**23**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00020**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0032**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.088**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0050**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00039**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Lead	**0.00015**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.00068**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00033**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-19 | Date Collected: 06/27/23 10:25 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138062										
Fluoride	**0.26**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**20**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**4.3**	**mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**600**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**21**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.03**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHm**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-20 | Date Collected: 06/27/23 11:10 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138485										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Boron	**4.0**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**220**	**mg/L**	**2.6**	**10**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.76**
Lithium	**0.088**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0094**
Magnesium	**27**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**12**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**38**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Antimony	**0.00016**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.53**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.034**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0018**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.00087**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Molybdenum	**0.00030**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00030**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-20 | Date Collected: 06/27/23 11:10 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T138062									
Fluoride	**0.26 mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**23 mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	<0.41 mg/L	3.0	5	06/29/23	mr	06/29/23	mr		0.41
Analysis Method: SM 2320 B-11									
Batch: T138223									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**970 mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	07/06/23	mr	07/06/23	mr	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**970 mg/L**	**10**	**2**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T138108									
Total Dissolved Solids	**820 mg/L**	**21**	**2.083333**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T138069									
Total Suspended Solids	**170 mg/L**	**4.0**	**1.010101**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11									
Batch: T138106									
pH	**6.56 pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHn**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-21 | Date Collected: 06/27/23 09:00 | Matrix: Ground Water
Sample ID: MWT-12 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138526										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Boron	**0.34**	**mg/L**	**0.0088**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0016**
Calcium	**80**	**mg/L**	**0.26**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.076**
Lithium	**0.0055**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0019**
Magnesium	**17**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**1.4**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**12**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Antimony	**0.00072**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Arsenic	**0.0033**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.048**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	**0.0029**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000075**
Chromium	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Cobalt	**0.00056**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.00017**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0097**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00022**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-21 | Date Collected: 06/27/23 09:00 | Matrix: Ground Water
Sample ID: MWT-12 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138064										
Fluoride	**0.26**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**17**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**110**	**mg/L**	**6.0**	**10**	**06/29/23**	**mr**	**06/30/23**	**mr**		**0.82**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**350**	**mg/L**	**21**	**2.083333**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**3.0**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.42**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHp**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-22 | Date Collected: 06/27/23 13:40 | Matrix: Ground Water
Sample ID: MWT-30 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138526										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Boron	**1.9**	**mg/L**	**0.044**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0082**
Calcium	**490**	**mg/L**	**5.1**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**1.5**
Lithium	**0.14**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0094**
Magnesium	**130**	**mg/L**	**1.0**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.20**
Potassium	**12**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**100**	**mg/L**	**2.5**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**1.8**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Antimony	<0.00050	mg/L	0.0012	5	07/14/23	fs	07/21/23	acs		0.00050
Arsenic	**0.00023**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Barium	**0.065**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.011**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	<0.00050	mg/L	0.0028	5	07/14/23	fs	07/21/23	acs		0.00050
Molybdenum	**0.00074**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00025**
Selenium	**0.00012**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.00038	mg/L	0.0019	5	07/14/23	fs	07/21/23	acs		0.00038

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-22 | Date Collected: 06/27/23 13:40 | Matrix: Ground Water
Sample ID: MWT-30 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138064										
Fluoride	**1.0**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**110**	**mg/L**	**7.5**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**6.0**
Sulfate as SO4	**940**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**670**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**670**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138108										
Total Dissolved Solids	**2400**	**mg/L**	**20**	**2**	**06/30/23**	**mr**	**06/30/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**5.0**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**7.03**	**pH Units**		**1**	**06/27/23**	**sb**	**06/29/23**	**sb**	**511, pHr**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-23 | Date Collected: 06/28/23 13:35 | Matrix: Surface Water
Sample ID: SG-02 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138526										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Boron	**5.6**	**mg/L**	**0.0088**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0016**
Calcium	**210**	**mg/L**	**5.1**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**1.5**
Lithium	**0.067**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0019**
Magnesium	**53**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**18**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**52**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Antimony	**0.00085**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Arsenic	**0.0037**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.13**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	**0.00029**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.00091**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00040**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Lead	**0.00050**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0072**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.0013**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-23 | Date Collected: 06/28/23 13:35 | Matrix: Surface Water
Sample ID: SG-02 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138064										
Fluoride	**4.6**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**86**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**620**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**73**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**73**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**1200**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**30**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**8.33**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHr**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-24 | Date Collected: 06/28/23 13:25 | Matrix: Surface Water
Sample ID: SG-03 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138526										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Boron	**5.8**	**mg/L**	**0.0088**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0016**
Calcium	**220**	**mg/L**	**5.1**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**1.5**
Lithium	**0.067**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0019**
Magnesium	**56**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**19**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**57**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Antimony	**0.00088**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Arsenic	**0.0040**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.13**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	**0.00040**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0012**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00043**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Lead	**0.00076**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Molybdenum	**0.0069**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.0012**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-24 | Date Collected: 06/28/23 13:25 | Matrix: Surface Water
Sample ID: SG-03 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138064										
Fluoride	**4.6**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**86**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**620**	**mg/L**	**30**	**50**	**06/29/23**	**mr**	**06/30/23**	**mr**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**73**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**73**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**1200**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**34**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**8.41**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHs**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-25 | Date Collected: 06/28/23 13:10 | Matrix: Surface Water
Sample ID: SG-04R | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138526										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Boron	**5.0**	**mg/L**	**0.0088**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0016**
Calcium	**600**	**mg/L**	**5.1**	**20**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**1.5**
Lithium	**0.072**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0019**
Magnesium	**53**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**17**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**39**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Antimony	**0.0013**	**mg/L**	**0.0012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00050**
Arsenic	**0.0043**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.040**	**mg/L**	**0.012**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0034**
Beryllium	**0.00012**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000075
Chromium	**0.0010**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Lead	**0.0025**	**mg/L**	**0.0028**	**5**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00050**
Molybdenum	**0.013**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.0023**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Thallium	<0.00038	mg/L	0.0019	5	07/14/23	fs	07/21/23	acs		0.00038

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-25 | Date Collected: 06/28/23 13:10 | Matrix: Surface Water
Sample ID: SG-04R | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138064										
Fluoride	**5.0**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**33**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**1600**	**mg/L**	**60**	**100**	**06/29/23**	**mr**	**06/30/23**	**mr**		**8.2**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**50**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	07/06/23	mr	07/06/23	mr	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**50**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**2500**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**23**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**8.25**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHt**	

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-26 | Date Collected: 06/28/23 12:50 | Matrix: Surface Water
Sample ID: SG-05 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T138526										
Mercury	<0.00016	mg/L	0.00020	1	07/13/23	fs	07/14/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Boron	**0.46**	**mg/L**	**0.0088**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**		**0.0016**
Calcium	**34**	**mg/L**	**0.26**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.076**
Lithium	**0.022**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/27/23**	**ckd**	**N**	**0.0019**
Magnesium	**21**	**mg/L**	**0.10**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.010**
Potassium	**0.31**	**mg/L**	**0.25**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.036**
Sodium	**44**	**mg/L**	**0.12**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Antimony	**0.0010**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Arsenic	**0.0024**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Barium	**0.11**	**mg/L**	**0.0025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.000052
Cadmium	**0.00011**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.000075**
Chromium	**0.00049**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Cobalt	**0.00032**	**mg/L**	**0.00052**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Lead	**0.0040**	**mg/L**	**0.00055**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00010**
Molybdenum	**0.0087**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00025**
Selenium	**0.00038**	**mg/L**	**0.00050**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	07/14/23	fs	07/21/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-26 | Date Collected: 06/28/23 12:50 | Matrix: Surface Water
Sample ID: SG-05 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T138064										
Fluoride	**0.42**	**mg/L**	**0.10**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**	**N**	**0.055**
Chloride	**64**	**mg/L**	**0.75**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.60**
Sulfate as SO4	**38**	**mg/L**	**3.0**	**5**	**06/29/23**	**mr**	**06/29/23**	**mr**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T138223										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**65**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	**46**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**	**N**	**0.16**
Total Alkalinity as CaCO3 at pH 4.5	**110**	**mg/L**	**5.0**	**1**	**07/06/23**	**mr**	**07/06/23**	**mr**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T138141										
Total Dissolved Solids	**320**	**mg/L**	**20**	**2**	**07/05/23**	**ljs**	**07/05/23**	**ljs**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T138069										
Total Suspended Solids	**14**	**mg/L**	**4.0**	**1**	**06/29/23**	**mr**	**06/29/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T138106										
pH	**9.72**	**pH Units**		**1**	**06/28/23**	**sb**	**06/29/23**	**sb**	**pHt**	

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QUALITY CONTROL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138485
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T138485-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T138485-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00206	103	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T138485-MSD1

Original: **23F1319-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00206	0.00204	103	102	76-123	1	20	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138526
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T138526-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.000050	0.000050	

LABORATORY CONTROL SAMPLE: T138526-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00202	101	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T138526-MSD1

Original: **23F1319-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00204	0.00204	102	102	76-123	0	20	

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Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138479
QC Batch Method: EPA 200.2
Analysis Description: Calcium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T138479-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	**mg/L**	**0.00199**	**0.0088**	**J**
Calcium	mg/L	<0.26	0.26	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T138479-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.66	104	85-115	
Calcium	mg/L	16.0	17.0	106	85-115	
Potassium	mg/L	16.0	15.5	97	85-115	
Lithium	mg/L	1.60	1.60	100	85-115	
Magnesium	mg/L	16.0	15.2	95	85-115	
Sodium	mg/L	16.0	16.1	100	85-115	

MATRIX SPIKE: T138479-MS1 Original: **23F1319-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**149**	**1.60**	148	**-64**	**70-130**	**243**
Calcium	**mg/L**	**209**	**16.0**	235	**165**	**70-130**	**243**
Potassium	**mg/L**	**88.6**	**16.0**	98.9	**65**	**70-130**	**243**
Lithium	mg/L	3.24	1.60	4.61	86	70-130	
Magnesium	**mg/L**	**101**	**16.0**	125	**150**	**70-130**	**243**
Sodium	**mg/L**	**427**	**16.0**	455	**173**	**70-130**	**243**

MATRIX SPIKE: T138479-MS2 Original: **23F1319-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**111**	**1.60**	119	**487**	**70-130**	**243**
Calcium	**mg/L**	**215**	**16.0**	258	**271**	**70-130**	**243**
Potassium	**mg/L**	**56.0**	**16.0**	64.4	**52**	**70-130**	**241**
Lithium	mg/L	1.67	1.60	2.96	81	70-130	

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MATRIX SPIKE: T138479-MS2 Original: **23F1319-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Magnesium	mg/L	61.8	16.0	77.8	100	70-130	
Sodium	**mg/L**	**319**	**16.0**	345	**163**	**70-130**	**243**

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138527
QC Batch Method: EPA 200.2
Analysis Description: Sodium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T138527-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	**mg/L**	**0.00421**	**0.0088**	**J**
Calcium	mg/L	<0.26	0.26	
Potassium	mg/L	0.0359	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T138527-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.68	105	85-115	
Calcium	mg/L	16.0	16.9	106	85-115	
Potassium	mg/L	16.0	15.8	99	85-115	
Lithium	mg/L	1.60	1.65	103	85-115	
Magnesium	mg/L	16.0	15.3	96	85-115	
Sodium	mg/L	16.0	16.2	101	85-115	

MATRIX SPIKE: T138527-MS1 Original: **23F1319-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	0.343	1.60	1.98	102	70-130	
Calcium	mg/L	79.6	16.0	91.3	73	70-130	
Potassium	mg/L	1.44	16.0	17.1	98	70-130	
Lithium	mg/L	0	1.60	1.58	99	70-130	
Magnesium	mg/L	17.1	16.0	31.3	89	70-130	
Sodium	mg/L	12.3	16.0	27.6	95	70-130	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T138479
QC Batch Method: EPA 200.2

Analysis Description: Thallium, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T138479-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	**mg/L**	**0.000141**	**0.00055**	**J**
Barium	mg/L	<0.0025	0.0025	
Beryllium	**mg/L**	**0.000110**	**0.00025**	**J**
Cadmium	**mg/L**	**0.000148**	**0.00025**	**J**
Cobalt	**mg/L**	**0.000264**	**0.00052**	**J**
Chromium	mg/L	<0.00025	0.00025	
Molybdenum	**mg/L**	**0.000363**	**0.0012**	**J**
Lead	**mg/L**	**0.000158**	**0.00055**	**J**
Antimony	mg/L	<0.00025	0.00025	
Selenium	**mg/L**	**0.000143**	**0.00050**	**J**
Thallium	**mg/L**	**0.000157**	**0.00038**	**J**

LABORATORY CONTROL SAMPLE: T138479-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.101	101	85-115	
Barium	mg/L	1.60	1.68	105	85-115	
Beryllium	mg/L	0.200	0.210	105	85-115	
Cadmium	mg/L	0.0500	0.0533	107	85-115	
Cobalt	mg/L	1.60	1.59	99	85-115	
Chromium	mg/L	0.0500	0.0521	104	85-115	
Molybdenum	mg/L	1.60	1.52	95	85-115	
Lead	mg/L	0.100	0.103	103	85-115	
Antimony	mg/L	0.100	0.107	107	85-115	
Selenium	mg/L	0.100	0.0989	99	85-115	
Thallium	mg/L	0.100	0.100	100	85-115	

MATRIX SPIKE: T138479-MS1 Original: **23F1319-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00189	0.100	0.101	99	70-130	
Barium	mg/L	0.294	1.60	2.00	107	70-130	
Beryllium	mg/L	0.000364	0.200	0.221	110	70-130	
Cadmium	mg/L	0.000343	0.0500	0.0506	100	70-130	
Cobalt	mg/L	0.00445	1.60	1.62	101	70-130	
Chromium	mg/L	0.00433	0.0500	0.0605	112	70-130	

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MATRIX SPIKE: T138479-MS1 Original: **23F1319-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Molybdenum	mg/L	0	1.60	1.61	101	70-130	
Lead	mg/L	0.00526	0.100	0.101	95	70-130	
Antimony	mg/L	0.000709	0.100	0.112	111	70-130	
Selenium	**mg/L**	**0.000758**	**0.100**	0.0693	**69**	**70-130**	**241**
Thallium	mg/L	0	0.100	0.0925	93	70-130	

MATRIX SPIKE: T138479-MS2 Original: **23F1319-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00961	0.100	0.110	101	70-130	
Barium	mg/L	0.467	1.60	2.18	107	70-130	
Beryllium	mg/L	0.000324	0.200	0.218	109	70-130	
Cadmium	mg/L	0	0.0500	0.0500	100	70-130	
Cobalt	mg/L	0.00887	1.60	1.68	104	70-130	
Chromium	mg/L	0.0679	0.0500	0.112	88	70-130	
Molybdenum	mg/L	0.00616	1.60	1.58	98	70-130	
Lead	mg/L	0.00394	0.100	0.0945	91	70-130	
Antimony	mg/L	0	0.100	0.109	109	70-130	
Selenium	mg/L	0.00144	0.100	0.0918	90	70-130	
Thallium	mg/L	0	0.100	0.0891	89	70-130	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138527
QC Batch Method: EPA 200.2
Analysis Description: Cadmium, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T138527-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	

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METHOD BLANK: T138527-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Thallium	mg/L	<0.00038	0.00038	

LABORATORY CONTROL SAMPLE: T138527-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.0923	92	85-115	
Barium	mg/L	1.60	1.55	97	85-115	
Beryllium	mg/L	0.200	0.174	87	85-115	
Cadmium	mg/L	0.0500	0.0482	96	85-115	
Cobalt	mg/L	1.60	1.41	88	85-115	
Chromium	mg/L	0.0500	0.0461	92	85-115	
Molybdenum	mg/L	1.60	1.38	86	85-115	
Lead	mg/L	0.100	0.0918	92	85-115	
Antimony	mg/L	0.100	0.0989	99	85-115	
Selenium	mg/L	0.100	0.0927	93	85-115	
Thallium	mg/L	0.100	0.0890	89	85-115	

MATRIX SPIKE: T138527-MS1 Original: **23F1319-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00326	0.100	0.104	100	70-130	
Barium	mg/L	0.0478	1.60	1.74	106	70-130	
Beryllium	mg/L	0	0.200	0.191	95	70-130	
Cadmium	mg/L	0.00286	0.0500	0.0558	106	70-130	
Cobalt	mg/L	0.000557	1.60	1.51	94	70-130	
Chromium	mg/L	0	0.0500	0.0515	103	70-130	
Molybdenum	mg/L	0.00970	1.60	1.53	95	70-130	
Lead	mg/L	0	0.100	0.0984	98	70-130	
Antimony	mg/L	0.000722	0.100	0.108	107	70-130	
Selenium	mg/L	0	0.100	0.0963	96	70-130	
Thallium	mg/L	0	0.100	0.0953	95	70-130	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138062
QC Batch Method: IC Prep W

Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

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METHOD BLANK: T138062-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T138062-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	5.07	101	90-110	
Fluoride	mg/L	1.00	1.08	108	90-110	
Sulfate as SO4	mg/L	5.00	4.83	97	90-110	

MATRIX SPIKE: T138062-MS1 Original: **23F1319-06**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	13.5	25.0	37.8	97	80-120	
Fluoride	mg/L	0.0803	5.00	5.03	99	80-120	
Sulfate as SO4	mg/L	18.0	25.0	42.9	99	80-120	

MATRIX SPIKE: T138062-MS2 Original: **23F1319-07**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	29.0	25.0	53.4	98	80-120	
Fluoride	mg/L	1.03	5.00	6.06	101	80-120	
Sulfate as SO4	mg/L	0	25.0	23.2	93	80-120	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138064
QC Batch Method: IC Prep W

Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T138064-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T138064-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes

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Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

LABORATORY CONTROL SAMPLE: T138064-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	**mg/L**	**5.00**	**<10**	**101**	**90-110**	**J**
Fluoride	mg/L	1.00	1.08	108	90-110	
Sulfate as SO4	mg/L	5.00	4.83	97	90-110	

MATRIX SPIKE: T138064-MS1 Original: **23F1319-26**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	64.5	25.0	90.0	102	80-120	
Fluoride	mg/L	0.420	5.00	5.50	102	80-120	
Sulfate as SO4	mg/L	38.1	25.0	63.7	102	80-120	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138140
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Carbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T138140-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	94.2	94	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	94.2	94	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	94.2	94	88-112	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138223
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Total
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T138223-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	98.7	99	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	98.7	99	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	98.7	99	88-112	

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SAMPLE DUPLICATE: T138223-DUP1 Original: **23F1319-23**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	72.7	72.0	0.9	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<5.0		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	72.7	72.0	0.9	20	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138399
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T138399-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	101	101	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	101	101	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	101	101	88-112	

SAMPLE DUPLICATE: T138399-DUP1 Original: **23F1319-02**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	458	461	0.7	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<5.0		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	458	461	0.7	20	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138108
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T138108-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

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LABORATORY CONTROL SAMPLE: T138108-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	484	97	80-120	

SAMPLE DUPLICATE: T138108-DUP1 Original: **23F1319-11**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	328	339	3	10	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138109
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T138109-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T138109-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	484	97	80-120	

SAMPLE DUPLICATE: T138109-DUP1 Original: **23F1319-02**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	**mg/L**	**2100**	**1700**	**21**	**10**	**623**

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138141
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T138141-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	**mg/L**	**1.00**	**10**	**J**

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LABORATORY CONTROL SAMPLE: T138141-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	480	96	80-120	

SAMPLE DUPLICATE: T138141-DUP1 Original: **23F1319-03**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	2320	2340	1	10	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138052
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T138052-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	**mg/L**	**1.00**	**4.0**	**J**

LABORATORY CONTROL SAMPLE: T138052-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	90.2	90	85-115	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138069
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T138069-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T138069-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	114	114	85-115	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T138106
QC Batch Method: *** DEFAULT PREP ***

Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T138106-DUP1 Original: **23F1319-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.61**	**7.64**	**0.4**	**20**	**pHa**

SAMPLE DUPLICATE: T138106-DUP2 Original: **23F1319-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.42**	**7.35**	**0.9**	**20**	**pHq**

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Phone 231.773.5998
Fax 888.979.4469
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Trace ID No. 23F1319

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: SKB / KKB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above ↑	Number of Containers	Preservation: Cool ≤ 4°C	~~Hydrochloric Acid (HCl)~~	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	~~See attached list~~ AB							Remarks/Notes	Possible Health Hazards?
1	6/28/23	850	MW-01R	N	GW	6	6	~~5~~	5						1	X	X	X	X									
2	6/27/23	1605	MW-02	N	GW	6	6	~~5~~	5						1	X	X	X	X									
3	6/28/23	1100	MW-03	N	GW	6	6	~~5~~	5						1	X	X	X	X									
4	6/28/23	955	MW-04	N	GW	6	6	~~5~~	5						1	X	X	X	X									
5	6/28/23	1200	MW-06	N	GW	6	6	~~5~~	5						1	X	X	X	X									
6	6/~~28~~27/23	1200	MW-07	N	GW	6	6	~~5~~	5						1	X	X	X	X								coll. 6/27/23	
7	6/27/23	1720	MW-08	N	GW	6	6	~~5~~	5						1	X	X	X	X									
8	6/29/23	1445	MW-09	N	GW	6	6	~~5~~	5						1	X	X	X	X									
9	6/27/23	1730	MW-10	N	GW	6	6	~~5~~	5						1	X	X	X	X									
10	6/28/23	1210	MW-11	N	GW	6	6	~~5~~	5						1	X	X	X	X									

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Bryan	Beverly Ty	6/29/23	0833	2)			
	3)				4)			

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CHAIN-OF-CUSTODY RECORD

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2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
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Trace ID No. 23F1319

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: SB / KB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

* *Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, DW = Drinking Water, GW = Groundwater, LW = Liquid Waste, O = Oil, WI = Wipes, S = Solid, SL = Sludge, A = Air, U = Unknown

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above ↑	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	~~See attached list.~~ AB							Remarks/Notes	Possible Health Hazards?
11	6/27/23	900	MW-12	N	GW	6	6		S						1	X	X	X	X									
12	6/27/23	1100	MW-18	N	GW	6	6		S						1	X	X	X	X									
13	6/28/23	1030	MW-19	N	GW	6	6		S						1	X	X	X	X									
14	6/28/23	900	MW-20	N	GW	6	6		S						1	X	X	X	X									
15	6/27/23	1205	MW-27	N	GW	6	6		S						1	X	X	X	X									
16	6/27/23	1340	MW-30	N	GW	6	6		S						1	X	X	X	X									
17	6/27/23	1430	MW-31	N	GW	6	6		S						1	X	X	X	X									
18	6/27/23	1540	MW-32	N	GW	6	6		S						1	X	X	X	X									
19	6/27/23	1025	MW-33	N	GW	6	6		S						1	X	X	X	X									
20	6/27/23	1110	MW-34	N	GW	6	6		S						1	X	X	X	X									

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
1) Andrew J Bay	Kaily Vaz	6/29/23	833	2)			
3)				4)			

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Phone 231.773.5998
Fax 888.979.4469
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Trace ID No. 23F1319

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: SB/KB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

* *Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, DW = Drinking Water, GW = Groundwater, LW = Liquid Waste, O = Oil, WI = Wipes, S = Solid, SL = Sludge, A = Air, U = Unknown

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	~~See attached list.~~ AB						Remarks/Notes	Possible Health Hazards?
21	6/27/23	900	MWT-12	N	GW	6	6		5						1	X	X	X	X								
22	6/27/23	1340	MWT-30	N	GW	6	6		5						1	X	X	X	X								
23	6/28/23	1335	SG-02	N	GW	6	6		5						1	X	X	X	X								
24	6/28/23	1325	SG-03	N	SW	6	6		5						1	X	X	X	X								
25	6/28/23	1310	SG-04R	N	SW	6	6		5						1	X	X	X	X								
26	6/28/23	1250	SG-05	N	SW	6	6		5						1	X	X	X	X								
																								AB			

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
1) [signature]	[signature]	6/29/23	833	2)			
3)				4)			

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23F1319

HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 929									
Logged by: SK									
Package Description: cooler									
Package Temp °C	2.4	2.4		✓					
Representative Sample Temp °C	9.7	9.7		✓					✓

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
	✓		Samples preserved at Trace
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

MW-02, MW-08, MW-04, MW-01R

Form 70-A.48
Effective 5/24/23

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231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23F1319

HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 910									
Logged by: SKB									
Package Description: Cooler									
Package Temp °C	-0.1	-0.1		X					
Representative Sample Temp °C	7.1	7.1				X		X	

Sample Receipt

Yes	No	
☒	☐	Received on ice or other coolant
☒	☐	Ice still present upon receipt
☐	☒	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☒ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☒	☐	☐	All sample containers arrived unbroken and labeled
☒	☐	☐	Sufficient sample to run requested analyses
☒	☐	☐	Correct chemical preservative added to samples
☐	☒	☐	Samples preserved at Trace
☒	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☒ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☒	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☒	☐	All bottle labels agree with COC
☒	☐	COC filled out properly
☒	☐	COC signed by client

Notes:

MW-19, MW-06, MW-20, MW-10

Form 70-A.48
Effective 5/24/23

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TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	NR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/29/23									
Time: 10:15									
Logged by: KB									
Package Description: cooler									
Package Temp °C	1.4	1.4		✓					
Representative Sample Temp °C	7.5	7.4					✓	✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present — ☐ Yes ☐ No Custody seals intact (if applicable)
- ☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☐ ☐ ☑ Samples preserved at Trace
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes: MWT 12
MW 12
MW 34
MW 33

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23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 9:30									
Logged by: KB									
Package Description: Cooler									
Package Temp °C	5.3	5.3							
Representative Sample Temp °C	5.0	4.9							

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace — HNO3 added at 9:37 on 6/29/23
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes: MW-03
MW-11
SG-02

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23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 9:45									
Logged by: ILB									
Package Description: Cooler									
Package Temp °C	5.8	5.8		✓					
Representative Sample Temp °C	11.5	11.4					✓	✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☐ ☐ ☑ Samples preserved at Trace
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes: MW-18
MW-07
MW-31
MW-32

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23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 10:02									
Logged by: ICB									
Package Description: Cooler									
Package Temp °C	0.5	0.5		✓					
Representative Sample Temp °C	4.7	4.6						✓	✓

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☐ ☐ ☑ Samples preserved at Trace
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes: SG 04R
SG 03
SG 05

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23F1319

HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 9:42									
Logged by: SKB									
Package Description: Cooler									
Package Temp °C	9.1	9.1		✓					
Representative Sample Temp °C	10.2	10.2				✓		✓	

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present
✓		Trace Courier
✓		Client Drop-off

Custody seals intact (if applicable): ☐ Yes ☐ No

☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

6/29/23 SKB

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
	✓		Samples preserved at Trace
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

MW-27, MW-09, MWT-30, MW-30

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September 06, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

Phone: (734) 263-7138

RE: Trace Project 23F1319
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

Wisconsin Accreditation No. FID: 998044080 / TNI EL V1:2016

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SAMPLE SUMMARY

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23F1319-01	MW-01R	Ground Water	Client	06/28/23 08:50	06/29/23 08:33
23F1319-02	MW-02	Ground Water	Client	06/27/23 16:05	06/29/23 08:33
23F1319-03	MW-03	Ground Water	Client	06/28/23 11:00	06/29/23 08:33
23F1319-04	MW-04	Ground Water	Client	06/28/23 09:55	06/29/23 08:33
23F1319-05	MW-06	Ground Water	Client	06/28/23 12:00	06/29/23 08:33
23F1319-06	MW-07	Ground Water	Client	06/27/23 12:00	06/29/23 08:33
23F1319-07	MW-08	Ground Water	Client	06/27/23 17:20	06/29/23 08:33
23F1319-08	MW-09	Ground Water	Client	06/27/23 14:45	06/29/23 08:33
23F1319-09	MW-10	Ground Water	Client	06/27/23 17:30	06/29/23 08:33
23F1319-10	MW-11	Ground Water	Client	06/28/23 12:10	06/29/23 08:33
23F1319-11	MW-12	Ground Water	Client	06/27/23 09:00	06/29/23 08:33
23F1319-12	MW-18	Ground Water	Client	06/27/23 11:00	06/29/23 08:33
23F1319-13	MW-19	Ground Water	Client	06/28/23 10:30	06/29/23 08:33
23F1319-14	MW-20	Ground Water	Client	06/28/23 09:00	06/29/23 08:33
23F1319-15	MW-27	Ground Water	Client	06/27/23 12:05	06/29/23 08:33
23F1319-16	MW-30	Ground Water	Client	06/27/23 13:40	06/29/23 08:33
23F1319-17	MW-31	Ground Water	Client	06/27/23 14:30	06/29/23 08:33
23F1319-18	MW-32	Ground Water	Client	06/27/23 15:40	06/29/23 08:33
23F1319-19	MW-33	Ground Water	Client	06/27/23 10:25	06/29/23 08:33
23F1319-20	MW-34	Ground Water	Client	06/27/23 11:10	06/29/23 08:33
23F1319-21	MWT-12	Ground Water	Client	06/27/23 09:00	06/29/23 08:33
23F1319-22	MWT-30	Ground Water	Client	06/27/23 13:40	06/29/23 08:33
23F1319-23	SG-02	Surface Water	Client	06/28/23 13:35	06/29/23 08:33
23F1319-24	SG-03	Surface Water	Client	06/28/23 13:25	06/29/23 08:33
23F1319-25	SG-04R	Surface Water	Client	06/28/23 13:10	06/29/23 08:33
23F1319-26	SG-05	Surface Water	Client	06/28/23 12:50	06/29/23 08:33

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
LOQ	Limit of Quantitation
LOD	Limit of Detection
J	Estimated result greater than the LOD but less than the LOQ
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-01 | Date Collected: 06/28/23 08:50 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**0.48**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.0013**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0053**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0046**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0085**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-02 | Date Collected: 06/27/23 16:05 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**24**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.0026**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.025**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0067**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0027**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-03 | Date Collected: 06/28/23 11:00 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**0.31**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.00030**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0016**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.0019**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-04 | Date Collected: 06/28/23 09:55 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**6.8**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.022**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-05 | Date Collected: 06/28/23 12:00 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**18**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.0010**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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888-979-4469 Fax
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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-06 | Date Collected: 06/27/23 12:00 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**17**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	<0.00065	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00065
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-07 | Date Collected: 06/27/23 17:20 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**15**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.0011**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-08 | Date Collected: 06/27/23 14:45 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**19**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-09 | Date Collected: 06/27/23 17:30 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**4.5**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.00088**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.0012**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-10 | Date Collected: 06/28/23 12:10 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**4.2**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.00056**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0013**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.0049**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-11 | Date Collected: 06/27/23 09:00 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**0.051**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.0012**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0031**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0012**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0085**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-12 | Date Collected: 06/27/23 11:00 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**5.8**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.00088**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0075**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.061**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-13 | Date Collected: 06/28/23 10:30 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**16**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-14 | Date Collected: 06/28/23 09:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**18**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.00036**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0098**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.030**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-15 | Date Collected: 06/27/23 12:05 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**9.4**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.00067**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.00082**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00062**
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-16 | Date Collected: 06/27/23 13:40 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**2.9**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.0021**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-17 | Date Collected: 06/27/23 14:30 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**0.92**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	<0.00065	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00065
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-18 | Date Collected: 06/27/23 15:40 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**15**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.0026**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-19 | Date Collected: 06/27/23 10:25 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**7.7**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.0011**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0081**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.00065**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00062**
Zinc	<0.0012	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-20 | Date Collected: 06/27/23 11:10 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138479										
Iron	**77**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138479										
Copper	**0.00045**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0020**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.00069**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**	**J**	**0.00062**
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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888-979-4469 Fax
www.trace-labs.com

ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-21 | Date Collected: 06/27/23 09:00 | Matrix: Ground Water
Sample ID: MWT-12 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Iron	**0.062**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Copper	**0.0013**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0033**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0012**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0096**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-22 | Date Collected: 06/27/23 13:40 | Matrix: Ground Water
Sample ID: MWT-30 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Iron	**2.7**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Copper	<0.00020	mg/L	0.00025	1	07/14/23	fs	07/21/23	acs		0.00020
Nickel	**0.0017**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	07/14/23	fs	07/21/23	acs		0.00062
Zinc	**0.0015**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-23 | Date Collected: 06/28/23 13:35 | Matrix: Surface Water
Sample ID: SG-02 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Iron	**0.27**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Copper	**0.0012**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0036**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0014**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0024**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-24 | Date Collected: 06/28/23 13:25 | Matrix: Surface Water
Sample ID: SG-03 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Iron	**0.31**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Copper	**0.0013**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0036**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0020**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0029**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-25 | Date Collected: 06/28/23 13:10 | Matrix: Surface Water
Sample ID: SG-04R | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Iron	**0.31**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Copper	**0.0018**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0055**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0041**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0070**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23F1319-26 | Date Collected: 06/28/23 12:50 | Matrix: Surface Water
Sample ID: SG-05 | Date Received: 06/29/23 08:33

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T138527										
Iron	**0.74**	**mg/L**	**0.050**	**1**	**07/14/23**	**fs**	**07/21/23**	**jma**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T138527										
Copper	**0.0028**	**mg/L**	**0.00025**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00020**
Nickel	**0.0034**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	07/14/23	fs	07/21/23	acs		0.000050
Vanadium	**0.0012**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.00062**
Zinc	**0.0090**	**mg/L**	**0.0012**	**1**	**07/14/23**	**fs**	**07/21/23**	**acs**		**0.0012**

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QUALITY CONTROL RESULTS

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138479
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T138479-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.050	0.050	

LABORATORY CONTROL SAMPLE: T138479-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	15.6	98	85-115	

MATRIX SPIKE: T138479-MS1 Original: **23F1319-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	0.477	16.0	16.2	98	70-130	

MATRIX SPIKE: T138479-MS2 Original: **23F1319-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	23.6	16.0	40.0	102	70-130	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138527
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T138527-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.050	0.050	

LABORATORY CONTROL SAMPLE: T138527-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	15.5	97	85-115	

MATRIX SPIKE: T138527-MS1 Original: **23F1319-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes

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MATRIX SPIKE: T138527-MS1 Original: **23F1319-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	0	16.0	15.6	97	70-130	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138479
QC Batch Method: EPA 200.2
Analysis Description: Nickel, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T138479-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Copper	mg/L	0.000317	0.00025	
Nickel	mg/L	<0.0012	0.0012	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T138479-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0573	115	85-115	
Copper	mg/L	1.60	1.46	91	85-115	
Nickel	mg/L	1.60	1.48	93	85-115	
Vanadium	mg/L	1.60	1.64	103	85-115	
Zinc	mg/L	1.60	1.61	101	85-115	

MATRIX SPIKE: T138479-MS1 Original: **23F1319-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0534	107	70-130	
Copper	mg/L	0.00132	1.60	1.43	89	70-130	
Nickel	mg/L	0.00531	1.60	1.45	90	70-130	
Vanadium	mg/L	0.00459	1.60	1.85	115	70-130	
Zinc	mg/L	0.00853	1.60	1.45	90	70-130	

MATRIX SPIKE: T138479-MS2 Original: **23F1319-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0527	105	70-130	
Copper	mg/L	0.00263	1.60	1.44	90	70-130	
Nickel	mg/L	0.0248	1.60	1.51	93	70-130	

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MATRIX SPIKE: T138479-MS2 Original: **23F1319-02**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Vanadium	mg/L	0.00670	1.60	1.88	117	70-130	
Zinc	mg/L	0	1.60	1.47	92	70-130	

Trace Project ID: 23F1319
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T138527
QC Batch Method: EPA 200.2
Analysis Description: Copper, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T138527-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Copper	mg/L	<0.00025	0.00025	
Nickel	mg/L	<0.0012	0.0012	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T138527-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0531	106	85-115	
Copper	mg/L	1.60	1.36	85	85-115	
Nickel	mg/L	1.60	1.38	86	85-115	
Vanadium	mg/L	1.60	1.38	86	85-115	
Zinc	mg/L	1.60	1.45	90	85-115	

MATRIX SPIKE: T138527-MS1 Original: **23F1319-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0565	113	70-130	
Copper	mg/L	0.00127	1.60	1.37	85	70-130	
Nickel	mg/L	0.00334	1.60	1.40	87	70-130	
Vanadium	mg/L	0	1.60	1.53	95	70-130	
Zinc	mg/L	0.00958	1.60	1.53	95	70-130	

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CHAIN-OF-CUSTODY RECORD

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Trace ID No. 23F1319

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: SKB / KKB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above ↑	Number of Containers	Preservation: Cool ≤ 4°C	~~Hydrochloric Acid (HCl)~~	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	~~See attached list.~~ AB							Remarks/Notes	Possible Health Hazards?
1	6/28/23	850	MW-01R	N	GW	6	6	~~5~~	5						1	X	X	X	X									
2	6/27/23	1605	MW-02	N	GW	6	6	~~5~~	5						1	X	X	X	X									
3	6/28/23	1100	MW-03	N	GW	6	6	~~5~~	5						1	X	X	X	X									
4	6/28/23	955	MW-04	N	GW	6	6	~~5~~	5						1	X	X	X	X									
5	6/28/23	1200	MW-06	N	GW	6	6	~~5~~	5						1	X	X	X	X									
6	6/~~28~~27/23	1200	MW-07	N	GW	6	6	~~5~~	5						1	X	X	X	X								coll. 6/27/23	
7	6/27/23	1720	MW-08	N	GW	6	6	~~5~~	5						1	X	X	X	X									
8	6/29/23	1445	MW-09	N	GW	6	6	~~5~~	5						1	X	X	X	X									
9	6/27/23	1730	MW-10	N	GW	6	6	~~5~~	5						1	X	X	X	X									
10	6/28/23	1210	MW-11	N	GW	6	6	~~5~~	5						1	X	X	X	X									

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew J Bryan	Beverly Ty	6/29/23	0833	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

☐ Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

Form 70-Z.2

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CHAIN-OF-CUSTODY RECORD

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Trace ID No. 23F1319

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: SB / KB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

* *Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, DW = Drinking Water, GW = Groundwater, LW = Liquid Waste, O = Oil, WI = Wipes, S = Solid, SL = Sludge, A = Air, U = Unknown

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	~~See attached list.~~ AB							Remarks/Notes	Possible Health Hazards?
11	6/27/23	900	MW-12	N	GW	6	6		S						1	X	X	X	X									
12	6/27/23	1100	MW-18	N	GW	6	6		S						1	X	X	X	X									
13	6/28/23	1030	MW-19	N	GW	6	6		S						1	X	X	X	X									
14	6/28/23	900	MW-20	N	GW	6	6		S						1	X	X	X	X									
15	6/27/23	1205	MW-27	N	GW	6	6		S						1	X	X	X	X									
16	6/27/23	1340	MW-30	N	GW	6	6		S						1	X	X	X	X									
17	6/27/23	1430	MW-31	N	GW	6	6		S						1	X	X	X	X									
18	6/27/23	1540	MW-32	N	GW	6	6		S						1	X	X	X	X									
19	6/27/23	1025	MW-33	N	GW	6	6		S						1	X	X	X	X									
20	6/27/23	1110	MW-34	N	GW	6	6		S						1	X	X	X	X									

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
1) Andrew J Bay	Kaily Vaz	6/29/23	833	2)			
3)				4)			

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Form 70-Z.2

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231-773-5998 Phone
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www.trace-labs.com

TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Page 3 of 3

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23F1319

Report Results To:

Company Name: HDR, Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different):
City, State, Zip Code:
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: SB/KB
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

* *Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, DW = Drinking Water, GW = Groundwater, LW = Liquid Waste, O = Oil, WI = Wipes, S = Solid, SL = Sludge, A = Air, U = Unknown

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Appendix III to Part 257	40 CFR Appendix IV to Part 257	Additional MI Part 115 Metals	Total Suspended Solids (TSS)	~~See attached list.~~ AB							Remarks/Notes	Possible Health Hazards?
21	6/27/23	900	MWT-12	N	GW	6	6		5						1	X	X	X	X									
22	6/27/23	1340	MWT-30	N	GW	6	6		5						1	X	X	X	X									
23	6/28/23	1335	SG-02	N	GW	6	6		5						1	X	X	X	X									
24	6/28/23	1325	SG-03	N	SW	6	6		5						1	X	X	X	X									
25	6/28/23	1310	SG-04R	N	SW	6	6		5						1	X	X	X	X									
26	6/28/23	1250	SG-05	N	SW	6	6		5						1	X	X	X	X									
																									AB			

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
1) Ann J Bn	[signature]	6/29/23	833	2)			
3)				4)			

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888-979-4469 Fax
www.trace-labs.com

23F1319

HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 929									
Logged by: SK									
Package Description: cooler									
Package Temp °C	2.4	2.4		✓					
Representative Sample Temp °C	9.7	9.7		✓					✓

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
	✓		Samples preserved at Trace
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

MW-02, MW-08, MW-04, MW-01R

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888-979-4469 Fax
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23F1319

HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 918									
Logged by: SKB									
Package Description: Cooler									
Package Temp °C	-0.1	-0.1		X					
Representative Sample Temp °C	7.1	7.1				X		X	

Sample Receipt

Yes	No	
☒	☐	Received on ice or other coolant
☒	☐	Ice still present upon receipt
☐	☒	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☒ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☒	☐	☐	All sample containers arrived unbroken and labeled
☒	☐	☐	Sufficient sample to run requested analyses
☒	☐	☐	Correct chemical preservative added to samples
☐	☒	☐	Samples preserved at Trace
☒	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☒ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☒	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☒	☐	All bottle labels agree with COC
☒	☐	COC filled out properly
☒	☐	COC signed by client

Notes:

MW-19, MW-06, MW-20, MW-10

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23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	NR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/29/23									
Time: 10:15									
Logged by: KB									
Package Description: cooler									
Package Temp °C	1.4	1.4		✓					
Representative Sample Temp °C	7.5	7.4					✓	✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present — ☐ Yes ☐ No Custody seals intact (if applicable)
- ☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☐ ☐ ☑ Samples preserved at Trace
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes: MWT 12
MW 12
MW 34
MW 33

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www.trace-labs.com

23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 9:30									
Logged by: KB									
Package Description: Cooler									
Package Temp °C	5.3	5.3		✓					
Representative Sample Temp °C	5.0	4.9						✓	✓

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☑ ☐ ☐ Samples preserved at Trace HNO3 added at 9:37 on 6/29/23
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes: MW-03
MW-11
SG-02

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23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 9:45									
Logged by: ILB									
Package Description: Cooler									
Package Temp °C	5.8	5.8		✓					
Representative Sample Temp °C	11.5	11.4					✓	✓	

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☐ ☐ ☑ Samples preserved at Trace
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes: MW-18
MW-07
MW-31
MW-32

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888-979-4469 Fax
www.trace-labs.com

23F1319
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 10:02									
Logged by: ICB									
Package Description: Cooler									
Package Temp °C	0.5	0.5		✓					
Representative Sample Temp °C	4.7	4.6						✓	✓

Sample Receipt

Yes No
- ☑ ☐ Received on ice or other coolant
- ☑ ☐ Ice still present upon receipt
- ☐ ☑ Custody seals present ☐ Yes ☐ No Custody seals intact (if applicable)
- ☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes No N/A
- ☑ ☐ ☐ All sample containers arrived unbroken and labeled
- ☑ ☐ ☐ Sufficient sample to run requested analyses
- ☑ ☐ ☐ Correct chemical preservative added to samples
- ☐ ☐ ☑ Samples preserved at Trace
- ☑ ☐ ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ ☐ ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- ☑ ☐ All bottle labels agree with COC
- ☑ ☐ COC filled out properly
- ☑ ☐ COC signed by client

Notes: SG 04R
SG 03
SG 05

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www.trace-labs.com

23F1319

HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: 0.0°C)	IR-10 (CF: 0.0°C)	IR-12 (CF: +0.1°C)	SR1 (CF: 0.0°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 6/29/23									
Time: 9:42									
Logged by: SKB									
Package Description: Cooler									
Package Temp °C	9.1	9.1		✓					
Representative Sample Temp °C	10.2	10.2				✓		✓	

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [x] Trace Courier — [x] Client Drop-off — [ ] UPS — [ ] Fed Ex — [ ] US Mail — [ ] Other

6/29/23 SKB

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [ ] [x] [ ] Samples preserved at Trace
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) — [ ] pH 11.0-13.0 (Lot: HC022540) — [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

MW-27, MW-09, MWT-30, MW-30

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eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Jon Mink
Trace Analytical Laboratories
2241 Black Creek Road
Muskegon MI 49444

Generated 8/10/2023 6:22 PM

JOB DESCRIPTION

23F1321 - Harbor Island

JOB NUMBER

810-68124-1

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend IN 46617

See page two for job notes and contact information.

my EOL

Eurofins Eaton Analytical South Bend

Job Notes

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Authorized for release by
Karen Fullmer, Project Manager
Karen.Fullmer@et.eurofinsus.com
574 233-4777

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Definitions/Glossary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job Narrative
810-68124-1

Receipt
The samples were received on 6/30/2023 9:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice.

Gas Flow Proportional Counter
Method 903.0: Radium-226 batch 619283Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-01R (810-68124-1), MW-02 (810-68124-2), MW-03 (810-68124-3), MW-04 (810-68124-4), MW-06 (810-68124-5), MW-07 (810-68124-6), MW-08 (810-68124-7), MW-09 (810-68124-8), MW-10 (810-68124-9), MW-11 (810-68124-10), MW-12 (810-68124-11), MW-18 (810-68124-12), MW-19 (810-68124-13), MW-20 (810-68124-14), MW-27 (810-68124-15), (LCS 160-619283/2-A), (MB 160-619283/1-A), (500-235842-C-20-A) and (500-235842-E-20-C DU)

Method 903.0: Radium-226 batch 619466Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.SG-03 (810-68124-24), (LCS 160-619466/2-A), (MB 160-619466/1-A), (380-53265-A-1-A) and (380-53265-C-1-C DU)

Method 903.0: Radium-226 batch 620620Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-30 (810-68124-16), MW-31 (810-68124-17), MW-32 (810-68124-18), MW-33 (810-68124-19), MW-34 (810-68124-20), MWT-12 (810-68124-21), MWT-30 (810-68124-22), SG-02 (810-68124-23), SG-04R (810-68124-25), SG-05 (810-68124-26), (LCS 160-620620/2-A), (MB 160-620620/1-A) and (810-68124-B-21-A DU)

Method 904.0: Radium-228 batch 619284Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-01R (810-68124-1), MW-02 (810-68124-2), MW-03 (810-68124-3), MW-04 (810-68124-4), MW-06 (810-68124-5), MW-07 (810-68124-6), MW-08 (810-68124-7), MW-09 (810-68124-8), MW-10 (810-68124-9), MW-11 (810-68124-10), MW-12 (810-68124-11), MW-18 (810-68124-12), MW-19 (810-68124-13), MW-20 (810-68124-14), MW-27 (810-68124-15), (LCS 160-619284/2-A), (MB 160-619284/1-A), (500-235842-C-20-B) and (500-235842-E-20-D DU)

Method 904.0: Radium-228 batch 619467Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.SG-03 (810-68124-24), (LCS 160-619467/2-A), (MB 160-619467/1-A), (380-53265-A-1-B) and (380-53265-C-1-D DU)

Method 904.0: Radium-228 batch 620621Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-30 (810-68124-16), MW-31 (810-68124-17), MW-32 (810-68124-18), MW-33 (810-68124-19), MW-34 (810-68124-20), MWT-12 (810-68124-21), MWT-30 (810-68124-22), SG-02 (810-68124-23), SG-04R (810-68124-25), SG-05 (810-68124-26), (LCS 160-620621/2-B), (MB 160-620621/1-B) and (810-68124-B-21-B DU)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

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No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-01R — Lab Sample ID: 810-68124-1

No Detections.

Client Sample ID: MW-02 — Lab Sample ID: 810-68124-2

No Detections.

Client Sample ID: MW-03 — Lab Sample ID: 810-68124-3

No Detections.

Client Sample ID: MW-04 — Lab Sample ID: 810-68124-4

No Detections.

Client Sample ID: MW-06 — Lab Sample ID: 810-68124-5

No Detections.

Client Sample ID: MW-07 — Lab Sample ID: 810-68124-6

No Detections.

Client Sample ID: MW-08 — Lab Sample ID: 810-68124-7

No Detections.

Client Sample ID: MW-09 — Lab Sample ID: 810-68124-8

No Detections.

Client Sample ID: MW-10 — Lab Sample ID: 810-68124-9

No Detections.

Client Sample ID: MW-11 — Lab Sample ID: 810-68124-10

No Detections.

Client Sample ID: MW-12 — Lab Sample ID: 810-68124-11

No Detections.

Client Sample ID: MW-18 — Lab Sample ID: 810-68124-12

No Detections.

Client Sample ID: MW-19 — Lab Sample ID: 810-68124-13

No Detections.

Client Sample ID: MW-20 — Lab Sample ID: 810-68124-14

No Detections.

Client Sample ID: MW-27 — Lab Sample ID: 810-68124-15

No Detections.

Client Sample ID: MW-30 — Lab Sample ID: 810-68124-16

No Detections.

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-31 — Lab Sample ID: 810-68124-17

No Detections.

Client Sample ID: MW-32 — Lab Sample ID: 810-68124-18

No Detections.

Client Sample ID: MW-33 — Lab Sample ID: 810-68124-19

No Detections.

Client Sample ID: MW-34 — Lab Sample ID: 810-68124-20

No Detections.

Client Sample ID: MWT-12 — Lab Sample ID: 810-68124-21

No Detections.

Client Sample ID: MWT-30 — Lab Sample ID: 810-68124-22

No Detections.

Client Sample ID: SG-02 — Lab Sample ID: 810-68124-23

No Detections.

Client Sample ID: SG-03 — Lab Sample ID: 810-68124-24

No Detections.

Client Sample ID: SG-04R — Lab Sample ID: 810-68124-25

No Detections.

Client Sample ID: SG-05 — Lab Sample ID: 810-68124-26

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-01R

Lab Sample ID: 810-68124-1

Date Collected: 06/28/23 08:50
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0854	U	0.101	0.101	1.00	0.164	pCi/L	07/07/23 08:55	07/31/23 14:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.5*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:28*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.515	U	0.362	0.365	1.00	0.534	pCi/L	07/07/23 08:58	07/26/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.5*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*
Y Carrier	*90.8*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.601**		0.376	0.379	5.00	0.534	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-02

Lab Sample ID: 810-68124-2

Date Collected: 06/27/23 16:05
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.714**		0.200	0.210	1.00	0.159	pCi/L	07/07/23 08:55	07/31/23 14:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.0*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:28*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.957**		0.577	0.583	1.00	0.866	pCi/L	07/07/23 08:58	07/26/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.0*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*
Y Carrier	*90.1*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.67**		0.611	0.620	5.00	0.866	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-03

Lab Sample ID: 810-68124-3

Date Collected: 06/28/23 11:00
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0840	U	0.123	0.123	1.00	0.209	pCi/L	07/07/23 08:55	07/31/23 14:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:28*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.18**		0.617	0.626	1.00	0.892	pCi/L	07/07/23 08:58	07/26/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*
Y Carrier	*85.6*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.26**		0.629	0.638	5.00	0.892	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-04

Lab Sample ID: 810-68124-4

Date Collected: 06/28/23 09:55
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.232**		0.135	0.137	1.00	0.186	pCi/L	07/07/23 08:55	07/31/23 14:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.2*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:28*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.963**		0.472	0.480	1.00	0.676	pCi/L	07/07/23 08:58	07/26/23 12:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.2*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*
Y Carrier	*86.0*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:09*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.20**		0.491	0.499	5.00	0.676	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-06

Lab Sample ID: 810-68124-5

Date Collected: 06/28/23 12:00
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.331**		0.157	0.160	1.00	0.196	pCi/L	07/07/23 08:55	07/31/23 14:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:28*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.493	U	0.390	0.392	1.00	0.606	pCi/L	07/07/23 08:58	07/26/23 12:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*
Y Carrier	*104*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.824**		0.420	0.423	5.00	0.606	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-07

Lab Sample ID: 810-68124-6

Date Collected: 06/27/23 12:00
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.341**		0.161	0.164	1.00	0.200	pCi/L	07/07/23 08:55	07/31/23 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:29*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.133	U	0.392	0.392	1.00	0.697	pCi/L	07/07/23 08:58	07/26/23 12:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*
Y Carrier	*88.6*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.474	U	0.424	0.425	5.00	0.697	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-08

Lab Sample ID: 810-68124-7

Date Collected: 06/27/23 17:20
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.190**		0.132	0.133	1.00	0.189	pCi/L	07/07/23 08:55	07/31/23 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:29*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.153	U	0.345	0.345	1.00	0.606	pCi/L	07/07/23 08:58	07/26/23 12:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*
Y Carrier	*92.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.343	U	0.369	0.370	5.00	0.606	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-09

Lab Sample ID: 810-68124-8

Date Collected: 06/27/23 14:45
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0269	U	0.0856	0.0856	1.00	0.186	pCi/L	07/07/23 08:55	07/31/23 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.7*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:29*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0748	U	0.387	0.388	1.00	0.742	pCi/L	07/07/23 08:58	07/26/23 12:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*
Y Carrier	*83.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.000	U	0.396	0.397	5.00	0.742	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-10

Lab Sample ID: 810-68124-9

Date Collected: 06/27/23 17:30
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.132	U	0.118	0.118	1.00	0.179	pCi/L	07/07/23 08:55	07/31/23 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.9*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:29*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.195	U	0.431	0.431	1.00	0.752	pCi/L	07/07/23 08:58	07/26/23 12:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.9*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*
Y Carrier	*86.4*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.326	U	0.447	0.447	5.00	0.752	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-11

Lab Sample ID: 810-68124-10

Date Collected: 06/28/23 12:10
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.243**		0.119	0.121	1.00	0.147	pCi/L	07/07/23 08:55	07/31/23 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:29*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.726	U	0.642	0.646	1.00	1.00	pCi/L	07/07/23 08:58	07/26/23 12:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*
Y Carrier	*42.6*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.970	U	0.653	0.657	5.00	1.00	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-12

Lab Sample ID: 810-68124-11

Date Collected: 06/27/23 09:00
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0488	U	0.0725	0.0726	1.00	0.124	pCi/L	07/07/23 08:55	07/31/23 15:58	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.9*		*30 - 110*	*07/07/23 08:55*	*07/31/23 15:58*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0196	U	0.317	0.317	1.00	0.590	pCi/L	07/07/23 08:58	07/26/23 12:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.9*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*
Y Carrier	*84.5*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:12*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0684	U	0.325	0.325	5.00	0.590	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-18

Lab Sample ID: 810-68124-12

Date Collected: 06/27/23 11:00
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0782	U	0.0792	0.0795	1.00	0.124	pCi/L	07/07/23 08:55	07/31/23 15:58	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*07/07/23 08:55*	*07/31/23 15:58*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.407	U	0.415	0.416	1.00	0.872	pCi/L	07/07/23 08:58	07/26/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*
Y Carrier	*60.2*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0782	U	0.422	0.424	5.00	0.872	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-19

Lab Sample ID: 810-68124-13

Date Collected: 06/28/23 10:30
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.106	U	0.0876	0.0882	1.00	0.129	pCi/L	07/07/23 08:55	07/31/23 15:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*30 - 110*	*07/07/23 08:55*	*07/31/23 15:59*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0244	U	0.304	0.304	1.00	0.561	pCi/L	07/07/23 08:58	07/26/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*
Y Carrier	*87.9*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.130	U	0.316	0.317	5.00	0.561	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-20

Lab Sample ID: 810-68124-14

Date Collected: 06/28/23 09:00
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0371	U	0.0681	0.0682	1.00	0.122	pCi/L	07/07/23 08:55	07/31/23 15:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.4*		*30 - 110*	*07/07/23 08:55*	*07/31/23 15:59*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0349	U	0.248	0.248	1.00	0.467	pCi/L	07/07/23 08:58	07/26/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.4*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*
Y Carrier	*86.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0720	U	0.257	0.257	5.00	0.467	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-27

Lab Sample ID: 810-68124-15

Date Collected: 06/27/23 12:05
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.458**		0.172	0.177	1.00	0.181	pCi/L	07/07/23 08:55	07/31/23 15:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.5*		*30 - 110*	*07/07/23 08:55*	*07/31/23 15:59*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.382	U	0.365	0.367	1.00	0.578	pCi/L	07/07/23 08:58	07/26/23 12:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.5*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*
Y Carrier	*86.7*		*30 - 110*	*07/07/23 08:58*	*07/26/23 12:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.840**		0.403	0.407	5.00	0.578	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-30

Lab Sample ID: 810-68124-16

Date Collected: 06/27/23 13:40
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.0986**		0.0653	0.0659	1.00	0.0857	pCi/L	07/18/23 11:01	08/09/23 07:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*07/18/23 11:01*	*08/09/23 07:40*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.487	U	0.371	0.374	1.00	0.566	pCi/L	07/18/23 11:12	07/27/23 13:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.7*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:10*	*1*
Y Carrier	*78.1*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:10*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.586**		0.377	0.380	5.00	0.566	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-31

Lab Sample ID: 810-68124-17

Date Collected: 06/27/23 14:30
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.270**		0.100	0.103	1.00	0.0994	pCi/L	07/18/23 11:01	08/09/23 07:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.2*		*30 - 110*	*07/18/23 11:01*	*08/09/23 07:40*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.310	U	0.307	0.308	1.00	0.489	pCi/L	07/18/23 11:12	07/27/23 13:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.2*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:10*	*1*
Y Carrier	*82.6*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:10*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.580**		0.323	0.325	5.00	0.489	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-32

Lab Sample ID: 810-68124-18

Date Collected: 06/27/23 15:40
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0850	U	0.0652	0.0656	1.00	0.0916	pCi/L	07/18/23 11:01	08/09/23 07:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*30 - 110*	*07/18/23 11:01*	*08/09/23 07:40*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.496	U	0.392	0.395	1.00	0.607	pCi/L	07/18/23 11:12	07/27/23 13:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:10*	*1*
Y Carrier	*79.3*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:10*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.581	U	0.397	0.400	5.00	0.607	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-33

Lab Sample ID: 810-68124-19

Date Collected: 06/27/23 10:25
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.154		0.107	0.108	1.00	0.151	pCi/L	07/18/23 11:01	08/09/23 07:40	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	81.9		30 - 110	07/18/23 11:01	08/09/23 07:40	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.674	U	0.506	0.510	1.00	0.768	pCi/L	07/18/23 11:12	07/27/23 13:11	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	81.9		30 - 110	07/18/23 11:12	07/27/23 13:11	1
Y Carrier	79.3		30 - 110	07/18/23 11:12	07/27/23 13:11	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.828		0.517	0.521	5.00	0.768	pCi/L		08/09/23 15:06	1

Client Sample ID: MW-34

Lab Sample ID: 810-68124-20

Date Collected: 06/27/23 11:10
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.357		0.125	0.129	1.00	0.113	pCi/L	07/18/23 11:01	08/09/23 07:42	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.0		30 - 110	07/18/23 11:01	08/09/23 07:42	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.44		0.762	0.794	1.00	0.954	pCi/L	07/18/23 11:12	07/27/23 13:11	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.0		30 - 110	07/18/23 11:12	07/27/23 13:11	1
Y Carrier	78.5		30 - 110	07/18/23 11:12	07/27/23 13:11	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	2.79		0.772	0.804	5.00	0.954	pCi/L		08/09/23 15:06	1

Client Sample ID: MWT-12

Lab Sample ID: 810-68124-21

Date Collected: 06/27/23 09:00
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0612	U	0.0604	0.0606	1.00	0.0940	pCi/L	07/18/23 11:01	08/09/23 07:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*30 - 110*	*07/18/23 11:01*	*08/09/23 07:42*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.312	U	0.312	0.313	1.00	0.501	pCi/L	07/18/23 11:12	07/27/23 13:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.7*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*
Y Carrier	*83.4*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.373	U	0.318	0.319	5.00	0.501	pCi/L		08/09/23 15:06	1

Client Sample ID: MWT-30

Lab Sample ID: 810-68124-22

Date Collected: 06/27/23 13:40
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0528	U	0.0554	0.0556	1.00	0.0863	pCi/L	07/18/23 11:01	08/09/23 07:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.2*		*30 - 110*	*07/18/23 11:01*	*08/09/23 07:42*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.224	U	0.277	0.278	1.00	0.459	pCi/L	07/18/23 11:12	07/27/23 13:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.2*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*
Y Carrier	*84.9*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.276	U	0.282	0.284	5.00	0.459	pCi/L		08/09/23 15:06	1

Client Sample ID: SG-02

Lab Sample ID: 810-68124-23

Date Collected: 06/28/23 13:35
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.456		0.141	0.146	1.00	0.129	pCi/L	07/18/23 11:01	08/09/23 07:42	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	69.6		30 - 110	07/18/23 11:01	08/09/23 07:42	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.981		0.542	0.549	1.00	0.777	pCi/L	07/18/23 11:12	07/27/23 13:13	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	69.6		30 - 110	07/18/23 11:12	07/27/23 13:13	1
Y Carrier	78.1		30 - 110	07/18/23 11:12	07/27/23 13:13	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.44		0.560	0.568	5.00	0.777	pCi/L		08/09/23 15:06	1

Client Sample ID: SG-03

Lab Sample ID: 810-68124-24

Date Collected: 06/01/23 13:25
Date Received: 06/30/23 09:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.353		0.156	0.159	1.00	0.189	pCi/L	07/10/23 11:12	08/01/23 07:58	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	93.5		30 - 110	07/10/23 11:12	08/01/23 07:58	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.125	U	0.366	0.366	1.00	0.653	pCi/L	07/10/23 11:16	07/26/23 12:03	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	93.5		30 - 110	07/10/23 11:16	07/26/23 12:03	1
Y Carrier	88.6		30 - 110	07/10/23 11:16	07/26/23 12:03	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.478	U	0.398	0.399	5.00	0.653	pCi/L		08/01/23 14:56	1

Client Sample ID: SG-04R

Lab Sample ID: 810-68124-25

Date Collected: 06/28/23 13:10
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.233**		0.127	0.129	1.00	0.151	pCi/L	07/18/23 11:01	08/09/23 07:43	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*51.3*		*30 - 110*	*07/18/23 11:01*	*08/09/23 07:43*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.59**		0.743	0.757	1.00	1.00	pCi/L	07/18/23 11:12	07/27/23 13:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*51.3*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*
Y Carrier	*82.6*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.82**		0.754	0.768	5.00	1.00	pCi/L		08/09/23 15:06	1

Client Sample ID: SG-05

Lab Sample ID: 810-68124-26

Date Collected: 06/28/23 12:50
Matrix: Ground Water
Date Received: 06/30/23 09:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0660	U	0.0914	0.0915	1.00	0.154	pCi/L	07/18/23 11:01	08/09/23 07:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*61.1*		*30 - 110*	*07/18/23 11:01*	*08/09/23 07:47*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.372	U	0.490	0.491	1.00	0.818	pCi/L	07/18/23 11:12	07/27/23 13:13	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*61.1*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*
Y Carrier	*78.9*		*30 - 110*	*07/18/23 11:12*	*07/27/23 13:13*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.438	U	0.498	0.499	5.00	0.818	pCi/L		08/09/23 15:06	1

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-01R — Lab Sample ID: 810-68124-1

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.601		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-02 — Lab Sample ID: 810-68124-2

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.67		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-03 — Lab Sample ID: 810-68124-3

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.26		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-04 — Lab Sample ID: 810-68124-4

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.20		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-06 — Lab Sample ID: 810-68124-5

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.824		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-07 — Lab Sample ID: 810-68124-6

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.474	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-08 — Lab Sample ID: 810-68124-7

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.343	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-09 — Lab Sample ID: 810-68124-8

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.000	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-10 — Lab Sample ID: 810-68124-9

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.326	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-11 — Lab Sample ID: 810-68124-10

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.970	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-12 — Lab Sample ID: 810-68124-11

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.0684	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-18 — Lab Sample ID: 810-68124-12

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.0782	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-19 — Lab Sample ID: 810-68124-13

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.130	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-20 — Lab Sample ID: 810-68124-14

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.0720	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-27 — Lab Sample ID: 810-68124-15

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.840		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-30 — Lab Sample ID: 810-68124-16

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.586		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-31 — Lab Sample ID: 810-68124-17

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.580		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-32 — Lab Sample ID: 810-68124-18

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.581	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-33 — Lab Sample ID: 810-68124-19

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.828		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-34 — Lab Sample ID: 810-68124-20

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	2.79		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MWT-12 — Lab Sample ID: 810-68124-21

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.373	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MWT-30 — Lab Sample ID: 810-68124-22

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.276	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: SG-02 — Lab Sample ID: 810-68124-23

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.44		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: SG-03 — Lab Sample ID: 810-68124-24

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.478	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: SG-04R — Lab Sample ID: 810-68124-25

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.82		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: SG-05

Lab Sample ID: 810-68124-26

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.438	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Ba (30-110)							
LCS 160-619283/2-A	Lab Control Sample	93.5							
LCS 160-619466/2-A	Lab Control Sample	99.0							
LCS 160-620620/2-A	Lab Control Sample	96.2							
MB 160-619283/1-A	Method Blank	97.2							
MB 160-619466/1-A	Method Blank	98.2							
MB 160-620620/1-A	Method Blank	101							

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 903.0 - Radium-226 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Ba (30-110)							
810-68124-1	MW-01R	92.5							
810-68124-2	MW-02	91.0							
810-68124-3	MW-03	88.7							
810-68124-4	MW-04	88.2							
810-68124-5	MW-06	94.0							
810-68124-6	MW-07	88.7							
810-68124-7	MW-08	94.0							
810-68124-8	MW-09	93.7							
810-68124-9	MW-10	87.9							
810-68124-10	MW-11	91.7							
810-68124-11	MW-12	87.9							
810-68124-12	MW-18	89.7							
810-68124-13	MW-19	89.4							
810-68124-14	MW-20	85.4							
810-68124-15	MW-27	91.5							
810-68124-16	MW-30	88.7							
810-68124-17	MW-31	89.2							
810-68124-18	MW-32	94.7							
810-68124-19	MW-33	81.9							
810-68124-20	MW-34	91.0							
810-68124-21	MWT-12	94.7							
810-68124-21 DU	MWT-12	90.2							
810-68124-22	MWT-30	95.2							
810-68124-23	SG-02	69.6							
810-68124-24	SG-03	93.5							
810-68124-25	SG-04R	51.3							
810-68124-26	SG-05	61.1							

Tracer/Carrier Legend

Ba = Ba Carrier

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Job ID: 810-68124-1
Project/Site: 23F1321 - Harbor Island

Method: 904.0 - Radium-228 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(30-110)	(30-110)
LCS 160-619284/2-A	Lab Control Sample	93.5	85.2
LCS 160-619467/2-A	Lab Control Sample	99.0	85.2
LCS 160-620621/2-B	Lab Control Sample	96.2	86.4
MB 160-619284/1-A	Method Blank	97.2	81.1
MB 160-619467/1-A	Method Blank	98.2	81.5
MB 160-620621/1-B	Method Blank	101	83.7

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(30-110)	(30-110)
810-68124-1	MW-01R	92.5	90.8
810-68124-2	MW-02	91.0	90.1
810-68124-3	MW-03	88.7	85.6
810-68124-4	MW-04	88.2	86.0
810-68124-5	MW-06	94.0	104
810-68124-6	MW-07	88.7	88.6
810-68124-7	MW-08	94.0	92.7
810-68124-8	MW-09	93.7	83.7
810-68124-9	MW-10	87.9	86.4
810-68124-10	MW-11	91.7	42.6
810-68124-11	MW-12	87.9	84.5
810-68124-12	MW-18	89.7	60.2
810-68124-13	MW-19	89.4	87.9
810-68124-14	MW-20	85.4	86.7
810-68124-15	MW-27	91.5	86.7
810-68124-16	MW-30	88.7	78.1
810-68124-17	MW-31	89.2	82.6
810-68124-18	MW-32	94.7	79.3
810-68124-19	MW-33	81.9	79.3
810-68124-20	MW-34	91.0	78.5
810-68124-21	MWT-12	94.7	83.4
810-68124-21 DU	MWT-12	90.2	82.2
810-68124-22	MWT-30	95.2	84.9
810-68124-23	SG-02	69.6	78.1
810-68124-24	SG-03	93.5	88.6
810-68124-25	SG-04R	51.3	82.6
810-68124-26	SG-05	61.1	78.9

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-619283/1-A
Matrix: Drinking Water
Analysis Batch: 622151

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 619283

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.01329	U	0.0562	0.0563	1.00	0.115	pCi/L	07/07/23 08:55	07/31/23 14:19	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.2*		*30 - 110*	*07/07/23 08:55*	*07/31/23 14:19*	*1*

Lab Sample ID: LCS 160-619283/2-A
Matrix: Drinking Water
Analysis Batch: 622151

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 619283

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.982		1.08	1.00	0.113	pCi/L	88	80 - 120		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*93.5*		*30 - 110*

Lab Sample ID: MB 160-619466/1-A
Matrix: Drinking Water
Analysis Batch: 622360

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 619466

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0000	U	0.0477	0.0477	1.00	0.103	pCi/L	07/10/23 09:20	08/01/23 07:39	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.2*		*30 - 110*	*07/10/23 09:20*	*08/01/23 07:39*	*1*

Lab Sample ID: LCS 160-619466/2-A
Matrix: Drinking Water
Analysis Batch: 622360

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 619466

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	11.05		1.16	1.00	0.108	pCi/L	98	80 - 120		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*99.0*		*30 - 110*

Lab Sample ID: MB 160-620620/1-A
Matrix: Drinking Water
Analysis Batch: 623571

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 620620

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.003790	U	0.0418	0.0418	1.00	0.0858	pCi/L	07/18/23 11:01	08/09/23 07:38	1

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: MB 160-620620/1-A
Matrix: Drinking Water
Analysis Batch: 623571

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 620620

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		30 - 110	07/18/23 11:01	08/09/23 07:38	1

Lab Sample ID: LCS 160-620620/2-A
Matrix: Drinking Water
Analysis Batch: 623571

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 620620

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	9.902		1.03	1.00	0.120	pCi/L	87	80 - 120		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	96.2		30 - 110

Lab Sample ID: 810-68124-21 DU
Matrix: Ground Water
Analysis Batch: 623571

Client Sample ID: MWT-12
Prep Type: Total/NA
Prep Batch: 620620

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.0612	U		0.1026		0.0665	1.00	0.0835	pCi/L			0.33	1

Carrier	DU %Yield	DU Qualifier	Limits
Ba Carrier	90.2		30 - 110

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-619284/1-A
Matrix: Drinking Water
Analysis Batch: 621719

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 619284

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1032	U	0.246	0.246	1.00	0.439	pCi/L	07/07/23 08:58	07/26/23 12:04	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	97.2		30 - 110	07/07/23 08:58	07/26/23 12:04	1
Y Carrier	81.1		30 - 110	07/07/23 08:58	07/26/23 12:04	1

Lab Sample ID: LCS 160-619284/2-A
Matrix: Drinking Water
Analysis Batch: 621719

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 619284

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.01	8.297		1.17	1.00	0.534	pCi/L	104	80 - 120		

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-619284/2-A
Matrix: Drinking Water
Analysis Batch: 621719

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 619284

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	93.5		30 - 110
Y Carrier	85.2		30 - 110

Lab Sample ID: MB 160-619467/1-A
Matrix: Drinking Water
Analysis Batch: 621778

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 619467

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.7359		0.368	0.374	1.00	0.511	pCi/L	07/10/23 09:22	07/26/23 11:59	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	98.2		30 - 110	07/10/23 09:22	07/26/23 11:59	1
Y Carrier	81.5		30 - 110	07/10/23 09:22	07/26/23 11:59	1

Lab Sample ID: LCS 160-619467/2-A
Matrix: Drinking Water
Analysis Batch: 621778

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 619467

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.01	8.463		1.16	1.00	0.448	pCi/L	106	80 - 120		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	99.0		30 - 110
Y Carrier	85.2		30 - 110

Lab Sample ID: MB 160-620621/1-B
Matrix: Drinking Water
Analysis Batch: 621813

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 620621

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.08436	U	0.278	0.278	1.00	0.497	pCi/L	07/18/23 11:12	07/27/23 13:10	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	101		30 - 110	07/18/23 11:12	07/27/23 13:10	1
Y Carrier	83.7		30 - 110	07/18/23 11:12	07/27/23 13:10	1

Lab Sample ID: LCS 160-620621/2-B
Matrix: Drinking Water
Analysis Batch: 621813

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 620621

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.01	8.616		1.18	1.00	0.446	pCi/L	108	80 - 120		

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-620621/2-B
Matrix: Drinking Water
Analysis Batch: 621813

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 620621

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	96.2		30 - 110
Y Carrier	86.4		30 - 110

Lab Sample ID: 810-68124-21 DU
Matrix: Ground Water
Analysis Batch: 621813

Client Sample ID: MWT-12
Prep Type: Total/NA
Prep Batch: 620621

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.312	U		0.3802	U	0.364	1.00	0.579	pCi/L			0.10	1

Carrier	DU %Yield	DU Qualifier	Limits
Ba Carrier	90.2		30 - 110
Y Carrier	82.2		30 - 110

QC Association Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Rad

Prep Batch: 619283

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-68124-1	MW-01R	Total/NA	Ground Water	PrecSep-21	
810-68124-2	MW-02	Total/NA	Ground Water	PrecSep-21	
810-68124-3	MW-03	Total/NA	Ground Water	PrecSep-21	
810-68124-4	MW-04	Total/NA	Ground Water	PrecSep-21	
810-68124-5	MW-06	Total/NA	Ground Water	PrecSep-21	
810-68124-6	MW-07	Total/NA	Ground Water	PrecSep-21	
810-68124-7	MW-08	Total/NA	Ground Water	PrecSep-21	
810-68124-8	MW-09	Total/NA	Ground Water	PrecSep-21	
810-68124-9	MW-10	Total/NA	Ground Water	PrecSep-21	
810-68124-10	MW-11	Total/NA	Ground Water	PrecSep-21	
810-68124-11	MW-12	Total/NA	Ground Water	PrecSep-21	
810-68124-12	MW-18	Total/NA	Ground Water	PrecSep-21	
810-68124-13	MW-19	Total/NA	Ground Water	PrecSep-21	
810-68124-14	MW-20	Total/NA	Ground Water	PrecSep-21	
810-68124-15	MW-27	Total/NA	Ground Water	PrecSep-21	
MB 160-619283/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-619283/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	

Prep Batch: 619284

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-68124-1	MW-01R	Total/NA	Ground Water	PrecSep_0	
810-68124-2	MW-02	Total/NA	Ground Water	PrecSep_0	
810-68124-3	MW-03	Total/NA	Ground Water	PrecSep_0	
810-68124-4	MW-04	Total/NA	Ground Water	PrecSep_0	
810-68124-5	MW-06	Total/NA	Ground Water	PrecSep_0	
810-68124-6	MW-07	Total/NA	Ground Water	PrecSep_0	
810-68124-7	MW-08	Total/NA	Ground Water	PrecSep_0	
810-68124-8	MW-09	Total/NA	Ground Water	PrecSep_0	
810-68124-9	MW-10	Total/NA	Ground Water	PrecSep_0	
810-68124-10	MW-11	Total/NA	Ground Water	PrecSep_0	
810-68124-11	MW-12	Total/NA	Ground Water	PrecSep_0	
810-68124-12	MW-18	Total/NA	Ground Water	PrecSep_0	
810-68124-13	MW-19	Total/NA	Ground Water	PrecSep_0	
810-68124-14	MW-20	Total/NA	Ground Water	PrecSep_0	
810-68124-15	MW-27	Total/NA	Ground Water	PrecSep_0	
MB 160-619284/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-619284/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	

Prep Batch: 619466

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-68124-24	SG-03	Total/NA	Ground Water	PrecSep-21	
MB 160-619466/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-619466/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	

Prep Batch: 619467

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-68124-24	SG-03	Total/NA	Ground Water	PrecSep_0	
MB 160-619467/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-619467/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	

QC Association Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Rad

Prep Batch: 620620

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-68124-16	MW-30	Total/NA	Ground Water	PrecSep-21	
810-68124-17	MW-31	Total/NA	Ground Water	PrecSep-21	
810-68124-18	MW-32	Total/NA	Ground Water	PrecSep-21	
810-68124-19	MW-33	Total/NA	Ground Water	PrecSep-21	
810-68124-20	MW-34	Total/NA	Ground Water	PrecSep-21	
810-68124-21	MWT-12	Total/NA	Ground Water	PrecSep-21	
810-68124-22	MWT-30	Total/NA	Ground Water	PrecSep-21	
810-68124-23	SG-02	Total/NA	Ground Water	PrecSep-21	
810-68124-25	SG-04R	Total/NA	Ground Water	PrecSep-21	
810-68124-26	SG-05	Total/NA	Ground Water	PrecSep-21	
MB 160-620620/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-620620/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	
810-68124-21 DU	MWT-12	Total/NA	Ground Water	PrecSep-21	

Prep Batch: 620621

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-68124-16	MW-30	Total/NA	Ground Water	PrecSep_0	
810-68124-17	MW-31	Total/NA	Ground Water	PrecSep_0	
810-68124-18	MW-32	Total/NA	Ground Water	PrecSep_0	
810-68124-19	MW-33	Total/NA	Ground Water	PrecSep_0	
810-68124-20	MW-34	Total/NA	Ground Water	PrecSep_0	
810-68124-21	MWT-12	Total/NA	Ground Water	PrecSep_0	
810-68124-22	MWT-30	Total/NA	Ground Water	PrecSep_0	
810-68124-23	SG-02	Total/NA	Ground Water	PrecSep_0	
810-68124-25	SG-04R	Total/NA	Ground Water	PrecSep_0	
810-68124-26	SG-05	Total/NA	Ground Water	PrecSep_0	
MB 160-620621/1-B	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-620621/2-B	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	
810-68124-21 DU	MWT-12	Total/NA	Ground Water	PrecSep_0	

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-01R
Date Collected: 06/28/23 08:50
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-1
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622291	FLC	EET SL	07/31/23 14:28
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621777	FLC	EET SL	07/26/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-02
Date Collected: 06/27/23 16:05
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-2
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622291	FLC	EET SL	07/31/23 14:28
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621777	FLC	EET SL	07/26/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-03
Date Collected: 06/28/23 11:00
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-3
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622291	FLC	EET SL	07/31/23 14:28
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621777	FLC	EET SL	07/26/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-04
Date Collected: 06/28/23 09:55
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-4
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622291	FLC	EET SL	07/31/23 14:28
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621777	FLC	EET SL	07/26/23 12:09
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-06
Date Collected: 06/28/23 12:00
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-5
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622293	FLC	EET SL	07/31/23 14:28
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:12
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-07
Date Collected: 06/27/23 12:00
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-6
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622293	FLC	EET SL	07/31/23 14:29
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:12
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-08
Date Collected: 06/27/23 17:20
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-7
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622293	FLC	EET SL	07/31/23 14:29
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:12
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-09
Date Collected: 06/27/23 14:45
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-8
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622293	FLC	EET SL	07/31/23 14:29
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:12
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-10
Date Collected: 06/27/23 17:30
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-9
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622293	FLC	EET SL	07/31/23 14:29
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:12
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-11
Date Collected: 06/28/23 12:10
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-10
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622293	FLC	EET SL	07/31/23 14:29
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:12
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-12
Date Collected: 06/27/23 09:00
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-11
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622151	FLC	EET SL	07/31/23 15:58
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:12
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-18
Date Collected: 06/27/23 11:00
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-12
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622151	FLC	EET SL	07/31/23 15:58
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-19
Date Collected: 06/28/23 10:30
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-13
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622151	FLC	EET SL	07/31/23 15:59
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-20
Date Collected: 06/28/23 09:00
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-14
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622151	FLC	EET SL	07/31/23 15:59
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-27
Date Collected: 06/27/23 12:05
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-15
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619283	SRH	EET SL	07/07/23 08:55
Total/NA	Analysis	903.0		1	622151	FLC	EET SL	07/31/23 15:59
Total/NA	Prep	PrecSep_0			619284	SRH	EET SL	07/07/23 08:58
Total/NA	Analysis	904.0		1	621779	FLC	EET SL	07/26/23 12:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-30
Date Collected: 06/27/23 13:40
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-16
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:40
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:10
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MW-31
Date Collected: 06/27/23 14:30
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-17
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:40
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:10
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-32
Date Collected: 06/27/23 15:40
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-18
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:40
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:10
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-33
Date Collected: 06/27/23 10:25
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-19
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:40
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:11
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MW-34
Date Collected: 06/27/23 11:10
Date Received: 06/30/23 09:00

Lab Sample ID: 810-68124-20
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:42
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:11
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: MWT-12

Lab Sample ID: 810-68124-21

Date Collected: 06/27/23 09:00
Matrix: Ground Water
Date Received: 06/30/23 09:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:42
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: MWT-30

Lab Sample ID: 810-68124-22

Date Collected: 06/27/23 13:40
Matrix: Ground Water
Date Received: 06/30/23 09:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:42
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: SG-02

Lab Sample ID: 810-68124-23

Date Collected: 06/28/23 13:35
Matrix: Ground Water
Date Received: 06/30/23 09:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:42
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: SG-03

Lab Sample ID: 810-68124-24

Date Collected: 06/01/23 13:25
Matrix: Ground Water
Date Received: 06/30/23 09:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			619466	KAC	EET SL	07/10/23 11:12
Total/NA	Analysis	903.0		1	622368	FLC	EET SL	08/01/23 07:58
Total/NA	Prep	PrecSep_0			619467	KAC	EET SL	07/10/23 11:16
Total/NA	Analysis	904.0		1	621719	FLC	EET SL	07/26/23 12:03
Total/NA	Analysis	Ra226_Ra228 Pos		1	622501	SCB	EET SL	08/01/23 14:56

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Client Sample ID: SG-04R

Lab Sample ID: 810-68124-25

Date Collected: 06/28/23 13:10
Matrix: Ground Water
Date Received: 06/30/23 09:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623571	FLC	EET SL	08/09/23 07:43
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Client Sample ID: SG-05

Lab Sample ID: 810-68124-26

Date Collected: 06/28/23 12:50
Matrix: Ground Water
Date Received: 06/30/23 09:00

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			620620	BMP	EET SL	07/18/23 11:01
Total/NA	Analysis	903.0		1	623585	FLC	EET SL	08/09/23 07:47
Total/NA	Prep	PrecSep_0			620621	BMP	EET SL	07/18/23 11:12
Total/NA	Analysis	904.0		1	621813	FLC	EET SL	07/27/23 13:13
Total/NA	Analysis	Ra226_Ra228 Pos		1	623606	EMH	EET SL	08/09/23 15:06

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-23
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-23 *
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-30-24
HI - RadChem Recognition	State	n/a	06-30-24
Illinois	NELAP	200023	11-30-23
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-23
Kentucky (DW)	State	KY90125	12-31-23
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-23
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-24
Louisiana (DW)	State	LA011	12-31-23
Maryland	State	310	09-30-24
Massachusetts	State	M-MO054	06-30-24
MI - RadChem Recognition	State	9005	06-30-24
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	08-31-23
New Jersey	NELAP	MO002	06-30-24
New Mexico	State	MO00054	06-30-24
New York	NELAP	11616	03-31-24
North Carolina (DW)	State	29700	07-31-24
North Dakota	State	R-207	06-30-23 *
Oklahoma	NELAP	9997	08-31-23
Oregon	NELAP	4157	09-01-23
Pennsylvania	NELAP	68-00540	02-28-24
South Carolina	State	85002001	06-30-23 *
Texas	NELAP	T104704193	07-31-24
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO000542021-14	07-31-23 *
Virginia	NELAP	10310	06-15-25
Washington	State	C592	08-30-23
West Virginia DEP	State	381	10-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	EET SL
904.0	Radium-228 (GFPC)	EPA	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
Pos			
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Trace Analytical Laboratories
Project/Site: 23F1321 - Harbor Island

Job ID: 810-68124-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
810-68124-1	MW-01R	Ground Water	06/28/23 08:50	06/30/23 09:00
810-68124-2	MW-02	Ground Water	06/27/23 16:05	06/30/23 09:00
810-68124-3	MW-03	Ground Water	06/28/23 11:00	06/30/23 09:00
810-68124-4	MW-04	Ground Water	06/28/23 09:55	06/30/23 09:00
810-68124-5	MW-06	Ground Water	06/28/23 12:00	06/30/23 09:00
810-68124-6	MW-07	Ground Water	06/27/23 12:00	06/30/23 09:00
810-68124-7	MW-08	Ground Water	06/27/23 17:20	06/30/23 09:00
810-68124-8	MW-09	Ground Water	06/27/23 14:45	06/30/23 09:00
810-68124-9	MW-10	Ground Water	06/27/23 17:30	06/30/23 09:00
810-68124-10	MW-11	Ground Water	06/28/23 12:10	06/30/23 09:00
810-68124-11	MW-12	Ground Water	06/27/23 09:00	06/30/23 09:00
810-68124-12	MW-18	Ground Water	06/27/23 11:00	06/30/23 09:00
810-68124-13	MW-19	Ground Water	06/28/23 10:30	06/30/23 09:00
810-68124-14	MW-20	Ground Water	06/28/23 09:00	06/30/23 09:00
810-68124-15	MW-27	Ground Water	06/27/23 12:05	06/30/23 09:00
810-68124-16	MW-30	Ground Water	06/27/23 13:40	06/30/23 09:00
810-68124-17	MW-31	Ground Water	06/27/23 14:30	06/30/23 09:00
810-68124-18	MW-32	Ground Water	06/27/23 15:40	06/30/23 09:00
810-68124-19	MW-33	Ground Water	06/27/23 10:25	06/30/23 09:00
810-68124-20	MW-34	Ground Water	06/27/23 11:10	06/30/23 09:00
810-68124-21	MWT-12	Ground Water	06/27/23 09:00	06/30/23 09:00
810-68124-22	MWT-30	Ground Water	06/27/23 13:40	06/30/23 09:00
810-68124-23	SG-02	Ground Water	06/28/23 13:35	06/30/23 09:00
810-68124-24	SG-03	Ground Water	06/01/23 13:25	06/30/23 09:00
810-68124-25	SG-04R	Ground Water	06/28/23 13:10	06/30/23 09:00
810-68124-26	SG-05	Ground Water	06/28/23 12:50	06/30/23 09:00

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins St. Louis Job No.: 810-68124-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
Ba carrier_00132	05/04/24	05/25/23	DI Water, Lot N/A	1000 mL	BaCl2_00011	39.5518 g	Ba Carrier	39.5518 mg/mL
							Barium Chloride	39.5518 mg/mL
					Nitric Acid_01898	5 mL	Nitric acid	0.08 mg/mL
.BaCl2_00011	05/05/28	Acros Organics (Fisher), Lot A0427481			(Purchased Reagent)		Ba Carrier	100 %
							Barium Chloride	100 %
.Nitric Acid_01898	05/24/24	Fisher Chemical, Lot 22845			(Purchased Reagent)		Nitric acid	16 mol/L
Ra-226_00022	12/06/19	08/24/16	1M HNO3, Lot n/a	100 mL			Ra	7534.61 dpm/mL
					Ra-226_00021	5.0595 g	Radium-226	7534.61 dpm/mL
							Rn-222	7534.61 dpm/mL
							Total Alpha Emitting Radium Isotopes	7534.61 dpm/mL
.Ra-226_00021	09/01/53	NIST, Lot 4967A			(Purchased Reagent)		Radium-226	2482 Bq/g
							Rn-222	2482 Bq/g
							Total Alpha Emitting Radium Isotopes	2482 Bq/g
Ra-226_00025							Gross Alpha	
							Gross Beta	
					Ra-226_00024	4.9774 g	Ra	8409.79 dpm/mL
							Radium-226	8409.79 dpm/mL
							Rn-222	8409.79 dpm/mL
							Total Alpha Emitting Radium Isotopes	8409.79 dpm/mL
.Ra-226_00024	12/05/66	Eckert & Ziegler, Lot 104858			(Purchased Reagent)		Ra	2815.99 Bq/g
							Radium-226	2815.99 Bq/g
							Rn-222	2815.99 Bq/g
							Total Alpha Emitting Radium Isotopes	2815.99 Bq/g
Ra-226_00041	09/15/23	09/15/22	0.1M HCl, Lot N/A	500 mL	Ra-226_00025	15 mL	Ra	252.294 dpm/mL
							Radium-226	252.294 dpm/mL
							Rn-222	252.294 dpm/mL
							Total Alpha Emitting Radium Isotopes	252.294 dpm/mL
.Ra-226_00025	09/18/22	12/08/16	0.1M HCl, Lot N/A	100 mL	Ra-226_00024	4.9774 g	Ra	8409.79 dpm/mL
							Radium-226	8409.79 dpm/mL
							Rn-222	8409.79 dpm/mL

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins St. Louis Job No.: 810-68124-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Total Alpha Emitting Radium Isotopes	8409.79 dpm/mL
..Ra-226_00024	12/05/66	Eckert & Ziegler, Lot 104858			(Purchased Reagent)		Ra	2815.99 Bq/g
							Radium-226	2815.99 Bq/g
							Rn-222	2815.99 Bq/g
							Total Alpha Emitting Radium Isotopes	2815.99 Bq/g
Ra-228_00051	10/03/23	10/03/22	0.1M HCl, Lot N/A	1 L	Ra-228_00050	5.00238 g	Radium-228	20.496 dpm/mL
.Ra-228_00050	10/03/23	Eckert & Ziegler, Lot 121695			(Purchased Reagent)		Radium-228	68.2874 Bq/g
Sr-90_00004	09/17/59	06/21/11	0.1M HCL, Lot 0	100 mL	Sr-90_00001	5.0139 g	Gross Beta	45120.6 dpm/mL
							Sr	22560.3 dpm/mL
							Sr-90	22560.3 dpm/mL
.Sr-90_00001	09/17/59	Eckert & Ziegler, Lot 80573-334			(Purchased Reagent)		Gross Beta	14998.5 Bq/g
							Sr	7499.25 Bq/g
							Sr-90	7499.25 Bq/g
Sr-90_00018							Gross Alpha	
					Sr-90_00017	4.9997 g	Gross Beta	44774.2 dpm/mL
							Sr-90	22387.1 dpm/mL
.Sr-90_00017	11/29/62	Analytics, Lot 92352			(Purchased Reagent)		Gross Beta	14925.6 Bq/g
							Sr-90	7462.82 Bq/g
Th-230_00052	11/12/22	11/15/19	0.5 M HNO3, Lot n/a	100 mL	Th-230_00051	5.0493 g	Gross Alpha	2254.57 dpm/mL
							Th-230	2254.57 dpm/mL
.Th-230_00051	11/15/20	Eckect & Ziegler, Lot 114474			(Purchased Reagent)		Gross Alpha	744.187 Bq/g
							Th-230	744.187 Bq/g
Th-230_00056							Gross Beta	
					Th-230_00054	5.0402 g	Gross Alpha	2289.58 dpm/mL
							Th-230	2289.58 dpm/mL
.Th-230_00054	11/15/20	Eckect & Ziegler, Lot 114475			(Purchased Reagent)		Gross Alpha	757.106 Bq/g
							Th-230	757.106 Bq/g
Y Carrier_00086	07/06/24	CPI, Lot 2315059-1L			(Purchased Reagent)		Y Carrier	10000 mg/L

Reagent

Ba carrier_00132

Standardization of Carrier

[redacted]

Carrier Reagent ID: Ba Carrier_00132
ID from TALS or lot number

#	Tare Wght (g)	Gross Wght (g)	Net Wght (g)	Z Score
1	8.7862	8.8265	0.0403	1.3355
2	8.8555	8.8950	0.0395	0.7324
3	8.8724	8.9124	0.0400	0.5601
4	8.8617	8.9016	0.0399	0.3016
5	8.8551	8.8949	0.0398	0.0431
6	8.8333	8.8725	0.0392	1.5078

Average: 0.0398 Standardized value
StDev: 0.0004
StDev %: 0.97%

Record the Reagent IDs of all chemicals used to create this carrier in the spaces below.

Reagent ID: Sulfuric Acid - 2419003
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:

SOP Reference: ST-RC-0002, ST-RC-0041
SOP reference containing prep procedure must be documented

Minimum Criteria:

- Z Score must be within 3 sigma (**2.58**) and no more than one score outside of 2 sigma (**1.96**)
- 4 points required
- Any criteria stipulated in the above referenced SOP must be satisfied in addition.

Carrier: 0 ***Standardized Value:*** 0.0398 Carrier Reagent or Lot ID: Ba Carrier_00132

Approved By: MichaKoniuhinger Date Approved: 5/26/2023

Reagent

Ra-226_00021

National Institute of Standards & Technology

Certificate

Standard Reference Material® 4967A

Radium-226 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive radium-226 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4967A consists of approximately 5 mL of a hydrochloric acid and barium chloride solution, whose composition is specified in Table 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **radium-226** massic activity value, at a **Reference Time of 1200 EST, 01 September 2003**, is:

$$(2482 \pm 30)\ \mathrm{Bq \cdot g^{-1}}$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Table 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analyses.

Expiration of Certification: The certification of **SRM 4967A** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterweger, Group Leader of the Radioactivity Group. The overall production, technical direction, and physical measurement leading to certification were provided by R. Collé and P. Volkovitsky of the NIST Radiation Physics Division, Radioactivity Group. Statistical consultation was provided by S.D. Leigh of the NIST Statistical Engineering Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Lisa R. Karam, Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 03 September 2013
See Certificate Revision History on Last Page

Robert L. Watters, Jr., Director
Office of Reference Materials

Table 3. Uncertainty Evaluation for the Massic Activity of SRM 4967A

	Uncertainty component	Assessment Type[a]	Relative standard uncertainty contribution on massic activity of ^{226}Ra (%)
1	Calibration of the "1947 (1967 recalibrated) series" of radium-226 solution standards in terms of mass of radium-226[b]	B	0.34
2	Ratio of the mass of radium-226 in SRM 4967A to the mass of radium-226 in the "1947 (1967 recalibrated) series" of radium-226 solution standards. Weighted mean of the ratios obtained using seven different comparisons.	B	0.15
3	Corrections for the decay of radium-226. Standard uncertainty of the radium-226 half-life.	A	0.007
4	Gravimetric measurements	B	0.10
5	Conversion of radium-226 mass to activity. Standard uncertainty of the radium-226 half-life.[c]	A	0.44
6	Photon emitting impurities. Limit of detection.	B	0.01
Relative combined standard uncertainty			**0.6**
Relative expanded uncertainty ($k = 2$)			**1.2**

[a] Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

[b] For further details on NBS/NIST radium series calibrations refer to reference [8]. The 1967 recalibrations of the "1947 series" and of the "1957 series" were made using pressurized "4π"γ ionization chamber (PIC) "A". The master solution for SRM 4967A was directly compared with the "1947 (1967 recalibrated) series" of radium-226 solution standards using PIC "A", and was compared with the solutions of the "1992 series" of radium solution standards (SRM 4967) using PIC "A", pulse-ionization-chamber radon analyses (see references [9] and [10]), and germanium photon spectrometry. The radium-226 in SRM 4967A was chemically purified approximately 55 years from the reference time. The lead-210 and its daughter radionuclides are still not in equilibrium as of the 2013 certificate issue date.

[c] The U.S National Standards for radium-226 are certified in terms of mass of radium-226, as were all radium-226 SRMs prior to the "1992 series". Beginning with "1992 series", radium-226 solution SRMs are now certified in terms of the massic activity of radium-226. The relative standard uncertainty of the activity of radium-226 per unit mass of radium-226 is determined by the relative standard uncertainty of λ (i.e., of the half-life). The relative standard uncertainties of the atomic weight of radium-226 and of Avogadro's number are negligible.

Table 1. Certified Massic Activity of SRM 4967A

Radionuclide	**Radium-226**
Reference time	**1200 EST, 01 September 2003**
Massic activity of the solution	**2482 Bq•g^{-1}**
Relative expanded uncertainty ($k = 2$)	**1.20 %**

Table 2. Uncertified Information of SRM 4967A

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	1.0 mol•L^{-1} HCl with 80µg of $BaCl_2$ per gram of solution
Solution density	(1.017 ± 0.002) g•mL^{-1} at 21 °C[(a)]
Solution mass	(5.086 ± 0.003) g[(a)]
Photon-Emitting Impurities	None detected[(b)]
Half-lives used	^{226}Ra: (1600 ± 7) a [6][(c)] ^{222}Ra: (3.8235 ± 0.0003) d [7][(c)]
Calibration methods (and instruments)	Gravimetric dilution of SRM 4963, confirmed by comparison with solution standards, and derivatives thereof, from the NBS/NIST "1947 (1967 recalibrated) series" of radium-226 solution standards. The mass of radium-226 in these solution standards had previously been determined by comparison with the U.S. National Standards for radium-226. Conversion from mass of radium-226 to activity of radium-226 was done using the half-life of radium-226 shown above.[(d)]

[(a)] The stated uncertainty is two times the standard uncertainty. See reference 5.

[(b)] The estimated lower limits of detection for photon-emitting impurities, as of September 2003, expressed as massic photon mission rate, are:

6×10^{0} s^{-1}•g^{-1} for energies between 22 keV and 182 keV,
3×10^{0} s^{-1}•g^{-1} for energies between 190 keV and 347 keV,
8×10^{-1} s^{-1}•g^{-1} for energies between 356 keV and 1455 keV, and
3×10^{-1} s^{-1}•g^{-1} for energies between 1465 keV and 2750 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ^{226}Ra and progeny.

[(c)] The stated uncertainty is the standard uncertainty. See reference 5.

[(d)] For further details on NBS/NIST radium series calibrations refer to reference [8]. The 1967 recalibrations of the "1947 series" and of the "1957 series" were made using pressurized "4π"γ ionization chamber (PIC) "A". The master solution for SRM 4967A was directly compared with the "1947 (1967 recalibrated) series" of radium-226 solution standards using PIC "A", and was compared with the solutions of the "1992 series" of radium solution standards (SRM 4967) using PIC "A", pulse-ionization-chamber radon analyses (see references [9] and [10]), and germanium photon spectrometry. The radium-226 in SRM 4967A was chemically purified approximately 55 years from the reference time. The lead-210 and its daughter radionuclides are still not in equilibrium as of the 2013 certificate issue date.

INSTRUCTIONS FOR HANDLING AND STORAGE

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. Only persons qualified to handle both radioactive material and alkaline and/or acidic solutions should open the ampoule. To minimize personnel exposure, appropriate shielding and/or distance should be used. Refer to the SDS for further information.

Storage: SRM 4967A should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

REFERENCES

[1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*, available at http://www.nist.gov/pml/div682/grp04/srm.cfm (accessed Sep 2013). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.

[2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 19 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Sep 2013).

[3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 18 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Sep 2013).

[4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement;* (GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France (2008); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Sep 2013).

[5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://www.nist.gov/pml/pubs/index.cfm (accessed Sep 2013).

[6] Chisté, V; Bé, M.M.; *January 2007, ^{226}Ra*; LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-226_tables.pdf (accessed Sep 2013).

[7] Chisté, V; Bé, M.M.; *July 2010, ^{222}Rn*; LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Rn-222_tables.pdf (accessed Sep 2013).

[8] Mann, W.B.; Stockman, L.L.; Youden, W.J.; Schwebel, A.; Mullen, P.A.; Garfinkel, S.B.; Preparation of New Solution Standards of Radium, *Journal of Research of the National Bureau of Standards* 62 (1959) 21-26.

[9] Collé, R.; Hutchinson, J.M.R.; Unterweger, M.P.; The NIST Primary Radon-222 Measurement System, *Journal of Research of the National Institute of Standards and Technology* 95 (1990) 155-165.

[10] Hutchinson J.M.R; Cessna, J.; Collé R.; Hodge P.; An International Radon-In-Air Measurement Intercomparison Using a New Transfer Standard, *Applied Radiation Isotopes* 43 (1992) 175-189.

Certificate Revision History: September 2013 (Text and expiration date revised); December 2004 (Original certification date).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.

Reagent

Ra-226_00024

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 104858
Source Description: 5 mL Liquid in Flame Sealed Vial
Product Code: 8226
Customer: TestAmerica St. Louis
P.O. Number: 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 05-December-2016 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty u_A, %	u_B, %	U, %*	Calibration Method**
Ra-226	5.844E+05	1.408E+04	1.0	2.1	4.7	HPGe

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 104858

Comments:

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

Impurities:

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

Reagent

Ra-226_00025

SRS Number: 104858

Comments:

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

Impurities:

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 104858
Source Description: 5 mL Liquid in Flame Sealed Vial
Product Code: 8226
Customer: TestAmerica St. Louis
P.O. Number: 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 05-December-2016 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty u_A, %	u_B, %	U, %*	Calibration Method**
Ra-226	5.844E+05	1.408E+04	1.0	2.1	4.7	HPGe

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Reagent

Ra-226_00041

Standard ID Number: a-226_00041 (2309057/2309058
True Value = 113650 pCi/L or g
Date Analyzed: 9/15/2022

Radionuclide: Ra-226

	Replicates	
#1	107700	pCi/L or g
#2	110200	pCi/L or g
#3	105600	pCi/L or g

Mean = 107833.33

1 sigma = 2302.8967

1.96 sigma = 4513.678

True Value minus 10% = 102285 (True Value - 10%)
True Value plus 10% = 125015 (True Value + 10%)

Accuracy:
Mean value within 10% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

1st Reviewed By/Date: MichaKoniringer 9/15/2022

2nd Reviewed By/Date: Sarah C. Beusen 9/16/22

MANUAL DATA ENTRY REQUIRED AT INSTRUMENT? (circle one) YES NO
If YES, data entry MUST be 2nd reviewed

1st Reviewed By/Date: _____

2nd Reviewed By/Date: _____

eurofins | Environment Testing America

Ra-226_00039

Reagent ID: Ra-226_00039

		Expiration Date:	09/18/2022
Description:	Ra-226 Spike	Laboratory:	Eurofins St. Louis
No. of Bottles:	2	Prepared By:	Mazariegos, Chelsea M
Storage Location:	RAD Separations Reagents - Rm 131	Solvent:	0.1M HCl
Reagent Volume:	500.000 mL	Solvent Lot:	N/A
Creation Date:	09/16/2021		
Open Date:			
Container(s):	2131808, 2131809		
Comment:	standard split into (2) 250 mL bottles		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Ra	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Ra-226	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Rn-222	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Total Alpha Emitting Radium Isotopes	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Ra-226_00025	Ra-226 Parent		09/18/22				15.00000	mL

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	12/5/2022 0:00		
Decayto Date/Time (t):	9/15/22 0:00		
Initial Activity (A_0):	252.29	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	252.29	dpm/mL	
***Soln. Density:**		g/mL	
Nuclide:	Ra-226		
Half-Life (days):	584400	decay days	fraction
****Decay Factor:**	1.0001	-81.00	-0.00014
Decay Corr Activity:	2.5231E+02	dpm	
Decay Corr Conc:	2.5231E+02	dpm/mL	

Conversion/Calculations

Final Activity Unit:	pCi	
Activity Unit Factor:	0.45045	
Final Volume Unit:	L	
Volume Unit Factor:	0.001	
Final Concentration:	1.1365E+05	pCi/L
Aliquot Volume:	1.0000E+00	L
Final Activity (A):	1.1365E+05	pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

eurofins Environment Testing TestAmerica

Analysis Report for Total Alpha-Emitting Radium

Batch: 581978 **Operator:**

SampID / Analyte	WRKNO	Ts	Aliquot Tb	Cs	Ba Mass Cb	Ba Yield CPMs	Trunc Yield CPMb	Ingrowth	Ba Precip Time	InstrID	Eff	Cal Type	Cnt Date Time	Sigma
160-46998-A-2-B	160-46998-A-2-B		0.1000mL		0.0385	96.01%	False	1.0149	9/15/22 11:00	Red13	0.1937	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	462	108	4.62	0.11	1.077E+005pCi/L	5.137E+003	7.062E+003	3.423E+003	1.917E+003	7061.9826	
160-46998-A-3-B	160-46998-A-3-B		0.1000mL		0.0395	98.58%	False	1.0150	9/15/22 11:00	Red14	0.1920	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	480	103	4.80	0.10	1.102E+005pCi/L	5.145E+003	7.146E+003	3.302E+003	1.840E+003	7145.9155	
160-46998-B-1-B	160-46998-B-1-B		0.1000mL		0.0371	92.52%	False	1.0149	9/15/22 11:00	Red10	0.1993	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	446	72	4.46	0.07	1.056E+005pCi/L	5.088E+003	6.963E+003	2.951E+003	1.578E+003	6962.8945	

Activity	UncCount	UncTotal	MDA	DLC	MQO

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

SampID	SampDupID	Analyte	Activity	DupActivity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	WRKNO	Analyte	Activity	MSActivity	StdAdded	Recovery	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal

Radium-226 Standard Verification

Std #: Ra-226_00039 (2131809)
Activity: 252.2935552dpm/mL
Reference Date: 12/05/2016

Ver#	D.I. H2O	Barium Carrier mL	Ra-226 Spike mL	18M Sulfuric mL	EDTA mL	Ammonium Sulfate mL	Acetic Acid mL
Ra-226_00039	*N/A*	*2179499*	*2131809*	*2285368*	*2291818*	*2291233*	*2300893*
1	10	1	0.1	1	15	1	2
2	10	1	0.1	1	15	1	2
3	10	1	0.1	1	15	1	2

In a clean centrifuge tube add the following:

- 10mL D.I.
- 0.1mL Radium-226 standard
- 1mL Barium Carrier
- 1mL 18M Sulfuric Acid

Heat in hot bath for 30mins **agitate every 10 mins**
Centrifuge/Decant and wash with 10mL D.I. H2O
Dissolve in 15mL EDTA
Add 1mL Ammonium Sulfate and 2mL Acetic Acid
Heat in hot bath for 30mins **agitate every 10 mins**
Centrifuge/Decant and wash with 10mL D.I. H2O
Plate with minimal D.I. H2O onto a tared planchet

Prepared by: Micha Korrinhizer
Date: 9/15/2022

PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-581978

Analyst: Korrinhizer, Micha L

Batch Open: 9/13/2022 5:11:00PM

Batch End: 9/13/2022 6:00:00PM

Preparation, Precipitate Separation

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments JB 9/15/22	Output Sample Lab ID
1	160-46998-B-1 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION Red 10	160-46998-B-1-B
2	160-46998-A-2 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION 13	160-46998-A-2-B
3	160-46998-A-3 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION 14	160-46998-A-3-B

Reagent

Ra-228_00050

Eckert & Ziegler
Analytics

Kalibrierschein / Calibration Certificate

erstellt durch das Kalibrierlaboratorium

issued by the calibration laboratory

DAkkS Deutsche Akkreditierungsstelle D-K-19023-01-00

Eckert & Ziegler Analytics, Inc.
1380 Seaboard Industrial Blvd.
Atlanta, GA 30318, USA
Tel 1-404-352-8677
Fax 1-404-352-2837

Kalibrierzeichen
Calibration mark

002018
D-K-19023-01-00
2022-05

Gegenstand *Object*	**5 mL Liquid in 5 mL Flame Sealed Ampoule**
Hersteller *Manufacturer*	**Eckert & Ziegler Analytics, Inc.**
Typ *Type*	**8328-5FSA-370BQ-D**
Serien-Nr. *Serial number*	**121695**
Auftraggeber *Customer*	**Test America Laboratories- St. Louis**
Auftragsnummer *Order No.*	**CO-053651**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**31-May-2022 1200 EST (1700 UTC)**

Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the metrological traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine sind bei Nennung des für die Freigabe Verantwortlichen in Klarschrift auch ohne Unterschrift gültig.

This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates with the full name of the approval responsible person are valid without signature.

Datum der Ausstellung *Date of issue*	Freigabe des Kalibrierscheins durch *Approval of the certificate of calibration by*
26-May-22	Levan Tkavadze

002018
D-K-19023-01-00
2022-05

- **Customer Purchase Order No.:**
  GamCred001, Item 1

- **Calibration Results:**

Nuclide	Half-Life *, d	Activity, Bq	Uncertainty, %	Calibration Method
Ra-228	2.100E+03	3.416E+02	4.9	HPGe

- **Calibration Method(s):**
  This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty:**
  The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with EA-4/02 M. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability:**
  Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

- **Impurities:**
  α-impurities: Ra-226 6.5E+00 Bq, other α-impurities (other than decay products) < 0.1 %
  γ-impurities (other than decay products) < 0.1 %

- **Expiration Date:**
  No expiration date has been given for this source.

- **Wipe Test *:**
  This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information:**
  - 5.00238 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.
  - Separation date: 01-March-2018
  - *Values not calibrated by EZA (i.e. published nuclear data, uncertified values, etc.)
  - Date of Calibration corresponds to Reference Date for this source.
  - Expiration Date refers to useful life of this source.

End of Certificate

Reagent

Ra-228_00051

Standard ID Number: Ra-228 00051

True Value = 8.2961 pCi/L or g

Date Analyzed: 4/10/2023

Radionuclide: Ra-228

	Replicates	
#1	9.38	pCi/L or g
#2	8.232	pCi/L or g
#3	8.417	pCi/L or g
#4	8.393	pCi/L or g
#5	8.94	pCi/L or g
#6	8.425	pCi/L or g

Mean = 8.63116667

1 sigma = 0.43830556

1.96 sigma = 0.859079

True Value minus 5% = 7.881295 (True Value - 5%)

True Value plus 5% = 8.710905 (True Value + 5%)

Accuracy:

Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:

1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

1st Reviewed By/Date: Michaelkonintinger 4/11/2023

2nd Reviewed By/Date: Sarah Bussin 4/11/23

MANUAL DATA ENTRY REQUIRED AT INSTRUMENT? (circle one) YES NO

If YES, data entry MUST be 2nd reviewed

1st Reviewed By/Date: _____

2nd Reviewed By/Date: _____

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	5/21/2022 0:00		
Decayto Date/Time (t):	4/10/23 0:00		
Initial Activity (A_0):	20.50	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	20.49597	dpm/mL	
***Soln. Density:**	1	g/mL	
Nuclide:	Ra-228		
Half-Life (days):	2100.1875	decay days	fraction
****Decay Factor:**	0.8986	324.00	0.15427
Decay Corr Activity:	1.8417E+01	dpm	
Decay Corr Conc:	1.8417E+01	dpm/mL	

Conversion/Calculations

Final Activity Unit:	pCi	
Activity Unit Factor:	0.45045	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	8.2961E+00	pCi/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	8.2961E+00	pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

eurofins Environment Testing TestAmerica

Analysis Report for Radium 228

Batch: 606428 **Operator:**

SampID	WRKNO	Aliquot	TruncYields		BaYield	YYield	InstrID	Eff	Y Ingrowth Time	Y Precip Time	CountDateTime	Sigma	CalType
Analyte		SampCntD	BkgCntDur	SampCnt	BkgCnt	Activity		UncCount	UncTotal	MDA	DLC	MQO	
160-46998-A-2-E	160-46998-A-2-E	1000.0000mL	False		90.89%	84.11%	Orange17	0.4404	4/7/23 14:00	4/10/23 9:00	4/10/23 12:31	1.00	1
Ra-228		100.00	1000.00	461	312	9.380E+000	pCi/L	4.702E-001	6.381E-001	4.861E-001	2.979E-001	0.6381	
160-46998-A-2-F	160-46998-A-2-F	1000.0000mL	False		95.19%	88.60%	Orange18	0.4417	4/7/23 14:00	4/10/23 9:00	4/10/23 12:31	1.00	1
Ra-228		100.00	1000.00	451	337	8.232E+000	pCi/L	4.205E-001	5.659E-001	4.543E-001	2.798E-001	0.5659	
160-46998-A-2-G	160-46998-A-2-G	1000.0000mL	False		97.47%	84.11%	Orange19	0.4457	4/7/23 14:00	4/10/23 9:00	4/10/23 12:31	1.00	1
Ra-228		100.00	1000.00	457	386	8.417E+000	pCi/L	4.319E-001	5.800E-001	4.916E-001	3.054E-001	0.5800	
160-46998-A-2-H	160-46998-A-2-H	1000.0000mL	False		98.48%	85.23%	Orange20	0.4422	4/7/23 14:00	4/10/23 9:00	4/10/23 12:31	1.00	1
Ra-228		100.00	1000.00	454	302	8.393E+000	pCi/L	4.234E-001	5.730E-001	4.349E-001	2.660E-001	0.5730	
160-46998-A-2-I	160-46998-A-2-I	1000.0000mL	False		97.22%	82.99%	Orange21	0.4460	4/7/23 14:00	4/10/23 9:00	4/10/23 12:31	1.00	1
Ra-228		100.00	1000.00	465	275	8.940E+000	pCi/L	4.420E-001	6.037E-001	4.311E-001	2.619E-001	0.6037	
160-46998-A-2-J	160-46998-A-2-J	1000.0000mL	False		94.18%	82.24%	Orange23	0.4411	4/7/23 14:00	4/10/23 9:00	4/10/23 12:31	1.00	1
Ra-228		100.00	1000.00	423	315	8.425E+000	pCi/L	4.443E-001	5.896E-001	4.813E-001	2.952E-001	0.5896	

Laboratory Control Sample Information

SampID	WRKNO	ComponentName	Activity	StdAdded	Recovery	LCL	UCL	ZFactor
					%			

Sample Duplicate Information

SampID	SampDupID	Analyte	Activity	DupActivity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery	ZFactor
						%	

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

eurofins | Environment Testing

Ra-228_00051

Reagent ID: Ra-228_00051

		Expiration Date:	10/03/2023
Description:	Ra-228 Spike	Laboratory:	Eurofins St. Louis
No. of Bottles:	2	Prepared By:	Korrinhizer, Micha L
Storage Location:	RAD Separations Reagents - Rm 112	Solvent:	0.1M HCl
Reagent Volume:	1.000 L	Solvent Lot:	N/A
Creation Date:	10/03/2022		
Open Date:			
Container(s):	2318210, 2318211		
Comment:	Spike at 1mL		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Ra-228	Ra-228_00050	10/03/2023	68.28700	Bq/g	20.49597	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Ra-228_00050	Ra-228 Ampoule	ASTD	10/03/23	Eckert & Ziegler	121695	D-K-19023-01-00	5.00238	g

Reagent

Sr-90_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

80573-334

5 mL Liquid in Flame Sealed Vial

Customer: Test America St. Louis
P.O. No.: 2324797, Item 1

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Sr-90	10515.5	3.782E+04	0.1	0.9	1.8	09/17/2009

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities <0.1%. 5.04317 grams 0.1M HCl solution with approximately 30 microg/g each of Sr and Y carriers. NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total beta emission rate for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 9-22-09
D. M. Montgomery, QA Manager

ACCREDITED SOURCE CALIBRATION LABORATORY
HEALTH PHYSICS SOCIETY
FOUNDED 1958

Corporate Office
Laboratory
1380 Seaboard Industrial Blvd., Atlanta, Georgia 30318

Reagent

Sr-90_00017

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

92352

Sr-90 5 mL Liquid in Flame Sealed Vial

Customer: TestAmerica St. Louis
P.O. No.: 2502682, Item 1 Product Code: 8090-5FSA-37kBq

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Sr-90	1.052E+04	3.749E+04	0.1	0.9	1.8	11/29/2012

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities<0.1%.
5.02357 g 0.1M HCl solution with approximately 30 μg/g each Sr and Y carriers.

NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 26 NOV 12
J.D. McCorvey, Counting Room Manager

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

RAD12-0042
Sr-90
hursts
None
Prep/Opened: 11/28/2012
Exp(1): 11/29/2062
Exp(2): 11/29/2062

51511
ID Sr-90_00017
Sr-90 Ampoule

Single Isotope Certificate Rev 3, 23 August 2012

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Reagent

Sr-90_00018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sr-90_00018

Reagent ID: Sr-90_00018

		Expiration Date:	11/29/2062
Description:	Sr-90 Calibration STD	Laboratory:	TestAmerica St. Louis
No. of Bottles:	1	Prepared By:	Hurst, Sarah
Storage Location:	RAD Separations Reagents - 1	Solvent:	0.1M HCL
Reagent Volume:	100.000 mL	Solvent Lot:	0
Creation Date:	11/28/2012		
Container(s):	51512		
Comment:	Rad12-0043		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Gross Beta	Sr-90_00017	11/29/2062	14925.64000	Bq/g	44774.23338	dpm/mL
Sr-90	Sr-90_00017	11/29/2062	7462.82000	Bq/g	22387.11669	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Sr-90_00017	Sr-90 Ampoule	ASTD	11/29/62	Analytics	92352		4.99970	g

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1976.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Low mass)

	Replicates	
#1	1935	pCi/sample or g
#2	1941	pCi/sample or g
#3	1924	pCi/sample or g

Mean = 1933.333

1 sigma = 8.621678 1.96 sigma = 16.89849

True Value minus 5% = 1877.913 (True Value - 5%)
True Value plus 5% = 2075.588 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1948.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Medium mass)

	Replicates	
#1	1911	pCi/sample or g
#2	1945	pCi/sample or g
#3	1893	pCi/sample or g

Mean = 1916.333

1 sigma = 26.40707 1.96 sigma = 51.75786

True Value minus 5% = 1851.313 (True Value - 5%)
True Value plus 5% = 2046.188 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1992 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (High mass)

	Replicates	
#1	1907	pCi/sample or g
#2	1930	pCi/sample or g
#3	1937	pCi/sample or g

Mean = 1924.667

1 sigma = 15.69501 1.96 sigma = 30.76222

True Value minus 5% = 1892.4 (True Value - 5%)
True Value plus 5% = 2091.6 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

Protean Beta ICV-ACV recoveries from March 2013			
Protean Detector	**Low** pCi/sample	**Medium** pCi/sample	**High** pCi/sample
0	1962	1945	1971
1	2003	1947	1995
2	1960	1965	1998
3	1988	1942	1995
4	1977	1940	1997
5	1969	1949	2013
6	1986	1938	1986
7	1969	1964	1981
Average pCi/sample	1976.75	1948.75	1992

Protean Beta ICV-ACV recoveries from February 2014			
Protean Detector	**Low** pCi/sample	**Medium** pCi/sample	**High** pCi/sample
4	1935	1911	1907
5	1941	1945	1930
6	1924	1893	1937
Average pCi/sample	1933.33	1916.33	1924.67

Standard ID
Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean4	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	49	0.00	0.000E+000	4.900E-002	0.1157	**-1.908E-001**	pCi/sample	5.869E-002	5.452E-002	3.382E+000	8.968E-001
	Gross Beta	9072	417	0.00	1.814E+003	4.170E-001	0.4224	**1.935E+003**	pCi/sample	1.977E+002	4.063E+001	1.594E+000	7.165E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean4	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	1	49	0.00	2.000E-001	4.900E-002	0.0830	**8.194E-001**	pCi/sample	2.174E+000	2.172E+000	4.713E+000	1.250E+000
	Gross Beta	8432	417	0.00	1.686E+003	4.170E-001	0.3973	**1.911E+003**	pCi/sample	1.956E+002	4.164E+001	1.694E+000	7.616E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean4	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	1	49	0.00	2.000E-001	4.900E-002	0.0540	**1.260E+000**	pCi/sample	3.343E+000	3.340E+000	7.248E+000	1.922E+000
	Gross Beta	8054	417	0.00	1.611E+003	4.170E-001	0.3804	**1.907E+003**	pCi/sample	1.954E+002	4.251E+001	1.770E+000	7.956E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean5	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	43	0.00	0.000E+000	4.300E-002	0.1145	**-1.692E-001**pCi/sample		5.510E-002	5.161E-002	3.337E+000	8.490E-001
	Gross Beta	9111	398	0.00	1.822E+003	3.980E-001	0.4228	**1.941E+003**pCi/sample		1.983E+002	4.068E+001	1.569E+000	6.992E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean5	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	43	0.00	0.000E+000	4.300E-002	0.0823	**-2.353E-001**pCi/sample		7.661E-002	7.176E-002	4.639E+000	1.180E+000
	Gross Beta	8552	398	0.00	1.710E+003	3.980E-001	0.3960	**1.945E+003**pCi/sample		1.990E+002	4.207E+001	1.675E+000	7.465E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean5	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	2	43	0.00	4.000E-001	4.300E-002	0.0532	**3.022E+000**pCi/sample		4.802E+000	4.790E+000	7.178E+000	1.826E+000
	Gross Beta	8046	398	0.00	1.609E+003	3.980E-001	0.3755	**1.930E+003**pCi/sample		1.977E+002	4.304E+001	1.766E+000	7.873E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean6	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.1165	-3.362E-001 pCi/sample		8.166E-002	7.210E-002	3.776E+000	1.186E+000
	Gross Beta	8992	520	0.00	1.798E+003	5.200E-001	0.4209	1.924E+003 pCi/sample		1.966E+002	4.059E+001	1.718E+000	8.029E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean6	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.0842	-4.657E-001 pCi/sample		1.131E-001	9.985E-002	5.230E+000	1.642E+000
	Gross Beta	8356	520	0.00	1.671E+003	5.200E-001	0.3976	1.893E+003 pCi/sample		1.937E+002	4.142E+001	1.819E+000	8.499E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean6	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.0559	-7.014E-001 pCi/sample		1.703E-001	1.504E-001	7.877E+000	2.474E+000
	Gross Beta	8127	520	0.00	1.625E+003	5.200E-001	0.3778	1.937E+003 pCi/sample		1.985E+002	4.300E+001	1.914E+000	8.945E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica St. Louis

Standards Preparation Logbook Record

Nov-28-2012

Logbook: \\Qstlmo01\Stdslog\RAD_STD.std

RAD12-0042, Sr-90 Sr-90-00017 #51511 Analyst: hursts

Vendor: Analytics Lot No.: 92352
Solvent: None
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)
Cert: 92352 Activity: 37490Bq Mass: 5.02357 Ref. Date: 11/29/12

Component	Initial Conc (dpm/g)	Final Conc (dpm/g)
Sr-90	447,769	447,769

RAD12-0043, Sr-90 Calibration STD Sr-90-00018 #51512 Analyst: hursts

Solvent: None Volume (ml): 100.00
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)

Parent Std No.: RAD12-0042, Sr-90 Aliquot Amount (g): 4.9997
Parent Date Expires(1): 11-29-2062 Parent Date Expires(2): 11-29-2062

Component	Initial Conc (dpm/g)	Final Conc (dpm/mL)
Sr-90	447,769	22,387

Reviewed By: SB

Page 1 of 1

St. Louis Radiological Standard Reverification Form

Standard ID Number: Rad12-0043
True Value = 2016.7 pCi/L or g
Date Analyzed: 11/30/2012

Radionuclide: Sr90

	Replicates	
#1	1964	pCi/L or g
#2	1958	pCi/L or g
#3	2015	pCi/L or g

Mean = 1979

1 sigma = 31.32092 1.96 sigma = 61.389

True Value minus 5% = 1915.865 (True Value - 5%)
True Value plus 5% = 2117.535 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: 11/30/12

SOP Reference: STL-QA-0002, Current Revision

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122629 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC
verification-1b	NA	1.000E+000	sample	0.0536 g	Purple16	11/30/12 10:42		8.00	1000.00	1.00	1.00	
	Gross Alpha	123	175	0.00	1.538E+001	1.750E-001	0.4314	1.587E+001 pCi/sample	1.707E+000	1.448E+000	8.638E-001	3.593E-001
	Gross Beta	14954	485	0.00	1.869E+003	4.850E-001	0.4285	1.964E+003 pCi/sample	9.953E+001	1.607E+001	1.211E+000	6.021E-001
verification-2b	NA	1.000E+000	sample	0.0529 g	Purple17	11/30/12 10:43		8.00	1000.00	1.00	1.00	
	Gross Alpha	53	87	0.00	6.625E+000	8.700E-002	0.1306	2.254E+001 pCi/sample	3.391E+000	3.138E+000	2.356E+000	8.365E-001
	Gross Beta	15152	362	0.00	1.894E+003	3.620E-001	0.4356	1.958E+003 pCi/sample	9.919E+001	1.591E+001	1.077E+000	5.117E-001
verification-3b	NA	1.000E+000	sample	0.0528 g	Purple18	11/30/12 10:43		8.00	1000.00	1.00	1.00	
	Gross Alpha	85	62	0.00	1.063E+001	6.200E-002	0.1313	3.624E+001 pCi/sample	4.462E+000	3.954E+000	2.160E+000	7.027E-001
	Gross Beta	15378	395	0.00	1.922E+003	3.950E-001	0.4296	2.015E+003 pCi/sample	1.020E+002	1.625E+001	1.125E+000	5.420E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Prep Report for Gross Alpha/Beta

Batch: M122629 **Prep Analyst:** 250

SampID	WRKNO	Aliquot		Gross	Tare	Mass	Dilution
verification-1b	NA	1.000E+000	sample	8.7067 g	8.6531 g	0.0536 g	1.00
verification-2b	NA	1.000E+000	sample	8.6615 g	8.6086 g	0.0529 g	1.00
verification-3b	NA	1.000E+000	sample	8.6935 g	8.6407 g	0.0528 g	1.00

purple 16

17

18

Spike Information

Sample ID	Standard ID	Analyte	Std Conc	Aliquot	Ref Date	StdAdded
	Rad12-0043	SR-90	22.387 dpm/mL	0.1 mL	11-29-12	

MS — Spiked By

LM — Spike Verified By

11-28-12 — Spike Date

Standard Operating Procedures

SOPNumber	Title	Revision

Reviewed By — 11/30/12 Review Date

MS — Analyst/Relenquished By — 11/28/12 Release Date

Received By — 11/28/12 Receipt Date

MS 11-30-12 ~~112~~ 1123433897/MS/11-28-12

Balance ID / Initials / Date

Reagent

Th-230_00051

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 114474
Source Description: 5 mL Liquid in Flame Sealed Ampoule
Product Code: 8230
Customer: Test America Laboratories- St. Louis
P.O. Number: 3053229, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-October-2019 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A, %	u_B, %	U, %*	
Th-230	2.753E+07	3.786E+03	0.2	1.0	2.0	4π LS

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Th-230-00051

Reagent

Th-230_00052

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

St. Louis Radiological Standard Verification

Printed: 11/18/2019 12:43 PM

Standard ID Number: Th-230_00053
True Value = 20311 pCi/L or g
Date Analyzed: 11/16/2019

Radionuclide: Th-230

	Replicates	
#1	19840	pCi/L or g
#2	20910	pCi/L or g
#3	19879	pCi/L or g

Mean = 20209.667

1 sigma = 606.81985

1.96 sigma = 1189.367

True Value minus 5% = 19295.45 (True Value - 5%)
True Value plus 5% = 21326.55 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: TJR 11/18/19

2nd Reviewed By/Date: 11/18/19

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	10/29/2019 0:00		
Decayto Date/Time (t):	11/16/19 0:00		
Initial Activity (A_0):	45.09 dpm		
Initial Aliquot:	1 mL		
Initial Conc:	45.0915 dpm/mL		
***Soln. Density:**	1 g/mL		
Nuclide:	Th-230		
Half-Life (days):	27539850	decay days	fraction
****Decay Factor:**	1.0000	18.00	0.00000
Decay Corr Activity:	4.5091E+01 dpm		
Decay Corr Conc:	4.5091E+01 dpm/mL		

Conversion/Calculations

Final Activity Unit:	pCi
Activity Unit Factor:	0.45045
Final Volume Unit:	L
Volume Unit Factor:	0.001
Final Concentration:	2.0311E+04 pCi/L
Aliquot Volume:	1.0000E+00 L
Final Activity (A):	2.0311E+04 pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:37:53AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-A Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-A
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246263
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

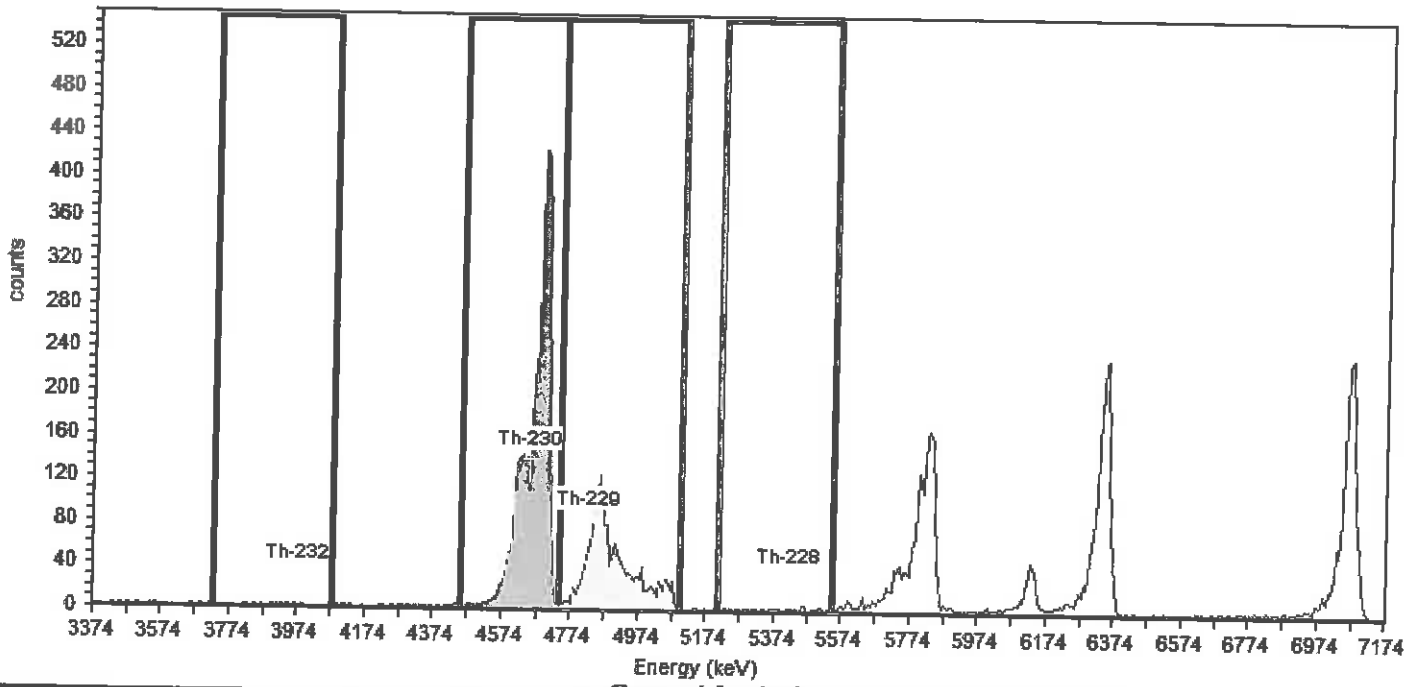
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 92.98%

Acquisition

Detector: AV244 SN: 51-005EE3
Acquisition Start Date: 11/16/2019 1:40:35PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV244; Det: AV244; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-1370619;AV244-11152018
Efficiency Calibration:IC-1370619;AV244-11152018
Calibration Date: 11/15/2018 10:58:47PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 28.89% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	.3	100.2	11	2.0000	9.00	5.229E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4739.1	34.6	99.7	3399	1.0000	3398.00	1.984E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4739.1	5097.1	73.2	99.6	1706	6.0000	1700.00	9.237E+003	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	.9	99.8	45	19.0000	26.00	1.517E+002	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:28:03AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-B Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-B
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246269
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

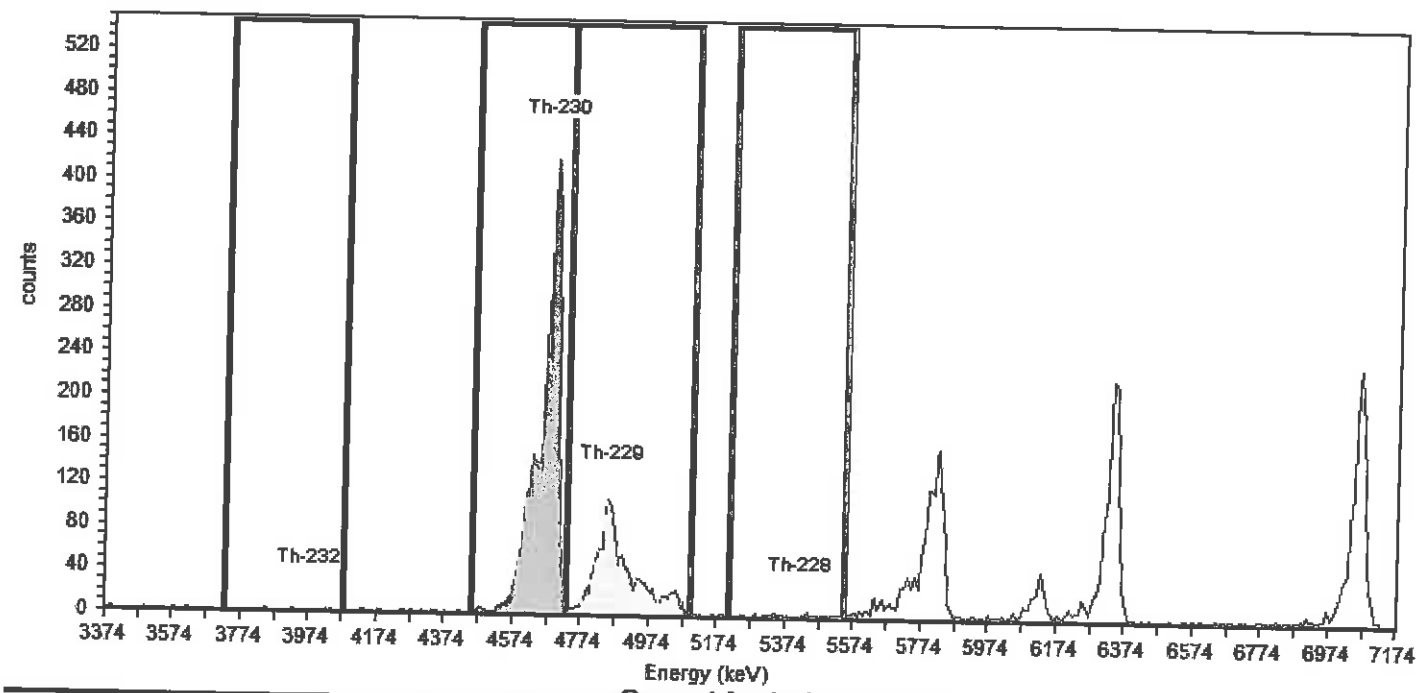
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 94.23%

Acquisition

Detector: AV245 SN: 49-037W4
Acquisition Start Date: 11/16/2019 1:40:35PM
Live Time: 960.00 min.
Real Time: 960.04 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV245; Det: AV245; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-1370620;AV245-11152018
Efficiency Calibration:IC-1370620;AV245-11152018
Calibration Date: 11/15/2018 10:58:51PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.18% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	10.5	100.2	4	0.0000	4.00	2.531E+001	pCi/L
Th-230	4686.9	4,687.5	-0.6	4455.8	4731.7	30.4	99.7	3292	4.0000	3288.00	2.091E+004	pCi/L
Th-229	4858.5	4,845.3	13.2	4731.7	5097.1	80.2	99.6	1567	6.0000	1561.00	9.361E+003	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	227.6	99.8	38	16.0000	22.00	1.398E+002	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:08:38AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-C Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-C
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246265
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

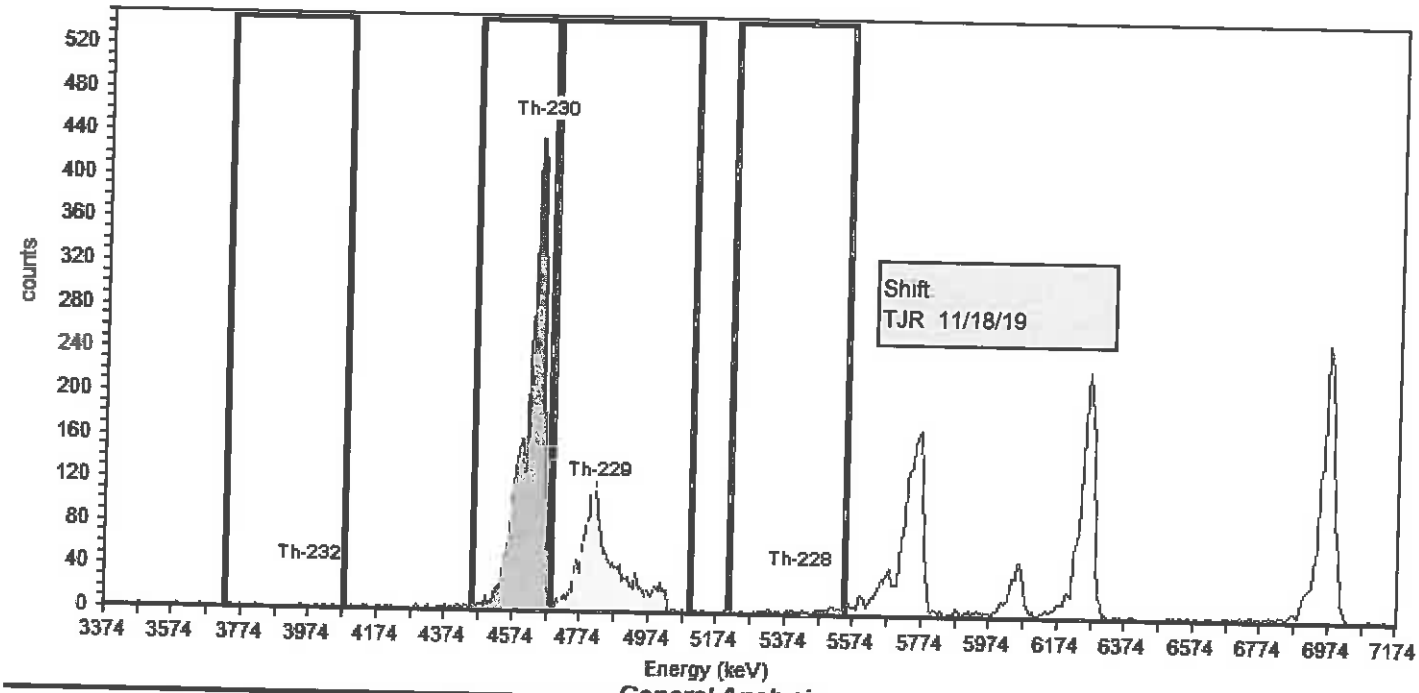
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 102.72%

Acquisition

Detector: AV246 SN: 51-005Q2
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV246; Det: AV246; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-7107;AV246-11152018
Efficiency Calibration:IC-7107;AV246-11152018
Calibration Date: 11/15/2018 10:58:54PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.21% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	29.9	100.2	8	2.0000	6.00	3.479E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4679.5	46.7	~~23.4~~ 99.7	3412	1.0000	3411.00	~~8.470E+004~~	pCi/L
Th-229	4828.6	4,845.3	-16.7	4686.9	5097.1	70.6	99.8	1711	5.0000	1706.00	1.020E+004	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	.0	99.8	84	14.0000	70.00	4.077E+002	pCi/L

TJR 11/18/19

$84700 \cdot \frac{.234}{.997} = 19879$

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:35:47AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-D Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-D
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246266
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

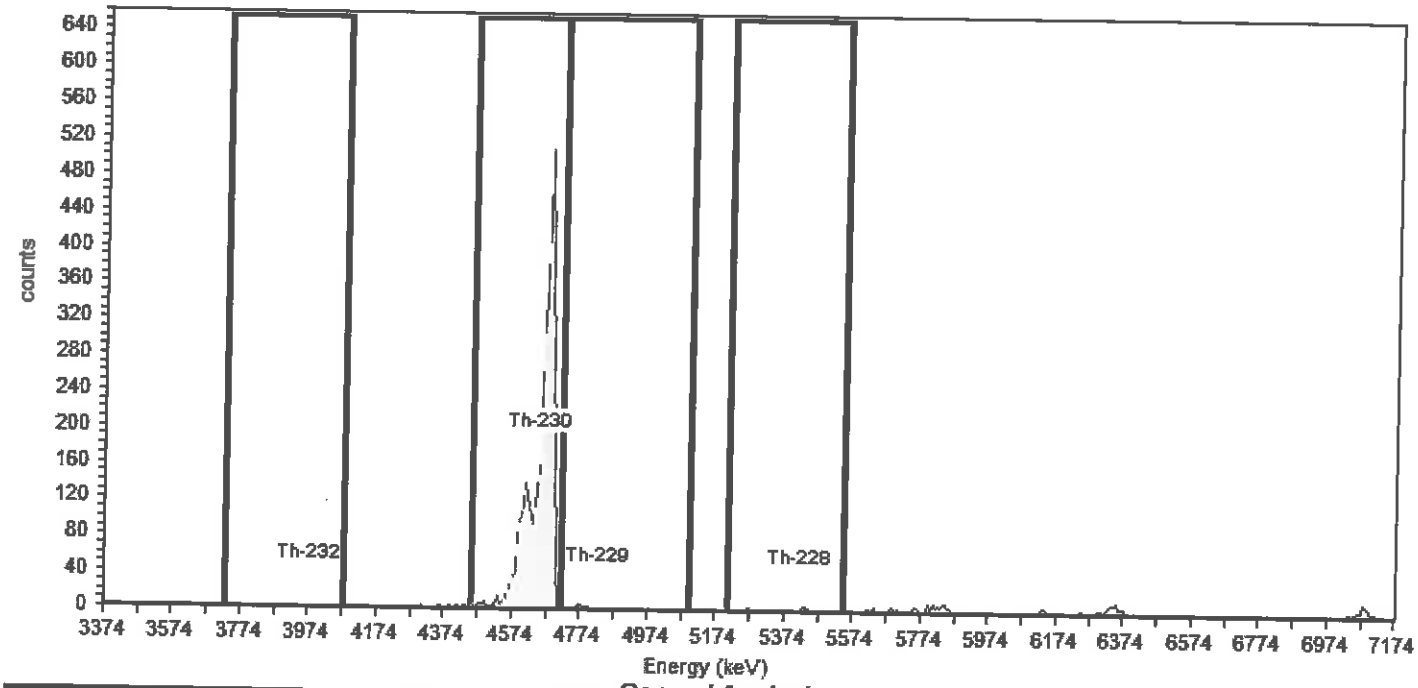
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 94.74%

Acquisition

Detector: AV247 SN: 51-027F3
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV247; Det: AV247; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-8874;AV247-11152018
Efficiency Calibration:IC-8874;AV247-11152018
Calibration Date: 11/16/2018 11:45:39AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.31% +/- 0.37% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	32.5	100.2	4	0.0000	4.00	2.505E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	19.6	99.7	3227	0.0000	3227.00	1.924E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	42.6	99.6	19	9.0000	10.00	6.298E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	43.0	99.8	22	12.0000	10.00	6.290E+001	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:36:27AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-E Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-E
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246267
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

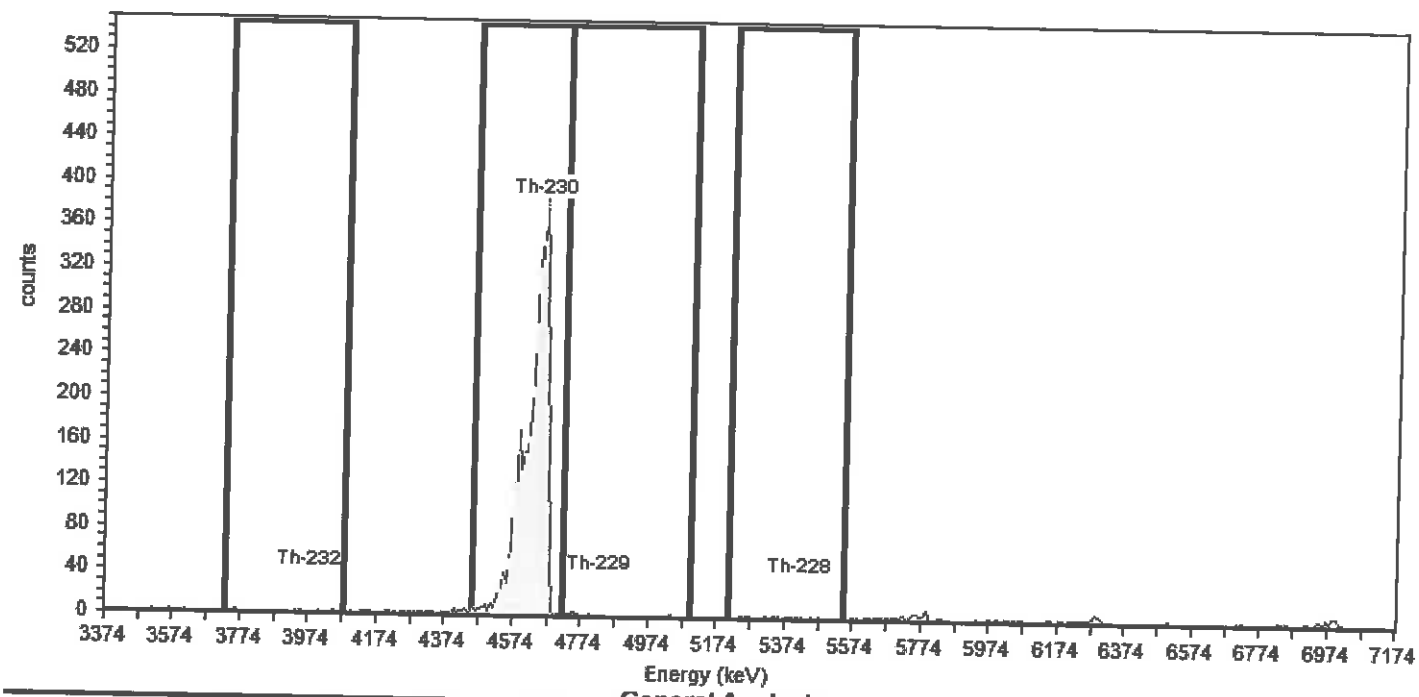
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 110.62%

Acquisition

Detector: AV249 SN: 51-005EE5
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:28PM
Bkgd Info: Sample: ICB;AV249; Det: AV249; Spectrum #1; 11/9/2019 2:31:28 PM

Energy Calibration: IC-9520;AV249-11152018
Efficiency Calibration:IC-9520;AV249-11152018
Calibration Date: 11/15/2018 10:59:03PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 23.81% +/- 0.34% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	9.5	100.2	5	1.0000	4.00	2.371E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	65.6	99.7	3411	1.0000	3410.00	2.247E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	39.7	99.6	19	7.0000	12.00	7.152E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	186.1	99.8	17	13.0000	4.00	2.381E+001	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:37:05AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-F Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-F
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246268
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

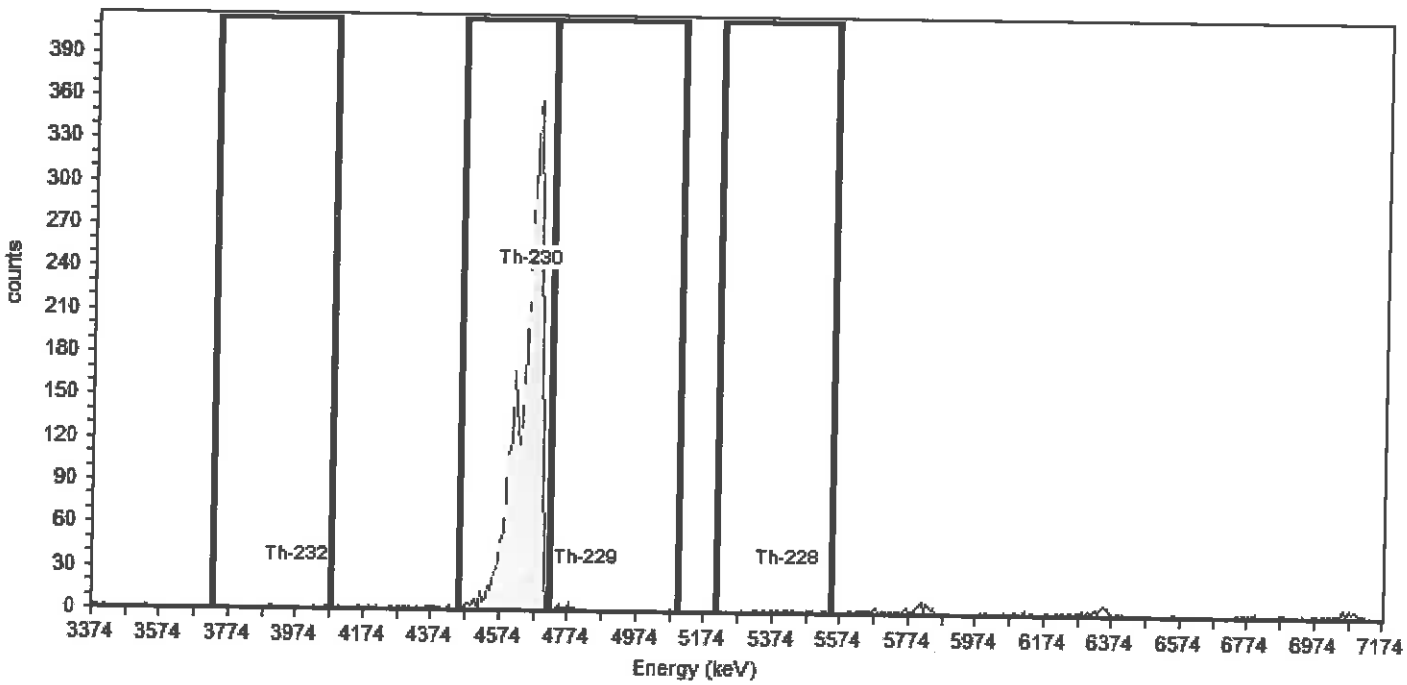
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 107.83%

Acquisition

Detector: AV250 SN: 47-052x7
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 11/9/2019 2:31:28PM
Bkgd Info: Sample: ICB;AV250; Det: AV250; Spectrum #1; 11/9/2019 2:31:28 PM

Energy Calibration: IC-9792;AV250-11152018
Efficiency Calibration:IC-9792;AV250-11152018
Calibration Date: 11/15/2018 10:59:07PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 22.66% +/- 0.28% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	10.4	100.2	3	7.0000	-4.00	2.556E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	19.5	99.7	3168	5.0000	3163.00	2.190E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	51.0	99.6	20	7.0000	13.00	8.353E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	134.4	99.8	17	16.0000	1.00	6.418E+000	pCi/L

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

TestAmerica

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Radiochemistry Data Review Checklist

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Review Item	Yes	No	N/A	2 Rvw
Rad Prep				
1 Are all samples on batch sheet present or removed from batch?	☑	☐	☐	☐
2 Are all samples, QC and methods in compliance with client requirements?	☑	☐	☐	☐
3 Were forms checked for transcription errors?	☑	☐	☐	☐
4 Are all TALS entries complete? (End Dates and appropriate worksheet fields completed)	☑	☐	☐	☐
5 Are all problems and deviations documented? (NCM printed and attached with paperwork)	☐	☐	☑	☐
6 Does this batch contain re-extracts?	☐	☑	☐	☐
Sample Analysis				
1 Are carrier/tracer yields within acceptance limits? 183818	☐	☑	☐	☐
2 Were all sample holding times met?	☑	☐	☐	☐
3 If alpha or LSC, were samples analyzed using normal ROI's, and were spectra evaluated for interferences? 183815	☑	☐	☐	☐
QC Samples				
1 Is the blank activity <= MDA	☐	☐	☑	☐
2 Is the blank activity <= client CRDL?	☐	☐	☑	☐
3 If blank activity exceeds limit, is sample activity >= 5X blank activity?	☐	☐	☑	☐
4 Is LCS recovery within acceptance limits?	☐	☐	☑	☐
5 Is duplicate precision (e.g. RPD/RER/DER/z-score) within acceptance limits?	☐	☐	☑	☐
6 Is MS/MSD recovery within acceptance limits?	☐	☐	☑	☐
7 Do samples meet CRDL?	☐	☐	☑	☐
8 Is the absolute value of any negative result < 3sigma uncert.?	☐	☐	☑	☐
Other				
1 Are all nonconformances documented and noted? 183819, 183821	☑	☐	☐	☐
2 Were manual data entries and/or calculations checked?	☐	☐	☑	☐
Data Packaging				
1 Run logs included?	☐	☐	☐	☐
2 Daily checks included?	☐	☐	☐	☐
3 Backgrounds included?	☐	☐	☐	☐
4 Calibrations included?	☐	☐	☐	☐

Lot Number	Analytical Due Date
160-36383-A-1-A	
160-36383-A-1-B	
160-36383-A-1-C	
160-36383-A-1-D	
160-36383-A-1-E	
160-36383-A-1-F	
160-36383-A-2-A	
160-36383-A-2-B	
160-36383-A-2-C	
160-36383-A-2-D	
160-36383-A-2-E	
160-36383-A-2-F	

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Comments:

Prep Analyst: cmm Date: 11/15/2019

Analyst: Date:

Second Level Reviewer Date:

Date Uploaded:

Date Verified:

Date Review Released:

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

960min
~~240min~~ KR 11/16/19

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Preparation, Extraction Chromatography Resin Actinide Separation

TA 1.00 ml/L

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments	Output Sample Lab ID
1	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ adjust 244	160-36383-A-1-A
2	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	adjust / 245	160-36383-A-1-B
3	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 246 SWOFF	160-36383-A-1-C
4	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 247	160-36383-A-1-D
5	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 249	160-36383-A-1-E
6	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 250	160-36383-A-1-F
8	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	1	160-36383-A-2-A
9	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	3	160-36383-A-2-B
10	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	4	160-36383-A-2-C
11	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	14 6	160-36383-A-2-D
12	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	15 7	160-36383-A-2-E
									16 8 KR 11/16/19	160-36383-A-2-F

Page 106 of 143

08/10/2023

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Isotopic Thorium (Alpha Spectrometry)

	Input Sample Lab ID (Analytical Method)	(Sub-List)	Analytes
1	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
2	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
3	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
4	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
5	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
6	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
7	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
8	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
9	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
10	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
11	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
12	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Batch Notes

Balance ID	N/A
Analyst ID - Reagent Drop	CMM
Analyst ID - Reagent Drop Witness	KLH per CMM
Pipette ID	RAD104
Analyst ID - Column	N/A
Column Date	N/A
Analyst ID - CoPrecipitation	CMM
CoPrecipitation Date	11/15/2019
SOP Number	ST-RC-0100
Batch Comment	

Comments

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Reagent Additions Worksheet

Lab ID	Reagent Code	Amount Added	Final Amount	By	Witness
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

160-36383-A-2	Th-230_00057	0.3 mL			

Other Reagents:

Reagent	Amount/Units	Lot#:

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

08/10/2023

Reagent

Th-230_00054

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 114475
Source Description: 5 mL Liquid in Flame Sealed Ampoule
Product Code: 8230
Customer: Test America Laboratories- St. Louis
P.O. Number: 3053229, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-October-2019 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A, %	u_B, %	U, %*	
Th-230	2.753E+07	3.843E+03	0.2	1.0	2.0	4π LS

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Reagent

Th-230_00056

TestAmerica
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St. Louis Radiological Standard Verification

Printed: 11/18/2019 11:25 AM

Standard ID Number: Th-230_00057
True Value = 20627 pCi/L or g
Date Analyzed: 11/16/2019

Radionuclide: Th-230

	Replicates	
#1	19791	pCi/L or g
#2	20695	pCi/L or g
#3	18802	pCi/L or g

Mean = 19762.667

1 sigma = 946.818

1.96 sigma = 1855.763

True Value minus 5% = 19595.65 (True Value - 5%)
True Value plus 5% = 21658.35 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: TJR 11/18/19

2nd Reviewed By/Date: 11/18/19

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	10/29/2019 0:00		
Decayto Date/Time (t):	11/16/19 0:00		
Initial Activity (A_0):	45.79 dpm		
Initial Aliquot:	1 mL		
Initial Conc:	45.7916 dpm/mL		
***Soln. Density:**	1 g/mL		
Nuclide:	Th-230		
Half-Life (days):	27539850	decay days	fraction
****Decay Factor:**	1.0000	18.00	0.00000
Decay Corr Activity:	4.5792E+01 dpm		
Decay Corr Conc:	4.5792E+01 dpm/mL		

Conversion/Calculations

Final Activity Unit:	pCi
Activity Unit Factor:	0.45045
Final Volume Unit:	L
Volume Unit Factor:	0.001
Final Concentration:	2.0627E+04 pCi/L
Aliquot Volume:	1.0000E+00 L
Final Activity (A):	2.0627E+04 pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

TestAmerica
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Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
5:43:23AM 11/17/2019

Sample

Sample Name: 160-36383-A-2-A
SampleType: Sample
: 160-36383-A-2-A
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775471

Analyst: 60040

Tracer

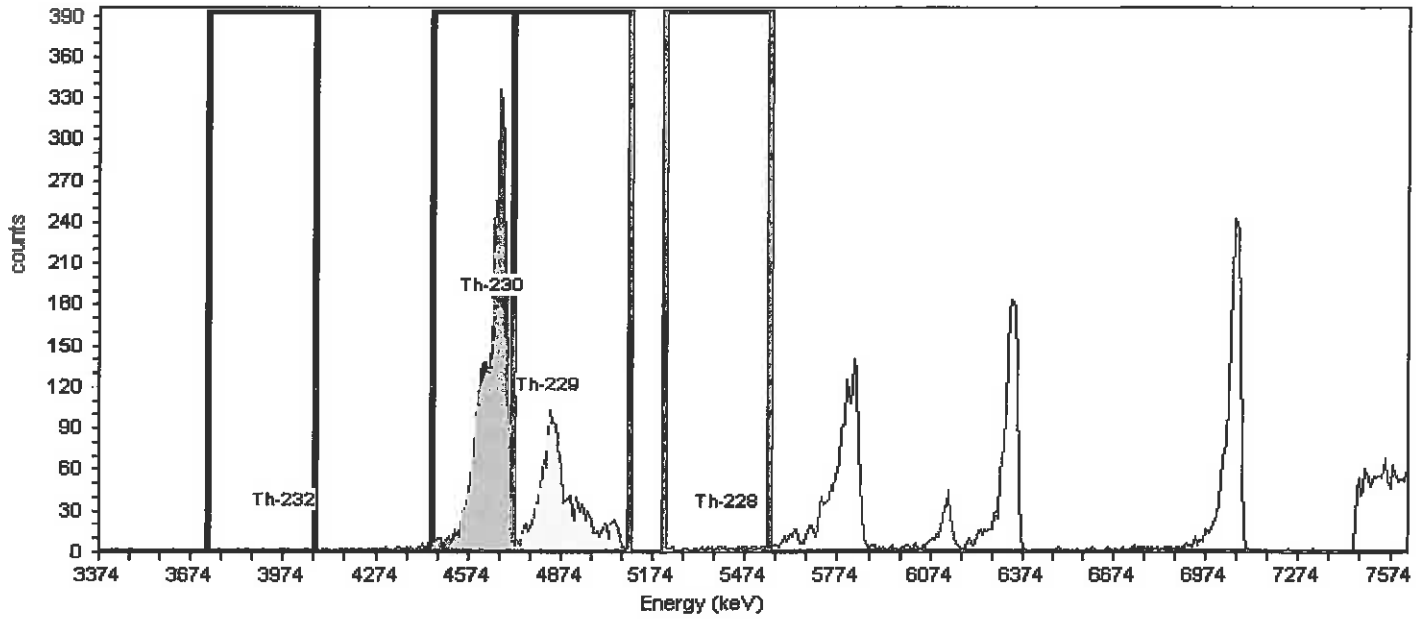
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 101.73%

Acquisition

Detector: AV1
Serial Number: 49-188 AA4
Acquisition Start Date: 11/16/2019 1:42:29PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:56:34PM
Background Info: Sample: ICB;AV1; Det: AV1; Spectrum #2; Nov-13-2019 13:56

Calibration Name: IC-7107;AV1-05142018
Calibration Date: 5/14/2018 6:23:45PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 24.36% +/- 0.28% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	32.5	100.2	9	4.0000	5.00	31.497	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	23.5	99.7	3137	11.0000	3126.00	19,790.970	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	78.3	99.6	1571	3.0000	1568.00	10,105.280	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	27.5	99.8	51	7.0000	44.00	278.400	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:51:27AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-B
SampleType: Sample
: 160-36383-A-2-B
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775566

Analyst: 60040

Tracer

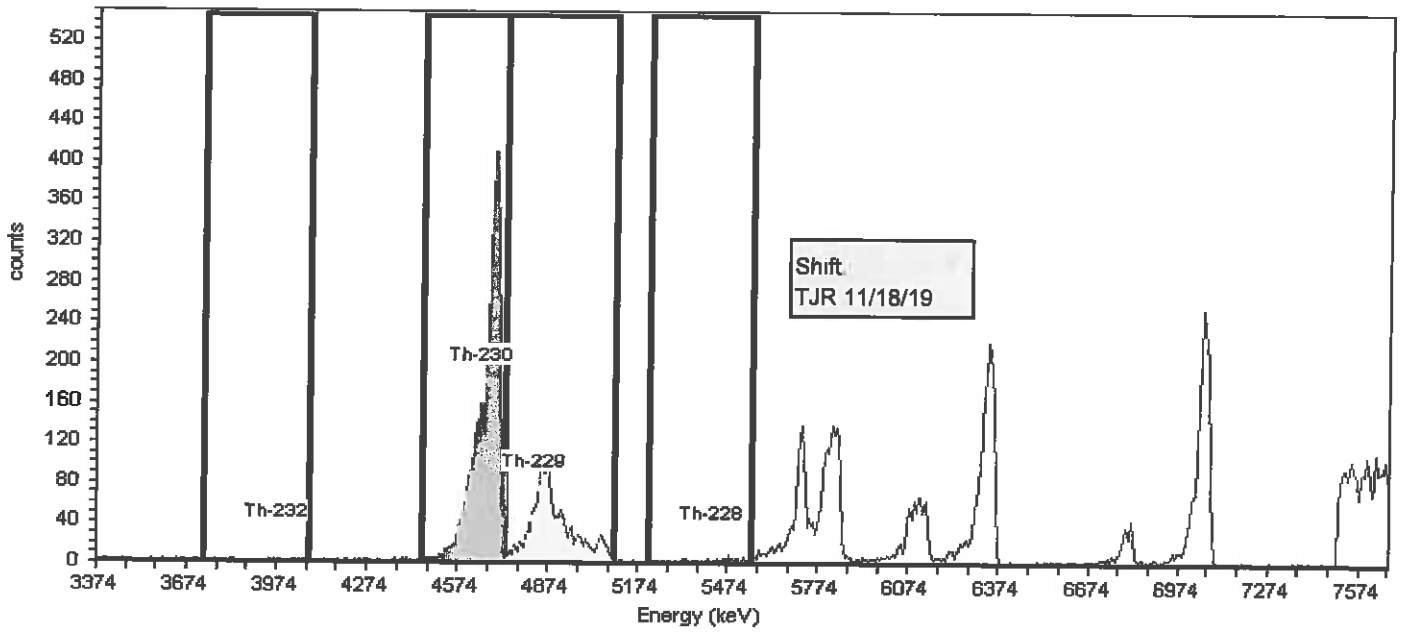
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 102.38%

Acquisition

Detector: AV3
Serial Number: 49-202 FF7
Acquisition Start Date: 11/16/2019 1:42:31PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:56:37PM
Background Info: Sample: ICB;AV3; Det: AV3; Spectrum #2; Nov-13-2019 13:56

Calibration Name: IC-8877;AV3-05142018
Calibration Date: 5/14/2018 6:25:15PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 24.44% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	12.1	100.2	14	16.0000	-2.00	-12.480	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4731.7	22.3	99.7	3313	13.0000	3300.00	20,694.600	pCi/L
Th-229	4828.6	4,845.3	-16.7	4731.7	5097.1	82.4	99.6	1591	8.0000	1583.00	10,169.700	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	18.4	99.8	79	4.0000	75.00	470.050	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
5:42:33AM 11/17/2019

Sample

Sample Name: 160-36383-A-2-C
SampleType: Sample
: 160-36383-A-2-C
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775467

Analyst: 60040

Tracer

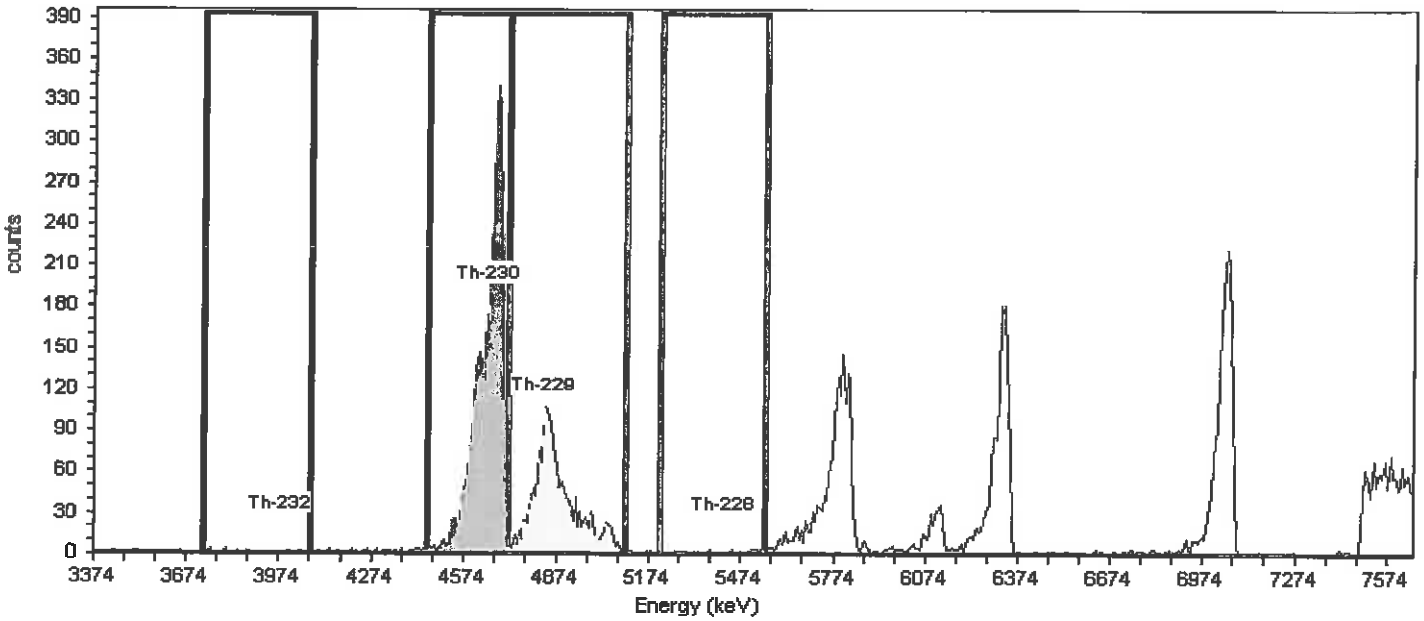
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 116.50%

Acquisition

Detector: AV4
Serial Number: 46-033Q4
Acquisition Start Date: 11/16/2019 1:42:33PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:54:23PM
Background Info: Sample: ICB;AV4; Det: AV4; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-9520;AV4-05142018
Calibration Date: 5/14/2018 6:25:34PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 22.79% +/- 0.33% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	305.2	100.2	9	7.0000	2.00	11.759	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	24.7	99.7	3184	2.0000	3182.00	18,802.470	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	87.4	99.6	1685	5.0000	1680.00	11,572.560	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	29.2	99.8	33	7.0000	26.00	153.542	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:42:35AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-D
SampleType: Sample
: 160-36383-A-2-D
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775571

Analyst: 60040

Tracer

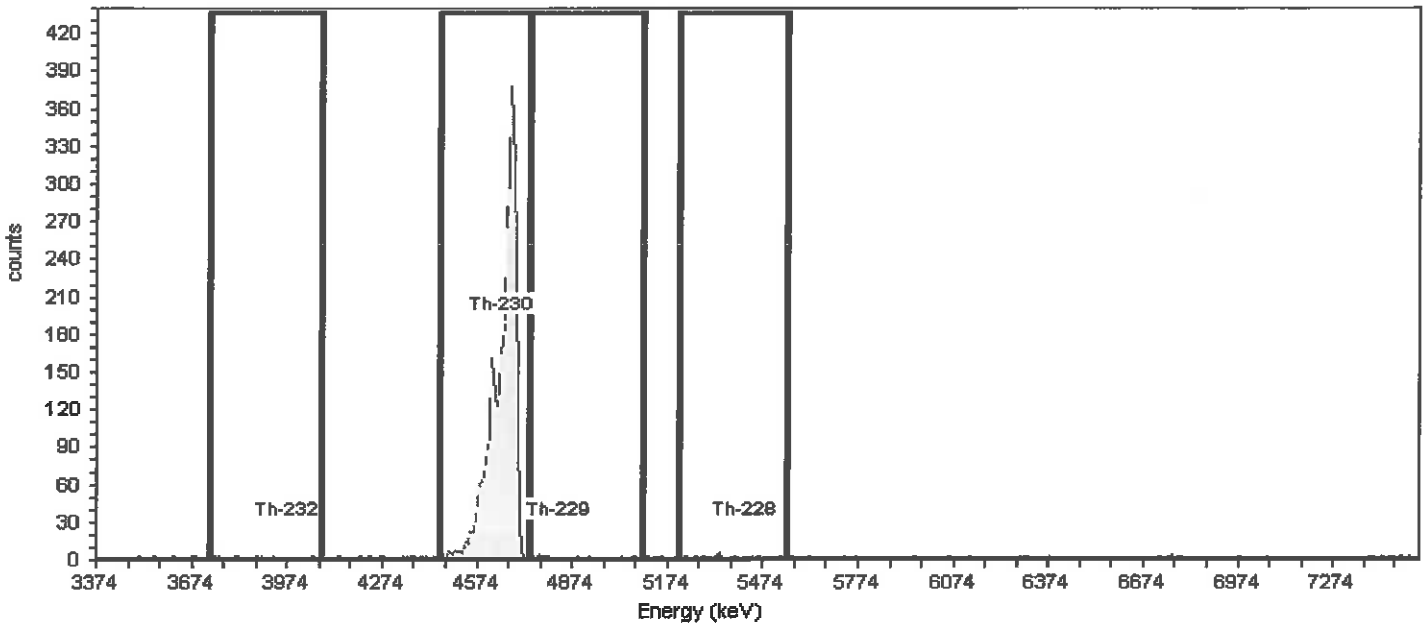
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 89.46%

Acquisition

Detector: AV14
Serial Number: 50-060W4
Acquisition Start Date: 11/16/2019 1:42:42PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:35PM
Background Info: Sample: ICB;AV14; Det: AV14; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-1370622;AV14-05142018
Calibration Date: 5/14/2018 6:27:53PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.40% +/- 0.23% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	15.9	100.2	9	2.0000	7.00	46.270	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4739.1	63.3	99.7	3108	3.0000	3105.00	18,452.200	pCi/L
Th-229	4828.6	4,845.3	-16.7	4739.1	5097.1	306.2	99.6	18	3.0000	15.00	99.700	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	223.9	99.8	14	11.0000	3.00	19.917	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:42:50AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-E
SampleType: Sample
: 160-36383-A-2-E
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775569

Analyst: 60040

Tracer

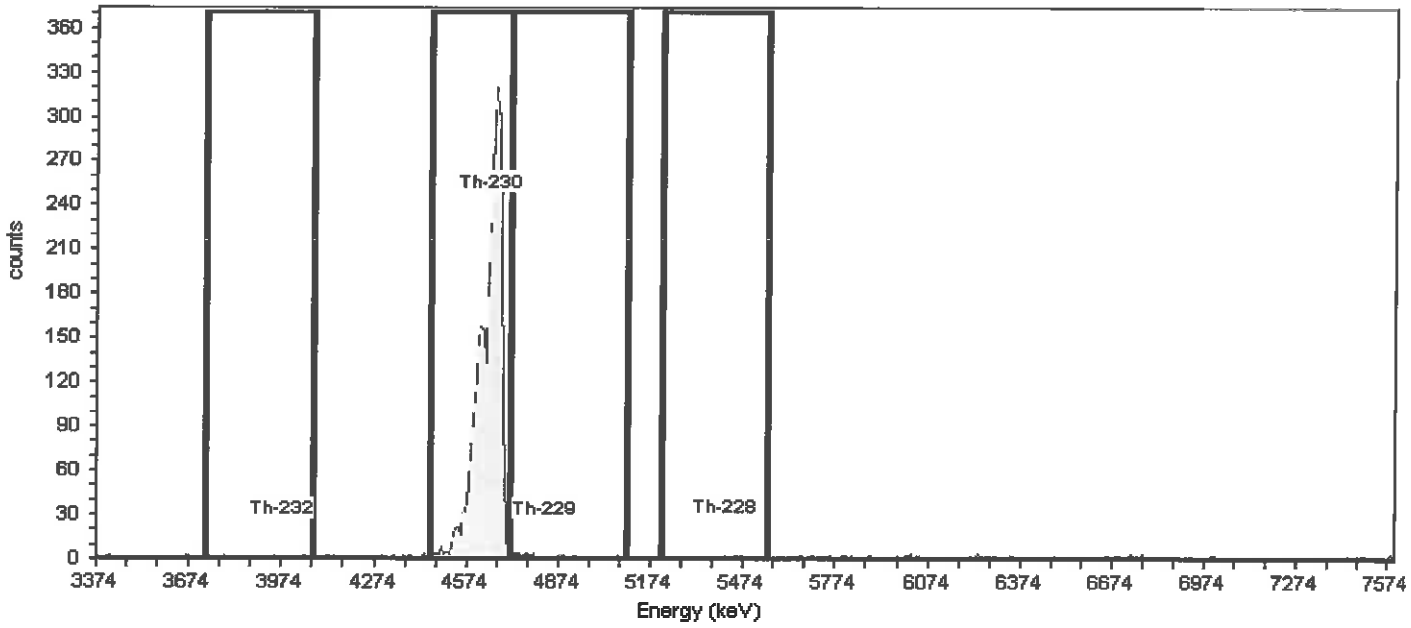
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 86.22%

Acquisition

Detector: AV15
Serial Number: 41-172C5
Acquisition Start Date: 11/16/2019 1:42:43PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:37PM
Background Info: Sample: ICB;AV15; Det: AV15; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-1370619;AV15-05142018
Calibration Date: 5/14/2018 6:28:04PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 27.26% +/- 0.23% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	29.5	100.2	5	5.0000	0.00	0.000	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	33.0	99.7	3098	8.0000	3090.00	17,785.010	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	60.9	99.6	19	9.0000	10.00	66.789	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	55.9	99.8	4	6.0000	-2.00	-13.343	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:43:04AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-F
SampleType: Sample
: 160-36383-A-2-F
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775570

Analyst: 60040

Tracer

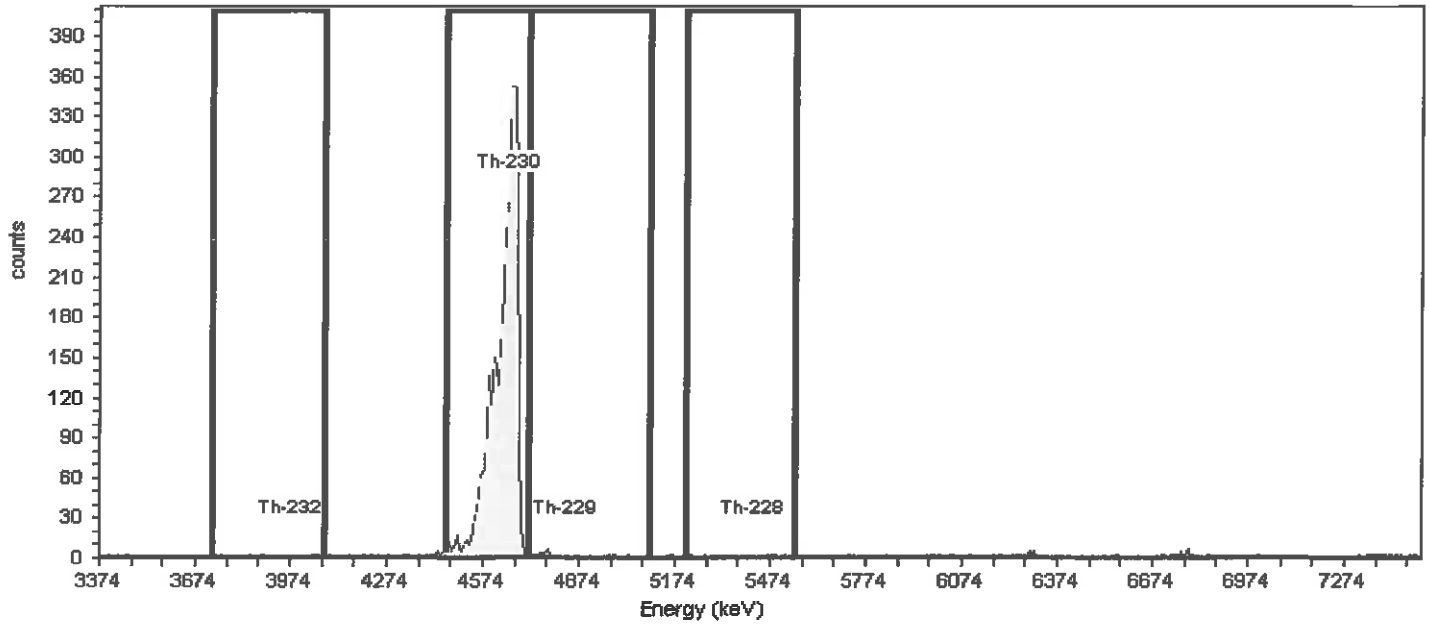
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 93.47%

Acquisition

Detector: AV16
Serial Number: 51-082B6
Acquisition Start Date: 11/16/2019 1:42:45PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:38PM
Background Info: Sample: ICB;AV16; Det: AV16; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-137620;AV16-05142018
Calibration Date: 5/14/2018 6:28:17PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.96% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	23.8	100.2	7	1.0000	6.00	37.170	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	42.4	99.7	3321	8.0000	3313.00	19,279.790	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	.0	99.6	28	6.0000	22.00	137.046	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	10.3	99.8	6	5.0000	1.00	6.222	pCi/L

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Radiochemistry Data Review Checklist

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Review Item	Yes	No	N/A	2 Rvw
Rad Prep				
1 Are all samples on batch sheet present or removed from batch?	☑	☐	☐	☐
2 Are all samples, QC and methods in compliance with client requirements?	☑	☐	☐	☐
3 Were forms checked for transcription errors?	☑	☐	☐	☐
4 Are all TALS entries complete? (End Dates and appropriate worksheet fields completed)	☑	☐	☐	☐
5 Are all problems and deviations documented? (NCM printed and attached with paperwork)	☐	☐	☑	☐
6 Does this batch contain re-extracts?	☐	☑	☐	☐
Sample Analysis				
1 Are carrier/tracer yields within acceptance limits? 183818	☐	☑	☐	☐
2 Were all sample holding times met?	☑	☐	☐	☐
3 If alpha or LSC, were samples analyzed using normal ROI's, and were spectra evaluated for interferences? 183815	☑	☐	☐	☐
QC Samples				
1 Is the blank activity <= MDA	☐	☐	☑	☐
2 Is the blank activity <= client CRDL?	☐	☐	☑	☐
3 If blank activity exceeds limit, is sample activity >= 5X blank activity?	☐	☐	☑	☐
4 Is LCS recovery within acceptance limits?	☐	☐	☑	☐
5 Is duplicate precision (e.g. RPD/RER/DER/z-score) within acceptance limits?	☐	☐	☑	☐
6 Is MS/MSD recovery within acceptance limits?	☐	☐	☑	☐
7 Do samples meet CRDL?	☐	☐	☑	☐
8 Is the absolute value of any negative result < 3sigma uncert.?	☐	☐	☑	☐
Other				
1 Are all nonconformances documented and noted? 183819, 183821	☑	☐	☐	☐
2 Were manual data entries and/or calculations checked?	☐	☐	☑	☐
Data Packaging				
1 Run logs included?	☐	☐	☐	☐
2 Daily checks included?	☐	☐	☐	☐
3 Backgrounds included?	☐	☐	☐	☐
4 Calibrations included?	☐	☐	☐	☐

Lot Number	Analytical Due Date
160-36383-A-1-A	
160-36383-A-1-B	
160-36383-A-1-C	
160-36383-A-1-D	
160-36383-A-1-E	
160-36383-A-1-F	
160-36383-A-2-A	
160-36383-A-2-B	
160-36383-A-2-C	
160-36383-A-2-D	
160-36383-A-2-E	
160-36383-A-2-F	

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Comments:

Prep Analyst: cmm Date: 11/15/2019

Analyst: Date:

Second Level Reviewer Date:

Date Uploaded:

Date Verified:

Date Review Released:

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

960min
~~240min~~ KR 11/16/19

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Preparation, Extraction Chromatography Resin Actinide Separation

TA 1.00 pi/L

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments	Output Sample Lab ID
1	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ adjust 244	160-36383-A-1-A
2	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	adjust / 245	160-36383-A-1-B
3	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 246 Shift	160-36383-A-1-C
4	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 247	160-36383-A-1-D
6	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 249	160-36383-A-1-E
7	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 250	160-36383-A-1-F
8	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	1	160-36383-A-2-A
9	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	3	160-36383-A-2-B
10	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	4	160-36383-A-2-C
11	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	14 6	160-36383-A-2-D
12	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	15 7	160-36383-A-2-E
									16 8 KR 11/16/19	160-36383-A-2-F

08/10/2023

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Isotopic Thorium (Alpha Spectrometry)

	Input Sample Lab ID (Analytical Method)	(Sub-List)	Analytes
1	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
2	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
3	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
4	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
5	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
6	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
7	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
8	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
9	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
10	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
11	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
12	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Batch Notes

Balance ID	N/A
Analyst ID - Reagent Drop	CMM
Analyst ID - Reagent Drop Witness	KLH per CMM
Pipette ID	RAD104
Analyst ID - Column	N/A
Column Date	N/A
Analyst ID - CoPrecipitation	CMM
CoPrecipitation Date	11/15/2019
SOP Number	ST-RC-0100
Batch Comment	

Comments

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Reagent Additions Worksheet

Lab ID	Reagent Code	Amount Added	Final Amount	By	Witness
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

160-36383-A-2	Th-230_00057	0.3 mL			

Other Reagents:

Reagent	Amount/Units	Lot#:

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

Subcontract Data

Shipping and Receiving Documents

eurofins | Eaton Analytical

810-68124 Chain of Custody

110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order #

Batch # _____

www.EurofinsUS.com/Eaton

CHAIN OF CUSTODY RECORD

Page _____ of _____

Shaded area for EEA use only

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998			MI	23F1321	23F1321
BILL TO: Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444	COMPLIANCE MONITORING: Yes x / No	POPULATION SERVED	SOURCE WATER		

LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	06/28/23	8:50			MW-01R	Radium 226/228				4	DW	SW
2	06/27/23	16:05			MW-02	Radium 226/228				4	DW	SW
3	06/28/23	11:00			MW-03	Radium 226/228				4	DW	SW
4	06/28/23	9:55			MW-04	Radium 226/228				4	DW	SW
5	06/28/23	12:00			MW-06	Radium 226/228				4	DW	SW
6	06/27/23	12:00			MW-07	Radium 226/228				4	DW	SW
7	06/27/23	17:20			MW-08	Radium 226/228				4	DW	SW
8	06/27/23	14:45			MW-09	Radium 226/228				4	DW	SW
9	06/27/23	17:30			MW-10	Radium 226/228				4	DW	SW
10	06/28/23	12:10			MW-11	Radium 226/228				4	DW	SW
11	06/27/23	9:00			MW-12	Radium 226/228				4	DW	SW
12	06/27/23	11:00			MW-18	Radium 226/228				4	DW	SW
13	06/28/23	10:30			MW-19	Radium 226/228				4	DW	SW
14	06/28/23	9:00			MW-20	Radium 226/228				4	DW	SW

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
Beverly Vorst	6/29/23	AM PM	Fedex	6/29/23	AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
Fedex		AM PM	Kameron Williams	6/30/23	0900 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
		AM PM			AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS: Level IV with EDD from St. Louis

pH Acceptable

CONDITIONS UPON RECEIPT (check one):

____ Iced: Wet/Blue ____ Ambient X °C Upon Receipt____ N/A

MATRIX CODES:

DW-DRINKING WATER
~~RW-REAGENT WATER~~
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
~~PW-POOL WATER~~
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0%
RV* = Rush Verbal: (5 working days) 50%
RW* = Rush Written: (5 working days) 75%
IV* = Immediate Verbal: (3 working days) 100%
IW* = Immediate Written: (3 working days) 125%
SP* = Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

08/10/2023

eurofins | Eaton Analytical

110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order #

Batch # _____

08/10/2023

www.EurofinsUS.com/Eaton

CHAIN OF CUSTODY RECORD

Page _____ of _____

Shaded area for EEA use only

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998			MI	23F1321	23F1321

BILL TO:	COMPLIANCE MONITORING	Yes	No	POPULATION SERVED	SOURCE WATER
Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444		x			

	LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1		06/27/23	12:05			MW-27	Radium 226/228				4	DW	SW
2		06/27/23	13:40			MW-30	Radium 226/228				4	DW	SW
3		06/27/23	14:30			MW-31	Radium 226/228				4	DW	SW
4		06/27/23	15:40			MW-32	Radium 226/228				4	DW	SW
5		06/27/23	10:25			MW-33	Radium 226/228				4	DW	SW
6		06/27/23	11:10			MW-34	Radium 226/228				4	DW	SW
7		06/27/23	9:00			MWT-12	Radium 226/228				4	DW	SW
8		06/27/23	13:40			MWT-30	Radium 226/228				4	DW	SW
9		06/28/23	13:35			SG-02	Radium 226/228				4	DW	SW
10		06/01/23	13:25			SG-03	Radium 226/228				4	DW	SW
11		06/28/23	13:10			SG-04R	Radium 226/228				4	DW	SW
12		06/28/23	12:50			SG-05	Radium 226/228				4	DW	SW
13													
14													

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
Beverly Vaul	6/29/23	AM PM	Fedex	6/29/23	AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
Fedex		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
		AM PM			AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS: Level IV with EDD from St. Louis

CONDITIONS UPON RECEIPT (check one):

____ Iced: Wet/Blue ____ Ambient _____ °C Upon Receipt ____ N/A

MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0%
RV* = Rush Verbal: (5 working days) 50%
RW* = Rush Written: (5 working days) 75%
IV* = Immediate Verbal: (3 working days) 100%
IW* = Immediate Written: (3 working days) 125%
SP* = Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-26818.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-68124-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 8/3/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23F1321	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of Containers	Special Instructions/Note:
			Preservation Code:								
MW-01R (810-68124-1)	6/28/23	08:50 Eastern		Drinking Wate			X	X	X	4	
MW-02 (810-68124-2)	6/27/23	16:05 Eastern		Drinking Wate			X	X	X	4	
MW-03 (810-68124-3)	6/28/23	11:00 Eastern		Drinking Wate			X	X	X	4	
MW-04 (810-68124-4)	6/28/23	09:55 Eastern		Drinking Wate			X	X	X	4	
MW-06 (810-68124-5)	6/28/23	12:00 Eastern		Drinking Wate			X	X	X	4	
MW-07 (810-68124-6)	6/27/23	12:00 Eastern		Drinking Wate			X	X	X	4	
MW-08 (810-68124-7)	6/27/23	17:20 Eastern		Drinking Wate			X	X	X	4	
MW-09 (810-68124-8)	6/27/23	14:45 Eastern		Drinking Wate			X	X	X	4	
MW-10 (810-68124-9)	6/27/23	17:30 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)***
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time: 7/5/2023 1600	Company: ECA	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.: HB	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-26818.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-68124-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 8/3/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23F1321	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
				Preservation Code:							
MW-11 (810-68124-10)	6/28/23	12:10 Eastern		Drinking Wate			X	X	X	4	
MW-12 (810-68124-11)	6/27/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MW-18 (810-68124-12)	6/27/23	11:00 Eastern		Drinking Wate			X	X	X	4	
MW-19 (810-68124-13)	6/28/23	10:30 Eastern		Drinking Wate			X	X	X	4	
MW-20 (810-68124-14)	6/28/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MW-27 (810-68124-15)	6/27/23	12:05 Eastern		Drinking Wate			X	X	X	4	
MW-30 (810-68124-16)	6/27/23	13:40 Eastern		Drinking Wate			X	X	X	4	
MW-31 (810-68124-17)	6/27/23	14:30 Eastern		Drinking Wate			X	X	X	4	
MW-32 (810-68124-18)	6/27/23	15:40 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time: 7/5/2023 1600	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-26818.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-68124-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 8/3/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23F1321	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-33 (810-68124-19)	6/27/23	10:25 Eastern		Drinking Wate			X	X	X	4	
MW-34 (810-68124-20)	6/27/23	11:10 Eastern		Drinking Wate			X	X	X	4	
MWT-12 (810-68124-21)	6/27/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MWT-30 (810-68124-22)	6/27/23	13:40 Eastern		Drinking Wate			X	X	X	4	
SG-02 (810-68124-23)	6/28/23	13:35 Eastern		Drinking Wate			X	X	X	4	
SG-03 (810-68124-24)	6/1/23	13:25 Eastern		Drinking Wate			X	X	X	4	
SG-04R (810-68124-25)	6/28/23	13:10 Eastern		Drinking Wate			X	X	X	4	
SG-05 (810-68124-26)	6/28/23	12:50 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time: 7/5/2023 1600	Company: EA	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-26818.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-68124-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 8/3/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23F1321	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-01R (810-68124-1)	6/28/23	08:50 Eastern		Drinking Wate			X	X	X	4	
MW-02 (810-68124-2)	6/27/23	16:05 Eastern		Drinking Wate			X	X	X	4	
MW-03 (810-68124-3)	6/28/23	11:00 Eastern		Drinking Wate			X	X	X	4	
MW-04 (810-68124-4)	6/28/23	09:55 Eastern		Drinking Wate			X	X	X	4	
MW-06 (810-68124-5)	6/28/23	12:00 Eastern		Drinking Wate			X	X	X	4	
MW-07 (810-68124-6)	6/27/23	12:00 Eastern		Drinking Wate			X	X	X	4	
MW-08 (810-68124-7)	6/27/23	17:20 Eastern		Drinking Wate			X	X	X	4	
MW-09 (810-68124-8)	6/27/23	14:45 Eastern		Drinking Wate			X	X	X	4	
MW-10 (810-68124-9)	6/27/23	17:30 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by:	Date/Time:	Company	Received by: FED EX	Date/Time:	Company
Relinquished by: FED EX	Date/Time:	Company	Received by: Sierra Worthington	Date/Time: JUL 0 6 2023 0840	Company GTASR
Relinquished by:	Date/Time: 7/5/2023 1600	Company EGA	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.: KB		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-26818.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-68124-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 8/3/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23F1321	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-11 (810-68124-10)	6/28/23	12:10 Eastern		Drinking Wate			X	X	X	4	
MW-12 (810-68124-11)	6/27/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MW-18 (810-68124-12)	6/27/23	11:00 Eastern		Drinking Wate			X	X	X	4	
MW-19 (810-68124-13)	6/28/23	10:30 Eastern		Drinking Wate			X	X	X	4	
MW-20 (810-68124-14)	6/28/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MW-27 (810-68124-15)	6/27/23	12:05 Eastern		Drinking Wate			X	X	X	4	
MW-30 (810-68124-16)	6/27/23	13:40 Eastern		Drinking Wate			X	X	X	4	
MW-31 (810-68124-17)	6/27/23	14:30 Eastern		Drinking Wate			X	X	X	4	
MW-32 (810-68124-18)	6/27/23	15:40 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by: FED EX	Date/Time:	Company
Relinquished by: FED EX	Date/Time:	Company	Received by: Sena Worthington	Date/Time: JUL 06 2023 0840	Company CTAS
Relinquished by:	Date/Time: 7/5/2023 1600	Company CTA	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-26818.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-68124-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 8/3/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23F1321	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-33 (810-68124-19)	6/27/23	10:25 Eastern		Drinking Wate			X	X	X	4	
MW-34 (810-68124-20)	6/27/23	11:10 Eastern		Drinking Wate			X	X	X	4	
MWT-12 (810-68124-21)	6/27/23	09:00 Eastern		Drinking Wate			X	X	X	4	
MWT-30 (810-68124-22)	6/27/23	13:40 Eastern		Drinking Wate			X	X	X	4	
SG-02 (810-68124-23)	6/28/23	13:35 Eastern		Drinking Wate			X	X	X	4	
SG-03 (810-68124-24)	6/1/23	13:25 Eastern		Drinking Wate			X	X	X	4	
SG-04R (810-68124-25)	6/28/23	13:10 Eastern		Drinking Wate			X	X	X	4	
SG-05 (810-68124-26)	6/28/23	12:50 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time:	Company	Received by: FED EX	Date/Time:	Company
Relinquished by: FED EX	Date/Time:	Company	Received by: Sierra Worthington	Date/Time: JUL 0 6 2023 0848	Company EXASIZ
Relinquished by:	Date/Time: 7/5/2023 1600	Company: EEA	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-68124-1

Login Number: 68124
List Number: 1
Creator: Williams, Kameron

List Source: Eurofins Eaton Analytical South Bend

Question	Answer	Comment
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
Samples were received on ice.	False	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	False	Thermal preservation not required.
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Samples do not require splitting or compositing.	True	
Container provided by EEA	True	

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-68124-1

Login Number: 68124
List Number: 2
Creator: Worthington, Sierra M

List Source: Eurofins St. Louis
List Creation: 07/06/23 11:00 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE
ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

September 06, 2023

Ms. Molly Reeves
HDR Michigan Inc.
5405 Data Court
Ann Arbor, MI 48108

Phone: (734) 263-7138

RE: Trace Project 23H0444
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

Wisconsin Accreditation No. FID: 998044080 / TNI EL V1:2016

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2241 Black Creek Road
Muskegon, MI 49444-2673

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www.trace-labs.com

SAMPLE SUMMARY

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23H0444-01	MW-01R	Ground Water	AB/TB	08/08/23 14:25	08/09/23 08:35
23H0444-02	MW-02	Ground Water	AB/TB	08/08/23 10:25	08/09/23 08:35
23H0444-03	MW-03	Ground Water	AB/TB	08/07/23 15:20	08/09/23 08:35
23H0444-04	MW-04	Ground Water	AB/TB	08/07/23 14:00	08/09/23 08:35
23H0444-05	MW-06	Ground Water	AB/TB	08/08/23 14:30	08/09/23 08:35
23H0444-06	MW-07	Ground Water	AB/TB	08/07/23 14:30	08/09/23 08:35
23H0444-07	MW-08	Ground Water	AB/TB	08/08/23 12:40	08/09/23 08:35
23H0444-08	MW-09	Ground Water	AB/TB	08/08/23 09:20	08/09/23 08:35
23H0444-09	MW-10	Ground Water	AB/TB	08/08/23 11:45	08/09/23 08:35
23H0444-10	MW-11	Ground Water	AB/TB	08/08/23 16:00	08/09/23 08:35
23H0444-11	MW-12	Ground Water	AB/TB	08/07/23 16:30	08/09/23 08:35
23H0444-12	MW-18	Ground Water	AB/TB	08/08/23 15:30	08/09/23 08:35
23H0444-13	MW-19	Ground Water	AB/TB	08/07/23 17:30	08/09/23 08:35
23H0444-14	MW-20	Ground Water	AB/TB	08/07/23 16:00	08/09/23 08:35
23H0444-15	MW-27	Ground Water	AB/TB	08/07/23 12:55	08/09/23 08:35
23H0444-16	MW-30	Ground Water	AB/TB	08/08/23 09:20	08/09/23 08:35
23H0444-17	MW-31	Ground Water	AB/TB	08/08/23 11:30	08/09/23 08:35
23H0444-18	MW-32	Ground Water	AB/TB	08/08/23 13:00	08/09/23 08:35
23H0444-19	MW-33	Ground Water	AB/TB	08/07/23 12:00	08/09/23 08:35
23H0444-20	MW-34	Ground Water	AB/TB	08/07/23 11:20	08/09/23 08:35
23H0444-21	MWT-04	Ground Water	AB/TB	08/07/23 14:00	08/09/23 08:35
23H0444-22	MWT-12	Ground Water	AB/TB	08/07/23 16:30	08/09/23 08:35
23H0444-23	SG-02	Surface Water	AB/TB	08/08/23 17:05	08/09/23 08:35
23H0444-24	SG-03	Surface Water	AB/TB	08/08/23 17:15	08/09/23 08:35
23H0444-25	SG-04R	Surface Water	AB/TB	08/08/23 16:50	08/09/23 08:35
23H0444-26	SG-05	Surface Water	AB/TB	08/08/23 16:40	08/09/23 08:35
23H0444-27	SG-06	Surface Water	AB/TB	08/08/23 17:25	08/09/23 08:35

CERTIFICATE OF ANALYSIS

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Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
LOQ	Limit of Quantitation
LOD	Limit of Detection
J	Estimated result greater than the LOD but less than the LOQ
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: 23H0444-01

Analysis: EPA 200.8 Rev. 5.4

Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pH : The pH was analyzed at 10:47

Trace ID: 23H0444-02

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHb : The pH was analyzed at 10:49

Trace ID: 23H0444-03

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

CERTIFICATE OF ANALYSIS

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pH	Note pHc : The pH was analyzed at 10:50

Trace ID: 23H0444-04

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHd : The pH was analyzed at 10:51

Trace ID: 23H0444-05

Analysis: SM 4500-H+ B-11

pH	Note pHe : The pH was analyzed at 10:52

Trace ID: 23H0444-06

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHf : The pH was analyzed at 10:53

Trace ID: 23H0444-07

Analysis: SM 4500-H+ B-11

pH	Note pHg : The pH was analyzed at 10:54

Trace ID: 23H0444-08

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHh : The pH was analyzed at 10:55

Trace ID: 23H0444-09

Analysis: SM 4500-H+ B-11

pH	Note pHi : The pH was analyzed at 10:57

Trace ID: 23H0444-10

Analysis: SM 4500-H+ B-11

pH	Note pHj : The pH was analyzed at 10:58

Trace ID: 23H0444-11

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHk : The pH was analyzed at 10:59

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Trace ID: 23H0444-12

Analysis: SM 4500-H+ B-11

pH	Note pHl : The pH was analyzed at 11:00

Trace ID: 23H0444-13

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHm : The pH was analyzed at 11:01

Trace ID: 23H0444-14

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHn : The pH was analyzed at 11:02

Trace ID: 23H0444-15

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHo : The pH was analyzed at 11:03

Trace ID: 23H0444-16

Analysis: EPA 200.8 Rev. 5.4

Lead	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.
Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.
pH	Note pHp : The pH was analyzed at 11:05

Trace ID: 23H0444-17

Analysis: SM 4500-H+ B-11

pH	Note pHq : The pH was analyzed at 11:07

Trace ID: 23H0444-18

Analysis: SM 4500-H+ B-11

pH	Note pHr : The pH was analyzed at 11:08

Trace ID: 23H0444-19

Analysis: SM 4500-H+ B-11

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pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHs : The pH was analyzed at 11:09

Trace ID: 23H0444-20

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHt : The pH was analyzed at 11:10

Trace ID: 23H0444-21

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHu : The pH was analyzed at 11:14

Trace ID: 23H0444-22

Analysis: SM 4500-H+ B-11

pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.
pH	Note pHw : The pH was analyzed at 11:16

Trace ID: 23H0444-23

Analysis: SM 4500-H+ B-11

pH	Note pHx : The pH was analyzed at 11:18

Trace ID: 23H0444-24

Analysis: SM 4500-H+ B-11

pH	Note pHy : The pH was analyzed at 11:19

Trace ID: 23H0444-25

Analysis: EPA 200.7 Rev. 4.4

Calcium	Note 605 : The result for this analyte was quantitated from the initial calibration, but is estimated due to the amount found being above the linear range of the calibration curve.

Analysis: EPA 200.8 Rev. 5.4

Thallium	Note 402.5 : The reporting limit was raised due to a dilution required because of sample matrix interference with the internal standards.

Analysis: SM 4500-H+ B-11

pH	Note pHz : The pH was analyzed at 11:20

Trace ID: 23H0444-26

Analysis: SM 4500-H+ B-11

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pH	Note pHaa : The pH was analyzed at 11:21

Trace ID: 23H0444-27

Analysis: SM 4500-H+ B-11

pH	Note pHab : The pH was analyzed at 11:22

Trace ID: T140005-DUP1

Analysis: SM 4500-H+ B-11

pH	Note pHa : The pH was analyzed at 10:48

Trace ID: T140005-DUP2

Analysis: SM 4500-H+ B-11

pH	Note pHv : The pH was analyzed at 11:15

Trace ID: T140107-MS1

Analysis: EPA 200.7 Rev. 4.4

Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Trace ID: T140107-MS2

Analysis: EPA 200.7 Rev. 4.4

Potassium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Trace ID: T140108-MS1

Analysis: EPA 200.7 Rev. 4.4

Potassium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Sodium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-01 | Date Collected: 08/08/23 14:25 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140108										
Boron	**140**	**mg/L**	**0.22**	**25**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.041**
Calcium	**160**	**mg/L**	**6.4**	**25**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.18**
Iron	**0.16**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**3.3**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**96**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**90**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**430**	**mg/L**	**3.1**	**25**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**2.2**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140108										
Antimony	**0.00025**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Arsenic	**0.0017**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.38**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.00035**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0037**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.0016**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00045**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.0010**	**mg/L**	**0.0028**	**5**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00050**
Molybdenum	**0.00082**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00025**
Nickel	**0.0027**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00066**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.00038	mg/L	0.0019	5	08/17/23	bjv	08/18/23	acs	402.5	0.00038
Vanadium	**0.0035**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00062**
Zinc	**0.0012**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-01 | Date Collected: 08/08/23 14:25 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**14**	**mg/L**	**1.0**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.55**
Chloride	**180**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**110**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1400**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**1400**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**2400**	**mg/L**	**40**	**4**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139787										
Total Suspended Solids	**3.0**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.63**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pH**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-02 | Date Collected: 08/08/23 10:25 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140108										
Boron	**99**	**mg/L**	**0.088**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.016**
Calcium	**180**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**20**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**1.4**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**58**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**46**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**310**	**mg/L**	**3.1**	**25**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**2.2**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140108										
Antimony	**0.00018**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0086**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.45**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.00043**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.054**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.0076**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.0018**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.0017**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Molybdenum	**0.0052**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.022**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.0012**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.0049**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00062**
Zinc	**0.0041**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-02 | Date Collected: 08/08/23 10:25 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**9.7**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**130**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**0.93**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**J**	**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**2100**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**2100**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**1900**	**mg/L**	**100**	**10**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139787										
Total Suspended Solids	**16**	**mg/L**	**4.0**	**0.990099**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.13**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**503, pHb**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-03 | Date Collected: 08/07/23 15:20 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140108										
Boron	**4.1**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**350**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**0.28**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.041**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**200**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**18**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**110**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140108										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.00076**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.38**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0053**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00024**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00020**
Lead	<0.00050	mg/L	0.0028	5	08/17/23	bjv	08/18/23	acs	402.5	0.00050
Molybdenum	<0.00025	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00025
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00034**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.00038	mg/L	0.0019	5	08/17/23	bjv	08/18/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-03 | Date Collected: 08/07/23 15:20 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.61**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**170**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**480**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1300**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**1300**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**2300**	**mg/L**	**20**	**2**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139787										
Total Suspended Solids	**3.0**	**mg/L**	**4.0**	**1.010101**	**08/09/23**	**mr**	**08/09/23**	**mr**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.25**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHc**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-04 | Date Collected: 08/07/23 14:00 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140108										
Boron	**4.0**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**330**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**5.0**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.074**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**120**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**23**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**87**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140108										
Antimony	**0.00012**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Arsenic	**0.00088**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.12**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0044**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00062**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	**0.0012**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.019**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00021**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-04 | Date Collected: 08/07/23 14:00 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**160**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**610**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**750**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**750**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**1900**	**mg/L**	**40**	**4**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139787										
Total Suspended Solids	<	mg/L	4.0	1.010101	08/09/23	mr	08/09/23	mr		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.23**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHd**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-05 | Date Collected: 08/08/23 14:30 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140108										
Boron	**9.9**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**230**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**14**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.22**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**90**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**24**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**77**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140108										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.00082**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**1.4**	**mg/L**	**0.012**	**5**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0023**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00067**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	<0.00025	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00025
Nickel	**0.00090**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00065**
Selenium	**0.00019**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.0013**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-05 | Date Collected: 08/08/23 14:30 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**76**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**0.98**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**J**	**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**1200**	**mg/L**	**40**	**4**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139787										
Total Suspended Solids	**37**	**mg/L**	**4.0**	**0.990099**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.16**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHe**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-06 | Date Collected: 08/07/23 14:30 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140108										
Boron	**11**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**120**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**14**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.0042**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**35**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**5.1**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**48**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140108										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.00020**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Barium	**0.34**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.000066**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00032**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00098**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	<0.00025	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00025
Nickel	<0.00065	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00065
Selenium	<0.00010	mg/L	0.00050	1	08/17/23	bjv	08/18/23	acs		0.00010
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-06 | Date Collected: 08/07/23 14:30 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.083**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**J, N**	**0.055**
Chloride	**13**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**19**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**620**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**620**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**620**	**mg/L**	**40**	**4**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139787										
Total Suspended Solids	**41**	**mg/L**	**4.0**	**0.9708738**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**6.87**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHf**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-07 | Date Collected: 08/08/23 12:40 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140108										
Boron	**7.1**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**120**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**13**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.12**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**26**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**12**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**36**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140108										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.029**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**1.2**	**mg/L**	**0.012**	**5**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00087**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00058**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	**0.00036**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00025**
Nickel	**0.0010**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00065**
Selenium	**0.00014**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-07 | Date Collected: 08/08/23 12:40 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**1.0**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**30**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	<0.41	mg/L	3.0	5	08/09/23	ans	08/10/23	ans		0.41
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**530**	**mg/L**	**38**	**3.846154**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**20**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.01**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHg**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-08 | Date Collected: 08/08/23 09:20 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**5.7**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**330**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**16**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.33**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**46**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**17**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**27**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.0024**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.20**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0027**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00075**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00043**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	**0.019**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00026**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-08 | Date Collected: 08/08/23 09:20 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**2.9**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**12**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**450**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**660**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**660**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**1400**	**mg/L**	**42**	**4.166667**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**48**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**6.93**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**503, pHh**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-09 | Date Collected: 08/08/23 11:45 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**28**	**mg/L**	**0.088**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.016**
Calcium	**160**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**3.2**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**1.2**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**58**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**48**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**390**	**mg/L**	**3.1**	**25**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**2.2**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00011**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.28**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.00015**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0085**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00090**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	**0.00012**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0028**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00041**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.0014**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-09 | Date Collected: 08/08/23 11:45 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**7.7**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**430**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**140**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**770**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**770**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**1900**	**mg/L**	**20**	**2**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**2.0**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.55**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHi**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-10 | Date Collected: 08/08/23 16:00 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**7.2**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**240**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**6.7**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.095**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**56**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**14**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**50**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.0019**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.57**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0018**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00061**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.0016**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00017**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0013**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0018**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00021**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.0031**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-10 | Date Collected: 08/08/23 16:00 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.69**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**73**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**1.8**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**J**	**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**800**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**800**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**930**	**mg/L**	**40**	**4**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**6.0**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.29**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHj**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-11 | Date Collected: 08/07/23 16:30 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**0.36**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**95**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**0.064**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.0042**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**19**	**mg/L**	**0.10**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.010**
Potassium	**1.8**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**14**	**mg/L**	**0.12**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00040**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Arsenic	**0.0034**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.053**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	**0.0022**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.000075**
Chromium	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Cobalt	**0.00053**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00094**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00021**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0088**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0035**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00013**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.00095**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00062**
Zinc	**0.010**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-11 | Date Collected: 08/07/23 16:30 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.28**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**22**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**130**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**140**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**420**	**mg/L**	**10**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**0.98**	**mg/L**	**4.0**	**0.9803922**	**08/09/23**	**mr**	**08/09/23**	**mr**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.45**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHk**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-12 | Date Collected: 08/08/23 15:30 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**2.3**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**250**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**4.9**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.045**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**21**	**mg/L**	**0.10**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.010**
Potassium	**11**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**20**	**mg/L**	**0.12**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.030**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.023**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	**0.000089**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.000075**
Chromium	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Cobalt	**0.0023**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.0015**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00032**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.021**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0049**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00016**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.028**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-12 | Date Collected: 08/08/23 15:30 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**5.1**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**27**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**620**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**200**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**200**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**1100**	**mg/L**	**42**	**4.166667**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**7.9**	**mg/L**	**4.0**	**0.990099**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.06**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHI**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-13 | Date Collected: 08/07/23 17:30 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**1.9**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**360**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**15**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.098**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**30**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**17**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**31**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.0073**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.037**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.000072**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00029**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00044**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	**0.013**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	<0.00010	mg/L	0.00050	1	08/17/23	bjv	08/18/23	acs		0.00010
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-13 | Date Collected: 08/07/23 17:30 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**2.2**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**38**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**830**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**330**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**330**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**1600**	**mg/L**	**40**	**4**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**33**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**6.82**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHm**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-14 | Date Collected: 08/07/23 16:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**1.1**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**110**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**16**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.079**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**48**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**13**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**57**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00014**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0017**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.49**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00053**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.0023**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Molybdenum	**0.0051**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0078**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00010**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.025**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-14 | Date Collected: 08/07/23 16:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.23**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**70**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**19**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**460**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**460**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**570**	**mg/L**	**38**	**3.846154**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**37**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.07**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHn**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-15 | Date Collected: 08/07/23 12:55 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**0.44**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**150**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**8.0**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.0093**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**35**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**12**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**80**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.25**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.034**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00083**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00023**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00020**
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	<0.00025	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00025
Nickel	**0.00075**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00065**
Selenium	**0.00022**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.00093**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00062**
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-15 | Date Collected: 08/07/23 12:55 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.41**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**100**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**3.0**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**1100**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**690**	**mg/L**	**37**	**3.703704**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**6.76**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHo**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-16 | Date Collected: 08/08/23 09:20 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**1.8**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**400**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**2.9**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.14**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**100**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**13**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**88**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.00043**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Barium	**0.048**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.013**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.0011**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00050	mg/L	0.0028	5	08/17/23	bjv	08/18/23	acs	402.5	0.00050
Molybdenum	**0.0011**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00025**
Nickel	**0.0011**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00065**
Selenium	**0.00012**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.00038	mg/L	0.0019	5	08/17/23	bjv	08/18/23	acs	402.5	0.00038
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-16 | Date Collected: 08/08/23 09:20 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**1.1**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**98**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**860**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**690**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**690**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**2300**	**mg/L**	**20**	**2.040816**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**5.0**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.09**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**503, pHp**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-17 | Date Collected: 08/08/23 11:30 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**4.8**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**150**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**0.21**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.054**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**38**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**12**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**56**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00012**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.16**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0023**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00018**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	**0.0011**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00025**
Nickel	<0.00065	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00065
Selenium	**0.00015**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-17 | Date Collected: 08/08/23 11:30 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**5.1**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**110**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**100**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**410**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**410**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**860**	**mg/L**	**10**	**1.010101**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**1.0**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**	**J**	
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.85**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHq**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-18 | Date Collected: 08/08/23 13:00 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**3.7**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**130**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**11**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.14**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**28**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**13**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**32**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.00062**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.41**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00031**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00058**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	**0.0046**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.00086**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00065**
Selenium	<0.00010	mg/L	0.00050	1	08/17/23	bjv	08/18/23	acs		0.00010
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.0030**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-18 | Date Collected: 08/08/23 13:00 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**1.6**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**44**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**17**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**440**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**550**	**mg/L**	**40**	**4**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.47**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHr**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-19 | Date Collected: 08/07/23 12:00 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**0.12**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**150**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**8.7**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.0041**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**16**	**mg/L**	**0.10**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.010**
Potassium	**5.1**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**22**	**mg/L**	**0.12**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00015**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0027**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.098**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0059**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00041**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Copper	**0.00079**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00015**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.00052**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00025**
Nickel	**0.0049**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00029**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.00079**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00062**
Zinc	<0.0012	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-19 | Date Collected: 08/07/23 12:00 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.27**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**23**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**1.6**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**J**	**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**480**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**570**	**mg/L**	**38**	**3.846154**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**22**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**6.97**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHs**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-20 | Date Collected: 08/07/23 11:20 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140112										
Mercury	<0.00016	mg/L	0.00020	1	08/21/23	bjv	08/21/23	jma		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**3.6**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**190**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**64**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.26**
Lithium	**0.10**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**26**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**13**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**33**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00015**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.49**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.028**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.0016**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00043**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00091**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Molybdenum	<0.00025	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00025
Nickel	**0.0018**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00027**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.0017**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-20 | Date Collected: 08/07/23 11:20 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139804										
Fluoride	**0.29**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**24**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	<0.41	mg/L	3.0	5	08/09/23	ans	08/10/23	ans		0.41
Analysis Method: SM 2320 B-11										
Batch: T139852										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**970**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**970**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139809										
Total Dissolved Solids	**770**	**mg/L**	**100**	**10**	**08/09/23**	**mr**	**08/09/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**130**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**6.59**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHt**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-21 | Date Collected: 08/07/23 14:00 | Matrix: Ground Water
Sample ID: MWT-04 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140114										
Mercury	<0.00016	mg/L	0.00020	1	08/16/23	fs	08/17/23	fs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**4.0**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**330**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**5.3**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.077**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**120**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**23**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**85**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.00089**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.13**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.0046**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00061**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Lead	<0.00010	mg/L	0.00055	1	08/17/23	bjv	08/18/23	acs		0.00010
Molybdenum	**0.0012**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.019**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00013**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.0030**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-21 | Date Collected: 08/07/23 14:00 | Matrix: Ground Water
Sample ID: MWT-04 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139805										
Fluoride	**1.4**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**160**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**630**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139853										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**740**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**740**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139899										
Total Dissolved Solids	**1900**	**mg/L**	**40**	**4**	**08/10/23**	**mr**	**08/10/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**8.0**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.08**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHu**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-22 | Date Collected: 08/07/23 16:30 | Matrix: Ground Water
Sample ID: MWT-12 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140114										
Mercury	<0.00016	mg/L	0.00020	1	08/16/23	fs	08/17/23	fs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**0.33**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**85**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**0.059**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.0045**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**18**	**mg/L**	**0.10**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.010**
Potassium	**1.8**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**13**	**mg/L**	**0.12**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00040**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Arsenic	**0.0035**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.052**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	**0.0023**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.000075**
Chromium	<0.00020	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00020
Cobalt	**0.00052**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00095**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00022**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0087**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0035**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00014**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.00097**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00062**
Zinc	**0.011**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-22 | Date Collected: 08/07/23 16:30 | Matrix: Ground Water
Sample ID: MWT-12 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139805										
Fluoride	**0.29**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**22**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**130**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139853										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**150**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**150**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139899										
Total Dissolved Solids	**420**	**mg/L**	**20**	**2**	**08/10/23**	**mr**	**08/10/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	<	mg/L	4.0	1	08/09/23	mr	08/09/23	mr		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.37**	**pH Units**		**1**	**08/07/23**	**mj**	**08/09/23**	**com**	**511, pHw**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-23 | Date Collected: 08/08/23 17:05 | Matrix: Surface Water
Sample ID: SG-02 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140114										
Mercury	<0.00016	mg/L	0.00020	1	08/16/23	fs	08/17/23	fs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**6.9**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**170**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**0.48**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.085**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**63**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**21**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**62**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.0011**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Arsenic	**0.0091**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.11**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.00014**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00080**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00057**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.0010**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.0012**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Molybdenum	**0.012**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0040**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.0014**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.0052**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00062**
Zinc	**0.0028**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-23 | Date Collected: 08/08/23 17:05 | Matrix: Surface Water
Sample ID: SG-02 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139805										
Fluoride	**5.1**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**120**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**640**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139853										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**65**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	**19**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Total Alkalinity as CaCO3 at pH 4.5	**83**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139899										
Total Dissolved Solids	**1400**	**mg/L**	**20**	**2.040816**	**08/10/23**	**mr**	**08/10/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**14**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**8.54**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHx**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-24 | Date Collected: 08/08/23 17:15 | Matrix: Surface Water
Sample ID: SG-03 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140114										
Mercury	<0.00016	mg/L	0.00020	1	08/16/23	fs	08/17/23	fs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**7.5**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**180**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**0.48**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.090**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**67**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**22**	**mg/L**	**2.5**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.36**
Sodium	**66**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.0012**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Arsenic	**0.0094**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.13**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.000091**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00069**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00055**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.0010**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00091**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Molybdenum	**0.013**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0039**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.0016**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.0053**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00062**
Zinc	**0.0024**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-24 | Date Collected: 08/08/23 17:15 | Matrix: Surface Water
Sample ID: SG-03 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139805										
Fluoride	**5.0**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**120**	**mg/L**	**7.5**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**6.0**
Sulfate as SO4	**640**	**mg/L**	**30**	**50**	**08/09/23**	**ans**	**08/10/23**	**ans**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T139853										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**69**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	**16**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Total Alkalinity as CaCO3 at pH 4.5	**85**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139899										
Total Dissolved Solids	**1400**	**mg/L**	**20**	**2**	**08/10/23**	**mr**	**08/10/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**16**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**8.51**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHy**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-25 | Date Collected: 08/08/23 16:50 | Matrix: Surface Water
Sample ID: SG-04R | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140114										
Mercury	<0.00016	mg/L	0.00020	1	08/16/23	fs	08/17/23	fs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**5.4**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**580**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**605**	**0.070**
Iron	**0.089**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.084**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**62**	**mg/L**	**0.50**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.10**
Potassium	**21**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**40**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.0011**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Arsenic	**0.0058**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.029**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	**0.000066**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00028**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00083**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Copper	**0.00071**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00054**	**mg/L**	**0.0028**	**5**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00050**
Molybdenum	**0.016**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0041**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.0028**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.00038	mg/L	0.0019	5	08/17/23	bjv	08/18/23	acs	402.5	0.00038
Vanadium	**0.0065**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00062**
Zinc	**0.0019**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-25 | Date Collected: 08/08/23 16:50 | Matrix: Surface Water
Sample ID: SG-04R | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139805										
Fluoride	**5.3**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**38**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**1800**	**mg/L**	**150**	**250**	**08/14/23**	**jlh**	**08/14/23**	**jlh**		**21**
Analysis Method: SM 2320 B-11										
Batch: T139853										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**30**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	**13**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Total Alkalinity as CaCO3 at pH 4.5	**43**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139899										
Total Dissolved Solids	**2700**	**mg/L**	**20**	**2.040816**	**08/10/23**	**mr**	**08/10/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**9.0**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**8.62**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHz**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-26 | Date Collected: 08/08/23 16:40 | Matrix: Surface Water
Sample ID: SG-05 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140114										
Mercury	<0.00016	mg/L	0.00020	1	08/16/23	fs	08/17/23	fs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**0.39**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**34**	**mg/L**	**0.26**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0070**
Iron	**1.1**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.027**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**12**	**mg/L**	**0.10**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.010**
Potassium	**0.79**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**21**	**mg/L**	**0.12**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.088**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	**0.00044**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.16**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	**0.00075**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.000075**
Chromium	**0.0017**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00033**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Copper	**0.0066**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.0095**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Molybdenum	**0.0015**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00025**
Nickel	**0.0026**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00065**
Selenium	**0.00027**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	**0.00069**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00062**
Zinc	**0.019**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-26 | Date Collected: 08/08/23 16:40 | Matrix: Surface Water
Sample ID: SG-05 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139805										
Fluoride	**0.45**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**29**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**11**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139853										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**96**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	**16**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Total Alkalinity as CaCO3 at pH 4.5	**110**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139899										
Total Dissolved Solids	**210**	**mg/L**	**20**	**2.040816**	**08/10/23**	**mr**	**08/10/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139788										
Total Suspended Solids	**73**	**mg/L**	**4.0**	**1**	**08/09/23**	**mr**	**08/09/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**8.92**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHaa**	

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-27 | Date Collected: 08/08/23 17:25 | Matrix: Surface Water
Sample ID: SG-06 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T140114										
Mercury	<0.00016	mg/L	0.00020	1	08/16/23	fs	08/17/23	fs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T140107										
Boron	**0.21**	**mg/L**	**0.0088**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.0016**
Calcium	**69**	**mg/L**	**2.6**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.070**
Iron	**0.55**	**mg/L**	**0.050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.026**
Lithium	**0.0061**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**	**N**	**0.0019**
Magnesium	**21**	**mg/L**	**0.10**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.010**
Potassium	**0.78**	**mg/L**	**0.25**	**1**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.036**
Sodium	**29**	**mg/L**	**1.2**	**10**	**08/17/23**	**bjv**	**08/18/23**	**jma**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T140107										
Antimony	<0.00010	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.00010
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Barium	**0.10**	**mg/L**	**0.0025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	08/17/23	bjv	08/18/23	acs		0.000075
Chromium	**0.00088**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Cobalt	**0.00019**	**mg/L**	**0.00052**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Copper	**0.00089**	**mg/L**	**0.00025**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00020**
Lead	**0.00071**	**mg/L**	**0.00055**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.00010**
Molybdenum	**0.00039**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00025**
Nickel	**0.00084**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00065**
Selenium	**0.00015**	**mg/L**	**0.00050**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**	**J**	**0.00010**
Silver	<0.000050	mg/L	0.000050	1	08/17/23	bjv	08/18/23	acs		0.000050
Thallium	<0.000075	mg/L	0.00038	1	08/17/23	bjv	08/18/23	acs		0.000075
Vanadium	<0.00062	mg/L	0.0012	1	08/17/23	bjv	08/18/23	acs		0.00062
Zinc	**0.0045**	**mg/L**	**0.0012**	**1**	**08/17/23**	**bjv**	**08/18/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23H0444-27 | Date Collected: 08/08/23 17:25 | Matrix: Surface Water
Sample ID: SG-06 | Date Received: 08/09/23 08:35

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T139805										
Fluoride	**0.18**	**mg/L**	**0.10**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**	**N**	**0.055**
Chloride	**53**	**mg/L**	**0.75**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.60**
Sulfate as SO4	**15**	**mg/L**	**3.0**	**5**	**08/09/23**	**ans**	**08/10/23**	**ans**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T139853										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**230**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	08/10/23	aeo	08/11/23	aeo	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**230**	**mg/L**	**5.0**	**1**	**08/10/23**	**aeo**	**08/11/23**	**aeo**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T139899										
Total Dissolved Solids	**380**	**mg/L**	**40**	**4**	**08/10/23**	**mr**	**08/10/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T139888										
Total Suspended Solids	**120**	**mg/L**	**4.0**	**1**	**08/10/23**	**mr**	**08/10/23**	**mr**		
Analysis Method: SM 4500-H+ B-11										
Batch: T140005										
pH	**7.50**	**pH Units**		**1**	**08/08/23**	**mj**	**08/09/23**	**com**	**pHab**	

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QUALITY CONTROL RESULTS

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140112
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T140112-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T140112-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00204	102	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T140112-MSD1

Original: **23H0444-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00206	0.00199	103	100	76-123	3	20	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140114
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T140114-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T140114-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00208	104	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T140114-MSD1

Original: **23H0444-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00206	0.00202	103	101	76-123	2	20	

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Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140107
QC Batch Method: EPA 200.2
Analysis Description: Calcium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T140107-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	**mg/L**	**0.00758**	**0.0088**	**J**
Calcium	mg/L	<0.26	0.26	
Iron	mg/L	<0.050	0.050	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T140107-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.53	96	85-115	
Calcium	mg/L	16.0	15.6	98	85-115	
Iron	mg/L	16.0	14.3	89	85-115	
Potassium	mg/L	16.0	14.7	92	85-115	
Lithium	mg/L	1.60	1.56	97	85-115	
Magnesium	mg/L	16.0	15.0	94	85-115	
Sodium	mg/L	16.0	15.6	97	85-115	

MATRIX SPIKE: T140107-MS1 Original: **23H0444-08**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	5.66	1.60	7.27	101	70-130	
Calcium	**mg/L**	**335**	**16.0**	363	**177**	**70-130**	**243**
Iron	mg/L	15.7	16.0	30.8	94	70-130	
Potassium	mg/L	17.3	16.0	32.4	94	70-130	
Lithium	mg/L	0.330	1.60	2.12	112	70-130	
Magnesium	mg/L	46.4	16.0	60.2	86	70-130	
Sodium	mg/L	27.1	16.0	45.9	117	70-130	

MATRIX SPIKE: T140107-MS2 Original: **23H0444-09**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	28.0	1.60	29.3	86	70-130	

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MATRIX SPIKE: T140107-MS2 Original: **23H0444-09**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Calcium	mg/L	164	16.0	183	121	70-130	
Iron	mg/L	3.22	16.0	18.1	93	70-130	
Potassium	**mg/L**	**47.5**	**16.0**	72.3	**155**	**70-130**	**243**
Lithium	mg/L	1.20	1.60	3.04	116	70-130	
Magnesium	mg/L	57.5	16.0	72.4	93	70-130	
Sodium	**mg/L**	**389**	**16.0**	390	**8**	**70-130**	**243**

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140108
QC Batch Method: EPA 200.2
Analysis Description: Sodium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T140108-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	**mg/L**	**0.00455**	**0.0088**	**J**
Calcium	mg/L	<0.26	0.26	
Iron	mg/L	<0.050	0.050	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T140108-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.59	99	85-115	
Calcium	mg/L	16.0	16.3	102	85-115	
Iron	mg/L	16.0	14.9	93	85-115	
Potassium	mg/L	16.0	15.1	94	85-115	
Lithium	mg/L	1.60	1.62	101	85-115	
Magnesium	mg/L	16.0	15.6	97	85-115	
Sodium	mg/L	16.0	16.1	101	85-115	

MATRIX SPIKE: T140108-MS1 Original: **23H0444-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	mg/L	140	1.60	142	110	70-130	
Calcium	mg/L	158	16.0	173	92	70-130	

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MATRIX SPIKE: T140108-MS1 Original: **23H0444-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	0.158	16.0	14.5	90	70-130	
Potassium	**mg/L**	**90.1**	**16.0**	98.3	**51**	**70-130**	**243**
Lithium	mg/L	3.35	1.60	5.10	109	70-130	
Magnesium	mg/L	95.8	16.0	116	128	70-130	
Sodium	**mg/L**	**433**	**16.0**	459	**163**	**70-130**	**243**

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140107
QC Batch Method: EPA 200.2
Analysis Description: Antimony, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T140107-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Copper	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Nickel	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T140107-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0505	101	85-115	
Arsenic	mg/L	0.100	0.0992	99	85-115	
Barium	mg/L	1.60	1.68	105	85-115	
Beryllium	mg/L	0.200	0.195	97	85-115	
Cadmium	mg/L	0.0500	0.0509	102	85-115	

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LABORATORY CONTROL SAMPLE: T140107-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Cobalt	mg/L	1.60	1.57	98	85-115	
Chromium	mg/L	0.0500	0.0506	101	85-115	
Copper	mg/L	1.60	1.51	95	85-115	
Molybdenum	mg/L	1.60	1.56	97	85-115	
Nickel	mg/L	1.60	1.44	90	85-115	
Lead	mg/L	0.100	0.0962	96	85-115	
Antimony	mg/L	0.100	0.112	112	85-115	
Selenium	mg/L	0.100	0.0945	94	85-115	
Thallium	mg/L	0.100	0.0941	94	85-115	
Vanadium	mg/L	1.60	1.63	102	85-115	
Zinc	mg/L	1.60	1.54	96	85-115	

MATRIX SPIKE: T140107-MS1 Original: **23H0444-08**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0489	98	70-130	
Arsenic	mg/L	0.00243	0.100	0.102	100	70-130	
Barium	mg/L	0.203	1.60	1.94	109	70-130	
Beryllium	mg/L	0	0.200	0.196	98	70-130	
Cadmium	mg/L	0	0.0500	0.0495	99	70-130	
Cobalt	mg/L	0.000747	1.60	1.61	101	70-130	
Chromium	mg/L	0.00265	0.0500	0.0589	113	70-130	
Copper	mg/L	0	1.60	1.46	91	70-130	
Molybdenum	mg/L	0.0194	1.60	1.64	101	70-130	
Nickel	mg/L	0	1.60	1.43	90	70-130	
Lead	mg/L	0	0.100	0.0903	90	70-130	
Antimony	mg/L	0	0.100	0.113	113	70-130	
Selenium	mg/L	0	0.100	0.0892	89	70-130	
Thallium	mg/L	0	0.100	0.0908	91	70-130	
Vanadium	mg/L	0	1.60	1.88	118	70-130	
Zinc	mg/L	0	1.60	1.40	87	70-130	

MATRIX SPIKE: T140107-MS2 Original: **23H0444-09**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0501	100	70-130	
Arsenic	mg/L	0.00106	0.100	0.101	100	70-130	
Barium	mg/L	0.285	1.60	2.01	108	70-130	

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MATRIX SPIKE: T140107-MS2 Original: **23H0444-09**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Beryllium	mg/L	0	0.200	0.213	107	70-130	
Cadmium	mg/L	0	0.0500	0.0485	97	70-130	
Cobalt	mg/L	0.000896	1.60	1.67	104	70-130	
Chromium	mg/L	0.00848	0.0500	0.0642	111	70-130	
Copper	mg/L	0	1.60	1.50	94	70-130	
Molybdenum	mg/L	0.00279	1.60	1.68	105	70-130	
Nickel	mg/L	0	1.60	1.47	92	70-130	
Lead	mg/L	0	0.100	0.0887	89	70-130	
Antimony	mg/L	0	0.100	0.114	114	70-130	
Selenium	mg/L	0.000407	0.100	0.0850	85	70-130	
Thallium	mg/L	0	0.100	0.0879	88	70-130	
Vanadium	mg/L	0	1.60	1.92	120	70-130	
Zinc	mg/L	0	1.60	1.42	89	70-130	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140108
QC Batch Method: EPA 200.2
Analysis Description: Lead, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T140108-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Copper	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Nickel	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

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LABORATORY CONTROL SAMPLE: T140108-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0505	101	85-115	
Arsenic	mg/L	0.100	0.0977	98	85-115	
Barium	mg/L	1.60	1.66	104	85-115	
Beryllium	mg/L	0.200	0.203	101	85-115	
Cadmium	mg/L	0.0500	0.0512	102	85-115	
Cobalt	mg/L	1.60	1.56	97	85-115	
Chromium	mg/L	0.0500	0.0502	100	85-115	
Copper	mg/L	1.60	1.51	95	85-115	
Molybdenum	mg/L	1.60	1.56	98	85-115	
Nickel	mg/L	1.60	1.44	90	85-115	
Lead	mg/L	0.100	0.0965	96	85-115	
Antimony	mg/L	0.100	0.113	113	85-115	
Selenium	mg/L	0.100	0.0943	94	85-115	
Thallium	mg/L	0.100	0.0952	95	85-115	
Vanadium	mg/L	1.60	1.60	100	85-115	
Zinc	mg/L	1.60	1.55	97	85-115	

MATRIX SPIKE: T140108-MS1 Original: **23H0444-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0471	94	70-130	
Arsenic	mg/L	0.00168	0.100	0.0976	96	70-130	
Barium	mg/L	0.379	1.60	2.13	110	70-130	
Beryllium	mg/L	0.000346	0.200	0.209	104	70-130	
Cadmium	mg/L	0	0.0500	0.0485	97	70-130	
Cobalt	mg/L	0.00157	1.60	1.63	102	70-130	
Chromium	mg/L	0.00372	0.0500	0.0594	111	70-130	
Copper	mg/L	0	1.60	1.47	92	70-130	
Molybdenum	mg/L	0	1.60	1.68	105	70-130	
Nickel	mg/L	0.00273	1.60	1.43	89	70-130	
Lead	mg/L	0.00101	0.100	0.0906	90	70-130	
Antimony	mg/L	0	0.100	0.118	118	70-130	
Selenium	mg/L	0.000662	0.100	0.0730	72	70-130	
Thallium	mg/L	0	0.100	0.0885	89	70-130	
Vanadium	mg/L	0.00349	1.60	1.86	116	70-130	
Zinc	mg/L	0	1.60	1.38	86	70-130	

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Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139804
QC Batch Method: IC Prep W

Analysis Description: Chloride
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T139804-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<0.60	0.60	

LABORATORY CONTROL SAMPLE: T139804-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	4.84	97	90-110	
Fluoride	mg/L	1.00	1.09	109	90-110	
Sulfate as SO4	mg/L	5.00	5.06	101	90-110	

MATRIX SPIKE: T139804-MS1 Original: **23H0444-06**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	13.4	25.0	37.8	97	80-120	
Fluoride	mg/L	0.0828	5.00	5.28	104	80-120	
Sulfate as SO4	mg/L	18.7	25.0	44.2	102	80-120	

MATRIX SPIKE: T139804-MS2 Original: **23H0444-07**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	29.7	25.0	54.8	100	80-120	
Fluoride	mg/L	1.04	5.00	6.64	112	80-120	
Sulfate as SO4	mg/L	0	25.0	23.8	95	80-120	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139805
QC Batch Method: IC Prep W

Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T139805-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	

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METHOD BLANK: T139805-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<0.60	0.60	

LABORATORY CONTROL SAMPLE: T139805-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	4.84	97	90-110	
Fluoride	mg/L	1.00	1.09	109	90-110	
Sulfate as SO4	mg/L	5.00	5.06	101	90-110	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140026
QC Batch Method: IC Prep W
Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T140026-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Sulfate as SO4	mg/L	<1.0	1.0	

LABORATORY CONTROL SAMPLE: T140026-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Sulfate as SO4	mg/L	5.00	5.08	102	90-110	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139852
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T139852-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	92.9	93	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	92.9	93	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	92.9	93	88-112	

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SAMPLE DUPLICATE: T139852-DUP1 Original: **23H0444-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	1450	1420	2	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	1450	1420	2	20	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139853
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T139853-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	92.9	93	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	92.9	93	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	92.9	93	88-112	

SAMPLE DUPLICATE: T139853-DUP1 Original: **23H0444-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	743	756	2	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	743	756	2	20	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139809
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T139809-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

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LABORATORY CONTROL SAMPLE: T139809-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	482	96	80-120	

SAMPLE DUPLICATE: T139809-DUP1 Original: **23H0444-11**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	420	432	3	10	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139899
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T139899-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T139899-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	488	98	80-120	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139787
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T139787-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	**mg/L**	**0.500**	**4.0**	**J**

LABORATORY CONTROL SAMPLE: T139787-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	200	190	95	85-115	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T139788
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T139788-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T139788-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	200	190	95	85-115	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T139888
QC Batch Method: SM 2540 D-15

Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T139888-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T139888-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	86.0	86	85-115	

SAMPLE DUPLICATE: T139888-DUP1 Original: **23H0444-27**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Suspended Solids	mg/L	117	124	6	10	

Trace Project ID: 23H0444
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T140005
QC Batch Method: *** DEFAULT PREP ***

Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T140005-DUP1 Original: **23H0444-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.63**	**7.65**	**0.3**	**20**	**pHa**

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SAMPLE DUPLICATE: T140005-DUP2 Original: **23H0444-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	**pH Units**	**7.08**	**7.18**	**1**	**20**	**pHv**

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Page 1 of 3

Trace ID No. 23H0444

Report Results To:

Company Name: HDR Inc.
Report To: Molly Reeves
Mailing Address: 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Office Phone:
Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com

Bill To:

PO #: 10337505.006
Contact Name: Lara Zawaideh
Billing Address (if different): 1000 Oakbrook Drive, Suite 200
City, State, Zip Code: Ann Arbor, MI 48104
Phone Number: 734.223.9074
Billing Email Address: lara.zawaideh@hdrinc.com

Trace Use:

Logged By: MJ
Checked By: BV
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Andrew Byks / Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)								Remarks/Notes	Possible Health Hazards?
1	8/8/23	1425	MW-01R	N	GW	6	6	5							1	X	X	X	X									
2	8/8/23	1025	MW-02	N	GW	6	6	5							1	X	X	X	X									
3	8/7/23	1520	MW-03	N	GW	6	6	5							1	X	X	X	X									
4	8/7/23	1400	MW-04	N	GW	6	6	5							1	X	X	X	X									
5	8/8/23	1430	MW-06	N	GW	6	6	5							1	X	X	X	X									
6	8/7/23	1430	MW-07	N	GW	6	6	5							1	X	X	X	X									
7	8/8/23	1240	MW-08	N	GW	6	6	5							1	X	X	X	X									
8	8/8/23	920	MW-09	N	GW	6	6	5							1	X	X	X	X									
9	8/8/23	1145	MW-10	N	GW	6	6	5							1	X	X	X	X									
10	8/8/23	1600	MW-11	N	GW	6	6	5							1	X	X	X	X									

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
1) Andrew Byks	Beverly [illegible]	8/9/23	8:35	2)			
3)				4)			

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- [ ] Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

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CHAIN-OF-CUSTODY RECORD

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Trace ID No. 23H0444

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	Cell Phone: 734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By:	MJ
Checked By:	BV
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air, DW = Drinking Water, WI = Wipes, U = Unknown, GW = Groundwater, S = Solid, LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	Remarks/Notes	Possible Health Hazards?
11	8/7/23	1630	MW-12	N	GW	6	6	S							1	X	X	X	X		
12	8/8/23	1530	MW-18	N	GW	6	6	S							1	X	X	X	X		
13	8/7/23	1730	MW-19	N	GW	6	6	S							1	X	X	X	X		
14	8/7/23	1600	MW-20	N	GW	6	6	S							1	X	X	X	X		
15	8/7/23	1255	MW-27	N	GW	6	6	S							1	X	X	X	X		
16	8/8/23	920	MW-30	N	GW	6	6	S							1	X	X	X	X		
17	8/8/23	1130	MW-31	N	GW	6	6	S							1	X	X	X	X		
18	8/8/23	1300	MW-32	N	GW	6	6	S							1	X	X	X	X		
19	8/7/23	1200	MW-33	N	GW	6	6	S							1	X	X	X	X		
20	8/7/23	1120	MW-34	N	GW	6	6	S							1	X	X	X	X		

Please Sign

Released By	Received By	Date	Time	Released By	Received By	Date	Time
1) Ann J Br	Beverly Ｓ/C	8/9/23	8:35	2)			
3)				4)			

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Form 70-Z.2

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231-773-5998 Phone
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TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Page 3 of 3

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23H0444

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	Cell Phone: 734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By:	MJ
Checked By:	BV
Soil Volatiles Preserved (circle if applicable):	MeOH Low Level Lab
Sample Collection Time (Hrs):	

Requested Turnaround Times (TAT)

- [x] Standard: 5-10 Business days
- [ ] 3 Business Days*
- [ ] 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island

Sampled By (print):

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)							Remarks/Notes	Possible Health Hazards?
21	8/7/23	1400	MWT-04	N	GW	6	6	5							1	X	X	X	X								
22	8/7/23	1630	MWT-12	N	GW	6	6	5							1	X	X	X	X								
23	8/8/23	1705	SG-02	N	SW	6	6	5							1	X	X	X	X								
24	8/8/23	1715	SG-03	N	SW	6	6	5							1	X	X	X	X								
25	8/8/23	1650	SG-04R	N	SW	6	6	5							1	X	X	X	X								
26	8/8/23	1640	SG-05	N	SW	6	6	5							1	X	X	X	X								
27	8/8/23	1725	SG-06	N	SW	6	6	5							1	X	X	X	X								

Analysis Requested

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) [signature]	Beverly Vogel	8/9/23	8:35	2)			
	3)				4)			

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23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 8/9/23									
Time: 9:05									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.3	-0.1			✓				
Representative Sample Temp °C	8.4	8.8			✓				✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace HNO3 added 8/9/23 @ 9:30
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

Points: 21, 03, 20, 04

Form 7O-A.51
Effective 8/48/23

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888-979-4469 Fax
www.trace-labs.com

23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 8/9/23									
Time: 9:25									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	1.3	0.9			✓				
Representative Sample Temp °C	11.9	11.5			✓				✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [x] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace HNO3 added 8/9/23 @ 9:40
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

Points: 15, 19, 11, ~~20~~ 22 CM 8/9

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23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 8/9/23									
Time: 9:50									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.3	-0.1			✓				
Representative Sample Temp °C	6.3	5.9			✓				✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace HNO3 added 8/9/23 @ 10:00
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

Points: 09, 02, 08

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23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 8/9/23									
Time: 16:09									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	-0.2	-0.6			✓				
Representative Sample Temp °C	14.2	13.8			✓				✓

Sample Receipt

Yes No
- [✓] [ ] Received on ice or other coolant
- [✓] [ ] Ice still present upon receipt
- [ ] [✓] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [✓] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [✓] [ ] [ ] All sample containers arrived unbroken and labeled
- [✓] [ ] [ ] Sufficient sample to run requested analyses
- [✓] [ ] [ ] Correct chemical preservative added to samples
- [✓] [ ] [ ] Samples preserved at Trace HNO3 added 8/9/23 @ 10:15
- [✓] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [✓] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [✓] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [✓] [ ] All bottle labels agree with COC
- [✓] [ ] COC filled out properly
- [✓] [ ] COC signed by client

Notes:

Points: 07, 01, 12

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888-979-4469 Fax
www.trace-labs.com

23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 08/09/2023									
Time: 9:31									
Logged by: CH									
Package Description: Cooler									
Package Temp °C	4.8	4.4			/				
Representative Sample Temp °C	13.7	13.3			/				/

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☐	☑	☐	Samples preserved at Trace
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☑	☐	All bottle labels agree with COC
☑	☐	COC filled out properly
☑	☐	COC signed by client

Notes:

Points: ~~04R, 05, 06~~ CH 8/9 25, 26, 27

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888-979-4469 Fax
www.trace-labs.com

23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 08/09/2023									
Time: 9:42									
Logged by: CL									
Package Description: Cooler									
Package Temp °C	0.5	0.1							
Representative Sample Temp °C	9.1	8.7							

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace HNO3 added @ 9:51, 8/9/23
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

Points: 06, 13, 14, 16

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888-979-4469 Fax
www.trace-labs.com

23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 08/09/2023									
Time: 9:24									
Logged by: CM									
Package Description: Cooler									
Package Temp °C	1.5	1.1			✓				
Representative Sample Temp °C	14.1	13.7			✓				✓

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Trace Courier ☑ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
	✓		Samples preserved at Trace
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

Points: ~~02, 03~~ SM 8/16 23, 24

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Effective 8/48/23

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888-979-4469 Fax
www.trace-labs.com

23H0444
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 08/09/2023									
Time: 9:05									
Logged by: CM									
Package Description: Cooler									
Package Temp °C	0.6	0.2			/				
Representative Sample Temp °C	13.9	13.5			/				/

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [ ] Trace Courier [x] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [x] [ ] [ ] Samples preserved at Trace HNO3 added @ 9:22, 8/9/23
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

Points: ~~6, 11, 31, 32~~ CM 8/9 05, 10, 17, 18

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eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Jon Mink
Trace Analytical Laboratories
2241 Black Creek Road
Muskegon MI 49444

Generated 9/14/2023 5:08 PM

JOB DESCRIPTION

23H0448 - Harbor Island

JOB NUMBER

810-73371-1

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend IN 46617

See page two for job notes and contact information.

my EOL

Eurofins Eaton Analytical South Bend

Job Notes

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Authorization

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9/14/2023 5:08 PM

Authorized for release by
Karen Fullmer, Project Manager
Karen.Fullmer@et.eurofinsus.com
574 233-4777

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Definitions/Glossary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Qualifiers

Rad

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job Narrative
810-73371-1

Receipt
The samples were received on 8/10/2023 11:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice.

Gas Flow Proportional Counter
Method 903.0: Radium-226 Prep Batch 160-624323The following samples were prepared at a reduced aliquot due to Matrix: MW-30 (810-73371-16), MW-31 (810-73371-17), MW-32 (810-73371-18) and MW-33 (810-73371-19). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method 903.0: Radium-226 Prep Batch 160-624323Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-34 (810-73371-20). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method 903.0: Radium-226 prep batch 160-624323:The laboratory control sample duplicate (LCSD) recovered at 87% which is outside the 90-110 limits. The laboratory control sample (LCS) was within the 90-110 QC limits. Additionally the primary purpose of the LCSD is to demonstrate method precision. The RER/RPD between the LCS/LCSD passed. Original results will be qualified and reported. (LCSD 160-624323/3-A)

Method 903.0: Radium-226 prep batch 160-624323:Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-30 (810-73371-16), MW-31 (810-73371-17), MW-32 (810-73371-18), MW-33 (810-73371-19), MW-34 (810-73371-20), (LCS 160-624323/2-A), (LCSD 160-624323/3-A) and (MB 160-624323/1-A)

Method 903.0: Radium-226 prep batch 160-624325:Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MWT-04 (810-73371-21), MWT-12 (810-73371-22), SG-02 (810-73371-23), SG-03 (810-73371-24), SG-04R (810-73371-25), SG-05 (810-73371-26), SG-06 (810-73371-27), (LCS 160-624325/2-A), (MB 160-624325/1-A), (380-58521-A-1-A) and (380-58521-A-1-F DU)

Method 903.0: Radium-226 prep batch 160-624483:Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date. MW-01R (810-73371-1), MW-02 (810-73371-2), MW-03 (810-73371-3), MW-04 (810-73371-4), MW-06 (810-73371-5), MW-07 (810-73371-6), MW-08 (810-73371-7), MW-09 (810-73371-8), MW-10 (810-73371-9), MW-11 (810-73371-10), MW-12 (810-73371-11), MW-18 (810-73371-12), MW-19 (810-73371-13), MW-20 (810-73371-14), MW-27 (810-73371-15), (LCS 160-624483/2-A), (MB 160-624483/1-A), (380-58734-B-1-A) and (380-58734-C-1-A DU)

Method 904.0: Radium-228 Prep Batch 160-624324The following samples were prepared at a reduced aliquot due to Matrix: MW-30 (810-73371-16), MW-31 (810-73371-17), MW-32 (810-73371-18) and MW-33 (810-73371-19). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead of a sample duplicate (DUP) to demonstrate batch precision.

Method 904.0: Radium-228 Prep Batch 160-624324Insufficient sample volume was available to perform a sample duplicate for the following samples: MW-34 (810-73371-20). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

Method 904.0: Radium-228 batch 624324Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-30 (810-73371-16), MW-31 (810-73371-17), MW-32 (810-73371-18), MW-33 (810-73371-19), MW-34 (810-73371-20), (LCS 160-624324/2-A), (LCSD 160-624324/3-A) and (MB 160-624324/1-A)

Method 904.0: Radium-228 batch 624326Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MWT-04 (810-73371-21), MWT-12 (810-73371-22), SG-02 (810-73371-23), SG-03 (810-73371-24), SG-04R (810-73371-25), SG-05 (810-73371-26), SG-06 (810-73371-27), (LCS 160-624326/2-A), (MB 160-624326/1-A), (380-58521-A-1-C) and (380-58521-A-1-D DU)

Method 904.0: Radium-228 batch 624485The detection goal was not met for the following sample(s). Samples were prepped at a reduced volume due to the presence of matrix interferences: MW-02 (810-73371-2) and MW-08 (810-73371-7). Analytical results are reported with the detection limit achieved.

Method 904.0: Radium-228 batch 624485Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative. Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.MW-01R (810-73371-1), MW-02 (810-73371-2), MW-03 (810-73371-3), MW-04 (810-73371-4), MW-06 (810-73371-5), MW-07 (810-73371-6), MW-08 (810-73371-7), MW-09 (810-73371-8), MW-10 (810-73371-9), MW-11 (810-73371-10), MW-12 (810-73371-11), MW-18 (810-73371-12), MW-19 (810-73371-13), MW-20 (810-73371-14), MW-27 (810-73371-15), (LCS 160-624485/2-A), (MB 160-624485/1-A), (380-58734-B-1-B) and (380-58734-C-1-B DU)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

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No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-01R

Date Collected: 08/08/23 14:25
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-1

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.152		0.100	0.101	1.00	0.130	pCi/L	08/17/23 10:33	09/08/23 07:14	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	87.2		30 - 110	08/17/23 10:33	09/08/23 07:14	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.11		0.574	0.583	1.00	0.804	pCi/L	08/17/23 10:40	08/31/23 11:28	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	87.2		30 - 110	08/17/23 10:40	08/31/23 11:28	1
Y Carrier	80.0		30 - 110	08/17/23 10:40	08/31/23 11:28	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.26		0.583	0.592	5.00	0.804	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-02

Date Collected: 08/08/23 10:25
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-2

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.743		0.237	0.247	1.00	0.208	pCi/L	08/17/23 10:33	09/08/23 07:14	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	89.2		30 - 110	08/17/23 10:33	09/08/23 07:14	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.71	G	0.782	0.798	1.00	1.03	pCi/L	08/17/23 10:40	08/31/23 11:28	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	89.2		30 - 110	08/17/23 10:40	08/31/23 11:28	1
Y Carrier	81.5		30 - 110	08/17/23 10:40	08/31/23 11:28	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	2.45		0.817	0.835	5.00	1.03	pCi/L		09/13/23 16:43	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-03

Lab Sample ID: 810-73371-3

Date Collected: 08/07/23 15:20
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.417**		0.154	0.158	1.00	0.153	pCi/L	08/17/23 10:33	09/08/23 07:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.0*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:14*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.579	U	0.489	0.492	1.00	0.763	pCi/L	08/17/23 10:40	08/31/23 11:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.0*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:28*	*1*
Y Carrier	*82.6*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:28*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.996**		0.513	0.517	5.00	0.763	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-04

Lab Sample ID: 810-73371-4

Date Collected: 08/07/23 14:00
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.152**		0.108	0.109	1.00	0.151	pCi/L	08/17/23 10:33	09/08/23 07:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.5*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:14*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.14**		0.625	0.634	1.00	0.892	pCi/L	08/17/23 10:40	08/31/23 11:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.5*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:36*	*1*
Y Carrier	*72.5*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:36*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.29**		0.634	0.643	5.00	0.892	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-06

Lab Sample ID: 810-73371-5

Date Collected: 08/08/23 14:30
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.465**		0.147	0.153	1.00	0.122	pCi/L	08/17/23 10:33	09/08/23 07:15	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.2*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:15*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.473	U	0.460	0.462	1.00	0.735	pCi/L	08/17/23 10:40	08/31/23 11:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.2*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:36*	*1*
Y Carrier	*77.4*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:36*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.938**		0.483	0.487	5.00	0.735	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-07

Lab Sample ID: 810-73371-6

Date Collected: 08/07/23 14:30
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.665**		0.180	0.190	1.00	0.129	pCi/L	08/17/23 10:33	09/08/23 07:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.5*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:16*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.70**		0.630	0.649	1.00	0.776	pCi/L	08/17/23 10:40	08/31/23 11:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.5*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:36*	*1*
Y Carrier	*78.9*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:36*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**2.36**		0.655	0.676	5.00	0.776	pCi/L		09/13/23 16:43	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-08

Lab Sample ID: 810-73371-7

Date Collected: 08/08/23 12:40
Date Received: 08/10/23 11:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.358		0.139	0.142	1.00	0.127	pCi/L	08/17/23 10:33	09/08/23 07:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.0*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:16*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.74	G	0.750	0.767	1.00	1.01	pCi/L	08/17/23 10:40	08/31/23 11:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.0*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*
Y Carrier	*75.5*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	2.10		0.763	0.780	5.00	1.01	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-09

Lab Sample ID: 810-73371-8

Date Collected: 08/08/23 09:20
Date Received: 08/10/23 11:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0113	U	0.0818	0.0818	1.00	0.163	pCi/L	08/17/23 10:33	09/08/23 07:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.2*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:16*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0692	U	0.425	0.425	1.00	0.821	pCi/L	08/17/23 10:40	08/31/23 11:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.2*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*
Y Carrier	*80.7*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.0113	U	0.433	0.433	5.00	0.821	pCi/L		09/13/23 16:43	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-10

Lab Sample ID: 810-73371-9

Date Collected: 08/08/23 11:45
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0905	U	0.0916	0.0919	1.00	0.142	pCi/L	08/17/23 10:33	09/08/23 07:16	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.0*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:16*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.634	U	0.486	0.490	1.00	0.736	pCi/L	08/17/23 10:40	08/31/23 11:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.0*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*
Y Carrier	*79.3*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.724	U	0.495	0.499	5.00	0.736	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-11

Lab Sample ID: 810-73371-10

Date Collected: 08/08/23 16:00
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.409**		0.156	0.160	1.00	0.169	pCi/L	08/17/23 10:33	09/08/23 07:20	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:20*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.35**		0.560	0.574	1.00	0.721	pCi/L	08/17/23 10:40	08/31/23 11:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*
Y Carrier	*83.0*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:37*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.76**		0.581	0.596	5.00	0.721	pCi/L		09/13/23 16:43	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-12

Lab Sample ID: 810-73371-11

Date Collected: 08/07/23 16:30
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0384	U	0.0607	0.0608	1.00	0.106	pCi/L	08/17/23 10:33	09/08/23 07:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.5*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:21*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.504	U	0.380	0.382	1.00	0.578	pCi/L	08/17/23 10:40	08/31/23 11:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.5*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:32*	*1*
Y Carrier	*80.4*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:32*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.542	U	0.385	0.387	5.00	0.578	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-18

Lab Sample ID: 810-73371-12

Date Collected: 08/08/23 15:30
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0175	U	0.0549	0.0550	1.00	0.105	pCi/L	08/17/23 10:33	09/08/23 07:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.5*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:21*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.713**		0.434	0.439	1.00	0.639	pCi/L	08/17/23 10:40	08/31/23 11:32	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.5*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:32*	*1*
Y Carrier	*77.0*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:32*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**0.730**		0.437	0.442	5.00	0.639	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-19

Lab Sample ID: 810-73371-13

Date Collected: 08/07/23 17:30
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.179		0.108	0.109	1.00	0.147	pCi/L	08/17/23 10:33	09/08/23 07:21	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.5		30 - 110	08/17/23 10:33	09/08/23 07:21	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.993		0.477	0.486	1.00	0.670	pCi/L	08/17/23 10:40	08/31/23 11:32	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.5		30 - 110	08/17/23 10:40	08/31/23 11:32	1
Y Carrier	78.5		30 - 110	08/17/23 10:40	08/31/23 11:32	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.17		0.489	0.498	5.00	0.670	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-20

Lab Sample ID: 810-73371-14

Date Collected: 08/07/23 16:00
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.118		0.0797	0.0804	1.00	0.109	pCi/L	08/17/23 10:33	09/08/23 07:21	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	89.7		30 - 110	08/17/23 10:33	09/08/23 07:21	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.958		0.480	0.488	1.00	0.686	pCi/L	08/17/23 10:40	08/31/23 11:32	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	89.7		30 - 110	08/17/23 10:40	08/31/23 11:32	1
Y Carrier	80.7		30 - 110	08/17/23 10:40	08/31/23 11:32	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.08		0.487	0.495	5.00	0.686	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-27

Lab Sample ID: 810-73371-15

Date Collected: 08/07/23 12:55
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.477		0.169	0.174	1.00	0.182	pCi/L	08/17/23 10:33	09/08/23 07:21	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	84.0		30 - 110	08/17/23 10:33	09/08/23 07:21	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.28		0.588	0.600	1.00	0.782	pCi/L	08/17/23 10:40	08/31/23 11:32	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	84.0		30 - 110	08/17/23 10:40	08/31/23 11:32	1
Y Carrier	79.6		30 - 110	08/17/23 10:40	08/31/23 11:32	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.76		0.612	0.625	5.00	0.782	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-30

Lab Sample ID: 810-73371-16

Date Collected: 08/08/23 09:20
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0911	U *	0.101	0.101	1.00	0.163	pCi/L	08/16/23 09:56	09/07/23 07:42	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	83.7		30 - 110	08/16/23 09:56	09/07/23 07:42	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.820		0.535	0.540	1.00	0.787	pCi/L	08/16/23 10:00	08/29/23 12:35	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	83.7		30 - 110	08/16/23 10:00	08/29/23 12:35	1
Y Carrier	78.1		30 - 110	08/16/23 10:00	08/29/23 12:35	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.911		0.544	0.549	5.00	0.787	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-31

Lab Sample ID: 810-73371-17

Date Collected: 08/08/23 11:30
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.262	*	0.122	0.124	1.00	0.138	pCi/L	08/16/23 09:56	09/07/23 09:34	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	87.0		30 - 110	08/16/23 09:56	09/07/23 09:34	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.970		0.545	0.552	1.00	0.773	pCi/L	08/16/23 10:00	08/29/23 12:35	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	87.0		30 - 110	08/16/23 10:00	08/29/23 12:35	1
Y Carrier	78.1		30 - 110	08/16/23 10:00	08/29/23 12:35	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.23		0.558	0.566	5.00	0.773	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-32

Lab Sample ID: 810-73371-18

Date Collected: 08/08/23 13:00
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.403	*	0.144	0.148	1.00	0.137	pCi/L	08/16/23 09:56	09/07/23 09:34	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	88.2		30 - 110	08/16/23 09:56	09/07/23 09:34	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.582	U	0.533	0.535	1.00	0.848	pCi/L	08/16/23 10:00	08/29/23 12:35	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	88.2		30 - 110	08/16/23 10:00	08/29/23 12:35	1
Y Carrier	78.9		30 - 110	08/16/23 10:00	08/29/23 12:35	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.985		0.552	0.555	5.00	0.848	pCi/L		09/13/23 16:43	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-33

Lab Sample ID: 810-73371-19

Date Collected: 08/07/23 12:00
Date Received: 08/10/23 11:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.276	*	0.141	0.143	1.00	0.186	pCi/L	08/16/23 09:56	09/07/23 09:34	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.0		30 - 110	08/16/23 09:56	09/07/23 09:34	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.875		0.537	0.543	1.00	0.786	pCi/L	08/16/23 10:00	08/29/23 12:35	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	91.0		30 - 110	08/16/23 10:00	08/29/23 12:35	1
Y Carrier	77.8		30 - 110	08/16/23 10:00	08/29/23 12:35	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.15		0.555	0.562	5.00	0.786	pCi/L		09/13/23 16:43	1

Client Sample ID: MW-34

Lab Sample ID: 810-73371-20

Date Collected: 08/07/23 11:20
Date Received: 08/10/23 11:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.637	*	0.194	0.202	1.00	0.152	pCi/L	08/16/23 09:56	09/07/23 09:34	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	83.0		30 - 110	08/16/23 09:56	09/07/23 09:34	1

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.600	U	0.546	0.548	1.00	0.862	pCi/L	08/16/23 10:00	08/29/23 12:36	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	83.0		30 - 110	08/16/23 10:00	08/29/23 12:36	1
Y Carrier	75.5		30 - 110	08/16/23 10:00	08/29/23 12:36	1

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.24		0.579	0.584	5.00	0.862	pCi/L		09/13/23 16:43	1

Client Sample ID: MWT-04

Lab Sample ID: 810-73371-21

Date Collected: 08/07/23 14:00
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.301**		0.131	0.134	1.00	0.134	pCi/L	08/16/23 10:01	09/07/23 09:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.5*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.890**		0.564	0.570	1.00	0.832	pCi/L	08/16/23 10:10	08/31/23 11:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*88.5*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:46*	*1*
Y Carrier	*78.9*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:46*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	**1.19**		0.579	0.586	5.00	0.832	pCi/L		09/13/23 16:43	1

Client Sample ID: MWT-12

Lab Sample ID: 810-73371-22

Date Collected: 08/07/23 16:30
Matrix: Ground Water
Date Received: 08/10/23 11:00

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0899	U	0.0733	0.0738	1.00	0.106	pCi/L	08/16/23 10:01	09/07/23 09:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.7*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0251	U	0.337	0.337	1.00	0.623	pCi/L	08/16/23 10:10	08/31/23 11:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.7*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:46*	*1*
Y Carrier	*77.0*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:46*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.115	U	0.345	0.345	5.00	0.623	pCi/L		09/13/23 16:43	1

Client Sample ID: SG-02

Lab Sample ID: 810-73371-23

Date Collected: 08/08/23 17:05
Date Received: 08/10/23 11:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.329		0.147	0.150	1.00	0.164	pCi/L	08/16/23 10:01	09/07/23 09:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*81.7*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.954		0.574	0.580	1.00	0.824	pCi/L	08/16/23 10:10	08/31/23 11:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*81.7*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*
Y Carrier	*78.9*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	1.28		0.593	0.599	5.00	0.824	pCi/L		09/13/23 16:43	1

Client Sample ID: SG-03

Lab Sample ID: 810-73371-24

Date Collected: 08/08/23 17:15
Date Received: 08/10/23 11:00

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.253		0.132	0.134	1.00	0.161	pCi/L	08/16/23 10:01	09/07/23 09:36	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.0*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:36*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.716	U	0.548	0.552	1.00	0.842	pCi/L	08/16/23 10:10	08/31/23 11:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.0*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*
Y Carrier	*77.8*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.969		0.564	0.568	5.00	0.842	pCi/L		09/13/23 16:43	1

Client Sample ID: SG-04R

Date Collected: 08/08/23 16:50
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-25

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.126	U	0.0961	0.0967	1.00	0.133	pCi/L	08/16/23 10:01	09/07/23 09:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.2*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:37*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.166	U	0.442	0.442	1.00	0.788	pCi/L	08/16/23 10:10	08/31/23 11:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.2*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*
Y Carrier	*77.4*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.292	U	0.452	0.452	5.00	0.788	pCi/L		09/13/23 16:43	1

Client Sample ID: SG-05

Date Collected: 08/08/23 16:40
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-26

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0576	U	0.0855	0.0857	1.00	0.147	pCi/L	08/16/23 10:01	09/07/23 09:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:37*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.389	U	0.493	0.495	1.00	0.820	pCi/L	08/16/23 10:10	08/31/23 11:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*79.4*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*
Y Carrier	*78.5*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.446	U	0.500	0.502	5.00	0.820	pCi/L		09/13/23 16:43	1

Client Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: SG-06

Date Collected: 08/08/23 17:25
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-27

Matrix: Ground Water

Method: EPA 903.0 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.131	U	0.112	0.112	1.00	0.160	pCi/L	08/16/23 10:01	09/07/23 09:37	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*70.2*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:37*	*1*

Method: EPA 904.0 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.315	U	0.537	0.538	1.00	0.926	pCi/L	08/16/23 10:10	08/31/23 11:47	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*70.2*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*
Y Carrier	*78.9*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:47*	*1*

Method: TAL-STL Ra226_Ra228 Pos - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium 226 and 228	0.446	U	0.549	0.550	5.00	0.926	pCi/L		09/13/23 16:43	1

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-01R — Lab Sample ID: 810-73371-1

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.26		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-02 — Lab Sample ID: 810-73371-2

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	2.45		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-03 — Lab Sample ID: 810-73371-3

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.996		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-04 — Lab Sample ID: 810-73371-4

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.29		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-06 — Lab Sample ID: 810-73371-5

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.938		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-07 — Lab Sample ID: 810-73371-6

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	2.36		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-08 — Lab Sample ID: 810-73371-7

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	2.10		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-09 — Lab Sample ID: 810-73371-8

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.0113	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-10 — Lab Sample ID: 810-73371-9

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.724	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-11 — Lab Sample ID: 810-73371-10

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.76		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-12 — Lab Sample ID: 810-73371-11

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.542	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-18 — Lab Sample ID: 810-73371-12

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.730		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-19 — Lab Sample ID: 810-73371-13

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.17		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-20 — Lab Sample ID: 810-73371-14

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.08		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-27 — Lab Sample ID: 810-73371-15

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.76		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-30 — Lab Sample ID: 810-73371-16

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.911		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-31 — Lab Sample ID: 810-73371-17

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.23		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-32 — Lab Sample ID: 810-73371-18

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.985		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-33 — Lab Sample ID: 810-73371-19

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.15		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MW-34 — Lab Sample ID: 810-73371-20

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.24		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MWT-04 — Lab Sample ID: 810-73371-21

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.19		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: MWT-12 — Lab Sample ID: 810-73371-22

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.115	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: SG-02 — Lab Sample ID: 810-73371-23

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	1.28		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: SG-03 — Lab Sample ID: 810-73371-24

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.969		pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: SG-04R — Lab Sample ID: 810-73371-25

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.292	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Action Limit Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: SG-05 — Lab Sample ID: 810-73371-26

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.446	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Client Sample ID: SG-06 — Lab Sample ID: 810-73371-27

Compliance Check

The results obtained from the analytical testing of this data set were checked against compliance limits received from the client. Any results at or above the compliance limits have been highlighted for your convenience.

Analyte	Result	Qualifier	Unit	EPAMCL Limit	RL	Method	Prep Type
Radium 226 and 228	0.446	U	pCi/L	5	5.00	Ra226_Ra228 Pos	Total/NA

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Method: 903.0 - Radium-226 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Ba (30-110)							
LCS 160-624323/2-A	Lab Control Sample	92.5							
LCS 160-624325/2-A	Lab Control Sample	93.7							
LCS 160-624483/2-A	Lab Control Sample	94.2							
MB 160-624323/1-A	Method Blank	95.0							
MB 160-624325/1-A	Method Blank	89.7							
MB 160-624483/1-A	Method Blank	94.0							

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 903.0 - Radium-226 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)							
Lab Sample ID	Client Sample ID	Ba (30-110)							
810-73371-1	MW-01R	87.2							
810-73371-2	MW-02	89.2							
810-73371-3	MW-03	85.0							
810-73371-4	MW-04	88.5							
810-73371-5	MW-06	94.2							
810-73371-6	MW-07	87.5							
810-73371-7	MW-08	83.0							
810-73371-8	MW-09	83.2							
810-73371-9	MW-10	84.0							
810-73371-10	MW-11	89.7							
810-73371-11	MW-12	86.5							
810-73371-12	MW-18	90.5							
810-73371-13	MW-19	91.5							
810-73371-14	MW-20	89.7							
810-73371-15	MW-27	84.0							
810-73371-16	MW-30	83.7							
810-73371-17	MW-31	87.0							
810-73371-18	MW-32	88.2							
810-73371-19	MW-33	91.0							
810-73371-20	MW-34	83.0							
810-73371-21	MWT-04	88.5							
810-73371-22	MWT-12	90.7							
810-73371-23	SG-02	81.7							
810-73371-24	SG-03	85.0							
810-73371-25	SG-04R	87.2							
810-73371-26	SG-05	79.4							
810-73371-27	SG-06	70.2							

Tracer/Carrier Legend

Ba = Ba Carrier

Tracer/Carrier Summary

Client: Trace Analytical Laboratories
Job ID: 810-73371-1
Project/Site: 23H0448 - Harbor Island

Method: 904.0 - Radium-228 (GFPC)

Matrix: Drinking Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (30-110)	Y (30-110)
LCS 160-624324/2-A	Lab Control Sample	92.5	78.5
LCS 160-624326/2-A	Lab Control Sample	93.7	80.7
LCS 160-624485/2-A	Lab Control Sample	94.2	80.7
LCSD 160-624324/3-A	Lab Control Sample Dup	93.0	77.0
MB 160-624324/1-A	Method Blank	95.0	72.1
MB 160-624326/1-A	Method Blank	89.7	76.6
MB 160-624485/1-A	Method Blank	94.0	81.1

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 904.0 - Radium-228 (GFPC)

Matrix: Ground Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (30-110)	Y (30-110)
810-73371-1	MW-01R	87.2	80.0
810-73371-2	MW-02	89.2	81.5
810-73371-3	MW-03	85.0	82.6
810-73371-4	MW-04	88.5	72.5
810-73371-5	MW-06	94.2	77.4
810-73371-6	MW-07	87.5	78.9
810-73371-7	MW-08	83.0	75.5
810-73371-8	MW-09	83.2	80.7
810-73371-9	MW-10	84.0	79.3
810-73371-10	MW-11	89.7	83.0
810-73371-11	MW-12	86.5	80.4
810-73371-12	MW-18	90.5	77.0
810-73371-13	MW-19	91.5	78.5
810-73371-14	MW-20	89.7	80.7
810-73371-15	MW-27	84.0	79.6
810-73371-16	MW-30	83.7	78.1
810-73371-17	MW-31	87.0	78.1
810-73371-18	MW-32	88.2	78.9
810-73371-19	MW-33	91.0	77.8
810-73371-20	MW-34	83.0	75.5
810-73371-21	MWT-04	88.5	78.9
810-73371-22	MWT-12	90.7	77.0
810-73371-23	SG-02	81.7	78.9
810-73371-24	SG-03	85.0	77.8
810-73371-25	SG-04R	87.2	77.4
810-73371-26	SG-05	79.4	78.5
810-73371-27	SG-06	70.2	78.9

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

QC Sample Results

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Method: 903.0 - Radium-226 (GFPC)

Lab Sample ID: MB 160-624323/1-A
Matrix: Drinking Water
Analysis Batch: 627054

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 624323

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.002850	U	0.0367	0.0367	1.00	0.0836	pCi/L	08/16/23 09:56	09/07/23 07:35	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.0*		*30 - 110*	*08/16/23 09:56*	*09/07/23 07:35*	*1*

Lab Sample ID: LCS 160-624323/2-A
Matrix: Drinking Water
Analysis Batch: 627054

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 624323

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.78		1.12	1.00	0.0907	pCi/L	95	90 - 110		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*92.5*		*30 - 110*

Lab Sample ID: LCSD 160-624323/3-A
Matrix: Drinking Water
Analysis Batch: 627054

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 624323

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-226			11.3	9.894	*	1.04	1.00	0.0891	pCi/L	87	90 - 110	0.41	1

Lab Sample ID: MB 160-624325/1-A
Matrix: Drinking Water
Analysis Batch: 627054

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 624325

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.02900	U	0.0526	0.0526	1.00	0.0945	pCi/L	08/16/23 10:01	09/07/23 09:35	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*08/16/23 10:01*	*09/07/23 09:35*	*1*

Lab Sample ID: LCS 160-624325/2-A
Matrix: Drinking Water
Analysis Batch: 627054

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 624325

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.20		1.08	1.00	0.0969	pCi/L	90	90 - 110		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*93.7*		*30 - 110*

Method: 903.0 - Radium-226 (GFPC) (Continued)

Lab Sample ID: MB 160-624483/1-A
Matrix: Drinking Water
Analysis Batch: 627236

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 624483

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.06554	U	0.0656	0.0658	1.00	0.102	pCi/L	08/17/23 10:33	09/08/23 07:11	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*08/17/23 10:33*	*09/08/23 07:11*	*1*

Lab Sample ID: LCS 160-624483/2-A
Matrix: Drinking Water
Analysis Batch: 627236

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 624483

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.41		1.09	1.00	0.102	pCi/L	92	90 - 110		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.2*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC)

Lab Sample ID: MB 160-624324/1-A
Matrix: Drinking Water
Analysis Batch: 625942

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 624324

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.3670	U	0.378	0.380	1.00	0.612	pCi/L	08/16/23 10:00	08/29/23 12:33	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.0*		*30 - 110*	*08/16/23 10:00*	*08/29/23 12:33*	*1*
Y Carrier	*72.1*		*30 - 110*	*08/16/23 10:00*	*08/29/23 12:33*	*1*

Lab Sample ID: LCS 160-624324/2-A
Matrix: Drinking Water
Analysis Batch: 625887

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 624324

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			7.92	8.141		1.72	1.00	1.43	pCi/L	103	80 - 120		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*92.5*		*30 - 110*
Y Carrier	*78.5*		*30 - 110*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCSD 160-624324/3-A
Matrix: Drinking Water
Analysis Batch: 625887

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 624324

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits	RER	RER Limit
Radium-228			7.92	9.171		1.87	1.00	1.56	pCi/L	116	80 - 120	0.29	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*93.0*		*30 - 110*
Y Carrier	*77.0*		*30 - 110*

Lab Sample ID: MB 160-624326/1-A
Matrix: Drinking Water
Analysis Batch: 626294

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 624326

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.4450	U	0.410	0.412	1.00	0.653	pCi/L	08/16/23 10:10	08/31/23 11:42	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:42*	*1*
Y Carrier	*76.6*		*30 - 110*	*08/16/23 10:10*	*08/31/23 11:42*	*1*

Lab Sample ID: LCS 160-624326/2-A
Matrix: Drinking Water
Analysis Batch: 626294

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 624326

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			7.91	8.293		1.20	1.00	0.538	pCi/L	105	80 - 120		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*93.7*		*30 - 110*
Y Carrier	*80.7*		*30 - 110*

Lab Sample ID: MB 160-624485/1-A
Matrix: Drinking Water
Analysis Batch: 626305

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 624485

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1228	U	0.289	0.289	1.00	0.510	pCi/L	08/17/23 10:40	08/31/23 11:29	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:29*	*1*
Y Carrier	*81.1*		*30 - 110*	*08/17/23 10:40*	*08/31/23 11:29*	*1*

Method: 904.0 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-624485/2-A
Matrix: Drinking Water
Analysis Batch: 626305

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 624485

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			7.91	8.673		1.22	1.00	0.531	pCi/L	110	80 - 120		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.2*		*30 - 110*
Y Carrier	*80.7*		*30 - 110*

Rad

Prep Batch: 624323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-73371-16	MW-30	Total/NA	Ground Water	PrecSep-21	
810-73371-17	MW-31	Total/NA	Ground Water	PrecSep-21	
810-73371-18	MW-32	Total/NA	Ground Water	PrecSep-21	
810-73371-19	MW-33	Total/NA	Ground Water	PrecSep-21	
810-73371-20	MW-34	Total/NA	Ground Water	PrecSep-21	
MB 160-624323/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-624323/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	
LCSD 160-624323/3-A	Lab Control Sample Dup	Total/NA	Drinking Water	PrecSep-21	

Prep Batch: 624324

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-73371-16	MW-30	Total/NA	Ground Water	PrecSep_0	
810-73371-17	MW-31	Total/NA	Ground Water	PrecSep_0	
810-73371-18	MW-32	Total/NA	Ground Water	PrecSep_0	
810-73371-19	MW-33	Total/NA	Ground Water	PrecSep_0	
810-73371-20	MW-34	Total/NA	Ground Water	PrecSep_0	
MB 160-624324/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-624324/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	
LCSD 160-624324/3-A	Lab Control Sample Dup	Total/NA	Drinking Water	PrecSep_0	

Prep Batch: 624325

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-73371-21	MWT-04	Total/NA	Ground Water	PrecSep-21	
810-73371-22	MWT-12	Total/NA	Ground Water	PrecSep-21	
810-73371-23	SG-02	Total/NA	Ground Water	PrecSep-21	
810-73371-24	SG-03	Total/NA	Ground Water	PrecSep-21	
810-73371-25	SG-04R	Total/NA	Ground Water	PrecSep-21	
810-73371-26	SG-05	Total/NA	Ground Water	PrecSep-21	
810-73371-27	SG-06	Total/NA	Ground Water	PrecSep-21	
MB 160-624325/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-624325/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	

Prep Batch: 624326

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-73371-21	MWT-04	Total/NA	Ground Water	PrecSep_0	
810-73371-22	MWT-12	Total/NA	Ground Water	PrecSep_0	
810-73371-23	SG-02	Total/NA	Ground Water	PrecSep_0	
810-73371-24	SG-03	Total/NA	Ground Water	PrecSep_0	
810-73371-25	SG-04R	Total/NA	Ground Water	PrecSep_0	
810-73371-26	SG-05	Total/NA	Ground Water	PrecSep_0	
810-73371-27	SG-06	Total/NA	Ground Water	PrecSep_0	
MB 160-624326/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-624326/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	

Prep Batch: 624483

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-73371-1	MW-01R	Total/NA	Ground Water	PrecSep-21	
810-73371-2	MW-02	Total/NA	Ground Water	PrecSep-21	
810-73371-3	MW-03	Total/NA	Ground Water	PrecSep-21	
810-73371-4	MW-04	Total/NA	Ground Water	PrecSep-21	
810-73371-5	MW-06	Total/NA	Ground Water	PrecSep-21	

Rad (Continued)

Prep Batch: 624483 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-73371-6	MW-07	Total/NA	Ground Water	PrecSep-21	
810-73371-7	MW-08	Total/NA	Ground Water	PrecSep-21	
810-73371-8	MW-09	Total/NA	Ground Water	PrecSep-21	
810-73371-9	MW-10	Total/NA	Ground Water	PrecSep-21	
810-73371-10	MW-11	Total/NA	Ground Water	PrecSep-21	
810-73371-11	MW-12	Total/NA	Ground Water	PrecSep-21	
810-73371-12	MW-18	Total/NA	Ground Water	PrecSep-21	
810-73371-13	MW-19	Total/NA	Ground Water	PrecSep-21	
810-73371-14	MW-20	Total/NA	Ground Water	PrecSep-21	
810-73371-15	MW-27	Total/NA	Ground Water	PrecSep-21	
MB 160-624483/1-A	Method Blank	Total/NA	Drinking Water	PrecSep-21	
LCS 160-624483/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep-21	

Prep Batch: 624485

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
810-73371-1	MW-01R	Total/NA	Ground Water	PrecSep_0	
810-73371-2	MW-02	Total/NA	Ground Water	PrecSep_0	
810-73371-3	MW-03	Total/NA	Ground Water	PrecSep_0	
810-73371-4	MW-04	Total/NA	Ground Water	PrecSep_0	
810-73371-5	MW-06	Total/NA	Ground Water	PrecSep_0	
810-73371-6	MW-07	Total/NA	Ground Water	PrecSep_0	
810-73371-7	MW-08	Total/NA	Ground Water	PrecSep_0	
810-73371-8	MW-09	Total/NA	Ground Water	PrecSep_0	
810-73371-9	MW-10	Total/NA	Ground Water	PrecSep_0	
810-73371-10	MW-11	Total/NA	Ground Water	PrecSep_0	
810-73371-11	MW-12	Total/NA	Ground Water	PrecSep_0	
810-73371-12	MW-18	Total/NA	Ground Water	PrecSep_0	
810-73371-13	MW-19	Total/NA	Ground Water	PrecSep_0	
810-73371-14	MW-20	Total/NA	Ground Water	PrecSep_0	
810-73371-15	MW-27	Total/NA	Ground Water	PrecSep_0	
MB 160-624485/1-A	Method Blank	Total/NA	Drinking Water	PrecSep_0	
LCS 160-624485/2-A	Lab Control Sample	Total/NA	Drinking Water	PrecSep_0	

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-01R
Date Collected: 08/08/23 14:25
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-1
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:14
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626305	FLC	EET SL	08/31/23 11:28
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-02
Date Collected: 08/08/23 10:25
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-2
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:14
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626305	FLC	EET SL	08/31/23 11:28
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-03
Date Collected: 08/07/23 15:20
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-3
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:14
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626305	FLC	EET SL	08/31/23 11:28
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-04
Date Collected: 08/07/23 14:00
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-4
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:14
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:36
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-06
Date Collected: 08/08/23 14:30
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-5
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:15
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:36
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-07
Date Collected: 08/07/23 14:30
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-6
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:16
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:36
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-08
Date Collected: 08/08/23 12:40
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-7
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:16
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:37
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-09
Date Collected: 08/08/23 09:20
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-8
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:16
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:37
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-10
Date Collected: 08/08/23 11:45
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-9
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627236	SCB	EET SL	09/08/23 07:16
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:37
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-11
Date Collected: 08/08/23 16:00
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-10
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627239	SCB	EET SL	09/08/23 07:20
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:37
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-12
Date Collected: 08/07/23 16:30
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-11
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627239	SCB	EET SL	09/08/23 07:21
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:32
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-18
Date Collected: 08/08/23 15:30
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-12
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627239	SCB	EET SL	09/08/23 07:21
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:32
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-19
Date Collected: 08/07/23 17:30
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-13
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627239	SCB	EET SL	09/08/23 07:21
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:32
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-20
Date Collected: 08/07/23 16:00
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-14
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627239	SCB	EET SL	09/08/23 07:21
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:32
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-27
Date Collected: 08/07/23 12:55
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-15
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624483	KAC	EET SL	08/17/23 10:33
Total/NA	Analysis	903.0		1	627241	SCB	EET SL	09/08/23 07:21
Total/NA	Prep	PrecSep_0			624485	KAC	EET SL	08/17/23 10:40
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:32
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-30
Date Collected: 08/08/23 09:20
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-16
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624323	KAC	EET SL	08/16/23 09:56
Total/NA	Analysis	903.0		1	627058	SCB	EET SL	09/07/23 07:42
Total/NA	Prep	PrecSep_0			624324	KAC	EET SL	08/16/23 10:00
Total/NA	Analysis	904.0		1	625944	CMM	EET SL	08/29/23 12:35
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MW-31
Date Collected: 08/08/23 11:30
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-17
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624323	KAC	EET SL	08/16/23 09:56
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:34
Total/NA	Prep	PrecSep_0			624324	KAC	EET SL	08/16/23 10:00
Total/NA	Analysis	904.0		1	625944	CMM	EET SL	08/29/23 12:35
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-32
Date Collected: 08/08/23 13:00
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-18
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624323	KAC	EET SL	08/16/23 09:56
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:34
Total/NA	Prep	PrecSep_0			624324	KAC	EET SL	08/16/23 10:00
Total/NA	Analysis	904.0		1	625944	CMM	EET SL	08/29/23 12:35
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-33
Date Collected: 08/07/23 12:00
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-19
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624323	KAC	EET SL	08/16/23 09:56
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:34
Total/NA	Prep	PrecSep_0			624324	KAC	EET SL	08/16/23 10:00
Total/NA	Analysis	904.0		1	625944	CMM	EET SL	08/29/23 12:35
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MW-34
Date Collected: 08/07/23 11:20
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-20
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624323	KAC	EET SL	08/16/23 09:56
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:34
Total/NA	Prep	PrecSep_0			624324	KAC	EET SL	08/16/23 10:00
Total/NA	Analysis	904.0		1	625944	CMM	EET SL	08/29/23 12:36
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: MWT-04
Date Collected: 08/07/23 14:00
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-21
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624325	KAC	EET SL	08/16/23 10:01
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:36
Total/NA	Prep	PrecSep_0			624326	KAC	EET SL	08/16/23 10:10
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:46
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: MWT-12
Date Collected: 08/07/23 16:30
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-22
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624325	KAC	EET SL	08/16/23 10:01
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:36
Total/NA	Prep	PrecSep_0			624326	KAC	EET SL	08/16/23 10:10
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:46
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: SG-02
Date Collected: 08/08/23 17:05
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-23
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624325	KAC	EET SL	08/16/23 10:01
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:36
Total/NA	Prep	PrecSep_0			624326	KAC	EET SL	08/16/23 10:10
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:47
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: SG-03
Date Collected: 08/08/23 17:15
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-24
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624325	KAC	EET SL	08/16/23 10:01
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:36
Total/NA	Prep	PrecSep_0			624326	KAC	EET SL	08/16/23 10:10
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:47
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Lab Chronicle

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Client Sample ID: SG-04R
Date Collected: 08/08/23 16:50
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-25
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624325	KAC	EET SL	08/16/23 10:01
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:37
Total/NA	Prep	PrecSep_0			624326	KAC	EET SL	08/16/23 10:10
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:47
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: SG-05
Date Collected: 08/08/23 16:40
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-26
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624325	KAC	EET SL	08/16/23 10:01
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:37
Total/NA	Prep	PrecSep_0			624326	KAC	EET SL	08/16/23 10:10
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:47
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Client Sample ID: SG-06
Date Collected: 08/08/23 17:25
Date Received: 08/10/23 11:00

Lab Sample ID: 810-73371-27
Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	PrecSep-21			624325	KAC	EET SL	08/16/23 10:01
Total/NA	Analysis	903.0		1	627054	SCB	EET SL	09/07/23 09:37
Total/NA	Prep	PrecSep_0			624326	KAC	EET SL	08/16/23 10:10
Total/NA	Analysis	904.0		1	626294	FLC	EET SL	08/31/23 11:47
Total/NA	Analysis	Ra226_Ra228 Pos		1	627952	FLC	EET SL	09/13/23 16:43

Laboratory References:
EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: Trace Analytical Laboratories
Job ID: 810-73371-1
Project/Site: 23H0448 - Harbor Island

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-23
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-24
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-30-24
HI - RadChem Recognition	State	n/a	06-30-24
Illinois	NELAP	200023	11-30-23
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-23
Kentucky (DW)	State	KY90125	12-31-23
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-23
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-24
Louisiana (DW)	State	LA011	12-31-23
Maryland	State	310	09-30-24
Massachusetts	State	M-MO054	06-30-24
MI - RadChem Recognition	State	9005	06-30-24
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	07-31-24
New Jersey	NELAP	MO002	06-30-24
New Mexico	State	MO00054	06-30-24
New York	NELAP	11616	03-31-24
North Carolina (DW)	State	29700	07-31-24
North Dakota	State	R-207	06-30-24
Oregon	NELAP	4157	09-01-24
Pennsylvania	NELAP	68-00540	02-28-24
South Carolina	State	85002001	06-30-23 *
Texas	NELAP	T104704193	07-31-24
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO000542021-14	07-31-24
Virginia	NELAP	10310	06-15-25
West Virginia DEP	State	381	10-31-23

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Method	Method Description	Protocol	Laboratory
903.0	Radium-226 (GFPC)	EPA	EET SL
904.0	Radium-228 (GFPC)	EPA	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
Pos			
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

EPA = US Environmental Protection Agency

None = None

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Trace Analytical Laboratories
Project/Site: 23H0448 - Harbor Island

Job ID: 810-73371-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
810-73371-1	MW-01R	Ground Water	08/08/23 14:25	08/10/23 11:00
810-73371-2	MW-02	Ground Water	08/08/23 10:25	08/10/23 11:00
810-73371-3	MW-03	Ground Water	08/07/23 15:20	08/10/23 11:00
810-73371-4	MW-04	Ground Water	08/07/23 14:00	08/10/23 11:00
810-73371-5	MW-06	Ground Water	08/08/23 14:30	08/10/23 11:00
810-73371-6	MW-07	Ground Water	08/07/23 14:30	08/10/23 11:00
810-73371-7	MW-08	Ground Water	08/08/23 12:40	08/10/23 11:00
810-73371-8	MW-09	Ground Water	08/08/23 09:20	08/10/23 11:00
810-73371-9	MW-10	Ground Water	08/08/23 11:45	08/10/23 11:00
810-73371-10	MW-11	Ground Water	08/08/23 16:00	08/10/23 11:00
810-73371-11	MW-12	Ground Water	08/07/23 16:30	08/10/23 11:00
810-73371-12	MW-18	Ground Water	08/08/23 15:30	08/10/23 11:00
810-73371-13	MW-19	Ground Water	08/07/23 17:30	08/10/23 11:00
810-73371-14	MW-20	Ground Water	08/07/23 16:00	08/10/23 11:00
810-73371-15	MW-27	Ground Water	08/07/23 12:55	08/10/23 11:00
810-73371-16	MW-30	Ground Water	08/08/23 09:20	08/10/23 11:00
810-73371-17	MW-31	Ground Water	08/08/23 11:30	08/10/23 11:00
810-73371-18	MW-32	Ground Water	08/08/23 13:00	08/10/23 11:00
810-73371-19	MW-33	Ground Water	08/07/23 12:00	08/10/23 11:00
810-73371-20	MW-34	Ground Water	08/07/23 11:20	08/10/23 11:00
810-73371-21	MWT-04	Ground Water	08/07/23 14:00	08/10/23 11:00
810-73371-22	MWT-12	Ground Water	08/07/23 16:30	08/10/23 11:00
810-73371-23	SG-02	Ground Water	08/08/23 17:05	08/10/23 11:00
810-73371-24	SG-03	Ground Water	08/08/23 17:15	08/10/23 11:00
810-73371-25	SG-04R	Ground Water	08/08/23 16:50	08/10/23 11:00
810-73371-26	SG-05	Ground Water	08/08/23 16:40	08/10/23 11:00
810-73371-27	SG-06	Ground Water	08/08/23 17:25	08/10/23 11:00

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
Ba carrier_00134	07/04/24	07/07/23	DI Water, Lot N/A	1000 mL	BaCl2_00011	39.5542 g	Ba Carrier	39.5542 mg/mL
							Barium Chloride	39.5542 mg/mL
					HNO3_00280	5 mL	Nitric acid	0.08 mg/mL
.BaCl2_00011	05/05/28	Acros Organics (Fisher), Lot A0427481			(Purchased Reagent)		Ba Carrier	100 %
							Barium Chloride	100 %
.HNO3_00280	07/04/24	Macron, Lot 22F2462005			(Purchased Reagent)		Nitric acid	16 mol/L
Ra-226_00022	12/06/19	08/24/16	1M HNO3, Lot n/a	100 mL			Ra	7534.61 dpm/mL
					Ra-226_00021	5.0595 g	Radium-226	7534.61 dpm/mL
							Rn-222	7534.61 dpm/mL
							Total Alpha Emitting Radium Isotopes	7534.61 dpm/mL
.Ra-226_00021	09/01/53	NIST, Lot 4967A			(Purchased Reagent)		Radium-226	2482 Bq/g
							Rn-222	2482 Bq/g
							Total Alpha Emitting Radium Isotopes	2482 Bq/g
Ra-226_00025							Gross Alpha	
							Gross Beta	
					Ra-226_00024	4.9774 g	Ra	8409.79 dpm/mL
							Radium-226	8409.79 dpm/mL
							Rn-222	8409.79 dpm/mL
							Total Alpha Emitting Radium Isotopes	8409.79 dpm/mL
.Ra-226_00024	12/05/66	Eckert & Ziegler, Lot 104858			(Purchased Reagent)		Ra	2815.99 Bq/g
							Radium-226	2815.99 Bq/g
							Rn-222	2815.99 Bq/g
							Total Alpha Emitting Radium Isotopes	2815.99 Bq/g
Ra-226_00041	09/15/23	09/15/22	0.1M HCl, Lot N/A	500 mL	Ra-226_00025	15 mL	Ra	252.294 dpm/mL
							Radium-226	252.294 dpm/mL
							Rn-222	252.294 dpm/mL
							Total Alpha Emitting Radium Isotopes	252.294 dpm/mL
.Ra-226_00025	09/18/22	12/08/16	0.1M HCl, Lot N/A	100 mL	Ra-226_00024	4.9774 g	Ra	8409.79 dpm/mL
							Radium-226	8409.79 dpm/mL
							Rn-222	8409.79 dpm/mL

REAGENT TRACEABILITY SUMMARY

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Total Alpha Emitting Radium Isotopes	8409.79 dpm/mL
..Ra-226_00024	12/05/66	Eckert & Ziegler, Lot 104858			(Purchased Reagent)		Ra	2815.99 Bq/g
							Radium-226	2815.99 Bq/g
							Rn-222	2815.99 Bq/g
							Total Alpha Emitting Radium Isotopes	2815.99 Bq/g
Ra-228_00051	10/03/23	10/03/22	0.1M HCl, Lot N/A	1 L	Ra-228_00050	5.00238 g	Radium-228	20.496 dpm/mL
.Ra-228_00050	10/03/23	Eckert & Ziegler, Lot 121695			(Purchased Reagent)		Radium-228	68.2874 Bq/g
Sr-90_00004	09/17/59	06/21/11	0.1M HCL, Lot 0	100 mL	Sr-90_00001	5.0139 g	Gross Beta	45120.6 dpm/mL
							Sr	22560.3 dpm/mL
							Sr-90	22560.3 dpm/mL
.Sr-90_00001	09/17/59	Eckert & Ziegler, Lot 80573-334			(Purchased Reagent)		Gross Beta	14998.5 Bq/g
							Sr	7499.25 Bq/g
							Sr-90	7499.25 Bq/g
Sr-90_00018							Gross Alpha	
					Sr-90_00017	4.9997 g	Gross Beta	44774.2 dpm/mL
							Sr-90	22387.1 dpm/mL
.Sr-90_00017	11/29/62	Analytics, Lot 92352			(Purchased Reagent)		Gross Beta	14925.6 Bq/g
							Sr-90	7462.82 Bq/g
Th-230_00052	11/12/22	11/15/19	0.5 M HNO3, Lot n/a	100 mL	Th-230_00051	5.0493 g	Gross Alpha	2254.57 dpm/mL
							Th-230	2254.57 dpm/mL
.Th-230_00051	11/15/20	Eckect & Ziegler, Lot 114474			(Purchased Reagent)		Gross Alpha	744.187 Bq/g
							Th-230	744.187 Bq/g
Th-230_00056							Gross Beta	
					Th-230_00054	5.0402 g	Gross Alpha	2289.58 dpm/mL
							Th-230	2289.58 dpm/mL
.Th-230_00054	11/15/20	Eckect & Ziegler, Lot 114475			(Purchased Reagent)		Gross Alpha	757.106 Bq/g
							Th-230	757.106 Bq/g
Y Carrier_00086	07/06/24	CPI, Lot 2315059-1L			(Purchased Reagent)		Y Carrier	10000 mg/L

Reagent

Ba carrier_00134

Standardization of Carrier

Carrier Reagent ID: Ba Carrier_00134
ID from TALS or lot number

#	Tare Wght (g)	Gross Wght (g)	Net Wght (g)	Z Score
1	8.6768	8.7167	0.0399	0.0257
2	8.7061	8.7469	0.0408	1.3603
3	8.7187	8.7586	0.0399	0.0257
4	8.6824	8.7223	0.0399	0.0257
5	8.7042	8.7430	0.0388	1.7196
6	8.6893	8.7295	0.0402	0.4363

Average: 0.0399 Standardized value
StDev: 0.0006
StDev %: 1.63%

Record the Reagent IDs of all chemicals used to create this carrier in the spaces below.

Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:
Reagent ID:

SOP Reference: ST-RC-0002, ST-RC-0041
SOP reference containing prep procedure must be documented

Minimum Criteria:

- Z Score must be within 3 sigma (**2.58**) and no more than one score outside of 2 sigma (**1.96**)
- 4 points required
- Any criteria stipulated in the above referenced SOP must be satisfied in addition.

Carrier: 0 **Standardized Value:** 0.0399 Carrier Reagent or Lot ID: Ba Carrier_00134

Approved By: CMM Date Approved: 7/11/2023

NOTE: spreadsheet MUST be attached in TALS as a PDF (either print to PDF, or print hardcopy and then scan)

Reagent

Ra-226_00021

National Institute of Standards & Technology

Certificate

Standard Reference Material® 4967A

Radium-226 Radioactivity Standard

This Standard Reference Material (SRM) consists of a solution of a standardized and certified quantity of radioactive radium-226 in a suitably stable and homogeneous matrix. It is intended primarily for the calibration of instruments that are used to measure radioactivity and for the monitoring of radiochemical procedures. A unit of SRM 4967A consists of approximately 5 mL of a hydrochloric acid and barium chloride solution, whose composition is specified in Table 1 and 2, contained in a flame-sealed borosilicate-glass ampoule [1].

The certified **radium-226** massic activity value, at a **Reference Time of 1200 EST, 01 September 2003**, is:

$$(2482 \pm 30)\ \mathrm{Bq \cdot g^{-1}}$$

A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment. It is a "measurement result" [2] obtained directly or indirectly from a "primary reference measurement procedure" [3]. The certified value is traceable to the derived SI unit, becquerel (Bq).

Additional physical, chemical, and radiological properties for this SRM, as well as details on the standardization method, are given in Table 1 and 2. Uncertainties for the certified quantities are expanded ($k = 2$). The uncertainties are calculated according to the ISO and NIST Guides [4,5]. Table 3 contains a specification of the components that comprise the uncertainty analyses.

Expiration of Certification: The certification of **SRM 4967A** is valid indefinitely, within the measurement uncertainty specified, provided that the SRM is handled and stored properly and that no evaporation or change in composition has occurred. The solution matrix, in an unopened ampoule, is homogeneous and stable within its half-life-dependent useful lifetime provided the SRM is handled in accordance with instructions given in this certificate (see "Instructions for Handling and Storage"). Periodic recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

Radiological and chemical hazard: Consult the Safety Data Sheet (SDS), enclosed with the SRM shipment, for radiological and chemical hazard information.

This SRM was prepared in the NIST Physical Measurement Laboratory, Radiation Physics Division, under the direction of M.P. Unterweger, Group Leader of the Radioactivity Group. The overall production, technical direction, and physical measurement leading to certification were provided by R. Collé and P. Volkovitsky of the NIST Radiation Physics Division, Radioactivity Group. Statistical consultation was provided by S.D. Leigh of the NIST Statistical Engineering Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Lisa R. Karam, Chief
Radiation Physics Division

Gaithersburg, Maryland 20899
Certificate Issue Date: 03 September 2013
See Certificate Revision History on Last Page

Robert L. Watters, Jr., Director
Office of Reference Materials

Table 3. Uncertainty Evaluation for the Massic Activity of SRM 4967A

	Uncertainty component	Assessment Type[a]	Relative standard uncertainty contribution on massic activity of ^{226}Ra (%)
1	Calibration of the "1947 (1967 recalibrated) series" of radium-226 solution standards in terms of mass of radium-226[b]	B	0.34
2	Ratio of the mass of radium-226 in SRM 4967A to the mass of radium-226 in the "1947 (1967 recalibrated) series" of radium-226 solution standards. Weighted mean of the ratios obtained using seven different comparisons.	B	0.15
3	Corrections for the decay of radium-226. Standard uncertainty of the radium-226 half-life.	A	0.007
4	Gravimetric measurements	B	0.10
5	Conversion of radium-226 mass to activity. Standard uncertainty of the radium-226 half-life.[c]	A	0.44
6	Photon emitting impurities. Limit of detection.	B	0.01
Relative combined standard uncertainty			**0.6**
Relative expanded uncertainty ($k = 2$)			**1.2**

[a] Letter A denotes evaluation by statistical methods; B denotes evaluation by other methods.

[b] For further details on NBS/NIST radium series calibrations refer to reference [8]. The 1967 recalibrations of the "1947 series" and of the "1957 series" were made using pressurized "4π"γ ionization chamber (PIC) "A". The master solution for SRM 4967A was directly compared with the "1947 (1967 recalibrated) series" of radium-226 solution standards using PIC "A", and was compared with the solutions of the "1992 series" of radium solution standards (SRM 4967) using PIC "A", pulse-ionization-chamber radon analyses (see references [9] and [10]), and germanium photon spectrometry. The radium-226 in SRM 4967A was chemically purified approximately 55 years from the reference time. The lead-210 and its daughter radionuclides are still not in equilibrium as of the 2013 certificate issue date.

[c] The U.S National Standards for radium-226 are certified in terms of mass of radium-226, as were all radium-226 SRMs prior to the "1992 series". Beginning with "1992 series", radium-226 solution SRMs are now certified in terms of the massic activity of radium-226. The relative standard uncertainty of the activity of radium-226 per unit mass of radium-226 is determined by the relative standard uncertainty of λ (i.e., of the half-life). The relative standard uncertainties of the atomic weight of radium-226 and of Avogadro's number are negligible.

Table 1. Certified Massic Activity of SRM 4967A

Radionuclide	**Radium-226**
Reference time	**1200 EST, 01 September 2003**
Massic activity of the solution	**2482 Bq•g^{-1}**
Relative expanded uncertainty ($k = 2$)	**1.20 %**

Table 2. Uncertified Information of SRM 4967A

Source description	Liquid in a flame-sealed 5 mL borosilicate-glass ampoule [1]
Solution composition	1.0 mol•L^{-1} HCl with 80µg of $BaCl_2$ per gram of solution
Solution density	(1.017 ± 0.002) g•mL^{-1} at 21 °C[(a)]
Solution mass	(5.086 ± 0.003) g[(a)]
Photon-Emitting Impurities	None detected[(b)]
Half-lives used	^{226}Ra: (1600 ± 7) a [6][(c)] ^{222}Ra: (3.8235 ± 0.0003) d [7][(c)]
Calibration methods (and instruments)	Gravimetric dilution of SRM 4963, confirmed by comparison with solution standards, and derivatives thereof, from the NBS/NIST "1947 (1967 recalibrated) series" of radium-226 solution standards. The mass of radium-226 in these solution standards had previously been determined by comparison with the U.S. National Standards for radium-226. Conversion from mass of radium-226 to activity of radium-226 was done using the half-life of radium-226 shown above.[(d)]

[(a)] The stated uncertainty is two times the standard uncertainty. See reference 5.

[(b)] The estimated lower limits of detection for photon-emitting impurities, as of September 2003, expressed as massic photon mission rate, are:

6×10^{0} s^{-1}•g^{-1} for energies between 22 keV and 182 keV,
3×10^{0} s^{-1}•g^{-1} for energies between 190 keV and 347 keV,
8×10^{-1} s^{-1}•g^{-1} for energies between 356 keV and 1455 keV, and
3×10^{-1} s^{-1}•g^{-1} for energies between 1465 keV and 2750 keV,

provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of ^{226}Ra and progeny.

[(c)] The stated uncertainty is the standard uncertainty. See reference 5.

[(d)] For further details on NBS/NIST radium series calibrations refer to reference [8]. The 1967 recalibrations of the "1947 series" and of the "1957 series" were made using pressurized "4π"γ ionization chamber (PIC) "A". The master solution for SRM 4967A was directly compared with the "1947 (1967 recalibrated) series" of radium-226 solution standards using PIC "A", and was compared with the solutions of the "1992 series" of radium solution standards (SRM 4967) using PIC "A", pulse-ionization-chamber radon analyses (see references [9] and [10]), and germanium photon spectrometry. The radium-226 in SRM 4967A was chemically purified approximately 55 years from the reference time. The lead-210 and its daughter radionuclides are still not in equilibrium as of the 2013 certificate issue date.

INSTRUCTIONS FOR HANDLING AND STORAGE

Handling: If the ampoule is transported, it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of both the radioactivity and the strong acid. Only persons qualified to handle both radioactive material and alkaline and/or acidic solutions should open the ampoule. To minimize personnel exposure, appropriate shielding and/or distance should be used. Refer to the SDS for further information.

Storage: SRM 4967A should be stored and used at a temperature between 5 °C and 65 °C. The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material.

REFERENCES

[1] NIST Physical Measurement Laboratory; *Storage and Handling of Radioactive Standard Reference Materials, Ampoule Specifications and Opening Procedure*, available at http://www.nist.gov/pml/div682/grp04/srm.cfm (accessed Sep 2013). Note: This SRM is contained in a generic borosilicate-glass ampoule and not in the standard NIST ampoule.

[2] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 19 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Sep 2013).

[3] JCGM 200:2012; *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (2008 version with Minor Corrections), 3rd edition; Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France; p. 18 (2012); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf (accessed Sep 2013).

[4] JCGM 100:2008; *Guide to the Expression of Uncertainty in Measurement;* (GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology: BIPM, Sevres Cedex, France (2008); available at http://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Sep 2013).

[5] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at http://www.nist.gov/pml/pubs/index.cfm (accessed Sep 2013).

[6] Chisté, V; Bé, M.M.; *January 2007, ^{226}Ra*; LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Ra-226_tables.pdf (accessed Sep 2013).

[7] Chisté, V; Bé, M.M.; *July 2010, ^{222}Rn*; LNE-LNHB/CEA Table of Radionuclides, available at http://www.nucleide.org/DDEP_WG/Nuclides/Rn-222_tables.pdf (accessed Sep 2013).

[8] Mann, W.B.; Stockman, L.L.; Youden, W.J.; Schwebel, A.; Mullen, P.A.; Garfinkel, S.B.; Preparation of New Solution Standards of Radium, *Journal of Research of the National Bureau of Standards* 62 (1959) 21-26.

[9] Collé, R.; Hutchinson, J.M.R.; Unterweger, M.P.; The NIST Primary Radon-222 Measurement System, *Journal of Research of the National Institute of Standards and Technology* 95 (1990) 155-165.

[10] Hutchinson J.M.R; Cessna, J.; Collé R.; Hodge P.; An International Radon-In-Air Measurement Intercomparison Using a New Transfer Standard, *Applied Radiation Isotopes* 43 (1992) 175-189.

Certificate Revision History: September 2013 (Text and expiration date revised); December 2004 (Original certification date).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.

Reagent

Ra-226_00024

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 104858
Source Description: 5 mL Liquid in Flame Sealed Vial
Product Code: 8226
Customer: TestAmerica St. Louis
P.O. Number: 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 05-December-2016 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty u_A, %	u_B, %	U, %*	Calibration Method**
Ra-226	5.844E+05	1.408E+04	1.0	2.1	4.7	HPGe

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

SRS Number: 104858

Comments:

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

Impurities:

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

Reagent

Ra-226_00025

SRS Number: 104858

Comments:

5.00002 g 0.1 M HCl solution with approximately 30 µg/g Ba carrier.

Impurities:

γ-impurities (other than decay products) < 0.1%

This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

Source Prepared by: _____

Z. Dimitrova, Radiochemist

QC Approved by: _____ Date: 05-DEC-16

J. Lahr, Spectroscopist

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 104858
Source Description: 5 mL Liquid in Flame Sealed Vial
Product Code: 8226
Customer: TestAmerica St. Louis
P.O. Number: 2665998, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA) using a germanium gamma-ray spectrometer system. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 05-December-2016 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty u_A, %	u_B, %	U, %*	Calibration Method**
Ra-226	5.844E+05	1.408E+04	1.0	2.1	4.7	HPGe

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Reagent

Ra-226_00041

Standard ID Number: a-226_00041 (2309057/2309058
True Value = 113650 pCi/L or g
Date Analyzed: 9/15/2022

Radionuclide: Ra-226

	Replicates	
#1	107700	pCi/L or g
#2	110200	pCi/L or g
#3	105600	pCi/L or g

Mean = 107833.33

1 sigma = 2302.8967

1.96 sigma = 4513.678

True Value minus 10% = 102285 (True Value - 10%)
True Value plus 10% = 125015 (True Value + 10%)

Accuracy:
Mean value within 10% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

1st Reviewed By/Date: MichaKoinkinger 9/15/2022

2nd Reviewed By/Date: Sarah C. Beusen 9/16/22

MANUAL DATA ENTRY REQUIRED AT INSTRUMENT? (circle one) YES NO
If YES, data entry MUST be 2nd reviewed

1st Reviewed By/Date: _____

2nd Reviewed By/Date: _____

eurofins | Environment Testing America

Ra-226_00039

Reagent ID: Ra-226_00039

		Expiration Date:	09/18/2022
Description:	Ra-226 Spike	Laboratory:	Eurofins St. Louis
No. of Bottles:	2	Prepared By:	Mazariegos, Chelsea M
Storage Location:	RAD Separations Reagents - Rm 131	Solvent:	0.1M HCl
Reagent Volume:	500.000 mL	Solvent Lot:	N/A
Creation Date:	09/16/2021		
Open Date:			
Container(s):	2131808, 2131809		
Comment:	standard split into (2) 250 mL bottles		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Ra	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Ra-226	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Rn-222	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL
Total Alpha Emitting Radium Isotopes	Ra-226_00025	09/18/2022	8409.78500	dpm/mL	252.29356	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Ra-226_00025	Ra-226 Parent		09/18/22				15.00000	mL

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	12/5/2022 0:00		
Decayto Date/Time (t):	9/15/22 0:00		
Initial Activity (A_0):	252.29	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	252.29	dpm/mL	
***Soln. Density:**		g/mL	
Nuclide:	Ra-226		
Half-Life (days):	584400	decay days	fraction
****Decay Factor:**	1.0001	-81.00	-0.00014
Decay Corr Activity:	2.5231E+02	dpm	
Decay Corr Conc:	2.5231E+02	dpm/mL	

Conversion/Calculations

Final Activity Unit:	pCi	
Activity Unit Factor:	0.45045	
Final Volume Unit:	L	
Volume Unit Factor:	0.001	
Final Concentration:	1.1365E+05	pCi/L
Aliquot Volume:	1.0000E+00	L
Final Activity (A):	1.1365E+05	pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

eurofins Environment Testing TestAmerica

Analysis Report for Total Alpha-Emitting Radium

Batch: 581978 **Operator:**

SampID / Analyte	WRKNO	Ts	Aliquot Tb	Cs	Ba Mass Cb	Ba Yield CPMs	Trunc Yield CPMb	Ingrowth	Ba Precip Time	InstrID	Eff	Cal Type	Cnt Date Time	Sigma
160-46998-A-2-B	160-46998-A-2-B		0.1000mL		0.0385	96.01%	False	1.0149	9/15/22 11:00	Red13	0.1937	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	462	108	4.62	0.11	1.077E+005pCi/L	5.137E+003	7.062E+003	3.423E+003	1.917E+003	7061.9826	
160-46998-A-3-B	160-46998-A-3-B		0.1000mL		0.0395	98.58%	False	1.0150	9/15/22 11:00	Red14	0.1920	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	480	103	4.80	0.10	1.102E+005pCi/L	5.145E+003	7.146E+003	3.302E+003	1.840E+003	7145.9155	
160-46998-B-1-B	160-46998-B-1-B		0.1000mL		0.0371	92.52%	False	1.0149	9/15/22 11:00	Red10	0.1993	2	9/15/22 10:49	1.00
Total Alpha Emitting		100.00	1000.00	446	72	4.46	0.07	1.056E+005pCi/L	5.088E+003	6.963E+003	2.951E+003	1.578E+003	6962.8945	

UncCount	UncTotal	MDA	DLC	MQO

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

SampID	SampDupID	Analyte	Activity	DupActivity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	WRKNO	Analyte	Activity	MSActivity	StdAdded	Recovery	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal

Radium-226 Standard Verification

Std #: Ra-226_00039 (2131809)
Activity: 252.2935552dpm/mL
Reference Date: 12/05/2016

Ver#	D.I. H2O	Barium Carrier mL	Ra-226 Spike mL	18M Sulfuric mL	EDTA mL	Ammonium Sulfate mL	Acetic Acid mL
Ra-226_00039	*N/A*	*2179499*	*2131809*	*2285368*	*2291818*	*2291233*	*2300893*
1	10	1	0.1	1	15	1	2
2	10	1	0.1	1	15	1	2
3	10	1	0.1	1	15	1	2

In a clean centrifuge tube add the following:

- 10mL D.I.
- 0.1mL Radium-226 standard
- 1mL Barium Carrier
- 1mL 18M Sulfuric Acid

Heat in hot bath for 30mins **agitate every 10 mins**
Centrifuge/Decant and wash with 10mL D.I. H2O
Dissolve in 15mL EDTA
Add 1mL Ammonium Sulfate and 2mL Acetic Acid
Heat in hot bath for 30mins **agitate every 10 mins**
Centrifuge/Decant and wash with 10mL D.I. H2O
Plate with minimal D.I. H2O onto a tared planchet

Prepared by: Micha Korrinhizer
Date: 9/15/2022

PrecSep_0 Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-581978

Analyst: Korrinhizer, Micha L

Batch Open: 9/13/2022 5:11:00PM

Batch End: 9/13/2022 6:00:00PM

Preparation, Precipitate Separation

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments JB 9/15/22	Output Sample Lab ID
1	160-46998-B-1 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION Red 10	160-46998-B-1-B
2	160-46998-A-2 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION 13	160-46998-A-2-B
3	160-46998-A-3 (903.0_TAR)	N/A (160-46998-1)	Water	0.1 mL		10/7/22	18_Days	4	Ra-226_00039 VERIFICATION 14	160-46998-A-3-B

Reagent

Ra-228_00050

Eckert & Ziegler
Analytics

Kalibrierschein / Calibration Certificate

erstellt durch das Kalibrierlaboratorium

issued by the calibration laboratory

DAkkS Deutsche Akkreditierungsstelle D-K-19023-01-00

Eckert & Ziegler Analytics, Inc.
1380 Seaboard Industrial Blvd.
Atlanta, GA 30318, USA
Tel 1-404-352-8677
Fax 1-404-352-2837

Kalibrierzeichen
Calibration mark

002018
D-K-19023-01-00
2022-05

Gegenstand *Object*	**5 mL Liquid in 5 mL Flame Sealed Ampoule**
Hersteller *Manufacturer*	**Eckert & Ziegler Analytics, Inc.**
Typ *Type*	**8328-5FSA-370BQ-D**
Serien-Nr. *Serial number*	**121695**
Auftraggeber *Customer*	**Test America Laboratories- St. Louis**
Auftragsnummer *Order No.*	**CO-053651**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**31-May-2022 1200 EST (1700 UTC)**

Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the metrological traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine sind bei Nennung des für die Freigabe Verantwortlichen in Klarschrift auch ohne Unterschrift gültig.

This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates with the full name of the approval responsible person are valid without signature.

Datum der Ausstellung *Date of issue*	Freigabe des Kalibrierscheins durch *Approval of the certificate of calibration by*
26-May-22	Levan Tkavadze

002018
D-K-19023-01-00
2022-05

- **Customer Purchase Order No.:**
  GamCred001, Item 1

- **Calibration Results:**

Nuclide	Half-Life *, d	Activity, Bq	Uncertainty, %	Calibration Method
Ra-228	2.100E+03	3.416E+02	4.9	HPGe

- **Calibration Method(s):**
  This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics using a germanium gamma-ray spectrometer system (HPGe).

- **Uncertainty:**
  The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. It has been determined in accordance with EA-4/02 M. The value of the measurand lies within the assigned range of values with a probability of approximately 95%. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

- **Traceability:**
  Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

- **Impurities:**
  α-impurities: Ra-226 6.5E+00 Bq, other α-impurities (other than decay products) < 0.1 %
  γ-impurities (other than decay products) < 0.1 %

- **Expiration Date:**
  No expiration date has been given for this source.

- **Wipe Test *:**
  This source was wipe tested in its inactive areas with leak test results < 185 Bq (5 nCi) of removable activity per ISO 9978:1992.

- **Additional Information:**
  - 5.00238 g of 0.1 M HCl solution with approximately 30 µg/g Ba carrier.
  - Separation date: 01-March-2018
  - *Values not calibrated by EZA (i.e. published nuclear data, uncertified values, etc.)
  - Date of Calibration corresponds to Reference Date for this source.
  - Expiration Date refers to useful life of this source.

End of Certificate

Reagent

Ra-228_00051

St. Louis Radiological Standard Verification Form

Standard ID Number: Ra-228 00051
True Value = 8.2961 pCi/L or g
Date Analyzed: 4/10/2023

Radionuclide: Ra-228

	Replicates	
#1	9.38	pCi/L or g
#2	8.232	pCi/L or g
#3	8.417	pCi/L or g
#4	8.393	pCi/L or g
#5	8.94	pCi/L or g
#6	8.425	pCi/L or g

Mean = 8.63116667

1 sigma = 0.43830556 1.96 sigma = 0.859079

True Value minus 5% = 7.881295 (True Value - 5%)
True Value plus 5% = 8.710905 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

1st Reviewed By/Date: Michaelkonintinger 4/11/2023

2nd Reviewed By/Date: Sarah Bussin 4/11/23

MANUAL DATA ENTRY REQUIRED AT INSTRUMENT? (circle one) YES NO
If YES, data entry MUST be 2nd reviewed

1st Reviewed By/Date: _____

2nd Reviewed By/Date: _____

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	5/21/2022 0:00		
Decayto Date/Time (t):	4/10/23 0:00		
Initial Activity (A_0):	20.50	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	20.49597	dpm/mL	
***Soln. Density:**	1	g/mL	
Nuclide:	Ra-228		
Half-Life (days):	2100.1875	decay days	fraction
****Decay Factor:**	0.8986	324.00	0.15427
Decay Corr Activity:	1.8417E+01	dpm	
Decay Corr Conc:	1.8417E+01	dpm/mL	

Conversion/Calculations

Final Activity Unit:	pCi	
Activity Unit Factor:	0.45045	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	8.2961E+00	pCi/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	8.2961E+00	pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

eurofins Environment Testing TestAmerica

Analysis Report for Radium 228

Batch: 606428 **Operator:**

SampID	WRKNO / Analyte	Aliquot / SampCntD	TruncYields / BkgCntDur	TruncYields / SampCnt	BaYield / BkgCnt	YYield / Activity	InstrID	Eff / UncCount	Y Ingrowth Time / UncTotal	Y Precip Time / MDA	Y Precip Time / DLC	CountDateTime / MQO	Sigma	CalType
160-46998-A-2-E	160-46998-A-2-E	1000.0000mL	False		90.89%	84.11%	Orange17	0.4404	4/7/23 14:00	4/10/23 9:00		4/10/23 12:31	1.00	1
	Ra-228	100.00	1000.00	461	312	9.380E+000 pCi/L		4.702E-001	6.381E-001	4.861E-001	2.979E-001	0.6381		
160-46998-A-2-F	160-46998-A-2-F	1000.0000mL	False		95.19%	88.60%	Orange18	0.4417	4/7/23 14:00	4/10/23 9:00		4/10/23 12:31	1.00	1
	Ra-228	100.00	1000.00	451	337	8.232E+000 pCi/L		4.205E-001	5.659E-001	4.543E-001	2.798E-001	0.5659		
160-46998-A-2-G	160-46998-A-2-G	1000.0000mL	False		97.47%	84.11%	Orange19	0.4457	4/7/23 14:00	4/10/23 9:00		4/10/23 12:31	1.00	1
	Ra-228	100.00	1000.00	457	386	8.417E+000 pCi/L		4.319E-001	5.800E-001	4.916E-001	3.054E-001	0.5800		
160-46998-A-2-H	160-46998-A-2-H	1000.0000mL	False		98.48%	85.23%	Orange20	0.4422	4/7/23 14:00	4/10/23 9:00		4/10/23 12:31	1.00	1
	Ra-228	100.00	1000.00	454	302	8.393E+000 pCi/L		4.234E-001	5.730E-001	4.349E-001	2.660E-001	0.5730		
160-46998-A-2-I	160-46998-A-2-I	1000.0000mL	False		97.22%	82.99%	Orange21	0.4460	4/7/23 14:00	4/10/23 9:00		4/10/23 12:31	1.00	1
	Ra-228	100.00	1000.00	465	275	8.940E+000 pCi/L		4.420E-001	6.037E-001	4.311E-001	2.619E-001	0.6037		
160-46998-A-2-J	160-46998-A-2-J	1000.0000mL	False		94.18%	82.24%	Orange23	0.4411	4/7/23 14:00	4/10/23 9:00		4/10/23 12:31	1.00	1
	Ra-228	100.00	1000.00	423	315	8.425E+000 pCi/L		4.443E-001	5.896E-001	4.813E-001	2.952E-001	0.5896		

Laboratory Control Sample Information

SampID	WRKNO	ComponentName	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

SampID	SampDupID	Analyte	Activity	DupActivity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

eurofins | Environment Testing

Ra-228_00051

Reagent ID: Ra-228_00051

		Expiration Date:	10/03/2023
Description:	Ra-228 Spike	Laboratory:	Eurofins St. Louis
No. of Bottles:	2	Prepared By:	Korrinhizer, Micha L
Storage Location:	RAD Separations Reagents - Rm 112	Solvent:	0.1M HCl
Reagent Volume:	1.000 L	Solvent Lot:	N/A
Creation Date:	10/03/2022		
Open Date:			
Container(s):	2318210, 2318211		
Comment:	Spike at 1mL		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Ra-228	Ra-228_00050	10/03/2023	68.28700	Bq/g	20.49597	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Ra-228_00050	Ra-228 Ampoule	ASTD	10/03/23	Eckert & Ziegler	121695	D-K-19023-01-00	5.00238	g

Reagent

Sr-90_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

80573-334

5 mL Liquid in Flame Sealed Vial

Customer: Test America St. Louis
P.O. No.: 2324797, Item 1

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting. Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Sr-90	10515.5	3.782E+04	0.1	0.9	1.8	09/17/2009

*Uncertainty: U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities <0.1%. 5.04317 grams 0.1M HCl solution with approximately 30 microg/g each of Sr and Y carriers. NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total beta emission rate for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 9-22-09
D. M. Montgomery, QA Manager

ACCREDITED SOURCE CALIBRATION LABORATORY
HEALTH PHYSICS SOCIETY
FOUNDED 1958

Corporate Office
Laboratory
1380 Seaboard Industrial Blvd., Atlanta, Georgia 30318

Reagent

Sr-90_00017

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

92352

Sr-90 5 mL Liquid in Flame Sealed Vial

Customer: TestAmerica St. Louis
P.O. No.: 2502682, Item 1 Product Code: 8090-5FSA-37kBq

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
Sr-90	1.052E+04	3.749E+04	0.1	0.9	1.8	11/29/2012

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities<0.1%.
5.02357 g 0.1M HCl solution with approximately 30 μg/g each Sr and Y carriers.

NOTE: This source also contains Y-90 in secular equilibrium with Sr-90. The Y-90 activity is equal to the Sr-90 activity. Since Sr-90 and Y-90 both decay 100% by beta emission, the total activity for the source is twice the certified Sr-90 activity. The half-life for Y-90 is 64.08 hours.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 26 NOV 12
J.D. McCorvey, Counting Room Manager

RAD12-0042
Sr-90
hursts
None
Prep/Opened: 11/28/2012
Exp(1): 11/29/2062
Exp(2): 11/29/2062

51511
ID Sr-90_00017
Sr-90 Ampoule

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

Single Isotope Certificate Rev 3, 23 August 2012

Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Reagent

Sr-90_00018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sr-90_00018

Reagent ID: Sr-90_00018

		Expiration Date:	11/29/2062
Description:	Sr-90 Calibration STD	Laboratory:	TestAmerica St. Louis
No. of Bottles:	1	Prepared By:	Hurst, Sarah
Storage Location:	RAD Separations Reagents - 1	Solvent:	0.1M HCL
Reagent Volume:	100.000 mL	Solvent Lot:	0
Creation Date:	11/28/2012		
Container(s):	51512		
Comment:	Rad12-0043		

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
Gross Beta	Sr-90_00017	11/29/2062	14925.64000	Bq/g	44774.23338	dpm/mL
Sr-90	Sr-90_00017	11/29/2062	7462.82000	Bq/g	22387.11669	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
Sr-90_00017	Sr-90 Ampoule	ASTD	11/29/62	Analytics	92352		4.99970	g

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1976.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Low mass)

	Replicates	
#1	1935	pCi/sample or g
#2	1941	pCi/sample or g
#3	1924	pCi/sample or g

Mean = 1933.333

1 sigma = 8.621678 1.96 sigma = 16.89849

True Value minus 5% = 1877.913 (True Value - 5%)
True Value plus 5% = 2075.588 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1948.75 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (Medium mass)

	Replicates	
#1	1911	pCi/sample or g
#2	1945	pCi/sample or g
#3	1893	pCi/sample or g

Mean = 1916.333

1 sigma = 26.40707

1.96 sigma = 51.75786

True Value minus 5% = 1851.313 (True Value - 5%)
True Value plus 5% = 2046.188 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Sr-90_00018 (51512)
True Value = 1992 pCi/sample or g
Date Analyzed: 2/10/2014

Radionuclide: Sr-90 (High mass)

	Replicates	
#1	1907	pCi/sample or g
#2	1930	pCi/sample or g
#3	1937	pCi/sample or g

Mean = 1924.667

1 sigma = 15.69501

1.96 sigma = 30.76222

True Value minus 5% = 1892.4 (True Value - 5%)
True Value plus 5% = 2091.6 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 2/10/14

SOP Reference: STL-QA-0002, Current Revision

Protean Beta ICV-ACV recoveries from March 2013			
Protean Detector	**Low** pCi/sample	**Medium** pCi/sample	**High** pCi/sample
0	1962	1945	1971
1	2003	1947	1995
2	1960	1965	1998
3	1988	1942	1995
4	1977	1940	1997
5	1969	1949	2013
6	1986	1938	1986
7	1969	1964	1981
Average pCi/sample	1976.75	1948.75	1992

Protean Beta ICV-ACV recoveries from February 2014			
Protean Detector	**Low** pCi/sample	**Medium** pCi/sample	**High** pCi/sample
4	1935	1911	1907
5	1941	1945	1930
6	1924	1893	1937
Average pCi/sample	1933.33	1916.33	1924.67

Standard ID
Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean4	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	49	0.00	0.000E+000	4.900E-002	0.1157	**-1.908E-001**	pCi/sample	5.869E-002	5.452E-002	3.382E+000	8.968E-001
	Gross Beta	9072	417	0.00	1.814E+003	4.170E-001	0.4224	**1.935E+003**	pCi/sample	1.977E+002	4.063E+001	1.594E+000	7.165E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean4	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	1	49	0.00	2.000E-001	4.900E-002	0.0830	**8.194E-001**	pCi/sample	2.174E+000	2.172E+000	4.713E+000	1.250E+000
	Gross Beta	8432	417	0.00	1.686E+003	4.170E-001	0.3973	**1.911E+003**	pCi/sample	1.956E+002	4.164E+001	1.694E+000	7.616E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean4	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	1	49	0.00	2.000E-001	4.900E-002	0.0540	**1.260E+000**	pCi/sample	3.343E+000	3.340E+000	7.248E+000	1.922E+000
	Gross Beta	8054	417	0.00	1.611E+003	4.170E-001	0.3804	**1.907E+003**	pCi/sample	1.954E+002	4.251E+001	1.770E+000	7.956E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean5	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	43	0.00	0.000E+000	4.300E-002	0.1145	-1.692E-001	pCi/sample	5.510E-002	5.161E-002	3.337E+000	8.490E-001
	Gross Beta	9111	398	0.00	1.822E+003	3.980E-001	0.4228	1.941E+003	pCi/sample	1.983E+002	4.068E+001	1.569E+000	6.992E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean5	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	43	0.00	0.000E+000	4.300E-002	0.0823	-2.353E-001	pCi/sample	7.661E-002	7.176E-002	4.639E+000	1.180E+000
	Gross Beta	8552	398	0.00	1.710E+003	3.980E-001	0.3960	1.945E+003	pCi/sample	1.990E+002	4.207E+001	1.675E+000	7.465E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean5	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	2	43	0.00	4.000E-001	4.300E-002	0.0532	3.022E+000	pCi/sample	4.802E+000	4.790E+000	7.178E+000	1.826E+000
	Gross Beta	8046	398	0.00	1.609E+003	3.980E-001	0.3755	1.930E+003	pCi/sample	1.977E+002	4.304E+001	1.766E+000	7.873E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122640 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot Cs	Aliquot Cb	Mass XT	Instr ID CPMs	CountTime CPMb	CountTime Eff	Activity	Ts	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC
ICVABT-51512;B1	NA	1.000E+000	sample	0.0513 g	Protean6	2/10/14 23:19			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.1165	-3.362E-001 pCi/sample		8.166E-002	7.210E-002	3.776E+000	1.186E+000
	Gross Beta	8992	520	0.00	1.798E+003	5.200E-001	0.4209	1.924E+003 pCi/sample		1.966E+002	4.059E+001	1.718E+000	8.029E-001
ICVABT-51512;B2	NA	1.000E+000	sample	0.1114 g	Protean6	2/10/14 23:04			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.0842	-4.657E-001 pCi/sample		1.131E-001	9.985E-002	5.230E+000	1.642E+000
	Gross Beta	8356	520	0.00	1.671E+003	5.200E-001	0.3976	1.893E+003 pCi/sample		1.937E+002	4.142E+001	1.819E+000	8.499E-001
ICVABT-51512;B3	NA	1.000E+000	sample	0.1813 g	Protean6	2/10/14 22:54			5.00	1000.00	1.00	2.00	
	Gross Alpha	0	87	0.00	0.000E+000	8.700E-002	0.0559	-7.014E-001 pCi/sample		1.703E-001	1.504E-001	7.877E+000	2.474E+000
	Gross Beta	8127	520	0.00	1.625E+003	5.200E-001	0.3778	1.937E+003 pCi/sample		1.985E+002	4.300E+001	1.914E+000	8.945E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica St. Louis

Standards Preparation Logbook Record

Nov-28-2012

Logbook: \\Qstlmo01\Stdslog\RAD_STD.std

RAD12-0042, Sr-90 Sr-90-00017 #51511 Analyst: hursts

Vendor: Analytics Lot No.: 92352
Solvent: None
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)
Cert: 92352 Activity: 37490Bq Mass: 5.02357 Ref. Date: 11/29/12

Component	Initial Conc (dpm/g)	Final Conc (dpm/g)
Sr-90	447,769	447,769

RAD12-0043, Sr-90 Calibration STD Sr-90-00018 #51512 Analyst: hursts

Solvent: None Volume (ml): 100.00
Date Prep./Opened: 11-28-2012
Date Expires(1): 11-29-2062 (50 Years)
Date Expires(2): 11-29-2062 (50 Years)

Parent Std No.: RAD12-0042, Sr-90 Aliquot Amount (g): 4.9997
Parent Date Expires(1): 11-29-2062 Parent Date Expires(2): 11-29-2062

Component	Initial Conc (dpm/g)	Final Conc (dpm/mL)
Sr-90	447,769	22,387

Reviewed By: SB

St. Louis Radiological Standard Reverification Form

Standard ID Number: Rad12-0043
True Value = 2016.7 pCi/L or g
Date Analyzed: 11/30/2012

Radionuclide: Sr90

	Replicates	
#1	1964	pCi/L or g
#2	1958	pCi/L or g
#3	2015	pCi/L or g

Mean = 1979

1 sigma = 31.32092 1.96 sigma = 61.389

True Value minus 5% = 1915.865 (True Value - 5%)
True Value plus 5% = 2117.535 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? **Yes** **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? **Yes** **(Acceptance Criteria)**

Standard Reverification Acceptable? **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: 11/30/12

SOP Reference: STL-QA-0002, Current Revision

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Gross Alpha/Beta

Batch: M122629 **Operator:** 63903

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC
verification-1b	NA	1.000E+000	sample	0.0536 g	Purple16	11/30/12 10:42		8.00	1000.00	1.00	1.00	
	Gross Alpha	123	175	0.00	1.538E+001	1.750E-001	0.4314	1.587E+001 pCi/sample	1.707E+000	1.448E+000	8.638E-001	3.593E-001
	Gross Beta	14954	485	0.00	1.869E+003	4.850E-001	0.4285	1.964E+003 pCi/sample	9.953E+001	1.607E+001	1.211E+000	6.021E-001
verification-2b	NA	1.000E+000	sample	0.0529 g	Purple17	11/30/12 10:43		8.00	1000.00	1.00	1.00	
	Gross Alpha	53	87	0.00	6.625E+000	8.700E-002	0.1306	2.254E+001 pCi/sample	3.391E+000	3.138E+000	2.356E+000	8.365E-001
	Gross Beta	15152	362	0.00	1.894E+003	3.620E-001	0.4356	1.958E+003 pCi/sample	9.919E+001	1.591E+001	1.077E+000	5.117E-001
verification-3b	NA	1.000E+000	sample	0.0528 g	Purple18	11/30/12 10:43		8.00	1000.00	1.00	1.00	
	Gross Alpha	85	62	0.00	1.063E+001	6.200E-002	0.1313	3.624E+001 pCi/sample	4.462E+000	3.954E+000	2.160E+000	7.027E-001
	Gross Beta	15378	395	0.00	1.922E+003	3.950E-001	0.4296	2.015E+003 pCi/sample	1.020E+002	1.625E+001	1.125E+000	5.420E-001

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Prep Report for Gross Alpha/Beta

Batch: M122629 **Prep Analyst:** 250

SampID	WRKNO	Aliquot		Gross	Tare	Mass	Dilution
verification-1b	NA	1.000E+000	sample purple 16	8.7067 g	8.6531 g	0.0536 g	1.00
verification-2b	NA	1.000E+000	sample 17	8.6615 g	8.6086 g	0.0529 g	1.00
verification-3b	NA	1.000E+000	sample 18	8.6935 g	8.6407 g	0.0528 g	1.00

Spike Information

Sample ID	Standard ID	Analyte	Std Conc	Aliquot	Ref Date	StdAdded
	Rad12-0043	SR-90	22.387 dpm/mL	0.1 mL	11-29-12	

MS — Spiked By

LM — Spike Verified By

11-28-12 — Spike Date

Standard Operating Procedures

SOPNumber	Title	Revision

Reviewed By — 11/30/12 Review Date

MS — Analyst/Relenquished By — 11/28/12 Release Date

Received By — 11/28/12 Receipt Date

MS 11-30-12 ~~112~~ 1123433897/MS/11-28-12

Balance ID / Initials / Date

Reagent

Th-230_00051

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 114474
Source Description: 5 mL Liquid in Flame Sealed Ampoule
Product Code: 8230
Customer: Test America Laboratories- St. Louis
P.O. Number: 3053229, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-October-2019 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A, %	u_B, %	U, %*	
Th-230	2.753E+07	3.786E+03	0.2	1.0	2.0	4π LS

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Th-230-00051

Reagent

Th-230_00052

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

St. Louis Radiological Standard Verification

Printed: 11/18/2019 12:43 PM

Standard ID Number: Th-230_00053
True Value = 20311 pCi/L or g
Date Analyzed: 11/16/2019

Radionuclide: Th-230

	Replicates	
#1	19840	pCi/L or g
#2	20910	pCi/L or g
#3	19879	pCi/L or g

Mean = 20209.667

1 sigma = 606.81985

1.96 sigma = 1189.367

True Value minus 5% = 19295.45 (True Value - 5%)
True Value plus 5% = 21326.55 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: TJR 11/18/19

2nd Reviewed By/Date: 11/18/19

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	10/29/2019 0:00		
Decayto Date/Time (t):	11/16/19 0:00		
Initial Activity (A_0):	45.09 dpm		
Initial Aliquot:	1 mL		
Initial Conc:	45.0915 dpm/mL		
***Soln. Density:**	1 g/mL		
Nuclide:	Th-230		
Half-Life (days):	27539850	decay days	fraction
****Decay Factor:**	1.0000	18.00	0.00000
Decay Corr Activity:	4.5091E+01 dpm		
Decay Corr Conc:	4.5091E+01 dpm/mL		

Conversion/Calculations

Final Activity Unit:	pCi
Activity Unit Factor:	0.45045
Final Volume Unit:	L
Volume Unit Factor:	0.001
Final Concentration:	2.0311E+04 pCi/L
Aliquot Volume:	1.0000E+00 L
Final Activity (A):	2.0311E+04 pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:37:53AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-A Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-A
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246263
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

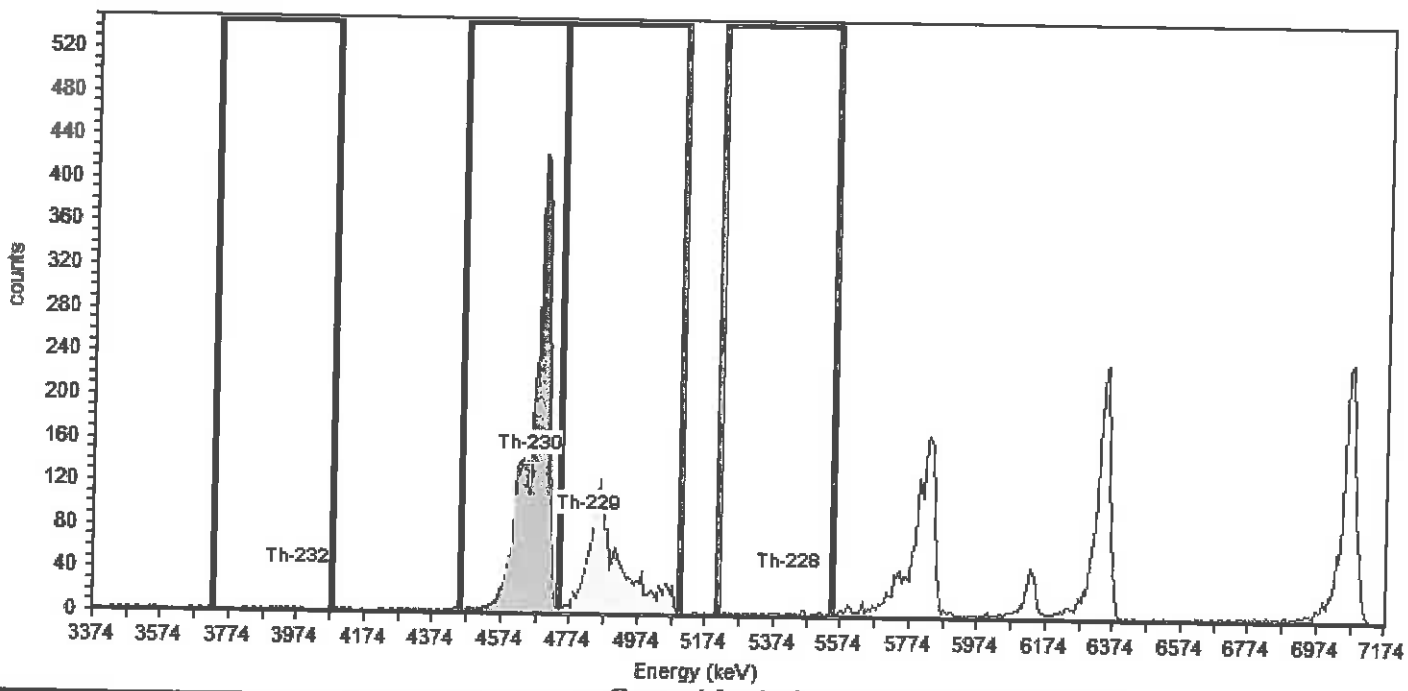
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 92.98%

Acquisition

Detector: AV244 SN: 51-005EE3
Acquisition Start Date: 11/16/2019 1:40:35PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV244; Det: AV244; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-1370619;AV244-11152018
Efficiency Calibration:IC-1370619;AV244-11152018
Calibration Date: 11/15/2018 10:58:47PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 28.89% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	.3	100.2	11	2.0000	9.00	5.229E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4739.1	34.6	99.7	3399	1.0000	3398.00	1.984E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4739.1	5097.1	73.2	99.6	1706	6.0000	1700.00	9.237E+003	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	.9	99.8	45	19.0000	26.00	1.517E+002	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:28:03AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-B Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-B
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246269
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

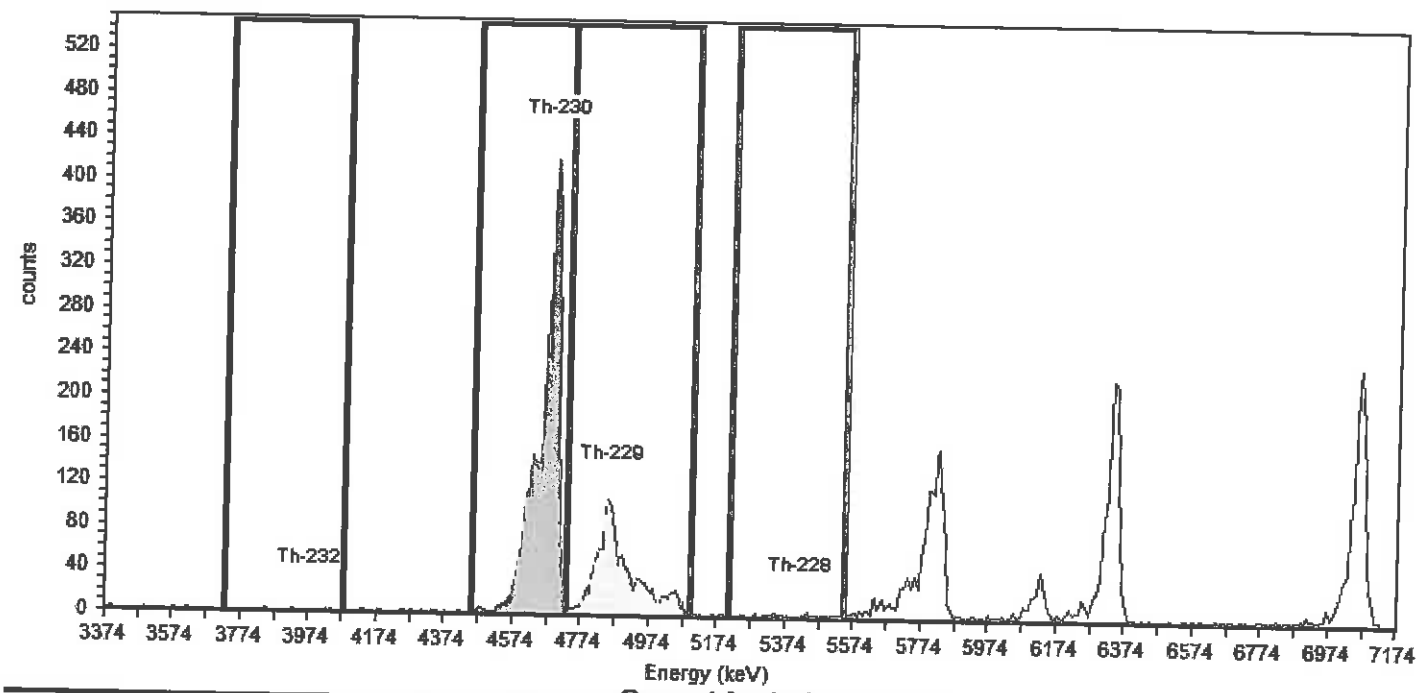
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 94.23%

Acquisition

Detector: AV245 SN: 49-037W4
Acquisition Start Date: 11/16/2019 1:40:35PM
Live Time: 960.00 min.
Real Time: 960.04 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV245; Det: AV245; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-1370620;AV245-11152018
Efficiency Calibration:IC-1370620;AV245-11152018
Calibration Date: 11/15/2018 10:58:51PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.18% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	10.5	100.2	4	0.0000	4.00	2.531E+001	pCi/L
Th-230	4686.9	4,687.5	-0.6	4455.8	4731.7	30.4	99.7	3292	4.0000	3288.00	2.091E+004	pCi/L
Th-229	4858.5	4,845.3	13.2	4731.7	5097.1	80.2	99.6	1567	6.0000	1561.00	9.361E+003	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	227.6	99.8	38	16.0000	22.00	1.398E+002	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:08:38AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-C Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-C
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246265
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

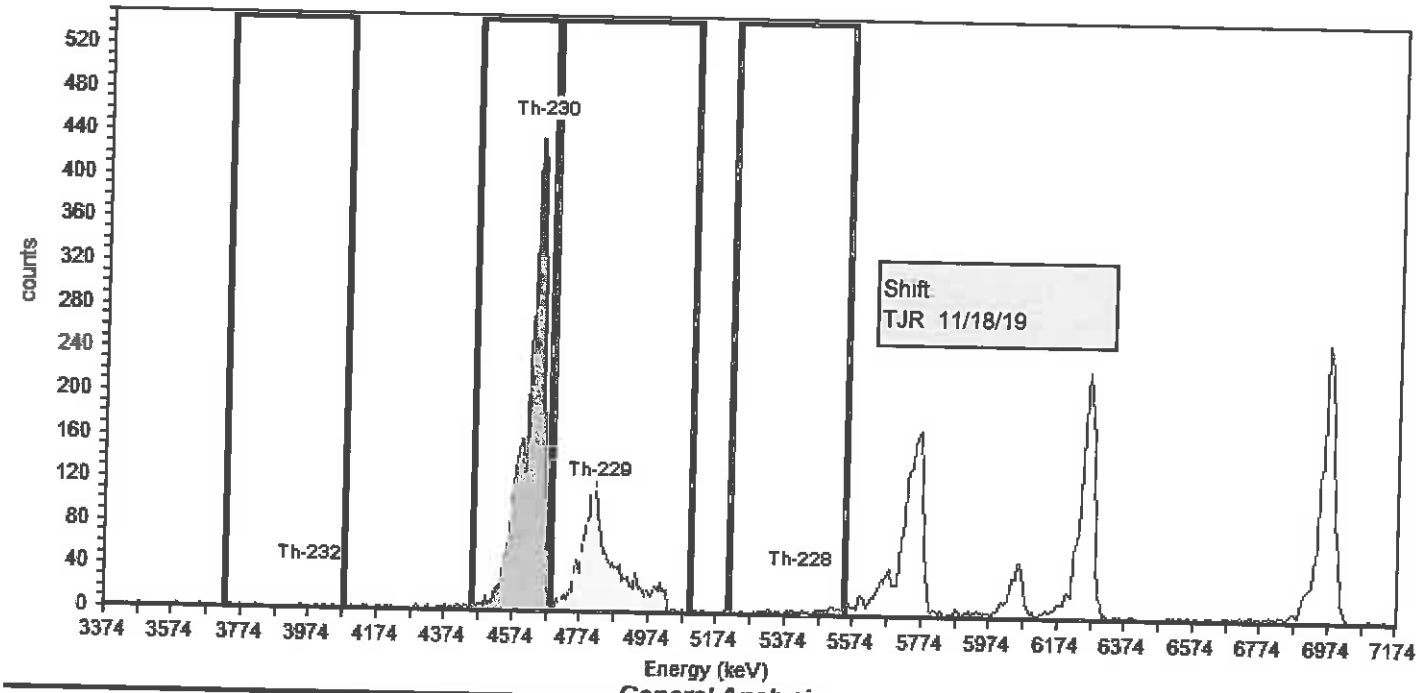
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM / mL x (Vol.) 0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 9:44:32AM

Tracer Nuclide: Th-229
Tracer Recovery: 102.72%

Acquisition

Detector: AV246 SN: 51-005Q2
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV246; Det: AV246; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-7107;AV246-11152018
Efficiency Calibration:IC-7107;AV246-11152018
Calibration Date: 11/15/2018 10:58:54PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.21% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: Interactive ROI Analysis
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	29.9	100.2	8	2.0000	6.00	3.479E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4679.5	46.7	~~23.4~~ 99.7	3412	1.0000	3411.00	~~8.470E+004~~	pCi/L
Th-229	4828.6	4,845.3	-16.7	4686.9	5097.1	70.6	99.8	1711	5.0000	1706.00	1.020E+004	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	.0	99.8	84	14.0000	70.00	4.077E+002	pCi/L

TJR 11/18/19

$84700 \cdot \frac{.234}{.997} = 19879$

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:35:47AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-D Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-D
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246266
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

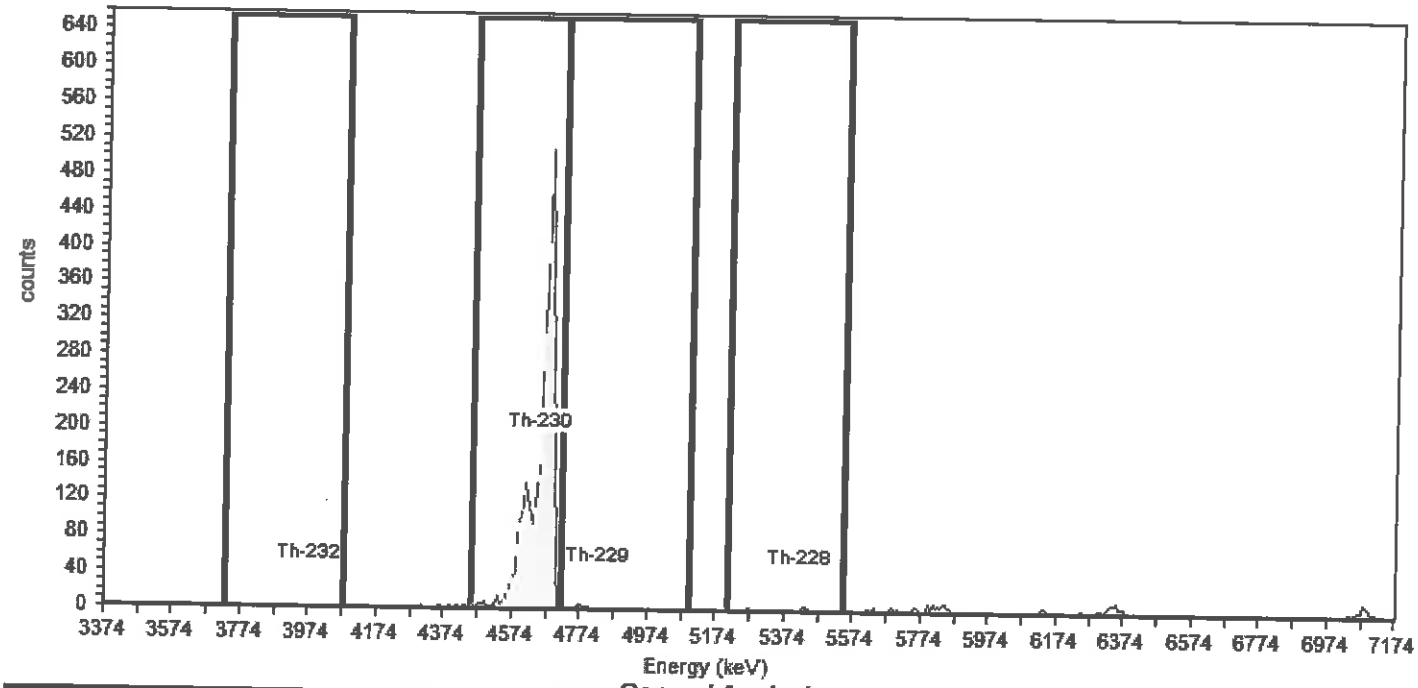
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 94.74%

Acquisition

Detector: AV247 SN: 51-027F3
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 11/9/2019 2:31:27PM
Bkgd Info: Sample: ICB;AV247; Det: AV247; Spectrum #1; 11/9/2019 2:31:27 PM

Energy Calibration: IC-8874;AV247-11152018
Efficiency Calibration:IC-8874;AV247-11152018
Calibration Date: 11/16/2018 11:45:39AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.31% +/- 0.37% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	32.5	100.2	4	0.0000	4.00	2.505E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	19.6	99.7	3227	0.0000	3227.00	1.924E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	42.6	99.6	19	9.0000	10.00	6.298E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	43.0	99.8	22	12.0000	10.00	6.290E+001	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:36:27AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-E Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-E
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246267
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

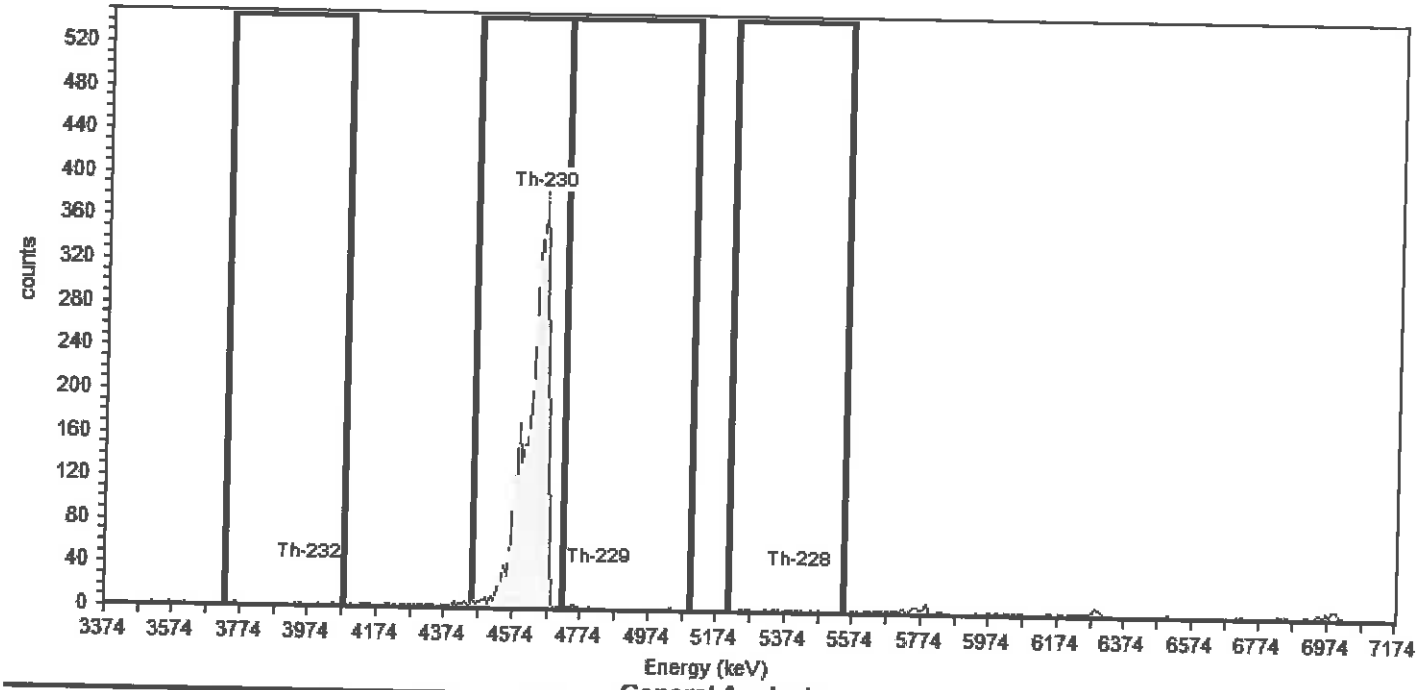
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 110.62%

Acquisition

Detector: AV249 SN: 51-005EE5
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/9/2019 2:31:28PM
Bkgd Info: Sample: ICB;AV249; Det: AV249; Spectrum #1; 11/9/2019 2:31:28 PM

Energy Calibration: IC-9520;AV249-11152018
Efficiency Calibration:IC-9520;AV249-11152018
Calibration Date: 11/15/2018 10:59:03PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 23.81% +/- 0.34% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	9.5	100.2	5	1.0000	4.00	2.371E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	65.6	99.7	3411	1.0000	3410.00	2.247E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	39.7	99.6	19	7.0000	12.00	7.152E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	186.1	99.8	17	13.0000	4.00	2.381E+001	pCi/L

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Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:37:05AM 11/18/2019

Sample

Sample Name: 160-36383-A-1-F Type: Sample
Spectrum #1 Analysis #1
: 160-36383-A-1-F
Sample Collection Date: 11/15/2019 12:00:00PM
Comment:

Sample Volume : 0.00 Sample Units: L
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

Batch

Batch Name: 450711
AnalysisResultsID: 246268
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

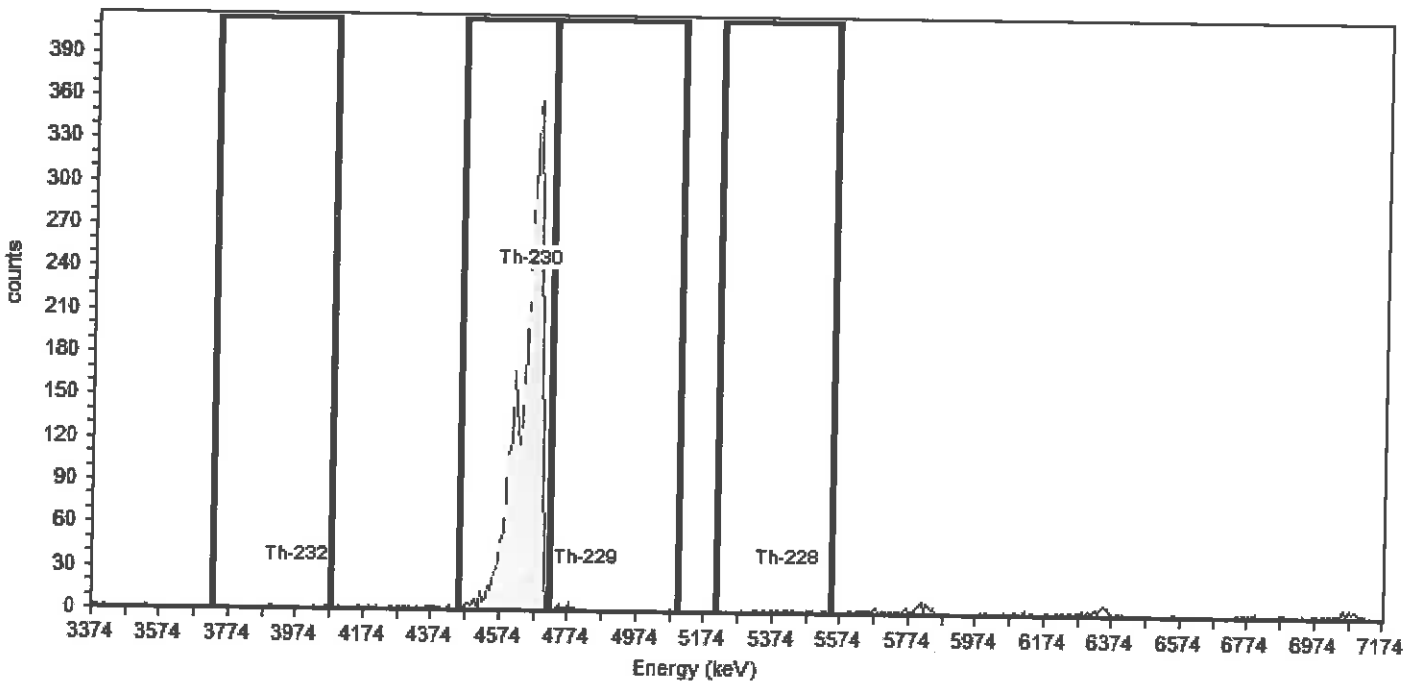
Tracer Name: Th-230_00053
Tracer Activity: 45.09 DPM / mL x (Vol.) 0.30 mL = 13.53 DPM
Tracer Ref. Date: 10/29/2019 9:30:47AM

Tracer Nuclide: Th-230
Tracer Recovery: 107.83%

Acquisition

Detector: AV250 SN: 47-052x7
Acquisition Start Date: 11/16/2019 1:40:36PM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 11/9/2019 2:31:28PM
Bkgd Info: Sample: ICB;AV250; Det: AV250; Spectrum #1; 11/9/2019 2:31:28 PM

Energy Calibration: IC-9792;AV250-11152018
Efficiency Calibration:IC-9792;AV250-11152018
Calibration Date: 11/15/2018 10:59:07PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 22.66% +/- 0.28% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction:11/16/2019 1:38:32PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	10.4	100.2	3	7.0000	-4.00	2.556E+001	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	19.5	99.7	3168	5.0000	3163.00	2.190E+004	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	51.0	99.6	20	7.0000	13.00	8.353E+001	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	134.4	99.8	17	16.0000	1.00	6.418E+000	pCi/L

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Radiochemistry Data Review Checklist

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Review Item	Yes	No	N/A	2 Rvw
Rad Prep				
1 Are all samples on batch sheet present or removed from batch?	☒	☐	☐	☐
2 Are all samples, QC and methods in compliance with client requirements?	☒	☐	☐	☐
3 Were forms checked for transcription errors?	☒	☐	☐	☐
4 Are all TALS entries complete? (End Dates and appropriate worksheet fields completed)	☒	☐	☐	☐
5 Are all problems and deviations documented? (NCM printed and attached with paperwork)	☐	☐	☒	☐
6 Does this batch contain re-extracts?	☐	☒	☐	☐
Sample Analysis				
1 Are carrier/tracer yields within acceptance limits? 183818	☐	☒	☐	☐
2 Were all sample holding times met?	☒	☐	☐	☐
3 If alpha or LSC, were samples analyzed using normal ROI's, and were spectra evaluated for interferences? 183815	☒	☐	☐	☐
QC Samples				
1 Is the blank activity <= MDA	☐	☐	☒	☐
2 Is the blank activity <= client CRDL?	☐	☐	☒	☐
3 If blank activity exceeds limit, is sample activity >= 5X blank activity?	☐	☐	☒	☐
4 Is LCS recovery within acceptance limits?	☐	☐	☒	☐
5 Is duplicate precision (e.g. RPD/RER/DER/z-score) within acceptance limits?	☐	☐	☒	☐
6 Is MS/MSD recovery within acceptance limits?	☐	☐	☒	☐
7 Do samples meet CRDL?	☐	☐	☒	☐
8 Is the absolute value of any negative result < 3sigma uncert.?	☐	☐	☒	☐
Other				
1 Are all nonconformances documented and noted? 183819, 183821	☒	☐	☐	☐
2 Were manual data entries and/or calculations checked?	☐	☐	☒	☐
Data Packaging				
1 Run logs included?	☐	☐	☐	☐
2 Daily checks included?	☐	☐	☐	☐
3 Backgrounds included?	☐	☐	☐	☐
4 Calibrations included?	☐	☐	☐	☐

Lot Number	Analytical Due Date
160-36383-A-1-A	
160-36383-A-1-B	
160-36383-A-1-C	
160-36383-A-1-D	
160-36383-A-1-E	
160-36383-A-1-F	
160-36383-A-2-A	
160-36383-A-2-B	
160-36383-A-2-C	
160-36383-A-2-D	
160-36383-A-2-E	
160-36383-A-2-F	

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Comments:

Prep Analyst: cmm Date: 11/15/2019

Analyst: Date:

Second Level Reviewer Date:

Date Uploaded:

Date Verified:

Date Review Released:

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

960min
~~240min~~ KE 11/16/19

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Preparation, Extraction Chromatography Resin Actinide Separation

TA 1.00 ml/L

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments	Output Sample Lab ID
1	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ adjust 244	160-36383-A-1-A
2	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	adjust / 245	160-36383-A-1-B
3	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 246 SWift	160-36383-A-1-C
4	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 247	160-36383-A-1-D
5	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 249	160-36383-A-1-E
6	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 250	160-36383-A-1-F
8	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	1	160-36383-A-2-A
9	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	3	160-36383-A-2-B
10	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	4	160-36383-A-2-C
11	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	14 6	160-36383-A-2-D
12	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	15 7	160-36383-A-2-E
									16 8 KE 11/16/19	160-36383-A-2-F

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Isotopic Thorium (Alpha Spectrometry)

	Input Sample Lab ID (Analytical Method)	(Sub-List)	Analytes
1	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
2	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
3	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
4	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
5	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
6	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
7	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
8	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
9	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
10	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
11	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
12	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Batch Notes

Balance ID	N/A
Analyst ID - Reagent Drop	CMM
Analyst ID - Reagent Drop Witness	KLH per CMM
Pipette ID	RAD104
Analyst ID - Column	N/A
Column Date	N/A
Analyst ID - CoPrecipitation	CMM
CoPrecipitation Date	11/15/2019
SOP Number	ST-RC-0100
Batch Comment	

Comments

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Reagent Additions Worksheet

Lab ID	Reagent Code	Amount Added	Final Amount	By	Witness
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

160-36383-A-2	Th-230_00057	0.3 mL			

Other Reagents:

Reagent	Amount/Units	Lot#:

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

Reagent

Th-230_00054

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.ezag.com

CERTIFICATE OF CALIBRATION
Standard Reference Source

SRS Number: 114475
Source Description: 5 mL Liquid in Flame Sealed Ampoule
Product Code: 8230
Customer: Test America Laboratories- St. Louis
P.O. Number: 3053229, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics (EZA). The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. EZA maintains traceability to the National Institute of Standards and Technology (NIST) through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

Reference Date: 29-October-2019 12:00 PM EST

Isotope	Half-Life, d	Activity, Bq	Uncertainty			Calibration Method**
			u_A, %	u_B, %	U, %*	
Th-230	2.753E+07	3.843E+03	0.2	1.0	2.0	4π LS

***Uncertainty:** U - Relative expanded uncertainty, $k = 2$. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results." ****Calibration Methods:** 4π LS - 4π Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber.

(Certificate continued on reverse side)

Reagent

Th-230_00056

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

St. Louis Radiological Standard Verification

Printed: 11/18/2019 11:25 AM

Standard ID Number: Th-230_00057
True Value = 20627 pCi/L or g
Date Analyzed: 11/16/2019

Radionuclide: Th-230

	Replicates	
#1	19791	pCi/L or g
#2	20695	pCi/L or g
#3	18802	pCi/L or g

Mean = 19762.667

1 sigma = 946.818

1.96 sigma = 1855.763

True Value minus 5% = 19595.65 (True Value - 5%)
True Value plus 5% = 21658.35 (True Value + 5%)

Accuracy:
Mean value within 5% of Certified (True) Value? Yes **(Acceptance Criteria)**

Precision:
1.96 sigma Value Within 10% of Mean Value? Yes **(Acceptance Criteria)**

Standard Reverification Acceptable? Yes

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: TJR 11/18/19

2nd Reviewed By/Date: 11/18/19

Decay Calculations

Raw Sample/Standard Information

Initial Date/Time (t_0):	10/29/2019 0:00		
Decayto Date/Time (t):	11/16/19 0:00		
Initial Activity (A_0):	45.79 dpm		
Initial Aliquot:	1 mL		
Initial Conc:	45.7916 dpm/mL		
***Soln. Density:**	1 g/mL		
Nuclide:	Th-230		
Half-Life (days):	27539850	decay days	fraction
****Decay Factor:**	1.0000	18.00	0.00000
Decay Corr Activity:	4.5792E+01 dpm		
Decay Corr Conc:	4.5792E+01 dpm/mL		

Conversion/Calculations

Final Activity Unit:	pCi
Activity Unit Factor:	0.45045
Final Volume Unit:	L
Volume Unit Factor:	0.001
Final Concentration:	2.0627E+04 pCi/L
Aliquot Volume:	1.0000E+00 L
Final Activity (A):	2.0627E+04 pCi

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
5:43:23AM 11/17/2019

Sample

Sample Name: 160-36383-A-2-A
SampleType: Sample
: 160-36383-A-2-A
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775471

Analyst: 60040

Tracer

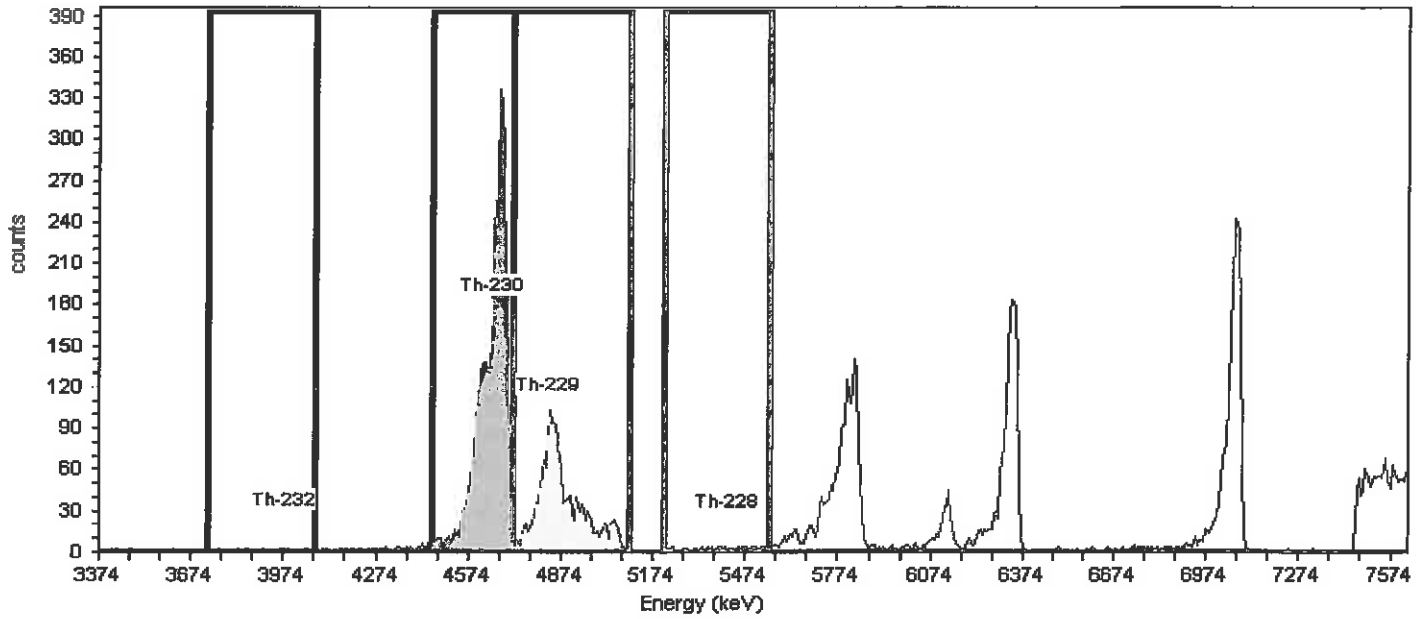
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 101.73%

Acquisition

Detector: AV1
Serial Number: 49-188 AA4
Acquisition Start Date: 11/16/2019 1:42:29PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:56:34PM
Background Info: Sample: ICB;AV1; Det: AV1; Spectrum #2; Nov-13-2019 13:56

Calibration Name: IC-7107;AV1-05142018
Calibration Date: 5/14/2018 6:23:45PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 24.36% +/- 0.28% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	32.5	100.2	9	4.0000	5.00	31.497	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	23.5	99.7	3137	11.0000	3126.00	19,790.970	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	78.3	99.6	1571	3.0000	1568.00	10,105.280	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	27.5	99.8	51	7.0000	44.00	278.400	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:51:27AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-B
SampleType: Sample
: 160-36383-A-2-B
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775566

Analyst: 60040

Tracer

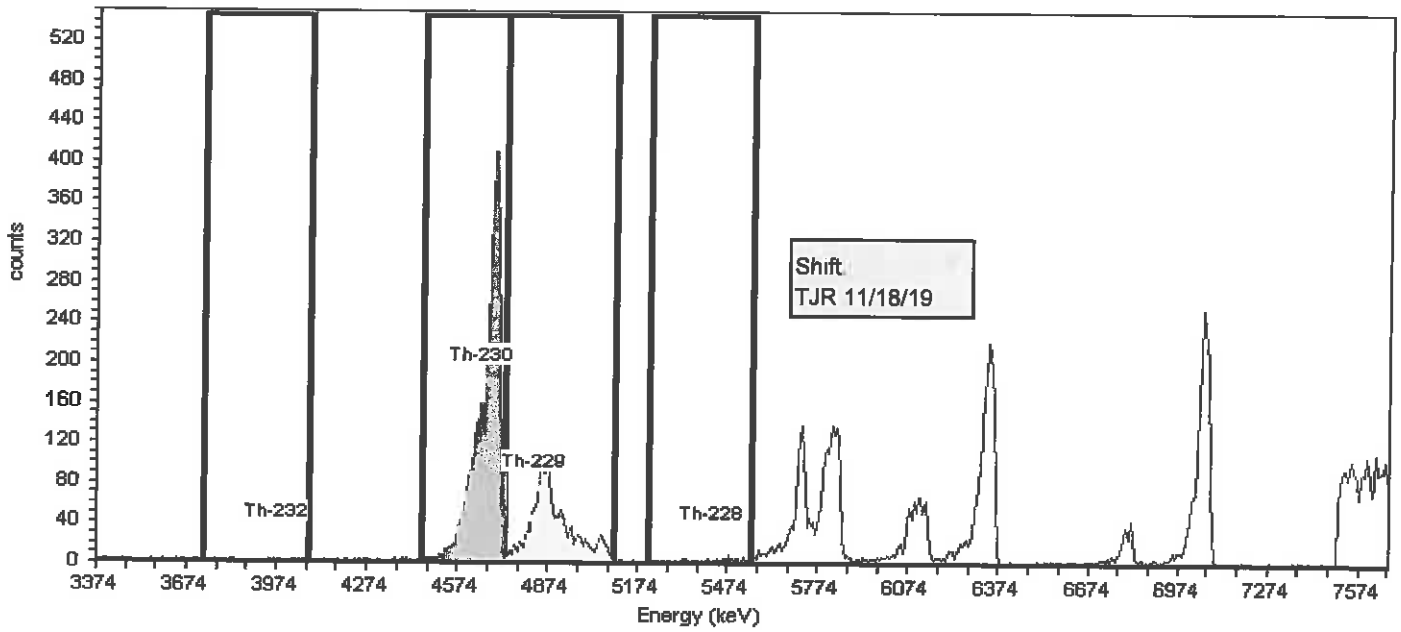
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 102.38%

Acquisition

Detector: AV3
Serial Number: 49-202 FF7
Acquisition Start Date: 11/16/2019 1:42:31PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:56:37PM
Background Info: Sample: ICB;AV3; Det: AV3; Spectrum #2; Nov-13-2019 13:56

Calibration Name: IC-8877;AV3-05142018
Calibration Date: 5/14/2018 6:25:15PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 24.44% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	12.1	100.2	14	16.0000	-2.00	-12.480	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4731.7	22.3	99.7	3313	13.0000	3300.00	20,694.600	pCi/L
Th-229	4828.6	4,845.3	-16.7	4731.7	5097.1	82.4	99.6	1591	8.0000	1583.00	10,169.700	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	18.4	99.8	79	4.0000	75.00	470.050	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
5:42:33AM 11/17/2019

Sample

Sample Name: 160-36383-A-2-C
SampleType: Sample
: 160-36383-A-2-C
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775467

Analyst: 60040

Tracer

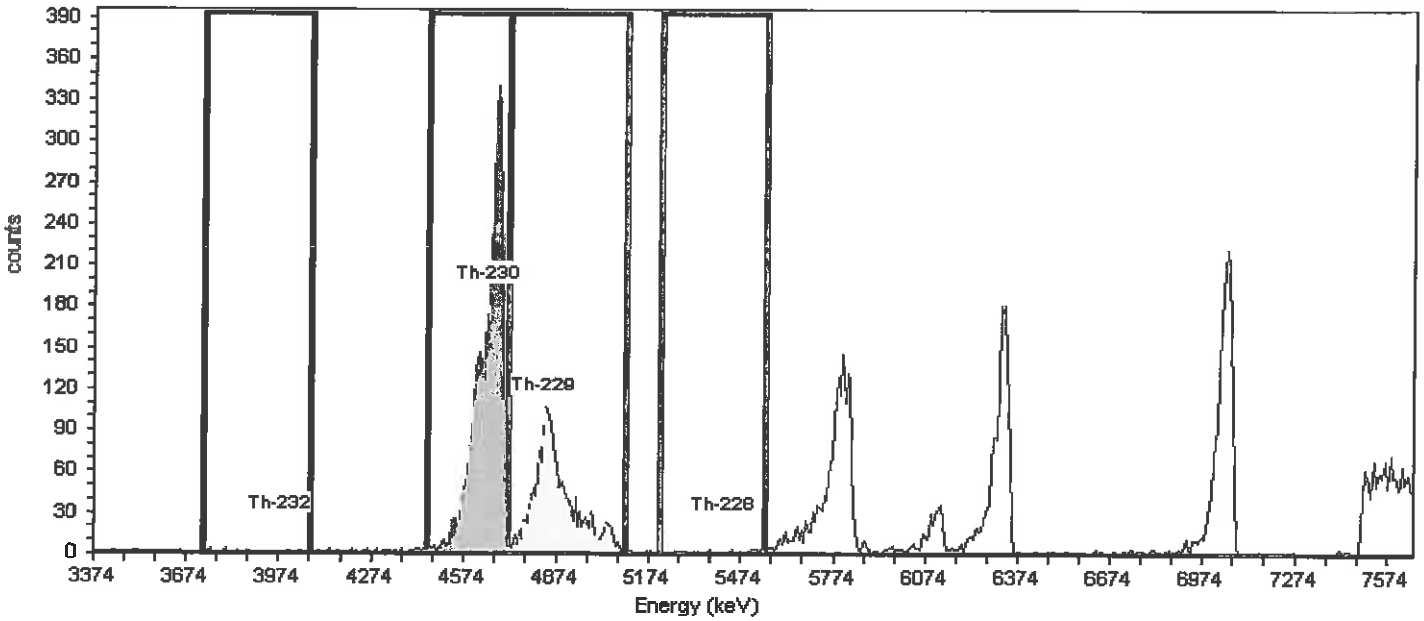
Tracer Name: Th-229_00028
Tracer Activity: 66.16 DPM/mL x (Vol.)0.10 mL = 6.62 DPM
Tracer Ref. Date: 8/29/2018 12:00:31PM

Tracer Nuclide: Th-229
Tracer Recovery: 116.50%

Acquisition

Detector: AV4
Serial Number: 46-033Q4
Acquisition Start Date: 11/16/2019 1:42:33PM
Live Time: 960.00 min.
Real Time: 960.03 min.
Background Date: 11/13/2019 1:54:23PM
Background Info: Sample: ICB;AV4; Det: AV4; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-9520;AV4-05142018
Calibration Date: 5/14/2018 6:25:34PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 22.79% +/- 0.33% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-229 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	305.2	100.2	9	7.0000	2.00	11.759	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	24.7	99.7	3184	2.0000	3182.00	18,802.470	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	87.4	99.6	1685	5.0000	1680.00	11,572.560	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	29.2	99.8	33	7.0000	26.00	153.542	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:42:35AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-D
SampleType: Sample
: 160-36383-A-2-D
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775571

Analyst: 60040

Tracer

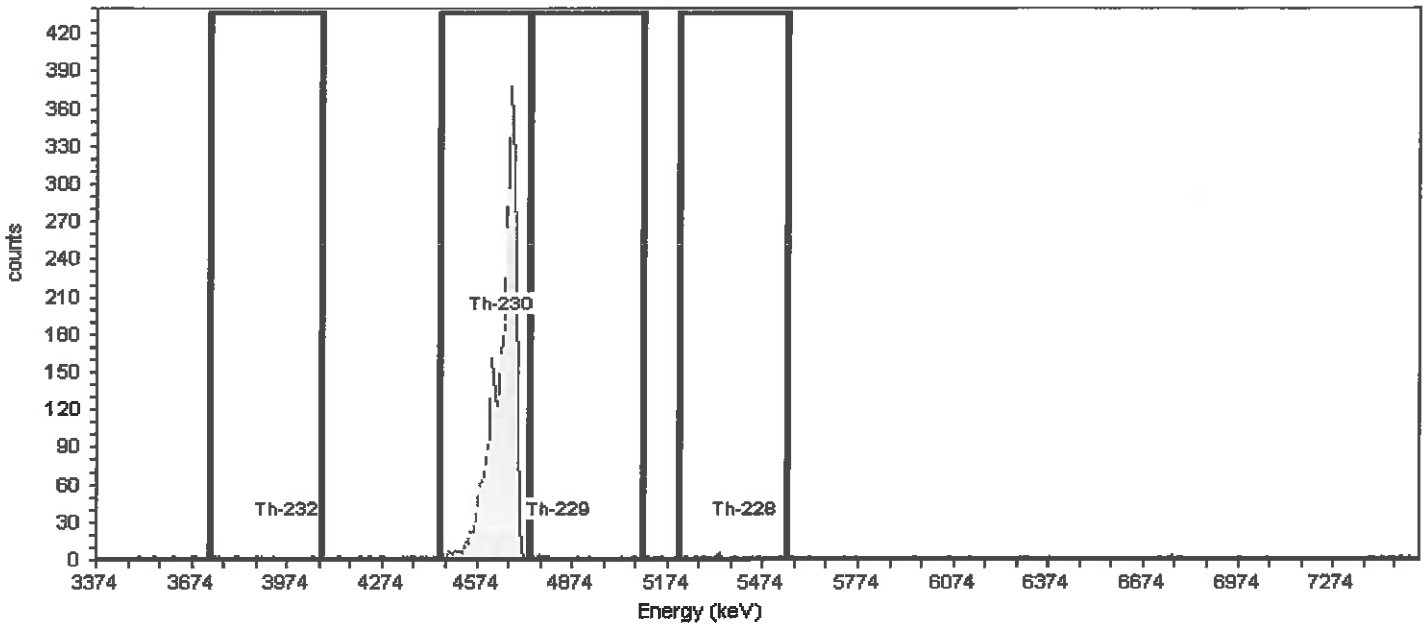
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 89.46%

Acquisition

Detector: AV14
Serial Number: 50-060W4
Acquisition Start Date: 11/16/2019 1:42:42PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:35PM
Background Info: Sample: ICB;AV14; Det: AV14; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-1370622;AV14-05142018
Calibration Date: 5/14/2018 6:27:53PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.40% +/- 0.23% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	15.9	100.2	9	2.0000	7.00	46.270	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4739.1	63.3	99.7	3108	3.0000	3105.00	18,452.200	pCi/L
Th-229	4828.6	4,845.3	-16.7	4739.1	5097.1	306.2	99.6	18	3.0000	15.00	99.700	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	223.9	99.8	14	11.0000	3.00	19.917	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:42:50AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-E
SampleType: Sample
: 160-36383-A-2-E
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775569

Analyst: 60040

Tracer

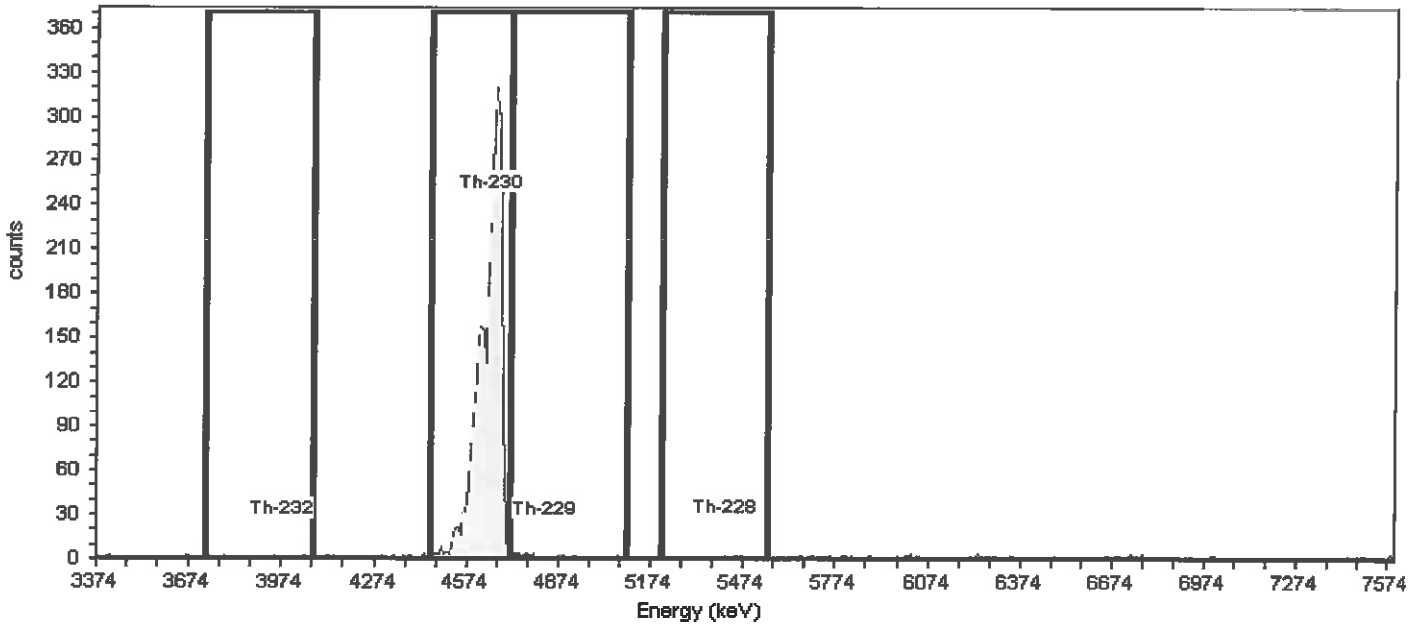
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 86.22%

Acquisition

Detector: AV15
Serial Number: 41-172C5
Acquisition Start Date: 11/16/2019 1:42:43PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:37PM
Background Info: Sample: ICB;AV15; Det: AV15; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-1370619;AV15-05142018
Calibration Date: 5/14/2018 6:28:04PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 27.26% +/- 0.23% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	29.5	100.2	5	5.0000	0.00	0.000	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	33.0	99.7	3098	8.0000	3090.00	17,785.010	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	60.9	99.6	19	9.0000	10.00	66.789	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	55.9	99.8	4	6.0000	-2.00	-13.343	pCi/L

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:43:04AM 11/18/2019

Sample

Sample Name: 160-36383-A-2-F
SampleType: Sample
: 160-36383-A-2-F
Sample Collection Date: 11/15/2019 12:00:00PM

Spectrum #1 Analysis #1
Sample Volume : 0.0003L
Aliquot: N/A Aliquot Fraction: N/A

Batch

Batch Name: 450711
AnalysisID: 775570

Analyst: 60040

Tracer

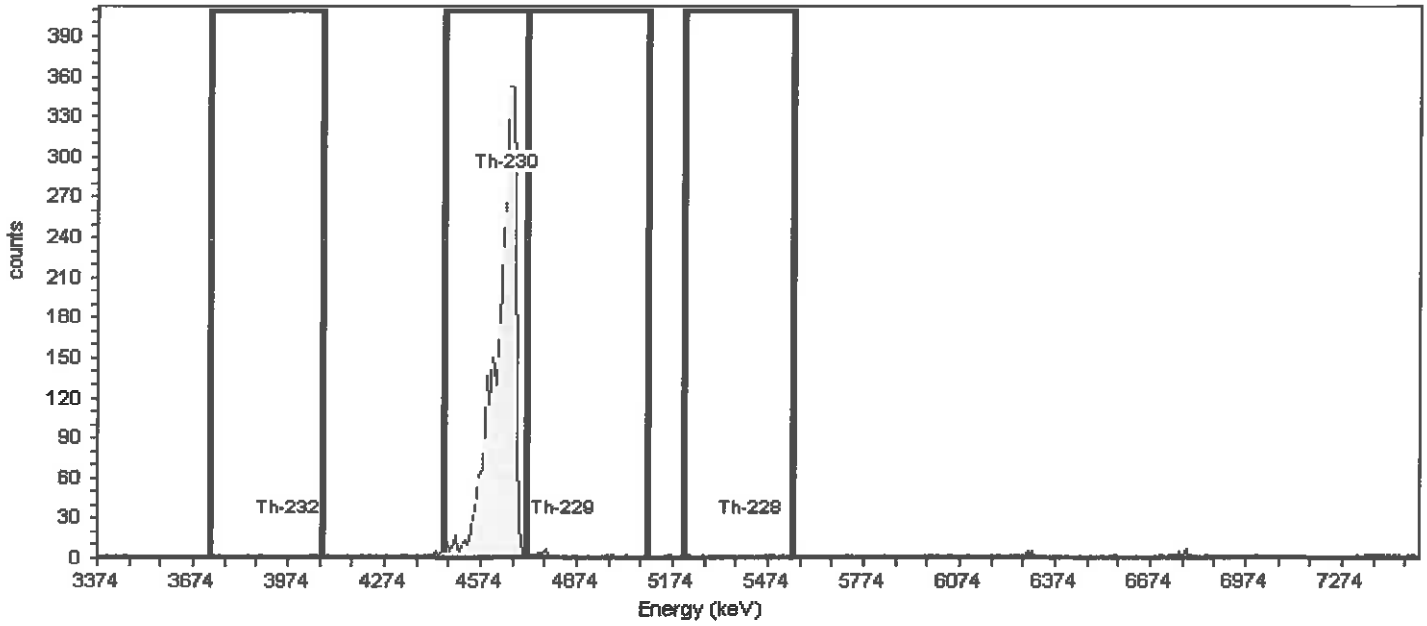
Tracer Name: Th-230_00057
Tracer Activity: 45.79 DPM/mL x (Vol.)0.30 mL = 13.74 DPM
Tracer Ref. Date: 10/29/2019 11:00:53AM

Tracer Nuclide: Th-230
Tracer Recovery: 93.47%

Acquisition

Detector: AV16
Serial Number: 51-082B6
Acquisition Start Date: 11/16/2019 1:42:45PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 11/13/2019 1:54:38PM
Background Info: Sample: ICB;AV16; Det: AV16; Spectrum #2; Nov-13-2019 13:54

Calibration Name: IC-137620;AV16-05142018
Calibration Date: 5/14/2018 6:28:17PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch^2
Efficiency: 26.96% +/- 0.24% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = Thorium_Th-230 (T)
Decay Correction: 11/16/2019 1:41:05PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Nuclide Summary (ROI)

Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
Th-232	3971.0	4,010.0	-39.0	3724.9	4075.4	23.8	100.2	7	1.0000	6.00	37.170	pCi/L
Th-230	4649.7	4,687.5	-37.8	4455.8	4716.8	42.4	99.7	3321	8.0000	3313.00	19,279.790	pCi/L
Th-229	4828.6	4,845.3	-16.7	4716.8	5097.1	.0	99.6	28	6.0000	22.00	137.046	pCi/L
Th-228	5417.8	5,423.3	-5.5	5209.0	5552.0	10.3	99.8	6	5.0000	1.00	6.222	pCi/L

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Radiochemistry Data Review Checklist

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Review Item	Yes	No	N/A	2 Rvw
Rad Prep				
1 Are all samples on batch sheet present or removed from batch?	☑	☐	☐	☐
2 Are all samples, QC and methods in compliance with client requirements?	☑	☐	☐	☐
3 Were forms checked for transcription errors?	☑	☐	☐	☐
4 Are all TALS entries complete? (End Dates and appropriate worksheet fields completed)	☑	☐	☐	☐
5 Are all problems and deviations documented? (NCM printed and attached with paperwork)	☐	☐	☑	☐
6 Does this batch contain re-extracts?	☐	☑	☐	☐
Sample Analysis				
1 Are carrier/tracer yields within acceptance limits? 183818	☐	☑	☐	☐
2 Were all sample holding times met?	☑	☐	☐	☐
3 If alpha or LSC, were samples analyzed using normal ROI's, and were spectra evaluated for interferences? 183815	☑	☐	☐	☐
QC Samples				
1 Is the blank activity <= MDA	☐	☐	☑	☐
2 Is the blank activity <= client CRDL?	☐	☐	☑	☐
3 If blank activity exceeds limit, is sample activity >= 5X blank activity?	☐	☐	☑	☐
4 Is LCS recovery within acceptance limits?	☐	☐	☑	☐
5 Is duplicate precision (e.g. RPD/RER/DER/z-score) within acceptance limits?	☐	☐	☑	☐
6 Is MS/MSD recovery within acceptance limits?	☐	☐	☑	☐
7 Do samples meet CRDL?	☐	☐	☑	☐
8 Is the absolute value of any negative result < 3sigma uncert.?	☐	☐	☑	☐
Other				
1 Are all nonconformances documented and noted? 183819, 183821	☑	☐	☐	☐
2 Were manual data entries and/or calculations checked?	☐	☐	☑	☐
Data Packaging				
1 Run logs included?	☐	☐	☐	☐
2 Daily checks included?	☐	☐	☐	☐
3 Backgrounds included?	☐	☐	☐	☐
4 Calibrations included?	☐	☐	☐	☐

Lot Number	Analytical Due Date
160-36383-A-1-A	
160-36383-A-1-B	
160-36383-A-1-C	
160-36383-A-1-D	
160-36383-A-1-E	
160-36383-A-1-F	
160-36383-A-2-A	
160-36383-A-2-B	
160-36383-A-2-C	
160-36383-A-2-D	
160-36383-A-2-E	
160-36383-A-2-F	

Batch: 450711 **Analysis:** Thorium, Isotopic by Alpha Spectroscopy

Comments:

Prep Analyst: cmm Date: 11/15/2019

Analyst: Date:

Second Level Reviewer Date:

Date Uploaded:

Date Verified:

Date Review Released:

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

960min
~~240min~~ KR 11/16/19

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Preparation, Extraction Chromatography Resin Actinide Separation

TA 1.00 pi/L

	Input Sample Lab ID (Analytical Method)	SDG (Job #)	Matrix	Initial Amount	Final Amount	Due Date	Analytical TAT	Div Rank	Comments	Output Sample Lab ID
1	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ adjust 244	160-36383-A-1-A
2	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	adjust / 245	160-36383-A-1-B
3	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 246 Shift	160-36383-A-1-C
4	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 247	160-36383-A-1-D
	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 249	160-36383-A-1-E
	160-36383-A-1 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	/ 250	160-36383-A-1-F
8	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	1	160-36383-A-2-A
9	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	3	160-36383-A-2-B
10	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	4	160-36383-A-2-C
11	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	14 6	160-36383-A-2-D
12	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	15 7	160-36383-A-2-E
	160-36383-A-2 (A01R_Th)	N/A (160-36383-1)	Water	0.3 mL		12/12/19	18_Days	2	16 8 KR 11/16/19	160-36383-A-2-F

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Isotopic Thorium (Alpha Spectrometry)

	Input Sample Lab ID (Analytical Method)	(Sub-List)	Analytes
1	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
2	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
3	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
4	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
5	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
6	160-36383-A-1 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
7	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
8	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
9	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
10	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
11	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232
12	160-36383-A-2 (A01R_Th)	(Standard Target List)	Th-228, Th-229, Th-230, Th-232

Analytes that are not being reported with be displayed in [...] brackets. Analytes that are not being reported but are on the spike list with be displayed in (...) parentheses.

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Batch Notes

Balance ID	N/A
Analyst ID - Reagent Drop	CMM
Analyst ID - Reagent Drop Witness	KLH per CMM
Pipette ID	RAD104
Analyst ID - Column	N/A
Column Date	N/A
Analyst ID - CoPrecipitation	CMM
CoPrecipitation Date	11/15/2019
SOP Number	ST-RC-0100
Batch Comment	

Comments

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

Reagent Additions Worksheet

Lab ID	Reagent Code	Amount Added	Final Amount	By	Witness
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-229_00028	0.1 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-1	Th-230_00053	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-229_00028	0.1 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			
160-36383-A-2	Th-230_00057	0.3 mL			

ExtChrom_Actin Analysis Sheet

(To Accompany Samples to Instruments)

Batch Number: 160-450711

Analyst: Mazariegos, Chelsea M

Batch Open: 11/15/2019 4:08:00PM

Batch End: 11/15/2019 4:41:00PM

160-36383-A-2	Th-230_00057	0.3 mL			

Other Reagents:

Reagent	Amount/Units	Lot#:

Rad Worksheet

Batch Number: 160-450711
Method: ExtChrom
Analyst: Mazariegos, Chelsea M

Date Open: Nov 15 2019 4:08PM
Batch End: Nov 15 2019 4:41PM

Lab ID	Client ID	Method Chain	Basis	Initial weight/volume of sample	Th-229_00028	Th-230_00053	Th-230_00057
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL	0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-1	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL		0.3 mL	
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL	0.1 mL		0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL
160-36383-A-2	Th-230 Std Verify 1	ExtChrom_Actin, A01R_Th	T	0.3 mL			0.3 mL

Balance ID:	N/A
Analyst ID - Reagent Drop:	CMM
Analyst ID - Reagent Drop Witness:	KLH per CMM
Pipette ID:	RAD104
Analyst ID - Column:	N/A
Column Date:	N/A
Analyst ID - CoPrecipitation:	CMM
CoPrecipitation Date:	11/15/2019
SOP Number:	ST-RC-0100

GAS FLOW PROPORTIONAL COUNTER

Method 903.0

Radium-226 (GFPC) by Method 903.0

Prep Batch: 624323

Preparation, Precipitate Separation (21-Day In-Growth)

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624323

Lab Id: MB 160-624323/1-A | Analyzed: 09/07/23 07:35 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red9 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	-0.002850	0.0367	0.0367	U	pCi/L	1.00	0.0836	6	64	.	1.	0.19574	3.4004	1.	627054

Carrier	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03790				g		0.0399	95.0	30 - 110

Lab Id: LCS 160-624323/2-A | Analyzed: 09/07/23 07:35 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red10 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	10.78	0.558	1.12		pCi/L	1.00	0.0907	1509	78	.	1.	0.19950	3.4004	1.	627054

Carrier	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03690				g		0.0399	92.5	30 - 110

Lab Id: LCSD 160-624323/3-A | Analyzed: 09/07/23 07:35 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red12 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	LCSD Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	9.894	0.542	1.04	*	pCi/L	1.00	0.0891	1347	69	.	1.	0.19297	3.4004	1.	627054

Lab Id: 810-73371-16 | Analyzed: 09/07/23 07:42 | Decay Corrected: No | Ts: 100
Client ID: MW-30 | Detector: Purple22 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.0911	0.101	0.101	U *	pCi/L	1.00	0.163	21	125	.	1.	0.19866	3.401	1.	627058

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0334				g		0.0399	83.7	30 - 110

Lab Id: 810-73371-17 | Analyzed: 09/07/23 09:34 | Decay Corrected: No | Ts: 100
Client ID: MW-31 | Detector: Red0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.262	0.122	0.124	*	pCi/L	1.00	0.138	35	93	.	1.	0.19714	3.4093	1.	627054

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624323

Lab Id: 810-73371-17 | Analyzed: 09/07/23 09:34 | Decay Corrected: | Ts: 100
Client ID: MW-31 | Detector: Red0 | Yield Truncated: | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0347				g		0.0399	87.0	30 - 110

Lab Id: 810-73371-18 | Analyzed: 09/07/23 09:34 | Decay Corrected: No | Ts: 100
Client ID: MW-32 | Detector: Red1 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.403	0.144	0.148	*	pCi/L	1.00	0.137	49	93	.	1.	0.19665	3.4093	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0352				g		0.0399	88.2	30 - 110

Lab Id: 810-73371-19 | Analyzed: 09/07/23 09:34 | Decay Corrected: No | Ts: 100
Client ID: MW-33 | Detector: Red4 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.276	0.141	0.143	*	pCi/L	1.00	0.186	48	204	.	1.	0.19424	3.4093	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0363				g		0.0399	91.0	30 - 110

Lab Id: 810-73371-20 | Analyzed: 09/07/23 09:34 | Decay Corrected: No | Ts: 100
Client ID: MW-34 | Detector: Red8 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.637	0.194	0.202	*	pCi/L	1.00	0.152	56	65	.	1.	0.16585	3.4094	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0331				g		0.0399	83.0	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624323

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-624323/1-A	Radium-226			-0.002850	U	pCi/L							-.1552
Lab Control Sample ID:	**Analyte**	**Parent Result**	**Spike Added**	**LCS Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**RER Limit**	**Z Factor**
LCS 160-624323/2-A	Radium-226		11.3	10.78		pCi/L	95	90 - 110	9				-.8739
Lab Control Sample Duplicate	**Analyte**	**Parent Result**	**Spike Added**	**LCSD Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**RER Limit**	**Z Factor**
LCSD 160-624323/3-A	Radium-226		11.3	9.894	*	pCi/L	87	90 - 110	9	0.41		1	1.1569

Glossary:

Ts = Count Duration, Sample
Tb = Count Duration, Background
Cs = Total Counts, Sample
Cb = Total Counts, Background
X Talk = Crosstalk
Decay = Decay Factor
Eff = Efficiency
I = Ingrowth Factor
A = Abundance

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624323 Batch Start Date: 08/16/23 09:56 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep-21 Batch End Date: 08/29/23 14:20

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Ba_TareWt	Ba_GrossWt	Ba_Mass	IngDecDate1	IngDecDate2
MB 160-624323/1		PrecSep-21, 903.0		1000 mL	8.7038 g	8.7417 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15
LCS 160-624323/2		PrecSep-21, 903.0		1000 mL	8.6572 g	8.6941 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15
LCSD 160-624323/3		PrecSep-21, 903.0		1000 mL	8.6738 g	8.7109 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15
810-73371-A-16	MW-30	PrecSep-21, 903.0	T	743.07 mL	8.6939 g	8.7273 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15
810-73371-A-17	MW-31	PrecSep-21, 903.0	T	756.78 mL	8.6805 g	8.7152 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15
810-73371-A-18	MW-32	PrecSep-21, 903.0	T	749.49 mL	8.6893 g	8.7245 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15
810-73371-A-19	MW-33	PrecSep-21, 903.0	T	748.95 mL	8.6720 g	8.7083 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15
810-73371-A-20	MW-34	PrecSep-21, 903.0	T	746.40 mL	8.6767 g	8.7098 g	0.0399 g	08/17/2023 13:44	08/29/2023 11:15

Lab Sample ID	Client Sample ID	Method Chain	Basis	IngDecDate3	NativeMassBa	Ba carrier 00134	Ra-226 00041		
MB 160-624323/1		PrecSep-21, 903.0		09/07/2023 00:00	0 g	1 mL			
LCS 160-624323/2		PrecSep-21, 903.0		09/07/2023 00:00	0 g	1 mL	0.1 mL		
LCSD 160-624323/3		PrecSep-21, 903.0		09/07/2023 00:00	0 g	1 mL	0.1 mL		
810-73371-A-16	MW-30	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-17	MW-31	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-18	MW-32	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-19	MW-33	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-20	MW-34	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624323 Batch Start Date: 08/16/23 09:56 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep-21 Batch End Date: 08/29/23 14:20

Batch Notes	
Balance ID	1121470622, B016
Balance is Level? (Y/N)	yes
Analyst ID - Reagent Drop	KAC
Analyst ID - Reagent Drop Witness	BMP per KAC
Pipette ID	RAD132, RAD144, RAD169
SOP Number	ST-RC-0002, ST-RC-0041
Batch Comment	In: JEL; Out: BCC

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID MB 160-624323/1-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 7:35:11 AM

Count Ended 9/7/2023 9:15:20 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	6	0.060	-0.004
sd	0.008	2.449	0.024	0.027
Beta	0.339	39	0.390	0.051
sd	0.018	6.245	0.062	0.065

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID LCS 160-624323/2-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 7:35:19 AM

Count Ended 9/7/2023 9:15:29 AM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	1,509	15.090	15.012
sd	0.009	38.846	0.388	0.389
Beta	0.441	2,320	23.200	22.759
sd	0.021	48.166	0.482	0.482

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID LCSD 160-624323/3-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 7:35:30 AM

Count Ended 9/7/2023 9:15:35 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.069	1,347	13.470	13.401
sd	0.008	36.701	0.367	0.367
Beta	0.566	2,363	23.630	23.064
sd	0.024	48.611	0.486	0.487

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID 810-73371-A-16-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 7:42:58 AM

Count Ended 9/7/2023 9:23:11 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.125	21	0.210	0.085
sd	0.011	4.583	0.046	0.047
Beta	0.247	24	0.240	-0.007
sd	0.016	4.899	0.049	0.053

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID 810-73371-A-17-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:34:04 AM

Count Ended 9/7/2023 11:14:10 AM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	35	0.350	0.257
sd	0.010	5.916	0.059	0.060
Beta	0.402	86	0.860	0.458
sd	0.020	9.274	0.093	0.095

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID 810-73371-A-18-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:34:08 AM

Count Ended 9/7/2023 11:14:15 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	49	0.490	0.397
sd	0.010	7.000	0.070	0.071
Beta	0.341	147	1.470	1.129
sd	0.018	12.124	0.121	0.123

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID 810-73371-A-19-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:34:12 AM

Count Ended 9/7/2023 11:14:19 AM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.204	48	0.480	0.276
sd	0.014	6.928	0.069	0.071
Beta	0.479	105	1.050	0.571
sd	0.022	10.247	0.102	0.105

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID 810-73371-A-20-A

Repeat 1

Carrier No. 0

Batch ID 624323

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:34:57 AM

Count Ended 9/7/2023 11:15:03 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.065	56	0.560	0.495
sd	0.008	7.483	0.075	0.075
Beta	0.334	190	1.900	1.566
sd	0.018	13.784	0.138	0.139

Prep Batch: 624325

Preparation, Precipitate Separation (21-Day In-Growth)

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624325

Lab Id: MB 160-624325/1-A | Analyzed: 09/07/23 09:35 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red9 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.02900	0.0526	0.0526	U	pCi/L	1.00	0.0945	10	64	.	1.	0.19794	3.1487	1.	627054

Carrier	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03580				g		0.0399	89.7	30 - 110

Lab Id: LCS 160-624325/2-A | Analyzed: 09/07/23 09:35 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red10 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	10.20	0.561	1.08		pCi/L	1.00	0.0969	1337	78	.	1.	0.19897	3.1487	1.	627054

Carrier	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03740				g		0.0399	93.7	30 - 110

Lab Id: 810-73371-21 | Analyzed: 09/07/23 09:36 | Decay Corrected: No | Ts: 100
Client ID: MWT-04 | Detector: Red12 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.301	0.131	0.134		pCi/L	1.00	0.134	34	69	.	1.	0.19488	3.1487	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0353				g		0.0399	88.5	30 - 110

Lab Id: 810-73371-22 | Analyzed: 09/07/23 09:36 | Decay Corrected: No | Ts: 100
Client ID: MWT-12 | Detector: Red13 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.0899	0.0733	0.0738	U	pCi/L	1.00	0.106	20	88	.	1.	0.19597	3.1487	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0362				g		0.0399	90.7	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624325

Lab Id: 810-73371-23 | Analyzed: 09/07/23 09:36 | Decay Corrected: No | Ts: 100
Client ID: SG-02 | Detector: Red14 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.329	0.147	0.150		pCi/L	1.00	0.164	38	100	.	1.	0.19931	3.1487	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0326				g		0.0399	81.7	30 - 110

Lab Id: 810-73371-24 | Analyzed: 09/07/23 09:36 | Decay Corrected: No | Ts: 100
Client ID: SG-03 | Detector: Red15 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.253	0.132	0.134		pCi/L	1.00	0.161	33	106	.	1.	0.19660	3.1487	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0339				g		0.0399	85.0	30 - 110

Lab Id: 810-73371-25 | Analyzed: 09/07/23 09:37 | Decay Corrected: No | Ts: 100
Client ID: SG-04R | Detector: Red16 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.126	0.0961	0.0967	U	pCi/L	1.00	0.133	18	67	.	1.	0.19694	3.1488	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0348				g		0.0399	87.2	30 - 110

Lab Id: 810-73371-26 | Analyzed: 09/07/23 09:37 | Decay Corrected: No | Ts: 100
Client ID: SG-05 | Detector: Red17 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.0576	0.0855	0.0857	U	pCi/L	1.00	0.147	12	72	.	1.	0.20159	3.1488	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0317				g		0.0399	79.4	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624325

Lab Id:	810-73371-27	Analyzed:	09/07/23 09:37	Decay Corrected:	No	Ts:	100
Client ID:	SG-06	Detector:	Red18	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	2		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.131	0.112	0.112	U	pCi/L	1.00	0.160	16	64	.	1.	0.19909	3.1488	1.	627054

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0280				g		0.0399	70.2	30 - 110

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-624325/1-A	Radium-226			0.02900	U	pCi/L							1.1023
Lab Control Sample ID:	**Analyte**	**Parent Result**	**Spike Added**	**LCS Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**RER Limit**	**Z Factor**
LCS 160-624325/2-A	Radium-226		11.3	10.20		pCi/L	90	90 - 110					-1.8506

Glossary:

- Ts = Count Duration, Sample
- Tb = Count Duration, Background
- Cs = Total Counts, Sample
- Cb = Total Counts, Background
- X Talk = Crosstalk
- Decay = Decay Factor
- Eff = Efficiency
- I = Ingrowth Factor
- A = Abundance

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624325 Batch Start Date: 08/16/23 10:01 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep-21 Batch End Date: 08/31/23 14:39

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Ba_TareWt	Ba_GrossWt	Ba_Mass	IngDecDate1	IngDecDate2
MB 160-624325/1		PrecSep-21, 903.0		1000 mL	8.6964 g	8.7322 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
LCS 160-624325/2		PrecSep-21, 903.0		1000 mL	8.6848 g	8.7222 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
810-73371-A-21	MWT-04	PrecSep-21, 903.0	T	746.59 mL	8.6819 g	8.7172 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
810-73371-A-22	MWT-12	PrecSep-21, 903.0	T	1002.71 mL	8.6745 g	8.7107 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
810-73371-A-23	SG-02	PrecSep-21, 903.0	T	747.03 mL	8.6800 g	8.7126 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
810-73371-A-24	SG-03	PrecSep-21, 903.0	T	757.02 mL	8.6799 g	8.7138 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
810-73371-A-25	SG-04R	PrecSep-21, 903.0	T	749.11 mL	8.6830 g	8.7178 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
810-73371-A-26	SG-05	PrecSep-21, 903.0	T	744.89 mL	8.6937 g	8.7254 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40
810-73371-A-27	SG-06	PrecSep-21, 903.0	T	748.67 mL	8.6922 g	8.7202 g	0.0399 g	08/17/2023 13:39	08/31/2023 11:40

Lab Sample ID	Client Sample ID	Method Chain	Basis	IngDecDate3	NativeMassBa	Ba carrier 00134	Ra-226 00041		
MB 160-624325/1		PrecSep-21, 903.0		09/07/2023 00:00	0 g	1 mL			
LCS 160-624325/2		PrecSep-21, 903.0		09/07/2023 00:00	0 g	1 mL	0.1 mL		
810-73371-A-21	MWT-04	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-22	MWT-12	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-23	SG-02	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-24	SG-03	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-25	SG-04R	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-26	SG-05	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			
810-73371-A-27	SG-06	PrecSep-21, 903.0	T	09/07/2023 00:00	0 g	1 mL			

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624325 Batch Start Date: 08/16/23 10:01 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep-21 Batch End Date: 08/31/23 14:39

Batch Notes	
Balance ID	1121470622, B016
Balance is Level? (Y/N)	yes
Analyst ID - Reagent Drop	KAC
Analyst ID - Reagent Drop Witness	BMP per KAC
Pipette ID	RAD132, RAD144, RAD169
SOP Number	ST-RC-0002, ST-RC-0041
Batch Comment	In: JEL; Out: BCC

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID MB 160-624325/1-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:35:52 AM

Count Ended 9/7/2023 11:15:59 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	10	0.100	0.036
sd	0.008	3.162	0.032	0.033
Beta	0.339	47	0.470	0.131
sd	0.018	6.856	0.069	0.071

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID LCS 160-624325/2-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:35:56 AM

Count Ended 9/7/2023 11:16:05 AM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	1,337	13.370	13.292
sd	0.009	36.565	0.366	0.366
Beta	0.441	2,268	22.680	22.239
sd	0.021	47.624	0.476	0.477

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID 810-73371-A-21-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:36:04 AM

Count Ended 9/7/2023 11:16:09 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.069	34	0.340	0.271
sd	0.008	5.831	0.058	0.059
Beta	0.566	112	1.120	0.554
sd	0.024	10.583	0.106	0.108

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID 810-73371-A-22-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:36:08 AM

Count Ended 9/7/2023 11:16:15 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	20	0.200	0.112
sd	0.009	4.472	0.045	0.046
Beta	0.328	39	0.390	0.062
sd	0.018	6.245	0.062	0.065

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID 810-73371-A-23-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:36:11 AM

Count Ended 9/7/2023 11:16:19 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.100	38	0.380	0.280
sd	0.010	6.164	0.062	0.062
Beta	0.426	63	0.630	0.204
sd	0.021	7.937	0.079	0.082

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID 810-73371-A-24-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:36:15 AM

Count Ended 9/7/2023 11:16:22 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	33	0.330	0.224
sd	0.010	5.745	0.057	0.058
Beta	0.339	56	0.560	0.221
sd	0.018	7.483	0.075	0.077

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID 810-73371-A-25-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:37:12 AM

Count Ended 9/7/2023 11:17:19 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.067	18	0.180	0.113
sd	0.008	4.243	0.042	0.043
Beta	0.388	68	0.680	0.292
sd	0.020	8.246	0.082	0.085

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID 810-73371-A-26-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:37:16 AM

Count Ended 9/7/2023 11:17:26 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.072	12	0.120	0.048
sd	0.008	3.464	0.035	0.036
Beta	0.400	39	0.390	-0.010
sd	0.020	6.245	0.062	0.067

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID 810-73371-A-27-A

Repeat 1

Carrier No. 0

Batch ID 624325

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/7/2023 9:37:21 AM

Count Ended 9/7/2023 11:17:29 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	16	0.160	0.096
sd	0.008	4.000	0.040	0.041
Beta	0.312	53	0.530	0.218
sd	0.018	7.280	0.073	0.075

Prep Batch: 624483

Preparation, Precipitate Separation (21-Day In-Growth)

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624483

Lab Id: MB 160-624483/1-A | Analyzed: 09/08/23 07:11 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.06554	0.0656	0.0658	U	pCi/L	1.00	0.102	18	93	.	1.	0.19416	3.2768	1.	627236

Carrier	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03750				g		0.0399	94.0	30 - 110

Lab Id: LCS 160-624483/2-A | Analyzed: 09/08/23 07:11 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red1 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	10.41	0.561	1.09		pCi/L	1.00	0.102	1394	93	.	1.	0.19410	3.2768	1.	627236

Carrier	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03760				g		0.0399	94.2	30 - 110

Lab Id: 810-73371-1 | Analyzed: 09/08/23 07:14 | Decay Corrected: No | Ts: 100
Client ID: MW-01R | Detector: Red12 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.152	0.100	0.101		pCi/L	1.00	0.130	21	69	.	1.	0.19542	3.277	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0348				g		0.0399	87.2	30 - 110

Lab Id: 810-73371-2 | Analyzed: 09/08/23 07:14 | Decay Corrected: No | Ts: 100
Client ID: MW-02 | Detector: Red13 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.743	0.237	0.247		pCi/L	1.00	0.208	56	88	.	1.	0.19659	3.2771	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0356				g		0.0399	89.2	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624483

Lab Id: 810-73371-3 | Analyzed: 09/08/23 07:14 | Decay Corrected: No | Ts: 100
Client ID: MW-03 | Detector: Red14 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.417	0.154	0.158		pCi/L	1.00	0.153	48	100	.	1.	0.19790	3.2771	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0339				g		0.0399	85.0	30 - 110

Lab Id: 810-73371-4 | Analyzed: 09/08/23 07:14 | Decay Corrected: No | Ts: 100
Client ID: MW-04 | Detector: Red15 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.152	0.108	0.109		pCi/L	1.00	0.151	25	106	.	1.	0.19509	3.2771	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0353				g		0.0399	88.5	30 - 110

Lab Id: 810-73371-5 | Analyzed: 09/08/23 07:15 | Decay Corrected: No | Ts: 100
Client ID: MW-06 | Detector: Red17 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.465	0.147	0.153		pCi/L	1.00	0.122	54	72	.	1.	0.19517	3.2772	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0376				g		0.0399	94.2	30 - 110

Lab Id: 810-73371-6 | Analyzed: 09/08/23 07:16 | Decay Corrected: No | Ts: 100
Client ID: MW-07 | Detector: Red18 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.665	0.180	0.190		pCi/L	1.00	0.129	67	64	.	1.	0.19141	3.2772	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0349				g		0.0399	87.5	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624483

Lab Id: 810-73371-7 | Analyzed: 09/08/23 07:16 | Decay Corrected: No | Ts: 100
Client ID: MW-08 | Detector: Red19 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.358	0.139	0.142		pCi/L	1.00	0.127	38	59	.	1.	0.19919	3.2772	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0331				g		0.0399	83.0	30 - 110

Lab Id: 810-73371-8 | Analyzed: 09/08/23 07:16 | Decay Corrected: No | Ts: 100
Client ID: MW-09 | Detector: Red21 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.0113	0.0818	0.0818	U	pCi/L	1.00	0.163	12	110	.	1.	0.19504	3.2772	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0332				g		0.0399	83.2	30 - 110

Lab Id: 810-73371-9 | Analyzed: 09/08/23 07:16 | Decay Corrected: No | Ts: 100
Client ID: MW-10 | Detector: Red22 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.0905	0.0916	0.0919	U	pCi/L	1.00	0.142	16	79	.	1.	0.19588	3.2773	1.	627236

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0335				g		0.0399	84.0	30 - 110

Lab Id: 810-73371-10 | Analyzed: 09/08/23 07:20 | Decay Corrected: No | Ts: 100
Client ID: MW-11 | Detector: Blue3 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.409	0.156	0.160		pCi/L	1.00	0.169	53	143	.	1.	0.19266	3.2777	1.	627239

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0358				g		0.0399	89.7	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624483

Lab Id: 810-73371-11 | Analyzed: 09/08/23 07:21 | Decay Corrected: No | Ts: 100
Client ID: MW-12 | Detector: Blue10 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.0384	0.0607	0.0608	U	pCi/L	1.00	0.106	13	83	.	1.	0.19546	3.2777	1.	627239

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0345				g		0.0399	86.5	30 - 110

Lab Id: 810-73371-12 | Analyzed: 09/08/23 07:21 | Decay Corrected: No | Ts: 100
Client ID: MW-18 | Detector: Blue11 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.0175	0.0549	0.0550	U	pCi/L	1.00	0.105	11	88	.	1.	0.19140	3.2777	1.	627239

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0361				g		0.0399	90.5	30 - 110

Lab Id: 810-73371-13 | Analyzed: 09/08/23 07:21 | Decay Corrected: No | Ts: 100
Client ID: MW-19 | Detector: Blue12 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.179	0.108	0.109		pCi/L	1.00	0.147	38	170	.	1.	0.17739	3.2777	1.	627239

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0365				g		0.0399	91.5	30 - 110

Lab Id: 810-73371-14 | Analyzed: 09/08/23 07:21 | Decay Corrected: No | Ts: 100
Client ID: MW-20 | Detector: Blue13 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.118	0.0797	0.0804		pCi/L	1.00	0.109	26	106	.	1.	0.19899	3.2777	1.	627239

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0358				g		0.0399	89.7	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624483

Lab Id:	810-73371-15	Analyzed:	09/08/23 07:21	Decay Corrected:	No	Ts:	100
Client ID:	MW-27	Detector:	Purple0	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	2		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-226	0.477	0.169	0.174		pCi/L	1.00	0.182	62	169	.	1.	0.20569	3.2778	1.	627241

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0335				g		0.0399	84.0	30 - 110

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-624483/1-A	Radium-226			0.06554	U	pCi/L							1.9916
Lab Control Sample ID:	**Analyte**	**Parent Result**	**Spike Added**	**LCS Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**RER Limit**	**Z Factor**
LCS 160-624483/2-A	Radium-226		11.3	10.41		pCi/L	92	90 - 110					-1.4898

Glossary:

- Ts = Count Duration, Sample
- Tb = Count Duration, Background
- Cs = Total Counts, Sample
- Cb = Total Counts, Background
- X Talk = Crosstalk
- Decay = Decay Factor
- Eff = Efficiency
- I = Ingrowth Factor
- A = Abundance

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624483 Batch Start Date: 08/17/23 10:33 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep-21 Batch End Date: 08/31/23 14:50

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Ba_TareWt	Ba_GrossWt	Ba_Mass	IngDecDate1	IngDecDate2
MB 160-624483/1		PrecSep-21, 903.0		1000 mL	8.7102 g	8.7477 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
LCS 160-624483/2		PrecSep-21, 903.0		1000 mL	8.6903 g	8.7279 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-1	MW-01R	PrecSep-21, 903.0	T	749.55 mL	8.6536 g	8.6884 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-2	MW-02	PrecSep-21, 903.0	T	497.92 mL	8.6620 g	8.6976 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-3	MW-03	PrecSep-21, 903.0	T	744.45 mL	8.6859 g	8.7198 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-4	MW-04	PrecSep-21, 903.0	T	752.46 mL	8.6684 g	8.7037 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-5	MW-06	PrecSep-21, 903.0	T	752.32 mL	8.6744 g	8.7120 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-6	MW-07	PrecSep-21, 903.0	T	748.54 mL	8.6459 g	8.6808 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-7	MW-08	PrecSep-21, 903.0	T	745.30 mL	8.6911 g	8.7242 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-8	MW-09	PrecSep-21, 903.0	T	749.30 mL	8.6794 g	8.7126 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-9	MW-10	PrecSep-21, 903.0	T	747.91 mL	8.6792 g	8.7127 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-10	MW-11	PrecSep-21, 903.0	T	753.00 mL	8.6849 g	8.7207 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-11	MW-12	PrecSep-21, 903.0	T	996.54 mL	8.6941 g	8.7286 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-12	MW-18	PrecSep-21, 903.0	T	995.91 mL	8.6926 g	8.7287 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-13	MW-19	PrecSep-21, 903.0	T	992.38 mL	8.6680 g	8.7045 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-14	MW-20	PrecSep-21, 903.0	T	1005.30 mL	8.6609 g	8.6967 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40
810-73371-C-15	MW-27	PrecSep-21, 903.0	T	752.56 mL	8.6506 g	8.6841 g	0.0399 g	08/18/2023 14:13	08/31/2023 11:40

Lab Sample ID	Client Sample ID	Method Chain	Basis	IngDecDate3	NativeMassBa	Ba carrier 00134	Ra-226 00041		
MB 160-624483/1		PrecSep-21, 903.0		09/08/2023 00:00	0 g	1 mL			
LCS 160-624483/2		PrecSep-21, 903.0		09/08/2023 00:00	0 g	1 mL	0.1 mL		

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624483 Batch Start Date: 08/17/23 10:33 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep-21 Batch End Date: 08/31/23 14:50

Lab Sample ID	Client Sample ID	Method Chain	Basis	IngDecDate3	NativeMassBa	Ba carrier 00134	Ra-226 00041		
810-73371-C-1	MW-01R	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-2	MW-02	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-3	MW-03	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-4	MW-04	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-5	MW-06	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-6	MW-07	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-7	MW-08	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-8	MW-09	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-9	MW-10	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-10	MW-11	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-11	MW-12	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-12	MW-18	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-13	MW-19	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-14	MW-20	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			
810-73371-C-15	MW-27	PrecSep-21, 903.0	T	09/08/2023 00:00	0 g	1 mL			

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624483 Batch Start Date: 08/17/23 10:33 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep-21 Batch End Date: 08/31/23 14:50

Batch Notes	
Balance ID	1121470622, B016
Balance is Level? (Y/N)	yes
Analyst ID - Reagent Drop	KAC
Analyst ID - Reagent Drop Witness	BMP per KAC
Pipette ID	RAD132, RAD144, RAD169
SOP Number	ST-RC-0002, ST-RC-0041
Batch Comment	In: JEL; Out: BCC

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID MB 160-624483/1-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:11:39 AM

Count Ended 9/8/2023 8:51:45 AM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	18	0.180	0.087
sd	0.010	4.243	0.042	0.044
Beta	0.402	41	0.410	0.008
sd	0.020	6.403	0.064	0.067

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID LCS 160-624483/2-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:11:46 AM

Count Ended 9/8/2023 8:51:53 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	1,394	13.940	13.847
sd	0.010	37.336	0.373	0.373
Beta	0.341	2,298	22.980	22.639
sd	0.018	47.937	0.479	0.480

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID 810-73371-C-1-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:14:06 AM

Count Ended 9/8/2023 8:54:11 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.069	21	0.210	0.141
sd	0.008	4.583	0.046	0.047
Beta	0.566	65	0.650	0.084
sd	0.024	8.062	0.081	0.084

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID 810-73371-C-2-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:14:14 AM

Count Ended 9/8/2023 8:54:22 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	56	0.560	0.472
sd	0.009	7.483	0.075	0.075
Beta	0.328	89	0.890	0.562
sd	0.018	9.434	0.094	0.096

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID 810-73371-C-3-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:14:20 AM

Count Ended 9/8/2023 8:54:27 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.100	48	0.480	0.380
sd	0.010	6.928	0.069	0.070
Beta	0.426	133	1.330	0.904
sd	0.021	11.533	0.115	0.117

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID 810-73371-C-4-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:14:33 AM

Count Ended 9/8/2023 8:54:41 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	25	0.250	0.144
sd	0.010	5.000	0.050	0.051
Beta	0.339	77	0.770	0.431
sd	0.018	8.775	0.088	0.090

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID 810-73371-C-5-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:15:54 AM

Count Ended 9/8/2023 8:56:01 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.072	54	0.540	0.468
sd	0.008	7.348	0.073	0.074
Beta	0.400	129	1.290	0.890
sd	0.020	11.358	0.114	0.115

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID 810-73371-C-6-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:16:05 AM

Count Ended 9/8/2023 8:56:13 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	67	0.670	0.606
sd	0.008	8.185	0.082	0.082
Beta	0.312	91	0.910	0.598
sd	0.018	9.539	0.095	0.097

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID 810-73371-C-7-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:16:11 AM

Count Ended 9/8/2023 8:56:18 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.059	38	0.380	0.321
sd	0.008	6.164	0.062	0.062
Beta	0.383	94	0.940	0.557
sd	0.020	9.695	0.097	0.099

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID 810-73371-C-8-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:16:19 AM

Count Ended 9/8/2023 8:56:27 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.110	12	0.120	0.010
sd	0.010	3.464	0.035	0.036
Beta	0.288	19	0.190	-0.098
sd	0.017	4.359	0.044	0.064

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID 810-73371-C-9-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:16:27 AM

Count Ended 9/8/2023 8:56:35 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.079	16	0.160	0.081
sd	0.009	4.000	0.040	0.041
Beta	0.296	71	0.710	0.414
sd	0.017	8.426	0.084	0.086

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID 810-73371-C-10-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:20:53 AM

Count Ended 9/8/2023 9:01:03 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.143	53	0.530	0.387
sd	0.012	7.280	0.073	0.074
Beta	0.483	105	1.050	0.567
sd	0.022	10.247	0.102	0.105

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID 810-73371-C-11-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:21:03 AM

Count Ended 9/8/2023 9:01:36 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.083	13	0.130	0.047
sd	0.009	3.606	0.036	0.037
Beta	0.340	34	0.340	0.000
sd	0.018	5.831	0.058	0.061

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID 810-73371-C-12-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:21:10 AM

Count Ended 9/8/2023 9:01:59 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	11	0.110	0.022
sd	0.009	3.317	0.033	0.034
Beta	0.424	56	0.560	0.136
sd	0.021	7.483	0.075	0.078

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID 810-73371-C-13-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:21:17 AM

Count Ended 9/8/2023 9:02:35 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.170	38	0.380	0.210
sd	0.013	6.164	0.062	0.063
Beta	0.387	80	0.800	0.413
sd	0.020	8.944	0.089	0.092

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID 810-73371-C-14-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:21:25 AM

Count Ended 9/8/2023 9:02:56 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	26	0.260	0.154
sd	0.010	5.099	0.051	0.052
Beta	0.340	65	0.650	0.310
sd	0.018	8.062	0.081	0.083

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID 810-73371-C-15-A

Repeat 1

Carrier No. 0

Batch ID 624483

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 9/8/2023 7:21:59 AM

Count Ended 9/8/2023 9:02:10 AM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.169	62	0.620	0.451
sd	0.013	7.874	0.079	0.080
Beta	4.661	509	5.090	0.429
sd	0.068	22.561	0.226	0.236

Method 904.0

Radium-228 (GFPC) by Method 904.0

Prep Batch: 624324

Preparation, Precipitate Separation

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624324

Lab Id: MB 160-624324/1-A | Analyzed: 08/29/23 12:33 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Blue0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.3670	0.378	0.380	U	pCi/L	1.00	0.612	55	401	.	.6548	0.44697	.9117	1.	625942

Carrier	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03790				g		0.0399	95.0	30 - 110
Y Carrier	0.01930				g		0.0268	72.1	30 - 110

Lab Id: LCS 160-624324/2-A | Analyzed: 08/29/23 20:04 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red10 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	8.141	1.54	1.72		pCi/L	1.00	1.43	192	441	.	.2805	0.44067	.9117	1.	625887

Carrier	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03690				g		0.0399	92.5	30 - 110
Y Carrier	0.02100				g		0.0268	78.5	30 - 110

Lab Id: LCSD 160-624324/3-A | Analyzed: 08/29/23 20:04 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red11 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	LCSD Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	9.171	1.67	1.87		pCi/L	1.00	1.56	214	510	.	.2805	0.43722	.9117	1.	625887

Carrier	LCSD Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03710				g		0.0399	93.0	30 - 110
Y Carrier	0.02060				g		0.0268	77.0	30 - 110

Lab Id: 810-73371-16 | Analyzed: 08/29/23 12:35 | Decay Corrected: No | Ts: 100
Client ID: MW-30 | Detector: Purple10 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.820	0.535	0.540		pCi/L	1.00	0.787	56	324	.	.6522	0.44862	.9117	1.	625944

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0334				g		0.0399	83.7	30 - 110
Y Carrier	0.0209				g		0.0268	78.1	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624324

Lab Id: 810-73371-17 | Analyzed: 08/29/23 12:35 | Decay Corrected: No | Ts: 100
Client ID: MW-31 | Detector: Purple11 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.970	0.545	0.552		pCi/L	1.00	0.773	63	340	.	.652	0.44063	.9117	1.	625944

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0347				g		0.0399	87.0	30 - 110
Y Carrier	0.0209				g		0.0268	78.1	30 - 110

Lab Id: 810-73371-18 | Analyzed: 08/29/23 12:35 | Decay Corrected: No | Ts: 100
Client ID: MW-32 | Detector: Purple16 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.582	0.533	0.535	U	pCi/L	1.00	0.848	62	442	.	.6519	0.44475	.9117	1.	625944

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0352				g		0.0399	88.2	30 - 110
Y Carrier	0.0211				g		0.0268	78.9	30 - 110

Lab Id: 810-73371-19 | Analyzed: 08/29/23 12:35 | Decay Corrected: No | Ts: 100
Client ID: MW-33 | Detector: Purple18 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.875	0.537	0.543		pCi/L	1.00	0.786	65	380	.	.6518	0.44160	.9117	1.	625944

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0363				g		0.0399	91.0	30 - 110
Y Carrier	0.0208				g		0.0268	77.8	30 - 110

Lab Id: 810-73371-20 | Analyzed: 08/29/23 12:36 | Decay Corrected: No | Ts: 100
Client ID: MW-34 | Detector: Purple23 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.600	0.546	0.548	U	pCi/L	1.00	0.862	49	331	.	.6517	0.42989	.9117	1.	625944

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0331				g		0.0399	83.0	30 - 110
Y Carrier	0.0202				g		0.0268	75.5	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624324

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-624324/1-A	Radium-228			0.3670	U	pCi/L							1.932
Lab Control Sample ID:	**Analyte**	**Parent Result**	**Spike Added**	**LCS Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**RER Limit**	**Z Factor**
LCS 160-624324/2-A	Radium-228		7.92	8.141		pCi/L	103	80 - 120	12				.2541
Lab Control Sample Duplicate	**Analyte**	**Parent Result**	**Spike Added**	**LCSD Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**RER Limit**	**Z Factor**
LCSD 160-624324/3-A	Radium-228		7.92	9.171		pCi/L	116	80 - 120	12	0.29		1	.8124

Glossary:

Ts = Count Duration, Sample
Tb = Count Duration, Background
Cs = Total Counts, Sample
Cb = Total Counts, Background
X Talk = Crosstalk
Decay = Decay Factor
Eff = Efficiency
I = Ingrowth Factor
A = Abundance

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624324 Batch Start Date: 08/16/23 10:00 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/29/23 11:34

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Ba_TareWt	Ba_GrossWt	Ba_Mass	Y_TareWt	Y_GrossWt
MB 160-624324/1		PrecSep_0, 904.0		1000 mL	8.7038 g	8.7417 g	0.0399 g	8.6792 g	8.6985 g
LCS 160-624324/2		PrecSep_0, 904.0		1000 mL	8.6572 g	8.6941 g	0.0399 g	8.6546 g	8.6756 g
LCSD 160-624324/3		PrecSep_0, 904.0		1000 mL	8.6738 g	8.7109 g	0.0399 g	8.6875 g	8.7081 g
810-73371-A-16	MW-30	PrecSep_0, 904.0	T	743.07 mL	8.6939 g	8.7273 g	0.0399 g	8.6546 g	8.6755 g
810-73371-A-17	MW-31	PrecSep_0, 904.0	T	756.78 mL	8.6805 g	8.7152 g	0.0399 g	8.7122 g	8.7331 g
810-73371-A-18	MW-32	PrecSep_0, 904.0	T	749.49 mL	8.6893 g	8.7245 g	0.0399 g	8.7056 g	8.7267 g
810-73371-A-19	MW-33	PrecSep_0, 904.0	T	748.95 mL	8.6720 g	8.7083 g	0.0399 g	8.6964 g	8.7172 g
810-73371-A-20	MW-34	PrecSep_0, 904.0	T	746.40 mL	8.6767 g	8.7098 g	0.0399 g	8.6710 g	8.6912 g

Lab Sample ID	Client Sample ID	Method Chain	Basis	Y_Mass	IngDecDate1	IngDecDate2	NativeMassBa	NativeMassY	Ba carrier 00134
MB 160-624324/1		PrecSep_0, 904.0		0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL
LCS 160-624324/2		PrecSep_0, 904.0		0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL
LCSD 160-624324/3		PrecSep_0, 904.0		0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL
810-73371-A-16	MW-30	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL
810-73371-A-17	MW-31	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL
810-73371-A-18	MW-32	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL
810-73371-A-19	MW-33	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL
810-73371-A-20	MW-34	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:44	08/29/2023 08:48	0 g	0 g	1 mL

Lab Sample ID	Client Sample ID	Method Chain	Basis	Ra-228 00051	Y Carrier 00086				
MB 160-624324/1		PrecSep_0, 904.0			0.2 mL				
LCS 160-624324/2		PrecSep_0, 904.0		1 mL	0.2 mL				

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624324 Batch Start Date: 08/16/23 10:00 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/29/23 11:34

Lab Sample ID	Client Sample ID	Method Chain	Basis	Ra-228 00051	Y Carrier 00086				
LCSD 160-624324/3		PrecSep_0, 904.0		1 mL	0.2 mL				
810-73371-A-16	MW-30	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-17	MW-31	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-18	MW-32	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-19	MW-33	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-20	MW-34	PrecSep_0, 904.0	T		0.2 mL				

Batch Notes	
Balance ID	1121470622, B016
Balance is Level? (Y/N)	yes
Analyst ID - Reagent Drop	KAC, JEL
Analyst ID - Reagent Drop Witness	BMP per KAC, BMP per JEL
Pipette ID	RAD132, RAD144, RAD169
SOP Number	ST-RC-0002, ST-RC-0041
Batch Comment	In: JEL; Out: BCC

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID MB 160-624324/1-A

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 12:33:29 PM

Count Ended 8/29/2023 2:13:35 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.129	14	0.140	0.011
sd	0.011	3.742	0.037	0.039
Beta	0.401	55	0.550	0.149
sd	0.020	7.416	0.074	0.077

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID LCS 160-624324/2-A

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 8:04:47 PM

Count Ended 8/29/2023 9:44:55 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	19	0.190	0.112
sd	0.009	4.359	0.044	0.044
Beta	0.441	192	1.920	1.479
sd	0.021	13.856	0.139	0.140

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID LCSD 160-624324/3-A

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 8:04:53 PM

Count Ended 8/29/2023 9:45:01 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	14	0.140	0.066
sd	0.009	3.742	0.037	0.038
Beta	0.510	214	2.140	1.630
sd	0.023	14.629	0.146	0.148

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID 810-73371-A-16-B

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 12:35:36 PM

Count Ended 8/29/2023 2:15:49 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	23	0.230	0.110
sd	0.011	4.796	0.048	0.049
Beta	0.324	56	0.560	0.236
sd	0.018	7.483	0.075	0.077

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID 810-73371-A-17-B

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 12:35:43 PM

Count Ended 8/29/2023 2:15:53 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.044	10	0.100	0.056
sd	0.007	3.162	0.032	0.032
Beta	0.340	63	0.630	0.290
sd	0.018	7.937	0.079	0.081

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID 810-73371-A-18-B

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 12:35:51 PM

Count Ended 8/29/2023 2:15:58 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	8	0.080	-0.042
sd	0.011	2.828	0.028	0.042
Beta	0.442	62	0.620	0.178
sd	0.021	7.874	0.079	0.081

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID 810-73371-A-19-B

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 12:35:56 PM

Count Ended 8/29/2023 2:16:10 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.113	11	0.110	-0.003
sd	0.011	3.317	0.033	0.036
Beta	0.380	65	0.650	0.270
sd	0.019	8.062	0.081	0.083

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID 810-73371-A-20-B

Repeat 1

Carrier No. 0

Batch ID 624324

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/29/2023 12:36:01 PM

Count Ended 8/29/2023 2:16:30 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.309	37	0.370	0.061
sd	0.018	6.083	0.061	0.063
Beta	0.331	49	0.490	0.159
sd	0.018	7.000	0.070	0.072

Prep Batch: 624326

Preparation, Precipitate Separation

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624326

Lab Id: MB 160-624326/1-A | Analyzed: 08/31/23 11:42 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red14 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.4450	0.410	0.412	U	pCi/L	1.00	0.653	60	426	.	.6421	0.43762	.9117	1.	626294

Carrier	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03580				g		0.0399	89.7	30 - 110
Y Carrier	0.02050				g		0.0268	76.6	30 - 110

Lab Id: LCS 160-624326/2-A | Analyzed: 08/31/23 11:42 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Red15 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	8.293	0.924	1.20		pCi/L	1.00	0.538	390	339	.	.642	0.43663	.9117	1.	626294

Carrier	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03740				g		0.0399	93.7	30 - 110
Y Carrier	0.02160				g		0.0268	80.7	30 - 110

Lab Id: 810-73371-21 | Analyzed: 08/31/23 11:46 | Decay Corrected: No | Ts: 100
Client ID: MWT-04 | Detector: Red16 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.890	0.564	0.570		pCi/L	1.00	0.832	65	388	.	.6374	0.43796	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0353				g		0.0399	88.5	30 - 110
Y Carrier	0.0211				g		0.0268	78.9	30 - 110

Lab Id: 810-73371-22 | Analyzed: 08/31/23 11:46 | Decay Corrected: No | Ts: 100
Client ID: MWT-12 | Detector: Red17 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.0251	0.337	0.337	U	pCi/L	1.00	0.623	41	400	.	.6373	0.44095	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0362				g		0.0399	90.7	30 - 110
Y Carrier	0.0206				g		0.0268	77.0	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624326

Lab Id: 810-73371-23 | Analyzed: 08/31/23 11:47 | Decay Corrected: No | Ts: 100
Client ID: SG-02 | Detector: Red18 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.954	0.574	0.580		pCi/L	1.00	0.824	57	312	.	.6372	0.43547	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0326				g		0.0399	81.7	30 - 110
Y Carrier	0.0211				g		0.0268	78.9	30 - 110

Lab Id: 810-73371-24 | Analyzed: 08/31/23 11:47 | Decay Corrected: No | Ts: 100
Client ID: SG-03 | Detector: Red19 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.716	0.548	0.552	U	pCi/L	1.00	0.842	59	383	.	.6371	0.44835	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0339				g		0.0399	85.0	30 - 110
Y Carrier	0.0208				g		0.0268	77.8	30 - 110

Lab Id: 810-73371-25 | Analyzed: 08/31/23 11:47 | Decay Corrected: No | Ts: 100
Client ID: SG-04R | Detector: Red20 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.166	0.442	0.442	U	pCi/L	1.00	0.788	36	313	.	.6369	0.43413	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0348				g		0.0399	87.2	30 - 110
Y Carrier	0.0207				g		0.0268	77.4	30 - 110

Lab Id: 810-73371-26 | Analyzed: 08/31/23 11:47 | Decay Corrected: No | Ts: 100
Client ID: SG-05 | Detector: Red21 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.389	0.493	0.495	U	pCi/L	1.00	0.820	39	288	.	.6368	0.43799	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0317				g		0.0399	79.4	30 - 110
Y Carrier	0.0210				g		0.0268	78.5	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624326

Lab Id:	810-73371-27	Analyzed:	08/31/23 11:47	Decay Corrected:	No	Ts:	100
Client ID:	SG-06	Detector:	Red22	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	1		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.315	0.537	0.538	U	pCi/L	1.00	0.926	37	296	.	.6368	0.44046	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0280				g		0.0399	70.2	30 - 110
Y Carrier	0.0211				g		0.0268	78.9	30 - 110

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-624326/1-A	Radium-228			0.4450	U	pCi/L							2.1599
Lab Control Sample ID:	**Analyte**	**Parent Result**	**Spike Added**	**LCS Result**	**Qualifier**	**Unit**	**% Rec**	**% Rec Limits**	**RPD**	**RER**	**DER**	**RER Limit**	**Z Factor**
LCS 160-624326/2-A	Radium-228		7.91	8.293		pCi/L	105	80 - 120					.6021

Glossary:

- Ts = Count Duration, Sample
- Tb = Count Duration, Background
- Cs = Total Counts, Sample
- Cb = Total Counts, Background
- X Talk = Crosstalk
- Decay = Decay Factor
- Eff = Efficiency
- I = Ingrowth Factor
- A = Abundance

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624326 Batch Start Date: 08/16/23 10:10 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/31/23 10:49

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Ba_TareWt	Ba_GrossWt	Ba_Mass	Y_TareWt	Y_GrossWt
MB 160-624326/1		PrecSep_0, 904.0		1000 mL	8.6964 g	8.7322 g	0.0399 g	8.6838 g	8.7043 g
LCS 160-624326/2		PrecSep_0, 904.0		1000 mL	8.6848 g	8.7222 g	0.0399 g	8.6859 g	8.7075 g
810-73371-A-21	MWT-04	PrecSep_0, 904.0	T	746.59 mL	8.6819 g	8.7172 g	0.0399 g	8.6823 g	8.7034 g
810-73371-A-22	MWT-12	PrecSep_0, 904.0	T	1002.71 mL	8.6745 g	8.7107 g	0.0399 g	8.6854 g	8.7060 g
810-73371-A-23	SG-02	PrecSep_0, 904.0	T	747.03 mL	8.6800 g	8.7126 g	0.0399 g	8.6928 g	8.7139 g
810-73371-A-24	SG-03	PrecSep_0, 904.0	T	757.02 mL	8.6799 g	8.7138 g	0.0399 g	8.6578 g	8.6786 g
810-73371-A-25	SG-04R	PrecSep_0, 904.0	T	749.11 mL	8.6830 g	8.7178 g	0.0399 g	8.6686 g	8.6893 g
810-73371-A-26	SG-05	PrecSep_0, 904.0	T	744.89 mL	8.6937 g	8.7254 g	0.0399 g	8.6885 g	8.7095 g
810-73371-A-27	SG-06	PrecSep_0, 904.0	T	748.67 mL	8.6922 g	8.7202 g	0.0399 g	8.6867 g	8.7078 g

Lab Sample ID	Client Sample ID	Method Chain	Basis	Y_Mass	IngDecDate1	IngDecDate2	NativeMassBa	NativeMassY	Ba carrier 00134
MB 160-624326/1		PrecSep_0, 904.0		0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
LCS 160-624326/2		PrecSep_0, 904.0		0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-A-21	MWT-04	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-A-22	MWT-12	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-A-23	SG-02	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-A-24	SG-03	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-A-25	SG-04R	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-A-26	SG-05	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-A-27	SG-06	PrecSep_0, 904.0	T	0.02675 g	08/17/2023 13:39	08/31/2023 07:47	0 g	0 g	1 mL

Lab Sample ID	Client Sample ID	Method Chain	Basis	Ra-228 00051	Y Carrier 00086				

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624326 Batch Start Date: 08/16/23 10:10 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/31/23 10:49

Lab Sample ID	Client Sample ID	Method Chain	Basis	Ra-228 00051	Y Carrier 00086				
MB 160-624326/1		PrecSep_0, 904.0			0.2 mL				
LCS 160-624326/2		PrecSep_0, 904.0		1 mL	0.2 mL				
810-73371-A-21	MWT-04	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-22	MWT-12	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-23	SG-02	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-24	SG-03	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-25	SG-04R	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-26	SG-05	PrecSep_0, 904.0	T		0.2 mL				
810-73371-A-27	SG-06	PrecSep_0, 904.0	T		0.2 mL				

Batch Notes	
Balance ID	1121470622, B016
Balance is Level? (Y/N)	yes
Analyst ID - Reagent Drop	KAC, JEL
Analyst ID - Reagent Drop Witness	BMP per KAC, BMP per JEL
Pipette ID	RAD132, RAD144, RAD169
SOP Number	ST-RC-0002, ST-RC-0041
Batch Comment	In: JEL; Out: BCC

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID MB 160-624326/1-A

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:42:54 AM

Count Ended 8/31/2023 1:23:01 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.100	9	0.090	-0.010
sd	0.010	3.000	0.030	0.035
Beta	0.426	60	0.600	0.174
sd	0.021	7.746	0.077	0.080

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID LCS 160-624326/2-A

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:42:59 AM

Count Ended 8/31/2023 1:23:07 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	15	0.150	0.044
sd	0.010	3.873	0.039	0.040
Beta	0.339	390	3.900	3.561
sd	0.018	19.748	0.197	0.198

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID 810-73371-A-21-B

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:46:49 AM

Count Ended 8/31/2023 1:26:55 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.067	12	0.120	0.053
sd	0.008	3.464	0.035	0.036
Beta	0.388	65	0.650	0.262
sd	0.020	8.062	0.081	0.083

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID 810-73371-A-22-B

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:46:55 AM

Count Ended 8/31/2023 1:27:04 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.072	12	0.120	0.048
sd	0.008	3.464	0.035	0.036
Beta	0.400	41	0.410	0.010
sd	0.020	6.403	0.064	0.067

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID 810-73371-A-23-B

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:47:00 AM

Count Ended 8/31/2023 1:27:07 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	4	0.040	-0.024
sd	0.008	2.000	0.020	0.031
Beta	0.312	57	0.570	0.258
sd	0.018	7.550	0.075	0.078

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID 810-73371-A-24-B

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:47:04 AM

Count Ended 8/31/2023 1:27:10 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.059	10	0.100	0.041
sd	0.008	3.162	0.032	0.033
Beta	0.383	59	0.590	0.207
sd	0.020	7.681	0.077	0.079

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID 810-73371-A-25-B

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:47:12 AM

Count Ended 8/31/2023 1:27:19 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.067	13	0.130	0.063
sd	0.008	3.606	0.036	0.037
Beta	0.313	36	0.360	0.047
sd	0.018	6.000	0.060	0.063

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID 810-73371-A-26-B

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:47:16 AM

Count Ended 8/31/2023 1:27:24 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.110	14	0.140	0.030
sd	0.010	3.742	0.037	0.039
Beta	0.288	39	0.390	0.102
sd	0.017	6.245	0.062	0.065

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID 810-73371-A-27-B

Repeat 1

Carrier No. 0

Batch ID 624326

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:47:19 AM

Count Ended 8/31/2023 1:27:27 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.079	9	0.090	0.011
sd	0.009	3.000	0.030	0.031
Beta	0.296	37	0.370	0.074
sd	0.017	6.083	0.061	0.063

Prep Batch: 624485

Preparation, Precipitate Separation

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624485

Lab Id: MB 160-624485/1-A | Analyzed: 08/31/23 11:29 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Orange0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.1228	0.289	0.289	U	pCi/L	1.00	0.510	40	344	.	.6589	0.44852	.9117	1.	626305

Carrier	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03750				g		0.0399	94.0	30 - 110
Y Carrier	0.02170				g		0.0268	81.1	30 - 110

Lab Id: LCS 160-624485/2-A | Analyzed: 08/31/23 11:29 | Decay Corrected: No | Ts: 100
Client ID: | Detector: Orange3 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	8.673	0.924	1.22		pCi/L	1.00	0.531	425	363	.	.6588	0.44166	.9117	1.	626305

Carrier	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.03760				g		0.0399	94.2	30 - 110
Y Carrier	0.02160				g		0.0268	80.7	30 - 110

Lab Id: 810-73371-1 | Analyzed: 08/31/23 11:28 | Decay Corrected: No | Ts: 100
Client ID: MW-01R | Detector: Orange15 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	1.11	0.574	0.583		pCi/L	1.00	0.804	73	391	.	.6592	0.43823	.9117	1.	626305

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0348				g		0.0399	87.2	30 - 110
Y Carrier	0.0214				g		0.0268	80.0	30 - 110

Lab Id: 810-73371-2 | Analyzed: 08/31/23 11:28 | Decay Corrected: No | Ts: 100
Client ID: MW-02 | Detector: Orange20 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	1.71	0.782	0.798	G	pCi/L	1.00	1.03	67	305	.	.6595	0.44277	.9117	1.	626305

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0356				g		0.0399	89.2	30 - 110
Y Carrier	0.0218				g		0.0268	81.5	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624485

Lab Id: 810-73371-3 | Analyzed: 08/31/23 11:28 | Decay Corrected: No | Ts: 100
Client ID: MW-03 | Detector: Orange23 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.579	0.489	0.492	U	pCi/L	1.00	0.763	53	352	.	.6593	0.44110	.9117	1.	626305

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0339				g		0.0399	85.0	30 - 110
Y Carrier	0.0221				g		0.0268	82.6	30 - 110

Lab Id: 810-73371-4 | Analyzed: 08/31/23 11:36 | Decay Corrected: No | Ts: 100
Client ID: MW-04 | Detector: Red0 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	1.14	0.625	0.634		pCi/L	1.00	0.892	72	402	.	.6499	0.43930	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0353				g		0.0399	88.5	30 - 110
Y Carrier	0.0194				g		0.0268	72.5	30 - 110

Lab Id: 810-73371-5 | Analyzed: 08/31/23 11:36 | Decay Corrected: No | Ts: 100
Client ID: MW-06 | Detector: Red1 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.473	0.460	0.462	U	pCi/L	1.00	0.735	49	341	.	.6498	0.43669	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0376				g		0.0399	94.2	30 - 110
Y Carrier	0.0207				g		0.0268	77.4	30 - 110

Lab Id: 810-73371-6 | Analyzed: 08/31/23 11:36 | Decay Corrected: No | Ts: 100
Client ID: MW-07 | Detector: Red2 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	1.70	0.630	0.649		pCi/L	1.00	0.776	84	336	.	.6497	0.43674	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0349				g		0.0399	87.5	30 - 110
Y Carrier	0.0211				g		0.0268	78.9	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624485

Lab Id:	810-73371-7	Analyzed:	08/31/23 11:37	Decay Corrected:	No	Ts:	100
Client ID:	MW-08	Detector:	Red4	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	1		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	1.74	0.750	0.767	G	pCi/L	1.00	1.01	94	479	.	.649	0.43224	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0331				g		0.0399	83.0	30 - 110
Y Carrier	0.0202				g		0.0268	75.5	30 - 110

Lab Id:	810-73371-8	Analyzed:	08/31/23 11:37	Decay Corrected:	No	Ts:	100
Client ID:	MW-09	Detector:	Red5	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	1		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	-0.0692	0.425	0.425	U	pCi/L	1.00	0.821	34	360	.	.6489	0.43685	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0332				g		0.0399	83.2	30 - 110
Y Carrier	0.0216				g		0.0268	80.7	30 - 110

Lab Id:	810-73371-9	Analyzed:	08/31/23 11:37	Decay Corrected:	No	Ts:	100
Client ID:	MW-10	Detector:	Red6	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	1		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.634	0.486	0.490	U	pCi/L	1.00	0.736	44	262	.	.6488	0.42978	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0335				g		0.0399	84.0	30 - 110
Y Carrier	0.0212				g		0.0268	79.3	30 - 110

Lab Id:	810-73371-10	Analyzed:	08/31/23 11:37	Decay Corrected:	No	Ts:	100
Client ID:	MW-11	Detector:	Red7	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	1		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	1.35	0.560	0.574		pCi/L	1.00	0.721	78	344	.	.6486	0.43766	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0358				g		0.0399	89.7	30 - 110
Y Carrier	0.0222				g		0.0268	83.0	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624485

Lab Id: 810-73371-11 | Analyzed: 08/31/23 11:32 | Decay Corrected: No | Ts: 100
Client ID: MW-12 | Detector: Red9 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.504	0.380	0.382	U	pCi/L	1.00	0.578	54	339	.	.655	0.43480	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0345				g		0.0399	86.5	30 - 110
Y Carrier	0.0215				g		0.0268	80.4	30 - 110

Lab Id: 810-73371-12 | Analyzed: 08/31/23 11:32 | Decay Corrected: No | Ts: 100
Client ID: MW-18 | Detector: Red10 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.713	0.434	0.439		pCi/L	1.00	0.639	73	441	.	.6549	0.44085	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0361				g		0.0399	90.5	30 - 110
Y Carrier	0.0206				g		0.0268	77.0	30 - 110

Lab Id: 810-73371-13 | Analyzed: 08/31/23 11:32 | Decay Corrected: No | Ts: 100
Client ID: MW-19 | Detector: Red11 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.993	0.477	0.486		pCi/L	1.00	0.670	92	510	.	.6548	0.43704	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0365				g		0.0399	91.5	30 - 110
Y Carrier	0.0210				g		0.0268	78.5	30 - 110

Lab Id: 810-73371-14 | Analyzed: 08/31/23 11:32 | Decay Corrected: No | Ts: 100
Client ID: MW-20 | Detector: Red12 | Yield Truncated: No | Tb: 1000
Sigma: 2 | Dil Fac: 1 | Calibration Type: 1

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	0.958	0.480	0.488		pCi/L	1.00	0.686	97	566	.	.6551	0.43683	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0358				g		0.0399	89.7	30 - 110
Y Carrier	0.0216				g		0.0268	80.7	30 - 110

Gas Flow Proportional Counter Analysis Detail Report
Prep Batch: 624485

Lab Id:	810-73371-15	Analyzed:	08/31/23 11:32	Decay Corrected:	No	Ts:	100
Client ID:	MW-27	Detector:	Red13	Yield Truncated:	No	Tb:	1000
Sigma:	2	Dil Fac:	1	Calibration Type:	1		

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	RL	MDC	Cs	Cb	X Talk	Decay	Eff	I	A	Anly Batch
Radium-228	1.28	0.588	0.600		pCi/L	1.00	0.782	70	328	.	.6552	0.43621	.9117	1.	626294

Carrier	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	Spike Added	% Rec	% Rec Limits
Ba Carrier	0.0335				g		0.0399	84.0	30 - 110
Y Carrier	0.0213				g		0.0268	79.6	30 - 110

Quality Control Summary

Method Blank ID:	Analyte	Parent Result	Spike Added	MB Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
MB 160-624485/1-A	Radium-228			0.1228	U	pCi/L							.849

Lab Control Sample ID:	Analyte	Parent Result	Spike Added	LCS Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
LCS 160-624485/2-A	Radium-228		7.91	8.673		pCi/L	110	80 - 120					1.1862

Glossary:

- Ts = Count Duration, Sample
- Tb = Count Duration, Background
- Cs = Total Counts, Sample
- Cb = Total Counts, Background
- X Talk = Crosstalk
- Decay = Decay Factor
- Eff = Efficiency
- I = Ingrowth Factor
- A = Abundance

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624485 Batch Start Date: 08/17/23 10:40 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/31/23 10:57

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Ba_TareWt	Ba_GrossWt	Ba_Mass	Y_TareWt	Y_GrossWt
MB 160-624485/1		PrecSep_0, 904.0		1000 mL	8.7102 g	8.7477 g	0.0399 g	8.6854 g	8.7071 g
LCS 160-624485/2		PrecSep_0, 904.0		1000 mL	8.6903 g	8.7279 g	0.0399 g	8.6616 g	8.6832 g
810-73371-C-1	MW-01R	PrecSep_0, 904.0	T	749.55 mL	8.6536 g	8.6884 g	0.0399 g	8.6965 g	8.7179 g
810-73371-C-2	MW-02	PrecSep_0, 904.0	T	497.92 mL	8.6620 g	8.6976 g	0.0399 g	8.6860 g	8.7078 g
810-73371-C-3	MW-03	PrecSep_0, 904.0	T	744.45 mL	8.6859 g	8.7198 g	0.0399 g	8.6527 g	8.6748 g
810-73371-C-4	MW-04	PrecSep_0, 904.0	T	752.46 mL	8.6684 g	8.7037 g	0.0399 g	8.6707 g	8.6901 g
810-73371-C-5	MW-06	PrecSep_0, 904.0	T	752.32 mL	8.6744 g	8.7120 g	0.0399 g	8.6967 g	8.7174 g
810-73371-C-6	MW-07	PrecSep_0, 904.0	T	748.54 mL	8.6459 g	8.6808 g	0.0399 g	8.6584 g	8.6795 g
810-73371-C-7	MW-08	PrecSep_0, 904.0	T	745.30 mL	8.6911 g	8.7242 g	0.0399 g	8.6841 g	8.7043 g
810-73371-C-8	MW-09	PrecSep_0, 904.0	T	749.30 mL	8.6794 g	8.7126 g	0.0399 g	8.6816 g	8.7032 g
810-73371-C-9	MW-10	PrecSep_0, 904.0	T	747.91 mL	8.6792 g	8.7127 g	0.0399 g	8.6619 g	8.6831 g
810-73371-C-10	MW-11	PrecSep_0, 904.0	T	753.00 mL	8.6849 g	8.7207 g	0.0399 g	8.6882 g	8.7104 g
810-73371-C-11	MW-12	PrecSep_0, 904.0	T	996.54 mL	8.6941 g	8.7286 g	0.0399 g	8.6765 g	8.6980 g
810-73371-C-12	MW-18	PrecSep_0, 904.0	T	995.91 mL	8.6926 g	8.7287 g	0.0399 g	8.6597 g	8.6803 g
810-73371-C-13	MW-19	PrecSep_0, 904.0	T	992.38 mL	8.6680 g	8.7045 g	0.0399 g	8.7098 g	8.7308 g
810-73371-C-14	MW-20	PrecSep_0, 904.0	T	1005.30 mL	8.6609 g	8.6967 g	0.0399 g	8.6497 g	8.6713 g
810-73371-C-15	MW-27	PrecSep_0, 904.0	T	752.56 mL	8.6506 g	8.6841 g	0.0399 g	8.6932 g	8.7145 g

Lab Sample ID	Client Sample ID	Method Chain	Basis	Y_Mass	IngDecDate1	IngDecDate2	NativeMassBa	NativeMassY	Ba carrier 00134
MB 160-624485/1		PrecSep_0, 904.0		0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
LCS 160-624485/2		PrecSep_0, 904.0		0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624485 Batch Start Date: 08/17/23 10:40 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/31/23 10:57

Lab Sample ID	Client Sample ID	Method Chain	Basis	Y_Mass	IngDecDate1	IngDecDate2	NativeMassBa	NativeMassY	Ba carrier 00134
810-73371-C-1	MW-01R	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-2	MW-02	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-3	MW-03	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-4	MW-04	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-5	MW-06	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-6	MW-07	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-7	MW-08	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-8	MW-09	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-9	MW-10	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-10	MW-11	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-11	MW-12	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-12	MW-18	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-13	MW-19	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-14	MW-20	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL
810-73371-C-15	MW-27	PrecSep_0, 904.0	T	0.02675 g	08/18/2023 14:13	08/31/2023 07:47	0 g	0 g	1 mL

Lab Sample ID	Client Sample ID	Method Chain	Basis	Ra-228 00051	Y Carrier 00086				
MB 160-624485/1		PrecSep_0, 904.0			0.2 mL				
LCS 160-624485/2		PrecSep_0, 904.0		1 mL	0.2 mL				
810-73371-C-1	MW-01R	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-2	MW-02	PrecSep_0, 904.0	T		0.2 mL				

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624485 Batch Start Date: 08/17/23 10:40 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/31/23 10:57

Lab Sample ID	Client Sample ID	Method Chain	Basis	Ra-228 00051	Y Carrier 00086				
810-73371-C-3	MW-03	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-4	MW-04	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-5	MW-06	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-6	MW-07	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-7	MW-08	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-8	MW-09	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-9	MW-10	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-10	MW-11	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-11	MW-12	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-12	MW-18	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-13	MW-19	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-14	MW-20	PrecSep_0, 904.0	T		0.2 mL				
810-73371-C-15	MW-27	PrecSep_0, 904.0	T		0.2 mL				

Batch Notes	
Balance ID	1121470622, B016
Balance is Level? (Y/N)	yes
Analyst ID - Reagent Drop	KAC, JEL
Analyst ID - Reagent Drop Witness	BMP per KAC, BMP per JEL
Pipette ID	RAD132, RAD144, RAD169
SOP Number	ST-RC-0002, ST-RC-0041
Batch Comment	In: JEL; Out: BCC

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAS FLOW PROPORTIONAL COUNTER BATCH WORKSHEET

Lab Name: Eurofins St. Louis Job No.: 810-73371-1

SDG No.:

Batch Number: 624485 Batch Start Date: 08/17/23 10:40 Batch Analyst: Cox, Kevin A

Batch Method: PrecSep_0 Batch End Date: 08/31/23 10:57

Basis	Basis Description
T	Total/NA

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID MB 160-624485/1-A

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:29:06 AM

Count Ended 8/31/2023 1:10:31 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.085	11	0.110	0.025
sd	0.009	3.317	0.033	0.034
Beta	0.344	40	0.400	0.056
sd	0.019	6.325	0.063	0.066

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID LCS 160-624485/2-A

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:29:11 AM

Count Ended 8/31/2023 1:10:37 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.135	28	0.280	0.145
sd	0.012	5.292	0.053	0.054
Beta	0.363	425	4.250	3.887
sd	0.019	20.616	0.206	0.207

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID 810-73371-C-1-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:28:56 AM

Count Ended 8/31/2023 1:15:08 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	14	0.140	0.065
sd	0.009	3.742	0.037	0.038
Beta	0.391	73	0.730	0.339
sd	0.020	8.544	0.085	0.088

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID 810-73371-C-2-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:28:40 AM

Count Ended 8/31/2023 1:08:50 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.094	17	0.170	0.076
sd	0.010	4.123	0.041	0.042
Beta	0.305	67	0.670	0.365
sd	0.017	8.185	0.082	0.084

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID 810-73371-C-3-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:28:48 AM

Count Ended 8/31/2023 1:10:30 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.110	8	0.080	-0.030
sd	0.010	2.828	0.028	0.039
Beta	0.352	53	0.530	0.178
sd	0.019	7.280	0.073	0.075

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID 810-73371-C-4-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:36:26 AM

Count Ended 8/31/2023 1:16:33 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	17	0.170	0.077
sd	0.010	4.123	0.041	0.042
Beta	0.402	72	0.720	0.318
sd	0.020	8.485	0.085	0.087

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID 810-73371-C-5-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:36:31 AM

Count Ended 8/31/2023 1:16:39 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	15	0.150	0.057
sd	0.010	3.873	0.039	0.040
Beta	0.341	49	0.490	0.149
sd	0.018	7.000	0.070	0.072

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID 810-73371-C-6-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:36:37 AM

Count Ended 8/31/2023 1:16:45 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.071	12	0.120	0.049
sd	0.008	3.464	0.035	0.036
Beta	0.336	84	0.840	0.504
sd	0.018	9.165	0.092	0.093

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID 810-73371-C-7-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:37:14 AM

Count Ended 8/31/2023 1:17:21 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.204	26	0.260	0.056
sd	0.014	5.099	0.051	0.053
Beta	0.479	94	0.940	0.461
sd	0.022	9.695	0.097	0.099

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID 810-73371-C-8-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:37:19 AM

Count Ended 8/31/2023 1:17:26 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.123	13	0.130	0.007
sd	0.011	3.606	0.036	0.038
Beta	0.360	34	0.340	-0.020
sd	0.019	5.831	0.058	0.064

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID 810-73371-C-9-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:37:24 AM

Count Ended 8/31/2023 1:17:46 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	13	0.130	0.039
sd	0.010	3.606	0.036	0.037
Beta	0.262	44	0.440	0.178
sd	0.016	6.633	0.066	0.068

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID 810-73371-C-10-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:37:30 AM

Count Ended 8/31/2023 1:17:39 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	5	0.050	-0.038
sd	0.009	2.236	0.022	0.037
Beta	0.344	78	0.780	0.436
sd	0.019	8.832	0.088	0.090

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID 810-73371-C-11-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:32:20 AM

Count Ended 8/31/2023 1:12:28 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	18	0.180	0.116
sd	0.008	4.243	0.042	0.043
Beta	0.339	54	0.540	0.201
sd	0.018	7.348	0.073	0.076

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID 810-73371-C-12-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:32:25 AM

Count Ended 8/31/2023 1:12:34 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	14	0.140	0.062
sd	0.009	3.742	0.037	0.038
Beta	0.441	73	0.730	0.289
sd	0.021	8.544	0.085	0.088

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID 810-73371-C-13-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:32:30 AM

Count Ended 8/31/2023 1:12:37 PM

Sample Count Time 100.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	17	0.170	0.096
sd	0.009	4.123	0.041	0.042
Beta	0.510	92	0.920	0.410
sd	0.023	9.592	0.096	0.099

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID 810-73371-C-14-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:32:13 AM

Count Ended 8/31/2023 1:12:21 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.069	13	0.130	0.061
sd	0.008	3.606	0.036	0.037
Beta	0.566	97	0.970	0.404
sd	0.024	9.849	0.098	0.101

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID 810-73371-C-15-B

Repeat 1

Carrier No. 0

Batch ID 624485

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/31/2023 11:32:08 AM

Count Ended 8/31/2023 1:12:15 PM

Sample Count Time 100.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	7	0.070	-0.018
sd	0.009	2.646	0.026	0.034
Beta	0.328	70	0.700	0.372
sd	0.018	8.367	0.084	0.086

Daily Checks

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
8/29/2023 12:23:00 AM	9732.72	9731.78	291.95	0.94	Pass	3637.00	3783.75	55.06	-146.750	**WARNING**
8/30/2023 12:21:00 AM	9624.04	9731.78	291.95	-107.73	Pass	3736.50	3783.75	55.06	-47.250	Pass
Detector 1										
8/29/2023 12:23:00 AM	11293.80	11203.08	336.09	90.72	Pass	4151.00	4270.00	56.54	-119.000	**WARNING**
8/30/2023 12:22:00 AM	11243.25	11203.08	336.09	40.17	Pass	4234.00	4270.00	56.54	-36.000	Pass
Detector 2										
8/29/2023 12:23:00 AM	10275.79	10359.33	310.78	-83.54	Pass	3984.50	4091.73	50.75	-107.225	**WARNING**
8/30/2023 12:22:00 AM	10130.55	10359.33	310.78	-228.78	Pass	4027.00	4091.73	50.75	-64.725	Pass
Detector 3										
8/29/2023 12:24:00 AM	11375.96	11400.95	342.03	-24.99	Pass	4224.50	4294.73	42.38	-70.225	Pass
8/30/2023 12:23:00 AM	11240.74	11400.95	342.03	-160.21	Pass	4308.00	4294.73	42.38	13.275	Pass
Detector 4										
8/29/2023 12:24:00 AM	14435.50	14325.50	429.77	110.00	Pass	6228.50	6338.90	205.79	-110.400	Pass
8/30/2023 12:23:00 AM	14304.81	14325.50	429.77	-20.69	Pass	6323.00	6338.90	205.79	-15.900	Pass
Detector 5										
8/29/2023 12:24:00 AM	14797.22	14830.60	444.92	-33.38	Pass	5398.00	5533.48	81.19	-135.475	Pass
8/30/2023 12:23:00 AM	14721.63	14830.60	444.92	-108.97	Pass	5419.50	5533.48	81.19	-113.975	Pass
Detector 6										
8/29/2023 12:25:00 AM	12169.03	12305.73	369.17	-136.70	Pass	4653.00	4715.55	63.03	-62.550	Pass
8/30/2023 12:24:00 AM	12280.30	12305.73	369.17	-25.43	Pass	4639.00	4715.55	63.03	-76.550	Pass
Detector 7										
8/29/2023 12:25:00 AM	12426.03	12708.25	381.25	-282.22	Pass	4847.00	4810.10	73.07	36.900	Pass
8/30/2023 12:24:00 AM	12273.79	12708.25	381.25	-434.46	**FAIL**	4826.00	4810.10	73.07	15.900	Pass
Detector 8										
8/29/2023 12:39:00 AM	9539.34	9451.15	283.53	88.19	Pass	3699.50	3851.33	50.28	-151.825	**DOEF**
8/30/2023 12:37:00 AM	9634.07	9451.15	283.53	182.92	Pass	3686.00	3851.33	50.28	-165.325	**DOEF**
Detector 9										
8/29/2023 12:39:00 AM	10949.62	10846.68	325.40	102.94	Pass	4234.50	4390.08	73.38	-155.575	**WARNING**
8/30/2023 12:37:00 AM	10881.03	10846.68	325.40	34.36	Pass	4252.50	4390.08	73.38	-137.575	Pass
Detector 10										
8/29/2023 12:39:00 AM	10401.04	10386.65	311.60	14.39	Pass	3914.50	4154.40	60.48	-239.900	**DOEF**
8/30/2023 12:38:00 AM	10456.19	10386.65	311.60	69.54	Pass	3896.50	4154.40	60.48	-257.900	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
8/29/2023 12:39:00 AM	11411.53	11316.08	339.48	95.46	Pass	4260.50	4591.48	60.25	-330.975	**DOEF**
8/30/2023 12:38:00 AM	11427.61	11316.08	339.48	111.54	Pass	4283.50	4591.48	60.25	-307.975	**DOEF**
Detector 12										
8/29/2023 12:40:00 AM	14199.04	14250.38	427.51	-51.34	Pass	6508.50	6540.40	105.21	-31.900	Pass
8/30/2023 12:39:00 AM	14073.85	14250.38	427.51	-176.53	Pass	6464.50	6540.40	105.21	-75.900	Pass
Detector 13										
8/29/2023 12:40:00 AM	15507.62	15581.68	467.45	-74.05	Pass	4868.00	4978.43	68.62	-110.425	Pass
8/30/2023 12:39:00 AM	15609.89	15581.68	467.45	28.22	Pass	4831.50	4978.43	68.62	-146.925	**WARNING**
Detector 14										
8/29/2023 12:40:00 AM	11407.52	11508.73	345.26	-101.20	Pass	5325.50	5412.75	104.76	-87.250	Pass
8/30/2023 12:39:00 AM	11278.82	11508.73	345.26	-229.91	Pass	5357.00	5412.75	104.76	-55.750	Pass
Detector 15										
8/29/2023 12:40:00 AM	12007.21	12031.40	360.94	-24.19	Pass	5405.50	5413.25	103.25	-7.750	Pass
8/30/2023 12:40:00 AM	12032.31	12031.40	360.94	0.91	Pass	5450.00	5413.25	103.25	36.750	Pass
Detector 16										
8/29/2023 12:30:00 AM	9759.27	9639.28	289.18	119.99	Pass	3692.00	3817.55	37.67	-125.550	**DOEF**
8/30/2023 12:30:00 AM	9653.10	9639.28	289.18	13.83	Pass	3645.50	3817.55	37.67	-172.050	**DOEF**
Detector 17										
8/29/2023 12:30:00 AM	10973.66	11061.48	331.84	-87.81	Pass	4120.00	4226.70	53.61	-106.700	Pass
8/30/2023 12:30:00 AM	11231.72	11061.48	331.84	170.25	Pass	4124.50	4226.70	53.61	-102.200	Pass
Detector 18										
8/29/2023 12:30:00 AM	10631.98	10659.53	319.79	-27.54	Pass	3811.00	3935.95	34.99	-124.950	**DOEF**
8/30/2023 12:31:00 AM	10647.56	10659.53	319.79	-11.96	Pass	3843.00	3935.95	34.99	-92.950	**WARNING**
Detector 19										
8/29/2023 12:31:00 AM	11522.24	11467.10	344.01	55.14	Pass	4381.50	4448.70	59.17	-67.200	Pass
8/30/2023 12:31:00 AM	11591.43	11467.10	344.01	124.33	Pass	4324.00	4448.70	59.17	-124.700	**WARNING**
Detector 20										
8/29/2023 12:31:00 AM	14386.40	14347.83	430.43	38.57	Pass	6538.50	6614.45	91.13	-75.950	Pass
8/30/2023 12:31:00 AM	14468.12	14347.83	430.43	120.30	Pass	6653.50	6614.45	91.13	39.050	Pass
Detector 21										
8/29/2023 12:31:00 AM	10375.98	9869.88	296.10	506.11	**FAIL**	9927.00	10259.65	129.52	-332.650	**WARNING**
8/30/2023 12:31:00 AM	9687.17	9869.88	296.10	-182.71	Pass	10286.50	10259.65	129.52	26.850	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
8/29/2023 12:31:00 AM	11763.72	11742.60	352.28	21.12	Pass	5285.00	5466.15	85.68	-181.150	**WARNING**
8/30/2023 12:32:00 AM	11766.78	11742.60	352.28	24.18	Pass	5332.00	5466.15	85.68	-134.150	Pass
Detector 23										
8/29/2023 12:32:00 AM	12074.84	12061.73	361.85	13.11	Pass	5654.00	5992.08	108.01	-338.075	**DOEF**
8/30/2023 12:32:00 AM	12158.56	12061.73	361.85	96.83	Pass	5774.50	5992.08	108.01	-217.575	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
8/29/2023 12:32:00 AM	49825.07	50552.05	1516.56	-726.98	Pass	NA	NA	NA	NA	NA
8/30/2023 12:32:00 AM	49931.12	50552.05	1516.56	-620.93	Pass	NA	NA	NA	NA	NA
Detector 1										
8/29/2023 12:32:00 AM	48455.41	47641.23	1429.24	814.19	Pass	NA	NA	NA	NA	NA
8/30/2023 12:33:00 AM	48656.67	47641.23	1429.24	1015.44	Pass	NA	NA	NA	NA	NA
Detector 2										
8/29/2023 12:33:00 AM	48995.76	49734.44	1492.03	-738.68	Pass	NA	NA	NA	NA	NA
8/30/2023 12:33:00 AM	49158.02	49734.44	1492.03	-576.42	Pass	NA	NA	NA	NA	NA
Detector 3										
8/29/2023 12:33:00 AM	58982.88	60167.98	1805.04	-1185.09	Pass	NA	NA	NA	NA	NA
8/30/2023 12:33:00 AM	59401.27	60167.98	1805.04	-766.70	Pass	NA	NA	NA	NA	NA
Detector 4										
8/29/2023 12:33:00 AM	47393.33	47227.93	1416.84	165.40	Pass	NA	NA	NA	NA	NA
8/30/2023 12:34:00 AM	47329.18	47227.93	1416.84	101.26	Pass	NA	NA	NA	NA	NA
Detector 5										
8/29/2023 12:33:00 AM	54942.96	55004.03	1650.12	-61.06	Pass	NA	NA	NA	NA	NA
8/30/2023 12:34:00 AM	54795.61	55004.03	1650.12	-208.41	Pass	NA	NA	NA	NA	NA
Detector 6										
8/29/2023 12:33:00 AM	50881.34	52072.68	1562.18	-1191.33	Pass	NA	NA	NA	NA	NA
8/30/2023 12:34:00 AM	50795.09	52072.68	1562.18	-1277.58	Pass	NA	NA	NA	NA	NA
Detector 7										
8/29/2023 12:34:00 AM	44137.14	44302.58	1329.08	-165.43	Pass	NA	NA	NA	NA	NA
8/30/2023 12:35:00 AM	44004.22	44302.58	1329.08	-298.35	Pass	NA	NA	NA	NA	NA
Detector 8										
8/29/2023 12:25:00 AM	49608.47	49959.33	1498.78	-350.86	Pass	NA	NA	NA	NA	NA
8/30/2023 12:24:00 AM	49440.10	49959.33	1498.78	-519.22	Pass	NA	NA	NA	NA	NA
Detector 9										
8/29/2023 12:25:00 AM	47713.46	47696.08	1430.88	17.38	Pass	NA	NA	NA	NA	NA
8/30/2023 12:25:00 AM	47953.70	47696.08	1430.88	257.63	Pass	NA	NA	NA	NA	NA
Detector 10										
8/29/2023 12:25:00 AM	49329.10	50136.65	1504.10	-807.55	Pass	NA	NA	NA	NA	NA
8/30/2023 12:25:00 AM	49129.72	50136.65	1504.10	-1006.93	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
8/29/2023 12:26:00 AM	59538.44	59951.55	1798.55	-413.11	Pass	NA	NA	NA	NA	NA
8/30/2023 12:25:00 AM	60277.19	59951.55	1798.55	325.64	Pass	NA	NA	NA	NA	NA
Detector 12										
8/29/2023 12:26:00 AM	49225.24	49257.90	1477.74	-32.66	Pass	NA	NA	NA	NA	NA
8/30/2023 12:26:00 AM	48591.68	49257.90	1477.74	-666.22	Pass	NA	NA	NA	NA	NA
Detector 13										
8/29/2023 12:26:00 AM	55134.70	55607.20	1668.22	-472.50	Pass	NA	NA	NA	NA	NA
8/30/2023 12:26:00 AM	54933.21	55607.20	1668.22	-673.99	Pass	NA	NA	NA	NA	NA
Detector 14										
8/29/2023 12:27:00 AM	49096.40	50580.03	1517.40	-1483.63	Pass	NA	NA	NA	NA	NA
8/30/2023 12:26:00 AM	49851.28	50580.03	1517.40	-728.74	Pass	NA	NA	NA	NA	NA
Detector 15										
8/29/2023 12:27:00 AM	44603.75	45674.43	1370.23	-1070.68	Pass	NA	NA	NA	NA	NA
8/30/2023 12:27:00 AM	44502.21	45674.43	1370.23	-1172.21	Pass	NA	NA	NA	NA	NA
Detector 16										
8/29/2023 12:41:00 AM	49659.57	49653.23	1489.60	6.35	Pass	NA	NA	NA	NA	NA
8/30/2023 12:40:00 AM	49425.39	49653.23	1489.60	-227.83	Pass	NA	NA	NA	NA	NA
Detector 17										
8/29/2023 12:42:00 AM	47905.93	48166.13	1444.98	-260.19	Pass	NA	NA	NA	NA	NA
8/30/2023 12:40:00 AM	47859.15	48166.13	1444.98	-306.98	Pass	NA	NA	NA	NA	NA
Detector 18										
8/29/2023 12:42:00 AM	49410.03	49957.23	1498.72	-547.20	Pass	NA	NA	NA	NA	NA
8/30/2023 12:41:00 AM	49357.82	49957.23	1498.72	-599.40	Pass	NA	NA	NA	NA	NA
Detector 19										
8/29/2023 12:42:00 AM	60320.42	59167.80	1775.03	1152.62	Pass	NA	NA	NA	NA	NA
8/30/2023 12:41:00 AM	59983.99	59167.80	1775.03	816.19	Pass	NA	NA	NA	NA	NA
Detector 20										
8/29/2023 12:42:00 AM	49513.57	49987.80	1499.63	-474.23	Pass	NA	NA	NA	NA	NA
8/30/2023 12:41:00 AM	49507.45	49987.80	1499.63	-480.35	Pass	NA	NA	NA	NA	NA
Detector 21										
8/29/2023 12:42:00 AM	47284.49	55281.80	1658.45	-7997.31	**FAIL**	NA	NA	NA	NA	NA
8/30/2023 12:42:00 AM	46054.02	55281.80	1658.45	-9227.78	**FAIL**	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
8/29/2023 12:42:00 AM	51210.11	52477.75	1574.33	-1267.64	Pass	NA	NA	NA	NA	NA
8/30/2023 12:42:00 AM	51196.33	52477.75	1574.33	-1281.42	Pass	NA	NA	NA	NA	NA
Detector 23										
8/29/2023 12:41:00 AM	45159.35	46160.75	1384.82	-1001.40	Pass	NA	NA	NA	NA	NA
8/30/2023 12:42:00 AM	44800.48	46160.75	1384.82	-1360.27	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
8/29/2023 4:04:00 AM	0.13	0.19	0.02	-0.06	Pass	0.56	0.54	0.10	0.019	Pass
8/30/2023 4:03:00 AM	0.09	0.19	0.02	-0.10	FAIL	0.42	0.54	0.10	-0.121	Pass
Detector 1										
8/29/2023 4:04:00 AM	0.11	0.23	0.03	-0.12	FAIL	0.24	0.47	0.07	-0.234	FAIL
8/30/2023 4:03:00 AM	0.13	0.23	0.03	-0.11	FAIL	0.39	0.47	0.07	-0.088	Pass
Detector 2										
8/29/2023 4:04:00 AM	0.12	0.21	0.06	-0.09	Pass	0.58	0.54	0.11	0.036	Pass
8/30/2023 4:03:00 AM	0.14	0.21	0.06	-0.08	Pass	0.50	0.54	0.11	-0.044	Pass
Detector 3										
8/29/2023 4:04:00 AM	0.11	0.24	0.04	-0.13	FAIL	0.46	0.52	0.09	-0.064	Pass
8/30/2023 4:03:00 AM	0.10	0.24	0.04	-0.14	FAIL	0.41	0.52	0.09	-0.119	Pass
Detector 4										
8/29/2023 4:04:00 AM	0.12	0.23	0.04	-0.11	Pass	0.48	0.45	0.07	0.025	Pass
8/30/2023 4:03:00 AM	0.13	0.23	0.04	-0.10	Pass	0.34	0.45	0.07	-0.115	Pass
Detector 5										
8/29/2023 4:04:00 AM	0.19	0.22	0.03	-0.03	Pass	0.51	0.44	0.08	0.067	Pass
8/30/2023 4:04:00 AM	0.13	0.22	0.03	-0.10	Pass	0.35	0.44	0.08	-0.099	Pass
Detector 6										
8/29/2023 4:04:00 AM	0.17	0.25	0.04	-0.08	Pass	0.39	0.46	0.07	-0.078	Pass
8/30/2023 4:04:00 AM	0.16	0.25	0.04	-0.09	Pass	0.39	0.46	0.07	-0.078	Pass
Detector 7										
8/29/2023 4:04:00 AM	0.15	0.30	0.06	-0.15	Pass	0.46	0.54	0.09	-0.089	Pass
8/30/2023 4:04:00 AM	0.13	0.30	0.06	-0.17	Pass	0.55	0.54	0.09	0.001	Pass
Detector 8										
8/29/2023 4:05:00 AM	0.10	0.21	0.06	-0.11	Pass	0.45	0.51	0.10	-0.060	Pass
8/30/2023 4:04:00 AM	0.09	0.21	0.06	-0.12	Pass	0.28	0.51	0.10	-0.230	Pass
Detector 9										
8/29/2023 4:05:00 AM	0.12	0.18	0.05	-0.07	Pass	0.38	0.41	0.07	-0.032	Pass
8/30/2023 4:04:00 AM	0.11	0.18	0.05	-0.08	Pass	0.38	0.41	0.07	-0.032	Pass
Detector 10										
8/29/2023 4:05:00 AM	0.08	0.20	0.05	-0.12	Pass	0.27	0.42	0.10	-0.155	Pass
8/30/2023 4:04:00 AM	0.11	0.20	0.05	-0.10	Pass	0.36	0.42	0.10	-0.065	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
8/29/2023 4:05:00 AM	0.09	0.19	0.04	-0.10	Pass	0.34	0.50	0.09	-0.163	Pass
8/30/2023 4:04:00 AM	0.09	0.19	0.04	-0.10	Pass	0.40	0.50	0.09	-0.103	Pass
Detector 12										
8/29/2023 4:05:00 AM	0.17	0.28	0.05	-0.11	Pass	0.44	0.51	0.09	-0.066	Pass
8/30/2023 4:04:00 AM	0.14	0.28	0.05	-0.14	Pass	0.32	0.51	0.09	-0.186	Pass
Detector 13										
8/29/2023 4:05:00 AM	0.08	0.21	0.05	-0.14	**FAIL**	0.33	0.43	0.09	-0.101	Pass
8/30/2023 4:04:00 AM	0.12	0.21	0.05	-0.09	Pass	0.31	0.43	0.09	-0.121	Pass
Detector 14										
8/29/2023 4:04:00 AM	0.10	0.22	0.05	-0.13	Pass	0.32	0.41	0.09	-0.093	Pass
8/30/2023 4:04:00 AM	0.06	0.22	0.05	-0.16	**FAIL**	0.33	0.41	0.09	-0.083	Pass
Detector 15										
8/29/2023 4:05:00 AM	0.18	0.23	0.05	-0.06	Pass	0.39	0.49	0.08	-0.100	Pass
8/30/2023 4:04:00 AM	0.11	0.23	0.05	-0.12	Pass	0.48	0.49	0.08	-0.015	Pass
Detector 16										
8/29/2023 4:05:00 AM	0.10	0.18	0.05	-0.09	Pass	0.40	0.56	0.34	-0.168	Pass
8/30/2023 4:04:00 AM	0.06	0.18	0.05	-0.13	Pass	0.51	0.56	0.34	-0.058	Pass
Detector 17										
8/29/2023 4:05:00 AM	0.13	0.22	0.04	-0.09	Pass	0.47	0.44	0.10	0.026	Pass
8/30/2023 4:04:00 AM	0.13	0.22	0.04	-0.09	Pass	0.39	0.44	0.10	-0.049	Pass
Detector 18										
8/29/2023 4:05:00 AM	1.06	1.16	0.12	-0.11	Pass	1.28	1.31	0.19	-0.038	Pass
8/30/2023 4:04:00 AM	0.87	1.16	0.12	-0.30	Pass	0.96	1.31	0.19	-0.353	Pass
Detector 19										
8/29/2023 4:05:00 AM	0.24	0.37	0.06	-0.13	Pass	0.42	0.63	0.12	-0.208	Pass
8/30/2023 4:04:00 AM	0.22	0.37	0.06	-0.16	Pass	0.56	0.63	0.12	-0.073	Pass
Detector 20										
8/29/2023 4:05:00 AM	0.05	0.25	0.04	-0.20	**FAIL**	0.29	0.48	0.11	-0.193	Pass
8/30/2023 4:04:00 AM	0.02	0.25	0.04	-0.23	**FAIL**	0.34	0.48	0.11	-0.143	Pass
Detector 21										
8/29/2023 4:06:00 AM	0.05	0.24	0.04	-0.19	**FAIL**	0.16	0.37	0.07	-0.213	Pass
8/30/2023 4:04:00 AM	0.03	0.24	0.04	-0.21	**FAIL**	0.13	0.37	0.07	-0.238	**FAIL**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
8/29/2023 4:05:00 AM	0.18	0.28	0.05	-0.10	Pass	0.35	0.42	0.09	-0.072	Pass
8/30/2023 4:04:00 AM	0.16	0.28	0.05	-0.12	Pass	0.39	0.42	0.09	-0.032	Pass
Detector 23										
8/29/2023 4:06:00 AM	0.39	0.48	0.06	-0.09	Pass	0.84	0.77	0.13	0.069	Pass
8/30/2023 4:04:00 AM	0.39	0.48	0.06	-0.09	Pass	0.78	0.77	0.13	0.009	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
8/30/2023 12:21:00 AM	9624.04	9731.78	291.95	-107.73	Pass	3736.50	3783.75	55.06	-47.250	Pass
8/31/2023 12:22:00 AM	9537.91	9731.78	291.95	-193.86	Pass	3659.50	3783.75	55.06	-124.250	**WARNING**
Detector 1										
8/30/2023 12:22:00 AM	11243.25	11203.08	336.09	40.17	Pass	4234.00	4270.00	56.54	-36.000	Pass
8/31/2023 12:22:00 AM	11198.21	11203.08	336.09	-4.87	Pass	4222.00	4270.00	56.54	-48.000	Pass
Detector 2										
8/30/2023 12:22:00 AM	10130.55	10359.33	310.78	-228.78	Pass	4027.00	4091.73	50.75	-64.725	Pass
8/31/2023 12:23:00 AM	10219.27	10359.33	310.78	-140.06	Pass	4075.50	4091.73	50.75	-16.225	Pass
Detector 3										
8/30/2023 12:23:00 AM	11240.74	11400.95	342.03	-160.21	Pass	4308.00	4294.73	42.38	13.275	Pass
8/31/2023 12:23:00 AM	11316.94	11400.95	342.03	-84.01	Pass	4217.00	4294.73	42.38	-77.725	Pass
Detector 4										
8/30/2023 12:23:00 AM	14304.81	14325.50	429.77	-20.69	Pass	6323.00	6338.90	205.79	-15.900	Pass
8/31/2023 12:23:00 AM	14105.47	14325.50	429.77	-220.03	Pass	6373.50	6338.90	205.79	34.600	Pass
Detector 5										
8/30/2023 12:23:00 AM	14721.63	14830.60	444.92	-108.97	Pass	5419.50	5533.48	81.19	-113.975	Pass
8/31/2023 12:23:00 AM	14824.40	14830.60	444.92	-6.20	Pass	5493.50	5533.48	81.19	-39.975	Pass
Detector 6										
8/30/2023 12:24:00 AM	12280.30	12305.73	369.17	-25.43	Pass	4639.00	4715.55	63.03	-76.550	Pass
8/31/2023 12:24:00 AM	12175.65	12305.73	369.17	-130.08	Pass	4580.00	4715.55	63.03	-135.550	**WARNING**
Detector 7										
8/30/2023 12:24:00 AM	12273.79	12708.25	381.25	-434.46	**FAIL**	4826.00	4810.10	73.07	15.900	Pass
8/31/2023 12:24:00 AM	12372.54	12708.25	381.25	-335.71	Pass	4877.00	4810.10	73.07	66.900	Pass
Detector 8										
8/30/2023 12:37:00 AM	9634.07	9451.15	283.53	182.92	Pass	3686.00	3851.33	50.28	-165.325	**DOEF**
8/31/2023 12:37:00 AM	9372.09	9451.15	283.53	-79.06	Pass	3684.50	3851.33	50.28	-166.825	**DOEF**
Detector 9										
8/30/2023 12:37:00 AM	10881.03	10846.68	325.40	34.36	Pass	4252.50	4390.08	73.38	-137.575	Pass
8/31/2023 12:38:00 AM	10749.82	10846.68	325.40	-96.86	Pass	4069.50	4390.08	73.38	-320.575	**DOEF**
Detector 10										
8/30/2023 12:38:00 AM	10456.19	10386.65	311.60	69.54	Pass	3896.50	4154.40	60.48	-257.900	**DOEF**
8/31/2023 12:38:00 AM	10312.95	10386.65	311.60	-73.70	Pass	3906.00	4154.40	60.48	-248.400	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
8/30/2023 12:38:00 AM	11427.61	11316.08	339.48	111.54	Pass	4283.50	4591.48	60.25	-307.975	**DOEF**
8/31/2023 12:39:00 AM	11374.56	11316.08	339.48	58.48	Pass	4458.00	4591.48	60.25	-133.475	**WARNING**
Detector 12										
8/30/2023 12:39:00 AM	14073.85	14250.38	427.51	-176.53	Pass	6464.50	6540.40	105.21	-75.900	Pass
8/31/2023 12:39:00 AM	14134.03	14250.38	427.51	-116.34	Pass	6579.00	6540.40	105.21	38.600	Pass
Detector 13										
8/30/2023 12:39:00 AM	15609.89	15581.68	467.45	28.22	Pass	4831.50	4978.43	68.62	-146.925	**WARNING**
8/31/2023 12:39:00 AM	15465.17	15581.68	467.45	-116.50	Pass	4864.50	4978.43	68.62	-113.925	Pass
Detector 14										
8/30/2023 12:39:00 AM	11278.82	11508.73	345.26	-229.91	Pass	5357.00	5412.75	104.76	-55.750	Pass
8/31/2023 12:40:00 AM	11213.24	11508.73	345.26	-295.49	Pass	5343.50	5412.75	104.76	-69.250	Pass
Detector 15										
8/30/2023 12:40:00 AM	12032.31	12031.40	360.94	0.91	Pass	5450.00	5413.25	103.25	36.750	Pass
8/31/2023 12:40:00 AM	11846.99	12031.40	360.94	-184.41	Pass	5577.50	5413.25	103.25	164.250	Pass
Detector 16										
8/30/2023 12:30:00 AM	9653.10	9639.28	289.18	13.83	Pass	3645.50	3817.55	37.67	-172.050	**DOEF**
8/31/2023 12:30:00 AM	9679.70	9639.28	289.18	40.42	Pass	3643.50	3817.55	37.67	-174.050	**DOEF**
Detector 17										
8/30/2023 12:30:00 AM	11231.72	11061.48	331.84	170.25	Pass	4124.50	4226.70	53.61	-102.200	Pass
8/31/2023 12:30:00 AM	11031.87	11061.48	331.84	-29.60	Pass	4079.50	4226.70	53.61	-147.200	**WARNING**
Detector 18										
8/30/2023 12:31:00 AM	10647.56	10659.53	319.79	-11.96	Pass	3843.00	3935.95	34.99	-92.950	**WARNING**
8/31/2023 12:31:00 AM	10575.47	10659.53	319.79	-84.06	Pass	3917.00	3935.95	34.99	-18.950	Pass
Detector 19										
8/30/2023 12:31:00 AM	11591.43	11467.10	344.01	124.33	Pass	4324.00	4448.70	59.17	-124.700	**WARNING**
8/31/2023 12:31:00 AM	11415.63	11467.10	344.01	-51.47	Pass	4382.00	4448.70	59.17	-66.700	Pass
Detector 20										
8/30/2023 12:31:00 AM	14468.12	14347.83	430.43	120.30	Pass	6653.50	6614.45	91.13	39.050	Pass
8/31/2023 12:31:00 AM	14409.57	14347.83	430.43	61.75	Pass	6549.50	6614.45	91.13	-64.950	Pass
Detector 21										
8/30/2023 12:31:00 AM	9687.17	9869.88	296.10	-182.71	Pass	10286.50	10259.65	129.52	26.850	Pass
8/31/2023 12:31:00 AM	9977.28	9869.88	296.10	107.41	Pass	10182.50	10259.65	129.52	-77.150	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
8/30/2023 12:32:00 AM	11766.78	11742.60	352.28	24.18	Pass	5332.00	5466.15	85.68	-134.150	Pass
8/31/2023 12:32:00 AM	11799.40	11742.60	352.28	56.80	Pass	5508.50	5466.15	85.68	42.350	Pass
Detector 23										
8/30/2023 12:32:00 AM	12158.56	12061.73	361.85	96.83	Pass	5774.50	5992.08	108.01	-217.575	**WARNING**
8/31/2023 12:32:00 AM	12107.01	12061.73	361.85	45.28	Pass	5763.50	5992.08	108.01	-228.575	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
8/30/2023 12:32:00 AM	49931.12	50552.05	1516.56	-620.93	Pass	NA	NA	NA	NA	NA
8/31/2023 12:32:00 AM	49839.69	50552.05	1516.56	-712.36	Pass	NA	NA	NA	NA	NA
Detector 1										
8/30/2023 12:33:00 AM	48656.67	47641.23	1429.24	1015.44	Pass	NA	NA	NA	NA	NA
8/31/2023 12:32:00 AM	48295.32	47641.23	1429.24	654.10	Pass	NA	NA	NA	NA	NA
Detector 2										
8/30/2023 12:33:00 AM	49158.02	49734.44	1492.03	-576.42	Pass	NA	NA	NA	NA	NA
8/31/2023 12:33:00 AM	49226.14	49734.44	1492.03	-508.30	Pass	NA	NA	NA	NA	NA
Detector 3										
8/30/2023 12:33:00 AM	59401.27	60167.98	1805.04	-766.70	Pass	NA	NA	NA	NA	NA
8/31/2023 12:33:00 AM	59154.87	60167.98	1805.04	-1013.10	Pass	NA	NA	NA	NA	NA
Detector 4										
8/30/2023 12:34:00 AM	47329.18	47227.93	1416.84	101.26	Pass	NA	NA	NA	NA	NA
8/31/2023 12:33:00 AM	47041.81	47227.93	1416.84	-186.12	Pass	NA	NA	NA	NA	NA
Detector 5										
8/30/2023 12:34:00 AM	54795.61	55004.03	1650.12	-208.41	Pass	NA	NA	NA	NA	NA
8/31/2023 12:34:00 AM	54888.79	55004.03	1650.12	-115.23	Pass	NA	NA	NA	NA	NA
Detector 6										
8/30/2023 12:34:00 AM	50795.09	52072.68	1562.18	-1277.58	Pass	NA	NA	NA	NA	NA
8/31/2023 12:34:00 AM	50646.05	52072.68	1562.18	-1426.63	Pass	NA	NA	NA	NA	NA
Detector 7										
8/30/2023 12:35:00 AM	44004.22	44302.58	1329.08	-298.35	Pass	NA	NA	NA	NA	NA
8/31/2023 12:34:00 AM	43580.77	44302.58	1329.08	-721.81	Pass	NA	NA	NA	NA	NA
Detector 8										
8/30/2023 12:24:00 AM	49440.10	49959.33	1498.78	-519.22	Pass	NA	NA	NA	NA	NA
8/31/2023 12:25:00 AM	49385.96	49959.33	1498.78	-573.37	Pass	NA	NA	NA	NA	NA
Detector 9										
8/30/2023 12:25:00 AM	47953.70	47696.08	1430.88	257.63	Pass	NA	NA	NA	NA	NA
8/31/2023 12:25:00 AM	47933.91	47696.08	1430.88	237.83	Pass	NA	NA	NA	NA	NA
Detector 10										
8/30/2023 12:25:00 AM	49129.72	50136.65	1504.10	-1006.93	Pass	NA	NA	NA	NA	NA
8/31/2023 12:26:00 AM	49209.89	50136.65	1504.10	-926.76	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
8/30/2023 12:25:00 AM	60277.19	59951.55	1798.55	325.64	Pass	NA	NA	NA	NA	NA
8/31/2023 12:26:00 AM	59398.19	59951.55	1798.55	-553.36	Pass	NA	NA	NA	NA	NA
Detector 12										
8/30/2023 12:26:00 AM	48591.68	49257.90	1477.74	-666.22	Pass	NA	NA	NA	NA	NA
8/31/2023 12:26:00 AM	48837.95	49257.90	1477.74	-419.95	Pass	NA	NA	NA	NA	NA
Detector 13										
8/30/2023 12:26:00 AM	54933.21	55607.20	1668.22	-673.99	Pass	NA	NA	NA	NA	NA
8/31/2023 12:24:00 AM	55198.39	55607.20	1668.22	-408.81	Pass	NA	NA	NA	NA	NA
Detector 14										
8/30/2023 12:26:00 AM	49851.28	50580.03	1517.40	-728.74	Pass	NA	NA	NA	NA	NA
8/31/2023 12:25:00 AM	49153.03	50580.03	1517.40	-1426.99	Pass	NA	NA	NA	NA	NA
Detector 15										
8/30/2023 12:27:00 AM	44502.21	45674.43	1370.23	-1172.21	Pass	NA	NA	NA	NA	NA
8/31/2023 12:25:00 AM	44073.99	45674.43	1370.23	-1600.43	**FAIL**	NA	NA	NA	NA	NA
Detector 16										
8/30/2023 12:40:00 AM	49425.39	49653.23	1489.60	-227.83	Pass	NA	NA	NA	NA	NA
8/31/2023 12:40:00 AM	49746.05	49653.23	1489.60	92.82	Pass	NA	NA	NA	NA	NA
Detector 17										
8/30/2023 12:40:00 AM	47859.15	48166.13	1444.98	-306.98	Pass	NA	NA	NA	NA	NA
8/31/2023 12:40:00 AM	48030.53	48166.13	1444.98	-135.60	Pass	NA	NA	NA	NA	NA
Detector 18										
8/30/2023 12:41:00 AM	49357.82	49957.23	1498.72	-599.40	Pass	NA	NA	NA	NA	NA
8/31/2023 12:40:00 AM	49583.54	49957.23	1498.72	-373.69	Pass	NA	NA	NA	NA	NA
Detector 19										
8/30/2023 12:41:00 AM	59983.99	59167.80	1775.03	816.19	Pass	NA	NA	NA	NA	NA
8/31/2023 12:41:00 AM	59865.67	59167.80	1775.03	697.87	Pass	NA	NA	NA	NA	NA
Detector 20										
8/30/2023 12:41:00 AM	49507.45	49987.80	1499.63	-480.35	Pass	NA	NA	NA	NA	NA
8/31/2023 12:41:00 AM	49671.36	49987.80	1499.63	-316.44	Pass	NA	NA	NA	NA	NA
Detector 21										
8/30/2023 12:42:00 AM	46054.02	55281.80	1658.45	-9227.78	**FAIL**	NA	NA	NA	NA	NA
8/31/2023 12:41:00 AM	46127.48	55281.80	1658.45	-9154.32	**FAIL**	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
8/30/2023 12:42:00 AM	51196.33	52477.75	1574.33	-1281.42	Pass	NA	NA	NA	NA	NA
8/31/2023 12:41:00 AM	51129.90	52477.75	1574.33	-1347.85	Pass	NA	NA	NA	NA	NA
Detector 23										
8/30/2023 12:42:00 AM	44800.48	46160.75	1384.82	-1360.27	Pass	NA	NA	NA	NA	NA
8/31/2023 12:42:00 AM	44706.10	46160.75	1384.82	-1454.65	**FAIL**	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
8/30/2023 4:03:00 AM	0.09	0.19	0.02	-0.10	FAIL	0.42	0.54	0.10	-0.121	Pass
8/31/2023 4:03:00 AM	0.14	0.19	0.02	-0.05	Pass	0.51	0.54	0.10	-0.026	Pass
Detector 1										
8/30/2023 4:03:00 AM	0.13	0.23	0.03	-0.11	FAIL	0.39	0.47	0.07	-0.088	Pass
8/31/2023 4:03:00 AM	0.06	0.23	0.03	-0.17	FAIL	0.32	0.47	0.07	-0.154	Pass
Detector 2										
8/30/2023 4:03:00 AM	0.14	0.21	0.06	-0.08	Pass	0.50	0.54	0.11	-0.044	Pass
8/31/2023 4:03:00 AM	0.09	0.21	0.06	-0.12	Pass	0.39	0.54	0.11	-0.154	Pass
Detector 3										
8/30/2023 4:03:00 AM	0.10	0.24	0.04	-0.14	FAIL	0.41	0.52	0.09	-0.119	Pass
8/31/2023 4:03:00 AM	0.11	0.24	0.04	-0.13	FAIL	0.42	0.52	0.09	-0.104	Pass
Detector 4										
8/30/2023 4:03:00 AM	0.13	0.23	0.04	-0.10	Pass	0.34	0.45	0.07	-0.115	Pass
8/31/2023 4:04:00 AM	0.17	0.23	0.04	-0.06	Pass	0.42	0.45	0.07	-0.030	Pass
Detector 5										
8/30/2023 4:04:00 AM	0.13	0.22	0.03	-0.10	Pass	0.35	0.44	0.08	-0.099	Pass
8/31/2023 4:04:00 AM	0.13	0.22	0.03	-0.09	Pass	0.43	0.44	0.08	-0.014	Pass
Detector 6										
8/30/2023 4:04:00 AM	0.16	0.25	0.04	-0.09	Pass	0.39	0.46	0.07	-0.078	Pass
8/31/2023 4:04:00 AM	0.12	0.25	0.04	-0.13	FAIL	0.45	0.46	0.07	-0.013	Pass
Detector 7										
8/30/2023 4:04:00 AM	0.13	0.30	0.06	-0.17	Pass	0.55	0.54	0.09	0.001	Pass
8/31/2023 4:04:00 AM	0.16	0.30	0.06	-0.14	Pass	0.52	0.54	0.09	-0.024	Pass
Detector 8										
8/30/2023 4:04:00 AM	0.09	0.21	0.06	-0.12	Pass	0.28	0.51	0.10	-0.230	Pass
8/31/2023 4:04:00 AM	0.07	0.21	0.06	-0.15	Pass	0.32	0.51	0.10	-0.195	Pass
Detector 9										
8/30/2023 4:04:00 AM	0.11	0.18	0.05	-0.08	Pass	0.38	0.41	0.07	-0.032	Pass
8/31/2023 4:04:00 AM	0.07	0.18	0.05	-0.11	Pass	0.33	0.41	0.07	-0.077	Pass
Detector 10										
8/30/2023 4:04:00 AM	0.11	0.20	0.05	-0.10	Pass	0.36	0.42	0.10	-0.065	Pass
8/31/2023 4:04:00 AM	0.10	0.20	0.05	-0.11	Pass	0.24	0.42	0.10	-0.180	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
8/30/2023 4:04:00 AM	0.09	0.19	0.04	-0.10	Pass	0.40	0.50	0.09	-0.103	Pass
8/31/2023 4:04:00 AM	0.08	0.19	0.04	-0.11	Pass	0.37	0.50	0.09	-0.133	Pass
Detector 12										
8/30/2023 4:04:00 AM	0.14	0.28	0.05	-0.14	Pass	0.32	0.51	0.09	-0.186	Pass
8/31/2023 4:04:00 AM	0.21	0.28	0.05	-0.07	Pass	0.53	0.51	0.09	0.024	Pass
Detector 13										
8/30/2023 4:04:00 AM	0.12	0.21	0.05	-0.09	Pass	0.31	0.43	0.09	-0.121	Pass
8/31/2023 4:04:00 AM	0.13	0.21	0.05	-0.08	Pass	0.32	0.43	0.09	-0.106	Pass
Detector 14										
8/30/2023 4:04:00 AM	0.06	0.22	0.05	-0.16	**FAIL**	0.33	0.41	0.09	-0.083	Pass
8/31/2023 4:04:00 AM	0.15	0.22	0.05	-0.07	Pass	0.33	0.41	0.09	-0.083	Pass
Detector 15										
8/30/2023 4:04:00 AM	0.11	0.23	0.05	-0.12	Pass	0.48	0.49	0.08	-0.015	Pass
8/31/2023 4:04:00 AM	0.16	0.23	0.05	-0.07	Pass	0.39	0.49	0.08	-0.100	Pass
Detector 16										
8/30/2023 4:04:00 AM	0.06	0.18	0.05	-0.13	Pass	0.51	0.56	0.34	-0.058	Pass
8/31/2023 4:04:00 AM	0.06	0.18	0.05	-0.13	Pass	0.36	0.56	0.34	-0.203	Pass
Detector 17										
8/30/2023 4:04:00 AM	0.13	0.22	0.04	-0.09	Pass	0.39	0.44	0.10	-0.049	Pass
8/31/2023 4:04:00 AM	0.13	0.22	0.04	-0.09	Pass	0.36	0.44	0.10	-0.079	Pass
Detector 18										
8/30/2023 4:04:00 AM	0.87	1.16	0.12	-0.30	Pass	0.96	1.31	0.19	-0.353	Pass
8/31/2023 4:04:00 AM	0.97	1.16	0.12	-0.19	Pass	1.30	1.31	0.19	-0.018	Pass
Detector 19										
8/30/2023 4:04:00 AM	0.22	0.37	0.06	-0.16	Pass	0.56	0.63	0.12	-0.073	Pass
8/31/2023 4:05:00 AM	0.32	0.37	0.06	-0.05	Pass	0.54	0.63	0.12	-0.093	Pass
Detector 20										
8/30/2023 4:04:00 AM	0.02	0.25	0.04	-0.23	**FAIL**	0.34	0.48	0.11	-0.143	Pass
8/31/2023 4:05:00 AM	0.04	0.25	0.04	-0.21	**FAIL**	0.30	0.48	0.11	-0.178	Pass
Detector 21										
8/30/2023 4:04:00 AM	0.03	0.24	0.04	-0.21	**FAIL**	0.13	0.37	0.07	-0.238	**FAIL**
8/31/2023 4:05:00 AM	0.04	0.24	0.04	-0.21	**FAIL**	0.13	0.37	0.07	-0.238	**FAIL**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
8/30/2023 4:04:00 AM	0.16	0.28	0.05	-0.12	Pass	0.39	0.42	0.09	-0.032	Pass
8/31/2023 4:05:00 AM	0.16	0.28	0.05	-0.12	Pass	0.30	0.42	0.09	-0.122	Pass
Detector 23										
8/30/2023 4:04:00 AM	0.39	0.48	0.06	-0.09	Pass	0.78	0.77	0.13	0.009	Pass
8/31/2023 4:05:00 AM	0.48	0.48	0.06	0.00	Pass	0.75	0.77	0.13	-0.016	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:25:00 AM	9574.78	9731.78	291.95	-156.99	Pass	3607.00	3783.75	55.06	-176.750	**DOEF**
9/8/2023 12:23:00 AM	9552.78	9731.78	291.95	-179.00	Pass	3725.50	3783.75	55.06	-58.250	Pass
Detector 1										
9/7/2023 12:26:00 AM	11262.18	11203.08	336.09	59.10	Pass	4251.00	4270.00	56.54	-19.000	Pass
9/8/2023 12:24:00 AM	10937.07	11203.08	336.09	-266.00	Pass	4231.00	4270.00	56.54	-39.000	Pass
Detector 2										
9/7/2023 12:26:00 AM	10130.40	10359.33	310.78	-228.92	Pass	4003.00	4091.73	50.75	-88.725	Pass
9/8/2023 12:24:00 AM	10278.74	10359.33	310.78	-80.58	Pass	4116.00	4091.73	50.75	24.275	Pass
Detector 3										
9/7/2023 12:26:00 AM	11434.53	11400.95	342.03	33.58	Pass	4237.00	4294.73	42.38	-57.725	Pass
9/8/2023 12:24:00 AM	11294.29	11400.95	342.03	-106.66	Pass	4190.50	4294.73	42.38	-104.225	**WARNING**
Detector 4										
9/7/2023 12:27:00 AM	14135.97	14325.50	429.77	-189.53	Pass	6258.00	6338.90	205.79	-80.900	Pass
9/8/2023 12:24:00 AM	13996.75	14325.50	429.77	-328.75	Pass	6472.50	6338.90	205.79	133.600	Pass
Detector 5										
9/7/2023 12:27:00 AM	14937.58	14830.60	444.92	106.98	Pass	5432.00	5533.48	81.19	-101.475	Pass
9/8/2023 12:25:00 AM	14706.18	14830.60	444.92	-124.42	Pass	5479.00	5533.48	81.19	-54.475	Pass
Detector 6										
9/7/2023 12:27:00 AM	12161.49	12305.73	369.17	-144.23	Pass	4649.00	4715.55	63.03	-66.550	Pass
9/8/2023 12:25:00 AM	12164.55	12305.73	369.17	-141.17	Pass	4605.00	4715.55	63.03	-110.550	Pass
Detector 7										
9/7/2023 12:28:00 AM	12468.11	12708.25	381.25	-240.14	Pass	4848.50	4810.10	73.07	38.400	Pass
9/8/2023 12:25:00 AM	12231.69	12708.25	381.25	-476.56	**FAIL**	4858.00	4810.10	73.07	47.900	Pass
Detector 8										
9/7/2023 12:41:00 AM	9537.21	9451.15	283.53	86.06	Pass	3738.00	3851.33	50.28	-113.325	**WARNING**
9/8/2023 12:43:00 AM	9503.18	9451.15	283.53	52.03	Pass	3749.00	3851.33	50.28	-102.325	**WARNING**
Detector 9										
9/7/2023 12:42:00 AM	10981.61	10846.68	325.40	134.94	Pass	4177.50	4390.08	73.38	-212.575	**WARNING**
9/8/2023 12:44:00 AM	10811.82	10846.68	325.40	-34.85	Pass	4256.50	4390.08	73.38	-133.575	Pass
Detector 10										
9/7/2023 12:42:00 AM	10282.21	10386.65	311.60	-104.44	Pass	3902.00	4154.40	60.48	-252.400	**DOEF**
9/8/2023 12:44:00 AM	10228.64	10386.65	311.60	-158.01	Pass	3984.00	4154.40	60.48	-170.400	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/7/2023 12:42:00 AM	11354.87	11316.08	339.48	38.79	Pass	4367.00	4591.48	60.25	-224.475	**DOEF**
9/8/2023 12:44:00 AM	11329.36	11316.08	339.48	13.29	Pass	4334.50	4591.48	60.25	-256.975	**DOEF**
Detector 12										
9/7/2023 12:42:00 AM	14219.14	14250.38	427.51	-31.24	Pass	6326.00	6540.40	105.21	-214.400	**WARNING**
9/8/2023 12:45:00 AM	13945.65	14250.38	427.51	-304.73	Pass	6568.00	6540.40	105.21	27.600	Pass
Detector 13										
9/7/2023 12:42:00 AM	15357.43	15581.68	467.45	-224.24	Pass	4772.00	4978.43	68.62	-206.425	**DOEF**
9/8/2023 12:45:00 AM	15375.54	15581.68	467.45	-206.14	Pass	4915.00	4978.43	68.62	-63.425	Pass
Detector 14										
9/7/2023 12:43:00 AM	11302.26	11508.73	345.26	-206.46	Pass	5271.00	5412.75	104.76	-141.750	Pass
9/8/2023 12:45:00 AM	11096.40	11508.73	345.26	-412.33	**FAIL**	5390.50	5412.75	104.76	-22.250	Pass
Detector 15										
9/7/2023 12:43:00 AM	11856.88	12031.40	360.94	-174.52	Pass	5374.00	5413.25	103.25	-39.250	Pass
9/8/2023 12:46:00 AM	11858.43	12031.40	360.94	-172.97	Pass	5711.00	5413.25	103.25	297.750	**WARNING**
Detector 16										
9/7/2023 12:34:00 AM	9718.07	9639.28	289.18	78.79	Pass	3648.50	3817.55	37.67	-169.050	**DOEF**
9/8/2023 12:34:00 AM	9517.21	9639.28	289.18	-122.07	Pass	3781.50	3817.55	37.67	-36.050	Pass
Detector 17										
9/7/2023 12:34:00 AM	11048.75	11061.48	331.84	-12.73	Pass	4105.00	4226.70	53.61	-121.700	**WARNING**
9/8/2023 12:34:00 AM	11062.82	11061.48	331.84	1.35	Pass	4068.00	4226.70	53.61	-158.700	**WARNING**
Detector 18										
9/7/2023 12:35:00 AM	10682.00	10659.53	319.79	22.48	Pass	3830.00	3935.95	34.99	-105.950	**DOEF**
9/8/2023 12:35:00 AM	10639.97	10659.53	319.79	-19.56	Pass	3890.00	3935.95	34.99	-45.950	Pass
Detector 19										
9/7/2023 12:35:00 AM	11439.03	11467.10	344.01	-28.07	Pass	4451.00	4448.70	59.17	2.300	Pass
9/8/2023 12:35:00 AM	11383.97	11467.10	344.01	-83.13	Pass	4517.00	4448.70	59.17	68.300	Pass
Detector 20										
9/7/2023 12:35:00 AM	14551.80	14347.83	430.43	203.98	Pass	6679.00	6614.45	91.13	64.550	Pass
9/8/2023 12:36:00 AM	14279.31	14347.83	430.43	-68.51	Pass	6659.50	6614.45	91.13	45.050	Pass
Detector 21										
9/7/2023 12:36:00 AM	9880.39	9869.88	296.10	10.52	Pass	10270.00	10259.65	129.52	10.350	Pass
9/8/2023 12:36:00 AM	9429.03	9869.88	296.10	-440.85	**FAIL**	10560.00	10259.65	129.52	300.350	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/7/2023 12:36:00 AM	11762.18	11742.60	352.28	19.58	Pass	5309.00	5466.15	85.68	-157.150	Pass
9/8/2023 12:36:00 AM	11682.07	11742.60	352.28	-60.53	Pass	5414.50	5466.15	85.68	-51.650	Pass
Detector 23										
9/7/2023 12:36:00 AM	12078.82	12061.73	361.85	17.10	Pass	5795.50	5992.08	108.01	-196.575	Pass
9/8/2023 12:37:00 AM	12134.99	12061.73	361.85	73.26	Pass	5873.00	5992.08	108.01	-119.075	Pass

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:38:00 AM	50037.35	50552.05	1516.56	-514.70	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49946.45	50552.05	1516.56	-605.60	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:38:00 AM	48133.85	47641.23	1429.24	492.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	48302.46	47641.23	1429.24	661.23	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:39:00 AM	48878.41	49734.44	1492.03	-856.03	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49506.06	49734.44	1492.03	-228.38	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:36:00 AM	59188.54	60167.98	1805.04	-979.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	58882.83	60167.98	1805.04	-1285.15	Pass	NA	NA	NA	NA	NA
Detector 4										
9/7/2023 12:37:00 AM	47410.02	47227.93	1416.84	182.10	Pass	NA	NA	NA	NA	NA
9/8/2023 12:37:00 AM	47364.62	47227.93	1416.84	136.70	Pass	NA	NA	NA	NA	NA
Detector 5										
9/7/2023 12:37:00 AM	54756.79	55004.03	1650.12	-247.24	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	55098.73	55004.03	1650.12	94.71	Pass	NA	NA	NA	NA	NA
Detector 6										
9/7/2023 12:37:00 AM	50631.20	52072.68	1562.18	-1441.47	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	50570.01	52072.68	1562.18	-1502.66	Pass	NA	NA	NA	NA	NA
Detector 7										
9/7/2023 12:38:00 AM	43920.12	44302.58	1329.08	-382.45	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	44162.87	44302.58	1329.08	-139.70	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:28:00 AM	49473.12	49959.33	1498.78	-486.21	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49339.68	49959.33	1498.78	-619.64	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:28:00 AM	47779.16	47696.08	1430.88	83.08	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	47837.46	47696.08	1430.88	141.38	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:29:00 AM	48923.63	50136.65	1504.10	-1213.02	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	49248.53	50136.65	1504.10	-888.12	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/7/2023 12:29:00 AM	59822.54	59951.55	1798.55	-129.01	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	59893.70	59951.55	1798.55	-57.85	Pass	NA	NA	NA	NA	NA
Detector 12										
9/7/2023 12:29:00 AM	48755.12	49257.90	1477.74	-502.78	Pass	NA	NA	NA	NA	NA
9/8/2023 12:28:00 AM	48887.24	49257.90	1477.74	-370.66	Pass	NA	NA	NA	NA	NA
Detector 13										
9/7/2023 12:29:00 AM	54840.23	55607.20	1668.22	-766.97	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	54777.72	55607.20	1668.22	-829.48	Pass	NA	NA	NA	NA	NA
Detector 14										
9/7/2023 12:30:00 AM	49584.56	50580.03	1517.40	-995.46	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49206.94	50580.03	1517.40	-1373.08	Pass	NA	NA	NA	NA	NA
Detector 15										
9/7/2023 12:30:00 AM	44393.04	45674.43	1370.23	-1281.38	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	43739.99	45674.43	1370.23	-1934.43	**FAIL**	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:45:00 AM	49790.75	49653.23	1489.60	137.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49506.75	49653.23	1489.60	-146.47	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:45:00 AM	48206.67	48166.13	1444.98	40.55	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	48156.43	48166.13	1444.98	-9.69	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:45:00 AM	49375.32	49957.23	1498.72	-581.90	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49698.42	49957.23	1498.72	-258.80	Pass	NA	NA	NA	NA	NA
Detector 19										
9/7/2023 12:43:00 AM	59990.99	59167.80	1775.03	823.19	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	59879.49	59167.80	1775.03	711.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:44:00 AM	49401.07	49987.80	1499.63	-586.73	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	49700.21	49987.80	1499.63	-287.59	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:44:00 AM	46576.06	55281.80	1658.45	-8705.74	**FAIL**	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	45626.04	55281.80	1658.45	-9655.76	**FAIL**	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/7/2023 12:44:00 AM	51225.10	52477.75	1574.33	-1252.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	51031.53	52477.75	1574.33	-1446.22	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:44:00 AM	45103.13	46160.75	1384.82	-1057.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	45025.91	46160.75	1384.82	-1134.84	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:09:00 AM	0.12	0.19	0.02	-0.07	FAIL	0.50	0.54	0.10	-0.041	Pass
9/8/2023 4:11:00 AM	0.11	0.19	0.02	-0.08	FAIL	0.42	0.54	0.10	-0.121	Pass
Detector 1										
9/7/2023 4:09:00 AM	0.12	0.23	0.03	-0.12	FAIL	0.38	0.47	0.07	-0.093	Pass
9/8/2023 4:11:00 AM	0.10	0.23	0.03	-0.14	FAIL	0.33	0.47	0.07	-0.144	Pass
Detector 2										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.14	Pass	0.35	0.54	0.11	-0.194	Pass
9/8/2023 4:11:00 AM	0.15	0.21	0.06	-0.07	Pass	0.37	0.54	0.11	-0.174	Pass
Detector 3										
9/7/2023 4:09:00 AM	0.37	0.24	0.04	0.13	FAIL	0.77	0.52	0.09	0.241	Pass
9/8/2023 4:11:00 AM	0.22	0.24	0.04	-0.02	Pass	0.51	0.52	0.09	-0.014	Pass
Detector 4										
9/7/2023 4:10:00 AM	0.19	0.23	0.04	-0.04	Pass	0.42	0.45	0.07	-0.030	Pass
9/8/2023 4:11:00 AM	0.17	0.23	0.04	-0.06	Pass	0.40	0.45	0.07	-0.050	Pass
Detector 5										
9/7/2023 4:10:00 AM	0.20	0.22	0.03	-0.03	Pass	0.47	0.44	0.08	0.027	Pass
9/8/2023 4:11:00 AM	0.14	0.22	0.03	-0.09	Pass	0.44	0.44	0.08	-0.003	Pass
Detector 6										
9/7/2023 4:10:00 AM	0.15	0.25	0.04	-0.10	Pass	0.30	0.46	0.07	-0.163	Pass
9/8/2023 4:11:00 AM	0.13	0.25	0.04	-0.12	Pass	0.33	0.46	0.07	-0.133	Pass
Detector 7										
9/7/2023 4:10:00 AM	0.21	0.30	0.06	-0.09	Pass	0.76	0.54	0.09	0.211	Pass
9/8/2023 4:11:00 AM	0.19	0.30	0.06	-0.11	Pass	0.54	0.54	0.09	-0.009	Pass
Detector 8										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.13	Pass	0.40	0.51	0.10	-0.110	Pass
9/8/2023 4:12:00 AM	0.11	0.21	0.06	-0.10	Pass	0.26	0.51	0.10	-0.250	Pass
Detector 9										
9/7/2023 4:09:00 AM	0.16	0.18	0.05	-0.03	Pass	0.43	0.41	0.07	0.019	Pass
9/8/2023 4:12:00 AM	0.10	0.18	0.05	-0.08	Pass	0.34	0.41	0.07	-0.067	Pass
Detector 10										
9/7/2023 4:09:00 AM	0.09	0.20	0.05	-0.12	Pass	0.39	0.42	0.10	-0.035	Pass
9/8/2023 4:12:00 AM	0.10	0.20	0.05	-0.11	Pass	0.40	0.42	0.10	-0.020	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/7/2023 4:09:00 AM	0.08	0.19	0.04	-0.11	Pass	0.45	0.50	0.09	-0.058	Pass
9/8/2023 4:12:00 AM	0.11	0.19	0.04	-0.08	Pass	0.51	0.50	0.09	0.007	Pass
Detector 12										
9/7/2023 4:09:00 AM	0.13	0.28	0.05	-0.15	FAIL	0.50	0.51	0.09	-0.011	Pass
9/8/2023 4:12:00 AM	0.14	0.28	0.05	-0.14	Pass	0.49	0.51	0.09	-0.016	Pass
Detector 13										
9/7/2023 4:09:00 AM	0.06	0.21	0.05	-0.16	FAIL	0.26	0.43	0.09	-0.166	Pass
9/8/2023 4:12:00 AM	0.14	0.21	0.05	-0.07	Pass	0.29	0.43	0.09	-0.136	Pass
Detector 14										
9/7/2023 4:09:00 AM	0.12	0.22	0.05	-0.10	Pass	0.31	0.41	0.09	-0.108	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.05	-0.08	Pass	0.33	0.41	0.09	-0.083	Pass
Detector 15										
9/7/2023 4:09:00 AM	0.17	0.23	0.05	-0.07	Pass	0.36	0.49	0.08	-0.135	Pass
9/8/2023 4:13:00 AM	0.13	0.23	0.05	-0.11	Pass	0.41	0.49	0.08	-0.085	Pass
Detector 16										
9/7/2023 4:08:00 AM	0.09	0.18	0.05	-0.09	Pass	0.41	0.56	0.34	-0.158	Pass
9/8/2023 4:13:00 AM	0.08	0.18	0.05	-0.11	Pass	0.33	0.56	0.34	-0.233	Pass
Detector 17										
9/7/2023 4:09:00 AM	0.10	0.22	0.04	-0.12	Pass	0.32	0.44	0.10	-0.119	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.04	-0.08	Pass	0.39	0.44	0.10	-0.054	Pass
Detector 18										
9/7/2023 4:09:00 AM	1.05	1.16	0.12	-0.12	Pass	1.33	1.31	0.19	0.012	Pass
9/8/2023 4:13:00 AM	0.81	1.16	0.12	-0.36	Pass	1.03	1.31	0.19	-0.283	Pass
Detector 19										
9/7/2023 4:09:00 AM	0.20	0.37	0.06	-0.17	Pass	0.47	0.63	0.12	-0.163	Pass
9/8/2023 4:13:00 AM	0.20	0.37	0.06	-0.17	Pass	0.64	0.63	0.12	0.007	Pass
Detector 20										
9/7/2023 4:09:00 AM	0.04	0.25	0.04	-0.21	FAIL	0.42	0.48	0.11	-0.058	Pass
9/8/2023 4:13:00 AM	0.05	0.25	0.04	-0.20	FAIL	0.32	0.48	0.11	-0.163	Pass
Detector 21										
9/7/2023 4:09:00 AM	0.03	0.24	0.04	-0.21	FAIL	0.17	0.37	0.07	-0.198	Pass
9/8/2023 4:12:00 AM	0.04	0.24	0.04	-0.21	FAIL	0.14	0.37	0.07	-0.228	FAIL

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/7/2023 4:09:00 AM	0.20	0.28	0.05	-0.08	Pass	0.33	0.42	0.09	-0.092	Pass
9/8/2023 4:12:00 AM	0.22	0.28	0.05	-0.06	Pass	0.30	0.42	0.09	-0.117	Pass
Detector 23										
9/7/2023 4:09:00 AM	0.40	0.48	0.06	-0.08	Pass	0.58	0.77	0.13	-0.186	Pass
9/8/2023 4:12:00 AM	0.38	0.48	0.06	-0.10	Pass	0.63	0.77	0.13	-0.136	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:25:00 AM	9574.78	9731.78	291.95	-156.99	Pass	3607.00	3783.75	55.06	-176.750	**DOEF**
9/8/2023 12:23:00 AM	9552.78	9731.78	291.95	-179.00	Pass	3725.50	3783.75	55.06	-58.250	Pass
Detector 1										
9/7/2023 12:26:00 AM	11262.18	11203.08	336.09	59.10	Pass	4251.00	4270.00	56.54	-19.000	Pass
9/8/2023 12:24:00 AM	10937.07	11203.08	336.09	-266.00	Pass	4231.00	4270.00	56.54	-39.000	Pass
Detector 2										
9/7/2023 12:26:00 AM	10130.40	10359.33	310.78	-228.92	Pass	4003.00	4091.73	50.75	-88.725	Pass
9/8/2023 12:24:00 AM	10278.74	10359.33	310.78	-80.58	Pass	4116.00	4091.73	50.75	24.275	Pass
Detector 3										
9/7/2023 12:26:00 AM	11434.53	11400.95	342.03	33.58	Pass	4237.00	4294.73	42.38	-57.725	Pass
9/8/2023 12:24:00 AM	11294.29	11400.95	342.03	-106.66	Pass	4190.50	4294.73	42.38	-104.225	**WARNING**
Detector 4										
9/7/2023 12:27:00 AM	14135.97	14325.50	429.77	-189.53	Pass	6258.00	6338.90	205.79	-80.900	Pass
9/8/2023 12:24:00 AM	13996.75	14325.50	429.77	-328.75	Pass	6472.50	6338.90	205.79	133.600	Pass
Detector 5										
9/7/2023 12:27:00 AM	14937.58	14830.60	444.92	106.98	Pass	5432.00	5533.48	81.19	-101.475	Pass
9/8/2023 12:25:00 AM	14706.18	14830.60	444.92	-124.42	Pass	5479.00	5533.48	81.19	-54.475	Pass
Detector 6										
9/7/2023 12:27:00 AM	12161.49	12305.73	369.17	-144.23	Pass	4649.00	4715.55	63.03	-66.550	Pass
9/8/2023 12:25:00 AM	12164.55	12305.73	369.17	-141.17	Pass	4605.00	4715.55	63.03	-110.550	Pass
Detector 7										
9/7/2023 12:28:00 AM	12468.11	12708.25	381.25	-240.14	Pass	4848.50	4810.10	73.07	38.400	Pass
9/8/2023 12:25:00 AM	12231.69	12708.25	381.25	-476.56	**FAIL**	4858.00	4810.10	73.07	47.900	Pass
Detector 8										
9/7/2023 12:41:00 AM	9537.21	9451.15	283.53	86.06	Pass	3738.00	3851.33	50.28	-113.325	**WARNING**
9/8/2023 12:43:00 AM	9503.18	9451.15	283.53	52.03	Pass	3749.00	3851.33	50.28	-102.325	**WARNING**
Detector 9										
9/7/2023 12:42:00 AM	10981.61	10846.68	325.40	134.94	Pass	4177.50	4390.08	73.38	-212.575	**WARNING**
9/8/2023 12:44:00 AM	10811.82	10846.68	325.40	-34.85	Pass	4256.50	4390.08	73.38	-133.575	Pass
Detector 10										
9/7/2023 12:42:00 AM	10282.21	10386.65	311.60	-104.44	Pass	3902.00	4154.40	60.48	-252.400	**DOEF**
9/8/2023 12:44:00 AM	10228.64	10386.65	311.60	-158.01	Pass	3984.00	4154.40	60.48	-170.400	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/7/2023 12:42:00 AM	11354.87	11316.08	339.48	38.79	Pass	4367.00	4591.48	60.25	-224.475	**DOEF**
9/8/2023 12:44:00 AM	11329.36	11316.08	339.48	13.29	Pass	4334.50	4591.48	60.25	-256.975	**DOEF**
Detector 12										
9/7/2023 12:42:00 AM	14219.14	14250.38	427.51	-31.24	Pass	6326.00	6540.40	105.21	-214.400	**WARNING**
9/8/2023 12:45:00 AM	13945.65	14250.38	427.51	-304.73	Pass	6568.00	6540.40	105.21	27.600	Pass
Detector 13										
9/7/2023 12:42:00 AM	15357.43	15581.68	467.45	-224.24	Pass	4772.00	4978.43	68.62	-206.425	**DOEF**
9/8/2023 12:45:00 AM	15375.54	15581.68	467.45	-206.14	Pass	4915.00	4978.43	68.62	-63.425	Pass
Detector 14										
9/7/2023 12:43:00 AM	11302.26	11508.73	345.26	-206.46	Pass	5271.00	5412.75	104.76	-141.750	Pass
9/8/2023 12:45:00 AM	11096.40	11508.73	345.26	-412.33	**FAIL**	5390.50	5412.75	104.76	-22.250	Pass
Detector 15										
9/7/2023 12:43:00 AM	11856.88	12031.40	360.94	-174.52	Pass	5374.00	5413.25	103.25	-39.250	Pass
9/8/2023 12:46:00 AM	11858.43	12031.40	360.94	-172.97	Pass	5711.00	5413.25	103.25	297.750	**WARNING**
Detector 16										
9/7/2023 12:34:00 AM	9718.07	9639.28	289.18	78.79	Pass	3648.50	3817.55	37.67	-169.050	**DOEF**
9/8/2023 12:34:00 AM	9517.21	9639.28	289.18	-122.07	Pass	3781.50	3817.55	37.67	-36.050	Pass
Detector 17										
9/7/2023 12:34:00 AM	11048.75	11061.48	331.84	-12.73	Pass	4105.00	4226.70	53.61	-121.700	**WARNING**
9/8/2023 12:34:00 AM	11062.82	11061.48	331.84	1.35	Pass	4068.00	4226.70	53.61	-158.700	**WARNING**
Detector 18										
9/7/2023 12:35:00 AM	10682.00	10659.53	319.79	22.48	Pass	3830.00	3935.95	34.99	-105.950	**DOEF**
9/8/2023 12:35:00 AM	10639.97	10659.53	319.79	-19.56	Pass	3890.00	3935.95	34.99	-45.950	Pass
Detector 19										
9/7/2023 12:35:00 AM	11439.03	11467.10	344.01	-28.07	Pass	4451.00	4448.70	59.17	2.300	Pass
9/8/2023 12:35:00 AM	11383.97	11467.10	344.01	-83.13	Pass	4517.00	4448.70	59.17	68.300	Pass
Detector 20										
9/7/2023 12:35:00 AM	14551.80	14347.83	430.43	203.98	Pass	6679.00	6614.45	91.13	64.550	Pass
9/8/2023 12:36:00 AM	14279.31	14347.83	430.43	-68.51	Pass	6659.50	6614.45	91.13	45.050	Pass
Detector 21										
9/7/2023 12:36:00 AM	9880.39	9869.88	296.10	10.52	Pass	10270.00	10259.65	129.52	10.350	Pass
9/8/2023 12:36:00 AM	9429.03	9869.88	296.10	-440.85	**FAIL**	10560.00	10259.65	129.52	300.350	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/7/2023 12:36:00 AM	11762.18	11742.60	352.28	19.58	Pass	5309.00	5466.15	85.68	-157.150	Pass
9/8/2023 12:36:00 AM	11682.07	11742.60	352.28	-60.53	Pass	5414.50	5466.15	85.68	-51.650	Pass
Detector 23										
9/7/2023 12:36:00 AM	12078.82	12061.73	361.85	17.10	Pass	5795.50	5992.08	108.01	-196.575	Pass
9/8/2023 12:37:00 AM	12134.99	12061.73	361.85	73.26	Pass	5873.00	5992.08	108.01	-119.075	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:38:00 AM	50037.35	50552.05	1516.56	-514.70	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49946.45	50552.05	1516.56	-605.60	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:38:00 AM	48133.85	47641.23	1429.24	492.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	48302.46	47641.23	1429.24	661.23	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:39:00 AM	48878.41	49734.44	1492.03	-856.03	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49506.06	49734.44	1492.03	-228.38	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:36:00 AM	59188.54	60167.98	1805.04	-979.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	58882.83	60167.98	1805.04	-1285.15	Pass	NA	NA	NA	NA	NA
Detector 4										
9/7/2023 12:37:00 AM	47410.02	47227.93	1416.84	182.10	Pass	NA	NA	NA	NA	NA
9/8/2023 12:37:00 AM	47364.62	47227.93	1416.84	136.70	Pass	NA	NA	NA	NA	NA
Detector 5										
9/7/2023 12:37:00 AM	54756.79	55004.03	1650.12	-247.24	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	55098.73	55004.03	1650.12	94.71	Pass	NA	NA	NA	NA	NA
Detector 6										
9/7/2023 12:37:00 AM	50631.20	52072.68	1562.18	-1441.47	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	50570.01	52072.68	1562.18	-1502.66	Pass	NA	NA	NA	NA	NA
Detector 7										
9/7/2023 12:38:00 AM	43920.12	44302.58	1329.08	-382.45	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	44162.87	44302.58	1329.08	-139.70	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:28:00 AM	49473.12	49959.33	1498.78	-486.21	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49339.68	49959.33	1498.78	-619.64	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:28:00 AM	47779.16	47696.08	1430.88	83.08	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	47837.46	47696.08	1430.88	141.38	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:29:00 AM	48923.63	50136.65	1504.10	-1213.02	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	49248.53	50136.65	1504.10	-888.12	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/7/2023 12:29:00 AM	59822.54	59951.55	1798.55	-129.01	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	59893.70	59951.55	1798.55	-57.85	Pass	NA	NA	NA	NA	NA
Detector 12										
9/7/2023 12:29:00 AM	48755.12	49257.90	1477.74	-502.78	Pass	NA	NA	NA	NA	NA
9/8/2023 12:28:00 AM	48887.24	49257.90	1477.74	-370.66	Pass	NA	NA	NA	NA	NA
Detector 13										
9/7/2023 12:29:00 AM	54840.23	55607.20	1668.22	-766.97	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	54777.72	55607.20	1668.22	-829.48	Pass	NA	NA	NA	NA	NA
Detector 14										
9/7/2023 12:30:00 AM	49584.56	50580.03	1517.40	-995.46	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49206.94	50580.03	1517.40	-1373.08	Pass	NA	NA	NA	NA	NA
Detector 15										
9/7/2023 12:30:00 AM	44393.04	45674.43	1370.23	-1281.38	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	43739.99	45674.43	1370.23	-1934.43	**FAIL**	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:45:00 AM	49790.75	49653.23	1489.60	137.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49506.75	49653.23	1489.60	-146.47	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:45:00 AM	48206.67	48166.13	1444.98	40.55	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	48156.43	48166.13	1444.98	-9.69	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:45:00 AM	49375.32	49957.23	1498.72	-581.90	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49698.42	49957.23	1498.72	-258.80	Pass	NA	NA	NA	NA	NA
Detector 19										
9/7/2023 12:43:00 AM	59990.99	59167.80	1775.03	823.19	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	59879.49	59167.80	1775.03	711.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:44:00 AM	49401.07	49987.80	1499.63	-586.73	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	49700.21	49987.80	1499.63	-287.59	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:44:00 AM	46576.06	55281.80	1658.45	-8705.74	**FAIL**	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	45626.04	55281.80	1658.45	-9655.76	**FAIL**	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/7/2023 12:44:00 AM	51225.10	52477.75	1574.33	-1252.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	51031.53	52477.75	1574.33	-1446.22	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:44:00 AM	45103.13	46160.75	1384.82	-1057.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	45025.91	46160.75	1384.82	-1134.84	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:09:00 AM	0.12	0.19	0.02	-0.07	FAIL	0.50	0.54	0.10	-0.041	Pass
9/8/2023 4:11:00 AM	0.11	0.19	0.02	-0.08	FAIL	0.42	0.54	0.10	-0.121	Pass
Detector 1										
9/7/2023 4:09:00 AM	0.12	0.23	0.03	-0.12	FAIL	0.38	0.47	0.07	-0.093	Pass
9/8/2023 4:11:00 AM	0.10	0.23	0.03	-0.14	FAIL	0.33	0.47	0.07	-0.144	Pass
Detector 2										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.14	Pass	0.35	0.54	0.11	-0.194	Pass
9/8/2023 4:11:00 AM	0.15	0.21	0.06	-0.07	Pass	0.37	0.54	0.11	-0.174	Pass
Detector 3										
9/7/2023 4:09:00 AM	0.37	0.24	0.04	0.13	FAIL	0.77	0.52	0.09	0.241	Pass
9/8/2023 4:11:00 AM	0.22	0.24	0.04	-0.02	Pass	0.51	0.52	0.09	-0.014	Pass
Detector 4										
9/7/2023 4:10:00 AM	0.19	0.23	0.04	-0.04	Pass	0.42	0.45	0.07	-0.030	Pass
9/8/2023 4:11:00 AM	0.17	0.23	0.04	-0.06	Pass	0.40	0.45	0.07	-0.050	Pass
Detector 5										
9/7/2023 4:10:00 AM	0.20	0.22	0.03	-0.03	Pass	0.47	0.44	0.08	0.027	Pass
9/8/2023 4:11:00 AM	0.14	0.22	0.03	-0.09	Pass	0.44	0.44	0.08	-0.003	Pass
Detector 6										
9/7/2023 4:10:00 AM	0.15	0.25	0.04	-0.10	Pass	0.30	0.46	0.07	-0.163	Pass
9/8/2023 4:11:00 AM	0.13	0.25	0.04	-0.12	Pass	0.33	0.46	0.07	-0.133	Pass
Detector 7										
9/7/2023 4:10:00 AM	0.21	0.30	0.06	-0.09	Pass	0.76	0.54	0.09	0.211	Pass
9/8/2023 4:11:00 AM	0.19	0.30	0.06	-0.11	Pass	0.54	0.54	0.09	-0.009	Pass
Detector 8										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.13	Pass	0.40	0.51	0.10	-0.110	Pass
9/8/2023 4:12:00 AM	0.11	0.21	0.06	-0.10	Pass	0.26	0.51	0.10	-0.250	Pass
Detector 9										
9/7/2023 4:09:00 AM	0.16	0.18	0.05	-0.03	Pass	0.43	0.41	0.07	0.019	Pass
9/8/2023 4:12:00 AM	0.10	0.18	0.05	-0.08	Pass	0.34	0.41	0.07	-0.067	Pass
Detector 10										
9/7/2023 4:09:00 AM	0.09	0.20	0.05	-0.12	Pass	0.39	0.42	0.10	-0.035	Pass
9/8/2023 4:12:00 AM	0.10	0.20	0.05	-0.11	Pass	0.40	0.42	0.10	-0.020	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/7/2023 4:09:00 AM	0.08	0.19	0.04	-0.11	Pass	0.45	0.50	0.09	-0.058	Pass
9/8/2023 4:12:00 AM	0.11	0.19	0.04	-0.08	Pass	0.51	0.50	0.09	0.007	Pass
Detector 12										
9/7/2023 4:09:00 AM	0.13	0.28	0.05	-0.15	FAIL	0.50	0.51	0.09	-0.011	Pass
9/8/2023 4:12:00 AM	0.14	0.28	0.05	-0.14	Pass	0.49	0.51	0.09	-0.016	Pass
Detector 13										
9/7/2023 4:09:00 AM	0.06	0.21	0.05	-0.16	FAIL	0.26	0.43	0.09	-0.166	Pass
9/8/2023 4:12:00 AM	0.14	0.21	0.05	-0.07	Pass	0.29	0.43	0.09	-0.136	Pass
Detector 14										
9/7/2023 4:09:00 AM	0.12	0.22	0.05	-0.10	Pass	0.31	0.41	0.09	-0.108	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.05	-0.08	Pass	0.33	0.41	0.09	-0.083	Pass
Detector 15										
9/7/2023 4:09:00 AM	0.17	0.23	0.05	-0.07	Pass	0.36	0.49	0.08	-0.135	Pass
9/8/2023 4:13:00 AM	0.13	0.23	0.05	-0.11	Pass	0.41	0.49	0.08	-0.085	Pass
Detector 16										
9/7/2023 4:08:00 AM	0.09	0.18	0.05	-0.09	Pass	0.41	0.56	0.34	-0.158	Pass
9/8/2023 4:13:00 AM	0.08	0.18	0.05	-0.11	Pass	0.33	0.56	0.34	-0.233	Pass
Detector 17										
9/7/2023 4:09:00 AM	0.10	0.22	0.04	-0.12	Pass	0.32	0.44	0.10	-0.119	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.04	-0.08	Pass	0.39	0.44	0.10	-0.054	Pass
Detector 18										
9/7/2023 4:09:00 AM	1.05	1.16	0.12	-0.12	Pass	1.33	1.31	0.19	0.012	Pass
9/8/2023 4:13:00 AM	0.81	1.16	0.12	-0.36	Pass	1.03	1.31	0.19	-0.283	Pass
Detector 19										
9/7/2023 4:09:00 AM	0.20	0.37	0.06	-0.17	Pass	0.47	0.63	0.12	-0.163	Pass
9/8/2023 4:13:00 AM	0.20	0.37	0.06	-0.17	Pass	0.64	0.63	0.12	0.007	Pass
Detector 20										
9/7/2023 4:09:00 AM	0.04	0.25	0.04	-0.21	FAIL	0.42	0.48	0.11	-0.058	Pass
9/8/2023 4:13:00 AM	0.05	0.25	0.04	-0.20	FAIL	0.32	0.48	0.11	-0.163	Pass
Detector 21										
9/7/2023 4:09:00 AM	0.03	0.24	0.04	-0.21	FAIL	0.17	0.37	0.07	-0.198	Pass
9/8/2023 4:12:00 AM	0.04	0.24	0.04	-0.21	FAIL	0.14	0.37	0.07	-0.228	FAIL

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/7/2023 4:09:00 AM	0.20	0.28	0.05	-0.08	Pass	0.33	0.42	0.09	-0.092	Pass
9/8/2023 4:12:00 AM	0.22	0.28	0.05	-0.06	Pass	0.30	0.42	0.09	-0.117	Pass
Detector 23										
9/7/2023 4:09:00 AM	0.40	0.48	0.06	-0.08	Pass	0.58	0.77	0.13	-0.186	Pass
9/8/2023 4:12:00 AM	0.38	0.48	0.06	-0.10	Pass	0.63	0.77	0.13	-0.136	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:25:00 AM	9574.78	9731.78	291.95	-156.99	Pass	3607.00	3783.75	55.06	-176.750	**DOEF**
9/8/2023 12:23:00 AM	9552.78	9731.78	291.95	-179.00	Pass	3725.50	3783.75	55.06	-58.250	Pass
Detector 1										
9/7/2023 12:26:00 AM	11262.18	11203.08	336.09	59.10	Pass	4251.00	4270.00	56.54	-19.000	Pass
9/8/2023 12:24:00 AM	10937.07	11203.08	336.09	-266.00	Pass	4231.00	4270.00	56.54	-39.000	Pass
Detector 2										
9/7/2023 12:26:00 AM	10130.40	10359.33	310.78	-228.92	Pass	4003.00	4091.73	50.75	-88.725	Pass
9/8/2023 12:24:00 AM	10278.74	10359.33	310.78	-80.58	Pass	4116.00	4091.73	50.75	24.275	Pass
Detector 3										
9/7/2023 12:26:00 AM	11434.53	11400.95	342.03	33.58	Pass	4237.00	4294.73	42.38	-57.725	Pass
9/8/2023 12:24:00 AM	11294.29	11400.95	342.03	-106.66	Pass	4190.50	4294.73	42.38	-104.225	**WARNING**
Detector 4										
9/7/2023 12:27:00 AM	14135.97	14325.50	429.77	-189.53	Pass	6258.00	6338.90	205.79	-80.900	Pass
9/8/2023 12:24:00 AM	13996.75	14325.50	429.77	-328.75	Pass	6472.50	6338.90	205.79	133.600	Pass
Detector 5										
9/7/2023 12:27:00 AM	14937.58	14830.60	444.92	106.98	Pass	5432.00	5533.48	81.19	-101.475	Pass
9/8/2023 12:25:00 AM	14706.18	14830.60	444.92	-124.42	Pass	5479.00	5533.48	81.19	-54.475	Pass
Detector 6										
9/7/2023 12:27:00 AM	12161.49	12305.73	369.17	-144.23	Pass	4649.00	4715.55	63.03	-66.550	Pass
9/8/2023 12:25:00 AM	12164.55	12305.73	369.17	-141.17	Pass	4605.00	4715.55	63.03	-110.550	Pass
Detector 7										
9/7/2023 12:28:00 AM	12468.11	12708.25	381.25	-240.14	Pass	4848.50	4810.10	73.07	38.400	Pass
9/8/2023 12:25:00 AM	12231.69	12708.25	381.25	-476.56	**FAIL**	4858.00	4810.10	73.07	47.900	Pass
Detector 8										
9/7/2023 12:41:00 AM	9537.21	9451.15	283.53	86.06	Pass	3738.00	3851.33	50.28	-113.325	**WARNING**
9/8/2023 12:43:00 AM	9503.18	9451.15	283.53	52.03	Pass	3749.00	3851.33	50.28	-102.325	**WARNING**
Detector 9										
9/7/2023 12:42:00 AM	10981.61	10846.68	325.40	134.94	Pass	4177.50	4390.08	73.38	-212.575	**WARNING**
9/8/2023 12:44:00 AM	10811.82	10846.68	325.40	-34.85	Pass	4256.50	4390.08	73.38	-133.575	Pass
Detector 10										
9/7/2023 12:42:00 AM	10282.21	10386.65	311.60	-104.44	Pass	3902.00	4154.40	60.48	-252.400	**DOEF**
9/8/2023 12:44:00 AM	10228.64	10386.65	311.60	-158.01	Pass	3984.00	4154.40	60.48	-170.400	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/7/2023 12:42:00 AM	11354.87	11316.08	339.48	38.79	Pass	4367.00	4591.48	60.25	-224.475	**DOEF**
9/8/2023 12:44:00 AM	11329.36	11316.08	339.48	13.29	Pass	4334.50	4591.48	60.25	-256.975	**DOEF**
Detector 12										
9/7/2023 12:42:00 AM	14219.14	14250.38	427.51	-31.24	Pass	6326.00	6540.40	105.21	-214.400	**WARNING**
9/8/2023 12:45:00 AM	13945.65	14250.38	427.51	-304.73	Pass	6568.00	6540.40	105.21	27.600	Pass
Detector 13										
9/7/2023 12:42:00 AM	15357.43	15581.68	467.45	-224.24	Pass	4772.00	4978.43	68.62	-206.425	**DOEF**
9/8/2023 12:45:00 AM	15375.54	15581.68	467.45	-206.14	Pass	4915.00	4978.43	68.62	-63.425	Pass
Detector 14										
9/7/2023 12:43:00 AM	11302.26	11508.73	345.26	-206.46	Pass	5271.00	5412.75	104.76	-141.750	Pass
9/8/2023 12:45:00 AM	11096.40	11508.73	345.26	-412.33	**FAIL**	5390.50	5412.75	104.76	-22.250	Pass
Detector 15										
9/7/2023 12:43:00 AM	11856.88	12031.40	360.94	-174.52	Pass	5374.00	5413.25	103.25	-39.250	Pass
9/8/2023 12:46:00 AM	11858.43	12031.40	360.94	-172.97	Pass	5711.00	5413.25	103.25	297.750	**WARNING**
Detector 16										
9/7/2023 12:34:00 AM	9718.07	9639.28	289.18	78.79	Pass	3648.50	3817.55	37.67	-169.050	**DOEF**
9/8/2023 12:34:00 AM	9517.21	9639.28	289.18	-122.07	Pass	3781.50	3817.55	37.67	-36.050	Pass
Detector 17										
9/7/2023 12:34:00 AM	11048.75	11061.48	331.84	-12.73	Pass	4105.00	4226.70	53.61	-121.700	**WARNING**
9/8/2023 12:34:00 AM	11062.82	11061.48	331.84	1.35	Pass	4068.00	4226.70	53.61	-158.700	**WARNING**
Detector 18										
9/7/2023 12:35:00 AM	10682.00	10659.53	319.79	22.48	Pass	3830.00	3935.95	34.99	-105.950	**DOEF**
9/8/2023 12:35:00 AM	10639.97	10659.53	319.79	-19.56	Pass	3890.00	3935.95	34.99	-45.950	Pass
Detector 19										
9/7/2023 12:35:00 AM	11439.03	11467.10	344.01	-28.07	Pass	4451.00	4448.70	59.17	2.300	Pass
9/8/2023 12:35:00 AM	11383.97	11467.10	344.01	-83.13	Pass	4517.00	4448.70	59.17	68.300	Pass
Detector 20										
9/7/2023 12:35:00 AM	14551.80	14347.83	430.43	203.98	Pass	6679.00	6614.45	91.13	64.550	Pass
9/8/2023 12:36:00 AM	14279.31	14347.83	430.43	-68.51	Pass	6659.50	6614.45	91.13	45.050	Pass
Detector 21										
9/7/2023 12:36:00 AM	9880.39	9869.88	296.10	10.52	Pass	10270.00	10259.65	129.52	10.350	Pass
9/8/2023 12:36:00 AM	9429.03	9869.88	296.10	-440.85	**FAIL**	10560.00	10259.65	129.52	300.350	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/7/2023 12:36:00 AM	11762.18	11742.60	352.28	19.58	Pass	5309.00	5466.15	85.68	-157.150	Pass
9/8/2023 12:36:00 AM	11682.07	11742.60	352.28	-60.53	Pass	5414.50	5466.15	85.68	-51.650	Pass
Detector 23										
9/7/2023 12:36:00 AM	12078.82	12061.73	361.85	17.10	Pass	5795.50	5992.08	108.01	-196.575	Pass
9/8/2023 12:37:00 AM	12134.99	12061.73	361.85	73.26	Pass	5873.00	5992.08	108.01	-119.075	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:38:00 AM	50037.35	50552.05	1516.56	-514.70	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49946.45	50552.05	1516.56	-605.60	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:38:00 AM	48133.85	47641.23	1429.24	492.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	48302.46	47641.23	1429.24	661.23	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:39:00 AM	48878.41	49734.44	1492.03	-856.03	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49506.06	49734.44	1492.03	-228.38	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:36:00 AM	59188.54	60167.98	1805.04	-979.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	58882.83	60167.98	1805.04	-1285.15	Pass	NA	NA	NA	NA	NA
Detector 4										
9/7/2023 12:37:00 AM	47410.02	47227.93	1416.84	182.10	Pass	NA	NA	NA	NA	NA
9/8/2023 12:37:00 AM	47364.62	47227.93	1416.84	136.70	Pass	NA	NA	NA	NA	NA
Detector 5										
9/7/2023 12:37:00 AM	54756.79	55004.03	1650.12	-247.24	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	55098.73	55004.03	1650.12	94.71	Pass	NA	NA	NA	NA	NA
Detector 6										
9/7/2023 12:37:00 AM	50631.20	52072.68	1562.18	-1441.47	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	50570.01	52072.68	1562.18	-1502.66	Pass	NA	NA	NA	NA	NA
Detector 7										
9/7/2023 12:38:00 AM	43920.12	44302.58	1329.08	-382.45	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	44162.87	44302.58	1329.08	-139.70	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:28:00 AM	49473.12	49959.33	1498.78	-486.21	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49339.68	49959.33	1498.78	-619.64	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:28:00 AM	47779.16	47696.08	1430.88	83.08	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	47837.46	47696.08	1430.88	141.38	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:29:00 AM	48923.63	50136.65	1504.10	-1213.02	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	49248.53	50136.65	1504.10	-888.12	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/7/2023 12:29:00 AM	59822.54	59951.55	1798.55	-129.01	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	59893.70	59951.55	1798.55	-57.85	Pass	NA	NA	NA	NA	NA
Detector 12										
9/7/2023 12:29:00 AM	48755.12	49257.90	1477.74	-502.78	Pass	NA	NA	NA	NA	NA
9/8/2023 12:28:00 AM	48887.24	49257.90	1477.74	-370.66	Pass	NA	NA	NA	NA	NA
Detector 13										
9/7/2023 12:29:00 AM	54840.23	55607.20	1668.22	-766.97	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	54777.72	55607.20	1668.22	-829.48	Pass	NA	NA	NA	NA	NA
Detector 14										
9/7/2023 12:30:00 AM	49584.56	50580.03	1517.40	-995.46	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49206.94	50580.03	1517.40	-1373.08	Pass	NA	NA	NA	NA	NA
Detector 15										
9/7/2023 12:30:00 AM	44393.04	45674.43	1370.23	-1281.38	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	43739.99	45674.43	1370.23	-1934.43	**FAIL**	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:45:00 AM	49790.75	49653.23	1489.60	137.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49506.75	49653.23	1489.60	-146.47	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:45:00 AM	48206.67	48166.13	1444.98	40.55	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	48156.43	48166.13	1444.98	-9.69	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:45:00 AM	49375.32	49957.23	1498.72	-581.90	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49698.42	49957.23	1498.72	-258.80	Pass	NA	NA	NA	NA	NA
Detector 19										
9/7/2023 12:43:00 AM	59990.99	59167.80	1775.03	823.19	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	59879.49	59167.80	1775.03	711.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:44:00 AM	49401.07	49987.80	1499.63	-586.73	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	49700.21	49987.80	1499.63	-287.59	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:44:00 AM	46576.06	55281.80	1658.45	-8705.74	**FAIL**	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	45626.04	55281.80	1658.45	-9655.76	**FAIL**	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/7/2023 12:44:00 AM	51225.10	52477.75	1574.33	-1252.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	51031.53	52477.75	1574.33	-1446.22	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:44:00 AM	45103.13	46160.75	1384.82	-1057.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	45025.91	46160.75	1384.82	-1134.84	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:09:00 AM	0.12	0.19	0.02	-0.07	FAIL	0.50	0.54	0.10	-0.041	Pass
9/8/2023 4:11:00 AM	0.11	0.19	0.02	-0.08	FAIL	0.42	0.54	0.10	-0.121	Pass
Detector 1										
9/7/2023 4:09:00 AM	0.12	0.23	0.03	-0.12	FAIL	0.38	0.47	0.07	-0.093	Pass
9/8/2023 4:11:00 AM	0.10	0.23	0.03	-0.14	FAIL	0.33	0.47	0.07	-0.144	Pass
Detector 2										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.14	Pass	0.35	0.54	0.11	-0.194	Pass
9/8/2023 4:11:00 AM	0.15	0.21	0.06	-0.07	Pass	0.37	0.54	0.11	-0.174	Pass
Detector 3										
9/7/2023 4:09:00 AM	0.37	0.24	0.04	0.13	FAIL	0.77	0.52	0.09	0.241	Pass
9/8/2023 4:11:00 AM	0.22	0.24	0.04	-0.02	Pass	0.51	0.52	0.09	-0.014	Pass
Detector 4										
9/7/2023 4:10:00 AM	0.19	0.23	0.04	-0.04	Pass	0.42	0.45	0.07	-0.030	Pass
9/8/2023 4:11:00 AM	0.17	0.23	0.04	-0.06	Pass	0.40	0.45	0.07	-0.050	Pass
Detector 5										
9/7/2023 4:10:00 AM	0.20	0.22	0.03	-0.03	Pass	0.47	0.44	0.08	0.027	Pass
9/8/2023 4:11:00 AM	0.14	0.22	0.03	-0.09	Pass	0.44	0.44	0.08	-0.003	Pass
Detector 6										
9/7/2023 4:10:00 AM	0.15	0.25	0.04	-0.10	Pass	0.30	0.46	0.07	-0.163	Pass
9/8/2023 4:11:00 AM	0.13	0.25	0.04	-0.12	Pass	0.33	0.46	0.07	-0.133	Pass
Detector 7										
9/7/2023 4:10:00 AM	0.21	0.30	0.06	-0.09	Pass	0.76	0.54	0.09	0.211	Pass
9/8/2023 4:11:00 AM	0.19	0.30	0.06	-0.11	Pass	0.54	0.54	0.09	-0.009	Pass
Detector 8										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.13	Pass	0.40	0.51	0.10	-0.110	Pass
9/8/2023 4:12:00 AM	0.11	0.21	0.06	-0.10	Pass	0.26	0.51	0.10	-0.250	Pass
Detector 9										
9/7/2023 4:09:00 AM	0.16	0.18	0.05	-0.03	Pass	0.43	0.41	0.07	0.019	Pass
9/8/2023 4:12:00 AM	0.10	0.18	0.05	-0.08	Pass	0.34	0.41	0.07	-0.067	Pass
Detector 10										
9/7/2023 4:09:00 AM	0.09	0.20	0.05	-0.12	Pass	0.39	0.42	0.10	-0.035	Pass
9/8/2023 4:12:00 AM	0.10	0.20	0.05	-0.11	Pass	0.40	0.42	0.10	-0.020	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/7/2023 4:09:00 AM	0.08	0.19	0.04	-0.11	Pass	0.45	0.50	0.09	-0.058	Pass
9/8/2023 4:12:00 AM	0.11	0.19	0.04	-0.08	Pass	0.51	0.50	0.09	0.007	Pass
Detector 12										
9/7/2023 4:09:00 AM	0.13	0.28	0.05	-0.15	FAIL	0.50	0.51	0.09	-0.011	Pass
9/8/2023 4:12:00 AM	0.14	0.28	0.05	-0.14	Pass	0.49	0.51	0.09	-0.016	Pass
Detector 13										
9/7/2023 4:09:00 AM	0.06	0.21	0.05	-0.16	FAIL	0.26	0.43	0.09	-0.166	Pass
9/8/2023 4:12:00 AM	0.14	0.21	0.05	-0.07	Pass	0.29	0.43	0.09	-0.136	Pass
Detector 14										
9/7/2023 4:09:00 AM	0.12	0.22	0.05	-0.10	Pass	0.31	0.41	0.09	-0.108	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.05	-0.08	Pass	0.33	0.41	0.09	-0.083	Pass
Detector 15										
9/7/2023 4:09:00 AM	0.17	0.23	0.05	-0.07	Pass	0.36	0.49	0.08	-0.135	Pass
9/8/2023 4:13:00 AM	0.13	0.23	0.05	-0.11	Pass	0.41	0.49	0.08	-0.085	Pass
Detector 16										
9/7/2023 4:08:00 AM	0.09	0.18	0.05	-0.09	Pass	0.41	0.56	0.34	-0.158	Pass
9/8/2023 4:13:00 AM	0.08	0.18	0.05	-0.11	Pass	0.33	0.56	0.34	-0.233	Pass
Detector 17										
9/7/2023 4:09:00 AM	0.10	0.22	0.04	-0.12	Pass	0.32	0.44	0.10	-0.119	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.04	-0.08	Pass	0.39	0.44	0.10	-0.054	Pass
Detector 18										
9/7/2023 4:09:00 AM	1.05	1.16	0.12	-0.12	Pass	1.33	1.31	0.19	0.012	Pass
9/8/2023 4:13:00 AM	0.81	1.16	0.12	-0.36	Pass	1.03	1.31	0.19	-0.283	Pass
Detector 19										
9/7/2023 4:09:00 AM	0.20	0.37	0.06	-0.17	Pass	0.47	0.63	0.12	-0.163	Pass
9/8/2023 4:13:00 AM	0.20	0.37	0.06	-0.17	Pass	0.64	0.63	0.12	0.007	Pass
Detector 20										
9/7/2023 4:09:00 AM	0.04	0.25	0.04	-0.21	FAIL	0.42	0.48	0.11	-0.058	Pass
9/8/2023 4:13:00 AM	0.05	0.25	0.04	-0.20	FAIL	0.32	0.48	0.11	-0.163	Pass
Detector 21										
9/7/2023 4:09:00 AM	0.03	0.24	0.04	-0.21	FAIL	0.17	0.37	0.07	-0.198	Pass
9/8/2023 4:12:00 AM	0.04	0.24	0.04	-0.21	FAIL	0.14	0.37	0.07	-0.228	FAIL

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/7/2023 4:09:00 AM	0.20	0.28	0.05	-0.08	Pass	0.33	0.42	0.09	-0.092	Pass
9/8/2023 4:12:00 AM	0.22	0.28	0.05	-0.06	Pass	0.30	0.42	0.09	-0.117	Pass
Detector 23										
9/7/2023 4:09:00 AM	0.40	0.48	0.06	-0.08	Pass	0.58	0.77	0.13	-0.186	Pass
9/8/2023 4:12:00 AM	0.38	0.48	0.06	-0.10	Pass	0.63	0.77	0.13	-0.136	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:25:00 AM	9574.78	9731.78	291.95	-156.99	Pass	3607.00	3783.75	55.06	-176.750	**DOEF**
9/8/2023 12:23:00 AM	9552.78	9731.78	291.95	-179.00	Pass	3725.50	3783.75	55.06	-58.250	Pass
Detector 1										
9/7/2023 12:26:00 AM	11262.18	11203.08	336.09	59.10	Pass	4251.00	4270.00	56.54	-19.000	Pass
9/8/2023 12:24:00 AM	10937.07	11203.08	336.09	-266.00	Pass	4231.00	4270.00	56.54	-39.000	Pass
Detector 2										
9/7/2023 12:26:00 AM	10130.40	10359.33	310.78	-228.92	Pass	4003.00	4091.73	50.75	-88.725	Pass
9/8/2023 12:24:00 AM	10278.74	10359.33	310.78	-80.58	Pass	4116.00	4091.73	50.75	24.275	Pass
Detector 3										
9/7/2023 12:26:00 AM	11434.53	11400.95	342.03	33.58	Pass	4237.00	4294.73	42.38	-57.725	Pass
9/8/2023 12:24:00 AM	11294.29	11400.95	342.03	-106.66	Pass	4190.50	4294.73	42.38	-104.225	**WARNING**
Detector 4										
9/7/2023 12:27:00 AM	14135.97	14325.50	429.77	-189.53	Pass	6258.00	6338.90	205.79	-80.900	Pass
9/8/2023 12:24:00 AM	13996.75	14325.50	429.77	-328.75	Pass	6472.50	6338.90	205.79	133.600	Pass
Detector 5										
9/7/2023 12:27:00 AM	14937.58	14830.60	444.92	106.98	Pass	5432.00	5533.48	81.19	-101.475	Pass
9/8/2023 12:25:00 AM	14706.18	14830.60	444.92	-124.42	Pass	5479.00	5533.48	81.19	-54.475	Pass
Detector 6										
9/7/2023 12:27:00 AM	12161.49	12305.73	369.17	-144.23	Pass	4649.00	4715.55	63.03	-66.550	Pass
9/8/2023 12:25:00 AM	12164.55	12305.73	369.17	-141.17	Pass	4605.00	4715.55	63.03	-110.550	Pass
Detector 7										
9/7/2023 12:28:00 AM	12468.11	12708.25	381.25	-240.14	Pass	4848.50	4810.10	73.07	38.400	Pass
9/8/2023 12:25:00 AM	12231.69	12708.25	381.25	-476.56	**FAIL**	4858.00	4810.10	73.07	47.900	Pass
Detector 8										
9/7/2023 12:41:00 AM	9537.21	9451.15	283.53	86.06	Pass	3738.00	3851.33	50.28	-113.325	**WARNING**
9/8/2023 12:43:00 AM	9503.18	9451.15	283.53	52.03	Pass	3749.00	3851.33	50.28	-102.325	**WARNING**
Detector 9										
9/7/2023 12:42:00 AM	10981.61	10846.68	325.40	134.94	Pass	4177.50	4390.08	73.38	-212.575	**WARNING**
9/8/2023 12:44:00 AM	10811.82	10846.68	325.40	-34.85	Pass	4256.50	4390.08	73.38	-133.575	Pass
Detector 10										
9/7/2023 12:42:00 AM	10282.21	10386.65	311.60	-104.44	Pass	3902.00	4154.40	60.48	-252.400	**DOEF**
9/8/2023 12:44:00 AM	10228.64	10386.65	311.60	-158.01	Pass	3984.00	4154.40	60.48	-170.400	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/7/2023 12:42:00 AM	11354.87	11316.08	339.48	38.79	Pass	4367.00	4591.48	60.25	-224.475	**DOEF**
9/8/2023 12:44:00 AM	11329.36	11316.08	339.48	13.29	Pass	4334.50	4591.48	60.25	-256.975	**DOEF**
Detector 12										
9/7/2023 12:42:00 AM	14219.14	14250.38	427.51	-31.24	Pass	6326.00	6540.40	105.21	-214.400	**WARNING**
9/8/2023 12:45:00 AM	13945.65	14250.38	427.51	-304.73	Pass	6568.00	6540.40	105.21	27.600	Pass
Detector 13										
9/7/2023 12:42:00 AM	15357.43	15581.68	467.45	-224.24	Pass	4772.00	4978.43	68.62	-206.425	**DOEF**
9/8/2023 12:45:00 AM	15375.54	15581.68	467.45	-206.14	Pass	4915.00	4978.43	68.62	-63.425	Pass
Detector 14										
9/7/2023 12:43:00 AM	11302.26	11508.73	345.26	-206.46	Pass	5271.00	5412.75	104.76	-141.750	Pass
9/8/2023 12:45:00 AM	11096.40	11508.73	345.26	-412.33	**FAIL**	5390.50	5412.75	104.76	-22.250	Pass
Detector 15										
9/7/2023 12:43:00 AM	11856.88	12031.40	360.94	-174.52	Pass	5374.00	5413.25	103.25	-39.250	Pass
9/8/2023 12:46:00 AM	11858.43	12031.40	360.94	-172.97	Pass	5711.00	5413.25	103.25	297.750	**WARNING**
Detector 16										
9/7/2023 12:34:00 AM	9718.07	9639.28	289.18	78.79	Pass	3648.50	3817.55	37.67	-169.050	**DOEF**
9/8/2023 12:34:00 AM	9517.21	9639.28	289.18	-122.07	Pass	3781.50	3817.55	37.67	-36.050	Pass
Detector 17										
9/7/2023 12:34:00 AM	11048.75	11061.48	331.84	-12.73	Pass	4105.00	4226.70	53.61	-121.700	**WARNING**
9/8/2023 12:34:00 AM	11062.82	11061.48	331.84	1.35	Pass	4068.00	4226.70	53.61	-158.700	**WARNING**
Detector 18										
9/7/2023 12:35:00 AM	10682.00	10659.53	319.79	22.48	Pass	3830.00	3935.95	34.99	-105.950	**DOEF**
9/8/2023 12:35:00 AM	10639.97	10659.53	319.79	-19.56	Pass	3890.00	3935.95	34.99	-45.950	Pass
Detector 19										
9/7/2023 12:35:00 AM	11439.03	11467.10	344.01	-28.07	Pass	4451.00	4448.70	59.17	2.300	Pass
9/8/2023 12:35:00 AM	11383.97	11467.10	344.01	-83.13	Pass	4517.00	4448.70	59.17	68.300	Pass
Detector 20										
9/7/2023 12:35:00 AM	14551.80	14347.83	430.43	203.98	Pass	6679.00	6614.45	91.13	64.550	Pass
9/8/2023 12:36:00 AM	14279.31	14347.83	430.43	-68.51	Pass	6659.50	6614.45	91.13	45.050	Pass
Detector 21										
9/7/2023 12:36:00 AM	9880.39	9869.88	296.10	10.52	Pass	10270.00	10259.65	129.52	10.350	Pass
9/8/2023 12:36:00 AM	9429.03	9869.88	296.10	-440.85	**FAIL**	10560.00	10259.65	129.52	300.350	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/7/2023 12:36:00 AM	11762.18	11742.60	352.28	19.58	Pass	5309.00	5466.15	85.68	-157.150	Pass
9/8/2023 12:36:00 AM	11682.07	11742.60	352.28	-60.53	Pass	5414.50	5466.15	85.68	-51.650	Pass
Detector 23										
9/7/2023 12:36:00 AM	12078.82	12061.73	361.85	17.10	Pass	5795.50	5992.08	108.01	-196.575	Pass
9/8/2023 12:37:00 AM	12134.99	12061.73	361.85	73.26	Pass	5873.00	5992.08	108.01	-119.075	Pass

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:38:00 AM	50037.35	50552.05	1516.56	-514.70	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49946.45	50552.05	1516.56	-605.60	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:38:00 AM	48133.85	47641.23	1429.24	492.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	48302.46	47641.23	1429.24	661.23	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:39:00 AM	48878.41	49734.44	1492.03	-856.03	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49506.06	49734.44	1492.03	-228.38	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:36:00 AM	59188.54	60167.98	1805.04	-979.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	58882.83	60167.98	1805.04	-1285.15	Pass	NA	NA	NA	NA	NA
Detector 4										
9/7/2023 12:37:00 AM	47410.02	47227.93	1416.84	182.10	Pass	NA	NA	NA	NA	NA
9/8/2023 12:37:00 AM	47364.62	47227.93	1416.84	136.70	Pass	NA	NA	NA	NA	NA
Detector 5										
9/7/2023 12:37:00 AM	54756.79	55004.03	1650.12	-247.24	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	55098.73	55004.03	1650.12	94.71	Pass	NA	NA	NA	NA	NA
Detector 6										
9/7/2023 12:37:00 AM	50631.20	52072.68	1562.18	-1441.47	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	50570.01	52072.68	1562.18	-1502.66	Pass	NA	NA	NA	NA	NA
Detector 7										
9/7/2023 12:38:00 AM	43920.12	44302.58	1329.08	-382.45	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	44162.87	44302.58	1329.08	-139.70	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:28:00 AM	49473.12	49959.33	1498.78	-486.21	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49339.68	49959.33	1498.78	-619.64	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:28:00 AM	47779.16	47696.08	1430.88	83.08	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	47837.46	47696.08	1430.88	141.38	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:29:00 AM	48923.63	50136.65	1504.10	-1213.02	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	49248.53	50136.65	1504.10	-888.12	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/7/2023 12:29:00 AM	59822.54	59951.55	1798.55	-129.01	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	59893.70	59951.55	1798.55	-57.85	Pass	NA	NA	NA	NA	NA
Detector 12										
9/7/2023 12:29:00 AM	48755.12	49257.90	1477.74	-502.78	Pass	NA	NA	NA	NA	NA
9/8/2023 12:28:00 AM	48887.24	49257.90	1477.74	-370.66	Pass	NA	NA	NA	NA	NA
Detector 13										
9/7/2023 12:29:00 AM	54840.23	55607.20	1668.22	-766.97	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	54777.72	55607.20	1668.22	-829.48	Pass	NA	NA	NA	NA	NA
Detector 14										
9/7/2023 12:30:00 AM	49584.56	50580.03	1517.40	-995.46	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49206.94	50580.03	1517.40	-1373.08	Pass	NA	NA	NA	NA	NA
Detector 15										
9/7/2023 12:30:00 AM	44393.04	45674.43	1370.23	-1281.38	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	43739.99	45674.43	1370.23	-1934.43	**FAIL**	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:45:00 AM	49790.75	49653.23	1489.60	137.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49506.75	49653.23	1489.60	-146.47	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:45:00 AM	48206.67	48166.13	1444.98	40.55	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	48156.43	48166.13	1444.98	-9.69	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:45:00 AM	49375.32	49957.23	1498.72	-581.90	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49698.42	49957.23	1498.72	-258.80	Pass	NA	NA	NA	NA	NA
Detector 19										
9/7/2023 12:43:00 AM	59990.99	59167.80	1775.03	823.19	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	59879.49	59167.80	1775.03	711.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:44:00 AM	49401.07	49987.80	1499.63	-586.73	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	49700.21	49987.80	1499.63	-287.59	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:44:00 AM	46576.06	55281.80	1658.45	-8705.74	**FAIL**	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	45626.04	55281.80	1658.45	-9655.76	**FAIL**	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/7/2023 12:44:00 AM	51225.10	52477.75	1574.33	-1252.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	51031.53	52477.75	1574.33	-1446.22	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:44:00 AM	45103.13	46160.75	1384.82	-1057.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	45025.91	46160.75	1384.82	-1134.84	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:09:00 AM	0.12	0.19	0.02	-0.07	FAIL	0.50	0.54	0.10	-0.041	Pass
9/8/2023 4:11:00 AM	0.11	0.19	0.02	-0.08	FAIL	0.42	0.54	0.10	-0.121	Pass
Detector 1										
9/7/2023 4:09:00 AM	0.12	0.23	0.03	-0.12	FAIL	0.38	0.47	0.07	-0.093	Pass
9/8/2023 4:11:00 AM	0.10	0.23	0.03	-0.14	FAIL	0.33	0.47	0.07	-0.144	Pass
Detector 2										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.14	Pass	0.35	0.54	0.11	-0.194	Pass
9/8/2023 4:11:00 AM	0.15	0.21	0.06	-0.07	Pass	0.37	0.54	0.11	-0.174	Pass
Detector 3										
9/7/2023 4:09:00 AM	0.37	0.24	0.04	0.13	FAIL	0.77	0.52	0.09	0.241	Pass
9/8/2023 4:11:00 AM	0.22	0.24	0.04	-0.02	Pass	0.51	0.52	0.09	-0.014	Pass
Detector 4										
9/7/2023 4:10:00 AM	0.19	0.23	0.04	-0.04	Pass	0.42	0.45	0.07	-0.030	Pass
9/8/2023 4:11:00 AM	0.17	0.23	0.04	-0.06	Pass	0.40	0.45	0.07	-0.050	Pass
Detector 5										
9/7/2023 4:10:00 AM	0.20	0.22	0.03	-0.03	Pass	0.47	0.44	0.08	0.027	Pass
9/8/2023 4:11:00 AM	0.14	0.22	0.03	-0.09	Pass	0.44	0.44	0.08	-0.003	Pass
Detector 6										
9/7/2023 4:10:00 AM	0.15	0.25	0.04	-0.10	Pass	0.30	0.46	0.07	-0.163	Pass
9/8/2023 4:11:00 AM	0.13	0.25	0.04	-0.12	Pass	0.33	0.46	0.07	-0.133	Pass
Detector 7										
9/7/2023 4:10:00 AM	0.21	0.30	0.06	-0.09	Pass	0.76	0.54	0.09	0.211	Pass
9/8/2023 4:11:00 AM	0.19	0.30	0.06	-0.11	Pass	0.54	0.54	0.09	-0.009	Pass
Detector 8										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.13	Pass	0.40	0.51	0.10	-0.110	Pass
9/8/2023 4:12:00 AM	0.11	0.21	0.06	-0.10	Pass	0.26	0.51	0.10	-0.250	Pass
Detector 9										
9/7/2023 4:09:00 AM	0.16	0.18	0.05	-0.03	Pass	0.43	0.41	0.07	0.019	Pass
9/8/2023 4:12:00 AM	0.10	0.18	0.05	-0.08	Pass	0.34	0.41	0.07	-0.067	Pass
Detector 10										
9/7/2023 4:09:00 AM	0.09	0.20	0.05	-0.12	Pass	0.39	0.42	0.10	-0.035	Pass
9/8/2023 4:12:00 AM	0.10	0.20	0.05	-0.11	Pass	0.40	0.42	0.10	-0.020	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/7/2023 4:09:00 AM	0.08	0.19	0.04	-0.11	Pass	0.45	0.50	0.09	-0.058	Pass
9/8/2023 4:12:00 AM	0.11	0.19	0.04	-0.08	Pass	0.51	0.50	0.09	0.007	Pass
Detector 12										
9/7/2023 4:09:00 AM	0.13	0.28	0.05	-0.15	FAIL	0.50	0.51	0.09	-0.011	Pass
9/8/2023 4:12:00 AM	0.14	0.28	0.05	-0.14	Pass	0.49	0.51	0.09	-0.016	Pass
Detector 13										
9/7/2023 4:09:00 AM	0.06	0.21	0.05	-0.16	FAIL	0.26	0.43	0.09	-0.166	Pass
9/8/2023 4:12:00 AM	0.14	0.21	0.05	-0.07	Pass	0.29	0.43	0.09	-0.136	Pass
Detector 14										
9/7/2023 4:09:00 AM	0.12	0.22	0.05	-0.10	Pass	0.31	0.41	0.09	-0.108	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.05	-0.08	Pass	0.33	0.41	0.09	-0.083	Pass
Detector 15										
9/7/2023 4:09:00 AM	0.17	0.23	0.05	-0.07	Pass	0.36	0.49	0.08	-0.135	Pass
9/8/2023 4:13:00 AM	0.13	0.23	0.05	-0.11	Pass	0.41	0.49	0.08	-0.085	Pass
Detector 16										
9/7/2023 4:08:00 AM	0.09	0.18	0.05	-0.09	Pass	0.41	0.56	0.34	-0.158	Pass
9/8/2023 4:13:00 AM	0.08	0.18	0.05	-0.11	Pass	0.33	0.56	0.34	-0.233	Pass
Detector 17										
9/7/2023 4:09:00 AM	0.10	0.22	0.04	-0.12	Pass	0.32	0.44	0.10	-0.119	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.04	-0.08	Pass	0.39	0.44	0.10	-0.054	Pass
Detector 18										
9/7/2023 4:09:00 AM	1.05	1.16	0.12	-0.12	Pass	1.33	1.31	0.19	0.012	Pass
9/8/2023 4:13:00 AM	0.81	1.16	0.12	-0.36	Pass	1.03	1.31	0.19	-0.283	Pass
Detector 19										
9/7/2023 4:09:00 AM	0.20	0.37	0.06	-0.17	Pass	0.47	0.63	0.12	-0.163	Pass
9/8/2023 4:13:00 AM	0.20	0.37	0.06	-0.17	Pass	0.64	0.63	0.12	0.007	Pass
Detector 20										
9/7/2023 4:09:00 AM	0.04	0.25	0.04	-0.21	FAIL	0.42	0.48	0.11	-0.058	Pass
9/8/2023 4:13:00 AM	0.05	0.25	0.04	-0.20	FAIL	0.32	0.48	0.11	-0.163	Pass
Detector 21										
9/7/2023 4:09:00 AM	0.03	0.24	0.04	-0.21	FAIL	0.17	0.37	0.07	-0.198	Pass
9/8/2023 4:12:00 AM	0.04	0.24	0.04	-0.21	FAIL	0.14	0.37	0.07	-0.228	FAIL

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/7/2023 4:09:00 AM	0.20	0.28	0.05	-0.08	Pass	0.33	0.42	0.09	-0.092	Pass
9/8/2023 4:12:00 AM	0.22	0.28	0.05	-0.06	Pass	0.30	0.42	0.09	-0.117	Pass
Detector 23										
9/7/2023 4:09:00 AM	0.40	0.48	0.06	-0.08	Pass	0.58	0.77	0.13	-0.186	Pass
9/8/2023 4:12:00 AM	0.38	0.48	0.06	-0.10	Pass	0.63	0.77	0.13	-0.136	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:25:00 AM	9574.78	9731.78	291.95	-156.99	Pass	3607.00	3783.75	55.06	-176.750	**DOEF**
9/8/2023 12:23:00 AM	9552.78	9731.78	291.95	-179.00	Pass	3725.50	3783.75	55.06	-58.250	Pass
Detector 1										
9/7/2023 12:26:00 AM	11262.18	11203.08	336.09	59.10	Pass	4251.00	4270.00	56.54	-19.000	Pass
9/8/2023 12:24:00 AM	10937.07	11203.08	336.09	-266.00	Pass	4231.00	4270.00	56.54	-39.000	Pass
Detector 2										
9/7/2023 12:26:00 AM	10130.40	10359.33	310.78	-228.92	Pass	4003.00	4091.73	50.75	-88.725	Pass
9/8/2023 12:24:00 AM	10278.74	10359.33	310.78	-80.58	Pass	4116.00	4091.73	50.75	24.275	Pass
Detector 3										
9/7/2023 12:26:00 AM	11434.53	11400.95	342.03	33.58	Pass	4237.00	4294.73	42.38	-57.725	Pass
9/8/2023 12:24:00 AM	11294.29	11400.95	342.03	-106.66	Pass	4190.50	4294.73	42.38	-104.225	**WARNING**
Detector 4										
9/7/2023 12:27:00 AM	14135.97	14325.50	429.77	-189.53	Pass	6258.00	6338.90	205.79	-80.900	Pass
9/8/2023 12:24:00 AM	13996.75	14325.50	429.77	-328.75	Pass	6472.50	6338.90	205.79	133.600	Pass
Detector 5										
9/7/2023 12:27:00 AM	14937.58	14830.60	444.92	106.98	Pass	5432.00	5533.48	81.19	-101.475	Pass
9/8/2023 12:25:00 AM	14706.18	14830.60	444.92	-124.42	Pass	5479.00	5533.48	81.19	-54.475	Pass
Detector 6										
9/7/2023 12:27:00 AM	12161.49	12305.73	369.17	-144.23	Pass	4649.00	4715.55	63.03	-66.550	Pass
9/8/2023 12:25:00 AM	12164.55	12305.73	369.17	-141.17	Pass	4605.00	4715.55	63.03	-110.550	Pass
Detector 7										
9/7/2023 12:28:00 AM	12468.11	12708.25	381.25	-240.14	Pass	4848.50	4810.10	73.07	38.400	Pass
9/8/2023 12:25:00 AM	12231.69	12708.25	381.25	-476.56	**FAIL**	4858.00	4810.10	73.07	47.900	Pass
Detector 8										
9/7/2023 12:41:00 AM	9537.21	9451.15	283.53	86.06	Pass	3738.00	3851.33	50.28	-113.325	**WARNING**
9/8/2023 12:43:00 AM	9503.18	9451.15	283.53	52.03	Pass	3749.00	3851.33	50.28	-102.325	**WARNING**
Detector 9										
9/7/2023 12:42:00 AM	10981.61	10846.68	325.40	134.94	Pass	4177.50	4390.08	73.38	-212.575	**WARNING**
9/8/2023 12:44:00 AM	10811.82	10846.68	325.40	-34.85	Pass	4256.50	4390.08	73.38	-133.575	Pass
Detector 10										
9/7/2023 12:42:00 AM	10282.21	10386.65	311.60	-104.44	Pass	3902.00	4154.40	60.48	-252.400	**DOEF**
9/8/2023 12:44:00 AM	10228.64	10386.65	311.60	-158.01	Pass	3984.00	4154.40	60.48	-170.400	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/7/2023 12:42:00 AM	11354.87	11316.08	339.48	38.79	Pass	4367.00	4591.48	60.25	-224.475	**DOEF**
9/8/2023 12:44:00 AM	11329.36	11316.08	339.48	13.29	Pass	4334.50	4591.48	60.25	-256.975	**DOEF**
Detector 12										
9/7/2023 12:42:00 AM	14219.14	14250.38	427.51	-31.24	Pass	6326.00	6540.40	105.21	-214.400	**WARNING**
9/8/2023 12:45:00 AM	13945.65	14250.38	427.51	-304.73	Pass	6568.00	6540.40	105.21	27.600	Pass
Detector 13										
9/7/2023 12:42:00 AM	15357.43	15581.68	467.45	-224.24	Pass	4772.00	4978.43	68.62	-206.425	**DOEF**
9/8/2023 12:45:00 AM	15375.54	15581.68	467.45	-206.14	Pass	4915.00	4978.43	68.62	-63.425	Pass
Detector 14										
9/7/2023 12:43:00 AM	11302.26	11508.73	345.26	-206.46	Pass	5271.00	5412.75	104.76	-141.750	Pass
9/8/2023 12:45:00 AM	11096.40	11508.73	345.26	-412.33	**FAIL**	5390.50	5412.75	104.76	-22.250	Pass
Detector 15										
9/7/2023 12:43:00 AM	11856.88	12031.40	360.94	-174.52	Pass	5374.00	5413.25	103.25	-39.250	Pass
9/8/2023 12:46:00 AM	11858.43	12031.40	360.94	-172.97	Pass	5711.00	5413.25	103.25	297.750	**WARNING**
Detector 16										
9/7/2023 12:34:00 AM	9718.07	9639.28	289.18	78.79	Pass	3648.50	3817.55	37.67	-169.050	**DOEF**
9/8/2023 12:34:00 AM	9517.21	9639.28	289.18	-122.07	Pass	3781.50	3817.55	37.67	-36.050	Pass
Detector 17										
9/7/2023 12:34:00 AM	11048.75	11061.48	331.84	-12.73	Pass	4105.00	4226.70	53.61	-121.700	**WARNING**
9/8/2023 12:34:00 AM	11062.82	11061.48	331.84	1.35	Pass	4068.00	4226.70	53.61	-158.700	**WARNING**
Detector 18										
9/7/2023 12:35:00 AM	10682.00	10659.53	319.79	22.48	Pass	3830.00	3935.95	34.99	-105.950	**DOEF**
9/8/2023 12:35:00 AM	10639.97	10659.53	319.79	-19.56	Pass	3890.00	3935.95	34.99	-45.950	Pass
Detector 19										
9/7/2023 12:35:00 AM	11439.03	11467.10	344.01	-28.07	Pass	4451.00	4448.70	59.17	2.300	Pass
9/8/2023 12:35:00 AM	11383.97	11467.10	344.01	-83.13	Pass	4517.00	4448.70	59.17	68.300	Pass
Detector 20										
9/7/2023 12:35:00 AM	14551.80	14347.83	430.43	203.98	Pass	6679.00	6614.45	91.13	64.550	Pass
9/8/2023 12:36:00 AM	14279.31	14347.83	430.43	-68.51	Pass	6659.50	6614.45	91.13	45.050	Pass
Detector 21										
9/7/2023 12:36:00 AM	9880.39	9869.88	296.10	10.52	Pass	10270.00	10259.65	129.52	10.350	Pass
9/8/2023 12:36:00 AM	9429.03	9869.88	296.10	-440.85	**FAIL**	10560.00	10259.65	129.52	300.350	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/7/2023 12:36:00 AM	11762.18	11742.60	352.28	19.58	Pass	5309.00	5466.15	85.68	-157.150	Pass
9/8/2023 12:36:00 AM	11682.07	11742.60	352.28	-60.53	Pass	5414.50	5466.15	85.68	-51.650	Pass
Detector 23										
9/7/2023 12:36:00 AM	12078.82	12061.73	361.85	17.10	Pass	5795.50	5992.08	108.01	-196.575	Pass
9/8/2023 12:37:00 AM	12134.99	12061.73	361.85	73.26	Pass	5873.00	5992.08	108.01	-119.075	Pass

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:38:00 AM	50037.35	50552.05	1516.56	-514.70	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49946.45	50552.05	1516.56	-605.60	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:38:00 AM	48133.85	47641.23	1429.24	492.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	48302.46	47641.23	1429.24	661.23	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:39:00 AM	48878.41	49734.44	1492.03	-856.03	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49506.06	49734.44	1492.03	-228.38	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:36:00 AM	59188.54	60167.98	1805.04	-979.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	58882.83	60167.98	1805.04	-1285.15	Pass	NA	NA	NA	NA	NA
Detector 4										
9/7/2023 12:37:00 AM	47410.02	47227.93	1416.84	182.10	Pass	NA	NA	NA	NA	NA
9/8/2023 12:37:00 AM	47364.62	47227.93	1416.84	136.70	Pass	NA	NA	NA	NA	NA
Detector 5										
9/7/2023 12:37:00 AM	54756.79	55004.03	1650.12	-247.24	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	55098.73	55004.03	1650.12	94.71	Pass	NA	NA	NA	NA	NA
Detector 6										
9/7/2023 12:37:00 AM	50631.20	52072.68	1562.18	-1441.47	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	50570.01	52072.68	1562.18	-1502.66	Pass	NA	NA	NA	NA	NA
Detector 7										
9/7/2023 12:38:00 AM	43920.12	44302.58	1329.08	-382.45	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	44162.87	44302.58	1329.08	-139.70	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:28:00 AM	49473.12	49959.33	1498.78	-486.21	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49339.68	49959.33	1498.78	-619.64	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:28:00 AM	47779.16	47696.08	1430.88	83.08	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	47837.46	47696.08	1430.88	141.38	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:29:00 AM	48923.63	50136.65	1504.10	-1213.02	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	49248.53	50136.65	1504.10	-888.12	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/7/2023 12:29:00 AM	59822.54	59951.55	1798.55	-129.01	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	59893.70	59951.55	1798.55	-57.85	Pass	NA	NA	NA	NA	NA
Detector 12										
9/7/2023 12:29:00 AM	48755.12	49257.90	1477.74	-502.78	Pass	NA	NA	NA	NA	NA
9/8/2023 12:28:00 AM	48887.24	49257.90	1477.74	-370.66	Pass	NA	NA	NA	NA	NA
Detector 13										
9/7/2023 12:29:00 AM	54840.23	55607.20	1668.22	-766.97	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	54777.72	55607.20	1668.22	-829.48	Pass	NA	NA	NA	NA	NA
Detector 14										
9/7/2023 12:30:00 AM	49584.56	50580.03	1517.40	-995.46	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49206.94	50580.03	1517.40	-1373.08	Pass	NA	NA	NA	NA	NA
Detector 15										
9/7/2023 12:30:00 AM	44393.04	45674.43	1370.23	-1281.38	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	43739.99	45674.43	1370.23	-1934.43	**FAIL**	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:45:00 AM	49790.75	49653.23	1489.60	137.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49506.75	49653.23	1489.60	-146.47	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:45:00 AM	48206.67	48166.13	1444.98	40.55	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	48156.43	48166.13	1444.98	-9.69	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:45:00 AM	49375.32	49957.23	1498.72	-581.90	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49698.42	49957.23	1498.72	-258.80	Pass	NA	NA	NA	NA	NA
Detector 19										
9/7/2023 12:43:00 AM	59990.99	59167.80	1775.03	823.19	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	59879.49	59167.80	1775.03	711.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:44:00 AM	49401.07	49987.80	1499.63	-586.73	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	49700.21	49987.80	1499.63	-287.59	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:44:00 AM	46576.06	55281.80	1658.45	-8705.74	**FAIL**	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	45626.04	55281.80	1658.45	-9655.76	**FAIL**	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/7/2023 12:44:00 AM	51225.10	52477.75	1574.33	-1252.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	51031.53	52477.75	1574.33	-1446.22	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:44:00 AM	45103.13	46160.75	1384.82	-1057.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	45025.91	46160.75	1384.82	-1134.84	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:09:00 AM	0.12	0.19	0.02	-0.07	FAIL	0.50	0.54	0.10	-0.041	Pass
9/8/2023 4:11:00 AM	0.11	0.19	0.02	-0.08	FAIL	0.42	0.54	0.10	-0.121	Pass
Detector 1										
9/7/2023 4:09:00 AM	0.12	0.23	0.03	-0.12	FAIL	0.38	0.47	0.07	-0.093	Pass
9/8/2023 4:11:00 AM	0.10	0.23	0.03	-0.14	FAIL	0.33	0.47	0.07	-0.144	Pass
Detector 2										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.14	Pass	0.35	0.54	0.11	-0.194	Pass
9/8/2023 4:11:00 AM	0.15	0.21	0.06	-0.07	Pass	0.37	0.54	0.11	-0.174	Pass
Detector 3										
9/7/2023 4:09:00 AM	0.37	0.24	0.04	0.13	FAIL	0.77	0.52	0.09	0.241	Pass
9/8/2023 4:11:00 AM	0.22	0.24	0.04	-0.02	Pass	0.51	0.52	0.09	-0.014	Pass
Detector 4										
9/7/2023 4:10:00 AM	0.19	0.23	0.04	-0.04	Pass	0.42	0.45	0.07	-0.030	Pass
9/8/2023 4:11:00 AM	0.17	0.23	0.04	-0.06	Pass	0.40	0.45	0.07	-0.050	Pass
Detector 5										
9/7/2023 4:10:00 AM	0.20	0.22	0.03	-0.03	Pass	0.47	0.44	0.08	0.027	Pass
9/8/2023 4:11:00 AM	0.14	0.22	0.03	-0.09	Pass	0.44	0.44	0.08	-0.003	Pass
Detector 6										
9/7/2023 4:10:00 AM	0.15	0.25	0.04	-0.10	Pass	0.30	0.46	0.07	-0.163	Pass
9/8/2023 4:11:00 AM	0.13	0.25	0.04	-0.12	Pass	0.33	0.46	0.07	-0.133	Pass
Detector 7										
9/7/2023 4:10:00 AM	0.21	0.30	0.06	-0.09	Pass	0.76	0.54	0.09	0.211	Pass
9/8/2023 4:11:00 AM	0.19	0.30	0.06	-0.11	Pass	0.54	0.54	0.09	-0.009	Pass
Detector 8										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.13	Pass	0.40	0.51	0.10	-0.110	Pass
9/8/2023 4:12:00 AM	0.11	0.21	0.06	-0.10	Pass	0.26	0.51	0.10	-0.250	Pass
Detector 9										
9/7/2023 4:09:00 AM	0.16	0.18	0.05	-0.03	Pass	0.43	0.41	0.07	0.019	Pass
9/8/2023 4:12:00 AM	0.10	0.18	0.05	-0.08	Pass	0.34	0.41	0.07	-0.067	Pass
Detector 10										
9/7/2023 4:09:00 AM	0.09	0.20	0.05	-0.12	Pass	0.39	0.42	0.10	-0.035	Pass
9/8/2023 4:12:00 AM	0.10	0.20	0.05	-0.11	Pass	0.40	0.42	0.10	-0.020	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/7/2023 4:09:00 AM	0.08	0.19	0.04	-0.11	Pass	0.45	0.50	0.09	-0.058	Pass
9/8/2023 4:12:00 AM	0.11	0.19	0.04	-0.08	Pass	0.51	0.50	0.09	0.007	Pass
Detector 12										
9/7/2023 4:09:00 AM	0.13	0.28	0.05	-0.15	FAIL	0.50	0.51	0.09	-0.011	Pass
9/8/2023 4:12:00 AM	0.14	0.28	0.05	-0.14	Pass	0.49	0.51	0.09	-0.016	Pass
Detector 13										
9/7/2023 4:09:00 AM	0.06	0.21	0.05	-0.16	FAIL	0.26	0.43	0.09	-0.166	Pass
9/8/2023 4:12:00 AM	0.14	0.21	0.05	-0.07	Pass	0.29	0.43	0.09	-0.136	Pass
Detector 14										
9/7/2023 4:09:00 AM	0.12	0.22	0.05	-0.10	Pass	0.31	0.41	0.09	-0.108	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.05	-0.08	Pass	0.33	0.41	0.09	-0.083	Pass
Detector 15										
9/7/2023 4:09:00 AM	0.17	0.23	0.05	-0.07	Pass	0.36	0.49	0.08	-0.135	Pass
9/8/2023 4:13:00 AM	0.13	0.23	0.05	-0.11	Pass	0.41	0.49	0.08	-0.085	Pass
Detector 16										
9/7/2023 4:08:00 AM	0.09	0.18	0.05	-0.09	Pass	0.41	0.56	0.34	-0.158	Pass
9/8/2023 4:13:00 AM	0.08	0.18	0.05	-0.11	Pass	0.33	0.56	0.34	-0.233	Pass
Detector 17										
9/7/2023 4:09:00 AM	0.10	0.22	0.04	-0.12	Pass	0.32	0.44	0.10	-0.119	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.04	-0.08	Pass	0.39	0.44	0.10	-0.054	Pass
Detector 18										
9/7/2023 4:09:00 AM	1.05	1.16	0.12	-0.12	Pass	1.33	1.31	0.19	0.012	Pass
9/8/2023 4:13:00 AM	0.81	1.16	0.12	-0.36	Pass	1.03	1.31	0.19	-0.283	Pass
Detector 19										
9/7/2023 4:09:00 AM	0.20	0.37	0.06	-0.17	Pass	0.47	0.63	0.12	-0.163	Pass
9/8/2023 4:13:00 AM	0.20	0.37	0.06	-0.17	Pass	0.64	0.63	0.12	0.007	Pass
Detector 20										
9/7/2023 4:09:00 AM	0.04	0.25	0.04	-0.21	FAIL	0.42	0.48	0.11	-0.058	Pass
9/8/2023 4:13:00 AM	0.05	0.25	0.04	-0.20	FAIL	0.32	0.48	0.11	-0.163	Pass
Detector 21										
9/7/2023 4:09:00 AM	0.03	0.24	0.04	-0.21	FAIL	0.17	0.37	0.07	-0.198	Pass
9/8/2023 4:12:00 AM	0.04	0.24	0.04	-0.21	FAIL	0.14	0.37	0.07	-0.228	FAIL

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/7/2023 4:09:00 AM	0.20	0.28	0.05	-0.08	Pass	0.33	0.42	0.09	-0.092	Pass
9/8/2023 4:12:00 AM	0.22	0.28	0.05	-0.06	Pass	0.30	0.42	0.09	-0.117	Pass
Detector 23										
9/7/2023 4:09:00 AM	0.40	0.48	0.06	-0.08	Pass	0.58	0.77	0.13	-0.186	Pass
9/8/2023 4:12:00 AM	0.38	0.48	0.06	-0.10	Pass	0.63	0.77	0.13	-0.136	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:25:00 AM	9574.78	9731.78	291.95	-156.99	Pass	3607.00	3783.75	55.06	-176.750	**DOEF**
9/8/2023 12:23:00 AM	9552.78	9731.78	291.95	-179.00	Pass	3725.50	3783.75	55.06	-58.250	Pass
Detector 1										
9/7/2023 12:26:00 AM	11262.18	11203.08	336.09	59.10	Pass	4251.00	4270.00	56.54	-19.000	Pass
9/8/2023 12:24:00 AM	10937.07	11203.08	336.09	-266.00	Pass	4231.00	4270.00	56.54	-39.000	Pass
Detector 2										
9/7/2023 12:26:00 AM	10130.40	10359.33	310.78	-228.92	Pass	4003.00	4091.73	50.75	-88.725	Pass
9/8/2023 12:24:00 AM	10278.74	10359.33	310.78	-80.58	Pass	4116.00	4091.73	50.75	24.275	Pass
Detector 3										
9/7/2023 12:26:00 AM	11434.53	11400.95	342.03	33.58	Pass	4237.00	4294.73	42.38	-57.725	Pass
9/8/2023 12:24:00 AM	11294.29	11400.95	342.03	-106.66	Pass	4190.50	4294.73	42.38	-104.225	**WARNING**
Detector 4										
9/7/2023 12:27:00 AM	14135.97	14325.50	429.77	-189.53	Pass	6258.00	6338.90	205.79	-80.900	Pass
9/8/2023 12:24:00 AM	13996.75	14325.50	429.77	-328.75	Pass	6472.50	6338.90	205.79	133.600	Pass
Detector 5										
9/7/2023 12:27:00 AM	14937.58	14830.60	444.92	106.98	Pass	5432.00	5533.48	81.19	-101.475	Pass
9/8/2023 12:25:00 AM	14706.18	14830.60	444.92	-124.42	Pass	5479.00	5533.48	81.19	-54.475	Pass
Detector 6										
9/7/2023 12:27:00 AM	12161.49	12305.73	369.17	-144.23	Pass	4649.00	4715.55	63.03	-66.550	Pass
9/8/2023 12:25:00 AM	12164.55	12305.73	369.17	-141.17	Pass	4605.00	4715.55	63.03	-110.550	Pass
Detector 7										
9/7/2023 12:28:00 AM	12468.11	12708.25	381.25	-240.14	Pass	4848.50	4810.10	73.07	38.400	Pass
9/8/2023 12:25:00 AM	12231.69	12708.25	381.25	-476.56	**FAIL**	4858.00	4810.10	73.07	47.900	Pass
Detector 8										
9/7/2023 12:41:00 AM	9537.21	9451.15	283.53	86.06	Pass	3738.00	3851.33	50.28	-113.325	**WARNING**
9/8/2023 12:43:00 AM	9503.18	9451.15	283.53	52.03	Pass	3749.00	3851.33	50.28	-102.325	**WARNING**
Detector 9										
9/7/2023 12:42:00 AM	10981.61	10846.68	325.40	134.94	Pass	4177.50	4390.08	73.38	-212.575	**WARNING**
9/8/2023 12:44:00 AM	10811.82	10846.68	325.40	-34.85	Pass	4256.50	4390.08	73.38	-133.575	Pass
Detector 10										
9/7/2023 12:42:00 AM	10282.21	10386.65	311.60	-104.44	Pass	3902.00	4154.40	60.48	-252.400	**DOEF**
9/8/2023 12:44:00 AM	10228.64	10386.65	311.60	-158.01	Pass	3984.00	4154.40	60.48	-170.400	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/7/2023 12:42:00 AM	11354.87	11316.08	339.48	38.79	Pass	4367.00	4591.48	60.25	-224.475	**DOEF**
9/8/2023 12:44:00 AM	11329.36	11316.08	339.48	13.29	Pass	4334.50	4591.48	60.25	-256.975	**DOEF**
Detector 12										
9/7/2023 12:42:00 AM	14219.14	14250.38	427.51	-31.24	Pass	6326.00	6540.40	105.21	-214.400	**WARNING**
9/8/2023 12:45:00 AM	13945.65	14250.38	427.51	-304.73	Pass	6568.00	6540.40	105.21	27.600	Pass
Detector 13										
9/7/2023 12:42:00 AM	15357.43	15581.68	467.45	-224.24	Pass	4772.00	4978.43	68.62	-206.425	**DOEF**
9/8/2023 12:45:00 AM	15375.54	15581.68	467.45	-206.14	Pass	4915.00	4978.43	68.62	-63.425	Pass
Detector 14										
9/7/2023 12:43:00 AM	11302.26	11508.73	345.26	-206.46	Pass	5271.00	5412.75	104.76	-141.750	Pass
9/8/2023 12:45:00 AM	11096.40	11508.73	345.26	-412.33	**FAIL**	5390.50	5412.75	104.76	-22.250	Pass
Detector 15										
9/7/2023 12:43:00 AM	11856.88	12031.40	360.94	-174.52	Pass	5374.00	5413.25	103.25	-39.250	Pass
9/8/2023 12:46:00 AM	11858.43	12031.40	360.94	-172.97	Pass	5711.00	5413.25	103.25	297.750	**WARNING**
Detector 16										
9/7/2023 12:34:00 AM	9718.07	9639.28	289.18	78.79	Pass	3648.50	3817.55	37.67	-169.050	**DOEF**
9/8/2023 12:34:00 AM	9517.21	9639.28	289.18	-122.07	Pass	3781.50	3817.55	37.67	-36.050	Pass
Detector 17										
9/7/2023 12:34:00 AM	11048.75	11061.48	331.84	-12.73	Pass	4105.00	4226.70	53.61	-121.700	**WARNING**
9/8/2023 12:34:00 AM	11062.82	11061.48	331.84	1.35	Pass	4068.00	4226.70	53.61	-158.700	**WARNING**
Detector 18										
9/7/2023 12:35:00 AM	10682.00	10659.53	319.79	22.48	Pass	3830.00	3935.95	34.99	-105.950	**DOEF**
9/8/2023 12:35:00 AM	10639.97	10659.53	319.79	-19.56	Pass	3890.00	3935.95	34.99	-45.950	Pass
Detector 19										
9/7/2023 12:35:00 AM	11439.03	11467.10	344.01	-28.07	Pass	4451.00	4448.70	59.17	2.300	Pass
9/8/2023 12:35:00 AM	11383.97	11467.10	344.01	-83.13	Pass	4517.00	4448.70	59.17	68.300	Pass
Detector 20										
9/7/2023 12:35:00 AM	14551.80	14347.83	430.43	203.98	Pass	6679.00	6614.45	91.13	64.550	Pass
9/8/2023 12:36:00 AM	14279.31	14347.83	430.43	-68.51	Pass	6659.50	6614.45	91.13	45.050	Pass
Detector 21										
9/7/2023 12:36:00 AM	9880.39	9869.88	296.10	10.52	Pass	10270.00	10259.65	129.52	10.350	Pass
9/8/2023 12:36:00 AM	9429.03	9869.88	296.10	-440.85	**FAIL**	10560.00	10259.65	129.52	300.350	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/7/2023 12:36:00 AM	11762.18	11742.60	352.28	19.58	Pass	5309.00	5466.15	85.68	-157.150	Pass
9/8/2023 12:36:00 AM	11682.07	11742.60	352.28	-60.53	Pass	5414.50	5466.15	85.68	-51.650	Pass
Detector 23										
9/7/2023 12:36:00 AM	12078.82	12061.73	361.85	17.10	Pass	5795.50	5992.08	108.01	-196.575	Pass
9/8/2023 12:37:00 AM	12134.99	12061.73	361.85	73.26	Pass	5873.00	5992.08	108.01	-119.075	Pass

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:38:00 AM	50037.35	50552.05	1516.56	-514.70	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49946.45	50552.05	1516.56	-605.60	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:38:00 AM	48133.85	47641.23	1429.24	492.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	48302.46	47641.23	1429.24	661.23	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:39:00 AM	48878.41	49734.44	1492.03	-856.03	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	49506.06	49734.44	1492.03	-228.38	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:36:00 AM	59188.54	60167.98	1805.04	-979.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:39:00 AM	58882.83	60167.98	1805.04	-1285.15	Pass	NA	NA	NA	NA	NA
Detector 4										
9/7/2023 12:37:00 AM	47410.02	47227.93	1416.84	182.10	Pass	NA	NA	NA	NA	NA
9/8/2023 12:37:00 AM	47364.62	47227.93	1416.84	136.70	Pass	NA	NA	NA	NA	NA
Detector 5										
9/7/2023 12:37:00 AM	54756.79	55004.03	1650.12	-247.24	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	55098.73	55004.03	1650.12	94.71	Pass	NA	NA	NA	NA	NA
Detector 6										
9/7/2023 12:37:00 AM	50631.20	52072.68	1562.18	-1441.47	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	50570.01	52072.68	1562.18	-1502.66	Pass	NA	NA	NA	NA	NA
Detector 7										
9/7/2023 12:38:00 AM	43920.12	44302.58	1329.08	-382.45	Pass	NA	NA	NA	NA	NA
9/8/2023 12:38:00 AM	44162.87	44302.58	1329.08	-139.70	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:28:00 AM	49473.12	49959.33	1498.78	-486.21	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49339.68	49959.33	1498.78	-619.64	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:28:00 AM	47779.16	47696.08	1430.88	83.08	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	47837.46	47696.08	1430.88	141.38	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:29:00 AM	48923.63	50136.65	1504.10	-1213.02	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	49248.53	50136.65	1504.10	-888.12	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/7/2023 12:29:00 AM	59822.54	59951.55	1798.55	-129.01	Pass	NA	NA	NA	NA	NA
9/8/2023 12:27:00 AM	59893.70	59951.55	1798.55	-57.85	Pass	NA	NA	NA	NA	NA
Detector 12										
9/7/2023 12:29:00 AM	48755.12	49257.90	1477.74	-502.78	Pass	NA	NA	NA	NA	NA
9/8/2023 12:28:00 AM	48887.24	49257.90	1477.74	-370.66	Pass	NA	NA	NA	NA	NA
Detector 13										
9/7/2023 12:29:00 AM	54840.23	55607.20	1668.22	-766.97	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	54777.72	55607.20	1668.22	-829.48	Pass	NA	NA	NA	NA	NA
Detector 14										
9/7/2023 12:30:00 AM	49584.56	50580.03	1517.40	-995.46	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	49206.94	50580.03	1517.40	-1373.08	Pass	NA	NA	NA	NA	NA
Detector 15										
9/7/2023 12:30:00 AM	44393.04	45674.43	1370.23	-1281.38	Pass	NA	NA	NA	NA	NA
9/8/2023 12:26:00 AM	43739.99	45674.43	1370.23	-1934.43	**FAIL**	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:45:00 AM	49790.75	49653.23	1489.60	137.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49506.75	49653.23	1489.60	-146.47	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:45:00 AM	48206.67	48166.13	1444.98	40.55	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	48156.43	48166.13	1444.98	-9.69	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:45:00 AM	49375.32	49957.23	1498.72	-581.90	Pass	NA	NA	NA	NA	NA
9/8/2023 12:46:00 AM	49698.42	49957.23	1498.72	-258.80	Pass	NA	NA	NA	NA	NA
Detector 19										
9/7/2023 12:43:00 AM	59990.99	59167.80	1775.03	823.19	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	59879.49	59167.80	1775.03	711.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:44:00 AM	49401.07	49987.80	1499.63	-586.73	Pass	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	49700.21	49987.80	1499.63	-287.59	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:44:00 AM	46576.06	55281.80	1658.45	-8705.74	**FAIL**	NA	NA	NA	NA	NA
9/8/2023 12:47:00 AM	45626.04	55281.80	1658.45	-9655.76	**FAIL**	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/7/2023 12:44:00 AM	51225.10	52477.75	1574.33	-1252.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	51031.53	52477.75	1574.33	-1446.22	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:44:00 AM	45103.13	46160.75	1384.82	-1057.62	Pass	NA	NA	NA	NA	NA
9/8/2023 12:48:00 AM	45025.91	46160.75	1384.82	-1134.84	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:09:00 AM	0.12	0.19	0.02	-0.07	FAIL	0.50	0.54	0.10	-0.041	Pass
9/8/2023 4:11:00 AM	0.11	0.19	0.02	-0.08	FAIL	0.42	0.54	0.10	-0.121	Pass
Detector 1										
9/7/2023 4:09:00 AM	0.12	0.23	0.03	-0.12	FAIL	0.38	0.47	0.07	-0.093	Pass
9/8/2023 4:11:00 AM	0.10	0.23	0.03	-0.14	FAIL	0.33	0.47	0.07	-0.144	Pass
Detector 2										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.14	Pass	0.35	0.54	0.11	-0.194	Pass
9/8/2023 4:11:00 AM	0.15	0.21	0.06	-0.07	Pass	0.37	0.54	0.11	-0.174	Pass
Detector 3										
9/7/2023 4:09:00 AM	0.37	0.24	0.04	0.13	FAIL	0.77	0.52	0.09	0.241	Pass
9/8/2023 4:11:00 AM	0.22	0.24	0.04	-0.02	Pass	0.51	0.52	0.09	-0.014	Pass
Detector 4										
9/7/2023 4:10:00 AM	0.19	0.23	0.04	-0.04	Pass	0.42	0.45	0.07	-0.030	Pass
9/8/2023 4:11:00 AM	0.17	0.23	0.04	-0.06	Pass	0.40	0.45	0.07	-0.050	Pass
Detector 5										
9/7/2023 4:10:00 AM	0.20	0.22	0.03	-0.03	Pass	0.47	0.44	0.08	0.027	Pass
9/8/2023 4:11:00 AM	0.14	0.22	0.03	-0.09	Pass	0.44	0.44	0.08	-0.003	Pass
Detector 6										
9/7/2023 4:10:00 AM	0.15	0.25	0.04	-0.10	Pass	0.30	0.46	0.07	-0.163	Pass
9/8/2023 4:11:00 AM	0.13	0.25	0.04	-0.12	Pass	0.33	0.46	0.07	-0.133	Pass
Detector 7										
9/7/2023 4:10:00 AM	0.21	0.30	0.06	-0.09	Pass	0.76	0.54	0.09	0.211	Pass
9/8/2023 4:11:00 AM	0.19	0.30	0.06	-0.11	Pass	0.54	0.54	0.09	-0.009	Pass
Detector 8										
9/7/2023 4:09:00 AM	0.08	0.21	0.06	-0.13	Pass	0.40	0.51	0.10	-0.110	Pass
9/8/2023 4:12:00 AM	0.11	0.21	0.06	-0.10	Pass	0.26	0.51	0.10	-0.250	Pass
Detector 9										
9/7/2023 4:09:00 AM	0.16	0.18	0.05	-0.03	Pass	0.43	0.41	0.07	0.019	Pass
9/8/2023 4:12:00 AM	0.10	0.18	0.05	-0.08	Pass	0.34	0.41	0.07	-0.067	Pass
Detector 10										
9/7/2023 4:09:00 AM	0.09	0.20	0.05	-0.12	Pass	0.39	0.42	0.10	-0.035	Pass
9/8/2023 4:12:00 AM	0.10	0.20	0.05	-0.11	Pass	0.40	0.42	0.10	-0.020	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/7/2023 4:09:00 AM	0.08	0.19	0.04	-0.11	Pass	0.45	0.50	0.09	-0.058	Pass
9/8/2023 4:12:00 AM	0.11	0.19	0.04	-0.08	Pass	0.51	0.50	0.09	0.007	Pass
Detector 12										
9/7/2023 4:09:00 AM	0.13	0.28	0.05	-0.15	FAIL	0.50	0.51	0.09	-0.011	Pass
9/8/2023 4:12:00 AM	0.14	0.28	0.05	-0.14	Pass	0.49	0.51	0.09	-0.016	Pass
Detector 13										
9/7/2023 4:09:00 AM	0.06	0.21	0.05	-0.16	FAIL	0.26	0.43	0.09	-0.166	Pass
9/8/2023 4:12:00 AM	0.14	0.21	0.05	-0.07	Pass	0.29	0.43	0.09	-0.136	Pass
Detector 14										
9/7/2023 4:09:00 AM	0.12	0.22	0.05	-0.10	Pass	0.31	0.41	0.09	-0.108	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.05	-0.08	Pass	0.33	0.41	0.09	-0.083	Pass
Detector 15										
9/7/2023 4:09:00 AM	0.17	0.23	0.05	-0.07	Pass	0.36	0.49	0.08	-0.135	Pass
9/8/2023 4:13:00 AM	0.13	0.23	0.05	-0.11	Pass	0.41	0.49	0.08	-0.085	Pass
Detector 16										
9/7/2023 4:08:00 AM	0.09	0.18	0.05	-0.09	Pass	0.41	0.56	0.34	-0.158	Pass
9/8/2023 4:13:00 AM	0.08	0.18	0.05	-0.11	Pass	0.33	0.56	0.34	-0.233	Pass
Detector 17										
9/7/2023 4:09:00 AM	0.10	0.22	0.04	-0.12	Pass	0.32	0.44	0.10	-0.119	Pass
9/8/2023 4:13:00 AM	0.14	0.22	0.04	-0.08	Pass	0.39	0.44	0.10	-0.054	Pass
Detector 18										
9/7/2023 4:09:00 AM	1.05	1.16	0.12	-0.12	Pass	1.33	1.31	0.19	0.012	Pass
9/8/2023 4:13:00 AM	0.81	1.16	0.12	-0.36	Pass	1.03	1.31	0.19	-0.283	Pass
Detector 19										
9/7/2023 4:09:00 AM	0.20	0.37	0.06	-0.17	Pass	0.47	0.63	0.12	-0.163	Pass
9/8/2023 4:13:00 AM	0.20	0.37	0.06	-0.17	Pass	0.64	0.63	0.12	0.007	Pass
Detector 20										
9/7/2023 4:09:00 AM	0.04	0.25	0.04	-0.21	FAIL	0.42	0.48	0.11	-0.058	Pass
9/8/2023 4:13:00 AM	0.05	0.25	0.04	-0.20	FAIL	0.32	0.48	0.11	-0.163	Pass
Detector 21										
9/7/2023 4:09:00 AM	0.03	0.24	0.04	-0.21	FAIL	0.17	0.37	0.07	-0.198	Pass
9/8/2023 4:12:00 AM	0.04	0.24	0.04	-0.21	FAIL	0.14	0.37	0.07	-0.228	FAIL

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Blue

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/7/2023 4:09:00 AM	0.20	0.28	0.05	-0.08	Pass	0.33	0.42	0.09	-0.092	Pass
9/8/2023 4:12:00 AM	0.22	0.28	0.05	-0.06	Pass	0.30	0.42	0.09	-0.117	Pass
Detector 23										
9/7/2023 4:09:00 AM	0.40	0.48	0.06	-0.08	Pass	0.58	0.77	0.13	-0.186	Pass
9/8/2023 4:12:00 AM	0.38	0.48	0.06	-0.10	Pass	0.63	0.77	0.13	-0.136	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Orange

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
8/30/2023 1:01:00 AM	9859.61	10277.20	308.32	-417.59	FAIL	3536.50	3597.60	54.45	-61.100	Pass
8/31/2023 1:01:00 AM	9846.11	10277.20	308.32	-431.09	FAIL	3468.00	3597.60	54.45	-129.600	WARNING
Detector 1										
8/30/2023 1:01:00 AM	11048.82	11473.33	344.20	-424.50	FAIL	4074.50	4331.20	68.54	-256.700	DOEF
8/31/2023 1:02:00 AM	11009.25	11473.33	344.20	-464.08	FAIL	4090.50	4331.20	68.54	-240.700	DOEF
Detector 2										
8/30/2023 1:01:00 AM	10461.49	11257.50	337.73	-796.01	FAIL	3908.00	4094.70	69.24	-186.700	WARNING
8/31/2023 1:02:00 AM	10499.15	11257.50	337.73	-758.35	FAIL	3909.00	4094.70	69.24	-185.700	WARNING
Detector 3										
8/30/2023 1:01:00 AM	11036.32	11779.10	353.37	-742.78	FAIL	4602.00	4423.38	66.03	178.625	WARNING
8/31/2023 1:03:00 AM	11101.58	11779.10	353.37	-677.52	FAIL	4682.50	4423.38	66.03	259.125	DOEF
Detector 4										
8/30/2023 1:02:00 AM	14614.63	14794.15	443.82	-179.52	Pass	6456.50	6401.25	95.24	55.250	Pass
8/31/2023 1:03:00 AM	14214.43	14794.15	443.82	-579.72	FAIL	6515.00	6401.25	95.24	113.750	Pass
Detector 5										
8/30/2023 1:02:00 AM	15171.88	15011.80	450.35	160.08	Pass	5422.00	6014.78	68.39	-592.775	DOEF
8/31/2023 1:03:00 AM	15122.29	15011.80	450.35	110.49	Pass	5421.00	6014.78	68.39	-593.775	DOEF
Detector 6										
8/30/2023 1:02:00 AM	11692.35	12797.33	383.92	-1104.97	FAIL	4976.50	5402.30	82.99	-425.800	DOEF
8/31/2023 1:03:00 AM	11695.91	12797.33	383.92	-1101.41	FAIL	5014.50	5402.30	82.99	-387.800	DOEF
Detector 7										
8/30/2023 1:03:00 AM	12395.62	13309.73	399.29	-914.10	FAIL	5137.00	5272.40	65.64	-135.400	WARNING
8/31/2023 1:04:00 AM	12627.91	13309.73	399.29	-681.82	FAIL	5052.50	5272.40	65.64	-219.900	DOEF
Detector 8										
8/30/2023 1:12:00 AM	9806.96	10335.73	310.07	-528.77	FAIL	3532.00	3852.45	48.76	-320.450	DOEF
8/31/2023 1:09:00 AM	9799.98	10335.73	310.07	-535.75	FAIL	3619.50	3852.45	48.76	-232.950	DOEF
Detector 9										
8/30/2023 1:12:00 AM	11294.16	11676.73	350.30	-382.56	FAIL	4060.00	4282.35	52.85	-222.350	DOEF
8/31/2023 1:09:00 AM	11377.98	11676.73	350.30	-298.75	Pass	4101.00	4282.35	52.85	-181.350	DOEF
Detector 11										
8/30/2023 1:12:00 AM	11741.02	12112.38	363.37	-371.36	FAIL	4248.50	4358.93	60.77	-110.425	Pass
8/31/2023 1:09:00 AM	11697.43	12112.38	363.37	-414.94	FAIL	4239.50	4358.93	60.77	-119.425	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Orange

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 12										
8/30/2023 1:13:00 AM	15300.71	15517.88	465.54	-217.16	Pass	5579.50	5581.38	55.65	-1.875	Pass
8/31/2023 1:09:00 AM	15072.09	15517.88	465.54	-445.79	Pass	5521.50	5581.38	55.65	-59.875	Pass
Detector 13										
8/30/2023 1:13:00 AM	15308.41	15884.83	476.54	-576.41	**FAIL**	5171.00	5346.90	66.33	-175.900	**WARNING**
8/31/2023 1:10:00 AM	15452.44	15884.83	476.54	-432.39	Pass	5076.50	5346.90	66.33	-270.400	**DOEF**
Detector 14										
8/30/2023 1:13:00 AM	12460.01	13508.25	405.25	-1048.24	**FAIL**	4458.00	4788.33	59.74	-330.325	**DOEF**
8/31/2023 1:10:00 AM	12498.69	13508.25	405.25	-1009.56	**FAIL**	4537.00	4788.33	59.74	-251.325	**DOEF**
Detector 15										
8/30/2023 1:13:00 AM	13044.91	13855.23	415.66	-810.32	**FAIL**	4787.00	4728.98	105.00	58.025	Pass
8/31/2023 1:10:00 AM	12883.44	13855.23	415.66	-971.78	**FAIL**	4710.50	4728.98	105.00	-18.475	Pass
Detector 20										
8/30/2023 12:50:00 AM	15441.20	15595.13	467.85	-153.93	Pass	5233.50	5412.58	61.33	-179.075	**WARNING**
8/31/2023 12:48:00 AM	15301.81	15595.13	467.85	-293.31	Pass	5284.50	5412.58	61.33	-128.075	**WARNING**
Detector 21										
8/30/2023 12:50:00 AM	15334.35	15748.85	472.47	-414.50	Pass	5224.50	5428.88	52.55	-204.375	**DOEF**
8/31/2023 12:48:00 AM	15288.77	15748.85	472.47	-460.08	Pass	5276.00	5428.88	52.55	-152.875	**WARNING**
Detector 22										
8/30/2023 12:51:00 AM	12303.00	13242.35	397.27	-939.35	**FAIL**	4614.50	4980.40	60.42	-365.900	**DOEF**
8/31/2023 12:48:00 AM	12425.95	13242.35	397.27	-816.40	**FAIL**	4682.50	4980.40	60.42	-297.900	**DOEF**
Detector 23										
8/30/2023 12:51:00 AM	12694.27	13617.98	408.54	-923.71	**FAIL**	4827.50	5092.00	64.25	-264.500	**DOEF**
8/31/2023 12:48:00 AM	12777.60	13617.98	408.54	-840.38	**FAIL**	4871.00	5092.00	64.25	-221.000	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Orange

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
8/30/2023 1:13:00 AM	49015.80	49935.03	1498.05	-919.23	Pass	NA	NA	NA	NA	NA
8/31/2023 1:10:00 AM	49318.42	49935.03	1498.05	-616.61	Pass	NA	NA	NA	NA	NA
Detector 1										
8/30/2023 1:13:00 AM	47055.39	48521.48	1455.64	-1466.08	**FAIL**	NA	NA	NA	NA	NA
8/31/2023 1:10:00 AM	46703.47	48521.48	1455.64	-1818.01	**FAIL**	NA	NA	NA	NA	NA
Detector 2										
8/30/2023 1:13:00 AM	48496.50	49918.95	1497.57	-1422.45	Pass	NA	NA	NA	NA	NA
8/31/2023 1:10:00 AM	48109.14	49918.95	1497.57	-1809.81	**FAIL**	NA	NA	NA	NA	NA
Detector 3										
8/30/2023 1:14:00 AM	57013.86	59069.20	1772.08	-2055.34	**FAIL**	NA	NA	NA	NA	NA
8/31/2023 1:10:00 AM	57488.87	59069.20	1772.08	-1580.33	Pass	NA	NA	NA	NA	NA
Detector 4										
8/30/2023 1:14:00 AM	48107.63	48513.93	1455.42	-406.30	Pass	NA	NA	NA	NA	NA
8/31/2023 1:11:00 AM	48282.92	48513.93	1455.42	-231.00	Pass	NA	NA	NA	NA	NA
Detector 5										
8/30/2023 1:14:00 AM	54620.24	54077.08	1622.31	543.17	Pass	NA	NA	NA	NA	NA
8/31/2023 1:11:00 AM	54744.68	54077.08	1622.31	667.60	Pass	NA	NA	NA	NA	NA
Detector 6										
8/30/2023 1:14:00 AM	49756.55	49158.55	1474.76	598.00	Pass	NA	NA	NA	NA	NA
8/31/2023 1:11:00 AM	49416.83	49158.55	1474.76	258.28	Pass	NA	NA	NA	NA	NA
Detector 7										
8/30/2023 1:15:00 AM	44219.17	45414.23	1362.43	-1195.06	Pass	NA	NA	NA	NA	NA
8/31/2023 1:09:00 AM	44370.96	45414.23	1362.43	-1043.26	Pass	NA	NA	NA	NA	NA
Detector 8										
8/30/2023 1:03:00 AM	49157.18	49452.15	1483.56	-294.97	Pass	NA	NA	NA	NA	NA
8/31/2023 1:04:00 AM	49212.13	49452.15	1483.56	-240.02	Pass	NA	NA	NA	NA	NA
Detector 9										
8/30/2023 1:03:00 AM	48060.34	48747.90	1462.44	-687.56	Pass	NA	NA	NA	NA	NA
8/31/2023 1:04:00 AM	47876.24	48747.90	1462.44	-871.66	Pass	NA	NA	NA	NA	NA
Detector 11										
8/30/2023 1:03:00 AM	59565.69	59142.43	1774.27	423.27	Pass	NA	NA	NA	NA	NA
8/31/2023 1:04:00 AM	59165.80	59142.43	1774.27	23.38	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Orange

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 12										
8/30/2023 1:03:00 AM	48903.89	49073.15	1472.19	-169.26	Pass	NA	NA	NA	NA	NA
8/31/2023 1:04:00 AM	48739.18	49073.15	1472.19	-333.97	Pass	NA	NA	NA	NA	NA
Detector 13										
8/30/2023 1:03:00 AM	55162.97	55204.43	1656.13	-41.45	Pass	NA	NA	NA	NA	NA
8/31/2023 1:04:00 AM	54979.35	55204.43	1656.13	-225.07	Pass	NA	NA	NA	NA	NA
Detector 14										
8/30/2023 1:03:00 AM	50770.83	51681.73	1550.45	-910.90	Pass	NA	NA	NA	NA	NA
8/31/2023 1:05:00 AM	50176.87	51681.73	1550.45	-1504.85	Pass	NA	NA	NA	NA	NA
Detector 15										
8/30/2023 1:04:00 AM	44775.32	44769.68	1343.09	5.65	Pass	NA	NA	NA	NA	NA
8/31/2023 1:05:00 AM	45074.69	44769.68	1343.09	305.02	Pass	NA	NA	NA	NA	NA
Detector 20										
8/30/2023 12:57:00 AM	48356.62	48680.95	1460.43	-324.33	Pass	NA	NA	NA	NA	NA
8/31/2023 12:54:00 AM	48440.66	48680.95	1460.43	-240.29	Pass	NA	NA	NA	NA	NA
Detector 21										
8/30/2023 12:57:00 AM	54361.17	55234.63	1657.04	-873.46	Pass	NA	NA	NA	NA	NA
8/31/2023 12:54:00 AM	55062.73	55234.63	1657.04	-171.89	Pass	NA	NA	NA	NA	NA
Detector 22										
8/30/2023 12:57:00 AM	50701.43	52617.68	1578.53	-1916.25	**FAIL**	NA	NA	NA	NA	NA
8/31/2023 12:54:00 AM	50662.27	52617.68	1578.53	-1955.41	**FAIL**	NA	NA	NA	NA	NA
Detector 23										
8/30/2023 12:57:00 AM	43836.22	45356.30	1360.69	-1520.08	**FAIL**	NA	NA	NA	NA	NA
8/31/2023 12:54:00 AM	44622.31	45356.30	1360.69	-733.99	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Orange

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
8/30/2023 4:42:00 AM	0.07	0.18	0.04	-0.12	FAIL	0.36	0.40	0.07	-0.048	Pass
8/31/2023 4:37:00 AM	0.08	0.18	0.04	-0.10	Pass	0.45	0.40	0.07	0.042	Pass
Detector 1										
8/30/2023 4:42:00 AM	0.10	0.18	0.04	-0.08	Pass	0.38	0.31	0.05	0.067	Pass
8/31/2023 4:38:00 AM	0.15	0.18	0.04	-0.04	Pass	0.29	0.31	0.05	-0.023	Pass
Detector 2										
8/30/2023 4:43:00 AM	0.09	0.16	0.04	-0.07	Pass	0.21	0.32	0.04	-0.111	Pass
8/31/2023 4:39:00 AM	0.12	0.16	0.04	-0.04	Pass	0.33	0.32	0.04	0.004	Pass
Detector 3										
8/30/2023 4:43:00 AM	0.23	0.36	0.05	-0.13	Pass	0.49	0.49	0.08	0.001	Pass
8/31/2023 4:39:00 AM	0.15	0.36	0.05	-0.21	FAIL	0.34	0.49	0.08	-0.149	Pass
Detector 4										
8/30/2023 4:43:00 AM	0.11	0.20	0.03	-0.09	Pass	0.40	0.35	0.05	0.045	Pass
8/31/2023 4:40:00 AM	0.13	0.20	0.03	-0.07	Pass	0.23	0.35	0.05	-0.130	Pass
Detector 5										
8/30/2023 4:43:00 AM	0.10	0.19	0.04	-0.10	Pass	0.36	0.35	0.07	0.014	Pass
8/31/2023 4:40:00 AM	0.10	0.19	0.04	-0.09	Pass	0.22	0.35	0.07	-0.131	Pass
Detector 6										
8/30/2023 4:43:00 AM	0.08	0.20	0.04	-0.12	Pass	0.52	0.33	0.05	0.193	FAIL
8/31/2023 4:41:00 AM	0.09	0.20	0.04	-0.11	Pass	0.48	0.33	0.05	0.153	Pass
Detector 7										
8/30/2023 4:44:00 AM	0.14	0.20	0.05	-0.06	Pass	0.27	0.44	0.10	-0.171	Pass
8/31/2023 4:41:00 AM	0.14	0.20	0.05	-0.06	Pass	0.47	0.44	0.10	0.030	Pass
Detector 8										
8/30/2023 4:44:00 AM	0.11	0.16	0.03	-0.05	Pass	0.45	0.29	0.17	0.164	Pass
8/31/2023 4:42:00 AM	0.08	0.16	0.03	-0.08	Pass	0.47	0.29	0.17	0.179	Pass
Detector 9										
8/30/2023 4:44:00 AM	0.06	0.15	0.04	-0.09	Pass	0.38	0.29	0.17	0.084	Pass
8/31/2023 4:42:00 AM	0.10	0.15	0.04	-0.05	Pass	0.44	0.29	0.17	0.149	Pass
Detector 11										
8/30/2023 4:44:00 AM	0.07	0.21	0.04	-0.15	FAIL	0.43	0.44	0.26	-0.013	Pass
8/31/2023 4:43:00 AM	0.10	0.21	0.04	-0.12	Pass	0.57	0.44	0.26	0.128	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Orange

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 12										
8/30/2023 4:45:00 AM	0.12	0.20	0.05	-0.08	Pass	0.24	0.38	0.12	-0.143	Pass
8/31/2023 4:43:00 AM	0.12	0.20	0.05	-0.08	Pass	0.37	0.38	0.12	-0.018	Pass
Detector 13										
8/30/2023 4:45:00 AM	0.10	0.19	0.03	-0.09	Pass	0.28	0.39	0.13	-0.106	Pass
8/31/2023 4:43:00 AM	0.10	0.19	0.03	-0.09	Pass	0.27	0.39	0.13	-0.116	Pass
Detector 14										
8/30/2023 4:45:00 AM	0.06	0.20	0.03	-0.14	FAIL	0.21	0.37	0.14	-0.159	Pass
8/31/2023 4:43:00 AM	0.12	0.20	0.03	-0.08	Pass	0.31	0.37	0.14	-0.059	Pass
Detector 15										
8/30/2023 4:45:00 AM	0.09	0.18	0.03	-0.10	FAIL	0.49	0.35	0.09	0.136	Pass
8/31/2023 4:43:00 AM	0.10	0.18	0.03	-0.09	Pass	0.45	0.35	0.09	0.096	Pass
Detector 20										
8/30/2023 4:46:00 AM	0.09	0.25	0.04	-0.17	FAIL	0.33	0.52	0.13	-0.194	Pass
8/31/2023 4:35:00 AM	0.05	0.25	0.04	-0.20	FAIL	0.31	0.52	0.13	-0.214	Pass
Detector 21										
8/30/2023 4:46:00 AM	0.09	0.18	0.04	-0.09	Pass	0.29	0.41	0.10	-0.116	Pass
8/31/2023 4:35:00 AM	0.08	0.18	0.04	-0.10	Pass	0.30	0.41	0.10	-0.106	Pass
Detector 22										
8/30/2023 4:46:00 AM	0.13	0.20	0.04	-0.08	Pass	0.33	0.50	0.13	-0.174	Pass
8/31/2023 4:37:00 AM	0.09	0.20	0.04	-0.11	Pass	0.37	0.50	0.13	-0.134	Pass
Detector 23										
8/30/2023 4:46:00 AM	0.06	0.20	0.04	-0.14	FAIL	0.31	0.50	0.12	-0.195	Pass
8/31/2023 4:37:00 AM	0.14	0.20	0.04	-0.06	Pass	0.37	0.50	0.12	-0.140	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
8/29/2023 12:43:00 AM	10120.62	10005.95	300.18	114.67	Pass	3482.00	3304.25	47.99	177.750	DOEF
8/30/2023 12:42:00 AM	9967.97	10005.95	300.18	-37.98	Pass	3346.00	3304.25	47.99	41.750	Pass
Detector 1										
8/29/2023 12:43:00 AM	11503.41	11474.00	344.22	29.41	Pass	3783.50	3668.10	92.50	115.400	Pass
8/30/2023 12:42:00 AM	11568.55	11474.00	344.22	94.55	Pass	3792.00	3668.10	92.50	123.900	Pass
Detector 2										
8/29/2023 12:43:00 AM	10801.00	10779.28	323.38	21.73	Pass	3728.50	3622.45	60.39	106.050	Pass
8/30/2023 12:42:00 AM	10756.49	10779.28	323.38	-22.78	Pass	3701.50	3622.45	60.39	79.050	Pass
Detector 3										
8/29/2023 12:43:00 AM	11471.87	11620.73	348.62	-148.85	Pass	4312.00	4154.53	83.95	157.475	Pass
8/30/2023 12:43:00 AM	11466.42	11620.73	348.62	-154.31	Pass	4276.00	4154.53	83.95	121.475	Pass
Detector 8										
8/29/2023 12:55:00 AM	9824.74	9904.33	297.13	-79.59	Pass	3454.50	3192.58	64.13	261.925	DOEF
8/30/2023 12:56:00 AM	9845.81	9904.33	297.13	-58.52	Pass	3376.00	3192.58	64.13	183.425	WARNING
Detector 9										
8/29/2023 12:55:00 AM	11261.10	11361.38	340.84	-100.27	Pass	3989.00	3899.85	43.84	89.150	WARNING
8/30/2023 12:56:00 AM	11332.74	11361.38	340.84	-28.63	Pass	4032.50	3899.85	43.84	132.650	DOEF
Detector 10										
8/29/2023 12:56:00 AM	10644.80	10759.58	322.79	-114.77	Pass	3884.50	3707.40	46.90	177.100	DOEF
8/30/2023 12:56:00 AM	10733.46	10759.58	322.79	-26.11	Pass	3860.50	3707.40	46.90	153.100	DOEF
Detector 11										
8/29/2023 12:56:00 AM	11368.74	11694.93	350.85	-326.18	Pass	4219.00	3629.48	107.65	589.525	DOEF
8/30/2023 12:57:00 AM	11358.78	11694.93	350.85	-336.15	Pass	4158.50	3629.48	107.65	529.025	DOEF
Detector 16										
8/29/2023 12:48:00 AM	9548.87	9851.13	295.53	-302.26	FAIL	3281.00	3068.29	89.69	212.711	WARNING
8/30/2023 12:50:00 AM	9711.12	9851.13	295.53	-140.01	Pass	3366.00	3068.29	89.69	297.711	DOEF
Detector 17										
8/29/2023 12:48:00 AM	11665.61	11664.32	349.93	1.30	Pass	3421.50	3276.32	55.74	145.184	WARNING
8/30/2023 12:50:00 AM	11587.56	11664.32	349.93	-76.75	Pass	3427.00	3276.32	55.74	150.684	WARNING
Detector 18										
8/29/2023 12:48:00 AM	10638.78	10763.16	322.89	-124.37	Pass	3909.50	3698.37	56.57	211.132	DOEF
8/30/2023 12:50:00 AM	10687.39	10763.16	322.89	-75.76	Pass	3874.50	3698.37	56.57	176.132	DOEF

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 19										
8/29/2023 12:48:00 AM	11879.39	11980.39	359.41	-101.00	Pass	4096.50	3947.45	80.92	149.053	Pass
8/30/2023 12:50:00 AM	11912.49	11980.39	359.41	-67.91	Pass	4124.00	3947.45	80.92	176.553	**WARNING**
Detector 20										
8/29/2023 12:43:00 AM	15518.61	15638.68	469.16	-120.08	Pass	5007.50	4996.66	60.03	10.842	Pass
8/30/2023 12:43:00 AM	15521.68	15638.68	469.16	-117.01	Pass	4965.50	4996.66	60.03	-31.158	Pass
Detector 21										
8/29/2023 12:43:00 AM	15190.68	15339.71	460.19	-149.03	Pass	5258.50	5084.89	57.28	173.605	**DOEF**
8/30/2023 12:43:00 AM	15348.45	15339.71	460.19	8.74	Pass	5224.50	5084.89	57.28	139.605	**WARNING**
Detector 22										
8/29/2023 12:43:00 AM	12509.71	12713.74	381.41	-204.03	Pass	4439.50	4136.55	78.76	302.947	**DOEF**
8/30/2023 12:43:00 AM	12549.31	12713.74	381.41	-164.42	Pass	4505.50	4136.55	78.76	368.947	**DOEF**
Detector 23										
8/29/2023 12:43:00 AM	12671.92	12915.71	387.47	-243.79	Pass	4972.50	4694.21	79.75	278.289	**DOEF**
8/30/2023 12:43:00 AM	12789.63	12915.71	387.47	-126.08	Pass	4926.00	4694.21	79.75	231.789	**WARNING**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
8/29/2023 12:49:00 AM	49381.32	50226.98	1506.81	-845.66	Pass	NA	NA	NA	NA	NA
8/30/2023 12:50:00 AM	49863.33	50226.98	1506.81	-363.64	Pass	NA	NA	NA	NA	NA
Detector 1										
8/29/2023 12:49:00 AM	48139.33	48796.70	1463.90	-657.37	Pass	NA	NA	NA	NA	NA
8/30/2023 12:50:00 AM	48090.46	48796.70	1463.90	-706.24	Pass	NA	NA	NA	NA	NA
Detector 2										
8/29/2023 12:49:00 AM	49579.90	50875.48	1526.26	-1295.58	Pass	NA	NA	NA	NA	NA
8/30/2023 12:51:00 AM	49606.14	50875.48	1526.26	-1269.33	Pass	NA	NA	NA	NA	NA
Detector 3										
8/29/2023 12:49:00 AM	59294.70	60107.23	1803.22	-812.53	Pass	NA	NA	NA	NA	NA
8/30/2023 12:51:00 AM	59393.36	60107.23	1803.22	-713.87	Pass	NA	NA	NA	NA	NA
Detector 8										
8/29/2023 12:44:00 AM	49527.50	50025.35	1500.76	-497.85	Pass	NA	NA	NA	NA	NA
8/30/2023 12:44:00 AM	49851.75	50025.35	1500.76	-173.60	Pass	NA	NA	NA	NA	NA
Detector 9										
8/29/2023 12:44:00 AM	48094.40	48665.90	1459.98	-571.50	Pass	NA	NA	NA	NA	NA
8/30/2023 12:44:00 AM	47973.55	48665.90	1459.98	-692.35	Pass	NA	NA	NA	NA	NA
Detector 10										
8/29/2023 12:44:00 AM	49471.24	50649.48	1519.48	-1178.24	Pass	NA	NA	NA	NA	NA
8/30/2023 12:44:00 AM	49639.87	50649.48	1519.48	-1009.60	Pass	NA	NA	NA	NA	NA
Detector 11										
8/29/2023 12:44:00 AM	58730.12	59849.50	1795.49	-1119.38	Pass	NA	NA	NA	NA	NA
8/30/2023 12:44:00 AM	58674.28	59849.50	1795.49	-1175.22	Pass	NA	NA	NA	NA	NA
Detector 16										
8/29/2023 12:57:00 AM	49168.56	49489.98	1484.70	-321.42	Pass	NA	NA	NA	NA	NA
8/30/2023 12:57:00 AM	49222.91	49489.98	1484.70	-267.07	Pass	NA	NA	NA	NA	NA
Detector 17										
8/29/2023 12:57:00 AM	46046.29	46812.78	1404.38	-766.49	Pass	NA	NA	NA	NA	NA
8/30/2023 12:57:00 AM	46094.69	46812.78	1404.38	-718.09	Pass	NA	NA	NA	NA	NA
Detector 18										
8/29/2023 12:57:00 AM	49074.39	50124.63	1503.74	-1050.23	Pass	NA	NA	NA	NA	NA
8/30/2023 12:57:00 AM	49268.84	50124.63	1503.74	-855.78	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 19										
8/29/2023 12:57:00 AM	57516.66	57663.50	1729.91	-146.84	Pass	NA	NA	NA	NA	NA
8/30/2023 12:57:00 AM	57529.82	57663.50	1729.91	-133.68	Pass	NA	NA	NA	NA	NA
Detector 20										
8/29/2023 12:48:00 AM	49337.18	49753.68	1492.61	-416.49	Pass	NA	NA	NA	NA	NA
8/30/2023 12:50:00 AM	48959.19	49753.68	1492.61	-794.49	Pass	NA	NA	NA	NA	NA
Detector 21										
8/29/2023 12:49:00 AM	54763.72	54662.13	1639.86	101.59	Pass	NA	NA	NA	NA	NA
8/30/2023 12:50:00 AM	54876.43	54662.13	1639.86	214.31	Pass	NA	NA	NA	NA	NA
Detector 22										
8/29/2023 12:49:00 AM	51541.12	52239.03	1567.17	-697.91	Pass	NA	NA	NA	NA	NA
8/30/2023 12:50:00 AM	51346.99	52239.03	1567.17	-892.04	Pass	NA	NA	NA	NA	NA
Detector 23										
8/29/2023 12:49:00 AM	44734.97	45717.00	1371.51	-982.03	Pass	NA	NA	NA	NA	NA
8/30/2023 12:50:00 AM	44607.58	45717.00	1371.51	-1109.42	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
8/29/2023 4:19:00 AM	0.12	0.25	0.04	-0.13	FAIL	3.41	0.55	0.07	2.858	FAIL
8/30/2023 4:20:00 AM	0.19	0.25	0.04	-0.06	Pass	3.35	0.55	0.07	2.803	FAIL
Detector 1										
8/29/2023 4:19:00 AM	0.35	0.62	0.06	-0.28	FAIL	0.49	0.83	0.09	-0.342	FAIL
8/30/2023 4:20:00 AM	0.45	0.62	0.06	-0.18	FAIL	0.74	0.83	0.09	-0.092	Pass
Detector 2										
8/29/2023 4:19:00 AM	0.15	0.27	0.04	-0.12	FAIL	0.47	0.54	0.08	-0.072	Pass
8/30/2023 4:20:00 AM	0.17	0.27	0.04	-0.10	Pass	0.50	0.54	0.08	-0.047	Pass
Detector 3										
8/29/2023 4:19:00 AM	0.14	0.25	0.03	-0.11	FAIL	2.58	0.47	0.07	2.101	FAIL
8/30/2023 4:20:00 AM	0.17	0.25	0.03	-0.08	Pass	2.56	0.47	0.07	2.081	FAIL
Detector 8										
8/29/2023 4:20:00 AM	0.13	0.21	0.03	-0.08	Pass	0.43	0.52	0.06	-0.087	Pass
8/30/2023 4:20:00 AM	0.13	0.21	0.03	-0.08	Pass	0.39	0.52	0.06	-0.132	Pass
Detector 9										
8/29/2023 4:19:00 AM	0.16	0.23	0.05	-0.07	Pass	0.35	0.48	0.09	-0.135	Pass
8/30/2023 4:21:00 AM	0.13	0.23	0.05	-0.10	Pass	0.41	0.48	0.09	-0.070	Pass
Detector 10										
8/29/2023 4:20:00 AM	0.19	0.21	0.03	-0.02	Pass	0.34	0.39	0.06	-0.055	Pass
8/30/2023 4:19:00 AM	0.16	0.21	0.03	-0.05	Pass	0.37	0.39	0.06	-0.025	Pass
Detector 11										
8/29/2023 4:20:00 AM	0.07	0.20	0.04	-0.13	FAIL	0.40	0.49	0.07	-0.091	Pass
8/30/2023 4:19:00 AM	0.07	0.20	0.04	-0.13	FAIL	0.40	0.49	0.07	-0.091	Pass
Detector 16										
8/29/2023 4:20:00 AM	0.15	0.19	0.04	-0.04	Pass	0.39	0.47	0.06	-0.081	Pass
8/30/2023 4:18:00 AM	0.11	0.19	0.04	-0.09	Pass	0.55	0.47	0.06	0.079	Pass
Detector 17										
8/29/2023 4:20:00 AM	0.11	0.22	0.05	-0.11	Pass	0.28	0.36	0.06	-0.086	Pass
8/30/2023 4:18:00 AM	0.14	0.22	0.05	-0.08	Pass	0.35	0.36	0.06	-0.011	Pass
Detector 18										
8/29/2023 4:20:00 AM	0.11	0.20	0.03	-0.09	FAIL	0.32	0.42	0.06	-0.109	Pass
8/30/2023 4:19:00 AM	0.14	0.20	0.03	-0.06	Pass	0.37	0.42	0.06	-0.059	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 19										
8/29/2023 4:20:00 AM	0.13	0.23	0.04	-0.11	Pass	0.57	0.52	0.07	0.050	Pass
8/30/2023 4:19:00 AM	0.12	0.23	0.04	-0.12	FAIL	0.44	0.52	0.07	-0.085	Pass
Detector 20										
8/29/2023 4:20:00 AM	0.17	0.24	0.04	-0.07	Pass	0.37	0.47	0.08	-0.104	Pass
8/30/2023 4:19:00 AM	0.09	0.24	0.04	-0.15	FAIL	0.41	0.47	0.08	-0.064	Pass
Detector 21										
8/29/2023 4:20:00 AM	0.14	0.21	0.04	-0.07	Pass	0.21	0.27	0.04	-0.062	Pass
8/30/2023 4:19:00 AM	0.10	0.21	0.04	-0.11	Pass	0.33	0.27	0.04	0.053	Pass
Detector 22										
8/29/2023 4:20:00 AM	0.09	0.22	0.04	-0.13	Pass	0.27	0.28	0.04	-0.017	Pass
8/30/2023 4:20:00 AM	0.15	0.22	0.04	-0.07	Pass	0.28	0.28	0.04	-0.002	Pass
Detector 23										
8/29/2023 4:20:00 AM	0.28	0.90	0.14	-0.63	FAIL	0.25	0.71	0.16	-0.465	Pass
8/30/2023 4:20:00 AM	0.34	0.90	0.14	-0.57	FAIL	0.32	0.71	0.16	-0.395	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:48:00 AM	10032.90	10005.95	300.18	26.95	Pass	3361.50	3304.25	47.99	57.250	Pass
9/8/2023 12:50:00 AM	10064.99	10005.95	300.18	59.04	Pass	3359.50	3304.25	47.99	55.250	Pass
Detector 1										
9/7/2023 12:48:00 AM	11583.47	11474.00	344.22	109.47	Pass	3727.00	3668.10	92.50	58.900	Pass
9/8/2023 12:50:00 AM	11594.54	11474.00	344.22	120.54	Pass	3776.00	3668.10	92.50	107.900	Pass
Detector 2										
9/7/2023 12:49:00 AM	10549.09	10779.28	323.38	-230.18	Pass	3666.50	3622.45	60.39	44.050	Pass
9/8/2023 12:50:00 AM	10761.92	10779.28	323.38	-17.35	Pass	3684.00	3622.45	60.39	61.550	Pass
Detector 3										
9/7/2023 12:49:00 AM	11467.82	11620.73	348.62	-152.91	Pass	4245.00	4154.53	83.95	90.475	Pass
9/8/2023 12:50:00 AM	11421.31	11620.73	348.62	-199.42	Pass	4292.00	4154.53	83.95	137.475	Pass
Detector 8										
9/7/2023 12:58:00 AM	9852.16	9904.33	297.13	-52.16	Pass	3334.50	3192.58	64.13	141.925	**WARNING**
9/8/2023 1:03:00 AM	9778.61	9904.33	297.13	-125.72	Pass	3367.50	3192.58	64.13	174.925	**WARNING**
Detector 9										
9/7/2023 12:58:00 AM	11226.00	11361.38	340.84	-135.38	Pass	3883.50	3899.85	43.84	-16.350	Pass
9/8/2023 1:03:00 AM	11232.06	11361.38	340.84	-129.32	Pass	4029.00	3899.85	43.84	129.150	**WARNING**
Detector 10										
9/7/2023 12:58:00 AM	10593.65	10759.58	322.79	-165.92	Pass	3878.00	3707.40	46.90	170.600	**DOEF**
9/8/2023 1:03:00 AM	10658.79	10759.58	322.79	-100.79	Pass	3918.00	3707.40	46.90	210.600	**DOEF**
Detector 11										
9/7/2023 12:58:00 AM	11448.80	11694.93	350.85	-246.13	Pass	4026.50	3629.48	107.65	397.025	**DOEF**
9/8/2023 1:04:00 AM	11503.92	11694.93	350.85	-191.00	Pass	4111.50	3629.48	107.65	482.025	**DOEF**
Detector 16										
9/7/2023 12:55:00 AM	9797.08	9851.13	295.53	-54.05	Pass	3298.50	3068.29	89.69	230.211	**WARNING**
9/8/2023 1:00:00 AM	9855.20	9851.13	295.53	4.07	Pass	3354.00	3068.29	89.69	285.711	**DOEF**
Detector 17										
9/7/2023 12:55:00 AM	11617.01	11664.32	349.93	-47.31	Pass	3413.00	3276.32	55.74	136.684	**WARNING**
9/8/2023 12:57:00 AM	11576.51	11664.32	349.93	-87.81	Pass	3402.00	3276.32	55.74	125.684	**WARNING**
Detector 18										
9/7/2023 12:55:00 AM	10734.83	10763.16	322.89	-28.33	Pass	3867.50	3698.37	56.57	169.132	**WARNING**
9/8/2023 12:57:00 AM	10751.40	10763.16	322.89	-11.76	Pass	3877.50	3698.37	56.57	179.132	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 19										
9/7/2023 12:55:00 AM	11890.88	11980.39	359.41	-89.52	Pass	4089.50	3947.45	80.92	142.053	Pass
9/8/2023 12:57:00 AM	11718.70	11980.39	359.41	-261.70	Pass	4142.50	3947.45	80.92	195.053	**WARNING**
Detector 20										
9/7/2023 12:50:00 AM	15573.79	15638.68	469.16	-64.89	Pass	5067.00	4996.66	60.03	70.342	Pass
9/8/2023 12:50:00 AM	15353.57	15638.68	469.16	-285.12	Pass	5072.00	4996.66	60.03	75.342	Pass
Detector 21										
9/7/2023 12:51:00 AM	15126.70	15339.71	460.19	-213.02	Pass	5228.50	5084.89	57.28	143.605	**WARNING**
9/8/2023 12:50:00 AM	15177.83	15339.71	460.19	-161.88	Pass	5241.00	5084.89	57.28	156.105	**WARNING**
Detector 22										
9/7/2023 12:51:00 AM	12636.37	12713.74	381.41	-77.37	Pass	4533.50	4136.55	78.76	396.947	**DOEF**
9/8/2023 12:51:00 AM	12569.34	12713.74	381.41	-144.40	Pass	4507.50	4136.55	78.76	370.947	**DOEF**
Detector 23										
9/7/2023 12:51:00 AM	12644.88	12915.71	387.47	-270.83	Pass	4947.00	4694.21	79.75	252.789	**DOEF**
9/8/2023 12:51:00 AM	12582.35	12915.71	387.47	-333.36	Pass	5098.00	4694.21	79.75	403.789	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:55:00 AM	49481.63	50226.98	1506.81	-745.34	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49575.90	50226.98	1506.81	-651.07	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:55:00 AM	48416.85	48796.70	1463.90	-379.85	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	48203.74	48796.70	1463.90	-592.96	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:55:00 AM	50058.64	50875.48	1526.26	-816.83	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49925.78	50875.48	1526.26	-949.69	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:55:00 AM	59401.19	60107.23	1803.22	-706.04	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	59091.41	60107.23	1803.22	-1015.82	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:49:00 AM	49694.82	50025.35	1500.76	-330.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49592.97	50025.35	1500.76	-432.38	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:49:00 AM	48117.25	48665.90	1459.98	-548.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	47886.59	48665.90	1459.98	-779.31	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:50:00 AM	49415.62	50649.48	1519.48	-1233.86	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49726.26	50649.48	1519.48	-923.22	Pass	NA	NA	NA	NA	NA
Detector 11										
9/7/2023 12:50:00 AM	58604.17	59849.50	1795.49	-1245.33	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	58965.40	59849.50	1795.49	-884.10	Pass	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:58:00 AM	49075.42	49489.98	1484.70	-414.56	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49044.76	49489.98	1484.70	-445.22	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:58:00 AM	46067.91	46812.78	1404.38	-744.86	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	46100.26	46812.78	1404.38	-712.52	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:58:00 AM	49265.00	50124.63	1503.74	-859.62	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49237.23	50124.63	1503.74	-887.40	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 19										
9/7/2023 12:58:00 AM	57607.04	57663.50	1729.91	-56.46	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	57339.81	57663.50	1729.91	-323.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:55:00 AM	49199.53	49753.68	1492.61	-554.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:57:00 AM	49131.28	49753.68	1492.61	-622.39	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:55:00 AM	54715.27	54662.13	1639.86	53.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	54820.58	54662.13	1639.86	158.45	Pass	NA	NA	NA	NA	NA
Detector 22										
9/7/2023 12:55:00 AM	51354.59	52239.03	1567.17	-884.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	51116.09	52239.03	1567.17	-1122.94	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:55:00 AM	44911.51	45717.00	1371.51	-805.49	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	44801.86	45717.00	1371.51	-915.14	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:33:00 AM	0.15	0.25	0.04	-0.10	Pass	3.24	0.55	0.07	2.688	FAIL
9/8/2023 4:29:00 AM	0.20	0.25	0.04	-0.05	Pass	4.12	0.55	0.07	3.573	FAIL
Detector 1										
9/7/2023 4:33:00 AM	0.45	0.62	0.06	-0.18	FAIL	0.76	0.83	0.09	-0.077	Pass
9/8/2023 4:29:00 AM	0.49	0.62	0.06	-0.14	Pass	0.56	0.83	0.09	-0.272	FAIL
Detector 2										
9/7/2023 4:33:00 AM	0.19	0.27	0.04	-0.08	Pass	0.51	0.54	0.08	-0.032	Pass
9/8/2023 4:29:00 AM	0.15	0.27	0.04	-0.12	FAIL	0.45	0.54	0.08	-0.092	Pass
Detector 3										
9/7/2023 4:33:00 AM	0.15	0.25	0.03	-0.10	FAIL	4.74	0.47	0.07	4.266	FAIL
9/8/2023 4:29:00 AM	0.21	0.25	0.03	-0.04	Pass	2.11	0.47	0.07	1.631	FAIL
Detector 8										
9/7/2023 4:33:00 AM	0.09	0.21	0.03	-0.12	FAIL	0.54	0.52	0.06	0.023	Pass
9/8/2023 4:29:00 AM	0.10	0.21	0.03	-0.11	FAIL	0.50	0.52	0.06	-0.017	Pass
Detector 9										
9/7/2023 4:34:00 AM	0.12	0.23	0.05	-0.11	Pass	0.41	0.48	0.09	-0.070	Pass
9/8/2023 4:29:00 AM	0.13	0.23	0.05	-0.10	Pass	0.47	0.48	0.09	-0.010	Pass
Detector 10										
9/7/2023 4:34:00 AM	0.15	0.21	0.03	-0.06	Pass	0.33	0.39	0.06	-0.060	Pass
9/8/2023 4:29:00 AM	0.11	0.21	0.03	-0.10	FAIL	0.40	0.39	0.06	0.005	Pass
Detector 11										
9/7/2023 4:34:00 AM	0.05	0.20	0.04	-0.15	FAIL	0.42	0.49	0.07	-0.066	Pass
9/8/2023 4:29:00 AM	0.02	0.20	0.04	-0.18	FAIL	0.36	0.49	0.07	-0.126	Pass
Detector 16										
9/7/2023 4:32:00 AM	0.15	0.19	0.04	-0.04	Pass	0.34	0.47	0.06	-0.136	Pass
9/8/2023 4:29:00 AM	0.14	0.19	0.04	-0.06	Pass	0.37	0.47	0.06	-0.106	Pass
Detector 17										
9/7/2023 4:32:00 AM	0.10	0.22	0.05	-0.13	Pass	0.28	0.36	0.06	-0.081	Pass
9/8/2023 4:29:00 AM	0.14	0.22	0.05	-0.08	Pass	0.37	0.36	0.06	0.009	Pass
Detector 18										
9/7/2023 4:32:00 AM	0.16	0.20	0.03	-0.04	Pass	0.32	0.42	0.06	-0.104	Pass
9/8/2023 4:29:00 AM	0.14	0.20	0.03	-0.06	Pass	0.35	0.42	0.06	-0.079	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 19										
9/7/2023 4:33:00 AM	0.09	0.23	0.04	-0.15	FAIL	0.40	0.52	0.07	-0.125	Pass
9/8/2023 4:30:00 AM	0.13	0.23	0.04	-0.10	Pass	0.35	0.52	0.07	-0.175	Pass
Detector 20										
9/7/2023 4:34:00 AM	0.24	0.24	0.04	0.00	Pass	0.33	0.47	0.08	-0.149	Pass
9/8/2023 4:30:00 AM	0.16	0.24	0.04	-0.08	Pass	0.45	0.47	0.08	-0.024	Pass
Detector 21										
9/7/2023 4:34:00 AM	0.14	0.21	0.04	-0.07	Pass	0.23	0.27	0.04	-0.047	Pass
9/8/2023 4:30:00 AM	0.15	0.21	0.04	-0.06	Pass	0.23	0.27	0.04	-0.042	Pass
Detector 22										
9/7/2023 4:34:00 AM	0.15	0.22	0.04	-0.07	Pass	0.25	0.28	0.04	-0.032	Pass
9/8/2023 4:30:00 AM	0.18	0.22	0.04	-0.04	Pass	0.25	0.28	0.04	-0.032	Pass
Detector 23										
9/7/2023 4:34:00 AM	0.27	0.90	0.14	-0.63	FAIL	0.32	0.71	0.16	-0.400	Pass
9/8/2023 4:30:00 AM	0.35	0.90	0.14	-0.56	FAIL	0.38	0.71	0.16	-0.335	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:48:00 AM	10032.90	10005.95	300.18	26.95	Pass	3361.50	3304.25	47.99	57.250	Pass
9/8/2023 12:50:00 AM	10064.99	10005.95	300.18	59.04	Pass	3359.50	3304.25	47.99	55.250	Pass
Detector 1										
9/7/2023 12:48:00 AM	11583.47	11474.00	344.22	109.47	Pass	3727.00	3668.10	92.50	58.900	Pass
9/8/2023 12:50:00 AM	11594.54	11474.00	344.22	120.54	Pass	3776.00	3668.10	92.50	107.900	Pass
Detector 2										
9/7/2023 12:49:00 AM	10549.09	10779.28	323.38	-230.18	Pass	3666.50	3622.45	60.39	44.050	Pass
9/8/2023 12:50:00 AM	10761.92	10779.28	323.38	-17.35	Pass	3684.00	3622.45	60.39	61.550	Pass
Detector 3										
9/7/2023 12:49:00 AM	11467.82	11620.73	348.62	-152.91	Pass	4245.00	4154.53	83.95	90.475	Pass
9/8/2023 12:50:00 AM	11421.31	11620.73	348.62	-199.42	Pass	4292.00	4154.53	83.95	137.475	Pass
Detector 8										
9/7/2023 12:58:00 AM	9852.16	9904.33	297.13	-52.16	Pass	3334.50	3192.58	64.13	141.925	**WARNING**
9/8/2023 1:03:00 AM	9778.61	9904.33	297.13	-125.72	Pass	3367.50	3192.58	64.13	174.925	**WARNING**
Detector 9										
9/7/2023 12:58:00 AM	11226.00	11361.38	340.84	-135.38	Pass	3883.50	3899.85	43.84	-16.350	Pass
9/8/2023 1:03:00 AM	11232.06	11361.38	340.84	-129.32	Pass	4029.00	3899.85	43.84	129.150	**WARNING**
Detector 10										
9/7/2023 12:58:00 AM	10593.65	10759.58	322.79	-165.92	Pass	3878.00	3707.40	46.90	170.600	**DOEF**
9/8/2023 1:03:00 AM	10658.79	10759.58	322.79	-100.79	Pass	3918.00	3707.40	46.90	210.600	**DOEF**
Detector 11										
9/7/2023 12:58:00 AM	11448.80	11694.93	350.85	-246.13	Pass	4026.50	3629.48	107.65	397.025	**DOEF**
9/8/2023 1:04:00 AM	11503.92	11694.93	350.85	-191.00	Pass	4111.50	3629.48	107.65	482.025	**DOEF**
Detector 16										
9/7/2023 12:55:00 AM	9797.08	9851.13	295.53	-54.05	Pass	3298.50	3068.29	89.69	230.211	**WARNING**
9/8/2023 1:00:00 AM	9855.20	9851.13	295.53	4.07	Pass	3354.00	3068.29	89.69	285.711	**DOEF**
Detector 17										
9/7/2023 12:55:00 AM	11617.01	11664.32	349.93	-47.31	Pass	3413.00	3276.32	55.74	136.684	**WARNING**
9/8/2023 12:57:00 AM	11576.51	11664.32	349.93	-87.81	Pass	3402.00	3276.32	55.74	125.684	**WARNING**
Detector 18										
9/7/2023 12:55:00 AM	10734.83	10763.16	322.89	-28.33	Pass	3867.50	3698.37	56.57	169.132	**WARNING**
9/8/2023 12:57:00 AM	10751.40	10763.16	322.89	-11.76	Pass	3877.50	3698.37	56.57	179.132	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 19										
9/7/2023 12:55:00 AM	11890.88	11980.39	359.41	-89.52	Pass	4089.50	3947.45	80.92	142.053	Pass
9/8/2023 12:57:00 AM	11718.70	11980.39	359.41	-261.70	Pass	4142.50	3947.45	80.92	195.053	**WARNING**
Detector 20										
9/7/2023 12:50:00 AM	15573.79	15638.68	469.16	-64.89	Pass	5067.00	4996.66	60.03	70.342	Pass
9/8/2023 12:50:00 AM	15353.57	15638.68	469.16	-285.12	Pass	5072.00	4996.66	60.03	75.342	Pass
Detector 21										
9/7/2023 12:51:00 AM	15126.70	15339.71	460.19	-213.02	Pass	5228.50	5084.89	57.28	143.605	**WARNING**
9/8/2023 12:50:00 AM	15177.83	15339.71	460.19	-161.88	Pass	5241.00	5084.89	57.28	156.105	**WARNING**
Detector 22										
9/7/2023 12:51:00 AM	12636.37	12713.74	381.41	-77.37	Pass	4533.50	4136.55	78.76	396.947	**DOEF**
9/8/2023 12:51:00 AM	12569.34	12713.74	381.41	-144.40	Pass	4507.50	4136.55	78.76	370.947	**DOEF**
Detector 23										
9/7/2023 12:51:00 AM	12644.88	12915.71	387.47	-270.83	Pass	4947.00	4694.21	79.75	252.789	**DOEF**
9/8/2023 12:51:00 AM	12582.35	12915.71	387.47	-333.36	Pass	5098.00	4694.21	79.75	403.789	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:55:00 AM	49481.63	50226.98	1506.81	-745.34	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49575.90	50226.98	1506.81	-651.07	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:55:00 AM	48416.85	48796.70	1463.90	-379.85	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	48203.74	48796.70	1463.90	-592.96	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:55:00 AM	50058.64	50875.48	1526.26	-816.83	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49925.78	50875.48	1526.26	-949.69	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:55:00 AM	59401.19	60107.23	1803.22	-706.04	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	59091.41	60107.23	1803.22	-1015.82	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:49:00 AM	49694.82	50025.35	1500.76	-330.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49592.97	50025.35	1500.76	-432.38	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:49:00 AM	48117.25	48665.90	1459.98	-548.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	47886.59	48665.90	1459.98	-779.31	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:50:00 AM	49415.62	50649.48	1519.48	-1233.86	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49726.26	50649.48	1519.48	-923.22	Pass	NA	NA	NA	NA	NA
Detector 11										
9/7/2023 12:50:00 AM	58604.17	59849.50	1795.49	-1245.33	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	58965.40	59849.50	1795.49	-884.10	Pass	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:58:00 AM	49075.42	49489.98	1484.70	-414.56	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49044.76	49489.98	1484.70	-445.22	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:58:00 AM	46067.91	46812.78	1404.38	-744.86	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	46100.26	46812.78	1404.38	-712.52	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:58:00 AM	49265.00	50124.63	1503.74	-859.62	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49237.23	50124.63	1503.74	-887.40	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 19										
9/7/2023 12:58:00 AM	57607.04	57663.50	1729.91	-56.46	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	57339.81	57663.50	1729.91	-323.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:55:00 AM	49199.53	49753.68	1492.61	-554.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:57:00 AM	49131.28	49753.68	1492.61	-622.39	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:55:00 AM	54715.27	54662.13	1639.86	53.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	54820.58	54662.13	1639.86	158.45	Pass	NA	NA	NA	NA	NA
Detector 22										
9/7/2023 12:55:00 AM	51354.59	52239.03	1567.17	-884.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	51116.09	52239.03	1567.17	-1122.94	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:55:00 AM	44911.51	45717.00	1371.51	-805.49	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	44801.86	45717.00	1371.51	-915.14	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:33:00 AM	0.15	0.25	0.04	-0.10	Pass	3.24	0.55	0.07	2.688	FAIL
9/8/2023 4:29:00 AM	0.20	0.25	0.04	-0.05	Pass	4.12	0.55	0.07	3.573	FAIL
Detector 1										
9/7/2023 4:33:00 AM	0.45	0.62	0.06	-0.18	FAIL	0.76	0.83	0.09	-0.077	Pass
9/8/2023 4:29:00 AM	0.49	0.62	0.06	-0.14	Pass	0.56	0.83	0.09	-0.272	FAIL
Detector 2										
9/7/2023 4:33:00 AM	0.19	0.27	0.04	-0.08	Pass	0.51	0.54	0.08	-0.032	Pass
9/8/2023 4:29:00 AM	0.15	0.27	0.04	-0.12	FAIL	0.45	0.54	0.08	-0.092	Pass
Detector 3										
9/7/2023 4:33:00 AM	0.15	0.25	0.03	-0.10	FAIL	4.74	0.47	0.07	4.266	FAIL
9/8/2023 4:29:00 AM	0.21	0.25	0.03	-0.04	Pass	2.11	0.47	0.07	1.631	FAIL
Detector 8										
9/7/2023 4:33:00 AM	0.09	0.21	0.03	-0.12	FAIL	0.54	0.52	0.06	0.023	Pass
9/8/2023 4:29:00 AM	0.10	0.21	0.03	-0.11	FAIL	0.50	0.52	0.06	-0.017	Pass
Detector 9										
9/7/2023 4:34:00 AM	0.12	0.23	0.05	-0.11	Pass	0.41	0.48	0.09	-0.070	Pass
9/8/2023 4:29:00 AM	0.13	0.23	0.05	-0.10	Pass	0.47	0.48	0.09	-0.010	Pass
Detector 10										
9/7/2023 4:34:00 AM	0.15	0.21	0.03	-0.06	Pass	0.33	0.39	0.06	-0.060	Pass
9/8/2023 4:29:00 AM	0.11	0.21	0.03	-0.10	FAIL	0.40	0.39	0.06	0.005	Pass
Detector 11										
9/7/2023 4:34:00 AM	0.05	0.20	0.04	-0.15	FAIL	0.42	0.49	0.07	-0.066	Pass
9/8/2023 4:29:00 AM	0.02	0.20	0.04	-0.18	FAIL	0.36	0.49	0.07	-0.126	Pass
Detector 16										
9/7/2023 4:32:00 AM	0.15	0.19	0.04	-0.04	Pass	0.34	0.47	0.06	-0.136	Pass
9/8/2023 4:29:00 AM	0.14	0.19	0.04	-0.06	Pass	0.37	0.47	0.06	-0.106	Pass
Detector 17										
9/7/2023 4:32:00 AM	0.10	0.22	0.05	-0.13	Pass	0.28	0.36	0.06	-0.081	Pass
9/8/2023 4:29:00 AM	0.14	0.22	0.05	-0.08	Pass	0.37	0.36	0.06	0.009	Pass
Detector 18										
9/7/2023 4:32:00 AM	0.16	0.20	0.03	-0.04	Pass	0.32	0.42	0.06	-0.104	Pass
9/8/2023 4:29:00 AM	0.14	0.20	0.03	-0.06	Pass	0.35	0.42	0.06	-0.079	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 19										
9/7/2023 4:33:00 AM	0.09	0.23	0.04	-0.15	FAIL	0.40	0.52	0.07	-0.125	Pass
9/8/2023 4:30:00 AM	0.13	0.23	0.04	-0.10	Pass	0.35	0.52	0.07	-0.175	Pass
Detector 20										
9/7/2023 4:34:00 AM	0.24	0.24	0.04	0.00	Pass	0.33	0.47	0.08	-0.149	Pass
9/8/2023 4:30:00 AM	0.16	0.24	0.04	-0.08	Pass	0.45	0.47	0.08	-0.024	Pass
Detector 21										
9/7/2023 4:34:00 AM	0.14	0.21	0.04	-0.07	Pass	0.23	0.27	0.04	-0.047	Pass
9/8/2023 4:30:00 AM	0.15	0.21	0.04	-0.06	Pass	0.23	0.27	0.04	-0.042	Pass
Detector 22										
9/7/2023 4:34:00 AM	0.15	0.22	0.04	-0.07	Pass	0.25	0.28	0.04	-0.032	Pass
9/8/2023 4:30:00 AM	0.18	0.22	0.04	-0.04	Pass	0.25	0.28	0.04	-0.032	Pass
Detector 23										
9/7/2023 4:34:00 AM	0.27	0.90	0.14	-0.63	FAIL	0.32	0.71	0.16	-0.400	Pass
9/8/2023 4:30:00 AM	0.35	0.90	0.14	-0.56	FAIL	0.38	0.71	0.16	-0.335	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:48:00 AM	10032.90	10005.95	300.18	26.95	Pass	3361.50	3304.25	47.99	57.250	Pass
9/8/2023 12:50:00 AM	10064.99	10005.95	300.18	59.04	Pass	3359.50	3304.25	47.99	55.250	Pass
Detector 1										
9/7/2023 12:48:00 AM	11583.47	11474.00	344.22	109.47	Pass	3727.00	3668.10	92.50	58.900	Pass
9/8/2023 12:50:00 AM	11594.54	11474.00	344.22	120.54	Pass	3776.00	3668.10	92.50	107.900	Pass
Detector 2										
9/7/2023 12:49:00 AM	10549.09	10779.28	323.38	-230.18	Pass	3666.50	3622.45	60.39	44.050	Pass
9/8/2023 12:50:00 AM	10761.92	10779.28	323.38	-17.35	Pass	3684.00	3622.45	60.39	61.550	Pass
Detector 3										
9/7/2023 12:49:00 AM	11467.82	11620.73	348.62	-152.91	Pass	4245.00	4154.53	83.95	90.475	Pass
9/8/2023 12:50:00 AM	11421.31	11620.73	348.62	-199.42	Pass	4292.00	4154.53	83.95	137.475	Pass
Detector 8										
9/7/2023 12:58:00 AM	9852.16	9904.33	297.13	-52.16	Pass	3334.50	3192.58	64.13	141.925	**WARNING**
9/8/2023 1:03:00 AM	9778.61	9904.33	297.13	-125.72	Pass	3367.50	3192.58	64.13	174.925	**WARNING**
Detector 9										
9/7/2023 12:58:00 AM	11226.00	11361.38	340.84	-135.38	Pass	3883.50	3899.85	43.84	-16.350	Pass
9/8/2023 1:03:00 AM	11232.06	11361.38	340.84	-129.32	Pass	4029.00	3899.85	43.84	129.150	**WARNING**
Detector 10										
9/7/2023 12:58:00 AM	10593.65	10759.58	322.79	-165.92	Pass	3878.00	3707.40	46.90	170.600	**DOEF**
9/8/2023 1:03:00 AM	10658.79	10759.58	322.79	-100.79	Pass	3918.00	3707.40	46.90	210.600	**DOEF**
Detector 11										
9/7/2023 12:58:00 AM	11448.80	11694.93	350.85	-246.13	Pass	4026.50	3629.48	107.65	397.025	**DOEF**
9/8/2023 1:04:00 AM	11503.92	11694.93	350.85	-191.00	Pass	4111.50	3629.48	107.65	482.025	**DOEF**
Detector 16										
9/7/2023 12:55:00 AM	9797.08	9851.13	295.53	-54.05	Pass	3298.50	3068.29	89.69	230.211	**WARNING**
9/8/2023 1:00:00 AM	9855.20	9851.13	295.53	4.07	Pass	3354.00	3068.29	89.69	285.711	**DOEF**
Detector 17										
9/7/2023 12:55:00 AM	11617.01	11664.32	349.93	-47.31	Pass	3413.00	3276.32	55.74	136.684	**WARNING**
9/8/2023 12:57:00 AM	11576.51	11664.32	349.93	-87.81	Pass	3402.00	3276.32	55.74	125.684	**WARNING**
Detector 18										
9/7/2023 12:55:00 AM	10734.83	10763.16	322.89	-28.33	Pass	3867.50	3698.37	56.57	169.132	**WARNING**
9/8/2023 12:57:00 AM	10751.40	10763.16	322.89	-11.76	Pass	3877.50	3698.37	56.57	179.132	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 19										
9/7/2023 12:55:00 AM	11890.88	11980.39	359.41	-89.52	Pass	4089.50	3947.45	80.92	142.053	Pass
9/8/2023 12:57:00 AM	11718.70	11980.39	359.41	-261.70	Pass	4142.50	3947.45	80.92	195.053	**WARNING**
Detector 20										
9/7/2023 12:50:00 AM	15573.79	15638.68	469.16	-64.89	Pass	5067.00	4996.66	60.03	70.342	Pass
9/8/2023 12:50:00 AM	15353.57	15638.68	469.16	-285.12	Pass	5072.00	4996.66	60.03	75.342	Pass
Detector 21										
9/7/2023 12:51:00 AM	15126.70	15339.71	460.19	-213.02	Pass	5228.50	5084.89	57.28	143.605	**WARNING**
9/8/2023 12:50:00 AM	15177.83	15339.71	460.19	-161.88	Pass	5241.00	5084.89	57.28	156.105	**WARNING**
Detector 22										
9/7/2023 12:51:00 AM	12636.37	12713.74	381.41	-77.37	Pass	4533.50	4136.55	78.76	396.947	**DOEF**
9/8/2023 12:51:00 AM	12569.34	12713.74	381.41	-144.40	Pass	4507.50	4136.55	78.76	370.947	**DOEF**
Detector 23										
9/7/2023 12:51:00 AM	12644.88	12915.71	387.47	-270.83	Pass	4947.00	4694.21	79.75	252.789	**DOEF**
9/8/2023 12:51:00 AM	12582.35	12915.71	387.47	-333.36	Pass	5098.00	4694.21	79.75	403.789	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:55:00 AM	49481.63	50226.98	1506.81	-745.34	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49575.90	50226.98	1506.81	-651.07	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:55:00 AM	48416.85	48796.70	1463.90	-379.85	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	48203.74	48796.70	1463.90	-592.96	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:55:00 AM	50058.64	50875.48	1526.26	-816.83	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49925.78	50875.48	1526.26	-949.69	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:55:00 AM	59401.19	60107.23	1803.22	-706.04	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	59091.41	60107.23	1803.22	-1015.82	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:49:00 AM	49694.82	50025.35	1500.76	-330.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49592.97	50025.35	1500.76	-432.38	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:49:00 AM	48117.25	48665.90	1459.98	-548.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	47886.59	48665.90	1459.98	-779.31	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:50:00 AM	49415.62	50649.48	1519.48	-1233.86	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49726.26	50649.48	1519.48	-923.22	Pass	NA	NA	NA	NA	NA
Detector 11										
9/7/2023 12:50:00 AM	58604.17	59849.50	1795.49	-1245.33	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	58965.40	59849.50	1795.49	-884.10	Pass	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:58:00 AM	49075.42	49489.98	1484.70	-414.56	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49044.76	49489.98	1484.70	-445.22	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:58:00 AM	46067.91	46812.78	1404.38	-744.86	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	46100.26	46812.78	1404.38	-712.52	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:58:00 AM	49265.00	50124.63	1503.74	-859.62	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49237.23	50124.63	1503.74	-887.40	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 19										
9/7/2023 12:58:00 AM	57607.04	57663.50	1729.91	-56.46	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	57339.81	57663.50	1729.91	-323.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:55:00 AM	49199.53	49753.68	1492.61	-554.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:57:00 AM	49131.28	49753.68	1492.61	-622.39	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:55:00 AM	54715.27	54662.13	1639.86	53.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	54820.58	54662.13	1639.86	158.45	Pass	NA	NA	NA	NA	NA
Detector 22										
9/7/2023 12:55:00 AM	51354.59	52239.03	1567.17	-884.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	51116.09	52239.03	1567.17	-1122.94	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:55:00 AM	44911.51	45717.00	1371.51	-805.49	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	44801.86	45717.00	1371.51	-915.14	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:33:00 AM	0.15	0.25	0.04	-0.10	Pass	3.24	0.55	0.07	2.688	FAIL
9/8/2023 4:29:00 AM	0.20	0.25	0.04	-0.05	Pass	4.12	0.55	0.07	3.573	FAIL
Detector 1										
9/7/2023 4:33:00 AM	0.45	0.62	0.06	-0.18	FAIL	0.76	0.83	0.09	-0.077	Pass
9/8/2023 4:29:00 AM	0.49	0.62	0.06	-0.14	Pass	0.56	0.83	0.09	-0.272	FAIL
Detector 2										
9/7/2023 4:33:00 AM	0.19	0.27	0.04	-0.08	Pass	0.51	0.54	0.08	-0.032	Pass
9/8/2023 4:29:00 AM	0.15	0.27	0.04	-0.12	FAIL	0.45	0.54	0.08	-0.092	Pass
Detector 3										
9/7/2023 4:33:00 AM	0.15	0.25	0.03	-0.10	FAIL	4.74	0.47	0.07	4.266	FAIL
9/8/2023 4:29:00 AM	0.21	0.25	0.03	-0.04	Pass	2.11	0.47	0.07	1.631	FAIL
Detector 8										
9/7/2023 4:33:00 AM	0.09	0.21	0.03	-0.12	FAIL	0.54	0.52	0.06	0.023	Pass
9/8/2023 4:29:00 AM	0.10	0.21	0.03	-0.11	FAIL	0.50	0.52	0.06	-0.017	Pass
Detector 9										
9/7/2023 4:34:00 AM	0.12	0.23	0.05	-0.11	Pass	0.41	0.48	0.09	-0.070	Pass
9/8/2023 4:29:00 AM	0.13	0.23	0.05	-0.10	Pass	0.47	0.48	0.09	-0.010	Pass
Detector 10										
9/7/2023 4:34:00 AM	0.15	0.21	0.03	-0.06	Pass	0.33	0.39	0.06	-0.060	Pass
9/8/2023 4:29:00 AM	0.11	0.21	0.03	-0.10	FAIL	0.40	0.39	0.06	0.005	Pass
Detector 11										
9/7/2023 4:34:00 AM	0.05	0.20	0.04	-0.15	FAIL	0.42	0.49	0.07	-0.066	Pass
9/8/2023 4:29:00 AM	0.02	0.20	0.04	-0.18	FAIL	0.36	0.49	0.07	-0.126	Pass
Detector 16										
9/7/2023 4:32:00 AM	0.15	0.19	0.04	-0.04	Pass	0.34	0.47	0.06	-0.136	Pass
9/8/2023 4:29:00 AM	0.14	0.19	0.04	-0.06	Pass	0.37	0.47	0.06	-0.106	Pass
Detector 17										
9/7/2023 4:32:00 AM	0.10	0.22	0.05	-0.13	Pass	0.28	0.36	0.06	-0.081	Pass
9/8/2023 4:29:00 AM	0.14	0.22	0.05	-0.08	Pass	0.37	0.36	0.06	0.009	Pass
Detector 18										
9/7/2023 4:32:00 AM	0.16	0.20	0.03	-0.04	Pass	0.32	0.42	0.06	-0.104	Pass
9/8/2023 4:29:00 AM	0.14	0.20	0.03	-0.06	Pass	0.35	0.42	0.06	-0.079	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 19										
9/7/2023 4:33:00 AM	0.09	0.23	0.04	-0.15	FAIL	0.40	0.52	0.07	-0.125	Pass
9/8/2023 4:30:00 AM	0.13	0.23	0.04	-0.10	Pass	0.35	0.52	0.07	-0.175	Pass
Detector 20										
9/7/2023 4:34:00 AM	0.24	0.24	0.04	0.00	Pass	0.33	0.47	0.08	-0.149	Pass
9/8/2023 4:30:00 AM	0.16	0.24	0.04	-0.08	Pass	0.45	0.47	0.08	-0.024	Pass
Detector 21										
9/7/2023 4:34:00 AM	0.14	0.21	0.04	-0.07	Pass	0.23	0.27	0.04	-0.047	Pass
9/8/2023 4:30:00 AM	0.15	0.21	0.04	-0.06	Pass	0.23	0.27	0.04	-0.042	Pass
Detector 22										
9/7/2023 4:34:00 AM	0.15	0.22	0.04	-0.07	Pass	0.25	0.28	0.04	-0.032	Pass
9/8/2023 4:30:00 AM	0.18	0.22	0.04	-0.04	Pass	0.25	0.28	0.04	-0.032	Pass
Detector 23										
9/7/2023 4:34:00 AM	0.27	0.90	0.14	-0.63	FAIL	0.32	0.71	0.16	-0.400	Pass
9/8/2023 4:30:00 AM	0.35	0.90	0.14	-0.56	FAIL	0.38	0.71	0.16	-0.335	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:48:00 AM	10032.90	10005.95	300.18	26.95	Pass	3361.50	3304.25	47.99	57.250	Pass
9/8/2023 12:50:00 AM	10064.99	10005.95	300.18	59.04	Pass	3359.50	3304.25	47.99	55.250	Pass
Detector 1										
9/7/2023 12:48:00 AM	11583.47	11474.00	344.22	109.47	Pass	3727.00	3668.10	92.50	58.900	Pass
9/8/2023 12:50:00 AM	11594.54	11474.00	344.22	120.54	Pass	3776.00	3668.10	92.50	107.900	Pass
Detector 2										
9/7/2023 12:49:00 AM	10549.09	10779.28	323.38	-230.18	Pass	3666.50	3622.45	60.39	44.050	Pass
9/8/2023 12:50:00 AM	10761.92	10779.28	323.38	-17.35	Pass	3684.00	3622.45	60.39	61.550	Pass
Detector 3										
9/7/2023 12:49:00 AM	11467.82	11620.73	348.62	-152.91	Pass	4245.00	4154.53	83.95	90.475	Pass
9/8/2023 12:50:00 AM	11421.31	11620.73	348.62	-199.42	Pass	4292.00	4154.53	83.95	137.475	Pass
Detector 8										
9/7/2023 12:58:00 AM	9852.16	9904.33	297.13	-52.16	Pass	3334.50	3192.58	64.13	141.925	**WARNING**
9/8/2023 1:03:00 AM	9778.61	9904.33	297.13	-125.72	Pass	3367.50	3192.58	64.13	174.925	**WARNING**
Detector 9										
9/7/2023 12:58:00 AM	11226.00	11361.38	340.84	-135.38	Pass	3883.50	3899.85	43.84	-16.350	Pass
9/8/2023 1:03:00 AM	11232.06	11361.38	340.84	-129.32	Pass	4029.00	3899.85	43.84	129.150	**WARNING**
Detector 10										
9/7/2023 12:58:00 AM	10593.65	10759.58	322.79	-165.92	Pass	3878.00	3707.40	46.90	170.600	**DOEF**
9/8/2023 1:03:00 AM	10658.79	10759.58	322.79	-100.79	Pass	3918.00	3707.40	46.90	210.600	**DOEF**
Detector 11										
9/7/2023 12:58:00 AM	11448.80	11694.93	350.85	-246.13	Pass	4026.50	3629.48	107.65	397.025	**DOEF**
9/8/2023 1:04:00 AM	11503.92	11694.93	350.85	-191.00	Pass	4111.50	3629.48	107.65	482.025	**DOEF**
Detector 16										
9/7/2023 12:55:00 AM	9797.08	9851.13	295.53	-54.05	Pass	3298.50	3068.29	89.69	230.211	**WARNING**
9/8/2023 1:00:00 AM	9855.20	9851.13	295.53	4.07	Pass	3354.00	3068.29	89.69	285.711	**DOEF**
Detector 17										
9/7/2023 12:55:00 AM	11617.01	11664.32	349.93	-47.31	Pass	3413.00	3276.32	55.74	136.684	**WARNING**
9/8/2023 12:57:00 AM	11576.51	11664.32	349.93	-87.81	Pass	3402.00	3276.32	55.74	125.684	**WARNING**
Detector 18										
9/7/2023 12:55:00 AM	10734.83	10763.16	322.89	-28.33	Pass	3867.50	3698.37	56.57	169.132	**WARNING**
9/8/2023 12:57:00 AM	10751.40	10763.16	322.89	-11.76	Pass	3877.50	3698.37	56.57	179.132	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 19										
9/7/2023 12:55:00 AM	11890.88	11980.39	359.41	-89.52	Pass	4089.50	3947.45	80.92	142.053	Pass
9/8/2023 12:57:00 AM	11718.70	11980.39	359.41	-261.70	Pass	4142.50	3947.45	80.92	195.053	**WARNING**
Detector 20										
9/7/2023 12:50:00 AM	15573.79	15638.68	469.16	-64.89	Pass	5067.00	4996.66	60.03	70.342	Pass
9/8/2023 12:50:00 AM	15353.57	15638.68	469.16	-285.12	Pass	5072.00	4996.66	60.03	75.342	Pass
Detector 21										
9/7/2023 12:51:00 AM	15126.70	15339.71	460.19	-213.02	Pass	5228.50	5084.89	57.28	143.605	**WARNING**
9/8/2023 12:50:00 AM	15177.83	15339.71	460.19	-161.88	Pass	5241.00	5084.89	57.28	156.105	**WARNING**
Detector 22										
9/7/2023 12:51:00 AM	12636.37	12713.74	381.41	-77.37	Pass	4533.50	4136.55	78.76	396.947	**DOEF**
9/8/2023 12:51:00 AM	12569.34	12713.74	381.41	-144.40	Pass	4507.50	4136.55	78.76	370.947	**DOEF**
Detector 23										
9/7/2023 12:51:00 AM	12644.88	12915.71	387.47	-270.83	Pass	4947.00	4694.21	79.75	252.789	**DOEF**
9/8/2023 12:51:00 AM	12582.35	12915.71	387.47	-333.36	Pass	5098.00	4694.21	79.75	403.789	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:55:00 AM	49481.63	50226.98	1506.81	-745.34	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49575.90	50226.98	1506.81	-651.07	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:55:00 AM	48416.85	48796.70	1463.90	-379.85	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	48203.74	48796.70	1463.90	-592.96	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:55:00 AM	50058.64	50875.48	1526.26	-816.83	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49925.78	50875.48	1526.26	-949.69	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:55:00 AM	59401.19	60107.23	1803.22	-706.04	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	59091.41	60107.23	1803.22	-1015.82	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:49:00 AM	49694.82	50025.35	1500.76	-330.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49592.97	50025.35	1500.76	-432.38	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:49:00 AM	48117.25	48665.90	1459.98	-548.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	47886.59	48665.90	1459.98	-779.31	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:50:00 AM	49415.62	50649.48	1519.48	-1233.86	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49726.26	50649.48	1519.48	-923.22	Pass	NA	NA	NA	NA	NA
Detector 11										
9/7/2023 12:50:00 AM	58604.17	59849.50	1795.49	-1245.33	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	58965.40	59849.50	1795.49	-884.10	Pass	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:58:00 AM	49075.42	49489.98	1484.70	-414.56	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49044.76	49489.98	1484.70	-445.22	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:58:00 AM	46067.91	46812.78	1404.38	-744.86	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	46100.26	46812.78	1404.38	-712.52	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:58:00 AM	49265.00	50124.63	1503.74	-859.62	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49237.23	50124.63	1503.74	-887.40	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 19										
9/7/2023 12:58:00 AM	57607.04	57663.50	1729.91	-56.46	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	57339.81	57663.50	1729.91	-323.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:55:00 AM	49199.53	49753.68	1492.61	-554.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:57:00 AM	49131.28	49753.68	1492.61	-622.39	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:55:00 AM	54715.27	54662.13	1639.86	53.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	54820.58	54662.13	1639.86	158.45	Pass	NA	NA	NA	NA	NA
Detector 22										
9/7/2023 12:55:00 AM	51354.59	52239.03	1567.17	-884.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	51116.09	52239.03	1567.17	-1122.94	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:55:00 AM	44911.51	45717.00	1371.51	-805.49	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	44801.86	45717.00	1371.51	-915.14	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:33:00 AM	0.15	0.25	0.04	-0.10	Pass	3.24	0.55	0.07	2.688	FAIL
9/8/2023 4:29:00 AM	0.20	0.25	0.04	-0.05	Pass	4.12	0.55	0.07	3.573	FAIL
Detector 1										
9/7/2023 4:33:00 AM	0.45	0.62	0.06	-0.18	FAIL	0.76	0.83	0.09	-0.077	Pass
9/8/2023 4:29:00 AM	0.49	0.62	0.06	-0.14	Pass	0.56	0.83	0.09	-0.272	FAIL
Detector 2										
9/7/2023 4:33:00 AM	0.19	0.27	0.04	-0.08	Pass	0.51	0.54	0.08	-0.032	Pass
9/8/2023 4:29:00 AM	0.15	0.27	0.04	-0.12	FAIL	0.45	0.54	0.08	-0.092	Pass
Detector 3										
9/7/2023 4:33:00 AM	0.15	0.25	0.03	-0.10	FAIL	4.74	0.47	0.07	4.266	FAIL
9/8/2023 4:29:00 AM	0.21	0.25	0.03	-0.04	Pass	2.11	0.47	0.07	1.631	FAIL
Detector 8										
9/7/2023 4:33:00 AM	0.09	0.21	0.03	-0.12	FAIL	0.54	0.52	0.06	0.023	Pass
9/8/2023 4:29:00 AM	0.10	0.21	0.03	-0.11	FAIL	0.50	0.52	0.06	-0.017	Pass
Detector 9										
9/7/2023 4:34:00 AM	0.12	0.23	0.05	-0.11	Pass	0.41	0.48	0.09	-0.070	Pass
9/8/2023 4:29:00 AM	0.13	0.23	0.05	-0.10	Pass	0.47	0.48	0.09	-0.010	Pass
Detector 10										
9/7/2023 4:34:00 AM	0.15	0.21	0.03	-0.06	Pass	0.33	0.39	0.06	-0.060	Pass
9/8/2023 4:29:00 AM	0.11	0.21	0.03	-0.10	FAIL	0.40	0.39	0.06	0.005	Pass
Detector 11										
9/7/2023 4:34:00 AM	0.05	0.20	0.04	-0.15	FAIL	0.42	0.49	0.07	-0.066	Pass
9/8/2023 4:29:00 AM	0.02	0.20	0.04	-0.18	FAIL	0.36	0.49	0.07	-0.126	Pass
Detector 16										
9/7/2023 4:32:00 AM	0.15	0.19	0.04	-0.04	Pass	0.34	0.47	0.06	-0.136	Pass
9/8/2023 4:29:00 AM	0.14	0.19	0.04	-0.06	Pass	0.37	0.47	0.06	-0.106	Pass
Detector 17										
9/7/2023 4:32:00 AM	0.10	0.22	0.05	-0.13	Pass	0.28	0.36	0.06	-0.081	Pass
9/8/2023 4:29:00 AM	0.14	0.22	0.05	-0.08	Pass	0.37	0.36	0.06	0.009	Pass
Detector 18										
9/7/2023 4:32:00 AM	0.16	0.20	0.03	-0.04	Pass	0.32	0.42	0.06	-0.104	Pass
9/8/2023 4:29:00 AM	0.14	0.20	0.03	-0.06	Pass	0.35	0.42	0.06	-0.079	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 19										
9/7/2023 4:33:00 AM	0.09	0.23	0.04	-0.15	FAIL	0.40	0.52	0.07	-0.125	Pass
9/8/2023 4:30:00 AM	0.13	0.23	0.04	-0.10	Pass	0.35	0.52	0.07	-0.175	Pass
Detector 20										
9/7/2023 4:34:00 AM	0.24	0.24	0.04	0.00	Pass	0.33	0.47	0.08	-0.149	Pass
9/8/2023 4:30:00 AM	0.16	0.24	0.04	-0.08	Pass	0.45	0.47	0.08	-0.024	Pass
Detector 21										
9/7/2023 4:34:00 AM	0.14	0.21	0.04	-0.07	Pass	0.23	0.27	0.04	-0.047	Pass
9/8/2023 4:30:00 AM	0.15	0.21	0.04	-0.06	Pass	0.23	0.27	0.04	-0.042	Pass
Detector 22										
9/7/2023 4:34:00 AM	0.15	0.22	0.04	-0.07	Pass	0.25	0.28	0.04	-0.032	Pass
9/8/2023 4:30:00 AM	0.18	0.22	0.04	-0.04	Pass	0.25	0.28	0.04	-0.032	Pass
Detector 23										
9/7/2023 4:34:00 AM	0.27	0.90	0.14	-0.63	FAIL	0.32	0.71	0.16	-0.400	Pass
9/8/2023 4:30:00 AM	0.35	0.90	0.14	-0.56	FAIL	0.38	0.71	0.16	-0.335	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:48:00 AM	10032.90	10005.95	300.18	26.95	Pass	3361.50	3304.25	47.99	57.250	Pass
9/8/2023 12:50:00 AM	10064.99	10005.95	300.18	59.04	Pass	3359.50	3304.25	47.99	55.250	Pass
Detector 1										
9/7/2023 12:48:00 AM	11583.47	11474.00	344.22	109.47	Pass	3727.00	3668.10	92.50	58.900	Pass
9/8/2023 12:50:00 AM	11594.54	11474.00	344.22	120.54	Pass	3776.00	3668.10	92.50	107.900	Pass
Detector 2										
9/7/2023 12:49:00 AM	10549.09	10779.28	323.38	-230.18	Pass	3666.50	3622.45	60.39	44.050	Pass
9/8/2023 12:50:00 AM	10761.92	10779.28	323.38	-17.35	Pass	3684.00	3622.45	60.39	61.550	Pass
Detector 3										
9/7/2023 12:49:00 AM	11467.82	11620.73	348.62	-152.91	Pass	4245.00	4154.53	83.95	90.475	Pass
9/8/2023 12:50:00 AM	11421.31	11620.73	348.62	-199.42	Pass	4292.00	4154.53	83.95	137.475	Pass
Detector 8										
9/7/2023 12:58:00 AM	9852.16	9904.33	297.13	-52.16	Pass	3334.50	3192.58	64.13	141.925	**WARNING**
9/8/2023 1:03:00 AM	9778.61	9904.33	297.13	-125.72	Pass	3367.50	3192.58	64.13	174.925	**WARNING**
Detector 9										
9/7/2023 12:58:00 AM	11226.00	11361.38	340.84	-135.38	Pass	3883.50	3899.85	43.84	-16.350	Pass
9/8/2023 1:03:00 AM	11232.06	11361.38	340.84	-129.32	Pass	4029.00	3899.85	43.84	129.150	**WARNING**
Detector 10										
9/7/2023 12:58:00 AM	10593.65	10759.58	322.79	-165.92	Pass	3878.00	3707.40	46.90	170.600	**DOEF**
9/8/2023 1:03:00 AM	10658.79	10759.58	322.79	-100.79	Pass	3918.00	3707.40	46.90	210.600	**DOEF**
Detector 11										
9/7/2023 12:58:00 AM	11448.80	11694.93	350.85	-246.13	Pass	4026.50	3629.48	107.65	397.025	**DOEF**
9/8/2023 1:04:00 AM	11503.92	11694.93	350.85	-191.00	Pass	4111.50	3629.48	107.65	482.025	**DOEF**
Detector 16										
9/7/2023 12:55:00 AM	9797.08	9851.13	295.53	-54.05	Pass	3298.50	3068.29	89.69	230.211	**WARNING**
9/8/2023 1:00:00 AM	9855.20	9851.13	295.53	4.07	Pass	3354.00	3068.29	89.69	285.711	**DOEF**
Detector 17										
9/7/2023 12:55:00 AM	11617.01	11664.32	349.93	-47.31	Pass	3413.00	3276.32	55.74	136.684	**WARNING**
9/8/2023 12:57:00 AM	11576.51	11664.32	349.93	-87.81	Pass	3402.00	3276.32	55.74	125.684	**WARNING**
Detector 18										
9/7/2023 12:55:00 AM	10734.83	10763.16	322.89	-28.33	Pass	3867.50	3698.37	56.57	169.132	**WARNING**
9/8/2023 12:57:00 AM	10751.40	10763.16	322.89	-11.76	Pass	3877.50	3698.37	56.57	179.132	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 19										
9/7/2023 12:55:00 AM	11890.88	11980.39	359.41	-89.52	Pass	4089.50	3947.45	80.92	142.053	Pass
9/8/2023 12:57:00 AM	11718.70	11980.39	359.41	-261.70	Pass	4142.50	3947.45	80.92	195.053	**WARNING**
Detector 20										
9/7/2023 12:50:00 AM	15573.79	15638.68	469.16	-64.89	Pass	5067.00	4996.66	60.03	70.342	Pass
9/8/2023 12:50:00 AM	15353.57	15638.68	469.16	-285.12	Pass	5072.00	4996.66	60.03	75.342	Pass
Detector 21										
9/7/2023 12:51:00 AM	15126.70	15339.71	460.19	-213.02	Pass	5228.50	5084.89	57.28	143.605	**WARNING**
9/8/2023 12:50:00 AM	15177.83	15339.71	460.19	-161.88	Pass	5241.00	5084.89	57.28	156.105	**WARNING**
Detector 22										
9/7/2023 12:51:00 AM	12636.37	12713.74	381.41	-77.37	Pass	4533.50	4136.55	78.76	396.947	**DOEF**
9/8/2023 12:51:00 AM	12569.34	12713.74	381.41	-144.40	Pass	4507.50	4136.55	78.76	370.947	**DOEF**
Detector 23										
9/7/2023 12:51:00 AM	12644.88	12915.71	387.47	-270.83	Pass	4947.00	4694.21	79.75	252.789	**DOEF**
9/8/2023 12:51:00 AM	12582.35	12915.71	387.47	-333.36	Pass	5098.00	4694.21	79.75	403.789	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:55:00 AM	49481.63	50226.98	1506.81	-745.34	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49575.90	50226.98	1506.81	-651.07	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:55:00 AM	48416.85	48796.70	1463.90	-379.85	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	48203.74	48796.70	1463.90	-592.96	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:55:00 AM	50058.64	50875.48	1526.26	-816.83	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49925.78	50875.48	1526.26	-949.69	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:55:00 AM	59401.19	60107.23	1803.22	-706.04	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	59091.41	60107.23	1803.22	-1015.82	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:49:00 AM	49694.82	50025.35	1500.76	-330.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49592.97	50025.35	1500.76	-432.38	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:49:00 AM	48117.25	48665.90	1459.98	-548.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	47886.59	48665.90	1459.98	-779.31	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:50:00 AM	49415.62	50649.48	1519.48	-1233.86	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49726.26	50649.48	1519.48	-923.22	Pass	NA	NA	NA	NA	NA
Detector 11										
9/7/2023 12:50:00 AM	58604.17	59849.50	1795.49	-1245.33	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	58965.40	59849.50	1795.49	-884.10	Pass	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:58:00 AM	49075.42	49489.98	1484.70	-414.56	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49044.76	49489.98	1484.70	-445.22	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:58:00 AM	46067.91	46812.78	1404.38	-744.86	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	46100.26	46812.78	1404.38	-712.52	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:58:00 AM	49265.00	50124.63	1503.74	-859.62	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49237.23	50124.63	1503.74	-887.40	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 19										
9/7/2023 12:58:00 AM	57607.04	57663.50	1729.91	-56.46	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	57339.81	57663.50	1729.91	-323.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:55:00 AM	49199.53	49753.68	1492.61	-554.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:57:00 AM	49131.28	49753.68	1492.61	-622.39	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:55:00 AM	54715.27	54662.13	1639.86	53.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	54820.58	54662.13	1639.86	158.45	Pass	NA	NA	NA	NA	NA
Detector 22										
9/7/2023 12:55:00 AM	51354.59	52239.03	1567.17	-884.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	51116.09	52239.03	1567.17	-1122.94	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:55:00 AM	44911.51	45717.00	1371.51	-805.49	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	44801.86	45717.00	1371.51	-915.14	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:33:00 AM	0.15	0.25	0.04	-0.10	Pass	3.24	0.55	0.07	2.688	FAIL
9/8/2023 4:29:00 AM	0.20	0.25	0.04	-0.05	Pass	4.12	0.55	0.07	3.573	FAIL
Detector 1										
9/7/2023 4:33:00 AM	0.45	0.62	0.06	-0.18	FAIL	0.76	0.83	0.09	-0.077	Pass
9/8/2023 4:29:00 AM	0.49	0.62	0.06	-0.14	Pass	0.56	0.83	0.09	-0.272	FAIL
Detector 2										
9/7/2023 4:33:00 AM	0.19	0.27	0.04	-0.08	Pass	0.51	0.54	0.08	-0.032	Pass
9/8/2023 4:29:00 AM	0.15	0.27	0.04	-0.12	FAIL	0.45	0.54	0.08	-0.092	Pass
Detector 3										
9/7/2023 4:33:00 AM	0.15	0.25	0.03	-0.10	FAIL	4.74	0.47	0.07	4.266	FAIL
9/8/2023 4:29:00 AM	0.21	0.25	0.03	-0.04	Pass	2.11	0.47	0.07	1.631	FAIL
Detector 8										
9/7/2023 4:33:00 AM	0.09	0.21	0.03	-0.12	FAIL	0.54	0.52	0.06	0.023	Pass
9/8/2023 4:29:00 AM	0.10	0.21	0.03	-0.11	FAIL	0.50	0.52	0.06	-0.017	Pass
Detector 9										
9/7/2023 4:34:00 AM	0.12	0.23	0.05	-0.11	Pass	0.41	0.48	0.09	-0.070	Pass
9/8/2023 4:29:00 AM	0.13	0.23	0.05	-0.10	Pass	0.47	0.48	0.09	-0.010	Pass
Detector 10										
9/7/2023 4:34:00 AM	0.15	0.21	0.03	-0.06	Pass	0.33	0.39	0.06	-0.060	Pass
9/8/2023 4:29:00 AM	0.11	0.21	0.03	-0.10	FAIL	0.40	0.39	0.06	0.005	Pass
Detector 11										
9/7/2023 4:34:00 AM	0.05	0.20	0.04	-0.15	FAIL	0.42	0.49	0.07	-0.066	Pass
9/8/2023 4:29:00 AM	0.02	0.20	0.04	-0.18	FAIL	0.36	0.49	0.07	-0.126	Pass
Detector 16										
9/7/2023 4:32:00 AM	0.15	0.19	0.04	-0.04	Pass	0.34	0.47	0.06	-0.136	Pass
9/8/2023 4:29:00 AM	0.14	0.19	0.04	-0.06	Pass	0.37	0.47	0.06	-0.106	Pass
Detector 17										
9/7/2023 4:32:00 AM	0.10	0.22	0.05	-0.13	Pass	0.28	0.36	0.06	-0.081	Pass
9/8/2023 4:29:00 AM	0.14	0.22	0.05	-0.08	Pass	0.37	0.36	0.06	0.009	Pass
Detector 18										
9/7/2023 4:32:00 AM	0.16	0.20	0.03	-0.04	Pass	0.32	0.42	0.06	-0.104	Pass
9/8/2023 4:29:00 AM	0.14	0.20	0.03	-0.06	Pass	0.35	0.42	0.06	-0.079	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 19										
9/7/2023 4:33:00 AM	0.09	0.23	0.04	-0.15	FAIL	0.40	0.52	0.07	-0.125	Pass
9/8/2023 4:30:00 AM	0.13	0.23	0.04	-0.10	Pass	0.35	0.52	0.07	-0.175	Pass
Detector 20										
9/7/2023 4:34:00 AM	0.24	0.24	0.04	0.00	Pass	0.33	0.47	0.08	-0.149	Pass
9/8/2023 4:30:00 AM	0.16	0.24	0.04	-0.08	Pass	0.45	0.47	0.08	-0.024	Pass
Detector 21										
9/7/2023 4:34:00 AM	0.14	0.21	0.04	-0.07	Pass	0.23	0.27	0.04	-0.047	Pass
9/8/2023 4:30:00 AM	0.15	0.21	0.04	-0.06	Pass	0.23	0.27	0.04	-0.042	Pass
Detector 22										
9/7/2023 4:34:00 AM	0.15	0.22	0.04	-0.07	Pass	0.25	0.28	0.04	-0.032	Pass
9/8/2023 4:30:00 AM	0.18	0.22	0.04	-0.04	Pass	0.25	0.28	0.04	-0.032	Pass
Detector 23										
9/7/2023 4:34:00 AM	0.27	0.90	0.14	-0.63	FAIL	0.32	0.71	0.16	-0.400	Pass
9/8/2023 4:30:00 AM	0.35	0.90	0.14	-0.56	FAIL	0.38	0.71	0.16	-0.335	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:48:00 AM	10032.90	10005.95	300.18	26.95	Pass	3361.50	3304.25	47.99	57.250	Pass
9/8/2023 12:50:00 AM	10064.99	10005.95	300.18	59.04	Pass	3359.50	3304.25	47.99	55.250	Pass
Detector 1										
9/7/2023 12:48:00 AM	11583.47	11474.00	344.22	109.47	Pass	3727.00	3668.10	92.50	58.900	Pass
9/8/2023 12:50:00 AM	11594.54	11474.00	344.22	120.54	Pass	3776.00	3668.10	92.50	107.900	Pass
Detector 2										
9/7/2023 12:49:00 AM	10549.09	10779.28	323.38	-230.18	Pass	3666.50	3622.45	60.39	44.050	Pass
9/8/2023 12:50:00 AM	10761.92	10779.28	323.38	-17.35	Pass	3684.00	3622.45	60.39	61.550	Pass
Detector 3										
9/7/2023 12:49:00 AM	11467.82	11620.73	348.62	-152.91	Pass	4245.00	4154.53	83.95	90.475	Pass
9/8/2023 12:50:00 AM	11421.31	11620.73	348.62	-199.42	Pass	4292.00	4154.53	83.95	137.475	Pass
Detector 8										
9/7/2023 12:58:00 AM	9852.16	9904.33	297.13	-52.16	Pass	3334.50	3192.58	64.13	141.925	**WARNING**
9/8/2023 1:03:00 AM	9778.61	9904.33	297.13	-125.72	Pass	3367.50	3192.58	64.13	174.925	**WARNING**
Detector 9										
9/7/2023 12:58:00 AM	11226.00	11361.38	340.84	-135.38	Pass	3883.50	3899.85	43.84	-16.350	Pass
9/8/2023 1:03:00 AM	11232.06	11361.38	340.84	-129.32	Pass	4029.00	3899.85	43.84	129.150	**WARNING**
Detector 10										
9/7/2023 12:58:00 AM	10593.65	10759.58	322.79	-165.92	Pass	3878.00	3707.40	46.90	170.600	**DOEF**
9/8/2023 1:03:00 AM	10658.79	10759.58	322.79	-100.79	Pass	3918.00	3707.40	46.90	210.600	**DOEF**
Detector 11										
9/7/2023 12:58:00 AM	11448.80	11694.93	350.85	-246.13	Pass	4026.50	3629.48	107.65	397.025	**DOEF**
9/8/2023 1:04:00 AM	11503.92	11694.93	350.85	-191.00	Pass	4111.50	3629.48	107.65	482.025	**DOEF**
Detector 16										
9/7/2023 12:55:00 AM	9797.08	9851.13	295.53	-54.05	Pass	3298.50	3068.29	89.69	230.211	**WARNING**
9/8/2023 1:00:00 AM	9855.20	9851.13	295.53	4.07	Pass	3354.00	3068.29	89.69	285.711	**DOEF**
Detector 17										
9/7/2023 12:55:00 AM	11617.01	11664.32	349.93	-47.31	Pass	3413.00	3276.32	55.74	136.684	**WARNING**
9/8/2023 12:57:00 AM	11576.51	11664.32	349.93	-87.81	Pass	3402.00	3276.32	55.74	125.684	**WARNING**
Detector 18										
9/7/2023 12:55:00 AM	10734.83	10763.16	322.89	-28.33	Pass	3867.50	3698.37	56.57	169.132	**WARNING**
9/8/2023 12:57:00 AM	10751.40	10763.16	322.89	-11.76	Pass	3877.50	3698.37	56.57	179.132	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 19										
9/7/2023 12:55:00 AM	11890.88	11980.39	359.41	-89.52	Pass	4089.50	3947.45	80.92	142.053	Pass
9/8/2023 12:57:00 AM	11718.70	11980.39	359.41	-261.70	Pass	4142.50	3947.45	80.92	195.053	**WARNING**
Detector 20										
9/7/2023 12:50:00 AM	15573.79	15638.68	469.16	-64.89	Pass	5067.00	4996.66	60.03	70.342	Pass
9/8/2023 12:50:00 AM	15353.57	15638.68	469.16	-285.12	Pass	5072.00	4996.66	60.03	75.342	Pass
Detector 21										
9/7/2023 12:51:00 AM	15126.70	15339.71	460.19	-213.02	Pass	5228.50	5084.89	57.28	143.605	**WARNING**
9/8/2023 12:50:00 AM	15177.83	15339.71	460.19	-161.88	Pass	5241.00	5084.89	57.28	156.105	**WARNING**
Detector 22										
9/7/2023 12:51:00 AM	12636.37	12713.74	381.41	-77.37	Pass	4533.50	4136.55	78.76	396.947	**DOEF**
9/8/2023 12:51:00 AM	12569.34	12713.74	381.41	-144.40	Pass	4507.50	4136.55	78.76	370.947	**DOEF**
Detector 23										
9/7/2023 12:51:00 AM	12644.88	12915.71	387.47	-270.83	Pass	4947.00	4694.21	79.75	252.789	**DOEF**
9/8/2023 12:51:00 AM	12582.35	12915.71	387.47	-333.36	Pass	5098.00	4694.21	79.75	403.789	**DOEF**

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:55:00 AM	49481.63	50226.98	1506.81	-745.34	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49575.90	50226.98	1506.81	-651.07	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:55:00 AM	48416.85	48796.70	1463.90	-379.85	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	48203.74	48796.70	1463.90	-592.96	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:55:00 AM	50058.64	50875.48	1526.26	-816.83	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	49925.78	50875.48	1526.26	-949.69	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:55:00 AM	59401.19	60107.23	1803.22	-706.04	Pass	NA	NA	NA	NA	NA
9/8/2023 1:00:00 AM	59091.41	60107.23	1803.22	-1015.82	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:49:00 AM	49694.82	50025.35	1500.76	-330.53	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49592.97	50025.35	1500.76	-432.38	Pass	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:49:00 AM	48117.25	48665.90	1459.98	-548.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	47886.59	48665.90	1459.98	-779.31	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:50:00 AM	49415.62	50649.48	1519.48	-1233.86	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	49726.26	50649.48	1519.48	-923.22	Pass	NA	NA	NA	NA	NA
Detector 11										
9/7/2023 12:50:00 AM	58604.17	59849.50	1795.49	-1245.33	Pass	NA	NA	NA	NA	NA
9/8/2023 12:51:00 AM	58965.40	59849.50	1795.49	-884.10	Pass	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:58:00 AM	49075.42	49489.98	1484.70	-414.56	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49044.76	49489.98	1484.70	-445.22	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:58:00 AM	46067.91	46812.78	1404.38	-744.86	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	46100.26	46812.78	1404.38	-712.52	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:58:00 AM	49265.00	50124.63	1503.74	-859.62	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	49237.23	50124.63	1503.74	-887.40	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 19										
9/7/2023 12:58:00 AM	57607.04	57663.50	1729.91	-56.46	Pass	NA	NA	NA	NA	NA
9/8/2023 1:04:00 AM	57339.81	57663.50	1729.91	-323.69	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:55:00 AM	49199.53	49753.68	1492.61	-554.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:57:00 AM	49131.28	49753.68	1492.61	-622.39	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:55:00 AM	54715.27	54662.13	1639.86	53.15	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	54820.58	54662.13	1639.86	158.45	Pass	NA	NA	NA	NA	NA
Detector 22										
9/7/2023 12:55:00 AM	51354.59	52239.03	1567.17	-884.44	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	51116.09	52239.03	1567.17	-1122.94	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 12:55:00 AM	44911.51	45717.00	1371.51	-805.49	Pass	NA	NA	NA	NA	NA
9/8/2023 12:59:00 AM	44801.86	45717.00	1371.51	-915.14	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 4:33:00 AM	0.15	0.25	0.04	-0.10	Pass	3.24	0.55	0.07	2.688	FAIL
9/8/2023 4:29:00 AM	0.20	0.25	0.04	-0.05	Pass	4.12	0.55	0.07	3.573	FAIL
Detector 1										
9/7/2023 4:33:00 AM	0.45	0.62	0.06	-0.18	FAIL	0.76	0.83	0.09	-0.077	Pass
9/8/2023 4:29:00 AM	0.49	0.62	0.06	-0.14	Pass	0.56	0.83	0.09	-0.272	FAIL
Detector 2										
9/7/2023 4:33:00 AM	0.19	0.27	0.04	-0.08	Pass	0.51	0.54	0.08	-0.032	Pass
9/8/2023 4:29:00 AM	0.15	0.27	0.04	-0.12	FAIL	0.45	0.54	0.08	-0.092	Pass
Detector 3										
9/7/2023 4:33:00 AM	0.15	0.25	0.03	-0.10	FAIL	4.74	0.47	0.07	4.266	FAIL
9/8/2023 4:29:00 AM	0.21	0.25	0.03	-0.04	Pass	2.11	0.47	0.07	1.631	FAIL
Detector 8										
9/7/2023 4:33:00 AM	0.09	0.21	0.03	-0.12	FAIL	0.54	0.52	0.06	0.023	Pass
9/8/2023 4:29:00 AM	0.10	0.21	0.03	-0.11	FAIL	0.50	0.52	0.06	-0.017	Pass
Detector 9										
9/7/2023 4:34:00 AM	0.12	0.23	0.05	-0.11	Pass	0.41	0.48	0.09	-0.070	Pass
9/8/2023 4:29:00 AM	0.13	0.23	0.05	-0.10	Pass	0.47	0.48	0.09	-0.010	Pass
Detector 10										
9/7/2023 4:34:00 AM	0.15	0.21	0.03	-0.06	Pass	0.33	0.39	0.06	-0.060	Pass
9/8/2023 4:29:00 AM	0.11	0.21	0.03	-0.10	FAIL	0.40	0.39	0.06	0.005	Pass
Detector 11										
9/7/2023 4:34:00 AM	0.05	0.20	0.04	-0.15	FAIL	0.42	0.49	0.07	-0.066	Pass
9/8/2023 4:29:00 AM	0.02	0.20	0.04	-0.18	FAIL	0.36	0.49	0.07	-0.126	Pass
Detector 16										
9/7/2023 4:32:00 AM	0.15	0.19	0.04	-0.04	Pass	0.34	0.47	0.06	-0.136	Pass
9/8/2023 4:29:00 AM	0.14	0.19	0.04	-0.06	Pass	0.37	0.47	0.06	-0.106	Pass
Detector 17										
9/7/2023 4:32:00 AM	0.10	0.22	0.05	-0.13	Pass	0.28	0.36	0.06	-0.081	Pass
9/8/2023 4:29:00 AM	0.14	0.22	0.05	-0.08	Pass	0.37	0.36	0.06	0.009	Pass
Detector 18										
9/7/2023 4:32:00 AM	0.16	0.20	0.03	-0.04	Pass	0.32	0.42	0.06	-0.104	Pass
9/8/2023 4:29:00 AM	0.14	0.20	0.03	-0.06	Pass	0.35	0.42	0.06	-0.079	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Purple

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 19										
9/7/2023 4:33:00 AM	0.09	0.23	0.04	-0.15	FAIL	0.40	0.52	0.07	-0.125	Pass
9/8/2023 4:30:00 AM	0.13	0.23	0.04	-0.10	Pass	0.35	0.52	0.07	-0.175	Pass
Detector 20										
9/7/2023 4:34:00 AM	0.24	0.24	0.04	0.00	Pass	0.33	0.47	0.08	-0.149	Pass
9/8/2023 4:30:00 AM	0.16	0.24	0.04	-0.08	Pass	0.45	0.47	0.08	-0.024	Pass
Detector 21										
9/7/2023 4:34:00 AM	0.14	0.21	0.04	-0.07	Pass	0.23	0.27	0.04	-0.047	Pass
9/8/2023 4:30:00 AM	0.15	0.21	0.04	-0.06	Pass	0.23	0.27	0.04	-0.042	Pass
Detector 22										
9/7/2023 4:34:00 AM	0.15	0.22	0.04	-0.07	Pass	0.25	0.28	0.04	-0.032	Pass
9/8/2023 4:30:00 AM	0.18	0.22	0.04	-0.04	Pass	0.25	0.28	0.04	-0.032	Pass
Detector 23										
9/7/2023 4:34:00 AM	0.27	0.90	0.14	-0.63	FAIL	0.32	0.71	0.16	-0.400	Pass
9/8/2023 4:30:00 AM	0.35	0.90	0.14	-0.56	FAIL	0.38	0.71	0.16	-0.335	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
8/29/2023 12:07:00 AM	9688.71	9785.18	293.56	-96.46	Pass	3352.00	3364.35	39.95	-12.350	Pass
8/30/2023 12:07:00 AM	9635.65	9785.18	293.56	-149.53	Pass	3362.00	3364.35	39.95	-2.350	Pass
Detector 1										
8/29/2023 12:07:00 AM	11080.54	11182.10	335.46	-101.56	Pass	3788.00	3961.88	58.91	-173.875	**WARNING**
8/30/2023 12:07:00 AM	10970.86	11182.10	335.46	-211.24	Pass	3900.00	3961.88	58.91	-61.875	Pass
Detector 2										
8/29/2023 12:07:00 AM	10327.00	10547.78	316.43	-220.77	Pass	3902.50	3862.43	54.26	40.075	Pass
8/30/2023 12:07:00 AM	10436.77	10547.78	316.43	-111.00	Pass	3933.00	3862.43	54.26	70.575	Pass
Detector 3										
8/29/2023 12:07:00 AM	11558.01	11644.80	349.34	-86.79	Pass	4087.00	4157.70	57.23	-70.700	Pass
8/30/2023 12:07:00 AM	11531.00	11644.80	349.34	-113.80	Pass	4180.50	4157.70	57.23	22.800	Pass
Detector 4										
8/29/2023 12:08:00 AM	15240.50	15407.73	462.23	-167.23	Pass	4933.00	4850.53	67.02	82.475	Pass
8/30/2023 12:07:00 AM	15169.42	15407.73	462.23	-238.30	Pass	4955.00	4850.53	67.02	104.475	Pass
Detector 5										
8/29/2023 12:08:00 AM	15081.17	15246.68	457.40	-165.50	Pass	4789.00	4784.45	54.21	4.550	Pass
8/30/2023 12:07:00 AM	14852.78	15246.68	457.40	-393.90	Pass	4857.00	4784.45	54.21	72.550	Pass
Detector 6										
8/29/2023 12:08:00 AM	12286.99	12512.03	375.36	-225.03	Pass	4314.00	4250.58	61.83	63.425	Pass
8/30/2023 12:08:00 AM	12218.41	12512.03	375.36	-293.62	Pass	4361.50	4250.58	61.83	110.925	Pass
Detector 7										
8/29/2023 12:08:00 AM	12812.56	13104.10	393.12	-291.54	Pass	4624.00	4544.05	59.72	79.950	Pass
8/30/2023 12:07:00 AM	12816.63	13104.10	393.12	-287.47	Pass	4627.00	4544.05	59.72	82.950	Pass
Detector 8										
8/29/2023 12:17:00 AM	8610.50	8616.85	258.51	-6.35	Pass	4429.50	4337.84	112.88	91.660	Pass
8/30/2023 12:15:00 AM	8566.95	8616.85	258.51	-49.90	Pass	4466.50	4337.84	112.88	128.660	Pass
Detector 9										
8/29/2023 12:17:00 AM	11500.37	11482.23	344.47	18.15	Pass	3696.00	3691.35	48.64	4.650	Pass
8/30/2023 12:15:00 AM	11466.85	11482.23	344.47	-15.37	Pass	3737.00	3691.35	48.64	45.650	Pass
Detector 10										
8/29/2023 12:17:00 AM	10823.50	10892.15	326.76	-68.65	Pass	3510.00	3537.60	35.64	-27.600	Pass
8/30/2023 12:15:00 AM	10779.96	10892.15	326.76	-112.19	Pass	3532.50	3537.60	35.64	-5.100	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
8/29/2023 12:17:00 AM	11802.49	11798.93	353.97	3.56	Pass	3781.50	3873.03	45.81	-91.525	Pass
8/30/2023 12:15:00 AM	11660.75	11798.93	353.97	-138.18	Pass	3787.50	3873.03	45.81	-85.525	Pass
Detector 12										
8/29/2023 12:17:00 AM	14632.74	14376.38	431.29	256.36	Pass	5537.50	5778.53	78.33	-241.025	**DOEF**
8/30/2023 12:15:00 AM	14513.56	14376.38	431.29	137.18	Pass	5631.50	5778.53	78.33	-147.025	Pass
Detector 13										
8/29/2023 12:17:00 AM	14909.30	15112.78	453.38	-203.47	Pass	4731.00	4872.78	66.66	-141.775	**WARNING**
8/30/2023 12:15:00 AM	15213.99	15112.78	453.38	101.21	Pass	4717.00	4872.78	66.66	-155.775	**WARNING**
Detector 14										
8/29/2023 12:17:00 AM	12406.21	12445.30	373.36	-39.09	Pass	4294.00	4336.03	47.90	-42.025	Pass
8/30/2023 12:15:00 AM	12344.14	12445.30	373.36	-101.16	Pass	4282.00	4336.03	47.90	-54.025	Pass
Detector 15										
8/29/2023 12:17:00 AM	12784.48	12888.03	386.64	-103.54	Pass	4351.00	4413.40	31.79	-62.400	Pass
8/30/2023 12:16:00 AM	13002.48	12888.03	386.64	114.46	Pass	4437.50	4413.40	31.79	24.100	Pass
Detector 16										
8/29/2023 12:12:00 AM	9889.08	9814.13	294.42	74.96	Pass	3459.50	3388.58	61.49	70.925	Pass
8/30/2023 12:12:00 AM	9705.75	9814.13	294.42	-108.37	Pass	3379.50	3388.58	61.49	-9.075	Pass
Detector 17										
8/29/2023 12:12:00 AM	11106.55	11253.23	337.60	-146.67	Pass	3925.50	3958.00	41.22	-32.500	Pass
8/30/2023 12:12:00 AM	11172.24	11253.23	337.60	-80.99	Pass	4027.50	3958.00	41.22	69.500	Pass
Detector 18										
8/29/2023 12:12:00 AM	10413.65	10555.95	316.68	-142.30	Pass	3971.50	3948.08	59.81	23.425	Pass
8/30/2023 12:12:00 AM	10463.79	10555.95	316.68	-92.16	Pass	4057.00	3948.08	59.81	108.925	Pass
Detector 19										
8/29/2023 12:12:00 AM	11426.70	11591.85	347.76	-165.15	Pass	4110.00	4218.30	50.23	-108.300	**WARNING**
8/30/2023 12:12:00 AM	11496.90	11591.85	347.76	-94.95	Pass	4129.00	4218.30	50.23	-89.300	Pass
Detector 20										
8/29/2023 12:12:00 AM	15268.50	15329.28	459.88	-60.77	Pass	5144.00	5170.15	64.69	-26.148	Pass
8/30/2023 12:12:00 AM	15248.53	15329.28	459.88	-80.74	Pass	5218.50	5170.15	64.69	48.352	Pass
Detector 21										
8/29/2023 12:13:00 AM	15181.83	15305.28	459.16	-123.45	Pass	5051.50	5199.90	72.13	-148.400	**WARNING**
8/30/2023 12:12:00 AM	15073.67	15305.28	459.16	-231.60	Pass	5154.00	5199.90	72.13	-45.900	Pass

Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
8/29/2023 12:13:00 AM	12251.38	12418.15	372.54	-166.77	Pass	4211.00	4433.95	55.09	-222.950	**DOEF**
8/30/2023 12:12:00 AM	11985.89	12418.15	372.54	-432.26	**FAIL**	4389.00	4433.95	55.09	-44.950	Pass
Detector 23										
8/29/2023 12:13:00 AM	12703.30	12827.98	384.84	-124.68	Pass	4710.50	4667.03	71.68	43.475	Pass
8/30/2023 12:12:00 AM	12798.54	12827.98	384.84	-29.43	Pass	4646.00	4667.03	71.68	-21.025	Pass

Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
8/29/2023 12:13:00 AM	46844.86	46977.48	1409.32	-132.62	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	46723.09	46977.48	1409.32	-254.39	Pass	NA	NA	NA	NA	NA
Detector 1										
8/29/2023 12:13:00 AM	45523.42	45880.28	1376.41	-356.85	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	45307.51	45880.28	1376.41	-572.77	Pass	NA	NA	NA	NA	NA
Detector 2										
8/29/2023 12:13:00 AM	46392.06	47375.98	1421.28	-983.92	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	46154.20	47375.98	1421.28	-1221.78	Pass	NA	NA	NA	NA	NA
Detector 3										
8/29/2023 12:13:00 AM	56370.41	56474.80	1694.24	-104.39	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	56346.08	56474.80	1694.24	-128.72	Pass	NA	NA	NA	NA	NA
Detector 4										
8/29/2023 12:13:00 AM	48124.78	48963.30	1468.90	-838.52	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	48264.60	48963.30	1468.90	-698.70	Pass	NA	NA	NA	NA	NA
Detector 5										
8/29/2023 12:13:00 AM	51509.08	52229.20	1566.88	-720.12	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	51777.07	52229.20	1566.88	-452.13	Pass	NA	NA	NA	NA	NA
Detector 6										
8/29/2023 12:13:00 AM	47928.26	48723.95	1461.72	-795.69	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	47834.62	48723.95	1461.72	-889.33	Pass	NA	NA	NA	NA	NA
Detector 7										
8/29/2023 12:13:00 AM	42820.55	43315.00	1299.45	-494.45	Pass	NA	NA	NA	NA	NA
8/30/2023 12:13:00 AM	43074.75	43315.00	1299.45	-240.25	Pass	NA	NA	NA	NA	NA
Detector 8										
8/29/2023 12:08:00 AM	42477.30	39314.88	1179.45	3162.43	**FAIL**	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	42178.45	39314.88	1179.45	2863.58	**FAIL**	NA	NA	NA	NA	NA
Detector 9										
8/29/2023 12:08:00 AM	45287.83	45154.48	1354.63	133.35	Pass	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	45972.22	45154.48	1354.63	817.74	Pass	NA	NA	NA	NA	NA
Detector 10										
8/29/2023 12:08:00 AM	47070.62	46629.73	1398.89	440.89	Pass	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	47225.04	46629.73	1398.89	595.31	Pass	NA	NA	NA	NA	NA

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Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
8/29/2023 12:08:00 AM	56400.46	55931.08	1677.93	469.38	Pass	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	56578.56	55931.08	1677.93	647.49	Pass	NA	NA	NA	NA	NA
Detector 12										
8/29/2023 12:08:00 AM	47167.43	47429.53	1422.89	-262.10	Pass	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	46958.28	47429.53	1422.89	-471.25	Pass	NA	NA	NA	NA	NA
Detector 13										
8/29/2023 12:08:00 AM	52036.81	51931.68	1557.95	105.14	Pass	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	51391.69	51931.68	1557.95	-539.98	Pass	NA	NA	NA	NA	NA
Detector 14										
8/29/2023 12:08:00 AM	48521.82	48963.20	1468.90	-441.38	Pass	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	48397.40	48963.20	1468.90	-565.80	Pass	NA	NA	NA	NA	NA
Detector 15										
8/29/2023 12:08:00 AM	42583.80	43148.10	1294.44	-564.30	Pass	NA	NA	NA	NA	NA
8/30/2023 12:08:00 AM	42912.90	43148.10	1294.44	-235.20	Pass	NA	NA	NA	NA	NA
Detector 16										
8/29/2023 12:17:00 AM	47023.96	46968.15	1409.04	55.81	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	46897.22	46968.15	1409.04	-70.93	Pass	NA	NA	NA	NA	NA
Detector 17										
8/29/2023 12:17:00 AM	45418.44	46192.13	1385.76	-773.68	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	45661.85	46192.13	1385.76	-530.27	Pass	NA	NA	NA	NA	NA
Detector 18										
8/29/2023 12:17:00 AM	46686.11	46867.38	1406.02	-181.26	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	46440.31	46867.38	1406.02	-427.07	Pass	NA	NA	NA	NA	NA
Detector 19										
8/29/2023 12:17:00 AM	56812.69	56633.50	1699.01	179.19	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	56475.36	56633.50	1699.01	-158.14	Pass	NA	NA	NA	NA	NA
Detector 20										
8/29/2023 12:17:00 AM	48330.52	48917.15	1467.51	-586.63	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	48095.38	48917.15	1467.51	-821.77	Pass	NA	NA	NA	NA	NA
Detector 21										
8/29/2023 12:17:00 AM	52285.95	51775.10	1553.25	510.85	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	52027.58	51775.10	1553.25	252.48	Pass	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
8/29/2023 12:17:00 AM	48191.71	48938.63	1468.16	-746.91	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	47903.34	48938.63	1468.16	-1035.28	Pass	NA	NA	NA	NA	NA
Detector 23										
8/29/2023 12:17:00 AM	42512.19	43236.93	1297.11	-724.73	Pass	NA	NA	NA	NA	NA
8/30/2023 12:16:00 AM	42482.00	43236.93	1297.11	-754.93	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
8/29/2023 3:40:00 AM	0.09	0.17	0.04	-0.08	Pass	0.48	0.47	0.08	0.009	Pass
8/30/2023 3:38:00 AM	0.04	0.17	0.04	-0.13	FAIL	0.51	0.47	0.08	0.040	Pass
Detector 1										
8/29/2023 3:40:00 AM	0.09	0.17	0.03	-0.08	Pass	0.31	0.41	0.06	-0.098	Pass
8/30/2023 3:38:00 AM	0.11	0.17	0.03	-0.07	Pass	0.23	0.41	0.06	-0.183	Pass
Detector 2										
8/29/2023 3:40:00 AM	0.04	0.19	0.03	-0.15	FAIL	0.25	0.41	0.08	-0.161	Pass
8/30/2023 3:38:00 AM	0.06	0.19	0.03	-0.13	FAIL	0.33	0.41	0.08	-0.081	Pass
Detector 3										
8/29/2023 3:40:00 AM	0.11	0.27	0.05	-0.16	FAIL	0.28	0.62	0.08	-0.349	FAIL
8/30/2023 3:38:00 AM	0.09	0.27	0.05	-0.18	FAIL	0.28	0.62	0.08	-0.349	FAIL
Detector 4										
8/29/2023 3:39:00 AM	0.24	0.29	0.04	-0.05	Pass	0.69	0.48	0.12	0.201	Pass
8/30/2023 3:38:00 AM	0.19	0.29	0.04	-0.10	Pass	0.47	0.48	0.12	-0.019	Pass
Detector 5										
8/29/2023 3:39:00 AM	0.14	0.22	0.05	-0.08	Pass	0.24	0.52	0.20	-0.280	Pass
8/30/2023 3:38:00 AM	0.08	0.22	0.05	-0.15	FAIL	0.30	0.52	0.20	-0.220	Pass
Detector 6										
8/29/2023 3:39:00 AM	0.10	0.25	0.04	-0.15	FAIL	0.32	0.39	0.07	-0.073	Pass
8/30/2023 3:38:00 AM	0.11	0.25	0.04	-0.14	FAIL	0.27	0.39	0.07	-0.118	Pass
Detector 7										
8/29/2023 3:39:00 AM	0.05	0.27	0.04	-0.22	FAIL	0.29	0.57	0.09	-0.284	FAIL
8/30/2023 3:38:00 AM	0.07	0.27	0.04	-0.21	FAIL	0.34	0.57	0.09	-0.229	Pass
Detector 8										
8/29/2023 3:39:00 AM	0.05	0.18	0.04	-0.13	FAIL	0.63	0.40	0.09	0.226	Pass
8/30/2023 3:38:00 AM	0.04	0.18	0.04	-0.15	FAIL	0.59	0.40	0.09	0.191	Pass
Detector 9										
8/29/2023 3:39:00 AM	0.10	0.18	0.03	-0.08	Pass	0.33	0.43	0.07	-0.101	Pass
8/30/2023 3:38:00 AM	0.06	0.18	0.03	-0.12	FAIL	0.41	0.43	0.07	-0.026	Pass
Detector 10										
8/29/2023 3:39:00 AM	0.04	0.19	0.04	-0.15	FAIL	0.47	0.51	0.10	-0.042	Pass
8/30/2023 3:38:00 AM	0.08	0.19	0.04	-0.11	Pass	0.43	0.51	0.10	-0.082	Pass

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Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
8/29/2023 3:39:00 AM	0.05	0.17	0.04	-0.12	FAIL	0.47	0.61	0.09	-0.138	Pass
8/30/2023 3:38:00 AM	0.06	0.17	0.04	-0.11	Pass	0.49	0.61	0.09	-0.118	Pass
Detector 12										
8/29/2023 3:39:00 AM	0.07	0.16	0.03	-0.09	FAIL	0.56	0.46	0.08	0.102	Pass
8/30/2023 3:38:00 AM	0.06	0.16	0.03	-0.10	FAIL	0.54	0.46	0.08	0.082	Pass
Detector 13										
8/29/2023 3:39:00 AM	0.07	0.17	0.04	-0.11	Pass	0.28	0.38	0.06	-0.100	Pass
8/30/2023 3:38:00 AM	0.09	0.17	0.04	-0.09	Pass	0.35	0.38	0.06	-0.030	Pass
Detector 14										
8/29/2023 3:39:00 AM	0.05	0.20	0.04	-0.15	FAIL	0.40	0.50	0.07	-0.106	Pass
8/30/2023 3:38:00 AM	0.08	0.20	0.04	-0.13	FAIL	0.48	0.50	0.07	-0.026	Pass
Detector 15										
8/29/2023 3:39:00 AM	0.08	0.17	0.03	-0.09	FAIL	0.36	0.42	0.06	-0.063	Pass
8/30/2023 3:38:00 AM	0.11	0.17	0.03	-0.06	Pass	0.37	0.42	0.06	-0.053	Pass
Detector 16										
8/29/2023 3:39:00 AM	0.07	0.14	0.03	-0.07	Pass	0.34	0.45	0.10	-0.115	Pass
8/30/2023 3:38:00 AM	0.04	0.14	0.03	-0.10	FAIL	0.49	0.45	0.10	0.035	Pass
Detector 17										
8/29/2023 3:39:00 AM	0.08	0.14	0.02	-0.06	Pass	0.52	6.82	8.30	-6.301	Pass
8/30/2023 3:38:00 AM	0.09	0.14	0.02	-0.06	Pass	0.33	6.82	8.30	-6.491	Pass
Detector 18										
8/29/2023 3:39:00 AM	0.05	0.13	0.03	-0.08	Pass	0.26	0.37	0.08	-0.105	Pass
8/30/2023 3:39:00 AM	0.09	0.13	0.03	-0.04	Pass	0.31	0.37	0.08	-0.060	Pass
Detector 19										
8/29/2023 3:39:00 AM	0.15	0.16	0.05	-0.01	Pass	0.42	0.44	0.08	-0.027	Pass
8/30/2023 3:39:00 AM	0.06	0.16	0.05	-0.10	Pass	0.47	0.44	0.08	0.023	Pass
Detector 20										
8/29/2023 3:39:00 AM	0.08	0.15	0.03	-0.07	Pass	0.38	0.42	0.07	-0.040	Pass
8/30/2023 3:39:00 AM	0.09	0.15	0.03	-0.06	Pass	0.30	0.42	0.07	-0.115	Pass
Detector 21										
8/29/2023 3:39:00 AM	0.12	0.15	0.04	-0.03	Pass	0.33	0.32	0.05	0.008	Pass
8/30/2023 3:39:00 AM	0.08	0.15	0.04	-0.07	Pass	0.37	0.32	0.05	0.043	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
8/29/2023 3:39:00 AM	0.06	0.17	0.04	-0.12	Pass	0.30	0.35	0.06	-0.060	Pass
8/30/2023 3:39:00 AM	0.07	0.17	0.04	-0.11	Pass	0.45	0.35	0.06	0.091	Pass
Detector 23										
8/29/2023 3:39:00 AM	0.05	0.15	0.03	-0.10	**FAIL**	0.26	0.43	0.06	-0.175	**FAIL**
8/30/2023 3:39:00 AM	0.07	0.15	0.03	-0.08	Pass	0.36	0.43	0.06	-0.080	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
8/30/2023 12:07:00 AM	9635.65	9785.18	293.56	-149.53	Pass	3362.00	3364.35	39.95	-2.350	Pass
8/31/2023 12:09:00 AM	9799.02	9785.18	293.56	13.85	Pass	3455.50	3364.35	39.95	91.150	**WARNING**
Detector 1										
8/30/2023 12:07:00 AM	10970.86	11182.10	335.46	-211.24	Pass	3900.00	3961.88	58.91	-61.875	Pass
8/31/2023 12:09:00 AM	10870.71	11182.10	335.46	-311.39	Pass	3902.50	3961.88	58.91	-59.375	Pass
Detector 2										
8/30/2023 12:07:00 AM	10436.77	10547.78	316.43	-111.00	Pass	3933.00	3862.43	54.26	70.575	Pass
8/31/2023 12:09:00 AM	10327.60	10547.78	316.43	-220.18	Pass	4044.50	3862.43	54.26	182.075	**DOEF**
Detector 3										
8/30/2023 12:07:00 AM	11531.00	11644.80	349.34	-113.80	Pass	4180.50	4157.70	57.23	22.800	Pass
8/31/2023 12:09:00 AM	11545.58	11644.80	349.34	-99.22	Pass	4234.50	4157.70	57.23	76.800	Pass
Detector 4										
8/30/2023 12:07:00 AM	15169.42	15407.73	462.23	-238.30	Pass	4955.00	4850.53	67.02	104.475	Pass
8/31/2023 12:09:00 AM	15307.27	15407.73	462.23	-100.46	Pass	4990.50	4850.53	67.02	139.975	**WARNING**
Detector 5										
8/30/2023 12:07:00 AM	14852.78	15246.68	457.40	-393.90	Pass	4857.00	4784.45	54.21	72.550	Pass
8/31/2023 12:09:00 AM	14966.07	15246.68	457.40	-280.60	Pass	4927.00	4784.45	54.21	142.550	**WARNING**
Detector 6										
8/30/2023 12:08:00 AM	12218.41	12512.03	375.36	-293.62	Pass	4361.50	4250.58	61.83	110.925	Pass
8/31/2023 12:09:00 AM	12163.85	12512.03	375.36	-348.18	Pass	4388.50	4250.58	61.83	137.925	**WARNING**
Detector 7										
8/30/2023 12:07:00 AM	12816.63	13104.10	393.12	-287.47	Pass	4627.00	4544.05	59.72	82.950	Pass
8/31/2023 12:09:00 AM	12763.57	13104.10	393.12	-340.53	Pass	4622.00	4544.05	59.72	77.950	Pass
Detector 8										
8/30/2023 12:15:00 AM	8566.95	8616.85	258.51	-49.90	Pass	4466.50	4337.84	112.88	128.660	Pass
8/31/2023 12:16:00 AM	8489.83	8616.85	258.51	-127.02	Pass	4461.00	4337.84	112.88	123.160	Pass
Detector 9										
8/30/2023 12:15:00 AM	11466.85	11482.23	344.47	-15.37	Pass	3737.00	3691.35	48.64	45.650	Pass
8/31/2023 12:16:00 AM	11338.64	11482.23	344.47	-143.58	Pass	3652.50	3691.35	48.64	-38.850	Pass
Detector 10										
8/30/2023 12:15:00 AM	10779.96	10892.15	326.76	-112.19	Pass	3532.50	3537.60	35.64	-5.100	Pass
8/31/2023 12:16:00 AM	10919.79	10892.15	326.76	27.64	Pass	3491.00	3537.60	35.64	-46.600	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
8/30/2023 12:15:00 AM	11660.75	11798.93	353.97	-138.18	Pass	3787.50	3873.03	45.81	-85.525	Pass
8/31/2023 12:16:00 AM	11546.57	11798.93	353.97	-252.36	Pass	3833.50	3873.03	45.81	-39.525	Pass
Detector 12										
8/30/2023 12:15:00 AM	14513.56	14376.38	431.29	137.18	Pass	5631.50	5778.53	78.33	-147.025	Pass
8/31/2023 12:16:00 AM	14330.25	14376.38	431.29	-46.13	Pass	5804.50	5778.53	78.33	25.975	Pass
Detector 13										
8/30/2023 12:15:00 AM	15213.99	15112.78	453.38	101.21	Pass	4717.00	4872.78	66.66	-155.775	**WARNING**
8/31/2023 12:16:00 AM	14943.50	15112.78	453.38	-169.27	Pass	4862.00	4872.78	66.66	-10.775	Pass
Detector 14										
8/30/2023 12:15:00 AM	12344.14	12445.30	373.36	-101.16	Pass	4282.00	4336.03	47.90	-54.025	Pass
8/31/2023 12:16:00 AM	12390.29	12445.30	373.36	-55.01	Pass	4276.50	4336.03	47.90	-59.525	Pass
Detector 15										
8/30/2023 12:16:00 AM	13002.48	12888.03	386.64	114.46	Pass	4437.50	4413.40	31.79	24.100	Pass
8/31/2023 12:16:00 AM	12860.25	12888.03	386.64	-27.78	Pass	4359.00	4413.40	31.79	-54.400	Pass
Detector 16										
8/30/2023 12:12:00 AM	9705.75	9814.13	294.42	-108.37	Pass	3379.50	3388.58	61.49	-9.075	Pass
8/31/2023 12:13:00 AM	9995.38	9814.13	294.42	181.26	Pass	3413.50	3388.58	61.49	24.925	Pass
Detector 17										
8/30/2023 12:12:00 AM	11172.24	11253.23	337.60	-80.99	Pass	4027.50	3958.00	41.22	69.500	Pass
8/31/2023 12:13:00 AM	11031.00	11253.23	337.60	-222.23	Pass	3915.50	3958.00	41.22	-42.500	Pass
Detector 18										
8/30/2023 12:12:00 AM	10463.79	10555.95	316.68	-92.16	Pass	4057.00	3948.08	59.81	108.925	Pass
8/31/2023 12:13:00 AM	10397.70	10555.95	316.68	-158.25	Pass	4023.00	3948.08	59.81	74.925	Pass
Detector 19										
8/30/2023 12:12:00 AM	11496.90	11591.85	347.76	-94.95	Pass	4129.00	4218.30	50.23	-89.300	Pass
8/31/2023 12:13:00 AM	11491.44	11591.85	347.76	-100.41	Pass	4165.00	4218.30	50.23	-53.300	Pass
Detector 20										
8/30/2023 12:12:00 AM	15248.53	15329.28	459.88	-80.74	Pass	5218.50	5170.15	64.69	48.352	Pass
8/31/2023 12:13:00 AM	15176.95	15329.28	459.88	-152.32	Pass	5128.00	5170.15	64.69	-42.148	Pass
Detector 21										
8/30/2023 12:12:00 AM	15073.67	15305.28	459.16	-231.60	Pass	5154.00	5199.90	72.13	-45.900	Pass
8/31/2023 12:13:00 AM	15090.78	15305.28	459.16	-214.50	Pass	4995.50	5199.90	72.13	-204.400	**WARNING**

Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
8/30/2023 12:12:00 AM	11985.89	12418.15	372.54	-432.26	**FAIL**	4389.00	4433.95	55.09	-44.950	Pass
8/31/2023 12:13:00 AM	12158.30	12418.15	372.54	-259.85	Pass	4293.00	4433.95	55.09	-140.950	**WARNING**
Detector 23										
8/30/2023 12:12:00 AM	12798.54	12827.98	384.84	-29.43	Pass	4646.00	4667.03	71.68	-21.025	Pass
8/31/2023 12:13:00 AM	12493.48	12827.98	384.84	-334.50	Pass	4706.00	4667.03	71.68	38.975	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
8/30/2023 12:13:00 AM	46723.09	46977.48	1409.32	-254.39	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	46862.05	46977.48	1409.32	-115.43	Pass	NA	NA	NA	NA	NA
Detector 1										
8/30/2023 12:13:00 AM	45307.51	45880.28	1376.41	-572.77	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	45355.61	45880.28	1376.41	-524.67	Pass	NA	NA	NA	NA	NA
Detector 2										
8/30/2023 12:13:00 AM	46154.20	47375.98	1421.28	-1221.78	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	46063.73	47375.98	1421.28	-1312.25	Pass	NA	NA	NA	NA	NA
Detector 3										
8/30/2023 12:13:00 AM	56346.08	56474.80	1694.24	-128.72	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	56757.99	56474.80	1694.24	283.19	Pass	NA	NA	NA	NA	NA
Detector 4										
8/30/2023 12:13:00 AM	48264.60	48963.30	1468.90	-698.70	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	48259.45	48963.30	1468.90	-703.85	Pass	NA	NA	NA	NA	NA
Detector 5										
8/30/2023 12:13:00 AM	51777.07	52229.20	1566.88	-452.13	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	51572.55	52229.20	1566.88	-656.65	Pass	NA	NA	NA	NA	NA
Detector 6										
8/30/2023 12:13:00 AM	47834.62	48723.95	1461.72	-889.33	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	47772.32	48723.95	1461.72	-951.63	Pass	NA	NA	NA	NA	NA
Detector 7										
8/30/2023 12:13:00 AM	43074.75	43315.00	1299.45	-240.25	Pass	NA	NA	NA	NA	NA
8/31/2023 12:14:00 AM	42638.63	43315.00	1299.45	-676.37	Pass	NA	NA	NA	NA	NA
Detector 8										
8/30/2023 12:08:00 AM	42178.45	39314.88	1179.45	2863.58	**FAIL**	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	41874.62	39314.88	1179.45	2559.74	**FAIL**	NA	NA	NA	NA	NA
Detector 9										
8/30/2023 12:08:00 AM	45972.22	45154.48	1354.63	817.74	Pass	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	45701.03	45154.48	1354.63	546.55	Pass	NA	NA	NA	NA	NA
Detector 10										
8/30/2023 12:08:00 AM	47225.04	46629.73	1398.89	595.31	Pass	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	47041.07	46629.73	1398.89	411.34	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
8/30/2023 12:08:00 AM	56578.56	55931.08	1677.93	647.49	Pass	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	56555.89	55931.08	1677.93	624.82	Pass	NA	NA	NA	NA	NA
Detector 12										
8/30/2023 12:08:00 AM	46958.28	47429.53	1422.89	-471.25	Pass	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	46423.12	47429.53	1422.89	-1006.40	Pass	NA	NA	NA	NA	NA
Detector 13										
8/30/2023 12:08:00 AM	51391.69	51931.68	1557.95	-539.98	Pass	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	52075.04	51931.68	1557.95	143.37	Pass	NA	NA	NA	NA	NA
Detector 14										
8/30/2023 12:08:00 AM	48397.40	48963.20	1468.90	-565.80	Pass	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	48183.29	48963.20	1468.90	-779.91	Pass	NA	NA	NA	NA	NA
Detector 15										
8/30/2023 12:08:00 AM	42912.90	43148.10	1294.44	-235.20	Pass	NA	NA	NA	NA	NA
8/31/2023 12:09:00 AM	42463.97	43148.10	1294.44	-684.13	Pass	NA	NA	NA	NA	NA
Detector 16										
8/30/2023 12:16:00 AM	46897.22	46968.15	1409.04	-70.93	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	46887.66	46968.15	1409.04	-80.49	Pass	NA	NA	NA	NA	NA
Detector 17										
8/30/2023 12:16:00 AM	45661.85	46192.13	1385.76	-530.27	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	45498.71	46192.13	1385.76	-693.41	Pass	NA	NA	NA	NA	NA
Detector 18										
8/30/2023 12:16:00 AM	46440.31	46867.38	1406.02	-427.07	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	46344.47	46867.38	1406.02	-522.90	Pass	NA	NA	NA	NA	NA
Detector 19										
8/30/2023 12:16:00 AM	56475.36	56633.50	1699.01	-158.14	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	56350.35	56633.50	1699.01	-283.15	Pass	NA	NA	NA	NA	NA
Detector 20										
8/30/2023 12:16:00 AM	48095.38	48917.15	1467.51	-821.77	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	48636.79	48917.15	1467.51	-280.36	Pass	NA	NA	NA	NA	NA
Detector 21										
8/30/2023 12:16:00 AM	52027.58	51775.10	1553.25	252.48	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	52205.39	51775.10	1553.25	430.29	Pass	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
8/30/2023 12:16:00 AM	47903.34	48938.63	1468.16	-1035.28	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	47902.10	48938.63	1468.16	-1036.52	Pass	NA	NA	NA	NA	NA
Detector 23										
8/30/2023 12:16:00 AM	42482.00	43236.93	1297.11	-754.93	Pass	NA	NA	NA	NA	NA
8/31/2023 12:17:00 AM	42538.16	43236.93	1297.11	-698.76	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
8/30/2023 3:38:00 AM	0.04	0.17	0.04	-0.13	FAIL	0.51	0.47	0.08	0.040	Pass
8/31/2023 3:40:00 AM	0.07	0.17	0.04	-0.10	Pass	0.49	0.47	0.08	0.015	Pass
Detector 1										
8/30/2023 3:38:00 AM	0.11	0.17	0.03	-0.07	Pass	0.23	0.41	0.06	-0.183	Pass
8/31/2023 3:40:00 AM	0.06	0.17	0.03	-0.11	FAIL	0.28	0.41	0.06	-0.128	Pass
Detector 2										
8/30/2023 3:38:00 AM	0.06	0.19	0.03	-0.13	FAIL	0.33	0.41	0.08	-0.081	Pass
8/31/2023 3:40:00 AM	0.04	0.19	0.03	-0.15	FAIL	0.40	0.41	0.08	-0.005	Pass
Detector 3										
8/30/2023 3:38:00 AM	0.09	0.27	0.05	-0.18	FAIL	0.28	0.62	0.08	-0.349	FAIL
8/31/2023 3:40:00 AM	0.08	0.27	0.05	-0.19	FAIL	0.36	0.62	0.08	-0.269	FAIL
Detector 4										
8/30/2023 3:38:00 AM	0.19	0.29	0.04	-0.10	Pass	0.47	0.48	0.12	-0.019	Pass
8/31/2023 3:39:00 AM	0.11	0.29	0.04	-0.18	FAIL	0.44	0.48	0.12	-0.049	Pass
Detector 5										
8/30/2023 3:38:00 AM	0.08	0.22	0.05	-0.15	FAIL	0.30	0.52	0.20	-0.220	Pass
8/31/2023 3:39:00 AM	0.11	0.22	0.05	-0.12	Pass	0.29	0.52	0.20	-0.230	Pass
Detector 6										
8/30/2023 3:38:00 AM	0.11	0.25	0.04	-0.14	FAIL	0.27	0.39	0.07	-0.118	Pass
8/31/2023 3:39:00 AM	0.08	0.25	0.04	-0.17	FAIL	0.25	0.39	0.07	-0.143	Pass
Detector 7										
8/30/2023 3:38:00 AM	0.07	0.27	0.04	-0.21	FAIL	0.34	0.57	0.09	-0.229	Pass
8/31/2023 3:39:00 AM	0.11	0.27	0.04	-0.17	FAIL	0.35	0.57	0.09	-0.219	Pass
Detector 8										
8/30/2023 3:38:00 AM	0.04	0.18	0.04	-0.15	FAIL	0.59	0.40	0.09	0.191	Pass
8/31/2023 3:39:00 AM	0.05	0.18	0.04	-0.14	FAIL	0.60	0.40	0.09	0.201	Pass
Detector 9										
8/30/2023 3:38:00 AM	0.06	0.18	0.03	-0.12	FAIL	0.41	0.43	0.07	-0.026	Pass
8/31/2023 3:39:00 AM	0.07	0.18	0.03	-0.11	FAIL	0.34	0.43	0.07	-0.096	Pass
Detector 10										
8/30/2023 3:38:00 AM	0.08	0.19	0.04	-0.11	Pass	0.43	0.51	0.10	-0.082	Pass
8/31/2023 3:39:00 AM	0.03	0.19	0.04	-0.16	FAIL	0.42	0.51	0.10	-0.097	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
8/30/2023 3:38:00 AM	0.06	0.17	0.04	-0.11	Pass	0.49	0.61	0.09	-0.118	Pass
8/31/2023 3:39:00 AM	0.07	0.17	0.04	-0.10	Pass	0.40	0.61	0.09	-0.213	Pass
Detector 12										
8/30/2023 3:38:00 AM	0.06	0.16	0.03	-0.10	FAIL	0.54	0.46	0.08	0.082	Pass
8/31/2023 3:39:00 AM	0.05	0.16	0.03	-0.11	FAIL	0.66	0.46	0.08	0.197	Pass
Detector 13										
8/30/2023 3:38:00 AM	0.09	0.17	0.04	-0.09	Pass	0.35	0.38	0.06	-0.030	Pass
8/31/2023 3:39:00 AM	0.10	0.17	0.04	-0.07	Pass	0.22	0.38	0.06	-0.165	Pass
Detector 14										
8/30/2023 3:38:00 AM	0.08	0.20	0.04	-0.13	FAIL	0.48	0.50	0.07	-0.026	Pass
8/31/2023 3:39:00 AM	0.07	0.20	0.04	-0.14	FAIL	0.47	0.50	0.07	-0.031	Pass
Detector 15										
8/30/2023 3:38:00 AM	0.11	0.17	0.03	-0.06	Pass	0.37	0.42	0.06	-0.053	Pass
8/31/2023 3:39:00 AM	0.07	0.17	0.03	-0.10	FAIL	0.33	0.42	0.06	-0.093	Pass
Detector 16										
8/30/2023 3:38:00 AM	0.04	0.14	0.03	-0.10	FAIL	0.49	0.45	0.10	0.035	Pass
8/31/2023 3:39:00 AM	0.08	0.14	0.03	-0.06	Pass	0.41	0.45	0.10	-0.040	Pass
Detector 17										
8/30/2023 3:38:00 AM	0.09	0.14	0.02	-0.06	Pass	0.33	6.82	8.30	-6.491	Pass
8/31/2023 3:39:00 AM	0.12	0.14	0.02	-0.03	Pass	0.49	6.82	8.30	-6.336	Pass
Detector 18										
8/30/2023 3:39:00 AM	0.09	0.13	0.03	-0.04	Pass	0.31	0.37	0.08	-0.060	Pass
8/31/2023 3:39:00 AM	0.07	0.13	0.03	-0.06	Pass	0.23	0.37	0.08	-0.140	Pass
Detector 19										
8/30/2023 3:39:00 AM	0.06	0.16	0.05	-0.10	Pass	0.47	0.44	0.08	0.023	Pass
8/31/2023 3:39:00 AM	0.06	0.16	0.05	-0.10	Pass	0.37	0.44	0.08	-0.072	Pass
Detector 20										
8/30/2023 3:39:00 AM	0.09	0.15	0.03	-0.06	Pass	0.30	0.42	0.07	-0.115	Pass
8/31/2023 3:39:00 AM	0.04	0.15	0.03	-0.11	FAIL	0.40	0.42	0.07	-0.020	Pass
Detector 21										
8/30/2023 3:39:00 AM	0.08	0.15	0.04	-0.07	Pass	0.37	0.32	0.05	0.043	Pass
8/31/2023 3:39:00 AM	0.09	0.15	0.04	-0.06	Pass	0.25	0.32	0.05	-0.072	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
8/30/2023 3:39:00 AM	0.07	0.17	0.04	-0.11	Pass	0.45	0.35	0.06	0.091	Pass
8/31/2023 3:39:00 AM	0.06	0.17	0.04	-0.12	Pass	0.30	0.35	0.06	-0.060	Pass
Detector 23										
8/30/2023 3:39:00 AM	0.07	0.15	0.03	-0.08	Pass	0.36	0.43	0.06	-0.080	Pass
8/31/2023 3:39:00 AM	0.05	0.15	0.03	-0.11	**FAIL**	0.28	0.43	0.06	-0.155	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/7/2023 12:10:00 AM	9649.01	9785.18	293.56	-136.16	Pass	3353.50	3364.35	39.95	-10.850	Pass
9/8/2023 12:09:00 AM	9626.51	9785.18	293.56	-158.67	Pass	3429.00	3364.35	39.95	64.650	Pass
Detector 1										
9/7/2023 12:11:00 AM	11046.90	11182.10	335.46	-135.20	Pass	3876.00	3961.88	58.91	-85.875	Pass
9/8/2023 12:09:00 AM	11033.43	11182.10	335.46	-148.67	Pass	3915.00	3961.88	58.91	-46.875	Pass
Detector 2										
9/7/2023 12:10:00 AM	10475.72	10547.78	316.43	-72.05	Pass	3934.50	3862.43	54.26	72.075	Pass
9/8/2023 12:09:00 AM	10325.45	10547.78	316.43	-222.32	Pass	3927.50	3862.43	54.26	65.075	Pass
Detector 3										
9/7/2023 12:10:00 AM	11650.66	11644.80	349.34	5.86	Pass	4082.00	4157.70	57.23	-75.700	Pass
9/8/2023 12:09:00 AM	11447.29	11644.80	349.34	-197.51	Pass	4080.50	4157.70	57.23	-77.200	Pass
Detector 4										
9/7/2023 12:11:00 AM	15286.19	15407.73	462.23	-121.53	Pass	4961.00	4850.53	67.02	110.475	Pass
9/8/2023 12:09:00 AM	15140.46	15407.73	462.23	-267.27	Pass	5020.00	4850.53	67.02	169.475	**WARNING**
Detector 5										
9/7/2023 12:11:00 AM	14767.12	15246.68	457.40	-479.56	**FAIL**	4836.50	4784.45	54.21	52.050	Pass
9/8/2023 12:09:00 AM	14889.94	15246.68	457.40	-356.74	Pass	4816.00	4784.45	54.21	31.550	Pass
Detector 6										
9/7/2023 12:11:00 AM	12136.16	12512.03	375.36	-375.86	**FAIL**	4426.50	4250.58	61.83	175.925	**WARNING**
9/8/2023 12:09:00 AM	12145.24	12512.03	375.36	-366.79	Pass	4401.50	4250.58	61.83	150.925	**WARNING**
Detector 7										
9/7/2023 12:11:00 AM	12889.73	13104.10	393.12	-214.37	Pass	4600.50	4544.05	59.72	56.450	Pass
9/8/2023 12:09:00 AM	12817.63	13104.10	393.12	-286.47	Pass	4667.00	4544.05	59.72	122.950	**WARNING**
Detector 8										
9/7/2023 12:19:00 AM	8784.70	8616.85	258.51	167.85	Pass	4430.00	4337.84	112.88	92.160	Pass
9/8/2023 12:17:00 AM	8369.88	8616.85	258.51	-246.97	Pass	4553.50	4337.84	112.88	215.660	Pass
Detector 9										
9/7/2023 12:19:00 AM	11412.64	11482.23	344.47	-69.58	Pass	3673.00	3691.35	48.64	-18.350	Pass
9/8/2023 12:17:00 AM	11478.83	11482.23	344.47	-3.39	Pass	3618.00	3691.35	48.64	-73.350	Pass
Detector 10										
9/7/2023 12:19:00 AM	10807.89	10892.15	326.76	-84.26	Pass	3532.50	3537.60	35.64	-5.100	Pass
9/8/2023 12:17:00 AM	10802.93	10892.15	326.76	-89.22	Pass	3601.00	3537.60	35.64	63.400	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/7/2023 12:19:00 AM	11707.76	11798.93	353.97	-91.17	Pass	3826.00	3873.03	45.81	-47.025	Pass
9/8/2023 12:17:00 AM	11655.20	11798.93	353.97	-143.73	Pass	3749.00	3873.03	45.81	-124.025	**WARNING**
Detector 12										
9/7/2023 12:19:00 AM	14603.76	14376.38	431.29	227.38	Pass	5638.00	5778.53	78.33	-140.525	Pass
9/8/2023 12:17:00 AM	14197.98	14376.38	431.29	-178.40	Pass	5849.50	5778.53	78.33	70.975	Pass
Detector 13										
9/7/2023 12:19:00 AM	15185.46	15112.78	453.38	72.69	Pass	4748.50	4872.78	66.66	-124.275	Pass
9/8/2023 12:17:00 AM	14965.57	15112.78	453.38	-147.20	Pass	4673.50	4872.78	66.66	-199.275	**WARNING**
Detector 14										
9/7/2023 12:19:00 AM	12209.29	12445.30	373.36	-236.01	Pass	4235.00	4336.03	47.90	-101.025	**WARNING**
9/8/2023 12:17:00 AM	12391.73	12445.30	373.36	-53.57	Pass	4292.50	4336.03	47.90	-43.525	Pass
Detector 15										
9/7/2023 12:19:00 AM	12849.12	12888.03	386.64	-38.90	Pass	4253.50	4413.40	31.79	-159.900	**DOEF**
9/8/2023 12:17:00 AM	12832.64	12888.03	386.64	-55.38	Pass	4413.50	4413.40	31.79	0.100	Pass
Detector 16										
9/7/2023 12:14:00 AM	9609.89	9814.13	294.42	-204.23	Pass	3466.50	3388.58	61.49	77.925	Pass
9/8/2023 12:13:00 AM	9730.69	9814.13	294.42	-83.44	Pass	3484.50	3388.58	61.49	95.925	Pass
Detector 17										
9/7/2023 12:14:00 AM	11234.26	11253.23	337.60	-18.97	Pass	4037.00	3958.00	41.22	79.000	Pass
9/8/2023 12:13:00 AM	11114.06	11253.23	337.60	-139.17	Pass	4005.00	3958.00	41.22	47.000	Pass
Detector 18										
9/7/2023 12:14:00 AM	10337.40	10555.95	316.68	-218.55	Pass	3964.50	3948.08	59.81	16.425	Pass
9/8/2023 12:13:00 AM	10302.87	10555.95	316.68	-253.08	Pass	3933.00	3948.08	59.81	-15.075	Pass
Detector 19										
9/7/2023 12:14:00 AM	11504.31	11591.85	347.76	-87.54	Pass	4103.50	4218.30	50.23	-114.800	**WARNING**
9/8/2023 12:13:00 AM	11526.41	11591.85	347.76	-65.44	Pass	4201.50	4218.30	50.23	-16.800	Pass
Detector 20										
9/7/2023 12:14:00 AM	15160.38	15329.28	459.88	-168.89	Pass	5093.50	5170.15	64.69	-76.648	Pass
9/8/2023 12:13:00 AM	15041.20	15329.28	459.88	-288.07	Pass	5190.00	5170.15	64.69	19.852	Pass
Detector 21										
9/7/2023 12:14:00 AM	15156.88	15305.28	459.16	-148.40	Pass	5107.00	5199.90	72.13	-92.900	Pass
9/8/2023 12:13:00 AM	15198.53	15305.28	459.16	-106.75	Pass	5073.00	5199.90	72.13	-126.900	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/7/2023 7:59:00 AM	12152.16	12418.15	372.54	-265.99	Pass	4272.50	4433.95	55.09	-161.450	**WARNING**
9/8/2023 12:13:00 AM	12185.78	12418.15	372.54	-232.37	Pass	4217.50	4433.95	55.09	-216.450	**DOEF**
Detector 23										
9/7/2023 7:59:00 AM	12738.87	12827.98	384.84	-89.11	Pass	4709.00	4667.03	71.68	41.975	Pass
9/8/2023 12:13:00 AM	12792.04	12827.98	384.84	-35.94	Pass	4622.50	4667.03	71.68	-44.525	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/7/2023 12:15:00 AM	46948.10	46977.48	1409.32	-29.37	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	46836.72	46977.48	1409.32	-140.75	Pass	NA	NA	NA	NA	NA
Detector 1										
9/7/2023 12:15:00 AM	45467.38	45880.28	1376.41	-412.89	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	45294.81	45880.28	1376.41	-585.46	Pass	NA	NA	NA	NA	NA
Detector 2										
9/7/2023 12:15:00 AM	46327.73	47375.98	1421.28	-1048.25	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	45991.20	47375.98	1421.28	-1384.78	Pass	NA	NA	NA	NA	NA
Detector 3										
9/7/2023 12:15:00 AM	56332.92	56474.80	1694.24	-141.88	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	56227.66	56474.80	1694.24	-247.14	Pass	NA	NA	NA	NA	NA
Detector 4										
9/7/2023 12:15:00 AM	48332.90	48963.30	1468.90	-630.40	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	48173.79	48963.30	1468.90	-789.51	Pass	NA	NA	NA	NA	NA
Detector 5										
9/7/2023 12:15:00 AM	51763.70	52229.20	1566.88	-465.50	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	51849.13	52229.20	1566.88	-380.07	Pass	NA	NA	NA	NA	NA
Detector 6										
9/7/2023 12:15:00 AM	47716.81	48723.95	1461.72	-1007.14	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	47526.23	48723.95	1461.72	-1197.72	Pass	NA	NA	NA	NA	NA
Detector 7										
9/7/2023 12:15:00 AM	42489.94	43315.00	1299.45	-825.06	Pass	NA	NA	NA	NA	NA
9/8/2023 12:14:00 AM	42641.89	43315.00	1299.45	-673.11	Pass	NA	NA	NA	NA	NA
Detector 8										
9/7/2023 12:11:00 AM	42521.80	39314.88	1179.45	3206.92	**FAIL**	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	42034.74	39314.88	1179.45	2719.87	**FAIL**	NA	NA	NA	NA	NA
Detector 9										
9/7/2023 12:11:00 AM	45757.89	45154.48	1354.63	603.42	Pass	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	45773.01	45154.48	1354.63	618.54	Pass	NA	NA	NA	NA	NA
Detector 10										
9/7/2023 12:11:00 AM	47412.39	46629.73	1398.89	782.67	Pass	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	47215.67	46629.73	1398.89	585.95	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/7/2023 12:11:00 AM	56340.42	55931.08	1677.93	409.35	Pass	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	56352.40	55931.08	1677.93	421.32	Pass	NA	NA	NA	NA	NA
Detector 12										
9/7/2023 12:11:00 AM	46623.56	47429.53	1422.89	-805.96	Pass	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	46429.91	47429.53	1422.89	-999.62	Pass	NA	NA	NA	NA	NA
Detector 13										
9/7/2023 12:11:00 AM	52322.57	51931.68	1557.95	390.90	Pass	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	51943.49	51931.68	1557.95	11.81	Pass	NA	NA	NA	NA	NA
Detector 14										
9/7/2023 12:11:00 AM	48646.98	48963.20	1468.90	-316.22	Pass	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	48112.42	48963.20	1468.90	-850.78	Pass	NA	NA	NA	NA	NA
Detector 15										
9/7/2023 12:11:00 AM	42539.75	43148.10	1294.44	-608.35	Pass	NA	NA	NA	NA	NA
9/8/2023 12:09:00 AM	42610.28	43148.10	1294.44	-537.82	Pass	NA	NA	NA	NA	NA
Detector 16										
9/7/2023 12:19:00 AM	46945.67	46968.15	1409.04	-22.48	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	47154.11	46968.15	1409.04	185.96	Pass	NA	NA	NA	NA	NA
Detector 17										
9/7/2023 12:19:00 AM	45836.25	46192.13	1385.76	-355.88	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	45434.68	46192.13	1385.76	-757.45	Pass	NA	NA	NA	NA	NA
Detector 18										
9/7/2023 12:19:00 AM	46215.83	46867.38	1406.02	-651.55	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	46132.02	46867.38	1406.02	-735.35	Pass	NA	NA	NA	NA	NA
Detector 19										
9/7/2023 12:19:00 AM	56353.83	56633.50	1699.01	-279.67	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	56308.01	56633.50	1699.01	-325.49	Pass	NA	NA	NA	NA	NA
Detector 20										
9/7/2023 12:20:00 AM	48658.76	48917.15	1467.51	-258.39	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	48470.98	48917.15	1467.51	-446.17	Pass	NA	NA	NA	NA	NA
Detector 21										
9/7/2023 12:20:00 AM	52531.66	51775.10	1553.25	756.56	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	52153.72	51775.10	1553.25	378.62	Pass	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/7/2023 8:03:00 AM	47598.97	48938.63	1468.16	-1339.65	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	47975.30	48938.63	1468.16	-963.32	Pass	NA	NA	NA	NA	NA
Detector 23										
9/7/2023 8:03:00 AM	42307.97	43236.93	1297.11	-928.95	Pass	NA	NA	NA	NA	NA
9/8/2023 12:17:00 AM	42474.78	43236.93	1297.11	-762.15	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/7/2023 3:42:00 AM	0.10	0.17	0.04	-0.07	Pass	0.43	0.47	0.08	-0.041	Pass
9/8/2023 3:40:00 AM	0.09	0.17	0.04	-0.08	Pass	0.43	0.47	0.08	-0.046	Pass
Detector 1										
9/7/2023 3:42:00 AM	0.12	0.17	0.03	-0.05	Pass	0.30	0.41	0.06	-0.113	Pass
9/8/2023 3:41:00 AM	0.09	0.17	0.03	-0.08	Pass	0.35	0.41	0.06	-0.058	Pass
Detector 2										
9/7/2023 3:42:00 AM	0.06	0.19	0.03	-0.14	FAIL	0.24	0.41	0.08	-0.166	Pass
9/8/2023 3:40:00 AM	0.05	0.19	0.03	-0.14	FAIL	0.31	0.41	0.08	-0.101	Pass
Detector 3										
9/7/2023 3:42:00 AM	0.09	0.27	0.05	-0.18	FAIL	0.39	0.62	0.08	-0.234	Pass
9/8/2023 3:40:00 AM	0.12	0.27	0.05	-0.16	Pass	0.49	0.62	0.08	-0.134	Pass
Detector 4										
9/7/2023 3:42:00 AM	0.20	0.29	0.04	-0.09	Pass	0.58	0.48	0.12	0.091	Pass
9/8/2023 3:40:00 AM	0.21	0.29	0.04	-0.08	Pass	0.60	0.48	0.12	0.111	Pass
Detector 5										
9/7/2023 3:42:00 AM	0.20	0.22	0.05	-0.02	Pass	0.45	0.52	0.20	-0.075	Pass
9/8/2023 3:40:00 AM	0.15	0.22	0.05	-0.07	Pass	0.36	0.52	0.20	-0.165	Pass
Detector 6										
9/7/2023 3:42:00 AM	0.06	0.25	0.04	-0.19	FAIL	0.37	0.39	0.07	-0.023	Pass
9/8/2023 3:40:00 AM	0.06	0.25	0.04	-0.19	FAIL	0.28	0.39	0.07	-0.108	Pass
Detector 7										
9/7/2023 3:42:00 AM	0.08	0.27	0.04	-0.20	FAIL	0.47	0.57	0.09	-0.104	Pass
9/8/2023 3:40:00 AM	0.08	0.27	0.04	-0.19	FAIL	0.33	0.57	0.09	-0.239	Pass
Detector 8										
9/7/2023 3:42:00 AM	0.08	0.18	0.04	-0.10	Pass	0.67	0.40	0.09	0.271	Pass
9/8/2023 3:40:00 AM	0.10	0.18	0.04	-0.09	Pass	0.54	0.40	0.09	0.141	Pass
Detector 9										
9/7/2023 3:42:00 AM	0.09	0.18	0.03	-0.09	Pass	0.35	0.43	0.07	-0.086	Pass
9/8/2023 3:40:00 AM	0.07	0.18	0.03	-0.11	FAIL	0.42	0.43	0.07	-0.016	Pass
Detector 10										
9/7/2023 3:42:00 AM	0.09	0.19	0.04	-0.10	Pass	0.37	0.51	0.10	-0.147	Pass
9/8/2023 3:40:00 AM	0.12	0.19	0.04	-0.08	Pass	0.49	0.51	0.10	-0.022	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/7/2023 3:42:00 AM	0.05	0.17	0.04	-0.12	FAIL	0.42	0.61	0.09	-0.193	Pass
9/8/2023 3:40:00 AM	0.09	0.17	0.04	-0.08	Pass	0.69	0.61	0.09	0.082	Pass
Detector 12										
9/7/2023 3:42:00 AM	0.10	0.16	0.03	-0.06	Pass	0.68	0.46	0.08	0.222	Pass
9/8/2023 3:40:00 AM	0.08	0.16	0.03	-0.08	Pass	0.61	0.46	0.08	0.147	Pass
Detector 13										
9/7/2023 3:42:00 AM	0.09	0.17	0.04	-0.09	Pass	0.21	0.38	0.06	-0.175	Pass
9/8/2023 3:40:00 AM	0.12	0.17	0.04	-0.05	Pass	0.41	0.38	0.06	0.025	Pass
Detector 14										
9/7/2023 3:42:00 AM	0.09	0.20	0.04	-0.11	Pass	0.37	0.50	0.07	-0.136	Pass
9/8/2023 3:40:00 AM	0.13	0.20	0.04	-0.07	Pass	0.36	0.50	0.07	-0.146	Pass
Detector 15										
9/7/2023 3:42:00 AM	0.16	0.17	0.03	-0.01	Pass	0.32	0.42	0.06	-0.103	Pass
9/8/2023 3:40:00 AM	0.13	0.17	0.03	-0.04	Pass	0.37	0.42	0.06	-0.053	Pass
Detector 16										
9/7/2023 3:42:00 AM	0.08	0.14	0.03	-0.06	Pass	0.42	0.45	0.10	-0.035	Pass
9/8/2023 3:40:00 AM	0.05	0.14	0.03	-0.09	FAIL	0.27	0.45	0.10	-0.185	Pass
Detector 17										
9/7/2023 3:42:00 AM	0.08	0.14	0.02	-0.07	Pass	0.48	6.82	8.30	-6.341	Pass
9/8/2023 3:40:00 AM	0.09	0.14	0.02	-0.06	Pass	0.41	6.82	8.30	-6.411	Pass
Detector 18										
9/7/2023 3:42:00 AM	0.05	0.13	0.03	-0.08	Pass	0.35	0.37	0.08	-0.015	Pass
9/8/2023 3:40:00 AM	0.08	0.13	0.03	-0.05	Pass	0.40	0.37	0.08	0.030	Pass
Detector 19										
9/7/2023 3:42:00 AM	0.09	0.16	0.05	-0.07	Pass	0.43	0.44	0.08	-0.017	Pass
9/8/2023 3:40:00 AM	0.06	0.16	0.05	-0.10	Pass	0.42	0.44	0.08	-0.022	Pass
Detector 20										
9/7/2023 3:42:00 AM	0.10	0.15	0.03	-0.05	Pass	0.44	0.42	0.07	0.020	Pass
9/8/2023 3:40:00 AM	0.07	0.15	0.03	-0.08	FAIL	0.35	0.42	0.07	-0.070	Pass
Detector 21										
9/7/2023 3:42:00 AM	0.10	0.15	0.04	-0.05	Pass	0.24	0.32	0.05	-0.082	Pass
9/8/2023 3:40:00 AM	0.15	0.15	0.04	0.00	Pass	0.33	0.32	0.05	0.003	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/7/2023 12:26:00 PM	0.12	0.17	0.04	-0.06	Pass	0.33	0.35	0.06	-0.030	Pass
9/8/2023 3:40:00 AM	0.07	0.17	0.04	-0.11	Pass	0.33	0.35	0.06	-0.025	Pass
Detector 23										
9/7/2023 12:27:00 PM	0.05	0.15	0.03	-0.10	**FAIL**	0.41	0.43	0.06	-0.030	Pass
9/8/2023 3:40:00 AM	0.04	0.15	0.03	-0.12	**FAIL**	0.31	0.43	0.06	-0.125	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Check Type = Alpha										
Detector 0										
9/8/2023 12:09:00 AM	9626.51	9785.18	293.56	-158.67	Pass	3429.00	3364.35	39.95	64.650	Pass
9/11/2023 6:41:00 AM	9620.62	9785.18	293.56	-164.55	Pass	3383.50	3364.35	39.95	19.150	Pass
Detector 1										
9/8/2023 12:09:00 AM	11033.43	11182.10	335.46	-148.67	Pass	3915.00	3961.88	58.91	-46.875	Pass
9/11/2023 6:41:00 AM	10955.91	11182.10	335.46	-226.19	Pass	4016.00	3961.88	58.91	54.125	Pass
Detector 2										
9/8/2023 12:09:00 AM	10325.45	10547.78	316.43	-222.32	Pass	3927.50	3862.43	54.26	65.075	Pass
9/11/2023 6:41:00 AM	10068.05	10547.78	316.43	-479.72	**FAIL**	4139.50	3862.43	54.26	277.075	**DOEF**
Detector 3										
9/8/2023 12:09:00 AM	11447.29	11644.80	349.34	-197.51	Pass	4080.50	4157.70	57.23	-77.200	Pass
9/11/2023 6:41:00 AM	11493.53	11644.80	349.34	-151.27	Pass	4252.00	4157.70	57.23	94.300	Pass
Detector 4										
9/8/2023 12:09:00 AM	15140.46	15407.73	462.23	-267.27	Pass	5020.00	4850.53	67.02	169.475	**WARNING**
9/11/2023 6:41:00 AM	14979.32	15407.73	462.23	-428.40	Pass	5121.00	4850.53	67.02	270.475	**DOEF**
Detector 5										
9/8/2023 12:09:00 AM	14889.94	15246.68	457.40	-356.74	Pass	4816.00	4784.45	54.21	31.550	Pass
9/11/2023 6:41:00 AM	14571.47	15246.68	457.40	-675.21	**FAIL**	5105.00	4784.45	54.21	320.550	**DOEF**
Detector 6										
9/8/2023 12:09:00 AM	12145.24	12512.03	375.36	-366.79	Pass	4401.50	4250.58	61.83	150.925	**WARNING**
9/11/2023 6:41:00 AM	12046.19	12512.03	375.36	-465.84	**FAIL**	4559.00	4250.58	61.83	308.425	**DOEF**
Detector 7										
9/8/2023 12:09:00 AM	12817.63	13104.10	393.12	-286.47	Pass	4667.00	4544.05	59.72	122.950	**WARNING**
9/11/2023 6:42:00 AM	12554.75	13104.10	393.12	-549.35	**FAIL**	4851.50	4544.05	59.72	307.450	**DOEF**
Detector 8										
9/8/2023 12:17:00 AM	8369.88	8616.85	258.51	-246.97	Pass	4553.50	4337.84	112.88	215.660	Pass
9/11/2023 6:46:00 AM	7826.35	8616.85	258.51	-790.50	**FAIL**	4813.00	4337.84	112.88	475.160	**DOEF**
Detector 9										
9/8/2023 12:17:00 AM	11478.83	11482.23	344.47	-3.39	Pass	3618.00	3691.35	48.64	-73.350	Pass
9/11/2023 6:47:00 AM	11408.84	11482.23	344.47	-73.39	Pass	3701.00	3691.35	48.64	9.650	Pass
Detector 10										
9/8/2023 12:17:00 AM	10802.93	10892.15	326.76	-89.22	Pass	3601.00	3537.60	35.64	63.400	Pass
9/11/2023 6:47:00 AM	10696.85	10892.15	326.76	-195.30	Pass	3488.00	3537.60	35.64	-49.600	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 11										
9/8/2023 12:17:00 AM	11655.20	11798.93	353.97	-143.73	Pass	3749.00	3873.03	45.81	-124.025	**WARNING**
9/11/2023 6:47:00 AM	11693.43	11798.93	353.97	-105.49	Pass	3909.00	3873.03	45.81	35.975	Pass
Detector 12										
9/8/2023 12:17:00 AM	14197.98	14376.38	431.29	-178.40	Pass	5849.50	5778.53	78.33	70.975	Pass
9/11/2023 6:47:00 AM	13965.18	14376.38	431.29	-411.20	Pass	6160.00	5778.53	78.33	381.475	**DOEF**
Detector 13										
9/8/2023 12:17:00 AM	14965.57	15112.78	453.38	-147.20	Pass	4673.50	4872.78	66.66	-199.275	**WARNING**
9/11/2023 6:47:00 AM	14836.50	15112.78	453.38	-276.28	Pass	4809.00	4872.78	66.66	-63.775	Pass
Detector 14										
9/8/2023 12:17:00 AM	12391.73	12445.30	373.36	-53.57	Pass	4292.50	4336.03	47.90	-43.525	Pass
9/11/2023 6:47:00 AM	12195.98	12445.30	373.36	-249.32	Pass	4370.00	4336.03	47.90	33.975	Pass
Detector 15										
9/8/2023 12:17:00 AM	12832.64	12888.03	386.64	-55.38	Pass	4413.50	4413.40	31.79	0.100	Pass
9/11/2023 6:47:00 AM	12846.84	12888.03	386.64	-41.18	Pass	4431.00	4413.40	31.79	17.600	Pass
Detector 16										
9/8/2023 12:13:00 AM	9730.69	9814.13	294.42	-83.44	Pass	3484.50	3388.58	61.49	95.925	Pass
9/11/2023 6:51:00 AM	9703.76	9814.13	294.42	-110.37	Pass	3476.00	3388.58	61.49	87.425	Pass
Detector 17										
9/8/2023 12:13:00 AM	11114.06	11253.23	337.60	-139.17	Pass	4005.00	3958.00	41.22	47.000	Pass
9/11/2023 6:51:00 AM	11017.50	11253.23	337.60	-235.73	Pass	4027.00	3958.00	41.22	69.000	Pass
Detector 18										
9/8/2023 12:13:00 AM	10302.87	10555.95	316.68	-253.08	Pass	3933.00	3948.08	59.81	-15.075	Pass
9/11/2023 6:51:00 AM	10184.26	10555.95	316.68	-371.69	**FAIL**	4062.00	3948.08	59.81	113.925	Pass
Detector 19										
9/8/2023 12:13:00 AM	11526.41	11591.85	347.76	-65.44	Pass	4201.50	4218.30	50.23	-16.800	Pass
9/11/2023 6:51:00 AM	11196.87	11591.85	347.76	-394.98	**FAIL**	4268.00	4218.30	50.23	49.700	Pass
Detector 20										
9/8/2023 12:13:00 AM	15041.20	15329.28	459.88	-288.07	Pass	5190.00	5170.15	64.69	19.852	Pass
9/11/2023 6:51:00 AM	15032.38	15329.28	459.88	-296.89	Pass	5308.50	5170.15	64.69	138.352	**WARNING**
Detector 21										
9/8/2023 12:13:00 AM	15198.53	15305.28	459.16	-106.75	Pass	5073.00	5199.90	72.13	-126.900	Pass
9/11/2023 6:51:00 AM	15109.04	15305.28	459.16	-196.23	Pass	5290.50	5199.90	72.13	90.600	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Alpha CPM	Alpha Mean	Alpha +/- limit	Alpha Deviation	Alpha Flag	A>>B XT CPM	A>>B XT Mean	A>>B XT +/- limit	A>>B XT Deviation	A>>B XT Flag
Detector 22										
9/8/2023 12:13:00 AM	12185.78	12418.15	372.54	-232.37	Pass	4217.50	4433.95	55.09	-216.450	**DOEF**
9/11/2023 6:51:00 AM	12052.66	12418.15	372.54	-365.49	Pass	4332.00	4433.95	55.09	-101.950	Pass
Detector 23										
9/8/2023 12:13:00 AM	12792.04	12827.98	384.84	-35.94	Pass	4622.50	4667.03	71.68	-44.525	Pass
9/11/2023 6:51:00 AM	12613.83	12827.98	384.84	-214.14	Pass	4772.00	4667.03	71.68	104.975	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Check Type = Beta										
Detector 0										
9/8/2023 12:14:00 AM	46836.72	46977.48	1409.32	-140.75	Pass	NA	NA	NA	NA	NA
9/11/2023 6:36:00 AM	46452.41	46977.48	1409.32	-525.07	Pass	NA	NA	NA	NA	NA
Detector 1										
9/8/2023 12:14:00 AM	45294.81	45880.28	1376.41	-585.46	Pass	NA	NA	NA	NA	NA
9/11/2023 6:36:00 AM	45120.47	45880.28	1376.41	-759.80	Pass	NA	NA	NA	NA	NA
Detector 2										
9/8/2023 12:14:00 AM	45991.20	47375.98	1421.28	-1384.78	Pass	NA	NA	NA	NA	NA
9/11/2023 6:36:00 AM	45590.19	47375.98	1421.28	-1785.79	**FAIL**	NA	NA	NA	NA	NA
Detector 3										
9/8/2023 12:14:00 AM	56227.66	56474.80	1694.24	-247.14	Pass	NA	NA	NA	NA	NA
9/11/2023 6:36:00 AM	56234.39	56474.80	1694.24	-240.41	Pass	NA	NA	NA	NA	NA
Detector 4										
9/8/2023 12:14:00 AM	48173.79	48963.30	1468.90	-789.51	Pass	NA	NA	NA	NA	NA
9/11/2023 6:36:00 AM	48464.67	48963.30	1468.90	-498.63	Pass	NA	NA	NA	NA	NA
Detector 5										
9/8/2023 12:14:00 AM	51849.13	52229.20	1566.88	-380.07	Pass	NA	NA	NA	NA	NA
9/11/2023 6:37:00 AM	51360.09	52229.20	1566.88	-869.11	Pass	NA	NA	NA	NA	NA
Detector 6										
9/8/2023 12:14:00 AM	47526.23	48723.95	1461.72	-1197.72	Pass	NA	NA	NA	NA	NA
9/11/2023 6:37:00 AM	46897.10	48723.95	1461.72	-1826.85	**FAIL**	NA	NA	NA	NA	NA
Detector 7										
9/8/2023 12:14:00 AM	42641.89	43315.00	1299.45	-673.11	Pass	NA	NA	NA	NA	NA
9/11/2023 6:37:00 AM	42362.99	43315.00	1299.45	-952.01	Pass	NA	NA	NA	NA	NA
Detector 8										
9/8/2023 12:09:00 AM	42034.74	39314.88	1179.45	2719.87	**FAIL**	NA	NA	NA	NA	NA
9/11/2023 6:40:00 AM	39510.23	39314.88	1179.45	195.36	Pass	NA	NA	NA	NA	NA
Detector 9										
9/8/2023 12:09:00 AM	45773.01	45154.48	1354.63	618.54	Pass	NA	NA	NA	NA	NA
9/11/2023 6:40:00 AM	45622.59	45154.48	1354.63	468.12	Pass	NA	NA	NA	NA	NA
Detector 10										
9/8/2023 12:09:00 AM	47215.67	46629.73	1398.89	585.95	Pass	NA	NA	NA	NA	NA
9/11/2023 6:40:00 AM	47220.07	46629.73	1398.89	590.35	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 11										
9/8/2023 12:09:00 AM	56352.40	55931.08	1677.93	421.32	Pass	NA	NA	NA	NA	NA
9/11/2023 6:41:00 AM	56338.24	55931.08	1677.93	407.16	Pass	NA	NA	NA	NA	NA
Detector 12										
9/8/2023 12:09:00 AM	46429.91	47429.53	1422.89	-999.62	Pass	NA	NA	NA	NA	NA
9/11/2023 6:41:00 AM	45965.18	47429.53	1422.89	-1464.35	**FAIL**	NA	NA	NA	NA	NA
Detector 13										
9/8/2023 12:09:00 AM	51943.49	51931.68	1557.95	11.81	Pass	NA	NA	NA	NA	NA
9/11/2023 6:41:00 AM	52274.19	51931.68	1557.95	342.51	Pass	NA	NA	NA	NA	NA
Detector 14										
9/8/2023 12:09:00 AM	48112.42	48963.20	1468.90	-850.78	Pass	NA	NA	NA	NA	NA
9/11/2023 6:41:00 AM	47959.54	48963.20	1468.90	-1003.66	Pass	NA	NA	NA	NA	NA
Detector 15										
9/8/2023 12:09:00 AM	42610.28	43148.10	1294.44	-537.82	Pass	NA	NA	NA	NA	NA
9/11/2023 6:41:00 AM	42576.87	43148.10	1294.44	-571.23	Pass	NA	NA	NA	NA	NA
Detector 16										
9/8/2023 12:17:00 AM	47154.11	46968.15	1409.04	185.96	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	46715.25	46968.15	1409.04	-252.90	Pass	NA	NA	NA	NA	NA
Detector 17										
9/8/2023 12:17:00 AM	45434.68	46192.13	1385.76	-757.45	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	45743.20	46192.13	1385.76	-448.93	Pass	NA	NA	NA	NA	NA
Detector 18										
9/8/2023 12:17:00 AM	46132.02	46867.38	1406.02	-735.35	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	45885.48	46867.38	1406.02	-981.90	Pass	NA	NA	NA	NA	NA
Detector 19										
9/8/2023 12:17:00 AM	56308.01	56633.50	1699.01	-325.49	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	55556.63	56633.50	1699.01	-1076.87	Pass	NA	NA	NA	NA	NA
Detector 20										
9/8/2023 12:17:00 AM	48470.98	48917.15	1467.51	-446.17	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	48084.97	48917.15	1467.51	-832.18	Pass	NA	NA	NA	NA	NA
Detector 21										
9/8/2023 12:17:00 AM	52153.72	51775.10	1553.25	378.62	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	51769.36	51775.10	1553.25	-5.74	Pass	NA	NA	NA	NA	NA

Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	Beta CPM	Beta Mean	Beta +/- limit	Beta Deviation	Beta Flag	B>>A XT CPM	B>>A XT Mean	B>>A XT +/- limit	B>>A XT Deviation	B>>A XT Flag
Detector 22										
9/8/2023 12:17:00 AM	47975.30	48938.63	1468.16	-963.32	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	47531.17	48938.63	1468.16	-1407.46	Pass	NA	NA	NA	NA	NA
Detector 23										
9/8/2023 12:17:00 AM	42474.78	43236.93	1297.11	-762.15	Pass	NA	NA	NA	NA	NA
9/11/2023 6:46:00 AM	42188.68	43236.93	1297.11	-1048.24	Pass	NA	NA	NA	NA	NA

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Check Type = BKG										
Detector 0										
9/8/2023 3:40:00 AM	0.09	0.17	0.04	-0.08	Pass	0.43	0.47	0.08	-0.046	Pass
9/11/2023 3:25:00 AM	0.08	0.17	0.04	-0.09	Pass	0.33	0.47	0.08	-0.146	Pass
Detector 1										
9/8/2023 3:41:00 AM	0.09	0.17	0.03	-0.08	Pass	0.35	0.41	0.06	-0.058	Pass
9/11/2023 3:25:00 AM	0.06	0.17	0.03	-0.12	FAIL	0.27	0.41	0.06	-0.143	Pass
Detector 2										
9/8/2023 3:40:00 AM	0.05	0.19	0.03	-0.14	FAIL	0.31	0.41	0.08	-0.101	Pass
9/11/2023 3:25:00 AM	0.12	0.19	0.03	-0.08	Pass	0.28	0.41	0.08	-0.131	Pass
Detector 3										
9/8/2023 3:40:00 AM	0.12	0.27	0.05	-0.16	Pass	0.49	0.62	0.08	-0.134	Pass
9/11/2023 3:25:00 AM	0.11	0.27	0.05	-0.17	FAIL	0.51	0.62	0.08	-0.114	Pass
Detector 4										
9/8/2023 3:40:00 AM	0.21	0.29	0.04	-0.08	Pass	0.60	0.48	0.12	0.111	Pass
9/11/2023 3:25:00 AM	0.14	0.29	0.04	-0.15	FAIL	0.37	0.48	0.12	-0.119	Pass
Detector 5										
9/8/2023 3:40:00 AM	0.15	0.22	0.05	-0.07	Pass	0.36	0.52	0.20	-0.165	Pass
9/11/2023 3:25:00 AM	0.12	0.22	0.05	-0.10	Pass	0.32	0.52	0.20	-0.200	Pass
Detector 6										
9/8/2023 3:40:00 AM	0.06	0.25	0.04	-0.19	FAIL	0.28	0.39	0.07	-0.108	Pass
9/11/2023 3:25:00 AM	0.08	0.25	0.04	-0.17	FAIL	0.28	0.39	0.07	-0.108	Pass
Detector 7										
9/8/2023 3:40:00 AM	0.08	0.27	0.04	-0.19	FAIL	0.33	0.57	0.09	-0.239	Pass
9/11/2023 3:25:00 AM	0.10	0.27	0.04	-0.17	FAIL	0.30	0.57	0.09	-0.269	FAIL
Detector 8										
9/8/2023 3:40:00 AM	0.10	0.18	0.04	-0.09	Pass	0.54	0.40	0.09	0.141	Pass
9/11/2023 3:25:00 AM	0.10	0.18	0.04	-0.08	Pass	0.26	0.40	0.09	-0.144	Pass
Detector 9										
9/8/2023 3:40:00 AM	0.07	0.18	0.03	-0.11	FAIL	0.42	0.43	0.07	-0.016	Pass
9/11/2023 3:25:00 AM	0.08	0.18	0.03	-0.10	FAIL	0.29	0.43	0.07	-0.141	Pass
Detector 10										
9/8/2023 3:40:00 AM	0.12	0.19	0.04	-0.08	Pass	0.49	0.51	0.10	-0.022	Pass
9/11/2023 3:25:00 AM	0.09	0.19	0.04	-0.10	Pass	0.43	0.51	0.10	-0.082	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 11										
9/8/2023 3:40:00 AM	0.09	0.17	0.04	-0.08	Pass	0.69	0.61	0.09	0.082	Pass
9/11/2023 3:25:00 AM	0.10	0.17	0.04	-0.07	Pass	0.55	0.61	0.09	-0.058	Pass
Detector 12										
9/8/2023 3:40:00 AM	0.08	0.16	0.03	-0.08	Pass	0.61	0.46	0.08	0.147	Pass
9/11/2023 3:25:00 AM	0.07	0.16	0.03	-0.09	**FAIL**	0.33	0.46	0.08	-0.133	Pass
Detector 13										
9/8/2023 3:40:00 AM	0.12	0.17	0.04	-0.05	Pass	0.41	0.38	0.06	0.025	Pass
9/11/2023 3:25:00 AM	0.12	0.17	0.04	-0.06	Pass	0.46	0.38	0.06	0.080	Pass
Detector 14										
9/8/2023 3:40:00 AM	0.13	0.20	0.04	-0.07	Pass	0.36	0.50	0.07	-0.146	Pass
9/11/2023 3:25:00 AM	0.07	0.20	0.04	-0.14	**FAIL**	0.40	0.50	0.07	-0.101	Pass
Detector 15										
9/8/2023 3:40:00 AM	0.13	0.17	0.03	-0.04	Pass	0.37	0.42	0.06	-0.053	Pass
9/11/2023 3:25:00 AM	0.10	0.17	0.03	-0.07	Pass	0.48	0.42	0.06	0.052	Pass
Detector 16										
9/8/2023 3:40:00 AM	0.05	0.14	0.03	-0.09	**FAIL**	0.27	0.45	0.10	-0.185	Pass
9/11/2023 3:25:00 AM	0.08	0.14	0.03	-0.06	Pass	0.30	0.45	0.10	-0.150	Pass
Detector 17										
9/8/2023 3:40:00 AM	0.09	0.14	0.02	-0.06	Pass	0.41	6.82	8.30	-6.411	Pass
9/11/2023 3:25:00 AM	0.14	0.14	0.02	-0.01	Pass	0.54	6.82	8.30	-6.286	Pass
Detector 18										
9/8/2023 3:40:00 AM	0.08	0.13	0.03	-0.05	Pass	0.40	0.37	0.08	0.030	Pass
9/11/2023 3:25:00 AM	0.08	0.13	0.03	-0.05	Pass	0.32	0.37	0.08	-0.045	Pass
Detector 19										
9/8/2023 3:40:00 AM	0.06	0.16	0.05	-0.10	Pass	0.42	0.44	0.08	-0.022	Pass
9/11/2023 3:25:00 AM	0.05	0.16	0.05	-0.11	Pass	0.36	0.44	0.08	-0.082	Pass
Detector 20										
9/8/2023 3:40:00 AM	0.07	0.15	0.03	-0.08	**FAIL**	0.35	0.42	0.07	-0.070	Pass
9/11/2023 3:25:00 AM	0.10	0.15	0.03	-0.05	Pass	0.42	0.42	0.07	0.005	Pass
Detector 21										
9/8/2023 3:40:00 AM	0.15	0.15	0.04	0.00	Pass	0.33	0.32	0.05	0.003	Pass
9/11/2023 3:25:00 AM	0.14	0.15	0.04	-0.01	Pass	0.28	0.32	0.05	-0.047	Pass

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Gas Proportional Counter Daily Quality Control Checks

Instrument: Red

	AlphaBKG CPM	BKG Mean	BKG +/- limit	BKG Deviation	BKG Flag	BetaBKG CPM	BetaBKG Mean	BetaBKG +/- limit	BetaBKG Deviation	BetaBKG Flag
Detector 22										
9/8/2023 3:40:00 AM	0.07	0.17	0.04	-0.11	Pass	0.33	0.35	0.06	-0.025	Pass
9/11/2023 3:25:00 AM	0.11	0.17	0.04	-0.06	Pass	0.34	0.35	0.06	-0.015	Pass
Detector 23										
9/8/2023 3:40:00 AM	0.04	0.15	0.03	-0.12	FAIL	0.31	0.43	0.06	-0.125	Pass
9/11/2023 3:25:00 AM	0.11	0.15	0.03	-0.04	Pass	0.31	0.43	0.06	-0.130	Pass

The Alpha and Beta +/- limit are based upon initial 20-point population.

The Alpha and Beta +/- limit for Efficiency is stated at 3%. Flags are "FAIL" > 3%.

The Alpha and Beta +/- limit for Background is stated at 1 StDev. Flags are "FAIL" > 3 StDev.

The Alpha +/- limit for Crosstalk is stated at 1 StDev. Flags are "Warning > 2 StDev and "DOEF" > 3 StDev. Beta is negligible, for trend only ("NA").

Times shown reflect the end of the count duration.

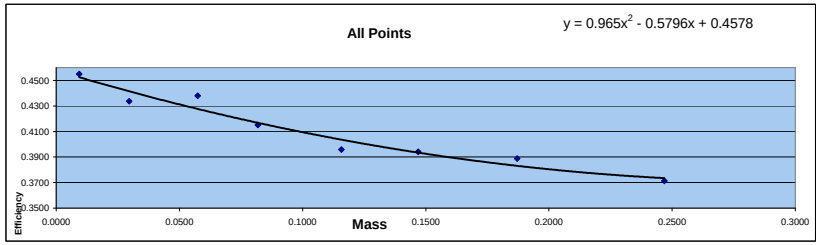
Alpha Beta Calibrations

Curve is for Gross Beta
Strontium 90
and
Total Strontium

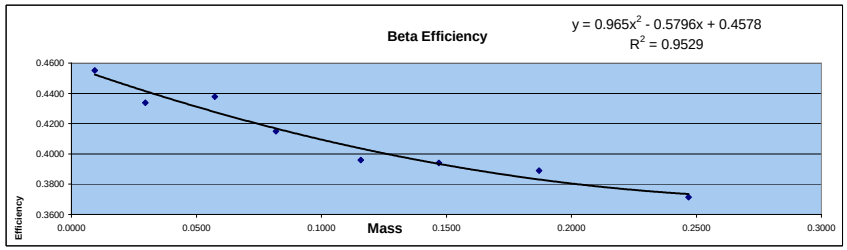
Blue 0

Detector ID	Std ID	Sample Wt	Count Date	Count Time	Beta Counts	DPM 37595.2171 DPM 37592.71382 CPM	Sr-90 Eff	Standard Aliquot
0	B1	0.0093	3/19/2017 14:32	5	85550	17110.000	0.4551	1mL
0	B2	0.0296	3/20/2017 0:59	5	81536	16307.200	0.4338	1mL
0	B3	0.0574	3/20/2017 0:37	5	82310	16462.000	0.4379	1mL
0	B4	0.0818	3/20/2017 0:22	5	78015	15603.000	0.4151	1mL
0	B5	0.1157	3/19/2017 14:40	5	74417	14883.400	0.3959	1mL
0	B6	0.1470	3/20/2017 1:50	5	74059	14811.800	0.3940	1mL
0	B7	0.1871	3/20/2017 3:22	5	73102	14620.400	0.3889	1mL
0	B8	0.2469	3/20/2017 3:28	5	69810	13962.000	0.3714	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4551	0.4525	0.58%
0.0296	0.4338	0.4415	-1.74%
0.0574	0.4379	0.4277	2.38%
0.0818	0.4151	0.4168	-0.43%
0.1157	0.3959	0.4037	-1.93%
0.1470	0.3940	0.3935	0.14%
0.1871	0.3889	0.3831	1.51%
0.2469	0.3714	0.3735	-0.57%



Mass	Efficiency
0.0093	0.4551
0.0296	0.4338
0.0574	0.4379
0.0818	0.4151
0.1157	0.3959
0.1470	0.3940
0.1871	0.3889
0.2469	0.3714



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560 dpm/mL
Reference Date:	9/17/2009
Count Date:	3/19/2017
Elapsed Time:	2740.000 days
Half Life:	10409.625 days
Exponential Term:	0.833227329
Corrected Activity:	18797.60855 dpm/mL
Decay Activity (Sr/Y-90)	37595.2171 dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560 dpm/mL
Reference Date:	9/17/2009
Count Date:	3/20/2017
Elapsed Time:	2741.000 days
Half Life:	10409.625 days
Exponential Term:	0.833171849
Corrected Activity:	18796.35691 dpm/mL
Decay Activity (Sr/Y-90)	37592.71382 dpm

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta1

Repeat 5

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 3/19/2017 2:32:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 3/19/2017 2:37:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	15	3.000	3.000
sd	0.000			0.000	3.873	0.775	0.775
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	85,550	17,110.000	17,110.000
sd	0.000			0.000	292.489	58.498	58.498

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta5

Repeat 5

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 3/19/2017 2:40:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 3/19/2017 2:45:21 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,417	14,883.400	14,883.400
sd	0.000			0.000	272.795	54.559	54.559

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta4

Repeat 10

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 3/20/2017 12:22:23 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 3/20/2017 12:27:36 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	16	3.200	3.200
sd	0.000			0.000	4.000	0.800	0.800
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	78,015	15,603.000	15,603.000
sd	0.000			0.000	279.312	55.862	55.862

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta3

Repeat 11

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***ml*** **sd** 0 ***ml***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 3/20/2017 12:37:38 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 3/20/2017 12:42:47 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	15	3.000	3.000
sd	0.000			0.000	3.873	0.775	0.775
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	82,310	16,462.000	16,462.000
sd	0.000			0.000	286.897	57.379	57.379

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta2

Repeat 12

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 3/20/2017 12:59:01 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 3/20/2017 1:04:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	15	3.000	3.000
sd	0.000			0.000	3.873	0.775	0.775
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	81,536	16,307.200	16,307.200
sd	0.000			0.000	285.545	57.109	57.109

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta6

Repeat 8

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 3/20/2017 1:50:40 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 3/20/2017 1:55:48 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	24	4.800	4.800
sd	0.000			0.000	4.899	0.980	0.980
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,059	14,811.800	14,811.800
sd	0.000			0.000	272.138	54.428	54.428

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta7

Repeat 8

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 3/20/2017 3:22:35 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 3/20/2017 3:27:46 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	73,102	14,620.400	14,620.400
sd	0.000			0.000	270.374	54.075	54.075

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-6322;Beta8

Repeat 8

Carrier No. 0

Batch ID Beta_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 3/20/2017 3:28:59 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 3/20/2017 3:34:08 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,810	13,962.000	13,962.000
sd	0.000			0.000	264.216	52.843	52.843

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

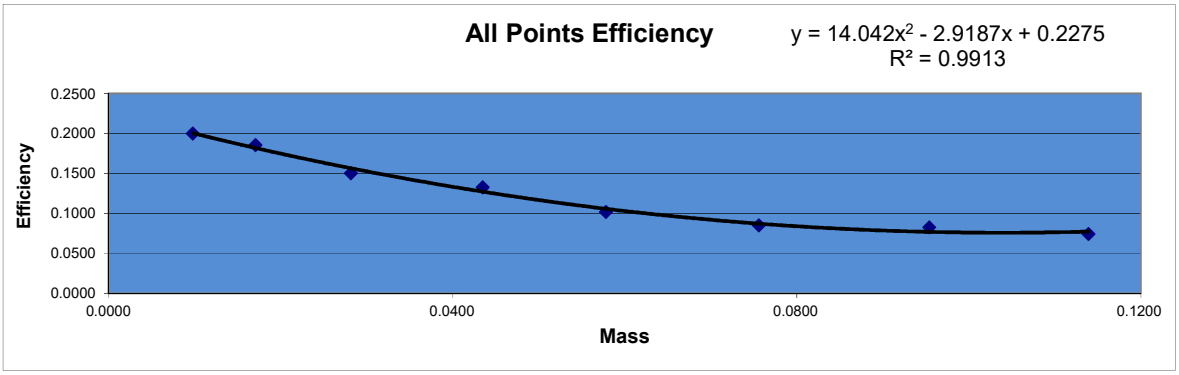
Blue 0

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Alpha CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
0	ICABT-1835503; A	6/1/2022 14:10	45	20280	450.667	2254.6	0.1999	1	0.0098
0	ICABT-1835503; B	6/1/2022 19:54	45	18798	417.733	2254.6	0.1853	1	0.0171
0	ICABT-1835503; C	6/1/2022 19:05	45	15258	339.067	2254.6	0.1504	1	0.0282
0	ICABT-1835503; D	6/1/2022 18:17	45	13463	299.178	2254.6	0.1327	1	0.0435
0	ICABT-1835503; E	6/1/2022 17:27	45	20622	458.267	4509.1	0.1016	2	0.0578
0	ICABT-1835503; F	6/1/2022 16:37	45	17294	384.311	4509.1	0.0852	2	0.0756
0	ICABT-1835503; G	6/1/2022 15:49	45	16792	373.156	4509.1	0.0828	2	0.0954
0	ICABT-1835503; H	6/1/2022 15:01	45	15106	335.689	4509.1	0.0744	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1999	0.2002	-0.18%
0.0171	0.1853	0.1817	1.97%
0.0282	0.1504	0.1564	-3.82%
0.0435	0.1327	0.1271	4.40%
0.0578	0.1016	0.1057	-3.86%
0.0756	0.0852	0.0871	-2.15%
0.0954	0.0828	0.0769	7.68%
0.1139	0.0744	0.0772	-3.60%

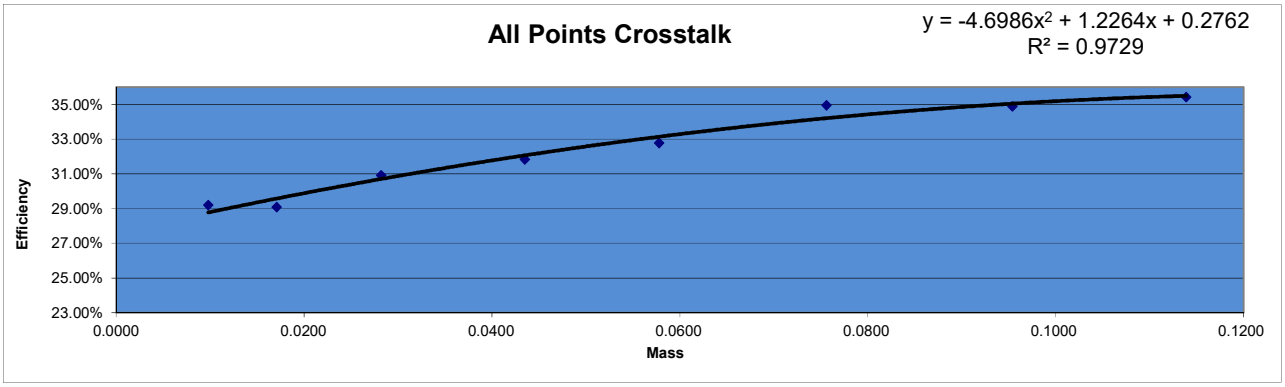
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.042
X Coeff:	-2.9187
Intercept:	0.2275

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20280	8359	450.67	185.76	29.19%	Min
ICABT-1835503; B	0.0171	45	18798	7708	417.73	171.29	29.08%	29.08%
ICABT-1835503; C	0.0282	45	15258	6827	339.07	151.71	30.91%	
ICABT-1835503; D	0.0435	45	13463	6284	299.18	139.64	31.82%	Max
ICABT-1835503; E	0.0578	45	20622	10048	458.27	223.29	32.76%	35.41%
ICABT-1835503; F	0.0756	45	17294	9288	384.31	206.40	34.94%	
ICABT-1835503; G	0.0954	45	16792	8995	373.16	199.89	34.88%	Mean
ICABT-1835503; H	0.1139	45	15106	8280	335.69	184.00	35.41%	32.37%



Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; A

Repeat 59

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 2:10:05 PM

Count Ended 6/1/2022 2:55:14 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	20,280	450.667	450.547
sd	0.011	142.408	3.165	3.165
Beta	0.431	8,359	185.756	185.325
sd	0.021	91.428	2.032	2.032

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; H

Repeat 60

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 3:01:19 PM

Count Ended 6/1/2022 3:47:44 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	15,106	335.689	335.569
sd	0.011	122.906	2.731	2.731
Beta	0.431	8,280	184.000	183.569
sd	0.021	90.995	2.022	2.022

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; G

Repeat 61

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 3:49:14 PM

Count Ended 6/1/2022 4:35:05 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	16,792	373.156	373.036
sd	0.011	129.584	2.880	2.880
Beta	0.431	8,995	199.889	199.458
sd	0.021	94.842	2.108	2.108

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; F

Repeat 62

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 4:37:58 PM

Count Ended 6/1/2022 5:23:20 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	17,294	384.311	384.191
sd	0.011	131.507	2.922	2.922
Beta	0.431	9,288	206.400	205.969
sd	0.021	96.374	2.142	2.142

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; E

Repeat 63

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 5:27:30 PM

Count Ended 6/1/2022 6:12:40 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	20,622	458.267	458.147
sd	0.011	143.604	3.191	3.191
Beta	0.431	10,048	223.289	222.858
sd	0.021	100.240	2.228	2.228

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; D

Repeat 64

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 6:17:02 PM

Count Ended 6/1/2022 7:02:09 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	13,463	299.178	299.058
sd	0.011	116.030	2.578	2.578
Beta	0.431	6,284	139.644	139.213
sd	0.021	79.272	1.762	1.762

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; C

Repeat 65

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 7:05:24 PM

Count Ended 6/1/2022 7:50:34 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	15,258	339.067	338.947
sd	0.011	123.523	2.745	2.745
Beta	0.431	6,827	151.711	151.280
sd	0.021	82.626	1.836	1.836

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICABT-1835503; B

Repeat 66

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/1/2022 7:54:27 PM

Count Ended 6/1/2022 8:39:45 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

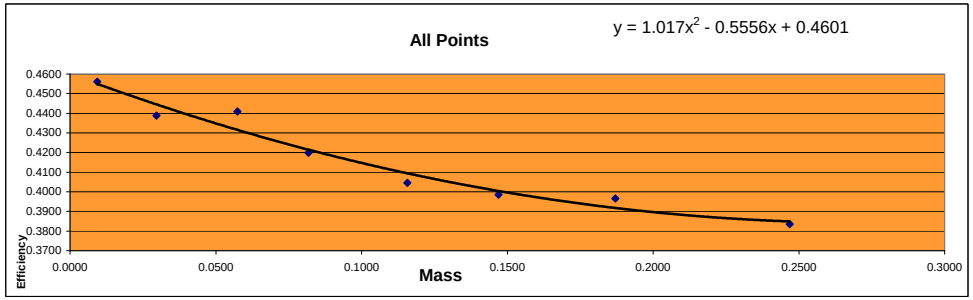
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	18,798	417.733	417.613
sd	0.011	137.106	3.047	3.047
Beta	0.431	7,708	171.289	170.858
sd	0.021	87.795	1.951	1.951

Curve is for Gross Beta
Strontium 90
and
Total Strontium

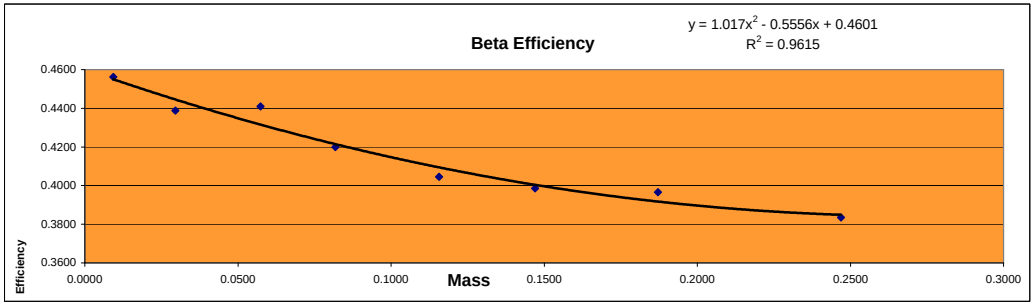
Orange 0

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41588.469 CPM	Sr-90 Eff	Standard Aliquot
0	B1	1/23/2013 14:44	0.0093	5	94846	18969.200	0.4561	1mL
0	B2	1/23/2013 15:46	0.0296	5	91244	18248.800	0.4388	1mL
0	B3	1/23/2013 15:37	0.0574	5	91691	18338.200	0.4409	1mL
0	B4	1/23/2013 15:26	0.0818	5	87307	17461.400	0.4199	1mL
0	B5	1/23/2013 15:19	0.1157	5	84120	16824.000	0.4045	1mL
0	B6	1/23/2013 15:09	0.1470	5	82888	16577.600	0.3986	1mL
0	B7	1/23/2013 15:01	0.1871	5	82469	16493.800	0.3966	1mL
0	B8	1/23/2013 14:53	0.2469	5	79762	15952.400	0.3836	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4561	0.4550	0.24%
0.0296	0.4388	0.4445	-1.29%
0.0574	0.4409	0.4316	2.17%
0.0818	0.4199	0.4215	-0.38%
0.1157	0.4045	0.4094	-1.20%
0.1470	0.3986	0.4004	-0.45%
0.1871	0.3966	0.3917	1.24%
0.2469	0.3836	0.3849	-0.35%



Mass	Efficiency
0.0093	0.4561
0.0296	0.4388
0.0574	0.4409
0.0818	0.4199
0.1157	0.4045
0.1470	0.3986
0.1871	0.3966
0.2469	0.3836



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560 dpm/mL
Reference Date:	9/17/2009
Count Date:	1/23/2013
Elapsed Time:	1224.000 days
Half Life:	10409.625 days
Exponential Term:	0.92173026
Corrected Activity:	20794.2346 dpm/mL
Decay Activity (Sr/Y-90)	41588.4692 dpm

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B1

Repeat 40

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 2:44:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 2:50:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	396	79.200	79.122
sd	0.000			0.009	19.900	3.980	3.980
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	94,846	18,969.200	18,968.797
sd	0.000			0.020	307.971	61.594	61.594

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B8

Repeat 40

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 2:53:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 2:58:47 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	265	53.000	52.922
sd	0.000			0.009	16.279	3.256	3.256
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	79,762	15,952.400	15,951.997
sd	0.000			0.020	282.422	56.484	56.484

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B7

Repeat 41

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:01:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:06:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	306	61.200	61.122
sd	0.000			0.009	17.493	3.499	3.499
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	82,469	16,493.800	16,493.397
sd	0.000			0.020	287.174	57.435	57.435

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B6

Repeat 42

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:09:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:14:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	353	70.600	70.522
sd	0.000			0.009	18.788	3.758	3.758
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	82,888	16,577.600	16,577.197
sd	0.000			0.020	287.903	57.581	57.581

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B5

Repeat 43

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/23/2013 3:19:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 1/23/2013 3:24:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	341	68.200	68.122
sd	0.000			0.009	18.466	3.693	3.693
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	84,120	16,824.000	16,823.597
sd	0.000			0.020	290.034	58.007	58.007

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B4

Repeat 45

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:26:50 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:32:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	304	60.800	60.722
sd	0.000			0.009	17.436	3.487	3.487
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	87,307	17,461.400	17,460.997
sd	0.000			0.020	295.478	59.096	59.096

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B3

Repeat 46

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:37:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:42:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	362	72.400	72.322
sd	0.000			0.009	19.026	3.805	3.805
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	91,691	18,338.200	18,337.797
sd	0.000			0.020	302.805	60.561	60.561

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-6322;B2

Repeat 47

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:46:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:51:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	363	72.600	72.522
sd	0.000			0.009	19.053	3.811	3.811
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	91,244	18,248.800	18,248.397
sd	0.000			0.020	302.066	60.413	60.413

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

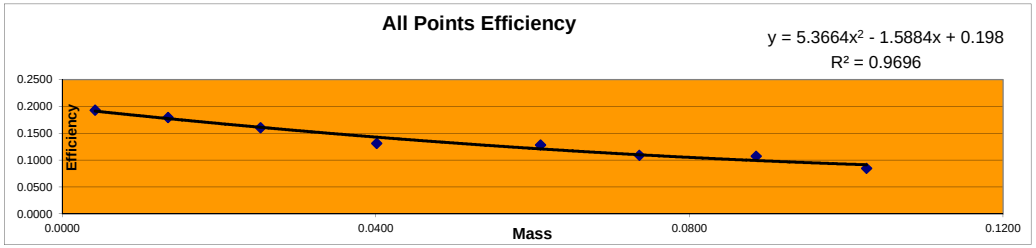
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Curve is for Gross Alpha

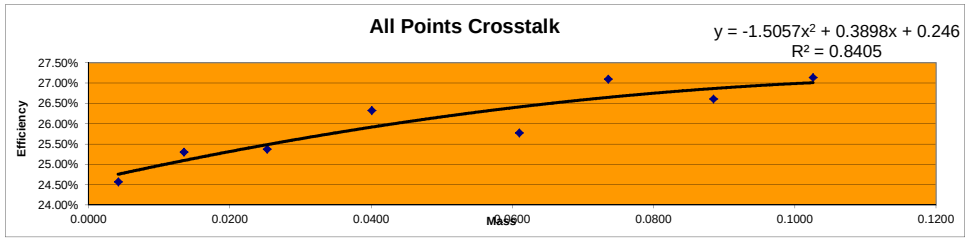
Orange 0

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot	Mass
0	ICABT-1835503; A	8/26/2020 8:22	25	21783	871.320	4509.1	0.1932	2mL	0.0042
0	ICABT-1835503; B	8/26/2020 13:32	25	20252	810.080	4509.1	0.1797	2mL	0.0135
0	ICABT-1835503; C	8/26/2020 13:05	25	18123	724.920	4509.1	0.1608	2mL	0.0253
0	ICABT-1835503; D	8/26/2020 12:03	25	14804	592.160	4509.1	0.1313	2mL	0.0401
0	ICABT-1835503; ED	8/27/2020 12:57	25	28922	1156.880	9018.3	0.1283	4mL	0.0610
0	ICABT-1835503; F	8/26/2020 10:55	25	24630	985.200	9018.3	0.1092	4mL	0.0736
0	ICABT-1835503; G	8/26/2020 10:26	25	24266	970.640	9018.3	0.1076	4mL	0.0885
0	ICABT-1835503; H	8/26/2020 9:58	25	19181	767.240	9018.3	0.0851	4mL	0.1026

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0042	0.1932	0.1914	0.95%
0.0135	0.1797	0.1775	1.19%
0.0253	0.1608	0.1612	-0.30%
0.0401	0.1313	0.1429	-8.12%
0.0610	0.1283	0.1211	5.95%
0.0736	0.1092	0.1102	-0.83%
0.0885	0.1076	0.0995	8.22%
0.1026	0.0851	0.0915	-7.04%



Detector ID	Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
0	ICABT-1835503; A	0.0042	25	21783	7095	871.32	283.80	24.57%	Min
0	ICABT-1835503; B	0.0135	25	20252	6860	810.08	274.40	25.30%	24.57%
0	ICABT-1835503; C	0.0253	25	18123	6162	724.92	246.48	25.37%	
0	ICABT-1835503; D	0.0401	25	14804	5290	592.16	211.60	26.33%	Max
0	ICABT-1835503; ED	0.0610	25	28922	10044	1156.88	401.76	25.78%	27.14%
0	ICABT-1835503; F	0.0736	25	24630	9154	985.20	366.16	27.10%	
0	ICABT-1835503; G	0.0885	25	24266	8797	970.64	351.88	26.61%	Mean
0	ICABT-1835503; H	0.1026	25	19181	7144	767.24	285.76	27.14%	26.02%



Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/19
Activity 2254.57 dpm/mL

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; A

Repeat 1

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 8:22:33 AM

Count Ended 8/26/2020 8:47:43 AM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	21,783	871.320	871.234
sd	0.009	147.591	5.904	5.904
Beta	0.450	7,095	283.800	283.350
sd	0.021	84.232	3.369	3.369

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; H

Repeat 2

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 9:58:26 AM

Count Ended 8/26/2020 10:23:34 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	19,181	767.240	767.154
sd	0.009	138.495	5.540	5.540
Beta	0.450	7,144	285.760	285.310
sd	0.021	84.522	3.381	3.381

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; G

Repeat 3

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 10:26:30 AM

Count Ended 8/26/2020 10:51:36 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	24,266	970.640	970.554
sd	0.009	155.775	6.231	6.231
Beta	0.450	8,797	351.880	351.430
sd	0.021	93.792	3.752	3.752

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; F

Repeat 4

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 10:55:49 AM

Count Ended 8/26/2020 11:20:58 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	24,630	985.200	985.114
sd	0.009	156.939	6.278	6.278
Beta	0.450	9,154	366.160	365.710
sd	0.021	95.677	3.827	3.827

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; D

Repeat 6

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 12:03:15 PM

Count Ended 8/26/2020 12:28:18 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	14,804	592.160	592.074
sd	0.009	121.672	4.867	4.867
Beta	0.450	5,290	211.600	211.150
sd	0.021	72.732	2.909	2.909

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; C

Repeat 7

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 1:05:06 PM

Count Ended 8/26/2020 1:30:16 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	18,123	724.920	724.834
sd	0.009	134.622	5.385	5.385
Beta	0.450	6,162	246.480	246.030
sd	0.021	78.498	3.140	3.140

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; B

Repeat 8

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 1:32:08 PM

Count Ended 8/26/2020 1:57:16 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	20,252	810.080	809.994
sd	0.009	142.310	5.692	5.692
Beta	0.450	6,860	274.400	273.950
sd	0.021	82.825	3.313	3.313

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICABT-1835503; ED

Repeat 15

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 12:57:27 PM

Count Ended 8/27/2020 1:22:36 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

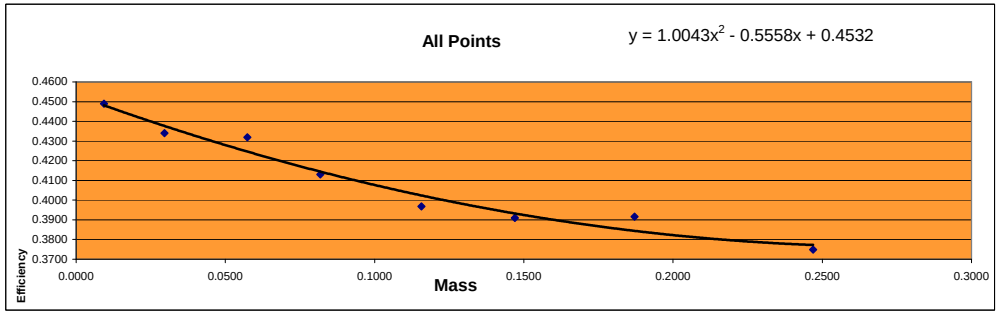
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	28,922	1,156.880	1,156.794
sd	0.009	170.065	6.803	6.803
Beta	0.450	10,044	401.760	401.310
sd	0.021	100.220	4.009	4.009

Curve is for Gross Beta
Strontium 90
and
Total Strontium

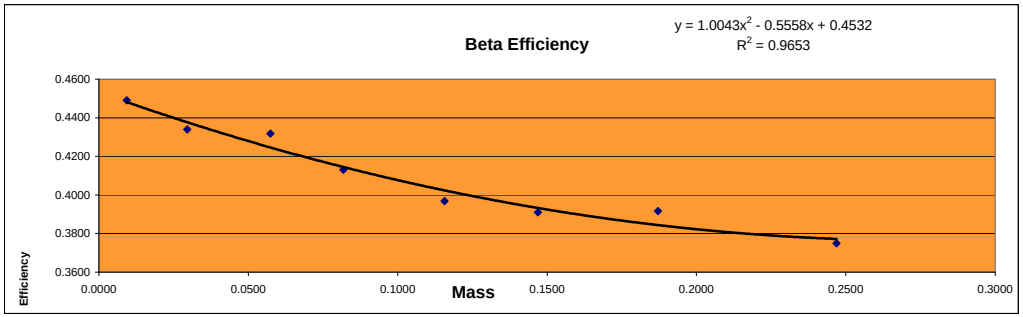
Orange 3

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41588.469 CPM	Sr-90 Eff	Standard Aliquot
3	B1	1/23/2013 15:09	0.0093	5	93370	18674.000	0.4490	1mL
3	B2	1/23/2013 15:00	0.0296	5	90236	18047.200	0.4339	1mL
3	B3	1/23/2013 14:53	0.0574	5	89800	17960.000	0.4319	1mL
3	B4	1/23/2013 14:45	0.0818	5	85882	17176.400	0.4130	1mL
3	B5	1/23/2013 15:46	0.1157	5	82510	16502.000	0.3968	1mL
3	B6	1/23/2013 15:37	0.1470	5	81306	16261.200	0.3910	1mL
3	B7	1/23/2013 15:27	0.1871	5	81437	16287.400	0.3916	1mL
3	B8	1/23/2013 15:19	0.2469	5	77961	15592.200	0.3749	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4490	0.4481	0.20%
0.0296	0.4339	0.4376	-0.84%
0.0574	0.4319	0.4246	1.71%
0.0818	0.4130	0.4145	-0.35%
0.1157	0.3968	0.4023	-1.38%
0.1470	0.3910	0.3932	-0.56%
0.1871	0.3916	0.3844	1.89%
0.2469	0.3749	0.3772	-0.60%



Mass	Efficiency
0.0093	0.4490
0.0296	0.4339
0.0574	0.4319
0.0818	0.4130
0.1157	0.3968
0.1470	0.3910
0.1871	0.3916
0.2469	0.3749



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	1/23/2013	
Elapsed Time:	1224.000	days
Half Life:	10409.625	days
Exponential Term:	0.921730256	
Corrected Activity:	20794.23458	dpm/mL
Decay Activity (Sr/Y-90)	41588.46916	dpm

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B4

Repeat 40

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 2:45:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 2:50:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	30	6.000	5.935
sd	0.000			0.008	5.477	1.095	1.095
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	85,882	17,176.400	17,176.044
sd	0.000			0.019	293.056	58.611	58.611

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B3

Repeat 41

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 2:53:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 2:58:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	32	6.400	6.335
sd	0.000			0.008	5.657	1.131	1.131
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	89,800	17,960.000	17,959.644
sd	0.000			0.019	299.666	59.933	59.933

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B2

Repeat 42

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:00:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:05:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	46	9.200	9.135
sd	0.000			0.008	6.782	1.356	1.356
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	90,236	18,047.200	18,046.844
sd	0.000			0.019	300.393	60.079	60.079

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B1

Repeat 43

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/23/2013 3:09:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 1/23/2013 3:14:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	29	5.800	5.735
sd	0.000			0.008	5.385	1.077	1.077
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	93,370	18,674.000	18,673.644
sd	0.000			0.019	305.565	61.113	61.113

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B8

Repeat 43

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/23/2013 3:19:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 1/23/2013 3:24:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	38	7.600	7.535
sd	0.000			0.008	6.164	1.233	1.233
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	77,961	15,592.200	15,591.844
sd	0.000			0.019	279.215	55.843	55.843

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B7

Repeat 44

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:27:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:32:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	35	7.000	6.935
sd	0.000			0.008	5.916	1.183	1.183
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	81,437	16,287.400	16,287.044
sd	0.000			0.019	285.372	57.074	57.074

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B6

Repeat 45

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:37:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:42:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	31	6.200	6.135
sd	0.000			0.008	5.568	1.114	1.114
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	81,306	16,261.200	16,260.844
sd	0.000			0.019	285.142	57.028	57.028

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-6322;B5

Repeat 46

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 3:46:16 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 3:51:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	38	7.600	7.535
sd	0.000			0.008	6.164	1.233	1.233
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	82,510	16,502.000	16,501.644
sd	0.000			0.019	287.246	57.449	57.449

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

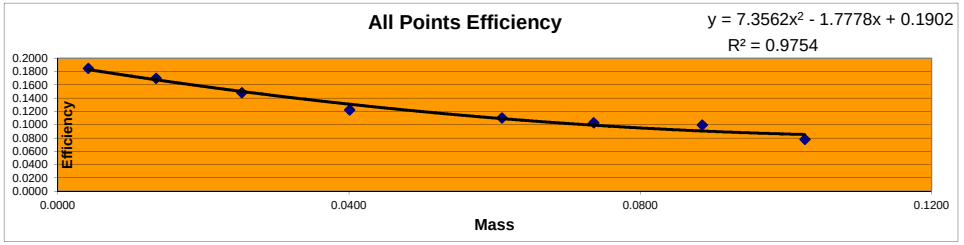
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Curve is for Gross Alpha

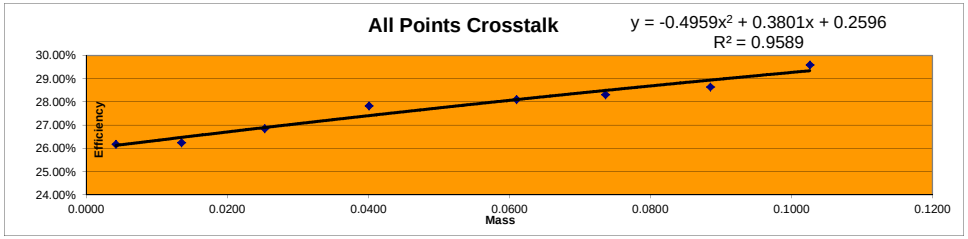
Orange 3

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot	Mass
3	ICABT-1835503; A	8/26/2020 10:56	25	20827	833.080	4509.1	0.1848	2mL	0.0042
3	ICABT-1835503; B	8/26/2020 10:26	25	19156	766.240	4509.1	0.1699	2mL	0.0135
3	ICABT-1835503; C	8/26/2020 9:58	25	16711	668.440	4509.1	0.1482	2mL	0.0253
3	ICABT-1835503; D	8/26/2020 9:06	25	13754	550.160	4509.1	0.1220	2mL	0.0401
3	ICABT-1835503; ED	8/27/2020 7:43	25	24828	993.120	9018.3	0.1101	4mL	0.0610
3	ICABT-1835503; F	8/26/2020 13:05	25	23172	926.880	9018.3	0.1028	4mL	0.0736
3	ICABT-1835503; G	8/26/2020 12:03	25	22425	897.000	9018.3	0.0995	4mL	0.0885
3	ICABT-1835503; H	8/26/2020 11:24	25	17521	700.840	9018.3	0.0777	4mL	0.1026

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0042	0.1848	0.1829	1.03%
0.0135	0.1699	0.1675	1.43%
0.0253	0.1482	0.1499	-1.13%
0.0401	0.1220	0.1307	-6.68%
0.0610	0.1101	0.1091	0.91%
0.0736	0.1028	0.0992	3.60%
0.0885	0.0995	0.0905	9.93%
0.1026	0.0777	0.0852	-8.82%



Detector ID	Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
3	ICABT-1835503; A	0.0042	25	20827	7386	833.08	295.44	26.18%	Min
3	ICABT-1835503; B	0.0135	25	19156	6818	766.24	272.72	26.25%	26.18%
3	ICABT-1835503; C	0.0253	25	16711	6134	668.44	245.36	26.85%	
3	ICABT-1835503; D	0.0401	25	13754	5305	550.16	212.20	27.83%	Max
3	ICABT-1835503; ED	0.0610	25	24828	9707	993.12	388.28	28.11%	29.59%
3	ICABT-1835503; F	0.0736	25	23172	9150	926.88	366.00	28.31%	
3	ICABT-1835503; G	0.0885	25	22425	9003	897.00	360.12	28.65%	Mean
3	ICABT-1835503; H	0.1026	25	17521	7365	700.84	294.60	29.59%	27.72%



Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/19
Activity 2254.57 dpm/mL

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; D

Repeat 1

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 9:06:26 AM

Count Ended 8/26/2020 9:31:31 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	13,754	550.160	550.054
sd	0.010	117.277	4.691	4.691
Beta	0.525	5,305	212.200	211.675
sd	0.023	72.835	2.913	2.914

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; C

Repeat 2

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 9:58:54 AM

Count Ended 8/26/2020 10:24:04 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	16,711	668.440	668.334
sd	0.010	129.271	5.171	5.171
Beta	0.525	6,134	245.360	244.835
sd	0.023	78.320	3.133	3.133

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; B

Repeat 3

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 10:26:42 AM

Count Ended 8/26/2020 10:51:51 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	19,156	766.240	766.134
sd	0.010	138.405	5.536	5.536
Beta	0.525	6,818	272.720	272.195
sd	0.023	82.571	3.303	3.303

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; A

Repeat 4

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 10:56:19 AM

Count Ended 8/26/2020 11:21:28 AM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	20,827	833.080	832.974
sd	0.010	144.316	5.773	5.773
Beta	0.525	7,386	295.440	294.915
sd	0.023	85.942	3.438	3.438

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; H

Repeat 5

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 11:24:08 AM

Count Ended 8/26/2020 11:49:15 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	17,521	700.840	700.734
sd	0.010	132.367	5.295	5.295
Beta	0.525	7,365	294.600	294.075
sd	0.023	85.820	3.433	3.433

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; G

Repeat 6

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 12:03:29 PM

Count Ended 8/26/2020 12:28:34 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	22,425	897.000	896.894
sd	0.010	149.750	5.990	5.990
Beta	0.525	9,003	360.120	359.595
sd	0.023	94.884	3.795	3.795

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; F

Repeat 7

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/26/2020 1:05:22 PM

Count Ended 8/26/2020 1:30:32 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	23,172	926.880	926.774
sd	0.010	152.224	6.089	6.089
Beta	0.525	9,150	366.000	365.475
sd	0.023	95.656	3.826	3.826

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICABT-1835503; ED

Repeat 12

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 7:43:04 AM

Count Ended 8/27/2020 8:08:12 AM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

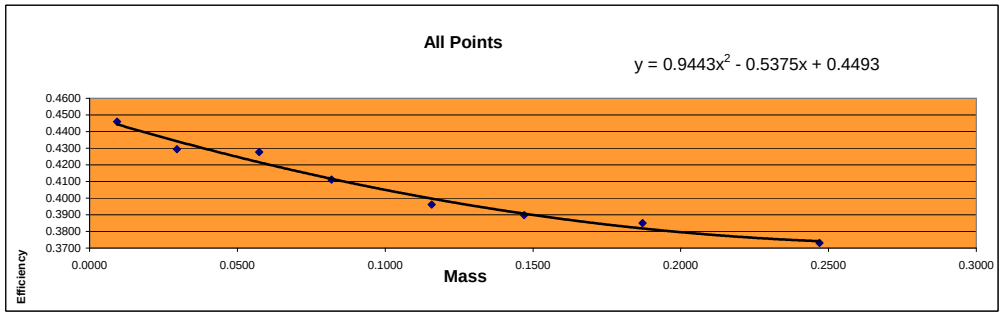
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	24,828	993.120	993.014
sd	0.010	157.569	6.303	6.303
Beta	0.525	9,707	388.280	387.755
sd	0.023	98.524	3.941	3.941

Curve is for Gross Beta
Strontium 90
and
Total Strontium

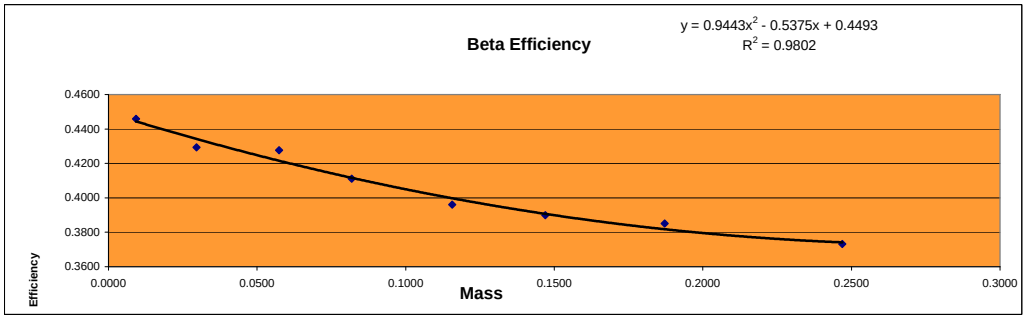
Orange 15

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41588.469 CPM	Sr-90 Eff	Standard Aliquot
15	B1	1/23/2013 17:27	0.0093	5	92715	18543.000	0.4459	1mL
15	B2	1/23/2013 17:19	0.0296	5	89283	17856.600	0.4294	1mL
15	B3	1/23/2013 17:12	0.0574	5	88932	17786.400	0.4277	1mL
15	B4	1/23/2013 17:05	0.0818	5	85478	17095.600	0.4111	1mL
15	B5	1/23/2013 16:58	0.1157	5	82369	16473.800	0.3961	1mL
15	B6	1/23/2013 16:47	0.1470	5	81071	16214.200	0.3899	1mL
15	B7	1/23/2013 14:37	0.1871	5	80061	16012.200	0.3850	1mL
15	B8	1/23/2013 14:28	0.2469	5	77598	15519.600	0.3732	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4459	0.4444	0.33%
0.0296	0.4294	0.4342	-1.12%
0.0574	0.4277	0.4216	1.45%
0.0818	0.4111	0.4117	-0.14%
0.1157	0.3961	0.3998	-0.91%
0.1470	0.3899	0.3907	-0.21%
0.1871	0.3850	0.3818	0.84%
0.2469	0.3732	0.3742	-0.26%



Mass	Efficiency
0.0093	0.4459
0.0296	0.4294
0.0574	0.4277
0.0818	0.4111
0.1157	0.3961
0.1470	0.3899
0.1871	0.3850
0.2469	0.3732



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	1/23/2013	
Elapsed Time:	1224.000	days
Half Life:	10409.625	days
Exponential Term:	0.921730256	
Corrected Activity:	20794.23458	dpm/mL
Decay Activity (Sr/Y-90)	41588.46916	dpm

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B8

Repeat 37

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 2:28:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 2:33:22 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	76	15.200	15.098
sd	0.000			0.010	8.718	1.744	1.744
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	77,598	15,519.600	15,519.198
sd	0.000			0.020	278.564	55.713	55.713

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B7

Repeat 38

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 2:37:18 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 2:42:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	55	11.000	10.898
sd	0.000			0.010	7.416	1.483	1.483
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	80,061	16,012.200	16,011.798
sd	0.000			0.020	282.951	56.590	56.590

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B6

Repeat 47

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 4:47:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 4:52:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	57	11.400	11.298
sd	0.000			0.010	7.550	1.510	1.510
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	81,071	16,214.200	16,213.798
sd	0.000			0.020	284.730	56.946	56.946

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B5

Repeat 48

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 4:58:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 5:03:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	76	15.200	15.098
sd	0.000			0.010	8.718	1.744	1.744
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	82,369	16,473.800	16,473.398
sd	0.000			0.020	287.000	57.400	57.400

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B4

Repeat 50

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 5:05:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 5:10:48 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	70	14.000	13.898
sd	0.000			0.010	8.367	1.673	1.673
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	85,478	17,095.600	17,095.198
sd	0.000			0.020	292.366	58.473	58.473

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B3

Repeat 51

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 5:12:23 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 5:17:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	67	13.400	13.298
sd	0.000			0.010	8.185	1.637	1.637
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	88,932	17,786.400	17,785.998
sd	0.000			0.020	298.215	59.643	59.643

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B2

Repeat 52

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 5:19:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 5:24:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	72	14.400	14.298
sd	0.000			0.010	8.485	1.697	1.697
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	89,283	17,856.600	17,856.198
sd	0.000			0.020	298.803	59.761	59.761

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-6322;B1

Repeat 53

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 5:27:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 5:32:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	64	12.800	12.698
sd	0.000			0.010	8.000	1.600	1.600
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	92,715	18,543.000	18,542.598
sd	0.000			0.020	304.491	60.898	60.898

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

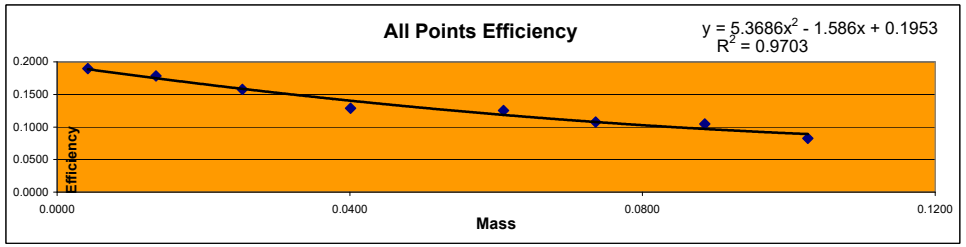
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Curve is for Gross Alpha

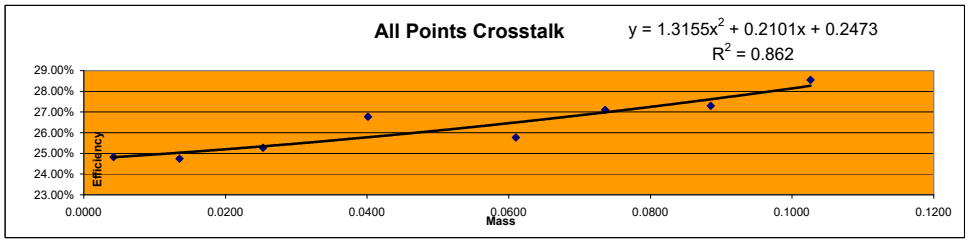
Orange 15

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot	Mass
15	ICABT-1835503; A	8/27/2020 21:33	25	21387	855.480	4509.1	0.1897	2mL	0.0042
15	ICABT-1835503; B	8/27/2020 20:47	25	20124	804.960	4509.1	0.1785	2mL	0.0135
15	ICABT-1835503; C	8/27/2020 19:35	25	17780	711.200	4509.1	0.1577	2mL	0.0253
15	ICABT-1835503; D	8/27/2020 18:58	25	14509	580.360	4509.1	0.1287	2mL	0.0401
15	ICABT-1835503; ED	8/27/2020 18:10	25	28209	1128.360	9018.3	0.1251	4mL	0.0610
15	ICABT-1835503; F	8/27/2020 17:41	25	24254	970.160	9018.3	0.1076	4mL	0.0736
15	ICABT-1835503; G	8/27/2020 16:53	25	23637	945.480	9018.3	0.1048	4mL	0.0885
15	ICABT-1835503; H	8/27/2020 15:35	25	18665	746.600	9018.3	0.0828	4mL	0.1026

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0042	0.1897	0.1887	0.52%
0.0135	0.1785	0.1749	2.09%
0.0253	0.1577	0.1586	-0.56%
0.0401	0.1287	0.1403	-8.28%
0.0610	0.1251	0.1185	5.56%
0.0736	0.1076	0.1077	-0.07%
0.0885	0.1048	0.0970	8.10%
0.1026	0.0828	0.0891	-7.07%



Detector ID	Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
15	ICABT-1835503; A	0.0042	25	21387	7060	855.48	282.40	24.82%	Min
15	ICABT-1835503; B	0.0135	25	20124	6620	804.96	264.80	24.75%	24.75%
15	ICABT-1835503; C	0.0253	25	17780	6013	711.20	240.52	25.27%	
15	ICABT-1835503; D	0.0401	25	14509	5303	580.36	212.12	26.77%	Max
15	ICABT-1835503; ED	0.0610	25	28209	9794	1128.36	391.76	25.77%	28.56%
15	ICABT-1835503; F	0.0736	25	24254	9013	970.16	360.52	27.09%	
15	ICABT-1835503; G	0.0885	25	23637	8878	945.48	355.12	27.30%	Mean
15	ICABT-1835503; H	0.1026	25	18665	7461	746.60	298.44	28.56%	26.29%



Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/19
Activity 2254.57 dpm/mL

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; H

Repeat 9

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 3:35:37 PM

Count Ended 8/27/2020 4:00:47 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	18,665	746.600	746.478
sd	0.011	136.620	5.465	5.465
Beta	0.398	7,461	298.440	298.042
sd	0.020	86.377	3.455	3.455

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; G

Repeat 10

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 4:53:23 PM

Count Ended 8/27/2020 5:18:29 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	23,637	945.480	945.358
sd	0.011	153.743	6.150	6.150
Beta	0.398	8,878	355.120	354.722
sd	0.020	94.223	3.769	3.769

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; F

Repeat 11

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 5:41:18 PM

Count Ended 8/27/2020 6:06:24 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	24,254	970.160	970.038
sd	0.011	155.737	6.229	6.229
Beta	0.398	9,013	360.520	360.122
sd	0.020	94.937	3.797	3.798

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; ED

Repeat 23

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 6:10:10 PM

Count Ended 8/27/2020 6:35:16 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	28,209	1,128.360	1,128.238
sd	0.011	167.955	6.718	6.718
Beta	0.398	9,794	391.760	391.362
sd	0.020	98.965	3.959	3.959

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; D

Repeat 13

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 6:58:19 PM

Count Ended 8/27/2020 7:23:25 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	14,509	580.360	580.238
sd	0.011	120.453	4.818	4.818
Beta	0.398	5,303	212.120	211.722
sd	0.020	72.822	2.913	2.913

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; C

Repeat 14

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 7:35:56 PM

Count Ended 8/27/2020 8:01:05 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	17,780	711.200	711.078
sd	0.011	133.342	5.334	5.334
Beta	0.398	6,013	240.520	240.122
sd	0.020	77.544	3.102	3.102

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; B

Repeat 15

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 8:47:53 PM

Count Ended 8/27/2020 9:12:59 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	20,124	804.960	804.838
sd	0.011	141.859	5.674	5.674
Beta	0.398	6,620	264.800	264.402
sd	0.020	81.363	3.255	3.255

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICABT-1835503; A

Repeat 16

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 9:33:13 PM

Count Ended 8/27/2020 9:58:23 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

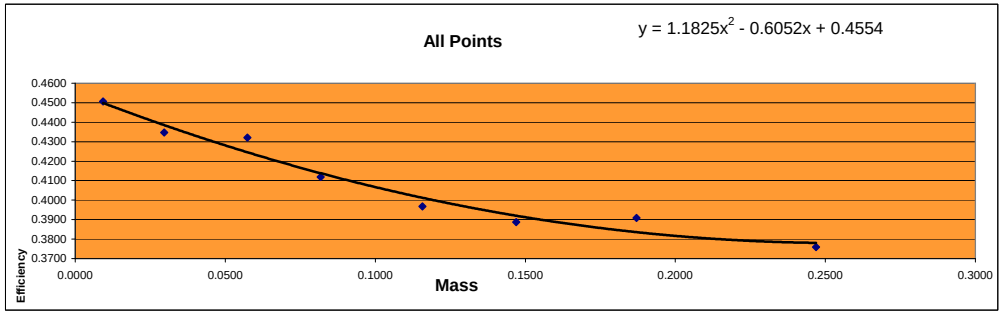
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	21,387	855.480	855.358
sd	0.011	146.243	5.850	5.850
Beta	0.398	7,060	282.400	282.002
sd	0.020	84.024	3.361	3.361

Curve is for Gross Beta
Strontium 90
and
Total Strontium

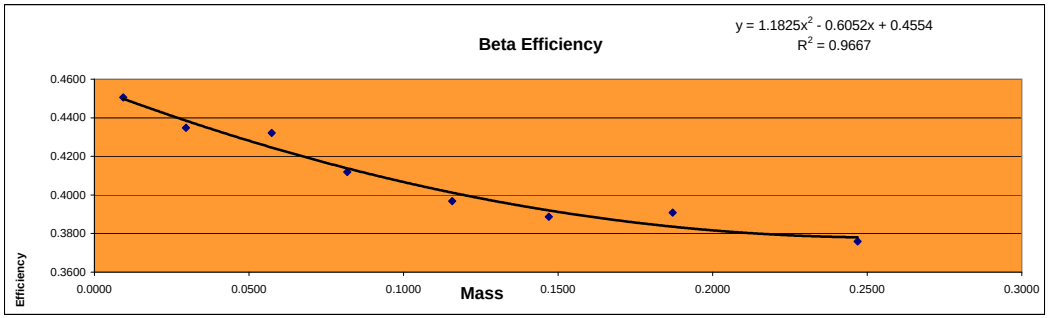
Orange 20

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41588.469 CPM	Sr-90 Eff	Standard Aliquot
20	B1	1/23/2013 12:53	0.0093	5	93705	18741.000	0.4506	1mL
20	B2	1/23/2013 12:45	0.0296	5	90406	18081.200	0.4348	1mL
20	B3	1/23/2013 12:37	0.0574	5	89849	17969.800	0.4321	1mL
20	B4	1/23/2013 12:30	0.0818	5	85645	17129.000	0.4119	1mL
20	B5	1/23/2013 12:20	0.1157	5	82516	16503.200	0.3968	1mL
20	B6	1/23/2013 13:15	0.1470	5	80825	16165.000	0.3887	1mL
20	B7	1/23/2013 13:07	0.1871	5	81283	16256.600	0.3909	1mL
20	B8	1/23/2013 13:01	0.2469	5	78155	15631.000	0.3758	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4506	0.4499	0.17%
0.0296	0.4348	0.4385	-0.86%
0.0574	0.4321	0.4246	1.77%
0.0818	0.4119	0.4138	-0.47%
0.1157	0.3968	0.4012	-1.09%
0.1470	0.3887	0.3920	-0.84%
0.1871	0.3909	0.3836	1.91%
0.2469	0.3758	0.3781	-0.58%



Mass	Efficiency
0.0093	0.4506
0.0296	0.4348
0.0574	0.4321
0.0818	0.4119
0.1157	0.3968
0.1470	0.3887
0.1871	0.3909
0.2469	0.3758



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	1/23/2013	
Elapsed Time:	1224.000	days
Half Life:	10409.625	days
Exponential Term:	0.921730256	
Corrected Activity:	20794.23458	dpm/mL
Decay Activity (Sr/Y-90)	41588.46916	dpm

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B5

Repeat 29

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:20:34 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:25:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	52	10.400	10.333
sd	0.000			0.008	7.211	1.442	1.442
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	82,516	16,503.200	16,502.931
sd	0.000			0.016	287.256	57.451	57.451

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B4

Repeat 31

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:30:04 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:35:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	50	10.000	9.933
sd	0.000			0.008	7.071	1.414	1.414
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	85,645	17,129.000	17,128.731
sd	0.000			0.016	292.652	58.530	58.530

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B3

Repeat 32

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:37:48 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:42:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	55	11.000	10.933
sd	0.000			0.008	7.416	1.483	1.483
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	89,849	17,969.800	17,969.531
sd	0.000			0.016	299.748	59.950	59.950

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B2

Repeat 33

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:45:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:50:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	47	9.400	9.333
sd	0.000			0.008	6.856	1.371	1.371
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	90,406	18,081.200	18,080.931
sd	0.000			0.016	300.676	60.135	60.135

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B1

Repeat 34

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:53:16 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:58:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	53	10.600	10.533
sd	0.000			0.008	7.280	1.456	1.456
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	93,705	18,741.000	18,740.731
sd	0.000			0.016	306.113	61.223	61.223

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B8

Repeat 34

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 1:01:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 1:06:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	42	8.400	8.333
sd	0.000			0.008	6.481	1.296	1.296
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	78,155	15,631.000	15,630.731
sd	0.000			0.016	279.562	55.912	55.912

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B7

Repeat 35

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 1:07:57 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 1:13:06 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	38	7.600	7.533
sd	0.000			0.008	6.164	1.233	1.233
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	81,283	16,256.600	16,256.331
sd	0.000			0.016	285.102	57.020	57.020

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-6322;B6

Repeat 36

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 1:15:07 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 1:20:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	58	11.600	11.533
sd	0.000			0.008	7.616	1.523	1.523
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	80,825	16,165.000	16,164.731
sd	0.000			0.016	284.297	56.859	56.859

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

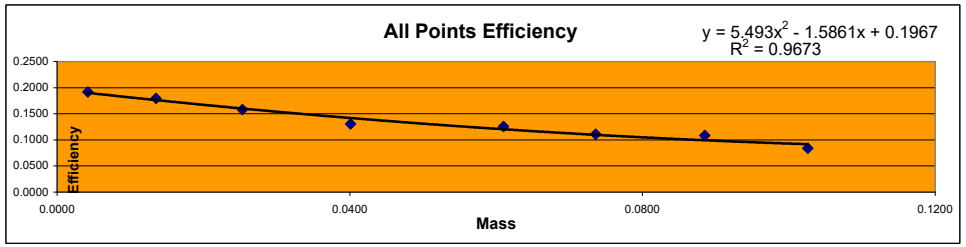
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Curve is for Gross Alpha

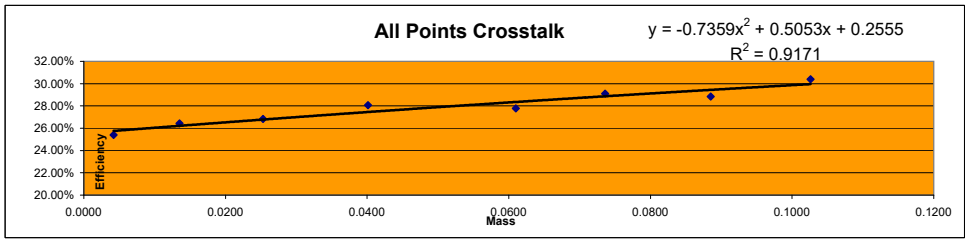
Orange 20

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot	Mass
20	ICABT-1835503; A	8/28/2020 15:20	25	21645	865.800	4509.1	0.1920	2mL	0.0042
20	ICABT-1835503; B	8/28/2020 13:20	25	20221	808.840	4509.1	0.1794	2mL	0.0135
20	ICABT-1835503; C	8/28/2020 7:49	25	17844	713.760	4509.1	0.1583	2mL	0.0253
20	ICABT-1835503; D	8/27/2020 22:38	25	14709	588.360	4509.1	0.1305	2mL	0.0401
20	ICABT-1835503; ED	8/27/2020 22:09	25	28338	1133.520	9018.3	0.1257	4mL	0.0610
20	ICABT-1835503; F	8/30/2020 16:32	25	25005	1000.200	9018.3	0.1109	4mL	0.0736
20	ICABT-1835503; G	8/30/2020 16:06	25	24460	978.400	9018.3	0.1085	4mL	0.0885
20	ICABT-1835503; H	8/30/2020 15:14	25	18990	759.600	9018.3	0.0842	4mL	0.1026

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0042	0.1920	0.1901	0.99%
0.0135	0.1794	0.1763	1.75%
0.0253	0.1583	0.1601	-1.12%
0.0401	0.1305	0.1419	-8.07%
0.0610	0.1257	0.1204	4.41%
0.0736	0.1109	0.1097	1.08%
0.0885	0.1085	0.0994	9.20%
0.1026	0.0842	0.0918	-8.24%



Detector ID	Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
20	ICABT-1835503; A	0.0042	25	21645	7365	865.80	294.60	25.39%	Min
20	ICABT-1835503; B	0.0135	25	20221	7268	808.84	290.72	26.44%	25.39%
20	ICABT-1835503; C	0.0253	25	17844	6548	713.76	261.92	26.84%	
20	ICABT-1835503; D	0.0401	25	14709	5736	588.36	229.44	28.06%	Max
20	ICABT-1835503; ED	0.0610	25	28338	10893	1133.52	435.72	27.77%	30.39%
20	ICABT-1835503; F	0.0736	25	25005	10261	1000.20	410.44	29.10%	
20	ICABT-1835503; G	0.0885	25	24460	9915	978.40	396.60	28.84%	Mean
20	ICABT-1835503; H	0.1026	25	18990	8292	759.60	331.68	30.39%	27.85%



Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/19
Activity 2254.57 dpm/mL

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; ED

Repeat 28

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 10:09:54 PM

Count Ended 8/27/2020 10:35:01 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	28,338	1,133.520	1,133.324
sd	0.014	168.339	6.734	6.734
Beta	0.377	10,893	435.720	435.343
sd	0.019	104.370	4.175	4.175

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; D

Repeat 18

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 10:38:57 PM

Count Ended 8/27/2020 11:04:05 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	14,709	588.360	588.164
sd	0.014	121.281	4.851	4.851
Beta	0.377	5,736	229.440	229.063
sd	0.019	75.736	3.029	3.030

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; C

Repeat 19

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/28/2020 7:49:17 AM

Count Ended 8/28/2020 8:14:23 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	17,844	713.760	713.564
sd	0.014	133.581	5.343	5.343
Beta	0.377	6,548	261.920	261.543
sd	0.019	80.920	3.237	3.237

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; B

Repeat 20

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/28/2020 1:20:03 PM

Count Ended 8/28/2020 1:45:10 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	20,221	808.840	808.644
sd	0.014	142.201	5.688	5.688
Beta	0.377	7,268	290.720	290.343
sd	0.019	85.253	3.410	3.410

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; A

Repeat 21

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/28/2020 3:20:47 PM

Count Ended 8/28/2020 3:45:57 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	21,645	865.800	865.604
sd	0.014	147.122	5.885	5.885
Beta	0.377	7,365	294.600	294.223
sd	0.019	85.820	3.433	3.433

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; H

Repeat 22

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 3:14:56 PM

Count Ended 8/30/2020 3:40:08 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	18,990	759.600	759.404
sd	0.014	137.804	5.512	5.512
Beta	0.377	8,292	331.680	331.303
sd	0.019	91.060	3.642	3.642

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; G

Repeat 23

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 4:06:06 PM

Count Ended 8/30/2020 4:31:17 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	24,460	978.400	978.204
sd	0.014	156.397	6.256	6.256
Beta	0.377	9,915	396.600	396.223
sd	0.019	99.574	3.983	3.983

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICABT-1835503; F

Repeat 24

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 4:32:55 PM

Count Ended 8/30/2020 4:58:02 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

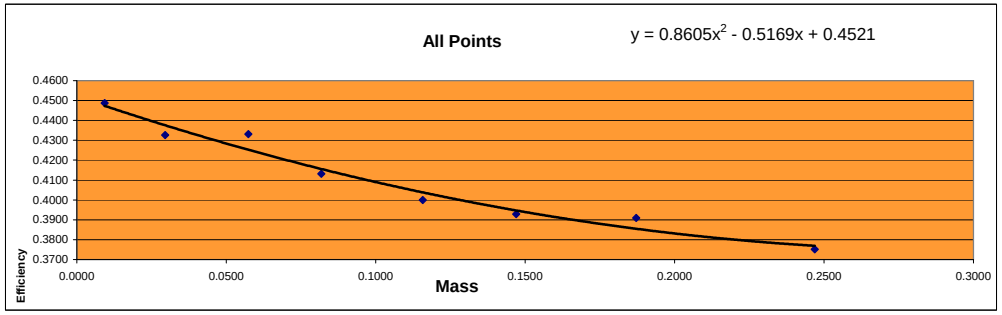
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	25,005	1,000.200	1,000.004
sd	0.014	158.130	6.325	6.325
Beta	0.377	10,261	410.440	410.063
sd	0.019	101.297	4.052	4.052

Curve is for Gross Beta
Strontium 90
and
Total Strontium

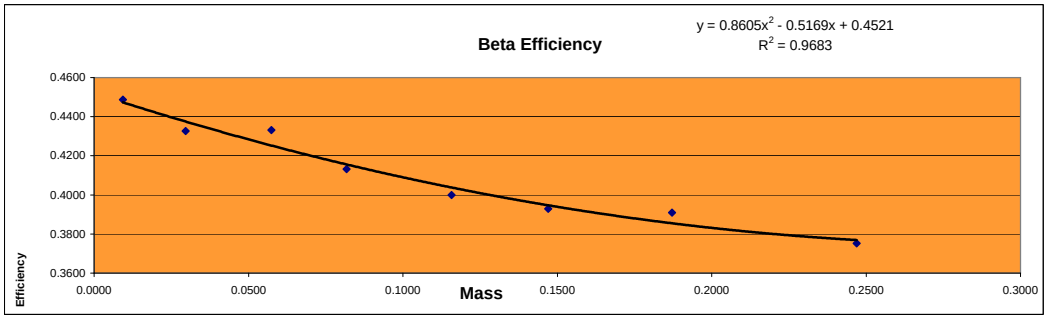
Orange 23

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41588.469 CPM	Sr-90 Eff	Standard Aliquot
23	B1	1/23/2013 13:14	0.0093	5	93320	18664.000	0.4488	1mL
23	B2	1/23/2013 13:07	0.0296	5	89959	17991.800	0.4326	1mL
23	B3	1/23/2013 13:00	0.0574	5	90060	18012.000	0.4331	1mL
23	B4	1/23/2013 12:53	0.0818	5	85913	17182.600	0.4132	1mL
23	B5	1/23/2013 12:46	0.1157	5	83172	16634.400	0.4000	1mL
23	B6	1/23/2013 12:38	0.1470	5	81701	16340.200	0.3929	1mL
23	B7	1/23/2013 12:30	0.1871	5	81277	16255.400	0.3909	1mL
23	B8	1/23/2013 12:20	0.2469	5	78026	15605.200	0.3752	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4488	0.4474	0.32%
0.0296	0.4326	0.4376	-1.13%
0.0574	0.4331	0.4253	1.84%
0.0818	0.4132	0.4156	-0.58%
0.1157	0.4000	0.4038	-0.95%
0.1470	0.3929	0.3947	-0.46%
0.1871	0.3909	0.3855	1.39%
0.2469	0.3752	0.3769	-0.45%



Mass	Efficiency
0.0093	0.4488
0.0296	0.4326
0.0574	0.4331
0.0818	0.4132
0.1157	0.4000
0.1470	0.3929
0.1871	0.3909
0.2469	0.3752



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	1/23/2013	
Elapsed Time:	1224.000	days
Half Life:	10409.625	days
Exponential Term:	0.921730256	
Corrected Activity:	20794.23458	dpm/mL
Decay Activity (Sr/Y-90)	41588.46916	dpm

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B8

Repeat 29

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/23/2013 12:20:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 1/23/2013 12:26:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	34	6.800	6.754
sd	0.000			0.007	5.831	1.166	1.166
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	78,026	15,605.200	15,604.870
sd	0.000			0.018	279.331	55.866	55.866

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B7

Repeat 30

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:30:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:35:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	28	5.600	5.554
sd	0.000			0.007	5.292	1.058	1.058
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	81,277	16,255.400	16,255.070
sd	0.000			0.018	285.091	57.018	57.018

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B6

Repeat 31

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:38:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:43:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	34	6.800	6.754
sd	0.000			0.007	5.831	1.166	1.166
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	81,701	16,340.200	16,339.870
sd	0.000			0.018	285.834	57.167	57.167

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B5

Repeat 32

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:46:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:51:10 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	29	5.800	5.754
sd	0.000			0.007	5.385	1.077	1.077
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	83,172	16,634.400	16,634.070
sd	0.000			0.018	288.396	57.679	57.679

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B4

Repeat 34

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 12:53:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 12:58:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	33	6.600	6.554
sd	0.000			0.007	5.745	1.149	1.149
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	85,913	17,182.600	17,182.270
sd	0.000			0.018	293.109	58.622	58.622

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B3

Repeat 35

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 1:00:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 1:05:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	40	8.000	7.954
sd	0.000			0.007	6.325	1.265	1.265
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	90,060	18,012.000	18,011.670
sd	0.000			0.018	300.100	60.020	60.020

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B2

Repeat 36

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/23/2013 1:07:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/23/2013 1:12:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	28	5.600	5.554
sd	0.000			0.007	5.292	1.058	1.058
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	89,959	17,991.800	17,991.470
sd	0.000			0.018	299.932	59.986	59.986

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-6322;B1

Repeat 37

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/23/2013 1:14:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 1/23/2013 1:19:55 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	34	6.800	6.754
sd	0.000			0.007	5.831	1.166	1.166
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	93,320	18,664.000	18,663.670
sd	0.000			0.018	305.483	61.097	61.097

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

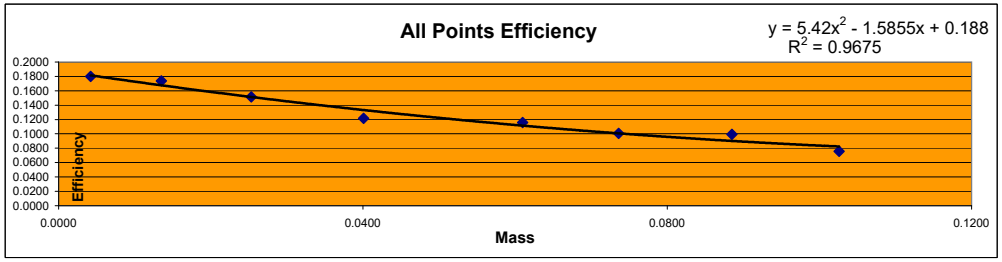
*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Curve is for Gross Alpha

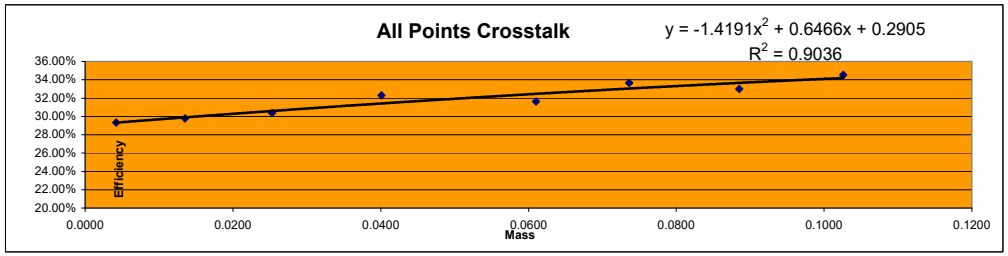
Orange 23

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot	Mass
23	ICABT-1835503; A	8/30/2020 16:33	25	20292	811.680	4509.1	0.1800	2mL	0.0042
23	ICABT-1835503; B	8/30/2020 16:06	25	19591	783.640	4509.1	0.1738	2mL	0.0135
23	ICABT-1835503; C	8/30/2020 15:15	25	17095	683.800	4509.1	0.1516	2mL	0.0253
23	ICABT-1835503; D	8/28/2020 15:21	25	13689	547.560	4509.1	0.1214	2mL	0.0401
23	ICABT-1835503; ED	8/28/2020 13:20	25	26122	1044.880	9018.3	0.1159	4mL	0.0610
23	ICABT-1835503; F	8/28/2020 7:49	25	22672	906.880	9018.3	0.1006	4mL	0.0736
23	ICABT-1835503; G	8/27/2020 22:39	25	22351	894.040	9018.3	0.0991	4mL	0.0885
23	ICABT-1835503; H	8/27/2020 22:10	25	17116	684.640	9018.3	0.0759	4mL	0.1026

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0042	0.1800	0.1814	-0.79%
0.0135	0.1738	0.1676	3.70%
0.0253	0.1516	0.1514	0.19%
0.0401	0.1214	0.1331	-8.79%
0.0610	0.1159	0.1115	3.96%
0.0736	0.1006	0.1007	-0.11%
0.0885	0.0991	0.0901	9.99%
0.1026	0.0759	0.0824	-7.85%



Detector ID	Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
23	ICABT-1835503; A	0.0042	25	20292	8418	811.68	336.72	29.32%	Min
23	ICABT-1835503; B	0.0135	25	19591	8303	783.64	332.12	29.77%	29.32%
23	ICABT-1835503; C	0.0253	25	17095	7457	683.80	298.28	30.37%	
23	ICABT-1835503; D	0.0401	25	13689	6527	547.56	261.08	32.29%	Max
23	ICABT-1835503; ED	0.0610	25	26122	12096	1044.88	483.84	31.65%	34.53%
23	ICABT-1835503; F	0.0736	25	22672	11498	906.88	459.92	33.65%	
23	ICABT-1835503; G	0.0885	25	22351	11014	894.04	440.56	33.01%	Mean
23	ICABT-1835503; H	0.1026	25	17116	9029	684.64	361.16	34.53%	31.82%



Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/19
Activity 2254.57 dpm/mL

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; H

Repeat 17

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 10:10:10 PM

Count Ended 8/27/2020 10:35:19 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	17,116	684.640	684.549
sd	0.010	130.828	5.233	5.233
Beta	0.392	9,029	361.160	360.768
sd	0.020	95.021	3.801	3.801

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; G

Repeat 18

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 10:39:08 PM

Count Ended 8/27/2020 11:04:15 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	22,351	894.040	893.949
sd	0.010	149.503	5.980	5.980
Beta	0.392	11,014	440.560	440.168
sd	0.020	104.948	4.198	4.198

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; F

Repeat 19

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/28/2020 7:49:38 AM

Count Ended 8/28/2020 8:14:45 AM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	22,672	906.880	906.789
sd	0.010	150.572	6.023	6.023
Beta	0.392	11,498	459.920	459.528
sd	0.020	107.229	4.289	4.289

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; ED

Repeat 31

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/28/2020 1:20:23 PM

Count Ended 8/28/2020 1:45:29 PM

Sample Count Time 25.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	26,122	1,044.880	1,044.789
sd	0.010	161.623	6.465	6.465
Beta	0.392	12,096	483.840	483.448
sd	0.020	109.982	4.399	4.399

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; D

Repeat 21

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/28/2020 3:21:06 PM

Count Ended 8/28/2020 3:46:13 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	13,689	547.560	547.469
sd	0.010	117.000	4.680	4.680
Beta	0.392	6,527	261.080	260.688
sd	0.020	80.790	3.232	3.232

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; C

Repeat 22

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 3:15:13 PM

Count Ended 8/30/2020 3:40:25 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	17,095	683.800	683.709
sd	0.010	130.748	5.230	5.230
Beta	0.392	7,457	298.280	297.888
sd	0.020	86.354	3.454	3.454

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; B

Repeat 23

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 4:06:20 PM

Count Ended 8/30/2020 4:31:26 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	19,591	783.640	783.549
sd	0.010	139.968	5.599	5.599
Beta	0.392	8,303	332.120	331.728
sd	0.020	91.121	3.645	3.645

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICABT-1835503; A

Repeat 24

Carrier No. 0

Batch ID 449828

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 4:33:09 PM

Count Ended 8/30/2020 4:58:18 PM

Sample Count Time 25.00 ***mins***

Background Count Time 1,000.00 ***mins***

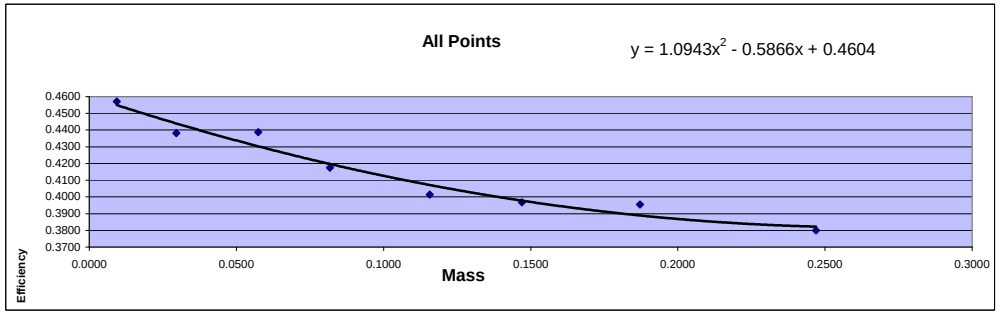
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	20,292	811.680	811.589
sd	0.010	142.450	5.698	5.698
Beta	0.392	8,418	336.720	336.328
sd	0.020	91.750	3.670	3.670

Curve is for Gross Beta
Strontium 90
and
Total Strontium

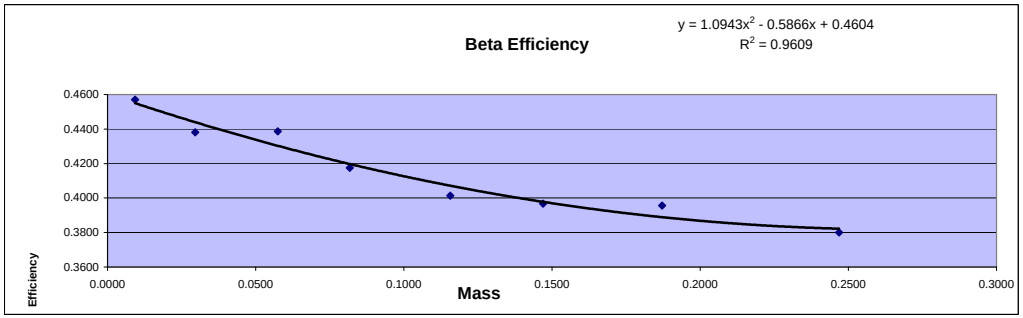
Purple 10

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41558.018 CPM	Sr-90 Eff	Standard Aliquot
10	B1	2/3/2013 17:43	0.0093	5	94979	18995.800	0.4571	1mL
10	B2	2/3/2013 17:29	0.0296	5	91052	18210.400	0.4382	1mL
10	B3	2/3/2013 17:22	0.0574	5	91150	18230.000	0.4387	1mL
10	B4	2/3/2013 18:51	0.0818	5	86754	17350.800	0.4175	1mL
10	B5	2/3/2013 18:32	0.1157	5	83407	16681.400	0.4014	1mL
10	B6	2/3/2013 18:19	0.1470	5	82434	16486.800	0.3967	1mL
10	B7	2/3/2013 18:07	0.1871	5	82188	16437.600	0.3955	1mL
10	B8	2/3/2013 17:51	0.2469	5	78950	15790.000	0.3800	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4571	0.4550	0.45%
0.0296	0.4382	0.4440	-1.31%
0.0574	0.4387	0.4303	1.94%
0.0818	0.4175	0.4197	-0.53%
0.1157	0.4014	0.4072	-1.42%
0.1470	0.3967	0.3978	-0.28%
0.1871	0.3955	0.3890	1.69%
0.2469	0.3800	0.3823	-0.61%



Mass	Efficiency
0.0093	0.4571
0.0296	0.4382
0.0574	0.4387
0.0818	0.4175
0.1157	0.4014
0.1470	0.3967
0.1871	0.3955
0.2469	0.3800



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	2/3/2013	
Elapsed Time:	1235.000	days
Half Life:	10409.625	days
Exponential Term:	0.921055374	
Corrected Activity:	20779.00924	dpm/mL
Decay Activity (Sr/Y-90)	41558.01848	dpm

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B3

Repeat 36

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 5:22:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 5:27:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	141	28.200	28.142
sd	0.000			0.008	11.874	2.375	2.375
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	91,150	18,230.000	18,229.703
sd	0.000			0.017	301.911	60.382	60.382

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B2

Repeat 37

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 5:29:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 5:34:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	160	32.000	31.942
sd	0.000			0.008	12.649	2.530	2.530
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	91,052	18,210.400	18,210.103
sd	0.000			0.017	301.748	60.350	60.350

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B1

Repeat 38

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 5:43:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 5:48:46 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	182	36.400	36.342
sd	0.000			0.008	13.491	2.698	2.698
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	94,979	18,995.800	18,995.503
sd	0.000			0.017	308.187	61.637	61.637

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B8

Repeat 38

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 5:51:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 5:56:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	117	23.400	23.342
sd	0.000			0.008	10.817	2.163	2.163
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	78,950	15,790.000	15,789.703
sd	0.000			0.017	280.980	56.196	56.196

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B7

Repeat 39

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 6:07:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 6:12:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	154	30.800	30.742
sd	0.000			0.008	12.410	2.482	2.482
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	82,188	16,437.600	16,437.303
sd	0.000			0.017	286.684	57.337	57.337

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B6

Repeat 40

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 6:19:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 6:25:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	143	28.600	28.542
sd	0.000			0.008	11.958	2.392	2.392
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	82,434	16,486.800	16,486.503
sd	0.000			0.017	287.113	57.423	57.423

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B5

Repeat 41

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 6:32:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 6:37:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	126	25.200	25.142
sd	0.000			0.008	11.225	2.245	2.245
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	83,407	16,681.400	16,681.103
sd	0.000			0.017	288.803	57.761	57.761

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-6322;B4

Repeat 43

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 6:51:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 6:56:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	129	25.800	25.742
sd	0.000			0.008	11.358	2.272	2.272
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	86,754	17,350.800	17,350.503
sd	0.000			0.017	294.540	58.908	58.908

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

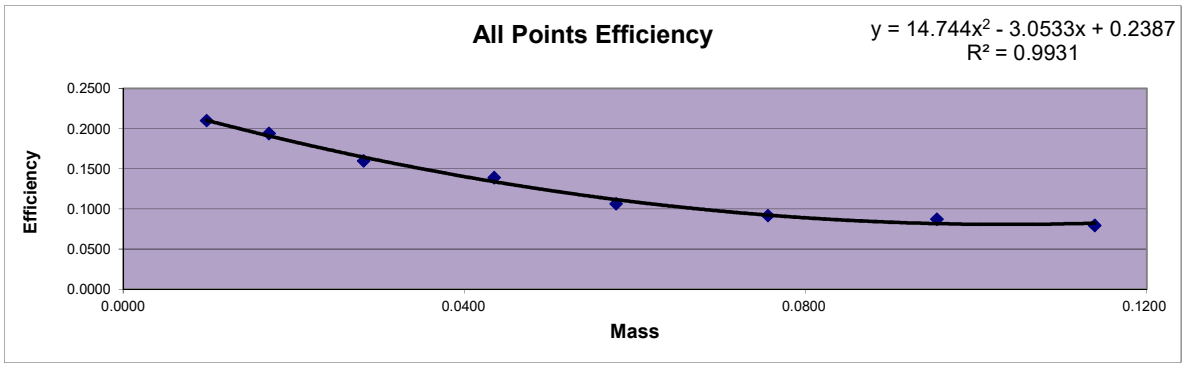
Purple 10

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
10	ICABT-1835503; A	7/7/2022 9:51	45	21305	473.444	2254.6	0.2100	1	0.0098
10	ICABT-1835503; B	7/7/2022 9:00	45	19671	437.133	2254.6	0.1939	1	0.0171
10	ICABT-1835503; C	7/7/2022 8:11	45	16190	359.778	2254.6	0.1596	1	0.0282
10	ICABT-1835503; D	7/7/2022 15:07	45	14077	312.822	2254.6	0.1388	1	0.0435
10	ICABT-1835503; E	7/7/2022 14:10	45	21584	479.644	4509.1	0.1064	2	0.0578
10	ICABT-1835503; F	7/7/2022 13:23	45	18609	413.533	4509.1	0.0917	2	0.0756
10	ICABT-1835503; G	7/7/2022 12:33	45	17696	393.244	4509.1	0.0872	2	0.0954
10	ICABT-1835503; H	7/7/2022 10:50	45	16111	358.022	4509.1	0.0794	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2100	0.2102	-0.10%
0.0171	0.1939	0.1908	1.62%
0.0282	0.1596	0.1643	-2.89%
0.0435	0.1388	0.1338	3.71%
0.0578	0.1064	0.1115	-4.58%
0.0756	0.0917	0.0921	-0.46%
0.0954	0.0872	0.0816	6.87%
0.1139	0.0794	0.0822	-3.41%

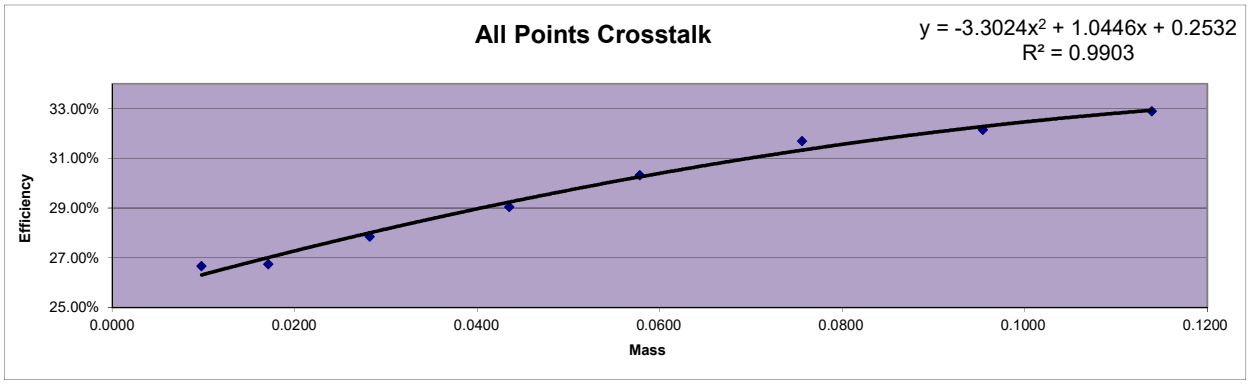
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.744
X Coeff:	-3.0533
Intercept:	0.2387

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	21305	7747	473.44	172.16	26.67%	Min
ICABT-1835503; B	0.0171	45	19671	7183	437.13	159.62	26.75%	26.67%
ICABT-1835503; C	0.0282	45	16190	6250	359.78	138.89	27.85%	
ICABT-1835503; D	0.0435	45	14077	5762	312.82	128.04	29.04%	Max
ICABT-1835503; E	0.0578	45	21584	9394	479.64	208.76	30.32%	32.89%
ICABT-1835503; F	0.0756	45	18609	8633	413.53	191.84	31.69%	
ICABT-1835503; G	0.0954	45	17696	8385	393.24	186.33	32.15%	Mean
ICABT-1835503; H	0.1139	45	16111	7896	358.02	175.47	32.89%	29.67%



Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; C

Repeat 36

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 8:11:57 AM

Count Ended 7/7/2022 8:57:05 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	16,190	359.778	359.602
sd	0.013	127.240	2.828	2.828
Beta	0.317	6,250	138.889	138.572
sd	0.018	79.057	1.757	1.757

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; B

Repeat 36

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 9:00:32 AM

Count Ended 7/7/2022 9:45:40 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	19,671	437.133	436.957
sd	0.013	140.253	3.117	3.117
Beta	0.317	7,183	159.622	159.305
sd	0.018	84.753	1.883	1.883

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; A

Repeat 37

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 9:51:18 AM

Count Ended 7/7/2022 10:36:28 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	21,305	473.444	473.268
sd	0.013	145.962	3.244	3.244
Beta	0.317	7,747	172.156	171.839
sd	0.018	88.017	1.956	1.956

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; H

Repeat 34

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 10:50:36 AM

Count Ended 7/7/2022 11:35:45 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	16,111	358.022	357.846
sd	0.013	126.929	2.821	2.821
Beta	0.317	7,896	175.467	175.150
sd	0.018	88.859	1.975	1.975

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; G

Repeat 36

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 12:33:00 PM

Count Ended 7/7/2022 1:18:11 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	17,696	393.244	393.068
sd	0.013	133.026	2.956	2.956
Beta	0.317	8,385	186.333	186.016
sd	0.018	91.570	2.035	2.035

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; F

Repeat 37

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 1:23:32 PM

Count Ended 7/7/2022 2:08:38 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	18,609	413.533	413.357
sd	0.013	136.415	3.031	3.031
Beta	0.317	8,633	191.844	191.527
sd	0.018	92.914	2.065	2.065

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; E

Repeat 38

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 2:10:41 PM

Count Ended 7/7/2022 2:55:48 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	21,584	479.644	479.468
sd	0.013	146.915	3.265	3.265
Beta	0.317	9,394	208.756	208.439
sd	0.018	96.923	2.154	2.154

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICABT-1835503; D

Repeat 40

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 3:07:53 PM

Count Ended 7/7/2022 3:52:58 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

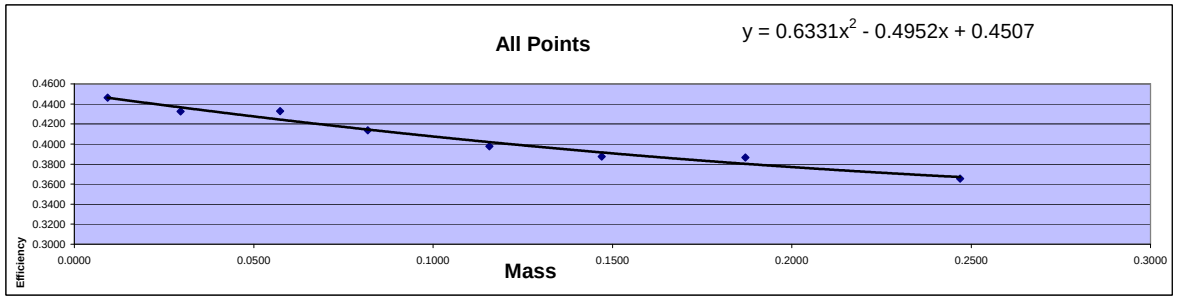
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	14,077	312.822	312.646
sd	0.013	118.647	2.637	2.637
Beta	0.317	5,762	128.044	127.727
sd	0.018	75.908	1.687	1.687

Curve is for Gross Beta
Strontium 90
and
Total Strontium

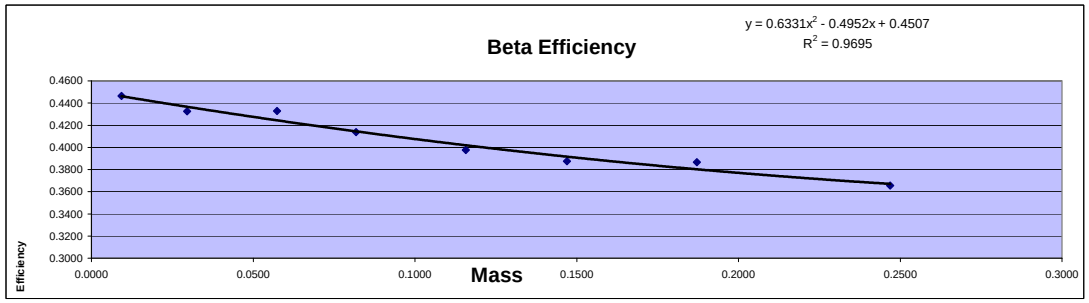
Purple 11

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 38756.83632 CPM	Sr-90 Eff	Standard Aliquot
11	ICABT-6322;B1	12/18/2015 9:33	0.0093	5	86485	17297.000	0.4463	1mL
11	ICABT-6322;B2	12/18/2015 11:20	0.0296	5	83797	16759.400	0.4324	1mL
11	ICABT-6322;B3	12/18/2015 9:41	0.0574	5	83886	16777.200	0.4329	1mL
11	ICABT-6322;B4	12/18/2015 11:31	0.0818	5	80173	16034.600	0.4137	1mL
11	ICABT-6322;B5	12/18/2015 9:48	0.1157	5	77067	15413.400	0.3977	1mL
11	ICABT-6322;B6	12/18/2015 11:37	0.1470	5	75072	15014.400	0.3874	1mL
11	ICABT-6322;B7	12/18/2015 9:58	0.1871	5	74910	14982.000	0.3866	1mL
11	ICABT-6322;B8	12/18/2015 11:44	0.2469	5	70838	14167.600	0.3656	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4463	0.4461	0.03%
0.0296	0.4324	0.4366	-0.96%
0.0574	0.4329	0.4244	2.01%
0.0818	0.4137	0.4144	-0.17%
0.1157	0.3977	0.4019	-1.04%
0.1470	0.3874	0.3916	-1.07%
0.1871	0.3866	0.3802	1.67%
0.2469	0.3656	0.3670	-0.40%



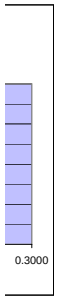
Mass	Efficiency
0.0093	0.4463
0.0296	0.4324
0.0574	0.4329
0.0818	0.4137
0.1157	0.3977
0.1470	0.3874
0.1871	0.3866
0.2469	0.3656



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560
Reference Date:	9/17/2009
Count Date:	12/18/2015
Elapsed Time:	2283.000
Half Life:	10409.625
Exponential Term:	0.858972436
Corrected Activity:	19378.41816
Decay Activity (Sr/Y-90)	38756.83632

Curve is for Gross Beta
Strontium 90
and
Total Strontium



dpm/mL

days
days

dpm/mL
dpm

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B1

Repeat 55

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 9:33:56 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 9:39:06 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	18	3.600	3.453
sd	0.000			0.012	4.243	0.849	0.849
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	86,485	17,297.000	17,296.531
sd	0.000			0.022	294.083	58.817	58.817

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B3

Repeat 54

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***Sample***	**sd**	0 ***Sample***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 12/18/2015 9:41:38 AM

Count Ended 12/18/2015 9:46:48 AM

Collection Date 1 1/1/1900

Collection Date 2 1/1/1900

Half Life 0.00 ***days***

Decay Factor 1.000

Sample Count Time 5.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	11	2.200	2.053
sd	0.000			0.012	3.317	0.663	0.663
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	83,886	16,777.200	16,776.731
sd	0.000			0.022	289.631	57.926	57.926

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected**

MDC Method Currie

Error = .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B5

Repeat 53

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 9:48:21 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 9:53:30 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	10	2.000	1.853
sd	0.000			0.012	3.162	0.632	0.633
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	77,067	15,413.400	15,412.931
sd	0.000			0.022	277.609	55.522	55.522

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B7

Repeat 53

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 9:58:06 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 10:03:15 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	10	2.000	1.853
sd	0.000			0.012	3.162	0.632	0.633
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	74,910	14,982.000	14,981.531
sd	0.000			0.022	273.697	54.739	54.739

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B2

Repeat 56

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:20:20 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:25:28 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	19	3.800	3.653
sd	0.000			0.012	4.359	0.872	0.872
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	83,797	16,759.400	16,758.931
sd	0.000			0.022	289.477	57.895	57.895

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B4

Repeat 55

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:31:04 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:36:12 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	15	3.000	2.853
sd	0.000			0.012	3.873	0.775	0.775
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	80,173	16,034.600	16,034.131
sd	0.000			0.022	283.148	56.630	56.630

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B6

Repeat 54

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:37:58 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:43:06 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	18	3.600	3.453
sd	0.000			0.012	4.243	0.849	0.849
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	75,072	15,014.400	15,013.931
sd	0.000			0.022	273.993	54.799	54.799

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-6322;B8

Repeat 54

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:44:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:49:19 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	15	3.000	2.853
sd	0.000			0.012	3.873	0.775	0.775
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	70,838	14,167.600	14,167.131
sd	0.000			0.022	266.154	53.231	53.231

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

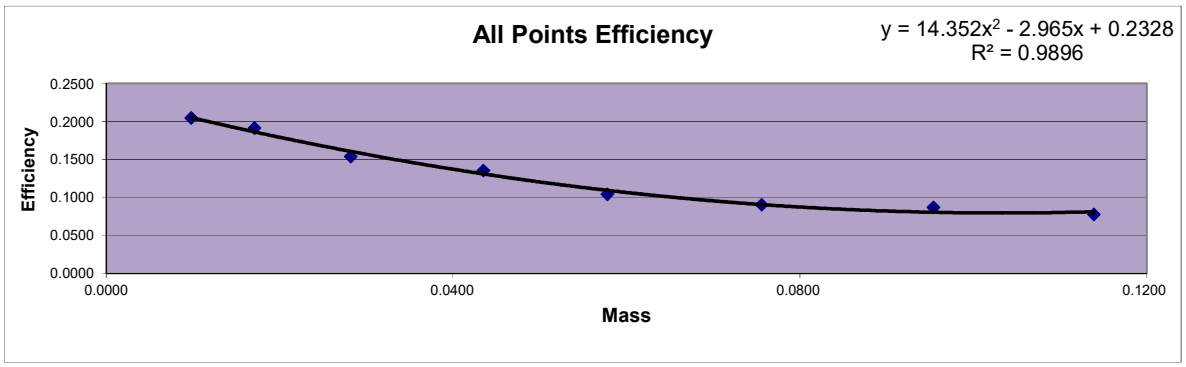
Purple 11

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
11	ICABT-1835503; A	7/7/2022 10:50	45	20747	461.044	2254.6	0.2045	1	0.0098
11	ICABT-1835503; B	7/7/2022 9:51	45	19412	431.378	2254.6	0.1913	1	0.0171
11	ICABT-1835503; C	7/7/2022 9:00	45	15614	346.978	2254.6	0.1539	1	0.0282
11	ICABT-1835503; D	7/7/2022 8:12	45	13762	305.822	2254.6	0.1356	1	0.0435
11	ICABT-1835503; E	7/7/2022 15:07	45	21153	470.067	4509.1	0.1042	2	0.0578
11	ICABT-1835503; F	7/7/2022 14:10	45	18344	407.644	4509.1	0.0904	2	0.0756
11	ICABT-1835503; G	7/7/2022 13:23	45	17679	392.867	4509.1	0.0871	2	0.0954
11	ICABT-1835503; H	7/7/2022 12:33	45	15770	350.444	4509.1	0.0777	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2045	0.2051	-0.31%
0.0171	0.1913	0.1863	2.71%
0.0282	0.1539	0.1606	-4.17%
0.0435	0.1356	0.1310	3.56%
0.0578	0.1042	0.1094	-4.68%
0.0756	0.0904	0.0907	-0.30%
0.0954	0.0871	0.0806	8.15%
0.1139	0.0777	0.0813	-4.38%

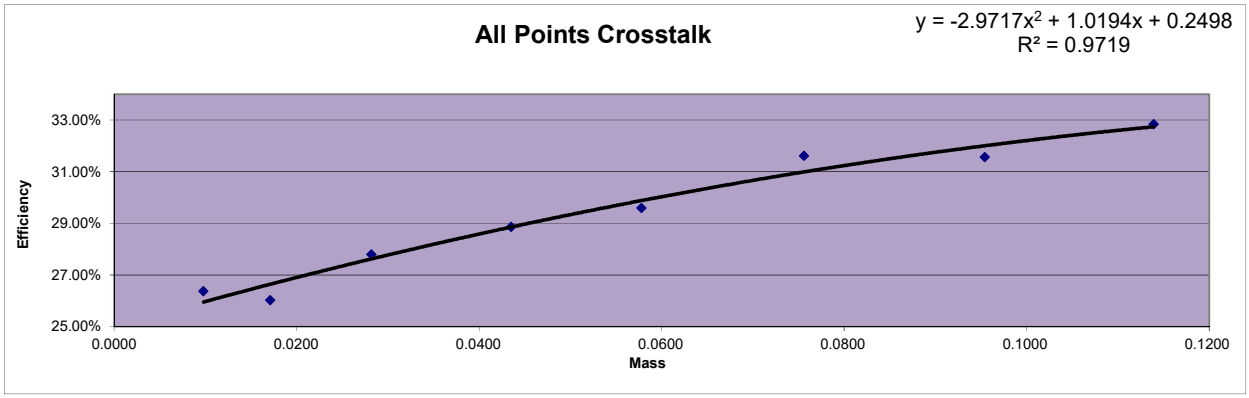
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.352
X Coeff:	-2.965
Intercept:	0.2328

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20747	7431	461.04	165.13	26.37%	Min
ICABT-1835503; B	0.0171	45	19412	6831	431.38	151.80	26.03%	26.03%
ICABT-1835503; C	0.0282	45	15614	6012	346.98	133.60	27.80%	
ICABT-1835503; D	0.0435	45	13762	5584	305.82	124.09	28.86%	Max
ICABT-1835503; E	0.0578	45	21153	8893	470.07	197.62	29.60%	32.84%
ICABT-1835503; F	0.0756	45	18344	8485	407.64	188.56	31.63%	
ICABT-1835503; G	0.0954	45	17679	8156	392.87	181.24	31.57%	Mean
ICABT-1835503; H	0.1139	45	15770	7711	350.44	171.36	32.84%	29.34%



Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; D

Repeat 33

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 8:12:02 AM

Count Ended 7/7/2022 8:57:13 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	13,762	305.822	305.726
sd	0.010	117.312	2.607	2.607
Beta	0.607	5,584	124.089	123.482
sd	0.025	74.726	1.661	1.661

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; C

Repeat 37

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 9:00:35 AM

Count Ended 7/7/2022 9:45:40 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	15,614	346.978	346.882
sd	0.010	124.956	2.777	2.777
Beta	0.607	6,012	133.600	132.993
sd	0.025	77.537	1.723	1.723

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; B

Repeat 37

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 9:51:22 AM

Count Ended 7/7/2022 10:36:29 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	19,412	431.378	431.282
sd	0.010	139.327	3.096	3.096
Beta	0.607	6,831	151.800	151.193
sd	0.025	82.650	1.837	1.837

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; A

Repeat 38

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 10:50:39 AM

Count Ended 7/7/2022 11:35:45 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	20,747	461.044	460.948
sd	0.010	144.038	3.201	3.201
Beta	0.607	7,431	165.133	164.526
sd	0.025	86.203	1.916	1.916

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; H

Repeat 35

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 12:33:03 PM

Count Ended 7/7/2022 1:18:12 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	15,770	350.444	350.348
sd	0.010	125.579	2.791	2.791
Beta	0.607	7,711	171.356	170.749
sd	0.025	87.812	1.951	1.952

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; G

Repeat 37

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 1:23:35 PM

Count Ended 7/7/2022 2:08:45 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	17,679	392.867	392.771
sd	0.010	132.962	2.955	2.955
Beta	0.607	8,156	181.244	180.637
sd	0.025	90.311	2.007	2.007

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; F

Repeat 38

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 2:10:46 PM

Count Ended 7/7/2022 2:55:56 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	18,344	407.644	407.548
sd	0.010	135.440	3.010	3.010
Beta	0.607	8,485	188.556	187.949
sd	0.025	92.114	2.047	2.047

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICABT-1835503; E

Repeat 39

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 3:07:56 PM

Count Ended 7/7/2022 3:53:05 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

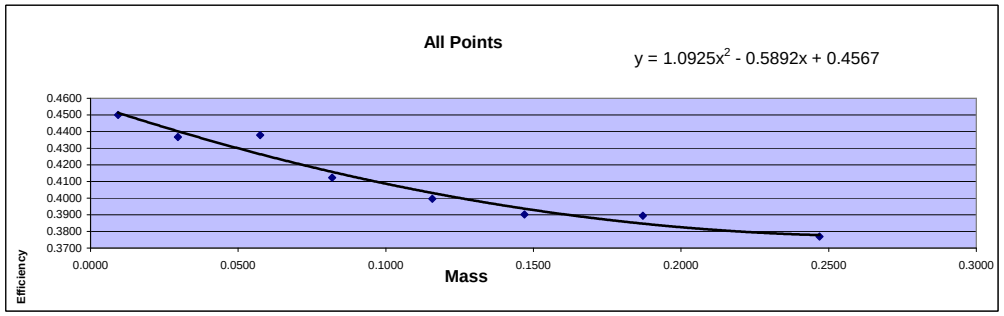
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	21,153	470.067	469.971
sd	0.010	145.441	3.232	3.232
Beta	0.607	8,893	197.622	197.015
sd	0.025	94.303	2.096	2.096

Curve is for Gross Beta
Strontium 90
and
Total Strontium

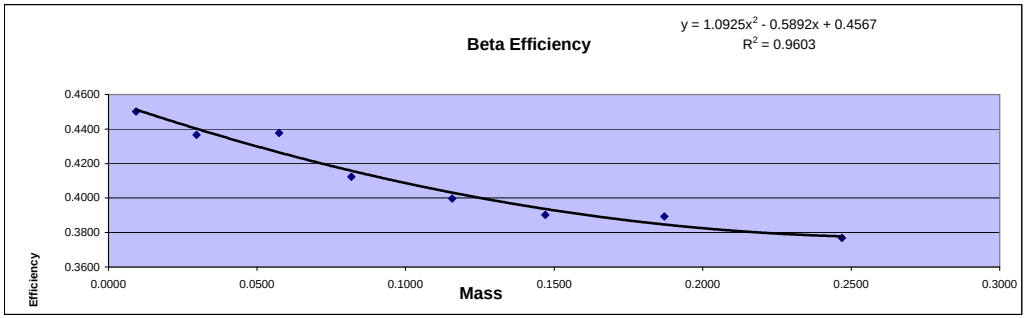
Purple 16

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41558.018 CPM	Sr-90 Eff	Standard Aliquot
16	B1	2/3/2013 19:04	0.0093	5	93524	18704.800	0.4501	1mL
16	B2	2/3/2013 20:25	0.0296	5	90736	18147.200	0.4367	1mL
16	B3	2/3/2013 20:17	0.0574	5	90972	18194.400	0.4378	1mL
16	B4	2/3/2013 20:08	0.0818	5	85671	17134.200	0.4123	1mL
16	B5	2/3/2013 20:00	0.1157	5	83046	16609.200	0.3997	1mL
16	B6	2/3/2013 19:53	0.1470	5	81078	16215.600	0.3902	1mL
16	B7	2/3/2013 19:21	0.1871	5	80914	16182.800	0.3894	1mL
16	B8	2/3/2013 19:13	0.2469	5	78316	15663.200	0.3769	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4501	0.4513	-0.27%
0.0296	0.4367	0.4402	-0.81%
0.0574	0.4378	0.4265	2.66%
0.0818	0.4123	0.4158	-0.85%
0.1157	0.3997	0.4032	-0.87%
0.1470	0.3902	0.3937	-0.89%
0.1871	0.3894	0.3847	1.22%
0.2469	0.3769	0.3778	-0.24%



Mass	Efficiency
0.0093	0.4501
0.0296	0.4367
0.0574	0.4378
0.0818	0.4123
0.1157	0.3997
0.1470	0.3902
0.1871	0.3894
0.2469	0.3769



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	2/3/2013	
Elapsed Time:	1235.000	days
Half Life:	10409.625	days
Exponential Term:	0.921055374	
Corrected Activity:	20779.00924	dpm/mL
Decay Activity (Sr/Y-90)	41558.01848	dpm

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B1

Repeat 44

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:04:43 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:09:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	156	31.200	31.030
sd	0.000			0.013	12.490	2.498	2.498
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	93,524	18,704.800	18,704.403
sd	0.000			0.020	305.817	61.163	61.163

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B8

Repeat 44

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:13:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:19:00 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	117	23.400	23.230
sd	0.000			0.013	10.817	2.163	2.163
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	78,316	15,663.200	15,662.803
sd	0.000			0.020	279.850	55.970	55.970

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B7

Repeat 45

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:21:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:26:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	118	23.600	23.430
sd	0.000			0.013	10.863	2.173	2.173
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	80,914	16,182.800	16,182.403
sd	0.000			0.020	284.454	56.891	56.891

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B6

Repeat 46

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:53:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:58:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	101	20.200	20.030
sd	0.000			0.013	10.050	2.010	2.010
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	81,078	16,215.600	16,215.203
sd	0.000			0.020	284.742	56.948	56.948

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B5

Repeat 47

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:00:50 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:05:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	134	26.800	26.630
sd	0.000			0.013	11.576	2.315	2.315
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	83,046	16,609.200	16,608.803
sd	0.000			0.020	288.177	57.635	57.635

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B4

Repeat 49

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:08:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:13:17 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	155	31.000	30.830
sd	0.000			0.013	12.450	2.490	2.490
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	85,671	17,134.200	17,133.803
sd	0.000			0.020	292.696	58.539	58.539

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B3

Repeat 50

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:17:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:22:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	148	29.600	29.430
sd	0.000			0.013	12.166	2.433	2.433
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	90,972	18,194.400	18,194.003
sd	0.000			0.020	301.616	60.323	60.323

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-6322;B2

Repeat 51

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:25:21 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:30:32 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	179	35.800	35.630
sd	0.000			0.013	13.379	2.676	2.676
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	90,736	18,147.200	18,146.803
sd	0.000			0.020	301.224	60.245	60.245

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

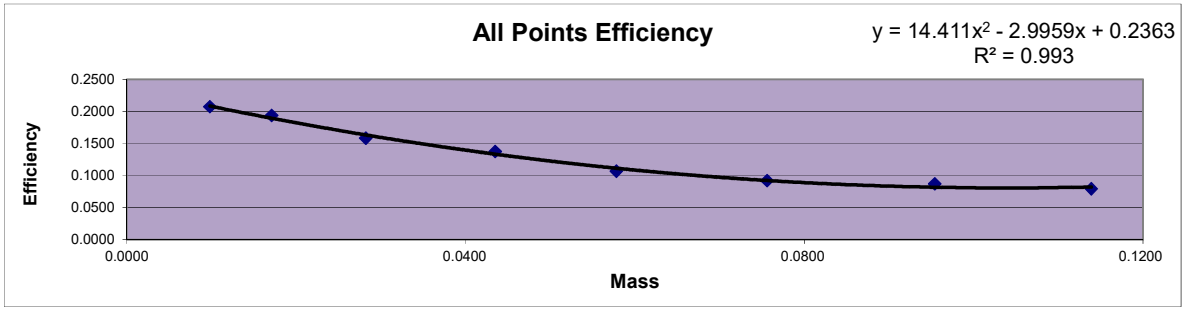
Purple 16

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
16	ICABT-1835503; A	7/7/2022 15:57	45	21045	467.667	2254.6	0.2074	1	0.0098
16	ICABT-1835503; B	7/7/2022 22:37	45	19649	436.644	2254.6	0.1937	1	0.0171
16	ICABT-1835503; C	7/7/2022 21:49	45	16043	356.511	2254.6	0.1581	1	0.0282
16	ICABT-1835503; D	7/7/2022 20:20	45	13941	309.800	2254.6	0.1374	1	0.0435
16	ICABT-1835503; E	7/7/2022 19:32	45	21642	480.933	4509.1	0.1067	2	0.0578
16	ICABT-1835503; F	7/7/2022 18:42	45	18675	415.000	4509.1	0.0920	2	0.0756
16	ICABT-1835503; G	7/7/2022 17:54	45	17636	391.911	4509.1	0.0869	2	0.0954
16	ICABT-1835503; H	7/7/2022 16:49	45	16089	357.533	4509.1	0.0793	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2074	0.2083	-0.43%
0.0171	0.1937	0.1893	2.32%
0.0282	0.1581	0.1633	-3.15%
0.0435	0.1374	0.1332	3.12%
0.0578	0.1067	0.1113	-4.16%
0.0756	0.0920	0.0922	-0.15%
0.0954	0.0869	0.0816	6.45%
0.1139	0.0793	0.0820	-3.33%

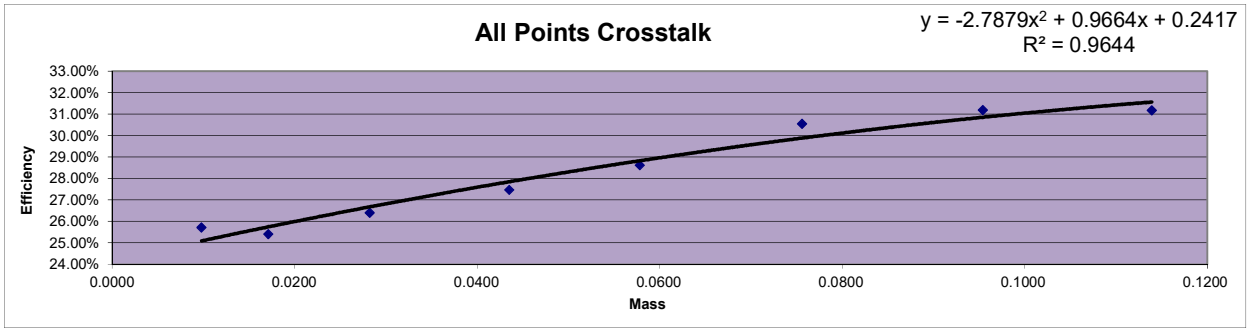
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.411
X Coeff:	-2.9959
Intercept:	0.2363

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	21045	7284	467.67	161.87	25.71%	Min
ICABT-1835503; B	0.0171	45	19649	6693	436.64	148.73	25.41%	25.41%
ICABT-1835503; C	0.0282	45	16043	5754	356.51	127.87	26.40%	
ICABT-1835503; D	0.0435	45	13941	5277	309.80	117.27	27.46%	Max
ICABT-1835503; E	0.0578	45	21642	8674	480.93	192.76	28.61%	31.18%
ICABT-1835503; F	0.0756	45	18675	8213	415.00	182.51	30.55%	
ICABT-1835503; G	0.0954	45	17636	7990	391.91	177.56	31.18%	Mean
ICABT-1835503; H	0.1139	45	16089	7288	357.53	161.96	31.18%	28.31%



Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; A

Repeat 43

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 3:57:09 PM

Count Ended 7/7/2022 4:42:17 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	21,045	467.667	467.518
sd	0.012	145.069	3.224	3.224
Beta	0.442	7,284	161.867	161.425
sd	0.021	85.346	1.897	1.897

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; H

Repeat 40

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 4:49:35 PM

Count Ended 7/7/2022 5:34:44 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	16,089	357.533	357.384
sd	0.012	126.842	2.819	2.819
Beta	0.442	7,288	161.956	161.514
sd	0.021	85.370	1.897	1.897

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; G

Repeat 42

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 5:54:27 PM

Count Ended 7/7/2022 6:39:35 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	17,636	391.911	391.762
sd	0.012	132.801	2.951	2.951
Beta	0.442	7,990	177.556	177.114
sd	0.021	89.387	1.986	1.986

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; F

Repeat 43

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 6:42:44 PM

Count Ended 7/7/2022 7:27:51 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	18,675	415.000	414.851
sd	0.012	136.657	3.037	3.037
Beta	0.442	8,213	182.511	182.069
sd	0.021	90.626	2.014	2.014

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; E

Repeat 44

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 7:32:08 PM

Count Ended 7/7/2022 8:17:16 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	21,642	480.933	480.784
sd	0.012	147.112	3.269	3.269
Beta	0.442	8,674	192.756	192.314
sd	0.021	93.134	2.070	2.070

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; D

Repeat 46

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 8:20:23 PM

Count Ended 7/7/2022 9:05:33 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	13,941	309.800	309.651
sd	0.012	118.072	2.624	2.624
Beta	0.442	5,277	117.267	116.825
sd	0.021	72.643	1.614	1.614

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; C

Repeat 50

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 9:49:59 PM

Count Ended 7/7/2022 10:35:09 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	16,043	356.511	356.362
sd	0.012	126.661	2.815	2.815
Beta	0.442	5,754	127.867	127.425
sd	0.021	75.855	1.686	1.686

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICABT-1835503; B

Repeat 50

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 10:37:22 PM

Count Ended 7/7/2022 11:22:32 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

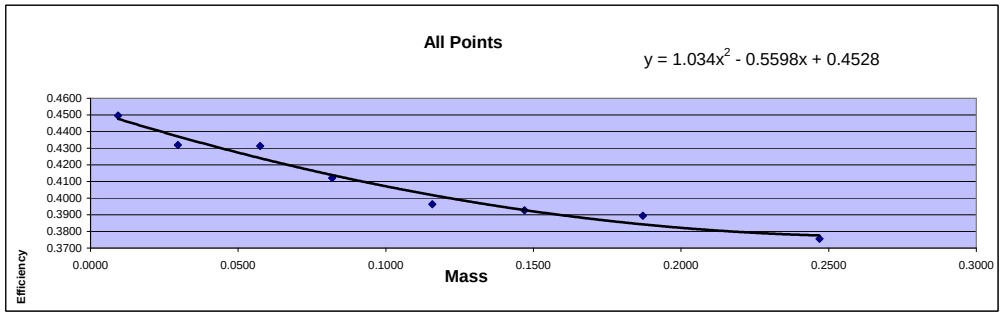
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	19,649	436.644	436.495
sd	0.012	140.175	3.115	3.115
Beta	0.442	6,693	148.733	148.291
sd	0.021	81.811	1.818	1.818

Curve is for Gross Beta
Strontium 90
and
Total Strontium

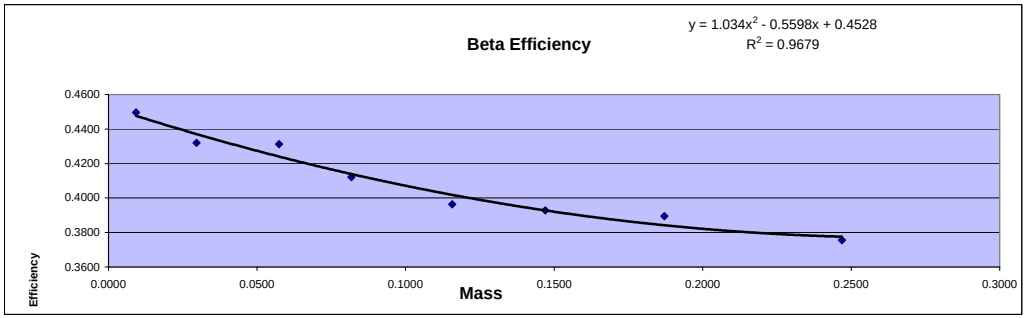
Purple 18

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 41558.018 CPM	Sr-90 Eff	Standard Aliquot
18	B1	2/3/2013 19:21	0.0093	5	93422	18684.400	0.4496	1mL
18	B2	2/3/2013 19:13	0.0296	5	89762	17952.400	0.4320	1mL
18	B3	2/3/2013 19:04	0.0574	5	89614	17922.800	0.4313	1mL
18	B4	2/3/2013 20:25	0.0818	5	85627	17125.400	0.4121	1mL
18	B5	2/3/2013 20:17	0.1157	5	82362	16472.400	0.3964	1mL
18	B6	2/3/2013 20:08	0.1470	5	81610	16322.000	0.3928	1mL
18	B7	2/3/2013 20:01	0.1871	5	80938	16187.600	0.3895	1mL
18	B8	2/3/2013 19:53	0.2469	5	78059	15611.800	0.3757	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4496	0.4477	0.43%
0.0296	0.4320	0.4371	-1.18%
0.0574	0.4313	0.4241	1.70%
0.0818	0.4121	0.4139	-0.45%
0.1157	0.3964	0.4019	-1.37%
0.1470	0.3928	0.3929	-0.03%
0.1871	0.3895	0.3843	1.37%
0.2469	0.3757	0.3776	-0.52%



Mass	Efficiency
0.0093	0.4496
0.0296	0.4320
0.0574	0.4313
0.0818	0.4121
0.1157	0.3964
0.1470	0.3928
0.1871	0.3895
0.2469	0.3757



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	2/3/2013	
Elapsed Time:	1235.000	days
Half Life:	10409.625	days
Exponential Term:	0.921055374	
Corrected Activity:	20779.00924	dpm/mL
Decay Activity (Sr/Y-90)	41558.01848	dpm

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B3

Repeat 44

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:04:53 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:10:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	62	12.400	12.278
sd	0.000			0.011	7.874	1.575	1.575
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	89,614	17,922.800	17,922.342
sd	0.000			0.021	299.356	59.871	59.871

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B2

Repeat 45

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:13:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:19:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	70	14.000	13.878
sd	0.000			0.011	8.367	1.673	1.673
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	89,762	17,952.400	17,951.942
sd	0.000			0.021	299.603	59.921	59.921

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B1

Repeat 46

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:21:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:26:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	79	15.800	15.678
sd	0.000			0.011	8.888	1.778	1.778
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	93,422	18,684.400	18,683.942
sd	0.000			0.021	305.650	61.130	61.130

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B8

Repeat 46

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 7:53:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 7:58:38 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	43	8.600	8.478
sd	0.000			0.011	6.557	1.311	1.312
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	78,059	15,611.800	15,611.342
sd	0.000			0.021	279.390	55.878	55.878

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B7

Repeat 47

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:01:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:06:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	53	10.600	10.478
sd	0.000			0.011	7.280	1.456	1.456
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	80,938	16,187.600	16,187.142
sd	0.000			0.021	284.496	56.899	56.899

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B6

Repeat 48

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:08:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:13:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	58	11.600	11.478
sd	0.000			0.011	7.616	1.523	1.523
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	81,610	16,322.000	16,321.542
sd	0.000			0.021	285.675	57.135	57.135

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B5

Repeat 49

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:17:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:23:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	63	12.600	12.478
sd	0.000			0.011	7.937	1.587	1.587
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	82,362	16,472.400	16,471.942
sd	0.000			0.021	286.988	57.398	57.398

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-6322;B4

Repeat 51

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/3/2013 8:25:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/3/2013 8:30:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	56	11.200	11.078
sd	0.000			0.011	7.483	1.497	1.497
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	85,627	17,125.400	17,124.942
sd	0.000			0.021	292.621	58.524	58.524

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

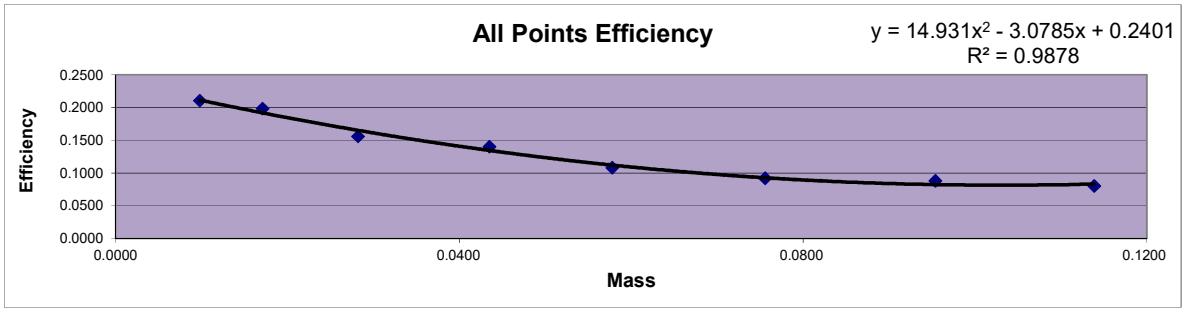
Curve is for Gross Alpha

Purple 18

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
18	ICABT-1835503; A	7/7/2022 17:54	45	21363	474.733	2254.6	0.2106	1	0.0098
18	ICABT-1835503; B	7/7/2022 16:48	45	20117	447.044	2254.6	0.1983	1	0.0171
18	ICABT-1835503; C	7/7/2022 15:57	45	15817	351.489	2254.6	0.1559	1	0.0282
18	ICABT-1835503; D	7/7/2022 22:37	45	14214	315.867	2254.6	0.1401	1	0.0435
18	ICABT-1835503; E	7/7/2022 21:50	45	21959	487.978	4509.1	0.1082	2	0.0578
18	ICABT-1835503; F	7/7/2022 20:20	45	18645	414.333	4509.1	0.0919	2	0.0756
18	ICABT-1835503; G	7/7/2022 19:32	45	17873	397.178	4509.1	0.0881	2	0.0954
18	ICABT-1835503; H	7/7/2022 18:43	45	16253	361.178	4509.1	0.0801	2	0.1139

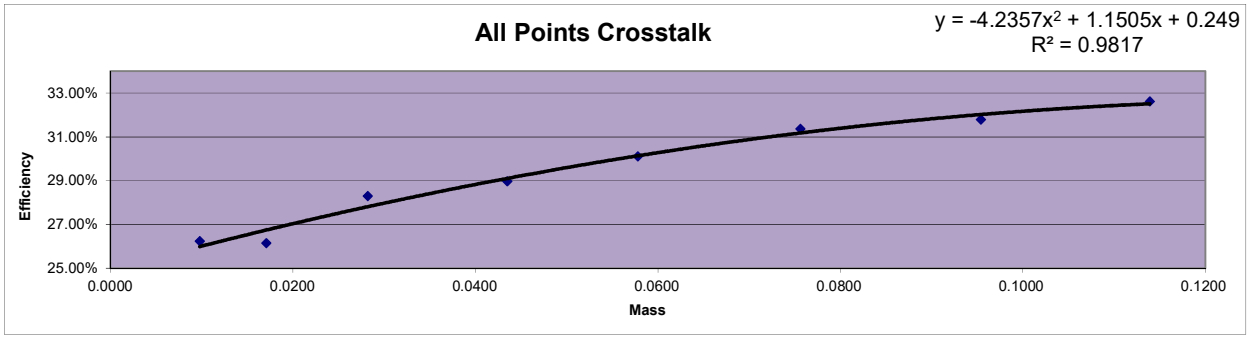
Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2106	0.2114	-0.38%
0.0171	0.1983	0.1918	3.37%
0.0282	0.1559	0.1652	-5.61%
0.0435	0.1401	0.1344	4.21%
0.0578	0.1082	0.1120	-3.41%
0.0756	0.0919	0.0927	-0.88%
0.0954	0.0881	0.0823	7.03%
0.1139	0.0801	0.0832	-3.68%

Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.931
X Coeff:	-3.0785
Intercept:	0.2401

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	21363	7599	474.73	168.87	26.24%	Min
ICABT-1835503; B	0.0171	45	20117	7120	447.04	158.22	26.14%	26.14%
ICABT-1835503; C	0.0282	45	15817	6240	351.49	138.67	28.29%	
ICABT-1835503; D	0.0435	45	14214	5798	315.87	128.84	28.97%	Max
ICABT-1835503; E	0.0578	45	21959	9457	487.98	210.16	30.10%	32.61%
ICABT-1835503; F	0.0756	45	18645	8516	414.33	189.24	31.35%	
ICABT-1835503; G	0.0954	45	17873	8329	397.18	185.09	31.79%	Mean
ICABT-1835503; H	0.1139	45	16253	7864	361.18	174.76	32.61%	29.44%



Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; C

Repeat 44

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 3:57:19 PM

Count Ended 7/7/2022 4:42:25 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	15,817	351.489	351.355
sd	0.012	125.766	2.795	2.795
Beta	0.370	6,240	138.667	138.297
sd	0.019	78.994	1.755	1.756

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; B

Repeat 44

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 4:48:43 PM

Count Ended 7/7/2022 5:33:55 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	20,117	447.044	446.910
sd	0.012	141.834	3.152	3.152
Beta	0.370	7,120	158.222	157.852
sd	0.019	84.380	1.875	1.875

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; A

Repeat 45

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 5:54:06 PM

Count Ended 7/7/2022 6:39:13 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	21,363	474.733	474.599
sd	0.012	146.161	3.248	3.248
Beta	0.370	7,599	168.867	168.497
sd	0.019	87.172	1.937	1.937

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; H

Repeat 42

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 6:43:11 PM

Count Ended 7/7/2022 7:28:22 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	16,253	361.178	361.044
sd	0.012	127.487	2.833	2.833
Beta	0.370	7,864	174.756	174.386
sd	0.019	88.679	1.971	1.971

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; G

Repeat 44

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 7:32:14 PM

Count Ended 7/7/2022 8:17:20 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	17,873	397.178	397.044
sd	0.012	133.690	2.971	2.971
Beta	0.370	8,329	185.089	184.719
sd	0.019	91.263	2.028	2.028

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; F

Repeat 45

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 8:20:33 PM

Count Ended 7/7/2022 9:05:42 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	18,645	414.333	414.199
sd	0.012	136.547	3.034	3.034
Beta	0.370	8,516	189.244	188.874
sd	0.019	92.282	2.051	2.051

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; E

Repeat 46

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 9:50:08 PM

Count Ended 7/7/2022 10:35:17 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	21,959	487.978	487.844
sd	0.012	148.186	3.293	3.293
Beta	0.370	9,457	210.156	209.786
sd	0.019	97.247	2.161	2.161

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICABT-1835503; D

Repeat 48

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 10:37:30 PM

Count Ended 7/7/2022 11:22:41 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

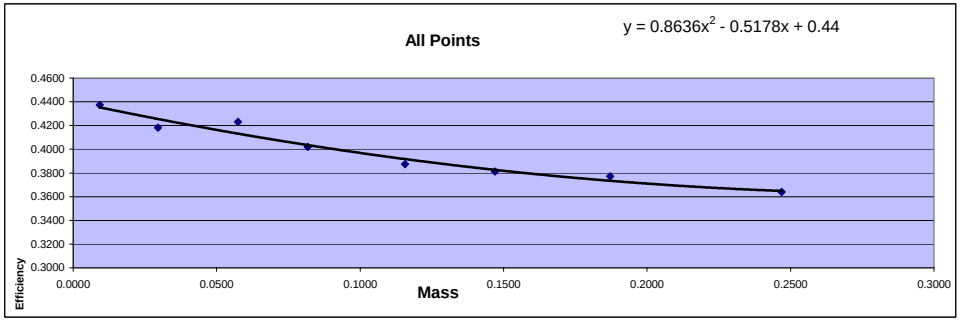
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	14,214	315.867	315.733
sd	0.012	119.222	2.649	2.649
Beta	0.370	5,798	128.844	128.474
sd	0.019	76.145	1.692	1.692

Curve is for Gross Beta
Strontium 90
and
Total Strontium

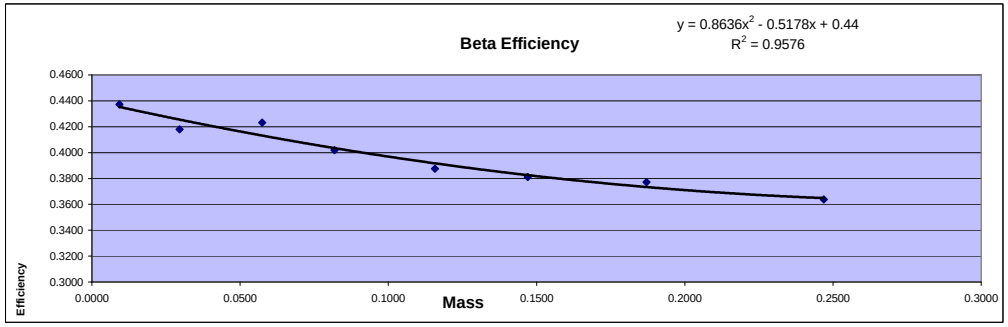
Purple 23

Detector ID	Std ID	Count Date	Sample Wt	Count Time	Beta Counts	DPM 38756.83632 CPM	Sr-90 Eff	Standard Aliquot
23	ICABT-6322;B1	12/18/2015 11:20	0.0093	5	84733	16946.600	0.4373	1mL
23	ICABT-6322;B2	12/18/2015 9:34	0.0296	5	81014	16202.800	0.4181	1mL
23	ICABT-6322;B3	12/18/2015 11:31	0.0574	5	81981	16396.200	0.4231	1mL
23	ICABT-6322;B4	12/18/2015 9:41	0.0818	5	77896	15579.200	0.4020	1mL
23	ICABT-6322;B5	12/18/2015 11:38	0.1157	5	75080	15016.000	0.3874	1mL
23	ICABT-6322;B6	12/18/2015 9:48	0.1470	5	73855	14771.000	0.3811	1mL
23	ICABT-6322;B7	12/18/2015 11:44	0.1871	5	73090	14618.000	0.3772	1mL
23	ICABT-6322;B8	12/18/2015 9:58	0.2469	5	70512	14102.400	0.3639	1mL

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0093	0.4373	0.4353	0.46%
0.0296	0.4181	0.4254	-1.73%
0.0574	0.4231	0.4131	2.40%
0.0818	0.4020	0.4034	-0.36%
0.1157	0.3874	0.3917	-1.07%
0.1470	0.3811	0.3825	-0.37%
0.1871	0.3772	0.3734	1.02%
0.2469	0.3639	0.3648	-0.26%



Mass	Efficiency
0.0093	0.4373
0.0296	0.4181
0.0574	0.4231
0.0818	0.4020
0.1157	0.3874
0.1470	0.3811
0.1871	0.3772
0.2469	0.3639



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/172009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	12/18/2015	
Elapsed Time:	2283.000	days
Half Life:	10409.625	days
Exponential Term:	0.858972436	
Corrected Activity:	19378.41816	dpm/mL
Decay Activity (Sr/Y-90)	38756.83632	dpm

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B2

Repeat 55

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 9:34:18 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 9:39:28 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,886	377.200	377.083
sd	0.000			0.011	43.428	8.686	8.686
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	81,014	16,202.800	16,202.054
sd	0.000			0.027	284.630	56.926	56.926

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B4

Repeat 54

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 9:41:53 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 9:47:02 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,660	332.000	331.883
sd	0.000			0.011	40.743	8.149	8.149
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	77,896	15,579.200	15,578.454
sd	0.000			0.027	279.099	55.820	55.820

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B6

Repeat 53

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 9:48:36 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 9:53:45 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,525	305.000	304.883
sd	0.000			0.011	39.051	7.810	7.810
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	73,855	14,771.000	14,770.254
sd	0.000			0.027	271.763	54.353	54.353

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B8

Repeat 53

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 9:58:15 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 10:03:25 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,349	269.800	269.683
sd	0.000			0.011	36.729	7.346	7.346
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	70,512	14,102.400	14,101.654
sd	0.000			0.027	265.541	53.108	53.108

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B1

Repeat 56

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:20:09 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:25:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,952	390.400	390.283
sd	0.000			0.011	44.181	8.836	8.836
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	84,733	16,946.600	16,945.854
sd	0.000			0.027	291.089	58.218	58.218

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B3

Repeat 55

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:31:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:36:21 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,853	370.600	370.483
sd	0.000			0.011	43.046	8.609	8.609
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	81,981	16,396.200	16,395.454
sd	0.000			0.027	286.323	57.265	57.265

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B5

Repeat 54

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:38:07 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:43:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,594	318.800	318.683
sd	0.000			0.011	39.925	7.985	7.985
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	75,080	15,016.000	15,015.254
sd	0.000			0.027	274.007	54.801	54.801

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-6322;B7

Repeat 54

Carrier No. 0

Batch ID M122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 11:44:20 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 11:49:29 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	1,509	301.800	301.683
sd	0.000			0.011	38.846	7.769	7.769
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	73,090	14,618.000	14,617.254
sd	0.000			0.027	270.352	54.070	54.070

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

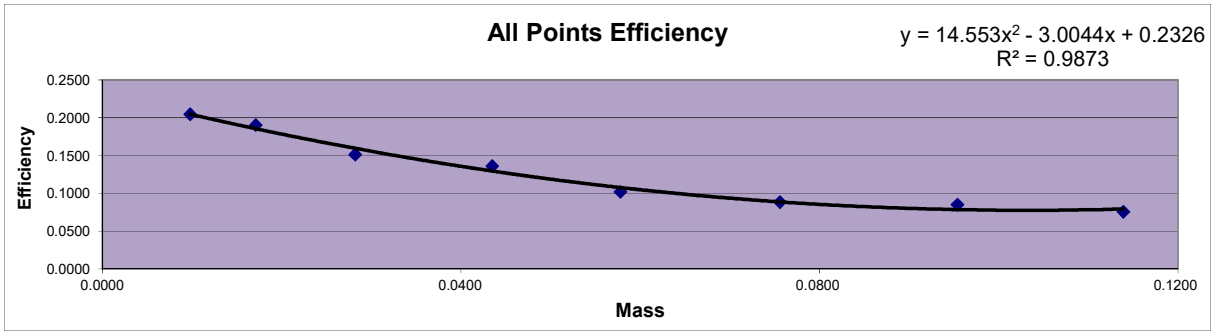
Purple 23

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
23	ICABT-1835503; A	7/7/2022 22:37	45	20759	461.311	2254.6	0.2046	1	0.0098
23	ICABT-1835503; B	7/7/2022 21:49	45	19303	428.956	2254.6	0.1903	1	0.0171
23	ICABT-1835503; C	7/7/2022 20:20	45	15338	340.844	2254.6	0.1512	1	0.0282
23	ICABT-1835503; D	7/7/2022 19:32	45	13785	306.333	2254.6	0.1359	1	0.0435
23	ICABT-1835503; E	7/7/2022 18:43	45	20709	460.200	4509.1	0.1021	2	0.0578
23	ICABT-1835503; F	7/7/2022 17:54	45	17916	398.133	4509.1	0.0883	2	0.0756
23	ICABT-1835503; G	7/7/2022 16:49	45	17247	383.267	4509.1	0.0850	2	0.0954
23	ICABT-1835503; H	7/7/2022 15:57	45	15358	341.289	4509.1	0.0757	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2046	0.2046	0.03%
0.0171	0.1903	0.1855	2.58%
0.0282	0.1512	0.1594	-5.19%
0.0435	0.1359	0.1294	4.96%
0.0578	0.1021	0.1076	-5.12%
0.0756	0.0883	0.0886	-0.39%
0.0954	0.0850	0.0784	8.37%
0.1139	0.0757	0.0792	-4.43%

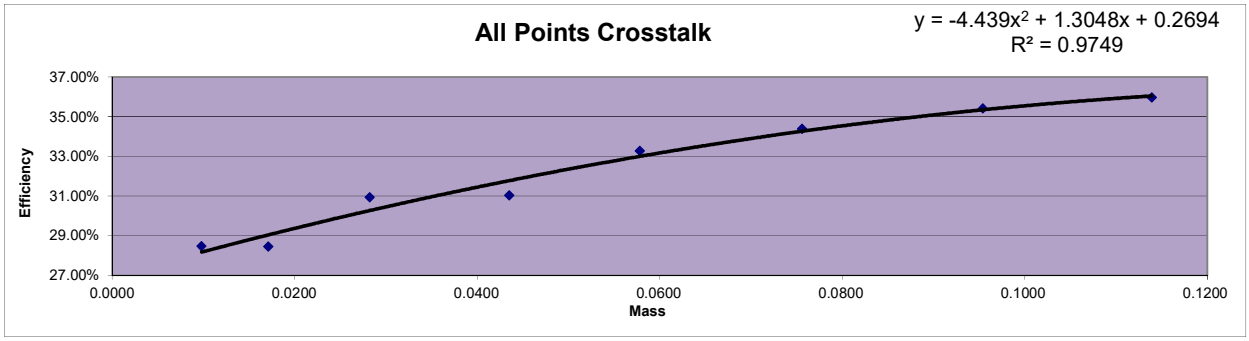
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X² Coeff:	14.553
X Coeff:	-3.0044
Intercept:	0.2326

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20759	8263	461.31	183.62	28.47%	Min
ICABT-1835503; B	0.0171	45	19303	7674	428.96	170.53	28.45%	28.45%
ICABT-1835503; C	0.0282	45	15338	6869	340.84	152.64	30.93%	
ICABT-1835503; D	0.0435	45	13785	6202	306.33	137.82	31.03%	Max
ICABT-1835503; E	0.0578	45	20709	10325	460.20	229.44	33.27%	35.95%
ICABT-1835503; F	0.0756	45	17916	9384	398.13	208.53	34.37%	
ICABT-1835503; G	0.0954	45	17247	9454	383.27	210.09	35.41%	Mean
ICABT-1835503; H	0.1139	45	15358	8621	341.29	191.58	35.95%	32.24%



Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; H

Repeat 39

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 3:57:44 PM

Count Ended 7/7/2022 4:42:56 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	15,358	341.289	340.851
sd	0.021	123.927	2.754	2.754
Beta	0.456	8,621	191.578	191.122
sd	0.021	92.849	2.063	2.063

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; G

Repeat 41

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 4:49:31 PM

Count Ended 7/7/2022 5:34:40 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	17,247	383.267	382.829
sd	0.021	131.328	2.918	2.918
Beta	0.456	9,454	210.089	209.633
sd	0.021	97.232	2.161	2.161

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; F

Repeat 42

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 5:54:23 PM

Count Ended 7/7/2022 6:39:31 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	17,916	398.133	397.695
sd	0.021	133.851	2.974	2.975
Beta	0.456	9,384	208.533	208.077
sd	0.021	96.871	2.153	2.153

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; E

Repeat 43

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 6:43:02 PM

Count Ended 7/7/2022 7:28:09 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	20,709	460.200	459.762
sd	0.021	143.906	3.198	3.198
Beta	0.456	10,325	229.444	228.988
sd	0.021	101.612	2.258	2.258

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; D

Repeat 45

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 7:32:03 PM

Count Ended 7/7/2022 8:17:16 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	13,785	306.333	305.895
sd	0.021	117.410	2.609	2.609
Beta	0.456	6,202	137.822	137.366
sd	0.021	78.753	1.750	1.750

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; C

Repeat 49

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 8:20:20 PM

Count Ended 7/7/2022 9:05:28 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	15,338	340.844	340.406
sd	0.021	123.847	2.752	2.752
Beta	0.456	6,869	152.644	152.188
sd	0.021	82.879	1.842	1.842

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; B

Repeat 49

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 9:49:56 PM

Count Ended 7/7/2022 10:35:04 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	19,303	428.956	428.518
sd	0.021	138.935	3.087	3.088
Beta	0.456	7,674	170.533	170.077
sd	0.021	87.601	1.947	1.947

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICABT-1835503; A

Repeat 50

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/7/2022 10:37:19 PM

Count Ended 7/7/2022 11:22:28 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

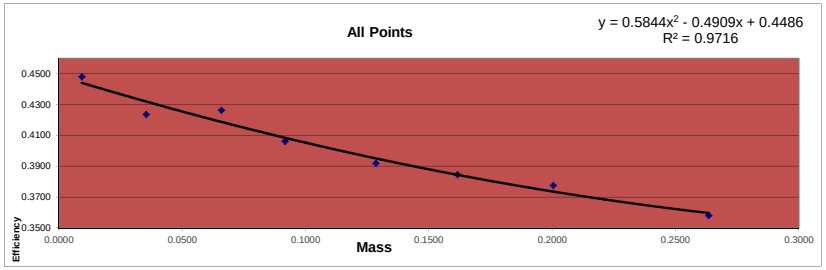
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	20,759	461.311	460.873
sd	0.021	144.080	3.202	3.202
Beta	0.456	8,263	183.622	183.166
sd	0.021	90.901	2.020	2.020

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 0

					DPM			
					35716.83	16-Jun		
					DPM			
					35714.485	17-Jun		
					DPM			
					35712.14	18-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
0	6322;B1	6/16/2019 23:47	5	80004	16000.800	0.4480	1mL	0.0092
0	6322;B2	6/18/2019 11:49	5	75635	15127.000	0.4236	1mL	0.0353
0	6322;B3	6/18/2019 10:52	5	76103	15220.600	0.4262	1mL	0.0658
0	6322;B4	6/18/2019 10:02	5	72537	14507.400	0.4062	1mL	0.0916
0	6322;B5	6/17/2019 16:37	5	69994	13998.800	0.3920	1mL	0.1285
0	6322;B6	6/17/2019 14:34	5	68686	13737.200	0.3846	1mL	0.1615
0	6322;B7	6/17/2019 13:38	5	67428	13485.600	0.3776	1mL	0.2003
0	6322;B8	6/17/2019 0:34	5	63959	12791.800	0.3582	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4480	0.4441	0.87%
0.0353	0.4236	0.4320	-1.95%
0.0658	0.4262	0.4188	1.76%
0.0916	0.4062	0.4085	-0.56%
0.1285	0.3920	0.3952	-0.81%
0.1615	0.3846	0.3846	0.02%
0.2003	0.3776	0.3737	1.04%
0.2634	0.3582	0.3598	-0.47%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/16/2019	
Elapsed Time:	3559.000	days
Half Life:	10555.725	days
Exponential Term:	0.791596419	
Corrected Activity:	17858.41522	dpm/mL
Decay Activity (Sr/Y-90)	35716.83043	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/17/2019	
Elapsed Time:	3560.000	days
Half Life:	10555.725	days
Exponential Term:	0.79154444	
Corrected Activity:	17857.24257	dpm/mL
Decay Activity (Sr/Y-90)	35714.48514	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/18/2019	
Elapsed Time:	3561.000	days
Half Life:	10555.725	days
Exponential Term:	0.791492465	
Corrected Activity:	17856.07	dpm/mL
Decay Activity (Sr/Y-90)	35712.14001	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B1

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/16/2019 11:47:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/16/2019 11:52:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	80,004	16,000.800	16,000.800
sd	0.000			0.000	282.850	56.570	56.570

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B8

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 12:34:04 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 12:39:14 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	63,959	12,791.800	12,791.800
sd	0.000			0.000	252.901	50.580	50.580

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B7

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 1:38:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 1:44:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,428	13,485.600	13,485.600
sd	0.000			0.000	259.669	51.934	51.934

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B6

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 2:34:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 2:39:37 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,686	13,737.200	13,737.200
sd	0.000			0.000	262.080	52.416	52.416

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B5

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 4:37:39 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 4:42:50 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,994	13,998.800	13,998.800
sd	0.000			0.000	264.564	52.913	52.913

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B4

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:02:49 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:08:01 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,537	14,507.400	14,507.400
sd	0.000			0.000	269.327	53.865	53.865

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B3

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:52:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:57:14 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,103	15,220.600	15,220.600
sd	0.000			0.000	275.868	55.174	55.174

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-6322;B2

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 11:49:35 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 11:54:47 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,635	15,127.000	15,127.000
sd	0.000			0.000	275.018	55.004	55.004

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

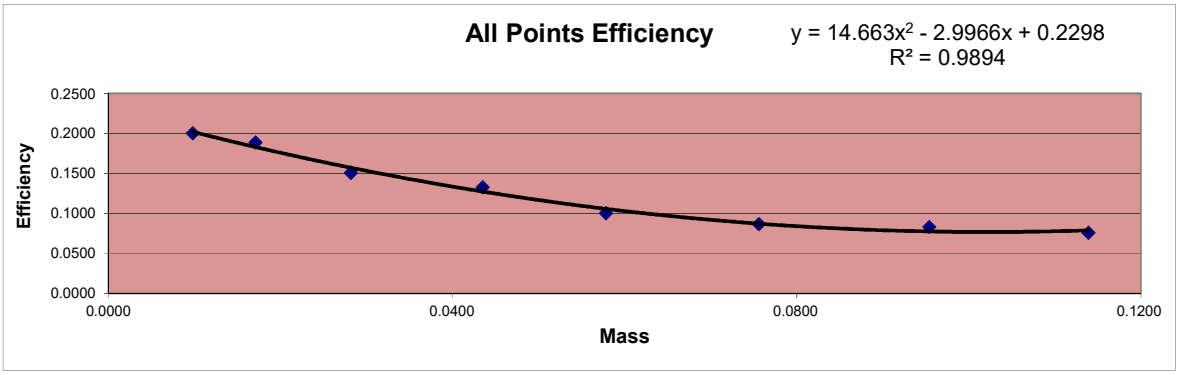
Red 0

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Alpha CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
0	ICABT-1835503; A	5/13/2022 12:27	45	20325	451.6666667	2254.6	0.2003	1	0.0098
0	ICABT-1835503; B	5/13/2022 18:48	45	19128	425.0666667	2254.6	0.1885	1	0.0171
0	ICABT-1835503; C	5/13/2022 17:59	45	15277	339.4888889	2254.6	0.1506	1	0.0282
0	ICABT-1835503; D	5/13/2022 17:01	45	13454	298.9777778	2254.6	0.1326	1	0.0435
0	ICABT-1835503; E	5/13/2022 16:01	45	20364	452.5333333	4509.1	0.1004	2	0.0578
0	ICABT-1835503; F	5/13/2022 15:14	45	17536	389.6888889	4509.1	0.0864	2	0.0756
0	ICABT-1835503; G	5/13/2022 14:22	45	16900	375.5555556	4509.1	0.0833	2	0.0954
0	ICABT-1835503; H	5/13/2022 13:28	45	15379	341.7555556	4509.1	0.0758	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2003	0.2018	-0.75%
0.0171	0.1885	0.1828	3.11%
0.0282	0.1506	0.1570	-4.06%
0.0435	0.1326	0.1272	4.26%
0.0578	0.1004	0.1056	-4.95%
0.0756	0.0864	0.0871	-0.73%
0.0954	0.0833	0.0774	7.64%
0.1139	0.0758	0.0787	-3.71%

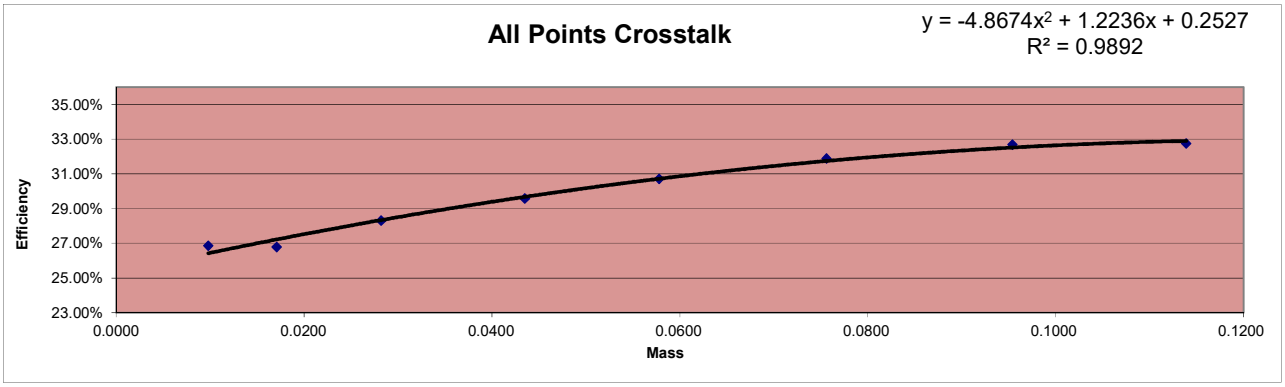
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.663
X Coeff:	-2.9966
Intercept:	0.2298

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20325	7460	451.67	165.78	26.85%	Min
ICABT-1835503; B	0.0171	45	19128	6995	425.07	155.44	26.78%	26.78%
ICABT-1835503; C	0.0282	45	15277	6032	339.49	134.04	28.31%	
ICABT-1835503; D	0.0435	45	13454	5651	298.98	125.58	29.58%	Max
ICABT-1835503; E	0.0578	45	20364	9025	452.53	200.56	30.71%	32.74%
ICABT-1835503; F	0.0756	45	17536	8206	389.69	182.36	31.88%	
ICABT-1835503; G	0.0954	45	16900	8203	375.56	182.29	32.68%	Mean
ICABT-1835503; H	0.1139	45	15379	7487	341.76	166.38	32.74%	29.94%



Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; A

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 12:27:29 PM

Count Ended 5/13/2022 1:12:49 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	20,325	451.667	451.578
sd	0.009	142.566	3.168	3.168
Beta	0.374	7,460	165.778	165.404
sd	0.019	86.371	1.919	1.919

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; H

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 1:28:40 PM

Count Ended 5/13/2022 2:13:48 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	15,379	341.756	341.667
sd	0.009	124.012	2.756	2.756
Beta	0.374	7,487	166.378	166.004
sd	0.019	86.527	1.923	1.923

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; G

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 2:22:27 PM

Count Ended 5/13/2022 3:07:35 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	16,900	375.556	375.467
sd	0.009	130.000	2.889	2.889
Beta	0.374	8,203	182.289	181.915
sd	0.019	90.570	2.013	2.013

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; F

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 3:14:20 PM

Count Ended 5/13/2022 3:59:27 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	17,536	389.689	389.600
sd	0.009	132.424	2.943	2.943
Beta	0.374	8,206	182.356	181.982
sd	0.019	90.587	2.013	2.013

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; E

Repeat 17

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 4:01:49 PM

Count Ended 5/13/2022 4:46:58 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	20,364	452.533	452.444
sd	0.009	142.702	3.171	3.171
Beta	0.374	9,025	200.556	200.182
sd	0.019	95.000	2.111	2.111

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; D

Repeat 18

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 5:01:48 PM

Count Ended 5/13/2022 5:46:54 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	13,454	298.978	298.889
sd	0.009	115.991	2.578	2.578
Beta	0.374	5,651	125.578	125.204
sd	0.019	75.173	1.671	1.671

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; C

Repeat 19

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 5:59:06 PM

Count Ended 5/13/2022 6:44:14 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	15,277	339.489	339.400
sd	0.009	123.600	2.747	2.747
Beta	0.374	6,032	134.044	133.670
sd	0.019	77.666	1.726	1.726

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICABT-1835503; B

Repeat 20

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 6:48:00 PM

Count Ended 5/13/2022 7:33:08 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

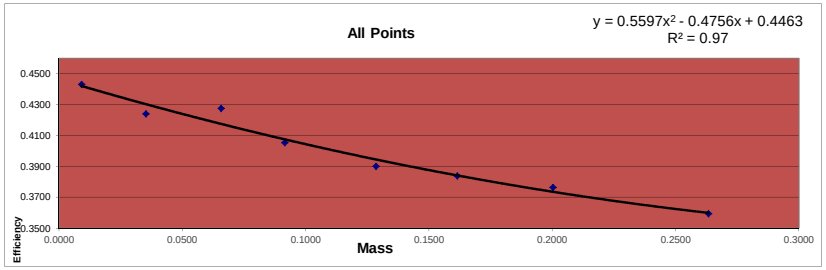
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	19,128	425.067	424.978
sd	0.009	138.304	3.073	3.073
Beta	0.374	6,995	155.444	155.070
sd	0.019	83.636	1.859	1.859

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 1

					DPM	
					35716.83	16-Jun
					DPM	
					35714.485	17-Jun
					DPM	
					35712.14	18-Jun
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
1	6322;B1	6/17/2019 0:33	5	79121	15824.200	0.4431	1mL	0.0092
1	6322;B2	6/16/2019 23:47	5	75729	15145.800	0.4241	1mL	0.0353
1	6322;B3	6/18/2019 11:49	5	76337	15267.400	0.4275	1mL	0.0658
1	6322;B4	6/18/2019 10:52	5	72389	14477.800	0.4054	1mL	0.0916
1	6322;B5	6/18/2019 10:02	5	69628	13925.600	0.3899	1mL	0.1285
1	6322;B6	6/17/2019 16:37	5	68518	13703.600	0.3837	1mL	0.1615
1	6322;B7	6/17/2019 14:34	5	67209	13441.800	0.3764	1mL	0.2003
1	6322;B8	6/17/2019 13:38	5	64155	12831.000	0.3593	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4431	0.4420	0.25%
0.0353	0.4241	0.4302	-1.43%
0.0658	0.4275	0.4174	2.42%
0.0916	0.4054	0.4074	-0.50%
0.1285	0.3899	0.3944	-1.14%
0.1615	0.3837	0.3841	-0.10%
0.2003	0.3764	0.3735	0.77%
0.2634	0.3593	0.3599	-0.16%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/16/2019	
Elapsed Time:	3559.000	days
Half Life:	10555.725	days
Exponential Term:	0.791596419	
Corrected Activity:	17858.41522	dpm/mL
Decay Activity (Sr/Y-90)	35716.83043	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/17/2019	
Elapsed Time:	3560.000	days
Half Life:	10555.725	days
Exponential Term:	0.79154444	
Corrected Activity:	17857.24257	dpm/mL
Decay Activity (Sr/Y-90)	35714.48514	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/18/2019	
Elapsed Time:	3561.000	days
Half Life:	10555.725	days
Exponential Term:	0.791492465	
Corrected Activity:	17856.07	dpm/mL
Decay Activity (Sr/Y-90)	35712.14001	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B2

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/16/2019 11:47:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/16/2019 11:52:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,729	15,145.800	15,145.800
sd	0.000			0.000	275.189	55.038	55.038

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B1

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 12:33:38 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 12:38:50 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	18	3.600	3.600
sd	0.000			0.000	4.243	0.849	0.849
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,121	15,824.200	15,824.200
sd	0.000			0.000	281.285	56.257	56.257

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B8

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 1:38:57 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 1:44:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,155	12,831.000	12,831.000
sd	0.000			0.000	253.288	50.658	50.658

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B7

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 2:34:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 2:39:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,209	13,441.800	13,441.800
sd	0.000			0.000	259.247	51.849	51.849

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B6

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 4:37:45 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 4:42:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,518	13,703.600	13,703.600
sd	0.000			0.000	261.759	52.352	52.352

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B5

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:02:55 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:08:08 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,628	13,925.600	13,925.600
sd	0.000			0.000	263.871	52.774	52.774

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B4

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:52:07 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:57:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,389	14,477.800	14,477.800
sd	0.000			0.000	269.052	53.810	53.810

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-6322;B3

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 11:49:40 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 11:54:53 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,337	15,267.400	15,267.400
sd	0.000			0.000	276.292	55.258	55.258

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

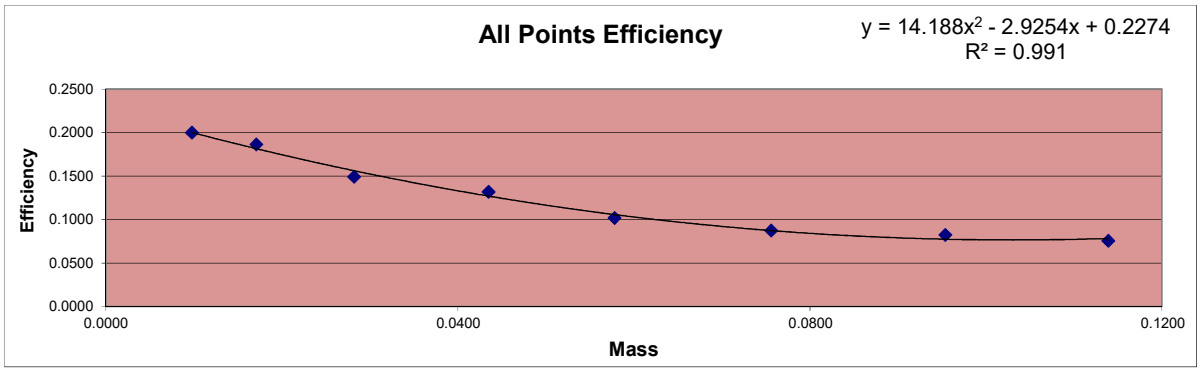
Red 1

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
1	ICABT-1835503; A	5/13/2022 13:28	45	20266	450.356	2254.6	0.1998	1	0.0098
1	ICABT-1835503; B	5/13/2022 12:27	45	18896	419.911	2254.6	0.1862	1	0.0171
1	ICABT-1835503; C	5/13/2022 18:48	45	15111	335.800	2254.6	0.1489	1	0.0282
1	ICABT-1835503; D	5/13/2022 17:59	45	13382	297.378	2254.6	0.1319	1	0.0435
1	ICABT-1835503; E	5/13/2022 17:01	45	20652	458.933	4509.1	0.1018	2	0.0578
1	ICABT-1835503; F	5/13/2022 16:01	45	17682	392.933	4509.1	0.0871	2	0.0756
1	ICABT-1835503; G	5/13/2022 15:14	45	16704	371.200	4509.1	0.0823	2	0.0954
1	ICABT-1835503; H	5/13/2022 14:22	45	15342	340.933	4509.1	0.0756	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1998	0.2001	-0.17%
0.0171	0.1862	0.1815	2.60%
0.0282	0.1489	0.1562	-4.64%
0.0435	0.1319	0.1270	3.86%
0.0578	0.1018	0.1057	-3.72%
0.0756	0.0871	0.0873	-0.22%
0.0954	0.0823	0.0774	6.30%
0.1139	0.0756	0.0783	-3.39%

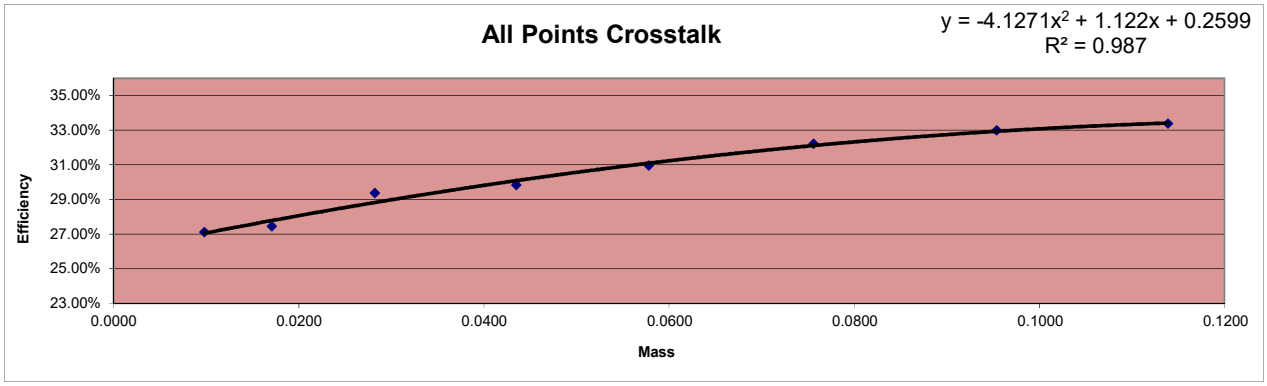
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.188
X Coeff:	-2.9254
Intercept:	0.2274

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20266	7537	450.36	167.49	27.11%	Min
ICABT-1835503; B	0.0171	45	18896	7149	419.91	158.87	27.45%	27.11%
ICABT-1835503; C	0.0282	45	15111	6286	335.80	139.69	29.38%	
ICABT-1835503; D	0.0435	45	13382	5690	297.38	126.44	29.83%	Max
ICABT-1835503; E	0.0578	45	20652	9261	458.93	205.80	30.96%	33.38%
ICABT-1835503; F	0.0756	45	17682	8402	392.93	186.71	32.21%	
ICABT-1835503; G	0.0954	45	16704	8225	371.20	182.78	32.99%	Mean
ICABT-1835503; H	0.1139	45	15342	7686	340.93	170.80	33.38%	30.41%



Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; B

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 12:27:36 PM

Count Ended 5/13/2022 1:12:49 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	18,896	419.911	419.816
sd	0.010	137.463	3.055	3.055
Beta	0.348	7,149	158.867	158.519
sd	0.019	84.552	1.879	1.879

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; A

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 1:28:01 PM

Count Ended 5/13/2022 2:13:11 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	20,266	450.356	450.261
sd	0.010	142.359	3.164	3.164
Beta	0.348	7,537	167.489	167.141
sd	0.019	86.816	1.929	1.929

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; H

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 2:22:31 PM

Count Ended 5/13/2022 3:07:41 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	15,342	340.933	340.838
sd	0.010	123.863	2.753	2.753
Beta	0.348	7,686	170.800	170.452
sd	0.019	87.670	1.948	1.948

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; G

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 3:14:25 PM

Count Ended 5/13/2022 3:59:35 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	16,704	371.200	371.105
sd	0.010	129.244	2.872	2.872
Beta	0.348	8,225	182.778	182.430
sd	0.019	90.692	2.015	2.015

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; F

Repeat 17

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 4:01:54 PM

Count Ended 5/13/2022 4:47:04 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	17,682	392.933	392.838
sd	0.010	132.974	2.955	2.955
Beta	0.348	8,402	186.711	186.363
sd	0.019	91.662	2.037	2.037

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; E

Repeat 18

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 5:01:52 PM

Count Ended 5/13/2022 5:47:03 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	20,652	458.933	458.838
sd	0.010	143.708	3.194	3.194
Beta	0.348	9,261	205.800	205.452
sd	0.019	96.234	2.139	2.139

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; D

Repeat 19

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 5:59:13 PM

Count Ended 5/13/2022 6:44:21 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	13,382	297.378	297.283
sd	0.010	115.681	2.571	2.571
Beta	0.348	5,690	126.444	126.096
sd	0.019	75.432	1.676	1.676

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICABT-1835503; C

Repeat 20

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 6:48:06 PM

Count Ended 5/13/2022 7:33:15 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

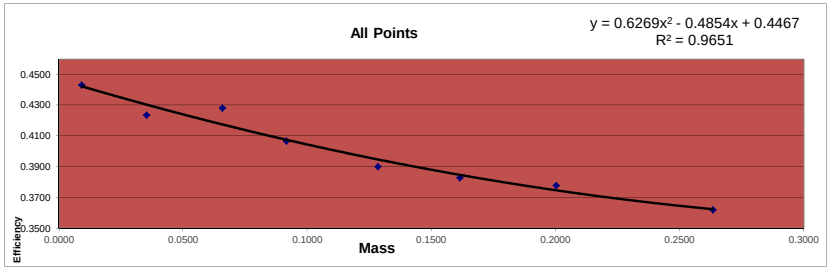
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	15,111	335.800	335.705
sd	0.010	122.927	2.732	2.732
Beta	0.348	6,286	139.689	139.341
sd	0.019	79.284	1.762	1.762

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 2

					DPM	
					35716.83	16-Jun
					DPM	
					35714.485	17-Jun
					DPM	
					35712.14	18-Jun
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
2	6322;B1	6/17/2019 13:39	5	79135	15827.000	0.4432	1mL	0.0092
2	6322;B2	6/17/2019 0:33	5	75648	15129.600	0.4236	1mL	0.0353
2	6322;B3	6/16/2019 23:47	5	76451	15290.200	0.4281	1mL	0.0658
2	6322;B4	6/18/2019 11:50	5	72629	14525.800	0.4067	1mL	0.0916
2	6322;B5	6/18/2019 10:52	5	69643	13928.600	0.3900	1mL	0.1285
2	6322;B6	6/18/2019 10:03	5	68353	13670.600	0.3828	1mL	0.1615
2	6322;B7	6/17/2019 16:37	5	67460	13492.000	0.3778	1mL	0.2003
2	6322;B8	6/17/2019 14:34	5	64633	12926.600	0.3619	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4432	0.4423	0.20%
0.0353	0.4236	0.4303	-1.56%
0.0658	0.4281	0.4175	2.54%
0.0916	0.4067	0.4075	-0.18%
0.1285	0.3900	0.3947	-1.18%
0.1615	0.3828	0.3847	-0.48%
0.2003	0.3778	0.3746	0.84%
0.2634	0.3619	0.3623	-0.11%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/16/2019	
Elapsed Time:	3559.000	days
Half Life:	10555.725	days
Exponential Term:	0.791596419	
Corrected Activity:	17858.41522	dpm/mL
Decay Activity (Sr/Y-90)	35716.83043	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/17/2019	
Elapsed Time:	3560.000	days
Half Life:	10555.725	days
Exponential Term:	0.79154444	
Corrected Activity:	17857.24257	dpm/mL
Decay Activity (Sr/Y-90)	35714.48514	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/18/2019	
Elapsed Time:	3561.000	days
Half Life:	10555.725	days
Exponential Term:	0.791492465	
Corrected Activity:	17856.07	dpm/mL
Decay Activity (Sr/Y-90)	35712.14001	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B3

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/16/2019 11:47:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/16/2019 11:52:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,451	15,290.200	15,290.200
sd	0.000			0.000	276.498	55.300	55.300

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B2

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 12:33:42 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 12:38:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,648	15,129.600	15,129.600
sd	0.000			0.000	275.042	55.008	55.008

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B1

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 1:39:04 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 1:44:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,135	15,827.000	15,827.000
sd	0.000			0.000	281.309	56.262	56.262

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B8

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 2:34:38 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 2:39:50 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,633	12,926.600	12,926.600
sd	0.000			0.000	254.230	50.846	50.846

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B7

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 4:37:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 4:43:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,460	13,492.000	13,492.000
sd	0.000			0.000	259.731	51.946	51.946

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B6

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:03:00 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:08:11 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,353	13,670.600	13,670.600
sd	0.000			0.000	261.444	52.289	52.289

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B5

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:52:13 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:57:24 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,643	13,928.600	13,928.600
sd	0.000			0.000	263.900	52.780	52.780

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-6322;B4

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 11:50:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 11:55:14 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,629	14,525.800	14,525.800
sd	0.000			0.000	269.498	53.900	53.900

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

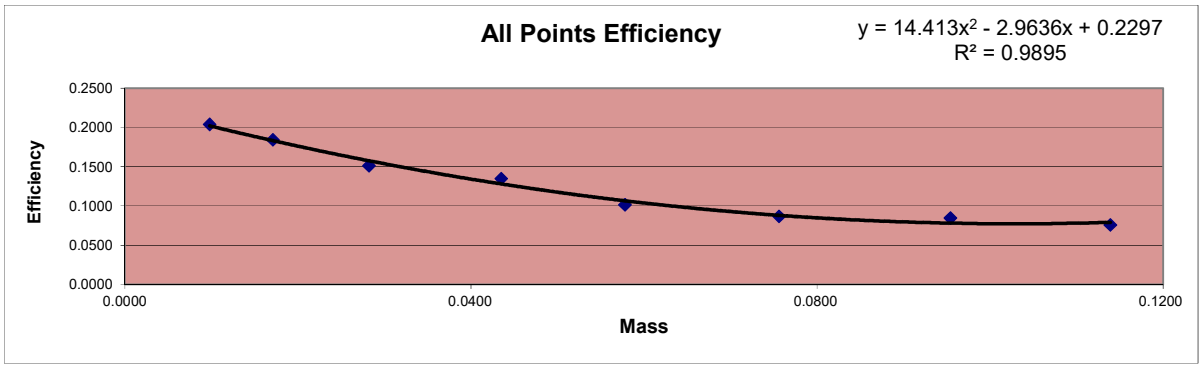
Red 2

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
2	ICABT-1835503; A	5/13/2022 14:21	45	20688	459.733	2254.6	0.2039	1	0.0098
2	ICABT-1835503; B	5/13/2022 13:28	45	18687	415.267	2254.6	0.1842	1	0.0171
2	ICABT-1835503; C	5/13/2022 12:27	45	15328	340.622	2254.6	0.1511	1	0.0282
2	ICABT-1835503; D	5/13/2022 18:48	45	13679	303.978	2254.6	0.1348	1	0.0435
2	ICABT-1835503; E	5/13/2022 17:59	45	20598	457.733	4509.1	0.1015	2	0.0578
2	ICABT-1835503; F	5/13/2022 17:01	45	17587	390.822	4509.1	0.0867	2	0.0756
2	ICABT-1835503; G	5/13/2022 16:02	45	17181	381.800	4509.1	0.0847	2	0.0954
2	ICABT-1835503; H	5/13/2022 15:14	45	15378	341.733	4509.1	0.0758	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2039	0.2020	0.93%
0.0171	0.1842	0.1832	0.52%
0.0282	0.1511	0.1576	-4.13%
0.0435	0.1348	0.1281	5.29%
0.0578	0.1015	0.1066	-4.73%
0.0756	0.0867	0.0880	-1.54%
0.0954	0.0847	0.0781	8.35%
0.1139	0.0758	0.0791	-4.22%

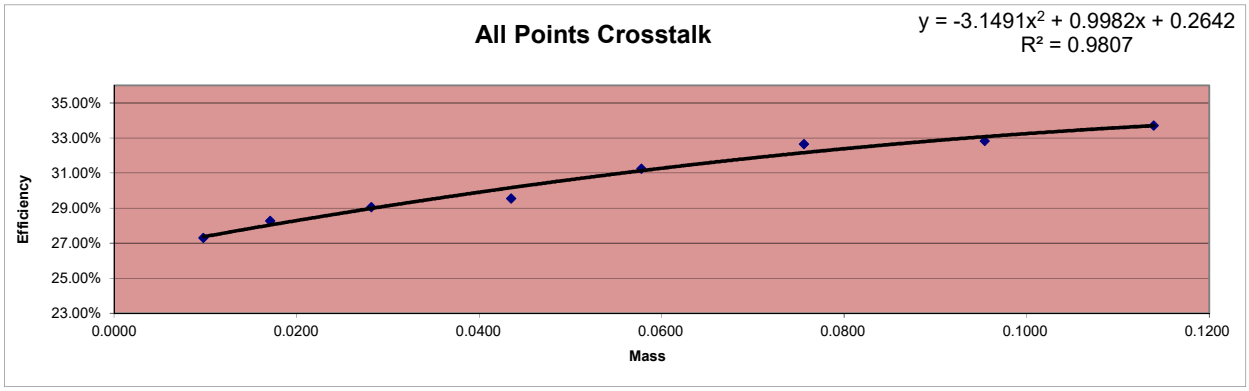
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.413
X Coeff:	-2.9636
Intercept:	0.2297

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20688	7766	459.73	172.58	27.29%	Min
ICABT-1835503; B	0.0171	45	18687	7365	415.27	163.67	28.27%	27.29%
ICABT-1835503; C	0.0282	45	15328	6280	340.62	139.56	29.06%	
ICABT-1835503; D	0.0435	45	13679	5738	303.98	127.51	29.55%	Max
ICABT-1835503; E	0.0578	45	20598	9363	457.73	208.07	31.25%	33.71%
ICABT-1835503; F	0.0756	45	17587	8527	390.82	189.49	32.65%	
ICABT-1835503; G	0.0954	45	17181	8398	381.80	186.62	32.83%	Mean
ICABT-1835503; H	0.1139	45	15378	7819	341.73	173.76	33.71%	30.58%



Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; C

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 12:27:44 PM

Count Ended 5/13/2022 1:12:53 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	15,328	340.622	340.534
sd	0.009	123.806	2.751	2.751
Beta	0.323	6,280	139.556	139.233
sd	0.018	79.246	1.761	1.761

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; B

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 1:28:07 PM

Count Ended 5/13/2022 2:13:15 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	18,687	415.267	415.179
sd	0.009	136.700	3.038	3.038
Beta	0.323	7,365	163.667	163.344
sd	0.018	85.820	1.907	1.907

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; A

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 2:21:52 PM

Count Ended 5/13/2022 3:07:01 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	20,688	459.733	459.645
sd	0.009	143.833	3.196	3.196
Beta	0.323	7,766	172.578	172.255
sd	0.018	88.125	1.958	1.958

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; H

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 3:14:30 PM

Count Ended 5/13/2022 3:59:38 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	15,378	341.733	341.645
sd	0.009	124.008	2.756	2.756
Beta	0.323	7,819	173.756	173.433
sd	0.018	88.425	1.965	1.965

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; G

Repeat 17

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 4:02:00 PM

Count Ended 5/13/2022 4:47:09 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	17,181	381.800	381.712
sd	0.009	131.076	2.913	2.913
Beta	0.323	8,398	186.622	186.299
sd	0.018	91.641	2.036	2.037

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; F

Repeat 18

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 5:01:57 PM

Count Ended 5/13/2022 5:47:06 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	17,587	390.822	390.734
sd	0.009	132.616	2.947	2.947
Beta	0.323	8,527	189.489	189.166
sd	0.018	92.342	2.052	2.052

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; E

Repeat 19

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 5:59:20 PM

Count Ended 5/13/2022 6:44:30 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	20,598	457.733	457.645
sd	0.009	143.520	3.189	3.189
Beta	0.323	9,363	208.067	207.744
sd	0.018	96.763	2.150	2.150

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICABT-1835503; D

Repeat 20

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 6:48:12 PM

Count Ended 5/13/2022 7:33:19 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

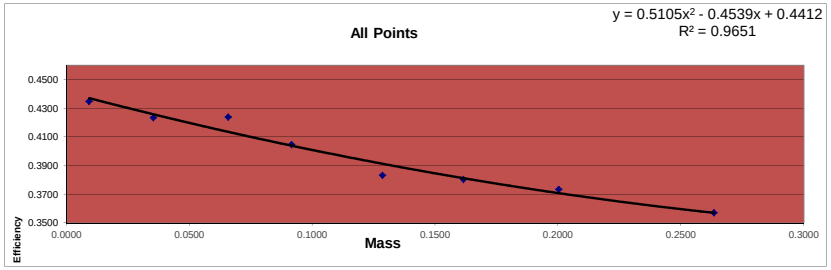
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	13,679	303.978	303.890
sd	0.009	116.957	2.599	2.599
Beta	0.323	5,738	127.511	127.188
sd	0.018	75.750	1.683	1.683

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 4

					DPM			
					35716.83	16-Jun		
					DPM			
					35714.485	17-Jun		
					DPM			
					35712.14	18-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
4	6322;B1	6/17/2019 16:38	5	77634	15526.800	0.4347	1mL	0.0092
4	6322;B2	6/17/2019 14:34	5	75588	15117.600	0.4233	1mL	0.0353
4	6322;B3	6/17/2019 13:39	5	75702	15140.400	0.4239	1mL	0.0658
4	6322;B4	6/17/2019 0:33	5	72245	14449.000	0.4046	1mL	0.0916
4	6322;B5	6/16/2019 23:47	5	68449	13689.800	0.3833	1mL	0.1285
4	6322;B6	6/18/2019 11:50	5	67908	13581.600	0.3803	1mL	0.1615
4	6322;B7	6/18/2019 10:52	5	66681	13336.200	0.3734	1mL	0.2003
4	6322;B8	6/18/2019 10:03	5	63759	12751.800	0.3571	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4347	0.4371	-0.53%
0.0353	0.4233	0.4258	-0.59%
0.0658	0.4239	0.4135	2.51%
0.0916	0.4046	0.4039	0.16%
0.1285	0.3833	0.3913	-2.05%
0.1615	0.3803	0.3812	-0.24%
0.2003	0.3734	0.3708	0.72%
0.2634	0.3571	0.3571	0.00%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/16/2019	
Elapsed Time:	3559.000	days
Half Life:	10555.725	days
Exponential Term:	0.791596419	
Corrected Activity:	17858.41522	dpm/mL
Decay Activity (Sr/Y-90)	35716.83043	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/17/2019	
Elapsed Time:	3560.000	days
Half Life:	10555.725	days
Exponential Term:	0.79154444	
Corrected Activity:	17857.24257	dpm/mL
Decay Activity (Sr/Y-90)	35714.48514	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/18/2019	
Elapsed Time:	3561.000	days
Half Life:	10555.725	days
Exponential Term:	0.791492465	
Corrected Activity:	17856.07	dpm/mL
Decay Activity (Sr/Y-90)	35712.14001	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B5

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/16/2019 11:47:34 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/16/2019 11:52:46 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,449	13,689.800	13,689.800
sd	0.000			0.000	261.628	52.326	52.326

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B4

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 12:33:48 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 12:39:01 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,245	14,449.000	14,449.000
sd	0.000			0.000	268.784	53.757	53.757

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B3

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 1:39:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 1:44:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,702	15,140.400	15,140.400
sd	0.000			0.000	275.140	55.028	55.028

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B2

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 2:34:50 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 2:40:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,588	15,117.600	15,117.600
sd	0.000			0.000	274.933	54.987	54.987

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B1

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 4:38:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 4:43:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	77,634	15,526.800	15,526.800
sd	0.000			0.000	278.629	55.726	55.726

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B8

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:03:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:08:21 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	63,759	12,751.800	12,751.800
sd	0.000			0.000	252.505	50.501	50.501

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B7

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:52:28 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:57:40 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	66,681	13,336.200	13,336.200
sd	0.000			0.000	258.227	51.645	51.645

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-6322;B6

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 11:50:13 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 11:55:25 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,908	13,581.600	13,581.600
sd	0.000			0.000	260.592	52.118	52.118

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

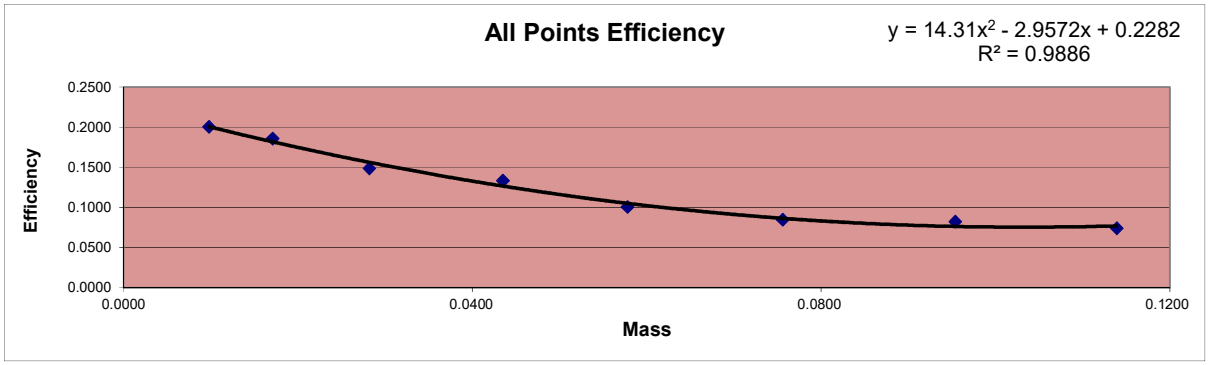
Red 4

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
4	ICABT-1835503; A	5/18/2022 18:30	45	20351	452.244	2254.6	0.2006	1	0.0098
4	ICABT-1835503; B	5/19/2022 1:55	45	18845	418.778	2254.6	0.1857	1	0.0171
4	ICABT-1835503; C	5/19/2022 1:08	45	15069	334.867	2254.6	0.1485	1	0.0282
4	ICABT-1835503; D	5/19/2022 0:17	45	13541	300.911	2254.6	0.1335	1	0.0435
4	ICABT-1835503; E	5/18/2022 23:27	45	20404	453.422	4509.1	0.1006	2	0.0578
4	ICABT-1835503; F	5/18/2022 22:38	45	17184	381.867	4509.1	0.0847	2	0.0756
4	ICABT-1835503; G	5/18/2022 21:31	45	16712	371.378	4509.1	0.0824	2	0.0954
4	ICABT-1835503; H	5/18/2022 20:02	45	15032	334.044	4509.1	0.0741	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2006	0.2006	0.00%
0.0171	0.1857	0.1818	2.16%
0.0282	0.1485	0.1562	-4.90%
0.0435	0.1335	0.1266	5.39%
0.0578	0.1006	0.1051	-4.31%
0.0756	0.0847	0.0864	-2.01%
0.0954	0.0824	0.0763	7.91%
0.1139	0.0741	0.0770	-3.82%

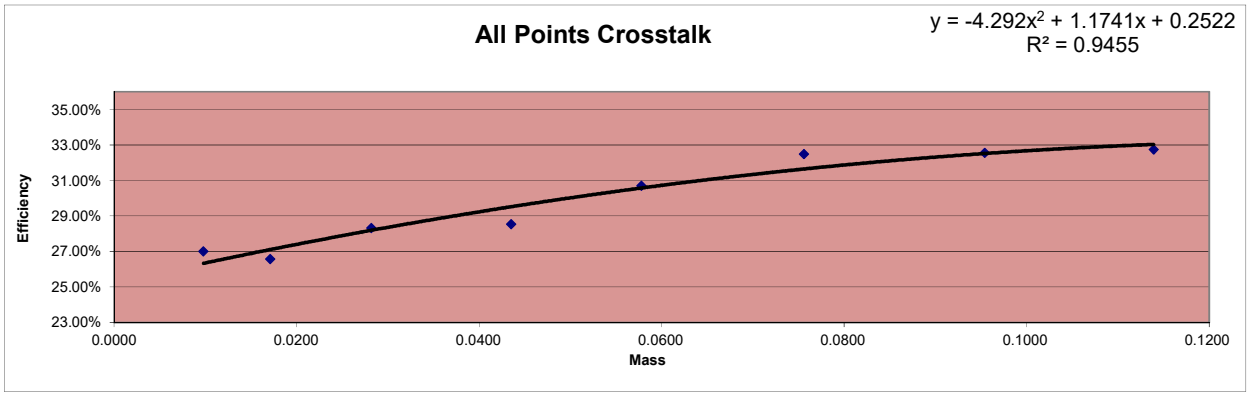
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.31
X Coeff:	-2.9572
Intercept:	0.2282

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20351	7529	452.24	167.31	27.01%	Min
ICABT-1835503; B	0.0171	45	18845	6819	418.78	151.53	26.57%	26.57%
ICABT-1835503; C	0.0282	45	15069	5955	334.87	132.33	28.32%	
ICABT-1835503; D	0.0435	45	13541	5408	300.91	120.18	28.54%	Max
ICABT-1835503; E	0.0578	45	20404	9038	453.42	200.84	30.70%	32.75%
ICABT-1835503; F	0.0756	45	17184	8270	381.87	183.78	32.49%	
ICABT-1835503; G	0.0954	45	16712	8063	371.38	179.18	32.54%	Mean
ICABT-1835503; H	0.1139	45	15032	7320	334.04	162.67	32.75%	29.87%



Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; A

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:30:43 PM

Count Ended 5/18/2022 7:16:00 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	20,351	452.244	451.980
sd	0.016	142.657	3.170	3.170
Beta	0.524	7,529	167.311	166.787
sd	0.023	86.770	1.928	1.928

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; H

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:02:22 PM

Count Ended 5/18/2022 8:47:29 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	15,032	334.044	333.780
sd	0.016	122.605	2.725	2.725
Beta	0.524	7,320	162.667	162.143
sd	0.023	85.557	1.901	1.901

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; G

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:31:46 PM

Count Ended 5/18/2022 10:16:53 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	16,712	371.378	371.114
sd	0.016	129.275	2.873	2.873
Beta	0.524	8,063	179.178	178.654
sd	0.023	89.794	1.995	1.996

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; F

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 10:38:50 PM

Count Ended 5/18/2022 11:23:57 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	17,184	381.867	381.603
sd	0.016	131.088	2.913	2.913
Beta	0.524	8,270	183.778	183.254
sd	0.023	90.940	2.021	2.021

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; E

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 11:27:47 PM

Count Ended 5/19/2022 12:12:56 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	20,404	453.422	453.158
sd	0.016	142.843	3.174	3.174
Beta	0.524	9,038	200.844	200.320
sd	0.023	95.068	2.113	2.113

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; D

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 12:17:07 AM

Count Ended 5/19/2022 1:02:14 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	13,541	300.911	300.647
sd	0.016	116.366	2.586	2.586
Beta	0.524	5,408	120.178	119.654
sd	0.023	73.539	1.634	1.634

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; C

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:08:07 AM

Count Ended 5/19/2022 1:53:13 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	15,069	334.867	334.603
sd	0.016	122.756	2.728	2.728
Beta	0.524	5,955	132.333	131.809
sd	0.023	77.169	1.715	1.715

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICABT-1835503; B

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:55:10 AM

Count Ended 5/19/2022 2:40:17 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	18,845	418.778	418.514
sd	0.016	137.277	3.051	3.051
Beta	0.524	6,819	151.533	151.009
sd	0.023	82.577	1.835	1.835

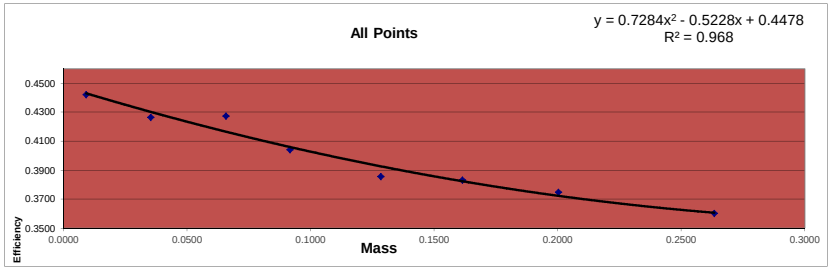
Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 5

					DPM	
					35716.83	16-Jun
					DPM	
					35714.485	17-Jun
					DPM	
					35712.14	18-Jun

Detector ID	Std ID	Count Date	Count Time	Beta Counts	CPM	Sr-90 Eff	Standard Aliquot	Sample Wt
5	6322;B1	6/18/2019 10:03	5	78961	15792.200	0.4422	1mL	0.0092
5	6322;B2	6/17/2019 16:38	5	76157	15231.400	0.4265	1mL	0.0353
5	6322;B3	6/17/2019 14:34	5	76310	15262.000	0.4273	1mL	0.0658
5	6322;B4	6/17/2019 13:39	5	72161	14432.200	0.4041	1mL	0.0916
5	6322;B5	6/17/2019 0:33	5	68871	13774.200	0.3857	1mL	0.1285
5	6322;B6	6/16/2019 23:47	5	68444	13688.800	0.3833	1mL	0.1615
5	6322;B7	6/18/2019 11:50	5	66917	13383.400	0.3748	1mL	0.2003
5	6322;B8	6/18/2019 10:52	5	64325	12865.000	0.3602	1mL	0.2634

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0092	0.4422	0.4431	-0.19%
0.0353	0.4265	0.4303	-0.88%
0.0658	0.4273	0.4166	2.59%
0.0916	0.4041	0.4060	-0.47%
0.1285	0.3857	0.3926	-1.78%
0.1615	0.3833	0.3824	0.23%
0.2003	0.3748	0.3723	0.66%
0.2634	0.3602	0.3606	-0.11%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/16/2019	
Elapsed Time:	3559.000	days
Half Life:	10555.725	days
Exponential Term:	0.791596419	
Corrected Activity:	17858.41522	dpm/mL
Decay Activity (Sr/Y-90)	35716.83043	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/17/2019	
Elapsed Time:	3560.000	days
Half Life:	10555.725	days
Exponential Term:	0.79154444	
Corrected Activity:	17857.24257	dpm/mL
Decay Activity (Sr/Y-90)	35714.48514	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/18/2019	
Elapsed Time:	3561.000	days
Half Life:	10555.725	days
Exponential Term:	0.791492465	
Corrected Activity:	17856.07	dpm/mL
Decay Activity (Sr/Y-90)	35712.14001	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B6

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/16/2019 11:47:38 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/16/2019 11:52:52 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,444	13,688.800	13,688.800
sd	0.000			0.000	261.618	52.324	52.324

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B5

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 12:33:51 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 12:39:04 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,871	13,774.200	13,774.200
sd	0.000			0.000	262.433	52.487	52.487

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B4

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 1:39:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 1:44:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,161	14,432.200	14,432.200
sd	0.000			0.000	268.628	53.726	53.726

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B3

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 2:34:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 2:40:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,310	15,262.000	15,262.000
sd	0.000			0.000	276.243	55.249	55.249

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B2

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 4:38:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 4:43:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	11	2.200	2.200
sd	0.000			0.000	3.317	0.663	0.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,157	15,231.400	15,231.400
sd	0.000			0.000	275.966	55.193	55.193

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B1

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:03:17 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:08:30 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	78,961	15,792.200	15,792.200
sd	0.000			0.000	281.000	56.200	56.200

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B8

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:52:35 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:57:45 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,325	12,865.000	12,865.000
sd	0.000			0.000	253.624	50.725	50.725

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-6322;B7

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 11:50:19 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 11:55:30 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	66,917	13,383.400	13,383.400
sd	0.000			0.000	258.683	51.737	51.737

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

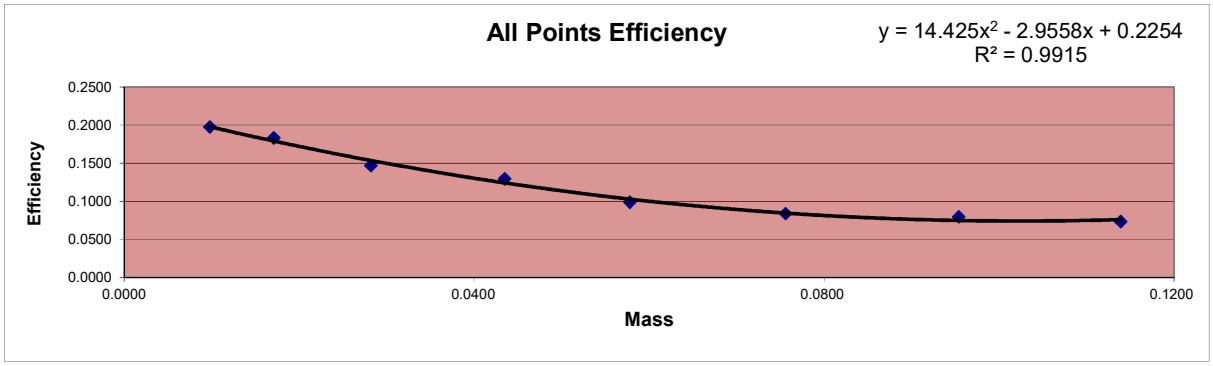
Red 5

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
5	ICABT-1835503; A	5/18/2022 20:02	45	20049	445.533	2254.6	0.1976	1	0.0098
5	ICABT-1835503; B	5/18/2022 18:30	45	18591	413.133	2254.6	0.1832	1	0.0171
5	ICABT-1835503; C	5/19/2022 1:55	45	14894	330.978	2254.6	0.1468	1	0.0282
5	ICABT-1835503; D	5/19/2022 1:08	45	13123	291.622	2254.6	0.1293	1	0.0435
5	ICABT-1835503; E	5/19/2022 0:16	45	20027	445.044	4509.1	0.0987	2	0.0578
5	ICABT-1835503; F	5/18/2022 23:27	45	17020	378.222	4509.1	0.0839	2	0.0756
5	ICABT-1835503; G	5/18/2022 22:38	45	16175	359.444	4509.1	0.0797	2	0.0954
5	ICABT-1835503; H	5/18/2022 21:31	45	14874	330.533	4509.1	0.0733	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1976	0.1978	-0.10%
0.0171	0.1832	0.1791	2.33%
0.0282	0.1468	0.1535	-4.37%
0.0435	0.1293	0.1241	4.21%
0.0578	0.0987	0.1027	-3.94%
0.0756	0.0839	0.0844	-0.60%
0.0954	0.0797	0.0747	6.71%
0.1139	0.0733	0.0759	-3.39%

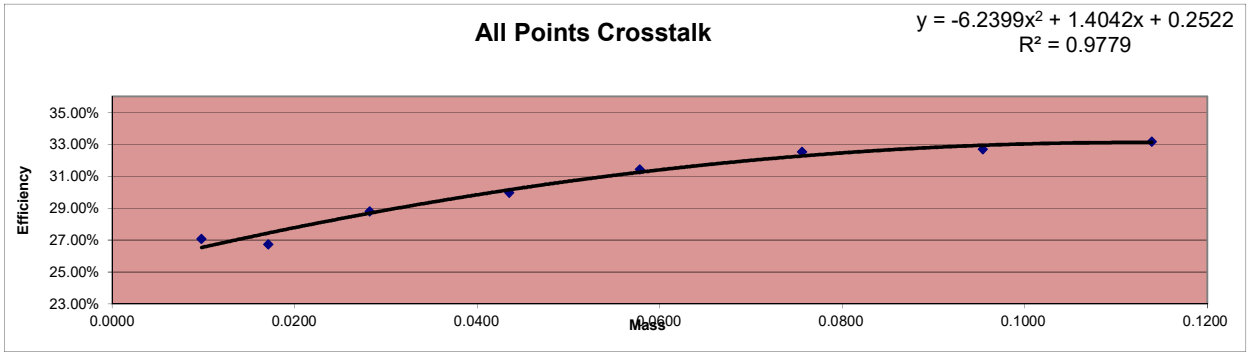
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.425
X Coeff:	-2.9558
Intercept:	0.2254

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20049	7444	445.53	165.42	27.08%	Min
ICABT-1835503; B	0.0171	45	18591	6780	413.13	150.67	26.72%	26.72%
ICABT-1835503; C	0.0282	45	14894	6023	330.98	133.84	28.79%	
ICABT-1835503; D	0.0435	45	13123	5615	291.62	124.78	29.97%	Max
ICABT-1835503; E	0.0578	45	20027	9176	445.04	203.91	31.42%	33.16%
ICABT-1835503; F	0.0756	45	17020	8207	378.22	182.38	32.53%	
ICABT-1835503; G	0.0954	45	16175	7856	359.44	174.58	32.69%	Mean
ICABT-1835503; H	0.1139	45	14874	7378	330.53	163.96	33.16%	30.30%



Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; B

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:30:49 PM

Count Ended 5/18/2022 7:16:04 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	18,591	413.133	412.974
sd	0.013	136.349	3.030	3.030
Beta	0.311	6,780	150.667	150.356
sd	0.018	82.341	1.830	1.830

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; A

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:02:28 PM

Count Ended 5/18/2022 8:47:37 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	20,049	445.533	445.374
sd	0.013	141.594	3.147	3.147
Beta	0.311	7,444	165.422	165.111
sd	0.018	86.279	1.917	1.917

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; H

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:31:51 PM

Count Ended 5/18/2022 10:17:00 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	14,874	330.533	330.374
sd	0.013	121.959	2.710	2.710
Beta	0.311	7,378	163.956	163.645
sd	0.018	85.895	1.909	1.909

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; G

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 10:38:57 PM

Count Ended 5/18/2022 11:24:05 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	16,175	359.444	359.285
sd	0.013	127.181	2.826	2.826
Beta	0.311	7,856	174.578	174.267
sd	0.018	88.634	1.970	1.970

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; F

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 11:27:54 PM

Count Ended 5/19/2022 12:13:02 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	17,020	378.222	378.063
sd	0.013	130.461	2.899	2.899
Beta	0.311	8,207	182.378	182.067
sd	0.018	90.592	2.013	2.013

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; E

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 12:16:54 AM

Count Ended 5/19/2022 1:02:04 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	20,027	445.044	444.885
sd	0.013	141.517	3.145	3.145
Beta	0.311	9,176	203.911	203.600
sd	0.018	95.791	2.129	2.129

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; D

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:08:13 AM

Count Ended 5/19/2022 1:53:21 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	13,123	291.622	291.463
sd	0.013	114.556	2.546	2.546
Beta	0.311	5,615	124.778	124.467
sd	0.018	74.933	1.665	1.665

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICABT-1835503; C

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:55:16 AM

Count Ended 5/19/2022 2:40:24 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

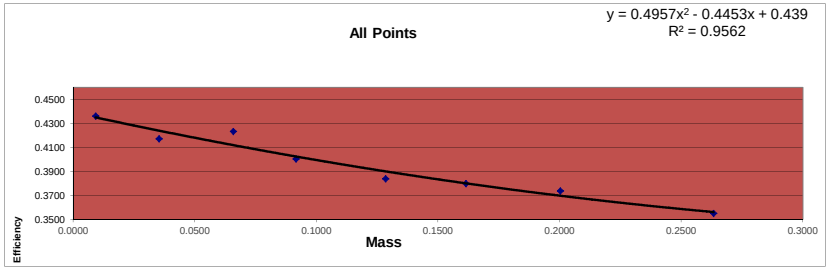
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	14,894	330.978	330.819
sd	0.013	122.041	2.712	2.712
Beta	0.311	6,023	133.844	133.533
sd	0.018	77.608	1.725	1.725

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 6

					DPM	
					35716.83	16-Jun
					DPM	
					35714.485	17-Jun
					DPM	
					35712.14	18-Jun
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
6	6322;B1	6/18/2019 10:52	5	77858	15571.600	0.4360	1mL	0.0092
6	6322;B2	6/18/2019 10:03	5	74490	14898.000	0.4172	1mL	0.0353
6	6322;B3	6/17/2019 16:38	5	75580	15116.000	0.4232	1mL	0.0658
6	6322;B4	6/17/2019 14:35	5	71458	14291.600	0.4002	1mL	0.0916
6	6322;B5	6/17/2019 13:39	5	68524	13704.800	0.3837	1mL	0.1285
6	6322;B6	6/17/2019 0:33	5	67830	13566.000	0.3798	1mL	0.1615
6	6322;B7	6/16/2019 23:47	5	66717	13343.400	0.3736	1mL	0.2003
6	6322;B8	6/18/2019 11:50	5	63404	12680.800	0.3551	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4360	0.4349	0.25%
0.0353	0.4172	0.4239	-1.59%
0.0658	0.4232	0.4118	2.77%
0.0916	0.4002	0.4024	-0.55%
0.1285	0.3837	0.3900	-1.60%
0.1615	0.3798	0.3800	-0.04%
0.2003	0.3736	0.3697	1.05%
0.2634	0.3551	0.3561	-0.29%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/16/2019	
Elapsed Time:	3559.000	days
Half Life:	10555.725	days
Exponential Term:	0.791596419	
Corrected Activity:	17858.41522	dpm/mL
Decay Activity (Sr/Y-90)	35716.83043	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/17/2019	
Elapsed Time:	3560.000	days
Half Life:	10555.725	days
Exponential Term:	0.79154444	
Corrected Activity:	17857.24257	dpm/mL
Decay Activity (Sr/Y-90)	35714.48514	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/18/2019	
Elapsed Time:	3561.000	days
Half Life:	10555.725	days
Exponential Term:	0.791492465	
Corrected Activity:	17856.07	dpm/mL
Decay Activity (Sr/Y-90)	35712.14001	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B7

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/16/2019 11:47:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/16/2019 11:52:55 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	66,717	13,343.400	13,343.400
sd	0.000			0.000	258.296	51.659	51.659

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B6

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 12:33:56 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 12:39:08 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,830	13,566.000	13,566.000
sd	0.000			0.000	260.442	52.088	52.088

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B5

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 1:39:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 1:44:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,524	13,704.800	13,704.800
sd	0.000			0.000	261.771	52.354	52.354

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B4

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 2:35:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 2:40:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	71,458	14,291.600	14,291.600
sd	0.000			0.000	267.316	53.463	53.463

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B3

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 4:38:18 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 4:43:32 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,580	15,116.000	15,116.000
sd	0.000			0.000	274.918	54.984	54.984

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B2

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:03:23 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:08:35 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,490	14,898.000	14,898.000
sd	0.000			0.000	272.929	54.586	54.586

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B1

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:52:41 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:57:53 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	77,858	15,571.600	15,571.600
sd	0.000			0.000	279.030	55.806	55.806

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-6322;B8

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 11:50:24 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 11:55:36 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	63,404	12,680.800	12,680.800
sd	0.000			0.000	251.802	50.360	50.360

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

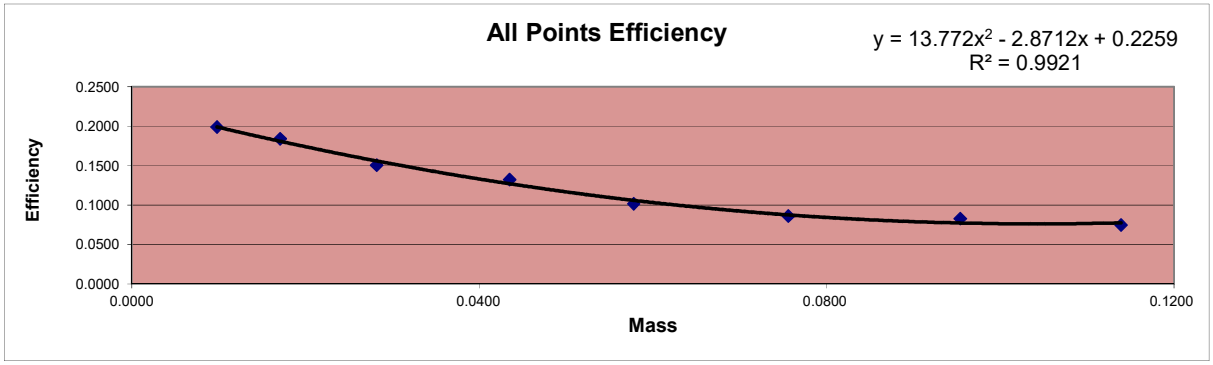
Red 6

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
6	ICABT-1835503; A	5/18/2022 21:31	45	20178	448.400	2254.6	0.1989	1	0.0098
6	ICABT-1835503; B	5/18/2022 20:02	45	18655	414.556	2254.6	0.1839	1	0.0171
6	ICABT-1835503; C	5/18/2022 18:30	45	15264	339.200	2254.6	0.1504	1	0.0282
6	ICABT-1835503; D	5/19/2022 1:55	45	13420	298.222	2254.6	0.1323	1	0.0435
6	ICABT-1835503; E	5/19/2022 1:08	45	20638	458.622	4509.1	0.1017	2	0.0578
6	ICABT-1835503; F	5/19/2022 0:17	45	17452	387.822	4509.1	0.0860	2	0.0756
6	ICABT-1835503; G	5/18/2022 23:27	45	16834	374.089	4509.1	0.0830	2	0.0954
6	ICABT-1835503; H	5/18/2022 22:39	45	15169	337.089	4509.1	0.0748	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1989	0.1991	-0.10%
0.0171	0.1839	0.1808	1.68%
0.0282	0.1504	0.1559	-3.49%
0.0435	0.1323	0.1271	4.10%
0.0578	0.1017	0.1060	-4.01%
0.0756	0.0860	0.0875	-1.76%
0.0954	0.0830	0.0773	7.29%
0.1139	0.0748	0.0775	-3.59%

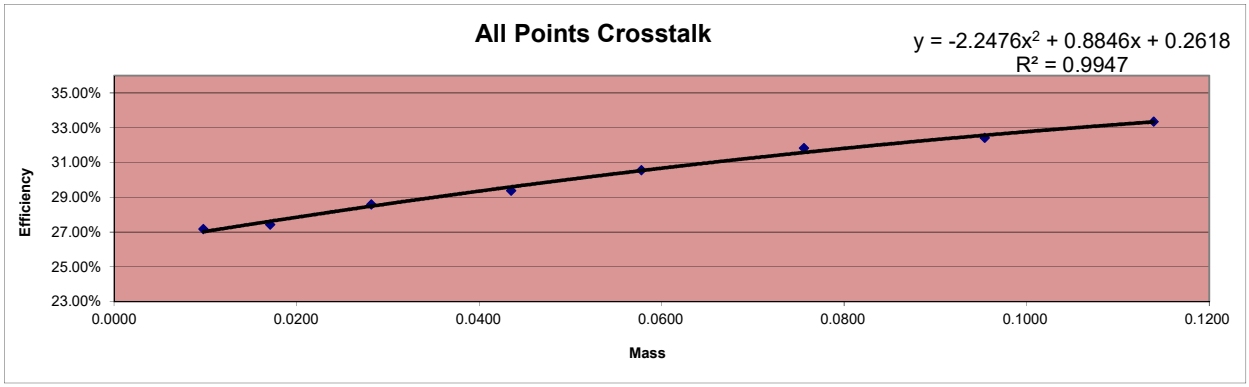
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	13.772
X Coeff:	-2.8712
Intercept:	0.2259

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20178	7530	448.40	167.33	27.18%	Min
ICABT-1835503; B	0.0171	45	18655	7053	414.56	156.73	27.44%	27.18%
ICABT-1835503; C	0.0282	45	15264	6111	339.20	135.80	28.59%	
ICABT-1835503; D	0.0435	45	13420	5584	298.22	124.09	29.38%	Max
ICABT-1835503; E	0.0578	45	20638	9086	458.62	201.91	30.57%	33.35%
ICABT-1835503; F	0.0756	45	17452	8149	387.82	181.09	31.83%	
ICABT-1835503; G	0.0954	45	16834	8077	374.09	179.49	32.42%	Mean
ICABT-1835503; H	0.1139	45	15169	7589	337.09	168.64	33.35%	30.09%



Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; C

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:30:56 PM

Count Ended 5/18/2022 7:16:04 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	15,264	339.200	339.107
sd	0.010	123.548	2.746	2.746
Beta	0.319	6,111	135.800	135.481
sd	0.018	78.173	1.737	1.737

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; B

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:02:34 PM

Count Ended 5/18/2022 8:47:43 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	18,655	414.556	414.463
sd	0.010	136.583	3.035	3.035
Beta	0.319	7,053	156.733	156.414
sd	0.018	83.982	1.866	1.866

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; A

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:31:57 PM

Count Ended 5/18/2022 10:17:05 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	20,178	448.400	448.307
sd	0.010	142.049	3.157	3.157
Beta	0.319	7,530	167.333	167.014
sd	0.018	86.776	1.928	1.928

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; H

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 10:39:02 PM

Count Ended 5/18/2022 11:24:11 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	15,169	337.089	336.996
sd	0.010	123.162	2.737	2.737
Beta	0.319	7,589	168.644	168.325
sd	0.018	87.115	1.936	1.936

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; G

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 11:27:59 PM

Count Ended 5/19/2022 12:13:07 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	16,834	374.089	373.996
sd	0.010	129.746	2.883	2.883
Beta	0.319	8,077	179.489	179.170
sd	0.018	89.872	1.997	1.997

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; F

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 12:17:00 AM

Count Ended 5/19/2022 1:02:10 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	17,452	387.822	387.729
sd	0.010	132.106	2.936	2.936
Beta	0.319	8,149	181.089	180.770
sd	0.018	90.272	2.006	2.006

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; E

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:08:18 AM

Count Ended 5/19/2022 1:53:26 AM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	20,638	458.622	458.529
sd	0.010	143.659	3.192	3.192
Beta	0.319	9,086	201.911	201.592
sd	0.018	95.321	2.118	2.118

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICABT-1835503; D

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:55:21 AM

Count Ended 5/19/2022 2:40:27 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

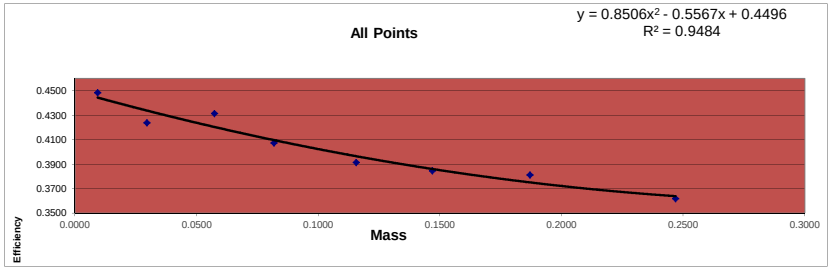
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	13,420	298.222	298.129
sd	0.010	115.845	2.574	2.574
Beta	0.319	5,584	124.089	123.770
sd	0.018	74.726	1.661	1.661

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 7

					DPM			
					35716.83	16-Jun		
					DPM			
					35714.485	17-Jun		
					DPM			
					35712.14	18-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
7	6322;B1	6/18/2019 11:50	5	80076	16015.200	0.4485	1mL	0.0093
7	6322;B2	6/18/2019 10:52	5	75678	15135.600	0.4238	1mL	0.0296
7	6322;B3	6/18/2019 10:03	5	77009	15401.800	0.4313	1mL	0.0574
7	6322;B4	6/17/2019 16:38	5	72736	14547.200	0.4073	1mL	0.0818
7	6322;B5	6/17/2019 14:35	5	69909	13981.800	0.3915	1mL	0.1157
7	6322;B6	6/17/2019 13:39	5	68691	13738.200	0.3847	1mL	0.1470
7	6322;B7	6/17/2019 0:33	5	68060	13612.000	0.3811	1mL	0.1871
7	6322;B8	6/16/2019 23:47	5	64638	12927.600	0.3619	1mL	0.2469

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0093	0.4485	0.4445	0.89%
0.0296	0.4238	0.4339	-2.32%
0.0574	0.4313	0.4204	2.58%
0.0818	0.4073	0.4098	-0.59%
0.1157	0.3915	0.3966	-1.28%
0.1470	0.3847	0.3861	-0.38%
0.1871	0.3811	0.3752	1.58%
0.2469	0.3619	0.3640	-0.56%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/16/2019	
Elapsed Time:	3559.000	days
Half Life:	10555.725	days
Exponential Term:	0.791596419	
Corrected Activity:	17858.41522	dpm/mL
Decay Activity (Sr/Y-90)	35716.83043	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/17/2019	
Elapsed Time:	3560.000	days
Half Life:	10555.725	days
Exponential Term:	0.79154444	
Corrected Activity:	17857.24257	dpm/mL
Decay Activity (Sr/Y-90)	35714.48514	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/18/2019	
Elapsed Time:	3561.000	days
Half Life:	10555.725	days
Exponential Term:	0.791492465	
Corrected Activity:	17856.07	dpm/mL
Decay Activity (Sr/Y-90)	35712.14001	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B8

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/16/2019 11:47:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/16/2019 11:52:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,638	12,927.600	12,927.600
sd	0.000			0.000	254.240	50.848	50.848

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B7

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 12:33:59 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 12:39:11 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,060	13,612.000	13,612.000
sd	0.000			0.000	260.883	52.177	52.177

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B6

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 1:39:39 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 1:44:52 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,691	13,738.200	13,738.200
sd	0.000			0.000	262.090	52.418	52.418

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B5

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 2:35:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 2:40:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,909	13,981.800	13,981.800
sd	0.000			0.000	264.403	52.881	52.881

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B4

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/17/2019 4:38:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/17/2019 4:43:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,736	14,547.200	14,547.200
sd	0.000			0.000	269.696	53.939	53.939

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B3

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:03:29 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:08:43 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	77,009	15,401.800	15,401.800
sd	0.000			0.000	277.505	55.501	55.501

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B2

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 10:52:47 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 10:58:01 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,678	15,135.600	15,135.600
sd	0.000			0.000	275.096	55.019	55.019

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-6322;B1

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 6/18/2019 11:50:31 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 6/18/2019 11:55:46 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	11	2.200	2.200
sd	0.000			0.000	3.317	0.663	0.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	80,076	16,015.200	16,015.200
sd	0.000			0.000	282.977	56.595	56.595

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

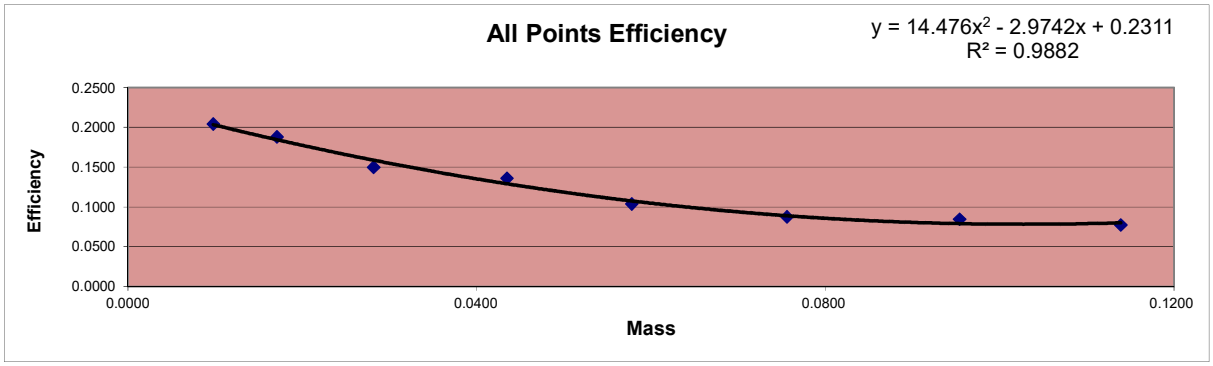
Red 7

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
7	ICABT-1835503; A	5/18/2022 22:39	45	20714	460.311	2254.6	0.2042	1	0.0098
7	ICABT-1835503; B	5/18/2022 21:32	45	19076	423.911	2254.6	0.1880	1	0.0171
7	ICABT-1835503; C	5/18/2022 20:02	45	15202	337.822	2254.6	0.1498	1	0.0282
7	ICABT-1835503; D	5/18/2022 18:31	45	13792	306.489	2254.6	0.1359	1	0.0435
7	ICABT-1835503; E	5/19/2022 1:55	45	21033	467.400	4509.1	0.1037	2	0.0578
7	ICABT-1835503; F	5/19/2022 1:08	45	17775	395.000	4509.1	0.0876	2	0.0756
7	ICABT-1835503; G	5/19/2022 0:17	45	17177	381.711	4509.1	0.0847	2	0.0954
7	ICABT-1835503; H	5/18/2022 23:28	45	15665	348.111	4509.1	0.0772	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2042	0.2033	0.41%
0.0171	0.1880	0.1845	1.92%
0.0282	0.1498	0.1587	-5.61%
0.0435	0.1359	0.1291	5.29%
0.0578	0.1037	0.1076	-3.62%
0.0756	0.0876	0.0890	-1.56%
0.0954	0.0847	0.0791	7.01%
0.1139	0.0772	0.0801	-3.67%

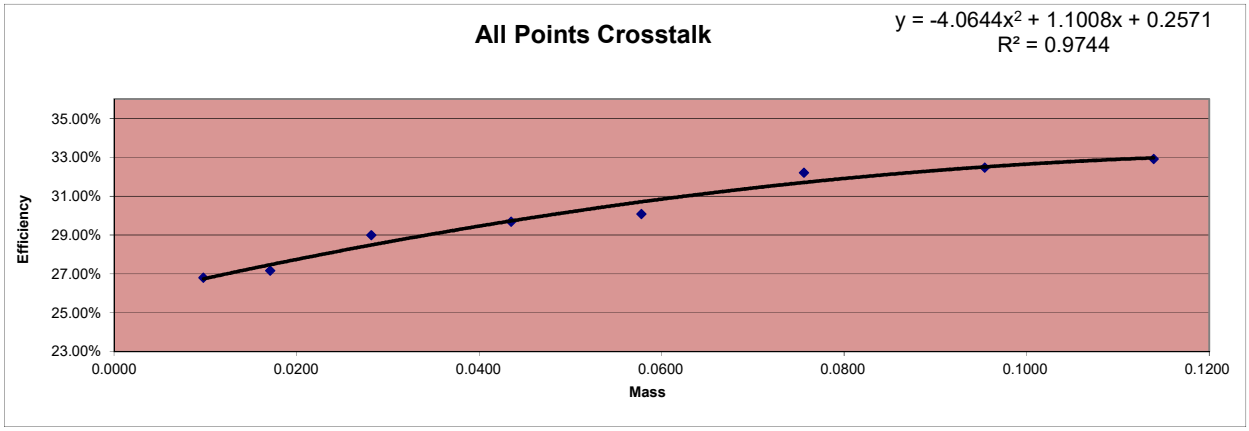
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.476
X Coeff:	-2.9742
Intercept:	0.2311

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20714	7584	460.31	168.53	26.80%	Min
ICABT-1835503; B	0.0171	45	19076	7115	423.91	158.11	27.17%	26.80%
ICABT-1835503; C	0.0282	45	15202	6206	337.82	137.91	28.99%	
ICABT-1835503; D	0.0435	45	13792	5822	306.49	129.38	29.68%	Max
ICABT-1835503; E	0.0578	45	21033	9051	467.40	201.13	30.09%	32.92%
ICABT-1835503; F	0.0756	45	17775	8445	395.00	187.67	32.21%	
ICABT-1835503; G	0.0954	45	17177	8258	381.71	183.51	32.47%	Mean
ICABT-1835503; H	0.1139	45	15665	7688	348.11	170.84	32.92%	30.04%



Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; D

Repeat 21

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:31:01 PM

Count Ended 5/18/2022 7:16:09 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	13,792	306.489	306.405
sd	0.009	117.439	2.610	2.610
Beta	0.374	5,822	129.378	129.004
sd	0.019	76.302	1.696	1.696

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; C

Repeat 22

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:02:44 PM

Count Ended 5/18/2022 8:47:53 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	15,202	337.822	337.738
sd	0.009	123.296	2.740	2.740
Beta	0.374	6,206	137.911	137.537
sd	0.019	78.778	1.751	1.751

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; B

Repeat 23

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:32:02 PM

Count Ended 5/18/2022 10:17:10 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	19,076	423.911	423.827
sd	0.009	138.116	3.069	3.069
Beta	0.374	7,115	158.111	157.737
sd	0.019	84.350	1.874	1.875

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; A

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 10:39:07 PM

Count Ended 5/18/2022 11:24:16 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	20,714	460.311	460.227
sd	0.009	143.924	3.198	3.198
Beta	0.374	7,584	168.533	168.159
sd	0.019	87.086	1.935	1.935

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; H

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 11:28:04 PM

Count Ended 5/19/2022 12:13:13 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	15,665	348.111	348.027
sd	0.009	125.160	2.781	2.781
Beta	0.374	7,688	170.844	170.470
sd	0.019	87.681	1.948	1.949

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; G

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 12:17:12 AM

Count Ended 5/19/2022 1:02:20 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	17,177	381.711	381.627
sd	0.009	131.061	2.912	2.912
Beta	0.374	8,258	183.511	183.137
sd	0.019	90.874	2.019	2.020

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; F

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:08:24 AM

Count Ended 5/19/2022 1:53:32 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	17,775	395.000	394.916
sd	0.009	133.323	2.963	2.963
Beta	0.374	8,445	187.667	187.293
sd	0.019	91.897	2.042	2.042

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICABT-1835503; E

Repeat 24

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 1:55:26 AM

Count Ended 5/19/2022 2:40:35 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	21,033	467.400	467.316
sd	0.009	145.028	3.223	3.223
Beta	0.374	9,051	201.133	200.759
sd	0.019	95.137	2.114	2.114

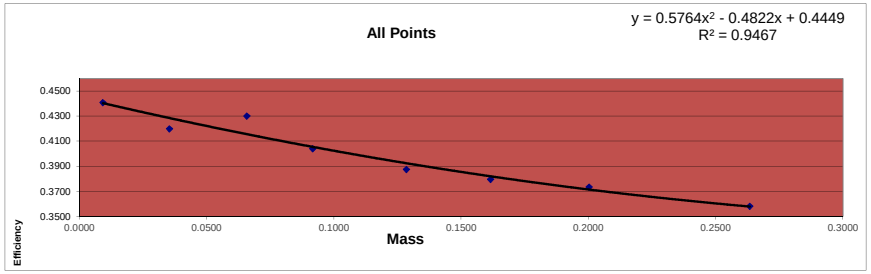
Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 9

					DPM	
					35726.21	12-Jun
					DPM	
					35723.87	13-Jun
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**
9	6322;B1	6/13/2019 0:05	5	78747	15749.400	0.4409
9	6322;B2	6/12/2019 12:55	5	75036	15007.200	0.4201
9	6322;B3	6/13/2019 12:11	5	76836	15367.200	0.4302
9	6322;B4	6/13/2019 10:25	5	72173	14434.600	0.4041
9	6322;B5	6/13/2019 8:37	5	69205	13841.000	0.3874
9	6322;B6	6/13/2019 2:18	5	67813	13562.600	0.3797
9	6322;B7	6/13/2019 1:11	5	66725	13345.000	0.3736
9	6322;B8	6/13/2019 0:12	5	63965	12793.000	0.3581

Standard Aliquot	**Sample Wt**
1mL	0.0092
1mL	0.0353
1mL	0.0658
1mL	0.0916
1mL	0.1285
1mL	0.1615
1mL	0.2003
1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4409	0.4405	0.08%
0.0353	0.4201	0.4286	-1.99%
0.0658	0.4302	0.4157	3.49%
0.0916	0.4041	0.4056	-0.37%
0.1285	0.3874	0.3925	-1.28%
0.1615	0.3797	0.3821	-0.63%
0.2003	0.3736	0.3714	0.57%
0.2634	0.3581	0.3579	0.06%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/12/2019	
Elapsed Time:	3555.000	days
Half Life:	10555.725	days
Exponential Term:	0.791804369	
Corrected Activity:	17863.10656	dpm/mL
Decay Activity (Sr/Y-90)	35726.21312	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B2

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/12/2019 12:55:07 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/12/2019 1:00:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	30	6.000	6.000
sd	0.000			0.000	5.477	1.095	1.095
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,036	15,007.200	15,007.200
sd	0.000			0.000	273.927	54.785	54.785

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B1

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:05:59 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:11:12 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	17	3.400	3.400
sd	0.000			0.000	4.123	0.825	0.825
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	78,747	15,749.400	15,749.400
sd	0.000			0.000	280.619	56.124	56.124

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B8

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:12:47 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:17:59 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	13	2.600	2.600
sd	0.000			0.000	3.606	0.721	0.721
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	63,965	12,793.000	12,793.000
sd	0.000			0.000	252.913	50.583	50.583

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B7

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 1:11:20 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 1:16:31 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	66,725	13,345.000	13,345.000
sd	0.000			0.000	258.312	51.662	51.662

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B6

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:18:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:23:23 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	21	4.200	4.200
sd	0.000			0.000	4.583	0.917	0.917
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,813	13,562.600	13,562.600
sd	0.000			0.000	260.409	52.082	52.082

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B5

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:37:20 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:42:32 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	19	3.800	3.800
sd	0.000			0.000	4.359	0.872	0.872
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,205	13,841.000	13,841.000
sd	0.000			0.000	263.068	52.614	52.614

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B4

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:25:49 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:31:03 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	20	4.000	4.000
sd	0.000			0.000	4.472	0.894	0.894
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,173	14,434.600	14,434.600
sd	0.000			0.000	268.650	53.730	53.730

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-6322;B3

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:11:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:16:55 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	16	3.200	3.200
sd	0.000			0.000	4.000	0.800	0.800
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,836	15,367.200	15,367.200
sd	0.000			0.000	277.193	55.439	55.439

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

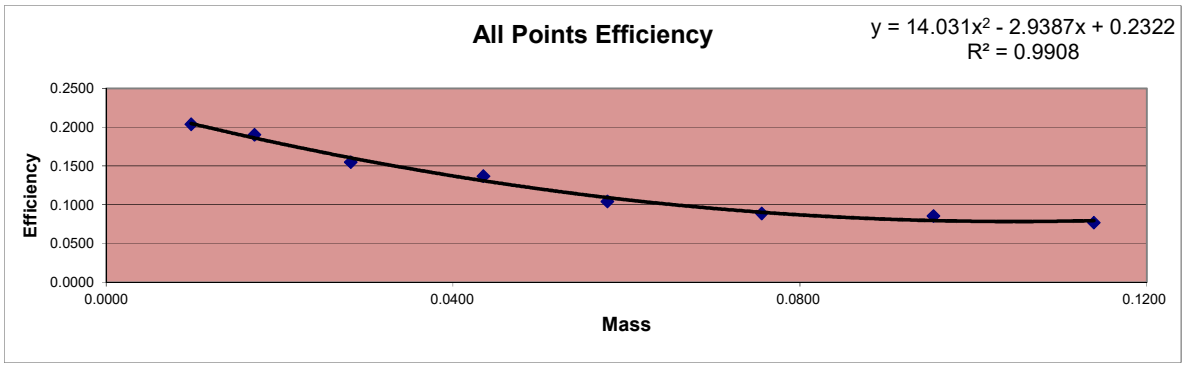
Red 9

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
9	ICABT-1835503; A	5/13/2022 21:56	45	20662	459.156	2254.6	0.2037	1	0.0098
9	ICABT-1835503; B	5/13/2022 20:48	45	19312	429.156	2254.6	0.1903	1	0.0171
9	ICABT-1835503; C	5/14/2022 7:14	45	15695	348.778	2254.6	0.1547	1	0.0282
9	ICABT-1835503; D	5/14/2022 6:23	45	13882	308.489	2254.6	0.1368	1	0.0435
9	ICABT-1835503; E	5/14/2022 1:15	45	21159	470.200	4509.1	0.1043	2	0.0578
9	ICABT-1835503; F	5/14/2022 0:28	45	17982	399.600	4509.1	0.0886	2	0.0756
9	ICABT-1835503; G	5/13/2022 23:37	45	17320	384.889	4509.1	0.0854	2	0.0954
9	ICABT-1835503; H	5/13/2022 22:44	45	15577	346.156	4509.1	0.0768	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2037	0.2047	-0.53%
0.0171	0.1903	0.1861	2.31%
0.0282	0.1547	0.1605	-3.61%
0.0435	0.1368	0.1309	4.52%
0.0578	0.1043	0.1092	-4.52%
0.0756	0.0886	0.0902	-1.78%
0.0954	0.0854	0.0795	7.31%
0.1139	0.0768	0.0795	-3.45%

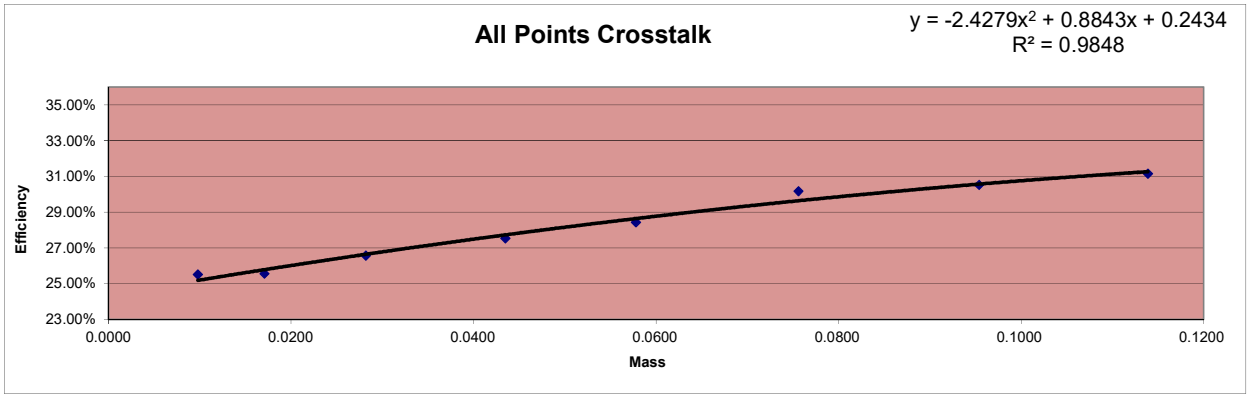
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.031
X Coeff:	-2.9387
Intercept:	0.2322

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20662	7074	459.16	157.20	25.50%	Min
ICABT-1835503; B	0.0171	45	19312	6631	429.16	147.36	25.56%	25.50%
ICABT-1835503; C	0.0282	45	15695	5676	348.78	126.13	26.56%	
ICABT-1835503; D	0.0435	45	13882	5275	308.49	117.22	27.54%	Max
ICABT-1835503; E	0.0578	45	21159	8408	470.20	186.84	28.44%	31.14%
ICABT-1835503; F	0.0756	45	17982	7770	399.60	172.67	30.17%	
ICABT-1835503; G	0.0954	45	17320	7610	384.89	169.11	30.53%	Mean
ICABT-1835503; H	0.1139	45	15577	7045	346.16	156.56	31.14%	28.18%



Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; B

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 8:48:49 PM

Count Ended 5/13/2022 9:33:59 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	19,312	429.156	429.072
sd	0.009	138.968	3.088	3.088
Beta	0.359	6,631	147.356	146.997
sd	0.019	81.431	1.810	1.810

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; A

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 9:56:48 PM

Count Ended 5/13/2022 10:41:56 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	20,662	459.156	459.072
sd	0.009	143.743	3.194	3.194
Beta	0.359	7,074	157.200	156.841
sd	0.019	84.107	1.869	1.869

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; H

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 10:44:55 PM

Count Ended 5/13/2022 11:30:05 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	15,577	346.156	346.072
sd	0.009	124.808	2.774	2.774
Beta	0.359	7,045	156.556	156.197
sd	0.019	83.934	1.865	1.865

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; G

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 11:37:52 PM

Count Ended 5/14/2022 12:22:59 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	17,320	384.889	384.805
sd	0.009	131.605	2.925	2.925
Beta	0.359	7,610	169.111	168.752
sd	0.019	87.235	1.939	1.939

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; F

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 12:28:06 AM

Count Ended 5/14/2022 1:13:16 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	17,982	399.600	399.516
sd	0.009	134.097	2.980	2.980
Beta	0.359	7,770	172.667	172.308
sd	0.019	88.148	1.959	1.959

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; E

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 1:15:54 AM

Count Ended 5/14/2022 2:01:04 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	21,159	470.200	470.116
sd	0.009	145.461	3.232	3.232
Beta	0.359	8,408	186.844	186.485
sd	0.019	91.695	2.038	2.038

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; D

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 6:23:21 AM

Count Ended 5/14/2022 7:08:28 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	13,882	308.489	308.405
sd	0.009	117.822	2.618	2.618
Beta	0.359	5,275	117.222	116.863
sd	0.019	72.629	1.614	1.614

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICABT-1835503; C

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 7:14:01 AM

Count Ended 5/14/2022 7:59:09 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	15,695	348.778	348.694
sd	0.009	125.280	2.784	2.784
Beta	0.359	5,676	126.133	125.774
sd	0.019	75.339	1.674	1.674

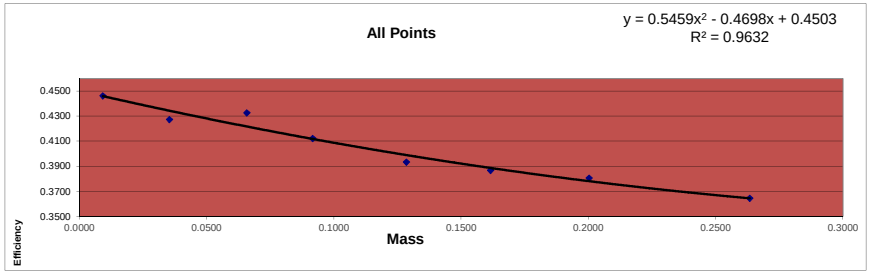
Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 10

					DPM	
					35726.21	12-Jun
					DPM	
					35723.87	13-Jun
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**
10	6322;B1	6/13/2019 0:12	5	79735	15947.000	0.4464
10	6322;B2	6/13/2019 0:06	5	76360	15272.000	0.4275
10	6322;B3	6/12/2019 12:55	5	77317	15463.400	0.4328
10	6322;B4	6/13/2019 12:11	5	73657	14731.400	0.4124
10	6322;B5	6/13/2019 10:25	5	70271	14054.200	0.3934
10	6322;B6	6/13/2019 8:37	5	69065	13813.000	0.3867
10	6322;B7	6/13/2019 2:18	5	67987	13597.400	0.3806
10	6322;B8	6/13/2019 1:11	5	65093	13018.600	0.3644

Standard Aliquot	**Sample Wt**
1mL	0.0092
1mL	0.0353
1mL	0.0658
1mL	0.0916
1mL	0.1285
1mL	0.1615
1mL	0.2003
1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4464	0.4460	0.08%
0.0353	0.4275	0.4344	-1.59%
0.0658	0.4328	0.4218	2.63%
0.0916	0.4124	0.4118	0.13%
0.1285	0.3934	0.3989	-1.39%
0.1615	0.3867	0.3887	-0.52%
0.2003	0.3806	0.3781	0.67%
0.2634	0.3644	0.3644	0.00%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/12/2019	
Elapsed Time:	3555.000	days
Half Life:	10555.725	days
Exponential Term:	0.791804369	
Corrected Activity:	17863.10656	dpm/mL
Decay Activity (Sr/Y-90)	35726.21312	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B3

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/12/2019 12:55:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/12/2019 1:00:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	21	4.200	4.200
sd	0.000			0.000	4.583	0.917	0.917
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	77,317	15,463.400	15,463.400
sd	0.000			0.000	278.059	55.612	55.612

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B2

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:06:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:11:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	15	3.000	3.000
sd	0.000			0.000	3.873	0.775	0.775
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,360	15,272.000	15,272.000
sd	0.000			0.000	276.333	55.267	55.267

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B1

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:12:53 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:18:06 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	27	5.400	5.400
sd	0.000			0.000	5.196	1.039	1.039
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,735	15,947.000	15,947.000
sd	0.000			0.000	282.374	56.475	56.475

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B8

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 1:11:23 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 1:16:34 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	15	3.000	3.000
sd	0.000			0.000	3.873	0.775	0.775
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	65,093	13,018.600	13,018.600
sd	0.000			0.000	255.133	51.027	51.027

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B7

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:18:14 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:23:26 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	14	2.800	2.800
sd	0.000			0.000	3.742	0.748	0.748
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,987	13,597.400	13,597.400
sd	0.000			0.000	260.743	52.149	52.149

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B6

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:37:24 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:42:38 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	19	3.800	3.800
sd	0.000			0.000	4.359	0.872	0.872
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,065	13,813.000	13,813.000
sd	0.000			0.000	262.802	52.560	52.560

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B5

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:25:58 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:31:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	14	2.800	2.800
sd	0.000			0.000	3.742	0.748	0.748
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	70,271	14,054.200	14,054.200
sd	0.000			0.000	265.087	53.017	53.017

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-6322;B4

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:11:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:16:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	16	3.200	3.200
sd	0.000			0.000	4.000	0.800	0.800
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	73,657	14,731.400	14,731.400
sd	0.000			0.000	271.398	54.280	54.280

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

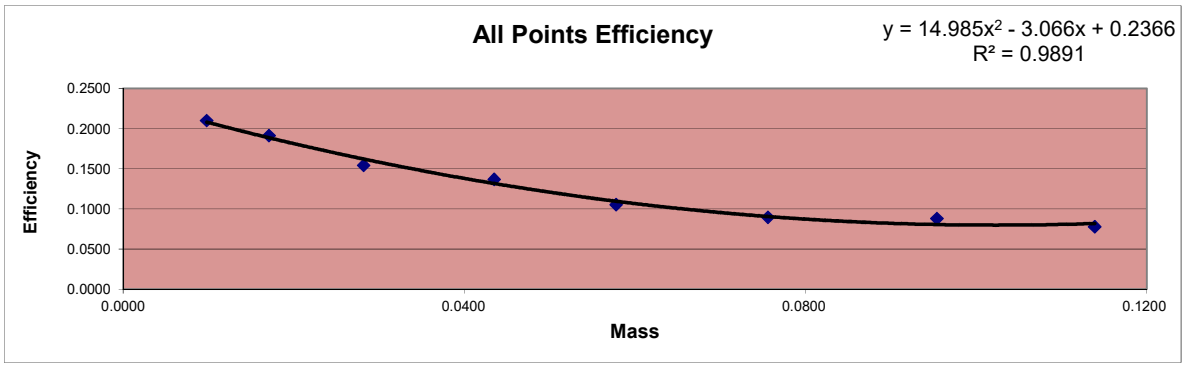
Red 10

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
10	ICABT-1835503; A	5/13/2022 22:45	45	21286	473.022	2254.6	0.2098	1	0.0098
10	ICABT-1835503; B	5/13/2022 21:56	45	19396	431.022	2254.6	0.1912	1	0.0171
10	ICABT-1835503; C	5/13/2022 20:48	45	15637	347.489	2254.6	0.1541	1	0.0282
10	ICABT-1835503; D	5/14/2022 7:14	45	13865	308.111	2254.6	0.1367	1	0.0435
10	ICABT-1835503; E	5/14/2022 6:23	45	21382	475.156	4509.1	0.1054	2	0.0578
10	ICABT-1835503; F	5/14/2022 1:16	45	18150	403.333	4509.1	0.0894	2	0.0756
10	ICABT-1835503; G	5/14/2022 0:28	45	17857	396.822	4509.1	0.0880	2	0.0954
10	ICABT-1835503; H	5/13/2022 23:37	45	15750	350.000	4509.1	0.0776	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2098	0.2080	0.87%
0.0171	0.1912	0.1886	1.39%
0.0282	0.1541	0.1621	-4.89%
0.0435	0.1367	0.1316	3.86%
0.0578	0.1054	0.1094	-3.72%
0.0756	0.0894	0.0905	-1.11%
0.0954	0.0880	0.0805	9.34%
0.1139	0.0776	0.0818	-5.09%

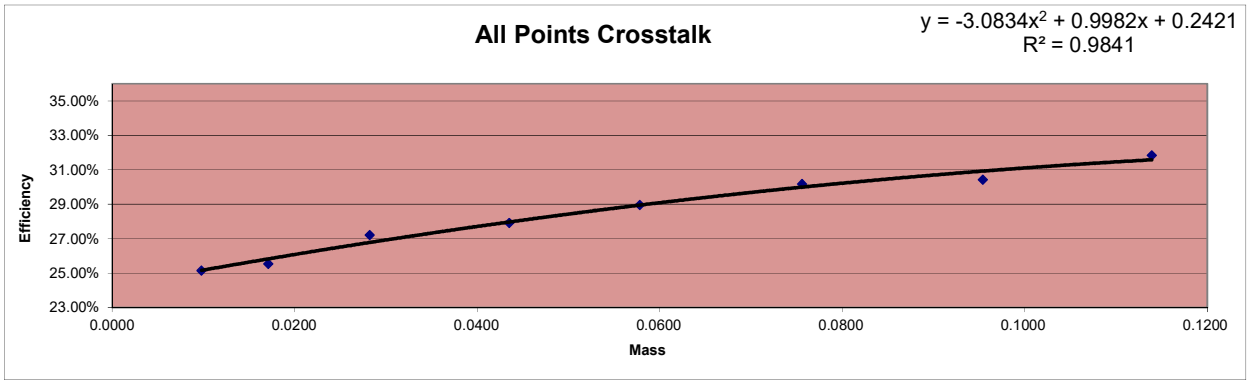
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.985
X Coeff:	-3.066
Intercept:	0.2366

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	21286	7151	473.02	158.91	25.15%	Min
ICABT-1835503; B	0.0171	45	19396	6648	431.02	147.73	25.53%	25.15%
ICABT-1835503; C	0.0282	45	15637	5845	347.49	129.89	27.21%	
ICABT-1835503; D	0.0435	45	13865	5368	308.11	119.29	27.91%	Max
ICABT-1835503; E	0.0578	45	21382	8716	475.16	193.69	28.96%	31.84%
ICABT-1835503; F	0.0756	45	18150	7844	403.33	174.31	30.18%	
ICABT-1835503; G	0.0954	45	17857	7808	396.82	173.51	30.42%	Mean
ICABT-1835503; H	0.1139	45	15750	7358	350.00	163.51	31.84%	28.40%



Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; C

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 8:48:55 PM

Count Ended 5/13/2022 9:34:02 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	15,637	347.489	347.398
sd	0.010	125.048	2.779	2.779
Beta	0.450	5,845	129.889	129.439
sd	0.021	76.453	1.699	1.699

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; B

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 9:56:54 PM

Count Ended 5/13/2022 10:42:02 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	19,396	431.022	430.931
sd	0.010	139.270	3.095	3.095
Beta	0.450	6,648	147.733	147.283
sd	0.021	81.535	1.812	1.812

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; A

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 10:45:00 PM

Count Ended 5/13/2022 11:30:09 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	21,286	473.022	472.931
sd	0.010	145.897	3.242	3.242
Beta	0.450	7,151	158.911	158.461
sd	0.021	84.564	1.879	1.879

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; H

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 11:37:55 PM

Count Ended 5/14/2022 12:23:04 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	15,750	350.000	349.909
sd	0.010	125.499	2.789	2.789
Beta	0.450	7,358	163.511	163.061
sd	0.021	85.779	1.906	1.906

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; G

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 12:28:12 AM

Count Ended 5/14/2022 1:13:20 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	17,857	396.822	396.731
sd	0.010	133.630	2.970	2.970
Beta	0.450	7,808	173.511	173.061
sd	0.021	88.363	1.964	1.964

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; F

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 1:16:00 AM

Count Ended 5/14/2022 2:01:08 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	18,150	403.333	403.242
sd	0.010	134.722	2.994	2.994
Beta	0.450	7,844	174.311	173.861
sd	0.021	88.566	1.968	1.968

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; E

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 6:23:31 AM

Count Ended 5/14/2022 7:08:40 AM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	21,382	475.156	475.065
sd	0.010	146.226	3.249	3.249
Beta	0.450	8,716	193.689	193.239
sd	0.021	93.360	2.075	2.075

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICABT-1835503; D

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 7:14:13 AM

Count Ended 5/14/2022 7:59:21 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

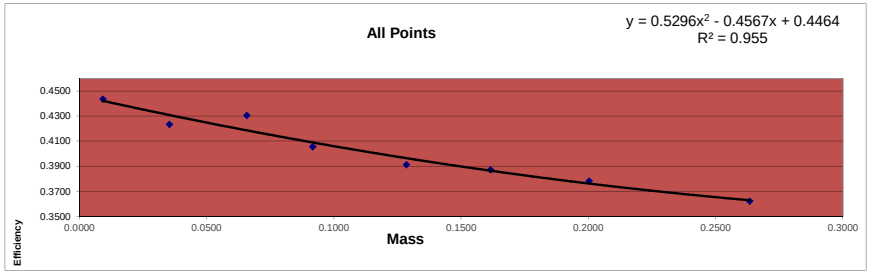
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	13,865	308.111	308.020
sd	0.010	117.750	2.617	2.617
Beta	0.450	5,368	119.289	118.839
sd	0.021	73.267	1.628	1.628

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 11

					DPM			
					35726.21	12-Jun		
					DPM			
					35723.87	13-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
11	6322;B1	6/13/2019 1:11	5	79242	15848.400	0.4436	1mL	0.0092
11	6322;B2	6/13/2019 0:12	5	75652	15130.400	0.4235	1mL	0.0353
11	6322;B3	6/13/2019 0:06	5	76945	15389.000	0.4308	1mL	0.0658
11	6322;B4	6/12/2019 12:55	5	72477	14495.400	0.4057	1mL	0.0916
11	6322;B5	6/13/2019 12:11	5	69894	13978.800	0.3913	1mL	0.1285
11	6322;B6	6/13/2019 10:26	5	69174	13834.800	0.3873	1mL	0.1615
11	6322;B7	6/13/2019 8:37	5	67591	13518.200	0.3784	1mL	0.2003
11	6322;B8	6/13/2019 2:18	5	64715	12943.000	0.3623	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4436	0.4422	0.31%
0.0353	0.4235	0.4309	-1.72%
0.0658	0.4308	0.4186	2.90%
0.0916	0.4057	0.4090	-0.80%
0.1285	0.3913	0.3965	-1.30%
0.1615	0.3873	0.3865	0.21%
0.2003	0.3784	0.3762	0.59%
0.2634	0.3623	0.3628	-0.15%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/12/2019	
Elapsed Time:	3555.000	days
Half Life:	10555.725	days
Exponential Term:	0.791804369	
Corrected Activity:	17863.10656	dpm/mL
Decay Activity (Sr/Y-90)	35726.21312	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B4

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/12/2019 12:55:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/12/2019 1:00:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	32	6.400	6.400
sd	0.000			0.000	5.657	1.131	1.131
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,477	14,495.400	14,495.400
sd	0.000			0.000	269.216	53.843	53.843

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B3

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:06:05 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:11:19 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	16	3.200	3.200
sd	0.000			0.000	4.000	0.800	0.800
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,945	15,389.000	15,389.000
sd	0.000			0.000	277.390	55.478	55.478

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B2

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:12:56 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:18:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	27	5.400	5.400
sd	0.000			0.000	5.196	1.039	1.039
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,652	15,130.400	15,130.400
sd	0.000			0.000	275.049	55.010	55.010

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B1

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 1:11:01 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 1:16:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	17	3.400	3.400
sd	0.000			0.000	4.123	0.825	0.825
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,242	15,848.400	15,848.400
sd	0.000			0.000	281.500	56.300	56.300

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B8

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:18:17 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:23:29 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	14	2.800	2.800
sd	0.000			0.000	3.742	0.748	0.748
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,715	12,943.000	12,943.000
sd	0.000			0.000	254.391	50.878	50.878

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B7

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:37:29 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:42:42 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	12	2.400	2.400
sd	0.000			0.000	3.464	0.693	0.693
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,591	13,518.200	13,518.200
sd	0.000			0.000	259.983	51.997	51.997

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B6

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:26:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:31:22 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	23	4.600	4.600
sd	0.000			0.000	4.796	0.959	0.959
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,174	13,834.800	13,834.800
sd	0.000			0.000	263.010	52.602	52.602

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-6322;B5

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:11:50 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:17:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	13	2.600	2.600
sd	0.000			0.000	3.606	0.721	0.721
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,894	13,978.800	13,978.800
sd	0.000			0.000	264.375	52.875	52.875

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

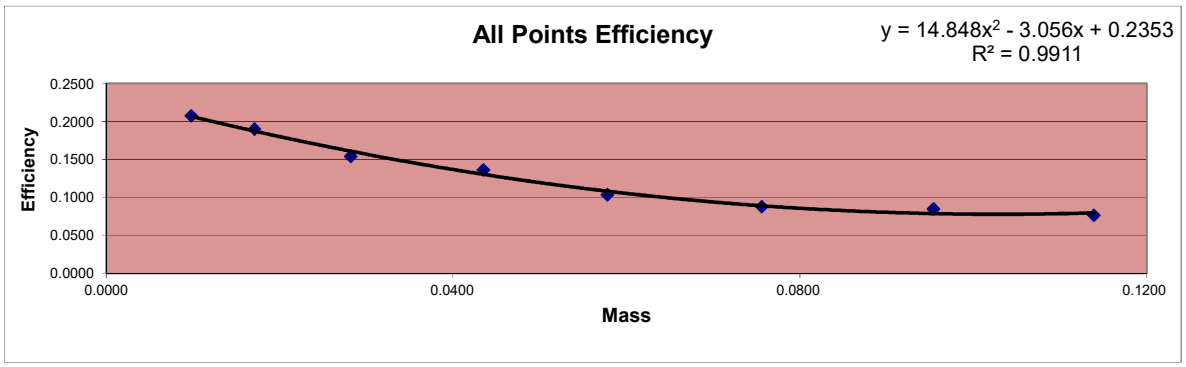
Red 11

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
11	ICABT-1835503; A	5/13/2022 23:37	45	21054	467.867	2254.6	0.2075	1	0.0098
11	ICABT-1835503; B	5/13/2022 22:45	45	19279	428.422	2254.6	0.1900	1	0.0171
11	ICABT-1835503; C	5/13/2022 21:57	45	15649	347.756	2254.6	0.1542	1	0.0282
11	ICABT-1835503; D	5/13/2022 20:49	45	13829	307.311	2254.6	0.1363	1	0.0435
11	ICABT-1835503; E	5/14/2022 7:14	45	21055	467.889	4509.1	0.1038	2	0.0578
11	ICABT-1835503; F	5/14/2022 6:23	45	17820	396.000	4509.1	0.0878	2	0.0756
11	ICABT-1835503; G	5/14/2022 1:16	45	17268	383.733	4509.1	0.0851	2	0.0954
11	ICABT-1835503; H	5/14/2022 0:28	45	15549	345.533	4509.1	0.0766	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2075	0.2068	0.36%
0.0171	0.1900	0.1874	1.41%
0.0282	0.1542	0.1609	-4.15%
0.0435	0.1363	0.1305	4.48%
0.0578	0.1038	0.1083	-4.16%
0.0756	0.0878	0.0891	-1.47%
0.0954	0.0851	0.0789	7.87%
0.1139	0.0766	0.0798	-4.03%

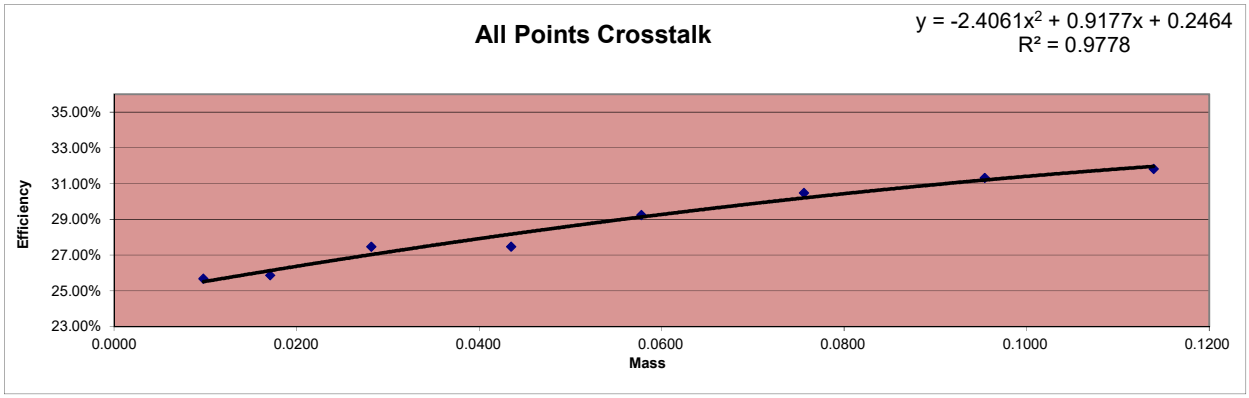
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.848
X Coeff:	-3.056
Intercept:	0.2353

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	21054	7278	467.87	161.73	25.69%	Min
ICABT-1835503; B	0.0171	45	19279	6731	428.42	149.58	25.88%	25.69%
ICABT-1835503; C	0.0282	45	15649	5927	347.76	131.71	27.47%	
ICABT-1835503; D	0.0435	45	13829	5240	307.31	116.44	27.48%	Max
ICABT-1835503; E	0.0578	45	21055	8701	467.89	193.36	29.24%	31.82%
ICABT-1835503; F	0.0756	45	17820	7811	396.00	173.58	30.47%	
ICABT-1835503; G	0.0954	45	17268	7872	383.73	174.93	31.31%	Mean
ICABT-1835503; H	0.1139	45	15549	7258	345.53	161.29	31.82%	28.67%



Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; D

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 8:49:00 PM

Count Ended 5/13/2022 9:34:08 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	13,829	307.311	307.236
sd	0.009	117.597	2.613	2.613
Beta	0.519	5,240	116.444	115.925
sd	0.023	72.388	1.609	1.609

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; C

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 9:57:00 PM

Count Ended 5/13/2022 10:42:09 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	15,649	347.756	347.681
sd	0.009	125.096	2.780	2.780
Beta	0.519	5,927	131.711	131.192
sd	0.023	76.987	1.711	1.711

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; B

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 10:45:05 PM

Count Ended 5/13/2022 11:30:15 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	19,279	428.422	428.347
sd	0.009	138.849	3.086	3.086
Beta	0.519	6,731	149.578	149.059
sd	0.023	82.043	1.823	1.823

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; A

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 11:37:18 PM

Count Ended 5/14/2022 12:22:27 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	21,054	467.867	467.792
sd	0.009	145.100	3.224	3.224
Beta	0.519	7,278	161.733	161.214
sd	0.023	85.311	1.896	1.896

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; H

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 12:28:17 AM

Count Ended 5/14/2022 1:13:26 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	15,549	345.533	345.458
sd	0.009	124.696	2.771	2.771
Beta	0.519	7,258	161.289	160.770
sd	0.023	85.194	1.893	1.893

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; G

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 1:16:06 AM

Count Ended 5/14/2022 2:01:14 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	17,268	383.733	383.658
sd	0.009	131.408	2.920	2.920
Beta	0.519	7,872	174.933	174.414
sd	0.023	88.724	1.972	1.972

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; F

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 6:23:47 AM

Count Ended 5/14/2022 7:08:55 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	17,820	396.000	395.925
sd	0.009	133.492	2.966	2.966
Beta	0.519	7,811	173.578	173.059
sd	0.023	88.380	1.964	1.964

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICABT-1835503; E

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 7:14:23 AM

Count Ended 5/14/2022 7:59:33 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

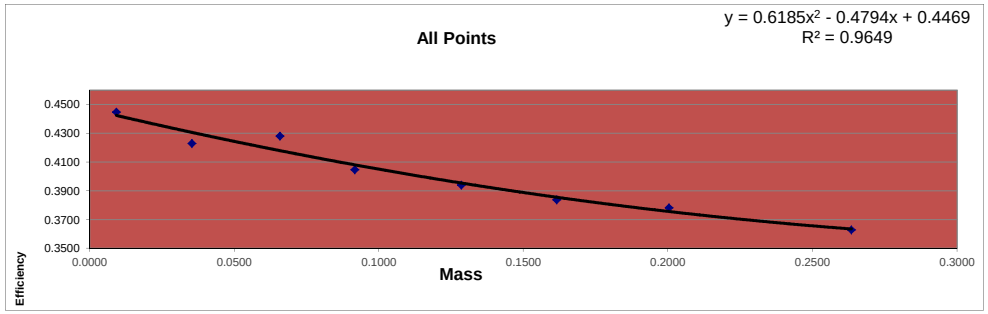
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	21,055	467.889	467.814
sd	0.009	145.103	3.225	3.225
Beta	0.519	8,701	193.356	192.837
sd	0.023	93.279	2.073	2.073

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 12

					DPM			
					35726.21	12-Jun		
					DPM			
					35723.87	13-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
12	6322;B1	6/13/2019 2:17	5	79449	15889.800	0.4448	1mL	0.0092
12	6322;B2	6/13/2019 1:11	5	75544	15108.800	0.4229	1mL	0.0353
12	6322;B3	6/13/2019 0:13	5	76462	15292.400	0.4281	1mL	0.0658
12	6322;B4	6/13/2019 0:06	5	72311	14462.200	0.4048	1mL	0.0916
12	6322;B5	6/12/2019 12:55	5	70388	14077.600	0.3940	1mL	0.1285
12	6322;B6	6/13/2019 12:11	5	68563	13712.600	0.3838	1mL	0.1615
12	6322;B7	6/13/2019 10:26	5	67577	13515.400	0.3783	1mL	0.2003
12	6322;B8	6/13/2019 8:37	5	64824	12964.800	0.3629	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4448	0.4425	0.51%
0.0353	0.4229	0.4307	-1.81%
0.0658	0.4281	0.4180	2.40%
0.0916	0.4048	0.4082	-0.82%
0.1285	0.3940	0.3955	-0.37%
0.1615	0.3838	0.3856	-0.46%
0.2003	0.3783	0.3757	0.70%
0.2634	0.3629	0.3635	-0.17%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/12/2019	
Elapsed Time:	3555.000	days
Half Life:	10555.725	days
Exponential Term:	0.791804369	
Corrected Activity:	17863.10656	dpm/mL
Decay Activity (Sr/Y-90)	35726.21312	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B5

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/12/2019 12:55:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/12/2019 1:00:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	70,388	14,077.600	14,077.600
sd	0.000			0.000	265.307	53.061	53.061

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B4

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:06:09 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:11:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,311	14,462.200	14,462.200
sd	0.000			0.000	268.907	53.781	53.781

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B3

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:13:00 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:18:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,462	15,292.400	15,292.400
sd	0.000			0.000	276.518	55.304	55.304

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B2

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 1:11:05 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 1:16:17 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,544	15,108.800	15,108.800
sd	0.000			0.000	274.853	54.971	54.971

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B1

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:17:52 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:23:05 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,449	15,889.800	15,889.800
sd	0.000			0.000	281.867	56.373	56.373

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B8

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:37:38 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:42:50 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,824	12,964.800	12,964.800
sd	0.000			0.000	254.606	50.921	50.921

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B7

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:26:16 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:31:28 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,577	13,515.400	13,515.400
sd	0.000			0.000	259.956	51.991	51.991

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-6322;B6

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:11:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:17:06 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,563	13,712.600	13,712.600
sd	0.000			0.000	261.845	52.369	52.369

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

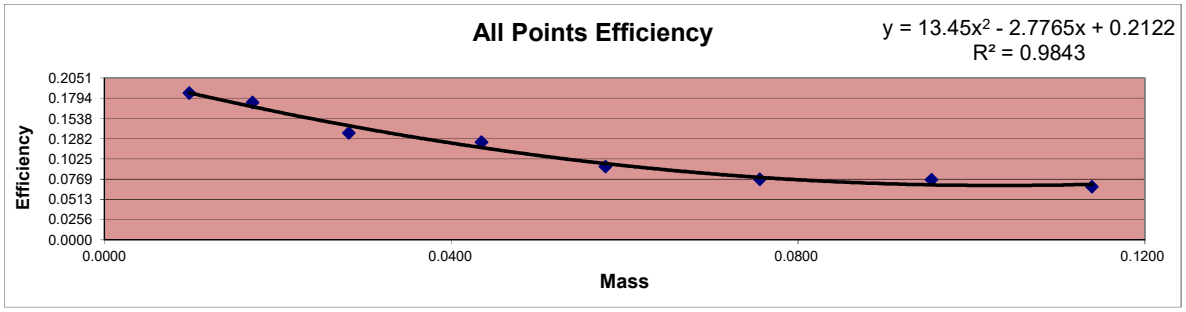
Red 12

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
12	ICABT-1835503; A	5/14/2022 0:28	45	18862	419.156	2254.6	0.1859	1	0.0098
12	ICABT-1835503; B	5/13/2022 23:37	45	17657	392.378	2254.6	0.1740	1	0.0171
12	ICABT-1835503; C	5/13/2022 22:45	45	13756	305.689	2254.6	0.1356	1	0.0282
12	ICABT-1835503; D	5/13/2022 21:57	45	12560	279.111	2254.6	0.1238	1	0.0435
12	ICABT-1835503; E	5/13/2022 20:49	45	18822	418.267	4509.1	0.0928	2	0.0578
12	ICABT-1835503; F	5/14/2022 7:14	45	15623	347.178	4509.1	0.0770	2	0.0756
12	ICABT-1835503; G	5/14/2022 6:23	45	15473	343.844	4509.1	0.0763	2	0.0954
12	ICABT-1835503; H	5/14/2022 1:16	45	13663	303.622	4509.1	0.0673	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1859	0.1863	-0.20%
0.0171	0.1740	0.1687	3.19%
0.0282	0.1356	0.1446	-6.23%
0.0435	0.1238	0.1169	5.93%
0.0578	0.0928	0.0967	-4.03%
0.0756	0.0770	0.0792	-2.75%
0.0954	0.0763	0.0697	9.35%
0.1139	0.0673	0.0704	-4.42%

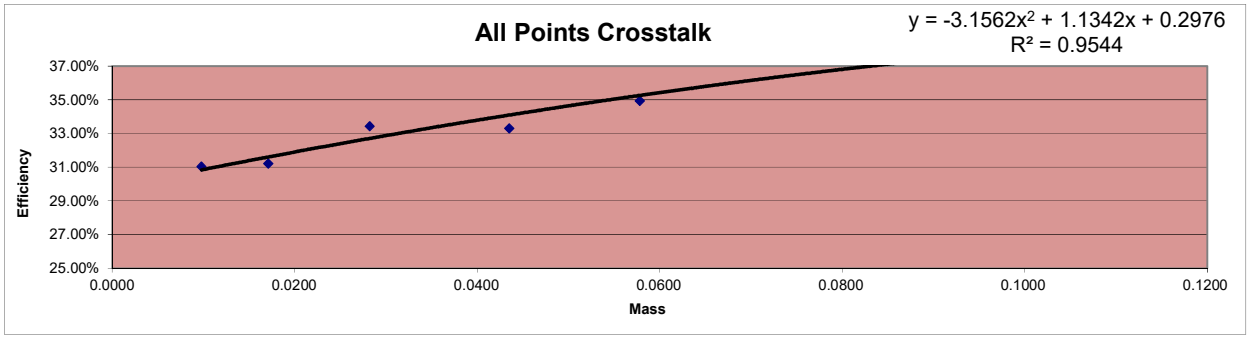
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	13.45
X Coeff:	-2.7765
Intercept:	0.2122

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	18862	8487	419.16	188.60	31.03%	Min
ICABT-1835503; B	0.0171	45	17657	8009	392.38	177.98	31.20%	31.03%
ICABT-1835503; C	0.0282	45	13756	6905	305.69	153.44	33.42%	
ICABT-1835503; D	0.0435	45	12560	6270	279.11	139.33	33.30%	Max
ICABT-1835503; E	0.0578	45	18822	10100	418.27	224.44	34.92%	38.58%
ICABT-1835503; F	0.0756	45	15623	9399	347.18	208.87	37.56%	
ICABT-1835503; G	0.0954	45	15473	9199	343.84	204.42	37.29%	Mean
ICABT-1835503; H	0.1139	45	13663	8584	303.62	190.76	38.58%	34.66%



Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; E

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 8:49:07 PM

Count Ended 5/13/2022 9:34:15 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	18,822	418.267	418.193
sd	0.009	137.193	3.049	3.049
Beta	0.395	10,100	224.444	224.049
sd	0.020	100.499	2.233	2.233

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; D

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 9:57:06 PM

Count Ended 5/13/2022 10:42:12 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	12,560	279.111	279.037
sd	0.009	112.071	2.490	2.490
Beta	0.395	6,270	139.333	138.938
sd	0.020	79.183	1.760	1.760

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; C

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 10:45:10 PM

Count Ended 5/13/2022 11:30:19 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	13,756	305.689	305.615
sd	0.009	117.286	2.606	2.606
Beta	0.395	6,905	153.444	153.049
sd	0.020	83.096	1.847	1.847

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; B

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 11:37:24 PM

Count Ended 5/14/2022 12:22:31 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	17,657	392.378	392.304
sd	0.009	132.880	2.953	2.953
Beta	0.395	8,009	177.978	177.583
sd	0.020	89.493	1.989	1.989

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; A

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 12:28:23 AM

Count Ended 5/14/2022 1:13:33 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	18,862	419.156	419.082
sd	0.009	137.339	3.052	3.052
Beta	0.395	8,487	188.600	188.205
sd	0.020	92.125	2.047	2.047

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; H

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 1:16:20 AM

Count Ended 5/14/2022 2:01:26 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	13,663	303.622	303.548
sd	0.009	116.889	2.598	2.598
Beta	0.395	8,584	190.756	190.361
sd	0.020	92.650	2.059	2.059

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; G

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 6:23:57 AM

Count Ended 5/14/2022 7:09:04 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	15,473	343.844	343.770
sd	0.009	124.391	2.764	2.764
Beta	0.395	9,199	204.422	204.027
sd	0.020	95.911	2.131	2.131

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICABT-1835503; F

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 7:14:33 AM

Count Ended 5/14/2022 7:59:39 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

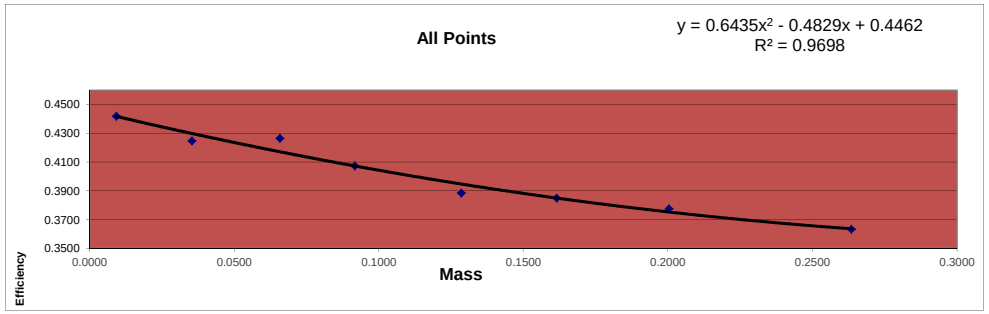
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	15,623	347.178	347.104
sd	0.009	124.992	2.778	2.778
Beta	0.395	9,399	208.867	208.472
sd	0.020	96.948	2.154	2.155

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 13

					DPM			
					35726.21	12-Jun		
					DPM			
					35723.87	13-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
13	6322;B1	6/13/2019 8:37	5	78930	15786	0.4419	1mL	0.0092
13	6322;B2	6/13/2019 2:17	5	75883	15176.6	0.4248	1mL	0.0353
13	6322;B3	6/13/2019 1:11	5	76210	15242	0.4267	1mL	0.0658
13	6322;B4	6/13/2019 0:13	5	72786	14557.2	0.4075	1mL	0.0916
13	6322;B5	6/13/2019 0:06	5	69385	13877	0.3885	1mL	0.1285
13	6322;B6	6/12/2019 12:55	5	68767	13753.4	0.3850	1mL	0.1615
13	6322;B7	6/13/2019 12:11	5	67433	13486.6	0.3775	1mL	0.2003
13	6322;B8	6/13/2019 10:26	5	64914	12982.8	0.3634	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4419	0.4418	0.02%
0.0353	0.4248	0.4300	-1.19%
0.0658	0.4267	0.4172	2.27%
0.0916	0.4075	0.4074	0.03%
0.1285	0.3885	0.3948	-1.60%
0.1615	0.3850	0.3850	-0.01%
0.2003	0.3775	0.3753	0.59%
0.2634	0.3634	0.3636	-0.06%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/12/2019	
Elapsed Time:	3555.000	days
Half Life:	10555.725	days
Exponential Term:	0.791804369	
Corrected Activity:	17863.10656	dpm/mL
Decay Activity (Sr/Y-90)	35726.21312	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B6

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/12/2019 12:55:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/12/2019 1:00:55 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,767	13,753.400	13,753.400
sd	0.000			0.000	262.235	52.447	52.447

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B5

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:06:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:11:24 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,385	13,877.000	13,877.000
sd	0.000			0.000	263.410	52.682	52.682

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B4

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:13:03 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:18:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,786	14,557.200	14,557.200
sd	0.000			0.000	269.789	53.958	53.958

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B3

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 1:11:07 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 1:16:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,210	15,242.000	15,242.000
sd	0.000			0.000	276.062	55.212	55.212

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B2

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:17:56 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:23:09 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,883	15,176.600	15,176.600
sd	0.000			0.000	275.469	55.094	55.094

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B1

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:37:44 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:42:58 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	11	2.200	2.200
sd	0.000			0.000	3.317	0.663	0.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	78,930	15,786.000	15,786.000
sd	0.000			0.000	280.945	56.189	56.189

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B8

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:26:21 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:31:34 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,914	12,982.800	12,982.800
sd	0.000			0.000	254.782	50.956	50.956

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-6322;B7

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:11:57 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:17:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,433	13,486.600	13,486.600
sd	0.000			0.000	259.679	51.936	51.936

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

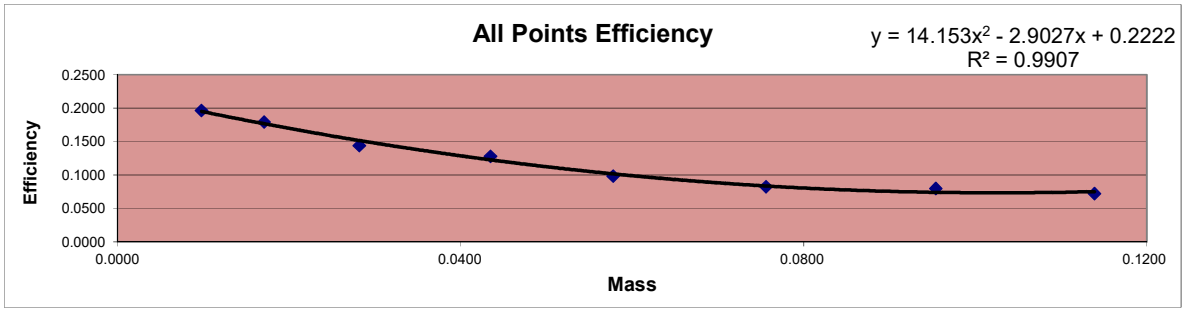
Red 13

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
13	ICABT-1835503; A	5/14/2022 1:16	45	19936	443.022	2254.6	0.1965	1	0.0098
13	ICABT-1835503; B	5/14/2022 0:28	45	18185	404.111	2254.6	0.1792	1	0.0171
13	ICABT-1835503; C	5/13/2022 23:37	45	14618	324.844	2254.6	0.1441	1	0.0282
13	ICABT-1835503; D	5/13/2022 22:45	45	12996	288.800	2254.6	0.1281	1	0.0435
13	ICABT-1835503; E	5/13/2022 21:57	45	20003	444.511	4509.1	0.0986	2	0.0578
13	ICABT-1835503; F	5/13/2022 20:49	45	16718	371.511	4509.1	0.0824	2	0.0756
13	ICABT-1835503; G	5/14/2022 7:14	45	16196	359.911	4509.1	0.0798	2	0.0954
13	ICABT-1835503; H	5/14/2022 6:24	45	14649	325.533	4509.1	0.0722	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1965	0.1951	0.71%
0.0171	0.1792	0.1767	1.44%
0.0282	0.1441	0.1516	-4.96%
0.0435	0.1281	0.1227	4.39%
0.0578	0.0986	0.1017	-3.07%
0.0756	0.0824	0.0836	-1.50%
0.0954	0.0798	0.0741	7.73%
0.1139	0.0722	0.0752	-3.99%

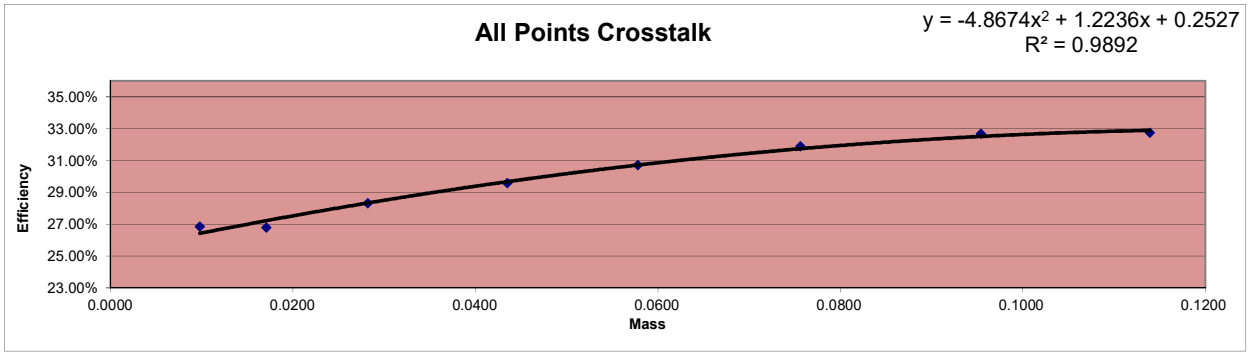
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.153
X Coeff:	-2.9027
Intercept:	0.2222

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	19936	7548	443.02	167.73	27.46%	Min
ICABT-1835503; B	0.0171	45	18185	6933	404.11	154.07	27.60%	27.46%
ICABT-1835503; C	0.0282	45	14618	6088	324.84	135.29	29.40%	
ICABT-1835503; D	0.0435	45	12996	5505	288.80	122.33	29.76%	Max
ICABT-1835503; E	0.0578	45	20003	8982	444.51	199.60	30.99%	33.78%
ICABT-1835503; F	0.0756	45	16718	8011	371.51	178.02	32.40%	
ICABT-1835503; G	0.0954	45	16196	8180	359.91	181.78	33.56%	Mean
ICABT-1835503; H	0.1139	45	14649	7472	325.53	166.04	33.78%	30.62%



Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; F

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 8:49:12 PM

Count Ended 5/13/2022 9:34:21 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	16,718	371.511	371.392
sd	0.011	129.298	2.873	2.873
Beta	0.346	8,011	178.022	177.676
sd	0.019	89.504	1.989	1.989

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; E

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 9:57:12 PM

Count Ended 5/13/2022 10:42:21 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	20,003	444.511	444.392
sd	0.011	141.432	3.143	3.143
Beta	0.346	8,982	199.600	199.254
sd	0.019	94.773	2.106	2.106

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; D

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 10:45:15 PM

Count Ended 5/13/2022 11:30:22 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	12,996	288.800	288.681
sd	0.011	114.000	2.533	2.533
Beta	0.346	5,505	122.333	121.987
sd	0.019	74.196	1.649	1.649

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; C

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 11:37:29 PM

Count Ended 5/14/2022 12:22:38 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	14,618	324.844	324.725
sd	0.011	120.905	2.687	2.687
Beta	0.346	6,088	135.289	134.943
sd	0.019	78.026	1.734	1.734

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; B

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 12:28:29 AM

Count Ended 5/14/2022 1:13:36 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	18,185	404.111	403.992
sd	0.011	134.852	2.997	2.997
Beta	0.346	6,933	154.067	153.721
sd	0.019	83.265	1.850	1.850

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; A

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 1:16:25 AM

Count Ended 5/14/2022 2:01:34 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	19,936	443.022	442.903
sd	0.011	141.195	3.138	3.138
Beta	0.346	7,548	167.733	167.387
sd	0.019	86.879	1.931	1.931

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; H

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 6:24:23 AM

Count Ended 5/14/2022 7:09:33 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	14,649	325.533	325.414
sd	0.011	121.033	2.690	2.690
Beta	0.346	7,472	166.044	165.698
sd	0.019	86.441	1.921	1.921

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICABT-1835503; G

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 7:14:43 AM

Count Ended 5/14/2022 7:59:50 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

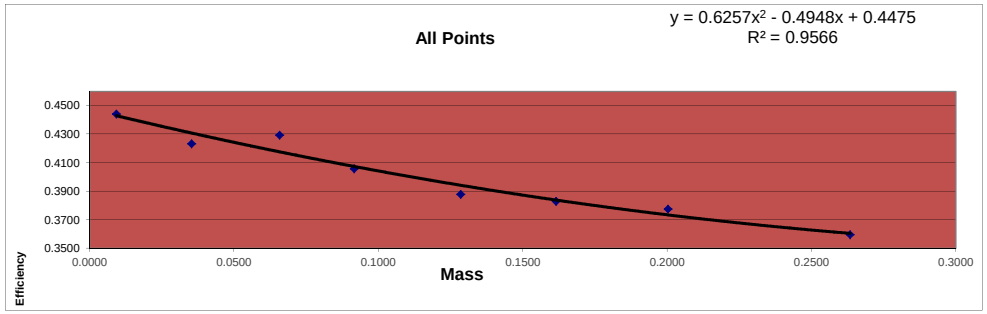
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	16,196	359.911	359.792
sd	0.011	127.264	2.828	2.828
Beta	0.346	8,180	181.778	181.432
sd	0.019	90.443	2.010	2.010

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 14

					DPM			
					35726.21	12-Jun		
					DPM			
					35723.87	13-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
14	6322;B1	6/13/2019 10:26	5	79337	15867.400	0.4442	1mL	0.0092
14	6322;B2	6/13/2019 8:37	5	75628	15125.600	0.4234	1mL	0.0353
14	6322;B3	6/13/2019 2:17	5	76707	15341.400	0.4294	1mL	0.0658
14	6322;B4	6/13/2019 1:11	5	72487	14497.400	0.4058	1mL	0.0916
14	6322;B5	6/13/2019 0:13	5	69272	13854.400	0.3878	1mL	0.1285
14	6322;B6	6/13/2019 0:06	5	68410	13682.000	0.3830	1mL	0.1615
14	6322;B7	6/12/2019 12:55	5	67462	13492.400	0.3777	1mL	0.2003
14	6322;B8	6/13/2019 12:12	5	64224	12844.800	0.3596	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4442	0.4430	0.26%
0.0353	0.4234	0.4308	-1.72%
0.0658	0.4294	0.4177	2.82%
0.0916	0.4058	0.4074	-0.39%
0.1285	0.3878	0.3942	-1.63%
0.1615	0.3830	0.3839	-0.24%
0.2003	0.3777	0.3735	1.12%
0.2634	0.3596	0.3606	-0.28%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/12/2019	
Elapsed Time:	3555.000	days
Half Life:	10555.725	days
Exponential Term:	0.791804369	
Corrected Activity:	17863.10656	dpm/mL
Decay Activity (Sr/Y-90)	35726.21312	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B7

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/12/2019 12:55:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/12/2019 1:00:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,462	13,492.400	13,492.400
sd	0.000			0.000	259.734	51.947	51.947

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B6

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:06:15 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:11:27 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,410	13,682.000	13,682.000
sd	0.000			0.000	261.553	52.311	52.311

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B5

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:13:07 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:18:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,272	13,854.400	13,854.400
sd	0.000			0.000	263.196	52.639	52.639

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B4

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 1:11:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 1:16:24 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,487	14,497.400	14,497.400
sd	0.000			0.000	269.234	53.847	53.847

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B3

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:17:59 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:23:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,707	15,341.400	15,341.400
sd	0.000			0.000	276.960	55.392	55.392

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B2

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:37:48 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:43:01 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,628	15,125.600	15,125.600
sd	0.000			0.000	275.005	55.001	55.001

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B1

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:26:27 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:31:42 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,337	15,867.400	15,867.400
sd	0.000			0.000	281.668	56.334	56.334

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-6322;B8

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:12:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:17:17 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,224	12,844.800	12,844.800
sd	0.000			0.000	253.425	50.685	50.685

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

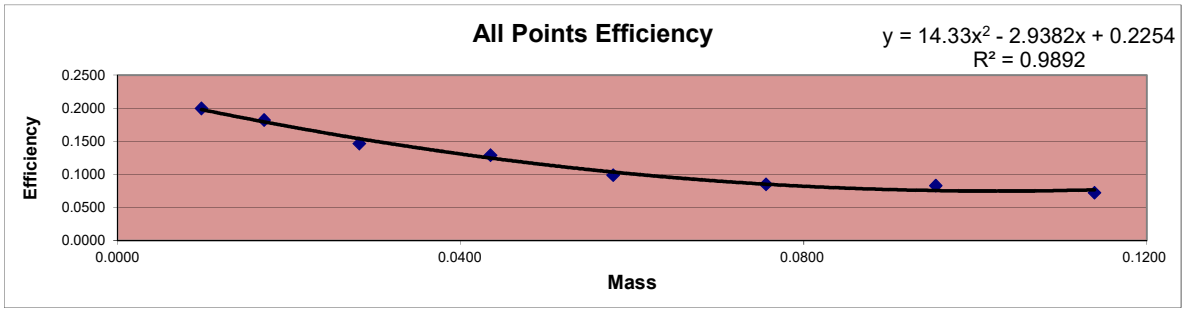
Curve is for Gross Alpha

Red 14

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
14	ICABT-1835503; A	5/14/2022 6:24	45	20247	449.933	2254.6	0.1996	1	0.0098
14	ICABT-1835503; B	5/14/2022 1:16	45	18483	410.733	2254.6	0.1822	1	0.0171
14	ICABT-1835503; C	5/14/2022 0:28	45	14876	330.578	2254.6	0.1466	1	0.0282
14	ICABT-1835503; D	5/13/2022 23:37	45	13070	290.444	2254.6	0.1288	1	0.0435
14	ICABT-1835503; E	5/13/2022 22:45	45	20077	446.156	4509.1	0.0989	2	0.0578
14	ICABT-1835503; F	5/13/2022 21:57	45	17266	383.689	4509.1	0.0851	2	0.0756
14	ICABT-1835503; G	5/13/2022 20:49	45	16817	373.711	4509.1	0.0829	2	0.0954
14	ICABT-1835503; H	5/14/2022 7:14	45	14680	326.222	4509.1	0.0723	2	0.1139

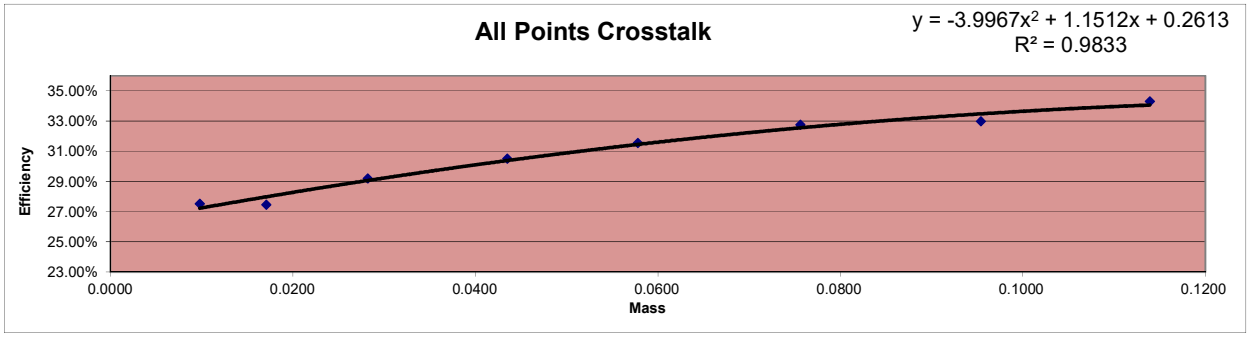
Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1996	0.1980	0.80%
0.0171	0.1822	0.1793	1.58%
0.0282	0.1466	0.1539	-4.75%
0.0435	0.1288	0.1247	3.30%
0.0578	0.0989	0.1034	-4.35%
0.0756	0.0851	0.0852	-0.10%
0.0954	0.0829	0.0755	9.75%
0.1139	0.0723	0.0766	-5.61%

Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.33
X Coeff:	-2.9382
Intercept:	0.2254

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20247	7686	449.93	170.80	27.52%	Min
ICABT-1835503; B	0.0171	45	18483	6991	410.73	155.36	27.44%	27.44%
ICABT-1835503; C	0.0282	45	14876	6132	330.58	136.27	29.19%	
ICABT-1835503; D	0.0435	45	13070	5736	290.44	127.47	30.50%	Max
ICABT-1835503; E	0.0578	45	20077	9250	446.16	205.56	31.54%	34.30%
ICABT-1835503; F	0.0756	45	17266	8404	383.69	186.76	32.74%	
ICABT-1835503; G	0.0954	45	16817	8271	373.71	183.80	32.97%	Mean
ICABT-1835503; H	0.1139	45	14680	7663	326.22	170.29	34.30%	30.77%



Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; G

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 8:49:18 PM

Count Ended 5/13/2022 9:34:26 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	16,817	373.711	373.605
sd	0.010	129.680	2.882	2.882
Beta	0.402	8,271	183.800	183.398
sd	0.020	90.945	2.021	2.021

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; F

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 9:57:18 PM

Count Ended 5/13/2022 10:42:27 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	17,266	383.689	383.583
sd	0.010	131.400	2.920	2.920
Beta	0.402	8,404	186.756	186.354
sd	0.020	91.673	2.037	2.037

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; E

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 10:45:22 PM

Count Ended 5/13/2022 11:30:30 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	20,077	446.156	446.050
sd	0.010	141.693	3.149	3.149
Beta	0.402	9,250	205.556	205.154
sd	0.020	96.177	2.137	2.137

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; D

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 11:37:34 PM

Count Ended 5/14/2022 12:22:41 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	13,070	290.444	290.338
sd	0.010	114.324	2.541	2.541
Beta	0.402	5,736	127.467	127.065
sd	0.020	75.736	1.683	1.683

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; C

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 12:28:34 AM

Count Ended 5/14/2022 1:13:42 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	14,876	330.578	330.472
sd	0.010	121.967	2.710	2.710
Beta	0.402	6,132	136.267	135.865
sd	0.020	78.307	1.740	1.740

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; B

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 1:16:30 AM

Count Ended 5/14/2022 2:01:40 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	18,483	410.733	410.627
sd	0.010	135.952	3.021	3.021
Beta	0.402	6,991	155.356	154.954
sd	0.020	83.612	1.858	1.858

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; A

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 6:24:35 AM

Count Ended 5/14/2022 7:09:43 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	20,247	449.933	449.827
sd	0.010	142.292	3.162	3.162
Beta	0.402	7,686	170.800	170.398
sd	0.020	87.670	1.948	1.948

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICABT-1835503; H

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 7:14:53 AM

Count Ended 5/14/2022 8:00:01 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

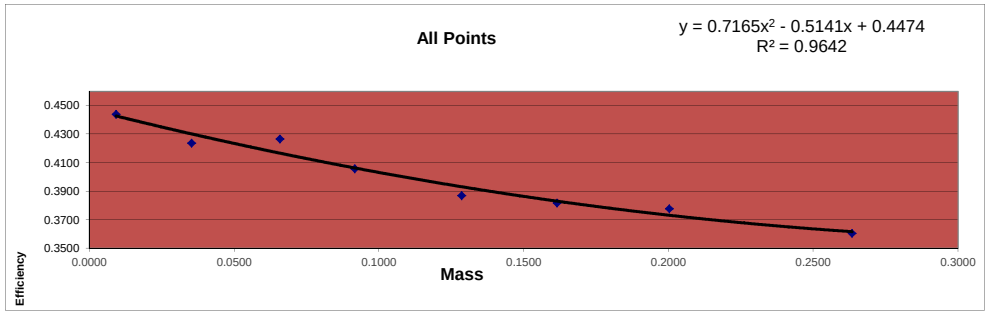
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	14,680	326.222	326.116
sd	0.010	121.161	2.692	2.692
Beta	0.402	7,663	170.289	169.887
sd	0.020	87.539	1.945	1.945

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 15

					DPM			
					35726.21	12-Jun		
					DPM			
					35723.87	13-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
15	6322;B1	6/13/2019 12:12	5	79287	15857.400	0.4439	1mL	0.0092
15	6322;B2	6/13/2019 10:26	5	75681	15136.200	0.4237	1mL	0.0353
15	6322;B3	6/13/2019 8:37	5	76217	15243.400	0.4267	1mL	0.0658
15	6322;B4	6/13/2019 2:18	5	72467	14493.400	0.4057	1mL	0.0916
15	6322;B5	6/13/2019 1:11	5	69130	13826.000	0.3870	1mL	0.1285
15	6322;B6	6/13/2019 0:13	5	68186	13637.200	0.3817	1mL	0.1615
15	6322;B7	6/13/2019 0:06	5	67491	13498.200	0.3778	1mL	0.2003
15	6322;B8	6/12/2019 12:55	5	64411	12882.200	0.3606	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4439	0.4427	0.26%
0.0353	0.4237	0.4301	-1.50%
0.0658	0.4267	0.4167	2.41%
0.0916	0.4057	0.4063	-0.15%
0.1285	0.3870	0.3932	-1.56%
0.1615	0.3817	0.3831	-0.35%
0.2003	0.3778	0.3732	1.25%
0.2634	0.3606	0.3617	-0.31%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/12/2019	
Elapsed Time:	3555.000	days
Half Life:	10555.725	days
Exponential Term:	0.791804369	
Corrected Activity:	17863.10656	dpm/mL
Decay Activity (Sr/Y-90)	35726.21312	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B8

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/12/2019 12:55:50 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/12/2019 1:01:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,411	12,882.200	12,882.200
sd	0.000			0.000	253.793	50.759	50.759

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B7

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:06:21 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:11:32 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	11	2.200	2.200
sd	0.000			0.000	3.317	0.663	0.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,491	13,498.200	13,498.200
sd	0.000			0.000	259.790	51.958	51.958

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B6

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:13:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:18:23 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,186	13,637.200	13,637.200
sd	0.000			0.000	261.124	52.225	52.225

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B5

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 1:11:13 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 1:16:24 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,130	13,826.000	13,826.000
sd	0.000			0.000	262.926	52.585	52.585

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B4

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:18:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:23:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,467	14,493.400	14,493.400
sd	0.000			0.000	269.197	53.839	53.839

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B3

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:37:52 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:43:04 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,217	15,243.400	15,243.400
sd	0.000			0.000	276.074	55.215	55.215

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B2

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:26:31 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:31:45 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,681	15,136.200	15,136.200
sd	0.000			0.000	275.102	55.020	55.020

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-6322;B1

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 12:12:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 12:17:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	12	2.400	2.400
sd	0.000			0.000	3.464	0.693	0.693
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,287	15,857.400	15,857.400
sd	0.000			0.000	281.579	56.316	56.316

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

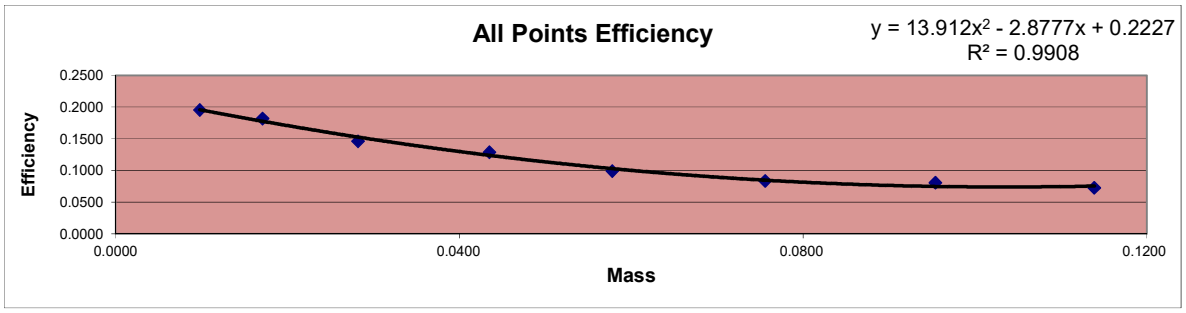
Red 15

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
15	ICABT-1835503; A	5/14/2022 7:15	45	19825	440.556	2254.6	0.1954	1	0.0098
15	ICABT-1835503; B	5/14/2022 6:24	45	18463	410.289	2254.6	0.1820	1	0.0171
15	ICABT-1835503; C	5/14/2022 1:16	45	14810	329.111	2254.6	0.1460	1	0.0282
15	ICABT-1835503; D	5/14/2022 0:28	45	13064	290.311	2254.6	0.1288	1	0.0435
15	ICABT-1835503; E	5/13/2022 23:37	45	20108	446.844	4509.1	0.0991	2	0.0578
15	ICABT-1835503; F	5/13/2022 22:45	45	16920	376.000	4509.1	0.0834	2	0.0756
15	ICABT-1835503; G	5/13/2022 21:57	45	16353	363.400	4509.1	0.0806	2	0.0954
15	ICABT-1835503; H	5/13/2022 20:49	45	14713	326.956	4509.1	0.0725	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1954	0.1958	-0.22%
0.0171	0.1820	0.1776	2.49%
0.0282	0.1460	0.1526	-4.35%
0.0435	0.1288	0.1238	3.97%
0.0578	0.0991	0.1028	-3.65%
0.0756	0.0834	0.0847	-1.50%
0.0954	0.0806	0.0748	7.77%
0.1139	0.0725	0.0754	-3.85%

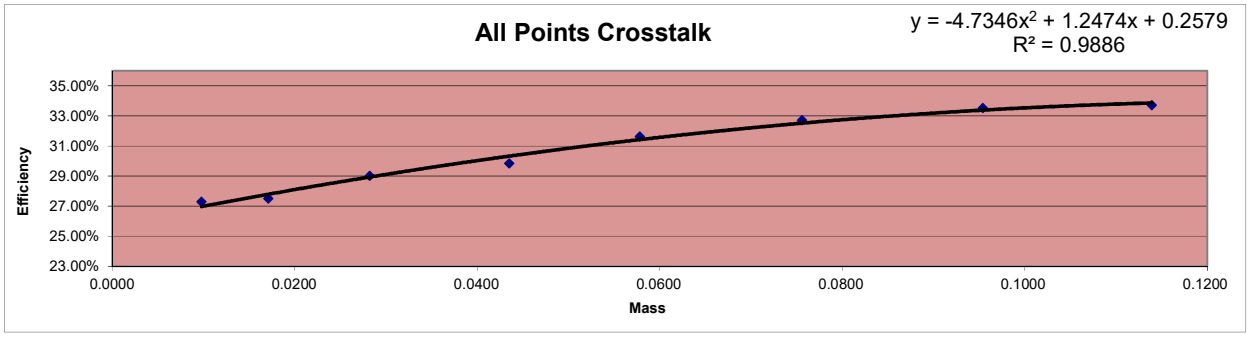
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	13.912
X Coeff:	-2.8777
Intercept:	0.2227

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	19825	7441	440.56	165.36	27.29%	Min
ICABT-1835503; B	0.0171	45	18463	7007	410.29	155.71	27.51%	27.29%
ICABT-1835503; C	0.0282	45	14810	6055	329.11	134.56	29.02%	
ICABT-1835503; D	0.0435	45	13064	5556	290.31	123.47	29.84%	Max
ICABT-1835503; E	0.0578	45	20108	9301	446.84	206.69	31.63%	33.70%
ICABT-1835503; F	0.0756	45	16920	8222	376.00	182.71	32.70%	
ICABT-1835503; G	0.0954	45	16353	8245	363.40	183.22	33.52%	Mean
ICABT-1835503; H	0.1139	45	14713	7480	326.96	166.22	33.70%	30.65%



Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; H

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 8:49:22 PM

Count Ended 5/13/2022 9:34:29 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	14,713	326.956	326.845
sd	0.011	121.297	2.695	2.696
Beta	0.351	7,480	166.222	165.871
sd	0.019	86.487	1.922	1.922

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; G

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 9:57:23 PM

Count Ended 5/13/2022 10:42:32 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	16,353	363.400	363.289
sd	0.011	127.879	2.842	2.842
Beta	0.351	8,245	183.222	182.871
sd	0.019	90.802	2.018	2.018

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; F

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 10:45:27 PM

Count Ended 5/13/2022 11:30:35 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	16,920	376.000	375.889
sd	0.011	130.077	2.891	2.891
Beta	0.351	8,222	182.711	182.360
sd	0.019	90.675	2.015	2.015

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; E

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/13/2022 11:37:39 PM

Count Ended 5/14/2022 12:22:47 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	20,108	446.844	446.733
sd	0.011	141.803	3.151	3.151
Beta	0.351	9,301	206.689	206.338
sd	0.019	96.442	2.143	2.143

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; D

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 12:28:38 AM

Count Ended 5/14/2022 1:13:45 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	13,064	290.311	290.200
sd	0.011	114.298	2.540	2.540
Beta	0.351	5,556	123.467	123.116
sd	0.019	74.539	1.656	1.657

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; C

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 1:16:34 AM

Count Ended 5/14/2022 2:01:43 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	14,810	329.111	329.000
sd	0.011	121.696	2.704	2.704
Beta	0.351	6,055	134.556	134.205
sd	0.019	77.814	1.729	1.729

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; B

Repeat 15

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 6:24:44 AM

Count Ended 5/14/2022 7:09:53 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	18,463	410.289	410.178
sd	0.011	135.879	3.020	3.020
Beta	0.351	7,007	155.711	155.360
sd	0.019	83.708	1.860	1.860

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICABT-1835503; A

Repeat 16

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 7:15:03 AM

Count Ended 5/14/2022 8:00:13 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

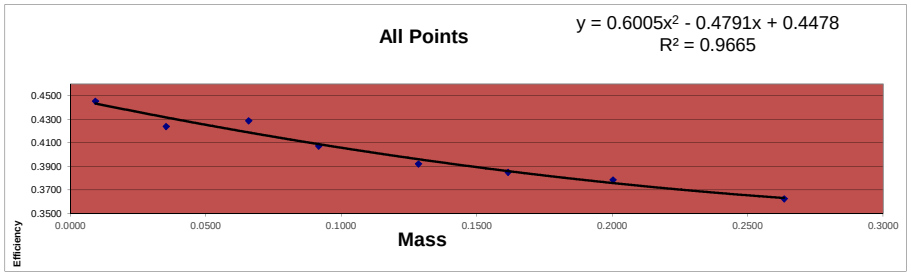
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	19,825	440.556	440.445
sd	0.011	140.801	3.129	3.129
Beta	0.351	7,441	165.356	165.005
sd	0.019	86.261	1.917	1.917

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 16

Detector ID	Std ID	Count Date	Count Time	Beta Counts	DPM 35723.87 / DPM 35721.52 CPM	13-Jun / 14-Jun Sr-90 Eff	Standard Aliquot	Sample Wt
16	6322;B1	6/13/2019 14:37	5	79556	15911.200	0.4454	1mL	0.0092
16	6322;B2	6/14/2019 12:27	5	75734	15146.800	0.4240	1mL	0.0353
16	6322;B3	6/14/2019 11:22	5	76594	15318.800	0.4288	1mL	0.0658
16	6322;B4	6/14/2019 1:01	5	72770	14554.000	0.4074	1mL	0.0916
16	6322;B5	6/13/2019 22:55	5	70069	14013.800	0.3923	1mL	0.1285
16	6322;B6	6/13/2019 22:07	5	68814	13762.800	0.3853	1mL	0.1615
16	6322;B7	6/13/2019 20:42	5	67634	13526.800	0.3786	1mL	0.2003
16	6322;B8	6/13/2019 20:16	5	64785	12957.000	0.3627	1mL	0.2634

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0092	0.4454	0.4434	0.44%
0.0353	0.4240	0.4316	-1.76%
0.0658	0.4288	0.4189	2.38%
0.0916	0.4074	0.4090	-0.37%
0.1285	0.3923	0.3962	-0.98%
0.1615	0.3853	0.3861	-0.22%
0.2003	0.3786	0.3759	0.72%
0.2634	0.3627	0.3633	-0.16%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/14/2019	
Elapsed Time:	3557.000	days
Half Life:	10555.725	days
Exponential Term:	0.791700387	
Corrected Activity:	17860.76073	dpm/mL
Decay Activity (Sr/Y-90)	35721.52147	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B1

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:37:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:42:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	11	2.200	2.200
sd	0.000			0.000	3.317	0.663	0.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,556	15,911.200	15,911.200
sd	0.000			0.000	282.057	56.411	56.411

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B8

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:16:13 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:21:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	11	2.200	2.200
sd	0.000			0.000	3.317	0.663	0.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,785	12,957.000	12,957.000
sd	0.000			0.000	254.529	50.906	50.906

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B7

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:42:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:47:38 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	11	2.200	2.200
sd	0.000			0.000	3.317	0.663	0.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,634	13,526.800	13,526.800
sd	0.000			0.000	260.065	52.013	52.013

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B6

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:07:55 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:13:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	9	1.800	1.800
sd	0.000			0.000	3.000	0.600	0.600
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,814	13,762.800	13,762.800
sd	0.000			0.000	262.324	52.465	52.465

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B5

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:55:41 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 11:00:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	70,069	14,013.800	14,013.800
sd	0.000			0.000	264.705	52.941	52.941

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B4

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 1:01:57 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 1:07:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	13	2.600	2.600
sd	0.000			0.000	3.606	0.721	0.721
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,770	14,554.000	14,554.000
sd	0.000			0.000	269.759	53.952	53.952

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B3

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 11:22:25 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 11:27:39 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,594	15,318.800	15,318.800
sd	0.000			0.000	276.756	55.351	55.351

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-6322;B2

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 12:27:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 12:32:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	15	3.000	3.000
sd	0.000			0.000	3.873	0.775	0.775
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,734	15,146.800	15,146.800
sd	0.000			0.000	275.198	55.040	55.040

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

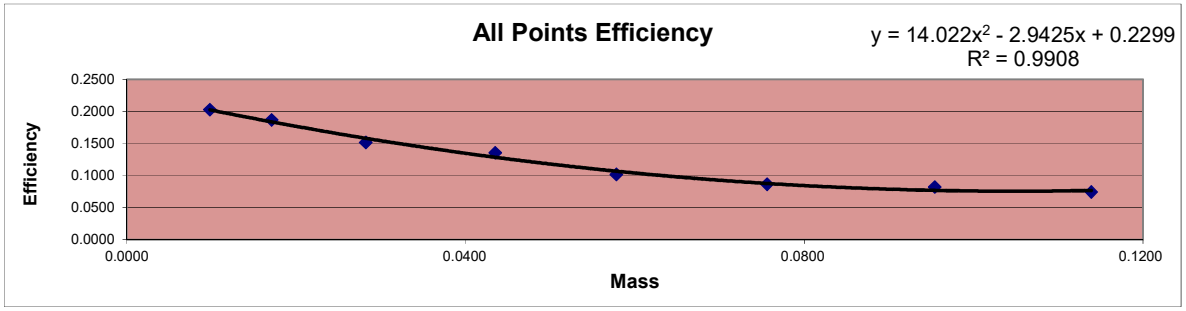
Red 16

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
16	ICABT-1835503; A	5/14/2022 8:32	45	20553	456.733	2254.6	0.2026	1	0.0098
16	ICABT-1835503; B	5/15/2022 17:41	45	18931	420.689	2254.6	0.1866	1	0.0171
16	ICABT-1835503; C	5/15/2022 16:52	45	15373	341.622	2254.6	0.1515	1	0.0282
16	ICABT-1835503; D	5/15/2022 16:04	45	13744	305.422	2254.6	0.1355	1	0.0435
16	ICABT-1835503; E	5/15/2022 15:16	45	20662	459.156	4509.1	0.1018	2	0.0578
16	ICABT-1835503; F	5/15/2022 14:25	45	17511	389.133	4509.1	0.0863	2	0.0756
16	ICABT-1835503; G	5/15/2022 13:35	45	16609	369.089	4509.1	0.0819	2	0.0954
16	ICABT-1835503; H	5/15/2022 12:46	45	15069	334.867	4509.1	0.0743	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2026	0.2024	0.08%
0.0171	0.1866	0.1837	1.58%
0.0282	0.1515	0.1581	-4.14%
0.0435	0.1355	0.1284	5.48%
0.0578	0.1018	0.1067	-4.54%
0.0756	0.0863	0.0876	-1.47%
0.0954	0.0819	0.0768	6.58%
0.1139	0.0743	0.0767	-3.13%

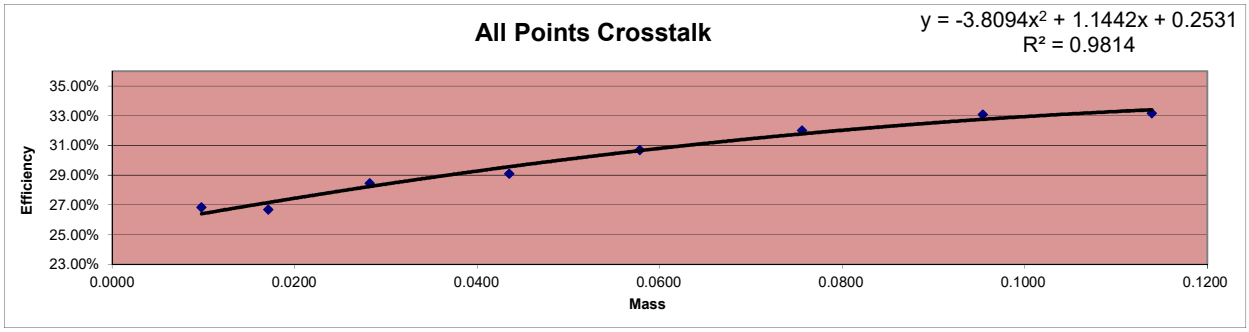
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X² Coeff:	14.022
X Coeff:	-2.9425
Intercept:	0.2299

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20553	7539	456.73	167.53	26.84%	Min
ICABT-1835503; B	0.0171	45	18931	6887	420.69	153.04	26.68%	26.68%
ICABT-1835503; C	0.0282	45	15373	6112	341.62	135.82	28.45%	
ICABT-1835503; D	0.0435	45	13744	5641	305.42	125.36	29.10%	Max
ICABT-1835503; E	0.0578	45	20662	9151	459.16	203.36	30.69%	33.15%
ICABT-1835503; F	0.0756	45	17511	8240	389.13	183.11	32.00%	
ICABT-1835503; G	0.0954	45	16609	8204	369.09	182.31	33.06%	Mean
ICABT-1835503; H	0.1139	45	15069	7473	334.87	166.07	33.15%	30.00%



Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; A

Repeat 7

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 8:32:29 AM

Count Ended 5/14/2022 9:17:45 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	20,553	456.733	456.655
sd	0.009	143.363	3.186	3.186
Beta	0.356	7,539	167.533	167.177
sd	0.019	86.827	1.929	1.930

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; H

Repeat 8

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 12:46:26 PM

Count Ended 5/15/2022 1:31:33 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	15,069	334.867	334.789
sd	0.009	122.756	2.728	2.728
Beta	0.356	7,473	166.067	165.711
sd	0.019	86.447	1.921	1.921

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; G

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 1:35:33 PM

Count Ended 5/15/2022 2:20:40 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	16,609	369.089	369.011
sd	0.009	128.876	2.864	2.864
Beta	0.356	8,204	182.311	181.955
sd	0.019	90.576	2.013	2.013

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; F

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 2:25:35 PM

Count Ended 5/15/2022 3:10:43 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	17,511	389.133	389.055
sd	0.009	132.329	2.941	2.941
Beta	0.356	8,240	183.111	182.755
sd	0.019	90.774	2.017	2.017

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; E

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 3:16:22 PM

Count Ended 5/15/2022 4:01:31 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	20,662	459.156	459.078
sd	0.009	143.743	3.194	3.194
Beta	0.356	9,151	203.356	203.000
sd	0.019	95.661	2.126	2.126

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; D

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:04:28 PM

Count Ended 5/15/2022 4:49:35 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	13,744	305.422	305.344
sd	0.009	117.235	2.605	2.605
Beta	0.356	5,641	125.356	125.000
sd	0.019	75.107	1.669	1.669

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; C

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:52:51 PM

Count Ended 5/15/2022 5:37:58 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	15,373	341.622	341.544
sd	0.009	123.988	2.755	2.755
Beta	0.356	6,112	135.822	135.466
sd	0.019	78.179	1.737	1.737

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICABT-1835503; B

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 5:41:17 PM

Count Ended 5/15/2022 6:26:25 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

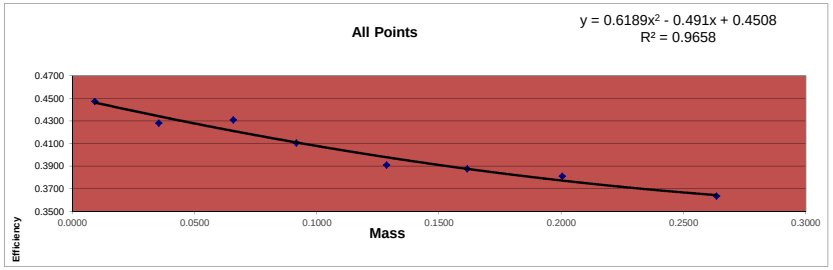
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	18,931	420.689	420.611
sd	0.009	137.590	3.058	3.058
Beta	0.356	6,887	153.044	152.688
sd	0.019	82.988	1.844	1.844

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 17

					DPM 35723.87	13-Jun		
					DPM 35721.52	14-Jun		
Detector ID	**Std ID**	Count Date	Count Time	Beta Counts	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
17	6322;B1	6/13/2019 20:15	5	79902	15980.400	0.4473	1mL	0.0092
17	6322;B2	6/13/2019 14:37	5	76458	15291.600	0.4280	1mL	0.0353
17	6322;B3	6/14/2019 12:27	5	76991	15398.200	0.4311	1mL	0.0658
17	6322;B4	6/14/2019 11:22	5	73316	14663.200	0.4105	1mL	0.0916
17	6322;B5	6/14/2019 1:02	5	69849	13969.800	0.3911	1mL	0.1285
17	6322;B6	6/13/2019 22:55	5	69240	13848.000	0.3876	1mL	0.1615
17	6322;B7	6/13/2019 22:07	5	68060	13612.000	0.3810	1mL	0.2003
17	6322;B8	6/13/2019 20:42	5	64923	12984.600	0.3635	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4473	0.4463	0.22%
0.0353	0.4280	0.4342	-1.43%
0.0658	0.4311	0.4212	2.35%
0.0916	0.4105	0.4110	-0.13%
0.1285	0.3911	0.3979	-1.72%
0.1615	0.3876	0.3876	0.00%
0.2003	0.3810	0.3773	0.99%
0.2634	0.3635	0.3644	-0.26%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/14/2019	
Elapsed Time:	3557.000	days
Half Life:	10555.725	days
Exponential Term:	0.791700387	
Corrected Activity:	17860.76073	dpm/mL
Decay Activity (Sr/Y-90)	35721.52147	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B2

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:37:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:42:37 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,458	15,291.600	15,291.600
sd	0.000			0.000	276.510	55.302	55.302

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B1

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:15:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:21:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,902	15,980.400	15,980.400
sd	0.000			0.000	282.669	56.534	56.534

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B8

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:42:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:47:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,923	12,984.600	12,984.600
sd	0.000			0.000	254.800	50.960	50.960

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B7

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:07:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:13:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,060	13,612.000	13,612.000
sd	0.000			0.000	260.883	52.177	52.177

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B6

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:55:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 11:00:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,240	13,848.000	13,848.000
sd	0.000			0.000	263.135	52.627	52.627

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B5

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 1:02:01 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 1:07:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,849	13,969.800	13,969.800
sd	0.000			0.000	264.290	52.858	52.858

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B4

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 11:22:31 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 11:27:43 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	73,316	14,663.200	14,663.200
sd	0.000			0.000	270.769	54.154	54.154

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-6322;B3

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 12:27:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 12:32:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,991	15,398.200	15,398.200
sd	0.000			0.000	277.473	55.495	55.495

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

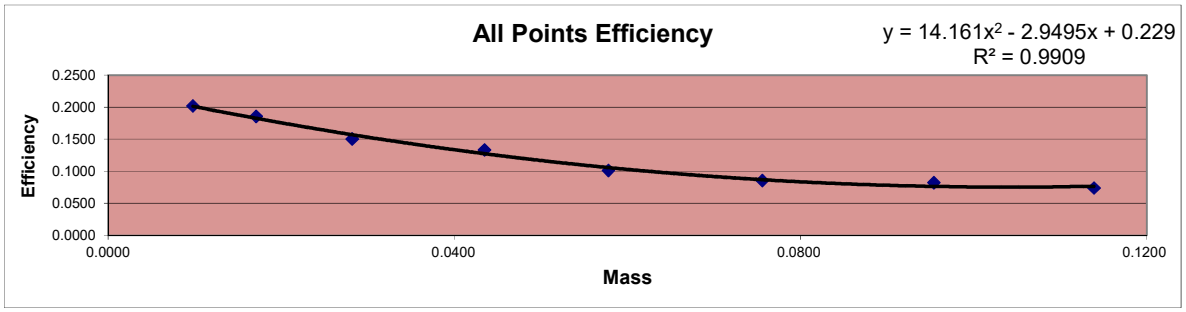
Red 17

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
17	ICABT-1835503; A	5/15/2022 12:46	45	20482	455.156	2254.6	0.2019	1	0.0098
17	ICABT-1835503; B	5/14/2022 8:32	45	18829	418.422	2254.6	0.1856	1	0.0171
17	ICABT-1835503; C	5/15/2022 17:41	45	15270	339.333	2254.6	0.1505	1	0.0282
17	ICABT-1835503; D	5/15/2022 16:52	45	13540	300.889	2254.6	0.1335	1	0.0435
17	ICABT-1835503; E	5/15/2022 16:04	45	20545	456.556	4509.1	0.1013	2	0.0578
17	ICABT-1835503; F	5/15/2022 15:16	45	17383	386.289	4509.1	0.0857	2	0.0756
17	ICABT-1835503; G	5/15/2022 14:25	45	16717	371.489	4509.1	0.0824	2	0.0954
17	ICABT-1835503; H	5/15/2022 13:35	45	14964	332.533	4509.1	0.0737	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2019	0.2015	0.21%
0.0171	0.1856	0.1827	1.58%
0.0282	0.1505	0.1571	-4.19%
0.0435	0.1335	0.1275	4.68%
0.0578	0.1013	0.1058	-4.33%
0.0756	0.0857	0.0870	-1.48%
0.0954	0.0824	0.0765	7.69%
0.1139	0.0737	0.0768	-3.93%

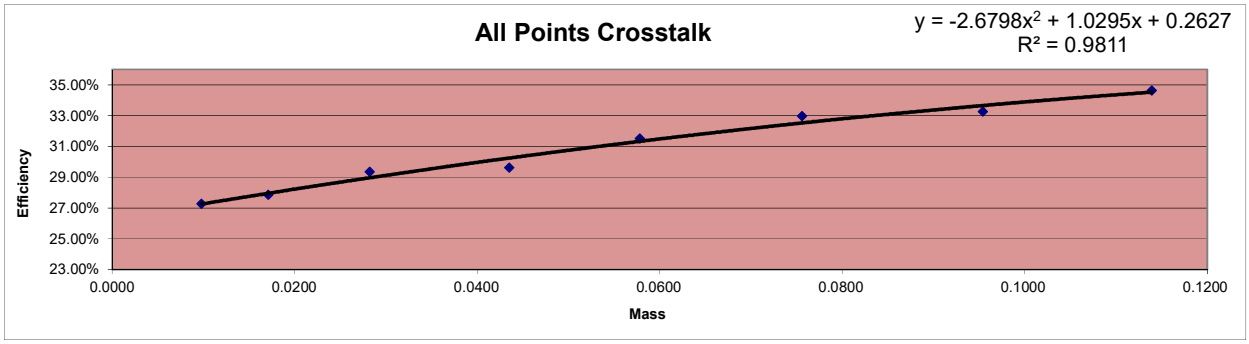
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X² Coeff:	14.161
X Coeff:	-2.9495
Intercept:	0.229

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20482	7679	455.16	170.64	27.27%	Min
ICABT-1835503; B	0.0171	45	18829	7273	418.42	161.62	27.86%	27.27%
ICABT-1835503; C	0.0282	45	15270	6343	339.33	140.96	29.35%	
ICABT-1835503; D	0.0435	45	13540	5696	300.89	126.58	29.61%	Max
ICABT-1835503; E	0.0578	45	20545	9451	456.56	210.02	31.51%	34.63%
ICABT-1835503; F	0.0756	45	17383	8549	386.29	189.98	32.97%	
ICABT-1835503; G	0.0954	45	16717	8331	371.49	185.13	33.26%	Mean
ICABT-1835503; H	0.1139	45	14964	7928	332.53	176.18	34.63%	30.81%



Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; B

Repeat 7

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 8:32:37 AM

Count Ended 5/14/2022 9:17:49 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	18,829	418.422	418.349
sd	0.009	137.219	3.049	3.049
Beta	1.642	7,273	161.622	159.980
sd	0.041	85.282	1.895	1.896

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; A

Repeat 8

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 12:46:31 PM

Count Ended 5/15/2022 1:31:39 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	20,482	455.156	455.083
sd	0.009	143.115	3.180	3.180
Beta	1.642	7,679	170.644	169.002
sd	0.041	87.630	1.947	1.948

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; H

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 1:35:36 PM

Count Ended 5/15/2022 2:20:43 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	14,964	332.533	332.460
sd	0.009	122.327	2.718	2.718
Beta	1.642	7,928	176.178	174.536
sd	0.041	89.039	1.979	1.979

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; G

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 2:25:40 PM

Count Ended 5/15/2022 3:10:49 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	16,717	371.489	371.416
sd	0.009	129.294	2.873	2.873
Beta	1.642	8,331	185.133	183.491
sd	0.041	91.274	2.028	2.029

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; F

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 3:16:29 PM

Count Ended 5/15/2022 4:01:37 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	17,383	386.289	386.216
sd	0.009	131.845	2.930	2.930
Beta	1.642	8,549	189.978	188.336
sd	0.041	92.461	2.055	2.055

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; E

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:04:33 PM

Count Ended 5/15/2022 4:49:41 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	20,545	456.556	456.483
sd	0.009	143.335	3.185	3.185
Beta	1.642	9,451	210.022	208.380
sd	0.041	97.216	2.160	2.161

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; D

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:52:55 PM

Count Ended 5/15/2022 5:38:01 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	13,540	300.889	300.816
sd	0.009	116.362	2.586	2.586
Beta	1.642	5,696	126.578	124.936
sd	0.041	75.472	1.677	1.678

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICABT-1835503; C

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 5:41:21 PM

Count Ended 5/15/2022 6:26:29 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

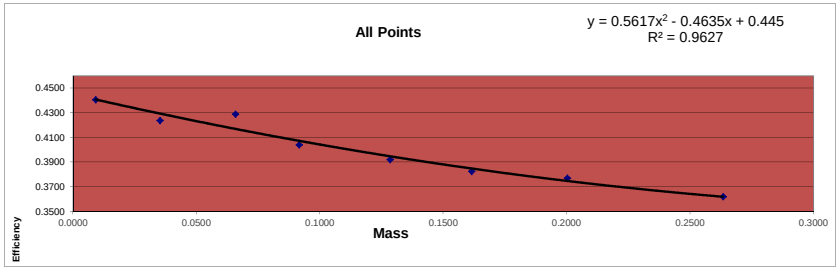
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	15,270	339.333	339.260
sd	0.009	123.572	2.746	2.746
Beta	1.642	6,343	140.956	139.314
sd	0.041	79.643	1.770	1.770

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 18

					DPM			
					35723.87	13-Jun		
					DPM			
					35721.52	14-Jun		
Detector ID	**Std ID**	Count Date	Count Time	Beta Counts	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
18	6322;B1	6/13/2019 20:42	5	78710	15742	0.4407	1mL	0.0092
18	6322;B2	6/13/2019 20:15	5	75682	15136.4	0.4237	1mL	0.0353
18	6322;B3	6/13/2019 14:37	5	76591	15318.2	0.4288	1mL	0.0658
18	6322;B4	6/14/2019 12:27	5	72137	14427.4	0.4039	1mL	0.0916
18	6322;B5	6/14/2019 11:22	5	70023	14004.6	0.3920	1mL	0.1285
18	6322;B6	6/14/2019 1:02	5	68307	13661.4	0.3824	1mL	0.1615
18	6322;B7	6/13/2019 22:55	5	67335	13467	0.3770	1mL	0.2003
18	6322;B8	6/13/2019 22:08	5	64631	12926.2	0.3618	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4407	0.4408	-0.03%
0.0353	0.4237	0.4293	-1.31%
0.0658	0.4288	0.4169	2.84%
0.0916	0.4039	0.4073	-0.83%
0.1285	0.3920	0.3947	-0.68%
0.1615	0.3824	0.3848	-0.61%
0.2003	0.3770	0.3747	0.61%
0.2634	0.3618	0.3619	-0.01%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/14/2019	
Elapsed Time:	3557.000	days
Half Life:	10555.725	days
Exponential Term:	0.791700387	
Corrected Activity:	17860.76073	dpm/mL
Decay Activity (Sr/Y-90)	35721.52147	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B3

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:37:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:42:37 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,591	15,318.200	15,318.200
sd	0.000			0.000	276.751	55.350	55.350

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B2

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:15:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:21:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,682	15,136.400	15,136.400
sd	0.000			0.000	275.104	55.021	55.021

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B1

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:42:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:47:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	78,710	15,742.000	15,742.000
sd	0.000			0.000	280.553	56.111	56.111

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B8

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:08:04 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:44:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	8	1.600	1.600
sd	0.000			0.000	2.828	0.566	0.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,631	12,926.200	12,926.200
sd	0.000			0.000	254.226	50.845	50.845

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B7

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:55:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 11:00:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,335	13,467.000	13,467.000
sd	0.000			0.000	259.490	51.898	51.898

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B6

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 1:02:03 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 1:07:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,307	13,661.400	13,661.400
sd	0.000			0.000	261.356	52.271	52.271

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B5

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 11:22:35 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 11:27:47 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	70,023	14,004.600	14,004.600
sd	0.000			0.000	264.619	52.924	52.924

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-6322;B4

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 12:27:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 12:32:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,137	14,427.400	14,427.400
sd	0.000			0.000	268.583	53.717	53.717

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

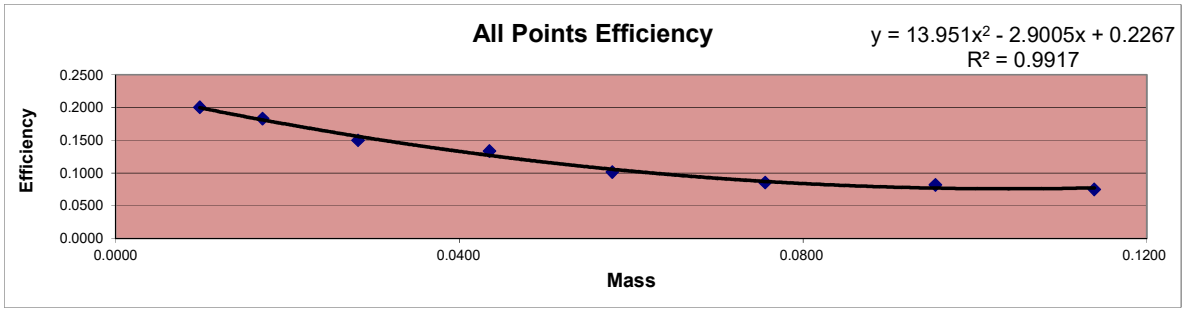
Curve is for Gross Alpha

Red 18

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
18	ICABT-1835503; A	5/15/2022 13:35	45	20331	451.800	2254.6	0.2004	1	0.0098
18	ICABT-1835503; B	5/15/2022 12:46	45	18556	412.356	2254.6	0.1829	1	0.0171
18	ICABT-1835503; C	5/14/2022 8:32	45	15220	338.222	2254.6	0.1500	1	0.0282
18	ICABT-1835503; D	5/15/2022 17:41	45	13562	301.378	2254.6	0.1337	1	0.0435
18	ICABT-1835503; E	5/15/2022 16:52	45	20588	457.511	4509.1	0.1015	2	0.0578
18	ICABT-1835503; F	5/15/2022 16:04	45	17350	385.556	4509.1	0.0855	2	0.0756
18	ICABT-1835503; G	5/15/2022 15:16	45	16600	368.889	4509.1	0.0818	2	0.0954
18	ICABT-1835503; H	5/15/2022 14:25	45	15231	338.467	4509.1	0.0751	2	0.1139

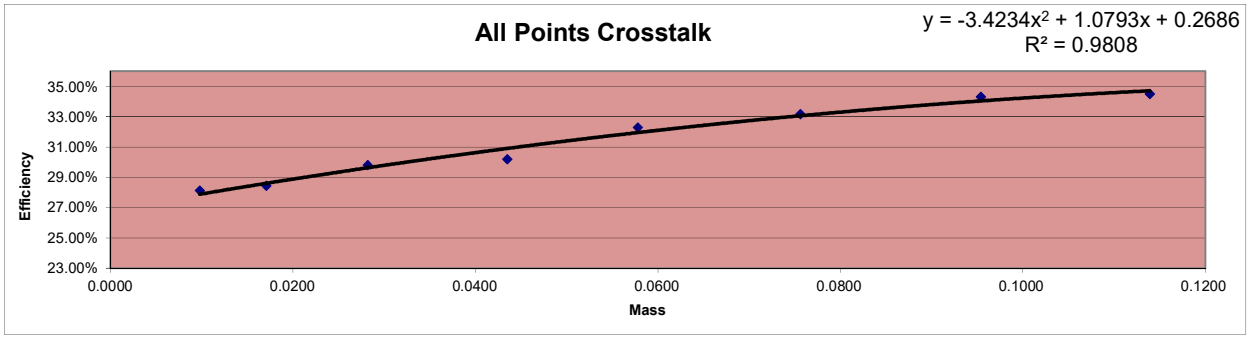
Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2004	0.1996	0.39%
0.0171	0.1829	0.1812	0.95%
0.0282	0.1500	0.1560	-3.84%
0.0435	0.1337	0.1269	5.32%
0.0578	0.1015	0.1057	-3.97%
0.0756	0.0855	0.0872	-1.90%
0.0954	0.0818	0.0770	6.30%
0.1139	0.0751	0.0773	-2.92%

Standard ID
Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	13.951
X Coeff:	-2.9005
Intercept:	0.2267

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20331	7955	451.80	176.78	28.12%	Min
ICABT-1835503; B	0.0171	45	18556	7374	412.36	163.87	28.44%	28.12%
ICABT-1835503; C	0.0282	45	15220	6459	338.22	143.53	29.79%	
ICABT-1835503; D	0.0435	45	13562	5863	301.38	130.29	30.18%	Max
ICABT-1835503; E	0.0578	45	20588	9815	457.51	218.11	32.28%	34.49%
ICABT-1835503; F	0.0756	45	17350	8608	385.56	191.29	33.16%	
ICABT-1835503; G	0.0954	45	16600	8667	368.89	192.60	34.30%	Mean
ICABT-1835503; H	0.1139	45	15231	8019	338.47	178.20	34.49%	31.35%



Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; C

Repeat 7

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 8:32:45 AM

Count Ended 5/14/2022 9:17:53 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	15,220	338.222	338.129
sd	0.010	123.369	2.742	2.742
Beta	0.286	6,459	143.533	143.247
sd	0.017	80.368	1.786	1.786

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; B

Repeat 8

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 12:46:34 PM

Count Ended 5/15/2022 1:31:43 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	18,556	412.356	412.263
sd	0.010	136.220	3.027	3.027
Beta	0.286	7,374	163.867	163.581
sd	0.017	85.872	1.908	1.908

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; A

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 1:35:09 PM

Count Ended 5/15/2022 2:20:18 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	20,331	451.800	451.707
sd	0.010	142.587	3.169	3.169
Beta	0.286	7,955	176.778	176.492
sd	0.017	89.191	1.982	1.982

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; H

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 2:25:45 PM

Count Ended 5/15/2022 3:10:52 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	15,231	338.467	338.374
sd	0.010	123.414	2.743	2.743
Beta	0.286	8,019	178.200	177.914
sd	0.017	89.549	1.990	1.990

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; G

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 3:16:32 PM

Count Ended 5/15/2022 4:01:40 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	16,600	368.889	368.796
sd	0.010	128.841	2.863	2.863
Beta	0.286	8,667	192.600	192.314
sd	0.017	93.097	2.069	2.069

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; F

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:04:35 PM

Count Ended 5/15/2022 4:49:44 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	17,350	385.556	385.463
sd	0.010	131.719	2.927	2.927
Beta	0.286	8,608	191.289	191.003
sd	0.017	92.779	2.062	2.062

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; E

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:52:58 PM

Count Ended 5/15/2022 5:38:05 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	20,588	457.511	457.418
sd	0.010	143.485	3.189	3.189
Beta	0.286	9,815	218.111	217.825
sd	0.017	99.071	2.202	2.202

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICABT-1835503; D

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 5:41:23 PM

Count Ended 5/15/2022 6:26:29 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

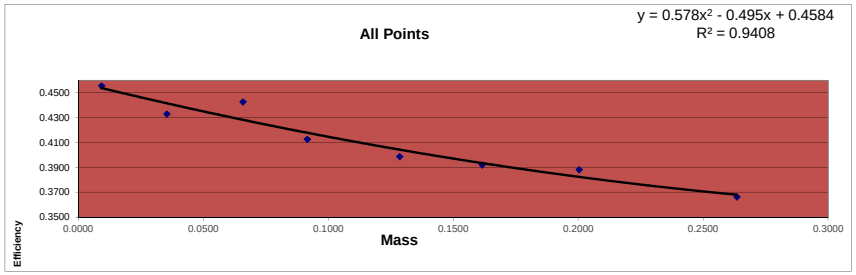
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	13,562	301.378	301.285
sd	0.010	116.456	2.588	2.588
Beta	0.286	5,863	130.289	130.003
sd	0.017	76.570	1.702	1.702

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 19

					DPM			
					35723.87	13-Jun		
					DPM			
					35721.52	14-Jun		
Detector ID	**Std ID**	**Count** Date	**Count** Time	**Beta** Counts	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
19	6322;B1	6/13/2019 22:07	5	81410	16282	0.4558	1mL	0.0092
19	6322;B2	6/13/2019 20:42	5	77354	15470.8	0.4331	1mL	0.0353
19	6322;B3	6/13/2019 20:15	5	79107	15821.4	0.4429	1mL	0.0658
19	6322;B4	6/13/2019 14:37	5	73707	14741.4	0.4126	1mL	0.0916
19	6322;B5	6/14/2019 12:27	5	71254	14250.8	0.3989	1mL	0.1285
19	6322;B6	6/14/2019 11:22	5	70031	14006.2	0.3921	1mL	0.1615
19	6322;B7	6/14/2019 1:02	5	69366	13873.2	0.3884	1mL	0.2003
19	6322;B8	6/13/2019 22:55	5	65443	13088.6	0.3664	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4558	0.4539	0.41%
0.0353	0.4331	0.4416	-1.94%
0.0658	0.4429	0.4283	3.40%
0.0916	0.4126	0.4179	-1.26%
0.1285	0.3989	0.4043	-1.33%
0.1615	0.3921	0.3935	-0.37%
0.2003	0.3884	0.3824	1.55%
0.2634	0.3664	0.3681	-0.47%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/14/2019	
Elapsed Time:	3557.000	days
Half Life:	10555.725	days
Exponential Term:	0.791700387	
Corrected Activity:	17860.76073	dpm/mL
Decay Activity (Sr/Y-90)	35721.52147	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B4

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:37:33 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:42:47 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	73,707	14,741.400	14,741.400
sd	0.000			0.000	271.490	54.298	54.298

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B3

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:15:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:21:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,107	15,821.400	15,821.400
sd	0.000			0.000	281.260	56.252	56.252

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B2

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:42:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:47:21 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	77,354	15,470.800	15,470.800
sd	0.000			0.000	278.126	55.625	55.625

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B1

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:07:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:12:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	81,410	16,282.000	16,282.000
sd	0.000			0.000	285.324	57.065	57.065

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B8

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:55:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 11:01:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	65,443	13,088.600	13,088.600
sd	0.000			0.000	255.818	51.164	51.164

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B7

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 1:02:06 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 1:07:19 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,366	13,873.200	13,873.200
sd	0.000			0.000	263.374	52.675	52.675

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B6

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 11:22:40 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 11:27:53 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	70,031	14,006.200	14,006.200
sd	0.000			0.000	264.634	52.927	52.927

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-6322;B5

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 12:27:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 12:32:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	71,254	14,250.800	14,250.800
sd	0.000			0.000	266.934	53.387	53.387

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

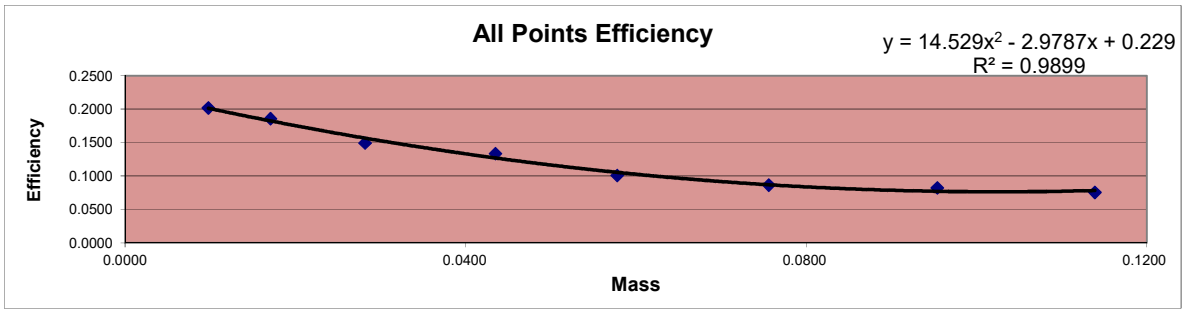
Red 19

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
19	ICABT-1835503; A	5/15/2022 14:25	45	20480	455.111	2254.6	0.2019	1	0.0098
19	ICABT-1835503; B	5/15/2022 13:35	45	18835	418.556	2254.6	0.1856	1	0.0171
19	ICABT-1835503; C	5/15/2022 12:46	45	15118	335.956	2254.6	0.1490	1	0.0282
19	ICABT-1835503; D	5/14/2022 8:32	45	13529	300.644	2254.6	0.1333	1	0.0435
19	ICABT-1835503; E	5/15/2022 17:41	45	20428	453.956	4509.1	0.1007	2	0.0578
19	ICABT-1835503; F	5/15/2022 16:53	45	17547	389.933	4509.1	0.0865	2	0.0756
19	ICABT-1835503; G	5/15/2022 16:04	45	16694	370.978	4509.1	0.0823	2	0.0954
19	ICABT-1835503; H	5/15/2022 15:16	45	15312	340.267	4509.1	0.0755	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2019	0.2012	0.33%
0.0171	0.1856	0.1823	1.83%
0.0282	0.1490	0.1566	-4.82%
0.0435	0.1333	0.1269	5.07%
0.0578	0.1007	0.1054	-4.46%
0.0756	0.0865	0.0868	-0.43%
0.0954	0.0823	0.0771	6.76%
0.1139	0.0755	0.0782	-3.52%

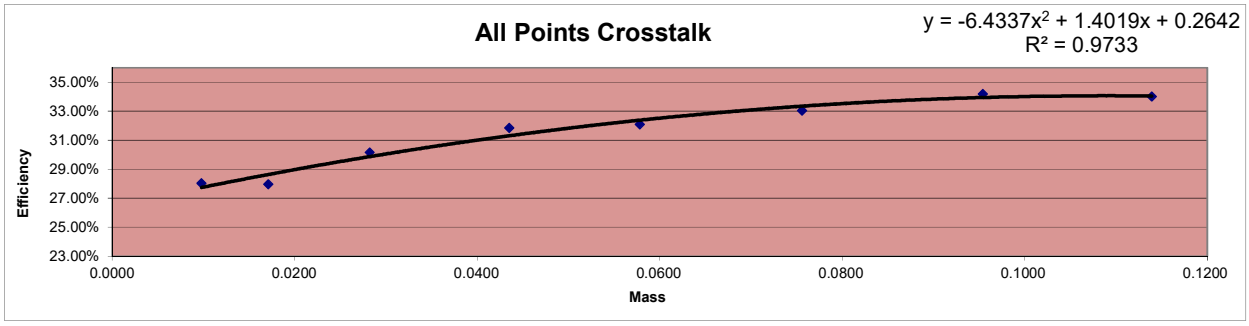
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.529
X Coeff:	-2.9787
Intercept:	0.229

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20480	7973	455.11	177.18	28.02%	Min
ICABT-1835503; B	0.0171	45	18835	7306	418.56	162.36	27.95%	27.95%
ICABT-1835503; C	0.0282	45	15118	6524	335.96	144.98	30.15%	
ICABT-1835503; D	0.0435	45	13529	6317	300.64	140.38	31.83%	Max
ICABT-1835503; E	0.0578	45	20428	9650	453.96	214.44	32.08%	34.18%
ICABT-1835503; F	0.0756	45	17547	8657	389.93	192.38	33.04%	
ICABT-1835503; G	0.0954	45	16694	8670	370.98	192.67	34.18%	Mean
ICABT-1835503; H	0.1139	45	15312	7892	340.27	175.38	34.01%	31.41%



Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; D

Repeat 7

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 8:32:51 AM

Count Ended 5/14/2022 9:17:59 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	13,529	300.644	300.580
sd	0.008	116.314	2.585	2.585
Beta	0.407	6,317	140.378	139.971
sd	0.020	79.480	1.766	1.766

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; C

Repeat 8

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 12:46:37 PM

Count Ended 5/15/2022 1:31:46 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	15,118	335.956	335.892
sd	0.008	122.955	2.732	2.732
Beta	0.407	6,524	144.978	144.571
sd	0.020	80.771	1.795	1.795

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; B

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 1:35:12 PM

Count Ended 5/15/2022 2:20:22 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	18,835	418.556	418.492
sd	0.008	137.241	3.050	3.050
Beta	0.407	7,306	162.356	161.949
sd	0.020	85.475	1.899	1.900

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; A

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 2:25:13 PM

Count Ended 5/15/2022 3:10:23 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	20,480	455.111	455.047
sd	0.008	143.108	3.180	3.180
Beta	0.407	7,973	177.178	176.771
sd	0.020	89.292	1.984	1.984

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; H

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 3:16:35 PM

Count Ended 5/15/2022 4:01:43 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	15,312	340.267	340.203
sd	0.008	123.742	2.750	2.750
Beta	0.407	7,892	175.378	174.971
sd	0.020	88.837	1.974	1.974

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; G

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:04:38 PM

Count Ended 5/15/2022 4:49:47 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	16,694	370.978	370.914
sd	0.008	129.205	2.871	2.871
Beta	0.407	8,670	192.667	192.260
sd	0.020	93.113	2.069	2.069

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; F

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:53:00 PM

Count Ended 5/15/2022 5:38:10 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	17,547	389.933	389.869
sd	0.008	132.465	2.944	2.944
Beta	0.407	8,657	192.378	191.971
sd	0.020	93.043	2.068	2.068

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICABT-1835503; E

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 5:41:27 PM

Count Ended 5/15/2022 6:26:35 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	20,428	453.956	453.892
sd	0.008	142.927	3.176	3.176
Beta	0.407	9,650	214.444	214.037
sd	0.020	98.234	2.183	2.183

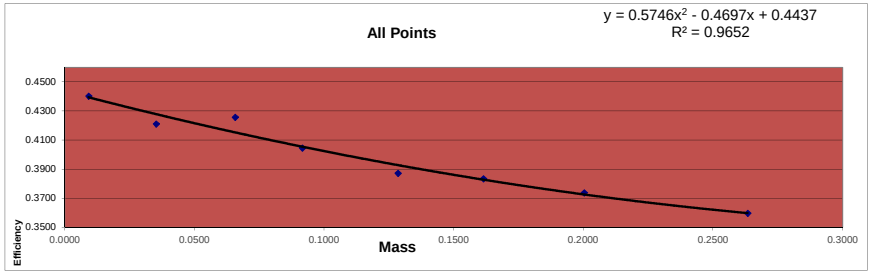
Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 20

					DPM	
					35723.87	13-Jun
					DPM	
					35721.52	14-Jun
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**
20	6322;B1	6/13/2019 22:55	5	78641	15728.200	0.4403
20	6322;B2	6/13/2019 22:07	5	75202	15040.400	0.4210
20	6322;B3	6/13/2019 20:42	5	76048	15209.600	0.4258
20	6322;B4	6/13/2019 20:15	5	72248	14449.600	0.4045
20	6322;B5	6/13/2019 14:37	5	69166	13833.200	0.3873
20	6322;B6	6/14/2019 12:27	5	68498	13699.600	0.3835
20	6322;B7	6/14/2019 11:22	5	66776	13355.200	0.3739
20	6322;B8	6/14/2019 1:02	5	64256	12851.200	0.3598

Standard Aliquot	**Sample Wt**
1mL	0.0092
1mL	0.0353
1mL	0.0658
1mL	0.0916
1mL	0.1285
1mL	0.1615
1mL	0.2003
1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4403	0.4393	0.22%
0.0353	0.4210	0.4277	-1.57%
0.0658	0.4258	0.4152	2.55%
0.0916	0.4045	0.4054	-0.22%
0.1285	0.3873	0.3928	-1.40%
0.1615	0.3835	0.3828	0.20%
0.2003	0.3739	0.3726	0.34%
0.2634	0.3598	0.3598	-0.01%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/14/2019	
Elapsed Time:	3557.000	days
Half Life:	10555.725	days
Exponential Term:	0.791700387	
Corrected Activity:	17860.76073	dpm/mL
Decay Activity (Sr/Y-90)	35721.52147	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B5

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:37:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:42:51 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,166	13,833.200	13,833.200
sd	0.000			0.000	262.994	52.599	52.599

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B4

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:15:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:21:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,248	14,449.600	14,449.600
sd	0.000			0.000	268.790	53.758	53.758

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B3

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:42:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:47:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,048	15,209.600	15,209.600
sd	0.000			0.000	275.768	55.154	55.154

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B2

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:07:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:12:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,202	15,040.400	15,040.400
sd	0.000			0.000	274.230	54.846	54.846

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B1

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:55:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 11:00:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	78,641	15,728.200	15,728.200
sd	0.000			0.000	280.430	56.086	56.086

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B8

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 1:02:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 1:07:23 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,256	12,851.200	12,851.200
sd	0.000			0.000	253.488	50.698	50.698

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B7

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 11:22:50 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 11:28:02 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	66,776	13,355.200	13,355.200
sd	0.000			0.000	258.411	51.682	51.682

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-6322;B6

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 12:27:39 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 12:32:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,498	13,699.600	13,699.600
sd	0.000			0.000	261.721	52.344	52.344

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

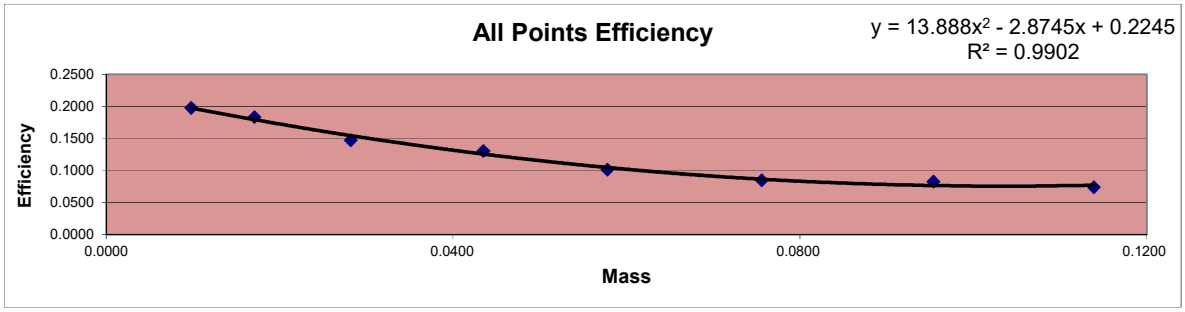
Red 20

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
20	ICABT-1835503; A	5/15/2022 15:16	45	20072	446.044	2254.6	0.1978	1	0.0098
20	ICABT-1835503; B	5/15/2022 14:25	45	18605	413.444	2254.6	0.1834	1	0.0171
20	ICABT-1835503; C	5/15/2022 13:35	45	14933	331.844	2254.6	0.1472	1	0.0282
20	ICABT-1835503; D	5/15/2022 12:46	45	13253	294.511	2254.6	0.1306	1	0.0435
20	ICABT-1835503; E	5/14/2022 8:32	45	20589	457.533	4509.1	0.1015	2	0.0578
20	ICABT-1835503; F	5/15/2022 17:41	45	17238	383.067	4509.1	0.0850	2	0.0756
20	ICABT-1835503; G	5/15/2022 16:53	45	16805	373.444	4509.1	0.0828	2	0.0954
20	ICABT-1835503; H	5/15/2022 16:04	45	15033	334.067	4509.1	0.0741	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1978	0.1977	0.09%
0.0171	0.1834	0.1794	2.21%
0.0282	0.1472	0.1545	-4.72%
0.0435	0.1306	0.1257	3.89%
0.0578	0.1015	0.1048	-3.13%
0.0756	0.0850	0.0866	-1.86%
0.0954	0.0828	0.0767	8.02%
0.1139	0.0741	0.0773	-4.12%

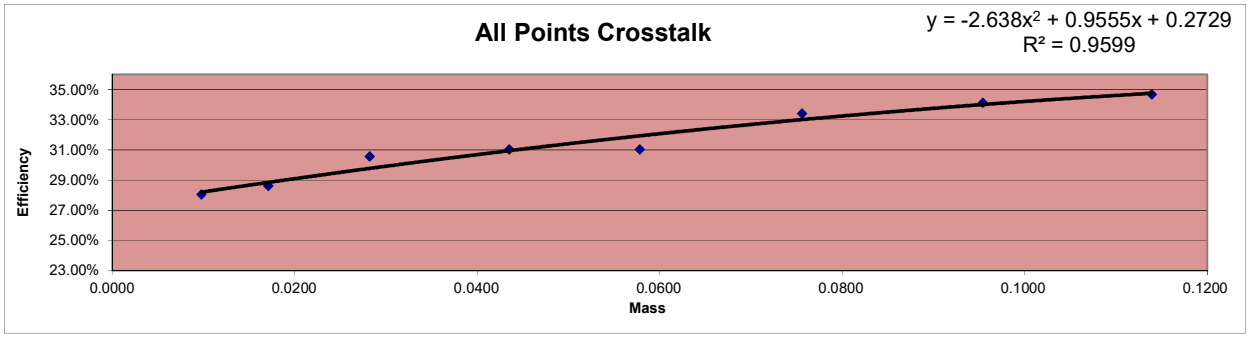
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	13.888
X Coeff:	-2.8745
Intercept:	0.2245

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20072	7824	446.04	173.87	28.05%	Min
ICABT-1835503; B	0.0171	45	18605	7451	413.44	165.58	28.60%	28.05%
ICABT-1835503; C	0.0282	45	14933	6571	331.84	146.02	30.56%	
ICABT-1835503; D	0.0435	45	13253	5962	294.51	132.49	31.03%	Max
ICABT-1835503; E	0.0578	45	20589	9263	457.53	205.84	31.03%	34.68%
ICABT-1835503; F	0.0756	45	17238	8646	383.07	192.13	33.40%	
ICABT-1835503; G	0.0954	45	16805	8696	373.44	193.24	34.10%	Mean
ICABT-1835503; H	0.1139	45	15033	7982	334.07	177.38	34.68%	31.43%



Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; E

Repeat 7

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 8:32:58 AM

Count Ended 5/14/2022 9:18:16 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	20,589	457.533	457.477
sd	0.007	143.489	3.189	3.189
Beta	0.353	9,263	205.844	205.491
sd	0.019	96.244	2.139	2.139

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; D

Repeat 8

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 12:46:40 PM

Count Ended 5/15/2022 1:31:47 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	13,253	294.511	294.455
sd	0.007	115.122	2.558	2.558
Beta	0.353	5,962	132.489	132.136
sd	0.019	77.214	1.716	1.716

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; C

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 1:35:16 PM

Count Ended 5/15/2022 2:20:26 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	14,933	331.844	331.788
sd	0.007	122.201	2.716	2.716
Beta	0.353	6,571	146.022	145.669
sd	0.019	81.062	1.801	1.801

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; B

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 2:25:19 PM

Count Ended 5/15/2022 3:10:27 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	18,605	413.444	413.388
sd	0.007	136.400	3.031	3.031
Beta	0.353	7,451	165.578	165.225
sd	0.019	86.319	1.918	1.918

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; A

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 3:16:09 PM

Count Ended 5/15/2022 4:01:17 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	20,072	446.044	445.988
sd	0.007	141.676	3.148	3.148
Beta	0.353	7,824	173.867	173.514
sd	0.019	88.453	1.966	1.966

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; H

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:04:42 PM

Count Ended 5/15/2022 4:49:51 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	15,033	334.067	334.011
sd	0.007	122.609	2.725	2.725
Beta	0.353	7,982	177.378	177.025
sd	0.019	89.342	1.985	1.985

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; G

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:53:04 PM

Count Ended 5/15/2022 5:38:11 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	16,805	373.444	373.388
sd	0.007	129.634	2.881	2.881
Beta	0.353	8,696	193.244	192.891
sd	0.019	93.252	2.072	2.072

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICABT-1835503; F

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 5:41:31 PM

Count Ended 5/15/2022 6:26:39 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

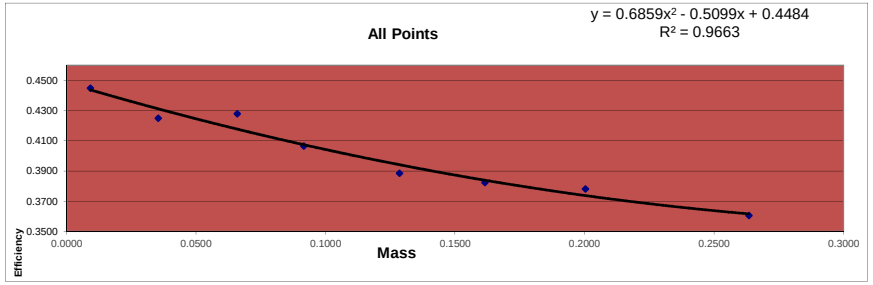
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	17,238	383.067	383.011
sd	0.007	131.294	2.918	2.918
Beta	0.353	8,646	192.133	191.780
sd	0.019	92.984	2.066	2.066

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 21

					DPM			
					35723.87	13-Jun		
					DPM			
					35721.52	14-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
21	6322;B1	6/14/2019 1:01	5	79449	15889.800	0.4448	1mL	0.0092
21	6322;B2	6/13/2019 22:55	5	75899	15179.800	0.4249	1mL	0.0353
21	6322;B3	6/13/2019 22:07	5	76426	15285.200	0.4279	1mL	0.0658
21	6322;B4	6/13/2019 20:42	5	72600	14520.000	0.4065	1mL	0.0916
21	6322;B5	6/13/2019 20:16	5	69407	13881.400	0.3886	1mL	0.1285
21	6322;B6	6/13/2019 14:37	5	68305	13661.000	0.3824	1mL	0.1615
21	6322;B7	6/14/2019 12:27	5	67561	13512.200	0.3783	1mL	0.2003
21	6322;B8	6/14/2019 11:22	5	64415	12883.000	0.3607	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4448	0.4438	0.24%
0.0353	0.4249	0.4312	-1.46%
0.0658	0.4279	0.4178	2.42%
0.0916	0.4065	0.4074	-0.23%
0.1285	0.3886	0.3942	-1.42%
0.1615	0.3824	0.3839	-0.39%
0.2003	0.3783	0.3738	1.20%
0.2634	0.3607	0.3617	-0.29%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/14/2019	
Elapsed Time:	3557.000	days
Half Life:	10555.725	days
Exponential Term:	0.791700387	
Corrected Activity:	17860.76073	dpm/mL
Decay Activity (Sr/Y-90)	35721.52147	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B6

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:37:45 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:42:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,305	13,661.000	13,661.000
sd	0.000			0.000	261.352	52.270	52.270

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B5

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:16:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:21:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,407	13,881.400	13,881.400
sd	0.000			0.000	263.452	52.690	52.690

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B4

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:42:16 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:47:28 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	72,600	14,520.000	14,520.000
sd	0.000			0.000	269.444	53.889	53.889

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B3

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:07:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:12:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,426	15,285.200	15,285.200
sd	0.000			0.000	276.453	55.291	55.291

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B2

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:55:33 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 11:00:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,899	15,179.800	15,179.800
sd	0.000			0.000	275.498	55.100	55.100

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B1

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 1:01:49 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 1:07:02 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	5	1.000	1.000
sd	0.000			0.000	2.236	0.447	0.447
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,449	15,889.800	15,889.800
sd	0.000			0.000	281.867	56.373	56.373

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B8

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 11:22:54 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 11:28:05 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,415	12,883.000	12,883.000
sd	0.000			0.000	253.801	50.760	50.760

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-6322;B7

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 12:27:43 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 12:32:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	67,561	13,512.200	13,512.200
sd	0.000			0.000	259.925	51.985	51.985

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

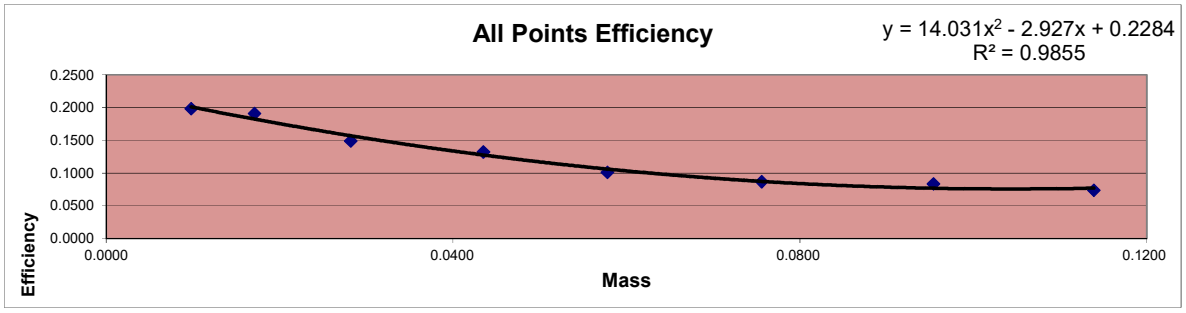
Red 21

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
21	ICABT-1835503; A	5/15/2022 16:04	45	20126	447.244	2254.6	0.1984	1	0.0098
21	ICABT-1835503; B	5/15/2022 15:16	45	19360	430.222	2254.6	0.1908	1	0.0171
21	ICABT-1835503; C	5/15/2022 14:25	45	15124	336.089	2254.6	0.1491	1	0.0282
21	ICABT-1835503; D	5/15/2022 13:35	45	13420	298.222	2254.6	0.1323	1	0.0435
21	ICABT-1835503; E	5/15/2022 12:46	45	20526	456.133	4509.1	0.1012	2	0.0578
21	ICABT-1835503; F	5/14/2022 8:33	45	17586	390.800	4509.1	0.0867	2	0.0756
21	ICABT-1835503; G	5/15/2022 17:41	45	16930	376.222	4509.1	0.0834	2	0.0954
21	ICABT-1835503; H	5/15/2022 16:53	45	14935	331.889	4509.1	0.0736	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.1984	0.2011	-1.34%
0.0171	0.1908	0.1825	4.59%
0.0282	0.1491	0.1570	-5.06%
0.0435	0.1323	0.1276	3.64%
0.0578	0.1012	0.1061	-4.65%
0.0756	0.0867	0.0873	-0.74%
0.0954	0.0834	0.0769	8.55%
0.1139	0.0736	0.0770	-4.46%

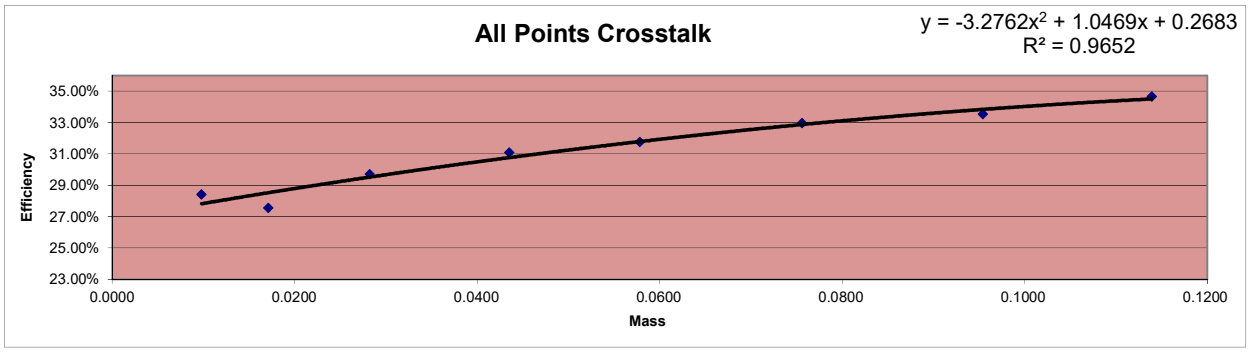
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.031
X Coeff:	-2.927
Intercept:	0.2284

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20126	7985	447.24	177.44	28.41%	Min
ICABT-1835503; B	0.0171	45	19360	7363	430.22	163.62	27.55%	27.55%
ICABT-1835503; C	0.0282	45	15124	6393	336.09	142.07	29.71%	
ICABT-1835503; D	0.0435	45	13420	6052	298.22	134.49	31.08%	Max
ICABT-1835503; E	0.0578	45	20526	9549	456.13	212.20	31.75%	34.65%
ICABT-1835503; F	0.0756	45	17586	8647	390.80	192.16	32.96%	
ICABT-1835503; G	0.0954	45	16930	8543	376.22	189.84	33.54%	Mean
ICABT-1835503; H	0.1139	45	14935	7918	331.89	175.96	34.65%	31.21%



Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; F

Repeat 7

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 8:33:04 AM

Count Ended 5/14/2022 9:18:16 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	17,586	390.800	390.724
sd	0.009	132.612	2.947	2.947
Beta	0.281	8,647	192.156	191.875
sd	0.017	92.989	2.066	2.066

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; E

Repeat 8

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 12:46:44 PM

Count Ended 5/15/2022 1:31:53 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	20,526	456.133	456.057
sd	0.009	143.269	3.184	3.184
Beta	0.281	9,549	212.200	211.919
sd	0.017	97.719	2.172	2.172

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; D

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 1:35:19 PM

Count Ended 5/15/2022 2:20:26 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	13,420	298.222	298.146
sd	0.009	115.845	2.574	2.574
Beta	0.281	6,052	134.489	134.208
sd	0.017	77.795	1.729	1.729

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; C

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 2:25:23 PM

Count Ended 5/15/2022 3:10:30 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	15,124	336.089	336.013
sd	0.009	122.980	2.733	2.733
Beta	0.281	6,393	142.067	141.786
sd	0.017	79.956	1.777	1.777

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; B

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 3:16:12 PM

Count Ended 5/15/2022 4:01:20 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	19,360	430.222	430.146
sd	0.009	139.140	3.092	3.092
Beta	0.281	7,363	163.622	163.341
sd	0.017	85.808	1.907	1.907

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; A

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:04:17 PM

Count Ended 5/15/2022 4:49:27 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	20,126	447.244	447.168
sd	0.009	141.866	3.153	3.153
Beta	0.281	7,985	177.444	177.163
sd	0.017	89.359	1.986	1.986

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; H

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:53:08 PM

Count Ended 5/15/2022 5:38:17 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	14,935	331.889	331.813
sd	0.009	122.209	2.716	2.716
Beta	0.281	7,918	175.956	175.675
sd	0.017	88.983	1.977	1.977

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICABT-1835503; G

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 5:41:34 PM

Count Ended 5/15/2022 6:26:42 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

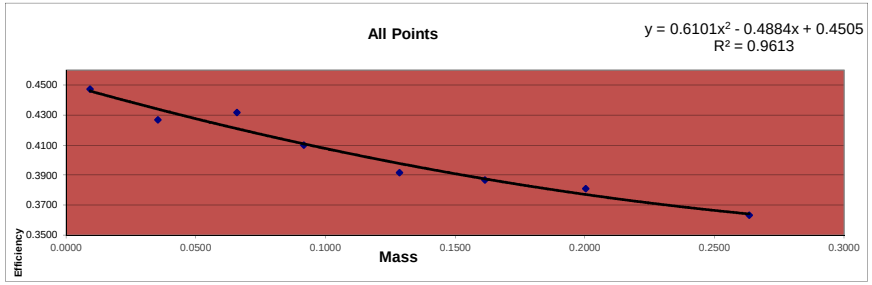
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	16,930	376.222	376.146
sd	0.009	130.115	2.891	2.891
Beta	0.281	8,543	189.844	189.563
sd	0.017	92.428	2.054	2.054

Curve is for Gross Beta
Strontium 90
and
Total Strontium

Red 22

					DPM			
					35723.87	13-Jun		
					DPM			
					35721.52	14-Jun		
Detector ID	**Std ID**	**Count Date**	**Count Time**	**Beta Counts**	**CPM**	**Sr-90 Eff**	**Standard Aliquot**	**Sample Wt**
22	6322;B1	6/14/2019 11:22	5	79900	15980.000	0.4473	1mL	0.0092
22	6322;B2	6/14/2019 1:01	5	76238	15247.600	0.4268	1mL	0.0353
22	6322;B3	6/13/2019 22:55	5	77132	15426.400	0.4319	1mL	0.0658
22	6322;B4	6/13/2019 22:07	5	73234	14646.800	0.4100	1mL	0.0916
22	6322;B5	6/13/2019 20:42	5	69940	13988.000	0.3916	1mL	0.1285
22	6322;B6	6/13/2019 20:16	5	69089	13817.800	0.3868	1mL	0.1615
22	6322;B7	6/13/2019 14:37	5	68041	13608.200	0.3810	1mL	0.2003
22	6322;B8	6/14/2019 12:27	5	64892	12978.400	0.3633	1mL	0.2634

Mass	**Measured Efficiency**	**Theoretical Efficiency**	**Percent Δ Efficiency**
0.0092	0.4473	0.4461	0.29%
0.0353	0.4268	0.4340	-1.65%
0.0658	0.4319	0.4210	2.58%
0.0916	0.4100	0.4109	-0.20%
0.1285	0.3916	0.3978	-1.56%
0.1615	0.3868	0.3875	-0.18%
0.2003	0.3810	0.3771	1.01%
0.2634	0.3633	0.3642	-0.24%



Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/13/2019	
Elapsed Time:	3556.000	days
Half Life:	10555.725	days
Exponential Term:	0.791752376	
Corrected Activity:	17861.93361	dpm/mL
Decay Activity (Sr/Y-90)	35723.86722	dpm

Standard ID
Strontium 90
Sr-90_00004 #6322
Cert# 80573-334 Ref. date 9/17/2009

Initial Activity:	22560	dpm/mL
Reference Date:	9/17/2009	
Count Date:	6/14/2019	
Elapsed Time:	3557.000	days
Half Life:	10555.725	days
Exponential Term:	0.791700387	
Corrected Activity:	17860.76073	dpm/mL
Decay Activity (Sr/Y-90)	35721.52147	dpm

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B7

Repeat 1

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 2:37:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 2:43:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	68,041	13,608.200	13,608.200
sd	0.000			0.000	260.847	52.169	52.169

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B6

Repeat 2

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:16:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:21:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,089	13,817.800	13,817.800
sd	0.000			0.000	262.848	52.570	52.570

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B5

Repeat 3

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 8:42:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 8:47:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	13	2.600	2.600
sd	0.000			0.000	3.606	0.721	0.721
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	69,940	13,988.000	13,988.000
sd	0.000			0.000	264.462	52.892	52.892

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B4

Repeat 4

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:07:48 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 10:13:00 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	10	2.000	2.000
sd	0.000			0.000	3.162	0.632	0.632
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	73,234	14,646.800	14,646.800
sd	0.000			0.000	270.618	54.124	54.124

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B3

Repeat 5

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/13/2019 10:55:34 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/13/2019 11:00:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	7	1.400	1.400
sd	0.000			0.000	2.646	0.529	0.529
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	77,132	15,426.400	15,426.400
sd	0.000			0.000	277.726	55.545	55.545

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B2

Repeat 6

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 1:01:52 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 1:07:05 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,238	15,247.600	15,247.600
sd	0.000			0.000	276.112	55.222	55.222

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B1

Repeat 7

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 11:22:59 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 11:28:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	12	2.400	2.400
sd	0.000			0.000	3.464	0.693	0.693
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	79,900	15,980.000	15,980.000
sd	0.000			0.000	282.666	56.533	56.533

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-6322;B8

Repeat 8

Carrier No. 0

Batch ID m122627

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 6/14/2019 12:27:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 6/14/2019 12:32:59 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	6	1.200	1.200
sd	0.000			0.000	2.449	0.490	0.490
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	64,892	12,978.400	12,978.400
sd	0.000			0.000	254.739	50.948	50.948

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Curve is for Gross Alpha

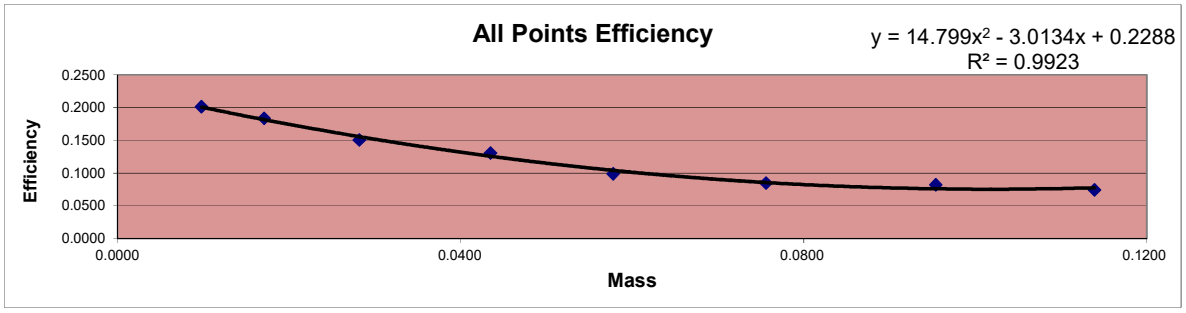
Red 22

Detector ID	Sample ID	Count Date	Count Time	Alpha Counts	Net CPM	DPM	Th-230 Efficiency	Standard Aliquot (mL)	Mass
22	ICABT-1835503; A	5/15/2022 16:52	45	20425	453.889	2254.6	0.2013	1	0.0098
22	ICABT-1835503; B	5/15/2022 16:04	45	18641	414.244	2254.6	0.1837	1	0.0171
22	ICABT-1835503; C	5/15/2022 15:16	45	15297	339.933	2254.6	0.1508	1	0.0282
22	ICABT-1835503; D	5/15/2022 14:25	45	13241	294.244	2254.6	0.1305	1	0.0435
22	ICABT-1835503; E	5/15/2022 13:35	45	20096	446.578	4509.1	0.0990	2	0.0578
22	ICABT-1835503; F	5/15/2022 12:46	45	17239	383.089	4509.1	0.0850	2	0.0756
22	ICABT-1835503; G	5/14/2022 8:33	45	16706	371.244	4509.1	0.0823	2	0.0954
22	ICABT-1835503; H	5/15/2022 17:41	45	15074	334.978	4509.1	0.0743	2	0.1139

Mass	Measured Efficiency	Theoretical Efficiency	Percent Δ Efficiency
0.0098	0.2013	0.2007	0.31%
0.0171	0.1837	0.1816	1.18%
0.0282	0.1508	0.1556	-3.10%
0.0435	0.1305	0.1257	3.81%
0.0578	0.0990	0.1041	-4.83%
0.0756	0.0850	0.0856	-0.71%
0.0954	0.0823	0.0760	8.32%
0.1139	0.0743	0.0776	-4.22%

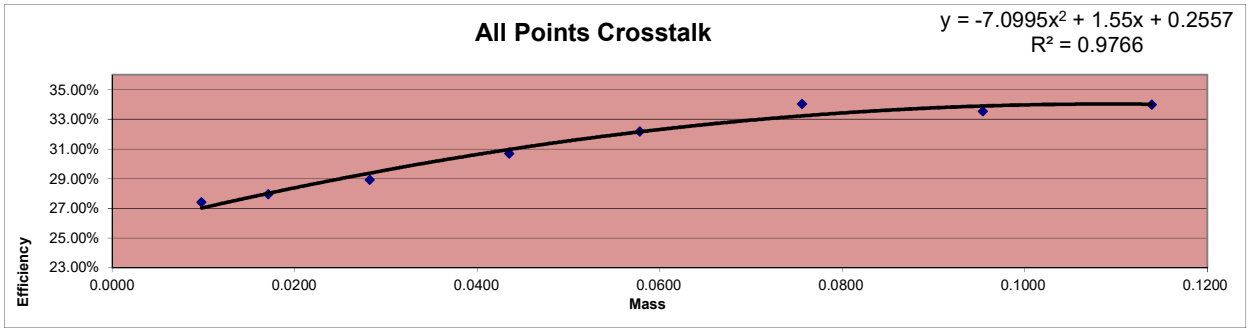
Standard ID

Thorium-230
Th-230_00052
Container#: 1835503
Cert #: 114474 Ref. date 10/29/2019
Activity (dpm) 2254.57



X^2 Coeff:	14.799
X Coeff:	-3.0134
Intercept:	0.2288

Sample ID	Mass	Count Time	Alpha Counts	Beta Counts	Alpha CPM	Beta CPM	% α into β	
ICABT-1835503; A	0.0098	45	20425	7714	453.89	171.42	27.41%	Min
ICABT-1835503; B	0.0171	45	18641	7232	414.24	160.71	27.95%	27.41%
ICABT-1835503; C	0.0282	45	15297	6222	339.93	138.27	28.91%	
ICABT-1835503; D	0.0435	45	13241	5859	294.24	130.20	30.68%	Max
ICABT-1835503; E	0.0578	45	20096	9528	446.58	211.73	32.16%	34.02%
ICABT-1835503; F	0.0756	45	17239	8890	383.09	197.56	34.02%	
ICABT-1835503; G	0.0954	45	16706	8427	371.24	187.27	33.53%	Mean
ICABT-1835503; H	0.1139	45	15074	7759	334.98	172.42	33.98%	31.08%



Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; G

Repeat 7

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/14/2022 8:33:11 AM

Count Ended 5/14/2022 9:18:20 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	16,706	371.244	371.147
sd	0.010	129.252	2.872	2.872
Beta	0.337	8,427	187.267	186.930
sd	0.018	91.799	2.040	2.040

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; F

Repeat 8

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 12:46:48 PM

Count Ended 5/15/2022 1:31:56 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	17,239	383.089	382.992
sd	0.010	131.297	2.918	2.918
Beta	0.337	8,890	197.556	197.219
sd	0.018	94.287	2.095	2.095

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; E

Repeat 9

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 1:35:22 PM

Count Ended 5/15/2022 2:20:32 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	20,096	446.578	446.481
sd	0.010	141.760	3.150	3.150
Beta	0.337	9,528	211.733	211.396
sd	0.018	97.611	2.169	2.169

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; D

Repeat 10

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 2:25:27 PM

Count Ended 5/15/2022 3:10:33 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	13,241	294.244	294.147
sd	0.010	115.070	2.557	2.557
Beta	0.337	5,859	130.200	129.863
sd	0.018	76.544	1.701	1.701

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; C

Repeat 11

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 3:16:15 PM

Count Ended 5/15/2022 4:01:24 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	15,297	339.933	339.836
sd	0.010	123.681	2.748	2.748
Beta	0.337	6,222	138.267	137.930
sd	0.018	78.880	1.753	1.753

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; B

Repeat 12

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:04:20 PM

Count Ended 5/15/2022 4:49:28 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	18,641	414.244	414.147
sd	0.010	136.532	3.034	3.034
Beta	0.337	7,232	160.711	160.374
sd	0.018	85.041	1.890	1.890

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; A

Repeat 13

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 4:52:42 PM

Count Ended 5/15/2022 5:37:51 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	20,425	453.889	453.792
sd	0.010	142.916	3.176	3.176
Beta	0.337	7,714	171.422	171.085
sd	0.018	87.829	1.952	1.952

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICABT-1835503; H

Repeat 14

Carrier No. 0

Batch ID 565419

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/15/2022 5:41:37 PM

Count Ended 5/15/2022 6:26:45 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

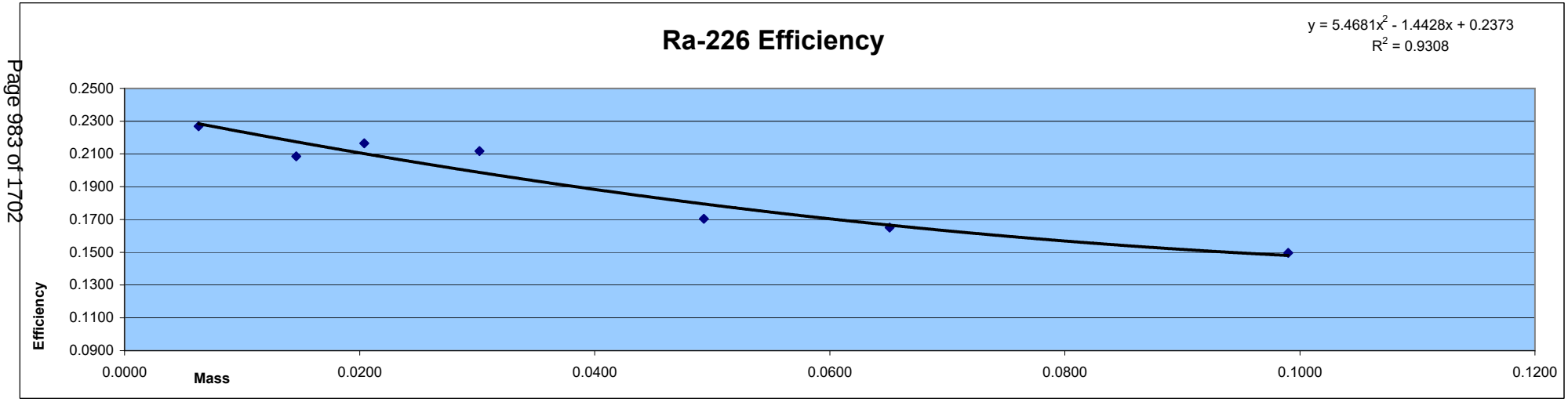
	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	15,074	334.978	334.881
sd	0.010	122.776	2.728	2.728
Beta	0.337	7,759	172.422	172.085
sd	0.018	88.085	1.957	1.958

Ra-226 Calibrations

Ra-226 Calibration 2019

Blue 3

Std #	Sample Time	Count Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency	Mass
ICRa6-1063071;Ra2	7/26/2019 16:32	15	46028	3068.5333	2/13/2017 13:30	4.0000	0.4487	1709.6036	7534.6	0.2269	0.0063
ICRa6-1063071;Ra3	7/26/2019 16:14	15	65354	4356.9333	2/13/2017 13:30	4.0000	0.6933	1571.1758	7534.6	0.2085	0.0146
ICRa6-1063071;Ra4	7/26/2019 15:56	15	71098	4739.8667	2/13/2017 13:30	4.0000	0.7265	1631.0622	7534.6	0.2165	0.0204
ICRa6-1063071;Ra5	7/26/2019 18:14	15	82384	5492.2667	2/13/2017 13:30	4.0000	0.8604	1595.8469	7534.6	0.2118	0.0302
ICRa6-1063071;Ra6	7/26/2019 17:42	15	72176	4811.7333	2/13/2017 13:30	4.0000	0.9364	1284.6774	7534.6	0.1705	0.0493
ICRa6-1063071;Ra7	7/26/2019 17:23	15	69202	4613.4667	2/13/2017 13:30	4.0000	0.9274	1243.7232	7534.6	0.1651	0.0651
ICRa6-1063071;Ra8	7/26/2019 17:06	15	63621	4241.4000	2/13/2017 13:30	4.0000	0.9402	1127.8279	7534.6	0.1497	0.0990



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICRa6-1063071;Ra4

Repeat 18

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/26/2019 3:56:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/26/2019 4:11:43 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	71,098	4,739.867	4,739.781
sd	0.000			0.009	266.642	17.776	17.776
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	82,741	5,516.067	5,515.674
sd	0.000			0.020	287.647	19.176	19.177

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICRa6-1063071;Ra3

Repeat 19

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/26/2019 4:14:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/26/2019 4:30:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	65,354	4,356.933	4,356.847
sd	0.000			0.009	255.644	17.043	17.043
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	75,403	5,026.867	5,026.474
sd	0.000			0.020	274.596	18.306	18.306

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICRa6-1063071;Ra2

Repeat 20

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/26/2019 4:32:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/26/2019 4:47:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	46,028	3,068.533	3,068.447
sd	0.000			0.009	214.541	14.303	14.303
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	51,168	3,411.200	3,410.807
sd	0.000			0.020	226.203	15.080	15.080

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICRa6-1063071;Ra8

Repeat 21

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/26/2019 5:06:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/26/2019 5:21:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	63,621	4,241.400	4,241.314
sd	0.000			0.009	252.232	16.815	16.815
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	99,452	6,630.133	6,629.740
sd	0.000			0.020	315.360	21.024	21.024

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICRa6-1063071;Ra7

Repeat 23

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/26/2019 5:23:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/26/2019 5:38:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	69,202	4,613.467	4,613.381
sd	0.000			0.009	263.063	17.538	17.538
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	96,142	6,409.467	6,409.074
sd	0.000			0.020	310.068	20.671	20.671

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICRa6-1063071;Ra6

Repeat 24

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/26/2019 5:42:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/26/2019 5:57:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	72,176	4,811.733	4,811.647
sd	0.000			0.009	268.656	17.910	17.910
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	97,377	6,491.800	6,491.407
sd	0.000			0.020	312.053	20.804	20.804

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICRa6-1063071;Ra5

Repeat 25

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/26/2019 6:14:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/26/2019 6:29:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	82,384	5,492.267	5,492.181
sd	0.000			0.009	287.026	19.135	19.135
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	96,306	6,420.400	6,420.007
sd	0.000			0.020	310.332	20.689	20.689

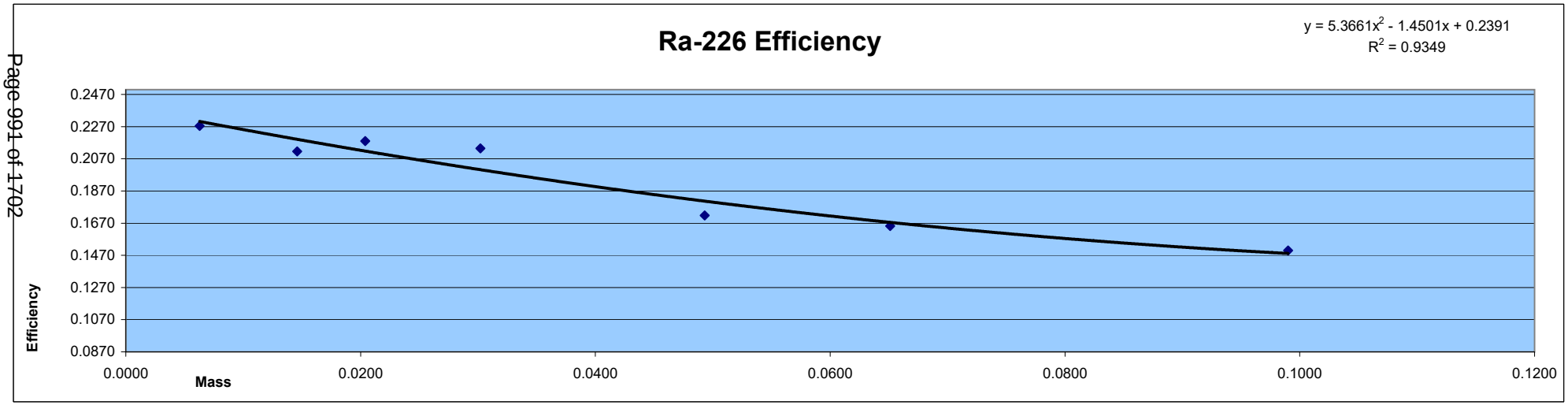
	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Blue 10

Std #	Sample Time	Count Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency	Mass
ICRa6-1063071;Ra2	7/24/2019 13:58	15	46141	3076.0667	2/13/2017 13:30	4.0000	0.4487	1713.8007	7534.6	0.2275	0.0063
ICRa6-1063071;Ra3	7/24/2019 13:40	15	66333	4422.2000	2/13/2017 13:30	4.0000	0.6933	1594.7119	7534.6	0.2117	0.0146
ICRa6-1063071;Ra4	7/24/2019 17:07	15	71613	4774.2000	2/13/2017 13:30	4.0000	0.7265	1642.8768	7534.6	0.2180	0.0204
ICRa6-1063071;Ra5	7/24/2019 16:50	15	83057	5537.1333	2/13/2017 13:30	4.0000	0.8604	1608.8835	7534.6	0.2135	0.0302
ICRa6-1063071;Ra6	7/24/2019 16:26	15	72708	4847.2000	2/13/2017 13:30	4.0000	0.9364	1294.1465	7534.6	0.1718	0.0493
ICRa6-1063071;Ra7	7/24/2019 15:48	15	69277	4618.4667	2/13/2017 13:30	4.0000	0.9274	1245.0711	7534.6	0.1652	0.0651
ICRa6-1063071;Ra8	7/24/2019 15:16	15	63768	4251.2000	2/13/2017 13:30	4.0000	0.9402	1130.4339	7534.6	0.1500	0.0990



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICRa6-1063071;Ra3

Repeat 10

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 1:40:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 1:55:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	66,333	4,422.200	4,422.068
sd	0.000			0.011	257.552	17.170	17.170
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	76,445	5,096.333	5,096.035
sd	0.000			0.017	276.487	18.432	18.432

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICRa6-1063071;Ra2

Repeat 11

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *Sample* **sd** 0 *Sample*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/24/2019 1:58:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/24/2019 2:13:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	46,141	3,076.067	3,075.935
sd	0.000			0.011	214.805	14.320	14.320
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	51,199	3,413.267	3,412.969
sd	0.000			0.017	226.272	15.085	15.085

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICRa6-1063071;Ra8

Repeat 12

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 3:16:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 3:32:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	63,768	4,251.200	4,251.068
sd	0.000			0.011	252.523	16.835	16.835
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	99,772	6,651.467	6,651.169
sd	0.000			0.017	315.867	21.058	21.058

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICRa6-1063071;Ra7

Repeat 14

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 3:48:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 4:03:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	69,277	4,618.467	4,618.335
sd	0.000			0.011	263.205	17.547	17.547
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	96,832	6,455.467	6,455.169
sd	0.000			0.017	311.178	20.745	20.745

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICRa6-1063071;Ra6

Repeat 15

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 4:26:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 4:41:32 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	72,708	4,847.200	4,847.068
sd	0.000			0.011	269.644	17.976	17.976
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	98,322	6,554.800	6,554.502
sd	0.000			0.017	313.563	20.904	20.904

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICRa6-1063071;Ra5

Repeat 16

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 4:50:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:05:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	83,057	5,537.133	5,537.001
sd	0.000			0.011	288.196	19.213	19.213
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	97,101	6,473.400	6,473.102
sd	0.000			0.017	311.610	20.774	20.774

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICRa6-1063071;Ra4

Repeat 17

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 5:07:43 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:23:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	71,613	4,774.200	4,774.068
sd	0.000			0.011	267.606	17.840	17.840
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	83,167	5,544.467	5,544.169
sd	0.000			0.017	288.387	19.226	19.226

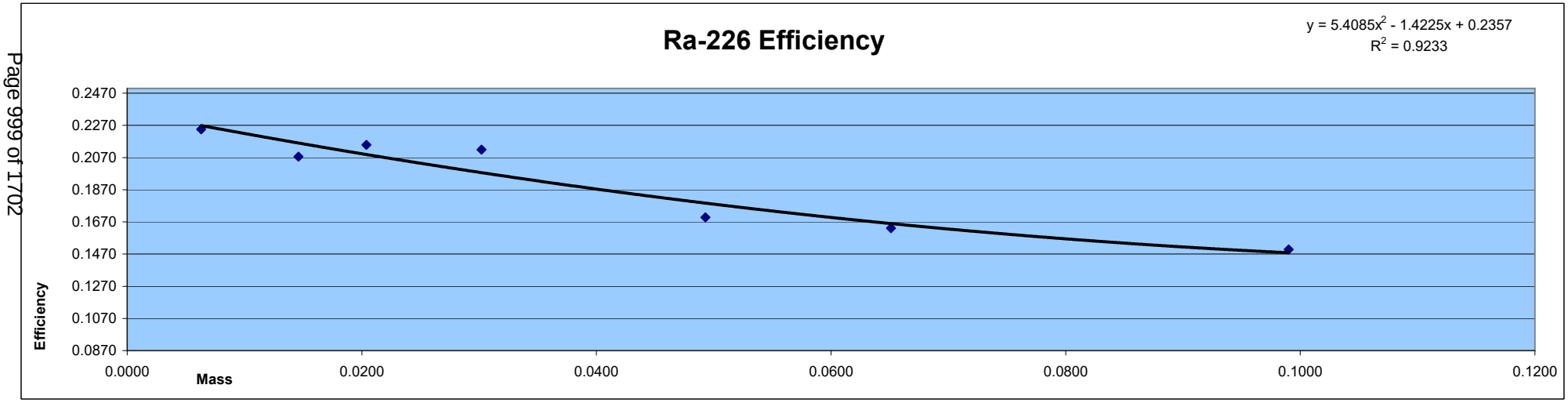
	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Blue 11

Std #	Sample Time	Count Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency	Mass
ICRa6-1063071;Ra2	7/24/2019 14:34	15	45544	3036.2667	2/13/2017 13:30	4.0000	0.4487	1691.6266	7534.6	0.2245	0.0063
ICRa6-1063071;Ra3	7/24/2019 13:58	15	65074	4338.2667	2/13/2017 13:30	4.0000	0.6933	1564.4443	7534.6	0.2076	0.0146
ICRa6-1063071;Ra4	7/24/2019 13:40	15	70591	4706.0667	2/13/2017 13:30	4.0000	0.7265	1619.4311	7534.6	0.2149	0.0204
ICRa6-1063071;Ra5	7/24/2019 17:07	15	82464	5497.6000	2/13/2017 13:30	4.0000	0.8604	1597.3966	7534.6	0.2120	0.0302
ICRa6-1063071;Ra6	7/24/2019 16:50	15	71922	4794.8000	2/13/2017 13:30	4.0000	0.9364	1280.1563	7534.6	0.1699	0.0493
ICRa6-1063071;Ra7	7/24/2019 16:26	15	68380	4558.6667	2/13/2017 13:30	4.0000	0.9274	1228.9499	7534.6	0.1631	0.0651
ICRa6-1063071;Ra8	7/24/2019 15:48	15	63691	4246.0667	2/13/2017 13:30	4.0000	0.9402	1129.0689	7534.6	0.1499	0.0990



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICRa6-1063071;Ra4

Repeat 10

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 1:40:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 1:55:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	70,591	4,706.067	4,705.993
sd	0.000			0.009	265.690	17.713	17.713
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	84,254	5,616.933	5,616.483
sd	0.000			0.021	290.265	19.351	19.351

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICRa6-1063071;Ra3

Repeat 11

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 1:58:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 2:13:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	65,074	4,338.267	4,338.193
sd	0.000			0.009	255.096	17.006	17.006
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	76,073	5,071.533	5,071.083
sd	0.000			0.021	275.813	18.388	18.388

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICRa6-1063071;Ra2

Repeat 12

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 2:34:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 2:49:58 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	45,544	3,036.267	3,036.193
sd	0.000			0.009	213.410	14.227	14.227
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	51,419	3,427.933	3,427.483
sd	0.000			0.021	226.758	15.117	15.117

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICRa6-1063071;Ra8

Repeat 13

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 3:48:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 4:03:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	63,691	4,246.067	4,245.993
sd	0.000			0.009	252.371	16.825	16.825
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	100,815	6,721.000	6,720.550
sd	0.000			0.021	317.514	21.168	21.168

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICRa6-1063071;Ra7

Repeat 15

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 4:26:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 4:41:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	68,380	4,558.667	4,558.593
sd	0.000			0.009	261.496	17.433	17.433
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	97,043	6,469.533	6,469.083
sd	0.000			0.021	311.517	20.768	20.768

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICRa6-1063071;Ra6

Repeat 16

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 4:50:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:05:33 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	71,922	4,794.800	4,794.726
sd	0.000			0.009	268.183	17.879	17.879
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	99,009	6,600.600	6,600.150
sd	0.000			0.021	314.657	20.977	20.977

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICRa6-1063071;Ra5

Repeat 17

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 5:07:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:23:10 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	82,464	5,497.600	5,497.526
sd	0.000			0.009	287.165	19.144	19.144
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	97,437	6,495.800	6,495.350
sd	0.000			0.021	312.149	20.810	20.810

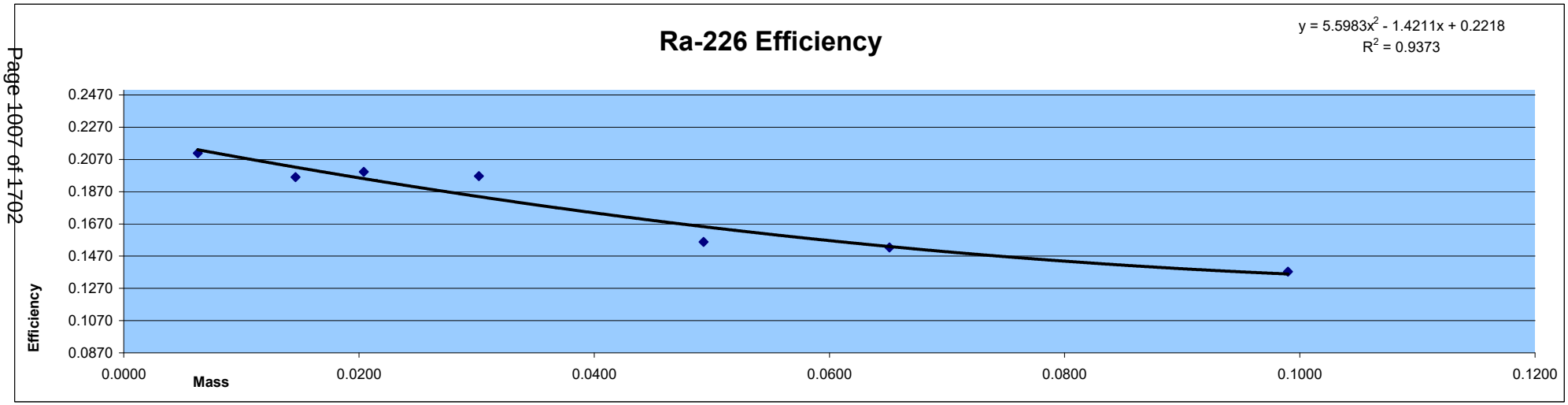
	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Blue 12

Std #	Sample Time	Count Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency	Mass
ICRa6-1063071;Ra2	7/24/2019 15:17	15	42771	2851.400	2/13/2017 13:30	4.0000	0.4487	1588.6299	7534.6	0.2108	0.0063
ICRa6-1063071;Ra3	7/24/2019 14:34	15	61453	4096.867	2/13/2017 13:30	4.0000	0.6933	1477.3918	7534.6	0.1961	0.0146
ICRa6-1063071;Ra4	7/24/2019 13:58	15	65449	4363.267	2/13/2017 13:30	4.0000	0.7265	1501.4682	7534.6	0.1993	0.0204
ICRa6-1063071;Ra5	7/24/2019 13:40	15	76519	5101.267	2/13/2017 13:30	4.0000	0.8604	1482.2369	7534.6	0.1967	0.0302
ICRa6-1063071;Ra6	7/24/2019 17:07	15	65981	4398.733	2/13/2017 13:30	4.0000	0.9364	1174.4111	7534.6	0.1559	0.0493
ICRa6-1063071;Ra7	7/24/2019 16:50	15	63875	4258.333	2/13/2017 13:30	4.0000	0.9274	1147.9844	7534.6	0.1524	0.0651
ICRa6-1063071;Ra8	7/24/2019 16:26	15	58360	3890.667	2/13/2017 13:30	4.0000	0.9402	1034.5647	7534.6	0.1373	0.0990



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICRa6-1063071;Ra5

Repeat 10

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 1:40:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 1:55:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	76,519	5,101.267	5,101.149
sd	0.000			0.011	276.621	18.441	18.441
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	102,691	6,846.067	6,845.710
sd	0.000			0.019	320.454	21.364	21.364

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICRa6-1063071;Ra4

Repeat 11

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 1:58:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 2:13:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	65,449	4,363.267	4,363.149
sd	0.000			0.011	255.830	17.055	17.055
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	88,049	5,869.933	5,869.576
sd	0.000			0.019	296.731	19.782	19.782

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICRa6-1063071;Ra3

Repeat 12

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 2:34:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 2:50:06 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	61,453	4,096.867	4,096.749
sd	0.000			0.011	247.897	16.526	16.526
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	79,673	5,311.533	5,311.176
sd	0.000			0.019	282.264	18.818	18.818

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICRa6-1063071;Ra2

Repeat 13

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 3:17:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 3:32:18 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	42,771	2,851.400	2,851.282
sd	0.000			0.011	206.812	13.787	13.787
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	54,183	3,612.200	3,611.843
sd	0.000			0.019	232.772	15.518	15.518

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICRa6-1063071;Ra8

Repeat 14

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 4:26:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 4:41:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	58,360	3,890.667	3,890.549
sd	0.000			0.011	241.578	16.105	16.105
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	105,447	7,029.800	7,029.443
sd	0.000			0.019	324.726	21.648	21.648

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICRa6-1063071;Ra7

Repeat 16

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 4:50:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:05:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	63,875	4,258.333	4,258.215
sd	0.000			0.011	252.735	16.849	16.849
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	102,124	6,808.267	6,807.910
sd	0.000			0.019	319.568	21.305	21.305

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICRa6-1063071;Ra6

Repeat 17

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 5:07:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:23:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	65,981	4,398.733	4,398.615
sd	0.000			0.011	256.868	17.125	17.125
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	103,183	6,878.867	6,878.510
sd	0.000			0.019	321.221	21.415	21.415

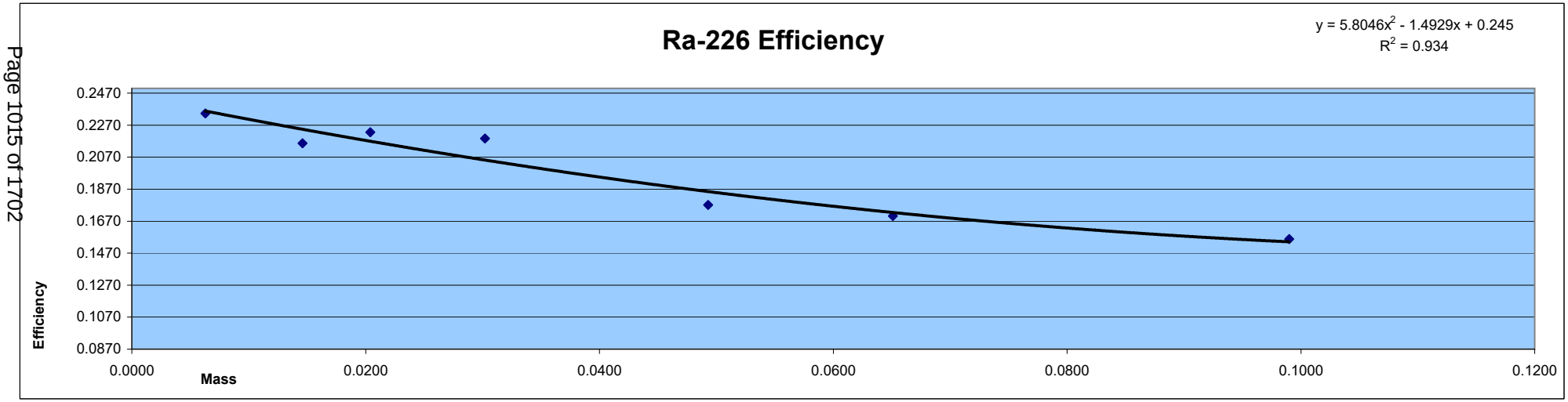
	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Blue 13

Std #	Sample Time	Count Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency	Mass
ICRa6-1063071;Ra2	7/24/2019 15:48	15	47540	3169.333	2/13/2017 13:30	4.0000	0.4487	1765.7634	7534.6	0.2344	0.0063
ICRa6-1063071;Ra3	7/24/2019 15:17	15	67578	4505.200	2/13/2017 13:30	4.0000	0.6933	1624.6430	7534.6	0.2156	0.0146
ICRa6-1063071;Ra4	7/24/2019 14:34	15	73095	4873.000	2/13/2017 13:30	4.0000	0.7265	1676.8754	7534.6	0.2226	0.0204
ICRa6-1063071;Ra5	7/24/2019 13:58	15	85066	5671.067	2/13/2017 13:30	4.0000	0.8604	1647.7995	7534.6	0.2187	0.0302
ICRa6-1063071;Ra6	7/24/2019 13:40	15	74944	4996.267	2/13/2017 13:30	4.0000	0.9364	1333.9456	7534.6	0.1770	0.0493
ICRa6-1063071;Ra7	7/24/2019 17:07	15	71396	4759.733	2/13/2017 13:30	4.0000	0.9274	1283.1545	7534.6	0.1703	0.0651
ICRa6-1063071;Ra8	7/24/2019 16:50	15	66214	4414.267	2/13/2017 13:30	4.0000	0.9402	1173.7948	7534.6	0.1558	0.0990



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICRa6-1063071;Ra6

Repeat 10

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 1:40:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 1:56:00 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	74,944	4,996.267	4,996.156
sd	0.000			0.011	273.759	18.251	18.251
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	95,462	6,364.133	6,363.772
sd	0.000			0.019	308.969	20.598	20.598

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICRa6-1063071;Ra5

Repeat 11

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *Sample* **sd** 0 *Sample*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/24/2019 1:58:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/24/2019 2:13:47 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	85,066	5,671.067	5,670.956
sd	0.000			0.011	291.661	19.444	19.444
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	94,997	6,333.133	6,332.772
sd	0.000			0.019	308.216	20.548	20.548

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICRa6-1063071;Ra4

Repeat 12

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 2:34:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 2:50:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	73,095	4,873.000	4,872.889
sd	0.000			0.011	270.361	18.024	18.024
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	81,045	5,403.000	5,402.639
sd	0.000			0.019	284.684	18.979	18.979

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICRa6-1063071;Ra3

Repeat 13

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 3:17:05 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 3:32:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	67,578	4,505.200	4,505.089
sd	0.000			0.011	259.958	17.331	17.331
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	73,720	4,914.667	4,914.306
sd	0.000			0.019	271.514	18.101	18.101

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICRa6-1063071;Ra2

Repeat 14

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 3:48:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 4:04:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	47,540	3,169.333	3,169.222
sd	0.000			0.011	218.037	14.536	14.536
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	49,713	3,314.200	3,313.839
sd	0.000			0.019	222.964	14.864	14.864

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICRa6-1063071;Ra8

Repeat 15

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 4:50:19 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:05:37 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	66,214	4,414.267	4,414.156
sd	0.000			0.011	257.321	17.155	17.155
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	97,725	6,515.000	6,514.639
sd	0.000			0.019	312.610	20.841	20.841

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICRa6-1063071;Ra7

Repeat 17

Carrier No. 0

Batch ID Ra226 - IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/24/2019 5:07:57 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/24/2019 5:23:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	71,396	4,759.733	4,759.622
sd	0.000			0.011	267.200	17.813	17.813
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	94,040	6,269.333	6,268.972
sd	0.000			0.019	306.659	20.444	20.444

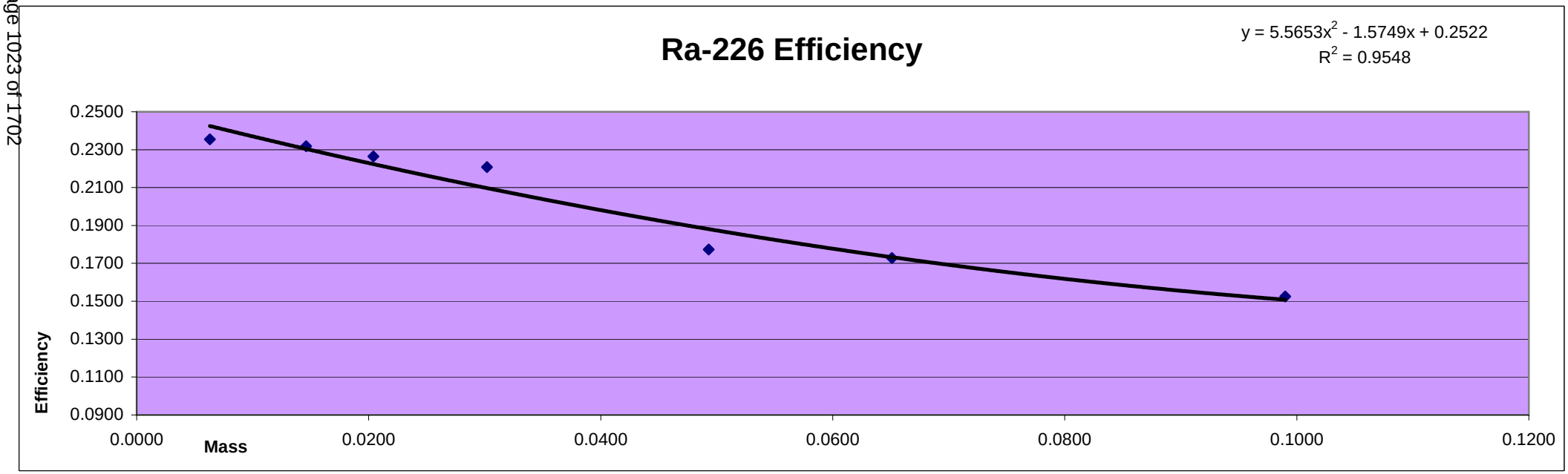
	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2017

Purple 0

Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
R2	0.0063	15.00	2/17/2017 1:15	28735	1915.6667	2/13/2017 13:30	2.4064	0.4487	1774.0852	7534.6	0.2355
R3	0.0146	15.00	2/17/2017 3:21	44155	2943.6667	2/13/2017 13:30	2.4314	0.6933	1746.3557	7534.6	0.2318
R4	0.0204	15.00	2/17/2017 3:04	45140	3009.3333	2/13/2017 13:30	2.4280	0.7265	1706.0163	7534.6	0.2264
R5	0.0302	15.00	2/17/2017 2:46	52073	3471.5333	2/13/2017 13:30	2.4245	0.8604	1664.1494	7534.6	0.2209
R6	0.0493	15.00	2/17/2017 2:29	45436	3029.0667	2/13/2017 13:30	2.4212	0.9364	1336.1015	7534.6	0.1773
R7	0.0651	15.00	2/17/2017 2:12	43806	2920.4000	2/13/2017 13:30	2.4178	0.9274	1302.5167	7534.6	0.1729
R8	0.0990	15.00	2/17/2017 1:55	39113	2607.5333	2/13/2017 13:30	2.4144	0.9402	1148.7426	7534.6	0.1525



Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICRa6-986404;2-A

Repeat 17

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/17/2017 1:15:45 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/17/2017 1:30:51 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	28,735	1,915.667	1,915.501
sd	0.000			0.013	169.514	11.301	11.301
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	22,366	1,491.067	1,490.610
sd	0.000			0.021	149.553	9.970	9.970

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICRa6-986404;-8-A

Repeat 19

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/17/2017 1:55:26 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/17/2017 2:10:41 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	39,113	2,607.533	2,607.367
sd	0.000			0.013	197.770	13.185	13.185
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	44,495	2,966.333	2,965.876
sd	0.000			0.021	210.938	14.063	14.063

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICRa6-986404;-7-A

Repeat 20

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/17/2017 2:12:35 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/17/2017 2:27:46 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	43,806	2,920.400	2,920.234
sd	0.000			0.013	209.299	13.953	13.953
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	43,875	2,925.000	2,924.543
sd	0.000			0.021	209.464	13.964	13.964

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICRa6-986404;-6-A

Repeat 21

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/17/2017 2:29:34 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/17/2017 2:44:47 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	45,436	3,029.067	3,028.901
sd	0.000			0.013	213.157	14.210	14.210
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	45,333	3,022.200	3,021.743
sd	0.000			0.021	212.915	14.194	14.194

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICRa6-986404;-5-A

Repeat 22

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/17/2017 2:46:37 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/17/2017 3:01:51 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	52,073	3,471.533	3,471.367
sd	0.000			0.013	228.195	15.213	15.213
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	43,471	2,898.067	2,897.610
sd	0.000			0.021	208.497	13.900	13.900

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICRa6-986404;4-A

Repeat 23

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/17/2017 3:04:11 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/17/2017 3:19:26 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	45,140	3,009.333	3,009.167
sd	0.000			0.013	212.462	14.164	14.164
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	37,808	2,520.533	2,520.076
sd	0.000			0.021	194.443	12.963	12.963

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICRa6-986404;3-A

Repeat 24

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/17/2017 3:21:24 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/17/2017 3:36:36 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	44,155	2,943.667	2,943.501
sd	0.000			0.013	210.131	14.009	14.009
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	35,762	2,384.133	2,383.676
sd	0.000			0.021	189.108	12.607	12.607

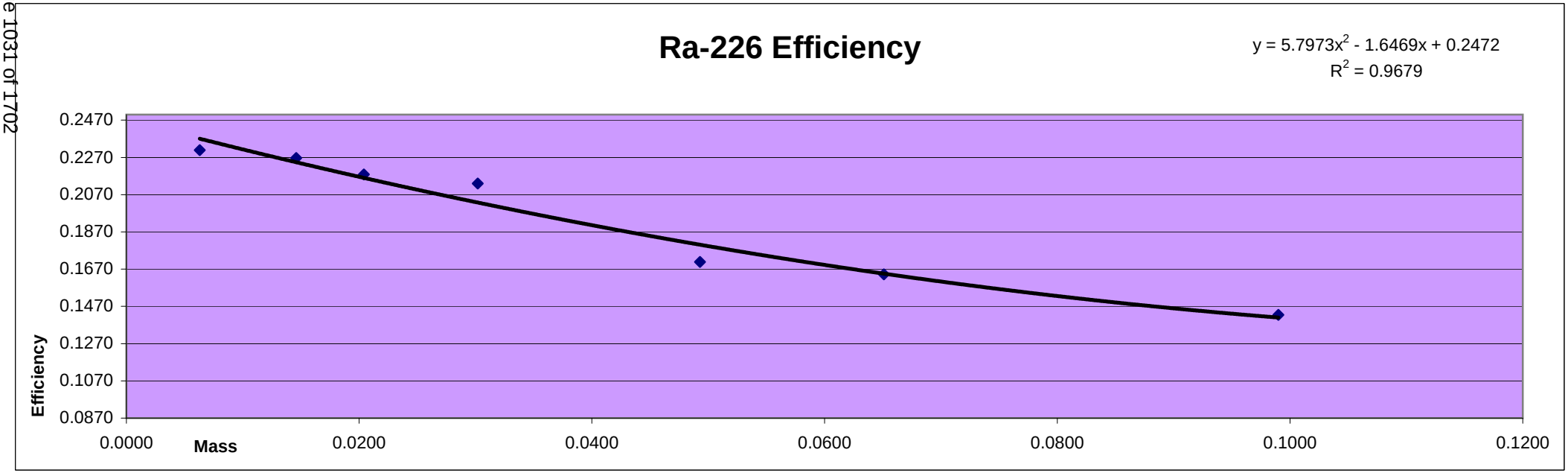
	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2017

Purple 22

Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
R2	0.0063	15.00	2/16/2017 21:37	27662	1844.1333	2/13/2017 13:30	2.3621	0.4487	1739.8866	7534.6	0.2309
R3	0.0146	15.00	2/16/2017 21:20	41900	2793.3333	2/13/2017 13:30	2.3586	0.6933	1708.3377	7534.6	0.2267
R4	0.0204	15.00	2/16/2017 13:00	40274	2684.9333	2/13/2017 13:30	2.2519	0.7265	1641.1208	7534.6	0.2178
R5	0.0302	15.00	2/16/2017 12:12	46424	3094.9333	2/13/2017 13:30	2.2412	0.8604	1604.9948	7534.6	0.2130
R6	0.0493	15.00	2/16/2017 11:52	40448	2696.5333	2/13/2017 13:30	2.2369	0.9364	1287.3772	7534.6	0.1709
R7	0.0651	15.00	2/16/2017 11:30	38418	2561.2000	2/13/2017 13:30	2.2320	0.9274	1237.3890	7534.6	0.1642
R8	0.0990	15.00	2/16/2017 10:40	33599	2239.9333	2/13/2017 13:30	2.2208	0.9402	1072.7865	7534.6	0.1424



Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICRa6-986404;8-A

Repeat 1

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 10:40:37 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 10:55:48 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	33,599	2,239.933	2,239.807
sd	0.000			0.011	183.300	12.220	12.220
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	39,535	2,635.667	2,635.369
sd	0.000			0.017	198.834	13.256	13.256

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICRa6-986404;7-A

Repeat 2

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 11:30:38 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 11:45:47 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	38,418	2,561.200	2,561.074
sd	0.000			0.011	196.005	13.067	13.067
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	39,510	2,634.000	2,633.702
sd	0.000			0.017	198.771	13.251	13.251

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICRa6-986404;6-A

Repeat 3

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 11:52:50 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 12:08:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	40,448	2,696.533	2,696.407
sd	0.000			0.011	201.117	13.408	13.408
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	40,767	2,717.800	2,717.502
sd	0.000			0.017	201.908	13.461	13.461

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICRa6-986404;5-A

Repeat 4

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 12:12:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 12:27:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	46,424	3,094.933	3,094.807
sd	0.000			0.011	215.462	14.364	14.364
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	39,084	2,605.600	2,605.302
sd	0.000			0.017	197.697	13.180	13.180

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICRa6-986404;4-A

Repeat 5

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 1:00:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 1:15:59 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	40,274	2,684.933	2,684.807
sd	0.000			0.011	200.684	13.379	13.379
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	33,824	2,254.933	2,254.635
sd	0.000			0.017	183.913	12.261	12.261

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICRa6-986404;-3-A

Repeat 6

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 9:20:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 9:36:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	41,900	2,793.333	2,793.207
sd	0.000			0.011	204.695	13.646	13.646
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	34,815	2,321.000	2,320.702
sd	0.000			0.017	186.588	12.439	12.439

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICRa6-986404;2-A

Repeat 7

Carrier No. 0

Batch ID 291968

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 9:37:48 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 9:52:59 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

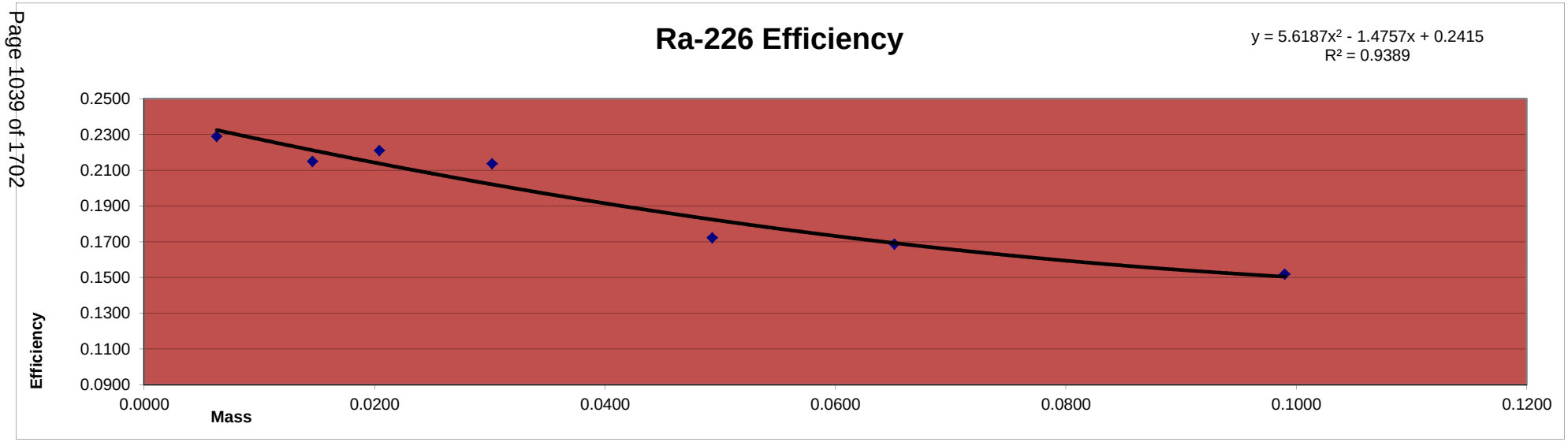
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	27,662	1,844.133	1,844.007
sd	0.000			0.011	166.319	11.088	11.088
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	22,771	1,518.067	1,517.769
sd	0.000			0.017	150.901	10.060	10.060

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	ID	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
0	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 19:02	46456	3097.0667	2/13/2017 13:30	4.0000	0.4487	1725.5007	7534.6	0.2290
0	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 18:44	67362	4490.8000	2/13/2017 13:30	4.0000	0.6933	1619.4501	7534.6	0.2149
0	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 18:26	72587	4839.1333	2/13/2017 13:30	4.0000	0.7265	1665.2214	7534.6	0.2210
0	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 18:08	83106	5540.4000	2/13/2017 13:30	4.0000	0.8604	1609.8326	7534.6	0.2137
0	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 17:49	72905	4860.3333	2/13/2017 13:30	4.0000	0.9364	1297.6530	7534.6	0.1722
0	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 17:30	70766	4717.7333	2/13/2017 13:30	4.0000	0.9274	1271.8319	7534.6	0.1688
0	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 16:46	64599	4306.6000	2/13/2017 13:30	4.0000	0.9402	1145.1652	7534.6	0.1520



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICRa6-1063071;Ra8

Repeat 2

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 4:46:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 5:01:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,599	4,306.600	4,306.600
sd	0.000			0.000	254.163	16.944	16.944
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,468	6,497.867	6,497.867
sd	0.000			0.000	312.199	20.813	20.813

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICRa6-1063071;Ra7

Repeat 3

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 5:30:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 5:45:28 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,766	4,717.733	4,717.733
sd	0.000			0.000	266.019	17.735	17.735
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,866	6,324.400	6,324.400
sd	0.000			0.000	308.003	20.534	20.534

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICRa6-1063071;Ra6

Repeat 4

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 5:49:26 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:04:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,905	4,860.333	4,860.333
sd	0.000			0.000	270.009	18.001	18.001
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,156	6,410.400	6,410.400
sd	0.000			0.000	310.090	20.673	20.673

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICRa6-1063071;Ra5

Repeat 5

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:08:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:23:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	83,106	5,540.400	5,540.400
sd	0.000			0.000	288.281	19.219	19.219
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,327	6,288.467	6,288.467
sd	0.000			0.000	307.127	20.475	20.475

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICRa6-1063071;Ra4

Repeat 6

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:26:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:42:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,587	4,839.133	4,839.133
sd	0.000			0.000	269.420	17.961	17.961
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	82,122	5,474.800	5,474.800
sd	0.000			0.000	286.569	19.105	19.105

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICRa6-1063071;Ra3

Repeat 7

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:44:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:59:51 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	67,362	4,490.800	4,490.800
sd	0.000			0.000	259.542	17.303	17.303
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,109	5,007.267	5,007.267
sd	0.000			0.000	274.060	18.271	18.271

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICRa6-1063071;Ra2

Repeat 8

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 7:02:14 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 7:17:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

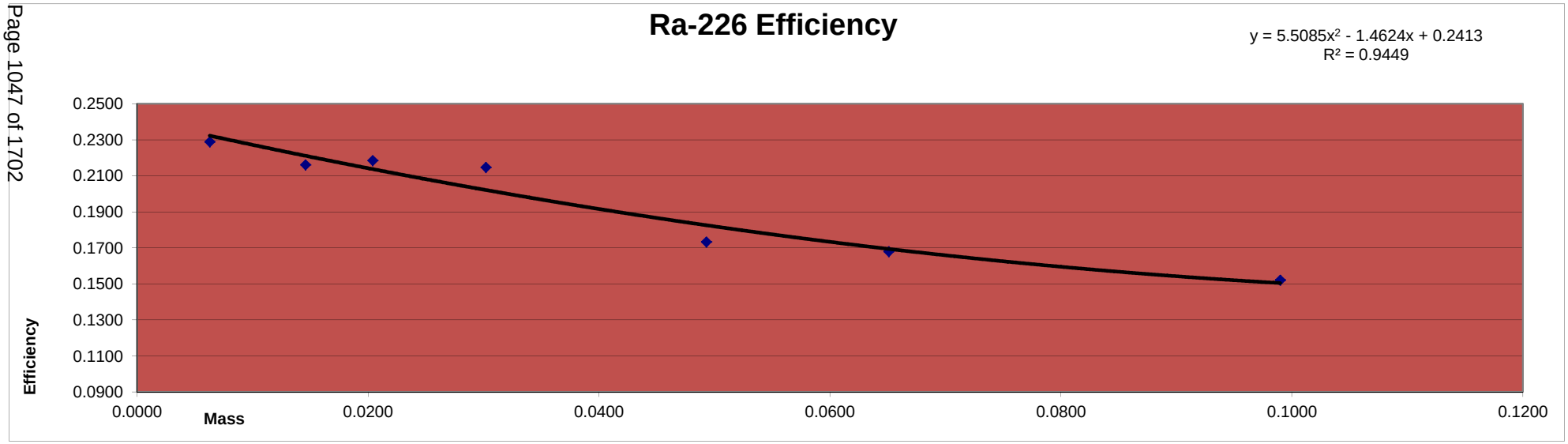
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	46,456	3,097.067	3,097.067
sd	0.000			0.000	215.537	14.369	14.369
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	49,928	3,328.533	3,328.533
sd	0.000			0.000	223.446	14.896	14.896

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
1	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 16:28	46425	3095.0000	2/13/2017 13:30	4.0000	0.4487	1724.3493	7534.6	0.2289
1	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 19:02	67740	4516.0000	2/13/2017 13:30	4.0000	0.6933	1628.5376	7534.6	0.2161
1	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 18:44	71778	4785.2000	2/13/2017 13:30	4.0000	0.7265	1646.6621	7534.6	0.2185
1	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 18:26	83517	5567.8000	2/13/2017 13:30	4.0000	0.8604	1617.7940	7534.6	0.2147
1	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 18:08	73397	4893.1333	2/13/2017 13:30	4.0000	0.9364	1306.4102	7534.6	0.1734
1	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 17:49	70420	4694.6667	2/13/2017 13:30	4.0000	0.9274	1265.6135	7534.6	0.1680
1	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 17:30	64666	4311.0667	2/13/2017 13:30	4.0000	0.9402	1146.3530	7534.6	0.1521



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICRa6-1063071;Ra2

Repeat 1

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 4:28:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 4:43:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	46,425	3,095.000	3,095.000
sd	0.000			0.000	215.465	14.364	14.364
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	50,021	3,334.733	3,334.733
sd	0.000			0.000	223.654	14.910	14.910

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICRa6-1063071;Ra8

Repeat 3

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 5:30:11 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 5:45:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,666	4,311.067	4,311.067
sd	0.000			0.000	254.295	16.953	16.953
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,839	6,522.600	6,522.600
sd	0.000			0.000	312.792	20.853	20.853

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICRa6-1063071;Ra7

Repeat 4

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 5:49:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:04:59 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,420	4,694.667	4,694.667
sd	0.000			0.000	265.368	17.691	17.691
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,568	6,304.533	6,304.533
sd	0.000			0.000	307.519	20.501	20.501

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICRa6-1063071;Ra6

Repeat 5

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:08:23 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:23:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,397	4,893.133	4,893.133
sd	0.000			0.000	270.919	18.061	18.061
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,177	6,411.800	6,411.800
sd	0.000			0.000	310.124	20.675	20.675

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICRa6-1063071;Ra5

Repeat 6

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:26:45 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:42:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	83,517	5,567.800	5,567.800
sd	0.000			0.000	288.993	19.266	19.266
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,830	6,322.000	6,322.000
sd	0.000			0.000	307.945	20.530	20.530

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICRa6-1063071;Ra4

Repeat 7

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:44:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 7:00:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,778	4,785.200	4,785.200
sd	0.000			0.000	267.914	17.861	17.861
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	82,371	5,491.400	5,491.400
sd	0.000			0.000	287.003	19.134	19.134

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICRa6-1063071;Ra3

Repeat 8

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 7:02:21 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 7:17:42 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

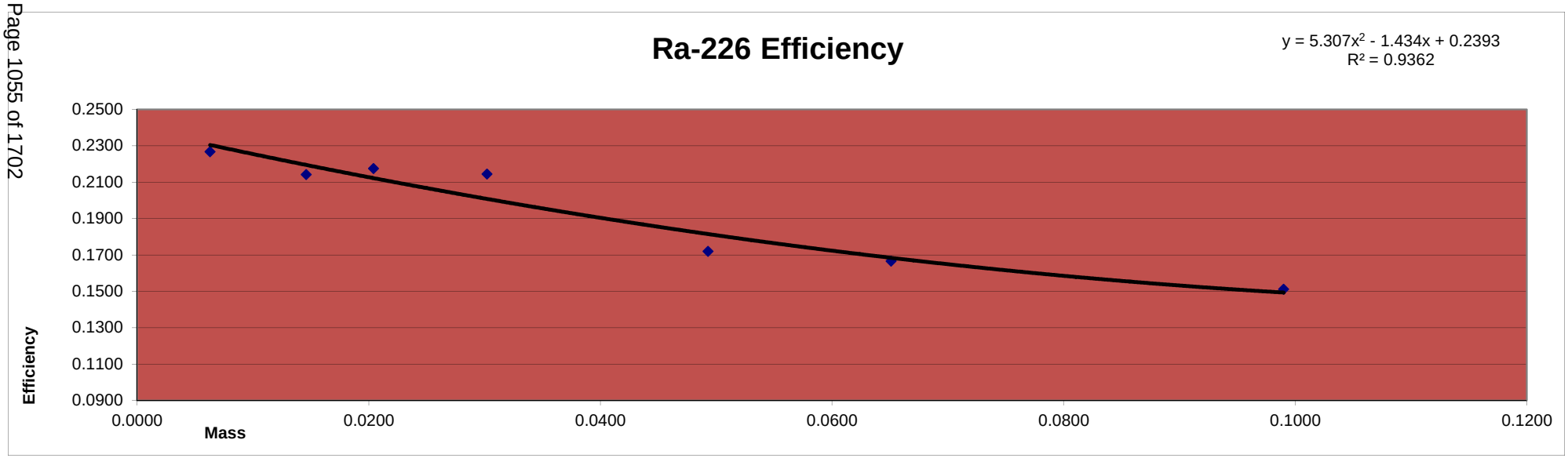
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	67,740	4,516.000	4,516.000
sd	0.000			0.000	260.269	17.351	17.351
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,820	5,054.667	5,054.667
sd	0.000			0.000	275.354	18.357	18.357

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
4	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 17:50	45997	3066.4667	2/13/2017 13:30	4.0000	0.4487	1708.4522	7534.6	0.2267
4	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 17:31	67107	4473.8000	2/13/2017 13:30	4.0000	0.6933	1613.3197	7534.6	0.2141
4	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 16:47	71424	4761.6000	2/13/2017 13:30	4.0000	0.7265	1638.5409	7534.6	0.2175
4	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 16:28	83383	5558.8667	2/13/2017 13:30	4.0000	0.8604	1615.1984	7534.6	0.2144
4	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 19:02	72777	4851.8000	2/13/2017 13:30	4.0000	0.9364	1295.3747	7534.6	0.1719
4	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 18:45	69823	4654.8667	2/13/2017 13:30	4.0000	0.9274	1254.8840	7534.6	0.1665
4	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 18:27	64265	4284.3333	2/13/2017 13:30	4.0000	0.9402	1139.2443	7534.6	0.1512



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICRa6-1063071;Ra5

Repeat 1

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 4:28:38 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 4:44:05 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	83,383	5,558.867	5,558.867
sd	0.000			0.000	288.761	19.251	19.251
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,989	6,332.600	6,332.600
sd	0.000			0.000	308.203	20.547	20.547

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICRa6-1063071;Ra4

Repeat 2

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 4:47:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 5:02:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,424	4,761.600	4,761.600
sd	0.000			0.000	267.253	17.817	17.817
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	82,002	5,466.800	5,466.800
sd	0.000			0.000	286.360	19.091	19.091

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICRa6-1063071;Ra3

Repeat 3

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 5:31:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 5:46:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	67,107	4,473.800	4,473.800
sd	0.000			0.000	259.050	17.270	17.270
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,957	4,997.133	4,997.133
sd	0.000			0.000	273.783	18.252	18.252

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICRa6-1063071;Ra2

Repeat 4

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 5:50:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:05:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	45,997	3,066.467	3,066.467
sd	0.000			0.000	214.469	14.298	14.298
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	49,635	3,309.000	3,309.000
sd	0.000			0.000	222.789	14.853	14.853

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICRa6-1063071;Ra8

Repeat 6

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:27:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 6:42:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,265	4,284.333	4,284.333
sd	0.000			0.000	253.505	16.900	16.900
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,702	6,446.800	6,446.800
sd	0.000			0.000	310.969	20.731	20.731

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICRa6-1063071;Ra7

Repeat 7

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 6:45:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 7:00:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	69,823	4,654.867	4,654.867
sd	0.000			0.000	264.240	17.616	17.616
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,239	6,349.267	6,349.267
sd	0.000			0.000	308.608	20.574	20.574

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICRa6-1063071;Ra6

Repeat 8

Carrier No. 0

Batch ID ra226-ic

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/9/2019 7:02:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/9/2019 7:18:02 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

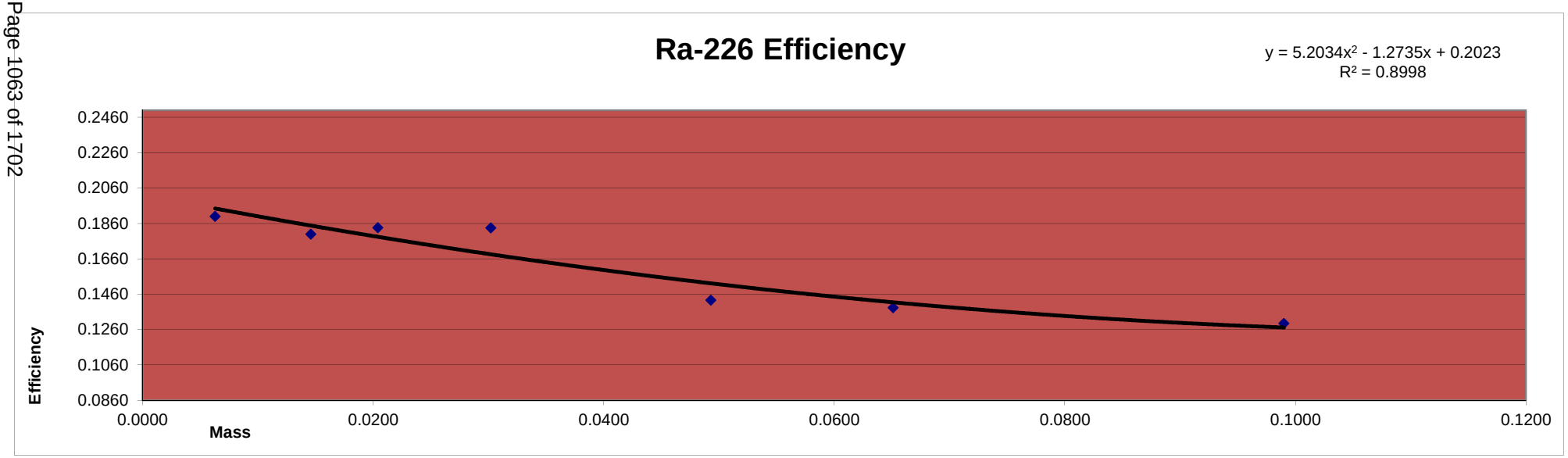
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,777	4,851.800	4,851.800
sd	0.000			0.000	269.772	17.985	17.985
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,307	6,353.800	6,353.800
sd	0.000			0.000	308.718	20.581	20.581

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
8	ICRa6-1063071;Ra2	0.0063	15.00	7/10/2019 11:32	38517	2567.8000	2/13/2017 13:30	4.0000	0.4487	1430.6249	7534.6	0.1899
8	ICRa6-1063071;Ra3	0.0146	15.00	7/10/2019 11:14	56373	3758.2000	2/13/2017 13:30	4.0000	0.6933	1355.2635	7534.6	0.1799
8	ICRa6-1063071;Ra4	0.0204	15.00	7/10/2019 10:57	60273	4018.2000	2/13/2017 13:30	4.0000	0.7265	1382.7254	7534.6	0.1835
8	ICRa6-1063071;Ra5	0.0302	15.00	7/10/2019 10:23	71373	4758.2000	2/13/2017 13:30	4.0000	0.8604	1382.5546	7534.6	0.1835
8	ICRa6-1063071;Ra6	0.0493	15.00	7/10/2019 10:05	60350	4023.3333	2/13/2017 13:30	4.0000	0.9364	1074.1836	7534.6	0.1426
8	ICRa6-1063071;Ra7	0.0651	15.00	7/10/2019 9:47	57987	3865.8000	2/13/2017 13:30	4.0000	0.9274	1042.1632	7534.6	0.1383
8	ICRa6-1063071;Ra8	0.0990	15.00	7/10/2019 9:27	55020	3668.0000	2/13/2017 13:30	4.0000	0.9402	975.3555	7534.6	0.1295



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICRa6-1063071;Ra8

Repeat 2

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:27:14 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 9:42:35 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	55,020	3,668.000	3,668.000
sd	0.000			0.000	234.563	15.638	15.638
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,760	6,384.000	6,384.000
sd	0.000			0.000	309.451	20.630	20.630

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICRa6-1063071;Ra7

Repeat 3

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:47:05 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:02:28 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	57,987	3,865.800	3,865.800
sd	0.000			0.000	240.805	16.054	16.054
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,071	6,271.400	6,271.400
sd	0.000			0.000	306.710	20.447	20.447

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICRa6-1063071;Ra6

Repeat 4

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:05:19 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:20:41 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	60,350	4,023.333	4,023.333
sd	0.000			0.000	245.662	16.377	16.377
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,165	6,344.333	6,344.333
sd	0.000			0.000	308.488	20.566	20.566

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICRa6-1063071;Ra5

Repeat 5

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:23:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:38:35 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,373	4,758.200	4,758.200
sd	0.000			0.000	267.157	17.810	17.810
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,865	6,391.000	6,391.000
sd	0.000			0.000	309.621	20.641	20.641

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICRa6-1063071;Ra4

Repeat 6

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:57:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:12:34 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	60,273	4,018.200	4,018.200
sd	0.000			0.000	245.506	16.367	16.367
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	82,525	5,501.667	5,501.667
sd	0.000			0.000	287.272	19.151	19.151

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICRa6-1063071;Ra3

Repeat 7

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:14:43 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:30:04 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	56,373	3,758.200	3,758.200
sd	0.000			0.000	237.430	15.829	15.829
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,470	5,098.000	5,098.000
sd	0.000			0.000	276.532	18.435	18.435

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICRa6-1063071;Ra2

Repeat 8

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:32:33 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:47:47 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

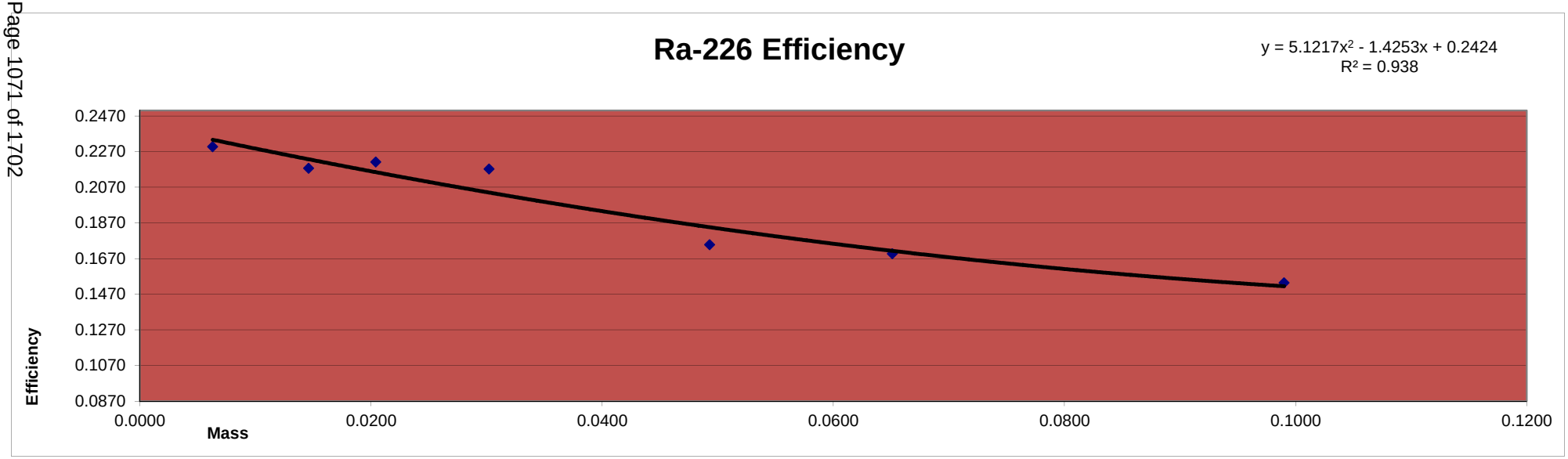
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	38,517	2,567.800	2,567.800
sd	0.000			0.000	196.257	13.084	13.084
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	50,951	3,396.733	3,396.733
sd	0.000			0.000	225.723	15.048	15.048

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
9	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 19:38	46572	3104.8000	2/13/2017 13:30	4.0000	0.4487	1729.8092	7534.6	0.2296
9	ICRa6-1063071;Ra3	0.0146	15.00	7/10/2019 11:32	68183	4545.5333	2/13/2017 13:30	4.0000	0.6933	1639.1878	7534.6	0.2176
9	ICRa6-1063071;Ra4	0.0204	15.00	7/10/2019 11:14	72615	4841.0000	2/13/2017 13:30	4.0000	0.7265	1665.8637	7534.6	0.2211
9	ICRa6-1063071;Ra5	0.0302	15.00	7/10/2019 10:57	84462	5630.8000	2/13/2017 13:30	4.0000	0.8604	1636.0995	7534.6	0.2171
9	ICRa6-1063071;Ra6	0.0493	15.00	7/10/2019 10:23	73985	4932.3333	2/13/2017 13:30	4.0000	0.9364	1316.8762	7534.6	0.1748
9	ICRa6-1063071;Ra7	0.0651	15.00	7/10/2019 10:05	71106	4740.4000	2/13/2017 13:30	4.0000	0.9274	1277.9425	7534.6	0.1696
9	ICRa6-1063071;Ra8	0.0990	15.00	7/10/2019 9:47	65156	4343.7333	2/13/2017 13:30	4.0000	0.9402	1155.0393	7534.6	0.1533



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICRa6-1063071;Ra2

Repeat 1

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:38:25 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:53:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	46,572	3,104.800	3,104.800
sd	0.000			0.000	215.805	14.387	14.387
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	48,650	3,243.333	3,243.333
sd	0.000			0.000	220.567	14.704	14.704

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICRa6-1063071;Ra8

Repeat 3

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:47:11 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:02:35 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	65,156	4,343.733	4,343.733
sd	0.000			0.000	255.257	17.017	17.017
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,026	6,401.733	6,401.733
sd	0.000			0.000	309.881	20.659	20.659

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICRa6-1063071;Ra7

Repeat 4

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:05:26 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:20:51 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,106	4,740.400	4,740.400
sd	0.000			0.000	266.657	17.777	17.777
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	93,049	6,203.267	6,203.267
sd	0.000			0.000	305.039	20.336	20.336

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICRa6-1063071;Ra6

Repeat 5

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:23:16 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:38:43 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,985	4,932.333	4,932.333
sd	0.000			0.000	272.002	18.133	18.133
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	93,949	6,263.267	6,263.267
sd	0.000			0.000	306.511	20.434	20.434

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICRa6-1063071;Ra5

Repeat 6

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:57:21 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:12:47 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	84,462	5,630.800	5,630.800
sd	0.000			0.000	290.623	19.375	19.375
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	92,489	6,165.933	6,165.933
sd	0.000			0.000	304.120	20.275	20.275

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICRa6-1063071;Ra4

Repeat 7

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:14:46 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:30:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,615	4,841.000	4,841.000
sd	0.000			0.000	269.472	17.965	17.965
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	80,264	5,350.933	5,350.933
sd	0.000			0.000	283.309	18.887	18.887

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICRa6-1063071;Ra3

Repeat 8

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:32:39 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:48:02 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

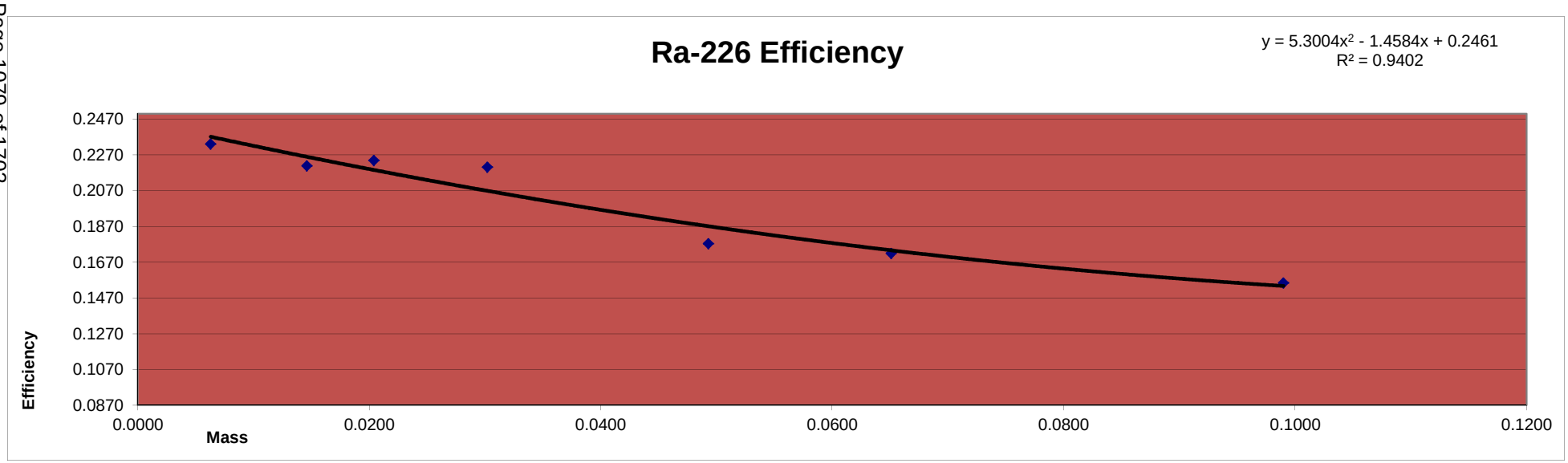
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	68,183	4,545.533	4,545.533
sd	0.000			0.000	261.119	17.408	17.408
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	73,582	4,905.467	4,905.467
sd	0.000			0.000	271.260	18.084	18.084

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
10	ICRa6-1063071;Ra2	0.0063	15.00	7/10/2019 9:26	47309	3153.9333	2/13/2017 13:30	4.0000	0.4487	1757.1834	7534.6	0.2332
10	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 19:38	69235	4615.6667	2/13/2017 13:30	4.0000	0.6933	1664.4789	7534.6	0.2209
10	ICRa6-1063071;Ra4	0.0204	15.00	7/10/2019 11:32	73545	4903.0000	2/13/2017 13:30	4.0000	0.7265	1687.1989	7534.6	0.2239
10	ICRa6-1063071;Ra5	0.0302	15.00	7/10/2019 11:14	85651	5710.0667	2/13/2017 13:30	4.0000	0.8604	1659.1314	7534.6	0.2202
10	ICRa6-1063071;Ra6	0.0493	15.00	7/10/2019 10:57	75090	5006.0000	2/13/2017 13:30	4.0000	0.9364	1336.5443	7534.6	0.1774
10	ICRa6-1063071;Ra7	0.0651	15.00	7/10/2019 10:23	72078	4805.2000	2/13/2017 13:30	4.0000	0.9274	1295.4117	7534.6	0.1719
10	ICRa6-1063071;Ra8	0.0990	15.00	7/10/2019 10:05	66098	4406.5333	2/13/2017 13:30	4.0000	0.9402	1171.7384	7534.6	0.1555



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICRa6-1063071;Ra3

Repeat 1

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:38:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:53:51 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	69,235	4,615.667	4,615.667
sd	0.000			0.000	263.125	17.542	17.542
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	73,630	4,908.667	4,908.667
sd	0.000			0.000	271.348	18.090	18.090

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICRa6-1063071;Ra2

Repeat 2

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:26:07 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 9:41:25 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	47,309	3,153.933	3,153.933
sd	0.000			0.000	217.506	14.500	14.500
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	49,097	3,273.133	3,273.133
sd	0.000			0.000	221.578	14.772	14.772

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICRa6-1063071;Ra8

Repeat 4

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:05:31 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:20:56 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	66,098	4,406.533	4,406.533
sd	0.000			0.000	257.095	17.140	17.140
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,609	6,373.933	6,373.933
sd	0.000			0.000	309.207	20.614	20.614

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICRa6-1063071;Ra7

Repeat 5

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:23:22 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:38:48 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,078	4,805.200	4,805.200
sd	0.000			0.000	268.473	17.898	17.898
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	93,024	6,201.600	6,201.600
sd	0.000			0.000	304.998	20.333	20.333

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICRa6-1063071;Ra6

Repeat 6

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:57:28 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:12:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	75,090	5,006.000	5,006.000
sd	0.000			0.000	274.026	18.268	18.268
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,268	6,284.533	6,284.533
sd	0.000			0.000	307.031	20.469	20.469

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICRa6-1063071;Ra5

Repeat 7

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:14:54 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:30:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	85,651	5,710.067	5,710.067
sd	0.000			0.000	292.662	19.511	19.511
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	92,949	6,196.600	6,196.600
sd	0.000			0.000	304.875	20.325	20.325

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICRa6-1063071;Ra4

Repeat 8

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:32:45 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:48:09 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

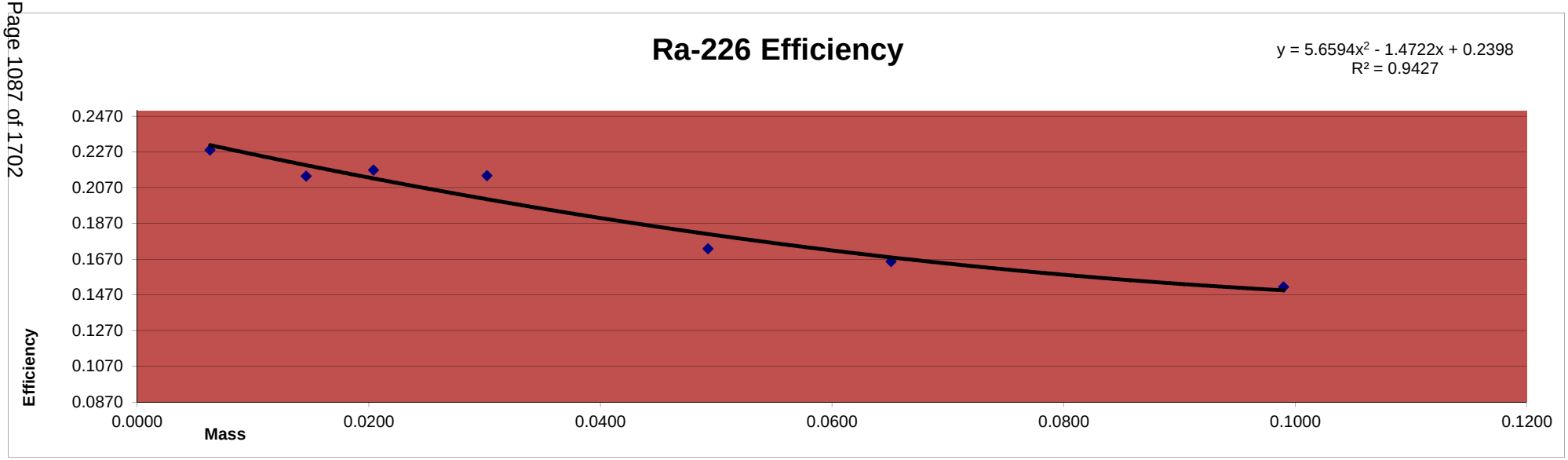
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,545	4,903.000	4,903.000
sd	0.000			0.000	271.192	18.079	18.079
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	80,745	5,383.000	5,383.000
sd	0.000			0.000	284.157	18.944	18.944

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
12	ICRa6-1063071;Ra2	0.0063	15.00	7/10/2019 10:04	46251	3083.4000	2/13/2017 13:30	4.0000	0.4487	1717.8864	7534.6	0.2280
12	ICRa6-1063071;Ra3	0.0146	15.00	7/10/2019 9:46	66884	4458.9333	2/13/2017 13:30	4.0000	0.6933	1607.9585	7534.6	0.2134
12	ICRa6-1063071;Ra4	0.0204	15.00	7/10/2019 9:26	71187	4745.8000	2/13/2017 13:30	4.0000	0.7265	1633.1039	7534.6	0.2167
12	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 19:38	83100	5540.0000	2/13/2017 13:30	4.0000	0.8604	1609.7164	7534.6	0.2136
12	ICRa6-1063071;Ra6	0.0493	15.00	7/10/2019 11:32	73114	4874.2667	2/13/2017 13:30	4.0000	0.9364	1301.3730	7534.6	0.1727
12	ICRa6-1063071;Ra7	0.0651	15.00	7/10/2019 11:15	69426	4628.4000	2/13/2017 13:30	4.0000	0.9274	1247.7490	7534.6	0.1656
12	ICRa6-1063071;Ra8	0.0990	15.00	7/10/2019 10:57	64324	4288.2667	2/13/2017 13:30	4.0000	0.9402	1140.2902	7534.6	0.1513



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICRa6-1063071;Ra5

Repeat 1

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:38:39 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:54:05 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	83,100	5,540.000	5,540.000
sd	0.000			0.000	288.271	19.218	19.218
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,193	6,279.533	6,279.533
sd	0.000			0.000	306.909	20.461	20.461

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICRa6-1063071;Ra4

Repeat 2

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:26:20 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 9:41:43 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,187	4,745.800	4,745.800
sd	0.000			0.000	266.809	17.787	17.787
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	81,436	5,429.067	5,429.067
sd	0.000			0.000	285.370	19.025	19.025

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICRa6-1063071;Ra3

Repeat 3

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:46:34 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:01:56 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	66,884	4,458.933	4,458.933
sd	0.000			0.000	258.619	17.241	17.241
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,141	5,009.400	5,009.400
sd	0.000			0.000	274.119	18.275	18.275

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICRa6-1063071;Ra2

Repeat 4

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:04:48 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:20:05 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	46,251	3,083.400	3,083.400
sd	0.000			0.000	215.060	14.337	14.337
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	50,421	3,361.400	3,361.400
sd	0.000			0.000	224.546	14.970	14.970

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICRa6-1063071;Ra8

Repeat 6

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:57:42 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:13:06 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,324	4,288.267	4,288.267
sd	0.000			0.000	253.622	16.908	16.908
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,206	6,480.400	6,480.400
sd	0.000			0.000	311.779	20.785	20.785

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICRa6-1063071;Ra7

Repeat 7

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:15:08 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:30:32 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	69,426	4,628.400	4,628.400
sd	0.000			0.000	263.488	17.566	17.566
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,031	6,268.733	6,268.733
sd	0.000			0.000	306.645	20.443	20.443

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICRa6-1063071;Ra6

Repeat 8

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***ml***	**sd**	0 ***ml***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 7/10/2019 11:32:57 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 11:48:22 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

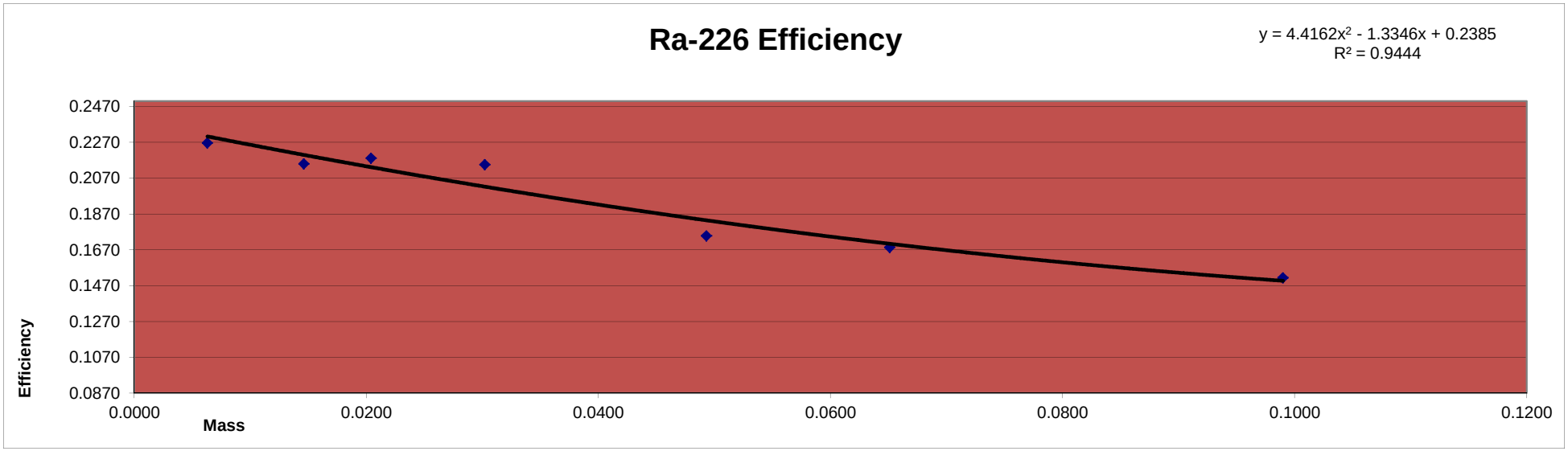
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,114	4,874.267	4,874.267
sd	0.000			0.000	270.396	18.026	18.026
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,834	6,388.933	6,388.933
sd	0.000			0.000	309.571	20.638	20.638

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
13	ICRa6-1063071;Ra2	0.0063	15.00	7/10/2019 10:22	45994	3066.2667	2/13/2017 13:30	4.0000	0.4487	1708.3408	7534.6	0.2267
13	ICRa6-1063071;Ra3	0.0146	15.00	7/10/2019 10:04	67400	4493.3333	2/13/2017 13:30	4.0000	0.6933	1620.3637	7534.6	0.2151
13	ICRa6-1063071;Ra4	0.0204	15.00	7/10/2019 9:46	71661	4777.4000	2/13/2017 13:30	4.0000	0.7265	1643.9780	7534.6	0.2182
13	ICRa6-1063071;Ra5	0.0302	15.00	7/10/2019 9:26	83475	5565.0000	2/13/2017 13:30	4.0000	0.8604	1616.9805	7534.6	0.2146
13	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 19:38	74005	4933.6667	2/13/2017 13:30	4.0000	0.9364	1317.2321	7534.6	0.1748
13	ICRa6-1063071;Ra7	0.0651	15.00	7/10/2019 11:33	70601	4706.7333	2/13/2017 13:30	4.0000	0.9274	1268.8665	7534.6	0.1684
13	ICRa6-1063071;Ra8	0.0990	15.00	7/10/2019 11:15	64373	4291.5333	2/13/2017 13:30	4.0000	0.9402	1141.1589	7534.6	0.1515



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICRa6-1063071;Ra6

Repeat 1

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:38:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:54:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	74,005	4,933.667	4,933.667
sd	0.000			0.000	272.039	18.136	18.136
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,237	6,349.133	6,349.133
sd	0.000			0.000	308.605	20.574	20.574

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICRa6-1063071;Ra5

Repeat 2

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:26:29 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 9:41:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	83,475	5,565.000	5,565.000
sd	0.000			0.000	288.920	19.261	19.261
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,394	6,292.933	6,292.933
sd	0.000			0.000	307.236	20.482	20.482

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICRa6-1063071;Ra4

Repeat 3

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:46:41 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:02:04 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,661	4,777.400	4,777.400
sd	0.000			0.000	267.696	17.846	17.846
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	80,985	5,399.000	5,399.000
sd	0.000			0.000	284.579	18.972	18.972

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICRa6-1063071;Ra3

Repeat 4

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:04:55 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:20:17 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	67,400	4,493.333	4,493.333
sd	0.000			0.000	259.615	17.308	17.308
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,481	4,965.400	4,965.400
sd	0.000			0.000	272.912	18.194	18.194

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICRa6-1063071;Ra2

Repeat 5

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:22:45 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:38:01 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	45,994	3,066.267	3,066.267
sd	0.000			0.000	214.462	14.297	14.297
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	49,259	3,283.933	3,283.933
sd	0.000			0.000	221.944	14.796	14.796

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICRa6-1063071;Ra8

Repeat 7

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:15:15 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:30:41 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,373	4,291.533	4,291.533
sd	0.000			0.000	253.718	16.915	16.915
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,501	6,500.067	6,500.067
sd	0.000			0.000	312.252	20.817	20.817

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICRa6-1063071;Ra7

Repeat 8

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:33:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:48:27 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

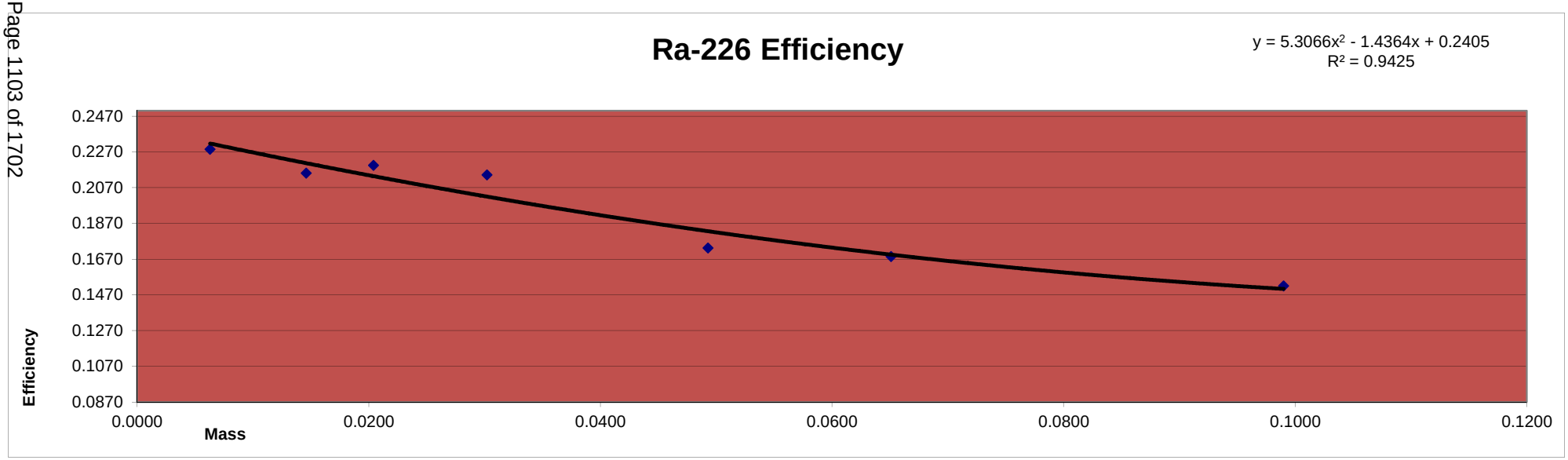
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,601	4,706.733	4,706.733
sd	0.000			0.000	265.708	17.714	17.714
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,264	6,284.267	6,284.267
sd	0.000			0.000	307.024	20.468	20.468

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
14	ICRa6-1063071;Ra2	0.0063	15.00	7/10/2019 10:58	46314	3087.6000	2/13/2017 13:30	4.0000	0.4487	1720.2264	7534.6	0.2283
14	ICRa6-1063071;Ra3	0.0146	15.00	7/10/2019 10:22	67396	4493.0667	2/13/2017 13:30	4.0000	0.6933	1620.2675	7534.6	0.2150
14	ICRa6-1063071;Ra4	0.0204	15.00	7/10/2019 10:05	72031	4802.0667	2/13/2017 13:30	4.0000	0.7265	1652.4662	7534.6	0.2193
14	ICRa6-1063071;Ra5	0.0302	15.00	7/10/2019 9:46	83258	5550.5333	2/13/2017 13:30	4.0000	0.8604	1612.7770	7534.6	0.2140
14	ICRa6-1063071;Ra6	0.0493	15.00	7/10/2019 9:26	73296	4886.4000	2/13/2017 13:30	4.0000	0.9364	1304.6125	7534.6	0.1731
14	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 19:38	70580	4705.3333	2/13/2017 13:30	4.0000	0.9274	1268.4891	7534.6	0.1684
14	ICRa6-1063071;Ra8	0.0990	15.00	7/10/2019 11:33	64569	4304.6000	2/13/2017 13:30	4.0000	0.9402	1144.6334	7534.6	0.1519



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICRa6-1063071;Ra7

Repeat 1

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/9/2019 7:38:48 PM

Count Ended 7/9/2019 7:54:14 PM

Sample Count Time 15.00 ***mins*** **Background Count Time** .00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	70,580	4,705.333	4,705.333
sd	0.000	265.669	17.711	17.711
Beta	0.000	94,421	6,294.733	6,294.733
sd	0.000	307.280	20.485	20.485

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICRa6-1063071;Ra6

Repeat 2

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:26:42 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 9:42:07 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,296	4,886.400	4,886.400
sd	0.000			0.000	270.732	18.049	18.049
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,113	6,340.867	6,340.867
sd	0.000			0.000	308.404	20.560	20.560

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICRa6-1063071;Ra5

Repeat 3

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:46:48 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:02:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	83,258	5,550.533	5,550.533
sd	0.000			0.000	288.545	19.236	19.236
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,109	6,273.933	6,273.933
sd	0.000			0.000	306.772	20.451	20.451

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICRa6-1063071;Ra4

Repeat 4

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:05:04 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:20:29 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,031	4,802.067	4,802.067
sd	0.000			0.000	268.386	17.892	17.892
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	80,583	5,372.200	5,372.200
sd	0.000			0.000	283.871	18.925	18.925

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICRa6-1063071;Ra3

Repeat 5

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:22:54 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:38:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	67,396	4,493.067	4,493.067
sd	0.000			0.000	259.607	17.307	17.307
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,575	4,971.667	4,971.667
sd	0.000			0.000	273.084	18.206	18.206

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICRa6-1063071;Ra2

Repeat 6

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:58:00 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:13:17 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	46,314	3,087.600	3,087.600
sd	0.000			0.000	215.207	14.347	14.347
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	49,505	3,300.333	3,300.333
sd	0.000			0.000	222.497	14.833	14.833

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICRa6-1063071;Ra8

Repeat 8

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:33:08 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:48:32 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

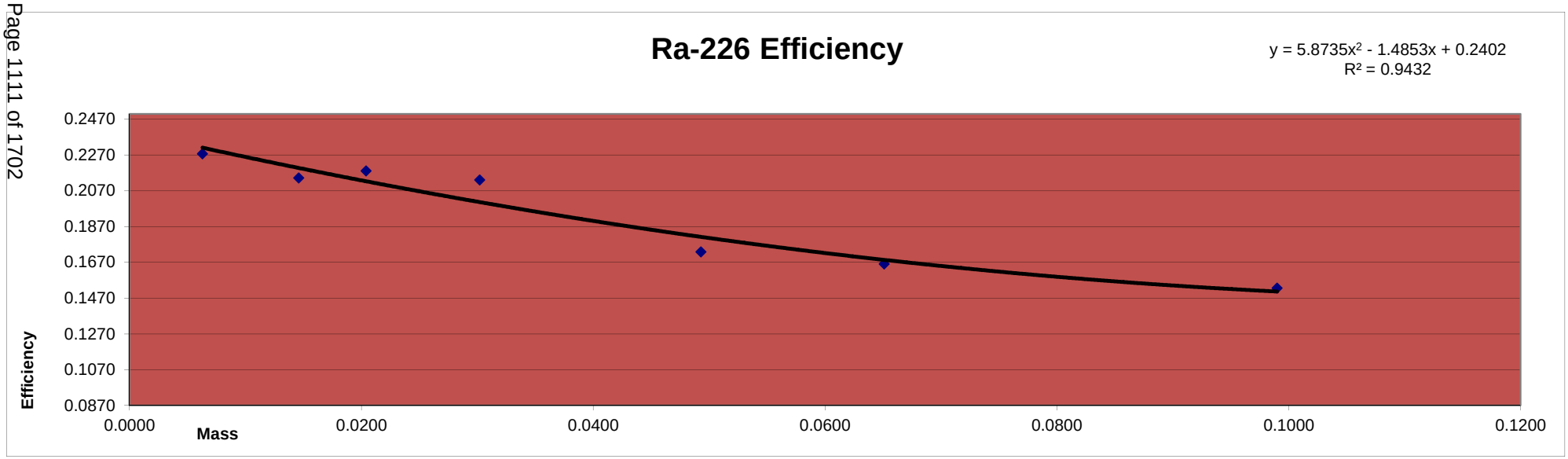
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,569	4,304.600	4,304.600
sd	0.000			0.000	254.104	16.940	16.940
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,721	6,448.067	6,448.067
sd	0.000			0.000	311.000	20.733	20.733

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
15	ICRa6-1063071;Ra2	0.0063	15.00	7/10/2019 11:15	46167	3077.8000	2/13/2017 13:30	4.0000	0.4487	1714.7664	7534.6	0.2276
15	ICRa6-1063071;Ra3	0.0146	15.00	7/10/2019 10:58	67095	4473.0000	2/13/2017 13:30	4.0000	0.6933	1613.0312	7534.6	0.2141
15	ICRa6-1063071;Ra4	0.0204	15.00	7/10/2019 10:23	71626	4775.0667	2/13/2017 13:30	4.0000	0.7265	1643.1750	7534.6	0.2181
15	ICRa6-1063071;Ra5	0.0302	15.00	7/10/2019 10:05	82828	5521.8667	2/13/2017 13:30	4.0000	0.8604	1604.4475	7534.6	0.2129
15	ICRa6-1063071;Ra6	0.0493	15.00	7/10/2019 9:46	73153	4876.8667	2/13/2017 13:30	4.0000	0.9364	1302.0672	7534.6	0.1728
15	ICRa6-1063071;Ra7	0.0651	15.00	7/10/2019 9:26	69626	4641.7333	2/13/2017 13:30	4.0000	0.9274	1251.3434	7534.6	0.1661
15	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 19:38	64832	4322.1333	2/13/2017 13:30	4.0000	0.9402	1149.2957	7534.6	0.1525



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICRa6-1063071;Ra8

Repeat 1

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:38:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:54:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,832	4,322.133	4,322.133
sd	0.000			0.000	254.621	16.975	16.975
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,799	6,453.267	6,453.267
sd	0.000			0.000	311.125	20.742	20.742

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICRa6-1063071;Ra7

Repeat 2

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:26:56 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 9:42:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	69,626	4,641.733	4,641.733
sd	0.000			0.000	263.867	17.591	17.591
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	94,280	6,285.333	6,285.333
sd	0.000			0.000	307.050	20.470	20.470

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICRa6-1063071;Ra6

Repeat 3

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 9:46:56 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:02:21 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,153	4,876.867	4,876.867
sd	0.000			0.000	270.468	18.031	18.031
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,348	6,356.533	6,356.533
sd	0.000			0.000	308.785	20.586	20.586

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICRa6-1063071;Ra5

Repeat 4

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:05:09 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:20:37 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	82,828	5,521.867	5,521.867
sd	0.000			0.000	287.799	19.187	19.187
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	93,683	6,245.533	6,245.533
sd	0.000			0.000	306.077	20.405	20.405

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICRa6-1063071;Ra4

Repeat 5

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:23:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 10:38:25 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,626	4,775.067	4,775.067
sd	0.000			0.000	267.630	17.842	17.842
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	80,893	5,392.867	5,392.867
sd	0.000			0.000	284.417	18.961	18.961

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICRa6-1063071;Ra3

Repeat 6

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 10:58:07 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:13:29 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	67,095	4,473.000	4,473.000
sd	0.000			0.000	259.027	17.268	17.268
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,690	4,979.333	4,979.333
sd	0.000			0.000	273.295	18.220	18.220

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICRa6-1063071;Ra2

Repeat 7

Carrier No. 0

Batch ID Ra226 IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:15:26 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:30:41 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

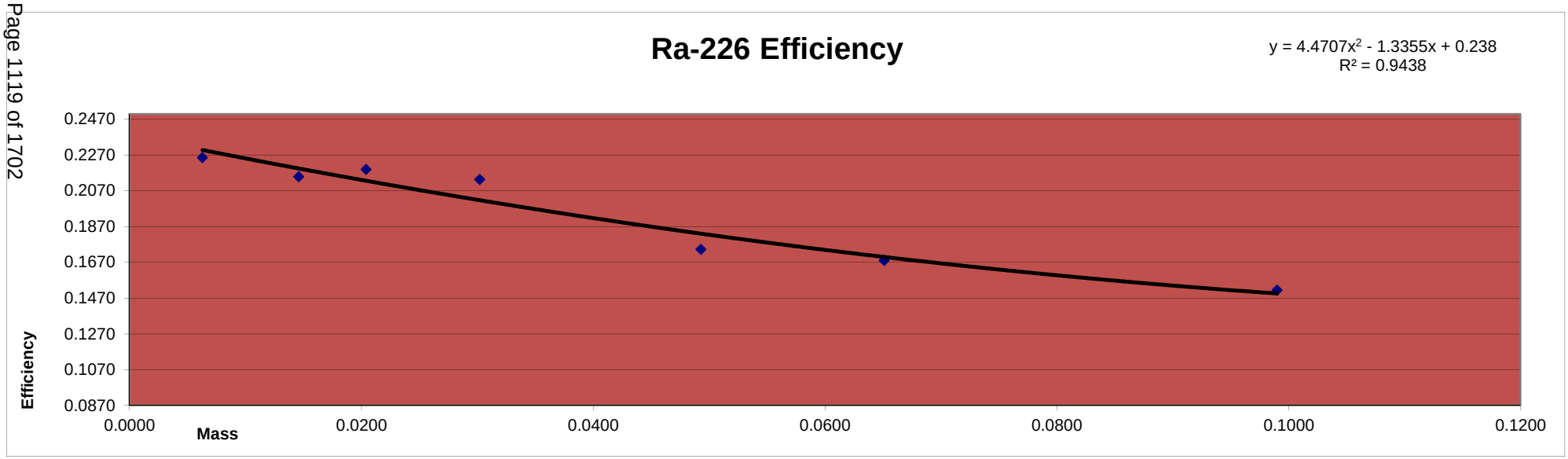
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	46,167	3,077.800	3,077.800
sd	0.000			0.000	214.865	14.324	14.324
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	49,953	3,330.200	3,330.200
sd	0.000			0.000	223.502	14.900	14.900

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
16	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 15:07	45743	3049.5333	2/13/2017 13:30	4.0000	0.4487	1699.0179	7534.6	0.2255
16	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 14:48	67344	4489.6000	2/13/2017 13:30	4.0000	0.6933	1619.0174	7534.6	0.2149
16	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 14:29	71881	4792.0667	2/13/2017 13:30	4.0000	0.7265	1649.0250	7534.6	0.2189
16	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 14:09	82978	5531.8667	2/13/2017 13:30	4.0000	0.8604	1607.3532	7534.6	0.2133
16	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 13:41	73750	4916.6667	2/13/2017 13:30	4.0000	0.9364	1312.6933	7534.6	0.1742
16	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 13:22	70449	4696.6000	2/13/2017 13:30	4.0000	0.9274	1266.1347	7534.6	0.1680
16	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 13:00	64357	4290.4667	2/13/2017 13:30	4.0000	0.9402	1140.8752	7534.6	0.1514



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICRa6-1063071;Ra8

Repeat 2

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:00:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:15:55 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	64,357	4,290.467	4,290.467
sd	0.000			0.000	253.687	16.912	16.912
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,328	6,488.533	6,488.533
sd	0.000			0.000	311.974	20.798	20.798

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICRa6-1063071;Ra7

Repeat 3

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:22:07 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:37:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,449	4,696.600	4,696.600
sd	0.000			0.000	265.422	17.695	17.695
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,214	6,347.600	6,347.600
sd	0.000			0.000	308.568	20.571	20.571

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICRa6-1063071;Ra6

Repeat 4

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:41:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:57:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,750	4,916.667	4,916.667
sd	0.000			0.000	271.570	18.105	18.105
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,074	6,404.933	6,404.933
sd	0.000			0.000	309.958	20.664	20.664

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICRa6-1063071;Ra5

Repeat 5

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:09:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:25:21 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	82,978	5,531.867	5,531.867
sd	0.000			0.000	288.059	19.204	19.204
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	93,924	6,261.600	6,261.600
sd	0.000			0.000	306.470	20.431	20.431

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICRa6-1063071;Ra4

Repeat 6

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:29:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:44:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,881	4,792.067	4,792.067
sd	0.000			0.000	268.106	17.874	17.874
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	81,922	5,461.467	5,461.467
sd	0.000			0.000	286.220	19.081	19.081

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICRa6-1063071;Ra3

Repeat 7

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:48:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:03:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	67,344	4,489.600	4,489.600
sd	0.000			0.000	259.507	17.300	17.300
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	74,876	4,991.733	4,991.733
sd	0.000			0.000	273.635	18.242	18.242

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICRa6-1063071;Ra2

Repeat 8

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 3:07:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:22:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

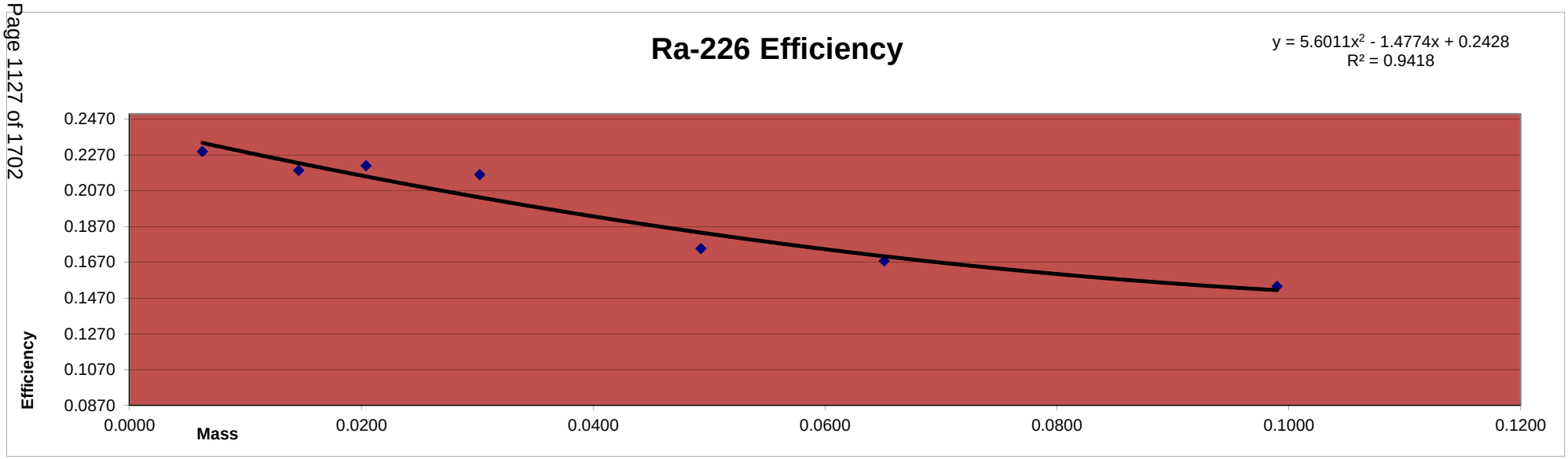
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	45,743	3,049.533	3,049.533
sd	0.000			0.000	213.876	14.258	14.258
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	49,858	3,323.867	3,323.867
sd	0.000			0.000	223.289	14.886	14.886

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
17	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 12:41	46417	3094.4667	2/13/2017 13:30	4.0000	0.4487	1724.0521	7534.6	0.2288
17	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 15:07	68436	4562.4000	2/13/2017 13:30	4.0000	0.6933	1645.2702	7534.6	0.2184
17	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 14:48	72582	4838.8000	2/13/2017 13:30	4.0000	0.7265	1665.1067	7534.6	0.2210
17	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 14:29	84007	5600.4667	2/13/2017 13:30	4.0000	0.8604	1627.2858	7534.6	0.2160
17	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 14:10	73910	4927.3333	2/13/2017 13:30	4.0000	0.9364	1315.5412	7534.6	0.1746
17	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 13:41	70314	4687.6000	2/13/2017 13:30	4.0000	0.9274	1263.7084	7534.6	0.1677
17	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 13:22	65252	4350.1333	2/13/2017 13:30	4.0000	0.9402	1156.7412	7534.6	0.1535



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICRa6-1063071;Ra2

Repeat 1

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 12:41:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 12:56:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	46,417	3,094.467	3,094.467
sd	0.000			0.000	215.446	14.363	14.363
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	50,296	3,353.067	3,353.067
sd	0.000			0.000	224.268	14.951	14.951

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICRa6-1063071;Ra8

Repeat 3

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:22:21 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:37:46 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	65,252	4,350.133	4,350.133
sd	0.000			0.000	255.445	17.030	17.030
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,963	6,530.867	6,530.867
sd	0.000			0.000	312.990	20.866	20.866

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICRa6-1063071;Ra7

Repeat 4

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:41:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:57:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,314	4,687.600	4,687.600
sd	0.000			0.000	265.168	17.678	17.678
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,711	6,380.733	6,380.733
sd	0.000			0.000	309.372	20.625	20.625

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICRa6-1063071;Ra6

Repeat 5

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:10:04 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:25:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,910	4,927.333	4,927.333
sd	0.000			0.000	271.864	18.124	18.124
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,510	6,434.000	6,434.000
sd	0.000			0.000	310.661	20.711	20.711

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICRa6-1063071;Ra5

Repeat 6

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:29:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:45:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	84,007	5,600.467	5,600.467
sd	0.000			0.000	289.840	19.323	19.323
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,035	6,335.667	6,335.667
sd	0.000			0.000	308.277	20.552	20.552

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICRa6-1063071;Ra4

Repeat 7

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:48:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:04:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,582	4,838.800	4,838.800
sd	0.000			0.000	269.410	17.961	17.961
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	82,414	5,494.267	5,494.267
sd	0.000			0.000	287.078	19.139	19.139

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICRa6-1063071;Ra3

Repeat 8

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 3:07:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:22:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

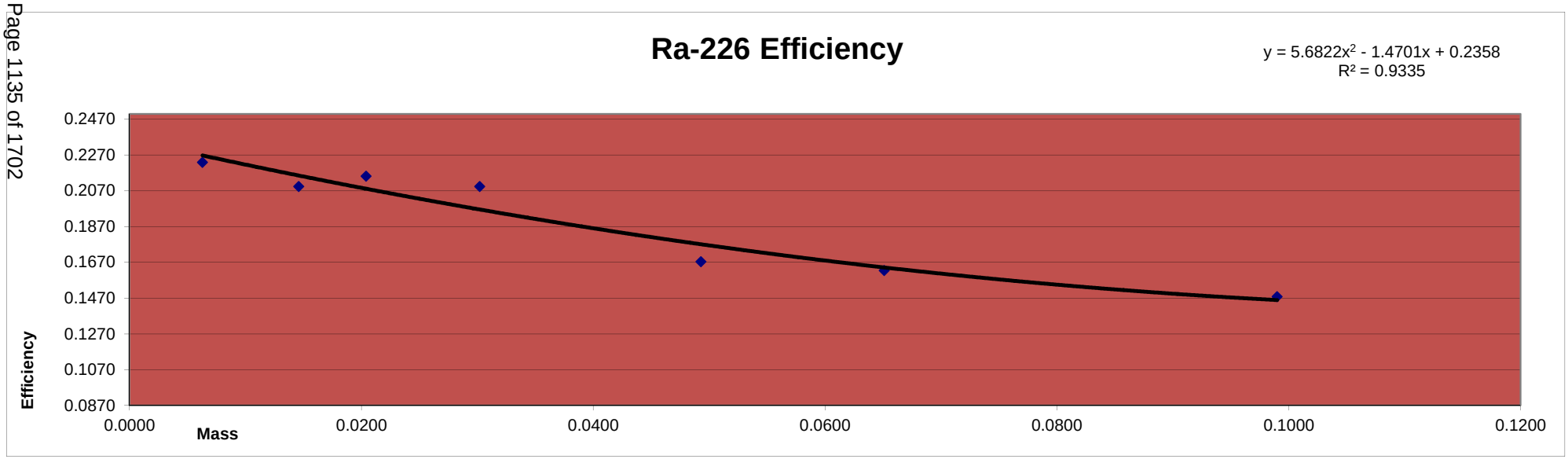
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	68,436	4,562.400	4,562.400
sd	0.000			0.000	261.603	17.440	17.440
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	75,818	5,054.533	5,054.533
sd	0.000			0.000	275.351	18.357	18.357

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
18	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 13:01	45206	3013.7333	2/13/2017 13:30	4.0000	0.4487	1679.0723	7534.6	0.2228
18	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 12:41	65622	4374.8000	2/13/2017 13:30	4.0000	0.6933	1577.6188	7534.6	0.2094
18	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 15:07	70646	4709.7333	2/13/2017 13:30	4.0000	0.7265	1620.6928	7534.6	0.2151
18	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 14:48	81421	5428.0667	2/13/2017 13:30	4.0000	0.8604	1577.1928	7534.6	0.2093
18	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 14:29	70815	4721.0000	2/13/2017 13:30	4.0000	0.9364	1260.4526	7534.6	0.1673
18	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 14:10	68102	4540.1333	2/13/2017 13:30	4.0000	0.9274	1223.9536	7534.6	0.1624
18	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 13:42	62806	4187.0667	2/13/2017 13:30	4.0000	0.9402	1113.3802	7534.6	0.1478



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICRa6-1063071;Ra3

Repeat 1

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 12:41:41 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 12:56:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	65,622	4,374.800	4,374.800
sd	0.000			0.000	256.168	17.078	17.078
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	77,517	5,167.800	5,167.800
sd	0.000			0.000	278.419	18.561	18.561

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICRa6-1063071;Ra2

Repeat 2

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:01:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:16:31 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	45,206	3,013.733	3,013.733
sd	0.000			0.000	212.617	14.174	14.174
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	51,402	3,426.800	3,426.800
sd	0.000			0.000	226.720	15.115	15.115

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICRa6-1063071;Ra8

Repeat 4

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:42:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:57:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	62,806	4,187.067	4,187.067
sd	0.000			0.000	250.611	16.707	16.707
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	100,203	6,680.200	6,680.200
sd	0.000			0.000	316.549	21.103	21.103

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICRa6-1063071;Ra7

Repeat 5

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:10:13 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:25:32 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	68,102	4,540.133	4,540.133
sd	0.000			0.000	260.964	17.398	17.398
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,132	6,475.467	6,475.467
sd	0.000			0.000	311.660	20.777	20.777

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICRa6-1063071;Ra6

Repeat 6

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:29:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:45:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,815	4,721.000	4,721.000
sd	0.000			0.000	266.111	17.741	17.741
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	98,256	6,550.400	6,550.400
sd	0.000			0.000	313.458	20.897	20.897

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICRa6-1063071;Ra5

Repeat 7

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:48:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:04:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	81,421	5,428.067	5,428.067
sd	0.000			0.000	285.344	19.023	19.023
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,694	6,512.933	6,512.933
sd	0.000			0.000	312.560	20.837	20.837

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICRa6-1063071;Ra4

Repeat 8

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 3:07:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:22:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

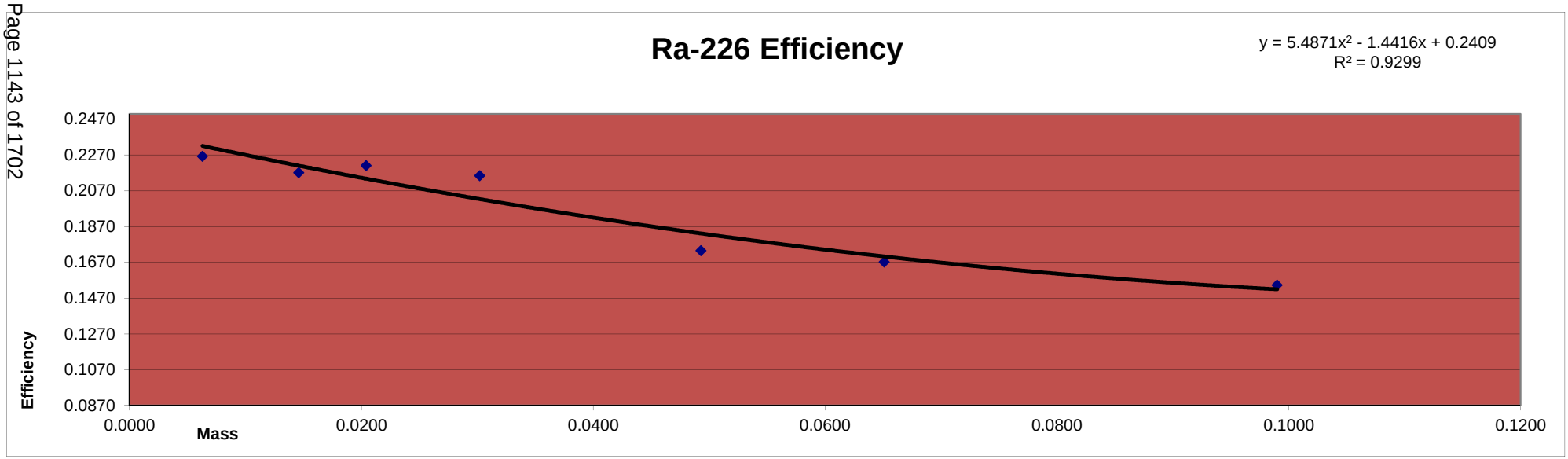
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,646	4,709.733	4,709.733
sd	0.000			0.000	265.793	17.720	17.720
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	84,962	5,664.133	5,664.133
sd	0.000			0.000	291.482	19.432	19.432

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
19	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 13:22	45874	3058.2667	2/13/2017 13:30	4.0000	0.4487	1703.8836	7534.6	0.2261
19	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 13:01	68016	4534.4000	2/13/2017 13:30	4.0000	0.6933	1635.1730	7534.6	0.2170
19	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 12:41	72578	4838.5333	2/13/2017 13:30	4.0000	0.7265	1665.0149	7534.6	0.2210
19	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 15:07	83791	5586.0667	2/13/2017 13:30	4.0000	0.8604	1623.1017	7534.6	0.2154
19	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 14:49	73459	4897.2667	2/13/2017 13:30	4.0000	0.9364	1307.5138	7534.6	0.1735
19	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 14:30	70113	4674.2000	2/13/2017 13:30	4.0000	0.9274	1260.0960	7534.6	0.1672
19	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 14:10	65561	4370.7333	2/13/2017 13:30	4.0000	0.9402	1162.2189	7534.6	0.1543



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICRa6-1063071;Ra4

Repeat 1

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 12:41:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 12:57:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,578	4,838.533	4,838.533
sd	0.000			0.000	269.403	17.960	17.960
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	85,570	5,704.667	5,704.667
sd	0.000			0.000	292.524	19.502	19.502

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICRa6-1063071;Ra3

Repeat 2

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:01:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:16:51 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	68,016	4,534.400	4,534.400
sd	0.000			0.000	260.799	17.387	17.387
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	78,531	5,235.400	5,235.400
sd	0.000			0.000	280.234	18.682	18.682

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICRa6-1063071;Ra2

Repeat 3

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:22:39 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:37:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	45,874	3,058.267	3,058.267
sd	0.000			0.000	214.182	14.279	14.279
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	52,152	3,476.800	3,476.800
sd	0.000			0.000	228.368	15.225	15.225

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICRa6-1063071;Ra8

Repeat 5

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:10:23 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:25:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	65,561	4,370.733	4,370.733
sd	0.000			0.000	256.049	17.070	17.070
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	100,427	6,695.133	6,695.133
sd	0.000			0.000	316.902	21.127	21.127

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICRa6-1063071;Ra7

Repeat 6

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:30:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:45:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,113	4,674.200	4,674.200
sd	0.000			0.000	264.789	17.653	17.653
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	97,355	6,490.333	6,490.333
sd	0.000			0.000	312.018	20.801	20.801

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICRa6-1063071;Ra6

Repeat 7

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:49:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:04:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	73,459	4,897.267	4,897.267
sd	0.000			0.000	271.033	18.069	18.069
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	98,533	6,568.867	6,568.867
sd	0.000			0.000	313.900	20.927	20.927

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICRa6-1063071;Ra5

Repeat 8

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 3:07:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:23:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

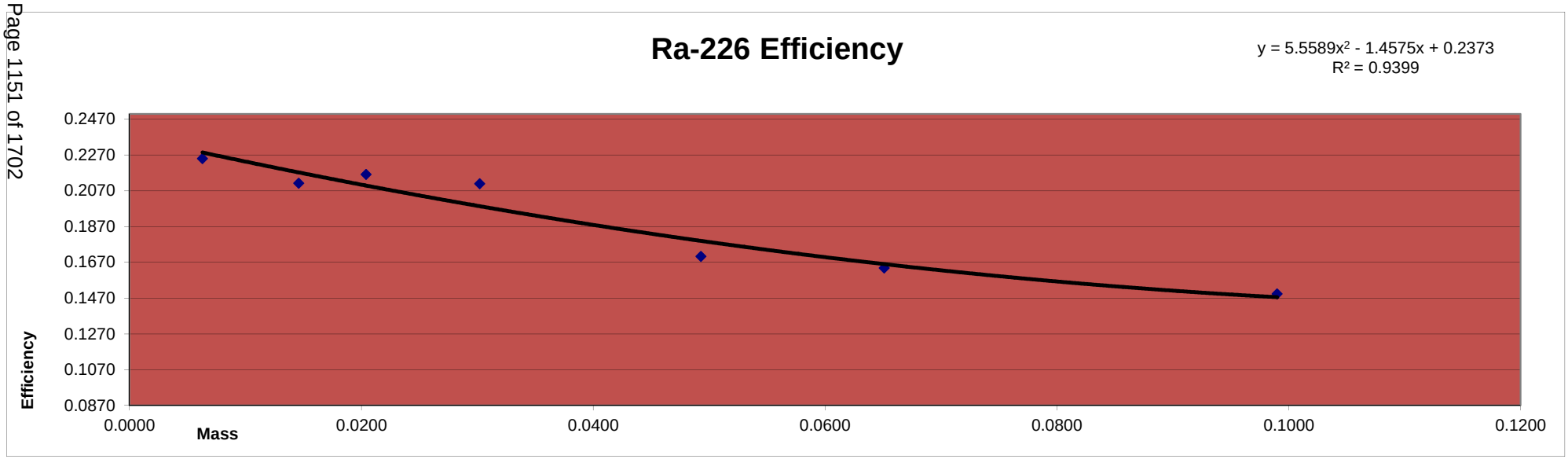
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	83,791	5,586.067	5,586.067
sd	0.000			0.000	289.467	19.298	19.298
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	98,619	6,574.600	6,574.600
sd	0.000			0.000	314.037	20.936	20.936

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
21	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 14:10	45638	3042.5333	2/13/2017 13:30	4.0000	0.4487	1695.1180	7534.6	0.2250
21	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 13:42	66158	4410.5333	2/13/2017 13:30	4.0000	0.6933	1590.5048	7534.6	0.2111
21	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 13:22	70957	4730.4667	2/13/2017 13:30	4.0000	0.7265	1627.8275	7534.6	0.2160
21	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 13:01	82049	5469.9333	2/13/2017 13:30	4.0000	0.8604	1589.3577	7534.6	0.2109
21	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 12:41	72082	4805.4667	2/13/2017 13:30	4.0000	0.9364	1283.0042	7534.6	0.1703
21	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 15:07	68660	4577.3333	2/13/2017 13:30	4.0000	0.9274	1233.9821	7534.6	0.1638
21	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 14:49	63493	4232.8667	2/13/2017 13:30	4.0000	0.9402	1125.5589	7534.6	0.1494



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICRa6-1063071;Ra5

Repeat 2

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:01:47 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:17:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	82,049	5,469.933	5,469.933
sd	0.000			0.000	286.442	19.096	19.096
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,010	6,400.667	6,400.667
sd	0.000			0.000	309.855	20.657	20.657

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICRa6-1063071;Ra4

Repeat 3

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:22:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:38:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	70,957	4,730.467	4,730.467
sd	0.000			0.000	266.378	17.759	17.759
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	83,231	5,548.733	5,548.733
sd	0.000			0.000	288.498	19.233	19.233

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICRa6-1063071;Ra3

Repeat 4

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:42:33 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:57:54 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	66,158	4,410.533	4,410.533
sd	0.000			0.000	257.212	17.147	17.147
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,020	5,068.000	5,068.000
sd	0.000			0.000	275.717	18.381	18.381

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICRa6-1063071;Ra2

Repeat 5

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:10:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:25:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	45,638	3,042.533	3,042.533
sd	0.000			0.000	213.631	14.242	14.242
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	50,704	3,380.267	3,380.267
sd	0.000			0.000	225.175	15.012	15.012

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICRa6-1063071;Ra8

Repeat 7

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:49:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:04:45 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	63,493	4,232.867	4,232.867
sd	0.000			0.000	251.978	16.799	16.799
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	98,523	6,568.200	6,568.200
sd	0.000			0.000	313.884	20.926	20.926

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICRa6-1063071;Ra7

Repeat 8

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 3:07:53 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:23:19 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

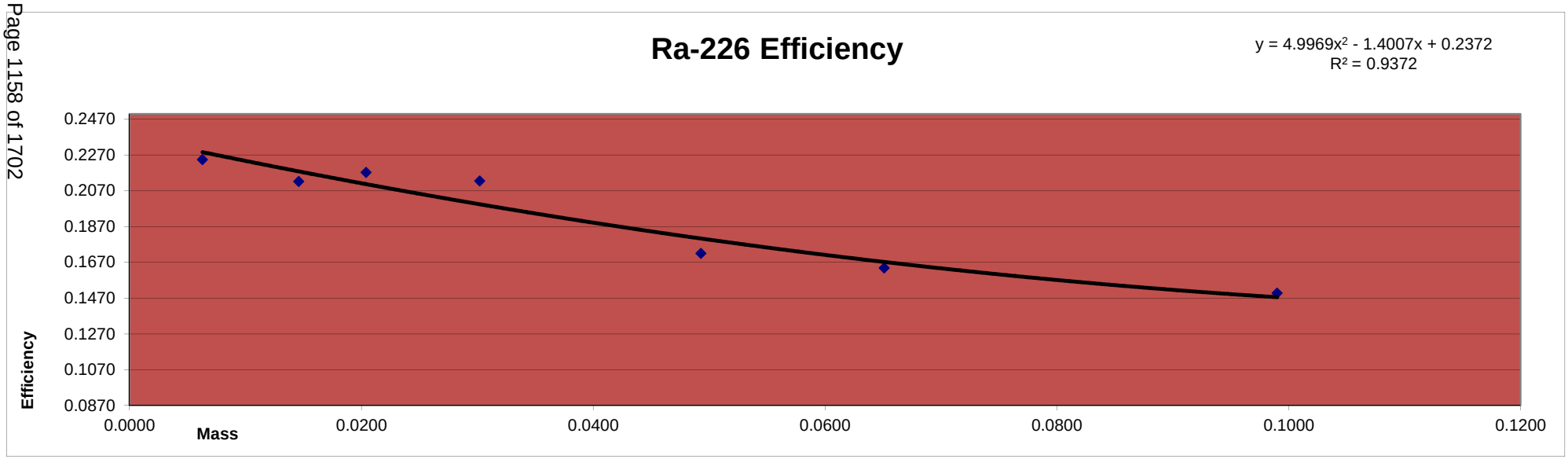
	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	68,660	4,577.333	4,577.333
sd	0.000			0.000	262.031	17.469	17.469
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,817	6,387.800	6,387.800
sd	0.000			0.000	309.543	20.636	20.636

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra-226 Calibration 2019

Detector	Std #	Mass	Count Time	Sample Time	Alpha Counts	CPM	Sep Time	Ingrowth	Recovery	Adj CPM	DPM	Efficiency
22	ICRa6-1063071;Ra2	0.0063	15.00	7/9/2019 14:30	45523	3034.8667	2/13/2017 13:30	4.0000	0.4487	1690.8466	7534.6	0.2244
22	ICRa6-1063071;Ra3	0.0146	15.00	7/9/2019 14:10	66468	4431.2000	2/13/2017 13:30	4.0000	0.6933	1597.9575	7534.6	0.2121
22	ICRa6-1063071;Ra4	0.0204	15.00	7/9/2019 13:42	71351	4756.7333	2/13/2017 13:30	4.0000	0.7265	1636.8663	7534.6	0.2172
22	ICRa6-1063071;Ra5	0.0302	15.00	7/9/2019 13:23	82604	5506.9333	2/13/2017 13:30	4.0000	0.8604	1600.1085	7534.6	0.2124
22	ICRa6-1063071;Ra6	0.0493	15.00	7/9/2019 13:01	72815	4854.3333	2/13/2017 13:30	4.0000	0.9364	1296.0511	7534.6	0.1720
22	ICRa6-1063071;Ra7	0.0651	15.00	7/9/2019 12:42	68703	4580.2000	2/13/2017 13:30	4.0000	0.9274	1234.7549	7534.6	0.1639
22	ICRa6-1063071;Ra8	0.0990	15.00	7/9/2019 15:08	63625	4241.6667	2/13/2017 13:30	4.0000	0.9402	1127.8989	7534.6	0.1497



Reagent ID:Ra-226_00022
Container #:986404
Final Conc.: 7534.60740 dpm/mL
Added: 1mL

Reagent ID:Ba Carrier_00026
Container #: 1015438
Cert.#: 16I027

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICRa6-1063071;Ra7

Repeat 1

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 12:42:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 12:57:24 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	68,703	4,580.200	4,580.200
sd	0.000			0.000	262.113	17.474	17.474
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	95,716	6,381.067	6,381.067
sd	0.000			0.000	309.380	20.625	20.625

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICRa6-1063071;Ra6

Repeat 2

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:01:55 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:17:22 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	72,815	4,854.333	4,854.333
sd	0.000			0.000	269.843	17.990	17.990
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,891	6,459.400	6,459.400
sd	0.000			0.000	311.273	20.752	20.752

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICRa6-1063071;Ra5

Repeat 3

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:23:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:38:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	82,604	5,506.933	5,506.933
sd	0.000			0.000	287.409	19.161	19.161
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	96,452	6,430.133	6,430.133
sd	0.000			0.000	310.567	20.704	20.704

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICRa6-1063071;Ra4

Repeat 4

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 1:42:41 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 1:58:05 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	71,351	4,756.733	4,756.733
sd	0.000			0.000	267.116	17.808	17.808
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	82,916	5,527.733	5,527.733
sd	0.000			0.000	287.951	19.197	19.197

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICRa6-1063071;Ra3

Repeat 5

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:10:42 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:26:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	66,468	4,431.200	4,431.200
sd	0.000			0.000	257.814	17.188	17.188
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	76,478	5,098.533	5,098.533
sd	0.000			0.000	276.547	18.436	18.436

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICRa6-1063071;Ra2

Repeat 6

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 2:30:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 2:45:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	45,523	3,034.867	3,034.867
sd	0.000			0.000	213.361	14.224	14.224
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	51,219	3,414.600	3,414.600
sd	0.000			0.000	226.316	15.088	15.088

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICRa6-1063071;Ra8

Repeat 8

Carrier No. 0

Batch ID Ra226_IC

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 3:08:03 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 3:23:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 15.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	63,625	4,241.667	4,241.667
sd	0.000			0.000	252.240	16.816	16.816
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	98,254	6,550.267	6,550.267
sd	0.000			0.000	313.455	20.897	20.897

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha Beta Calibration Verifications

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Blue - Beta ICV 2017				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
0	98.34%	96.97%	97.96%	97.76%

Beta Activity 1815.077 pCi

Standard ID
Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Count Date:	3/31/2017		(or date at which you wish to determine activity)
Elapsed Time:	1583.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.899957764		
Corrected Activity:	2014.735445	dpm	
Decay Activity (Sr/Y-90)	4029.47089	dpm	1815.077 pCi

Prep Batch: 239589

Detector	Beta 1	Activity	Units
0	Low Mass	1.785E+03	pCi/mL

Beta 2	Activity	Units
Medium Mass	1.760E+03	pCi/mL

Beta 3	Activity	Units
High Mass	1.778E+03	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICVABT-51512;Beta1

Repeat 1

Carrier No. 0

Batch ID Beta_ICV

Count Method Gross Alpha Beta

Detector Volts 1575

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 3/31/2017 12:09:35 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 3/31/2017 12:14:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.026	87	17.400	17.400
sd	0.000			0.000	9.327	1.865	1.865
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.350	8,534	1,706.800	1,706.800
sd	0.000			0.000	92.380	18.476	18.476

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICVABT-51512;Beta3

Repeat 3

Carrier No. 0

Batch ID Beta_ICV

Count Method Gross Alpha Beta

Detector Volts 1575

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 3/31/2017 12:27:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 3/31/2017 12:32:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.026	78	15.600	15.600
sd	0.000			0.000	8.832	1.766	1.766
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.350	7,590	1,518.000	1,518.000
sd	0.000			0.000	87.121	17.424	17.424

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICVABT-51512;Beta2

Repeat 4

Carrier No. 0

Batch ID Beta_ICV

Count Method Gross Alpha Beta

Detector Volts 1575

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 3/31/2017 12:43:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 3/31/2017 12:48:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.026	58	11.600	11.600
sd	0.000			0.000	7.616	1.523	1.523
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.350	7,918	1,583.600	1,583.600
sd	0.000			0.000	88.983	17.797	17.797

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Blue - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
0	85.52%	96.48%	103.46%	95.15%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 114475 Ref. date 10/29/19

Activity 1.031E+06 pCi/L

Prep Batch: 566222

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232	0.0537	0.0846
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
0	8.820E+05	9.950E+05	1.067E+06

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICVABT-1835527; A

Repeat 44

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/2/2022 12:44:20 PM

Count Ended 6/2/2022 1:04:30 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	6,556	327.800	327.680
sd	0.011	80.969	4.048	4.048
Beta	0.431	3,008	150.400	149.969
sd	0.021	54.845	2.742	2.742

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICVABT-1835527; C

Repeat 49

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/2/2022 3:07:13 PM

Count Ended 6/2/2022 3:27:57 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	7,683	384.150	384.030
sd	0.011	87.653	4.383	4.383
Beta	0.431	3,908	195.400	194.969
sd	0.021	62.514	3.126	3.126

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - A

Addr: 0

Sample ID ICVABT-1835527; B

Repeat 51

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 6/2/2022 3:29:45 PM

Count Ended 6/2/2022 3:50:03 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.120	9,833	491.650	491.530
sd	0.011	99.161	4.958	4.958
Beta	0.431	4,754	237.700	237.269
sd	0.021	68.949	3.447	3.448

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Orange Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
0	97.69%	98.94%	99.54%	98.72%

Beta Activity 2009.34 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Count Date:	1/24/2013		(or date at which you wish to determine activity)
Elapsed Time:	56.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.996278064		
Corrected Activity:	2230.367701	dpm	
Decay Activity (Sr/Y-90)	4460.735402	dpm	2009.34 pCi

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICV-51512;Beta 1

Repeat 8

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 7:06:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 7:11:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	32	6.400	6.322
sd	0.000			0.009	5.657	1.131	1.131
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	9,465	1,893.000	1,892.597
sd	0.000			0.020	97.288	19.458	19.458

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICV-51512;Beta 3

Repeat 8

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 7:16:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 7:21:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	30	6.000	5.922
sd	0.000			0.009	5.477	1.095	1.095
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	8,720	1,744.000	1,743.597
sd	0.000			0.020	93.381	18.676	18.676

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICV-51512;Beta 2

Repeat 9

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 7:24:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 7:29:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.078	39	7.800	7.722
sd	0.000			0.009	6.245	1.249	1.249
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.403	9,066	1,813.200	1,812.797
sd	0.000			0.020	95.216	19.043	19.043

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

eurofins Environment Testing TestAmerica

Analysis Report for Gross Alpha/Beta

Batch: 451383 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-36042-A-1-BG	1.000E+000mL		0.0314 g	Orange0	8/27/20 14:35		15.00	1000.00	1.00	1.00		
	Gross Alpha	10063	86	0.00	6.709E+002	8.600E-002	0.1534	**1.970E+003**pCi/mL	1.140E+002	1.964E+001	1.324E+000	3.685E-001	113.9665
ICVABT-1835527; B	160-36042-A-1-BH	1.000E+000mL		0.0588 g	Orange0	8/27/20 15:33		15.00	1000.00	1.00	1.00		
	Gross Alpha	8778	86	0.00	5.852E+002	8.600E-002	0.1232	**2.140E+003**pCi/mL	1.241E+002	2.285E+001	1.649E+000	4.590E-001	124.1057
ICVABT-1835527; C	160-36042-A-1-BI	1.000E+000mL		0.0961 g	Orange0	8/27/20 15:06		15.00	1000.00	1.00	1.00		
	Gross Alpha	13865	86	0.00	9.243E+002	8.600E-002	0.0949	**4.386E+003**pCi/mL	2.528E+002	3.725E+001	2.140E+000	5.955E-001	252.7815

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

ICV is for Gross Alpha

Orange Alpha ICV 2020				
				Mean
	Low Mass	Medium Mass	High Mass	Recovery
Detector	Recovery	Recovery	Recovery	
0	98.86%	107.39%	110.05%	105.43%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 95358 Ref. date 01/11/2017

Activity 2x 1992.7 pCi/mL

Activity 4x 3985.5 pCi/mL

Prep Batch: 451383

	Low Mass	Medium Mass	High Mass
	0.314g	0.0588g	0.0961
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
0	1.97E+03	2.14E+03	4.39E+03

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICVABT-1835527; A

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 2:35:33 PM

Count Ended 8/27/2020 2:50:41 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	10,063	670.867	670.781
sd	0.009	100.315	6.688	6.688
Beta	0.450	3,684	245.600	245.150
sd	0.021	60.696	4.046	4.046

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICVABT-1835527; C

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 3:06:03 PM

Count Ended 8/27/2020 3:21:10 PM

Sample Count Time 15.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	13,865	924.333	924.247
sd	0.009	117.750	7.850	7.850
Beta	0.450	5,154	343.600	343.150
sd	0.021	71.791	4.786	4.786

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - A

Addr: 0

Sample ID ICVABT-1835527; B

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 3:33:40 PM

Count Ended 8/27/2020 3:48:49 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.086	8,778	585.200	585.114
sd	0.009	93.691	6.246	6.246
Beta	0.450	3,227	215.133	214.683
sd	0.021	56.807	3.787	3.787

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Orange Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
3	98.34%	99.19%	98.84%	98.79%

Beta Activity 2009.34 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Current Date:	1/24/2013		(or date at which you wish to determine activity)
Elapsed Time:	56.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.996278064		
Corrected Activity:	2230.367701	dpm	
Decay Activity (Sr/Y-90)	4460.735402	dpm	2009.34 pCi

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICV-51512;Beta 2

Repeat 5

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 6:41:04 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 6:46:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	7	1.400	1.335
sd	0.000			0.008	2.646	0.529	0.529
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	8,934	1,786.800	1,786.444
sd	0.000			0.019	94.520	18.904	18.904

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICV-51512;Beta 1

Repeat 6

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 6:47:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 6:52:20 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	6	1.200	1.135
sd	0.000			0.008	2.449	0.490	0.490
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	9,374	1,874.800	1,874.444
sd	0.000			0.019	96.819	19.364	19.364

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICV-51512;Beta 3

Repeat 7

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/24/2013 6:56:50 PM

Collection Date 1 1/1/1900

Half Life 0.00 ***days***

Count Ended 1/24/2013 7:01:54 PM

Collection Date 2 1/1/1900

Decay Factor 1.000

Sample Count Time 5.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.065	6	1.200	1.135
sd	0.000			0.008	2.449	0.490	0.490
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.356	8,500	1,700.000	1,699.644
sd	0.000			0.019	92.195	18.439	18.439

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected**

MDC Method Tb = Ts < 10

Error = .00 **x sd**

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Analysis Report for Gross Alpha/Beta

Batch: 451383 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-36042-A-1-BG	1.000E+000mL		0.0314 g	Orange3	8/27/20 13:01		15.00	1000.00	1.00	1.00		
	Gross Alpha	9138	106	0.00	6.092E+002	1.060E-001	0.1416	1.937E+003pCi/mL	1.123E+002	2.027E+001	1.522E+000	4.431E-001	112.2655
ICVABT-1835527; B	160-36042-A-1-BH	1.000E+000mL		0.0588 g	Orange3	8/27/20 14:04		15.00	1000.00	1.00	1.00		
	Gross Alpha	7868	106	0.00	5.245E+002	1.060E-001	0.1111	2.126E+003pCi/mL	1.235E+002	2.398E+001	1.941E+000	5.649E-001	123.5471
ICVABT-1835527; C	160-36042-A-1-BI	1.000E+000mL		0.0961 g	Orange3	8/27/20 13:28		15.00	1000.00	1.00	1.00		
	Gross Alpha	12492	106	0.00	8.328E+002	1.060E-001	0.0873	4.297E+003pCi/mL	2.479E+002	3.845E+001	2.470E+000	7.189E-001	247.9314

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

ICV is for Gross Alpha

Orange Alpha ICV 2020				
				Mean
	Low Mass	Medium Mass	High Mass	Recovery
Detector	Recovery	Recovery	Recovery	
3	97.20%	106.69%	107.82%	103.90%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 95358 Ref. date 01/11/2017

Activity 2x 1992.7 pCi/mL

Activity 4x 3985.5 pCi/mL

Prep Batch: 451383

	Low Mass	Medium Mass	High Mass
	0.314g	0.0588g	0.0961
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
3	1.94E+03	2.13E+03	4.30E+03

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICVABT-1835527; A

Repeat 1

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 1:01:07 PM

Count Ended 8/27/2020 1:16:36 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	9,138	609.200	609.094
sd	0.010	95.593	6.373	6.373
Beta	0.525	3,599	239.933	239.408
sd	0.023	59.992	3.999	4.000

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICVABT-1835527; C

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 1:28:28 PM

Count Ended 8/27/2020 1:43:36 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	12,492	832.800	832.694
sd	0.010	111.768	7.451	7.451
Beta	0.525	5,048	336.533	336.008
sd	0.023	71.049	4.737	4.737

Alpha/Beta Count Results

Sample Activity Report

Orange 0-3 - D

Addr: 3

Sample ID ICVABT-1835527; B

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/27/2020 2:04:51 PM

Count Ended 8/27/2020 2:19:55 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	7,868	524.533	524.427
sd	0.010	88.702	5.913	5.913
Beta	0.525	3,187	212.467	211.942
sd	0.023	56.454	3.764	3.764

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Orange Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
15	99.49%	99.39%	99.49%	99.45%

Beta Activity 2009.34 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Current Date:	1/24/2013		(or date at which you wish to determine activity)
Elapsed Time:	56.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.996278064		
Corrected Activity:	2230.367701	dpm	
Decay Activity (Sr/Y-90)	4460.735402	dpm	2009.34 pCi

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICV-51512;Beta 3

Repeat 14

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 9:14:38 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 9:19:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	9	1.800	1.698
sd	0.000			0.010	3.000	0.600	0.600
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	8,500	1,700.000	1,699.598
sd	0.000			0.020	92.195	18.439	18.439

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICV-51512;Beta 2

Repeat 15

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 9:23:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 9:28:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	4	0.800	0.698
sd	0.000			0.010	2.000	0.400	0.400
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	8,892	1,778.400	1,777.998
sd	0.000			0.020	94.297	18.859	18.859

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICV-51512;Beta 1

Repeat 16

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 9:34:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 9:39:35 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.102	6	1.200	1.098
sd	0.000			0.010	2.449	0.490	0.490
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.402	9,415	1,883.000	1,882.598
sd	0.000			0.020	97.031	19.406	19.406

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

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Analysis Report for Gross Alpha/Beta

Batch: 451383 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-36042-A-1-BG	1.000E+000mL		0.0314 g	Orange15	8/30/20 17:09		15.00	1000.00	1.00	1.00		
	Gross Alpha	10068	122	0.00	6.712E+002	1.220E-001	0.1508	**2.005E+003**pCi/mL	1.160E+002	1.998E+001	1.490E+000	4.465E-001	115.9992
ICVABT-1835527; B	160-36042-A-1-BH	1.000E+000mL		0.0588 g	Orange15	8/30/20 16:29		15.00	1000.00	1.00	1.00		
	Gross Alpha	8588	122	0.00	5.725E+002	1.220E-001	0.1206	**2.138E+003**pCi/mL	1.240E+002	2.307E+001	1.863E+000	5.582E-001	124.0265
ICVABT-1835527; C	160-36042-A-1-BI	1.000E+000mL		0.0961 g	Orange15	8/30/20 16:07		15.00	1000.00	1.00	1.00		
	Gross Alpha	13815	122	0.00	9.210E+002	1.220E-001	0.0925	**4.486E+003**pCi/mL	2.585E+002	3.817E+001	2.431E+000	7.281E-001	258.5413

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

ICV is for Gross Alpha

Orange Alpha ICV 2020				
				Mean
	Low Mass	Medium Mass	High Mass	Recovery
Detector	Recovery	Recovery	Recovery	
15	100.62%	107.29%	112.56%	106.82%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 95358 Ref. date 01/11/2017

Activity 2x 1992.7 pCi/mL

Activity 4x 3985.5 pCi/mL

Prep Batch: 451383

	Low Mass	Medium Mass	High Mass
	0.314g	0.0588g	0.0961
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
15	2.01E+03	2.14E+03	4.49E+03

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICVABT-1835527; C

Repeat 14

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 4:07:45 PM

Count Ended 8/30/2020 4:22:51 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	13,815	921.000	920.878
sd	0.011	117.537	7.836	7.836
Beta	0.398	5,427	361.800	361.402
sd	0.020	73.668	4.911	4.911

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICVABT-1835527; B

Repeat 15

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 4:29:16 PM

Count Ended 8/30/2020 4:44:24 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	8,588	572.533	572.411
sd	0.011	92.671	6.178	6.178
Beta	0.398	3,074	204.933	204.535
sd	0.020	55.444	3.696	3.696

Alpha/Beta Count Results

Sample Activity Report

Orange 12-15 - D

Addr: 15

Sample ID ICVABT-1835527; A

Repeat 16

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 5:09:24 PM

Count Ended 8/30/2020 5:24:30 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.122	10,068	671.200	671.078
sd	0.011	100.339	6.689	6.689
Beta	0.398	3,595	239.667	239.269
sd	0.020	59.958	3.997	3.997

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Orange Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
20	100.68%	99.39%	100.88%	100.31%

Beta Activity 2009.34 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Current Date:	1/24/2013		(or date at which you wish to determine activity)
Elapsed Time:	56.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.996278064		
Corrected Activity:	2230.367701	dpm	
Decay Activity (Sr/Y-90)	4460.735402	dpm	2009.34 pCi

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICV-51512;Beta 1

Repeat 21

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 10:42:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 10:47:48 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	8	1.600	1.533
sd	0.000			0.008	2.828	0.566	0.566
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	9,601	1,920.200	1,919.931
sd	0.000			0.016	97.985	19.597	19.597

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICV-51512;Beta 3

Repeat 23

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 11:01:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 11:06:20 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	6	1.200	1.133
sd	0.000			0.008	2.449	0.490	0.490
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	8,653	1,730.600	1,730.331
sd	0.000			0.016	93.022	18.604	18.604

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICV-51512;Beta 2

Repeat 24

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/24/2013 11:07:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 1/24/2013 11:12:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.067	6	1.200	1.133
sd	0.000			0.008	2.449	0.490	0.490
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.269	8,925	1,785.000	1,784.731
sd	0.000			0.016	94.472	18.894	18.894

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

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Analysis Report for Gross Alpha/Beta

Batch: 451383 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-36042-A-1-BG	1.000E+000mL		0.0314 g	Orange20	8/30/20 19:33		15.00	1000.00	1.00	1.00		
	Gross Alpha	10160	196	0.00	6.773E+002	1.960E-001	0.1523	**2.003E+003**pCi/mL	1.159E+002	1.987E+001	1.712E+000	5.603E-001	115.8637
ICVABT-1835527; B	160-36042-A-1-BH	1.000E+000mL		0.0588 g	Orange20	8/30/20 19:01		15.00	1000.00	1.00	1.00		
	Gross Alpha	8826	196	0.00	5.884E+002	1.960E-001	0.1224	**2.164E+003**pCi/mL	1.255E+002	2.304E+001	2.130E+000	6.970E-001	125.4913
ICVABT-1835527; C	160-36042-A-1-BI	1.000E+000mL		0.0961 g	Orange20	8/30/20 18:38		15.00	1000.00	1.00	1.00		
	Gross Alpha	13981	196	0.00	9.321E+002	1.960E-001	0.0950	**4.418E+003**pCi/mL	2.546E+002	3.737E+001	2.745E+000	8.982E-001	254.6022

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

ICV is for Gross Alpha

Orange Alpha ICV 2020				
				Mean
	Low Mass	Medium Mass	High Mass	Recovery
Detector	Recovery	Recovery	Recovery	
20	100.52%	108.60%	110.85%	106.66%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 95358 Ref. date 01/11/2017

Activity 2x 1992.7 pCi/mL

Activity 4x 3985.5 pCi/mL

Prep Batch: 451383

	Low Mass	Medium Mass	High Mass
	0.314g	0.0588g	0.0961
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
20	2.00E+03	2.16E+03	4.42E+03

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICVABT-1835527; C

Repeat 19

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 6:38:55 PM

Count Ended 8/30/2020 6:54:00 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	13,981	932.067	931.871
sd	0.014	118.241	7.883	7.883
Beta	0.377	5,776	385.067	384.690
sd	0.019	76.000	5.067	5.067

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICVABT-1835527; B

Repeat 20

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 7:01:43 PM

Count Ended 8/30/2020 7:16:51 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	8,826	588.400	588.204
sd	0.014	93.947	6.263	6.263
Beta	0.377	3,449	229.933	229.556
sd	0.019	58.728	3.915	3.915

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - A

Addr: 20

Sample ID ICVABT-1835527; A

Repeat 21

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 7:33:19 PM

Count Ended 8/30/2020 7:48:28 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.196	10,160	677.333	677.137
sd	0.014	100.797	6.720	6.720
Beta	0.377	3,858	257.200	256.823
sd	0.019	62.113	4.141	4.141

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Orange Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
23	98.69%	98.64%	101.53%	99.62%

Beta Activity 2009.34 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512 (Rad12-0043)
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Current Date:	1/24/2013		(or date at which you wish to determine activity)
Elapsed Time:	56.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.996278064		
Corrected Activity:	2230.367701	dpm	
Decay Activity (Sr/Y-90)	4460.735402	dpm	2009.34 pCi

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICV-51512;Beta 3

Repeat 22

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***l***	**sd**	0 ***l***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 1/24/2013 10:51:11 PM

Collection Date 1 1/1/1900

Half Life 0.00 ***days***

Count Ended 1/24/2013 10:56:14 PM

Collection Date 2 1/1/1900

Decay Factor 1.000

Sample Count Time 5.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	3	0.600	0.554
sd	0.000			0.007	1.732	0.346	0.346
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	8,756	1,751.200	1,750.870
sd	0.000			0.018	93.574	18.715	18.715

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected**

MDC Method Tb = Ts < 10

Error = .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICV-51512;Beta 2

Repeat 23

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 11:01:28 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 11:06:30 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	5	1.000	0.954
sd	0.000			0.007	2.236	0.447	0.447
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	8,918	1,783.600	1,783.270
sd	0.000			0.018	94.435	18.887	18.887

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICV-51512;Beta 1

Repeat 24

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *l* **sd** 0 *l*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 1/24/2013 11:07:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 1/24/2013 11:12:38 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.046	3	0.600	0.554
sd	0.000			0.007	1.732	0.346	0.346
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.330	9,421	1,884.200	1,883.870
sd	0.000			0.018	97.062	19.412	19.412

	Net Activity dpm	LLD dpm	MDC pCi/l	MPC pCi/l	Net Concentration * pCi/l	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	1.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Tb = Ts < 10 **Error =** .00 **x sd**

eurofins Environment Testing TestAmerica

Analysis Report for Gross Alpha/Beta

Batch: 451383 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-36042-A-1-BG	1.000E+000mL		0.0314 g	Orange23	8/30/20 21:08		15.00	1000.00	1.00	1.00		
	Gross Alpha	9493	91	0.00	6.329E+002	9.100E-002	0.1436	**1.985E+003**pCi/mL	1.150E+002	2.038E+001	1.438E+000	4.050E-001	114.9929
ICVABT-1835527; B	160-36042-A-1-BH	1.000E+000mL		0.0588 g	Orange23	8/30/20 20:50		15.00	1000.00	1.00	1.00		
	Gross Alpha	8185	91	0.00	5.457E+002	9.100E-002	0.1135	**2.165E+003**pCi/mL	1.257E+002	2.393E+001	1.818E+000	5.122E-001	125.7053
ICVABT-1835527; C	160-36042-A-1-BI	1.000E+000mL		0.0961 g	Orange23	8/30/20 20:03		15.00	1000.00	1.00	1.00		
	Gross Alpha	12954	91	0.00	8.636E+002	9.100E-002	0.0857	**4.539E+003**pCi/mL	2.618E+002	3.989E+001	2.409E+000	6.786E-001	261.7984

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

ICV is for Gross Alpha

Orange Alpha ICV 2020				
				Mean
	Low Mass	Medium Mass	High Mass	Recovery
Detector	Recovery	Recovery	Recovery	
23	99.61%	108.65%	113.89%	107.38%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 95358 Ref. date 01/11/2017

Activity 2x 1992.7 pCi/mL

Activity 4x 3985.5 pCi/mL

Prep Batch: 451383

	Low Mass	Medium Mass	High Mass
	0.314g	0.0588g	0.0961
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
23	1.99E+03	2.17E+03	4.54E+03

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICVABT-1835527; C

Repeat 22

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 8:03:42 PM

Count Ended 8/30/2020 8:18:45 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	12,954	863.600	863.509
sd	0.010	113.816	7.588	7.588
Beta	0.392	6,485	432.333	431.941
sd	0.020	80.529	5.369	5.369

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICVABT-1835527; B

Repeat 23

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 8:50:12 PM

Count Ended 8/30/2020 9:05:18 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	8,185	545.667	545.576
sd	0.010	90.471	6.031	6.031
Beta	0.392	3,667	244.467	244.075
sd	0.020	60.556	4.037	4.037

Alpha/Beta Count Results

Sample Activity Report

Orange 20-23 - D

Addr: 23

Sample ID ICVABT-1835527; A

Repeat 24

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 8/30/2020 9:08:40 PM

Count Ended 8/30/2020 9:23:45 PM

Sample Count Time 15.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	9,493	632.867	632.776
sd	0.010	97.432	6.495	6.495
Beta	0.392	4,158	277.200	276.808
sd	0.020	64.483	4.299	4.299

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Purple Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
10	98.06%	98.56%	98.06%	98.23%

Beta Activity 2007.869 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Current Date:	2/4/2013		(or date at which you wish to determine activity)
Elapsed Time:	67.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.995548598		
Corrected Activity:	2228.734647	dpm	
Decay Activity (Sr/Y-90)	4457.469295	dpm	2007.869 pCi

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICVABT-51512;Beta 3

Repeat 21

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 6:35:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 6:40:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	19	3.800	3.742
sd	0.000			0.008	4.359	0.872	0.872
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	8,525	1,705.000	1,704.703
sd	0.000			0.017	92.331	18.466	18.466

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICVABT-51512;Beta 2

Repeat 4

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 6:57:08 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 7:02:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	17	3.400	3.342
sd	0.000			0.008	4.123	0.825	0.825
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	8,978	1,795.600	1,795.303
sd	0.000			0.017	94.752	18.950	18.950

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICVABT-51512;Beta 1

Repeat 5

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 7:02:55 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 7:07:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.058	22	4.400	4.342
sd	0.000			0.008	4.690	0.938	0.938
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.297	9,468	1,893.600	1,893.303
sd	0.000			0.017	97.304	19.461	19.461

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Purple - Alpha ICV 2021				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
10	88.49%	98.61%	104.82%	97.30%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 114475 Ref. date 10/29/19

Activity 1.031E+06 pCi/L

Prep Batch: 566222

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232	0.0537	0.0846
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
10	9.126E+05	1.017E+06	1.081E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT		Instr ID / CPMs	CountTime / CPMb		Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	*1.000E+000mL*		*0.0232*	*g*	*Purple10*	*7 / 19 / 22*	*0:17*		*20.00*	*1000.00*	*1.00*	*1.00*		
	Gross Alpha	7127	176	0.00		3.564E+002	1.760E-001		0.1758	**9.126E+005**pCi/L	5.313E+004	1.082E+004	1.183E+003	5.656E+002	53,132.0265
ICVABT-1835527; B	160-45488-A-2-A	*2.000E+000mL*		*0.0537*	*g*	*Purple10*	*7 / 18 / 22*	*23:43*		*20.00*	*1000.00*	*1.00*	*1.00*		
	Gross Alpha	10597	176	0.00		5.299E+002	1.760E-001		0.1173	**1.017E+006**pCi/L	5.883E+004	9.887E+003	8.868E+002	4.240E+002	58,828.8484
ICVABT-1835527; C	160-45488-A-3-A	*2.000E+000mL*		*0.0846*	*g*	*Purple10*	*7 / 18 / 22*	*23:10*		*20.00*	*1000.00*	*1.00*	*1.00*		
	Gross Alpha	8253	176	0.00		4.126E+002	1.760E-001		0.0859	**1.081E+006**pCi/L	6.277E+004	1.191E+004	1.210E+003	5.787E+002	62,772.8193

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICVABT-1835527; C

Repeat 65

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/18/2022 11:10:00 PM

Count Ended 7/18/2022 11:30:08 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	8,253	412.650	412.474
sd	0.013	90.846	4.542	4.542
Beta	0.317	3,884	194.200	193.883
sd	0.018	62.322	3.116	3.116

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICVABT-1835527; B

Repeat 62

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/18/2022 11:43:17 PM

Count Ended 7/19/2022 12:03:23 AM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	10,597	529.850	529.674
sd	0.013	102.942	5.147	5.147
Beta	0.317	4,513	225.650	225.333
sd	0.018	67.179	3.359	3.359

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - C

Addr: 10

Sample ID ICVABT-1835527; A

Repeat 68

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 12:17:29 AM

Count Ended 7/19/2022 12:37:37 AM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.176	7,127	356.350	356.174
sd	0.013	84.422	4.221	4.221
Beta	0.317	2,768	138.400	138.083
sd	0.018	52.612	2.631	2.631

Purple Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
11	99.48%	95.32%	97.35%	97.38%

Beta Activity	12/18/2015	1872.6551 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Count Date:	12/18/2015		(or date at which you wish to determine activity)
Elapsed Time:	1114.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.928506334		
Corrected Activity:	2078.64713	dpm	
Decay Activity (Sr/Y-90)	4157.29426	dpm	1872.655 pCi

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICVABT-51512;B1

Repeat 3

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***Sample***	**sd**	0 ***Sample***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 12/18/2015 1:10:51 PM

Count Ended 12/18/2015 1:15:54 PM

Collection Date 1 1/1/1900

Collection Date 2 1/1/1900

Half Life 0.00 ***days***

Decay Factor 1.000

Sample Count Time 5.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	2	0.400	0.253
sd	0.000			0.012	1.414	0.283	0.283
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	8,830	1,766.000	1,765.531
sd	0.000			0.022	93.968	18.794	18.794

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected**

MDC Method Currie

Error = .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICVABT-51512;B3

Repeat 3

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 1:16:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 1:21:59 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	4	0.800	0.653
sd	0.000			0.012	2.000	0.400	0.400
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	7,726	1,545.200	1,544.731
sd	0.000			0.022	87.898	17.580	17.580

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICVABT-51512;B2

Repeat 53

Carrier No. 0

Batch ID M122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***Sample***	**sd**	0 ***Sample***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 12/18/2015 1:22:51 PM

Count Ended 12/18/2015 1:27:53 PM

Collection Date 1 1/1/1900

Collection Date 2 1/1/1900

Half Life 0.00 ***days***

Decay Factor 1.000

Sample Count Time 5.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.147	0	0.000	-0.147
sd	0.000			0.012	0.000	0.000	0.243
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.469	7,997	1,599.400	1,598.931
sd	0.000			0.022	89.426	17.885	17.885

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected**

MDC Method Currie

Error = .00 **x sd**

ICV is for Gross Alpha

Purple - Alpha ICV 2021				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
11	88.72%	100.55%	105.11%	98.12%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 114475 Ref. date 10/29/19

Activity 1.031E+06 pCi/L

Prep Batch: 566222

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232	0.0537	0.0846
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
11	9.150E+05	1.037E+06	1.084E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Purple11	7 / 19 / 22 0:38		20.00	1000.00	1.00	1.00		
	Gross Alpha	6979	96	0.00	3.489E+002	9.600E-002	0.1717	**9.150E+005**pCi/L	5.329E+004	1.096E+004	9.972E+002	4.276E+002	53,294.0010
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Purple11	7 / 19 / 22 0:17		20.00	1000.00	1.00	1.00		
	Gross Alpha	10587	96	0.00	5.294E+002	9.600E-002	0.1150	**1.037E+006**pCi/L	5.995E+004	1.008E+004	7.448E+002	3.194E+002	59,952.9541
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Purple11	7 / 18 / 22 23:43		20.00	1000.00	1.00	1.00		
	Gross Alpha	8151	96	0.00	4.076E+002	9.600E-002	0.0847	**1.084E+006**pCi/L	6.293E+004	1.201E+004	1.011E+003	4.336E+002	62,927.2089

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICVABT-1835527; C

Repeat 66

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/18/2022 11:43:19 PM

Count Ended 7/19/2022 12:03:23 AM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	8,151	407.550	407.454
sd	0.010	90.283	4.514	4.514
Beta	0.607	3,736	186.800	186.193
sd	0.025	61.123	3.056	3.056

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICVABT-1835527; B

Repeat 63

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 12:17:32 AM

Count Ended 7/19/2022 12:37:41 AM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	10,587	529.350	529.254
sd	0.010	102.893	5.145	5.145
Beta	0.607	4,364	218.200	217.593
sd	0.025	66.061	3.303	3.303

Alpha/Beta Count Results

Sample Activity Report

Purple 8-11 - D

Addr: 11

Sample ID ICVABT-1835527; A

Repeat 69

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 12:38:34 AM

Count Ended 7/19/2022 12:58:37 AM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	6,979	348.950	348.854
sd	0.010	83.540	4.177	4.177
Beta	0.607	2,622	131.100	130.493
sd	0.025	51.205	2.560	2.560

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Purple Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
16	97.67%	100.06%	98.26%	98.66%

Beta Activity 2007.869 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Current Date:	2/4/2013		(or date at which you wish to determine activity)
Elapsed Time:	67.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.995548598		
Corrected Activity:	2228.734647	dpm	
Decay Activity (Sr/Y-90)	4457.469295	dpm	2007.869 pCi

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICVABT-51512;Beta 1

Repeat 11

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 8:45:31 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 8:50:33 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	21	4.200	4.030
sd	0.000			0.013	4.583	0.917	0.917
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	9,346	1,869.200	1,868.803
sd	0.000			0.020	96.675	19.335	19.335

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICVABT-51512;Beta 3

Repeat 35

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 9:41:48 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 9:46:50 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	12	2.400	2.230
sd	0.000			0.013	3.464	0.693	0.693
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	8,452	1,690.400	1,690.003
sd	0.000			0.020	91.935	18.387	18.387

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICVABT-51512;Beta 2

Repeat 18

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 9:47:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 9:52:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.170	10	2.000	1.830
sd	0.000			0.013	3.162	0.632	0.633
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.397	9,024	1,804.800	1,804.403
sd	0.000			0.020	94.995	18.999	18.999

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Purple - Alpha ICV 2021				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
16	88.00%	100.74%	101.71%	96.82%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 114475 Ref. date 10/29/19

Activity 1.031E+06 pCi/L

Prep Batch: 566222

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232	0.0537	0.0846
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
16	9.076E+05	1.039E+06	1.049E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT		Instr ID / CPMs	CountTime / CPMb		Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Purple16	7 / 19 / 22 10:09		20.00	1000.00	1.00	1.00		
	Gross Alpha	7037	149	0.00		3.519E+002	1.490E-001	0.1746	**9.076E+005**pCi/L	5.285E+004	1.082E+004	1.127E+003	5.242E+002	52,853.6012
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Purple16	7 / 19 / 22 14:31		20.00	1000.00	1.00	1.00		
	Gross Alpha	10800	149	0.00		5.400E+002	1.490E-001	0.1170	**1.039E+006**pCi/L	6.009E+004	1.000E+004	8.410E+002	3.911E+002	60,085.5625
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Purple16	7 / 19 / 22 14:01		20.00	1000.00	1.00	1.00		
	Gross Alpha	8011	149	0.00		4.006E+002	1.490E-001	0.0860	**1.049E+006**pCi/L	6.092E+004	1.172E+004	1.144E+003	5.320E+002	60,916.9146

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICVABT-1835527; A

Repeat 74

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 10:09:16 AM

Count Ended 7/19/2022 10:29:22 AM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	7,037	351.850	351.701
sd	0.012	83.887	4.194	4.194
Beta	0.442	2,568	128.400	127.958
sd	0.021	50.675	2.534	2.534

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICVABT-1835527; C

Repeat 79

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 2:01:17 PM

Count Ended 7/19/2022 2:21:20 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	8,011	400.550	400.401
sd	0.012	89.504	4.475	4.475
Beta	0.442	3,555	177.750	177.308
sd	0.021	59.624	2.981	2.981

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - A

Addr: 16

Sample ID ICVABT-1835527; B

Repeat 76

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 2:31:22 PM

Count Ended 7/19/2022 2:51:25 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.149	10,800	540.000	539.851
sd	0.012	103.923	5.196	5.196
Beta	0.442	4,196	209.800	209.358
sd	0.021	64.777	3.239	3.239

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Purple Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
18	99.11%	97.62%	97.91%	98.21%

Beta Activity 2007.869 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Current Date:	2/4/2013		(or date at which you wish to determine activity)
Elapsed Time:	67.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.995548598		
Corrected Activity:	2228.734647	dpm	
Decay Activity (Sr/Y-90)	4457.469295	dpm	2007.869 pCi

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICVABT-51512;Beta 3

Repeat 29

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 8:45:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 8:50:43 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	9	1.800	1.678
sd	0.000			0.011	3.000	0.600	0.600
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	8,412	1,682.400	1,681.942
sd	0.000			0.021	91.717	18.343	18.343

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICVABT-51512;Beta 2

Repeat 12

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 8:54:49 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 8:59:52 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	6	1.200	1.078
sd	0.000			0.011	2.449	0.490	0.490
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	8,774	1,754.800	1,754.342
sd	0.000			0.021	93.670	18.734	18.734

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICVABT-51512;Beta 1

Repeat 13

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/4/2013 9:00:37 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/4/2013 9:05:39 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.122	10	2.000	1.878
sd	0.000			0.011	3.162	0.632	0.633
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.458	9,428	1,885.600	1,885.142
sd	0.000			0.021	97.098	19.420	19.420

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Purple - Alpha ICV 2021				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
18	88.70%	100.45%	105.40%	98.18%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 114475 Ref. date 10/29/19

Activity 1.031E+06 pCi/L

Prep Batch: 566222

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232	0.0537	0.0846
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
18	9.148E+05	1.036E+06	1.087E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT		Instr ID / CPMs	CountTime / CPMb		Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Purple18	7 / 19 / 22 12:24		20.00	1000.00	1.00	1.00		
	Gross Alpha	7180	134	0.00		3.590E+002	1.340E-001	0.1767	**9.148E+005**pCi/L	5.325E+004	1.080E+004	1.076E+003	4.910E+002	53,247.7010
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Purple18	7 / 19 / 22 10:32		20.00	1000.00	1.00	1.00		
	Gross Alpha	10841	134	0.00		5.420E+002	1.340E-001	0.1178	**1.036E+006**pCi/L	5.987E+004	9.950E+003	8.065E+002	3.681E+002	59,870.0342
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Purple18	7 / 19 / 22 10:09		20.00	1000.00	1.00	1.00		
	Gross Alpha	8358	134	0.00		4.179E+002	1.340E-001	0.0865	**1.087E+006**pCi/L	6.312E+004	1.190E+004	1.098E+003	5.014E+002	63,118.0108

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICVABT-1835527; C

Repeat 73

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 10:09:24 AM

Count Ended 7/19/2022 10:29:31 AM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	8,358	417.900	417.766
sd	0.012	91.422	4.571	4.571
Beta	0.370	3,900	195.000	194.630
sd	0.019	62.450	3.122	3.123

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICVABT-1835527; B

Repeat 70

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 10:32:05 AM

Count Ended 7/19/2022 10:52:11 AM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	10,841	542.050	541.916
sd	0.012	104.120	5.206	5.206
Beta	0.370	4,580	229.000	228.630
sd	0.019	67.676	3.384	3.384

Alpha/Beta Count Results

Sample Activity Report

Purple 16-19 - C

Addr: 18

Sample ID ICVABT-1835527; A

Repeat 76

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 12:24:56 PM

Count Ended 7/19/2022 12:44:59 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.134	7,180	359.000	358.866
sd	0.012	84.735	4.237	4.237
Beta	0.370	2,792	139.600	139.230
sd	0.019	52.839	2.642	2.642

Purple Beta ICV 2013				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
23	96.44%	92.97%	99.45%	96.29%

Beta Activity	12/18/2015	
	1872.6551	pCi
Beta Activity	12/21/2015	
	1872.281	pCi

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Count Date:	12/18/2015		(or date at which you wish to determine activity)
Elapsed Time:	1114.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.928506334		
Corrected Activity:	2078.64713	dpm	
Decay Activity (Sr/Y-90)	4157.29426	dpm	1872.655 pCi

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Initial Activity:	2238.7	dpm	
Reference Date:	11/29/2012		
Count Date:	12/21/2015		(or date at which you wish to determine activity)
Elapsed Time:	1117.000	days	
Half Life:	10409.625	days	
Exponential Term:	0.928320873		
Corrected Activity:	2078.231938	dpm	
Decay Activity (Sr/Y-90)	4156.463876	dpm	1872.281 pCi

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICVABT-51512;B2

Repeat 3

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 1:11:00 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 1:16:03 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	202	40.400	40.283
sd	0.000			0.011	14.213	2.843	2.843
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	7,601	1,520.200	1,519.454
sd	0.000			0.027	87.184	17.437	17.437

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICVABT-51512;B1

Repeat 53

Carrier No. 0

Batch ID M122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 12/18/2015 1:19:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 12/18/2015 1:24:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	227	45.400	45.283
sd	0.000			0.011	15.067	3.013	3.013
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	8,339	1,667.800	1,667.054
sd	0.000			0.027	91.318	18.264	18.264

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICVABT-51512;B3

Repeat 27

Carrier No. 0

Batch ID m122640

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***Sample***	**sd**	0 ***Sample***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 12/21/2015 2:13:15 PM

Count Ended 12/21/2015 2:18:18 PM

Collection Date 1 1/1/1900

Collection Date 2 1/1/1900

Half Life 0.00 ***days***

Decay Factor 1.000

Sample Count Time 5.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.117	208	41.600	41.483
sd	0.000			0.011	14.422	2.884	2.884
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.746	7,743	1,548.600	1,547.854
sd	0.000			0.027	87.994	17.599	17.599

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected**

MDC Method Currie

Error = .00 **x sd**

ICV is for Gross Alpha

Purple - Alpha ICV 2021				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
23	88.57%	97.35%	106.08%	97.33%

Standard ID

Thorium-230

Th-230_00056 #1835527

Cert # 114475 Ref. date 10/29/19

Activity 1.031E+06 pCi/L

Prep Batch: 566222

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232	0.0537	0.0846
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
23	9.134E+05	1.004E+06	1.094E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Purple23	7 / 19 / 22 14:31		20.00	1000.00	1.00	1.00		
	Gross Alpha	6933	438	0.00	3.466E+002	4.380E-001	0.1707	**9.134E+005**pCi/L	5.321E+004	1.098E+004	1.693E+003	9.188E+002	53,211.7231
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Purple23	7 / 19 / 22 14:01		20.00	1000.00	1.00	1.00		
	Gross Alpha	10106	438	0.00	5.053E+002	4.380E-001	0.1132	**1.004E+006**pCi/L	5.811E+004	9.998E+003	1.276E+003	6.927E+002	58,106.9653
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Purple23	7 / 19 / 22 13:36		20.00	1000.00	1.00	1.00		
	Gross Alpha	8034	438	0.00	4.017E+002	4.380E-001	0.0826	**1.094E+006**pCi/L	6.356E+004	1.222E+004	1.750E+003	9.497E+002	63,561.6099

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICVABT-1835527; C

Repeat 78

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 1:36:48 PM

Count Ended 7/19/2022 1:56:53 PM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	8,034	401.700	401.262
sd	0.021	89.633	4.482	4.482
Beta	0.456	4,159	207.950	207.494
sd	0.021	64.490	3.225	3.225

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICVABT-1835527; B

Repeat 75

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 2:01:13 PM

Count Ended 7/19/2022 2:21:22 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	10,106	505.300	504.862
sd	0.021	100.529	5.026	5.026
Beta	0.456	4,858	242.900	242.444
sd	0.021	69.699	3.485	3.485

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - D

Addr: 23

Sample ID ICVABT-1835527; A

Repeat 81

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/19/2022 2:31:19 PM

Count Ended 7/19/2022 2:51:27 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.438	6,933	346.650	346.212
sd	0.021	83.265	4.163	4.163
Beta	0.456	3,060	153.000	152.544
sd	0.021	55.317	2.766	2.766

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-51512;B1

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:15:29 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:20:33 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,702	1,540.400	1,540.400
sd	0.000			0.000	87.761	17.552	17.552

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-51512;B1

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/8/2019 10:15:29 AM

Count Ended 7/8/2019 10:20:33 AM

Sample Count Time 5.00 ***mins***

Background Count Time .00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1	0.200	0.200
sd	0.000	1.000	0.200	0.200
Beta	0.000	7,702	1,540.400	1,540.400
sd	0.000	87.761	17.552	17.552

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
0	94.85%	92.74%	96.09%	94.56%

Prep Batch: 239589

Detector	B1	Activity	Units
0	Low Mass	3624.90	dpm/mL

B2	Activity	Units
Medium Mass	3544.20	dpm/mL

B3	Activity	Units
High Mass	3672.00	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
***Soln. Density:**	1	g/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-51512;B3

Repeat 8

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:28:24 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:33:27 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,955	1,391.000	1,391.000
sd	0.000			0.000	83.397	16.679	16.679

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-51512;B2

Repeat 9

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:35:07 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:40:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,109	1,421.800	1,421.800
sd	0.000			0.000	84.315	16.863	16.863

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-1835527;BG

Repeat 1

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:53:28 AM

Count Ended 11/21/2019 7:38:33 AM

Sample Count Time 45.00 *mins* **Background Count Time** 1,000.00 *mins*

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.114	13,004	288.978	288.864
sd	0.011	114.035	2.534	2.534
Beta	0.401	5,176	115.022	114.621
sd	0.020	71.944	1.599	1.599

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
0	87.98%	98.32%	109.18%	98.49%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 566222 (05/18/22)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
0	9.074E+05	1.014E+06	1.126E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red0	5/19/22 21:02		20.00	1000.00	1.00	1.00		
	Gross Alpha	6777	89	0.00	3.389E+002	8.900E-002	0.1682	**9.074E+005**pCi/L	5.288E+004	1.103E+004	9.955E+002	4.205E+002	52,882.6429
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red0	5/18/22 14:36		20.00	1000.00	1.00	1.00		
	Gross Alpha	10010	89	0.00	5.005E+002	8.900E-002	0.1112	**1.014E+006**pCi/L	5.867E+004	1.014E+004	7.530E+002	3.180E+002	58,671.1360
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red0	5/19/22 21:46		20.00	1000.00	1.00	1.00		
	Gross Alpha	8121	89	0.00	4.061E+002	8.900E-002	0.0812	**1.126E+006**pCi/L	6.536E+004	1.249E+004	1.030E+003	4.352E+002	65,361.8046

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-1835527; B

Repeat 12

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 2:36:18 PM

Count Ended 5/18/2022 2:56:24 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	10,010	500.500	500.411
sd	0.009	100.050	5.002	5.003
Beta	0.374	4,508	225.400	225.026
sd	0.019	67.142	3.357	3.357

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-1835527; A

Repeat 22

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 9:02:16 PM

Count Ended 5/19/2022 9:22:30 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	6,777	338.850	338.761
sd	0.009	82.323	4.116	4.116
Beta	0.374	2,767	138.350	137.976
sd	0.019	52.602	2.630	2.630

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVABT-1835527; C

Repeat 23

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 9:46:20 PM

Count Ended 5/19/2022 10:06:24 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.089	8,121	406.050	405.961
sd	0.009	90.117	4.506	4.506
Beta	0.374	3,699	184.950	184.576
sd	0.019	60.819	3.041	3.041

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
1	94.60%	94.32%	94.14%	94.35%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
1	Low Mass	3615.20	dpm/mL

B2	Activity	Units
Medium Mass	3604.60	dpm/mL

B3	Activity	Units
High Mass	3597.60	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-51512;B2

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:15:35 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:20:38 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,214	1,442.800	1,442.800
sd	0.000			0.000	84.935	16.987	16.987

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-51512;B1

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:32:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:37:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,653	1,530.600	1,530.600
sd	0.000			0.000	87.481	17.496	17.496

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-51512;B3

Repeat 9

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:35:21 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:40:25 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,808	1,361.600	1,361.600
sd	0.000			0.000	82.511	16.502	16.502

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-1835527;BH

Repeat 1

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:53:48 AM

Count Ended 11/21/2019 7:38:56 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	9,647	214.378	214.259
sd	0.011	98.219	2.183	2.183
Beta	0.397	4,257	94.600	94.203
sd	0.020	65.246	1.450	1.450

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-1835527;BG

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 7:47:16 AM

Count Ended 11/21/2019 8:32:24 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	12,979	288.422	288.303
sd	0.011	113.925	2.532	2.532
Beta	0.397	5,311	118.022	117.625
sd	0.020	72.877	1.619	1.620

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-1835527;BI

Repeat 8

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 12:45:02 PM

Count Ended 11/21/2019 1:30:10 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	13,107	291.267	291.148
sd	0.011	114.486	2.544	2.544
Beta	0.397	6,337	140.822	140.425
sd	0.020	79.605	1.769	1.769

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
1	87.61%	100.06%	104.43%	97.37%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
1	9.036E+05	1.032E+06	1.077E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot Cs	Cb	Mass XT	Instr ID CPMs	CountTime CPMb	Eff	Ts Activity	Tb UncTot	Dilution UncCnt	Sigma MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red1	5/19/22 21:24		20.00	1000.00	1.00	1.00		
	Gross Alpha	6709	95	0.00	3.354E+002	9.500E-002	0.1672	**9.036E+005**pCi/L	5.268E+004	1.104E+004	1.021E+003	4.370E+002	52,676.9483
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red1	5/19/22 21:02		20.00	1000.00	1.00	1.00		
	Gross Alpha	10197	95	0.00	5.099E+002	9.500E-002	0.1112	**1.032E+006**pCi/L	5.972E+004	1.022E+004	7.675E+002	3.284E+002	59,721.4917
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red1	5/18/22 14:36		20.00	1000.00	1.00	1.00		
	Gross Alpha	7792	95	0.00	3.896E+002	9.500E-002	0.0815	**1.077E+006**pCi/L	6.259E+004	1.220E+004	1.048E+003	4.484E+002	62,588.2781

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-1835527; C

Repeat 20

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 2:36:22 PM

Count Ended 5/18/2022 2:56:27 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	7,792	389.600	389.505
sd	0.010	88.272	4.414	4.414
Beta	0.348	3,853	192.650	192.302
sd	0.019	62.073	3.104	3.104

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-1835527; B

Repeat 13

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 9:02:24 PM

Count Ended 5/19/2022 9:22:33 PM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	10,197	509.850	509.755
sd	0.010	100.980	5.049	5.049
Beta	0.348	4,323	216.150	215.802
sd	0.019	65.750	3.287	3.288

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVABT-1835527; A

Repeat 23

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 9:24:16 PM

Count Ended 5/19/2022 9:44:22 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.095	6,709	335.450	335.355
sd	0.010	81.908	4.095	4.095
Beta	0.348	2,753	137.650	137.302
sd	0.019	52.469	2.623	2.624

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
2	95.35%	95.48%	98.05%	96.29%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
2	Low Mass	3643.90	dpm/mL

B2	Activity	Units
Medium Mass	3648.80	dpm/mL

B3	Activity	Units
High Mass	3746.90	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-51512;B3

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:15:40 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:20:44 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,106	1,421.200	1,421.200
sd	0.000			0.000	84.297	16.859	16.859

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-51512;B2

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:32:23 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:37:26 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,305	1,461.000	1,461.000
sd	0.000			0.000	85.469	17.094	17.094

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-51512;B1

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:39:54 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:44:58 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,715	1,543.000	1,543.000
sd	0.000			0.000	87.835	17.567	17.567

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-1835527;BI

Repeat 1

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:53:54 AM

Count Ended 11/21/2019 7:39:02 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.140	13,551	301.133	300.993
sd	0.012	116.409	2.587	2.587
Beta	0.361	6,356	141.244	140.883
sd	0.019	79.725	1.772	1.772

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-1835527;BH

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 7:47:21 AM

Count Ended 11/21/2019 8:32:27 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.140	9,919	220.422	220.282
sd	0.012	99.594	2.213	2.213
Beta	0.361	4,387	97.489	97.128
sd	0.019	66.234	1.472	1.472

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-1835527;BG

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 8:37:52 AM

Count Ended 11/21/2019 9:23:00 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.140	13,012	289.156	289.016
sd	0.012	114.070	2.535	2.535
Beta	0.361	5,282	117.378	117.017
sd	0.019	72.677	1.615	1.615

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
2	85.81%	99.87%	106.75%	97.48%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
2	8.850E+05	1.030E+06	1.101E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red2	5/19/22 21:46		20.00	1000.00	1.00	1.00		
	Gross Alpha	6631	88	0.00	3.316E+002	8.800E-002	0.1687	**8.850E+005**pCi/L	5.161E+004	1.087E+004	9.890E+002	4.168E+002	51,605.0420
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red2	5/19/22 21:24		20.00	1000.00	1.00	1.00		
	Gross Alpha	10261	88	0.00	5.130E+002	8.800E-002	0.1121	**1.030E+006**pCi/L	5.961E+004	1.017E+004	7.441E+002	3.136E+002	59,610.6607
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red2	5/19/22 21:02		20.00	1000.00	1.00	1.00		
	Gross Alpha	8029	88	0.00	4.014E+002	8.800E-002	0.0821	**1.101E+006**pCi/L	6.392E+004	1.229E+004	1.016E+003	4.280E+002	63,924.6626

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-1835527; C

Repeat 21

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 9:02:30 PM

Count Ended 5/19/2022 9:22:36 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	8,029	401.450	401.362
sd	0.009	89.605	4.480	4.480
Beta	0.323	3,854	192.700	192.377
sd	0.018	62.081	3.104	3.104

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-1835527; B

Repeat 14

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 9:24:21 PM

Count Ended 5/19/2022 9:44:27 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	10,261	513.050	512.962
sd	0.009	101.297	5.065	5.065
Beta	0.323	4,572	228.600	228.277
sd	0.018	67.617	3.381	3.381

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICVABT-1835527; A

Repeat 24

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 9:46:09 PM

Count Ended 5/19/2022 10:06:14 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.088	6,631	331.550	331.462
sd	0.009	81.431	4.072	4.072
Beta	0.323	2,899	144.950	144.627
sd	0.018	53.842	2.692	2.692

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
4	95.18%	96.02%	95.92%	95.71%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
4	Low Mass	3637.40	dpm/mL

B2	Activity	Units
Medium Mass	3669.30	dpm/mL

B3	Activity	Units
High Mass	3665.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-51512;B3

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:40:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:45:15 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,886	1,377.200	1,377.200
sd	0.000			0.000	82.982	16.596	16.596

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-51512;B2

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:47:04 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:52:09 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,283	1,456.600	1,456.600
sd	0.000			0.000	85.340	17.068	17.068

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-51512;B1

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:55:17 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:00:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,625	1,525.000	1,525.000
sd	0.000			0.000	87.321	17.464	17.464

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-51512;B1

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 7/8/2019 10:55:17 AM

Count Ended 7/8/2019 11:00:20 AM

Sample Count Time 5.00 ***mins***

Background Count Time .00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1	0.200	0.200
sd	0.000	1.000	0.200	0.200
Beta	0.000	7,625	1,525.000	1,525.000
sd	0.000	87.321	17.464	17.464

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-1835527;BI

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 8:38:01 AM

Count Ended 11/21/2019 9:23:07 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.214	13,105	291.222	291.008
sd	0.015	114.477	2.544	2.544
Beta	0.400	6,375	141.667	141.267
sd	0.020	79.844	1.774	1.774

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-1835527;BH

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 9:25:13 AM

Count Ended 11/21/2019 10:10:19 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.214	9,825	218.333	218.119
sd	0.015	99.121	2.203	2.203
Beta	0.400	4,347	96.600	96.200
sd	0.020	65.932	1.465	1.465

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-1835527;BG

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 10:12:56 AM

Count Ended 11/21/2019 10:58:04 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.214	12,863	285.844	285.630
sd	0.015	113.415	2.520	2.520
Beta	0.400	5,356	119.022	118.622
sd	0.020	73.185	1.626	1.626

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
4	81.82%	99.00%	105.78%	95.53%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
4	8.439E+05	1.021E+06	1.091E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO	Aliquot		Mass		Instr ID	CountTime		Ts	Tb	Dilution	Sigma		
	Analyte	Cs	Cb	XT		CPMs	CPMb	Eff	Activity	UncTot	UncCnt	MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red4	5/19/22 22:46		20.00	1000.00	1.00	1.00		
	Gross Alpha	6274	264	0.00		3.137E+002	2.640E-001	0.1673	**8.439E+005**pCi/L	4.927E+004	1.066E+004	1.432E+003	7.280E+002	49,272.4073
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red4	5/20/22 0:00		20.00	1000.00	1.00	1.00		
	Gross Alpha	10042	264	0.00		5.021E+002	2.640E-001	0.1107	**1.021E+006**pCi/L	5.910E+004	1.020E+004	1.082E+003	5.502E+002	59,102.9777
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red4	5/19/22 23:39		20.00	1000.00	1.00	1.00		
	Gross Alpha	7795	264	0.00		3.898E+002	2.640E-001	0.0804	**1.091E+006**pCi/L	6.338E+004	1.236E+004	1.489E+003	7.570E+002	63,377.1594

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-1835527; A

Repeat 25

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 10:46:50 PM

Count Ended 5/19/2022 11:07:04 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	6,274	313.700	313.436
sd	0.016	79.209	3.960	3.960
Beta	0.524	2,555	127.750	127.226
sd	0.023	50.547	2.527	2.527

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-1835527; C

Repeat 26

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 11:39:07 PM

Count Ended 5/19/2022 11:59:12 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	7,795	389.750	389.486
sd	0.016	88.289	4.414	4.414
Beta	0.524	3,684	184.200	183.676
sd	0.023	60.696	3.035	3.035

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVABT-1835527; B

Repeat 19

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/20/2022 12:00:59 AM

Count Ended 5/20/2022 12:21:05 AM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.264	10,042	502.100	501.836
sd	0.016	100.210	5.010	5.011
Beta	0.524	4,343	217.150	216.626
sd	0.023	65.901	3.295	3.295

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
5	94.81%	94.48%	98.02%	95.77%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
5	Low Mass	3623.10	dpm/mL

B2	Activity	Units
Medium Mass	3610.60	dpm/mL

B3	Activity	Units
High Mass	3745.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
5	94.81%	94.48%	98.02%	95.77%

Prep Batch:	**239589**

Detector	B1	Activity	Units
5	Low Mass	3623.10	dpm/mL

B2	Activity	Units
Medium Mass	3610.60	dpm/mL

B3	Activity	Units
High Mass	3745.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-51512;B3

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:47:13 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 10:52:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,060	1,412.000	1,412.000
sd	0.000			0.000	84.024	16.805	16.805

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-51512;B2

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:55:23 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:00:26 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,196	1,439.200	1,439.200
sd	0.000			0.000	84.829	16.966	16.966

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-51512;B1

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:01:50 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:06:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,661	1,532.200	1,532.200
sd	0.000			0.000	87.527	17.505	17.505

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-1835527;BI

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 9:25:17 AM

Count Ended 11/21/2019 10:10:25 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.153	13,568	301.511	301.358
sd	0.012	116.482	2.588	2.589
Beta	0.367	6,044	134.311	133.944
sd	0.019	77.743	1.728	1.728

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-1835527;BH

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 10:13:03 AM

Count Ended 11/21/2019 10:58:10 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.153	10,143	225.400	225.247
sd	0.012	100.712	2.238	2.238
Beta	0.367	4,186	93.022	92.655
sd	0.019	64.699	1.438	1.438

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-1835527;BG

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:04:30 AM

Count Ended 11/21/2019 11:49:38 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.153	13,253	294.511	294.358
sd	0.012	115.122	2.558	2.558
Beta	0.367	5,114	113.644	113.277
sd	0.019	71.512	1.589	1.589

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
5	87.01%	99.09%	108.30%	98.14%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
5	8.974E+05	1.022E+06	1.117E+06

eurofins Environment Testing TestAmerica

Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red5	5/19/22 23:09		20.00	1000.00	1.00	1.00		
	Gross Alpha	6561	159	0.00	3.281E+002	1.590E-001	0.1646	**8.974E+005**pCi/L	5.234E+004	1.108E+004	1.221E+003	5.742E+002	52,337.5143
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red5	5/19/22 22:46		20.00	1000.00	1.00	1.00		
	Gross Alpha	9833	159	0.00	4.916E+002	1.590E-001	0.1083	**1.022E+006**pCi/L	5.918E+004	1.031E+004	9.283E+002	4.365E+002	59,182.4301
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red5	5/20/22 0:01		20.00	1000.00	1.00	1.00		
	Gross Alpha	7796	159	0.00	3.898E+002	1.590E-001	0.0786	**1.117E+006**pCi/L	6.490E+004	1.265E+004	1.279E+003	6.014E+002	64,900.9766

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-1835527; B

Repeat 16

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 10:46:57 PM

Count Ended 5/19/2022 11:07:07 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	9,833	491.650	491.491
sd	0.013	99.161	4.958	4.958
Beta	0.311	4,285	214.250	213.939
sd	0.018	65.460	3.273	3.273

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-1835527; A

Repeat 26

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 11:09:53 PM

Count Ended 5/19/2022 11:29:59 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	6,561	328.050	327.891
sd	0.013	81.000	4.050	4.050
Beta	0.311	2,587	129.350	129.039
sd	0.018	50.863	2.543	2.543

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICVABT-1835527; C

Repeat 27

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/20/2022 12:01:09 AM

Count Ended 5/20/2022 12:21:15 AM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.159	7,796	389.800	389.641
sd	0.013	88.295	4.415	4.415
Beta	0.311	3,704	185.200	184.889
sd	0.018	60.860	3.043	3.043

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
6	97.17%	94.72%	97.23%	96.37%

Prep Batch:	**239589**

Detector	B1	Activity	Units
6	Low Mass	3713.40	dpm/mL

B2	Activity	Units
Medium Mass	3619.80	dpm/mL

B3	Activity	Units
High Mass	3715.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
6	97.17%	94.72%	97.23%	96.37%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
6	Low Mass	3713.40	dpm/mL

B2	Activity	Units
Medium Mass	3619.80	dpm/mL

B3	Activity	Units
High Mass	3715.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-51512;B3

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 10:55:30 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:00:33 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,959	1,391.800	1,391.800
sd	0.000			0.000	83.421	16.684	16.684

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-51512;B2

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:01:55 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:06:59 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,159	1,431.800	1,431.800
sd	0.000			0.000	84.611	16.922	16.922

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-51512;B1

Repeat 8

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:28:04 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:33:08 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,751	1,550.200	1,550.200
sd	0.000			0.000	88.040	17.608	17.608

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-1835527;BI

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 10:13:10 AM

Count Ended 11/21/2019 10:58:18 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.099	13,341	296.467	296.368
sd	0.010	115.503	2.567	2.567
Beta	0.290	6,209	137.978	137.688
sd	0.017	78.797	1.751	1.751

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-1835527;BH

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:04:40 AM

Count Ended 11/21/2019 11:49:47 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.099	9,870	219.333	219.234
sd	0.010	99.348	2.208	2.208
Beta	0.290	4,119	91.533	91.243
sd	0.017	64.179	1.426	1.426

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-1835527;BG

Repeat 7

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:55:54 AM

Count Ended 11/21/2019 12:41:03 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.099	12,900	286.667	286.568
sd	0.010	113.578	2.524	2.524
Beta	0.290	5,239	116.422	116.132
sd	0.017	72.381	1.608	1.609

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
6	88.16%	97.93%	107.72%	97.94%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
6	9.092E+05	1.010E+06	1.111E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red6	5/19/22 23:39		20.00	1000.00	1.00	1.00		
	Gross Alpha	6731	93	0.00	3.366E+002	9.300E-002	0.1667	**9.092E+005**pCi/L	5.299E+004	1.108E+004	1.018E+003	4.336E+002	52,994.1280
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red6	5/19/22 23:09		20.00	1000.00	1.00	1.00		
	Gross Alpha	9995	93	0.00	4.998E+002	9.300E-002	0.1114	**1.010E+006**pCi/L	5.844E+004	1.010E+004	7.611E+002	3.243E+002	58,444.9470
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red6	5/19/22 22:47		20.00	1000.00	1.00	1.00		
	Gross Alpha	8050	93	0.00	4.025E+002	9.300E-002	0.0816	**1.111E+006**pCi/L	6.454E+004	1.239E+004	1.040E+003	4.431E+002	64,536.4561

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery	LCL	UCL	ZFactor
					%			

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery	ZFactor
						%	

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-1835527; C

Repeat 24

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 10:47:09 PM

Count Ended 5/19/2022 11:07:15 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	8,050	402.500	402.407
sd	0.010	89.722	4.486	4.486
Beta	0.319	3,770	188.500	188.181
sd	0.018	61.400	3.070	3.070

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-1835527; B

Repeat 17

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 11:09:59 PM

Count Ended 5/19/2022 11:30:04 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	9,995	499.750	499.657
sd	0.010	99.975	4.999	4.999
Beta	0.319	4,387	219.350	219.031
sd	0.018	66.234	3.312	3.312

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICVABT-1835527; A

Repeat 27

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 11:39:12 PM

Count Ended 5/19/2022 11:59:18 PM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	6,731	336.550	336.457
sd	0.010	82.043	4.102	4.102
Beta	0.319	2,704	135.200	134.881
sd	0.018	52.000	2.600	2.600

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
7	97.90%	97.14%	95.30%	96.78%

Prep Batch: 239589

Detector	B1	Activity	Units
7	Low Mass	3741.30	dpm/mL

B2	Activity	Units
Medium Mass	3712.30	dpm/mL

B3	Activity	Units
High Mass	3641.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
7	97.90%	97.14%	95.30%	96.78%

Prep Batch: 239589

Detector	B1	Activity	Units
7	Low Mass	3741.30	dpm/mL

B2	Activity	Units
Medium Mass	3712.30	dpm/mL

B3	Activity	Units
High Mass	3641.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-51512;B3

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:02:03 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:07:07 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,858	1,371.600	1,371.600
sd	0.000			0.000	82.813	16.563	16.563

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-51512;B2

Repeat 8

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:28:15 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:33:19 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,390	1,478.000	1,478.000
sd	0.000			0.000	85.965	17.193	17.193

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-51512;B1

Repeat 9

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/8/2019 11:34:52 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/8/2019 11:39:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** .00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,918	1,583.600	1,583.600
sd	0.000			0.000	88.983	17.797	17.797

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-1835527;BI

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:04:48 AM

Count Ended 11/21/2019 11:49:55 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.257	13,673	303.844	303.587
sd	0.016	116.932	2.598	2.599
Beta	0.525	6,904	153.422	152.897
sd	0.023	83.090	1.846	1.847

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-1835527;BH

Repeat 7

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:55:59 AM

Count Ended 11/21/2019 12:41:06 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.257	9,746	216.578	216.321
sd	0.016	98.722	2.194	2.194
Beta	0.525	4,648	103.289	102.764
sd	0.023	68.176	1.515	1.515

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-1835527;BG

Repeat 8

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 12:44:50 PM

Count Ended 11/21/2019 1:31:00 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.257	12,751	283.356	283.099
sd	0.016	112.920	2.509	2.509
Beta	0.525	5,734	127.422	126.897
sd	0.023	75.723	1.683	1.683

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
7	86.77%	101.23%	107.24%	98.41%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
7	8.949E+05	1.044E+06	1.106E+06

eurofins Environment Testing TestAmerica

Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red7	5/20/22 0:00		20.00	1000.00	1.00	1.00		
	Gross Alpha	6752	84	0.00	3.376E+002	8.400E-002	0.1699	**8.949E+005**pCi/L	5.216E+004	1.089E+004	9.687E+002	4.044E+002	52,159.3395
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red7	5/19/22 23:39		20.00	1000.00	1.00	1.00		
	Gross Alpha	10490	84	0.00	5.245E+002	8.400E-002	0.1131	**1.044E+006**pCi/L	6.038E+004	1.020E+004	7.273E+002	3.036E+002	60,377.0657
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red7	5/19/22 23:10		20.00	1000.00	1.00	1.00		
	Gross Alpha	8165	84	0.00	4.083E+002	8.400E-002	0.0831	**1.106E+006**pCi/L	6.424E+004	1.225E+004	9.903E+002	4.134E+002	64,242.0536

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-1835527; C

Repeat 25

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 11:10:06 PM

Count Ended 5/19/2022 11:30:12 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	8,165	408.250	408.166
sd	0.009	90.360	4.518	4.518
Beta	0.374	3,790	189.500	189.126
sd	0.019	61.563	3.078	3.078

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-1835527; B

Repeat 18

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/19/2022 11:39:18 PM

Count Ended 5/19/2022 11:59:23 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	10,490	524.500	524.416
sd	0.009	102.421	5.121	5.121
Beta	0.374	4,456	222.800	222.426
sd	0.019	66.753	3.338	3.338

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICVABT-1835527; A

Repeat 28

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/20/2022 12:00:53 AM

Count Ended 5/20/2022 12:20:59 AM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	6,752	337.600	337.516
sd	0.009	82.171	4.109	4.109
Beta	0.374	2,815	140.750	140.376
sd	0.019	53.057	2.653	2.653

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
9	95.03%	94.66%	96.68%	95.46%

Prep Batch:	239589		
Detector	B1	Activity	Units
9	Low Mass	3631.70	dpm/mL

B2	Activity	Units
Medium Mas	3617.50	dpm/mL

B3	Activity	Units
High Mass	3694.80	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
nal Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-51512;B2

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 11:43:05 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 11:48:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,205	1,441.000	1,441.000
sd	0.000			0.000	84.882	16.976	16.976

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-51512;B1

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:06:17 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:11:22 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,657	1,531.400	1,531.400
sd	0.000			0.000	87.504	17.501	17.501

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-51512;B3

Repeat 9

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:50:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:55:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,954	1,390.800	1,390.800
sd	0.000			0.000	83.391	16.678	16.678

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-1835527;BH

Repeat 1

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 1:41:54 PM

Count Ended 11/21/2019 2:27:03 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.157	10,140	225.333	225.176
sd	0.013	100.698	2.238	2.238
Beta	0.362	4,162	92.489	92.127
sd	0.019	64.514	1.434	1.434

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-1835527;BG

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 2:33:00 PM

Count Ended 11/21/2019 3:18:11 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.157	13,095	291.000	290.843
sd	0.013	114.433	2.543	2.543
Beta	0.362	5,287	117.489	117.127
sd	0.019	72.712	1.616	1.616

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-1835527;BI

Repeat 8

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 7:49:20 PM

Count Ended 11/21/2019 8:34:28 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.157	13,851	307.800	307.643
sd	0.013	117.690	2.615	2.615
Beta	0.362	6,002	133.378	133.016
sd	0.019	77.473	1.722	1.722

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
9	89.46%	99.00%	107.33%	98.60%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
9	9.226E+05	1.021E+06	1.107E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT		Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red9	5/18/22 15:26		20.00	1000.00	1.00	1.00		
	Gross Alpha	7030	84	0.00		3.515E+002	8.400E-002	0.1716	**9.226E+005**pCi/L	5.373E+004	1.101E+004	9.592E+002	4.004E+002	53,727.9515
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red9	5/18/22 15:02		20.00	1000.00	1.00	1.00		
	Gross Alpha	10411	84	0.00		5.205E+002	8.400E-002	0.1149	**1.021E+006**pCi/L	5.903E+004	1.000E+004	7.164E+002	2.991E+002	59,029.6870
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red9	5/18/22 17:53		20.00	1000.00	1.00	1.00		
	Gross Alpha	8261	84	0.00		4.131E+002	8.400E-002	0.0840	**1.107E+006**pCi/L	6.427E+004	1.218E+004	9.795E+002	4.089E+002	64,273.3822

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-1835527; B

Repeat 9

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:02:45 PM

Count Ended 5/18/2022 3:22:52 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	10,411	520.550	520.466
sd	0.009	102.034	5.102	5.102
Beta	0.359	4,128	206.400	206.041
sd	0.019	64.250	3.212	3.213

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-1835527; A

Repeat 18

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:26:02 PM

Count Ended 5/18/2022 3:46:07 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	7,030	351.500	351.416
sd	0.009	83.845	4.192	4.192
Beta	0.359	2,563	128.150	127.791
sd	0.019	50.626	2.531	2.531

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVABT-1835527; C

Repeat 24

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 5:53:27 PM

Count Ended 5/18/2022 6:13:32 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.084	8,261	413.050	412.966
sd	0.009	90.890	4.545	4.545
Beta	0.359	3,607	180.350	179.991
sd	0.019	60.058	3.003	3.003

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
10	94.72%	94.26%	95.95%	94.98%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
10	Low Mass	3619.90	dpm/mL

B2	Activity	Units
Medium Mass	3602.30	dpm/mL

B3	Activity	Units
High Mass	3666.70	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-51512;B3

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 11:43:14 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 11:48:17 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	3	0.600	0.600
sd	0.000			0.000	1.732	0.346	0.346
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,023	1,404.600	1,404.600
sd	0.000			0.000	83.803	16.761	16.761

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-51512;B2

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:06:29 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:11:32 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	4	0.800	0.800
sd	0.000			0.000	2.000	0.400	0.400
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,290	1,458.000	1,458.000
sd	0.000			0.000	85.381	17.076	17.076

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-51512;B1

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:17:20 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:22:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,740	1,548.000	1,548.000
sd	0.000			0.000	87.977	17.595	17.595

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-1835527;BH

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 2:33:06 PM

Count Ended 11/21/2019 3:18:14 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.128	8,708	193.511	193.383
sd	0.011	93.317	2.074	2.074
Beta	0.343	5,373	119.400	119.057
sd	0.019	73.301	1.629	1.629

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-1835527;BG

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 3:33:44 PM

Count Ended 11/21/2019 4:18:50 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.128	11,431	254.022	253.894
sd	0.011	106.916	2.376	2.376
Beta	0.343	6,979	155.089	154.746
sd	0.019	83.540	1.856	1.857

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
10	87.12%	100.16%	105.20%	97.49%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
10	8.985E+05	1.033E+06	1.085E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red10	5/18/22 15:49		20.00	1000.00	1.00	1.00		
	Gross Alpha	6925	91	0.00	3.463E+002	9.100E-002	0.1735	**8.985E+005**pCi/L	5.234E+004	1.080E+004	9.711E+002	4.120E+002	52,343.1197
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red10	5/18/22 15:26		20.00	1000.00	1.00	1.00		
	Gross Alpha	10568	91	0.00	5.284E+002	9.100E-002	0.1152	**1.033E+006**pCi/L	5.974E+004	1.005E+004	7.317E+002	3.104E+002	59,742.5968
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red10	5/18/22 15:02		20.00	1000.00	1.00	1.00		
	Gross Alpha	8139	91	0.00	4.069E+002	9.100E-002	0.0845	**1.085E+006**pCi/L	6.300E+004	1.203E+004	9.976E+002	4.232E+002	62,996.3253

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-1835527; C

Repeat 18

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:02:49 PM

Count Ended 5/18/2022 3:22:56 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	8,139	406.950	406.859
sd	0.010	90.216	4.511	4.511
Beta	0.450	3,654	182.700	182.250
sd	0.021	60.448	3.022	3.022

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-1835527; B

Repeat 10

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:26:05 PM

Count Ended 5/18/2022 3:46:10 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	10,568	528.400	528.309
sd	0.010	102.801	5.140	5.140
Beta	0.450	4,268	213.400	212.950
sd	0.021	65.330	3.266	3.267

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVABT-1835527; A

Repeat 19

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:49:53 PM

Count Ended 5/18/2022 4:09:59 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.091	6,925	346.250	346.159
sd	0.010	83.217	4.161	4.161
Beta	0.450	2,560	128.000	127.550
sd	0.021	50.596	2.530	2.530

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
11	94.64%	94.19%	96.25%	95.03%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
11	Low Mass	3616.70	dpm/mL

B2	Activity	Units
Medium Mass	3599.60	dpm/mL

B3	Activity	Units
High Mass	3678.10	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-51512;B3

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:06:40 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:11:44 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,007	1,401.400	1,401.400
sd	0.000			0.000	83.708	16.742	16.742

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-51512;B2

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:17:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:22:33 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,237	1,447.400	1,447.400
sd	0.000			0.000	85.071	17.014	17.014

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-51512;B1

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:24:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:29:05 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,674	1,534.800	1,534.800
sd	0.000			0.000	87.601	17.520	17.520

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-1835527;BI

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 2:33:10 PM

Count Ended 11/21/2019 3:18:18 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.135	13,921	309.356	309.221
sd	0.012	117.987	2.622	2.622
Beta	0.545	6,106	135.689	135.144
sd	0.023	78.141	1.736	1.737

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-1835527;BH

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 3:33:51 PM

Count Ended 11/21/2019 4:18:59 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.135	10,023	222.733	222.598
sd	0.012	100.115	2.225	2.225
Beta	0.545	4,232	94.044	93.499
sd	0.023	65.054	1.446	1.446

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-1835527;BG

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 4:24:21 PM

Count Ended 11/21/2019 5:09:29 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.135	13,373	297.178	297.043
sd	0.012	115.642	2.570	2.570
Beta	0.545	5,162	114.711	114.166
sd	0.023	71.847	1.597	1.597

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
11	87.43%	101.03%	104.62%	97.69%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
11	9.017E+05	1.042E+06	1.079E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT		Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red11	5/18/22 16:22		20.00	1000.00	1.00	1.00		
	Gross Alpha	6903	75	0.00		3.451E+002	7.500E-002	0.1724	**9.017E+005**pCi/L	5.253E+004	1.085E+004	9.236E+002	3.765E+002	52,528.2329
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red11	5/18/22 15:49		20.00	1000.00	1.00	1.00		
	Gross Alpha	10552	75	0.00		5.276E+002	7.500E-002	0.1140	**1.042E+006**pCi/L	6.026E+004	1.015E+004	6.983E+002	2.847E+002	60,261.1401
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red11	5/18/22 15:26		20.00	1000.00	1.00	1.00		
	Gross Alpha	7955	75	0.00		3.978E+002	7.500E-002	0.0830	**1.079E+006**pCi/L	6.266E+004	1.210E+004	9.588E+002	3.909E+002	62,664.4214

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-1835527; C

Repeat 19

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:26:10 PM

Count Ended 5/18/2022 3:46:15 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	7,955	397.750	397.675
sd	0.009	89.191	4.460	4.460
Beta	0.519	3,581	179.050	178.531
sd	0.023	59.841	2.992	2.992

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-1835527; B

Repeat 11

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:49:56 PM

Count Ended 5/18/2022 4:10:02 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	10,552	527.600	527.525
sd	0.009	102.723	5.136	5.136
Beta	0.519	4,336	216.800	216.281
sd	0.023	65.848	3.292	3.292

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICVABT-1835527; A

Repeat 20

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 4:22:15 PM

Count Ended 5/18/2022 4:42:21 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.075	6,903	345.150	345.075
sd	0.009	83.084	4.154	4.154
Beta	0.519	2,596	129.800	129.281
sd	0.023	50.951	2.548	2.548

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
12	95.25%	94.42%	94.84%	94.84%

Prep Batch:	239589		
Detector	Beta 1	Activity	Units
12	Low Mass	3.640E+03	dpm/mL

Beta 2	Activity	Units
Medium Mass	3.608E+03	dpm/mL

Beta 3	Activity	Units
High Mass	3.624E+03	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Standard ID

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-51512;B3

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:17:41 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:22:43 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,892	1,378.400	1,378.400
sd	0.000			0.000	83.018	16.604	16.604

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-51512;B2

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:24:12 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:29:16 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,238	1,447.600	1,447.600
sd	0.000			0.000	85.076	17.015	17.015

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-51512;B1

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:30:21 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:35:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,716	1,543.200	1,543.200
sd	0.000			0.000	87.841	17.568	17.568

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-1835527;BI

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 3:33:59 PM

Count Ended 11/21/2019 4:19:06 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.100	12,710	282.444	282.344
sd	0.010	112.739	2.505	2.505
Beta	0.539	6,584	146.311	145.772
sd	0.023	81.142	1.803	1.803

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-1835527;BH

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 4:24:27 PM

Count Ended 11/21/2019 5:09:32 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.100	9,539	211.978	211.878
sd	0.010	97.668	2.170	2.170
Beta	0.539	4,415	98.111	97.572
sd	0.023	66.445	1.477	1.477

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-1835527;BG

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 5:13:03 PM

Count Ended 11/21/2019 5:58:09 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.100	12,636	280.800	280.700
sd	0.010	112.410	2.498	2.498
Beta	0.539	5,563	123.622	123.083
sd	0.023	74.586	1.657	1.658

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
12	88.20%	100.26%	104.13%	97.53%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
12	9.097E+05	1.034E+06	1.074E+06

eurofins Environment Testing TestAmerica

Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO	Aliquot		Mass		Instr ID	CountTime		Ts	Tb	Dilution	Sigma		
	Analyte	Cs	Cb	XT		CPMs	CPMb	Eff	Activity	UncTot	UncCnt	MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red12	5/18/22 16:44		20.00	1000.00	1.00	1.00		
	Gross Alpha	6263	74	0.00		3.131E+002	7.400E-002	0.1550	**9.097E+005**pCi/L	5.311E+004	1.150E+004	1.023E+003	4.159E+002	53,112.0703
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red12	5/18/22 16:22		20.00	1000.00	1.00	1.00		
	Gross Alpha	9357	74	0.00		4.679E+002	7.400E-002	0.1019	**1.034E+006**pCi/L	5.990E+004	1.069E+004	7.784E+002	3.164E+002	59,901.5546
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red12	5/18/22 15:50		20.00	1000.00	1.00	1.00		
	Gross Alpha	7019	74	0.00		3.509E+002	7.400E-002	0.0736	**1.074E+006**pCi/L	6.255E+004	1.282E+004	1.078E+003	4.382E+002	62,554.1593

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-1835527; C

Repeat 20

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 3:50:01 PM

Count Ended 5/18/2022 4:10:06 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	7,019	350.950	350.876
sd	0.009	83.779	4.189	4.189
Beta	0.395	4,263	213.150	212.755
sd	0.020	65.292	3.265	3.265

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-1835527; B

Repeat 12

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 4:22:19 PM

Count Ended 5/18/2022 4:42:24 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	9,357	467.850	467.776
sd	0.009	96.732	4.837	4.837
Beta	0.395	5,044	252.200	251.805
sd	0.020	71.021	3.551	3.551

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVABT-1835527; A

Repeat 21

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 4:44:12 PM

Count Ended 5/18/2022 5:04:17 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.074	6,263	313.150	313.076
sd	0.009	79.139	3.957	3.957
Beta	0.395	3,116	155.800	155.405
sd	0.020	55.821	2.791	2.791

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
13	94.39%	94.56%	96.11%	95.02%

Prep Batch: 239589

Detector	B1	Activity	Units
13	Low Mass	3607.00	dpm/mL

B2	Activity	Units
Medium Mass	3613.50	dpm/mL

B3	Activity	Units
High Mass	3673.00	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Standard ID

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-51512;B3

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:24:23 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:29:26 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,975	1,395.000	1,395.000
sd	0.000			0.000	83.516	16.703	16.703

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-51512;B2

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:30:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:35:36 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,234	1,446.800	1,446.800
sd	0.000			0.000	85.053	17.011	17.011

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-51512;B1

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:36:44 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:41:49 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,631	1,526.200	1,526.200
sd	0.000			0.000	87.356	17.471	17.471

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-1835527;BI

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 4:24:36 PM

Count Ended 11/21/2019 5:09:44 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.167	13,681	304.022	303.855
sd	0.013	116.966	2.599	2.599
Beta	0.393	6,457	143.489	143.096
sd	0.020	80.355	1.786	1.786

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-1835527;BH

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 5:13:10 PM

Count Ended 11/21/2019 5:58:18 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.167	9,814	218.089	217.922
sd	0.013	99.066	2.201	2.201
Beta	0.393	4,263	94.733	94.340
sd	0.020	65.292	1.451	1.451

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-1835527;BG

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:07:46 PM

Count Ended 11/21/2019 6:52:53 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.167	13,374	297.200	297.033
sd	0.013	115.646	2.570	2.570
Beta	0.393	5,354	118.978	118.585
sd	0.020	73.171	1.626	1.626

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
13	85.07%	99.67%	105.69%	96.81%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
13	8.774E+05	1.028E+06	1.090E+06

eurofins Environment Testing TestAmerica

Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red13	5/18/22 17:05		20.00	1000.00	1.00	1.00		
	Gross Alpha	6332	119	0.00	3.166E+002	1.190E-001	0.1625	**8.774E+005**pCi/L	5.121E+004	1.103E+004	1.126E+003	5.032E+002	51,214.9254
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red13	5/18/22 16:44		20.00	1000.00	1.00	1.00		
	Gross Alpha	9784	119	0.00	4.892E+002	1.190E-001	0.1071	**1.028E+006**pCi/L	5.952E+004	1.040E+004	8.541E+002	3.816E+002	59,519.3507
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red13	5/18/22 16:22		20.00	1000.00	1.00	1.00		
	Gross Alpha	7544	119	0.00	3.772E+002	1.190E-001	0.0779	**1.090E+006**pCi/L	6.338E+004	1.255E+004	1.174E+003	5.246E+002	63,376.3967

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-1835527; C

Repeat 21

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 4:22:24 PM

Count Ended 5/18/2022 4:42:30 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	7,544	377.200	377.081
sd	0.011	86.856	4.343	4.343
Beta	0.346	3,764	188.200	187.854
sd	0.019	61.351	3.068	3.068

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-1835527; B

Repeat 13

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 4:44:15 PM

Count Ended 5/18/2022 5:04:22 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	9,784	489.200	489.081
sd	0.011	98.914	4.946	4.946
Beta	0.346	4,539	226.950	226.604
sd	0.019	67.372	3.369	3.369

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVABT-1835527; A

Repeat 22

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 5:05:52 PM

Count Ended 5/18/2022 5:25:56 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.119	6,332	316.600	316.481
sd	0.011	79.574	3.979	3.979
Beta	0.346	2,720	136.000	135.654
sd	0.019	52.154	2.608	2.608

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
14	94.41%	93.65%	95.09%	94.38%

Prep Batch: 239589

Detector	B1	Activity	Units
14	Low Mass	3608.10	dpm/mL

B2	Activity	Units
Medium Mass	3578.70	dpm/mL

B3	Activity	Units
High Mass	3634.10	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Standard ID

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-51512;B3

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:30:46 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:35:50 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,875	1,375.000	1,375.000
sd	0.000			0.000	82.916	16.583	16.583

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-51512;B2

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:36:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:41:59 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,160	1,432.000	1,432.000
sd	0.000			0.000	84.617	16.923	16.923

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-51512;B1

Repeat 8

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:43:24 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:48:27 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,645	1,529.000	1,529.000
sd	0.000			0.000	87.436	17.487	17.487

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-1835527;BI

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 5:13:17 PM

Count Ended 11/21/2019 5:58:27 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	13,800	306.667	306.571
sd	0.010	117.473	2.611	2.611
Beta	0.615	6,400	142.222	141.607
sd	0.025	80.000	1.778	1.778

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-1835527;BH

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:07:51 PM

Count Ended 11/21/2019 6:52:59 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	10,190	226.444	226.348
sd	0.010	100.946	2.243	2.243
Beta	0.615	4,207	93.489	92.874
sd	0.025	64.861	1.441	1.442

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-1835527;BG

Repeat 7

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:58:35 PM

Count Ended 11/21/2019 7:43:43 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.096	13,299	295.533	295.437
sd	0.010	115.321	2.563	2.563
Beta	0.615	5,315	118.111	117.496
sd	0.025	72.904	1.620	1.620

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
14	88.87%	101.32%	106.36%	98.85%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
14	9.166E+05	1.045E+06	1.097E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO	Aliquot		Mass		Instr ID	CountTime		Ts	Tb	Dilution	Sigma		
	Analyte	Cs	Cb	XT		CPMs	CPMb	Eff	Activity	UncTot	UncCnt	MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red14	5/18/22 17:30		20.00	1000.00	1.00	1.00		
	Gross Alpha	6715	106	0.00		3.358E+002	1.060E-001	0.1649	**9.166E+005**pCi/L	5.343E+004	1.119E+004	1.070E+003	4.678E+002	53,431.1493
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red14	5/18/22 17:05		20.00	1000.00	1.00	1.00		
	Gross Alpha	10116	106	0.00		5.058E+002	1.060E-001	0.1089	**1.045E+006**pCi/L	6.049E+004	1.040E+004	8.102E+002	3.542E+002	60,491.6424
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red14	5/18/22 16:44		20.00	1000.00	1.00	1.00		
	Gross Alpha	7739	106	0.00		3.869E+002	1.060E-001	0.0794	**1.097E+006**pCi/L	6.379E+004	1.248E+004	1.112E+003	4.860E+002	63,787.0848

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-1835527; C

Repeat 22

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 4:44:19 PM

Count Ended 5/18/2022 5:04:25 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	7,739	386.950	386.844
sd	0.010	87.972	4.399	4.399
Beta	0.402	3,963	198.150	197.748
sd	0.020	62.952	3.148	3.148

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-1835527; B

Repeat 14

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 5:05:55 PM

Count Ended 5/18/2022 5:26:01 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	10,116	505.800	505.694
sd	0.010	100.578	5.029	5.029
Beta	0.402	4,573	228.650	228.248
sd	0.020	67.624	3.381	3.381

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVABT-1835527; A

Repeat 23

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 5:30:09 PM

Count Ended 5/18/2022 5:50:14 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.106	6,715	335.750	335.644
sd	0.010	81.945	4.097	4.097
Beta	0.402	2,811	140.550	140.148
sd	0.020	53.019	2.651	2.651

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
15	94.53%	94.53%	96.09%	95.05%

Prep Batch:	239589		
Detector	Beta 1	Activity	Units
15	Low Mass	3.613E+03	dpm/mL

Beta 2	Activity	Units
Medium Mass	3.577E+03	dpm/mL

Beta 3	Activity	Units
High Mass	3.672E+03	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/8/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2412.00	0.22850
Decay Corr Activity:	1.9108E+03	dpm	
Decay Corr Conc:	1.9108E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9108E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9108E+03	dpm
Final Activity (A=Sr/Y-90):	3821.55	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-51512;B3

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:37:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:42:11 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,936	1,387.200	1,387.200
sd	0.000			0.000	83.283	16.657	16.657

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-51512;B2

Repeat 8

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:43:36 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:48:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,136	1,427.200	1,427.200
sd	0.000			0.000	84.475	16.895	16.895

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-51512;B1

Repeat 9

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/8/2019 12:50:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/8/2019 12:55:14 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,639	1,527.800	1,527.800
sd	0.000			0.000	87.401	17.480	17.480

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-1835527;BI

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:07:55 PM

Count Ended 11/21/2019 6:53:03 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.136	13,262	294.711	294.575
sd	0.012	115.161	2.559	2.559
Beta	0.372	6,354	141.200	140.828
sd	0.019	79.712	1.771	1.771

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-1835527;BH

Repeat 7

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 6:58:42 PM

Count Ended 11/21/2019 7:43:48 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.136	9,717	215.933	215.797
sd	0.012	98.575	2.191	2.191
Beta	0.372	4,229	93.978	93.606
sd	0.019	65.031	1.445	1.445

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-1835527;BG

Repeat 8

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 7:49:06 PM

Count Ended 11/21/2019 8:34:14 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.136	12,750	283.333	283.197
sd	0.012	112.916	2.509	2.509
Beta	0.372	5,315	118.111	117.739
sd	0.019	72.904	1.620	1.620

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
15	88.32%	98.32%	107.33%	97.99%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
15	9.109E+05	1.014E+06	1.107E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red15	5/18/22 17:53		20.00	1000.00	1.00	1.00		
	Gross Alpha	6612	111	0.00	3.306E+002	1.110E-001	0.1634	**9.109E+005**pCi/L	5.312E+004	1.121E+004	1.096E+003	4.832E+002	53,118.4501
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red15	5/18/22 17:30		20.00	1000.00	1.00	1.00		
	Gross Alpha	9752	111	0.00	4.876E+002	1.110E-001	0.1083	**1.014E+006**pCi/L	5.870E+004	1.027E+004	8.268E+002	3.646E+002	58,699.8470
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red15	5/18/22 17:05		20.00	1000.00	1.00	1.00		
	Gross Alpha	7752	111	0.00	3.876E+002	1.110E-001	0.0788	**1.107E+006**pCi/L	6.436E+004	1.258E+004	1.136E+003	5.010E+002	64,356.2350

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-1835527; C

Repeat 23

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 5:05:59 PM

Count Ended 5/18/2022 5:26:04 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	7,752	387.600	387.489
sd	0.011	88.045	4.402	4.402
Beta	0.351	3,830	191.500	191.149
sd	0.019	61.887	3.094	3.094

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-1835527; B

Repeat 15

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 5:30:13 PM

Count Ended 5/18/2022 5:50:17 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	9,752	487.600	487.489
sd	0.011	98.752	4.938	4.938
Beta	0.351	4,570	228.500	228.149
sd	0.019	67.602	3.380	3.380

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVABT-1835527; A

Repeat 24

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 5:53:19 PM

Count Ended 5/18/2022 6:13:26 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.111	6,612	330.600	330.489
sd	0.011	81.314	4.066	4.066
Beta	0.351	2,657	132.850	132.499
sd	0.019	51.546	2.577	2.577

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
16	98.36%	94.11%	96.57%	96.34%

Prep Batch: 239589

Detector	B1	Activity	Units
16	Low Mass	3758.50	dpm/mL

B2	Activity	Units
Medium Mass	3596.10	dpm/mL

B3	Activity	Units
High Mass	3690.30	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/9/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2413.00	0.22860
Decay Corr Activity:	1.9107E+03	dpm	
Decay Corr Conc:	1.9107E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9107E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9107E+03	dpm
Final Activity (A=Sr/Y-90):	3821.30	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-51512;B1

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:30:01 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:35:03 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,983	1,596.600	1,596.600
sd	0.000			0.000	89.348	17.870	17.870

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-51512;B3

Repeat 8

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:08:26 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:13:29 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,024	1,404.800	1,404.800
sd	0.000			0.000	83.809	16.762	16.762

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-51512;B2

Repeat 9

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:14:38 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:19:42 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,226	1,445.200	1,445.200
sd	0.000			0.000	85.006	17.001	17.001

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-1835527;BG

Repeat 1

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 8:47:35 PM

Count Ended 11/21/2019 9:32:42 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.107	13,072	290.489	290.382
sd	0.010	114.333	2.541	2.541
Beta	0.412	5,038	111.956	111.544
sd	0.020	70.979	1.577	1.577

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-1835527;BI

Repeat 7

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 8:49:40 AM

Count Ended 11/22/2019 9:34:48 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.107	13,804	306.756	306.649
sd	0.010	117.490	2.611	2.611
Beta	0.412	6,061	134.689	134.277
sd	0.020	77.852	1.730	1.730

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-1835527;BH

Repeat 8

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 9:39:28 AM

Count Ended 11/22/2019 10:24:35 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.107	10,061	223.578	223.471
sd	0.010	100.305	2.229	2.229
Beta	0.412	4,153	92.289	91.877
sd	0.020	64.444	1.432	1.432

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
16	87.90%	101.13%	105.98%	98.34%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
16	9.066E+05	1.043E+06	1.093E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red16	5/18/22 18:35		20.00	1000.00	1.00	1.00		
	Gross Alpha	6812	78	0.00	3.406E+002	7.800E-002	0.1692	**9.066E+005**pCi/L	5.283E+004	1.099E+004	9.519E+002	3.913E+002	52,834.1891
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red16	5/18/22 21:54		20.00	1000.00	1.00	1.00		
	Gross Alpha	10400	78	0.00	5.200E+002	7.800E-002	0.1123	**1.043E+006**pCi/L	6.030E+004	1.022E+004	7.169E+002	2.947E+002	60,297.0996
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red16	5/18/22 21:30		20.00	1000.00	1.00	1.00		
	Gross Alpha	7892	78	0.00	3.946E+002	7.800E-002	0.0813	**1.093E+006**pCi/L	6.348E+004	1.230E+004	9.901E+002	4.070E+002	63,484.0407

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-1835527; A

Repeat 13

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:35:34 PM

Count Ended 5/18/2022 6:55:37 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	6,812	340.600	340.522
sd	0.009	82.535	4.127	4.127
Beta	0.356	2,709	135.450	135.094
sd	0.019	52.048	2.602	2.602

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-1835527; C

Repeat 19

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:30:47 PM

Count Ended 5/18/2022 9:50:52 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	7,892	394.600	394.522
sd	0.009	88.837	4.442	4.442
Beta	0.356	3,748	187.400	187.044
sd	0.019	61.221	3.061	3.061

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVABT-1835527; B

Repeat 14

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:54:18 PM

Count Ended 5/18/2022 10:14:23 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.078	10,400	520.000	519.922
sd	0.009	101.980	5.099	5.099
Beta	0.356	4,572	228.600	228.244
sd	0.019	67.617	3.381	3.381

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
17	95.35%	94.18%	94.96%	94.83%

Prep Batch: 239589

Detector	B1	Activity	Units
17	Low Mass	3643.80	dpm/mL

B2	Activity	Units
Medium Mass	3599.00	dpm/mL

B3	Activity	Units
High Mass	3628.70	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/9/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2413.00	0.22860
Decay Corr Activity:	1.9107E+03	dpm	
Decay Corr Conc:	1.9107E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9107E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9107E+03	dpm
Final Activity (A=Sr/Y-90):	3821.30	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-51512;B2

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:30:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:35:16 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,266	1,453.200	1,453.200
sd	0.000			0.000	85.241	17.048	17.048

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-51512;B1

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:36:21 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:41:26 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,784	1,556.800	1,556.800
sd	0.000			0.000	88.227	17.645	17.645

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-51512;B3

Repeat 9

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:14:46 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:19:49 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,933	1,386.600	1,386.600
sd	0.000			0.000	83.265	16.653	16.653

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-1835527;BH

Repeat 1

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 8:47:42 PM

Count Ended 11/21/2019 9:32:50 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.153	10,262	228.044	227.891
sd	0.012	101.302	2.251	2.251
Beta	0.372	4,228	93.956	93.584
sd	0.019	65.023	1.445	1.445

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-1835527;BG

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 9:42:42 PM

Count Ended 11/21/2019 10:27:49 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.153	13,590	302.000	301.847
sd	0.012	116.576	2.591	2.591
Beta	0.372	5,364	119.200	118.828
sd	0.019	73.239	1.628	1.628

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-1835527;BI

Repeat 8

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 9:39:32 AM

Count Ended 11/22/2019 10:24:41 AM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.153	14,095	313.222	313.069
sd	0.012	118.722	2.638	2.638
Beta	0.372	6,393	142.067	141.695
sd	0.019	79.956	1.777	1.777

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
17	88.39%	98.61%	105.78%	97.59%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
17	9.116E+05	1.017E+06	1.091E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO	Aliquot		Mass		Instr ID	CountTime		Ts	Tb	Dilution	Sigma		
	Analyte	Cs	Cb	XT		CPMs	CPMb	Eff	Activity	UncTot	UncCnt	MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red17	5/18/22 18:58		20.00	1000.00	1.00	1.00		
	Gross Alpha	6809	73	0.00		3.404E+002	7.300E-002	0.1682	**9.116E+005**pCi/L	5.312E+004	1.105E+004	9.393E+002	3.807E+002	53,122.2637
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red17	5/18/22 18:35		20.00	1000.00	1.00	1.00		
	Gross Alpha	10066	73	0.00		5.033E+002	7.300E-002	0.1114	**1.017E+006**pCi/L	5.885E+004	1.014E+004	7.088E+002	2.873E+002	58,847.2232
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red17	5/18/22 21:54		20.00	1000.00	1.00	1.00		
	Gross Alpha	7835	73	0.00		3.918E+002	7.300E-002	0.0808	**1.091E+006**pCi/L	6.342E+004	1.233E+004	9.774E+002	3.962E+002	63,422.7414

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-1835527; B

Repeat 7

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:35:38 PM

Count Ended 5/18/2022 6:55:43 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	10,066	503.300	503.227
sd	0.009	100.329	5.016	5.016
Beta	1.642	4,628	231.400	229.758
sd	0.041	68.029	3.401	3.402

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-1835527; A

Repeat 14

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:58:41 PM

Count Ended 5/18/2022 7:18:47 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	6,809	340.450	340.377
sd	0.009	82.517	4.126	4.126
Beta	1.642	2,766	138.300	136.658
sd	0.041	52.593	2.630	2.630

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVABT-1835527; C

Repeat 20

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:54:21 PM

Count Ended 5/18/2022 10:14:26 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.073	7,835	391.750	391.677
sd	0.009	88.516	4.426	4.426
Beta	1.642	3,910	195.500	193.858
sd	0.041	62.530	3.126	3.127

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
18	97.45%	94.42%	94.68%	95.52%

Prep Batch: 239589

Detector	B1	Activity	Units
18	Low Mass	3723.70	dpm/mL

B2	Activity	Units
Medium Mass	3608.00	dpm/mL

B3	Activity	Units
High Mass	3618.10	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/9/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2413.00	0.22860
Decay Corr Activity:	1.9107E+03	dpm	
Decay Corr Conc:	1.9107E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9107E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9107E+03	dpm
Final Activity (A=Sr/Y-90):	3821.30	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-51512;B3

Repeat 2

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:30:24 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:35:28 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,864	1,372.800	1,372.800
sd	0.000			0.000	82.849	16.570	16.570

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-51512;B2

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:36:33 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:41:36 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,222	1,444.400	1,444.400
sd	0.000			0.000	84.982	16.996	16.996

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-51512;B1

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:42:37 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:47:40 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,870	1,574.000	1,574.000
sd	0.000			0.000	88.713	17.743	17.743

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-1835527;BH

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 9:42:46 PM

Count Ended 11/21/2019 10:27:52 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.141	9,784	217.422	217.281
sd	0.012	98.914	2.198	2.198
Beta	0.372	4,305	95.667	95.295
sd	0.019	65.612	1.458	1.458

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-1835527;BG

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 10:32:00 PM

Count Ended 11/21/2019 11:17:06 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.141	12,736	283.022	282.881
sd	0.012	112.854	2.508	2.508
Beta	0.372	5,271	117.133	116.761
sd	0.019	72.602	1.613	1.613

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
18	86.13%	100.35%	105.20%	97.23%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
18	8.883E+05	1.035E+06	1.085E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red18	5/18/22 19:21		20.00	1000.00	1.00	1.00		
	Gross Alpha	6585	93	0.00	3.293E+002	9.300E-002	0.1669	**8.883E+005**pCi/L	5.180E+004	1.095E+004	1.016E+003	4.330E+002	51,802.1763
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red18	5/18/22 18:58		20.00	1000.00	1.00	1.00		
	Gross Alpha	10221	93	0.00	5.111E+002	9.300E-002	0.1112	**1.035E+006**pCi/L	5.989E+004	1.024E+004	7.629E+002	3.251E+002	59,885.1768
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red18	5/18/22 18:35		20.00	1000.00	1.00	1.00		
	Gross Alpha	7821	93	0.00	3.911E+002	9.300E-002	0.0812	**1.085E+006**pCi/L	6.304E+004	1.227E+004	1.045E+003	4.453E+002	63,041.3581

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-1835527; C

Repeat 13

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:35:42 PM

Count Ended 5/18/2022 6:55:48 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	7,821	391.050	390.957
sd	0.010	88.436	4.422	4.422
Beta	0.286	3,996	199.800	199.514
sd	0.017	63.214	3.161	3.161

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-1835527; B

Repeat 8

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:58:44 PM

Count Ended 5/18/2022 7:18:50 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	10,221	511.050	510.957
sd	0.010	101.099	5.055	5.055
Beta	0.286	4,804	240.200	239.914
sd	0.017	69.311	3.466	3.466

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVABT-1835527; A

Repeat 15

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 7:21:10 PM

Count Ended 5/18/2022 7:41:14 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.093	6,585	329.250	329.157
sd	0.010	81.148	4.057	4.057
Beta	0.286	2,890	144.500	144.214
sd	0.017	53.759	2.688	2.688

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019				
Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
19	95.62%	94.66%	95.24%	95.17%

Prep Batch:	239589		
Detector	B1	Activity	Units
19	Low Mass	3654.10	dpm/mL

B2	Activity	Units
Medium Mas	3617.20	dpm/mL

B3	Activity	Units
High Mass	3639.30	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/9/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2413.00	0.22860
Decay Corr Activity:	1.9107E+03	dpm	
Decay Corr Conc:	1.9107E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9107E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9107E+03	dpm
nal Activity (A=Sr/Y-90):	3821.30	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-51512;B3

Repeat 3

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:36:44 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:41:48 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,054	1,410.800	1,410.800
sd	0.000			0.000	83.988	16.798	16.798

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-51512;B2

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:42:46 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:47:50 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,423	1,484.600	1,484.600
sd	0.000			0.000	86.157	17.231	17.231

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-51512;B1

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:48:41 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:53:46 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,939	1,587.800	1,587.800
sd	0.000			0.000	89.101	17.820	17.820

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-1835527;BI

Repeat 2

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 9:42:51 PM

Count Ended 11/21/2019 10:28:01 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.150	13,860	308.000	307.850
sd	0.012	117.729	2.616	2.616
Beta	0.429	6,375	141.667	141.238
sd	0.021	79.844	1.774	1.774

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-1835527;BH

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 10:32:04 PM

Count Ended 11/21/2019 11:17:12 PM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.150	9,997	222.156	222.006
sd	0.012	99.985	2.222	2.222
Beta	0.429	4,376	97.244	96.815
sd	0.021	66.151	1.470	1.470

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-1835527;BG

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:30:58 PM

Count Ended 11/22/2019 12:16:06 AM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.150	13,352	296.711	296.561
sd	0.012	115.551	2.568	2.568
Beta	0.429	5,355	119.000	118.571
sd	0.021	73.178	1.626	1.626

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
19	87.00%	97.35%	104.33%	96.23%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
19	8.973E+05	1.004E+06	1.076E+06

eurofins Environment Testing TestAmerica

Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red19	5/18/22 19:43		20.00	1000.00	1.00	1.00		
	Gross Alpha	6683	64	0.00	3.341E+002	6.400E-002	0.1677	**8.973E+005**pCi/L	5.231E+004	1.098E+004	9.077E+002	3.575E+002	52,310.7436
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red19	5/18/22 19:21		20.00	1000.00	1.00	1.00		
	Gross Alpha	9895	64	0.00	4.948E+002	6.400E-002	0.1109	**1.004E+006**pCi/L	5.813E+004	1.010E+004	6.861E+002	2.702E+002	58,127.6291
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red19	5/18/22 18:58		20.00	1000.00	1.00	1.00		
	Gross Alpha	7742	64	0.00	3.871E+002	6.400E-002	0.0810	**1.076E+006**pCi/L	6.256E+004	1.223E+004	9.399E+002	3.702E+002	62,558.7957

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-1835527; C

Repeat 14

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 6:58:48 PM

Count Ended 5/18/2022 7:18:53 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	7,742	387.100	387.036
sd	0.008	87.989	4.399	4.399
Beta	0.407	4,018	200.900	200.493
sd	0.020	63.388	3.169	3.169

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-1835527; B

Repeat 9

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 7:21:13 PM

Count Ended 5/18/2022 7:41:19 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	9,895	494.750	494.686
sd	0.008	99.474	4.974	4.974
Beta	0.407	4,768	238.400	237.993
sd	0.020	69.051	3.453	3.453

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVABT-1835527; A

Repeat 16

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 7:43:05 PM

Count Ended 5/18/2022 8:03:11 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.064	6,683	334.150	334.086
sd	0.008	81.750	4.087	4.087
Beta	0.407	2,904	145.200	144.793
sd	0.020	53.889	2.694	2.695

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
20	94.57%	92.21%	96.04%	94.27%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
20	Low Mass	3613.70	dpm/mL

B2	Activity	Units
Medium Mass	3523.70	dpm/mL

B3	Activity	Units
High Mass	3670.10	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/9/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2413.00	0.22860
Decay Corr Activity:	1.9107E+03	dpm	
Decay Corr Conc:	1.9107E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9107E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9107E+03	dpm
Final Activity (A=Sr/Y-90):	3821.30	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-51512;B3

Repeat 4

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:42:55 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:47:58 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,926	1,385.200	1,385.200
sd	0.000			0.000	83.223	16.645	16.645

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-51512;B2

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:48:51 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:53:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,021	1,404.200	1,404.200
sd	0.000			0.000	83.791	16.758	16.758

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-51512;B1

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:54:51 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:59:54 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,609	1,521.800	1,521.800
sd	0.000			0.000	87.230	17.446	17.446

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-1835527;BI

Repeat 3

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 10:32:09 PM

Count Ended 11/21/2019 11:17:15 PM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.222	13,429	298.422	298.200
sd	0.015	115.884	2.575	2.575
Beta	0.394	6,224	138.311	137.917
sd	0.020	78.892	1.753	1.753

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-1835527;BH

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:31:03 PM

Count Ended 11/22/2019 12:16:09 AM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.222	9,949	221.089	220.867
sd	0.015	99.745	2.217	2.217
Beta	0.394	4,478	99.511	99.117
sd	0.020	66.918	1.487	1.487

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-1835527;BG

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 7:06:57 AM

Count Ended 11/22/2019 7:52:05 AM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.222	13,216	293.689	293.467
sd	0.015	114.961	2.555	2.555
Beta	0.394	5,316	118.133	117.739
sd	0.020	72.911	1.620	1.620

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
20	88.04%	100.35%	103.07%	97.15%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
20	9.080E+05	1.035E+06	1.063E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO	Aliquot		Mass		Instr ID	CountTime		Ts	Tb	Dilution	Sigma		
	Analyte	Cs	Cb	XT		CPMs	CPMb	Eff	Activity	UncTot	UncCnt	MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red20	5/18/22 20:05		20.00	1000.00	1.00	1.00		
	Gross Alpha	6665	56	0.00		3.333E+002	5.600E-002	0.1653	**9.080E+005**pCi/L	5.294E+004	1.112E+004	8.880E+002	3.393E+002	52,940.3841
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red20	5/18/22 19:43		20.00	1000.00	1.00	1.00		
	Gross Alpha	10133	56	0.00		5.066E+002	5.600E-002	0.1102	**1.035E+006**pCi/L	5.991E+004	1.029E+004	6.660E+002	2.545E+002	59,912.3313
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red20	5/18/22 19:21		20.00	1000.00	1.00	1.00		
	Gross Alpha	7623	56	0.00		3.811E+002	5.600E-002	0.0807	**1.063E+006**pCi/L	6.182E+004	1.218E+004	9.092E+002	3.475E+002	61,824.7194

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-1835527; C

Repeat 15

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 7:21:17 PM

Count Ended 5/18/2022 7:41:23 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	7,623	381.150	381.094
sd	0.007	87.310	4.365	4.365
Beta	0.353	3,897	194.850	194.497
sd	0.019	62.426	3.121	3.121

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-1835527; B

Repeat 10

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 7:43:08 PM

Count Ended 5/18/2022 8:03:15 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	10,133	506.650	506.594
sd	0.007	100.663	5.033	5.033
Beta	0.353	4,582	229.100	228.747
sd	0.019	67.690	3.385	3.385

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICVABT-1835527; A

Repeat 17

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:05:13 PM

Count Ended 5/18/2022 8:25:16 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.056	6,665	333.250	333.194
sd	0.007	81.639	4.082	4.082
Beta	0.353	2,854	142.700	142.347
sd	0.019	53.423	2.671	2.671

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
21	96.94%	96.37%	96.75%	96.69%

Prep Batch:	**239589**		
Detector	B1	Activity	Units
21	Low Mass	3704.30	dpm/mL

B2	Activity	Units
Medium Mass	3682.50	dpm/mL

B3	Activity	Units
High Mass	3697.20	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/9/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2413.00	0.22860
Decay Corr Activity:	1.9107E+03	dpm	
Decay Corr Conc:	1.9107E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9107E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9107E+03	dpm
Final Activity (A=Sr/Y-90):	3821.30	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-51512;B3

Repeat 5

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:49:00 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 6:54:04 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,997	1,399.400	1,399.400
sd	0.000			0.000	83.648	16.730	16.730

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-51512;B2

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:55:00 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:00:05 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,367	1,473.400	1,473.400
sd	0.000			0.000	85.831	17.166	17.166

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-51512;B1

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:00:54 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:05:58 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,854	1,570.800	1,570.800
sd	0.000			0.000	88.623	17.725	17.725

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-1835527;BI

Repeat 4

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/21/2019 11:31:08 PM

Count Ended 11/22/2019 12:16:15 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.165	13,522	300.489	300.324
sd	0.013	116.284	2.584	2.584
Beta	0.374	6,743	149.844	149.470
sd	0.019	82.116	1.825	1.825

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-1835527;BH

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 7:07:04 AM

Count Ended 11/22/2019 7:52:11 AM

Sample Count Time 45.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.165	10,003	222.289	222.124
sd	0.013	100.015	2.223	2.223
Beta	0.374	4,430	98.444	98.070
sd	0.019	66.558	1.479	1.479

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-1835527;BG

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 8:01:04 AM

Count Ended 11/22/2019 8:46:12 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.165	13,212	293.600	293.435
sd	0.013	114.943	2.554	2.554
Beta	0.374	5,537	123.044	122.670
sd	0.019	74.411	1.654	1.654

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
21	86.80%	98.80%	105.69%	97.10%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
21	8.952E+05	1.019E+06	1.090E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO / Analyte	Aliquot / Cs	Cb	Mass / XT	Instr ID / CPMs	CountTime / CPMb	Eff	Ts / Activity	Tb / UncTot	Dilution / UncCnt	Sigma / MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232 g	Red21	5/18/22 20:28		20.00	1000.00	1.00	1.00		
	Gross Alpha	6681	76	0.00	3.341E+002	7.600E-002	0.1680	**8.952E+005**pCi/L	5.219E+004	1.095E+004	9.511E+002	3.888E+002	52,190.5078
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537 g	Red21	5/18/22 20:05		20.00	1000.00	1.00	1.00		
	Gross Alpha	10106	76	0.00	5.053E+002	7.600E-002	0.1117	**1.019E+006**pCi/L	5.895E+004	1.014E+004	7.156E+002	2.925E+002	58,953.8268
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846 g	Red21	5/18/22 19:43		20.00	1000.00	1.00	1.00		
	Gross Alpha	7863	76	0.00	3.931E+002	7.600E-002	0.0812	**1.090E+006**pCi/L	6.335E+004	1.230E+004	9.842E+002	4.024E+002	63,352.2399

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-1835527; C

Repeat 16

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 7:43:13 PM

Count Ended 5/18/2022 8:03:17 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	7,863	393.150	393.074
sd	0.009	88.674	4.434	4.434
Beta	0.281	3,935	196.750	196.469
sd	0.017	62.730	3.136	3.137

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-1835527; B

Repeat 11

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:05:16 PM

Count Ended 5/18/2022 8:25:21 PM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	10,106	505.300	505.224
sd	0.009	100.529	5.026	5.026
Beta	0.281	4,732	236.600	236.319
sd	0.017	68.790	3.439	3.440

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVABT-1835527; A

Repeat 18

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:28:00 PM

Count Ended 5/18/2022 8:48:04 PM

Sample Count Time 20.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.076	6,681	334.050	333.974
sd	0.009	81.737	4.087	4.087
Beta	0.281	2,883	144.150	143.869
sd	0.017	53.694	2.685	2.685

ICV is for Gross Beta
Strontium 90
and
Total Strontium

Red - Beta ICV 2019

Detector	Low Mass Recovery	Medium Mass Recovery	High Mass Recovery	Mean Recovery
22	93.62%	91.53%	94.59%	93.25%

Prep Batch: 239589

Detector	B1	Activity	Units
22	Low Mass	3577.60	dpm/mL

B2	Activity	Units
Medium Mass	3497.50	dpm/mL

B3	Activity	Units
High Mass	3614.60	dpm/mL

Standard ID

Strontium 90
Sr-90_00018 #51512
Cert# 92352 Ref. date 11/29/12

Raw Sample/Standard Information

Initial Date/Time (t_0):	11/29/2012 0:00		
Decayto Date/Time (t):	7/9/19 0:00		
Initial Activity (A_0):	2,238.70	dpm	
Initial Aliquot:	1	mL	
Initial Conc:	2238.7	dpm/mL	
Nuclide:	Sr-90		
Half-Life (days):	10555.725	decay days	fraction
****Decay Factor:**	0.8535	2413.00	0.22860
Decay Corr Activity:	1.9107E+03	dpm	
Decay Corr Conc:	1.9107E+03	dpm/mL	

Conversion/Calculations

Final Activity Unit:	dpm	
Activity Unit Factor:	1.00000	
Final Volume Unit:	mL	
Volume Unit Factor:	1.000	
Final Concentration:	1.9107E+03	dpm/mL
Aliquot Volume:	1.0000E+00	mL
Final Activity (A):	1.9107E+03	dpm
Final Activity (A=Sr/Y-90):	3821.30	dpm

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-51512;B3

Repeat 6

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 6:55:14 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:00:17 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	0	0.000	0.000
sd	0.000			0.000	0.000	0.000	0.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	6,904	1,380.800	1,380.800
sd	0.000			0.000	83.090	16.618	16.618

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-51512;B2

Repeat 7

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:01:06 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:06:10 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	2	0.400	0.400
sd	0.000			0.000	1.414	0.283	0.283
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,059	1,411.800	1,411.800
sd	0.000			0.000	84.018	16.804	16.804

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-51512;B1

Repeat 8

Carrier No. 0

Batch ID 239589

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/9/2019 7:08:06 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/9/2019 7:13:11 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** .00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	1	0.200	0.200
sd	0.000			0.000	1.000	0.200	0.200
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	7,639	1,527.800	1,527.800
sd	0.000			0.000	87.401	17.480	17.480

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-1835527;BI

Repeat 5

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 7:07:13 AM

Count Ended 11/22/2019 7:52:22 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.180	13,661	303.578	303.398
sd	0.013	116.880	2.597	2.597
Beta	0.480	6,397	142.156	141.676
sd	0.022	79.981	1.777	1.777

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-1835527;BH

Repeat 6

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 8:01:08 AM

Count Ended 11/22/2019 8:46:16 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.180	9,773	217.178	216.998
sd	0.013	98.858	2.197	2.197
Beta	0.480	4,149	92.200	91.720
sd	0.022	64.413	1.431	1.432

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-1835527;BG

Repeat 7

Carrier No. 0

Batch ID 451383

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 11/22/2019 8:49:30 AM

Count Ended 11/22/2019 9:34:39 AM

Sample Count Time 45.00 ***mins***

Background Count Time 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.180	12,972	288.267	288.087
sd	0.013	113.895	2.531	2.531
Beta	0.480	5,214	115.867	115.387
sd	0.022	72.208	1.605	1.605

ICV is for Gross Alpha

Red - Alpha ICV				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
22	87.48%	98.61%	106.17%	97.42%

Standard ID

Thorium-230
Th-230_00056 #1835527
Cert # 114475 Ref. date 10/29/19
Activity 1.031E+06 pCi/L

Prep Batch: 516409(6/30/21)

	A1 = Low Mass	A2 = Medium Mass	A3 = High Mass
	0.0232g	0.0537g	0.0846g
Detector	Activity (pCi/mL)	Activity (pCi/mL)	Activity (pCi/mL)
22	9.022E+05	1.017E+06	1.095E+06

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Analysis Report for Gross Alpha/Beta

Batch: 566222 **Operator:**

Sample ID	WRKNO	Aliquot		Mass		Instr ID	CountTime		Ts	Tb	Dilution	Sigma		
	Analyte	Cs	Cb	XT		CPMs	CPMb	Eff	Activity	UncTot	UncCnt	MDA	DLC	
ICVABT-1835527; A	160-45488-A-1-A	1.000E+000mL		0.0232	g	Red22	5/18/22 21:30		20.00	1000.00	1.00	1.00		
	Gross Alpha	6686	97	0.00	3.343E+002	9.700E-002	0.1669		**9.022E+005**pCi/L	5.260E+004	1.104E+004	1.030E+003	4.424E+002	52,598.3942
ICVABT-1835527; B	160-45488-A-2-A	2.000E+000mL		0.0537	g	Red22	5/18/22 20:28		20.00	1000.00	1.00	1.00		
	Gross Alpha	9907	97	0.00	4.954E+002	9.700E-002	0.1097		**1.017E+006**pCi/L	5.888E+004	1.022E+004	7.834E+002	3.366E+002	58,875.1377
ICVABT-1835527; C	160-45488-A-3-A	2.000E+000mL		0.0846	g	Red22	5/18/22 20:05		20.00	1000.00	1.00	1.00		
	Gross Alpha	7761	97	0.00	3.881E+002	9.700E-002	0.0798		**1.095E+006**pCi/L	6.365E+004	1.243E+004	1.077E+003	4.626E+002	63,649.8956

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Sample Activity	Dup Activity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	Analyte	Sample Activity	MS Activity	StdAdded	MSRecovery %	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal	ZFactor

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-1835527; C

Repeat 17

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:05:20 PM

Count Ended 5/18/2022 8:25:24 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	7,761	388.050	387.953
sd	0.010	88.097	4.405	4.405
Beta	0.337	3,805	190.250	189.913
sd	0.018	61.685	3.084	3.084

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-1835527; B

Repeat 12

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 8:28:04 PM

Count Ended 5/18/2022 8:48:10 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	9,907	495.350	495.253
sd	0.010	99.534	4.977	4.977
Beta	0.337	4,617	230.850	230.513
sd	0.018	67.949	3.397	3.397

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVABT-1835527; A

Repeat 19

Carrier No. 0

Batch ID 566222

Count Method Gross Alpha Beta

Detector Volts 1515

Count Began 5/18/2022 9:30:39 PM

Count Ended 5/18/2022 9:50:43 PM

Sample Count Time 20.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.097	6,686	334.300	334.203
sd	0.010	81.768	4.088	4.088
Beta	0.337	2,840	142.000	141.663
sd	0.018	53.292	2.665	2.665

Ra-226 Calibration Verifications

Ra226 ICV

Blue - Ra226 ICV 2019				
	Low	Medium	High	Mean
	Mass	Mass	Mass	Recovery
Detector	Recovery	Recovery	Recovery	
3	88.43%	96.65%	90.49%	91.85%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

Detector	1	Activity	Units
3	Low Mass (0.0132g)	3.346E+06	pCi/mL

2	Activity	Units
Medium Mass (0.0271g)	3.657E+06	pCi/mL

3	Activity	Units
High Mass (0.0498g)	3.424E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICVRa6-1063071;Ra3

Repeat 2

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 11:38:42 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 11:43:52 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	25,284	5,056.800	5,056.714
sd	0.000			0.009	159.009	31.802	31.802
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	35,261	7,052.200	7,051.807
sd	0.000			0.020	187.779	37.556	37.556

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICVRa6-1063071;Ra2

Repeat 3

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 11:44:32 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 11:49:43 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	25,715	5,143.000	5,142.914
sd	0.000			0.009	160.359	32.072	32.072
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	31,020	6,204.000	6,203.607
sd	0.000			0.020	176.125	35.225	35.225

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 0-3 - D

Addr: 3

Sample ID ICVRa6-1063071;Ra1

Repeat 4

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 11:50:50 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 11:55:57 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.086	20,534	4,106.800	4,106.714
sd	0.000			0.009	143.297	28.659	28.659
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.393	24,351	4,870.200	4,869.807
sd	0.000			0.020	156.048	31.210	31.210

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra226 ICV

Blue - Ra226 ICV 2019				
	Low	Medium	High	Mean
	Mass	Mass	Mass	Recovery
Detector	Recovery	Recovery	Recovery	
10	85.57%	96.99%	89.93%	90.83%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

Detector	1	Activity	Units
10	Low Mass (0.0132g)	3.238E+06	pCi/mL

2	Activity	Units
Medium Mass (0.0271g)	3.670E+06	pCi/mL

3	Activity	Units
High Mass (0.0498g)	3.403E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICVRa6-1063071;Ra3

Repeat 9

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:17:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:22:20 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	25,295	5,059.000	5,058.868
sd	0.000			0.011	159.044	31.809	31.809
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	35,544	7,108.800	7,108.502
sd	0.000			0.017	188.531	37.706	37.706

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICVRa6-1063071;Ra2

Repeat 10

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:23:45 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:28:57 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	26,000	5,200.000	5,199.868
sd	0.000			0.011	161.245	32.249	32.249
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	31,286	6,257.200	6,256.902
sd	0.000			0.017	176.878	35.376	35.376

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - C

Addr: 10

Sample ID ICVRa6-1063071;Ra1

Repeat 11

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:30:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:36:08 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.132	20,020	4,004.000	4,003.868
sd	0.000			0.011	141.492	28.298	28.298
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	23,356	4,671.200	4,670.902
sd	0.000			0.017	152.827	30.565	30.565

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra226 ICV

Blue - Ra226 ICV 2019				
	Low	Medium	High	Mean
	Mass	Mass	Mass	Recovery
Detector	Recovery	Recovery	Recovery	
11	88.82%	96.38%	90.04%	91.75%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

Detector	1	Activity	Units
11	Low Mass (0.0132g)	3.361E+06	pCi/mL

2	Activity	Units
Medium Mass (0.0271g)	3.647E+06	pCi/mL

3	Activity	Units
High Mass (0.0498g)	3.407E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICVRa6-1063071;Ra3

Repeat 10

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:23:52 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:29:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	25,055	5,011.000	5,010.926
sd	0.000			0.009	158.288	31.658	31.658
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	35,465	7,093.000	7,092.550
sd	0.000			0.021	188.322	37.664	37.664

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICVRa6-1063071;Ra2

Repeat 11

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:31:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:36:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	25,506	5,101.200	5,101.126
sd	0.000			0.009	159.706	31.941	31.941
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	31,276	6,255.200	6,254.750
sd	0.000			0.021	176.850	35.370	35.370

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 8-11 - D

Addr: 11

Sample ID ICVRa6-1063071;Ra1

Repeat 12

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:38:18 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:43:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.074	20,499	4,099.800	4,099.726
sd	0.000			0.009	143.175	28.635	28.635
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.450	24,406	4,881.200	4,880.750
sd	0.000			0.021	156.224	31.245	31.245

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra226 ICV

Blue - Ra226 ICV 2019				
	Low	Medium	High	Mean
	Mass	Mass	Mass	Recovery
Detector	Recovery	Recovery	Recovery	
12	87.19%	96.46%	88.69%	90.78%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28/2019

Detector	1	Activity	Units
12	Low Mass (0.0132g)	3.299E+06	pCi/mL

2	Activity	Units
Medium Mass (0.0271g)	3.650E+06	pCi/mL

3	Activity	Units
High Mass (0.0498g)	3.356E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICVRa6-1063071;Ra3

Repeat 11

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:31:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:36:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	22,834	4,566.800	4,566.682
sd	0.000			0.011	151.109	30.222	30.222
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	37,173	7,434.600	7,434.243
sd	0.000			0.019	192.803	38.561	38.561

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICVRa6-1063071;Ra2

Repeat 12

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:38:22 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:43:33 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	23,780	4,756.000	4,755.882
sd	0.000			0.011	154.208	30.842	30.842
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	33,070	6,614.000	6,613.643
sd	0.000			0.019	181.852	36.370	36.370

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - A

Addr: 12

Sample ID ICVRa6-1063071;Ra1

Repeat 13

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:45:11 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:50:22 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.118	18,839	3,767.800	3,767.682
sd	0.000			0.011	137.255	27.451	27.451
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.357	25,957	5,191.400	5,191.043
sd	0.000			0.019	161.112	32.222	32.222

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Ra226 ICV

Blue - Ra226 ICV 2019				
	Low	Medium	High	Mean
	Mass	Mass	Mass	Recovery
Detector	Recovery	Recovery	Recovery	
13	89.04%	96.99%	90.07%	92.03%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3.7839E+06 pCi/mL

Prep Batch: 291970 7/28-29/19

Detector	1	Activity	Units
13	Low Mass (0.0132g)	3.369E+06	pCi/mL

2	Activity	Units
Medium Mass (0.0271g)	3.670E+06	pCi/mL

3	Activity	Units
High Mass (0.0498g)	3.408E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICVRa6-1063071;Ra3

Repeat 12

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:38:27 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:43:40 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	26,009	5,201.800	5,201.689
sd	0.000			0.011	161.273	32.255	32.255
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	34,392	6,878.400	6,878.039
sd	0.000			0.019	185.451	37.090	37.090

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICVRa6-1063071;Ra2

Repeat 13

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/28/2019 1:45:15 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/28/2019 1:50:25 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	26,649	5,329.800	5,329.689
sd	0.000			0.011	163.245	32.649	32.649
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	30,389	6,077.800	6,077.439
sd	0.000			0.019	174.324	34.865	34.865

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Blue 12-15 - B

Addr: 13

Sample ID ICVRa6-1063071;Ra1

Repeat 14

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/29/2019 6:49:49 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/29/2019 6:54:57 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.111	21,344	4,268.800	4,268.689
sd	0.000			0.011	146.096	29.219	29.219
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.361	23,667	4,733.400	4,733.039
sd	0.000			0.019	153.841	30.768	30.768

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Total Alpha-Emitting Radium

Batch: 291970 **Operator:**

SampID / Analyte	WRKNO	Ts	Aliquot Tb	Cs	Ba Mass Cb	Ba Yield CPMs	Trunc Yield CPMb	Ingrowth Activity	Ba Precip Time UncCount	InstrID UncTotal	Eff MDA	Cal Type DLC	Cnt Date Time MQO	Sigma
ICVRa6-1063071;1-A	160-21018-A-1-A		1.0000mL		0.0133	63.15%	False	3.2965	2/13/17 13:30	Purple0	0.2322	2	2/21/17 13:27	1.00
Total Alpha Emitting		5.00	1000.00	17832	166	3566.40	0.17	**3.323E+003**pCi/mL	2.489E+001	1.516E+002	1.119E+000	2.800E-001	151.5889	
ICVRa6-1063071;2-A	160-21018-A-2-A		1.0000mL		0.0276	78.63%	False	3.3347	2/13/17 13:30	Purple0	0.2130	2	2/21/17 20:52	1.00
Total Alpha Emitting		5.00	1000.00	22337	166	4467.40	0.17	**3.604E+003**pCi/mL	2.411E+001	1.639E+002	9.688E-001	2.424E-001	163.9470	
ICVRa6-1063071;3-A	160-21018-A-3-A		1.0000mL		0.0487	92.50%	False	3.3328	2/13/17 13:30	Purple0	0.1887	2	2/21/17 20:28	1.00
Total Alpha Emitting		5.00	1000.00	21719	166	4343.80	0.17	**3.364E+003**pCi/mL	2.283E+001	1.531E+002	9.301E-001	2.327E-001	153.0824	

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

SampID	SampDupID	Analyte	Activity	DupActivity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	WRKNO	Analyte	Activity	MSActivity	StdAdded	Recovery	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal

Ra-226 ICV

Purple Ra-226 ICV 2017				
	Low	Medium	High	Mean
	Mass	Mass	Mass	Recovery
Detector	Recovery	Recovery	Recovery	
0	87.72%	95.14%	88.80%	90.55%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3788.19152 pCi/mL

Prep Batch: 291970

Detector	1	Activity	Units
0	Low Mass (0.0133g)	3.323E+03	pCi/mL

2	Activity	Units
Medium Mass (0.0276g)	3.604E+03	pCi/mL

3	Activity	Units
High Mass (0.0487g)	3.364E+03	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICVRa6-1063071;1-A

Repeat 27

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/21/2017 1:27:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/21/2017 1:32:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	17,832	3,566.400	3,566.234
sd	0.000			0.013	133.537	26.707	26.707
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	17,420	3,484.000	3,483.543
sd	0.000			0.021	131.985	26.397	26.397

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICVRa6-1063071;3-A

Repeat 33

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/21/2017 8:28:43 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/21/2017 8:33:52 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	21,719	4,343.800	4,343.634
sd	0.000			0.013	147.374	29.475	29.475
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	25,229	5,045.800	5,045.343
sd	0.000			0.021	158.836	31.767	31.767

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 0-3 - A

Addr: 0

Sample ID ICVRa6-1063071;2-A

Repeat 34

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/21/2017 8:52:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/21/2017 8:57:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.166	22,337	4,467.400	4,467.234
sd	0.000			0.013	149.456	29.891	29.891
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.457	22,617	4,523.400	4,522.943
sd	0.000			0.021	150.389	30.078	30.078

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Analysis Report for Total Alpha-Emitting Radium

Batch: 291970 **Operator:**

SampID / Analyte	WRKNO	Ts	Aliquot Tb	Cs	Ba Mass Cb	Ba Yield CPMs	Trunc Yield CPMb	Ingrowth	Activity	Ba Precip Time	UncCount	InstrID	UncTotal	Eff	MDA	Cal Type	DLC	Cnt Date Time	MQO	Sigma
ICVRa6-1063071;1-A	160-21018-A-1-A		1.0000mL		0.0133		63.15%	False	2.3897	2/13/17 13:30		Purple22		0.2263		2		2/16/17 23:50		1.00
Total Alpha Emitting		5.00	1000.00	12910	126	2582.00	0.13		3.405E+003pCi/mL		2.997E+001		1.561E+002	1.482E+000	3.453E-001				156.1429	
ICVRa6-1063071;2-A	160-21018-A-2-A		1.0000mL		0.0276		78.63%	False	3.1691	2/13/17 13:30		Purple22		0.2062		2		2/20/17 15:26		1.00
Total Alpha Emitting		5.00	1000.00	20642	126	4128.40	0.13		3.620E+003pCi/mL		2.520E+001		1.648E+002	9.852E-001	2.296E-001				164.8365	
ICVRa6-1063071;3-A	160-21018-A-3-A		1.0000mL		0.0487		92.50%	False	2.3878	2/13/17 13:30		Purple22		0.1807		2		2/16/17 23:40		1.00
Total Alpha Emitting		5.00	1000.00	15137	126	3027.40	0.13		3.416E+003pCi/mL		2.777E+001		1.562E+002	1.268E+000	2.954E-001				156.2182	

Laboratory Control Sample Information

SampID	WRKNO	Analyte	Activity	StdAdded	Recovery %	LCL	UCL	ZFactor

Sample Duplicate Information

SampID	SampDupID	Analyte	Activity	DupActivity	RPD	RER	DER	ZFactor

Matrix Spike Information

SampID	SampMSID	WRKNO	Analyte	Activity	MSActivity	StdAdded	Recovery	ZFactor

Blanks Information

SampID	WRKNO	Analyte	Activity	UncTotal

Ra-226 ICV

Purple Ra-226 ICV 2017				
	Low	Medium	High	Mean
	Mass	Mass	Mass	Recovery
Detector	Recovery	Recovery	Recovery	
22	89.88%	95.56%	90.17%	91.87%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity 3788.19152 pCi/mL

Prep Batch: 291970

Detector	1	Activity	Units
22	Low Mass (0.0133g)	3.405E+03	pCi/mL

2	Activity	Units
Medium Mass (0.0276g)	3.620E+03	pCi/mL

3	Activity	Units
High Mass (0.0487g)	3.416E+03	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICVRa6-1063071;3-A

Repeat 13

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 11:40:30 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 11:45:38 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	15,137	3,027.400	3,027.274
sd	0.000			0.011	123.033	24.607	24.607
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	16,049	3,209.800	3,209.502
sd	0.000			0.017	126.685	25.337	25.337

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICVRa6-1063071;1-A

Repeat 14

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/16/2017 11:50:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/16/2017 11:55:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	12,910	2,582.000	2,581.874
sd	0.000			0.011	113.622	22.724	22.724
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	11,314	2,262.800	2,262.502
sd	0.000			0.017	106.367	21.273	21.273

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Purple 20-23 - C

Addr: 22

Sample ID ICVRa6-1063071;2-A

Repeat 26

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 2/20/2017 3:26:21 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 2/20/2017 3:31:28 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	1.000	1.000	0.126	20,642	4,128.400	4,128.274
sd	0.000			0.011	143.673	28.735	28.735
A to B	0.000	1.000				0.000	
sd	0.000					0.000	
Beta	0.000	1.000	1.000	0.298	21,582	4,316.400	4,316.102
sd	0.000			0.017	146.908	29.382	29.382

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
0	87.53%	96.30%	91.44%	91.76%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.312E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.644E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.460E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVRa6-1063071;Ra1

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 9:28:53 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 9:34:00 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.022	20,677	4,135.400	4,135.400
sd	0.000			0.000	143.795	28.759	28.759
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	2.772	23,772	4,754.400	4,754.400
sd	0.000			0.000	154.182	30.836	30.836

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVRa6-1063071;Ra3

Repeat 7

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 10:07:47 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 10:12:56 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.022	25,994	5,198.800	5,198.800
sd	0.000			0.000	161.227	32.245	32.245
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	2.772	34,258	6,851.600	6,851.600
sd	0.000			0.000	185.089	37.018	37.018

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICVRa6-1063071;Ra2

Repeat 8

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 10:14:25 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 10:19:33 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.022	26,061	5,212.200	5,212.200
sd	0.000			0.000	161.434	32.287	32.287
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	2.772	30,233	6,046.600	6,046.600
sd	0.000			0.000	173.876	34.775	34.775

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
1	89.27%	95.54%	88.90%	91.24%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.378E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.615E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.364E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVRa6-1063071;Ra2

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 9:29:01 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 9:34:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.022	25,862	5,172.400	5,172.400
sd	0.000			0.000	160.817	32.163	32.163
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.415	30,189	6,037.800	6,037.800
sd	0.000			0.000	173.750	34.750	34.750

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVRa6-1063071;Ra1

Repeat 2

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 9:35:36 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 9:40:46 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.022	21,081	4,216.200	4,216.200
sd	0.000			0.000	145.193	29.039	29.039
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.415	23,704	4,740.800	4,740.800
sd	0.000			0.000	153.961	30.792	30.792

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICVRa6-1063071;Ra3

Repeat 8

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 10:14:34 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 10:19:46 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.022	25,276	5,055.200	5,055.200
sd	0.000			0.000	158.984	31.797	31.797
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.415	34,257	6,851.400	6,851.400
sd	0.000			0.000	185.086	37.017	37.017

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
4	87.29%	96.09%	89.41%	90.93%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.303E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.636E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.383E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVRa6-1063071;Ra3

Repeat 3

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 9:42:12 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 9:47:23 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.048	25,267	5,053.400	5,053.400
sd	0.000			0.000	158.956	31.791	31.791
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.384	34,191	6,838.200	6,838.200
sd	0.000			0.000	184.908	36.982	36.982

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVRa6-1063071;Ra2

Repeat 4

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 9:48:40 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 9:53:49 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.048	25,839	5,167.800	5,167.800
sd	0.000			0.000	160.745	32.149	32.149
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.384	30,387	6,077.400	6,077.400
sd	0.000			0.000	174.319	34.864	34.864

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICVRa6-1063071;Ra1

Repeat 5

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 ***Sample*** **sd** 0 ***Sample***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 9:54:48 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 9:59:55 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.048	20,460	4,092.000	4,092.000
sd	0.000			0.000	143.038	28.608	28.608
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.384	23,833	4,766.600	4,766.600
sd	0.000			0.000	154.379	30.876	30.876

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
8	88.51%	97.10%	88.82%	91.48%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.349E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.674E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.361E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICVRa6-1063071;Ra1

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:06:13 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:12:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.039	17,471	3,494.200	3,494.200
sd	0.000			0.000	132.178	26.436	26.436
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.492	24,248	4,849.600	4,849.600
sd	0.000			0.000	155.718	31.144	31.144

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICVRa6-1063071;Ra3

Repeat 7

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:50:01 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:55:10 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.039	21,044	4,208.800	4,208.800
sd	0.000			0.000	145.066	29.013	29.013
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.492	33,622	6,724.400	6,724.400
sd	0.000			0.000	183.363	36.673	36.673

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICVRa6-1063071;Ra2

Repeat 8

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:57:06 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 1:02:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.039	21,922	4,384.400	4,384.400
sd	0.000			0.000	148.061	29.612	29.612
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.492	30,311	6,062.200	6,062.200
sd	0.000			0.000	174.101	34.820	34.820

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
9	89.43%	97.02%	89.19%	91.88%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.384E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.671E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.375E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVRa6-1063071;Ra2

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:06:18 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:12:10 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.034	26,498	5,299.600	5,299.600
sd	0.000			0.000	162.782	32.556	32.556
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.316	29,498	5,899.600	5,899.600
sd	0.000			0.000	171.750	34.350	34.350

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVRa6-1063071;Ra1

Repeat 2

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:17:13 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:22:23 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.034	21,261	4,252.200	4,252.200
sd	0.000			0.000	145.812	29.162	29.162
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.316	23,259	4,651.800	4,651.800
sd	0.000			0.000	152.509	30.502	30.502

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICVRa6-1063071;Ra3

Repeat 8

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:57:10 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 1:02:21 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.034	25,630	5,126.000	5,126.000
sd	0.000			0.000	160.094	32.019	32.019
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.316	32,934	6,586.800	6,586.800
sd	0.000			0.000	181.477	36.295	36.295

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
10	88.37%	97.15%	90.28%	91.93%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.344E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.676E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.416E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVRa6-1063071;Ra3

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:06:23 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:12:13 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.037	26,298	5,259.600	5,259.600
sd	0.000			0.000	162.167	32.433	32.433
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.440	33,394	6,678.800	6,678.800
sd	0.000			0.000	182.740	36.548	36.548

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVRa6-1063071;Ra2

Repeat 2

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:17:18 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:22:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.037	26,907	5,381.400	5,381.400
sd	0.000			0.000	164.034	32.807	32.807
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.440	29,574	5,914.800	5,914.800
sd	0.000			0.000	171.971	34.394	34.394

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICVRa6-1063071;Ra1

Repeat 3

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:23:32 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:28:41 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.037	21,318	4,263.600	4,263.600
sd	0.000			0.000	146.007	29.201	29.201
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.440	23,627	4,725.400	4,725.400
sd	0.000			0.000	153.711	30.742	30.742

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
12	87.82%	97.39%	90.59%	91.93%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.323E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.685E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.428E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVRa6-1063071;Ra3

Repeat 3

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:23:43 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:28:53 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.035	25,530	5,106.000	5,106.000
sd	0.000			0.000	159.781	31.956	31.956
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.587	33,857	6,771.400	6,771.400
sd	0.000			0.000	184.003	36.801	36.801

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVRa6-1063071;Ra2

Repeat 4

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:29:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:35:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.035	26,147	5,229.400	5,229.400
sd	0.000			0.000	161.700	32.340	32.340
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.587	30,221	6,044.200	6,044.200
sd	0.000			0.000	173.842	34.768	34.768

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICVRa6-1063071;Ra1

Repeat 5

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:35:48 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:40:56 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.035	20,589	4,117.800	4,117.800
sd	0.000			0.000	143.489	28.698	28.698
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.587	23,975	4,795.000	4,795.000
sd	0.000			0.000	154.839	30.968	30.968

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
13	89.30%	96.12%	89.64%	91.69%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.379E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.637E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.392E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVRa6-1063071;Ra3

Repeat 4

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:29:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:35:06 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.043	25,600	5,120.000	5,120.000
sd	0.000			0.000	160.000	32.000	32.000
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.334	33,589	6,717.800	6,717.800
sd	0.000			0.000	183.273	36.655	36.655

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVRa6-1063071;Ra2

Repeat 5

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:35:54 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:41:04 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.043	26,007	5,201.400	5,201.400
sd	0.000			0.000	161.267	32.253	32.253
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.334	29,654	5,930.800	5,930.800
sd	0.000			0.000	172.203	34.441	34.441

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICVRa6-1063071;Ra1

Repeat 6

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:41:58 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:47:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.043	20,967	4,193.400	4,193.400
sd	0.000			0.000	144.800	28.960	28.960
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.334	23,798	4,759.600	4,759.600
sd	0.000			0.000	154.266	30.853	30.853

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
14	87.77%	96.94%	89.72%	91.48%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.321E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.668E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.395E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVRa6-1063071;Ra3

Repeat 5

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:35:59 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:41:09 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.049	25,505	5,101.000	5,101.000
sd	0.000			0.000	159.703	31.941	31.941
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.510	33,508	6,701.600	6,701.600
sd	0.000			0.000	183.052	36.610	36.610

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVRa6-1063071;Ra2

Repeat 6

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:42:04 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:47:15 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.049	26,213	5,242.600	5,242.600
sd	0.000			0.000	161.904	32.381	32.381
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.510	30,081	6,016.200	6,016.200
sd	0.000			0.000	173.439	34.688	34.688

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICVRa6-1063071;Ra1

Repeat 7

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:49:51 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:55:01 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.049	20,684	4,136.800	4,136.800
sd	0.000			0.000	143.819	28.764	28.764
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.510	23,547	4,709.400	4,709.400
sd	0.000			0.000	153.450	30.690	30.690

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
15	89.04%	97.70%	89.62%	92.12%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.369E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.697E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.391E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVRa6-1063071;Ra3

Repeat 6

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:42:09 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:47:21 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.026	25,291	5,058.200	5,058.200
sd	0.000			0.000	159.031	31.806	31.806
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.345	33,941	6,788.200	6,788.200
sd	0.000			0.000	184.231	36.846	36.846

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVRa6-1063071;RA2

Repeat 7

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:49:56 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:55:07 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.026	26,263	5,252.600	5,252.600
sd	0.000			0.000	162.059	32.412	32.412
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.345	30,178	6,035.600	6,035.600
sd	0.000			0.000	173.718	34.744	34.744

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICVRa6-1063071;Ra1

Repeat 8

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 12:57:02 PM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 1:02:12 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.026	20,899	4,179.800	4,179.800
sd	0.000			0.000	144.565	28.913	28.913
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.345	23,709	4,741.800	4,741.800
sd	0.000			0.000	153.977	30.795	30.795

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
16	87.82%	95.56%	89.04%	90.81%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.323E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.616E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.369E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVRa6-1063071;Ra1

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:02:38 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:07:46 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.032	20,571	4,114.200	4,114.200
sd	0.000			0.000	143.426	28.685	28.685
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.318	23,581	4,716.200	4,716.200
sd	0.000			0.000	153.561	30.712	30.712

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVRa6-1063071;Ra3

Repeat 7

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:52:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:57:12 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.032	25,369	5,073.800	5,073.800
sd	0.000			0.000	159.276	31.855	31.855
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.318	33,634	6,726.800	6,726.800
sd	0.000			0.000	183.396	36.679	36.679

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICVRa6-1063071;Ra2

Repeat 8

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:58:19 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:03:29 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.032	25,797	5,159.400	5,159.400
sd	0.000			0.000	160.614	32.123	32.123
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.318	30,234	6,046.800	6,046.800
sd	0.000			0.000	173.879	34.776	34.776

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
17	87.42%	95.62%	89.41%	90.81%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.308E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.618E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.383E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVRa6-106307;1Ra2

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty	0 ***ml***	**sd**	0 ***ml***
Residual Wt	0 ***mg***	**sd**	0 ***mg***

Count Began 7/10/2019 11:02:45 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 11:07:56 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.029	26,027	5,205.400	5,205.400
sd	0.000			0.000	161.329	32.266	32.266
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.334	30,320	6,064.000	6,064.000
sd	0.000			0.000	174.126	34.825	34.825

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVRa6-1063071;Ra1

Repeat 2

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:11:59 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:17:08 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.029	20,767	4,153.400	4,153.400
sd	0.000			0.000	144.108	28.822	28.822
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.334	23,921	4,784.200	4,784.200
sd	0.000			0.000	154.664	30.933	30.933

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICVRa6-1063071;Ra3

Repeat 8

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:58:24 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 12:03:34 PM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.029	25,558	5,111.600	5,111.600
sd	0.000			0.000	159.869	31.974	31.974
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.334	33,935	6,787.000	6,787.000
sd	0.000			0.000	184.215	36.843	36.843

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
18	87.08%	95.17%	92.58%	91.61%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.295E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.601E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.503E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVRa6-1063071;Ra3

Repeat 1

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:02:51 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:07:59 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.031	25,535	5,107.000	5,107.000
sd	0.000			0.000	159.797	31.959	31.959
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.287	35,581	7,116.200	7,116.200
sd	0.000			0.000	188.629	37.726	37.726

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVRa6-1063071;Ra2

Repeat 2

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:12:05 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:17:13 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.031	25,063	5,012.600	5,012.600
sd	0.000			0.000	158.313	31.663	31.663
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.287	30,476	6,095.200	6,095.200
sd	0.000			0.000	174.574	34.915	34.915

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICVRa6-1063071;Ra1

Repeat 3

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:18:05 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:23:12 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.031	20,047	4,009.400	4,009.400
sd	0.000			0.000	141.587	28.317	28.317
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.287	24,689	4,937.800	4,937.800
sd	0.000			0.000	157.127	31.425	31.425

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
19	87.24%	95.30%	88.40%	90.31%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.301E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.606E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.345E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVRa6-1063071;Ra3

Repeat 2

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0.315 ***ml*** **sd** 0 ***ml***

Residual Wt 0 ***mg*** **sd** 0 ***mg***

Count Began 7/10/2019 11:12:13 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 ***days***

Count Ended 7/10/2019 11:17:23 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 ***mins*** **Background Count Time** 1,000.00 ***mins***

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.045	25,207	5,041.400	5,041.400
sd	0.000			0.000	158.767	31.753	31.753
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.315	35,042	7,008.400	7,008.400
sd	0.000			0.000	187.195	37.439	37.439

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVRa6-1063071;Ra2

Repeat 3

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:18:10 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:23:20 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.045	25,817	5,163.400	5,163.400
sd	0.000			0.000	160.677	32.135	32.135
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.315	30,952	6,190.400	6,190.400
sd	0.000			0.000	175.932	35.186	35.186

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICVRa6-106307;1Ra1

Repeat 4

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:28:49 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:33:58 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.045	20,587	4,117.400	4,117.400
sd	0.000			0.000	143.482	28.696	28.696
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.315	24,583	4,916.600	4,916.600
sd	0.000			0.000	156.790	31.358	31.358

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
21	87.29%	95.19%	89.01%	90.50%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.303E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.602E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.368E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVRa6-1063071;Ra3

Repeat 4

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:29:02 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:34:14 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	24,800	4,960.000	4,960.000
sd	0.000			0.057	157.480	31.496	31.496
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	33,948	6,789.600	6,789.600
sd	0.000			0.343	184.250	36.850	36.850

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVRa6-1063071;Ra2

Repeat 5

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:35:15 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:40:25 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	25,289	5,057.800	5,057.800
sd	0.000			0.057	159.025	31.805	31.805
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	30,277	6,055.400	6,055.400
sd	0.000			0.343	174.003	34.801	34.801

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICVRa6-1063071;Ra1

Repeat 6

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:42:28 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:47:37 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.000	20,252	4,050.400	4,050.400
sd	0.000			0.057	142.310	28.462	28.462
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.000	24,318	4,863.600	4,863.600
sd	0.000			0.343	155.942	31.188	31.188

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

ICV is for Gross Alpha

Red Ra226 ICV 2019				
	Low Mass	Medium Mass	High Mass	Mean
Detector	Recovery	Recovery	Recovery	Recovery
22	87.90%	95.30%	89.64%	90.95%

Standard ID

Ra-226
Ra-226_00025 #1063071
Cert # 104858
Added: 1mL
Activity: 3.7839E+06 pCi/mL

Prep Batch: 291970
Date counted: 7/10/19

Ra:1	Activity	Units
Low Mass (0.0132g)	3.326E+06	pCi/mL

Ra:2	Activity	Units
Medium Mass (0.0271g)	3.606E+06	pCi/mL

Ra:3	Activity	Units
High Mass (0.0498g)	3.392E+06	pCi/mL

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVRa6-1063071;Ra3

Repeat 5

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0.07 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:35:21 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:40:31 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.070	25,161	5,032.200	5,032.200
sd	0.000			0.000	158.622	31.724	31.724
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.351	34,551	6,910.200	6,910.200
sd	0.000			0.000	185.879	37.176	37.176

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVRa6-1063071;Ra2

Repeat 6

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:42:34 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:47:45 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.070	25,447	5,089.400	5,089.400
sd	0.000			0.000	159.521	31.904	31.904
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.351	30,198	6,039.600	6,039.600
sd	0.000			0.000	173.776	34.755	34.755

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Alpha/Beta Count Results

Sample Activity Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICVRa6-1063071;Ra1

Repeat 7

Carrier No. 0

Batch ID 291970

Count Method Gross Alpha Beta

Detector Volts 1515

Sample Qty 0 *ml* **sd** 0 *ml*

Residual Wt 0 *mg* **sd** 0 *mg*

Count Began 7/10/2019 11:51:51 AM **Collection Date 1** 1/1/1900 **Half Life** 0.00 *days*

Count Ended 7/10/2019 11:57:01 AM **Collection Date 2** 1/1/1900 **Decay Factor** 1.000

Sample Count Time 5.00 *mins* **Background Count Time** 1,000.00 *mins*

	Efficiency %	Attenuation Factor	Activity Divisor	Background cpm	Gross counts	Gross cpm	Net cpm
Alpha	0.000	0.000	1.000	0.070	20,441	4,088.200	4,088.200
sd	0.000			0.000	142.972	28.594	28.594
A to B	0.000	0.000				0.000	
sd	0.000					0.000	
Beta	0.000	0.000	1.000	0.351	24,127	4,825.400	4,825.400
sd	0.000			0.000	155.329	31.066	31.066

	Net Activity dpm	LLD dpm	MDC DPM	MPC DPM	Net Concentration * DPM	Conc / MPC Ratio
Alpha	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	
Beta	0.000	0.000	0.000	0.000	0.000 ± 0.000	0.000
sd	0.000				0.000	

*** Note: Decay Corrected** **MDC Method** Currie **Error =** .00 **x sd**

Monthly Backgrounds

Alpha/Beta Count Results

Source Count Report

Blue 0-3 - A

Addr: 0

Sample ID ICB
ICB;Monthly Background

Repeat 1988
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:26:43 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 2:59:32 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	129	0.129	0.000	0.129
sd	11.358	0.011	0.000	0.011
Beta	401	0.401	0.000	0.401
sd	20.025	0.020	0.000	0.020

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Blue 0-3 - D

Addr: 3

Sample ID ICB
ICB;Monthly Background

Repeat 1991
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:27:22 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:00:15 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	143	0.143	0.000	0.143
sd	11.958	0.012	0.000	0.012
Beta	483	0.483	0.000	0.483
sd	21.977	0.022	0.000	0.022

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Blue 4-7 - A

Addr: 4

Sample ID ICB
ICB;Monthly Background

Repeat 1992
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:27:51 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:00:41 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	168	0.168	0.000	0.168
sd	12.961	0.013	0.000	0.013
Beta	437	0.437	0.000	0.437
sd	20.905	0.021	0.000	0.021

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Blue 8-11 - A

Addr: 8

Sample ID ICB
ICB;Monthly Background

Repeat 1996
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:28:10 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:02:08 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	72	0.072	0.000	0.072
sd	8.485	0.008	0.000	0.008
Beta	341	0.341	0.000	0.341
sd	18.466	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Blue 8-11 - C

Addr: 10

Sample ID ICB
ICB;Monthly Background

Repeat 1997
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:27:08 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:02:27 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	83	0.083	0.000	0.083
sd	9.110	0.009	0.000	0.009
Beta	340	0.340	0.000	0.340
sd	18.439	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Blue 8-11 - D

Addr: 11

Sample ID ICB
ICB;Monthly Background

Repeat 1998
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:27:10 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:02:58 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	88	0.088	0.000	0.088
sd	9.381	0.009	0.000	0.009
Beta	424	0.424	0.000	0.424
sd	20.591	0.021	0.000	0.021

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Blue 12-15 - A

Addr: 12

Sample ID ICB
ICB;Monthly Background

Repeat 2009
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:26:55 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:06:04 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	170	0.170	0.000	0.170
sd	13.038	0.013	0.000	0.013
Beta	387	0.387	0.000	0.387
sd	19.672	0.020	0.000	0.020

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Blue 12-15 - B

Addr: 13

Sample ID ICB
ICB;Monthly Background

Repeat 2010
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 8:26:58 PM
Calibration Date 3/21/2017 12:09:15 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:06:34 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	106	0.106	0.000	0.106
sd	10.296	0.010	0.000	0.010
Beta	340	0.340	0.000	0.340
sd	18.439	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Orange 0-3 - A

Addr: 0

Sample ID ICB
ICB;Monthly Background Check

Repeat 3434
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 11:33:55 PM
Calibration Date 8/4/2012 9:20:16 AM
Decay Factor 1.000
Count Ended 8/26/2023 4:33:57 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	85	0.085	0.000	0.085
sd	9.220	0.009	0.000	0.009
Beta	344	0.344	0.000	0.344
sd	18.547	0.019	0.000	0.019

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Orange 0-3 - D

Addr: 3

Sample ID ICB
ICB;Monthly Background Check

Repeat 3436
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 11:34:07 PM
Calibration Date 8/4/2012 9:20:16 AM
Decay Factor 1.000
Count Ended 8/26/2023 4:35:16 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	135	0.135	0.000	0.135
sd	11.619	0.012	0.000	0.012
Beta	363	0.363	0.000	0.363
sd	19.053	0.019	0.000	0.019

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Orange 8-11 - D

Addr: 11

Sample ID ICB
ICB;Monthly Background Check

Repeat 3428
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 11:34:30 PM
Calibration Date 8/4/2012 9:20:16 AM
Decay Factor 1.000
Count Ended 8/26/2023 4:33:04 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	107	0.107	0.000	0.107
sd	10.344	0.010	0.000	0.010
Beta	552	0.552	0.000	0.552
sd	23.495	0.023	0.000	0.023

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Orange 12-15 - D

Addr: 15

Sample ID ICB
ICB;Monthly Background Check

Repeat 3432
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 11:34:39 PM
Calibration Date 8/4/2012 9:20:16 AM
Decay Factor 1.000
Count Ended 8/26/2023 4:33:54 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	75	0.075	0.000	0.075
sd	8.660	0.009	0.000	0.009
Beta	391	0.391	0.000	0.391
sd	19.774	0.020	0.000	0.020

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Orange 20-23 - A

Addr: 20

Sample ID ICB
ICB;Monthly Background Check

Repeat 3418
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 11:34:52 PM
Calibration Date 8/4/2012 9:20:16 AM
Decay Factor 1.000
Count Ended 8/26/2023 4:31:38 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	94	0.094	0.000	0.094
sd	9.695	0.010	0.000	0.010
Beta	305	0.305	0.000	0.305
sd	17.464	0.017	0.000	0.017

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Orange 20-23 - D

Addr: 23

Sample ID ICB
ICB;Monthly Background Check

Repeat 3421
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 11:34:58 PM
Calibration Date 8/4/2012 9:20:16 AM
Decay Factor 1.000
Count Ended 8/26/2023 4:32:21 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	110	0.110	0.000	0.110
sd	10.488	0.010	0.000	0.010
Beta	352	0.352	0.000	0.352
sd	18.762	0.019	0.000	0.019

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Purple 0-3 - A

Addr: 0

Sample ID ICB
ICB;Monthly Background

Repeat 3327
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 10:34:13 PM
Calibration Date 7/27/2018 3:07:26 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:35:13 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	169	0.169	0.000	0.169
sd	13.000	0.013	0.000	0.013
Beta	4,661	4.661	0.000	4.661
sd	68.272	0.068	0.000	0.068

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Purple 8-11 - C

Addr: 10

Sample ID ICB
ICB;Monthly Background

Repeat 3331
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 10:34:39 PM
Calibration Date 7/27/2018 3:07:26 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:35:37 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	120	0.120	0.000	0.120
sd	10.954	0.011	0.000	0.011
Beta	324	0.324	0.000	0.324
sd	18.000	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Purple 8-11 - D

Addr: 11

Sample ID ICB
ICB;Monthly Background

Repeat 3332
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 10:34:40 PM
Calibration Date 7/27/2018 3:07:26 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:35:38 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	44	0.044	0.000	0.044
sd	6.633	0.007	0.000	0.007
Beta	340	0.340	0.000	0.340
sd	18.439	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Purple 16-19 - A

Addr: 16

Sample ID ICB
ICB;Monthly Background

Repeat 3335
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 10:34:49 PM
Calibration Date 7/27/2018 3:07:26 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:36:10 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	122	0.122	0.000	0.122
sd	11.045	0.011	0.000	0.011
Beta	442	0.442	0.000	0.442
sd	21.024	0.021	0.000	0.021

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Purple 16-19 - C

Addr: 18

Sample ID ICB
ICB;Monthly Background

Repeat 3337
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 10:34:53 PM
Calibration Date 7/27/2018 3:07:26 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:36:28 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	113	0.113	0.000	0.113
sd	10.630	0.011	0.000	0.011
Beta	380	0.380	0.000	0.380
sd	19.494	0.019	0.000	0.019

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Purple 20-23 - C

Addr: 22

Sample ID ICB
ICB;Monthly Background

Repeat 3341
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 10:35:02 PM
Calibration Date 7/27/2018 3:07:26 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:37:25 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	125	0.125	0.000	0.125
sd	11.180	0.011	0.000	0.011
Beta	247	0.247	0.000	0.247
sd	15.716	0.016	0.000	0.016

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Purple 20-23 - D

Addr: 23

Sample ID ICB
ICB;Monthly Background

Repeat 3342
Carrier No. 0

Batch ID ICB;Monthly Background

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/25/2023 10:35:04 PM
Calibration Date 7/27/2018 3:07:26 PM
Decay Factor 1.000
Count Ended 8/26/2023 3:37:26 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	309	0.309	0.000	0.309
sd	17.578	0.018	0.000	0.018
Beta	331	0.331	0.000	0.331
sd	18.193	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 1 (0-3) - A

Addr: 0

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 404
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:17:21 AM
Count Ended 8/26/2023 5:27:56 PM

Calibration Date 6/11/2019 3:16:53 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	93	0.093	0.000	0.093
sd	9.644	0.010	0.000	0.010
Beta	402	0.402	0.000	0.402
sd	20.050	0.020	0.000	0.020

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 1 (0-3) - B

Addr: 1

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 405
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:17:29 AM
Count Ended 8/26/2023 5:27:57 PM

Calibration Date 6/11/2019 3:16:53 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	93	0.093	0.000	0.093
sd	9.644	0.010	0.000	0.010
Beta	341	0.341	0.000	0.341
sd	18.466	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 1 (0-3) - C

Addr: 2

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 402
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:17:44 AM
Count Ended 8/26/2023 5:27:49 PM

Calibration Date 6/11/2019 3:16:53 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	71	0.071	0.000	0.071
sd	8.426	0.008	0.000	0.008
Beta	336	0.336	0.000	0.336
sd	18.330	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 1 (4-7) - A

Addr: 4

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 407
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:02 AM
Count Ended 8/26/2023 5:28:05 PM

Calibration Date 6/11/2019 3:16:53 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	204	0.204	0.000	0.204
sd	14.283	0.014	0.000	0.014
Beta	479	0.479	0.000	0.479
sd	21.886	0.022	0.000	0.022

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 1 (4-7) - B

Addr: 5

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 408
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:08 AM
Count Ended 8/26/2023 5:28:06 PM

Calibration Date 6/11/2019 3:16:53 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	123	0.123	0.000	0.123
sd	11.091	0.011	0.000	0.011
Beta	360	0.360	0.000	0.360
sd	18.974	0.019	0.000	0.019

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 1 (4-7) - C

Addr: 6

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 409
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:17:59 AM
Count Ended 8/26/2023 5:28:06 PM

Calibration Date 6/11/2019 3:16:53 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	91	0.091	0.000	0.091
sd	9.539	0.010	0.000	0.010
Beta	262	0.262	0.000	0.262
sd	16.186	0.016	0.000	0.016

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 1 (4-7) - D

Addr: 7

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 406
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:17:56 AM
Count Ended 8/26/2023 5:28:04 PM

Calibration Date 6/11/2019 3:16:53 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	88	0.088	0.000	0.088
sd	9.381	0.009	0.000	0.009
Beta	344	0.344	0.000	0.344
sd	18.547	0.019	0.000	0.019

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (8-11) - A

Addr: 8

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 407
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:17 AM
Count Ended 8/26/2023 5:28:16 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	65	0.065	0.000	0.065
sd	8.062	0.008	0.000	0.008
Beta	334	0.334	0.000	0.334
sd	18.276	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (8-11) - B

Addr: 9

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 408
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:20 AM
Count Ended 8/26/2023 5:28:19 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	64	0.064	0.000	0.064
sd	8.000	0.008	0.000	0.008
Beta	339	0.339	0.000	0.339
sd	18.412	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (8-11) - C

Addr: 10

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 409
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:23 AM
Count Ended 8/26/2023 5:28:20 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	78	0.078	0.000	0.078
sd	8.832	0.009	0.000	0.009
Beta	441	0.441	0.000	0.441
sd	21.000	0.021	0.000	0.021

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (8-11) - D

Addr: 11

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 410
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:24 AM
Count Ended 8/26/2023 5:28:20 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	74	0.074	0.000	0.074
sd	8.602	0.009	0.000	0.009
Beta	510	0.510	0.000	0.510
sd	22.583	0.023	0.000	0.023

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (12-15) - A

Addr: 12

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 411
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:27 AM
Count Ended 8/26/2023 5:28:24 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	69	0.069	0.000	0.069
sd	8.307	0.008	0.000	0.008
Beta	566	0.566	0.000	0.566
sd	23.791	0.024	0.000	0.024

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (12-15) - B

Addr: 13

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 412
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:29 AM
Count Ended 8/26/2023 5:28:24 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	88	0.088	0.000	0.088
sd	9.381	0.009	0.000	0.009
Beta	328	0.328	0.000	0.328
sd	18.111	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (12-15) - C

Addr: 14

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 413
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:31 AM
Count Ended 8/26/2023 5:28:27 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	100	0.100	0.000	0.100
sd	10.000	0.010	0.000	0.010
Beta	426	0.426	0.000	0.426
sd	20.640	0.021	0.000	0.021

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 2 (12-15) - D

Addr: 15

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 414
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:33 AM
Count Ended 8/26/2023 5:28:28 PM

Calibration Date 6/11/2019 3:22:31 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	106	0.106	0.000	0.106
sd	10.296	0.010	0.000	0.010
Beta	339	0.339	0.000	0.339
sd	18.412	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 3 (16-19) - A

Addr: 16

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 384
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:40 AM
Count Ended 8/26/2023 5:28:44 PM

Calibration Date 6/11/2019 3:25:04 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	67	0.067	0.000	0.067
sd	8.185	0.008	0.000	0.008
Beta	388	0.388	0.000	0.388
sd	19.698	0.020	0.000	0.020

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 3 (16-19) - B

Addr: 17

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 385
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:43 AM
Count Ended 8/26/2023 5:28:47 PM

Calibration Date 6/11/2019 3:25:04 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	72	0.072	0.000	0.072
sd	8.485	0.008	0.000	0.008
Beta	400	0.400	0.000	0.400
sd	20.000	0.020	0.000	0.020

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 3 (16-19) - C

Addr: 18

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 386
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:45 AM
Count Ended 8/26/2023 5:28:47 PM

Calibration Date 6/11/2019 3:25:04 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	64	0.064	0.000	0.064
sd	8.000	0.008	0.000	0.008
Beta	312	0.312	0.000	0.312
sd	17.664	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 3 (16-19) - D

Addr: 19

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 387
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:48 AM
Count Ended 8/26/2023 5:28:47 PM

Calibration Date 6/11/2019 3:25:04 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	59	0.059	0.000	0.059
sd	7.681	0.008	0.000	0.008
Beta	383	0.383	0.000	0.383
sd	19.570	0.020	0.000	0.020

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 3 (20-23) - A

Addr: 20

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 388
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:50 AM
Count Ended 8/26/2023 5:28:52 PM

Calibration Date 6/11/2019 3:25:04 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	67	0.067	0.000	0.067
sd	8.185	0.008	0.000	0.008
Beta	313	0.313	0.000	0.313
sd	17.692	0.018	0.000	0.018

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 3 (20-23) - B

Addr: 21

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 389
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Half Life 0.00 *Years*
Count Began 8/26/2023 12:18:53 AM
Calibration Date 6/11/2019 3:25:04 PM
Decay Factor 1.000
Count Ended 8/26/2023 5:28:53 PM
Backgrounds From

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	110	0.110	0.000	0.110
sd	10.488	0.010	0.000	0.010
Beta	288	0.288	0.000	0.288
sd	16.971	0.017	0.000	0.017

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Alpha/Beta Count Results

Source Count Report

Red 3 (20-23) - C

Addr: 22

Sample ID ICB;Monthly Background
ICB;Monthly Background

Batch ID ICB;Monthly Background

Repeat 390
Carrier No. 0

Detector Volts 1515

Residual Wt 0 *mg*
Count Began 8/26/2023 12:18:55 AM
Count Ended 8/26/2023 5:28:53 PM

Calibration Date 6/11/2019 3:25:04 PM
Backgrounds From

Half Life 0.00 *Years*
Decay Factor 1.000

Sample Count Time 1,000.00 *mins*
Background Count Time 0.00

	Gross counts	Gross cpm	Background cpm	Net cpm
Alpha	79	0.079	0.000	0.079
sd	8.888	0.009	0.000	0.009
Beta	296	0.296	0.000	0.296
sd	17.205	0.017	0.000	0.017

	Uncorrected DPM	Corrected DPM	Corrected dpm	Efficiency %
Alpha	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000
Alpha to Beta				0.000
sd				0.000
Beta	0.000	0.000	0.000	0.000
sd	0.000	0.000	0.000	0.000

Run Logs

Gas Flow Proportional Counter Run Log

Detector: Blue0 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
03/19/17 14:32	5	ICABT 160-568288/12		568288			PS
03/19/17 14:40	5	ICABT 160-568288/13		568288			PS
03/20/17 00:22	5	ICABT 160-568288/14		568288			PS
03/20/17 00:37	5	ICABT 160-568288/15		568288			PS
03/20/17 00:59	5	ICABT 160-568288/16		568288			PS
03/20/17 01:50	5	ICABT 160-568288/17		568288			PS
03/20/17 03:22	5	ICABT 160-568288/18		568288			PS
03/20/17 03:28	5	ICABT 160-568288/19		568288			PS
03/31/17 12:09	5	ICVABT 160-568288/20		568288			PS
03/31/17 12:27	5	ICVABT 160-568288/21		568288			PS
03/31/17 12:43	5	ICVABT 160-568288/22		568288			PS
06/01/22 14:10	45	ICABT 160-568288/1		568288			PS
06/01/22 15:01	45	ICABT 160-568288/2		568288			PS
06/01/22 15:49	45	ICABT 160-568288/3		568288			PS
06/01/22 16:37	45	ICABT 160-568288/4		568288			PS
06/01/22 17:27	45	ICABT 160-568288/5		568288			PS
06/01/22 18:17	45	ICABT 160-568288/6		568288			PS
06/01/22 19:05	45	ICABT 160-568288/7		568288			PS
06/01/22 19:54	45	ICABT 160-568288/8		568288			PS
06/02/22 12:44	20	ICVABT 160-568288/9		568288			PS
06/02/22 15:07	20	ICVABT 160-568288/10		568288			PS
06/02/22 15:29	20	ICVABT 160-568288/11		568288			PS
08/25/23 20:26	1000	ICB 160-625620/9		625620			EJS
08/29/23 00:14	2	CCVA 160-625942/1		625942			CMM
08/29/23 00:27	2	CCVB 160-625942/25		625942			CMM
08/29/23 00:43	200	CCB 160-625942/49		625942			CMM
08/29/23 07:39	100	ZZZZZ		625942			
08/29/23 09:58	100	ZZZZZ		625942			
08/29/23 12:33	100	MB 160-624324/1-A		625942	624324	904.0	CMM
08/29/23 16:12	200	ZZZZZ		625942			
08/29/23 19:45	200	ZZZZZ		625942			

Detector: Blue3 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/26/19 15:56	15	ICRA6 160-439058/1		439058			SCB
07/26/19 16:14	15	ICRA6 160-439058/2		439058			SCB
07/26/19 16:32	15	ICRA6 160-439058/3		439058			SCB
07/26/19 16:49	15	ZZZZZ		439058			
07/26/19 17:06	15	ICRA6 160-439058/5		439058			SCB
07/26/19 17:23	15	ICRA6 160-439058/6		439058			SCB
07/26/19 17:42	15	ICRA6 160-439058/7		439058			SCB
07/26/19 18:14	15	ICRA6 160-439058/8		439058			SCB
07/28/19 11:38	5	ICVRA6 160-439058/9		439058			SCB
07/28/19 11:44	5	ICVRA6 160-439058/10		439058			SCB
07/28/19 11:50	5	ICVRA6 160-439058/11		439058			SCB
08/25/23 20:27	1000	ICB 160-625620/18		625620			EJS
09/08/23 00:15	2	CCVA 160-627239/4		627239			SCB
09/08/23 00:32	2	CCVB 160-627239/28		627239			SCB
09/08/23 00:49	200	CCB 160-627239/52		627239			SCB
09/08/23 07:20	100	810-73371-10	MW-11	627239	624483	903.0	SCB
09/08/23 17:30	400	ZZZZZ		627239			

Gas Flow Proportional Counter Run Log

Detector: Blue4 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
03/19/17 14:10	5	ICABT 160-568639/12		568639			PS
03/19/17 14:17	5	ICABT 160-568639/13		568639			PS
03/19/17 14:24	5	ICABT 160-568639/14		568639			PS
03/19/17 14:30	5	ICABT 160-568639/15		568639			PS
03/19/17 14:40	5	ICABT 160-568639/16		568639			PS
03/19/17 23:09	5	ICABT 160-568639/17		568639			PS
03/19/17 23:28	5	ICABT 160-568639/18		568639			PS
03/19/17 23:56	5	ICABT 160-568639/19		568639			PS
03/31/17 14:01	5	ICVABT 160-568639/20		568639			PS
03/31/17 16:03	5	ICVABT 160-568639/21		568639			PS
03/31/17 17:29	5	ICVABT 160-568639/22		568639			PS
06/01/22 14:10	45	ICABT 160-568639/1		568639			PS
06/01/22 15:01	45	ICABT 160-568639/2		568639			PS
06/01/22 15:48	45	ICABT 160-568639/3		568639			PS
06/01/22 16:37	45	ICABT 160-568639/4		568639			PS
06/01/22 17:27	45	ICABT 160-568639/5		568639			PS
06/01/22 18:17	45	ICABT 160-568639/6		568639			PS
06/01/22 19:05	45	ICABT 160-568639/7		568639			PS
06/01/22 19:54	45	ICABT 160-568639/8		568639			PS
06/03/22 12:50	20	ICVABT 160-568639/9		568639			PS
06/03/22 13:13	20	ICVABT 160-568639/10		568639			PS
06/03/22 13:35	20	ICVABT 160-568639/11		568639			PS
08/25/23 20:27	1000	ICB 160-625620/19		625620			EJS
08/31/23 00:15	2	CCVA 160-626304/5		626304			FLC
08/31/23 00:27	2	CCVB 160-626304/29		626304			FLC
08/31/23 00:42	200	CCB 160-626304/53		626304			FLC
08/31/23 07:46	100	ZZZZZ		626304			
08/31/23 11:47	100	ZZZZZ		626304			
08/31/23 18:53	60	ZZZZZ		626304			

Detector: Blue8 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/24/19 13:40	15	ZZZZZ		439063			
07/24/19 13:58	15	ICRA6 160-439063/5		439063			SCB
07/24/19 14:34	15	ICRA6 160-439063/6		439063			SCB
07/24/19 15:16	15	ICRA6 160-439063/7		439063			SCB
07/24/19 15:48	15	ICRA6 160-439063/8		439063			SCB
07/24/19 16:25	15	ICRA6 160-439063/9		439063			SCB
07/24/19 16:49	15	ICRA6 160-439063/10		439063			SCB
07/24/19 17:07	15	ICRA6 160-439063/11		439063			SCB
07/28/19 13:16	5	ICVRA6 160-439063/1		439063			SCB
07/29/19 07:07	5	ICVRA6 160-439063/2		439063			SCB
07/29/19 07:23	5	ICVRA6 160-439063/3		439063			SCB
08/25/23 20:28	1000	ICB 160-625620/21		625620			EJS
09/07/23 00:20	2	CCVB 160-627055/17		627055			SCB
09/07/23 00:33	2	CCVA 160-627055/33		627055			SCB
09/07/23 00:47	200	CCB 160-627055/57		627055			SCB
09/07/23 07:42	100	ZZZZZ		627055			
09/07/23 09:41	100	ZZZZZ		627055			
09/07/23 11:46	100	ZZZZZ		627055			
09/07/23 18:22	200	ZZZZZ		627055			

Gas Flow Proportional Counter Run Log

Detector: Blue10 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/24/19 13:40	15	ICRA6 160-439066/1		439066			SCB
07/24/19 13:58	15	ICRA6 160-439066/2		439066			SCB
07/24/19 14:34	15	ZZZZZ		439066			
07/24/19 15:16	15	ICRA6 160-439066/4		439066			SCB
07/24/19 15:48	15	ICRA6 160-439066/5		439066			SCB
07/24/19 16:26	15	ICRA6 160-439066/6		439066			SCB
07/24/19 16:50	15	ICRA6 160-439066/7		439066			SCB
07/24/19 17:07	15	ICRA6 160-439066/8		439066			SCB
07/28/19 13:17	5	ICVRA6 160-439066/9		439066			SCB
07/28/19 13:23	5	ICVRA6 160-439066/10		439066			SCB
07/28/19 13:30	5	ICVRA6 160-439066/11		439066			SCB
08/25/23 20:27	1000	ICB 160-625620/14		625620			EJS
09/08/23 00:18	2	CCVB 160-627239/19		627239			SCB
09/08/23 00:33	2	CCVA 160-627239/35		627239			SCB
09/08/23 00:49	200	CCB 160-627239/59		627239			SCB
09/08/23 07:21	100	810-73371-11	MW-12	627239	624483	903.0	SCB
09/08/23 17:38	400	ZZZZZ		627239			

Detector: Blue11 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/24/19 13:40	15	ICRA6 160-439068/1		439068			SCB
07/24/19 13:58	15	ICRA6 160-439068/2		439068			SCB
07/24/19 14:34	15	ICRA6 160-439068/3		439068			SCB
07/24/19 15:16	15	ZZZZZ		439068			
07/24/19 15:48	15	ICRA6 160-439068/5		439068			SCB
07/24/19 16:26	15	ICRA6 160-439068/6		439068			SCB
07/24/19 16:50	15	ICRA6 160-439068/7		439068			SCB
07/24/19 17:07	15	ICRA6 160-439068/8		439068			SCB
07/28/19 13:23	5	ICVRA6 160-439068/9		439068			SCB
07/28/19 13:31	5	ICVRA6 160-439068/10		439068			SCB
07/28/19 13:38	5	ICVRA6 160-439068/11		439068			SCB
08/25/23 20:27	1000	ICB 160-625620/15		625620			EJS
09/08/23 00:18	2	CCVB 160-627239/20		627239			SCB
09/08/23 00:33	2	CCVA 160-627239/36		627239			SCB
09/08/23 00:49	200	CCB 160-627239/60		627239			SCB
09/08/23 07:21	100	810-73371-12	MW-18	627239	624483	903.0	SCB
09/08/23 17:38	400	ZZZZZ		627239			

Detector: Blue12 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/24/19 13:40	15	ICRA6 160-439069/1		439069			SCB
07/24/19 13:58	15	ICRA6 160-439069/2		439069			SCB
07/24/19 14:34	15	ICRA6 160-439069/3		439069			SCB
07/24/19 15:17	15	ICRA6 160-439069/4		439069			SCB
07/24/19 15:48	15	ZZZZZ		439069			
07/24/19 16:26	15	ICRA6 160-439069/6		439069			SCB
07/24/19 16:50	15	ICRA6 160-439069/7		439069			SCB
07/24/19 17:07	15	ICRA6 160-439069/8		439069			SCB
07/28/19 13:31	5	ICVRA6 160-439069/9		439069			SCB
07/28/19 13:38	5	ICVRA6 160-439069/10		439069			SCB

Gas Flow Proportional Counter Run Log

Detector: Blue12 (Continued) — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/28/19 13:45	5	ICVRA6 160-439069/11		439069			SCB
08/25/23 20:26	1000	ICB 160-625620/10		625620			EJS
09/08/23 00:18	2	CCVB 160-627239/21		627239			SCB
09/08/23 00:33	2	CCVA 160-627239/37		627239			SCB
09/08/23 00:49	200	CCB 160-627239/61		627239			SCB
09/08/23 07:21	100	810-73371-13	MW-19	627239	624483	903.0	SCB
09/08/23 17:38	400	ZZZZZ		627239			

Detector: Blue13 — Serial Number: Unknown

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/24/19 13:40	15	ICRA6 160-439070/1		439070			SCB
07/24/19 13:58	15	ICRA6 160-439070/2		439070			SCB
07/24/19 14:34	15	ICRA6 160-439070/3		439070			SCB
07/24/19 15:17	15	ICRA6 160-439070/4		439070			SCB
07/24/19 15:48	15	ICRA6 160-439070/5		439070			SCB
07/24/19 16:26	15	ZZZZZ		439070			
07/24/19 16:50	15	ICRA6 160-439070/7		439070			SCB
07/24/19 17:07	15	ICRA6 160-439070/8		439070			SCB
07/28/19 13:38	5	ICVRA6 160-439070/9		439070			SCB
07/28/19 13:45	5	ICVRA6 160-439070/10		439070			SCB
07/29/19 06:49	5	ICVRA6 160-439070/11		439070			SCB
08/25/23 20:26	1000	ICB 160-625620/11		625620			EJS
09/08/23 00:18	2	CCVB 160-627239/22		627239			SCB
09/08/23 00:33	2	CCVA 160-627239/38		627239			SCB
09/08/23 00:49	200	CCB 160-627239/62		627239			SCB
09/08/23 07:21	100	810-73371-14	MW-20	627239	624483	903.0	SCB
09/08/23 17:38	400	ZZZZZ		627239			

Detector: Orange0

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
01/23/13 14:44	5	ICABT 160-480956/13		480956			JLW
01/23/13 14:53	5	ICABT 160-480956/14		480956			JLW
01/23/13 15:01	5	ICABT 160-480956/15		480956			JLW
01/23/13 15:09	5	ICABT 160-480956/16		480956			JLW
01/23/13 15:19	5	ICABT 160-480956/17		480956			JLW
01/23/13 15:26	5	ICABT 160-480956/18		480956			JLW
01/23/13 15:37	5	ICABT 160-480956/19		480956			JLW
01/23/13 15:46	5	ICABT 160-480956/20		480956			JLW
01/24/13 19:06	5	ICVABT 160-480956/21		480956			JLW
01/24/13 19:16	5	ICVABT 160-480956/22		480956			JLW
01/24/13 19:24	5	ICVABT 160-480956/23		480956			JLW
08/26/20 08:22	25	ICABT 160-480956/1		480956			JLW
08/26/20 09:58	25	ICABT 160-480956/2		480956			JLW
08/26/20 10:26	25	ICABT 160-480956/3		480956			JLW
08/26/20 10:55	25	ICABT 160-480956/4		480956			JLW
08/26/20 11:23	25	ZZZZZ		480956			
08/26/20 12:03	25	ICABT 160-480956/6		480956			JLW
08/26/20 13:05	25	ICABT 160-480956/7		480956			JLW
08/26/20 13:32	25	ICABT 160-480956/8		480956			JLW
08/27/20 12:57	25	ICABT 160-480956/9		480956			JLW

Gas Flow Proportional Counter Run Log

Detector: Orange0 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/27/20 14:35	15	ICVABT 160-480956/10		480956			JLW
08/27/20 15:06	15	ICVABT 160-480956/11		480956			JLW
08/27/20 15:33	15	ICVABT 160-480956/12		480956			JLW
08/25/23 23:33	1000	ICB 160-625621/1		625621			EJS
08/31/23 00:46	2	CCVA 160-626305/5		626305			FLC
08/31/23 01:06	2	CCVB 160-626305/24		626305			FLC
08/31/23 01:13	200	CCB 160-626305/39		626305			FLC
08/31/23 11:29	100	MB 160-624485/1-A		626305	624485	904.0	FLC

Detector: Orange3

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
01/23/13 14:45	5	ICABT 160-480959/13		480959			JLW
01/23/13 14:53	5	ICABT 160-480959/14		480959			JLW
01/23/13 15:00	5	ICABT 160-480959/15		480959			JLW
01/23/13 15:09	5	ICABT 160-480959/16		480959			JLW
01/23/13 15:19	5	ICABT 160-480959/17		480959			JLW
01/23/13 15:27	5	ICABT 160-480959/18		480959			JLW
01/23/13 15:37	5	ICABT 160-480959/19		480959			JLW
01/23/13 15:46	5	ICABT 160-480959/20		480959			JLW
01/24/13 18:41	5	ICVABT 160-480959/21		480959			JLW
01/24/13 18:47	5	ICVABT 160-480959/22		480959			JLW
01/24/13 18:56	5	ICVABT 160-480959/23		480959			JLW
08/26/20 09:06	25	ICABT 160-480959/1		480959			JLW
08/26/20 09:58	25	ICABT 160-480959/2		480959			JLW
08/26/20 10:26	25	ICABT 160-480959/3		480959			JLW
08/26/20 10:56	25	ICABT 160-480959/4		480959			JLW
08/26/20 11:24	25	ICABT 160-480959/5		480959			JLW
08/26/20 12:03	25	ICABT 160-480959/6		480959			JLW
08/26/20 13:05	25	ICABT 160-480959/7		480959			JLW
08/26/20 13:32	25	ZZZZZ		480959			
08/27/20 07:43	25	ICABT 160-480959/9		480959			JLW
08/27/20 13:01	15	ICVABT 160-480959/10		480959			JLW
08/27/20 13:28	15	ICVABT 160-480959/11		480959			JLW
08/27/20 14:04	15	ICVABT 160-480959/12		480959			JLW
08/25/23 23:34	1000	ICB 160-625621/4		625621			EJS
08/31/23 00:46	2	CCVA 160-626305/8		626305			FLC
08/31/23 01:06	2	CCVB 160-626305/27		626305			FLC
08/31/23 01:13	200	CCB 160-626305/42		626305			FLC
08/31/23 11:29	100	LCS 160-624485/2-A		626305	624485	904.0	FLC

Detector: Orange11

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
01/23/13 14:27	5	ICABT 160-481604/15		481604			EMH
01/23/13 14:36	5	ICABT 160-481604/14		481604			EMH
01/23/13 16:46	5	ICABT 160-481604/13		481604			EMH
01/23/13 16:58	5	ICABT 160-481604/12		481604			EMH
01/23/13 17:05	5	ICABT 160-481604/19		481604			EMH
01/23/13 17:12	5	ICABT 160-481604/18		481604			EMH
01/23/13 17:19	5	ICABT 160-481604/17		481604			EMH
01/23/13 17:27	5	ICABT 160-481604/16		481604			EMH

Gas Flow Proportional Counter Run Log

Detector: Orange11 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
01/24/13 19:32	5	ICVABT 160-481604/22		481604			EMH
01/24/13 19:38	5	ICVABT 160-481604/21		481604			EMH
01/24/13 19:50	5	ICVABT 160-481604/20		481604			EMH
08/27/20 15:35	25	ICABT 160-481604/1		481604			EMH
08/27/20 16:53	25	ICABT 160-481604/2		481604			EMH
08/27/20 17:41	25	ICABT 160-481604/3		481604			EMH
08/27/20 18:17	25	ICABT 160-481604/4		481604			EMH
08/27/20 18:58	25	ICABT 160-481604/5		481604			EMH
08/27/20 19:35	25	ICABT 160-481604/6		481604			EMH
08/27/20 20:47	25	ICABT 160-481604/7		481604			EMH
08/27/20 21:32	25	ICABT 160-481604/8		481604			EMH
08/27/20 22:35	15	ICVABT 160-481604/9		481604			EMH
08/28/20 07:50	15	ICVABT 160-481604/10		481604			EMH
08/30/20 15:16	15	ICVABT 160-481604/11		481604			EMH
08/25/23 23:34	1000	ICB 160-625621/11		625621			EJS
08/31/23 00:52	2	CCVB 160-626305/19		626305			FLC
08/31/23 01:07	2	CCVA 160-626305/34		626305			FLC
08/31/23 01:13	200	CCB 160-626305/49		626305			FLC
08/31/23 11:29	100	ZZZZZ		626305			

Detector: Orange15

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
01/23/13 14:28	5	ICABT 160-481608/19		481608			PS
01/23/13 14:37	5	ICABT 160-481608/18		481608			PS
01/23/13 16:47	5	ICABT 160-481608/17		481608			PS
01/23/13 16:58	5	ICABT 160-481608/16		481608			PS
01/23/13 17:05	5	ICABT 160-481608/15		481608			PS
01/23/13 17:12	5	ICABT 160-481608/14		481608			PS
01/23/13 17:19	5	ICABT 160-481608/13		481608			PS
01/23/13 17:27	5	ICABT 160-481608/12		481608			PS
01/24/13 21:14	5	ICVABT 160-481608/22		481608			PS
01/24/13 21:23	5	ICVABT 160-481608/21		481608			PS
01/24/13 21:34	5	ICVABT 160-481608/20		481608			PS
08/27/20 15:35	25	ICABT 160-481608/1		481608			PS
08/27/20 16:53	25	ICABT 160-481608/2		481608			PS
08/27/20 17:41	25	ICABT 160-481608/3		481608			PS
08/27/20 18:10	25	ICABT 160-481608/4		481608			PS
08/27/20 18:58	25	ICABT 160-481608/5		481608			PS
08/27/20 19:35	25	ICABT 160-481608/6		481608			PS
08/27/20 20:47	25	ICABT 160-481608/7		481608			PS
08/27/20 21:33	25	ICABT 160-481608/8		481608			PS
08/30/20 16:07	15	ICVABT 160-481608/9		481608			PS
08/30/20 16:29	15	ICVABT 160-481608/10		481608			PS
08/30/20 17:09	15	ICVABT 160-481608/11		481608			PS
08/25/23 23:34	1000	ICB 160-625621/15		625621			EJS
08/31/23 00:52	2	CCVB 160-626305/23		626305			FLC
08/31/23 01:07	2	CCVA 160-626305/38		626305			FLC
08/31/23 01:13	200	CCB 160-626305/53		626305			FLC
08/31/23 11:28	100	810-73371-1	MW-01R	626305	624485	904.0	FLC

Gas Flow Proportional Counter Run Log

Detector: Orange20

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
01/23/13 12:20	5	ICABT 160-481613/12		481613			PS
01/23/13 12:30	5	ICABT 160-481613/13		481613			PS
01/23/13 12:37	5	ICABT 160-481613/14		481613			PS
01/23/13 12:45	5	ICABT 160-481613/15		481613			PS
01/23/13 12:53	5	ICABT 160-481613/16		481613			PS
01/23/13 13:01	5	ICABT 160-481613/17		481613			PS
01/23/13 13:07	5	ICABT 160-481613/18		481613			PS
01/23/13 13:15	5	ICABT 160-481613/19		481613			PS
01/24/13 22:42	5	ICVABT 160-481613/20		481613			PS
01/24/13 23:01	5	ICVABT 160-481613/21		481613			PS
01/24/13 23:07	5	ICVABT 160-481613/22		481613			PS
08/27/20 22:09	25	ICABT 160-481613/1		481613			PS
08/27/20 22:38	25	ICABT 160-481613/2		481613			PS
08/28/20 07:49	25	ICABT 160-481613/3		481613			PS
08/28/20 13:20	25	ICABT 160-481613/4		481613			PS
08/28/20 15:20	25	ICABT 160-481613/5		481613			PS
08/30/20 15:14	25	ICABT 160-481613/6		481613			PS
08/30/20 16:06	25	ICABT 160-481613/7		481613			PS
08/30/20 16:32	25	ICABT 160-481613/8		481613			PS
08/30/20 18:38	15	ICVABT 160-481613/9		481613			PS
08/30/20 19:01	15	ICVABT 160-481613/10		481613			PS
08/30/20 19:33	15	ICVABT 160-481613/11		481613			PS
08/25/23 23:34	1000	ICB 160-625621/16		625621			EJS
08/31/23 00:45	2	CCVA 160-626305/1		626305			FLC
08/31/23 00:52	2	CCVB 160-626305/13		626305			FLC
08/31/23 01:13	200	CCB 160-626305/54		626305			FLC
08/31/23 11:28	100	810-73371-2	MW-02	626305	624485	904.0	FLC

Detector: Orange23

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
01/23/13 12:20	5	ICABT 160-481616/12		481616			PS
01/23/13 12:30	5	ICABT 160-481616/13		481616			PS
01/23/13 12:38	5	ICABT 160-481616/14		481616			PS
01/23/13 12:46	5	ICABT 160-481616/15		481616			PS
01/23/13 12:53	5	ICABT 160-481616/16		481616			PS
01/23/13 13:00	5	ICABT 160-481616/17		481616			PS
01/23/13 13:07	5	ICABT 160-481616/18		481616			PS
01/23/13 13:14	5	ICABT 160-481616/19		481616			PS
01/24/13 22:51	5	ICVABT 160-481616/20		481616			PS
01/24/13 23:01	5	ICVABT 160-481616/21		481616			PS
01/24/13 23:07	5	ICVABT 160-481616/22		481616			PS
08/27/20 22:10	25	ICABT 160-481616/1		481616			PS
08/27/20 22:39	25	ICABT 160-481616/2		481616			PS
08/28/20 07:49	25	ICABT 160-481616/3		481616			PS
08/28/20 13:20	25	ICABT 160-481616/4		481616			PS
08/28/20 15:21	25	ICABT 160-481616/5		481616			PS
08/30/20 15:15	25	ICABT 160-481616/6		481616			PS
08/30/20 16:06	25	ICABT 160-481616/7		481616			PS
08/30/20 16:33	25	ICABT 160-481616/8		481616			PS
08/30/20 20:03	15	ICVABT 160-481616/9		481616			PS
08/30/20 20:50	15	ICVABT 160-481616/10		481616			PS
08/30/20 21:08	15	ICVABT 160-481616/11		481616			PS

Gas Flow Proportional Counter Run Log

Detector: Orange23 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/25/23 23:34	1000	ICB 160-625621/19		625621			EJS
08/31/23 00:45	2	CCVA 160-626305/4		626305			FLC
08/31/23 00:52	2	CCVB 160-626305/16		626305			FLC
08/31/23 01:13	200	CCB 160-626305/57		626305			FLC
08/31/23 11:28	100	810-73371-3	MW-03	626305	624485	904.0	FLC

Detector: Purple0

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
02/17/17 01:15	15	ICRA6 160-293738/1		293738			PS
02/17/17 01:55	15	ICRA6 160-293738/2		293738			PS
02/17/17 02:12	15	ICRA6 160-293738/3		293738			PS
02/17/17 02:29	15	ICRA6 160-293738/4		293738			PS
02/17/17 02:46	15	ICRA6 160-293738/5		293738			PS
02/17/17 03:04	15	ICRA6 160-293738/6		293738			PS
02/17/17 03:21	15	ICRA6 160-293738/7		293738			PS
02/21/17 13:27	5	ICVRA6 160-293738/8		293738			PS
02/21/17 20:28	5	ICVRA6 160-293738/9		293738			PS
02/21/17 20:52	5	ICVRA6 160-293738/10		293738			PS
08/25/23 22:34	1000	ICB 160-625622/1		625622			EJS
09/08/23 00:32	2	CCVA 160-627241/1		627241			SCB
09/08/23 00:55	2	CCVB 160-627241/17		627241			SCB
09/08/23 01:08	200	CCB 160-627241/33		627241			SCB
09/08/23 07:21	100	810-73371-15	MW-27	627241	624483	903.0	SCB

Detector: Purple10

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
02/03/13 17:22	5	ICABT 160-592033/17		592033			PS
02/03/13 17:29	5	ICABT 160-592033/18		592033			PS
02/03/13 17:43	5	ICABT 160-592033/19		592033			PS
02/03/13 17:51	5	ICABT 160-592033/12		592033			PS
02/03/13 18:07	5	ICABT 160-592033/13		592033			PS
02/03/13 18:19	5	ICABT 160-592033/14		592033			PS
02/03/13 18:32	5	ICABT 160-592033/15		592033			PS
02/03/13 18:51	5	ICABT 160-592033/16		592033			PS
02/04/13 18:35	5	ICVABT 160-592033/20		592033			PS
02/04/13 18:57	5	ICVABT 160-592033/21		592033			PS
02/04/13 19:02	5	ICVABT 160-592033/22		592033			PS
07/07/22 08:11	45	ICABT 160-592033/1		592033			PS
07/07/22 09:00	45	ICABT 160-592033/2		592033			PS
07/07/22 09:51	45	ICABT 160-592033/3		592033			PS
07/07/22 10:50	45	ICABT 160-592033/4		592033			PS
07/07/22 12:33	45	ICABT 160-592033/5		592033			PS
07/07/22 13:23	45	ICABT 160-592033/6		592033			PS
07/07/22 14:10	45	ICABT 160-592033/7		592033			PS
07/07/22 15:07	45	ICABT 160-592033/8		592033			PS
07/18/22 23:10	20	ICVABT 160-592033/9		592033			PS
07/18/22 23:43	20	ICVABT 160-592033/10		592033			PS
07/19/22 00:17	20	ICVABT 160-592033/11		592033			PS
08/25/23 22:34	1000	ICB 160-625622/11		625622			EJS
08/29/23 00:36	2	CCVB 160-625944/15		625944			CMM

Gas Flow Proportional Counter Run Log

Detector: Purple10 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/29/23 00:46	2	CCVA 160-625944/27		625944			CMM
08/29/23 00:58	200	CCB 160-625944/39		625944			CMM
08/29/23 07:46	100	ZZZZZ		625944			
08/29/23 09:58	100	ZZZZZ		625944			
08/29/23 12:35	100	810-73371-16	MW-30	625944	624324	904.0	CMM
08/29/23 16:14	100	ZZZZZ		625944			
08/29/23 18:19	200	ZZZZZ		625944			

Detector: Purple11

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
12/18/15 09:33	5	ICABT 160-592034/12		592034			PS
12/18/15 09:41	5	ICABT 160-592034/13		592034			PS
12/18/15 09:48	5	ICABT 160-592034/14		592034			PS
12/18/15 09:58	5	ICABT 160-592034/15		592034			PS
12/18/15 11:20	5	ICABT 160-592034/16		592034			PS
12/18/15 11:31	5	ICABT 160-592034/17		592034			PS
12/18/15 11:37	5	ICABT 160-592034/18		592034			PS
12/18/15 11:44	5	ICABT 160-592034/19		592034			PS
12/18/15 13:10	5	ICVABT 160-592034/20		592034			PS
12/18/15 13:16	5	ICVABT 160-592034/21		592034			PS
12/18/15 13:22	5	ICVABT 160-592034/22		592034			PS
07/07/22 08:12	45	ICABT 160-592034/1		592034			PS
07/07/22 09:00	45	ICABT 160-592034/2		592034			PS
07/07/22 09:51	45	ICABT 160-592034/3		592034			PS
07/07/22 10:50	45	ICABT 160-592034/4		592034			PS
07/07/22 12:33	45	ICABT 160-592034/5		592034			PS
07/07/22 13:23	45	ICABT 160-592034/6		592034			PS
07/07/22 14:10	45	ICABT 160-592034/7		592034			PS
07/07/22 15:07	45	ICABT 160-592034/8		592034			PS
07/18/22 23:43	20	ICVABT 160-592034/9		592034			PS
07/19/22 00:17	20	ICVABT 160-592034/10		592034			PS
07/19/22 00:38	20	ICVABT 160-592034/11		592034			PS
08/25/23 22:34	1000	ICB 160-625622/12		625622			EJS
08/29/23 00:36	2	CCVB 160-625944/16		625944			CMM
08/29/23 00:46	2	CCVA 160-625944/28		625944			CMM
08/29/23 00:58	200	CCB 160-625944/40		625944			CMM
08/29/23 12:35	100	810-73371-17	MW-31	625944	624324	904.0	CMM

Detector: Purple16

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
02/03/13 19:04	5	ICABT 160-592040/19		592040			PS
02/03/13 19:13	5	ICABT 160-592040/12		592040			PS
02/03/13 19:21	5	ICABT 160-592040/13		592040			PS
02/03/13 19:53	5	ICABT 160-592040/14		592040			PS
02/03/13 20:00	5	ICABT 160-592040/15		592040			PS
02/03/13 20:08	5	ICABT 160-592040/16		592040			PS
02/03/13 20:17	5	ICABT 160-592040/17		592040			PS
02/03/13 20:25	5	ICABT 160-592040/18		592040			PS
02/04/13 20:45	5	ICVABT 160-592040/22		592040			PS
02/04/13 21:41	5	ICVABT 160-592040/20		592040			PS

Gas Flow Proportional Counter Run Log

Detector: Purple16 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
02/04/13 21:47	5	ICVABT 160-592040/21		592040			PS
07/07/22 15:57	45	ICABT 160-592040/1		592040			PS
07/07/22 16:49	45	ICABT 160-592040/2		592040			PS
07/07/22 17:54	45	ICABT 160-592040/3		592040			PS
07/07/22 18:42	45	ICABT 160-592040/4		592040			PS
07/07/22 19:32	45	ICABT 160-592040/5		592040			PS
07/07/22 20:20	45	ICABT 160-592040/6		592040			PS
07/07/22 21:49	45	ICABT 160-592040/7		592040			PS
07/07/22 22:37	45	ICABT 160-592040/8		592040			PS
07/19/22 10:09	20	ICVABT 160-592040/9		592040			PS
07/19/22 14:01	20	ICVABT 160-592040/10		592040			PS
07/19/22 14:31	20	ICVABT 160-592040/11		592040			PS
08/25/23 22:34	1000	ICB 160-625622/17		625622			EJS
08/29/23 00:27	2	CCVA 160-625944/5		625944			CMM
08/29/23 00:53	2	CCVB 160-625944/29		625944			CMM
08/29/23 00:58	200	CCB 160-625944/41		625944			CMM
08/29/23 12:35	100	810-73371-18	MW-32	625944	624324	904.0	CMM

Detector: Purple18

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
02/03/13 19:04	5	ICABT 160-592042/17		592042			PS
02/03/13 19:13	5	ICABT 160-592042/18		592042			PS
02/03/13 19:21	5	ICABT 160-592042/19		592042			PS
02/03/13 19:53	5	ICABT 160-592042/12		592042			PS
02/03/13 20:01	5	ICABT 160-592042/13		592042			PS
02/03/13 20:08	5	ICABT 160-592042/14		592042			PS
02/03/13 20:17	5	ICABT 160-592042/15		592042			PS
02/03/13 20:25	5	ICABT 160-592042/16		592042			PS
02/04/13 20:45	5	ICVABT 160-592042/20		592042			PS
02/04/13 20:54	5	ICVABT 160-592042/21		592042			PS
02/04/13 21:00	5	ICVABT 160-592042/22		592042			PS
07/07/22 15:57	45	ICABT 160-592042/1		592042			PS
07/07/22 16:48	45	ICABT 160-592042/2		592042			PS
07/07/22 17:54	45	ICABT 160-592042/3		592042			PS
07/07/22 18:43	45	ICABT 160-592042/4		592042			PS
07/07/22 19:32	45	ICABT 160-592042/5		592042			PS
07/07/22 20:20	45	ICABT 160-592042/6		592042			PS
07/07/22 21:50	45	ICABT 160-592042/7		592042			PS
07/07/22 22:37	45	ICABT 160-592042/8		592042			PS
07/19/22 10:09	20	ICVABT 160-592042/9		592042			PS
07/19/22 10:32	20	ICVABT 160-592042/10		592042			PS
07/19/22 12:24	20	ICVABT 160-592042/11		592042			PS
08/25/23 22:34	1000	ICB 160-625622/19		625622			EJS
08/29/23 00:27	2	CCVA 160-625944/7		625944			CMM
08/29/23 00:53	2	CCVB 160-625944/31		625944			CMM
08/29/23 00:58	200	CCB 160-625944/43		625944			CMM
08/29/23 12:35	100	810-73371-19	MW-33	625944	624324	904.0	CMM

Gas Flow Proportional Counter Run Log

Detector: Purple22

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
02/16/17 10:40	15	ICRA6 160-293731/1		293731			JLW
02/16/17 11:30	15	ICRA6 160-293731/2		293731			JLW
02/16/17 11:52	15	ICRA6 160-293731/3		293731			JLW
02/16/17 12:12	15	ICRA6 160-293731/4		293731			JLW
02/16/17 13:00	15	ICRA6 160-293731/5		293731			JLW
02/16/17 21:20	15	ICRA6 160-293731/6		293731			JLW
02/16/17 21:37	15	ICRA6 160-293731/7		293731			JLW
02/16/17 23:40	5	ICVRA6 160-293731/8		293731			JLW
02/16/17 23:50	5	ICVRA6 160-293731/9		293731			JLW
02/17/17 00:09	5	ZZZZZ		293731			
02/20/17 15:26	5	ICVRA6 160-293731/11		293731			JLW
08/25/23 22:35	1000	ICB 160-625622/23		625622			EJS
09/07/23 00:32	2	CCVA 160-627058/11		627058			SCB
09/07/23 00:52	2	CCVB 160-627058/23		627058			SCB
09/07/23 01:12	200	CCB 160-627058/47		627058			SCB
09/07/23 07:42	100	810-73371-16	MW-30	627058	624323	903.0	SCB
09/07/23 10:02	100	ZZZZZ		627058			
09/07/23 18:26	200	ZZZZZ		627058			

Detector: Purple23

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
12/18/15 09:34	5	ICABT 160-592048/12		592048			PS
12/18/15 09:41	5	ICABT 160-592048/13		592048			PS
12/18/15 09:48	5	ICABT 160-592048/14		592048			PS
12/18/15 09:58	5	ICABT 160-592048/15		592048			PS
12/18/15 11:20	5	ICABT 160-592048/16		592048			PS
12/18/15 11:31	5	ICABT 160-592048/17		592048			PS
12/18/15 11:38	5	ICABT 160-592048/18		592048			PS
12/18/15 11:44	5	ICABT 160-592048/19		592048			PS
12/18/15 13:11	5	ICVABT 160-592048/20		592048			PS
12/18/15 13:19	5	ICVABT 160-592048/21		592048			PS
12/21/15 14:13	5	ICVABT 160-592048/22		592048			PS
07/07/22 15:57	45	ICABT 160-592048/1		592048			PS
07/07/22 16:49	45	ICABT 160-592048/2		592048			PS
07/07/22 17:54	45	ICABT 160-592048/3		592048			PS
07/07/22 18:43	45	ICABT 160-592048/4		592048			PS
07/07/22 19:32	45	ICABT 160-592048/5		592048			PS
07/07/22 20:20	45	ICABT 160-592048/6		592048			PS
07/07/22 21:49	45	ICABT 160-592048/7		592048			PS
07/07/22 22:37	45	ICABT 160-592048/8		592048			PS
07/19/22 13:36	20	ICVABT 160-592048/9		592048			PS
07/19/22 14:01	20	ICVABT 160-592048/10		592048			PS
07/19/22 14:31	20	ICVABT 160-592048/11		592048			PS
08/25/23 22:35	1000	ICB 160-625622/24		625622			EJS
08/29/23 00:27	2	CCVA 160-625944/12		625944			CMM
08/29/23 00:46	2	CCVB 160-625944/24		625944			CMM
08/29/23 00:58	200	CCB 160-625944/48		625944			CMM
08/29/23 12:36	100	810-73371-20	MW-34	625944	624324	904.0	CMM
08/29/23 18:19	200	ZZZZZ		625944			

Gas Flow Proportional Counter Run Log

Detector: Red0

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/16/19 23:47	5	ICABT 160-567091/12		567091			PS
06/17/19 00:34	5	ICABT 160-567091/13		567091			PS
06/17/19 13:38	5	ICABT 160-567091/14		567091			PS
06/17/19 14:34	5	ICABT 160-567091/15		567091			PS
06/17/19 16:37	5	ICABT 160-567091/16		567091			PS
06/18/19 10:02	5	ICABT 160-567091/17		567091			PS
06/18/19 10:52	5	ICABT 160-567091/18		567091			PS
06/18/19 11:49	5	ICABT 160-567091/19		567091			PS
07/08/19 10:15	5	ICVABT 160-567091/23		567091			PS
07/08/19 11:28	5	ICVABT 160-567091/24		567091			PS
07/08/19 11:35	5	ICVABT 160-567091/25		567091			PS
07/09/19 16:46	15	ICRA6 160-438586/1		438586			SCB
07/09/19 17:30	15	ICRA6 160-438586/2		438586			SCB
07/09/19 17:49	15	ICRA6 160-438586/3		438586			SCB
07/09/19 18:08	15	ICRA6 160-438586/4		438586			SCB
07/09/19 18:26	15	ICRA6 160-438586/5		438586			SCB
07/09/19 18:44	15	ICRA6 160-438586/6		438586			SCB
07/09/19 19:02	15	ICRA6 160-438586/7		438586			SCB
07/10/19 09:28	5	ICVRA6 160-438586/8		438586			SCB
07/10/19 10:07	5	ICVRA6 160-438586/9		438586			SCB
07/10/19 10:14	5	ICVRA6 160-438586/10		438586			SCB
11/21/19 06:53	45	ICVABT 160-567091/20		567091			PS
11/21/19 11:56	45	ICVABT 160-567091/21		567091			PS
11/21/19 12:44	45	ICVABT 160-567091/22		567091			PS
05/13/22 12:27	45	ICABT 160-567091/1		567091			PS
05/13/22 13:28	45	ICABT 160-567091/2		567091			PS
05/13/22 14:22	45	ICABT 160-567091/3		567091			PS
05/13/22 15:14	45	ICABT 160-567091/4		567091			PS
05/13/22 16:01	45	ICABT 160-567091/5		567091			PS
05/13/22 17:01	45	ICABT 160-567091/6		567091			PS
05/13/22 17:59	45	ICABT 160-567091/7		567091			PS
05/13/22 18:48	45	ICABT 160-567091/8		567091			PS
05/18/22 14:36	20	ICVABT 160-567091/9		567091			PS
05/19/22 21:02	20	ICVABT 160-567091/10		567091			PS
05/19/22 21:46	20	ICVABT 160-567091/11		567091			PS
08/26/23 00:17	1000	ICB 160-625611/1		625611			EJS
08/31/23 00:06	2	CCVA 160-626294/1		626294			FLC
08/31/23 00:10	2	CCVB 160-626294/9		626294			FLC
08/31/23 00:17	200	CCB 160-626294/17		626294			FLC
08/31/23 07:35	100	ZZZZZ		626294			
08/31/23 11:17	15	ZZZZZ		626294			
08/31/23 11:36	100	810-73371-4	MW-04	626294	624485	904.0	FLC
08/31/23 18:58	200	ZZZZZ		626294			
09/07/23 00:07	2	CCVA 160-627054/1		627054			SCB
09/07/23 00:11	2	CCVB 160-627054/9		627054			SCB
09/07/23 00:18	200	CCB 160-627054/17		627054			SCB
09/07/23 07:33	100	ZZZZZ		627054			
09/07/23 09:34	100	810-73371-17	MW-31	627054	624323	903.0	SCB
09/07/23 11:35	100	ZZZZZ		627054			
09/07/23 18:14	200	ZZZZZ		627054			
09/08/23 00:06	2	CCVA 160-627236/1		627236			SCB
09/08/23 00:10	2	CCVB 160-627236/9		627236			SCB
09/08/23 00:17	200	CCB 160-627236/17		627236			SCB

Gas Flow Proportional Counter Run Log

Detector: Red0 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
09/08/23 07:11	100	MB 160-624483/1-A		627236	624483	903.0	SCB
09/08/23 09:31	100	ZZZZZ		627236			
09/08/23 12:03	100	ZZZZZ		627236			
09/08/23 17:00	200	ZZZZZ		627236			

Detector: Red1

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/16/19 23:47	5	ICABT 160-567092/12		567092			PS
06/17/19 00:33	5	ICABT 160-567092/13		567092			PS
06/17/19 13:38	5	ICABT 160-567092/14		567092			PS
06/17/19 14:34	5	ICABT 160-567092/15		567092			PS
06/17/19 16:37	5	ICABT 160-567092/16		567092			PS
06/18/19 10:02	5	ICABT 160-567092/17		567092			PS
06/18/19 10:52	5	ICABT 160-567092/18		567092			PS
06/18/19 11:49	5	ICABT 160-567092/19		567092			PS
07/08/19 10:15	5	ICVABT 160-567092/23		567092			PS
07/08/19 10:32	5	ICVABT 160-567092/24		567092			PS
07/08/19 11:35	5	ICVABT 160-567092/25		567092			PS
07/09/19 16:28	15	ICRA6 160-438587/1		438587			SCB
07/09/19 17:30	15	ICRA6 160-438587/2		438587			SCB
07/09/19 17:49	15	ICRA6 160-438587/3		438587			SCB
07/09/19 18:08	15	ICRA6 160-438587/4		438587			SCB
07/09/19 18:26	15	ICRA6 160-438587/5		438587			SCB
07/09/19 18:44	15	ICRA6 160-438587/6		438587			SCB
07/09/19 19:02	15	ICRA6 160-438587/7		438587			SCB
07/10/19 09:29	5	ICVRA6 160-438587/8		438587			SCB
07/10/19 09:35	5	ICVRA6 160-438587/9		438587			SCB
07/10/19 10:14	5	ICVRA6 160-438587/10		438587			SCB
11/21/19 06:53	45	ICVABT 160-567092/20		567092			PS
11/21/19 07:47	45	ICVABT 160-567092/21		567092			PS
11/21/19 12:45	45	ICVABT 160-567092/22		567092			PS
05/13/22 12:27	45	ICABT 160-567092/1		567092			PS
05/13/22 13:28	45	ICABT 160-567092/2		567092			PS
05/13/22 14:22	45	ICABT 160-567092/3		567092			PS
05/13/22 15:14	45	ICABT 160-567092/4		567092			PS
05/13/22 16:01	45	ICABT 160-567092/5		567092			PS
05/13/22 17:01	45	ICABT 160-567092/6		567092			PS
05/13/22 17:59	45	ICABT 160-567092/7		567092			PS
05/13/22 18:48	45	ICABT 160-567092/8		567092			PS
05/18/22 14:36	20	ICVABT 160-567092/9		567092			PS
05/19/22 21:02	20	ICVABT 160-567092/10		567092			PS
05/19/22 21:24	20	ICVABT 160-567092/11		567092			PS
08/26/23 00:17	1000	ICB 160-625611/2		625611			EJS
08/31/23 00:06	2	CCVA 160-626294/2		626294			FLC
08/31/23 00:10	2	CCVB 160-626294/10		626294			FLC
08/31/23 00:17	200	CCB 160-626294/20		626294			FLC
08/31/23 11:36	100	810-73371-5	MW-06	626294	624485	904.0	FLC
09/07/23 00:07	2	CCVA 160-627054/2		627054			SCB
09/07/23 00:11	2	CCVB 160-627054/10		627054			SCB
09/07/23 00:18	200	CCB 160-627054/18		627054			SCB
09/07/23 07:33	100	ZZZZZ		627054			
09/07/23 09:34	100	810-73371-18	MW-32	627054	624323	903.0	SCB

Gas Flow Proportional Counter Run Log

Detector: Red1 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
09/07/23 11:35	100	ZZZZZ		627054			
09/07/23 18:14	200	ZZZZZ		627054			
09/08/23 00:06	2	CCVA 160-627236/2		627236			SCB
09/08/23 00:10	2	CCVB 160-627236/10		627236			SCB
09/08/23 00:17	200	CCB 160-627236/18		627236			SCB
09/08/23 07:11	100	LCS 160-624483/2-A		627236	624483	903.0	SCB
09/08/23 09:31	100	ZZZZZ		627236			
09/08/23 12:03	100	ZZZZZ		627236			
09/08/23 17:10	400	ZZZZZ		627236			

Detector: Red2

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/16/19 23:47	5	ICABT 160-567093/12		567093			PS
06/17/19 00:33	5	ICABT 160-567093/13		567093			PS
06/17/19 13:39	5	ICABT 160-567093/14		567093			PS
06/17/19 14:34	5	ICABT 160-567093/15		567093			PS
06/17/19 16:37	5	ICABT 160-567093/16		567093			PS
06/18/19 10:03	5	ICABT 160-567093/17		567093			PS
06/18/19 10:52	5	ICABT 160-567093/18		567093			PS
06/18/19 11:50	5	ICABT 160-567093/19		567093			PS
07/08/19 10:15	5	ICVABT 160-567093/23		567093			PS
07/08/19 10:32	5	ICVABT 160-567093/24		567093			PS
07/08/19 10:39	5	ICVABT 160-567093/25		567093			PS
11/21/19 06:53	45	ICVABT 160-567093/20		567093			PS
11/21/19 07:47	45	ICVABT 160-567093/21		567093			PS
11/21/19 08:37	45	ICVABT 160-567093/22		567093			PS
05/13/22 12:27	45	ICABT 160-567093/1		567093			PS
05/13/22 13:28	45	ICABT 160-567093/2		567093			PS
05/13/22 14:21	45	ICABT 160-567093/3		567093			PS
05/13/22 15:14	45	ICABT 160-567093/4		567093			PS
05/13/22 16:02	45	ICABT 160-567093/5		567093			PS
05/13/22 17:01	45	ICABT 160-567093/6		567093			PS
05/13/22 17:59	45	ICABT 160-567093/7		567093			PS
05/13/22 18:48	45	ICABT 160-567093/8		567093			PS
05/19/22 21:02	20	ICVABT 160-567093/9		567093			PS
05/19/22 21:24	20	ICVABT 160-567093/10		567093			PS
05/19/22 21:46	20	ICVABT 160-567093/11		567093			PS
08/26/23 00:17	1000	ICB 160-625611/3		625611			EJS
08/31/23 00:06	2	CCVA 160-626294/3		626294			FLC
08/31/23 00:10	2	CCVB 160-626294/11		626294			FLC
08/31/23 00:17	200	CCB 160-626294/18		626294			FLC
08/31/23 11:36	100	810-73371-6	MW-07	626294	624485	904.0	FLC

Detector: Red4

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/16/19 23:47	5	ICABT 160-567098/12		567098			PS
06/17/19 00:33	5	ICABT 160-567098/13		567098			PS
06/17/19 13:39	5	ICABT 160-567098/14		567098			PS
06/17/19 14:34	5	ICABT 160-567098/15		567098			PS
06/17/19 16:38	5	ICABT 160-567098/16		567098			PS

Gas Flow Proportional Counter Run Log

Detector: Red4 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/18/19 10:03	5	ICABT 160-567098/17		567098			PS
06/18/19 10:52	5	ICABT 160-567098/18		567098			PS
06/18/19 11:50	5	ICABT 160-567098/19		567098			PS
07/08/19 10:40	5	ICVABT 160-567098/23		567098			PS
07/08/19 10:47	5	ICVABT 160-567098/24		567098			PS
07/08/19 10:55	5	ICVABT 160-567098/25		567098			PS
07/09/19 16:28	15	ICRA6 160-438590/1		438590			SCB
07/09/19 16:47	15	ICRA6 160-438590/2		438590			SCB
07/09/19 17:31	15	ICRA6 160-438590/3		438590			SCB
07/09/19 17:50	15	ICRA6 160-438590/4		438590			SCB
07/09/19 18:27	15	ICRA6 160-438590/5		438590			SCB
07/09/19 18:45	15	ICRA6 160-438590/6		438590			SCB
07/09/19 19:02	15	ICRA6 160-438590/7		438590			SCB
07/10/19 09:42	5	ICVRA6 160-438590/8		438590			SCB
07/10/19 09:48	5	ICVRA6 160-438590/9		438590			SCB
07/10/19 09:54	5	ICVRA6 160-438590/10		438590			SCB
11/21/19 08:38	45	ICVABT 160-567098/20		567098			PS
11/21/19 09:25	45	ICVABT 160-567098/21		567098			PS
11/21/19 10:12	45	ICVABT 160-567098/22		567098			PS
05/18/22 18:30	45	ICABT 160-567098/1		567098			PS
05/18/22 20:02	45	ICABT 160-567098/2		567098			PS
05/18/22 21:31	45	ICABT 160-567098/3		567098			PS
05/18/22 22:38	45	ICABT 160-567098/4		567098			PS
05/18/22 23:27	45	ICABT 160-567098/5		567098			PS
05/19/22 00:17	45	ICABT 160-567098/6		567098			PS
05/19/22 01:08	45	ICABT 160-567098/7		567098			PS
05/19/22 01:55	45	ICABT 160-567098/8		567098			PS
05/19/22 22:46	20	ICVABT 160-567098/9		567098			PS
05/19/22 23:39	20	ICVABT 160-567098/10		567098			PS
05/20/22 00:00	20	ICVABT 160-567098/11		567098			PS
08/26/23 00:18	1000	ICB 160-625611/7		625611			EJS
08/31/23 00:06	2	CCVA 160-626294/5		626294			FLC
08/31/23 00:10	2	CCVB 160-626294/13		626294			FLC
08/31/23 00:17	200	CCB 160-626294/21		626294			FLC
08/31/23 11:37	100	810-73371-7	MW-08	626294	624485	904.0	FLC
09/07/23 00:07	2	CCVA 160-627054/5		627054			SCB
09/07/23 00:12	2	CCVB 160-627054/13		627054			SCB
09/07/23 00:18	200	CCB 160-627054/21		627054			SCB
09/07/23 07:33	100	ZZZZZ		627054			
09/07/23 09:34	100	810-73371-19	MW-33	627054	624323	903.0	SCB
09/07/23 11:36	100	ZZZZZ		627054			
09/07/23 18:14	200	ZZZZZ		627054			

Detector: Red5

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/16/19 23:47	5	ICABT 160-567099/12		567099			PS
06/17/19 00:33	5	ICABT 160-567099/13		567099			PS
06/17/19 13:39	5	ICABT 160-567099/14		567099			PS
06/17/19 14:34	5	ICABT 160-567099/15		567099			PS
06/17/19 16:38	5	ICABT 160-567099/16		567099			PS
06/18/19 10:03	5	ICABT 160-567099/17		567099			PS
06/18/19 10:52	5	ICABT 160-567099/18		567099			PS

Gas Flow Proportional Counter Run Log

Detector: Red5 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/18/19 11:50	5	ICABT 160-567099/19		567099			PS
07/08/19 10:47	5	ICVABT 160-567099/23		567099			PS
07/08/19 10:55	5	ICVABT 160-567099/24		567099			PS
07/08/19 11:01	5	ICVABT 160-567099/25		567099			PS
11/21/19 09:25	45	ICVABT 160-567099/20		567099			PS
11/21/19 10:13	45	ICVABT 160-567099/21		567099			PS
11/21/19 11:04	45	ICVABT 160-567099/22		567099			PS
05/18/22 18:30	45	ICABT 160-567099/1		567099			PS
05/18/22 20:02	45	ICABT 160-567099/2		567099			PS
05/18/22 21:31	45	ICABT 160-567099/3		567099			PS
05/18/22 22:38	45	ICABT 160-567099/4		567099			PS
05/18/22 23:27	45	ICABT 160-567099/5		567099			PS
05/19/22 00:16	45	ICABT 160-567099/6		567099			PS
05/19/22 01:08	45	ICABT 160-567099/7		567099			PS
05/19/22 01:55	45	ICABT 160-567099/8		567099			PS
05/19/22 22:46	20	ICVABT 160-567099/9		567099			PS
05/19/22 23:09	20	ICVABT 160-567099/10		567099			PS
05/20/22 00:01	20	ICVABT 160-567099/11		567099			PS
08/26/23 00:18	1000	ICB 160-625611/8		625611			EJS
08/31/23 00:06	2	CCVA 160-626294/6		626294			FLC
08/31/23 00:10	2	CCVB 160-626294/14		626294			FLC
08/31/23 00:17	200	CCB 160-626294/22		626294			FLC
08/31/23 07:35	100	ZZZZZ		626294			
08/31/23 11:37	100	810-73371-8	MW-09	626294	624485	904.0	FLC
08/31/23 19:05	100	ZZZZZ		626294			

Detector: Red6

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/16/19 23:47	5	ICABT 160-567101/12		567101			PS
06/17/19 00:33	5	ICABT 160-567101/13		567101			PS
06/17/19 13:39	5	ICABT 160-567101/14		567101			PS
06/17/19 14:35	5	ICABT 160-567101/15		567101			PS
06/17/19 16:38	5	ICABT 160-567101/16		567101			PS
06/18/19 10:03	5	ICABT 160-567101/17		567101			PS
06/18/19 10:52	5	ICABT 160-567101/18		567101			PS
06/18/19 11:50	5	ICABT 160-567101/19		567101			PS
07/08/19 10:55	5	ICVABT 160-567101/23		567101			PS
07/08/19 11:01	5	ICVABT 160-567101/24		567101			PS
07/08/19 11:28	5	ICVABT 160-567101/25		567101			PS
11/21/19 10:13	45	ICVABT 160-567101/20		567101			PS
11/21/19 11:04	45	ICVABT 160-567101/21		567101			PS
11/21/19 11:55	45	ICVABT 160-567101/22		567101			PS
05/18/22 18:30	45	ICABT 160-567101/1		567101			PS
05/18/22 20:02	45	ICABT 160-567101/2		567101			PS
05/18/22 21:31	45	ICABT 160-567101/3		567101			PS
05/18/22 22:39	45	ICABT 160-567101/4		567101			PS
05/18/22 23:27	45	ICABT 160-567101/5		567101			PS
05/19/22 00:17	45	ICABT 160-567101/6		567101			PS
05/19/22 01:08	45	ICABT 160-567101/7		567101			PS
05/19/22 01:55	45	ICABT 160-567101/8		567101			PS
05/19/22 22:47	20	ICVABT 160-567101/9		567101			PS
05/19/22 23:09	20	ICVABT 160-567101/10		567101			PS

Gas Flow Proportional Counter Run Log

Detector: Red6 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
05/19/22 23:39	20	ICVABT 160-567101/11		567101			PS
08/26/23 00:17	1000	ICB 160-625611/6		625611			EJS
08/31/23 00:06	2	CCVA 160-626294/7		626294			FLC
08/31/23 00:10	2	CCVB 160-626294/15		626294			FLC
08/31/23 00:17	200	CCB 160-626294/23		626294			FLC
08/31/23 11:37	100	810-73371-9	MW-10	626294	624485	904.0	FLC

Detector: Red7

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/16/19 23:47	5	ICABT 160-567102/12		567102			PS
06/17/19 00:33	5	ICABT 160-567102/13		567102			PS
06/17/19 13:39	5	ICABT 160-567102/14		567102			PS
06/17/19 14:35	5	ICABT 160-567102/15		567102			PS
06/17/19 16:38	5	ICABT 160-567102/16		567102			PS
06/18/19 10:03	5	ICABT 160-567102/17		567102			PS
06/18/19 10:52	5	ICABT 160-567102/18		567102			PS
06/18/19 11:50	5	ICABT 160-567102/19		567102			PS
07/08/19 11:02	5	ICVABT 160-567102/23		567102			PS
07/08/19 11:28	5	ICVABT 160-567102/24		567102			PS
07/08/19 11:34	5	ICVABT 160-567102/25		567102			PS
11/21/19 11:04	45	ICVABT 160-567102/20		567102			PS
11/21/19 11:55	45	ICVABT 160-567102/21		567102			PS
11/21/19 12:44	45	ICVABT 160-567102/22		567102			PS
05/18/22 18:31	45	ICABT 160-567102/1		567102			PS
05/18/22 20:02	45	ICABT 160-567102/2		567102			PS
05/18/22 21:32	45	ICABT 160-567102/3		567102			PS
05/18/22 22:39	45	ICABT 160-567102/4		567102			PS
05/18/22 23:28	45	ICABT 160-567102/5		567102			PS
05/19/22 00:17	45	ICABT 160-567102/6		567102			PS
05/19/22 01:08	45	ICABT 160-567102/7		567102			PS
05/19/22 01:55	45	ICABT 160-567102/8		567102			PS
05/19/22 23:10	20	ICVABT 160-567102/9		567102			PS
05/19/22 23:39	20	ICVABT 160-567102/10		567102			PS
05/20/22 00:00	20	ICVABT 160-567102/11		567102			PS
08/26/23 00:17	1000	ICB 160-625611/5		625611			EJS
08/31/23 00:06	2	CCVA 160-626294/8		626294			FLC
08/31/23 00:11	2	CCVB 160-626294/16		626294			FLC
08/31/23 00:17	200	CCB 160-626294/24		626294			FLC
08/31/23 11:37	100	810-73371-10	MW-11	626294	624485	904.0	FLC

Detector: Red8

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/10/19 09:27	15	ICRA6 160-438595/1		438595			SCB
07/10/19 09:47	15	ICRA6 160-438595/2		438595			SCB
07/10/19 10:05	15	ICRA6 160-438595/3		438595			SCB
07/10/19 10:23	15	ICRA6 160-438595/4		438595			SCB
07/10/19 10:57	15	ICRA6 160-438595/5		438595			SCB
07/10/19 11:14	15	ICRA6 160-438595/6		438595			SCB
07/10/19 11:32	15	ICRA6 160-438595/7		438595			SCB
07/10/19 12:06	5	ICVRA6 160-438595/8		438595			SCB

Gas Flow Proportional Counter Run Log

Detector: Red8 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/10/19 12:50	5	ICVRA6 160-438595/9		438595			SCB
07/10/19 12:57	5	ICVRA6 160-438595/10		438595			SCB
08/26/23 00:18	1000	ICB 160-625610/9		625610			EJS
09/07/23 00:07	2	CCVB 160-627054/39		627054			SCB
09/07/23 00:13	2	CCVA 160-627054/47		627054			SCB
09/07/23 00:20	200	CCB 160-627054/55		627054			SCB
09/07/23 07:35	100	ZZZZZ		627054			
09/07/23 09:34	100	810-73371-20	MW-34	627054	624323	903.0	SCB
09/07/23 12:03	100	ZZZZZ		627054			
09/07/23 18:16	200	ZZZZZ		627054			
09/08/23 00:05	2	CCVB 160-627236/41		627236			SCB
09/08/23 00:12	2	CCVA 160-627236/49		627236			SCB
09/08/23 00:18	200	CCB 160-627236/57		627236			SCB
09/08/23 07:13	100	ZZZZZ		627236			

Detector: Red9

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/12/19 12:55	5	ICABT 160-567080/12		567080			PS
06/13/19 00:05	5	ICABT 160-567080/13		567080			PS
06/13/19 00:12	5	ICABT 160-567080/14		567080			PS
06/13/19 01:11	5	ICABT 160-567080/15		567080			PS
06/13/19 02:18	5	ICABT 160-567080/16		567080			PS
06/13/19 08:37	5	ICABT 160-567080/17		567080			PS
06/13/19 10:25	5	ICABT 160-567080/18		567080			PS
06/13/19 12:11	5	ICABT 160-567080/19		567080			PS
07/08/19 11:43	5	ICVABT 160-567080/23		567080			PS
07/08/19 12:06	5	ICVABT 160-567080/24		567080			PS
07/08/19 12:50	5	ICVABT 160-567080/25		567080			PS
07/09/19 19:38	15	ICRA6 160-438596/1		438596			SCB
07/10/19 09:47	15	ICRA6 160-438596/2		438596			SCB
07/10/19 10:05	15	ICRA6 160-438596/3		438596			SCB
07/10/19 10:23	15	ICRA6 160-438596/4		438596			SCB
07/10/19 10:57	15	ICRA6 160-438596/5		438596			SCB
07/10/19 11:14	15	ICRA6 160-438596/6		438596			SCB
07/10/19 11:32	15	ICRA6 160-438596/7		438596			SCB
07/10/19 12:06	5	ICVRA6 160-438596/8		438596			SCB
07/10/19 12:17	5	ICVRA6 160-438596/9		438596			SCB
07/10/19 12:57	5	ICVRA6 160-438596/10		438596			SCB
11/21/19 13:41	45	ICVABT 160-567080/20		567080			PS
11/21/19 14:33	45	ICVABT 160-567080/21		567080			PS
11/21/19 19:49	45	ICVABT 160-567080/22		567080			PS
05/13/22 20:48	45	ICABT 160-567080/1		567080			PS
05/13/22 21:56	45	ICABT 160-567080/2		567080			PS
05/13/22 22:44	45	ICABT 160-567080/3		567080			PS
05/13/22 23:37	45	ICABT 160-567080/4		567080			PS
05/14/22 00:28	45	ICABT 160-567080/5		567080			PS
05/14/22 01:15	45	ICABT 160-567080/6		567080			PS
05/14/22 06:23	45	ICABT 160-567080/7		567080			PS
05/14/22 07:14	45	ICABT 160-567080/8		567080			PS
05/18/22 15:02	20	ICVABT 160-567080/9		567080			PS
05/18/22 15:26	20	ICVABT 160-567080/10		567080			PS
05/18/22 17:53	20	ICVABT 160-567080/11		567080			PS

Gas Flow Proportional Counter Run Log

Detector: Red9 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/26/23 00:18	1000	ICB 160-625610/10		625610			EJS
08/31/23 00:07	2	CCVB 160-626294/36		626294			FLC
08/31/23 00:12	2	CCVA 160-626294/44		626294			FLC
08/31/23 00:17	200	CCB 160-626294/52		626294			FLC
08/31/23 11:32	100	810-73371-11	MW-12	626294	624485	904.0	FLC
09/07/23 00:07	2	CCVB 160-627054/40		627054			SCB
09/07/23 00:13	2	CCVA 160-627054/48		627054			SCB
09/07/23 00:20	200	CCB 160-627054/56		627054			SCB
09/07/23 07:35	100	MB 160-624323/1-A		627054	624323	903.0	SCB
09/07/23 09:35	100	MB 160-624325/1-A		627054	624325	903.0	SCB
09/07/23 11:37	100	ZZZZZ		627054			
09/07/23 18:16	200	ZZZZZ		627054			

Detector: Red10

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/12/19 12:55	5	ICABT 160-567081/12		567081			PS
06/13/19 00:06	5	ICABT 160-567081/13		567081			PS
06/13/19 00:12	5	ICABT 160-567081/14		567081			PS
06/13/19 01:11	5	ICABT 160-567081/15		567081			PS
06/13/19 02:18	5	ICABT 160-567081/16		567081			PS
06/13/19 08:37	5	ICABT 160-567081/17		567081			PS
06/13/19 10:25	5	ICABT 160-567081/18		567081			PS
06/13/19 12:11	5	ICABT 160-567081/19		567081			PS
07/08/19 11:43	5	ICVABT 160-567081/22		567081			PS
07/08/19 12:06	5	ICVABT 160-567081/23		567081			PS
07/08/19 12:17	5	ICVABT 160-567081/24		567081			PS
07/09/19 19:38	15	ICRA6 160-438597/1		438597			SCB
07/10/19 09:26	15	ICRA6 160-438597/2		438597			SCB
07/10/19 10:05	15	ICRA6 160-438597/3		438597			SCB
07/10/19 10:23	15	ICRA6 160-438597/4		438597			SCB
07/10/19 10:57	15	ICRA6 160-438597/5		438597			SCB
07/10/19 11:14	15	ICRA6 160-438597/6		438597			SCB
07/10/19 11:32	15	ICRA6 160-438597/7		438597			SCB
07/10/19 12:06	5	ICVRA6 160-438597/8		438597			SCB
07/10/19 12:17	5	ICVRA6 160-438597/9		438597			SCB
07/10/19 12:23	5	ICVRA6 160-438597/10		438597			SCB
11/21/19 14:33	45	ICVABT 160-567081/20		567081			PS
11/21/19 15:33	45	ICVABT 160-567081/21		567081			PS
05/13/22 20:48	45	ICABT 160-567081/1		567081			PS
05/13/22 21:56	45	ICABT 160-567081/2		567081			PS
05/13/22 22:45	45	ICABT 160-567081/3		567081			PS
05/13/22 23:37	45	ICABT 160-567081/4		567081			PS
05/14/22 00:28	45	ICABT 160-567081/5		567081			PS
05/14/22 01:16	45	ICABT 160-567081/6		567081			PS
05/14/22 06:23	45	ICABT 160-567081/7		567081			PS
05/14/22 07:14	45	ICABT 160-567081/8		567081			PS
05/18/22 15:02	20	ICVABT 160-567081/9		567081			PS
05/18/22 15:26	20	ICVABT 160-567081/10		567081			PS
05/18/22 15:49	20	ICVABT 160-567081/11		567081			PS
08/26/23 00:18	1000	ICB 160-625610/11		625610			EJS
08/29/23 00:05	2	CCVB 160-625887/40		625887			FLC
08/29/23 00:11	2	CCVA 160-625887/48		625887			FLC

Gas Flow Proportional Counter Run Log

Detector: Red10 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/29/23 00:17	200	CCB 160-625887/56		625887			FLC
08/29/23 12:15	100	ZZZZZ		625887			
08/29/23 15:45	200	ZZZZZ		625887			
08/29/23 20:04	100	LCS 160-624324/2-A		625887	624324	904.0	FLC
08/31/23 00:07	2	CCVB 160-626294/37		626294			FLC
08/31/23 00:12	2	CCVA 160-626294/45		626294			FLC
08/31/23 00:17	200	CCB 160-626294/52		626294			FLC
08/31/23 11:32	100	810-73371-12	MW-18	626294	624485	904.0	FLC
09/07/23 00:07	2	CCVB 160-627054/41		627054			SCB
09/07/23 00:13	2	CCVA 160-627054/49		627054			SCB
09/07/23 00:20	200	CCB 160-627054/56		627054			SCB
09/07/23 07:35	100	LCS 160-624323/2-A		627054	624323	903.0	SCB
09/07/23 09:35	100	LCS 160-624325/2-A		627054	624325	903.0	SCB
09/07/23 11:38	100	ZZZZZ		627054			
09/07/23 18:16	200	ZZZZZ		627054			

Detector: Red11

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/12/19 12:55	5	ICABT 160-567082/12		567082			PS
06/13/19 00:06	5	ICABT 160-567082/13		567082			PS
06/13/19 00:12	5	ICABT 160-567082/14		567082			PS
06/13/19 01:11	5	ICABT 160-567082/15		567082			PS
06/13/19 02:18	5	ICABT 160-567082/16		567082			PS
06/13/19 08:37	5	ICABT 160-567082/17		567082			PS
06/13/19 10:26	5	ICABT 160-567082/18		567082			PS
06/13/19 12:11	5	ICABT 160-567082/19		567082			PS
07/08/19 12:06	5	ICVABT 160-567082/23		567082			PS
07/08/19 12:17	5	ICVABT 160-567082/24		567082			PS
07/08/19 12:24	5	ICVABT 160-567082/25		567082			PS
11/21/19 14:33	45	ICVABT 160-567082/20		567082			PS
11/21/19 15:33	45	ICVABT 160-567082/21		567082			PS
11/21/19 16:24	45	ICVABT 160-567082/22		567082			PS
05/13/22 20:49	45	ICABT 160-567082/1		567082			PS
05/13/22 21:57	45	ICABT 160-567082/2		567082			PS
05/13/22 22:45	45	ICABT 160-567082/3		567082			PS
05/13/22 23:37	45	ICABT 160-567082/4		567082			PS
05/14/22 00:28	45	ICABT 160-567082/5		567082			PS
05/14/22 01:16	45	ICABT 160-567082/6		567082			PS
05/14/22 06:23	45	ICABT 160-567082/7		567082			PS
05/14/22 07:14	45	ICABT 160-567082/8		567082			PS
05/18/22 15:26	20	ICVABT 160-567082/9		567082			PS
05/18/22 15:49	20	ICVABT 160-567082/10		567082			PS
05/18/22 16:22	20	ICVABT 160-567082/11		567082			PS
08/26/23 00:18	1000	ICB 160-625610/12		625610			EJS
08/29/23 00:05	2	CCVB 160-625887/41		625887			FLC
08/29/23 00:11	2	CCVA 160-625887/49		625887			FLC
08/29/23 00:17	200	CCB 160-625887/57		625887			FLC
08/29/23 12:15	100	ZZZZZ		625887			
08/29/23 15:45	200	ZZZZZ		625887			
08/29/23 20:04	100	LCSD 160-624324/3-A		625887	624324	904.0	FLC
08/31/23 00:07	2	CCVB 160-626294/38		626294			FLC
08/31/23 00:12	2	CCVA 160-626294/46		626294			FLC

Gas Flow Proportional Counter Run Log

Detector: Red11 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/31/23 00:17	200	CCB 160-626294/53		626294			FLC
08/31/23 07:36	100	ZZZZZ		626294			
08/31/23 11:32	100	810-73371-13	MW-19	626294	624485	904.0	FLC
08/31/23 19:01	200	ZZZZZ		626294			

Detector: Red12

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/12/19 12:55	5	ICABT 160-567083/12		567083			SCB
06/13/19 00:06	5	ICABT 160-567083/13		567083			SCB
06/13/19 00:13	5	ICABT 160-567083/14		567083			SCB
06/13/19 01:11	5	ICABT 160-567083/15		567083			SCB
06/13/19 02:17	5	ICABT 160-567083/16		567083			SCB
06/13/19 08:37	5	ICABT 160-567083/17		567083			SCB
06/13/19 10:26	5	ICABT 160-567083/18		567083			SCB
06/13/19 12:11	5	ICABT 160-567083/19		567083			SCB
07/08/19 12:17	5	ICVABT 160-567083/23		567083			SCB
07/08/19 12:24	5	ICVABT 160-567083/24		567083			SCB
07/08/19 12:30	5	ICVABT 160-567083/25		567083			SCB
07/09/19 19:38	15	ICRA6 160-438599/1		438599			SCB
07/10/19 09:26	15	ICRA6 160-438599/2		438599			SCB
07/10/19 09:46	15	ICRA6 160-438599/3		438599			SCB
07/10/19 10:04	15	ICRA6 160-438599/4		438599			SCB
07/10/19 10:57	15	ICRA6 160-438599/5		438599			SCB
07/10/19 11:15	15	ICRA6 160-438599/6		438599			SCB
07/10/19 11:32	15	ICRA6 160-438599/7		438599			SCB
07/10/19 12:23	5	ICVRA6 160-438599/8		438599			SCB
07/10/19 12:29	5	ICVRA6 160-438599/9		438599			SCB
07/10/19 12:35	5	ICVRA6 160-438599/10		438599			SCB
11/21/19 15:33	45	ICVABT 160-567083/20		567083			SCB
11/21/19 16:24	45	ICVABT 160-567083/21		567083			SCB
11/21/19 17:13	45	ICVABT 160-567083/22		567083			SCB
05/13/22 20:49	45	ICABT 160-567083/1		567083			SCB
05/13/22 21:57	45	ICABT 160-567083/2		567083			SCB
05/13/22 22:45	45	ICABT 160-567083/3		567083			SCB
05/13/22 23:37	45	ICABT 160-567083/4		567083			SCB
05/14/22 00:28	45	ICABT 160-567083/5		567083			SCB
05/14/22 01:16	45	ICABT 160-567083/6		567083			SCB
05/14/22 06:23	45	ICABT 160-567083/7		567083			SCB
05/14/22 07:14	45	ICABT 160-567083/8		567083			SCB
05/18/22 15:50	20	ICVABT 160-567083/9		567083			SCB
05/18/22 16:22	20	ICVABT 160-567083/10		567083			SCB
05/18/22 16:44	20	ICVABT 160-567083/11		567083			SCB
08/26/23 00:18	1000	ICB 160-625610/13		625610			EJS
08/31/23 00:07	2	CCVB 160-626294/39		626294			FLC
08/31/23 00:12	2	CCVA 160-626294/47		626294			FLC
08/31/23 00:17	200	CCB 160-626294/54		626294			FLC
08/31/23 11:32	100	810-73371-14	MW-20	626294	624485	904.0	FLC
09/07/23 00:07	2	CCVB 160-627054/43		627054			SCB
09/07/23 00:13	2	CCVA 160-627054/51		627054			SCB
09/07/23 00:20	200	CCB 160-627054/57		627054			SCB
09/07/23 07:35	100	LCSD 160-624323/3-A		627054	624323	903.0	SCB
09/07/23 09:36	100	810-73371-21	MWT-04	627054	624325	903.0	SCB

Gas Flow Proportional Counter Run Log

Detector: Red12 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
09/07/23 11:38	100	ZZZZZ		627054			
09/07/23 18:16	200	ZZZZZ		627054			
09/08/23 00:06	2	CCVB 160-627236/45		627236			SCB
09/08/23 00:12	2	CCVA 160-627236/53		627236			SCB
09/08/23 00:18	200	CCB 160-627236/61		627236			SCB
09/08/23 07:14	100	810-73371-1	MW-01R	627236	624483	903.0	SCB
09/08/23 09:32	100	ZZZZZ		627236			
09/08/23 12:06	100	ZZZZZ		627236			
09/08/23 17:14	800	ZZZZZ		627236			

Detector: Red13

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/12/19 12:55	5	ICABT 160-567084/12		567084			PS
06/13/19 00:06	5	ICABT 160-567084/13		567084			PS
06/13/19 00:13	5	ICABT 160-567084/14		567084			PS
06/13/19 01:11	5	ICABT 160-567084/15		567084			PS
06/13/19 02:17	5	ICABT 160-567084/16		567084			PS
06/13/19 08:37	5	ICABT 160-567084/17		567084			PS
06/13/19 10:26	5	ICABT 160-567084/18		567084			PS
06/13/19 12:11	5	ICABT 160-567084/19		567084			PS
07/08/19 12:24	5	ICVABT 160-567084/23		567084			PS
07/08/19 12:30	5	ICVABT 160-567084/24		567084			PS
07/08/19 12:36	5	ICVABT 160-567084/25		567084			PS
07/09/19 19:38	15	ICRA6 160-438600/1		438600			SCB
07/10/19 09:26	15	ICRA6 160-438600/2		438600			SCB
07/10/19 09:46	15	ICRA6 160-438600/3		438600			SCB
07/10/19 10:04	15	ICRA6 160-438600/4		438600			SCB
07/10/19 10:22	15	ICRA6 160-438600/5		438600			SCB
07/10/19 11:15	15	ICRA6 160-438600/6		438600			SCB
07/10/19 11:33	15	ICRA6 160-438600/7		438600			SCB
07/10/19 12:29	5	ICVRA6 160-438600/8		438600			SCB
07/10/19 12:35	5	ICVRA6 160-438600/9		438600			SCB
07/10/19 12:41	5	ICVRA6 160-438600/10		438600			SCB
11/21/19 16:24	45	ICVABT 160-567084/20		567084			PS
11/21/19 17:13	45	ICVABT 160-567084/21		567084			PS
11/21/19 18:07	45	ICVABT 160-567084/22		567084			PS
05/13/22 20:49	45	ICABT 160-567084/1		567084			PS
05/13/22 21:57	45	ICABT 160-567084/2		567084			PS
05/13/22 22:45	45	ICABT 160-567084/3		567084			PS
05/13/22 23:37	45	ICABT 160-567084/4		567084			PS
05/14/22 00:28	45	ICABT 160-567084/5		567084			PS
05/14/22 01:16	45	ICABT 160-567084/6		567084			PS
05/14/22 06:24	45	ICABT 160-567084/7		567084			PS
05/14/22 07:14	45	ICABT 160-567084/8		567084			PS
05/18/22 16:22	20	ICVABT 160-567084/9		567084			PS
05/18/22 16:44	20	ICVABT 160-567084/10		567084			PS
05/18/22 17:05	20	ICVABT 160-567084/11		567084			PS
08/26/23 00:18	1000	ICB 160-625610/14		625610			EJS
08/31/23 00:07	2	CCVB 160-626294/40		626294			FLC
08/31/23 00:12	2	CCVA 160-626294/48		626294			FLC
08/31/23 00:17	200	CCB 160-626294/55		626294			FLC
08/31/23 07:37	100	ZZZZZ		626294			

Gas Flow Proportional Counter Run Log

Detector: Red13 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
08/31/23 11:32	100	810-73371-15	MW-27	626294	624485	904.0	FLC
08/31/23 19:01	200	ZZZZZ		626294			
09/07/23 00:07	2	CCVB 160-627054/44		627054			SCB
09/07/23 00:13	2	CCVA 160-627054/52		627054			SCB
09/07/23 00:20	200	CCB 160-627054/58		627054			SCB
09/07/23 07:36	100	ZZZZZ		627054			
09/07/23 09:36	100	810-73371-22	MWT-12	627054	624325	903.0	SCB
09/07/23 11:38	100	ZZZZZ		627054			
09/07/23 18:16	200	ZZZZZ		627054			
09/08/23 00:06	2	CCVB 160-627236/46		627236			SCB
09/08/23 00:12	2	CCVA 160-627236/54		627236			SCB
09/08/23 00:18	200	CCB 160-627236/62		627236			SCB
09/08/23 07:14	100	810-73371-2	MW-02	627236	624483	903.0	SCB
09/08/23 09:32	100	ZZZZZ		627236			
09/08/23 12:06	100	ZZZZZ		627236			
09/08/23 17:13	400	ZZZZZ		627236			

Detector: Red14

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/12/19 12:55	5	ICABT 160-567085/12		567085			PS
06/13/19 00:06	5	ICABT 160-567085/13		567085			PS
06/13/19 00:13	5	ICABT 160-567085/14		567085			PS
06/13/19 01:11	5	ICABT 160-567085/15		567085			PS
06/13/19 02:17	5	ICABT 160-567085/16		567085			PS
06/13/19 08:37	5	ICABT 160-567085/17		567085			PS
06/13/19 10:26	5	ICABT 160-567085/18		567085			PS
06/13/19 12:12	5	ICABT 160-567085/19		567085			PS
07/08/19 12:30	5	ICVABT 160-567085/23		567085			PS
07/08/19 12:36	5	ICVABT 160-567085/24		567085			PS
07/08/19 12:43	5	ICVABT 160-567085/25		567085			PS
07/09/19 19:38	15	ICRA6 160-438601/1		438601			SCB
07/10/19 09:26	15	ICRA6 160-438601/2		438601			SCB
07/10/19 09:46	15	ICRA6 160-438601/3		438601			SCB
07/10/19 10:05	15	ICRA6 160-438601/4		438601			SCB
07/10/19 10:22	15	ICRA6 160-438601/5		438601			SCB
07/10/19 10:58	15	ICRA6 160-438601/6		438601			SCB
07/10/19 11:33	15	ICRA6 160-438601/7		438601			SCB
07/10/19 12:35	5	ICVRA6 160-438601/8		438601			SCB
07/10/19 12:42	5	ICVRA6 160-438601/9		438601			SCB
07/10/19 12:49	5	ICVRA6 160-438601/10		438601			SCB
11/21/19 17:13	45	ICVABT 160-567085/20		567085			PS
11/21/19 18:07	45	ICVABT 160-567085/21		567085			PS
11/21/19 18:58	45	ICVABT 160-567085/22		567085			PS
05/13/22 20:49	45	ICABT 160-567085/1		567085			PS
05/13/22 21:57	45	ICABT 160-567085/2		567085			PS
05/13/22 22:45	45	ICABT 160-567085/3		567085			PS
05/13/22 23:37	45	ICABT 160-567085/4		567085			PS
05/14/22 00:28	45	ICABT 160-567085/5		567085			PS
05/14/22 01:16	45	ICABT 160-567085/6		567085			PS
05/14/22 06:24	45	ICABT 160-567085/7		567085			PS
05/14/22 07:14	45	ICABT 160-567085/8		567085			PS
05/18/22 16:44	20	ICVABT 160-567085/9		567085			PS

Gas Flow Proportional Counter Run Log

Detector: Red14 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
05/18/22 17:05	20	ICVABT 160-567085/10		567085			PS
05/18/22 17:30	20	ICVABT 160-567085/11		567085			PS
08/26/23 00:18	1000	ICB 160-625610/15		625610			EJS
08/31/23 00:07	2	CCVB 160-626294/41		626294			FLC
08/31/23 00:12	2	CCVA 160-626294/49		626294			FLC
08/31/23 00:17	200	CCB 160-626294/56		626294			FLC
08/31/23 11:42	100	MB 160-624326/1-A		626294	624326	904.0	FLC
09/07/23 00:07	2	CCVB 160-627054/45		627054			SCB
09/07/23 00:13	2	CCVA 160-627054/53		627054			SCB
09/07/23 00:20	200	CCB 160-627054/59		627054			SCB
09/07/23 07:36	100	ZZZZZ		627054			
09/07/23 09:36	100	810-73371-23	SG-02	627054	624325	903.0	SCB
09/07/23 11:38	100	ZZZZZ		627054			
09/07/23 18:16	200	ZZZZZ		627054			
09/08/23 00:06	2	CCVB 160-627236/47		627236			SCB
09/08/23 00:12	2	CCVA 160-627236/55		627236			SCB
09/08/23 00:18	200	CCB 160-627236/63		627236			SCB
09/08/23 07:14	100	810-73371-3	MW-03	627236	624483	903.0	SCB
09/08/23 09:32	100	ZZZZZ		627236			
09/08/23 12:06	100	ZZZZZ		627236			
09/08/23 17:13	400	ZZZZZ		627236			

Detector: Red15

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/12/19 12:55	5	ICABT 160-567086/12		567086			PS
06/13/19 00:06	5	ICABT 160-567086/13		567086			PS
06/13/19 00:13	5	ICABT 160-567086/14		567086			PS
06/13/19 01:11	5	ICABT 160-567086/15		567086			PS
06/13/19 02:18	5	ICABT 160-567086/16		567086			PS
06/13/19 08:37	5	ICABT 160-567086/17		567086			PS
06/13/19 10:26	5	ICABT 160-567086/18		567086			PS
06/13/19 12:12	5	ICABT 160-567086/19		567086			PS
07/08/19 12:37	5	ICVABT 160-567086/23		567086			PS
07/08/19 12:43	5	ICVABT 160-567086/24		567086			PS
07/08/19 12:50	5	ICVABT 160-567086/25		567086			PS
07/09/19 19:38	15	ICRA6 160-438603/1		438603			SCB
07/10/19 09:26	15	ICRA6 160-438603/2		438603			SCB
07/10/19 09:46	15	ICRA6 160-438603/3		438603			SCB
07/10/19 10:05	15	ICRA6 160-438603/4		438603			SCB
07/10/19 10:23	15	ICRA6 160-438603/5		438603			SCB
07/10/19 10:58	15	ICRA6 160-438603/6		438603			SCB
07/10/19 11:15	15	ICRA6 160-438603/7		438603			SCB
07/10/19 12:42	5	ICVRA6 160-438603/8		438603			SCB
07/10/19 12:49	5	ICVRA6 160-438603/9		438603			SCB
07/10/19 12:57	5	ICVRA6 160-438603/10		438603			SCB
11/21/19 18:07	45	ICVABT 160-567086/20		567086			PS
11/21/19 18:58	45	ICVABT 160-567086/21		567086			PS
11/21/19 19:49	45	ICVABT 160-567086/22		567086			PS
05/13/22 20:49	45	ICABT 160-567086/1		567086			PS
05/13/22 21:57	45	ICABT 160-567086/2		567086			PS
05/13/22 22:45	45	ICABT 160-567086/3		567086			PS
05/13/22 23:37	45	ICABT 160-567086/4		567086			PS

Gas Flow Proportional Counter Run Log

Detector: Red15 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
05/14/22 00:28	45	ICABT 160-567086/5		567086			PS
05/14/22 01:16	45	ICABT 160-567086/6		567086			PS
05/14/22 06:24	45	ICABT 160-567086/7		567086			PS
05/14/22 07:15	45	ICABT 160-567086/8		567086			PS
05/18/22 17:05	20	ICVABT 160-567086/9		567086			PS
05/18/22 17:30	20	ICVABT 160-567086/10		567086			PS
05/18/22 17:53	20	ICVABT 160-567086/11		567086			PS
08/26/23 00:18	1000	ICB 160-625610/16		625610			EJS
08/31/23 00:07	2	CCVB 160-626294/42		626294			FLC
08/31/23 00:12	2	CCVA 160-626294/50		626294			FLC
08/31/23 00:17	200	CCB 160-626294/57		626294			FLC
08/31/23 11:42	100	LCS 160-624326/2-A		626294	624326	904.0	FLC
09/07/23 00:07	2	CCVB 160-627054/46		627054			SCB
09/07/23 00:13	2	CCVA 160-627054/54		627054			SCB
09/07/23 00:20	200	CCB 160-627054/60		627054			SCB
09/07/23 07:35	100	ZZZZZ		627054			
09/07/23 09:36	100	810-73371-24	SG-03	627054	624325	903.0	SCB
09/07/23 11:38	100	ZZZZZ		627054			
09/07/23 18:16	200	ZZZZZ		627054			
09/08/23 00:06	2	CCVB 160-627236/48		627236			SCB
09/08/23 00:12	2	CCVA 160-627236/56		627236			SCB
09/08/23 00:18	200	CCB 160-627236/64		627236			SCB
09/08/23 07:14	100	810-73371-4	MW-04	627236	624483	903.0	SCB
09/08/23 09:32	100	ZZZZZ		627236			
09/08/23 12:06	100	ZZZZZ		627236			
09/08/23 17:13	400	ZZZZZ		627236			

Detector: Red16

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/13/19 14:37	5	ICABT 160-567069/12		567069			PS
06/13/19 20:16	5	ICABT 160-567069/13		567069			PS
06/13/19 20:42	5	ICABT 160-567069/14		567069			PS
06/13/19 22:07	5	ICABT 160-567069/15		567069			PS
06/13/19 22:55	5	ICABT 160-567069/16		567069			PS
06/14/19 01:01	5	ICABT 160-567069/17		567069			PS
06/14/19 11:22	5	ICABT 160-567069/18		567069			PS
06/14/19 12:27	5	ICABT 160-567069/19		567069			PS
07/09/19 06:30	5	ICVABT 160-567069/23		567069			PS
07/09/19 07:08	5	ICVABT 160-567069/24		567069			PS
07/09/19 07:14	5	ICVABT 160-567069/25		567069			PS
07/09/19 13:00	15	ICRA6 160-438604/1		438604			SCB
07/09/19 13:22	15	ICRA6 160-438604/2		438604			SCB
07/09/19 13:41	15	ICRA6 160-438604/3		438604			SCB
07/09/19 14:09	15	ICRA6 160-438604/4		438604			SCB
07/09/19 14:29	15	ICRA6 160-438604/5		438604			SCB
07/09/19 14:48	15	ICRA6 160-438604/6		438604			SCB
07/09/19 15:07	15	ICRA6 160-438604/7		438604			SCB
07/10/19 11:02	5	ICVRA6 160-438604/8		438604			SCB
07/10/19 11:52	5	ICVRA6 160-438604/9		438604			SCB
07/10/19 11:58	5	ICVRA6 160-438604/10		438604			SCB
11/21/19 20:47	45	ICVABT 160-567069/20		567069			PS
11/22/19 08:49	45	ICVABT 160-567069/21		567069			PS

Gas Flow Proportional Counter Run Log

Detector: Red16 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
11/22/19 09:39	45	ICVABT 160-567069/22		567069			PS
05/14/22 08:32	45	ICABT 160-567069/1		567069			PS
05/15/22 12:46	45	ICABT 160-567069/2		567069			PS
05/15/22 13:35	45	ICABT 160-567069/3		567069			PS
05/15/22 14:25	45	ICABT 160-567069/4		567069			PS
05/15/22 15:16	45	ICABT 160-567069/5		567069			PS
05/15/22 16:04	45	ICABT 160-567069/6		567069			PS
05/15/22 16:52	45	ICABT 160-567069/7		567069			PS
05/15/22 17:41	45	ICABT 160-567069/8		567069			PS
05/18/22 18:35	20	ICVABT 160-567069/9		567069			PS
05/18/22 21:30	20	ICVABT 160-567069/10		567069			PS
05/18/22 21:54	20	ICVABT 160-567069/11		567069			PS
08/26/23 00:18	1000	ICB 160-625610/1		625610			EJS
08/31/23 00:08	2	CCVA 160-626294/67		626294			FLC
08/31/23 00:14	2	CCVB 160-626294/75		626294			FLC
08/31/23 00:18	200	CCB 160-626294/83		626294			FLC
08/31/23 07:39	100	ZZZZZ		626294			
08/31/23 11:46	100	810-73371-21	MWT-04	626294	624326	904.0	FLC
09/07/23 00:09	2	CCVA 160-627054/83		627054			SCB
09/07/23 00:16	2	CCVB 160-627054/89		627054			SCB
09/07/23 00:21	200	CCB 160-627054/95		627054			SCB
09/07/23 07:37	100	ZZZZZ		627054			
09/07/23 09:37	100	810-73371-25	SG-04R	627054	624325	903.0	SCB
09/07/23 11:39	100	ZZZZZ		627054			
09/07/23 18:18	200	ZZZZZ		627054			

Detector: Red17

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/13/19 14:37	5	ICABT 160-567070/12		567070			PS
06/13/19 20:15	5	ICABT 160-567070/13		567070			PS
06/13/19 20:42	5	ICABT 160-567070/14		567070			PS
06/13/19 22:07	5	ICABT 160-567070/15		567070			PS
06/13/19 22:55	5	ICABT 160-567070/16		567070			PS
06/14/19 01:02	5	ICABT 160-567070/17		567070			PS
06/14/19 11:22	5	ICABT 160-567070/18		567070			PS
06/14/19 12:27	5	ICABT 160-567070/19		567070			PS
07/09/19 06:30	5	ICVABT 160-567070/23		567070			PS
07/09/19 06:36	5	ICVABT 160-567070/24		567070			PS
07/09/19 07:14	5	ICVABT 160-567070/25		567070			PS
07/09/19 12:41	15	ICRA6 160-438605/1		438605			JLW
07/09/19 13:22	15	ICRA6 160-438605/2		438605			JLW
07/09/19 13:41	15	ICRA6 160-438605/3		438605			JLW
07/09/19 14:10	15	ICRA6 160-438605/4		438605			JLW
07/09/19 14:29	15	ICRA6 160-438605/5		438605			JLW
07/09/19 14:48	15	ICRA6 160-438605/6		438605			JLW
07/09/19 15:07	15	ICRA6 160-438605/7		438605			JLW
07/10/19 11:02	5	ICVRA6 160-438605/8		438605			JLW
07/10/19 11:11	5	ICVRA6 160-438605/9		438605			JLW
07/10/19 11:58	5	ICVRA6 160-438605/10		438605			JLW
11/21/19 20:47	45	ICVABT 160-567070/20		567070			PS
11/21/19 21:42	45	ICVABT 160-567070/21		567070			PS
11/22/19 09:39	45	ICVABT 160-567070/22		567070			PS

Gas Flow Proportional Counter Run Log

Detector: Red17 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
05/14/22 08:32	45	ICABT 160-567070/1		567070			PS
05/15/22 12:46	45	ICABT 160-567070/2		567070			PS
05/15/22 13:35	45	ICABT 160-567070/3		567070			PS
05/15/22 14:25	45	ICABT 160-567070/4		567070			PS
05/15/22 15:16	45	ICABT 160-567070/5		567070			PS
05/15/22 16:04	45	ICABT 160-567070/6		567070			PS
05/15/22 16:52	45	ICABT 160-567070/7		567070			PS
05/15/22 17:41	45	ICABT 160-567070/8		567070			PS
05/18/22 18:35	20	ICVABT 160-567070/9		567070			PS
05/18/22 18:58	20	ICVABT 160-567070/10		567070			PS
05/18/22 21:54	20	ICVABT 160-567070/11		567070			PS
08/26/23 00:18	1000	ICB 160-625610/2		625610			EJS
08/31/23 00:08	2	CCVA 160-626294/68		626294			FLC
08/31/23 00:14	2	CCVB 160-626294/76		626294			FLC
08/31/23 00:18	200	CCB 160-626294/84		626294			FLC
08/31/23 07:39	100	ZZZZZ		626294			
08/31/23 11:46	100	810-73371-22	MWT-12	626294	624326	904.0	FLC
08/31/23 19:02	200	ZZZZZ		626294			
09/07/23 00:09	2	CCVA 160-627054/84		627054			SCB
09/07/23 00:16	2	CCVB 160-627054/90		627054			SCB
09/07/23 00:21	200	CCB 160-627054/96		627054			SCB
09/07/23 07:38	100	ZZZZZ		627054			
09/07/23 09:37	100	810-73371-26	SG-05	627054	624325	903.0	SCB
09/07/23 11:39	100	ZZZZZ		627054			
09/07/23 18:18	200	ZZZZZ		627054			
09/08/23 00:07	2	CCVA 160-627236/86		627236			SCB
09/08/23 00:14	2	CCVB 160-627236/94		627236			SCB
09/08/23 00:18	200	CCB 160-627236/101		627236			SCB
09/08/23 07:15	100	810-73371-5	MW-06	627236	624483	903.0	SCB
09/08/23 09:33	100	ZZZZZ		627236			
09/08/23 12:10	100	ZZZZZ		627236			
09/08/23 17:27	400	ZZZZZ		627236			

Detector: Red18

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/13/19 14:37	5	ICABT 160-567071/12		567071			PS
06/13/19 20:15	5	ICABT 160-567071/13		567071			PS
06/13/19 20:42	5	ICABT 160-567071/14		567071			PS
06/13/19 22:08	5	ICABT 160-567071/15		567071			PS
06/13/19 22:55	5	ICABT 160-567071/16		567071			PS
06/14/19 01:02	5	ICABT 160-567071/17		567071			PS
06/14/19 11:22	5	ICABT 160-567071/18		567071			PS
06/14/19 12:27	5	ICABT 160-567071/19		567071			PS
07/09/19 06:30	5	ICVABT 160-567071/22		567071			PS
07/09/19 06:36	5	ICVABT 160-567071/23		567071			PS
07/09/19 06:42	5	ICVABT 160-567071/24		567071			PS
07/09/19 12:41	15	ICRA6 160-438606/1		438606			SCB
07/09/19 13:01	15	ICRA6 160-438606/2		438606			SCB
07/09/19 13:42	15	ICRA6 160-438606/3		438606			SCB
07/09/19 14:10	15	ICRA6 160-438606/4		438606			SCB
07/09/19 14:29	15	ICRA6 160-438606/5		438606			SCB
07/09/19 14:48	15	ICRA6 160-438606/6		438606			SCB

Gas Flow Proportional Counter Run Log

Detector: Red18 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/09/19 15:07	15	ICRA6 160-438606/7		438606			SCB
07/10/19 11:02	5	ICVRA6 160-438606/8		438606			SCB
07/10/19 11:12	5	ICVRA6 160-438606/9		438606			SCB
07/10/19 11:18	5	ICVRA6 160-438606/10		438606			SCB
11/21/19 21:42	45	ICVABT 160-567071/20		567071			PS
11/21/19 22:32	45	ICVABT 160-567071/21		567071			PS
05/14/22 08:32	45	ICABT 160-567071/1		567071			PS
05/15/22 12:46	45	ICABT 160-567071/2		567071			PS
05/15/22 13:35	45	ICABT 160-567071/3		567071			PS
05/15/22 14:25	45	ICABT 160-567071/4		567071			PS
05/15/22 15:16	45	ICABT 160-567071/5		567071			PS
05/15/22 16:04	45	ICABT 160-567071/6		567071			PS
05/15/22 16:52	45	ICABT 160-567071/7		567071			PS
05/15/22 17:41	45	ICABT 160-567071/8		567071			PS
05/18/22 18:35	20	ICVABT 160-567071/9		567071			PS
05/18/22 18:58	20	ICVABT 160-567071/10		567071			PS
05/18/22 19:21	20	ICVABT 160-567071/11		567071			PS
08/26/23 00:18	1000	ICB 160-625610/3		625610			EJS
08/31/23 00:08	2	CCVA 160-626294/69		626294			FLC
08/31/23 00:14	2	CCVB 160-626294/77		626294			FLC
08/31/23 00:18	200	CCB 160-626294/85		626294			FLC
08/31/23 07:39	100	ZZZZZ		626294			
08/31/23 11:47	100	810-73371-23	SG-02	626294	624326	904.0	FLC
08/31/23 19:03	200	ZZZZZ		626294			
09/07/23 00:09	2	CCVA 160-627054/85		627054			SCB
09/07/23 00:16	2	CCVB 160-627054/91		627054			SCB
09/07/23 00:21	200	CCB 160-627054/97		627054			SCB
09/07/23 07:37	100	ZZZZZ		627054			
09/07/23 09:37	100	810-73371-27	SG-06	627054	624325	903.0	SCB
09/07/23 11:39	100	ZZZZZ		627054			
09/07/23 18:18	200	ZZZZZ		627054			
09/08/23 00:08	2	CCVA 160-627236/87		627236			SCB
09/08/23 00:14	2	CCVB 160-627236/95		627236			SCB
09/08/23 00:19	200	CCB 160-627236/102		627236			SCB
09/08/23 07:16	100	810-73371-6	MW-07	627236	624483	903.0	SCB
09/08/23 09:34	100	ZZZZZ		627236			
09/08/23 12:10	100	ZZZZZ		627236			
09/08/23 17:27	400	ZZZZZ		627236			

Detector: Red19

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/13/19 14:37	5	ICABT 160-567072/12		567072			PS
06/13/19 20:15	5	ICABT 160-567072/13		567072			PS
06/13/19 20:42	5	ICABT 160-567072/14		567072			PS
06/13/19 22:07	5	ICABT 160-567072/15		567072			PS
06/13/19 22:55	5	ICABT 160-567072/16		567072			PS
06/14/19 01:02	5	ICABT 160-567072/17		567072			PS
06/14/19 11:22	5	ICABT 160-567072/18		567072			PS
06/14/19 12:27	5	ICABT 160-567072/19		567072			PS
07/09/19 06:36	5	ICVABT 160-567072/23		567072			PS
07/09/19 06:42	5	ICVABT 160-567072/24		567072			PS
07/09/19 06:48	5	ICVABT 160-567072/25		567072			PS

Gas Flow Proportional Counter Run Log

Detector: Red19 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/09/19 12:41	15	ICRA6 160-438607/1		438607			JLW
07/09/19 13:01	15	ICRA6 160-438607/2		438607			JLW
07/09/19 13:22	15	ICRA6 160-438607/3		438607			JLW
07/09/19 14:10	15	ICRA6 160-438607/4		438607			JLW
07/09/19 14:30	15	ICRA6 160-438607/5		438607			JLW
07/09/19 14:49	15	ICRA6 160-438607/6		438607			JLW
07/09/19 15:07	15	ICRA6 160-438607/7		438607			JLW
07/10/19 11:12	5	ICVRA6 160-438607/8		438607			JLW
07/10/19 11:18	5	ICVRA6 160-438607/9		438607			JLW
07/10/19 11:28	5	ICVRA6 160-438607/10		438607			JLW
11/21/19 21:42	45	ICVABT 160-567072/20		567072			PS
11/21/19 22:32	45	ICVABT 160-567072/21		567072			PS
11/21/19 23:30	45	ICVABT 160-567072/22		567072			PS
05/14/22 08:32	45	ICABT 160-567072/1		567072			PS
05/15/22 12:46	45	ICABT 160-567072/2		567072			PS
05/15/22 13:35	45	ICABT 160-567072/3		567072			PS
05/15/22 14:25	45	ICABT 160-567072/4		567072			PS
05/15/22 15:16	45	ICABT 160-567072/5		567072			PS
05/15/22 16:04	45	ICABT 160-567072/6		567072			PS
05/15/22 16:53	45	ICABT 160-567072/7		567072			PS
05/15/22 17:41	45	ICABT 160-567072/8		567072			PS
05/18/22 18:58	20	ICVABT 160-567072/9		567072			PS
05/18/22 19:21	20	ICVABT 160-567072/10		567072			PS
05/18/22 19:43	20	ICVABT 160-567072/11		567072			PS
08/26/23 00:18	1000	ICB 160-625610/4		625610			EJS
08/31/23 00:08	2	CCVA 160-626294/70		626294			FLC
08/31/23 00:14	2	CCVB 160-626294/78		626294			FLC
08/31/23 00:18	200	CCB 160-626294/86		626294			FLC
08/31/23 07:39	100	ZZZZZ		626294			
08/31/23 11:47	100	810-73371-24	SG-03	626294	624326	904.0	FLC
08/31/23 19:03	200	ZZZZZ		626294			
09/08/23 00:08	2	CCVA 160-627236/88		627236			SCB
09/08/23 00:14	2	CCVB 160-627236/96		627236			SCB
09/08/23 00:19	200	CCB 160-627236/102		627236			SCB
09/08/23 07:16	100	810-73371-7	MW-08	627236	624483	903.0	SCB
09/08/23 09:34	100	ZZZZZ		627236			
09/08/23 12:10	100	ZZZZZ		627236			
09/08/23 17:27	400	ZZZZZ		627236			

Detector: Red20

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/13/19 14:37	5	ICABT 160-567073/12		567073			PS
06/13/19 20:15	5	ICABT 160-567073/13		567073			PS
06/13/19 20:42	5	ICABT 160-567073/14		567073			PS
06/13/19 22:07	5	ICABT 160-567073/15		567073			PS
06/13/19 22:55	5	ICABT 160-567073/16		567073			PS
06/14/19 01:02	5	ICABT 160-567073/17		567073			PS
06/14/19 11:22	5	ICABT 160-567073/18		567073			PS
06/14/19 12:27	5	ICABT 160-567073/19		567073			PS
07/09/19 06:42	5	ICVABT 160-567073/23		567073			PS
07/09/19 06:48	5	ICVABT 160-567073/24		567073			PS
07/09/19 06:54	5	ICVABT 160-567073/25		567073			PS

Gas Flow Proportional Counter Run Log

Detector: Red20 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
11/21/19 22:32	45	ICVABT 160-567073/20		567073			PS
11/21/19 23:31	45	ICVABT 160-567073/21		567073			PS
11/22/19 07:06	45	ICVABT 160-567073/22		567073			PS
05/14/22 08:32	45	ICABT 160-567073/1		567073			PS
05/15/22 12:46	45	ICABT 160-567073/2		567073			PS
05/15/22 13:35	45	ICABT 160-567073/3		567073			PS
05/15/22 14:25	45	ICABT 160-567073/4		567073			PS
05/15/22 15:16	45	ICABT 160-567073/5		567073			PS
05/15/22 16:04	45	ICABT 160-567073/6		567073			PS
05/15/22 16:53	45	ICABT 160-567073/7		567073			PS
05/15/22 17:41	45	ICABT 160-567073/8		567073			PS
05/18/22 19:21	20	ICVABT 160-567073/9		567073			PS
05/18/22 19:43	20	ICVABT 160-567073/10		567073			PS
05/18/22 20:05	20	ICVABT 160-567073/11		567073			PS
08/26/23 00:18	1000	ICB 160-625610/5		625610			EJS
08/31/23 00:08	2	CCVA 160-626294/71		626294			FLC
08/31/23 00:14	2	CCVB 160-626294/79		626294			FLC
08/31/23 00:18	200	CCB 160-626294/87		626294			FLC
08/31/23 11:47	100	810-73371-25	SG-04R	626294	624326	904.0	FLC

Detector: Red21

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/13/19 14:37	5	ICABT 160-567074/12		567074			EMH
06/13/19 20:16	5	ICABT 160-567074/13		567074			EMH
06/13/19 20:42	5	ICABT 160-567074/14		567074			EMH
06/13/19 22:07	5	ICABT 160-567074/15		567074			EMH
06/13/19 22:55	5	ICABT 160-567074/16		567074			EMH
06/14/19 01:01	5	ICABT 160-567074/17		567074			EMH
06/14/19 11:22	5	ICABT 160-567074/18		567074			EMH
06/14/19 12:27	5	ICABT 160-567074/19		567074			EMH
07/09/19 06:49	5	ICVABT 160-567074/23		567074			EMH
07/09/19 06:55	5	ICVABT 160-567074/24		567074			EMH
07/09/19 07:00	5	ICVABT 160-567074/25		567074			EMH
07/09/19 12:41	15	ICRA6 160-438609/1		438609			SCB
07/09/19 13:01	15	ICRA6 160-438609/2		438609			SCB
07/09/19 13:22	15	ICRA6 160-438609/3		438609			SCB
07/09/19 13:42	15	ICRA6 160-438609/4		438609			SCB
07/09/19 14:10	15	ICRA6 160-438609/5		438609			SCB
07/09/19 14:49	15	ICRA6 160-438609/6		438609			SCB
07/09/19 15:07	15	ICRA6 160-438609/7		438609			SCB
07/10/19 11:29	5	ICVRA6 160-438609/8		438609			SCB
07/10/19 11:35	5	ICVRA6 160-438609/9		438609			SCB
07/10/19 11:42	5	ICVRA6 160-438609/10		438609			SCB
11/21/19 23:31	45	ICVABT 160-567074/20		567074			EMH
11/22/19 07:07	45	ICVABT 160-567074/21		567074			EMH
11/22/19 08:01	45	ICVABT 160-567074/22		567074			EMH
05/14/22 08:33	45	ICABT 160-567074/1		567074			EMH
05/15/22 12:46	45	ICABT 160-567074/2		567074			EMH
05/15/22 13:35	45	ICABT 160-567074/3		567074			EMH
05/15/22 14:25	45	ICABT 160-567074/4		567074			EMH
05/15/22 15:16	45	ICABT 160-567074/5		567074			EMH
05/15/22 16:04	45	ICABT 160-567074/6		567074			EMH

Gas Flow Proportional Counter Run Log

Detector: Red21 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
05/15/22 16:53	45	ICABT 160-567074/7		567074			EMH
05/15/22 17:41	45	ICABT 160-567074/8		567074			EMH
05/18/22 19:43	20	ICVABT 160-567074/9		567074			EMH
05/18/22 20:05	20	ICVABT 160-567074/10		567074			EMH
05/18/22 20:28	20	ICVABT 160-567074/11		567074			EMH
08/26/23 00:18	1000	ICB 160-625610/6		625610			EJS
08/31/23 00:08	2	CCVA 160-626294/72		626294			FLC
08/31/23 00:14	2	CCVB 160-626294/80		626294			FLC
08/31/23 00:18	200	CCB 160-626294/88		626294			FLC
08/31/23 07:40	100	ZZZZZ		626294			
08/31/23 11:47	100	810-73371-26	SG-05	626294	624326	904.0	FLC
08/31/23 19:03	200	ZZZZZ		626294			
09/08/23 00:08	2	CCVA 160-627236/90		627236			SCB
09/08/23 00:14	2	CCVB 160-627236/98		627236			SCB
09/08/23 00:19	200	CCB 160-627236/104		627236			SCB
09/08/23 07:16	100	810-73371-8	MW-09	627236	624483	903.0	SCB
09/08/23 09:34	100	ZZZZZ		627236			
09/08/23 12:10	100	ZZZZZ		627236			
09/08/23 17:27	400	ZZZZZ		627236			

Detector: Red22

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/13/19 14:37	5	ICABT 160-567075/12		567075			PS
06/13/19 20:16	5	ICABT 160-567075/13		567075			PS
06/13/19 20:42	5	ICABT 160-567075/14		567075			PS
06/13/19 22:07	5	ICABT 160-567075/15		567075			PS
06/13/19 22:55	5	ICABT 160-567075/16		567075			PS
06/14/19 01:01	5	ICABT 160-567075/17		567075			PS
06/14/19 11:22	5	ICABT 160-567075/18		567075			PS
06/14/19 12:27	5	ICABT 160-567075/19		567075			PS
07/09/19 06:55	5	ICVABT 160-567075/23		567075			PS
07/09/19 07:01	5	ICVABT 160-567075/24		567075			PS
07/09/19 07:08	5	ICVABT 160-567075/25		567075			PS
07/09/19 12:42	15	ICRA6 160-438610/1		438610			SCB
07/09/19 13:01	15	ICRA6 160-438610/2		438610			SCB
07/09/19 13:23	15	ICRA6 160-438610/3		438610			SCB
07/09/19 13:42	15	ICRA6 160-438610/4		438610			SCB
07/09/19 14:10	15	ICRA6 160-438610/5		438610			SCB
07/09/19 14:30	15	ICRA6 160-438610/6		438610			SCB
07/09/19 15:08	15	ICRA6 160-438610/7		438610			SCB
07/10/19 11:35	5	ICVRA6 160-438610/8		438610			SCB
07/10/19 11:42	5	ICVRA6 160-438610/9		438610			SCB
07/10/19 11:51	5	ICVRA6 160-438610/10		438610			SCB
11/22/19 07:07	45	ICVABT 160-567075/20		567075			PS
11/22/19 08:01	45	ICVABT 160-567075/21		567075			PS
11/22/19 08:49	45	ICVABT 160-567075/22		567075			PS
05/14/22 08:33	45	ICABT 160-567075/1		567075			PS
05/15/22 12:46	45	ICABT 160-567075/2		567075			PS
05/15/22 13:35	45	ICABT 160-567075/3		567075			PS
05/15/22 14:25	45	ICABT 160-567075/4		567075			PS
05/15/22 15:16	45	ICABT 160-567075/5		567075			PS
05/15/22 16:04	45	ICABT 160-567075/6		567075			PS

Gas Flow Proportional Counter Run Log

Detector: Red22 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
05/15/22 16:52	45	ICABT 160-567075/7		567075			PS
05/15/22 17:41	45	ICABT 160-567075/8		567075			PS
05/18/22 20:05	20	ICVABT 160-567075/9		567075			PS
05/18/22 20:28	20	ICVABT 160-567075/10		567075			PS
05/18/22 21:30	20	ICVABT 160-567075/11		567075			PS
08/26/23 00:18	1000	ICB 160-625610/7		625610			EJS
08/31/23 00:08	2	CCVA 160-626294/73		626294			FLC
08/31/23 00:14	2	CCVB 160-626294/81		626294			FLC
08/31/23 00:18	200	CCB 160-626294/89		626294			FLC
08/31/23 07:40	100	ZZZZZ		626294			
08/31/23 11:47	100	810-73371-27	SG-06	626294	624326	904.0	FLC
09/07/23 07:57	2	CCVA 160-627054/107		627054			
09/07/23 08:01	2	CCVB 160-627054/109		627054			
09/07/23 09:06	200	CCB 160-627054/111		627054			SCB
09/08/23 00:08	2	CCVA 160-627236/91		627236			SCB
09/08/23 00:14	2	CCVB 160-627236/99		627236			SCB
09/08/23 00:19	200	CCB 160-627236/105		627236			SCB
09/08/23 07:16	100	810-73371-9	MW-10	627236	624483	903.0	SCB
09/08/23 09:34	100	ZZZZZ		627236			
09/08/23 12:10	100	ZZZZZ		627236			
09/08/23 17:27	400	ZZZZZ		627236			

Detector: Red23

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
09/07/23 07:57	2	CCVA 160-627054/108		627054			
09/07/23 08:01	2	CCVB 160-627054/110		627054			
09/07/23 09:06	200	CCB 160-627054/112		627054			SCB

Subcontract Data

Shipping and Receiving Documents

eurofins

Eaton Analytical

810-73371 Chain of Custody

. Hill Street
Bend, IN 46617
00.332.4345
74.233.8207

Order #

Batch # _____

www.EurofinsUS.com/Eaton

Shaded area for EEA use only

CHAIN OF CUSTODY RECORD

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998			MI	23H0448	23H0448
BILL TO: Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444	COMPLIANCE MONITORING: Yes / No	POPULATION SERVED	SOURCE WATER		

	LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1		08/08/23	14:25			MW-01R	Radium 226/228				4	GW	STD
2		08/08/23	10:25			MW-02	Radium 226/228				4	GW	STD
3		08/07/23	15:20			MW-03	Radium 226/228				4	GW	STD
4		08/07/23	14:00			MW-04	Radium 226/228				4	GW	STD
5		08/08/23	14:30			MW-06	Radium 226/228				4	GW	STD
6		08/07/23	14:30			MW-07	Radium 226/228				4	GW	STD
7		08/08/23	12:40			MW-08	Radium 226/228				4	GW	STD
8		08/08/23	9:20			MW-09	Radium 226/228				4	GW	STD
9		08/08/23	11:45			MW-10	Radium 226/228				4	GW	STD
10		08/08/23	16:00			MW-11	Radium 226/228				4	GW	STD
11		08/07/23	16:30			MW-12	Radium 226/228				4	GW	STD
12		08/08/23	15:30			MW-18	Radium 226/228				4	GW	STD
13		08/07/23	17:30			MW-19	Radium 226/228				4	GW	STD
14		08/07/23	16:00			MW-20	Radium 226/228				4	GW	STD

pH Acceptable

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
	8/9/23	AM PM	Fedex		AM PM
RELINQUISHED BY:(Signature) Fedex	DATE	TIME AM PM	RECEIVED BY:(Signature)	DATE	TIME AM PM
RELINQUISHED BY:(Signature)	DATE	TIME AM PM	RECEIVED FOR LABORATORY BY:	DATE 08-10 2023	TIME 1100 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

Level 4 EDD with St. Louis

CONDITIONS UPON RECEIPT (check one):

____ Iced: Wet/Blue ____ Ambient ____ °C Upon Receipt____ N/A

MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0%
RV* = Rush Verbal: (5 working days) 50%
RW* = Rush Written: (5 working days) 75%
IV* = Immediate Verbal: (3 working days) 100%
IW* =Immediate Written: (3 working days) 125%
SP* = Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

eurofins | Eaton Analytical

110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order #

Batch # _____

www.EurofinsUS.com/Eaton

CHAIN OF CUSTODY RECORD

Shaded area for EEA use only

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Jon Mink, Tim Brewer (jmink@trace-labs.com, tbrewer@trace-labs.com) Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444 231-773-5998			MI	23H0448	23H0448
BILL TO: Accounts Payable, Trace Analytical Laboratories, Inc., 2241 Black Creek Rd., Muskegon, MI 49444	COMPLIANCE MONITORING: Yes / No	POPULATION SERVED	SOURCE WATER		

	LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
15		08/07/23	12:55			MW-27	Radium 226/228				4	GW	STD
16		08/08/23	9:20			MW-30	Radium 226/228				4	GW	STD
17		08/08/23	11;30			MW-31	Radium 226/228				4	GW	STD
18		08/08/23	13:00			MW-32	Radium 226/228				4	GW	STD
19		08/07/23	12:00			MW-33	Radium 226/228				4	GW	STD
20		08/07/23	11:20			MW-34	Radium 226/228				4	GW	STD
21		08/07/23	14:00			MWT-04	Radium 226/228				4	GW	STD
22		08/07/23	16:30			MWT-12	Radium 226/228				4	GW	STD
23		08/08/23	17:05			SG-02	Radium 226/228				4	GW	STD
24		08/08/23	17:15			SG-03	Radium 226/228				4	GW	STD
25		08/08/23	16:50			SG-04R	Radium 226/228				4	GW	STD
26		08/08/23	16:40			SG-05	Radium 226/228				4	GW	STD
27		08/08/23	17:25			SG-06	Radium 226/228				4	GW	STD
28													

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
[signature]	8/9/23	AM PM	Fedex		AM PM
RELINQUISHED BY:(Signature) Fedex	DATE	TIME AM PM	RECEIVED BY:(Signature)	DATE	TIME AM PM
RELINQUISHED BY:(Signature)	DATE	TIME AM PM	RECEIVED FOR LABORATORY BY: [signature]	DATE 08/10 2023	TIME 1100 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

Level 4 EDD with St. Louis

CONDITIONS UPON RECEIPT (check one):

____ Iced: Wet/Blue ____ Ambient ____ °C Upon Receipt____ N/A

MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0%
RV* = Rush Verbal: (5 working days) 50%
RW* = Rush Written: (5 working days) 75%
IV* = Immediate Verbal: (3 working days) 100%
IW* =Immediate Written: (3 working days) 125%
SP* = Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges

06-LO-F0435 Issue 6.0 Effective Date: 2016-09-20

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-29186.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-73371-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 9/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23H0448	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-01R (810-73371-1)	8/8/23	14:25 Eastern		Drinking Wate			X	X	X	4	
MW-02 (810-73371-2)	8/8/23	10:25 Eastern		Drinking Wate			X	X	X	4	
MW-03 (810-73371-3)	8/7/23	15:20 Eastern		Drinking Wate			X	X	X	4	
MW-04 (810-73371-4)	8/7/23	14:00 Eastern		Drinking Wate			X	X	X	4	
MW-06 (810-73371-5)	8/8/23	14:30 Eastern		Drinking Wate			X	X	X	4	
MW-07 (810-73371-6)	8/7/23	14:30 Eastern		Drinking Wate			X	X	X	4	
MW-08 (810-73371-7)	8/8/23	12:40 Eastern		Drinking Wate			X	X	X	4	
MW-09 (810-73371-8)	8/8/23	09:20 Eastern		Drinking Wate			X	X	X	4	
MW-10 (810-73371-9)	8/8/23	11:45 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	8/14/2023 1600	CEA	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-29186.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-73371-1
Address: 13715 Rider Trail North,	Due Date Requested: 9/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23H0448	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-11 (810-73371-10)	8/8/23	16:00 Eastern		Drinking Wate			X	X	X	4	
MW-12 (810-73371-11)	8/7/23	16:30 Eastern		Drinking Wate			X	X	X	4	
MW-18 (810-73371-12)	8/8/23	15:30 Eastern		Drinking Wate			X	X	X	4	
MW-19 (810-73371-13)	8/7/23	17:30 Eastern		Drinking Wate			X	X	X	4	
MW-20 (810-73371-14)	8/7/23	16:00 Eastern		Drinking Wate			X	X	X	4	
MW-27 (810-73371-15)	8/7/23	12:55 Eastern		Drinking Wate			X	X	X	4	
MW-30 (810-73371-16)	8/8/23	09:20 Eastern		Drinking Wate			X	X	X	4	
MW-31 (810-73371-17)	8/8/23	11:30 Eastern		Drinking Wate			X	X	X	4	
MW-32 (810-73371-18)	8/8/23	13:00 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by: DB	Date/Time: 8/14/2023 1600	Company: EEA	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-29186.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-73371-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 9/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23H0448	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-33 (810-73371-19)	8/7/23	12:00 Eastern		Drinking Wate			X	X	X	4	
MW-34 (810-73371-20)	8/7/23	11:20 Eastern		Drinking Wate			X	X	X	4	
MWT-04 (810-73371-21)	8/7/23	14:00 Eastern		Drinking Wate			X	X	X	4	
MWT-12 (810-73371-22)	8/7/23	16:30 Eastern		Drinking Wate			X	X	X	4	
SG-02 (810-73371-23)	8/8/23	17:05 Eastern		Drinking Wate			X	X	X	4	
SG-03 (810-73371-24)	8/8/23	17:15 Eastern		Drinking Wate			X	X	X	4	
SG-04R (810-73371-25)	8/8/23	16:50 Eastern		Drinking Wate			X	X	X	4	
SG-05 (810-73371-26)	8/8/23	16:40 Eastern		Drinking Wate			X	X	X	4	
SG-06 (810-73371-27)	8/8/23	17:25 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time: 8/14/2023 1600	Company: EEA	Received by:	Date/Time	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-29186.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-73371-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 9/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23H0448	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-01R (810-73371-1)	8/8/23	14:25 Eastern		Drinking Wate			X	X	X	4	
MW-02 (810-73371-2)	8/8/23	10:25 Eastern		Drinking Wate			X	X	X	4	
MW-03 (810-73371-3)	8/7/23	15:20 Eastern		Drinking Wate			X	X	X	4	
MW-04 (810-73371-4)	8/7/23	14:00 Eastern		Drinking Wate			X	X	X	4	
MW-06 (810-73371-5)	8/8/23	14:30 Eastern		Drinking Wate			X	X	X	4	
MW-07 (810-73371-6)	8/7/23	14:30 Eastern		Drinking Wate			X	X	X	4	
MW-08 (810-73371-7)	8/8/23	12:40 Eastern		Drinking Wate			X	X	X	4	
MW-09 (810-73371-8)	8/8/23	09:20 Eastern		Drinking Wate			X	X	X	4	
MW-10 (810-73371-9)	8/8/23	11:45 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification: Unconfirmed	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
			FED EX		
Relinquished by: FED EX	Date/Time:	Company:	Received by: Sara Worthington	Date/Time: AUG 16 2023 0910	Company: GFSR
Relinquished by:	Date/Time: 8/14/2023 1600	Company: EEA	Received by:	Date/Time:	Company:

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax 574-233-8207

Chain of Custody Record

eurofins
Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-29186.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 2 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-73371-1
Address: 13715 Rider Trail North,	Due Date Requested: 9/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23H0448	Project #: 81000263			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-11 (810-73371-10)	8/8/23	16:00 Eastern		Drinking Wate			X	X	X	4	
MW-12 (810-73371-11)	8/7/23	16:30 Eastern		Drinking Wate			X	X	X	4	
MW-18 (810-73371-12)	8/8/23	15:30 Eastern		Drinking Wate			X	X	X	4	
MW-19 (810-73371-13)	8/7/23	17:30 Eastern		Drinking Wate			X	X	X	4	
MW-20 (810-73371-14)	8/7/23	16:00 Eastern		Drinking Wate			X	X	X	4	
MW-27 (810-73371-15)	8/7/23	12:55 Eastern		Drinking Wate			X	X	X	4	
MW-30 (810-73371-16)	8/8/23	09:20 Eastern		Drinking Wate			X	X	X	4	
MW-31 (810-73371-17)	8/8/23	11:30 Eastern		Drinking Wate			X	X	X	4	
MW-32 (810-73371-18)	8/8/23	13:00 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment: FED EX	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by: FED EX	Date/Time:	Company	Received by: Sierra Worthington	Date/Time: AUG 1 6 2023 0910	Company: EASN
Relinquished by:	Date/Time: 8/17/2023 1600	Company: ETA	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:
	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins Eaton Analytical South Bend
110 S Hill Street
South Bend, IN 46617
Phone: 574-233-4777 Fax: 574-233-8207

Chain of Custody Record

eurofins Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Fullmer, Karen	Carrier Tracking No(s):	COC No: 810-29186.3
Client Contact: Shipping/Receiving	Phone:	E-Mail: Karen.Fullmer@et.eurofinsus.com	State of Origin: Michigan	Page: Page 3 of 3
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State - Michigan		Job #: 810-73371-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 9/13/2023			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: 23H0448	Project #: 81000263			
Site:	SSOW#:			

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	903.0/PrecSep_21 EPA 903.0 - Radium 226 (St. Louis)	904.0/PrecSep_0 EPA 904.0 - Radium 228 (St. Louis)	Ra226_228GFPC_P/ Combined Ra226 & Ra228 Calc (St. Louis)	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-33 (810-73371-19)	8/7/23	12:00 Eastern		Drinking Wate			X	X	X	4	
MW-34 (810-73371-20)	8/7/23	11:20 Eastern		Drinking Wate			X	X	X	4	
MWT-04 (810-73371-21)	8/7/23	14:00 Eastern		Drinking Wate			X	X	X	4	
MWT-12 (810-73371-22)	8/7/23	16:30 Eastern		Drinking Wate			X	X	X	4	
SG-02 (810-73371-23)	8/8/23	17:05 Eastern		Drinking Wate			X	X	X	4	
SG-03 (810-73371-24)	8/8/23	17:15 Eastern		Drinking Wate			X	X	X	4	
SG-04R (810-73371-25)	8/8/23	16:50 Eastern		Drinking Wate			X	X	X	4	
SG-05 (810-73371-26)	8/8/23	16:40 Eastern		Drinking Wate			X	X	X	4	
SG-06 (810-73371-27)	8/8/23	17:25 Eastern		Drinking Wate			X	X	X	4	

Note: Since laboratory accreditations are subject to change, Eurofins Eaton Analytical, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Eaton Analytical, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Eaton Analytical, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Eaton Analytical, LLC.

Possible Hazard Identification: Unconfirmed	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
			FED EX		
FED EX					
			Sierra Worthington	AUG 16 2023 0910	GASR
	8/14/2023 1600	CEA			

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-73371-1

Login Number: 73371
List Number: 1
Creator: Trott, Riley

List Source: Eurofins Eaton Analytical South Bend

Question	Answer	Comment
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
Samples were received on ice.	False	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	False	Thermal preservation not required.
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Samples do not require splitting or compositing.	True	
Container provided by EEA	True	

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-73371-1

Login Number: 73371
List Number: 2
Creator: Worthington, Sierra M

List Source: Eurofins St. Louis
List Creation: 08/15/23 10:53 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Trace Analytical Laboratories

Job Number: 810-73371-1

Login Number: 73371
List Number: 3
Creator: Worthington, Sierra M

List Source: Eurofins St. Louis
List Creation: 08/16/23 01:36 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE
ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

December 04, 2023

Ms. Molly Reeves
HDR Michigan Inc.
1000 Oakbrook Dr., Suite 200
Ann Arbor, MI 48104

Phone: (734) 263-7138

RE: Trace Project 23J1216
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

This report was regenearted to correct the list of metals being reported.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

Wisconsin Accreditation No. FID: 998044080 / TNI EL V1:2016

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Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

SAMPLE SUMMARY

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23J1216-01	MW-01R	Ground Water	AB/TB	10/24/23 11:40	10/25/23 08:05
23J1216-02	MW-02	Ground Water	AB/TB	10/24/23 15:00	10/25/23 08:05
23J1216-03	MW-03	Ground Water	AB/TB	10/24/23 09:20	10/25/23 08:05
23J1216-04	MW-04	Ground Water	AB/TB	10/24/23 08:25	10/25/23 08:05
23J1216-05	MW-06	Ground Water	AB/TB	10/24/23 13:00	10/25/23 08:05
23J1216-06	MW-07	Ground Water	AB/TB	10/24/23 08:15	10/25/23 08:05
23J1216-07	MW-08	Ground Water	AB/TB	10/24/23 11:00	10/25/23 08:05
23J1216-08	MW-09	Ground Water	AB/TB	10/24/23 13:15	10/25/23 08:05
23J1216-09	MW-10	Ground Water	AB/TB	10/23/23 17:00	10/25/23 08:05
23J1216-10	MW-11	Ground Water	AB/TB	10/23/23 14:15	10/25/23 08:05
23J1216-11	MW-12	Ground Water	AB/TB	10/23/23 16:00	10/25/23 08:05
23J1216-12	MW-18	Ground Water	AB/TB	10/24/23 10:40	10/25/23 08:05
23J1216-13	MW-19	Ground Water	AB/TB	10/24/23 16:00	10/25/23 08:05
23J1216-14	MW-20	Ground Water	AB/TB	10/24/23 10:00	10/25/23 08:05
23J1216-15	MW-27	Ground Water	AB/TB	10/23/23 14:30	10/25/23 08:05
23J1216-16	MW-30	Ground Water	AB/TB	10/23/23 18:00	10/25/23 08:05
23J1216-17	MW-31	Ground Water	AB/TB	10/23/23 15:00	10/25/23 08:05
23J1216-18	MW-32	Ground Water	AB/TB	10/23/23 16:15	10/25/23 08:05
23J1216-19	MW-33	Ground Water	AB/TB	10/23/23 12:40	10/25/23 08:05
23J1216-20	MW-34	Ground Water	AB/TB	10/23/23 11:45	10/25/23 08:05
23J1216-21	MWT-10	Ground Water	AB/TB	10/23/23 17:00	10/25/23 08:05
23J1216-22	MWT-33	Ground Water	AB/TB	10/23/23 12:40	10/25/23 08:05
23J1216-23	SG-02	Ground Water	AB/TB	10/24/23 16:55	10/25/23 08:05
23J1216-24	SG-03	Ground Water	AB/TB	10/24/23 17:05	10/25/23 08:05
23J1216-25	SG-04R	Ground Water	AB/TB	10/24/23 16:40	10/25/23 08:05
23J1216-26	SG-05	Ground Water	AB/TB	10/24/23 16:30	10/25/23 08:05
23J1216-27	SG-06	Ground Water	AB/TB	10/24/23 17:15	10/25/23 08:05

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673

TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
LOQ	Limit of Quantitation
LOD	Limit of Detection
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

DATA QUALIFIERS

Trace ID: 23J1216-01

Analysis: SM 4500-H+ B-11

Note pH : The pH was analyzed at 11:00

Trace ID: 23J1216-02

Analysis: SM 4500-H+ B-11

Note pHb : The pH was analyzed at 11:02

Trace ID: 23J1216-03

Analysis: SM 4500-H+ B-11

Note pHc : The pH was analyzed at 11:03

pH — Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.

Trace ID: 23J1216-04

Analysis: EPA 200.7 Rev. 4.4

Boron — Note 240 : The MS recovery was out of control high. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.

Analysis: SM 4500-H+ B-11

Note pHd : The pH was analyzed at 11:04

CERTIFICATE OF ANALYSIS

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pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.

Trace ID: 23J1216-05

Analysis: SM 4500-H+ B-11

	Note pHe : The pH was analyzed at 11:05

Trace ID: 23J1216-06

Analysis: SM 4500-H+ B-11

	Note pHf : The pH was analyzed at 11:06
pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.

Trace ID: 23J1216-07

Analysis: SM 4500-H+ B-11

	Note pHg : The pH was analyzed at 11:07
pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.

Trace ID: 23J1216-08

Analysis: SM 4500-H+ B-11

	Note pHh : The pH was analyzed at 11:08

Trace ID: 23J1216-09

Analysis: SM 4500-H+ B-11

	Note pHi : The pH was analyzed at 11:09
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-10

Analysis: SM 4500-H+ B-11

	Note pHj : The pH was analyzed at 11:11
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-11

Analysis: SM 4500-H+ B-11

	Note pHk : The pH was analyzed at 11:12
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-12

Analysis: SM 4500-H+ B-11

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	Note pHl : The pH was analyzed at 11:13
pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.

Trace ID: 23J1216-13

Analysis: SM 4500-H+ B-11

	Note pHm : The pH was analyzed at 11:14

Trace ID: 23J1216-14

Analysis: SM 4500-H+ B-11

	Note pHn : The pH was analyzed at 11:15
pH	Note 503 : The sample result and reporting limit must be considered estimated. The analysis was performed beyond the EPA established 24-hour hold time.

Trace ID: 23J1216-15

Analysis: SM 4500-H+ B-11

	Note pHo : The pH was analyzed at 11:16
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-16

Analysis: SM 4500-H+ B-11

	Note pHp : The pH was analyzed at 11:17
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-17

Analysis: SM 4500-H+ B-11

	Note pHq : The pH was analyzed at 11:18
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-18

Analysis: SM 4500-H+ B-11

	Note pHr : The pH was analyzed at 11:19
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-19

Analysis: SM 4500-H+ B-11

	Note pHs : The pH was analyzed at 11:20

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pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-20

Analysis: SM 4500-H+ B-11

	Note pHt : The pH was analyzed at 11:21
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-21

Analysis: SM 4500-H+ B-11

	Note pHu : The pH was analyzed at 11:24
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-22

Analysis: SM 4500-H+ B-11

	Note pHv : The pH was analyzed at 11:25
pH	Note 511 : The sample was received and, therefore, analyzed beyond the established EPA hold time. The result must be considered estimated.

Trace ID: 23J1216-23

Analysis: SM 4500-H+ B-11

	Note pHw : The pH was analyzed at 11:26

Trace ID: 23J1216-24

Analysis: SM 4500-H+ B-11

	Note pHx : The pH was analyzed at 11:27

Trace ID: 23J1216-25

Analysis: SM 4500-H+ B-11

	Note pHy : The pH was analyzed at 11:28

Trace ID: 23J1216-26

Analysis: SM 4500-H+ B-11

	Note pHz : The pH was analyzed at 11:29

Trace ID: 23J1216-27

Analysis: SM 4500-H+ B-11

	Note pHaa : The pH was analyzed at 11:30

Trace ID: T143162-MS1

Analysis: EPA 200.7 Rev. 4.4

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Boron	Note 240 : The MS recovery was out of control high. The result for this analyte, in the non-spiked version of the sample, must be considered estimated.
Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Magnesium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Trace ID: T143162-MS2

Analysis: EPA 200.7 Rev. 4.4

Boron	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.
Calcium	Note 243 : The MS recovery was out of control. Because the background concentration of this analyte is greater than four times the spike amount, no data require qualification.

Trace ID: T143258-DUP1

Analysis: SM 4500-H+ B-11

Note pHa : The pH was analyzed at 11:01

Trace ID: T143258-DUP2

Analysis: SM 4500-H+ B-11

Note pHu : The pH was analyzed at 11:24

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-01 | Date Collected: 10/24/23 11:40 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**160**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**130**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**3.4**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**100**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**98**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**500**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	**0.00022**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.56**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	**0.00026**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.0022**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.0010**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	**0.00074**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Molybdenum	**0.00074**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00025**
Selenium	**0.00073**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-01 | Date Collected: 10/24/23 11:40 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143102									
Fluoride	**14 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**210 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**8.8 mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1700 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1700 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143121									
Total Dissolved Solids	**2600 mg/L**	**50**	**5**	**10/25/23**	**mr**	**10/25/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143124									
Total Suspended Solids	<4.0 mg/L	4.0	0.990099	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.69 pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-02 | Date Collected: 10/24/23 15:00 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**110**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**190**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**1.2**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**57**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**47**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**310**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	**0.00029**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Arsenic	**0.0074**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.42**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	**0.00052**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.000052**
Cadmium	**0.00049**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.000075**
Chromium	**0.032**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.0063**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	**0.0020**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Molybdenum	**0.0051**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.0018**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Thallium	**0.00062**	**mg/L**	**0.00038**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.000075**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-02 | Date Collected: 10/24/23 15:00 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143102										
Fluoride	**9.7**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**140**	**mg/L**	**7.5**	**50**	**10/25/23**	**jh**	**10/25/23**	**jh**		**6.0**
Sulfate as SO4	<0.41	mg/L	3.0	5	10/25/23	jh	10/25/23	jh		0.41
Analysis Method: SM 2320 B-11										
Batch: T143594										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**2300**	**mg/L**	**5.0**	**1**	**11/04/23**	**ans**	**11/04/23**	**ans**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	11/04/23	ans	11/04/23	ans	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**2300**	**mg/L**	**5.0**	**1**	**11/04/23**	**ans**	**11/04/23**	**ans**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T143121										
Total Dissolved Solids	**1600**	**mg/L**	**100**	**10**	**10/25/23**	**mr**	**10/25/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143124										
Total Suspended Solids	**6.1**	**mg/L**	**4.0**	**1.010101**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.10**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-03 | Date Collected: 10/24/23 09:20 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	**0.00024**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/02/23**	**acs**		**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**4.3**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**380**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.035**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**200**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**18**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**100**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.41**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	**0.00015**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.000052**
Cadmium	**0.00011**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.000075**
Chromium	**0.0030**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	**0.00022**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.00085**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00025**
Selenium	**0.00053**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Thallium	**0.00018**	**mg/L**	**0.00038**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.000075**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-03 | Date Collected: 10/24/23 09:20 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143102									
Fluoride	**0.60 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**180 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**380 mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/25/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1400 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1400 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143121									
Total Dissolved Solids	**2200 mg/L**	**40**	**4**	**10/25/23**	**mr**	**10/25/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143124									
Total Suspended Solids	<4.0 mg/L	4.0	1	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.28 pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**	**503**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-04 | Date Collected: 10/24/23 08:25 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**4.7**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**240**	**0.016**
Calcium	**360**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.066**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**120**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**24**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**83**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0010**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.12**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.0027**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00045**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.0015**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00024**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-04 | Date Collected: 10/24/23 08:25 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143102										
Fluoride	**1.9**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**150**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**630**	**mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/25/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**780**	**mg/L**	**5.0**	**1**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.16**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.16	mg/L	5.0	1	11/02/23	ans	11/02/23	ans	N	0.16
Total Alkalinity as CaCO3 at pH 4.5	**780**	**mg/L**	**5.0**	**1**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.16**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**1800**	**mg/L**	**40**	**4**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143124										
Total Suspended Solids	**8.0**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.25**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**	**503**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-05 | Date Collected: 10/24/23 13:00 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**11**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**240**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.19**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**89**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**26**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**71**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0010**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**1.5**	**mg/L**	**0.012**	**5**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0034**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.0015**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00047**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.00025**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00025**
Selenium	**0.00020**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-05 | Date Collected: 10/24/23 13:00 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143102									
Fluoride	**1.2 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**79 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	<0.41 mg/L	3.0	5	10/25/23	jh	10/25/23	jh		0.41
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1000 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1000 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**1100 mg/L**	**50**	**5**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143124									
Total Suspended Solids	**48 mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.12 pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-06 | Date Collected: 10/24/23 08:15 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**12**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**150**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.0062**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**38**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**4.9**	**mg/L**	**0.25**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.036**
Sodium	**51**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.00029**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Barium	**0.38**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	**0.000055**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.00036**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00098**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	<0.00025	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00025
Selenium	<0.00010	mg/L	0.00050	1	10/26/23	lv	11/03/23	acs		0.00010
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-06 | Date Collected: 10/24/23 08:15 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143102										
Fluoride	**0.14**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**14**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**26**	**mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**600**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**600**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**620**	**mg/L**	**50**	**5**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143124										
Total Suspended Solids	**38**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**6.91**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**	**503**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-07 | Date Collected: 10/24/23 11:00 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**4.1**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**130**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.076**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**22**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**8.6**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**23**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.011**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.98**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.00061**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00034**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.0016**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00015**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-07 | Date Collected: 10/24/23 11:00 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143102									
Fluoride	**0.55 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**17 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**1.7 mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**J**	**0.41**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**460 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**460 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**440 mg/L**	**50**	**5**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143124									
Total Suspended Solids	**43 mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**6.95 pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**	**503**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-08 | Date Collected: 10/24/23 13:15 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	**0.0024**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/02/23**	**acs**		**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**6.9**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**310**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.29**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**41**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**15**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**27**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0023**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.28**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.0018**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00024**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.021**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00023**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-08 | Date Collected: 10/24/23 13:15 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143102										
Fluoride	**2.8**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**12**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**210**	**mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/25/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**780**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**780**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**1100**	**mg/L**	**38**	**3.846154**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143124										
Total Suspended Solids	**39**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.01**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-09 | Date Collected: 10/23/23 17:00 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**23**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**190**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.94**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**61**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**45**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**300**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.00094**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.46**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	**0.000052**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.0042**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00038**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	**0.00017**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0027**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00036**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-09 | Date Collected: 10/23/23 17:00 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143102									
Fluoride	**6.0 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**310 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**330 mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/25/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**700 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**700 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**1600 mg/L**	**37**	**3.703704**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143124									
Total Suspended Solids	<4.0 mg/L	4.0	1	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.07 pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-10 | Date Collected: 10/23/23 14:15 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**12**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**150**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.15**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**52**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**18**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**67**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0023**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.87**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.00063**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00023**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	**0.00036**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0015**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00020**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-10 | Date Collected: 10/23/23 14:15 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143102										
Fluoride	**1.2**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**88**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	<0.41	mg/L	3.0	5	10/25/23	jh	10/25/23	jh		0.41
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**660**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**660**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**1800**	**mg/L**	**40**	**4**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143124										
Total Suspended Solids	**19**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.30**	**pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-11 | Date Collected: 10/23/23 16:00 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	**0.00016**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/02/23**	**acs**	**J**	**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**0.42**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**95**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.0048**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**22**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**1.7**	**mg/L**	**0.25**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.036**
Sodium	**16**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	**0.00041**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Arsenic	**0.0031**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.060**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	**0.0011**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.000075**
Chromium	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Cobalt	**0.00038**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	**0.00021**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0096**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00029**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-11 | Date Collected: 10/23/23 16:00 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143102									
Fluoride	**0.26 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**	**N**	**0.055**
Chloride	**26 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/25/23**	**jh**		**0.60**
Sulfate as SO4	**130 mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/25/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**190 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**190 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**200 mg/L**	**10**	**1**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143124									
Total Suspended Solids	<4.0 mg/L	4.0	1	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.34 pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-12 | Date Collected: 10/24/23 10:40 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**3.0**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**360**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.039**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**30**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**11**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**20**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	**0.00013**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Arsenic	**0.041**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.025**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Cobalt	**0.0017**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	**0.00014**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.020**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00082**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-12 | Date Collected: 10/24/23 10:40 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143102										
Fluoride	**4.5**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**22**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**800**	**mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**200**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**200**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**1400**	**mg/L**	**40**	**4**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143124										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**0.9803922**	**10/25/23**	**mr**	**10/25/23**	**mr**		**3.9**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.05**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**	**503**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-13 | Date Collected: 10/24/23 16:00 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**2.6**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**470**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.089**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**39**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**16**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**37**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0067**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.044**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Cobalt	**0.00013**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.010**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	<0.00010	mg/L	0.00050	1	10/26/23	lv	11/03/23	acs		0.00010
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-13 | Date Collected: 10/24/23 16:00 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**2.0**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**50**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**1100**	**mg/L**	**60**	**100**	**10/25/23**	**jh**	**10/26/23**	**jh**		**8.2**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**270**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**270**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**1900**	**mg/L**	**50**	**5**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	**26**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**6.74**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-14 | Date Collected: 10/24/23 10:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**1.1**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**130**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.071**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**53**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**12**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**61**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0017**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.53**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Cobalt	**0.00095**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	**0.0018**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Molybdenum	**0.0047**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00011**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-14 | Date Collected: 10/24/23 10:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**0.23**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**70**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**33**	**mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**560**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**560**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**650**	**mg/L**	**50**	**5**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	**38**	**mg/L**	**4.0**	**0.990099**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.05**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**	**503**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-15 | Date Collected: 10/23/23 14:30 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**0.32**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**190**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.0099**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**40**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**11**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**82**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0011**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.31**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.028**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00075**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	<0.00025	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00025
Selenium	**0.00020**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-15 | Date Collected: 10/23/23 14:30 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143103									
Fluoride	**0.43 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**110 mg/L**	**7.5**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**6.0**
Sulfate as SO4	**2.4 mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**J**	**0.41**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1400 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1400 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**870 mg/L**	**40**	**4**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143134									
Total Suspended Solids	**22 mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**6.87 pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-16 | Date Collected: 10/23/23 18:00 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**2.1**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**390**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.12**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**95**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**10**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**82**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.00063**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.058**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.0081**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00053**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.00061**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00025**
Selenium	**0.00013**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-16 | Date Collected: 10/23/23 18:00 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143103									
Fluoride	**1.2 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**97 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**610 mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**780 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**780 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**1800 mg/L**	**10**	**1**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143134									
Total Suspended Solids	**4.0 mg/L**	**4.0**	**1.010101**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.05 pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-17 | Date Collected: 10/23/23 15:00 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**5.1**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**170**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.049**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**35**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**11**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**56**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.16**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.0025**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00013**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.0013**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00014**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-17 | Date Collected: 10/23/23 15:00 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143103									
Fluoride	**4.6 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**100 mg/L**	**7.5**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**6.0**
Sulfate as SO4	**72 mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**440 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**440 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**730 mg/L**	**18**	**1.818182**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143134									
Total Suspended Solids	<4.0 mg/L	4.0	1	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.07 pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-18 | Date Collected: 10/23/23 16:15 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**5.0**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**150**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.19**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**30**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**13**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**35**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	<0.00010	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00010
Arsenic	**0.00058**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.85**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.00031**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00038**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Lead	<0.00010	mg/L	0.00055	1	10/26/23	lv	11/03/23	acs		0.00010
Molybdenum	**0.0045**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	<0.00010	mg/L	0.00050	1	10/26/23	lv	11/03/23	acs		0.00010
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-18 | Date Collected: 10/23/23 16:15 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**1.8**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**47**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**17**	**mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**520**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**520**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**640**	**mg/L**	**50**	**5**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	**23**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.44**	**pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-19 | Date Collected: 10/23/23 12:40 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**0.16**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**180**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.0054**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**19**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**4.9**	**mg/L**	**0.25**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.036**
Sodium	**30**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	**0.00048**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Arsenic	**0.0027**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.090**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	**0.00023**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.000075**
Chromium	**0.0029**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.00053**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	**0.00037**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0032**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00025**
Selenium	**0.00059**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-19 | Date Collected: 10/23/23 12:40 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**0.24**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**45**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**69**	**mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T143508										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**420**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**420**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**690**	**mg/L**	**20**	**2.040816**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	**10**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**6.97**	**pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-20 | Date Collected: 10/23/23 11:45 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143394										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/02/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Boron	**4.1**	**mg/L**	**0.088**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**220**	**mg/L**	**2.6**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.099**	**mg/L**	**0.025**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**29**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**13**	**mg/L**	**2.5**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**38**	**mg/L**	**1.2**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Antimony	**0.00014**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0013**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Barium	**0.52**	**mg/L**	**0.0025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.000075
Chromium	**0.019**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Cobalt	**0.0013**	**mg/L**	**0.00052**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Lead	**0.00063**	**mg/L**	**0.00055**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00010**
Molybdenum	<0.00025	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00025
Selenium	**0.00031**	**mg/L**	**0.00050**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/26/23	lv	11/03/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-20 | Date Collected: 10/23/23 11:45 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143103									
Fluoride	**0.28 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**25 mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	<0.41 mg/L	3.0	5	10/25/23	jh	10/26/23	jh		0.41
Analysis Method: SM 2320 B-11									
Batch: T143508									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**1000 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**1000 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**800 mg/L**	**50**	**5**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143134									
Total Suspended Solids	**150 mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**6.63 pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-21 | Date Collected: 10/23/23 17:00 | Matrix: Ground Water
Sample ID: MWT-10 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143395										
Mercury	**0.00033**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/03/23**	**acs**		**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Boron	**23**	**mg/L**	**0.088**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**210**	**mg/L**	**2.6**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.89**	**mg/L**	**0.025**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.019**
Magnesium	**63**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**42**	**mg/L**	**2.5**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**330**	**mg/L**	**1.2**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Antimony	**0.00015**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0012**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Barium	**0.42**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00068**
Beryllium	**0.00018**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.000052**
Cadmium	<0.000075	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000075
Chromium	**0.0062**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Cobalt	**0.0018**	**mg/L**	**0.00052**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Lead	**0.00020**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0026**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00025**
Selenium	**0.00046**	**mg/L**	**0.00050**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/27/23	lv	10/31/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-21 | Date Collected: 10/23/23 17:00 | Matrix: Ground Water
Sample ID: MWT-10 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**5.9**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**300**	**mg/L**	**7.5**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**6.0**
Sulfate as SO4	**330**	**mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11										
Batch: T143532										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**700**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**700**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**1700**	**mg/L**	**20**	**2**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	<4.0	mg/L	4.0	1	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.70**	**pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-22 | Date Collected: 10/23/23 12:40 | Matrix: Ground Water
Sample ID: MWT-33 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143395										
Mercury	**0.00033**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/03/23**	**acs**		**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Boron	**0.18**	**mg/L**	**0.088**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**190**	**mg/L**	**2.6**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.0054**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**19**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**4.9**	**mg/L**	**2.5**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**30**	**mg/L**	**1.2**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Antimony	**0.00051**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Arsenic	**0.0027**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Barium	**0.095**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000052
Cadmium	**0.00023**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.000075**
Chromium	**0.0039**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Cobalt	**0.00059**	**mg/L**	**0.00052**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Lead	**0.00049**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0038**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00025**
Selenium	**0.00066**	**mg/L**	**0.00050**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/27/23	lv	10/31/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-22 | Date Collected: 10/23/23 12:40 | Matrix: Ground Water
Sample ID: MWT-33 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**0.23**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**44**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**64**	**mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T143532										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**450**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**450**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143199										
Total Dissolved Solids	**680**	**mg/L**	**20**	**2**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	**11**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.09**	**pH Units**		**1**	**10/23/23**	**bsv**	**10/25/23**	**mj**	**511**	

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-23 | Date Collected: 10/24/23 16:55 | Matrix: Ground Water
Sample ID: SG-02 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143395										
Mercury	**0.00022**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/03/23**	**acs**		**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Boron	**7.0**	**mg/L**	**0.088**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**180**	**mg/L**	**2.6**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.058**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**57**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**16**	**mg/L**	**2.5**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**58**	**mg/L**	**1.2**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Antimony	**0.00061**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Arsenic	**0.0023**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Barium	**0.060**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000075
Chromium	**0.00036**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Cobalt	**0.00015**	**mg/L**	**0.00052**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Lead	**0.00064**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Molybdenum	**0.0081**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00025**
Selenium	**0.00080**	**mg/L**	**0.00050**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/27/23	lv	10/31/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-23 | Date Collected: 10/24/23 16:55 | Matrix: Ground Water
Sample ID: SG-02 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143103									
Fluoride	**3.6 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**99 mg/L**	**7.5**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**6.0**
Sulfate as SO4	**530 mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11									
Batch: T143532									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**130 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**130 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143199									
Total Dissolved Solids	**1100 mg/L**	**10**	**1**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143134									
Total Suspended Solids	<3.9 mg/L	4.0	0.9803922	10/25/23	mr	10/25/23	mr		3.9
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.87 pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-24 | Date Collected: 10/24/23 17:05 | Matrix: Ground Water
Sample ID: SG-03 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143395										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/03/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Boron	**6.9**	**mg/L**	**0.088**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**180**	**mg/L**	**2.6**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.059**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**57**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**17**	**mg/L**	**2.5**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**58**	**mg/L**	**1.2**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Antimony	**0.00063**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Arsenic	**0.0024**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Barium	**0.061**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000075
Chromium	**0.00049**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Cobalt	**0.00030**	**mg/L**	**0.00052**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Lead	**0.00066**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Molybdenum	**0.0083**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00025**
Selenium	**0.00081**	**mg/L**	**0.00050**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/27/23	lv	10/31/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-24 | Date Collected: 10/24/23 17:05 | Matrix: Ground Water
Sample ID: SG-03 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY									
Analysis Method: EPA 300.0 Rev. 2.1									
Batch: T143103									
Fluoride	**3.6 mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**100 mg/L**	**7.5**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**6.0**
Sulfate as SO4	**550 mg/L**	**30**	**50**	**10/25/23**	**jh**	**10/26/23**	**jh**		**4.1**
Analysis Method: SM 2320 B-11									
Batch: T143532									
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**120 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31 mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**120 mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15									
Batch: T143214									
Total Dissolved Solids	**1100 mg/L**	**10**	**1**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15									
Batch: T143134									
Total Suspended Solids	<4.0 mg/L	4.0	1	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11									
Batch: T143258									
pH	**7.91 pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-25 | Date Collected: 10/24/23 16:40 | Matrix: Ground Water
Sample ID: SG-04R | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143395										
Mercury	<0.00016	mg/L	0.00020	1	10/31/23	lv	11/03/23	acs		0.00016
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Boron	**5.4**	**mg/L**	**0.088**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**500**	**mg/L**	**2.6**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.064**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**57**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**12**	**mg/L**	**2.5**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**34**	**mg/L**	**1.2**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Antimony	**0.00089**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Arsenic	**0.0017**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Barium	**0.029**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000075
Chromium	**0.00063**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Cobalt	**0.00063**	**mg/L**	**0.00052**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Lead	**0.00022**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.016**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00025**
Selenium	**0.0024**	**mg/L**	**0.00050**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/27/23	lv	10/31/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-25 | Date Collected: 10/24/23 16:40 | Matrix: Ground Water
Sample ID: SG-04R | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**3.7**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**35**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**820**	**mg/L**	**60**	**100**	**10/25/23**	**jh**	**10/27/23**	**jh**		**8.2**
Analysis Method: SM 2320 B-11										
Batch: T143532										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**61**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**61**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143214										
Total Dissolved Solids	**2200**	**mg/L**	**10**	**1**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	<4.0	mg/L	4.0	1	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**8.11**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-26 | Date Collected: 10/24/23 16:30 | Matrix: Ground Water
Sample ID: SG-05 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143395										
Mercury	**0.00017**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Boron	**0.72**	**mg/L**	**0.088**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**120**	**mg/L**	**2.6**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.039**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**24**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**8.5**	**mg/L**	**2.5**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**40**	**mg/L**	**1.2**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Antimony	**0.00016**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Arsenic	**0.00088**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Barium	**0.51**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000052
Cadmium	**0.000094**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.000075**
Chromium	**0.00039**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Cobalt	**0.00027**	**mg/L**	**0.00052**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Lead	**0.0031**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Molybdenum	**0.00085**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00025**
Selenium	**0.00017**	**mg/L**	**0.00050**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/27/23	lv	10/31/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-26 | Date Collected: 10/24/23 16:30 | Matrix: Ground Water
Sample ID: SG-05 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**0.79**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**54**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**12**	**mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T143532										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**400**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**400**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143214										
Total Dissolved Solids	**510**	**mg/L**	**19**	**1.923077**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	**12**	**mg/L**	**4.0**	**1**	**10/25/23**	**mr**	**10/25/23**	**mr**		**4.0**
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.77**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-27 | Date Collected: 10/24/23 17:15 | Matrix: Ground Water
Sample ID: SG-06 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 7470A										
Batch: T143395										
Mercury	**0.00020**	**mg/L**	**0.00020**	**1**	**10/31/23**	**lv**	**11/03/23**	**acs**		**0.00016**
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Boron	**0.24**	**mg/L**	**0.088**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.016**
Calcium	**82**	**mg/L**	**2.6**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.76**
Lithium	**0.0087**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**	**N**	**0.0019**
Magnesium	**25**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.10**
Potassium	**5.0**	**mg/L**	**2.5**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.36**
Sodium	**35**	**mg/L**	**1.2**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.88**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Antimony	**0.00014**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Arsenic	**0.0016**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00010**
Barium	**0.092**	**mg/L**	**0.0025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00068**
Beryllium	<0.000052	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000052
Cadmium	<0.000075	mg/L	0.00025	1	10/27/23	lv	10/31/23	acs		0.000075
Chromium	**0.00044**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Cobalt	**0.00018**	**mg/L**	**0.00052**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Lead	**0.00053**	**mg/L**	**0.00055**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Molybdenum	**0.0034**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00025**
Selenium	**0.00012**	**mg/L**	**0.00050**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00010**
Thallium	<0.000075	mg/L	0.00038	1	10/27/23	lv	10/31/23	acs		0.000075

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-27 | Date Collected: 10/24/23 17:15 | Matrix: Ground Water
Sample ID: SG-06 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
WET CHEMISTRY										
Analysis Method: EPA 300.0 Rev. 2.1										
Batch: T143103										
Fluoride	**0.18**	**mg/L**	**0.10**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**	**N**	**0.055**
Chloride	**56**	**mg/L**	**0.75**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.60**
Sulfate as SO4	**30**	**mg/L**	**3.0**	**5**	**10/25/23**	**jh**	**10/26/23**	**jh**		**0.41**
Analysis Method: SM 2320 B-11										
Batch: T143532										
Bicarbonate Alkalinity as CaCO3 at pH 4.5	**270**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**	**N**	**0.31**
Carbonate Alkalinity as CaCO3 at pH 8.2	<0.31	mg/L	10	2	11/02/23	ans	11/02/23	ans	N	0.31
Total Alkalinity as CaCO3 at pH 4.5	**270**	**mg/L**	**10**	**2**	**11/02/23**	**ans**	**11/02/23**	**ans**		**0.31**
Analysis Method: SM 2540 C-15										
Batch: T143214										
Total Dissolved Solids	**410**	**mg/L**	**20**	**2**	**10/26/23**	**mr**	**10/26/23**	**mr**	**N**	
Analysis Method: SM 2540 D-15										
Batch: T143134										
Total Suspended Solids	<4.0	mg/L	4.0	1.010101	10/25/23	mr	10/25/23	mr		4.0
Analysis Method: SM 4500-H+ B-11										
Batch: T143258										
pH	**7.83**	**pH Units**		**1**	**10/24/23**	**bsv**	**10/25/23**	**mj**		

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QUALITY CONTROL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143394
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T143394-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T143394-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00220	110	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T143394-MSD1

Original: **23J1216-01**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0	0.00200	0.00234	0.00222	117	111	76-123	5	20	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143395
QC Batch Method: EPA 7470A Prep
Analysis Description: Mercury, Total, EPA 7470/7471
Analysis Method: EPA 7470A

METHOD BLANK: T143395-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Mercury	mg/L	<0.00020	0.00020	

LABORATORY CONTROL SAMPLE: T143395-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Mercury	mg/L	0.00200	0.00208	104	77-122	

MATRIX SPIKE / MATRIX SPIKE DUPLICATE: T143395-MSD1

Original: **23J1216-21**

Parameter	Units	Original Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limit	RPD	Max RPD	Notes
Mercury	mg/L	0.000328	0.00200	0.00218	0.00222	93	95	76-123	2	20	

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Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143162
QC Batch Method: EPA 200.2
Analysis Description: Calcium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T143162-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	**mg/L**	**0.00467**	**0.0088**	**J**
Calcium	mg/L	<0.26	0.26	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T143162-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.68	105	85-115	
Calcium	mg/L	16.0	16.8	105	85-115	
Potassium	mg/L	16.0	15.3	96	85-115	
Lithium	mg/L	1.60	1.56	98	85-115	
Magnesium	mg/L	16.0	15.1	94	85-115	
Sodium	mg/L	16.0	15.5	97	85-115	

MATRIX SPIKE: T143162-MS1 Original: **23J1216-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**4.66**	**1.60**	6.79	**133**	**70-130**	**240**
Calcium	**mg/L**	**362**	**16.0**	387	**156**	**70-130**	**243**
Potassium	mg/L	23.6	16.0	39.3	98	70-130	
Lithium	mg/L	0	1.60	1.65	103	70-130	
Magnesium	**mg/L**	**116**	**16.0**	137	**132**	**70-130**	**243**
Sodium	mg/L	83.4	16.0	101	109	70-130	

MATRIX SPIKE: T143162-MS2 Original: **23J1216-05**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Boron	**mg/L**	**10.7**	**1.60**	13.5	**176**	**70-130**	**243**
Calcium	**mg/L**	**239**	**16.0**	264	**154**	**70-130**	**243**
Potassium	mg/L	26.1	16.0	42.6	103	70-130	
Lithium	mg/L	0.194	1.60	1.75	97	70-130	

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MATRIX SPIKE: T143162-MS2 Original: **23J1216-05**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Magnesium	mg/L	88.9	16.0	108	118	70-130	
Sodium	mg/L	70.8	16.0	88.7	112	70-130	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143166
QC Batch Method: EPA 200.2
Analysis Description: Lithium, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T143166-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Boron	**mg/L**	**0.00598**	**0.0088**	**J**
Calcium	mg/L	<0.26	0.26	
Potassium	mg/L	<0.25	0.25	
Lithium	mg/L	<0.0025	0.0025	
Magnesium	mg/L	<0.10	0.10	
Sodium	mg/L	<0.12	0.12	

LABORATORY CONTROL SAMPLE: T143166-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Boron	mg/L	1.60	1.56	98	85-115	
Calcium	mg/L	16.0	16.3	102	85-115	
Potassium	mg/L	16.0	14.9	93	85-115	
Lithium	mg/L	1.60	1.55	97	85-115	
Magnesium	mg/L	16.0	14.6	91	85-115	
Sodium	mg/L	16.0	15.0	94	85-115	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143162
QC Batch Method: EPA 200.2
Analysis Description: Antimony, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T143162-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.00055	0.00055	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	

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METHOD BLANK: T143162-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Cadmium	mg/L	<0.00025	0.00025	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00055	0.00055	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	

LABORATORY CONTROL SAMPLE: T143162-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.0962	96	85-115	
Barium	mg/L	1.60	1.71	107	85-115	
Beryllium	mg/L	0.200	0.189	94	85-115	
Cadmium	mg/L	0.0500	0.0509	102	85-115	
Cobalt	mg/L	1.60	1.50	94	85-115	
Chromium	mg/L	0.0500	0.0474	95	85-115	
Molybdenum	mg/L	1.60	1.57	98	85-115	
Lead	mg/L	0.100	0.0913	91	85-115	
Antimony	mg/L	0.100	0.0970	97	85-115	
Selenium	mg/L	0.100	0.0923	92	85-115	
Thallium	mg/L	0.100	0.100	100	85-115	

MATRIX SPIKE: T143162-MS1 Original: **23J1216-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00102	0.100	0.0985	98	70-130	
Barium	mg/L	0.120	1.60	1.91	112	70-130	
Beryllium	mg/L	0	0.200	0.160	80	70-130	
Cadmium	mg/L	0	0.0500	0.0485	97	70-130	
Cobalt	mg/L	0.000452	1.60	1.39	87	70-130	
Chromium	mg/L	0.00270	0.0500	0.0482	91	70-130	
Molybdenum	mg/L	0.00154	1.60	1.62	101	70-130	
Lead	mg/L	0	0.100	0.0842	84	70-130	
Antimony	mg/L	0	0.100	0.125	125	70-130	
Selenium	mg/L	0	0.100	0.0889	89	70-130	
Thallium	mg/L	0	0.100	0.0907	91	70-130	

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MATRIX SPIKE: T143162-MS2 Original: **23J1216-05**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Arsenic	mg/L	0.00100	0.100	0.0932	92	70-130	
Barium	mg/L	1.50	1.60	3.42	120	70-130	
Beryllium	mg/L	0	0.200	0.158	79	70-130	
Cadmium	mg/L	0	0.0500	0.0460	92	70-130	
Cobalt	mg/L	0.000466	1.60	1.37	86	70-130	
Chromium	mg/L	0.00149	0.0500	0.0461	89	70-130	
Molybdenum	mg/L	0	1.60	1.55	97	70-130	
Lead	mg/L	0	0.100	0.0810	81	70-130	
Antimony	mg/L	0	0.100	0.121	121	70-130	
Selenium	mg/L	0	0.100	0.0901	90	70-130	
Thallium	mg/L	0	0.100	0.0822	82	70-130	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143166
QC Batch Method: EPA 200.2
Analysis Description: Lead, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T143166-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Arsenic	mg/L	<0.00050	0.00050	
Barium	mg/L	<0.0025	0.0025	
Beryllium	mg/L	<0.00025	0.00025	
Cadmium	mg/L	<0.00020	0.00020	
Cobalt	mg/L	<0.00052	0.00052	
Chromium	mg/L	<0.00025	0.00025	
Molybdenum	mg/L	<0.0012	0.0012	
Lead	mg/L	<0.00025	0.00025	
Antimony	mg/L	<0.00025	0.00025	
Selenium	mg/L	<0.00050	0.00050	
Thallium	mg/L	<0.00038	0.00038	

LABORATORY CONTROL SAMPLE: T143166-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Arsenic	mg/L	0.100	0.102	102	85-115	
Barium	mg/L	1.60	1.54	96	85-115	
Beryllium	mg/L	0.200	0.181	90	85-115	
Cadmium	mg/L	0.0500	0.0464	93	85-115	

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LABORATORY CONTROL SAMPLE: T143166-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Cobalt	mg/L	1.60	1.56	97	85-115	
Chromium	mg/L	0.0500	0.0516	103	85-115	
Molybdenum	mg/L	1.60	1.56	97	85-115	
Lead	mg/L	0.100	0.0892	89	85-115	
Antimony	mg/L	0.100	0.100	100	85-115	
Selenium	mg/L	0.100	0.101	101	85-115	
Thallium	mg/L	0.100	0.0911	91	85-115	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143102
QC Batch Method: IC Prep W
Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T143102-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<0.60	0.60	

LABORATORY CONTROL SAMPLE: T143102-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	mg/L	5.00	5.15	103	90-110	
Fluoride	mg/L	1.00	1.01	101	90-110	
Sulfate as SO4	mg/L	5.00	5.13	103	90-110	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143103
QC Batch Method: IC Prep W
Analysis Description: Sulfate
Analysis Method: EPA 300.0 Rev. 2.1

METHOD BLANK: T143103-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Chloride	mg/L	<0.15	0.15	
Fluoride	mg/L	<0.020	0.020	
Sulfate as SO4	mg/L	<1.0	1.0	

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LABORATORY CONTROL SAMPLE: T143103-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Chloride	**mg/L**	**5.00**	**<10**	**103**	**90-110**	**J**
Fluoride	mg/L	1.00	1.00	100	90-110	
Sulfate as SO4	mg/L	5.00	5.12	102	90-110	

MATRIX SPIKE: T143103-MS1 Original: **23J1216-14**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	69.9	25.0	94.1	97	80-120	
Fluoride	mg/L	0.233	5.00	5.58	107	80-120	
Sulfate as SO4	mg/L	32.8	25.0	56.0	93	80-120	

MATRIX SPIKE: T143103-MS2 Original: **23J1216-18**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Chloride	mg/L	47.2	25.0	74.3	108	80-120	
Fluoride	mg/L	1.76	5.00	6.92	103	80-120	
Sulfate as SO4	mg/L	16.7	25.0	41.1	98	80-120	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143508
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T143508-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	98.4	98	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	98.4	98	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	98.4	98	88-112	

SAMPLE DUPLICATE: T143508-DUP1 Original: **23J1216-01**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	1670	1610	4	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	1670	1610	4	20	

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Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143532
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Total
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T143532-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	98.4	98	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	98.4	98	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	98.4	98	88-112	

SAMPLE DUPLICATE: T143532-DUP1 Original: **23J1216-21**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	698	698	0.07	20	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	0	<10		20	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	698	698	0.07	20	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143594
QC Batch Method: SM 2320 B-11
Analysis Description: Alkalinity, Bicarbonate
Analysis Method: SM 2320 B-11

LABORATORY CONTROL SAMPLE: T143594-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Bicarbonate Alkalinity as CaCO3 at pH 4.5	mg/L	100	95.1	95	88-112	
Carbonate Alkalinity as CaCO3 at pH 8.2	mg/L	100	95.1	95	88-112	
Total Alkalinity as CaCO3 at pH 4.5	mg/L	100	95.1	95	88-112	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143121
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

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METHOD BLANK: T143121-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	**mg/L**	**2.97**	**10**	**J**

LABORATORY CONTROL SAMPLE: T143121-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	496	99	80-120	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143199
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T143199-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

LABORATORY CONTROL SAMPLE: T143199-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	484	97	80-120	

SAMPLE DUPLICATE: T143199-DUP1 Original: **23J1216-12**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Dissolved Solids	mg/L	1370	1340	2	10	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143214
QC Batch Method: SM 2540 C-15
Analysis Description: Total Dissolved Solids
Analysis Method: SM 2540 C-15

METHOD BLANK: T143214-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Dissolved Solids	mg/L	<10	10	

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LABORATORY CONTROL SAMPLE: T143214-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Dissolved Solids	mg/L	500	484	97	80-120	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143124
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T143124-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T143124-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	96.1	96	85-115	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143134
QC Batch Method: SM 2540 D-15
Analysis Description: Total Suspended Solids
Analysis Method: SM 2540 D-15

METHOD BLANK: T143134-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Total Suspended Solids	mg/L	<4.0	4.0	

LABORATORY CONTROL SAMPLE: T143134-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Total Suspended Solids	mg/L	100	96.1	96	85-115	

SAMPLE DUPLICATE: T143134-DUP1 Original: **23J1216-13**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
Total Suspended Solids	mg/L	26.0	27.0	4	10	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T143258
QC Batch Method: *** DEFAULT PREP ***

Analysis Description: pH, SM 4500
Analysis Method: SM 4500-H+ B-11

SAMPLE DUPLICATE: T143258-DUP1 Original: **23J1216-01** **pHa**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	pH Units	7.69	7.69	0	20	

SAMPLE DUPLICATE: T143258-DUP2 Original: **23J1216-21** **pHu**

Parameter	Units	Original Result	DUP Result	RPD	Max RPD	Notes
pH	pH Units	7.70	7.69	0.1	20	

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Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23J1216

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	
Cell Phone:	734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: NC
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Andrew Byks/Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	Remarks/Notes	Possible Health Hazards?
1	10/24/23	1140	MW-01R	N	GW	6	6		5						1	X	X	X	X		
2	10/24/23	1500	MW-02	N	GW	6	6		5						1	X	X	X	X		
3	10/24/23	920	MW-03	N	GW	6	6		5						1	X	X	X	X		
4	10/24/23	825	MW-04	N	GW	6	6		5						1	X	X	X	X		
5	10/24/23	1300	MW-06	N	GW	6	6		5						1	X	X	X	X		
6	10/24/23	815	MW-07	N	GW	6	6		5						1	X	X	X	X		
7	10/24/23	1100	MW-08	N	GW	6	6		5						1	X	X	X	X		
8	10/24/23	1315	MW-09	N	GW	6	6		5						1	X	X	X	X		
9	10/23/23	1700	MW-10	N	GW	6	6		5						1	X	X	X	X		
10	10/24/23	1415	MW-11	N	GW	6	6		5						1	X	X	X	X		

Analysis Requested

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew Byks	[illegible]	10/25/23	8:05	2)			
	3)				4)			

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Muskegon, MI 49444-2673 | www.trace-labs.com
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Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23J1216

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By: BVC
Checked By: BVC
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

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Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Andrew Byks/Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	Remarks/Notes	Possible Health Hazards?
11	10/23/23	1600	MW-12	N	GW	6	6		5						1	X	X	X	X		
12	10/24/23	1040	MW-18	N	GW	6	6		5						1	X	X	X	X		
13	10/24/23	1600	MW-19	N	GW	6	6		5						1	X	X	X	X		
14	10/24/23	1000	MW-20	N	GW	6	6		5						1	X	X	X	X		
15	10/23/23	1430	MW-27	N	GW	6	6		5						1	X	X	X	X		
16	10/23/23	1800	MW-30	N	GW	6	6		5						1	X	X	X	X		
17	10/23/23	1500	MW-31	N	GW	6	6		5						1	X	X	X	X		
18	10/23/23	1615	MW-32	N	GW	6	6		5						1	X	X	X	X		
19	10/23/23	1240	MW-33	N	GW	6	6		5						1	X	X	X	X		
20	10/23/23	1145	MW-34	N	GW	6	6		5						1	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew Byks	[signature]	10/25/23	8:05	2)			
	3)				4)			

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Phone 231.773.5998
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www.trace-labs.com

Trace ID No. 23J1216

Report Results To:

Company Name: HDR Inc.	
Report To: Molly Reeves	
Mailing Address: 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Office Phone:	Cell Phone: 734.263.7138
Email Address: molly.reeves@hdrinc.com	

Bill To:

PO #: 10337505.006	
Contact Name: Lara Zawaideh	
Billing Address (if different): 1000 Oakbrook Drive, Suite 200	
City, State, Zip Code: Ann Arbor, MI 48104	
Phone Number: 734.223.9074	
Billing Email Address: lara.zawaideh@hdrinc.com	

Trace Use:

Logged By: BK
Checked By: NC
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

* *Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Andrew Byks/Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	Remarks/Notes	Possible Health Hazards?
21	10/23/23	1700	MWT-10	N	GW	6	6		5						1	X	X	X	X		
22	10/23/23	1240	MWT-33	N	GW	6	6		5						1	X	X	X	X		
23	10/24/23	1655	SG-02	N	SW	6	6		5						1	X	X	X	X		
24	10/24/23	1705	SG-03	N	SW	6	6		5						1	X	X	X	X		
25	10/24/23	1640	SG-04R	N	SW	6	6		5						1	X	X	X	X		
26	10/24/23	1630	SG-05	N	SW	6	6		5						1	X	X	X	X		
27	10/24/23	1715	SG-06	N	SW	6	6		5						1	X	X	X	X		
																				AB	

Analysis Requested

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew Byks	[illegible]	10/25/23	8:05	2)			
	3)				4)			

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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 8:40									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.5	0.1			✓				
Representative Sample Temp °C	11.4	11.0			✓				✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [x] Trace Courier [ ] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [ ] [x] [ ] Samples preserved at Trace
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

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Effective 8/48/23

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888-979-4469 Fax
www.trace-labs.com

23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 8:52									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.3	-0.1			✓				
Representative Sample Temp °C									

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☐	☑	☐	Samples preserved at Trace
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☑	☐	All bottle labels agree with COC
☑	☐	COC filled out properly
☑	☐	COC signed by client

Notes:

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Effective 8/48/23

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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:00									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.4	0.0			✓				
Representative Sample Temp °C	11.6	11.2			✓				✓

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present
☑		Trace Courier ☐ Client Drop-off

☐ Yes ☐ No Custody seals intact (if applicable)
☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☐	☑	☐	Samples preserved at Trace
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☑	☐	All bottle labels agree with COC
☑	☐	COC filled out properly
☑	☐	COC signed by client

Notes:

Form 70-A.51
Effective 8/48/23

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TRACE ANALYTICAL LABORATORIES, INC.

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:15									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.2	-0.2			✓				
Representative Sample Temp °C	13.3	12.9			✓	✓			✓

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present
☑		Trace Courier ☐ Client Drop-off

☐ Yes ☐ No Custody seals intact (if applicable)
☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☐	☑	☐	Samples preserved at Trace
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☑	☐	All bottle labels agree with COC
☑	☐	COC filled out properly
☑	☐	COC signed by client

Notes:

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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:32									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	-0.3	-0.7			✓				
Representative Sample Temp °C	11.2	10.8			✓				✓

Sample Receipt

Yes / No
- ☑ / ☐ Received on ice or other coolant
- ☑ / ☐ Ice still present upon receipt
- ☐ / ☑ Custody seals present — ☐ Yes ☐ No Custody seals intact (if applicable)
- ☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes / No / N/A
- ☑ / ☐ / ☐ All sample containers arrived unbroken and labeled
- ☑ / ☐ / ☐ Sufficient sample to run requested analyses
- ☑ / ☐ / ☐ Correct chemical preservative added to samples
- ☐ / ☑ / ☐ Samples preserved at Trace
- ☑ / ☐ / ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ / ☐ / ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes / No
- ☑ / ☐ All bottle labels agree with COC
- ☑ / ☐ COC filled out properly
- ☑ / ☐ COC signed by client

Notes:

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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:38									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	-0.4	-0.8			✓				
Representative Sample Temp °C	11.6	11.2			✓				✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [x] Trace Courier [ ] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [ ] [x] [ ] Samples preserved at Trace
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:47									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.3	-0.1			✓				
Representative Sample Temp °C	11.9	11.5			✓				✓

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present
✓		Trace Courier

☐ Client Drop-off

☐ Yes ☐ No Custody seals intact (if applicable)

☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
	✓		Samples preserved at Trace
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

☐ ✓ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

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December 04, 2023

Ms. Molly Reeves
HDR Michigan Inc.
1000 Oakbrook Dr., Suite 200
Ann Arbor, MI 48104

Phone: (734) 263-7138

RE: Trace Project 23J1216
Client Project City of Grand Haven - Harbor Island

Dear Ms. Reeves:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

This report was regenearted to correct the list of metals being reported.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at jmink@trace-labs.com.

Sincerely,

Jon Mink
Senior Project Manager
Enclosures

Wisconsin Accreditation No. FID: 998044080 / TNI EL V1:2016

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SAMPLE SUMMARY

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
23J1216-01	MW-01R	Ground Water	AB/TB	10/24/23 11:40	10/25/23 08:05
23J1216-02	MW-02	Ground Water	AB/TB	10/24/23 15:00	10/25/23 08:05
23J1216-03	MW-03	Ground Water	AB/TB	10/24/23 09:20	10/25/23 08:05
23J1216-04	MW-04	Ground Water	AB/TB	10/24/23 08:25	10/25/23 08:05
23J1216-05	MW-06	Ground Water	AB/TB	10/24/23 13:00	10/25/23 08:05
23J1216-06	MW-07	Ground Water	AB/TB	10/24/23 08:15	10/25/23 08:05
23J1216-07	MW-08	Ground Water	AB/TB	10/24/23 11:00	10/25/23 08:05
23J1216-08	MW-09	Ground Water	AB/TB	10/24/23 13:15	10/25/23 08:05
23J1216-09	MW-10	Ground Water	AB/TB	10/23/23 17:00	10/25/23 08:05
23J1216-10	MW-11	Ground Water	AB/TB	10/23/23 14:15	10/25/23 08:05
23J1216-11	MW-12	Ground Water	AB/TB	10/23/23 16:00	10/25/23 08:05
23J1216-12	MW-18	Ground Water	AB/TB	10/24/23 10:40	10/25/23 08:05
23J1216-13	MW-19	Ground Water	AB/TB	10/24/23 16:00	10/25/23 08:05
23J1216-14	MW-20	Ground Water	AB/TB	10/24/23 10:00	10/25/23 08:05
23J1216-15	MW-27	Ground Water	AB/TB	10/23/23 14:30	10/25/23 08:05
23J1216-16	MW-30	Ground Water	AB/TB	10/23/23 18:00	10/25/23 08:05
23J1216-17	MW-31	Ground Water	AB/TB	10/23/23 15:00	10/25/23 08:05
23J1216-18	MW-32	Ground Water	AB/TB	10/23/23 16:15	10/25/23 08:05
23J1216-19	MW-33	Ground Water	AB/TB	10/23/23 12:40	10/25/23 08:05
23J1216-20	MW-34	Ground Water	AB/TB	10/23/23 11:45	10/25/23 08:05
23J1216-21	MWT-10	Ground Water	AB/TB	10/23/23 17:00	10/25/23 08:05
23J1216-22	MWT-33	Ground Water	AB/TB	10/23/23 12:40	10/25/23 08:05
23J1216-23	SG-02	Ground Water	AB/TB	10/24/23 16:55	10/25/23 08:05
23J1216-24	SG-03	Ground Water	AB/TB	10/24/23 17:05	10/25/23 08:05
23J1216-25	SG-04R	Ground Water	AB/TB	10/24/23 16:40	10/25/23 08:05
23J1216-26	SG-05	Ground Water	AB/TB	10/24/23 16:30	10/25/23 08:05
23J1216-27	SG-06	Ground Water	AB/TB	10/24/23 17:15	10/25/23 08:05

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AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
LOQ	Limit of Quantitation
LOD	Limit of Detection
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

NOTE: Samples for volatiles that have been extracted with a water miscible solvent were corrected for the total volume of the solvent/water mixture.
Solid matrices Method Blanks are at 100% solids as such results are the same wet or dry.

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-01 | Date Collected: 10/24/23 11:40 | Matrix: Ground Water
Sample ID: MW-01R | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**0.22**	**mg/L**	**0.050**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00029**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.0021**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	**0.0018**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00062**
Zinc	**0.0013**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-02 | Date Collected: 10/24/23 15:00 | Matrix: Ground Water
Sample ID: MW-02 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**18**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.0025**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.018**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	**0.0044**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00062**
Zinc	**0.0036**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-03 | Date Collected: 10/24/23 09:20 | Matrix: Ground Water
Sample ID: MW-03 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**0.43**	**mg/L**	**0.050**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00091**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.0017**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	**0.0012**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00062**
Zinc	**0.0020**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-04 | Date Collected: 10/24/23 08:25 | Matrix: Ground Water
Sample ID: MW-04 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**5.6**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00027**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.013**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0015**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-05 | Date Collected: 10/24/23 13:00 | Matrix: Ground Water
Sample ID: MW-06 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**19**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Nickel	**0.00079**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-06 | Date Collected: 10/24/23 08:15 | Matrix: Ground Water
Sample ID: MW-07 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**18**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00027**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	<0.00065	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00065
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0035**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-07 | Date Collected: 10/24/23 11:00 | Matrix: Ground Water
Sample ID: MW-08 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**22**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00021**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00020**
Nickel	**0.00085**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0025**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-08 | Date Collected: 10/24/23 13:15 | Matrix: Ground Water
Sample ID: MW-09 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**15**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Nickel	**0.00072**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-09 | Date Collected: 10/23/23 17:00 | Matrix: Ground Water
Sample ID: MW-10 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**2.4**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00038**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.00076**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0025**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-10 | Date Collected: 10/23/23 14:15 | Matrix: Ground Water
Sample ID: MW-11 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**11**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0018**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-11 | Date Collected: 10/23/23 16:00 | Matrix: Ground Water
Sample ID: MW-12 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**0.037**	**mg/L**	**0.050**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**	**J**	**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00071**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.0026**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0080**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-12 | Date Collected: 10/24/23 10:40 | Matrix: Ground Water
Sample ID: MW-18 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**7.0**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00047**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.0047**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.054**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-13 | Date Collected: 10/24/23 16:00 | Matrix: Ground Water
Sample ID: MW-19 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**24**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-14 | Date Collected: 10/24/23 10:00 | Matrix: Ground Water
Sample ID: MW-20 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**20**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00025**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.0066**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.024**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-15 | Date Collected: 10/23/23 14:30 | Matrix: Ground Water
Sample ID: MW-27 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**11**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00024**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00020**
Nickel	<0.00065	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00065
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-16 | Date Collected: 10/23/23 18:00 | Matrix: Ground Water
Sample ID: MW-30 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**1.4**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00054**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	<0.00065	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00065
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-17 | Date Collected: 10/23/23 15:00 | Matrix: Ground Water
Sample ID: MW-31 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**0.13**	**mg/L**	**0.050**	**1**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	<0.00020	mg/L	0.00025	1	10/26/23	lv	11/03/23	acs		0.00020
Nickel	<0.00065	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00065
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	<0.0012	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.0012

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-18 | Date Collected: 10/23/23 16:15 | Matrix: Ground Water
Sample ID: MW-32 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**11**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00041**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.00077**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0035**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-19 | Date Collected: 10/23/23 12:40 | Matrix: Ground Water
Sample ID: MW-33 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**4.4**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.0032**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.0077**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.018**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-20 | Date Collected: 10/23/23 11:45 | Matrix: Ground Water
Sample ID: MW-34 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143162										
Iron	**70**	**mg/L**	**0.50**	**10**	**10/26/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143162										
Copper	**0.00045**	**mg/L**	**0.00025**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00020**
Nickel	**0.0015**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/26/23	lv	11/03/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/26/23	lv	11/03/23	acs		0.00062
Zinc	**0.0021**	**mg/L**	**0.0012**	**1**	**10/26/23**	**lv**	**11/03/23**	**acs**		**0.0012**

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Muskegon, MI 49444-2673

231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-21 | Date Collected: 10/23/23 17:00 | Matrix: Ground Water
Sample ID: MWT-10 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Iron	**3.2**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Copper	**0.00088**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Nickel	**0.0014**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/27/23	lv	10/31/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/27/23	lv	10/31/23	acs		0.00062
Zinc	**0.042**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-22 | Date Collected: 10/23/23 12:40 | Matrix: Ground Water
Sample ID: MWT-33 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Iron	**4.3**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Copper	**0.0034**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Nickel	**0.0089**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/27/23	lv	10/31/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/27/23	lv	10/31/23	acs		0.00062
Zinc	**0.024**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-23 | Date Collected: 10/24/23 16:55 | Matrix: Ground Water
Sample ID: SG-02 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Iron	**0.28**	**mg/L**	**0.050**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Copper	**0.00047**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Nickel	**0.0034**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/27/23	lv	10/31/23	acs		0.000050
Vanadium	**0.00072**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00062**
Zinc	**0.0050**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-24 | Date Collected: 10/24/23 17:05 | Matrix: Ground Water
Sample ID: SG-03 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Iron	**0.29**	**mg/L**	**0.050**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Copper	**0.00051**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Nickel	**0.0035**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/27/23	lv	10/31/23	acs		0.000050
Vanadium	**0.00070**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00062**
Zinc	**0.0069**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-25 | Date Collected: 10/24/23 16:40 | Matrix: Ground Water
Sample ID: SG-04R | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Iron	**0.050**	**mg/L**	**0.050**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Copper	**0.00086**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Nickel	**0.0035**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/27/23	lv	10/31/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/27/23	lv	10/31/23	acs		0.00062
Zinc	**0.0086**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-26 | Date Collected: 10/24/23 16:30 | Matrix: Ground Water
Sample ID: SG-05 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Iron	**2.9**	**mg/L**	**0.50**	**10**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.26**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Copper	**0.0012**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Nickel	**0.0012**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/27/23	lv	10/31/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/27/23	lv	10/31/23	acs		0.00062
Zinc	**0.043**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.0012**

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ANALYTICAL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

Trace ID: 23J1216-27 | Date Collected: 10/24/23 17:15 | Matrix: Ground Water
Sample ID: SG-06 | Date Received: 10/25/23 08:05

PARAMETERS	RESULTS	UNITS	LOQ	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	LOD
METALS, TOTAL										
Analysis Method: EPA 200.7 Rev. 4.4										
Batch: T143166										
Iron	**0.23**	**mg/L**	**0.050**	**1**	**10/27/23**	**lv**	**11/02/23**	**ckd**		**0.026**
Analysis Method: EPA 200.8 Rev. 5.4										
Batch: T143166										
Copper	**0.00054**	**mg/L**	**0.00025**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.00020**
Nickel	**0.0011**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**	**J**	**0.00065**
Silver	<0.000050	mg/L	0.000050	1	10/27/23	lv	10/31/23	acs		0.000050
Vanadium	<0.00062	mg/L	0.0012	1	10/27/23	lv	10/31/23	acs		0.00062
Zinc	**0.0080**	**mg/L**	**0.0012**	**1**	**10/27/23**	**lv**	**10/31/23**	**acs**		**0.0012**

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QUALITY CONTROL RESULTS

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143162
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T143162-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.050	0.050	

LABORATORY CONTROL SAMPLE: T143162-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	15.5	97	85-115	

MATRIX SPIKE: T143162-MS1 Original: **23J1216-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	5.59	16.0	21.3	98	70-130	

MATRIX SPIKE: T143162-MS2 Original: **23J1216-05**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Iron	mg/L	18.6	16.0	34.5	100	70-130	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

QC Batch: T143166
QC Batch Method: EPA 200.2
Analysis Description: Iron, Total
Analysis Method: EPA 200.7 Rev. 4.4

METHOD BLANK: T143166-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Iron	mg/L	<0.050	0.050	

LABORATORY CONTROL SAMPLE: T143166-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Iron	mg/L	16.0	14.8	92	85-115	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T143162
QC Batch Method: EPA 200.2

Analysis Description: Copper, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T143162-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Copper	mg/L	<0.00025	0.00025	
Nickel	mg/L	<0.0012	0.0012	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T143162-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0532	106	85-115	
Copper	mg/L	1.60	1.46	91	85-115	
Nickel	mg/L	1.60	1.50	94	85-115	
Vanadium	mg/L	1.60	1.53	96	85-115	
Zinc	mg/L	1.60	1.53	96	85-115	

MATRIX SPIKE: T143162-MS1 Original: **23J1216-04**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0491	98	70-130	
Copper	mg/L	0	1.60	1.31	82	70-130	
Nickel	mg/L	0.0132	1.60	1.36	84	70-130	
Vanadium	mg/L	0	1.60	1.53	96	70-130	
Zinc	mg/L	0	1.60	1.31	82	70-130	

MATRIX SPIKE: T143162-MS2 Original: **23J1216-05**

Parameter	Units	Original Result	Spike Conc.	MS Result	MS % Rec	% Rec Unit	Notes
Silver	mg/L	0	0.0500	0.0487	97	70-130	
Copper	mg/L	0	1.60	1.28	80	70-130	
Nickel	mg/L	0	1.60	1.34	84	70-130	
Vanadium	mg/L	0	1.60	1.48	93	70-130	
Zinc	mg/L	0	1.60	1.28	80	70-130	

Trace Project ID: 23J1216
Client Project ID: City of Grand Haven - Harbor Island

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QC Batch: T143166
QC Batch Method: EPA 200.2

Analysis Description: Copper, Total
Analysis Method: EPA 200.8 Rev. 5.4

METHOD BLANK: T143166-BLK1

Parameter	Units	Blank Result	Reporting Limit	Notes
Silver	mg/L	<0.000050	0.000050	
Copper	mg/L	<0.00025	0.00025	
Nickel	mg/L	<0.0012	0.0012	
Vanadium	mg/L	<0.0012	0.0012	
Zinc	mg/L	<0.0012	0.0012	

LABORATORY CONTROL SAMPLE: T143166-BS1

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limit	Notes
Silver	mg/L	0.0500	0.0498	100	85-115	
Copper	mg/L	1.60	1.48	93	85-115	
Nickel	mg/L	1.60	1.53	96	85-115	
Vanadium	mg/L	1.60	1.69	105	85-115	
Zinc	mg/L	1.60	1.55	97	85-115	

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CHAIN-OF-CUSTODY RECORD

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Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Trace ID No. 23J1216

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	
Cell Phone:	734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BV
Checked By: NC
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Andrew Byks/Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	Remarks/Notes	Possible Health Hazards?
1	10/24/23	1140	MW-01R	N	GW	6	6		5						1	X	X	X	X		
2	10/24/23	1500	MW-02	N	GW	6	6		5						1	X	X	X	X		
3	10/24/23	920	MW-03	N	GW	6	6		5						1	X	X	X	X		
4	10/24/23	825	MW-04	N	GW	6	6		5						1	X	X	X	X		
5	10/24/23	1300	MW-06	N	GW	6	6		5						1	X	X	X	X		
6	10/24/23	815	MW-07	N	GW	6	6		5						1	X	X	X	X		
7	10/24/23	1100	MW-08	N	GW	6	6		5						1	X	X	X	X		
8	10/24/23	1315	MW-09	N	GW	6	6		5						1	X	X	X	X		
9	10/23/23	1700	MW-10	N	GW	6	6		5						1	X	X	X	X		
10	10/24/23	1415	MW-11	N	GW	6	6		5						1	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew Byks	[illegible]	10/25/23	8:05	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

☐ Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

Form 70-Z.2

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Phone 231.773.5998
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Trace ID No. 23J1216

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	Cell Phone: 734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BVC
Checked By: BVC
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Andrew Byks/Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filterd (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	Remarks/Notes	Possible Health Hazards?
11	10/23/23	1600	MW-12	N	GW	6	6		5						1	X	X	X	X		
12	10/24/23	1040	MW-18	N	GW	6	6		5						1	X	X	X	X		
13	10/24/23	1600	MW-19	N	GW	6	6		5						1	X	X	X	X		
14	10/24/23	1000	MW-20	N	GW	6	6		5						1	X	X	X	X		
15	10/23/23	1430	MW-27	N	GW	6	6		5						1	X	X	X	X		
16	10/23/23	1800	MW-30	N	GW	6	6		5						1	X	X	X	X		
17	10/23/23	1500	MW-31	N	GW	6	6		5						1	X	X	X	X		
18	10/23/23	1615	MW-32	N	GW	6	6		5						1	X	X	X	X		
19	10/23/23	1240	MW-33	N	GW	6	6		5						1	X	X	X	X		
20	10/23/23	1145	MW-34	N	GW	6	6		5						1	X	X	X	X		

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew Byks	[signature]	10/25/23	8:05	2)			
	3)				4)			

In executing this Chain of Custody, the client acknowledges the terms as set forth at www.trace-labs.com/terms-of-agreement.

☐ Check this box if you would not like your samples analyzed if received outside of the conditions outlined in the Trace Sample Acceptance Policy at www.trace-labs.com/downloads.

Form 70-Z.2

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TRACE ANALYTICAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORD

Page 3 of 3

Trace ID No. 23J1216

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
Phone 231.773.5998
Fax 888.979.4469
www.trace-labs.com

Report Results To:

Company Name:	HDR Inc.
Report To:	Molly Reeves
Mailing Address:	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Office Phone:	Cell Phone: 734.263.7138
Email Address:	molly.reeves@hdrinc.com

Bill To:

PO #:	10337505.006
Contact Name:	Lara Zawaideh
Billing Address (if different):	1000 Oakbrook Drive, Suite 200
City, State, Zip Code:	Ann Arbor, MI 48104
Phone Number:	734.223.9074
Billing Email Address:	lara.zawaideh@hdrinc.com

Trace Use:

Logged By: BK
Checked By: NC
Soil Volatiles Preserved (circle if applicable): MeOH Low Level Lab
Sample Collection Time (Hrs):

Requested Turnaround Times (TAT)

- ☒ Standard: 5-10 Business days
- ☐ 3 Business Days*
- ☐ 1 Business Day*

** Rush TAT Requires Prior Approval*

Matrix Key:

WW = Wastewater, O = Oil, A = Air
DW = Drinking Water, WI = Wipes, U = Unknown
GW = Groundwater, S = Solid
LW = Liquid Waste, SL = Sludge

Project Name: City of Grand Haven - Harbor Island
Sampled By (print): Andrew Byks/Tanten Buszka

Trace No.	Sample Collection Date	Sample Collection Time	Sample ID/Name	Metals Field Filtered (Y or N)	Matrix - see above →	Number of Containers	Preservation: Cool ≤ 4°C	Hydrochloric Acid (HCl)	Nitric Acid (HNO3)	Sulfuric Acid (H2SO4)	Sodium Thiosulfate	Sodium Hydroxide (NaOH)	Ascorbic Acid	Trizma	Other	40 CFR Part 257 Appendix III	40 CFR Part 257 Appendix IV	Additional Part 115 Metals	Total Suspended Solids (TSS)	Remarks/Notes	Possible Health Hazards?
21	10/23/23	1700	MWT-10	N	GW	6	6		5						1	X	X	X	X		
22	10/23/23	1240	MWT-33	N	GW	6	6		5						1	X	X	X	X		
23	10/24/23	1655	SG-02	N	SW	6	6		5						1	X	X	X	X		
24	10/24/23	1705	SG-03	N	SW	6	6		5						1	X	X	X	X		
25	10/24/23	1640	SG-04R	N	SW	6	6		5						1	X	X	X	X		
26	10/24/23	1630	SG-05	N	SW	6	6		5						1	X	X	X	X		
27	10/24/23	1715	SG-06	N	SW	6	6		5						1	X	X	X	X		
																				AB	

Please Sign	Released By	Received By	Date	Time	Released By	Received By	Date	Time
	1) Andrew Byks	[signature]	10/25/23	8:05	2)			
	3)				4)			

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231-773-5998 Phone
888-979-4469 Fax
www.trace-labs.com

23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 8:40									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.5	0.1			✓				
Representative Sample Temp °C	11.4	11.0			✓				✓

Sample Receipt

Yes	No	
✓		Received on ice or other coolant
✓		Ice still present upon receipt
	✓	Custody seals present
✓		Trace Courier

☐ Yes ☐ No Custody seals intact (if applicable)

☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
✓			All sample containers arrived unbroken and labeled
✓			Sufficient sample to run requested analyses
✓			Correct chemical preservative added to samples
	✓		Samples preserved at Trace
✓			Chemical preservation verified, check EMD pH test strip used (if applicable)
		✓	Air bubbles absent from VOAs

✓ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other

Chain of Custody (COC)

Yes	No	
✓		All bottle labels agree with COC
✓		COC filled out properly
✓		COC signed by client

Notes:

Form 70-A.51
Effective 8/48/23

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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 8:52									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.3	-0.1			✓				
Representative Sample Temp °C									

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☐	☑	☐	Samples preserved at Trace
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☑	☐	All bottle labels agree with COC
☑	☐	COC filled out properly
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HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:00									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.4	0.0			✓				
Representative Sample Temp °C	11.6	11.2			✓				✓

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present

☐ Yes ☐ No Custody seals intact (if applicable)

☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☐	☑	☐	Samples preserved at Trace
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☑	☐	All bottle labels agree with COC
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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:15									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.2	-0.2			✓				
Representative Sample Temp °C	13.3	12.9			✓	✓			✓

Sample Receipt

Yes	No	
☑	☐	Received on ice or other coolant
☑	☐	Ice still present upon receipt
☐	☑	Custody seals present
☑		Trace Courier ☐ Client Drop-off

☐ Yes ☐ No Custody seals intact (if applicable)
☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes	No	N/A	
☑	☐	☐	All sample containers arrived unbroken and labeled
☑	☐	☐	Sufficient sample to run requested analyses
☑	☐	☐	Correct chemical preservative added to samples
☐	☑	☐	Samples preserved at Trace
☑	☐	☐	Chemical preservation verified, check EMD pH test strip used (if applicable)
			☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
☐	☐	☑	Air bubbles absent from VOAs

Chain of Custody (COC)

Yes	No	
☑	☐	All bottle labels agree with COC
☑	☐	COC filled out properly
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23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:32									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	-0.3	-0.7			✓				
Representative Sample Temp °C	11.2	10.8			✓				✓

Sample Receipt

Yes / No
- ☑ / ☐ Received on ice or other coolant
- ☑ / ☐ Ice still present upon receipt
- ☐ / ☑ Custody seals present — ☐ Yes ☐ No Custody seals intact (if applicable)
- ☑ Trace Courier ☐ Client Drop-off ☐ UPS ☐ Fed Ex ☐ US Mail ☐ Other

Sample Condition

Yes / No / N/A
- ☑ / ☐ / ☐ All sample containers arrived unbroken and labeled
- ☑ / ☐ / ☐ Sufficient sample to run requested analyses
- ☑ / ☐ / ☐ Correct chemical preservative added to samples
- ☐ / ☑ / ☐ Samples preserved at Trace
- ☑ / ☐ / ☐ Chemical preservation verified, check EMD pH test strip used (if applicable)
  - ☑ pH 0-2.5 (Lot: HC201854) ☐ pH 11.0-13.0 (Lot: HC022540) ☐ Other
- ☐ / ☐ / ☑ Air bubbles absent from VOAs

Chain of Custody (COC)

Yes / No
- ☑ / ☐ All bottle labels agree with COC
- ☑ / ☐ COC filled out properly
- ☑ / ☐ COC signed by client

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www.trace-labs.com

23J1216
HDR Michigan Inc.
Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:38									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	-0.4	-0.8			✓				
Representative Sample Temp °C	11.6	11.2			✓				✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [x] Trace Courier [ ] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [ ] [x] [ ] Samples preserved at Trace
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

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23J1216
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Project Manager: Jon Mink

Sample Log In Checklist

	Original Observation	Corrected Temperature	IR-9 (CF: -0.4°C)	IR-10 (CF: -0.6°C)	IR-12 (CF: -0.4°C)	SR1 (CF: -0.2°C)	SR2 (CF: -0.1°C)	Temp Blank	Client Sample
Date: 10/25/23									
Time: 9:47									
Logged by: BV									
Package Description: Cooler									
Package Temp °C	0.3	-0.1			✓				
Representative Sample Temp °C	11.9	11.5			✓				✓

Sample Receipt

Yes No
- [x] [ ] Received on ice or other coolant
- [x] [ ] Ice still present upon receipt
- [ ] [x] Custody seals present — [ ] Yes [ ] No Custody seals intact (if applicable)
- [x] Trace Courier [ ] Client Drop-off [ ] UPS [ ] Fed Ex [ ] US Mail [ ] Other

Sample Condition

Yes No N/A
- [x] [ ] [ ] All sample containers arrived unbroken and labeled
- [x] [ ] [ ] Sufficient sample to run requested analyses
- [x] [ ] [ ] Correct chemical preservative added to samples
- [ ] [x] [ ] Samples preserved at Trace
- [x] [ ] [ ] Chemical preservation verified, check EMD pH test strip used (if applicable)
  - [x] pH 0-2.5 (Lot: HC201854) [ ] pH 11.0-13.0 (Lot: HC022540) [ ] Other
- [ ] [ ] [x] Air bubbles absent from VOAs

Chain of Custody (COC)

Yes No
- [x] [ ] All bottle labels agree with COC
- [x] [ ] COC filled out properly
- [x] [ ] COC signed by client

Notes:

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Appendix E

LCL Statistical Evaluation

Table 1: Summary Statistics, Non-Detects Included

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	110	110	70	160	34	0.31	47	0.27	-1.4
1_11_4_107	MW-01R	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	229	240	130	310	60	0.26	59	-0.32	-0.81
1_11_4_108	MW-01R	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	147	150	52	210	44	0.30	30	-1.1	2.2
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	12	14	8.1	15	2.8	0.23	1.5	-0.34	-2.1
1_11_4_120	MW-01R	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	7.6	7.8	6.0	7.8	0.58	0.076	0.059	-3	8.9
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Normal	Gamma	428	400	8.8	780	271	0.63	281	-0.12	-0.97
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2356	2400	2100	2600	142	0.060	0	-0.31	0.93
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.00045	0.00033	0.00022	0.0012	0.00032	0.72	0.00015	1.9	3.5
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0014	0.0013	0.00073	0.0020	0.00045	0.32	0.00059	-0.24	-0.80
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.31	0.29	0.21	0.56	0.11	0.34	0.059	1.8	4
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00025	0.00021	0.00012	0.00036	0.000081	0.33	0.000074	0.17	-1.0
1_11_5_106	MW-01R	Appendix IV	Cadmium	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00015	0.00011	0.000032	0.00038	0.00012	0.80	0.000074	1.2	0.070
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0023	0.0019	0.0013	0.0043	0.0011	0.47	0.00074	1.2	0.37
1_11_5_110	MW-01R	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0017	0.0012	0.00081	0.0045	0.0011	0.67	0.00058	2.2	5.2
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	12	14	8.1	15	2.8	0.23	1.5	-0.34	-2.1
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0014	0.0010	0.00044	0.0053	0.0015	1.1	0.00030	2.8	8.2
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.4	2.3	1.5	3.4	0.76	0.31	1.0	0.037	-1.9
1_11_5_117	MW-01R	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_11_5_118	MW-01R	Appendix IV	Molybdenum	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0011	0.00077	0.00033	0.0031	0.00087	0.76	0.00022	1.8	2.9
1_11_5_121	MW-01R	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-29 to 2023-10-24		Nonparametric	0.91	0.83	0.60	1.3	0.27	0.29	0.34	0.32	-1.8
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00064	0.00060	0.00030	0.00097	0.00018	0.28	0.000089	-0.026	1.8
1_11_5_125	MW-01R	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00024	0.00038	0.000075	0.00038	0.00016	0.66	0	-0.27	-2.6
1_11_6_111	MW-01R	Part 115	Copper	mg/L	9	5	56%	2022-11-29 to 2023-10-24		Nonparametric	0.00037	0.00020	0.00020	0.0013	0.00036	0.98	0	2.7	7.6
1_11_6_114	MW-01R	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.57	0.55	0.16	1.1	0.29	0.51	0.30	0.34	0.27
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0024	0.0021	0.0013	0.0053	0.0012	0.51	0.00074	2.0	4.9
1_11_6_123	MW-01R	Part 115	Silver	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.00010	0.86	0	0.86	-1.7
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0017	0.0013	0.00062	0.0046	0.0014	0.83	0.00093	1.4	0.95
1_11_6_130	MW-01R	Part 115	Zinc	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	0.0048	0.0013	0.0012	0.014	0.0055	1.1	0.00015	1.1	-0.76
1_15_4_105	MW-06	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	9.7	9.7	7.5	12	1.3	0.13	0.44	0.048	0.87
1_15_4_107	MW-06	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	254	250	220	310	30	0.12	30	0.87	-0.18
1_15_4_108	MW-06	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	92	79	57	160	32	0.35	12	1.3	1.4
1_15_4_112	MW-06	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	1.0	1.4	0.16	0.13	0.15	0.47	-1.3
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	7.2	7.3	6.4	7.4	0.29	0.040	0.074	-2.8	8.0
1_15_4_124	MW-06	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	11	9.6	0.41	20	7.4	0.67	9.5	-0.25	-1.3
1_15_4_126	MW-06	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-24		Nonparametric	1222	1200	1100	1300	67	0.055	0	-0.25	-0.040
1_15_5_101	MW-06	Appendix IV	Antimony	mg/L	9	7	78%	2022-11-29 to 2023-10-24		Nonparametric	0.00018	0.00010	0.000050	0.00050	0.00016	0.91	0.000074	1.4	0.76
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00068	0.00065	0.00047	0.0010	0.00016	0.24	0.00016	0.85	0.38
1_15_5_103	MW-06	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	1.4	1.4	0.99	1.6	0.18	0.13	0.15	-1.7	3.8
1_15_5_104	MW-06	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.000052	0.000052	0.000052	0.000054	0.00000067	0.013	0	3	9
1_15_5_106	MW-06	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00011	0.000075	0.000032	0.00038	0.00011	0.98	0.000064	2.0	4.4
1_15_5_109	MW-06	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0019	0.0020	0.0012	0.0030	0.00056	0.30	0.00074	0.74	0.41
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00059	0.00057	0.00046	0.00080	0.00013	0.21	0.00015	0.42	-1.4

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_15_5_113	MW-06	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	1.0	1.4	0.16	0.13	0.15	0.47	-1.3
1_15_5_115	MW-06	Appendix IV	Lead	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00044	0.00027	0.00010	0.0011	0.00039	0.88	0.00025	1.2	0.032
1_15_5_116	MW-06	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.20	0.20	0.15	0.23	0.031	0.16	0.030	-0.69	-0.85
1_15_5_117	MW-06	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_15_5_118	MW-06	Appendix IV	Molybdenum	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00074	0.00062	0.00025	0.0031	0.00091	1.2	0.00052	2.8	8
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-11-29 to 2023-10-24	Lognormal	Lognormal	0.90	0.82	0.62	1.9	0.40	0.44	0.17	2.5	6.7
1_15_5_122	MW-06	Appendix IV	Selenium	mg/L	9	5	56%	2022-11-29 to 2023-10-24		Nonparametric	0.00021	0.00022	0.00019	0.00022	0.000012	0.057	0	-1.1	-0.59
1_15_5_125	MW-06	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00018	0.000075	0.000075	0.00038	0.00015	0.86	0	0.86	-1.7
1_15_6_111	MW-06	Part 115	Copper	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00020	0.00020	0.00020	0.00020	0	0	0	NA	NA
1_15_6_114	MW-06	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	18	18	14	26	3.5	0.19	1.5	1.6	3.7
1_15_6_119	MW-06	Part 115	Nickel	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00092	0.00092	0.00065	0.0012	0.00020	0.21	0.00027	-0.22	-1.2
1_15_6_123	MW-06	Part 115	Silver	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.000100	0.86	0	0.86	-1.7
1_15_6_129	MW-06	Part 115	Vanadium	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00064	0.0000067	0.011	0	3	9
1_15_6_130	MW-06	Part 115	Zinc	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	0.018	0.0018	0.0012	0.094	0.034	1.9	0.00074	1.9	2.4
1_17_4_105	MW-08	Appendix III	Boron	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.2	7.0	2.5	9.3	2.1	0.34	1.2	-0.52	-0.33
1_17_4_107	MW-08	Appendix III	Calcium	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	142	150	120	160	13	0.092	15	-0.52	-0.81
1_17_4_108	MW-08	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	26	28	17	35	6.1	0.23	4.4	-0.42	-0.64
1_17_4_112	MW-08	Appendix III	Fluoride	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.88	1.0	0.40	1.3	0.31	0.35	0.15	-0.47	-1.1
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	2022-12-01 to 2023-10-24	Nonparametric	Nonparametric	7.2	7.2	6.2	7.5	0.37	0.052	0.12	-2.5	7.2
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	3	33%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	8.2	2.0	0.41	26	11	1.3	2.4	1.1	-0.42
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	538	550	440	630	62	0.12	89	-0.090	-0.80
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	9	3	33%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00013	0.00010	0.000054	0.00028	0.000069	0.52	0.000015	1.4	1.6
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.032	0.038	0.0069	0.050	0.016	0.50	0.016	-0.55	-1.3
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.3	1.2	0.98	1.5	0.16	0.13	0.15	-0.11	-0.49
1_17_5_104	MW-08	Appendix IV	Beryllium	mg/L	9	9	100%	2022-12-01 to 2023-10-24		Nonparametric	0.000052	0.000052	0.000052	0.000052	0	0	0	NA	NA
1_17_5_106	MW-08	Appendix IV	Cadmium	mg/L	9	9	100%	2022-12-01 to 2023-10-24		Nonparametric	0.000051	0.000032	0.000032	0.000075	0.000023	0.44	0	0.27	-2.6
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00095	0.00093	0.00061	0.0015	0.00026	0.28	0.00025	0.94	1.5
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00053	0.00058	0.00034	0.00070	0.00013	0.24	0.00010	-0.50	-0.88
1_17_5_113	MW-08	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.88	1.0	0.40	1.3	0.31	0.35	0.15	-0.47	-1.1
1_17_5_115	MW-08	Appendix IV	Lead	mg/L	9	7	78%	2022-12-01 to 2023-10-24		Nonparametric	0.00024	0.00022	0.00010	0.00086	0.00024	1.0	0.00018	2.6	7.5
1_17_5_116	MW-08	Appendix IV	Lithium	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.11	0.11	0.063	0.14	0.027	0.24	0.030	-0.83	-0.091
1_17_5_117	MW-08	Appendix IV	Mercury	mg/L	9	9	100%	2022-12-01 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0014	0.0015	0.00036	0.0028	0.00087	0.62	0.0012	0.36	-1.0
1_17_5_121	MW-08	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	0.61	2.1	0.47	0.39	0.45	0.74	0.39
1_17_5_122	MW-08	Appendix IV	Selenium	mg/L	9	5	56%	2022-12-01 to 2023-10-24		Nonparametric	0.00019	0.00022	0.00014	0.00022	0.000039	0.21	0	-0.35	-2.4
1_17_5_125	MW-08	Appendix IV	Thallium	mg/L	9	9	100%	2022-12-01 to 2023-10-24		Nonparametric	0.000075	0.000075	0.000075	0.000075	0	0	0	NA	NA
1_17_6_111	MW-08	Part 115	Copper	mg/L	9	5	56%	2022-12-01 to 2023-10-24		Nonparametric	0.00027	0.00020	0.00020	0.00045	0.00011	0.40	0	1.1	-0.72
1_17_6_114	MW-08	Part 115	Iron	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	21	21	13	32	6.3	0.30	4.4	0.67	-0.31
1_17_6_119	MW-08	Part 115	Nickel	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0011	0.0011	0.00085	0.0015	0.00020	0.18	0.00025	0.51	-0.18
1_17_6_123	MW-08	Part 115	Silver	mg/L	9	9	100%	2022-12-01 to 2023-10-24		Nonparametric	0.000050	0.000050	0.000050	0.000050	0	0	0	NA	NA
1_17_6_129	MW-08	Part 115	Vanadium	mg/L	9	9	100%	2022-12-01 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
1_17_6_130	MW-08	Part 115	Zinc	mg/L	9	2	22%	2022-12-01 to 2023-10-24	Lognormal	Nonparametric	0.021	0.0018	0.0012	0.12	0.041	2	0.00089	2.2	4.8

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_18_4_105	MW-09	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	5.9	5.9	4.9	6.9	0.60	0.10	0.30	-0.047	0.37
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	341	330	230	430	70	0.20	89	-0.23	-1.3
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	14	12	11	18	2.7	0.20	1.5	0.49	-1.7
1_18_4_112	MW-09	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.6	2.6	2.1	2.9	0.26	0.100	0.30	-0.66	0.26
1_18_4_120	MW-09	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	7.3	7.2	7.2	7.5	0.12	0.016	0.030	1.6	1.9
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	364	450	83	650	212	0.58	296	-0.12	-1.8
1_18_4_126	MW-09	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1267	1400	740	1600	304	0.24	296	-0.53	-0.94
1_18_5_101	MW-09	Appendix IV	Antimony	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00018	0.00010	0.000050	0.00050	0.00016	0.87	0.000040	1.4	0.98
1_18_5_102	MW-09	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.0022	0.0023	0.0013	0.0027	0.00050	0.23	0.00015	-1.3	0.37
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Lognormal	Lognormal	0.53	0.28	0.17	2.4	0.71	1.4	0.15	2.8	8.1
1_18_5_104	MW-09	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.000053	0.000052	0.000052	0.000058	0.0000020	0.038	0	3.0	9.0
1_18_5_106	MW-09	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.000099	0.000075	0.000032	0.00038	0.00011	1.1	0.000064	2.3	5.8
1_18_5_109	MW-09	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0025	0.0027	0.0018	0.0032	0.00058	0.23	0.00074	-0.18	-2.0
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00055	0.00053	0.00024	0.00099	0.00023	0.42	0.00024	0.64	0.15
1_18_5_113	MW-09	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.6	2.6	2.1	2.9	0.26	0.100	0.30	-0.66	0.26
1_18_5_115	MW-09	Appendix IV	Lead	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00041	0.00022	0.00010	0.0011	0.00041	1.0	0.00018	1.3	0.014
1_18_5_116	MW-09	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.31	0.31	0.26	0.34	0.028	0.091	0.030	-0.42	-0.95
1_18_5_117	MW-09	Appendix IV	Mercury	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00041	0.00016	0.00016	0.0024	0.00075	1.8	0	3.0	9.0
1_18_5_118	MW-09	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.022	0.021	0.012	0.033	0.0064	0.29	0.0030	0.24	-0.21
1_18_5_121	MW-09	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.75	0.74	0.64	0.91	0.086	0.11	0.080	0.64	-0.18
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.00023	0.00024	0.00012	0.00028	0.000048	0.20	0.000030	-1.9	4.4
1_18_5_125	MW-09	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00018	0.000075	0.000075	0.00038	0.00015	0.86	0	0.86	-1.7
1_18_6_111	MW-09	Part 115	Copper	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00023	0.00020	0.00020	0.00043	0.000077	0.34	0	3.0	9.0
1_18_6_114	MW-09	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	20	19	15	25	3.9	0.19	4.4	0.38	-1.5
1_18_6_119	MW-09	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0016	0.0012	0.00072	0.0033	0.00081	0.52	0.00071	1.3	1.7
1_18_6_123	MW-09	Part 115	Silver	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.000094	0.000050	0.000050	0.00025	0.000088	0.93	0	1.6	0.73
1_18_6_129	MW-09	Part 115	Vanadium	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
1_18_6_130	MW-09	Part 115	Zinc	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.0057	0.0012	0.0012	0.025	0.0091	1.6	0	1.8	1.8
1_22_4_105	MW-18	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.3	2.3	1.8	3.0	0.40	0.17	0.44	0.46	-0.60
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	337	340	240	450	72	0.22	104	0.039	-1.1
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	23	22	16	28	4.1	0.18	4.4	-0.19	-1.1
1_22_4_112	MW-18	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	4	3.8	3.3	5.1	0.58	0.15	0.44	0.90	0.17
1_22_4_120	MW-18	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.1	7.2	7.0	7.2	0.072	0.010	0.059	-0.62	-0.066
1_22_4_124	MW-18	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	804	760	480	1200	245	0.30	148	0.87	0.020
1_22_4_126	MW-18	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1422	1400	1100	1800	239	0.17	296	0.30	-1.0
1_22_5_101	MW-18	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.00021	0.00013	0.00010	0.00050	0.00014	0.66	0.000015	1.5	1.5
1_22_5_102	MW-18	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.025	0.023	0.015	0.041	0.0079	0.31	0.0089	0.86	0.81
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.019	0.021	0.012	0.025	0.0050	0.26	0.0044	-0.45	-1.6
1_22_5_104	MW-18	Appendix IV	Beryllium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000052	0.000052	0.000052	0.000052	0	0	0	NA	NA
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	9	2	22%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00022	0.00018	0.000075	0.00044	0.00012	0.53	0.00013	0.77	0.44
1_22_5_109	MW-18	Appendix IV	Chromium, Total	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00019	0.00018	0.00018	0.00025	0.000023	0.12	0	2.1	4.8
1_22_5_110	MW-18	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0034	0.0032	0.0017	0.0060	0.0016	0.48	0.0019	0.62	-1.3

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_22_5_113	MW-18	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	4	3.8	3.3	5.1	0.58	0.15	0.44	0.90	0.17
1_22_5_115	MW-18	Appendix IV	Lead	mg/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.00034	0.00022	0.00014	0.0011	0.00030	0.88	0.000089	2.4	6
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.036	0.039	0.026	0.045	0.0079	0.22	0.0089	-0.16	-2.2
1_22_5_117	MW-18	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_22_5_118	MW-18	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.015	0.013	0.0090	0.021	0.0043	0.29	0.0030	0.47	-1.3
1_22_5_121	MW-18	Appendix IV	Radium 226 and 228	pCi/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.71	0.62	0.48	1.3	0.24	0.34	0.16	1.8	3.6
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00045	0.00034	0.00016	0.00086	0.00029	0.66	0.00027	0.57	-1.7
1_22_5_125	MW-18	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00014	0.000075	0.000075	0.00038	0.00013	0.94	0	1.6	0.73
1_22_6_111	MW-18	Part 115	Copper	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal	Gamma	0.00064	0.00047	0.00043	0.0015	0.00036	0.56	0.000059	2.2	4.9
1_22_6_114	MW-18	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.5	5.8	4.3	10	1.9	0.29	1.5	0.95	0.18
1_22_6_119	MW-18	Part 115	Nickel	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0073	0.0074	0.0047	0.011	0.0026	0.36	0.0036	0.46	-1.6
1_22_6_123	MW-18	Part 115	Silver	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000094	0.000050	0.000050	0.00025	0.000088	0.93	0	1.6	0.73
1_22_6_129	MW-18	Part 115	Vanadium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
1_22_6_130	MW-18	Part 115	Zinc	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.057	0.060	0.028	0.088	0.019	0.33	0.021	0.029	-0.43
1_23_4_105	MW-19	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.1	2.0	1.5	2.6	0.40	0.19	0.44	0.13	-1.2
1_23_4_107	MW-19	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	480	480	360	550	56	0.12	44	-1.1	2.0
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	51	46	37	75	14	0.27	12	0.75	-1.0
1_23_4_112	MW-19	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2	1.9	1.7	2.3	0.20	0.10	0.15	0.31	-1.1
1_23_4_120	MW-19	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	6.9	6.9	6.4	7.1	0.20	0.028	0.12	-2.2	5.8
1_23_4_124	MW-19	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1037	1100	600	1300	242	0.23	296	-0.73	-0.50
1_23_4_126	MW-19	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1978	2000	1600	2200	239	0.12	296	-0.87	-0.58
1_23_5_101	MW-19	Appendix IV	Antimony	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00021	0.00010	0.000050	0.00072	0.00024	1.1	0.000074	1.6	1.6
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0054	0.0055	0.0031	0.0073	0.0016	0.29	0.0018	-0.48	-1.2
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.041	0.040	0.030	0.050	0.0063	0.15	0.0059	-0.34	-0.37
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	9	3	33%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.000085	0.000063	0.000052	0.00026	0.000066	0.78	0.000013	2.9	8.5
1_23_5_106	MW-19	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00011	0.000075	0.000032	0.00038	0.00011	0.98	0.000064	2.0	4.4
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	9	4	44%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00036	0.00029	0.00018	0.00088	0.00022	0.62	0.00013	1.9	3.7
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00056	0.00050	0.00013	0.00096	0.00024	0.43	0.00028	-0.12	0.26
1_23_5_113	MW-19	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2	1.9	1.7	2.3	0.20	0.10	0.15	0.31	-1.1
1_23_5_115	MW-19	Appendix IV	Lead	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00050	0.00022	0.00010	0.0011	0.00046	0.92	0.00018	0.63	-1.8
1_23_5_116	MW-19	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.097	0.098	0.085	0.11	0.0090	0.093	0.012	0.47	-0.97
1_23_5_117	MW-19	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_23_5_118	MW-19	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.010	0.011	0.0051	0.013	0.0024	0.24	0.0022	-1.2	2.1
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.89	0.93	0.56	1.2	0.24	0.27	0.29	-0.44	-1.7
1_23_5_122	MW-19	Appendix IV	Selenium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00026	0.00022	0.00010	0.0011	0.00032	1.2	0.00018	2.8	8.1
1_23_5_125	MW-19	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00021	0.000075	0.000075	0.00038	0.00016	0.76	0	0.27	-2.6
1_23_6_111	MW-19	Part 115	Copper	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00029	0.00020	0.00020	0.0010	0.00027	0.92	0	3.0	9.0
1_23_6_114	MW-19	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	16	15	12	24	3.6	0.23	3	1.6	3.3
1_23_6_119	MW-19	Part 115	Nickel	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0020	0.0017	0.0011	0.0032	0.00074	0.38	0.00089	0.45	-1.2
1_23_6_123	MW-19	Part 115	Silver	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.00010	0.86	0	0.86	-1.7
1_23_6_129	MW-19	Part 115	Vanadium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00090	0.00062	0.00062	0.0031	0.00083	0.92	0	3.0	9.0
1_23_6_130	MW-19	Part 115	Zinc	mg/L	9	7	78%	2022-11-30 to 2023-10-24		Nonparametric	0.0022	0.0012	0.0012	0.0059	0.0017	0.79	0	1.7	2

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_24_4_105	MW-20	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.96	0.92	0.80	1.1	0.14	0.14	0.18	0.072	-2.3
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Normal	Normal	124	130	58	170	30	0.24	15	-1.2	3.5
1_24_4_108	MW-20	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	72	70	60	92	11	0.15	5.9	1.1	0.26
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.27	0.23	0.21	0.55	0.11	0.40	0.030	2.8	8.2
1_24_4_120	MW-20	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.3	7.3	7.1	7.5	0.12	0.017	0.15	0.13	-1.2
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	66	76	19	120	36	0.55	50	0.18	-1.5
1_24_4_126	MW-20	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	677	660	570	770	60	0.089	30	0.097	0.55
1_24_5_101	MW-20	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.000099	0.00010	0.000054	0.00016	0.000035	0.36	0.000050	0.47	-0.47
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0014	0.0015	0.0012	0.0017	0.00021	0.15	0.00030	0.045	-1.9
1_24_5_103	MW-20	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.51	0.47	0.31	0.94	0.18	0.36	0.089	1.8	4.0
1_24_5_104	MW-20	Appendix IV	Beryllium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000052	0.000052	0.000052	0.000052	0	0	0	NA	NA
1_24_5_106	MW-20	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000051	0.000032	0.000032	0.000075	0.000023	0.44	0	0.27	-2.6
1_24_5_109	MW-20	Appendix IV	Chromium, Total	mg/L	9	5	56%	2022-11-30 to 2023-10-24		Nonparametric	0.00021	0.00020	0.00018	0.00029	0.000035	0.16	0.000015	1.7	2.5
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0013	0.0013	0.00095	0.0016	0.00021	0.16	0.00015	-0.42	0.052
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.27	0.23	0.21	0.55	0.11	0.40	0.030	2.8	8.2
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0021	0.0023	0.0016	0.0028	0.00049	0.23	0.00074	0.24	-1.6
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.066	0.065	0.049	0.083	0.011	0.17	0.013	-0.014	-0.94
1_24_5_117	MW-20	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0043	0.0041	0.0036	0.0051	0.00053	0.12	0.00074	0.13	-1.7
1_24_5_121	MW-20	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-30 to 2023-10-24		Nonparametric	0.74	0.59	0.47	1.5	0.34	0.45	0.13	1.6	2.1
1_24_5_122	MW-20	Appendix IV	Selenium	mg/L	9	5	56%	2022-11-30 to 2023-10-24		Nonparametric	0.00017	0.00022	0.00010	0.00022	0.000057	0.33	0	-0.33	-2.4
1_24_5_125	MW-20	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000075	0.000075	0.000075	0.000075	0	0	0	NA	NA
1_24_6_111	MW-20	Part 115	Copper	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00030	0.00025	0.00020	0.00053	0.00010	0.35	0.000059	1.7	3.0
1_24_6_114	MW-20	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	19	19	16	22	1.9	0.097	1.5	-0.33	-0.29
1_24_6_119	MW-20	Part 115	Nickel	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.0089	0.0092	0.0066	0.0099	0.0011	0.12	0.00044	-1.6	2.3
1_24_6_123	MW-20	Part 115	Silver	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000050	0.000050	0.000050	0.000050	0	0	0	NA	NA
1_24_6_129	MW-20	Part 115	Vanadium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
1_24_6_130	MW-20	Part 115	Zinc	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.035	0.028	0.024	0.071	0.017	0.49	0.0044	1.7	1.3
1_25_4_105	MW-30	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal	Gamma	2.1	1.9	1.7	3.5	0.55	0.26	0.30	2.4	6.5
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Nonparametric	Nonparametric	498	460	390	960	176	0.35	44	2.8	8.2
1_25_4_108	MW-30	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	137	120	97	190	42	0.31	33	0.52	-1.9
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.1	1.1	0.91	1.4	0.14	0.13	0.15	0.77	1.1
1_25_4_120	MW-30	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Normal	Normal	7.1	7.2	6.5	7.2	0.23	0.033	0.13	-2.2	5.2
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	864	860	610	1000	119	0.14	119	-1.2	1.7
1_25_4_126	MW-30	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	2233	2200	1800	2800	278	0.12	148	0.68	1.8
1_25_5_101	MW-30	Appendix IV	Antimony	mg/L	9	8	89%	2022-11-30 to 2023-10-23		Nonparametric	0.00022	0.00010	0.000050	0.00050	0.00020	0.88	0.000074	0.64	-1.6
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	9	2	22%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00040	0.00043	0.00010	0.00070	0.00021	0.52	0.00024	-0.19	-0.84
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.068	0.058	0.045	0.10	0.023	0.33	0.016	0.63	-1.5
1_25_5_104	MW-30	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-30 to 2023-10-23		Nonparametric	0.000075	0.000052	0.000052	0.00026	0.000069	0.92	0	3	9
1_25_5_106	MW-30	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00011	0.000075	0.000032	0.00038	0.00011	0.98	0.000064	2.0	4.4
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0099	0.010	0.0052	0.014	0.0031	0.32	0.0030	-0.29	-1.3
1_25_5_110	MW-30	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal	Gamma	0.0015	0.0011	0.00053	0.0044	0.0013	0.84	0.00030	1.8	3

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.1	1.1	0.91	1.4	0.14	0.13	0.15	0.77	1.1
1_25_5_115	MW-30	Appendix IV	Lead	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00059	0.00050	0.00010	0.0011	0.00041	0.68	0.00041	0.39	-1.7
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal	Gamma	0.14	0.12	0.11	0.27	0.050	0.36	0.015	2.6	7.3
1_25_5_117	MW-30	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_25_5_118	MW-30	Appendix IV	Molybdenum	mg/L	9	3	33%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0017	0.0011	0.00032	0.0036	0.0013	0.76	0.00089	0.60	-1.6
1_25_5_121	MW-30	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-30 to 2023-10-23		Nonparametric	0.70	0.66	0.44	0.91	0.17	0.24	0.20	-0.066	-1.5
1_25_5_122	MW-30	Appendix IV	Selenium	mg/L	9	6	67%	2022-11-30 to 2023-10-23		Nonparametric	0.00027	0.00022	0.00010	0.0011	0.00032	1.2	0.00013	2.8	8.3
1_25_5_125	MW-30	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00028	0.00038	0.000075	0.00038	0.00015	0.55	0	-0.86	-1.7
1_25_6_111	MW-30	Part 115	Copper	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.00035	0.00020	0.00020	0.0010	0.00027	0.79	0	2.1	4.5
1_25_6_114	MW-30	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	3.1	2.9	0.87	8.8	2.4	0.78	1.8	1.8	4.1
1_25_6_119	MW-30	Part 115	Nickel	mg/L	9	2	22%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0021	0.0018	0.00065	0.0045	0.0015	0.71	0.0016	0.67	-1.2
1_25_6_123	MW-30	Part 115	Silver	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.00010	0.86	0	0.86	-1.7
1_25_6_129	MW-30	Part 115	Vanadium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00090	0.00062	0.00062	0.0031	0.00083	0.92	0	3.0	9.0
1_25_6_130	MW-30	Part 115	Zinc	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.0026	0.0012	0.0012	0.0059	0.0021	0.81	0	0.91	-1.5
1_26_4_105	MW-31	Appendix III	Boron	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.5	4.5	3.6	5.4	0.61	0.14	0.74	0.052	-1.2
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	169	170	130	200	21	0.12	15	-0.45	0.46
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	104	100	92	120	9.3	0.089	12	0.45	-0.75
1_26_4_112	MW-31	Appendix III	Fluoride	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.8	4.7	4.6	5.2	0.24	0.051	0.15	0.49	-1.8
1_26_4_120	MW-31	Appendix III	pH (field)	su	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.8	7.8	7.7	8.0	0.099	0.013	0.089	0.36	0.47
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	176	180	72	250	68	0.39	104	-0.25	-1.4
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	817	810	730	940	67	0.081	74	0.55	-0.21
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	9	4	44%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.000097	0.00010	0.000050	0.00013	0.000026	0.27	0.000030	-0.57	-0.42
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0014	0.0013	0.0010	0.0018	0.00027	0.20	0.00030	0.41	-0.91
1_26_5_103	MW-31	Appendix IV	Barium	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.17	0.16	0.12	0.23	0.037	0.22	0.044	0.66	-0.63
1_26_5_104	MW-31	Appendix IV	Beryllium	mg/L	9	9	100%	2022-12-01 to 2023-10-23		Nonparametric	0.000052	0.000052	0.000052	0.000052	0	0	0	NA	NA
1_26_5_106	MW-31	Appendix IV	Cadmium	mg/L	9	9	100%	2022-12-01 to 2023-10-23		Nonparametric	0.000051	0.000032	0.000032	0.000075	0.000023	0.44	0	0.27	-2.6
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0022	0.0023	0.0018	0.0029	0.00035	0.16	0.00030	0.61	0.13
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00017	0.00018	0.00013	0.00021	0.000026	0.15	0.000030	-0.044	-0.73
1_26_5_113	MW-31	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.8	4.7	4.6	5.2	0.24	0.051	0.15	0.49	-1.8
1_26_5_115	MW-31	Appendix IV	Lead	mg/L	9	8	89%	2022-12-01 to 2023-10-23		Nonparametric	0.00019	0.00022	0.00010	0.00031	0.000073	0.39	0	-0.13	-0.82
1_26_5_116	MW-31	Appendix IV	Lithium	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.052	0.052	0.046	0.056	0.0032	0.063	0.0030	-0.53	-0.65
1_26_5_117	MW-31	Appendix IV	Mercury	mg/L	9	9	100%	2022-12-01 to 2023-10-23		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Nonparametric	Nonparametric	0.0014	0.0013	0.0011	0.0021	0.00035	0.26	0.00030	1.5	1.5
1_26_5_121	MW-31	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.76	0.72	0.50	1.2	0.25	0.33	0.19	1.2	0.30
1_26_5_122	MW-31	Appendix IV	Selenium	mg/L	9	5	56%	2022-12-01 to 2023-10-23		Nonparametric	0.00018	0.00022	0.00011	0.00022	0.000049	0.27	0	-0.46	-2.0
1_26_5_125	MW-31	Appendix IV	Thallium	mg/L	9	9	100%	2022-12-01 to 2023-10-23		Nonparametric	0.000075	0.000075	0.000075	0.000075	0	0	0	NA	NA
1_26_6_111	MW-31	Part 115	Copper	mg/L	9	8	89%	2022-12-01 to 2023-10-23		Nonparametric	0.00021	0.00020	0.00020	0.00027	0.000023	0.11	0	3.0	9.0
1_26_6_114	MW-31	Part 115	Iron	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.1	1.1	0.13	2.5	0.72	0.66	0.49	0.62	1.1
1_26_6_119	MW-31	Part 115	Nickel	mg/L	9	9	100%	2022-12-01 to 2023-10-23		Nonparametric	0.00065	0.00065	0.00065	0.00065	0	0	0	NA	NA
1_26_6_123	MW-31	Part 115	Silver	mg/L	9	9	100%	2022-12-01 to 2023-10-23		Nonparametric	0.000050	0.000050	0.000050	0.000050	0	0	0	NA	NA
1_26_6_129	MW-31	Part 115	Vanadium	mg/L	9	9	100%	2022-12-01 to 2023-10-23		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
1_26_6_130	MW-31	Part 115	Zinc	mg/L	9	6	67%	2022-12-01 to 2023-10-23		Nonparametric	0.0030	0.0012	0.0012	0.010	0.0035	1.2	0	1.7	1.2

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_12_4_105	MW-02	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	95	98	73	110	12	0.12	15	-0.61	0.35
2_12_4_107	MW-02	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	202	210	180	240	19	0.095	30	0.68	0.50
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	133	140	67	150	25	0.19	0	-2.7	7.6
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	8.9	9.4	4.5	10	1.7	0.19	0.44	-2.7	7.5
2_12_4_120	MW-02	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.2	7.2	7.1	7.4	0.13	0.019	0.15	0.38	-1.2
2_12_4_124	MW-02	Appendix III	Sulfate (as SO4)	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.79	0.41	0.41	2.2	0.59	0.75	0	1.9	4.1
2_12_4_126	MW-02	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1800	1800	1600	2100	150	0.083	148	0.86	0.83
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00029	0.00024	0.00015	0.00063	0.00017	0.58	0.000089	1.5	1.2
2_12_5_102	MW-02	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal	Gamma	0.0087	0.0083	0.0074	0.012	0.0014	0.16	0.00074	1.9	4.1
2_12_5_103	MW-02	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.48	0.48	0.38	0.55	0.054	0.11	0.044	-0.56	-0.32
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00033	0.00032	0.00015	0.00052	0.00011	0.35	0.00015	0.13	-0.34
2_12_5_106	MW-02	Appendix IV	Cadmium	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.00016	0.000075	0.000032	0.00049	0.00016	1.0	0.000064	1.4	0.83
2_12_5_109	MW-02	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.042	0.046	0.019	0.068	0.017	0.41	0.021	-0.050	-1.5
2_12_5_110	MW-02	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0060	0.0063	0.0031	0.0089	0.0020	0.34	0.0025	-0.19	-1.3
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	8.9	9.4	4.5	10	1.7	0.19	0.44	-2.7	7.5
2_12_5_115	MW-02	Appendix IV	Lead	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0025	0.0024	0.0010	0.0041	0.0010	0.41	0.00089	0.35	-0.70
2_12_5_116	MW-02	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.4	1.4	0.87	1.7	0.26	0.19	0.30	-0.55	0.0021
2_12_5_117	MW-02	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Lognormal	Lognormal	0.0072	0.0062	0.0051	0.011	0.0024	0.33	0.0015	0.93	-0.87
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.9	1.7	0.69	3.4	0.87	0.45	1.1	0.19	-0.60
2_12_5_122	MW-02	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0011	0.0012	0.00050	0.0018	0.00035	0.31	0.00030	0.13	1.7
2_12_5_125	MW-02	Appendix IV	Thallium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00024	0.000075	0.000075	0.00062	0.00021	0.87	0	0.80	-0.67
2_12_6_111	MW-02	Part 115	Copper	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0018	0.0018	0.00081	0.0026	0.00064	0.35	0.0010	-0.31	-1.1
2_12_6_114	MW-02	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	24	24	18	30	3.7	0.16	4.4	0.056	-0.35
2_12_6_119	MW-02	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.023	0.022	0.014	0.042	0.0094	0.40	0.0074	1.2	0.54
2_12_6_123	MW-02	Part 115	Silver	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.00010	0.86	0	0.86	-1.7
2_12_6_129	MW-02	Part 115	Vanadium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0035	0.0035	0.0013	0.0067	0.0017	0.48	0.0013	0.48	0.29
2_12_6_130	MW-02	Part 115	Zinc	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.0076	0.0033	0.0019	0.025	0.0093	1.2	0.0012	1.6	0.78
2_13_4_105	MW-03	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	4.1	4.2	3.3	4.4	0.34	0.082	0.15	-2	4.4
2_13_4_107	MW-03	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	379	390	290	430	41	0.11	30	-1.2	2
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	191	180	140	300	50	0.26	30	1.5	2.1
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.70	0.60	0.52	1.6	0.34	0.49	0.074	2.9	8.6
2_13_4_120	MW-03	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.4	7.3	7.2	7.6	0.12	0.016	0.074	0.98	0.64
2_13_4_124	MW-03	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Normal	Normal	456	480	42	760	220	0.48	148	-0.61	0.40
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24		Nonparametric	2211	2300	1700	2300	196	0.089	0	-2.7	7.8
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00024	0.00011	0.000087	0.00050	0.00019	0.77	0.000034	0.66	-1.8
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00089	0.00091	0.00049	0.0012	0.00026	0.30	0.00028	-0.57	-1.1
2_13_5_103	MW-03	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.37	0.38	0.13	0.50	0.11	0.29	0.074	-1.4	3
2_13_5_104	MW-03	Appendix IV	Beryllium	mg/L	9	7	78%	2022-11-28 to 2023-10-24		Nonparametric	0.000086	0.000052	0.000052	0.00026	0.000073	0.85	0	2.2	4.4
2_13_5_106	MW-03	Appendix IV	Cadmium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00012	0.000075	0.000032	0.00038	0.00011	0.94	0.000064	1.9	4.2
2_13_5_109	MW-03	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0049	0.0049	0.0030	0.0073	0.0014	0.29	0.0018	0.20	-0.80
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00085	0.00088	0.00044	0.0013	0.00033	0.39	0.00047	-0.12	-1.5

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.70	0.60	0.52	1.6	0.34	0.49	0.074	2.9	8.6
2_13_5_115	MW-03	Appendix IV	Lead	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00061	0.00050	0.00022	0.0011	0.00039	0.64	0.00041	0.50	-1.7
2_13_5_116	MW-03	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.043	0.041	0.035	0.065	0.0095	0.22	0.0059	1.6	3.0
2_13_5_117	MW-03	Appendix IV	Mercury	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00017	0.00016	0.00016	0.00024	0.000027	0.16	0	3.0	9
2_13_5_118	MW-03	Appendix IV	Molybdenum	mg/L	9	7	78%	2022-11-28 to 2023-10-24		Nonparametric	0.0011	0.00062	0.00025	0.0031	0.0012	1.1	0.00055	1.5	0.48
2_13_5_121	MW-03	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.3	0.75	1.9	0.41	0.33	0.51	0.54	-0.81
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	9	3	33%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00042	0.00040	0.00017	0.0011	0.00028	0.66	0.00019	2.0	5
2_13_5_125	MW-03	Appendix IV	Thallium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00029	0.00038	0.000075	0.00038	0.00014	0.48	0	-1.0	-1.1
2_13_6_111	MW-03	Part 115	Copper	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00039	0.00024	0.00020	0.0010	0.00032	0.83	0.000059	1.6	0.79
2_13_6_114	MW-03	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	1.9	1.6	0.28	5.9	1.9	0.97	1.7	1.3	1.4
2_13_6_119	MW-03	Part 115	Nickel	mg/L	9	1	11%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.0031	0.0016	0.00085	0.015	0.0045	1.4	0.00030	2.9	8.4
2_13_6_123	MW-03	Part 115	Silver	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.00010	0.86	0	0.86	-1.7
2_13_6_129	MW-03	Part 115	Vanadium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00096	0.00062	0.00062	0.0031	0.00083	0.86	0	2.7	7.6
2_13_6_130	MW-03	Part 115	Zinc	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.0057	0.0019	0.0012	0.019	0.0074	1.3	0.0010	1.5	0.42
2_14_4_105	MW-04	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	4.0	4.0	3.5	4.7	0.34	0.085	0.30	0.80	1.5
2_14_4_107	MW-04	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	361	360	310	410	33	0.092	44	0.11	-0.95
2_14_4_108	MW-04	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	202	200	150	300	44	0.22	30	1.4	2.9
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.3	1.3	0.76	1.9	0.29	0.22	0.15	0.28	3.1
2_14_4_120	MW-04	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.4	7.3	7.2	7.7	0.13	0.017	0.12	1.3	2.5
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	529	610	1.8	700	216	0.41	119	-2.2	5.2
2_14_4_126	MW-04	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1889	1900	1700	2100	154	0.081	148	0.24	-1.3
2_14_5_101	MW-04	Appendix IV	Antimony	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.00023	0.00012	0.000050	0.00050	0.00019	0.85	0.00010	0.62	-1.7
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00092	0.00092	0.00047	0.0012	0.00027	0.29	0.00041	-0.46	-0.87
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.16	0.12	0.10	0.46	0.11	0.72	0.015	2.9	8.6
2_14_5_104	MW-04	Appendix IV	Beryllium	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.000052	0.000052	0.000052	0.000052	0	0	0	NA	NA
2_14_5_106	MW-04	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00011	0.000075	0.000032	0.00038	0.00011	0.98	0.000064	2.0	4.4
2_14_5_109	MW-04	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0040	0.0044	0.0026	0.0060	0.0012	0.31	0.0019	0.24	-1.3
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00056	0.00062	0.00031	0.00093	0.00021	0.37	0.00025	0.44	-0.56
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.3	1.3	0.76	1.9	0.29	0.22	0.15	0.28	3.1
2_14_5_115	MW-04	Appendix IV	Lead	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00045	0.00022	0.00010	0.0011	0.00040	0.88	0.00018	1.1	-0.28
2_14_5_116	MW-04	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.064	0.066	0.047	0.074	0.0095	0.15	0.012	-0.64	-0.38
2_14_5_117	MW-04	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	9	2	22%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0011	0.00086	0.00041	0.0031	0.00083	0.74	0.00062	1.9	4.2
2_14_5_121	MW-04	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.2	0.66	1.6	0.31	0.26	0.30	-0.73	-0.51
2_14_5_122	MW-04	Appendix IV	Selenium	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00022	0.00022	0.00010	0.00041	0.000082	0.37	0.000015	1.3	4.2
2_14_5_125	MW-04	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00021	0.000075	0.000075	0.00038	0.00016	0.76	0	0.27	-2.6
2_14_6_111	MW-04	Part 115	Copper	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00021	0.00020	0.00020	0.00027	0.000023	0.11	0	3.0	9.0
2_14_6_114	MW-04	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	5.9	6.1	4.7	6.8	0.74	0.13	0.74	-0.42	-0.91
2_14_6_119	MW-04	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Normal	Normal	0.014	0.013	0.0019	0.022	0.0060	0.42	0.0074	-0.93	1.2
2_14_6_123	MW-04	Part 115	Silver	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.00010	0.86	0	0.86	-1.7
2_14_6_129	MW-04	Part 115	Vanadium	mg/L	9	9	100%	2022-11-28 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
2_14_6_130	MW-04	Part 115	Zinc	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.0021	0.0012	0.0012	0.0059	0.0018	0.84	0	1.8	2

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_16_4_105	MW-07	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	11	11	10	13	0.88	0.077	1.5	0.21	0.14
2_16_4_107	MW-07	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	142	140	120	160	12	0.085	15	-0.54	0.27
2_16_4_108	MW-07	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24		Nonparametric	14	14	13	15	0.78	0.056	1.5	0.22	-1.0
2_16_4_112	MW-07	Appendix III	Fluoride	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.10	0.11	0.055	0.14	0.033	0.32	0.044	-0.18	-1.7
2_16_4_120	MW-07	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Lognormal; Normal	Normal	6.8	6.9	6.6	7.0	0.14	0.021	0.074	-1.0	0.58
2_16_4_124	MW-07	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	23	20	15	33	6.6	0.29	7.4	0.37	-1.7
2_16_4_126	MW-07	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Lognormal; Normal	Normal	613	620	470	720	80	0.13	59	-0.94	0.30
2_16_5_101	MW-07	Appendix IV	Antimony	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.000075	0.000071	0.000050	0.00010	0.000025	0.34	0.000031	0.068	-2.4
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00021	0.00021	0.00013	0.00029	0.000043	0.21	0.000030	-0.11	1.7
2_16_5_103	MW-07	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.33	0.34	0.25	0.38	0.038	0.11	0.015	-1.4	2.4
2_16_5_104	MW-07	Appendix IV	Beryllium	mg/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.000055	0.000052	0.000052	0.000066	0.0000053	0.096	0	1.6	1.4
2_16_5_106	MW-07	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000051	0.000032	0.000032	0.000075	0.000023	0.44	0	0.27	-2.6
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00034	0.00033	0.00028	0.00042	0.000047	0.14	0.000059	0.40	-0.79
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00094	0.00098	0.00071	0.0011	0.00011	0.12	0.000044	-0.98	2
2_16_5_113	MW-07	Appendix IV	Fluoride (App IV)	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.10	0.11	0.055	0.14	0.033	0.32	0.044	-0.18	-1.7
2_16_5_115	MW-07	Appendix IV	Lead	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00017	0.00022	0.00010	0.00022	0.000063	0.38	0	-0.27	-2.6
2_16_5_116	MW-07	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0065	0.0062	0.0042	0.010	0.0018	0.27	0.0012	0.93	0.72
2_16_5_117	MW-07	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
2_16_5_118	MW-07	Appendix IV	Molybdenum	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00046	0.00062	0.00025	0.00062	0.00020	0.43	0	-0.27	-2.6
2_16_5_121	MW-07	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.1	1.0	0.67	2.4	0.52	0.48	0.34	2.0	5.0
2_16_5_122	MW-07	Appendix IV	Selenium	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00017	0.00022	0.00010	0.00022	0.000063	0.38	0	-0.27	-2.6
2_16_5_125	MW-07	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000075	0.000075	0.000075	0.000075	0	0	0	NA	NA
2_16_6_111	MW-07	Part 115	Copper	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00021	0.00020	0.00020	0.00027	0.000023	0.11	0	3.0	9.0
2_16_6_114	MW-07	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	15	15	13	19	2.2	0.14	3	0.47	-1.2
2_16_6_119	MW-07	Part 115	Nickel	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00065	0.00065	0.00065	0.00065	0	0	0	NA	NA
2_16_6_123	MW-07	Part 115	Silver	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.000050	0.000050	0.000050	0.000050	0	0	0	NA	NA
2_16_6_129	MW-07	Part 115	Vanadium	mg/L	9	9	100%	2022-11-30 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
2_16_6_130	MW-07	Part 115	Zinc	mg/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.0057	0.0012	0.0012	0.025	0.0087	1.5	0	1.9	2.5
2_19_4_105	MW-10	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	17	17	4.5	28	8.5	0.49	12	-0.19	-1.6
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal	Gamma	248	220	160	460	88	0.36	44	2.0	4.7
2_19_4_108	MW-10	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	219	170	92	430	111	0.51	74	0.88	-0.16
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	5.7	6.0	2.7	7.7	1.7	0.29	1.9	-0.69	-0.44
2_19_4_120	MW-10	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.9	7.8	7.0	8.8	0.48	0.061	0.16	0.46	1.9
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	487	410	140	950	282	0.58	311	0.65	-0.65
2_19_4_126	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1811	1800	1500	2400	257	0.14	148	1.5	3.5
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	9	5	56%	2022-11-29 to 2023-10-23		Nonparametric	0.00018	0.00011	0.000050	0.00050	0.00015	0.84	0.000089	1.4	1.2
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00057	0.00049	0.00020	0.0011	0.00030	0.53	0.00022	0.80	-0.41
2_19_5_103	MW-10	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.30	0.28	0.14	0.57	0.14	0.47	0.074	1.1	0.65
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	9	3	33%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.000089	0.000054	0.000052	0.00022	0.000059	0.67	0.0000030	1.8	2.6
2_19_5_106	MW-10	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-29 to 2023-10-23		Nonparametric	0.00011	0.000075	0.000032	0.00038	0.00011	0.98	0.000064	2.0	4.4
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0044	0.0042	0.0018	0.0085	0.0022	0.52	0.0024	0.75	-0.028
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00064	0.00041	0.00030	0.0018	0.00047	0.74	0.00016	2.2	5.2

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	5.7	6.0	2.7	7.7	1.7	0.29	1.9	-0.69	-0.44
2_19_5_115	MW-10	Appendix IV	Lead	mg/L	9	7	78%	2022-11-29 to 2023-10-23		Nonparametric	0.00052	0.00023	0.00010	0.0011	0.00045	0.88	0.00019	0.65	-1.8
2_19_5_116	MW-10	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.99	0.94	0.54	1.6	0.29	0.30	0.16	0.82	1.9
2_19_5_117	MW-10	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-29 to 2023-10-23		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
2_19_5_118	MW-10	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0039	0.0035	0.0019	0.0072	0.0017	0.42	0.0012	1.0	0.58
2_19_5_121	MW-10	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	2022-11-29 to 2023-10-23		Nonparametric	0.85	0.78	0.60	1.4	0.24	0.28	0.18	1.4	1.8
2_19_5_122	MW-10	Appendix IV	Selenium	mg/L	9	1	11%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00034	0.00036	0.00022	0.00046	0.000073	0.21	0.000074	-0.15	-0.14
2_19_5_125	MW-10	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-29 to 2023-10-23		Nonparametric	0.00021	0.000076	0.000075	0.00038	0.00016	0.76	0.0000015	0.27	-2.6
2_19_6_111	MW-10	Part 115	Copper	mg/L	9	6	67%	2022-11-29 to 2023-10-23		Nonparametric	0.00037	0.00020	0.00020	0.0013	0.00036	0.97	0	2.6	6.9
2_19_6_114	MW-10	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.7	3.9	2.4	7.3	1.8	0.38	1.0	0.57	-1.2
2_19_6_119	MW-10	Part 115	Nickel	mg/L	9	3	33%	2022-11-29 to 2023-10-23	Gamma; Lognormal	Gamma	0.00093	0.00087	0.00065	0.0018	0.00037	0.40	0.00033	1.9	3.9
2_19_6_123	MW-10	Part 115	Silver	mg/L	9	9	100%	2022-11-29 to 2023-10-23		Nonparametric	0.00012	0.000050	0.000050	0.00025	0.000100	0.86	0	0.86	-1.7
2_19_6_129	MW-10	Part 115	Vanadium	mg/L	9	8	89%	2022-11-29 to 2023-10-23		Nonparametric	0.00070	0.00062	0.00062	0.0013	0.00023	0.32	0	3	9
2_19_6_130	MW-10	Part 115	Zinc	mg/L	9	2	22%	2022-11-29 to 2023-10-23	Lognormal	Nonparametric	0.0042	0.0014	0.0012	0.014	0.0053	1.3	0.00030	1.6	0.75
2_20_4_105	MW-11	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.1	4.8	1.5	13	4.3	0.71	4.1	0.64	-1.1
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	270	300	130	380	87	0.32	89	-0.59	-0.82
2_20_4_108	MW-11	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	73	73	52	95	15	0.21	16	-0.15	-1.1
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.61	0.37	0.21	1.4	0.45	0.74	0.24	0.91	-0.61
2_20_4_120	MW-11	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.3	7.3	7.2	7.5	0.079	0.011	0.074	0.20	-0.41
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	62	17	0.41	210	80	1.3	25	1.3	0.056
2_20_4_126	MW-11	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1131	1100	680	1800	303	0.27	148	1.1	3.2
2_20_5_101	MW-11	Appendix IV	Antimony	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00022	0.00010	0.000050	0.00069	0.00023	1.1	0.000074	1.5	1.1
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0017	0.0016	0.00061	0.0041	0.0010	0.60	0.00074	1.7	3.6
2_20_5_103	MW-11	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.65	0.59	0.36	1.2	0.26	0.40	0.22	1.3	1.7
2_20_5_104	MW-11	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.000056	0.000052	0.000052	0.000091	0.000013	0.23	0	3.0	9.0
2_20_5_106	MW-11	Appendix IV	Cadmium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.00018	0.000075	0.000032	0.00073	0.00023	1.3	0.000064	2.1	4
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Lognormal	Lognormal	0.0018	0.00087	0.00045	0.0086	0.0026	1.5	0.00049	2.9	8.4
2_20_5_110	MW-11	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00058	0.00061	0.00023	0.0012	0.00028	0.49	0.00031	1.3	2.4
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.61	0.37	0.21	1.4	0.45	0.74	0.24	0.91	-0.61
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	9	3	33%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0087	0.0011	0.00017	0.068	0.022	2.6	0.0013	3	8.9
2_20_5_116	MW-11	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	0.076	0.052	0.0059	0.22	0.073	0.96	0.065	1.0	0.41
2_20_5_117	MW-11	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0012	0.0013	0.00043	0.0029	0.00078	0.63	0.00095	1.1	1.5
2_20_5_121	MW-11	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	0.62	1.8	0.38	0.33	0.37	0.50	-0.62
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	9	3	33%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00021	0.00022	0.00014	0.00031	0.000047	0.22	0.000015	0.72	2.3
2_20_5_125	MW-11	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-29 to 2023-10-24		Nonparametric	0.00018	0.000075	0.000075	0.00038	0.00015	0.86	0	0.86	-1.7
2_20_6_111	MW-11	Part 115	Copper	mg/L	9	3	33%	2022-11-29 to 2023-10-24	Lognormal	Nonparametric	0.0025	0.00043	0.00020	0.019	0.0062	2.4	0.00034	3	8.9
2_20_6_114	MW-11	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.6	6.1	3.6	11	2.8	0.42	3.4	0.56	-1.2
2_20_6_119	MW-11	Part 115	Nickel	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	0.0021	0.0013	0.00065	0.0094	0.0027	1.3	0.00030	2.9	8.5
2_20_6_123	MW-11	Part 115	Silver	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.00010	0.000050	0.000050	0.00025	0.000088	0.84	0	1.3	-0.25
2_20_6_129	MW-11	Part 115	Vanadium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
2_20_6_130	MW-11	Part 115	Zinc	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	0.021	0.0049	0.0012	0.10	0.032	1.6	0.0055	2.2	5.2

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_21_4_105	MW-12	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.30	0.27	0.19	0.42	0.083	0.28	0.10	0.22	-1.4
2_21_4_107	MW-12	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	72	77	46	95	17	0.23	21	-0.015	-0.81
2_21_4_108	MW-12	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	20	18	15	27	4.7	0.23	4.4	0.45	-1.7
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Lognormal	Lognormal	0.33	0.26	0.22	0.54	0.12	0.38	0.044	0.96	-0.89
2_21_4_120	MW-12	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.6	7.7	7.0	8.2	0.33	0.043	0.30	-0.48	1.0
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal	Gamma	132	130	99	180	29	0.22	30	1.0	-0.069
2_21_4_126	MW-12	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	288	270	200	420	79	0.27	104	0.35	-1.1
2_21_5_101	MW-12	Appendix IV	Antimony	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00071	0.00071	0.00040	0.0011	0.00024	0.34	0.00031	0.16	-1.1
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0024	0.0024	0.0014	0.0034	0.00069	0.29	0.00074	0.033	-1.4
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.034	0.030	0.017	0.060	0.015	0.44	0.012	0.83	-0.58
2_21_5_104	MW-12	Appendix IV	Beryllium	mg/L	9	9	100%	2022-11-28 to 2023-10-23		Nonparametric	0.000052	0.000052	0.000052	0.000052	0	0	0	NA	NA
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0013	0.0012	0.00062	0.0024	0.00064	0.48	0.00062	0.66	-0.73
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	9	4	44%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00037	0.00034	0.00020	0.00067	0.00018	0.49	0.00021	0.50	-1.2
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	9	3	33%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00026	0.00019	0.00010	0.00053	0.00017	0.68	0.00013	0.74	-1.2
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Lognormal	Lognormal	0.33	0.26	0.22	0.54	0.12	0.38	0.044	0.96	-0.89
2_21_5_115	MW-12	Appendix IV	Lead	mg/L	9	5	56%	2022-11-28 to 2023-10-23		Nonparametric	0.00020	0.00022	0.00014	0.00022	0.000032	0.16	0	-1.6	0.77
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0039	0.0037	0.0022	0.0064	0.0013	0.32	0.00089	0.70	1.1
2_21_5_117	MW-12	Appendix IV	Mercury	mg/L	9	8	89%	2022-11-28 to 2023-10-23		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0075	0.0072	0.0056	0.0096	0.0014	0.19	0.0022	0.035	-1.3
2_21_5_121	MW-12	Appendix IV	Radium 226 and 228	pCi/L	9	7	78%	2022-11-28 to 2023-10-23		Nonparametric	0.65	0.59	0.46	1.1	0.19	0.29	0.11	1.7	3.0
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Gamma	0.0011	0.00093	0.00013	0.0023	0.00084	0.76	0.0011	0.25	-1.6
2_21_5_125	MW-12	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-28 to 2023-10-23		Nonparametric	0.000075	0.000075	0.000075	0.000075	0	0	0	NA	NA
2_21_6_111	MW-12	Part 115	Copper	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0010	0.0010	0.00055	0.0016	0.00034	0.33	0.00030	0.42	-0.37
2_21_6_114	MW-12	Part 115	Iron	mg/L	9	4	44%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.061	0.033	0.026	0.26	0.076	1.2	0.010	2.8	8.2
2_21_6_119	MW-12	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0026	0.0025	0.0016	0.0035	0.00063	0.24	0.00059	0.067	-0.59
2_21_6_123	MW-12	Part 115	Silver	mg/L	9	9	100%	2022-11-28 to 2023-10-23		Nonparametric	0.000050	0.000050	0.000050	0.000050	0	0	0	NA	NA
2_21_6_129	MW-12	Part 115	Vanadium	mg/L	9	5	56%	2022-11-28 to 2023-10-23		Nonparametric	0.00082	0.00062	0.00062	0.0013	0.00027	0.33	0	0.99	-0.61
2_21_6_130	MW-12	Part 115	Zinc	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0079	0.0080	0.0037	0.010	0.0019	0.24	0.0015	-1.5	2.9
2_27_4_105	MW-32	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	3.4	3.1	2.6	5.0	0.74	0.21	0.74	1.2	1.4
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	178	190	130	220	29	0.16	15	-0.41	-0.63
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	46	47	41	50	3.5	0.075	4.4	-0.26	-1.4
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.5	1.5	1.4	1.8	0.13	0.086	0.15	1.2	1.7
2_27_4_120	MW-32	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.6	7.6	7.5	7.8	0.090	0.012	0.10	0.47	-1.4
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	94	100	17	190	64	0.68	77	0.21	-1.4
2_27_4_126	MW-32	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	708	730	550	800	92	0.13	89	-0.69	-0.99
2_27_5_101	MW-32	Appendix IV	Antimony	mg/L	9	6	67%	2022-11-30 to 2023-10-23		Nonparametric	0.000087	0.00010	0.000050	0.00014	0.000029	0.34	0.000041	0.35	-0.16
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00054	0.00055	0.00044	0.00062	0.000069	0.13	0.000089	-0.29	-1.6
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.50	0.41	0.29	0.85	0.18	0.36	0.18	0.92	0.43
2_27_5_104	MW-32	Appendix IV	Beryllium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.000052	0.000052	0.000052	0.000052	0	0	0	NA	NA
2_27_5_106	MW-32	Appendix IV	Cadmium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.000051	0.000032	0.000032	0.000075	0.000023	0.44	0	0.27	-2.6
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00044	0.00039	0.00031	0.00065	0.00013	0.29	0.00012	0.57	-1.2
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Lognormal	Lognormal	0.00042	0.00038	0.00031	0.00068	0.00012	0.29	0.000044	1.6	1.5

(Table continues on next page)

[a] Non-detects are excluded from goodness-of-fit tests.

Table 1: Summary Statistics, Non-Detects Included *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit[a]	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.5	1.5	1.4	1.8	0.13	0.086	0.15	1.2	1.7
2_27_5_115	MW-32	Appendix IV	Lead	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.00017	0.00022	0.00010	0.00022	0.000057	0.33	0	-0.42	-2.2
2_27_5_116	MW-32	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.13	0.13	0.094	0.19	0.029	0.23	0.030	0.85	1.0
2_27_5_117	MW-32	Appendix IV	Mercury	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00016	0.00016	0.00016	0.00016	0	0	0	NA	NA
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0042	0.0045	0.0032	0.0051	0.00063	0.15	0.00030	-0.59	-0.73
2_27_5_121	MW-32	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-30 to 2023-10-23		Nonparametric	0.71	0.61	0.50	0.98	0.16	0.23	0.17	0.60	-0.94
2_27_5_122	MW-32	Appendix IV	Selenium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00017	0.00022	0.00010	0.00022	0.000063	0.38	0	-0.27	-2.6
2_27_5_125	MW-32	Appendix IV	Thallium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.000075	0.000075	0.000075	0.000075	0	0	0	NA	NA
2_27_6_111	MW-32	Part 115	Copper	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.00022	0.00020	0.00020	0.00041	0.000070	0.31	0	3.0	9.0
2_27_6_114	MW-32	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	16	18	11	20	3.3	0.20	1.5	-0.98	-0.42
2_27_6_119	MW-32	Part 115	Nickel	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0011	0.0012	0.00077	0.0016	0.00026	0.24	0.00036	0.53	-0.089
2_27_6_123	MW-32	Part 115	Silver	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.000050	0.000050	0.000050	0.000050	0	0	0	NA	NA
2_27_6_129	MW-32	Part 115	Vanadium	mg/L	9	9	100%	2022-11-30 to 2023-10-23		Nonparametric	0.00062	0.00062	0.00062	0.00062	0	0	0	NA	NA
2_27_6_130	MW-32	Part 115	Zinc	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Nonparametric	Nonparametric	0.0090	0.0030	0.0022	0.031	0.012	1.4	0.00074	1.6	0.74

[a] Non-detects are excluded from goodness-of-fit tests.

Table 2: Summary Statistics, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	110	110	70	160	34	0.31	47	0.27	-1.4
1_11_4_107	MW-01R	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	229	240	130	310	60	0.26	59	-0.32	-0.81
1_11_4_108	MW-01R	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	147	150	52	210	44	0.30	30	-1.1	2.2
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	12	14	8.1	15	2.8	0.23	1.5	-0.34	-2.1
1_11_4_120	MW-01R	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	7.6	7.8	6.0	7.8	0.58	0.076	0.059	-3	8.9
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Normal	Gamma	428	400	8.8	780	271	0.63	281	-0.12	-0.97
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2356	2400	2100	2600	142	0.060	0	-0.31	0.93
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.00047	0.00033	0.00022	0.0012	0.00036	0.78	0.00015	1.7	2.6
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0014	0.0013	0.00073	0.0020	0.00045	0.32	0.00059	-0.24	-0.80
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.31	0.29	0.21	0.56	0.11	0.34	0.059	1.8	4
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00025	0.00021	0.00012	0.00036	0.000081	0.33	0.000074	0.17	-1.0
1_11_5_106	MW-01R	Appendix IV	Cadmium	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00017	0.00011	0.000062	0.00034	0.00015	0.87	0.000071	1.5	NA
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0023	0.0019	0.0013	0.0043	0.0011	0.47	0.00074	1.2	0.37
1_11_5_110	MW-01R	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0017	0.0012	0.00081	0.0045	0.0011	0.67	0.00058	2.2	5.2
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	12	14	8.1	15	2.8	0.23	1.5	-0.34	-2.1
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0015	0.00082	0.00044	0.0053	0.0017	1.1	0.00027	2.5	6.4
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.4	2.3	1.5	3.4	0.76	0.31	1.0	0.037	-1.9
1_11_5_118	MW-01R	Appendix IV	Molybdenum	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.00089	0.00076	0.00033	0.0020	0.00050	0.56	0.00015	1.8	4.2
1_11_5_121	MW-01R	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-29 to 2023-10-24		Nonparametric	1.1	1.2	0.60	1.3	0.32	0.30	0.16	-1.5	1.8
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00064	0.00060	0.00030	0.00097	0.00018	0.28	0.000089	-0.026	1.8
1_11_6_111	MW-01R	Part 115	Copper	mg/L	9	5	56%	2022-11-29 to 2023-10-24		Nonparametric	0.00058	0.00037	0.00027	0.0013	0.00049	0.85	0.00013	1.8	3.4
1_11_6_114	MW-01R	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.57	0.55	0.16	1.1	0.29	0.51	0.30	0.34	0.27
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.0024	0.0021	0.0013	0.0053	0.0012	0.51	0.00074	2.0	4.9
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0020	0.0016	0.00067	0.0046	0.0015	0.73	0.0013	1.1	-0.016
1_11_6_130	MW-01R	Part 115	Zinc	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	0.0053	0.0015	0.0012	0.014	0.0057	1.1	0.00052	0.90	-1.3
1_15_4_105	MW-06	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	9.7	9.7	7.5	12	1.3	0.13	0.44	0.048	0.87
1_15_4_107	MW-06	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	254	250	220	310	30	0.12	30	0.87	-0.18
1_15_4_108	MW-06	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	92	79	57	160	32	0.35	12	1.3	1.4
1_15_4_112	MW-06	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	1.0	1.4	0.16	0.13	0.15	0.47	-1.3
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	7.2	7.3	6.4	7.4	0.29	0.040	0.074	-2.8	8.0
1_15_4_124	MW-06	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	12	13	0.98	20	6.7	0.54	6.6	-0.45	-0.68
1_15_4_126	MW-06	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-24		Nonparametric	1222	1200	1100	1300	67	0.055	0	-0.25	-0.040
1_15_5_101	MW-06	Appendix IV	Antimony	mg/L	9	7	78%	2022-11-29 to 2023-10-24		Nonparametric	0.00022	0.00022	0.000075	0.00036	0.00020	0.93	0.00021	NA	NA
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00068	0.00065	0.00047	0.0010	0.00016	0.24	0.00016	0.85	0.38
1_15_5_103	MW-06	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	1.4	1.4	0.99	1.6	0.18	0.13	0.15	-1.7	3.8
1_15_5_104	MW-06	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.000052	0.000052	0.000052	0.000052	NA	NA	0	NA	NA
1_15_5_109	MW-06	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0019	0.0020	0.0012	0.0030	0.00056	0.30	0.00074	0.74	0.41
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00059	0.00057	0.00046	0.00080	0.00013	0.21	0.00015	0.42	-1.4
1_15_5_113	MW-06	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	1.0	1.4	0.16	0.13	0.15	0.47	-1.3
1_15_5_115	MW-06	Appendix IV	Lead	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00029	0.00027	0.00025	0.00035	0.000053	0.18	0.000030	1.5	NA
1_15_5_116	MW-06	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.20	0.20	0.15	0.23	0.031	0.16	0.030	-0.69	-0.85
1_15_5_118	MW-06	Appendix IV	Molybdenum	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00026	0.00026	0.00025	0.00027	0.000010	0.038	0.000015	0.000000000000025	NA
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-11-29 to 2023-10-24	Lognormal	Lognormal	0.96	0.86	0.62	1.9	0.44	0.46	0.11	2.2	5.3

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_15_5_122	MW-06	Appendix IV	Selenium	mg/L	9	5	56%	2022-11-29 to 2023-10-24		Nonparametric	0.00020	0.00020	0.00019	0.00022	0.000013	0.062	0.0000074	1.1	2.2
1_15_6_114	MW-06	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	18	18	14	26	3.5	0.19	1.5	1.6	3.7
1_15_6_119	MW-06	Part 115	Nickel	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0010	0.0010	0.00079	0.0012	0.00014	0.14	0.00015	-0.11	-0.90
1_15_6_130	MW-06	Part 115	Zinc	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	0.020	0.0018	0.0012	0.094	0.036	1.8	0.00044	1.7	1.7
1_17_4_105	MW-08	Appendix III	Boron	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.2	7.0	2.5	9.3	2.1	0.34	1.2	-0.52	-0.33
1_17_4_107	MW-08	Appendix III	Calcium	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	142	150	120	160	13	0.092	15	-0.52	-0.81
1_17_4_108	MW-08	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	26	28	17	35	6.1	0.23	4.4	-0.42	-0.64
1_17_4_112	MW-08	Appendix III	Fluoride	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.88	1.0	0.40	1.3	0.31	0.35	0.15	-0.47	-1.1
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	2022-12-01 to 2023-10-24	Nonparametric	Nonparametric	7.2	7.2	6.2	7.5	0.37	0.052	0.12	-2.5	7.2
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	3	33%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	12	9.2	1.7	26	11	0.91	11	0.49	-2.2
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	538	550	440	630	62	0.12	89	-0.090	-0.80
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	9	3	33%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00015	0.00014	0.000054	0.00028	0.000082	0.54	0.000078	0.67	-0.12
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.032	0.038	0.0069	0.050	0.016	0.50	0.016	-0.55	-1.3
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.3	1.2	0.98	1.5	0.16	0.13	0.15	-0.11	-0.49
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00095	0.00093	0.00061	0.0015	0.00026	0.28	0.00025	0.94	1.5
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00053	0.00058	0.00034	0.00070	0.00013	0.24	0.00010	-0.50	-0.88
1_17_5_113	MW-08	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.88	1.0	0.40	1.3	0.31	0.35	0.15	-0.47	-1.1
1_17_5_115	MW-08	Appendix IV	Lead	mg/L	9	7	78%	2022-12-01 to 2023-10-24		Nonparametric	0.00054	0.00054	0.00022	0.00086	0.00045	0.84	0.00047	NA	NA
1_17_5_116	MW-08	Appendix IV	Lithium	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.11	0.11	0.063	0.14	0.027	0.24	0.030	-0.83	-0.091
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0014	0.0015	0.00036	0.0028	0.00087	0.62	0.0012	0.36	-1.0
1_17_5_121	MW-08	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.3	1.2	0.74	2.1	0.43	0.32	0.37	0.70	0.86
1_17_5_122	MW-08	Appendix IV	Selenium	mg/L	9	5	56%	2022-12-01 to 2023-10-24		Nonparametric	0.00015	0.00014	0.00014	0.00016	0.0000096	0.065	0.0000074	0.85	-1.3
1_17_6_111	MW-08	Part 115	Copper	mg/L	9	5	56%	2022-12-01 to 2023-10-24		Nonparametric	0.00036	0.00038	0.00021	0.00045	0.00011	0.31	0.000081	-1.0	-0.11
1_17_6_114	MW-08	Part 115	Iron	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	21	21	13	32	6.3	0.30	4.4	0.67	-0.31
1_17_6_119	MW-08	Part 115	Nickel	mg/L	9	0	0%	2022-12-01 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0011	0.0011	0.00085	0.0015	0.00020	0.18	0.00025	0.51	-0.18
1_17_6_130	MW-08	Part 115	Zinc	mg/L	9	2	22%	2022-12-01 to 2023-10-24	Lognormal	Nonparametric	0.026	0.0025	0.0013	0.12	0.046	1.7	0.0018	1.9	3.2
1_18_4_105	MW-09	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	5.9	5.9	4.9	6.9	0.60	0.10	0.30	-0.047	0.37
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	341	330	230	430	70	0.20	89	-0.23	-1.3
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	14	12	11	18	2.7	0.20	1.5	0.49	-1.7
1_18_4_112	MW-09	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.6	2.6	2.1	2.9	0.26	0.100	0.30	-0.66	0.26
1_18_4_120	MW-09	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	7.3	7.2	7.2	7.5	0.12	0.016	0.030	1.6	1.9
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	364	450	83	650	212	0.58	296	-0.12	-1.8
1_18_4_126	MW-09	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1267	1400	740	1600	304	0.24	296	-0.53	-0.94
1_18_5_101	MW-09	Appendix IV	Antimony	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00019	0.00016	0.000073	0.00037	0.00014	0.72	0.00012	0.79	-1.5
1_18_5_102	MW-09	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.0022	0.0023	0.0013	0.0027	0.00050	0.23	0.00015	-1.3	0.37
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Lognormal	Lognormal	0.53	0.28	0.17	2.4	0.71	1.4	0.15	2.8	8.1
1_18_5_104	MW-09	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.000058	0.000058	0.000058	0.000058	NA	NA	0	NA	NA
1_18_5_109	MW-09	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0025	0.0027	0.0018	0.0032	0.00058	0.23	0.00074	-0.18	-2.0
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00055	0.00053	0.00024	0.00099	0.00023	0.42	0.00024	0.64	0.15
1_18_5_113	MW-09	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.6	2.6	2.1	2.9	0.26	0.100	0.30	-0.66	0.26
1_18_5_116	MW-09	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.31	0.31	0.26	0.34	0.028	0.091	0.030	-0.42	-0.95
1_18_5_117	MW-09	Appendix IV	Mercury	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.0024	0.0024	0.0024	0.0024	NA	NA	0	NA	NA
1_18_5_118	MW-09	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.022	0.021	0.012	0.033	0.0064	0.29	0.0030	0.24	-0.21

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_18_5_121	MW-09	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.79	0.79	0.79	0.79	NA	NA	0	NA	NA
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.00024	0.00026	0.00012	0.00028	0.000054	0.23	0.000030	-2.1	4.9
1_18_6_111	MW-09	Part 115	Copper	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00043	0.00043	0.00043	0.00043	NA	NA	0	NA	NA
1_18_6_114	MW-09	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	20	19	15	25	3.9	0.19	4.4	0.38	-1.5
1_18_6_119	MW-09	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0016	0.0012	0.00072	0.0033	0.00081	0.52	0.00071	1.3	1.7
1_18_6_130	MW-09	Part 115	Zinc	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.015	0.018	0.0015	0.025	0.012	0.81	0.010	-1.1	NA
1_22_4_105	MW-18	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.3	2.3	1.8	3.0	0.40	0.17	0.44	0.46	-0.60
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	337	340	240	450	72	0.22	104	0.039	-1.1
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	23	22	16	28	4.1	0.18	4.4	-0.19	-1.1
1_22_4_112	MW-18	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	4	3.8	3.3	5.1	0.58	0.15	0.44	0.90	0.17
1_22_4_120	MW-18	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.1	7.2	7.0	7.2	0.072	0.010	0.059	-0.62	-0.066
1_22_4_124	MW-18	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	804	760	480	1200	245	0.30	148	0.87	0.020
1_22_4_126	MW-18	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1422	1400	1100	1800	239	0.17	296	0.30	-1.0
1_22_5_101	MW-18	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.00018	0.00013	0.00012	0.00032	0.000089	0.50	0.000015	1.2	-0.75
1_22_5_102	MW-18	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.025	0.023	0.015	0.041	0.0079	0.31	0.0089	0.86	0.81
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.019	0.021	0.012	0.025	0.0050	0.26	0.0044	-0.45	-1.6
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	9	2	22%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00024	0.00022	0.000089	0.00044	0.00011	0.47	0.00012	0.57	0.49
1_22_5_109	MW-18	Appendix IV	Chromium, Total	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00025	0.00025	0.00025	0.00025	NA	NA	0	NA	NA
1_22_5_110	MW-18	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0034	0.0032	0.0017	0.0060	0.0016	0.48	0.0019	0.62	-1.3
1_22_5_113	MW-18	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	4	3.8	3.3	5.1	0.58	0.15	0.44	0.90	0.17
1_22_5_115	MW-18	Appendix IV	Lead	mg/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.00021	0.00016	0.00014	0.00032	0.000099	0.48	0.000030	1.7	NA
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.036	0.039	0.026	0.045	0.0079	0.22	0.0089	-0.16	-2.2
1_22_5_118	MW-18	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.015	0.013	0.0090	0.021	0.0043	0.29	0.0030	0.47	-1.3
1_22_5_121	MW-18	Appendix IV	Radium 226 and 228	pCi/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.87	0.73	0.62	1.3	0.35	0.40	0.17	1.5	NA
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00045	0.00034	0.00016	0.00086	0.00029	0.66	0.00027	0.57	-1.7
1_22_6_111	MW-18	Part 115	Copper	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal	Gamma	0.00064	0.00047	0.00043	0.0015	0.00036	0.56	0.000059	2.2	4.9
1_22_6_114	MW-18	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.5	5.8	4.3	10	1.9	0.29	1.5	0.95	0.18
1_22_6_119	MW-18	Part 115	Nickel	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0073	0.0074	0.0047	0.011	0.0026	0.36	0.0036	0.46	-1.6
1_22_6_130	MW-18	Part 115	Zinc	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.057	0.060	0.028	0.088	0.019	0.33	0.021	0.029	-0.43
1_23_4_105	MW-19	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2.1	2.0	1.5	2.6	0.40	0.19	0.44	0.13	-1.2
1_23_4_107	MW-19	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	480	480	360	550	56	0.12	44	-1.1	2.0
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	51	46	37	75	14	0.27	12	0.75	-1.0
1_23_4_112	MW-19	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2	1.9	1.7	2.3	0.20	0.10	0.15	0.31	-1.1
1_23_4_120	MW-19	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	6.9	6.9	6.4	7.1	0.20	0.028	0.12	-2.2	5.8
1_23_4_124	MW-19	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1037	1100	600	1300	242	0.23	296	-0.73	-0.50
1_23_4_126	MW-19	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1978	2000	1600	2200	239	0.12	296	-0.87	-0.58
1_23_5_101	MW-19	Appendix IV	Antimony	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00072	0.00072	0.00072	0.00072	NA	NA	0	NA	NA
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0054	0.0055	0.0031	0.0073	0.0016	0.29	0.0018	-0.48	-1.2
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.041	0.040	0.030	0.050	0.0063	0.15	0.0059	-0.34	-0.37
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	9	3	33%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.000067	0.000067	0.000057	0.000077	0.0000077	0.11	0.0000081	0.037	-1.7
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	9	4	44%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00035	0.00031	0.00027	0.00053	0.00011	0.30	0.000059	1.6	2.5
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00056	0.00050	0.00013	0.00096	0.00024	0.43	0.00028	-0.12	0.26
1_23_5_113	MW-19	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	2	1.9	1.7	2.3	0.20	0.10	0.15	0.31	-1.1

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_23_5_116	MW-19	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.097	0.098	0.085	0.11	0.0090	0.093	0.012	0.47	-0.97
1_23_5_118	MW-19	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.010	0.011	0.0051	0.013	0.0024	0.24	0.0022	-1.2	2.1
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.96	0.98	0.63	1.2	0.19	0.20	0.13	-1.1	1.6
1_23_6_114	MW-19	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	16	15	12	24	3.6	0.23	3	1.6	3.3
1_23_6_119	MW-19	Part 115	Nickel	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0018	0.0016	0.0011	0.0028	0.00063	0.34	0.00067	0.47	-1.4
1_23_6_130	MW-19	Part 115	Zinc	mg/L	9	7	78%	2022-11-30 to 2023-10-24		Nonparametric	0.0032	0.0032	0.0023	0.0042	0.0013	0.41	0.0014	NA	NA
1_24_4_105	MW-20	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.96	0.92	0.80	1.1	0.14	0.14	0.18	0.072	-2.3
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Normal	Normal	124	130	58	170	30	0.24	15	-1.2	3.5
1_24_4_108	MW-20	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	72	70	60	92	11	0.15	5.9	1.1	0.26
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.27	0.23	0.21	0.55	0.11	0.40	0.030	2.8	8.2
1_24_4_120	MW-20	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.3	7.3	7.1	7.5	0.12	0.017	0.15	0.13	-1.2
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	66	76	19	120	36	0.55	50	0.18	-1.5
1_24_4_126	MW-20	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	677	660	570	770	60	0.089	30	0.097	0.55
1_24_5_101	MW-20	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.000098	0.000096	0.000054	0.00016	0.000041	0.42	0.000050	0.48	-1.3
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0014	0.0015	0.0012	0.0017	0.00021	0.15	0.00030	0.045	-1.9
1_24_5_103	MW-20	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.51	0.47	0.31	0.94	0.18	0.36	0.089	1.8	4.0
1_24_5_109	MW-20	Appendix IV	Chromium, Total	mg/L	9	5	56%	2022-11-30 to 2023-10-24		Nonparametric	0.00023	0.00023	0.00019	0.00029	0.000044	0.19	0.000044	0.48	-1.7
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0013	0.0013	0.00095	0.0016	0.00021	0.16	0.00015	-0.42	0.052
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.27	0.23	0.21	0.55	0.11	0.40	0.030	2.8	8.2
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0021	0.0023	0.0016	0.0028	0.00049	0.23	0.00074	0.24	-1.6
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.066	0.065	0.049	0.083	0.011	0.17	0.013	-0.014	-0.94
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0043	0.0041	0.0036	0.0051	0.00053	0.12	0.00074	0.13	-1.7
1_24_5_121	MW-20	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-30 to 2023-10-24		Nonparametric	0.99	0.95	0.59	1.5	0.38	0.38	0.36	0.52	-0.41
1_24_5_122	MW-20	Appendix IV	Selenium	mg/L	9	5	56%	2022-11-30 to 2023-10-24		Nonparametric	0.00011	0.00011	0.00010	0.00013	0.000013	0.11	0.0000074	1.1	2.2
1_24_6_111	MW-20	Part 115	Copper	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00031	0.00027	0.00023	0.00053	0.00010	0.33	0.000059	1.7	2.9
1_24_6_114	MW-20	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	19	19	16	22	1.9	0.097	1.5	-0.33	-0.29
1_24_6_119	MW-20	Part 115	Nickel	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.0089	0.0092	0.0066	0.0099	0.0011	0.12	0.00044	-1.6	2.3
1_24_6_130	MW-20	Part 115	Zinc	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Nonparametric	Nonparametric	0.035	0.028	0.024	0.071	0.017	0.49	0.0044	1.7	1.3
1_25_4_105	MW-30	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal	Gamma	2.1	1.9	1.7	3.5	0.55	0.26	0.30	2.4	6.5
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Nonparametric	Nonparametric	498	460	390	960	176	0.35	44	2.8	8.2
1_25_4_108	MW-30	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	137	120	97	190	42	0.31	33	0.52	-1.9
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.1	1.1	0.91	1.4	0.14	0.13	0.15	0.77	1.1
1_25_4_120	MW-30	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Normal	Normal	7.1	7.2	6.5	7.2	0.23	0.033	0.13	-2.2	5.2
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	864	860	610	1000	119	0.14	119	-1.2	1.7
1_25_4_126	MW-30	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	2233	2200	1800	2800	278	0.12	148	0.68	1.8
1_25_5_101	MW-30	Appendix IV	Antimony	mg/L	9	8	89%	2022-11-30 to 2023-10-23		Nonparametric	0.00040	0.00040	0.00040	0.00040	NA	NA	0	NA	NA
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	9	2	22%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00043	0.00043	0.00012	0.00070	0.00020	0.46	0.00024	-0.16	-0.39
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.068	0.058	0.045	0.10	0.023	0.33	0.016	0.63	-1.5
1_25_5_104	MW-30	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-30 to 2023-10-23		Nonparametric	0.000053	0.000053	0.000053	0.000053	NA	NA	0	NA	NA
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0099	0.010	0.0052	0.014	0.0031	0.32	0.0030	-0.29	-1.3
1_25_5_110	MW-30	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal	Gamma	0.0015	0.0011	0.00053	0.0044	0.0013	0.84	0.00030	1.8	3
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.1	1.1	0.91	1.4	0.14	0.13	0.15	0.77	1.1
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal	Gamma	0.14	0.12	0.11	0.27	0.050	0.36	0.015	2.6	7.3

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
1_25_5_118	MW-30	Appendix IV	Molybdenum	mg/L	9	3	33%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0014	0.00096	0.00032	0.0036	0.0012	0.88	0.00073	1.7	3
1_25_5_121	MW-30	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-30 to 2023-10-23		Nonparametric	0.70	0.73	0.44	0.91	0.23	0.32	0.24	-0.30	-4.0
1_25_5_122	MW-30	Appendix IV	Selenium	mg/L	9	6	67%	2022-11-30 to 2023-10-23		Nonparametric	0.00012	0.00012	0.00011	0.00013	0.000010	0.083	0.000015	-0.0000000000000059	NA
1_25_6_111	MW-30	Part 115	Copper	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.00046	0.00046	0.00037	0.00054	0.00012	0.26	0.00013	NA	NA
1_25_6_114	MW-30	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	3.1	2.9	0.87	8.8	2.4	0.78	1.8	1.8	4.1
1_25_6_119	MW-30	Part 115	Nickel	mg/L	9	2	22%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0022	0.0018	0.00070	0.0045	0.0016	0.72	0.0015	0.83	-1.1
1_25_6_130	MW-30	Part 115	Zinc	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.0051	0.0051	0.0049	0.0053	0.00028	0.055	0.00030	NA	NA
1_26_4_105	MW-31	Appendix III	Boron	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.5	4.5	3.6	5.4	0.61	0.14	0.74	0.052	-1.2
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	169	170	130	200	21	0.12	15	-0.45	0.46
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	104	100	92	120	9.3	0.089	12	0.45	-0.75
1_26_4_112	MW-31	Appendix III	Fluoride	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.8	4.7	4.6	5.2	0.24	0.051	0.15	0.49	-1.8
1_26_4_120	MW-31	Appendix III	pH (field)	su	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.8	7.8	7.7	8.0	0.099	0.013	0.089	0.36	0.47
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	176	180	72	250	68	0.39	104	-0.25	-1.4
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	817	810	730	940	67	0.081	74	0.55	-0.21
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	9	4	44%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00010	0.00012	0.000069	0.00013	0.000027	0.26	0.000015	-0.59	-2.6
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0014	0.0013	0.0010	0.0018	0.00027	0.20	0.00030	0.41	-0.91
1_26_5_103	MW-31	Appendix IV	Barium	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.17	0.16	0.12	0.23	0.037	0.22	0.044	0.66	-0.63
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0022	0.0023	0.0018	0.0029	0.00035	0.16	0.00030	0.61	0.13
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00017	0.00018	0.00013	0.00021	0.000026	0.15	0.000030	-0.044	-0.73
1_26_5_113	MW-31	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.8	4.7	4.6	5.2	0.24	0.051	0.15	0.49	-1.8
1_26_5_115	MW-31	Appendix IV	Lead	mg/L	9	8	89%	2022-12-01 to 2023-10-23		Nonparametric	0.00031	0.00031	0.00031	0.00031	NA	NA	0	NA	NA
1_26_5_116	MW-31	Appendix IV	Lithium	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.052	0.052	0.046	0.056	0.0032	0.063	0.0030	-0.53	-0.65
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Nonparametric	Nonparametric	0.0014	0.0013	0.0011	0.0021	0.00035	0.26	0.00030	1.5	1.5
1_26_5_121	MW-31	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.84	0.73	0.58	1.2	0.28	0.34	0.22	0.77	-1.6
1_26_5_122	MW-31	Appendix IV	Selenium	mg/L	9	5	56%	2022-12-01 to 2023-10-23		Nonparametric	0.00013	0.00013	0.00011	0.00015	0.000018	0.14	0.000022	0.0000000000000022	-3.3
1_26_6_111	MW-31	Part 115	Copper	mg/L	9	8	89%	2022-12-01 to 2023-10-23		Nonparametric	0.00027	0.00027	0.00027	0.00027	NA	NA	0	NA	NA
1_26_6_114	MW-31	Part 115	Iron	mg/L	9	0	0%	2022-12-01 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.1	1.1	0.13	2.5	0.72	0.66	0.49	0.62	1.1
1_26_6_130	MW-31	Part 115	Zinc	mg/L	9	6	67%	2022-12-01 to 2023-10-23		Nonparametric	0.0065	0.0082	0.0014	0.010	0.0045	0.69	0.0027	-1.4	NA
2_12_4_105	MW-02	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	95	98	73	110	12	0.12	15	-0.61	0.35
2_12_4_107	MW-02	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	202	210	180	240	19	0.095	30	0.68	0.50
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	133	140	67	150	25	0.19	0	-2.7	7.6
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	8.9	9.4	4.5	10	1.7	0.19	0.44	-2.7	7.5
2_12_4_120	MW-02	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.2	7.2	7.1	7.4	0.13	0.019	0.15	0.38	-1.2
2_12_4_124	MW-02	Appendix III	Sulfate (as SO4)	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	1.3	1.0	0.86	2.2	0.63	0.49	0.18	1.9	3.5
2_12_4_126	MW-02	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1800	1800	1600	2100	150	0.083	148	0.86	0.83
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00026	0.00019	0.00015	0.00063	0.00017	0.64	0.000059	2.2	5.2
2_12_5_102	MW-02	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal	Gamma	0.0087	0.0083	0.0074	0.012	0.0014	0.16	0.00074	1.9	4.1
2_12_5_103	MW-02	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.48	0.48	0.38	0.55	0.054	0.11	0.044	-0.56	-0.32
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00033	0.00032	0.00015	0.00052	0.00011	0.35	0.00015	0.13	-0.34
2_12_5_106	MW-02	Appendix IV	Cadmium	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.00019	0.000046	0.000041	0.00049	0.00026	1.3	0.0000074	1.7	NA
2_12_5_109	MW-02	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.042	0.046	0.019	0.068	0.017	0.41	0.021	-0.050	-1.5
2_12_5_110	MW-02	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0060	0.0063	0.0031	0.0089	0.0020	0.34	0.0025	-0.19	-1.3
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	8.9	9.4	4.5	10	1.7	0.19	0.44	-2.7	7.5

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_12_5_115	MW-02	Appendix IV	Lead	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0025	0.0024	0.0010	0.0041	0.0010	0.41	0.00089	0.35	-0.70
2_12_5_116	MW-02	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.4	1.4	0.87	1.7	0.26	0.19	0.30	-0.55	0.0021
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Lognormal	Lognormal	0.0072	0.0062	0.0051	0.011	0.0024	0.33	0.0015	0.93	-0.87
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.9	1.7	0.90	3.4	0.85	0.44	0.65	0.87	0.78
2_12_5_122	MW-02	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0011	0.0012	0.00050	0.0018	0.00035	0.31	0.00030	0.13	1.7
2_12_5_125	MW-02	Appendix IV	Thallium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	NA	NA	0	NA	NA
2_12_6_111	MW-02	Part 115	Copper	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0018	0.0018	0.00081	0.0026	0.00064	0.35	0.0010	-0.31	-1.1
2_12_6_114	MW-02	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	24	24	18	30	3.7	0.16	4.4	0.056	-0.35
2_12_6_119	MW-02	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.023	0.022	0.014	0.042	0.0094	0.40	0.0074	1.2	0.54
2_12_6_129	MW-02	Part 115	Vanadium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0035	0.0035	0.0013	0.0067	0.0017	0.48	0.0013	0.48	0.29
2_12_6_130	MW-02	Part 115	Zinc	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.0076	0.0033	0.0019	0.025	0.0093	1.2	0.0012	1.6	0.78
2_13_4_105	MW-03	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	4.1	4.2	3.3	4.4	0.34	0.082	0.15	-2	4.4
2_13_4_107	MW-03	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	379	390	290	430	41	0.11	30	-1.2	2
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	191	180	140	300	50	0.26	30	1.5	2.1
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.70	0.60	0.52	1.6	0.34	0.49	0.074	2.9	8.6
2_13_4_120	MW-03	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.4	7.3	7.2	7.6	0.12	0.016	0.074	0.98	0.64
2_13_4_124	MW-03	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Normal	Normal	456	480	42	760	220	0.48	148	-0.61	0.40
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24		Nonparametric	2211	2300	1700	2300	196	0.089	0	-2.7	7.8
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00018	0.00010	0.000087	0.00045	0.00018	0.96	0.000017	2	3.9
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00089	0.00091	0.00049	0.0012	0.00026	0.30	0.00028	-0.57	-1.1
2_13_5_103	MW-03	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.37	0.38	0.13	0.50	0.11	0.29	0.074	-1.4	3
2_13_5_104	MW-03	Appendix IV	Beryllium	mg/L	9	7	78%	2022-11-28 to 2023-10-24		Nonparametric	0.00010	0.00010	0.000053	0.00015	0.000069	0.68	0.000072	NA	NA
2_13_5_106	MW-03	Appendix IV	Cadmium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00011	0.00011	0.00011	0.00011	NA	NA	0	NA	NA
2_13_5_109	MW-03	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0049	0.0049	0.0030	0.0073	0.0014	0.29	0.0018	0.20	-0.80
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00085	0.00088	0.00044	0.0013	0.00033	0.39	0.00047	-0.12	-1.5
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.70	0.60	0.52	1.6	0.34	0.49	0.074	2.9	8.6
2_13_5_115	MW-03	Appendix IV	Lead	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00022	0.00022	0.00022	0.00022	NA	NA	0	NA	NA
2_13_5_116	MW-03	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.043	0.041	0.035	0.065	0.0095	0.22	0.0059	1.6	3.0
2_13_5_117	MW-03	Appendix IV	Mercury	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00024	0.00024	0.00024	0.00024	NA	NA	0	NA	NA
2_13_5_118	MW-03	Appendix IV	Molybdenum	mg/L	9	7	78%	2022-11-28 to 2023-10-24		Nonparametric	0.00078	0.00078	0.00072	0.00085	0.000092	0.12	0.000096	NA	NA
2_13_5_121	MW-03	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	0.75	1.9	0.44	0.36	0.42	0.63	-1.1
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	9	3	33%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00038	0.00041	0.00017	0.00053	0.00012	0.32	0.000059	-1.0	2.1
2_13_5_125	MW-03	Appendix IV	Thallium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00018	0.00018	0.00018	0.00018	NA	NA	0	NA	NA
2_13_6_111	MW-03	Part 115	Copper	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00042	0.00028	0.00024	0.00091	0.00032	0.76	0.000044	2	3.9
2_13_6_114	MW-03	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	1.9	1.6	0.28	5.9	1.9	0.97	1.7	1.3	1.4
2_13_6_119	MW-03	Part 115	Nickel	mg/L	9	1	11%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.0031	0.0016	0.00085	0.015	0.0048	1.5	0.00022	2.8	7.9
2_13_6_129	MW-03	Part 115	Vanadium	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.0012	0.0012	0.0012	0.0012	NA	NA	0	NA	NA
2_13_6_130	MW-03	Part 115	Zinc	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.010	0.010	0.0019	0.019	0.0096	0.94	0.012	0.0094	-5.9
2_14_4_105	MW-04	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	4.0	4.0	3.5	4.7	0.34	0.085	0.30	0.80	1.5
2_14_4_107	MW-04	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	361	360	310	410	33	0.092	44	0.11	-0.95
2_14_4_108	MW-04	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	202	200	150	300	44	0.22	30	1.4	2.9
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.3	1.3	0.76	1.9	0.29	0.22	0.15	0.28	3.1
2_14_4_120	MW-04	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.4	7.3	7.2	7.7	0.13	0.017	0.12	1.3	2.5

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	529	610	1.8	700	216	0.41	119	-2.2	5.2
2_14_4_126	MW-04	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1889	1900	1700	2100	154	0.081	148	0.24	-1.3
2_14_5_101	MW-04	Appendix IV	Antimony	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.00020	0.00012	0.000071	0.00041	0.00018	0.91	0.000073	1.6	NA
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00092	0.00092	0.00047	0.0012	0.00027	0.29	0.00041	-0.46	-0.87
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Nonparametric	Nonparametric	0.16	0.12	0.10	0.46	0.11	0.72	0.015	2.9	8.6
2_14_5_109	MW-04	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0040	0.0044	0.0026	0.0060	0.0012	0.31	0.0019	0.24	-1.3
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00056	0.00062	0.00031	0.00093	0.00021	0.37	0.00025	0.44	-0.56
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.3	1.3	0.76	1.9	0.29	0.22	0.15	0.28	3.1
2_14_5_116	MW-04	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.064	0.066	0.047	0.074	0.0095	0.15	0.012	-0.64	-0.38
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	9	2	22%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00092	0.00086	0.00041	0.0015	0.00043	0.46	0.00062	0.055	-1.7
2_14_5_121	MW-04	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.3	0.66	1.6	0.28	0.23	0.26	-1.2	2
2_14_5_122	MW-04	Appendix IV	Selenium	mg/L	9	5	56%	2022-11-28 to 2023-10-24		Nonparametric	0.00026	0.00022	0.00017	0.00041	0.00011	0.41	0.000052	1.6	2.7
2_14_6_111	MW-04	Part 115	Copper	mg/L	9	8	89%	2022-11-28 to 2023-10-24		Nonparametric	0.00027	0.00027	0.00027	0.00027	NA	NA	0	NA	NA
2_14_6_114	MW-04	Part 115	Iron	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Gamma; Lognormal; Normal	Normal	5.9	6.1	4.7	6.8	0.74	0.13	0.74	-0.42	-0.91
2_14_6_119	MW-04	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-24	Normal	Normal	0.014	0.013	0.0019	0.022	0.0060	0.42	0.0074	-0.93	1.2
2_14_6_130	MW-04	Part 115	Zinc	mg/L	9	6	67%	2022-11-28 to 2023-10-24		Nonparametric	0.0039	0.0044	0.0015	0.0059	0.0022	0.57	0.0022	-0.90	NA
2_16_4_105	MW-07	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	11	11	10	13	0.88	0.077	1.5	0.21	0.14
2_16_4_107	MW-07	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	142	140	120	160	12	0.085	15	-0.54	0.27
2_16_4_108	MW-07	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-24		Nonparametric	14	14	13	15	0.78	0.056	1.5	0.22	-1.0
2_16_4_112	MW-07	Appendix III	Fluoride	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.11	0.12	0.070	0.14	0.029	0.27	0.037	-0.27	-1.9
2_16_4_120	MW-07	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-24	Lognormal; Normal	Normal	6.8	6.9	6.6	7.0	0.14	0.021	0.074	-1.0	0.58
2_16_4_124	MW-07	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	23	20	15	33	6.6	0.29	7.4	0.37	-1.7
2_16_4_126	MW-07	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Lognormal; Normal	Normal	613	620	470	720	80	0.13	59	-0.94	0.30
2_16_5_101	MW-07	Appendix IV	Antimony	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.000071	0.000071	0.000071	0.000071	NA	NA	0	NA	NA
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00021	0.00021	0.00013	0.00029	0.000043	0.21	0.000030	-0.11	1.7
2_16_5_103	MW-07	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.33	0.34	0.25	0.38	0.038	0.11	0.015	-1.4	2.4
2_16_5_104	MW-07	Appendix IV	Beryllium	mg/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.000061	0.000062	0.000055	0.000066	0.0000056	0.091	0.0000059	-0.78	NA
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00034	0.00033	0.00028	0.00042	0.000047	0.14	0.000059	0.40	-0.79
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00094	0.00098	0.00071	0.0011	0.00011	0.12	0.000044	-0.98	2
2_16_5_113	MW-07	Appendix IV	Fluoride (App IV)	mg/L	9	1	11%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.11	0.12	0.070	0.14	0.029	0.27	0.037	-0.27	-1.9
2_16_5_116	MW-07	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0065	0.0062	0.0042	0.010	0.0018	0.27	0.0012	0.93	0.72
2_16_5_121	MW-07	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.1	0.67	2.4	0.57	0.48	0.21	1.8	3.9
2_16_5_122	MW-07	Appendix IV	Selenium	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00010	0.00010	0.00010	0.00010	NA	NA	0	NA	NA
2_16_6_111	MW-07	Part 115	Copper	mg/L	9	8	89%	2022-11-30 to 2023-10-24		Nonparametric	0.00027	0.00027	0.00027	0.00027	NA	NA	0	NA	NA
2_16_6_114	MW-07	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-24	Gamma; Lognormal; Normal	Normal	15	15	13	19	2.2	0.14	3	0.47	-1.2
2_16_6_130	MW-07	Part 115	Zinc	mg/L	9	6	67%	2022-11-30 to 2023-10-24		Nonparametric	0.015	0.016	0.0035	0.025	0.011	0.73	0.013	-0.48	NA
2_19_4_105	MW-10	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	17	17	4.5	28	8.5	0.49	12	-0.19	-1.6
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal	Gamma	248	220	160	460	88	0.36	44	2.0	4.7
2_19_4_108	MW-10	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	219	170	92	430	111	0.51	74	0.88	-0.16
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	5.7	6.0	2.7	7.7	1.7	0.29	1.9	-0.69	-0.44
2_19_4_120	MW-10	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.9	7.8	7.0	8.8	0.48	0.061	0.16	0.46	1.9
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	487	410	140	950	282	0.58	311	0.65	-0.65
2_19_4_126	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1811	1800	1500	2400	257	0.14	148	1.5	3.5

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	9	5	56%	2022-11-29 to 2023-10-23		Nonparametric	0.00017	0.00012	0.00011	0.00034	0.00011	0.65	0.000015	2	3.9
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00057	0.00049	0.00020	0.0011	0.00030	0.53	0.00022	0.80	-0.41
2_19_5_103	MW-10	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.30	0.28	0.14	0.57	0.14	0.47	0.074	1.1	0.65
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	9	3	33%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00011	0.000082	0.000052	0.00022	0.000066	0.62	0.000042	1.2	0.55
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0044	0.0042	0.0018	0.0085	0.0022	0.52	0.0024	0.75	-0.028
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00064	0.00041	0.00030	0.0018	0.00047	0.74	0.00016	2.2	5.2
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	5.7	6.0	2.7	7.7	1.7	0.29	1.9	-0.69	-0.44
2_19_5_115	MW-10	Appendix IV	Lead	mg/L	9	7	78%	2022-11-29 to 2023-10-23		Nonparametric	0.00014	0.00014	0.00012	0.00017	0.000035	0.24	0.000037	NA	NA
2_19_5_116	MW-10	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.99	0.94	0.54	1.6	0.29	0.30	0.16	0.82	1.9
2_19_5_118	MW-10	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0039	0.0035	0.0019	0.0072	0.0017	0.42	0.0012	1.0	0.58
2_19_5_121	MW-10	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	2022-11-29 to 2023-10-23		Nonparametric	1.4	1.4	1.4	1.4	NA	NA	0	NA	NA
2_19_5_122	MW-10	Appendix IV	Selenium	mg/L	9	1	11%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00036	0.00036	0.00028	0.00046	0.000060	0.17	0.000074	0.35	-0.52
2_19_6_111	MW-10	Part 115	Copper	mg/L	9	6	67%	2022-11-29 to 2023-10-23		Nonparametric	0.00072	0.00049	0.00038	0.0013	0.00050	0.69	0.00016	1.6	NA
2_19_6_114	MW-10	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-23	Gamma; Lognormal; Normal	Normal	4.7	3.9	2.4	7.3	1.8	0.38	1.0	0.57	-1.2
2_19_6_119	MW-10	Part 115	Nickel	mg/L	9	3	33%	2022-11-29 to 2023-10-23	Gamma; Lognormal	Gamma	0.0011	0.00088	0.00076	0.0018	0.00039	0.36	0.00010	1.8	3.0
2_19_6_129	MW-10	Part 115	Vanadium	mg/L	9	8	89%	2022-11-29 to 2023-10-23		Nonparametric	0.0013	0.0013	0.0013	0.0013	NA	NA	0	NA	NA
2_19_6_130	MW-10	Part 115	Zinc	mg/L	9	2	22%	2022-11-29 to 2023-10-23	Lognormal	Nonparametric	0.0050	0.0018	0.0012	0.014	0.0058	1.2	0.00089	1.2	-0.80
2_20_4_105	MW-11	Appendix III	Boron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.1	4.8	1.5	13	4.3	0.71	4.1	0.64	-1.1
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	270	300	130	380	87	0.32	89	-0.59	-0.82
2_20_4_108	MW-11	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	73	73	52	95	15	0.21	16	-0.15	-1.1
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.61	0.37	0.21	1.4	0.45	0.74	0.24	0.91	-0.61
2_20_4_120	MW-11	Appendix III	pH (field)	su	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	7.3	7.3	7.2	7.5	0.079	0.011	0.074	0.20	-0.41
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	70	30	1.8	210	82	1.2	35	1.1	-0.48
2_20_4_126	MW-11	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1131	1100	680	1800	303	0.27	148	1.1	3.2
2_20_5_101	MW-11	Appendix IV	Antimony	mg/L	9	6	67%	2022-11-29 to 2023-10-24		Nonparametric	0.00035	0.00028	0.000082	0.00069	0.00031	0.88	0.00029	0.97	NA
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0017	0.0016	0.00061	0.0041	0.0010	0.60	0.00074	1.7	3.6
2_20_5_103	MW-11	Appendix IV	Barium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.65	0.59	0.36	1.2	0.26	0.40	0.22	1.3	1.7
2_20_5_104	MW-11	Appendix IV	Beryllium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.000091	0.000091	0.000091	0.000091	NA	NA	0	NA	NA
2_20_5_106	MW-11	Appendix IV	Cadmium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.00073	0.00073	0.00073	0.00073	NA	NA	0	NA	NA
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Lognormal	Lognormal	0.0018	0.00087	0.00045	0.0086	0.0026	1.5	0.00049	2.9	8.4
2_20_5_110	MW-11	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00058	0.00061	0.00023	0.0012	0.00028	0.49	0.00031	1.3	2.4
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.61	0.37	0.21	1.4	0.45	0.74	0.24	0.91	-0.61
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	9	3	33%	2022-11-29 to 2023-10-24	Gamma; Lognormal	Gamma	0.013	0.0022	0.00017	0.068	0.027	2.1	0.0025	2.4	5.9
2_20_5_116	MW-11	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	0.076	0.052	0.0059	0.22	0.073	0.96	0.065	1.0	0.41
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.0014	0.0015	0.00043	0.0029	0.00080	0.56	0.00030	0.80	1.4
2_20_5_121	MW-11	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	1.2	1.2	0.62	1.8	0.42	0.35	0.56	0.028	-1.1
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	9	3	33%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	0.00021	0.00020	0.00014	0.00031	0.000059	0.29	0.000044	1.0	1.6
2_20_6_111	MW-11	Part 115	Copper	mg/L	9	3	33%	2022-11-29 to 2023-10-24	Lognormal	Nonparametric	0.0037	0.00052	0.00024	0.019	0.0075	2.0	0.00027	2.4	5.9
2_20_6_114	MW-11	Part 115	Iron	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Normal	6.6	6.1	3.6	11	2.8	0.42	3.4	0.56	-1.2
2_20_6_119	MW-11	Part 115	Nickel	mg/L	9	0	0%	2022-11-29 to 2023-10-24	Nonparametric	Nonparametric	0.0021	0.0013	0.00065	0.0094	0.0027	1.3	0.00030	2.9	8.5
2_20_6_123	MW-11	Part 115	Silver	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.00014	0.00014	0.00014	0.00014	NA	NA	0	NA	NA
2_20_6_129	MW-11	Part 115	Vanadium	mg/L	9	8	89%	2022-11-29 to 2023-10-24		Nonparametric	0.00062	0.00062	0.00062	0.00062	NA	NA	0	NA	NA
2_20_6_130	MW-11	Part 115	Zinc	mg/L	9	2	22%	2022-11-29 to 2023-10-24	Gamma; Lognormal; Normal	Gamma	0.026	0.0085	0.0018	0.10	0.035	1.3	0.0099	1.9	3.9

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_21_4_105	MW-12	Appendix III	Boron	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.30	0.27	0.19	0.42	0.083	0.28	0.10	0.22	-1.4
2_21_4_107	MW-12	Appendix III	Calcium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	72	77	46	95	17	0.23	21	-0.015	-0.81
2_21_4_108	MW-12	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	20	18	15	27	4.7	0.23	4.4	0.45	-1.7
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Lognormal	Lognormal	0.33	0.26	0.22	0.54	0.12	0.38	0.044	0.96	-0.89
2_21_4_120	MW-12	Appendix III	pH (field)	su	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.6	7.7	7.0	8.2	0.33	0.043	0.30	-0.48	1.0
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal	Gamma	132	130	99	180	29	0.22	30	1.0	-0.069
2_21_4_126	MW-12	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	288	270	200	420	79	0.27	104	0.35	-1.1
2_21_5_101	MW-12	Appendix IV	Antimony	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00071	0.00071	0.00040	0.0011	0.00024	0.34	0.00031	0.16	-1.1
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0024	0.0024	0.0014	0.0034	0.00069	0.29	0.00074	0.033	-1.4
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.034	0.030	0.017	0.060	0.015	0.44	0.012	0.83	-0.58
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0013	0.0012	0.00062	0.0024	0.00064	0.48	0.00062	0.66	-0.73
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	9	4	44%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00050	0.00048	0.00034	0.00067	0.00012	0.24	0.000089	0.28	0.92
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	9	3	33%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00033	0.00032	0.00014	0.00053	0.00016	0.49	0.00023	0.12	-2.1
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Lognormal	Lognormal	0.33	0.26	0.22	0.54	0.12	0.38	0.044	0.96	-0.89
2_21_5_115	MW-12	Appendix IV	Lead	mg/L	9	5	56%	2022-11-28 to 2023-10-23		Nonparametric	0.00018	0.00018	0.00014	0.00021	0.000038	0.21	0.000044	-0.060	-5.7
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0039	0.0037	0.0022	0.0064	0.0013	0.32	0.00089	0.70	1.1
2_21_5_117	MW-12	Appendix IV	Mercury	mg/L	9	8	89%	2022-11-28 to 2023-10-23		Nonparametric	0.00016	0.00016	0.00016	0.00016	NA	NA	0	NA	NA
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0075	0.0072	0.0056	0.0096	0.0014	0.19	0.0022	0.035	-1.3
2_21_5_121	MW-12	Appendix IV	Radium 226 and 228	pCi/L	9	7	78%	2022-11-28 to 2023-10-23		Nonparametric	0.95	0.95	0.81	1.1	0.20	0.21	0.21	NA	NA
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Gamma	0.0011	0.00093	0.00013	0.0023	0.00084	0.76	0.0011	0.25	-1.6
2_21_6_111	MW-12	Part 115	Copper	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0010	0.0010	0.00055	0.0016	0.00034	0.33	0.00030	0.42	-0.37
2_21_6_114	MW-12	Part 115	Iron	mg/L	9	4	44%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.042	0.037	0.027	0.064	0.015	0.35	0.015	0.76	-0.81
2_21_6_119	MW-12	Part 115	Nickel	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0026	0.0025	0.0016	0.0035	0.00063	0.24	0.00059	0.067	-0.59
2_21_6_129	MW-12	Part 115	Vanadium	mg/L	9	5	56%	2022-11-28 to 2023-10-23		Nonparametric	0.0011	0.0011	0.00085	0.0013	0.00021	0.20	0.00026	-0.0000000000000015	-3.9
2_21_6_130	MW-12	Part 115	Zinc	mg/L	9	0	0%	2022-11-28 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0079	0.0080	0.0037	0.010	0.0019	0.24	0.0015	-1.5	2.9
2_27_4_105	MW-32	Appendix III	Boron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	3.4	3.1	2.6	5.0	0.74	0.21	0.74	1.2	1.4
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	178	190	130	220	29	0.16	15	-0.41	-0.63
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	46	47	41	50	3.5	0.075	4.4	-0.26	-1.4
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.5	1.5	1.4	1.8	0.13	0.086	0.15	1.2	1.7
2_27_4_120	MW-32	Appendix III	pH (field)	su	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	7.6	7.6	7.5	7.8	0.090	0.012	0.10	0.47	-1.4
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	94	100	17	190	64	0.68	77	0.21	-1.4
2_27_4_126	MW-32	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	708	730	550	800	92	0.13	89	-0.69	-0.99
2_27_5_101	MW-32	Appendix IV	Antimony	mg/L	9	6	67%	2022-11-30 to 2023-10-23		Nonparametric	0.000093	0.000072	0.000067	0.00014	0.000041	0.44	0.0000074	1.7	NA
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00054	0.00055	0.00044	0.00062	0.000069	0.13	0.000089	-0.29	-1.6
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.50	0.41	0.29	0.85	0.18	0.36	0.18	0.92	0.43
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.00044	0.00039	0.00031	0.00065	0.00013	0.29	0.00012	0.57	-1.2
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Lognormal	Lognormal	0.00042	0.00038	0.00031	0.00068	0.00012	0.29	0.000044	1.6	1.5
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	1.5	1.5	1.4	1.8	0.13	0.086	0.15	1.2	1.7
2_27_5_115	MW-32	Appendix IV	Lead	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.00013	0.00013	0.00012	0.00014	0.000014	0.11	0.000015	NA	NA
2_27_5_116	MW-32	Appendix IV	Lithium	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.13	0.13	0.094	0.19	0.029	0.23	0.030	0.85	1.0
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0042	0.0045	0.0032	0.0051	0.00063	0.15	0.00030	-0.59	-0.73
2_27_5_121	MW-32	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	2022-11-30 to 2023-10-23		Nonparametric	0.83	0.86	0.61	0.98	0.16	0.19	0.10	-1.1	2.1
2_27_6_111	MW-32	Part 115	Copper	mg/L	9	7	78%	2022-11-30 to 2023-10-23		Nonparametric	0.00030	0.00030	0.00020	0.00041	0.00015	0.49	0.00016	NA	NA

(Table continues on next page)

Table 2: Summary Statistics, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Date Range	Distributions Fit	Recommended Distribution	Mean	Median	Minimum	Maximum	SD	CV	MAD/0.675	Skewness	Kurtosis
2_27_6_114	MW-32	Part 115	Iron	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	16	18	11	20	3.3	0.20	1.5	-0.98	-0.42
2_27_6_119	MW-32	Part 115	Nickel	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Gamma; Lognormal; Normal	Normal	0.0011	0.0012	0.00077	0.0016	0.00026	0.24	0.00036	0.53	-0.089
2_27_6_130	MW-32	Part 115	Zinc	mg/L	9	0	0%	2022-11-30 to 2023-10-23	Nonparametric	Nonparametric	0.0090	0.0030	0.0022	0.031	0.012	1.4	0.00074	1.6	0.74

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	9	0	0%	0.91	0.35	0.17	0.66	0.92	0.37	0.17	0.67	0.18	>= 0.10	0.36	>= 0.10	0.31	Gamma; Lognormal; Normal	Normal
1_11_4_107	MW-01R	Appendix III	Calcium	mg/L	9	0	0%	0.96	0.83	0.14	0.90	0.94	0.54	0.17	0.66	0.16	>= 0.10	0.26	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
1_11_4_108	MW-01R	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.93	0.49	0.20	0.42	0.79	0.015	0.25	0.11	0.24	>= 0.10	0.64	0.05 <= p < 0.10	0.40	Gamma; Lognormal; Normal	Normal
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	9	0	0%	0.81	0.028	0.33	0.0060	0.81	0.031	0.33	0.0050	0.34	< 0.01	0.93	0.01 <= p < 0.05	0.24	Nonparametric	Nonparametric
1_11_4_120	MW-01R	Appendix III	pH (field)	su	9	0	0%	0.46	0	0.47	0	0.45	0	0.48	0	0.49	< 0.01	2.6	< 0.01	0.084	Nonparametric	Nonparametric
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.95	0.70	0.12	0.95	0.74	0.0040	0.30	0.021	0.24	>= 0.10	0.60	>= 0.10	1.4	Gamma; Normal	Gamma
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.88	0.18	0.29	0.029	0.88	0.16	0.30	0.021	0.30	0.01 <= p < 0.05	0.71	0.05 <= p < 0.10	0.061	Gamma; Lognormal; Normal	Normal
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	9	2	22%	0.74	0.011	0.35	0.0090	0.84	0.10	0.29	0.082	0.32	0.01 <= p < 0.05	0.69	0.05 <= p < 0.10	0.64	Gamma; Lognormal	Gamma
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	9	0	0%	0.93	0.46	0.20	0.39	0.88	0.17	0.26	0.073	0.24	>= 0.10	0.45	>= 0.10	0.36	Gamma; Lognormal; Normal	Normal
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	9	0	0%	0.80	0.021	0.32	0.0090	0.90	0.23	0.27	0.059	0.29	0.01 <= p < 0.05	0.56	>= 0.10	0.30	Gamma; Lognormal	Gamma
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	9	0	0%	0.91	0.30	0.23	0.19	0.91	0.29	0.22	0.26	0.20	>= 0.10	0.45	>= 0.10	0.35	Gamma; Lognormal; Normal	Normal
1_11_5_106	MW-01R	Appendix IV	Cadmium	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.87		Nonparametric
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.84	0.053	0.22	0.22	0.91	0.29	0.17	0.64	0.19	>= 0.10	0.48	>= 0.10	0.43	Gamma; Lognormal; Normal	Normal
1_11_5_110	MW-01R	Appendix IV	Cobalt	mg/L	9	0	0%	0.73	0.0030	0.28	0.043	0.90	0.23	0.21	0.31	0.23	>= 0.10	0.63	0.05 <= p < 0.10	0.52	Gamma; Lognormal	Gamma
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.81	0.028	0.33	0.0060	0.81	0.031	0.33	0.0050	0.34	< 0.01	0.93	0.01 <= p < 0.05	0.24	Nonparametric	Nonparametric
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	9	2	22%	0.61	0	0.38	0.0030	0.85	0.12	0.25	0.22	0.30	0.05 <= p < 0.10	0.87	0.01 <= p < 0.05	0.79	Gamma; Lognormal	Gamma
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	9	0	0%	0.89	0.22	0.17	0.60	0.89	0.22	0.17	0.63	0.18	>= 0.10	0.44	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
1_11_5_117	MW-01R	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_11_5_118	MW-01R	Appendix IV	Molybdenum	mg/L	9	1	11%	0.80	0.032	0.31	0.024	0.92	0.47	0.23	0.27	0.26	>= 0.10	0.51	>= 0.10	0.51	Gamma; Lognormal	Gamma
1_11_5_121	MW-01R	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.35		Nonparametric
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	9	0	0%	0.94	0.58	0.22	0.24	0.88	0.14	0.28	0.045	0.25	>= 0.10	0.47	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
1_11_5_125	MW-01R	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_11_6_111	MW-01R	Part 115	Copper	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.72		Nonparametric
1_11_6_114	MW-01R	Part 115	Iron	mg/L	9	0	0%	0.96	0.81	0.15	0.78	0.91	0.32	0.26	0.087	0.22	>= 0.10	0.34	>= 0.10	0.61	Gamma; Lognormal; Normal	Normal
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	9	0	0%	0.78	0.011	0.28	0.035	0.92	0.39	0.19	0.43	0.21	>= 0.10	0.46	>= 0.10	0.42	Gamma; Lognormal	Gamma
1_11_6_123	MW-01R	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	9	2	22%	0.86	0.16	0.27	0.12	0.93	0.55	0.16	0.84	0.20	>= 0.10	0.33	>= 0.10	0.74	Gamma; Lognormal; Normal	Normal
1_11_6_130	MW-01R	Part 115	Zinc	mg/L	9	1	11%	0.73	0.0050	0.36	0.0040	0.74	0.0070	0.30	0.037	0.34	0.01 <= p < 0.05	1.1	< 0.01	1.1	Nonparametric	Nonparametric
1_15_4_105	MW-06	Appendix III	Boron	mg/L	9	0	0%	0.96	0.81	0.20	0.36	0.95	0.74	0.23	0.21	0.21	>= 0.10	0.31	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_15_4_107	MW-06	Appendix III	Calcium	mg/L	9	0	0%	0.92	0.36	0.22	0.21	0.93	0.50	0.21	0.32	0.22	>= 0.10	0.36	>= 0.10	0.11	Gamma; Lognormal; Normal	Normal
1_15_4_108	MW-06	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.86	0.097	0.29	0.029	0.92	0.44	0.25	0.11	0.27	0.05 <= p < 0.10	0.50	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
1_15_4_112	MW-06	Appendix III	Fluoride	mg/L	9	0	0%	0.88	0.15	0.25	0.12	0.89	0.19	0.23	0.17	0.25	>= 0.10	0.48	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	0.58	0	0.38	0	0.57	0	0.39	0	0.39	< 0.01	1.8	< 0.01	0.042	Nonparametric	Nonparametric
1_15_4_124	MW-06	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	0.92	0.45	0.20	0.42	0.75	0.0070	0.27	0.088	0.23	>= 0.10	0.62	0.05 <= p < 0.10	0.99	Gamma; Lognormal; Normal	Normal
1_15_4_126	MW-06	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.055		Nonparametric
1_15_5_101	MW-06	Appendix IV	Antimony	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.1		Nonparametric
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	9	0	0%	0.94	0.55	0.24	0.14	0.97	0.90	0.20	0.34	0.22	>= 0.10	0.26	>= 0.10	0.23	Gamma; Lognormal; Normal	Normal
1_15_5_103	MW-06	Appendix IV	Barium	mg/L	9	0	0%	0.83	0.043	0.28	0.040	0.78	0.011	0.30	0.017	0.30	0.01 <= p < 0.05	0.85	0.01 <= p < 0.05	0.14	Nonparametric	Nonparametric
1_15_5_104	MW-06	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
1_15_5_106	MW-06	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_15_5_109	MW-06	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.93	0.44	0.21	0.33	0.95	0.70	0.20	0.39	0.21	>= 0.10	0.34	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	9	0	0%	0.89	0.21	0.22	0.26	0.89	0.22	0.21	0.29	0.23	>= 0.10	0.49	>= 0.10	0.21	Gamma; Lognormal; Normal	Normal
1_15_5_113	MW-06	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.88	0.15	0.25	0.12	0.89	0.19	0.23	0.17	0.25	>= 0.10	0.48	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_15_5_115	MW-06	Appendix IV	Lead	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.18		Nonparametric
1_15_5_116	MW-06	Appendix IV	Lithium	mg/L	9	0	0%	0.86	0.10	0.21	0.32	0.84	0.059	0.21	0.30	0.22	>= 0.10	0.61	>= 0.10	0.17	Gamma; Lognormal; Normal	Normal
1_15_5_117	MW-06	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_15_5_118	MW-06	Appendix IV	Molybdenum	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.038		Nonparametric
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	0.71	0.0050	0.38	0.0030	0.83	0.076	0.31	0.042	0.33	0.01 <= p < 0.05	0.72	0.01 <= p < 0.05	0.37	Lognormal	Lognormal
1_15_5_122	MW-06	Appendix IV	Selenium	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.061		Nonparametric
1_15_5_125	MW-06	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_15_6_111	MW-06	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_15_6_114	MW-06	Part 115	Iron	mg/L	9	0	0%	0.85	0.081	0.28	0.048	0.91	0.34	0.24	0.15	0.24	>= 0.10	0.44	>= 0.10	0.18	Gamma; Lognormal; Normal	Normal
1_15_6_119	MW-06	Part 115	Nickel	mg/L	9	2	22%	0.97	0.88	0.18	0.66	0.96	0.85	0.19	0.62	0.21	>= 0.10	0.24	>= 0.10	0.14	Gamma; Lognormal; Normal	Normal
1_15_6_123	MW-06	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_15_6_129	MW-06	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_15_6_130	MW-06	Part 115	Zinc	mg/L	9	1	11%	0.61	0	0.45	0	0.66	0.0010	0.42	0	0.46	< 0.01	1.6	< 0.01	1.8	Nonparametric	Nonparametric
1_17_4_105	MW-08	Appendix III	Boron	mg/L	9	0	0%	0.93	0.50	0.24	0.14	0.87	0.12	0.29	0.031	0.28	0.01 <= p < 0.05	0.56	>= 0.10	0.41	Gamma; Lognormal; Normal	Normal
1_17_4_107	MW-08	Appendix III	Calcium	mg/L	9	0	0%	0.90	0.26	0.28	0.040	0.89	0.22	0.28	0.035	0.30	0.01 <= p < 0.05	0.61	>= 0.10	0.094	Gamma; Lognormal; Normal	Normal
1_17_4_108	MW-08	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.92	0.41	0.18	0.51	0.88	0.17	0.21	0.30	0.21	>= 0.10	0.49	>= 0.10	0.25	Gamma; Lognormal; Normal	Normal
1_17_4_112	MW-08	Appendix III	Fluoride	mg/L	9	0	0%	0.91	0.30	0.22	0.25	0.87	0.11	0.27	0.053	0.26	0.05 <= p < 0.10	0.62	0.05 <= p < 0.10	0.40	Gamma; Lognormal; Normal	Normal
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	0.65	0	0.39	0	0.63	0	0.40	0	0.40	< 0.01	1.6	< 0.01	0.055	Nonparametric	Nonparametric
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	3	33%	0.84	0.13	0.23	0.40	0.88	0.26	0.19	0.71	0.21	>= 0.10	0.41	>= 0.10	1.2	Gamma; Lognormal; Normal	Gamma
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.96	0.77	0.16	0.76	0.95	0.72	0.15	0.79	0.17	>= 0.10	0.29	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	9	3	33%	0.96	0.84	0.19	0.73	0.99	0.98	0.13	0.98	0.16	>= 0.10	0.16	>= 0.10	0.59	Gamma; Lognormal; Normal	Normal
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	9	0	0%	0.90	0.28	0.19	0.44	0.84	0.053	0.24	0.15	0.24	>= 0.10	0.57	>= 0.10	0.71	Gamma; Lognormal; Normal	Normal
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	9	0	0%	0.96	0.82	0.18	0.51	0.96	0.76	0.17	0.62	0.18	>= 0.10	0.28	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_17_5_104	MW-08	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_17_5_106	MW-08	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.93	0.47	0.18	0.52	0.97	0.86	0.14	0.84	0.15	>= 0.10	0.25	>= 0.10	0.27	Gamma; Lognormal; Normal	Normal
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	9	0	0%	0.91	0.33	0.22	0.22	0.87	0.13	0.24	0.13	0.25	>= 0.10	0.53	>= 0.10	0.26	Gamma; Lognormal; Normal	Normal
1_17_5_113	MW-08	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.91	0.30	0.22	0.25	0.87	0.11	0.27	0.053	0.26	0.05 <= p < 0.10	0.62	0.05 <= p < 0.10	0.40	Gamma; Lognormal; Normal	Normal
1_17_5_115	MW-08	Appendix IV	Lead	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.96		Nonparametric
1_17_5_116	MW-08	Appendix IV	Lithium	mg/L	9	0	0%	0.89	0.20	0.26	0.073	0.85	0.067	0.31	0.013	0.30	0.01 <= p < 0.05	0.60	>= 0.10	0.27	Gamma; Lognormal; Normal	Normal
1_17_5_117	MW-08	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	9	0	0%	0.94	0.57	0.14	0.89	0.92	0.37	0.21	0.31	0.19	>= 0.10	0.29	>= 0.10	0.75	Gamma; Lognormal; Normal	Normal
1_17_5_121	MW-08	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	0.95	0.71	0.21	0.45	0.96	0.86	0.21	0.44	0.19	>= 0.10	0.26	>= 0.10	0.33	Gamma; Lognormal; Normal	Normal
1_17_5_122	MW-08	Appendix IV	Selenium	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.064		Nonparametric
1_17_5_125	MW-08	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
1_17_6_111	MW-08	Part 115	Copper	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.35		Nonparametric
1_17_6_114	MW-08	Part 115	Iron	mg/L	9	0	0%	0.92	0.41	0.23	0.19	0.96	0.76	0.18	0.57	0.19	>= 0.10	0.29	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
1_17_6_119	MW-08	Part 115	Nickel	mg/L	9	0	0%	0.95	0.69	0.23	0.20	0.96	0.84	0.20	0.40	0.21	>= 0.10	0.28	>= 0.10	0.18	Gamma; Lognormal; Normal	Normal
1_17_6_123	MW-08	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_17_6_129	MW-08	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_17_6_130	MW-08	Part 115	Zinc	mg/L	9	2	22%	0.65	0.0010	0.40	0.0010	0.79	0.033	0.29	0.071	0.37	0.01 <= p < 0.05	0.94	0.01 <= p < 0.05	1.9	Lognormal	Nonparametric
1_18_4_105	MW-09	Appendix III	Boron	mg/L	9	0	0%	0.96	0.81	0.18	0.59	0.95	0.74	0.19	0.43	0.18	>= 0.10	0.29	>= 0.10	0.10	Gamma; Lognormal; Normal	Normal
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	9	0	0%	0.94	0.57	0.20	0.35	0.93	0.51	0.21	0.31	0.22	>= 0.10	0.33	>= 0.10	0.21	Gamma; Lognormal; Normal	Normal
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.86	0.089	0.30	0.020	0.86	0.098	0.29	0.029	0.30	0.01 <= p < 0.05	0.64	0.05 <= p < 0.10	0.19	Gamma; Lognormal; Normal	Normal
1_18_4_112	MW-09	Appendix III	Fluoride	mg/L	9	0	0%	0.94	0.56	0.13	0.94	0.92	0.41	0.15	0.83	0.13	>= 0.10	0.30	>= 0.10	0.10	Gamma; Lognormal; Normal	Normal
1_18_4_120	MW-09	Appendix III	pH (field)	su	9	0	0%	0.78	0.014	0.33	0.0050	0.79	0.015	0.33	0.0050	0.34	< 0.01	0.98	< 0.01	0.016	Nonparametric	Nonparametric
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.90	0.27	0.21	0.28	0.87	0.13	0.27	0.060	0.27	0.05 <= p < 0.10	0.54	>= 0.10	0.76	Gamma; Lognormal; Normal	Normal
1_18_4_126	MW-09	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.91	0.34	0.22	0.21	0.89	0.21	0.24	0.13	0.25	>= 0.10	0.44	>= 0.10	0.26	Gamma; Lognormal; Normal	Normal
1_18_5_101	MW-09	Appendix IV	Antimony	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.76		Nonparametric
1_18_5_102	MW-09	Appendix IV	Arsenic	mg/L	9	0	0%	0.75	0.0060	0.39	0	0.70	0.0010	0.41	0	0.41	< 0.01	1.4	< 0.01	0.27	Nonparametric	Nonparametric
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	0.55	0	0.36	0.0010	0.80	0.023	0.23	0.19	0.30	0.01 <= p < 0.05	1.1	< 0.01	0.84	Lognormal	Lognormal
1_18_5_104	MW-09	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_5_106	MW-09	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_5_109	MW-09	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.87	0.12	0.19	0.45	0.86	0.088	0.22	0.24	0.22	>= 0.10	0.59	>= 0.10	0.24	Gamma; Lognormal; Normal	Normal
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	9	0	0%	0.97	0.88	0.12	0.98	0.99	0.99	0.10	1.0	0.12	>= 0.10	0.13	>= 0.10	0.44	Gamma; Lognormal; Normal	Normal
1_18_5_113	MW-09	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.94	0.56	0.13	0.94	0.92	0.41	0.15	0.83	0.13	>= 0.10	0.30	>= 0.10	0.10	Gamma; Lognormal; Normal	Normal
1_18_5_115	MW-09	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_5_116	MW-09	Appendix IV	Lithium	mg/L	9	0	0%	0.90	0.23	0.22	0.25	0.89	0.20	0.22	0.24	0.23	>= 0.10	0.52	>= 0.10	0.093	Gamma; Lognormal; Normal	Normal
1_18_5_117	MW-09	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_5_118	MW-09	Appendix IV	Molybdenum	mg/L	9	0	0%	0.93	0.49	0.26	0.092	0.92	0.40	0.22	0.22	0.22	>= 0.10	0.42	>= 0.10	0.30	Gamma; Lognormal; Normal	Normal
1_18_5_121	MW-09	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	0.74	0.010	0.30	0.048	0.66	0.0020	0.36	0.0070	0.34	0.01 <= p < 0.05	1.1	< 0.01	0.29	Nonparametric	Nonparametric
1_18_5_125	MW-09	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_6_111	MW-09	Part 115	Copper	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_6_114	MW-09	Part 115	Iron	mg/L	9	0	0%	0.87	0.14	0.26	0.086	0.89	0.22	0.23	0.20	0.24	>= 0.10	0.52	>= 0.10	0.19	Gamma; Lognormal; Normal	Normal
1_18_6_119	MW-09	Part 115	Nickel	mg/L	9	0	0%	0.88	0.14	0.23	0.18	0.96	0.77	0.18	0.50	0.21	>= 0.10	0.32	>= 0.10	0.48	Gamma; Lognormal; Normal	Normal
1_18_6_123	MW-09	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_6_129	MW-09	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_18_6_130	MW-09	Part 115	Zinc	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.5		Nonparametric
1_22_4_105	MW-18	Appendix III	Boron	mg/L	9	0	0%	0.96	0.78	0.18	0.57	0.97	0.88	0.15	0.82	0.16	>= 0.10	0.20	>= 0.10	0.17	Gamma; Lognormal; Normal	Normal
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	9	0	0%	0.95	0.73	0.15	0.77	0.94	0.60	0.17	0.65	0.17	>= 0.10	0.28	>= 0.10	0.22	Gamma; Lognormal; Normal	Normal
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.95	0.74	0.14	0.86	0.95	0.64	0.15	0.84	0.16	>= 0.10	0.28	>= 0.10	0.19	Gamma; Lognormal; Normal	Normal
1_22_4_112	MW-18	Appendix III	Fluoride	mg/L	9	0	0%	0.92	0.36	0.22	0.24	0.94	0.55	0.20	0.40	0.21	>= 0.10	0.36	>= 0.10	0.14	Gamma; Lognormal; Normal	Normal
1_22_4_120	MW-18	Appendix III	pH (field)	su	9	0	0%	0.93	0.50	0.25	0.12	0.93	0.49	0.25	0.12	0.25	>= 0.10	0.41	>= 0.10	0.010	Gamma; Lognormal; Normal	Normal

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
1_22_4_124	MW-18	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.86	0.10	0.28	0.034	0.92	0.38	0.23	0.17	0.25	>= 0.10	0.50	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
1_22_4_126	MW-18	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.94	0.55	0.20	0.35	0.94	0.61	0.17	0.60	0.18	>= 0.10	0.33	>= 0.10	0.17	Gamma; Lognormal; Normal	Normal
1_22_5_101	MW-18	Appendix IV	Antimony	mg/L	9	2	22%	0.68	0.0020	0.39	0.0020	0.71	0.0050	0.36	0.0070	0.38	< 0.01	1.1	< 0.01	0.44	Nonparametric	Nonparametric
1_22_5_102	MW-18	Appendix IV	Arsenic	mg/L	9	0	0%	0.93	0.47	0.17	0.67	0.97	0.88	0.17	0.65	0.17	>= 0.10	0.28	>= 0.10	0.30	Gamma; Lognormal; Normal	Normal
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	9	0	0%	0.89	0.20	0.21	0.28	0.87	0.14	0.22	0.26	0.23	>= 0.10	0.54	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal
1_22_5_104	MW-18	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	9	2	22%	0.95	0.77	0.17	0.79	0.95	0.74	0.20	0.51	0.17	>= 0.10	0.24	>= 0.10	0.51	Gamma; Lognormal; Normal	Normal
1_22_5_109	MW-18	Appendix IV	Chromium, Total	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_22_5_110	MW-18	Appendix IV	Cobalt	mg/L	9	0	0%	0.88	0.15	0.21	0.28	0.91	0.32	0.17	0.64	0.19	>= 0.10	0.44	>= 0.10	0.48	Gamma; Lognormal; Normal	Normal
1_22_5_113	MW-18	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.92	0.36	0.22	0.24	0.94	0.55	0.20	0.40	0.21	>= 0.10	0.36	>= 0.10	0.14	Gamma; Lognormal; Normal	Normal
1_22_5_115	MW-18	Appendix IV	Lead	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.44		Nonparametric
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	9	0	0%	0.84	0.065	0.25	0.11	0.84	0.055	0.24	0.14	0.26	0.05 <= p < 0.10	0.75	0.01 <= p < 0.05	0.23	Gamma; Lognormal; Normal	Normal
1_22_5_117	MW-18	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_22_5_118	MW-18	Appendix IV	Molybdenum	mg/L	9	0	0%	0.90	0.25	0.23	0.19	0.93	0.48	0.18	0.55	0.20	>= 0.10	0.42	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
1_22_5_121	MW-18	Appendix IV	Radium 226 and 228	pCi/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.38		Nonparametric
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	9	0	0%	0.82	0.038	0.22	0.25	0.87	0.12	0.20	0.37	0.22	>= 0.10	0.57	>= 0.10	0.70	Gamma; Lognormal; Normal	Normal
1_22_5_125	MW-18	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_22_6_111	MW-18	Part 115	Copper	mg/L	9	0	0%	0.67	0.0010	0.30	0.021	0.76	0.0070	0.25	0.12	0.25	>= 0.10	1.1	< 0.01	0.43	Gamma; Lognormal	Gamma
1_22_6_114	MW-18	Part 115	Iron	mg/L	9	0	0%	0.92	0.37	0.19	0.43	0.96	0.80	0.16	0.72	0.18	>= 0.10	0.29	>= 0.10	0.27	Gamma; Lognormal; Normal	Normal
1_22_6_119	MW-18	Part 115	Nickel	mg/L	9	0	0%	0.84	0.066	0.25	0.11	0.85	0.081	0.25	0.10	0.26	0.05 <= p < 0.10	0.62	0.05 <= p < 0.10	0.35	Gamma; Lognormal; Normal	Normal
1_22_6_123	MW-18	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_22_6_129	MW-18	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_22_6_130	MW-18	Part 115	Zinc	mg/L	9	0	0%	0.99	0.99	0.12	0.98	0.96	0.83	0.17	0.65	0.16	>= 0.10	0.19	>= 0.10	0.36	Gamma; Lognormal; Normal	Normal
1_23_4_105	MW-19	Appendix III	Boron	mg/L	9	0	0%	0.94	0.61	0.14	0.91	0.95	0.68	0.12	0.96	0.14	>= 0.10	0.23	>= 0.10	0.20	Gamma; Lognormal; Normal	Normal
1_23_4_107	MW-19	Appendix III	Calcium	mg/L	9	0	0%	0.92	0.38	0.18	0.50	0.88	0.15	0.21	0.30	0.19	>= 0.10	0.42	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.87	0.14	0.19	0.44	0.90	0.23	0.17	0.61	0.19	>= 0.10	0.50	>= 0.10	0.26	Gamma; Lognormal; Normal	Normal
1_23_4_112	MW-19	Appendix III	Fluoride	mg/L	9	0	0%	0.93	0.44	0.22	0.21	0.93	0.51	0.21	0.28	0.23	>= 0.10	0.40	>= 0.10	0.10	Gamma; Lognormal; Normal	Normal
1_23_4_120	MW-19	Appendix III	pH (field)	su	9	0	0%	0.75	0.0060	0.29	0.027	0.74	0.0040	0.30	0.022	0.30	0.01 <= p < 0.05	1.0	< 0.01	0.029	Nonparametric	Nonparametric
1_23_4_124	MW-19	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.90	0.24	0.27	0.057	0.87	0.11	0.30	0.021	0.30	0.01 <= p < 0.05	0.56	>= 0.10	0.26	Gamma; Lognormal; Normal	Normal
1_23_4_126	MW-19	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.83	0.051	0.20	0.35	0.82	0.031	0.22	0.22	0.22	>= 0.10	0.70	0.05 <= p < 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_23_5_101	MW-19	Appendix IV	Antimony	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	9	0	0%	0.91	0.33	0.19	0.44	0.87	0.13	0.24	0.13	0.23	>= 0.10	0.49	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	9	0	0%	0.97	0.92	0.13	0.95	0.96	0.76	0.14	0.91	0.14	>= 0.10	0.23	>= 0.10	0.16	Gamma; Lognormal; Normal	Normal
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	9	3	33%	0.95	0.72	0.21	0.58	0.95	0.72	0.22	0.51	0.23	>= 0.10	0.29	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
1_23_5_106	MW-19	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	9	4	44%	0.83	0.15	0.26	0.31	0.88	0.33	0.25	0.40	0.27	>= 0.10	0.44	>= 0.10	0.27	Gamma; Lognormal; Normal	Normal
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	9	0	0%	0.96	0.85	0.17	0.66	0.84	0.057	0.27	0.057	0.22	>= 0.10	0.44	>= 0.10	0.58	Gamma; Lognormal; Normal	Normal
1_23_5_113	MW-19	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.93	0.44	0.22	0.21	0.93	0.51	0.21	0.28	0.23	>= 0.10	0.40	>= 0.10	0.10	Gamma; Lognormal; Normal	Normal
1_23_5_115	MW-19	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
1_23_5_116	MW-19	Appendix IV	Lithium	mg/L	9	0	0%	0.90	0.23	0.21	0.27	0.90	0.28	0.21	0.28	0.22	>= 0.10	0.46	>= 0.10	0.092	Gamma; Lognormal; Normal	Normal
1_23_5_117	MW-19	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_5_118	MW-19	Appendix IV	Molybdenum	mg/L	9	0	0%	0.89	0.22	0.17	0.62	0.80	0.022	0.24	0.16	0.20	>= 0.10	0.58	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	0.93	0.58	0.22	0.46	0.88	0.25	0.26	0.21	0.24	>= 0.10	0.39	>= 0.10	0.22	Gamma; Lognormal; Normal	Normal
1_23_5_122	MW-19	Appendix IV	Selenium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_5_125	MW-19	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_6_111	MW-19	Part 115	Copper	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_6_114	MW-19	Part 115	Iron	mg/L	9	0	0%	0.85	0.072	0.25	0.099	0.91	0.33	0.21	0.29	0.22	>= 0.10	0.45	>= 0.10	0.21	Gamma; Lognormal; Normal	Normal
1_23_6_119	MW-19	Part 115	Nickel	mg/L	9	1	11%	0.90	0.31	0.20	0.42	0.92	0.47	0.20	0.43	0.22	>= 0.10	0.40	>= 0.10	0.34	Gamma; Lognormal; Normal	Normal
1_23_6_123	MW-19	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_6_129	MW-19	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_23_6_130	MW-19	Part 115	Zinc	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.43		Nonparametric
1_24_4_105	MW-20	Appendix III	Boron	mg/L	9	0	0%	0.78	0.013	0.29	0.027	0.79	0.017	0.29	0.029	0.30	0.01 <= p < 0.05	0.94	0.01 <= p < 0.05	0.14	Nonparametric	Nonparametric
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	9	0	0%	0.85	0.076	0.24	0.13	0.75	0.0050	0.28	0.046	0.27	0.05 <= p < 0.10	0.97	< 0.01	0.30	Gamma; Normal	Normal
1_24_4_108	MW-20	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.84	0.060	0.32	0.0090	0.87	0.12	0.29	0.024	0.30	0.01 <= p < 0.05	0.68	0.05 <= p < 0.10	0.14	Gamma; Lognormal; Normal	Normal
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	9	0	0%	0.55	0	0.42	0	0.64	0	0.36	0.0010	0.39	< 0.01	1.6	< 0.01	0.30	Nonparametric	Nonparametric
1_24_4_120	MW-20	Appendix III	pH (field)	su	9	0	0%	0.95	0.74	0.17	0.64	0.95	0.75	0.17	0.64	0.18	>= 0.10	0.26	>= 0.10	0.017	Gamma; Lognormal; Normal	Normal
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.92	0.43	0.19	0.47	0.92	0.40	0.24	0.14	0.23	>= 0.10	0.37	>= 0.10	0.65	Gamma; Lognormal; Normal	Normal
1_24_4_126	MW-20	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.91	0.33	0.22	0.25	0.91	0.34	0.23	0.18	0.22	>= 0.10	0.48	>= 0.10	0.090	Gamma; Lognormal; Normal	Normal
1_24_5_101	MW-20	Appendix IV	Antimony	mg/L	9	2	22%	0.92	0.46	0.21	0.43	0.93	0.55	0.21	0.49	0.23	>= 0.10	0.31	>= 0.10	0.42	Gamma; Lognormal; Normal	Normal
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	9	0	0%	0.85	0.084	0.20	0.40	0.85	0.073	0.20	0.35	0.22	>= 0.10	0.62	0.05 <= p < 0.10	0.15	Gamma; Lognormal; Normal	Normal
1_24_5_103	MW-20	Appendix IV	Barium	mg/L	9	0	0%	0.84	0.052	0.23	0.19	0.94	0.63	0.16	0.69	0.18	>= 0.10	0.38	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
1_24_5_104	MW-20	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_24_5_106	MW-20	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_24_5_109	MW-20	Appendix IV	Chromium, Total	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.19		Nonparametric
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	9	0	0%	0.93	0.45	0.22	0.21	0.91	0.31	0.26	0.092	0.24	>= 0.10	0.42	>= 0.10	0.17	Gamma; Lognormal; Normal	Normal
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.55	0	0.42	0	0.64	0	0.36	0.0010	0.39	< 0.01	1.6	< 0.01	0.30	Nonparametric	Nonparametric
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	9	0	0%	0.85	0.072	0.20	0.40	0.85	0.067	0.23	0.19	0.23	>= 0.10	0.65	0.05 <= p < 0.10	0.23	Gamma; Lognormal; Normal	Normal
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	9	0	0%	0.98	0.96	0.11	0.99	0.98	0.94	0.12	0.96	0.13	>= 0.10	0.16	>= 0.10	0.17	Gamma; Lognormal; Normal	Normal
1_24_5_117	MW-20	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	9	0	0%	0.92	0.35	0.22	0.26	0.92	0.38	0.21	0.28	0.22	>= 0.10	0.46	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
1_24_5_121	MW-20	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.39		Nonparametric
1_24_5_122	MW-20	Appendix IV	Selenium	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.11		Nonparametric
1_24_5_125	MW-20	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_24_6_111	MW-20	Part 115	Copper	mg/L	9	1	11%	0.80	0.028	0.22	0.30	0.86	0.12	0.22	0.30	0.23	>= 0.10	0.56	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
1_24_6_114	MW-20	Part 115	Iron	mg/L	9	0	0%	0.96	0.84	0.15	0.83	0.95	0.74	0.14	0.85	0.16	>= 0.10	0.26	>= 0.10	0.099	Gamma; Lognormal; Normal	Normal
1_24_6_119	MW-20	Part 115	Nickel	mg/L	9	0	0%	0.80	0.022	0.34	0.0030	0.77	0.0090	0.35	0.0020	0.35	< 0.01	0.93	0.01 <= p < 0.05	0.13	Nonparametric	Nonparametric
1_24_6_123	MW-20	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_24_6_129	MW-20	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
1_24_6_130	MW-20	Part 115	Zinc	mg/L	9	0	0%	0.68	0.0010	0.40	0	0.73	0.0030	0.36	0.0010	0.38	< 0.01	1.3	< 0.01	0.40	Nonparametric	Nonparametric
1_25_4_105	MW-30	Appendix III	Boron	mg/L	9	0	0%	0.69	0.0010	0.32	0.0090	0.77	0.0090	0.26	0.073	0.28	0.05 <= p < 0.10	0.94	0.01 <= p < 0.05	0.22	Gamma; Lognormal	Gamma
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	0.56	0	0.43	0	0.64	0	0.38	0	0.40	< 0.01	1.6	< 0.01	0.27	Nonparametric	Nonparametric
1_25_4_108	MW-30	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.79	0.017	0.23	0.18	0.82	0.031	0.22	0.22	0.24	>= 0.10	0.79	0.01 <= p < 0.05	0.30	Gamma; Lognormal; Normal	Normal
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	9	0	0%	0.94	0.55	0.20	0.37	0.96	0.76	0.18	0.56	0.19	>= 0.10	0.31	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_25_4_120	MW-30	Appendix III	pH (field)	su	9	0	0%	0.74	0.0050	0.27	0.057	0.73	0.0030	0.28	0.046	0.27	0.05 <= p < 0.10	1.0	< 0.01	0.034	Gamma; Normal	Normal
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.90	0.28	0.18	0.54	0.86	0.10	0.20	0.41	0.19	>= 0.10	0.47	>= 0.10	0.15	Gamma; Lognormal; Normal	Normal
1_25_4_126	MW-30	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.95	0.69	0.18	0.52	0.97	0.87	0.16	0.71	0.16	>= 0.10	0.26	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
1_25_5_101	MW-30	Appendix IV	Antimony	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	9	2	22%	0.97	0.92	0.15	0.90	0.89	0.30	0.23	0.28	0.20	>= 0.10	0.29	>= 0.10	0.60	Gamma; Lognormal; Normal	Normal
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	9	0	0%	0.84	0.059	0.22	0.21	0.87	0.13	0.19	0.46	0.21	>= 0.10	0.58	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
1_25_5_104	MW-30	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_5_106	MW-30	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.94	0.57	0.20	0.41	0.91	0.32	0.20	0.36	0.21	>= 0.10	0.36	>= 0.10	0.35	Gamma; Lognormal; Normal	Normal
1_25_5_110	MW-30	Appendix IV	Cobalt	mg/L	9	0	0%	0.74	0.0040	0.34	0.0030	0.90	0.25	0.23	0.20	0.28	0.05 <= p < 0.10	0.66	0.05 <= p < 0.10	0.69	Gamma; Lognormal	Gamma
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.94	0.55	0.20	0.37	0.96	0.76	0.18	0.56	0.19	>= 0.10	0.31	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_25_5_115	MW-30	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	0.62	0	0.32	0.0090	0.72	0.0020	0.25	0.12	0.27	0.05 <= p < 0.10	1.2	< 0.01	0.28	Gamma; Lognormal	Gamma
1_25_5_117	MW-30	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_5_118	MW-30	Appendix IV	Molybdenum	mg/L	9	3	33%	0.83	0.12	0.25	0.27	0.99	1.0	0.13	0.99	0.18	>= 0.10	0.22	>= 0.10	0.84	Gamma; Lognormal; Normal	Normal
1_25_5_121	MW-30	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.34		Nonparametric
1_25_5_122	MW-30	Appendix IV	Selenium	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.084		Nonparametric
1_25_5_125	MW-30	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_6_111	MW-30	Part 115	Copper	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.27		Nonparametric
1_25_6_114	MW-30	Part 115	Iron	mg/L	9	0	0%	0.81	0.029	0.23	0.19	0.95	0.73	0.16	0.76	0.14	>= 0.10	0.30	>= 0.10	0.73	Gamma; Lognormal; Normal	Normal
1_25_6_119	MW-30	Part 115	Nickel	mg/L	9	2	22%	0.85	0.12	0.23	0.32	0.92	0.46	0.17	0.81	0.19	>= 0.10	0.36	>= 0.10	0.74	Gamma; Lognormal; Normal	Normal
1_25_6_123	MW-30	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_6_129	MW-30	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_25_6_130	MW-30	Part 115	Zinc	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.055		Nonparametric
1_26_4_105	MW-31	Appendix III	Boron	mg/L	9	0	0%	0.97	0.86	0.15	0.79	0.96	0.85	0.16	0.69	0.17	>= 0.10	0.22	>= 0.10	0.14	Gamma; Lognormal; Normal	Normal
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	9	0	0%	0.97	0.88	0.19	0.48	0.95	0.68	0.21	0.31	0.20	>= 0.10	0.28	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.92	0.42	0.21	0.31	0.93	0.47	0.20	0.34	0.21	>= 0.10	0.40	>= 0.10	0.089	Gamma; Lognormal; Normal	Normal
1_26_4_112	MW-31	Appendix III	Fluoride	mg/L	9	0	0%	0.84	0.052	0.26	0.074	0.84	0.054	0.26	0.083	0.27	0.05 <= p < 0.10	0.71	0.05 <= p < 0.10	0.050	Gamma; Lognormal; Normal	Normal
1_26_4_120	MW-31	Appendix III	pH (field)	su	9	0	0%	0.95	0.71	0.17	0.61	0.95	0.72	0.17	0.62	0.17	>= 0.10	0.29	>= 0.10	0.013	Gamma; Lognormal; Normal	Normal
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.90	0.28	0.20	0.41	0.89	0.22	0.17	0.67	0.19	>= 0.10	0.40	>= 0.10	0.45	Gamma; Lognormal; Normal	Normal
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.94	0.59	0.15	0.78	0.95	0.68	0.15	0.82	0.16	>= 0.10	0.30	>= 0.10	0.080	Gamma; Lognormal; Normal	Normal
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	9	4	44%	0.84	0.17	0.32	0.095	0.83	0.15	0.33	0.075	0.35	0.05 <= p < 0.10	0.56	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	9	0	0%	0.95	0.70	0.17	0.68	0.96	0.84	0.16	0.73	0.17	>= 0.10	0.25	>= 0.10	0.19	Gamma; Lognormal; Normal	Normal
1_26_5_103	MW-31	Appendix IV	Barium	mg/L	9	0	0%	0.94	0.54	0.23	0.20	0.96	0.79	0.19	0.46	0.20	>= 0.10	0.26	>= 0.10	0.22	Gamma; Lognormal; Normal	Normal

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
1_26_5_104	MW-31	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_5_106	MW-31	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.94	0.59	0.16	0.70	0.95	0.71	0.17	0.64	0.18	>= 0.10	0.28	>= 0.10	0.15	Gamma; Lognormal; Normal	Normal
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	9	0	0%	0.96	0.77	0.19	0.45	0.95	0.72	0.21	0.30	0.21	>= 0.10	0.30	>= 0.10	0.15	Gamma; Lognormal; Normal	Normal
1_26_5_113	MW-31	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.84	0.052	0.26	0.074	0.84	0.054	0.26	0.083	0.27	0.05 <= p < 0.10	0.71	0.05 <= p < 0.10	0.050	Gamma; Lognormal; Normal	Normal
1_26_5_115	MW-31	Appendix IV	Lead	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_5_116	MW-31	Appendix IV	Lithium	mg/L	9	0	0%	0.94	0.63	0.22	0.23	0.94	0.55	0.23	0.18	0.23	>= 0.10	0.36	>= 0.10	0.064	Gamma; Lognormal; Normal	Normal
1_26_5_117	MW-31	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	9	0	0%	0.76	0.0080	0.35	0.0020	0.80	0.022	0.32	0.0080	0.34	< 0.01	0.90	0.01 <= p < 0.05	0.23	Nonparametric	Nonparametric
1_26_5_121	MW-31	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	0.84	0.13	0.28	0.14	0.87	0.21	0.24	0.35	0.26	>= 0.10	0.50	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
1_26_5_122	MW-31	Appendix IV	Selenium	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.14		Nonparametric
1_26_5_125	MW-31	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_6_111	MW-31	Part 115	Copper	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_6_114	MW-31	Part 115	Iron	mg/L	9	0	0%	0.94	0.62	0.17	0.66	0.86	0.099	0.26	0.075	0.21	>= 0.10	0.45	>= 0.10	0.96	Gamma; Lognormal; Normal	Normal
1_26_6_119	MW-31	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_6_123	MW-31	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_6_129	MW-31	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
1_26_6_130	MW-31	Part 115	Zinc	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.1		Nonparametric
2_12_4_105	MW-02	Appendix III	Boron	mg/L	9	0	0%	0.94	0.57	0.15	0.80	0.92	0.40	0.17	0.60	0.17	>= 0.10	0.32	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
2_12_4_107	MW-02	Appendix III	Calcium	mg/L	9	0	0%	0.88	0.15	0.23	0.18	0.89	0.18	0.23	0.20	0.23	>= 0.10	0.56	>= 0.10	0.093	Gamma; Lognormal; Normal	Normal
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.59	0	0.39	0	0.53	0	0.39	0	0.40	< 0.01	1.9	< 0.01	0.25	Nonparametric	Nonparametric
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	0.62	0	0.34	0.0040	0.55	0	0.38	0	0.37	< 0.01	1.7	< 0.01	0.25	Nonparametric	Nonparametric
2_12_4_120	MW-02	Appendix III	pH (field)	su	9	0	0%	0.93	0.47	0.21	0.31	0.93	0.48	0.21	0.32	0.22	>= 0.10	0.38	>= 0.10	0.019	Gamma; Lognormal; Normal	Normal
2_12_4_124	MW-02	Appendix III	Sulfate (as SO4)	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.43		Nonparametric
2_12_4_126	MW-02	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.93	0.45	0.19	0.44	0.94	0.58	0.19	0.45	0.20	>= 0.10	0.35	>= 0.10	0.082	Gamma; Lognormal; Normal	Normal
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	0.70	0.0040	0.29	0.069	0.84	0.098	0.23	0.34	0.25	>= 0.10	0.69	0.05 <= p < 0.10	0.50	Gamma; Lognormal; Normal	Normal
2_12_5_102	MW-02	Appendix IV	Arsenic	mg/L	9	0	0%	0.80	0.019	0.30	0.019	0.85	0.072	0.27	0.049	0.28	0.01 <= p < 0.05	0.65	0.05 <= p < 0.10	0.15	Gamma; Lognormal	Gamma
2_12_5_103	MW-02	Appendix IV	Barium	mg/L	9	0	0%	0.96	0.85	0.17	0.66	0.95	0.69	0.17	0.62	0.19	>= 0.10	0.25	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	9	0	0%	0.98	0.98	0.13	0.94	0.96	0.80	0.17	0.60	0.14	>= 0.10	0.19	>= 0.10	0.38	Gamma; Lognormal; Normal	Normal
2_12_5_106	MW-02	Appendix IV	Cadmium	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.4		Nonparametric
2_12_5_109	MW-02	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.93	0.49	0.19	0.43	0.91	0.34	0.21	0.32	0.22	>= 0.10	0.41	>= 0.10	0.45	Gamma; Lognormal; Normal	Normal
2_12_5_110	MW-02	Appendix IV	Cobalt	mg/L	9	0	0%	0.94	0.55	0.18	0.50	0.91	0.30	0.22	0.21	0.21	>= 0.10	0.42	>= 0.10	0.37	Gamma; Lognormal; Normal	Normal
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.62	0	0.34	0.0040	0.55	0	0.38	0	0.37	< 0.01	1.7	< 0.01	0.25	Nonparametric	Nonparametric
2_12_5_115	MW-02	Appendix IV	Lead	mg/L	9	0	0%	0.96	0.76	0.14	0.91	0.96	0.80	0.13	0.92	0.13	>= 0.10	0.18	>= 0.10	0.44	Gamma; Lognormal; Normal	Normal
2_12_5_116	MW-02	Appendix IV	Lithium	mg/L	9	0	0%	0.94	0.59	0.17	0.66	0.90	0.28	0.20	0.38	0.18	>= 0.10	0.40	>= 0.10	0.21	Gamma; Lognormal; Normal	Normal
2_12_5_117	MW-02	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	9	0	0%	0.80	0.019	0.30	0.018	0.83	0.048	0.26	0.069	0.28	0.01 <= p < 0.05	0.76	0.01 <= p < 0.05	0.31	Lognormal	Lognormal
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	0.92	0.51	0.29	0.12	0.95	0.75	0.22	0.45	0.26	>= 0.10	0.31	>= 0.10	0.45	Gamma; Lognormal; Normal	Normal
2_12_5_122	MW-02	Appendix IV	Selenium	mg/L	9	0	0%	0.94	0.60	0.21	0.31	0.89	0.18	0.24	0.13	0.21	>= 0.10	0.45	>= 0.10	0.35	Gamma; Lognormal; Normal	Normal

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
2_12_5_125	MW-02	Appendix IV	Thallium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_12_6_111	MW-02	Part 115	Copper	mg/L	9	0	0%	0.93	0.46	0.18	0.51	0.90	0.27	0.21	0.29	0.19	>= 0.10	0.37	>= 0.10	0.40	Gamma; Lognormal; Normal	Normal
2_12_6_114	MW-02	Part 115	Iron	mg/L	9	0	0%	0.98	0.96	0.15	0.77	0.98	0.94	0.13	0.92	0.15	>= 0.10	0.20	>= 0.10	0.16	Gamma; Lognormal; Normal	Normal
2_12_6_119	MW-02	Part 115	Nickel	mg/L	9	0	0%	0.88	0.15	0.21	0.29	0.94	0.58	0.15	0.82	0.17	>= 0.10	0.35	>= 0.10	0.37	Gamma; Lognormal; Normal	Normal
2_12_6_123	MW-02	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_12_6_129	MW-02	Part 115	Vanadium	mg/L	9	0	0%	0.96	0.76	0.15	0.84	0.93	0.46	0.19	0.49	0.16	>= 0.10	0.27	>= 0.10	0.55	Gamma; Lognormal; Normal	Normal
2_12_6_130	MW-02	Part 115	Zinc	mg/L	9	0	0%	0.62	0	0.43	0	0.76	0.0070	0.33	0.0060	0.38	< 0.01	1.4	< 0.01	0.96	Nonparametric	Nonparametric
2_13_4_105	MW-03	Appendix III	Boron	mg/L	9	0	0%	0.78	0.011	0.28	0.044	0.75	0.0050	0.29	0.025	0.29	0.01 <= p < 0.05	0.95	0.01 <= p < 0.05	0.088	Nonparametric	Nonparametric
2_13_4_107	MW-03	Appendix III	Calcium	mg/L	9	0	0%	0.91	0.33	0.18	0.57	0.88	0.14	0.20	0.40	0.19	>= 0.10	0.48	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.86	0.089	0.29	0.032	0.92	0.39	0.24	0.13	0.26	0.05 <= p < 0.10	0.44	>= 0.10	0.24	Gamma; Lognormal; Normal	Normal
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	9	0	0%	0.51	0	0.44	0	0.59	0	0.39	0	0.42	< 0.01	1.8	< 0.01	0.34	Nonparametric	Nonparametric
2_13_4_120	MW-03	Appendix III	pH (field)	su	9	0	0%	0.91	0.31	0.27	0.060	0.91	0.34	0.27	0.064	0.27	0.05 <= p < 0.10	0.47	>= 0.10	0.016	Gamma; Lognormal; Normal	Normal
2_13_4_124	MW-03	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.96	0.80	0.17	0.60	0.74	0.0040	0.29	0.024	0.26	>= 0.10	0.71	0.05 <= p < 0.10	0.88	Gamma; Normal	Normal
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.099		Nonparametric
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.78		Nonparametric
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	9	0	0%	0.89	0.18	0.23	0.18	0.84	0.065	0.22	0.22	0.24	>= 0.10	0.60	>= 0.10	0.34	Gamma; Lognormal; Normal	Normal
2_13_5_103	MW-03	Appendix IV	Barium	mg/L	9	0	0%	0.88	0.17	0.22	0.26	0.74	0.0040	0.26	0.086	0.25	>= 0.10	0.83	0.01 <= p < 0.05	0.40	Gamma; Lognormal; Normal	Normal
2_13_5_104	MW-03	Appendix IV	Beryllium	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.74		Nonparametric
2_13_5_106	MW-03	Appendix IV	Cadmium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_13_5_109	MW-03	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.96	0.85	0.14	0.90	0.96	0.79	0.13	0.92	0.14	>= 0.10	0.22	>= 0.10	0.30	Gamma; Lognormal; Normal	Normal
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	9	0	0%	0.91	0.32	0.19	0.46	0.87	0.13	0.19	0.42	0.20	>= 0.10	0.49	>= 0.10	0.43	Gamma; Lognormal; Normal	Normal
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.51	0	0.44	0	0.59	0	0.39	0	0.42	< 0.01	1.8	< 0.01	0.34	Nonparametric	Nonparametric
2_13_5_115	MW-03	Appendix IV	Lead	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_13_5_116	MW-03	Appendix IV	Lithium	mg/L	9	0	0%	0.84	0.057	0.21	0.28	0.89	0.22	0.17	0.63	0.18	>= 0.10	0.44	>= 0.10	0.20	Gamma; Lognormal; Normal	Normal
2_13_5_117	MW-03	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_13_5_118	MW-03	Appendix IV	Molybdenum	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.12		Nonparametric
2_13_5_121	MW-03	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	0.91	0.36	0.20	0.46	0.94	0.58	0.17	0.73	0.19	>= 0.10	0.30	>= 0.10	0.35	Gamma; Lognormal; Normal	Normal
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	9	3	33%	0.91	0.44	0.23	0.39	0.82	0.081	0.28	0.16	0.27	>= 0.10	0.56	>= 0.10	0.39	Gamma; Lognormal; Normal	Normal
2_13_5_125	MW-03	Appendix IV	Thallium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_13_6_111	MW-03	Part 115	Copper	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.63		Nonparametric
2_13_6_114	MW-03	Part 115	Iron	mg/L	9	0	0%	0.86	0.10	0.19	0.48	0.93	0.52	0.16	0.74	0.17	>= 0.10	0.27	>= 0.10	1.1	Gamma; Lognormal; Normal	Gamma
2_13_6_119	MW-03	Part 115	Nickel	mg/L	9	1	11%	0.49	0	0.48	0	0.70	0.0020	0.38	0.0010	0.45	< 0.01	1.6	< 0.01	0.90	Nonparametric	Nonparametric
2_13_6_123	MW-03	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_13_6_129	MW-03	Part 115	Vanadium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_13_6_130	MW-03	Part 115	Zinc	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.3		Nonparametric
2_14_4_105	MW-04	Appendix III	Boron	mg/L	9	0	0%	0.95	0.65	0.18	0.55	0.96	0.81	0.16	0.68	0.17	>= 0.10	0.28	>= 0.10	0.083	Gamma; Lognormal; Normal	Normal
2_14_4_107	MW-04	Appendix III	Calcium	mg/L	9	0	0%	0.96	0.81	0.18	0.55	0.96	0.84	0.16	0.70	0.17	>= 0.10	0.23	>= 0.10	0.092	Gamma; Lognormal; Normal	Normal
2_14_4_108	MW-04	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.89	0.18	0.23	0.18	0.94	0.60	0.19	0.42	0.20	>= 0.10	0.34	>= 0.10	0.20	Gamma; Lognormal; Normal	Normal
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	0.87	0.12	0.26	0.070	0.85	0.072	0.29	0.031	0.27	0.05 <= p < 0.10	0.72	0.01 <= p < 0.05	0.24	Gamma; Lognormal; Normal	Normal

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
2_14_4_120	MW-04	Appendix III	pH (field)	su	9	0	0%	0.90	0.24	0.19	0.48	0.90	0.27	0.18	0.51	0.17	>= 0.10	0.42	>= 0.10	0.017	Gamma; Lognormal; Normal	Normal
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.74	0.0040	0.28	0.041	0.46	0	0.45	0	0.42	< 0.01	2.3	< 0.01	1.9	Nonparametric	Nonparametric
2_14_4_126	MW-04	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.91	0.31	0.16	0.70	0.91	0.33	0.16	0.76	0.17	>= 0.10	0.36	>= 0.10	0.081	Gamma; Lognormal; Normal	Normal
2_14_5_101	MW-04	Appendix IV	Antimony	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.90		Nonparametric
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	9	0	0%	0.91	0.32	0.19	0.46	0.89	0.18	0.17	0.63	0.19	>= 0.10	0.41	>= 0.10	0.33	Gamma; Lognormal; Normal	Normal
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	9	0	0%	0.50	0	0.42	0	0.61	0	0.34	0.0030	0.37	< 0.01	1.9	< 0.01	0.46	Nonparametric	Nonparametric
2_14_5_104	MW-04	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_5_106	MW-04	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_5_109	MW-04	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.88	0.18	0.20	0.34	0.87	0.13	0.23	0.16	0.23	>= 0.10	0.61	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	9	0	0%	0.93	0.48	0.17	0.62	0.93	0.50	0.22	0.21	0.22	>= 0.10	0.36	>= 0.10	0.38	Gamma; Lognormal; Normal	Normal
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.87	0.12	0.26	0.070	0.85	0.072	0.29	0.031	0.27	0.05 <= p < 0.10	0.72	0.01 <= p < 0.05	0.24	Gamma; Lognormal; Normal	Normal
2_14_5_115	MW-04	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_5_116	MW-04	Appendix IV	Lithium	mg/L	9	0	0%	0.91	0.29	0.18	0.53	0.89	0.21	0.17	0.60	0.19	>= 0.10	0.42	>= 0.10	0.16	Gamma; Lognormal; Normal	Normal
2_14_5_117	MW-04	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	9	2	22%	0.93	0.55	0.17	0.76	0.91	0.37	0.19	0.61	0.20	>= 0.10	0.33	>= 0.10	0.52	Gamma; Lognormal; Normal	Normal
2_14_5_121	MW-04	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	0.90	0.32	0.19	0.53	0.82	0.051	0.24	0.18	0.22	>= 0.10	0.52	>= 0.10	0.27	Gamma; Lognormal; Normal	Normal
2_14_5_122	MW-04	Appendix IV	Selenium	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.38		Nonparametric
2_14_5_125	MW-04	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_6_111	MW-04	Part 115	Copper	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_6_114	MW-04	Part 115	Iron	mg/L	9	0	0%	0.93	0.48	0.16	0.76	0.92	0.40	0.17	0.61	0.18	>= 0.10	0.36	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
2_14_6_119	MW-04	Part 115	Nickel	mg/L	9	0	0%	0.91	0.34	0.18	0.55	0.69	0.0010	0.33	0.0050	0.28	0.01 <= p < 0.05	0.87	0.01 <= p < 0.05	0.74	Normal	Normal
2_14_6_123	MW-04	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_6_129	MW-04	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_14_6_130	MW-04	Part 115	Zinc	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.72		Nonparametric
2_16_4_105	MW-07	Appendix III	Boron	mg/L	9	0	0%	0.91	0.34	0.25	0.11	0.91	0.35	0.24	0.14	0.25	>= 0.10	0.55	>= 0.10	0.077	Gamma; Lognormal; Normal	Normal
2_16_4_107	MW-07	Appendix III	Calcium	mg/L	9	0	0%	0.94	0.59	0.20	0.34	0.93	0.47	0.22	0.23	0.21	>= 0.10	0.41	>= 0.10	0.087	Gamma; Lognormal; Normal	Normal
2_16_4_108	MW-07	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.056		Nonparametric
2_16_4_112	MW-07	Appendix III	Fluoride	mg/L	9	1	11%	0.86	0.11	0.22	0.31	0.86	0.11	0.21	0.40	0.23	>= 0.10	0.57	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal
2_16_4_120	MW-07	Appendix III	pH (field)	su	9	0	0%	0.86	0.088	0.31	0.012	0.85	0.079	0.32	0.010	0.32	0.01 <= p < 0.05	0.78	0.01 <= p < 0.05	0.021	Lognormal; Normal	Normal
2_16_4_124	MW-07	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.91	0.29	0.23	0.18	0.92	0.40	0.20	0.39	0.22	>= 0.10	0.44	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal
2_16_4_126	MW-07	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.87	0.12	0.31	0.012	0.84	0.061	0.33	0.0050	0.33	< 0.01	0.79	0.01 <= p < 0.05	0.14	Lognormal; Normal	Normal
2_16_5_101	MW-07	Appendix IV	Antimony	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	9	0	0%	0.94	0.60	0.22	0.23	0.91	0.33	0.22	0.26	0.20	>= 0.10	0.42	>= 0.10	0.22	Gamma; Lognormal; Normal	Normal
2_16_5_103	MW-07	Appendix IV	Barium	mg/L	9	0	0%	0.88	0.16	0.25	0.097	0.84	0.058	0.28	0.046	0.27	0.05 <= p < 0.10	0.68	0.05 <= p < 0.10	0.12	Gamma; Lognormal; Normal	Normal
2_16_5_104	MW-07	Appendix IV	Beryllium	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.093		Nonparametric
2_16_5_106	MW-07	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.96	0.75	0.13	0.93	0.96	0.81	0.14	0.90	0.14	>= 0.10	0.22	>= 0.10	0.14	Gamma; Lognormal; Normal	Normal
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	9	0	0%	0.90	0.26	0.21	0.31	0.87	0.12	0.22	0.21	0.22	>= 0.10	0.59	>= 0.10	0.12	Gamma; Lognormal; Normal	Normal
2_16_5_113	MW-07	Appendix IV	Fluoride (App IV)	mg/L	9	1	11%	0.86	0.11	0.22	0.31	0.86	0.11	0.21	0.40	0.23	>= 0.10	0.57	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
2_16_5_115	MW-07	Appendix IV	Lead	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_5_116	MW-07	Appendix IV	Lithium	mg/L	9	0	0%	0.94	0.57	0.17	0.67	0.98	0.96	0.14	0.86	0.16	>= 0.10	0.22	>= 0.10	0.26	Gamma; Lognormal; Normal	Normal
2_16_5_117	MW-07	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_5_118	MW-07	Appendix IV	Molybdenum	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_5_121	MW-07	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	0.80	0.037	0.30	0.059	0.89	0.28	0.22	0.40	0.24	>= 0.10	0.50	>= 0.10	0.43	Gamma; Lognormal; Normal	Normal
2_16_5_122	MW-07	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_5_125	MW-07	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_6_111	MW-07	Part 115	Copper	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_6_114	MW-07	Part 115	Iron	mg/L	9	0	0%	0.92	0.41	0.19	0.46	0.93	0.46	0.18	0.51	0.20	>= 0.10	0.32	>= 0.10	0.14	Gamma; Lognormal; Normal	Normal
2_16_6_119	MW-07	Part 115	Nickel	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_6_123	MW-07	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_6_129	MW-07	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_16_6_130	MW-07	Part 115	Zinc	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.0		Nonparametric
2_19_4_105	MW-10	Appendix III	Boron	mg/L	9	0	0%	0.92	0.44	0.19	0.46	0.90	0.22	0.20	0.39	0.21	>= 0.10	0.39	>= 0.10	0.62	Gamma; Lognormal; Normal	Normal
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	0.78	0.011	0.29	0.028	0.88	0.18	0.26	0.075	0.28	0.01 <= p < 0.05	0.64	0.05 <= p < 0.10	0.30	Gamma; Lognormal	Gamma
2_19_4_108	MW-10	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.91	0.30	0.23	0.20	0.96	0.84	0.17	0.66	0.20	>= 0.10	0.30	>= 0.10	0.50	Gamma; Lognormal; Normal	Normal
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	9	0	0%	0.94	0.59	0.16	0.74	0.89	0.18	0.21	0.28	0.20	>= 0.10	0.39	>= 0.10	0.34	Gamma; Lognormal; Normal	Normal
2_19_4_120	MW-10	Appendix III	pH (field)	su	9	0	0%	0.94	0.59	0.19	0.43	0.95	0.65	0.19	0.45	0.18	>= 0.10	0.37	>= 0.10	0.061	Gamma; Lognormal; Normal	Normal
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.92	0.44	0.16	0.70	0.96	0.82	0.14	0.88	0.13	>= 0.10	0.19	>= 0.10	0.64	Gamma; Lognormal; Normal	Normal
2_19_4_126	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.86	0.11	0.25	0.098	0.91	0.32	0.23	0.21	0.23	>= 0.10	0.44	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.54		Nonparametric
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	9	0	0%	0.92	0.40	0.19	0.47	0.97	0.90	0.14	0.89	0.17	>= 0.10	0.24	>= 0.10	0.54	Gamma; Lognormal; Normal	Normal
2_19_5_103	MW-10	Appendix IV	Barium	mg/L	9	0	0%	0.90	0.25	0.21	0.27	0.96	0.83	0.14	0.90	0.16	>= 0.10	0.28	>= 0.10	0.45	Gamma; Lognormal; Normal	Normal
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	9	3	33%	0.85	0.16	0.25	0.26	0.91	0.46	0.17	0.83	0.20	>= 0.10	0.37	>= 0.10	0.58	Gamma; Lognormal; Normal	Normal
2_19_5_106	MW-10	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.92	0.38	0.19	0.42	0.94	0.59	0.20	0.42	0.16	>= 0.10	0.29	>= 0.10	0.54	Gamma; Lognormal; Normal	Normal
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	9	0	0%	0.71	0.0020	0.26	0.079	0.86	0.11	0.25	0.11	0.26	0.05 <= p < 0.10	0.76	0.01 <= p < 0.05	0.56	Gamma; Lognormal; Normal	Normal
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.94	0.59	0.16	0.74	0.89	0.18	0.21	0.28	0.20	>= 0.10	0.39	>= 0.10	0.34	Gamma; Lognormal; Normal	Normal
2_19_5_115	MW-10	Appendix IV	Lead	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.25		Nonparametric
2_19_5_116	MW-10	Appendix IV	Lithium	mg/L	9	0	0%	0.94	0.56	0.18	0.58	0.96	0.76	0.20	0.34	0.18	>= 0.10	0.28	>= 0.10	0.30	Gamma; Lognormal; Normal	Normal
2_19_5_117	MW-10	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_19_5_118	MW-10	Appendix IV	Molybdenum	mg/L	9	0	0%	0.92	0.40	0.25	0.12	0.98	0.95	0.18	0.54	0.21	>= 0.10	0.25	>= 0.10	0.41	Gamma; Lognormal; Normal	Normal
2_19_5_121	MW-10	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_19_5_122	MW-10	Appendix IV	Selenium	mg/L	9	1	11%	0.96	0.84	0.17	0.67	0.97	0.88	0.17	0.68	0.19	>= 0.10	0.23	>= 0.10	0.16	Gamma; Lognormal; Normal	Normal
2_19_5_125	MW-10	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_19_6_111	MW-10	Part 115	Copper	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.65		Nonparametric
2_19_6_114	MW-10	Part 115	Iron	mg/L	9	0	0%	0.89	0.18	0.22	0.21	0.93	0.48	0.18	0.58	0.20	>= 0.10	0.42	>= 0.10	0.38	Gamma; Lognormal; Normal	Normal
2_19_6_119	MW-10	Part 115	Nickel	mg/L	9	3	33%	0.77	0.031	0.34	0.027	0.83	0.11	0.33	0.038	0.35	0.01 <= p < 0.05	0.66	0.05 <= p < 0.10	0.32	Gamma; Lognormal	Gamma
2_19_6_123	MW-10	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
2_19_6_129	MW-10	Part 115	Vanadium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_19_6_130	MW-10	Part 115	Zinc	mg/L	9	2	22%	0.67	0.0020	0.38	0.0030	0.77	0.021	0.27	0.14	0.33	0.01 <= p < 0.05	0.97	0.01 <= p < 0.05	1.1	Lognormal	Nonparametric
2_20_4_105	MW-11	Appendix III	Boron	mg/L	9	0	0%	0.89	0.20	0.21	0.32	0.94	0.57	0.16	0.71	0.20	>= 0.10	0.31	>= 0.10	0.79	Gamma; Lognormal; Normal	Normal
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	9	0	0%	0.92	0.40	0.19	0.45	0.87	0.11	0.22	0.23	0.22	>= 0.10	0.52	>= 0.10	0.38	Gamma; Lognormal; Normal	Normal
2_20_4_108	MW-11	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.95	0.71	0.14	0.88	0.93	0.51	0.18	0.56	0.17	>= 0.10	0.28	>= 0.10	0.21	Gamma; Lognormal; Normal	Normal
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	9	0	0%	0.85	0.068	0.26	0.086	0.90	0.23	0.19	0.45	0.23	>= 0.10	0.49	>= 0.10	0.74	Gamma; Lognormal; Normal	Normal
2_20_4_120	MW-11	Appendix III	pH (field)	su	9	0	0%	0.96	0.85	0.20	0.42	0.96	0.85	0.19	0.43	0.20	>= 0.10	0.26	>= 0.10	0.011	Gamma; Lognormal; Normal	Normal
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	0.80	0.029	0.26	0.12	0.95	0.71	0.13	0.95	0.20	>= 0.10	0.29	>= 0.10	1.6	Gamma; Lognormal; Normal	Gamma
2_20_4_126	MW-11	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.88	0.14	0.30	0.020	0.92	0.41	0.25	0.096	0.26	0.05 <= p < 0.10	0.48	>= 0.10	0.26	Gamma; Lognormal; Normal	Normal
2_20_5_101	MW-11	Appendix IV	Antimony	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		1.1		Nonparametric
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	9	0	0%	0.85	0.076	0.21	0.30	0.98	0.98	0.12	0.98	0.14	>= 0.10	0.25	>= 0.10	0.55	Gamma; Lognormal; Normal	Normal
2_20_5_103	MW-11	Appendix IV	Barium	mg/L	9	0	0%	0.90	0.25	0.24	0.14	0.97	0.91	0.18	0.52	0.21	>= 0.10	0.25	>= 0.10	0.37	Gamma; Lognormal; Normal	Normal
2_20_5_104	MW-11	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_20_5_106	MW-11	Appendix IV	Cadmium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.53	0	0.38	0	0.83	0.044	0.23	0.19	0.30	0.01 <= p < 0.05	1.1	< 0.01	0.89	Lognormal	Lognormal
2_20_5_110	MW-11	Appendix IV	Cobalt	mg/L	9	0	0%	0.89	0.20	0.20	0.41	0.96	0.85	0.18	0.51	0.18	>= 0.10	0.30	>= 0.10	0.48	Gamma; Lognormal; Normal	Normal
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.85	0.068	0.26	0.086	0.90	0.23	0.19	0.45	0.23	>= 0.10	0.49	>= 0.10	0.74	Gamma; Lognormal; Normal	Normal
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	9	3	33%	0.54	0	0.46	0	0.94	0.67	0.22	0.51	0.35	0.05 <= p < 0.10	0.64	>= 0.10	2.1	Gamma; Lognormal	Gamma
2_20_5_116	MW-11	Appendix IV	Lithium	mg/L	9	0	0%	0.88	0.18	0.19	0.47	0.94	0.62	0.18	0.56	0.16	>= 0.10	0.22	>= 0.10	1.3	Gamma; Lognormal; Normal	Gamma
2_20_5_117	MW-11	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	9	2	22%	0.92	0.47	0.22	0.36	0.93	0.53	0.25	0.19	0.22	>= 0.10	0.34	>= 0.10	0.63	Gamma; Lognormal; Normal	Normal
2_20_5_121	MW-11	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	0.96	0.82	0.15	0.90	0.95	0.75	0.15	0.92	0.16	>= 0.10	0.21	>= 0.10	0.37	Gamma; Lognormal; Normal	Normal
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	9	3	33%	0.92	0.51	0.24	0.32	0.96	0.83	0.20	0.64	0.20	>= 0.10	0.27	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal
2_20_5_125	MW-11	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_20_6_111	MW-11	Part 115	Copper	mg/L	9	3	33%	0.55	0	0.44	0	0.81	0.078	0.30	0.093	0.35	0.01 <= p < 0.05	0.97	0.01 <= p < 0.05	1.6	Lognormal	Nonparametric
2_20_6_114	MW-11	Part 115	Iron	mg/L	9	0	0%	0.90	0.28	0.17	0.64	0.93	0.45	0.14	0.87	0.16	>= 0.10	0.34	>= 0.10	0.42	Gamma; Lognormal; Normal	Normal
2_20_6_119	MW-11	Part 115	Nickel	mg/L	9	0	0%	0.52	0	0.44	0	0.79	0.014	0.29	0.029	0.36	< 0.01	1.3	< 0.01	0.78	Nonparametric	Nonparametric
2_20_6_123	MW-11	Part 115	Silver	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_20_6_129	MW-11	Part 115	Vanadium	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_20_6_130	MW-11	Part 115	Zinc	mg/L	9	2	22%	0.74	0.010	0.28	0.098	0.95	0.71	0.19	0.63	0.22	>= 0.10	0.37	>= 0.10	1.5	Gamma; Lognormal; Normal	Gamma
2_21_4_105	MW-12	Appendix III	Boron	mg/L	9	0	0%	0.94	0.58	0.18	0.58	0.94	0.62	0.14	0.88	0.15	>= 0.10	0.27	>= 0.10	0.29	Gamma; Lognormal; Normal	Normal
2_21_4_107	MW-12	Appendix III	Calcium	mg/L	9	0	0%	0.94	0.58	0.17	0.66	0.94	0.57	0.20	0.38	0.20	>= 0.10	0.30	>= 0.10	0.24	Gamma; Lognormal; Normal	Normal
2_21_4_108	MW-12	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.88	0.14	0.23	0.19	0.88	0.18	0.20	0.34	0.22	>= 0.10	0.54	>= 0.10	0.23	Gamma; Lognormal; Normal	Normal
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	9	0	0%	0.80	0.021	0.31	0.012	0.83	0.043	0.27	0.053	0.29	0.01 <= p < 0.05	0.84	0.01 <= p < 0.05	0.35	Lognormal	Lognormal
2_21_4_120	MW-12	Appendix III	pH (field)	su	9	0	0%	0.97	0.87	0.18	0.54	0.96	0.80	0.19	0.48	0.17	>= 0.10	0.24	>= 0.10	0.044	Gamma; Lognormal; Normal	Normal
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.83	0.046	0.31	0.015	0.88	0.14	0.27	0.057	0.28	0.01 <= p < 0.05	0.64	0.05 <= p < 0.10	0.21	Gamma; Lognormal	Gamma
2_21_4_126	MW-12	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.92	0.38	0.17	0.63	0.91	0.35	0.18	0.55	0.19	>= 0.10	0.38	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal
2_21_5_101	MW-12	Appendix IV	Antimony	mg/L	9	0	0%	0.95	0.72	0.14	0.90	0.94	0.57	0.14	0.88	0.15	>= 0.10	0.25	>= 0.10	0.36	Gamma; Lognormal; Normal	Normal
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	9	0	0%	0.94	0.61	0.21	0.29	0.94	0.56	0.19	0.48	0.21	>= 0.10	0.34	>= 0.10	0.30	Gamma; Lognormal; Normal	Normal

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	9	0	0%	0.90	0.28	0.22	0.24	0.96	0.77	0.15	0.81	0.17	>= 0.10	0.31	>= 0.10	0.42	Gamma; Lognormal; Normal	Normal
2_21_5_104	MW-12	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	9	0	0%	0.92	0.35	0.14	0.89	0.94	0.63	0.14	0.86	0.16	>= 0.10	0.26	>= 0.10	0.49	Gamma; Lognormal; Normal	Normal
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	9	4	44%	0.98	0.94	0.18	0.88	0.98	0.92	0.21	0.65	0.19	>= 0.10	0.21	>= 0.10	0.25	Gamma; Lognormal; Normal	Normal
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	9	3	33%	0.92	0.50	0.18	0.78	0.93	0.58	0.17	0.82	0.19	>= 0.10	0.29	>= 0.10	0.54	Gamma; Lognormal; Normal	Normal
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.80	0.021	0.31	0.012	0.83	0.043	0.27	0.053	0.29	0.01 <= p < 0.05	0.84	0.01 <= p < 0.05	0.35	Lognormal	Lognormal
2_21_5_115	MW-12	Appendix IV	Lead	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.22		Nonparametric
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	9	0	0%	0.95	0.71	0.15	0.79	0.97	0.90	0.16	0.74	0.14	>= 0.10	0.21	>= 0.10	0.32	Gamma; Lognormal; Normal	Normal
2_21_5_117	MW-12	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	9	0	0%	0.94	0.61	0.14	0.89	0.94	0.55	0.15	0.77	0.16	>= 0.10	0.31	>= 0.10	0.19	Gamma; Lognormal; Normal	Normal
2_21_5_121	MW-12	Appendix IV	Radium 226 and 228	pCi/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.21		Nonparametric
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	9	0	0%	0.91	0.29	0.17	0.65	0.89	0.22	0.19	0.49	0.19	>= 0.10	0.38	>= 0.10	1.1	Gamma; Lognormal; Normal	Gamma
2_21_5_125	MW-12	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_21_6_111	MW-12	Part 115	Copper	mg/L	9	0	0%	0.94	0.62	0.22	0.23	0.96	0.76	0.18	0.52	0.18	>= 0.10	0.27	>= 0.10	0.34	Gamma; Lognormal; Normal	Normal
2_21_6_114	MW-12	Part 115	Iron	mg/L	9	4	44%	0.94	0.63	0.24	0.44	0.97	0.85	0.20	0.73	0.23	>= 0.10	0.25	>= 0.10	0.35	Gamma; Lognormal; Normal	Normal
2_21_6_119	MW-12	Part 115	Nickel	mg/L	9	0	0%	0.94	0.59	0.19	0.48	0.94	0.59	0.14	0.85	0.16	>= 0.10	0.28	>= 0.10	0.25	Gamma; Lognormal; Normal	Normal
2_21_6_123	MW-12	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_21_6_129	MW-12	Part 115	Vanadium	mg/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.20		Nonparametric
2_21_6_130	MW-12	Part 115	Zinc	mg/L	9	0	0%	0.89	0.18	0.19	0.43	0.78	0.011	0.24	0.14	0.22	>= 0.10	0.69	0.05 <= p < 0.10	0.30	Gamma; Lognormal; Normal	Normal
2_27_4_105	MW-32	Appendix III	Boron	mg/L	9	0	0%	0.89	0.18	0.23	0.16	0.93	0.45	0.22	0.22	0.24	>= 0.10	0.43	>= 0.10	0.20	Gamma; Lognormal; Normal	Normal
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	9	0	0%	0.93	0.48	0.22	0.23	0.91	0.33	0.23	0.16	0.24	>= 0.10	0.52	>= 0.10	0.17	Gamma; Lognormal; Normal	Normal
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.90	0.25	0.20	0.41	0.90	0.25	0.19	0.44	0.21	>= 0.10	0.42	>= 0.10	0.076	Gamma; Lognormal; Normal	Normal
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	9	0	0%	0.85	0.080	0.23	0.16	0.87	0.12	0.22	0.22	0.23	>= 0.10	0.54	>= 0.10	0.083	Gamma; Lognormal; Normal	Normal
2_27_4_120	MW-32	Appendix III	pH (field)	su	9	0	0%	0.90	0.23	0.23	0.19	0.90	0.23	0.23	0.19	0.24	>= 0.10	0.52	>= 0.10	0.012	Gamma; Lognormal; Normal	Normal
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.93	0.47	0.18	0.57	0.88	0.15	0.21	0.30	0.19	>= 0.10	0.37	>= 0.10	0.92	Gamma; Lognormal; Normal	Normal
2_27_4_126	MW-32	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.89	0.20	0.20	0.41	0.88	0.16	0.20	0.41	0.21	>= 0.10	0.53	>= 0.10	0.14	Gamma; Lognormal; Normal	Normal
2_27_5_101	MW-32	Appendix IV	Antimony	mg/L	9	6	67%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.41		Nonparametric
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	9	0	0%	0.91	0.30	0.18	0.50	0.90	0.25	0.19	0.45	0.20	>= 0.10	0.45	>= 0.10	0.13	Gamma; Lognormal; Normal	Normal
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	9	0	0%	0.91	0.32	0.24	0.14	0.95	0.72	0.21	0.32	0.23	>= 0.10	0.34	>= 0.10	0.35	Gamma; Lognormal; Normal	Normal
2_27_5_104	MW-32	Appendix IV	Beryllium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_27_5_106	MW-32	Appendix IV	Cadmium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.89	0.21	0.20	0.35	0.90	0.26	0.17	0.64	0.19	>= 0.10	0.43	>= 0.10	0.28	Gamma; Lognormal; Normal	Normal
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	9	0	0%	0.79	0.014	0.32	0.0070	0.85	0.067	0.28	0.037	0.30	0.01 <= p < 0.05	0.82	0.01 <= p < 0.05	0.26	Lognormal	Lognormal
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.85	0.080	0.23	0.16	0.87	0.12	0.22	0.22	0.23	>= 0.10	0.54	>= 0.10	0.083	Gamma; Lognormal; Normal	Normal
2_27_5_115	MW-32	Appendix IV	Lead	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.11		Nonparametric
2_27_5_116	MW-32	Appendix IV	Lithium	mg/L	9	0	0%	0.94	0.60	0.15	0.81	0.97	0.91	0.12	0.97	0.12	>= 0.10	0.20	>= 0.10	0.22	Gamma; Lognormal; Normal	Normal
2_27_5_117	MW-32	Appendix IV	Mercury	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	9	0	0%	0.92	0.41	0.22	0.24	0.90	0.26	0.23	0.17	0.24	>= 0.10	0.49	>= 0.10	0.16	Gamma; Lognormal; Normal	Normal
2_27_5_121	MW-32	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.20		Nonparametric

(Table continues on next page)

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 3: Goodness-of-Fit Tests, Non-Detects Excluded *(continued)*

								Normal				Lognormal				Gamma						
								S-W		Lilliefors		S-W		Lilliefors		K-S		A-D				
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Stat.	p-Value	Log-SD (NDs excl.)	ProUCL Distributions Fit	Recommended Distribution
2_27_5_122	MW-32	Appendix IV	Selenium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_27_5_125	MW-32	Appendix IV	Thallium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_27_6_111	MW-32	Part 115	Copper	mg/L	9	7	78%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		0.51		Nonparametric
2_27_6_114	MW-32	Part 115	Iron	mg/L	9	0	0%	0.84	0.053	0.25	0.11	0.80	0.018	0.27	0.051	0.27	0.05 <= p < 0.10	0.86	0.01 <= p < 0.05	0.23	Gamma; Lognormal; Normal	Normal
2_27_6_119	MW-32	Part 115	Nickel	mg/L	9	0	0%	0.93	0.47	0.19	0.44	0.94	0.61	0.23	0.20	0.22	>= 0.10	0.37	>= 0.10	0.24	Gamma; Lognormal; Normal	Normal
2_27_6_123	MW-32	Part 115	Silver	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_27_6_129	MW-32	Part 115	Vanadium	mg/L	9	9	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA		Nonparametric
2_27_6_130	MW-32	Part 115	Zinc	mg/L	9	0	0%	0.58	0	0.45	0	0.67	0.0010	0.37	0.0010	0.42	< 0.01	1.7	< 0.01	1.1	Nonparametric	Nonparametric

Note: p-values above 0.05 suggest a fit to the tested distribution; a distribution passes its GOF test when at least one of the two p-values is above 0.05.

Table 4: Autocorrelation Tests, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	9	0	0%	0.60	0.035	*
1_11_4_107	MW-01R	Appendix III	Calcium	mg/L	9	0	0%	0.54	0.059	
1_11_4_108	MW-01R	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.30	0.30	
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	9	0	0%	0.52	0.069	
1_11_4_120	MW-01R	Appendix III	pH (field)	su	9	0	0%	-0.13	0.65	
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.50	0.078	
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.32	0.27	
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	9	2	22%	0.19	0.55	
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	9	0	0%	0.20	0.47	
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	9	0	0%	0.38	0.19	
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	9	0	0%	0.30	0.30	
1_11_5_106	MW-01R	Appendix IV	Cadmium	mg/L	9	6	67%	-0.27	0.46	
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.36	0.20	
1_11_5_110	MW-01R	Appendix IV	Cobalt	mg/L	9	0	0%	-0.24	0.41	
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.52	0.069	
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	9	2	22%	-0.15	0.62	
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	9	0	0%	0.53	0.061	
1_11_5_118	MW-01R	Appendix IV	Molybdenum	mg/L	9	1	11%	-0.41	0.17	
1_11_5_121	MW-01R	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	-0.65	0.065	
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	9	0	0%	-0.19	0.50	
1_11_6_111	MW-01R	Part 115	Copper	mg/L	9	5	56%	-0.39	0.27	
1_11_6_114	MW-01R	Part 115	Iron	mg/L	9	0	0%	0.37	0.19	
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	9	0	0%	-0.19	0.51	
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	9	2	22%	0.42	0.18	
1_11_6_130	MW-01R	Part 115	Zinc	mg/L	9	1	11%	-0.016	0.96	
1_15_4_105	MW-06	Appendix III	Boron	mg/L	9	0	0%	0.20	0.48	
1_15_4_107	MW-06	Appendix III	Calcium	mg/L	9	0	0%	0.059	0.84	
1_15_4_108	MW-06	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.51	0.075	
1_15_4_112	MW-06	Appendix III	Fluoride	mg/L	9	0	0%	0.27	0.34	
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	-0.057	0.84	
1_15_4_124	MW-06	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	-0.29	0.33	
1_15_4_126	MW-06	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.14	0.63	
1_15_5_101	MW-06	Appendix IV	Antimony	mg/L	9	7	78%	-0.50	0.16	
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	9	0	0%	0.41	0.15	
1_15_5_103	MW-06	Appendix IV	Barium	mg/L	9	0	0%	0.29	0.32	
1_15_5_104	MW-06	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	
1_15_5_109	MW-06	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.083	0.77	
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	9	0	0%	-0.081	0.77	
1_15_5_113	MW-06	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.27	0.34	
1_15_5_115	MW-06	Appendix IV	Lead	mg/L	9	6	67%	-0.29	0.43	
1_15_5_116	MW-06	Appendix IV	Lithium	mg/L	9	0	0%	0.21	0.47	
1_15_5_118	MW-06	Appendix IV	Molybdenum	mg/L	9	6	67%	-0.50	0.17	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	-0.26	0.40	
1_15_5_122	MW-06	Appendix IV	Selenium	mg/L	9	5	56%	-0.49	0.17	
1_15_6_114	MW-06	Part 115	Iron	mg/L	9	0	0%	-0.073	0.80	
1_15_6_119	MW-06	Part 115	Nickel	mg/L	9	2	22%	0.29	0.35	
1_15_6_130	MW-06	Part 115	Zinc	mg/L	9	1	11%	-0.23	0.43	
1_17_4_105	MW-08	Appendix III	Boron	mg/L	9	0	0%	0.15	0.60	
1_17_4_107	MW-08	Appendix III	Calcium	mg/L	9	0	0%	0.26	0.36	
1_17_4_108	MW-08	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.050	0.86	
1_17_4_112	MW-08	Appendix III	Fluoride	mg/L	9	0	0%	0.34	0.23	
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	0.063	0.82	
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	3	33%	-0.34	0.30	
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.38	0.18	
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	9	3	33%	-0.087	0.79	
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	9	0	0%	0.38	0.19	
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	9	0	0%	0.14	0.62	
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.12	0.66	
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	9	0	0%	0.10	0.72	
1_17_5_113	MW-08	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.34	0.23	
1_17_5_115	MW-08	Appendix IV	Lead	mg/L	9	7	78%	-0.50	0.16	
1_17_5_116	MW-08	Appendix IV	Lithium	mg/L	9	0	0%	0.12	0.68	
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	9	0	0%	0.30	0.28	
1_17_5_121	MW-08	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	-0.51	0.10	
1_17_5_122	MW-08	Appendix IV	Selenium	mg/L	9	5	56%	-0.20	0.56	
1_17_6_111	MW-08	Part 115	Copper	mg/L	9	5	56%	0.21	0.55	
1_17_6_114	MW-08	Part 115	Iron	mg/L	9	0	0%	0.51	0.071	
1_17_6_119	MW-08	Part 115	Nickel	mg/L	9	0	0%	0.39	0.18	
1_17_6_130	MW-08	Part 115	Zinc	mg/L	9	2	22%	-0.28	0.36	
1_18_4_105	MW-09	Appendix III	Boron	mg/L	9	0	0%	0.091	0.75	
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	9	0	0%	0.56	0.048	*
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.73	0.0098	**
1_18_4_112	MW-09	Appendix III	Fluoride	mg/L	9	0	0%	0.52	0.068	
1_18_4_120	MW-09	Appendix III	pH (field)	su	9	0	0%	-0.10	0.72	
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.61	0.031	*
1_18_4_126	MW-09	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.63	0.026	*
1_18_5_101	MW-09	Appendix IV	Antimony	mg/L	9	5	56%	-0.46	0.20	
1_18_5_102	MW-09	Appendix IV	Arsenic	mg/L	9	0	0%	0.20	0.48	
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	0.075	0.79	
1_18_5_104	MW-09	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	
1_18_5_109	MW-09	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.060	0.83	
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	9	0	0%	-0.085	0.77	
1_18_5_113	MW-09	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.52	0.068	
1_18_5_116	MW-09	Appendix IV	Lithium	mg/L	9	0	0%	0.10	0.72	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_18_5_117	MW-09	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	
1_18_5_118	MW-09	Appendix IV	Molybdenum	mg/L	9	0	0%	0.61	0.032	*
1_18_5_121	MW-09	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	NA	NA	
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	-0.14	0.65	
1_18_6_111	MW-09	Part 115	Copper	mg/L	9	8	89%	NA	NA	
1_18_6_114	MW-09	Part 115	Iron	mg/L	9	0	0%	0.54	0.055	
1_18_6_119	MW-09	Part 115	Nickel	mg/L	9	0	0%	0.30	0.29	
1_18_6_130	MW-09	Part 115	Zinc	mg/L	9	6	67%	-0.61	0.095	
1_22_4_105	MW-18	Appendix III	Boron	mg/L	9	0	0%	0.16	0.56	
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	9	0	0%	0.42	0.14	
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.49	0.087	
1_22_4_112	MW-18	Appendix III	Fluoride	mg/L	9	0	0%	0.67	0.018	*
1_22_4_120	MW-18	Appendix III	pH (field)	su	9	0	0%	0.15	0.59	
1_22_4_124	MW-18	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.15	0.60	
1_22_4_126	MW-18	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.40	0.16	
1_22_5_101	MW-18	Appendix IV	Antimony	mg/L	9	2	22%	-0.39	0.21	
1_22_5_102	MW-18	Appendix IV	Arsenic	mg/L	9	0	0%	0.26	0.35	
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	9	0	0%	0.57	0.044	*
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	9	2	22%	-0.14	0.64	
1_22_5_109	MW-18	Appendix IV	Chromium, Total	mg/L	9	8	89%	NA	NA	
1_22_5_110	MW-18	Appendix IV	Cobalt	mg/L	9	0	0%	0.59	0.038	*
1_22_5_113	MW-18	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.67	0.018	*
1_22_5_115	MW-18	Appendix IV	Lead	mg/L	9	6	67%	-0.66	0.071	
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	9	0	0%	0.53	0.061	
1_22_5_118	MW-18	Appendix IV	Molybdenum	mg/L	9	0	0%	0.42	0.14	
1_22_5_121	MW-18	Appendix IV	Radium 226 and 228	pCi/L	9	6	67%	-0.65	0.075	
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	9	0	0%	0.078	0.78	
1_22_6_111	MW-18	Part 115	Copper	mg/L	9	0	0%	0.18	0.54	
1_22_6_114	MW-18	Part 115	Iron	mg/L	9	0	0%	0.50	0.081	
1_22_6_119	MW-18	Part 115	Nickel	mg/L	9	0	0%	0.58	0.040	*
1_22_6_130	MW-18	Part 115	Zinc	mg/L	9	0	0%	0.24	0.41	
1_23_4_105	MW-19	Appendix III	Boron	mg/L	9	0	0%	0.051	0.86	
1_23_4_107	MW-19	Appendix III	Calcium	mg/L	9	0	0%	0.34	0.24	
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.59	0.038	*
1_23_4_112	MW-19	Appendix III	Fluoride	mg/L	9	0	0%	0.38	0.18	
1_23_4_120	MW-19	Appendix III	pH (field)	su	9	0	0%	-0.31	0.27	
1_23_4_124	MW-19	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	-0.068	0.81	
1_23_4_126	MW-19	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.64	0.024	*
1_23_5_101	MW-19	Appendix IV	Antimony	mg/L	9	8	89%	NA	NA	
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	9	0	0%	0.48	0.091	
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	9	0	0%	0.41	0.15	
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	9	3	33%	0.46	0.16	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	9	4	44%	-0.22	0.51	
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	9	0	0%	0.43	0.13	
1_23_5_113	MW-19	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.38	0.18	
1_23_5_116	MW-19	Appendix IV	Lithium	mg/L	9	0	0%	-0.21	0.45	
1_23_5_118	MW-19	Appendix IV	Molybdenum	mg/L	9	0	0%	0.036	0.90	
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	-0.16	0.63	
1_23_6_114	MW-19	Part 115	Iron	mg/L	9	0	0%	0.12	0.68	
1_23_6_119	MW-19	Part 115	Nickel	mg/L	9	1	11%	0.61	0.039	*
1_23_6_130	MW-19	Part 115	Zinc	mg/L	9	7	78%	-0.50	0.16	
1_24_4_105	MW-20	Appendix III	Boron	mg/L	9	0	0%	0.46	0.11	
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	9	0	0%	0.20	0.48	
1_24_4_108	MW-20	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.32	0.26	
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	9	0	0%	0.087	0.76	
1_24_4_120	MW-20	Appendix III	pH (field)	su	9	0	0%	-0.15	0.61	
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.63	0.028	*
1_24_4_126	MW-20	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.39	0.17	
1_24_5_101	MW-20	Appendix IV	Antimony	mg/L	9	2	22%	0.17	0.59	
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	9	0	0%	0.67	0.018	*
1_24_5_103	MW-20	Appendix IV	Barium	mg/L	9	0	0%	0.36	0.20	
1_24_5_109	MW-20	Appendix IV	Chromium, Total	mg/L	9	5	56%	-0.21	0.56	
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	9	0	0%	0.43	0.13	
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.087	0.76	
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	9	0	0%	0.21	0.46	
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	9	0	0%	0.50	0.076	
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	9	0	0%	0.54	0.057	
1_24_5_121	MW-20	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	-0.12	0.74	
1_24_5_122	MW-20	Appendix IV	Selenium	mg/L	9	5	56%	0.039	0.91	
1_24_6_111	MW-20	Part 115	Copper	mg/L	9	1	11%	0.11	0.72	
1_24_6_114	MW-20	Part 115	Iron	mg/L	9	0	0%	0.10	0.72	
1_24_6_119	MW-20	Part 115	Nickel	mg/L	9	0	0%	0.34	0.23	
1_24_6_130	MW-20	Part 115	Zinc	mg/L	9	0	0%	-0.16	0.56	
1_25_4_105	MW-30	Appendix III	Boron	mg/L	9	0	0%	-0.17	0.55	
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	-0.066	0.82	
1_25_4_108	MW-30	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.71	0.012	*
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	9	0	0%	-0.43	0.13	
1_25_4_120	MW-30	Appendix III	pH (field)	su	9	0	0%	-0.034	0.90	
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	-0.11	0.70	
1_25_4_126	MW-30	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.20	0.48	
1_25_5_101	MW-30	Appendix IV	Antimony	mg/L	9	8	89%	NA	NA	
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	9	2	22%	0.25	0.42	
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	9	0	0%	0.38	0.18	
1_25_5_104	MW-30	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.20	0.48	
1_25_5_110	MW-30	Appendix IV	Cobalt	mg/L	9	0	0%	-0.27	0.34	
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.43	0.13	
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	-0.27	0.35	
1_25_5_118	MW-30	Appendix IV	Molybdenum	mg/L	9	3	33%	0.18	0.57	
1_25_5_121	MW-30	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	-0.58	0.10	
1_25_5_122	MW-30	Appendix IV	Selenium	mg/L	9	6	67%	0	1.0	
1_25_6_111	MW-30	Part 115	Copper	mg/L	9	7	78%	-0.50	0.16	
1_25_6_114	MW-30	Part 115	Iron	mg/L	9	0	0%	-0.19	0.51	
1_25_6_119	MW-30	Part 115	Nickel	mg/L	9	2	22%	0.093	0.76	
1_25_6_130	MW-30	Part 115	Zinc	mg/L	9	7	78%	-0.50	0.16	
1_26_4_105	MW-31	Appendix III	Boron	mg/L	9	0	0%	0.34	0.23	
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	9	0	0%	0.39	0.17	
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.0074	0.98	
1_26_4_112	MW-31	Appendix III	Fluoride	mg/L	9	0	0%	-0.22	0.44	
1_26_4_120	MW-31	Appendix III	pH (field)	su	9	0	0%	-0.059	0.83	
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.57	0.044	*
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.14	0.63	
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	9	4	44%	0.43	0.20	
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	9	0	0%	0.27	0.34	
1_26_5_103	MW-31	Appendix IV	Barium	mg/L	9	0	0%	-0.22	0.44	
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.12	0.68	
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	9	0	0%	-0.072	0.80	
1_26_5_113	MW-31	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.22	0.44	
1_26_5_115	MW-31	Appendix IV	Lead	mg/L	9	8	89%	NA	NA	
1_26_5_116	MW-31	Appendix IV	Lithium	mg/L	9	0	0%	-0.15	0.60	
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.083	0.77	
1_26_5_121	MW-31	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	-0.54	0.092	
1_26_5_122	MW-31	Appendix IV	Selenium	mg/L	9	5	56%	0.20	0.57	
1_26_6_111	MW-31	Part 115	Copper	mg/L	9	8	89%	NA	NA	
1_26_6_114	MW-31	Part 115	Iron	mg/L	9	0	0%	0.37	0.20	
1_26_6_130	MW-31	Part 115	Zinc	mg/L	9	6	67%	-0.29	0.42	
2_12_4_105	MW-02	Appendix III	Boron	mg/L	9	0	0%	0.080	0.78	
2_12_4_107	MW-02	Appendix III	Calcium	mg/L	9	0	0%	-0.15	0.59	
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.11	0.70	
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	-0.21	0.46	
2_12_4_120	MW-02	Appendix III	pH (field)	su	9	0	0%	-0.024	0.93	
2_12_4_124	MW-02	Appendix III	Sulfate (as SO4)	mg/L	9	5	56%	-0.41	0.25	
2_12_4_126	MW-02	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.056	0.85	
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	-0.096	0.76	
2_12_5_102	MW-02	Appendix IV	Arsenic	mg/L	9	0	0%	0.18	0.53	
2_12_5_103	MW-02	Appendix IV	Barium	mg/L	9	0	0%	0.26	0.36	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	9	0	0%	0.42	0.14	
2_12_5_106	MW-02	Appendix IV	Cadmium	mg/L	9	6	67%	-0.17	0.64	
2_12_5_109	MW-02	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.020	0.94	
2_12_5_110	MW-02	Appendix IV	Cobalt	mg/L	9	0	0%	0.14	0.63	
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.21	0.46	
2_12_5_115	MW-02	Appendix IV	Lead	mg/L	9	0	0%	0.052	0.86	
2_12_5_116	MW-02	Appendix IV	Lithium	mg/L	9	0	0%	-0.10	0.72	
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	9	0	0%	0.52	0.066	
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	-0.28	0.38	
2_12_5_122	MW-02	Appendix IV	Selenium	mg/L	9	0	0%	0.21	0.45	
2_12_5_125	MW-02	Appendix IV	Thallium	mg/L	9	8	89%	NA	NA	
2_12_6_111	MW-02	Part 115	Copper	mg/L	9	0	0%	-0.019	0.95	
2_12_6_114	MW-02	Part 115	Iron	mg/L	9	0	0%	0.48	0.089	
2_12_6_119	MW-02	Part 115	Nickel	mg/L	9	0	0%	0.26	0.36	
2_12_6_129	MW-02	Part 115	Vanadium	mg/L	9	0	0%	0.23	0.42	
2_12_6_130	MW-02	Part 115	Zinc	mg/L	9	0	0%	-0.23	0.41	
2_13_4_105	MW-03	Appendix III	Boron	mg/L	9	0	0%	-0.38	0.18	
2_13_4_107	MW-03	Appendix III	Calcium	mg/L	9	0	0%	-0.26	0.35	
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.22	0.44	
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	9	0	0%	-0.021	0.94	
2_13_4_120	MW-03	Appendix III	pH (field)	su	9	0	0%	-0.17	0.56	
2_13_4_124	MW-03	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.23	0.42	
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.0040	0.99	
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	9	5	56%	-0.041	0.91	
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	9	0	0%	0.28	0.33	
2_13_5_103	MW-03	Appendix IV	Barium	mg/L	9	0	0%	-0.60	0.034	*
2_13_5_104	MW-03	Appendix IV	Beryllium	mg/L	9	7	78%	-0.50	0.16	
2_13_5_106	MW-03	Appendix IV	Cadmium	mg/L	9	8	89%	NA	NA	
2_13_5_109	MW-03	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.24	0.39	
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	9	0	0%	0.20	0.49	
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.021	0.94	
2_13_5_115	MW-03	Appendix IV	Lead	mg/L	9	8	89%	NA	NA	
2_13_5_116	MW-03	Appendix IV	Lithium	mg/L	9	0	0%	-0.13	0.64	
2_13_5_117	MW-03	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	
2_13_5_118	MW-03	Appendix IV	Molybdenum	mg/L	9	7	78%	-0.50	0.16	
2_13_5_121	MW-03	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	-0.60	0.043	*
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	9	3	33%	-0.27	0.40	
2_13_5_125	MW-03	Appendix IV	Thallium	mg/L	9	8	89%	NA	NA	
2_13_6_111	MW-03	Part 115	Copper	mg/L	9	5	56%	-0.14	0.69	
2_13_6_114	MW-03	Part 115	Iron	mg/L	9	0	0%	0.57	0.046	*
2_13_6_119	MW-03	Part 115	Nickel	mg/L	9	1	11%	-0.11	0.72	
2_13_6_129	MW-03	Part 115	Vanadium	mg/L	9	8	89%	NA	NA	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
2_13_6_130	MW-03	Part 115	Zinc	mg/L	9	5	56%	0.26	0.46	
2_14_4_105	MW-04	Appendix III	Boron	mg/L	9	0	0%	0.050	0.86	
2_14_4_107	MW-04	Appendix III	Calcium	mg/L	9	0	0%	-0.14	0.62	
2_14_4_108	MW-04	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.039	0.89	
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	0.15	0.59	
2_14_4_120	MW-04	Appendix III	pH (field)	su	9	0	0%	-0.053	0.85	
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.34	0.23	
2_14_4_126	MW-04	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.20	0.48	
2_14_5_101	MW-04	Appendix IV	Antimony	mg/L	9	6	67%	-0.65	0.073	
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	9	0	0%	0.088	0.76	
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	9	0	0%	-0.15	0.60	
2_14_5_109	MW-04	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.11	0.70	
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	9	0	0%	-0.16	0.58	
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.15	0.59	
2_14_5_116	MW-04	Appendix IV	Lithium	mg/L	9	0	0%	-0.013	0.96	
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	9	2	22%	0.23	0.46	
2_14_5_121	MW-04	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	-0.23	0.44	
2_14_5_122	MW-04	Appendix IV	Selenium	mg/L	9	5	56%	-0.25	0.48	
2_14_6_111	MW-04	Part 115	Copper	mg/L	9	8	89%	NA	NA	
2_14_6_114	MW-04	Part 115	Iron	mg/L	9	0	0%	-0.047	0.87	
2_14_6_119	MW-04	Part 115	Nickel	mg/L	9	0	0%	0.030	0.92	
2_14_6_130	MW-04	Part 115	Zinc	mg/L	9	6	67%	-0.39	0.29	
2_16_4_105	MW-07	Appendix III	Boron	mg/L	9	0	0%	-0.26	0.35	
2_16_4_107	MW-07	Appendix III	Calcium	mg/L	9	0	0%	-0.54	0.056	
2_16_4_108	MW-07	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.57	0.047	*
2_16_4_112	MW-07	Appendix III	Fluoride	mg/L	9	1	11%	-0.21	0.47	
2_16_4_120	MW-07	Appendix III	pH (field)	su	9	0	0%	-0.075	0.79	
2_16_4_124	MW-07	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.57	0.045	*
2_16_4_126	MW-07	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.21	0.45	
2_16_5_101	MW-07	Appendix IV	Antimony	mg/L	9	8	89%	NA	NA	
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	9	0	0%	-0.040	0.89	
2_16_5_103	MW-07	Appendix IV	Barium	mg/L	9	0	0%	0.17	0.54	
2_16_5_104	MW-07	Appendix IV	Beryllium	mg/L	9	6	67%	-0.40	0.27	
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.11	0.69	
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	9	0	0%	0.20	0.49	
2_16_5_113	MW-07	Appendix IV	Fluoride (App IV)	mg/L	9	1	11%	-0.21	0.47	
2_16_5_116	MW-07	Appendix IV	Lithium	mg/L	9	0	0%	-0.55	0.053	
2_16_5_121	MW-07	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	-0.60	0.050	
2_16_5_122	MW-07	Appendix IV	Selenium	mg/L	9	8	89%	NA	NA	
2_16_6_111	MW-07	Part 115	Copper	mg/L	9	8	89%	NA	NA	
2_16_6_114	MW-07	Part 115	Iron	mg/L	9	0	0%	0.021	0.94	
2_16_6_130	MW-07	Part 115	Zinc	mg/L	9	6	67%	-0.44	0.22	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
2_19_4_105	MW-10	Appendix III	Boron	mg/L	9	0	0%	0.61	0.031	*
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	0.35	0.21	
2_19_4_108	MW-10	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.65	0.021	*
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	9	0	0%	0.57	0.046	*
2_19_4_120	MW-10	Appendix III	pH (field)	su	9	0	0%	-0.023	0.94	
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.13	0.64	
2_19_4_126	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.048	0.87	
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	9	5	56%	-0.36	0.30	
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	9	0	0%	0.64	0.024	*
2_19_5_103	MW-10	Appendix IV	Barium	mg/L	9	0	0%	0.27	0.34	
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	9	3	33%	-0.40	0.22	
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.49	0.087	
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	9	0	0%	-0.13	0.66	
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.57	0.046	*
2_19_5_115	MW-10	Appendix IV	Lead	mg/L	9	7	78%	-0.50	0.16	
2_19_5_116	MW-10	Appendix IV	Lithium	mg/L	9	0	0%	-0.29	0.31	
2_19_5_118	MW-10	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.15	0.61	
2_19_5_121	MW-10	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	NA	NA	
2_19_5_122	MW-10	Appendix IV	Selenium	mg/L	9	1	11%	0.24	0.41	
2_19_6_111	MW-10	Part 115	Copper	mg/L	9	6	67%	-0.66	0.071	
2_19_6_114	MW-10	Part 115	Iron	mg/L	9	0	0%	0.54	0.058	
2_19_6_119	MW-10	Part 115	Nickel	mg/L	9	3	33%	-0.41	0.20	
2_19_6_129	MW-10	Part 115	Vanadium	mg/L	9	8	89%	NA	NA	
2_19_6_130	MW-10	Part 115	Zinc	mg/L	9	2	22%	-0.27	0.38	
2_20_4_105	MW-11	Appendix III	Boron	mg/L	9	0	0%	0.41	0.15	
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	9	0	0%	0.27	0.33	
2_20_4_108	MW-11	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.50	0.077	
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	9	0	0%	0.29	0.31	
2_20_4_120	MW-11	Appendix III	pH (field)	su	9	0	0%	-0.040	0.89	
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	0.48	0.11	
2_20_4_126	MW-11	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.12	0.67	
2_20_5_101	MW-11	Appendix IV	Antimony	mg/L	9	6	67%	-0.60	0.10	
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	9	0	0%	0.19	0.50	
2_20_5_103	MW-11	Appendix IV	Barium	mg/L	9	0	0%	0.25	0.38	
2_20_5_104	MW-11	Appendix IV	Beryllium	mg/L	9	8	89%	NA	NA	
2_20_5_106	MW-11	Appendix IV	Cadmium	mg/L	9	8	89%	NA	NA	
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.14	0.62	
2_20_5_110	MW-11	Appendix IV	Cobalt	mg/L	9	0	0%	-0.20	0.49	
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.29	0.31	
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	9	3	33%	-0.22	0.50	
2_20_5_116	MW-11	Appendix IV	Lithium	mg/L	9	0	0%	0.31	0.27	
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	9	2	22%	0.33	0.28	

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*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
2_20_5_121	MW-11	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	-0.77	0.013	*
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	9	3	33%	-0.15	0.65	
2_20_6_111	MW-11	Part 115	Copper	mg/L	9	3	33%	-0.25	0.44	
2_20_6_114	MW-11	Part 115	Iron	mg/L	9	0	0%	0.31	0.28	
2_20_6_119	MW-11	Part 115	Nickel	mg/L	9	0	0%	-0.080	0.78	
2_20_6_123	MW-11	Part 115	Silver	mg/L	9	8	89%	NA	NA	
2_20_6_129	MW-11	Part 115	Vanadium	mg/L	9	8	89%	NA	NA	
2_20_6_130	MW-11	Part 115	Zinc	mg/L	9	2	22%	-0.012	0.97	
2_21_4_105	MW-12	Appendix III	Boron	mg/L	9	0	0%	0.41	0.15	
2_21_4_107	MW-12	Appendix III	Calcium	mg/L	9	0	0%	0.10	0.71	
2_21_4_108	MW-12	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.046	0.87	
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	9	0	0%	0.049	0.86	
2_21_4_120	MW-12	Appendix III	pH (field)	su	9	0	0%	0.20	0.47	
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.15	0.61	
2_21_4_126	MW-12	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.36	0.20	
2_21_5_101	MW-12	Appendix IV	Antimony	mg/L	9	0	0%	0.25	0.39	
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	9	0	0%	0.64	0.025	*
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	9	0	0%	0.63	0.026	*
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	9	0	0%	0.41	0.15	
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	9	4	44%	0.073	0.83	
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	9	3	33%	0.54	0.093	
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.049	0.86	
2_21_5_115	MW-12	Appendix IV	Lead	mg/L	9	5	56%	0.20	0.57	
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	9	0	0%	0.46	0.11	
2_21_5_117	MW-12	Appendix IV	Mercury	mg/L	9	8	89%	NA	NA	
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	9	0	0%	0.57	0.045	*
2_21_5_121	MW-12	Appendix IV	Radium 226 and 228	pCi/L	9	7	78%	-0.50	0.16	
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	9	0	0%	0.56	0.049	*
2_21_6_111	MW-12	Part 115	Copper	mg/L	9	0	0%	0.44	0.12	
2_21_6_114	MW-12	Part 115	Iron	mg/L	9	4	44%	0.091	0.79	
2_21_6_119	MW-12	Part 115	Nickel	mg/L	9	0	0%	-0.063	0.82	
2_21_6_129	MW-12	Part 115	Vanadium	mg/L	9	5	56%	-0.29	0.42	
2_21_6_130	MW-12	Part 115	Zinc	mg/L	9	0	0%	-0.39	0.18	
2_27_4_105	MW-32	Appendix III	Boron	mg/L	9	0	0%	0.32	0.26	
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	9	0	0%	0.55	0.055	
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.67	0.019	*
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	9	0	0%	0.013	0.96	
2_27_4_120	MW-32	Appendix III	pH (field)	su	9	0	0%	0.17	0.56	
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.47	0.099	
2_27_4_126	MW-32	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.48	0.088	
2_27_5_101	MW-32	Appendix IV	Antimony	mg/L	9	6	67%	-0.13	0.72	
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	9	0	0%	0.24	0.40	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 4: Autocorrelation Tests, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Autocorrelation	Box-Ljung p-value	Sig.
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	9	0	0%	0.25	0.38	
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.65	0.022	*
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	9	0	0%	0.29	0.31	
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.013	0.96	
2_27_5_115	MW-32	Appendix IV	Lead	mg/L	9	7	78%	-0.50	0.16	
2_27_5_116	MW-32	Appendix IV	Lithium	mg/L	9	0	0%	0.40	0.16	
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	9	0	0%	0.47	0.097	
2_27_5_121	MW-32	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	-0.092	0.79	
2_27_6_111	MW-32	Part 115	Copper	mg/L	9	7	78%	-0.50	0.16	
2_27_6_114	MW-32	Part 115	Iron	mg/L	9	0	0%	0.61	0.032	*
2_27_6_119	MW-32	Part 115	Nickel	mg/L	9	0	0%	0.38	0.19	
2_27_6_130	MW-32	Part 115	Zinc	mg/L	9	0	0%	-0.17	0.54	

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 5: Outlier Counts by Date

Date	Count
2022-11-30	2
2023-01-03	7
2023-01-04	6
2023-01-05	1
2023-02-06	1
2023-02-08	3
2023-03-13	3
2023-03-14	3
2023-04-18	3
2023-05-23	1
2023-06-28	2
2023-08-07	1
2023-10-24	5

Table 6: Outliers Identified at the 1% Significance Level, Non-Detects Excluded

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	No. Detects	Date	Dilution	Value
1_11_4_120	MW-01R	Appendix III	pH (field)	su	9	0	0%	9	2023-01-03	NA	6.0
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	9	2	22%	7	2023-06-28	5	0.0053
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	9	0	0%	9	2023-06-28	1	0.0053
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	9	2023-02-06	NA	6.4
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	7	2023-03-14	NA	1.9
1_15_6_114	MW-06	Part 115	Iron	mg/L	9	0	0%	9	2023-03-14	50	26
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	9	2023-01-05	NA	6.2
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	9	2023-01-04	5	2.4
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	7	2023-05-23	1	0.00012
1_23_4_120	MW-19	Appendix III	pH (field)	su	9	0	0%	9	2023-01-03	NA	6.4
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	9	0	0%	9	2022-11-30	25	0.55
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	9	2022-11-30	25	0.55
1_25_4_105	MW-30	Appendix III	Boron	mg/L	9	0	0%	9	2023-03-13	50	3.5
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	9	2023-03-13	50	960
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	9	2023-03-13	50	0.27
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	9	2023-02-08	50	67
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	9	2023-02-08	50	4.5
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	7	2023-04-18	5	0.00063
2_12_5_106	MW-02	Appendix IV	Cadmium	mg/L	9	6	67%	3	2023-10-24	1	0.00049
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	9	2023-02-08	50	4.5
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	9	0	0%	9	2023-01-04	5	1.6
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	9	2023-01-04	4	1700
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	9	5	56%	4	2023-04-18	5	0.00045
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	9	2023-01-04	5	1.6

(Table continues on next page)

Table 6: Outliers Identified at the 1% Significance Level, Non-Detects Excluded *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	No. Detects	Date	Dilution	Value
2_13_6_111	MW-03	Part 115	Copper	mg/L	9	5	56%	4	2023-10-24	1	0.00091
2_13_6_119	MW-03	Part 115	Nickel	mg/L	9	1	11%	8	2023-01-04	1	0.015
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	9	2023-10-24	5	1.9
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	9	0	0%	9	2023-01-04	1	0.46
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	9	2023-10-24	5	1.9
2_16_5_121	MW-07	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	7	2023-08-07	1	2.4
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	9	2023-03-14	50	460
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	9	5	56%	4	2023-04-18	5	0.00034
2_20_4_126	MW-11	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	9	2023-10-24	4	1800
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	9	2023-01-03	1	0.0086
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	9	3	33%	6	2023-01-03	1	0.068
2_20_6_111	MW-11	Part 115	Copper	mg/L	9	3	33%	6	2023-01-03	1	0.019
2_20_6_119	MW-11	Part 115	Nickel	mg/L	9	0	0%	9	2023-01-03	1	0.0094
2_20_6_130	MW-11	Part 115	Zinc	mg/L	9	2	22%	7	2023-01-03	1	0.10

Table 7: Seasonality Tests

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.25	0.15	0.17	2	3	2	2	9	0.25	NA	0.15	0.17
1_11_4_107	MW-01R	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.28	0.26	0.29	2	3	2	2	9	0.28	NA	0.26	0.29
1_11_4_108	MW-01R	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.22	0.31	0.35	2	3	2	2	9	0.22	NA	0.31	0.35
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.11	0.036 *	0.038 *	2	3	2	2	9	0.11	NA	0.036 *	0.038 *
1_11_4_120	MW-01R	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.42	0.37	0.37	2	3	2	2	9	0.42	NA	0.37	0.37
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.18	0.16	0.40	2	3	2	2	9	0.18	NA	0.16	0.40
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.21	0.32	0.34	2	3	2	2	9	0.21	NA	0.32	0.34
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	22%	2	3	2	2	9	0.19	0.47	0.34	1	2	2	2	7	0.30	NA	0.63	0.60
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.15	0.094	0.092	2	3	2	2	9	0.15	NA	0.094	0.092
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.17	0.26	0.21	2	3	2	2	9	0.17	NA	0.26	0.21
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	0%	2	3	2	2	9	0.094	0.053	0.097	2	3	2	2	9	0.094	NA	0.053	0.097
1_11_5_106	MW-01R	Appendix IV	Cadmium	mg/L	67%	2	3	2	2	9	0.91	0.80	0.94	1	0	1	1	3	0.37	NA	NA	NA
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.18	0.0096 **	0.037 *	2	3	2	2	9	0.18	NA	0.0096 **	0.037 *
1_11_5_110	MW-01R	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.36	0.30	0.30	2	3	2	2	9	0.36	NA	0.30	0.30
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.11	0.036 *	0.038 *	2	3	2	2	9	0.11	NA	0.036 *	0.038 *
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	22%	2	3	2	2	9	0.57	0.36	0.36	1	2	2	2	7	0.33	NA	0.56	0.47
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.25	0.17	0.19	2	3	2	2	9	0.25	NA	0.17	0.19
1_11_5_117	MW-01R	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_11_5_118	MW-01R	Appendix IV	Molybdenum	mg/L	11%	2	3	2	2	9	0.67	0.51	0.82	2	2	2	2	8	0.76	NA	0.87	0.98
1_11_5_121	MW-01R	Appendix IV	Radium 226 and 228	pCi/L	56%	2	3	2	2	9	0.41	0.58	0.55	1	1	2	0	4	0.41	NA	0.85	0.85
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	0%	2	3	2	2	9	0.51	0.93	0.87	2	3	2	2	9	0.51	NA	0.93	0.87
1_11_5_125	MW-01R	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.28	0.32	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_11_6_111	MW-01R	Part 115	Copper	mg/L	56%	2	3	2	2	9	0.049 *	0.13	0.026 *	0	0	2	2	4	0.12	NA	0.30	0.20
1_11_6_114	MW-01R	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.27	0.40	0.38	2	3	2	2	9	0.27	NA	0.40	0.38
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.23	0.19	0.21	2	3	2	2	9	0.23	NA	0.19	0.21
1_11_6_123	MW-01R	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.34	0.40	0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	22%	2	3	2	2	9	0.13	0.0072 **	0.040 *	1	2	2	2	7	0.19	NA	0.049 *	0.10
1_11_6_130	MW-01R	Part 115	Zinc	mg/L	11%	2	3	2	2	9	0.38	0.78	0.77	2	2	2	2	8	0.28	NA	0.75	0.72
1_15_4_105	MW-06	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.085	0.034 *	0.049 *	2	3	2	2	9	0.085	NA	0.034 *	0.049 *
1_15_4_107	MW-06	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.27	0.37	0.36	2	3	2	2	9	0.27	NA	0.37	0.36
1_15_4_108	MW-06	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.18	0.22	0.17	2	3	2	2	9	0.18	NA	0.22	0.17
1_15_4_112	MW-06	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.21	0.31	0.28	2	3	2	2	9	0.21	NA	0.31	0.28
1_15_4_120	MW-06	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.43	0.37	0.37	2	3	2	2	9	0.43	NA	0.37	0.37
1_15_4_124	MW-06	Appendix III	Sulfate (as SO4)	mg/L	11%	2	3	2	2	9	0.70	0.85	0.63	2	3	2	1	8	0.73	NA	0.84	0.64
1_15_4_126	MW-06	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.74	0.82	0.82	2	3	2	2	9	0.74	NA	0.82	0.82
1_15_5_101	MW-06	Appendix IV	Antimony	mg/L	78%	2	3	2	2	9	0.80	0.46	0.73	0	1	0	1	2	0.32	NA	NA	NA
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.19	0.071	0.079	2	3	2	2	9	0.19	NA	0.071	0.079
1_15_5_103	MW-06	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.070	0.16	0.21	2	3	2	2	9	0.070	NA	0.16	0.21
1_15_5_104	MW-06	Appendix IV	Beryllium	mg/L	89%	2	3	2	2	9	0.32	0.37	0.37	1	0	0	0	1	NA	NA	NA	NA

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
1_15_5_106	MW-06	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.74	0.61	0.77	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_15_5_109	MW-06	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.52	0.73	0.64	2	3	2	2	9	0.52	NA	0.73	0.64
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.26	0.21	0.20	2	3	2	2	9	0.26	NA	0.21	0.20
1_15_5_113	MW-06	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.21	0.31	0.28	2	3	2	2	9	0.21	NA	0.31	0.28
1_15_5_115	MW-06	Appendix IV	Lead	mg/L	67%	2	3	2	2	9	0.53	0.52	0.42	1	0	1	1	3	0.37	NA	NA	NA
1_15_5_116	MW-06	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.80	0.65	0.58	2	3	2	2	9	0.80	NA	0.65	0.58
1_15_5_117	MW-06	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_15_5_118	MW-06	Appendix IV	Molybdenum	mg/L	67%	2	3	2	2	9	0.55	0.65	0.55	0	1	1	1	3	0.37	NA	NA	NA
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	22%	2	3	2	2	9	0.40	0.63	0.60	1	2	2	2	7	0.30	NA	0.45	0.37
1_15_5_122	MW-06	Appendix IV	Selenium	mg/L	56%	2	3	2	2	9	0.67	0.74	0.73	0	1	2	1	4	1.0	NA	0.97	0.98
1_15_5_125	MW-06	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.50	0.40	0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_15_6_111	MW-06	Part 115	Copper	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_15_6_114	MW-06	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.30	0.38	0.36	2	3	2	2	9	0.30	NA	0.38	0.36
1_15_6_119	MW-06	Part 115	Nickel	mg/L	22%	2	3	2	2	9	0.16	0.12	0.13	2	1	2	2	7	0.38	NA	0.48	0.52
1_15_6_123	MW-06	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.50	0.40	0.41	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_15_6_129	MW-06	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	0.32	0.37	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_15_6_130	MW-06	Part 115	Zinc	mg/L	11%	2	3	2	2	9	0.66	0.73	0.73	2	2	2	2	8	0.75	NA	0.60	0.66
1_17_4_105	MW-08	Appendix III	Boron	mg/L	0%	3	3	2	1	9	0.43	0.58	0.50	3	3	2	1	9	0.43	NA	0.58	0.50
1_17_4_107	MW-08	Appendix III	Calcium	mg/L	0%	3	3	2	1	9	0.26	0.33	0.34	3	3	2	1	9	0.26	NA	0.33	0.34
1_17_4_108	MW-08	Appendix III	Chloride (as Cl)	mg/L	0%	3	3	2	1	9	0.44	0.44	0.34	3	3	2	1	9	0.44	NA	0.44	0.34
1_17_4_112	MW-08	Appendix III	Fluoride	mg/L	0%	3	3	2	1	9	0.36	0.24	0.23	3	3	2	1	9	0.36	NA	0.24	0.23
1_17_4_120	MW-08	Appendix III	pH (field)	su	0%	3	3	2	1	9	0.097	0.41	0.43	3	3	2	1	9	0.097	NA	0.41	0.43
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	33%	3	3	2	1	9	0.23	0.55	0.19	3	2	0	1	6	0.34	NA	0.70	0.48
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	0%	3	3	2	1	9	0.41	0.41	0.36	3	3	2	1	9	0.41	NA	0.41	0.36
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	33%	3	3	2	1	9	0.57	0.64	0.67	3	2	1	0	6	0.38	NA	0.41	0.46
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	0%	3	3	2	1	9	0.28	0.26	0.28	3	3	2	1	9	0.28	NA	0.26	0.28
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	0%	3	3	2	1	9	0.36	0.33	0.26	3	3	2	1	9	0.36	NA	0.33	0.26
1_17_5_104	MW-08	Appendix IV	Beryllium	mg/L	100%	3	3	2	1	9	NA	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_17_5_106	MW-08	Appendix IV	Cadmium	mg/L	100%	3	3	2	1	9	0.13	0.089	0.089	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	0%	3	3	2	1	9	0.46	0.63	0.50	3	3	2	1	9	0.46	NA	0.63	0.50
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	0%	3	3	2	1	9	0.47	0.40	0.31	3	3	2	1	9	0.47	NA	0.40	0.31
1_17_5_113	MW-08	Appendix IV	Fluoride (App IV)	mg/L	0%	3	3	2	1	9	0.36	0.24	0.23	3	3	2	1	9	0.36	NA	0.24	0.23
1_17_5_115	MW-08	Appendix IV	Lead	mg/L	78%	3	3	2	1	9	0.13	0.44	0.19	1	1	0	0	2	0.32	NA	NA	NA
1_17_5_116	MW-08	Appendix IV	Lithium	mg/L	0%	3	3	2	1	9	0.55	0.50	0.48	3	3	2	1	9	0.55	NA	0.50	0.48
1_17_5_117	MW-08	Appendix IV	Mercury	mg/L	100%	3	3	2	1	9	NA	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	0%	3	3	2	1	9	0.21	0.31	0.067	3	3	2	1	9	0.21	NA	0.31	0.067
1_17_5_121	MW-08	Appendix IV	Radium 226 and 228	pCi/L	22%	3	3	2	1	9	0.66	0.80	0.80	2	3	1	1	7	0.14	NA	0.0038 **	0.0027 **
1_17_5_122	MW-08	Appendix IV	Selenium	mg/L	56%	3	3	2	1	9	0.071	0.034 *	0.027 *	0	1	2	1	4	0.22	NA	0.00000000000000010 ***	0.00000000000000031 ***
1_17_5_125	MW-08	Appendix IV	Thallium	mg/L	100%	3	3	2	1	9	NA	0.67	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full									Without Non-Detects									
						Sample Size					p-Value				Sample Size					p-Value				
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA	
1_17_6_111	MW-08	Part 115	Copper	mg/L	56%	3	3	2	1	9	0.50	0.64		0.62		1	2	0	1	4	0.41	NA	0.41		0.33	
1_17_6_114	MW-08	Part 115	Iron	mg/L	0%	3	3	2	1	9	0.11	0.059		0.035	*	3	3	2	1	9	0.11	NA	0.059		0.035	*
1_17_6_119	MW-08	Part 115	Nickel	mg/L	0%	3	3	2	1	9	0.34	0.42		0.38		3	3	2	1	9	0.34	NA	0.42		0.38	
1_17_6_123	MW-08	Part 115	Silver	mg/L	100%	3	3	2	1	9	NA	0.67		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_17_6_129	MW-08	Part 115	Vanadium	mg/L	100%	3	3	2	1	9	NA	NA		0.67		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_17_6_130	MW-08	Part 115	Zinc	mg/L	22%	3	3	2	1	9	0.78	0.80		0.85		2	3	1	1	7	0.69	NA	0.91		0.87	
1_18_4_105	MW-09	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.26	0.19		0.18		2	3	2	2	9	0.26	NA	0.19		0.18	
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.11	0.042	*	0.044	*	2	3	2	2	9	0.11	NA	0.042	*	0.044	*
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.16	0.11		0.13		2	3	2	2	9	0.16	NA	0.11		0.13	
1_18_4_112	MW-09	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.22	0.34		0.38		2	3	2	2	9	0.22	NA	0.34		0.38	
1_18_4_120	MW-09	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.13	0.23		0.23		2	3	2	2	9	0.13	NA	0.23		0.23	
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.088	0.0036	**	0.017	*	2	3	2	2	9	0.088	NA	0.0036	**	0.017	*
1_18_4_126	MW-09	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.092	0.015	*	0.027	*	2	3	2	2	9	0.092	NA	0.015	*	0.027	*
1_18_5_101	MW-09	Appendix IV	Antimony	mg/L	56%	2	3	2	2	9	0.56	0.32		0.42		1	2	0	1	4	0.41	NA	0.82		0.74	
1_18_5_102	MW-09	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.12	0.14		0.15		2	3	2	2	9	0.12	NA	0.14		0.15	
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.20	0.32		0.21		2	3	2	2	9	0.20	NA	0.32		0.21	
1_18_5_104	MW-09	Appendix IV	Beryllium	mg/L	89%	2	3	2	2	9	0.57	0.67		0.67		0	1	0	0	1	NA	NA	NA		NA	
1_18_5_106	MW-09	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.34	0.45		0.41		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_18_5_109	MW-09	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.24	0.20		0.20		2	3	2	2	9	0.24	NA	0.20		0.20	
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.16	0.31		0.17		2	3	2	2	9	0.16	NA	0.31		0.17	
1_18_5_113	MW-09	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.22	0.34		0.38		2	3	2	2	9	0.22	NA	0.34		0.38	
1_18_5_115	MW-09	Appendix IV	Lead	mg/L	100%	2	3	2	2	9	0.13	0.41		0.17		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_18_5_116	MW-09	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.097	0.041	*	0.054		2	3	2	2	9	0.097	NA	0.041	*	0.054	
1_18_5_117	MW-09	Appendix IV	Mercury	mg/L	89%	2	3	2	2	9	0.32	0.37		0.37		0	0	0	1	1	NA	NA	NA		NA	
1_18_5_118	MW-09	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.096	0.056		0.12		2	3	2	2	9	0.096	NA	0.056		0.12	
1_18_5_121	MW-09	Appendix IV	Radium 226 and 228	pCi/L	89%	2	3	2	2	9	0.19	0.38		0.35		0	0	0	1	1	NA	NA	NA		NA	
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	22%	2	3	2	2	9	0.33	0.40		0.45		1	2	2	2	7	0.20	NA	0.42		0.47	
1_18_5_125	MW-09	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.34	0.40		0.40		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_18_6_111	MW-09	Part 115	Copper	mg/L	89%	2	3	2	2	9	0.32	0.37		0.37		0	0	1	0	1	NA	NA	NA		NA	
1_18_6_114	MW-09	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.076	0.0018	**	0.0036	**	2	3	2	2	9	0.076	NA	0.0018	**	0.0036	**
1_18_6_119	MW-09	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.14	0.32		0.17		2	3	2	2	9	0.14	NA	0.32		0.17	
1_18_6_123	MW-09	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.21	0.20		0.20		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_18_6_129	MW-09	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	NA	NA		0.37		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_18_6_130	MW-09	Part 115	Zinc	mg/L	67%	2	3	2	2	9	0.69	0.60		0.67		1	1	0	1	3	0.37	NA	NA		NA	
1_22_4_105	MW-18	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.44	0.52		0.51		2	3	2	2	9	0.44	NA	0.52		0.51	
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.072	0.025	*	0.018	*	2	3	2	2	9	0.072	NA	0.025	*	0.018	*
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.13	0.073		0.057		2	3	2	2	9	0.13	NA	0.073		0.057	
1_22_4_112	MW-18	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.15	0.080		0.077		2	3	2	2	9	0.15	NA	0.080		0.077	
1_22_4_120	MW-18	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.62	0.56		0.56		2	3	2	2	9	0.62	NA	0.56		0.56	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
1_22_4_124	MW-18	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.42	0.65	0.71	2	3	2	2	9	0.42	NA	0.65	0.71
1_22_4_126	MW-18	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.16	0.12	0.13	2	3	2	2	9	0.16	NA	0.12	0.13
1_22_5_101	MW-18	Appendix IV	Antimony	mg/L	22%	2	3	2	2	9	0.11	0.36	0.27	2	2	1	2	7	0.25	NA	0.68	0.64
1_22_5_102	MW-18	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.088	0.031 *	0.025 *	2	3	2	2	9	0.088	NA	0.031 *	0.025 *
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.22	0.22	0.23	2	3	2	2	9	0.22	NA	0.22	0.23
1_22_5_104	MW-18	Appendix IV	Beryllium	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	22%	2	3	2	2	9	0.79	0.79	0.72	1	3	2	1	7	0.86	NA	0.92	0.87
1_22_5_109	MW-18	Appendix IV	Chromium, Total	mg/L	89%	2	3	2	2	9	0.45	0.78	0.77	0	1	0	0	1	NA	NA	NA	NA
1_22_5_110	MW-18	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.46	0.31	0.37	2	3	2	2	9	0.46	NA	0.31	0.37
1_22_5_113	MW-18	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.15	0.080	0.077	2	3	2	2	9	0.15	NA	0.080	0.077
1_22_5_115	MW-18	Appendix IV	Lead	mg/L	67%	2	3	2	2	9	0.45	0.46	0.49	0	0	2	1	3	0.22	NA	0.60	0.57
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.14	0.043 *	0.038 *	2	3	2	2	9	0.14	NA	0.043 *	0.038 *
1_22_5_117	MW-18	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_22_5_118	MW-18	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.17	0.076	0.10	2	3	2	2	9	0.17	NA	0.076	0.10
1_22_5_121	MW-18	Appendix IV	Radium 226 and 228	pCi/L	67%	2	3	2	2	9	0.14	0.41	0.26	0	1	1	1	3	0.37	NA	NA	NA
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	0%	2	3	2	2	9	0.45	0.46	0.41	2	3	2	2	9	0.45	NA	0.46	0.41
1_22_5_125	MW-18	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.57	0.67	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_22_6_111	MW-18	Part 115	Copper	mg/L	0%	2	3	2	2	9	0.12	0.038 *	0.015 *	2	3	2	2	9	0.12	NA	0.038 *	0.015 *
1_22_6_114	MW-18	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.10	0.066	0.047 *	2	3	2	2	9	0.10	NA	0.066	0.047 *
1_22_6_119	MW-18	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.44	0.31	0.37	2	3	2	2	9	0.44	NA	0.31	0.37
1_22_6_123	MW-18	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.57	0.67	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_22_6_129	MW-18	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	NA	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_22_6_130	MW-18	Part 115	Zinc	mg/L	0%	2	3	2	2	9	0.51	0.41	0.43	2	3	2	2	9	0.51	NA	0.41	0.43
1_23_4_105	MW-19	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.070	0.0086 **	0.011 *	2	3	2	2	9	0.070	NA	0.0086 **	0.011 *
1_23_4_107	MW-19	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.19	0.15	0.16	2	3	2	2	9	0.19	NA	0.15	0.16
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.072	0.039 *	0.022 *	2	3	2	2	9	0.072	NA	0.039 *	0.022 *
1_23_4_112	MW-19	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.20	0.29	0.27	2	3	2	2	9	0.20	NA	0.29	0.27
1_23_4_120	MW-19	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.56	0.52	0.51	2	3	2	2	9	0.56	NA	0.52	0.51
1_23_4_124	MW-19	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.42	0.40	0.41	2	3	2	2	9	0.42	NA	0.40	0.41
1_23_4_126	MW-19	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.11	0.0085 **	0.0056 **	2	3	2	2	9	0.11	NA	0.0085 **	0.0056 **
1_23_5_101	MW-19	Appendix IV	Antimony	mg/L	89%	2	3	2	2	9	0.69	0.36	0.59	0	1	0	0	1	NA	NA	NA	NA
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.055	0.0017 **	0.0042 **	2	3	2	2	9	0.055	NA	0.0017 **	0.0042 **
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.077	0.032 *	0.052	2	3	2	2	9	0.077	NA	0.032 *	0.052
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	33%	2	3	2	2	9	0.10	0.36	0.32	1	3	2	0	6	0.17	NA	0.25	0.27
1_23_5_106	MW-19	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.74	0.61	0.77	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	44%	2	3	2	2	9	0.17	0.040 *	0.046 *	1	1	2	1	5	0.28	NA	0.085	0.11
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.31	0.21	0.21	2	3	2	2	9	0.31	NA	0.21	0.21
1_23_5_113	MW-19	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.20	0.29	0.27	2	3	2	2	9	0.20	NA	0.29	0.27
1_23_5_115	MW-19	Appendix IV	Lead	mg/L	100%	2	3	2	2	9	0.099	0.14	0.043 *	NA	NA	NA	NA	NA	NA	NA	NA	NA

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full									Without Non-Detects									
						Sample Size					p-Value				Sample Size					p-Value				
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
1_23_5_116	MW-19	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.53	0.68		0.68		2	3	2	2	9	0.53	NA	0.68		0.68	
1_23_5_117	MW-19	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_23_5_118	MW-19	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.21	0.29		0.37		2	3	2	2	9	0.21	NA	0.29		0.37	
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	33%	2	3	2	2	9	0.99	0.94		0.91		2	3	1	0	6	0.30	NA	0.41		0.45	
1_23_5_122	MW-19	Appendix IV	Selenium	mg/L	100%	2	3	2	2	9	0.21	0.28		0.19		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_23_5_125	MW-19	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.10	0.045	*	0.045	*	NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_23_6_111	MW-19	Part 115	Copper	mg/L	100%	2	3	2	2	9	0.32	0.37		0.37		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_23_6_114	MW-19	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.11	0.20		0.14		2	3	2	2	9	0.11	NA	0.20		0.14	
1_23_6_119	MW-19	Part 115	Nickel	mg/L	11%	2	3	2	2	9	0.22	0.15		0.26		1	3	2	2	8	0.47	NA	0.48		0.61	
1_23_6_123	MW-19	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.34	0.40		0.40		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_23_6_129	MW-19	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	0.32	0.37		0.37		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_23_6_130	MW-19	Part 115	Zinc	mg/L	78%	2	3	2	2	9	0.69	0.66		0.74		0	1	0	1	2	0.32	NA	NA		NA	
1_24_4_105	MW-20	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.083	0.0018	**	0.0030	**	2	3	2	2	9	0.083	NA	0.0018	**	0.0030	**
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.18	0.15		0.15		2	3	2	2	9	0.18	NA	0.15		0.15	
1_24_4_108	MW-20	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.49	0.50		0.55		2	3	2	2	9	0.49	NA	0.50		0.55	
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.39	0.39		0.40		2	3	2	2	9	0.39	NA	0.39		0.40	
1_24_4_120	MW-20	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.59	0.53		0.53		2	3	2	2	9	0.59	NA	0.53		0.53	
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.084	0.017	*	0.0047	**	2	3	2	2	9	0.084	NA	0.017	*	0.0047	**
1_24_4_126	MW-20	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.089	0.084		0.086		2	3	2	2	9	0.089	NA	0.084		0.086	
1_24_5_101	MW-20	Appendix IV	Antimony	mg/L	22%	2	3	2	2	9	0.24	0.34		0.24		2	2	2	1	7	0.43	NA	0.54		0.46	
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.096	0.033	*	0.033	*	2	3	2	2	9	0.096	NA	0.033	*	0.033	*
1_24_5_103	MW-20	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.086	0.15		0.099		2	3	2	2	9	0.086	NA	0.15		0.099	
1_24_5_104	MW-20	Appendix IV	Beryllium	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_24_5_106	MW-20	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.28	0.32		0.32		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_24_5_109	MW-20	Appendix IV	Chromium, Total	mg/L	56%	2	3	2	2	9	0.47	0.70		0.70		1	2	0	1	4	0.41	NA	0.74		0.70	
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.38	0.36		0.35		2	3	2	2	9	0.38	NA	0.36		0.35	
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.39	0.39		0.40		2	3	2	2	9	0.39	NA	0.39		0.40	
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	0%	2	3	2	2	9	0.24	0.29		0.27		2	3	2	2	9	0.24	NA	0.29		0.27	
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.088	0.021	*	0.037	*	2	3	2	2	9	0.088	NA	0.021	*	0.037	*
1_24_5_117	MW-20	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.24	0.25		0.27		2	3	2	2	9	0.24	NA	0.25		0.27	
1_24_5_121	MW-20	Appendix IV	Radium 226 and 228	pCi/L	56%	2	3	2	2	9	0.85	0.60		0.68		1	1	1	1	4	0.39	NA	NA		NA	
1_24_5_122	MW-20	Appendix IV	Selenium	mg/L	56%	2	3	2	2	9	0.16	0.22		0.18		0	1	2	1	4	0.32	NA	0.32		0.36	
1_24_5_125	MW-20	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	NA	0.37		0.37		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_24_6_111	MW-20	Part 115	Copper	mg/L	11%	2	3	2	2	9	0.11	0.068		0.063		2	2	2	2	8	0.10	NA	0.12		0.095	
1_24_6_114	MW-20	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.11	0.072		0.067		2	3	2	2	9	0.11	NA	0.072		0.067	
1_24_6_119	MW-20	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.37	0.43		0.42		2	3	2	2	9	0.37	NA	0.43		0.42	
1_24_6_123	MW-20	Part 115	Silver	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_24_6_129	MW-20	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	NA	NA		0.37		NA	NA	NA	NA	NA	NA	NA	NA		NA	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
1_24_6_130	MW-20	Part 115	Zinc	mg/L	0%	2	3	2	2	9	0.65	0.65	0.68	2	3	2	2	9	0.65	NA	0.65	0.68
1_25_4_105	MW-30	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.55	0.79	0.81	2	3	2	2	9	0.55	NA	0.79	0.81
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.67	0.71	0.72	2	3	2	2	9	0.67	NA	0.71	0.72
1_25_4_108	MW-30	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.32	0.15	0.19	2	3	2	2	9	0.32	NA	0.15	0.19
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.67	0.68	0.68	2	3	2	2	9	0.67	NA	0.68	0.68
1_25_4_120	MW-30	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.34	0.45	0.45	2	3	2	2	9	0.34	NA	0.45	0.45
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.23	0.13	0.12	2	3	2	2	9	0.23	NA	0.13	0.12
1_25_4_126	MW-30	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.32	0.28	0.29	2	3	2	2	9	0.32	NA	0.28	0.29
1_25_5_101	MW-30	Appendix IV	Antimony	mg/L	89%	2	3	2	2	9	0.56	0.58	0.67	0	1	0	0	1	NA	NA	NA	NA
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	22%	2	3	2	2	9	0.087	0.083	0.12	1	2	2	2	7	0.17	NA	0.22	0.37
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.15	0.086	0.084	2	3	2	2	9	0.15	NA	0.086	0.084
1_25_5_104	MW-30	Appendix IV	Beryllium	mg/L	89%	2	3	2	2	9	0.049 *	0.37	0.36	1	0	0	0	1	NA	NA	NA	NA
1_25_5_106	MW-30	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.74	0.61	0.77	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.28	0.25	0.23	2	3	2	2	9	0.28	NA	0.25	0.23
1_25_5_110	MW-30	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.33	0.55	0.58	2	3	2	2	9	0.33	NA	0.55	0.58
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.67	0.68	0.68	2	3	2	2	9	0.67	NA	0.68	0.68
1_25_5_115	MW-30	Appendix IV	Lead	mg/L	100%	2	3	2	2	9	0.19	0.26	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.86	0.88	0.94	2	3	2	2	9	0.86	NA	0.88	0.94
1_25_5_117	MW-30	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_25_5_118	MW-30	Appendix IV	Molybdenum	mg/L	33%	2	3	2	2	9	0.20	0.098	0.26	1	2	2	1	6	0.46	NA	0.20	0.55
1_25_5_121	MW-30	Appendix IV	Radium 226 and 228	pCi/L	56%	2	3	2	2	9	0.44	0.54	0.48	1	1	2	0	4	0.41	NA	0.59	0.53
1_25_5_122	MW-30	Appendix IV	Selenium	mg/L	67%	2	3	2	2	9	0.25	0.29	0.21	0	0	2	1	3	0.22	NA	0.33	0.35
1_25_5_125	MW-30	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.11	0.058	0.058	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_25_6_111	MW-30	Part 115	Copper	mg/L	78%	2	3	2	2	9	0.13	0.21	0.13	1	0	0	1	2	0.32	NA	NA	NA
1_25_6_114	MW-30	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.24	0.35	0.19	2	3	2	2	9	0.24	NA	0.35	0.19
1_25_6_119	MW-30	Part 115	Nickel	mg/L	22%	2	3	2	2	9	0.19	0.19	0.17	1	3	2	1	7	0.41	NA	0.44	0.54
1_25_6_123	MW-30	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.34	0.40	0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_25_6_129	MW-30	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	0.32	0.37	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA
1_25_6_130	MW-30	Part 115	Zinc	mg/L	78%	2	3	2	2	9	0.63	0.77	0.79	0	1	0	1	2	0.32	NA	NA	NA
1_26_4_105	MW-31	Appendix III	Boron	mg/L	0%	3	3	2	1	9	0.16	0.14	0.16	3	3	2	1	9	0.16	NA	0.14	0.16
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	0%	3	3	2	1	9	0.19	0.14	0.11	3	3	2	1	9	0.19	NA	0.14	0.11
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	0%	3	3	2	1	9	0.098	0.095	0.081	3	3	2	1	9	0.098	NA	0.095	0.081
1_26_4_112	MW-31	Appendix III	Fluoride	mg/L	0%	3	3	2	1	9	0.49	0.58	0.58	3	3	2	1	9	0.49	NA	0.58	0.58
1_26_4_120	MW-31	Appendix III	pH (field)	su	0%	3	3	2	1	9	0.37	0.39	0.38	3	3	2	1	9	0.37	NA	0.39	0.38
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	0%	3	3	2	1	9	0.12	0.043 *	0.011 *	3	3	2	1	9	0.12	NA	0.043 *	0.011 *
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	0%	3	3	2	1	9	0.41	0.50	0.48	3	3	2	1	9	0.41	NA	0.50	0.48
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	44%	3	3	2	1	9	0.10	0.037 *	0.044 *	2	2	1	0	5	0.19	NA	0.037 *	0.044 *
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	0%	3	3	2	1	9	0.27	0.32	0.29	3	3	2	1	9	0.27	NA	0.32	0.29
1_26_5_103	MW-31	Appendix IV	Barium	mg/L	0%	3	3	2	1	9	0.20	0.29	0.25	3	3	2	1	9	0.20	NA	0.29	0.25

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full									Without Non-Detects									
						Sample Size					p-Value				Sample Size					p-Value				
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
1_26_5_104	MW-31	Appendix IV	Beryllium	mg/L	100%	3	3	2	1	9	NA	0.67		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_26_5_106	MW-31	Appendix IV	Cadmium	mg/L	100%	3	3	2	1	9	0.13	0.089		0.089		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	0%	3	3	2	1	9	0.63	0.85		0.83		3	3	2	1	9	0.63	NA	0.85		0.83	
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	0%	3	3	2	1	9	0.33	0.36		0.28		3	3	2	1	9	0.33	NA	0.36		0.28	
1_26_5_113	MW-31	Appendix IV	Fluoride (App IV)	mg/L	0%	3	3	2	1	9	0.49	0.58		0.58		3	3	2	1	9	0.49	NA	0.58		0.58	
1_26_5_115	MW-31	Appendix IV	Lead	mg/L	89%	3	3	2	1	9	0.072	0.011	*	0.0012	**	0	1	0	0	1	NA	NA	NA		NA	
1_26_5_116	MW-31	Appendix IV	Lithium	mg/L	0%	3	3	2	1	9	0.25	0.43		0.46		3	3	2	1	9	0.25	NA	0.43		0.46	
1_26_5_117	MW-31	Appendix IV	Mercury	mg/L	100%	3	3	2	1	9	NA	0.67		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	0%	3	3	2	1	9	0.24	0.57		0.53		3	3	2	1	9	0.24	NA	0.57		0.53	
1_26_5_121	MW-31	Appendix IV	Radium 226 and 228	pCi/L	33%	3	3	2	1	9	0.49	0.66		0.60		2	2	2	0	6	1.0	NA	0.88		0.94	
1_26_5_122	MW-31	Appendix IV	Selenium	mg/L	56%	3	3	2	1	9	0.28	0.23		0.29		0	1	2	1	4	0.41	NA	0.67		0.64	
1_26_5_125	MW-31	Appendix IV	Thallium	mg/L	100%	3	3	2	1	9	NA	0.67		0.67		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_26_6_111	MW-31	Part 115	Copper	mg/L	89%	3	3	2	1	9	0.57	0.67		0.67		0	1	0	0	1	NA	NA	NA		NA	
1_26_6_114	MW-31	Part 115	Iron	mg/L	0%	3	3	2	1	9	0.077	0.068		0.030	*	3	3	2	1	9	0.077	NA	0.068		0.030	*
1_26_6_119	MW-31	Part 115	Nickel	mg/L	100%	3	3	2	1	9	NA	NA		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_26_6_123	MW-31	Part 115	Silver	mg/L	100%	3	3	2	1	9	NA	0.67		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_26_6_129	MW-31	Part 115	Vanadium	mg/L	100%	3	3	2	1	9	NA	NA		0.67		NA	NA	NA	NA	NA	NA	NA	NA		NA	
1_26_6_130	MW-31	Part 115	Zinc	mg/L	67%	3	3	2	1	9	0.47	0.83		0.81		1	2	0	0	3	1.0	NA	0.79		0.73	
2_12_4_105	MW-02	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.44	0.58		0.59		2	3	2	2	9	0.44	NA	0.58		0.59	
2_12_4_107	MW-02	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.71	0.75		0.76		2	3	2	2	9	0.71	NA	0.75		0.76	
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.30	0.35		0.36		2	3	2	2	9	0.30	NA	0.35		0.36	
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.45	0.52		0.48		2	3	2	2	9	0.45	NA	0.52		0.48	
2_12_4_120	MW-02	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.30	0.50		0.50		2	3	2	2	9	0.30	NA	0.50		0.50	
2_12_4_124	MW-02	Appendix III	Sulfate (as SO4)	mg/L	56%	2	3	2	2	9	0.93	0.69		0.88		1	1	1	1	4	0.39	NA	NA		NA	
2_12_4_126	MW-02	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.082	0.035	*	0.033	*	2	3	2	2	9	0.082	NA	0.035	*	0.033	*
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	22%	2	3	2	2	9	0.49	0.33		0.40		1	2	2	2	7	0.59	NA	0.67		0.70	
2_12_5_102	MW-02	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.34	0.66		0.64		2	3	2	2	9	0.34	NA	0.66		0.64	
2_12_5_103	MW-02	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.23	0.39		0.45		2	3	2	2	9	0.23	NA	0.39		0.45	
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	0%	2	3	2	2	9	0.23	0.23		0.18		2	3	2	2	9	0.23	NA	0.23		0.18	
2_12_5_106	MW-02	Appendix IV	Cadmium	mg/L	67%	2	3	2	2	9	0.98	0.74		0.94		1	1	0	1	3	0.37	NA	NA		NA	
2_12_5_109	MW-02	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.11	0.042	*	0.087		2	3	2	2	9	0.11	NA	0.042	*	0.087	
2_12_5_110	MW-02	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.22	0.16		0.21		2	3	2	2	9	0.22	NA	0.16		0.21	
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.45	0.52		0.48		2	3	2	2	9	0.45	NA	0.52		0.48	
2_12_5_115	MW-02	Appendix IV	Lead	mg/L	0%	2	3	2	2	9	0.51	0.56		0.43		2	3	2	2	9	0.51	NA	0.56		0.43	
2_12_5_116	MW-02	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.35	0.41		0.44		2	3	2	2	9	0.35	NA	0.41		0.44	
2_12_5_117	MW-02	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA	NA		NA	
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.11	0.27		0.20		2	3	2	2	9	0.11	NA	0.27		0.20	
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	33%	2	3	2	2	9	0.13	0.096		0.23		1	2	2	1	6	0.23	NA	0.13		0.11	
2_12_5_122	MW-02	Appendix IV	Selenium	mg/L	0%	2	3	2	2	9	0.16	0.28		0.28		2	3	2	2	9	0.16	NA	0.28		0.28	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA		Log ANOVA	
2_12_5_125	MW-02	Appendix IV	Thallium	mg/L	89%	2	3	2	2	9	0.60	0.68	0.69	0	0	0	1	1	NA	NA	NA		NA	
2_12_6_111	MW-02	Part 115	Copper	mg/L	0%	2	3	2	2	9	0.58	0.64	0.63	2	3	2	2	9	0.58	NA	0.64		0.63	
2_12_6_114	MW-02	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.11	0.062	0.081	2	3	2	2	9	0.11	NA	0.062		0.081	
2_12_6_119	MW-02	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.33	0.47	0.44	2	3	2	2	9	0.33	NA	0.47		0.44	
2_12_6_123	MW-02	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.34	0.40	0.40	NA	NA	NA	NA	NA	NA	NA	NA		NA	
2_12_6_129	MW-02	Part 115	Vanadium	mg/L	0%	2	3	2	2	9	0.13	0.12	0.27	2	3	2	2	9	0.13	NA	0.12		0.27	
2_12_6_130	MW-02	Part 115	Zinc	mg/L	0%	2	3	2	2	9	0.67	0.71	0.76	2	3	2	2	9	0.67	NA	0.71		0.76	
2_13_4_105	MW-03	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.27	0.38	0.38	2	3	2	2	9	0.27	NA	0.38		0.38	
2_13_4_107	MW-03	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.84	0.72	0.68	2	3	2	2	9	0.84	NA	0.72		0.68	
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.22	0.28	0.25	2	3	2	2	9	0.22	NA	0.28		0.25	
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.16	0.32	0.28	2	3	2	2	9	0.16	NA	0.32		0.28	
2_13_4_120	MW-03	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.59	0.45	0.45	2	3	2	2	9	0.59	NA	0.45		0.45	
2_13_4_124	MW-03	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.068	0.073	0.21	2	3	2	2	9	0.068	NA	0.073		0.21	
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.16	0.40	0.40	2	3	2	2	9	0.16	NA	0.40		0.40	
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	56%	2	3	2	2	9	0.27	0.50	0.51	1	2	0	1	4	0.26	NA	0.78		0.74	
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.26	0.32	0.32	2	3	2	2	9	0.26	NA	0.32		0.32	
2_13_5_103	MW-03	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.76	0.86	0.71	2	3	2	2	9	0.76	NA	0.86		0.71	
2_13_5_104	MW-03	Appendix IV	Beryllium	mg/L	78%	2	3	2	2	9	0.63	0.46	0.48	0	1	0	1	2	0.32	NA	NA		NA	
2_13_5_106	MW-03	Appendix IV	Cadmium	mg/L	89%	2	3	2	2	9	0.82	0.66	0.86	0	0	0	1	1	NA	NA	NA		NA	
2_13_5_109	MW-03	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.41	0.64	0.55	2	3	2	2	9	0.41	NA	0.64		0.55	
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.17	0.16	0.20	2	3	2	2	9	0.17	NA	0.16		0.20	
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.16	0.32	0.28	2	3	2	2	9	0.16	NA	0.32		0.28	
2_13_5_115	MW-03	Appendix IV	Lead	mg/L	89%	2	3	2	2	9	0.22	0.31	0.22	0	0	0	1	1	NA	NA	NA		NA	
2_13_5_116	MW-03	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.54	0.52	0.54	2	3	2	2	9	0.54	NA	0.52		0.54	
2_13_5_117	MW-03	Appendix IV	Mercury	mg/L	89%	2	3	2	2	9	0.32	0.37	0.37	0	0	0	1	1	NA	NA	NA		NA	
2_13_5_118	MW-03	Appendix IV	Molybdenum	mg/L	78%	2	3	2	2	9	0.25	0.60	0.38	1	0	0	1	2	0.32	NA	NA		NA	
2_13_5_121	MW-03	Appendix IV	Radium 226 and 228	pCi/L	11%	2	3	2	2	9	0.77	0.84	0.88	1	3	2	2	8	0.48	NA	0.72		0.68	
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	33%	2	3	2	2	9	0.33	0.56	0.57	0	2	2	2	6	0.21	NA	0.35		0.39	
2_13_5_125	MW-03	Appendix IV	Thallium	mg/L	89%	2	3	2	2	9	0.14	0.12	0.19	0	0	0	1	1	NA	NA	NA		NA	
2_13_6_111	MW-03	Part 115	Copper	mg/L	56%	2	3	2	2	9	0.74	0.56	0.64	0	1	2	1	4	0.41	NA	0.076		0.14	
2_13_6_114	MW-03	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.13	0.20	0.10	2	3	2	2	9	0.13	NA	0.20		0.10	
2_13_6_119	MW-03	Part 115	Nickel	mg/L	11%	2	3	2	2	9	0.18	0.21	0.065	1	3	2	2	8	0.37	NA	0.000026	***	0.0078	**
2_13_6_123	MW-03	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.34	0.40	0.40	NA	NA	NA	NA	NA	NA	NA	NA		NA	
2_13_6_129	MW-03	Part 115	Vanadium	mg/L	89%	2	3	2	2	9	0.41	0.42	0.45	0	0	0	1	1	NA	NA	NA		NA	
2_13_6_130	MW-03	Part 115	Zinc	mg/L	56%	2	3	2	2	9	0.48	0.73	0.77	0	1	1	2	4	0.41	NA	0.73		0.71	
2_14_4_105	MW-04	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.36	0.47	0.48	2	3	2	2	9	0.36	NA	0.47		0.48	
2_14_4_107	MW-04	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.73	0.65	0.65	2	3	2	2	9	0.73	NA	0.65		0.65	
2_14_4_108	MW-04	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.099	0.18	0.14	2	3	2	2	9	0.099	NA	0.18		0.14	
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.67	0.43	0.41	2	3	2	2	9	0.67	NA	0.43		0.41	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
2_14_4_120	MW-04	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.24	0.36	0.36	2	3	2	2	9	0.24	NA	0.36	0.36
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.24	0.24	0.34	2	3	2	2	9	0.24	NA	0.24	0.34
2_14_4_126	MW-04	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.49	0.62	0.61	2	3	2	2	9	0.49	NA	0.62	0.61
2_14_5_101	MW-04	Appendix IV	Antimony	mg/L	67%	2	3	2	2	9	0.56	0.57	0.69	0	1	1	1	3	0.37	NA	NA	NA
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.58	0.63	0.55	2	3	2	2	9	0.58	NA	0.63	0.55
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.16	0.33	0.29	2	3	2	2	9	0.16	NA	0.33	0.29
2_14_5_104	MW-04	Appendix IV	Beryllium	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_5_106	MW-04	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.74	0.61	0.77	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_5_109	MW-04	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.23	0.10	0.095	2	3	2	2	9	0.23	NA	0.10	0.095
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.26	0.15	0.15	2	3	2	2	9	0.26	NA	0.15	0.15
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.67	0.43	0.41	2	3	2	2	9	0.67	NA	0.43	0.41
2_14_5_115	MW-04	Appendix IV	Lead	mg/L	100%	2	3	2	2	9	0.41	0.59	0.49	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_5_116	MW-04	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.19	0.20	0.21	2	3	2	2	9	0.19	NA	0.20	0.21
2_14_5_117	MW-04	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	22%	2	3	2	2	9	0.47	0.76	0.74	1	2	2	2	7	0.27	NA	0.35	0.49
2_14_5_121	MW-04	Appendix IV	Radium 226 and 228	pCi/L	11%	2	3	2	2	9	0.91	0.89	0.85	2	2	2	2	8	0.84	NA	0.80	0.73
2_14_5_122	MW-04	Appendix IV	Selenium	mg/L	56%	2	3	2	2	9	0.20	0.34	0.42	1	0	2	1	4	0.26	NA	0.15	0.23
2_14_5_125	MW-04	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.57	0.67	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_6_111	MW-04	Part 115	Copper	mg/L	89%	2	3	2	2	9	0.32	0.37	0.37	0	0	0	1	1	NA	NA	NA	NA
2_14_6_114	MW-04	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.36	0.39	0.37	2	3	2	2	9	0.36	NA	0.39	0.37
2_14_6_119	MW-04	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.27	0.40	0.45	2	3	2	2	9	0.27	NA	0.40	0.45
2_14_6_123	MW-04	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.34	0.40	0.40	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_6_129	MW-04	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	NA	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_14_6_130	MW-04	Part 115	Zinc	mg/L	67%	2	3	2	2	9	0.25	0.68	0.60	0	1	0	2	3	0.22	NA	0.45	0.54
2_16_4_105	MW-07	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.26	0.27	0.29	2	3	2	2	9	0.26	NA	0.27	0.29
2_16_4_107	MW-07	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.94	0.98	0.97	2	3	2	2	9	0.94	NA	0.98	0.97
2_16_4_108	MW-07	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.15	0.12	0.11	2	3	2	2	9	0.15	NA	0.12	0.11
2_16_4_112	MW-07	Appendix III	Fluoride	mg/L	11%	2	3	2	2	9	0.33	0.38	0.50	2	2	2	2	8	0.19	NA	0.13	0.16
2_16_4_120	MW-07	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.25	0.45	0.46	2	3	2	2	9	0.25	NA	0.45	0.46
2_16_4_124	MW-07	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.084	0.0021 **	0.0039 **	2	3	2	2	9	0.084	NA	0.0021 **	0.0039 **
2_16_4_126	MW-07	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.68	0.60	0.60	2	3	2	2	9	0.68	NA	0.60	0.60
2_16_5_101	MW-07	Appendix IV	Antimony	mg/L	89%	2	3	2	2	9	0.26	0.29	0.29	0	1	0	0	1	NA	NA	NA	NA
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.21	0.24	0.29	2	3	2	2	9	0.21	NA	0.24	0.29
2_16_5_103	MW-07	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.33	0.28	0.29	2	3	2	2	9	0.33	NA	0.28	0.29
2_16_5_104	MW-07	Appendix IV	Beryllium	mg/L	67%	2	3	2	2	9	0.55	0.55	0.56	1	0	1	1	3	0.37	NA	NA	NA
2_16_5_106	MW-07	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.28	0.32	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.67	0.83	0.81	2	3	2	2	9	0.67	NA	0.83	0.81
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.51	0.43	0.44	2	3	2	2	9	0.51	NA	0.43	0.44
2_16_5_113	MW-07	Appendix IV	Fluoride (App IV)	mg/L	11%	2	3	2	2	9	0.33	0.38	0.50	2	2	2	2	8	0.19	NA	0.13	0.16

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full									Without Non-Detects									
						Sample Size					p-Value				Sample Size					p-Value				
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA	
2_16_5_115	MW-07	Appendix IV	Lead	mg/L	100%	2	3	2	2	9	0.28	0.32		0.32		NA	NA	NA	NA	NA	NA	NA		NA	
2_16_5_116	MW-07	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.87	0.91		0.95		2	3	2	2	9	0.87	NA		0.91		0.95	
2_16_5_117	MW-07	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_16_5_118	MW-07	Appendix IV	Molybdenum	mg/L	100%	2	3	2	2	9	0.28	0.32		0.32		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_16_5_121	MW-07	Appendix IV	Radium 226 and 228	pCi/L	22%	2	3	2	2	9	0.67	0.65		0.77		2	2	1	2	7	0.39	NA		0.065		0.20	
2_16_5_122	MW-07	Appendix IV	Selenium	mg/L	89%	2	3	2	2	9	0.28	0.32		0.32		0	1	0	0	1	NA	NA		NA		NA	
2_16_5_125	MW-07	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	NA	0.37		0.37		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_16_6_111	MW-07	Part 115	Copper	mg/L	89%	2	3	2	2	9	0.32	0.37		0.37		0	0	0	1	1	NA	NA		NA		NA	
2_16_6_114	MW-07	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.19	0.34		0.28		2	3	2	2	9	0.19	NA		0.34		0.28	
2_16_6_119	MW-07	Part 115	Nickel	mg/L	100%	2	3	2	2	9	NA	NA		NA		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_16_6_123	MW-07	Part 115	Silver	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_16_6_129	MW-07	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	NA	NA		0.37		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_16_6_130	MW-07	Part 115	Zinc	mg/L	67%	2	3	2	2	9	0.25	0.67		0.43		0	1	0	2	3	0.22	NA		0.39		0.53	
2_19_4_105	MW-10	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.084	0.020	*	0.10		2	3	2	2	9	0.084	NA		0.020	*	0.10	
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.24	0.41		0.33		2	3	2	2	9	0.24	NA		0.41		0.33	
2_19_4_108	MW-10	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.084	0.013	*	0.018	*	2	3	2	2	9	0.084	NA		0.013	*	0.018	*
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.13	0.19		0.29		2	3	2	2	9	0.13	NA		0.19		0.29	
2_19_4_120	MW-10	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.12	0.17		0.17		2	3	2	2	9	0.12	NA		0.17		0.17	
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.14	0.19		0.050	*	2	3	2	2	9	0.14	NA		0.19		0.050	*
2_19_4_126	MW-10	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.61	0.78		0.80		2	3	2	2	9	0.61	NA		0.78		0.80	
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	56%	2	3	2	2	9	0.84	0.54		0.84		0	1	2	1	4	0.22	NA		0.000000000000000070	***	0	***
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.16	0.11		0.13		2	3	2	2	9	0.16	NA		0.11		0.13	
2_19_5_103	MW-10	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.094	0.15		0.081		2	3	2	2	9	0.094	NA		0.15		0.081	
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	33%	2	3	2	2	9	0.41	0.64		0.52		1	2	2	1	6	0.46	NA		0.84		0.80	
2_19_5_106	MW-10	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.74	0.61		0.77		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.16	0.030	*	0.087		2	3	2	2	9	0.16	NA		0.030	*	0.087	
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.32	0.66		0.55		2	3	2	2	9	0.32	NA		0.66		0.55	
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.13	0.19		0.29		2	3	2	2	9	0.13	NA		0.19		0.29	
2_19_5_115	MW-10	Appendix IV	Lead	mg/L	78%	2	3	2	2	9	0.10	0.16		0.047	*	0	0	1	1	2	0.32	NA		NA		NA	
2_19_5_116	MW-10	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.18	0.35		0.24		2	3	2	2	9	0.18	NA		0.35		0.24	
2_19_5_117	MW-10	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_19_5_118	MW-10	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.36	0.52		0.40		2	3	2	2	9	0.36	NA		0.52		0.40	
2_19_5_121	MW-10	Appendix IV	Radium 226 and 228	pCi/L	89%	2	3	2	2	9	0.82	0.82		0.89		1	0	0	0	1	NA	NA		NA		NA	
2_19_5_122	MW-10	Appendix IV	Selenium	mg/L	11%	2	3	2	2	9	0.48	0.73		0.78		2	2	2	2	8	0.13	NA		0.082		0.071	
2_19_5_125	MW-10	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.14	0.045	*	0.045	*	NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_19_6_111	MW-10	Part 115	Copper	mg/L	67%	2	3	2	2	9	0.25	0.70		0.57		0	1	0	2	3	0.22	NA		0.070		0.13	
2_19_6_114	MW-10	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.11	0.0056	**	0.016	*	2	3	2	2	9	0.11	NA		0.0056	**	0.016	*
2_19_6_119	MW-10	Part 115	Nickel	mg/L	33%	2	3	2	2	9	0.58	0.87		0.87		1	1	2	2	6	0.37	NA		0.12		0.18	
2_19_6_123	MW-10	Part 115	Silver	mg/L	100%	2	3	2	2	9	0.50	0.40		0.41		NA	NA	NA	NA	NA	NA	NA		NA		NA	

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full									Without Non-Detects									
						Sample Size					p-Value				Sample Size					p-Value				
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA		Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA		Log ANOVA	
2_19_6_129	MW-10	Part 115	Vanadium	mg/L	89%	2	3	2	2	9	0.61	0.68		0.68		0	1	0	0	1	NA	NA		NA		NA	
2_19_6_130	MW-10	Part 115	Zinc	mg/L	22%	2	3	2	2	9	0.17	0.56		0.39		1	2	2	2	7	0.18	NA		0.67		0.49	
2_20_4_105	MW-11	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.096	0.11		0.047	*	2	3	2	2	9	0.096	NA		0.11		0.047	*
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.19	0.22		0.27		2	3	2	2	9	0.19	NA		0.22		0.27	
2_20_4_108	MW-11	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.057	0.0015	**	0.0022	**	2	3	2	2	9	0.057	NA		0.0015	**	0.0022	**
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.13	0.22		0.14		2	3	2	2	9	0.13	NA		0.22		0.14	
2_20_4_120	MW-11	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.31	0.50		0.50		2	3	2	2	9	0.31	NA		0.50		0.50	
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	11%	2	3	2	2	9	0.11	0.024	*	0.081		2	3	2	1	8	0.16	NA		0.062		0.082	
2_20_4_126	MW-11	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.58	0.56		0.56		2	3	2	2	9	0.58	NA		0.56		0.56	
2_20_5_101	MW-11	Appendix IV	Antimony	mg/L	67%	2	3	2	2	9	0.94	0.62		0.84		1	1	0	1	3	0.37	NA		NA		NA	
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.12	0.21		0.11		2	3	2	2	9	0.12	NA		0.21		0.11	
2_20_5_103	MW-11	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.18	0.20		0.15		2	3	2	2	9	0.18	NA		0.20		0.15	
2_20_5_104	MW-11	Appendix IV	Beryllium	mg/L	89%	2	3	2	2	9	0.32	0.37		0.37		1	0	0	0	1	NA	NA		NA		NA	
2_20_5_106	MW-11	Appendix IV	Cadmium	mg/L	89%	2	3	2	2	9	0.82	0.57		0.80		1	0	0	0	1	NA	NA		NA		NA	
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.11	0.34		0.20		2	3	2	2	9	0.11	NA		0.34		0.20	
2_20_5_110	MW-11	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.16	0.16		0.092		2	3	2	2	9	0.16	NA		0.16		0.092	
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.13	0.22		0.14		2	3	2	2	9	0.13	NA		0.22		0.14	
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	33%	2	3	2	2	9	0.49	0.36		0.34		2	0	2	2	6	0.65	NA		0.46		0.47	
2_20_5_116	MW-11	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.13	0.21		0.072		2	3	2	2	9	0.13	NA		0.21		0.072	
2_20_5_117	MW-11	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37		NA		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	22%	2	3	2	2	9	0.067	0.059		0.024	*	2	1	2	2	7	0.17	NA		0.27		0.13	
2_20_5_121	MW-11	Appendix IV	Radium 226 and 228	pCi/L	22%	2	3	2	2	9	0.75	0.75		0.73		1	3	1	2	7	0.36	NA		0.53		0.58	
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	33%	2	3	2	2	9	0.33	0.35		0.42		1	1	2	2	6	0.28	NA		0.12		0.16	
2_20_5_125	MW-11	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	0.34	0.40		0.40		NA	NA	NA	NA	NA	NA	NA		NA		NA	
2_20_6_111	MW-11	Part 115	Copper	mg/L	33%	2	3	2	2	9	0.097	0.37		0.22		2	1	2	1	6	0.31	NA		0.76		0.74	
2_20_6_114	MW-11	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.18	0.15		0.17		2	3	2	2	9	0.18	NA		0.15		0.17	
2_20_6_119	MW-11	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.10	0.32		0.19		2	3	2	2	9	0.10	NA		0.32		0.19	
2_20_6_123	MW-11	Part 115	Silver	mg/L	89%	2	3	2	2	9	0.30	0.29		0.33		1	0	0	0	1	NA	NA		NA		NA	
2_20_6_129	MW-11	Part 115	Vanadium	mg/L	89%	2	3	2	2	9	NA	NA		0.37		1	0	0	0	1	NA	NA		NA		NA	
2_20_6_130	MW-11	Part 115	Zinc	mg/L	22%	2	3	2	2	9	0.48	0.48		0.59		2	1	2	2	7	0.36	NA		0.66		0.59	
2_21_4_105	MW-12	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.084	0.0047	**	0.011	*	2	3	2	2	9	0.084	NA		0.0047	**	0.011	*
2_21_4_107	MW-12	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.44	0.46		0.48		2	3	2	2	9	0.44	NA		0.46		0.48	
2_21_4_108	MW-12	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.29	0.23		0.23		2	3	2	2	9	0.29	NA		0.23		0.23	
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.70	0.83		0.86		2	3	2	2	9	0.70	NA		0.83		0.86	
2_21_4_120	MW-12	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.23	0.26		0.27		2	3	2	2	9	0.23	NA		0.26		0.27	
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.13	0.20		0.17		2	3	2	2	9	0.13	NA		0.20		0.17	
2_21_4_126	MW-12	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.46	0.38		0.44		2	3	2	2	9	0.46	NA		0.38		0.44	
2_21_5_101	MW-12	Appendix IV	Antimony	mg/L	0%	2	3	2	2	9	0.23	0.29		0.31		2	3	2	2	9	0.23	NA		0.29		0.31	
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.10	0.026	*	0.048	*	2	3	2	2	9	0.10	NA		0.026	*	0.048	*

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.14	0.11	0.074	2	3	2	2	9	0.14 NA	0.11	0.074
2_21_5_104	MW-12	Appendix IV	Beryllium	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA NA	NA	NA
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	0%	2	3	2	2	9	0.21	0.052	0.17	2	3	2	2	9	0.21 NA	0.052	0.17
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	44%	2	3	2	2	9	0.27	0.29	0.27	2	2	0	1	5	0.17 NA	0.15	0.099
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	33%	2	3	2	2	9	0.12	0.017 *	0.051	1	1	2	2	6	0.23 NA	0.20	0.24
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.70	0.83	0.86	2	3	2	2	9	0.70 NA	0.83	0.86
2_21_5_115	MW-12	Appendix IV	Lead	mg/L	56%	2	3	2	2	9	0.28	0.58	0.58	0	1	2	1	4	0.63 NA	0.76	0.77
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.20	0.20	0.20	2	3	2	2	9	0.20 NA	0.20	0.20
2_21_5_117	MW-12	Appendix IV	Mercury	mg/L	89%	2	3	2	2	9	NA	0.37	NA	0	0	0	1	1	NA NA	NA	NA
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.087	0.0078 **	0.011 *	2	3	2	2	9	0.087 NA	0.0078 **	0.011 *
2_21_5_121	MW-12	Appendix IV	Radium 226 and 228	pCi/L	78%	2	3	2	2	9	0.18	0.25	0.22	0	2	0	0	2	NA NA	NA	NA
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	0%	2	3	2	2	9	0.084	0.041 *	0.033 *	2	3	2	2	9	0.084 NA	0.041 *	0.033 *
2_21_5_125	MW-12	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	NA	0.37	0.37	NA	NA	NA	NA	NA	NA NA	NA	NA
2_21_6_111	MW-12	Part 115	Copper	mg/L	0%	2	3	2	2	9	0.11	0.073	0.041 *	2	3	2	2	9	0.11 NA	0.073	0.041 *
2_21_6_114	MW-12	Part 115	Iron	mg/L	44%	2	3	2	2	9	0.097	0.35	0.21	1	1	2	1	5	0.28 NA	0.38	0.29
2_21_6_119	MW-12	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.19	0.15	0.16	2	3	2	2	9	0.19 NA	0.15	0.16
2_21_6_123	MW-12	Part 115	Silver	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA NA	NA	NA
2_21_6_129	MW-12	Part 115	Vanadium	mg/L	56%	2	3	2	2	9	0.17	0.23	0.18	0	2	2	0	4	1.0 NA	1.0	0.95
2_21_6_130	MW-12	Part 115	Zinc	mg/L	0%	2	3	2	2	9	0.30	0.49	0.55	2	3	2	2	9	0.30 NA	0.49	0.55
2_27_4_105	MW-32	Appendix III	Boron	mg/L	0%	2	3	2	2	9	0.098	0.034 *	0.022 *	2	3	2	2	9	0.098 NA	0.034 *	0.022 *
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	0%	2	3	2	2	9	0.20	0.10	0.087	2	3	2	2	9	0.20 NA	0.10	0.087
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	0%	2	3	2	2	9	0.16	0.16	0.17	2	3	2	2	9	0.16 NA	0.16	0.17
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	0%	2	3	2	2	9	0.61	0.53	0.54	2	3	2	2	9	0.61 NA	0.53	0.54
2_27_4_120	MW-32	Appendix III	pH (field)	su	0%	2	3	2	2	9	0.49	0.66	0.66	2	3	2	2	9	0.49 NA	0.66	0.66
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	0%	2	3	2	2	9	0.090	0.036 *	0.13	2	3	2	2	9	0.090 NA	0.036 *	0.13
2_27_4_126	MW-32	Appendix III	Total Dissolved Solids	mg/L	0%	2	3	2	2	9	0.12	0.033 *	0.029 *	2	3	2	2	9	0.12 NA	0.033 *	0.029 *
2_27_5_101	MW-32	Appendix IV	Antimony	mg/L	67%	2	3	2	2	9	0.15	0.20	0.092	0	2	0	1	3	0.22 NA	0.63	0.61
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	0%	2	3	2	2	9	0.11	0.069	0.083	2	3	2	2	9	0.11 NA	0.069	0.083
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	0%	2	3	2	2	9	0.077	0.014 *	0.010 *	2	3	2	2	9	0.077 NA	0.014 *	0.010 *
2_27_5_104	MW-32	Appendix IV	Beryllium	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA NA	NA	NA
2_27_5_106	MW-32	Appendix IV	Cadmium	mg/L	100%	2	3	2	2	9	0.28	0.32	0.32	NA	NA	NA	NA	NA	NA NA	NA	NA
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	0%	2	3	2	2	9	0.12	0.061	0.069	2	3	2	2	9	0.12 NA	0.061	0.069
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	0%	2	3	2	2	9	0.23	0.0053 **	0.0094 **	2	3	2	2	9	0.23 NA	0.0053 **	0.0094 **
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	0%	2	3	2	2	9	0.61	0.53	0.54	2	3	2	2	9	0.61 NA	0.53	0.54
2_27_5_115	MW-32	Appendix IV	Lead	mg/L	78%	2	3	2	2	9	0.34	0.39	0.41	0	1	1	0	2	0.32 NA	NA	NA
2_27_5_116	MW-32	Appendix IV	Lithium	mg/L	0%	2	3	2	2	9	0.069	0.023 *	0.015 *	2	3	2	2	9	0.069 NA	0.023 *	0.015 *
2_27_5_117	MW-32	Appendix IV	Mercury	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA NA	NA	NA
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	0%	2	3	2	2	9	0.14	0.18	0.19	2	3	2	2	9	0.14 NA	0.18	0.19
2_27_5_121	MW-32	Appendix IV	Radium 226 and 228	pCi/L	56%	2	3	2	2	9	0.16	0.19	0.15	0	2	1	1	4	0.26 NA	0.078	0.070

(Table continues on next page)

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 7: Seasonality Tests *(continued)*

						Full								Without Non-Detects								
						Sample Size					p-Value			Sample Size					p-Value			
ID	Well	Constituent Type	Constituent	Unit	% NDs	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis	ANOVA	Log ANOVA	Winter	Spring	Summer	Fall	Total	Kruskal-Wallis		ANOVA	Log ANOVA
2_27_5_122	MW-32	Appendix IV	Selenium	mg/L	100%	2	3	2	2	9	0.28	0.32	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_27_5_125	MW-32	Appendix IV	Thallium	mg/L	100%	2	3	2	2	9	NA	0.37	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_27_6_111	MW-32	Part 115	Copper	mg/L	78%	2	3	2	2	9	0.32	0.37	0.37	0	1	0	1	2	0.32	NA	NA	NA
2_27_6_114	MW-32	Part 115	Iron	mg/L	0%	2	3	2	2	9	0.42	0.39	0.38	2	3	2	2	9	0.42	NA	0.39	0.38
2_27_6_119	MW-32	Part 115	Nickel	mg/L	0%	2	3	2	2	9	0.52	0.43	0.49	2	3	2	2	9	0.52	NA	0.43	0.49
2_27_6_123	MW-32	Part 115	Silver	mg/L	100%	2	3	2	2	9	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_27_6_129	MW-32	Part 115	Vanadium	mg/L	100%	2	3	2	2	9	NA	NA	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA
2_27_6_130	MW-32	Part 115	Zinc	mg/L	0%	2	3	2	2	9	0.26	0.62	0.52	2	3	2	2	9	0.26	NA	0.62	0.52

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 8: Trend Tests: Lognormal MLE and MK

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0020	0.0059	↑
1_11_4_107	MW-01R	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0019	0.0040	↓
1_11_4_108	MW-01R	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0019	0.084	↔
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	9	0	0%	Nonparametric	MK	0.0024	0.58	↔
1_11_4_120	MW-01R	Appendix III	pH (field)	su	9	0	0%	Nonparametric	MK	0.00023	0.53	↔
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.010	0.00037	↓
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00035	0.023	↔
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	9	2	22%	Parametric	Lognormal MLE	0.00023	0.91	↔
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00043	0.70	↔
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0018	0.010	↔
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00098	0.35	↔
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0022	0.047	↔
1_11_5_110	MW-01R	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00068	0.68	↔
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Nonparametric	MK	0.0024	0.58	↔
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	9	2	22%	Parametric	Lognormal MLE	0.0011	0.65	↔
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0017	0.036	↔
1_11_5_118	MW-01R	Appendix IV	Molybdenum	mg/L	9	1	11%	Parametric	Lognormal MLE	-0.0010	0.51	↔
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00029	0.77	↔
1_11_6_114	MW-01R	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0046	0.000084	↓
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0013	0.31	↔
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	9	2	22%	Parametric	Lognormal MLE	0.0060	0.0013	↑
1_11_6_130	MW-01R	Part 115	Zinc	mg/L	9	1	11%	Nonparametric	MK	0	0.74	↔
1_15_4_105	MW-06	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000077	0.85	↔
1_15_4_107	MW-06	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00016	0.65	↔
1_15_4_108	MW-06	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0021	0.0040	↓
1_15_4_112	MW-06	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000095	0.82	↔
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	Nonparametric	MK	-0.000095	0.83	↔
1_15_4_124	MW-06	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	Parametric	Lognormal MLE	-0.011	0.0015	↓
1_15_4_126	MW-06	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Nonparametric	MK	-0.17	0.16	↔
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00097	0.14	↔
1_15_5_103	MW-06	Appendix IV	Barium	mg/L	9	0	0%	Nonparametric	MK	-0.00019	0.59	↔
1_15_5_109	MW-06	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00037	0.68	↔
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0000098	0.99	↔
1_15_5_113	MW-06	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000095	0.82	↔
1_15_5_116	MW-06	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00050	0.31	↔
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	Parametric	Lognormal MLE	-0.00013	0.92	↔
1_15_6_114	MW-06	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00011	0.84	↔
1_15_6_119	MW-06	Part 115	Nickel	mg/L	9	2	22%	Parametric	Lognormal MLE	-0.0011	0.14	↔
1_15_6_130	MW-06	Part 115	Zinc	mg/L	9	1	11%	Nonparametric	MK	-0.0000027	0.34	↔
1_17_4_105	MW-08	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00099	0.43	↔
1_17_4_107	MW-08	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00064	0.0015	↓
1_17_4_108	MW-08	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00012	0.88	↔
1_17_4_112	MW-08	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00073	0.55	↔

(Table continues on next page)

Table 8: Trend Tests: Lognormal MLE and MK *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	Nonparametric	MK	0.00039	0.18	↔
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	3	33%	Parametric	Lognormal MLE	-0.014	0.0087	↓
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00034	0.33	↔
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	9	3	33%	Parametric	Lognormal MLE	-0.0022	0.39	↔
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00035	0.88	↔
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00066	0.065	↔
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00082	0.31	↔
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000028	0.97	↔
1_17_5_113	MW-08	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00073	0.55	↔
1_17_5_116	MW-08	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000049	0.95	↔
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0040	0.043	↔
1_17_5_121	MW-08	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	Parametric	Lognormal MLE	-0.0011	0.47	↔
1_17_6_114	MW-08	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0019	0.0059	↓
1_17_6_119	MW-08	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00091	0.053	↔
1_17_6_130	MW-08	Part 115	Zinc	mg/L	9	2	22%	Nonparametric	MK	-0.0000016	0.83	↔
1_18_4_105	MW-09	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00036	0.23	↔
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00087	0.15	↔
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0013	0.0010	↓
1_18_4_112	MW-09	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00083	0.0000010	↑
1_18_4_120	MW-09	Appendix III	pH (field)	su	9	0	0%	Nonparametric	MK	0	1.0	↔
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0035	0.085	↔
1_18_4_126	MW-09	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0012	0.10	↔
1_18_5_102	MW-09	Appendix IV	Arsenic	mg/L	9	0	0%	Nonparametric	MK	0	0.83	↔
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0050	0.014	↔
1_18_5_109	MW-09	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00071	0.32	↔
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00063	0.64	↔
1_18_5_113	MW-09	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00083	0.0000010	↑
1_18_5_116	MW-09	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000063	0.83	↔
1_18_5_118	MW-09	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0016	0.030	↔
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	Nonparametric	MK	-0.000000058	0.75	↔
1_18_6_114	MW-09	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00053	0.35	↔
1_18_6_119	MW-09	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0021	0.11	↔
1_22_4_105	MW-18	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0010	0.0099	↑
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0012	0.027	↔
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00024	0.67	↔
1_22_4_112	MW-18	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0012	0.000000015	↑
1_22_4_120	MW-18	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	0.000061	0.012	↔
1_22_4_124	MW-18	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0010	0.24	↔
1_22_4_126	MW-18	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00095	0.023	↔
1_22_5_102	MW-18	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0014	0.089	↔
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0014	0.073	↔
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	9	2	22%	Parametric	Lognormal MLE	-0.0033	0.10	↔
1_22_5_110	MW-18	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0038	0.0000025	↓

(Table continues on next page)

Table 8: Trend Tests: Lognormal MLE and MK *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
1_22_5_113	MW-18	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0012	0.000000015	↑
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00028	0.69	↔
1_22_5_118	MW-18	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0018	0.0072	↑
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00035	0.87	↔
1_22_6_111	MW-18	Part 115	Copper	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0022	0.053	↔
1_22_6_114	MW-18	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0013	0.085	↔
1_22_6_119	MW-18	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0028	0.0000026	↓
1_22_6_130	MW-18	Part 115	Zinc	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0021	0.019	↔
1_23_4_105	MW-19	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00019	0.76	↔
1_23_4_107	MW-19	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00078	0.0079	↓
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0017	0.0031	↓
1_23_4_112	MW-19	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00014	0.65	↔
1_23_4_120	MW-19	Appendix III	pH (field)	su	9	0	0%	Nonparametric	MK	-0.00028	0.40	↔
1_23_4_124	MW-19	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00053	0.51	↔
1_23_4_126	MW-19	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00090	0.00068	↓
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00070	0.48	↔
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00046	0.33	↔
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	9	3	33%	Parametric	Lognormal MLE	0.00033	0.61	↔
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	9	4	44%	Parametric	Lognormal MLE	-0.0025	0.13	↔
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0039	0.0024	↓
1_23_5_113	MW-19	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00014	0.65	↔
1_23_5_116	MW-19	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00044	0.083	↔
1_23_5_118	MW-19	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00031	0.73	↔
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	Parametric	Lognormal MLE	0.00089	0.48	↔
1_23_6_114	MW-19	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00076	0.21	↔
1_23_6_119	MW-19	Part 115	Nickel	mg/L	9	1	11%	Parametric	Lognormal MLE	-0.0026	0.000023	↓
1_24_4_105	MW-20	Appendix III	Boron	mg/L	9	0	0%	Nonparametric	MK	0.00077	0.32	↔
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00086	0.33	↔
1_24_4_108	MW-20	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00033	0.45	↔
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	9	0	0%	Nonparametric	MK	-0.00017	0.14	↔
1_24_4_120	MW-20	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	-0.000022	0.67	↔
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0036	0.027	↔
1_24_4_126	MW-20	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00022	0.41	↔
1_24_5_101	MW-20	Appendix IV	Antimony	mg/L	9	2	22%	Parametric	Lognormal MLE	0.0012	0.33	↔
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0010	0.0015	↑
1_24_5_103	MW-20	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0011	0.24	↔
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0011	0.0067	↓
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Nonparametric	MK	-0.00017	0.14	↔
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00055	0.44	↔
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00068	0.17	↔
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00080	0.0046	↑
1_24_6_111	MW-20	Part 115	Copper	mg/L	9	1	11%	Parametric	Lognormal MLE	0.0010	0.29	↔
1_24_6_114	MW-20	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00021	0.49	↔

(Table continues on next page)

Table 8: Trend Tests: Lognormal MLE and MK *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
1_24_6_119	MW-20	Part 115	Nickel	mg/L	9	0	0%	Nonparametric	MK	-0.0000026	0.67	↔
1_24_6_130	MW-20	Part 115	Zinc	mg/L	9	0	0%	Nonparametric	MK	-0.000019	0.34	↔
1_25_4_105	MW-30	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00032	0.64	↔
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	Nonparametric	MK	-0.26	0.045	↔
1_25_4_108	MW-30	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0026	0.000000000085	↓
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000062	0.88	↔
1_25_4_120	MW-30	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	0.000074	0.48	↔
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00068	0.10	↔
1_25_4_126	MW-30	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00024	0.52	↔
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	9	2	22%	Parametric	Lognormal MLE	0.000083	0.97	↔
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0019	0.019	↔
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00080	0.46	↔
1_25_5_110	MW-30	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0033	0.080	↔
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000062	0.88	↔
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00062	0.47	↔
1_25_5_118	MW-30	Appendix IV	Molybdenum	mg/L	9	3	33%	Parametric	Lognormal MLE	-0.0017	0.54	↔
1_25_6_114	MW-30	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00052	0.82	↔
1_25_6_119	MW-30	Part 115	Nickel	mg/L	9	2	22%	Parametric	Lognormal MLE	-0.0039	0.12	↔
1_26_4_105	MW-31	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00069	0.060	↔
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00066	0.051	↔
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00020	0.46	↔
1_26_4_112	MW-31	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000071	0.65	↔
1_26_4_120	MW-31	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	-0.000013	0.74	↔
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0035	0.0000038	↓
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00046	0.022	↔
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	9	4	44%	Parametric	Lognormal MLE	0.0010	0.44	↔
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000070	0.91	↔
1_26_5_103	MW-31	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00018	0.80	↔
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00075	0.069	↔
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00018	0.71	↔
1_26_5_113	MW-31	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000071	0.65	↔
1_26_5_116	MW-31	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000072	0.72	↔
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	9	0	0%	Nonparametric	MK	-0.00000083	0.45	↔
1_26_5_121	MW-31	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	Parametric	Lognormal MLE	0.000027	0.98	↔
1_26_6_114	MW-31	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0082	0.000000000080	↓
2_12_4_105	MW-02	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00065	0.055	↔
2_12_4_107	MW-02	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00025	0.38	↔
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Nonparametric	MK	0	0.49	↔
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	Nonparametric	MK	0.0019	0.40	↔
2_12_4_120	MW-02	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	0.000017	0.77	↔
2_12_4_126	MW-02	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000012	0.96	↔
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	Parametric	Lognormal MLE	0.0017	0.25	↔
2_12_5_102	MW-02	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00015	0.74	↔

(Table continues on next page)

Table 8: Trend Tests: Lognormal MLE and MK *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
2_12_5_103	MW-02	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00070	0.014	↔
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0012	0.29	↔
2_12_5_109	MW-02	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00048	0.73	↔
2_12_5_110	MW-02	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0010	0.36	↔
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Nonparametric	MK	0.0019	0.40	↔
2_12_5_115	MW-02	Appendix IV	Lead	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00094	0.49	↔
2_12_5_116	MW-02	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00014	0.83	↔
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0011	0.24	↔
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	Parametric	Lognormal MLE	-0.00049	0.82	↔
2_12_5_122	MW-02	Appendix IV	Selenium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0013	0.18	↔
2_12_6_111	MW-02	Part 115	Copper	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0019	0.091	↔
2_12_6_114	MW-02	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00069	0.12	↔
2_12_6_119	MW-02	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00062	0.59	↔
2_12_6_129	MW-02	Part 115	Vanadium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0028	0.053	↔
2_12_6_130	MW-02	Part 115	Zinc	mg/L	9	0	0%	Nonparametric	MK	-0.0000030	0.92	↔
2_13_4_105	MW-03	Appendix III	Boron	mg/L	9	0	0%	Nonparametric	MK	0	0.91	↔
2_13_4_107	MW-03	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00022	0.54	↔
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0014	0.019	↔
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	9	0	0%	Nonparametric	MK	-0.00022	0.25	↔
2_13_4_120	MW-03	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	0.000019	0.70	↔
2_13_4_124	MW-03	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0042	0.077	↔
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Nonparametric	MK	0	0.53	↔
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00040	0.70	↔
2_13_5_103	MW-03	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0012	0.32	↔
2_13_5_109	MW-03	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0012	0.18	↔
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0020	0.087	↔
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Nonparametric	MK	-0.00022	0.25	↔
2_13_5_116	MW-03	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00089	0.10	↔
2_13_5_121	MW-03	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	Parametric	Lognormal MLE	-0.00100	0.33	↔
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	9	3	33%	Parametric	Lognormal MLE	0.0016	0.31	↔
2_13_6_114	MW-03	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0094	0.00000000055	↓
2_13_6_119	MW-03	Part 115	Nickel	mg/L	9	1	11%	Nonparametric	MK	-0.0000023	0.40	↔
2_14_4_105	MW-04	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00047	0.024	↔
2_14_4_107	MW-04	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00026	0.35	↔
2_14_4_108	MW-04	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0012	0.0095	↓
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0015	0.0043	↑
2_14_4_120	MW-04	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	-0.0000023	0.97	↔
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Nonparametric	MK	0.73	0.059	↔
2_14_4_126	MW-04	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00014	0.58	↔
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00065	0.52	↔
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	9	0	0%	Nonparametric	MK	0	0.91	↔
2_14_5_109	MW-04	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00072	0.45	↔
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00024	0.84	↔

(Table continues on next page)

Table 8: Trend Tests: Lognormal MLE and MK *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0015	0.0043	↑
2_14_5_116	MW-04	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00060	0.18	↔
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	9	2	22%	Parametric	Lognormal MLE	0.0011	0.51	↔
2_14_5_121	MW-04	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	Parametric	Lognormal MLE	-0.0014	0.12	↔
2_14_6_114	MW-04	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00015	0.71	↔
2_14_6_119	MW-04	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0028	0.18	↔
2_16_4_105	MW-07	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00013	0.58	↔
2_16_4_107	MW-07	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000050	0.85	↔
2_16_4_108	MW-07	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Nonparametric	MK	-0.0072	0.032	↔
2_16_4_112	MW-07	Appendix III	Fluoride	mg/L	9	1	11%	Parametric	Lognormal MLE	0.00041	0.73	↔
2_16_4_120	MW-07	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	-0.000050	0.43	↔
2_16_4_124	MW-07	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0012	0.13	↔
2_16_4_126	MW-07	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00042	0.30	↔
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00047	0.48	↔
2_16_5_103	MW-07	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00033	0.38	↔
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00021	0.62	↔
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00072	0.019	↔
2_16_5_113	MW-07	Appendix IV	Fluoride (App IV)	mg/L	9	1	11%	Parametric	Lognormal MLE	0.00041	0.73	↔
2_16_5_116	MW-07	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.000014	0.99	↔
2_16_5_121	MW-07	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	Parametric	Lognormal MLE	-0.00092	0.54	↔
2_16_6_114	MW-07	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00065	0.088	↔
2_19_4_105	MW-10	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0022	0.21	↔
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0013	0.14	↔
2_19_4_108	MW-10	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0028	0.024	↔
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00097	0.34	↔
2_19_4_120	MW-10	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	0.0000013	0.99	↔
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0036	0.021	↔
2_19_4_126	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00031	0.44	↔
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0034	0.0060	↑
2_19_5_103	MW-10	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00026	0.85	↔
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	9	3	33%	Parametric	Lognormal MLE	0.0031	0.18	↔
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0019	0.22	↔
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0017	0.32	↔
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00097	0.34	↔
2_19_5_116	MW-10	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00077	0.39	↔
2_19_5_118	MW-10	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0024	0.013	↔
2_19_5_122	MW-10	Appendix IV	Selenium	mg/L	9	1	11%	Parametric	Lognormal MLE	0.00078	0.28	↔
2_19_6_114	MW-10	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0011	0.32	↔
2_19_6_119	MW-10	Part 115	Nickel	mg/L	9	3	33%	Parametric	Lognormal MLE	0.0011	0.44	↔
2_19_6_130	MW-10	Part 115	Zinc	mg/L	9	2	22%	Nonparametric	MK	0	0.91	↔
2_20_4_105	MW-11	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00011	0.96	↔
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00025	0.83	↔
2_20_4_108	MW-11	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00029	0.66	↔

(Table continues on next page)

Table 8: Trend Tests: Lognormal MLE and MK *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00014	0.95	↔
2_20_4_120	MW-11	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	0.0000070	0.83	↔
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	Parametric	Lognormal MLE	-0.013	0.048	↔
2_20_4_126	MW-11	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0015	0.015	↔
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00044	0.80	↔
2_20_5_103	MW-11	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00070	0.54	↔
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0025	0.35	↔
2_20_5_110	MW-11	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0021	0.12	↔
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00014	0.95	↔
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	9	3	33%	Parametric	Lognormal MLE	-0.0097	0.13	↔
2_20_5_116	MW-11	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00074	0.85	↔
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	9	2	22%	Parametric	Lognormal MLE	-0.0015	0.52	↔
2_20_5_121	MW-11	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	Parametric	Lognormal MLE	-0.00099	0.41	↔
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	9	3	33%	Parametric	Lognormal MLE	-0.00075	0.32	↔
2_20_6_111	MW-11	Part 115	Copper	mg/L	9	3	33%	Nonparametric	MK	-0.00000013	0.83	↔
2_20_6_114	MW-11	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000080	0.95	↔
2_20_6_119	MW-11	Part 115	Nickel	mg/L	9	0	0%	Nonparametric	MK	0	1.0	↔
2_20_6_130	MW-11	Part 115	Zinc	mg/L	9	2	22%	Parametric	Lognormal MLE	-0.0096	0.047	↔
2_21_4_105	MW-12	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0011	0.17	↔
2_21_4_107	MW-12	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0011	0.094	↔
2_21_4_108	MW-12	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00022	0.76	↔
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0019	0.027	↔
2_21_4_120	MW-12	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	-0.000029	0.83	↔
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00096	0.092	↔
2_21_4_126	MW-12	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00016	0.85	↔
2_21_5_101	MW-12	Appendix IV	Antimony	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0022	0.0088	↓
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0016	0.039	↔
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0033	0.0000048	↑
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0028	0.025	↔
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	9	4	44%	Parametric	Lognormal MLE	-0.0065	0.021	↔
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	9	3	33%	Parametric	Lognormal MLE	0.0056	0.010	↔
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0019	0.027	↔
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0019	0.021	↔
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00077	0.16	↔
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0084	0.0000082	↓
2_21_6_111	MW-12	Part 115	Copper	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00057	0.58	↔
2_21_6_114	MW-12	Part 115	Iron	mg/L	9	4	44%	Parametric	Lognormal MLE	0.0029	0.058	↔
2_21_6_119	MW-12	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00066	0.38	↔
2_21_6_130	MW-12	Part 115	Zinc	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00075	0.40	↔
2_27_4_105	MW-32	Appendix III	Boron	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0011	0.028	↔
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0012	0.00096	↓
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00036	0.077	↔
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00043	0.048	↔

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Table 8: Trend Tests: Lognormal MLE and MK *(continued)*

ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Type	Method	Slope	p-value	Trend
2_27_4_120	MW-32	Appendix III	pH (field)	su	9	0	0%	Parametric	Lognormal MLE	-0.000016	0.66	↔
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0060	0.0046	↓
2_27_4_126	MW-32	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.00082	0.012	↔
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00050	0.19	↔
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.000045	0.97	↔
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0023	0.0000020	↓
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	9	0	0%	Parametric	Lognormal MLE	0.0011	0.12	↔
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00043	0.048	↔
2_27_5_116	MW-32	Appendix IV	Lithium	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00062	0.34	↔
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	9	0	0%	Parametric	Lognormal MLE	0.00023	0.64	↔
2_27_6_114	MW-32	Part 115	Iron	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0019	0.00000000081	↓
2_27_6_119	MW-32	Part 115	Nickel	mg/L	9	0	0%	Parametric	Lognormal MLE	-0.0019	0.0000062	↓
2_27_6_130	MW-32	Part 115	Zinc	mg/L	9	0	0%	Nonparametric	MK	0.0000016	0.83	↔

Table 9: Trend Tests: Piecewise Linear-Linear

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	9	0	0%	-0.38	0.32	↔	0.43	0.0068	↑	2023-03-03	0.83	↔
1_11_4_107	MW-01R	Appendix III	Calcium	mg/L	9	0	0%	0.82	0.18	↔	-0.83	0.0025	↓	2023-03-13	0.88	↔
1_11_4_108	MW-01R	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-1.1	0.34	↔	0.50	0.0072	↑	2023-02-07	0.80	↔
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	9	0	0%	-0.064	0.15	↔	0.031	0.031	↔	2023-03-07	0.71	↔
1_11_4_120	MW-01R	Appendix III	pH (field)	su	9	0	0%	0.0051	0.43	↔	-0.00072	0.90	↔	2023-04-29	0.22	↔
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	1.6	0.49	↔	-4.0	0.018	↔	2023-04-17	0.75	↔
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-2.8	0.16	↔	1.7	0.018	↔	2023-02-15	0.77	↔
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	9	2	22%	0.0000047	0.13	↔	-0.0000033	0.25	↔	2023-04-18	0.49	↔
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000066	0.28	↔	0.0000035	0.28	↔	2023-04-13	0.42	↔
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	9	0	0%	-0.00074	0.026	↔	0.0019	0.00046	↑	2023-04-23	0.96	↔
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	9	0	0%	-0.00000043	0.72	↔	0.00000074	0.27	↔	2023-04-15	0.27	↔
1_11_5_106	MW-01R	Appendix IV	Cadmium	mg/L	9	6	67%	0.0000012	0.17	↔	-0.0000020	0.20	↔	2023-06-16	0.49	↔
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.0000021	0.89	↔	0.0000064	0.45	↔	2023-03-14	0.28	↔
1_11_5_110	MW-01R	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000093	0.29	↔	-0.000016	0.28	↔	2023-06-27	0.37	↔
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.064	0.15	↔	0.031	0.031	↔	2023-03-07	0.71	↔
1_11_5_115	MW-01R	Appendix IV	Lead	mg/L	9	2	22%	0.000010	0.39	↔	-0.000018	0.38	↔	2023-06-27	0.27	↔
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	9	0	0%	-0.0077	0.28	↔	0.0096	0.039	↔	2023-03-16	0.72	↔
1_11_5_118	MW-01R	Appendix IV	Molybdenum	mg/L	9	1	11%	0.0000080	0.53	↔	-0.0000080	0.26	↔	2023-04-16	0.29	↔
1_11_5_121	MW-01R	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	0.0057	0.36	↔	-0.0014	0.42	↔	2023-02-18	0.29	↔
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	9	0	0%	-0.00000054	0.79	↔	0.0000012	0.54	↔	2023-05-22	0.096	↔
1_11_5_125	MW-01R	Appendix IV	Thallium	mg/L	9	9	100%	0.0000016	0.066	↔	-0.0000040	0.14	↔	2023-07-21	0.63	↔
1_11_6_111	MW-01R	Part 115	Copper	mg/L	9	5	56%	0.0000030	0.29	↔	-0.0000035	0.46	↔	2023-06-27	0.34	↔
1_11_6_119	MW-01R	Part 115	Nickel	mg/L	9	0	0%	0.0000091	0.25	↔	-0.000011	0.67	↔	2023-06-28	0.27	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
1_11_6_123	MW-01R	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.26	↔	-0.0000011	0.27	↔	2023-04-18	0.40	↔
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	9	2	22%	0.000015	0.046	↔	-0.000022	0.29	↔	2023-08-05	0.68	↔
1_15_4_105	MW-06	Appendix III	Boron	mg/L	9	0	0%	-0.024	0.044	↔	0.016	0.019	↔	2023-04-17	0.81	↔
1_15_4_107	MW-06	Appendix III	Calcium	mg/L	9	0	0%	0.70	0.22	↔	-0.23	0.15	↔	2023-03-13	0.60	↔
1_15_4_108	MW-06	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.70	0.00051	↓	0.096	0.096	↔	2023-04-09	0.97	↔
1_15_4_112	MW-06	Appendix III	Fluoride	mg/L	9	0	0%	-0.0034	0.28	↔	0.0012	0.18	↔	2023-03-13	0.53	↔
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	0.00085	0.74	↔	0.000077	0.99	↔	2023-06-03	0.048	↔
1_15_4_124	MW-06	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	0.0052	0.91	↔	-0.12	0.20	↔	2023-06-08	0.50	↔
1_15_4_126	MW-06	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.10	0.76	↔	-1.3	0.28	↔	2023-07-15	0.53	↔
1_15_5_101	MW-06	Appendix IV	Antimony	mg/L	9	7	78%	0.0000017	0.28	↔	-0.0000020	0.19	↔	2023-05-22	0.44	↔
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000024	0.013	↔	0.0000027	0.00052	↑	2023-04-05	0.94	↔
1_15_5_103	MW-06	Appendix IV	Barium	mg/L	9	0	0%	-0.0028	0.088	↔	0.0017	0.25	↔	2023-04-18	0.55	↔
1_15_5_104	MW-06	Appendix IV	Beryllium	mg/L	9	8	89%	-0.000000020	0.087	↔	0.0000000015	0.58	↔	2023-02-24	0.71	↔
1_15_5_106	MW-06	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000012	0.26	↔	-0.0000013	0.23	↔	2023-05-22	0.43	↔
1_15_5_109	MW-06	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.000017	0.54	↔	-0.0000023	0.47	↔	2023-01-11	0.18	↔
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000027	0.66	↔	-0.00000044	0.53	↔	2023-02-05	0.20	↔
1_15_5_113	MW-06	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0034	0.28	↔	0.0012	0.18	↔	2023-03-13	0.53	↔
1_15_5_115	MW-06	Appendix IV	Lead	mg/L	9	6	67%	0.0000088	0.59	↔	-0.0000031	0.13	↔	2023-02-05	0.43	↔
1_15_5_116	MW-06	Appendix IV	Lithium	mg/L	9	0	0%	-0.00043	0.16	↔	0.00023	0.40	↔	2023-05-05	0.47	↔
1_15_5_118	MW-06	Appendix IV	Molybdenum	mg/L	9	6	67%	0.0000077	0.41	↔	-0.0000088	0.34	↔	2023-04-18	0.31	↔
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	0.0054	0.56	↔	-0.0028	0.29	↔	2023-03-13	0.28	↔
1_15_5_122	MW-06	Appendix IV	Selenium	mg/L	9	5	56%	-0.0000000000000046	1.0	↔	-0.00000011	0.11	↔	2023-03-02	0.56	↔
1_15_5_125	MW-06	Appendix IV	Thallium	mg/L	9	9	100%	0.0000017	0.27	↔	-0.0000016	0.28	↔	2023-04-18	0.39	↔
1_15_6_114	MW-06	Part 115	Iron	mg/L	9	0	0%	0.063	0.42	↔	-0.023	0.28	↔	2023-03-13	0.38	↔
1_15_6_119	MW-06	Part 115	Nickel	mg/L	9	2	22%	-0.0000030	0.22	↔	0.00000044	0.72	↔	2023-04-17	0.56	↔
1_15_6_123	MW-06	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.27	↔	-0.0000010	0.28	↔	2023-04-18	0.39	↔
1_15_6_129	MW-06	Part 115	Vanadium	mg/L	9	9	100%	-0.00000020	0.087	↔	0.000000015	0.58	↔	2023-02-24	0.71	↔
1_17_4_105	MW-08	Appendix III	Boron	mg/L	9	0	0%	0.092	0.013	↔	-0.012	0.11	↔	2023-02-07	0.81	↔
1_17_4_108	MW-08	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.25	0.17	↔	-0.048	0.043	↔	2023-02-06	0.75	↔
1_17_4_112	MW-08	Appendix III	Fluoride	mg/L	9	0	0%	0.010	0.012	↔	-0.0028	0.012	↔	2023-03-02	0.89	↔
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	0.0055	0.33	↔	-0.00015	0.96	↔	2023-03-14	0.31	↔
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	3	33%	-0.093	0.14	↔	0.017	0.93	↔	2023-07-05	0.47	↔
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.23	0.52	↔	-1.2	0.34	↔	2023-06-28	0.41	↔
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	9	3	33%	0.00000098	0.31	↔	-0.00000069	0.19	↔	2023-04-06	0.42	↔
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	9	0	0%	0.00062	0.0021	↑	-0.00016	0.0021	↓	2023-02-21	0.94	↔
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	9	0	0%	0.0034	0.58	↔	-0.0015	0.068	↔	2023-02-06	0.53	↔
1_17_5_106	MW-08	Appendix IV	Cadmium	mg/L	9	9	100%	0.00000000000028	1.0	↔	0.00000021	0.024	↔	2023-02-03	0.75	↔
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.0000093	0.22	↔	-0.0000026	0.019	↔	2023-02-06	0.75	↔
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000051	0.19	↔	-0.00000091	0.063	↔	2023-02-06	0.72	↔
1_17_5_113	MW-08	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.010	0.012	↔	-0.0028	0.012	↔	2023-03-02	0.89	↔
1_17_5_115	MW-08	Appendix IV	Lead	mg/L	9	7	78%	0.0000042	0.67	↔	-0.0000020	0.12	↔	2023-02-06	0.43	↔
1_17_5_116	MW-08	Appendix IV	Lithium	mg/L	9	0	0%	0.0013	0.078	↔	-0.00020	0.034	↔	2023-01-29	0.80	↔

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Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.0000091	0.046	↔	0.000016	0.22	↔	2023-07-31	0.67	↔
1_17_5_121	MW-08	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	-0.0069	0.77	↔	0.00022	0.93	↔	2023-02-06	0.11	↔
1_17_5_122	MW-08	Appendix IV	Selenium	mg/L	9	5	56%	0.0000000000011	1.0	↔	-0.00000037	0.021	↔	2023-02-06	0.76	↔
1_17_6_111	MW-08	Part 115	Copper	mg/L	9	5	56%	0.0000029	0.25	↔	-0.00000068	0.30	↔	2023-02-07	0.38	↔
1_17_6_114	MW-08	Part 115	Iron	mg/L	9	0	0%	-0.080	0.0017	↓	0.12	0.047	↔	2023-07-26	0.91	↔
1_17_6_119	MW-08	Part 115	Nickel	mg/L	9	0	0%	0.000011	0.026	↔	-0.0000022	0.0024	↓	2023-01-17	0.89	↔
1_17_6_130	MW-08	Part 115	Zinc	mg/L	9	2	22%	0.00017	0.80	↔	-0.00028	0.42	↔	2023-04-17	0.15	↔
1_18_4_105	MW-09	Appendix III	Boron	mg/L	9	0	0%	-0.0069	0.28	↔	0.0083	0.043	↔	2023-04-10	0.64	↔
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	9	0	0%	1.2	0.024	↔	-0.78	0.078	↔	2023-05-13	0.79	↔
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.030	0.076	↔	0.0074	0.76	↔	2023-06-23	0.67	↔
1_18_4_112	MW-09	Appendix III	Fluoride	mg/L	9	0	0%	0.0030	0.0063	↑	-0.0013	0.59	↔	2023-07-24	0.86	↔
1_18_4_120	MW-09	Appendix III	pH (field)	su	9	0	0%	0.0012	0.24	↔	-0.0017	0.10	↔	2023-05-22	0.53	↔
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	4.2	0.0019	↑	-2.4	0.018	↔	2023-04-29	0.91	↔
1_18_4_126	MW-09	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	5.5	0.0077	↑	-3.2	0.047	↔	2023-05-08	0.86	↔
1_18_5_101	MW-09	Appendix IV	Antimony	mg/L	9	5	56%	0.0000018	0.22	↔	-0.0000020	0.16	↔	2023-05-18	0.49	↔
1_18_5_102	MW-09	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000065	0.20	↔	0.0000046	0.33	↔	2023-04-18	0.40	↔
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	-0.0079	0.28	↔	0.00060	0.93	↔	2023-04-27	0.37	↔
1_18_5_104	MW-09	Appendix IV	Beryllium	mg/L	9	8	89%	0.000000018	0.27	↔	-0.000000020	0.46	↔	2023-05-23	0.30	↔
1_18_5_106	MW-09	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000013	0.21	↔	-0.0000012	0.25	↔	2023-05-22	0.48	↔
1_18_5_109	MW-09	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.000016	0.53	↔	-0.0000033	0.31	↔	2023-01-13	0.26	↔
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000042	0.39	↔	-0.0000019	0.18	↔	2023-03-13	0.43	↔
1_18_5_113	MW-09	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.0030	0.0063	↑	-0.0013	0.59	↔	2023-07-24	0.86	↔
1_18_5_115	MW-09	Appendix IV	Lead	mg/L	9	9	100%	0.000010	0.53	↔	-0.0000032	0.13	↔	2023-02-05	0.44	↔
1_18_5_117	MW-09	Appendix IV	Mercury	mg/L	9	8	89%	-0.00000097	0.36	↔	0.000024	0.00082	↑	2023-07-17	0.96	↔
1_18_5_118	MW-09	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000096	0.033	↔	0.000039	0.28	↔	2023-05-22	0.79	↔
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	-0.00000037	0.36	↔	0.00000037	0.58	↔	2023-05-23	0.21	↔
1_18_5_125	MW-09	Appendix IV	Thallium	mg/L	9	9	100%	0.0000017	0.42	↔	-0.0000016	0.18	↔	2023-04-17	0.39	↔
1_18_6_111	MW-09	Part 115	Copper	mg/L	9	8	89%	0.000000000000016	1.0	↔	0.00000035	0.51	↔	2023-03-02	0.15	↔
1_18_6_114	MW-09	Part 115	Iron	mg/L	9	0	0%	0.060	0.060	↔	-0.060	0.0064	↓	2023-04-16	0.84	↔
1_18_6_119	MW-09	Part 115	Nickel	mg/L	9	0	0%	0.000016	0.24	↔	-0.0000091	0.044	↔	2023-02-27	0.64	↔
1_18_6_123	MW-09	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.18	↔	-0.0000010	0.21	↔	2023-05-03	0.48	↔
1_22_4_105	MW-18	Appendix III	Boron	mg/L	9	0	0%	-0.0017	0.68	↔	0.0045	0.082	↔	2023-03-23	0.63	↔
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	9	0	0%	-0.91	0.0043	↓	1.4	0.069	↔	2023-07-22	0.86	↔
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.090	0.074	↔	0.035	0.15	↔	2023-03-26	0.64	↔
1_22_4_120	MW-18	Appendix III	pH (field)	su	9	0	0%	0.0020	0.42	↔	0.00016	0.57	↔	2023-02-07	0.62	↔
1_22_4_124	MW-18	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	-9.3	0.032	↔	0.43	0.64	↔	2023-02-08	0.75	↔
1_22_4_126	MW-18	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-5.5	0.034	↔	0.32	0.76	↔	2023-03-18	0.76	↔
1_22_5_101	MW-18	Appendix IV	Antimony	mg/L	9	2	22%	0.0000012	0.37	↔	-0.0000018	0.18	↔	2023-05-21	0.40	↔
1_22_5_102	MW-18	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000049	0.22	↔	0.00015	0.0061	↑	2023-05-15	0.85	↔
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	9	0	0%	-0.000086	0.26	↔	0.000059	0.024	↔	2023-02-27	0.72	↔
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	9	2	22%	0.00000063	0.44	↔	-0.0000017	0.25	↔	2023-05-23	0.43	↔
1_22_5_109	MW-18	Appendix IV	Chromium, Total	mg/L	9	8	89%	0.00000025	0.16	↔	-0.00000010	0.71	↔	2023-05-22	0.41	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
1_22_5_110	MW-18	Appendix IV	Cobalt	mg/L	9	0	0%	-0.000028	0.015	↔	-0.0000019	0.65	↔	2023-04-17	0.92	↔
1_22_5_115	MW-18	Appendix IV	Lead	mg/L	9	6	67%	0.0000065	0.62	↔	-0.0000021	0.21	↔	2023-02-07	0.34	↔
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	9	0	0%	-0.00021	0.12	↔	0.000078	0.051	↔	2023-03-02	0.69	↔
1_22_5_118	MW-18	Appendix IV	Molybdenum	mg/L	9	0	0%	0.0000076	0.81	↔	0.000058	0.090	↔	2023-05-21	0.65	↔
1_22_5_121	MW-18	Appendix IV	Radium 226 and 228	pCi/L	9	6	67%	0.0036	0.29	↔	-0.0016	0.35	↔	2023-04-17	0.43	↔
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	9	0	0%	-0.0000010	0.57	↔	0.0000066	0.31	↔	2023-08-02	0.28	↔
1_22_5_125	MW-18	Appendix IV	Thallium	mg/L	9	9	100%	0.00000062	0.59	↔	-0.0000012	0.54	↔	2023-05-22	0.17	↔
1_22_6_114	MW-18	Part 115	Iron	mg/L	9	0	0%	-0.045	0.0012	↓	0.011	0.024	↔	2023-04-04	0.95	↔
1_22_6_119	MW-18	Part 115	Nickel	mg/L	9	0	0%	-0.000042	0.011	↔	-0.0000049	0.64	↔	2023-04-18	0.88	↔
1_22_6_123	MW-18	Part 115	Silver	mg/L	9	9	100%	0.00000040	0.68	↔	-0.00000078	0.42	↔	2023-05-21	0.17	↔
1_23_4_105	MW-19	Appendix III	Boron	mg/L	9	0	0%	-0.0089	0.045	↔	0.0047	0.045	↔	2023-03-22	0.74	↔
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.21	0.0013	↓	0.12	0.094	↔	2023-06-08	0.93	↔
1_23_4_112	MW-19	Appendix III	Fluoride	mg/L	9	0	0%	-0.0052	0.14	↔	0.0015	0.11	↔	2023-03-12	0.68	↔
1_23_4_120	MW-19	Appendix III	pH (field)	su	9	0	0%	0.0013	0.47	↔	-0.00093	0.75	↔	2023-05-22	0.13	↔
1_23_5_101	MW-19	Appendix IV	Antimony	mg/L	9	8	89%	0.0000036	0.12	↔	-0.0000025	0.24	↔	2023-04-18	0.51	↔
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000018	0.32	↔	0.000021	0.054	↔	2023-04-17	0.60	↔
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	9	0	0%	-0.00011	0.12	↔	0.000049	0.18	↔	2023-04-17	0.66	↔
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	9	3	33%	0.0000014	0.34	↔	-0.00000044	0.30	↔	2023-02-08	0.33	↔
1_23_5_106	MW-19	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000012	0.26	↔	-0.0000013	0.23	↔	2023-05-21	0.44	↔
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	9	4	44%	0.0000068	0.48	↔	-0.0000017	0.14	↔	2023-01-14	0.43	↔
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000046	0.10	↔	-0.0000032	0.0036	↓	2023-02-25	0.87	↔
1_23_5_113	MW-19	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0052	0.14	↔	0.0015	0.11	↔	2023-03-12	0.68	↔
1_23_5_115	MW-19	Appendix IV	Lead	mg/L	9	9	100%	0.000013	0.088	↔	-0.0000052	0.025	↔	2023-02-19	0.74	↔
1_23_5_116	MW-19	Appendix IV	Lithium	mg/L	9	0	0%	-0.000062	0.40	↔	-0.000016	0.90	↔	2023-05-22	0.27	↔
1_23_5_118	MW-19	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000023	0.37	↔	0.000023	0.36	↔	2023-05-17	0.30	↔
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	0.0055	0.29	↔	0.00037	0.78	↔	2023-02-08	0.43	↔
1_23_5_122	MW-19	Appendix IV	Selenium	mg/L	9	9	100%	0.0000057	0.68	↔	-0.0000025	0.14	↔	2023-02-07	0.39	↔
1_23_5_125	MW-19	Appendix IV	Thallium	mg/L	9	9	100%	0.0000044	0.094	↔	-0.0000017	0.031	↔	2023-02-27	0.73	↔
1_23_6_111	MW-19	Part 115	Copper	mg/L	9	9	100%	0.0000052	0.41	↔	-0.0000018	0.31	↔	2023-02-08	0.30	↔
1_23_6_114	MW-19	Part 115	Iron	mg/L	9	0	0%	-0.032	0.14	↔	0.068	0.012	↔	2023-05-12	0.80	↔
1_23_6_119	MW-19	Part 115	Nickel	mg/L	9	1	11%	-0.0000084	0.061	↔	-0.0000019	0.77	↔	2023-05-22	0.71	↔
1_23_6_123	MW-19	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.41	↔	-0.0000011	0.17	↔	2023-04-17	0.40	↔
1_23_6_129	MW-19	Part 115	Vanadium	mg/L	9	9	100%	0.000016	0.68	↔	-0.0000054	0.23	↔	2023-02-07	0.30	↔
1_23_6_130	MW-19	Part 115	Zinc	mg/L	9	7	78%	0.000028	0.72	↔	-0.000012	0.20	↔	2023-02-07	0.32	↔
1_24_4_105	MW-20	Appendix III	Boron	mg/L	9	0	0%	-0.0034	0.13	↔	0.0015	0.028	↔	2023-02-16	0.72	↔
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	9	0	0%	-0.21	0.28	↔	0.26	0.68	↔	2023-07-04	0.26	↔
1_24_4_108	MW-20	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.11	0.19	↔	-0.099	0.48	↔	2023-05-23	0.36	↔
1_24_4_112	MW-20	Appendix III	Fluoride	mg/L	9	0	0%	-0.0083	0.00011	↓	-0.000058	0.53	↔	2023-01-06	0.98	↔
1_24_4_120	MW-20	Appendix III	pH (field)	su	9	0	0%	0.00037	0.80	↔	-0.00068	0.62	↔	2023-05-03	0.077	↔
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	1.0	0.24	↔	-0.41	0.0060	↓	2023-02-06	0.82	↔
1_24_4_126	MW-20	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.61	0.29	↔	-0.70	0.22	↔	2023-04-18	0.43	↔
1_24_5_101	MW-20	Appendix IV	Antimony	mg/L	9	2	22%	0.00000039	0.30	↔	-0.000000010	0.98	↔	2023-04-18	0.33	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000086	0.052	↔	0.0000023	0.0017	↑	2023-01-11	0.90	↔
1_24_5_103	MW-20	Appendix IV	Barium	mg/L	9	0	0%	-0.0068	0.00088	↓	0.00089	0.019	↔	2023-02-24	0.96	↔
1_24_5_106	MW-20	Appendix IV	Cadmium	mg/L	9	9	100%	0.00000000000024	1.0	↔	0.00000021	0.024	↔	2023-02-03	0.75	↔
1_24_5_109	MW-20	Appendix IV	Chromium, Total	mg/L	9	5	56%	0.00000086	0.24	↔	-0.00000029	0.16	↔	2023-02-22	0.49	↔
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000043	0.079	↔	-0.0000027	0.0037	↓	2023-02-21	0.87	↔
1_24_5_113	MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0083	0.00011	↓	-0.000058	0.53	↔	2023-01-06	0.98	↔
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	9	0	0%	0.0000042	0.17	↔	-0.0000067	0.48	↔	2023-06-28	0.39	↔
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	9	0	0%	-0.00030	0.43	↔	0.00011	0.044	↔	2023-02-06	0.62	↔
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.00000089	0.93	↔	0.0000052	0.087	↔	2023-03-12	0.57	↔
1_24_5_121	MW-20	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	-0.019	0.081	↔	0.00090	0.39	↔	2023-01-21	0.75	↔
1_24_5_122	MW-20	Appendix IV	Selenium	mg/L	9	5	56%	0.00000000000062	1.0	↔	-0.00000057	0.026	↔	2023-02-12	0.79	↔
1_24_6_111	MW-20	Part 115	Copper	mg/L	9	1	11%	-0.0000031	0.51	↔	0.00000060	0.29	↔	2023-01-08	0.28	↔
1_24_6_119	MW-20	Part 115	Nickel	mg/L	9	0	0%	0.0000018	0.58	↔	-0.000026	0.0042	↓	2023-06-21	0.90	↔
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	2.3	0.56	↔	-1.6	0.17	↔	2023-03-12	0.37	↔
1_25_4_108	MW-30	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.58	0.0019	↓	-0.052	0.77	↔	2023-05-22	0.93	↔
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	9	0	0%	-0.00077	0.43	↔	0.0016	0.63	↔	2023-06-27	0.18	↔
1_25_4_120	MW-30	Appendix III	pH (field)	su	9	0	0%	0.0036	0.33	↔	-0.00094	0.61	↔	2023-03-22	0.28	↔
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.92	0.33	↔	-1.8	0.080	↔	2023-04-28	0.61	↔
1_25_4_126	MW-30	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	1.5	0.35	↔	-6.6	0.23	↔	2023-07-14	0.46	↔
1_25_5_101	MW-30	Appendix IV	Antimony	mg/L	9	8	89%	0.0000026	0.049	↔	-0.0000030	0.14	↔	2023-06-02	0.66	↔
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	9	2	22%	-0.0000030	0.051	↔	0.0000033	0.033	↔	2023-05-18	0.76	↔
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	9	0	0%	-0.00045	0.067	↔	0.000023	0.83	↔	2023-03-28	0.73	↔
1_25_5_104	MW-30	Appendix IV	Beryllium	mg/L	9	8	89%	0.0000014	0.67	↔	-0.00000046	0.23	↔	2023-02-05	0.30	↔
1_25_5_106	MW-30	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000012	0.26	↔	-0.0000013	0.23	↔	2023-05-21	0.43	↔
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.000045	0.31	↔	0.000020	0.38	↔	2023-04-17	0.41	↔
1_25_5_110	MW-30	Appendix IV	Cobalt	mg/L	9	0	0%	-0.0000072	0.50	↔	-0.0000035	0.84	↔	2023-05-22	0.23	↔
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.00077	0.43	↔	0.0016	0.63	↔	2023-06-27	0.18	↔
1_25_5_115	MW-30	Appendix IV	Lead	mg/L	9	9	100%	0.000013	0.039	↔	-0.0000045	0.016	↔	2023-02-21	0.81	↔
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	0.00048	0.70	↔	-0.00033	0.35	↔	2023-03-12	0.20	↔
1_25_5_122	MW-30	Appendix IV	Selenium	mg/L	9	6	67%	0.0000058	0.68	↔	-0.0000024	0.16	↔	2023-02-05	0.37	↔
1_25_5_125	MW-30	Appendix IV	Thallium	mg/L	9	9	100%	0.0000026	0.029	↔	-0.0000020	0.058	↔	2023-05-02	0.76	↔
1_25_6_111	MW-30	Part 115	Copper	mg/L	9	7	78%	-0.0000012	0.51	↔	0.0000045	0.48	↔	2023-08-01	0.18	↔
1_25_6_114	MW-30	Part 115	Iron	mg/L	9	0	0%	0.046	0.36	↔	-0.021	0.15	↔	2023-03-12	0.47	↔
1_25_6_123	MW-30	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.27	↔	-0.0000011	0.27	↔	2023-04-18	0.40	↔
1_25_6_129	MW-30	Part 115	Vanadium	mg/L	9	9	100%	0.000017	0.66	↔	-0.0000054	0.23	↔	2023-02-05	0.30	↔
1_26_4_105	MW-31	Appendix III	Boron	mg/L	9	0	0%	-0.029	0.20	↔	0.0052	0.067	↔	2023-01-05	0.61	↔
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	9	0	0%	-0.22	0.070	↔	0.26	0.45	↔	2023-07-17	0.57	↔
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.17	0.20	↔	0.050	0.45	↔	2023-03-24	0.43	↔
1_26_4_112	MW-31	Appendix III	Fluoride	mg/L	9	0	0%	0.0026	0.30	↔	-0.0026	0.28	↔	2023-05-21	0.38	↔
1_26_4_120	MW-31	Appendix III	pH (field)	su	9	0	0%	0.00075	0.15	↔	-0.0022	0.20	↔	2023-06-27	0.60	↔
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.44	0.38	↔	-0.87	0.015	↔	2023-03-14	0.83	↔
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.54	0.41	↔	-0.16	0.79	↔	2023-05-21	0.39	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	9	4	44%	0.00000054	0.069	↔	-0.000000085	0.52	↔	2023-04-02	0.71	↔
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000015	0.19	↔	0.0000012	0.31	↔	2023-01-15	0.52	↔
1_26_5_103	MW-31	Appendix IV	Barium	mg/L	9	0	0%	-0.00038	0.53	↔	0.00018	0.56	↔	2023-04-07	0.17	↔
1_26_5_106	MW-31	Appendix IV	Cadmium	mg/L	9	9	100%	0.00000000000027	1.0	↔	0.00000021	0.024	↔	2023-02-03	0.75	↔
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.0000026	0.35	↔	0.00000034	0.94	↔	2023-05-22	0.29	↔
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	9	0	0%	0.00000026	0.14	↔	-0.00000045	0.13	↔	2023-05-31	0.58	↔
1_26_5_113	MW-31	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.0026	0.30	↔	-0.0026	0.28	↔	2023-05-21	0.38	↔
1_26_5_115	MW-31	Appendix IV	Lead	mg/L	9	8	89%	0.000000022	0.97	↔	-0.0000011	0.099	↔	2023-05-21	0.58	↔
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000024	0.089	↔	0.00000052	0.69	↔	2023-01-08	0.63	↔
1_26_5_122	MW-31	Appendix IV	Selenium	mg/L	9	5	56%	-0.00000052	0.045	↔	0.000000057	0.93	↔	2023-06-27	0.67	↔
1_26_6_111	MW-31	Part 115	Copper	mg/L	9	8	89%	0.00000021	0.39	↔	-0.00000023	0.33	↔	2023-05-21	0.31	↔
2_12_4_105	MW-02	Appendix III	Boron	mg/L	9	0	0%	-0.011	0.94	↔	0.12	0.18	↔	2023-04-17	0.43	↔
2_12_4_107	MW-02	Appendix III	Calcium	mg/L	9	0	0%	0.20	0.64	↔	-0.15	0.24	↔	2023-03-13	0.29	↔
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.54	0.63	↔	0.14	0.31	↔	2023-02-07	0.27	↔
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	-0.033	0.64	↔	0.012	0.19	↔	2023-02-07	0.35	↔
2_12_4_120	MW-02	Appendix III	pH (field)	su	9	0	0%	0.0015	0.13	↔	-0.0017	0.27	↔	2023-05-23	0.49	↔
2_12_4_124	MW-02	Appendix III	Sulfate (as SO4)	mg/L	9	5	56%	-0.0056	0.37	↔	0.00041	0.94	↔	2023-05-05	0.30	↔
2_12_4_126	MW-02	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	1.0	0.22	↔	-3.9	0.18	↔	2023-07-25	0.49	↔
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	0.0000026	0.23	↔	-0.0000013	0.25	↔	2023-04-17	0.50	↔
2_12_5_102	MW-02	Appendix IV	Arsenic	mg/L	9	0	0%	0.000016	0.11	↔	-0.000018	0.25	↔	2023-05-23	0.53	↔
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	9	0	0%	-0.00000087	0.29	↔	0.0000020	0.038	↔	2023-05-11	0.69	↔
2_12_5_106	MW-02	Appendix IV	Cadmium	mg/L	9	6	67%	0.00000050	0.81	↔	0.0000012	0.33	↔	2023-03-14	0.41	↔
2_12_5_110	MW-02	Appendix IV	Cobalt	mg/L	9	0	0%	0.000059	0.53	↔	0.0000022	0.85	↔	2023-01-04	0.18	↔
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.033	0.64	↔	0.012	0.19	↔	2023-02-07	0.35	↔
2_12_5_115	MW-02	Appendix IV	Lead	mg/L	9	0	0%	0.000011	0.15	↔	-0.000014	0.28	↔	2023-06-03	0.47	↔
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	9	0	0%	0.000080	0.029	↔	-0.000025	0.020	↔	2023-02-08	0.81	↔
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	-0.0089	0.32	↔	-0.00052	0.95	↔	2023-04-18	0.33	↔
2_12_5_122	MW-02	Appendix IV	Selenium	mg/L	9	0	0%	-0.0000029	0.22	↔	0.0000053	0.048	↔	2023-04-18	0.73	↔
2_12_5_125	MW-02	Appendix IV	Thallium	mg/L	9	8	89%	0.0000021	0.82	↔	0.00000069	0.54	↔	2023-02-07	0.24	↔
2_12_6_111	MW-02	Part 115	Copper	mg/L	9	0	0%	0.000026	0.33	↔	0.0000013	0.68	↔	2023-01-04	0.39	↔
2_12_6_114	MW-02	Part 115	Iron	mg/L	9	0	0%	0.064	0.043	↔	-0.054	0.0087	↓	2023-03-25	0.84	↔
2_12_6_119	MW-02	Part 115	Nickel	mg/L	9	0	0%	0.00025	0.20	↔	-0.000072	0.19	↔	2023-02-08	0.47	↔
2_12_6_123	MW-02	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.26	↔	-0.0000010	0.28	↔	2023-04-18	0.39	↔
2_12_6_129	MW-02	Part 115	Vanadium	mg/L	9	0	0%	0.0000046	0.78	↔	0.000012	0.46	↔	2023-04-18	0.33	↔
2_13_4_107	MW-03	Appendix III	Calcium	mg/L	9	0	0%	0.22	0.53	↔	-0.31	0.62	↔	2023-06-27	0.14	↔
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.86	0.022	↔	0.24	0.39	↔	2023-05-02	0.79	↔
2_13_4_112	MW-03	Appendix III	Fluoride	mg/L	9	0	0%	-0.0033	0.37	↔	0.00045	0.89	↔	2023-04-29	0.27	↔
2_13_4_120	MW-03	Appendix III	pH (field)	su	9	0	0%	0.0012	0.21	↔	-0.0013	0.41	↔	2023-05-23	0.36	↔
2_13_4_124	MW-03	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	4.3	0.014	↔	-1.9	0.16	↔	2023-04-18	0.78	↔
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2.2	0.28	↔	-0.67	0.73	↔	2023-04-27	0.31	↔
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	9	5	56%	0.0000024	0.045	↔	-0.0000029	0.12	↔	2023-05-28	0.68	↔
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000027	0.20	↔	0.0000028	0.40	↔	2023-05-23	0.38	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
2_13_5_104	MW-03	Appendix IV	Beryllium	mg/L	9	7	78%	-0.00000021	0.66	↔	0.0000013	0.45	↔	2023-08-06	0.16	↔
2_13_5_106	MW-03	Appendix IV	Cadmium	mg/L	9	8	89%	0.0000012	0.29	↔	-0.0000010	0.32	↔	2023-05-22	0.38	↔
2_13_5_109	MW-03	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.0000064	0.85	↔	-0.0000094	0.34	↔	2023-03-13	0.21	↔
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	9	0	0%	-0.0000010	0.70	↔	0.0000041	0.15	↔	2023-04-24	0.54	↔
2_13_5_113	MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0033	0.37	↔	0.00045	0.89	↔	2023-04-29	0.27	↔
2_13_5_115	MW-03	Appendix IV	Lead	mg/L	9	8	89%	0.000012	0.047	↔	-0.0000040	0.027	↔	2023-02-21	0.78	↔
2_13_5_116	MW-03	Appendix IV	Lithium	mg/L	9	0	0%	-0.000081	0.56	↔	-0.000012	0.88	↔	2023-04-17	0.26	↔
2_13_5_117	MW-03	Appendix IV	Mercury	mg/L	9	8	89%	-0.000000033	0.35	↔	0.00000085	0.00052	↑	2023-07-18	0.97	↔
2_13_5_118	MW-03	Appendix IV	Molybdenum	mg/L	9	7	78%	0.000023	0.65	↔	-0.0000075	0.24	↔	2023-02-06	0.30	↔
2_13_5_121	MW-03	Appendix IV	Radium 226 and 228	pCi/L	9	1	11%	-0.016	0.33	↔	-0.00065	0.73	↔	2023-01-10	0.43	↔
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	9	3	33%	-0.0000015	0.64	↔	0.0000014	0.64	↔	2023-05-22	0.10	↔
2_13_5_125	MW-03	Appendix IV	Thallium	mg/L	9	8	89%	0.0000042	0.041	↔	-0.00000078	0.13	↔	2023-03-03	0.80	↔
2_13_6_111	MW-03	Part 115	Copper	mg/L	9	5	56%	-0.00000065	0.73	↔	0.0000076	0.25	↔	2023-07-28	0.37	↔
2_13_6_114	MW-03	Part 115	Iron	mg/L	9	0	0%	-0.022	0.034	↔	0.0011	0.93	↔	2023-06-17	0.78	↔
2_13_6_119	MW-03	Part 115	Nickel	mg/L	9	1	11%	-0.000041	0.40	↔	0.0000043	0.92	↔	2023-05-02	0.26	↔
2_13_6_123	MW-03	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.27	↔	-0.0000010	0.28	↔	2023-04-18	0.39	↔
2_13_6_129	MW-03	Part 115	Vanadium	mg/L	9	8	89%	0.000014	0.72	↔	-0.0000037	0.44	↔	2023-02-06	0.17	↔
2_14_4_105	MW-04	Appendix III	Boron	mg/L	9	0	0%	-0.0020	0.55	↔	0.0047	0.036	↔	2023-04-13	0.68	↔
2_14_4_107	MW-04	Appendix III	Calcium	mg/L	9	0	0%	0.35	0.18	↔	-0.31	0.46	↔	2023-05-31	0.39	↔
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	0.0011	0.38	↔	0.0064	0.15	↔	2023-07-31	0.68	↔
2_14_4_120	MW-04	Appendix III	pH (field)	su	9	0	0%	0.0013	0.17	↔	-0.0017	0.25	↔	2023-05-23	0.47	↔
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	3.2	0.10	↔	-0.33	0.84	↔	2023-04-19	0.57	↔
2_14_4_126	MW-04	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	1.2	0.32	↔	-1.6	0.44	↔	2023-06-10	0.28	↔
2_14_5_101	MW-04	Appendix IV	Antimony	mg/L	9	6	67%	0.0000025	0.054	↔	-0.0000030	0.14	↔	2023-06-04	0.65	↔
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000029	0.16	↔	0.0000024	0.47	↔	2023-05-23	0.40	↔
2_14_5_103	MW-04	Appendix IV	Barium	mg/L	9	0	0%	-0.00092	0.60	↔	0.000027	0.98	↔	2023-04-18	0.18	↔
2_14_5_106	MW-04	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000012	0.26	↔	-0.0000013	0.23	↔	2023-05-22	0.43	↔
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	9	0	0%	-0.00000081	0.81	↔	0.00000014	0.94	↔	2023-04-18	0.037	↔
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.0011	0.38	↔	0.0064	0.15	↔	2023-07-31	0.68	↔
2_14_5_115	MW-04	Appendix IV	Lead	mg/L	9	9	100%	0.000010	0.22	↔	-0.0000030	0.21	↔	2023-02-07	0.45	↔
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	9	2	22%	0.0000039	0.78	↔	-0.0000016	0.83	↔	2023-04-18	0.046	↔
2_14_5_122	MW-04	Appendix IV	Selenium	mg/L	9	5	56%	-0.00000092	0.14	↔	0.00000061	0.54	↔	2023-05-23	0.42	↔
2_14_5_125	MW-04	Appendix IV	Thallium	mg/L	9	9	100%	0.0000017	0.23	↔	-0.0000023	0.13	↔	2023-05-22	0.51	↔
2_14_6_111	MW-04	Part 115	Copper	mg/L	9	8	89%	-0.000000028	0.36	↔	0.00000075	0.00052	↑	2023-07-18	0.97	↔
2_14_6_114	MW-04	Part 115	Iron	mg/L	9	0	0%	0.0082	0.24	↔	-0.0092	0.18	↔	2023-05-22	0.47	↔
2_14_6_119	MW-04	Part 115	Nickel	mg/L	9	0	0%	0.000046	0.23	↔	-0.000077	0.53	↔	2023-07-25	0.33	↔
2_14_6_123	MW-04	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.27	↔	-0.0000011	0.28	↔	2023-04-19	0.39	↔
2_16_4_105	MW-07	Appendix III	Boron	mg/L	9	0	0%	-0.015	0.23	↔	0.0067	0.28	↔	2023-04-09	0.47	↔
2_16_4_107	MW-07	Appendix III	Calcium	mg/L	9	0	0%	0.024	0.82	↔	-0.022	0.90	↔	2023-06-24	0.019	↔
2_16_4_108	MW-07	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.010	0.0014	↓	0.013	0.061	↔	2023-07-16	0.91	↔
2_16_4_120	MW-07	Appendix III	pH (field)	su	9	0	0%	-0.0019	0.58	↔	0.00026	0.78	↔	2023-03-12	0.21	↔
2_16_4_124	MW-07	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	-0.10	0.014	↔	0.070	0.19	↔	2023-05-25	0.78	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
2_16_5_101	MW-07	Appendix IV	Antimony	mg/L	9	8	89%	0.00000028	0.0076	↑	-0.0000000000000050	1.0	↔	2023-07-09	0.86	↔
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	9	0	0%	-0.00000054	0.13	↔	0.00000061	0.083	↔	2023-04-18	0.65	↔
2_16_5_103	MW-07	Appendix IV	Barium	mg/L	9	0	0%	-0.00039	0.40	↔	0.00049	0.079	↔	2023-04-17	0.54	↔
2_16_5_104	MW-07	Appendix IV	Beryllium	mg/L	9	6	67%	-0.00000000017	1.0	↔	0.000000030	0.61	↔	2023-05-14	0.10	↔
2_16_5_106	MW-07	Appendix IV	Cadmium	mg/L	9	9	100%	0.00000000000025	1.0	↔	0.00000021	0.024	↔	2023-02-03	0.75	↔
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.00000037	0.35	↔	0.00000032	0.63	↔	2023-05-23	0.21	↔
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000049	0.16	↔	0.00000013	0.71	↔	2023-01-21	0.72	↔
2_16_5_115	MW-07	Appendix IV	Lead	mg/L	9	9	100%	-0.00000062	0.033	↔	-0.00000000000017	1.0	↔	2023-07-30	0.76	↔
2_16_5_116	MW-07	Appendix IV	Lithium	mg/L	9	0	0%	0.000014	0.62	↔	-0.0000091	0.55	↔	2023-04-17	0.14	↔
2_16_5_118	MW-07	Appendix IV	Molybdenum	mg/L	9	9	100%	-0.0000000000021	1.0	↔	-0.0000018	0.024	↔	2023-02-03	0.75	↔
2_16_5_122	MW-07	Appendix IV	Selenium	mg/L	9	8	89%	-0.00000062	0.033	↔	-0.00000000000017	1.0	↔	2023-07-30	0.76	↔
2_16_6_111	MW-07	Part 115	Copper	mg/L	9	8	89%	-0.000000030	0.36	↔	0.00000074	0.00064	↑	2023-07-17	0.97	↔
2_19_4_105	MW-10	Appendix III	Boron	mg/L	9	0	0%	-0.22	0.12	↔	0.095	0.031	↔	2023-02-16	0.72	↔
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	1.4	0.20	↔	-0.98	0.11	↔	2023-03-14	0.57	↔
2_19_4_108	MW-10	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-1.3	0.46	↔	1.3	0.034	↔	2023-02-28	0.68	↔
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	9	0	0%	-0.045	0.18	↔	0.015	0.11	↔	2023-02-10	0.55	↔
2_19_4_120	MW-10	Appendix III	pH (field)	su	9	0	0%	0.0044	0.23	↔	-0.0060	0.34	↔	2023-05-23	0.39	↔
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	3.6	0.75	↔	-2.3	0.13	↔	2023-02-03	0.42	↔
2_19_4_126	MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	3.5	0.55	↔	-2.2	0.20	↔	2023-03-13	0.35	↔
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	9	5	56%	0.0000015	0.33	↔	-0.0000019	0.21	↔	2023-05-22	0.40	↔
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	9	0	0%	-0.00000093	0.70	↔	0.0000040	0.021	↔	2023-04-04	0.78	↔
2_19_5_103	MW-10	Appendix IV	Barium	mg/L	9	0	0%	-0.0020	0.094	↔	0.0019	0.093	↔	2023-05-08	0.63	↔
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	9	3	33%	0.00000043	0.22	↔	-0.0000013	0.29	↔	2023-08-07	0.41	↔
2_19_5_106	MW-10	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000012	0.16	↔	-0.0000013	0.36	↔	2023-05-23	0.43	↔
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.000020	0.70	↔	0.000019	0.20	↔	2023-03-06	0.34	↔
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000052	0.16	↔	-0.0000044	0.46	↔	2023-05-23	0.41	↔
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.045	0.18	↔	0.015	0.11	↔	2023-02-10	0.55	↔
2_19_5_115	MW-10	Appendix IV	Lead	mg/L	9	7	78%	0.000012	0.11	↔	-0.0000049	0.037	↔	2023-02-19	0.70	↔
2_19_5_116	MW-10	Appendix IV	Lithium	mg/L	9	0	0%	0.0036	0.63	↔	-0.00061	0.76	↔	2023-03-13	0.17	↔
2_19_5_121	MW-10	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	0.0049	0.66	↔	-0.0012	0.37	↔	2023-02-05	0.23	↔
2_19_5_122	MW-10	Appendix IV	Selenium	mg/L	9	1	11%	0.00000066	0.56	↔	0.000000090	0.88	↔	2023-03-14	0.18	↔
2_19_5_125	MW-10	Appendix IV	Thallium	mg/L	9	9	100%	0.0000043	0.11	↔	-0.0000017	0.034	↔	2023-02-28	0.72	↔
2_19_6_111	MW-10	Part 115	Copper	mg/L	9	6	67%	0.0000020	0.62	↔	-0.0000022	0.58	↔	2023-05-22	0.12	↔
2_19_6_114	MW-10	Part 115	Iron	mg/L	9	0	0%	0.031	0.050	↔	-0.027	0.0086	↓	2023-04-10	0.83	↔
2_19_6_119	MW-10	Part 115	Nickel	mg/L	9	3	33%	0.0000030	0.35	↔	-0.0000023	0.66	↔	2023-05-23	0.21	↔
2_19_6_123	MW-10	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.27	↔	-0.0000010	0.28	↔	2023-04-18	0.39	↔
2_19_6_129	MW-10	Part 115	Vanadium	mg/L	9	8	89%	0.0000020	0.41	↔	-0.0000022	0.34	↔	2023-05-22	0.29	↔
2_20_4_105	MW-11	Appendix III	Boron	mg/L	9	0	0%	-0.069	0.026	↔	0.068	0.024	↔	2023-05-03	0.80	↔
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	9	0	0%	1.7	0.10	↔	-0.98	0.080	↔	2023-03-29	0.64	↔
2_20_4_108	MW-11	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.31	0.00051	↓	0.20	0.0029	↑	2023-04-21	0.95	↔
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	9	0	0%	-0.0065	0.064	↔	0.0068	0.051	↔	2023-05-08	0.71	↔
2_20_4_120	MW-11	Appendix III	pH (field)	su	9	0	0%	0.0015	0.70	↔	-0.00022	0.62	↔	2023-02-07	0.17	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	1.5	0.092	↔	-0.99	0.052	↔	2023-03-29	0.68	↔
2_20_5_101	MW-11	Appendix IV	Antimony	mg/L	9	6	67%	0.00000020	0.92	↔	-0.0000015	0.67	↔	2023-05-23	0.10	↔
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000015	0.15	↔	0.0000089	0.34	↔	2023-04-21	0.45	↔
2_20_5_103	MW-11	Appendix IV	Barium	mg/L	9	0	0%	-0.0039	0.088	↔	0.0030	0.15	↔	2023-05-08	0.61	↔
2_20_5_104	MW-11	Appendix IV	Beryllium	mg/L	9	8	89%	-0.00000011	0.57	↔	0.0000000000000088	1.0	↔	2023-04-17	0.21	↔
2_20_5_106	MW-11	Appendix IV	Cadmium	mg/L	9	8	89%	-0.00000031	0.88	↔	-0.00000097	0.78	↔	2023-05-23	0.078	↔
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.000023	0.57	↔	0.0000019	0.93	↔	2023-04-17	0.20	↔
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0065	0.064	↔	0.0068	0.051	↔	2023-05-08	0.71	↔
2_20_5_115	MW-11	Appendix IV	Lead	mg/L	9	3	33%	-0.00021	0.53	↔	-0.0000051	0.98	↔	2023-04-09	0.23	↔
2_20_5_116	MW-11	Appendix IV	Lithium	mg/L	9	0	0%	-0.0011	0.079	↔	0.00098	0.097	↔	2023-05-05	0.65	↔
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	9	2	22%	-0.000013	0.059	↔	0.0000073	0.21	↔	2023-05-05	0.66	↔
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	9	3	33%	-0.00000055	0.12	↔	0.00000028	0.60	↔	2023-06-02	0.50	↔
2_20_5_125	MW-11	Appendix IV	Thallium	mg/L	9	9	100%	0.0000017	0.26	↔	-0.0000016	0.27	↔	2023-04-18	0.40	↔
2_20_6_111	MW-11	Part 115	Copper	mg/L	9	3	33%	-0.000055	0.56	↔	0.0000017	0.97	↔	2023-04-14	0.21	↔
2_20_6_114	MW-11	Part 115	Iron	mg/L	9	0	0%	-0.035	0.013	↔	0.057	0.015	↔	2023-06-02	0.85	↔
2_20_6_119	MW-11	Part 115	Nickel	mg/L	9	0	0%	-0.000027	0.37	↔	0.0000049	0.86	↔	2023-04-20	0.24	↔
2_20_6_123	MW-11	Part 115	Silver	mg/L	9	8	89%	0.00000088	0.32	↔	-0.0000010	0.24	↔	2023-05-05	0.38	↔
2_20_6_130	MW-11	Part 115	Zinc	mg/L	9	2	22%	-0.00045	0.32	↔	-0.000065	0.77	↔	2023-03-14	0.41	↔
2_21_4_105	MW-12	Appendix III	Boron	mg/L	9	0	0%	-0.0018	0.050	↔	0.0011	0.0026	↑	2023-03-06	0.88	↔
2_21_4_107	MW-12	Appendix III	Calcium	mg/L	9	0	0%	-0.039	0.79	↔	0.24	0.14	↔	2023-05-18	0.49	↔
2_21_4_108	MW-12	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.044	0.18	↔	0.073	0.19	↔	2023-05-25	0.52	↔
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	9	0	0%	-0.0033	0.42	↔	-0.00024	0.61	↔	2023-02-06	0.61	↔
2_21_4_120	MW-12	Appendix III	pH (field)	su	9	0	0%	0.0060	0.20	↔	-0.0027	0.27	↔	2023-03-13	0.43	↔
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	-0.42	0.084	↔	0.21	0.34	↔	2023-05-16	0.64	↔
2_21_5_101	MW-12	Appendix IV	Antimony	mg/L	9	0	0%	-0.00000016	0.94	↔	-0.0000031	0.17	↔	2023-05-22	0.49	↔
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000014	0.13	↔	0.0000083	0.012	↔	2023-02-17	0.80	↔
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	9	0	0%	-0.000024	0.74	↔	0.00021	0.0027	↑	2023-04-02	0.92	↔
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	9	0	0%	0.0000067	0.029	↔	-0.000014	0.12	↔	2023-08-05	0.74	↔
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	9	4	44%	0.0000017	0.56	↔	-0.0000020	0.044	↔	2023-03-10	0.63	↔
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	9	3	33%	-0.0000025	0.65	↔	0.0000016	0.046	↔	2023-01-14	0.64	↔
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0033	0.42	↔	-0.00024	0.61	↔	2023-02-06	0.61	↔
2_21_5_115	MW-12	Appendix IV	Lead	mg/L	9	5	56%	-0.00000033	0.075	↔	0.00000045	0.42	↔	2023-06-27	0.54	↔
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	9	0	0%	-0.000014	0.77	↔	0.000011	0.084	↔	2023-02-06	0.50	↔
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000028	0.0050	↓	0.000020	0.0014	↑	2023-03-15	0.93	↔
2_21_5_121	MW-12	Appendix IV	Radium 226 and 228	pCi/L	9	7	78%	0.0023	0.080	↔	-0.0028	0.18	↔	2023-05-23	0.60	↔
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	9	0	0%	0.000011	0.65	↔	-0.0000081	0.025	↔	2023-01-13	0.73	↔
2_21_6_111	MW-12	Part 115	Copper	mg/L	9	0	0%	0.0000056	0.0074	↑	-0.0000055	0.0074	↓	2023-05-13	0.89	↔
2_21_6_114	MW-12	Part 115	Iron	mg/L	9	4	44%	-0.0065	0.000069	↓	0.000085	0.24	↔	2023-01-03	0.98	↔
2_21_6_119	MW-12	Part 115	Nickel	mg/L	9	0	0%	-0.0000034	0.83	↔	0.0000036	0.42	↔	2023-03-12	0.15	↔
2_21_6_129	MW-12	Part 115	Vanadium	mg/L	9	5	56%	0.0000033	0.033	↔	-0.0000048	0.058	↔	2023-06-26	0.76	↔
2_21_6_130	MW-12	Part 115	Zinc	mg/L	9	0	0%	-0.0000069	0.82	↔	0.0000098	0.54	↔	2023-03-13	0.13	↔
2_27_4_105	MW-32	Appendix III	Boron	mg/L	9	0	0%	-0.0078	0.091	↔	0.012	0.0018	↑	2023-04-07	0.90	↔

(Table continues on next page)

Table 9: Trend Tests: Piecewise Linear-Linear *(continued)*

								Line 1			Line 2					
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	R-Squared	Overall Trend
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	9	0	0%	0.12	0.79	↔	-0.32	0.037	↔	2023-03-13	0.68	↔
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.040	0.040	↔	0.040	0.45	↔	2023-06-27	0.63	↔
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	9	0	0%	-0.00026	0.57	↔	0.0031	0.093	↔	2023-06-27	0.77	↔
2_27_4_120	MW-32	Appendix III	pH (field)	su	9	0	0%	0.00057	0.54	↔	-0.0011	0.26	↔	2023-05-21	0.29	↔
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.52	0.43	↔	-0.92	0.038	↔	2023-04-17	0.65	↔
2_27_4_126	MW-32	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	0.060	0.96	↔	-1.0	0.13	↔	2023-04-17	0.51	↔
2_27_5_101	MW-32	Appendix IV	Antimony	mg/L	9	6	67%	0.00000045	0.091	↔	-0.000000044	0.84	↔	2023-04-18	0.59	↔
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000013	0.34	↔	0.00000068	0.100	↔	2023-02-23	0.51	↔
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	9	0	0%	-0.0021	0.0083	↓	0.0043	0.0037	↑	2023-06-12	0.90	↔
2_27_5_106	MW-32	Appendix IV	Cadmium	mg/L	9	9	100%	0.00000000000029	1.0	↔	0.00000021	0.024	↔	2023-02-04	0.75	↔
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.0000012	0.060	↔	-0.0000000000066	1.0	↔	2023-08-01	0.69	↔
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	9	0	0%	0.00000069	0.71	↔	0.00000043	0.67	↔	2023-03-27	0.20	↔
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.00026	0.57	↔	0.0031	0.093	↔	2023-06-27	0.77	↔
2_27_5_115	MW-32	Appendix IV	Lead	mg/L	9	7	78%	0.00000000000044	1.0	↔	-0.00000059	0.016	↔	2023-02-19	0.82	↔
2_27_5_116	MW-32	Appendix IV	Lithium	mg/L	9	0	0%	-0.00041	0.00026	↓	0.00056	0.000046	↑	2023-04-29	0.98	↔
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000019	0.095	↔	0.0000062	0.056	↔	2023-02-24	0.69	↔
2_27_5_121	MW-32	Appendix IV	Radium 226 and 228	pCi/L	9	5	56%	0.0022	0.19	↔	-0.0010	0.49	↔	2023-05-01	0.42	↔
2_27_5_122	MW-32	Appendix IV	Selenium	mg/L	9	9	100%	-0.00000062	0.035	↔	-0.00000000000018	1.0	↔	2023-07-31	0.76	↔
2_27_6_111	MW-32	Part 115	Copper	mg/L	9	7	78%	-0.000000094	0.36	↔	0.0000022	0.00088	↑	2023-07-17	0.96	↔
2_27_6_114	MW-32	Part 115	Iron	mg/L	9	0	0%	-0.0088	0.62	↔	-0.042	0.0052	↓	2023-04-11	0.91	↔
2_27_6_119	MW-32	Part 115	Nickel	mg/L	9	0	0%	-0.0000030	0.14	↔	-0.0000013	0.46	↔	2023-04-18	0.68	↔

Table 10: Trend Tests: Piecewise Linear-Linear-Linear

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
1_11_4_105	MW-01R	Appendix III	Boron	mg/L	9	0	0%	-0.38	0.10	↔	0.91	0.17	↔	0.11	0.51	↔	2023-03-30	2023-06-27	0.95	↔
1_11_4_112	MW-01R	Appendix III	Fluoride	mg/L	9	0	0%	-0.064	0.035	↔	0.085	0.22	↔	-0.0029	0.87	↔	2023-04-02	2023-06-27	0.91	↔
1_11_4_124	MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	2.2	0.30	↔	-6.9	0.42	↔	-1.3	0.73	↔	2023-04-23	2023-07-20	0.82	↔
1_11_4_126	MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-2.8	0.30	↔	1.8	0.28	↔	1.4	0.53	↔	2023-02-19	2023-07-20	0.77	↔
1_11_5_101	MW-01R	Appendix IV	Antimony	mg/L	9	2	22%	-0.0000051	0.70	↔	0.000010	0.47	↔	-0.0000041	0.13	↔	2023-01-26	2023-04-17	0.69	↔
1_11_5_102	MW-01R	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000076	0.013	↔	0.000032	0.014	↔	-0.0000052	0.17	↔	2023-05-19	2023-06-28	0.95	↔
1_11_5_103	MW-01R	Appendix IV	Barium	mg/L	9	0	0%	-0.00083	0.065	↔	0.0011	0.090	↔	0.0023	0.011	↔	2023-04-03	2023-07-13	0.98	↔
1_11_5_104	MW-01R	Appendix IV	Beryllium	mg/L	9	0	0%	-0.00000086	0.22	↔	0.0000044	0.16	↔	-0.0000012	0.38	↔	2023-05-07	2023-07-04	0.79	↔
1_11_5_106	MW-01R	Appendix IV	Cadmium	mg/L	9	6	67%	-0.00000062	0.78	↔	0.0000041	0.14	↔	-0.0000021	0.19	↔	2023-03-11	2023-05-23	0.74	↔
1_11_5_109	MW-01R	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.0000023	0.65	↔	0.000067	0.042	↔	-0.000019	0.12	↔	2023-05-15	2023-06-30	0.92	↔
1_11_5_113	MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.064	0.035	↔	0.085	0.22	↔	-0.0029	0.87	↔	2023-04-02	2023-06-27	0.91	↔
1_11_5_116	MW-01R	Appendix IV	Lithium	mg/L	9	0	0%	-0.0077	0.25	↔	0.024	0.066	↔	0.0013	0.88	↔	2023-04-15	2023-06-30	0.88	↔
1_11_5_122	MW-01R	Appendix IV	Selenium	mg/L	9	0	0%	0.0000016	0.79	↔	-0.0000016	0.68	↔	0.0000018	0.74	↔	2023-03-13	2023-07-04	0.14	↔
1_11_5_125	MW-01R	Appendix IV	Thallium	mg/L	9	9	100%	0.0000028	0.68	↔	0.0000010	0.52	↔	-0.0000041	0.25	↔	2023-02-07	2023-07-31	0.66	↔

(Table continues on next page)

Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
1_11_6_111	MW-01R	Part 115	Copper	mg/L	9	5	56%	-0.0000016	0.72	↔	0.000012	0.42	↔	-0.0000065	0.19	↔	2023-04-13	2023-06-27	0.70	↔
1_11_6_123	MW-01R	Part 115	Silver	mg/L	9	9	100%	0.0000012	0.31	↔	-0.0000048	0.33	↔	0.00000037	0.86	↔	2023-05-21	2023-07-09	0.59	↔
1_11_6_129	MW-01R	Part 115	Vanadium	mg/L	9	2	22%	0.0000030	0.30	↔	0.000080	0.0049	↑	-0.000024	0.018	↔	2023-05-15	2023-06-28	0.99	↔
1_11_6_130	MW-01R	Part 115	Zinc	mg/L	9	1	11%	-0.00039	0.16	↔	0.00011	0.65	↔	-0.000042	0.31	↔	2023-01-10	2023-04-17	0.67	↔
1_15_4_120	MW-06	Appendix III	pH (field)	su	9	0	0%	-0.010	0.42	↔	0.0070	0.29	↔	-0.0014	0.60	↔	2023-02-05	2023-05-17	0.66	↔
1_15_5_101	MW-06	Appendix IV	Antimony	mg/L	9	7	78%	0.0000012	0.77	↔	0.0000020	0.82	↔	-0.0000020	0.31	↔	2023-02-08	2023-05-19	0.45	↔
1_15_5_102	MW-06	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000024	0.060	↔	0.0000024	0.41	↔	0.0000028	0.033	↔	2023-04-03	2023-06-23	0.94	↔
1_15_5_104	MW-06	Appendix IV	Beryllium	mg/L	9	8	89%	-0.000000033	0.13	↔	0.0000000018	0.65	↔	-0.0000000011	0.90	↔	2023-01-27	2023-07-19	0.86	↔
1_15_5_106	MW-06	Appendix IV	Cadmium	mg/L	9	9	100%	0.00000066	0.91	↔	0.0000014	0.64	↔	-0.0000013	0.35	↔	2023-01-26	2023-05-22	0.44	↔
1_15_5_110	MW-06	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000026	0.73	↔	0.00000016	0.92	↔	-0.0000023	0.51	↔	2023-01-21	2023-08-06	0.32	↔
1_15_5_115	MW-06	Appendix IV	Lead	mg/L	9	6	67%	0.0000040	0.54	↔	-0.0000091	0.39	↔	-0.00000010	0.99	↔	2023-04-17	2023-07-11	0.49	↔
1_15_5_118	MW-06	Appendix IV	Molybdenum	mg/L	9	6	67%	0.000012	0.44	↔	-0.000025	0.32	↔	0.0000043	0.84	↔	2023-04-17	2023-07-08	0.51	↔
1_15_5_121	MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	2	22%	0.0062	0.44	↔	-0.0043	0.72	↔	-0.00068	0.95	↔	2023-03-14	2023-07-12	0.30	↔
1_15_5_122	MW-06	Appendix IV	Selenium	mg/L	9	5	56%	0.000000058	0.83	↔	-0.00000014	0.42	↔	0.000000019	0.94	↔	2023-02-14	2023-08-07	0.61	↔
1_15_5_125	MW-06	Appendix IV	Thallium	mg/L	9	9	100%	0.0000017	0.32	↔	-0.0000074	0.33	↔	0.00000056	0.86	↔	2023-05-22	2023-07-09	0.58	↔
1_15_6_119	MW-06	Part 115	Nickel	mg/L	9	2	22%	-0.0000028	0.64	↔	-0.00000071	0.84	↔	-0.00000026	0.96	↔	2023-02-18	2023-08-04	0.37	↔
1_15_6_123	MW-06	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.32	↔	-0.0000048	0.33	↔	0.00000037	0.86	↔	2023-05-22	2023-07-09	0.58	↔
1_15_6_129	MW-06	Part 115	Vanadium	mg/L	9	9	100%	-0.00000033	0.14	↔	0.000000018	0.66	↔	-0.000000011	0.89	↔	2023-01-27	2023-07-24	0.86	↔
1_15_6_130	MW-06	Part 115	Zinc	mg/L	9	1	11%	-0.0014	0.44	↔	0.00078	0.40	↔	-0.00032	0.42	↔	2023-01-23	2023-04-18	0.50	↔
1_17_4_105	MW-08	Appendix III	Boron	mg/L	9	0	0%	0.084	0.046	↔	-0.0046	0.79	↔	-0.035	0.22	↔	2023-02-07	2023-07-31	0.88	↔
1_17_4_120	MW-08	Appendix III	pH (field)	su	9	0	0%	0.0056	0.46	↔	-0.00032	0.98	↔	0.00016	0.99	↔	2023-03-14	2023-07-27	0.31	↔
1_17_4_124	MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	3	33%	0.0021	0.99	↔	-0.17	0.51	↔	0.060	0.79	↔	2023-03-14	2023-07-07	0.56	↔
1_17_4_126	MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.26	0.80	↔	0.69	0.67	↔	-1.3	0.40	↔	2023-03-16	2023-06-27	0.48	↔
1_17_5_101	MW-08	Appendix IV	Antimony	mg/L	9	3	33%	0.0000012	0.27	↔	-0.0000021	0.22	↔	0.00000017	0.90	↔	2023-04-17	2023-06-28	0.64	↔
1_17_5_102	MW-08	Appendix IV	Arsenic	mg/L	9	0	0%	0.00062	0.0088	↑	-0.000057	0.60	↔	-0.00023	0.028	↔	2023-02-11	2023-06-09	0.97	↔
1_17_5_103	MW-08	Appendix IV	Barium	mg/L	9	0	0%	0.0029	0.49	↔	-0.0011	0.67	↔	-0.0027	0.47	↔	2023-02-07	2023-07-28	0.57	↔
1_17_5_106	MW-08	Appendix IV	Cadmium	mg/L	9	9	100%	-0.000000017	0.86	↔	0.00000084	0.056	↔	-0.000000057	0.53	↔	2023-04-10	2023-06-09	0.97	↔
1_17_5_109	MW-08	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.0000096	0.35	↔	-0.0000028	0.24	↔	-0.0000023	0.60	↔	2023-02-06	2023-06-30	0.75	↔
1_17_5_110	MW-08	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000044	0.25	↔	-0.00000025	0.74	↔	-0.0000029	0.14	↔	2023-02-06	2023-08-02	0.86	↔
1_17_5_115	MW-08	Appendix IV	Lead	mg/L	9	7	78%	0.0000079	0.40	↔	-0.0000075	0.16	↔	0.00000012	0.95	↔	2023-02-06	2023-04-26	0.74	↔
1_17_5_118	MW-08	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.00000023	0.98	↔	-0.000018	0.28	↔	0.000015	0.30	↔	2023-03-14	2023-07-08	0.78	↔
1_17_5_122	MW-08	Appendix IV	Selenium	mg/L	9	5	56%	0.0000000082	0.94	↔	-0.0000012	0.029	↔	0.00000014	0.23	↔	2023-04-12	2023-06-21	0.98	↔
1_17_6_111	MW-08	Part 115	Copper	mg/L	9	5	56%	0.0000014	0.29	↔	-0.0000040	0.48	↔	0.00000013	0.96	↔	2023-05-03	2023-06-28	0.51	↔
1_17_6_114	MW-08	Part 115	Iron	mg/L	9	0	0%	-0.15	0.16	↔	-0.055	0.059	↔	0.11	0.057	↔	2023-02-06	2023-08-05	0.96	↔
1_17_6_119	MW-08	Part 115	Nickel	mg/L	9	0	0%	0.000011	0.0097	↑	-0.0000060	0.045	↔	-0.0000014	0.019	↔	2023-01-28	2023-04-04	0.98	↔
1_17_6_130	MW-08	Part 115	Zinc	mg/L	9	2	22%	0.00032	0.59	↔	-0.00087	0.73	↔	0.00013	0.91	↔	2023-04-18	2023-07-01	0.27	↔
1_18_4_107	MW-09	Appendix III	Calcium	mg/L	9	0	0%	1.3	0.13	↔	0.57	0.80	↔	-0.92	0.22	↔	2023-03-15	2023-06-10	0.81	↔
1_18_4_108	MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.043	0.0095	↑	-0.11	0.0042	↓	0.0074	0.097	↔	2023-02-18	2023-04-28	0.99	↔
1_18_4_124	MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	4.2	0.018	↔	-1.8	0.68	↔	-3	0.20	↔	2023-04-25	2023-08-07	0.92	↔
1_18_5_101	MW-09	Appendix IV	Antimony	mg/L	9	5	56%	0.0000023	0.14	↔	-0.0000073	0.26	↔	0.00000085	0.74	↔	2023-05-22	2023-07-15	0.74	↔
1_18_5_103	MW-09	Appendix IV	Barium	mg/L	9	0	0%	-0.0079	0.42	↔	-0.00083	0.98	↔	0.0010	0.96	↔	2023-04-18	2023-07-04	0.37	↔
1_18_5_104	MW-09	Appendix IV	Beryllium	mg/L	9	8	89%	-0.0000000057	0.91	↔	0.000000051	0.37	↔	-0.000000027	0.41	↔	2023-03-13	2023-05-23	0.46	↔

(Table continues on next page)

Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
1_18_5_106	MW-09	Appendix IV	Cadmium	mg/L	9	9	100%	-0.00000087	0.86	↔	0.0000022	0.43	↔	-0.0000014	0.27	↔	2023-01-27	2023-05-22	0.58	↔
1_18_5_110	MW-09	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000042	0.51	↔	-0.00000059	0.88	↔	-0.0000040	0.48	↔	2023-02-28	2023-07-26	0.47	↔
1_18_5_115	MW-09	Appendix IV	Lead	mg/L	9	9	100%	0.0000049	0.32	↔	-0.000012	0.57	↔	0.000000086	0.99	↔	2023-04-18	2023-06-27	0.54	↔
1_18_5_116	MW-09	Appendix IV	Lithium	mg/L	9	0	0%	-0.00025	0.46	↔	0.0014	0.37	↔	-0.00052	0.46	↔	2023-05-16	2023-07-03	0.47	↔
1_18_5_122	MW-09	Appendix IV	Selenium	mg/L	9	2	22%	-0.00000055	0.34	↔	0.0000018	0.47	↔	-0.00000069	0.54	↔	2023-05-22	2023-07-24	0.51	↔
1_18_5_125	MW-09	Appendix IV	Thallium	mg/L	9	9	100%	0.0000017	0.32	↔	-0.0000075	0.33	↔	0.00000058	0.86	↔	2023-05-22	2023-07-08	0.58	↔
1_18_6_111	MW-09	Part 115	Copper	mg/L	9	8	89%	-0.00000064	0.74	↔	0.0000011	0.38	↔	-0.0000017	0.37	↔	2023-02-27	2023-08-05	0.52	↔
1_18_6_114	MW-09	Part 115	Iron	mg/L	9	0	0%	0.060	0.012	↔	-0.17	0.041	↔	-0.013	0.60	↔	2023-05-13	2023-07-12	0.96	↔
1_18_6_119	MW-09	Part 115	Nickel	mg/L	9	0	0%	0.000020	0.071	↔	-0.000032	0.12	↔	-0.0000016	0.64	↔	2023-03-13	2023-05-13	0.92	↔
1_18_6_123	MW-09	Part 115	Silver	mg/L	9	9	100%	0.0000013	0.16	↔	-0.0000046	0.23	↔	0.00000033	0.83	↔	2023-05-22	2023-07-07	0.72	↔
1_22_4_107	MW-18	Appendix III	Calcium	mg/L	9	0	0%	-1.1	0.12	↔	-0.45	0.62	↔	1.4	0.15	↔	2023-04-10	2023-08-07	0.88	↔
1_22_4_108	MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.090	0.00037	↓	0.14	0.0073	↑	-0.065	0.0073	↓	2023-04-25	2023-07-25	0.99	↔
1_22_5_101	MW-18	Appendix IV	Antimony	mg/L	9	2	22%	0.0000017	0.27	↔	-0.0000047	0.44	↔	0.0000011	0.69	↔	2023-05-21	2023-08-02	0.63	↔
1_22_5_103	MW-18	Appendix IV	Barium	mg/L	9	0	0%	-0.000087	0.0018	↓	0.00029	0.0015	↑	0.000011	0.25	↔	2023-04-07	2023-05-22	0.99	↔
1_22_5_106	MW-18	Appendix IV	Cadmium	mg/L	9	2	22%	-0.0000011	0.49	↔	0.0000032	0.52	↔	-0.0000022	0.18	↔	2023-03-15	2023-05-22	0.68	↔
1_22_5_109	MW-18	Appendix IV	Chromium, Total	mg/L	9	8	89%	-0.00000015	0.78	↔	0.00000064	0.53	↔	-0.00000019	0.41	↔	2023-03-01	2023-05-21	0.62	↔
1_22_5_115	MW-18	Appendix IV	Lead	mg/L	9	6	67%	0.0000082	0.62	↔	-0.0000041	0.47	↔	-0.00000026	0.96	↔	2023-02-07	2023-06-04	0.41	↔
1_22_5_116	MW-18	Appendix IV	Lithium	mg/L	9	0	0%	-0.00019	0.027	↔	0.00022	0.056	↔	-0.000078	0.31	↔	2023-04-05	2023-07-26	0.93	↔
1_22_5_122	MW-18	Appendix IV	Selenium	mg/L	9	0	0%	0.0000046	0.22	↔	-0.0000086	0.15	↔	0.0000086	0.13	↔	2023-04-02	2023-07-12	0.78	↔
1_22_5_125	MW-18	Appendix IV	Thallium	mg/L	9	9	100%	0.0000028	0.52	↔	-0.00000078	0.85	↔	-0.00000057	0.82	↔	2023-02-08	2023-06-26	0.24	↔
1_22_6_123	MW-18	Part 115	Silver	mg/L	9	9	100%	0.0000019	0.52	↔	-0.00000051	0.85	↔	-0.00000037	0.82	↔	2023-02-08	2023-06-26	0.24	↔
1_23_4_108	MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.24	0.039	↔	-0.071	0.56	↔	0.15	0.21	↔	2023-04-13	2023-07-21	0.94	↔
1_23_5_101	MW-19	Appendix IV	Antimony	mg/L	9	8	89%	0.0000039	0.16	↔	-0.000010	0.32	↔	0.00000038	0.93	↔	2023-05-12	2023-07-03	0.66	↔
1_23_5_102	MW-19	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000020	0.013	↔	0.00010	0.0075	↑	-0.0000077	0.38	↔	2023-05-19	2023-07-04	0.97	↔
1_23_5_103	MW-19	Appendix IV	Barium	mg/L	9	0	0%	0.00011	0.55	↔	-0.00031	0.16	↔	0.000056	0.13	↔	2023-01-22	2023-03-26	0.85	↔
1_23_5_104	MW-19	Appendix IV	Beryllium	mg/L	9	3	33%	0.0000020	0.59	↔	-0.0000011	0.38	↔	0.00000015	0.88	↔	2023-02-07	2023-06-08	0.47	↔
1_23_5_106	MW-19	Appendix IV	Cadmium	mg/L	9	9	100%	0.00000061	0.92	↔	0.0000015	0.63	↔	-0.0000013	0.34	↔	2023-01-27	2023-05-21	0.44	↔
1_23_5_109	MW-19	Appendix IV	Chromium, Total	mg/L	9	4	44%	0.0000095	0.12	↔	-0.0000100	0.12	↔	0.00000038	0.64	↔	2023-02-02	2023-04-10	0.91	↔
1_23_5_110	MW-19	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000059	0.088	↔	-0.0000051	0.35	↔	-0.0000022	0.12	↔	2023-02-23	2023-05-20	0.91	↔
1_23_5_115	MW-19	Appendix IV	Lead	mg/L	9	9	100%	0.000010	0.039	↔	-0.000015	0.20	↔	0.00000026	0.93	↔	2023-03-30	2023-06-22	0.91	↔
1_23_5_121	MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	0.0064	0.23	↔	-0.0030	0.54	↔	0.0040	0.21	↔	2023-02-28	2023-06-27	0.71	↔
1_23_5_122	MW-19	Appendix IV	Selenium	mg/L	9	9	100%	0.000010	0.18	↔	-0.0000090	0.48	↔	0.00000057	0.83	↔	2023-02-08	2023-05-06	0.70	↔
1_23_5_125	MW-19	Appendix IV	Thallium	mg/L	9	9	100%	0.0000027	0.057	↔	-0.0000074	0.14	↔	0.00000034	0.86	↔	2023-05-05	2023-07-04	0.86	↔
1_23_6_119	MW-19	Part 115	Nickel	mg/L	9	1	11%	0.000012	0.27	↔	-0.000022	0.015	↔	-0.000000017	0.99	↔	2023-02-06	2023-05-03	0.97	↔
1_23_6_123	MW-19	Part 115	Silver	mg/L	9	9	100%	0.0000012	0.30	↔	-0.0000048	0.32	↔	0.00000034	0.87	↔	2023-05-20	2023-07-08	0.60	↔
1_23_6_129	MW-19	Part 115	Vanadium	mg/L	9	9	100%	0.000034	0.30	↔	-0.000046	0.20	↔	0.0000015	0.76	↔	2023-02-07	2023-03-27	0.77	↔
1_23_6_130	MW-19	Part 115	Zinc	mg/L	9	7	78%	0.000037	0.71	↔	-0.000021	0.37	↔	0.0000043	0.92	↔	2023-02-07	2023-07-13	0.40	↔
1_24_4_105	MW-20	Appendix III	Boron	mg/L	9	0	0%	-0.0023	0.12	↔	0.0042	0.082	↔	-0.000000000019	1.0	↔	2023-04-04	2023-06-30	0.87	↔
1_24_4_107	MW-20	Appendix III	Calcium	mg/L	9	0	0%	0.40	0.27	↔	-0.90	0.40	↔	0.49	0.16	↔	2023-03-22	2023-06-27	0.78	↔
1_24_4_124	MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	1.1	0.0092	↑	-0.70	0.0089	↓	0.18	0.36	↔	2023-02-16	2023-07-27	0.98	↔
1_24_5_102	MW-20	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000044	0.065	↔	0.0000039	0.025	↔	-0.000000037	0.98	↔	2023-02-18	2023-07-22	0.95	↔
1_24_5_106	MW-20	Appendix IV	Cadmium	mg/L	9	9	100%	-0.000000017	0.87	↔	0.00000082	0.065	↔	-0.000000058	0.54	↔	2023-04-10	2023-06-10	0.96	↔

(Table continues on next page)

Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
1_24_5_109	MW-20	Appendix IV	Chromium, Total	mg/L	9	5	56%	0.00000097	0.19	↔	-0.00000098	0.18	↔	0.00000012	0.73	↔	2023-03-11	2023-06-07	0.76	↔
1_24_5_110	MW-20	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000045	0.18	↔	-0.0000030	0.32	↔	-0.0000026	0.17	↔	2023-02-21	2023-05-23	0.87	↔
1_24_5_115	MW-20	Appendix IV	Lead	mg/L	9	0	0%	-0.000020	0.30	↔	0.000017	0.12	↔	-0.0000045	0.28	↔	2023-01-25	2023-04-24	0.76	↔
1_24_5_116	MW-20	Appendix IV	Lithium	mg/L	9	0	0%	-0.00036	0.053	↔	0.00024	0.042	↔	-0.00010	0.39	↔	2023-02-17	2023-07-13	0.90	↔
1_24_5_118	MW-20	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.0000020	0.65	↔	0.000017	0.073	↔	-0.0000051	0.43	↔	2023-04-17	2023-07-11	0.87	↔
1_24_5_122	MW-20	Appendix IV	Selenium	mg/L	9	5	56%	0.000000000000027	1.0	↔	-0.0000015	0.019	↔	0.00000013	0.70	↔	2023-04-10	2023-06-30	0.97	↔
1_24_6_119	MW-20	Part 115	Nickel	mg/L	9	0	0%	0.0000074	0.53	↔	-0.0000025	0.82	↔	-0.000025	0.026	↔	2023-02-24	2023-06-27	0.92	↔
1_25_4_105	MW-30	Appendix III	Boron	mg/L	9	0	0%	0.0084	0.43	↔	-0.0096	0.55	↔	0.0054	0.71	↔	2023-03-13	2023-07-09	0.37	↔
1_25_4_107	MW-30	Appendix III	Calcium	mg/L	9	0	0%	3.6	0.42	↔	-4.7	0.31	↔	0.22	0.93	↔	2023-03-12	2023-06-02	0.58	↔
1_25_4_112	MW-30	Appendix III	Fluoride	mg/L	9	0	0%	0.00060	0.83	↔	-0.0023	0.61	↔	0.0021	0.60	↔	2023-03-22	2023-06-27	0.29	↔
1_25_4_124	MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.90	0.55	↔	-0.40	0.86	↔	-3.3	0.19	↔	2023-03-23	2023-07-28	0.71	↔
1_25_5_101	MW-30	Appendix IV	Antimony	mg/L	9	8	89%	0.00000074	0.85	↔	0.0000045	0.28	↔	-0.0000032	0.21	↔	2023-03-01	2023-05-25	0.72	↔
1_25_5_102	MW-30	Appendix IV	Arsenic	mg/L	9	2	22%	-0.0000030	0.14	↔	0.0000042	0.57	↔	0.0000026	0.45	↔	2023-05-21	2023-07-29	0.76	↔
1_25_5_103	MW-30	Appendix IV	Barium	mg/L	9	0	0%	-0.00045	0.15	↔	0.00032	0.70	↔	-0.000044	0.85	↔	2023-04-13	2023-05-30	0.75	↔
1_25_5_104	MW-30	Appendix IV	Beryllium	mg/L	9	8	89%	0.0000018	0.64	↔	-0.00000088	0.33	↔	0.00000049	0.78	↔	2023-02-05	2023-07-20	0.44	↔
1_25_5_106	MW-30	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000015	0.24	↔	-0.0000037	0.48	↔	0.00000057	0.81	↔	2023-05-21	2023-07-24	0.59	↔
1_25_5_109	MW-30	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.000053	0.023	↔	0.00019	0.037	↔	-0.000064	0.082	↔	2023-05-19	2023-07-11	0.93	↔
1_25_5_113	MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.00060	0.83	↔	-0.0023	0.61	↔	0.0021	0.60	↔	2023-03-22	2023-06-27	0.29	↔
1_25_5_115	MW-30	Appendix IV	Lead	mg/L	9	9	100%	0.000014	0.084	↔	-0.0000067	0.31	↔	-0.0000033	0.38	↔	2023-02-21	2023-05-22	0.83	↔
1_25_5_116	MW-30	Appendix IV	Lithium	mg/L	9	0	0%	0.00072	0.64	↔	-0.00079	0.42	↔	0.00028	0.84	↔	2023-03-12	2023-07-09	0.34	↔
1_25_5_118	MW-30	Appendix IV	Molybdenum	mg/L	9	3	33%	0.000079	0.19	↔	-0.000014	0.26	↔	0.0000022	0.92	↔	2023-01-04	2023-08-02	0.71	↔
1_25_5_122	MW-30	Appendix IV	Selenium	mg/L	9	6	67%	0.000011	0.41	↔	-0.0000100	0.17	↔	0.00000046	0.86	↔	2023-02-05	2023-04-24	0.71	↔
1_25_5_125	MW-30	Appendix IV	Thallium	mg/L	9	9	100%	0.0000045	0.058	↔	0.0000000039	1.0	↔	-0.0000040	0.058	↔	2023-02-17	2023-08-07	0.92	↔
1_25_6_111	MW-30	Part 115	Copper	mg/L	9	7	78%	0.0000066	0.38	↔	-0.0000036	0.42	↔	0.0000062	0.36	↔	2023-02-06	2023-07-27	0.52	↔
1_25_6_114	MW-30	Part 115	Iron	mg/L	9	0	0%	0.053	0.42	↔	-0.033	0.42	↔	-0.0041	0.94	↔	2023-03-12	2023-07-11	0.51	↔
1_25_6_119	MW-30	Part 115	Nickel	mg/L	9	2	22%	0.00011	0.078	↔	-0.000023	0.33	↔	-0.0000038	0.69	↔	2023-01-03	2023-05-21	0.84	↔
1_25_6_123	MW-30	Part 115	Silver	mg/L	9	9	100%	0.0000012	0.31	↔	-0.0000049	0.32	↔	0.00000036	0.86	↔	2023-05-21	2023-07-07	0.59	↔
1_25_6_129	MW-30	Part 115	Vanadium	mg/L	9	9	100%	0.000021	0.39	↔	-0.0000098	0.51	↔	0.0000061	0.77	↔	2023-02-06	2023-07-27	0.42	↔
1_25_6_130	MW-30	Part 115	Zinc	mg/L	9	7	78%	-0.0000050	0.85	↔	-0.000033	0.78	↔	0.0000043	0.94	↔	2023-04-18	2023-06-30	0.36	↔
1_26_4_107	MW-31	Appendix III	Calcium	mg/L	9	0	0%	0.11	0.55	↔	-0.57	0.12	↔	0.31	0.28	↔	2023-03-18	2023-06-27	0.86	↔
1_26_4_108	MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.16	0.094	↔	0.50	0.17	↔	-0.13	0.40	↔	2023-05-15	2023-07-05	0.78	↔
1_26_4_120	MW-31	Appendix III	pH (field)	su	9	0	0%	-0.00019	0.93	↔	0.0016	0.46	↔	-0.0025	0.099	↔	2023-03-13	2023-06-26	0.69	↔
1_26_4_124	MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.47	0.30	↔	-2.6	0.12	↔	-0.40	0.33	↔	2023-04-14	2023-06-02	0.93	↔
1_26_4_126	MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-1.0	0.78	↔	-0.11	0.90	↔	-0.94	0.58	↔	2023-02-06	2023-08-07	0.43	↔
1_26_5_101	MW-31	Appendix IV	Antimony	mg/L	9	4	44%	0.00000051	0.19	↔	-0.00000022	0.66	↔	0.0000000057	0.99	↔	2023-04-16	2023-07-10	0.72	↔
1_26_5_102	MW-31	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000088	0.028	↔	0.0000060	0.022	↔	-0.0000052	0.077	↔	2023-03-04	2023-07-17	0.94	↔
1_26_5_106	MW-31	Appendix IV	Cadmium	mg/L	9	9	100%	-0.000000019	0.86	↔	0.00000083	0.070	↔	-0.000000059	0.54	↔	2023-04-09	2023-06-09	0.96	↔
1_26_5_109	MW-31	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.0000017	0.76	↔	0.000014	0.45	↔	-0.0000014	0.78	↔	2023-04-03	2023-05-22	0.52	↔
1_26_5_110	MW-31	Appendix IV	Cobalt	mg/L	9	0	0%	0.00000060	0.59	↔	0.0000000061	0.98	↔	-0.00000066	0.24	↔	2023-02-06	2023-07-31	0.67	↔
1_26_5_115	MW-31	Appendix IV	Lead	mg/L	9	8	89%	0.00000028	0.58	↔	-0.0000030	0.23	↔	0.00000048	0.64	↔	2023-05-21	2023-07-25	0.83	↔
1_26_5_116	MW-31	Appendix IV	Lithium	mg/L	9	0	0%	-0.000016	0.66	↔	0.000097	0.55	↔	-0.000069	0.39	↔	2023-04-18	2023-07-02	0.53	↔
1_26_5_118	MW-31	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000026	0.15	↔	0.0000018	0.69	↔	-0.0000016	0.69	↔	2023-01-09	2023-06-26	0.68	↔

(Table continues on next page)

Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
1_26_5_122	MW-31	Appendix IV	Selenium	mg/L	9	5	56%	0.00000016	0.54	↔	-0.0000024	0.051	↔	0.00000018	0.47	↔	2023-04-03	2023-05-22	0.95	↔
1_26_6_111	MW-31	Part 115	Copper	mg/L	9	8	89%	0.00000027	0.38	↔	-0.00000068	0.59	↔	0.00000010	0.86	↔	2023-05-21	2023-07-23	0.43	↔
2_12_4_108	MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.66	0.39	↔	0.26	0.59	↔	-0.15	0.82	↔	2023-02-08	2023-07-26	0.36	↔
2_12_4_112	MW-02	Appendix III	Fluoride	mg/L	9	0	0%	-0.053	0.52	↔	0.044	0.34	↔	0.00072	0.97	↔	2023-02-07	2023-04-24	0.54	↔
2_12_4_120	MW-02	Appendix III	pH (field)	su	9	0	0%	0.0028	0.66	↔	0.00075	0.72	↔	-0.0016	0.43	↔	2023-02-07	2023-05-28	0.53	↔
2_12_5_101	MW-02	Appendix IV	Antimony	mg/L	9	2	22%	0.0000028	0.12	↔	-0.0000074	0.30	↔	0.0000014	0.63	↔	2023-05-16	2023-07-10	0.71	↔
2_12_5_103	MW-02	Appendix IV	Barium	mg/L	9	0	0%	0.0012	0.57	↔	-0.0014	0.25	↔	-0.0000042	0.99	↔	2023-01-21	2023-04-18	0.69	↔
2_12_5_104	MW-02	Appendix IV	Beryllium	mg/L	9	0	0%	0.0000033	0.19	↔	-0.0000030	0.061	↔	0.0000021	0.018	↔	2023-01-20	2023-04-21	0.93	↔
2_12_5_113	MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.053	0.52	↔	0.044	0.34	↔	0.00072	0.97	↔	2023-02-07	2023-04-24	0.54	↔
2_12_5_118	MW-02	Appendix IV	Molybdenum	mg/L	9	0	0%	0.000080	0.025	↔	-0.000064	0.047	↔	-0.0000076	0.55	↔	2023-02-27	2023-05-28	0.94	↔
2_12_5_121	MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	3	33%	-0.012	0.25	↔	0.010	0.81	↔	-0.018	0.39	↔	2023-04-18	2023-08-03	0.54	↔
2_12_5_125	MW-02	Appendix IV	Thallium	mg/L	9	8	89%	0.0000017	0.30	↔	-0.0000087	0.26	↔	0.0000071	0.091	↔	2023-05-22	2023-07-15	0.78	↔
2_12_6_123	MW-02	Part 115	Silver	mg/L	9	9	100%	0.0000013	0.27	↔	-0.0000047	0.35	↔	0.00000023	0.91	↔	2023-05-16	2023-07-04	0.59	↔
2_13_4_108	MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	-0.86	0.083	↔	0.56	0.73	↔	0.13	0.86	↔	2023-05-11	2023-07-09	0.79	↔
2_13_4_126	MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	2.5	0.52	↔	0.00000038	1.0	↔	-1.3	0.81	↔	2023-04-01	2023-08-06	0.32	↔
2_13_5_101	MW-03	Appendix IV	Antimony	mg/L	9	5	56%	0.00000063	0.85	↔	0.0000060	0.40	↔	-0.0000031	0.10	↔	2023-03-07	2023-05-11	0.76	↔
2_13_5_102	MW-03	Appendix IV	Arsenic	mg/L	9	0	0%	0.0000080	0.33	↔	-0.0000097	0.078	↔	0.0000033	0.13	↔	2023-01-30	2023-04-26	0.82	↔
2_13_5_104	MW-03	Appendix IV	Beryllium	mg/L	9	7	78%	0.0000017	0.63	↔	-0.00000087	0.33	↔	0.0000016	0.37	↔	2023-02-06	2023-07-26	0.49	↔
2_13_5_106	MW-03	Appendix IV	Cadmium	mg/L	9	8	89%	0.00000075	0.90	↔	0.0000014	0.67	↔	-0.0000011	0.44	↔	2023-02-01	2023-05-22	0.39	↔
2_13_5_110	MW-03	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000018	0.81	↔	-0.0000057	0.71	↔	0.0000045	0.23	↔	2023-02-24	2023-04-18	0.58	↔
2_13_5_115	MW-03	Appendix IV	Lead	mg/L	9	8	89%	0.000010	0.045	↔	-0.000013	0.30	↔	-0.0000020	0.53	↔	2023-03-24	2023-05-23	0.85	↔
2_13_5_118	MW-03	Appendix IV	Molybdenum	mg/L	9	7	78%	0.000011	0.44	↔	-0.000035	0.57	↔	0.0000087	0.75	↔	2023-04-18	2023-06-28	0.46	↔
2_13_5_122	MW-03	Appendix IV	Selenium	mg/L	9	3	33%	0.0000054	0.73	↔	-0.0000032	0.42	↔	0.0000039	0.61	↔	2023-02-06	2023-07-15	0.32	↔
2_13_5_125	MW-03	Appendix IV	Thallium	mg/L	9	8	89%	0.0000042	0.066	↔	0.0000000047	1.0	↔	-0.0000026	0.16	↔	2023-02-19	2023-08-06	0.89	↔
2_13_6_111	MW-03	Part 115	Copper	mg/L	9	5	56%	0.0000066	0.39	↔	-0.0000030	0.53	↔	0.0000093	0.22	↔	2023-02-07	2023-07-26	0.60	↔
2_13_6_123	MW-03	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.31	↔	-0.0000048	0.33	↔	0.00000036	0.86	↔	2023-05-22	2023-07-09	0.59	↔
2_13_6_129	MW-03	Part 115	Vanadium	mg/L	9	8	89%	0.000021	0.39	↔	-0.000010	0.49	↔	0.000013	0.55	↔	2023-02-07	2023-07-26	0.43	↔
2_14_4_112	MW-04	Appendix III	Fluoride	mg/L	9	0	0%	0.0031	0.38	↔	-0.0014	0.79	↔	0.0064	0.24	↔	2023-03-22	2023-07-07	0.74	↔
2_14_4_124	MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	3.2	0.21	↔	-2.2	0.82	↔	0.26	0.95	↔	2023-05-05	2023-07-02	0.58	↔
2_14_5_101	MW-04	Appendix IV	Antimony	mg/L	9	6	67%	0.00000054	0.88	↔	0.0000045	0.27	↔	-0.0000032	0.20	↔	2023-03-01	2023-05-26	0.73	↔
2_14_5_102	MW-04	Appendix IV	Arsenic	mg/L	9	0	0%	0.0000013	0.92	↔	-0.0000047	0.33	↔	0.0000029	0.49	↔	2023-01-30	2023-05-23	0.47	↔
2_14_5_106	MW-04	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000015	0.24	↔	-0.0000037	0.47	↔	0.00000054	0.82	↔	2023-05-22	2023-07-23	0.59	↔
2_14_5_110	MW-04	Appendix IV	Cobalt	mg/L	9	0	0%	-0.0000014	0.63	↔	0.0000078	0.55	↔	-0.0000030	0.61	↔	2023-05-22	2023-07-06	0.26	↔
2_14_5_113	MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.0031	0.38	↔	-0.0014	0.79	↔	0.0064	0.24	↔	2023-03-22	2023-07-07	0.74	↔
2_14_5_115	MW-04	Appendix IV	Lead	mg/L	9	9	100%	0.0000047	0.35	↔	-0.0000074	0.71	↔	-0.00000067	0.94	↔	2023-04-19	2023-07-27	0.47	↔
2_14_5_118	MW-04	Appendix IV	Molybdenum	mg/L	9	2	22%	0.0000095	0.53	↔	-0.000029	0.56	↔	0.000011	0.43	↔	2023-04-18	2023-06-17	0.41	↔
2_14_5_125	MW-04	Appendix IV	Thallium	mg/L	9	9	100%	0.0000027	0.72	↔	0.0000012	0.63	↔	-0.0000023	0.36	↔	2023-01-29	2023-05-29	0.52	↔
2_14_6_123	MW-04	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.31	↔	-0.0000049	0.32	↔	0.00000035	0.87	↔	2023-05-22	2023-07-08	0.59	↔
2_16_4_126	MW-07	Appendix III	Total Dissolved Solids	mg/L	9	0	0%	-0.80	0.57	↔	1.9	0.66	↔	-0.74	0.56	↔	2023-03-13	2023-06-10	0.44	↔
2_16_5_101	MW-07	Appendix IV	Antimony	mg/L	9	8	89%	0.000000025	0.70	↔	0.00000073	0.028	↔	-0.000000049	0.42	↔	2023-03-25	2023-06-06	0.99	↔
2_16_5_102	MW-07	Appendix IV	Arsenic	mg/L	9	0	0%	-0.00000049	0.43	↔	0.00000043	0.64	↔	0.00000085	0.33	↔	2023-04-17	2023-07-25	0.67	↔
2_16_5_106	MW-07	Appendix IV	Cadmium	mg/L	9	9	100%	-0.000000016	0.87	↔	0.00000084	0.056	↔	-0.000000057	0.53	↔	2023-04-10	2023-06-10	0.97	↔

(Table continues on next page)

Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
2_16_5_109	MW-07	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.000000083	0.93	↔	-0.00000073	0.80	↔	0.00000056	0.51	↔	2023-03-19	2023-06-21	0.27	↔
2_16_5_110	MW-07	Appendix IV	Cobalt	mg/L	9	0	0%	0.0000040	0.36	↔	0.00000037	0.77	↔	-0.00000027	0.82	↔	2023-01-26	2023-06-26	0.73	↔
2_16_5_115	MW-07	Appendix IV	Lead	mg/L	9	9	100%	0.000000045	0.87	↔	-0.0000023	0.056	↔	0.00000016	0.53	↔	2023-04-10	2023-06-10	0.97	↔
2_16_5_118	MW-07	Appendix IV	Molybdenum	mg/L	9	9	100%	0.00000014	0.87	↔	-0.0000072	0.056	↔	0.00000049	0.53	↔	2023-04-10	2023-06-10	0.97	↔
2_16_5_122	MW-07	Appendix IV	Selenium	mg/L	9	8	89%	0.000000045	0.87	↔	-0.0000023	0.056	↔	0.00000016	0.53	↔	2023-04-10	2023-06-10	0.97	↔
2_19_4_105	MW-10	Appendix III	Boron	mg/L	9	0	0%	-0.19	0.0044	↓	0.24	0.0082	↑	-0.066	0.16	↔	2023-03-20	2023-07-13	0.98	↔
2_19_4_107	MW-10	Appendix III	Calcium	mg/L	9	0	0%	1.9	0.11	↔	-2.0	0.22	↔	0.38	0.77	↔	2023-03-14	2023-07-09	0.79	↔
2_19_4_112	MW-10	Appendix III	Fluoride	mg/L	9	0	0%	-0.045	0.0091	↓	0.045	0.0023	↑	-0.022	0.045	↔	2023-03-08	2023-07-12	0.98	↔
2_19_4_120	MW-10	Appendix III	pH (field)	su	9	0	0%	-0.0083	0.45	↔	0.011	0.59	↔	-0.0076	0.16	↔	2023-02-06	2023-05-19	0.66	↔
2_19_4_124	MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	1.7	0.53	↔	-8.7	0.48	↔	2.4	0.66	↔	2023-04-18	2023-07-07	0.66	↔
2_19_5_101	MW-10	Appendix IV	Antimony	mg/L	9	5	56%	0.0000020	0.27	↔	-0.0000062	0.41	↔	0.00000067	0.84	↔	2023-05-22	2023-07-17	0.59	↔
2_19_5_102	MW-10	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000016	0.11	↔	0.0000076	0.088	↔	-0.0000018	0.29	↔	2023-04-18	2023-08-05	0.98	↔
2_19_5_104	MW-10	Appendix IV	Beryllium	mg/L	9	3	33%	-0.000000030	0.98	↔	0.00000079	0.45	↔	-0.0000013	0.40	↔	2023-03-06	2023-07-25	0.46	↔
2_19_5_106	MW-10	Appendix IV	Cadmium	mg/L	9	9	100%	0.0000015	0.25	↔	-0.0000038	0.48	↔	0.00000058	0.81	↔	2023-05-22	2023-07-23	0.59	↔
2_19_5_109	MW-10	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.000026	0.10	↔	0.000073	0.024	↔	-0.000057	0.038	↔	2023-04-10	2023-07-27	0.95	↔
2_19_5_110	MW-10	Appendix IV	Cobalt	mg/L	9	0	0%	0.00000051	0.97	↔	0.0000057	0.52	↔	-0.0000067	0.60	↔	2023-02-23	2023-06-30	0.36	↔
2_19_5_113	MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.045	0.0091	↓	0.045	0.0023	↑	-0.022	0.045	↔	2023-03-08	2023-07-12	0.98	↔
2_19_5_115	MW-10	Appendix IV	Lead	mg/L	9	7	78%	0.0000097	0.050	↔	-0.000016	0.20	↔	0.00000085	0.78	↔	2023-04-01	2023-06-22	0.90	↔
2_19_5_121	MW-10	Appendix IV	Radium 226 and 228	pCi/L	9	8	89%	0.0070	0.57	↔	-0.0033	0.29	↔	0.0029	0.61	↔	2023-02-05	2023-07-14	0.48	↔
2_19_5_125	MW-10	Appendix IV	Thallium	mg/L	9	9	100%	0.0000026	0.062	↔	-0.0000078	0.15	↔	0.00000039	0.85	↔	2023-05-06	2023-07-04	0.85	↔
2_19_6_111	MW-10	Part 115	Copper	mg/L	9	6	67%	-0.0000061	0.58	↔	0.0000070	0.74	↔	-0.0000035	0.47	↔	2023-02-13	2023-05-22	0.34	↔
2_19_6_114	MW-10	Part 115	Iron	mg/L	9	0	0%	0.031	0.044	↔	-0.049	0.32	↔	-0.011	0.62	↔	2023-04-25	2023-07-19	0.88	↔
2_19_6_119	MW-10	Part 115	Nickel	mg/L	9	3	33%	-0.0000034	0.76	↔	0.0000052	0.47	↔	-0.0000058	0.57	↔	2023-02-24	2023-07-12	0.33	↔
2_19_6_123	MW-10	Part 115	Silver	mg/L	9	9	100%	0.0000011	0.32	↔	-0.0000049	0.33	↔	0.00000039	0.86	↔	2023-05-22	2023-07-08	0.58	↔
2_19_6_129	MW-10	Part 115	Vanadium	mg/L	9	8	89%	-0.0000017	0.78	↔	0.0000043	0.73	↔	-0.0000028	0.34	↔	2023-02-13	2023-05-22	0.41	↔
2_20_4_105	MW-11	Appendix III	Boron	mg/L	9	0	0%	-0.072	0.17	↔	0.014	0.92	↔	0.074	0.14	↔	2023-04-11	2023-06-12	0.81	↔
2_20_4_107	MW-11	Appendix III	Calcium	mg/L	9	0	0%	1.6	0.38	↔	-0.18	0.87	↔	-1.6	0.35	↔	2023-03-13	2023-07-01	0.71	↔
2_20_4_112	MW-11	Appendix III	Fluoride	mg/L	9	0	0%	-0.0072	0.24	↔	0.00029	0.99	↔	0.0079	0.18	↔	2023-04-03	2023-06-19	0.72	↔
2_20_4_124	MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	1	11%	1.6	0.070	↔	-2.7	0.057	↔	-0.016	0.99	↔	2023-04-17	2023-06-30	0.89	↔
2_20_5_102	MW-11	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000015	0.28	↔	0.000012	0.82	↔	0.0000063	0.80	↔	2023-04-29	2023-08-02	0.46	↔
2_20_5_106	MW-11	Appendix IV	Cadmium	mg/L	9	8	89%	-0.0000013	0.79	↔	0.00000012	0.99	↔	-0.0000010	0.89	↔	2023-03-14	2023-07-08	0.084	↔
2_20_5_109	MW-11	Appendix IV	Chromium, Total	mg/L	9	0	0%	-0.000024	0.53	↔	0.000019	0.91	↔	-0.000015	0.84	↔	2023-05-06	2023-08-02	0.22	↔
2_20_5_113	MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0072	0.24	↔	0.00029	0.99	↔	0.0079	0.18	↔	2023-04-03	2023-06-19	0.72	↔
2_20_5_118	MW-11	Appendix IV	Molybdenum	mg/L	9	2	22%	-0.000013	0.26	↔	-0.0000034	0.92	↔	0.0000072	0.47	↔	2023-04-10	2023-05-23	0.66	↔
2_20_5_122	MW-11	Appendix IV	Selenium	mg/L	9	3	33%	0.0000014	0.46	↔	-0.00000098	0.16	↔	0.00000039	0.48	↔	2023-01-11	2023-05-27	0.72	↔
2_20_5_125	MW-11	Appendix IV	Thallium	mg/L	9	9	100%	0.0000018	0.31	↔	-0.0000073	0.33	↔	0.00000056	0.86	↔	2023-05-21	2023-07-09	0.59	↔
2_20_6_123	MW-11	Part 115	Silver	mg/L	9	8	89%	0.0000011	0.27	↔	-0.0000045	0.29	↔	0.00000022	0.90	↔	2023-05-22	2023-07-05	0.62	↔
2_21_4_105	MW-12	Appendix III	Boron	mg/L	9	0	0%	-0.0017	0.048	↔	0.0021	0.31	↔	0.00076	0.21	↔	2023-03-29	2023-06-17	0.91	↔
2_21_4_112	MW-12	Appendix III	Fluoride	mg/L	9	0	0%	-0.0033	0.54	↔	-0.00077	0.77	↔	0.00011	0.93	↔	2023-01-27	2023-05-22	0.63	↔
2_21_4_120	MW-12	Appendix III	pH (field)	su	9	0	0%	0.0064	0.29	↔	-0.0058	0.52	↔	-0.00013	0.99	↔	2023-03-26	2023-07-07	0.48	↔
2_21_4_124	MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	-0.15	0.90	↔	-0.60	0.35	↔	0.22	0.43	↔	2023-01-28	2023-05-07	0.67	↔
2_21_5_102	MW-12	Appendix IV	Arsenic	mg/L	9	0	0%	-0.000014	0.032	↔	0.000014	0.0091	↑	-0.0000039	0.33	↔	2023-03-06	2023-08-02	0.97	↔

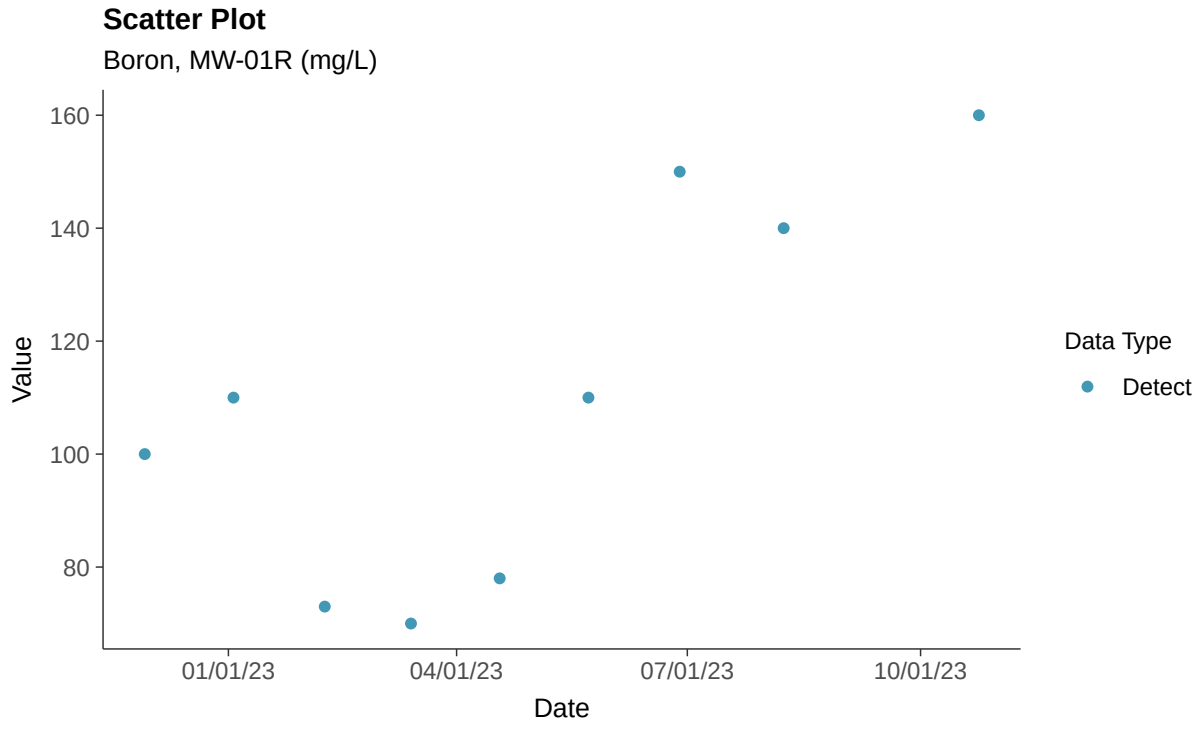
(Table continues on next page)

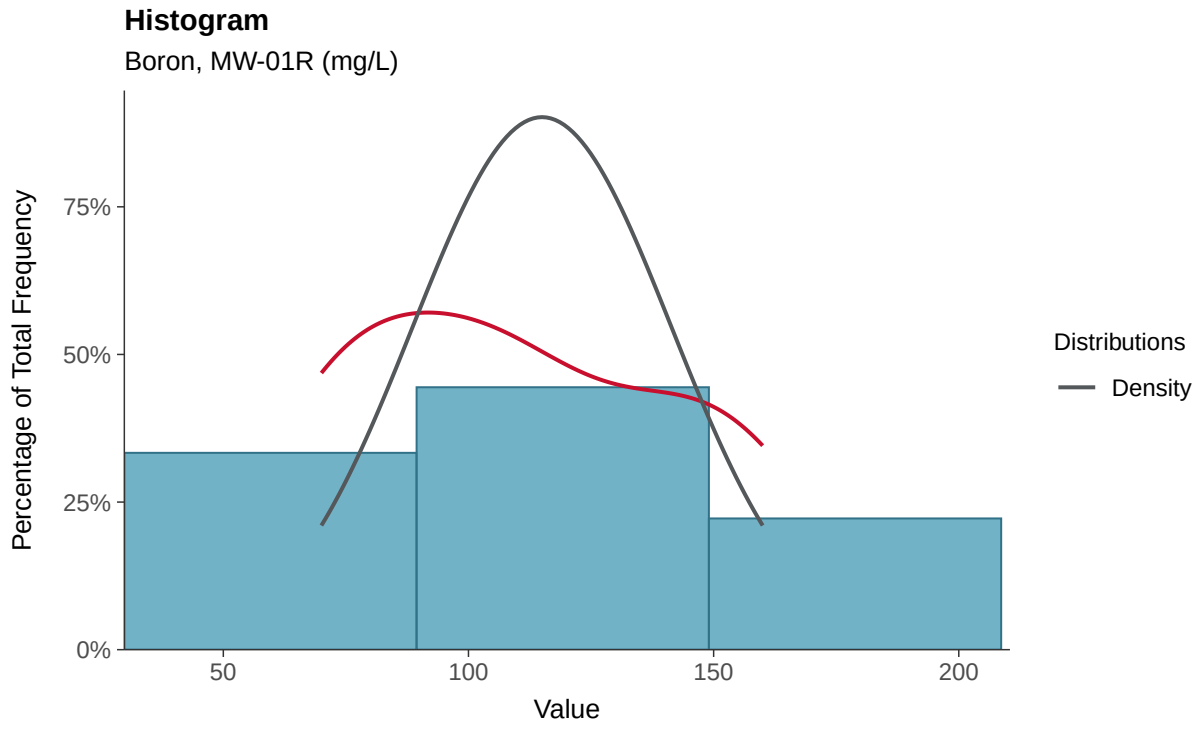
Table 10: Trend Tests: Piecewise Linear-Linear-Linear *(continued)*

								Line 1			Line 2			Line 3						
ID	Well	Constituent Type	Constituent	Unit	n	No. NDs	% NDs	Slope	p-Value	Trend	Slope	p-Value	Trend	Slope	p-Value	Trend	Break 1	Break 2	R-Squared	Overall Trend
2_21_5_103	MW-12	Appendix IV	Barium	mg/L	9	0	0%	-0.000023	0.65	↔	0.00031	0.23	↔	0.000091	0.41	↔	2023-04-20	2023-07-25	0.95	↔
2_21_5_106	MW-12	Appendix IV	Cadmium	mg/L	9	0	0%	0.0000026	0.48	↔	0.000023	0.22	↔	-0.000014	0.12	↔	2023-05-03	2023-07-07	0.88	↔
2_21_5_109	MW-12	Appendix IV	Chromium, Total	mg/L	9	4	44%	0.0000030	0.067	↔	-0.0000058	0.19	↔	0.00000031	0.77	↔	2023-03-17	2023-06-10	0.92	↔
2_21_5_110	MW-12	Appendix IV	Cobalt	mg/L	9	3	33%	-0.00000051	0.17	↔	0.0000069	0.013	↔	-0.0000019	0.045	↔	2023-04-27	2023-07-09	0.99	↔
2_21_5_113	MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	-0.0033	0.54	↔	-0.00077	0.77	↔	0.00011	0.93	↔	2023-01-27	2023-05-22	0.63	↔
2_21_5_115	MW-12	Appendix IV	Lead	mg/L	9	5	56%	0.000000088	0.78	↔	-0.0000017	0.16	↔	0.00000052	0.15	↔	2023-04-08	2023-05-27	0.82	↔
2_21_5_116	MW-12	Appendix IV	Lithium	mg/L	9	0	0%	-0.000022	0.26	↔	0.000029	0.17	↔	-0.0000096	0.39	↔	2023-02-21	2023-06-26	0.85	↔
2_21_5_118	MW-12	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000028	0.0024	↓	0.000036	0.0046	↑	0.000010	0.091	↔	2023-04-01	2023-07-04	0.99	↔
2_21_5_122	MW-12	Appendix IV	Selenium	mg/L	9	0	0%	0.000020	0.41	↔	-0.000012	0.083	↔	0.0000019	0.86	↔	2023-01-10	2023-07-15	0.85	↔
2_21_6_111	MW-12	Part 115	Copper	mg/L	9	0	0%	0.0000057	0.024	↔	-0.0000089	0.24	↔	-0.0000026	0.41	↔	2023-05-21	2023-08-03	0.93	↔
2_21_6_119	MW-12	Part 115	Nickel	mg/L	9	0	0%	-0.0000042	0.58	↔	0.000017	0.62	↔	-0.000012	0.46	↔	2023-04-27	2023-07-27	0.46	↔
2_21_6_129	MW-12	Part 115	Vanadium	mg/L	9	5	56%	-0.00000034	0.69	↔	0.0000097	0.030	↔	-0.0000049	0.0061	↓	2023-03-15	2023-05-29	0.98	↔
2_21_6_130	MW-12	Part 115	Zinc	mg/L	9	0	0%	-0.000015	0.79	↔	0.000024	0.52	↔	-0.000023	0.66	↔	2023-03-12	2023-08-04	0.30	↔
2_27_4_107	MW-32	Appendix III	Calcium	mg/L	9	0	0%	0.057	0.74	↔	-1.1	0.20	↔	0.26	0.47	↔	2023-05-11	2023-07-19	0.87	↔
2_27_4_108	MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0	0%	0.086	0.20	↔	-0.084	0.015	↔	0.049	0.049	↔	2023-01-27	2023-06-12	0.95	↔
2_27_4_112	MW-32	Appendix III	Fluoride	mg/L	9	0	0%	0.00024	0.91	↔	-0.00068	0.63	↔	0.0034	0.17	↔	2023-03-13	2023-06-30	0.78	↔
2_27_4_120	MW-32	Appendix III	pH (field)	su	9	0	0%	-0.0017	0.38	↔	0.0040	0.32	↔	-0.0014	0.15	↔	2023-03-03	2023-05-03	0.68	↔
2_27_4_124	MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0	0%	0.69	0.20	↔	-2.6	0.25	↔	-0.000000029	1.0	↔	2023-05-04	2023-07-09	0.80	↔
2_27_5_101	MW-32	Appendix IV	Antimony	mg/L	9	6	67%	0.00000047	0.19	↔	-0.00000013	0.92	↔	0.000000017	0.98	↔	2023-04-18	2023-06-30	0.60	↔
2_27_5_102	MW-32	Appendix IV	Arsenic	mg/L	9	0	0%	-0.0000010	0.27	↔	0.0000020	0.19	↔	-0.00000053	0.66	↔	2023-04-08	2023-07-16	0.73	↔
2_27_5_103	MW-32	Appendix IV	Barium	mg/L	9	0	0%	-0.0024	0.017	↔	0.00083	0.73	↔	0.0058	0.012	↔	2023-04-23	2023-08-06	0.96	↔
2_27_5_106	MW-32	Appendix IV	Cadmium	mg/L	9	9	100%	-0.000000017	0.86	↔	0.00000083	0.071	↔	-0.000000059	0.54	↔	2023-04-09	2023-06-10	0.96	↔
2_27_5_109	MW-32	Appendix IV	Chromium, Total	mg/L	9	0	0%	0.0000053	0.044	↔	-0.0000020	0.012	↔	0.000000064	0.94	↔	2023-01-04	2023-06-28	0.96	↔
2_27_5_110	MW-32	Appendix IV	Cobalt	mg/L	9	0	0%	-0.000000029	0.95	↔	0.0000086	0.017	↔	-0.0000026	0.054	↔	2023-05-20	2023-06-27	0.95	↔
2_27_5_113	MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0	0%	0.00024	0.91	↔	-0.00068	0.63	↔	0.0034	0.17	↔	2023-03-13	2023-06-30	0.78	↔
2_27_5_115	MW-32	Appendix IV	Lead	mg/L	9	7	78%	-0.00000000000038	1.0	↔	-0.0000011	0.15	↔	0.000000000000032	1.0	↔	2023-03-30	2023-07-14	0.90	↔
2_27_5_118	MW-32	Appendix IV	Molybdenum	mg/L	9	0	0%	-0.000019	0.0037	↓	0.000022	0.057	↔	-0.0000024	0.33	↔	2023-03-21	2023-06-12	0.97	↔
2_27_5_122	MW-32	Appendix IV	Selenium	mg/L	9	9	100%	0.000000049	0.86	↔	-0.0000023	0.071	↔	0.00000016	0.54	↔	2023-04-09	2023-06-10	0.96	↔
2_27_6_119	MW-32	Part 115	Nickel	mg/L	9	0	0%	-0.0000034	0.33	↔	0.0000013	0.90	↔	-0.0000023	0.46	↔	2023-04-17	2023-06-09	0.71	↔

Appendix III: Boron, MW-01R

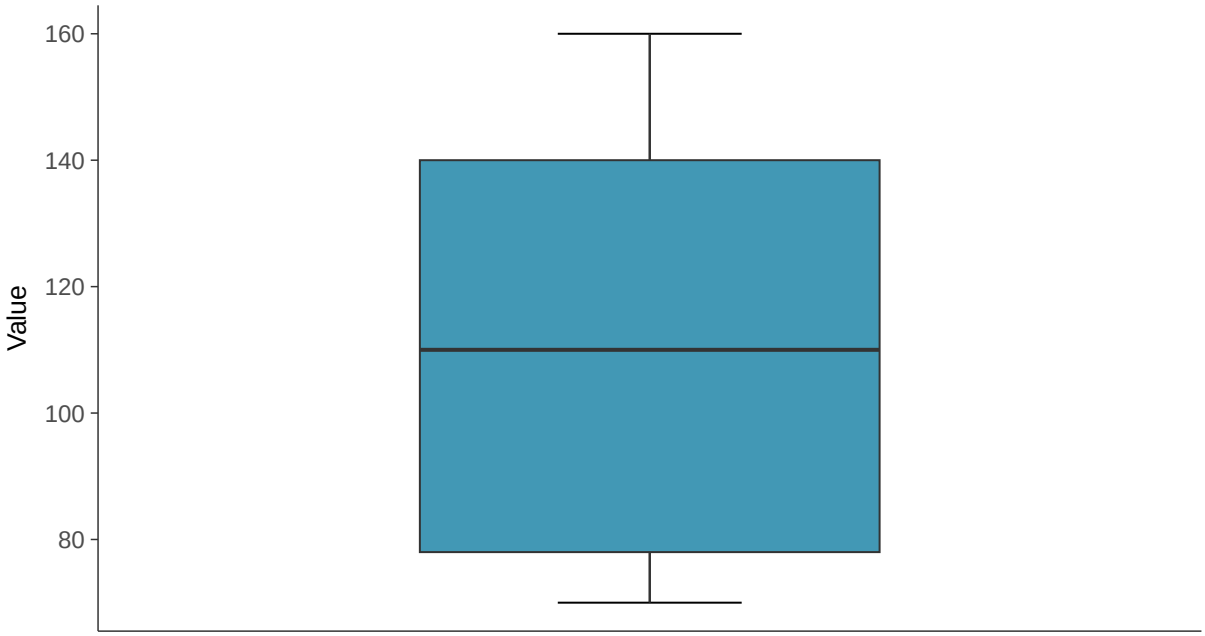
ID: 1_11_4_105





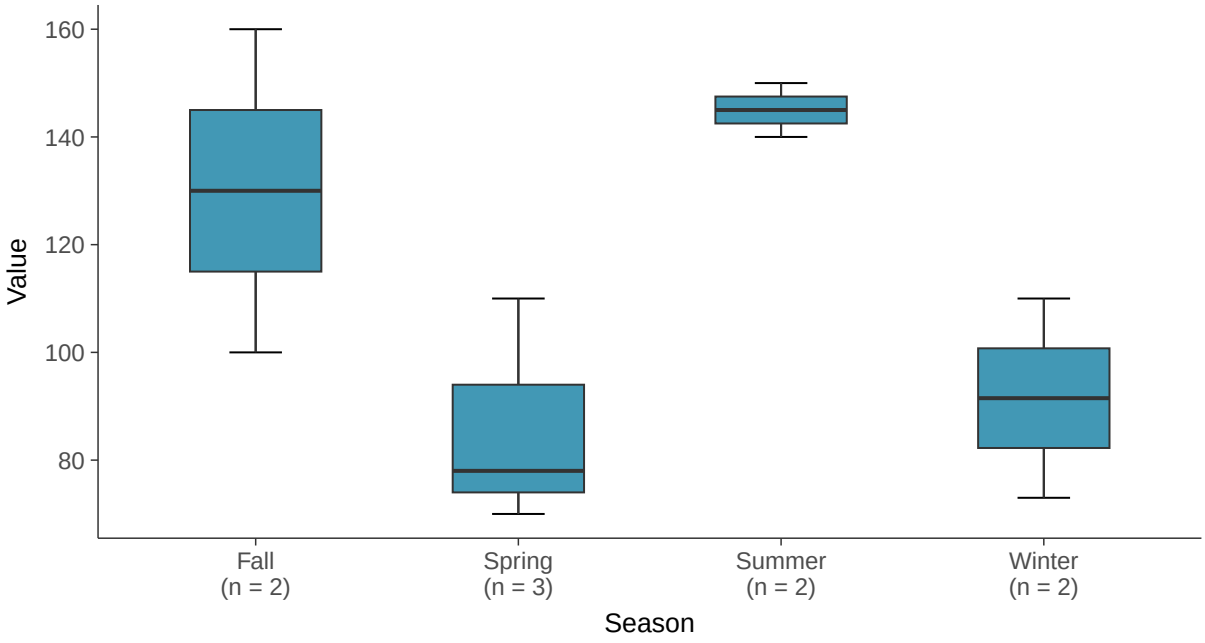
Boxplot

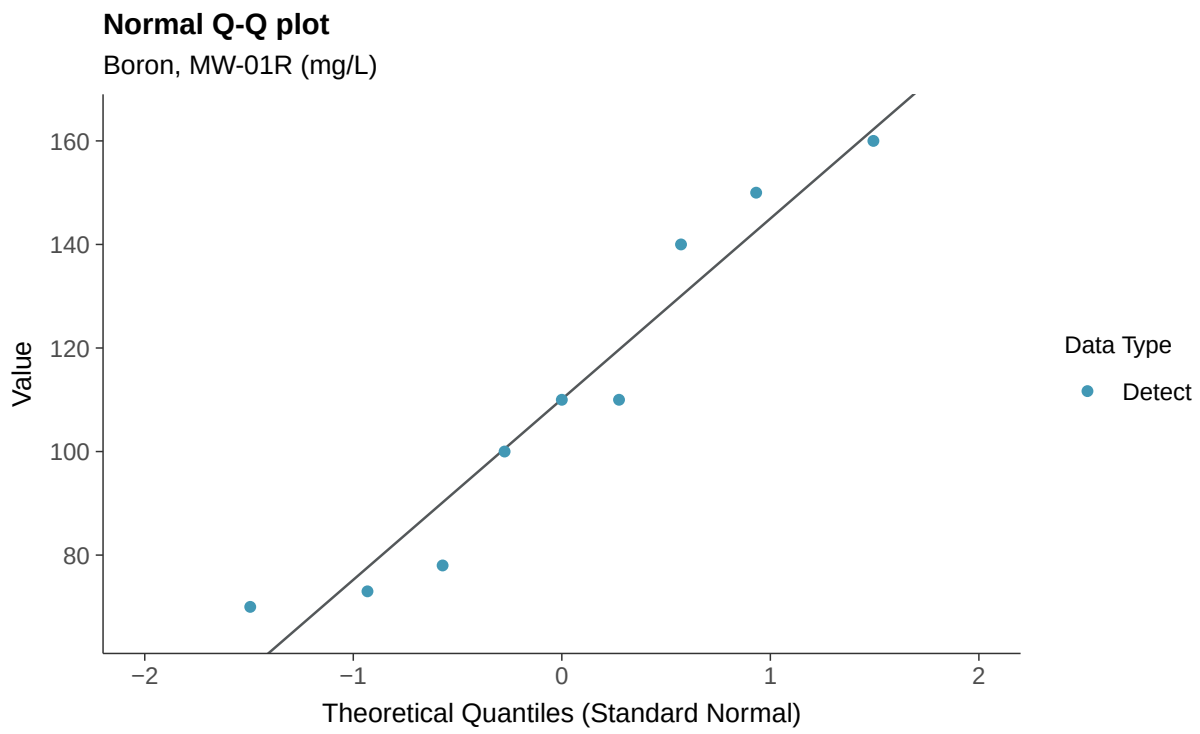
Boron, MW-01R (mg/L)

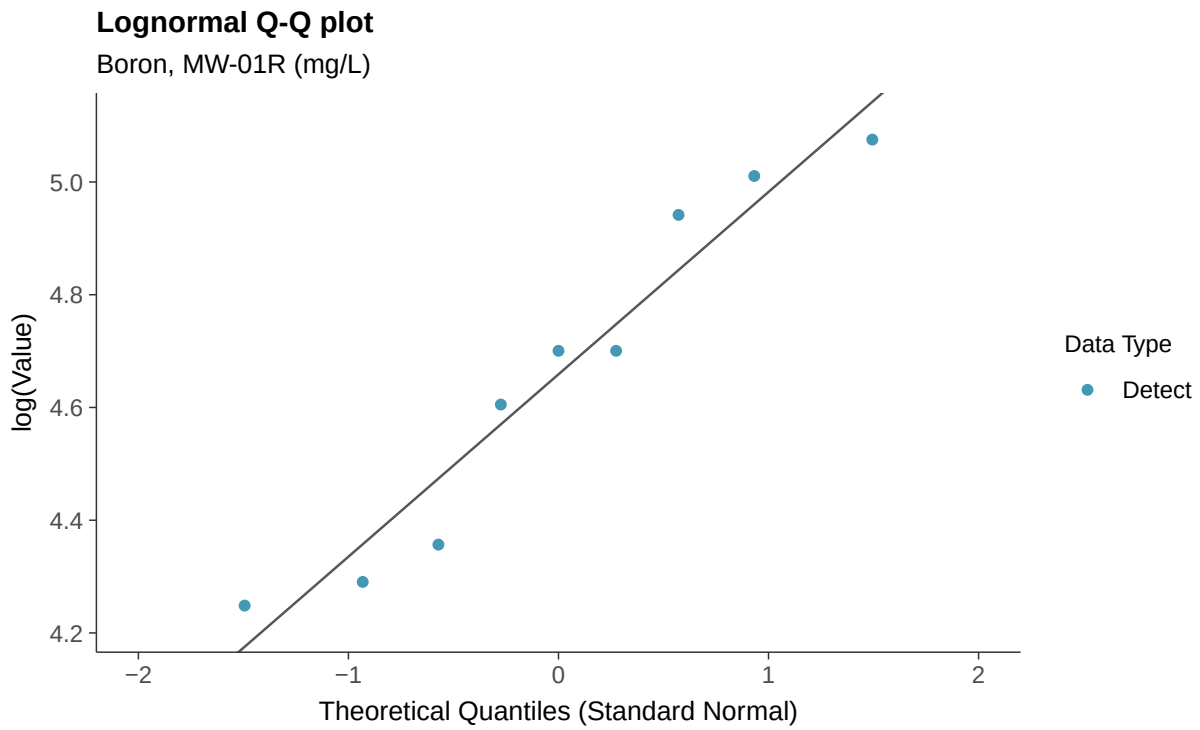


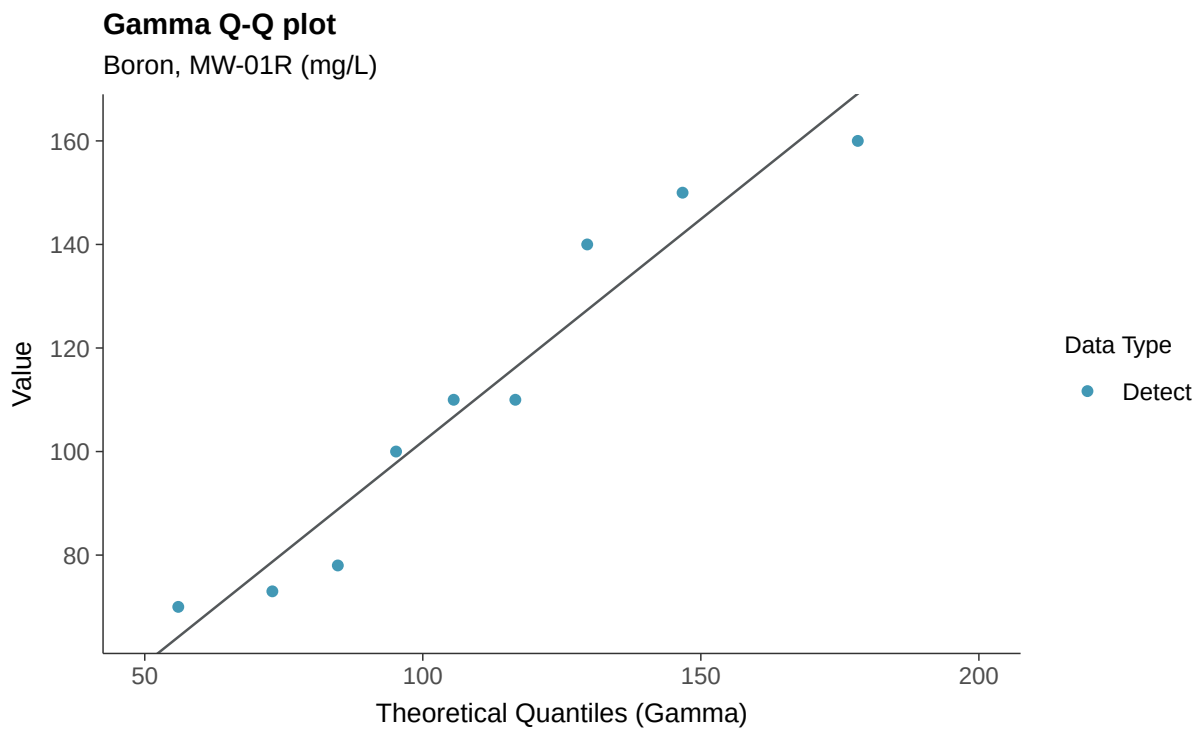
Boxplot by Season

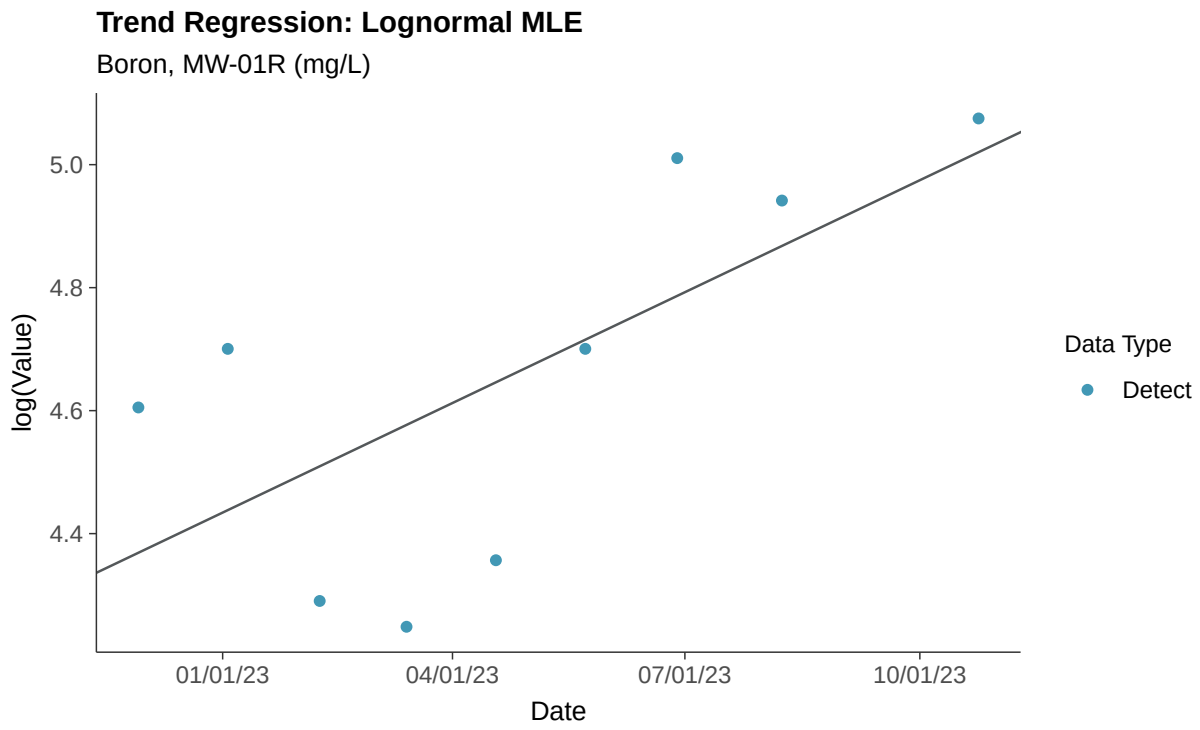
Boron, MW-01R (mg/L)




Normal Q-Q plot
Boron, MW-01R (mg/L)
Value
160
140
120
100
80
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

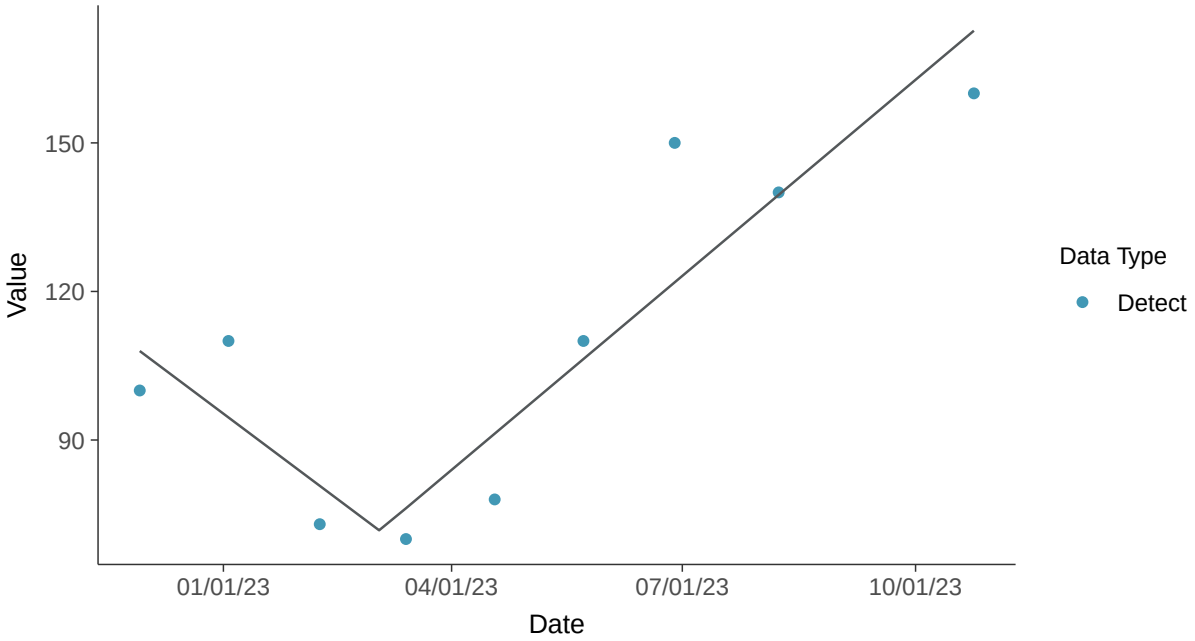

Lognormal Q-Q plot
Boron, MW-01R (mg/L)
log(Value)
5.0
4.8
4.6
4.4
4.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Boron, MW-01R (mg/L)
Value
160
140
120
100
80
50
100
150
200
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Boron, MW-01R (mg/L)
log(Value)
5.0
4.8
4.6
4.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

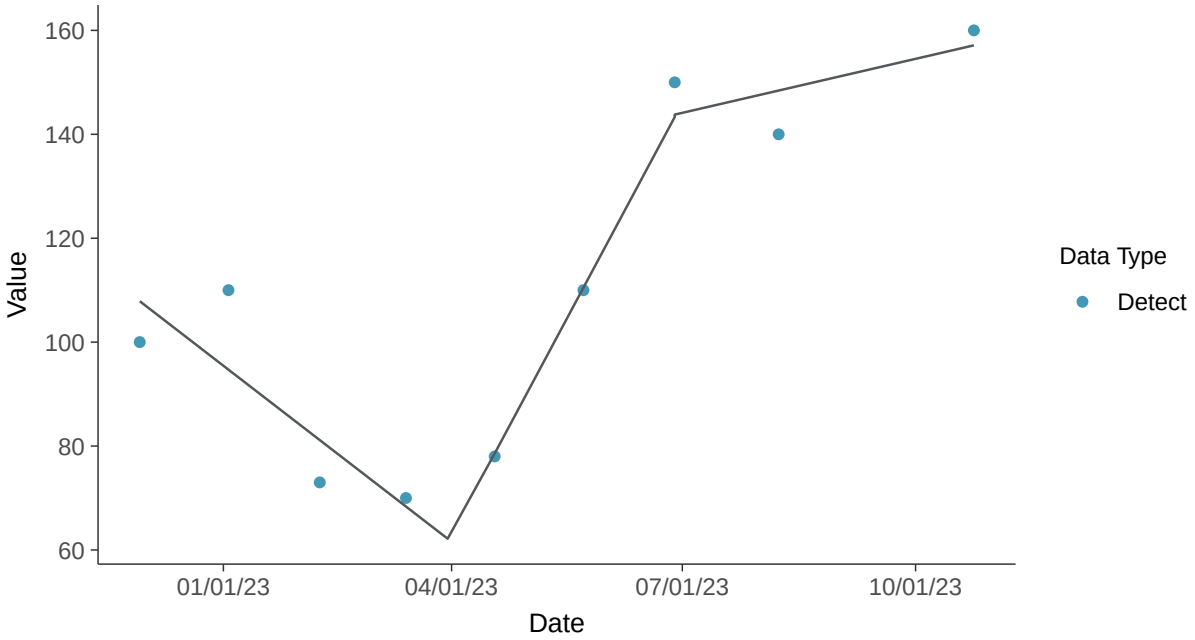
Trend Regression: Piecewise Linear-Linear

Boron, MW-01R (mg/L)



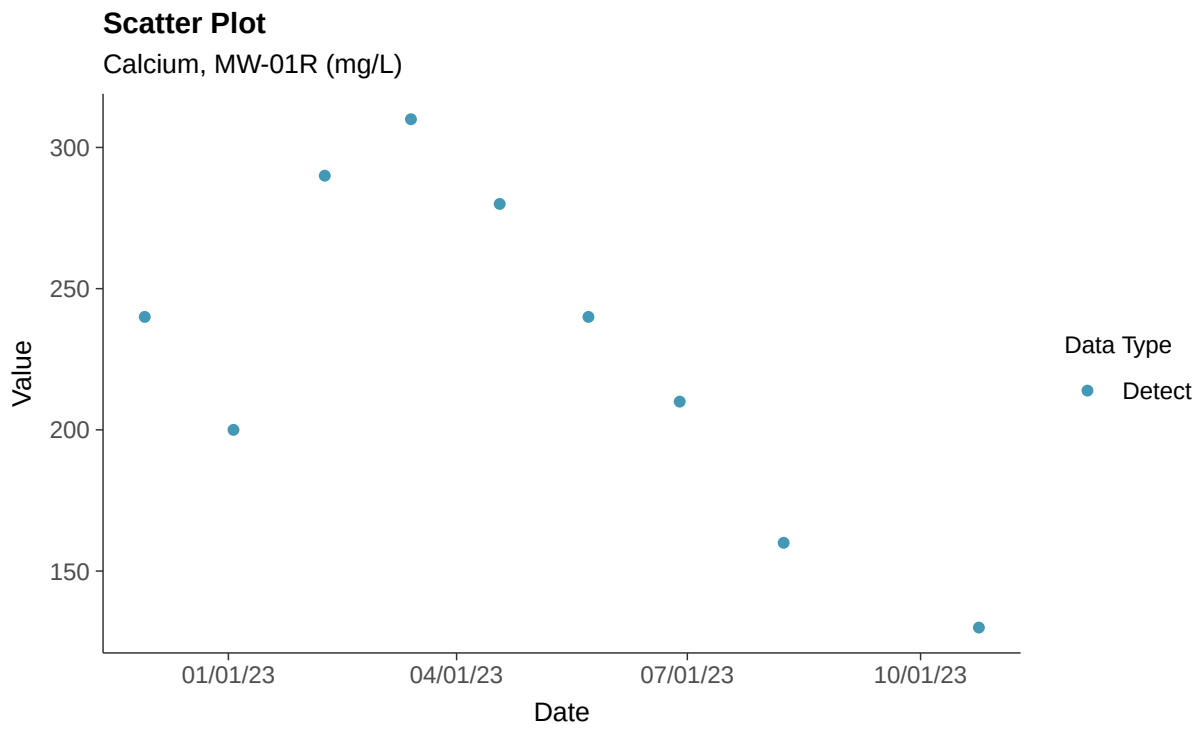
Trend Regression: Piecewise Linear-Linear-Linear

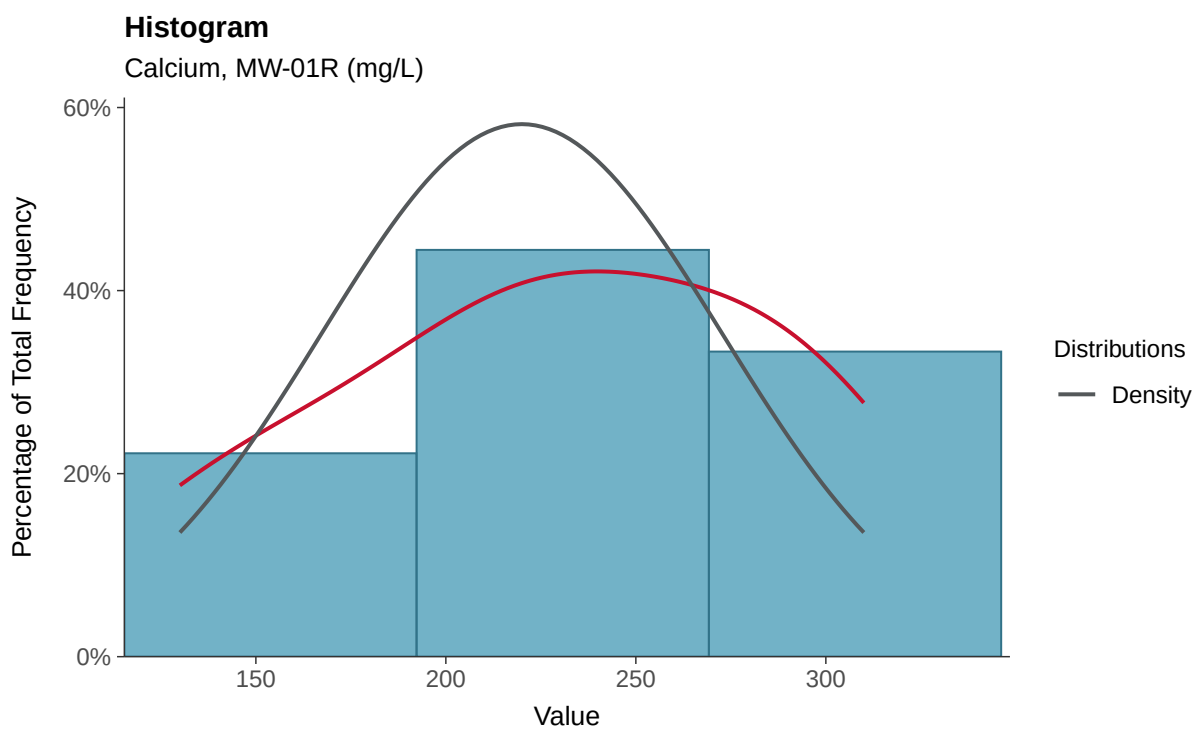
Boron, MW-01R (mg/L)



Appendix III: Calcium, MW-01R

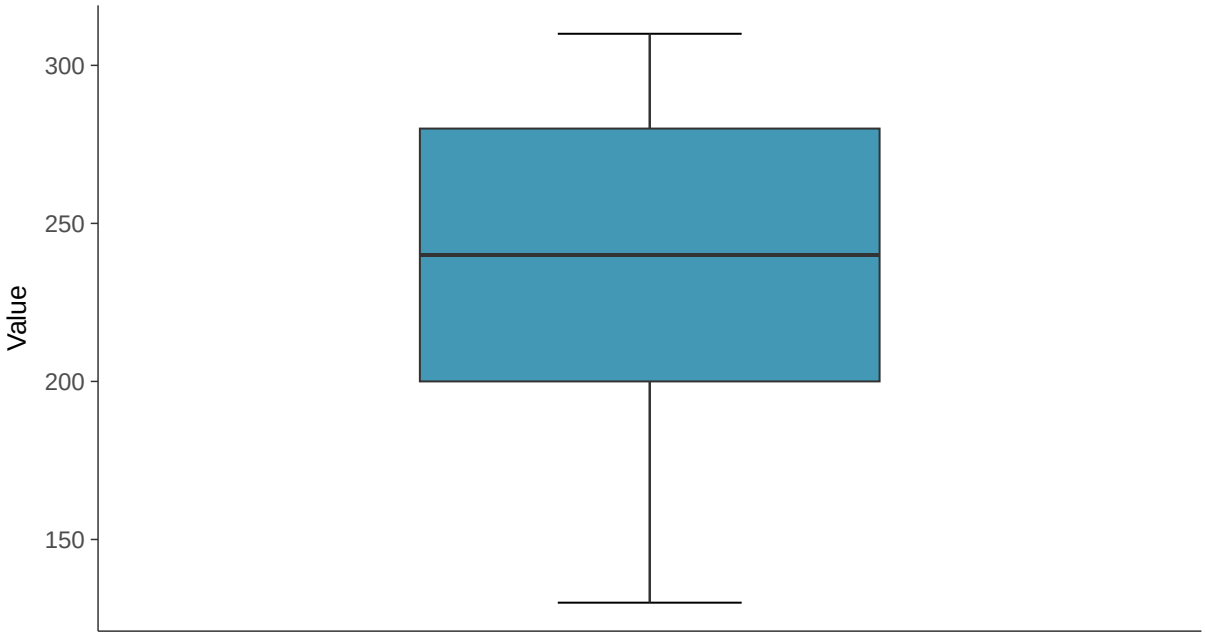
ID: 1_11_4_107





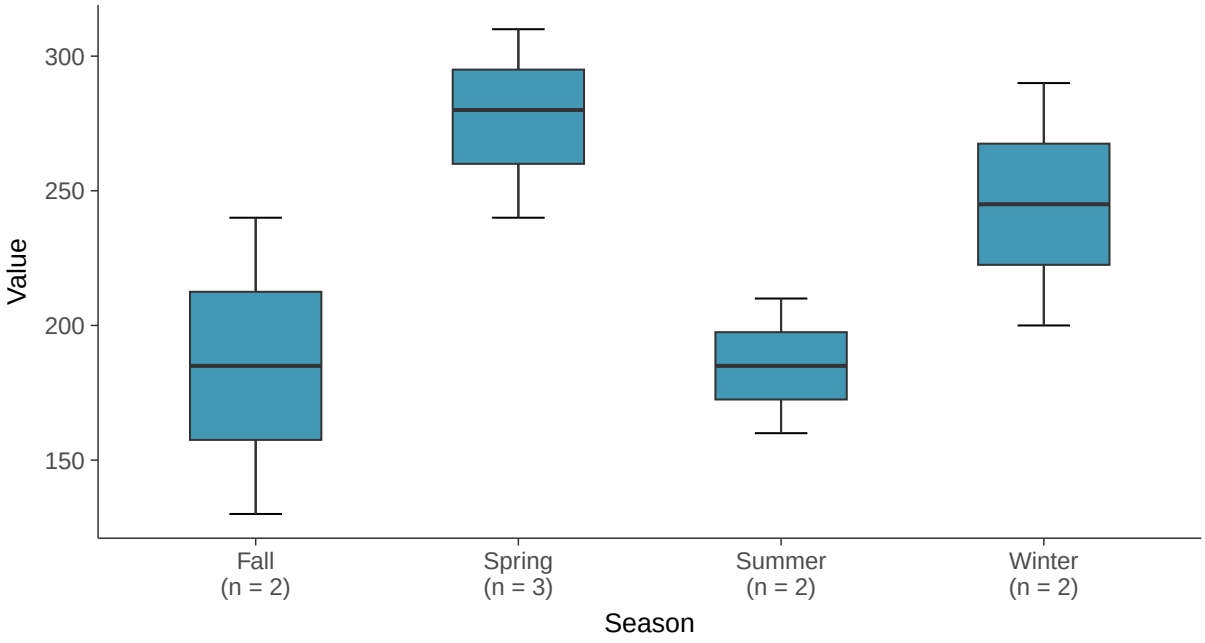
Boxplot

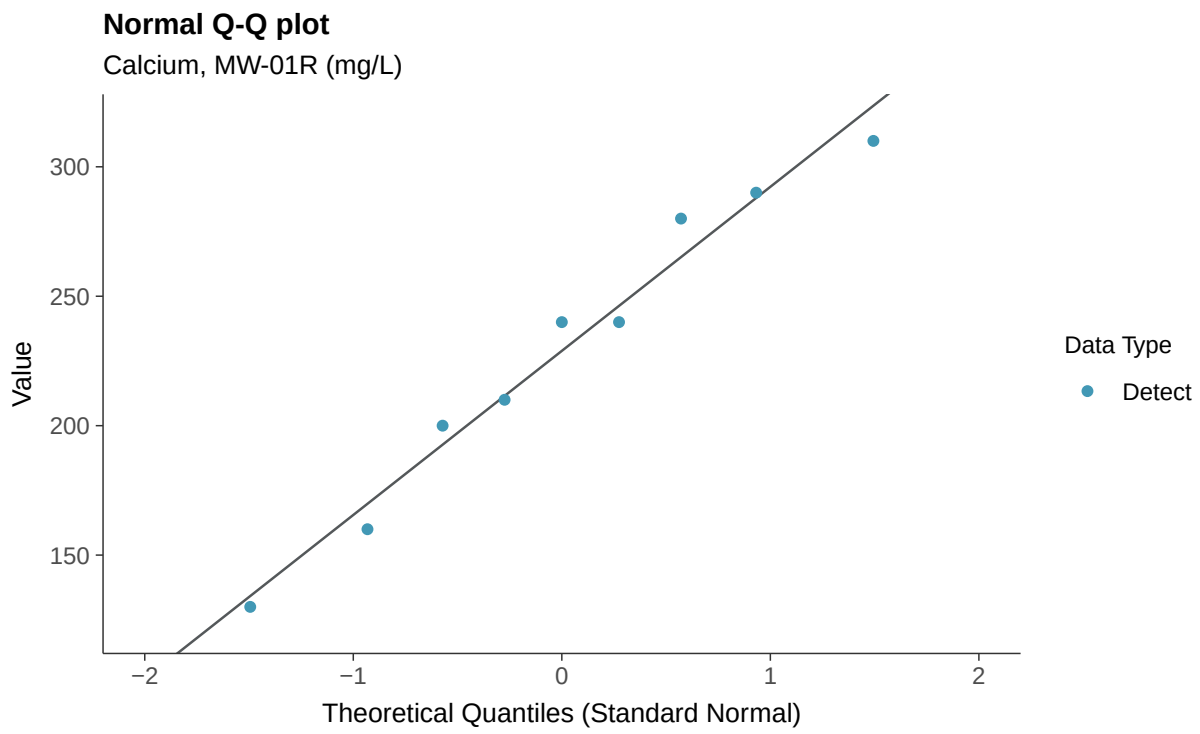
Calcium, MW-01R (mg/L)

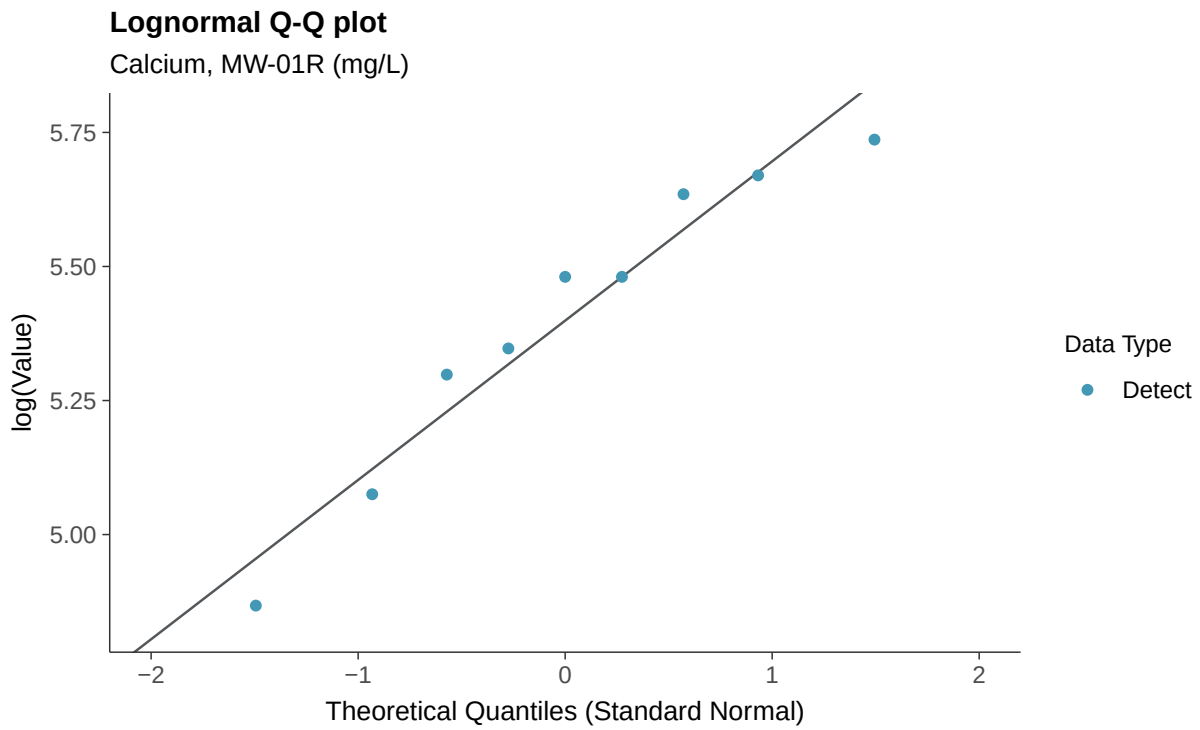


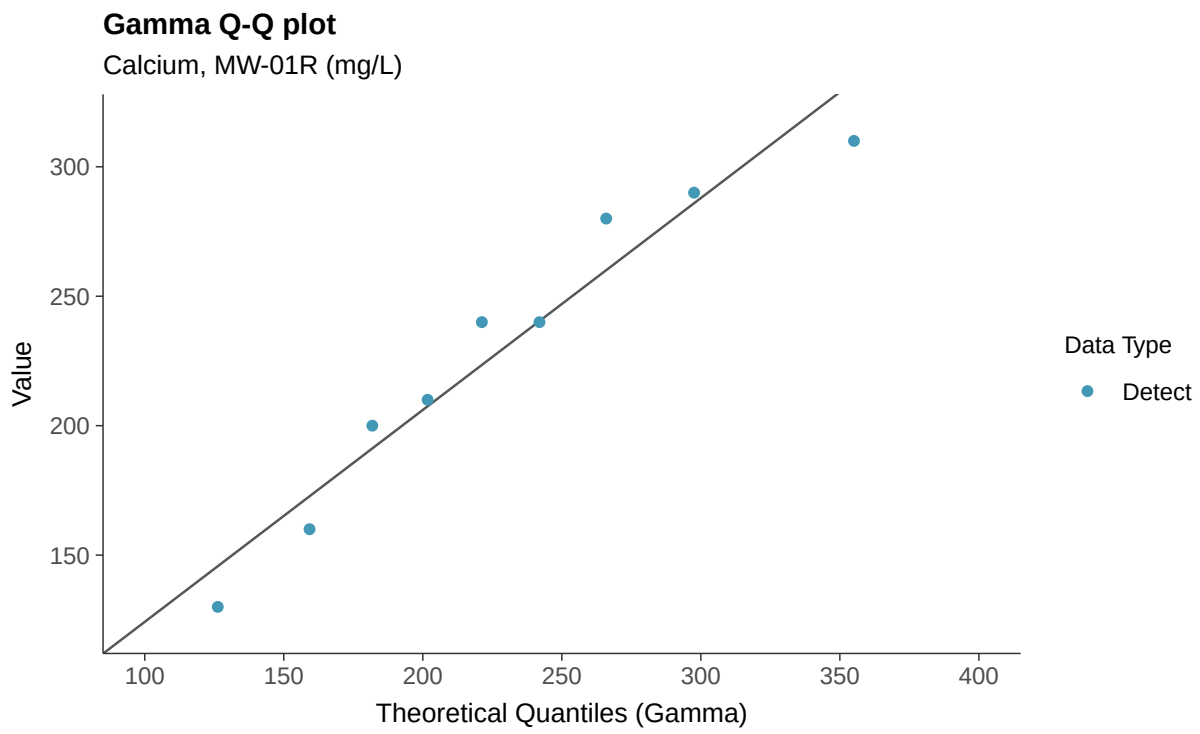
Boxplot by Season

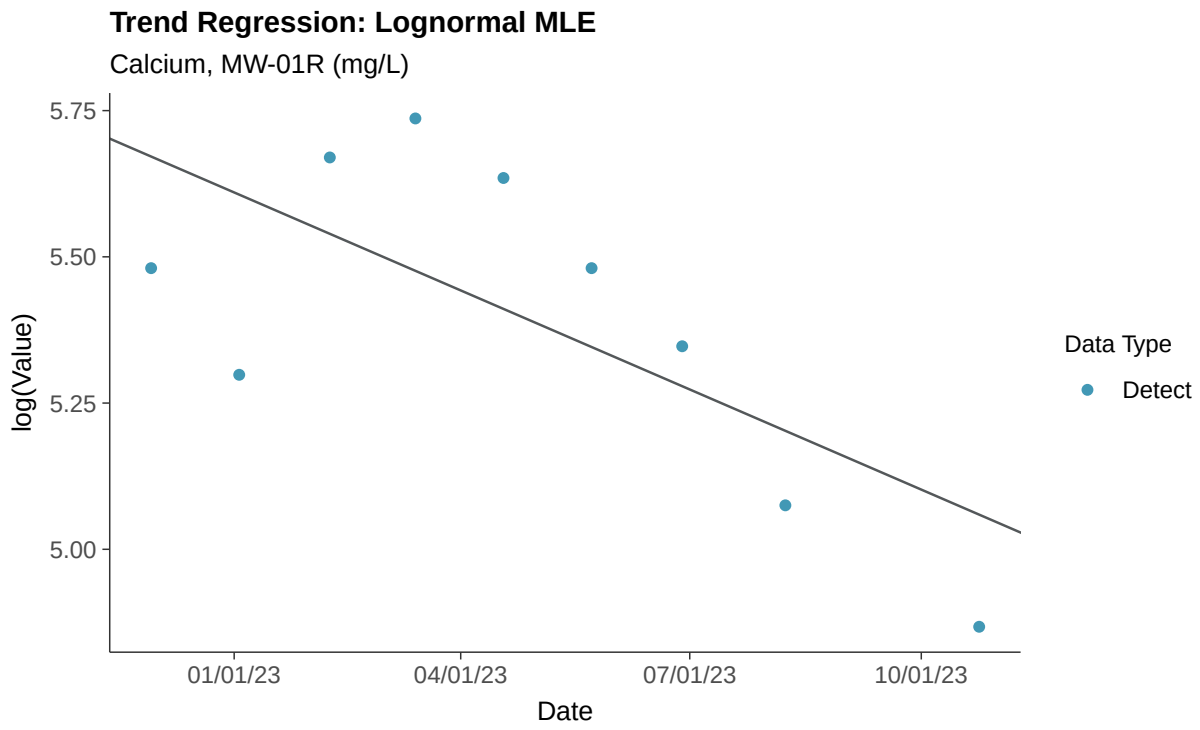
Calcium, MW-01R (mg/L)

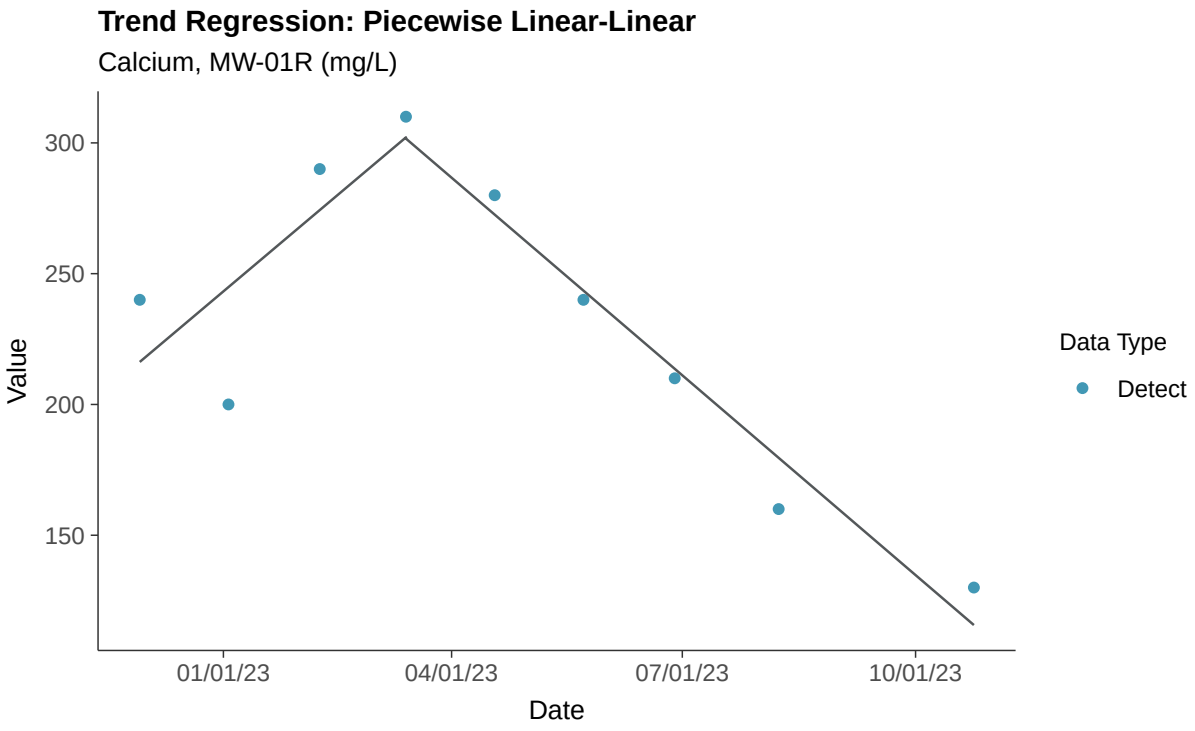



Normal Q-Q plot
Calcium, MW-01R (mg/L)
Value
300
250
200
150
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Calcium, MW-01R (mg/L)
log(Value)
5.75
5.50
5.25
5.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

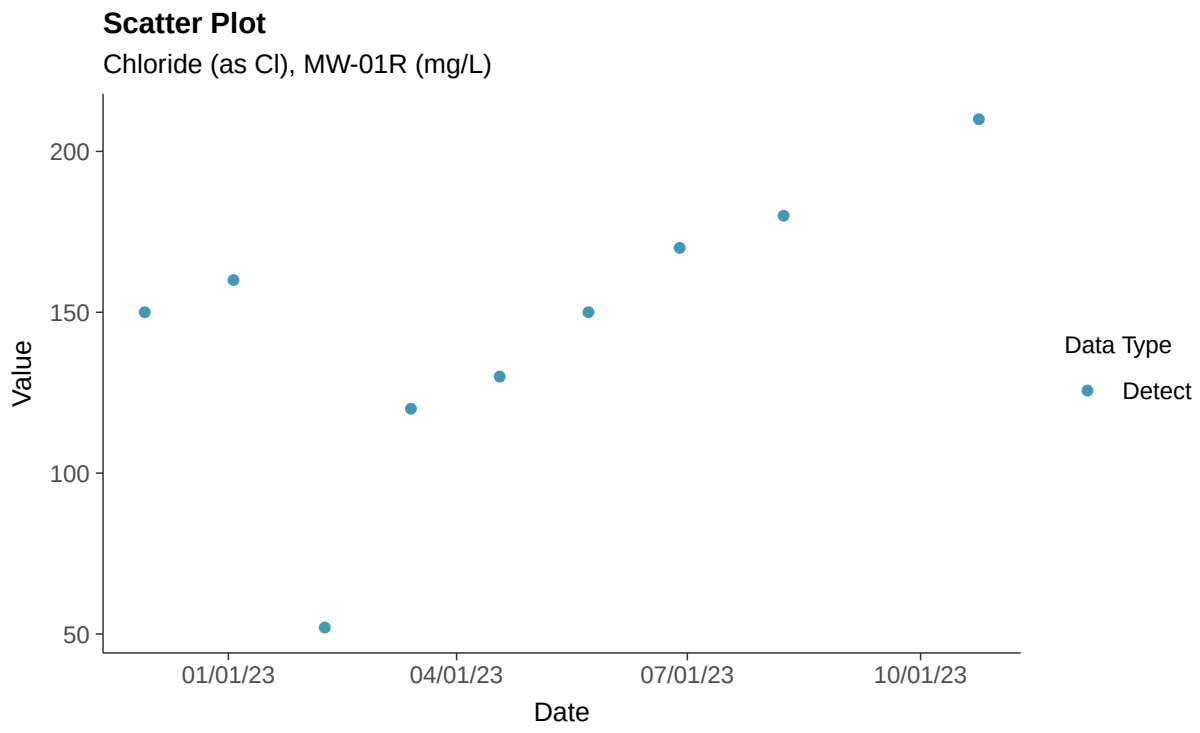

Gamma Q-Q plot
Calcium, MW-01R (mg/L)
Value
300
250
200
150
100
150
200
250
300
350
400
Theoretical Quantiles (Gamma)
Data Type
Detect

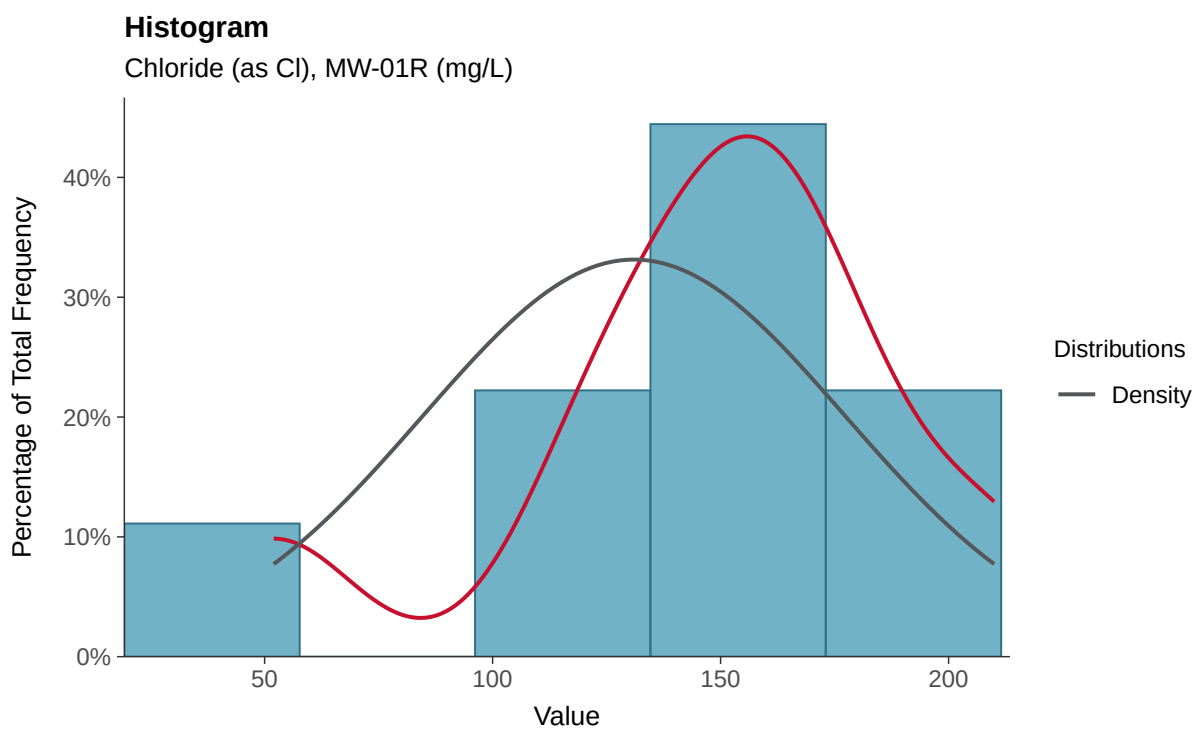

Trend Regression: Lognormal MLE
Calcium, MW-01R (mg/L)
log(Value)
5.75
5.50
5.25
5.00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Calcium, MW-01R (mg/L)
300
250
200
150
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-01R

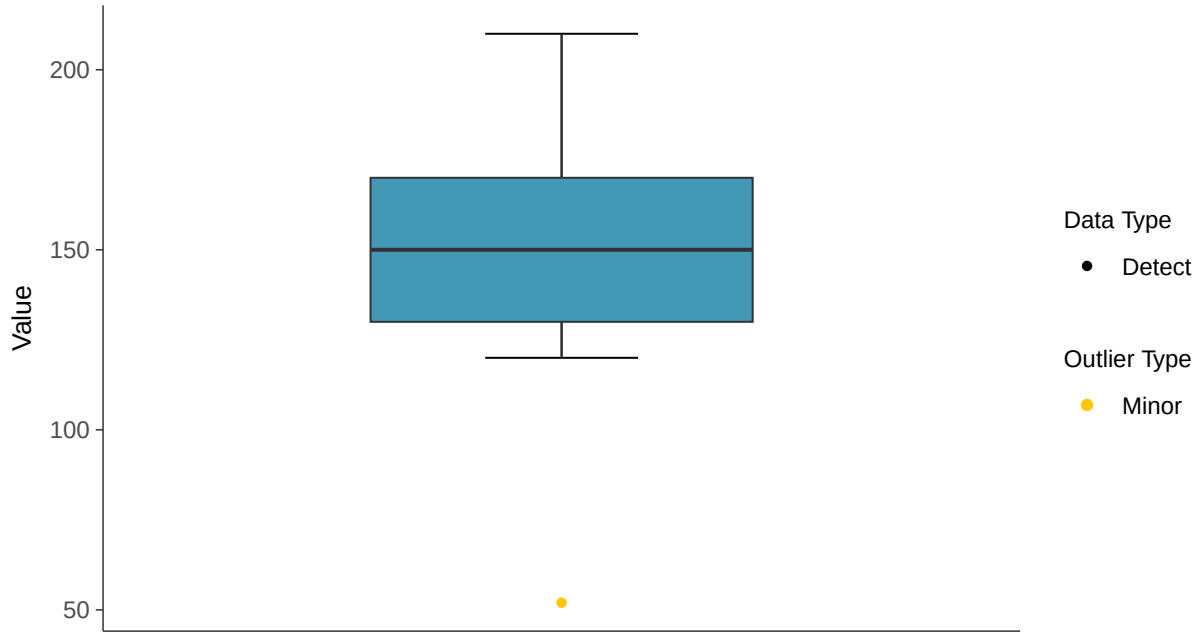
ID: 1_11_4_108





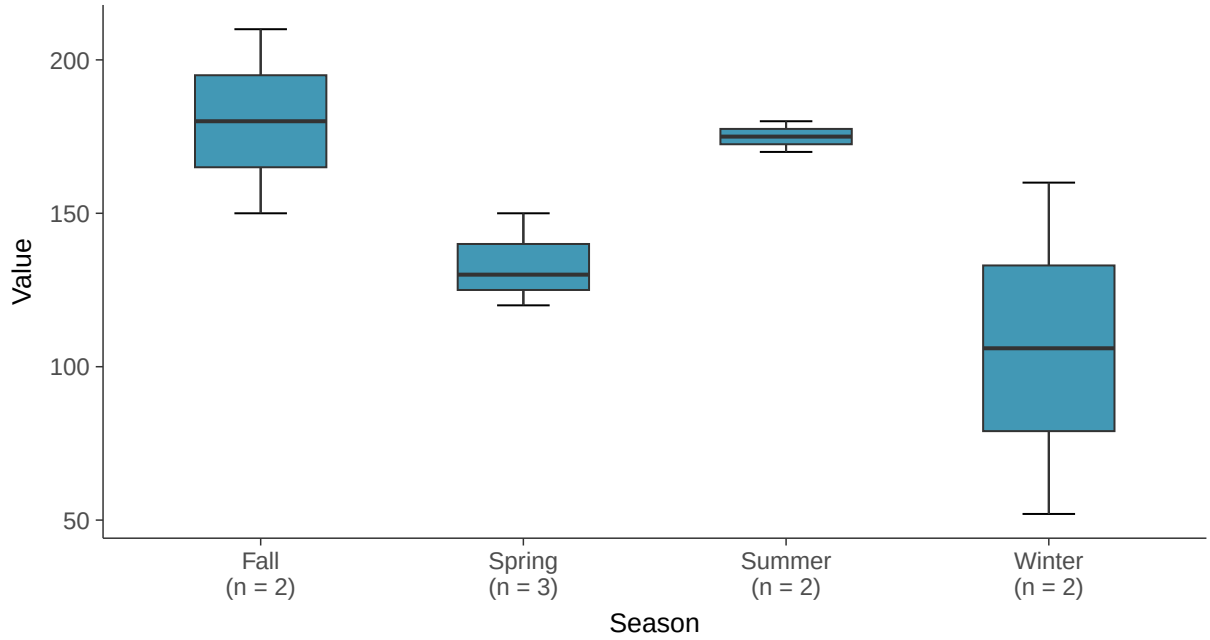
Boxplot

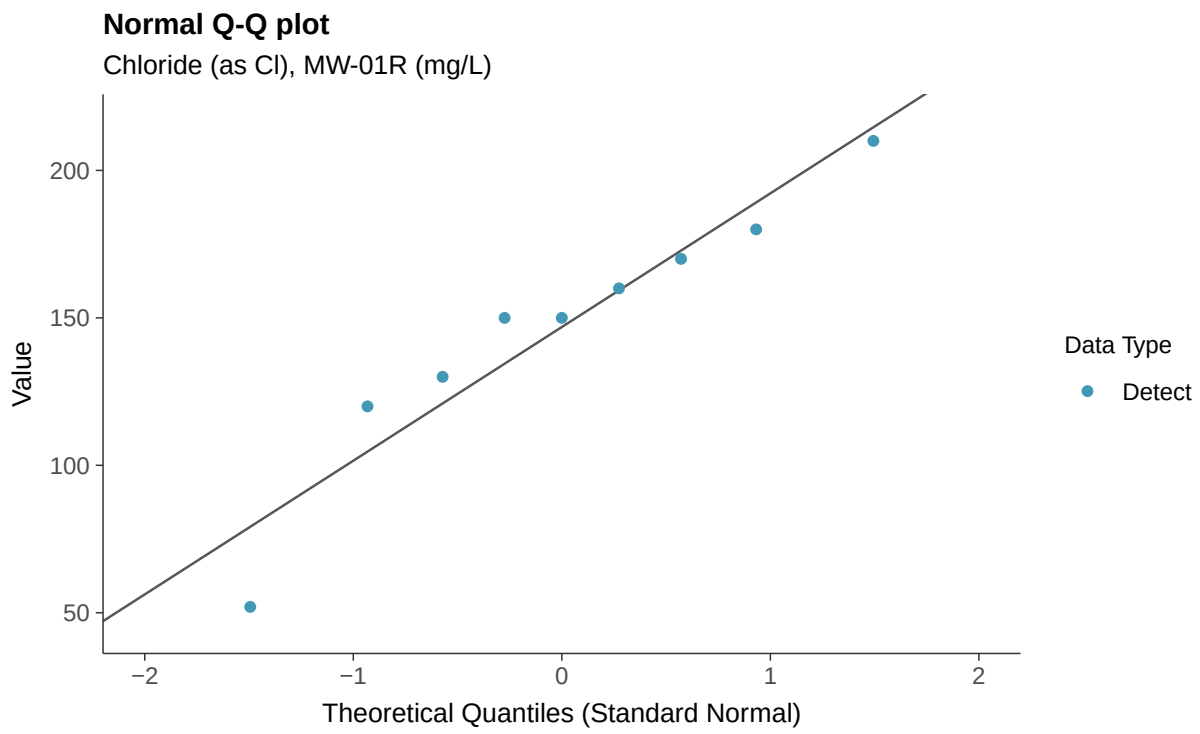
Chloride (as Cl), MW-01R (mg/L)

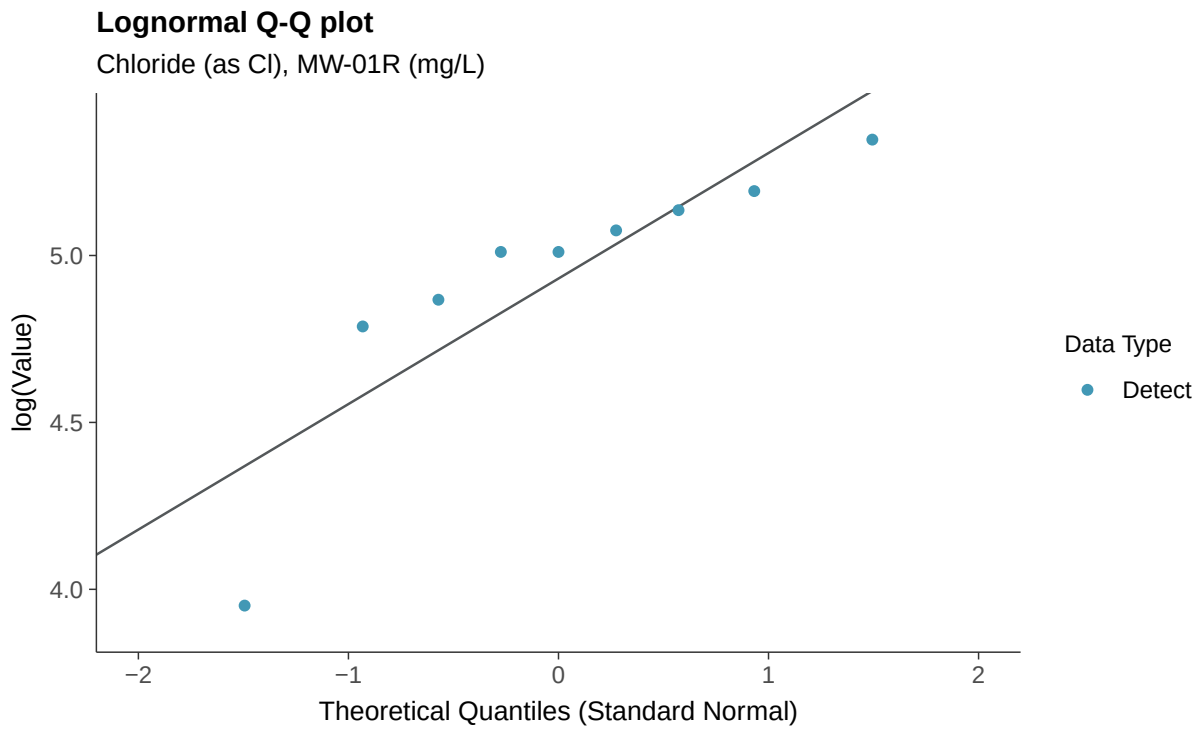


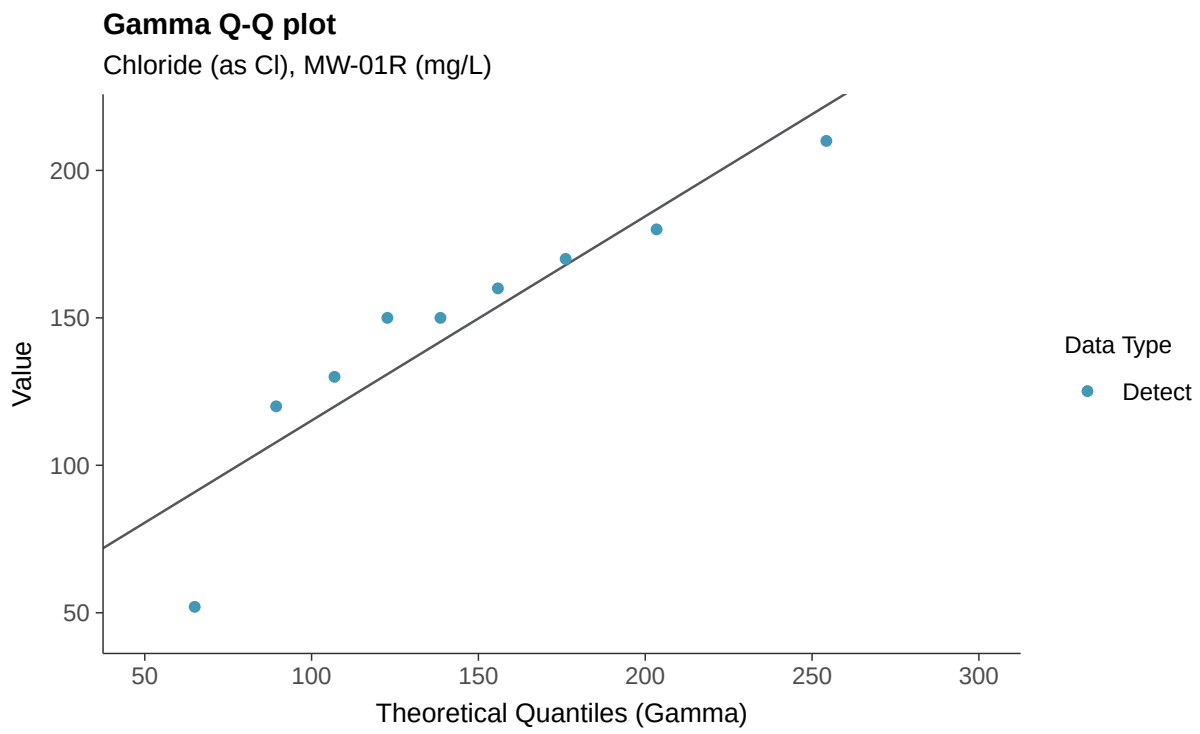
Boxplot by Season

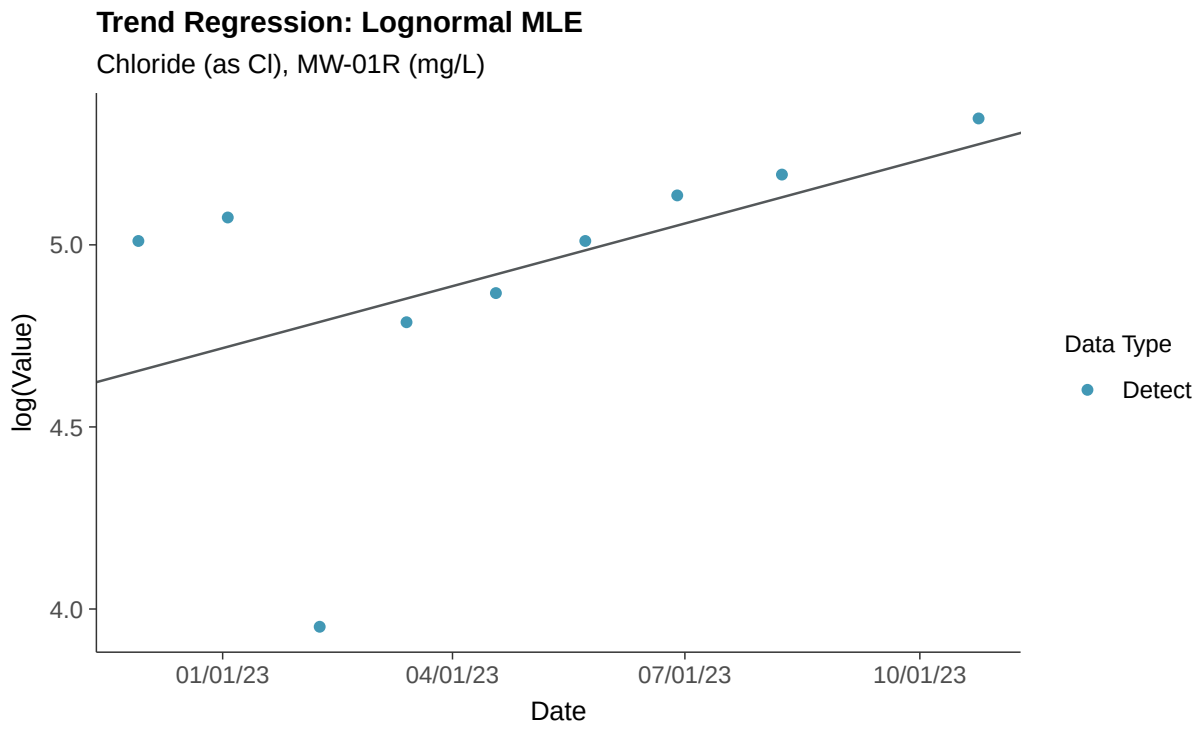
Chloride (as Cl), MW-01R (mg/L)

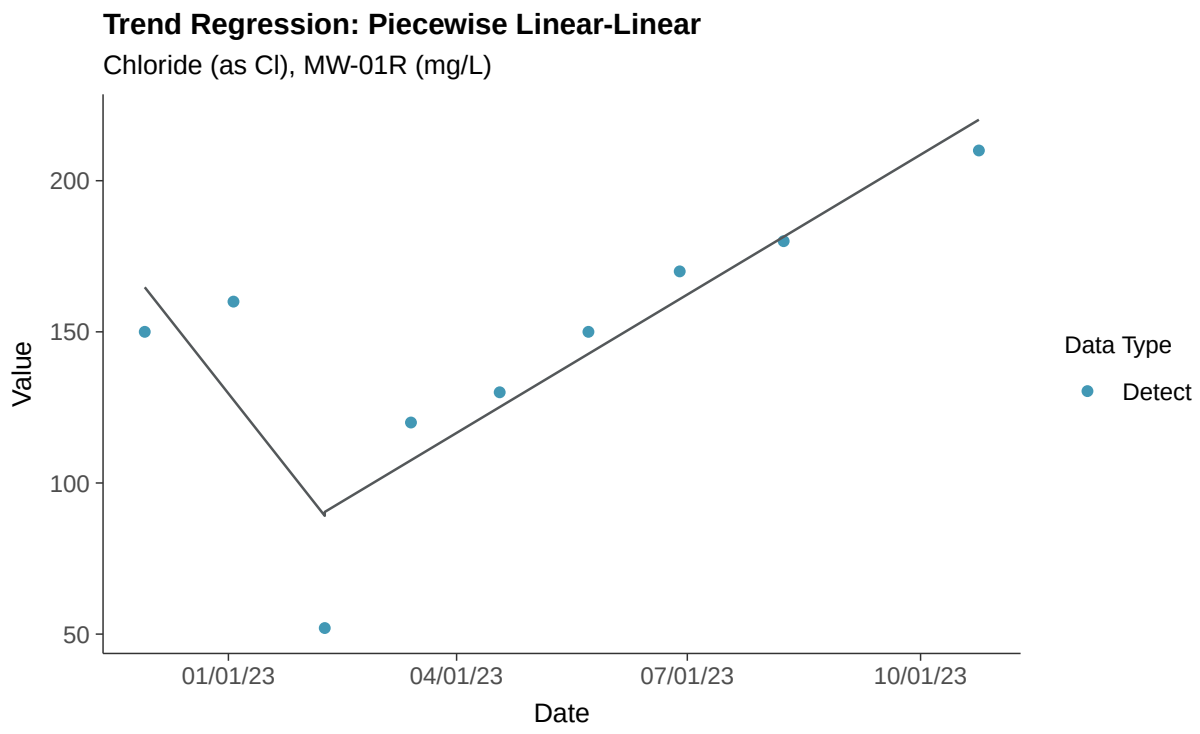



Normal Q-Q plot
Chloride (as Cl), MW-01R (mg/L)
Value
200
150
100
50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chloride (as Cl), MW-01R (mg/L)
log(Value)
5.0
4.5
4.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

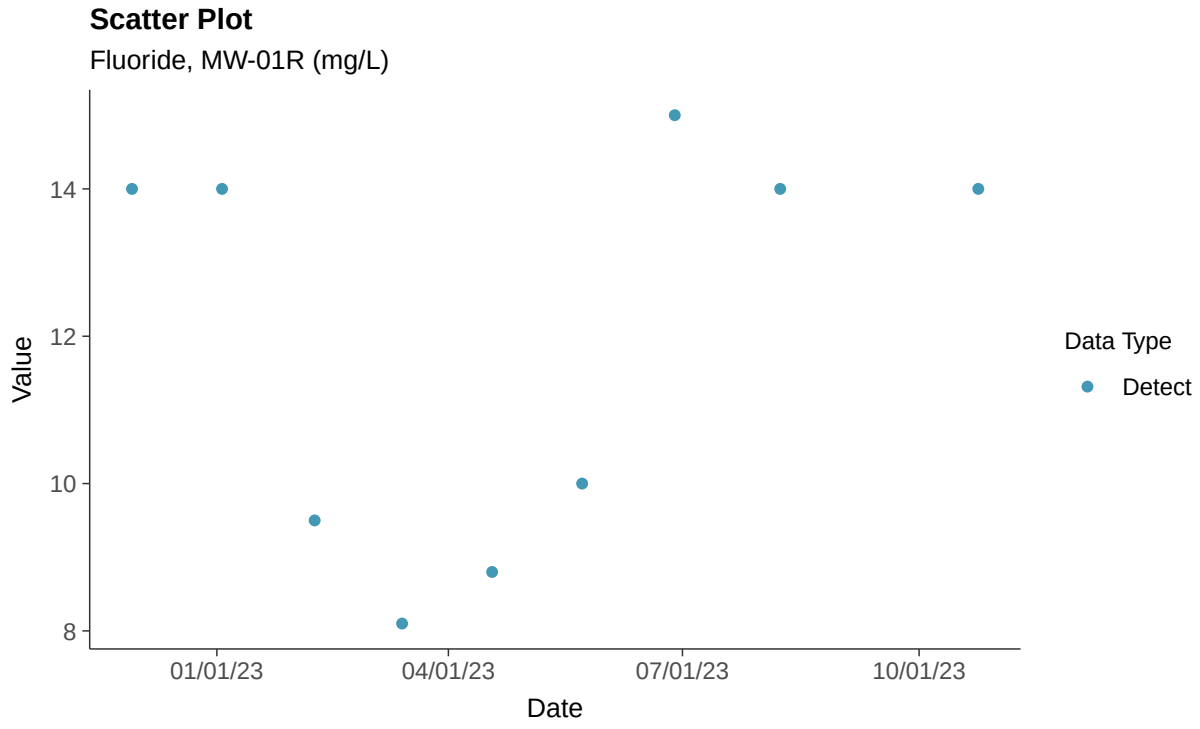

Gamma Q-Q plot
Chloride (as Cl), MW-01R (mg/L)
Value
200
150
100
50
50
100
150
200
250
300
Theoretical Quantiles (Gamma)
Data Type
Detect

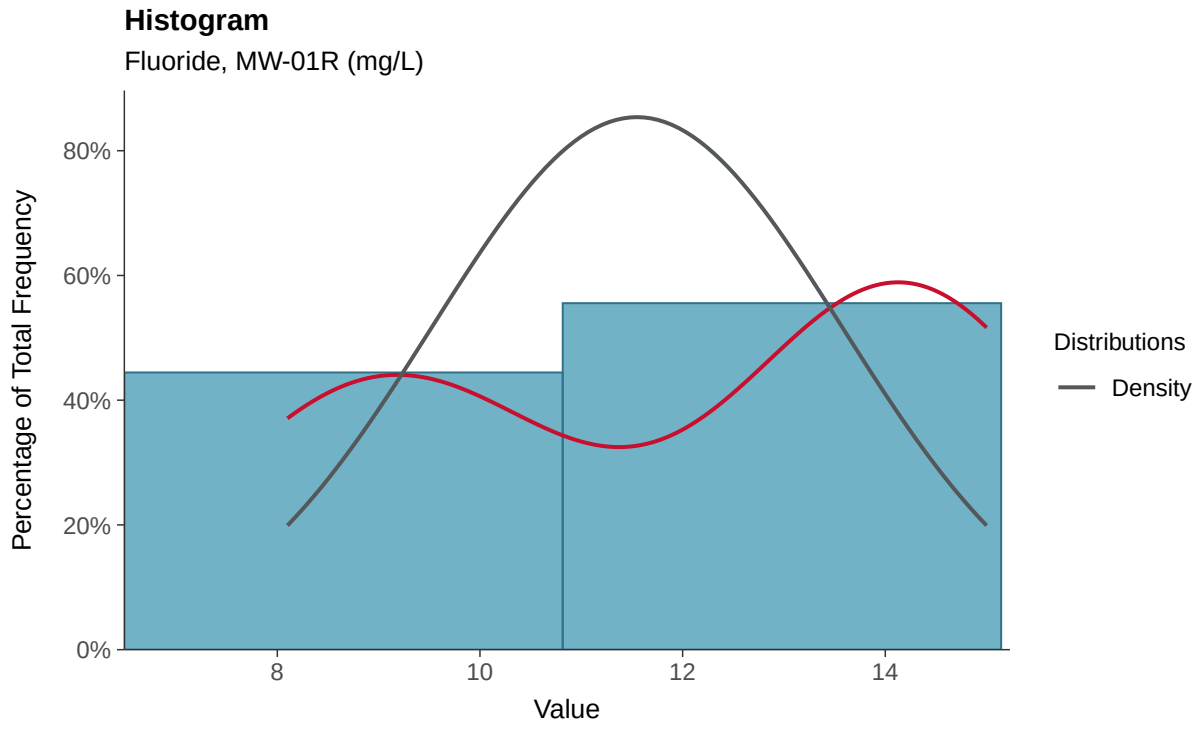

Trend Regression: Lognormal MLE
Chloride (as Cl), MW-01R (mg/L)
log(Value)
5.0
4.5
4.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-01R (mg/L)
Value
200
150
100
50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-01R

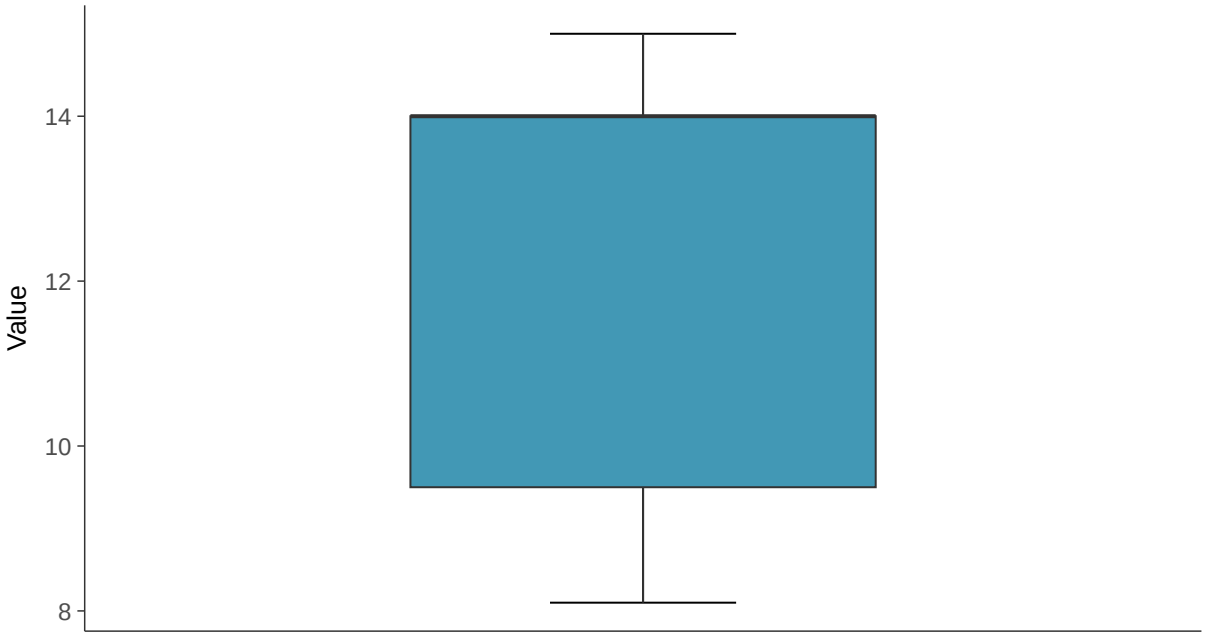
ID: 1_11_4_112





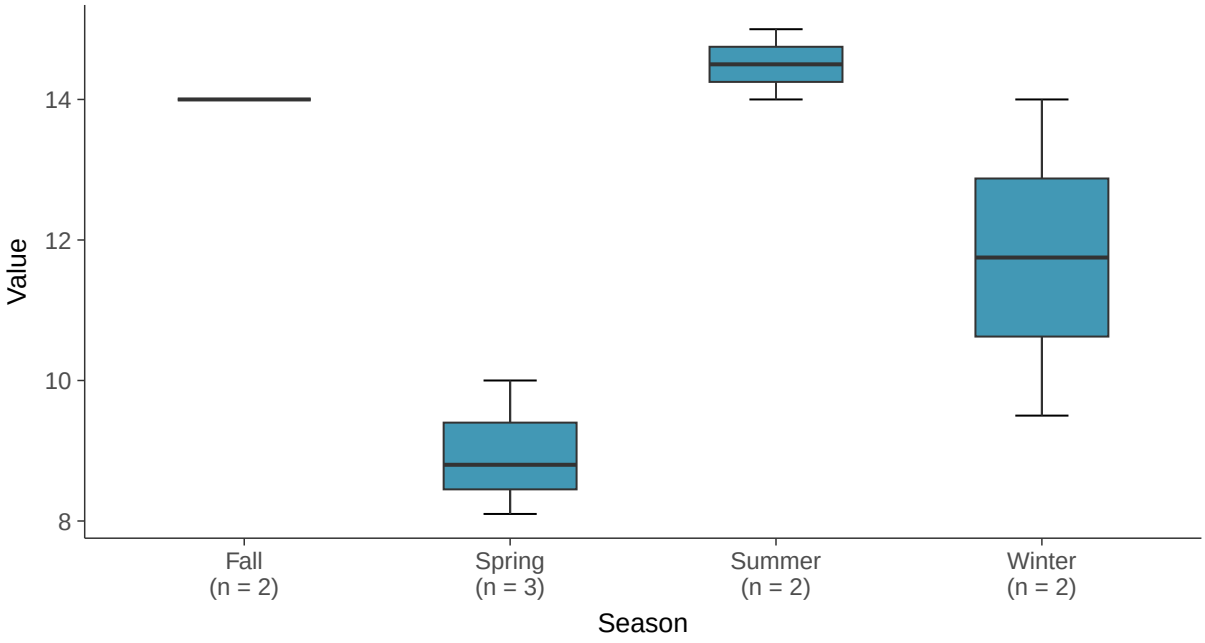
Boxplot

Fluoride, MW-01R (mg/L)



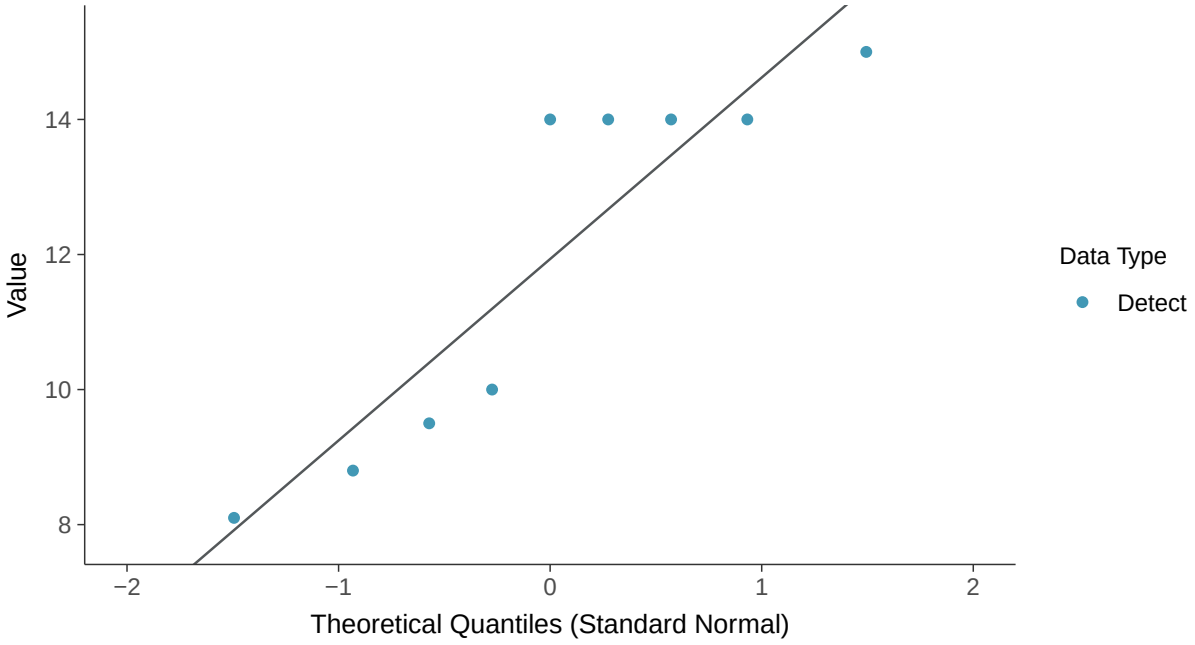
Boxplot by Season

Fluoride, MW-01R (mg/L)



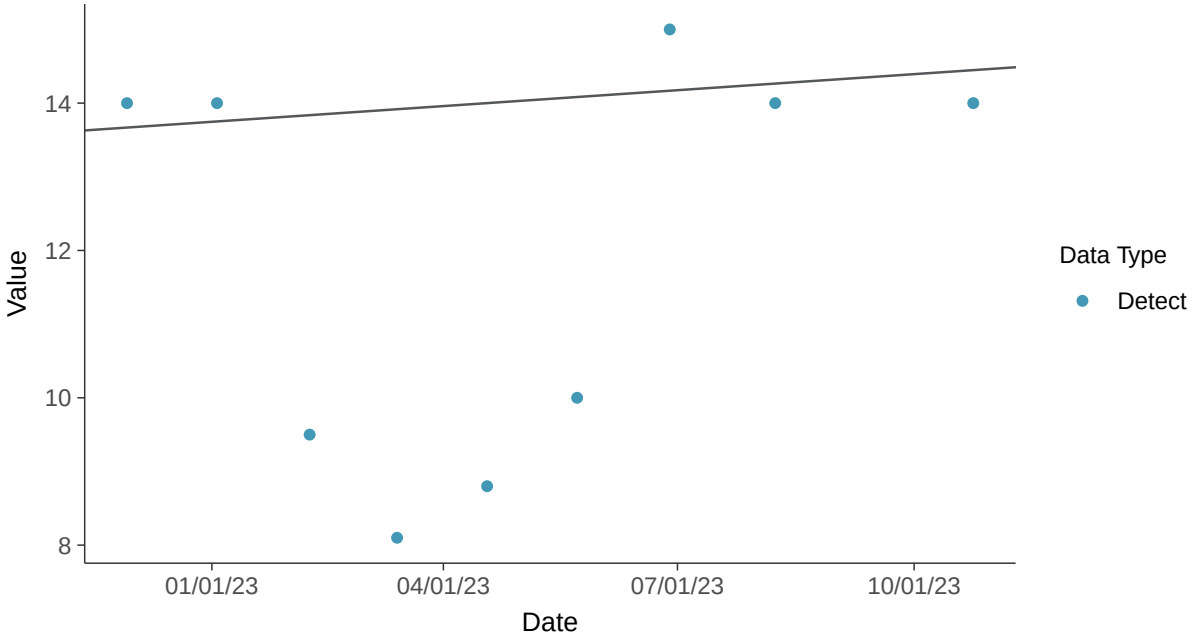
Normal Q-Q plot

Fluoride, MW-01R (mg/L)



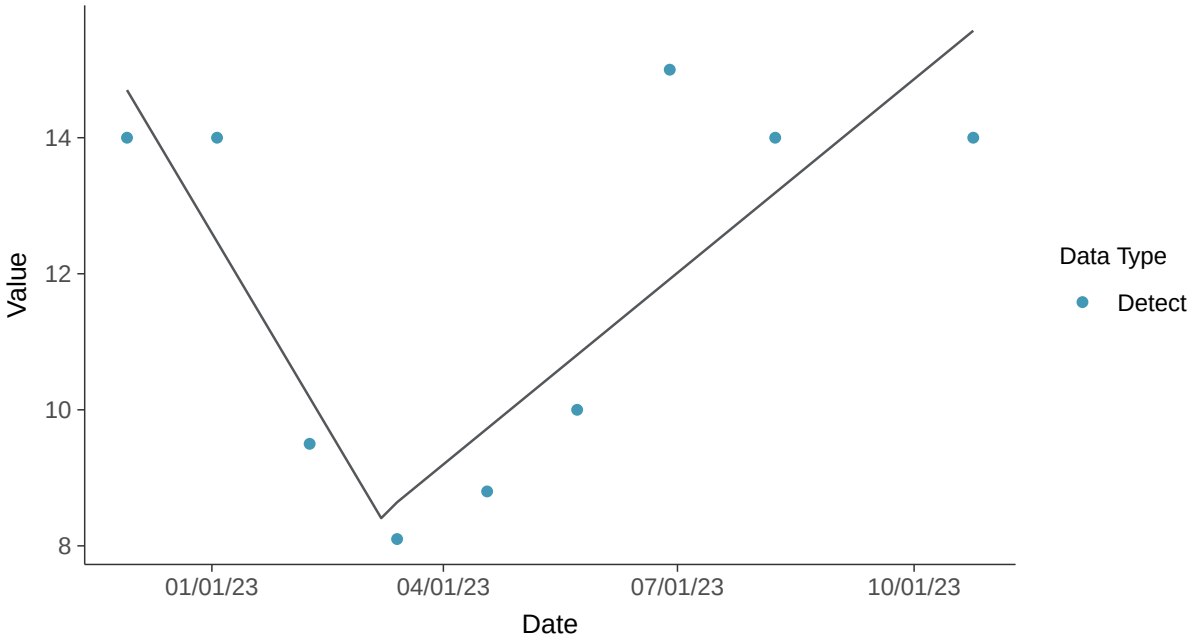
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Fluoride, MW-01R (mg/L)



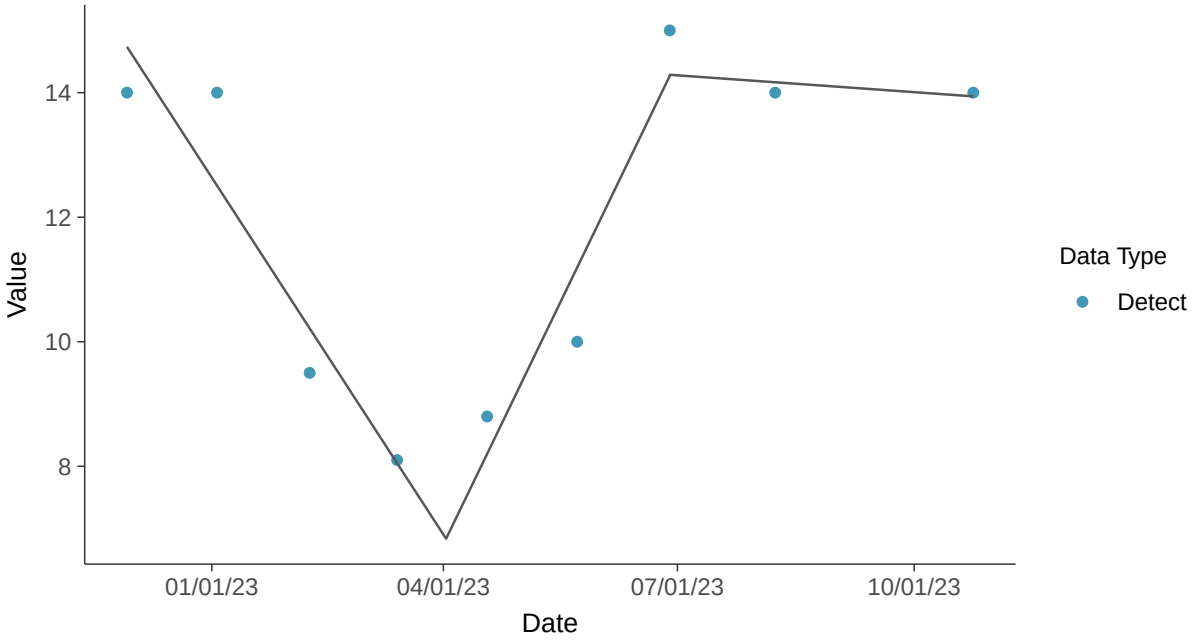
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-01R (mg/L)



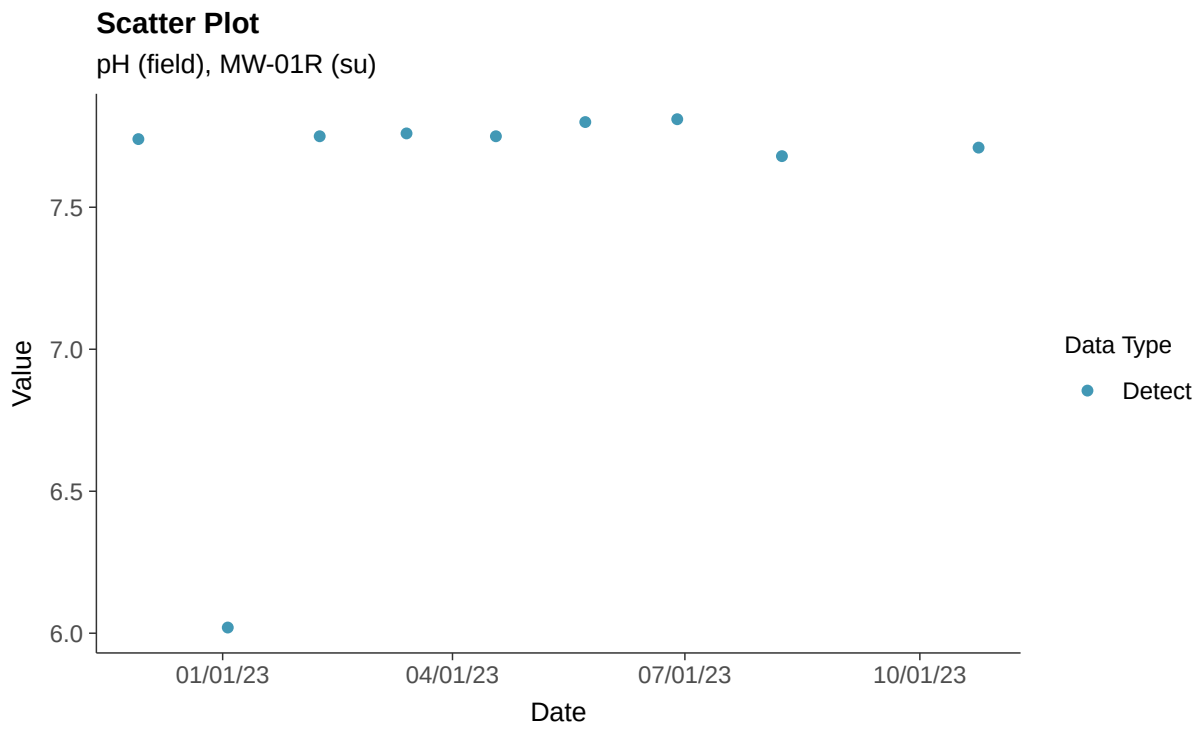
Trend Regression: Piecewise Linear-Linear-Linear

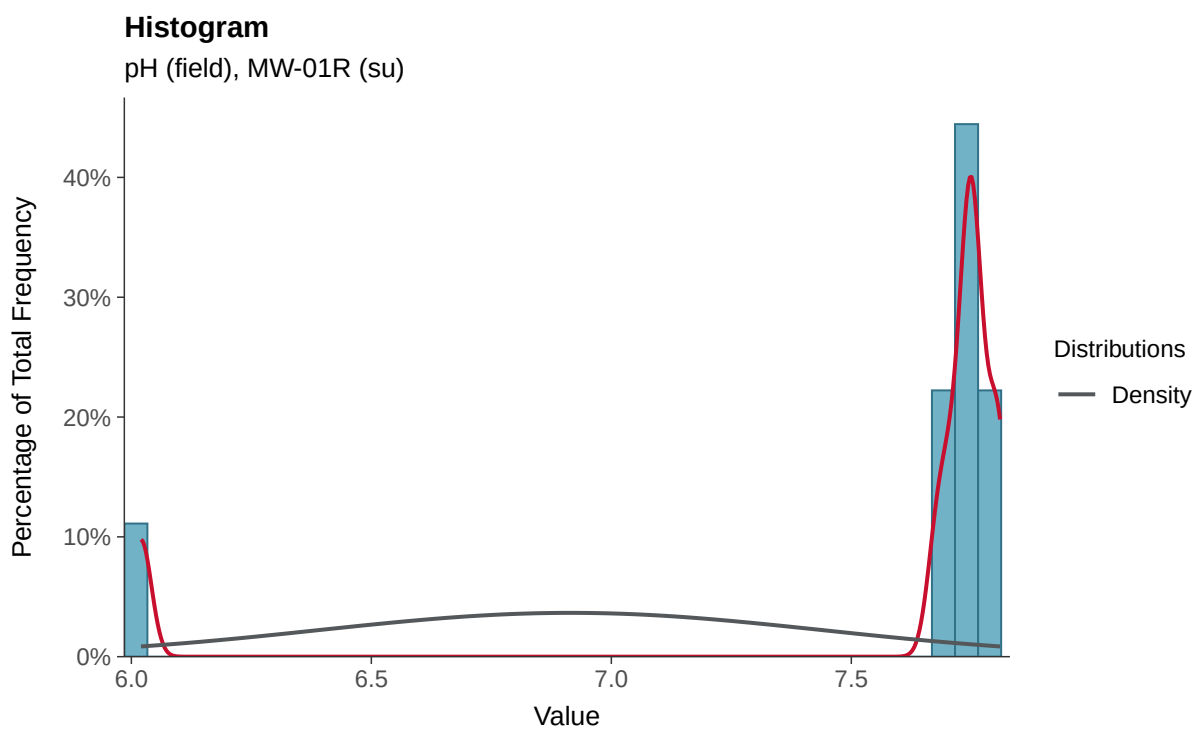
Fluoride, MW-01R (mg/L)



Appendix III: pH (field), MW-01R

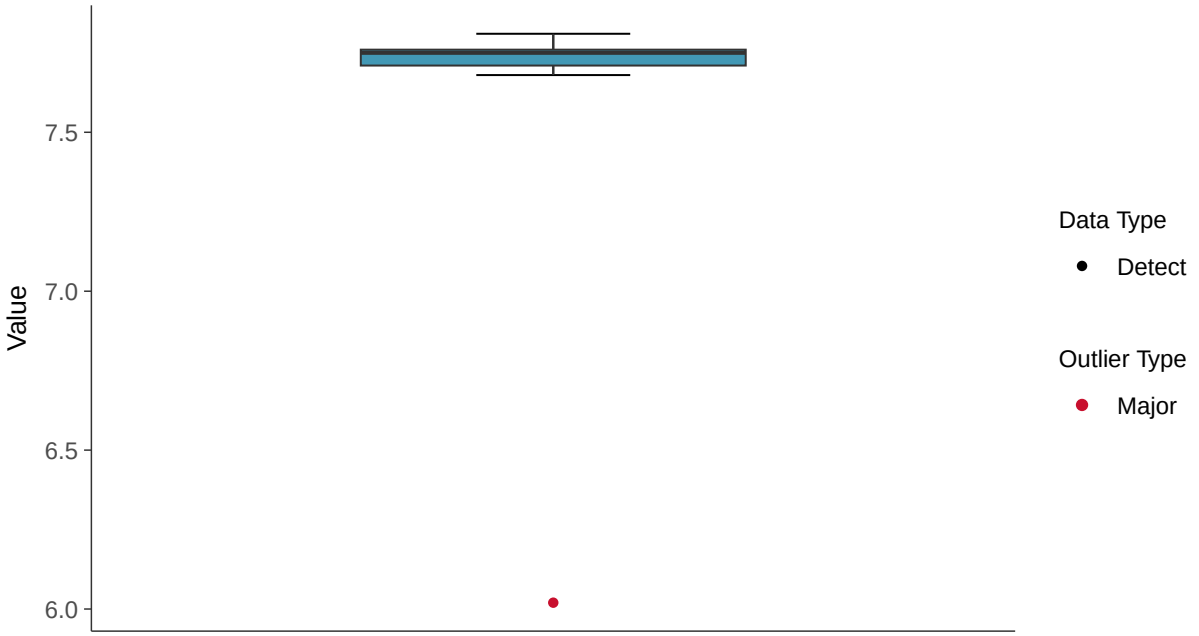
ID: 1_11_4_120





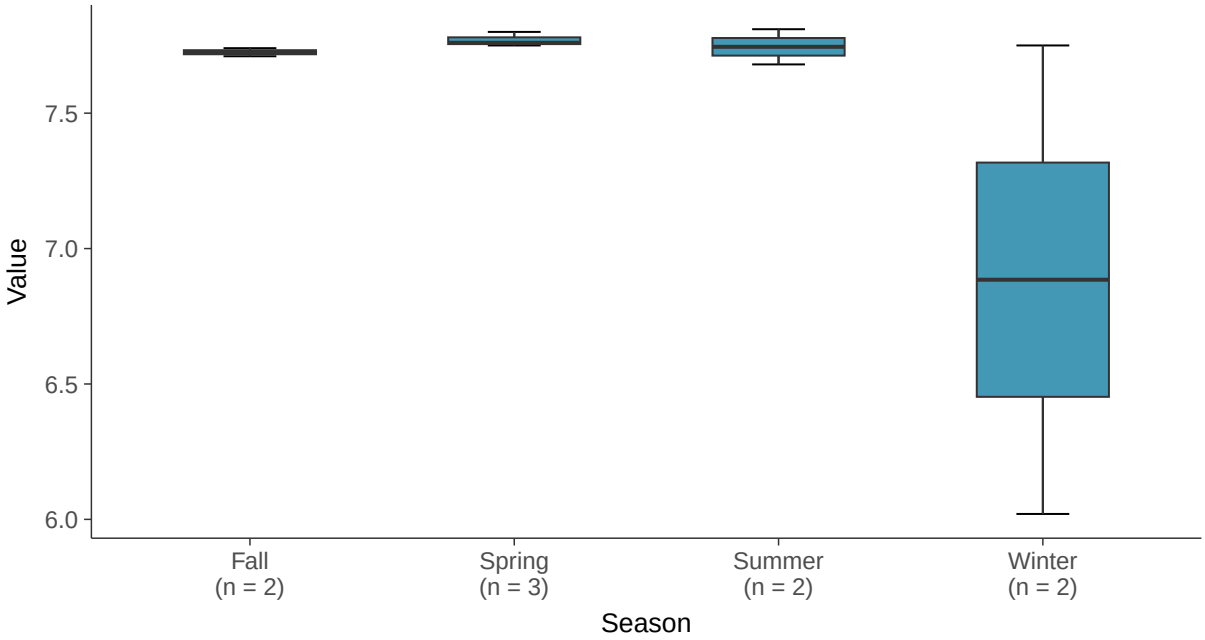
Boxplot

pH (field), MW-01R (su)



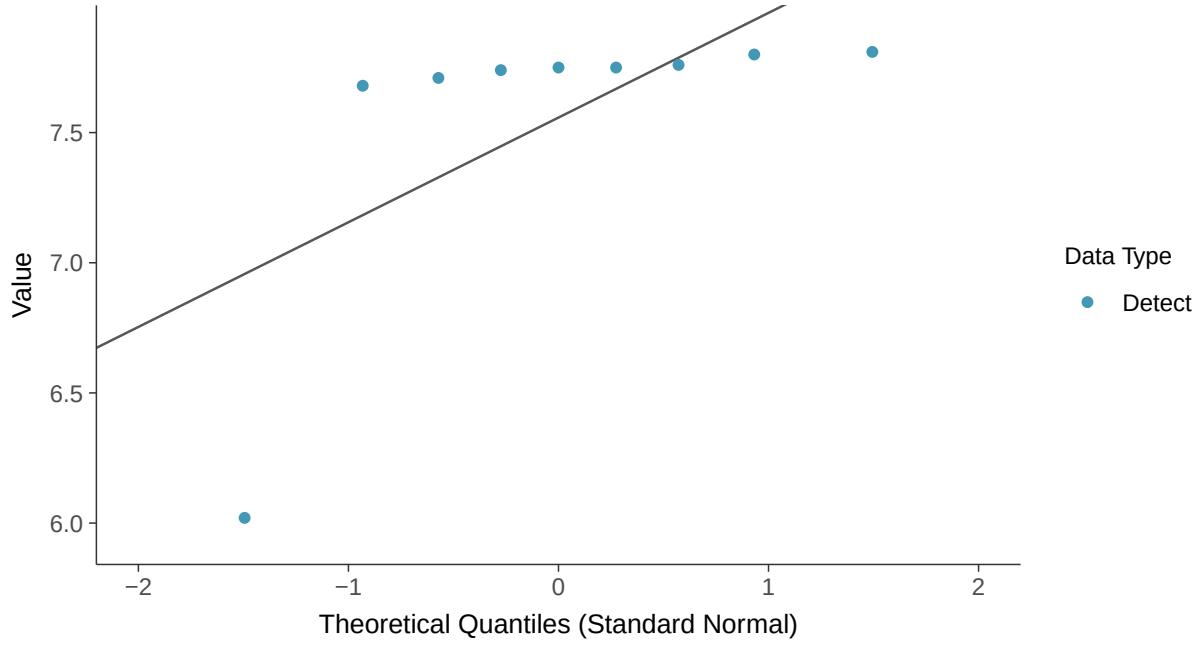
Boxplot by Season

pH (field), MW-01R (su)



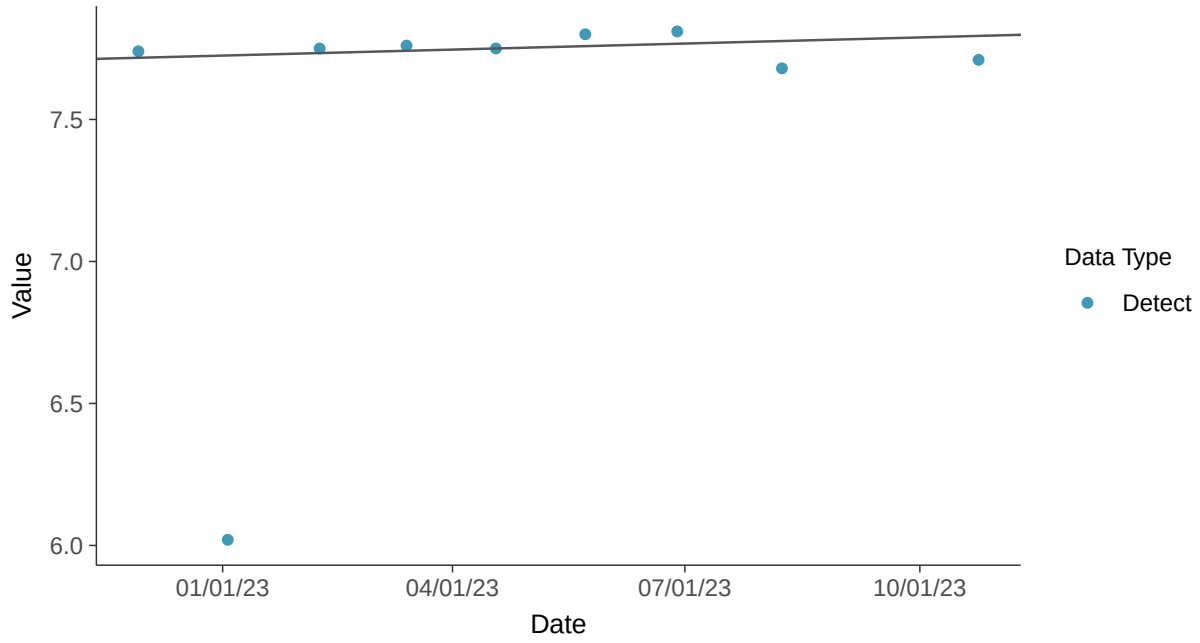
Normal Q-Q plot

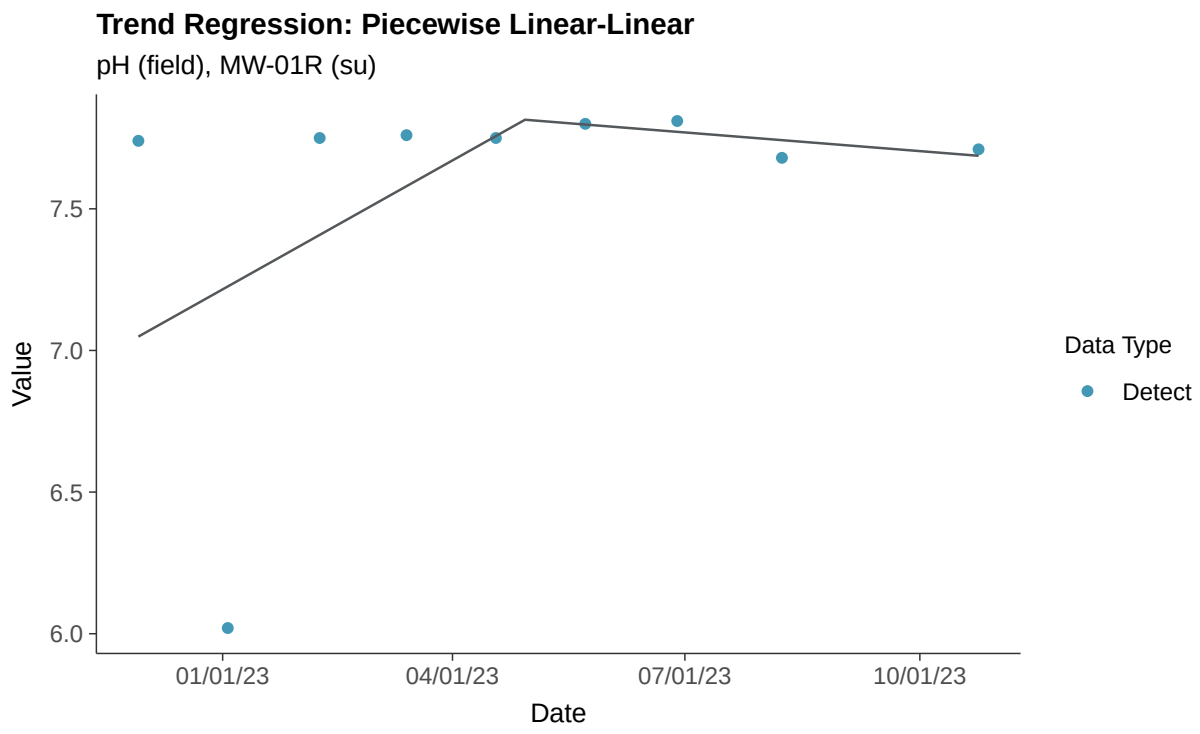
pH (field), MW-01R (su)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

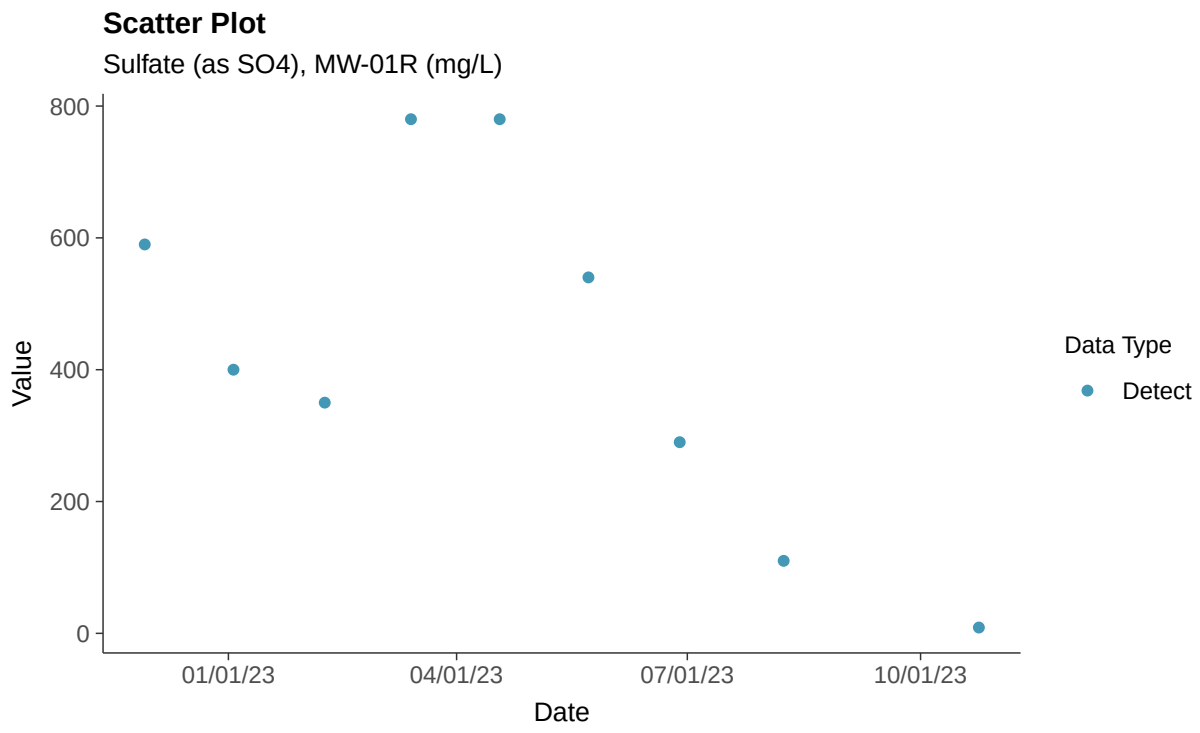
pH (field), MW-01R (su)

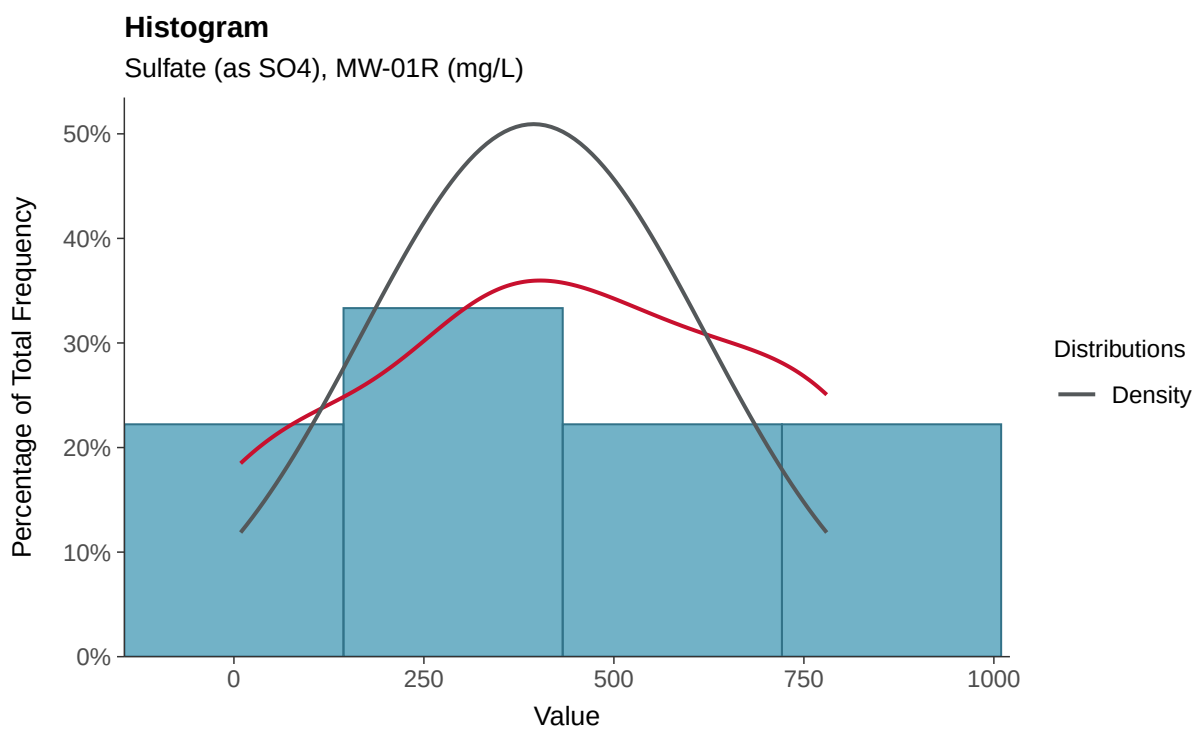



Trend Regression: Piecewise Linear-Linear
pH (field), MW-01R (su)
Value
7.5
7.0
6.5
6.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-01R

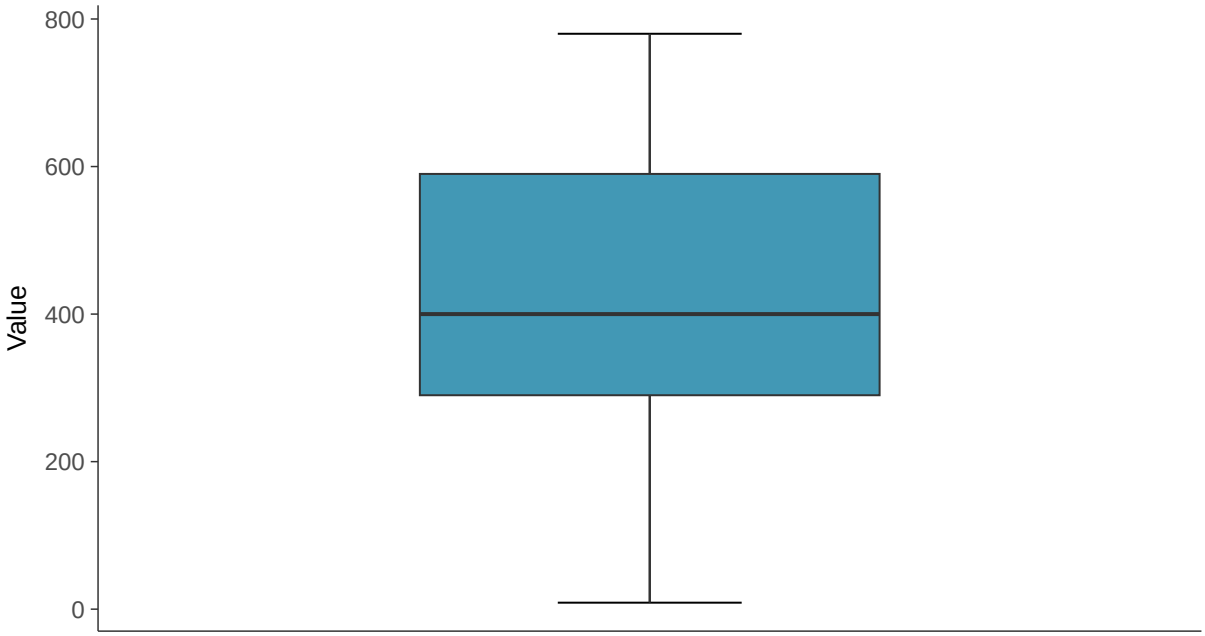
ID: 1_11_4_124





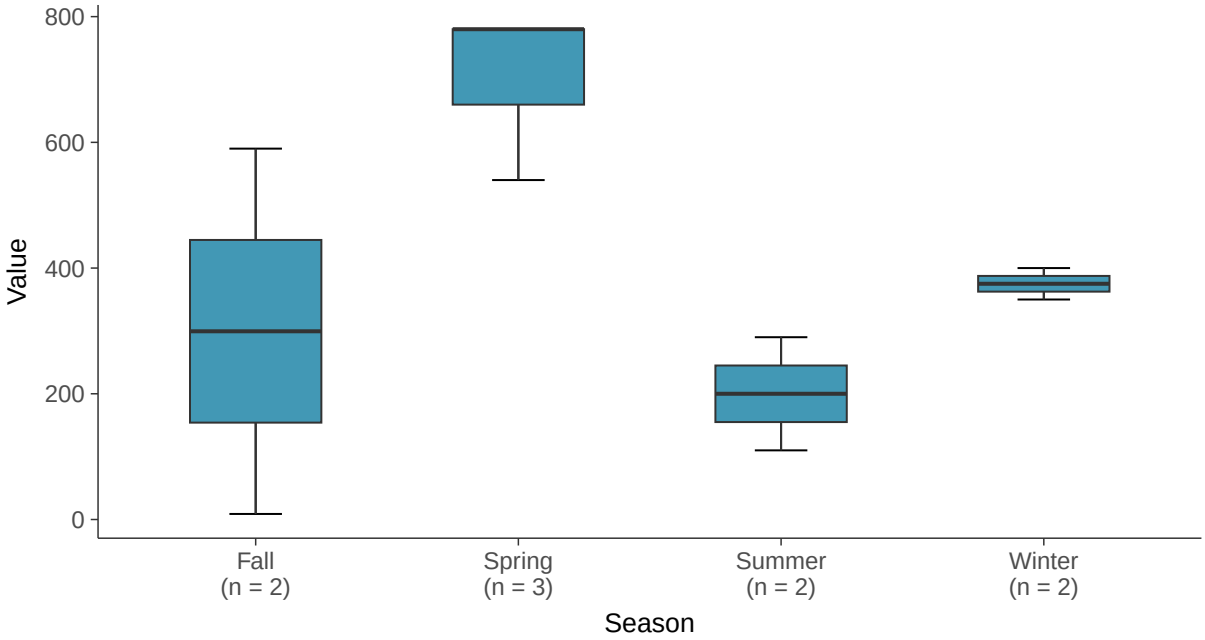
Boxplot

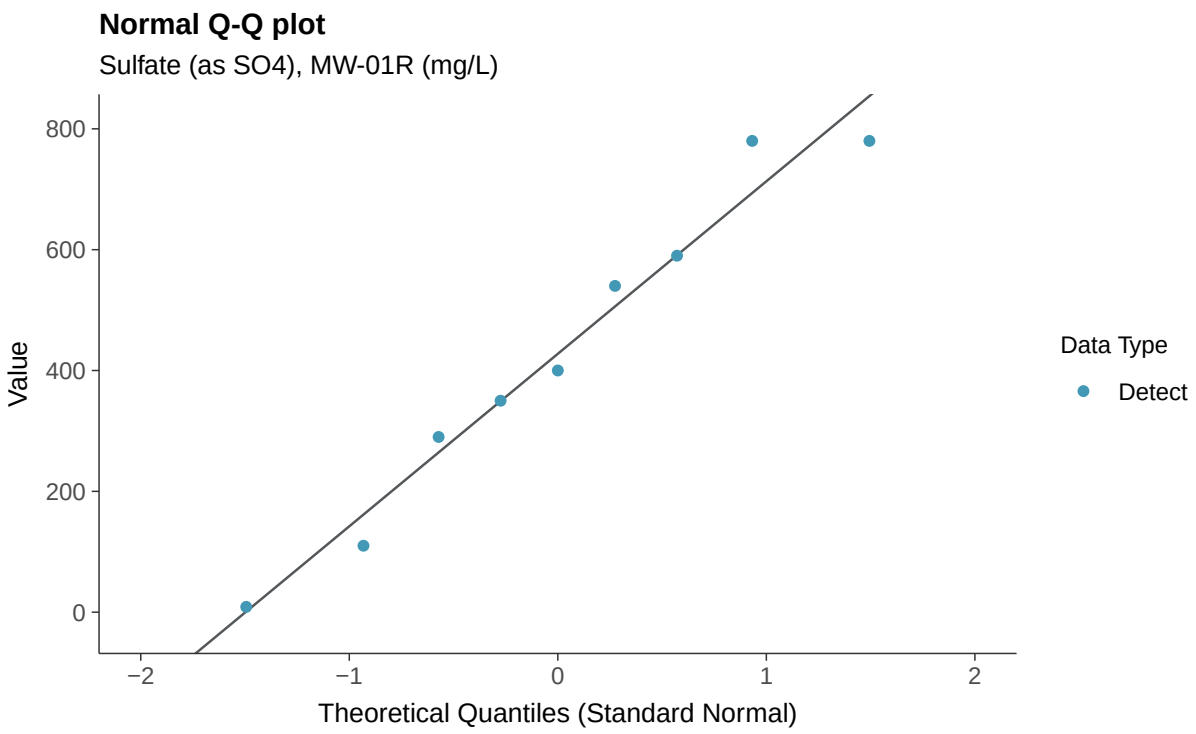
Sulfate (as SO4), MW-01R (mg/L)

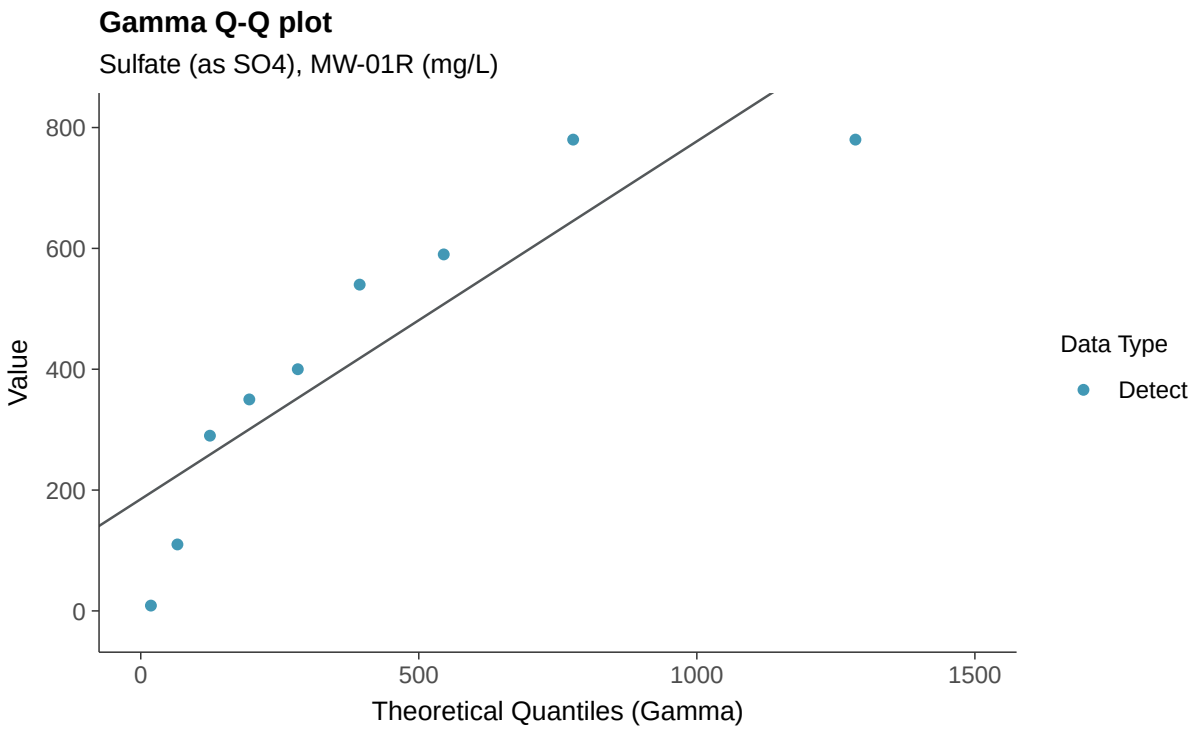


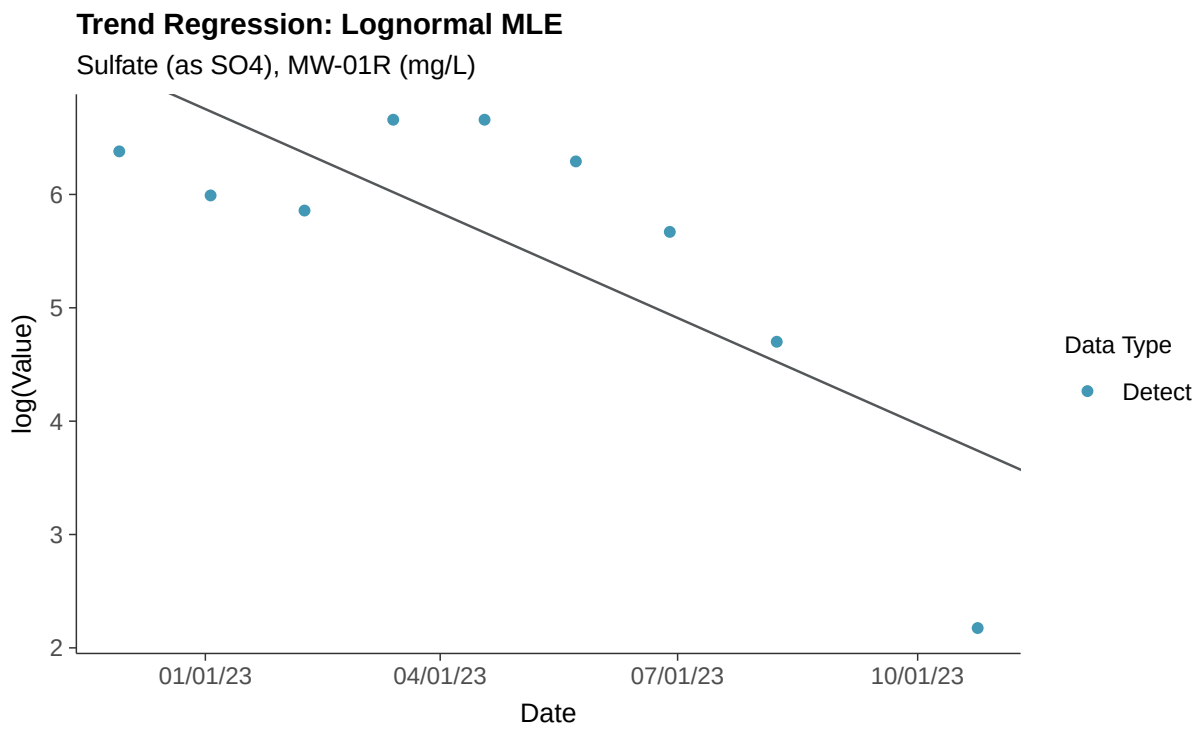
Boxplot by Season

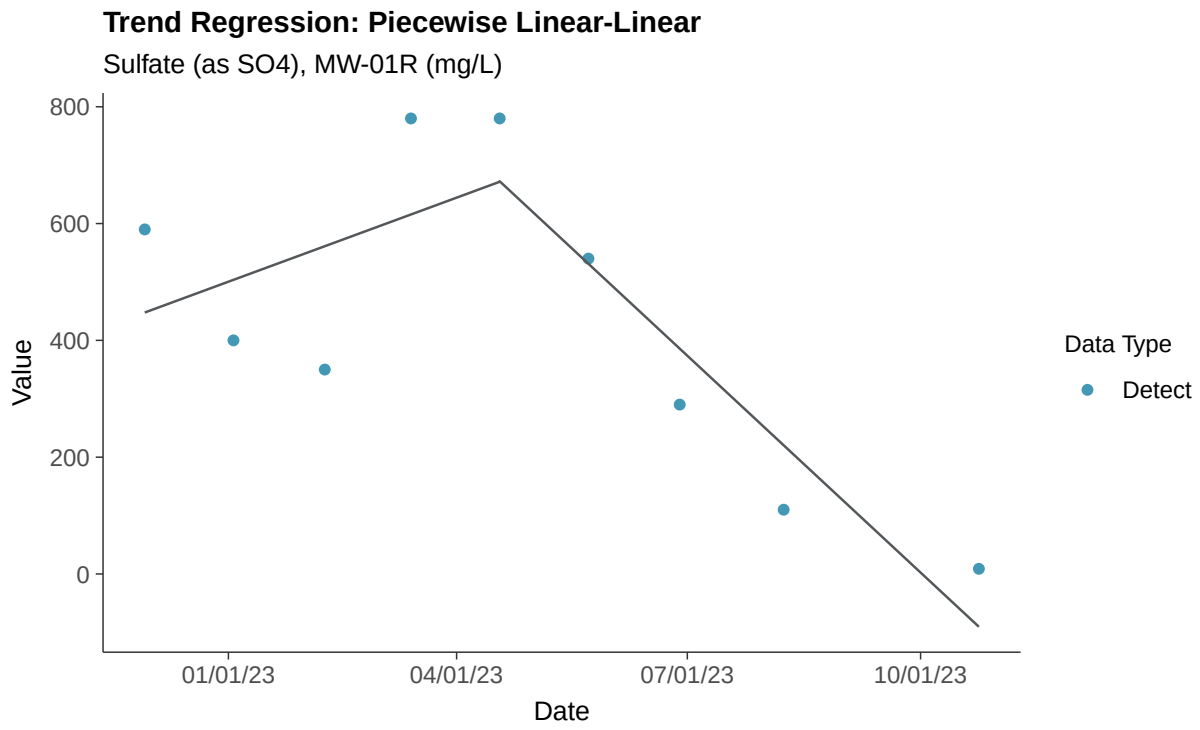
Sulfate (as SO4), MW-01R (mg/L)

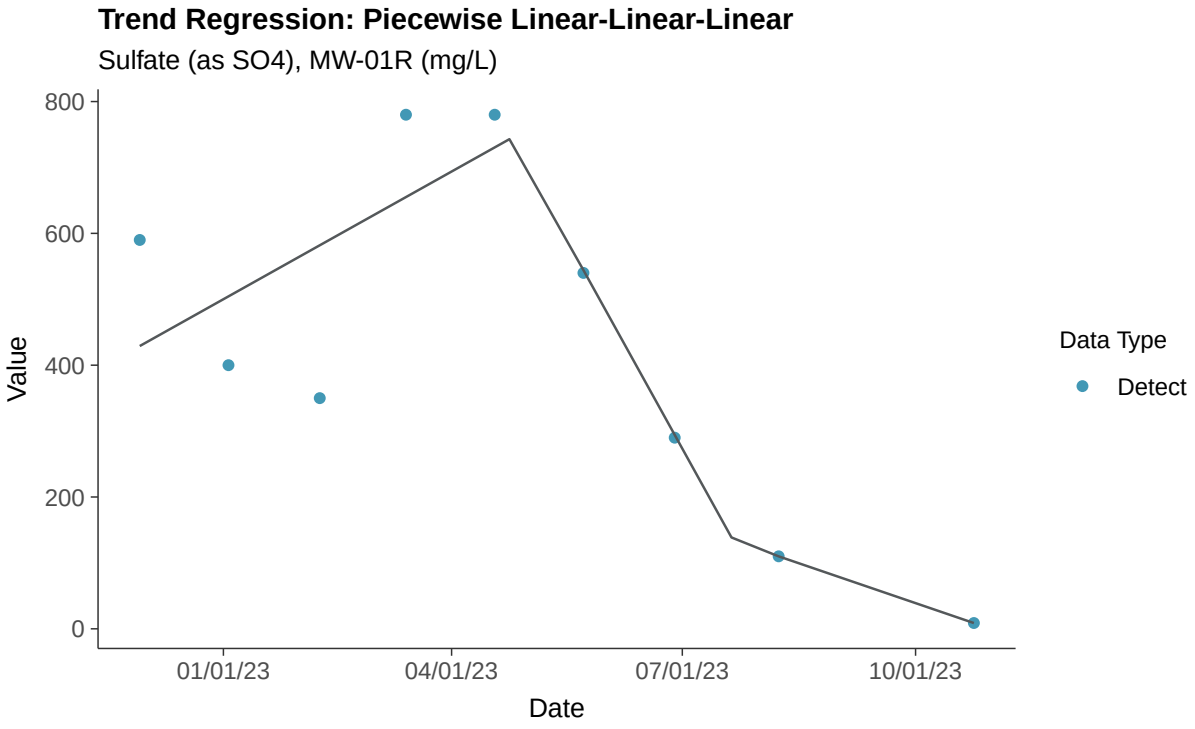



Normal Q-Q plot
Sulfate (as SO4), MW-01R (mg/L)
Value
800
600
400
200
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-01R (mg/L)
Value
800
600
400
200
0
0
500
1000
1500
Theoretical Quantiles (Gamma)
Data Type
Detect

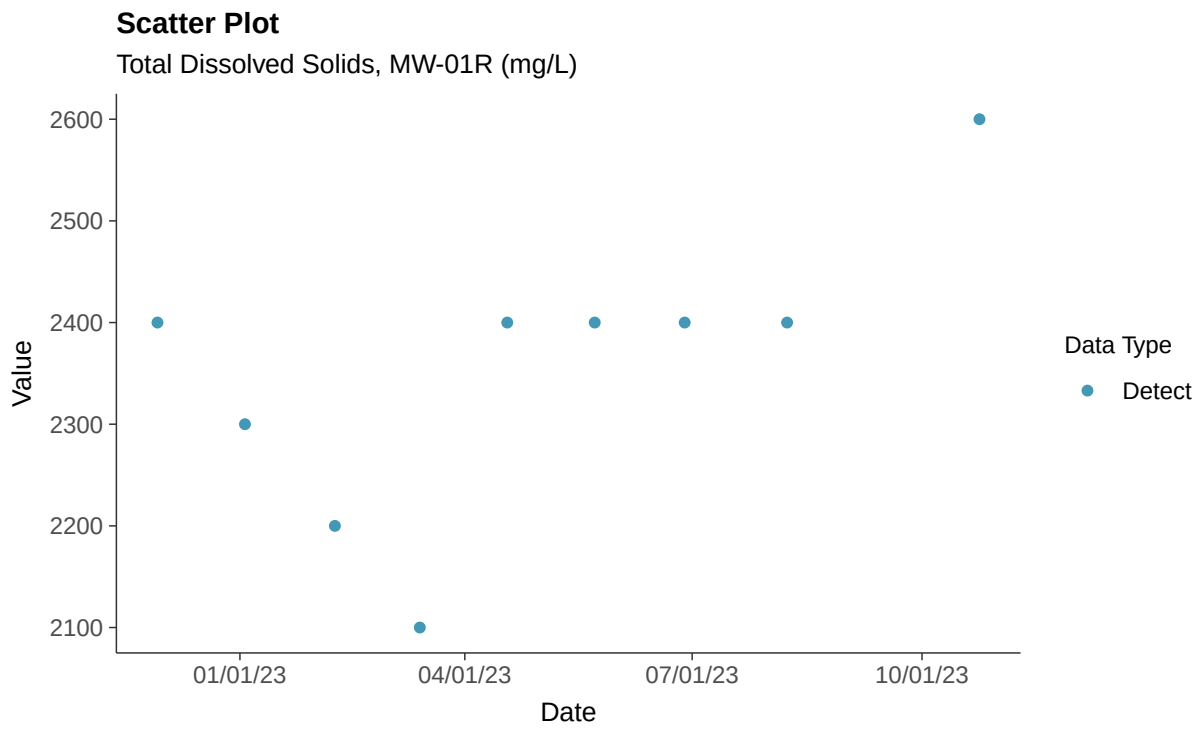

Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-01R (mg/L)
log(Value)
6
5
4
3
2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

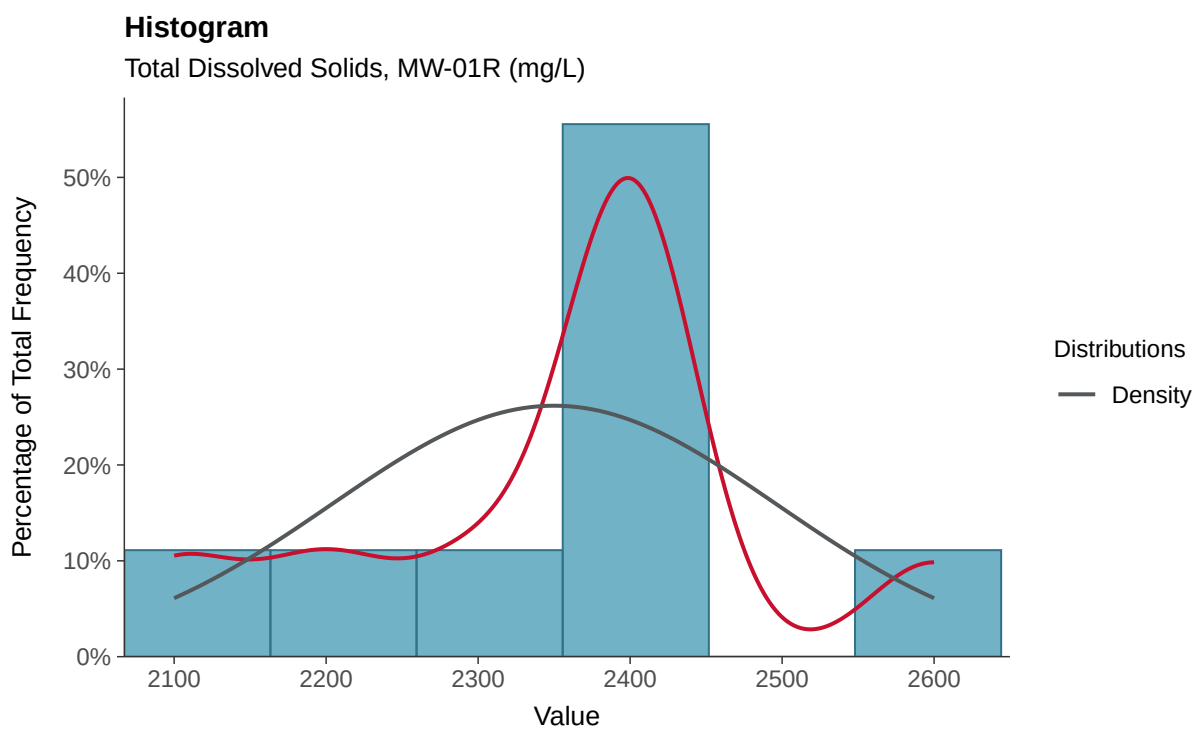

Trend Regression: Piecewise Linear-Linear
Sulfate (as SO4), MW-01R (mg/L)
Value
800
600
400
200
0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Sulfate (as SO4), MW-01R (mg/L)
800
600
400
200
0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Total Dissolved Solids, MW-01R

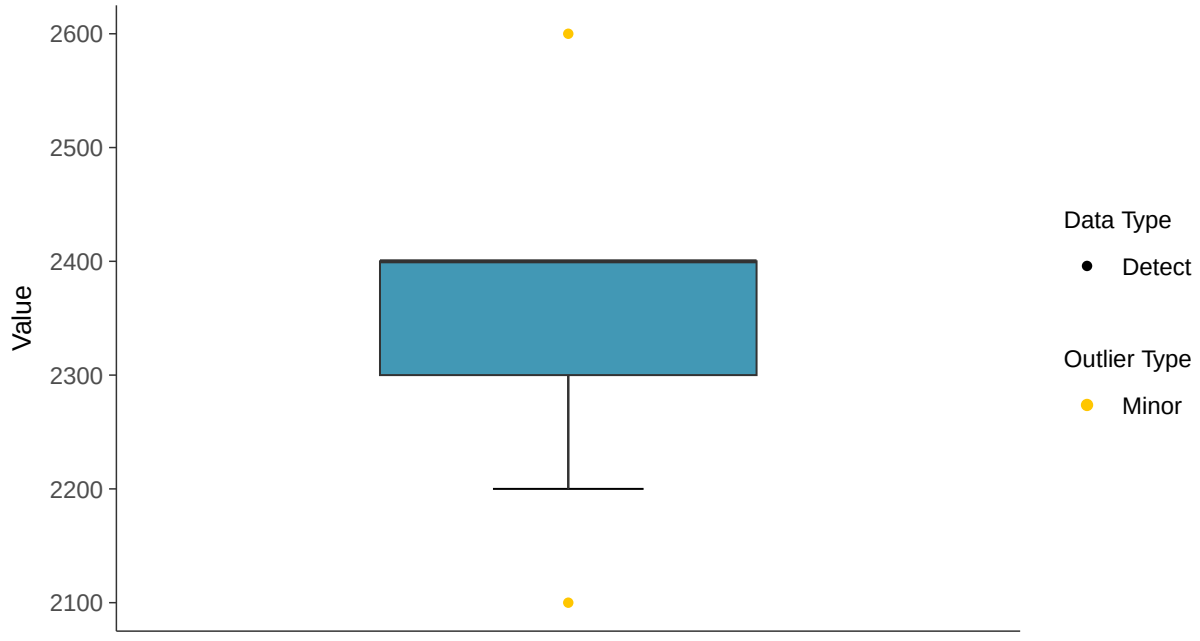
ID: 1_11_4_126





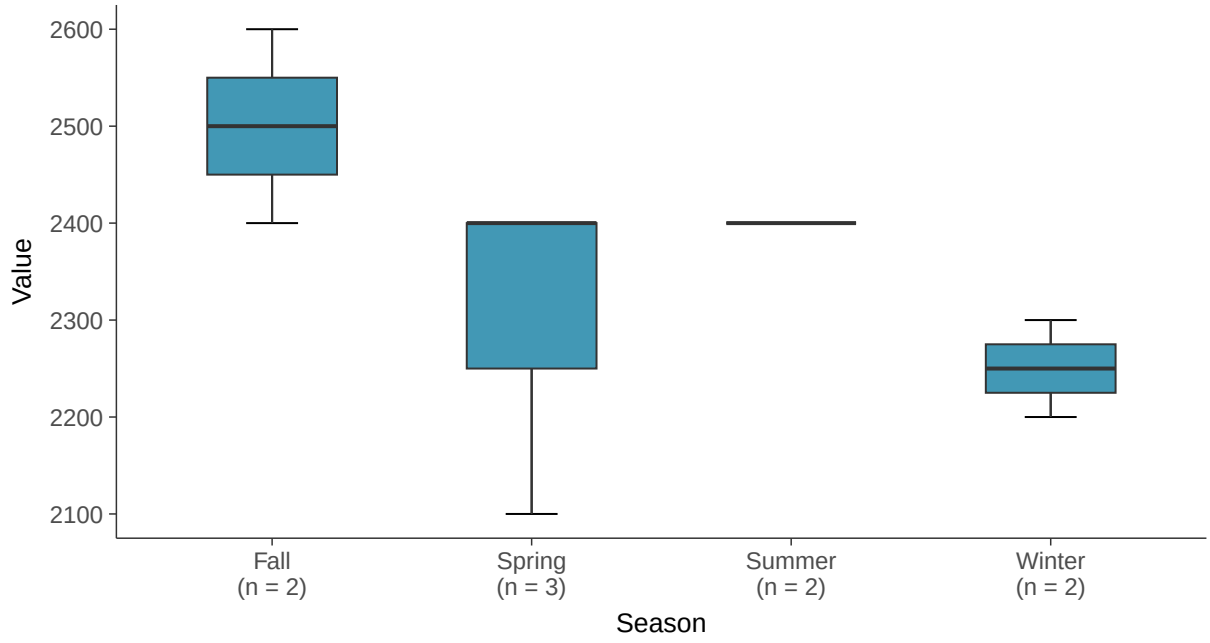
Boxplot

Total Dissolved Solids, MW-01R (mg/L)



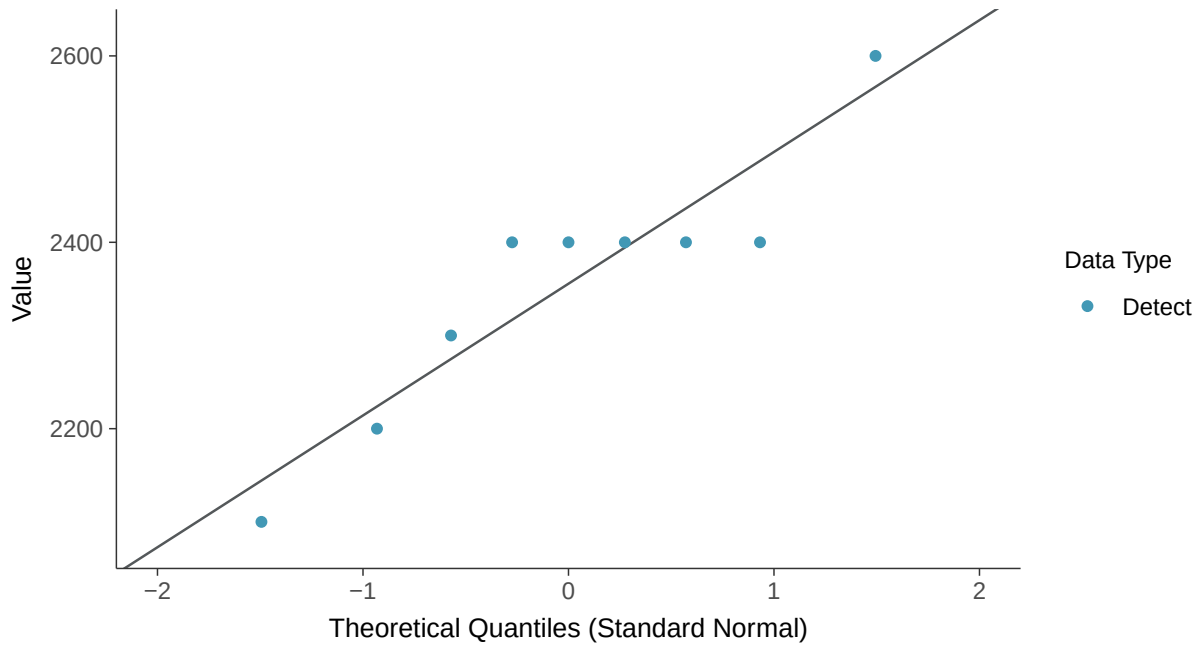
Boxplot by Season

Total Dissolved Solids, MW-01R (mg/L)



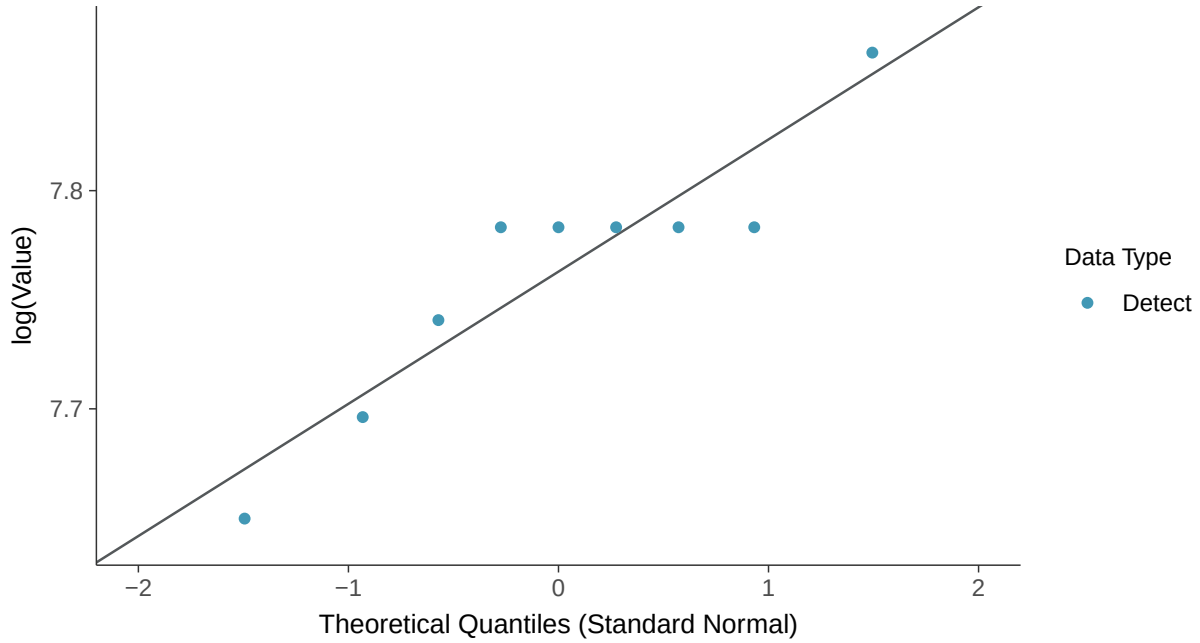
Normal Q-Q plot

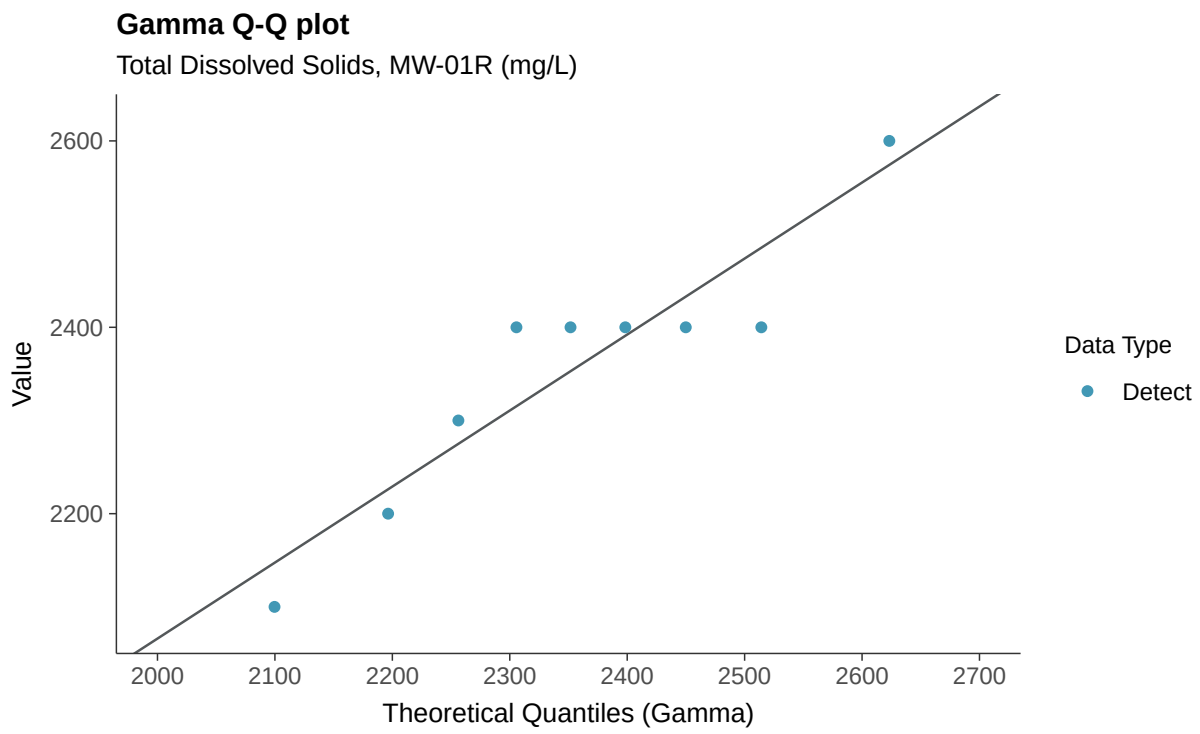
Total Dissolved Solids, MW-01R (mg/L)

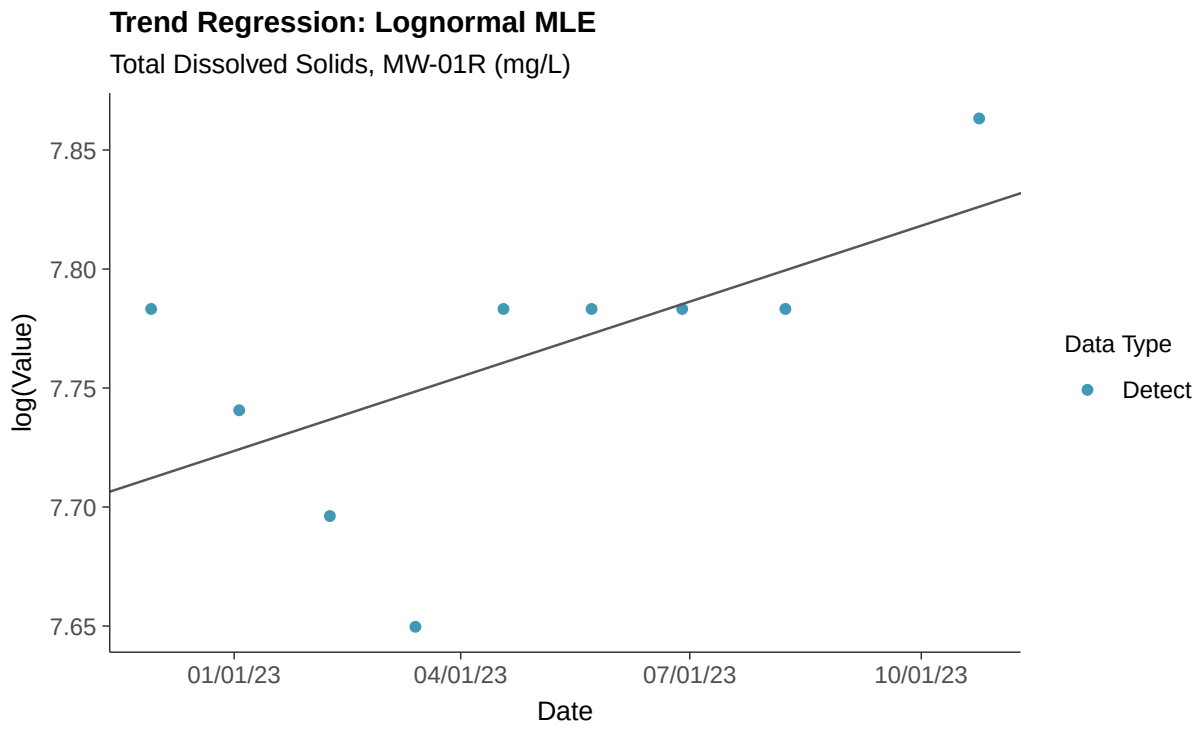


Lognormal Q-Q plot

Total Dissolved Solids, MW-01R (mg/L)

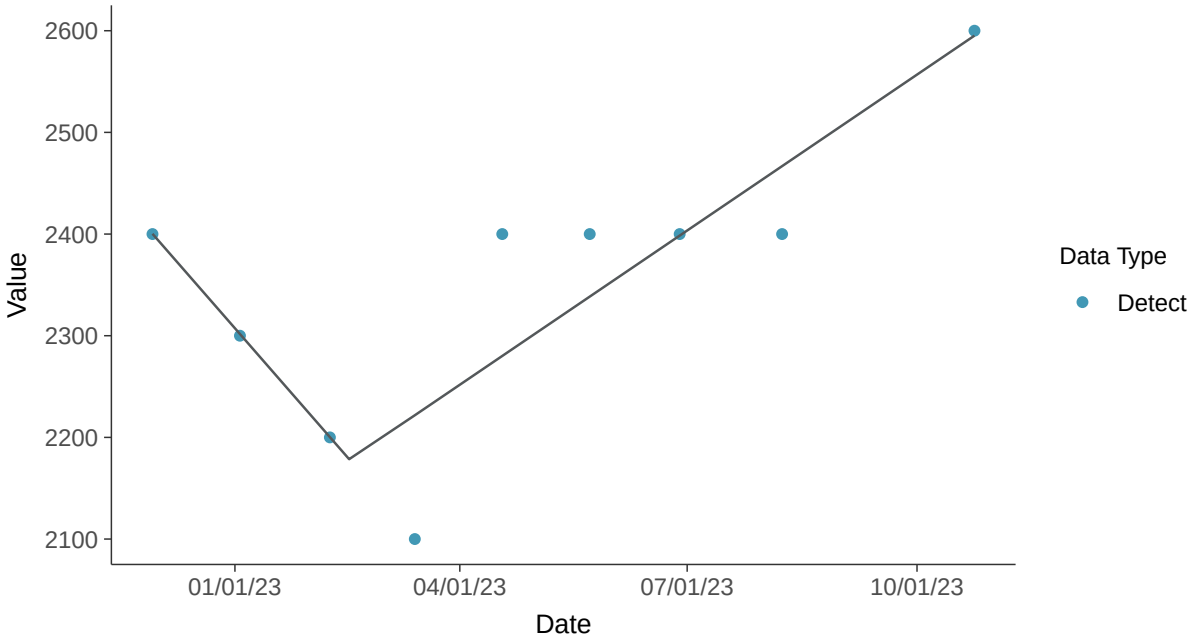



Gamma Q-Q plot
Total Dissolved Solids, MW-01R (mg/L)
Value
2600
2400
2200
2000
2100
2200
2300
2400
2500
2600
2700
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-01R (mg/L)
log(Value)
7.85
7.80
7.75
7.70
7.65
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

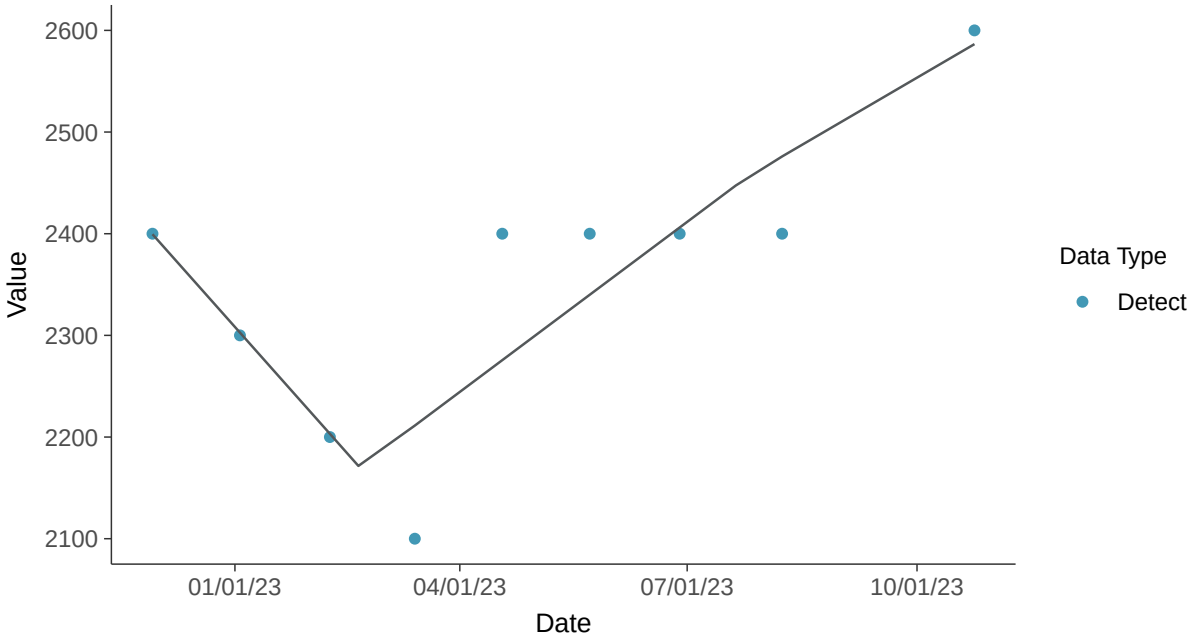
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-01R (mg/L)



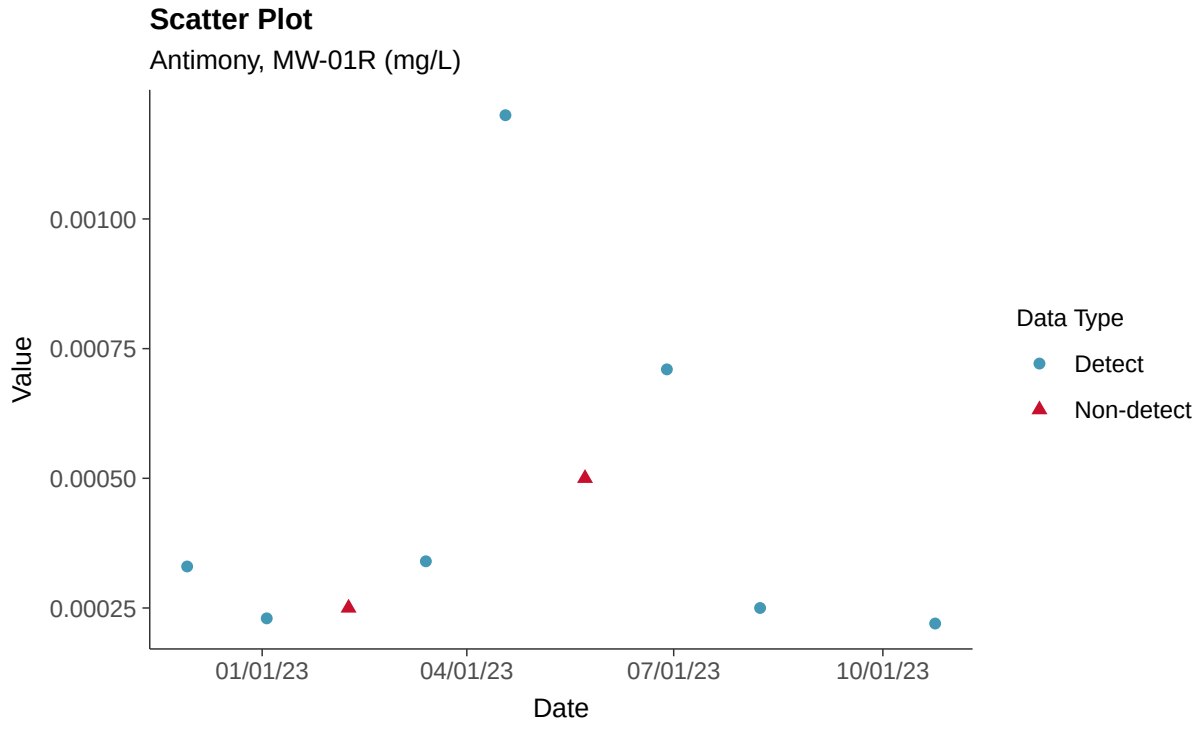
Trend Regression: Piecewise Linear-Linear-Linear

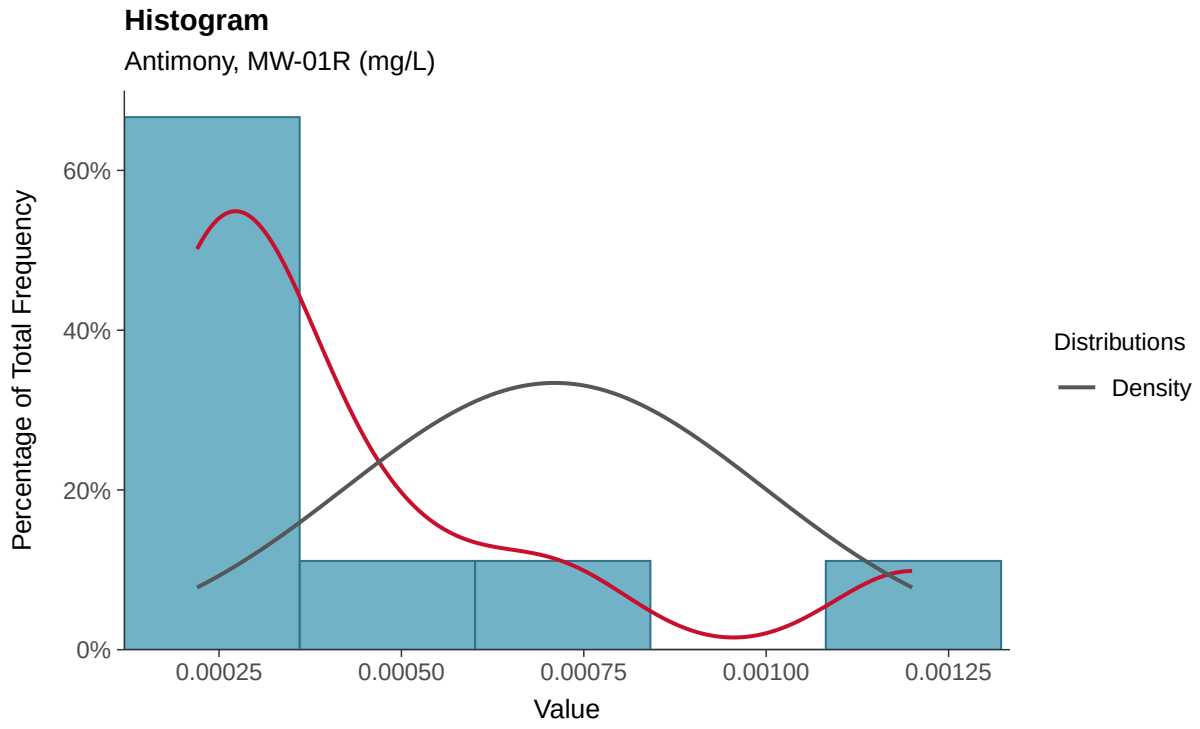
Total Dissolved Solids, MW-01R (mg/L)



Appendix IV: Antimony, MW-01R

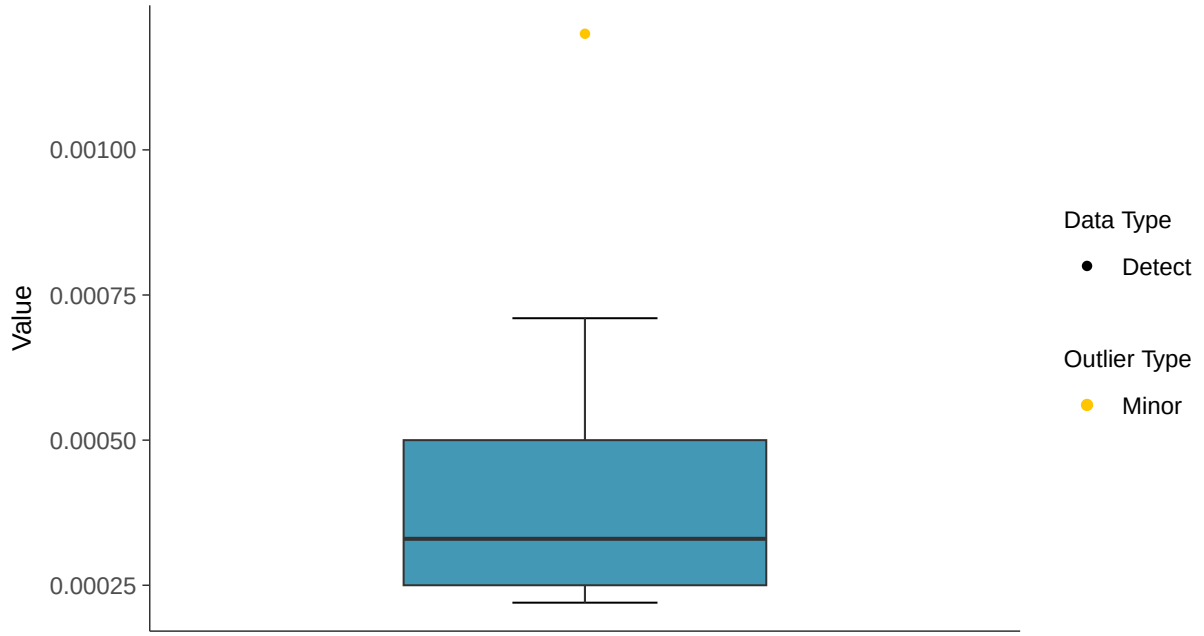
ID: 1_11_5_101





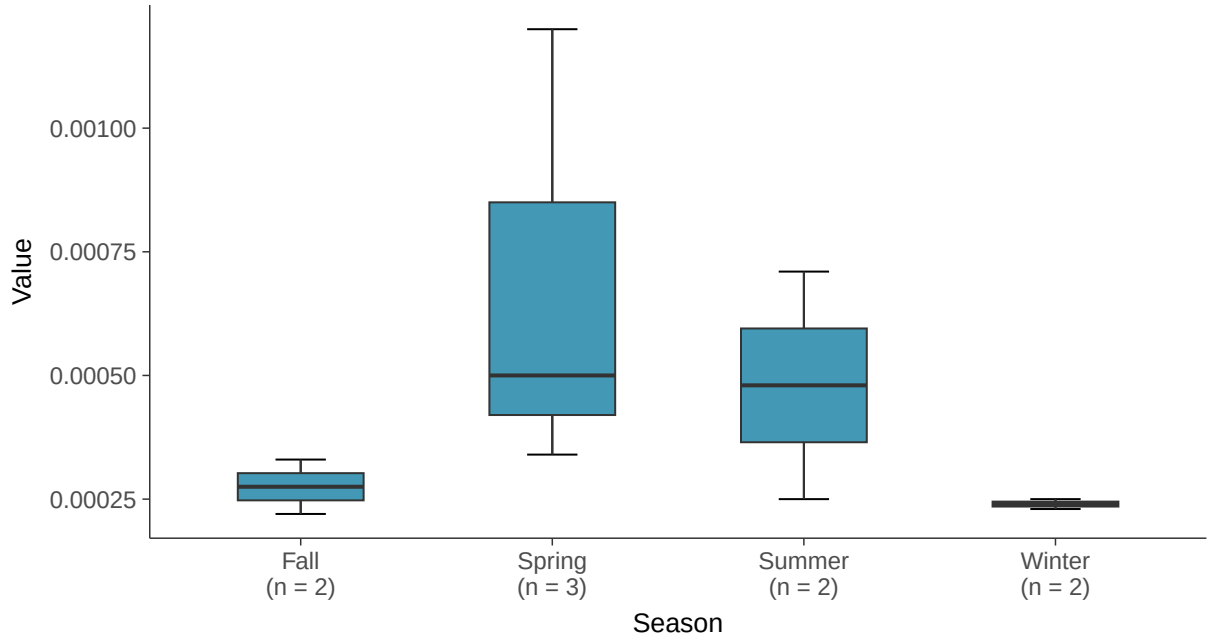
Boxplot

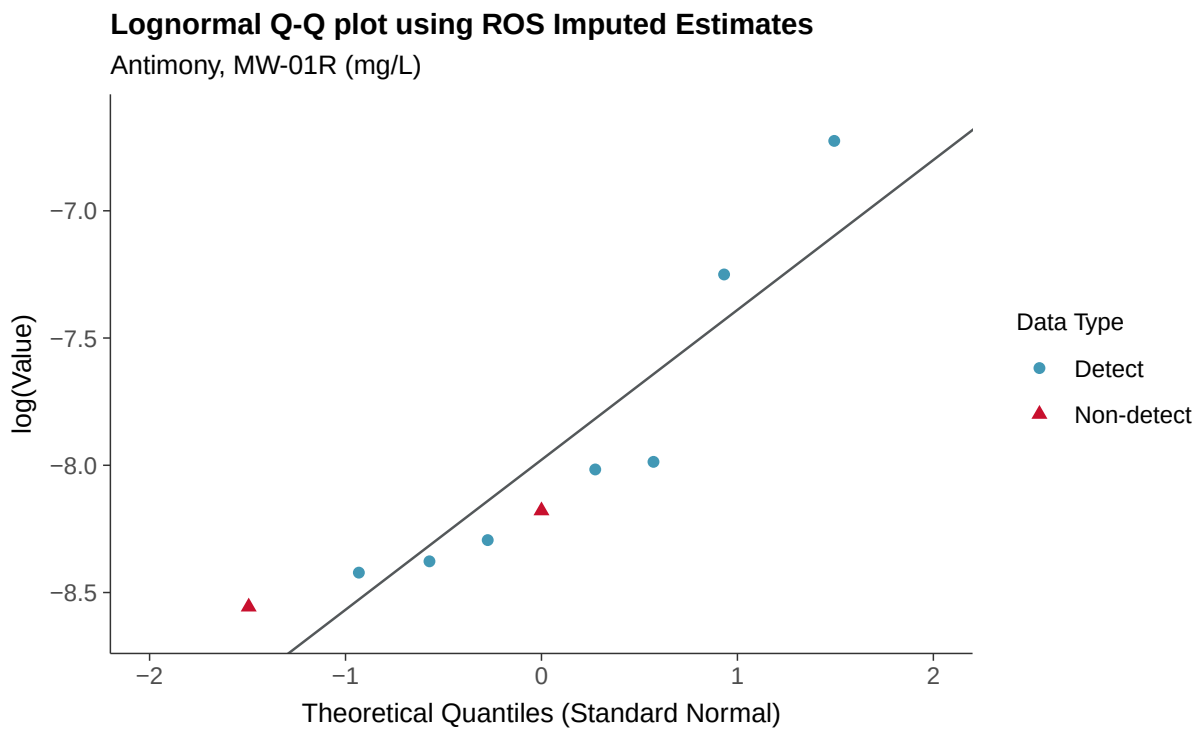
Antimony, MW-01R (mg/L)

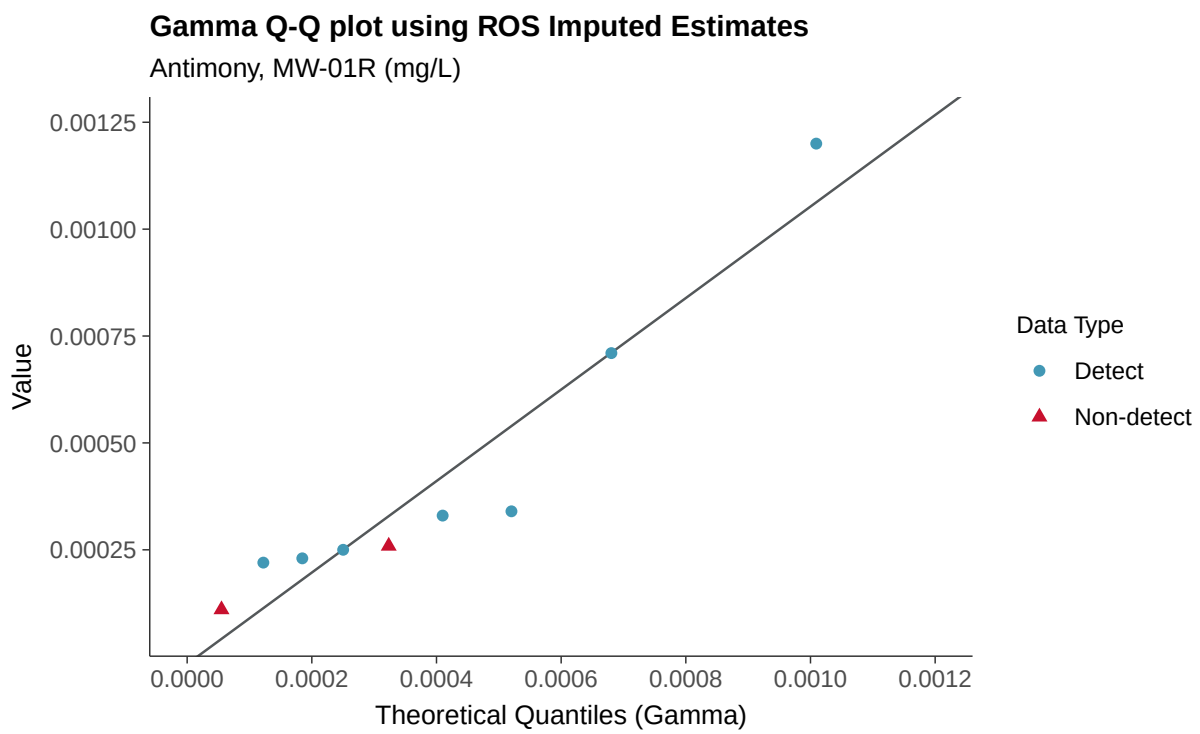


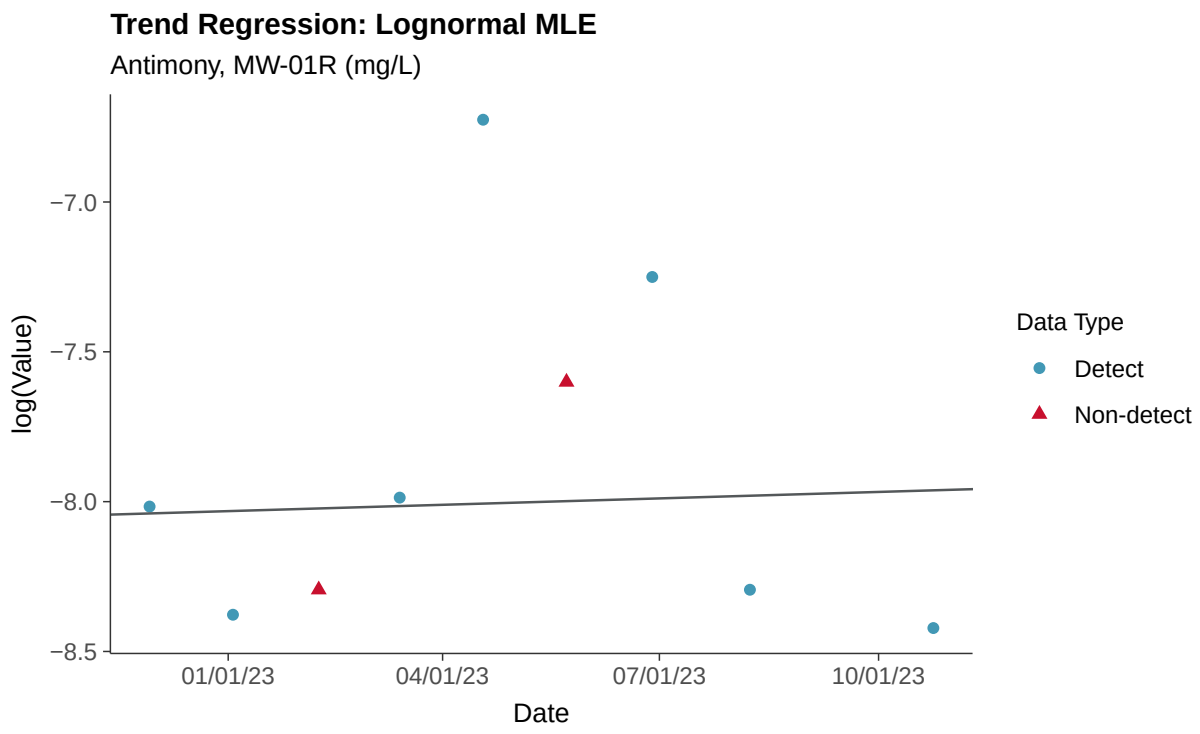
Boxplot by Season

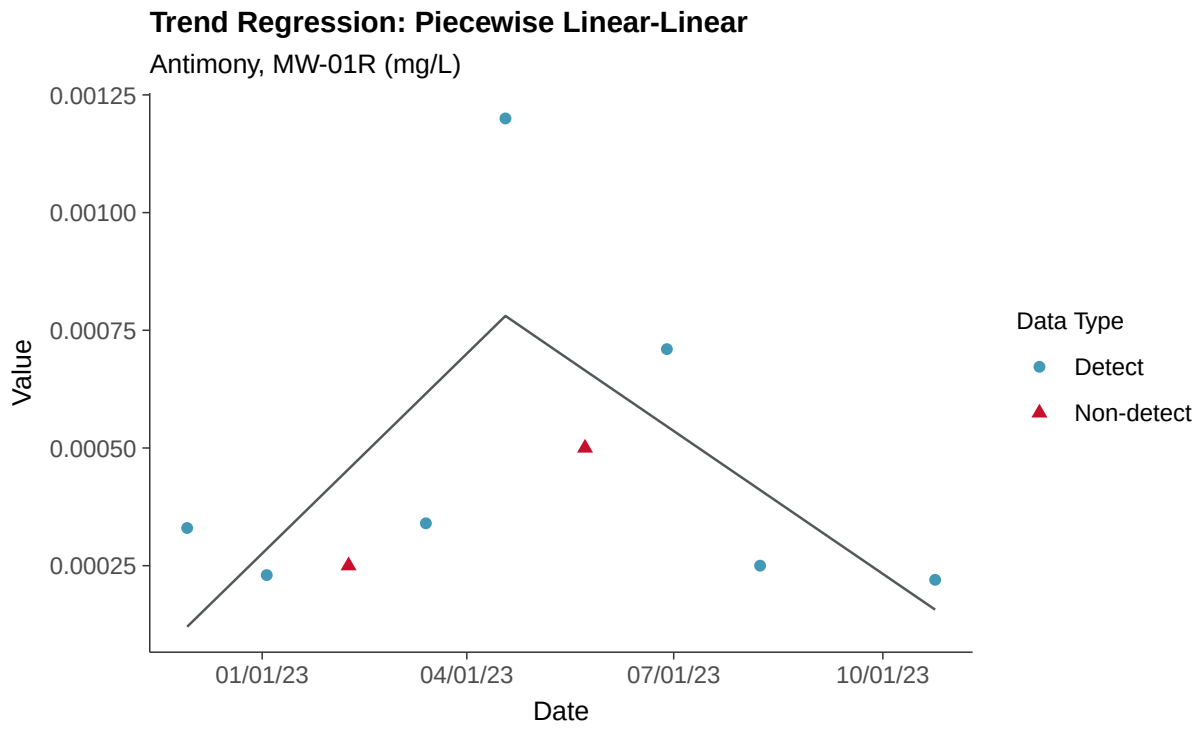
Antimony, MW-01R (mg/L)

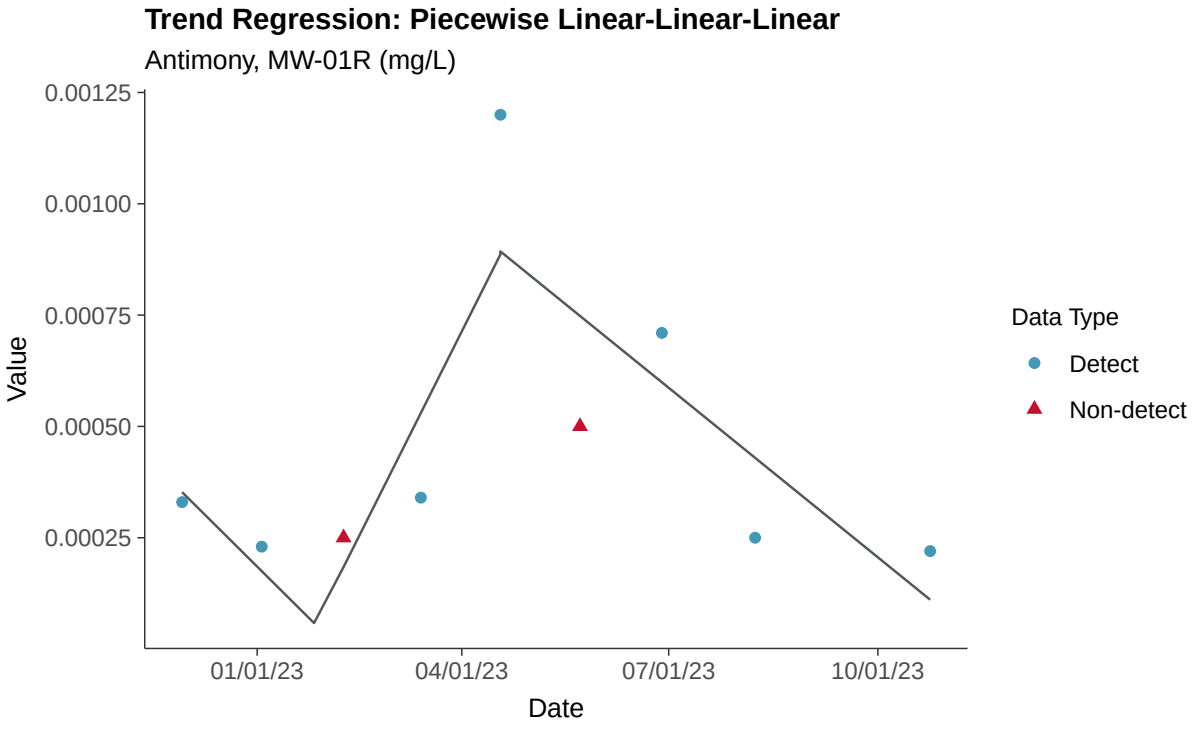



Lognormal Q-Q plot using ROS Imputed Estimates
Antimony, MW-01R (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Antimony, MW-01R (mg/L)
Value
0.00125
0.00100
0.00075
0.00050
0.00025
0.0000
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

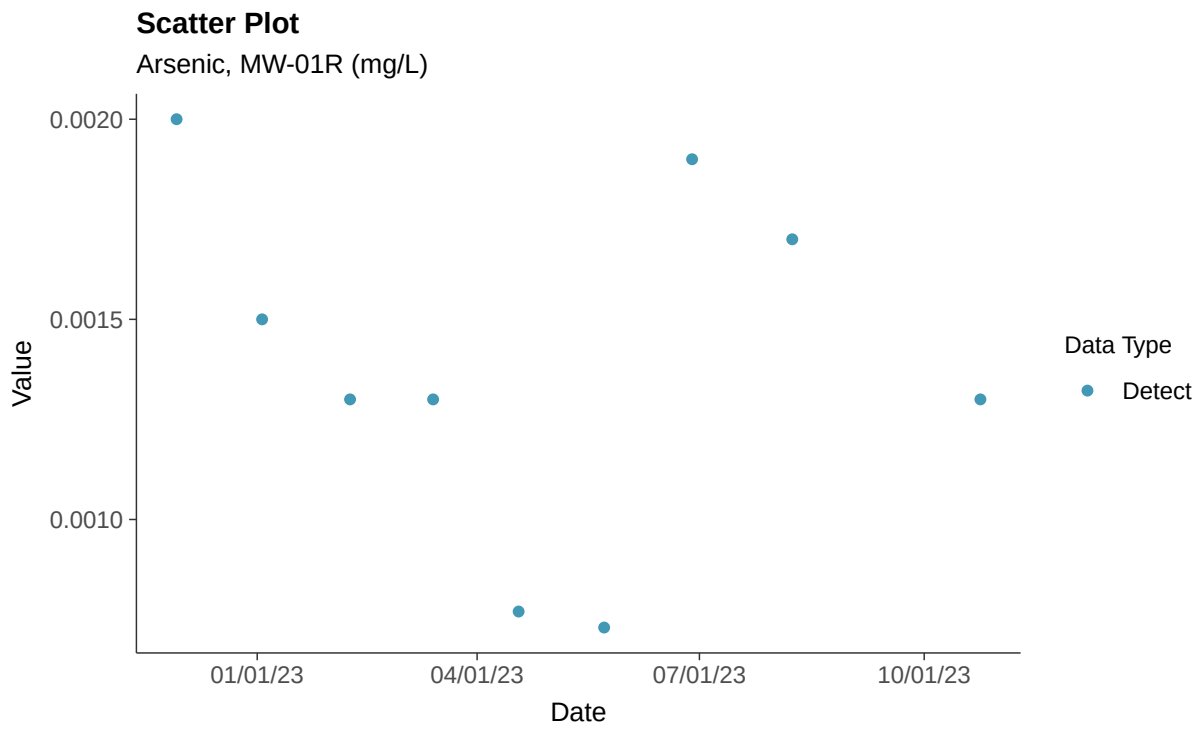

Trend Regression: Lognormal MLE
Antimony, MW-01R (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

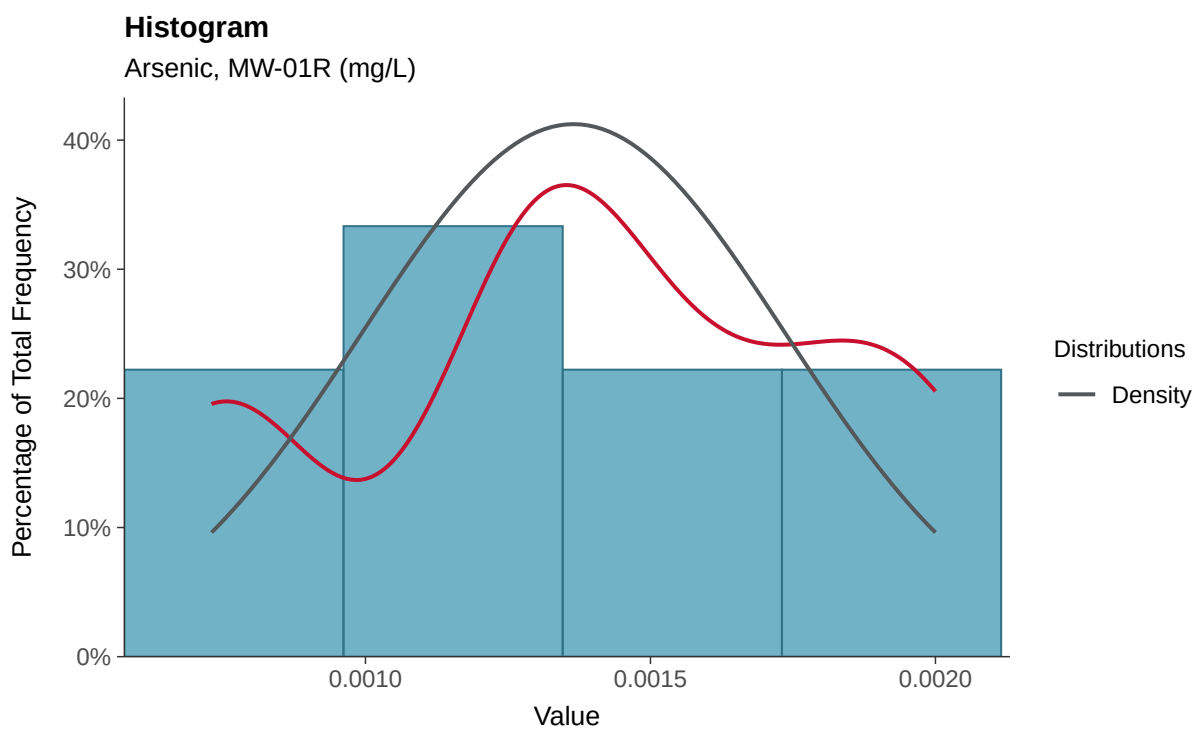

Trend Regression: Piecewise Linear-Linear
Antimony, MW-01R (mg/L)
Value
0.00125
0.00100
0.00075
0.00050
0.00025
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-01R (mg/L)
0.00125
0.00100
0.00075
0.00050
0.00025
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-01R

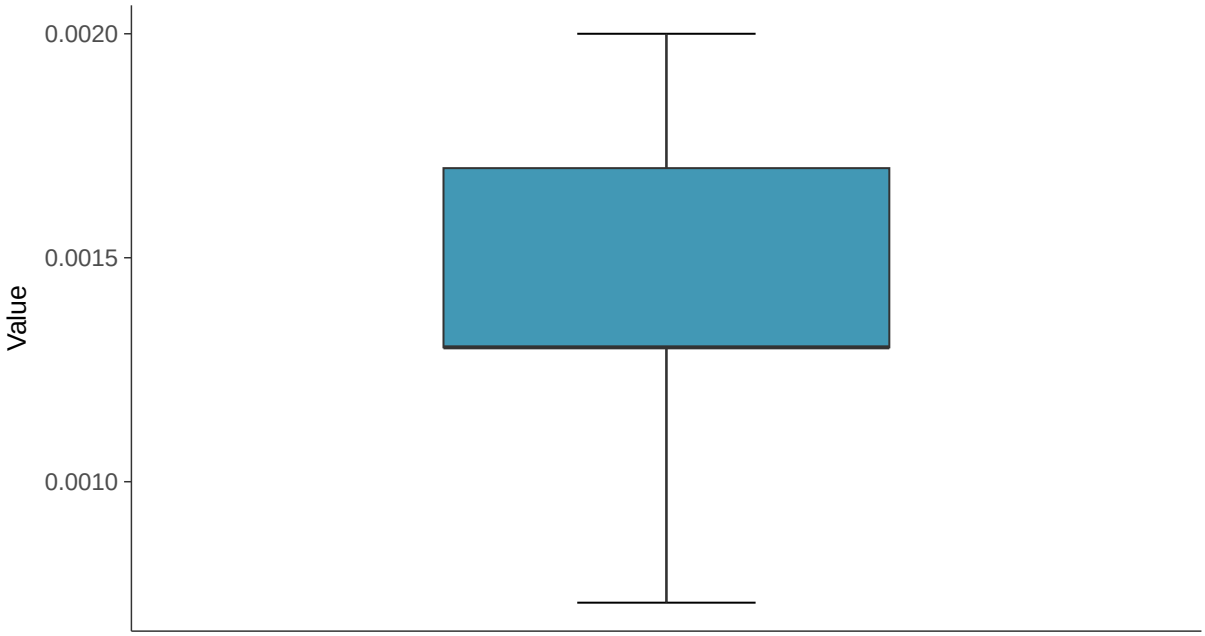
ID: 1_11_5_102





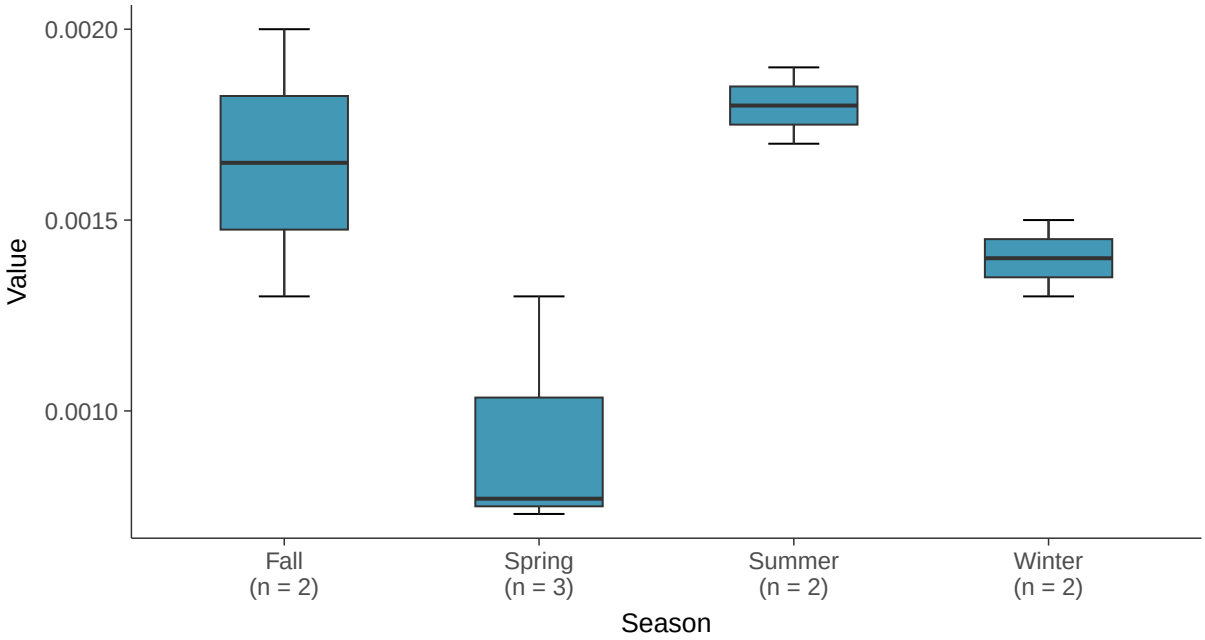
Boxplot

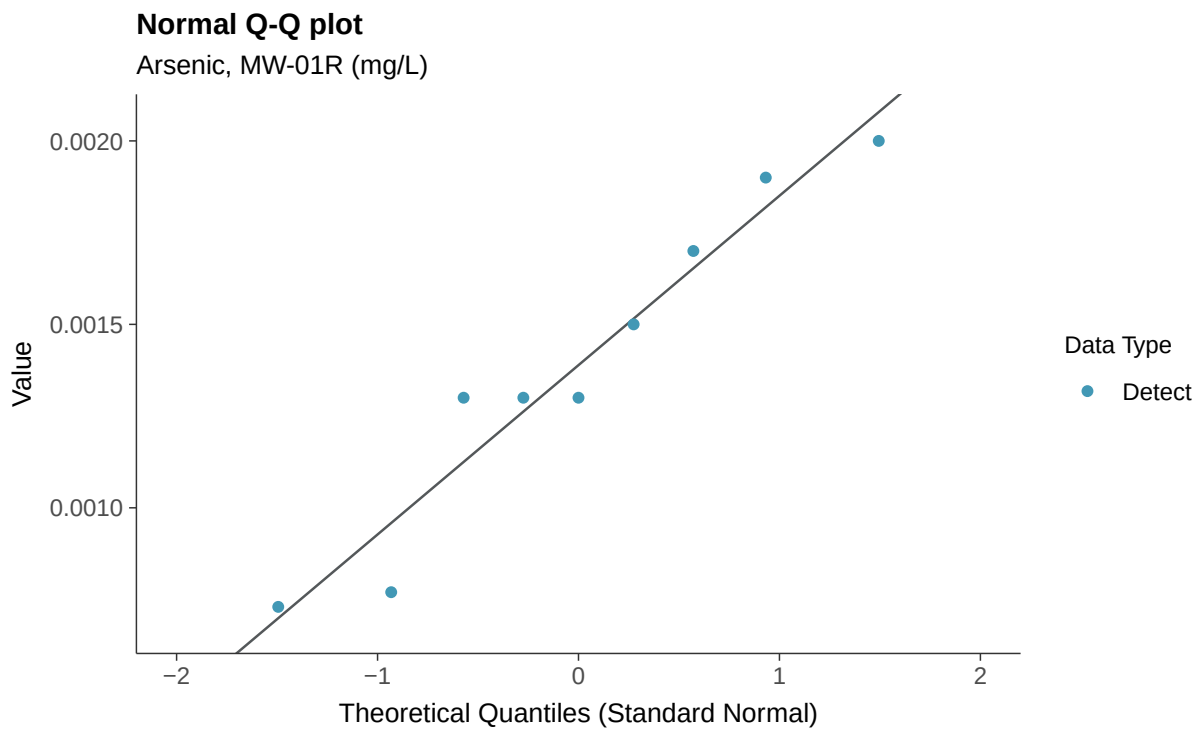
Arsenic, MW-01R (mg/L)

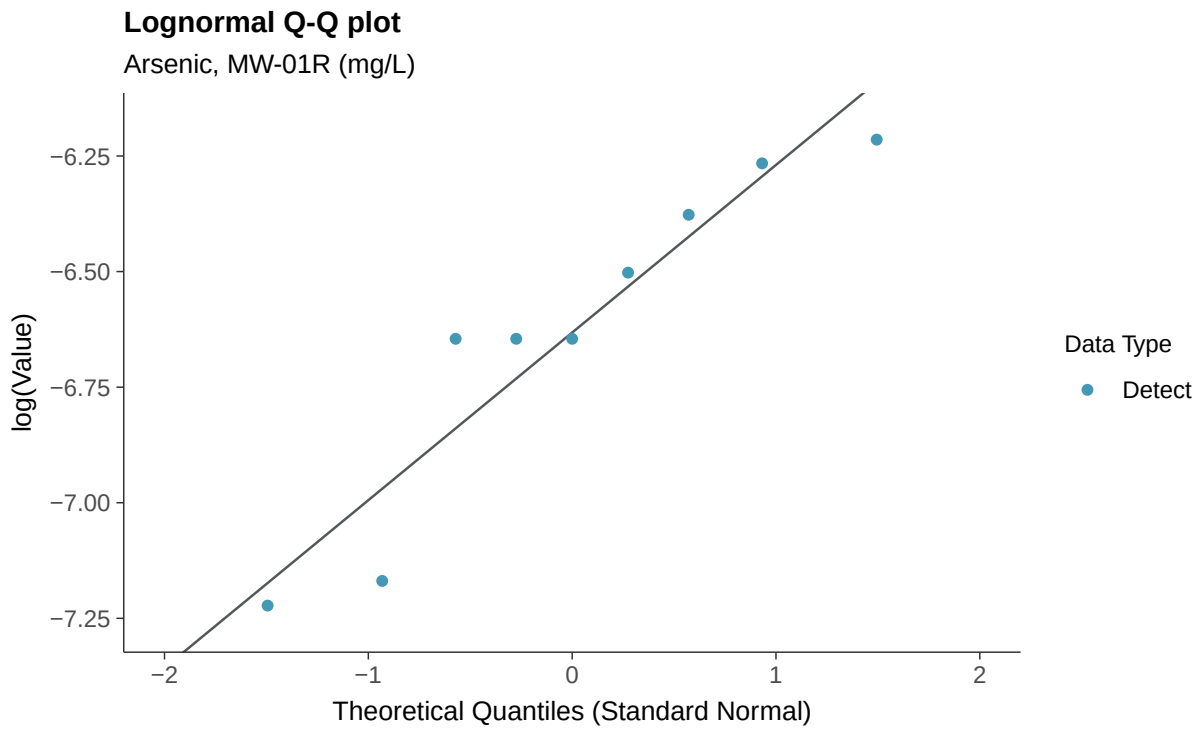


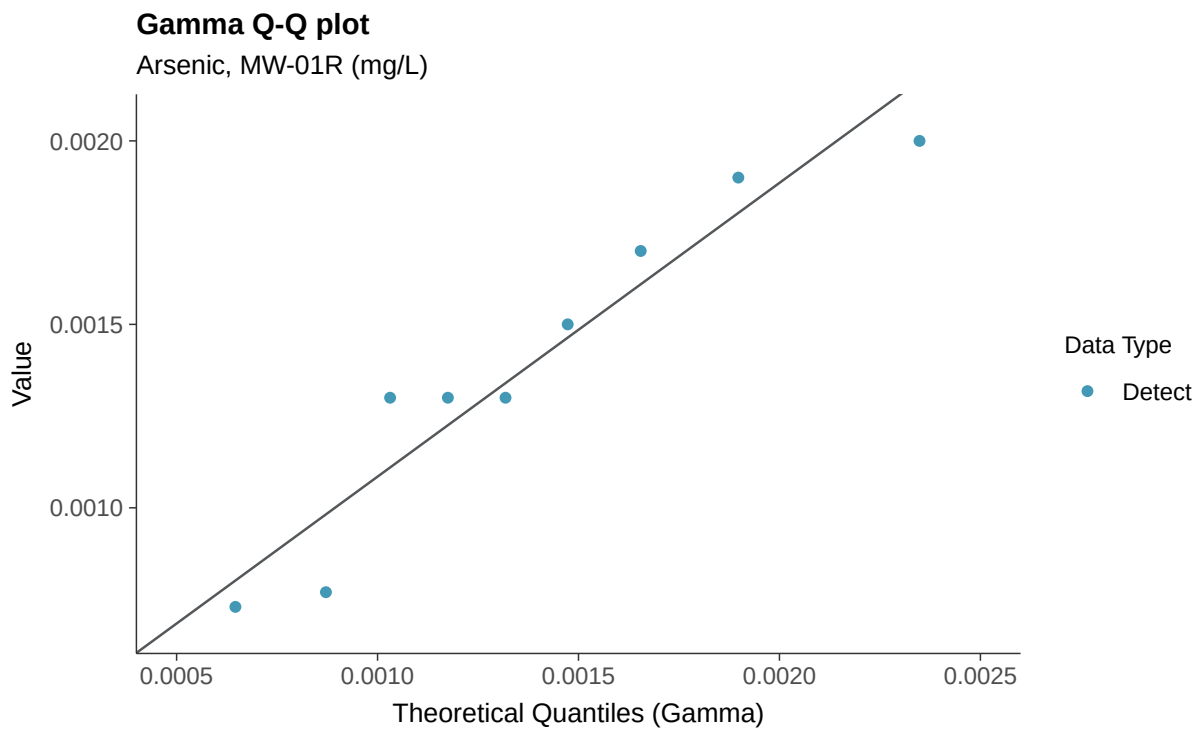
Boxplot by Season

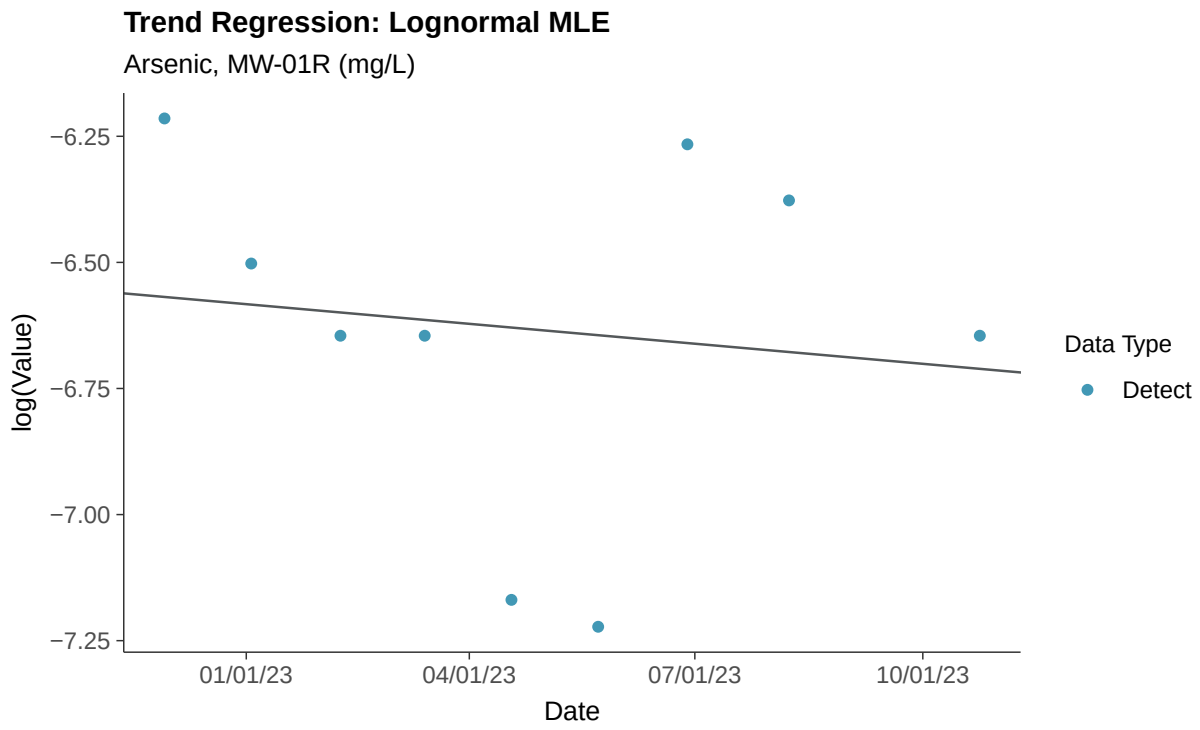
Arsenic, MW-01R (mg/L)

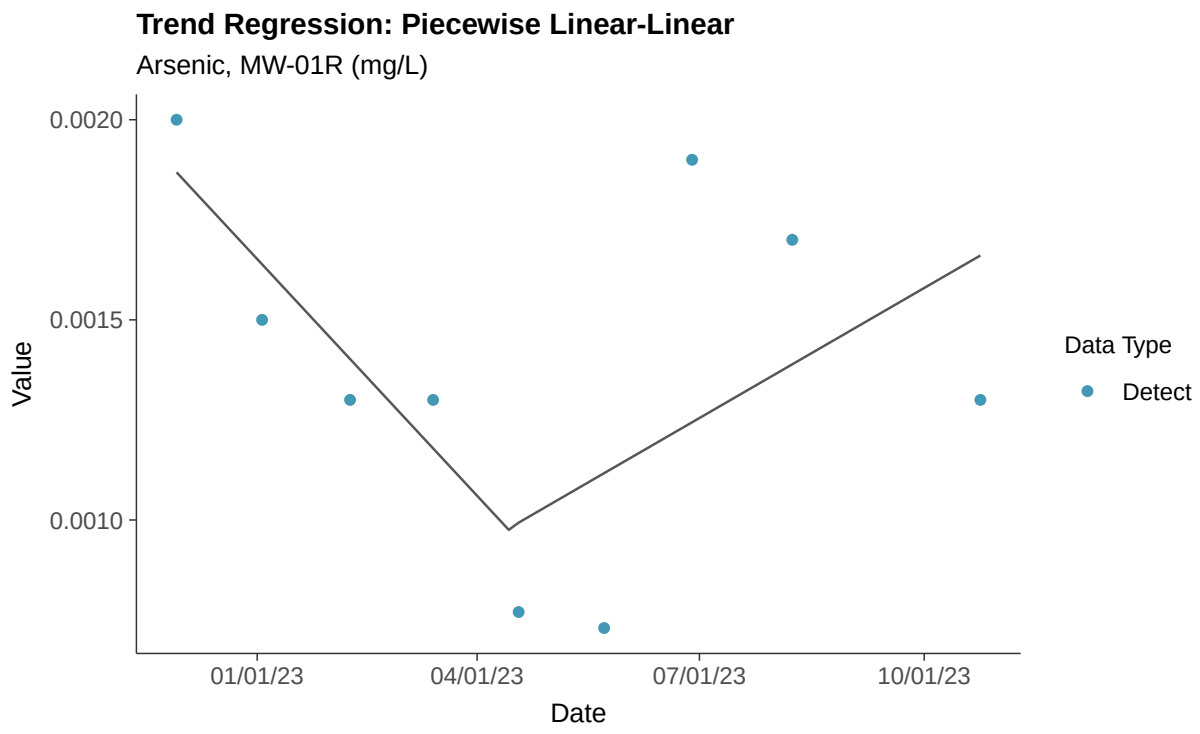


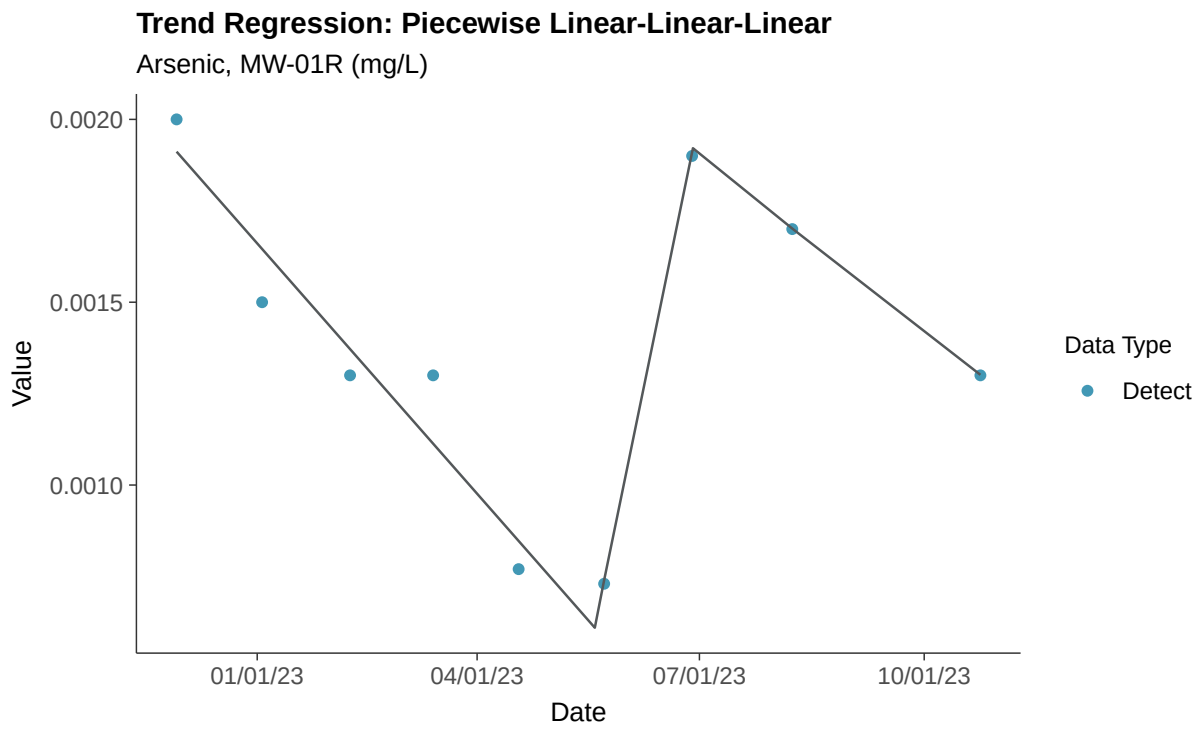

Normal Q-Q plot
Arsenic, MW-01R (mg/L)
Value
0.0020
0.0015
0.0010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Arsenic, MW-01R (mg/L)
log(Value)
−6.25
−6.50
−6.75
−7.00
−7.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-01R (mg/L)
Value
0.0020
0.0015
0.0010
0.0005
0.0010
0.0015
0.0020
0.0025
Theoretical Quantiles (Gamma)
Data Type
Detect

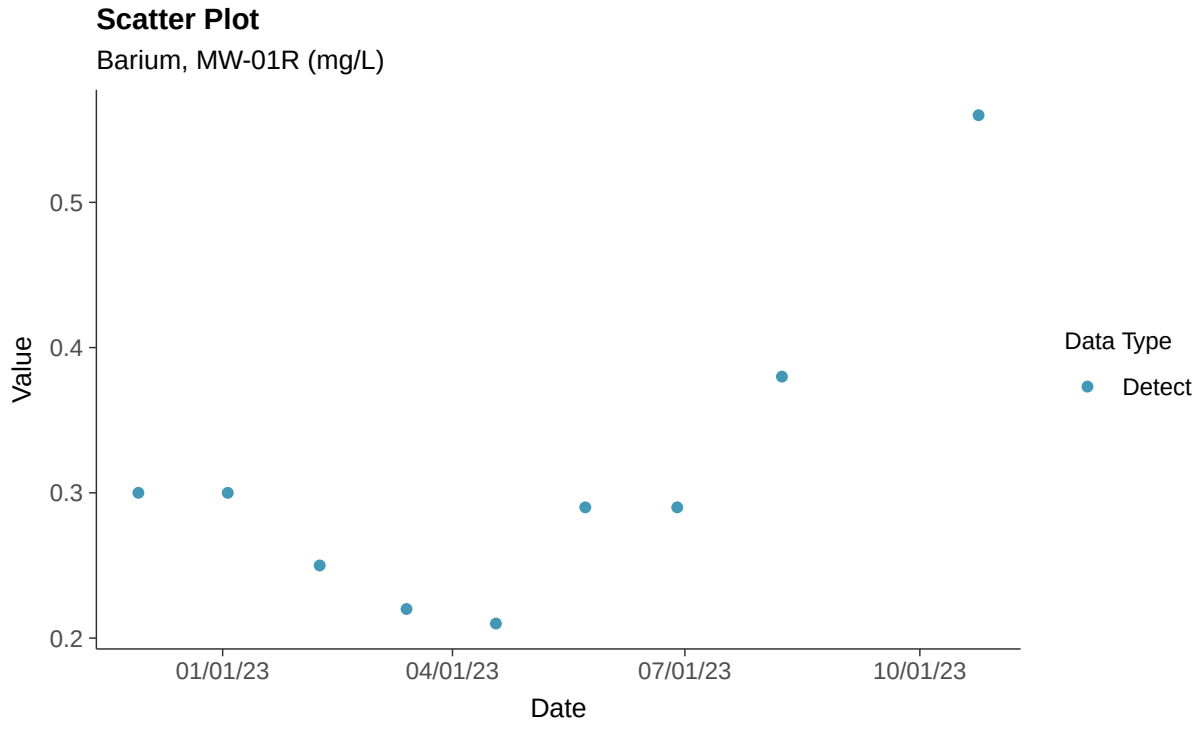

Trend Regression: Lognormal MLE
Arsenic, MW-01R (mg/L)
log(Value)
−6.25
−6.50
−6.75
−7.00
−7.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

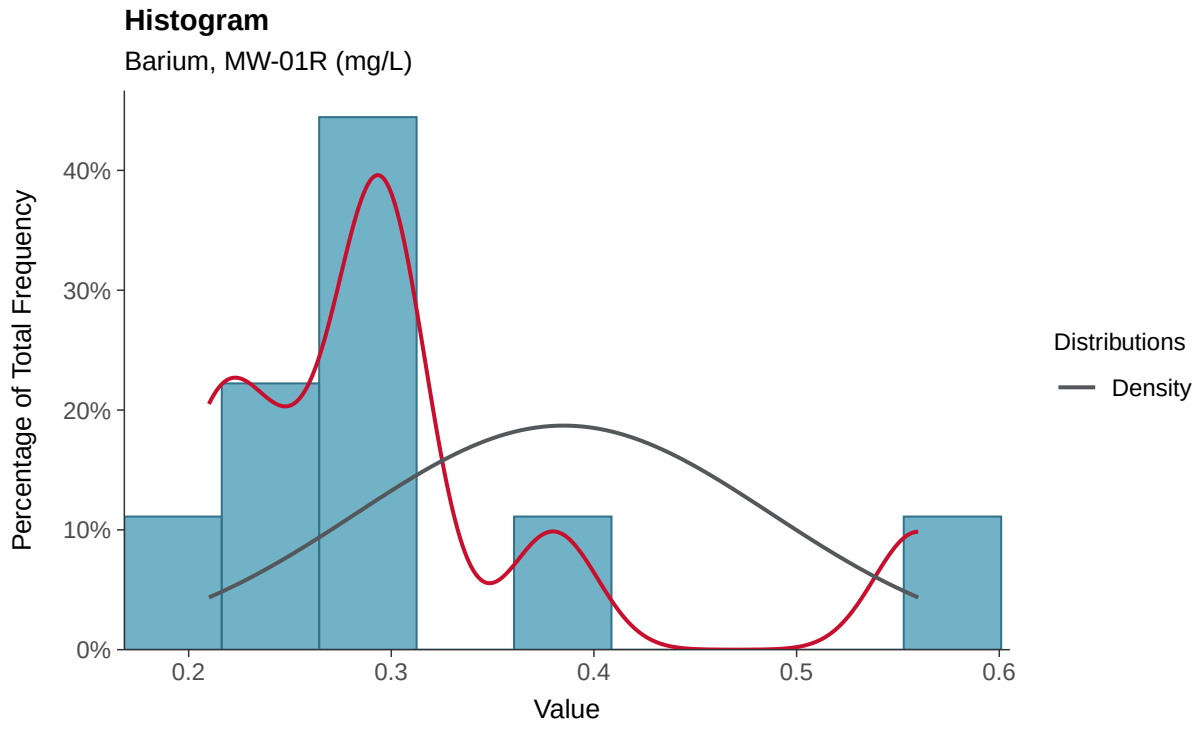

Trend Regression: Piecewise Linear-Linear
Arsenic, MW-01R (mg/L)
0.0020
0.0015
0.0010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Arsenic, MW-01R (mg/L)
0.0020
0.0015
0.0010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-01R

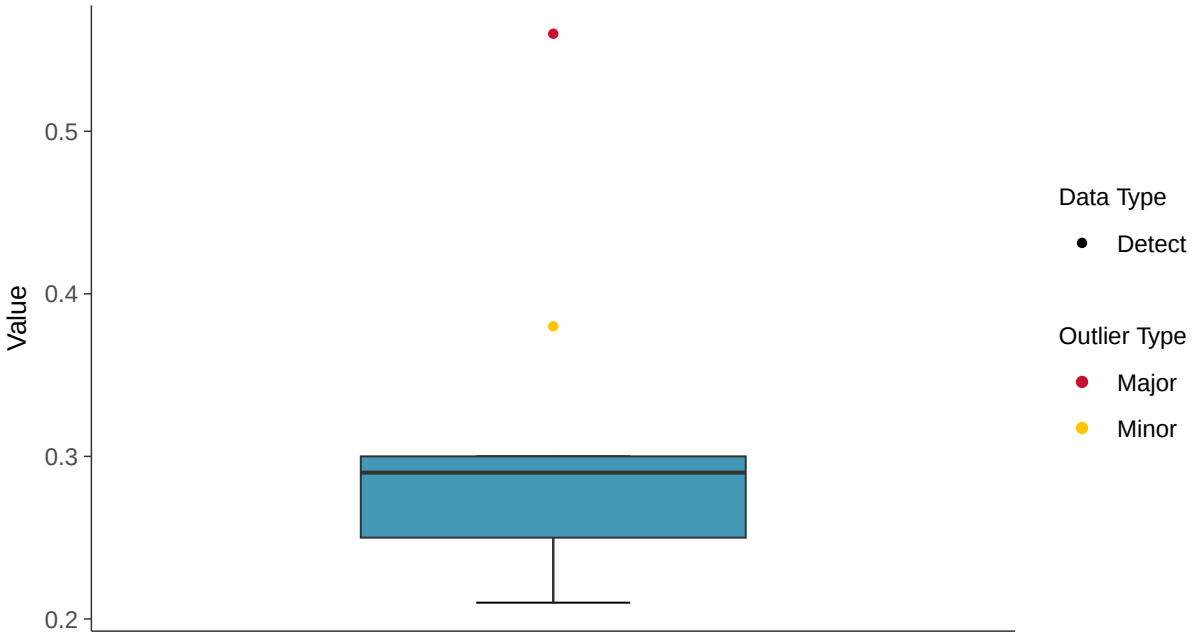
ID: 1_11_5_103





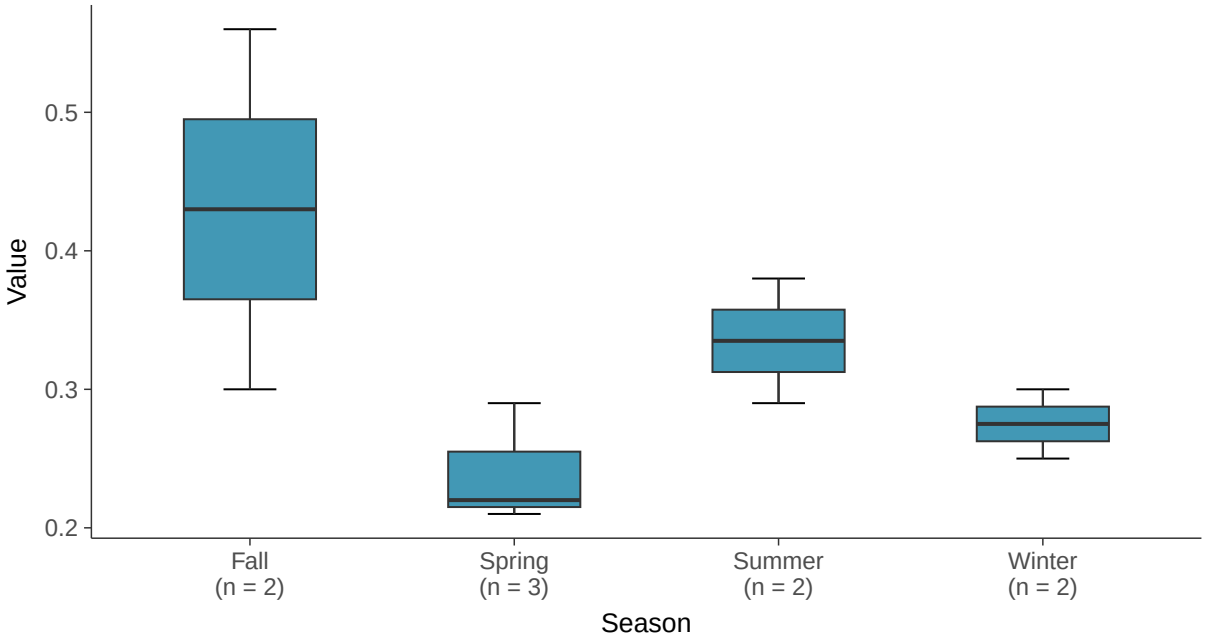
Boxplot

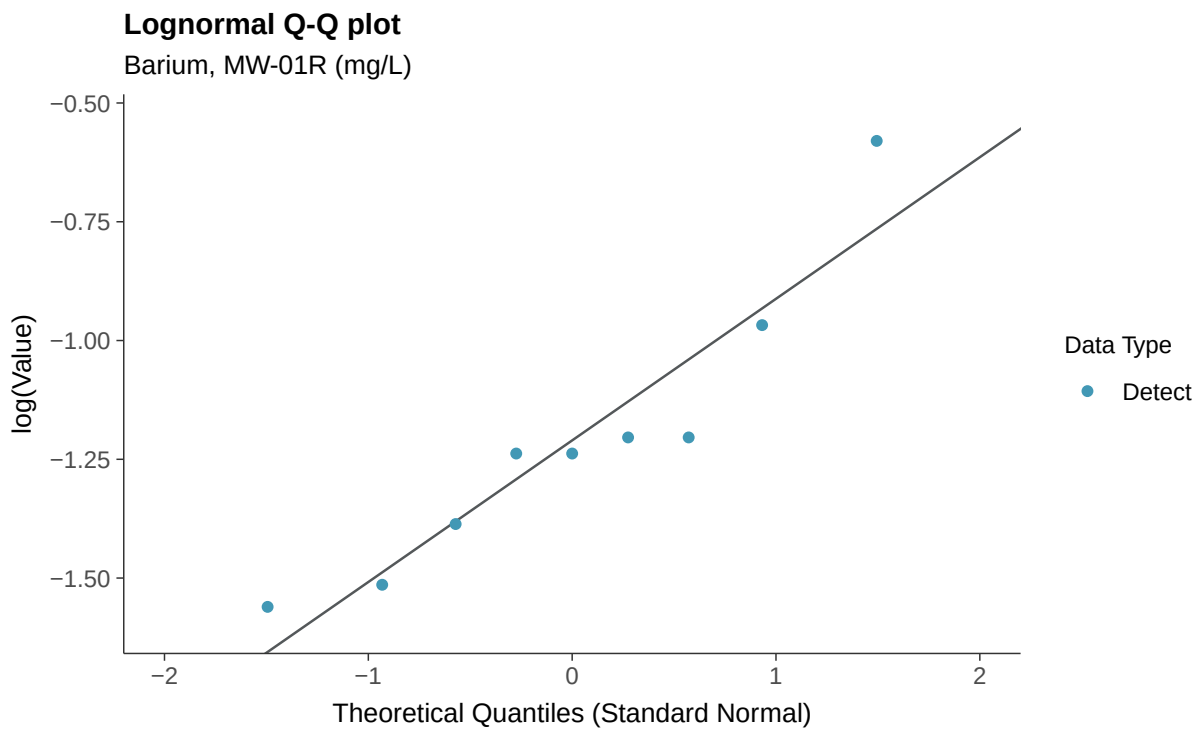
Barium, MW-01R (mg/L)

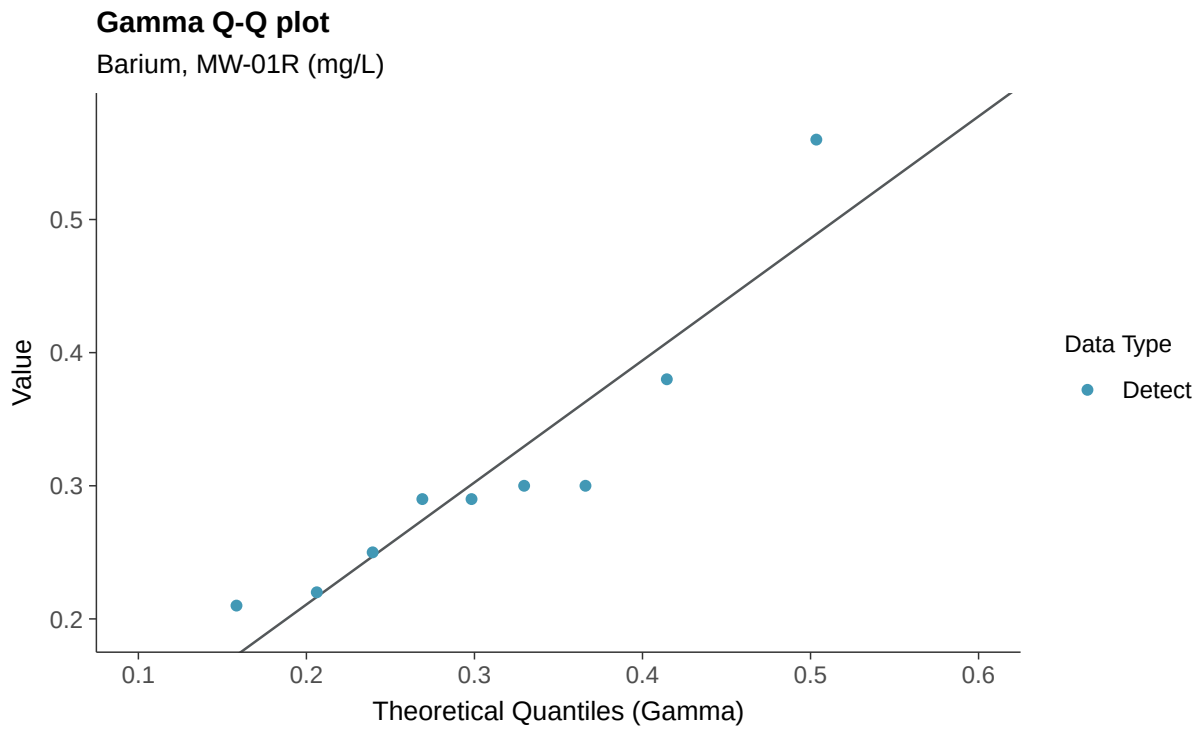


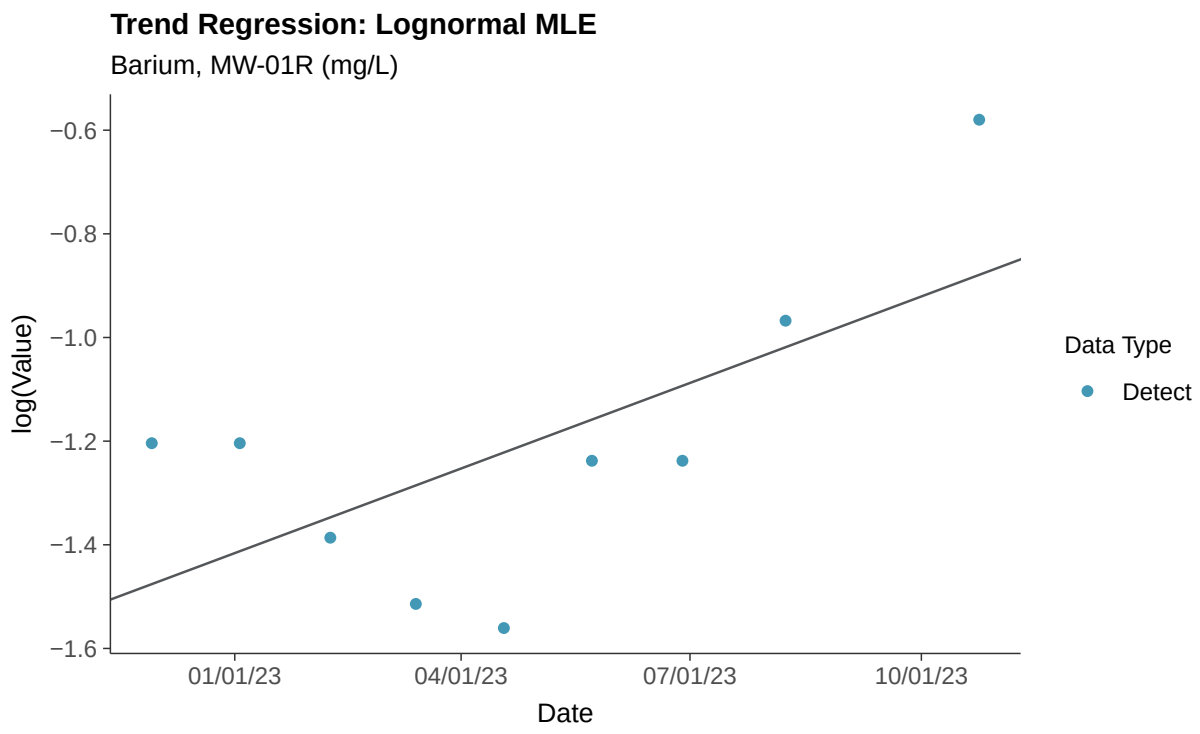
Boxplot by Season

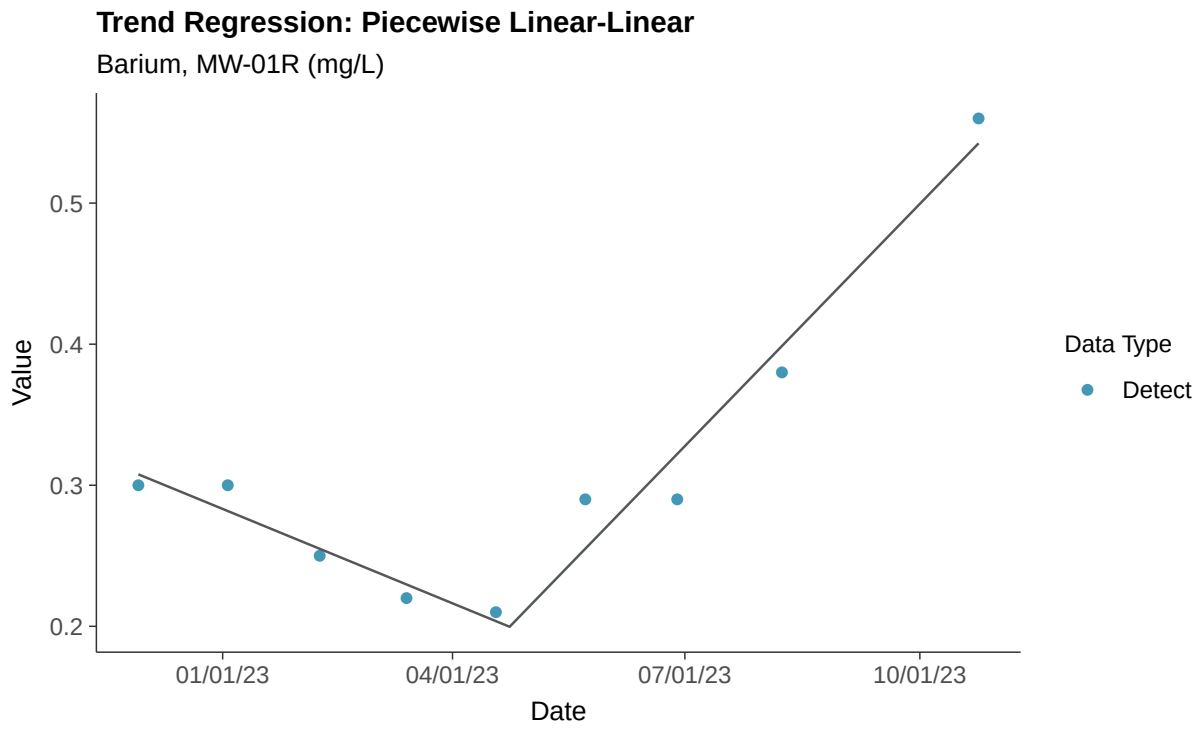
Barium, MW-01R (mg/L)

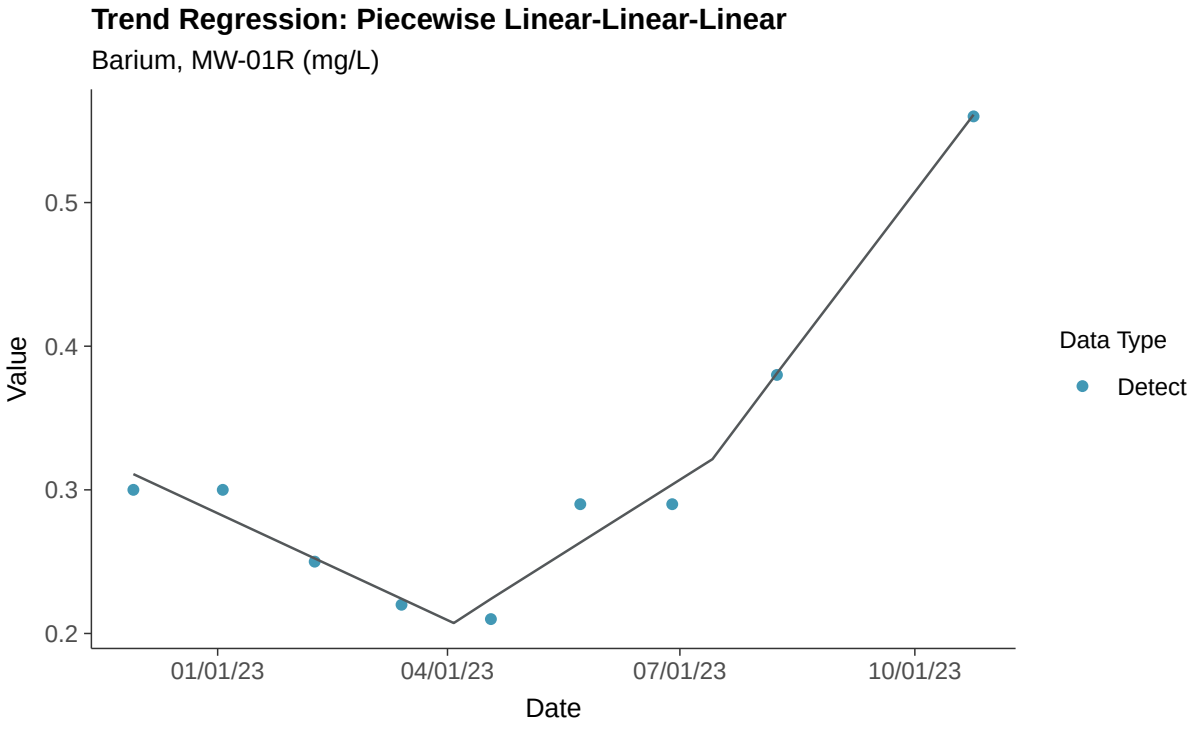



Lognormal Q-Q plot
Barium, MW-01R (mg/L)
log(Value)
−0.50
−0.75
−1.00
−1.25
−1.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Barium, MW-01R (mg/L)
Value
0.5
0.4
0.3
0.2
0.1
0.2
0.3
0.4
0.5
0.6
Theoretical Quantiles (Gamma)
Data Type
Detect

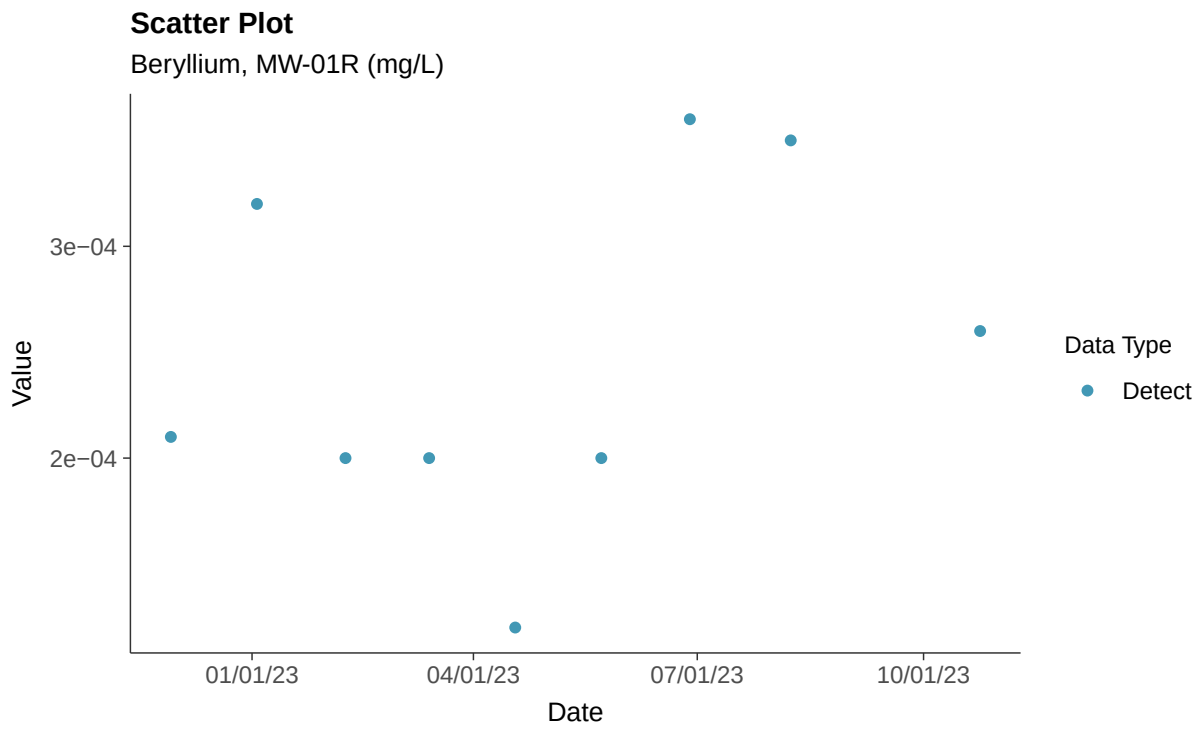

Trend Regression: Lognormal MLE
Barium, MW-01R (mg/L)
log(Value)
−0.6
−0.8
−1.0
−1.2
−1.4
−1.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

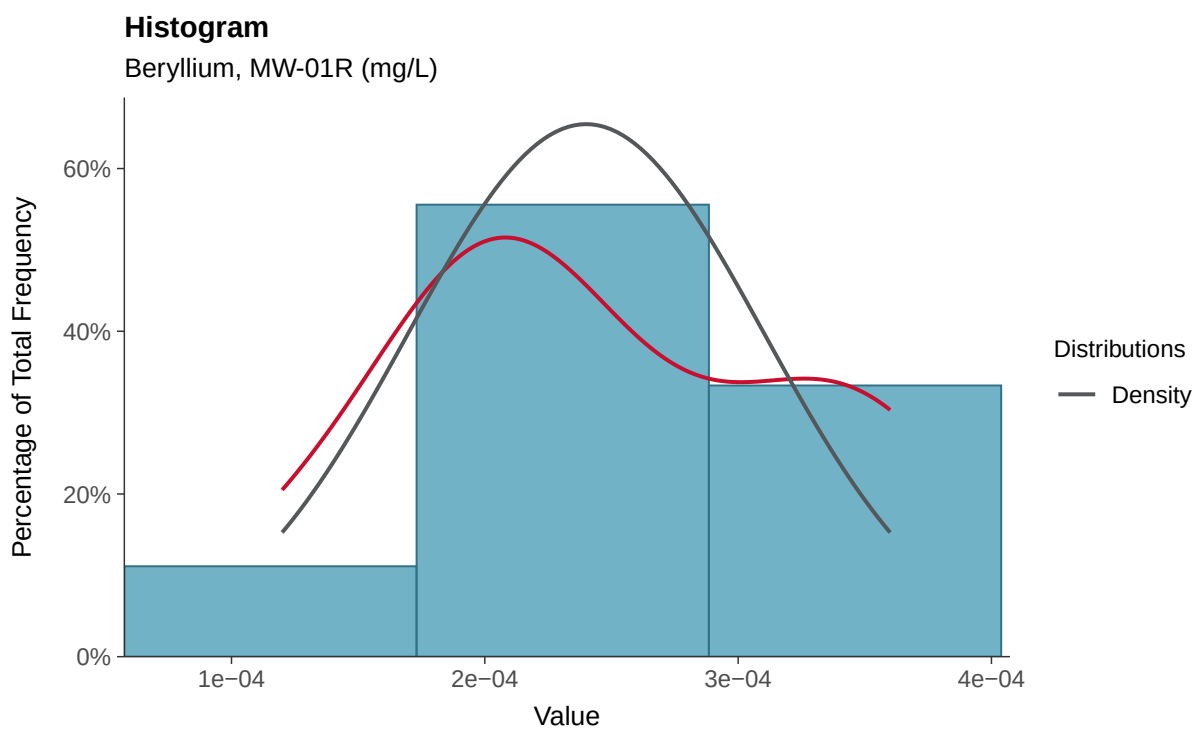

Trend Regression: Piecewise Linear-Linear
Barium, MW-01R (mg/L)
Value
0.5
0.4
0.3
0.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Barium, MW-01R (mg/L)
Value
0.5
0.4
0.3
0.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-01R

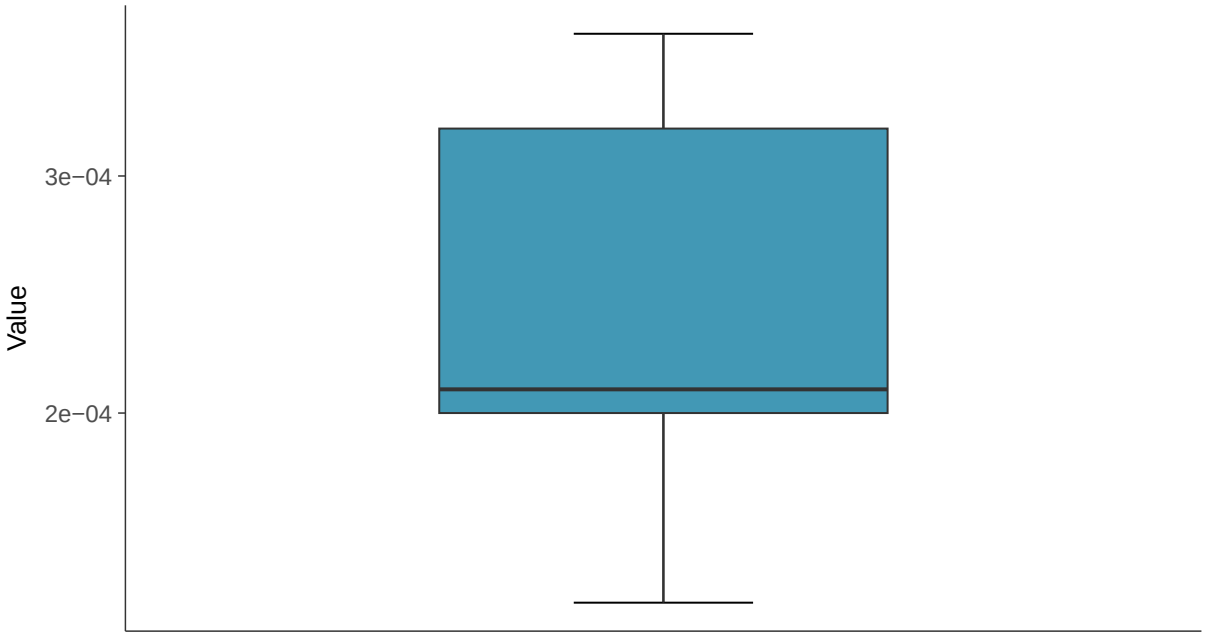
ID: 1_11_5_104





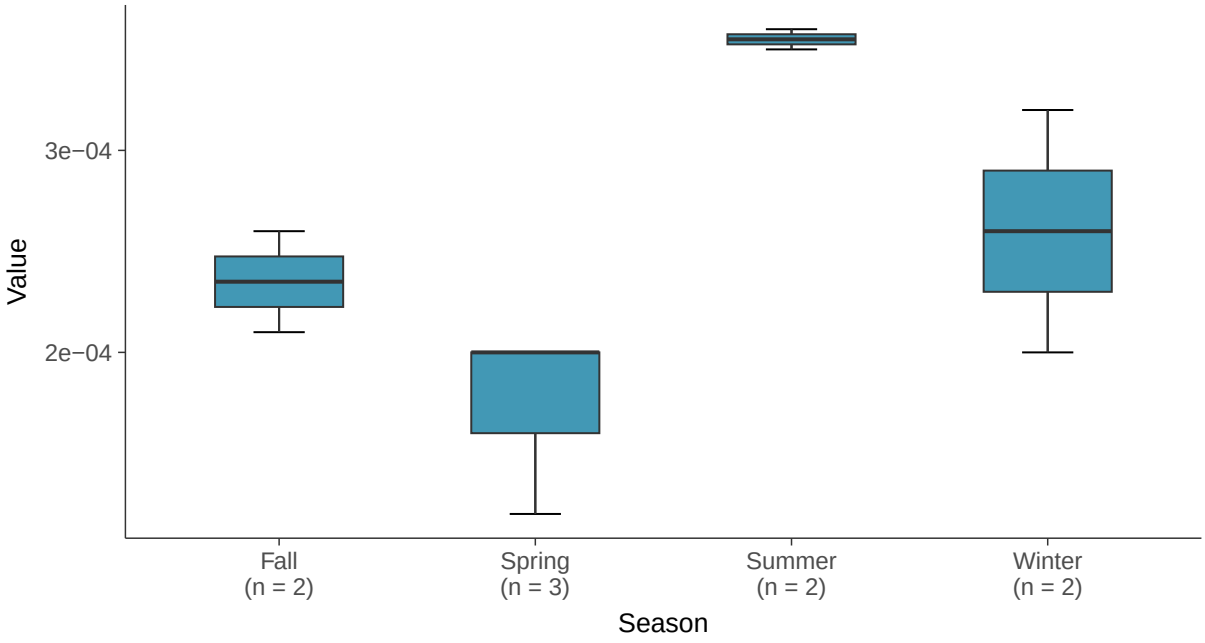
Boxplot

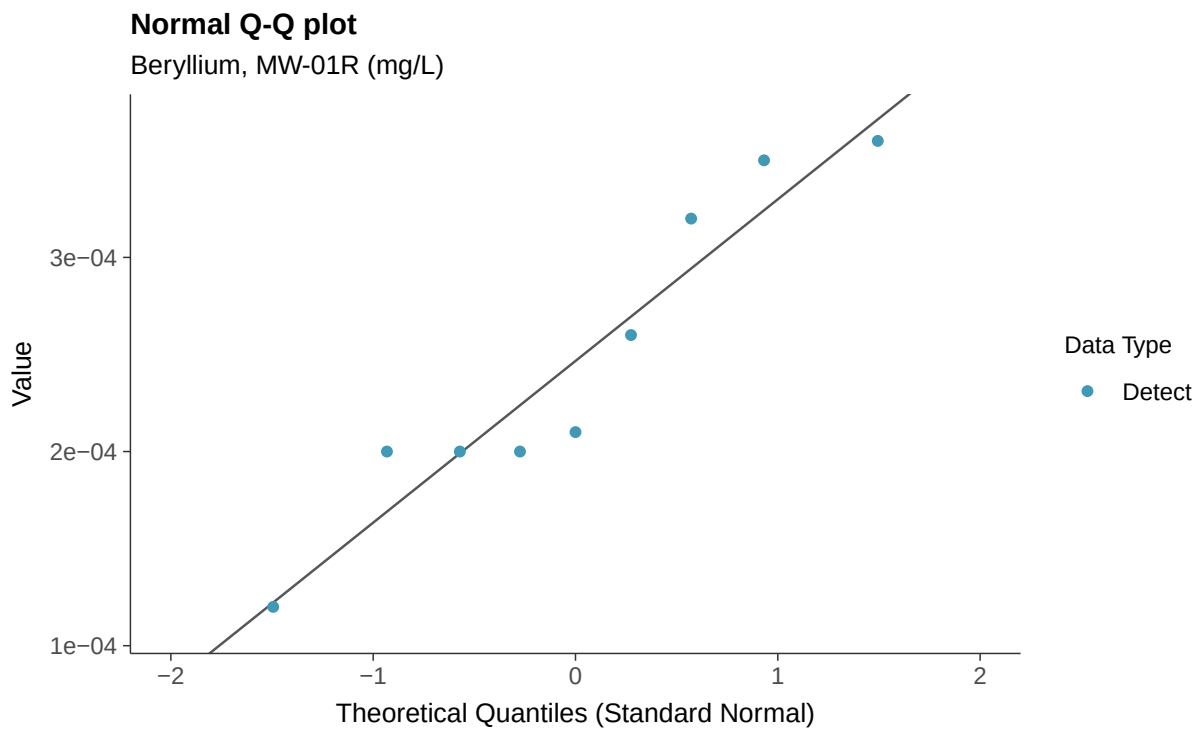
Beryllium, MW-01R (mg/L)

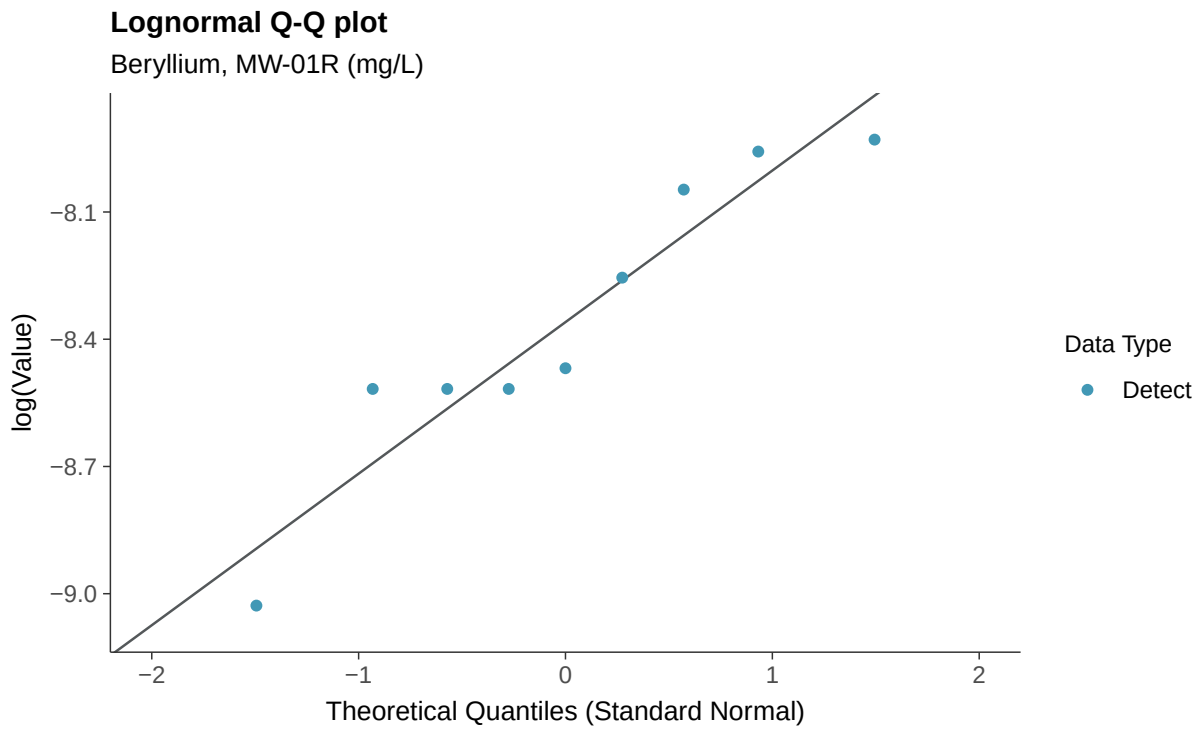


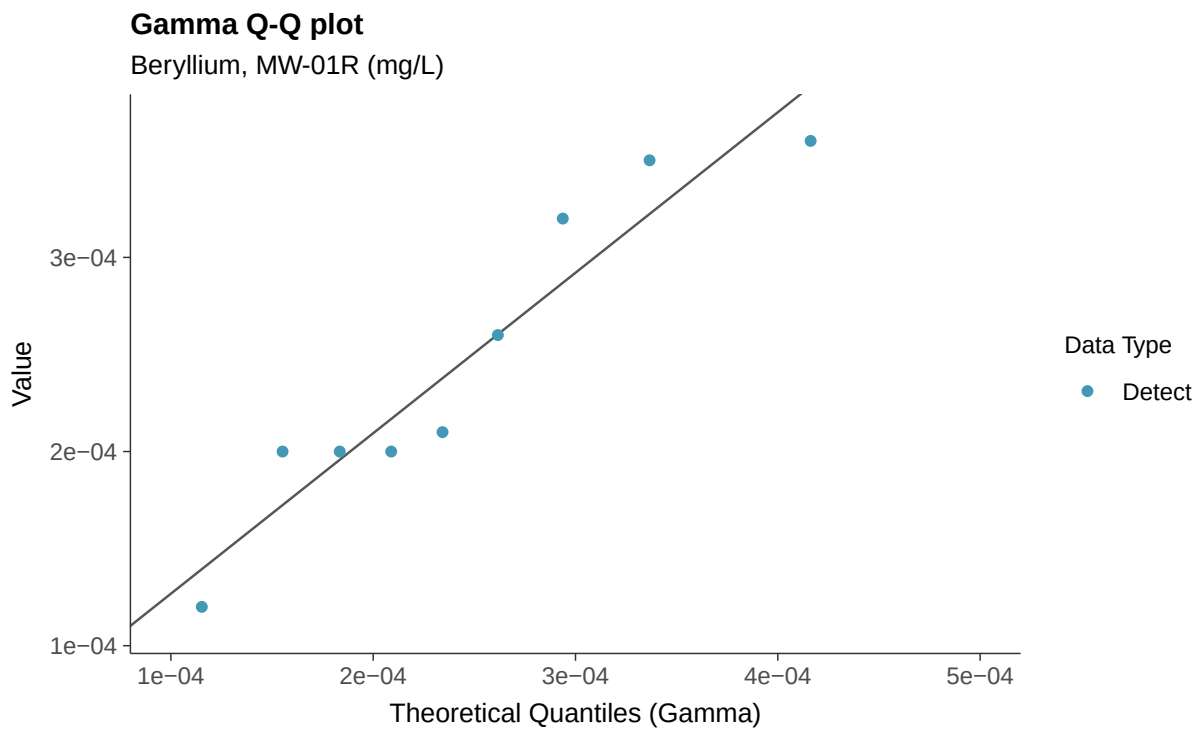
Boxplot by Season

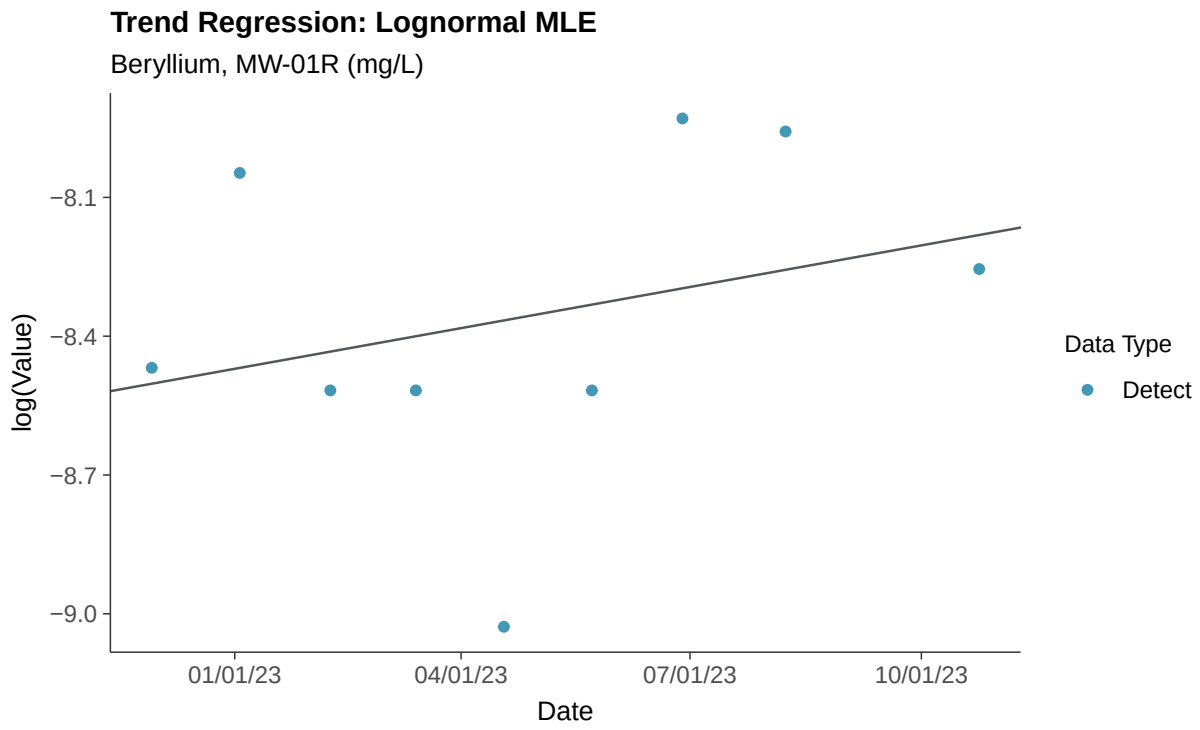
Beryllium, MW-01R (mg/L)




Normal Q-Q plot
Beryllium, MW-01R (mg/L)
Value
3e−04
2e−04
1e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

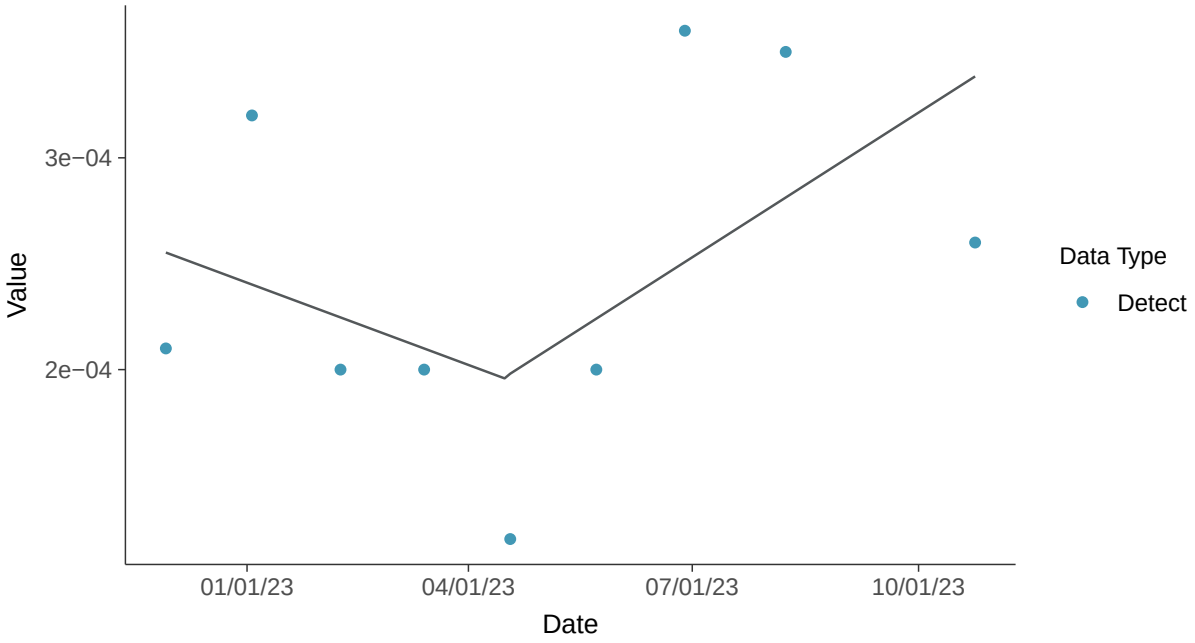

Lognormal Q-Q plot
Beryllium, MW-01R (mg/L)
log(Value)
−8.1
−8.4
−8.7
−9.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Beryllium, MW-01R (mg/L)
Value
3e−04
2e−04
1e−04
1e−04
2e−04
3e−04
4e−04
5e−04
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Beryllium, MW-01R (mg/L)
log(Value)
−8.1
−8.4
−8.7
−9.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

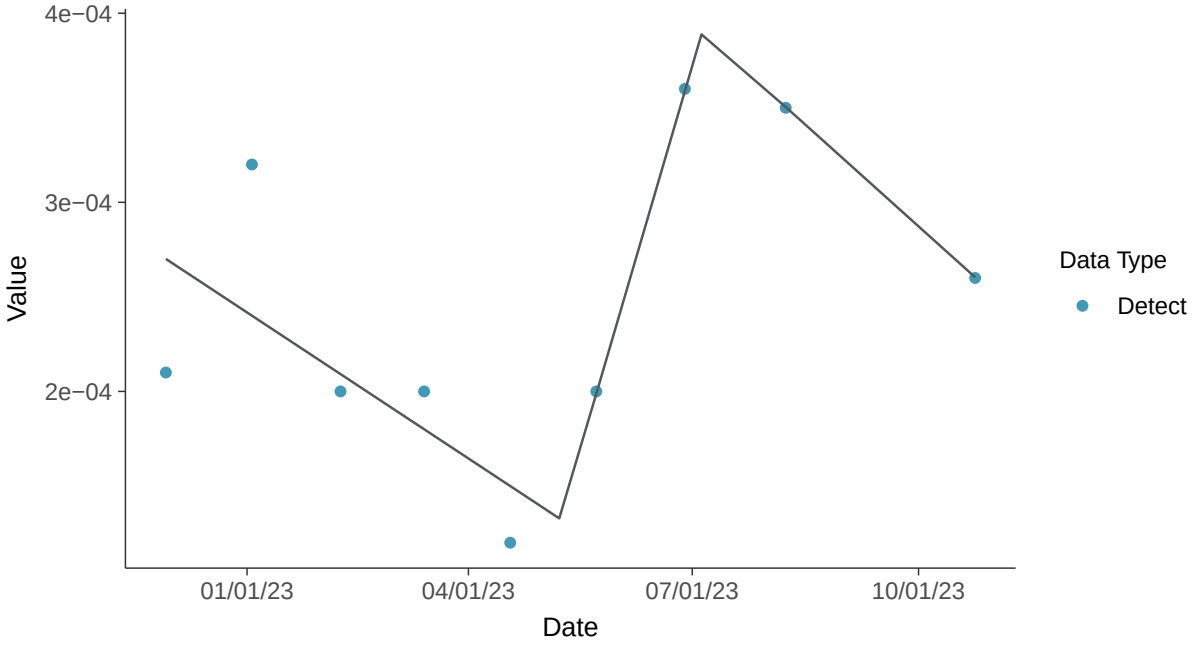
Trend Regression: Piecewise Linear-Linear

Beryllium, MW-01R (mg/L)



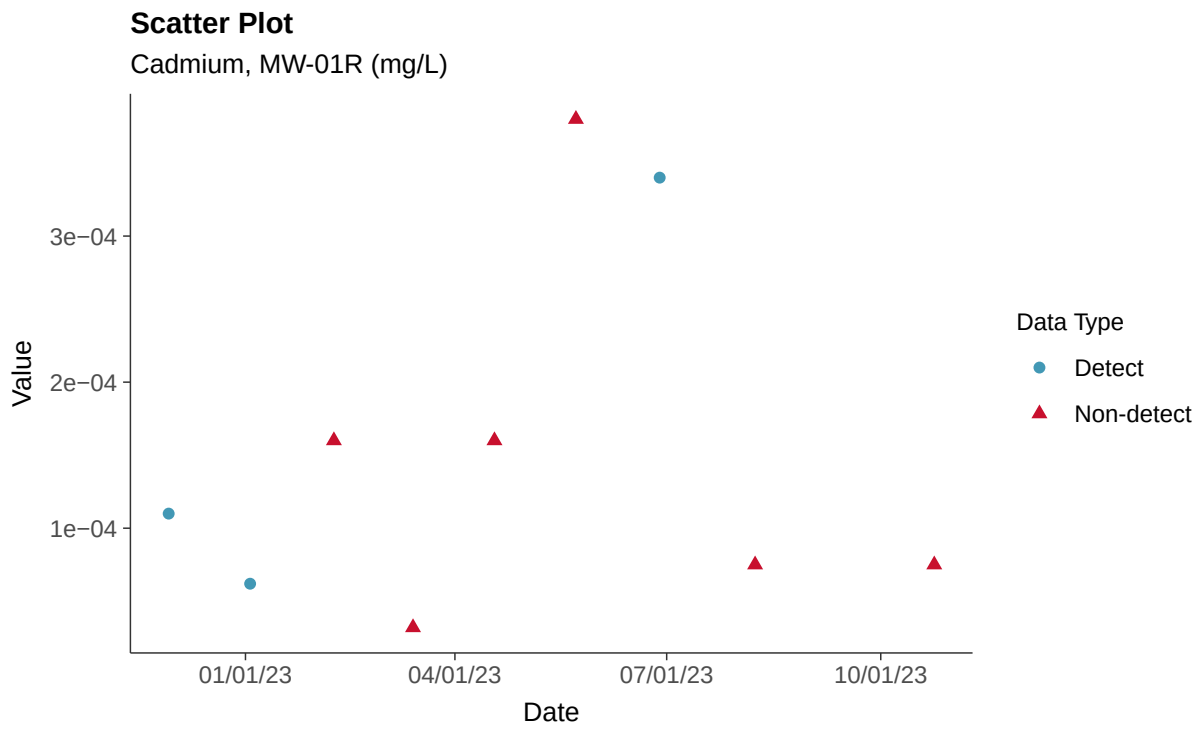
Trend Regression: Piecewise Linear-Linear-Linear

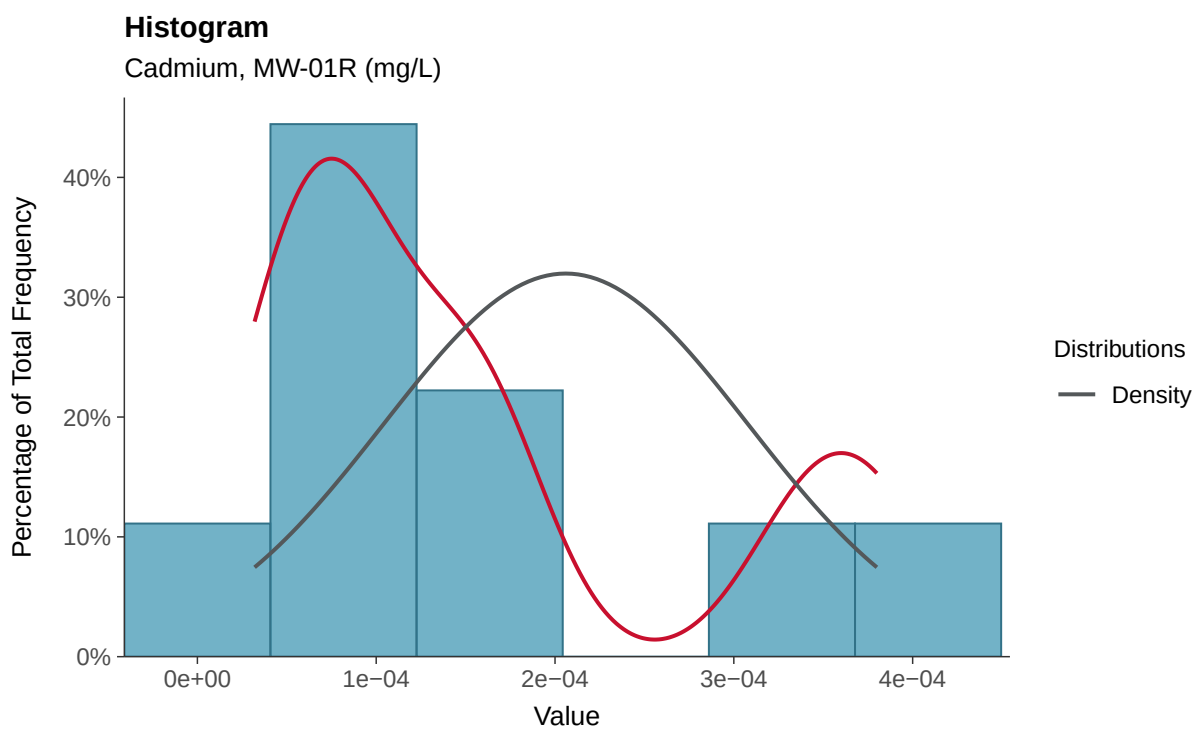
Beryllium, MW-01R (mg/L)



Appendix IV: Cadmium, MW-01R

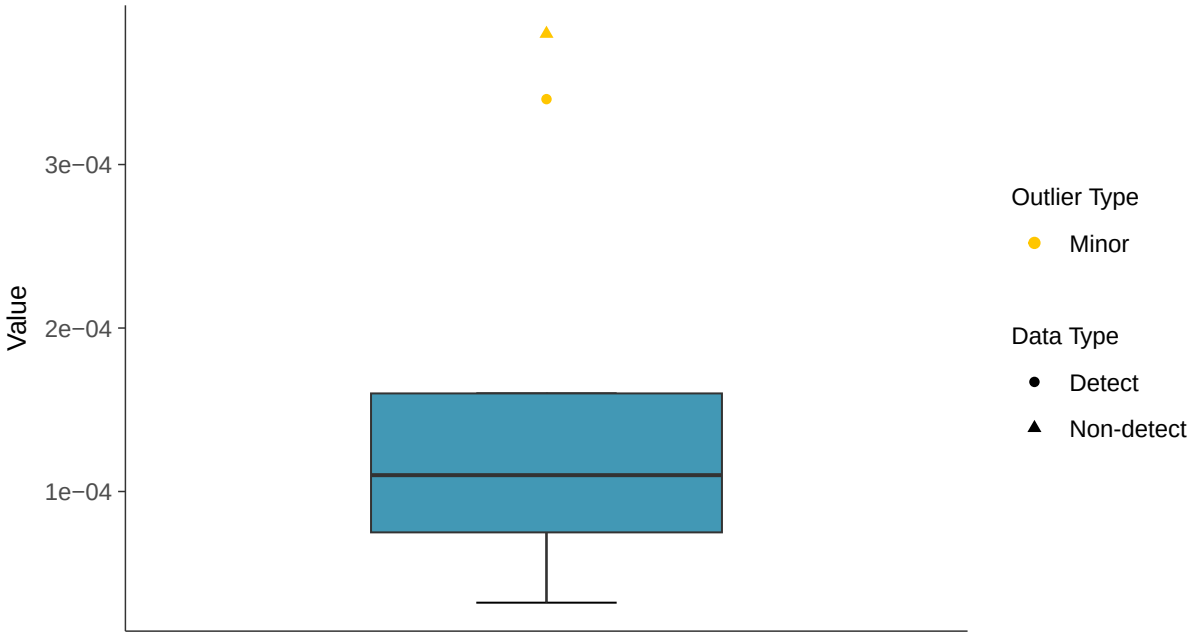
ID: 1_11_5_106





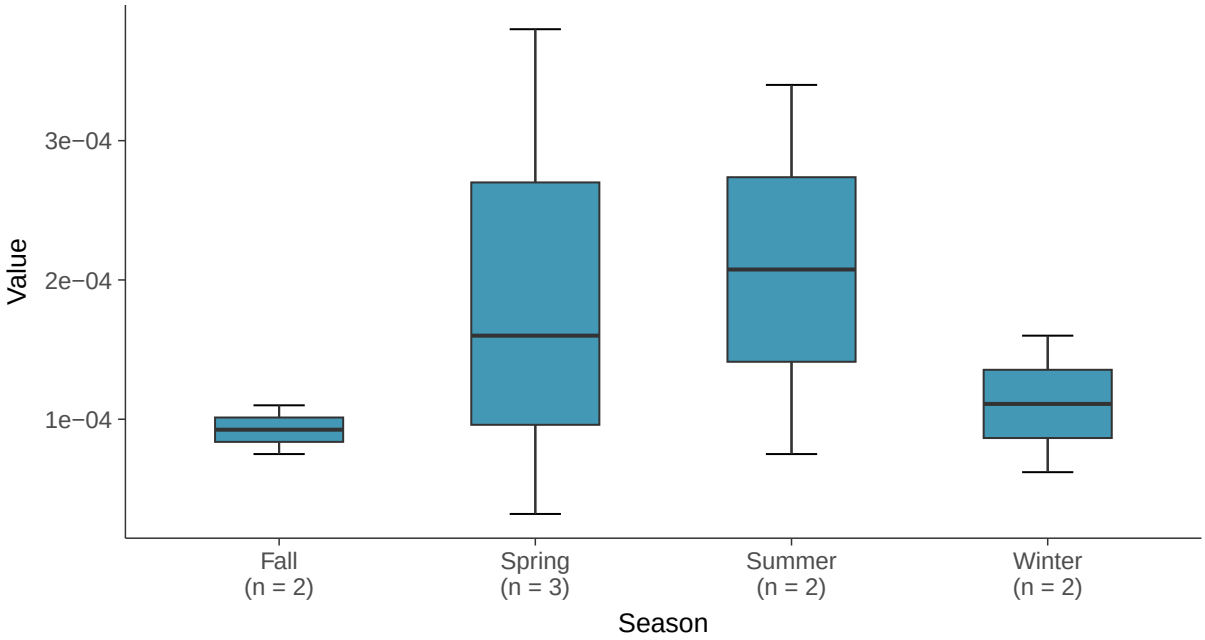
Boxplot

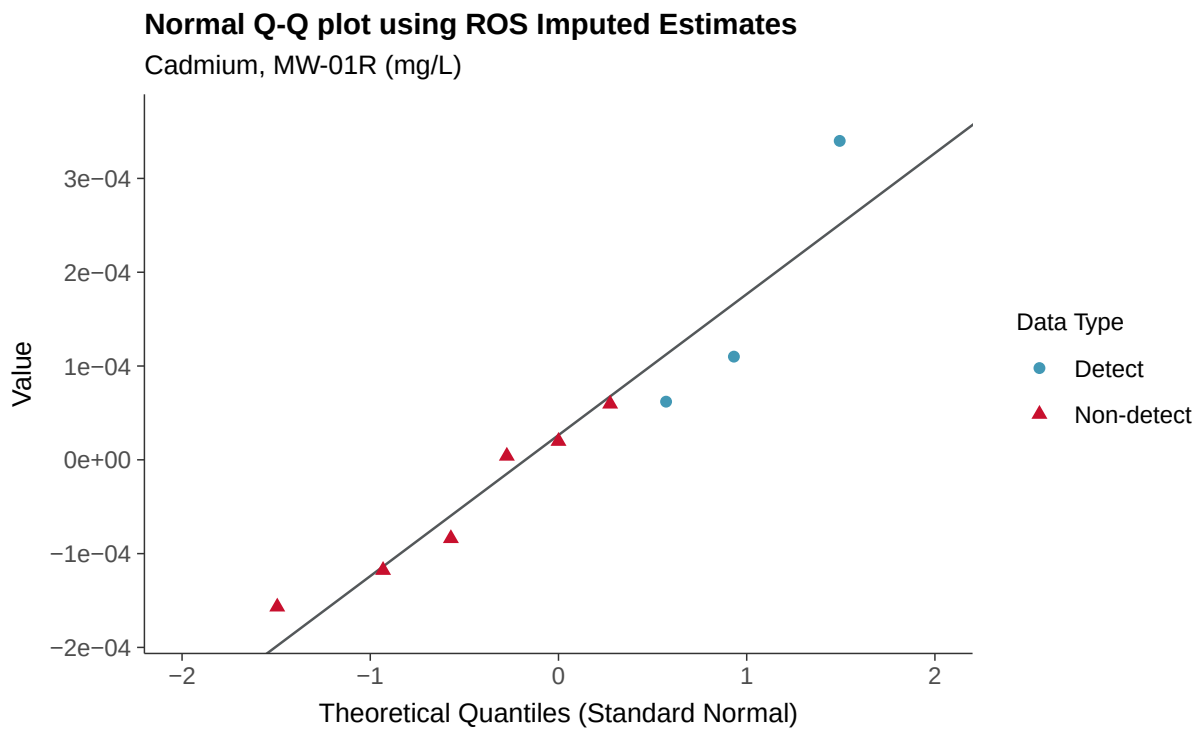
Cadmium, MW-01R (mg/L)

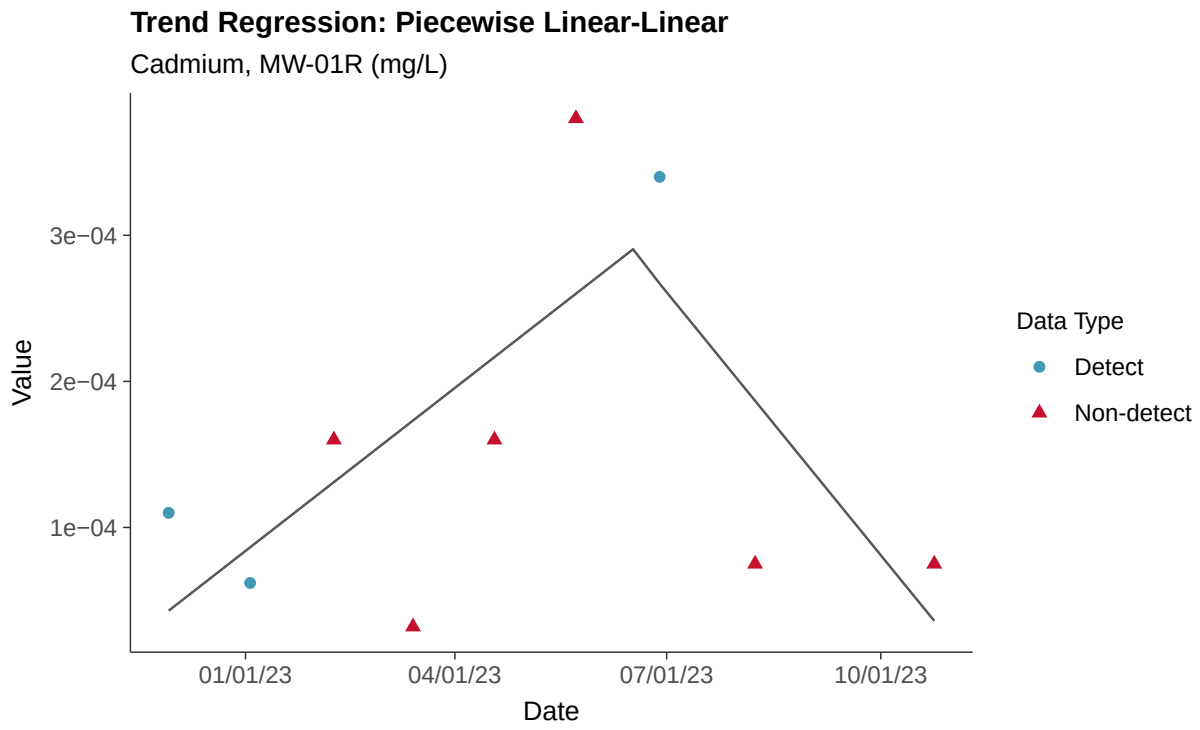


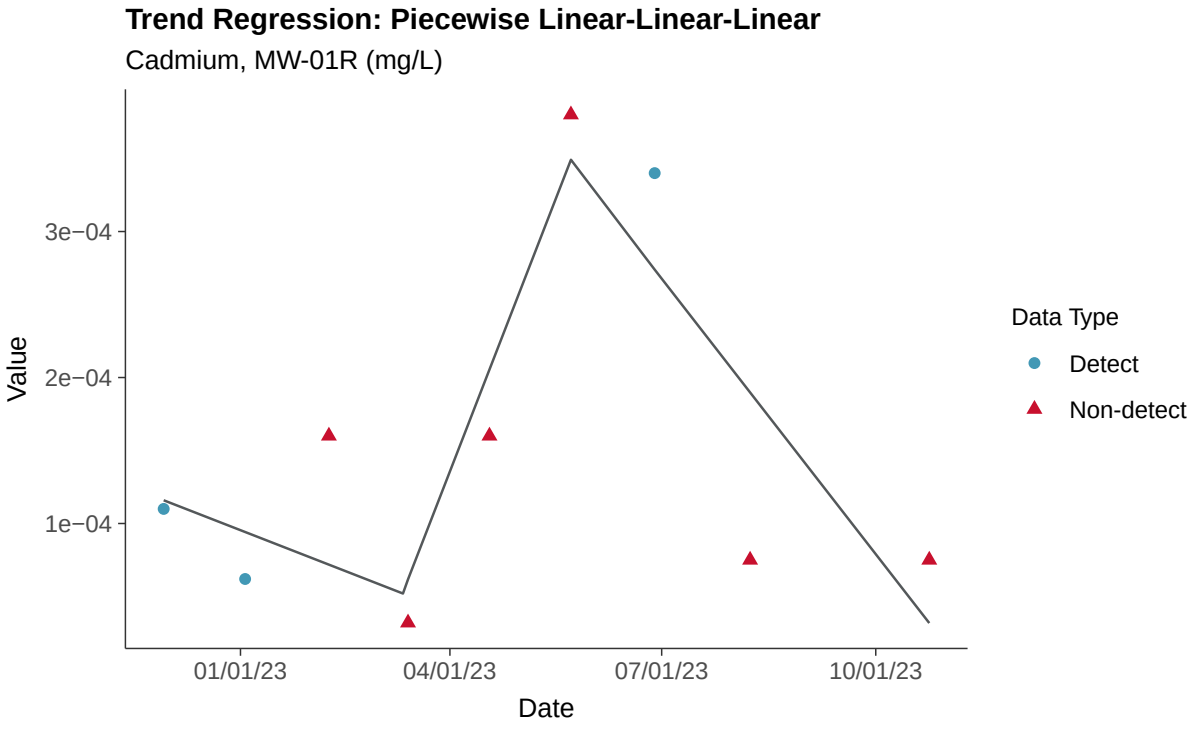
Boxplot by Season

Cadmium, MW-01R (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Cadmium, MW-01R (mg/L)
Value
3e−04
2e−04
1e−04
0e+00
−1e−04
−2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Cadmium, MW-01R (mg/L)
Value
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

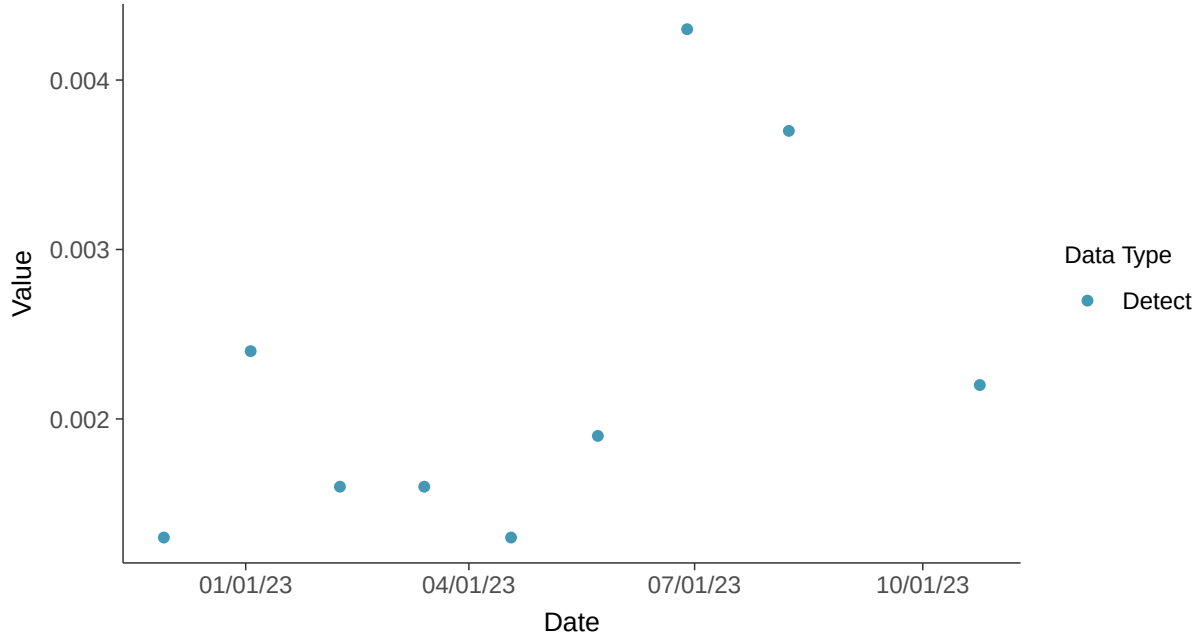

Trend Regression: Piecewise Linear-Linear-Linear
Cadmium, MW-01R (mg/L)
Value
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Chromium, Total, MW-01R

ID: 1_11_5_109

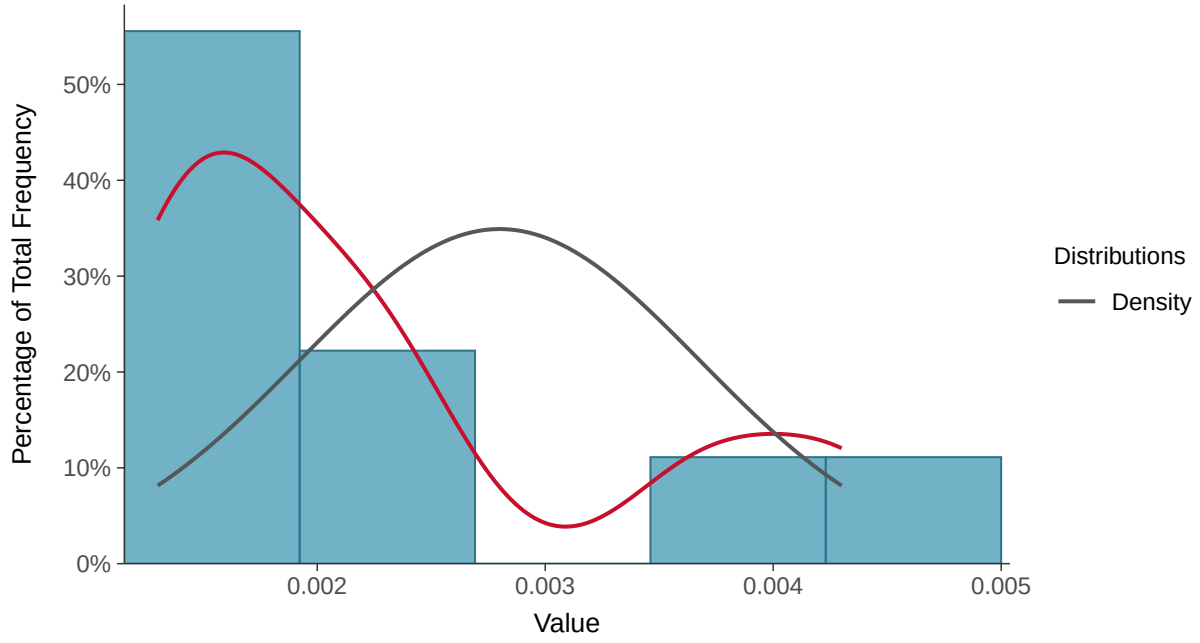
Scatter Plot

Chromium, Total, MW-01R (mg/L)



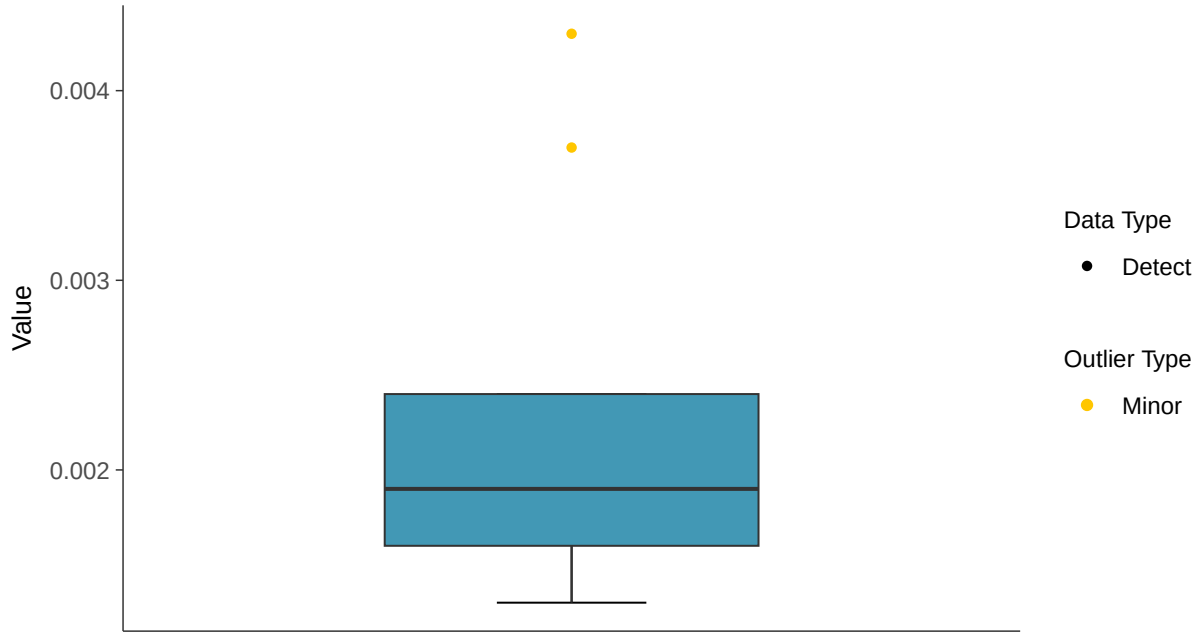
Histogram

Chromium, Total, MW-01R (mg/L)



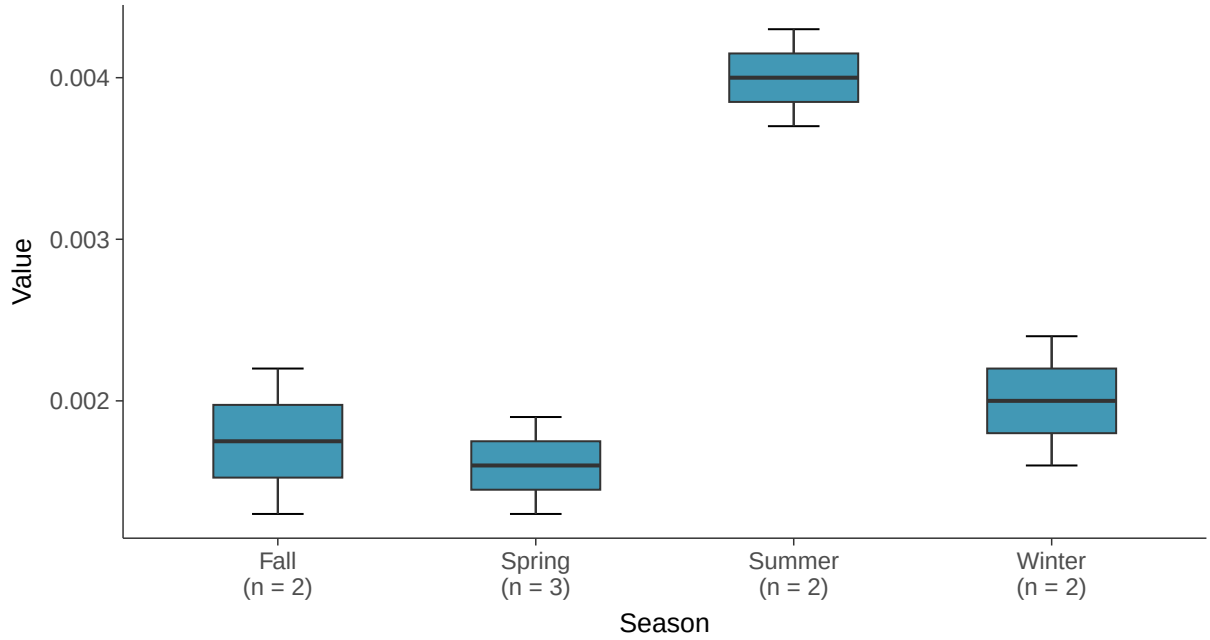
Boxplot

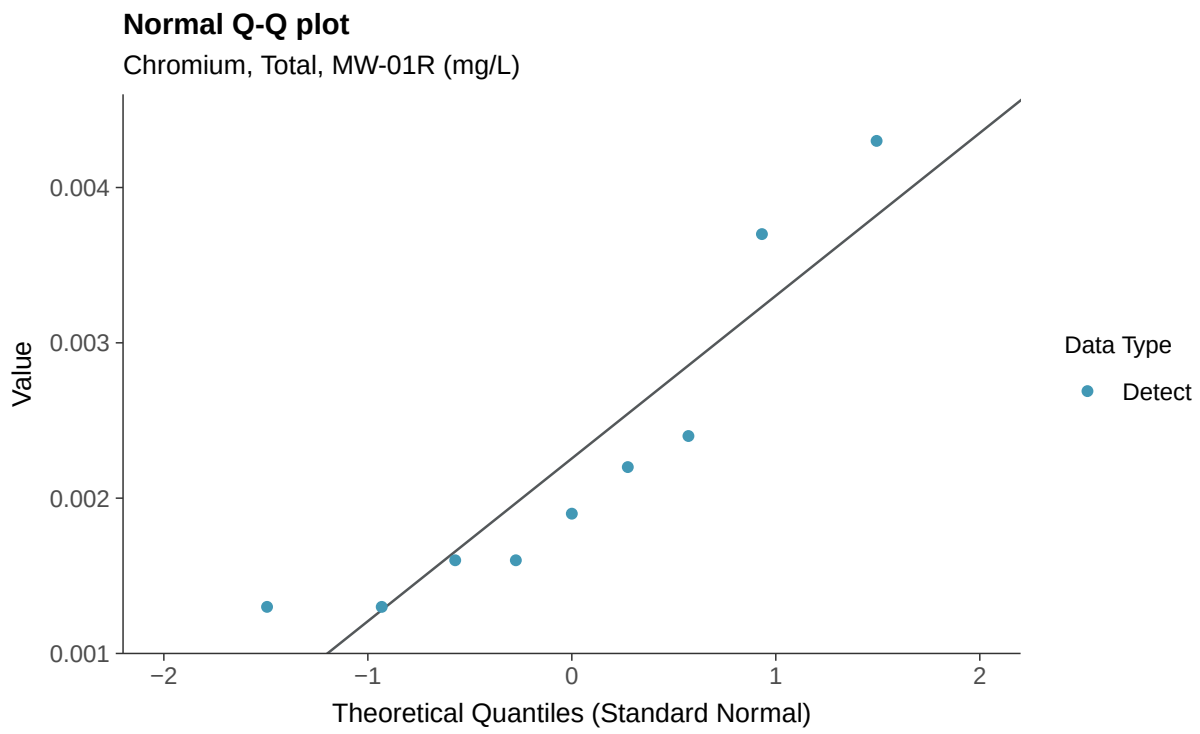
Chromium, Total, MW-01R (mg/L)

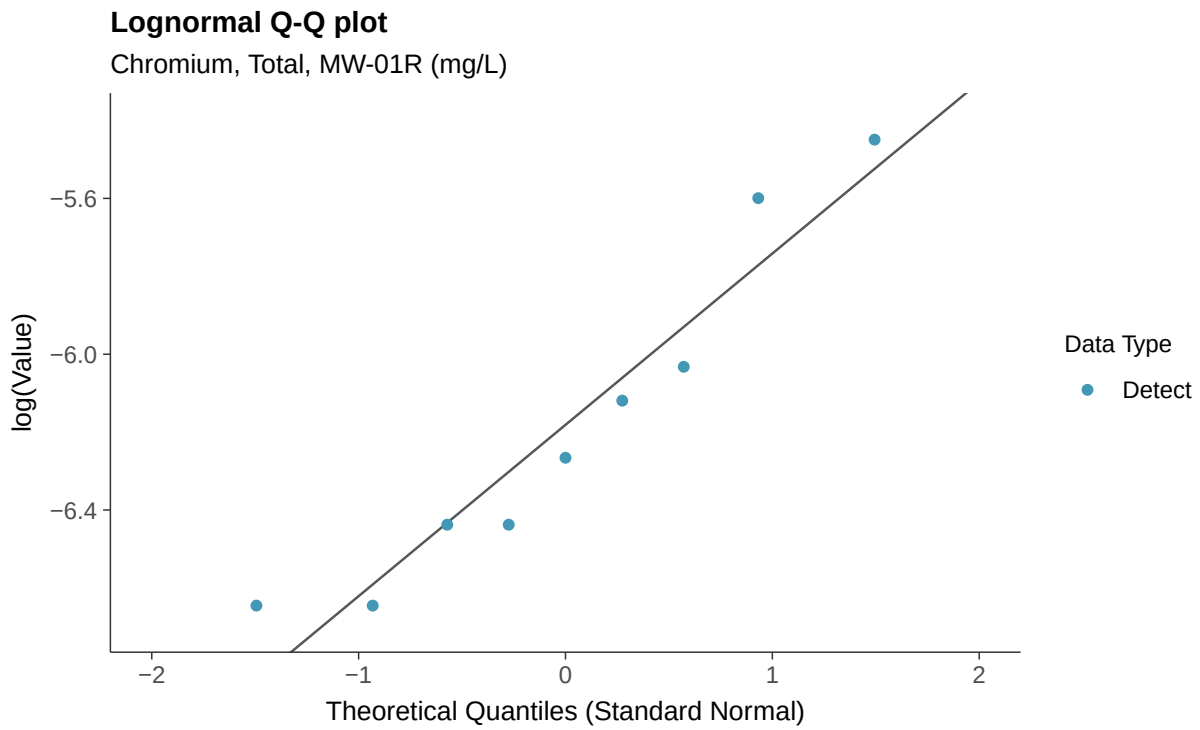


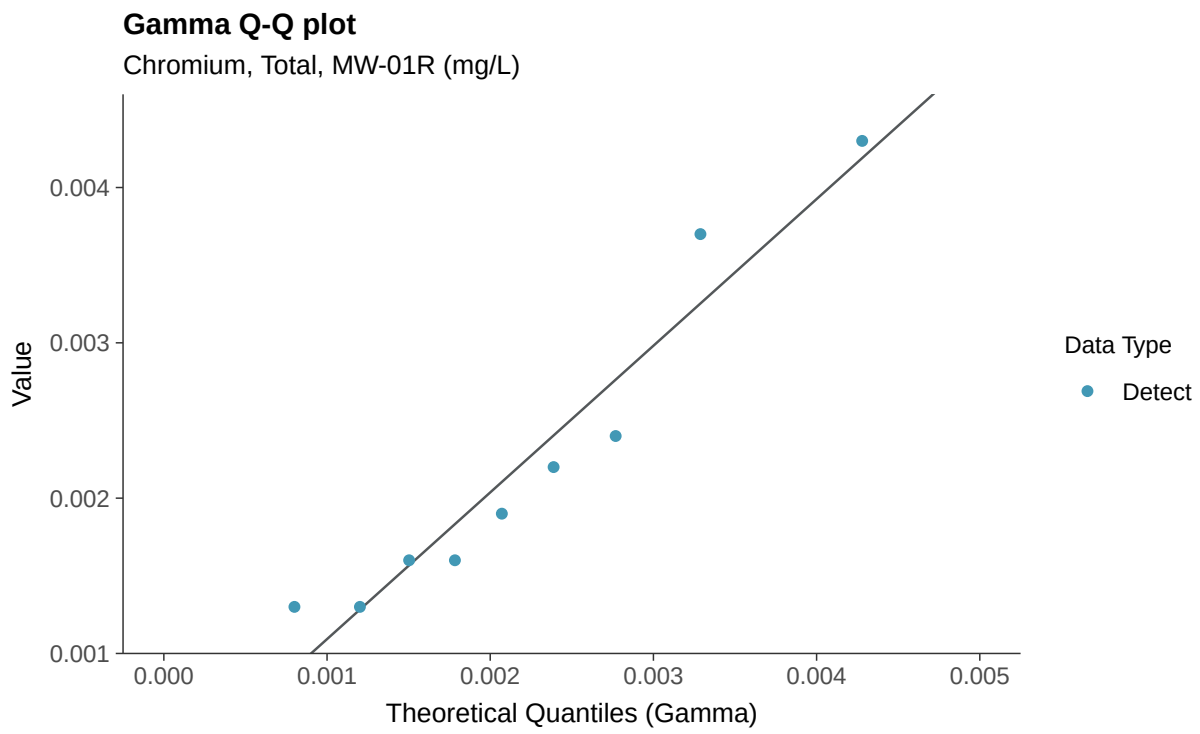
Boxplot by Season

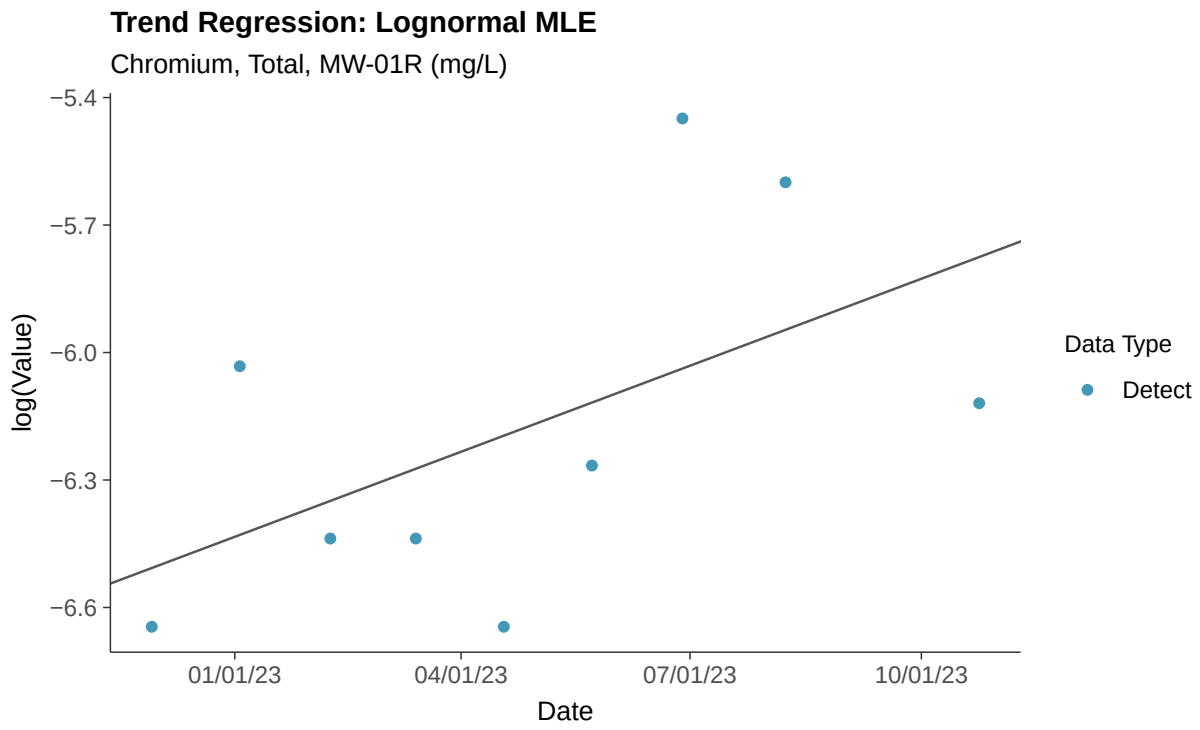
Chromium, Total, MW-01R (mg/L)




Normal Q-Q plot
Chromium, Total, MW-01R (mg/L)
Value
0.004
0.003
0.002
0.001
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

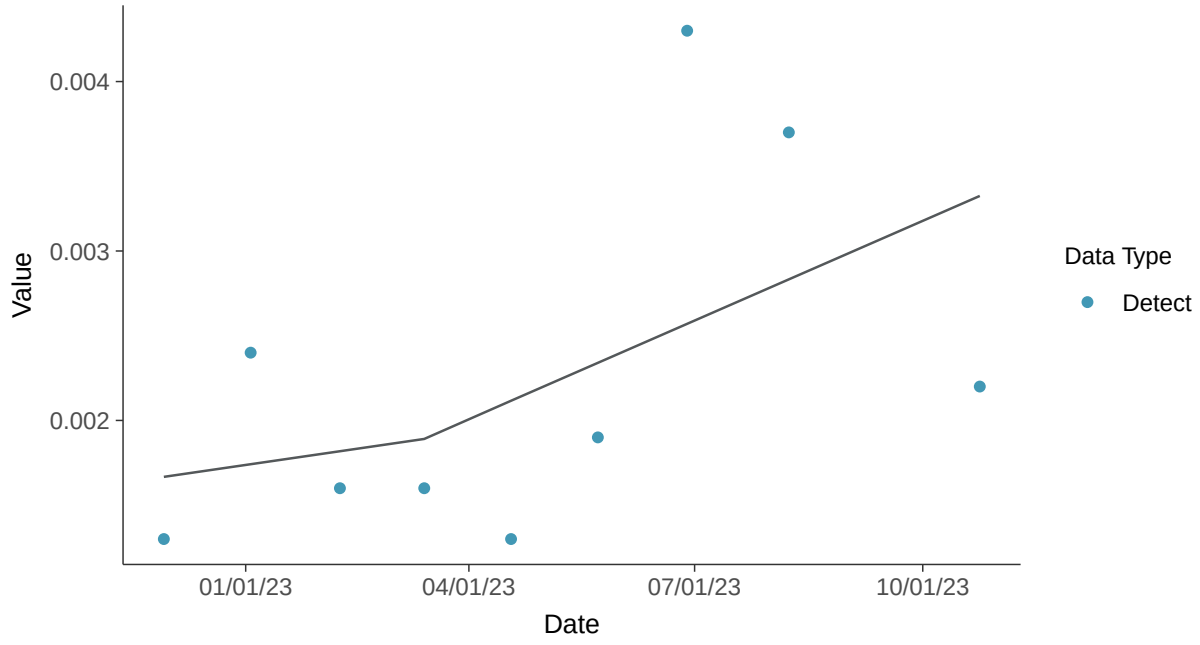

Lognormal Q-Q plot
Chromium, Total, MW-01R (mg/L)
log(Value)
−5.6
−6.0
−6.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chromium, Total, MW-01R (mg/L)
Value
0.004
0.003
0.002
0.001
0.000
0.001
0.002
0.003
0.004
0.005
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-01R (mg/L)
log(Value)
−5.4
−5.7
−6.0
−6.3
−6.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

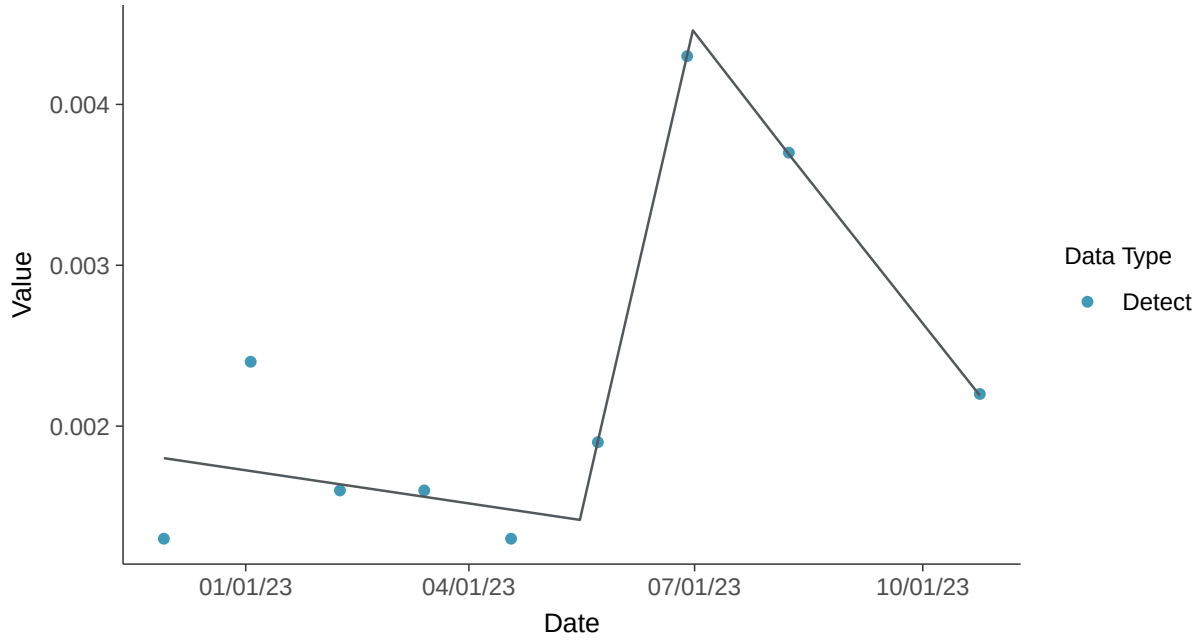
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-01R (mg/L)



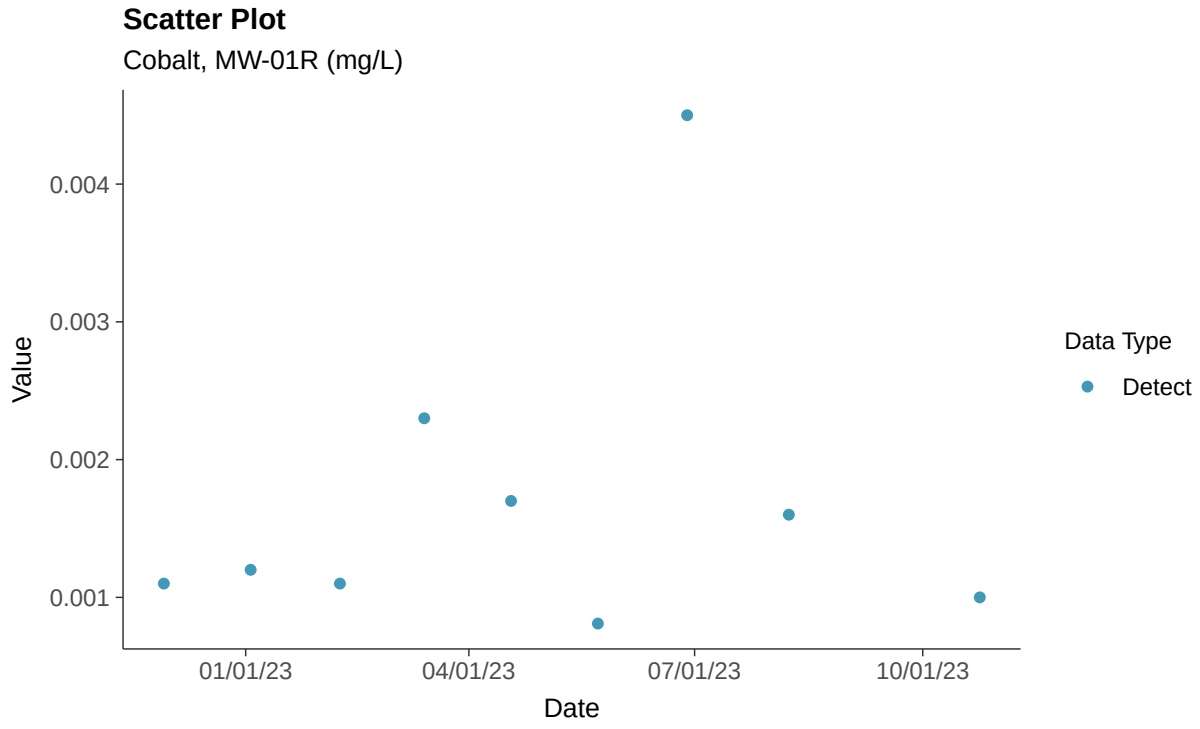
Trend Regression: Piecewise Linear-Linear-Linear

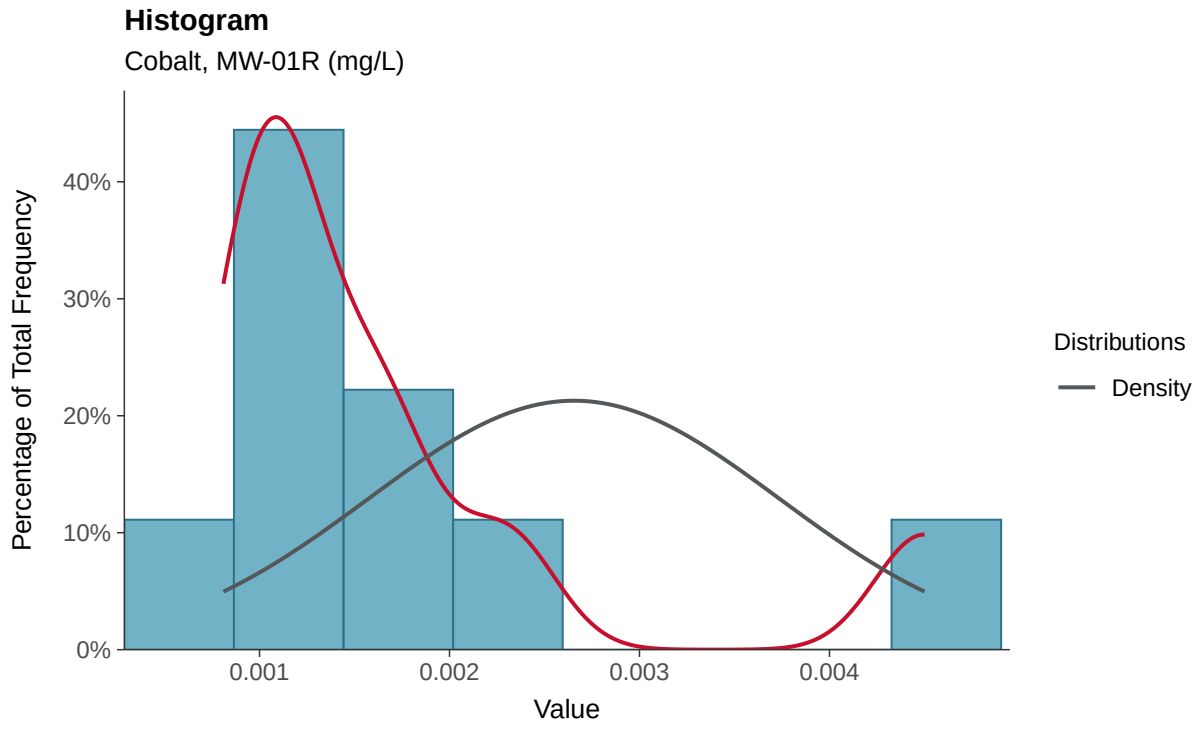
Chromium, Total, MW-01R (mg/L)



Appendix IV: Cobalt, MW-01R

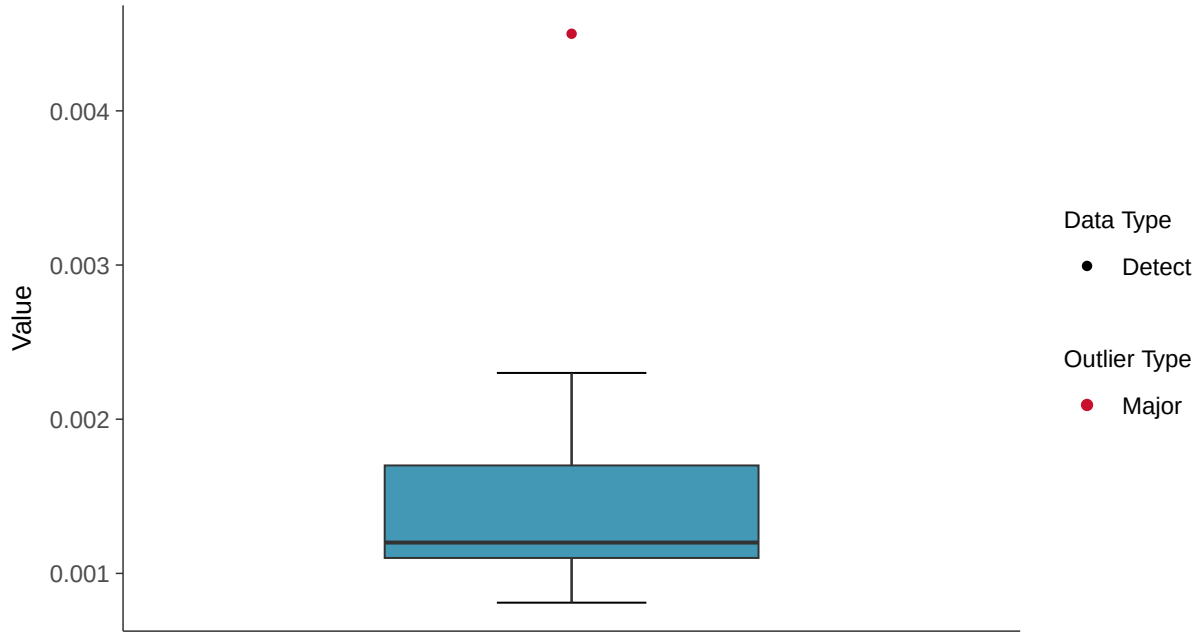
ID: 1_11_5_110





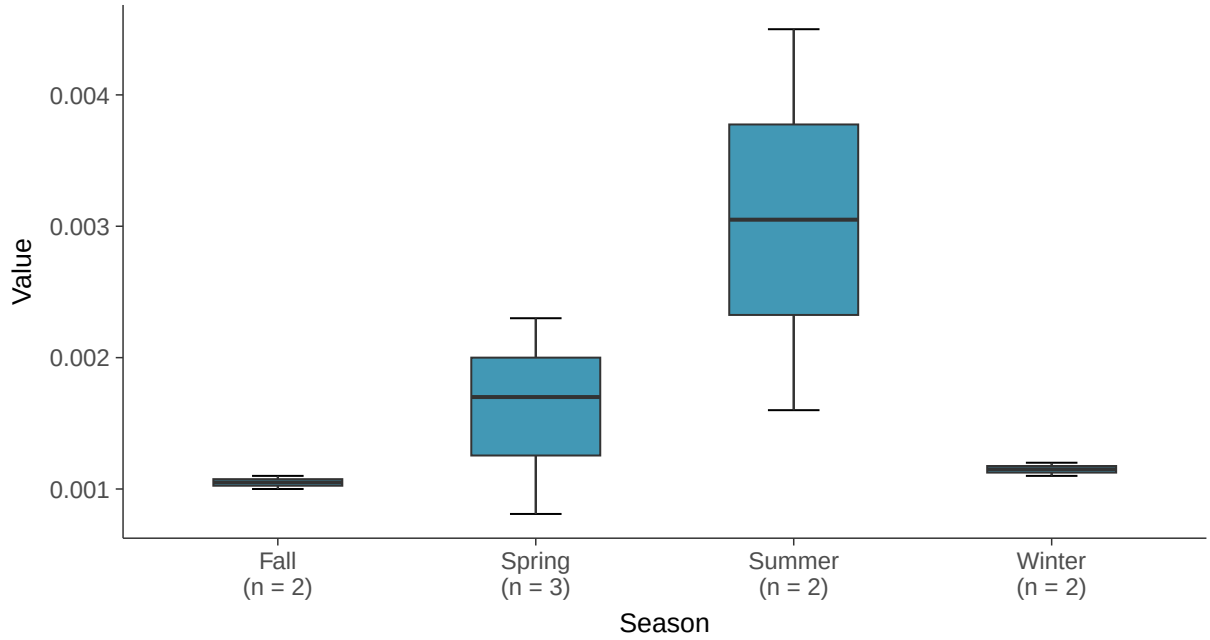
Boxplot

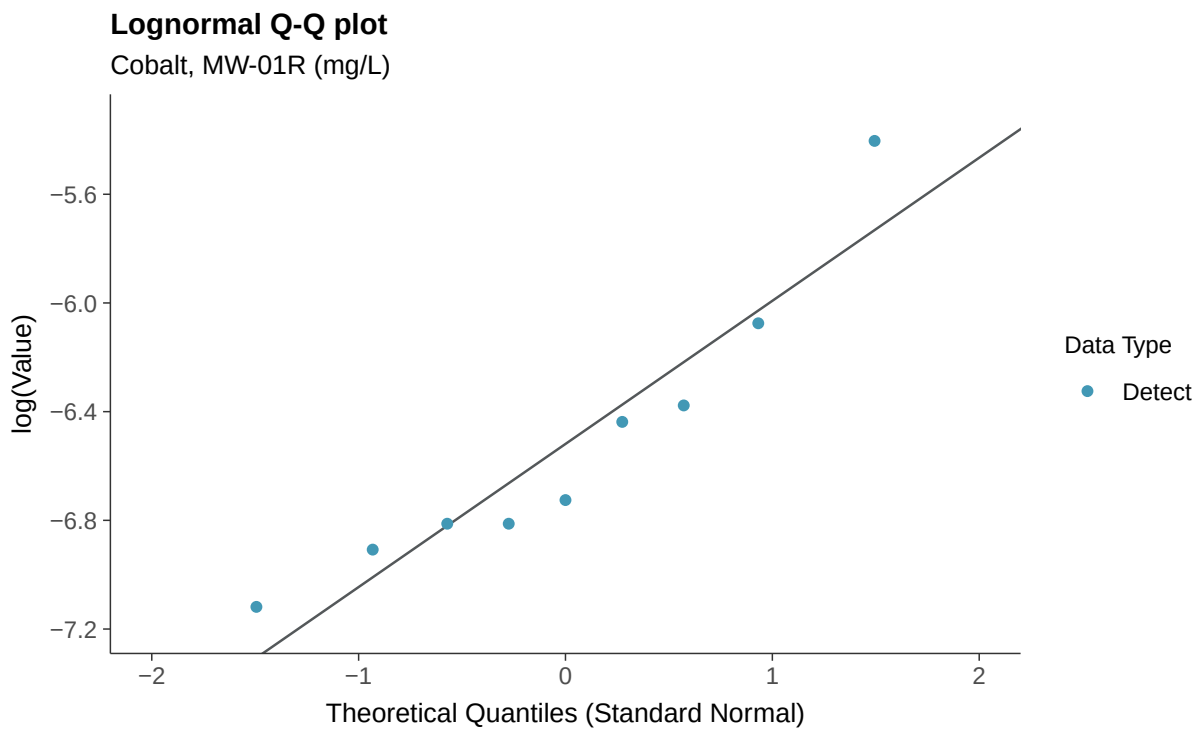
Cobalt, MW-01R (mg/L)

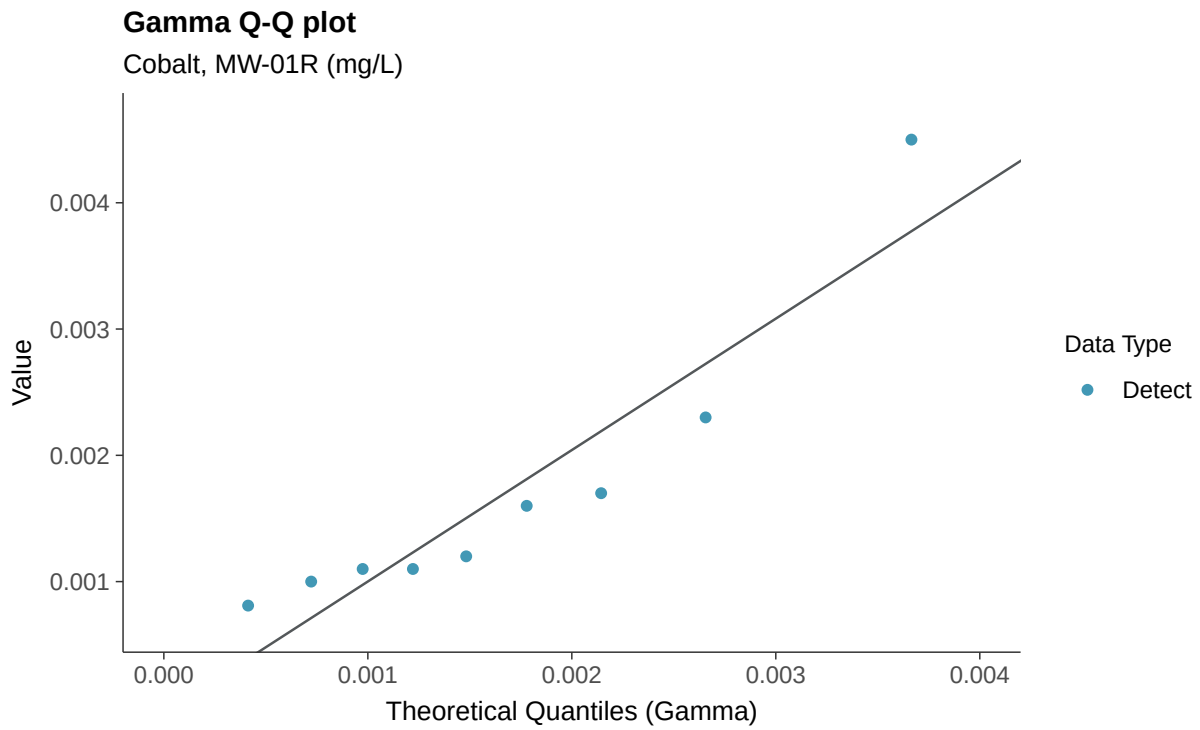


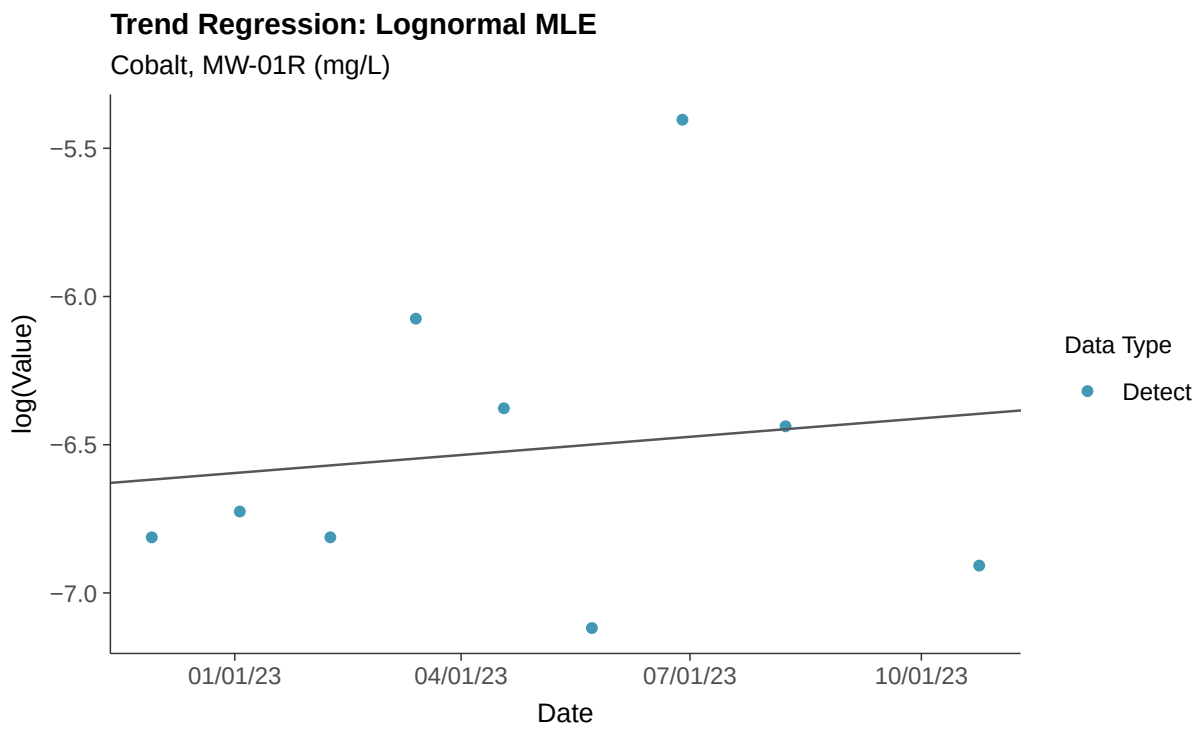
Boxplot by Season

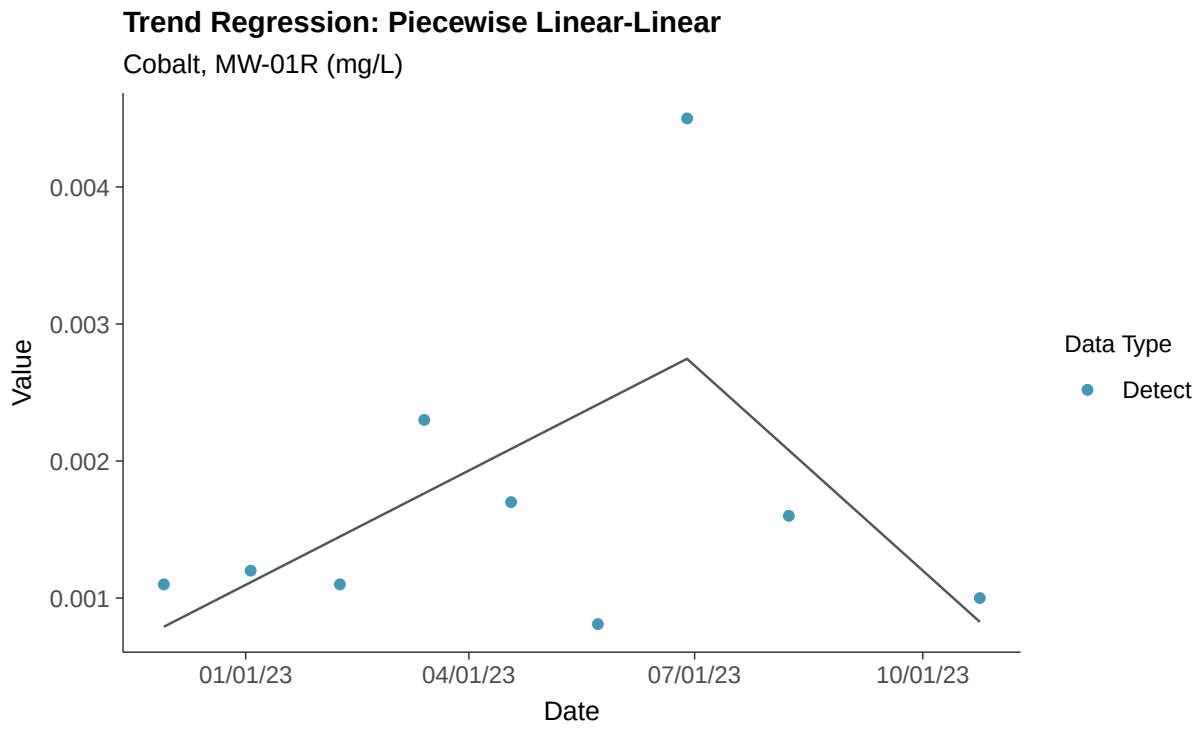
Cobalt, MW-01R (mg/L)




Lognormal Q-Q plot
Cobalt, MW-01R (mg/L)
log(Value)
−5.6
−6.0
−6.4
−6.8
−7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

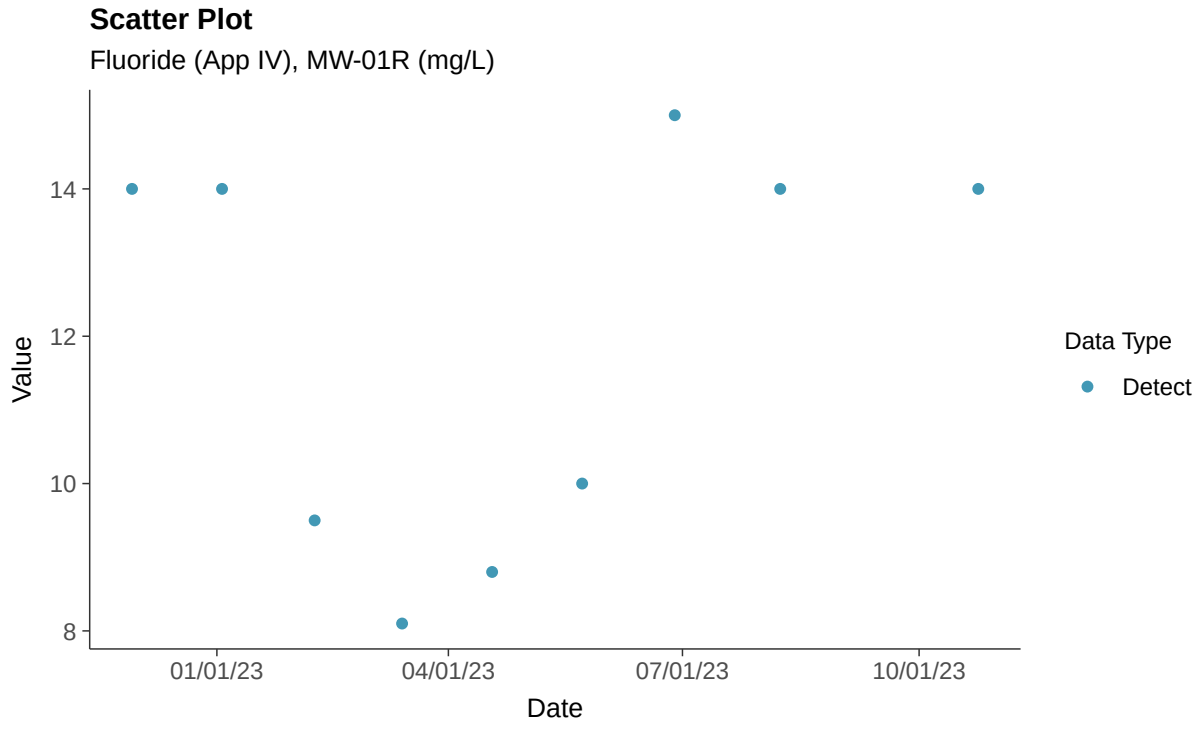

Gamma Q-Q plot
Cobalt, MW-01R (mg/L)
Value
0.004
0.003
0.002
0.001
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect

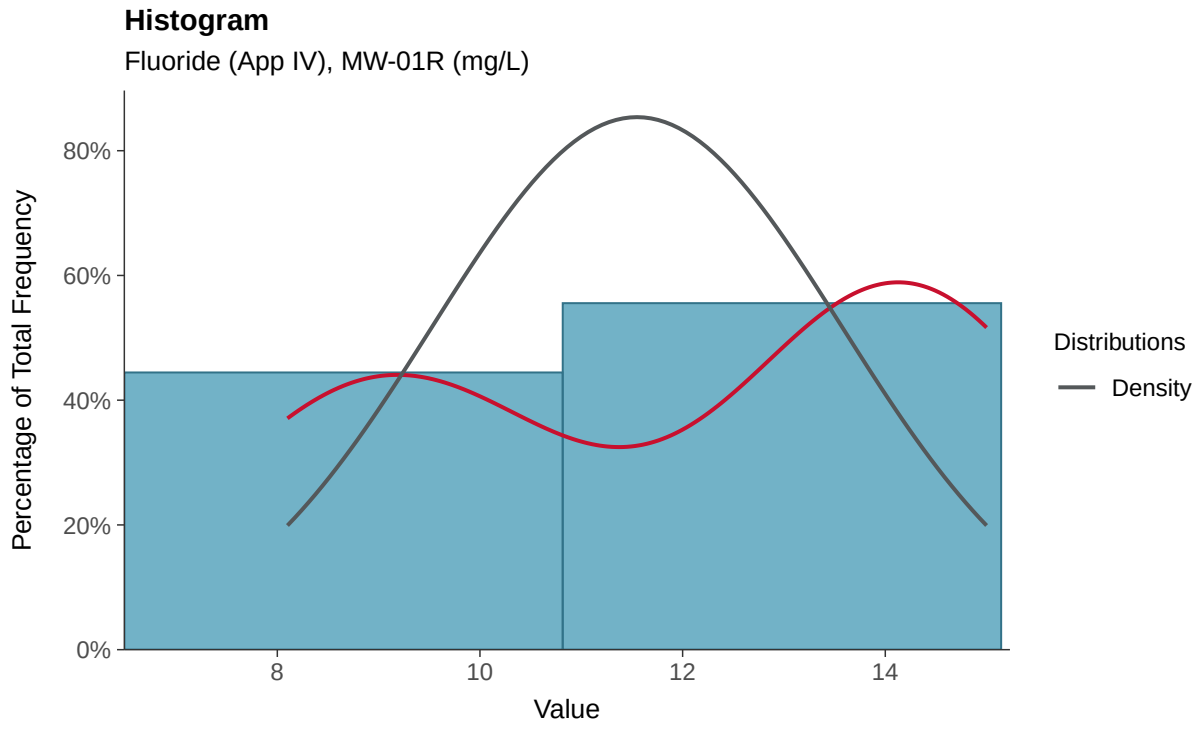

Trend Regression: Lognormal MLE
Cobalt, MW-01R (mg/L)
log(Value)
−5.5
−6.0
−6.5
−7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Cobalt, MW-01R (mg/L)
Value
0.004
0.003
0.002
0.001
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-01R

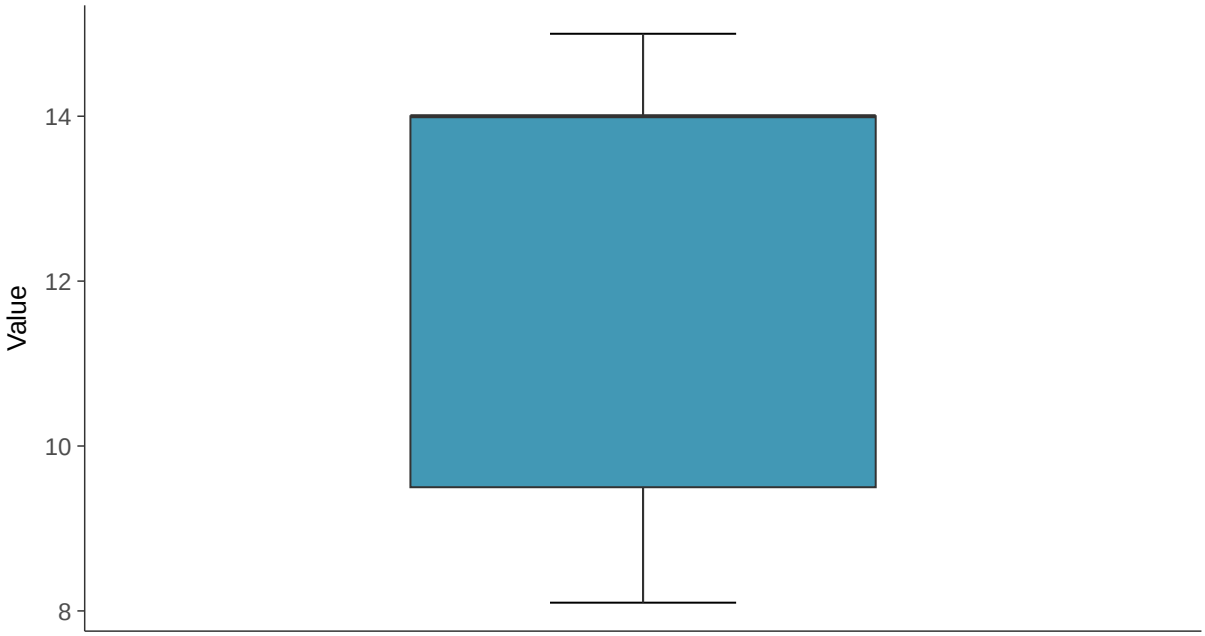
ID: 1_11_5_113





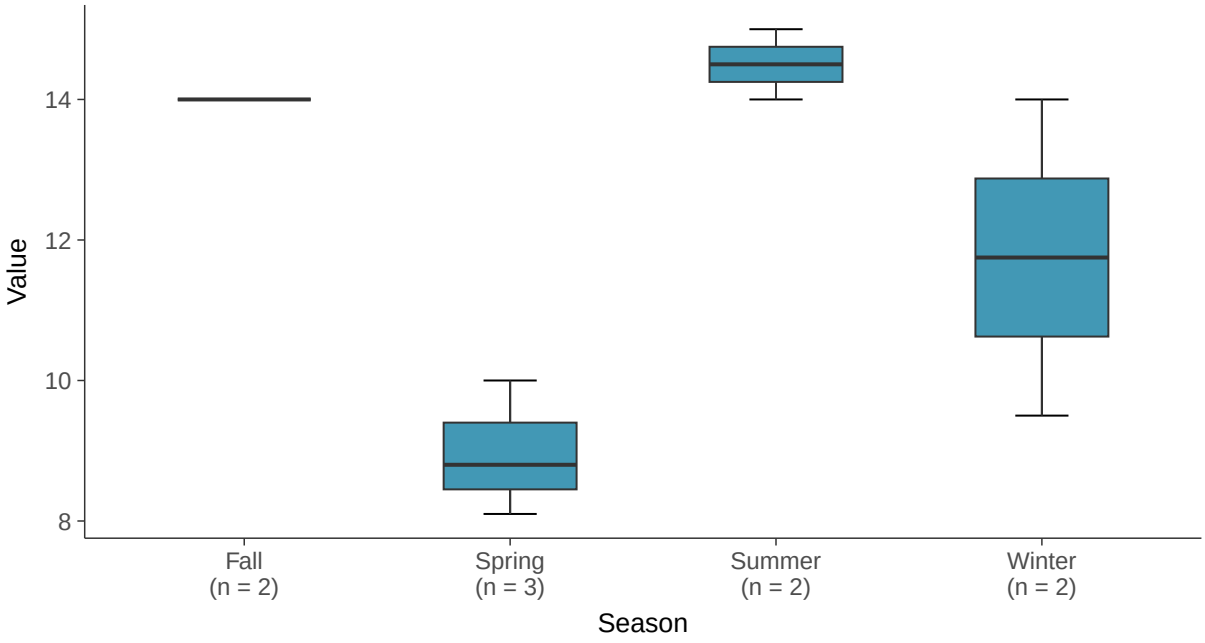
Boxplot

Fluoride (App IV), MW-01R (mg/L)



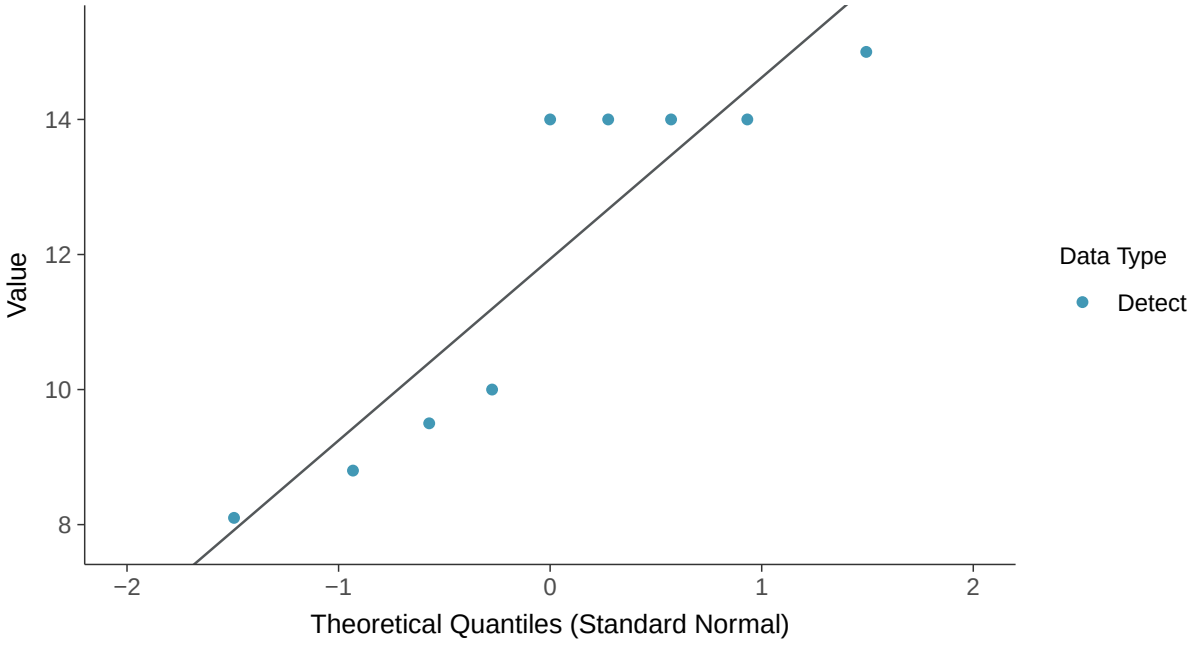
Boxplot by Season

Fluoride (App IV), MW-01R (mg/L)



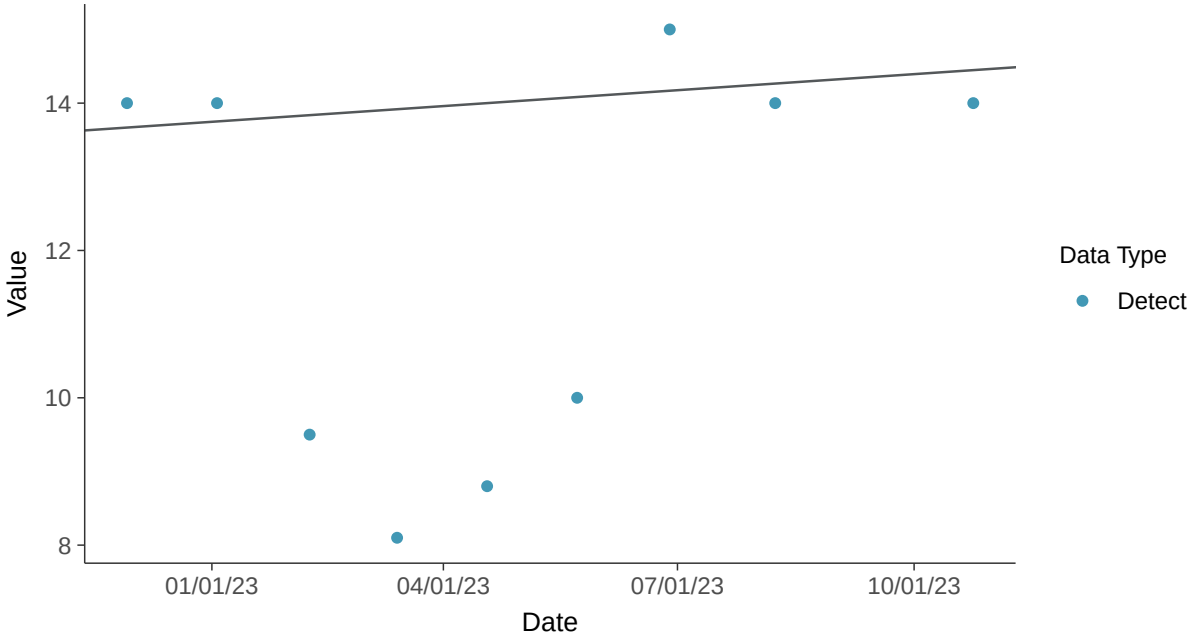
Normal Q-Q plot

Fluoride (App IV), MW-01R (mg/L)



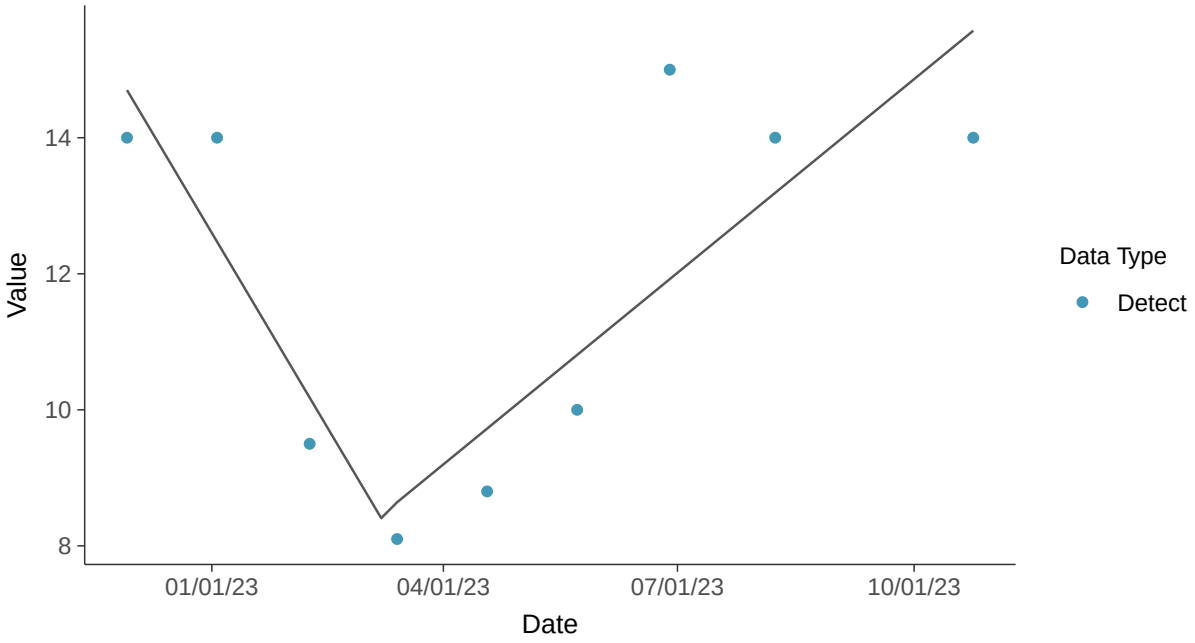
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Fluoride (App IV), MW-01R (mg/L)



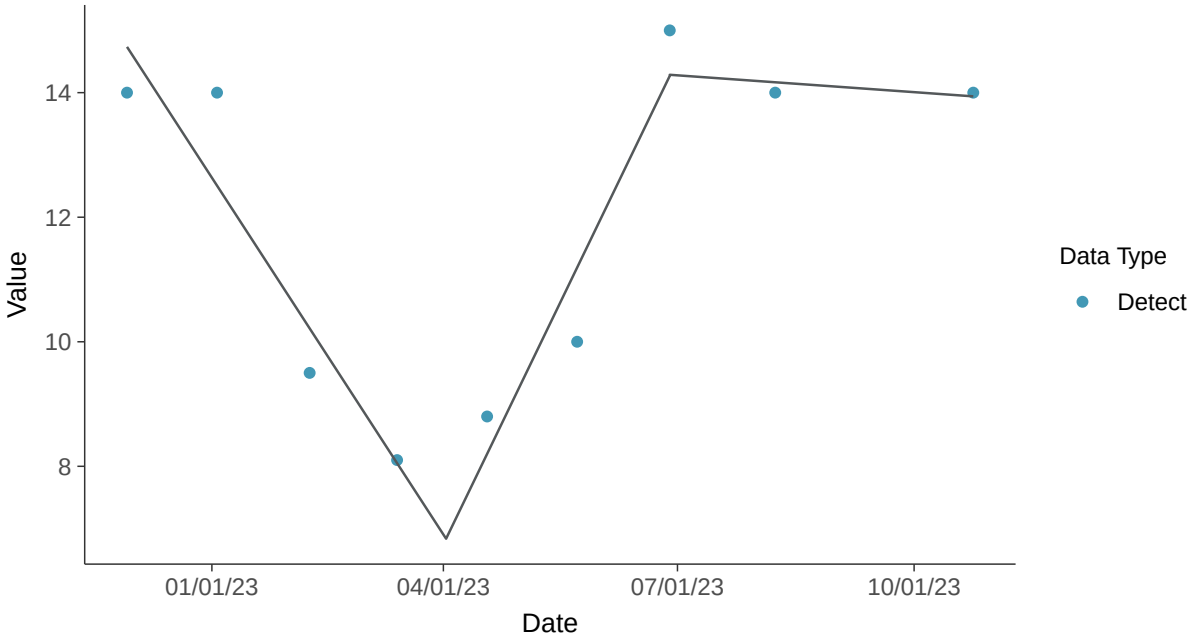
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-01R (mg/L)



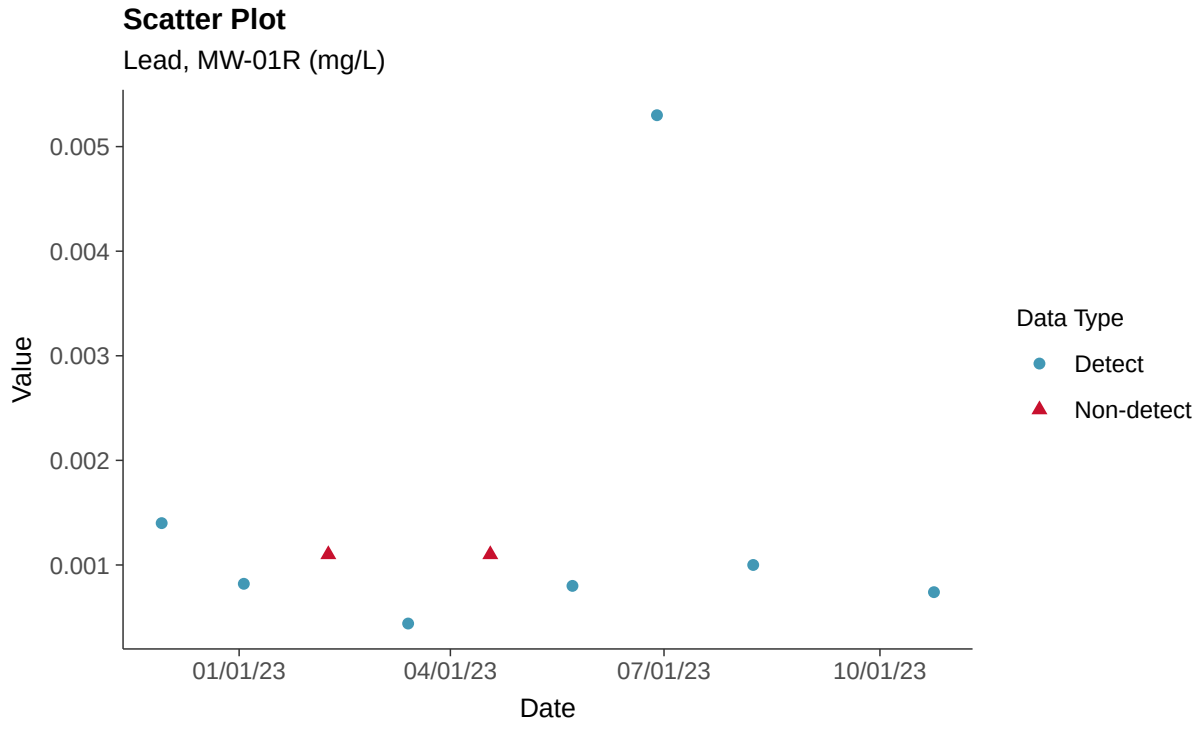
Trend Regression: Piecewise Linear-Linear-Linear

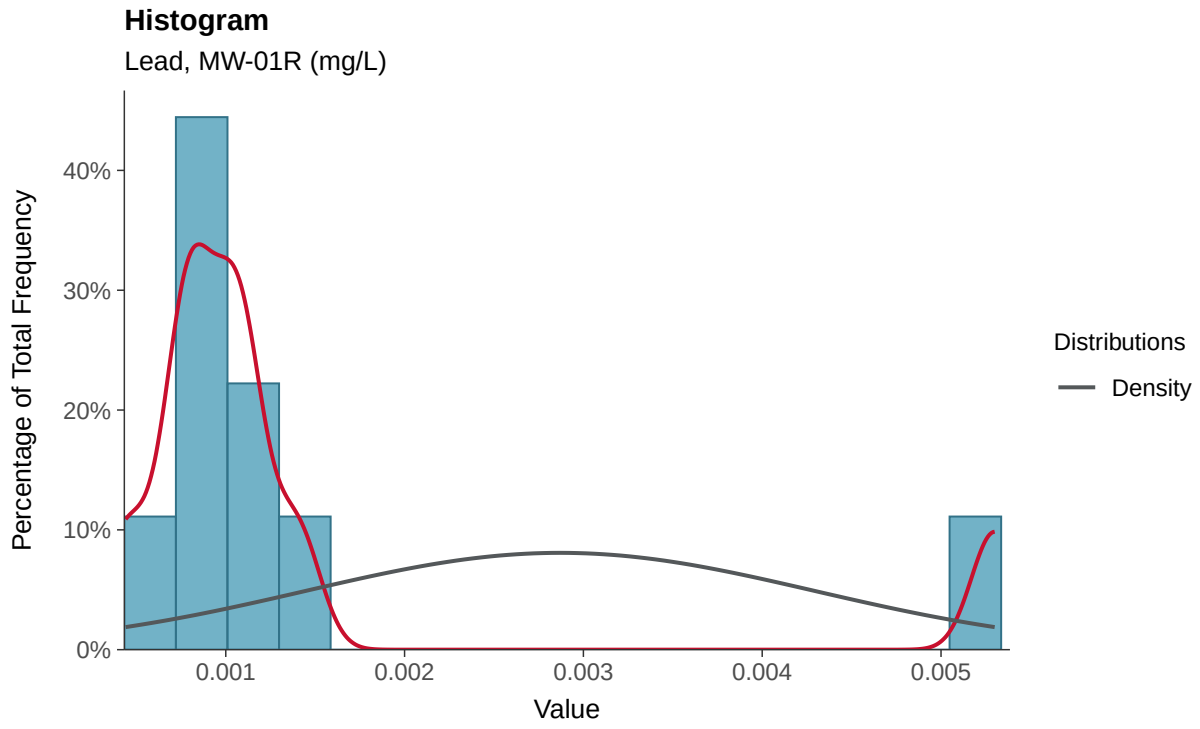
Fluoride (App IV), MW-01R (mg/L)



Appendix IV: Lead, MW-01R

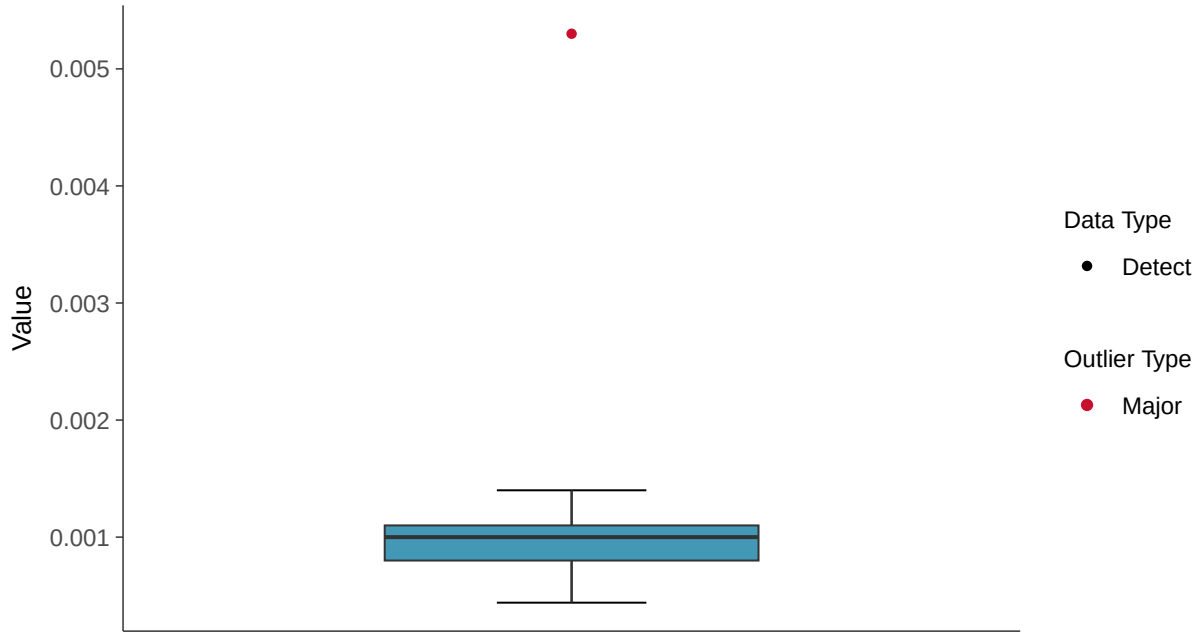
ID: 1_11_5_115





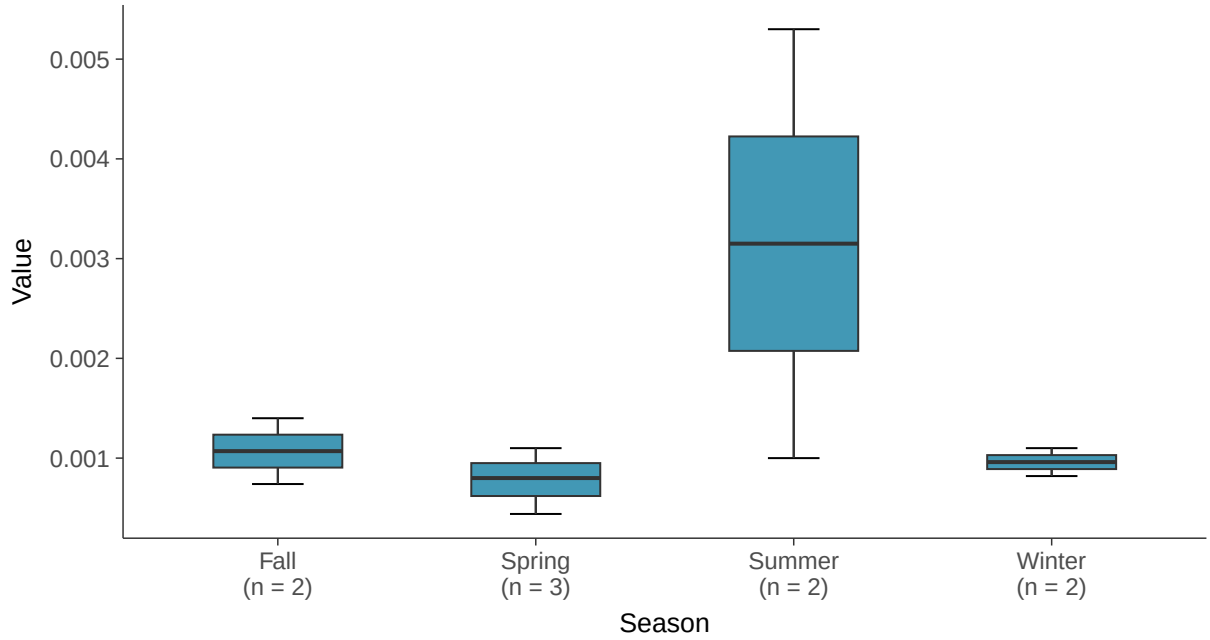
Boxplot

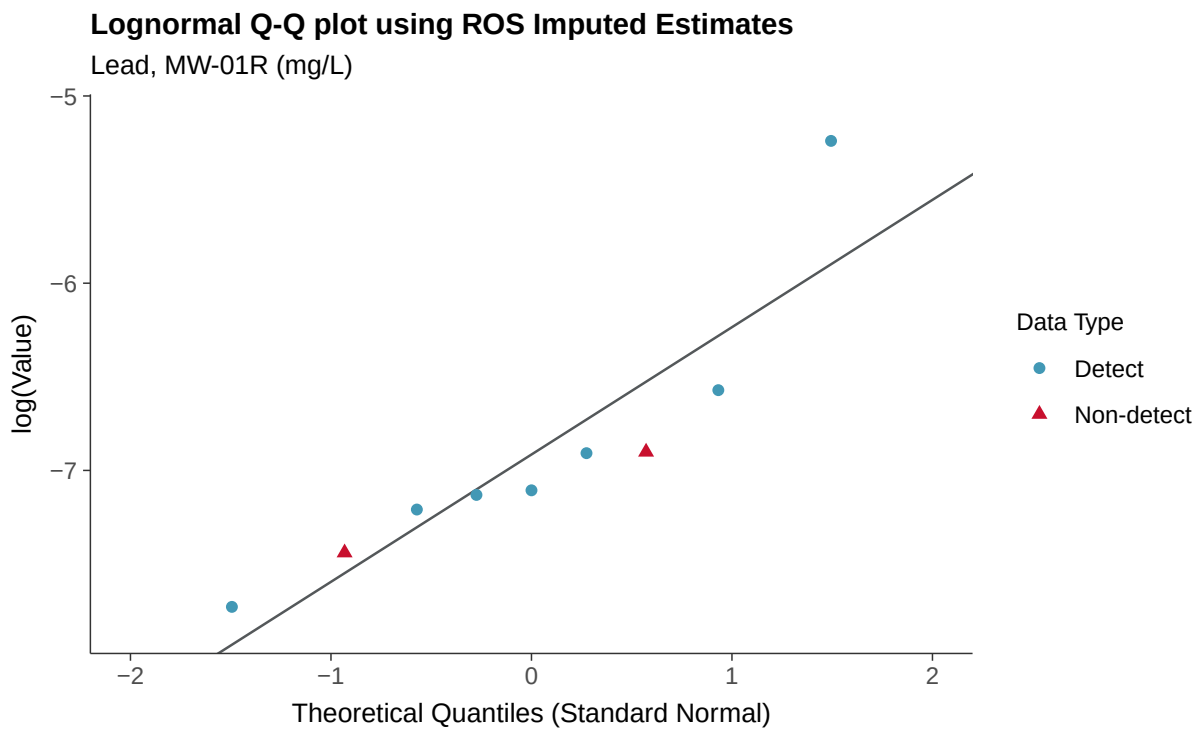
Lead, MW-01R (mg/L)

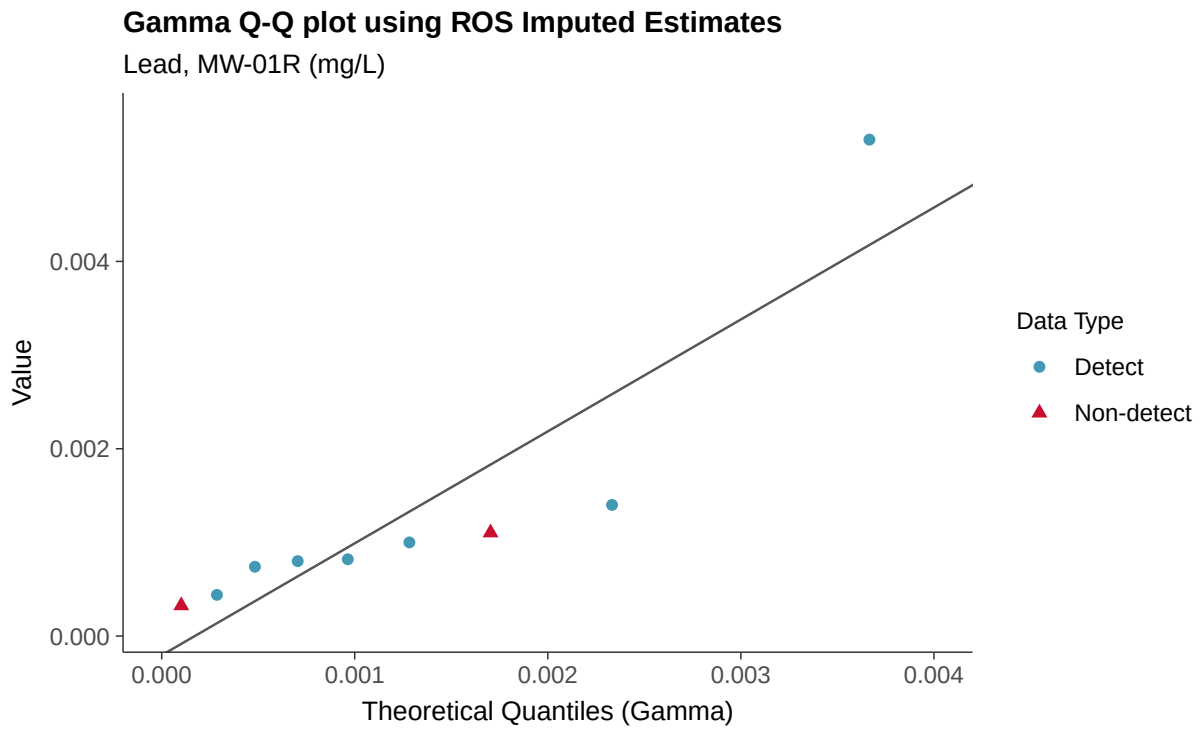


Boxplot by Season

Lead, MW-01R (mg/L)

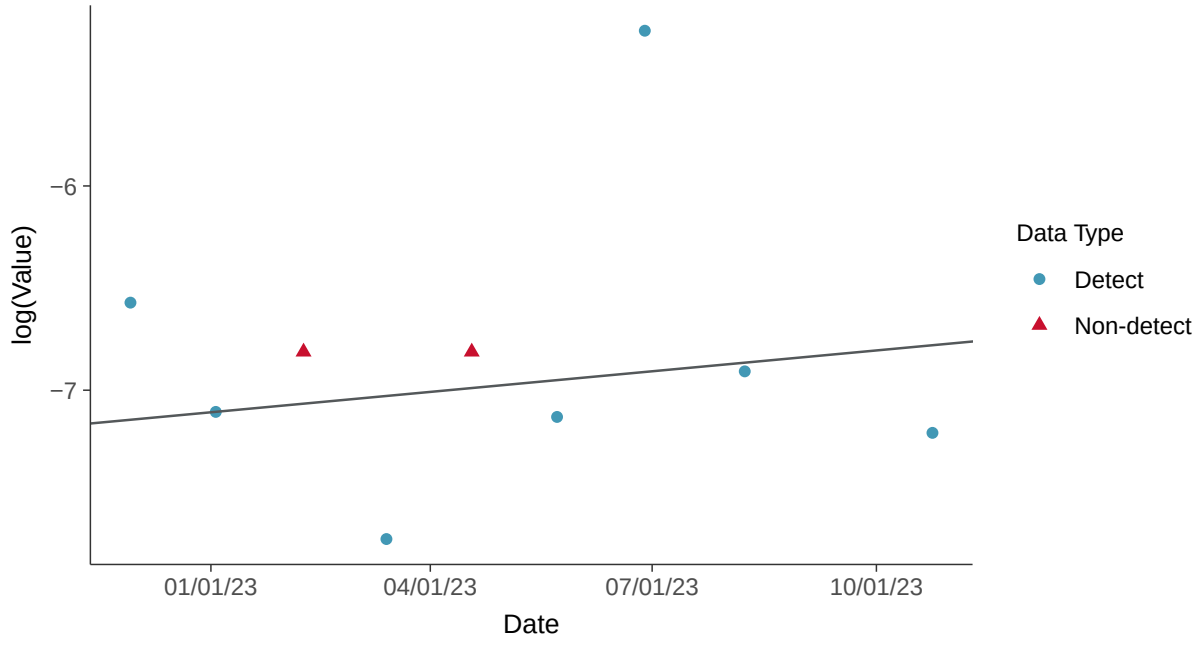



Lognormal Q-Q plot using ROS Imputed Estimates
Lead, MW-01R (mg/L)
log(Value)
−5
−6
−7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Lead, MW-01R (mg/L)
Value
0.004
0.002
0.000
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

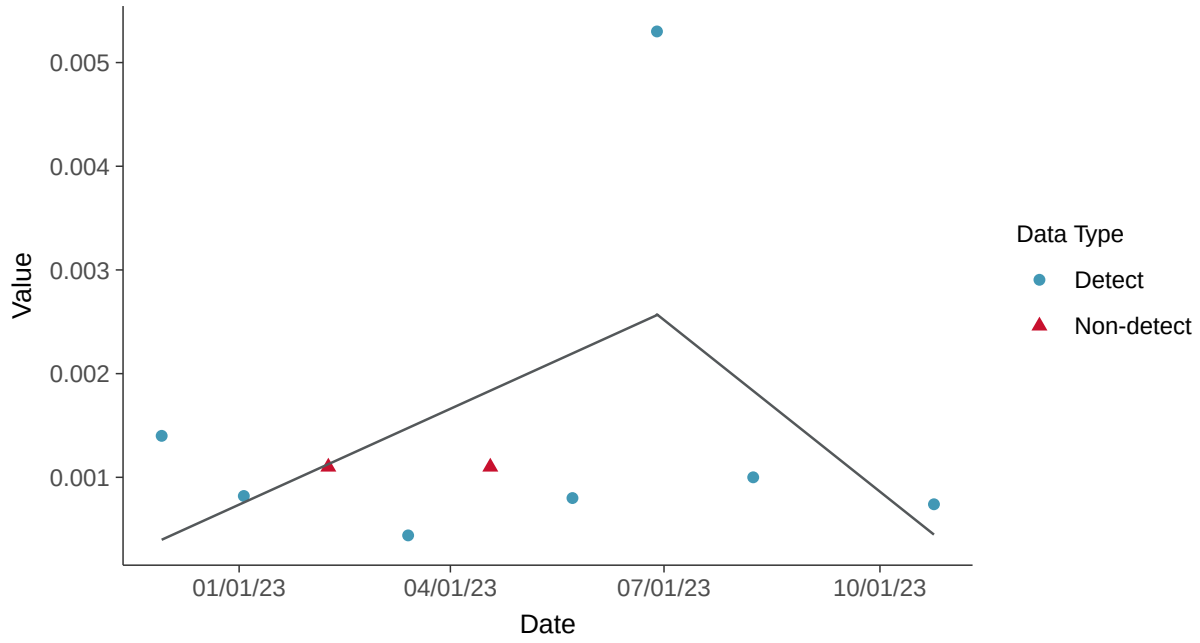
Trend Regression: Lognormal MLE

Lead, MW-01R (mg/L)



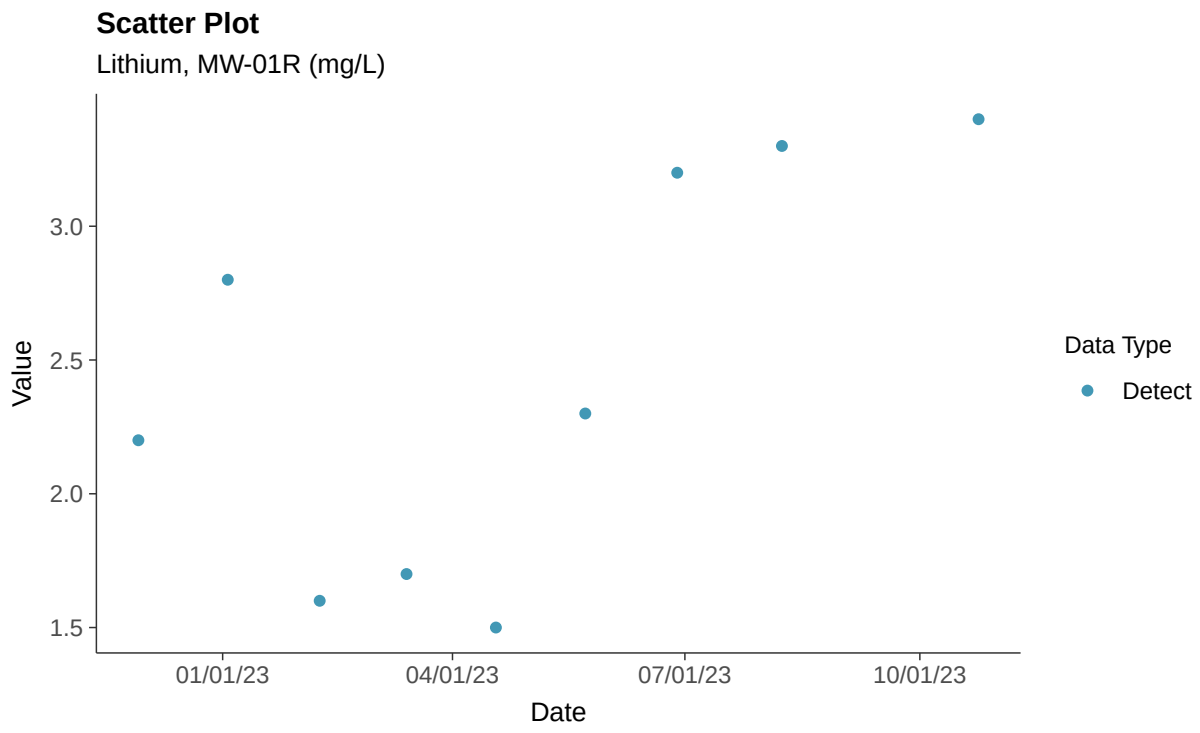
Trend Regression: Piecewise Linear-Linear

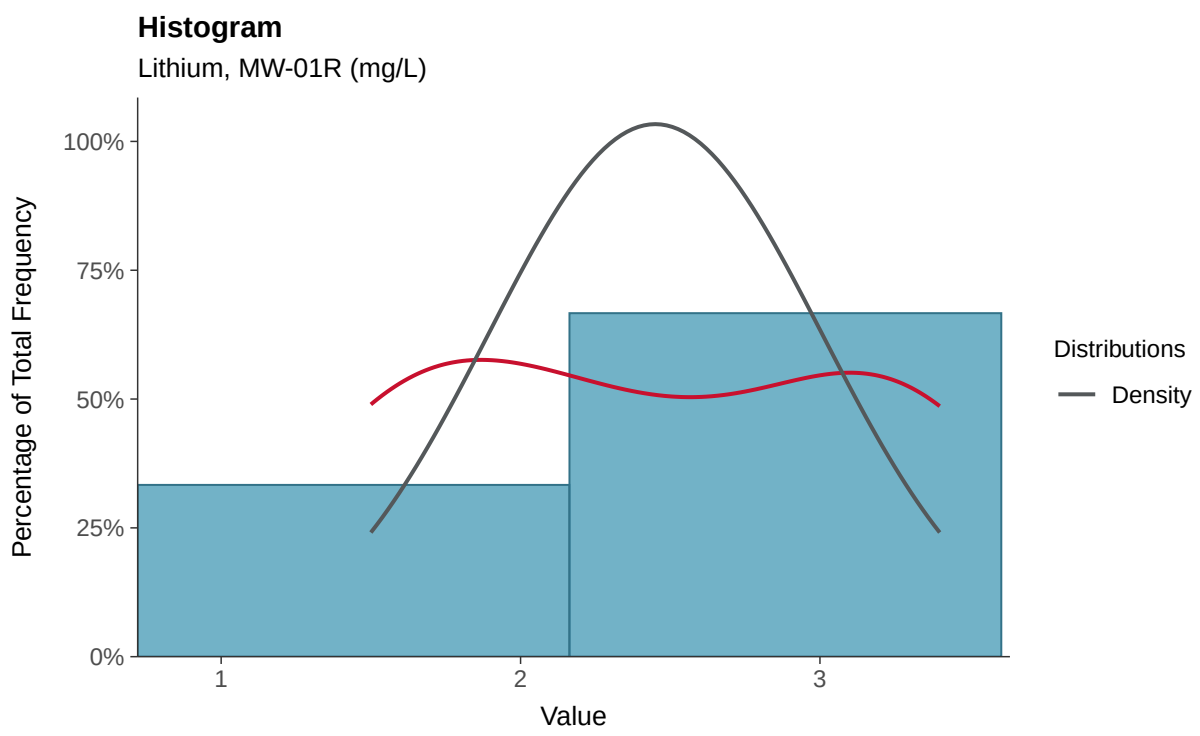
Lead, MW-01R (mg/L)



Appendix IV: Lithium, MW-01R

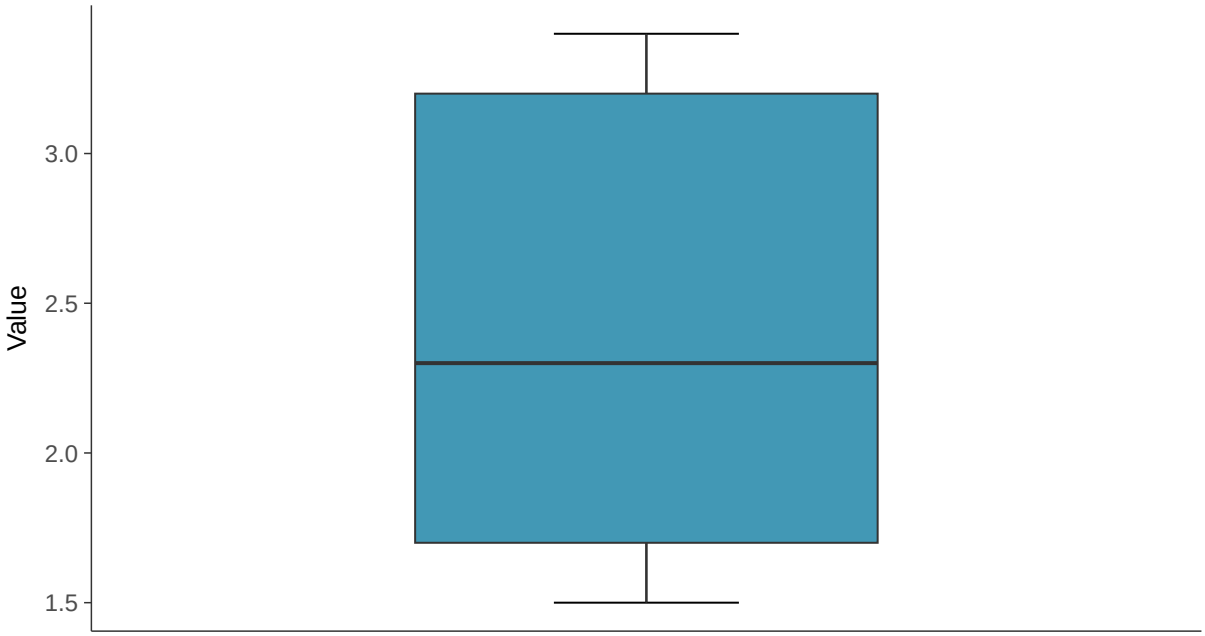
ID: 1_11_5_116





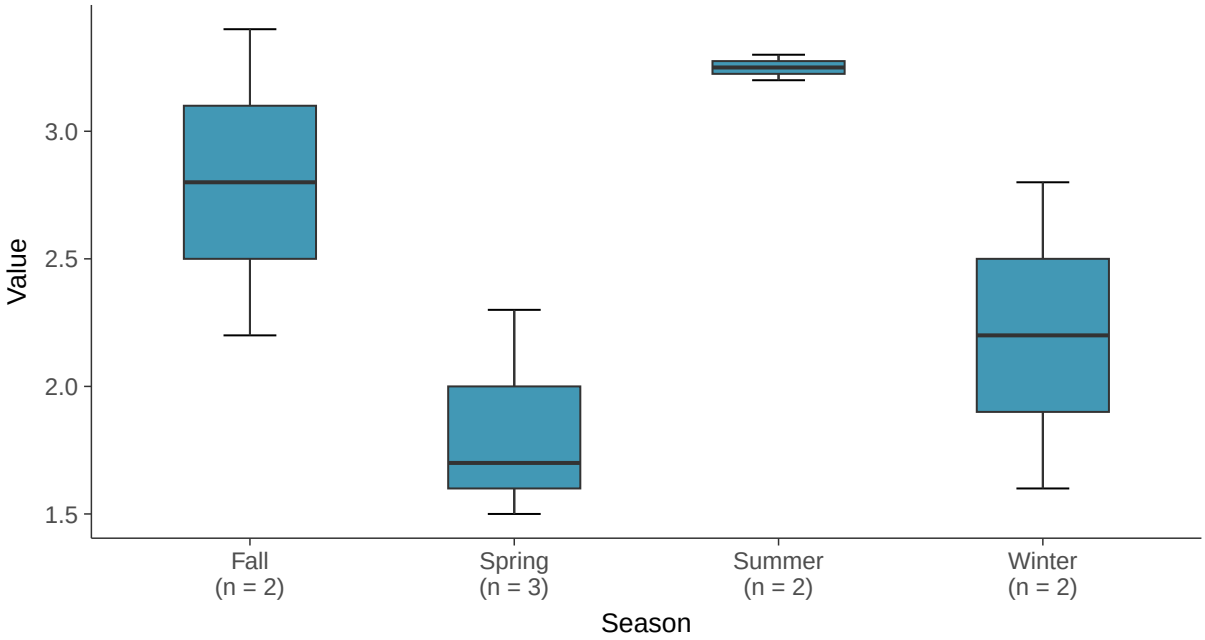
Boxplot

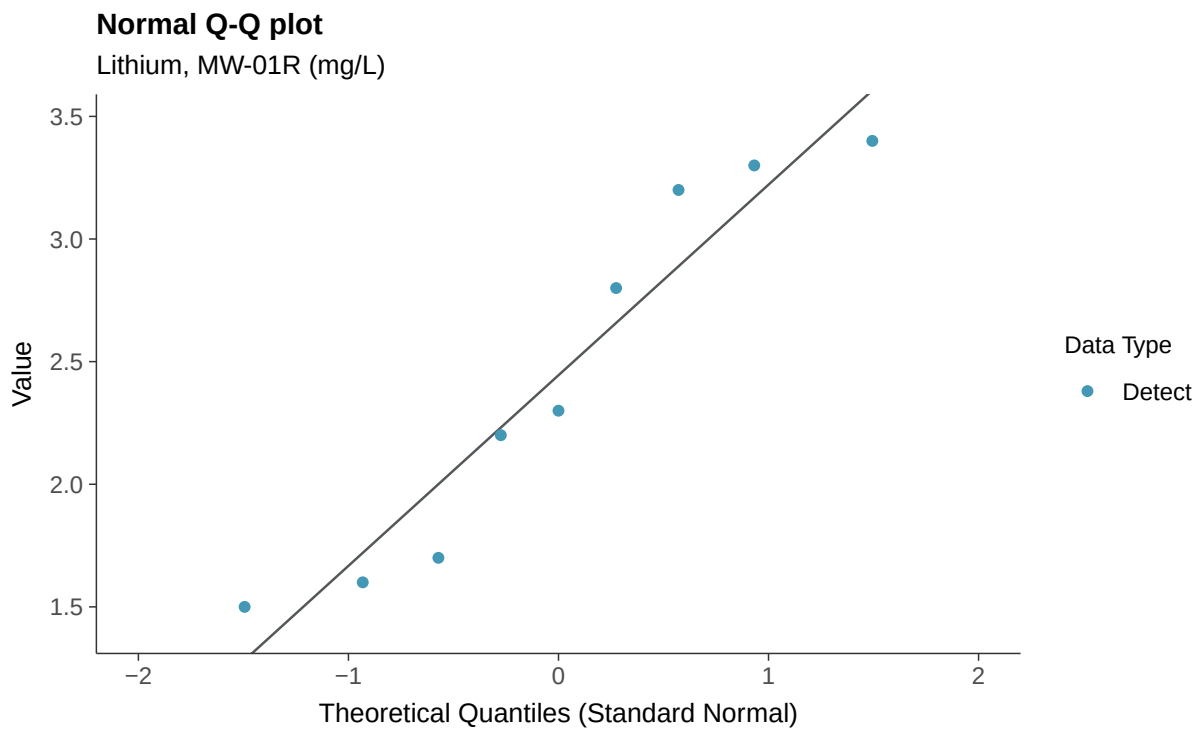
Lithium, MW-01R (mg/L)

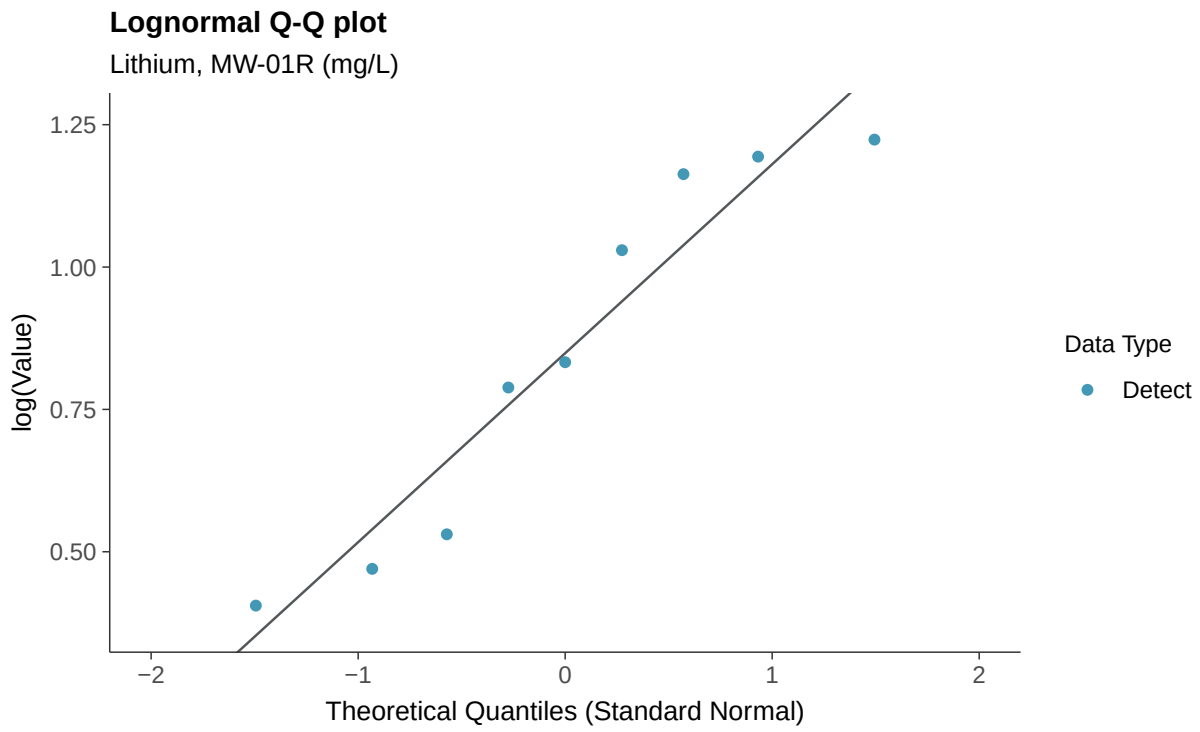


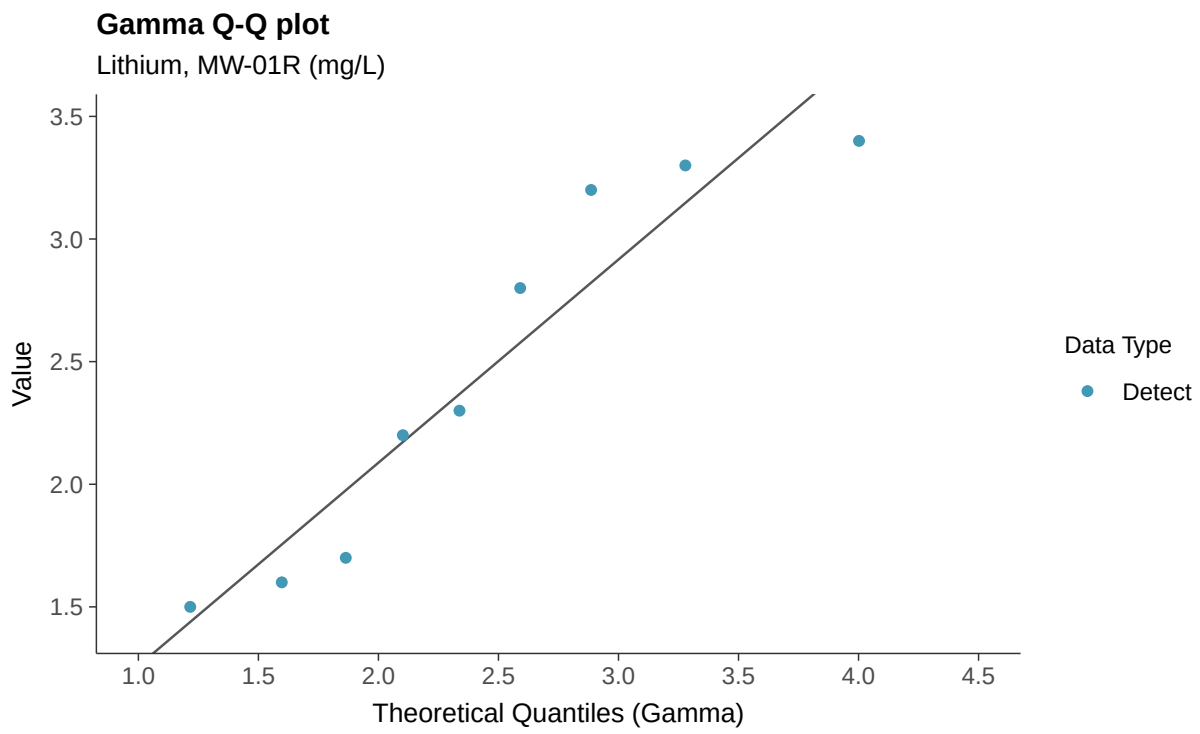
Boxplot by Season

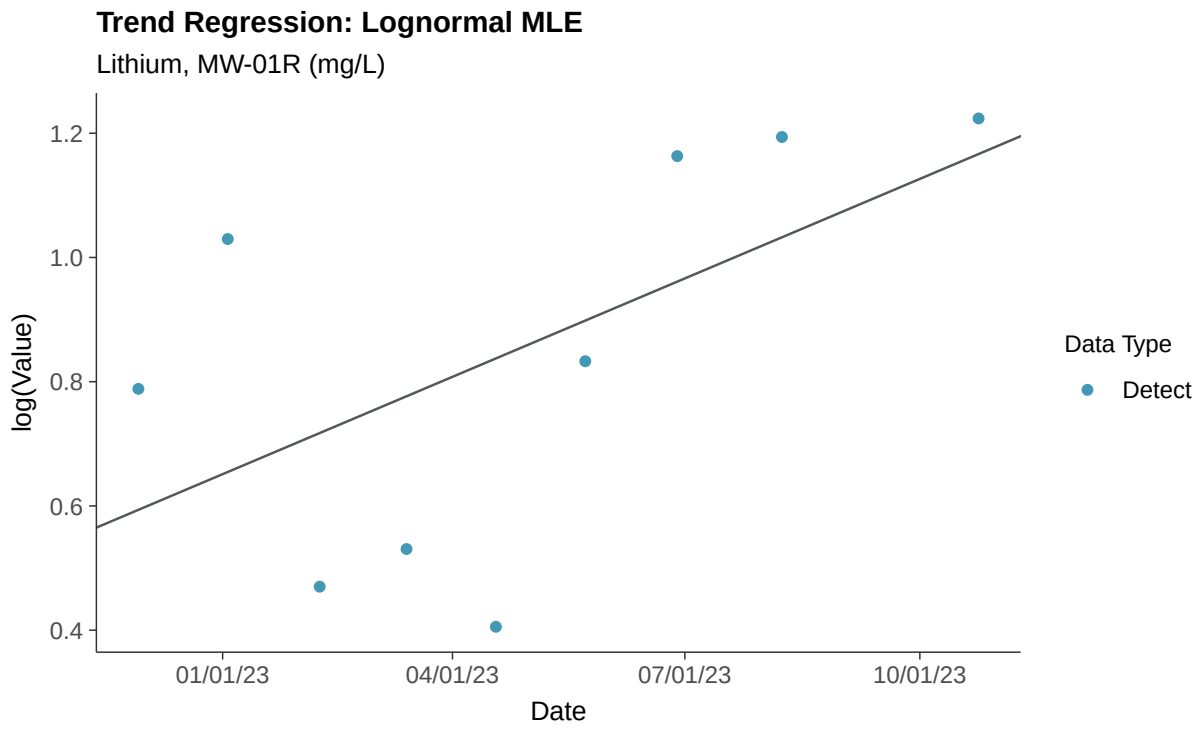
Lithium, MW-01R (mg/L)




Normal Q-Q plot
Lithium, MW-01R (mg/L)
Value
3.5
3.0
2.5
2.0
1.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

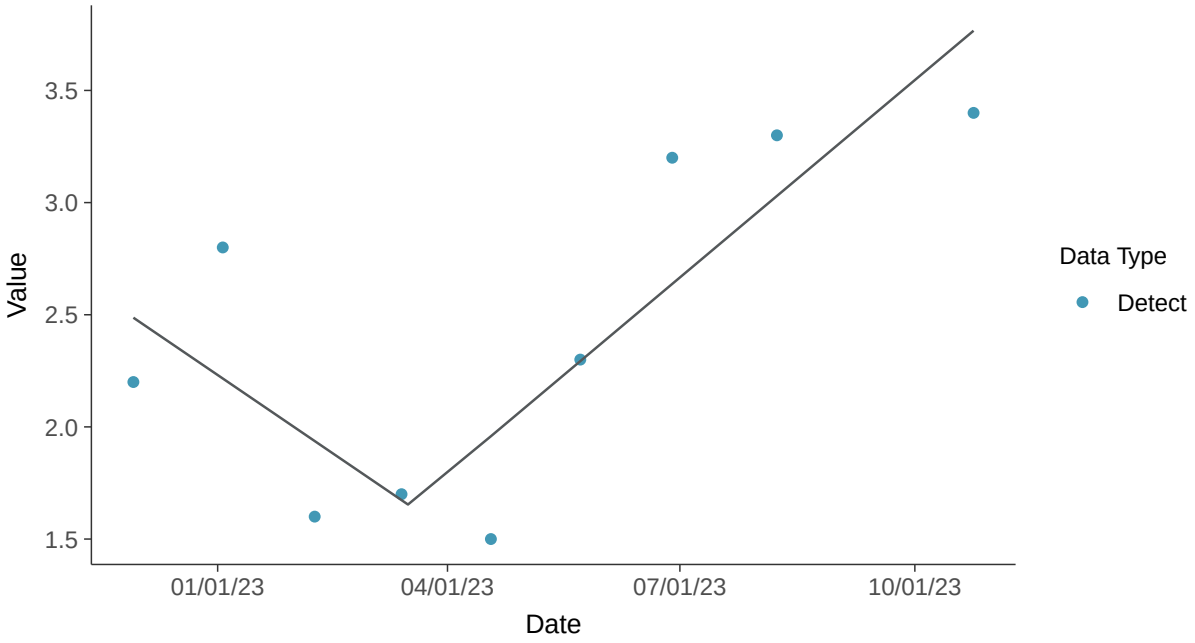

Lognormal Q-Q plot
Lithium, MW-01R (mg/L)
log(Value)
1.25
1.00
0.75
0.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Lithium, MW-01R (mg/L)
Value
3.5
3.0
2.5
2.0
1.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Lithium, MW-01R (mg/L)
log(Value)
1.2
1.0
0.8
0.6
0.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

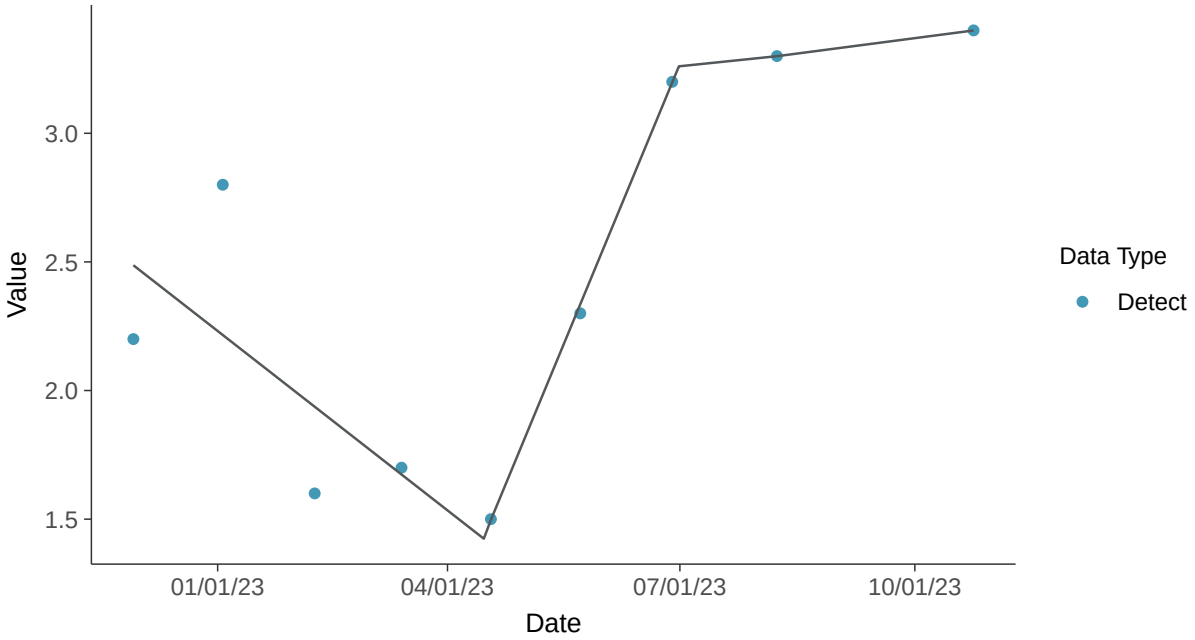
Trend Regression: Piecewise Linear-Linear

Lithium, MW-01R (mg/L)



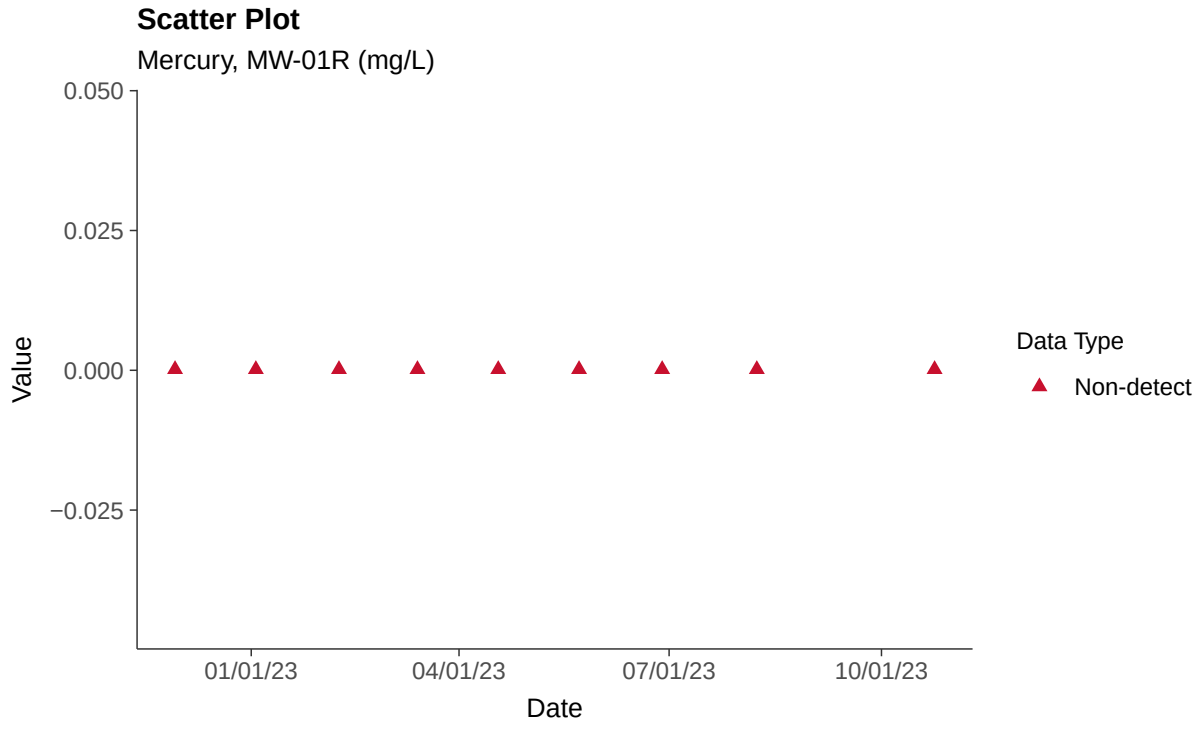
Trend Regression: Piecewise Linear-Linear-Linear

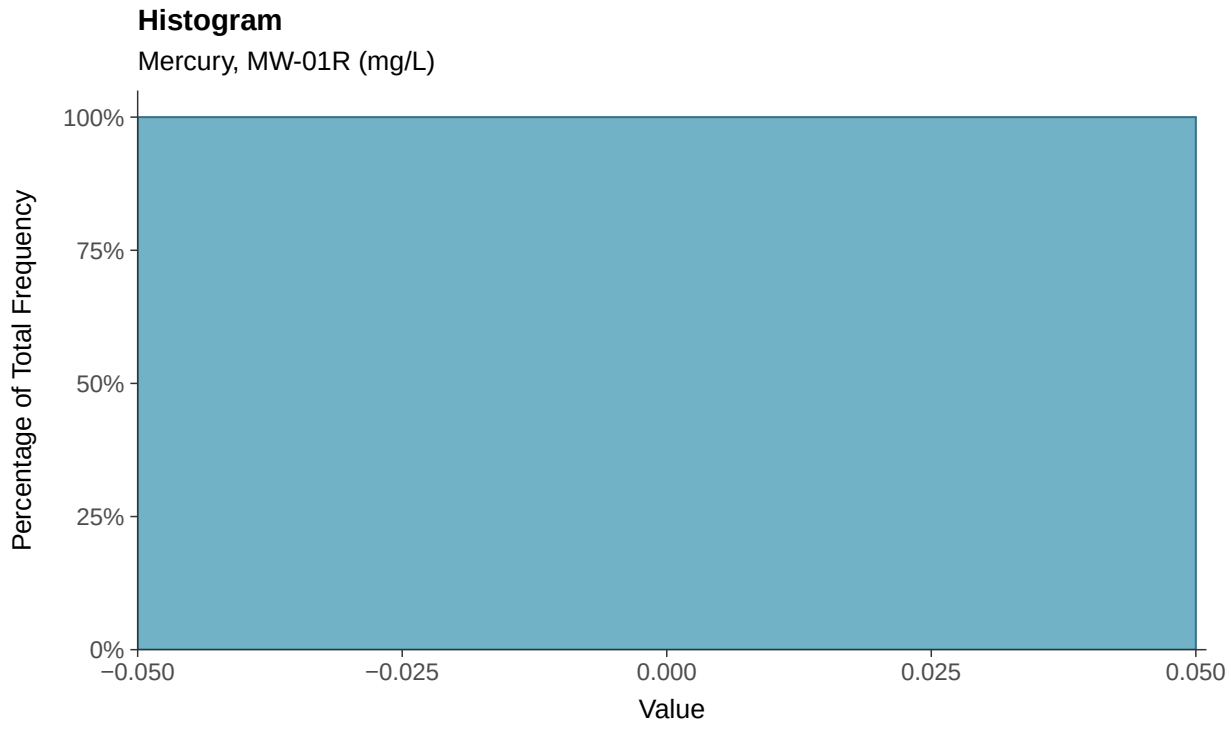
Lithium, MW-01R (mg/L)



Appendix IV: Mercury, MW-01R

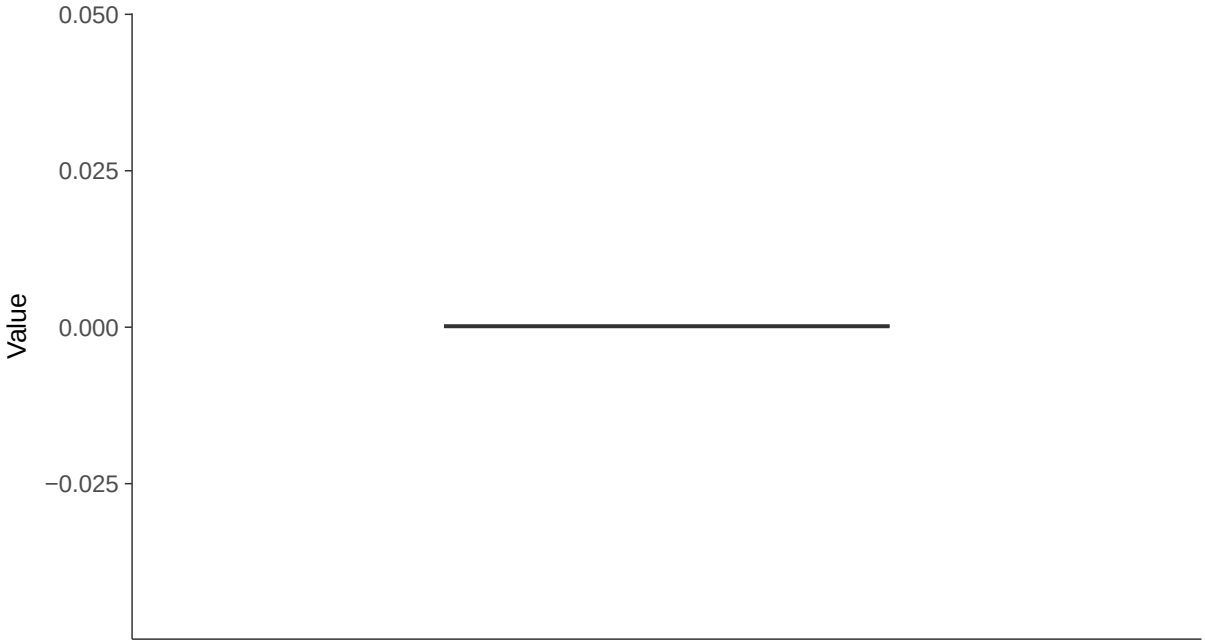
ID: 1_11_5_117





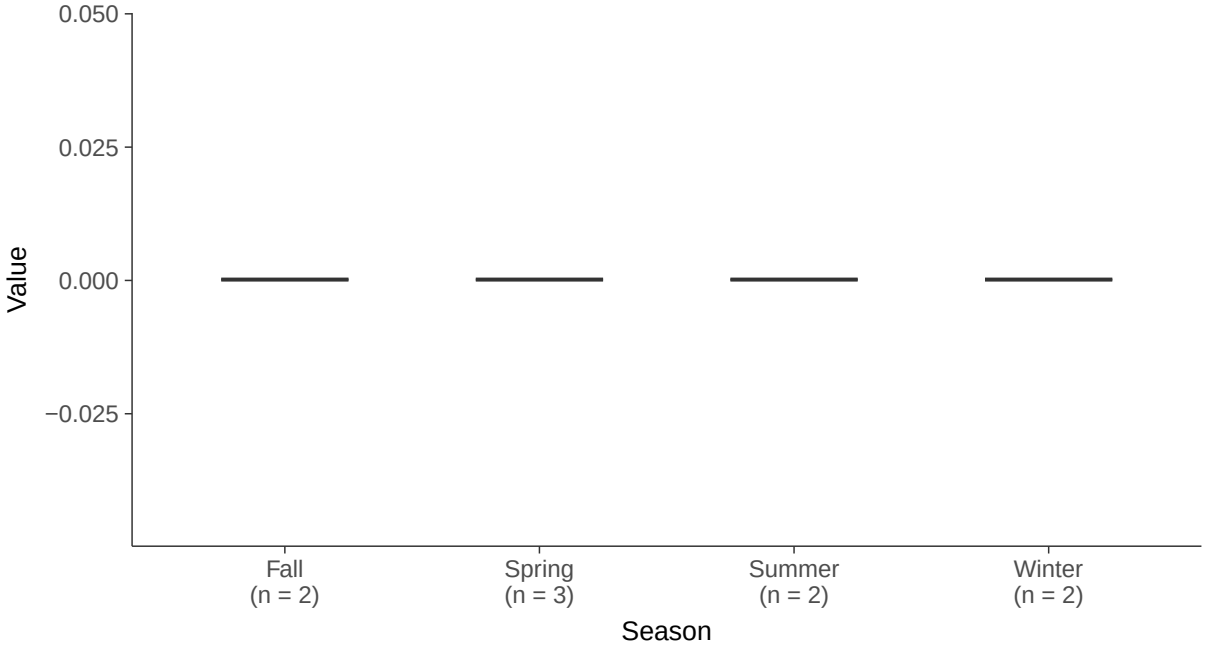
Boxplot

Mercury, MW-01R (mg/L)



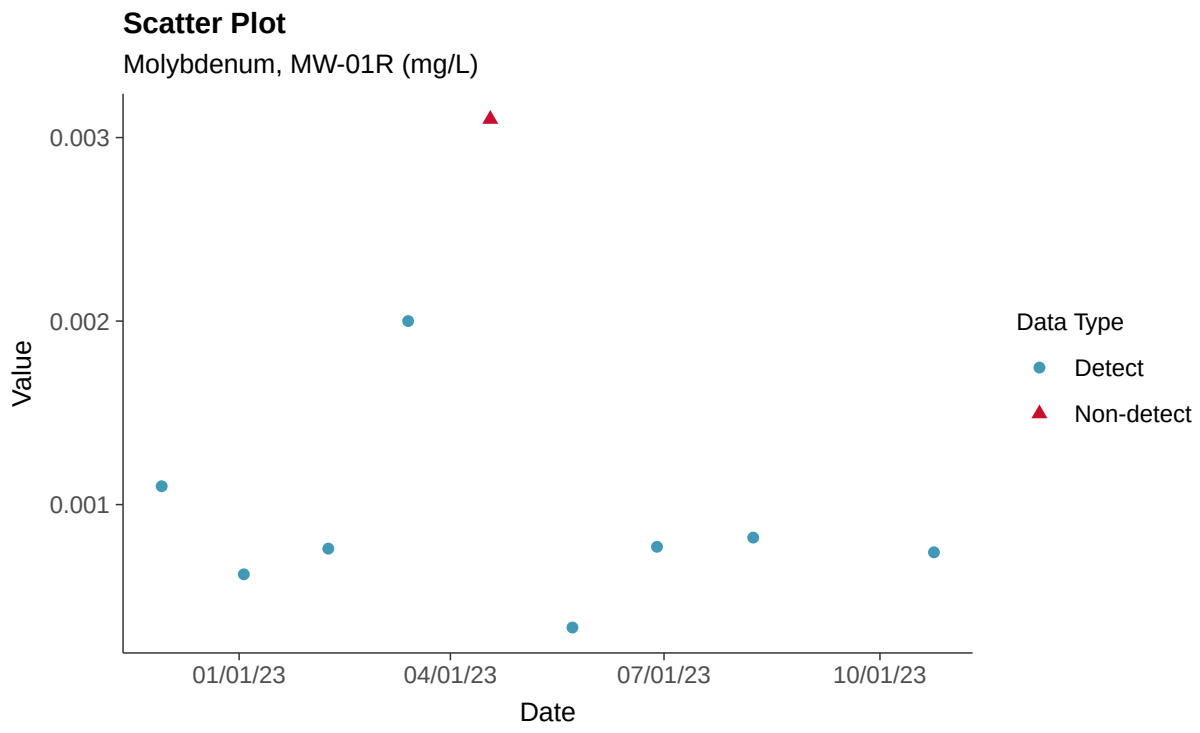
Boxplot by Season

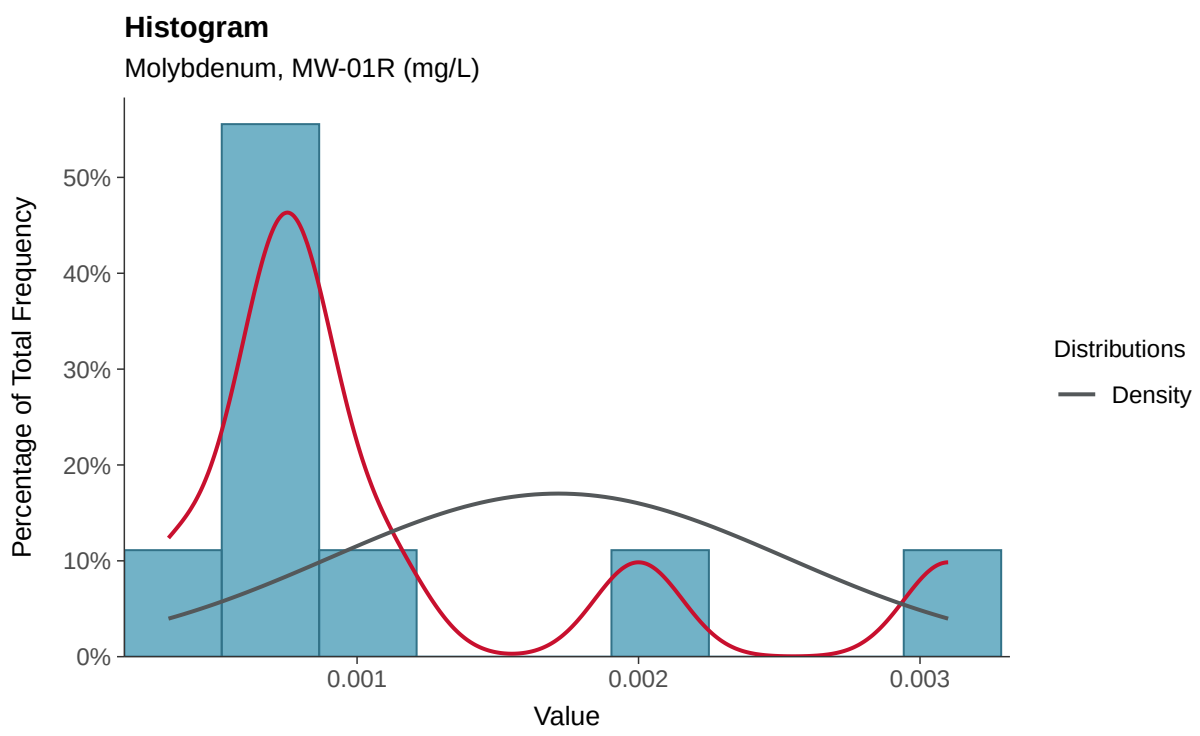
Mercury, MW-01R (mg/L)

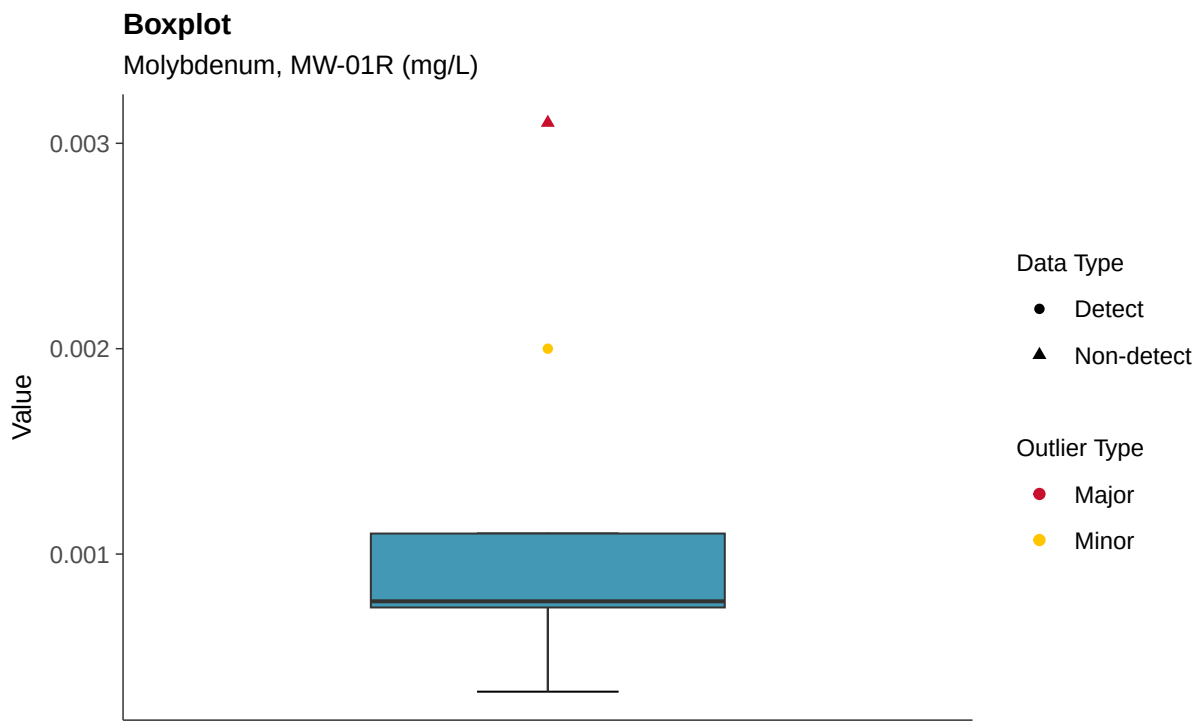


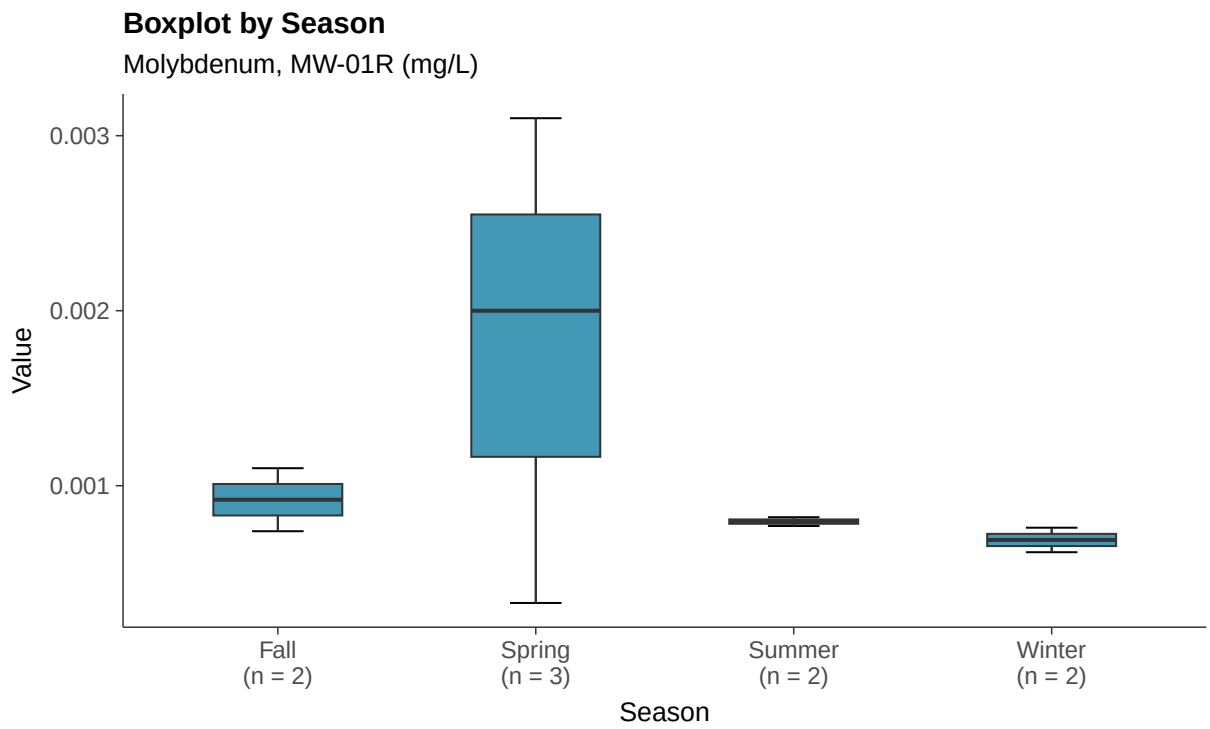
Appendix IV: Molybdenum, MW-01R

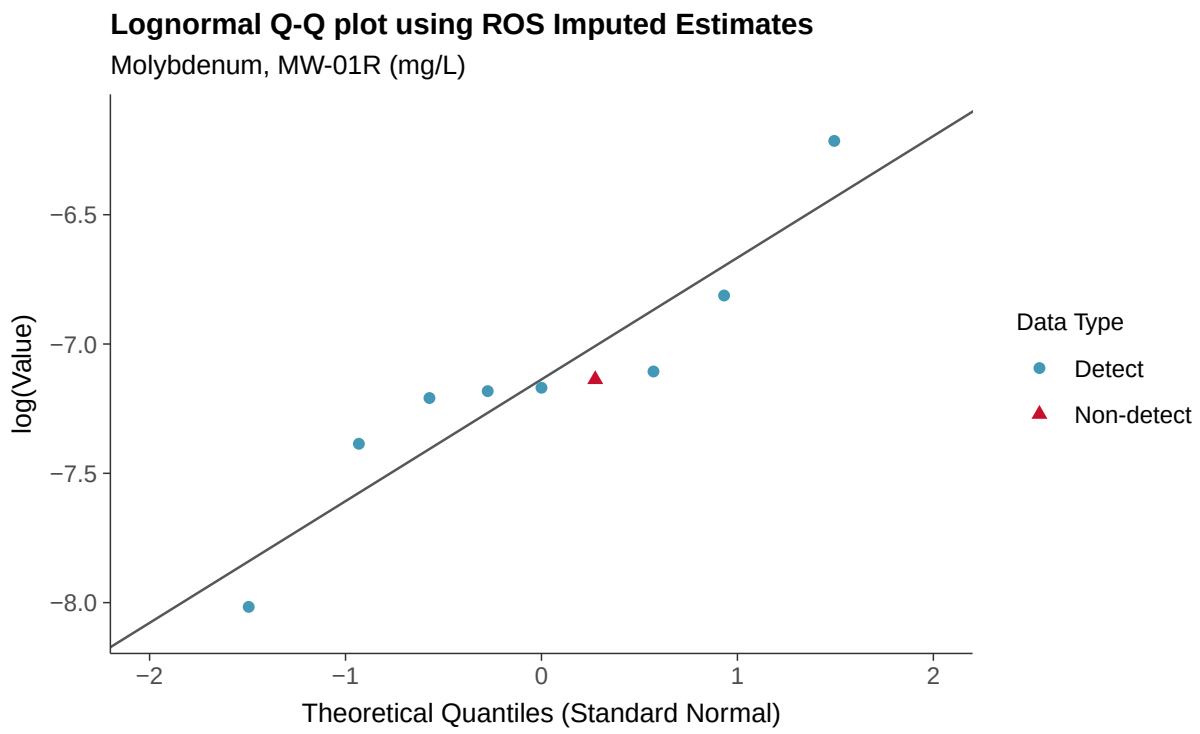
ID: 1_11_5_118

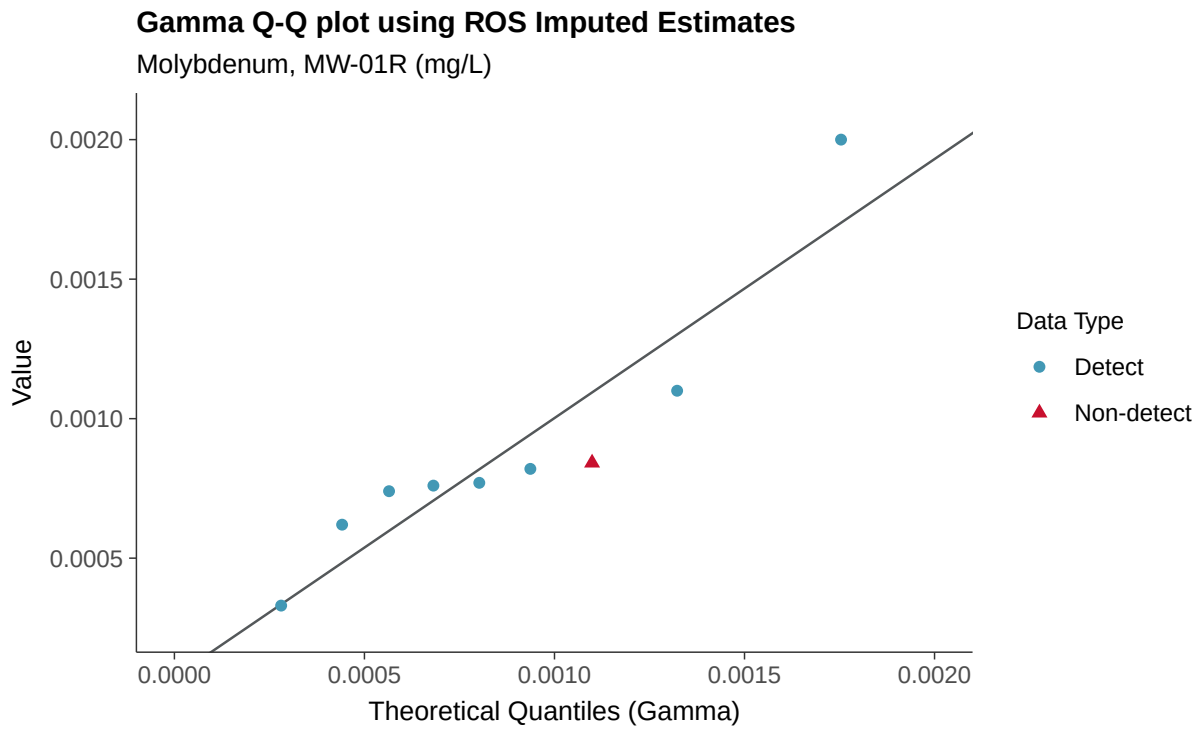


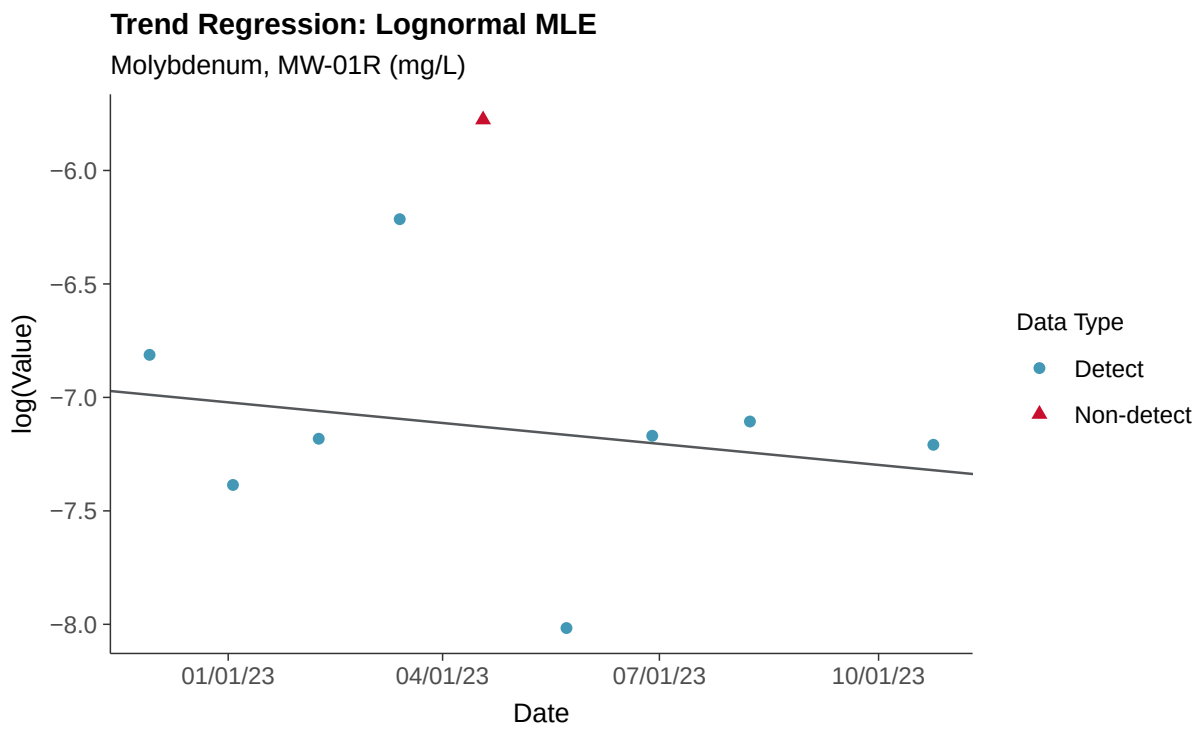


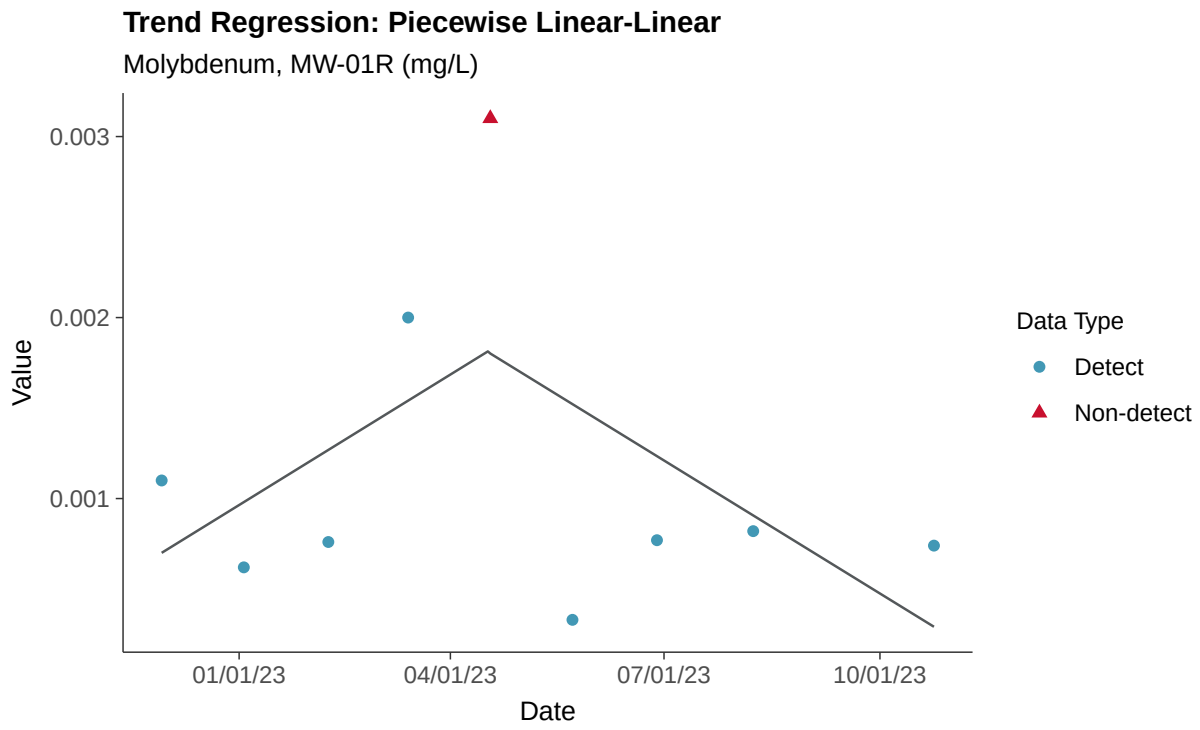

Boxplot
Molybdenum, MW-01R (mg/L)
Value
0.003
0.002
0.001
Data Type
Detect
Non-detect
Outlier Type
Major
Minor


Boxplot by Season
Molybdenum, MW-01R (mg/L)
Value
0.003
0.002
0.001
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Lognormal Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-01R (mg/L)
log(Value)
−6.5
−7.0
−7.5
−8.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

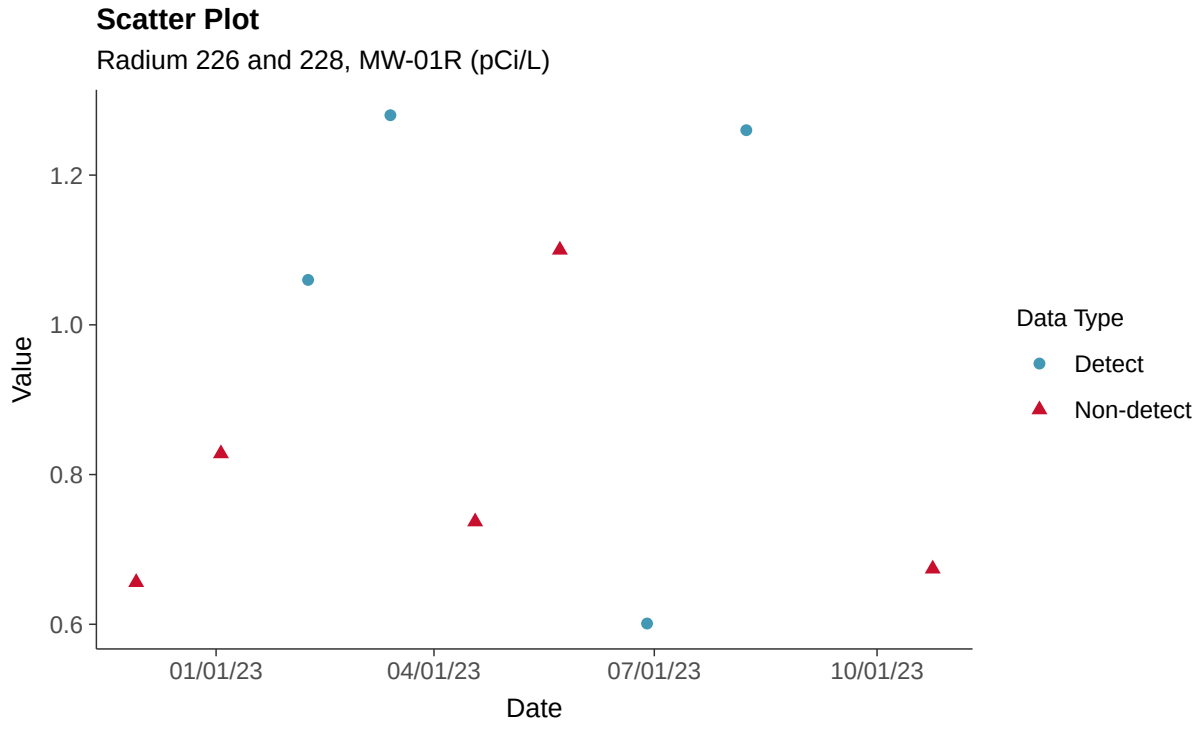

Gamma Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-01R (mg/L)
Value
0.0020
0.0015
0.0010
0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

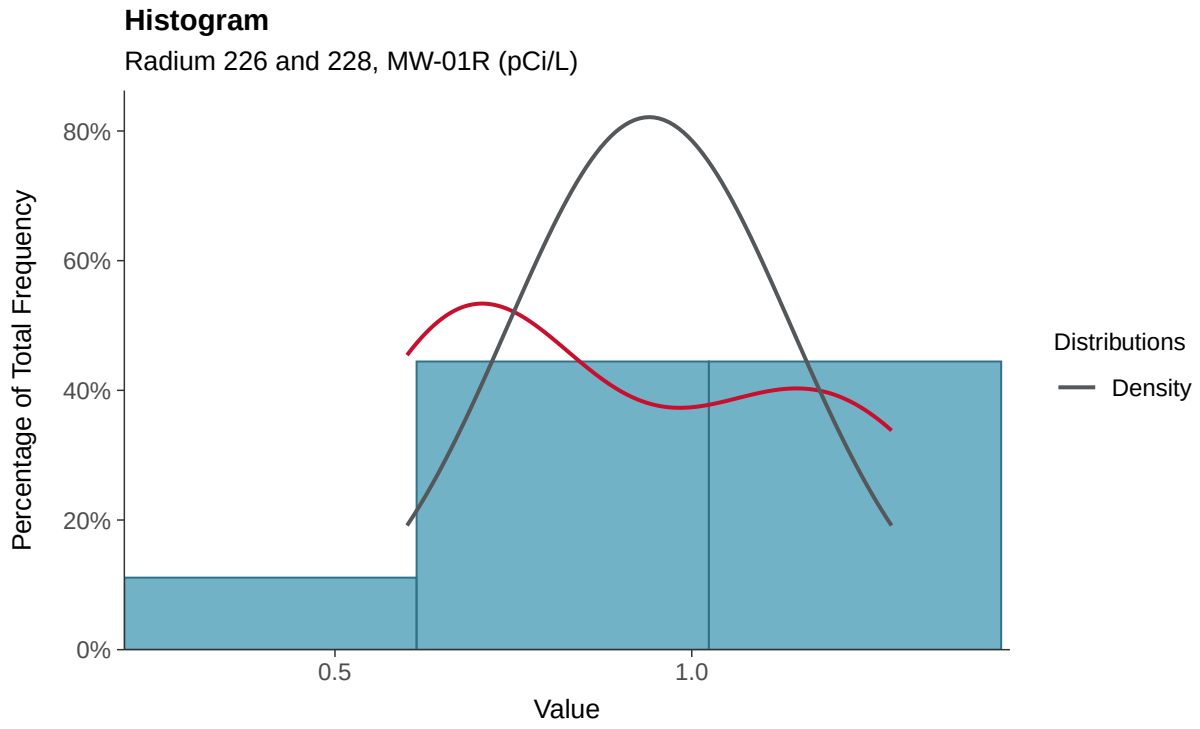

Trend Regression: Lognormal MLE
Molybdenum, MW-01R (mg/L)
log(Value)
−6.0
−6.5
−7.0
−7.5
−8.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-01R (mg/L)
Value
0.003
0.002
0.001
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Radium 226 and 228, MW-01R

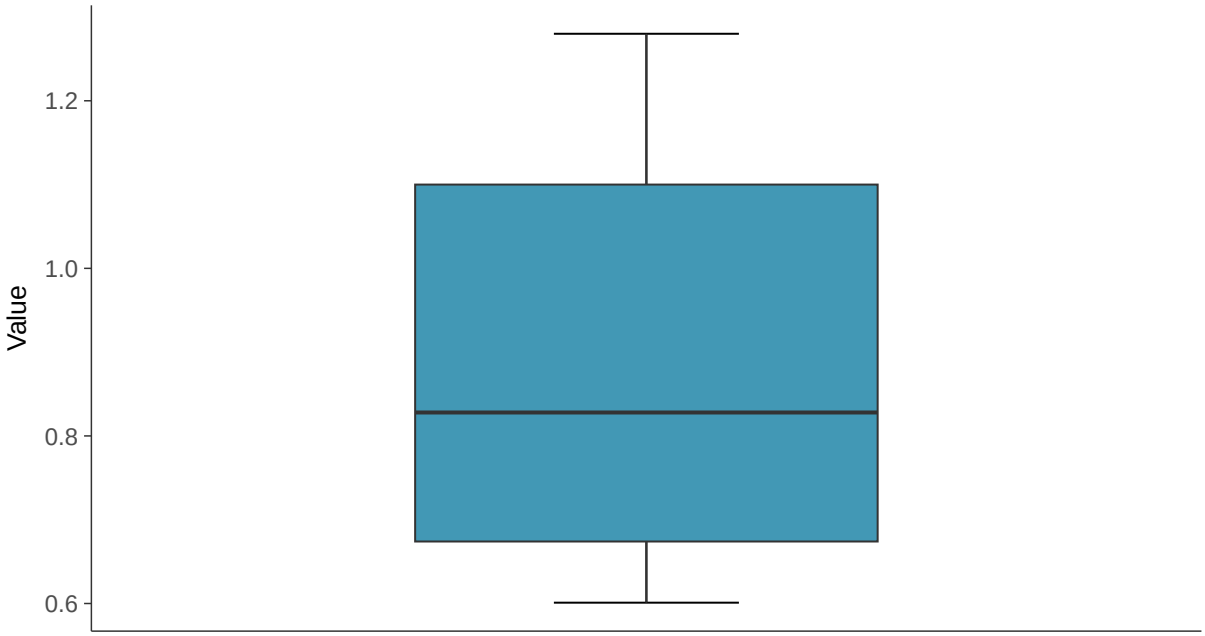
ID: 1_11_5_121





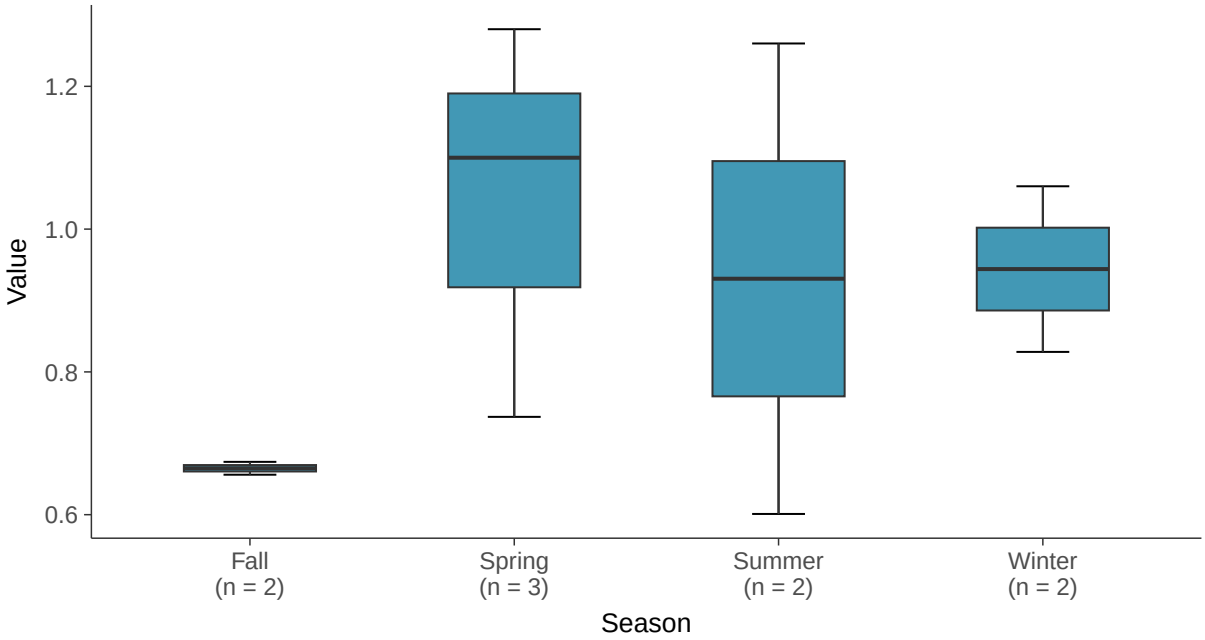
Boxplot

Radium 226 and 228, MW-01R (pCi/L)



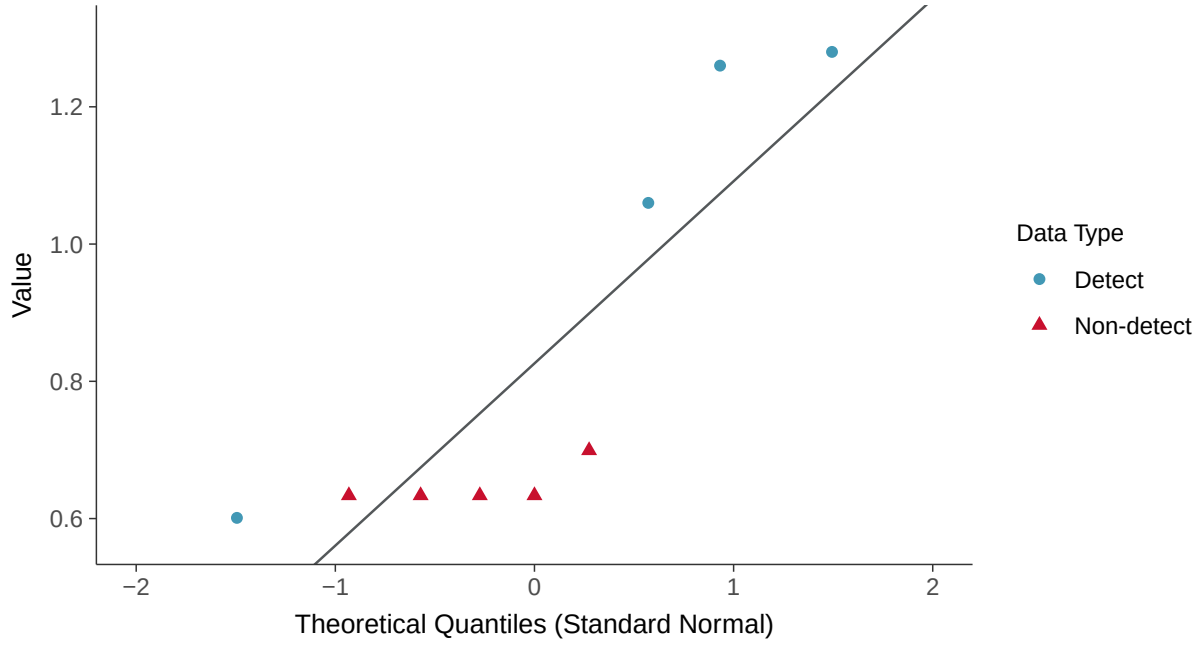
Boxplot by Season

Radium 226 and 228, MW-01R (pCi/L)



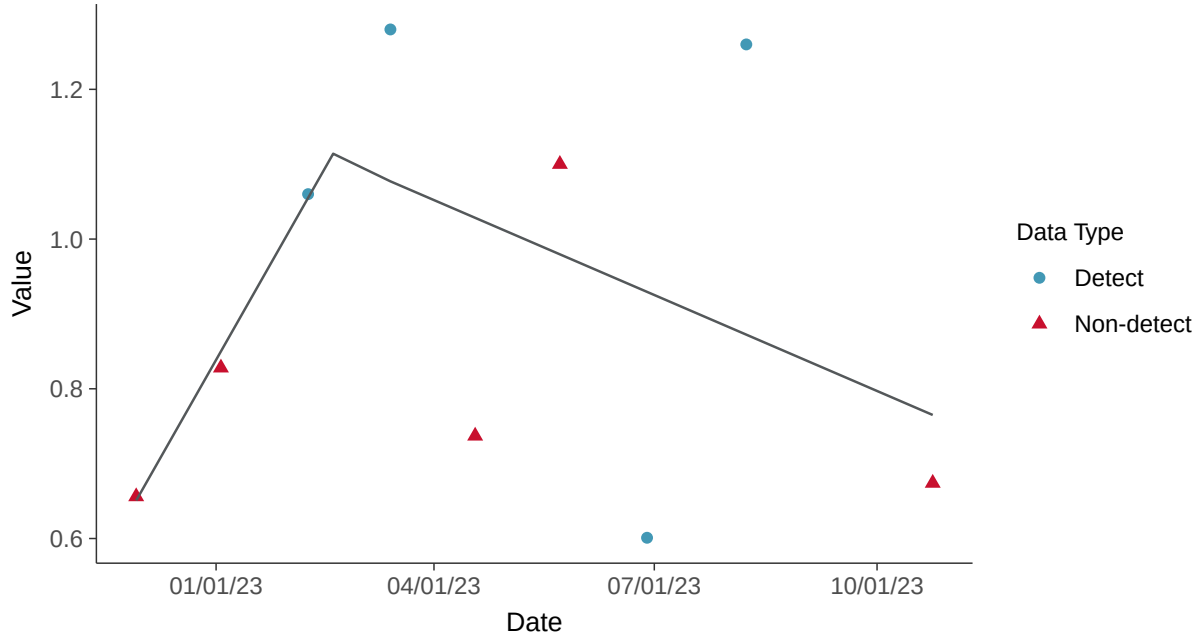
Normal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-01R (pCi/L)



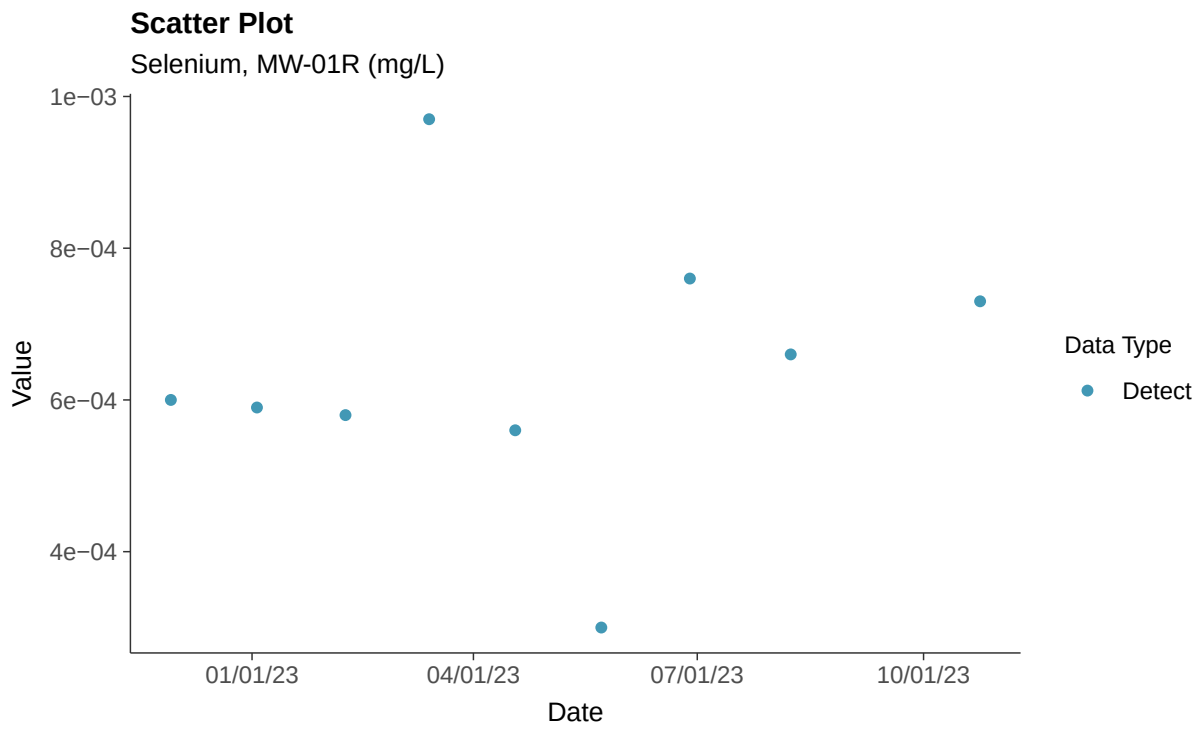
Trend Regression: Piecewise Linear-Linear

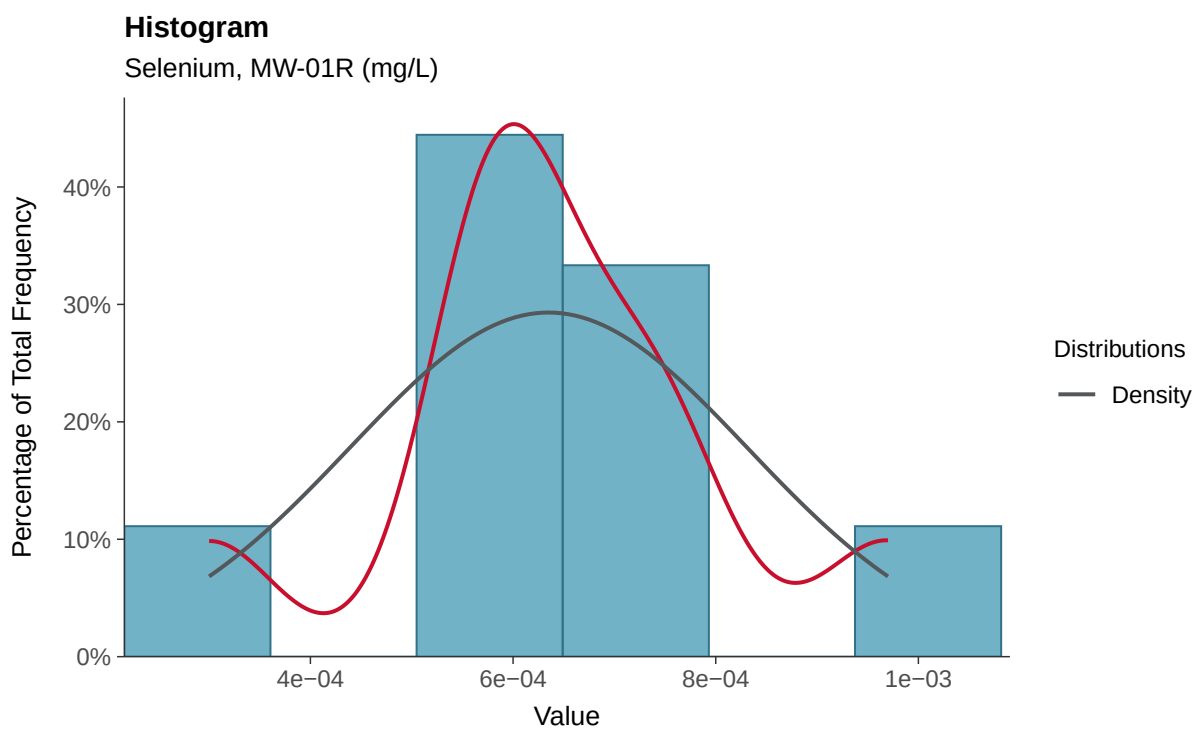
Radium 226 and 228, MW-01R (pCi/L)

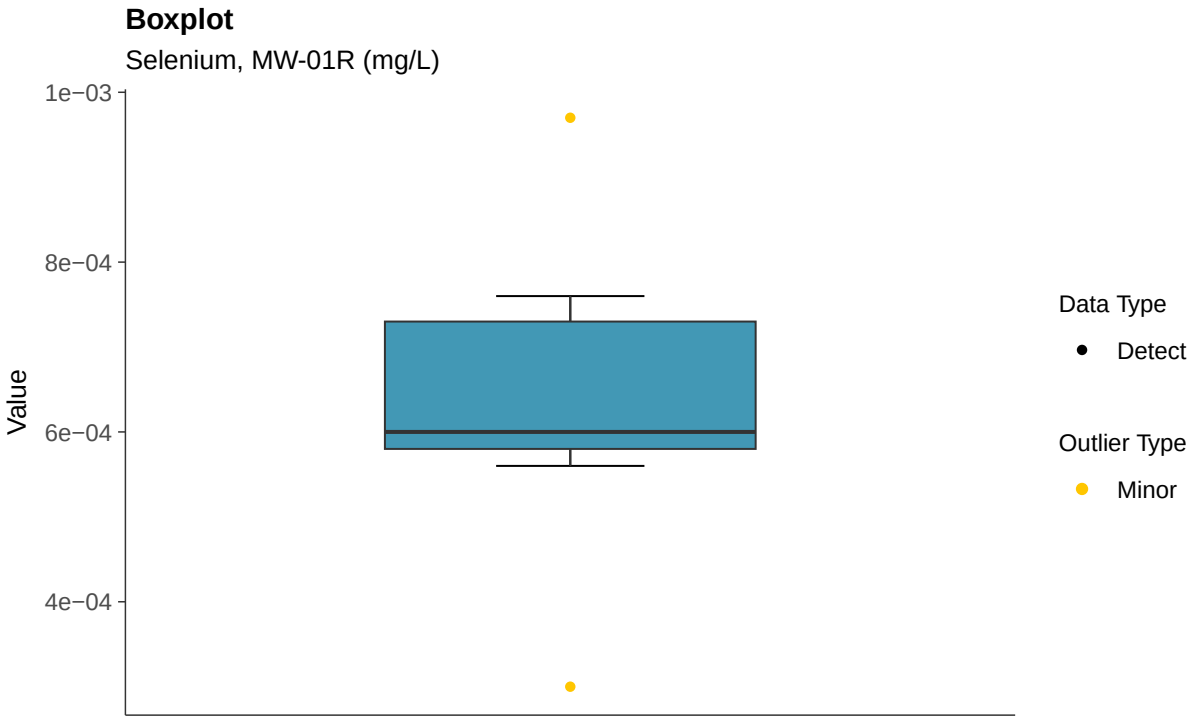


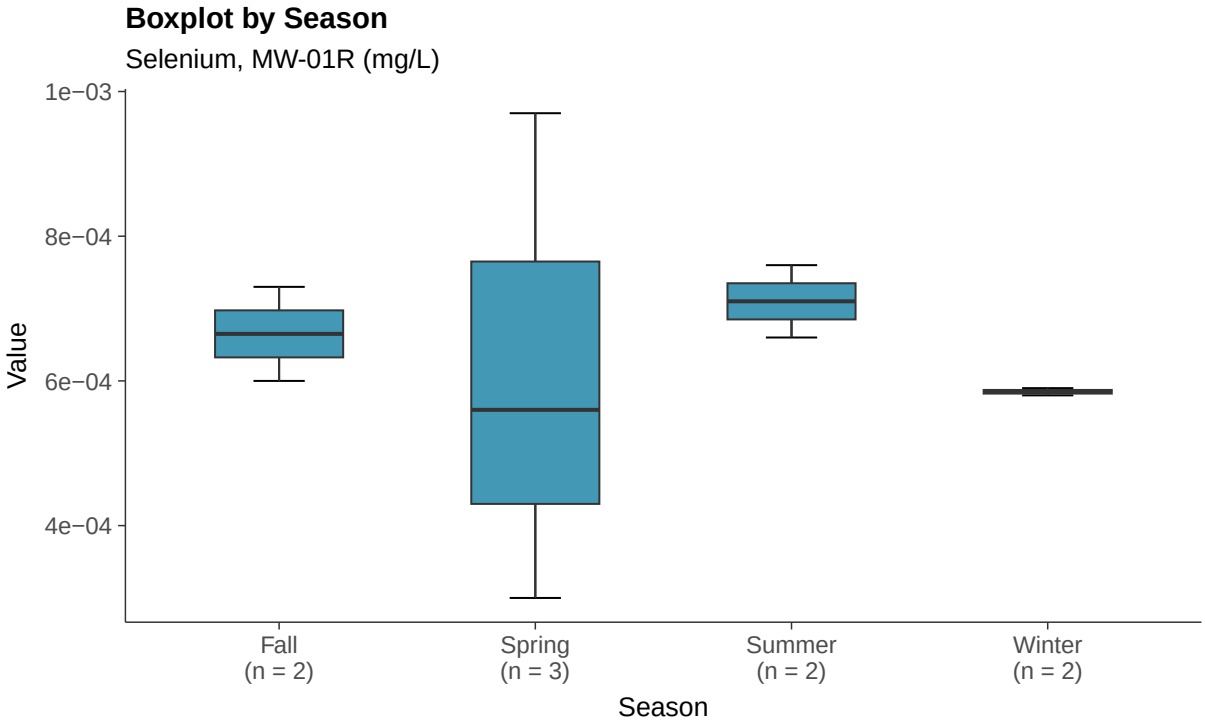
Appendix IV: Selenium, MW-01R

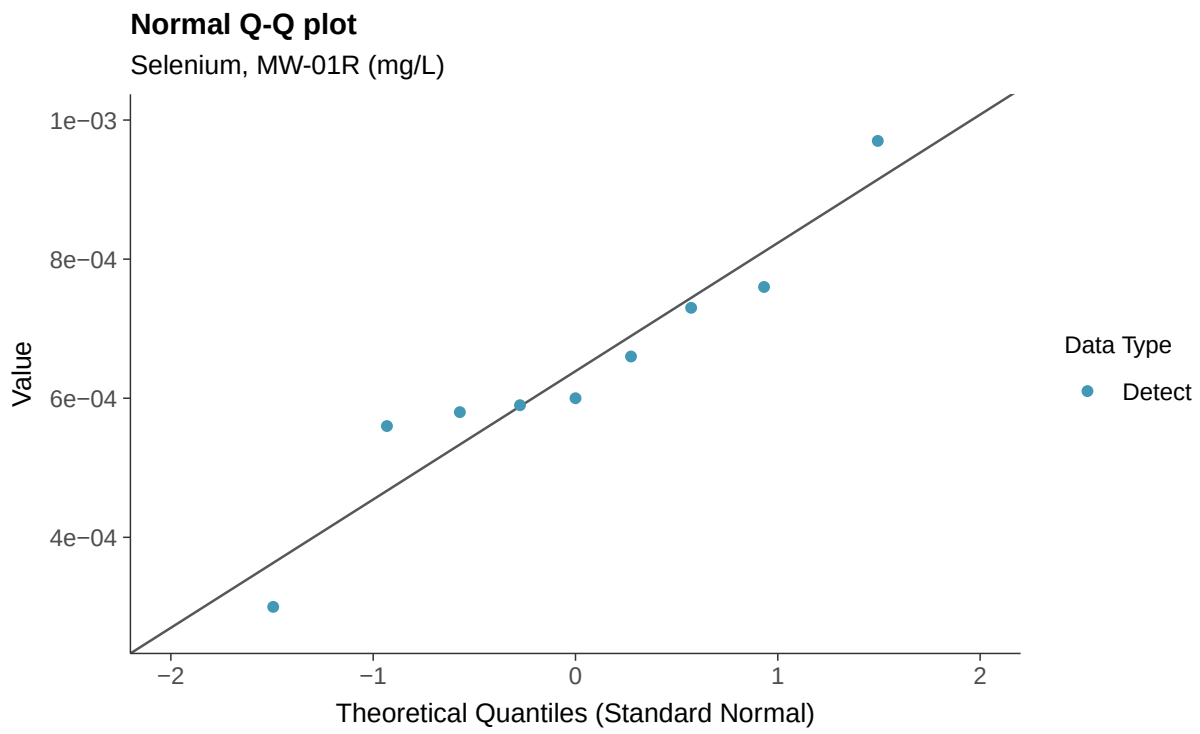
ID: 1_11_5_122

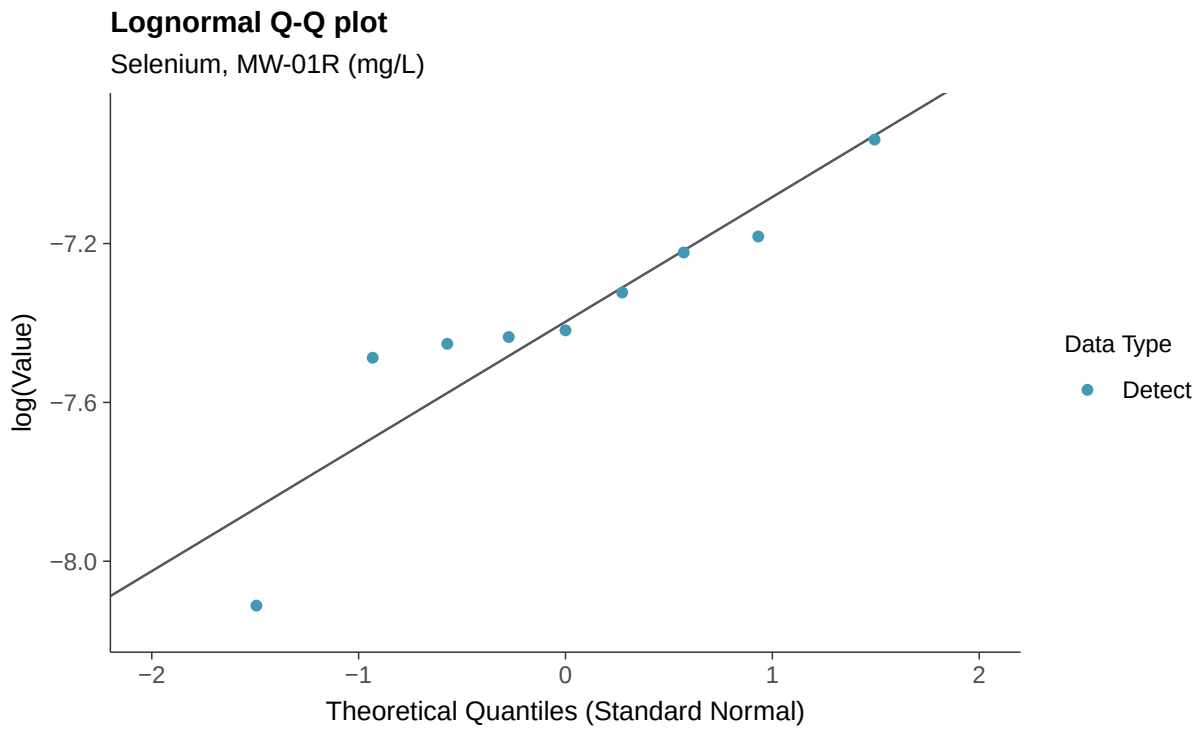


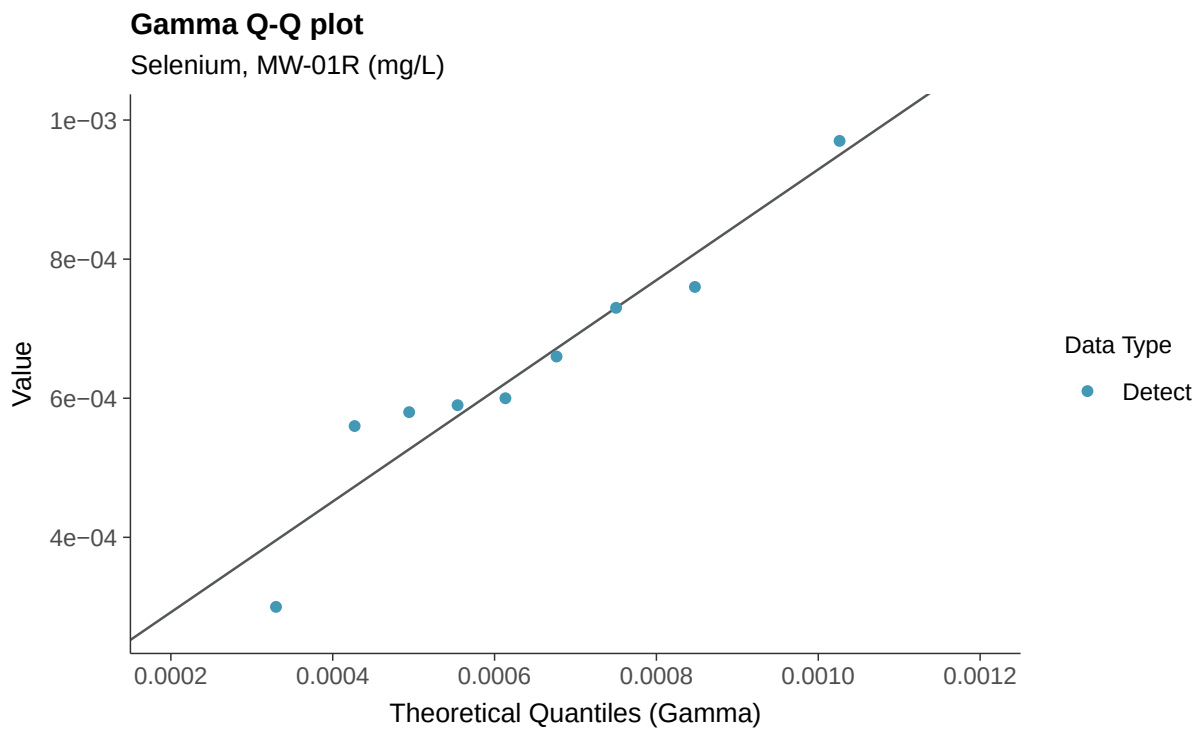


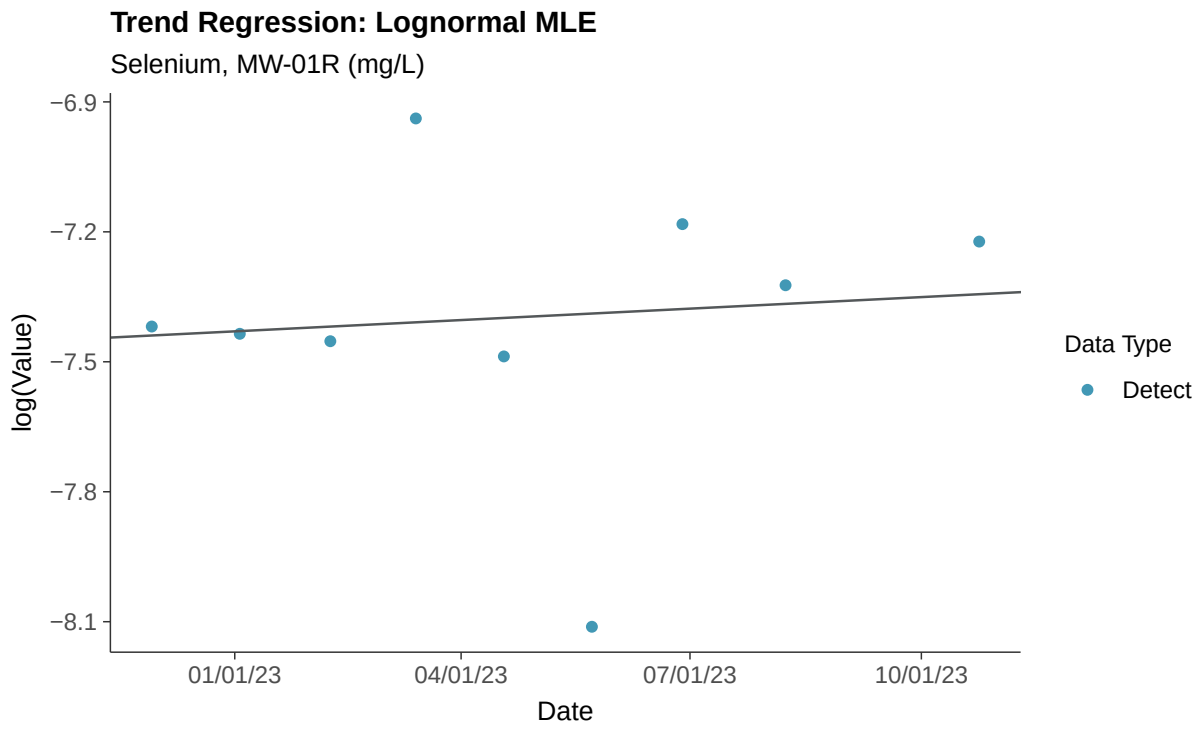

Boxplot
Selenium, MW-01R (mg/L)
1e−03
8e−04
6e−04
4e−04
Value
Data Type
Detect
Outlier Type
Minor

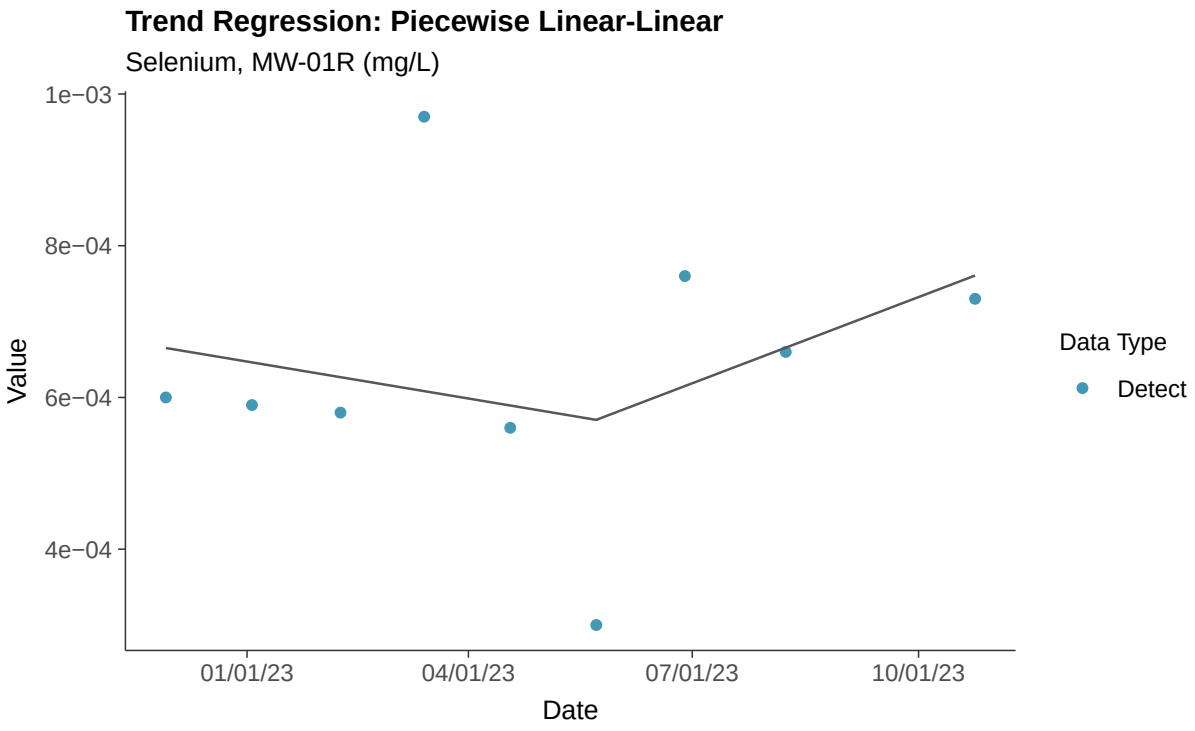

Boxplot by Season
Selenium, MW-01R (mg/L)
1e−03
8e−04
6e−04
4e−04
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

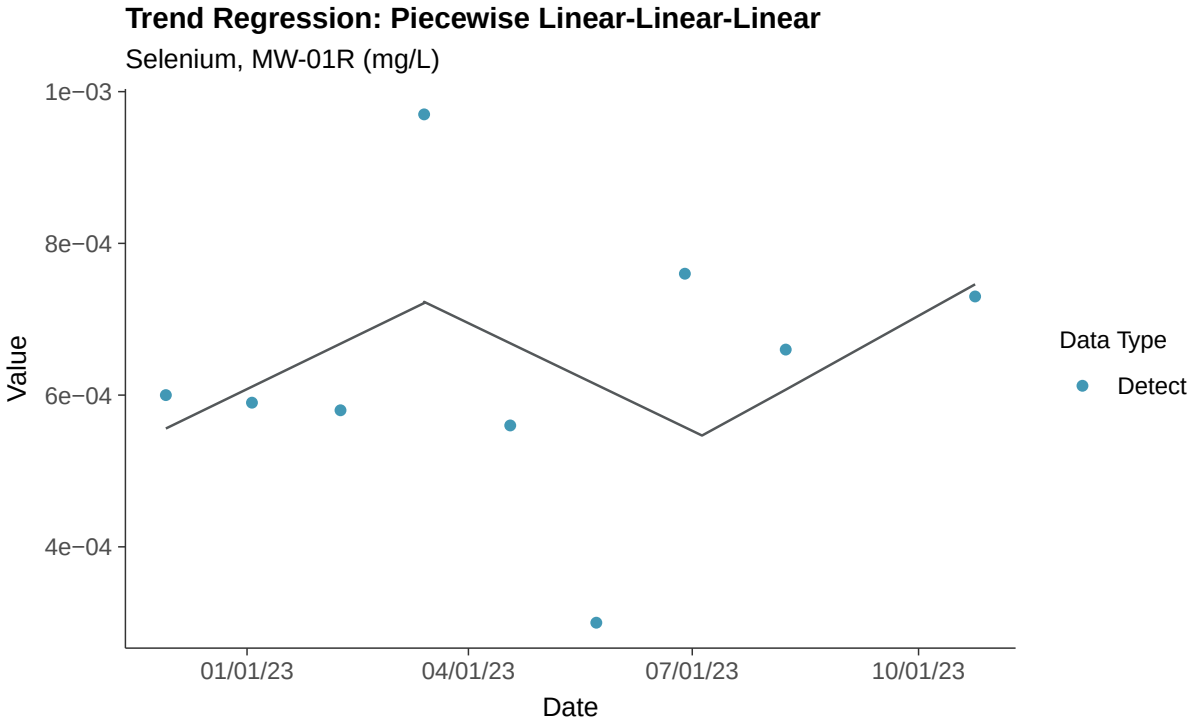

Normal Q-Q plot
Selenium, MW-01R (mg/L)
Value
1e−03
8e−04
6e−04
4e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Selenium, MW-01R (mg/L)
log(Value)
−7.2
−7.6
−8.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Selenium, MW-01R (mg/L)
1e−03
8e−04
6e−04
4e−04
Value
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect

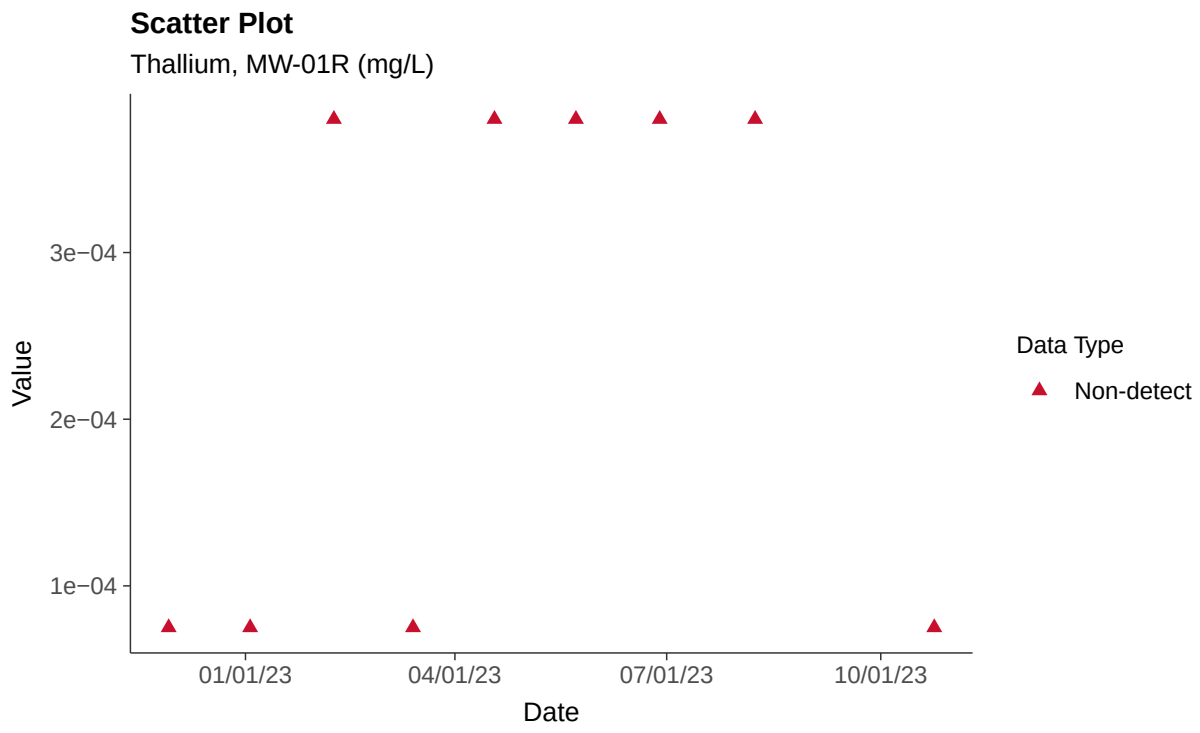

Trend Regression: Lognormal MLE
Selenium, MW-01R (mg/L)
−6.9
−7.2
−7.5
−7.8
−8.1
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

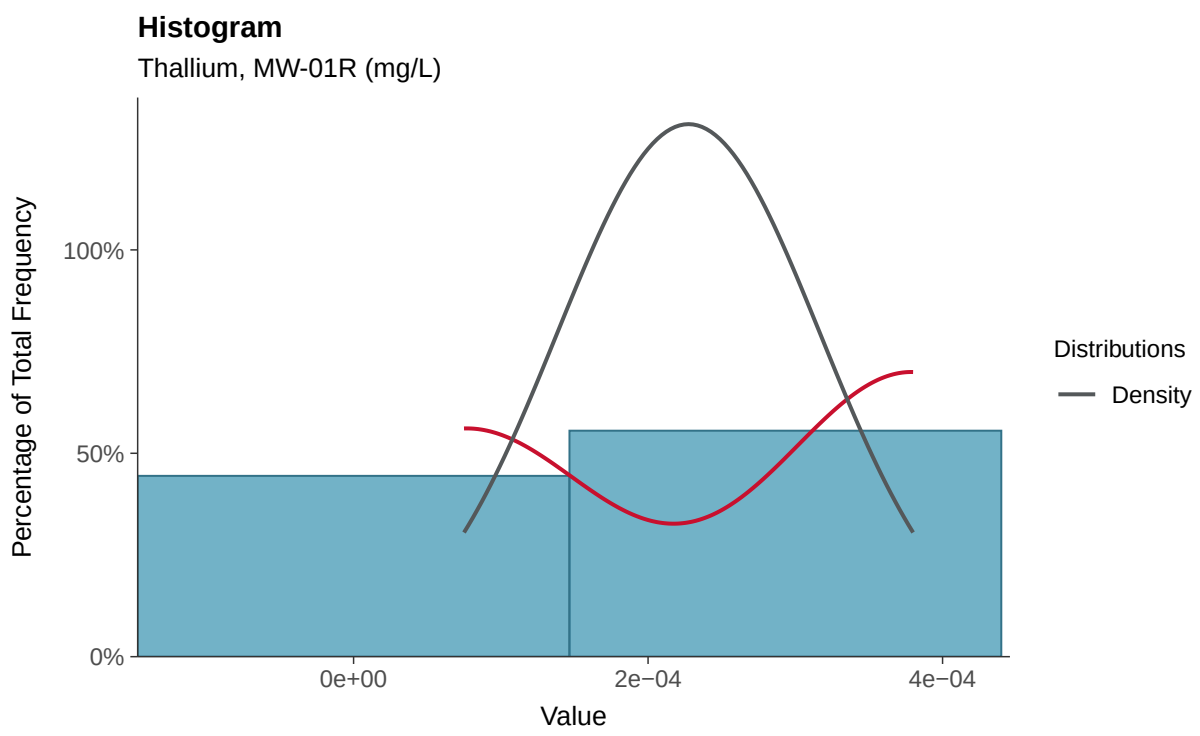

Trend Regression: Piecewise Linear-Linear
Selenium, MW-01R (mg/L)
1e−03
8e−04
6e−04
4e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-01R (mg/L)
1e−03
8e−04
6e−04
4e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Thallium, MW-01R

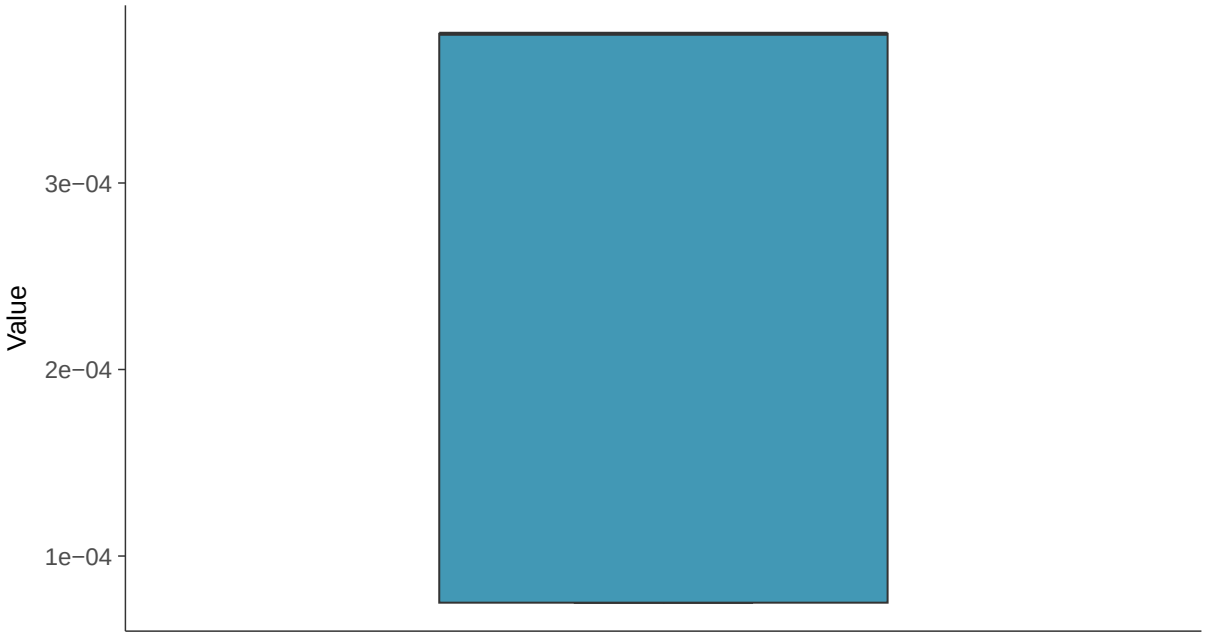
ID: 1_11_5_125





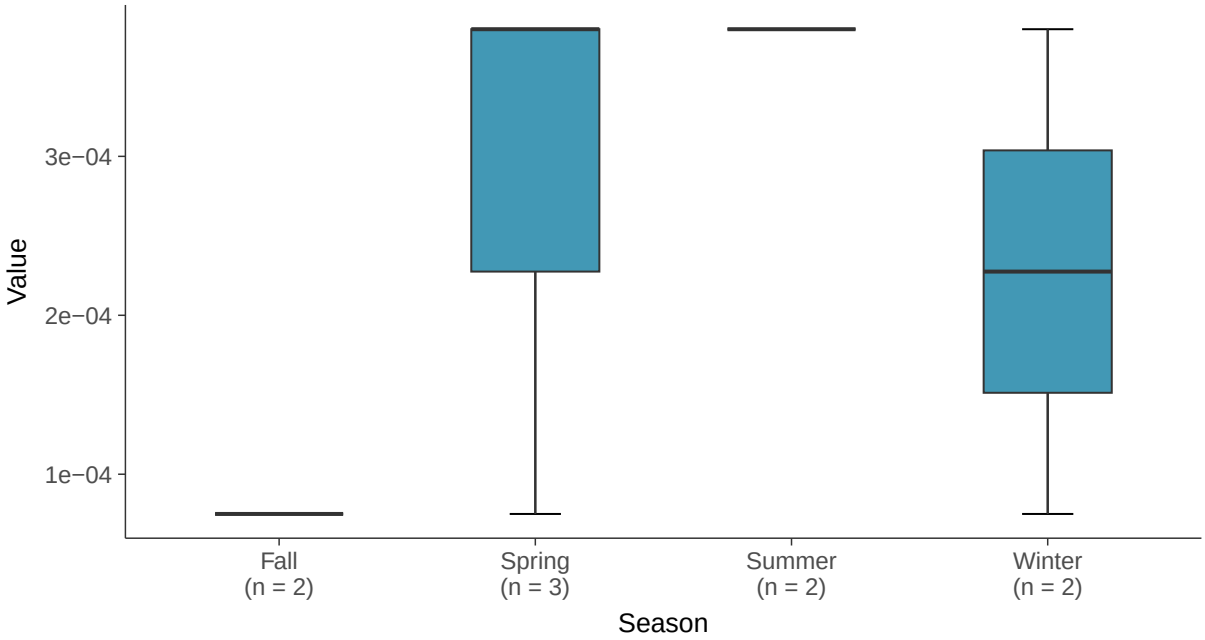
Boxplot

Thallium, MW-01R (mg/L)



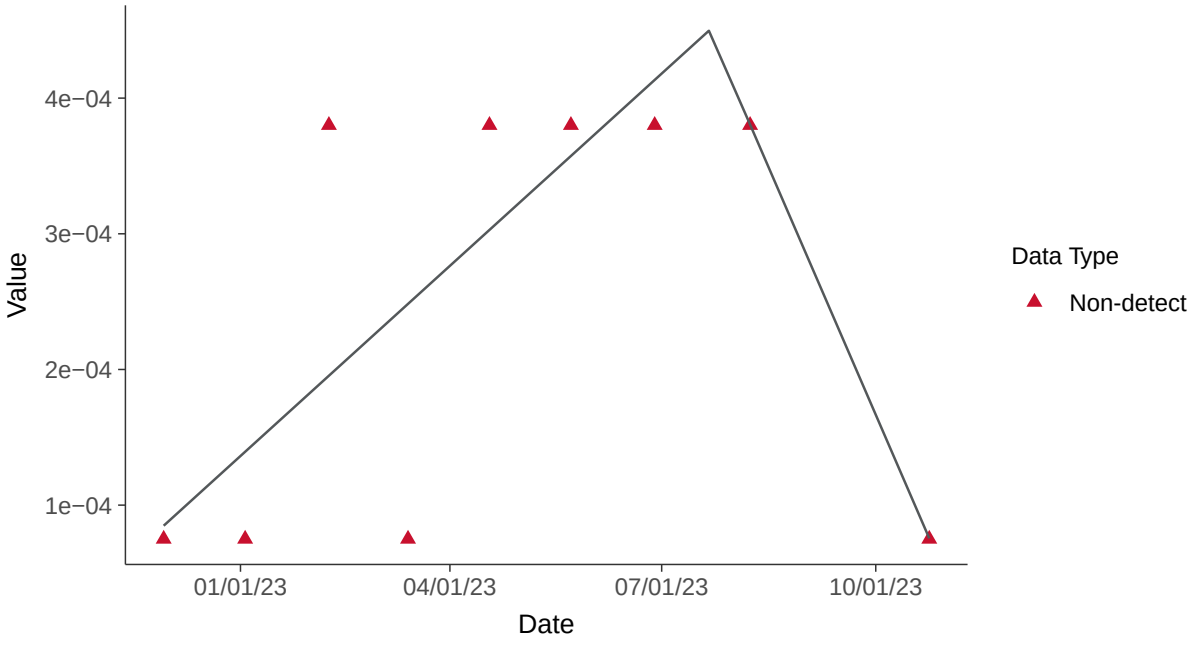
Boxplot by Season

Thallium, MW-01R (mg/L)



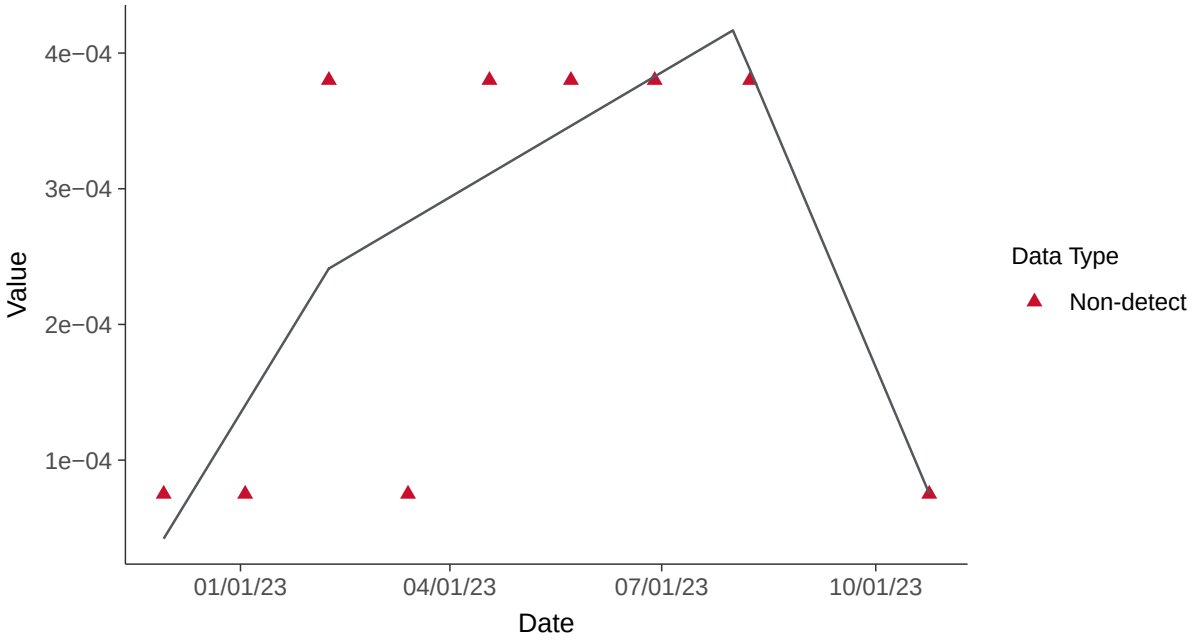
Trend Regression: Piecewise Linear-Linear

Thallium, MW-01R (mg/L)



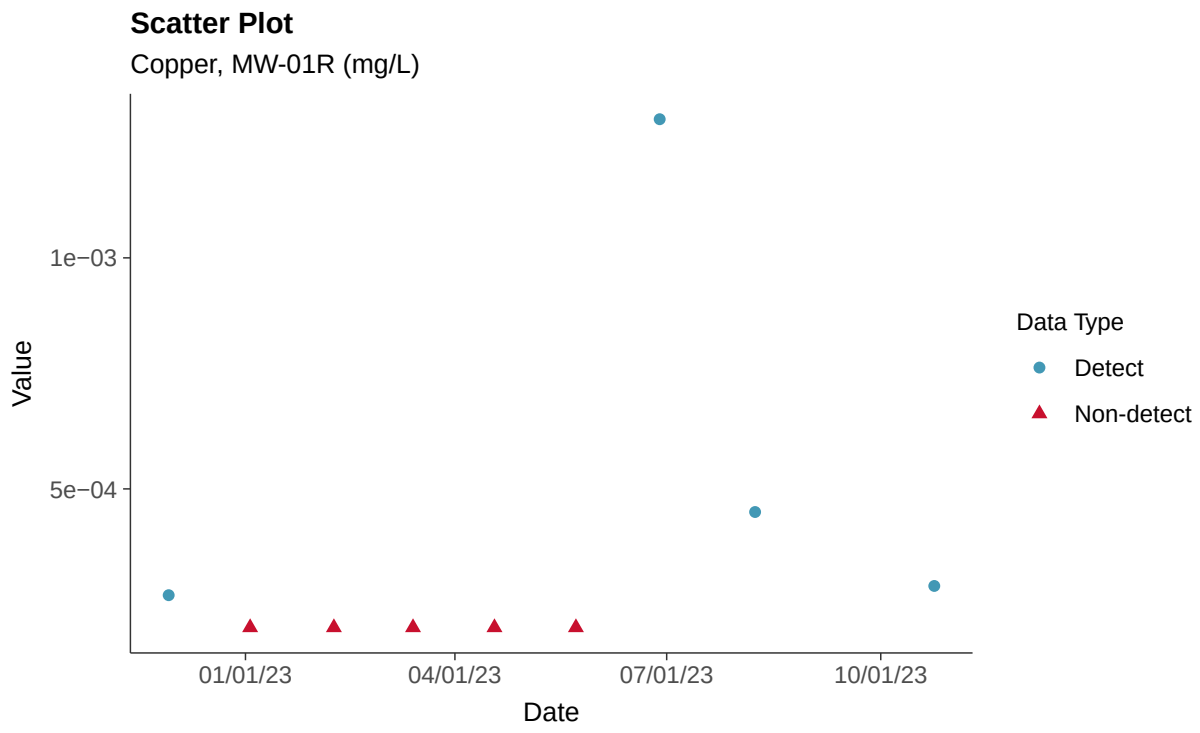
Trend Regression: Piecewise Linear-Linear-Linear

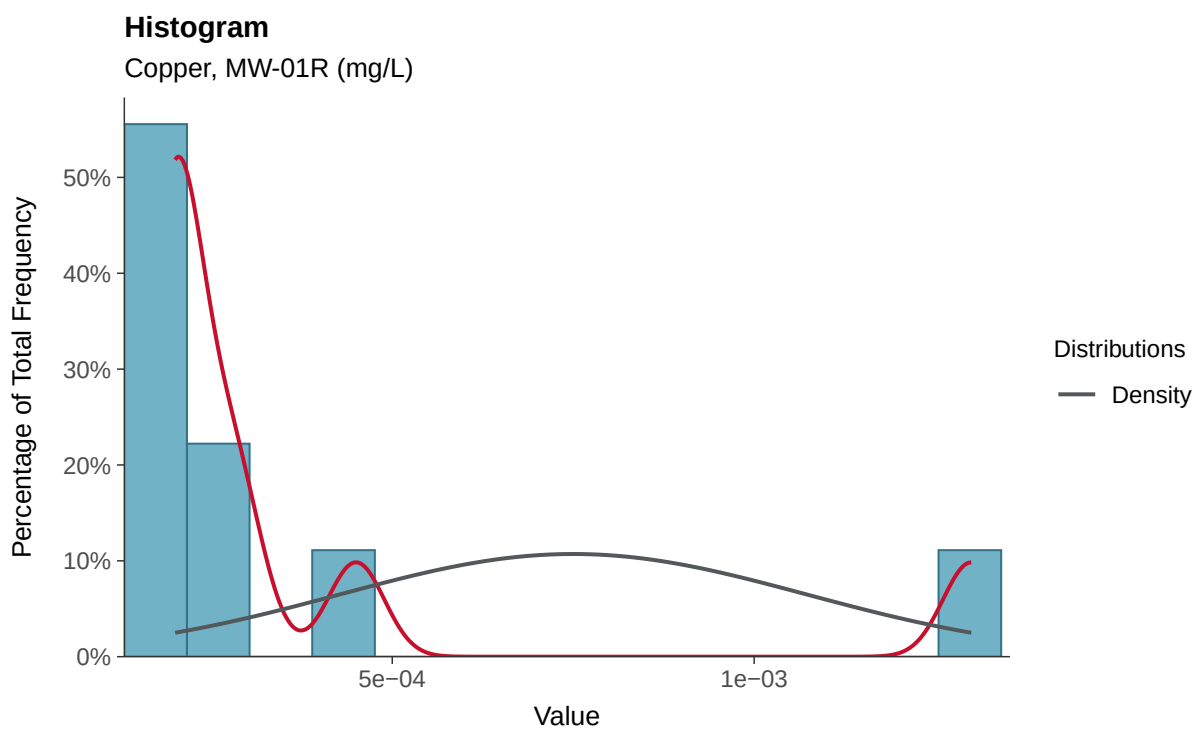
Thallium, MW-01R (mg/L)



Part 115: Copper, MW-01R

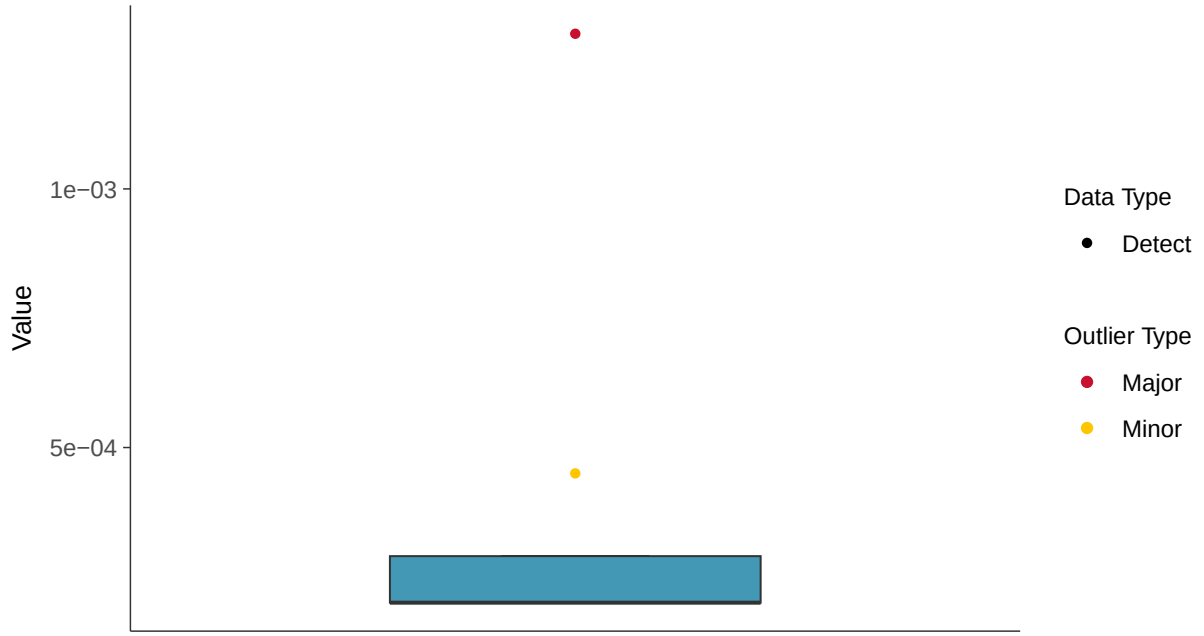
ID: 1_11_6_111





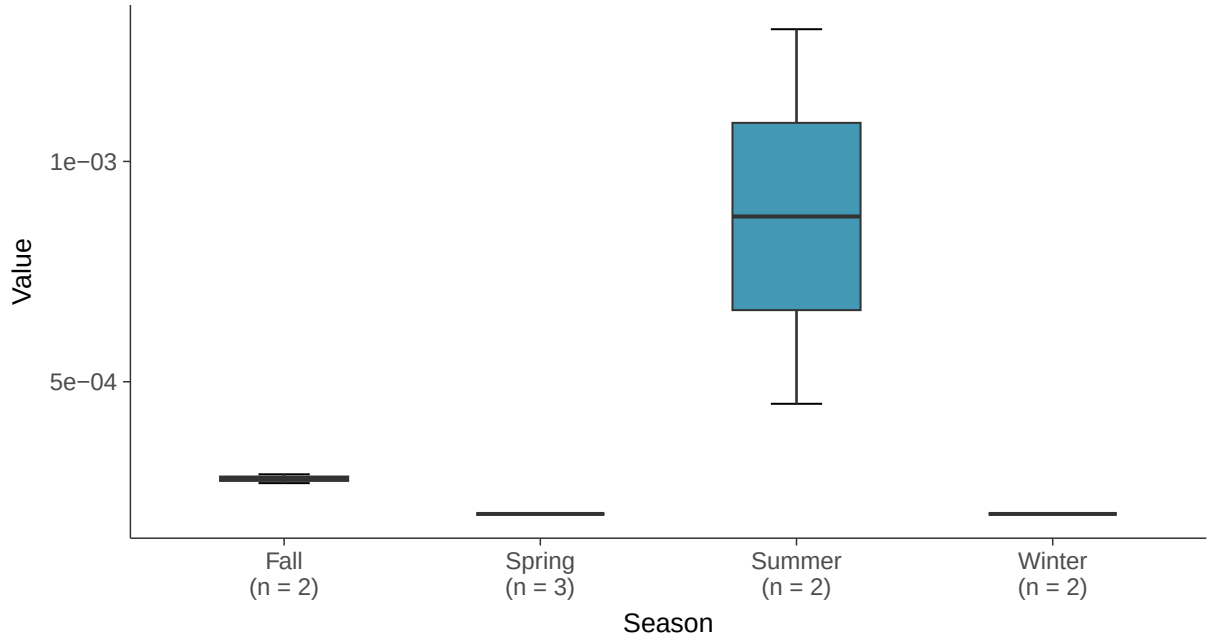
Boxplot

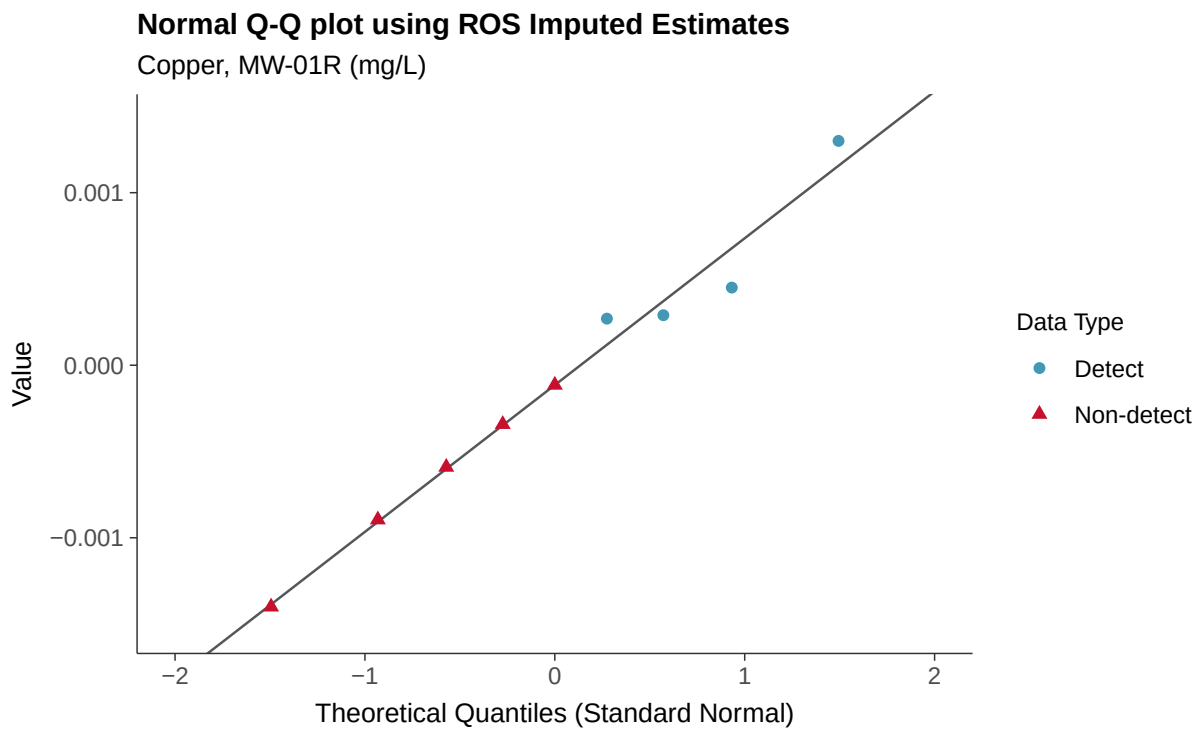
Copper, MW-01R (mg/L)

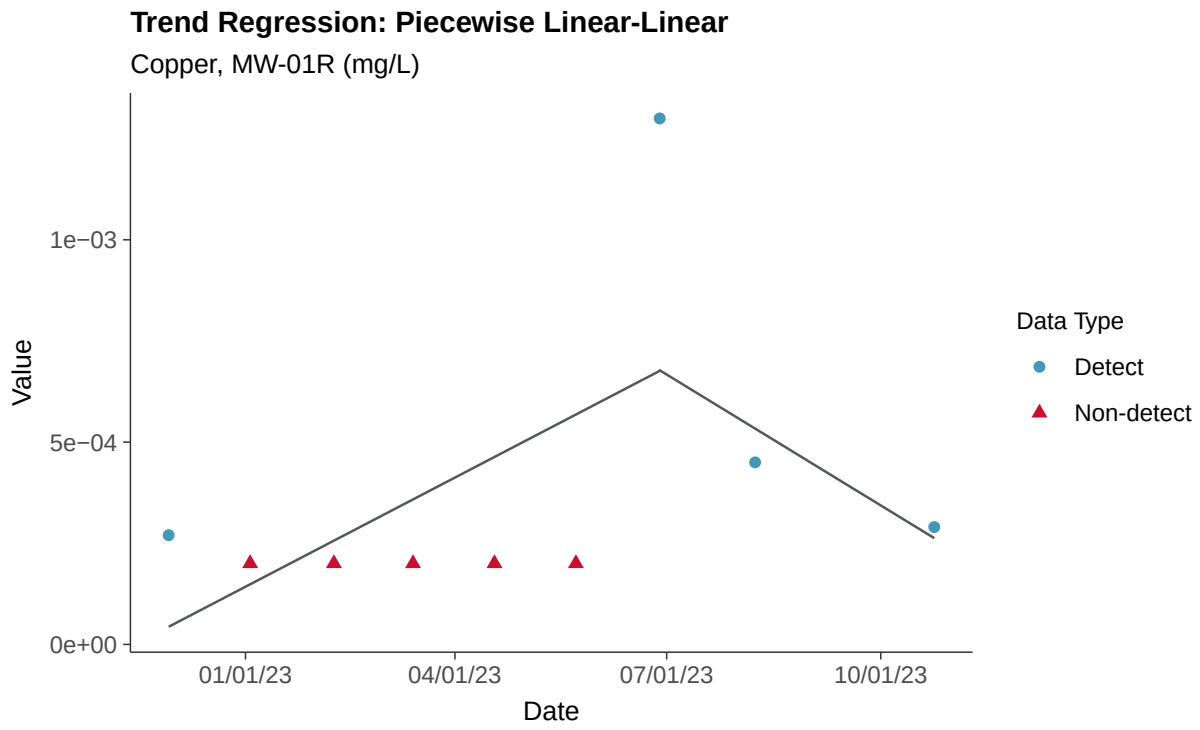


Boxplot by Season

Copper, MW-01R (mg/L)

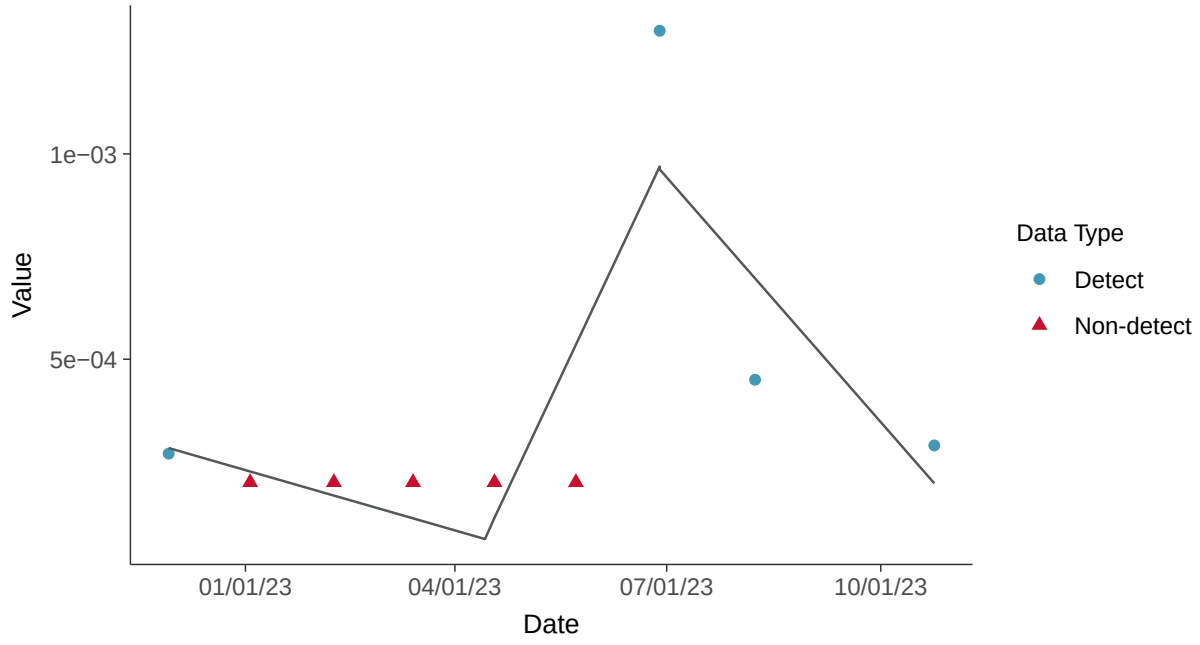



Normal Q-Q plot using ROS Imputed Estimates
Copper, MW-01R (mg/L)
Value
0.001
0.000
−0.001
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Copper, MW-01R (mg/L)
Value
1e−03
5e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

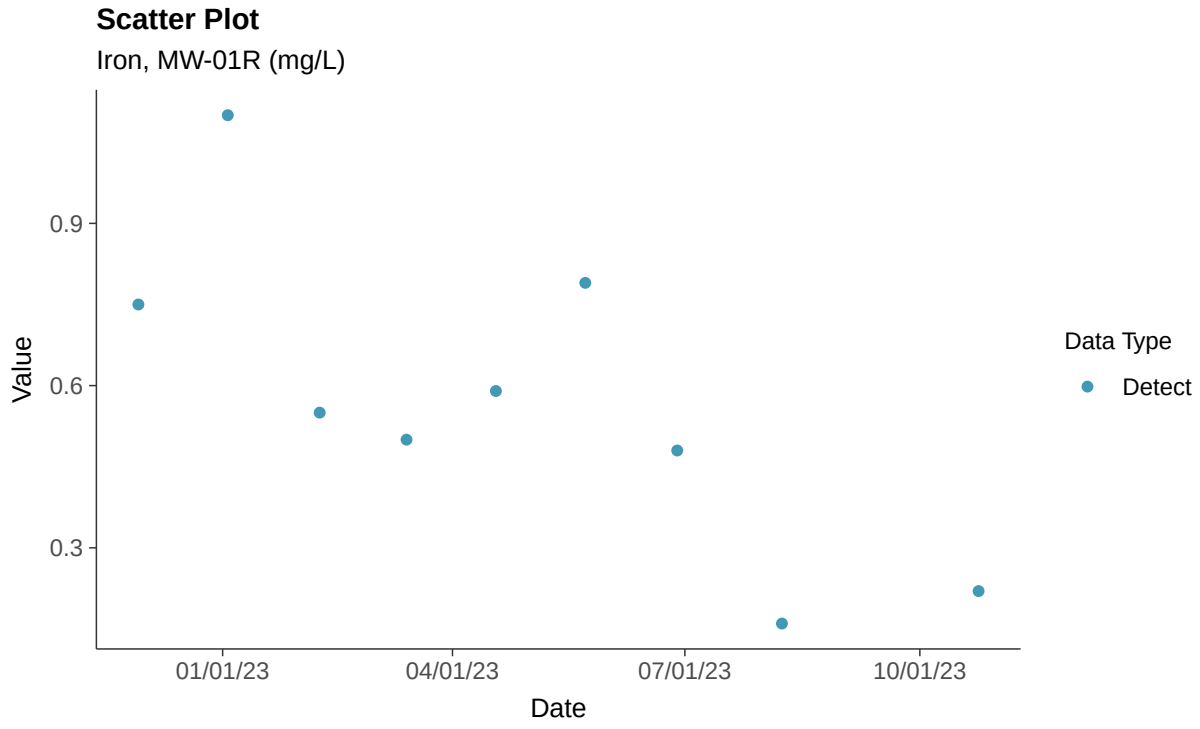
Trend Regression: Piecewise Linear-Linear-Linear

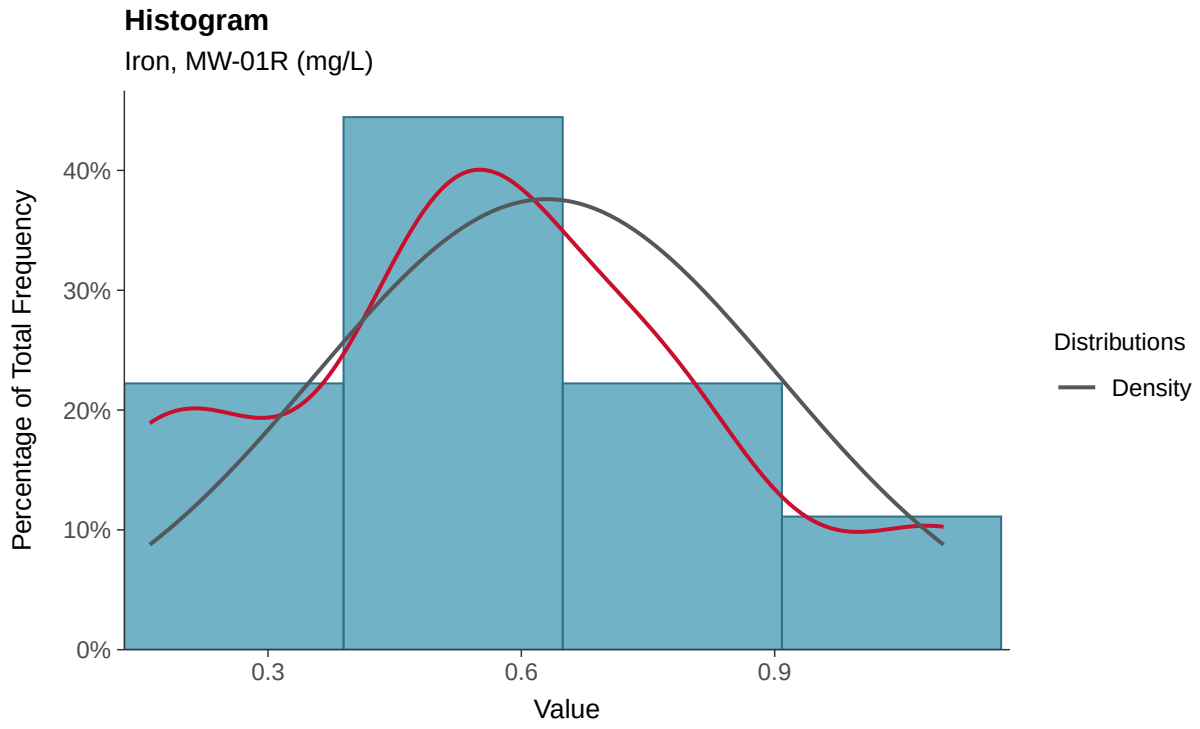
Copper, MW-01R (mg/L)



Part 115: Iron, MW-01R

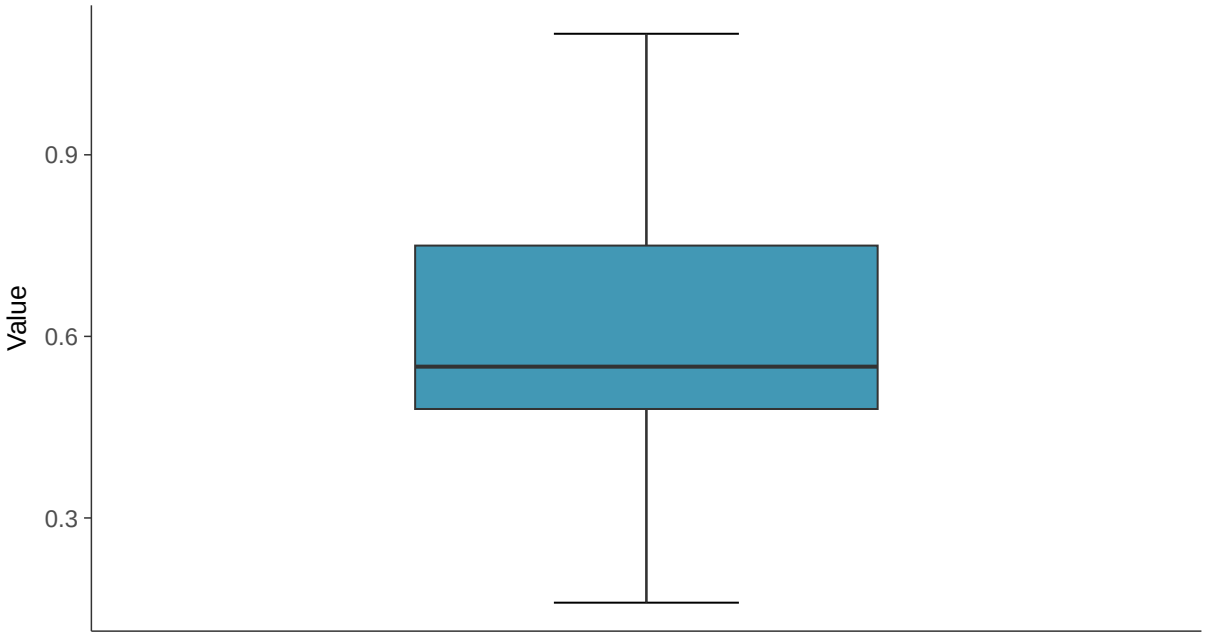
ID: 1_11_6_114





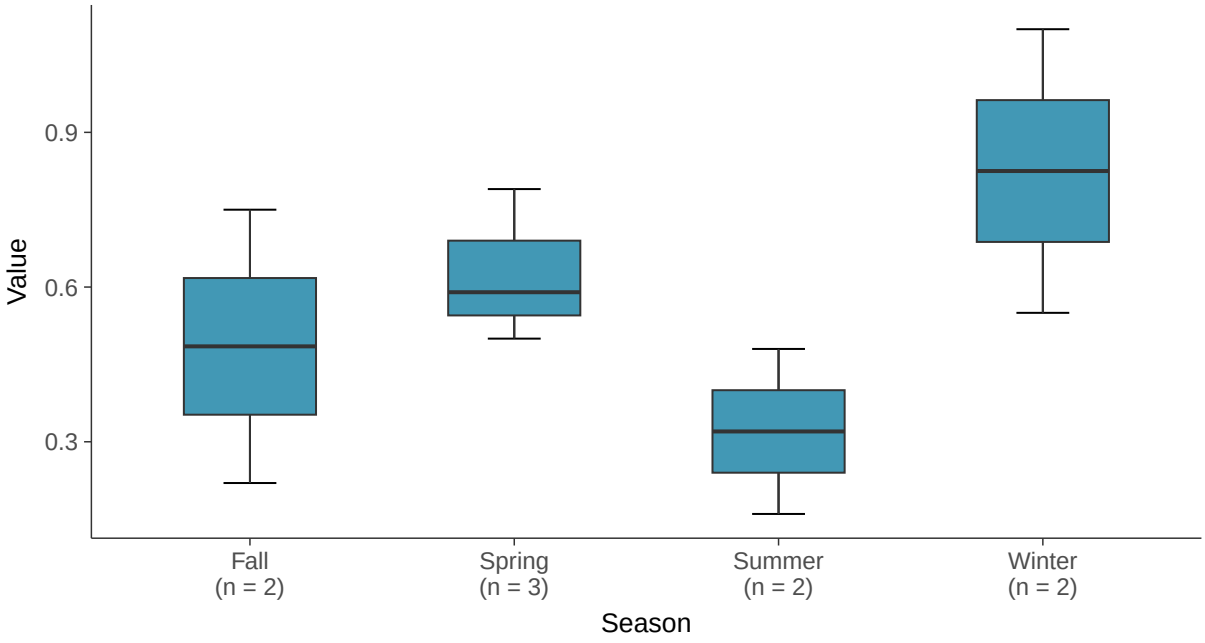
Boxplot

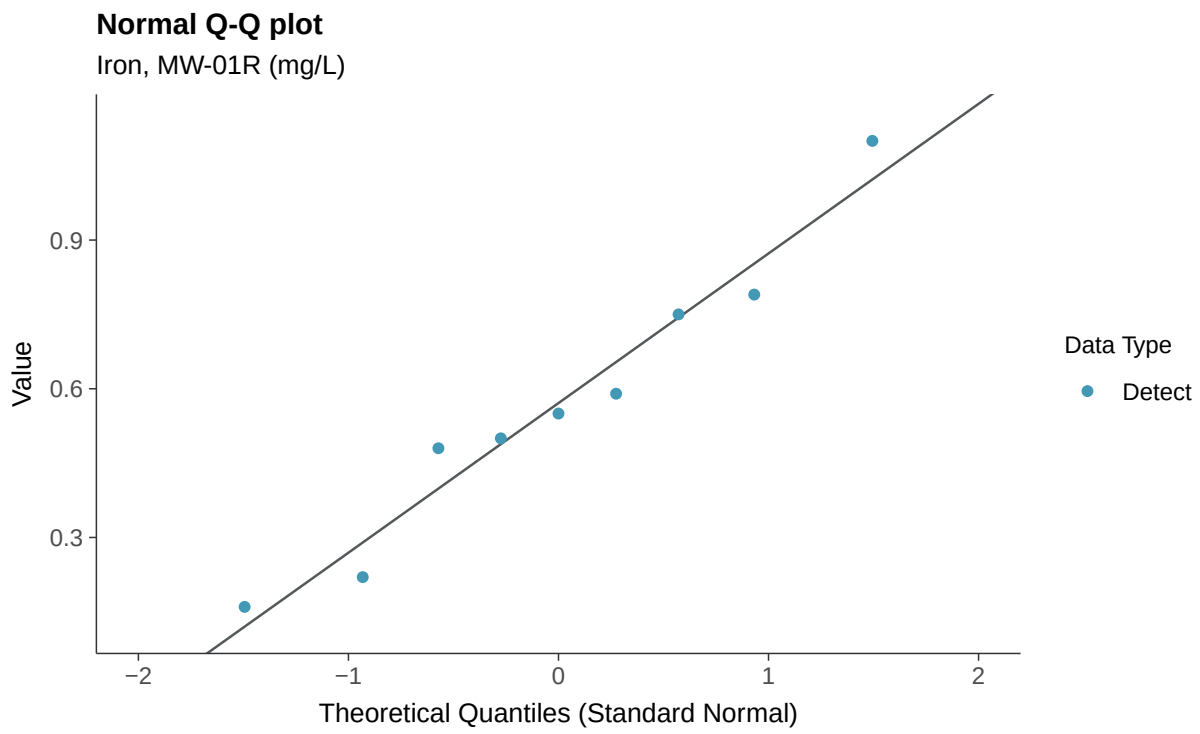
Iron, MW-01R (mg/L)

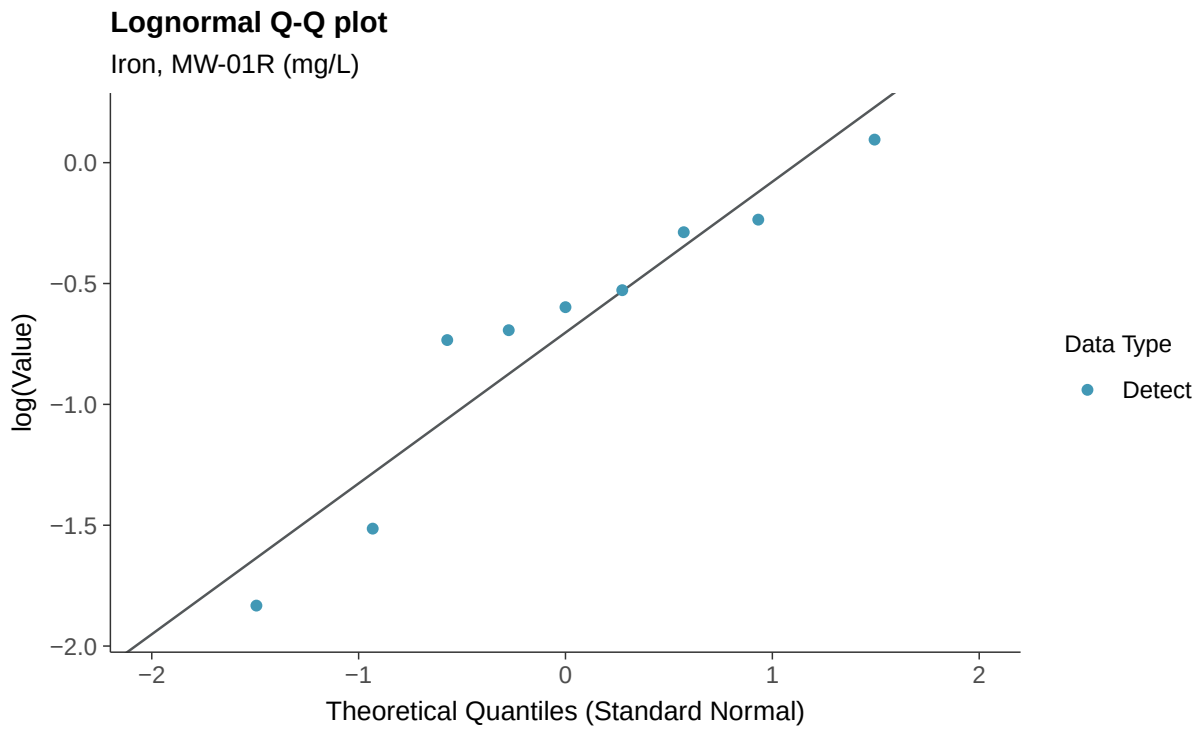


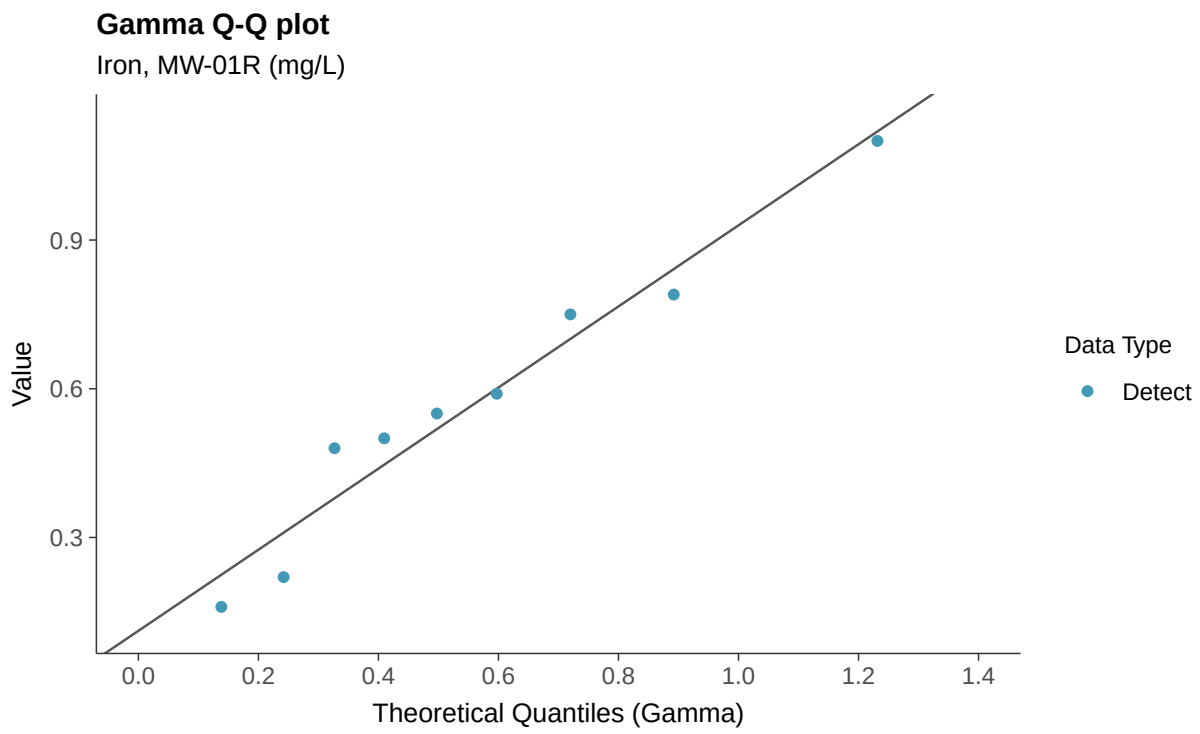
Boxplot by Season

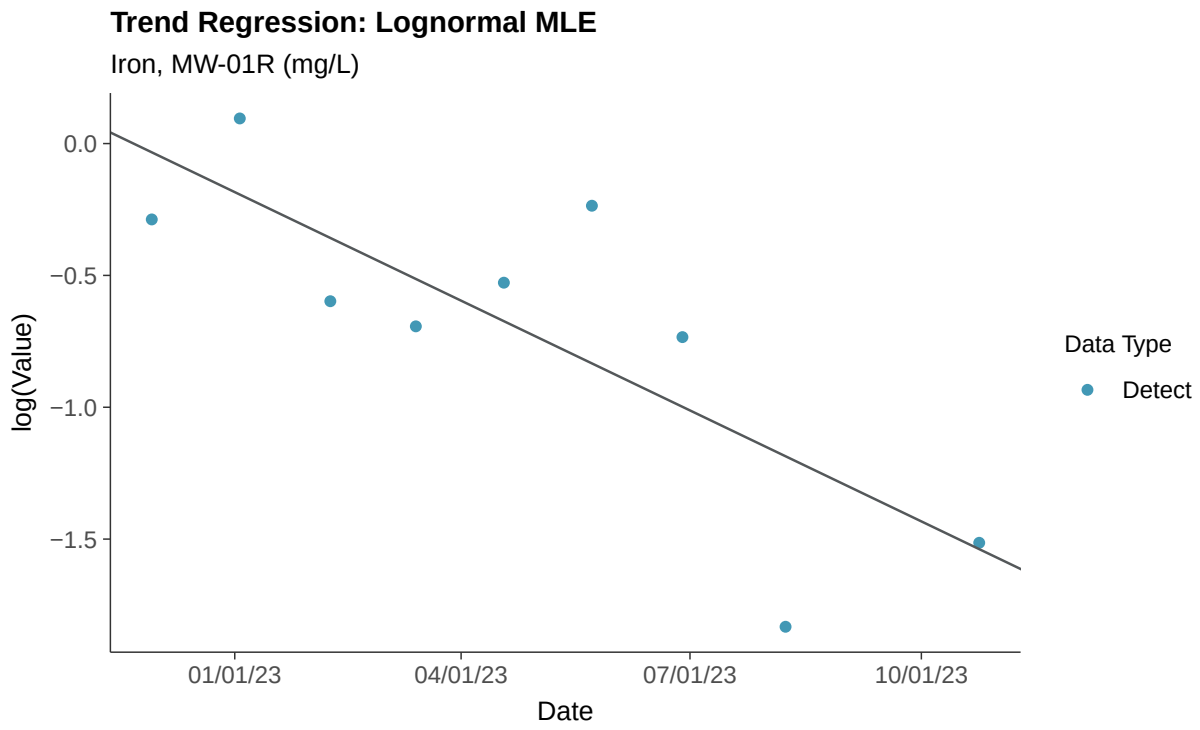
Iron, MW-01R (mg/L)




Normal Q-Q plot
Iron, MW-01R (mg/L)
Value
0.9
0.6
0.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

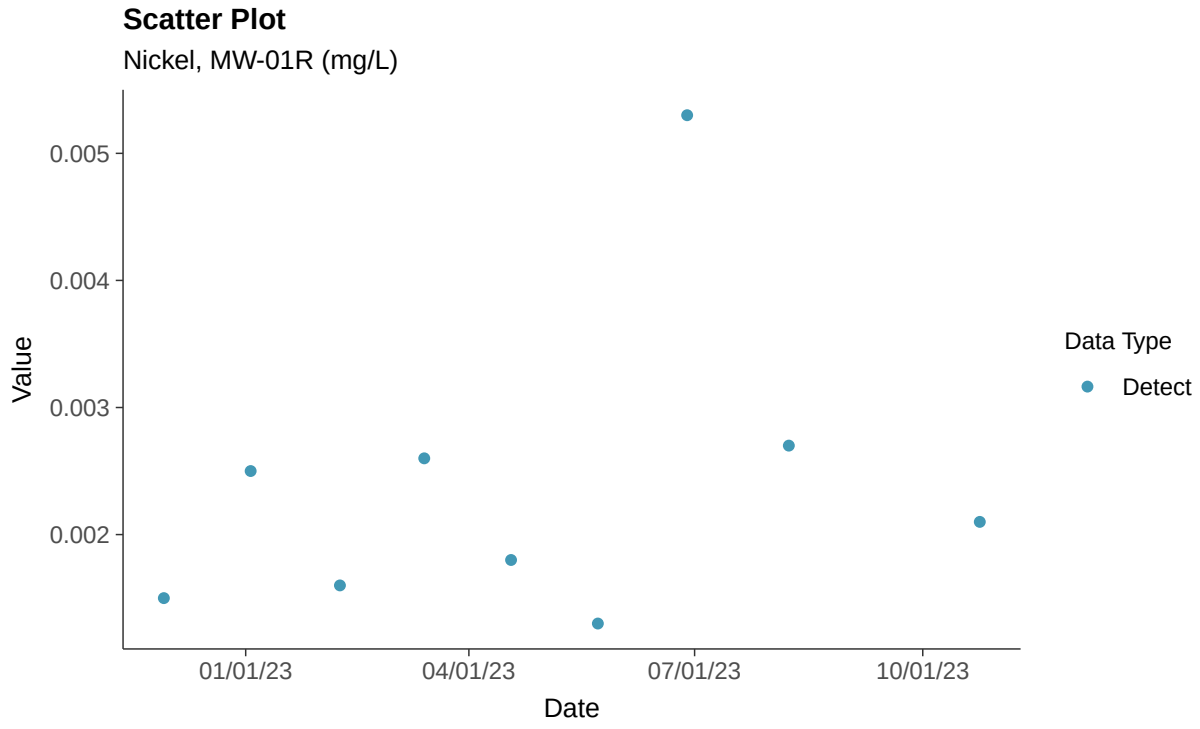

Lognormal Q-Q plot
Iron, MW-01R (mg/L)
log(Value)
0.0
−0.5
−1.0
−1.5
−2.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

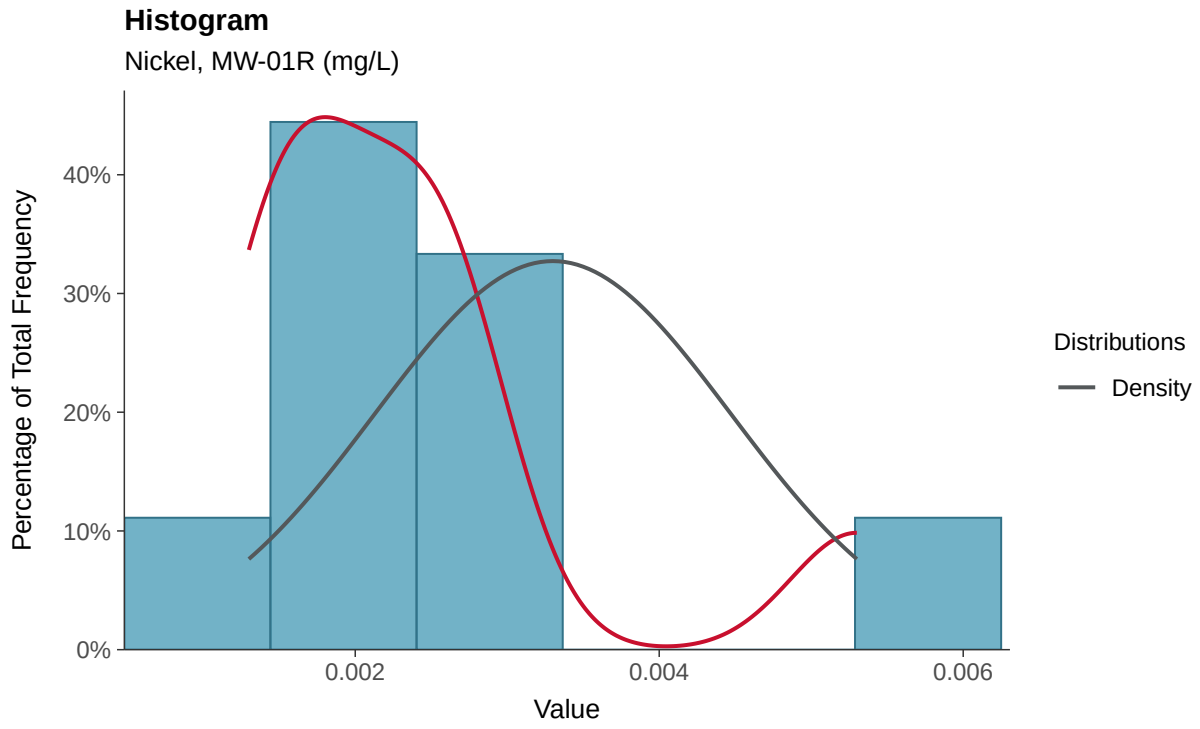

Gamma Q-Q plot
Iron, MW-01R (mg/L)
Value
0.9
0.6
0.3
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Iron, MW-01R (mg/L)
log(Value)
0.0
−0.5
−1.0
−1.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-01R

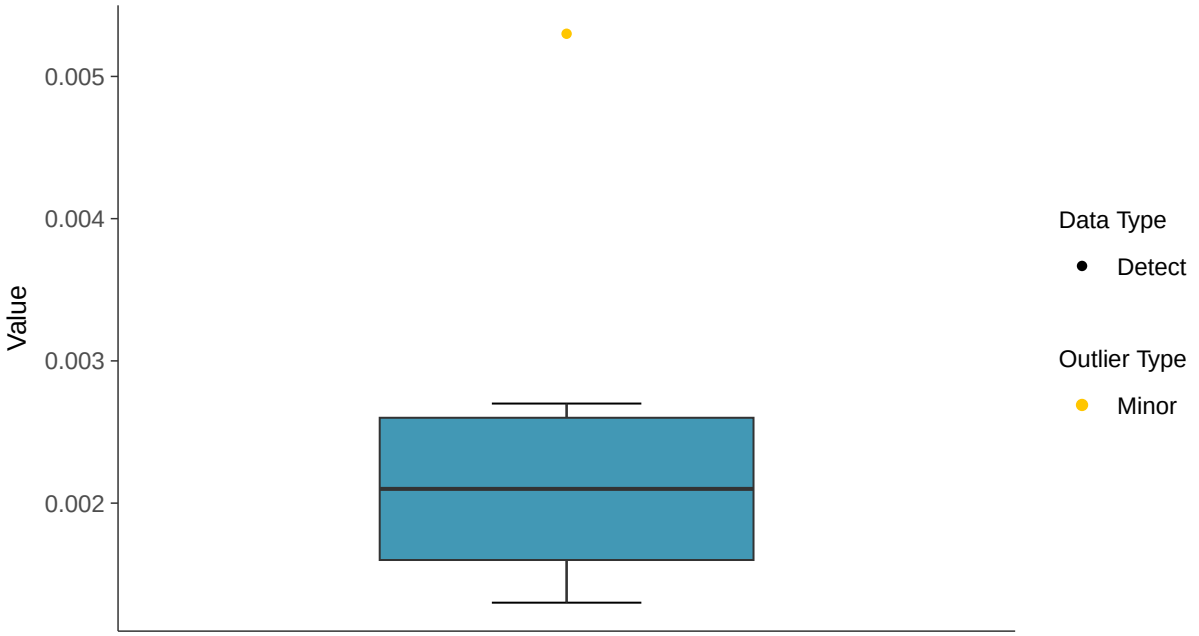
ID: 1_11_6_119





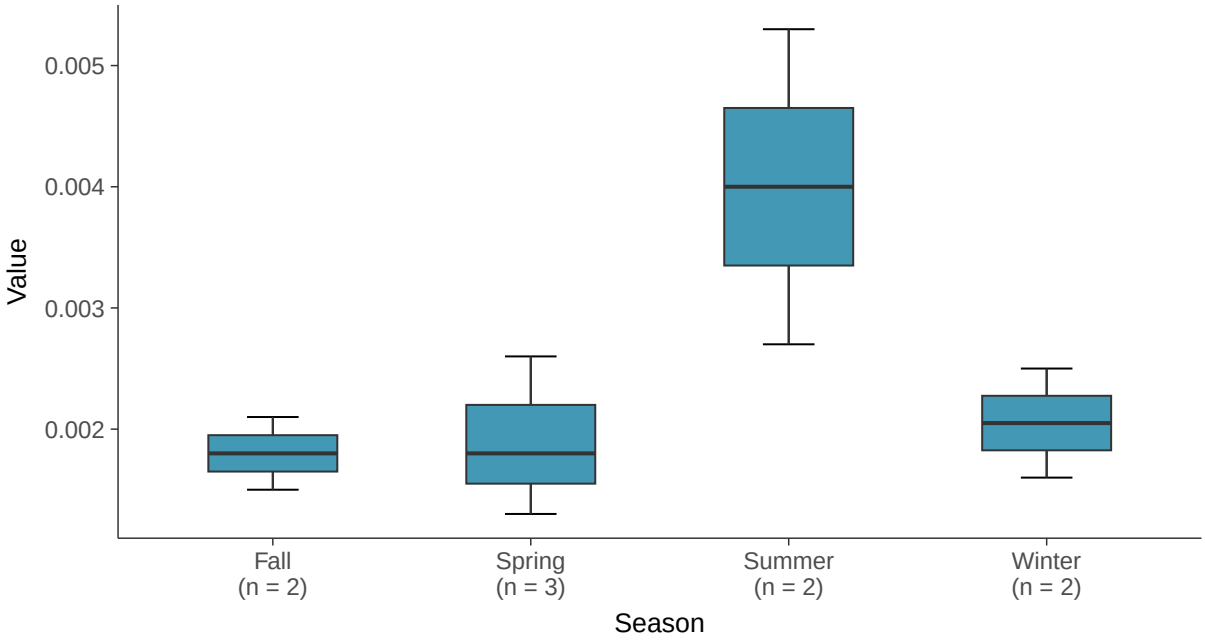
Boxplot

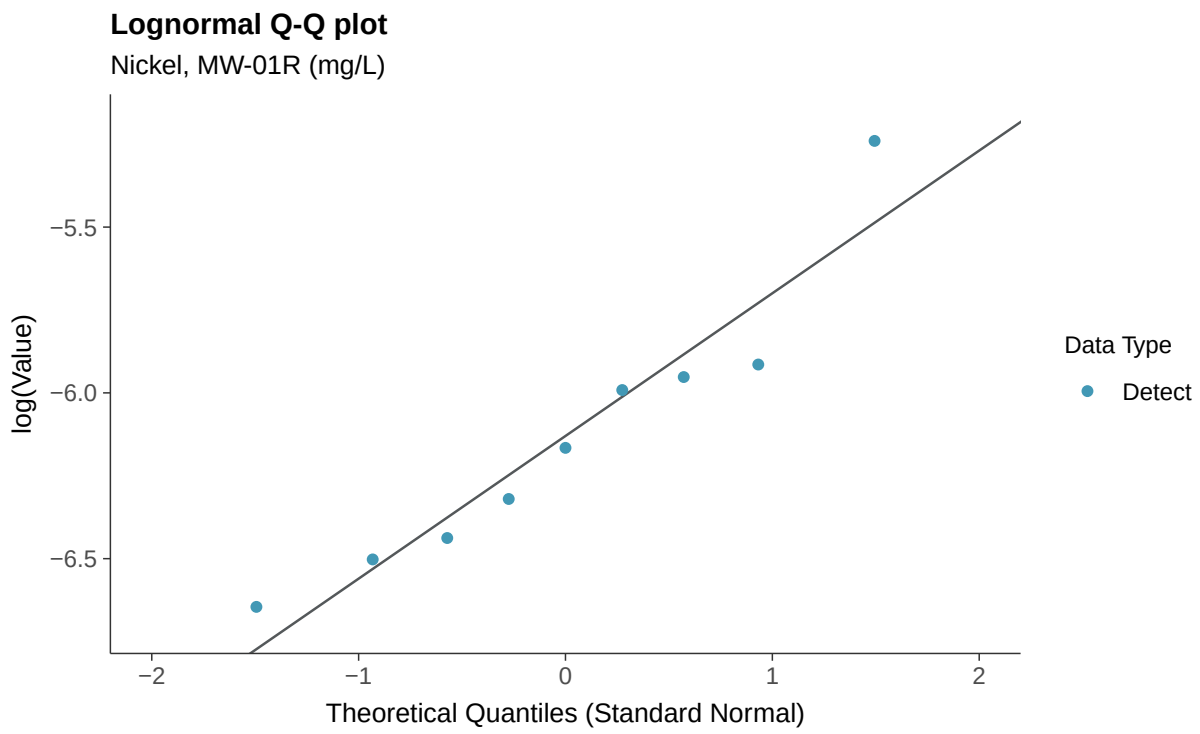
Nickel, MW-01R (mg/L)

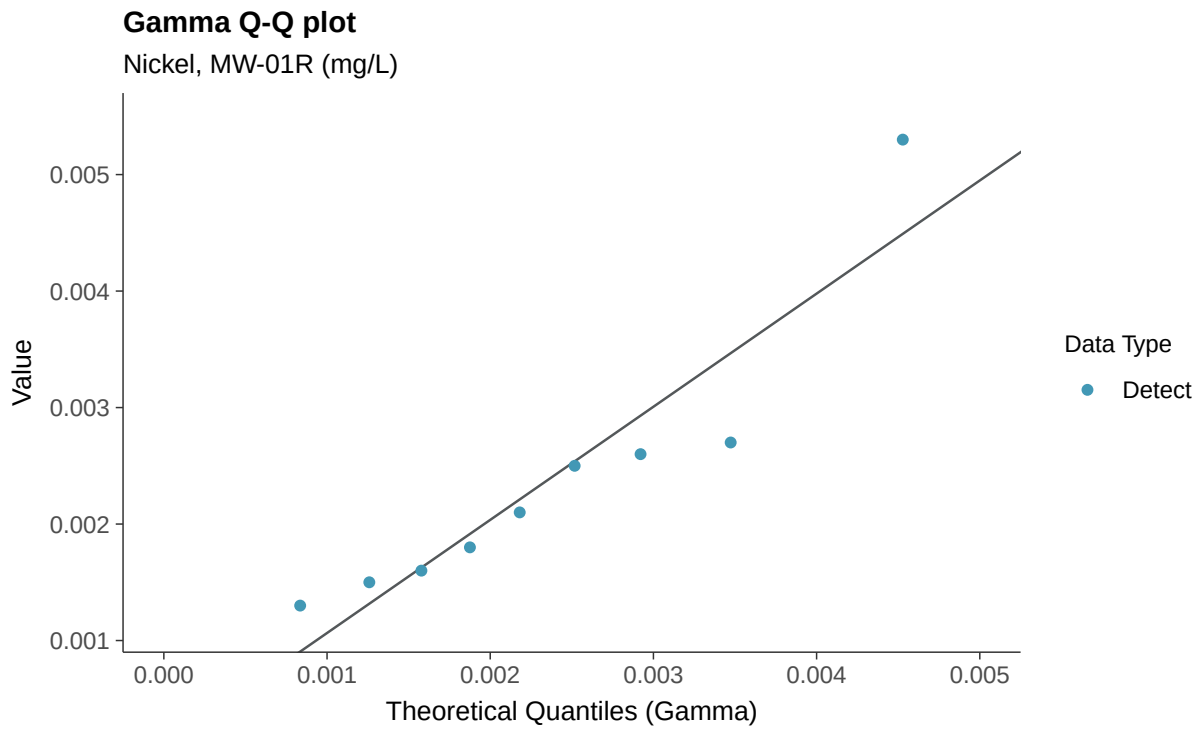


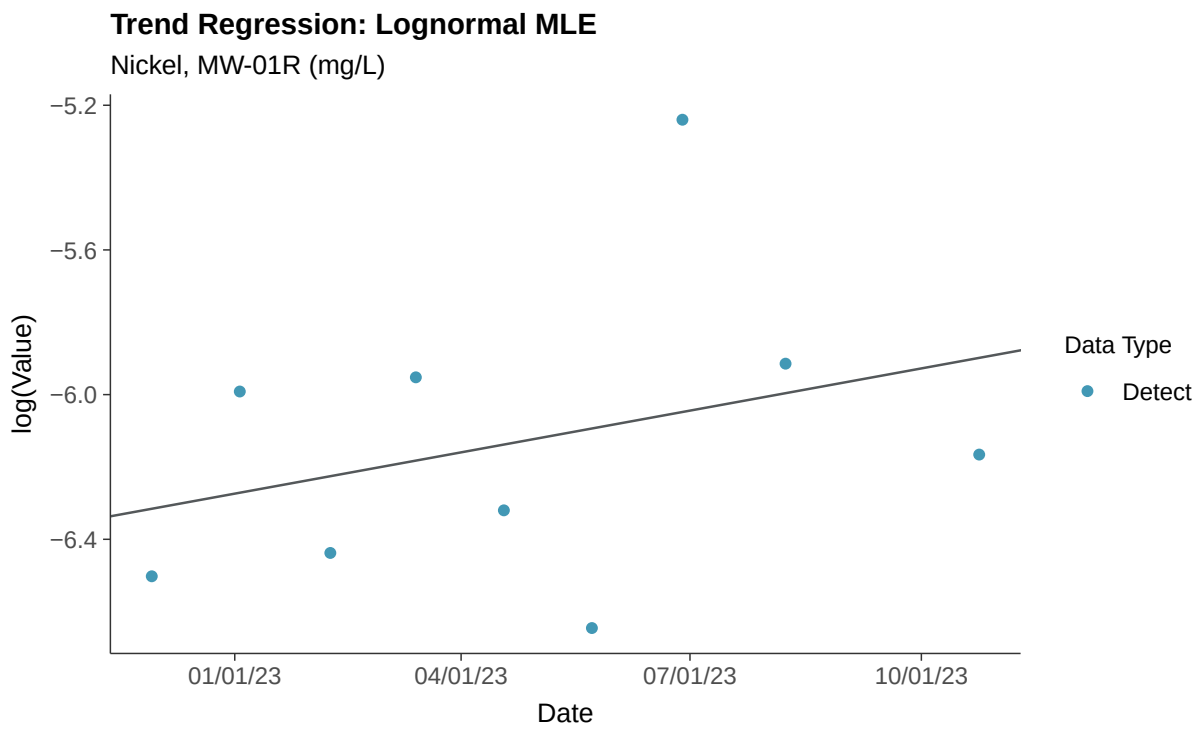
Boxplot by Season

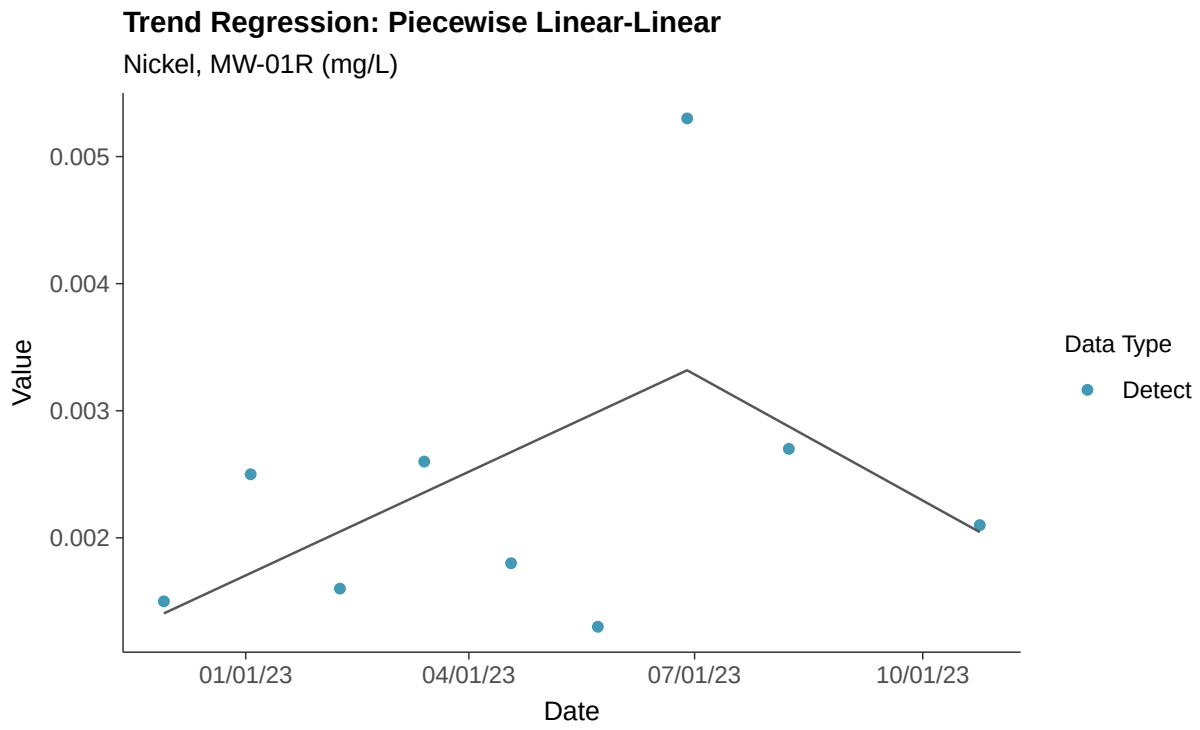
Nickel, MW-01R (mg/L)




Lognormal Q-Q plot
Nickel, MW-01R (mg/L)
log(Value)
−5.5
−6.0
−6.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

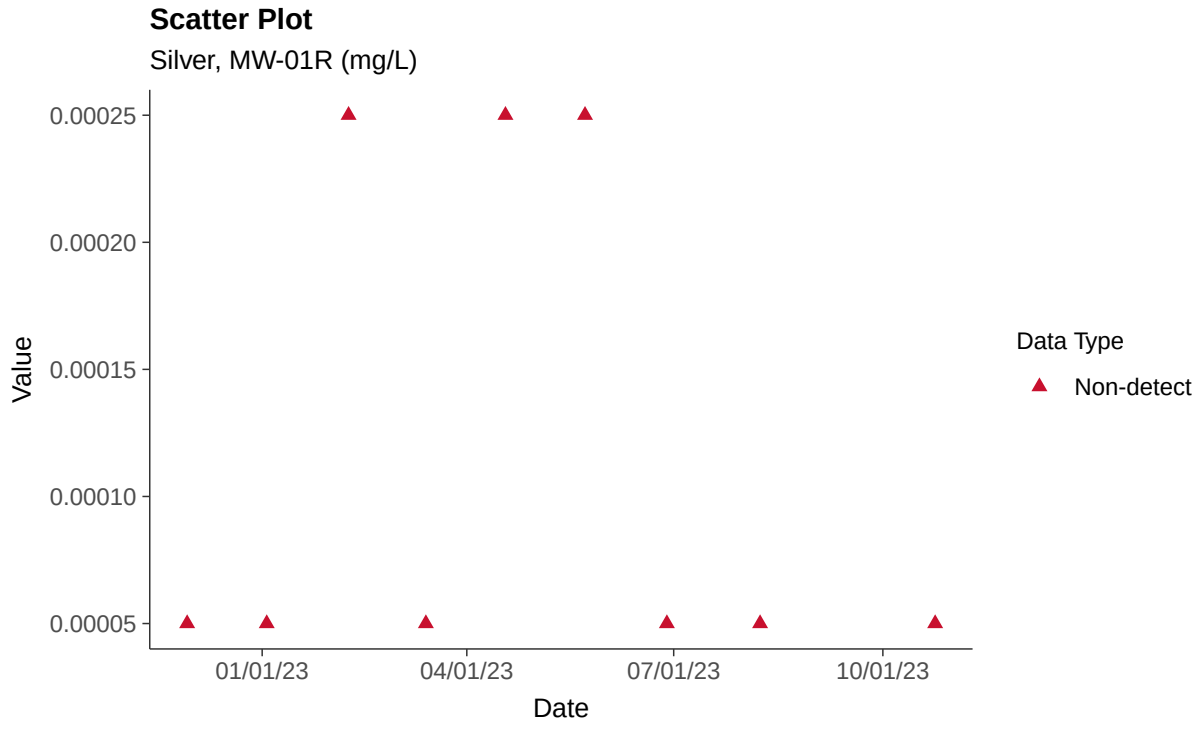

Gamma Q-Q plot
Nickel, MW-01R (mg/L)
Value
0.005
0.004
0.003
0.002
0.001
0.000
0.001
0.002
0.003
0.004
0.005
Theoretical Quantiles (Gamma)
Data Type
Detect

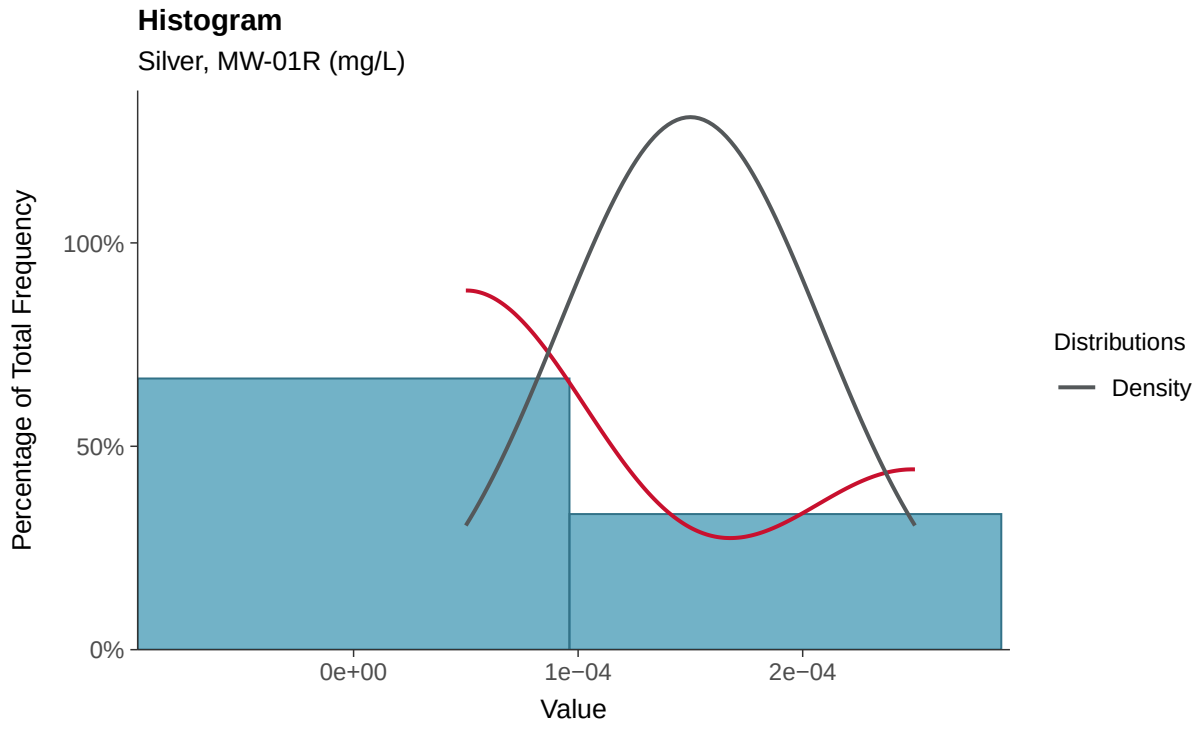

Trend Regression: Lognormal MLE
Nickel, MW-01R (mg/L)
−5.2
−5.6
−6.0
−6.4
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Nickel, MW-01R (mg/L)
0.005
0.004
0.003
0.002
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-01R

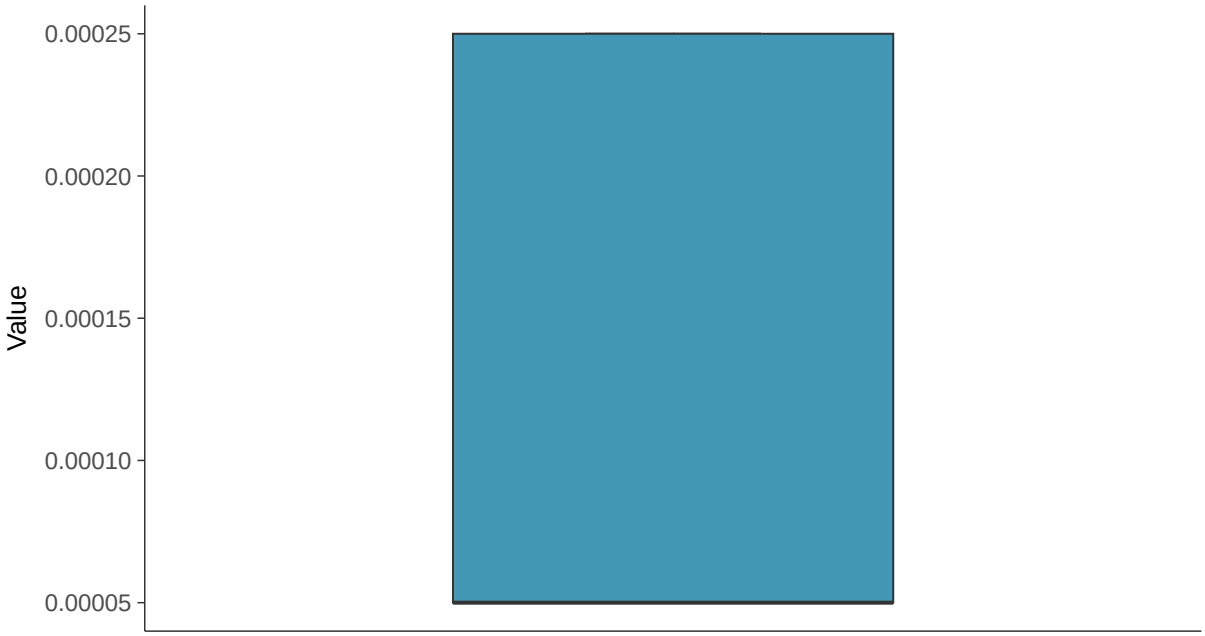
ID: 1_11_6_123





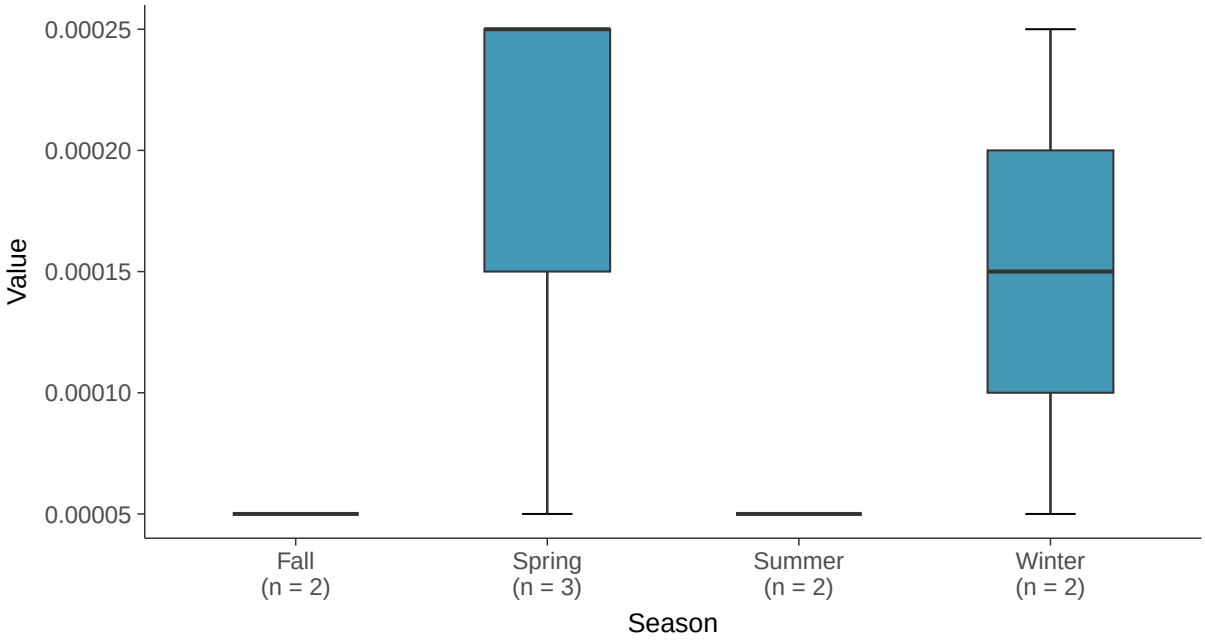
Boxplot

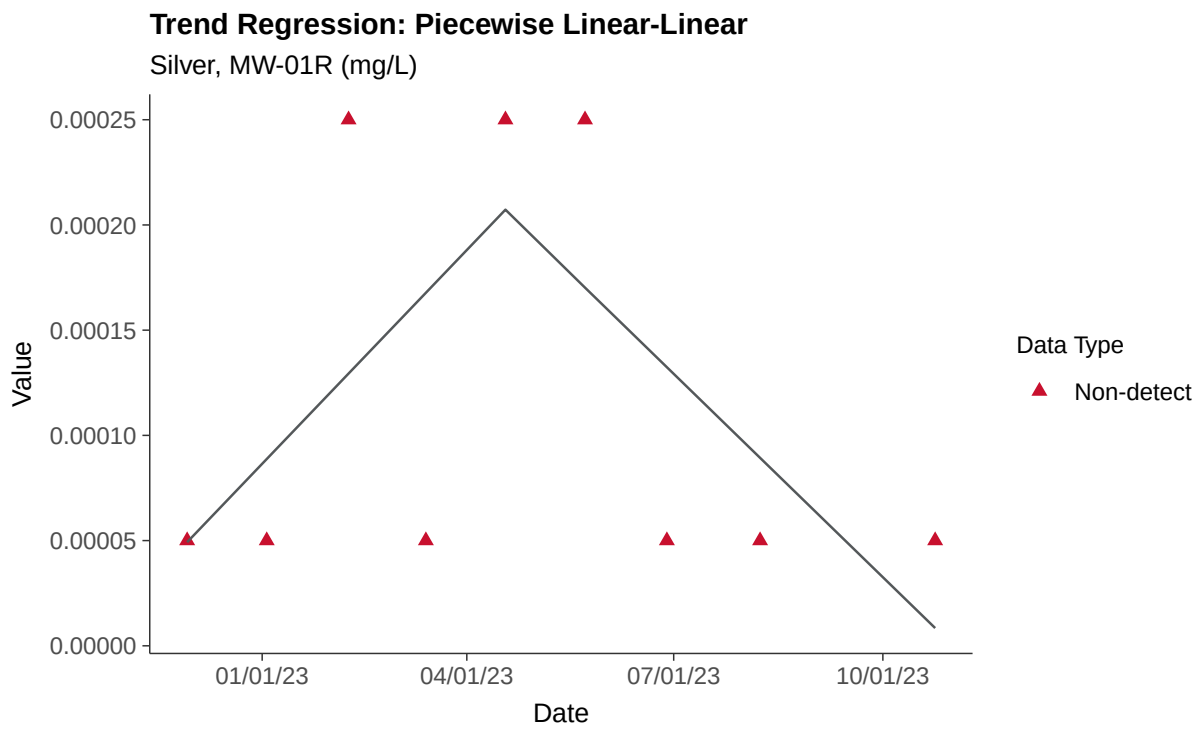
Silver, MW-01R (mg/L)

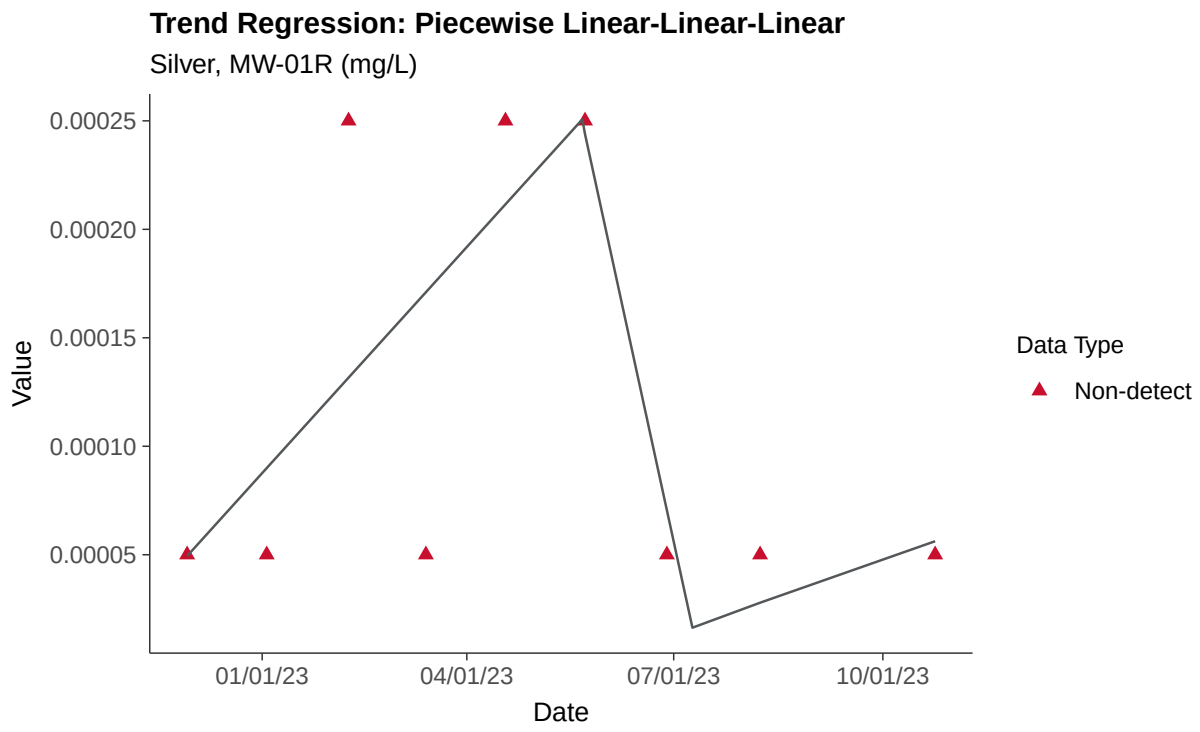


Boxplot by Season

Silver, MW-01R (mg/L)

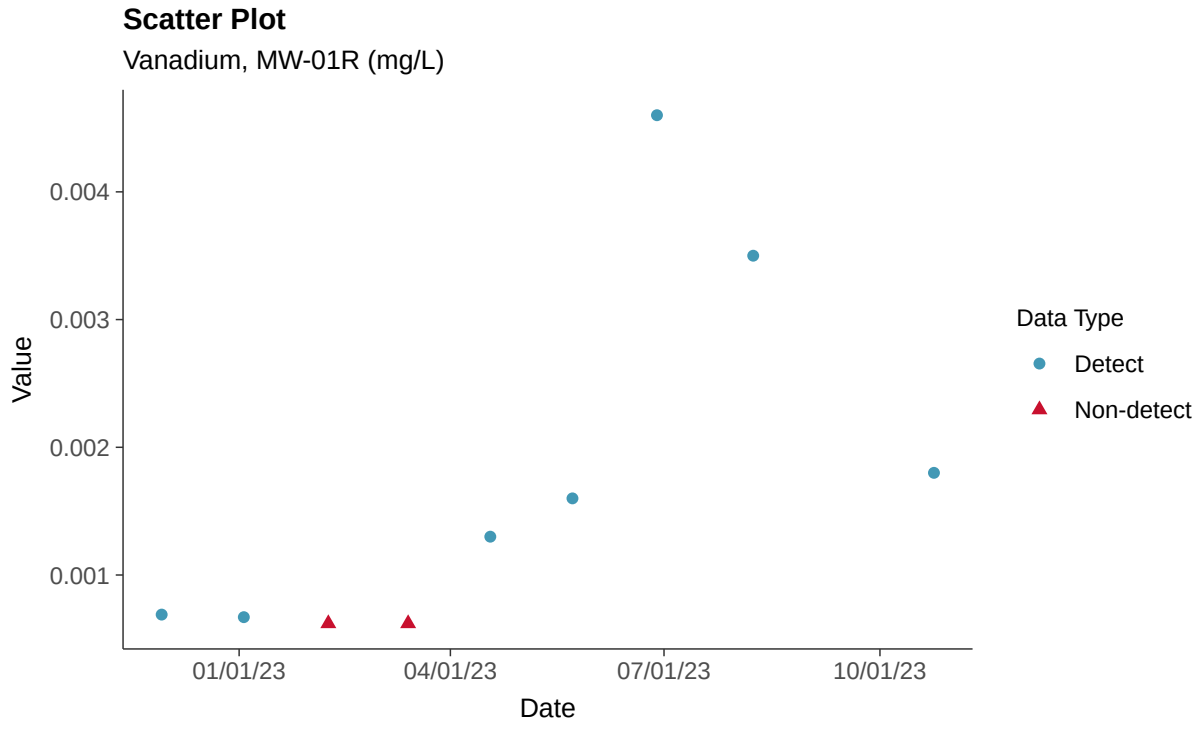


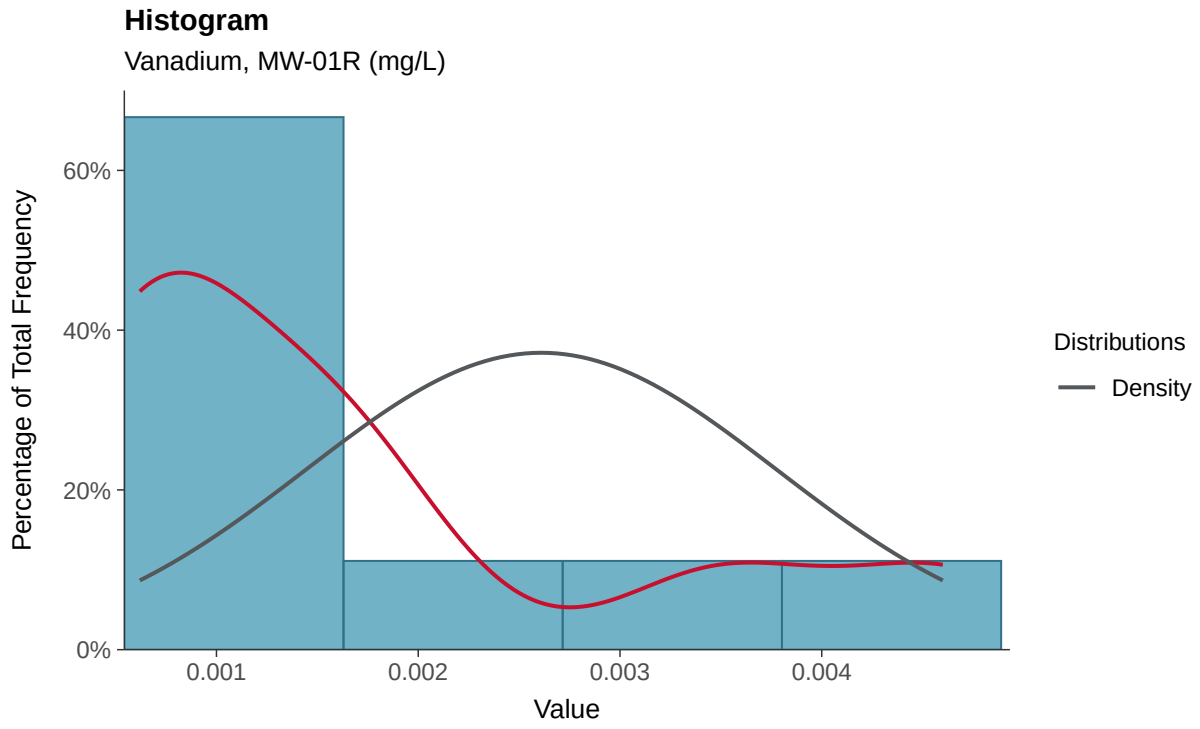

Trend Regression: Piecewise Linear-Linear
Silver, MW-01R (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-01R (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-01R

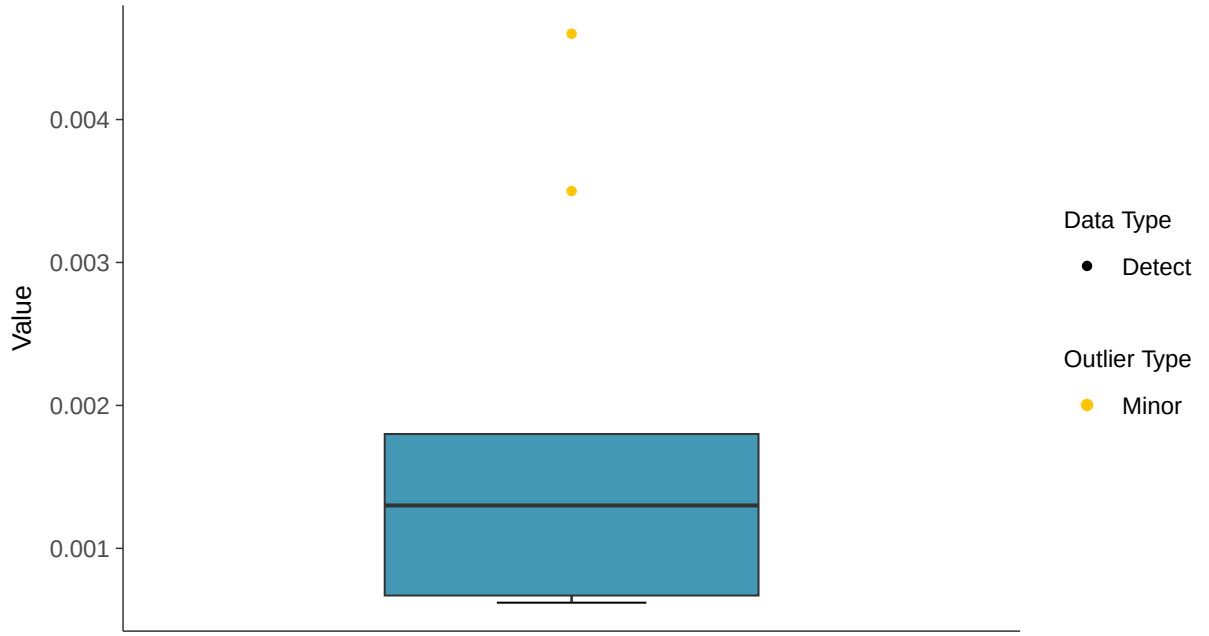
ID: 1_11_6_129





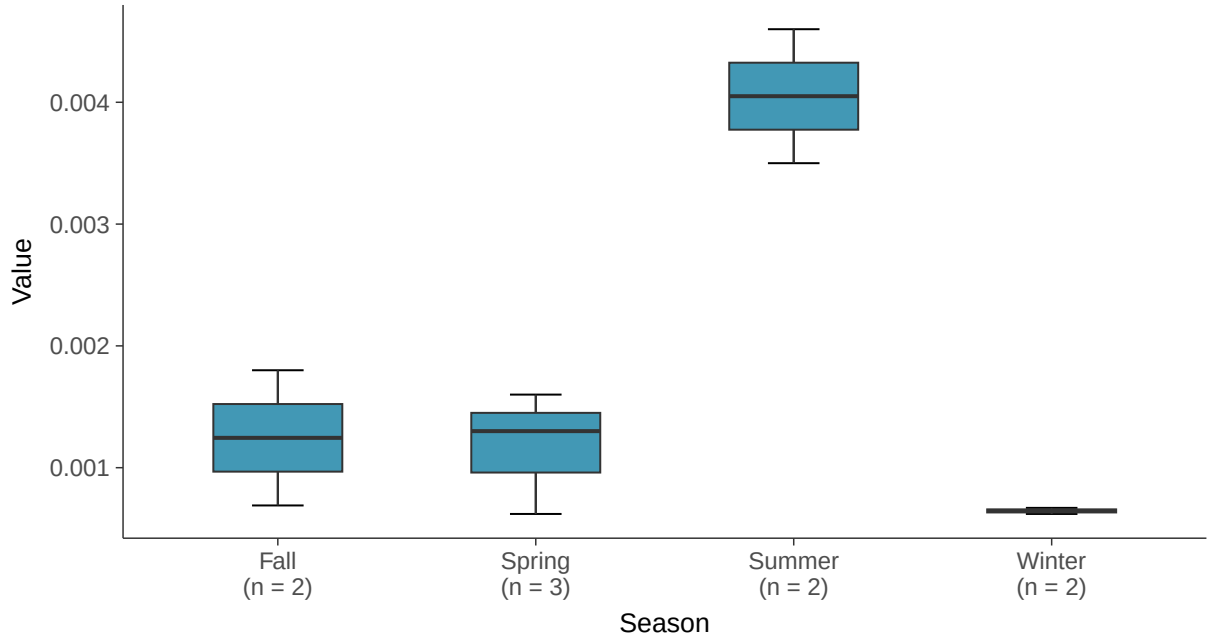
Boxplot

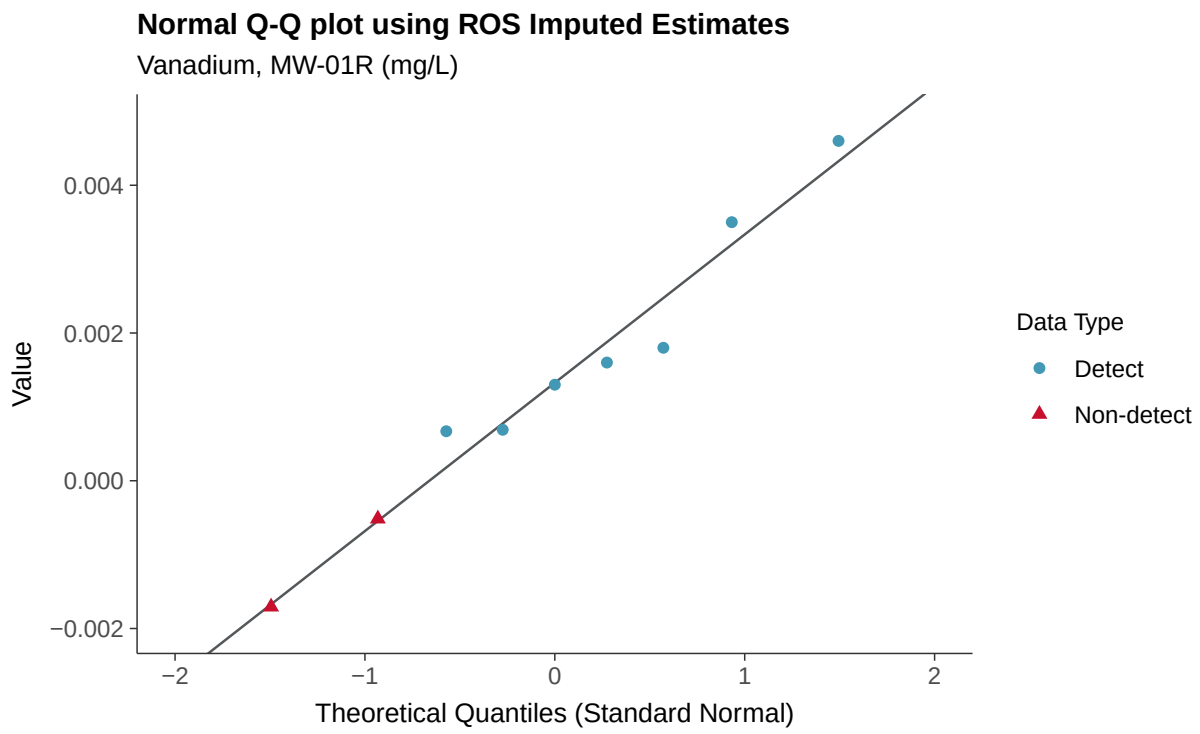
Vanadium, MW-01R (mg/L)

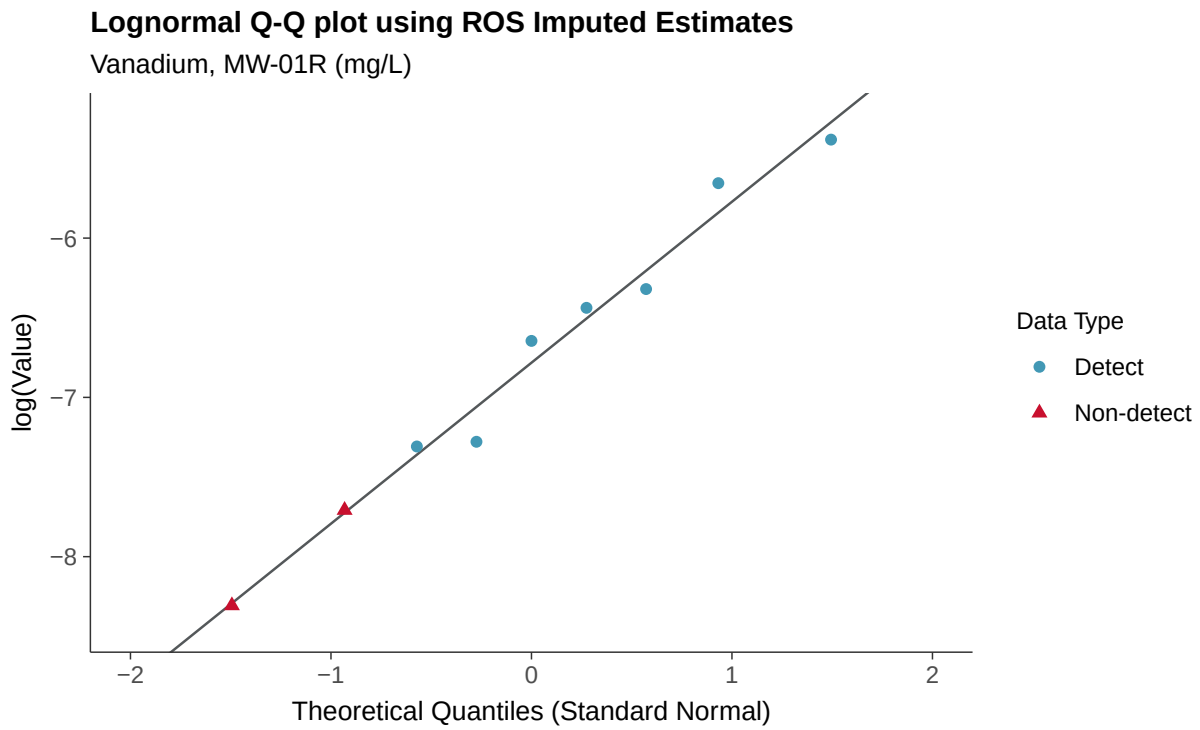


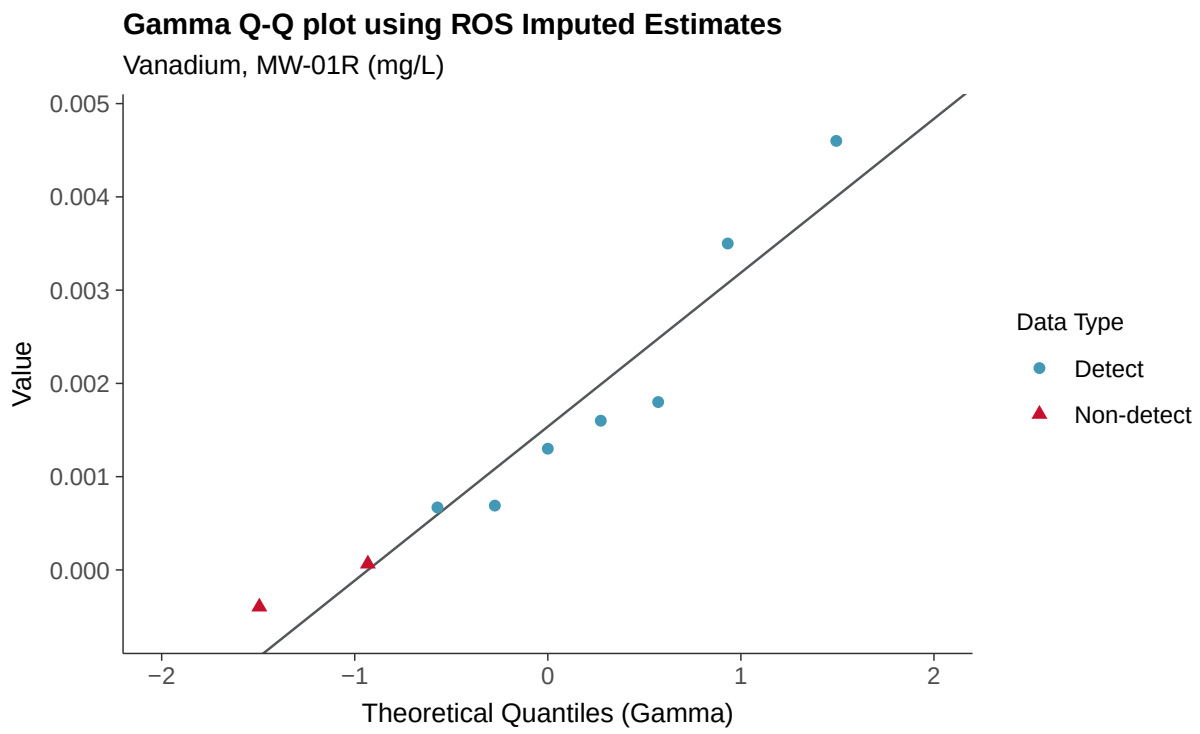
Boxplot by Season

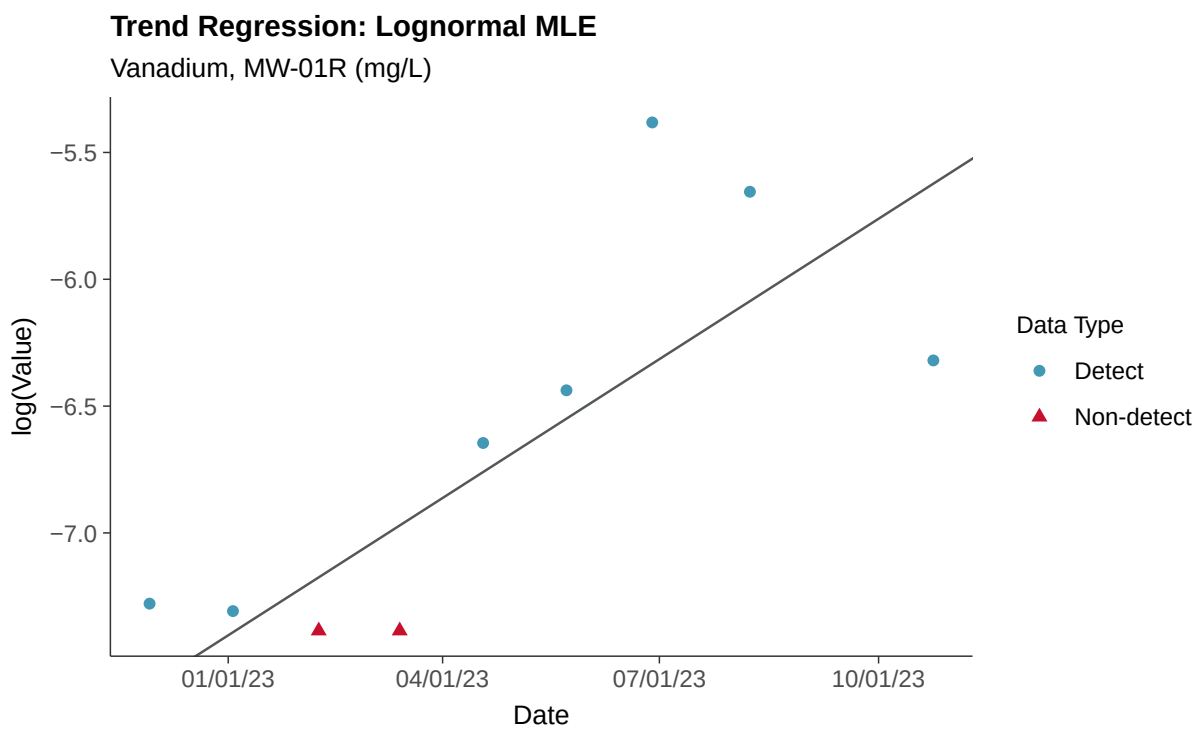
Vanadium, MW-01R (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Vanadium, MW-01R (mg/L)
Value
0.004
0.002
0.000
−0.002
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

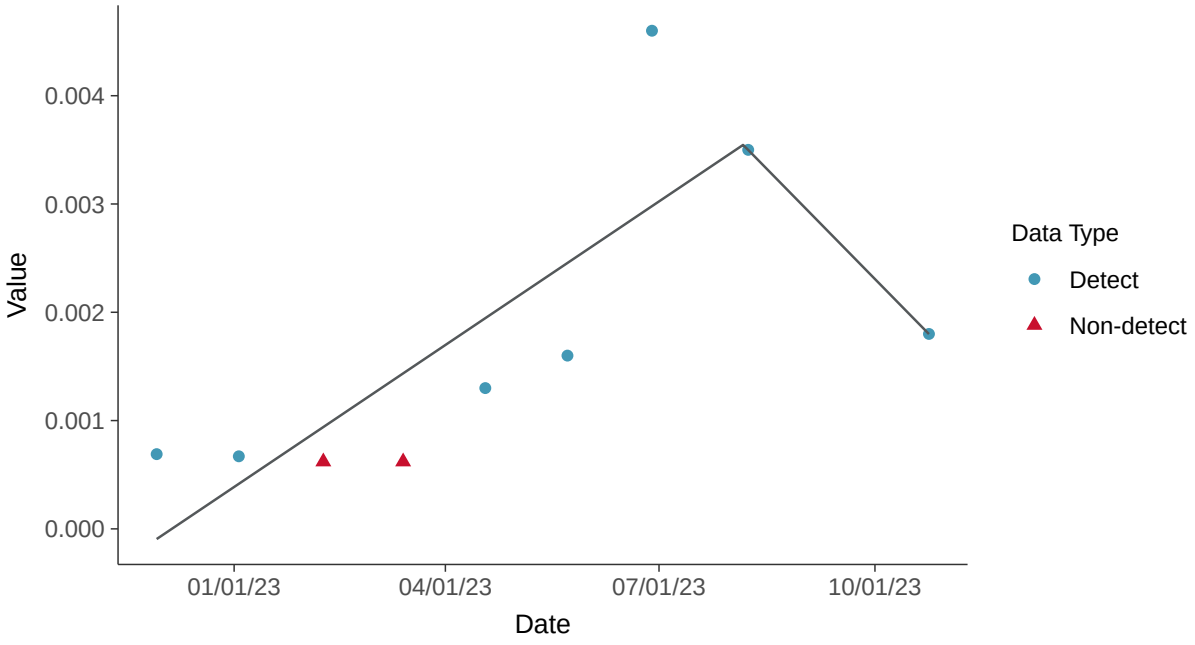

Lognormal Q-Q plot using ROS Imputed Estimates
Vanadium, MW-01R (mg/L)
log(Value)
−6
−7
−8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Vanadium, MW-01R (mg/L)
Value
0.005
0.004
0.003
0.002
0.001
0.000
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Vanadium, MW-01R (mg/L)
log(Value)
−5.5
−6.0
−6.5
−7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

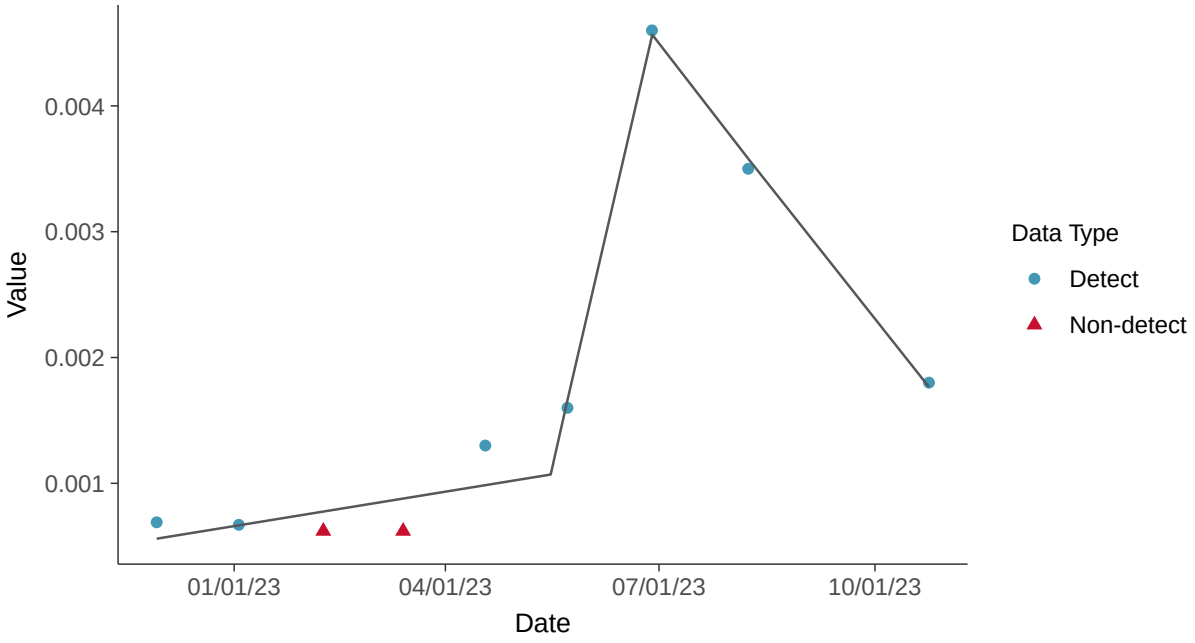
Trend Regression: Piecewise Linear-Linear

Vanadium, MW-01R (mg/L)



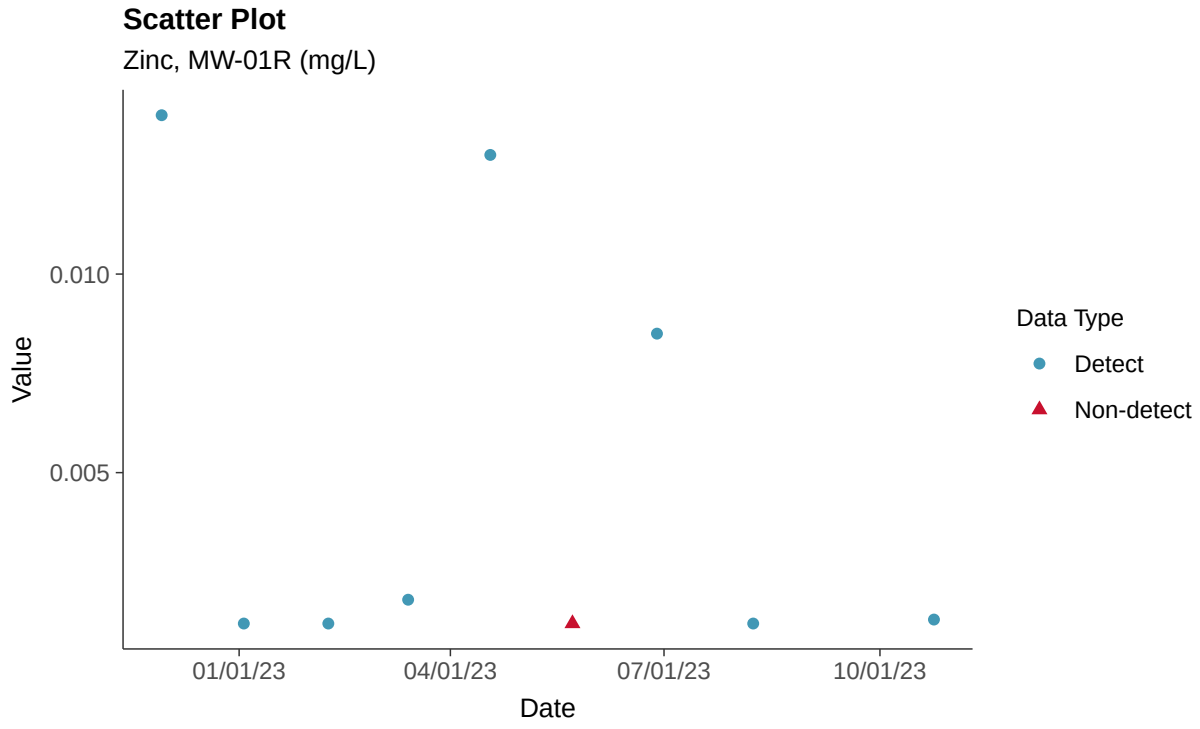
Trend Regression: Piecewise Linear-Linear-Linear

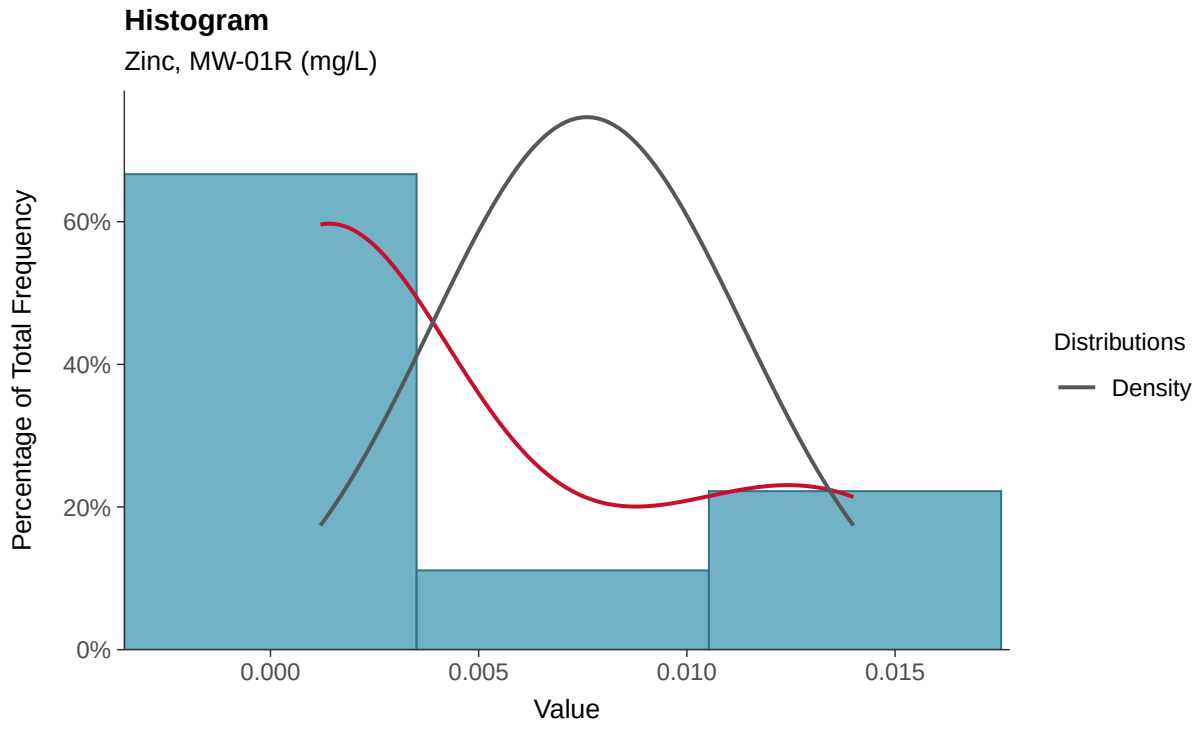
Vanadium, MW-01R (mg/L)



Part 115: Zinc, MW-01R

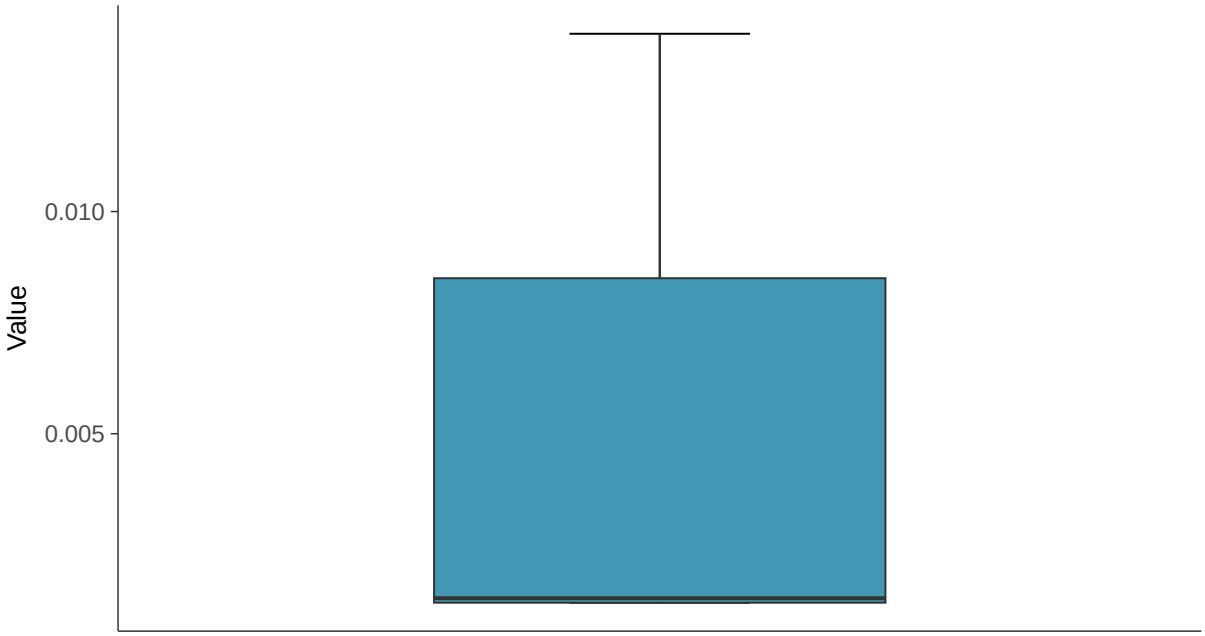
ID: 1_11_6_130





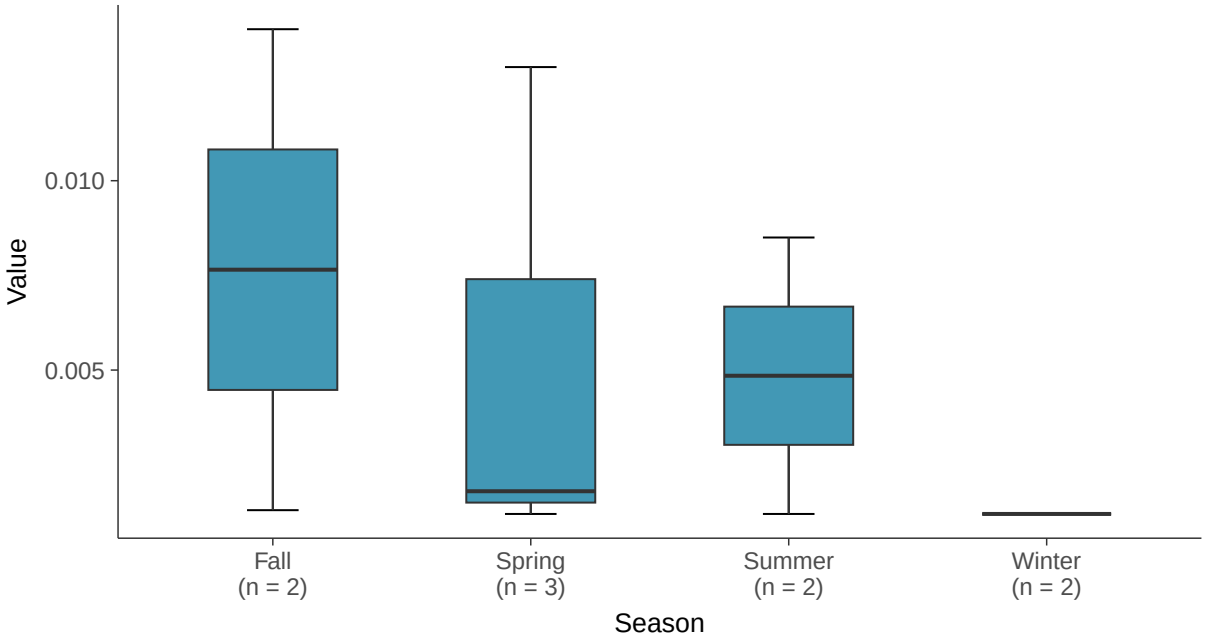
Boxplot

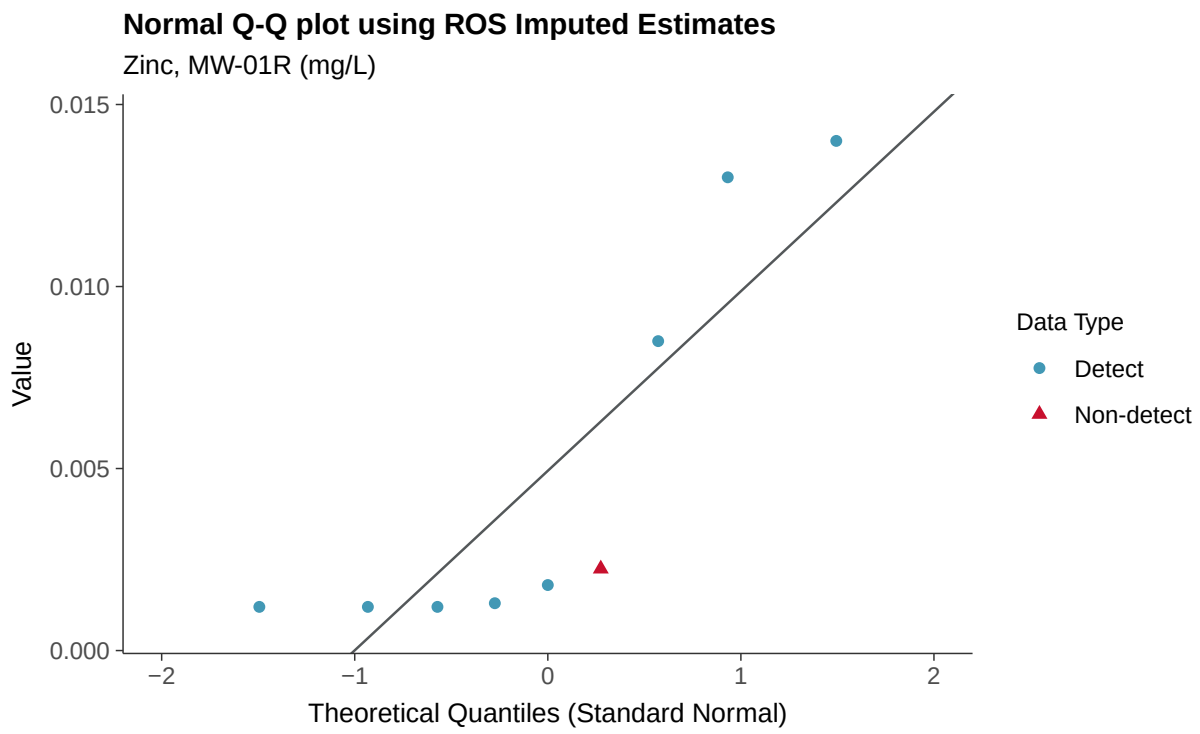
Zinc, MW-01R (mg/L)

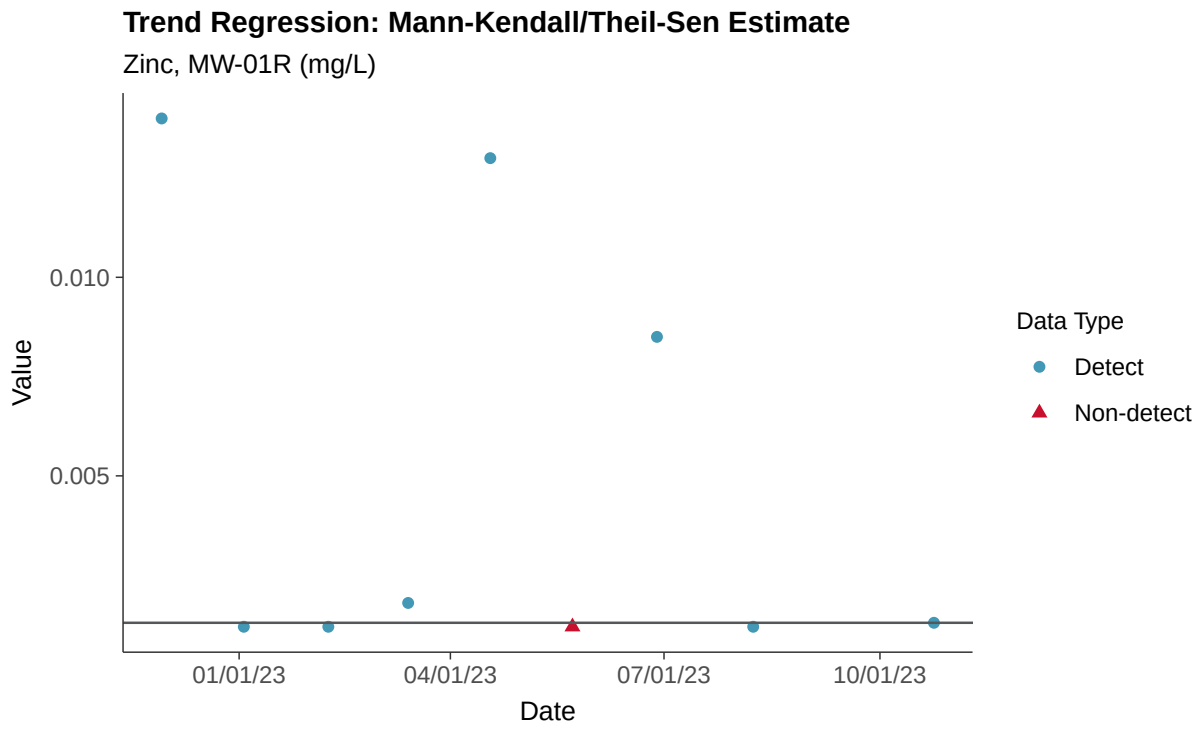


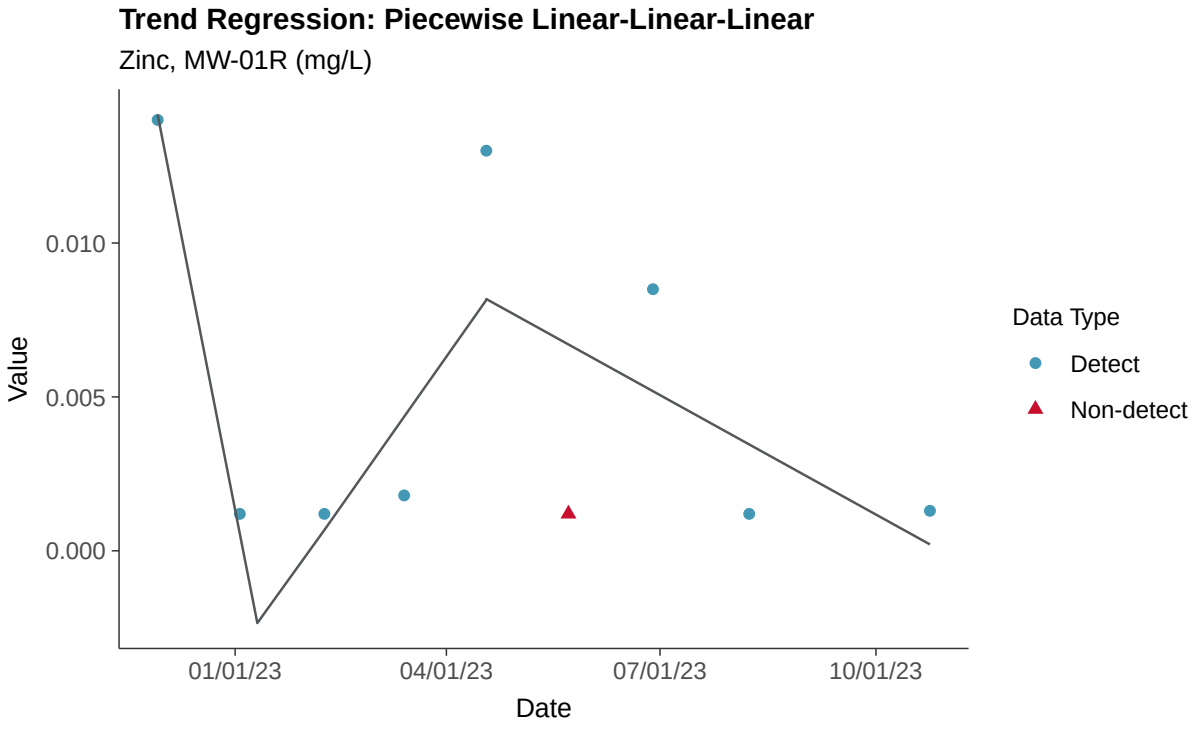
Boxplot by Season

Zinc, MW-01R (mg/L)



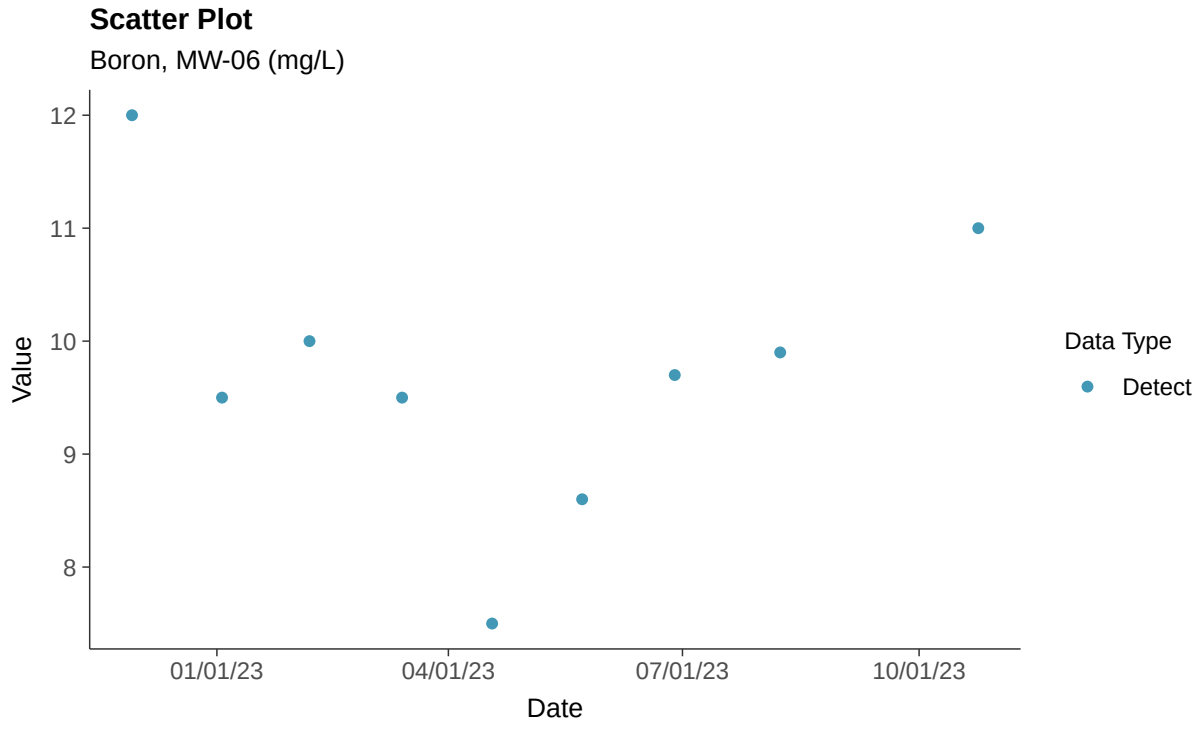

Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-01R (mg/L)
Value
0.015
0.010
0.005
0.000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

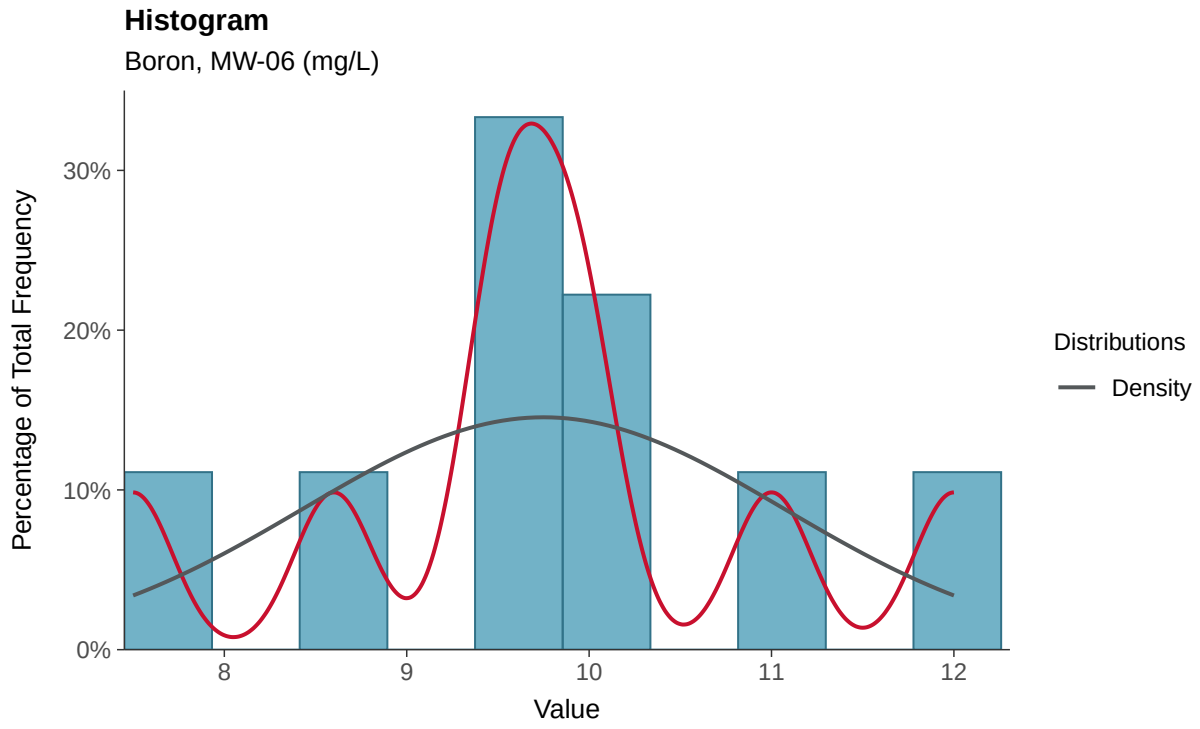

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Zinc, MW-01R (mg/L)
Value
0.010
0.005
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Zinc, MW-01R (mg/L)
Value
0.010
0.005
0.000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Boron, MW-06

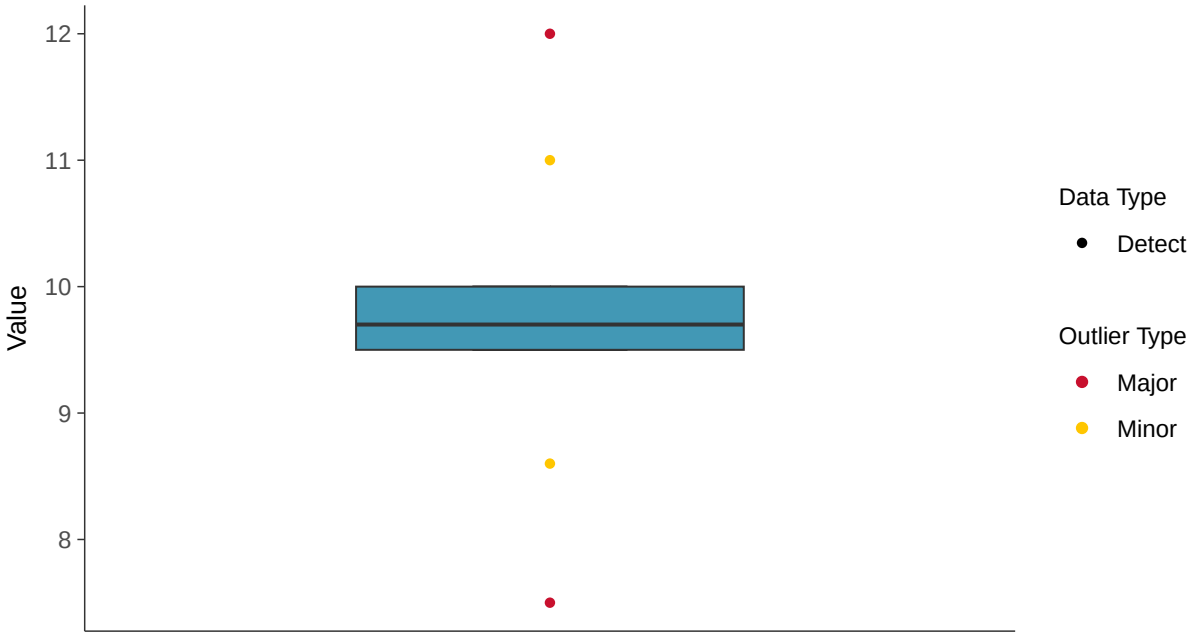
ID: 1_15_4_105





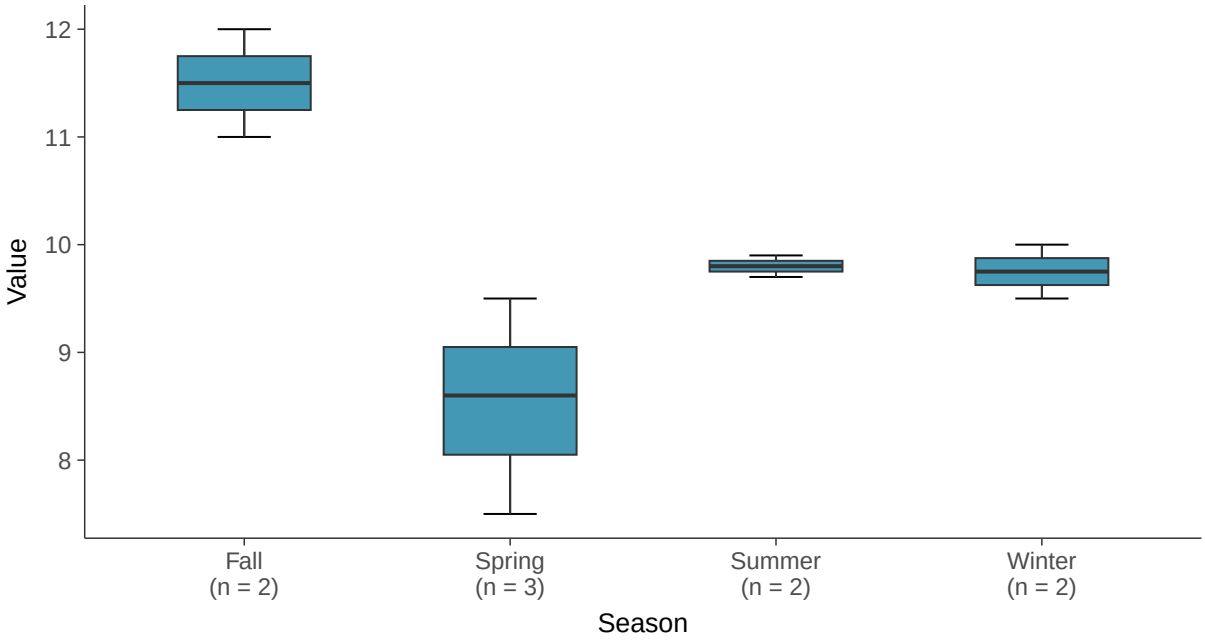
Boxplot

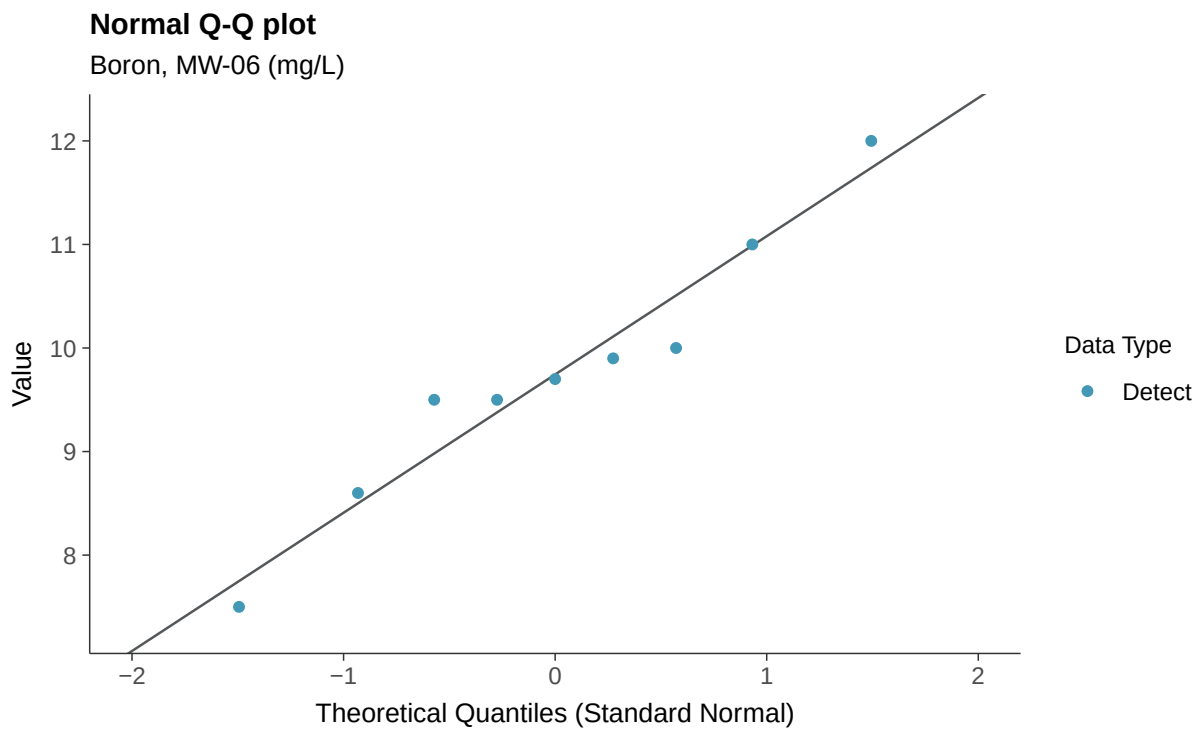
Boron, MW-06 (mg/L)

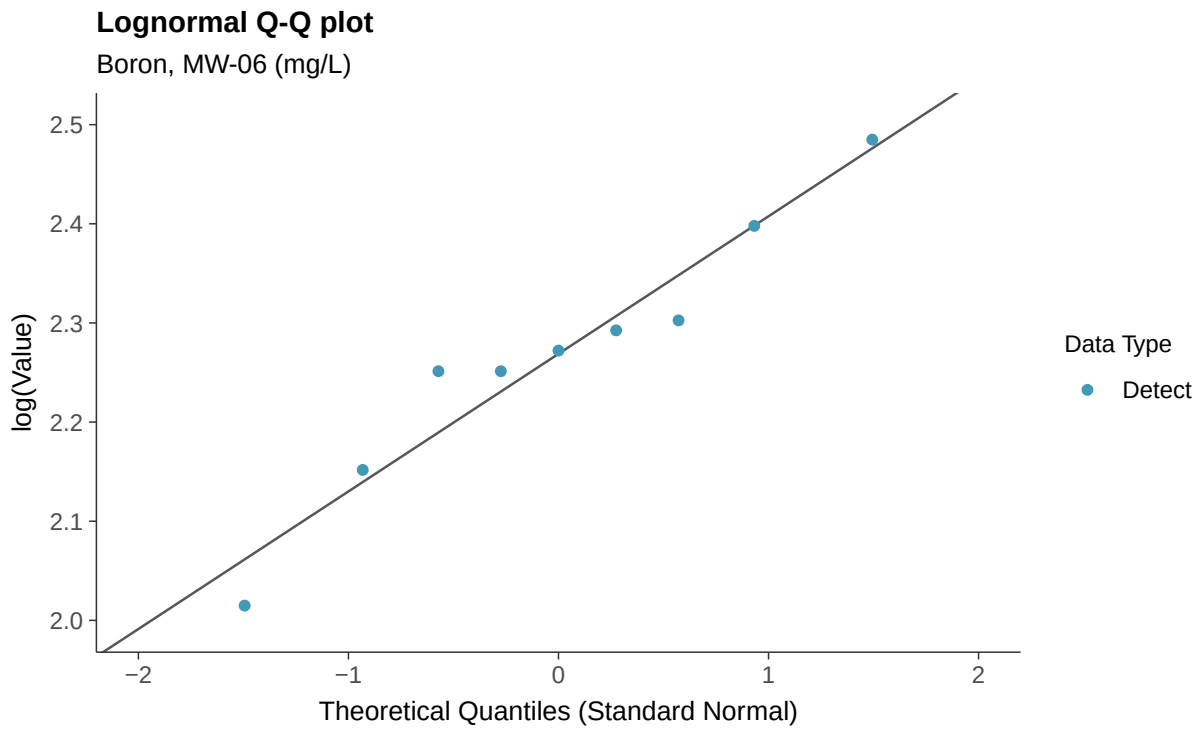


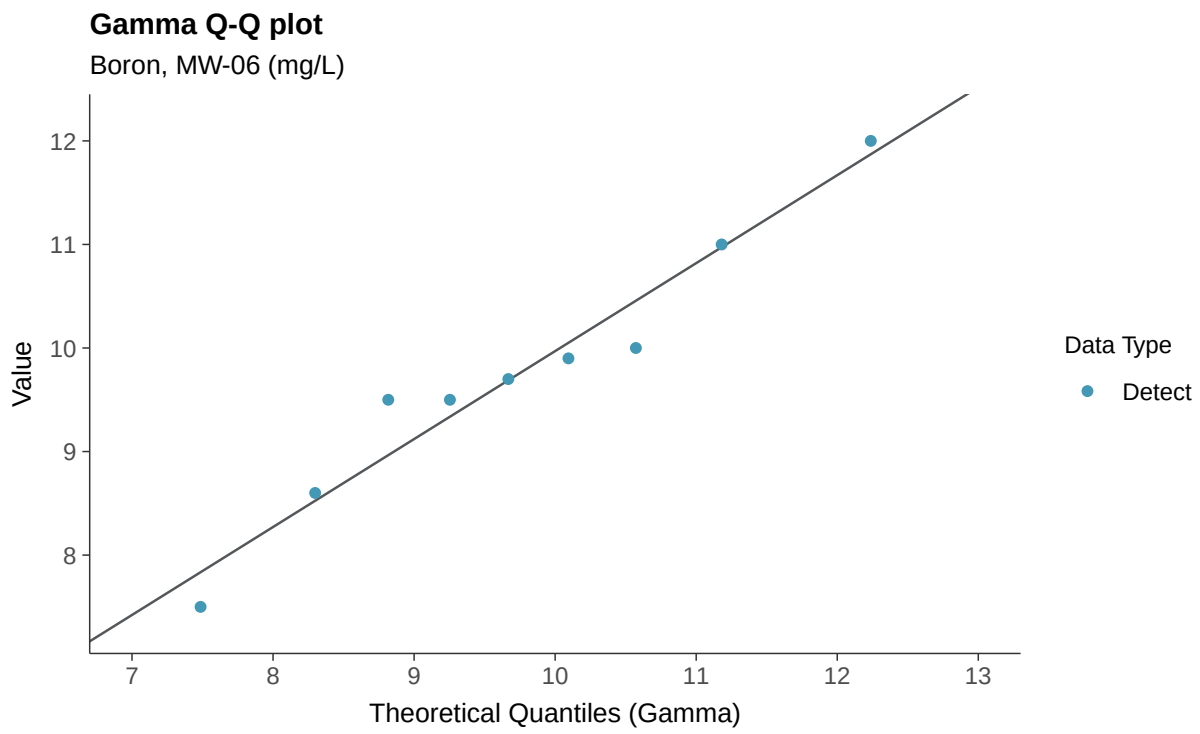
Boxplot by Season

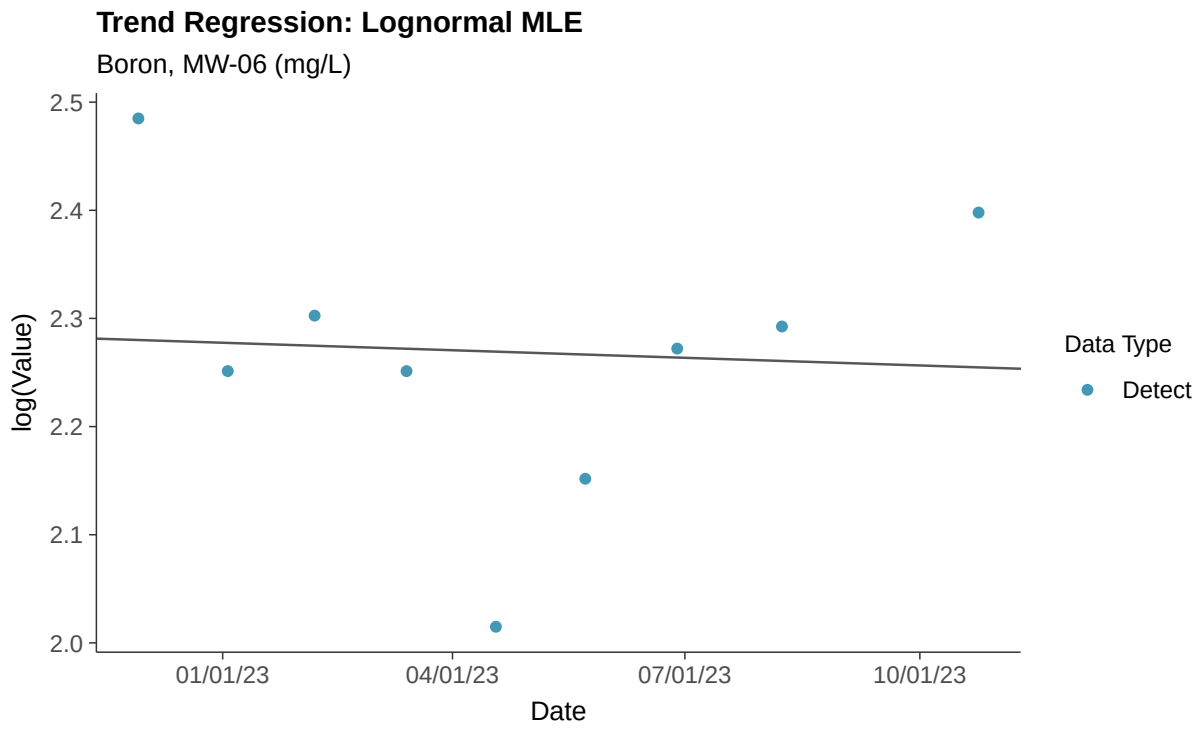
Boron, MW-06 (mg/L)

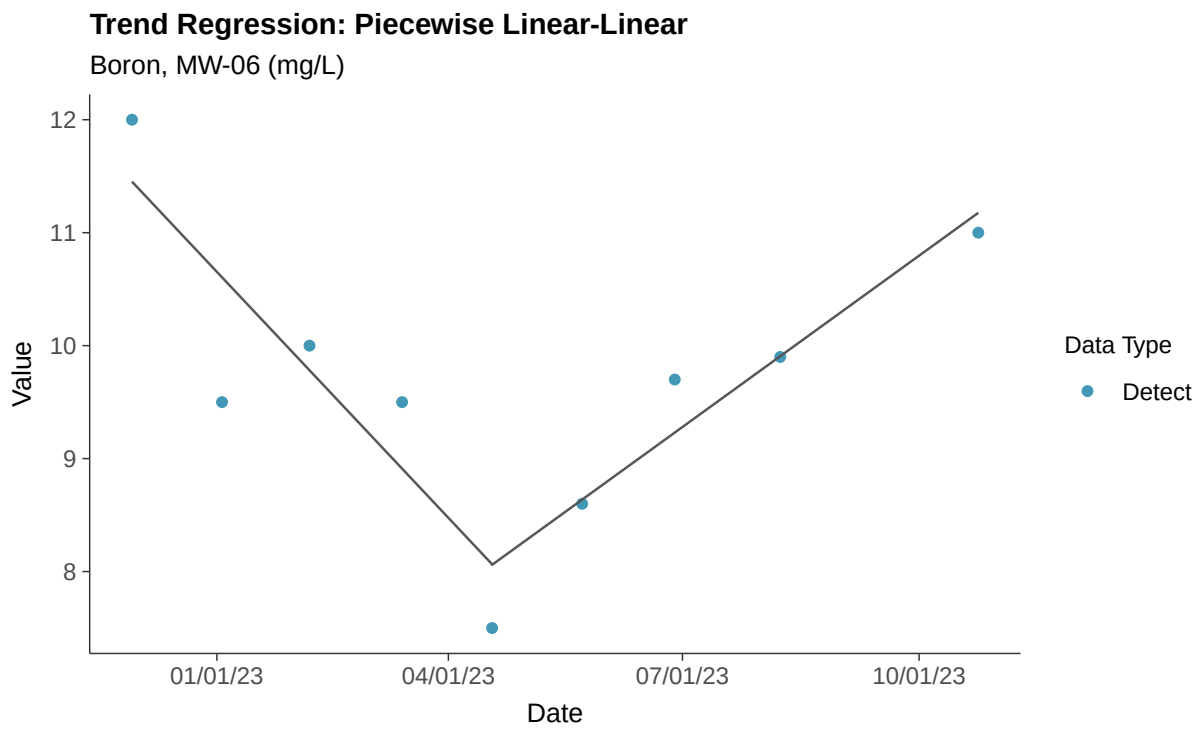



Normal Q-Q plot
Boron, MW-06 (mg/L)
Value
12
11
10
9
8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-06 (mg/L)
log(Value)
2.5
2.4
2.3
2.2
2.1
2.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

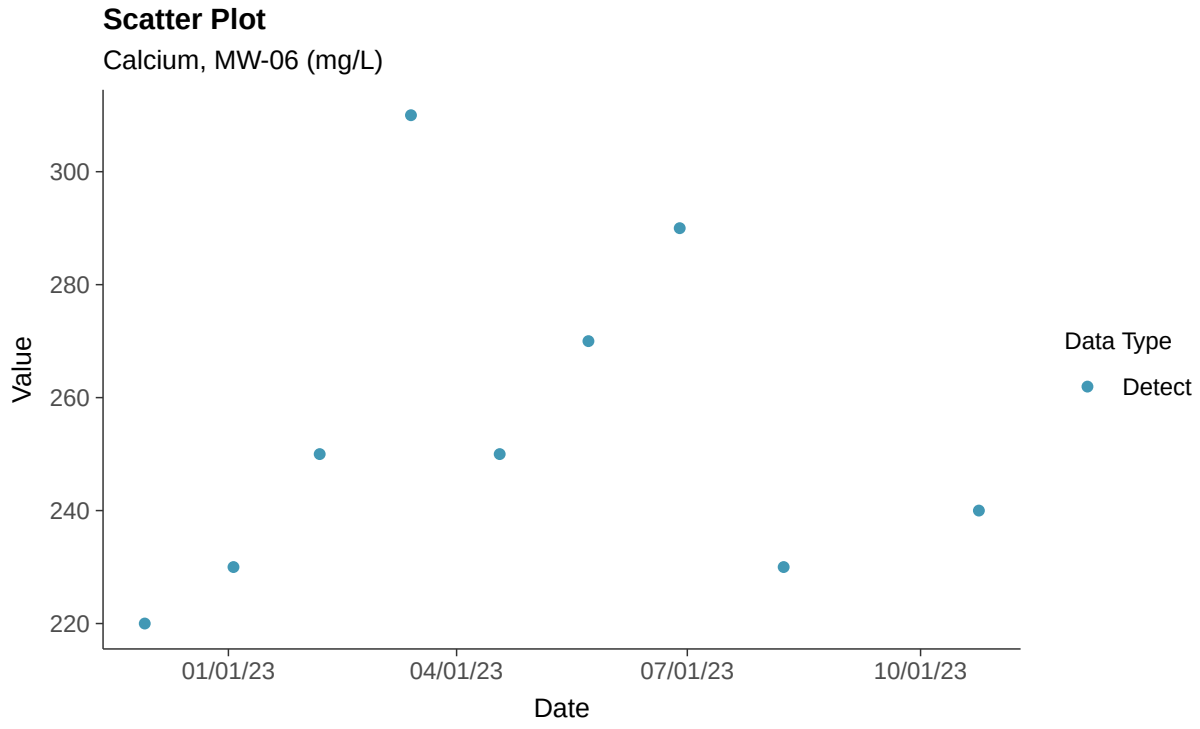

Gamma Q-Q plot
Boron, MW-06 (mg/L)
Value
12
11
10
9
8
7
8
9
10
11
12
13
Theoretical Quantiles (Gamma)
Data Type
Detect

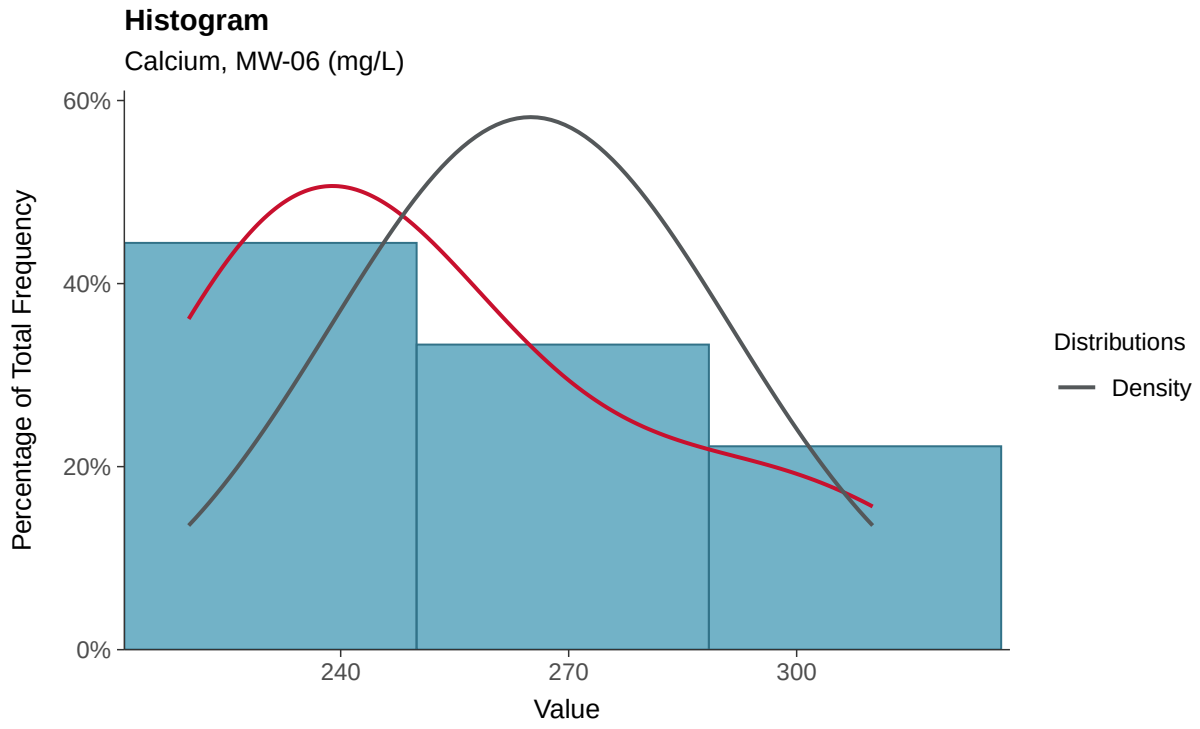

Trend Regression: Lognormal MLE
Boron, MW-06 (mg/L)
log(Value)
2.5
2.4
2.3
2.2
2.1
2.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Boron, MW-06 (mg/L)
12
11
10
9
8
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-06

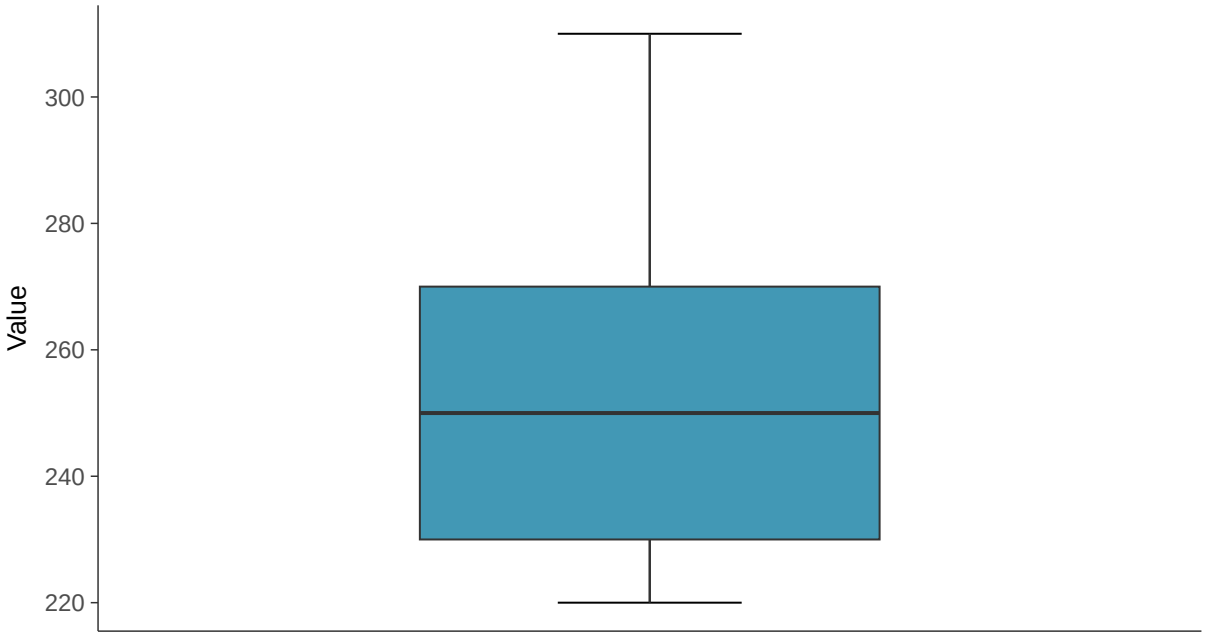
ID: 1_15_4_107





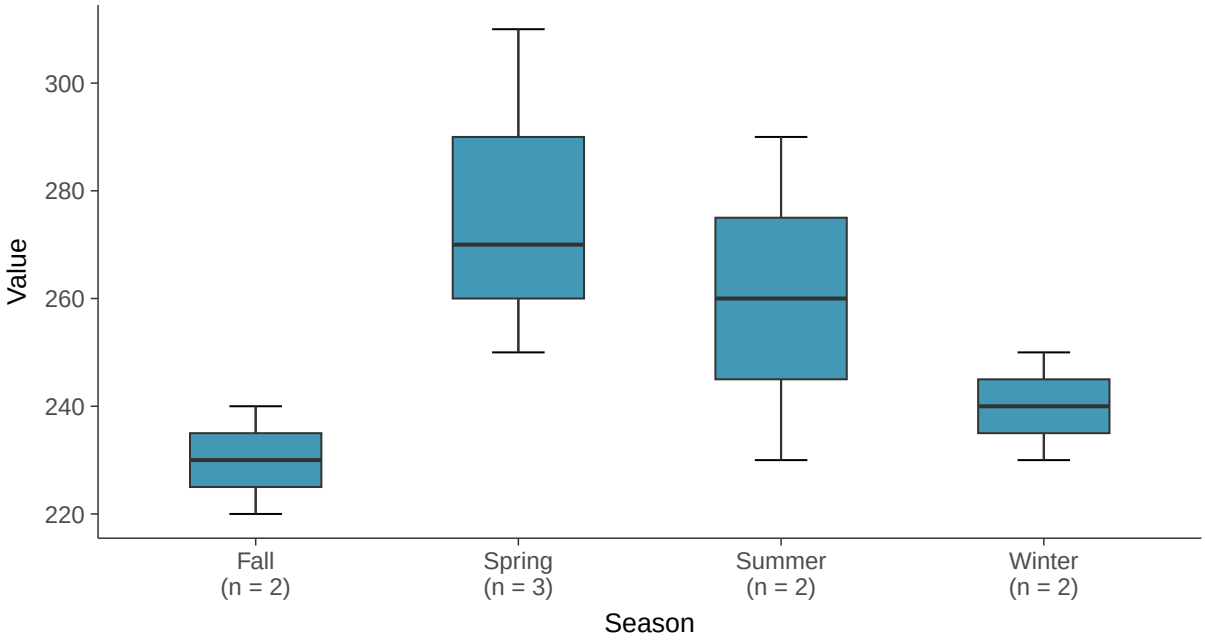
Boxplot

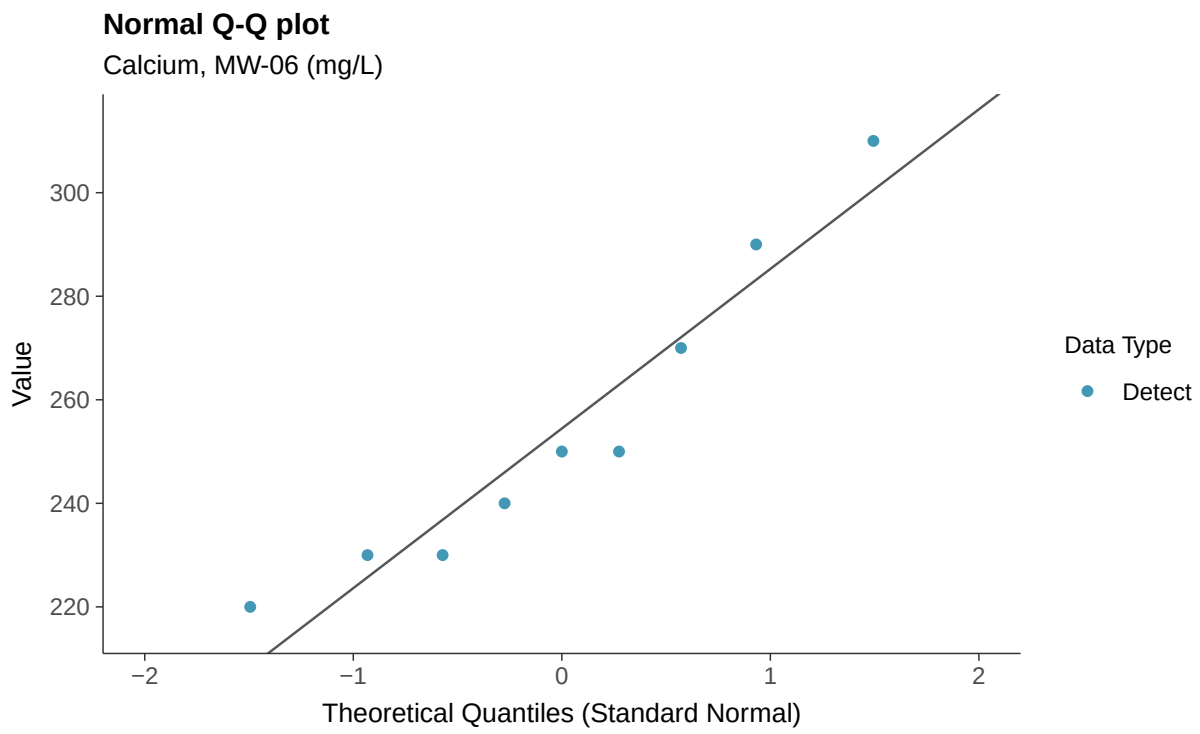
Calcium, MW-06 (mg/L)

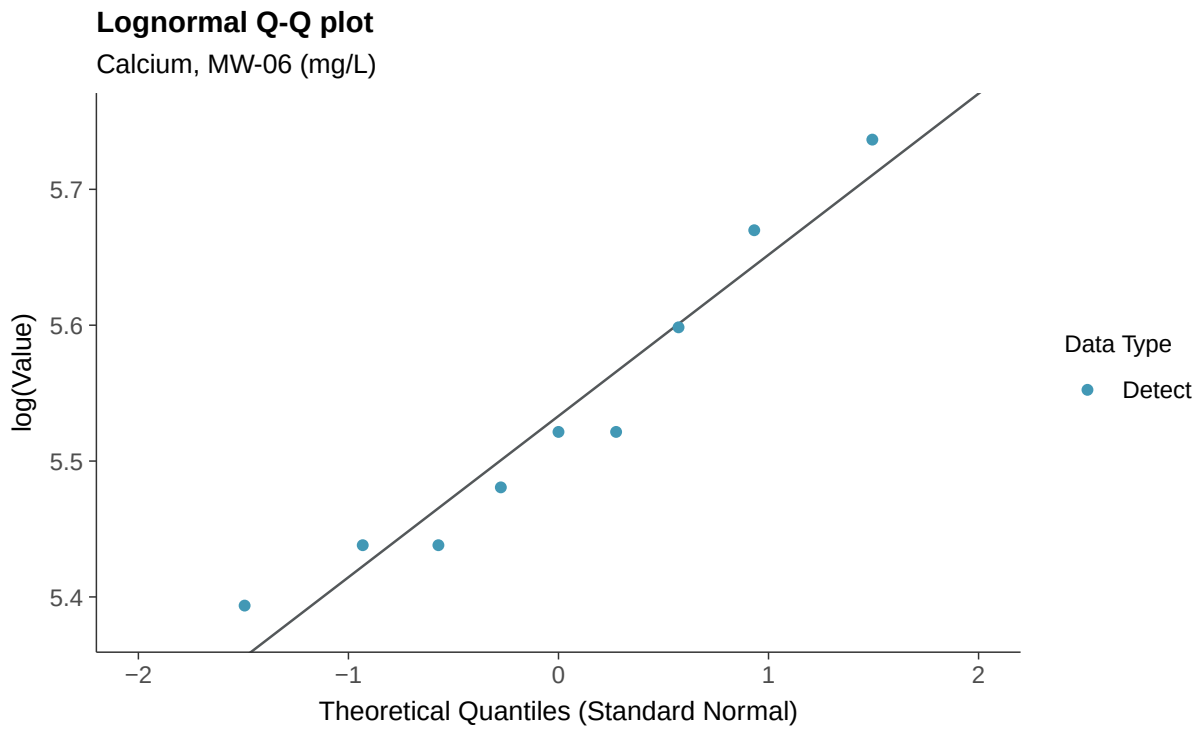


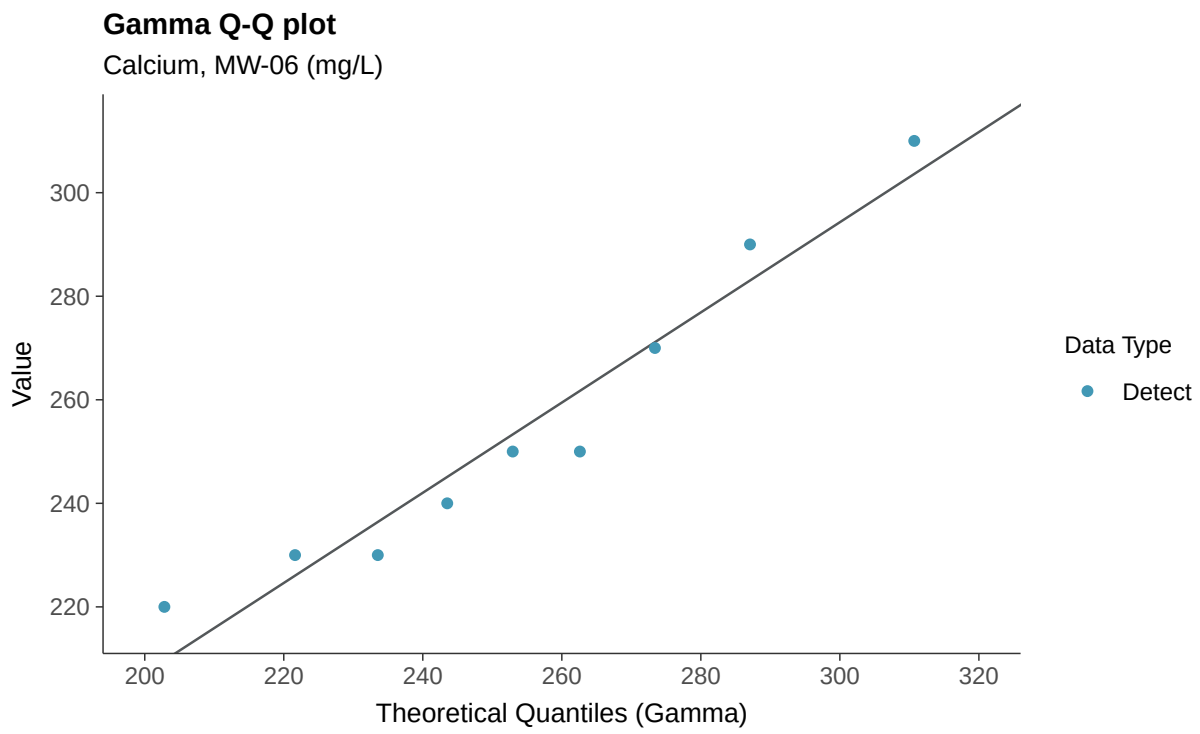
Boxplot by Season

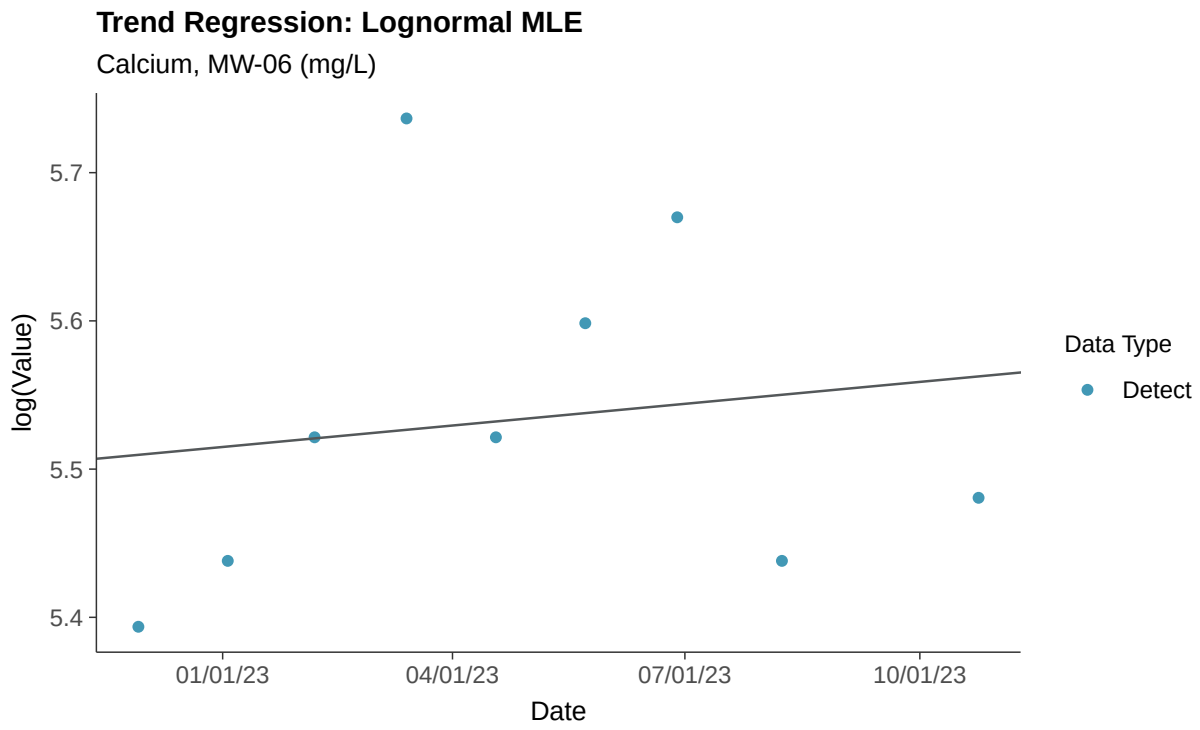
Calcium, MW-06 (mg/L)

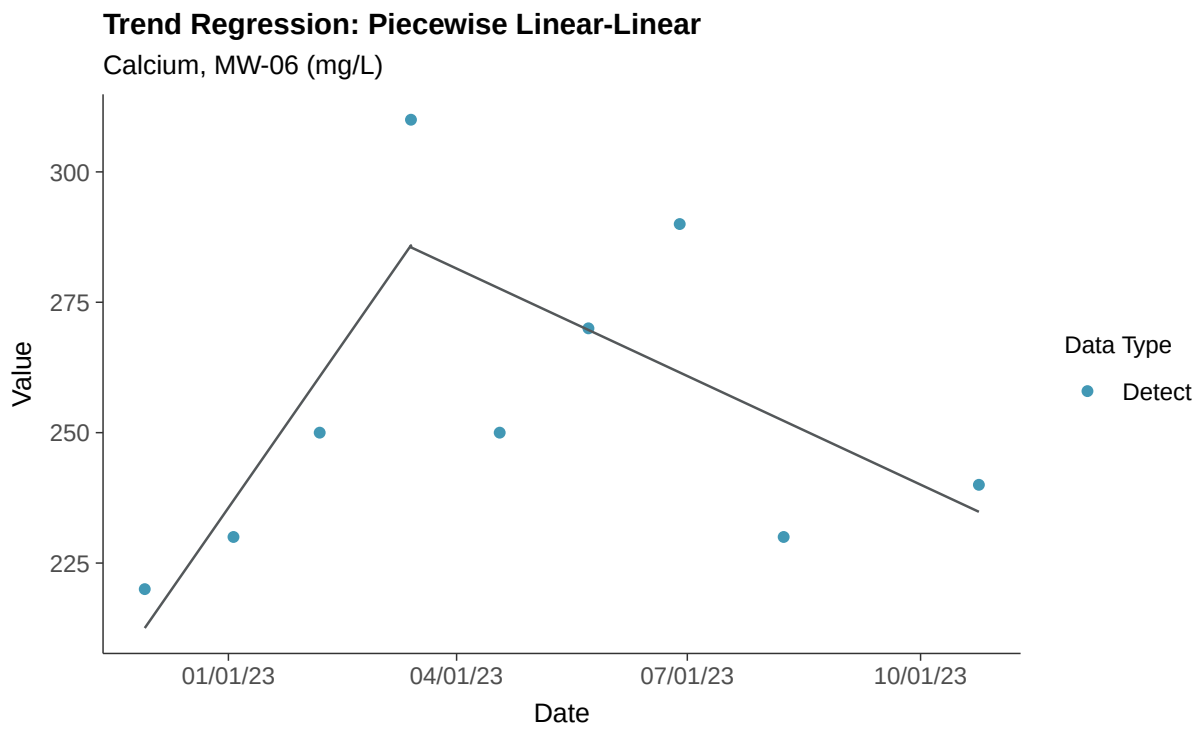



Normal Q-Q plot
Calcium, MW-06 (mg/L)
Value
300
280
260
240
220
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Calcium, MW-06 (mg/L)
log(Value)
5.7
5.6
5.5
5.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

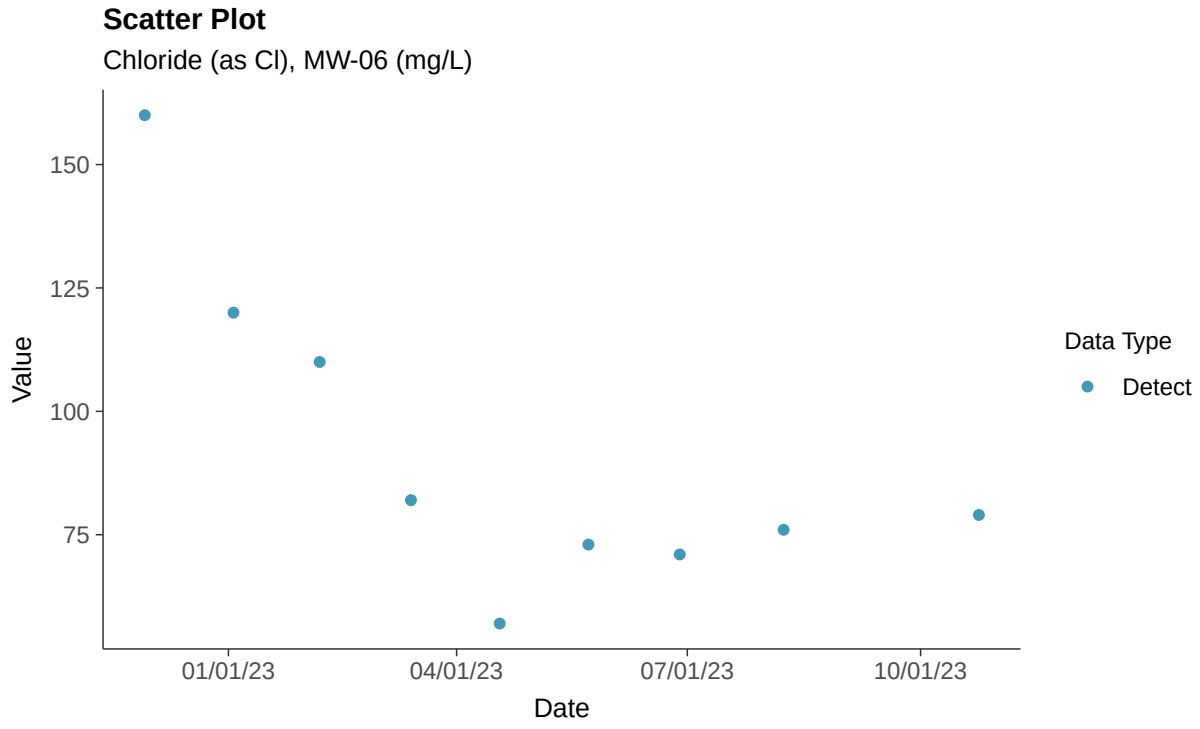

Gamma Q-Q plot
Calcium, MW-06 (mg/L)
Value
300
280
260
240
220
200
220
240
260
280
300
320
Theoretical Quantiles (Gamma)
Data Type
Detect

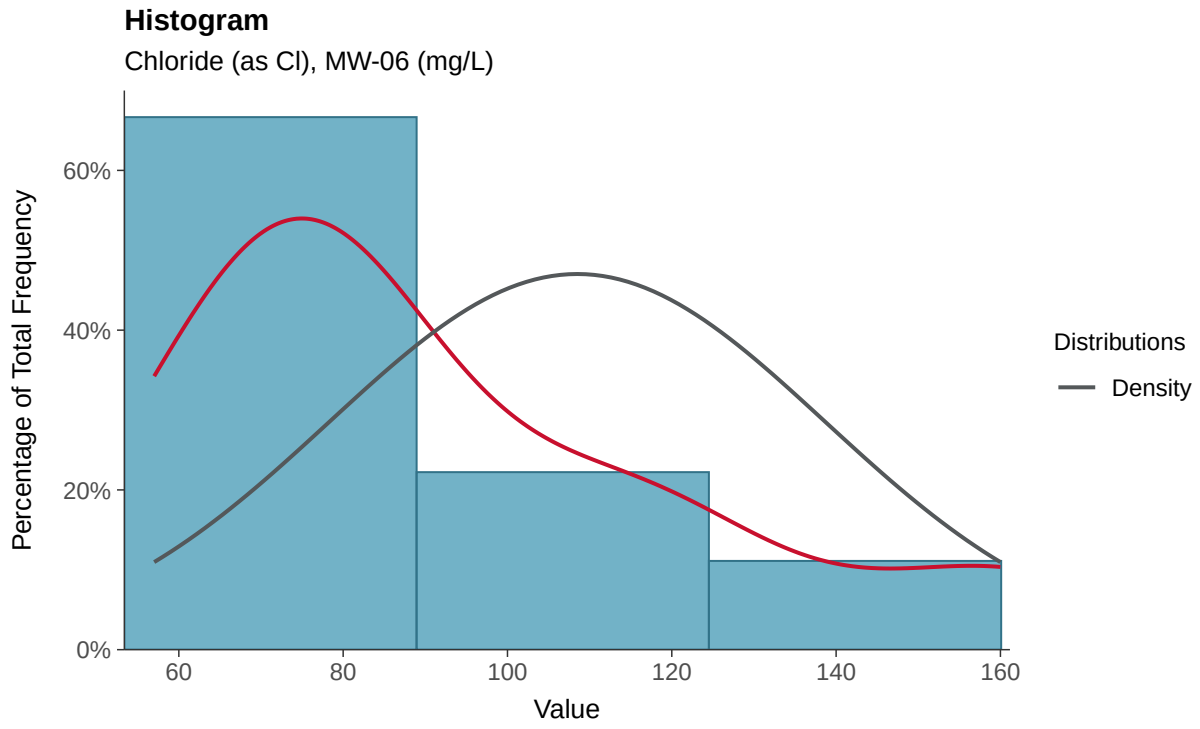

Trend Regression: Lognormal MLE
Calcium, MW-06 (mg/L)
log(Value)
5.7
5.6
5.5
5.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Calcium, MW-06 (mg/L)
Value
300
275
250
225
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-06

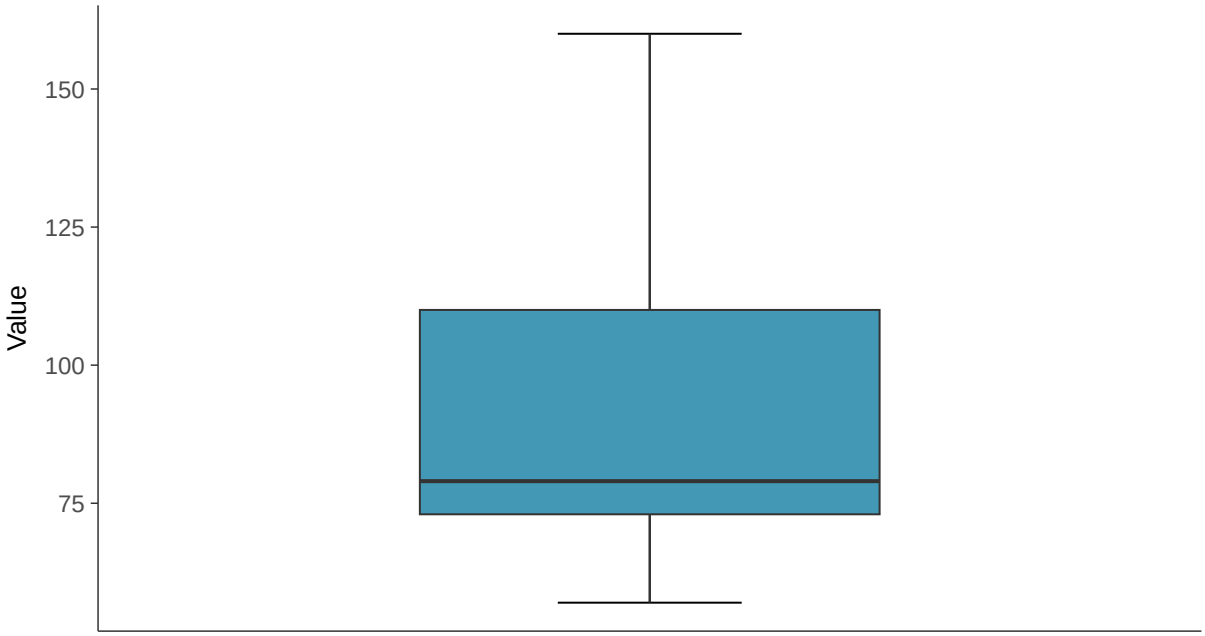
ID: 1_15_4_108





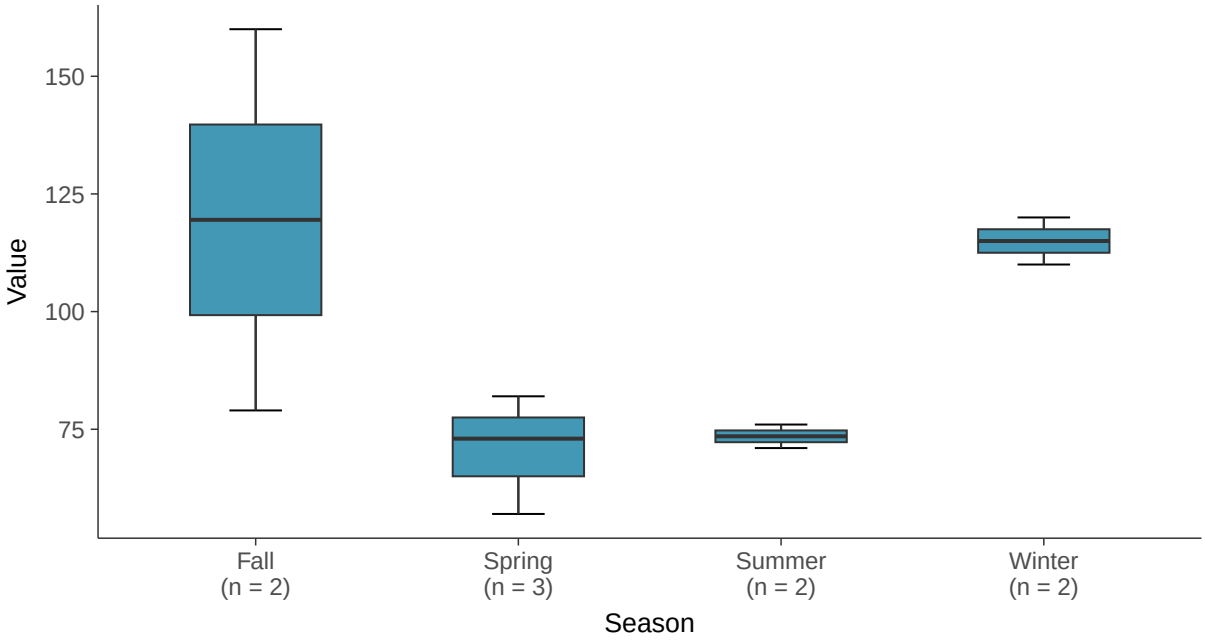
Boxplot

Chloride (as Cl), MW-06 (mg/L)



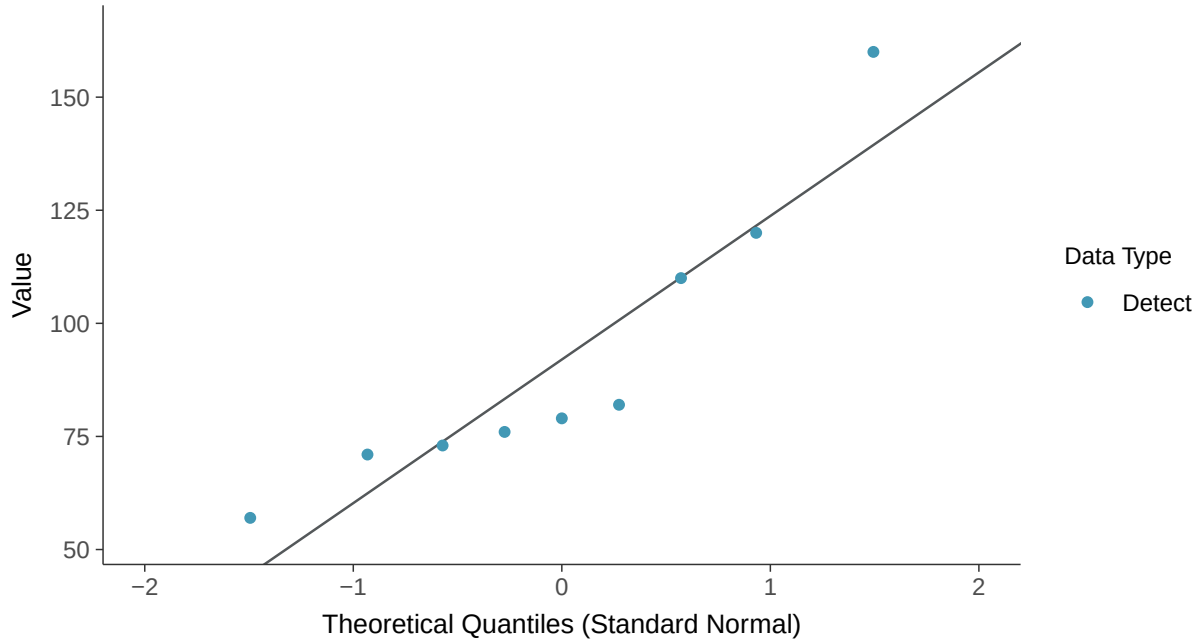
Boxplot by Season

Chloride (as Cl), MW-06 (mg/L)



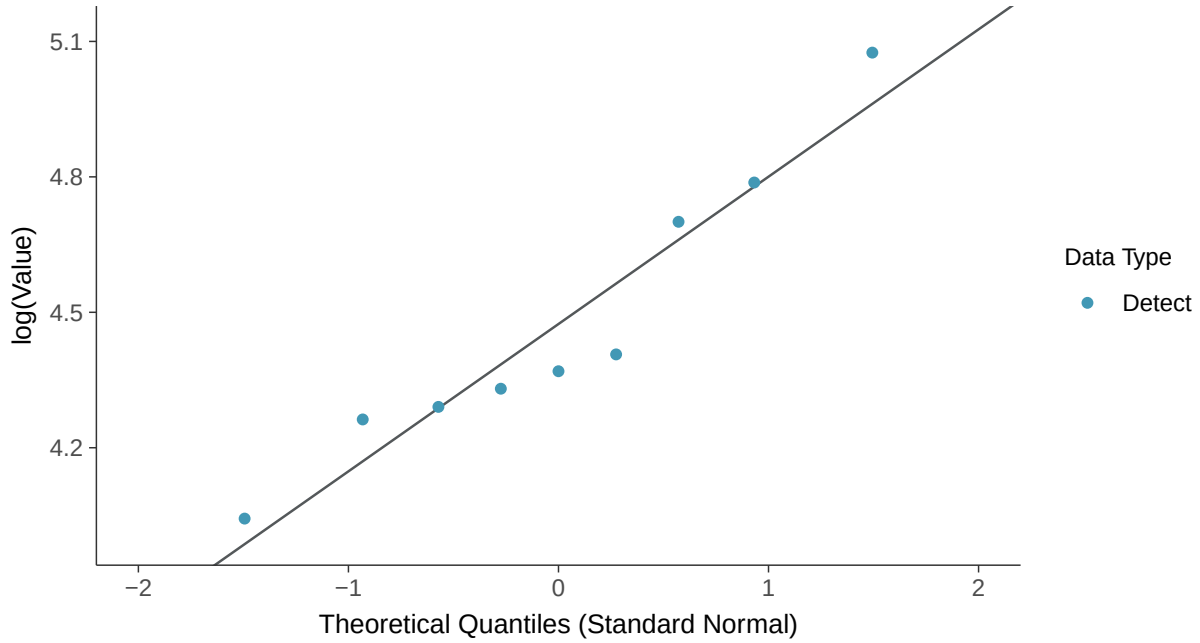
Normal Q-Q plot

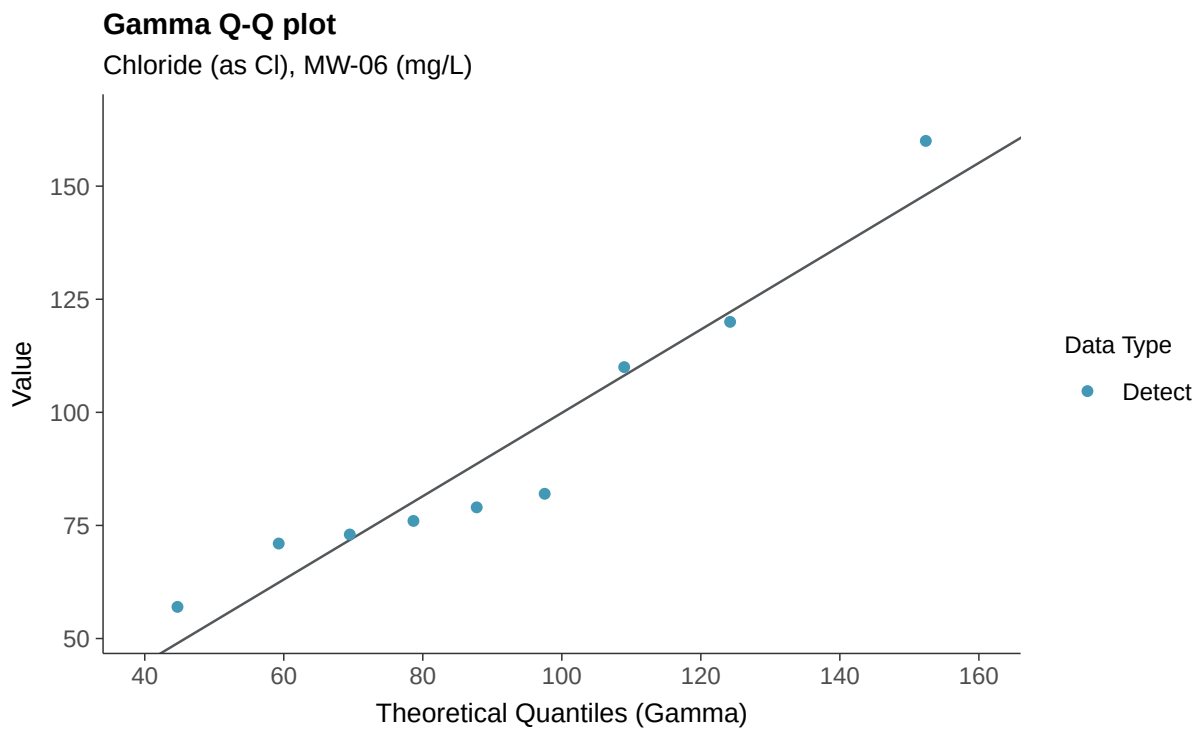
Chloride (as Cl), MW-06 (mg/L)

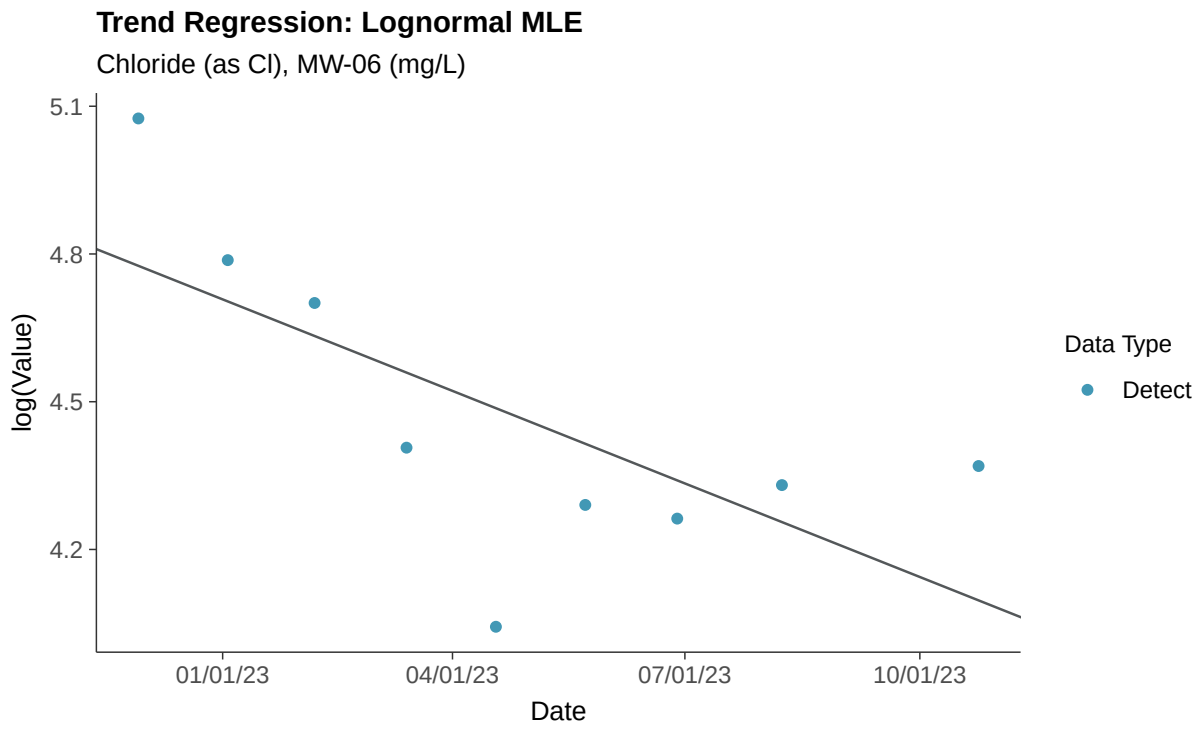


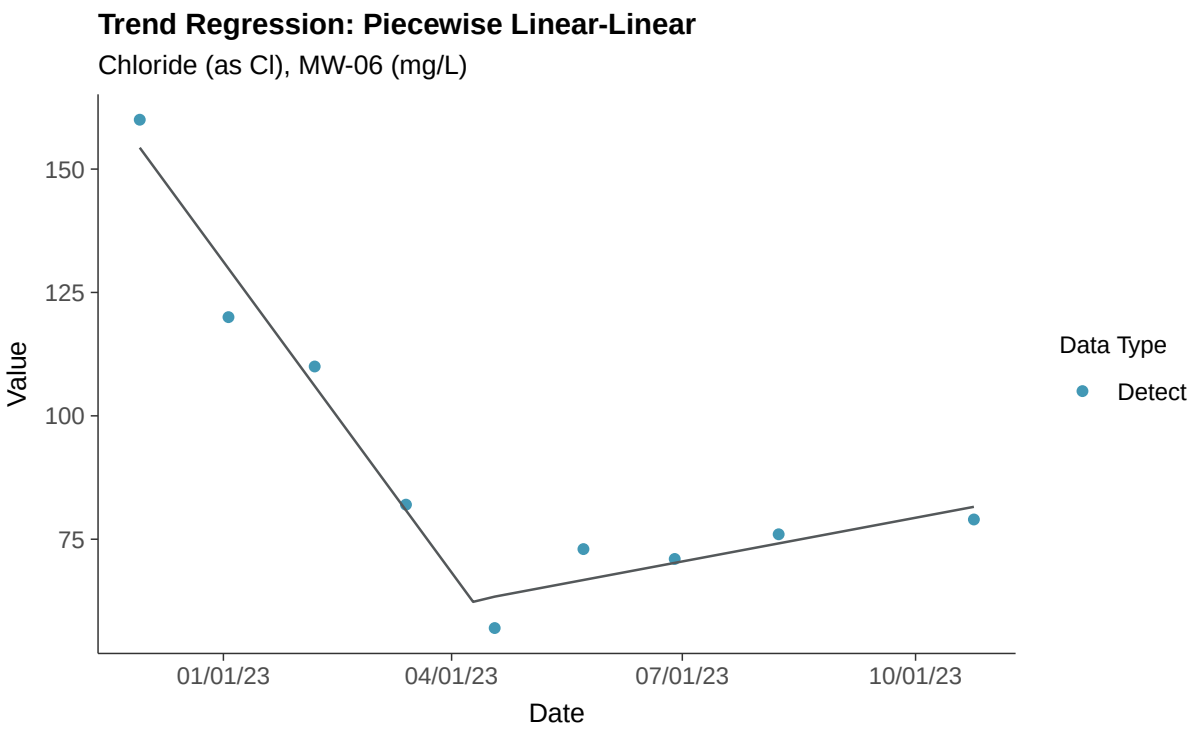
Lognormal Q-Q plot

Chloride (as Cl), MW-06 (mg/L)



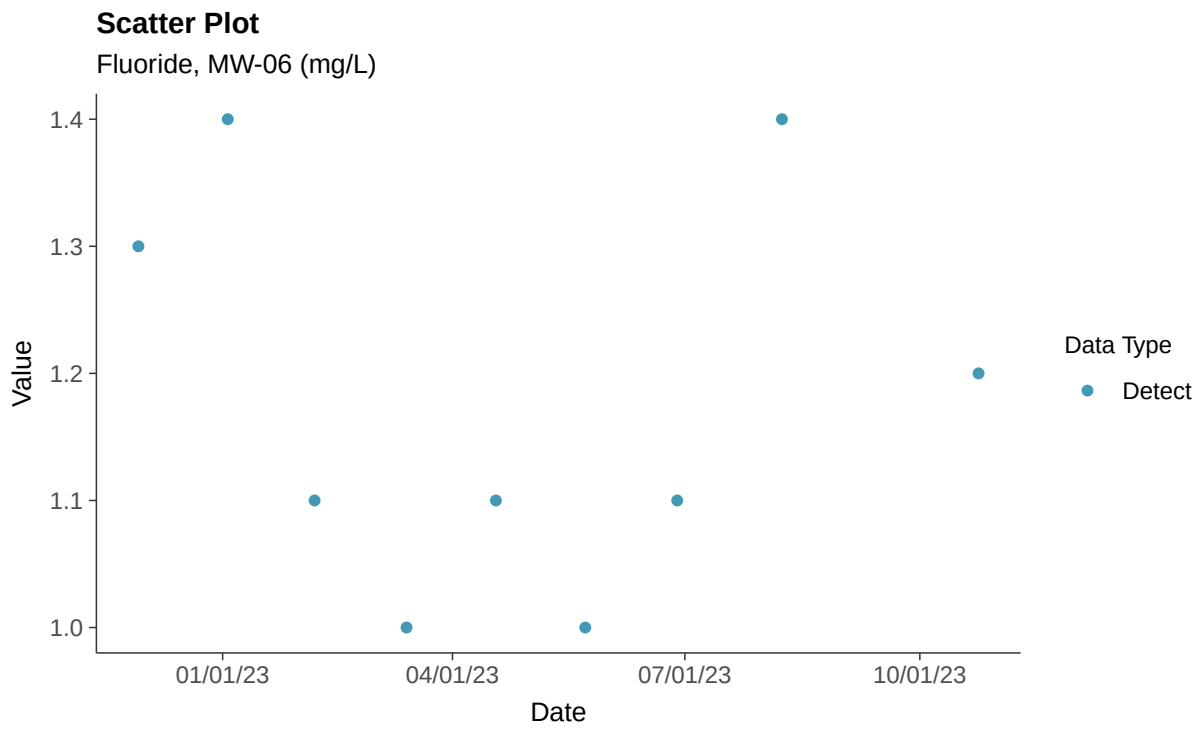

Gamma Q-Q plot
Chloride (as Cl), MW-06 (mg/L)
Value
150
125
100
75
50
40
60
80
100
120
140
160
Theoretical Quantiles (Gamma)
Data Type
Detect

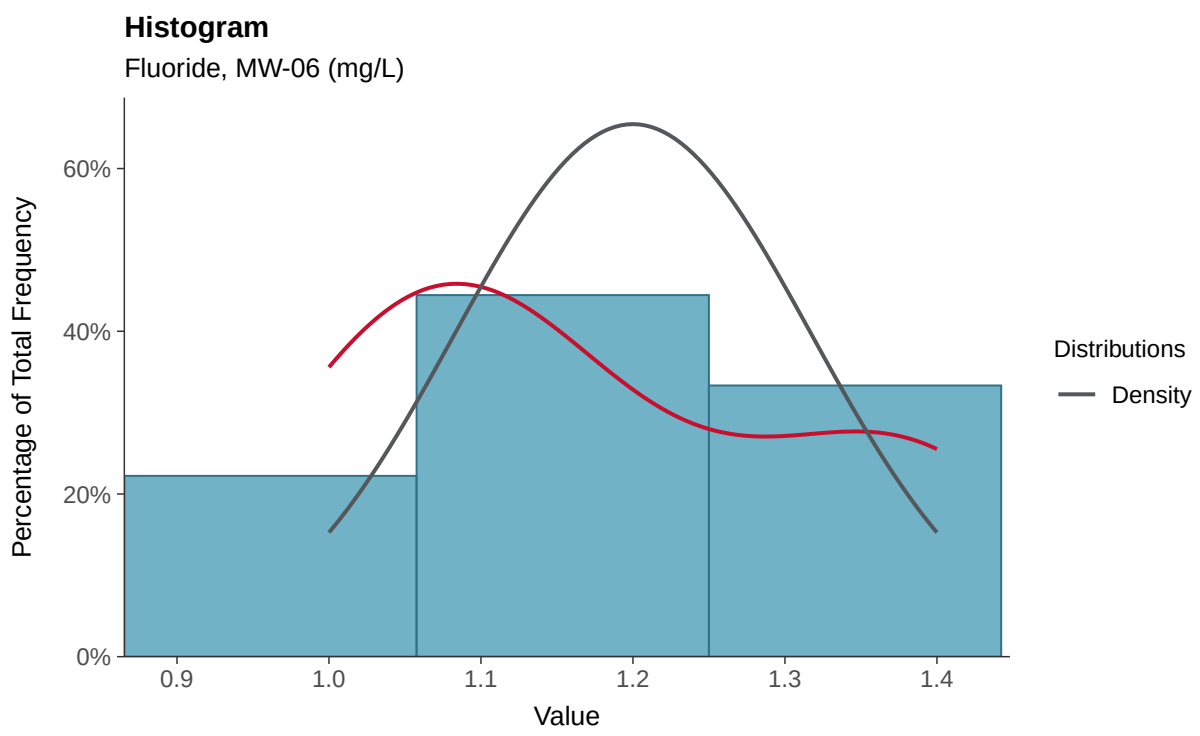

Trend Regression: Lognormal MLE
Chloride (as Cl), MW-06 (mg/L)
log(Value)
5.1
4.8
4.5
4.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-06 (mg/L)
Value
150
125
100
75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-06

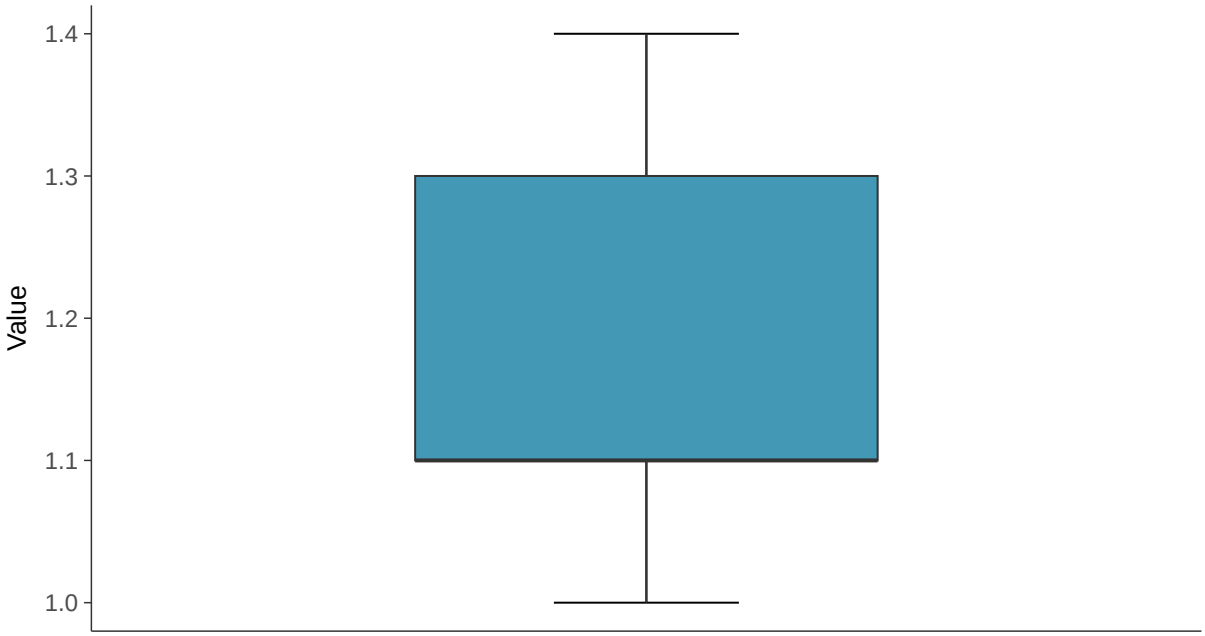
ID: 1_15_4_112





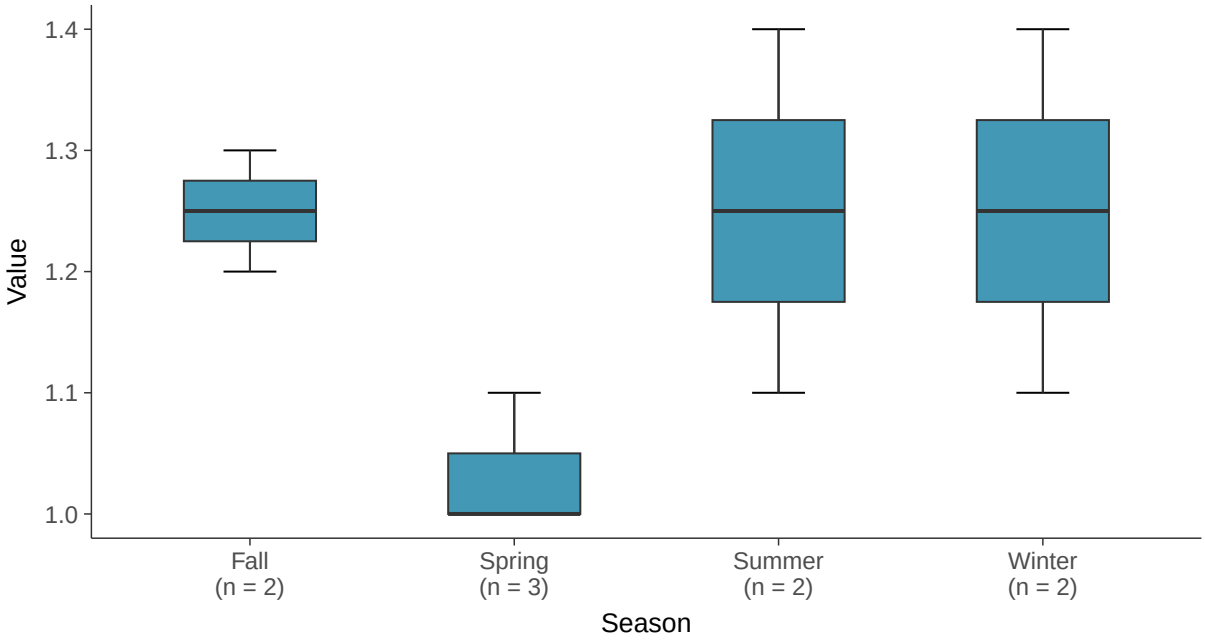
Boxplot

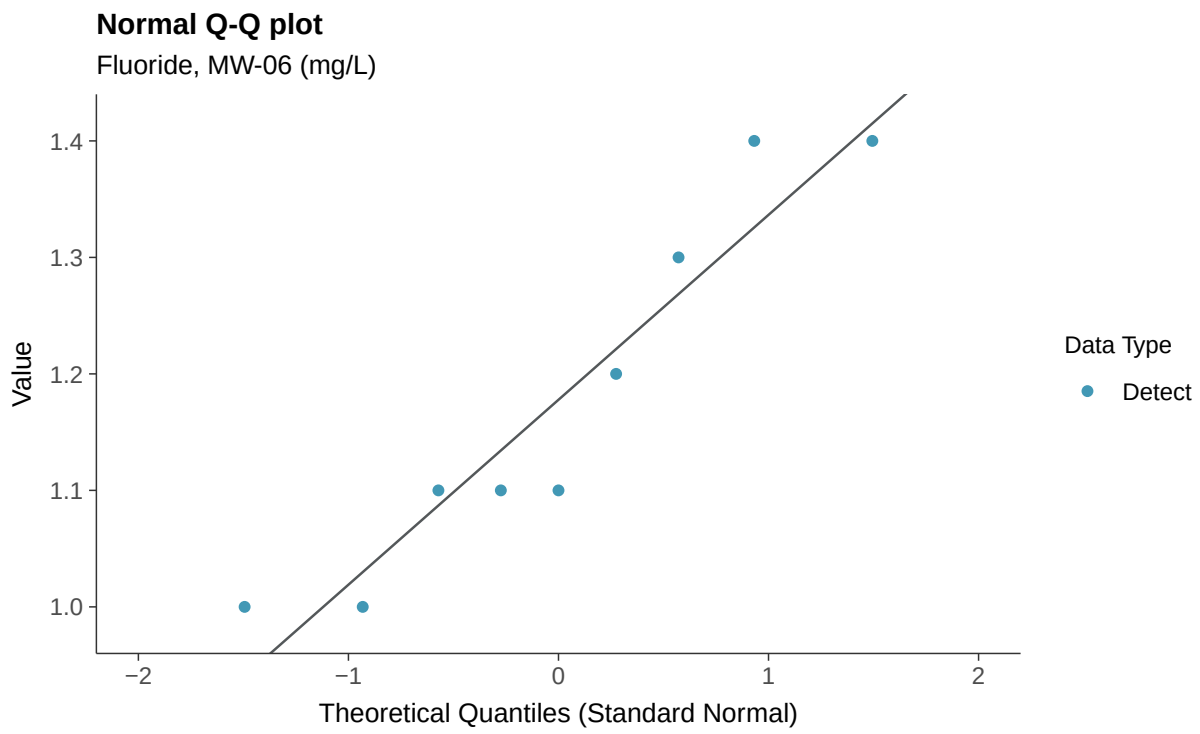
Fluoride, MW-06 (mg/L)

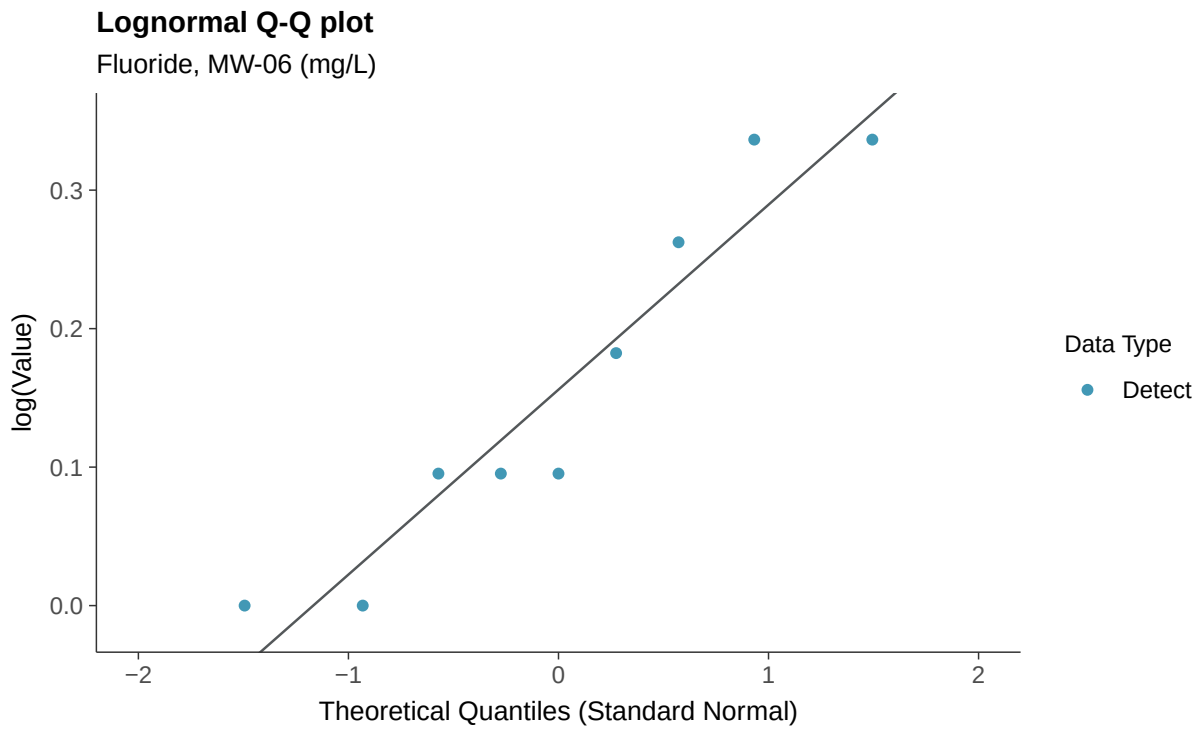


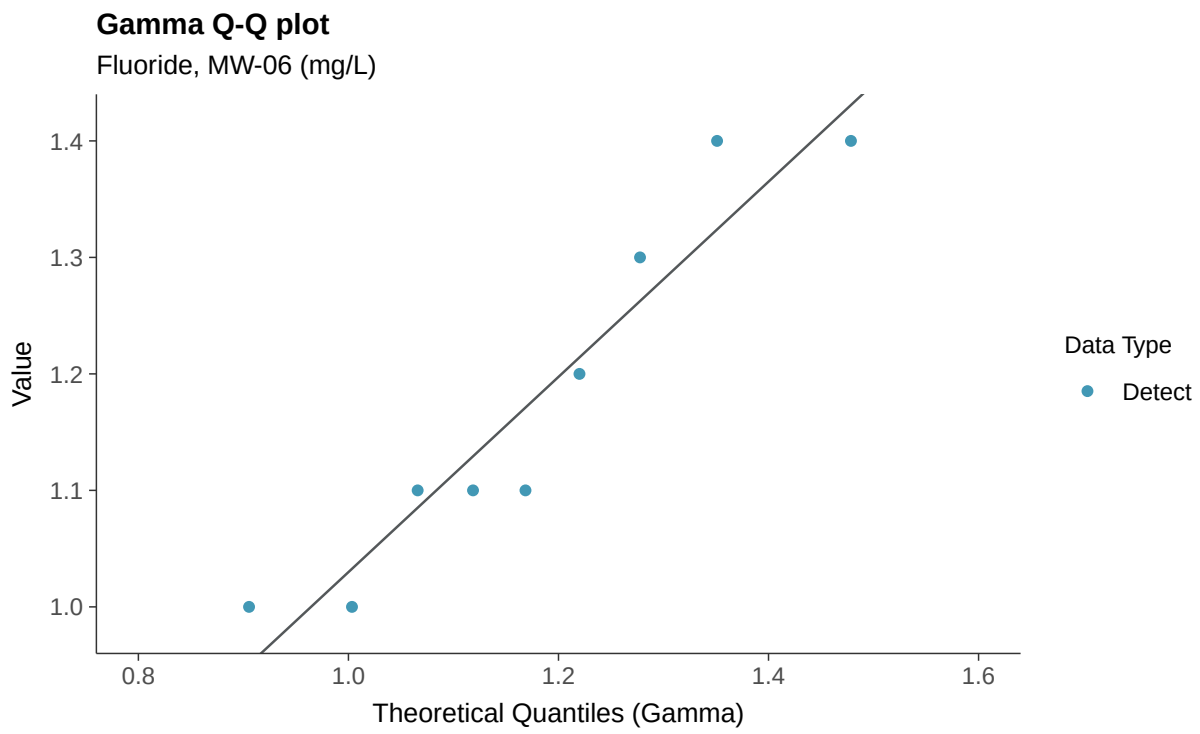
Boxplot by Season

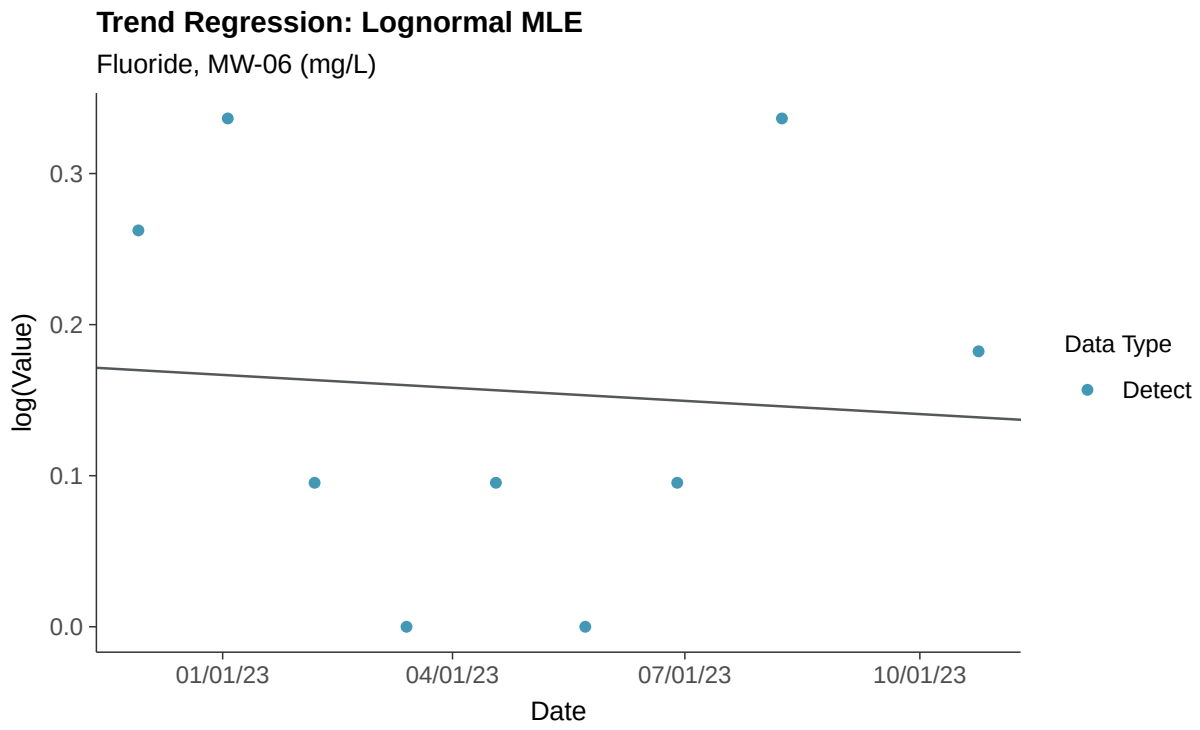
Fluoride, MW-06 (mg/L)

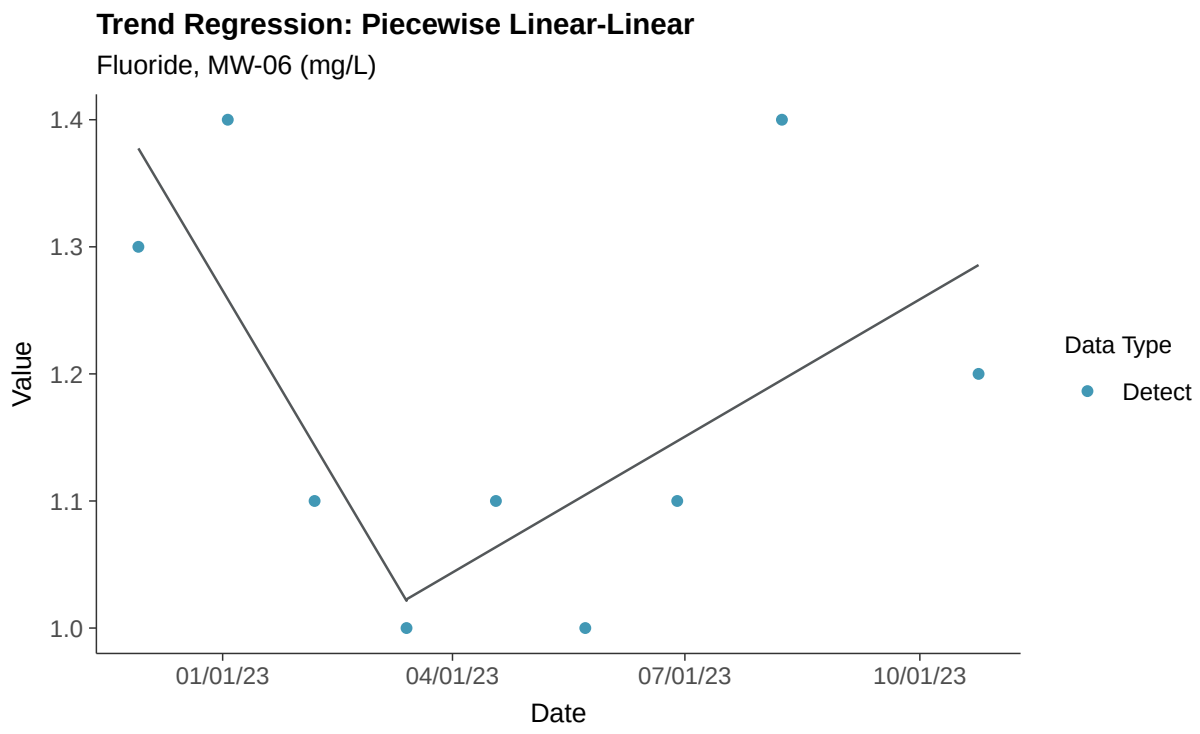



Normal Q-Q plot
Fluoride, MW-06 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride, MW-06 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

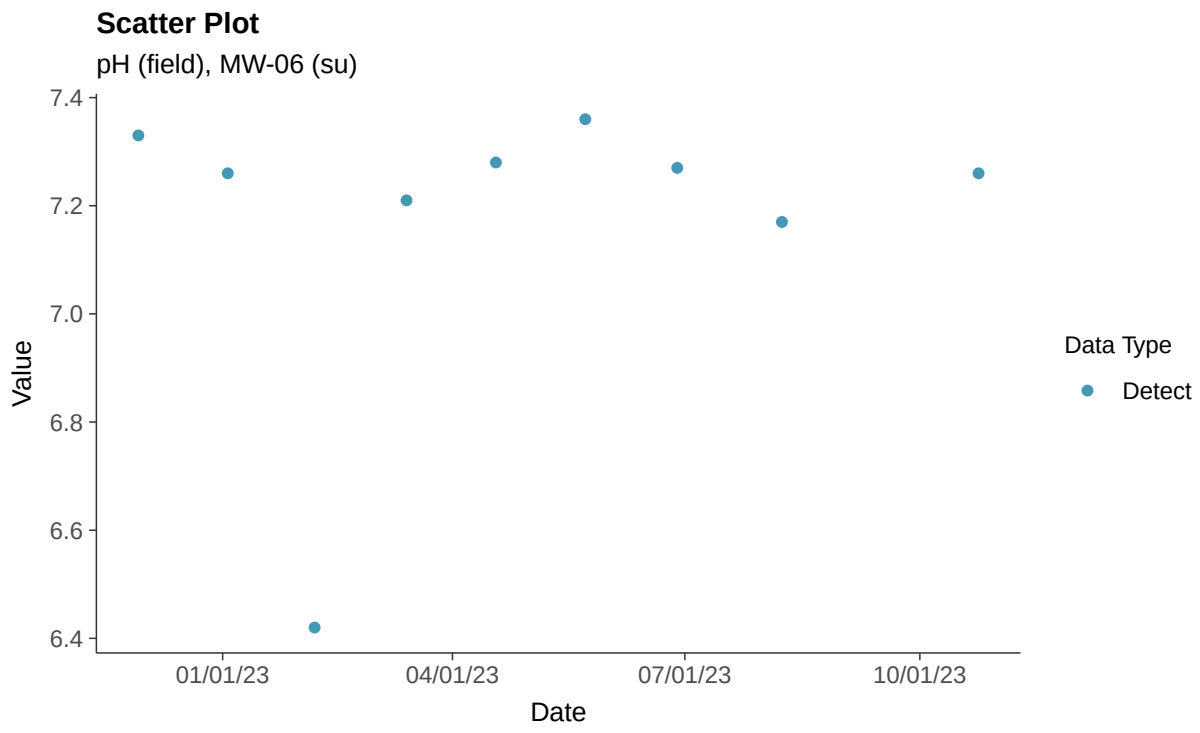

Gamma Q-Q plot
Fluoride, MW-06 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
0.8
1.0
1.2
1.4
1.6
Theoretical Quantiles (Gamma)
Data Type
Detect

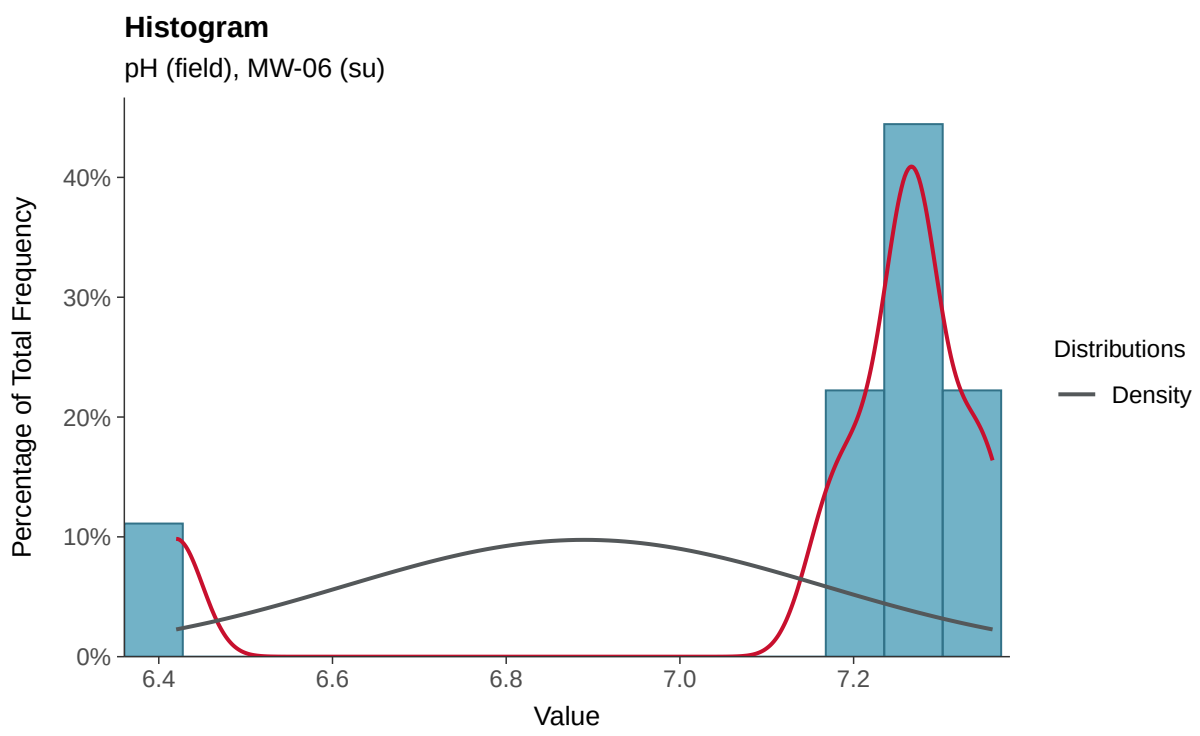

Trend Regression: Lognormal MLE
Fluoride, MW-06 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

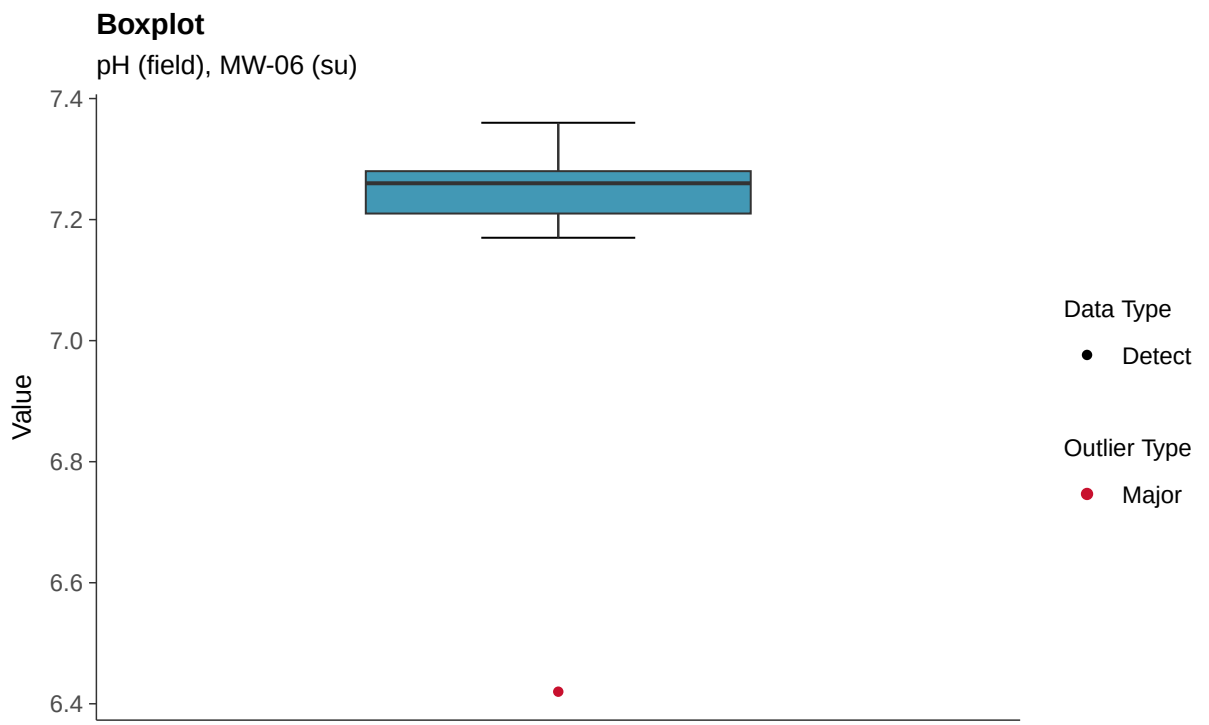

Trend Regression: Piecewise Linear-Linear
Fluoride, MW-06 (mg/L)
1.4
1.3
1.2
1.1
1.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

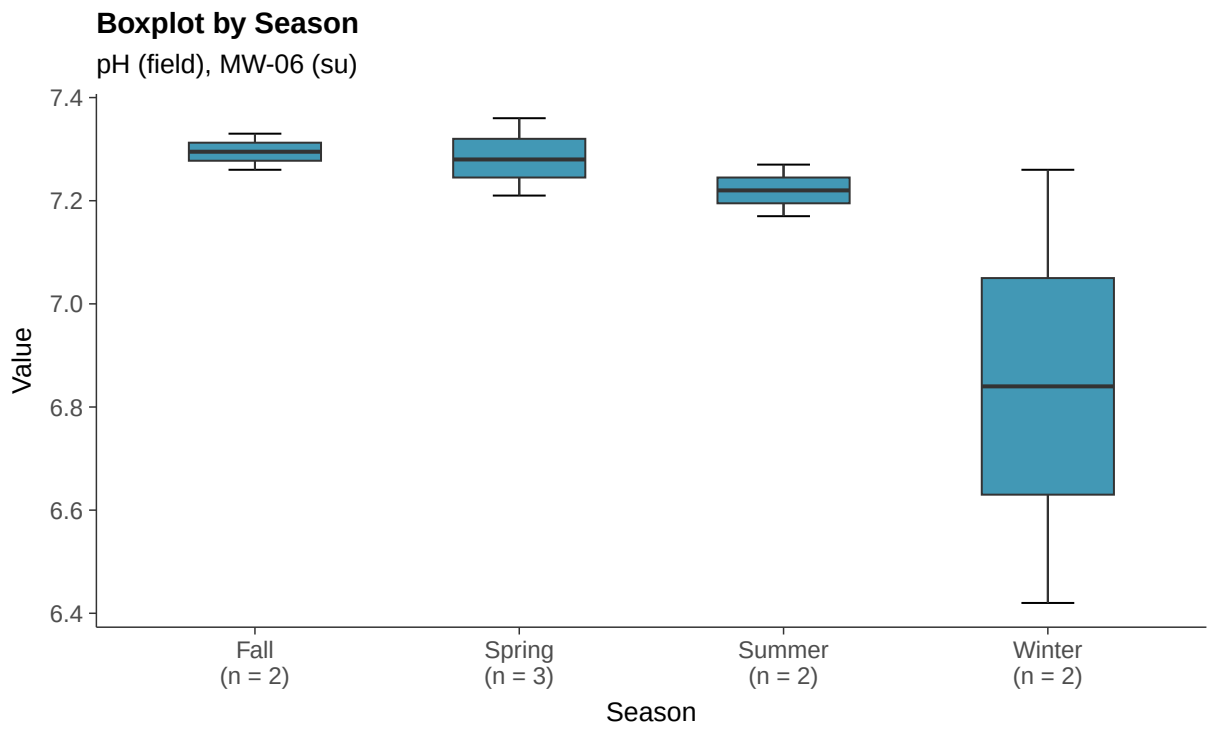
Appendix III: pH (field), MW-06

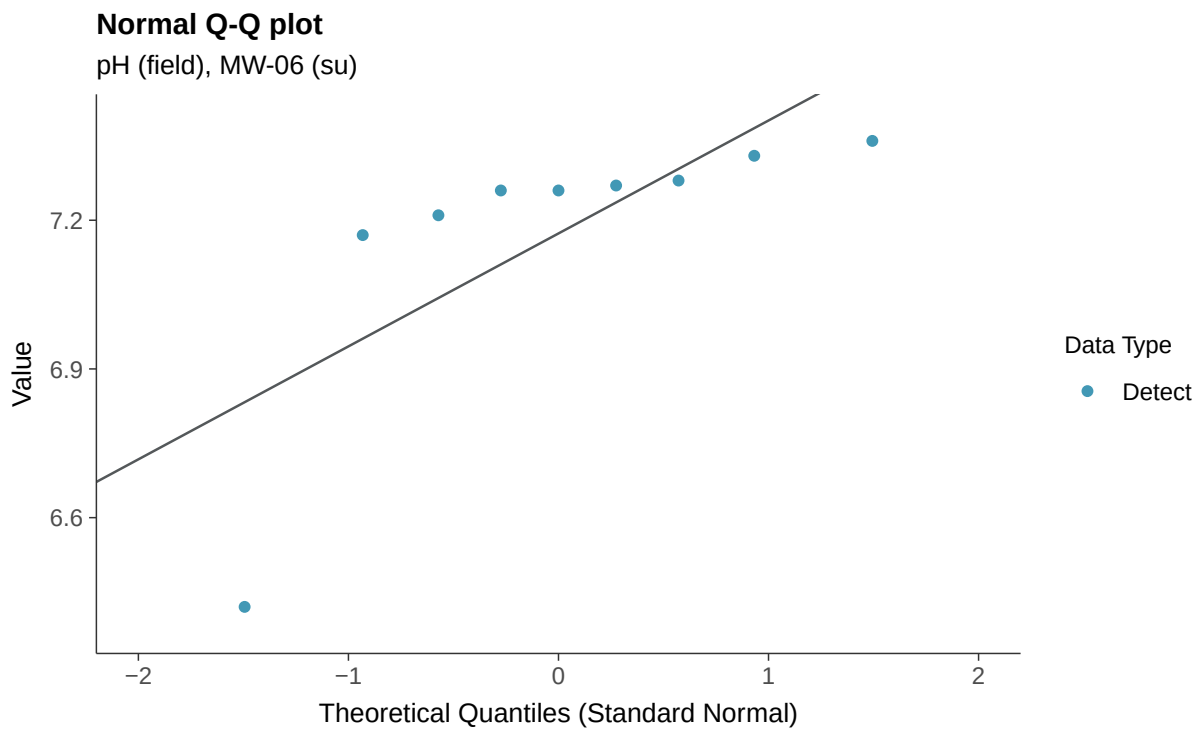
ID: 1_15_4_120

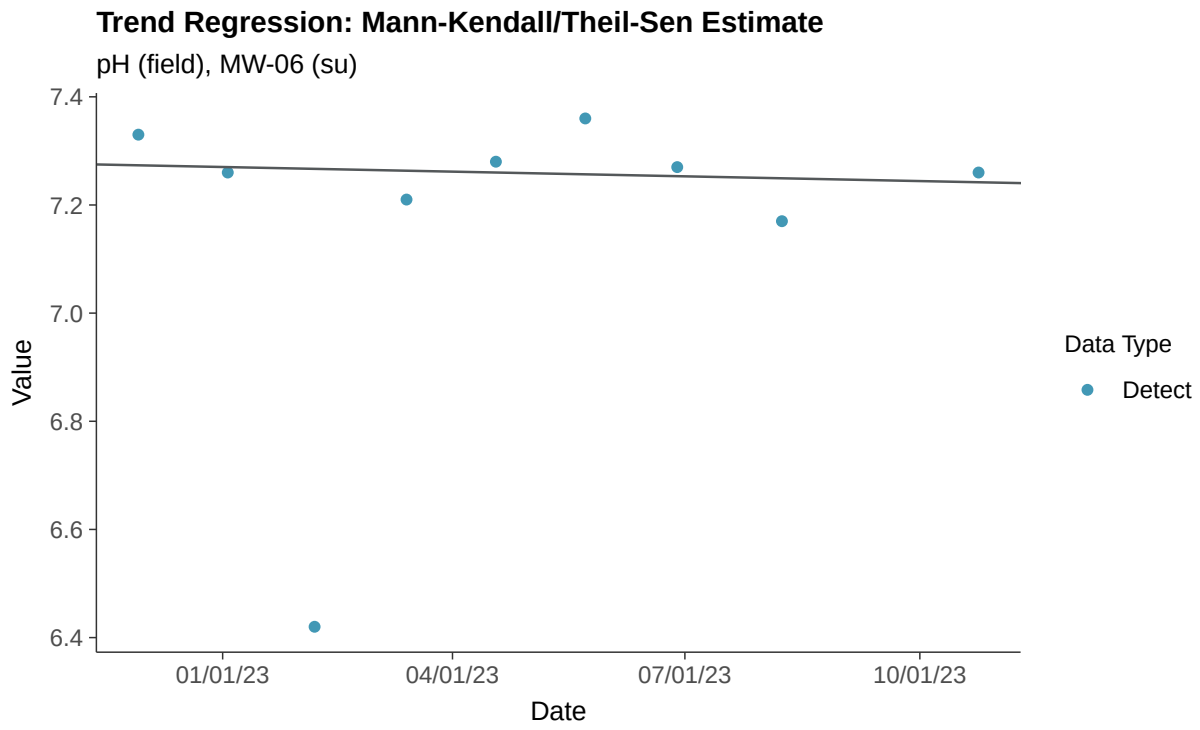


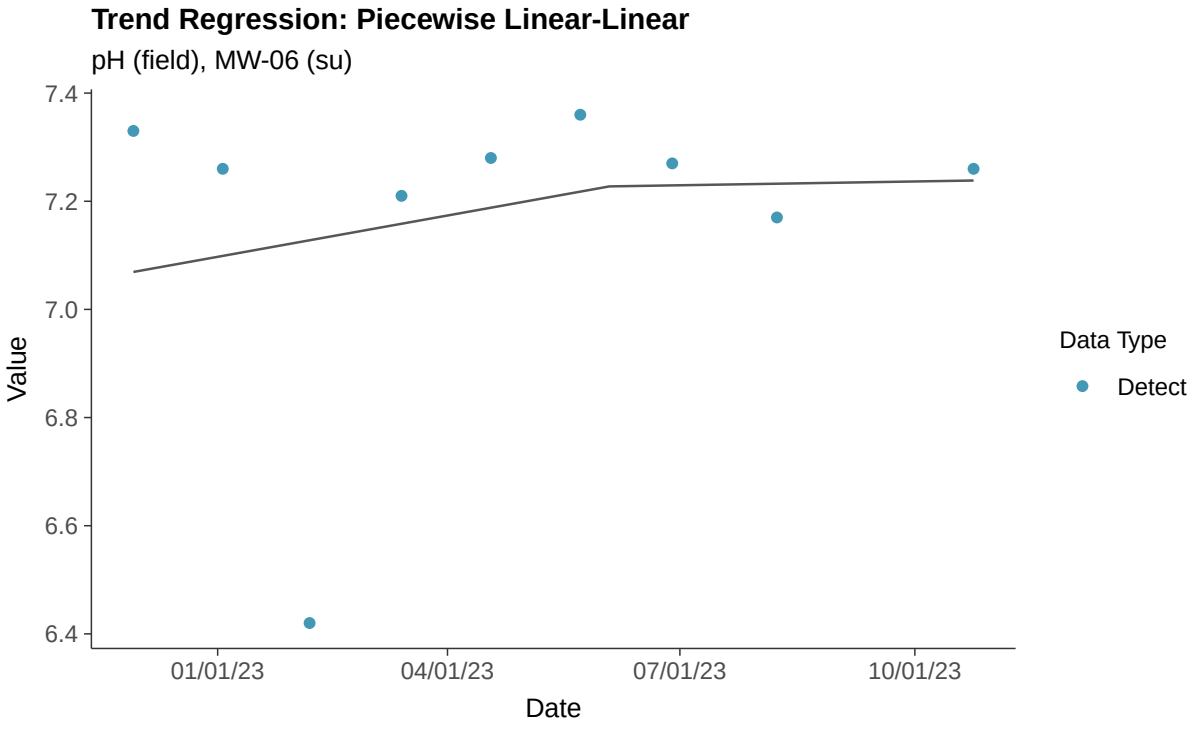


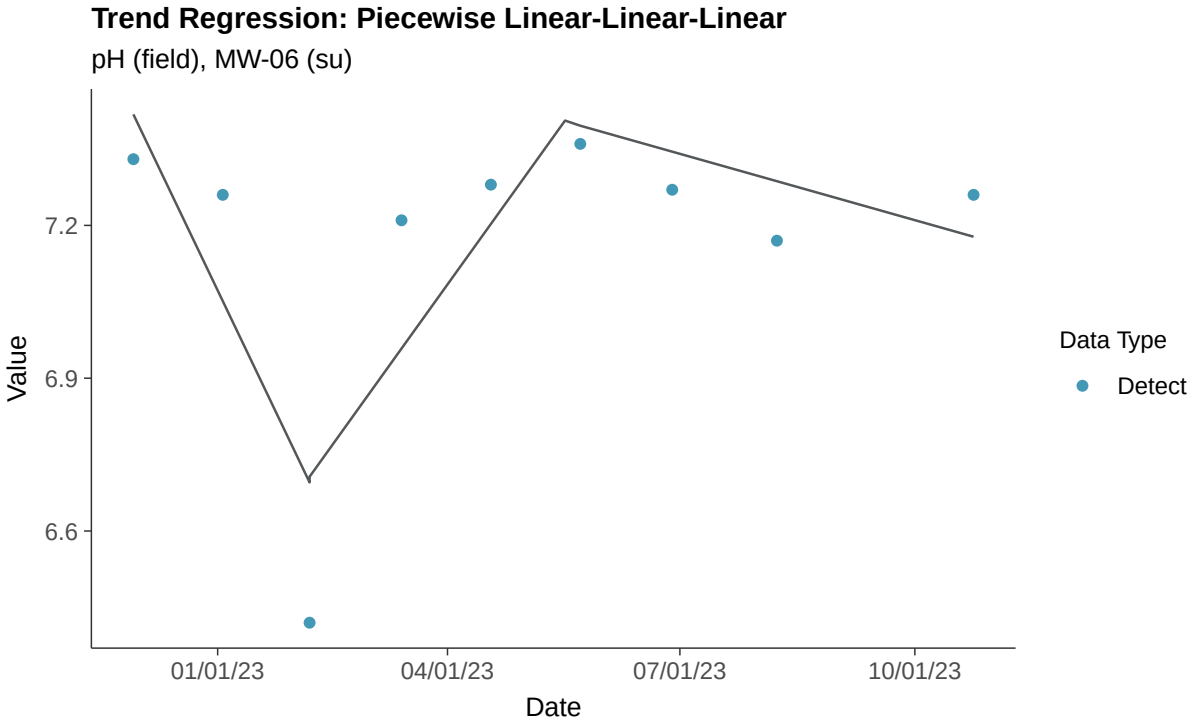

Boxplot
pH (field), MW-06 (su)
Value
7.4
7.2
7.0
6.8
6.6
6.4
Data Type
Detect
Outlier Type
Major


Boxplot by Season
pH (field), MW-06 (su)
Value
7.4
7.2
7.0
6.8
6.6
6.4
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Normal Q-Q plot
pH (field), MW-06 (su)
Value
7.2
6.9
6.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

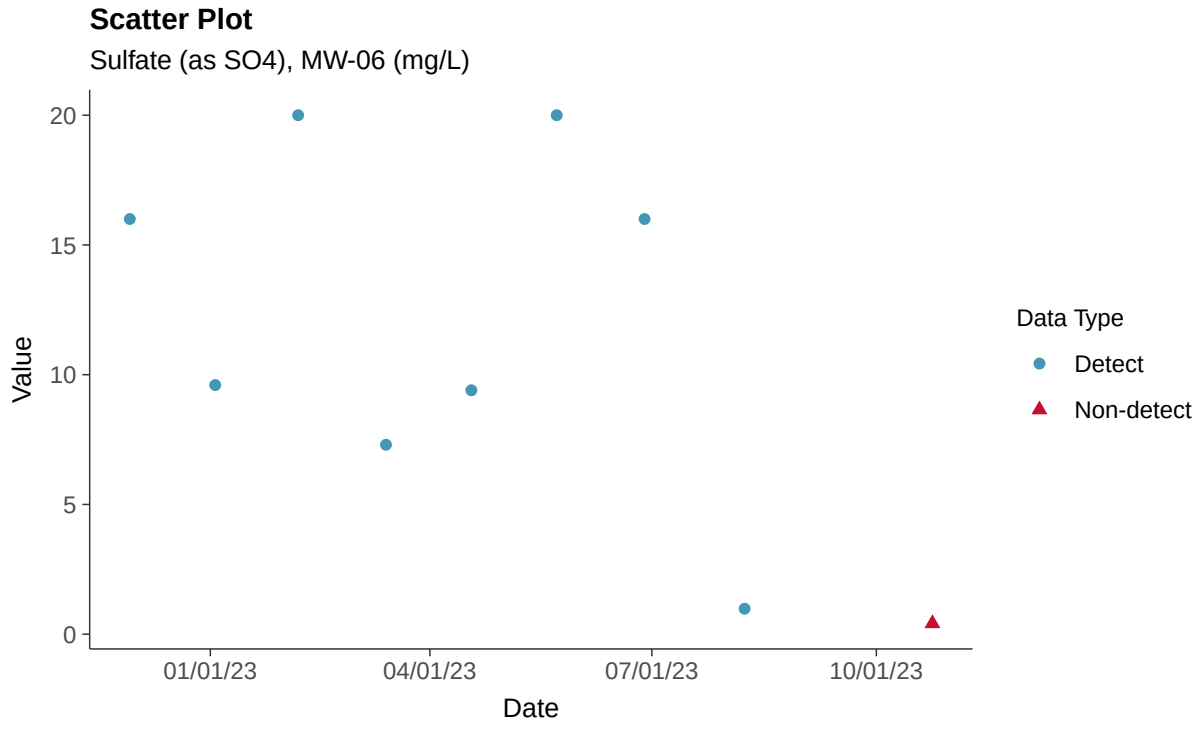

Trend Regression: Mann-Kendall/Theil-Sen Estimate
pH (field), MW-06 (su)
Value
7.4
7.2
7.0
6.8
6.6
6.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

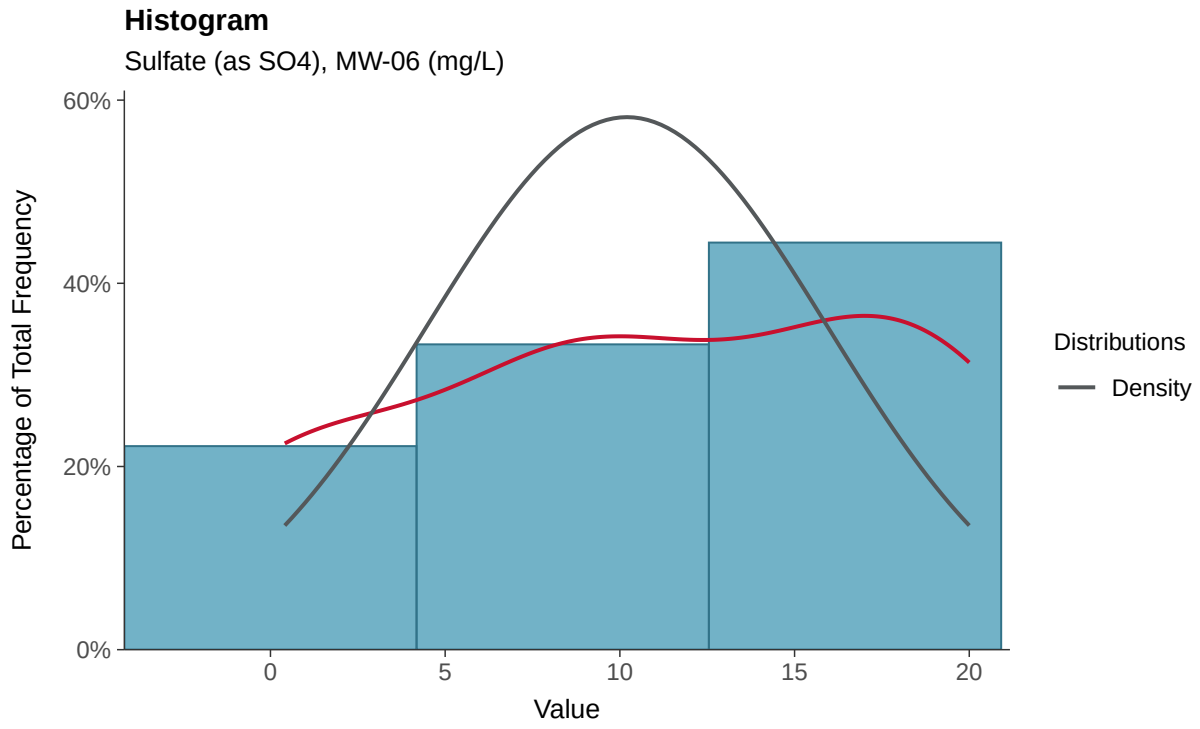

Trend Regression: Piecewise Linear-Linear
pH (field), MW-06 (su)
7.4
7.2
7.0
6.8
6.6
6.4
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
pH (field), MW-06 (su)
7.2
6.9
6.6
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-06

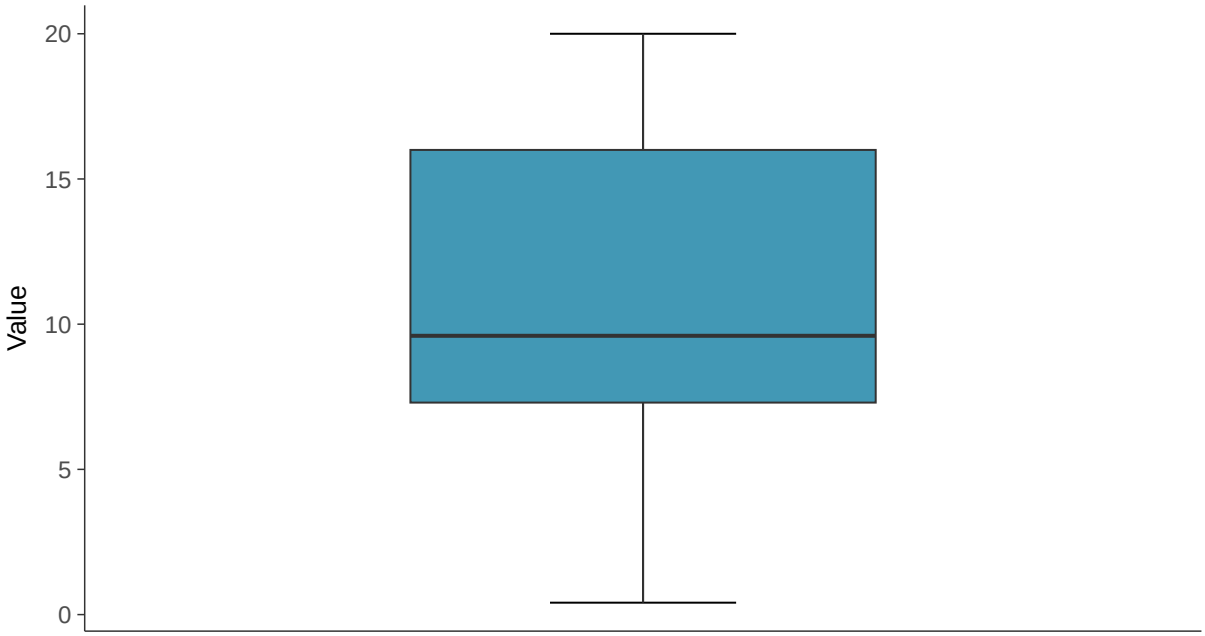
ID: 1_15_4_124





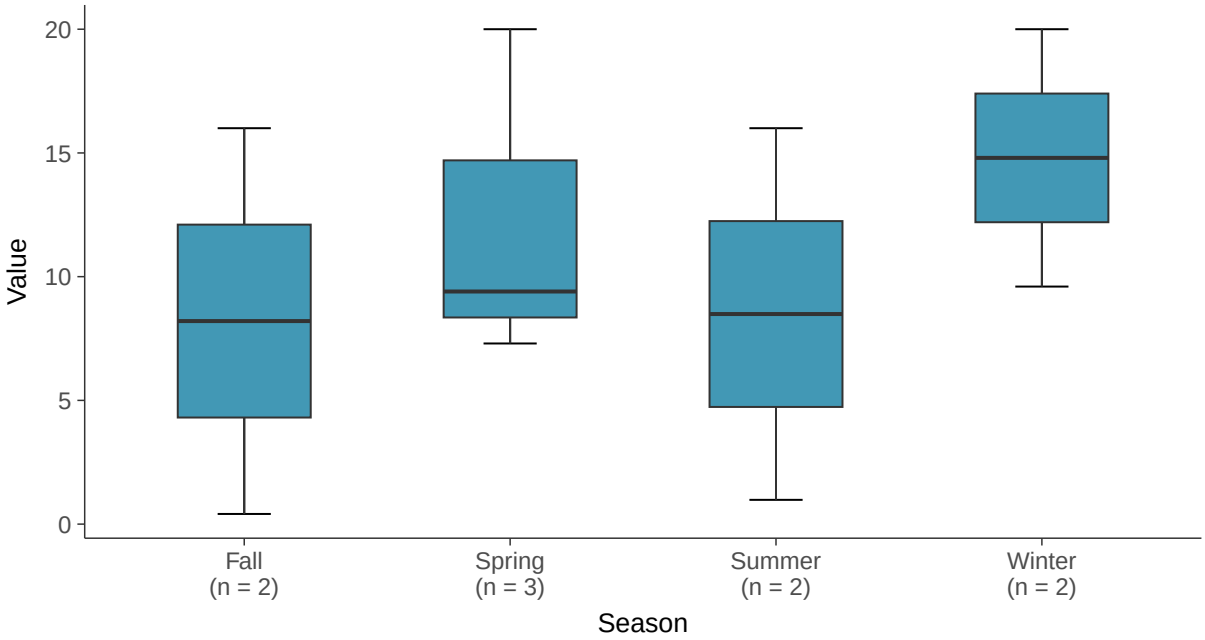
Boxplot

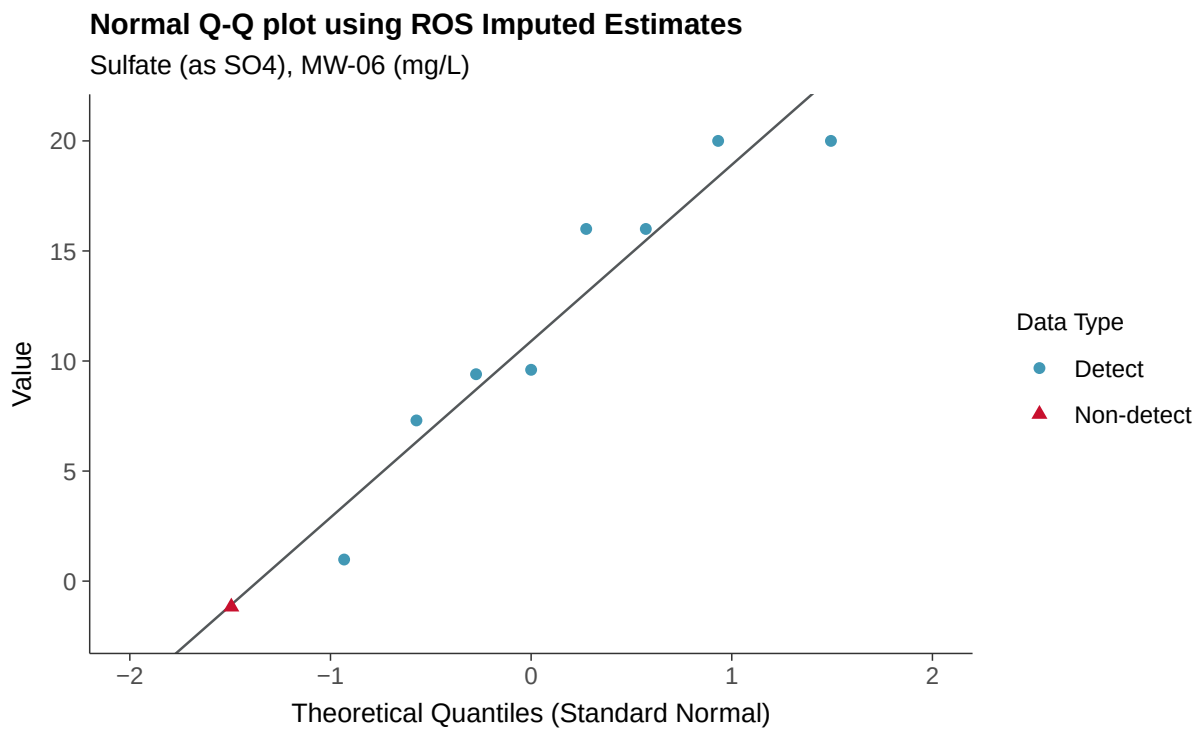
Sulfate (as SO4), MW-06 (mg/L)

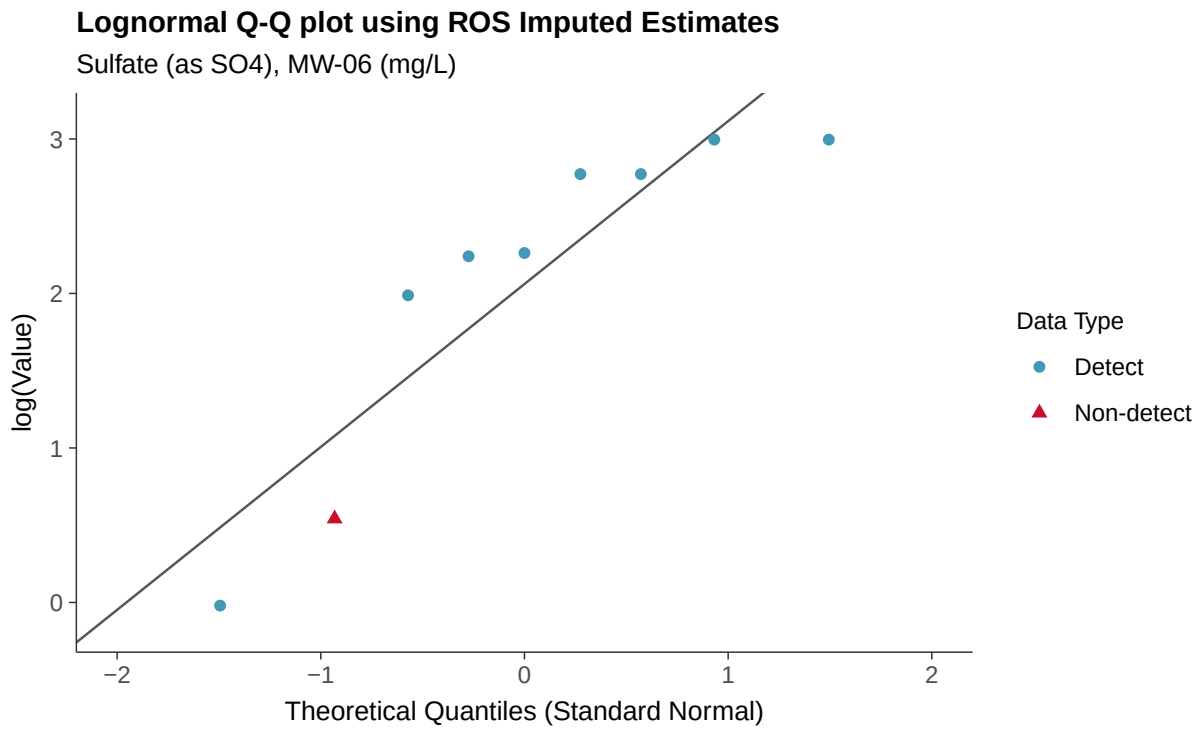


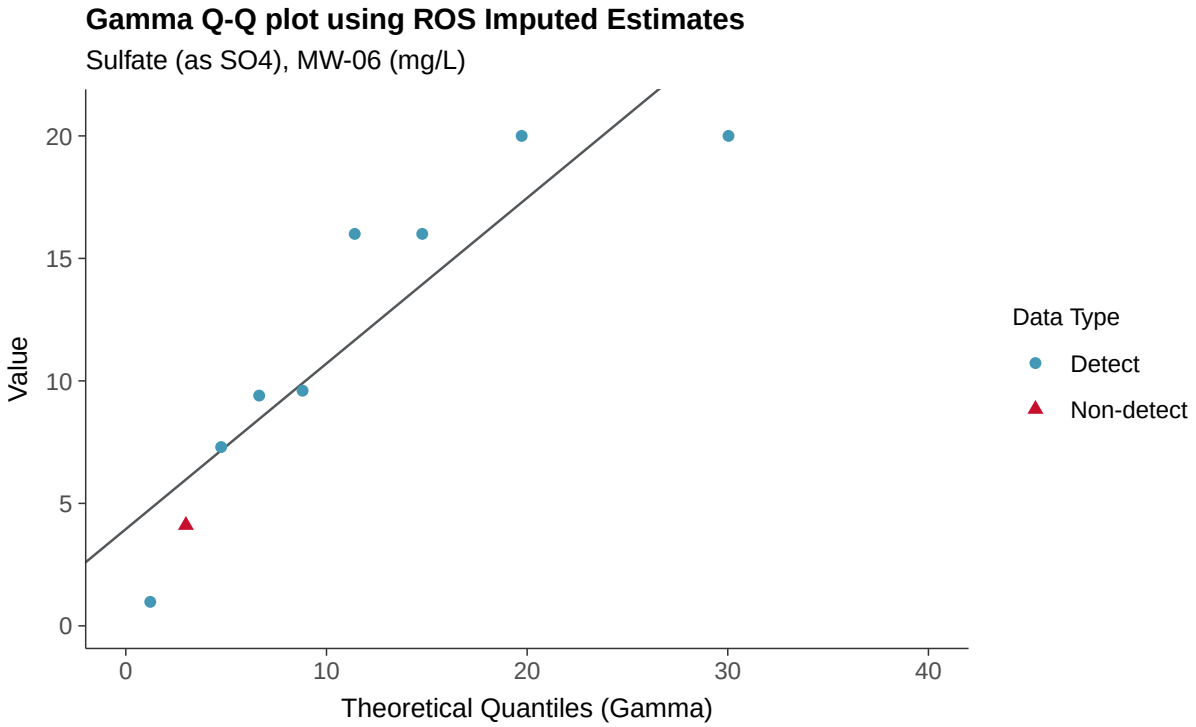
Boxplot by Season

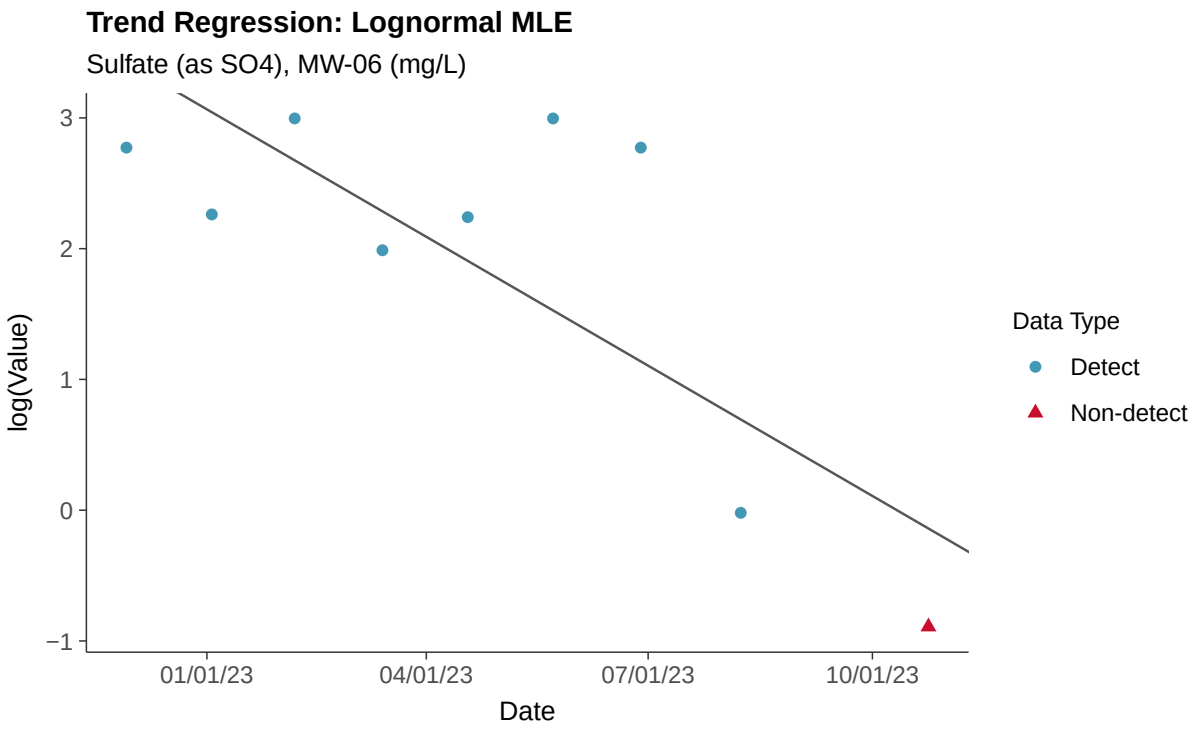
Sulfate (as SO4), MW-06 (mg/L)

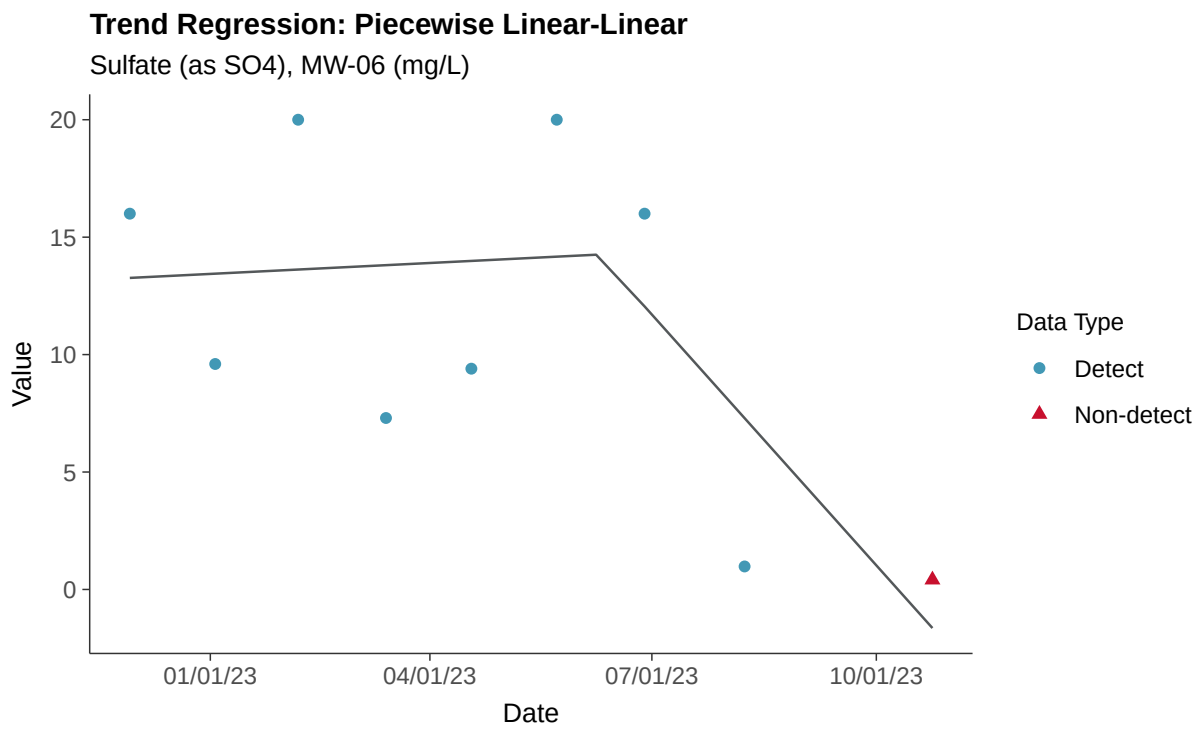



Normal Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-06 (mg/L)
Value
20
15
10
5
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-06 (mg/L)
log(Value)
3
2
1
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

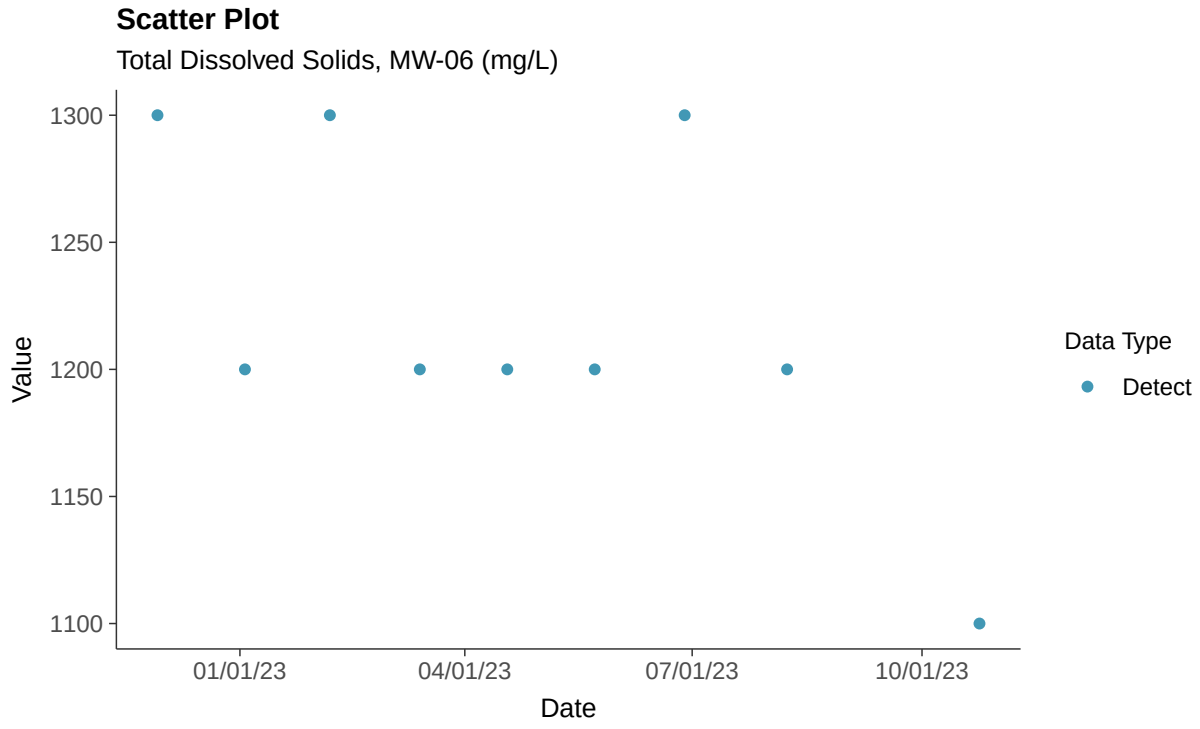

Gamma Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-06 (mg/L)
Value
Theoretical Quantiles (Gamma)
0
5
10
15
20
0
10
20
30
40
Data Type
Detect
Non-detect

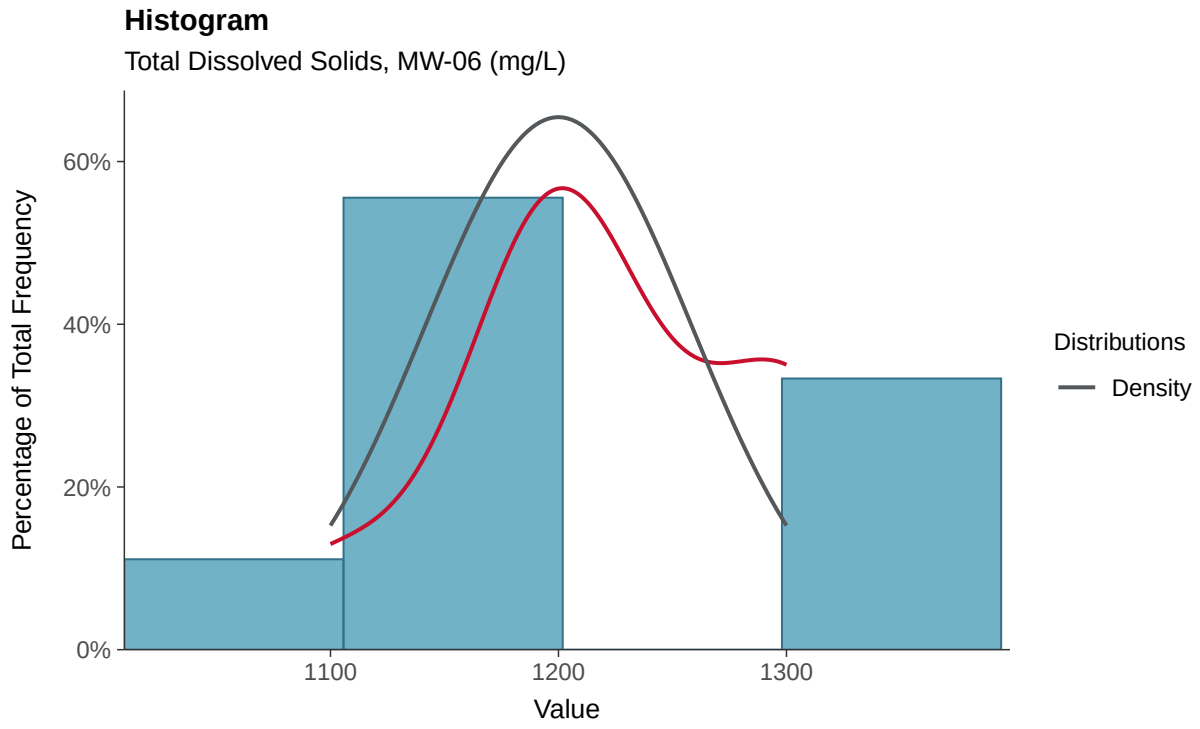

Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-06 (mg/L)
log(Value)
Date
−1
0
1
2
3
01/01/23
04/01/23
07/01/23
10/01/23
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Sulfate (as SO4), MW-06 (mg/L)
Value
20
15
10
5
0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Total Dissolved Solids, MW-06

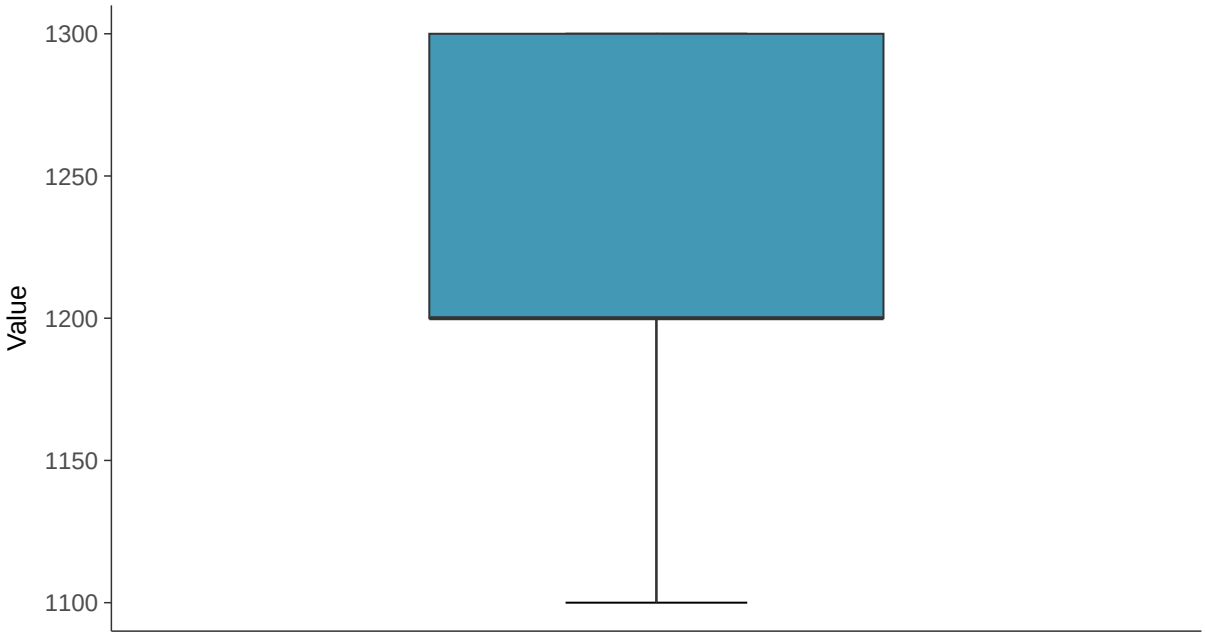
ID: 1_15_4_126





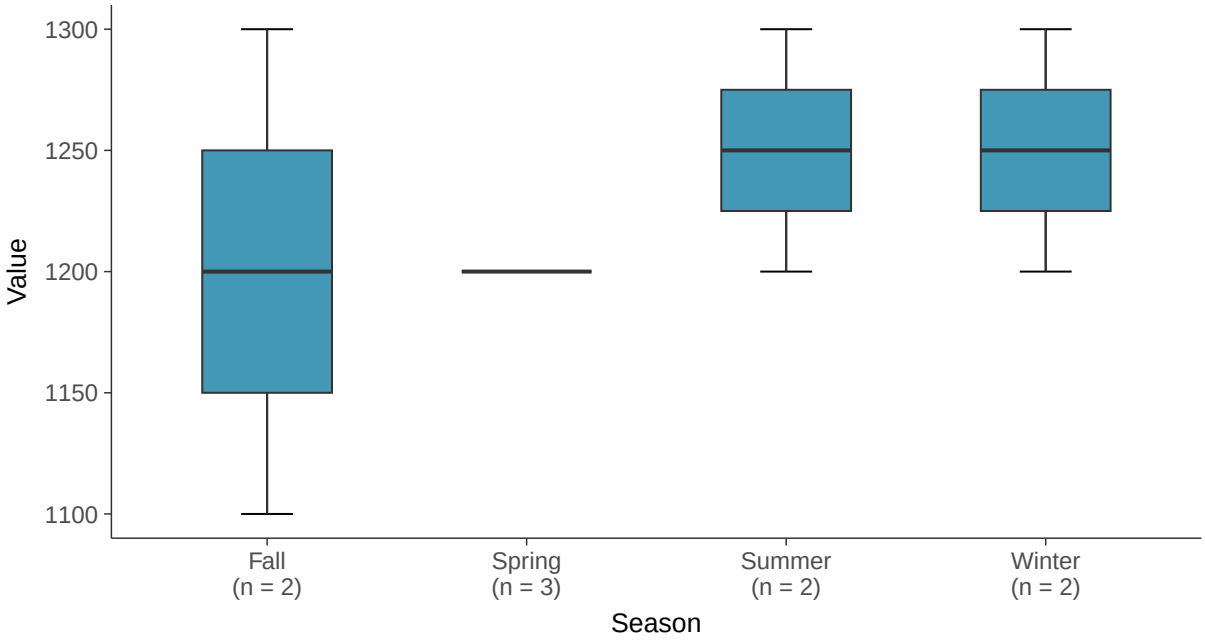
Boxplot

Total Dissolved Solids, MW-06 (mg/L)



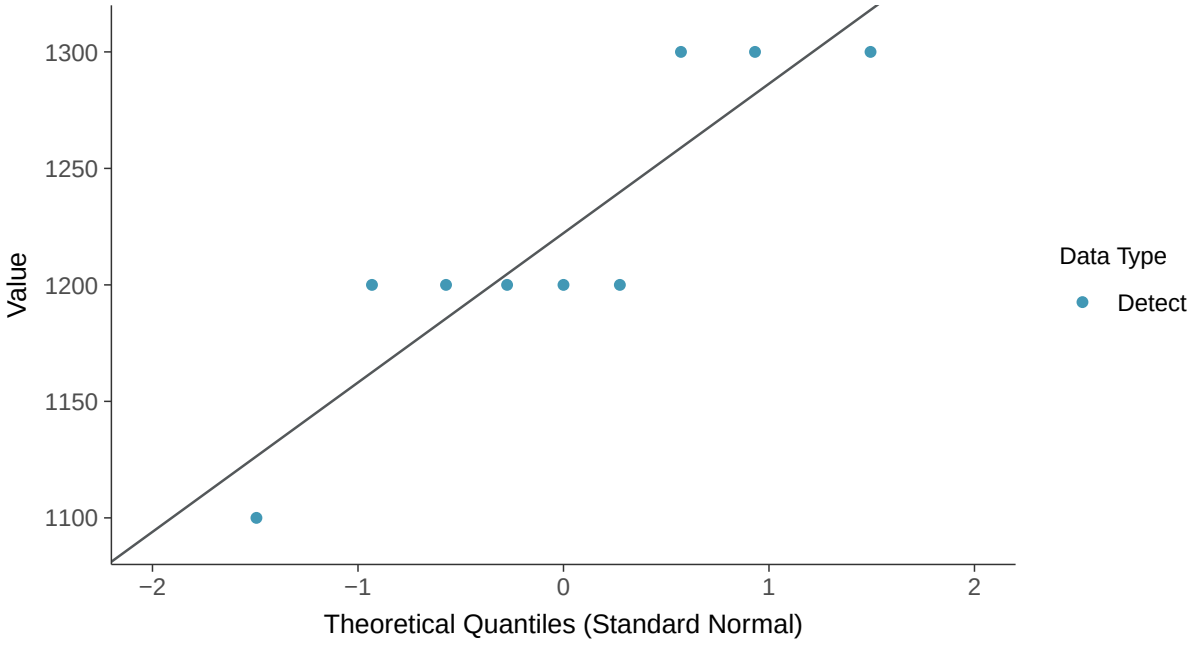
Boxplot by Season

Total Dissolved Solids, MW-06 (mg/L)



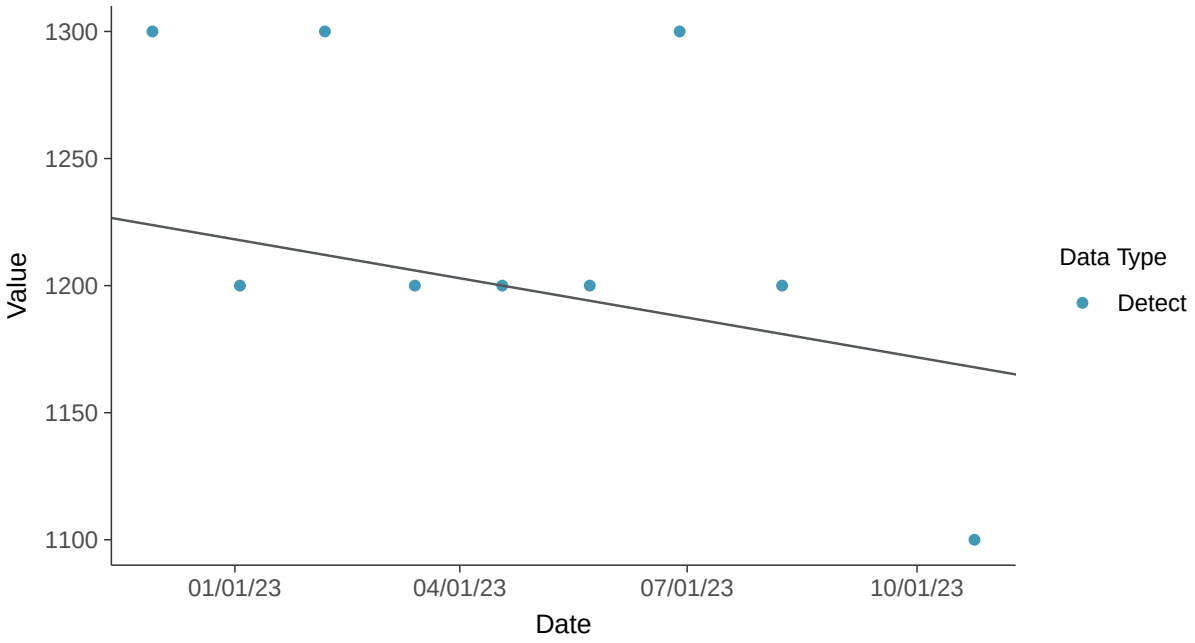
Normal Q-Q plot

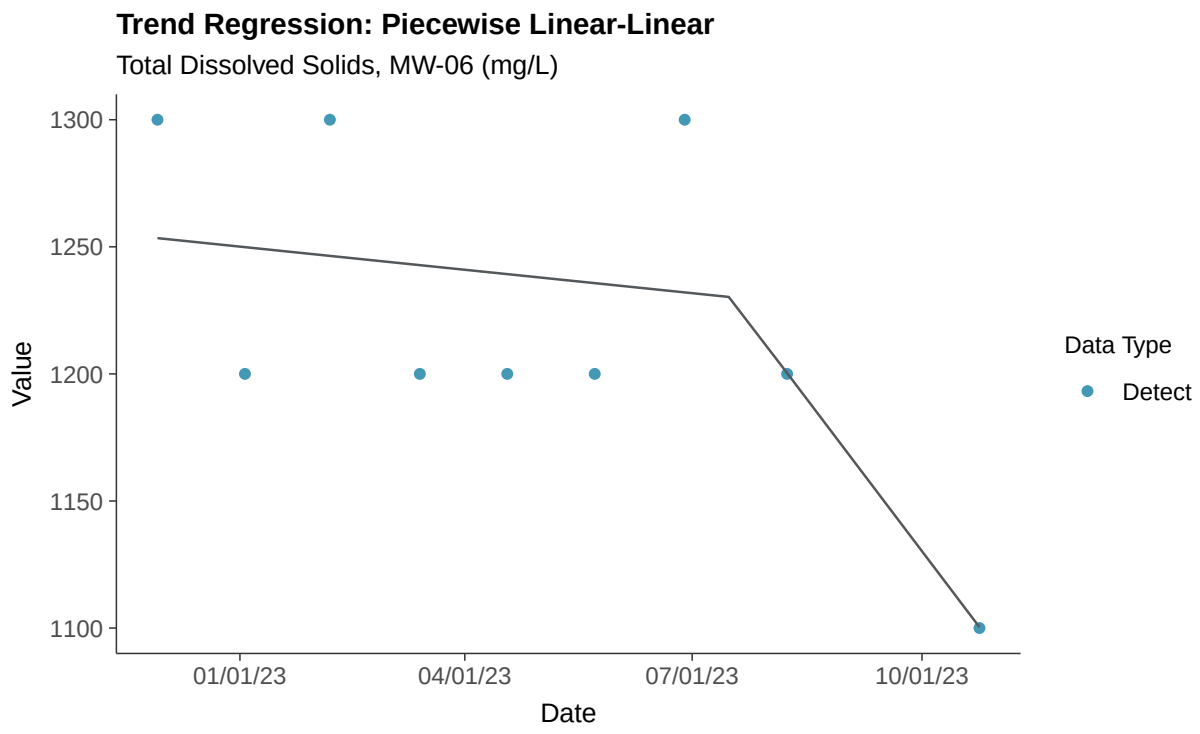
Total Dissolved Solids, MW-06 (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

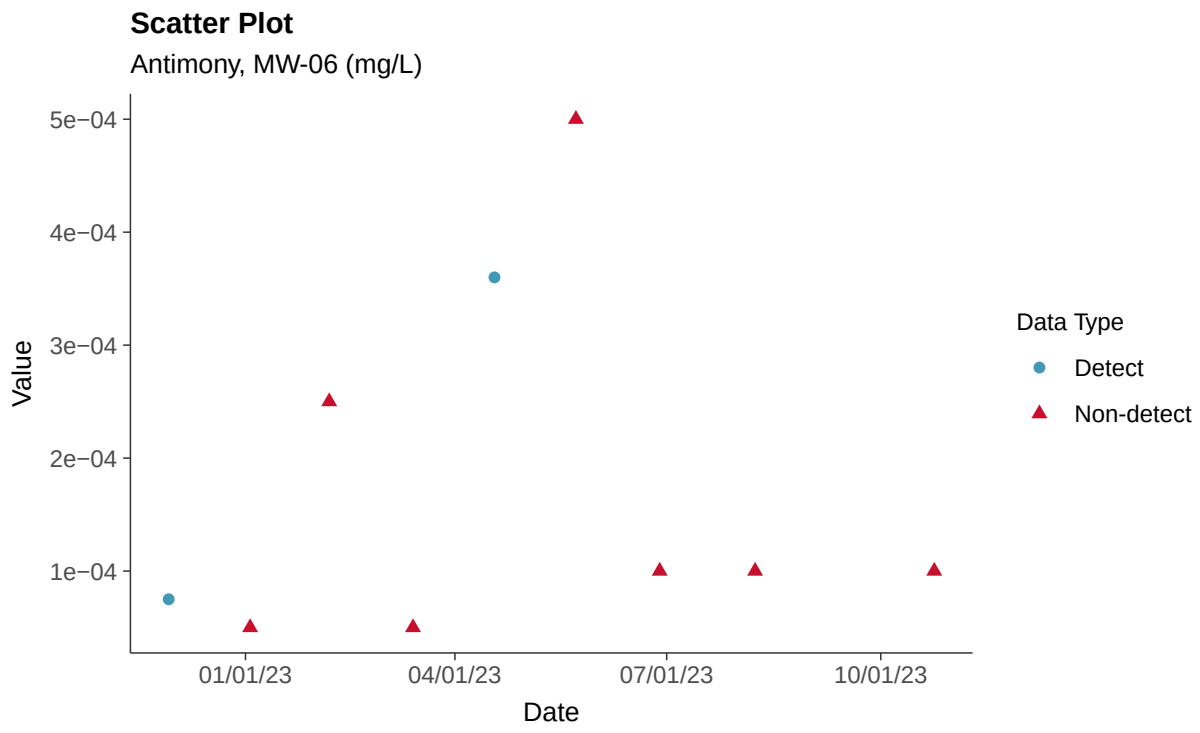
Total Dissolved Solids, MW-06 (mg/L)

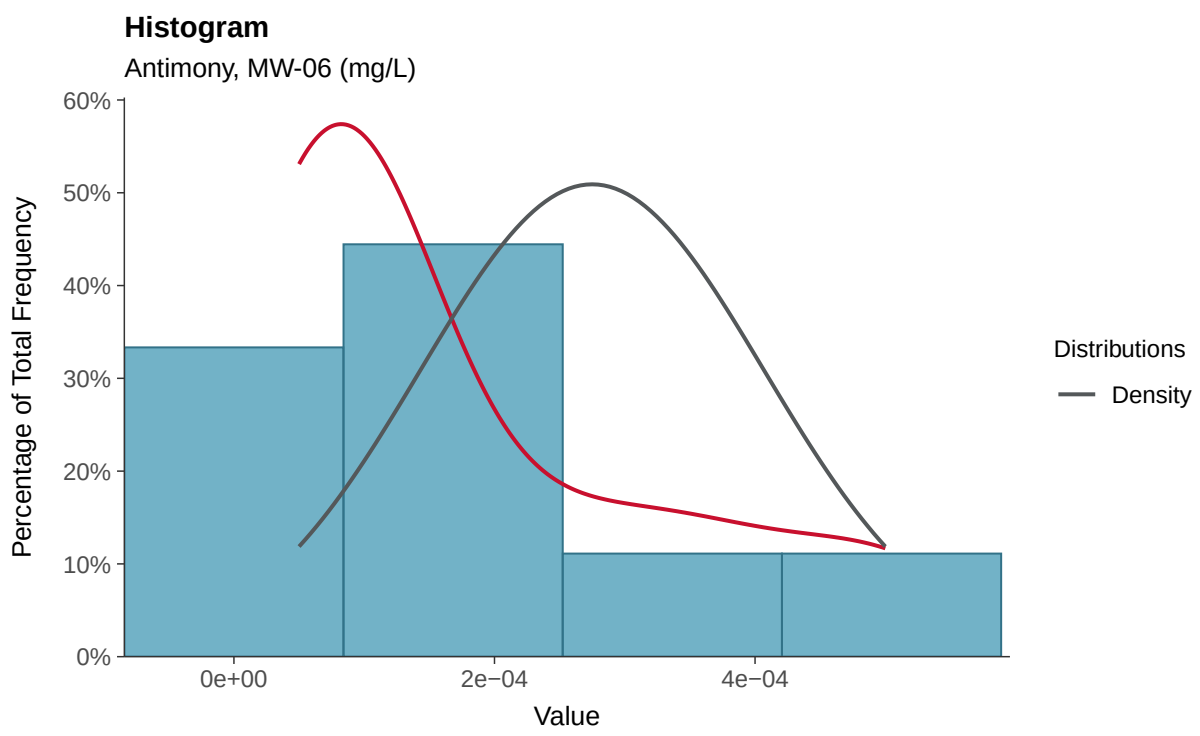



Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-06 (mg/L)
1300
1250
1200
1150
1100
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-06

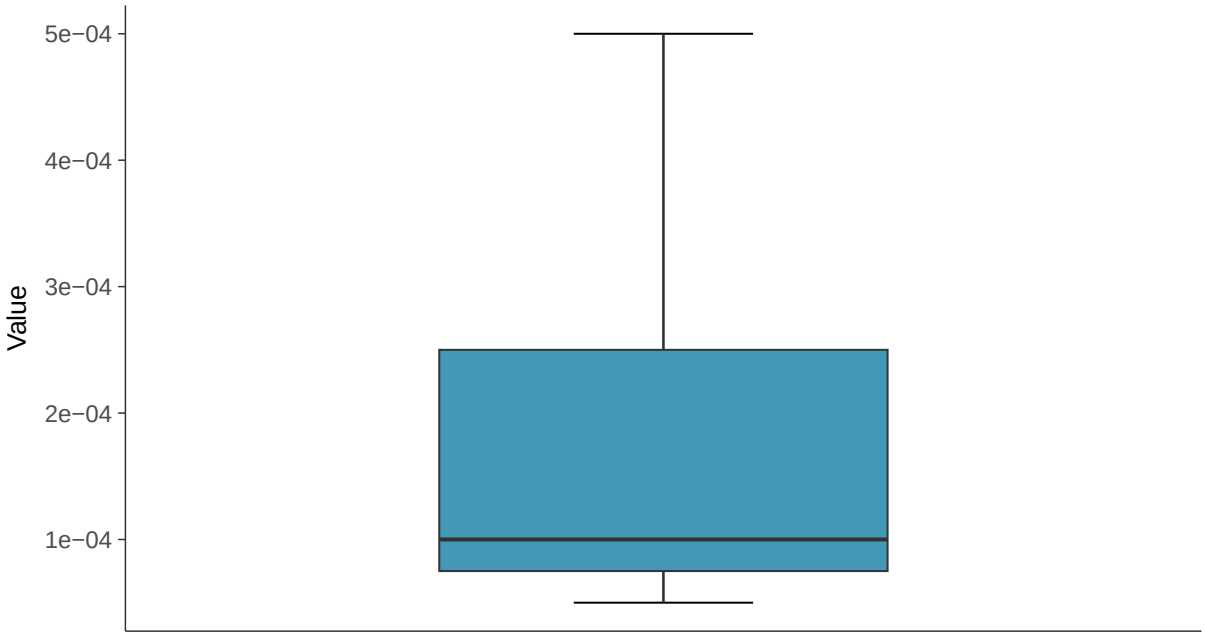
ID: 1_15_5_101





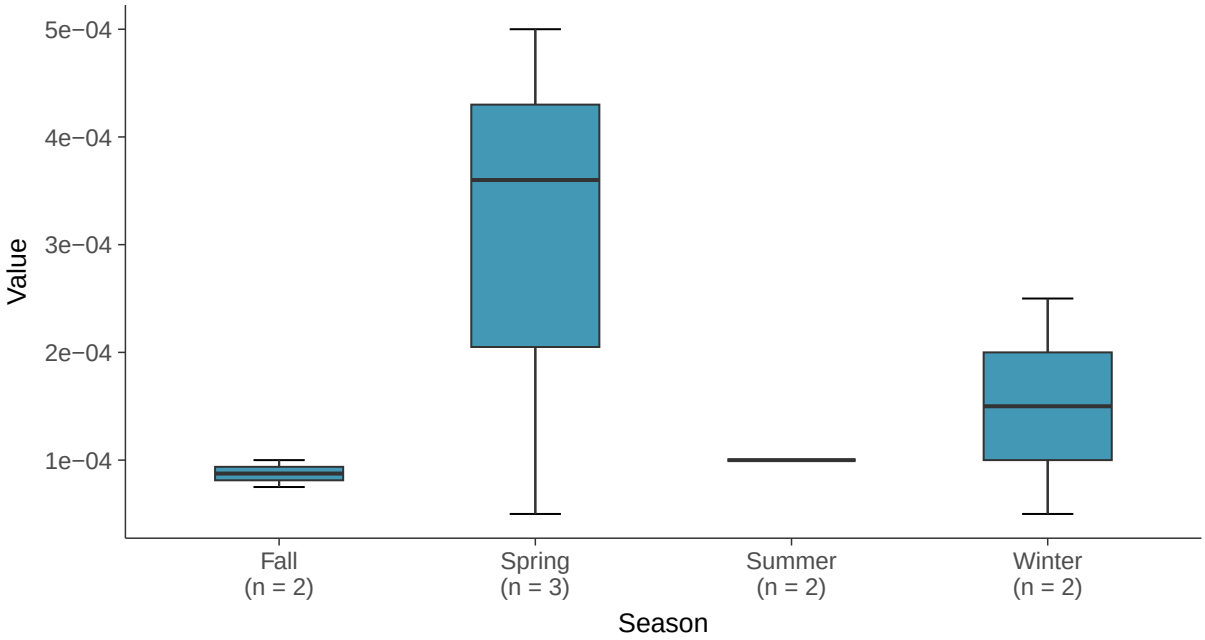
Boxplot

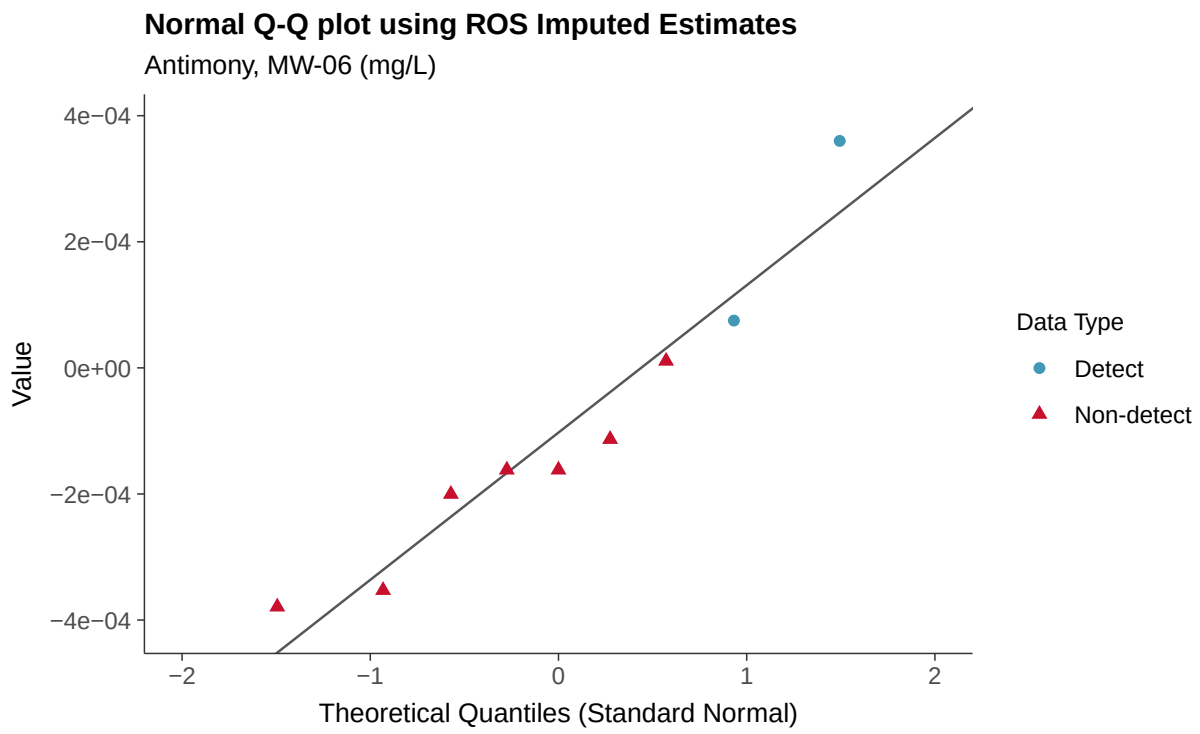
Antimony, MW-06 (mg/L)

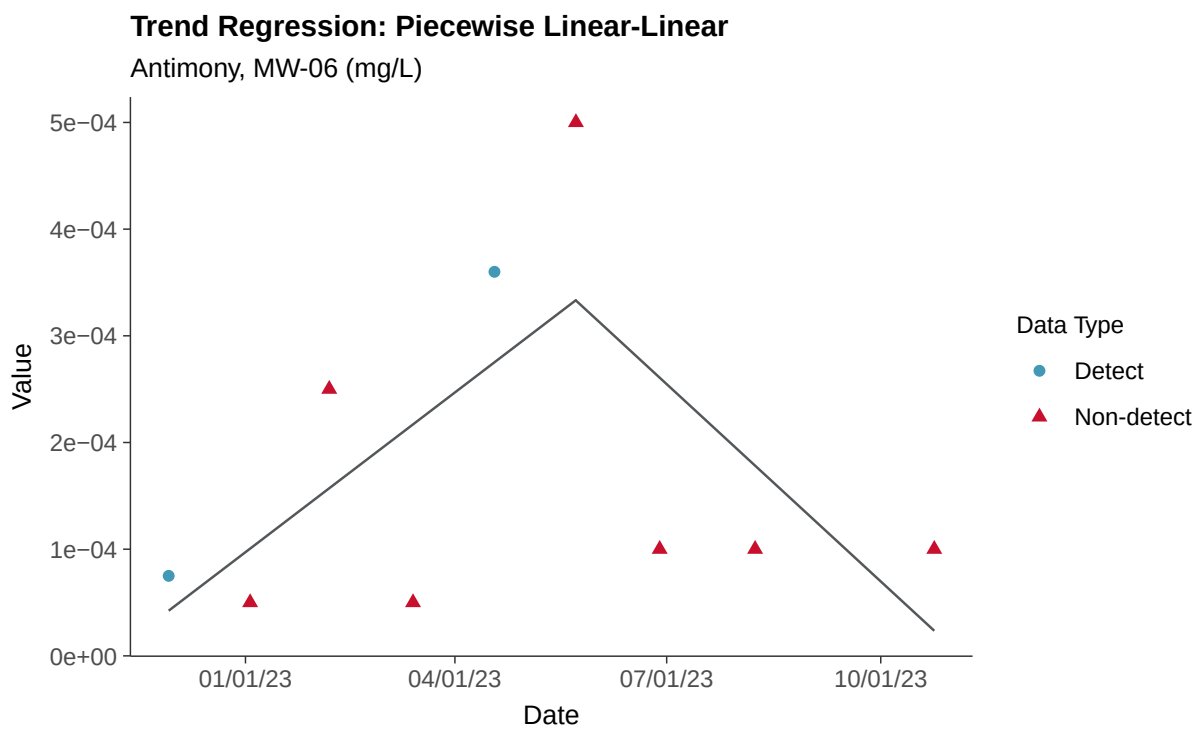


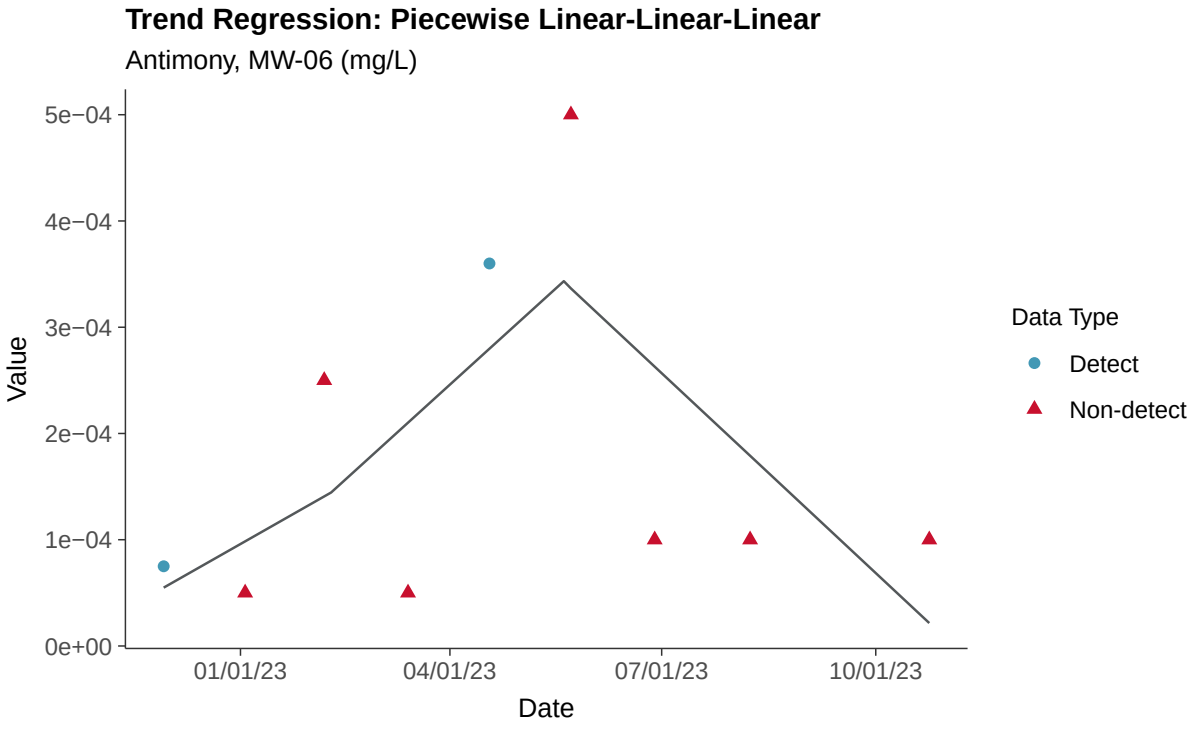
Boxplot by Season

Antimony, MW-06 (mg/L)



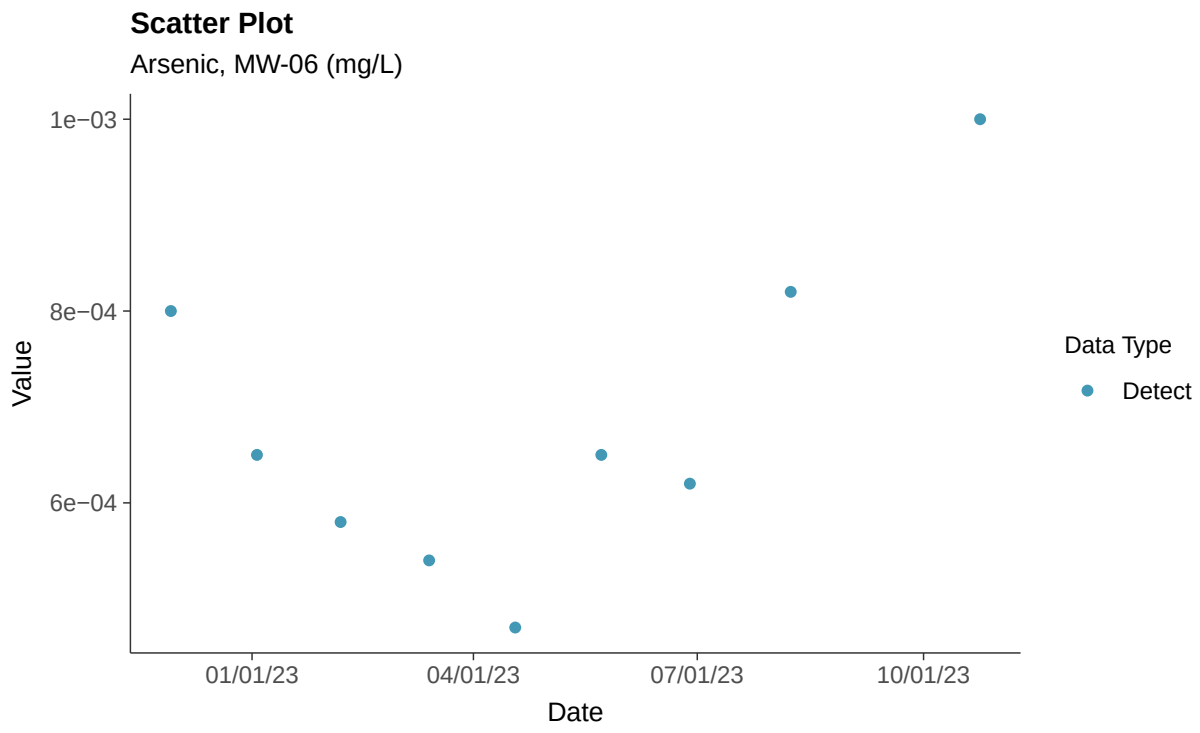

Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-06 (mg/L)
Value
4e−04
2e−04
0e+00
−2e−04
−4e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

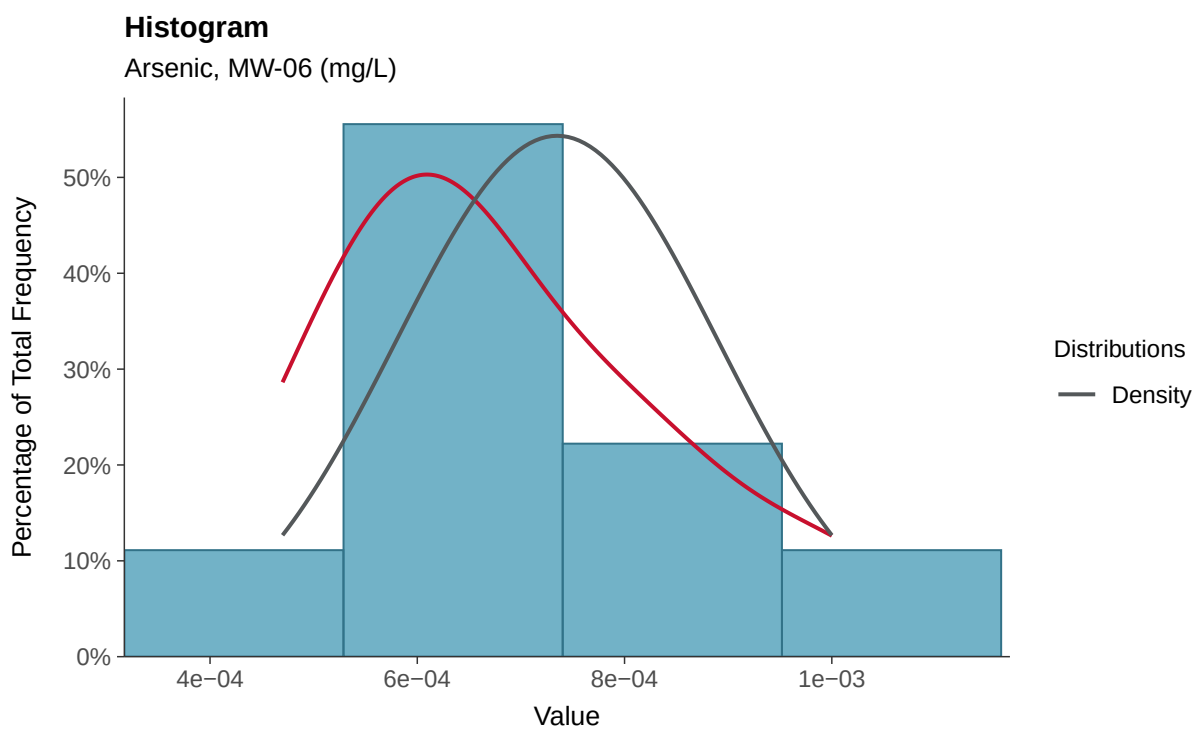

Trend Regression: Piecewise Linear-Linear
Antimony, MW-06 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-06 (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
0e+00
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-06

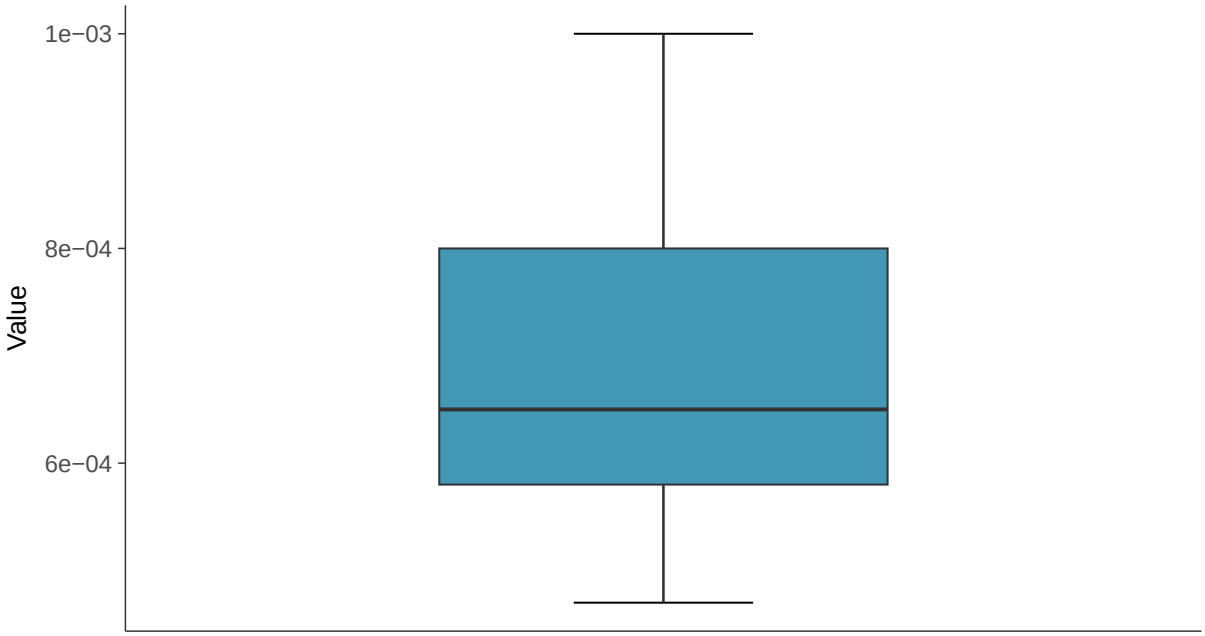
ID: 1_15_5_102





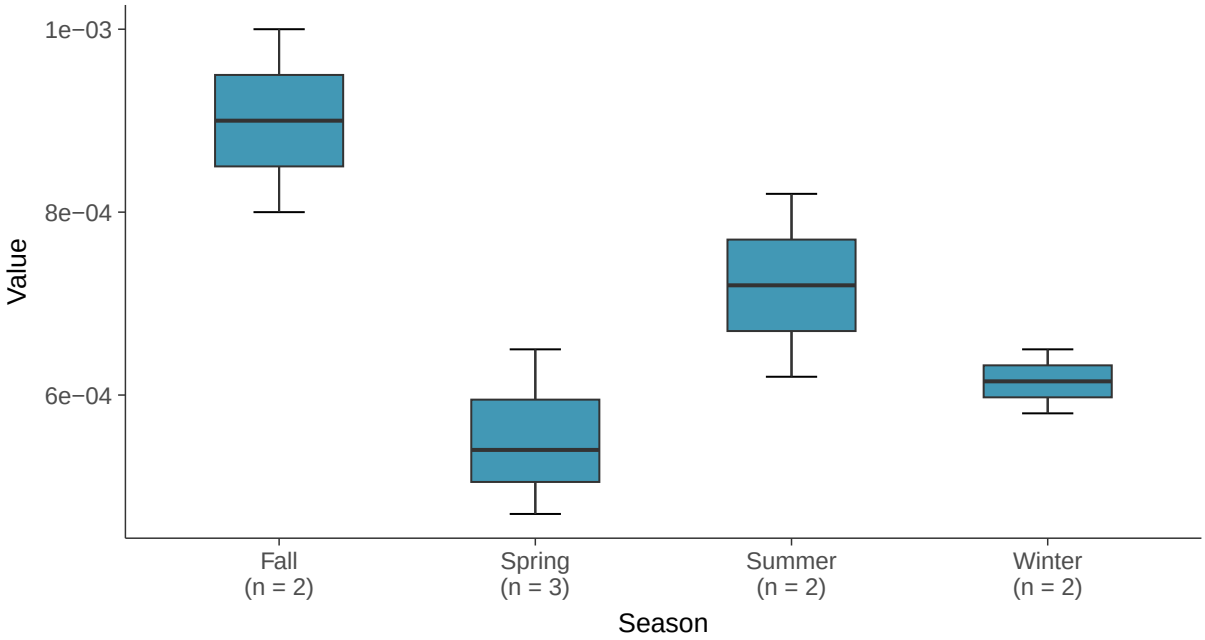
Boxplot

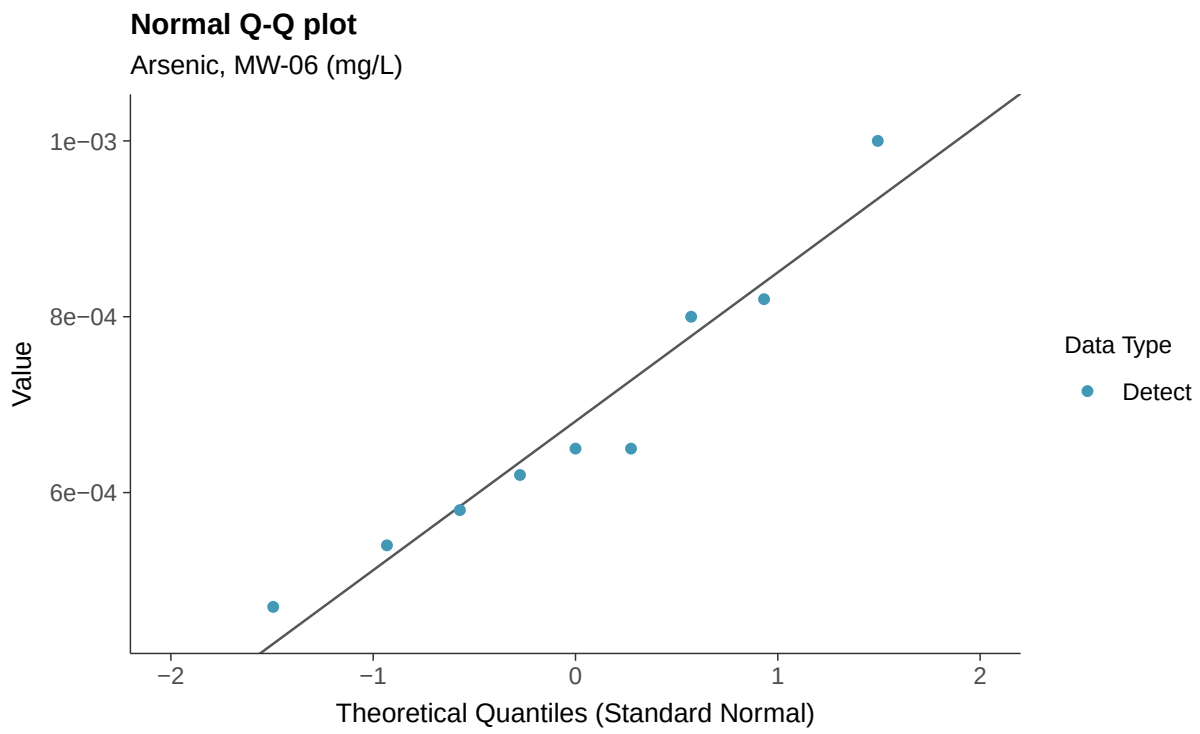
Arsenic, MW-06 (mg/L)

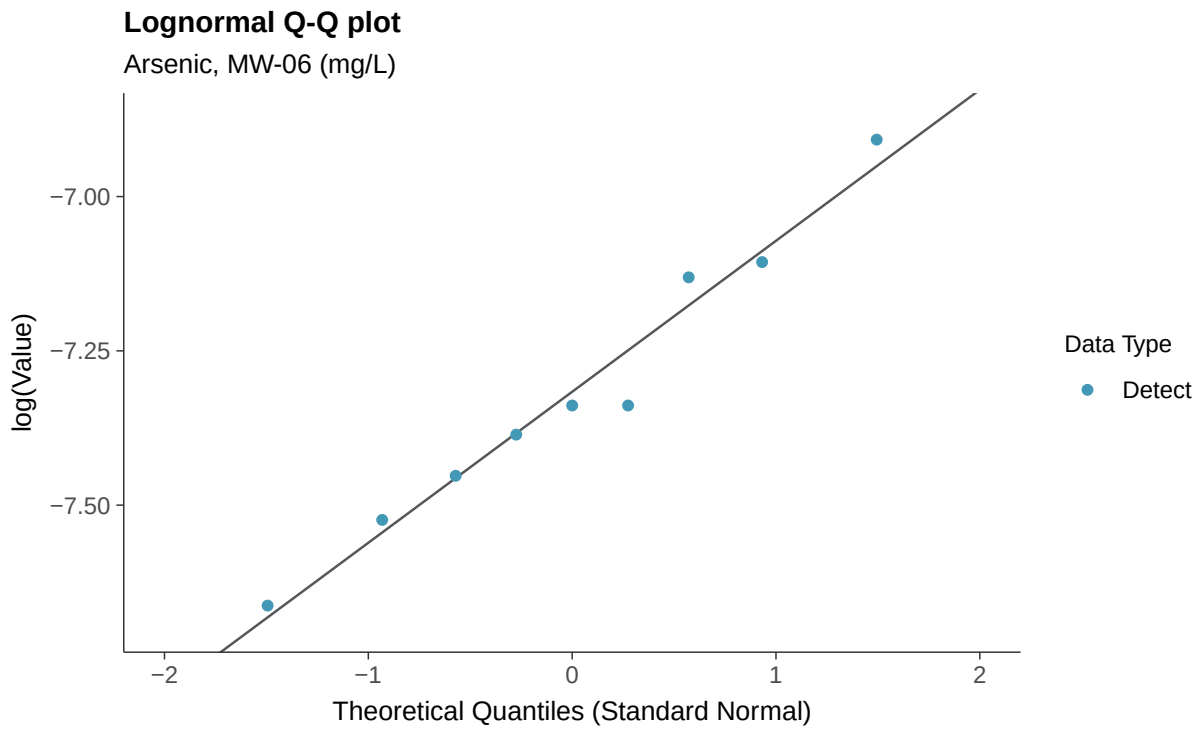


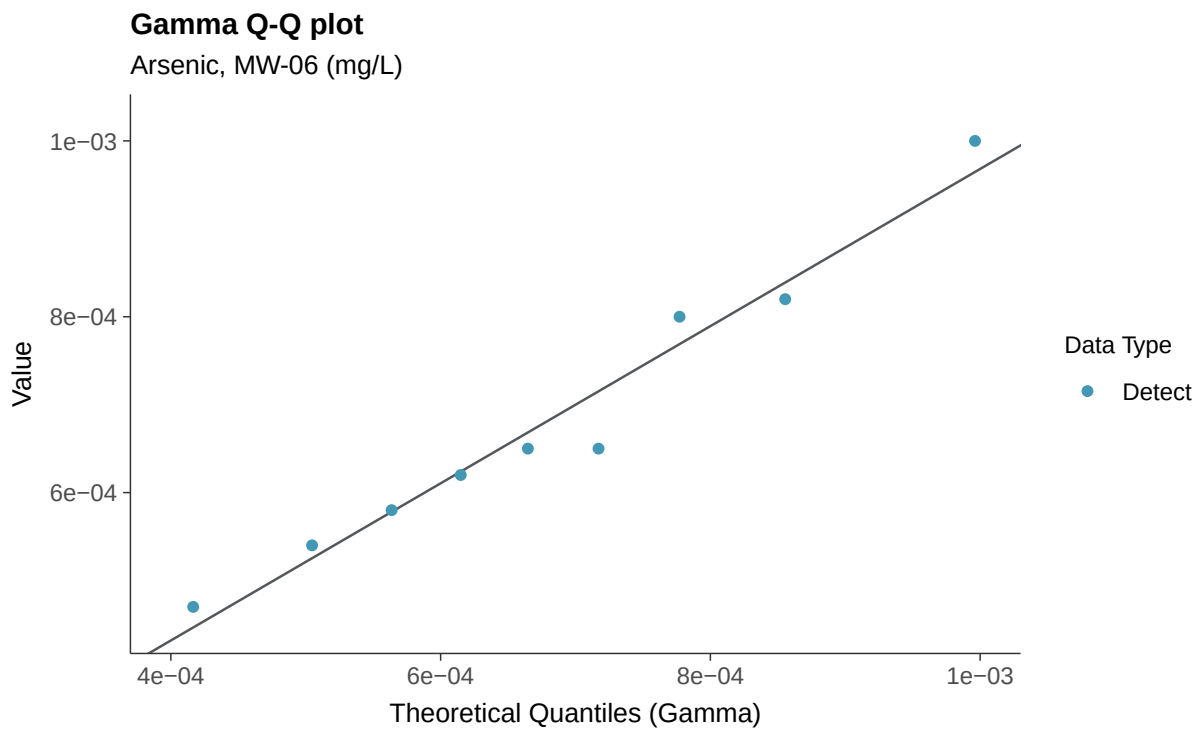
Boxplot by Season

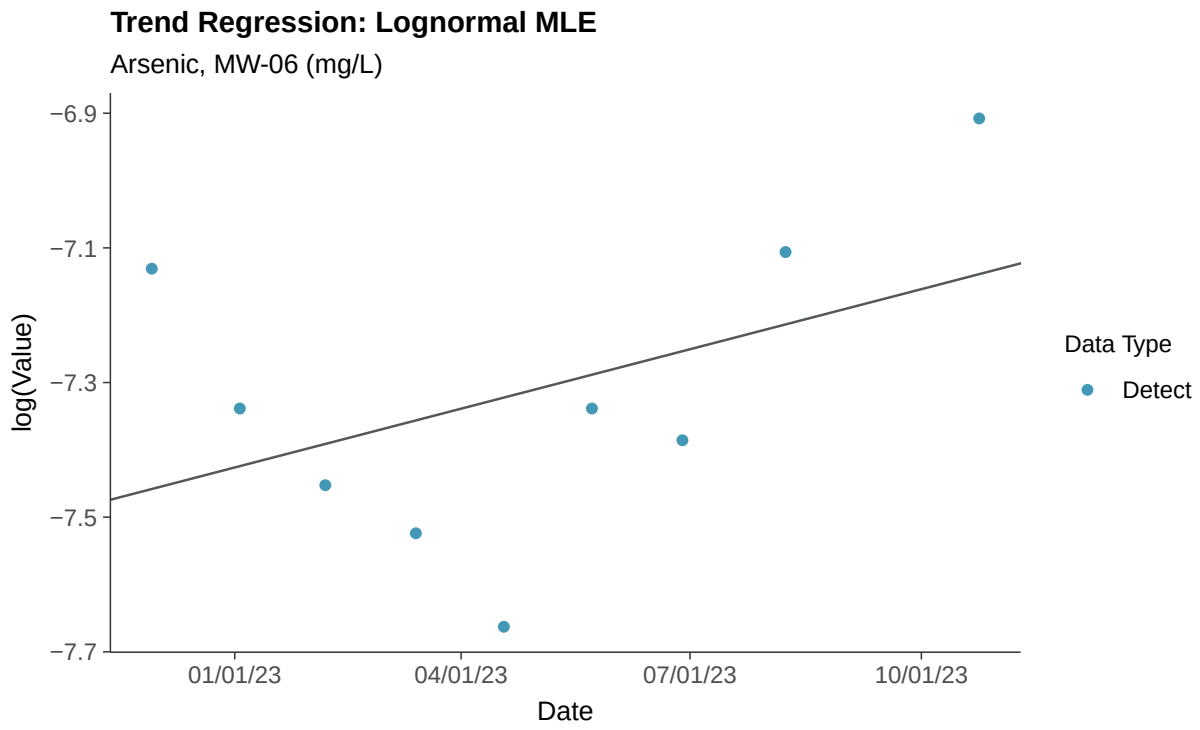
Arsenic, MW-06 (mg/L)




Normal Q-Q plot
Arsenic, MW-06 (mg/L)
Value
1e−03
8e−04
6e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

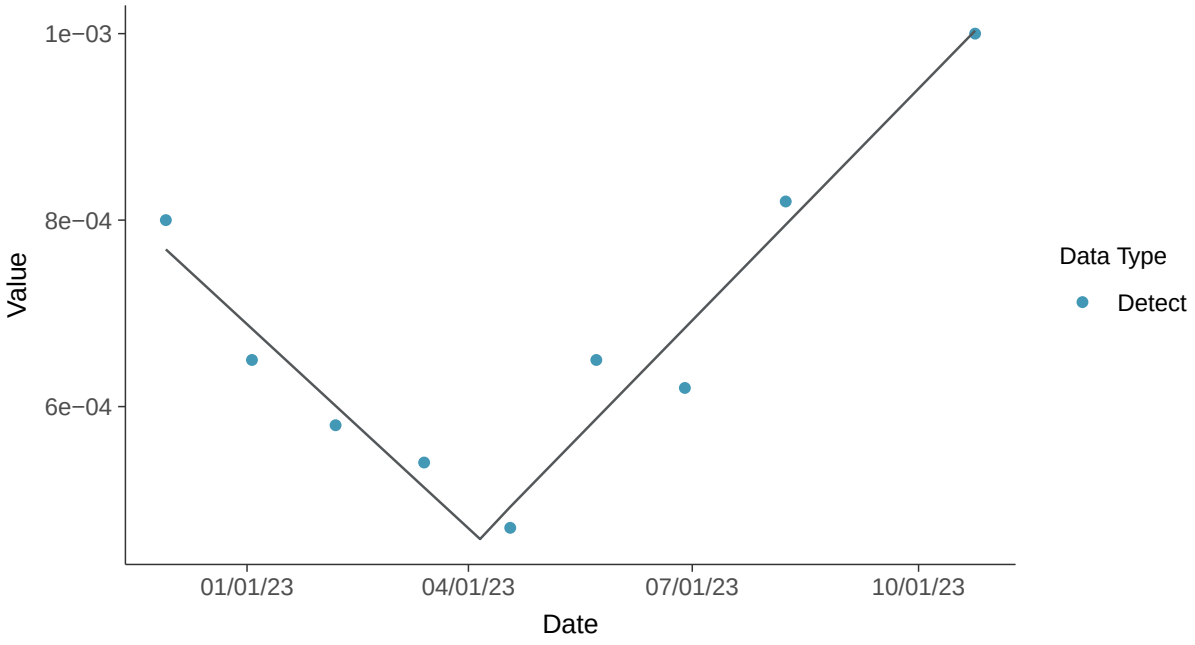

Lognormal Q-Q plot
Arsenic, MW-06 (mg/L)
log(Value)
−7.00
−7.25
−7.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-06 (mg/L)
1e−03
8e−04
6e−04
Value
4e−04
6e−04
8e−04
1e−03
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Arsenic, MW-06 (mg/L)
−6.9
−7.1
−7.3
−7.5
−7.7
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

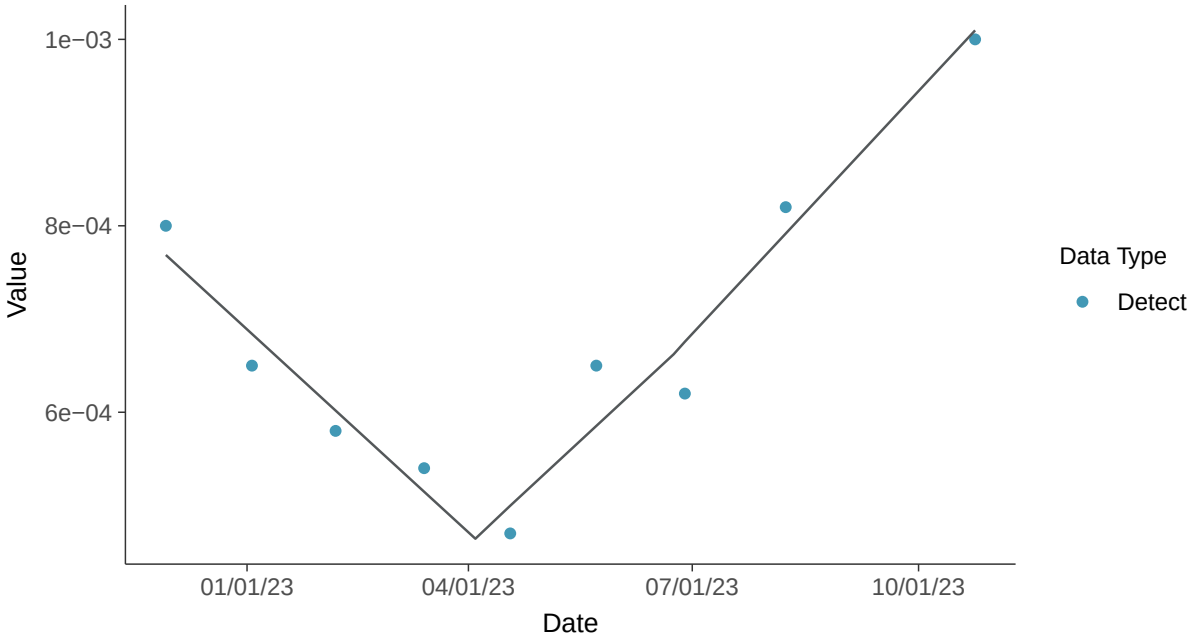
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-06 (mg/L)



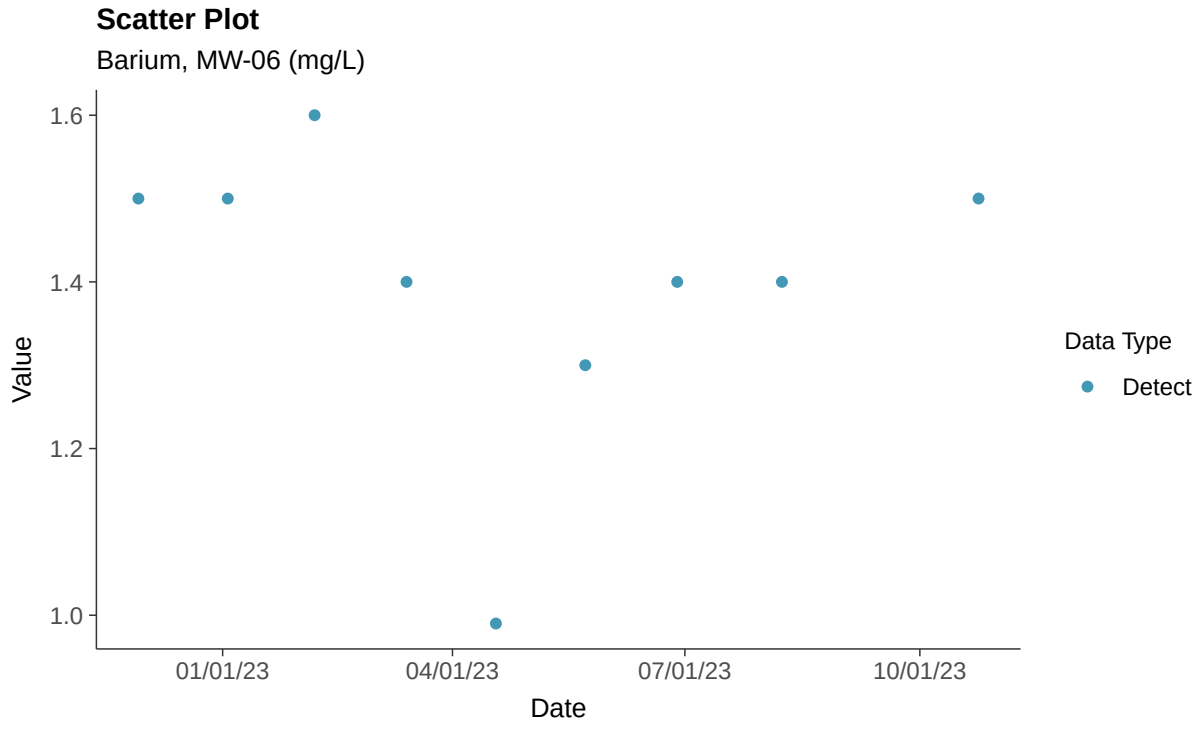
Trend Regression: Piecewise Linear-Linear-Linear

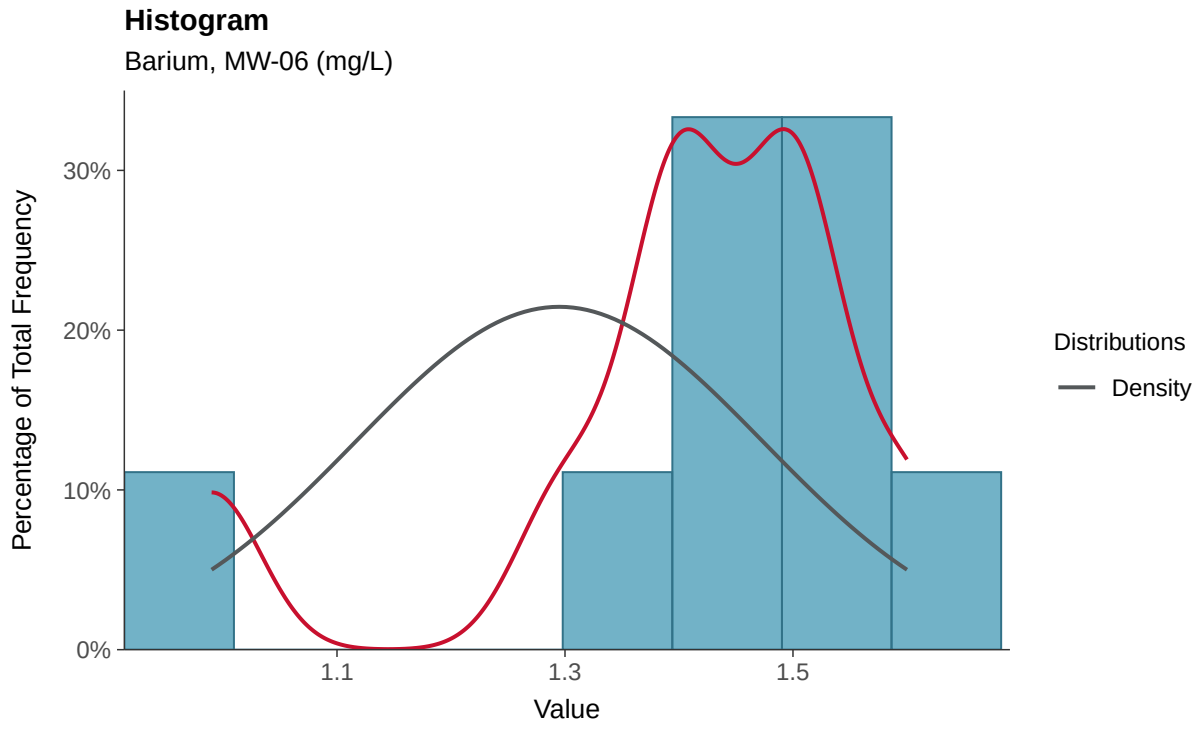
Arsenic, MW-06 (mg/L)



Appendix IV: Barium, MW-06

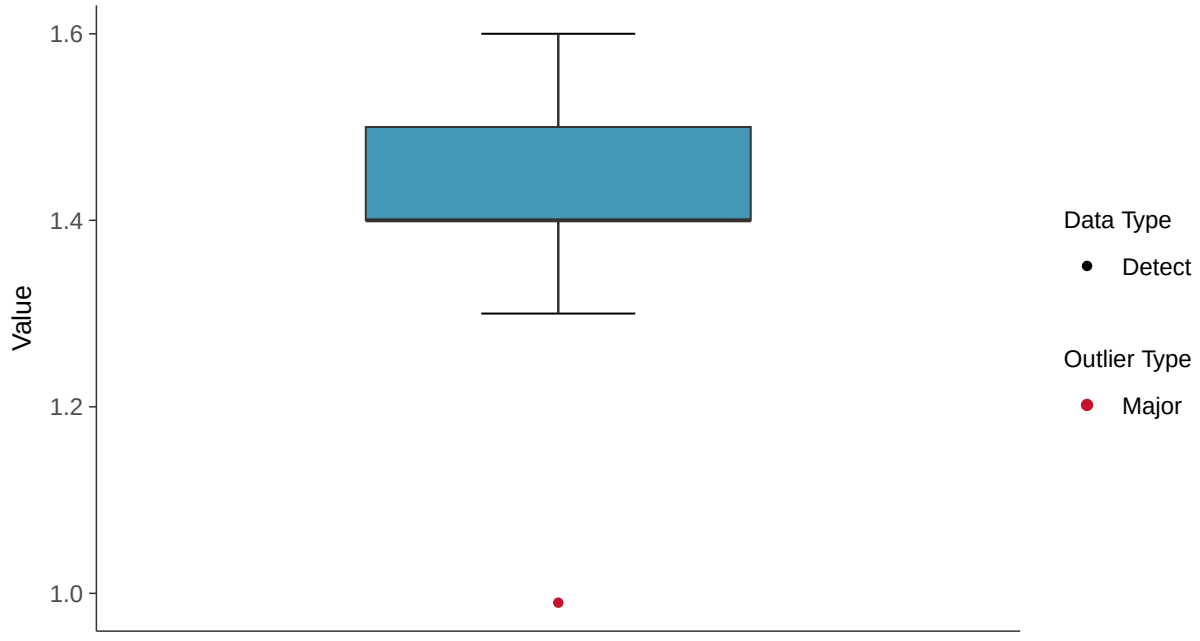
ID: 1_15_5_103





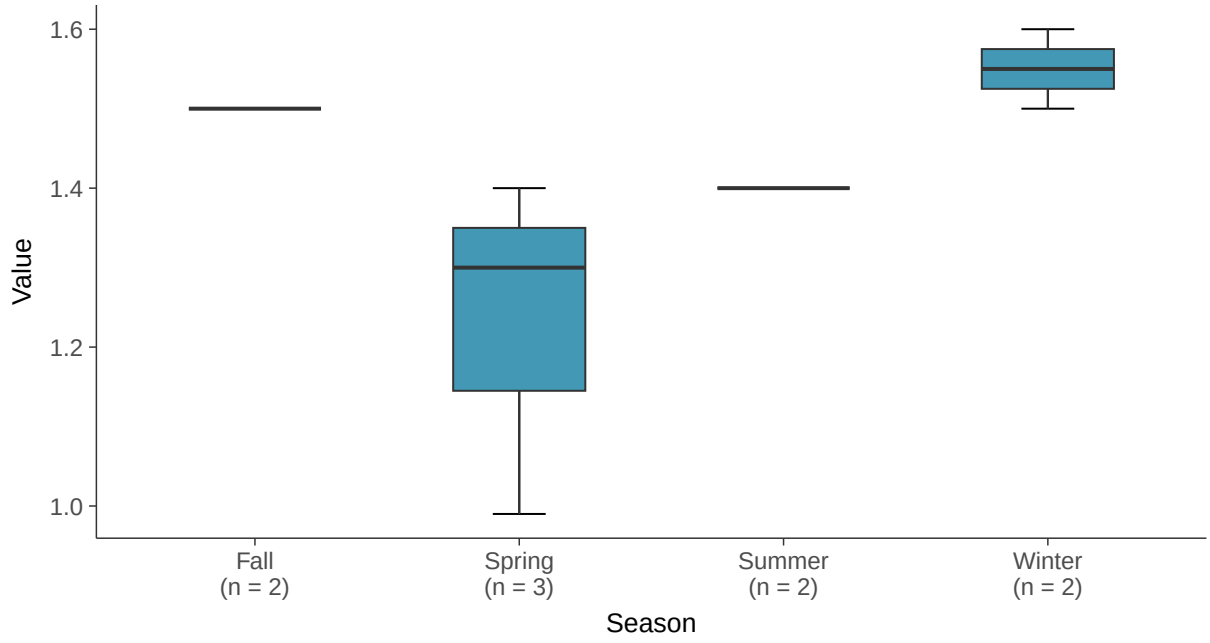
Boxplot

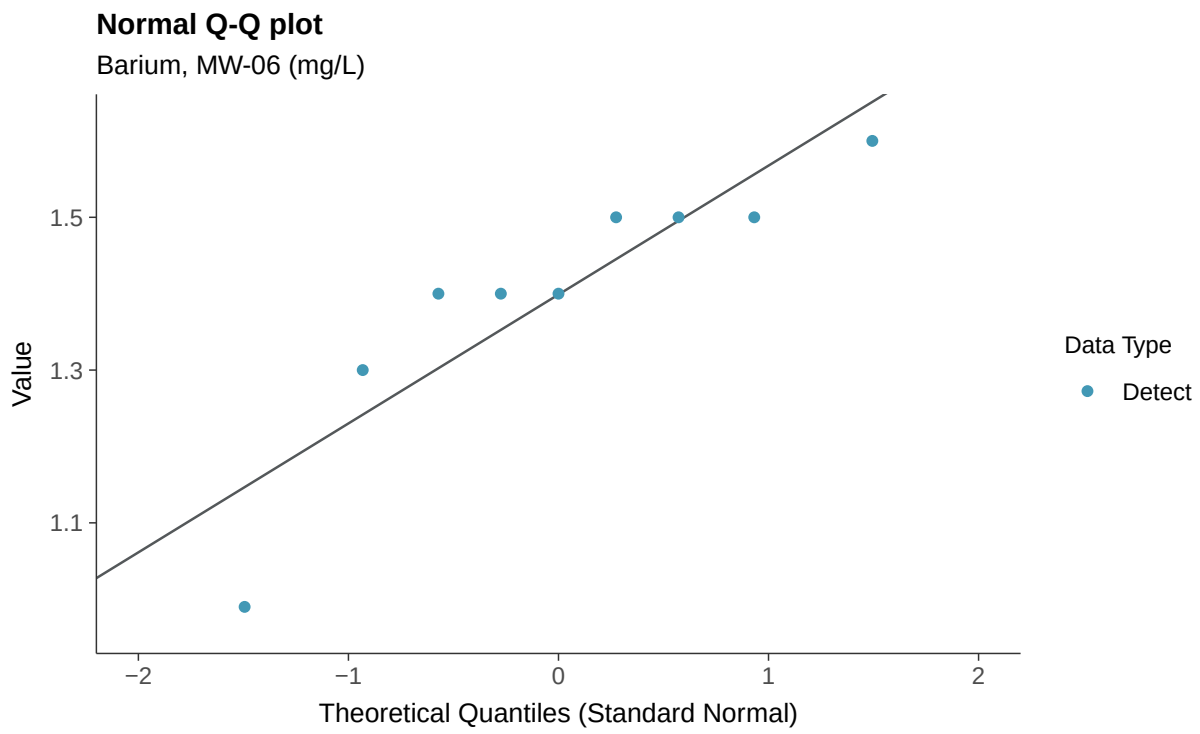
Barium, MW-06 (mg/L)

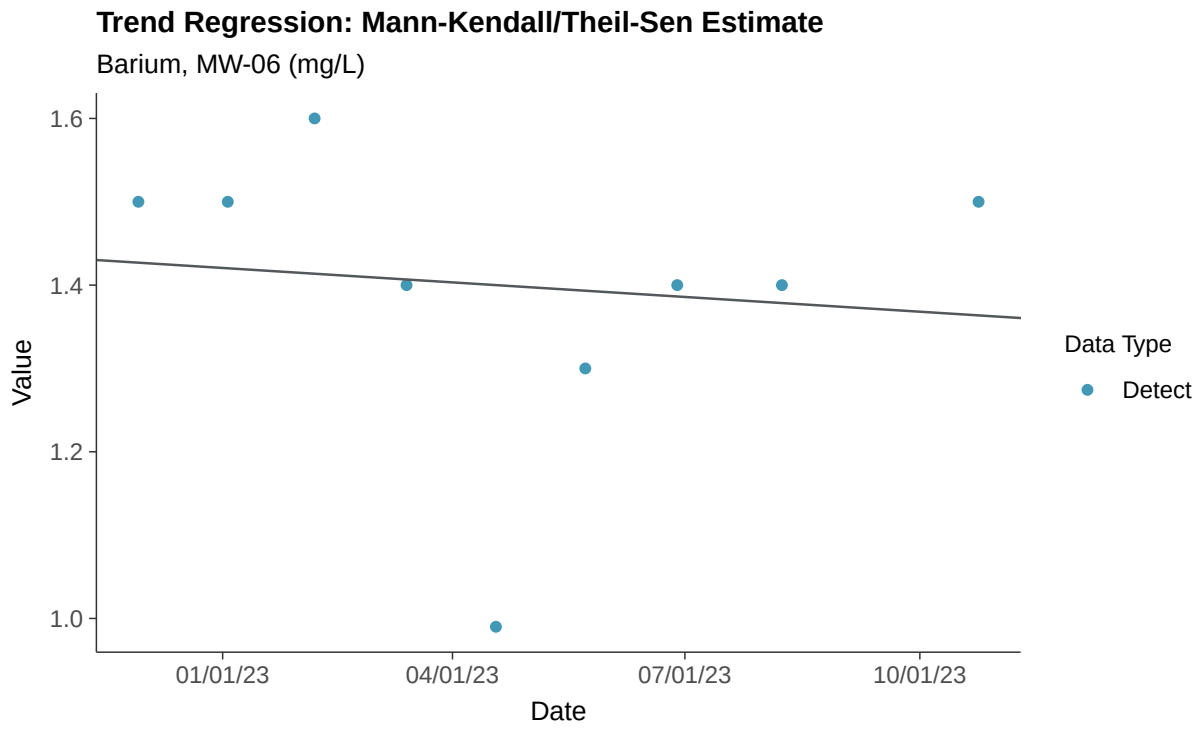


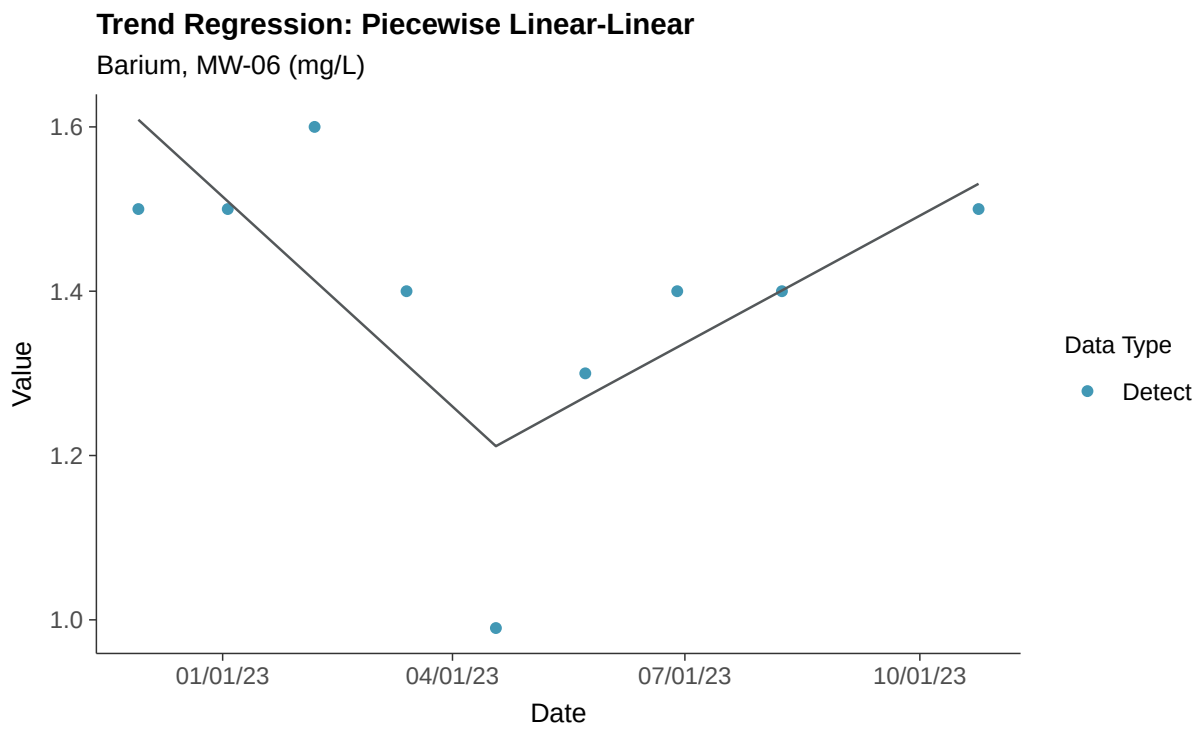
Boxplot by Season

Barium, MW-06 (mg/L)



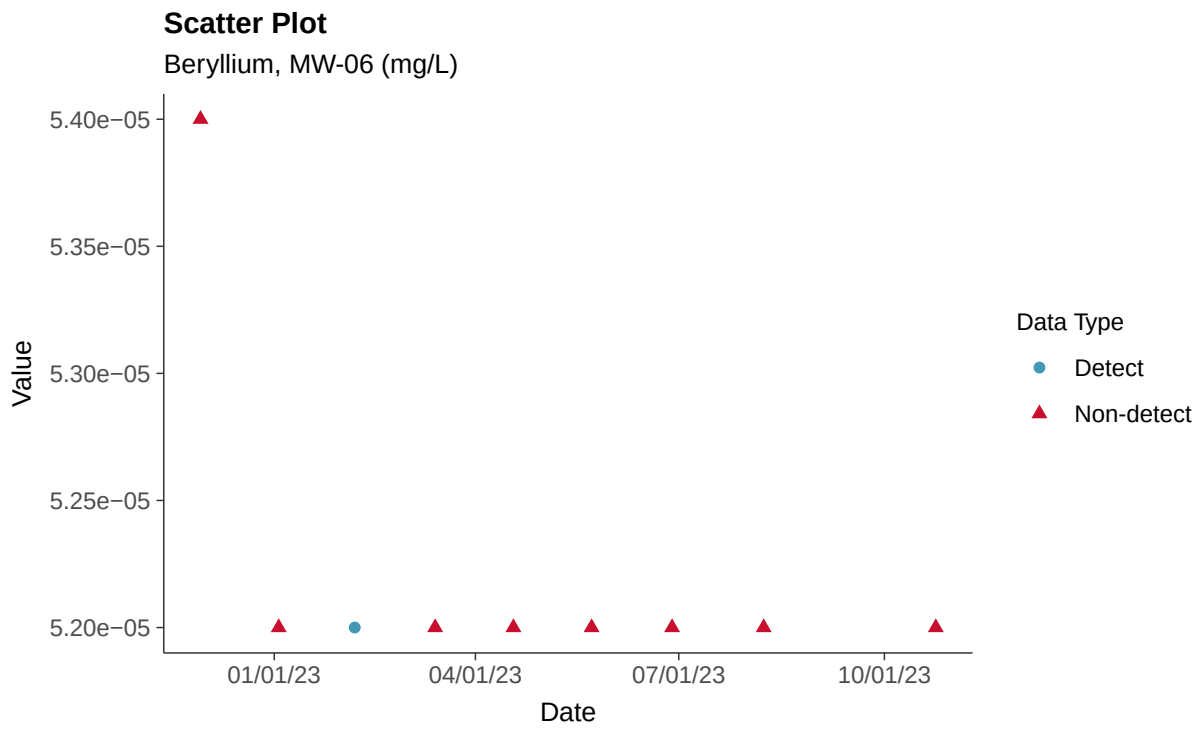

Normal Q-Q plot
Barium, MW-06 (mg/L)
Value
1.5
1.3
1.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

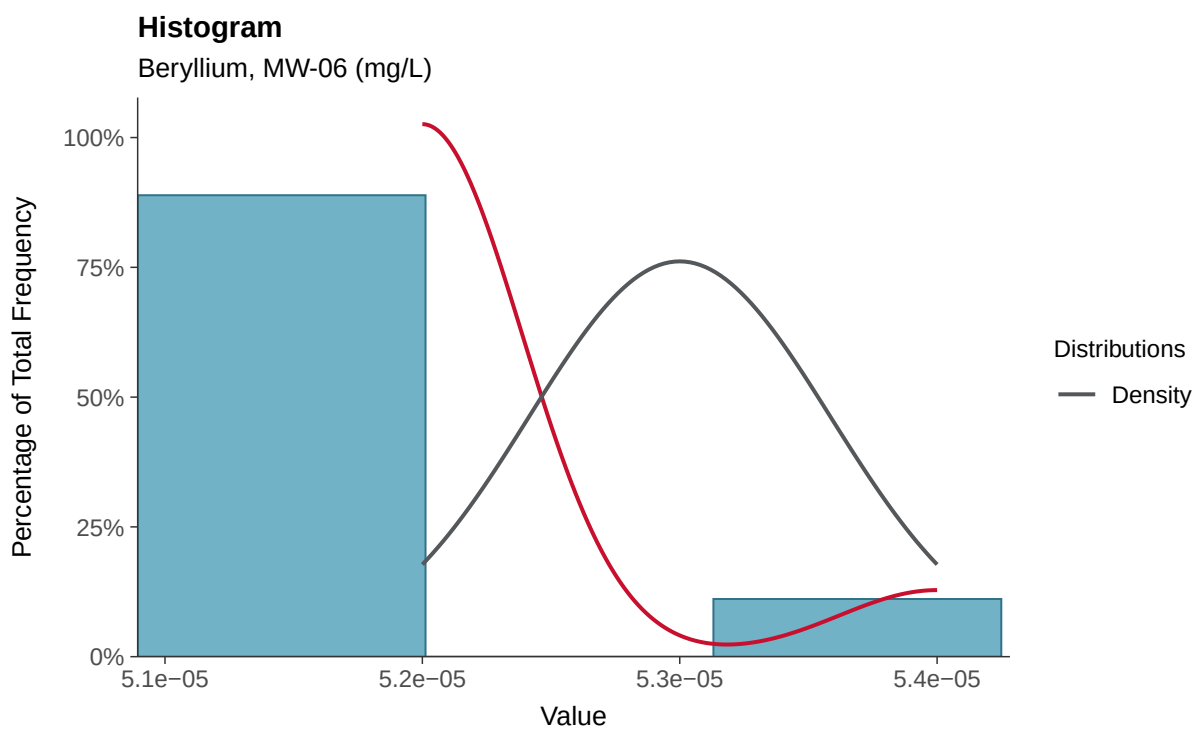

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Barium, MW-06 (mg/L)
Value
1.6
1.4
1.2
1.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Barium, MW-06 (mg/L)
1.6
1.4
1.2
1.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-06

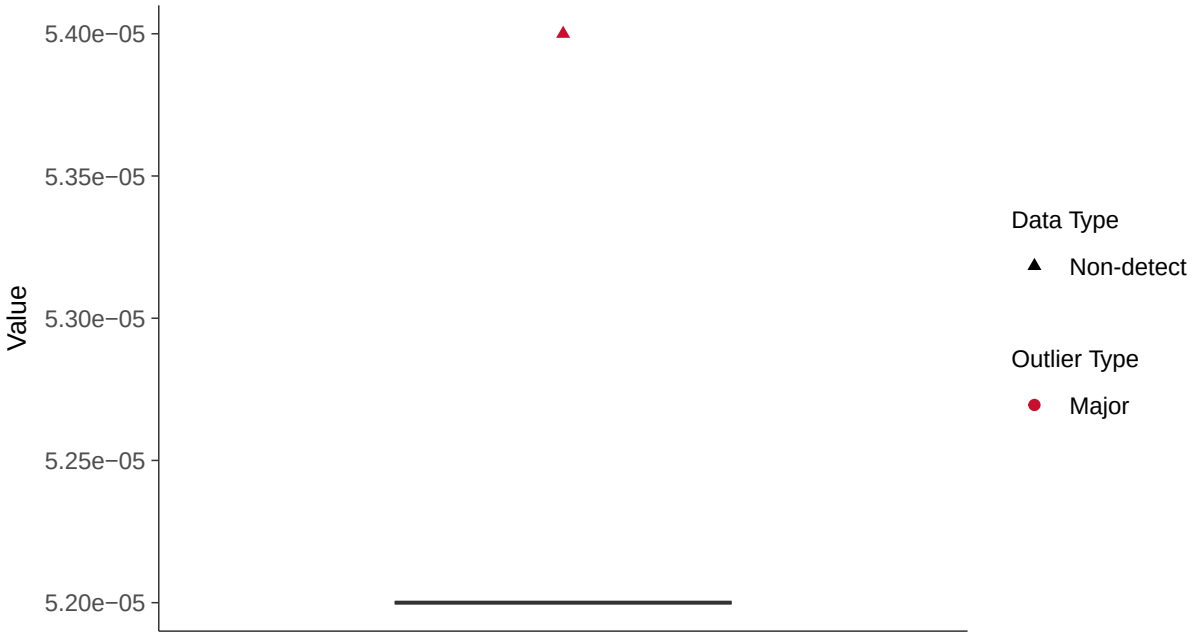
ID: 1_15_5_104





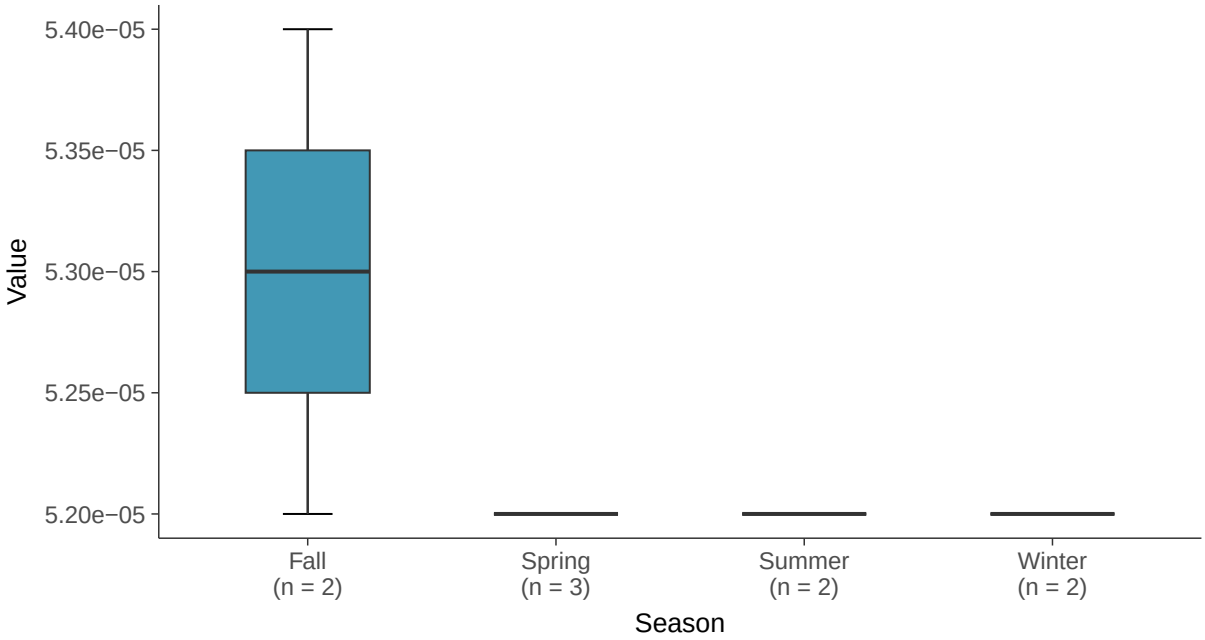
Boxplot

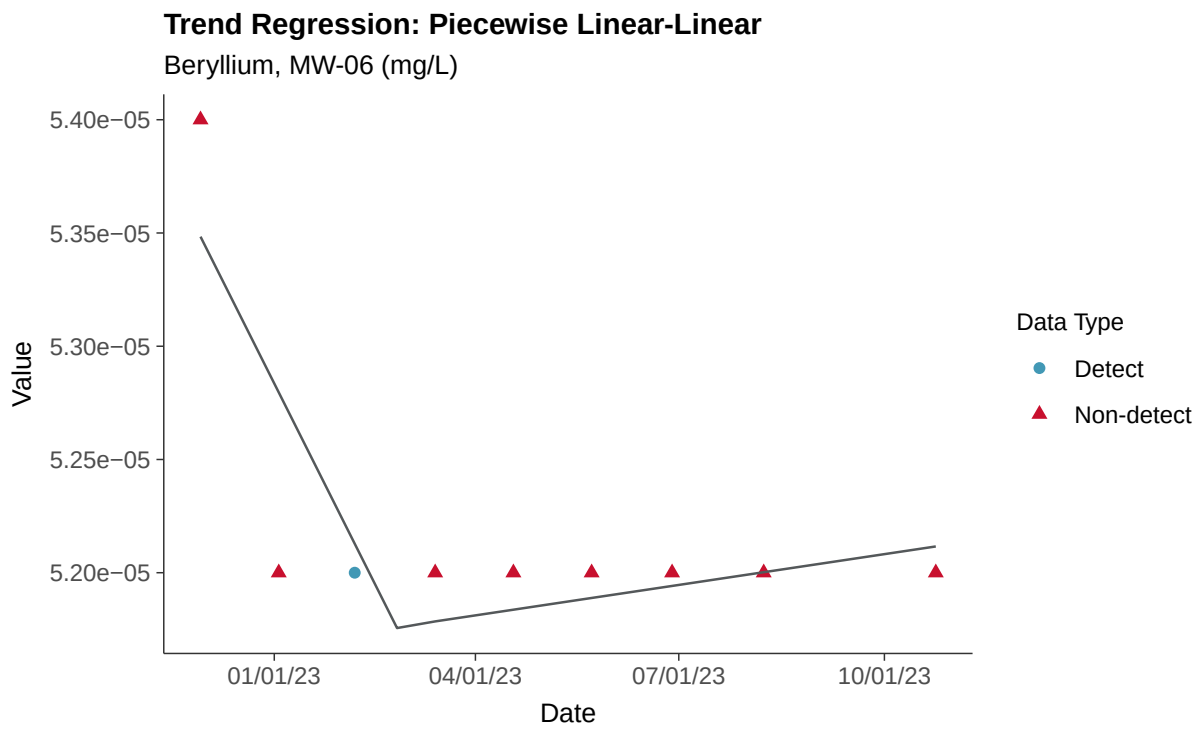
Beryllium, MW-06 (mg/L)

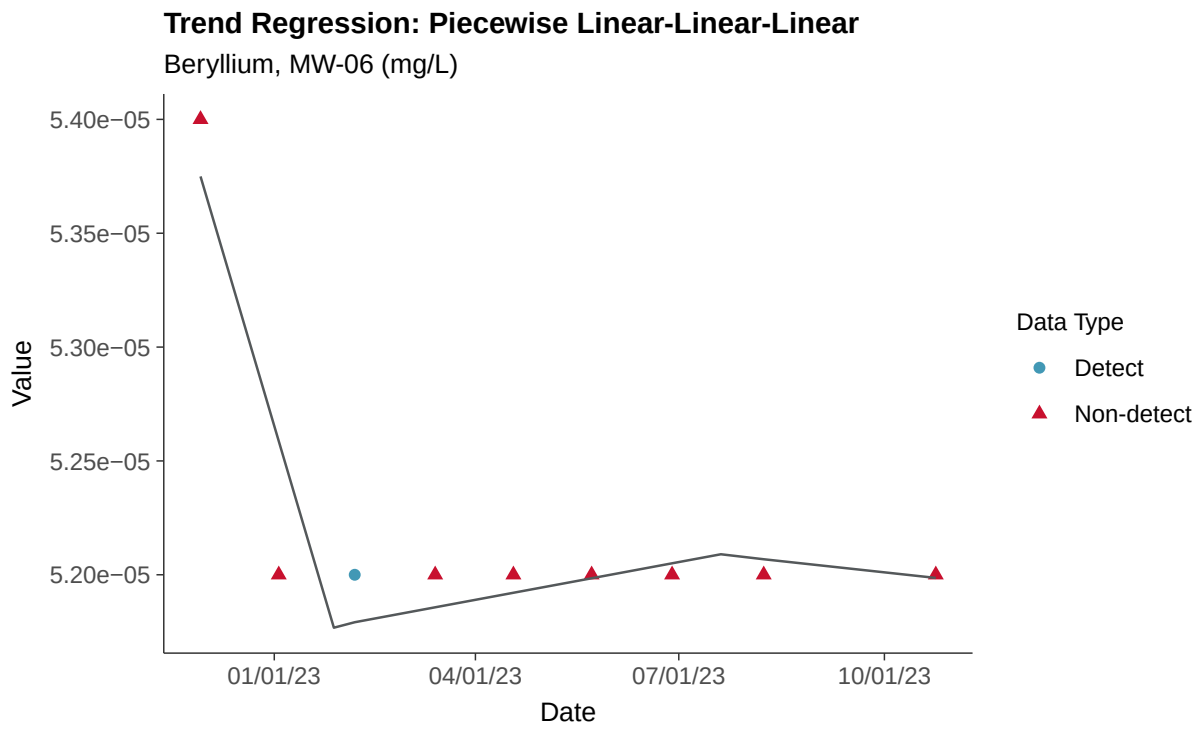


Boxplot by Season

Beryllium, MW-06 (mg/L)

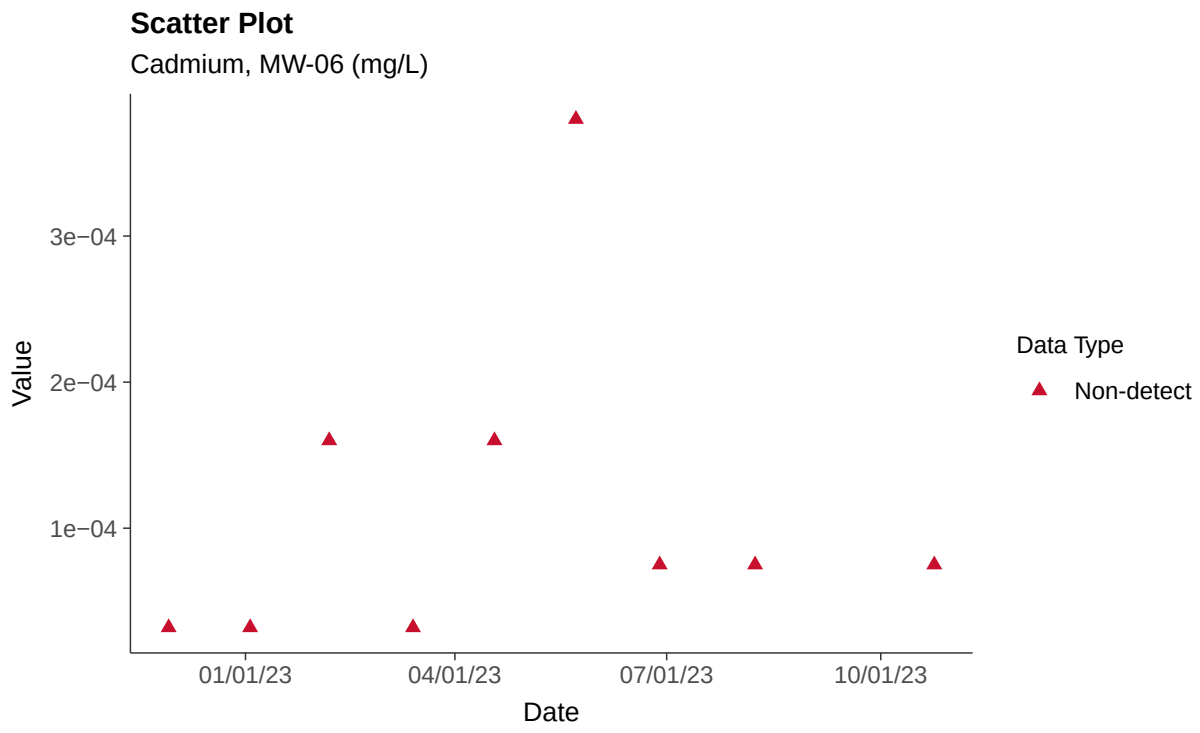


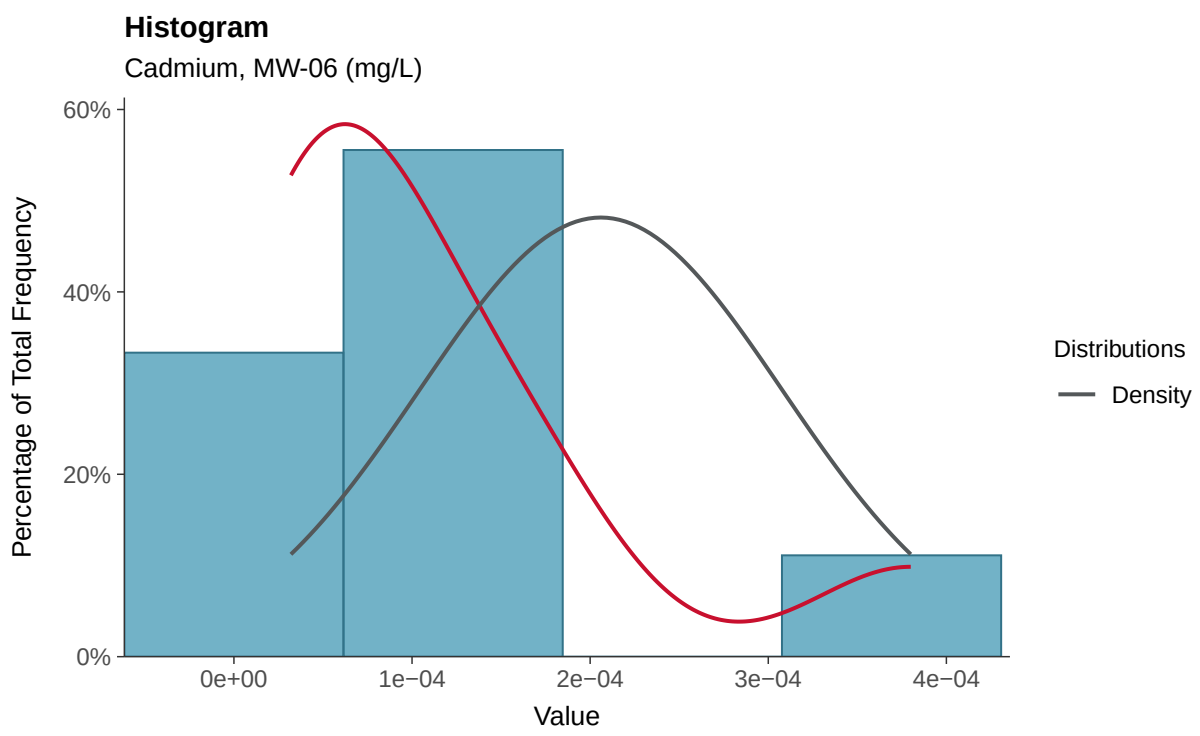

Trend Regression: Piecewise Linear-Linear
Beryllium, MW-06 (mg/L)
5.40e−05
5.35e−05
5.30e−05
5.25e−05
5.20e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Beryllium, MW-06 (mg/L)
5.40e−05
5.35e−05
5.30e−05
5.25e−05
5.20e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Cadmium, MW-06

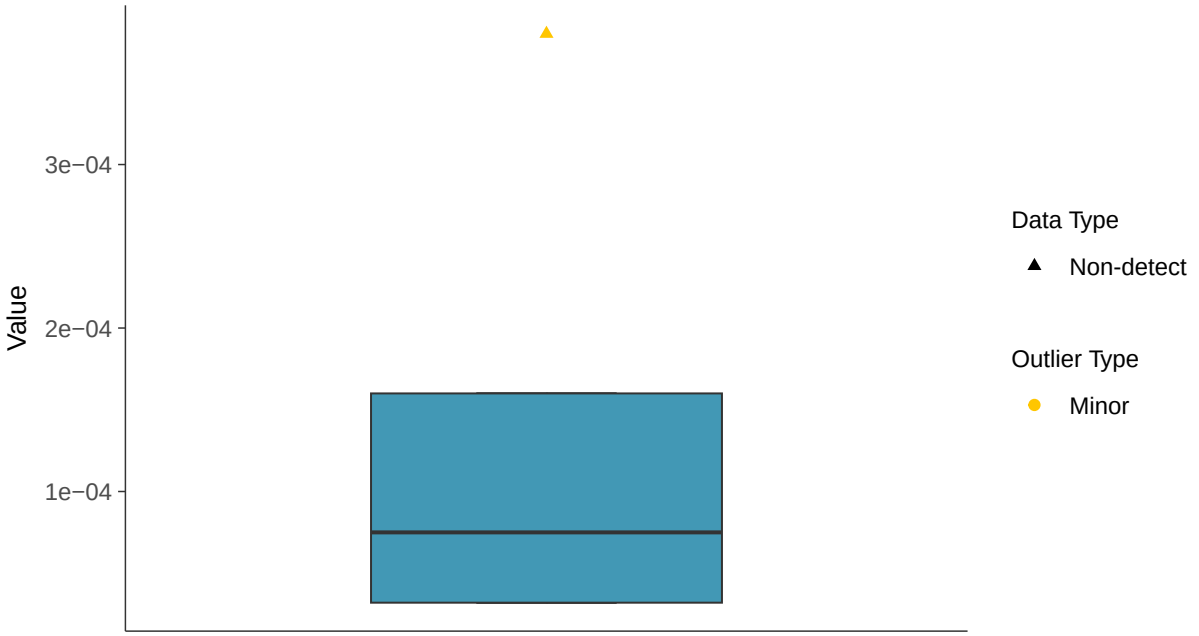
ID: 1_15_5_106





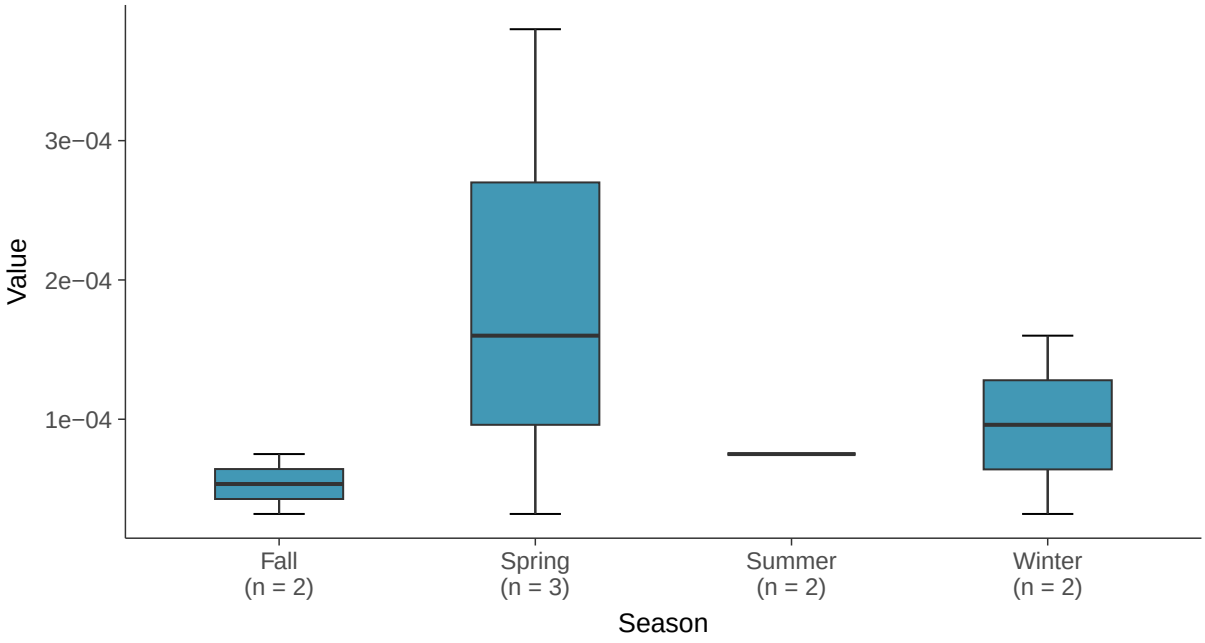
Boxplot

Cadmium, MW-06 (mg/L)



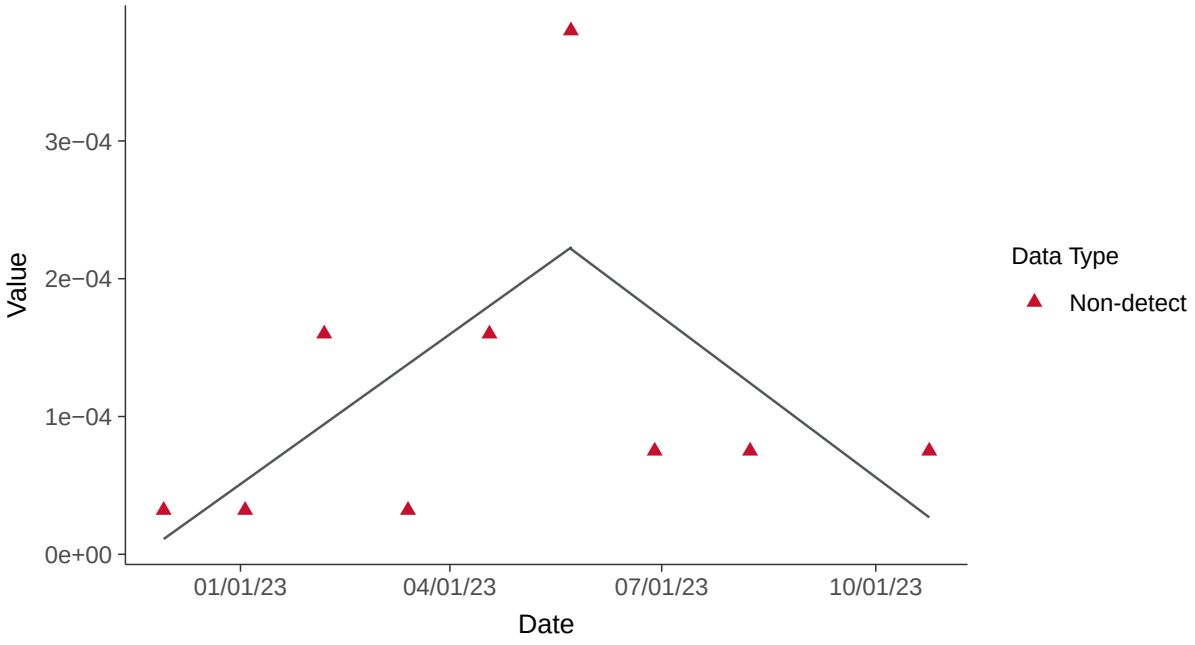
Boxplot by Season

Cadmium, MW-06 (mg/L)



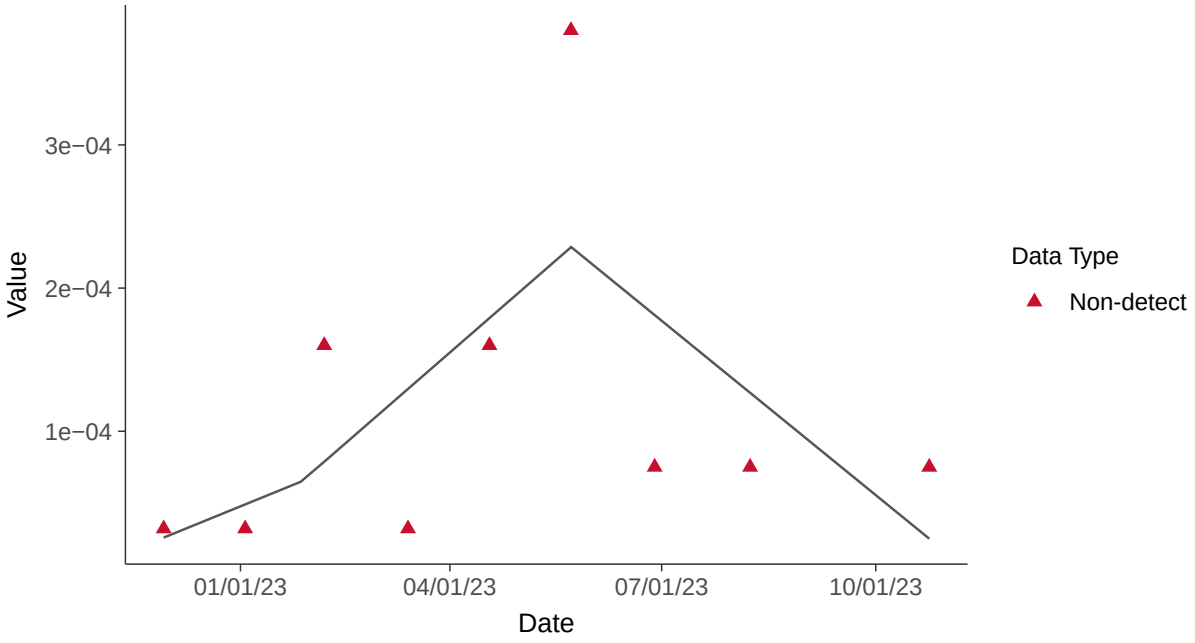
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-06 (mg/L)



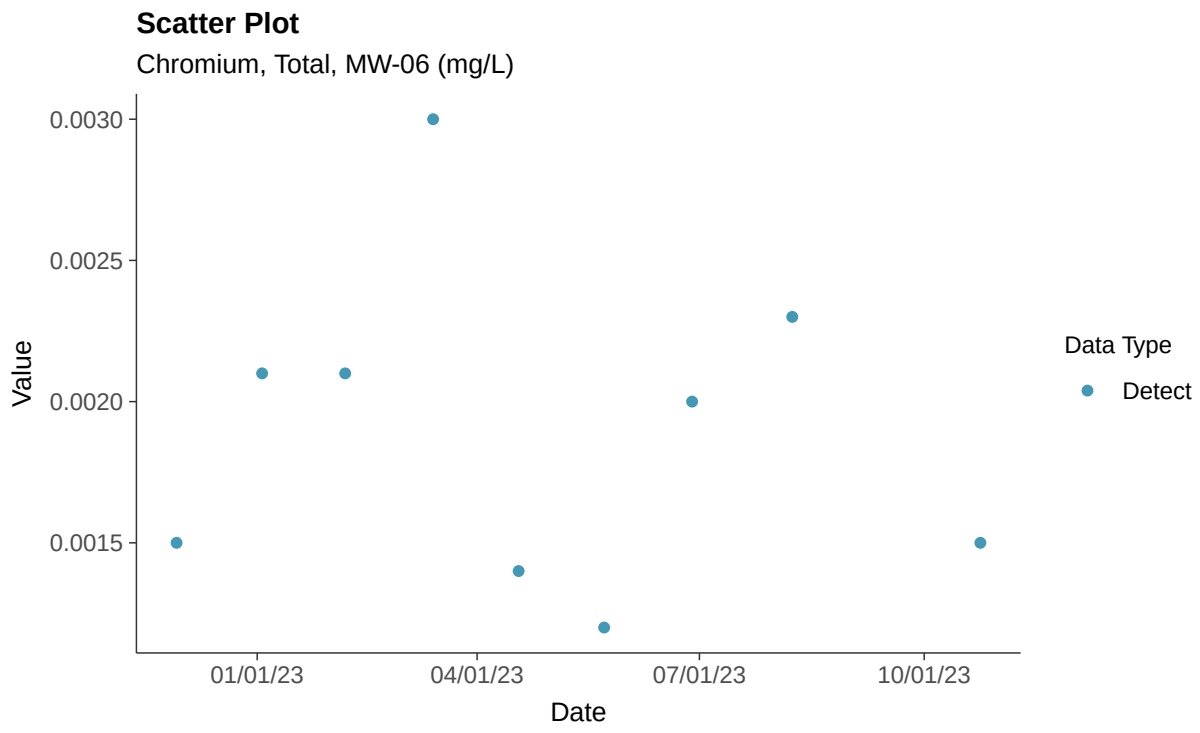
Trend Regression: Piecewise Linear-Linear-Linear

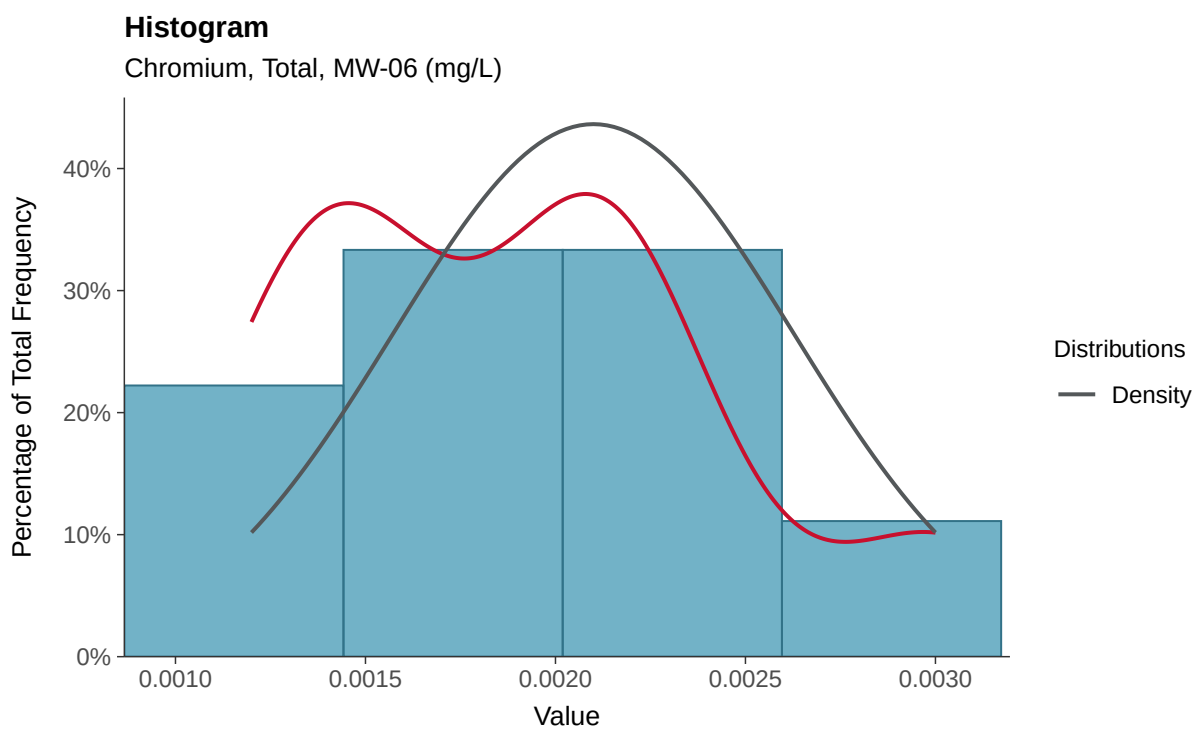
Cadmium, MW-06 (mg/L)



Appendix IV: Chromium, Total, MW-06

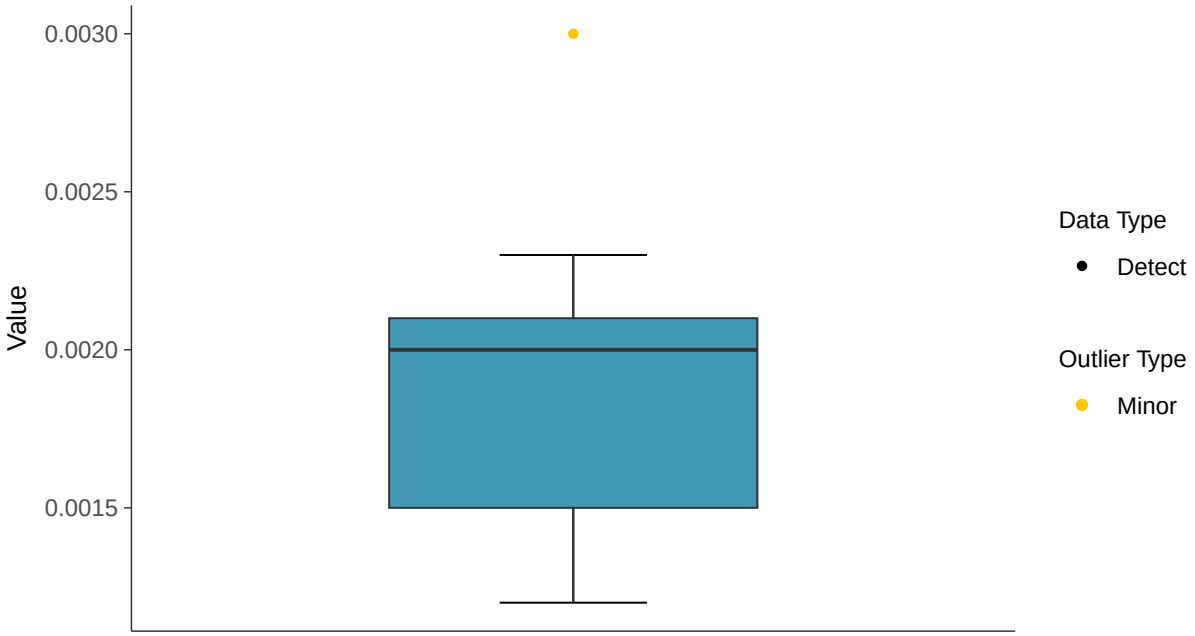
ID: 1_15_5_109





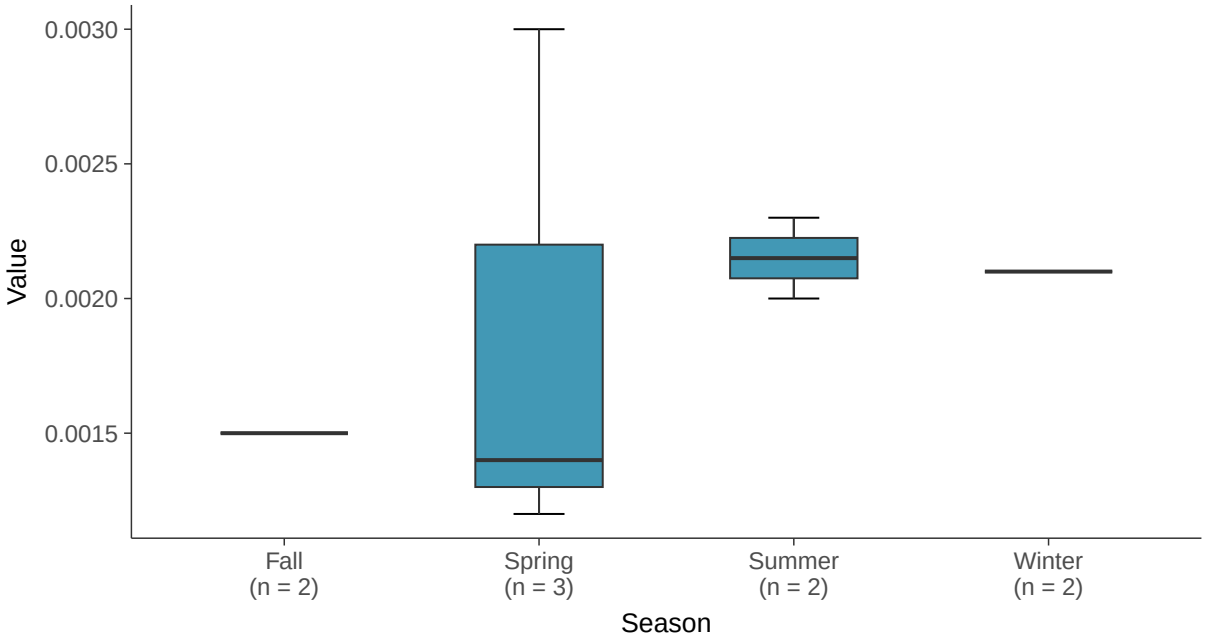
Boxplot

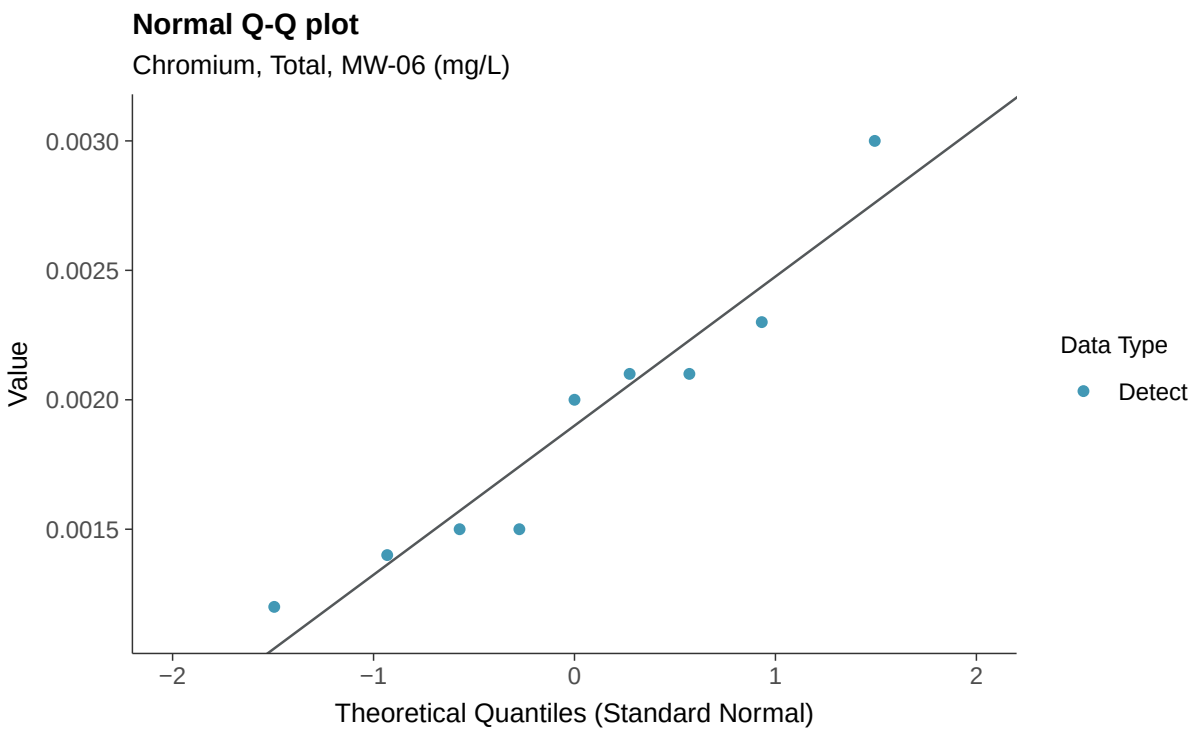
Chromium, Total, MW-06 (mg/L)

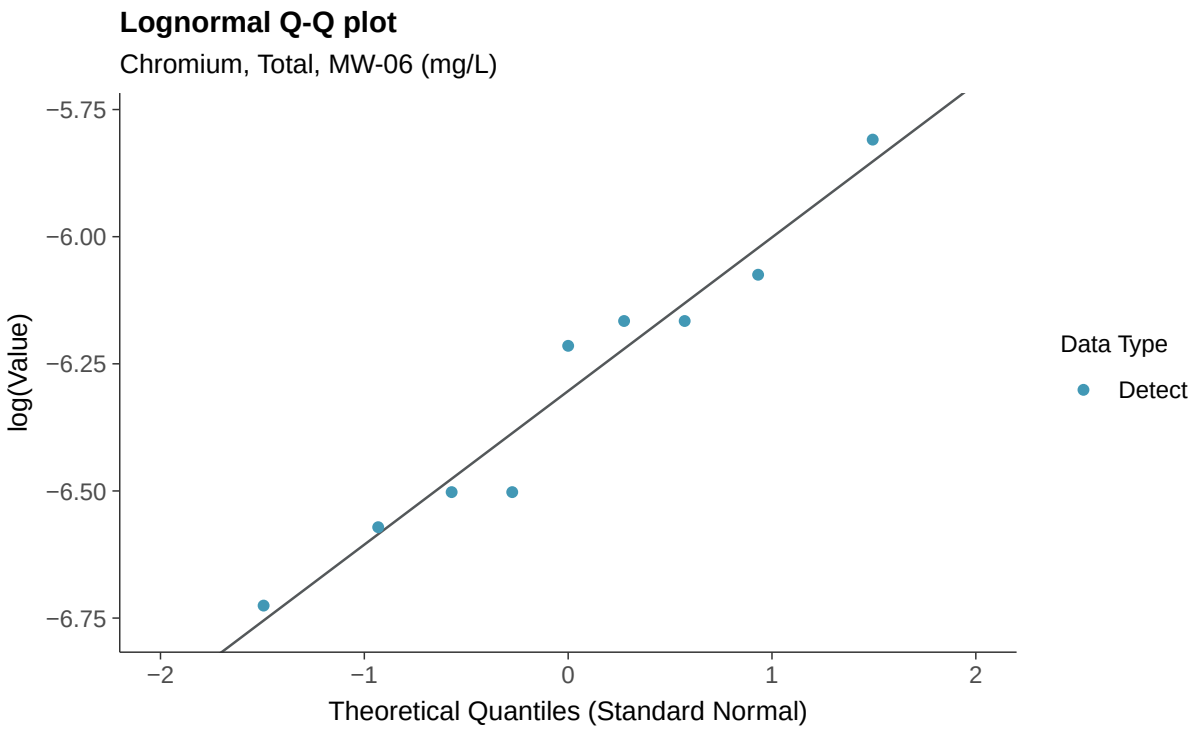


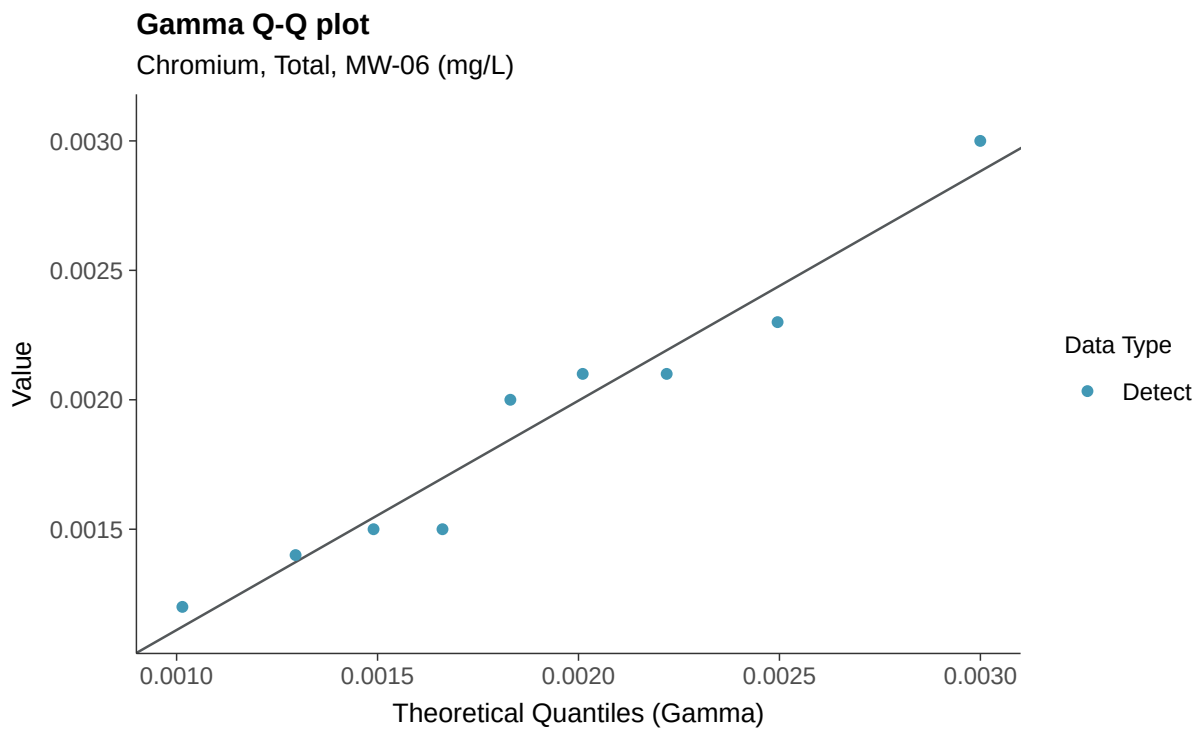
Boxplot by Season

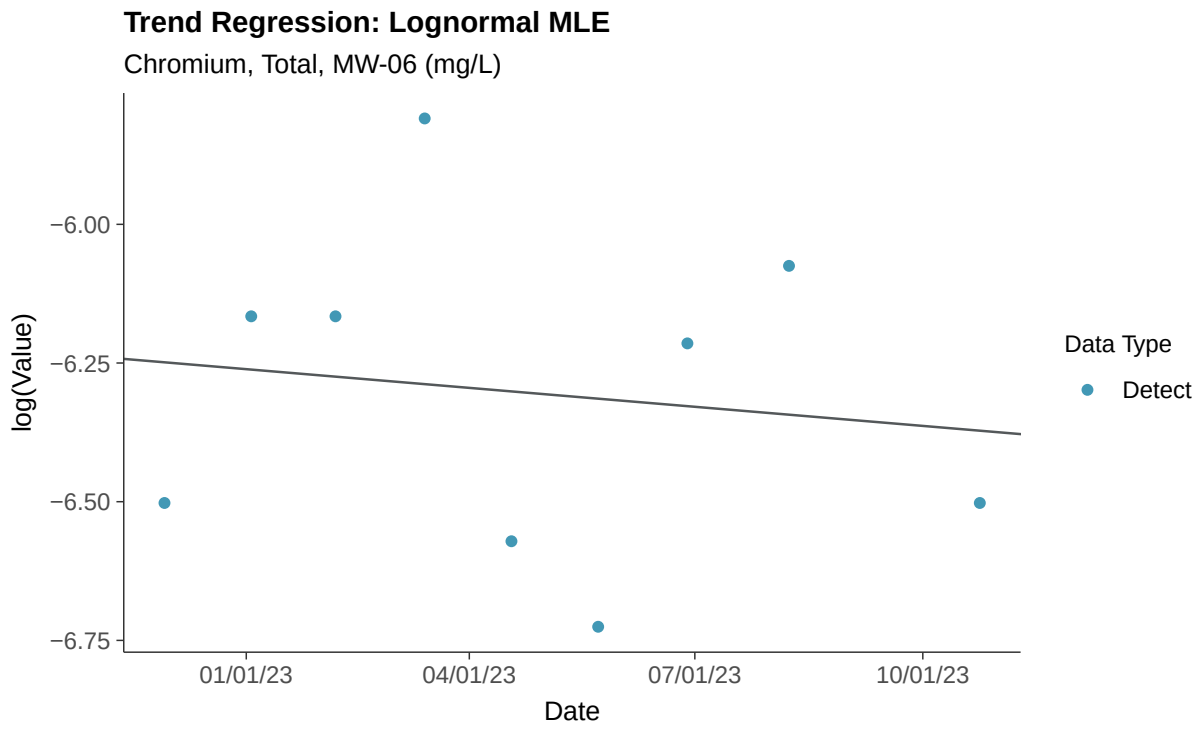
Chromium, Total, MW-06 (mg/L)

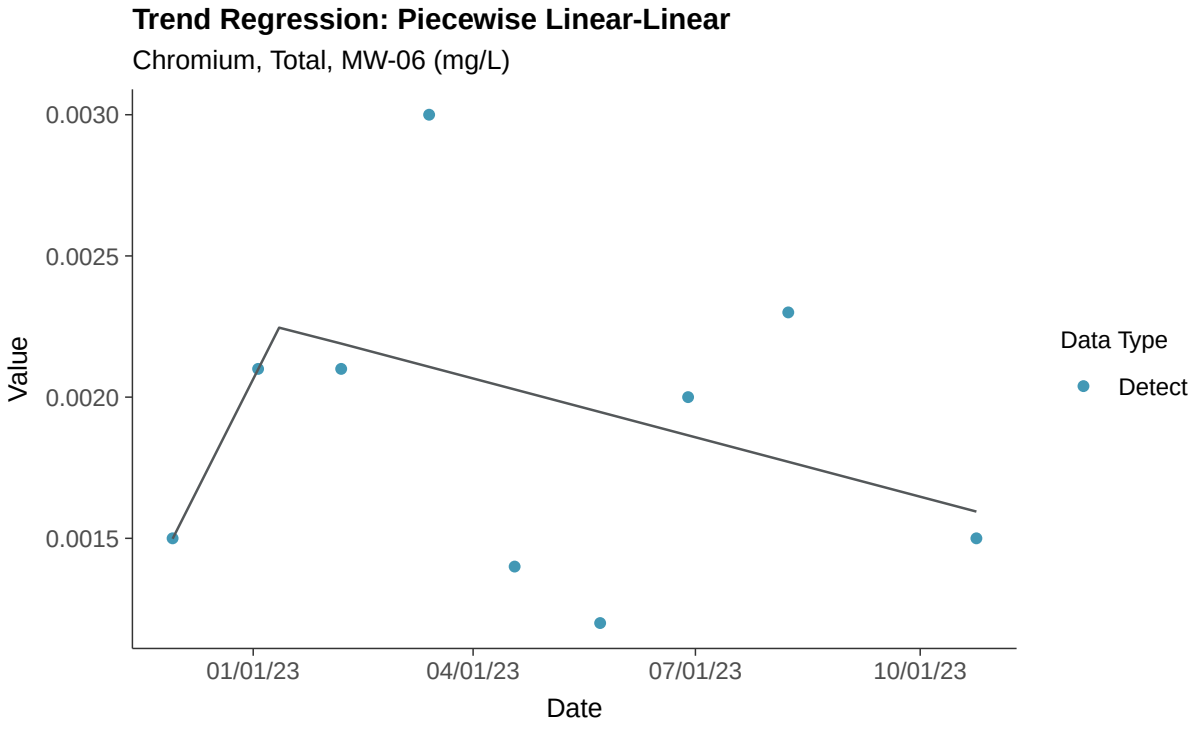



Normal Q-Q plot
Chromium, Total, MW-06 (mg/L)
Value
0.0030
0.0025
0.0020
0.0015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chromium, Total, MW-06 (mg/L)
log(Value)
−5.75
−6.00
−6.25
−6.50
−6.75
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

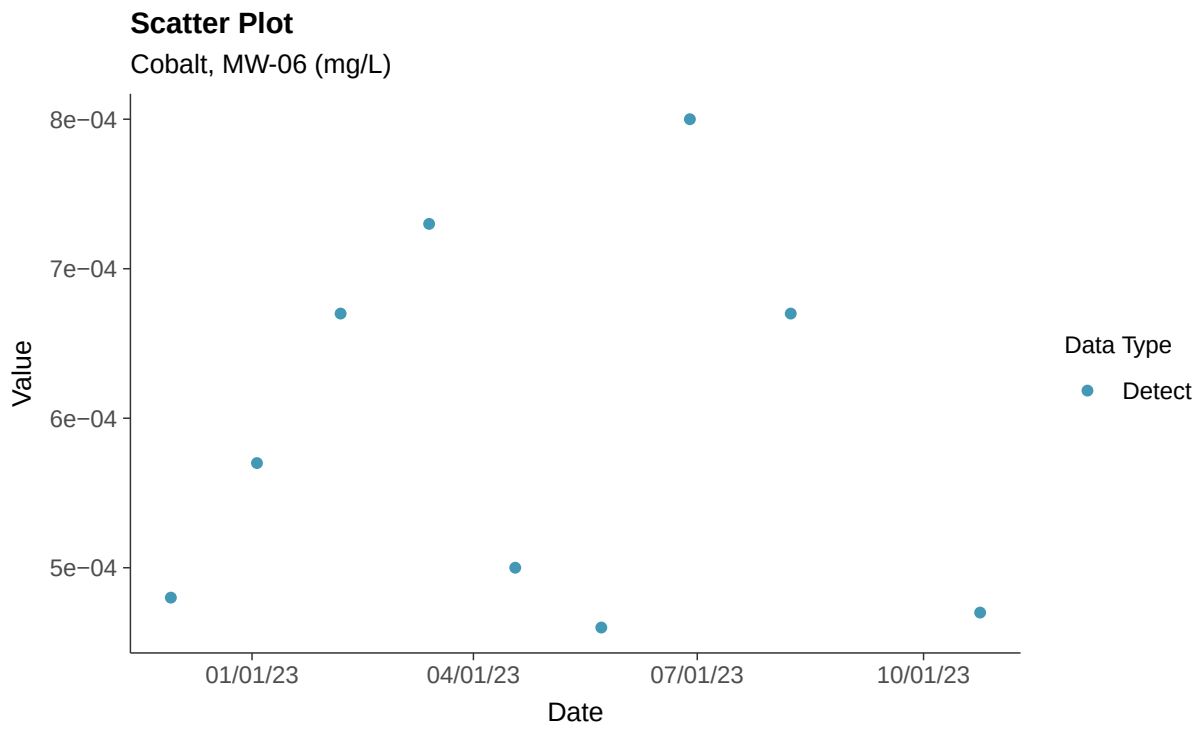

Gamma Q-Q plot
Chromium, Total, MW-06 (mg/L)
Value
0.0030
0.0025
0.0020
0.0015
0.0010
0.0015
0.0020
0.0025
0.0030
Theoretical Quantiles (Gamma)
Data Type
Detect

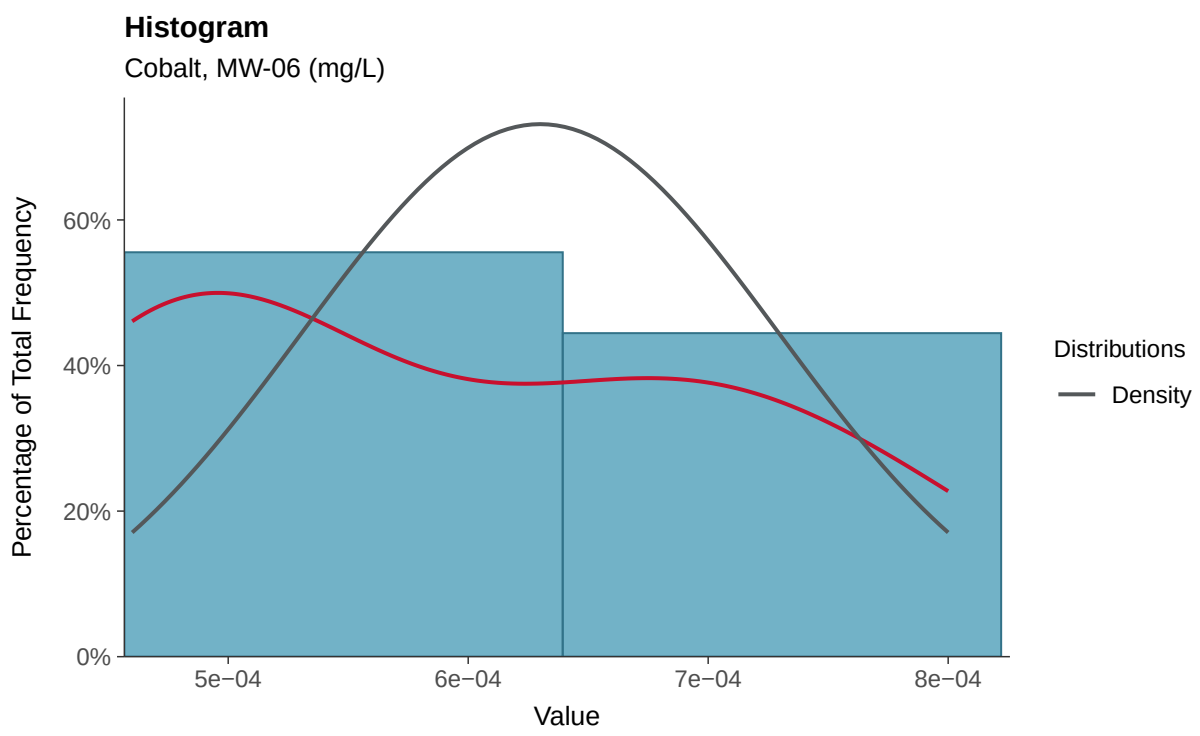

Trend Regression: Lognormal MLE
Chromium, Total, MW-06 (mg/L)
log(Value)
−6.00
−6.25
−6.50
−6.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chromium, Total, MW-06 (mg/L)
0.0030
0.0025
0.0020
0.0015
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Cobalt, MW-06

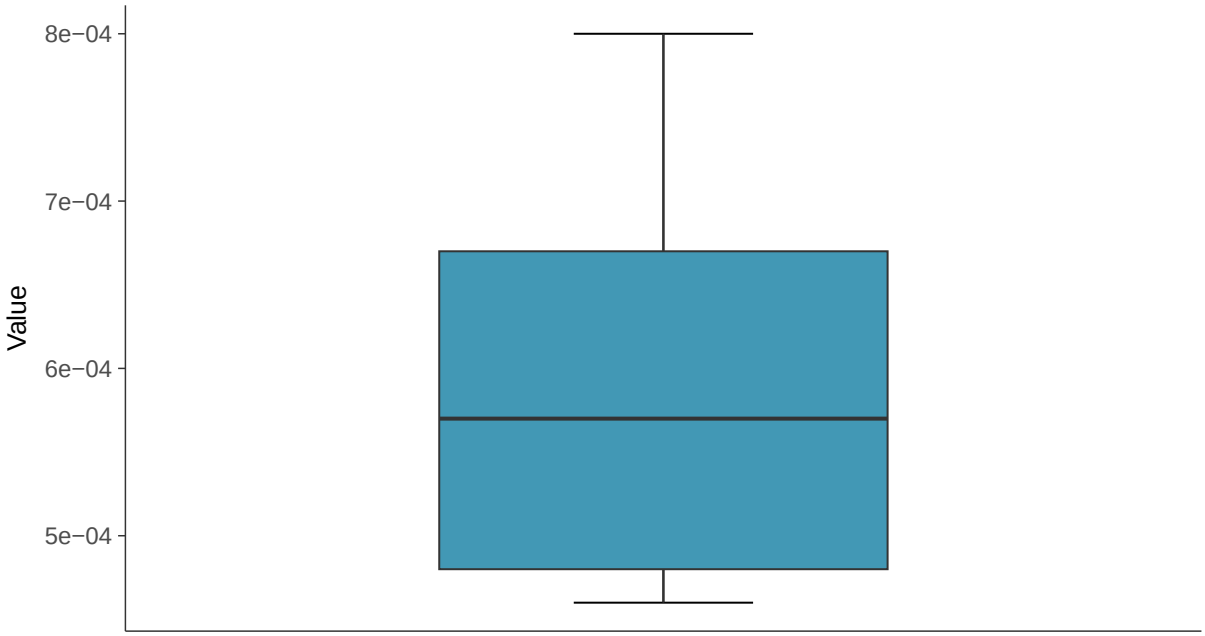
ID: 1_15_5_110





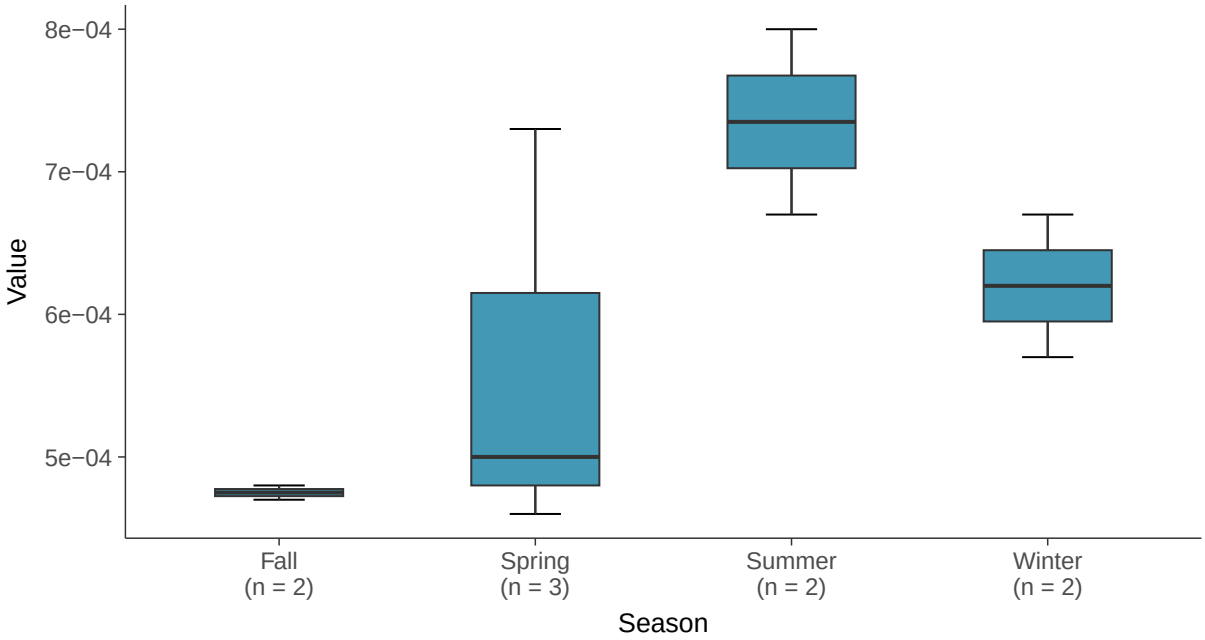
Boxplot

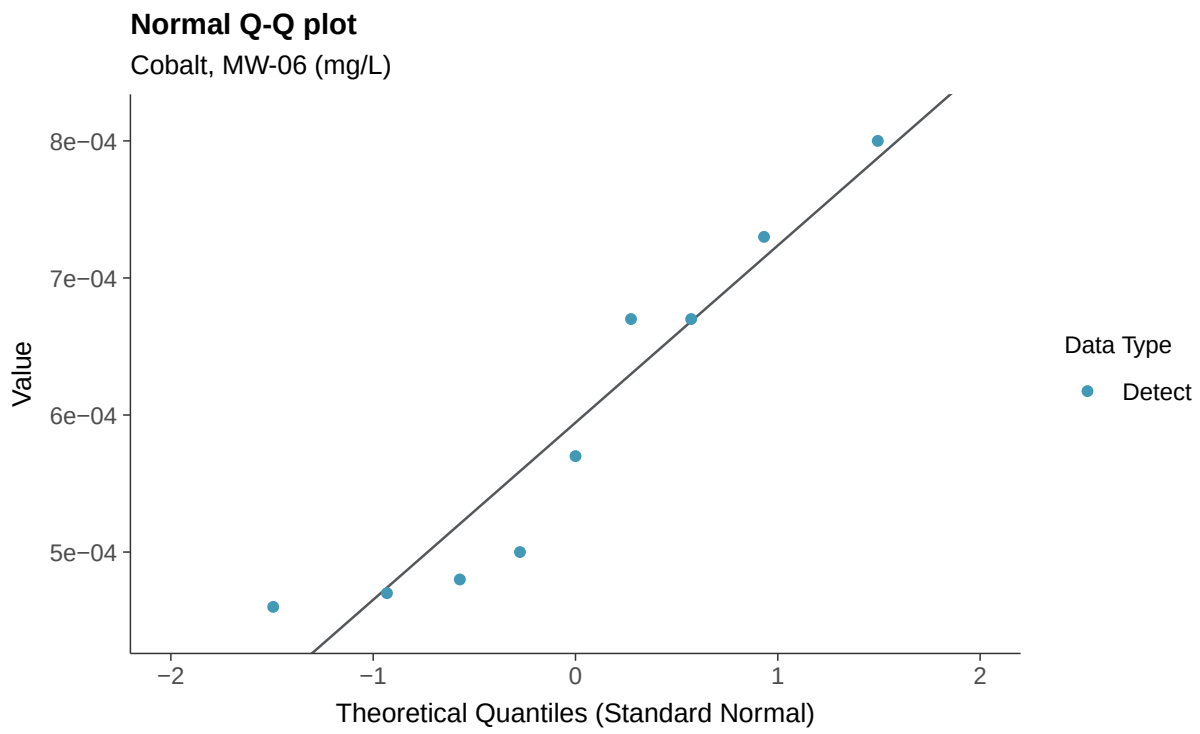
Cobalt, MW-06 (mg/L)

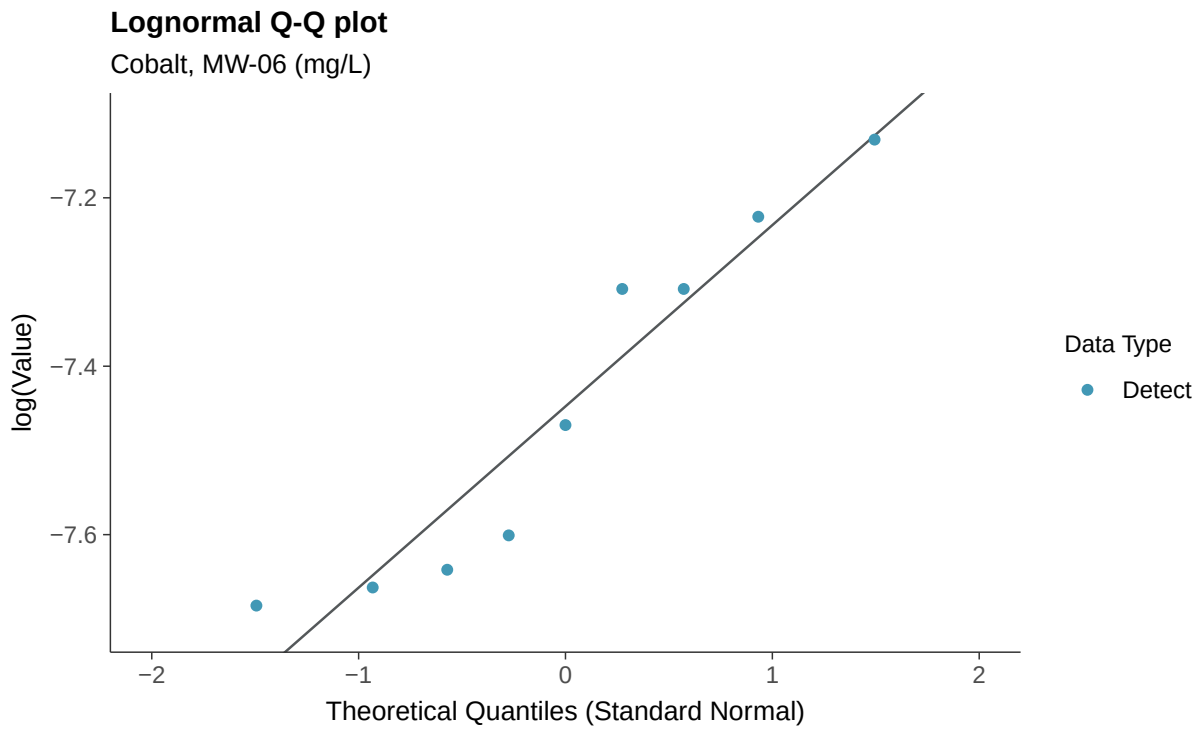


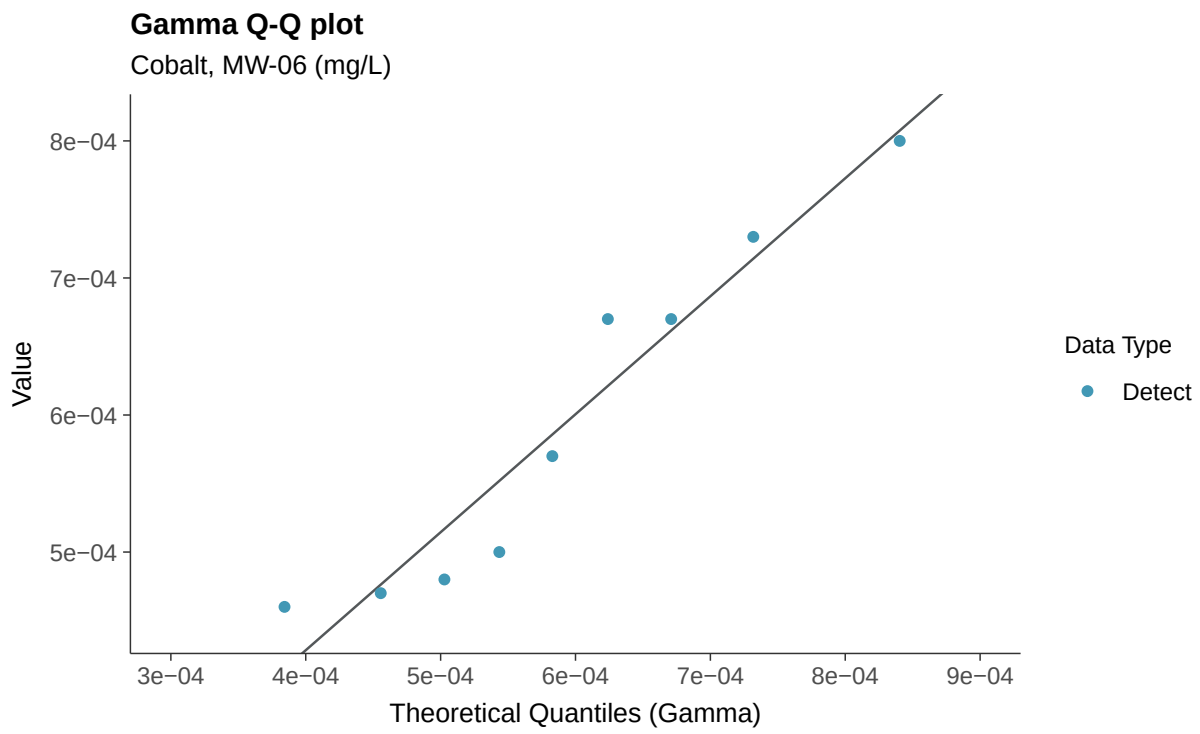
Boxplot by Season

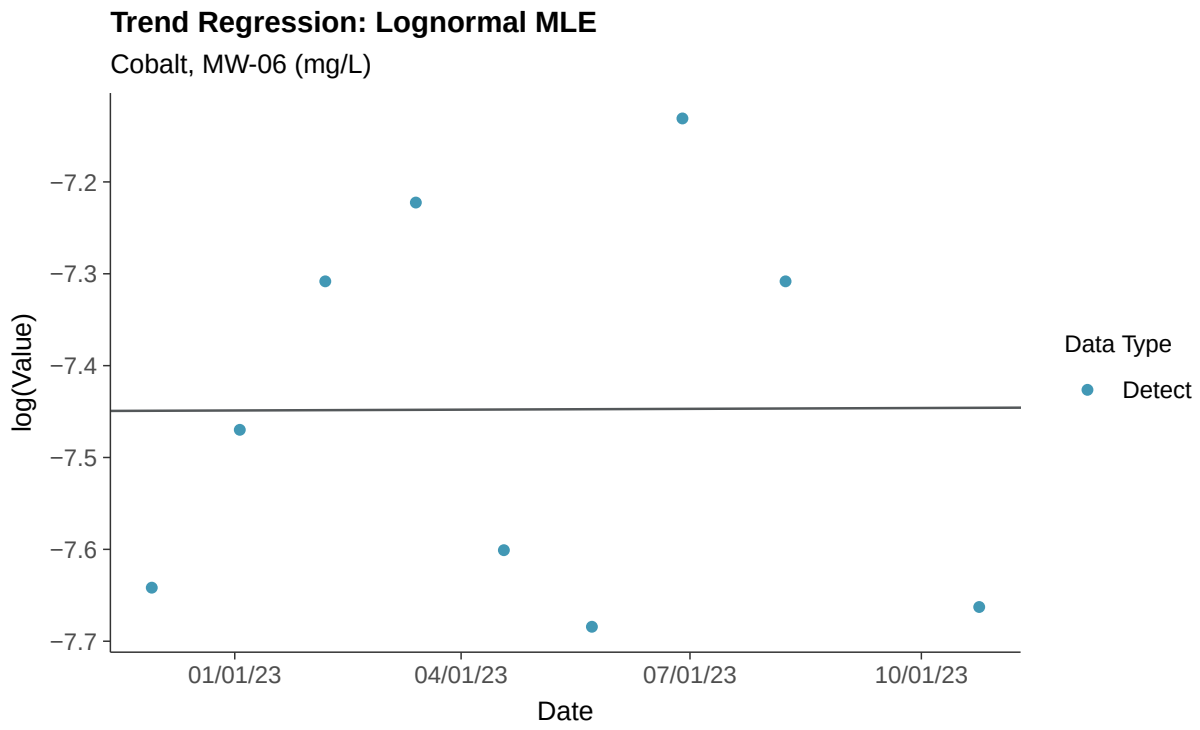
Cobalt, MW-06 (mg/L)




Normal Q-Q plot
Cobalt, MW-06 (mg/L)
Value
8e−04
7e−04
6e−04
5e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

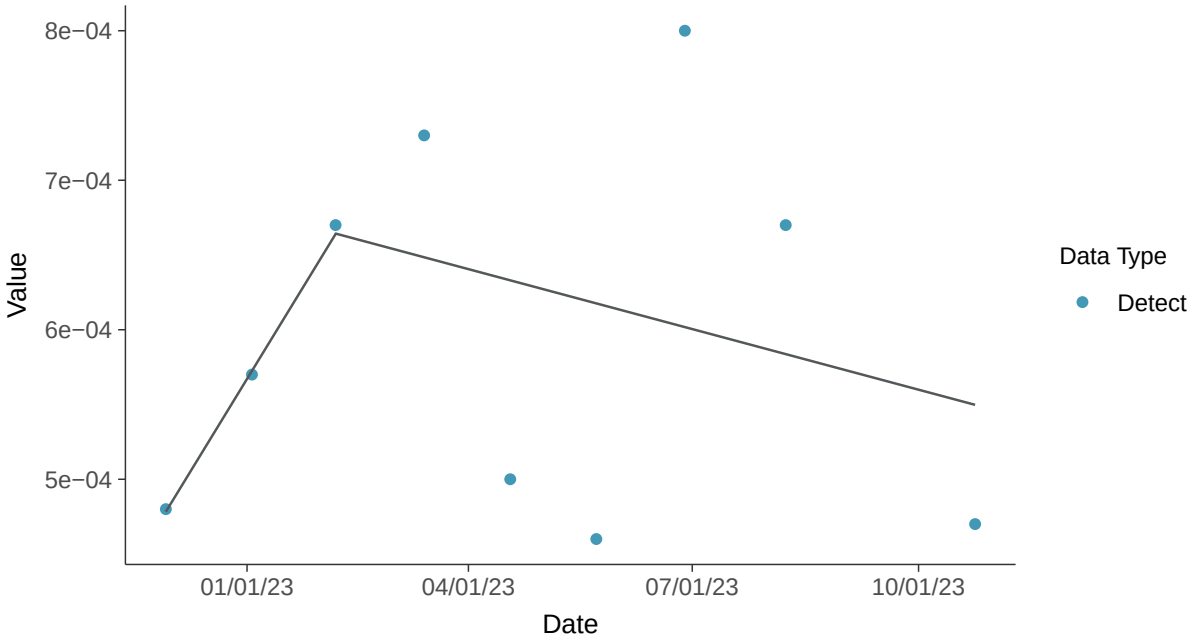

Lognormal Q-Q plot
Cobalt, MW-06 (mg/L)
log(Value)
−7.2
−7.4
−7.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-06 (mg/L)
Value
8e−04
7e−04
6e−04
5e−04
3e−04
4e−04
5e−04
6e−04
7e−04
8e−04
9e−04
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-06 (mg/L)
log(Value)
−7.2
−7.3
−7.4
−7.5
−7.6
−7.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

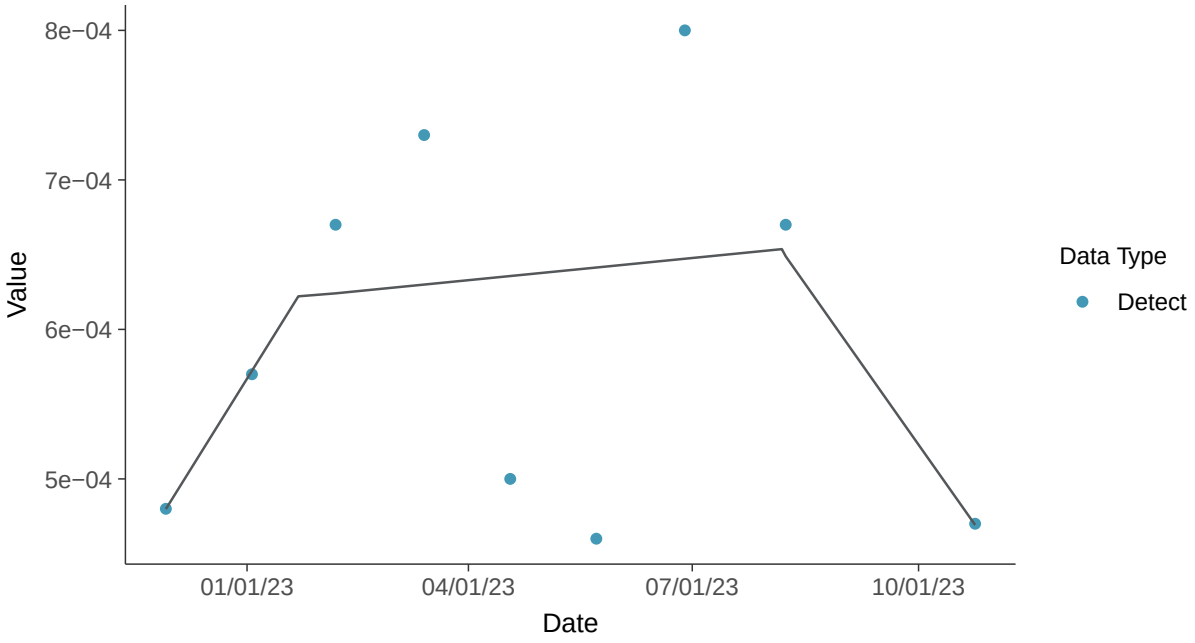
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-06 (mg/L)



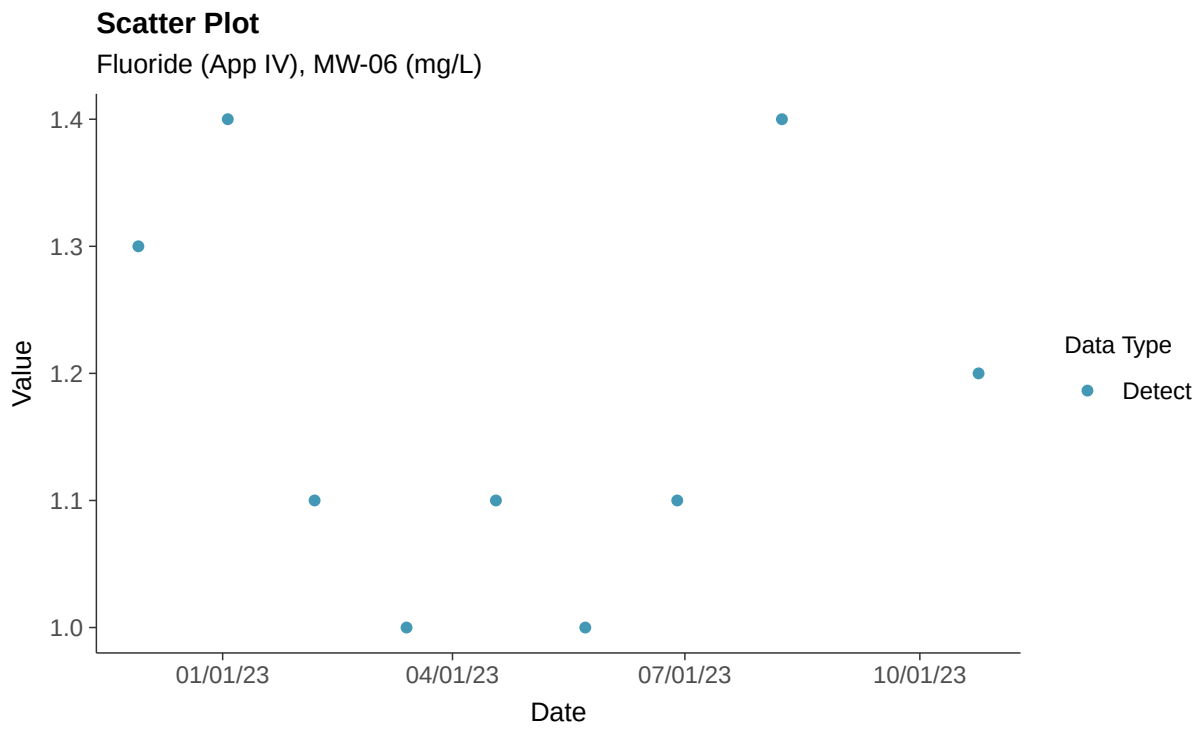
Trend Regression: Piecewise Linear-Linear-Linear

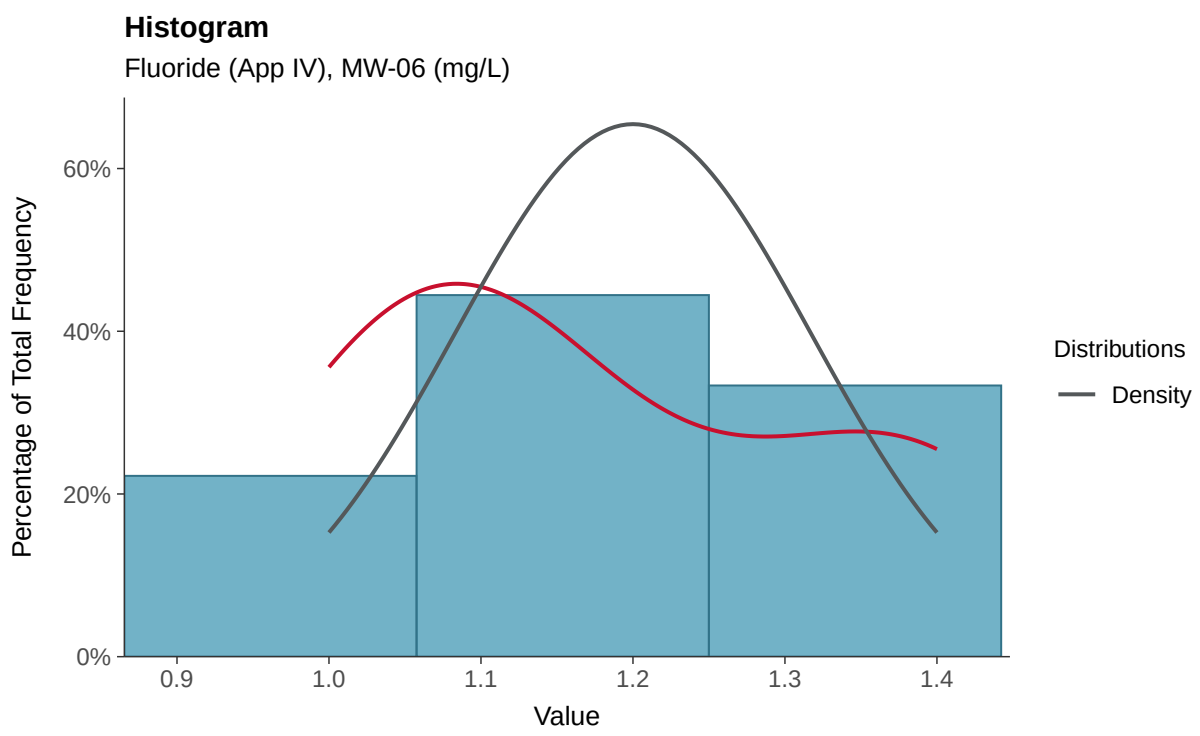
Cobalt, MW-06 (mg/L)



Appendix IV: Fluoride (App IV), MW-06

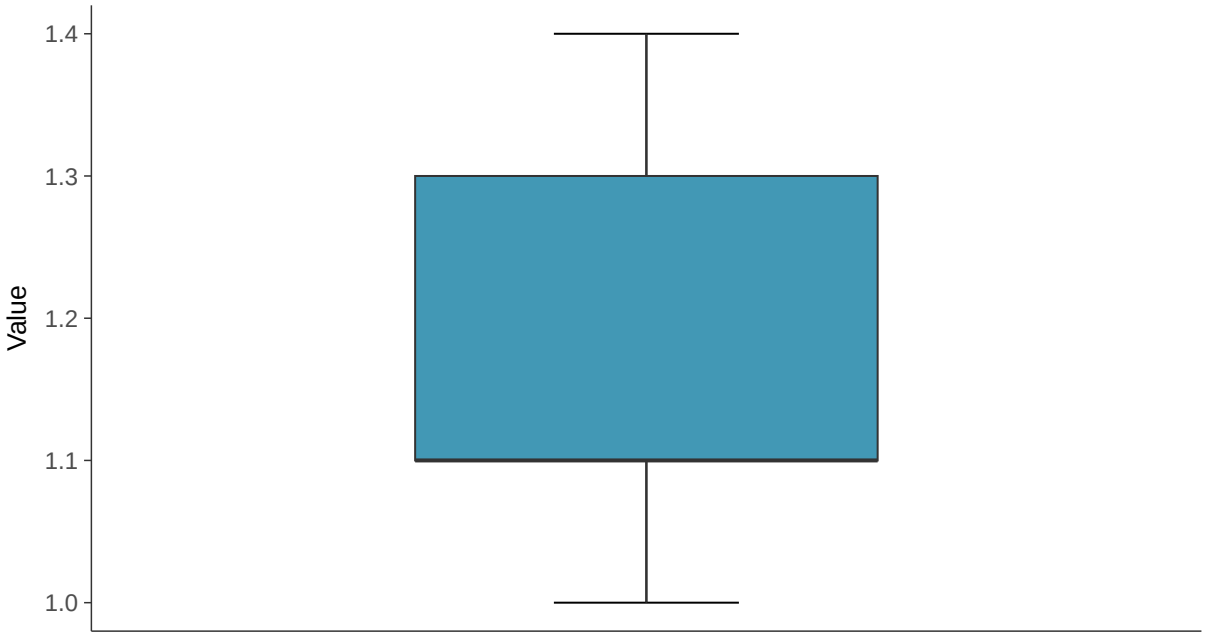
ID: 1_15_5_113





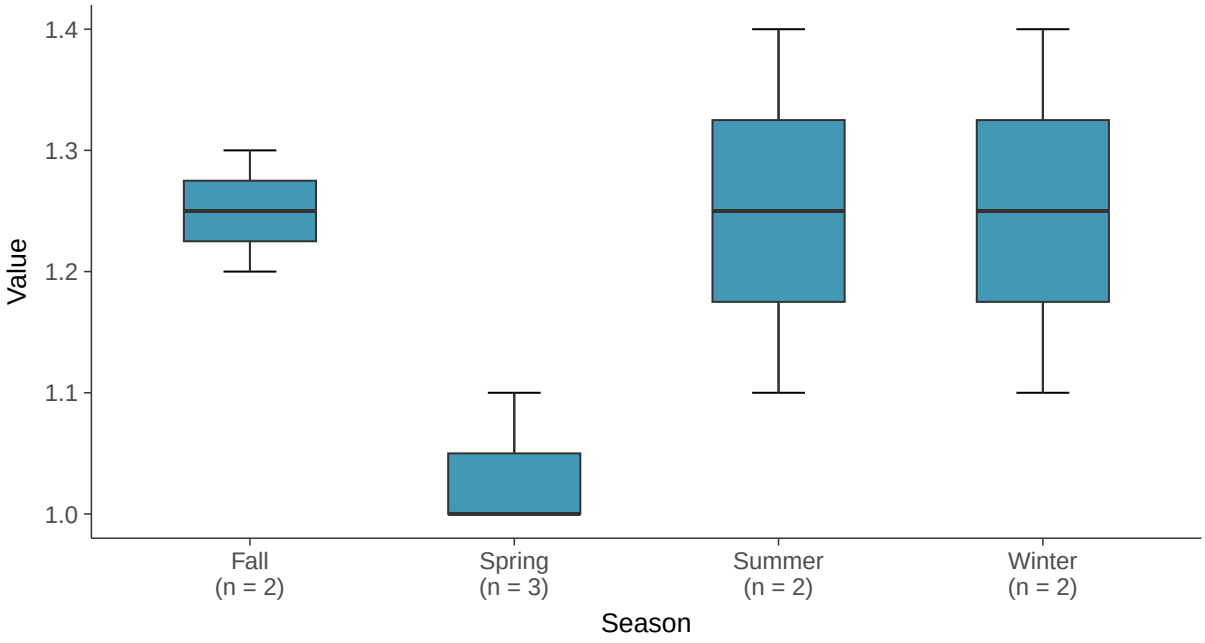
Boxplot

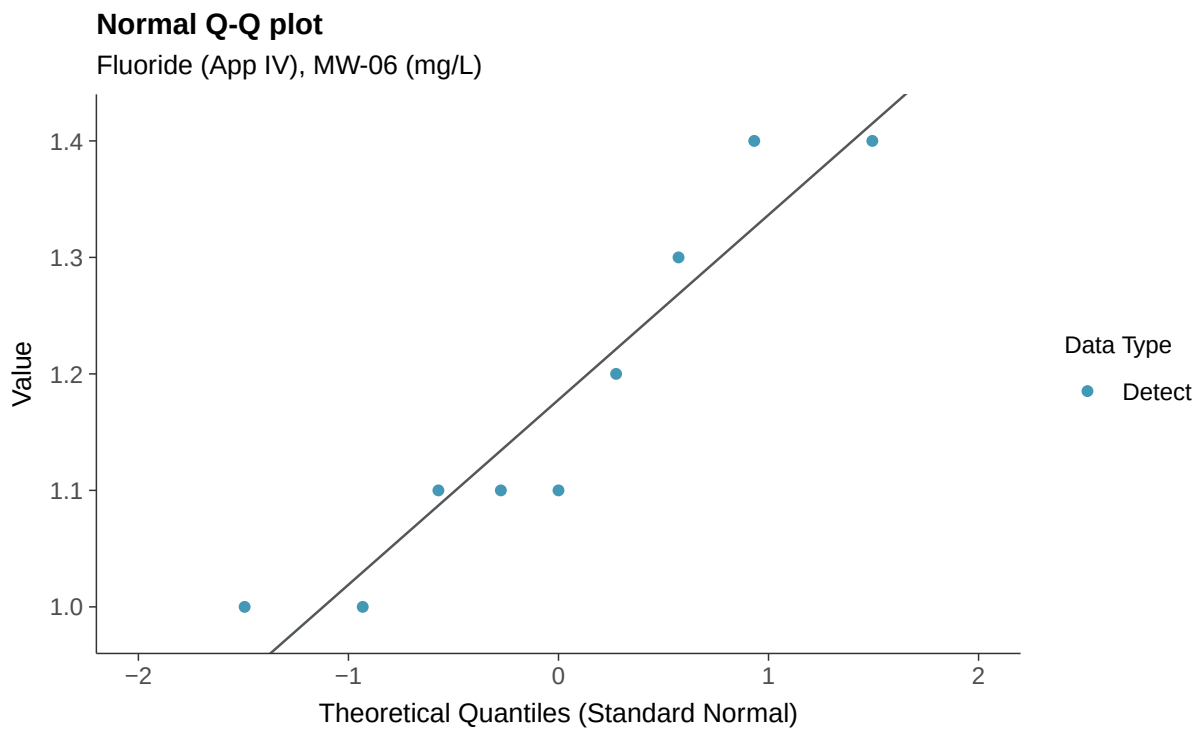
Fluoride (App IV), MW-06 (mg/L)

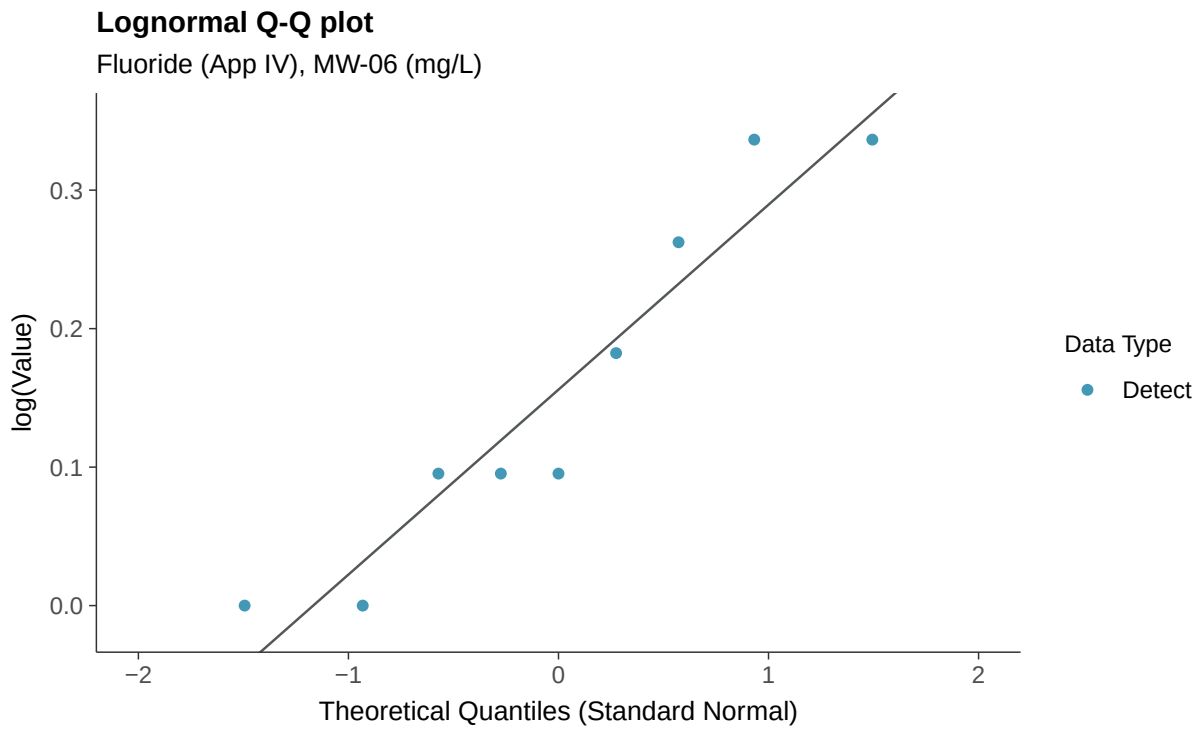


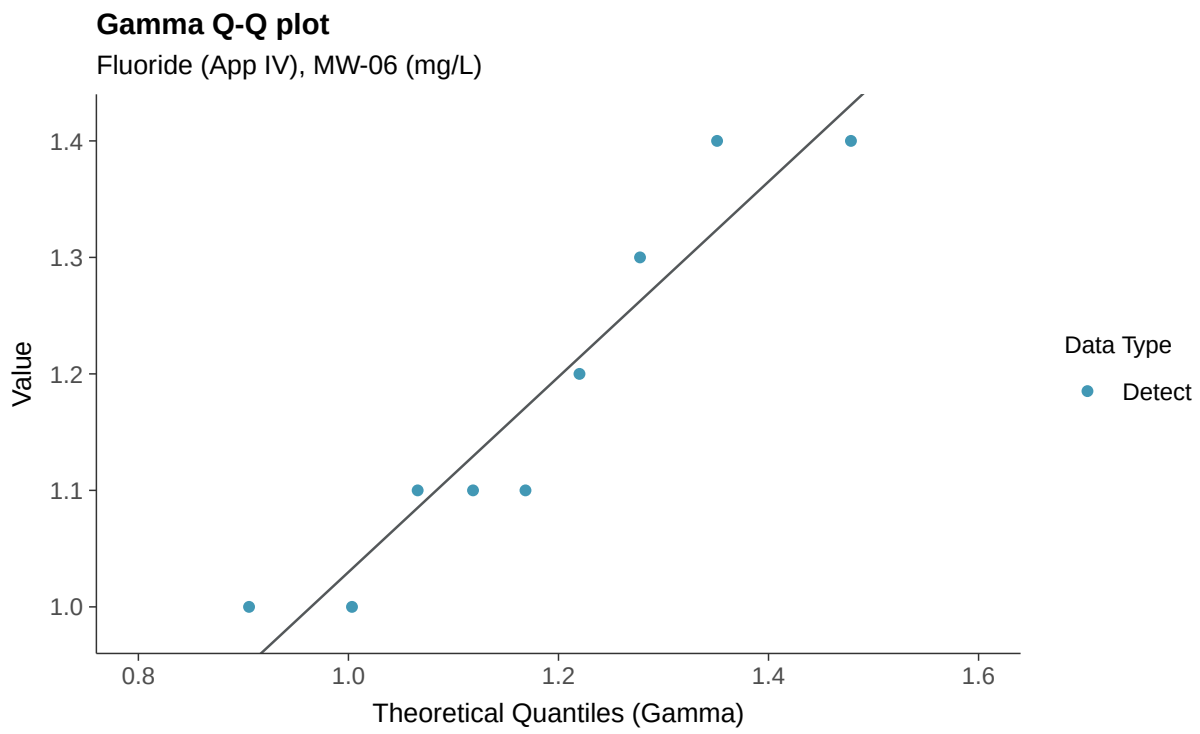
Boxplot by Season

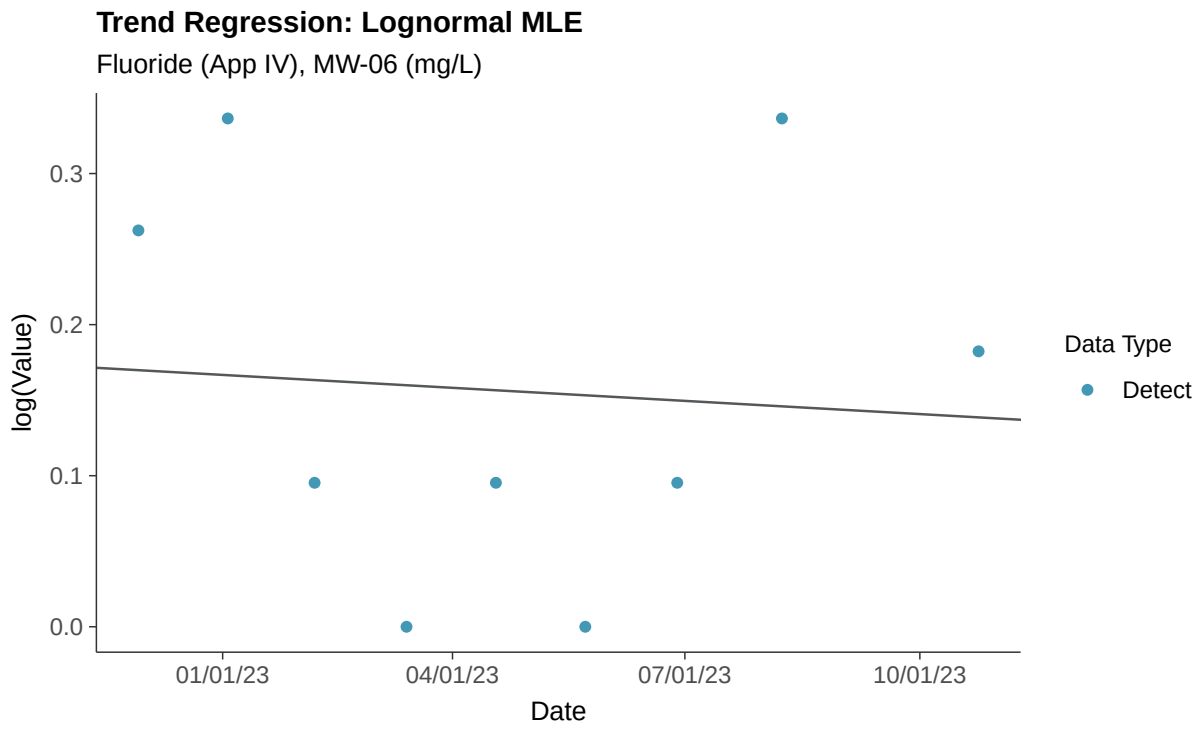
Fluoride (App IV), MW-06 (mg/L)




Normal Q-Q plot
Fluoride (App IV), MW-06 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

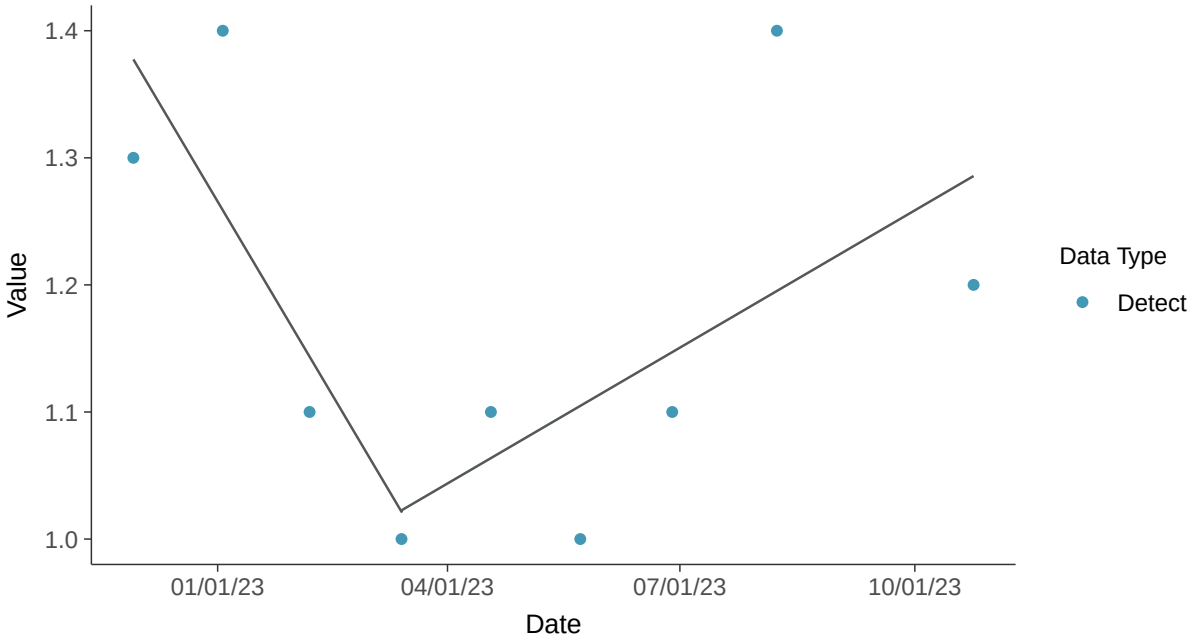

Lognormal Q-Q plot
Fluoride (App IV), MW-06 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride (App IV), MW-06 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
0.8
1.0
1.2
1.4
1.6
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-06 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

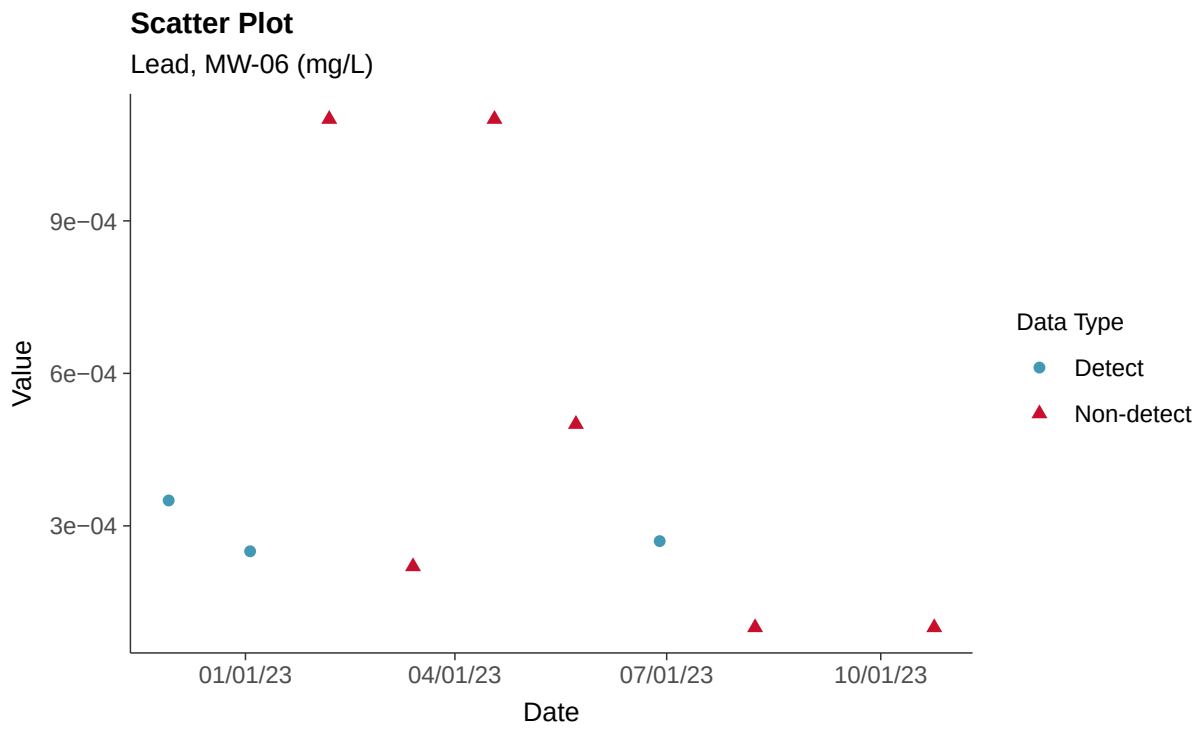
Trend Regression: Piecewise Linear-Linear

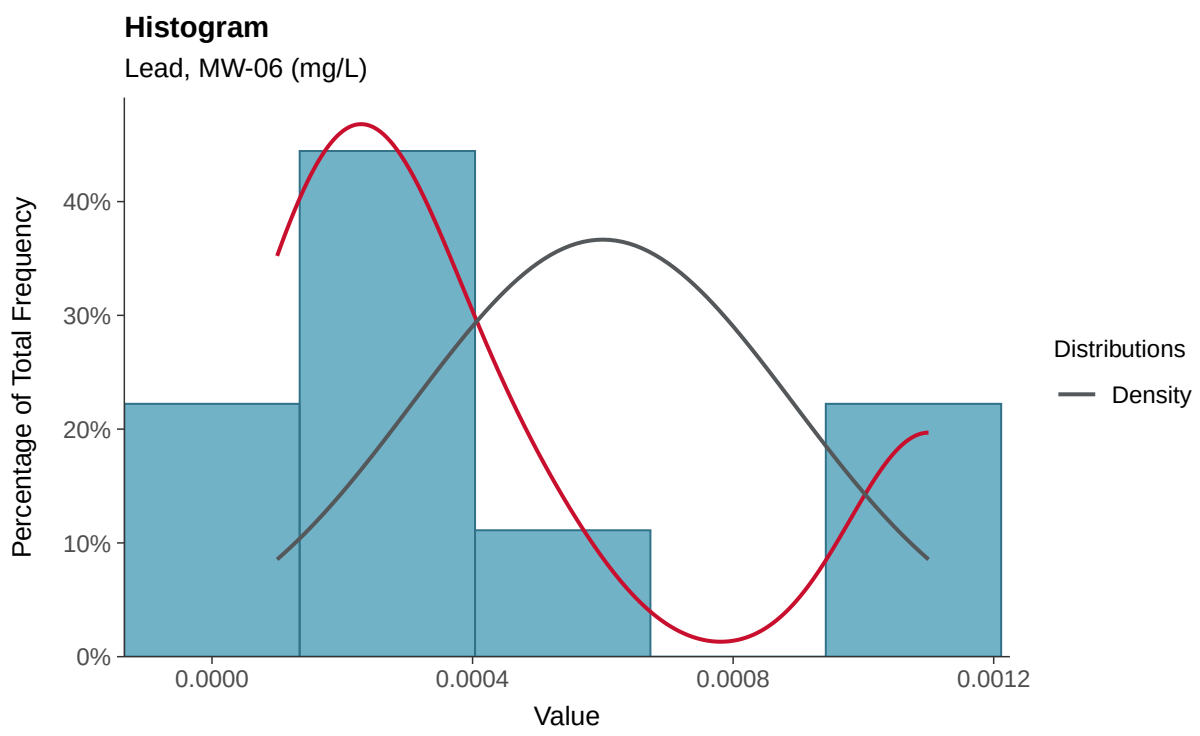
Fluoride (App IV), MW-06 (mg/L)



Appendix IV: Lead, MW-06

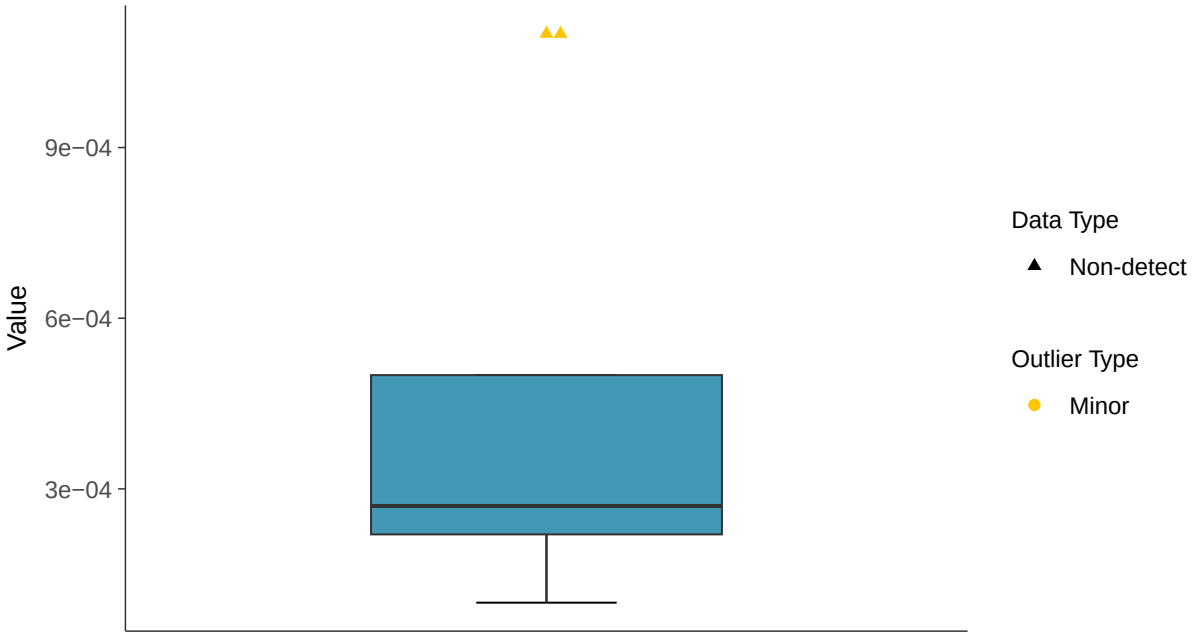
ID: 1_15_5_115





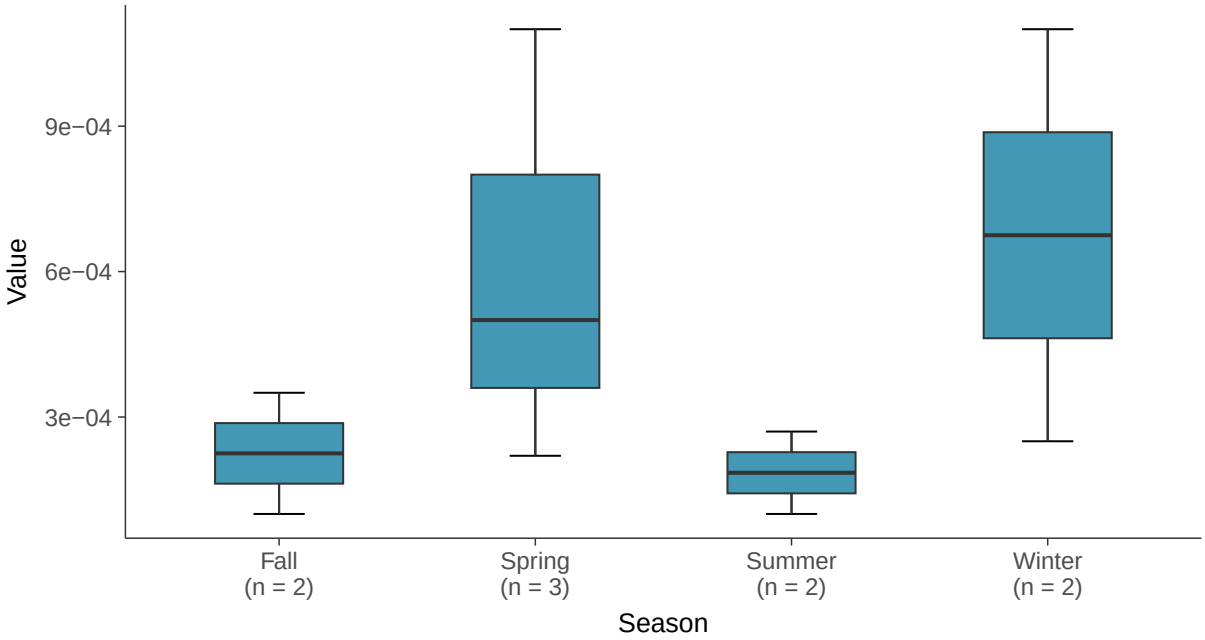
Boxplot

Lead, MW-06 (mg/L)



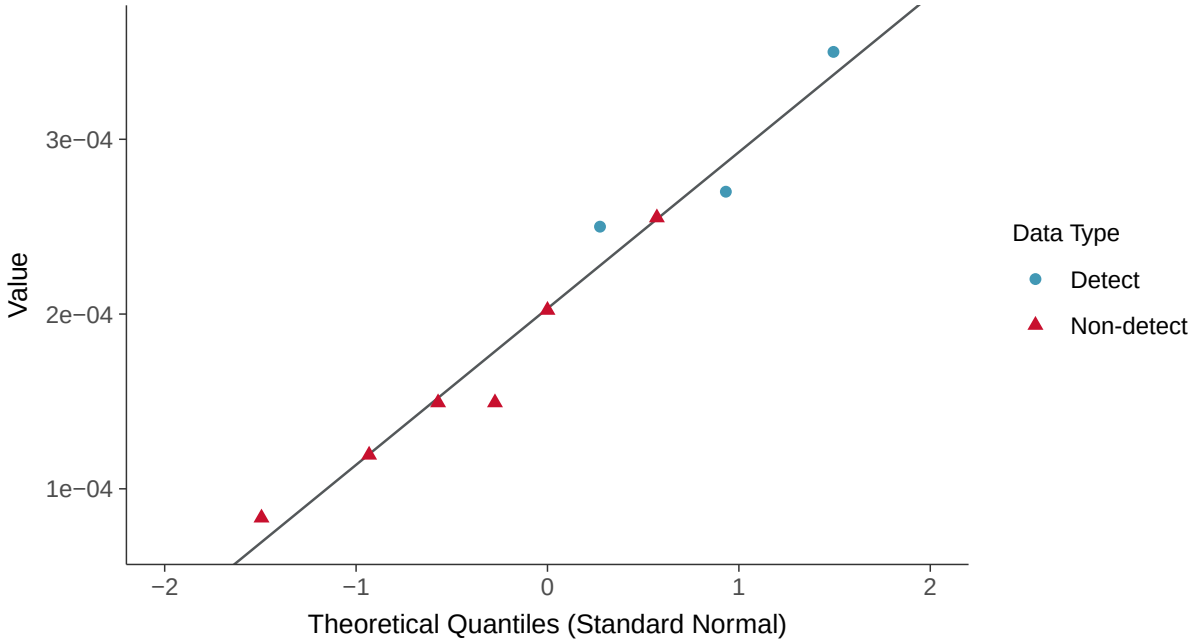
Boxplot by Season

Lead, MW-06 (mg/L)



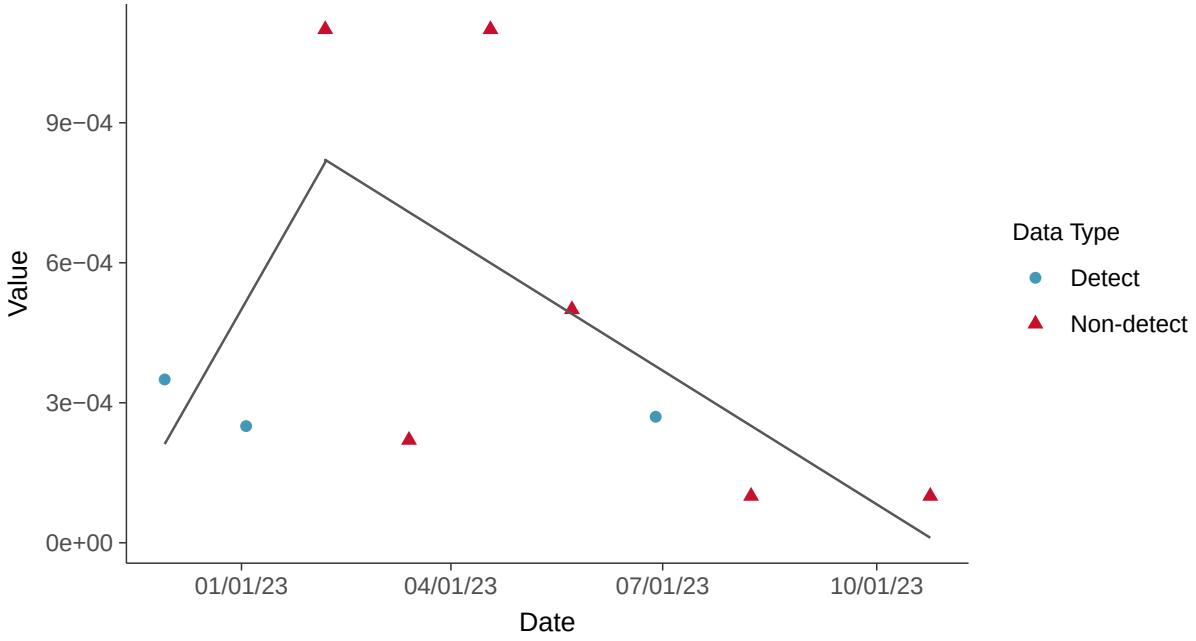
Normal Q-Q plot using ROS Imputed Estimates

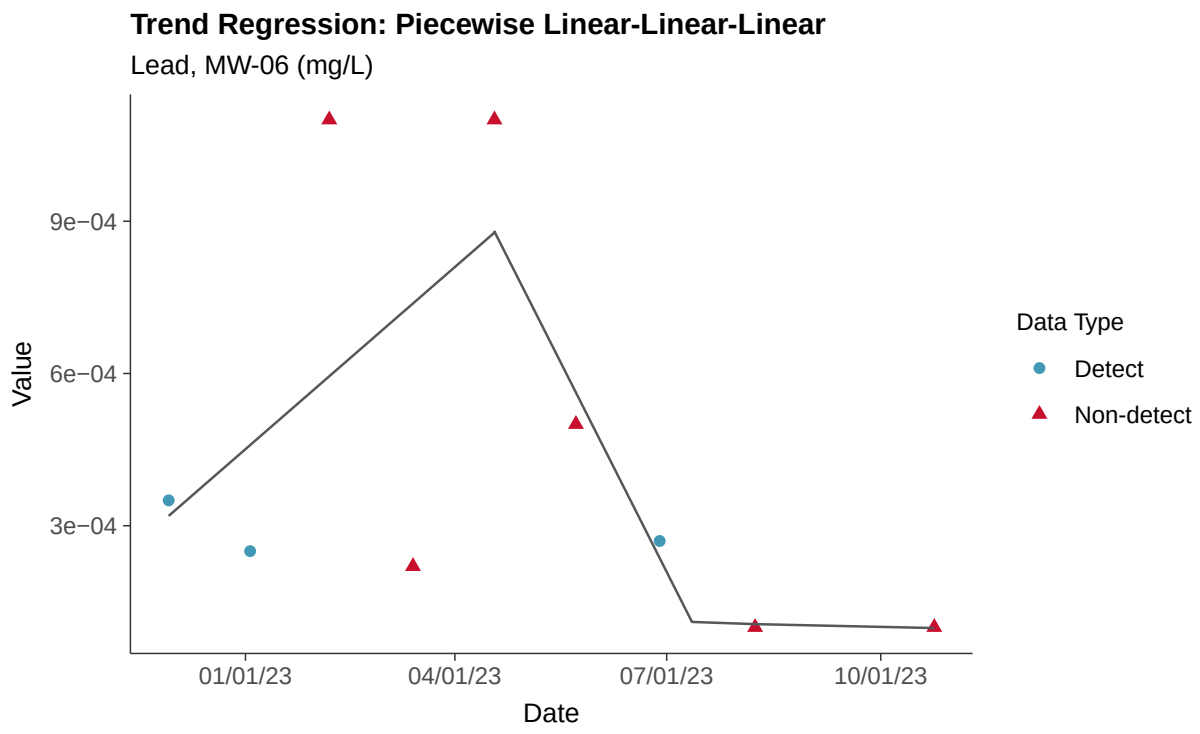
Lead, MW-06 (mg/L)



Trend Regression: Piecewise Linear-Linear

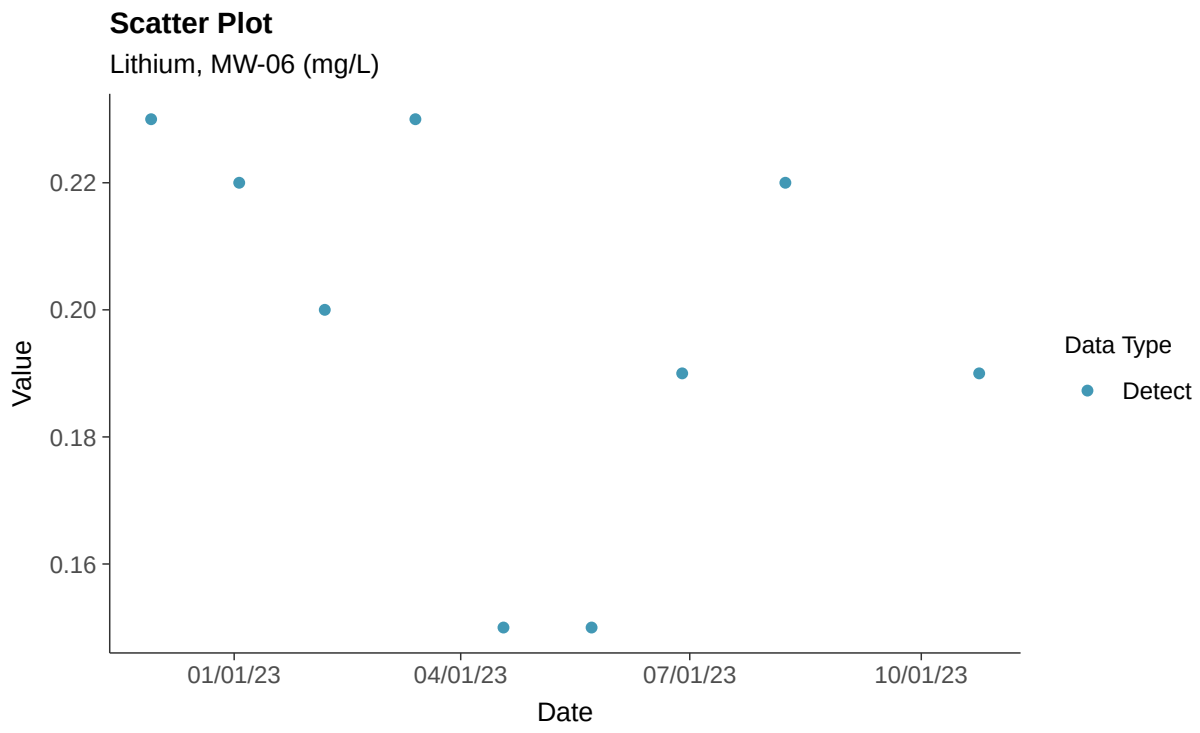
Lead, MW-06 (mg/L)

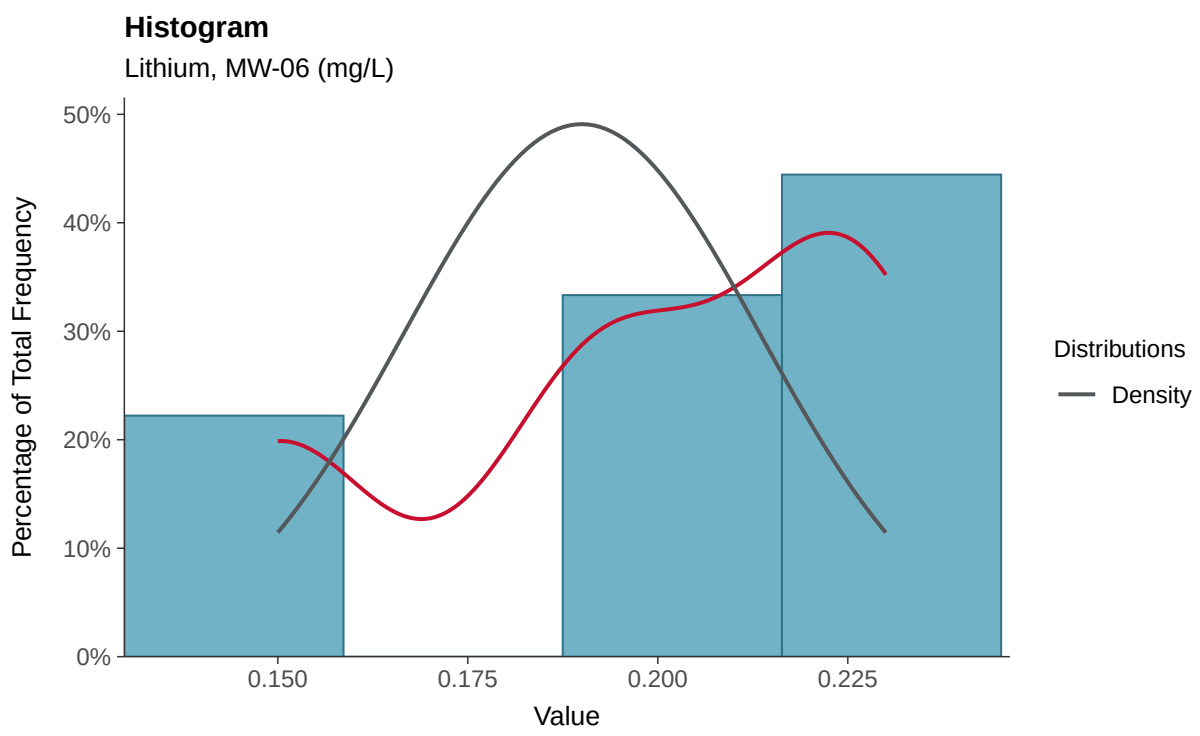



Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-06 (mg/L)
Value
9e−04
6e−04
3e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lithium, MW-06

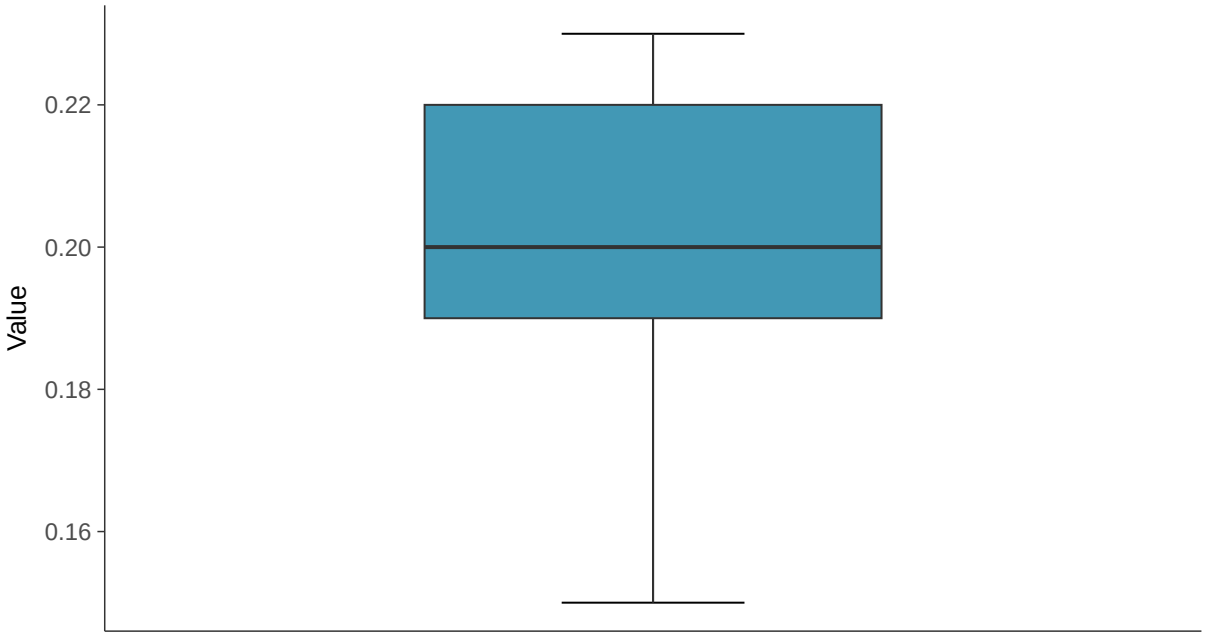
ID: 1_15_5_116





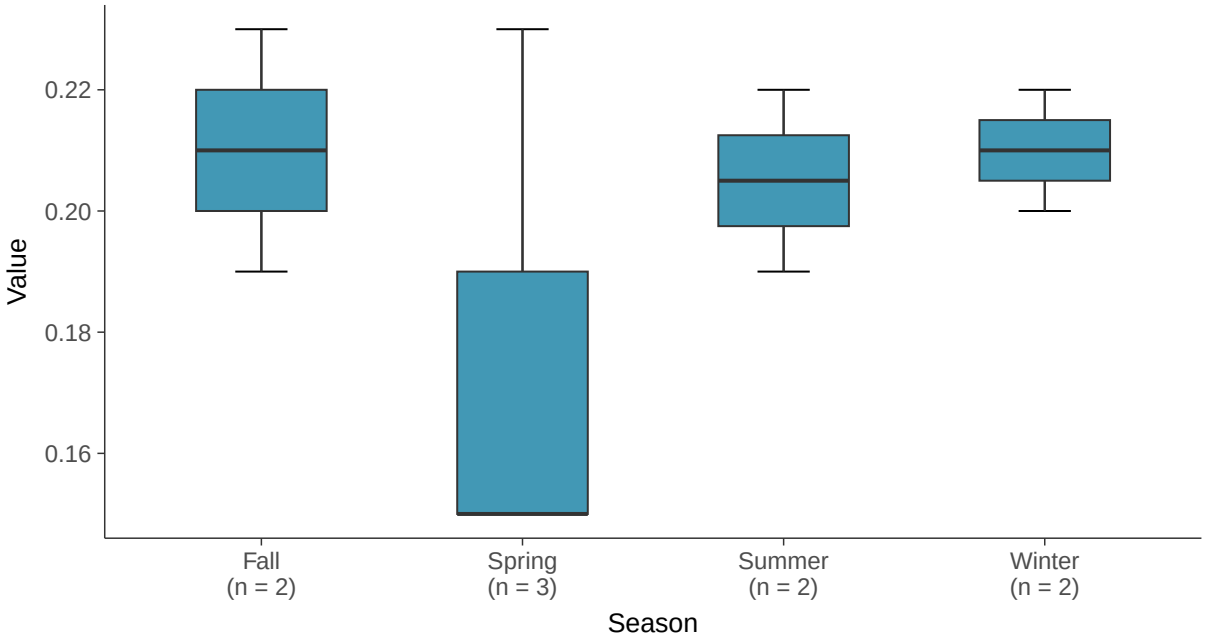
Boxplot

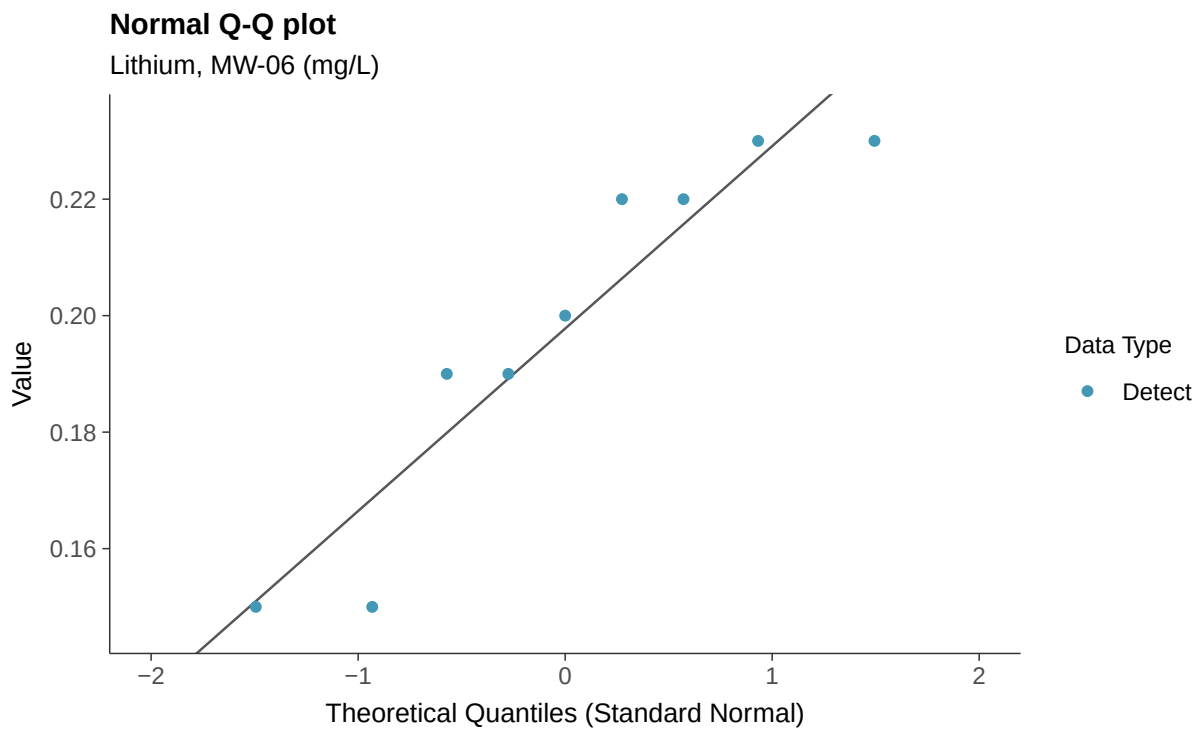
Lithium, MW-06 (mg/L)

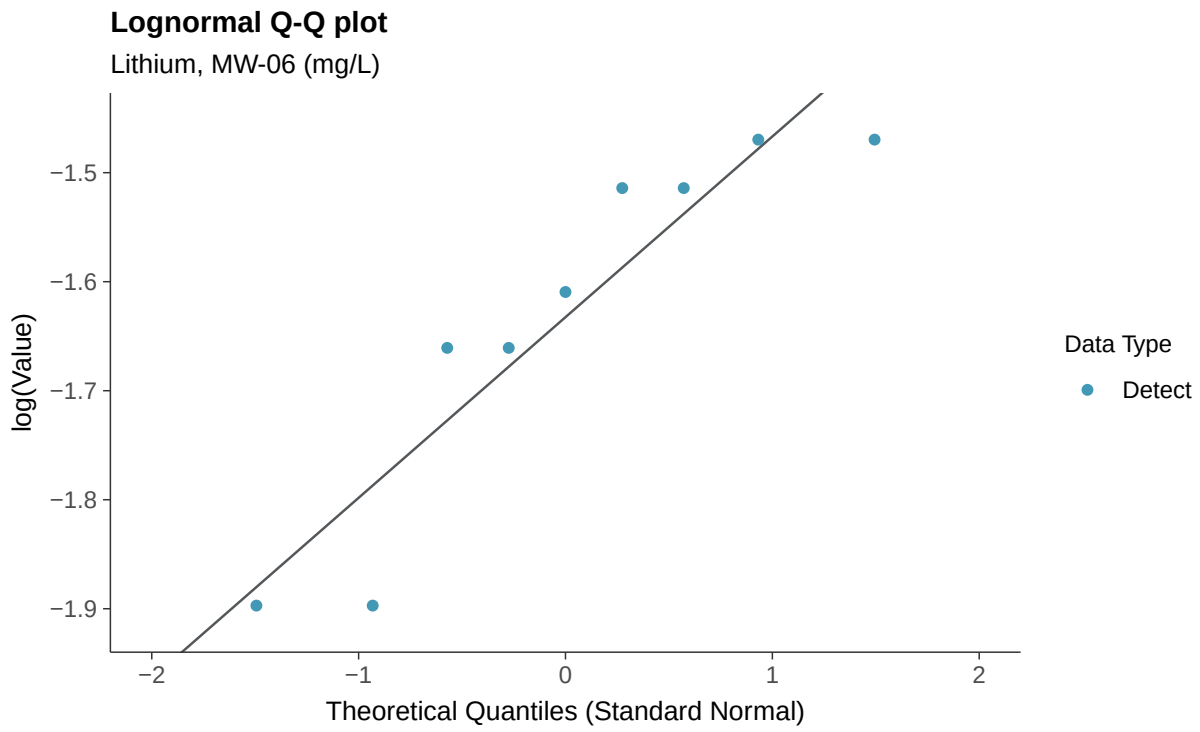


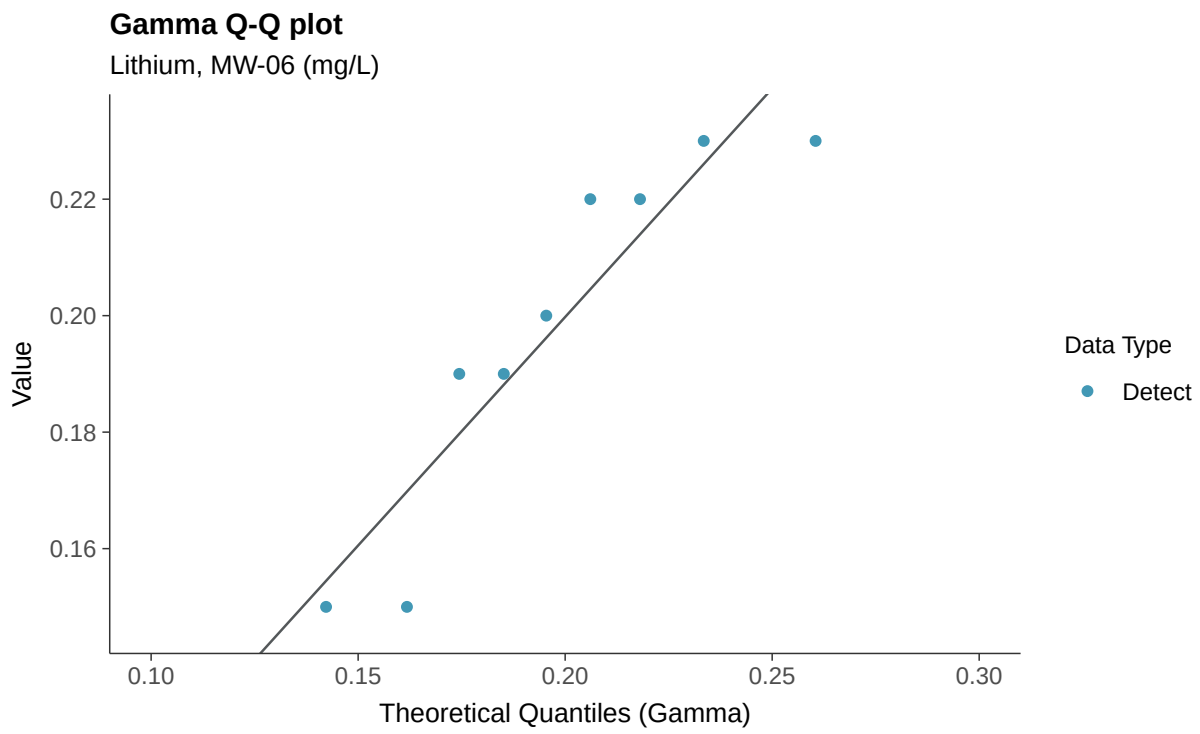
Boxplot by Season

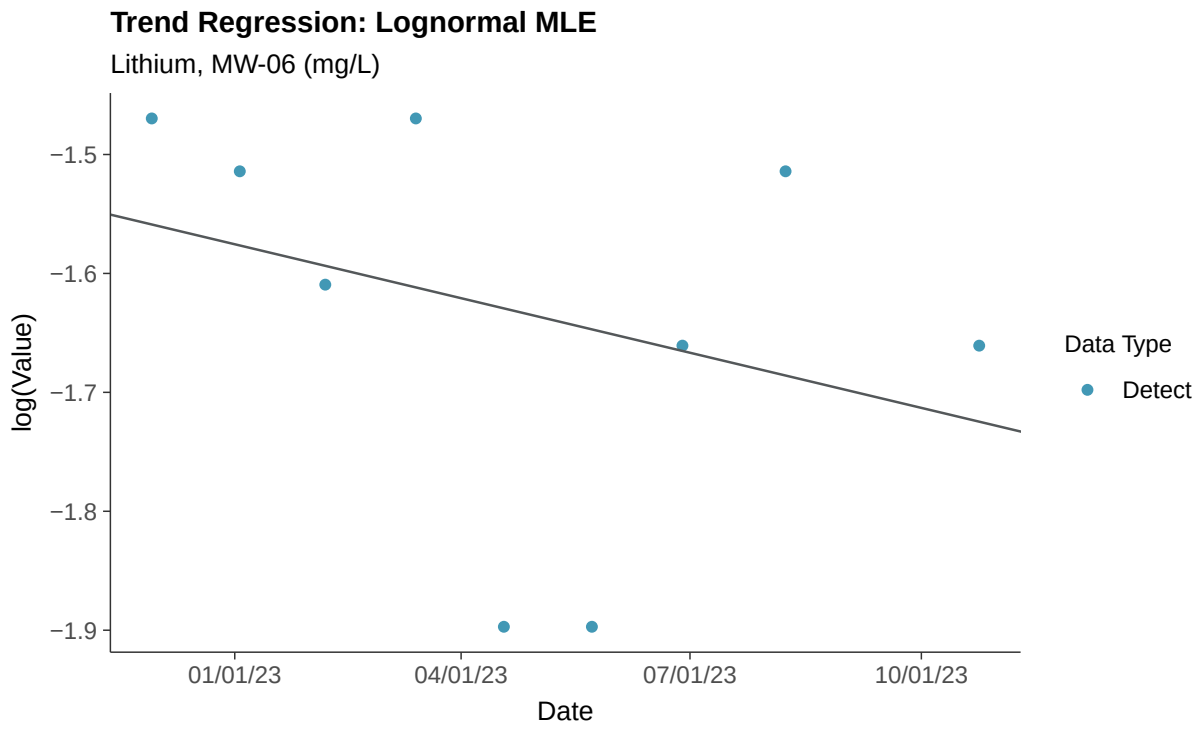
Lithium, MW-06 (mg/L)

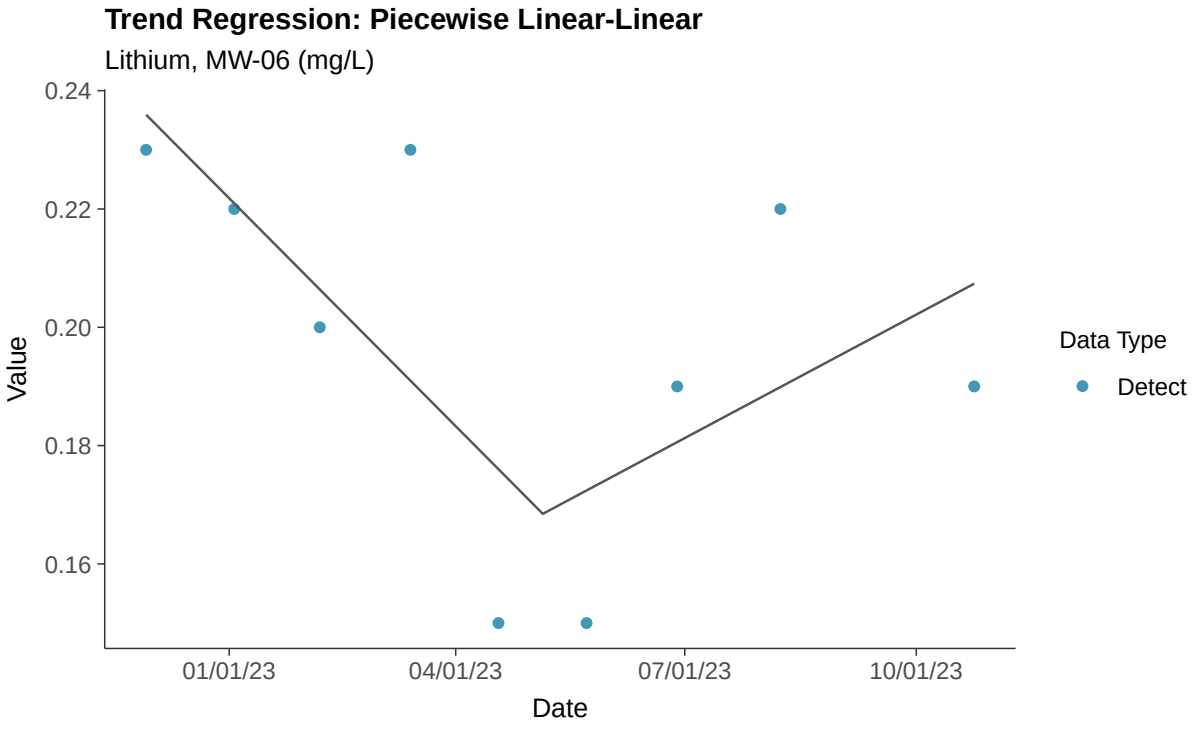



Normal Q-Q plot
Lithium, MW-06 (mg/L)
Value
0.22
0.20
0.18
0.16
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-06 (mg/L)
log(Value)
−1.5
−1.6
−1.7
−1.8
−1.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

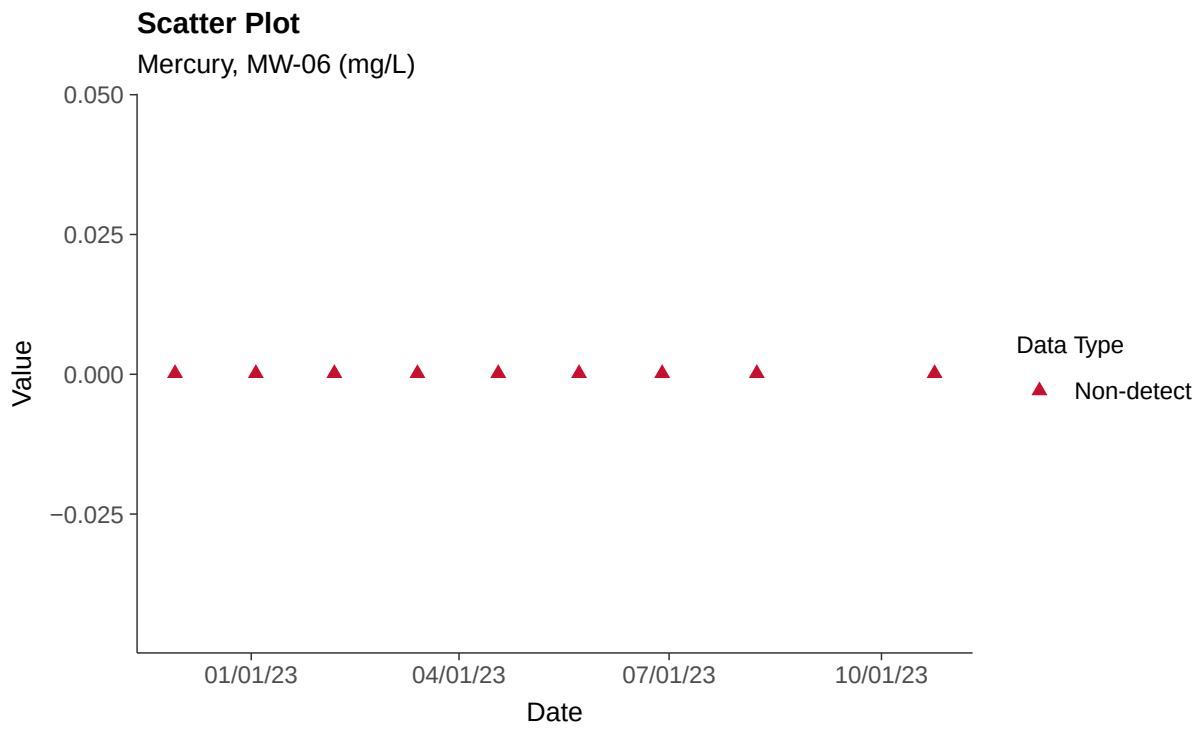

Gamma Q-Q plot
Lithium, MW-06 (mg/L)
Value
0.22
0.20
0.18
0.16
0.10
0.15
0.20
0.25
0.30
Theoretical Quantiles (Gamma)
Data Type
Detect

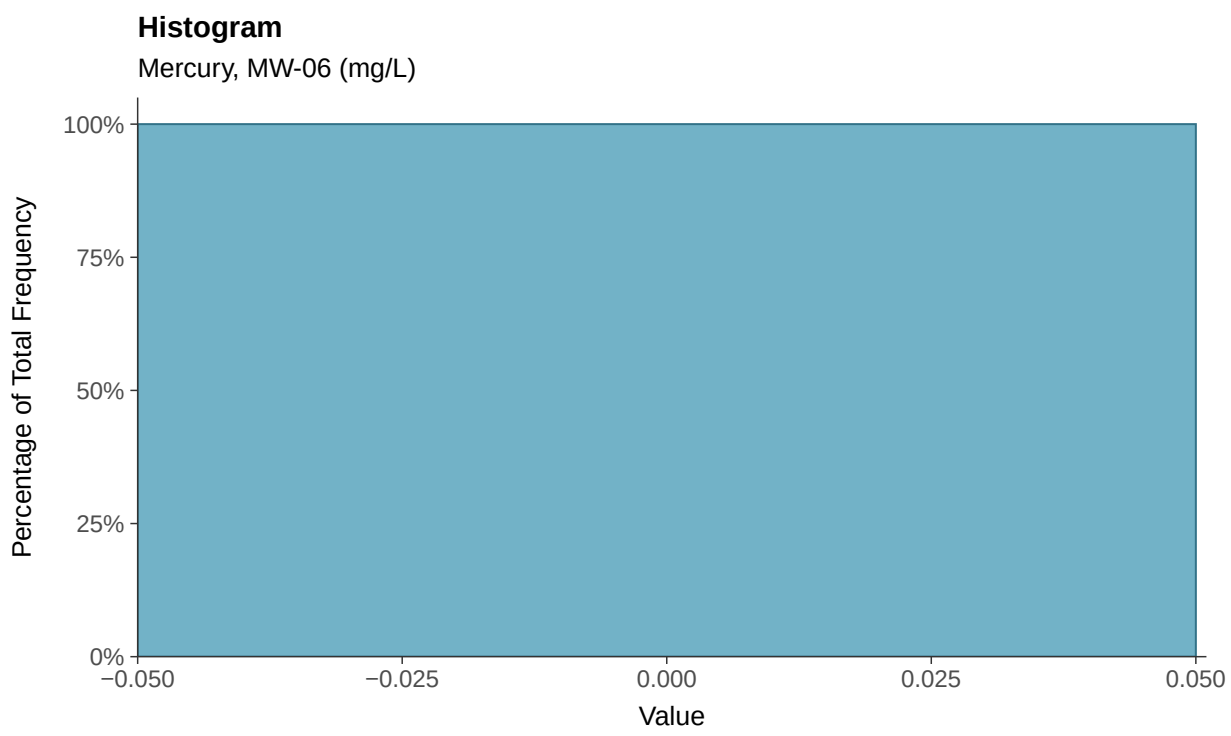

Trend Regression: Lognormal MLE
Lithium, MW-06 (mg/L)
log(Value)
−1.5
−1.6
−1.7
−1.8
−1.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Lithium, MW-06 (mg/L)
0.24
0.22
0.20
0.18
0.16
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-06

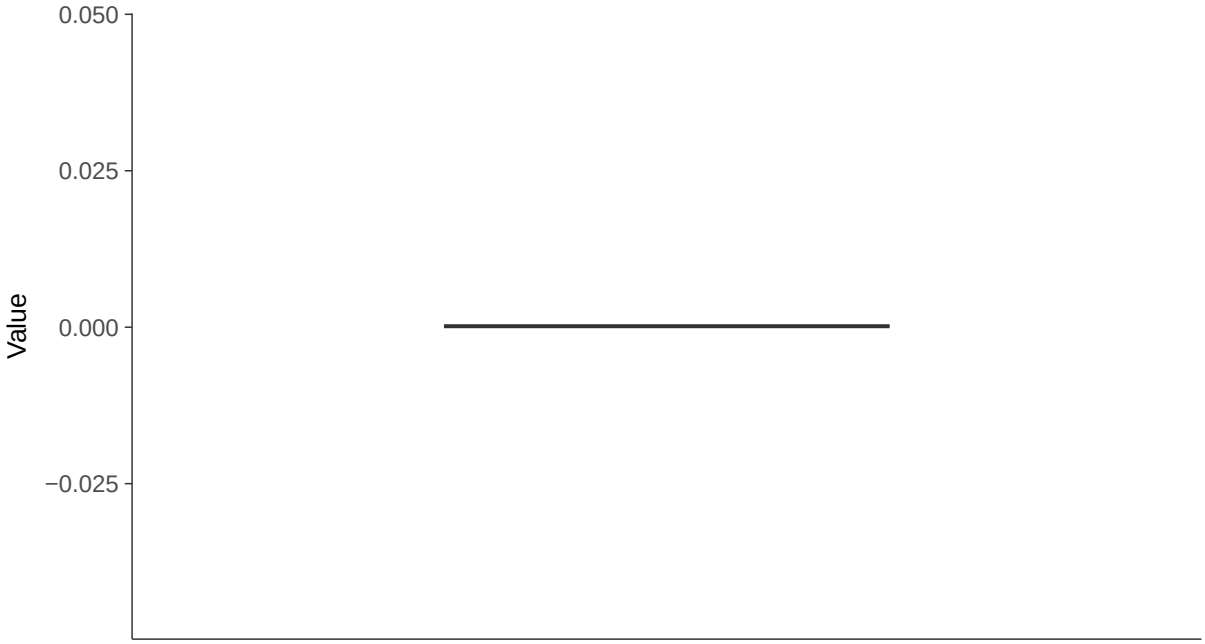
ID: 1_15_5_117





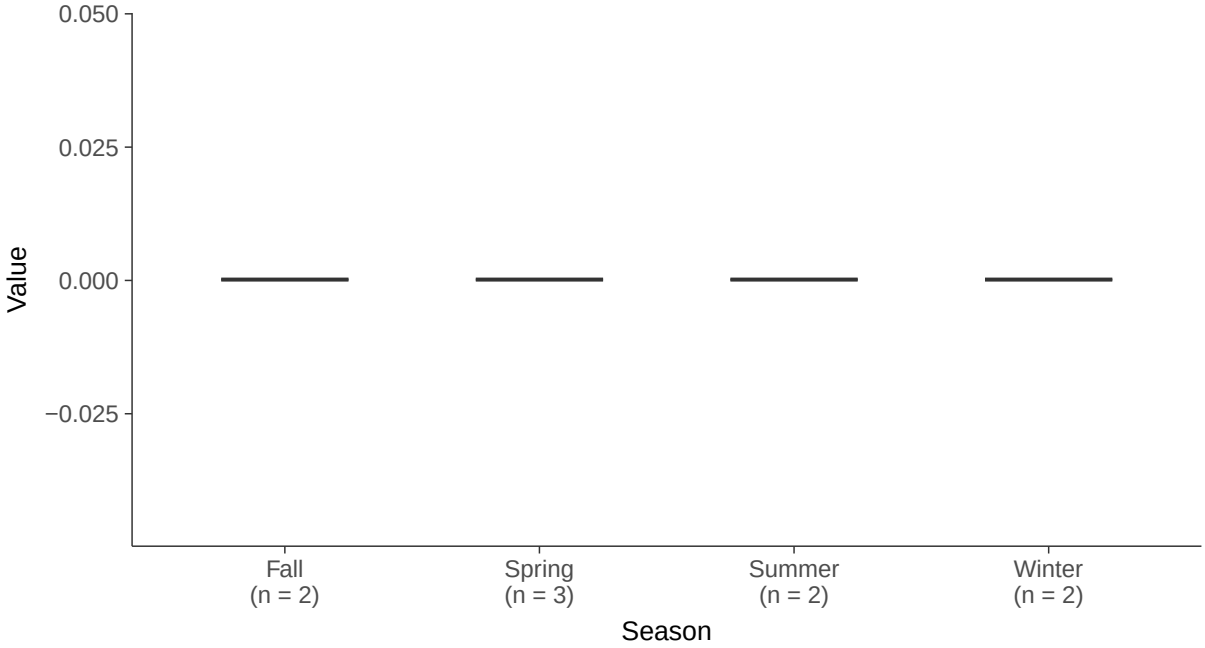
Boxplot

Mercury, MW-06 (mg/L)



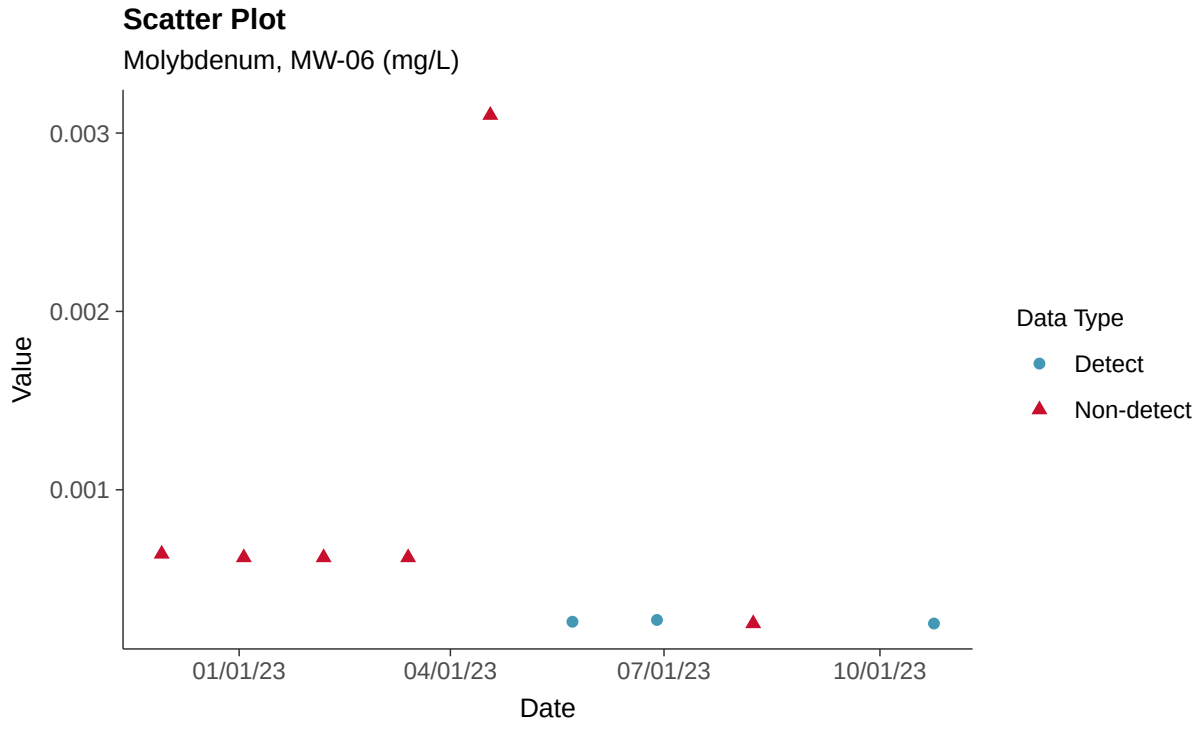
Boxplot by Season

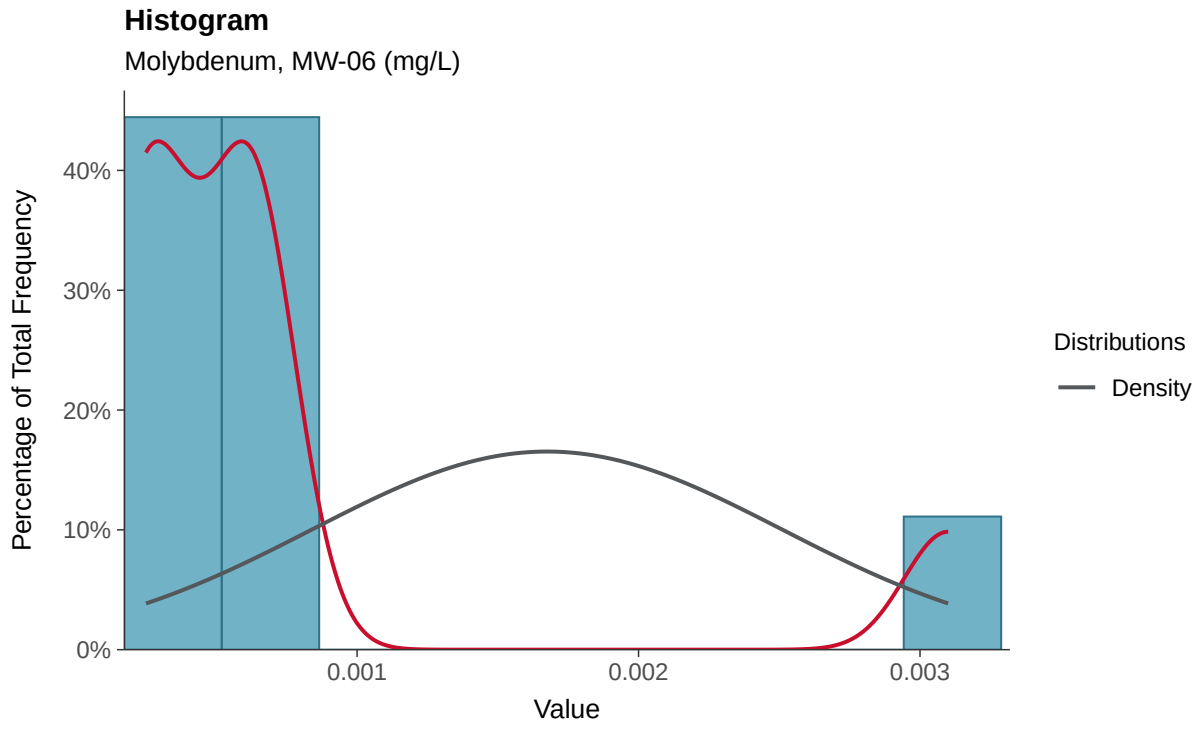
Mercury, MW-06 (mg/L)

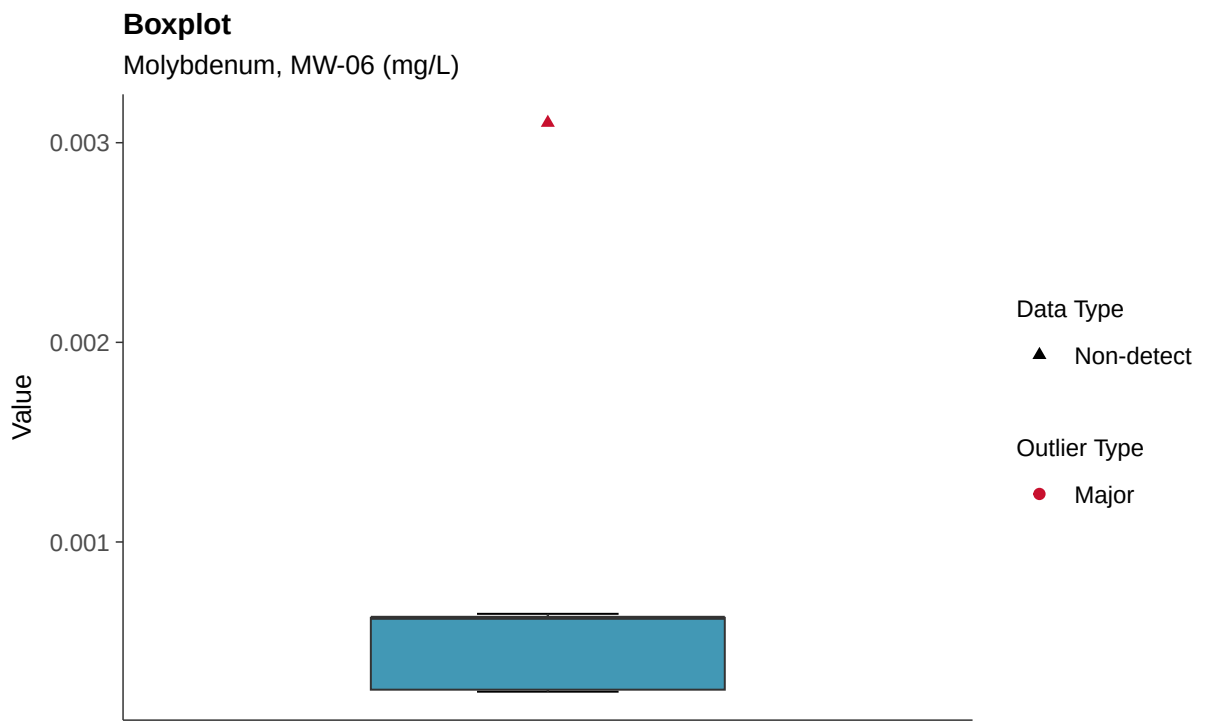


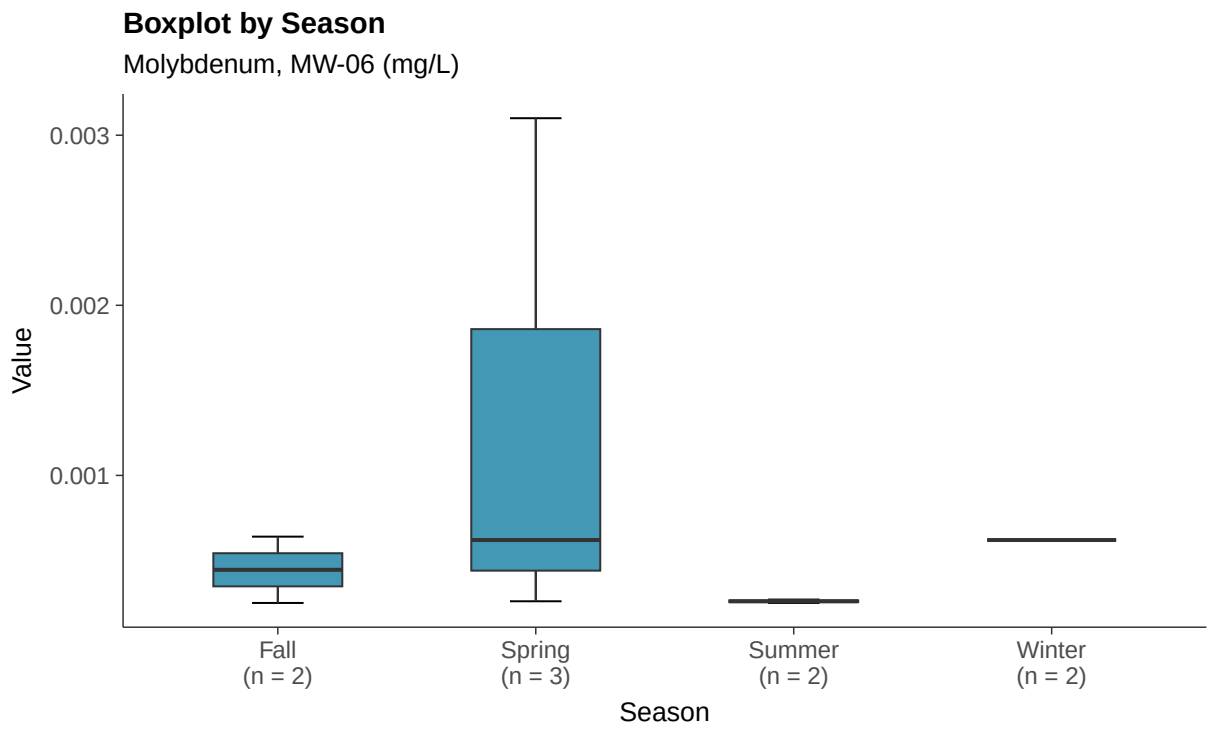
Appendix IV: Molybdenum, MW-06

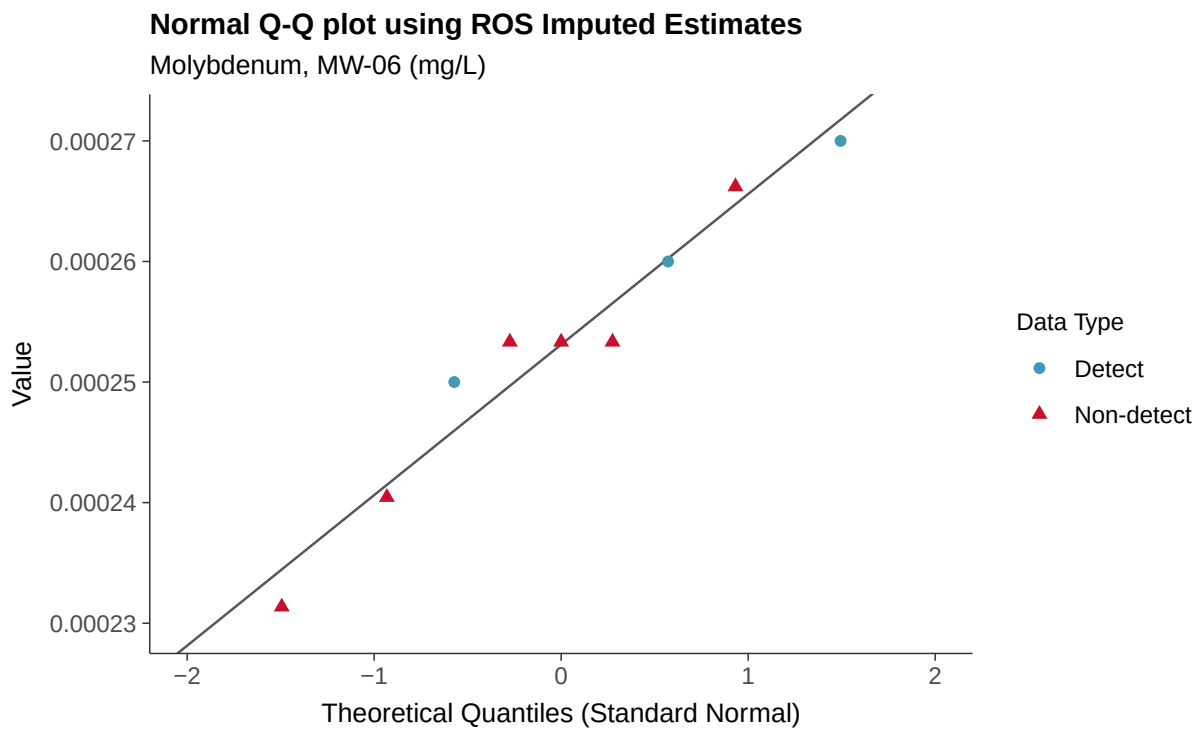
ID: 1_15_5_118

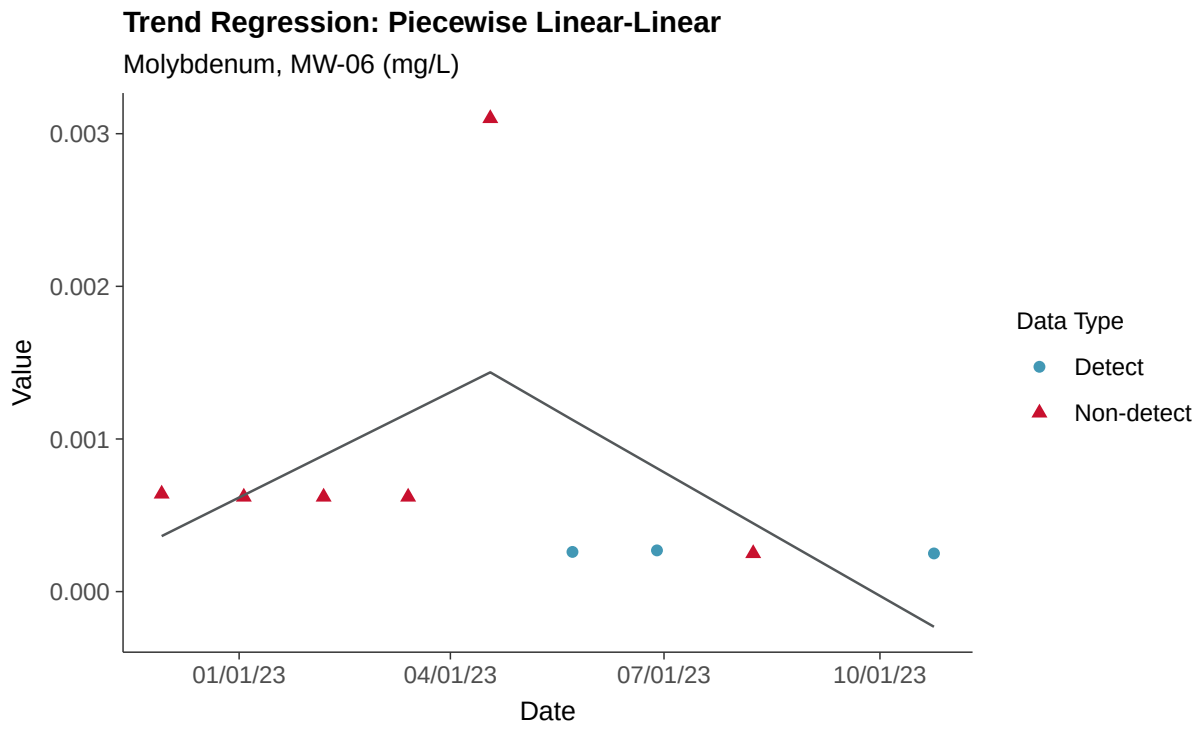


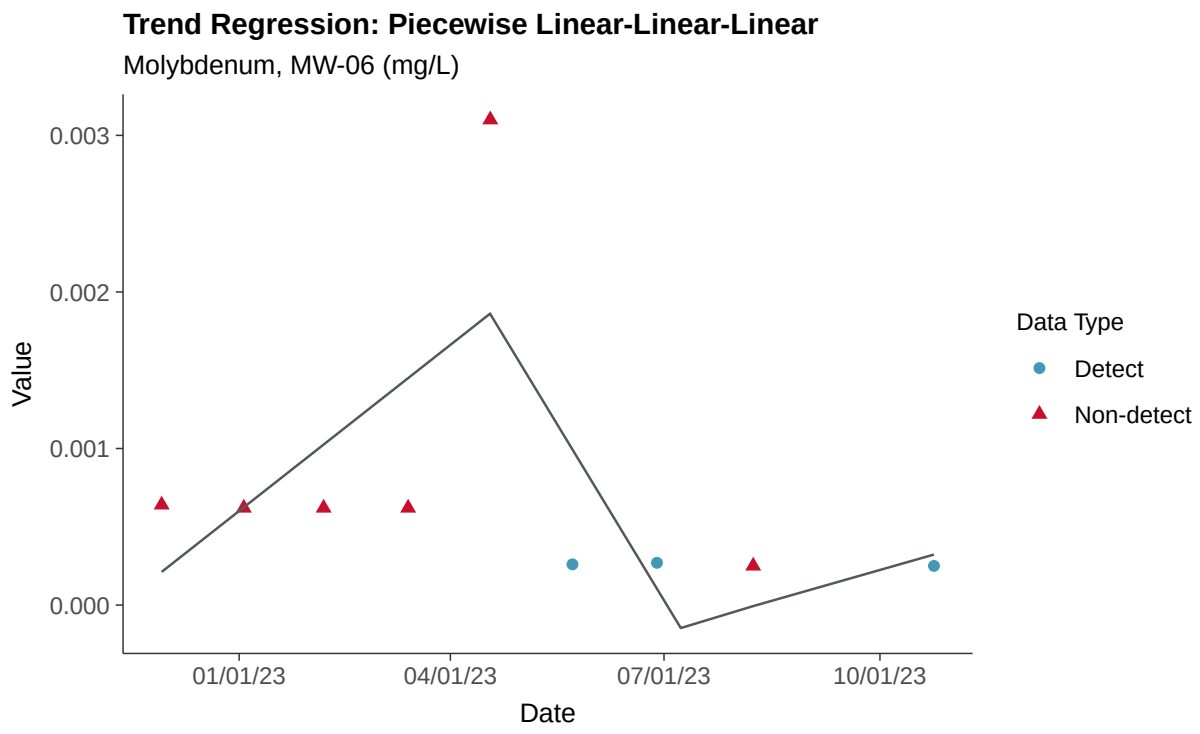



Boxplot
Molybdenum, MW-06 (mg/L)
Value
0.003
0.002
0.001
Data Type
Non-detect
Outlier Type
Major


Boxplot by Season
Molybdenum, MW-06 (mg/L)
Value
0.003
0.002
0.001
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

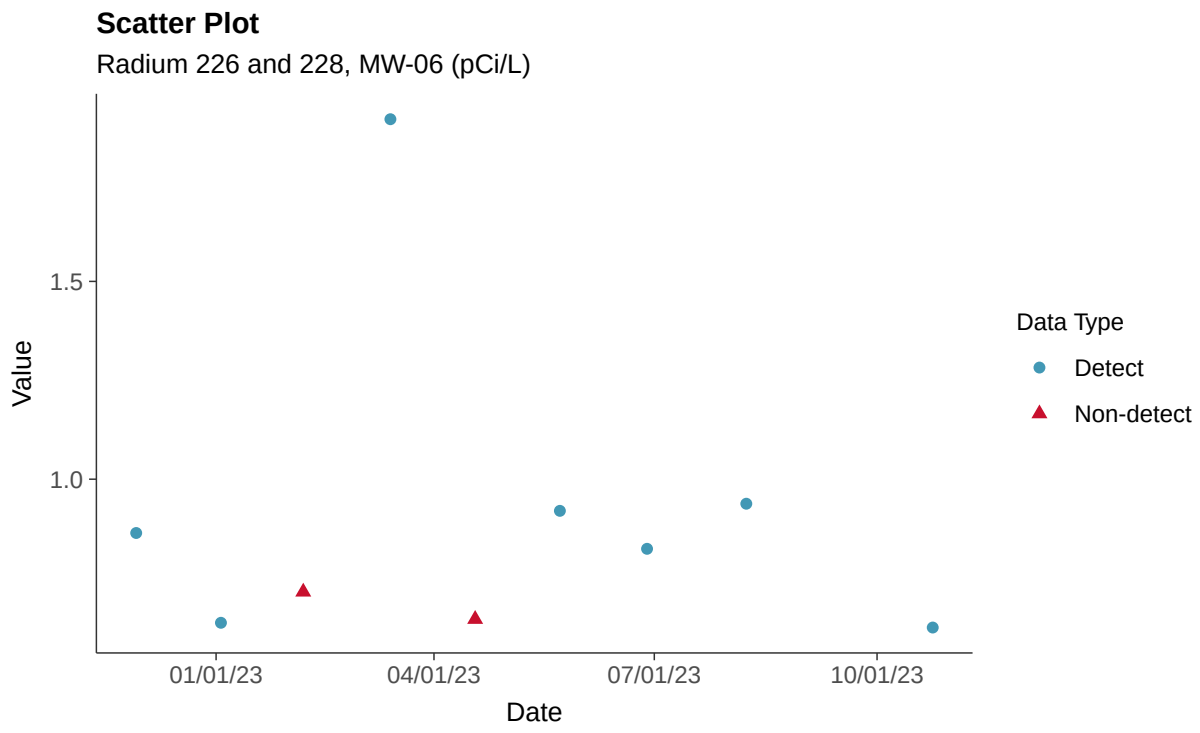

Normal Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-06 (mg/L)
Value
0.00027
0.00026
0.00025
0.00024
0.00023
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

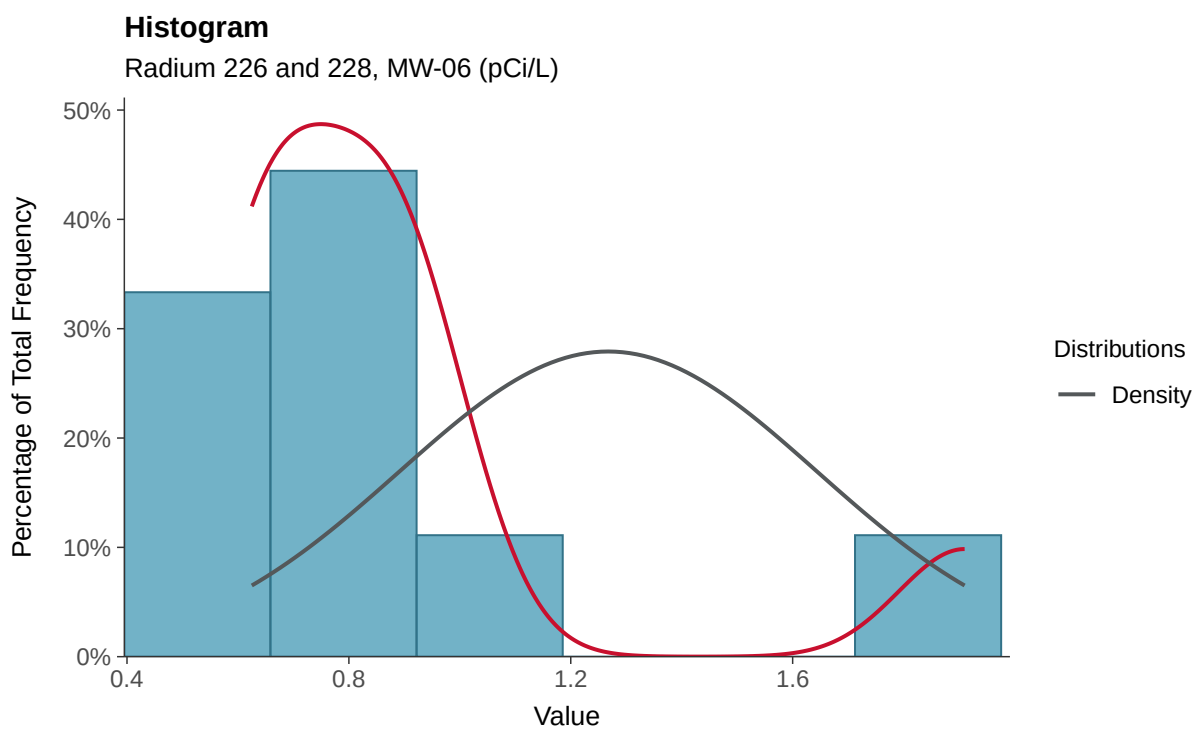

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-06 (mg/L)
Value
0.003
0.002
0.001
0.000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-06 (mg/L)
0.003
0.002
0.001
0.000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Radium 226 and 228, MW-06

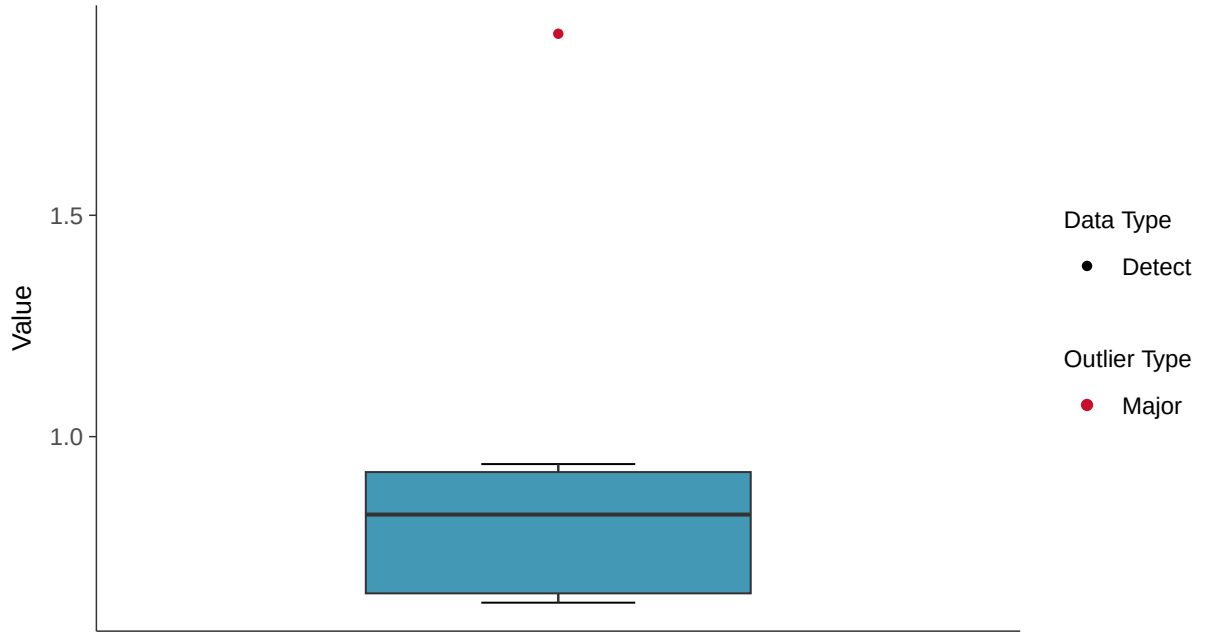
ID: 1_15_5_121





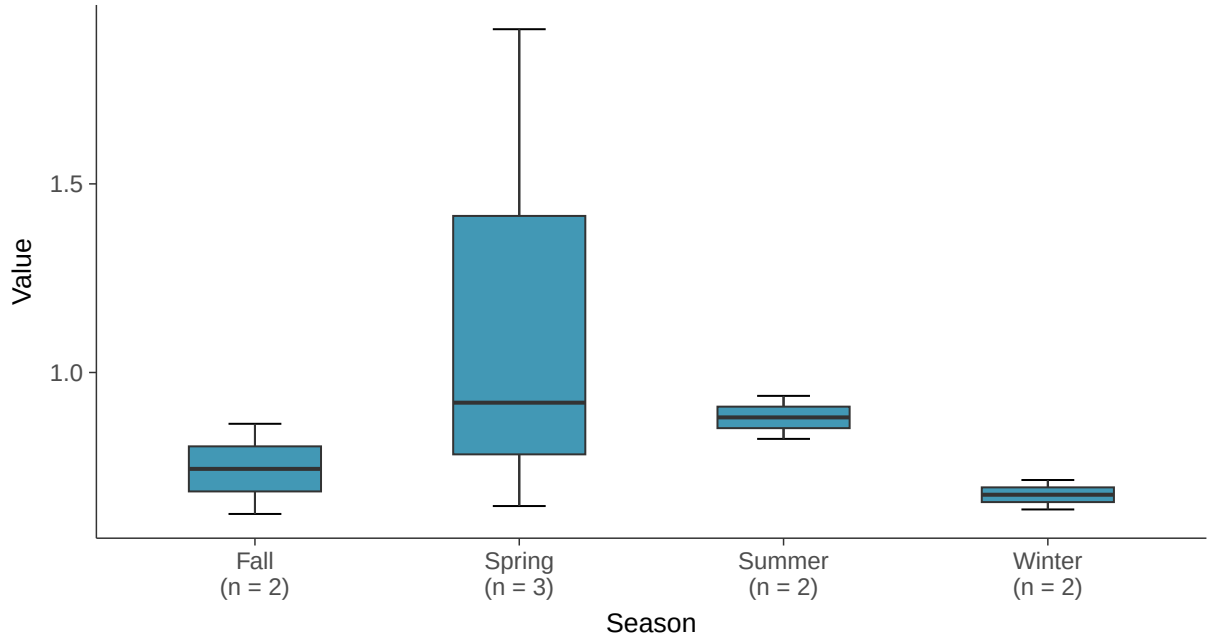
Boxplot

Radium 226 and 228, MW-06 (pCi/L)



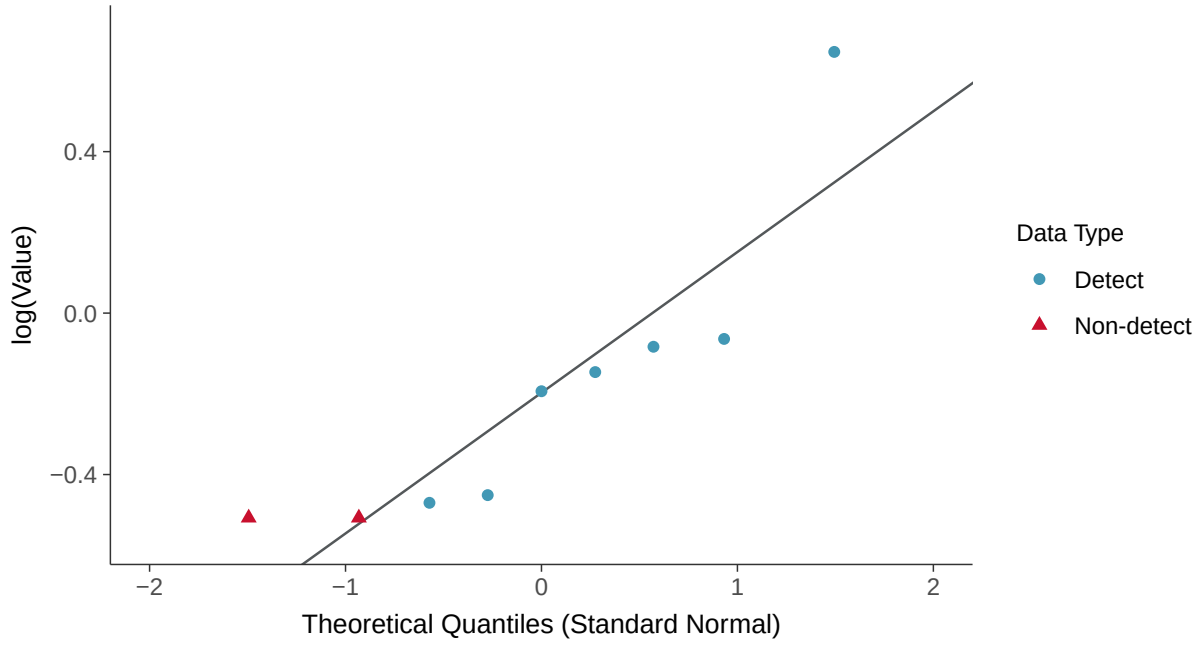
Boxplot by Season

Radium 226 and 228, MW-06 (pCi/L)



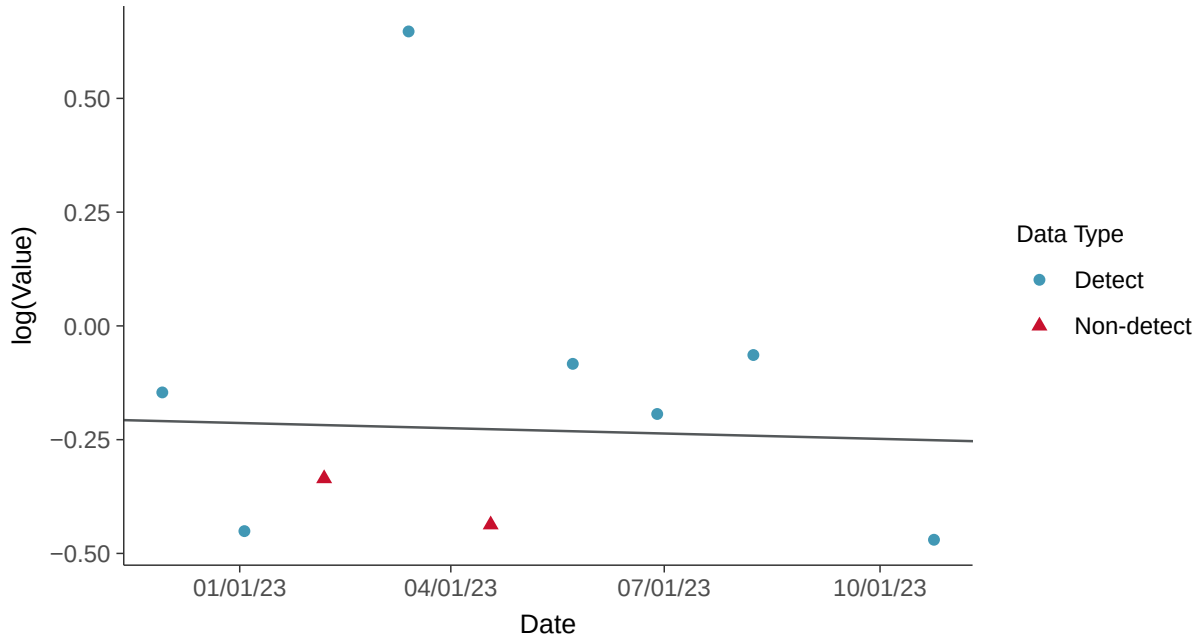
Lognormal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-06 (pCi/L)



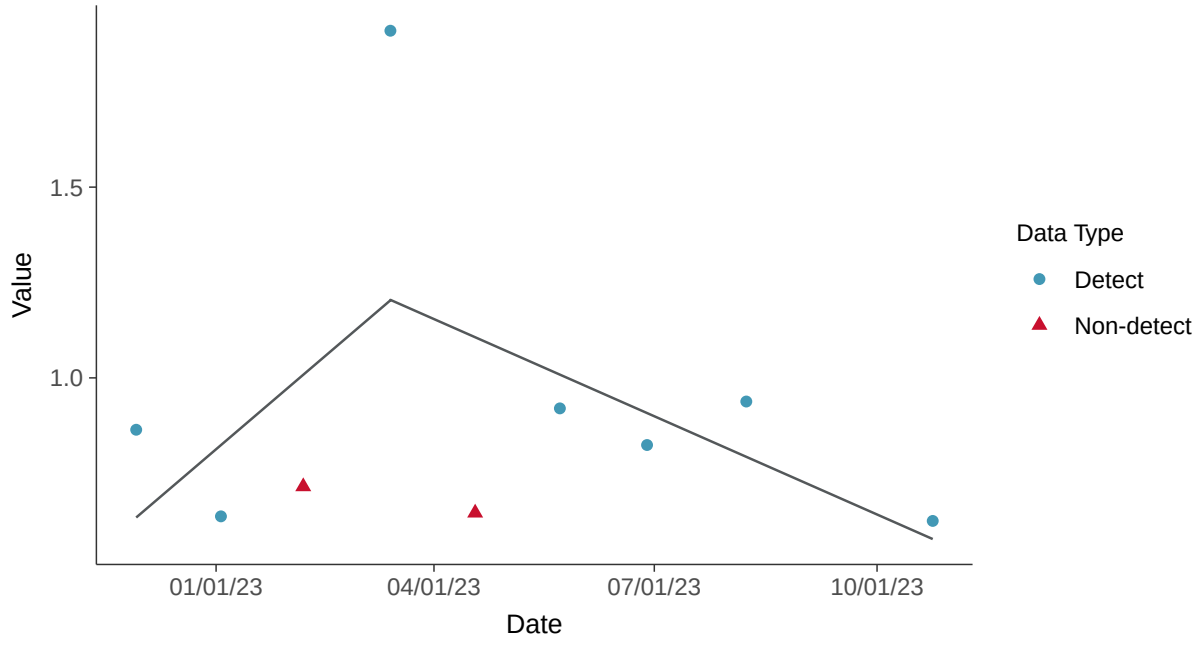
Trend Regression: Lognormal MLE

Radium 226 and 228, MW-06 (pCi/L)



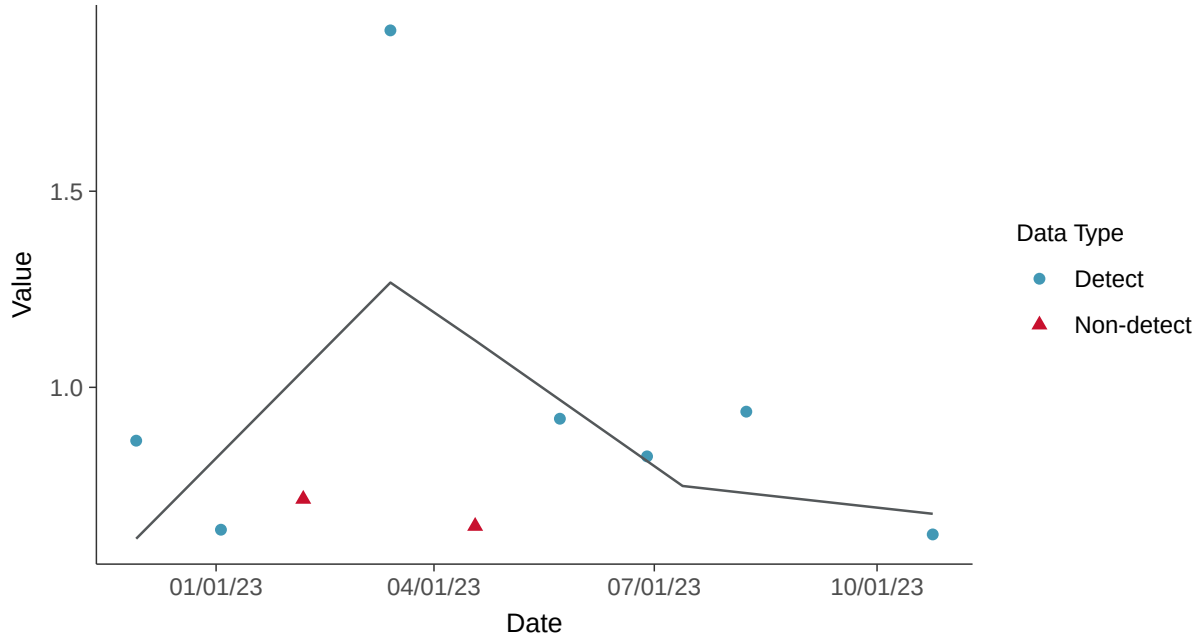
Trend Regression: Piecewise Linear-Linear

Radium 226 and 228, MW-06 (pCi/L)



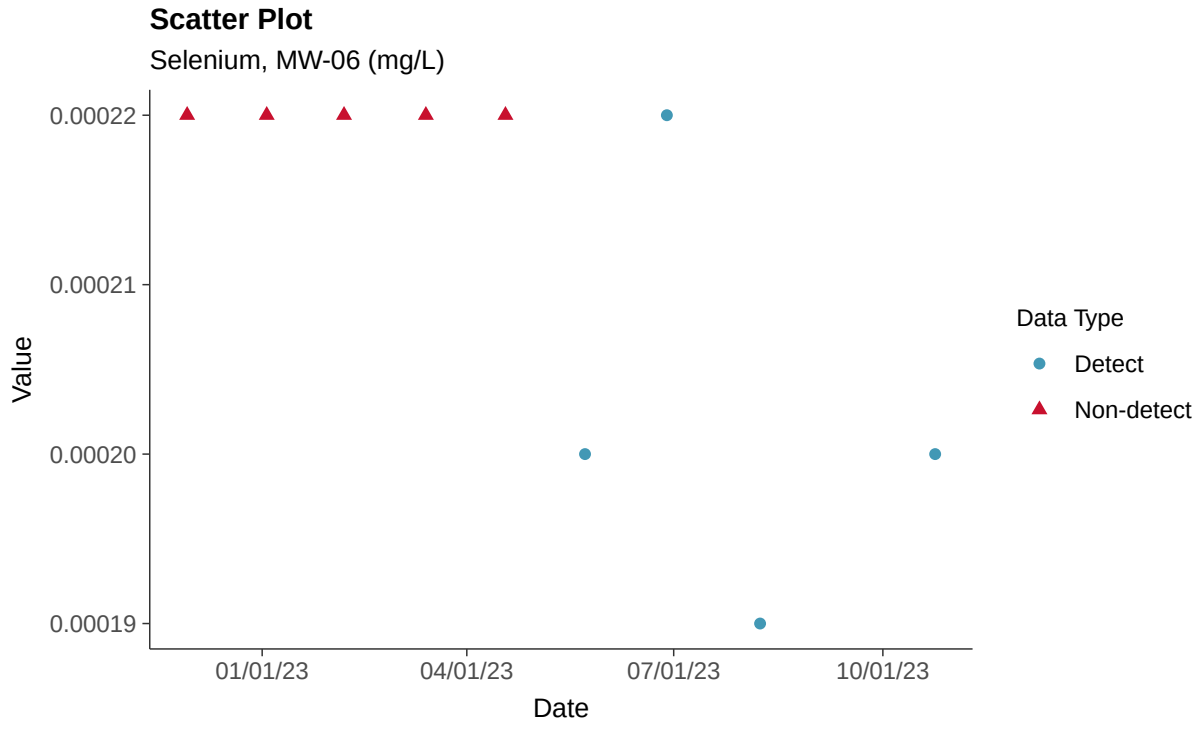
Trend Regression: Piecewise Linear-Linear-Linear

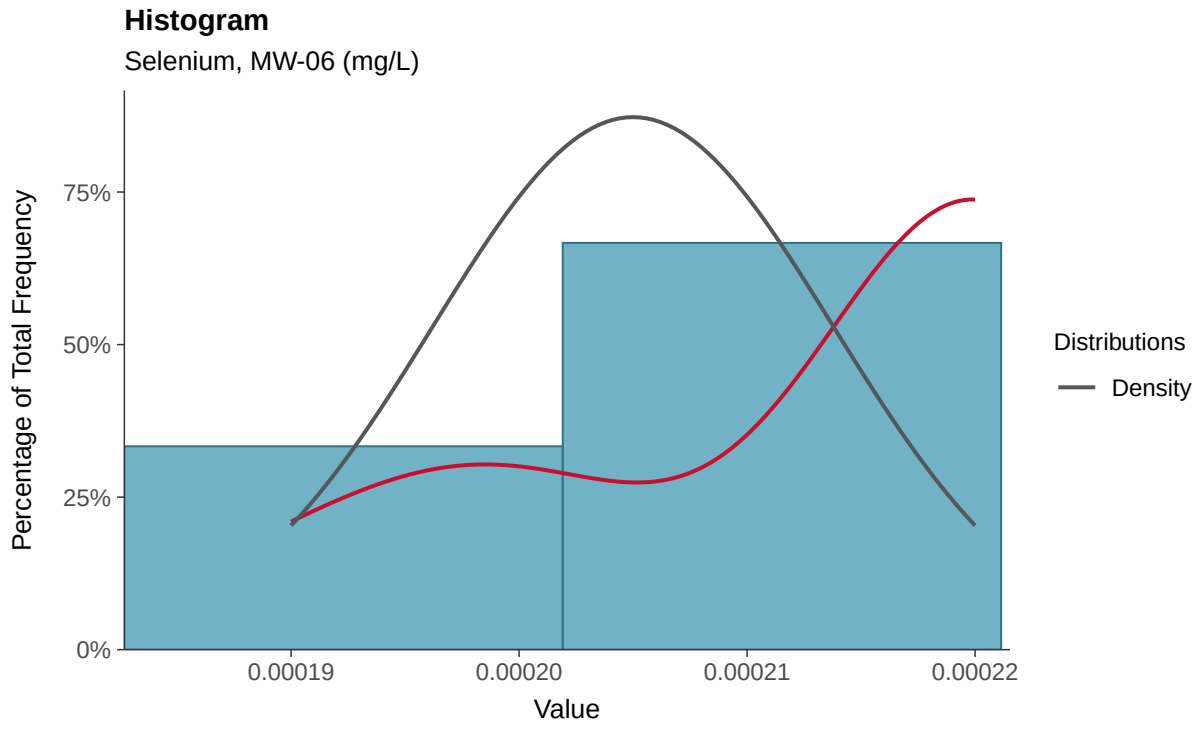
Radium 226 and 228, MW-06 (pCi/L)



Appendix IV: Selenium, MW-06

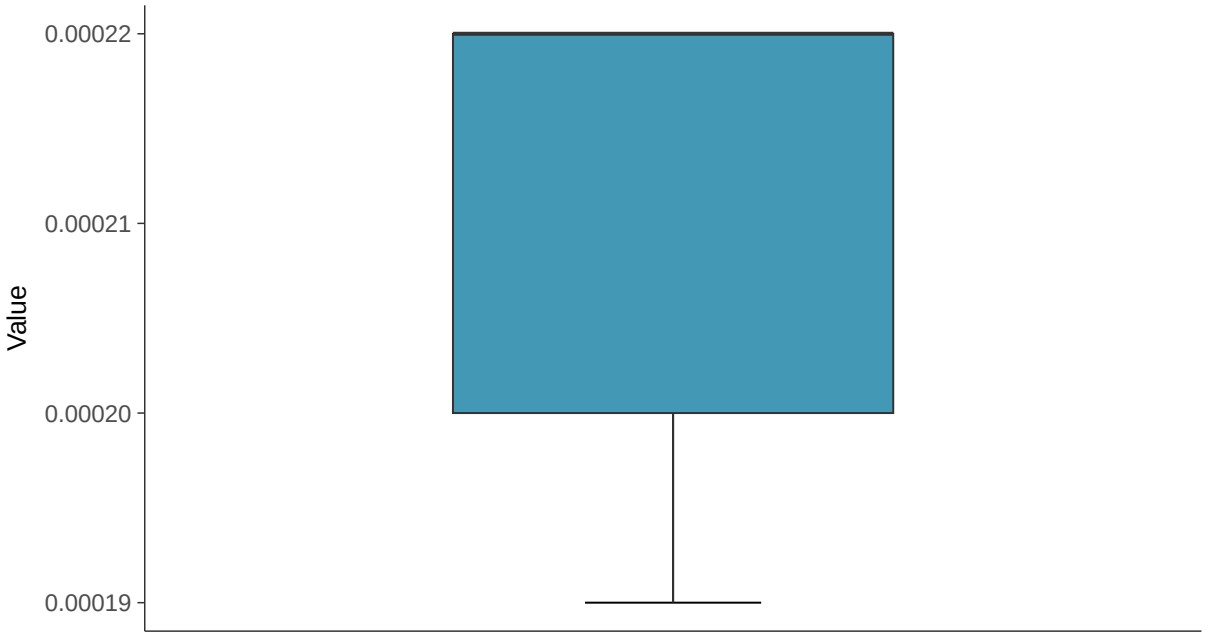
ID: 1_15_5_122





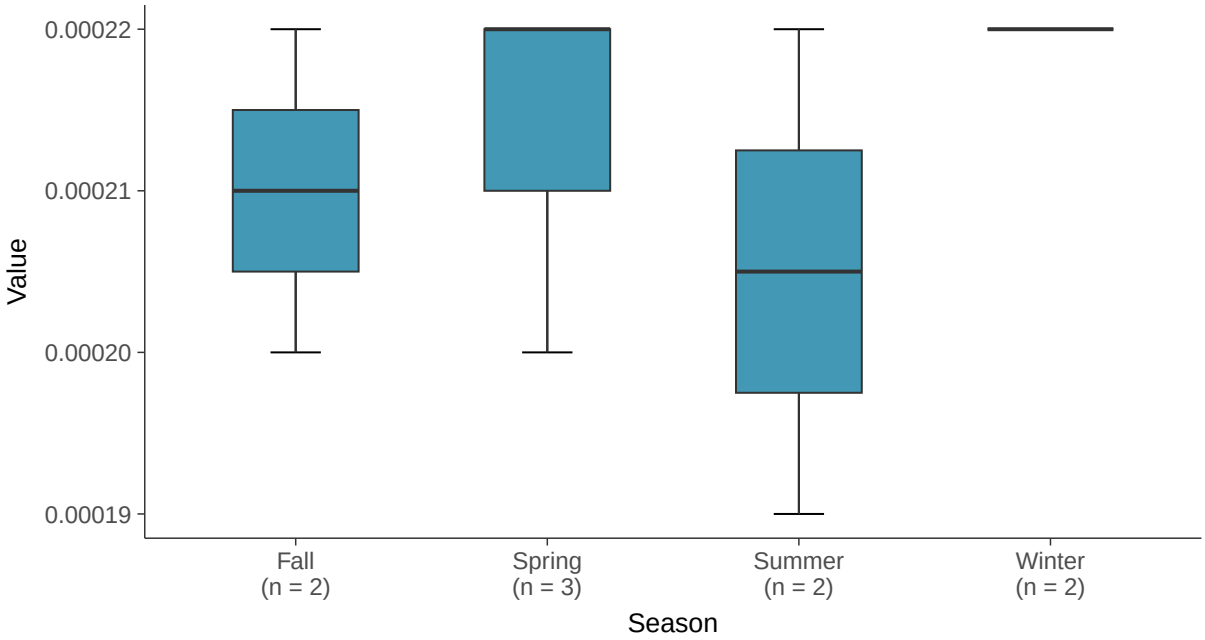
Boxplot

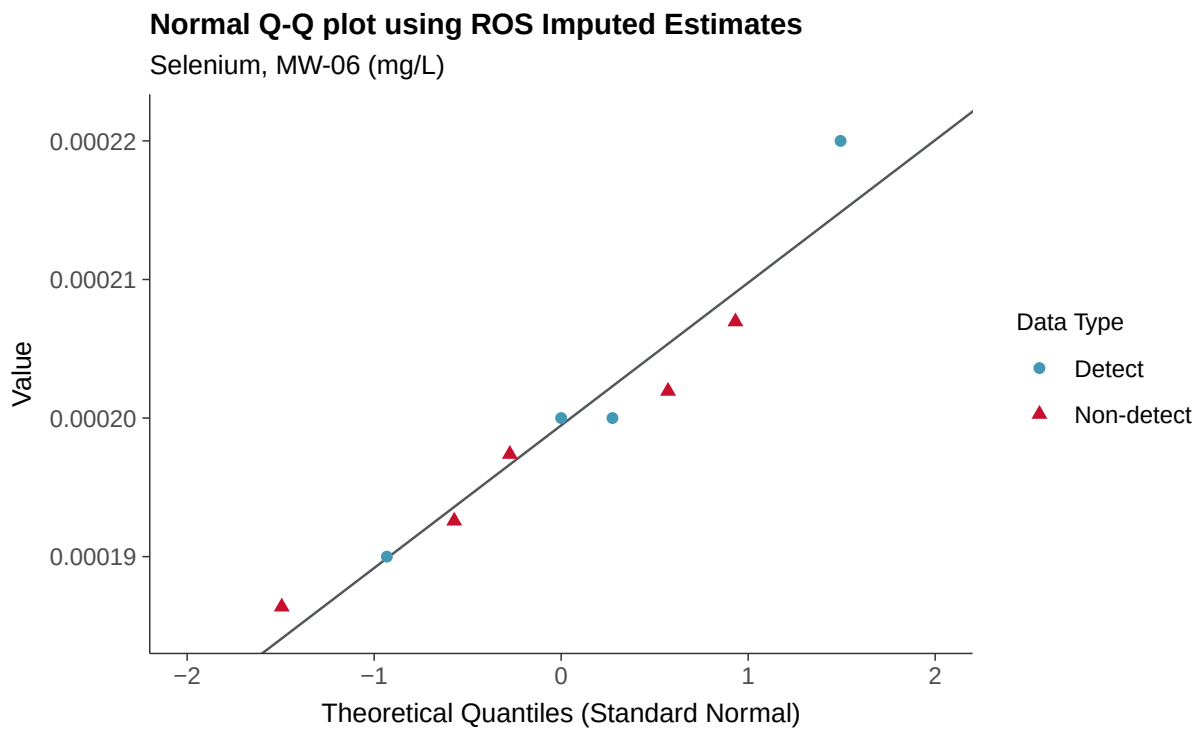
Selenium, MW-06 (mg/L)

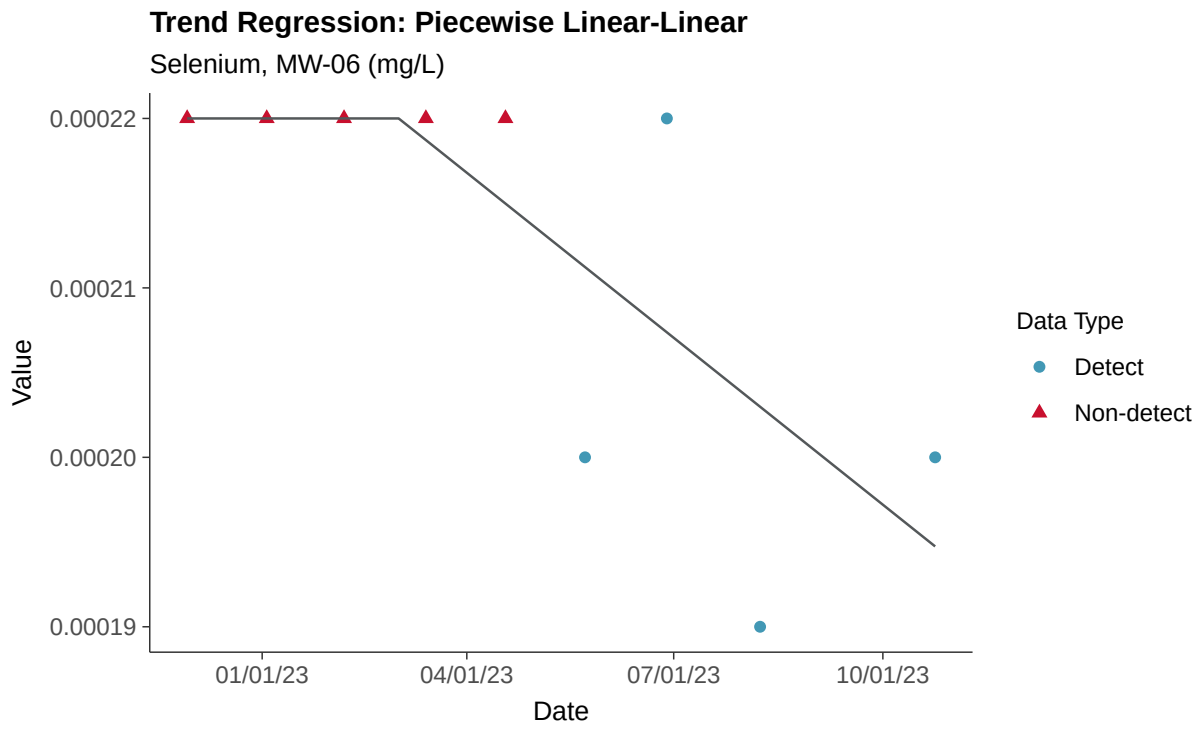


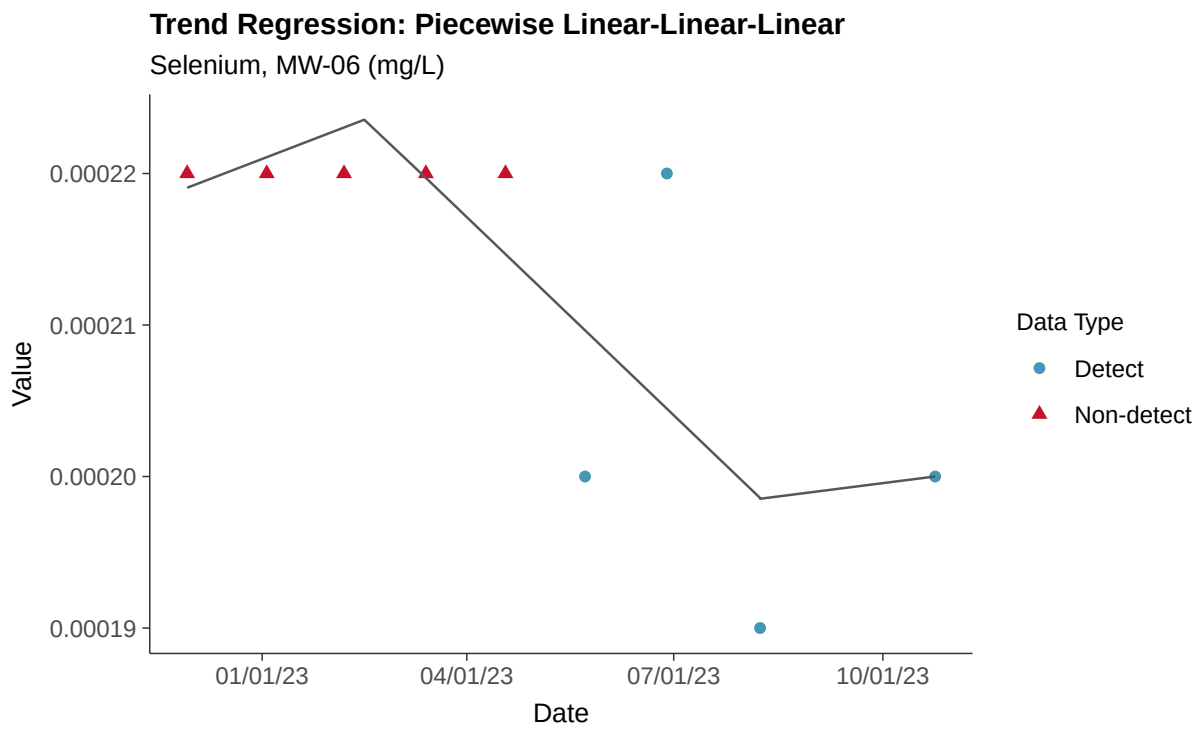
Boxplot by Season

Selenium, MW-06 (mg/L)



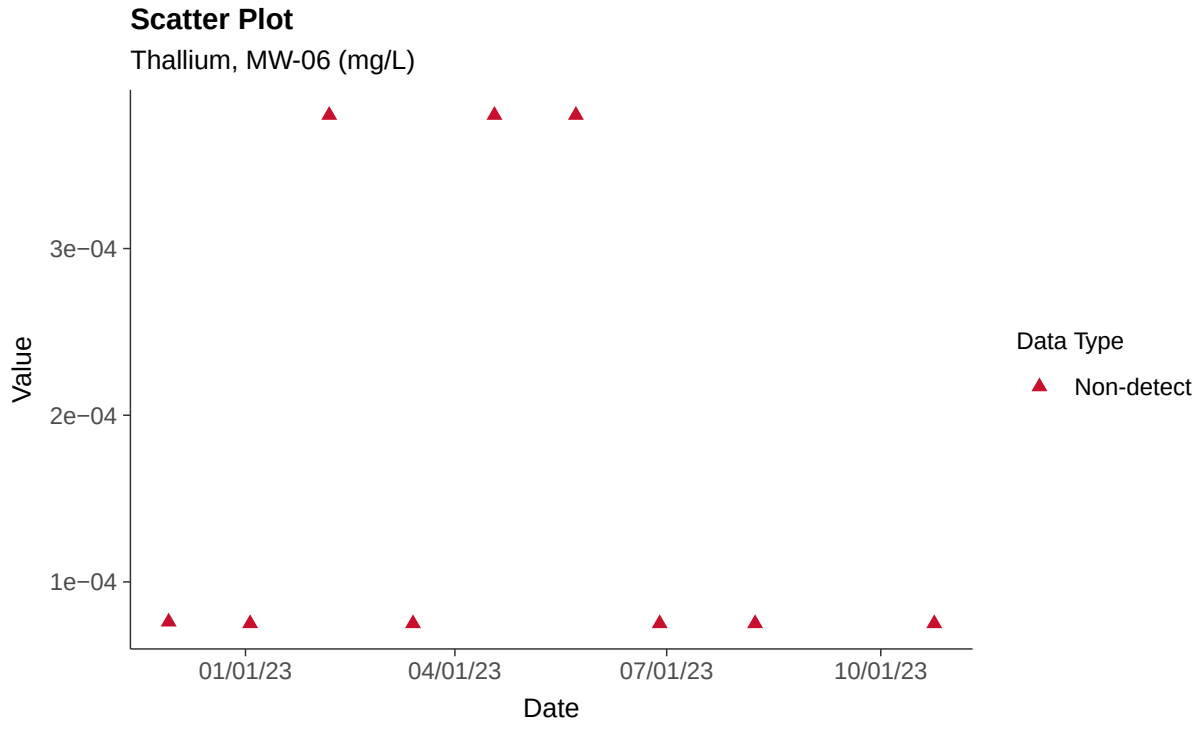

Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-06 (mg/L)
Value
0.00022
0.00021
0.00020
0.00019
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

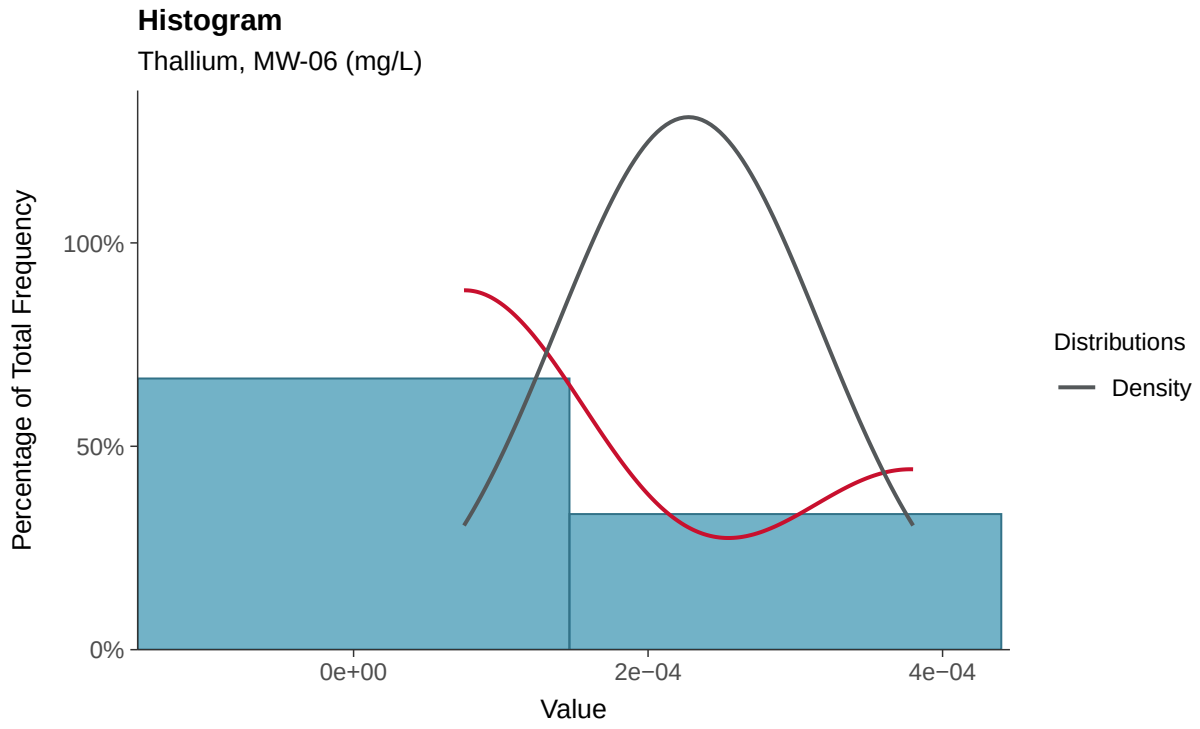

Trend Regression: Piecewise Linear-Linear
Selenium, MW-06 (mg/L)
Value
0.00022
0.00021
0.00020
0.00019
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-06 (mg/L)
0.00022
0.00021
0.00020
0.00019
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-06

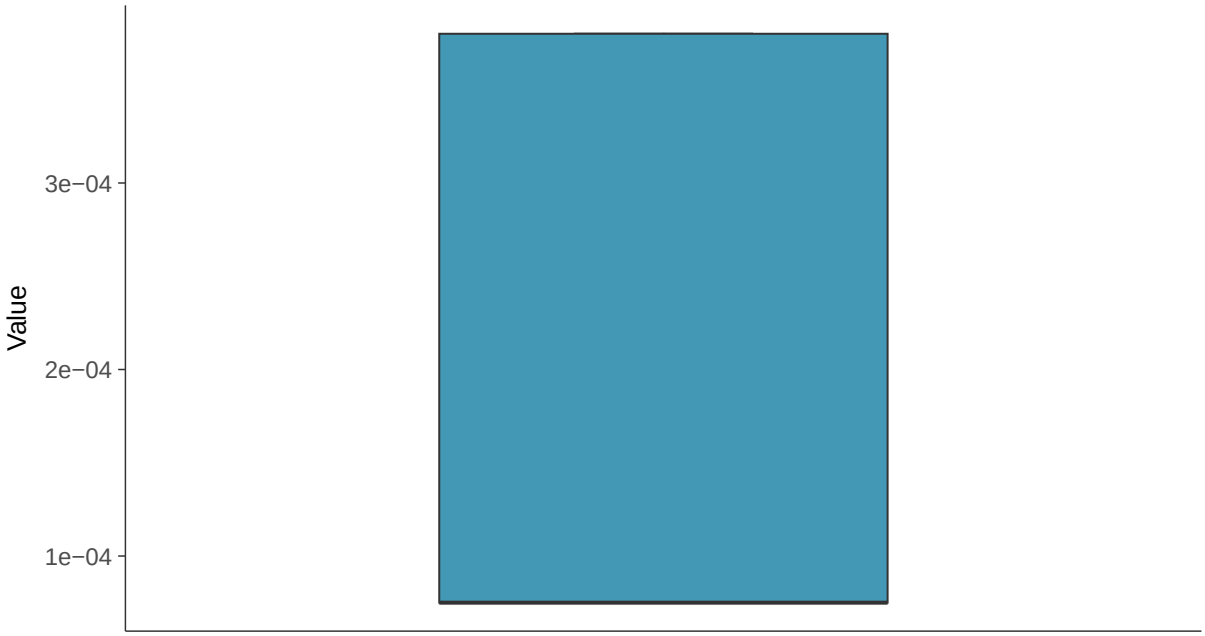
ID: 1_15_5_125





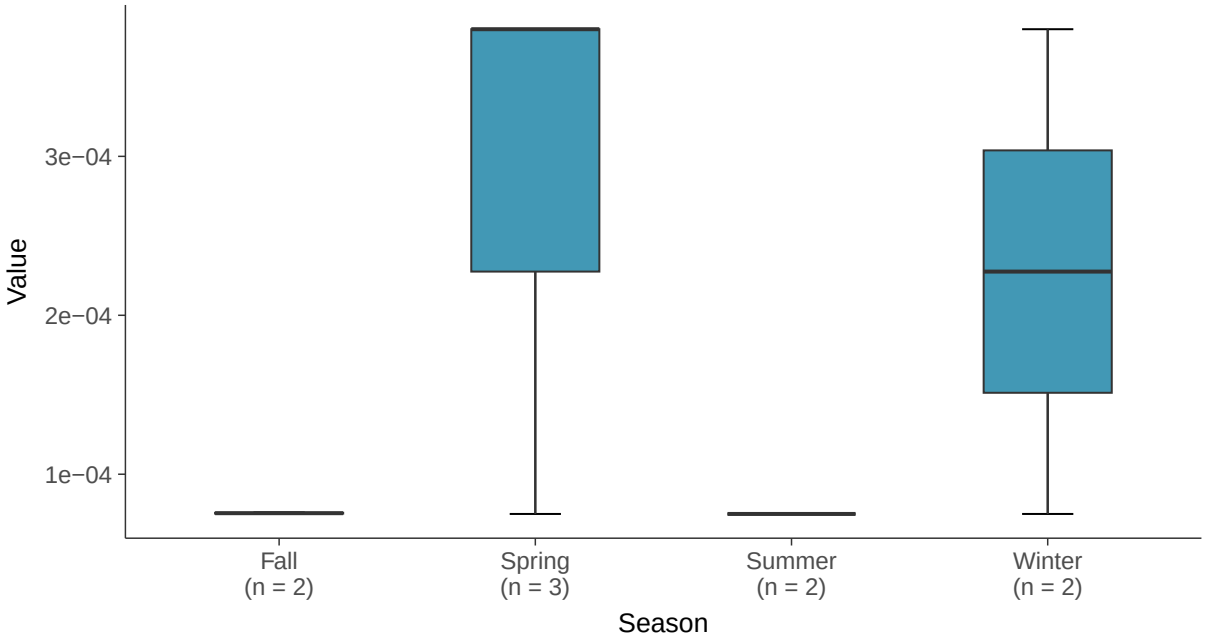
Boxplot

Thallium, MW-06 (mg/L)



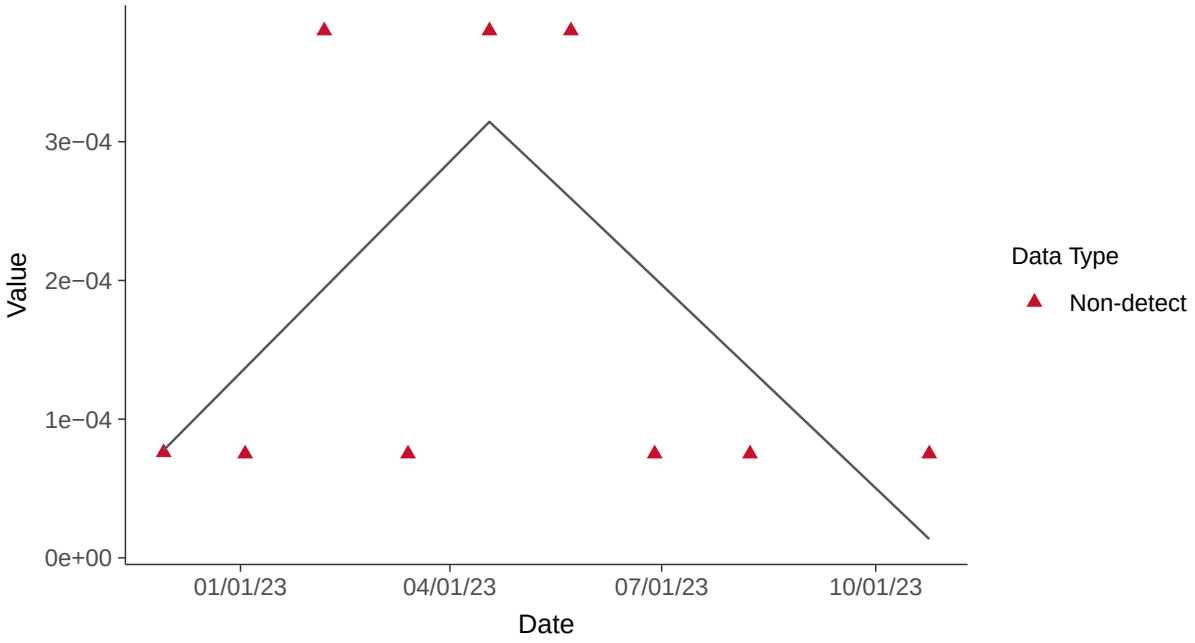
Boxplot by Season

Thallium, MW-06 (mg/L)



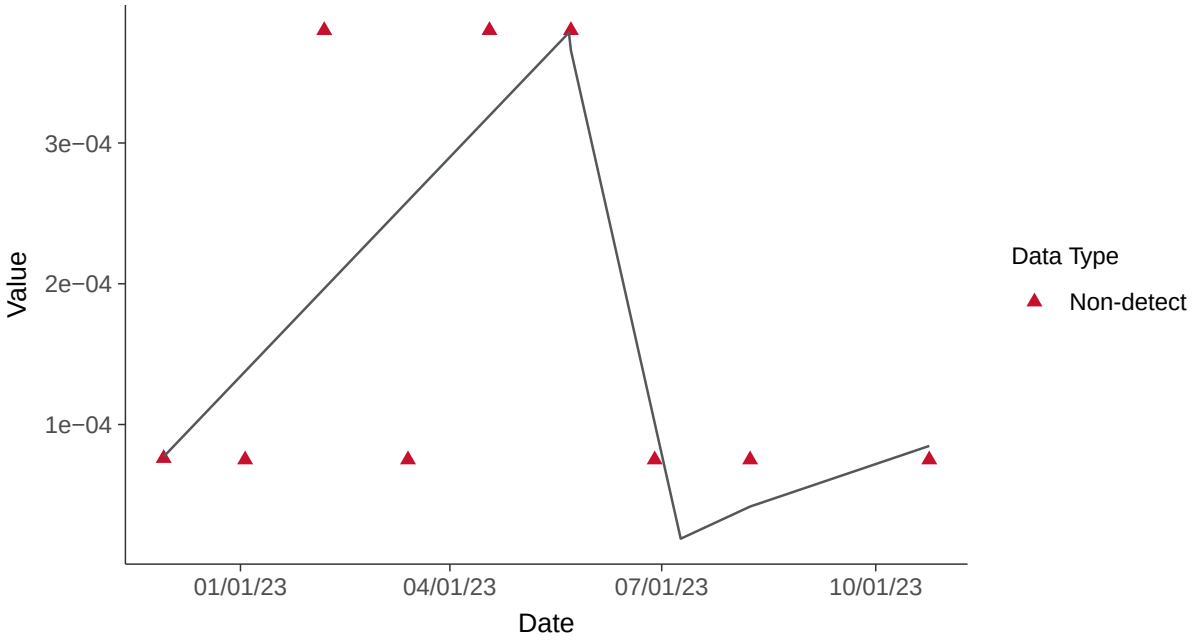
Trend Regression: Piecewise Linear-Linear

Thallium, MW-06 (mg/L)



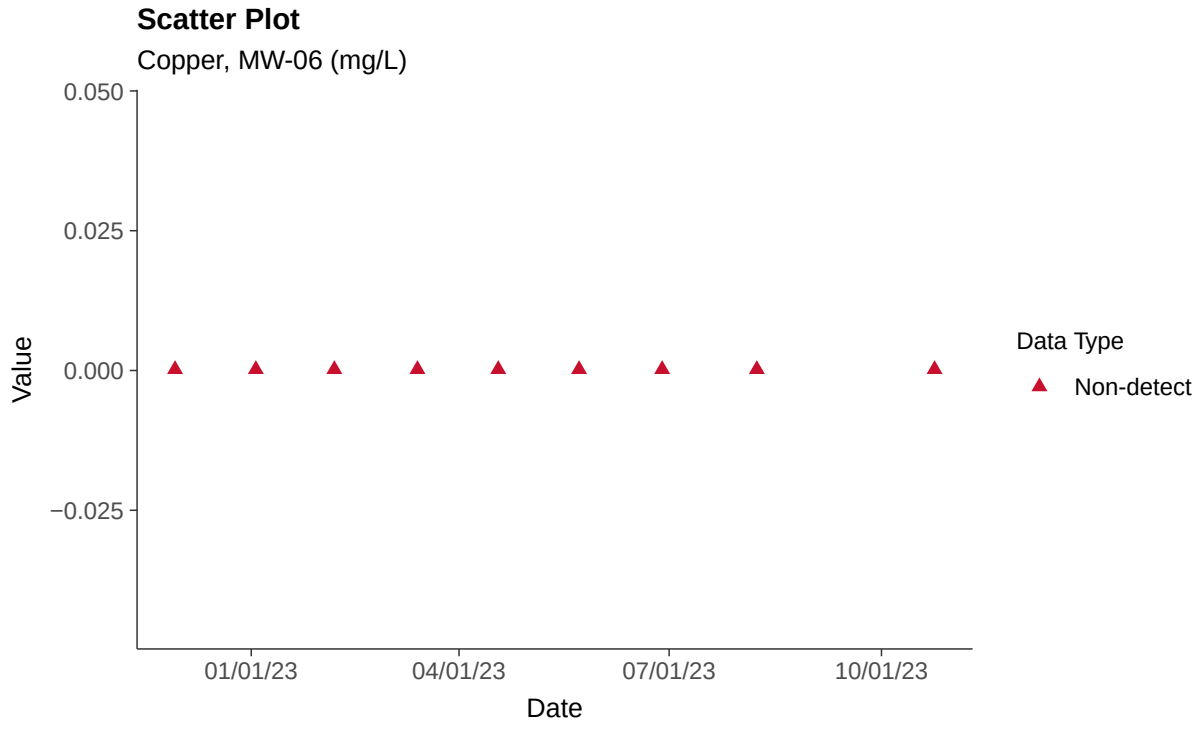
Trend Regression: Piecewise Linear-Linear-Linear

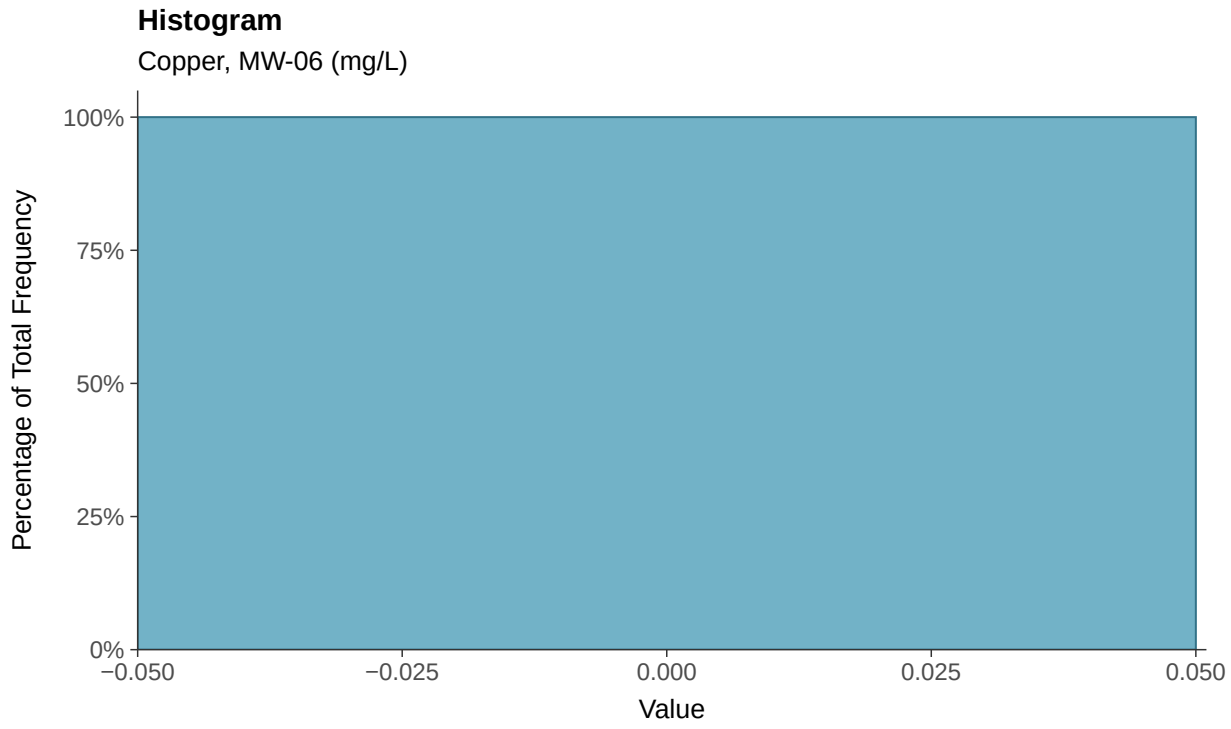
Thallium, MW-06 (mg/L)



Part 115: Copper, MW-06

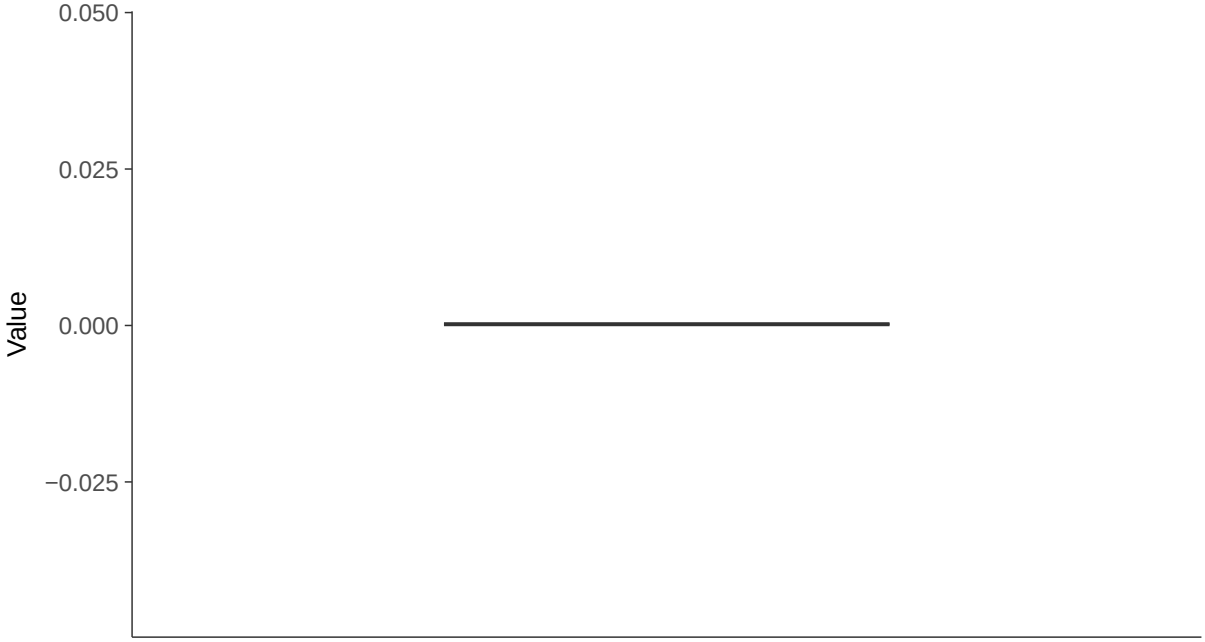
ID: 1_15_6_111





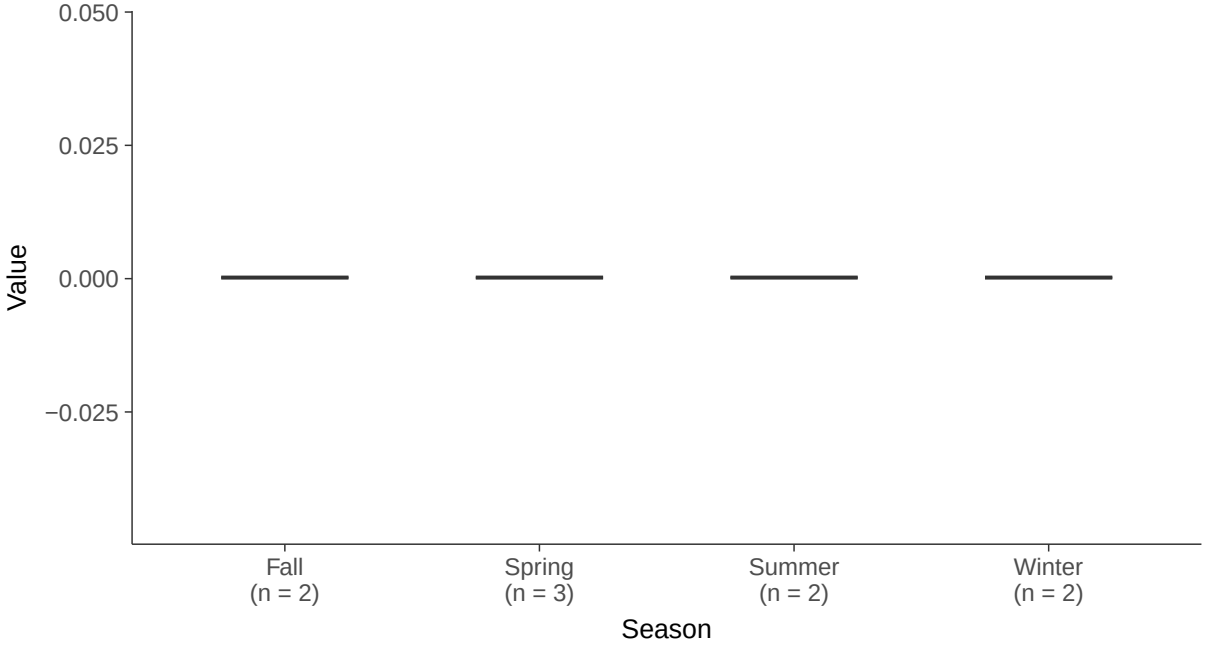
Boxplot

Copper, MW-06 (mg/L)



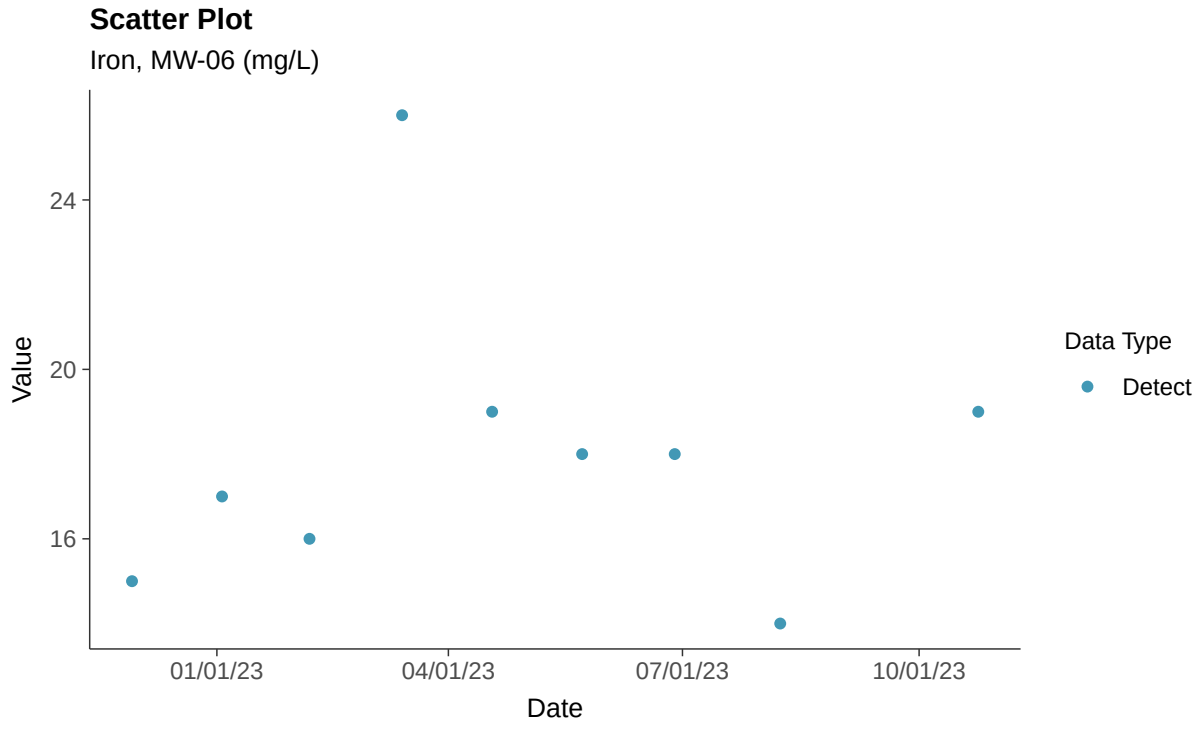
Boxplot by Season

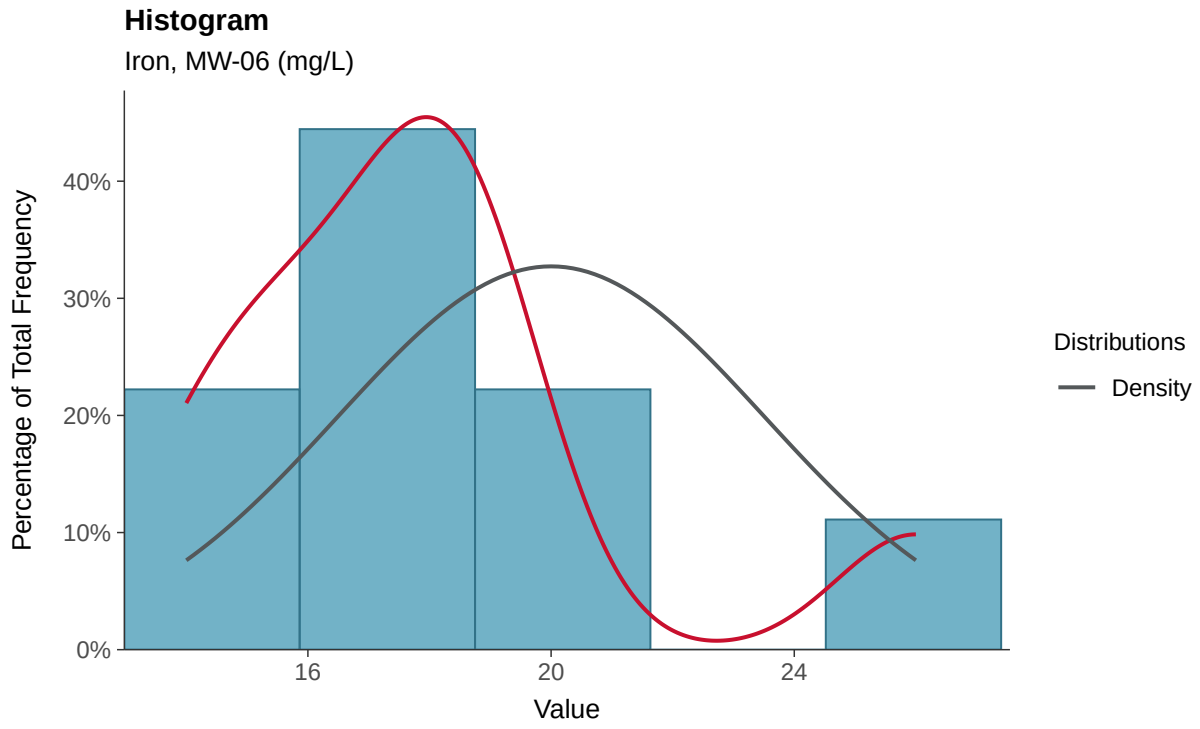
Copper, MW-06 (mg/L)



Part 115: Iron, MW-06

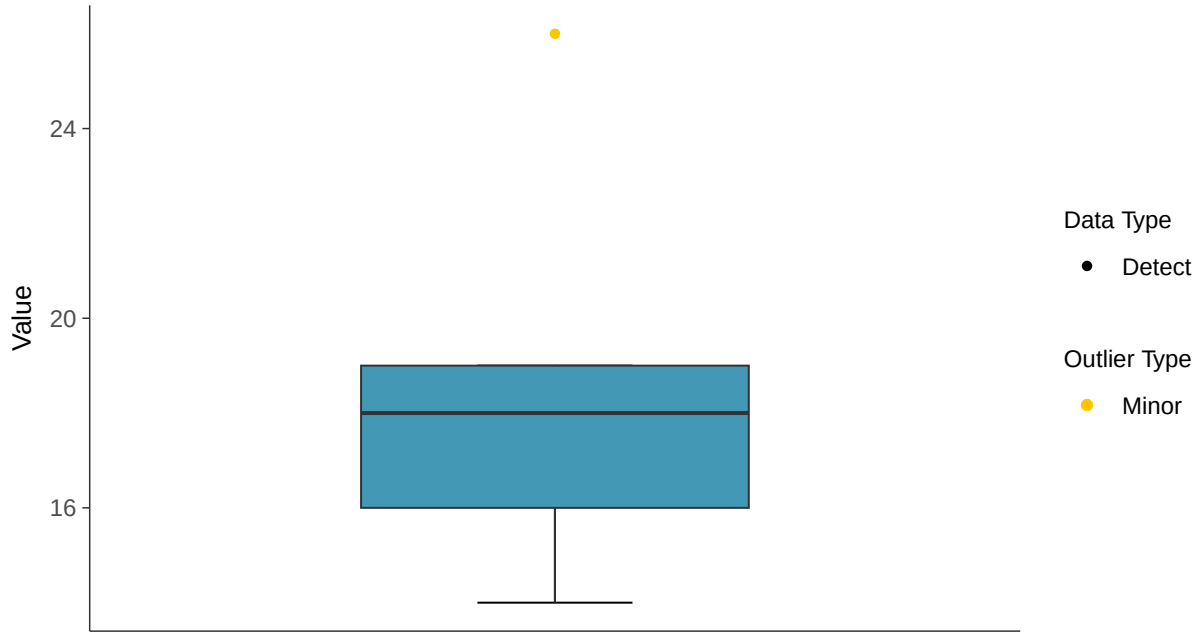
ID: 1_15_6_114





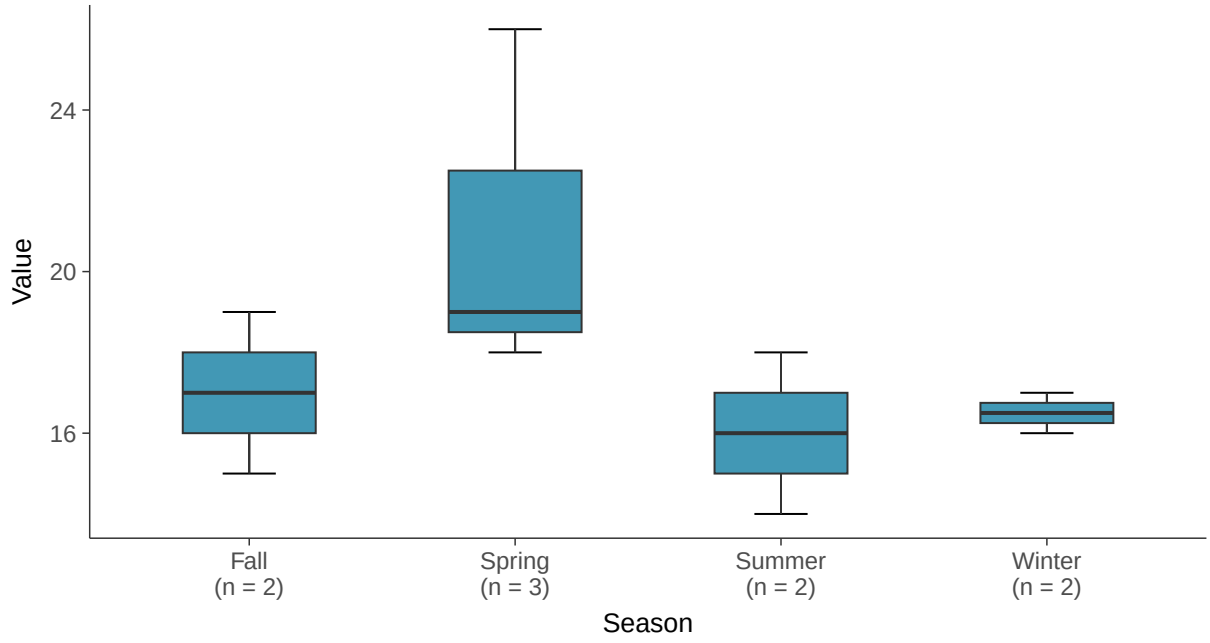
Boxplot

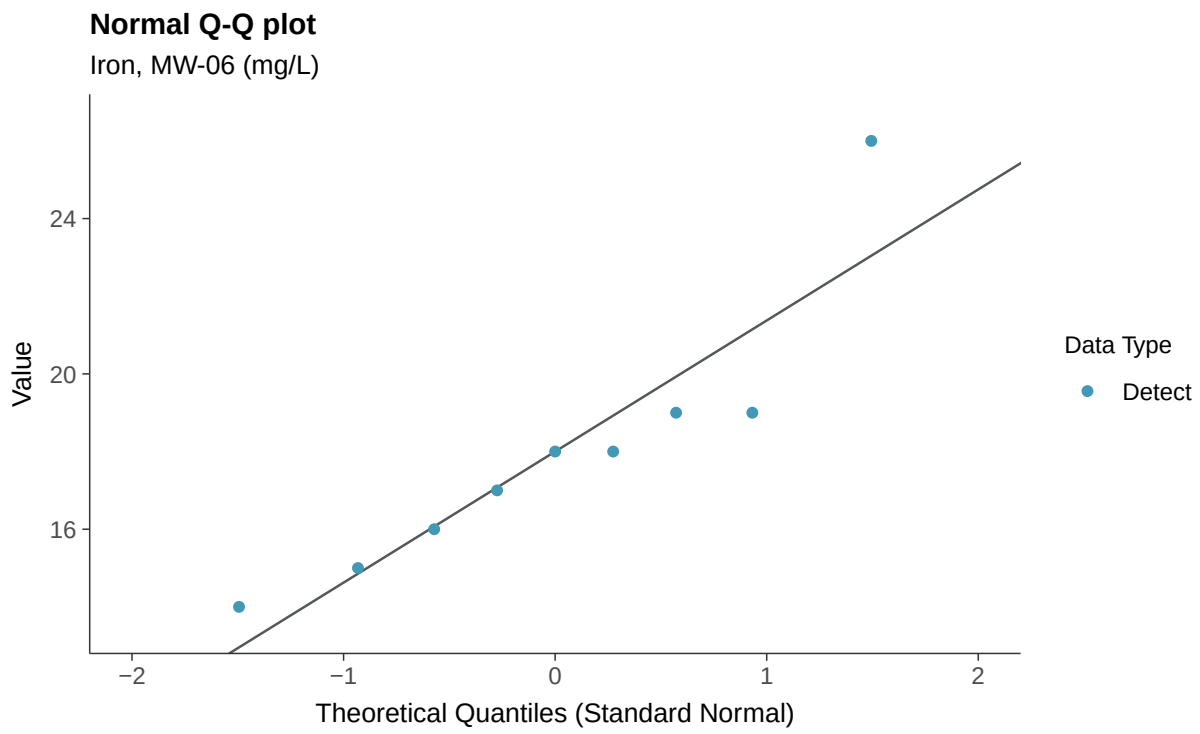
Iron, MW-06 (mg/L)

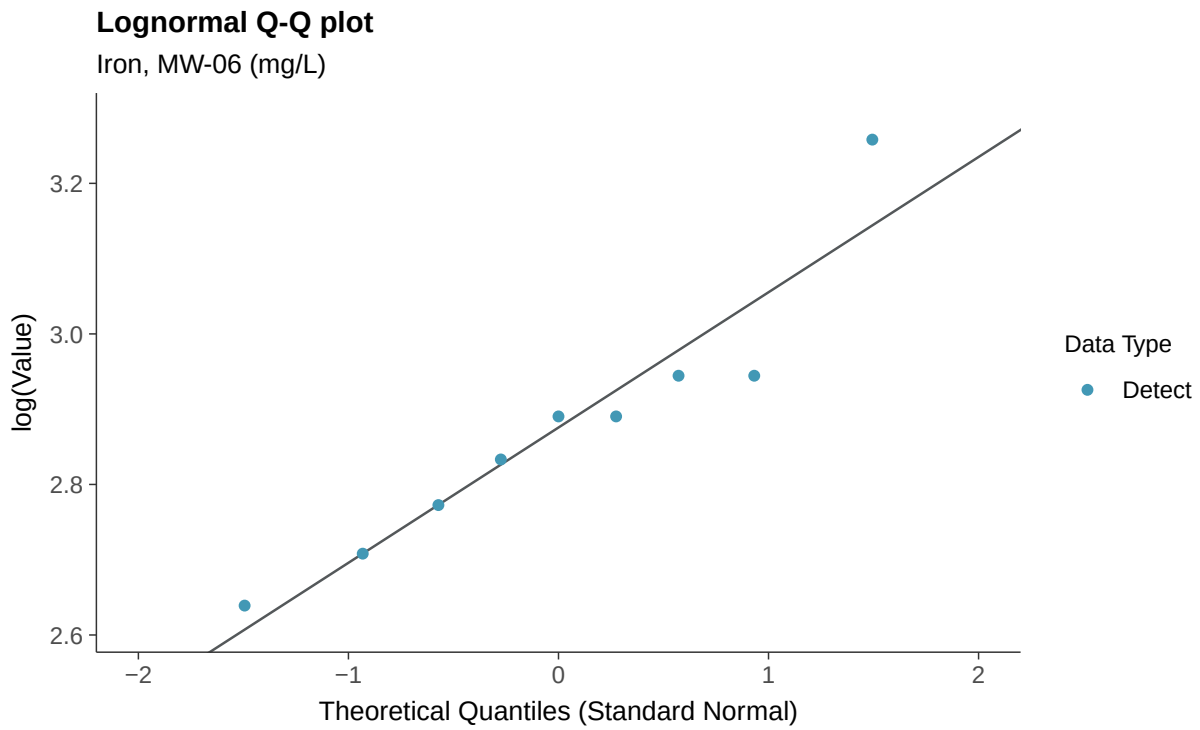


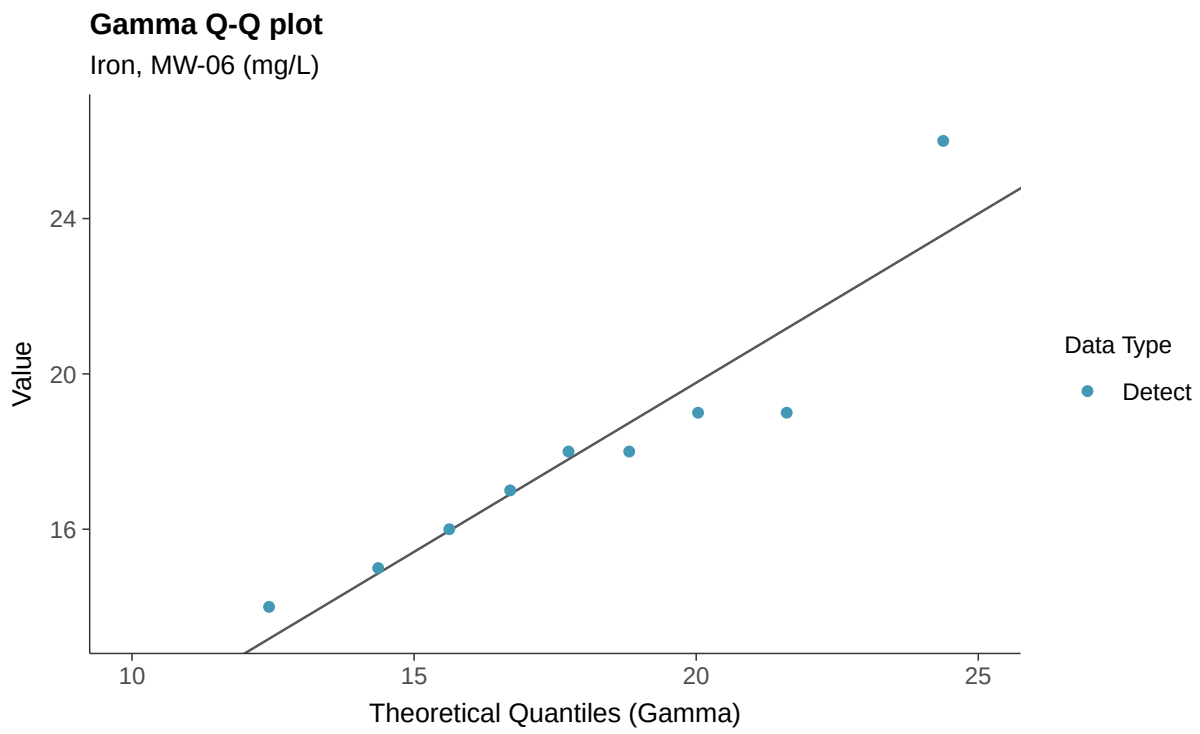
Boxplot by Season

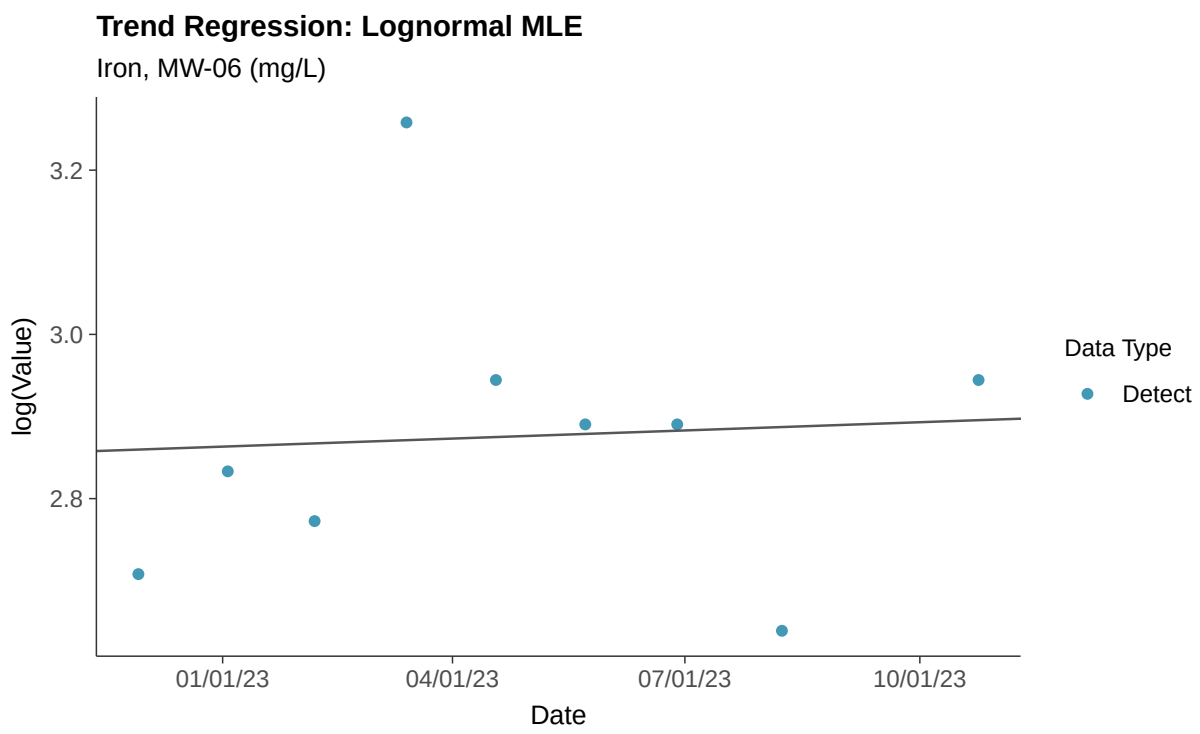
Iron, MW-06 (mg/L)

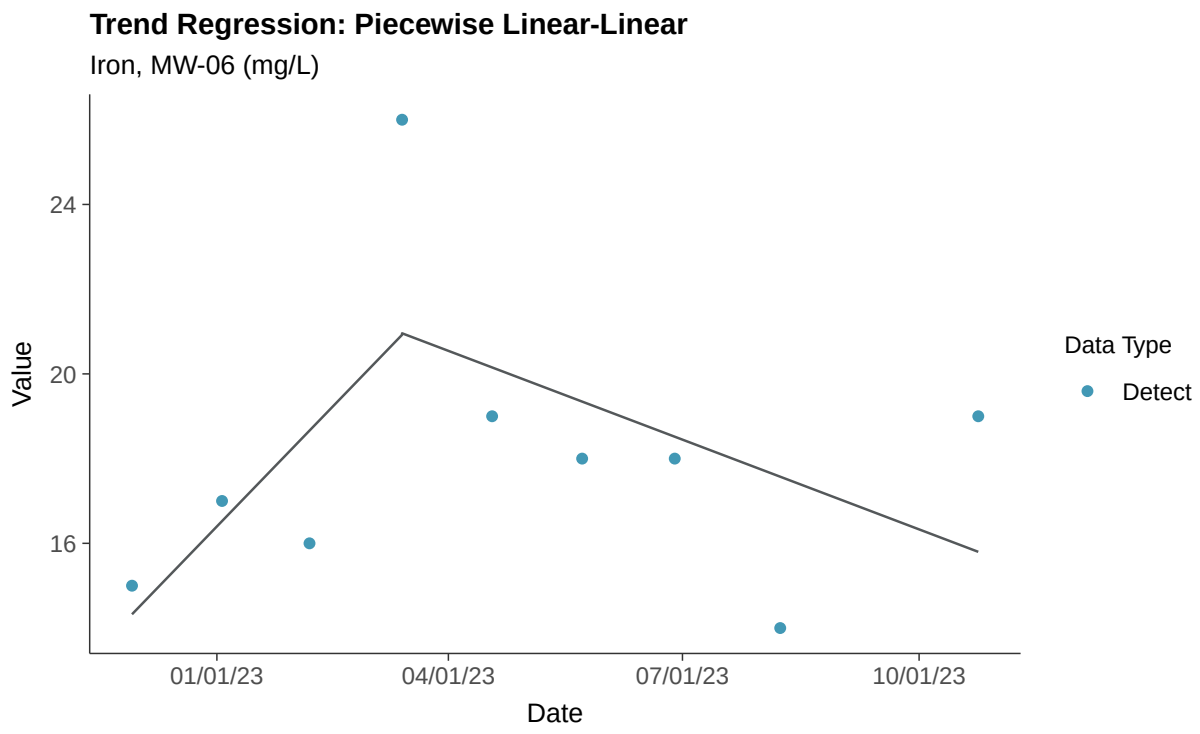



Normal Q-Q plot
Iron, MW-06 (mg/L)
Value
24
20
16
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-06 (mg/L)
log(Value)
3.2
3.0
2.8
2.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

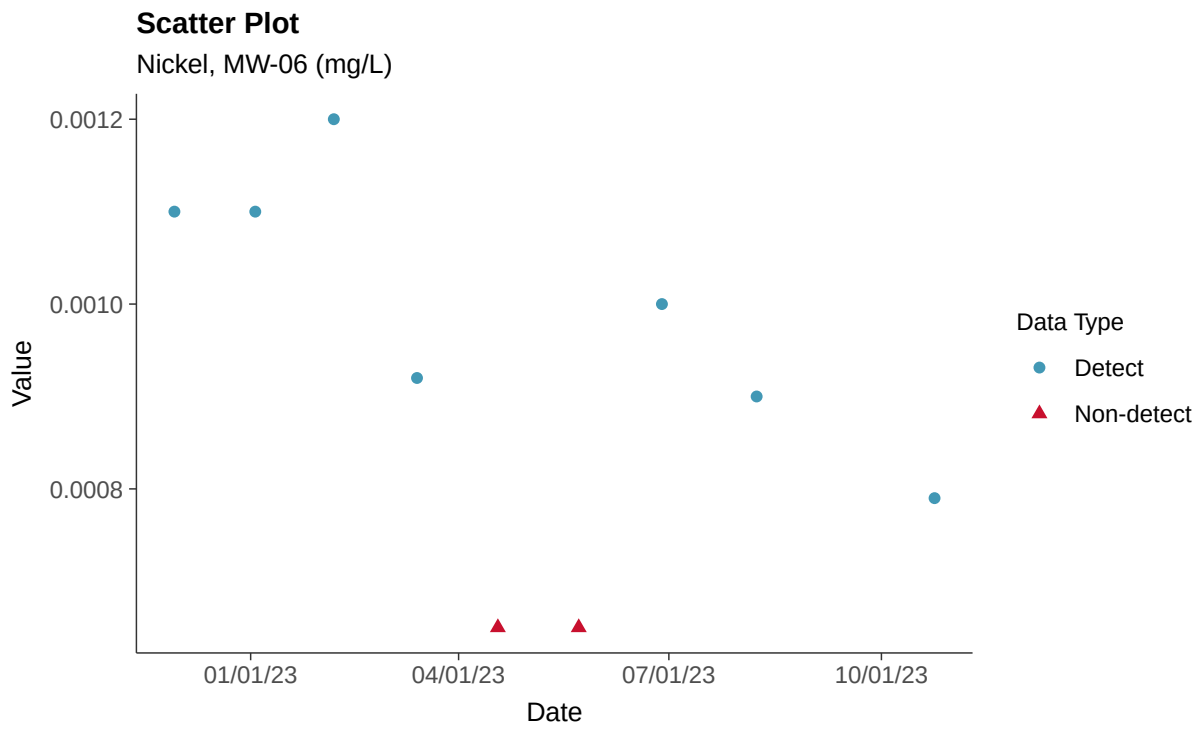

Gamma Q-Q plot
Iron, MW-06 (mg/L)
Value
24
20
16
10
15
20
25
Theoretical Quantiles (Gamma)
Data Type
Detect

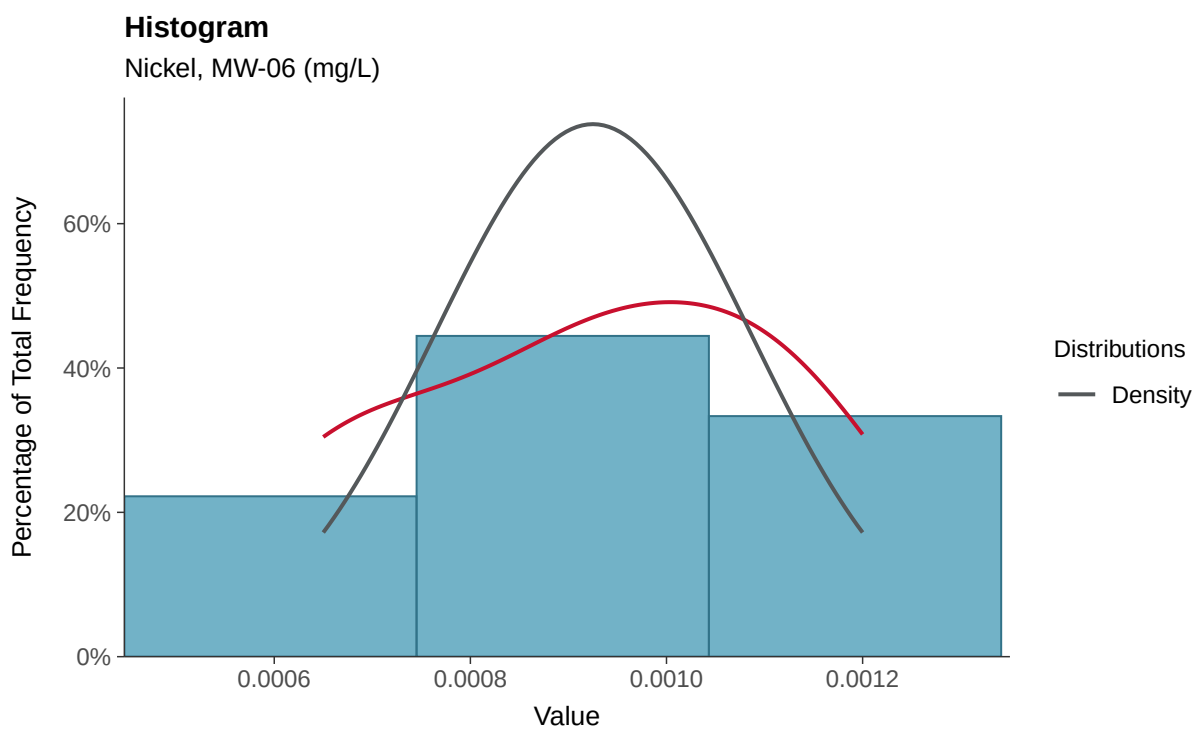

Trend Regression: Lognormal MLE
Iron, MW-06 (mg/L)
log(Value)
3.2
3.0
2.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-06 (mg/L)
Value
24
20
16
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-06

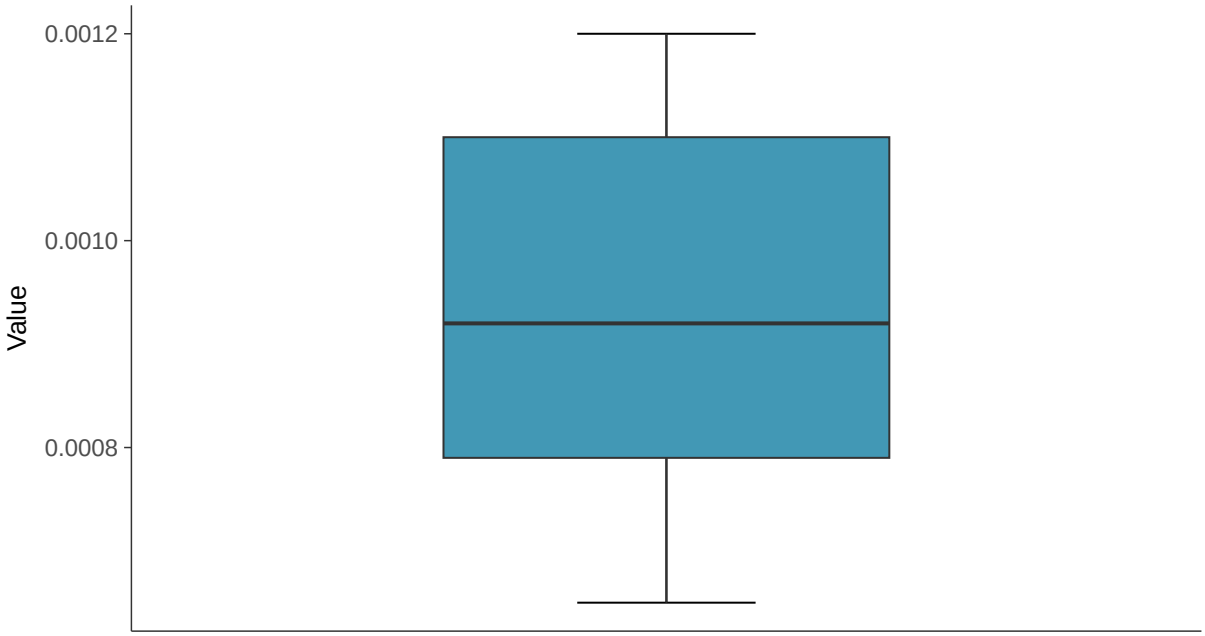
ID: 1_15_6_119





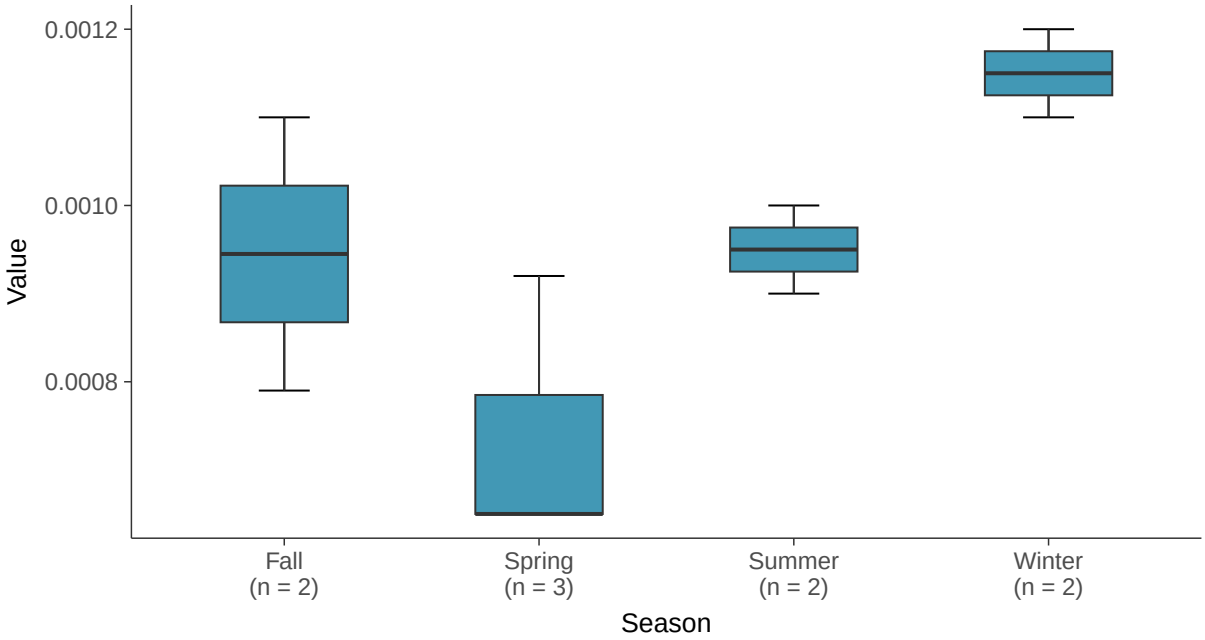
Boxplot

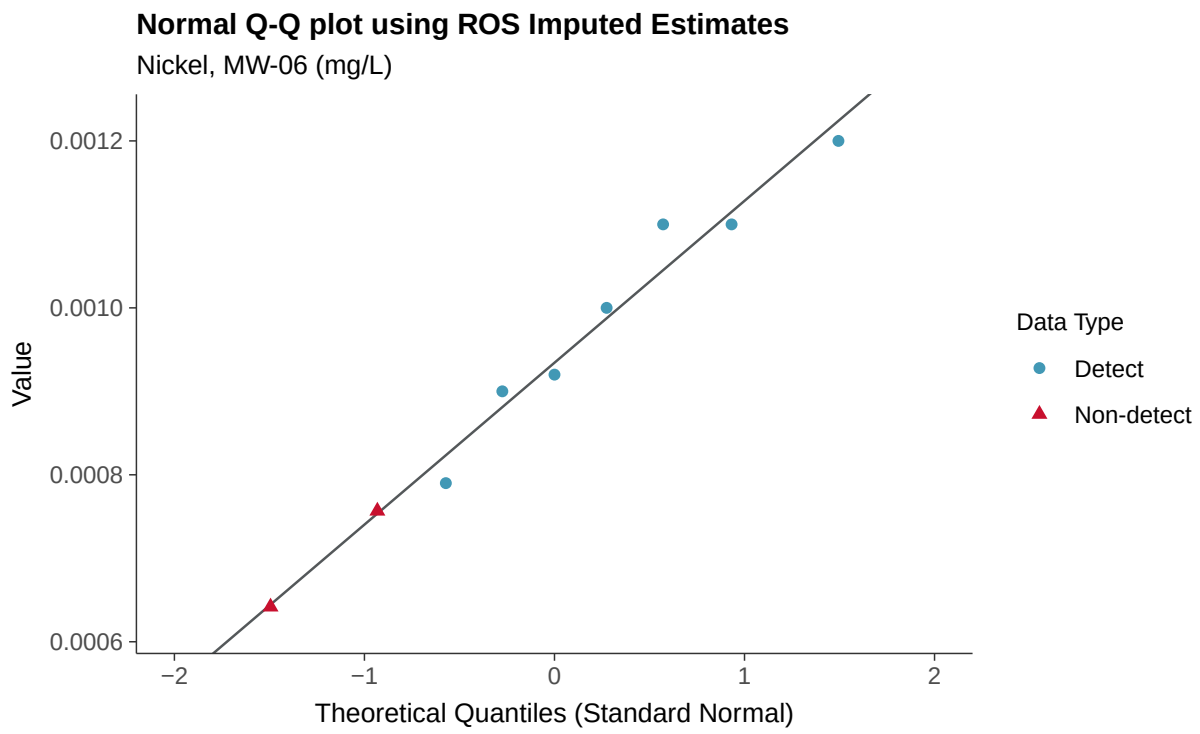
Nickel, MW-06 (mg/L)

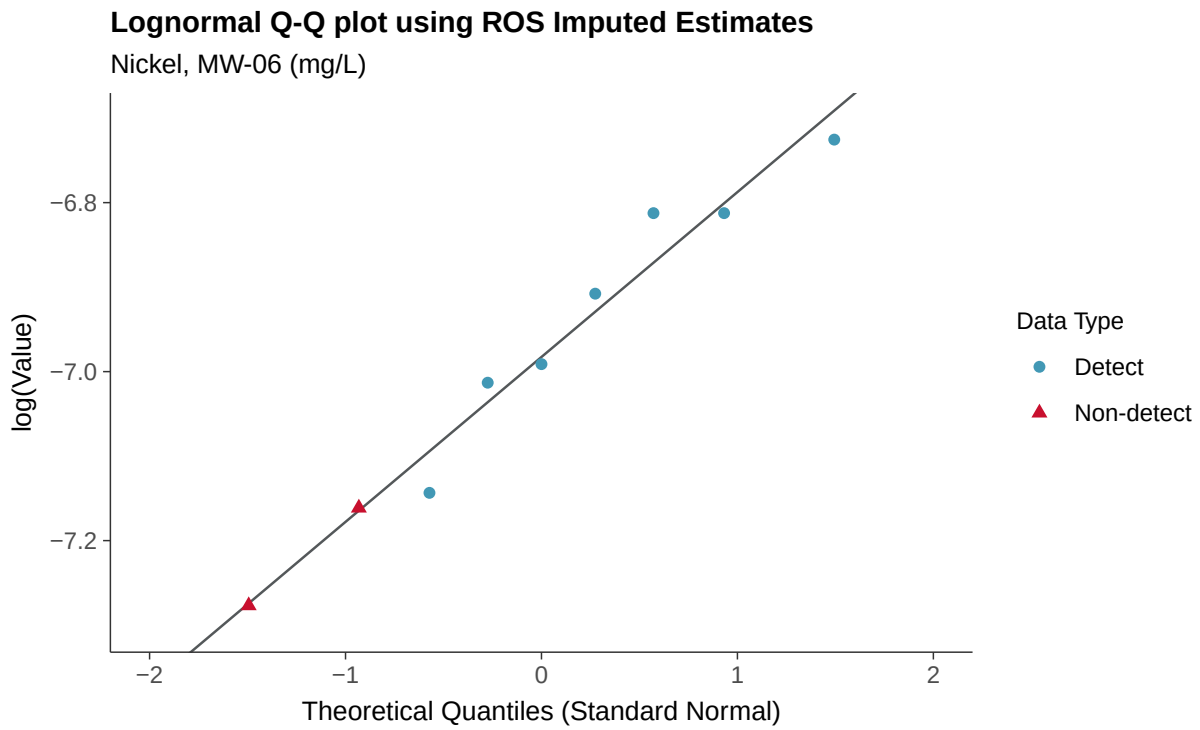


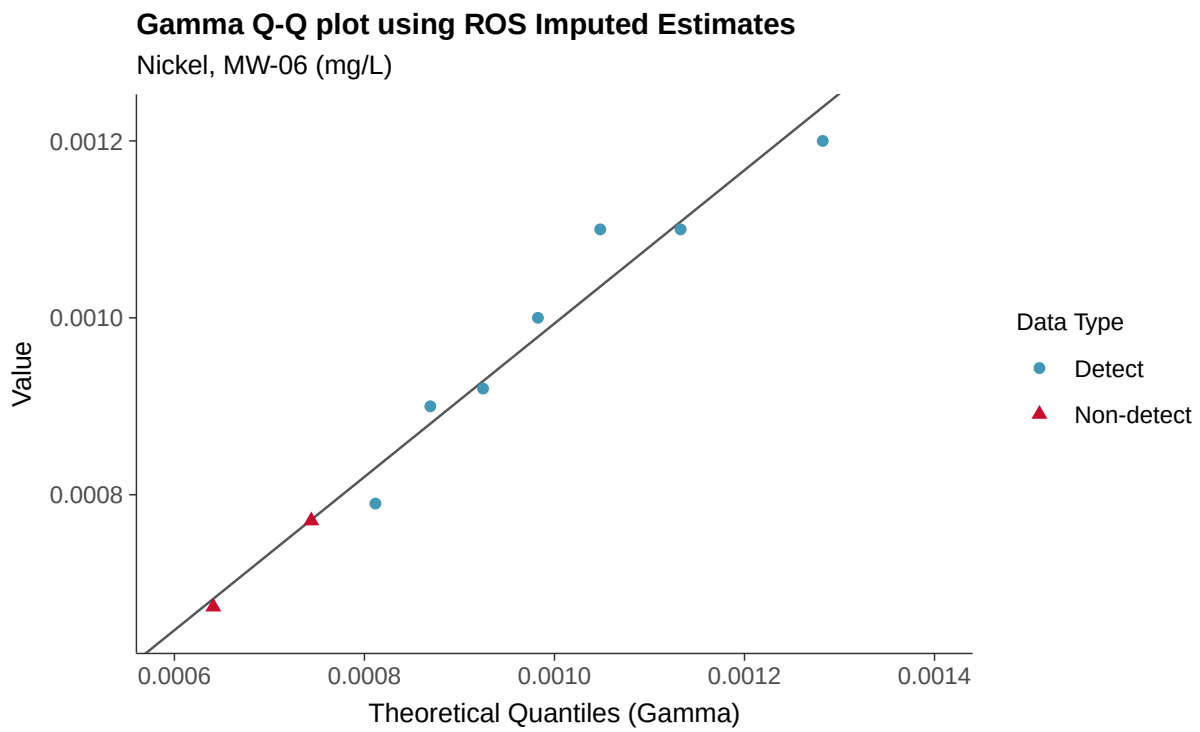
Boxplot by Season

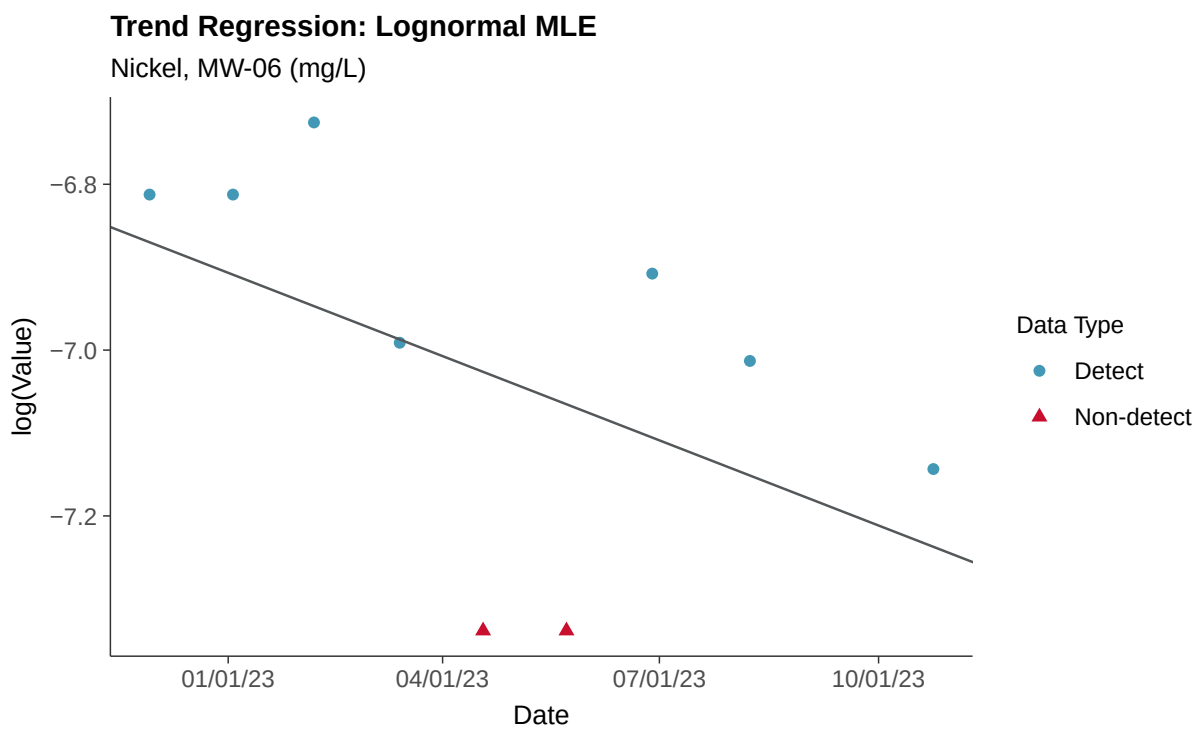
Nickel, MW-06 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Nickel, MW-06 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

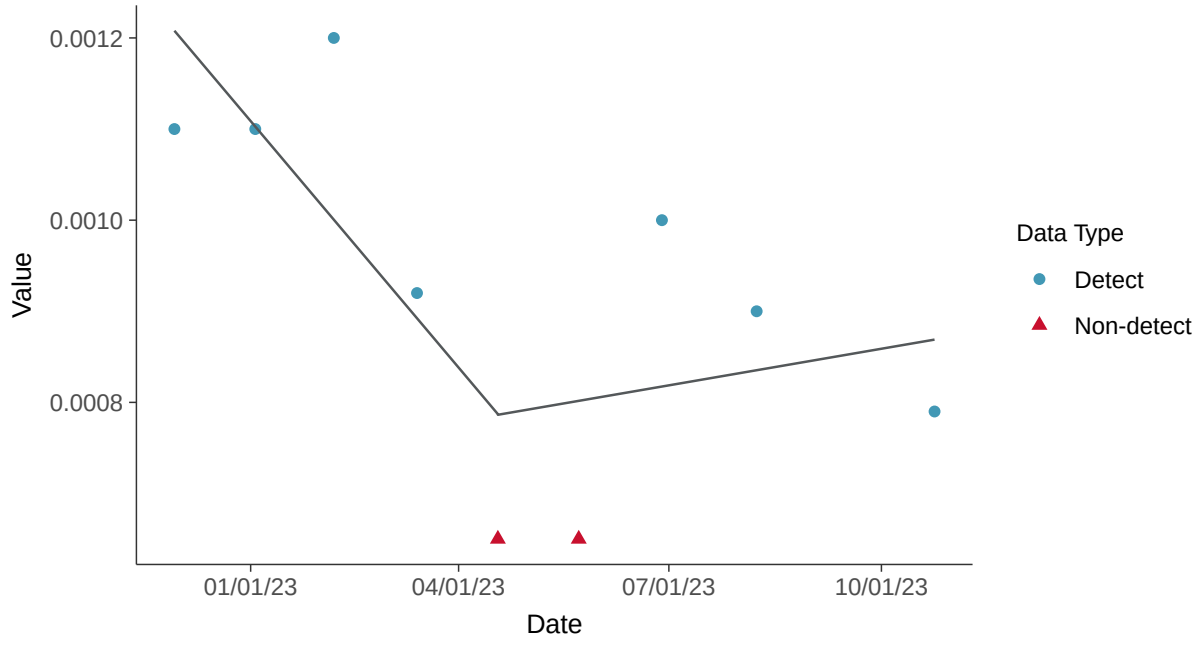

Lognormal Q-Q plot using ROS Imputed Estimates
Nickel, MW-06 (mg/L)
log(Value)
−6.8
−7.0
−7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Nickel, MW-06 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
0.0008
0.0010
0.0012
0.0014
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Nickel, MW-06 (mg/L)
log(Value)
−6.8
−7.0
−7.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

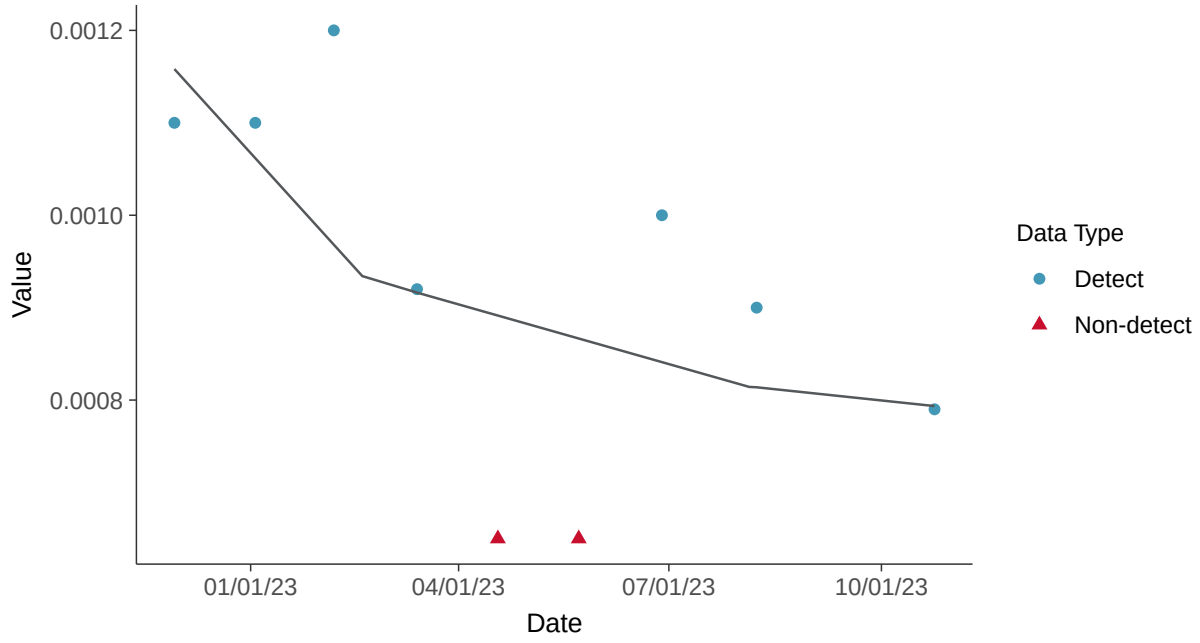
Trend Regression: Piecewise Linear-Linear

Nickel, MW-06 (mg/L)



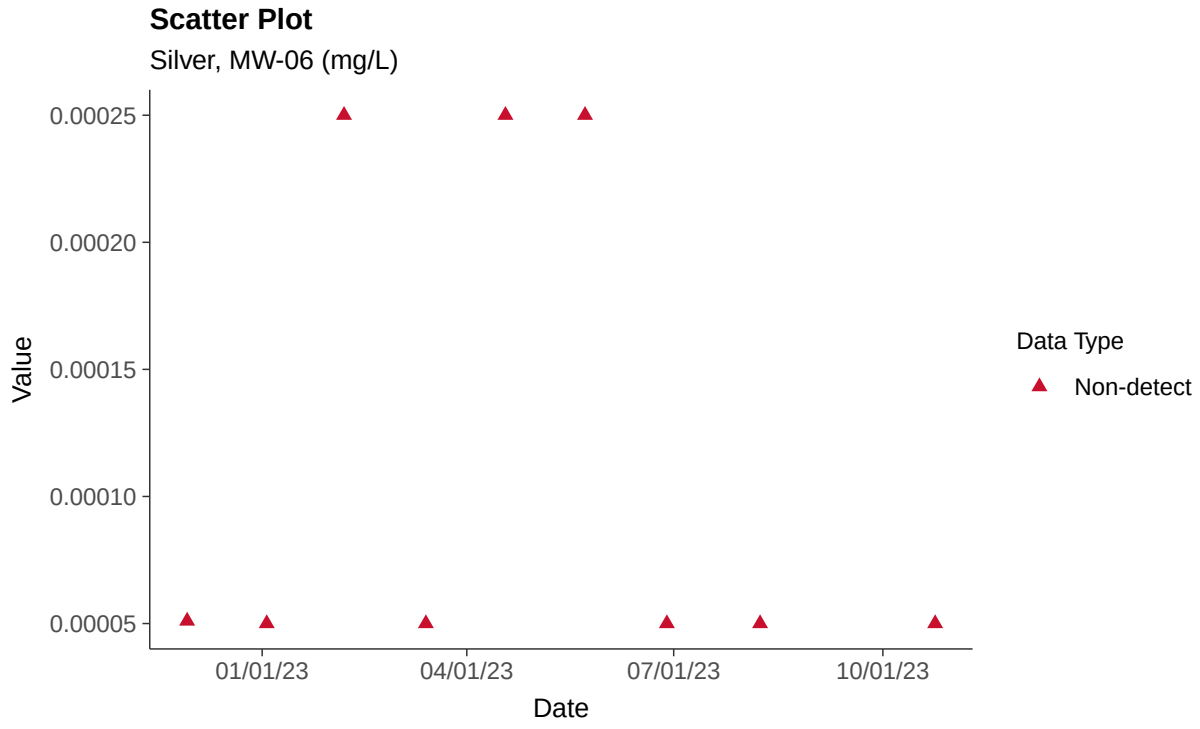
Trend Regression: Piecewise Linear-Linear-Linear

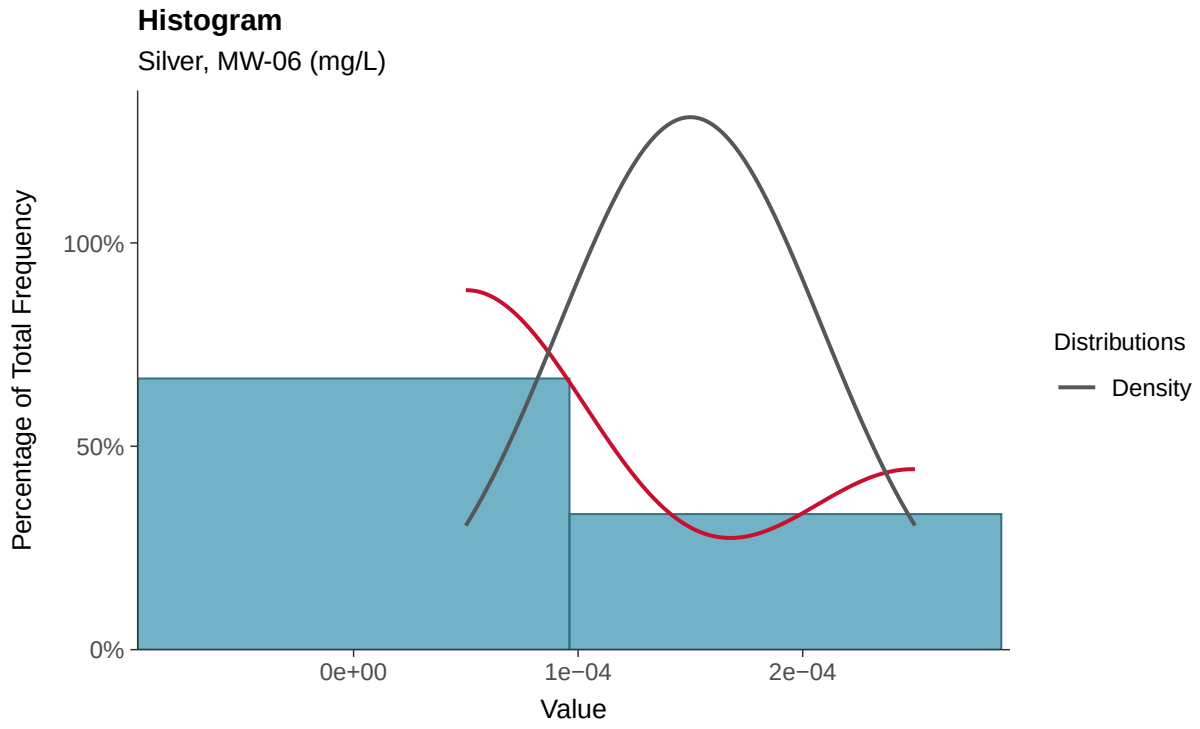
Nickel, MW-06 (mg/L)



Part 115: Silver, MW-06

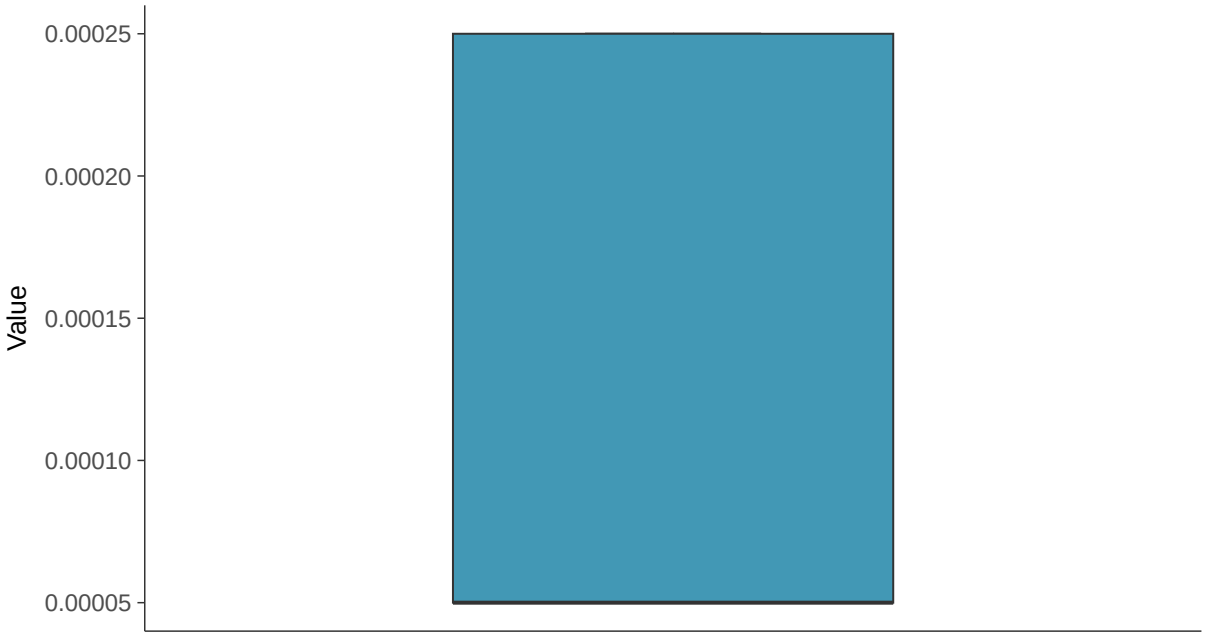
ID: 1_15_6_123





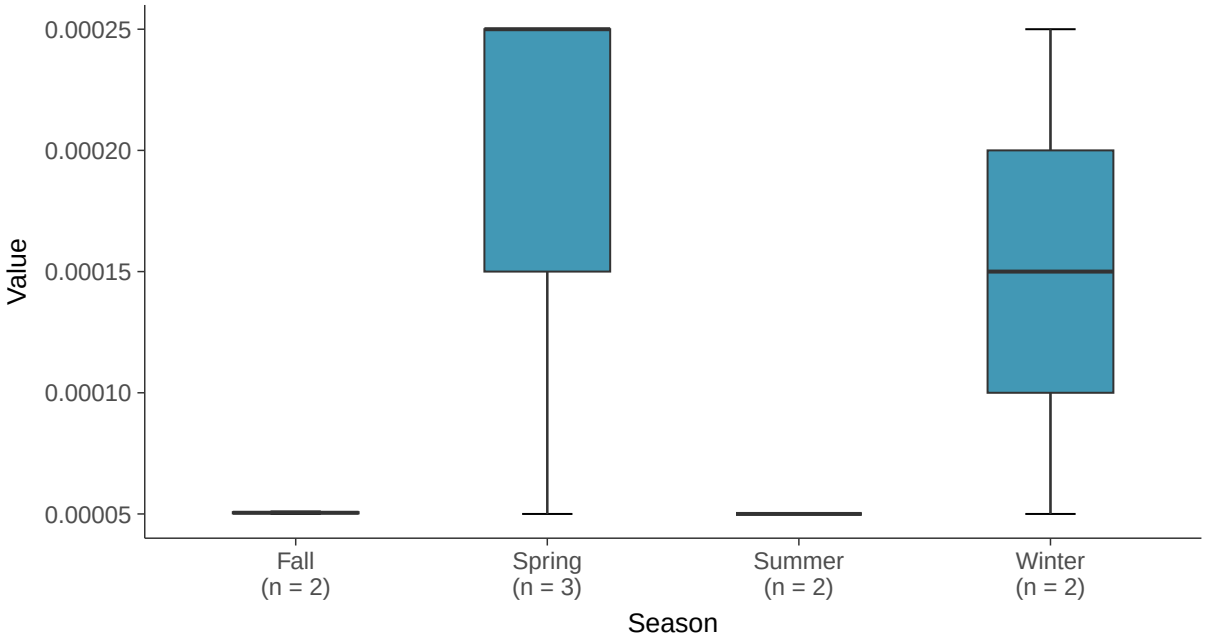
Boxplot

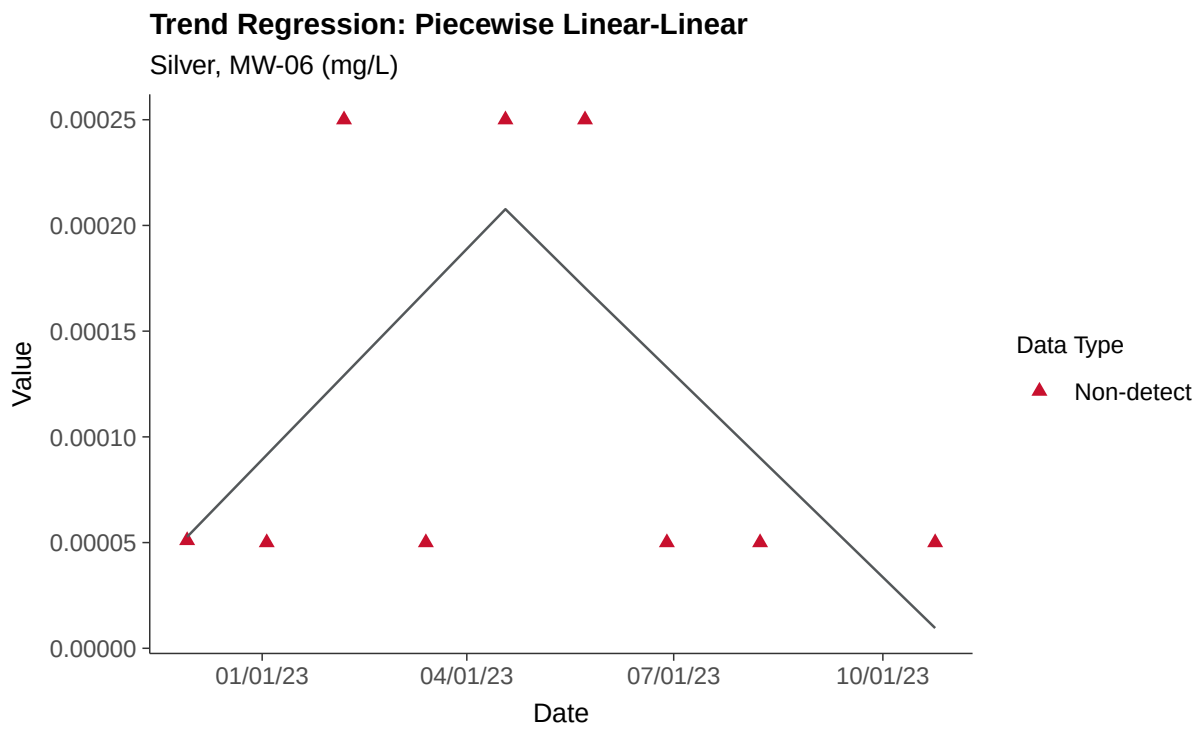
Silver, MW-06 (mg/L)

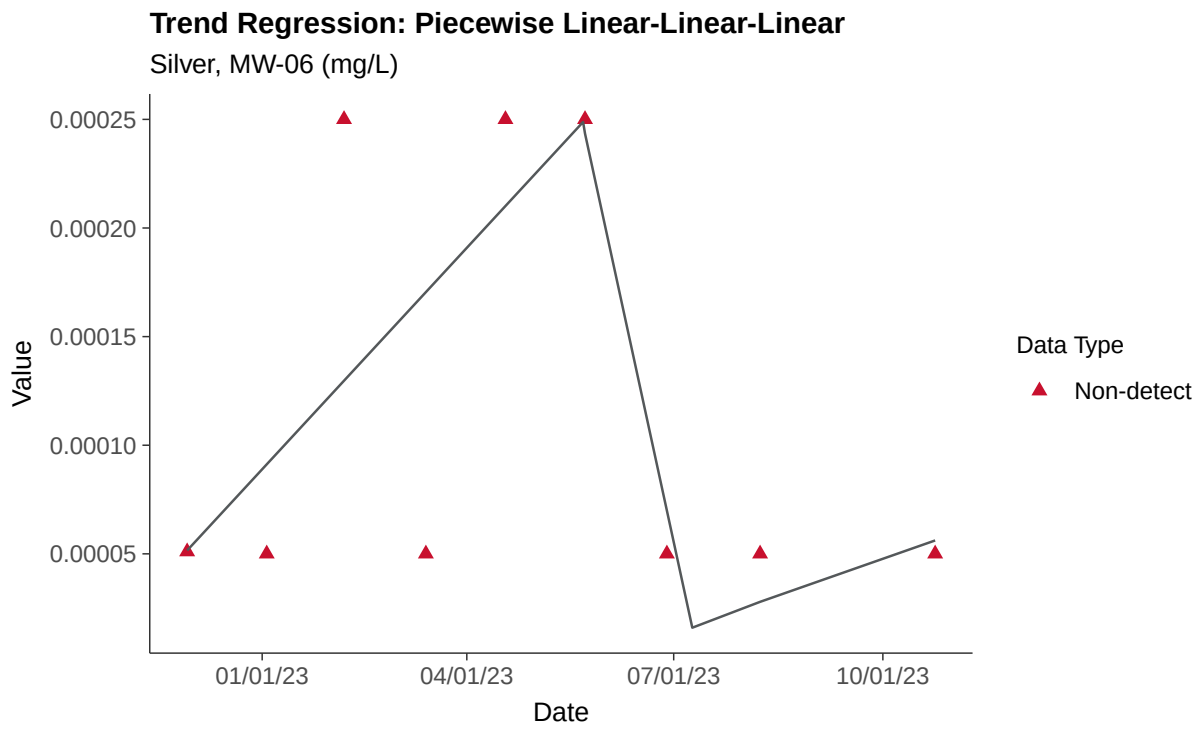


Boxplot by Season

Silver, MW-06 (mg/L)

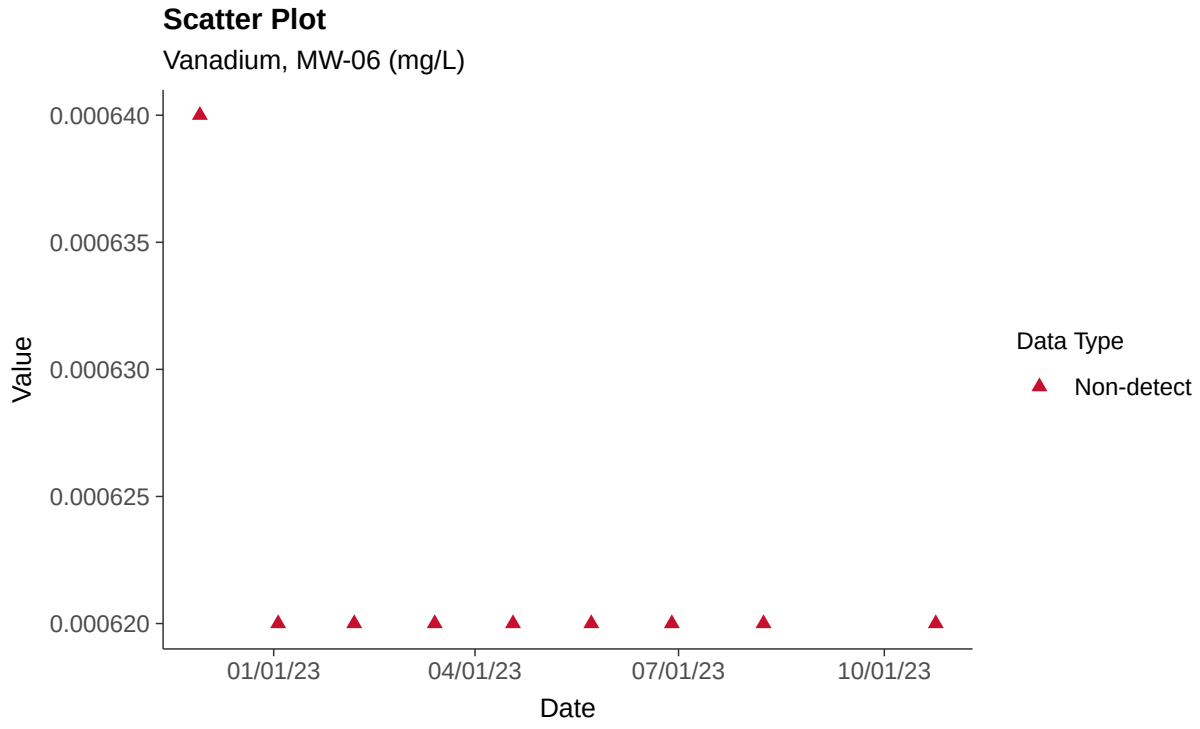


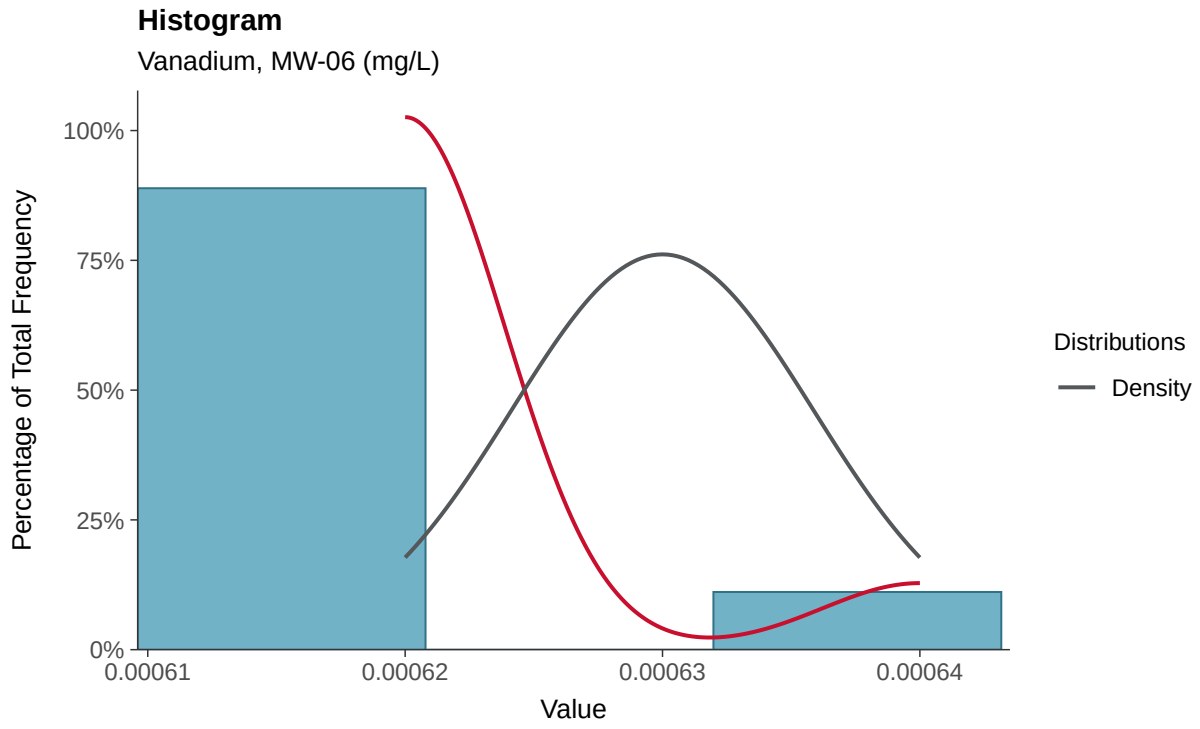

Trend Regression: Piecewise Linear-Linear
Silver, MW-06 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-06 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-06

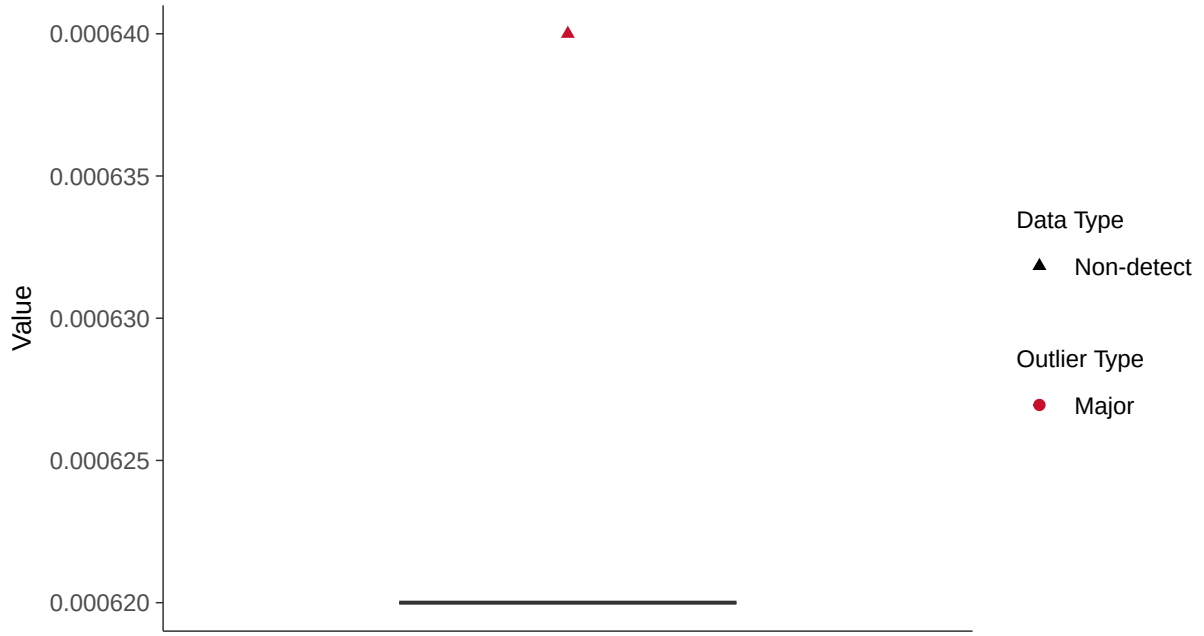
ID: 1_15_6_129





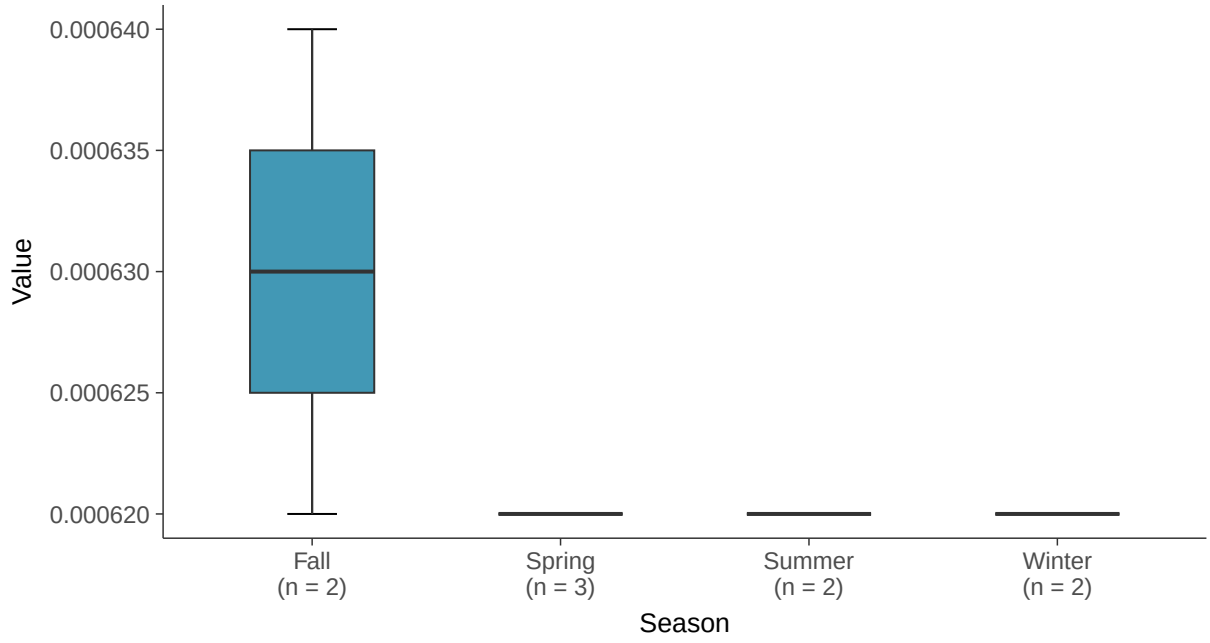
Boxplot

Vanadium, MW-06 (mg/L)



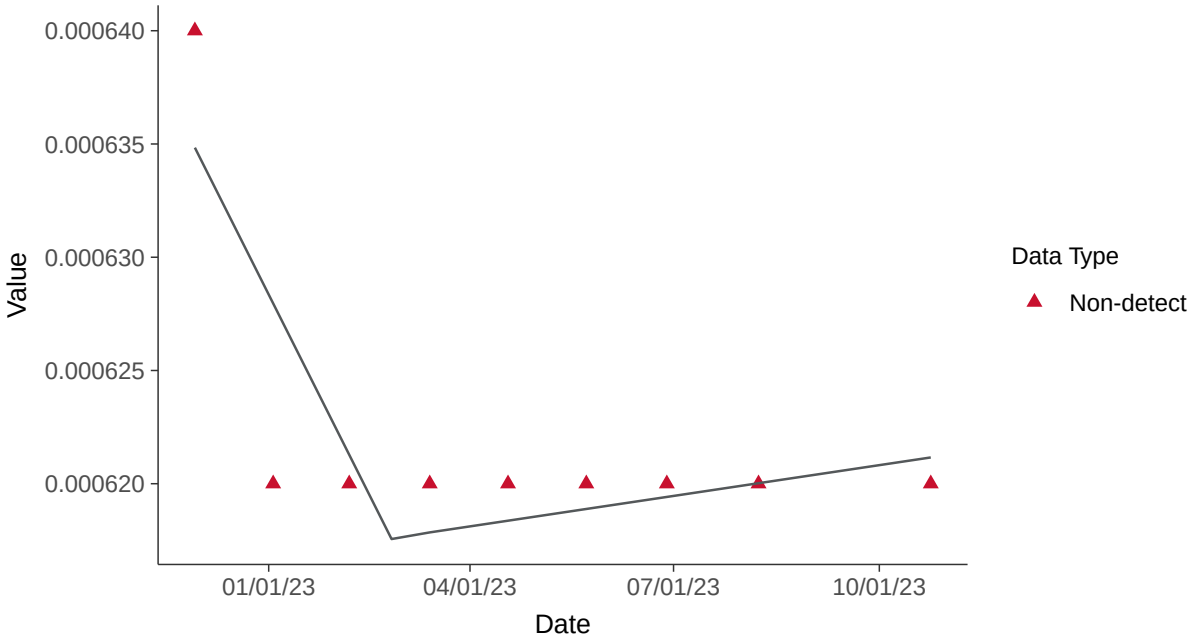
Boxplot by Season

Vanadium, MW-06 (mg/L)



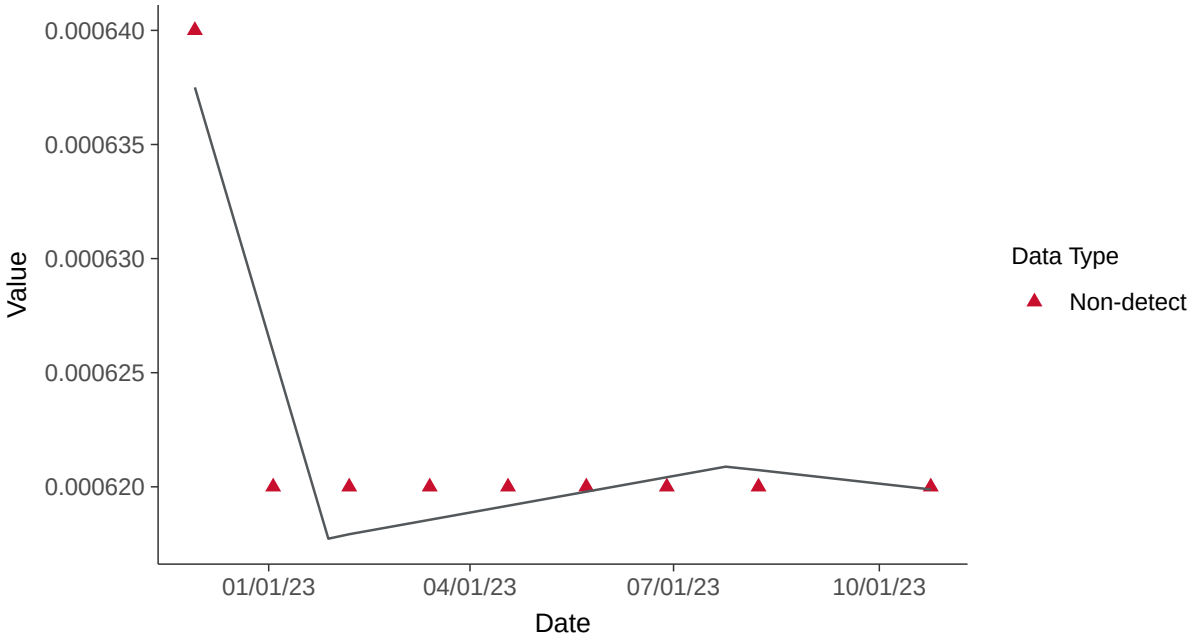
Trend Regression: Piecewise Linear-Linear

Vanadium, MW-06 (mg/L)



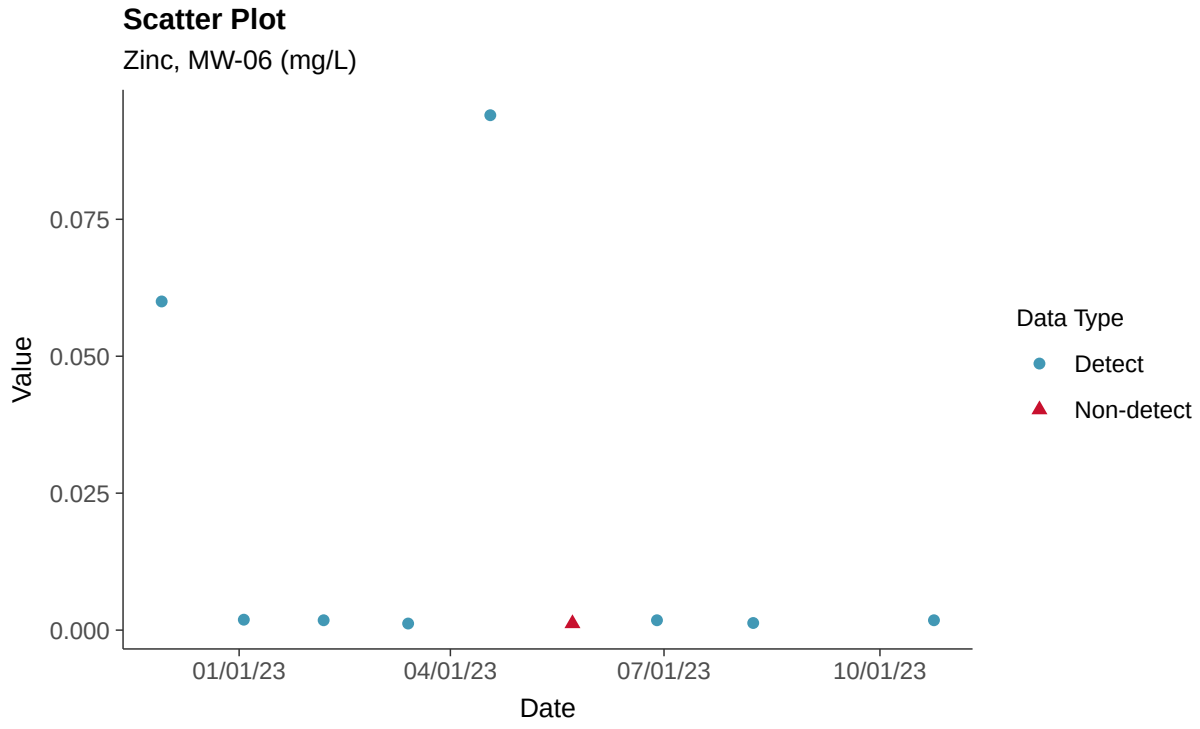
Trend Regression: Piecewise Linear-Linear-Linear

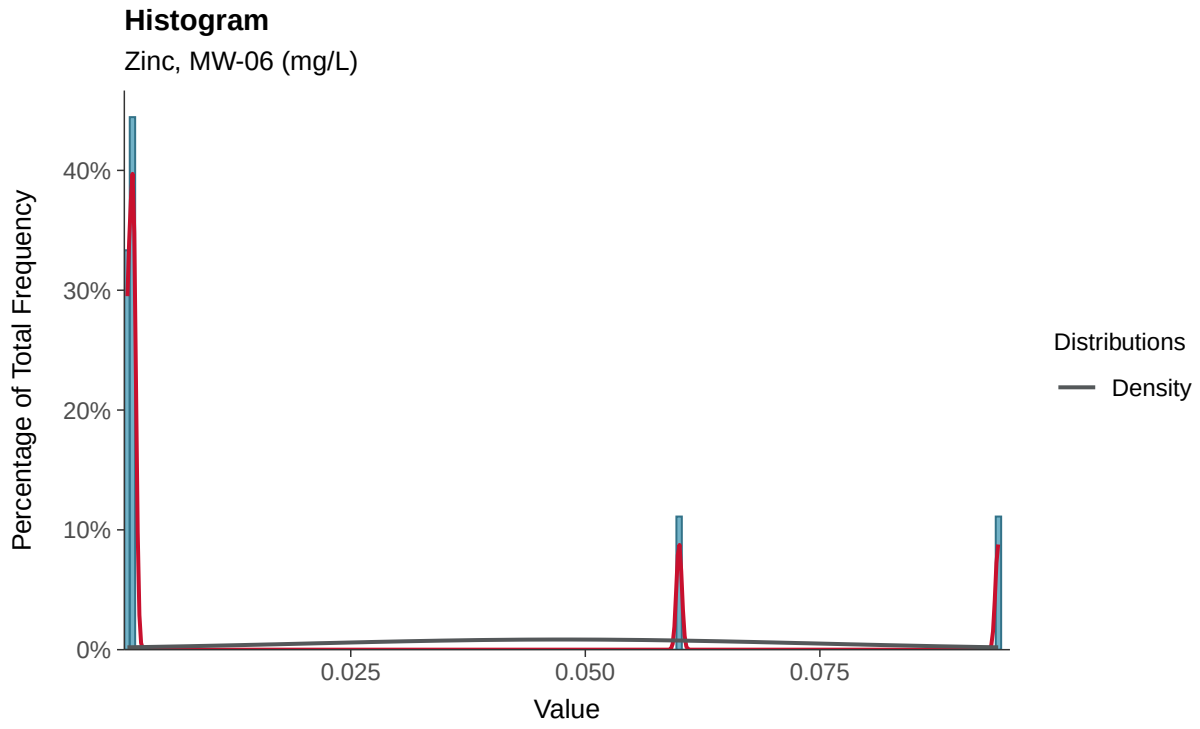
Vanadium, MW-06 (mg/L)



Part 115: Zinc, MW-06

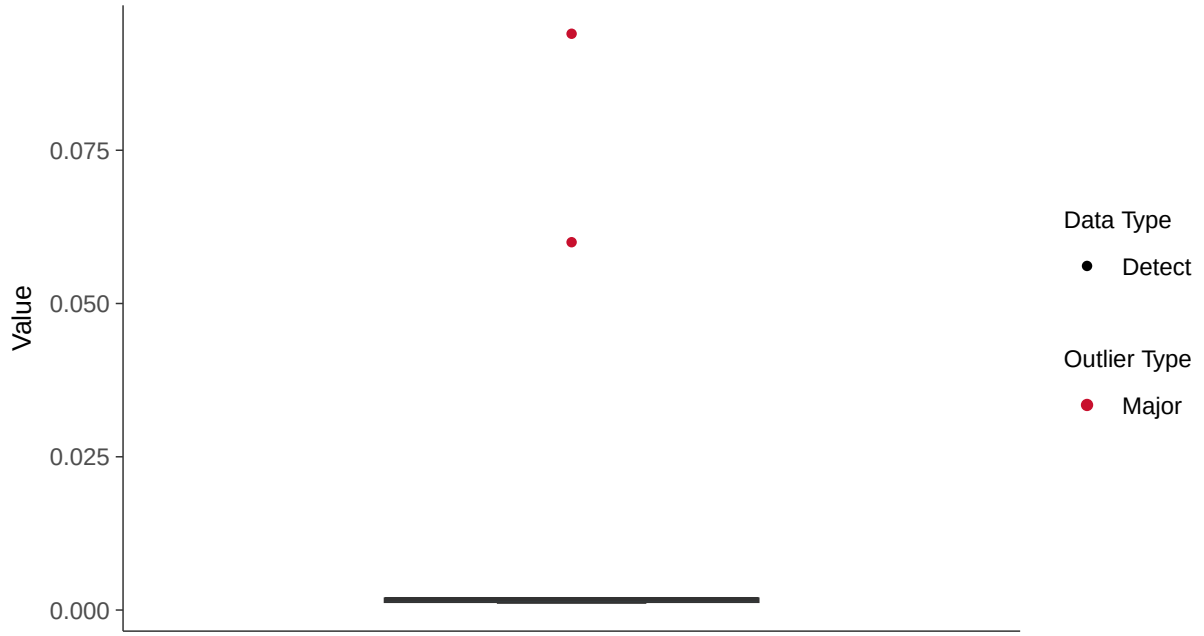
ID: 1_15_6_130





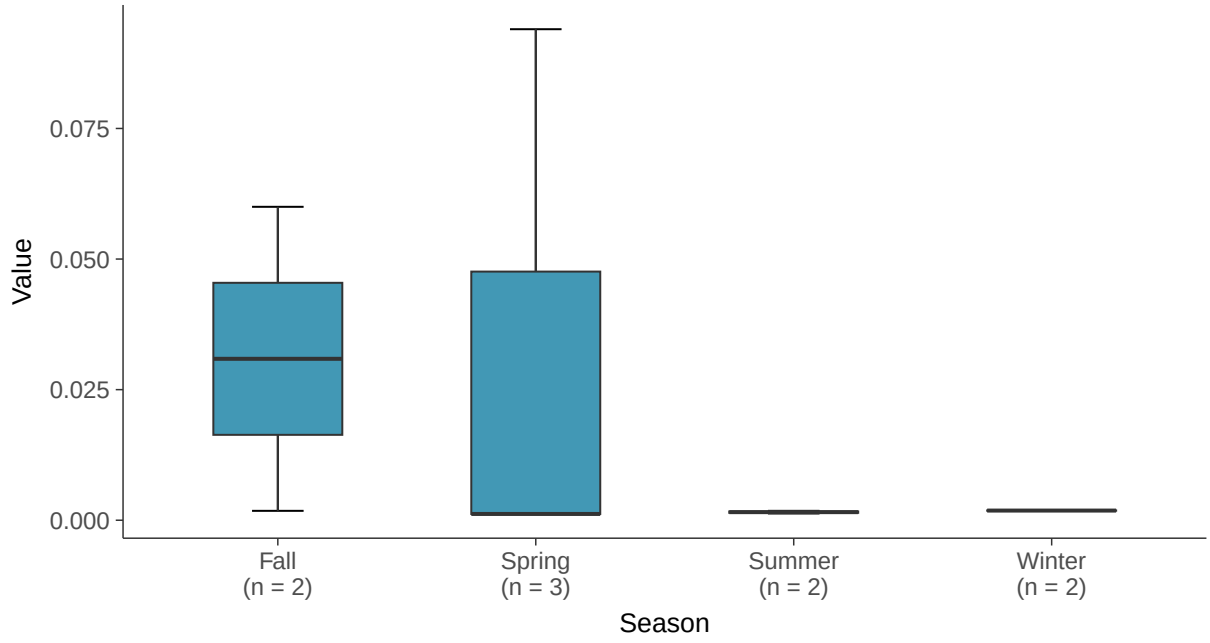
Boxplot

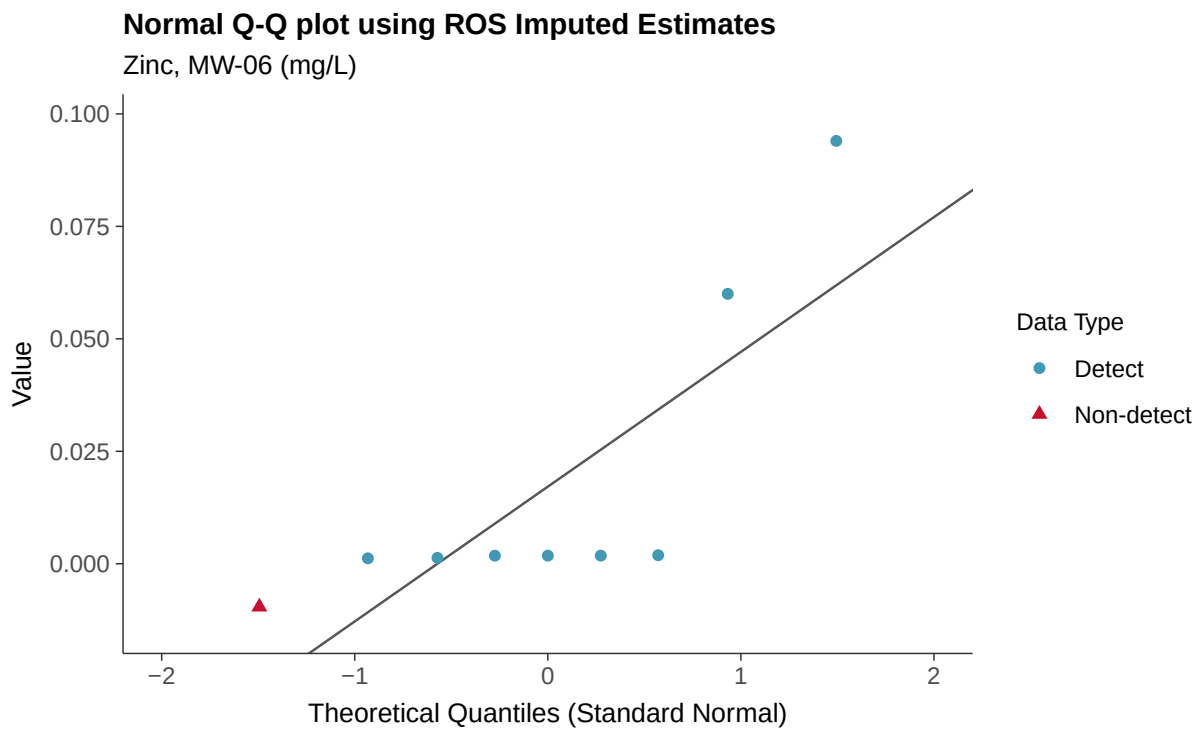
Zinc, MW-06 (mg/L)

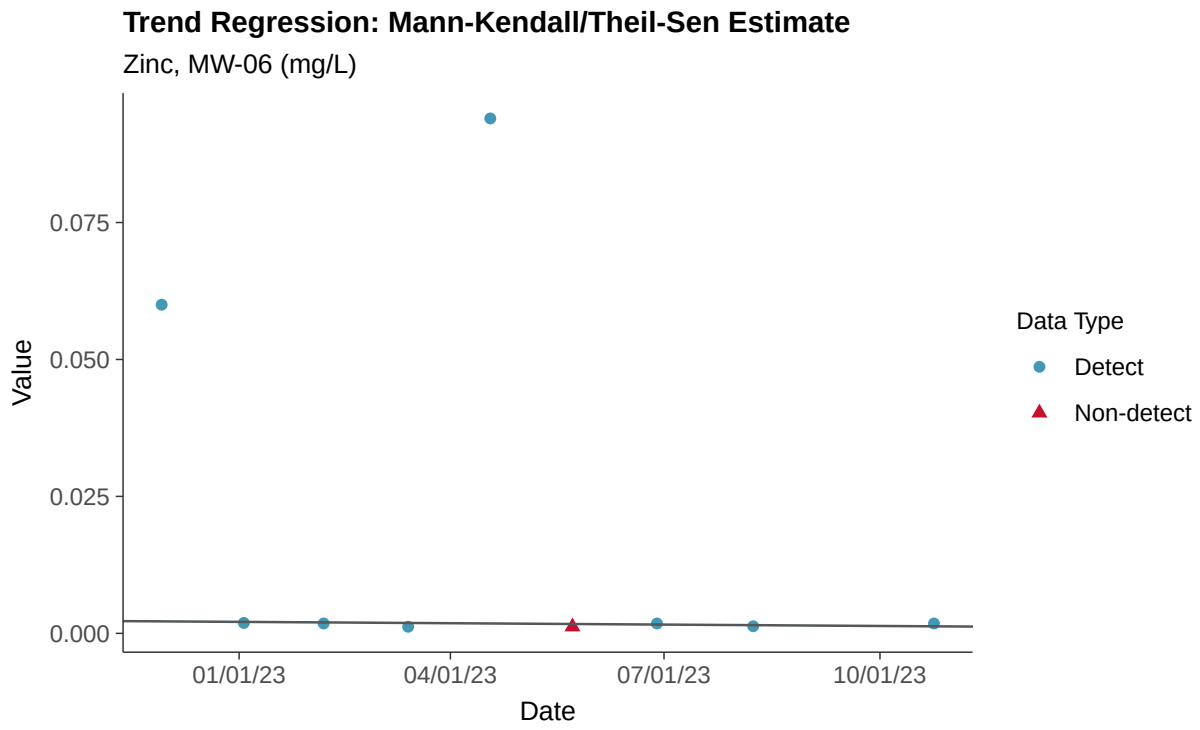


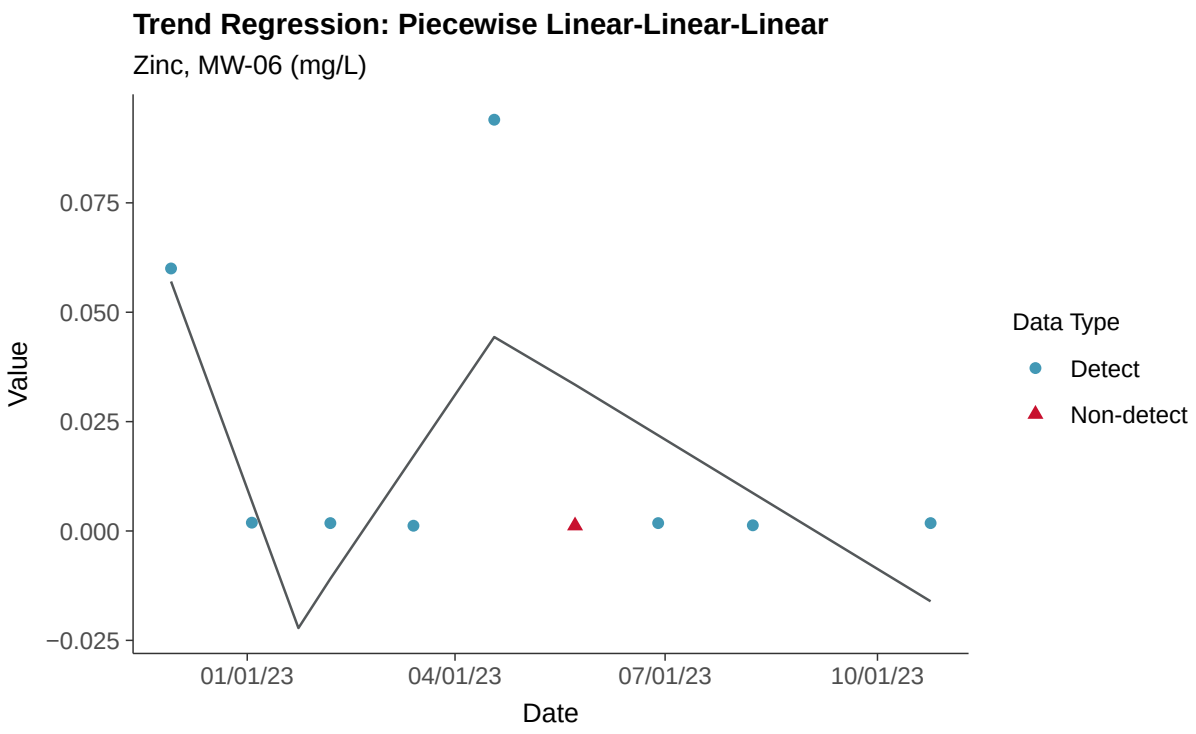
Boxplot by Season

Zinc, MW-06 (mg/L)



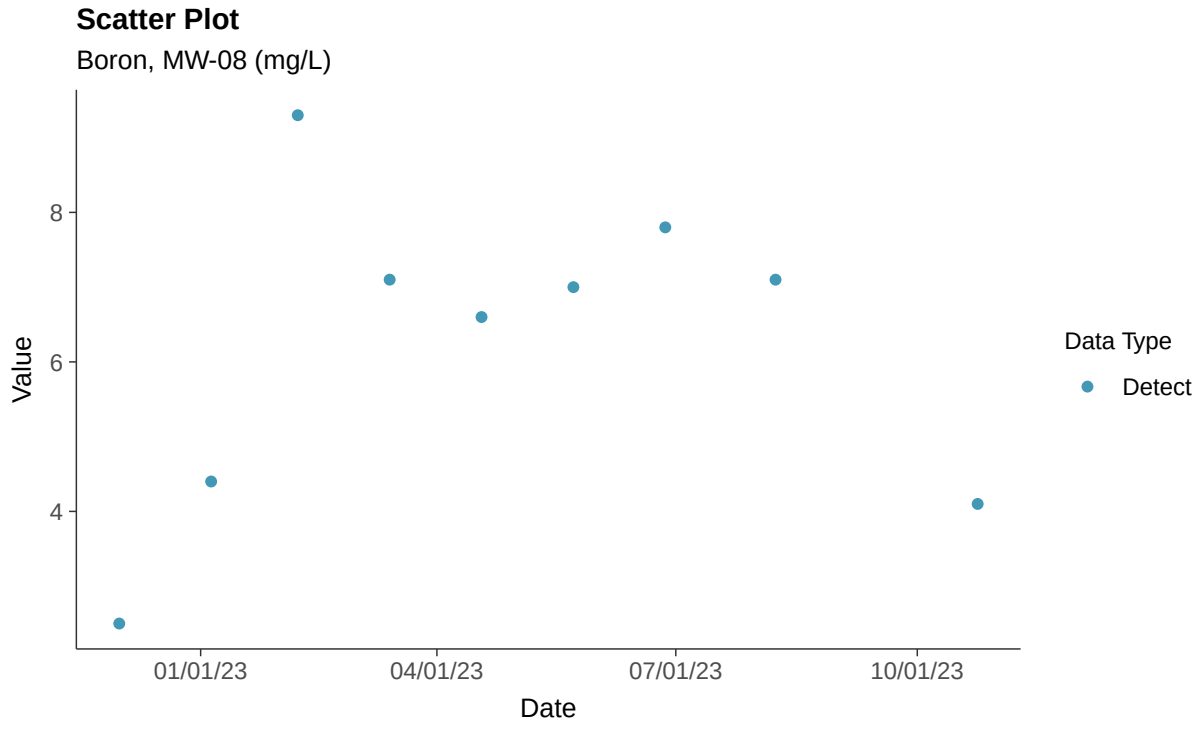

Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-06 (mg/L)
Value
0.100
0.075
0.050
0.025
0.000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

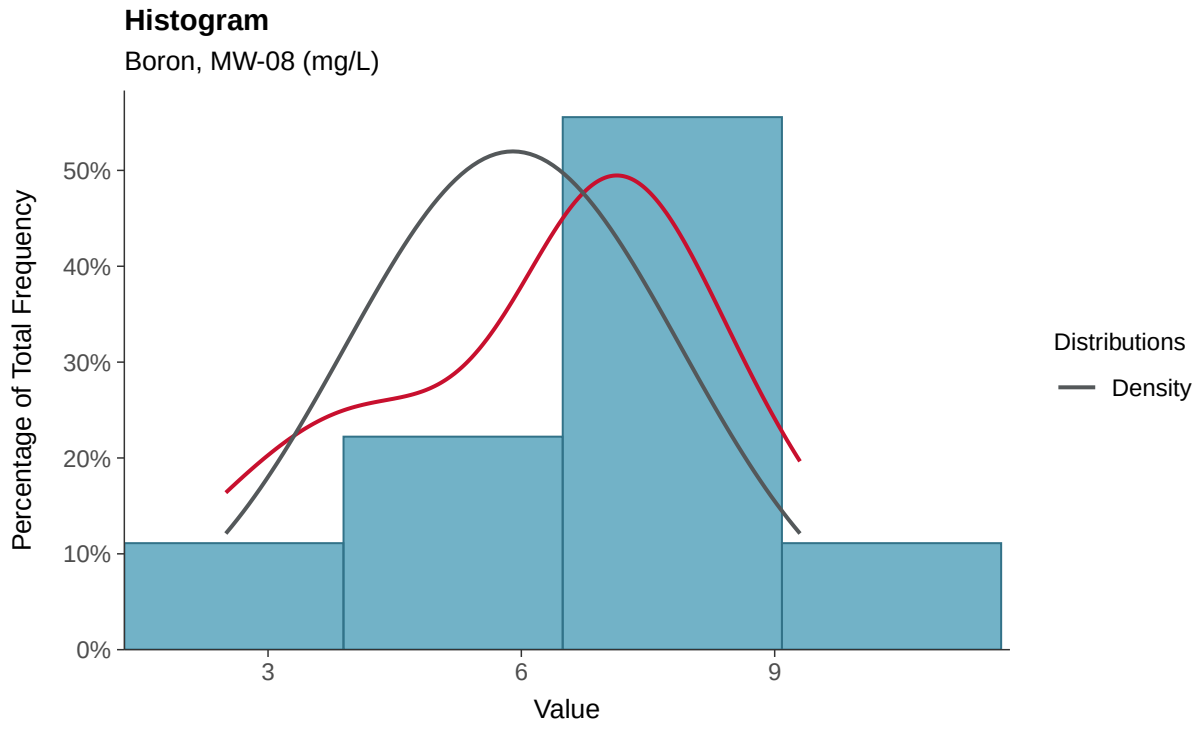

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Zinc, MW-06 (mg/L)
Value
0.075
0.050
0.025
0.000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Zinc, MW-06 (mg/L)
Value
0.075
0.050
0.025
0.000
−0.025
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Boron, MW-08

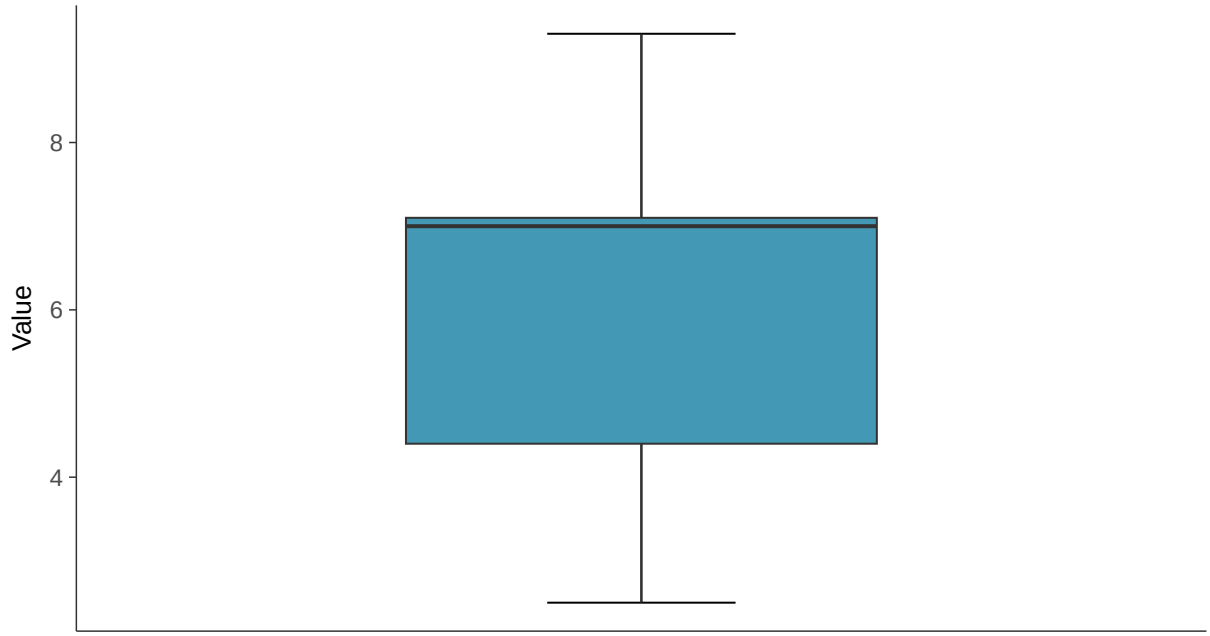
ID: 1_17_4_105





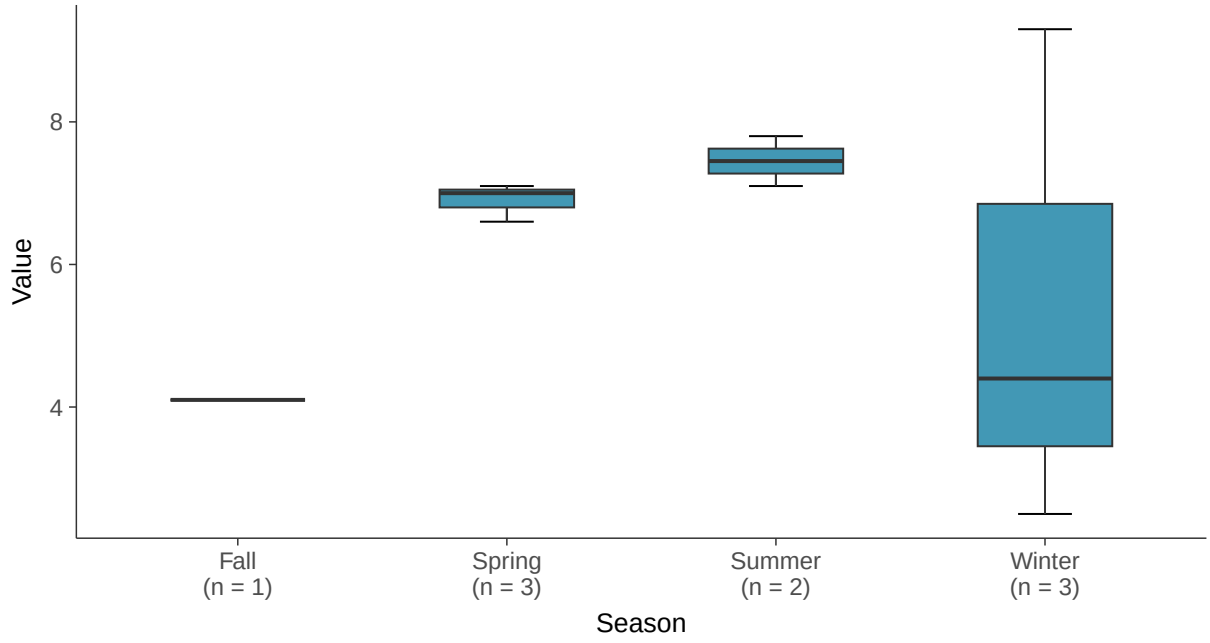
Boxplot

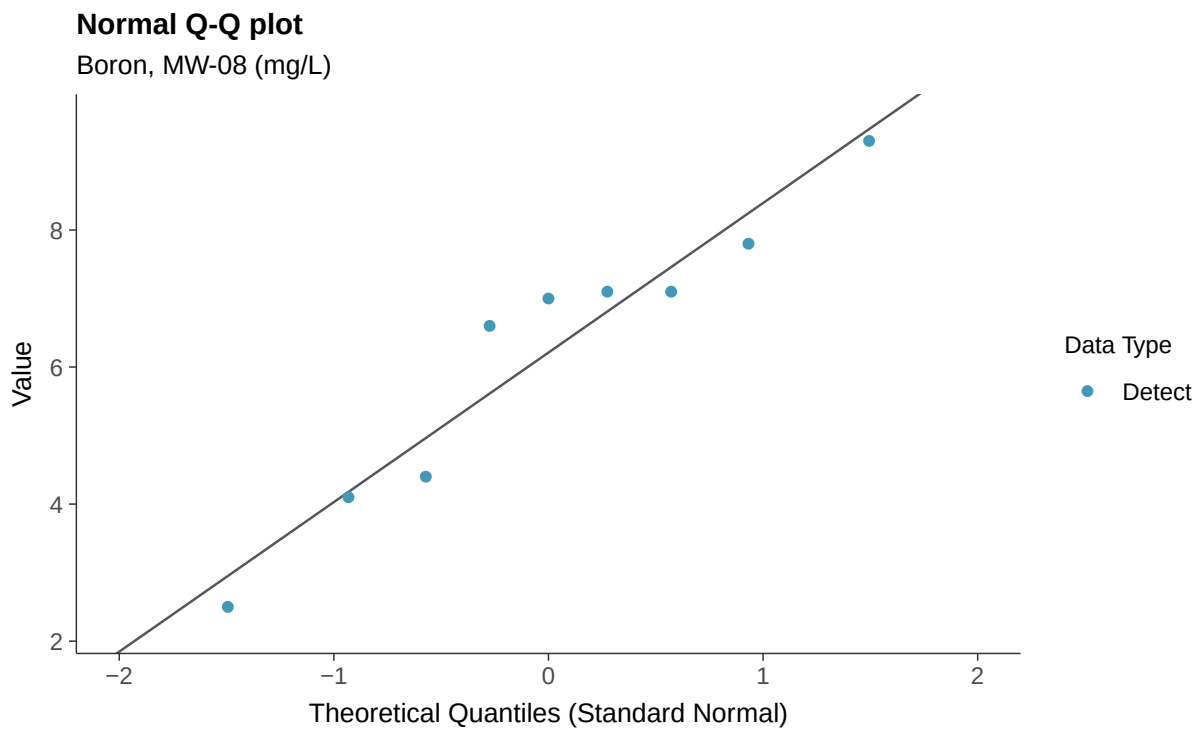
Boron, MW-08 (mg/L)

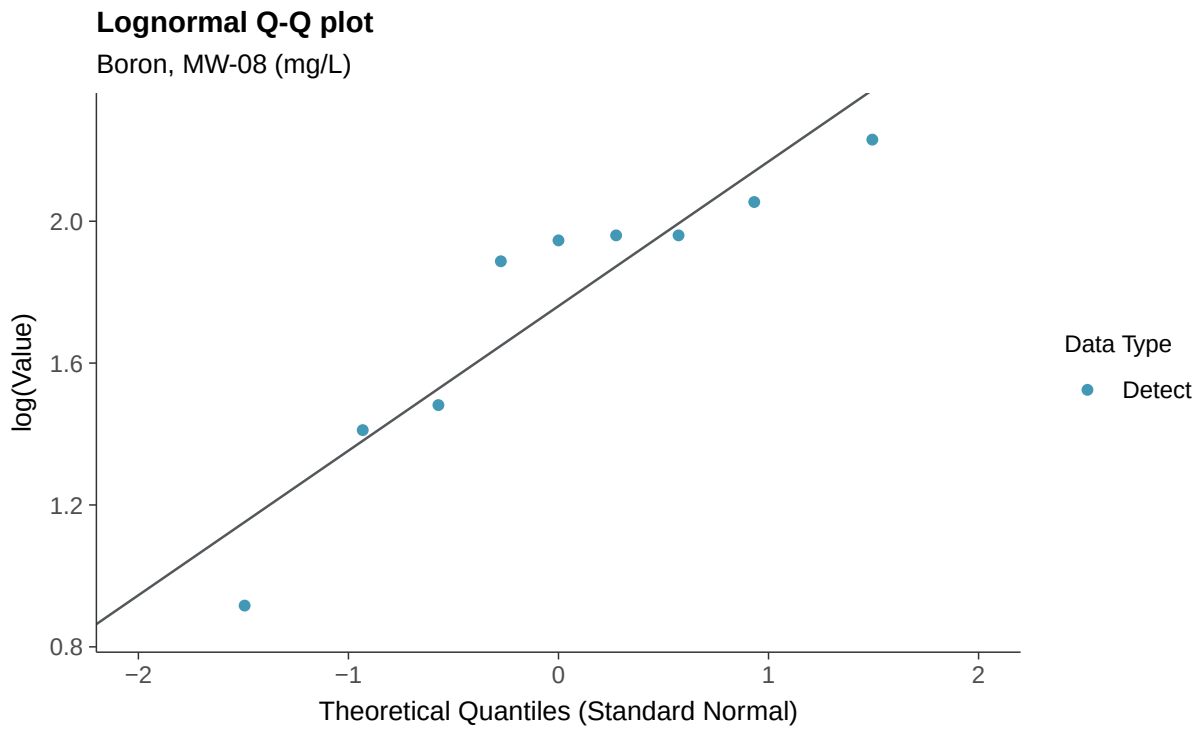


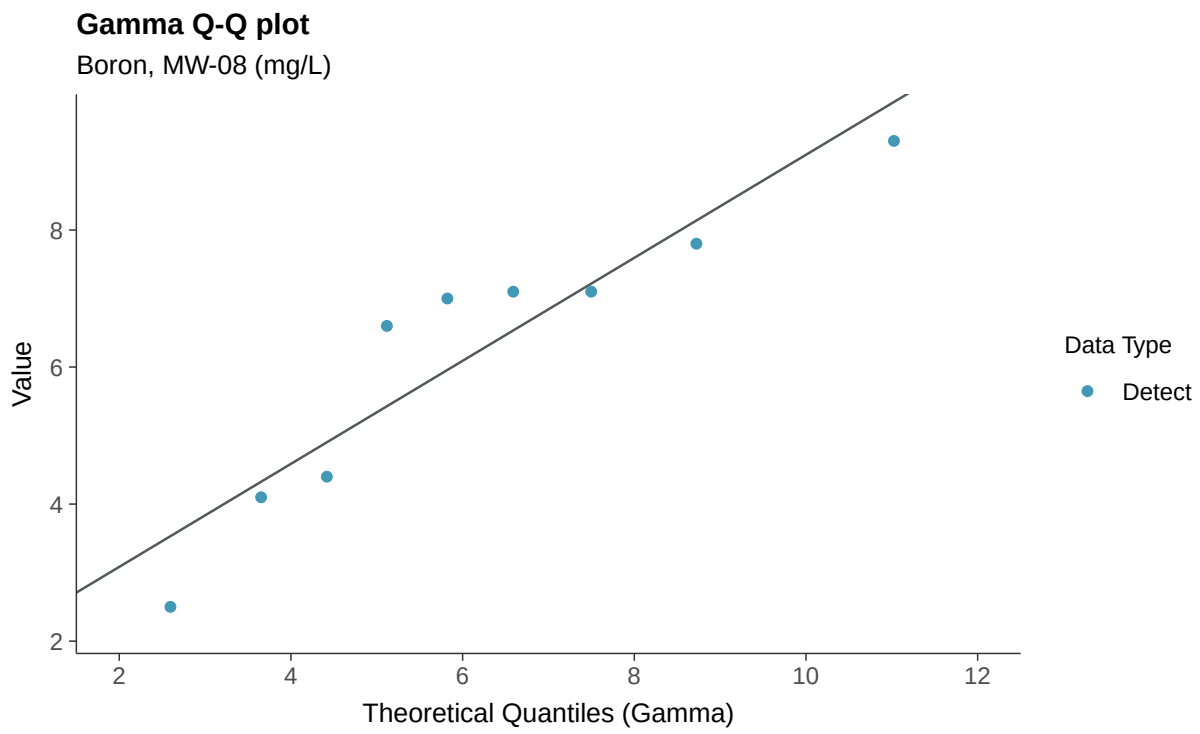
Boxplot by Season

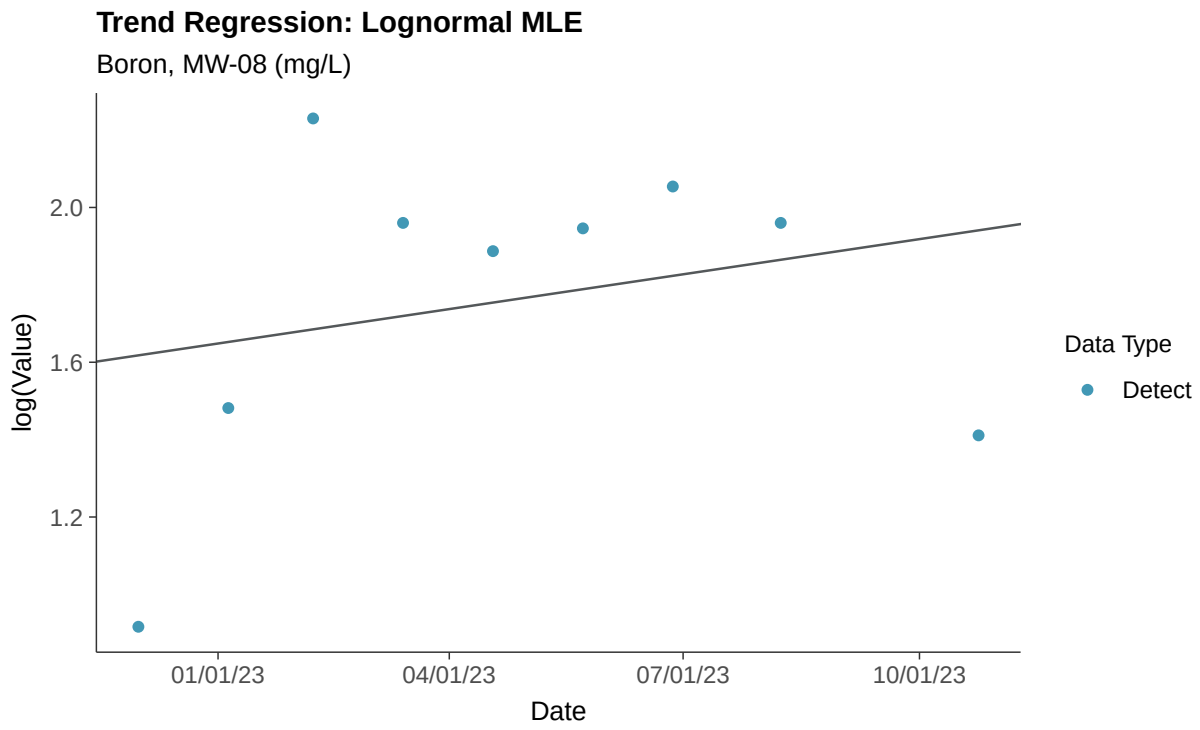
Boron, MW-08 (mg/L)




Normal Q-Q plot
Boron, MW-08 (mg/L)
Value
8
6
4
2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

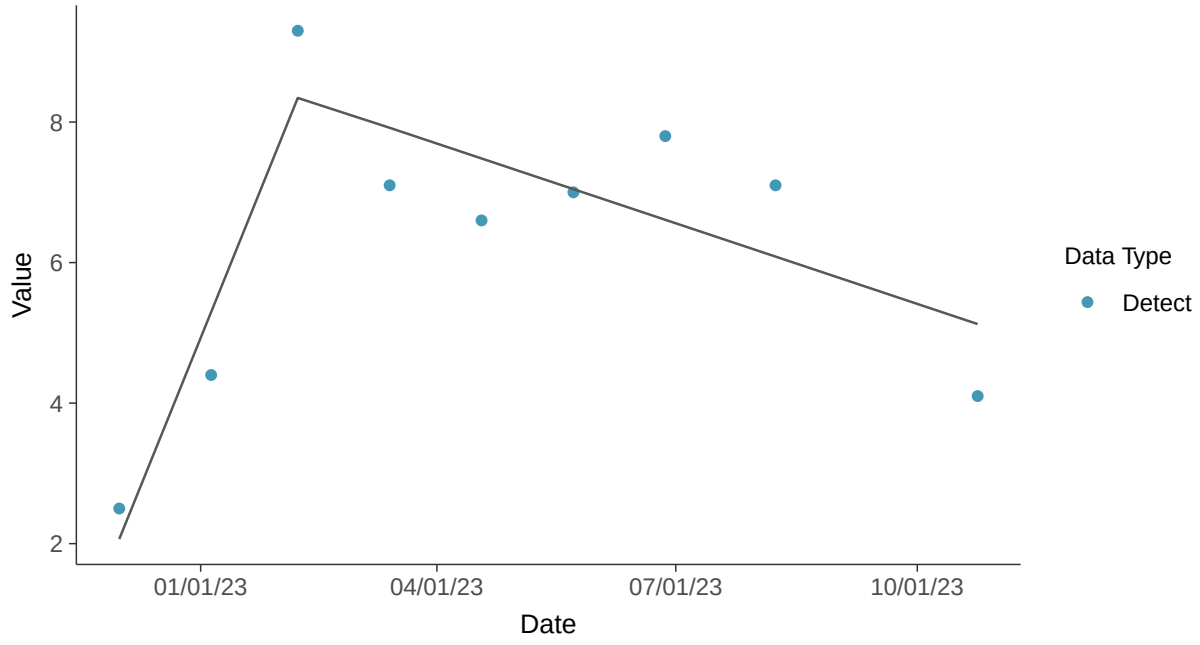

Lognormal Q-Q plot
Boron, MW-08 (mg/L)
log(Value)
2.0
1.6
1.2
0.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Boron, MW-08 (mg/L)
Value
2
4
6
8
2
4
6
8
10
12
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Boron, MW-08 (mg/L)
log(Value)
1.2
1.6
2.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

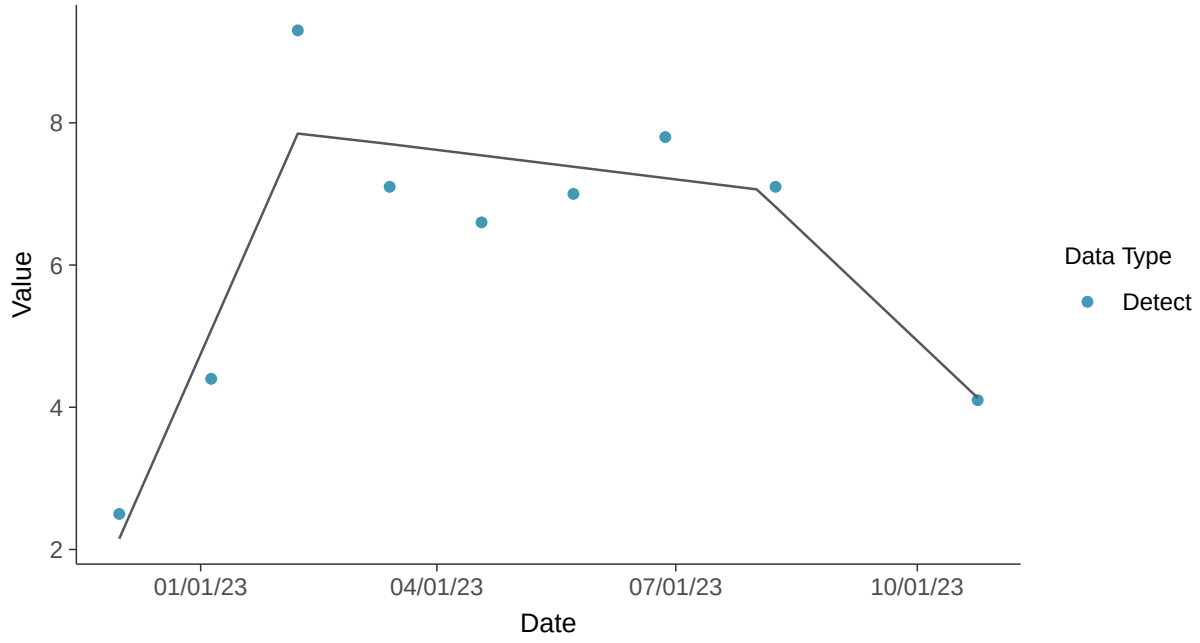
Trend Regression: Piecewise Linear-Linear

Boron, MW-08 (mg/L)



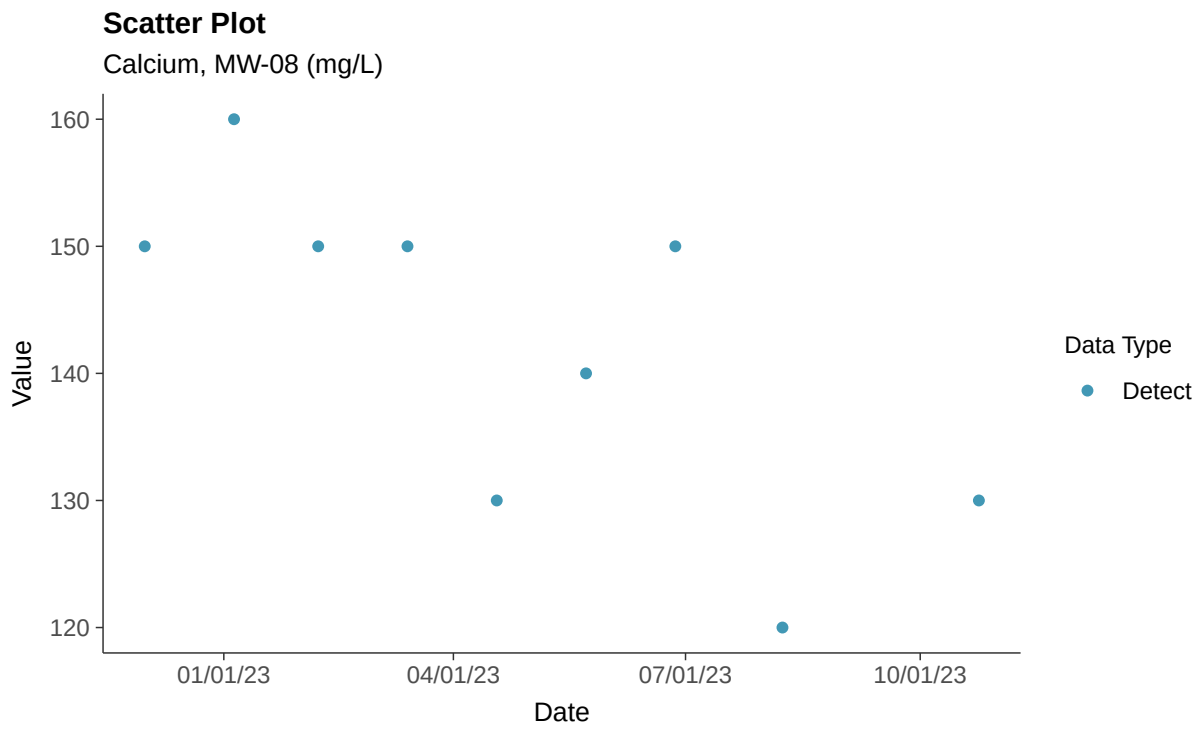
Trend Regression: Piecewise Linear-Linear-Linear

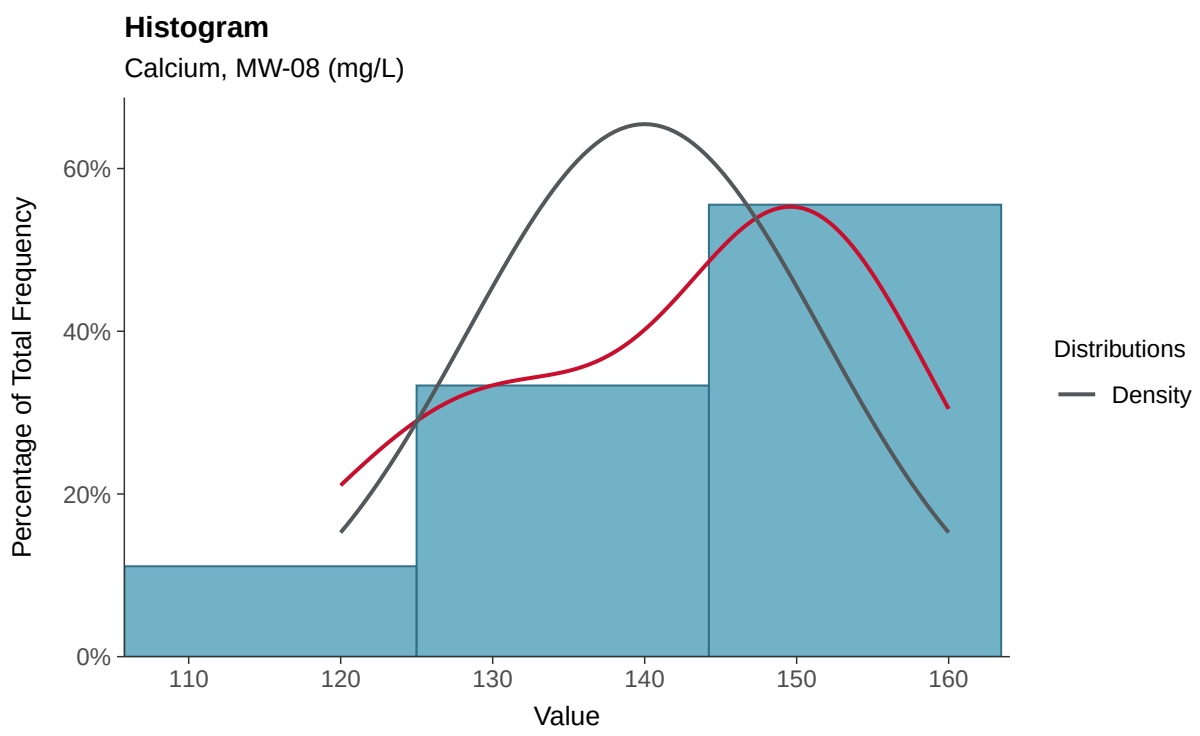
Boron, MW-08 (mg/L)



Appendix III: Calcium, MW-08

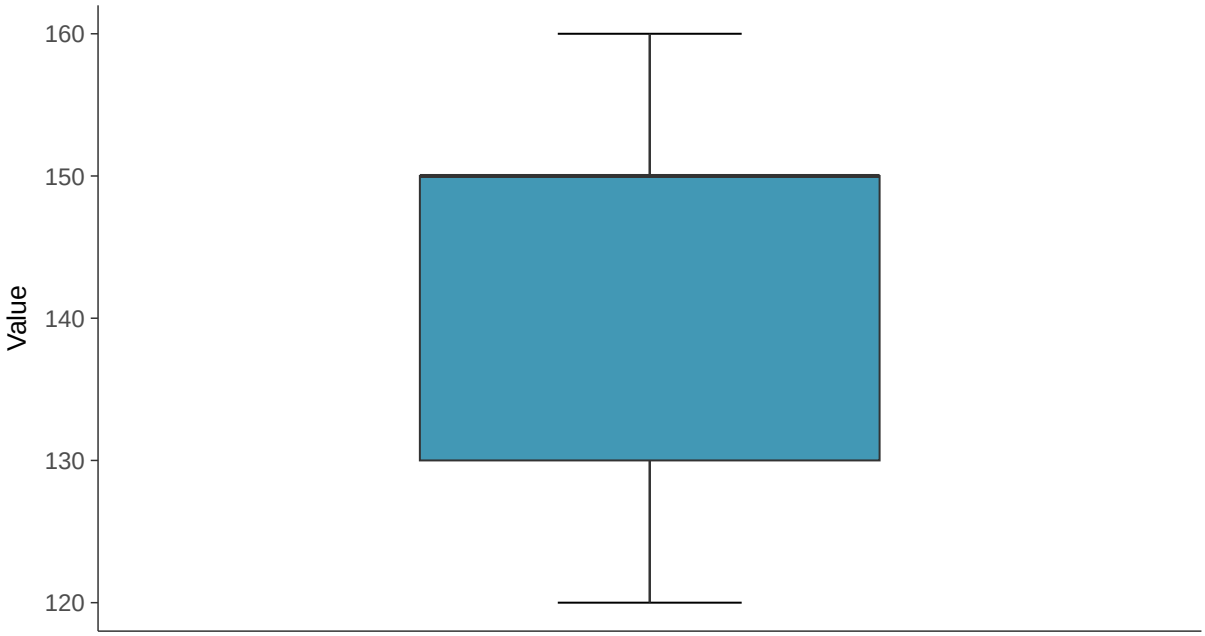
ID: 1_17_4_107





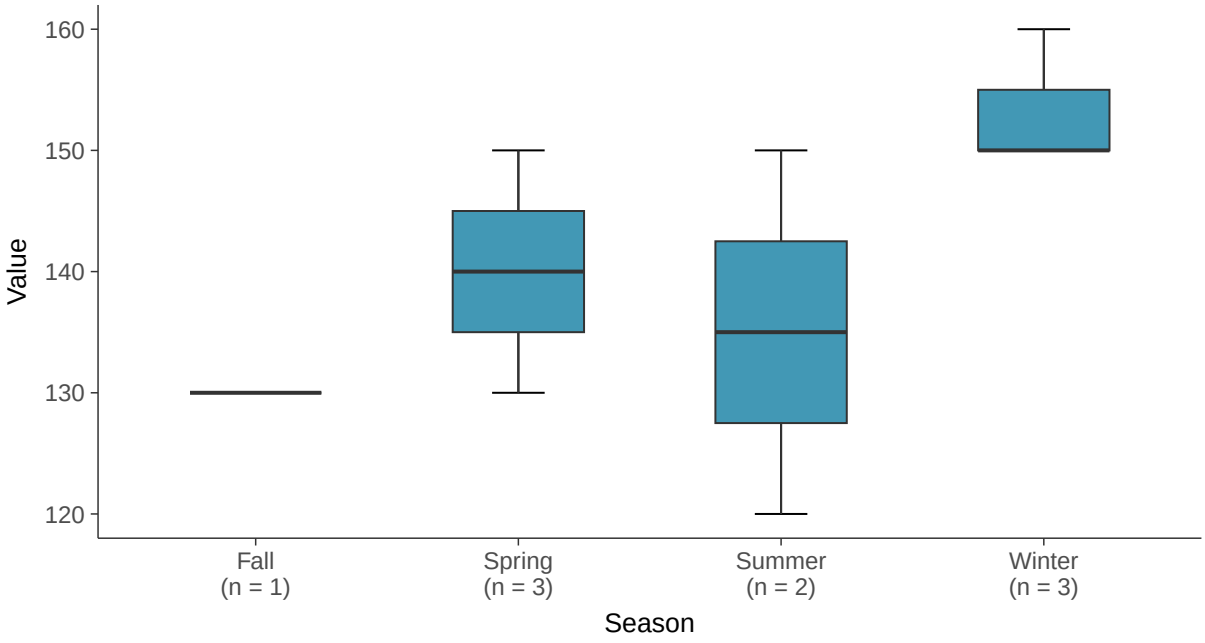
Boxplot

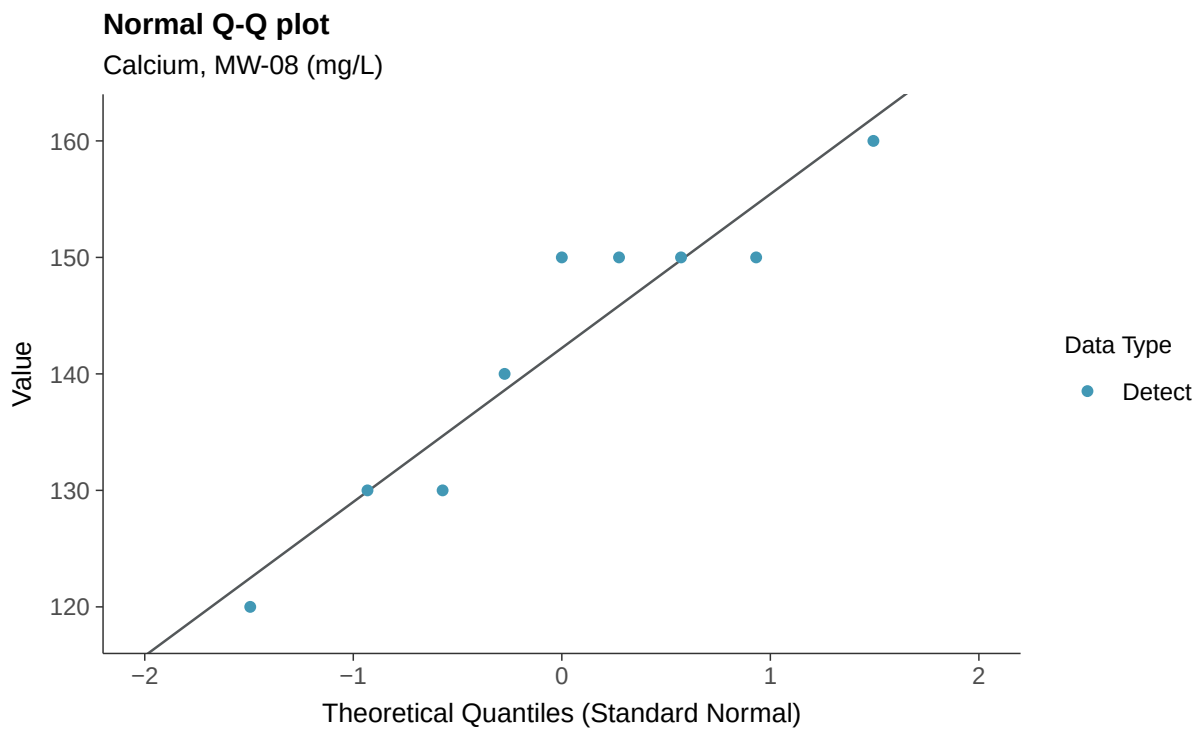
Calcium, MW-08 (mg/L)

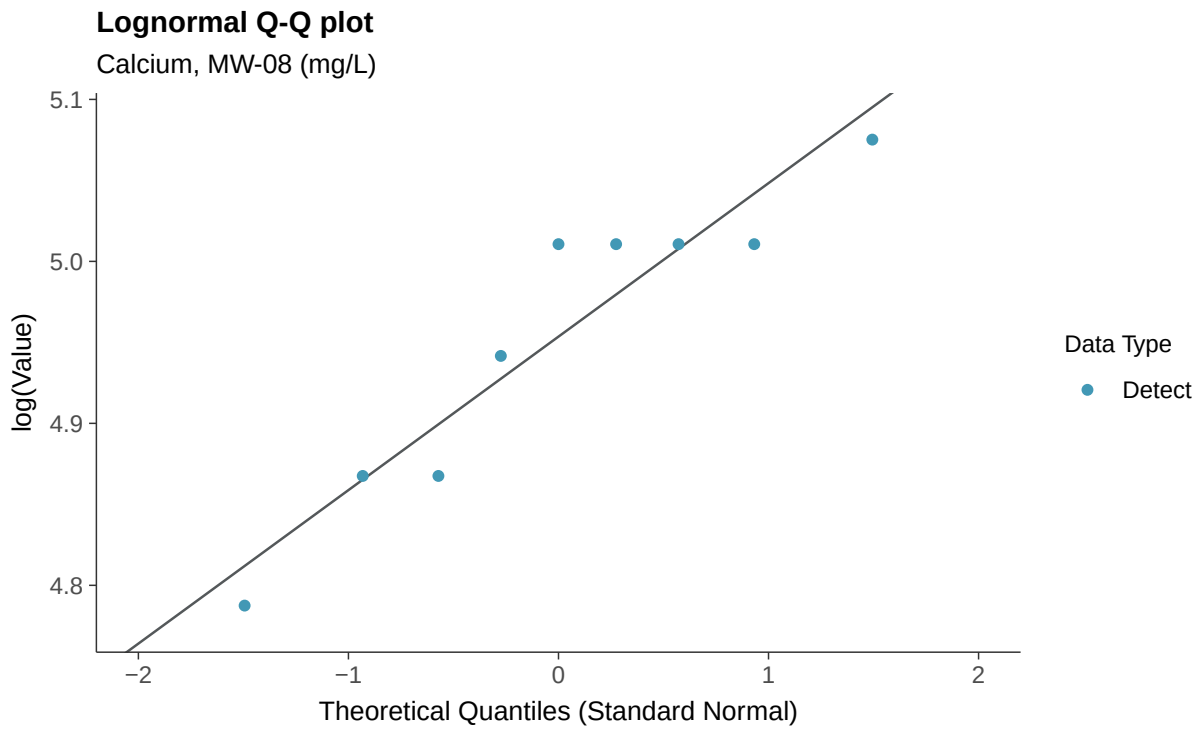


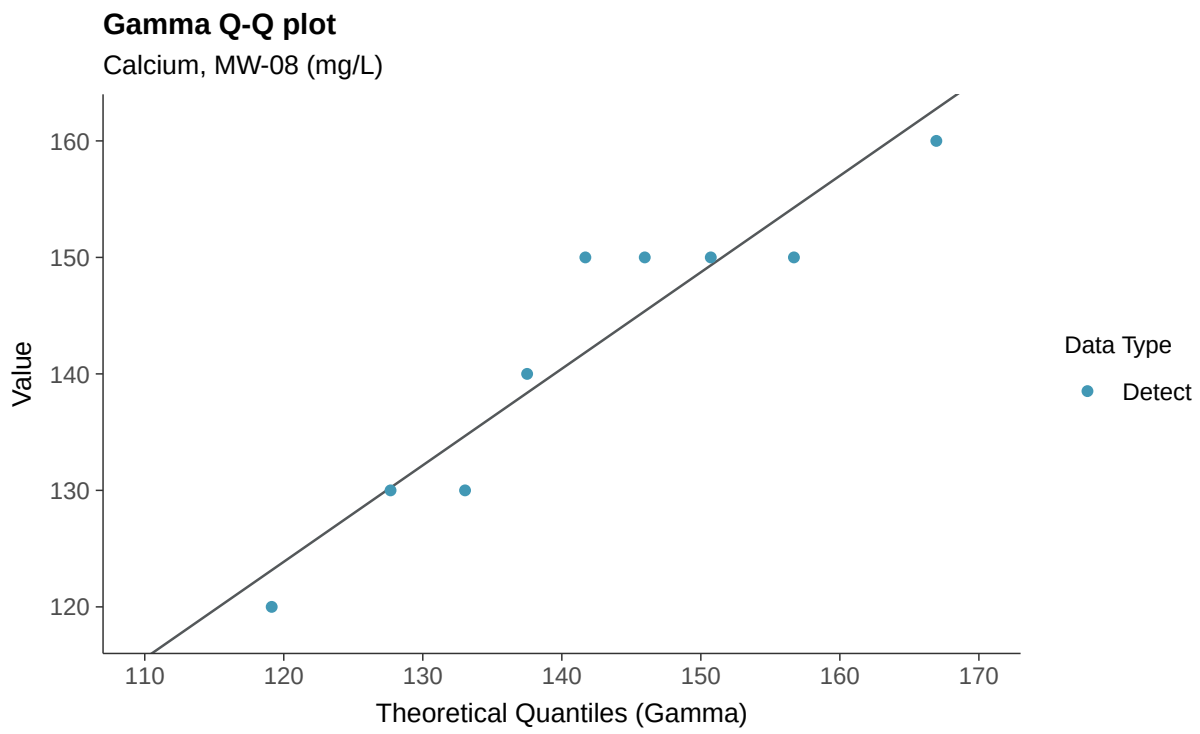
Boxplot by Season

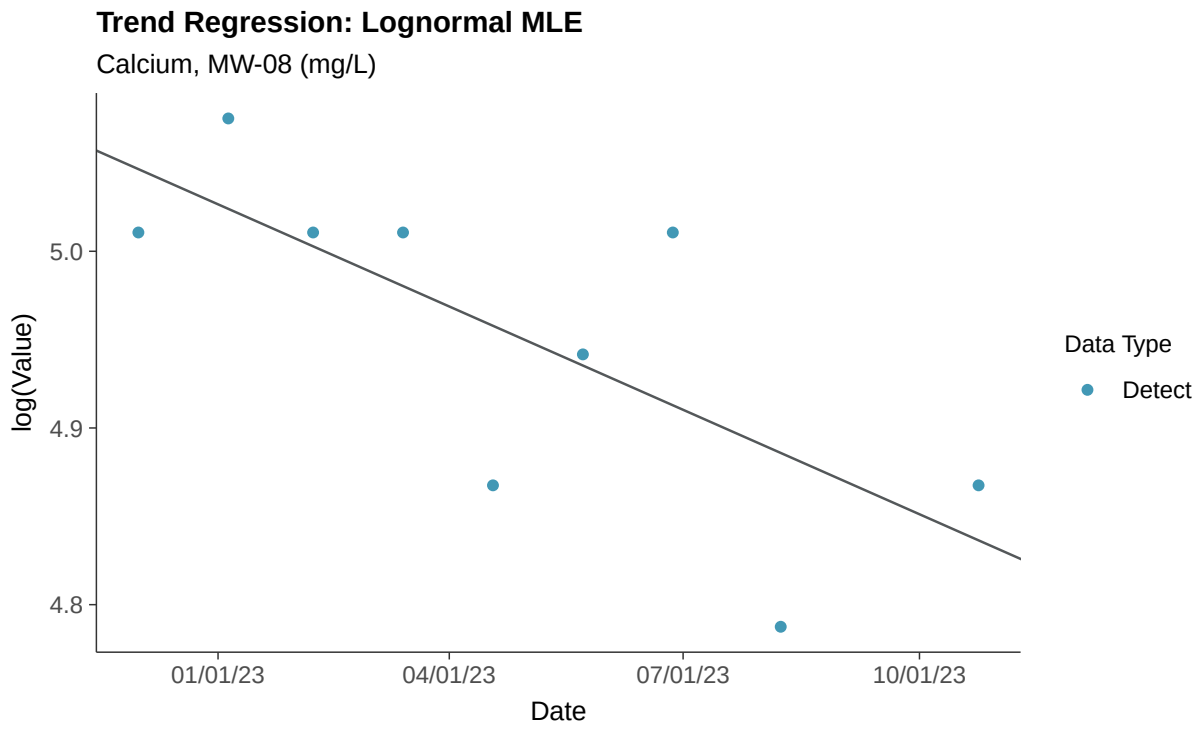
Calcium, MW-08 (mg/L)




Normal Q-Q plot
Calcium, MW-08 (mg/L)
Value
160
150
140
130
120
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

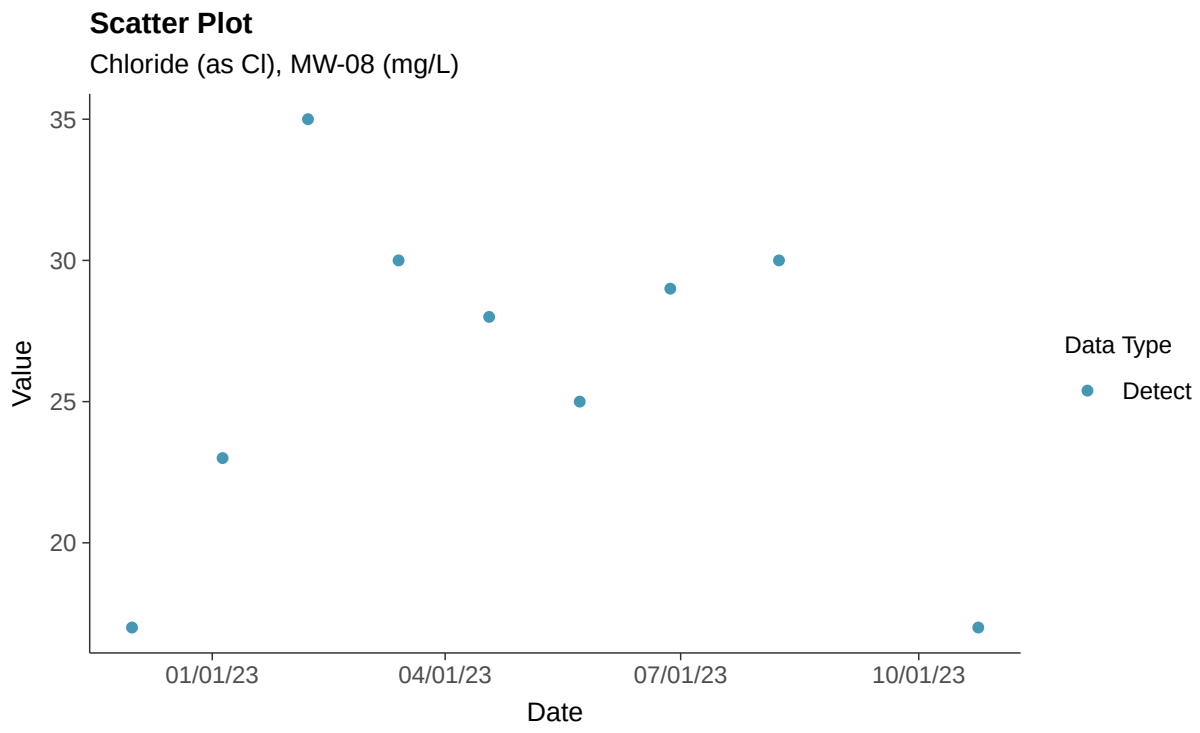

Lognormal Q-Q plot
Calcium, MW-08 (mg/L)
log(Value)
5.1
5.0
4.9
4.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

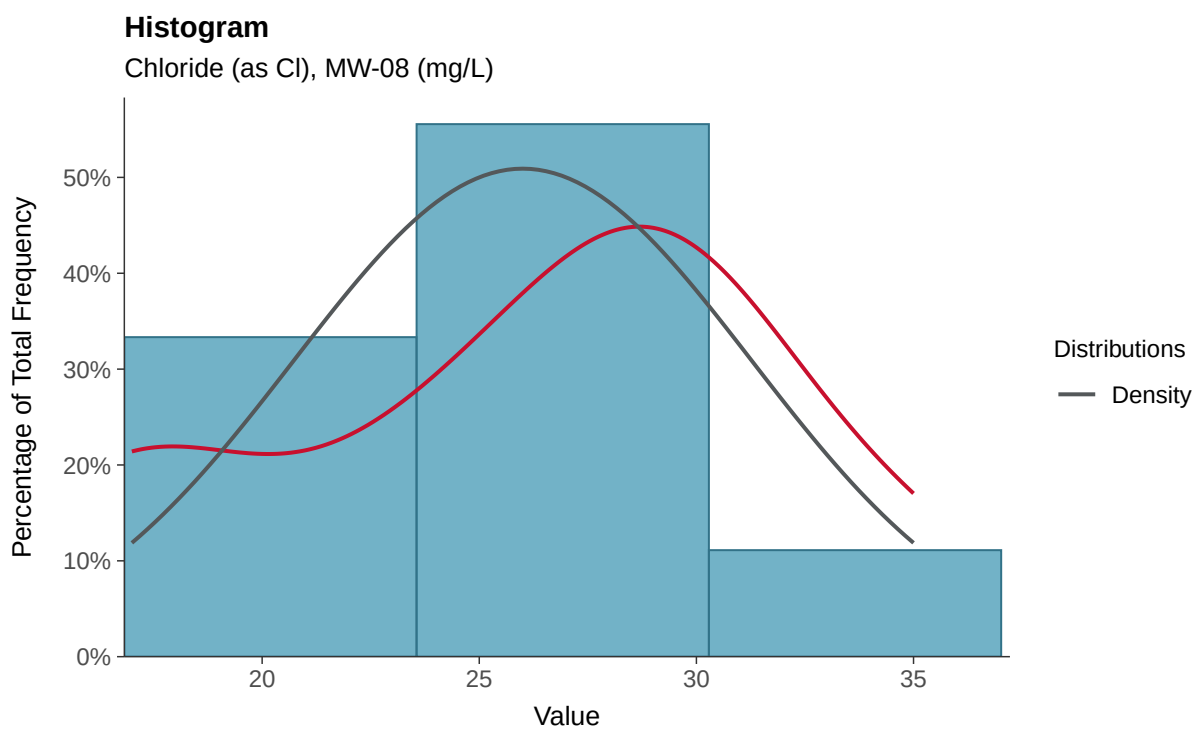

Gamma Q-Q plot
Calcium, MW-08 (mg/L)
Value
160
150
140
130
120
110
120
130
140
150
160
170
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-08 (mg/L)
log(Value)
5.0
4.9
4.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-08

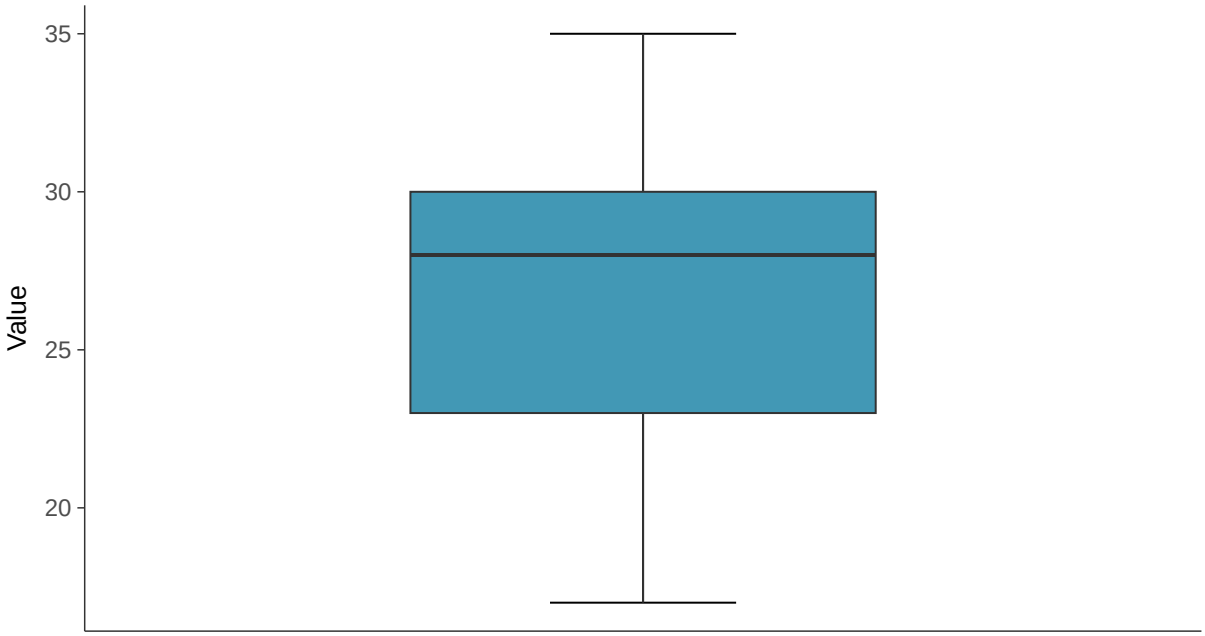
ID: 1_17_4_108





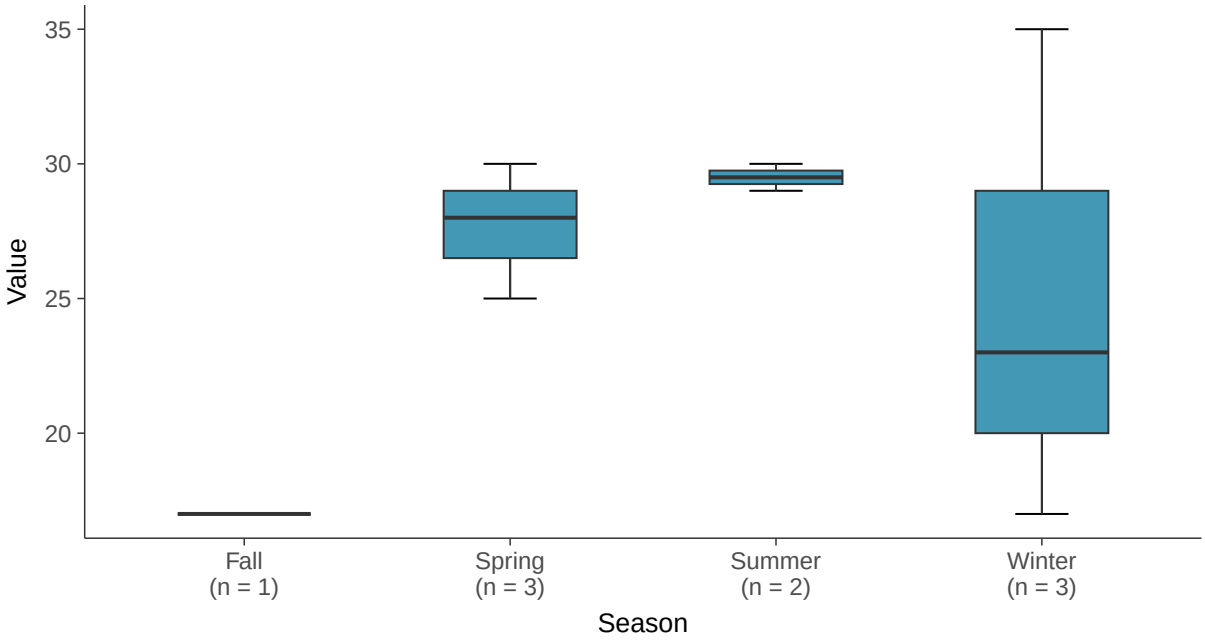
Boxplot

Chloride (as Cl), MW-08 (mg/L)



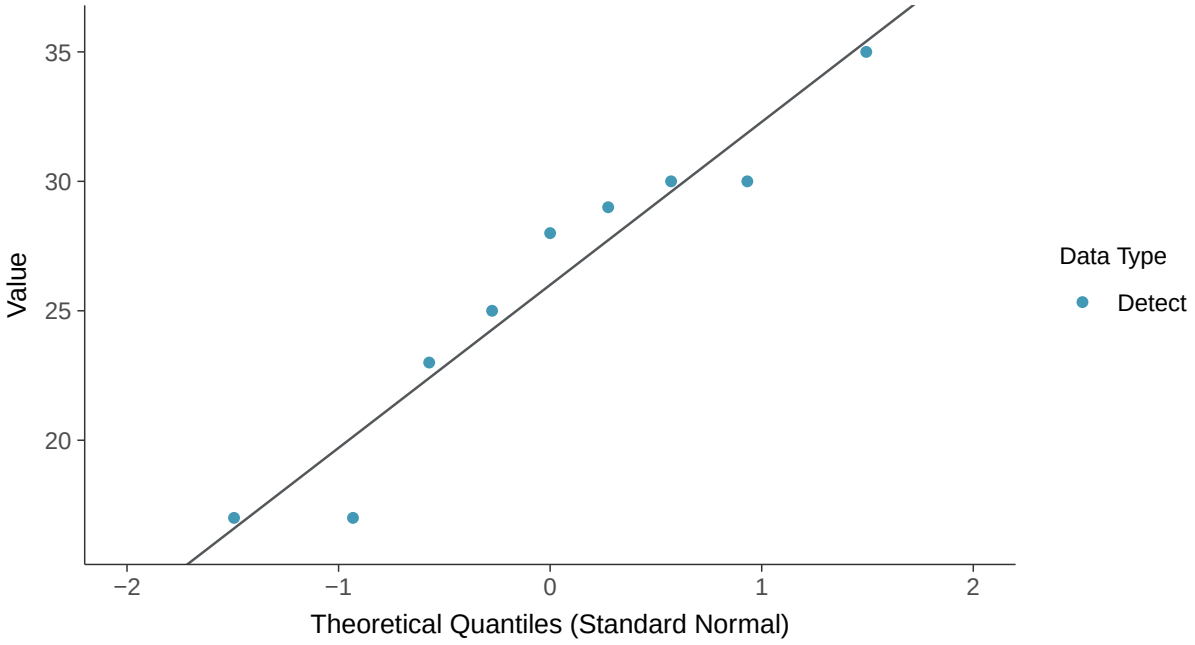
Boxplot by Season

Chloride (as Cl), MW-08 (mg/L)



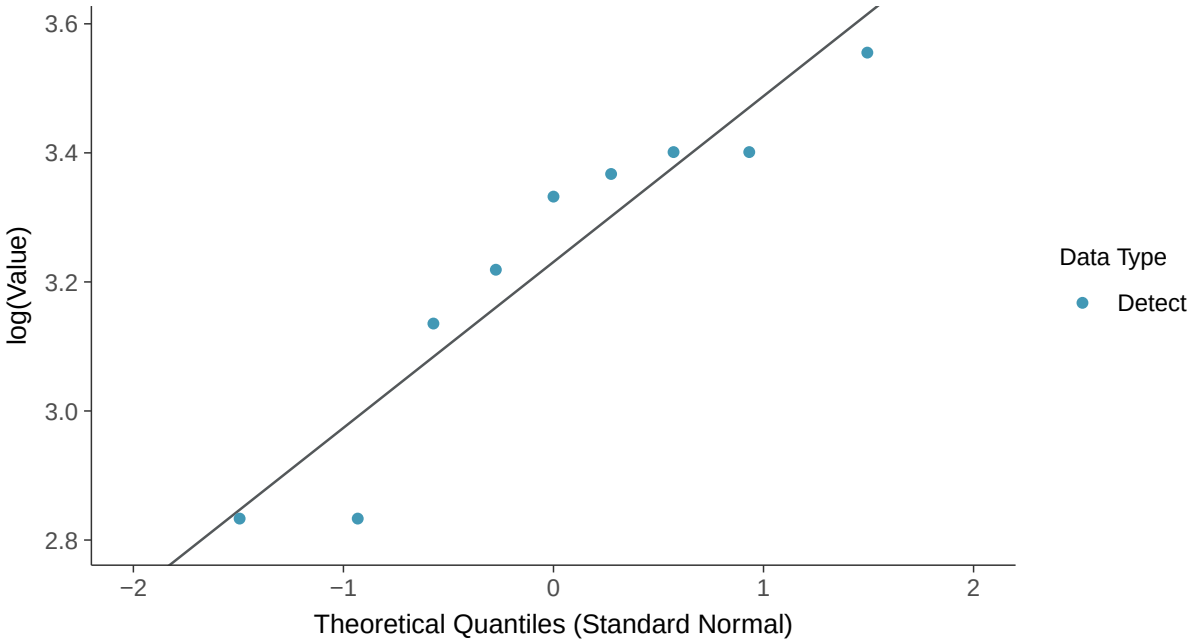
Normal Q-Q plot

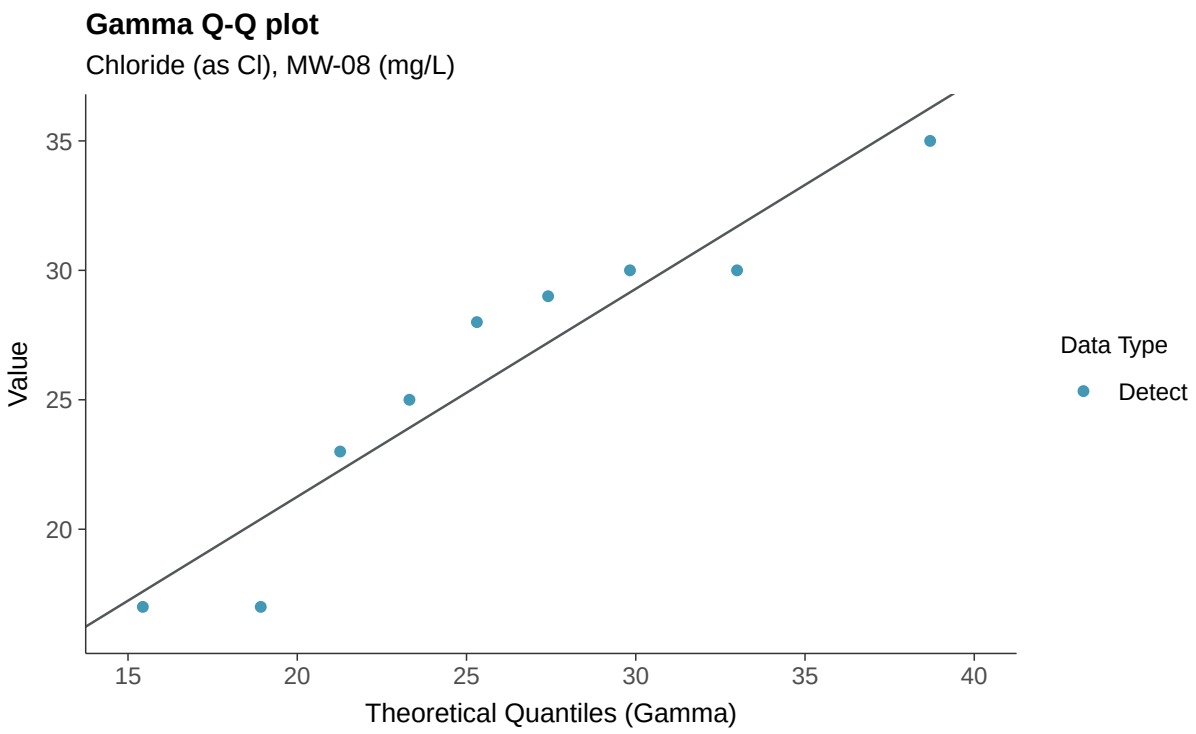
Chloride (as Cl), MW-08 (mg/L)

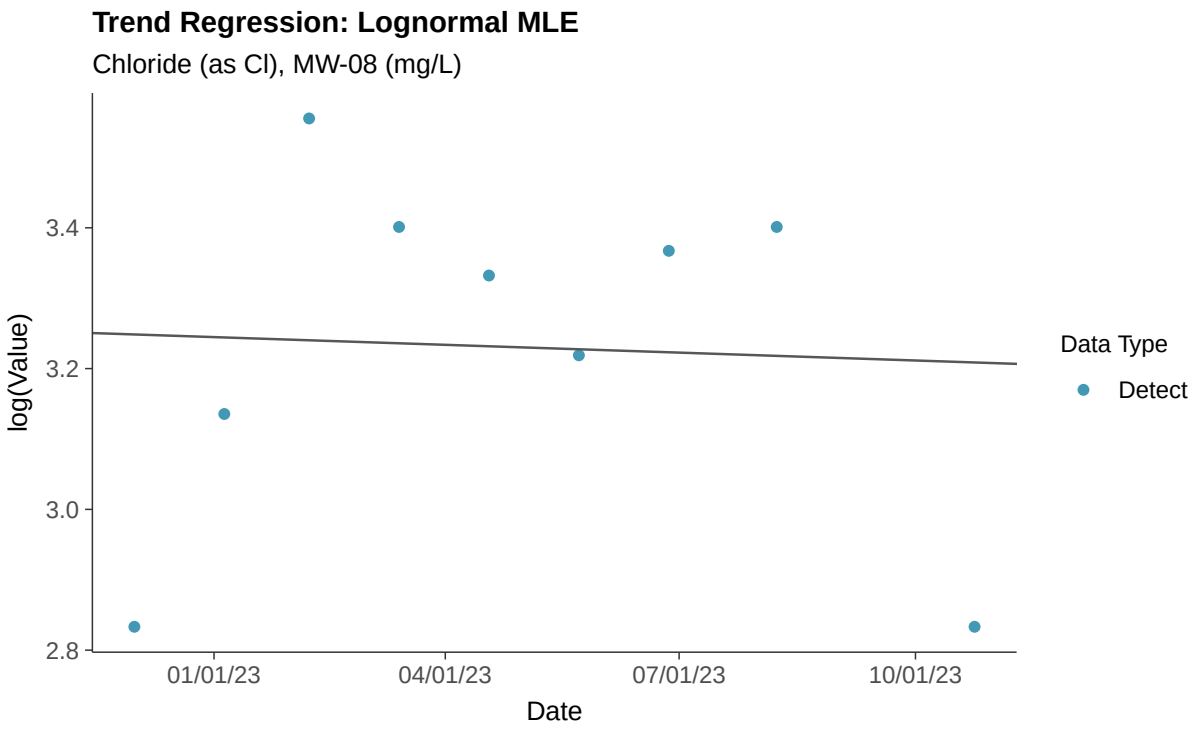


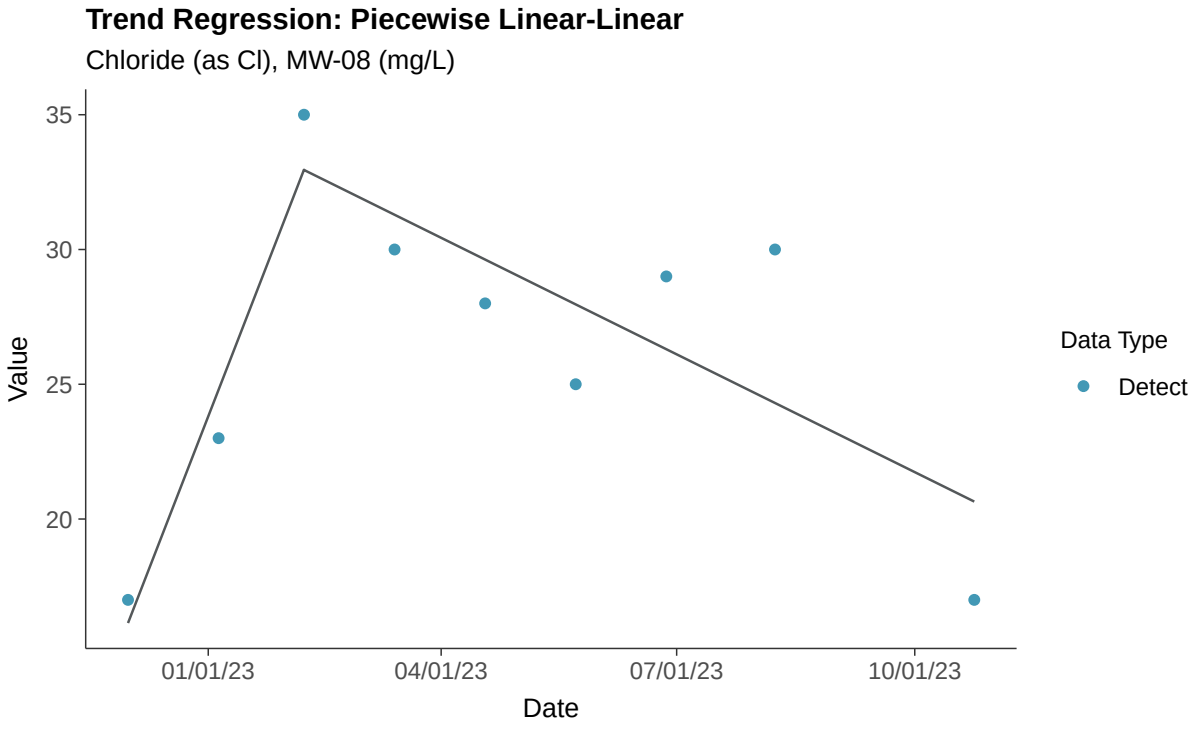
Lognormal Q-Q plot

Chloride (as Cl), MW-08 (mg/L)



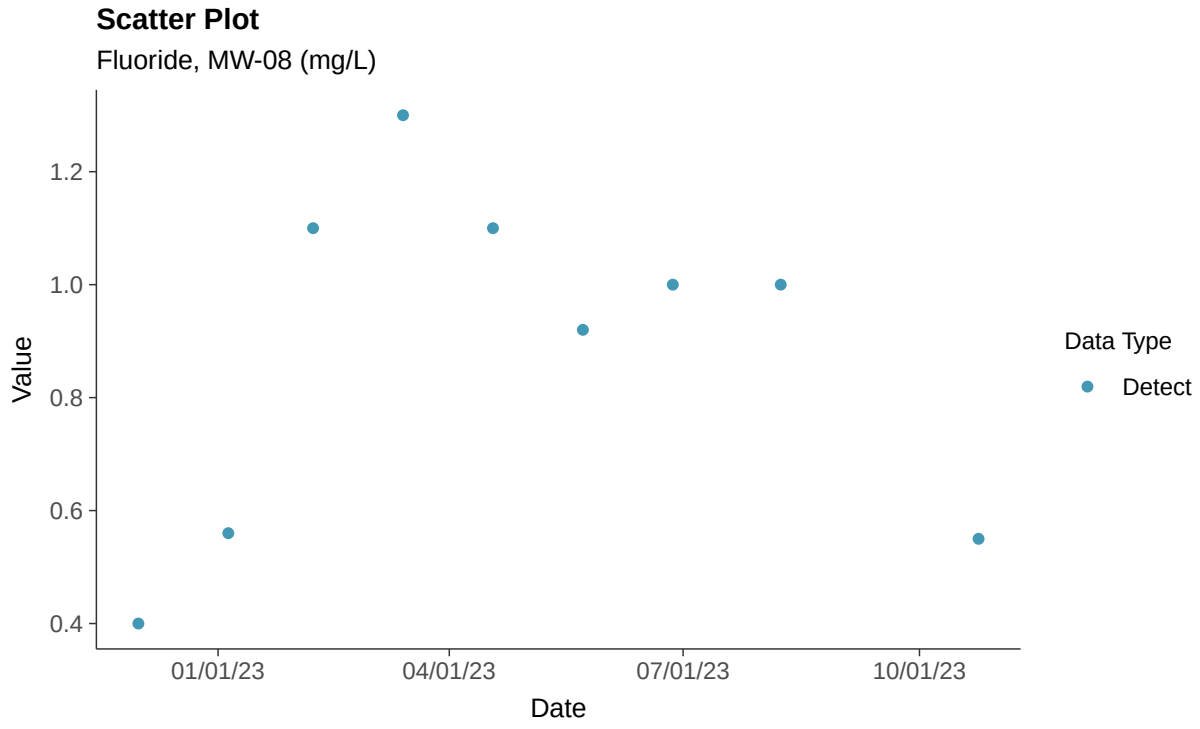

Gamma Q-Q plot
Chloride (as Cl), MW-08 (mg/L)
Value
35
30
25
20
15
20
25
30
35
40
Theoretical Quantiles (Gamma)
Data Type
Detect

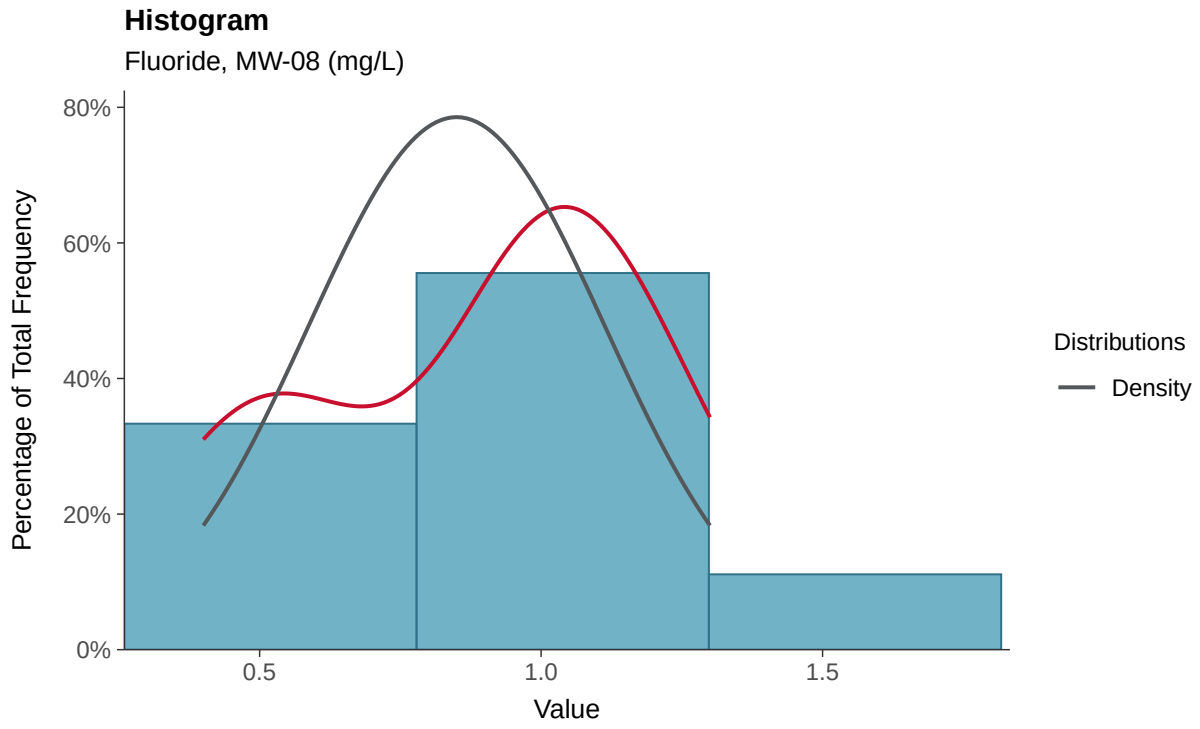

Trend Regression: Lognormal MLE
Chloride (as Cl), MW-08 (mg/L)
log(Value)
3.4
3.2
3.0
2.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-08 (mg/L)
35
30
25
20
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-08

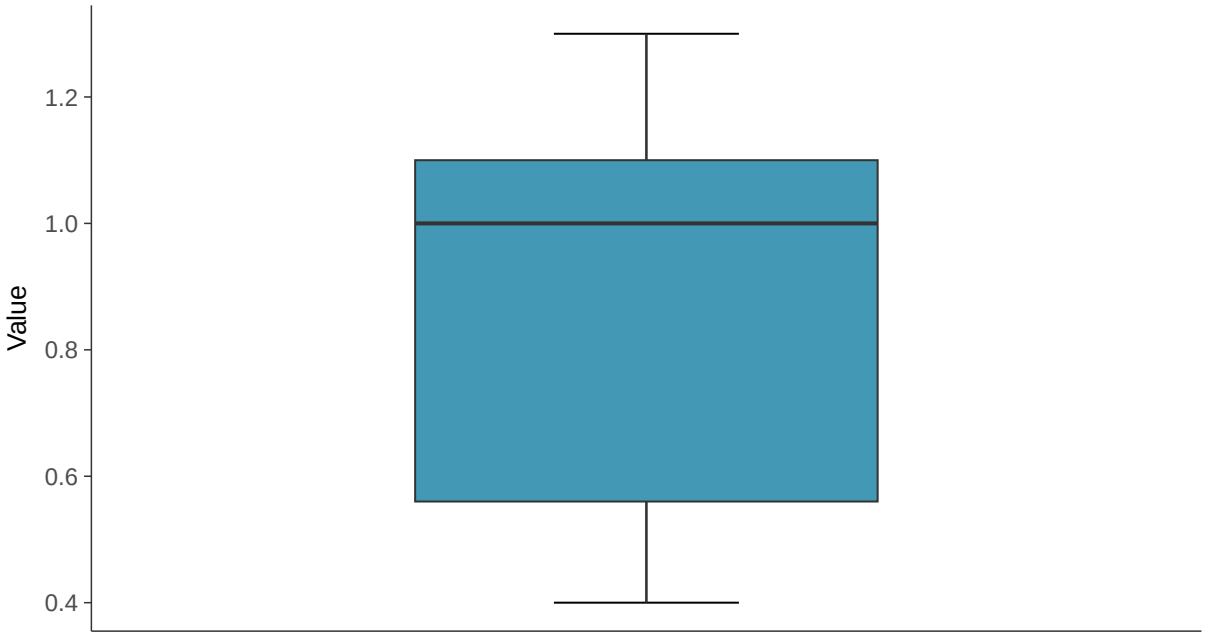
ID: 1_17_4_112





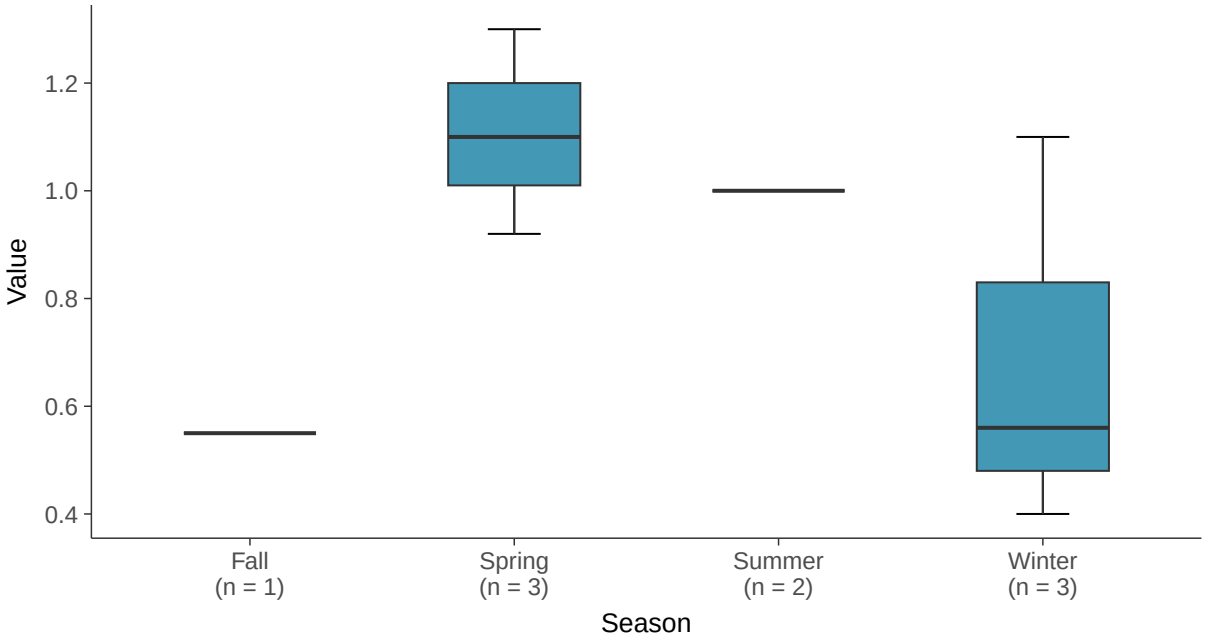
Boxplot

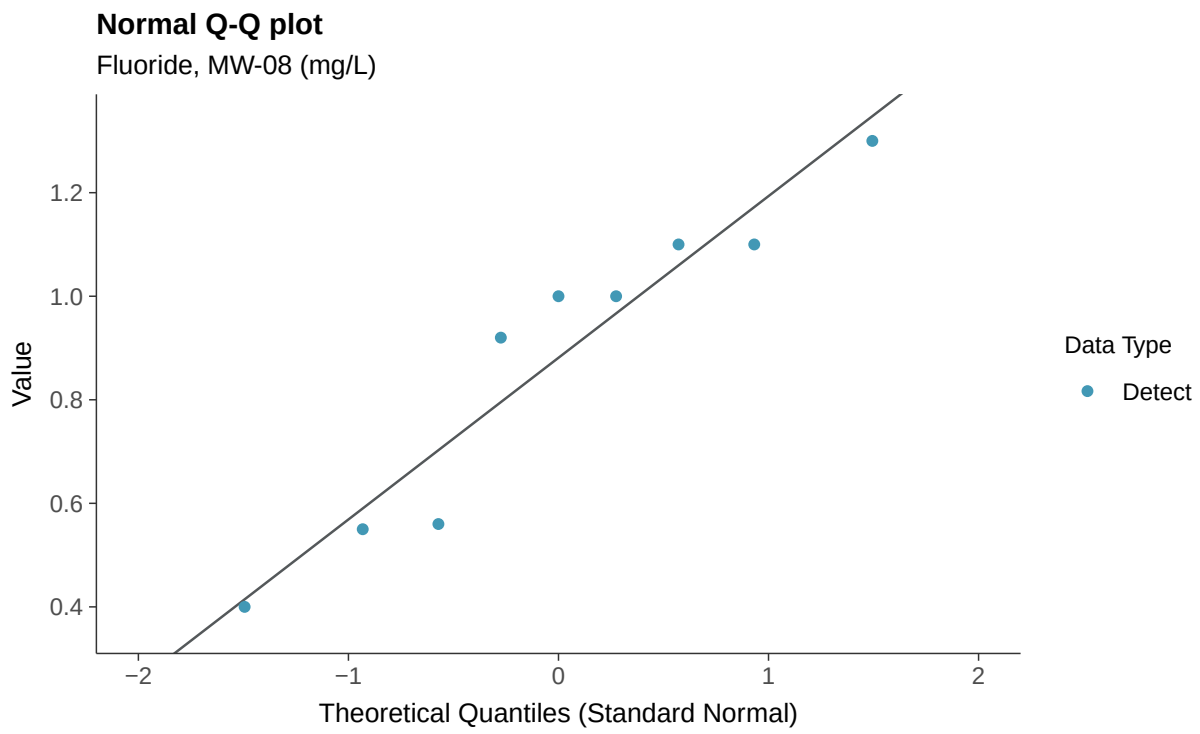
Fluoride, MW-08 (mg/L)

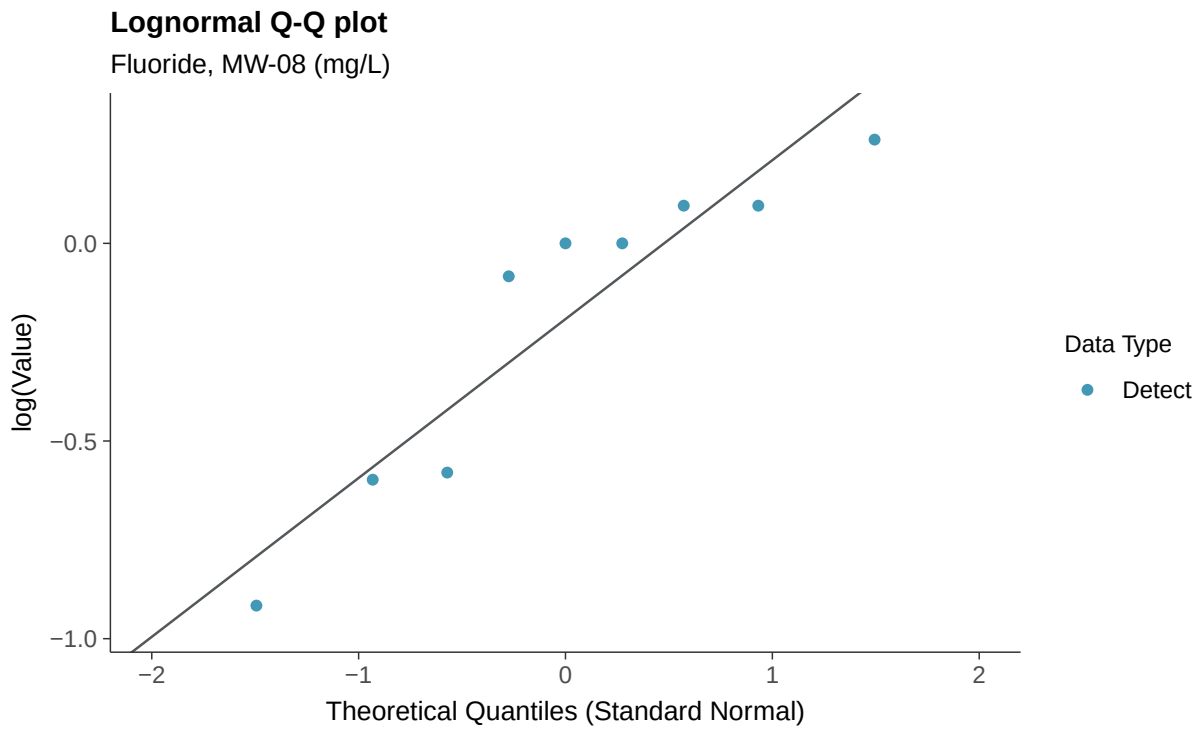


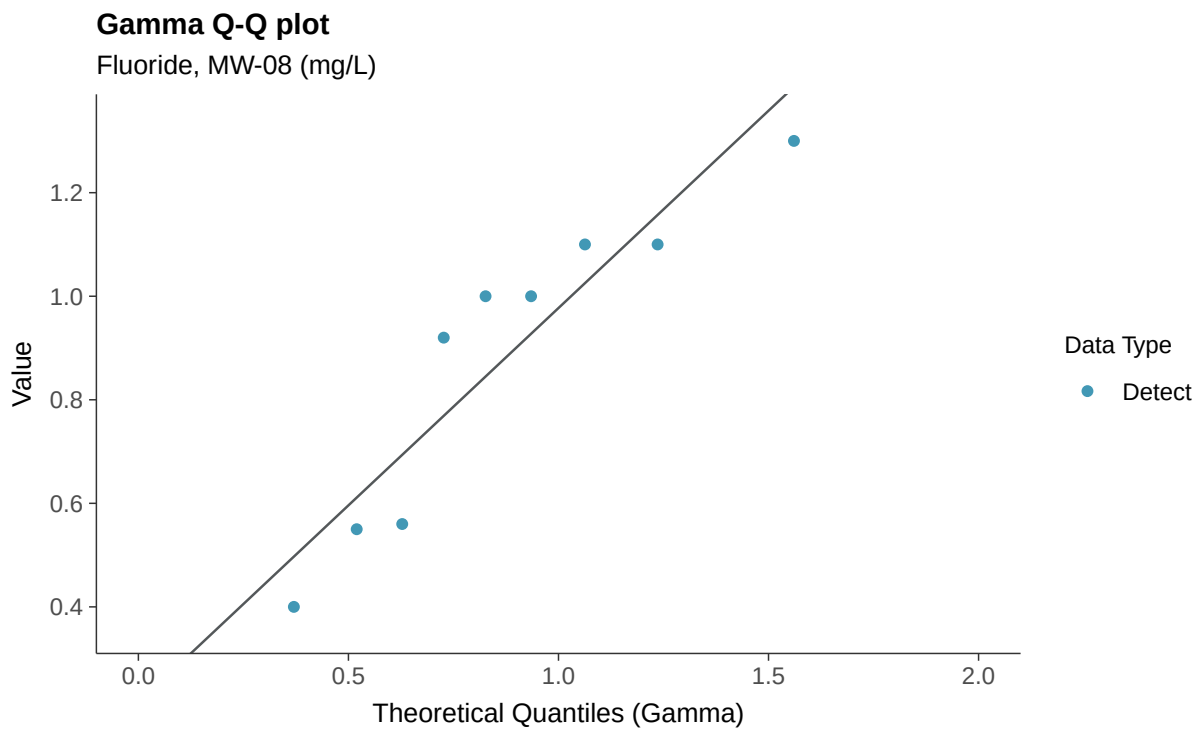
Boxplot by Season

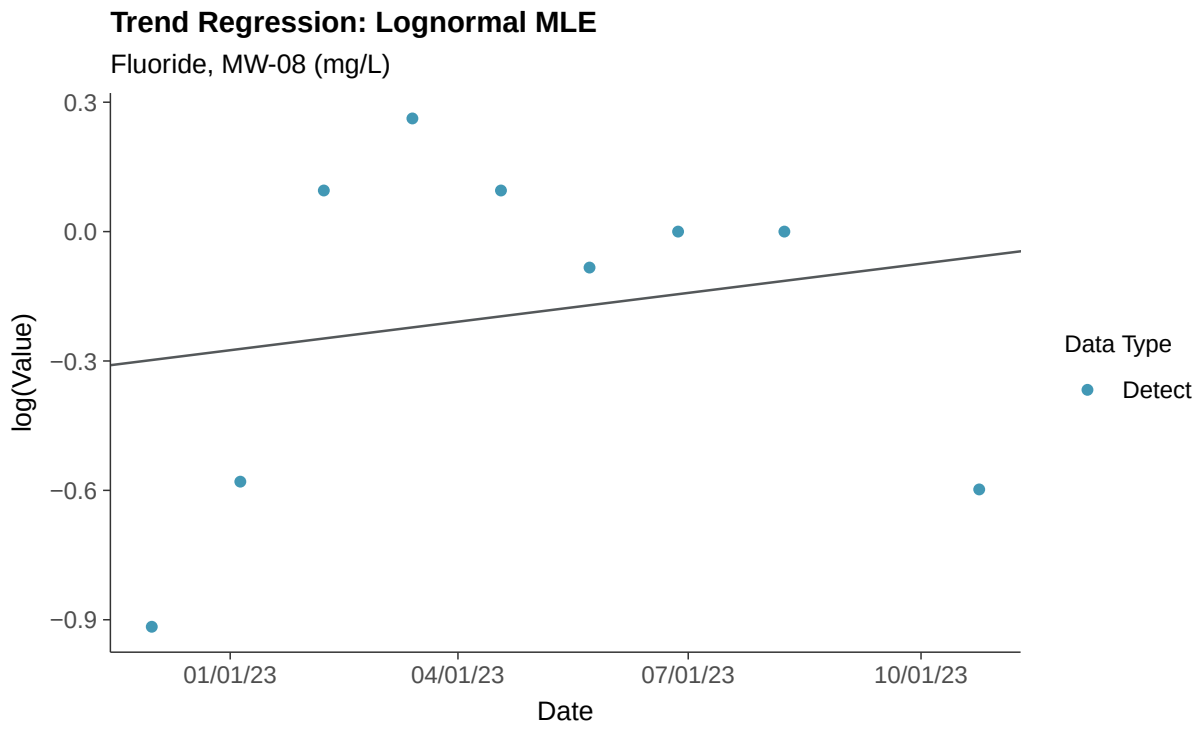
Fluoride, MW-08 (mg/L)

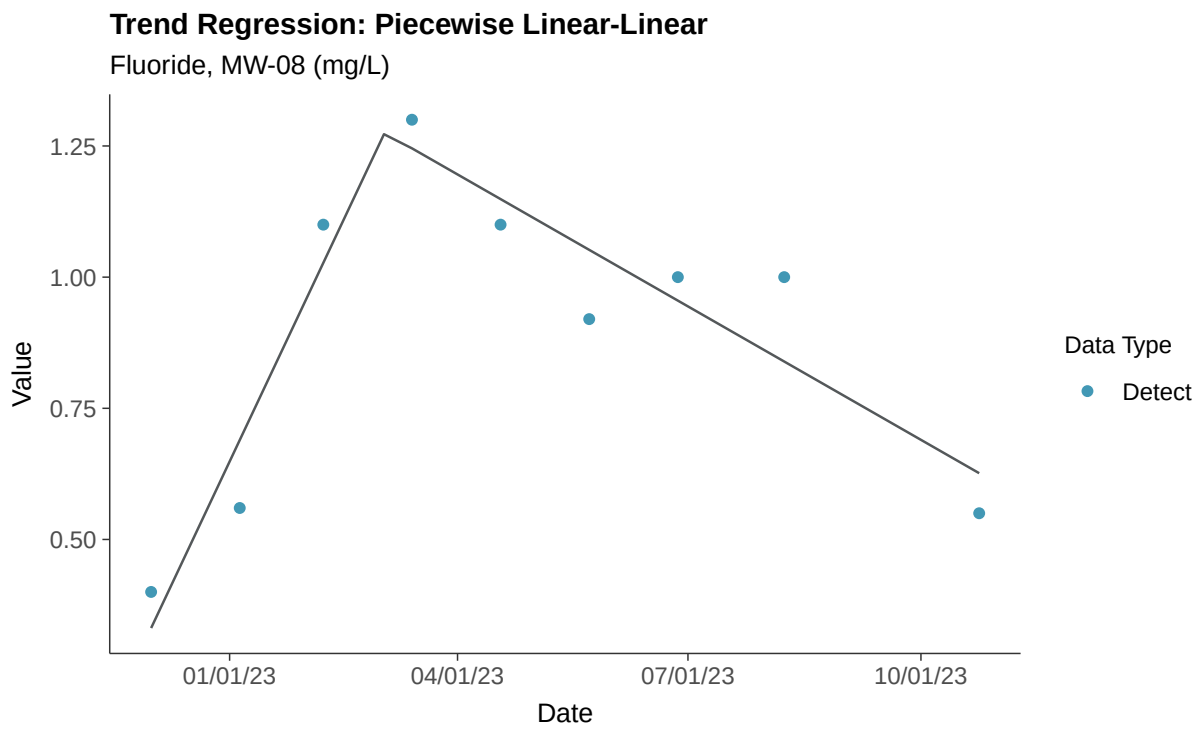



Normal Q-Q plot
Fluoride, MW-08 (mg/L)
Value
1.2
1.0
0.8
0.6
0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride, MW-08 (mg/L)
log(Value)
0.0
−0.5
−1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

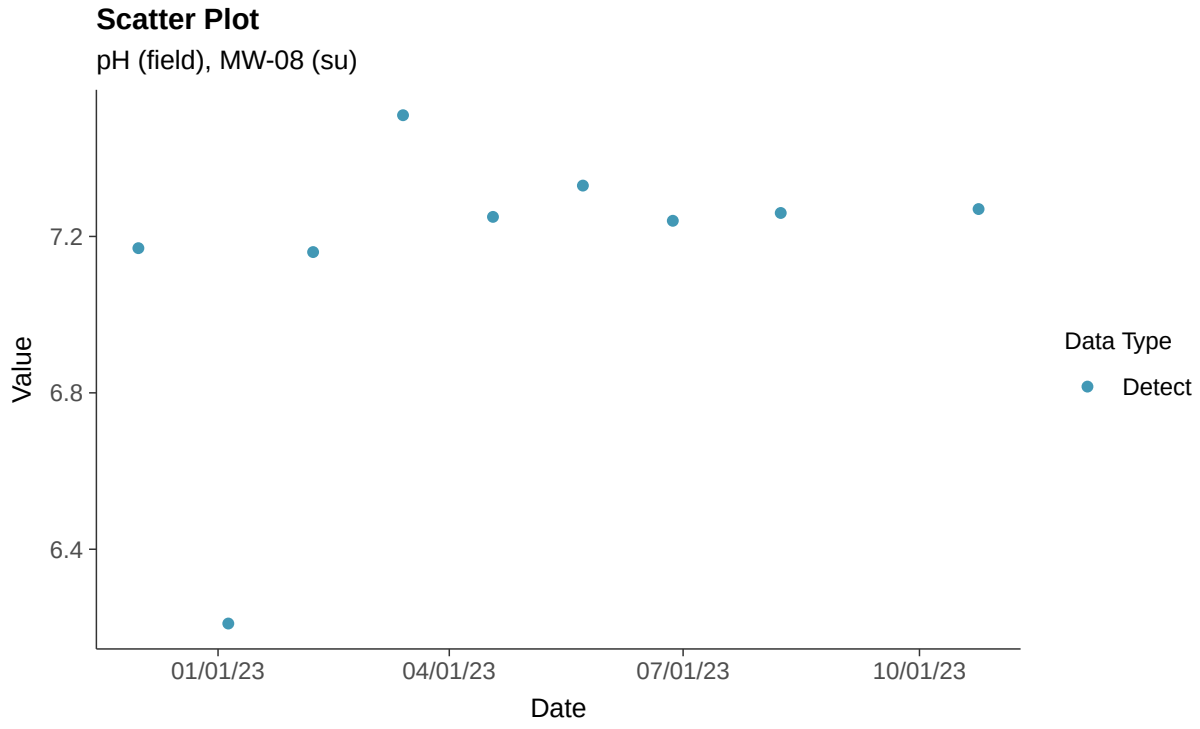

Gamma Q-Q plot
Fluoride, MW-08 (mg/L)
Value
1.2
1.0
0.8
0.6
0.4
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect

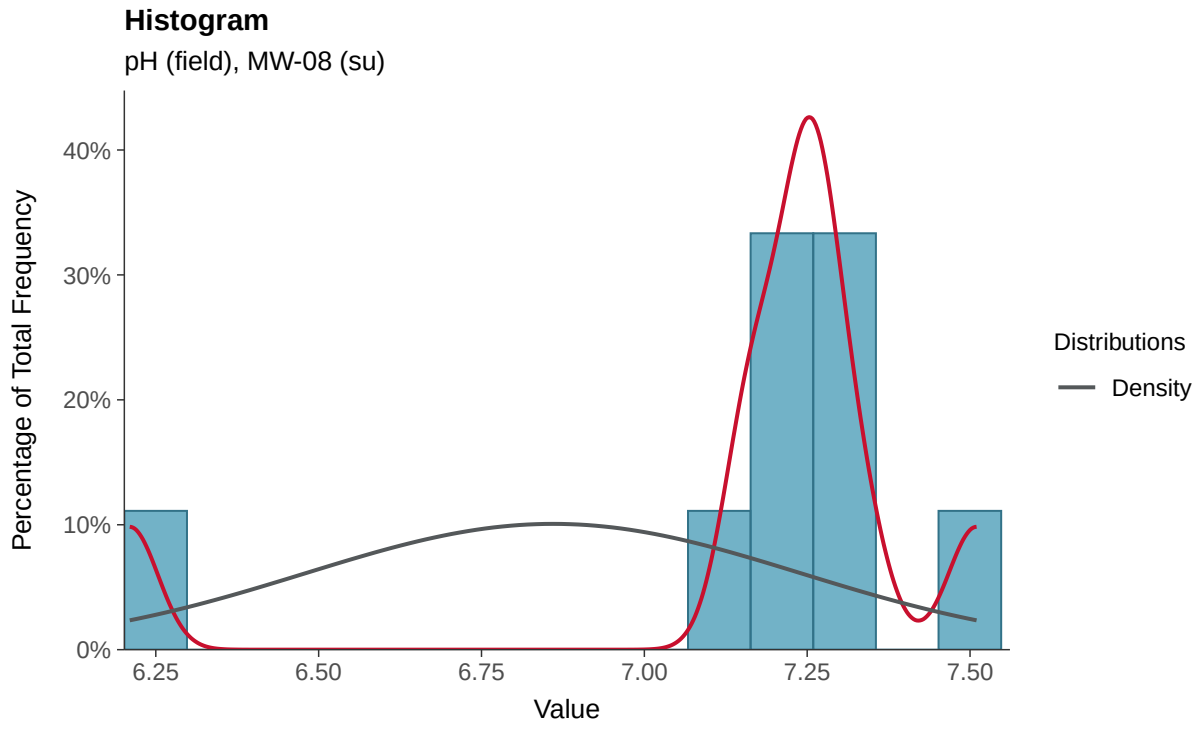

Trend Regression: Lognormal MLE
Fluoride, MW-08 (mg/L)
log(Value)
0.3
0.0
−0.3
−0.6
−0.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Fluoride, MW-08 (mg/L)
1.25
1.00
0.75
0.50
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: pH (field), MW-08

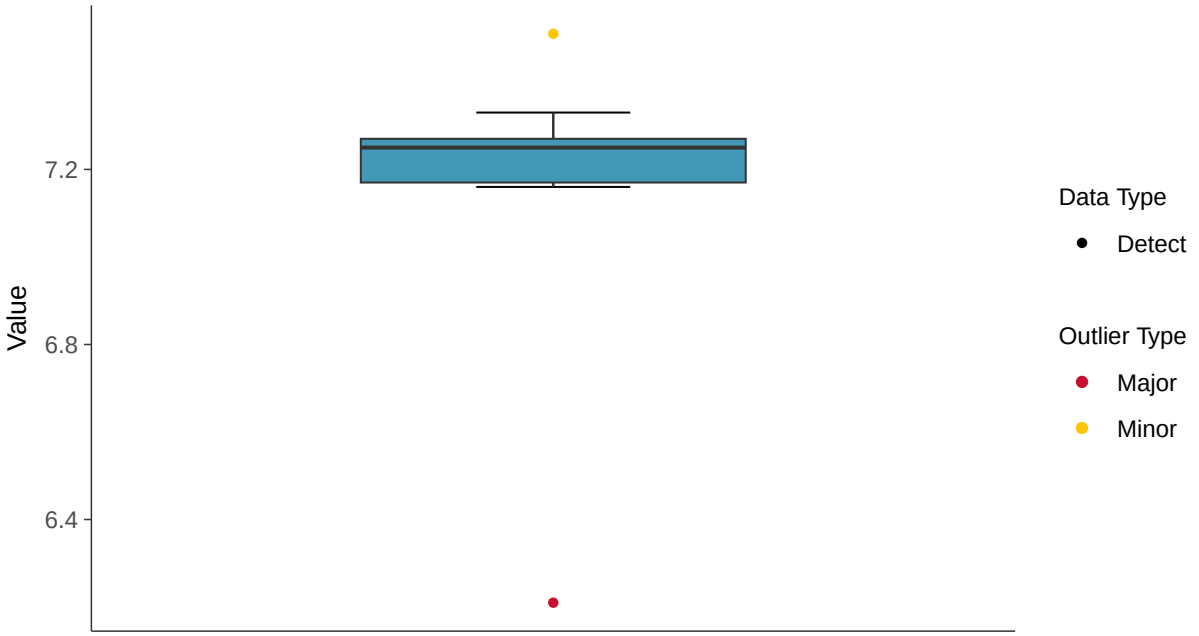
ID: 1_17_4_120





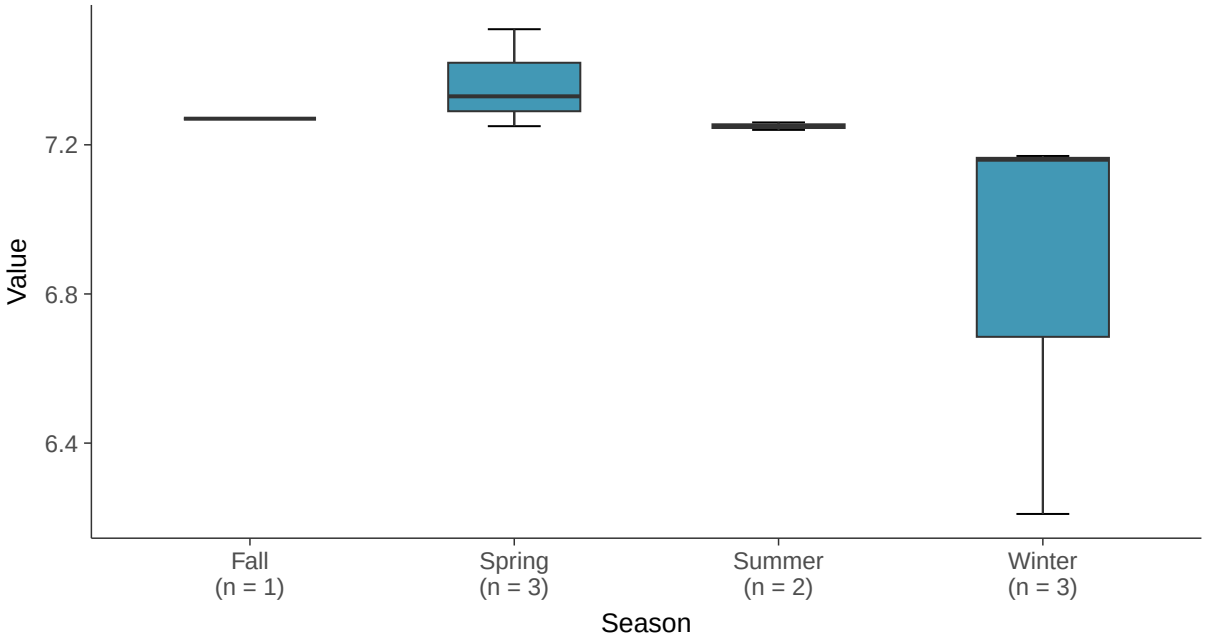
Boxplot

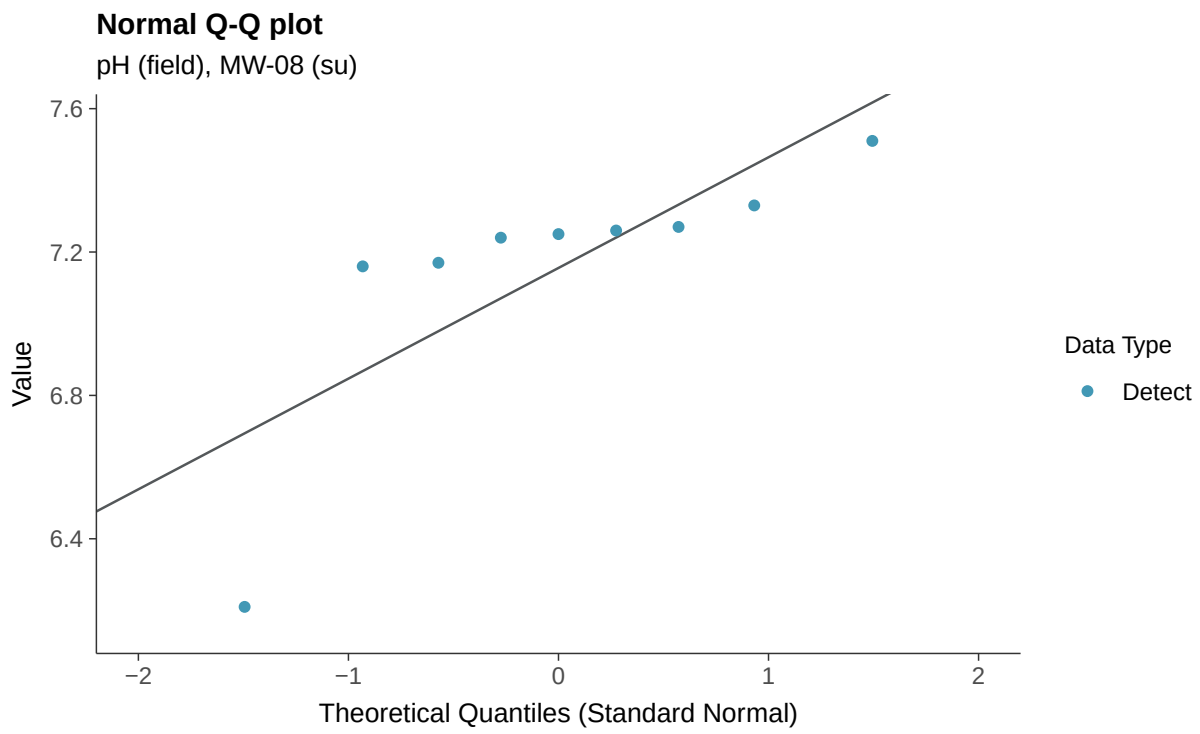
pH (field), MW-08 (su)

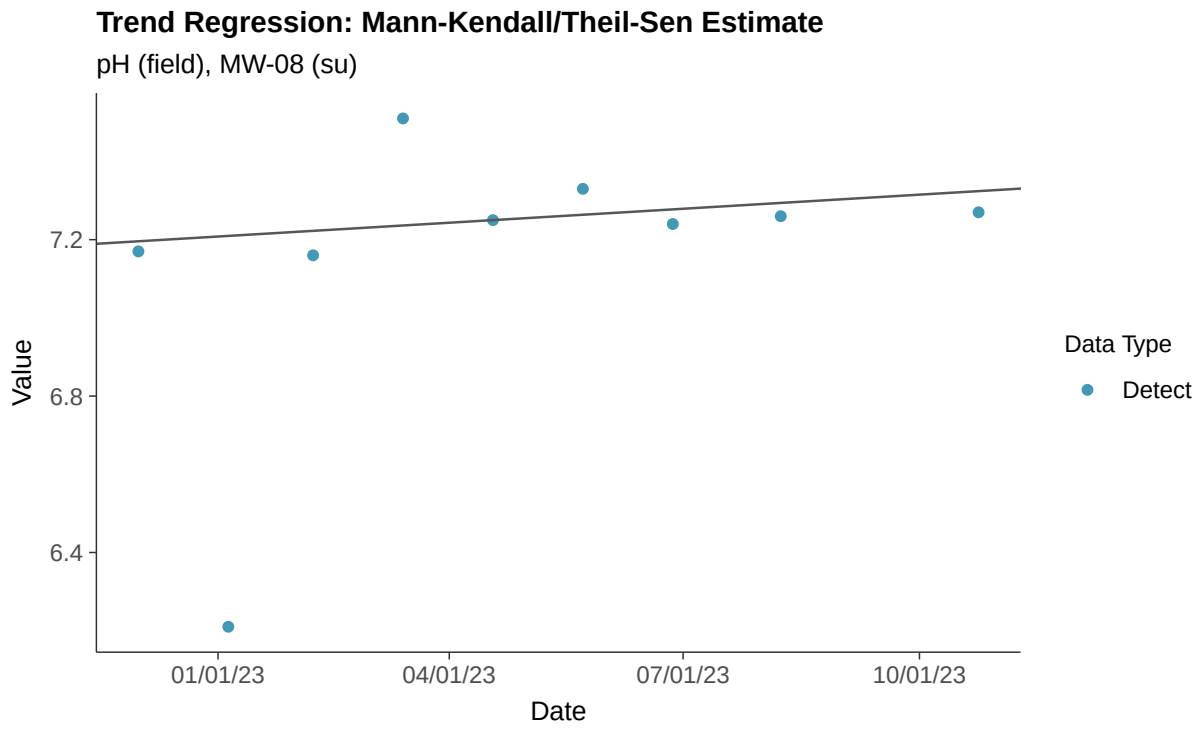


Boxplot by Season

pH (field), MW-08 (su)

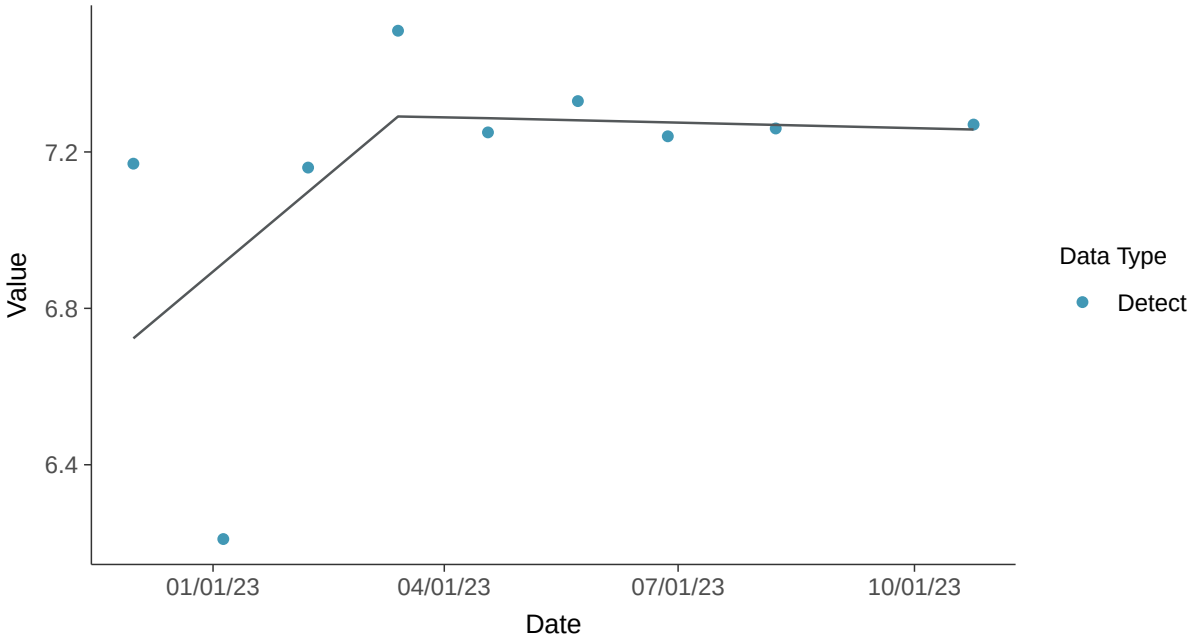



Normal Q-Q plot
pH (field), MW-08 (su)
7.6
7.2
6.8
6.4
Value
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
pH (field), MW-08 (su)
7.2
6.8
6.4
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

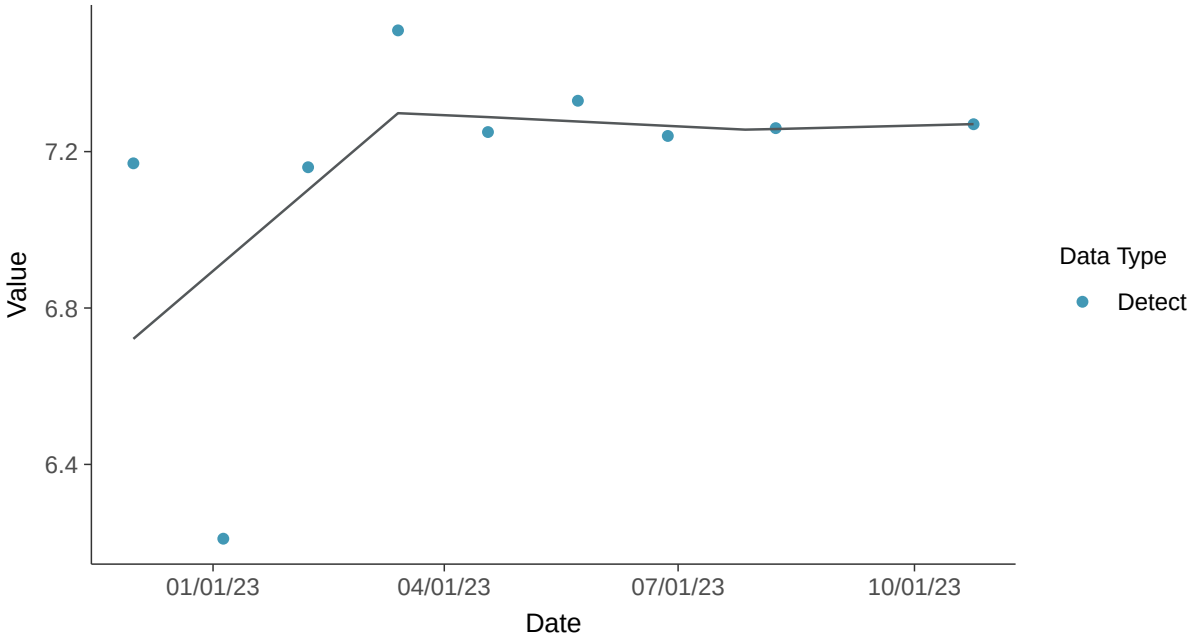
Trend Regression: Piecewise Linear-Linear

pH (field), MW-08 (su)



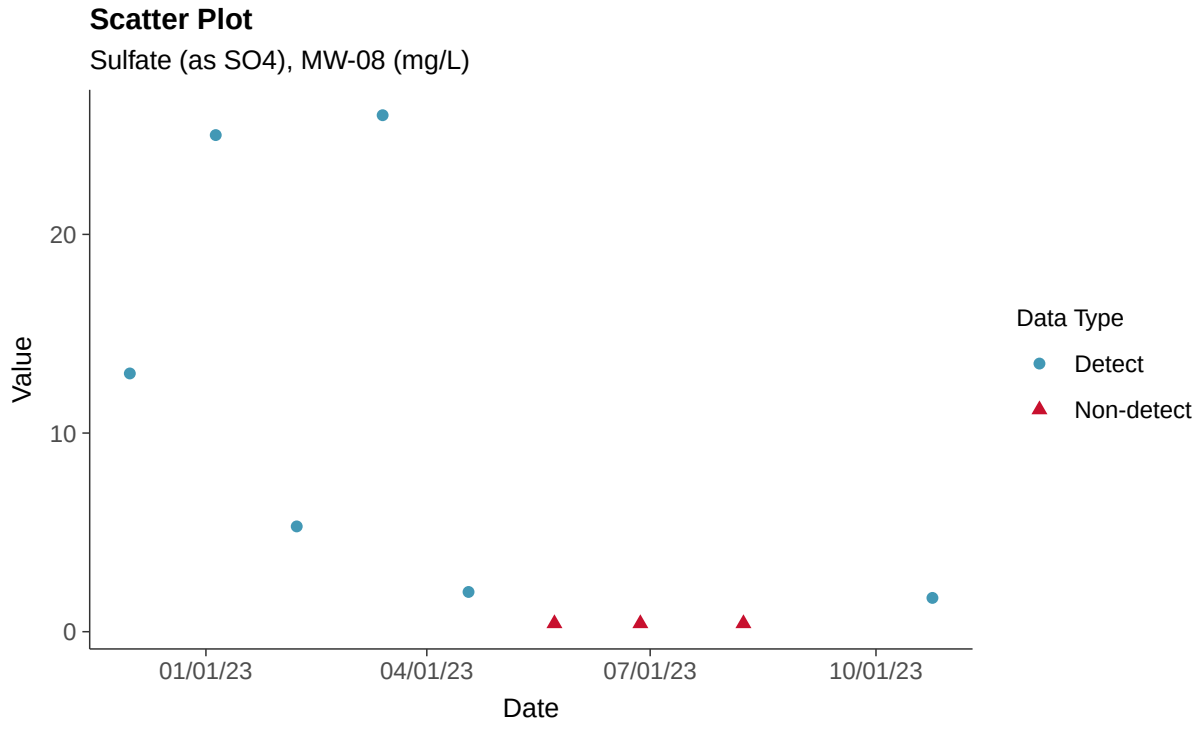
Trend Regression: Piecewise Linear-Linear-Linear

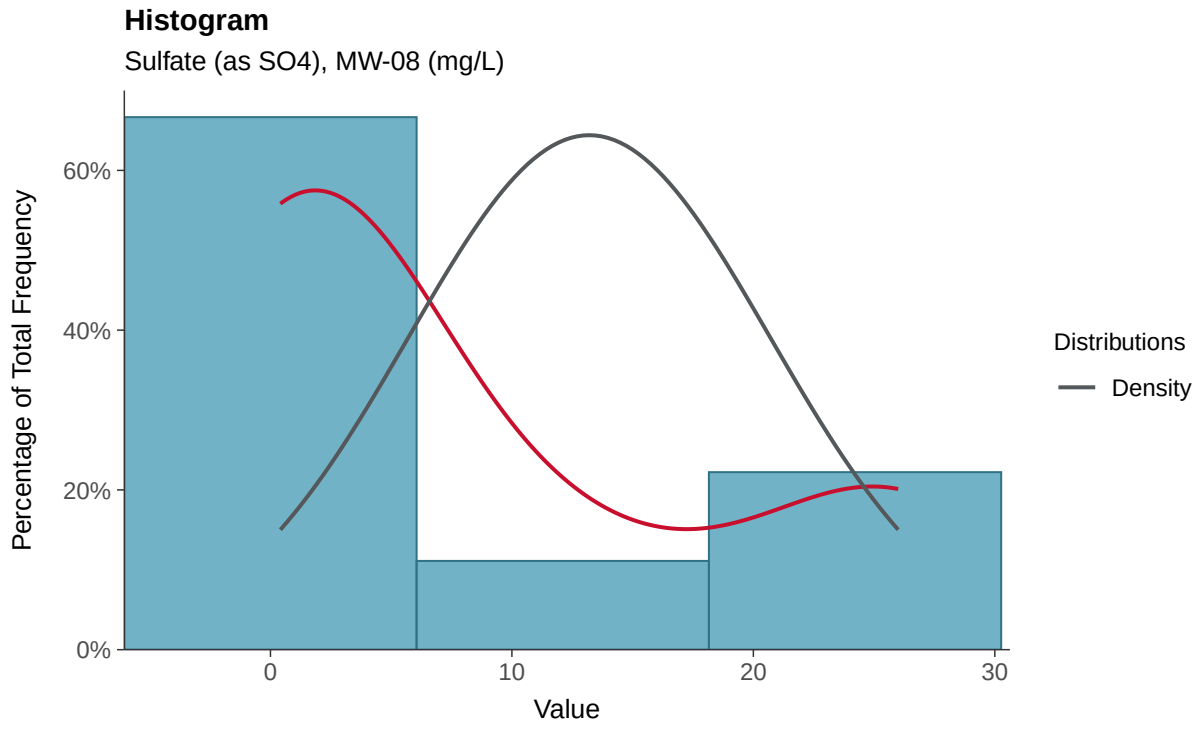
pH (field), MW-08 (su)



Appendix III: Sulfate (as SO4), MW-08

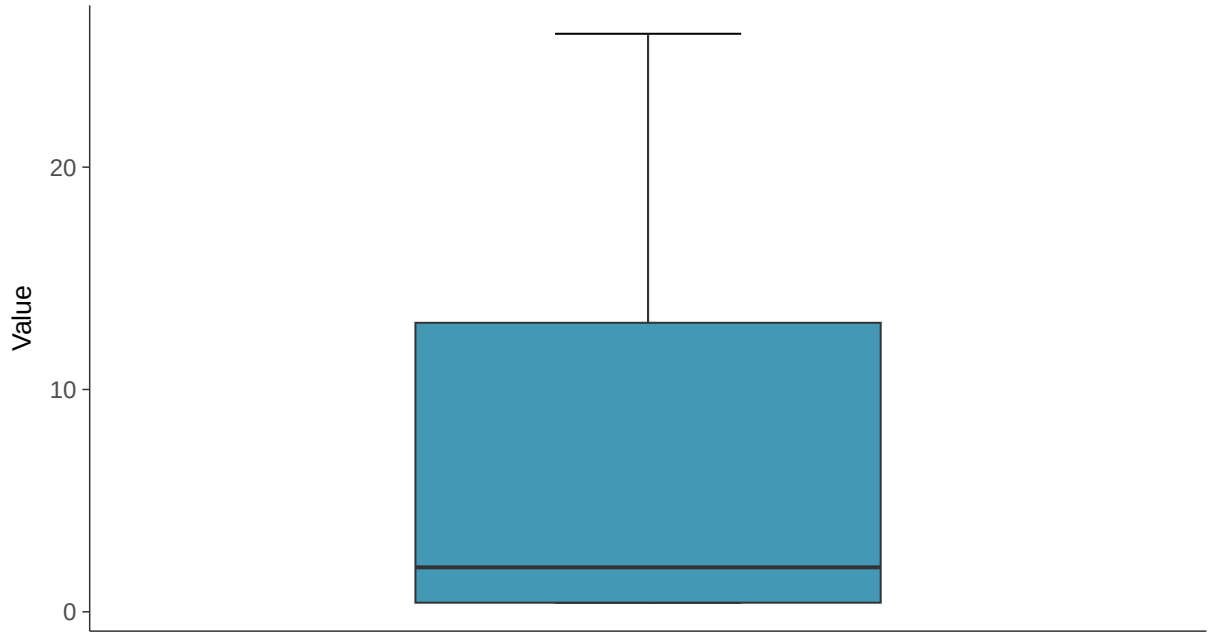
ID: 1_17_4_124





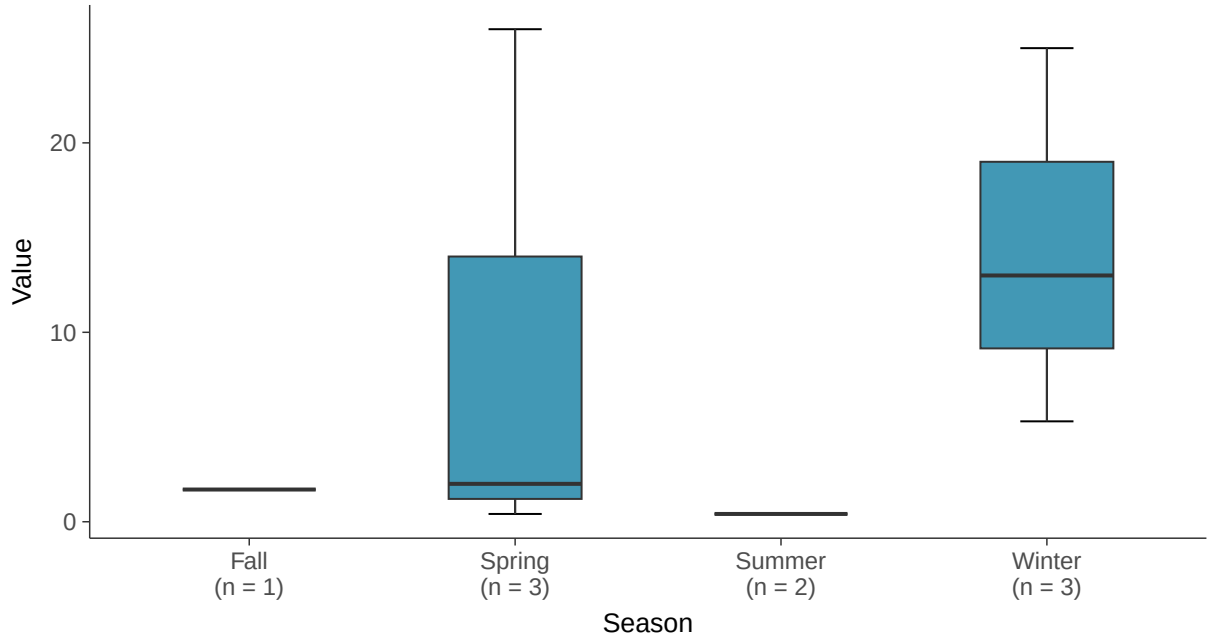
Boxplot

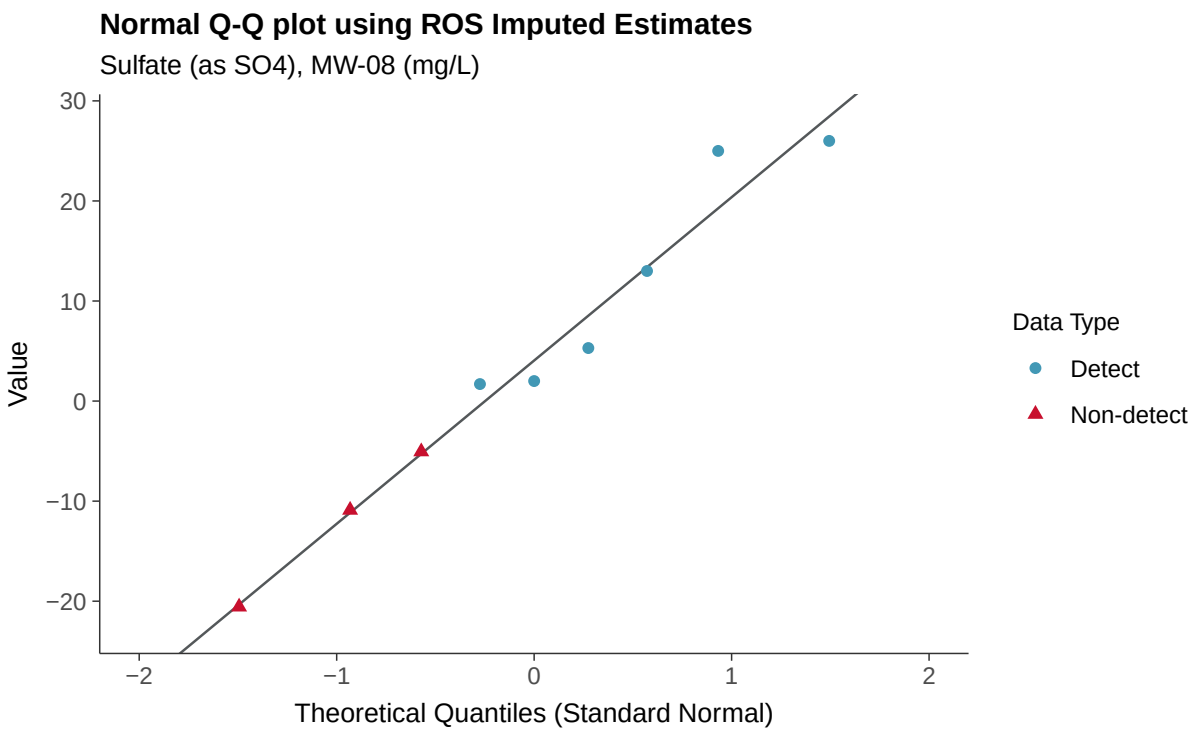
Sulfate (as SO4), MW-08 (mg/L)

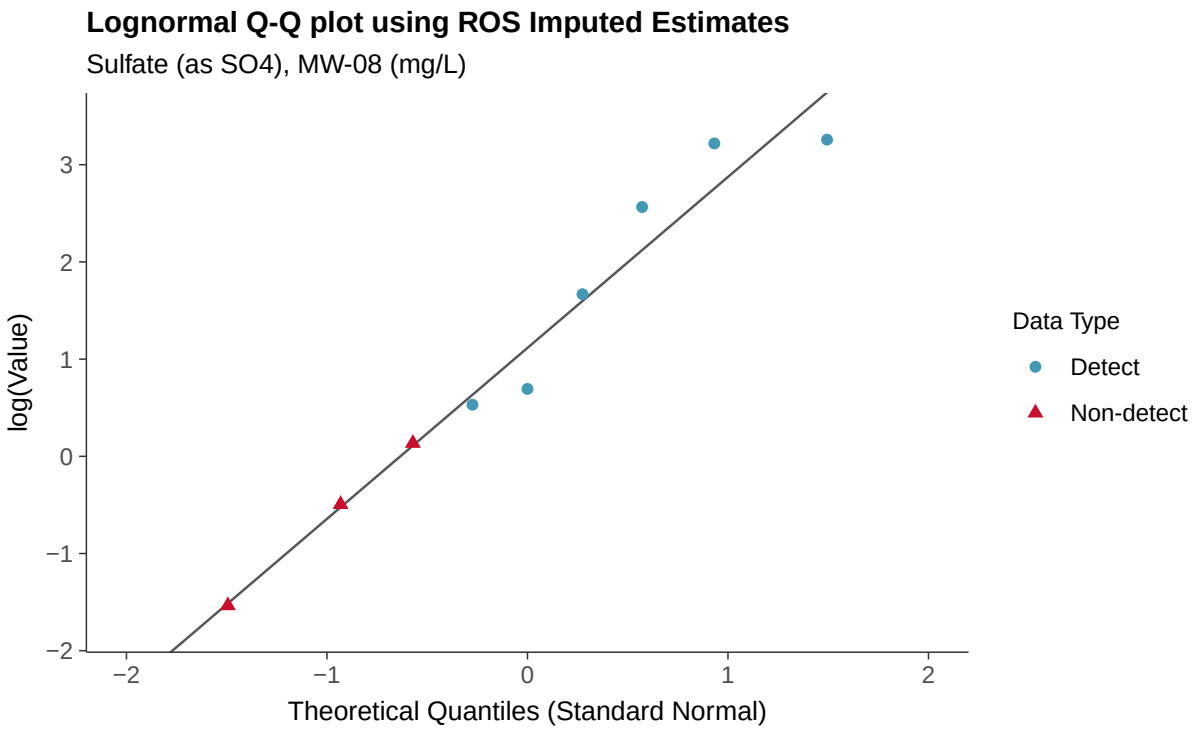


Boxplot by Season

Sulfate (as SO4), MW-08 (mg/L)

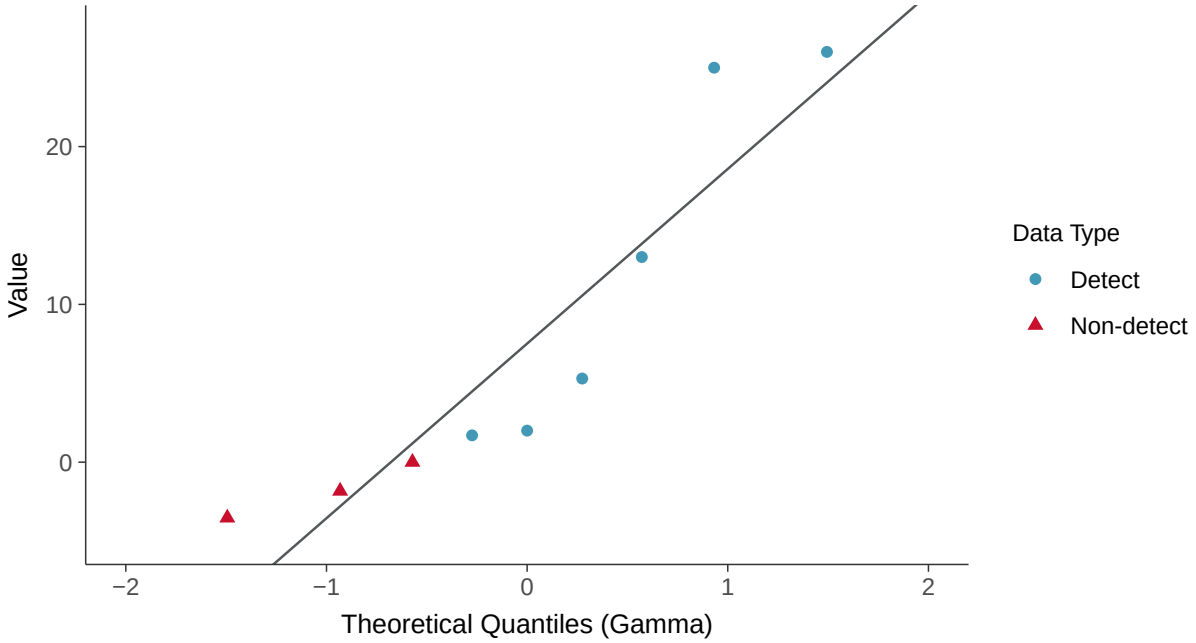



Normal Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-08 (mg/L)
Value
30
20
10
0
−10
−20
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-08 (mg/L)
log(Value)
3
2
1
0
−1
−2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

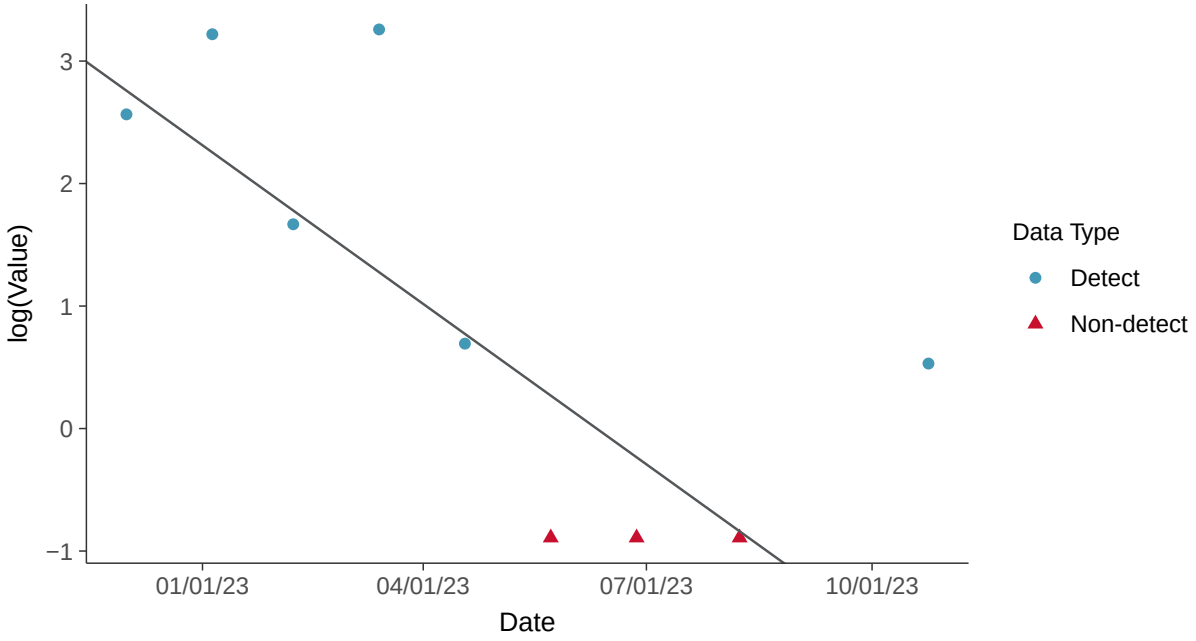
Gamma Q-Q plot using ROS Imputed Estimates

Sulfate (as SO4), MW-08 (mg/L)



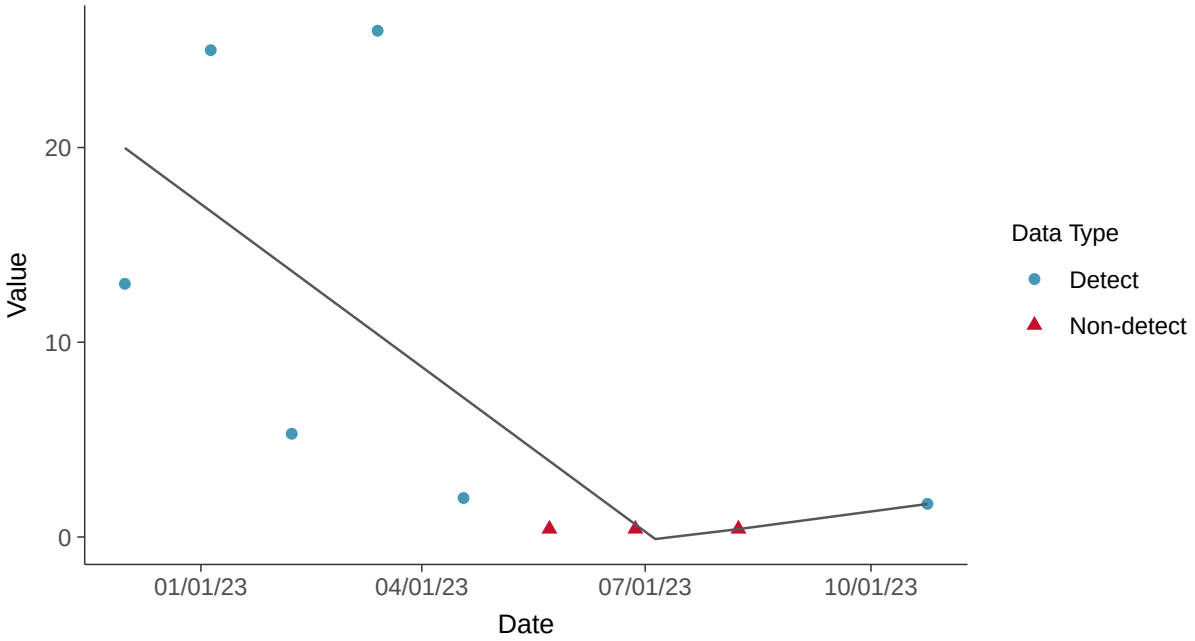
Trend Regression: Lognormal MLE

Sulfate (as SO4), MW-08 (mg/L)



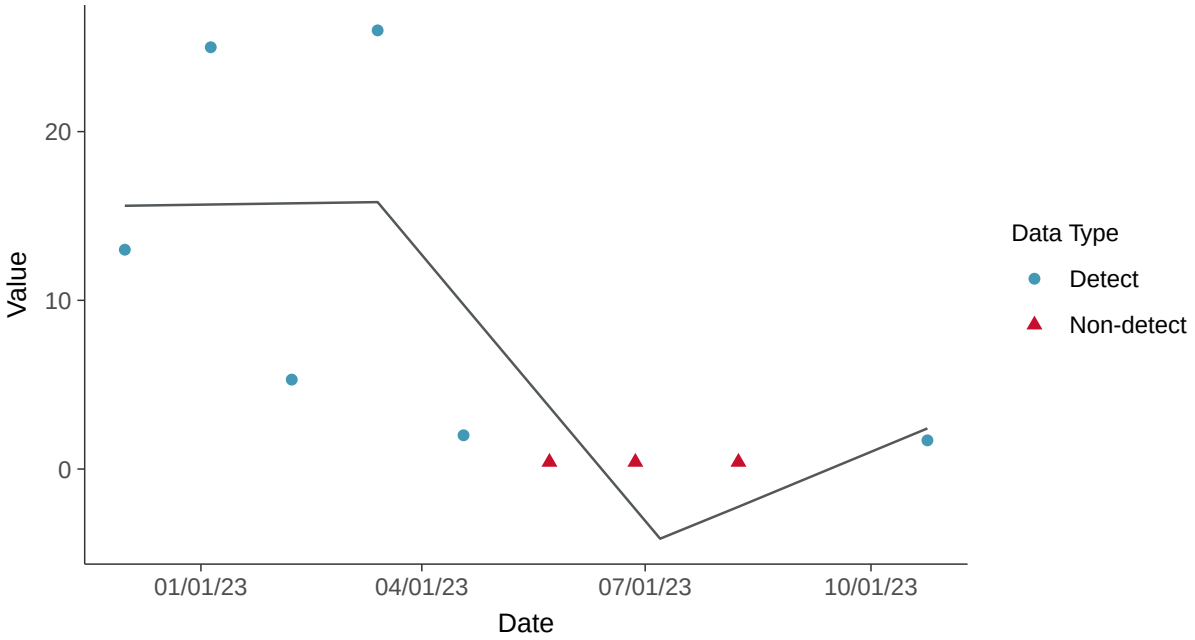
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-08 (mg/L)



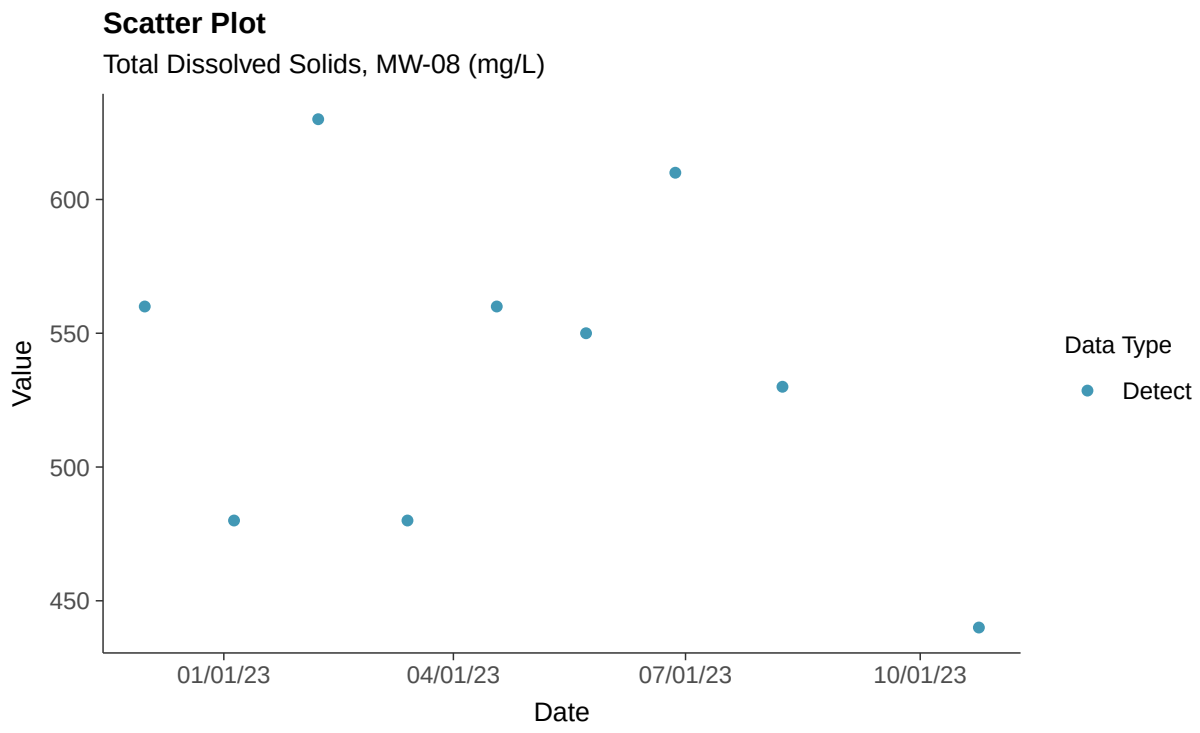
Trend Regression: Piecewise Linear-Linear-Linear

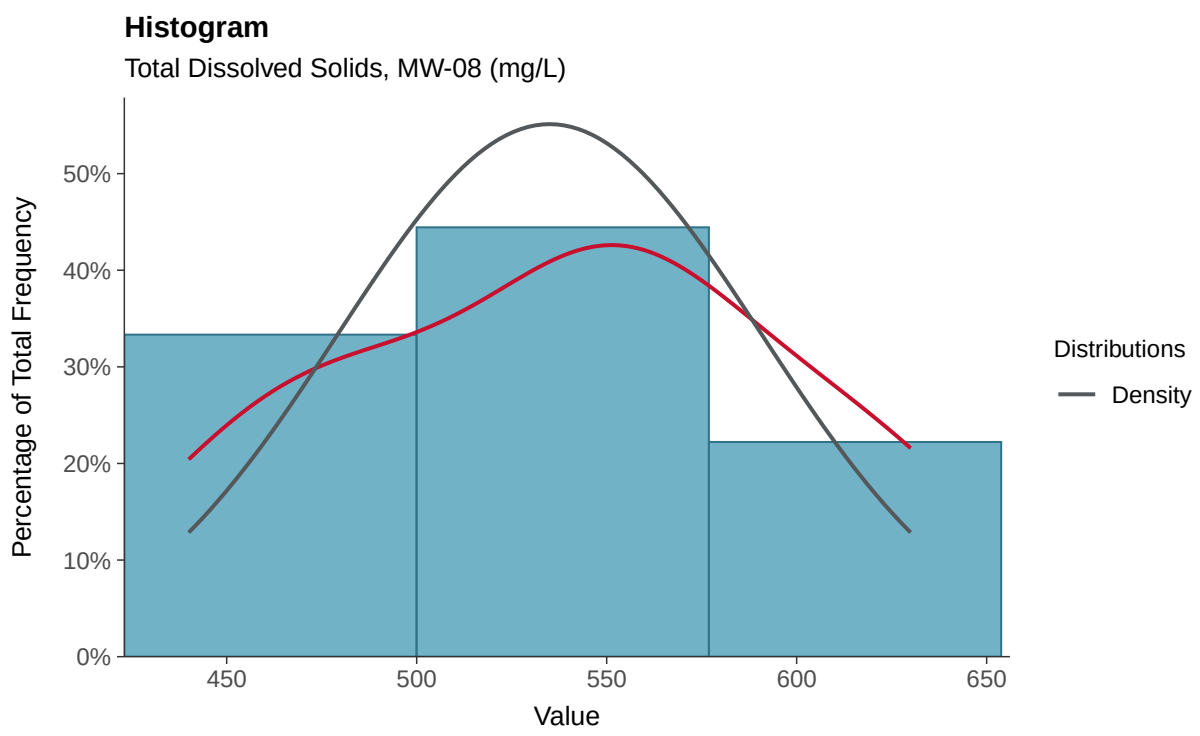
Sulfate (as SO4), MW-08 (mg/L)



Appendix III: Total Dissolved Solids, MW-08

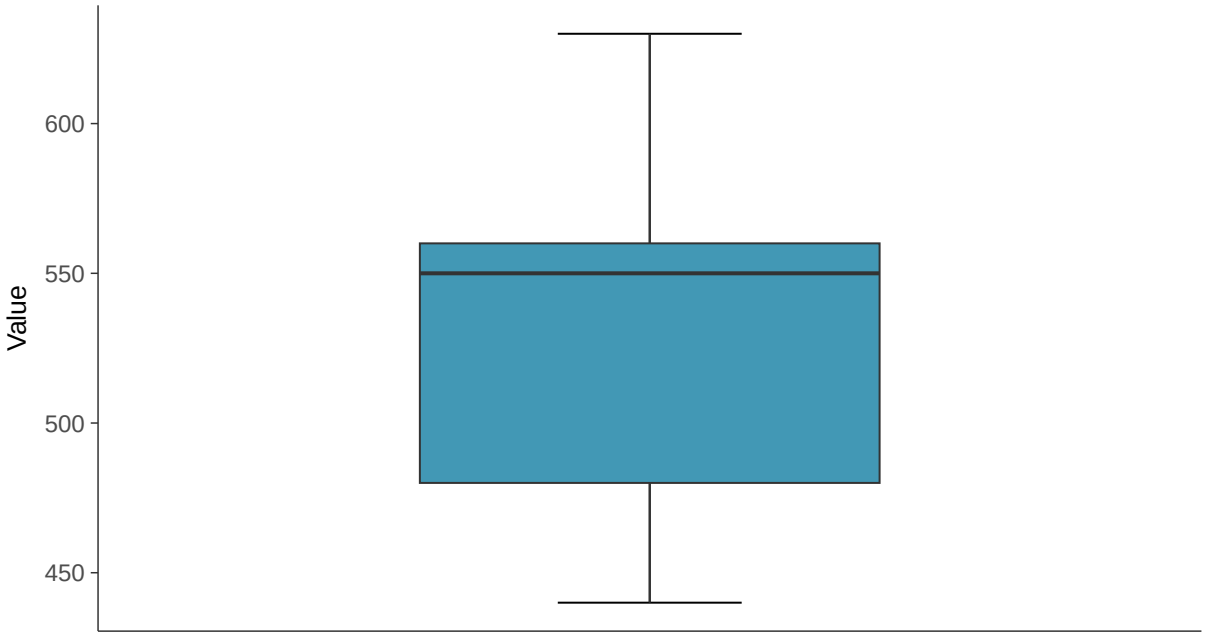
ID: 1_17_4_126





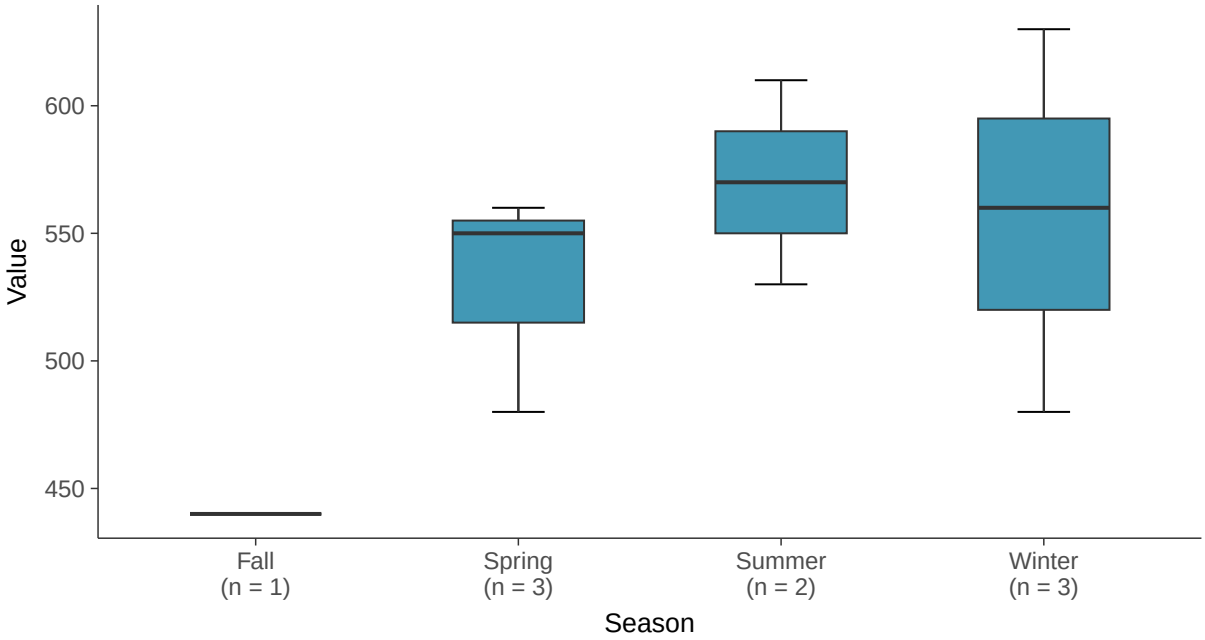
Boxplot

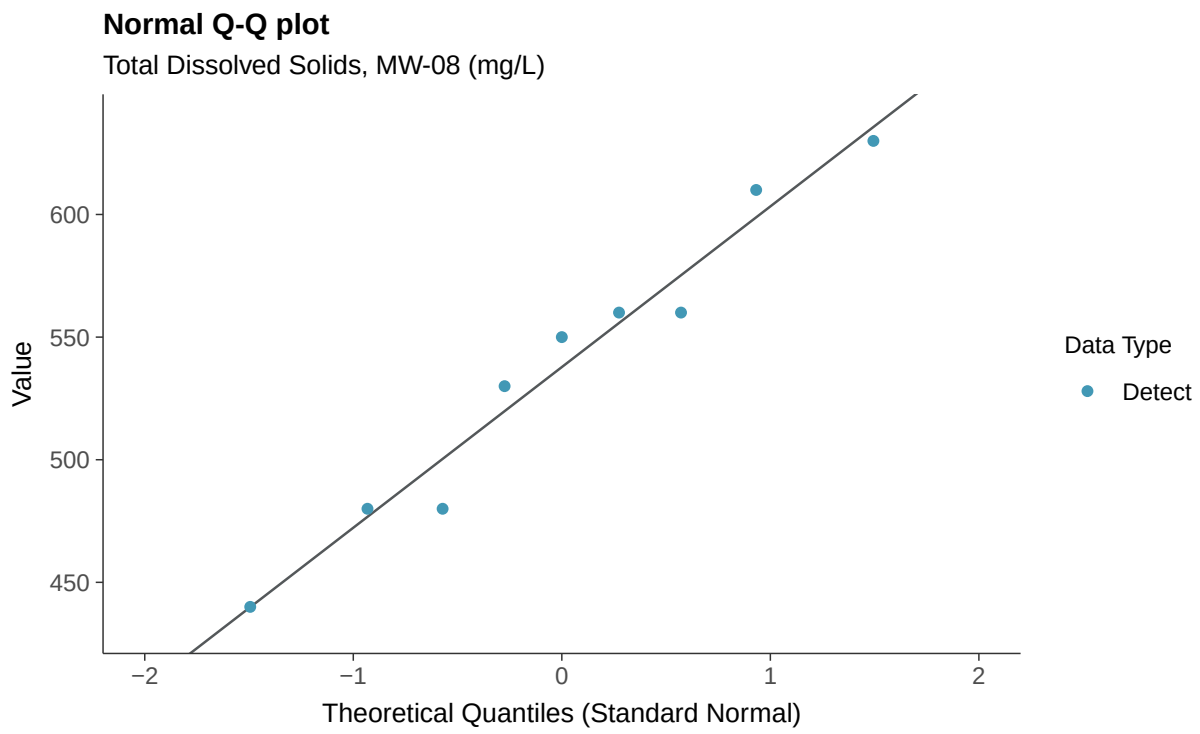
Total Dissolved Solids, MW-08 (mg/L)

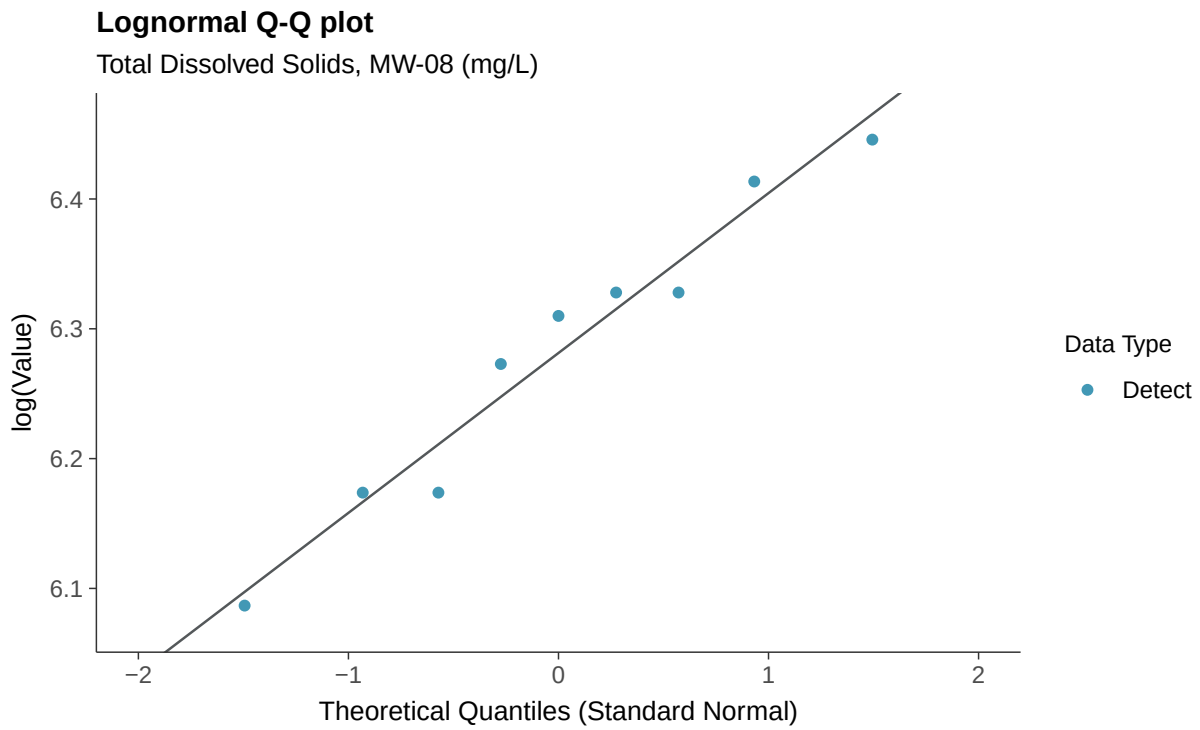


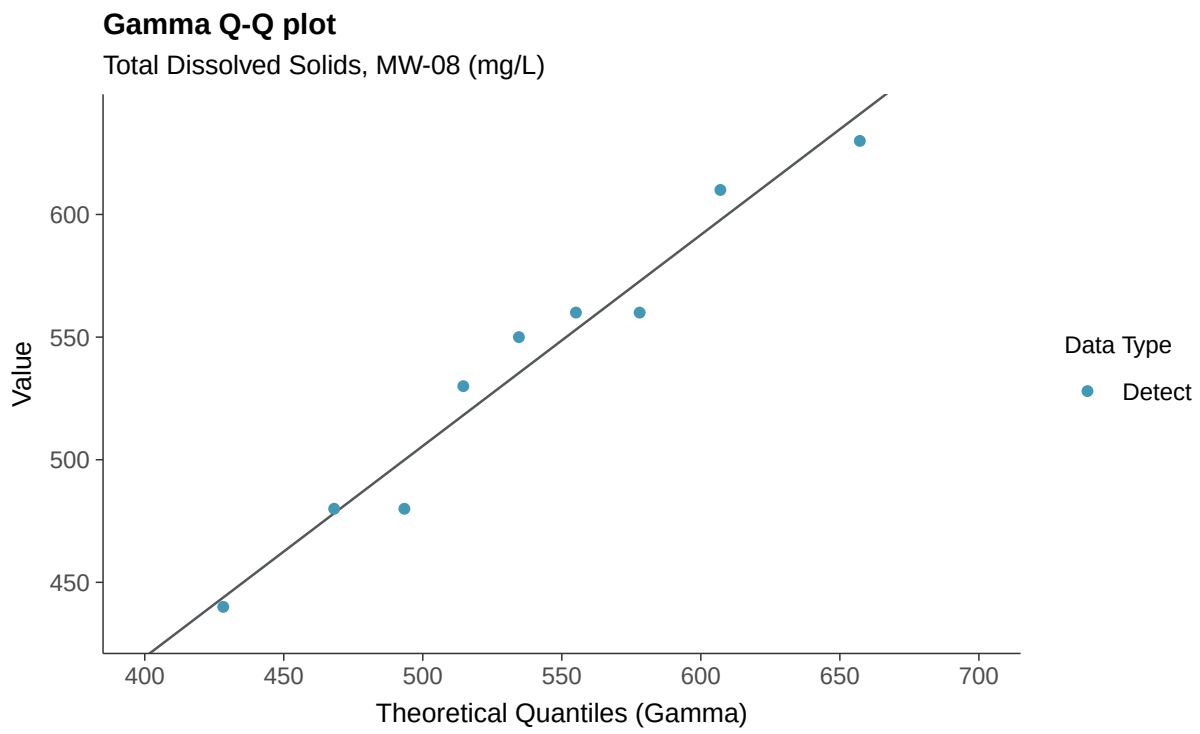
Boxplot by Season

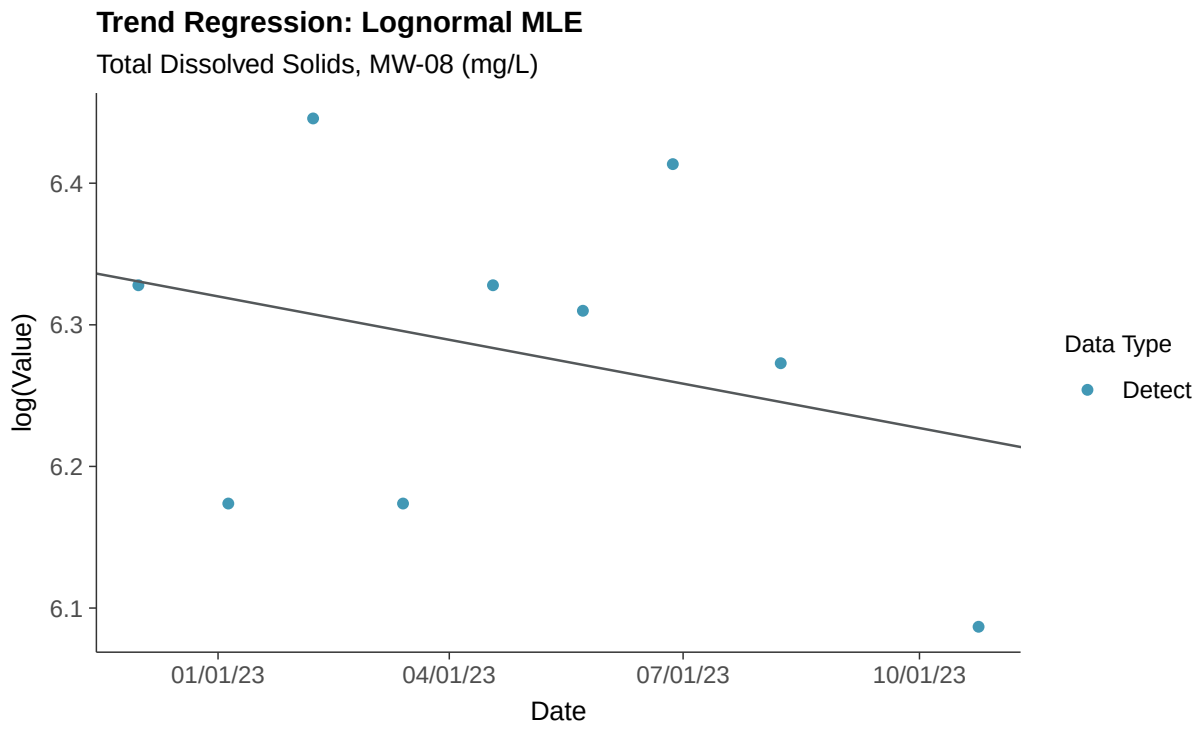
Total Dissolved Solids, MW-08 (mg/L)




Normal Q-Q plot
Total Dissolved Solids, MW-08 (mg/L)
Value
600
550
500
450
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

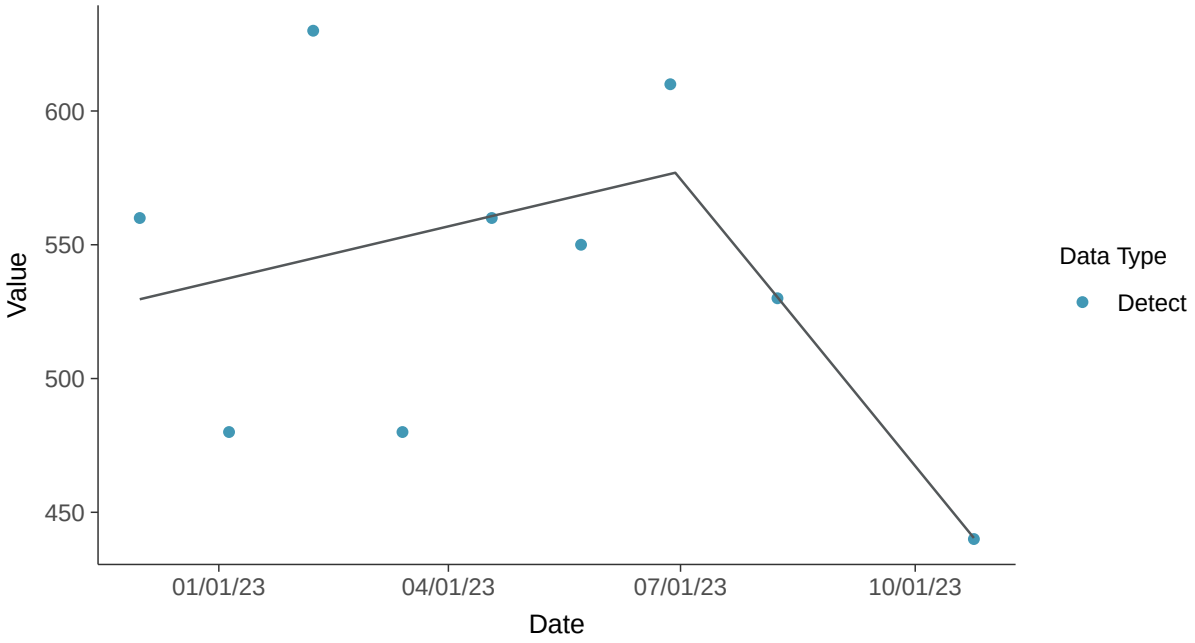

Lognormal Q-Q plot
Total Dissolved Solids, MW-08 (mg/L)
log(Value)
6.4
6.3
6.2
6.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Total Dissolved Solids, MW-08 (mg/L)
Value
600
550
500
450
400
450
500
550
600
650
700
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-08 (mg/L)
log(Value)
6.4
6.3
6.2
6.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

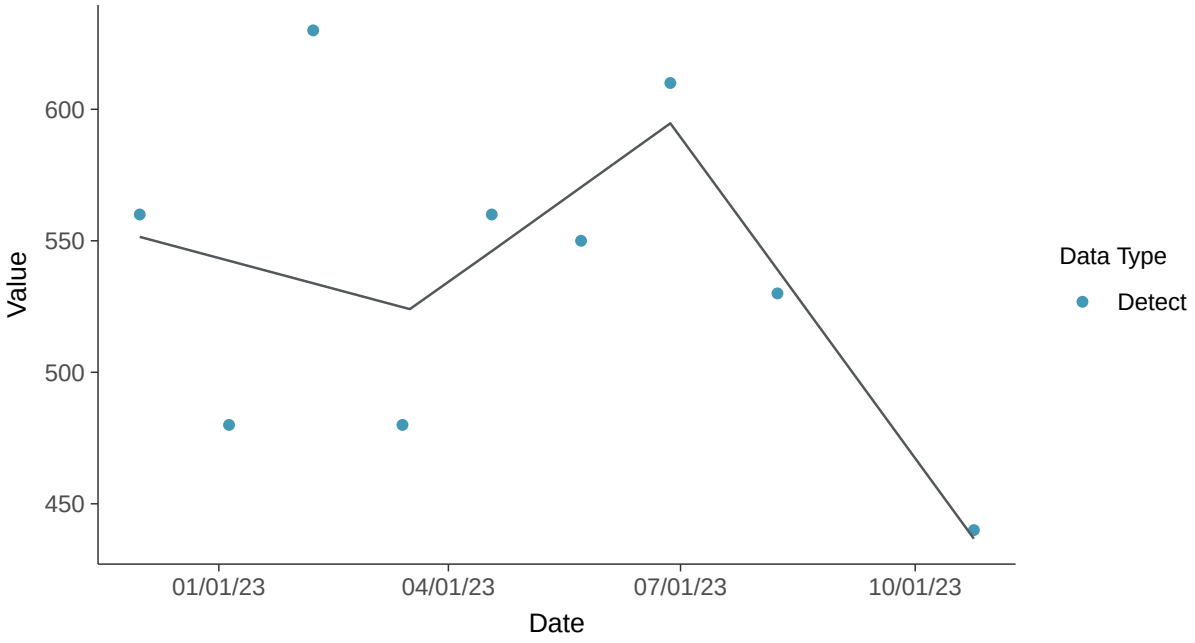
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-08 (mg/L)



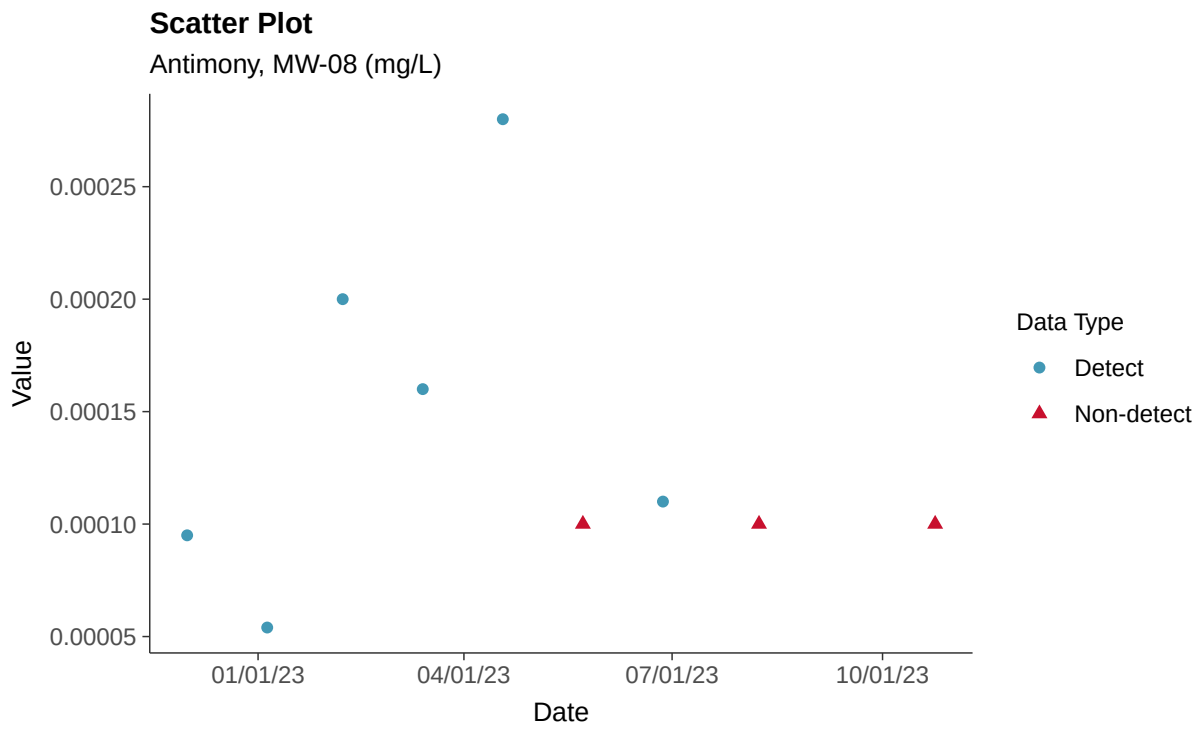
Trend Regression: Piecewise Linear-Linear-Linear

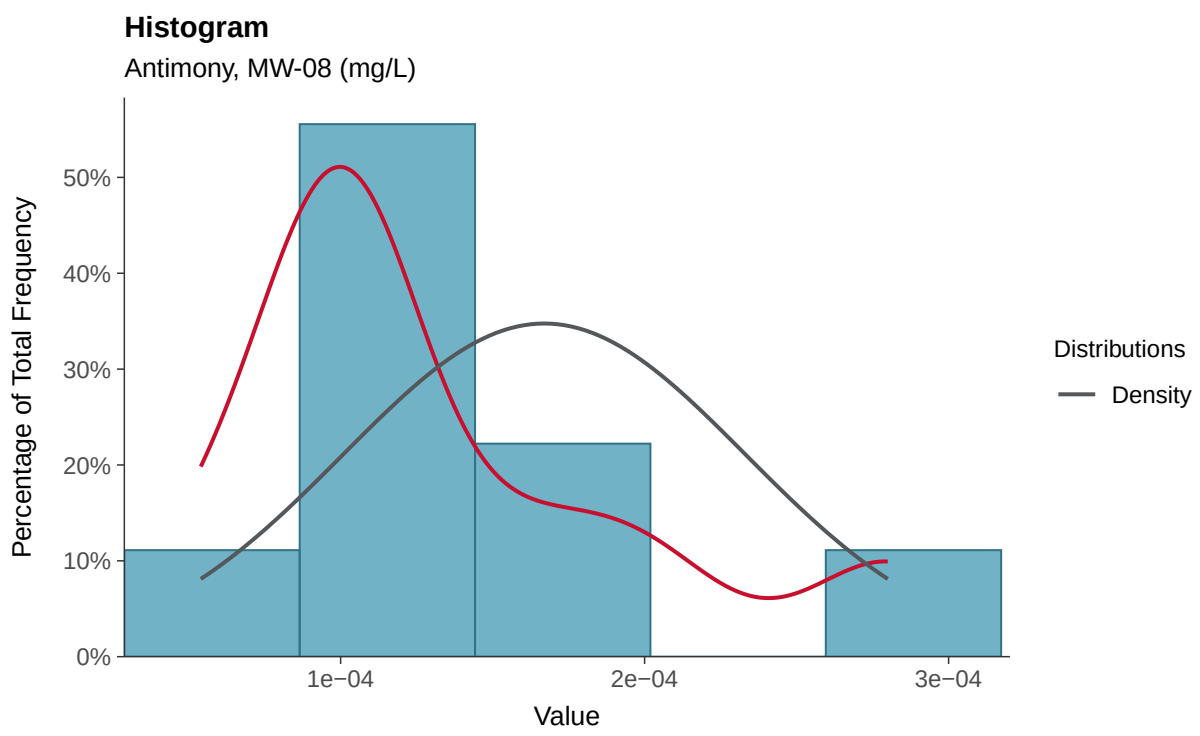
Total Dissolved Solids, MW-08 (mg/L)



Appendix IV: Antimony, MW-08

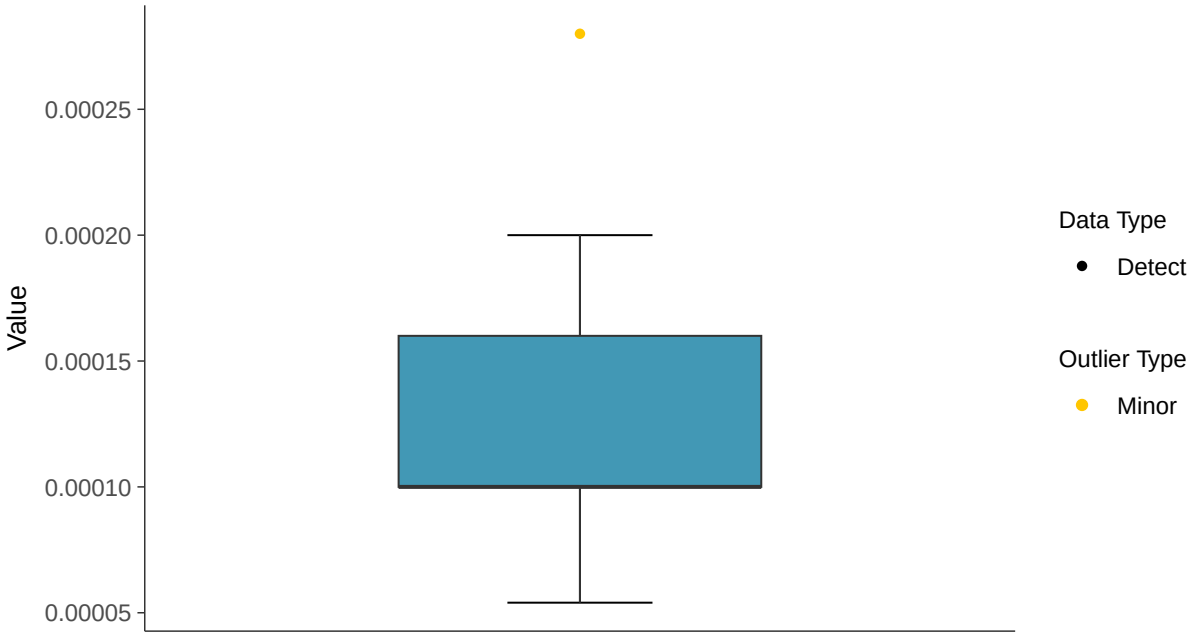
ID: 1_17_5_101





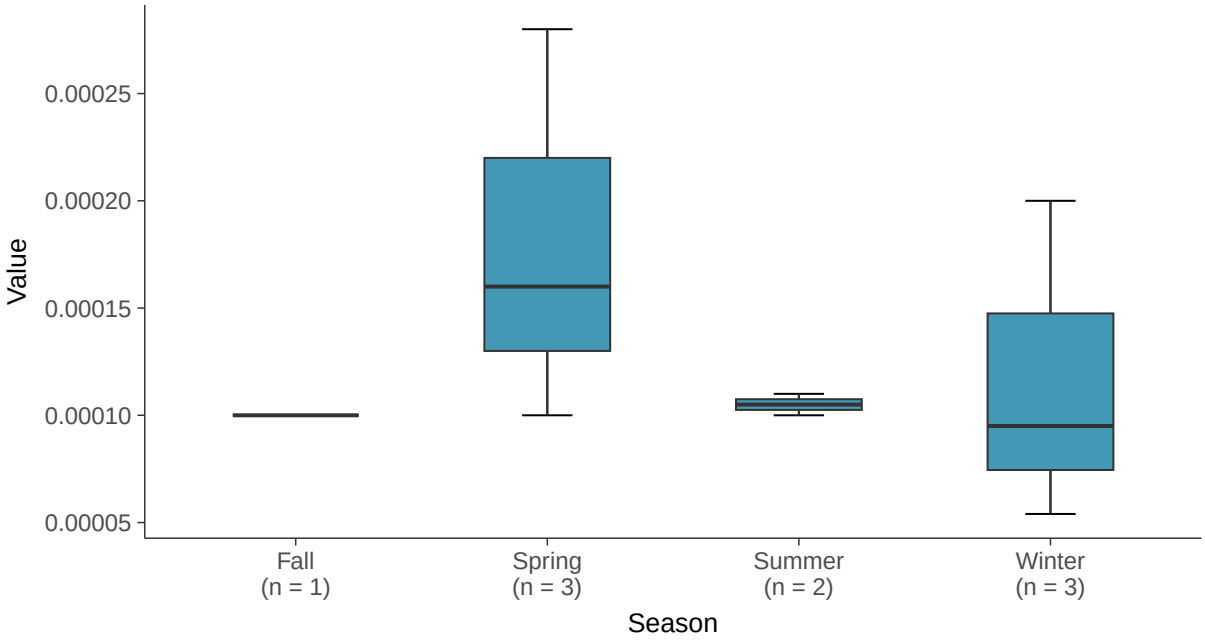
Boxplot

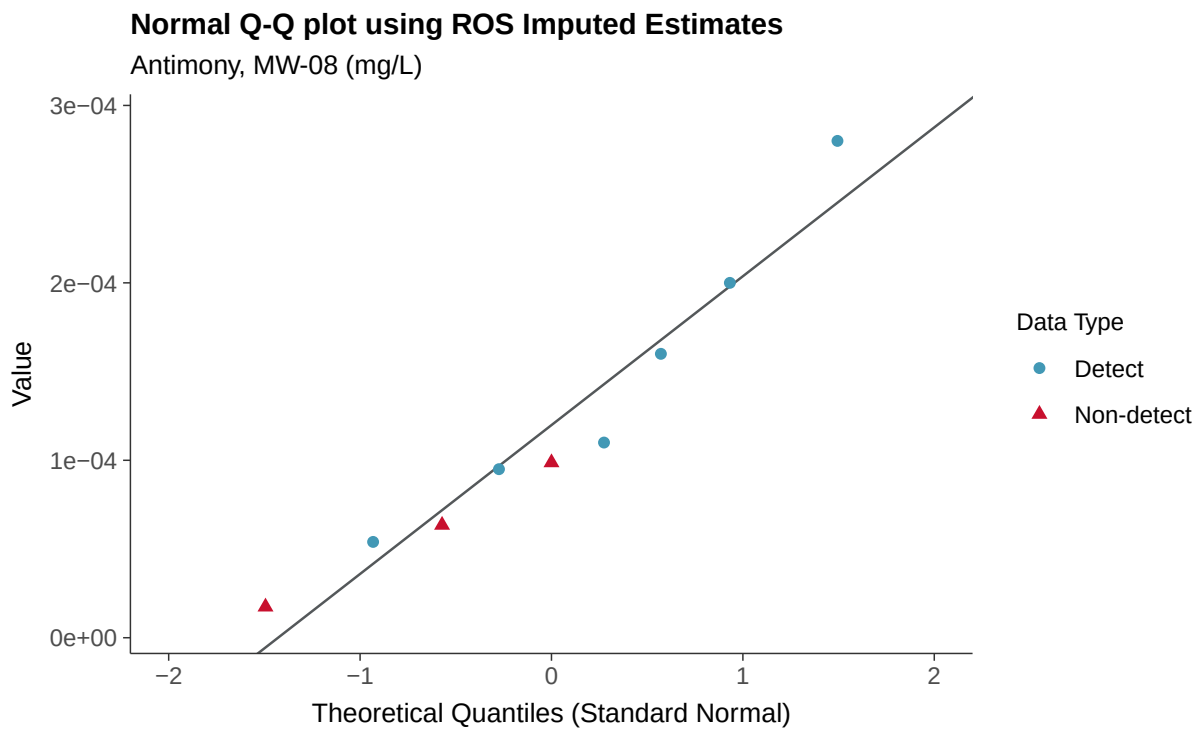
Antimony, MW-08 (mg/L)

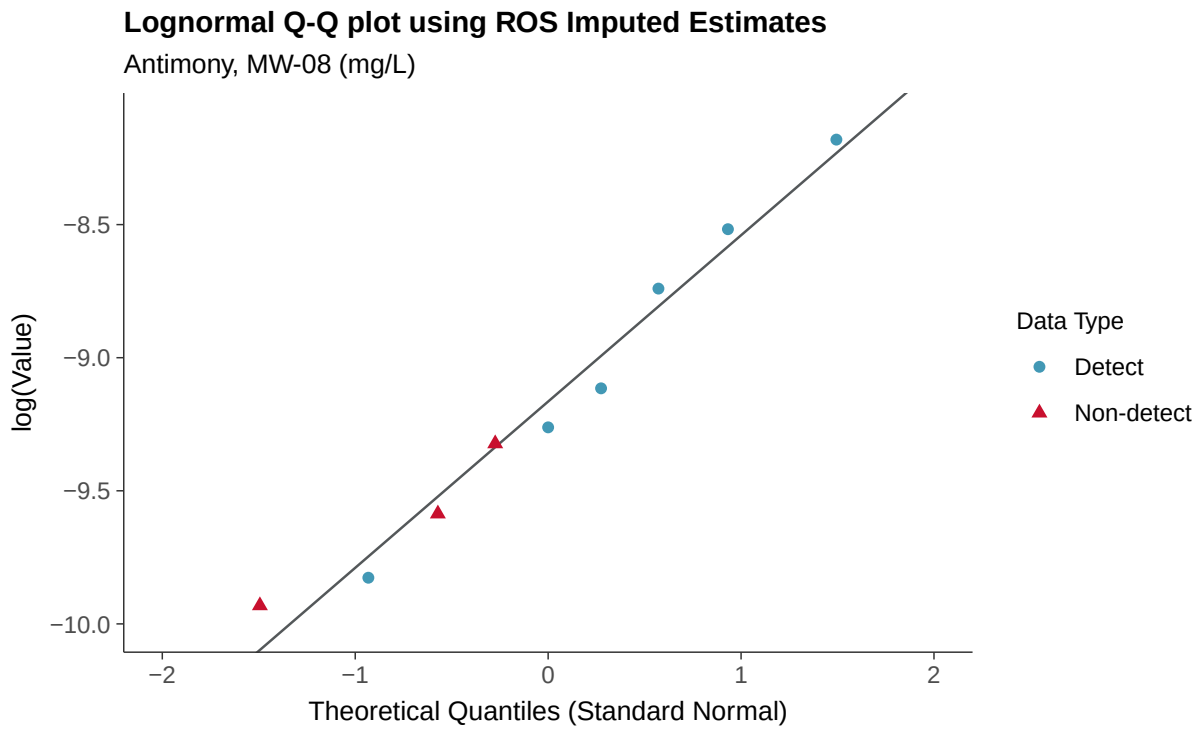


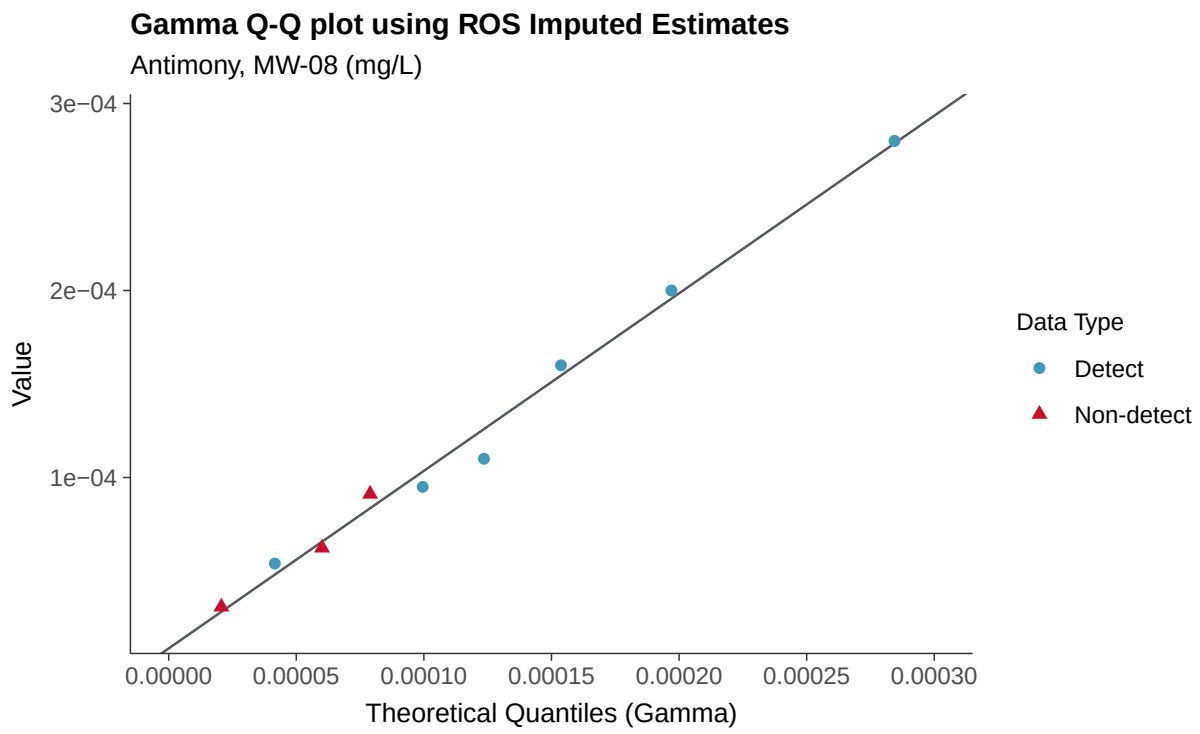
Boxplot by Season

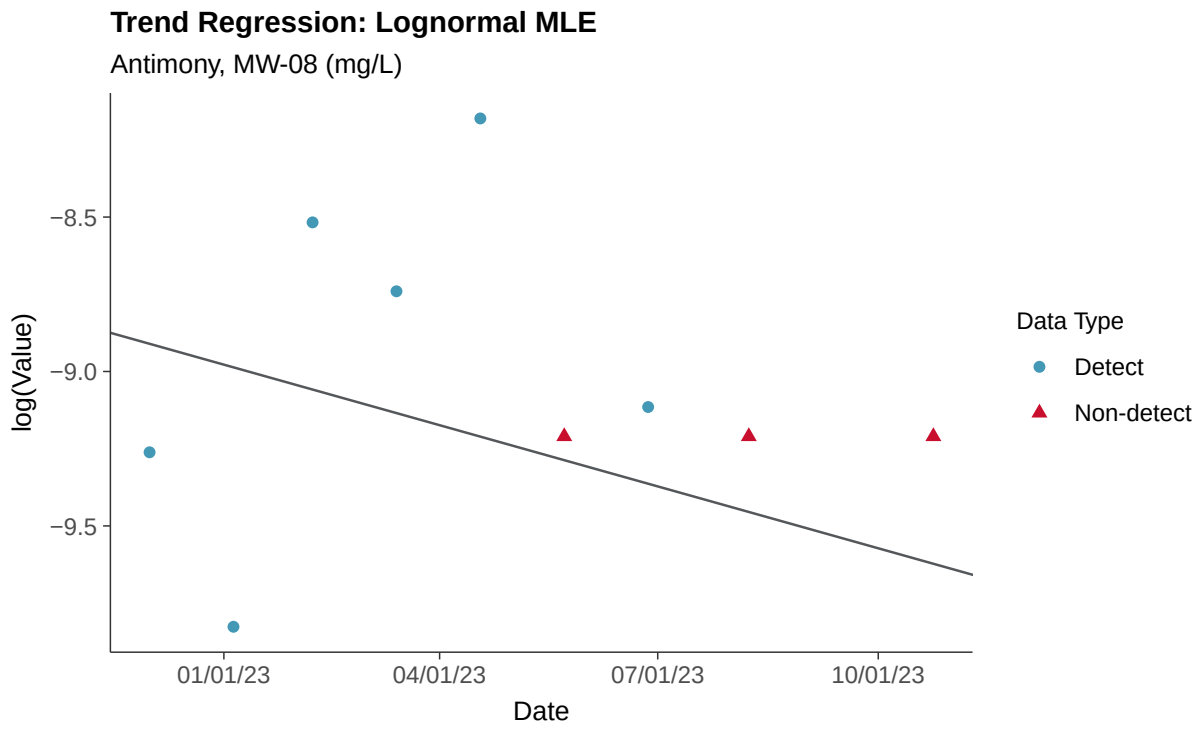
Antimony, MW-08 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-08 (mg/L)
Value
3e−04
2e−04
1e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

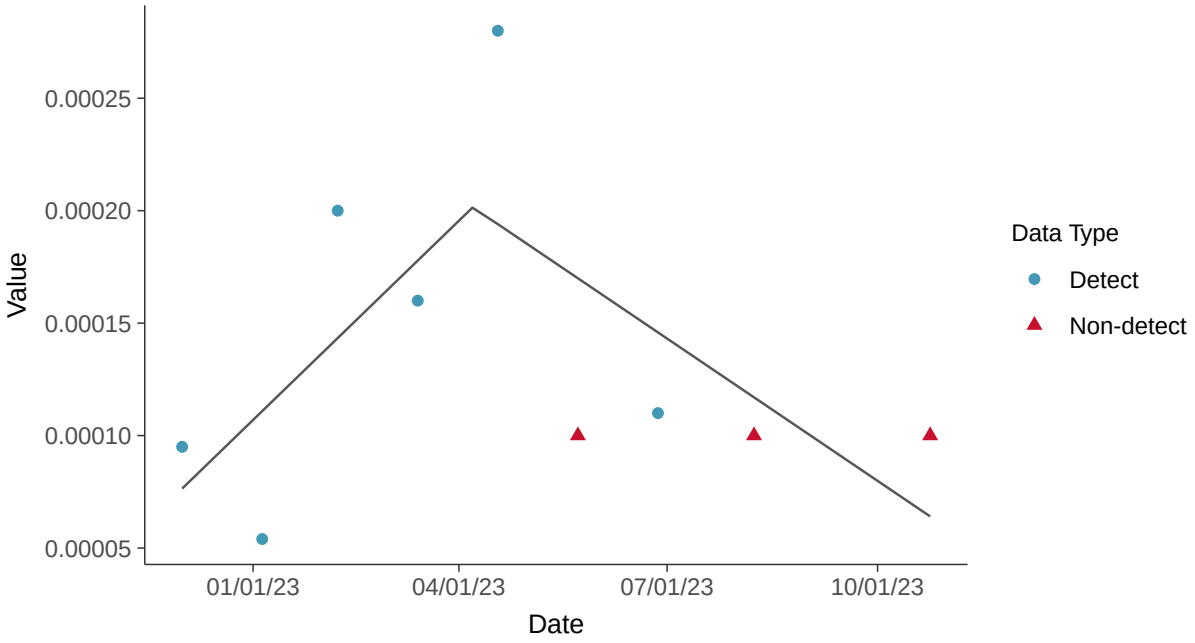

Lognormal Q-Q plot using ROS Imputed Estimates
Antimony, MW-08 (mg/L)
log(Value)
−8.5
−9.0
−9.5
−10.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Antimony, MW-08 (mg/L)
3e−04
2e−04
1e−04
Value
0.00000
0.00005
0.00010
0.00015
0.00020
0.00025
0.00030
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Antimony, MW-08 (mg/L)
−8.5
−9.0
−9.5
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

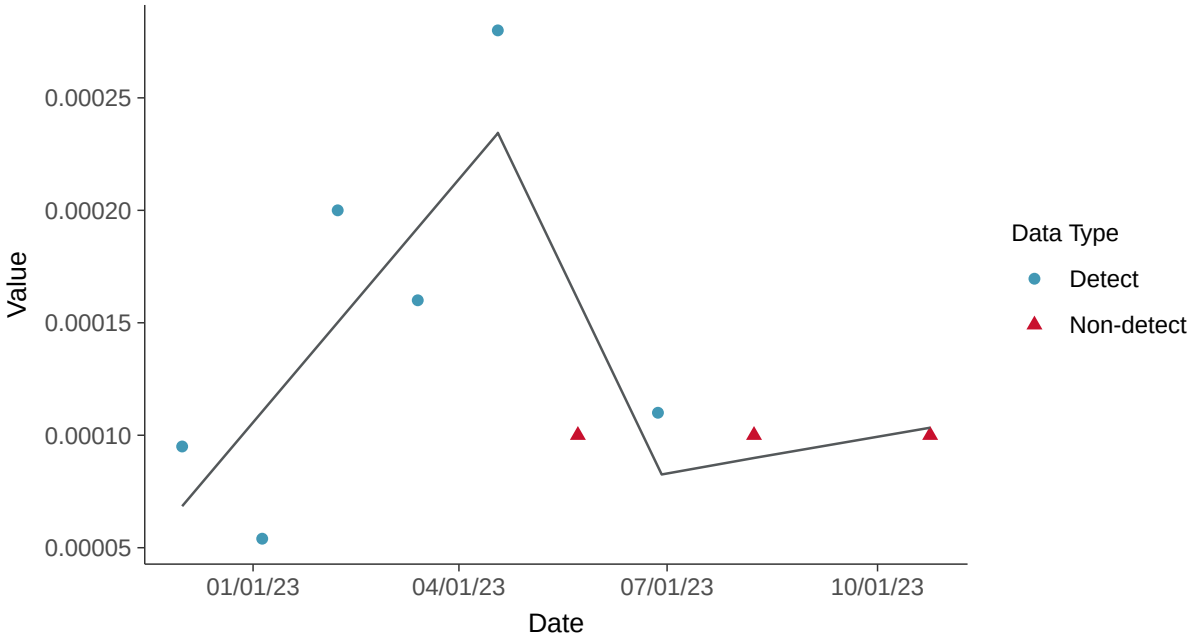
Trend Regression: Piecewise Linear-Linear

Antimony, MW-08 (mg/L)



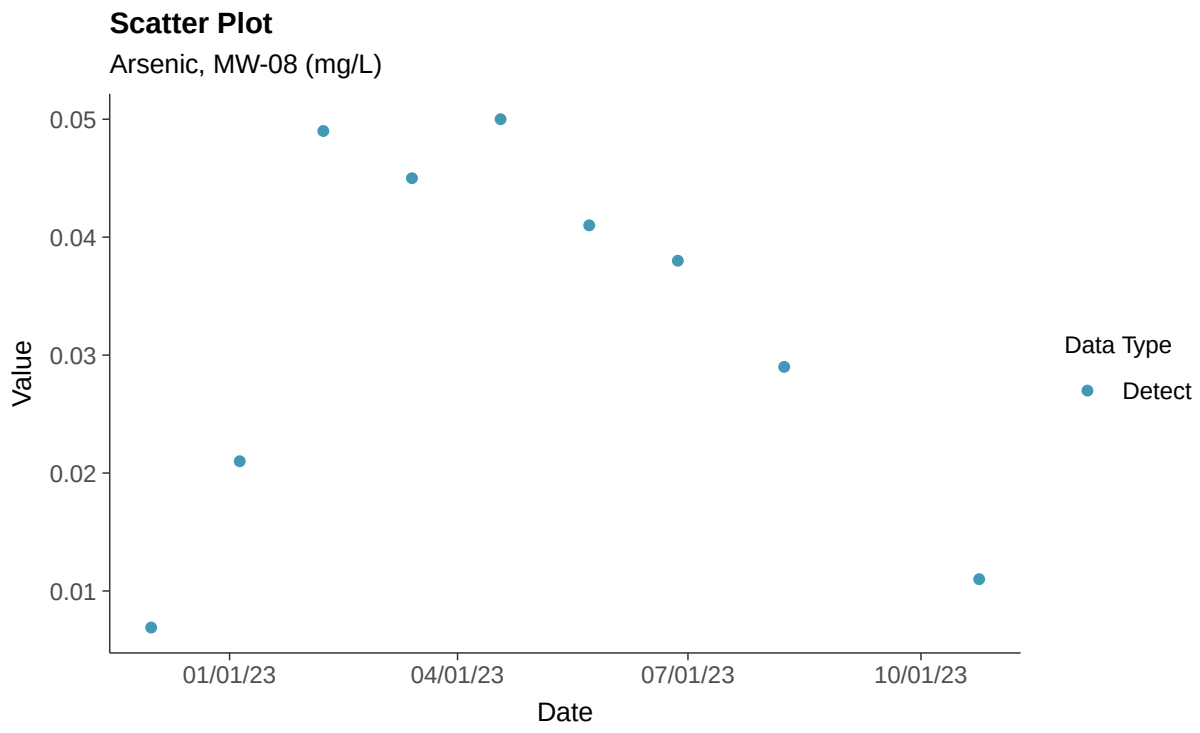
Trend Regression: Piecewise Linear-Linear-Linear

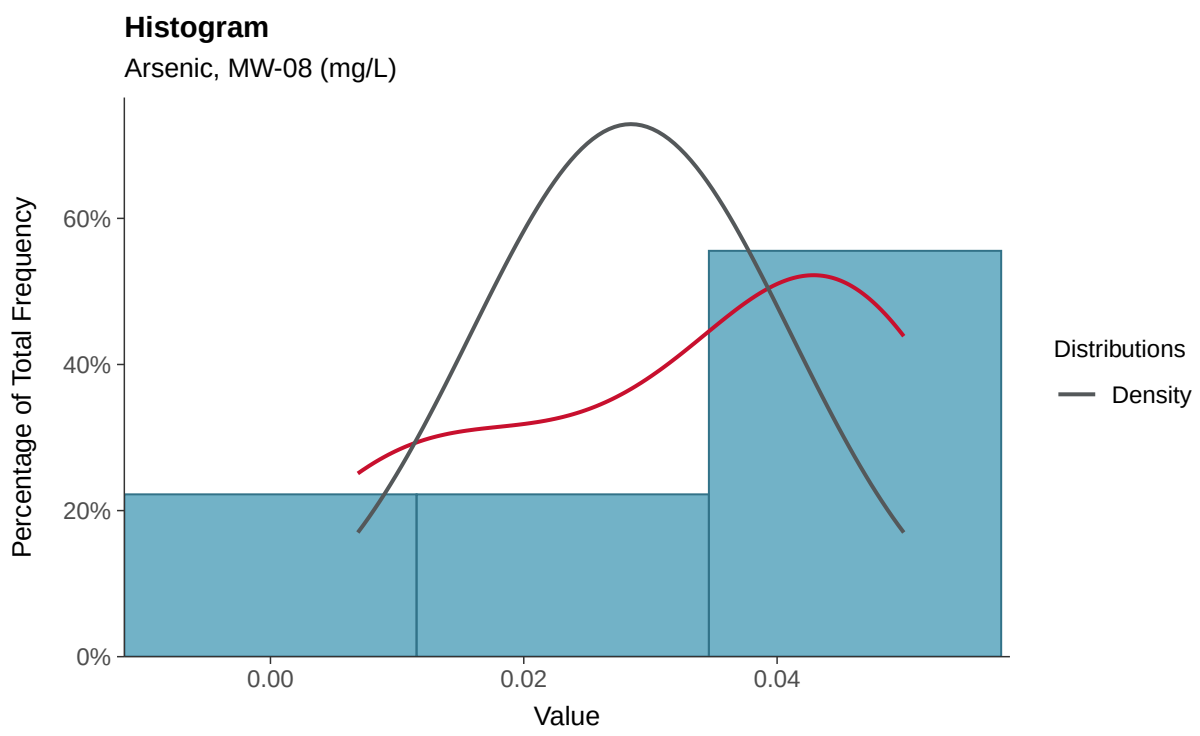
Antimony, MW-08 (mg/L)



Appendix IV: Arsenic, MW-08

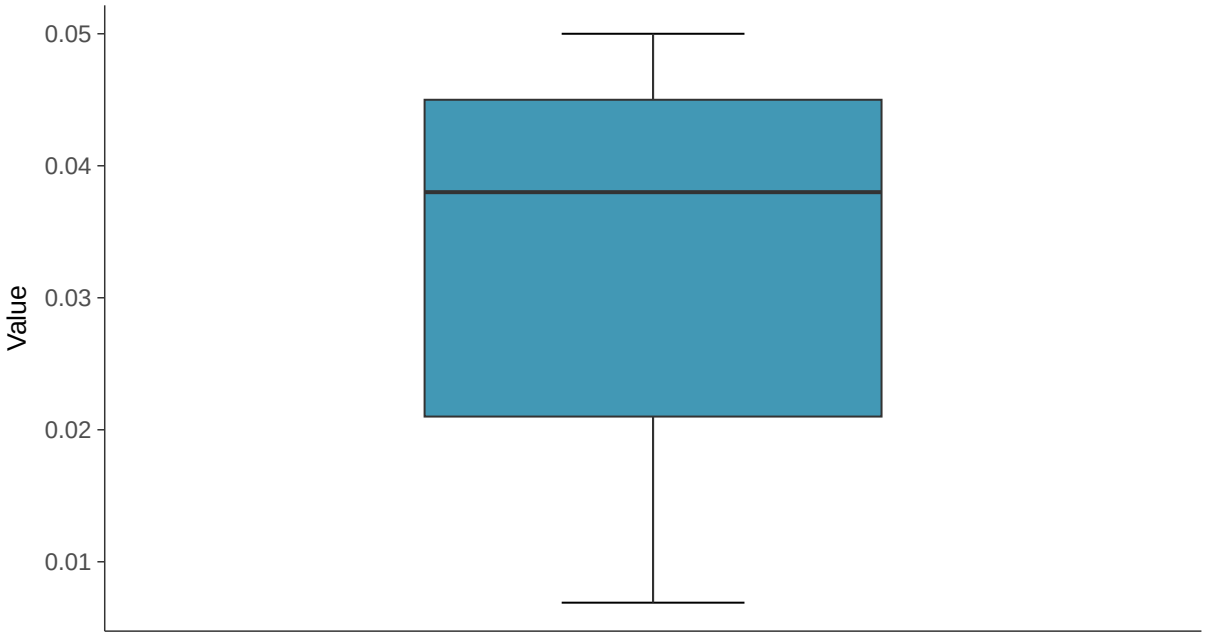
ID: 1_17_5_102





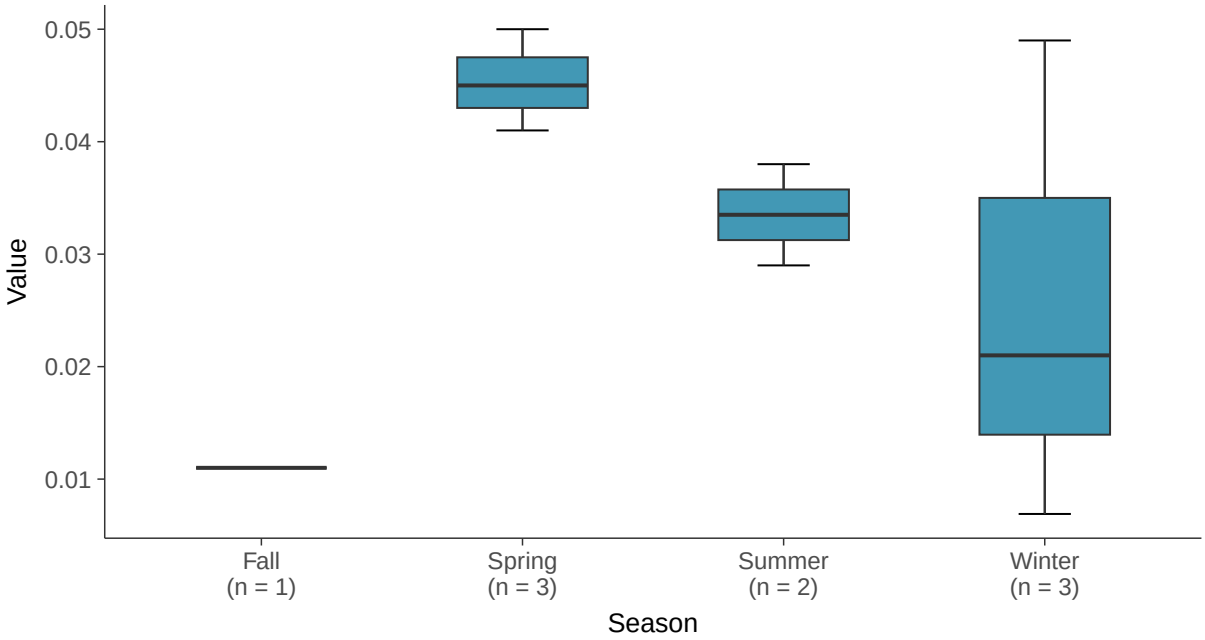
Boxplot

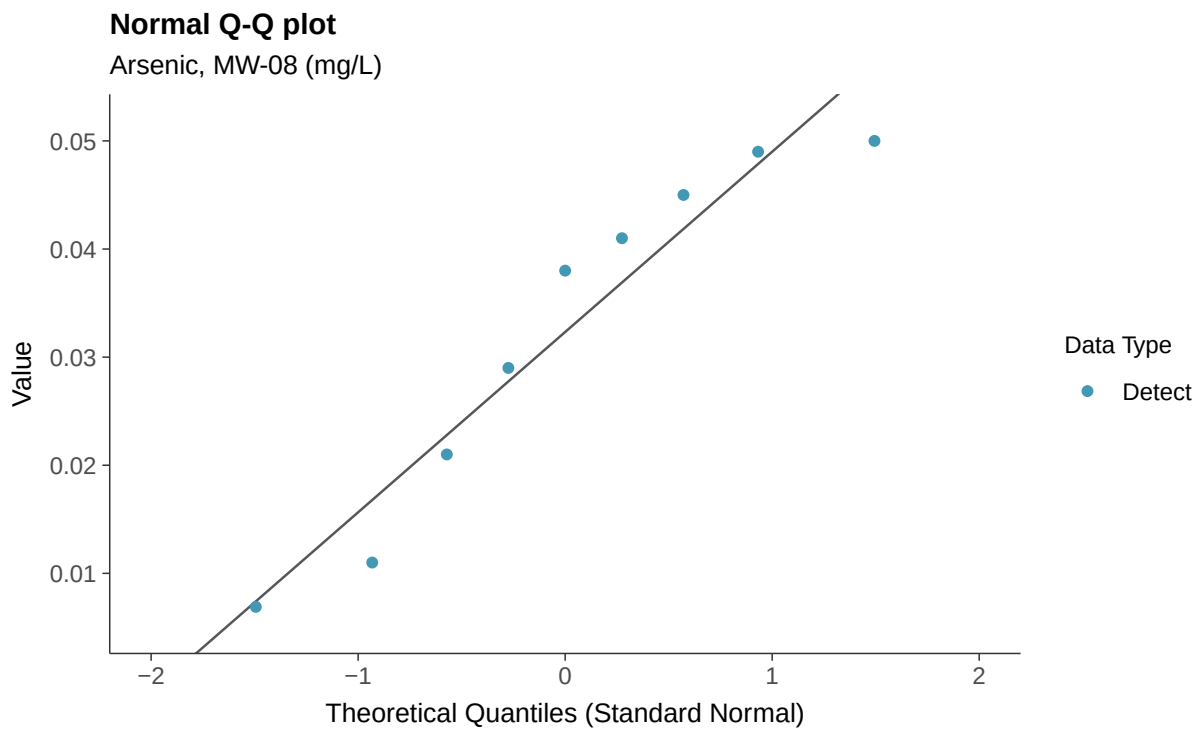
Arsenic, MW-08 (mg/L)

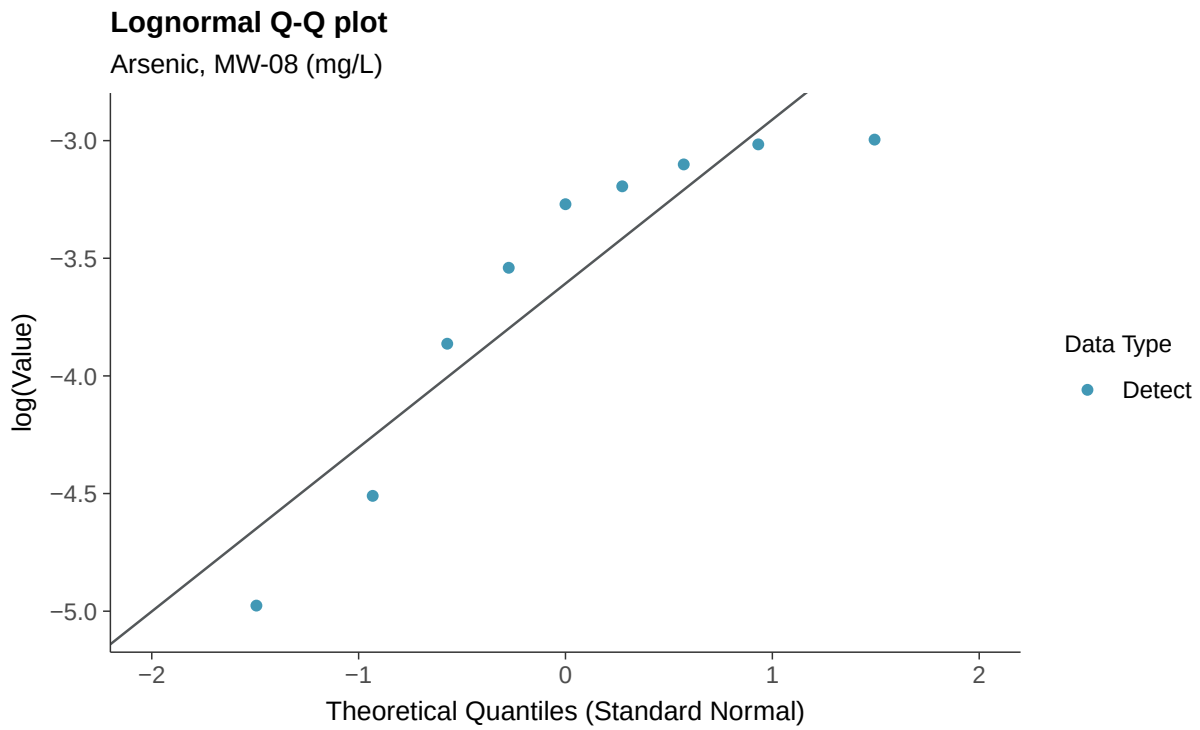


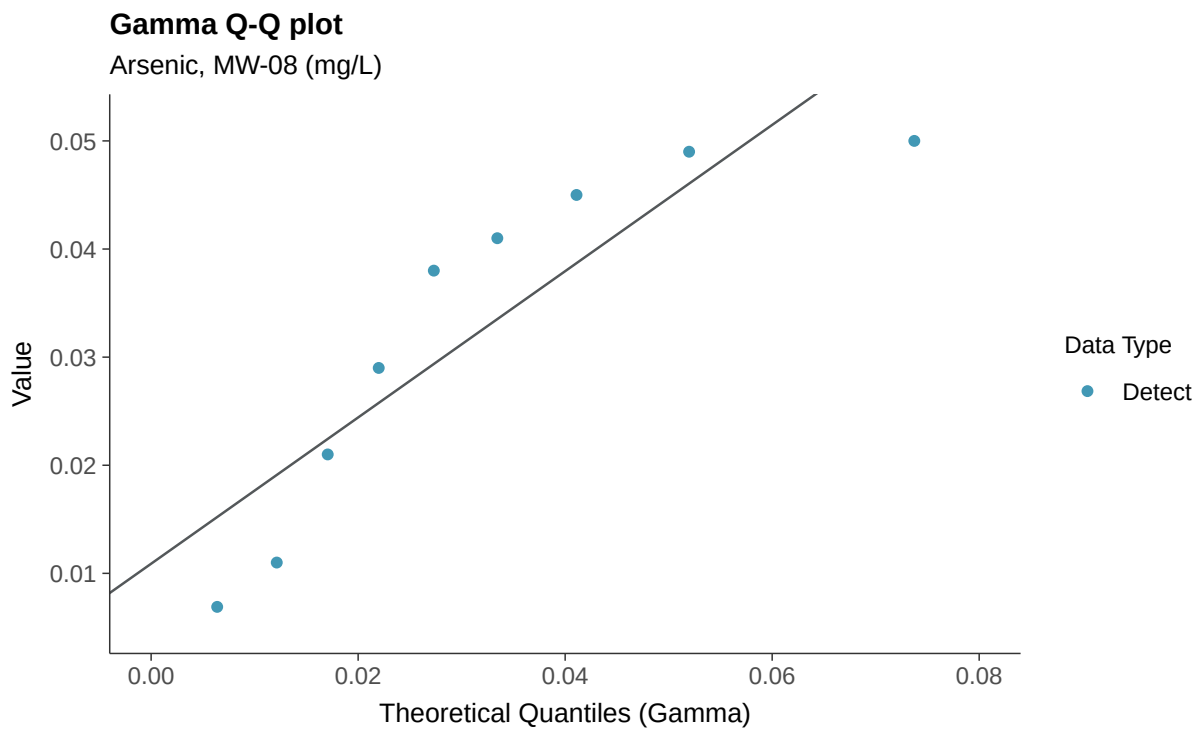
Boxplot by Season

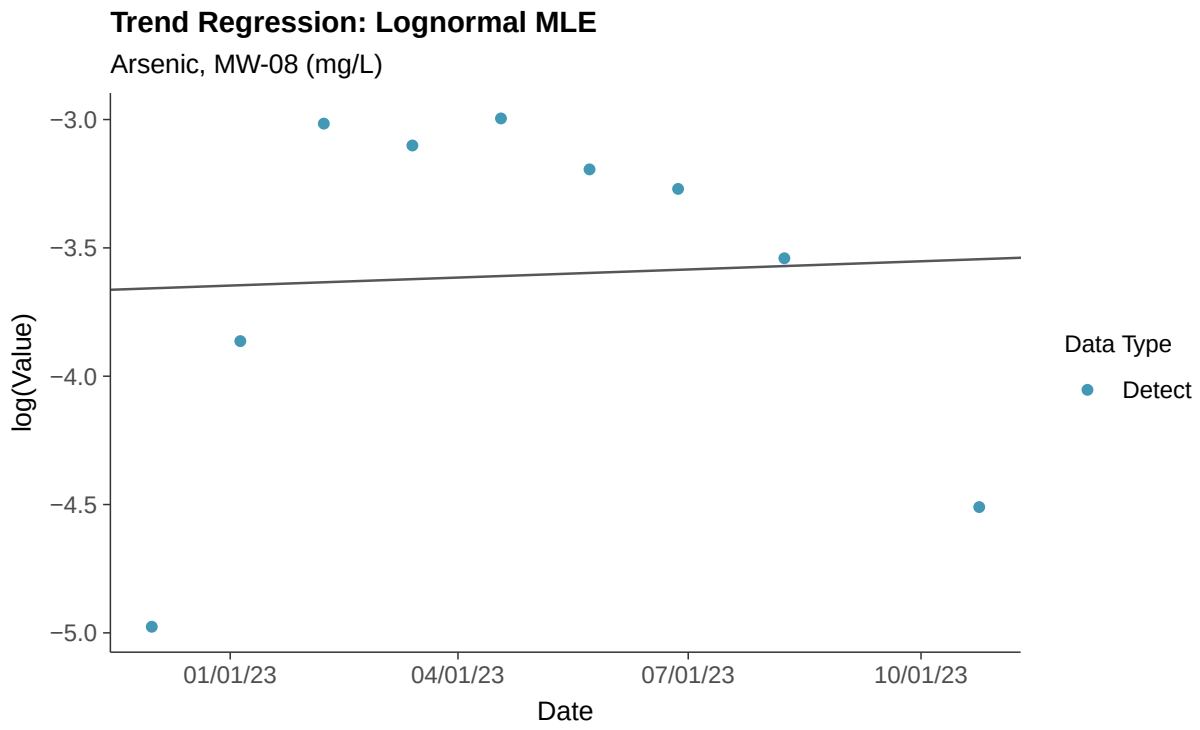
Arsenic, MW-08 (mg/L)




Normal Q-Q plot
Arsenic, MW-08 (mg/L)
Value
0.05
0.04
0.03
0.02
0.01
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

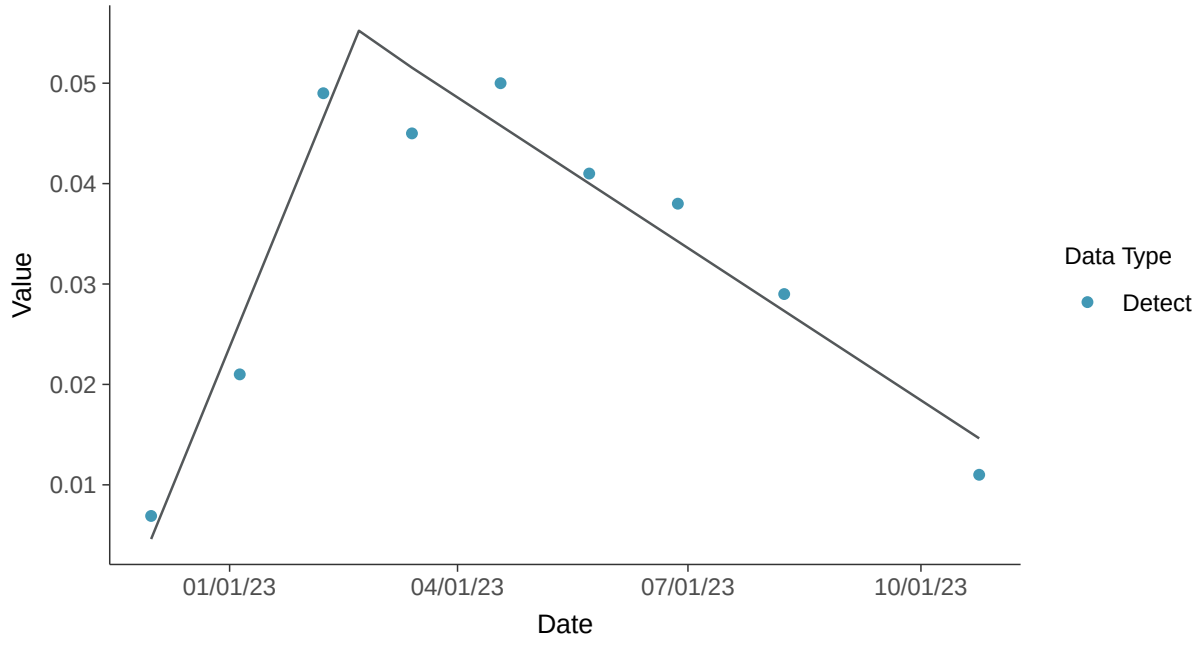

Lognormal Q-Q plot
Arsenic, MW-08 (mg/L)
log(Value)
−3.0
−3.5
−4.0
−4.5
−5.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-08 (mg/L)
Value
0.05
0.04
0.03
0.02
0.01
0.00
0.02
0.04
0.06
0.08
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Arsenic, MW-08 (mg/L)
log(Value)
−3.0
−3.5
−4.0
−4.5
−5.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

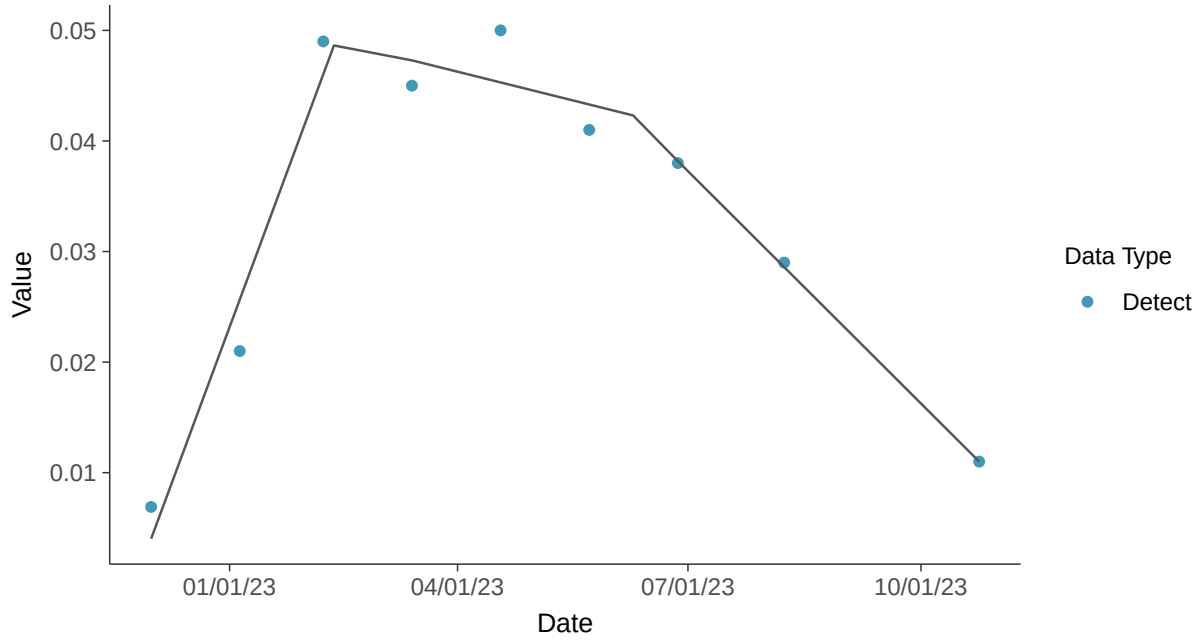
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-08 (mg/L)



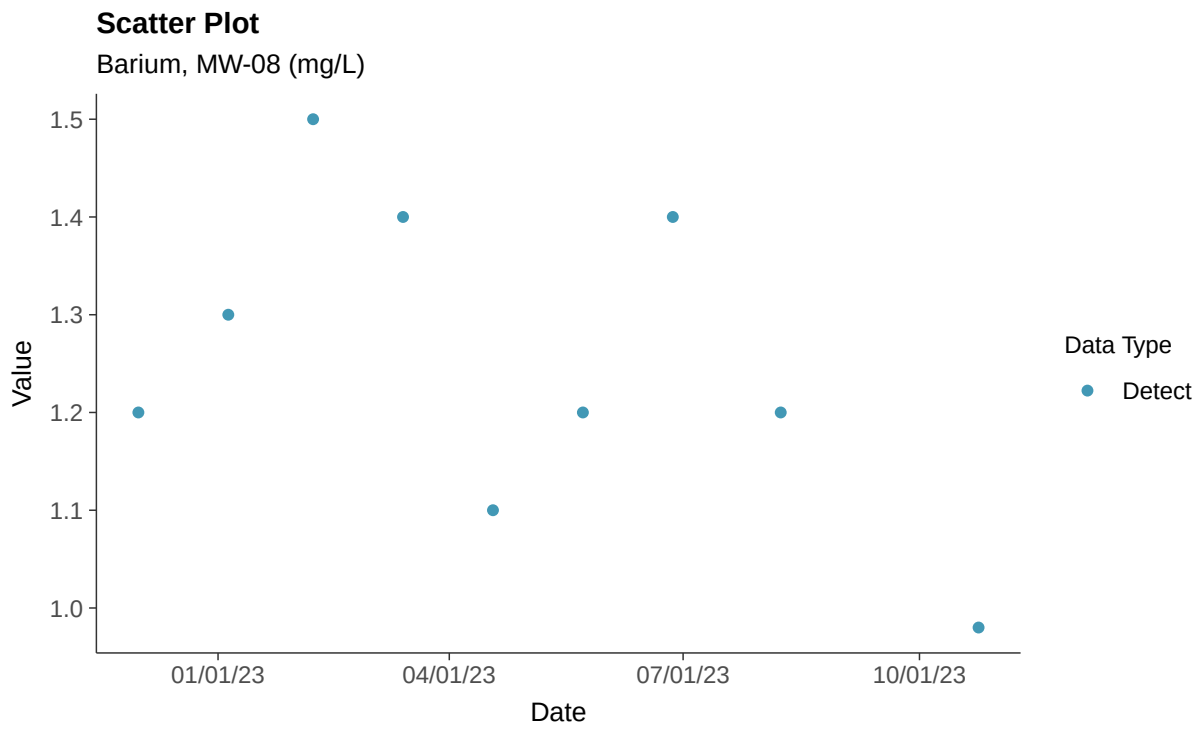
Trend Regression: Piecewise Linear-Linear-Linear

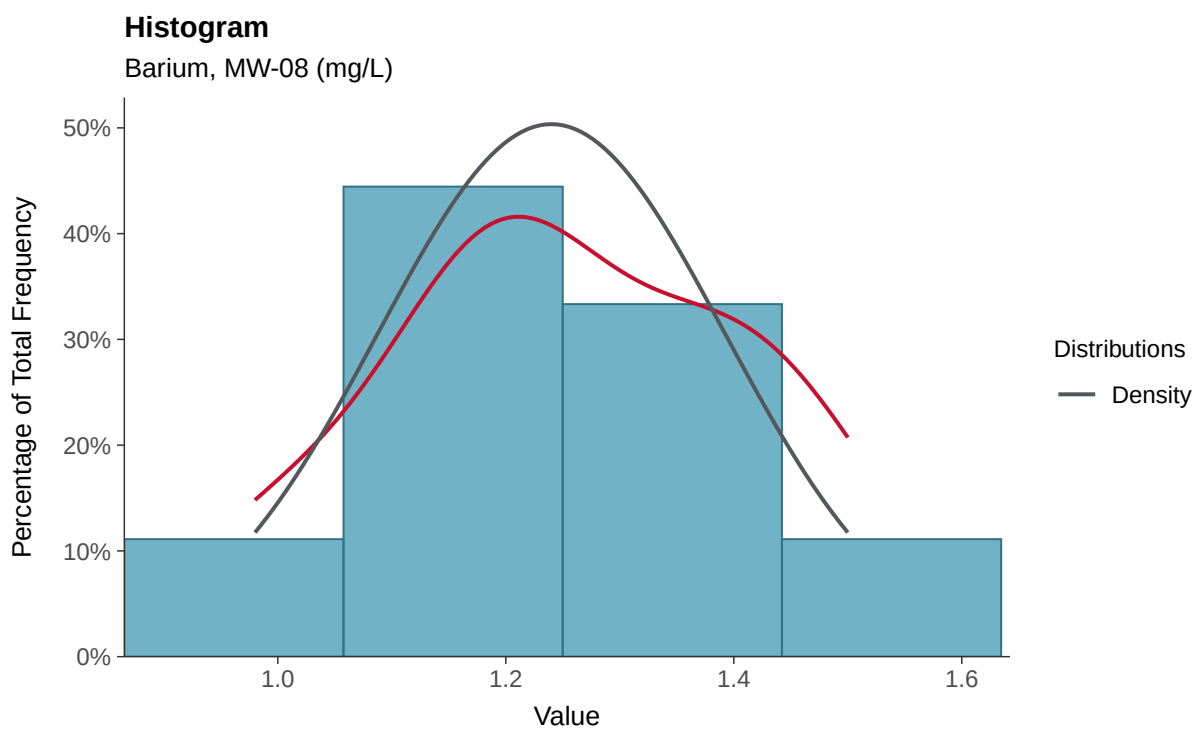
Arsenic, MW-08 (mg/L)



Appendix IV: Barium, MW-08

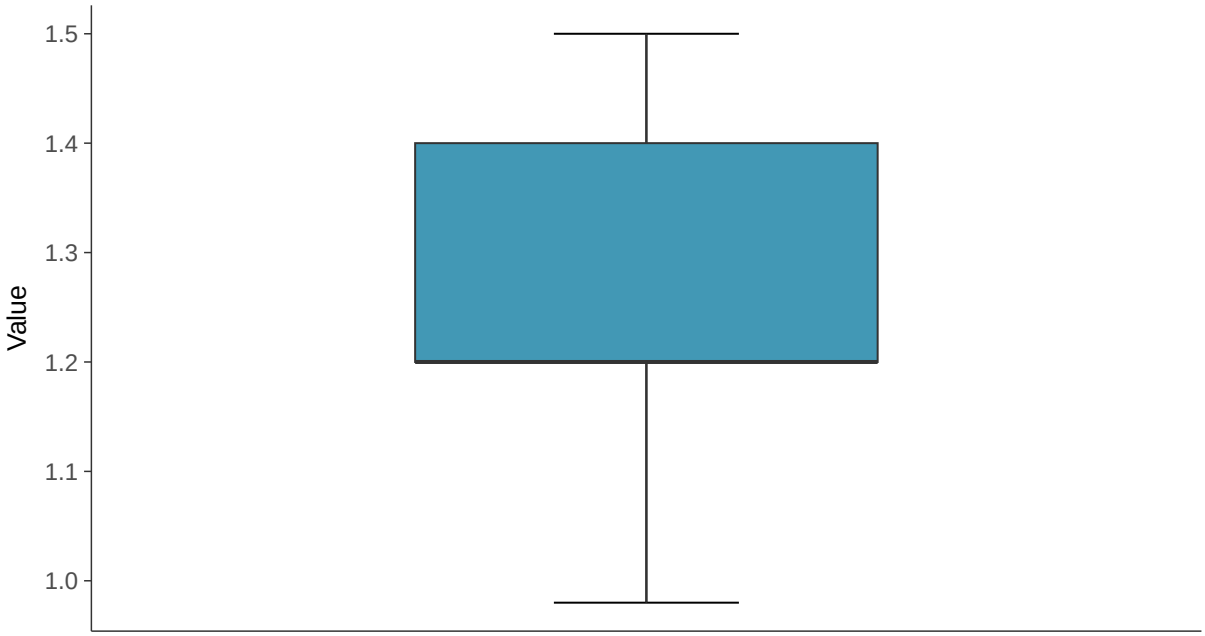
ID: 1_17_5_103





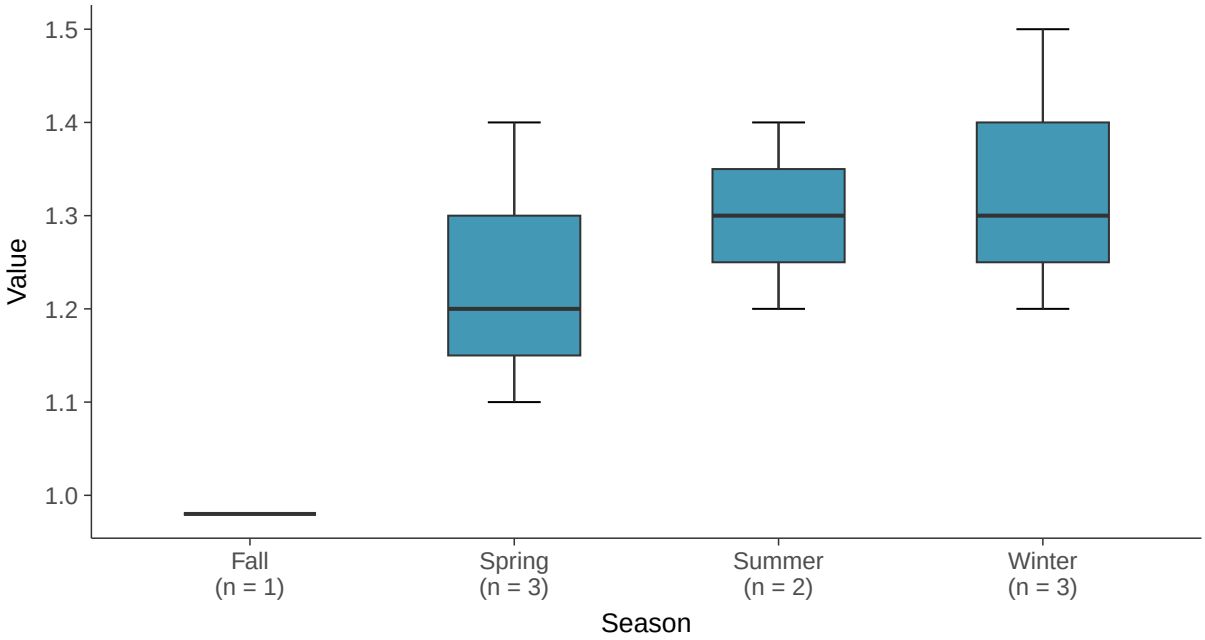
Boxplot

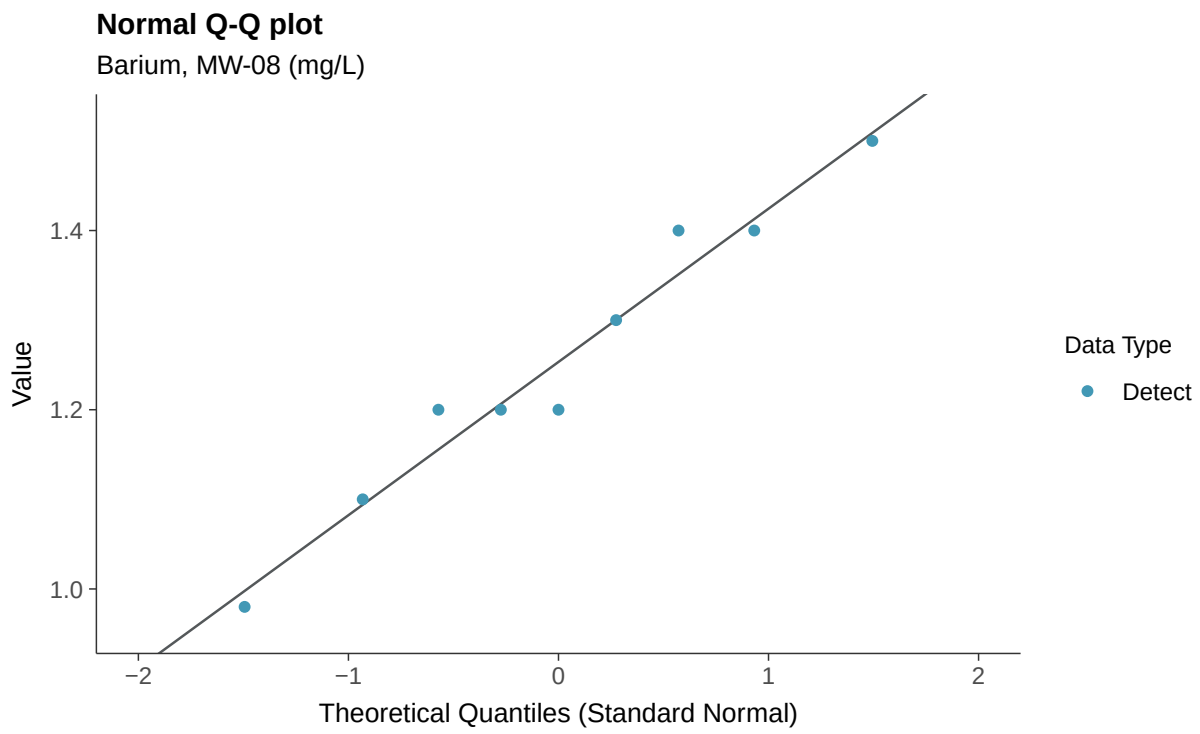
Barium, MW-08 (mg/L)

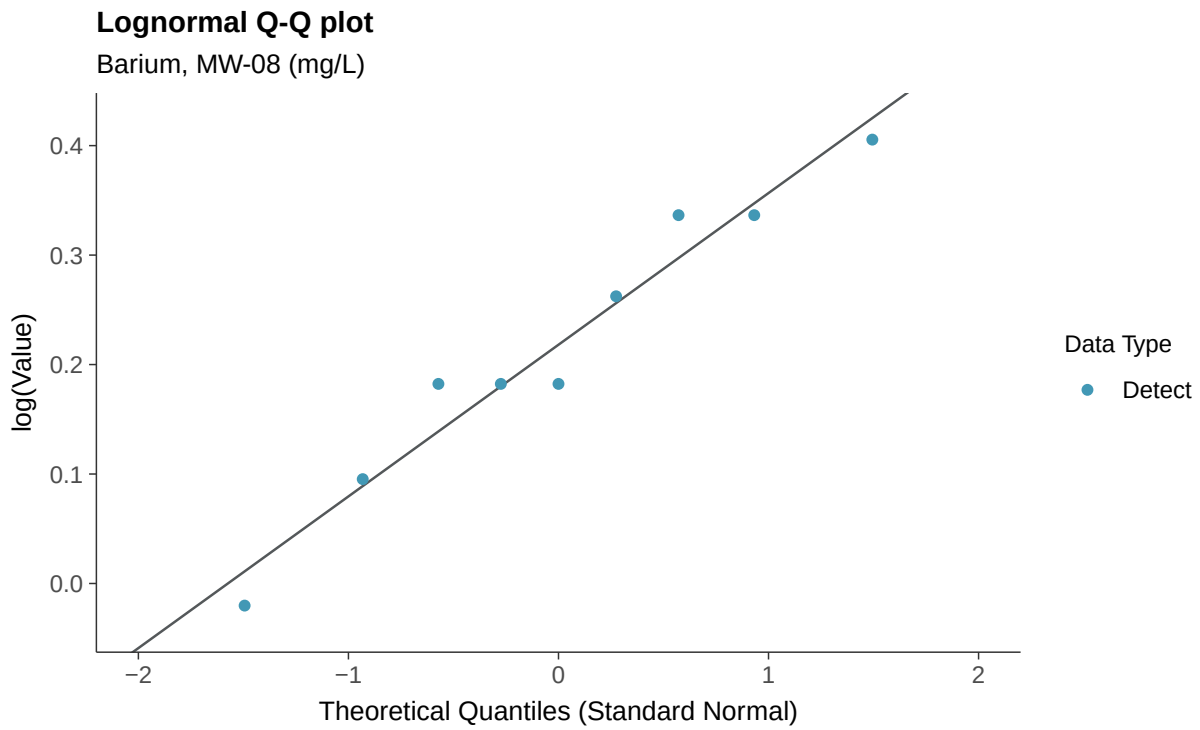


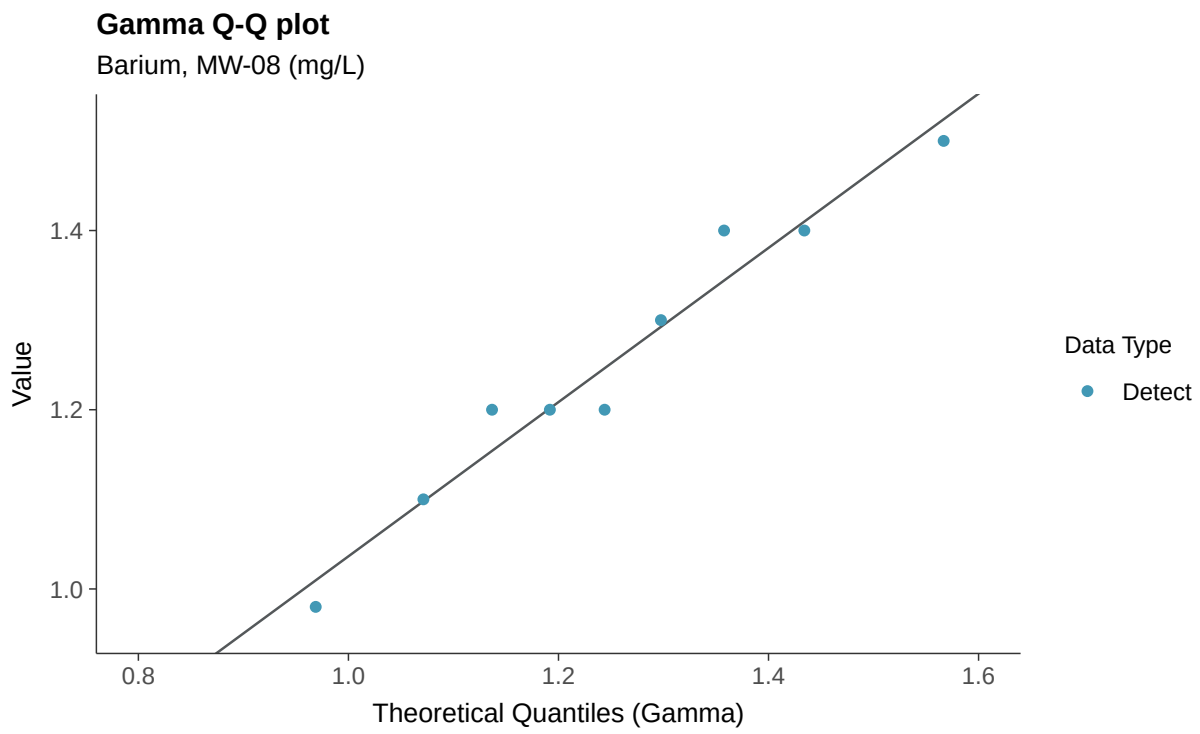
Boxplot by Season

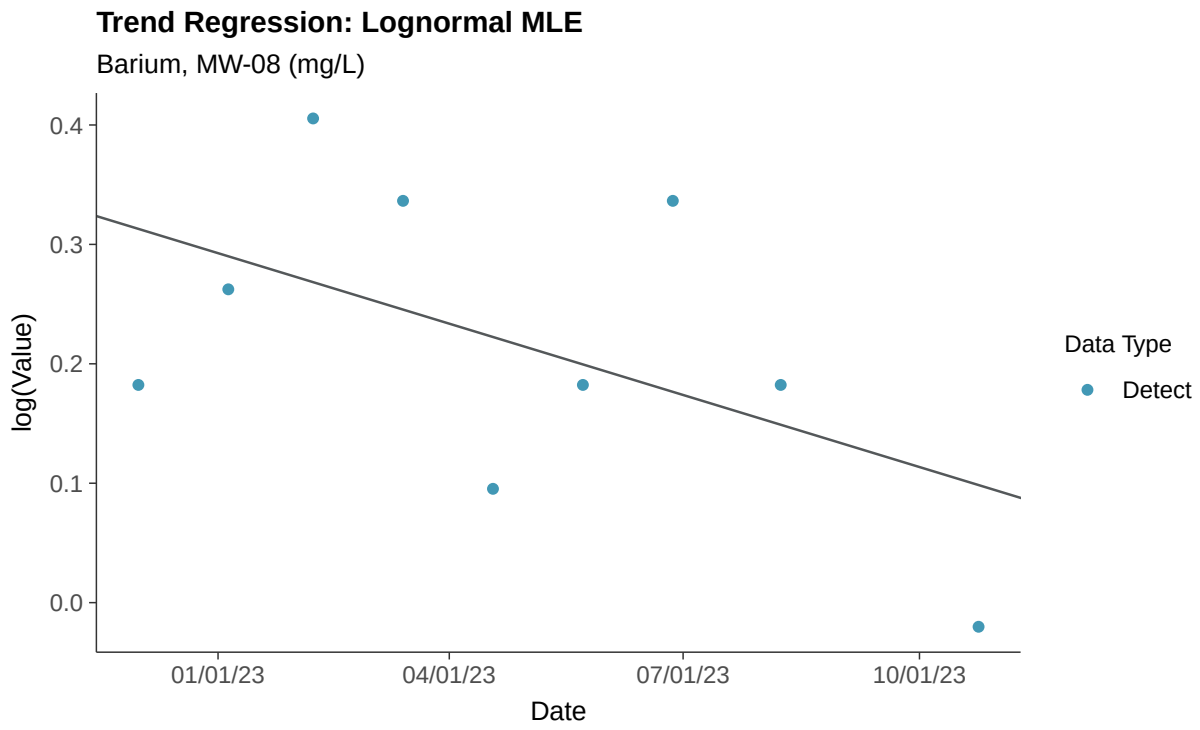
Barium, MW-08 (mg/L)




Normal Q-Q plot
Barium, MW-08 (mg/L)
Value
1.4
1.2
1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

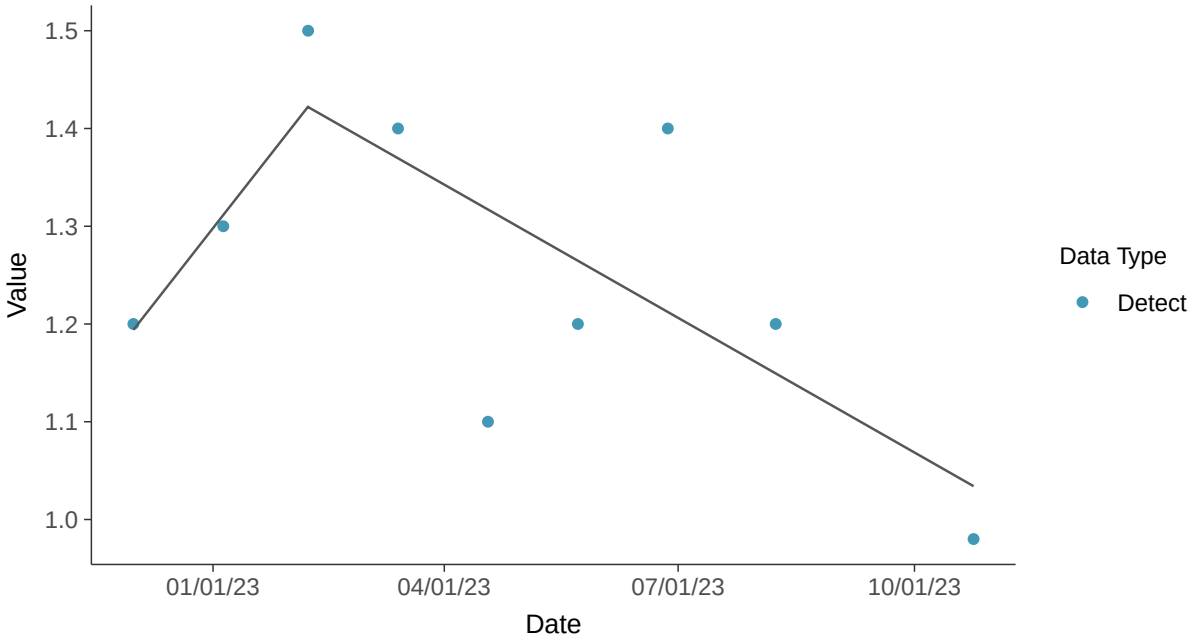

Lognormal Q-Q plot
Barium, MW-08 (mg/L)
log(Value)
0.4
0.3
0.2
0.1
0.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Barium, MW-08 (mg/L)
Value
1.4
1.2
1.0
0.8
1.0
1.2
1.4
1.6
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Barium, MW-08 (mg/L)
log(Value)
0.4
0.3
0.2
0.1
0.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

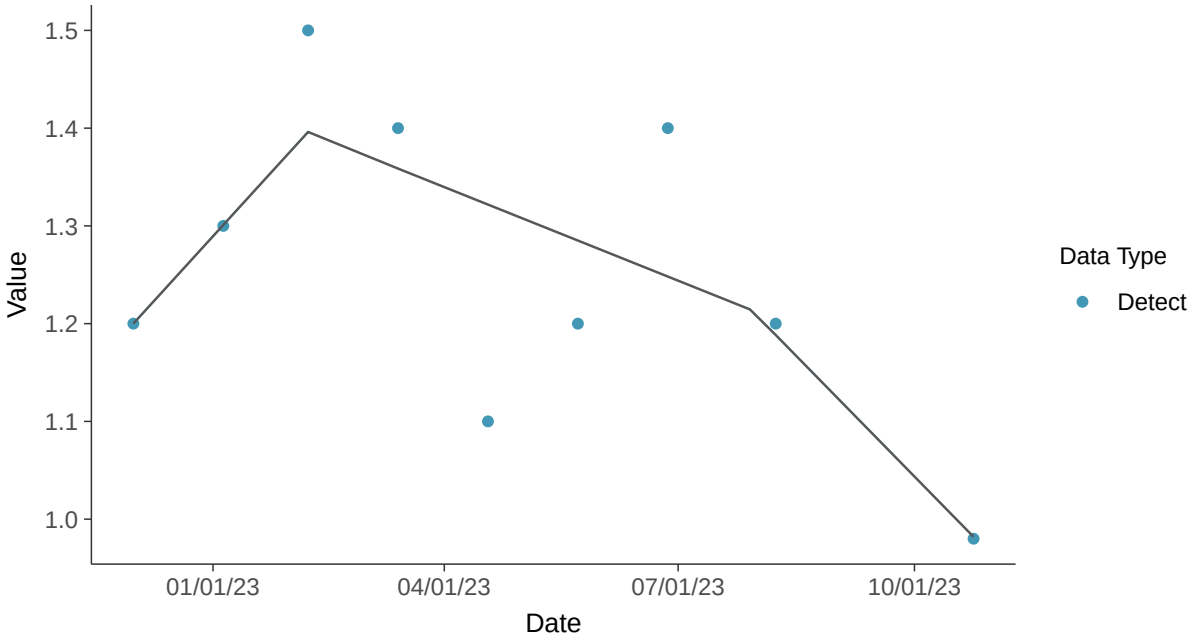
Trend Regression: Piecewise Linear-Linear

Barium, MW-08 (mg/L)



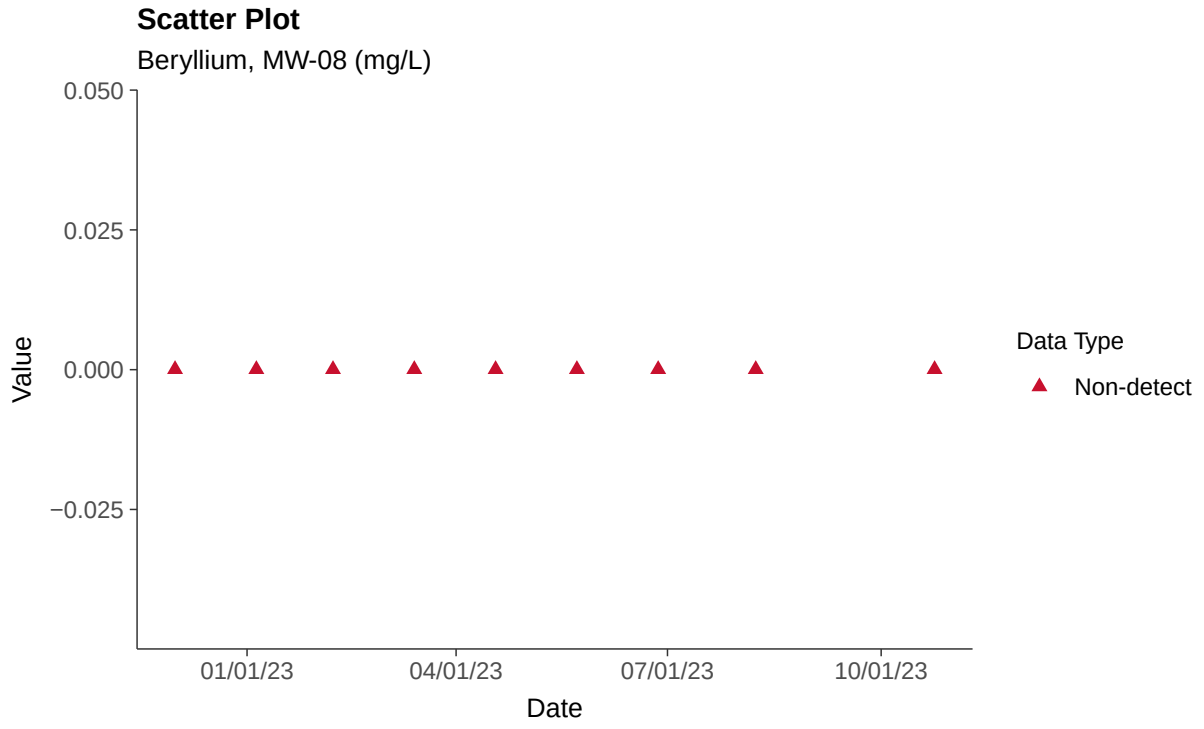
Trend Regression: Piecewise Linear-Linear-Linear

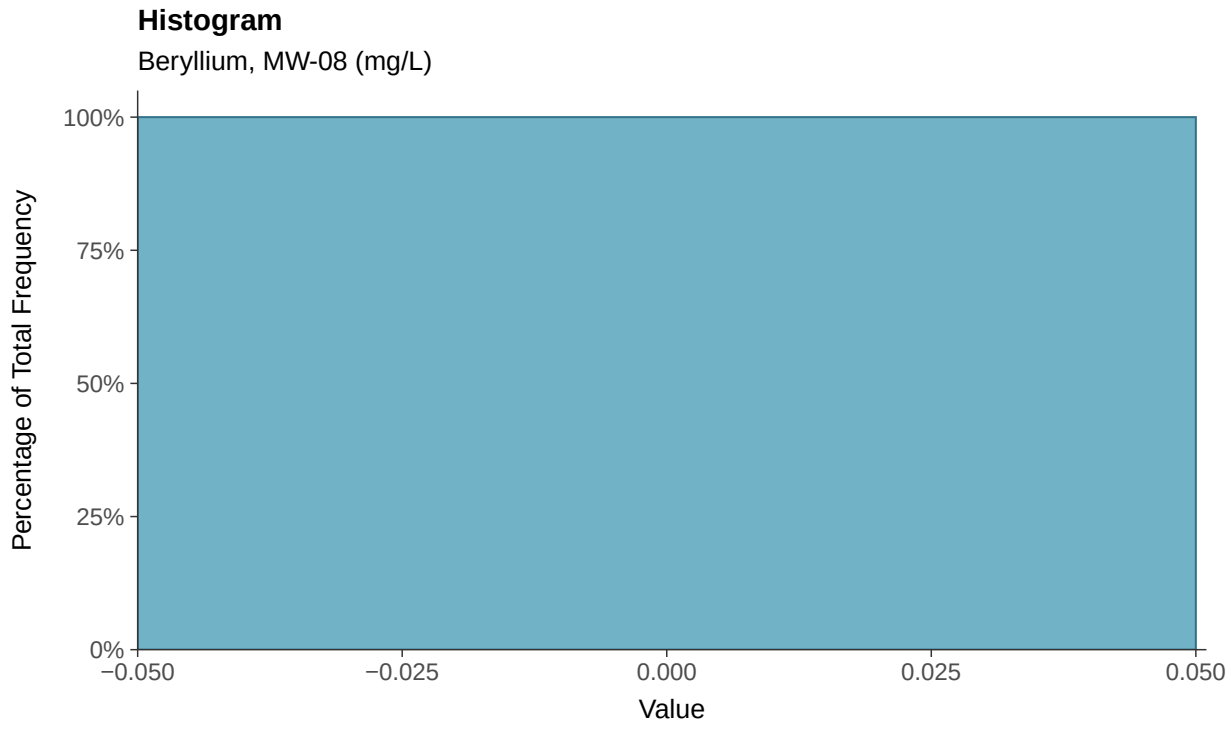
Barium, MW-08 (mg/L)



Appendix IV: Beryllium, MW-08

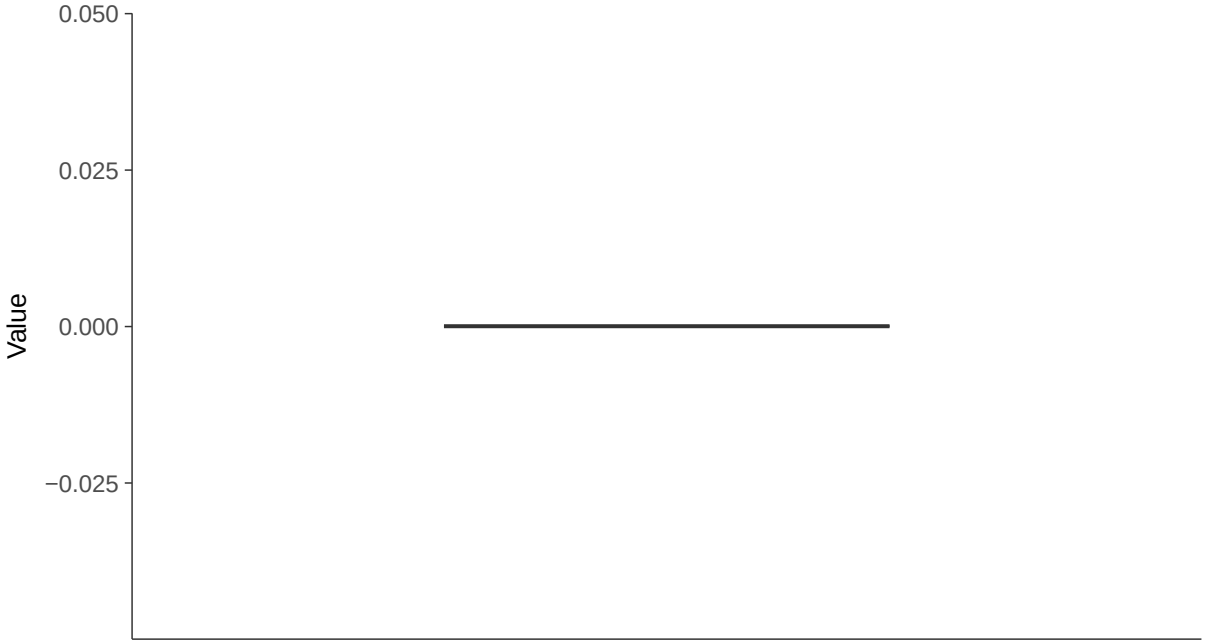
ID: 1_17_5_104





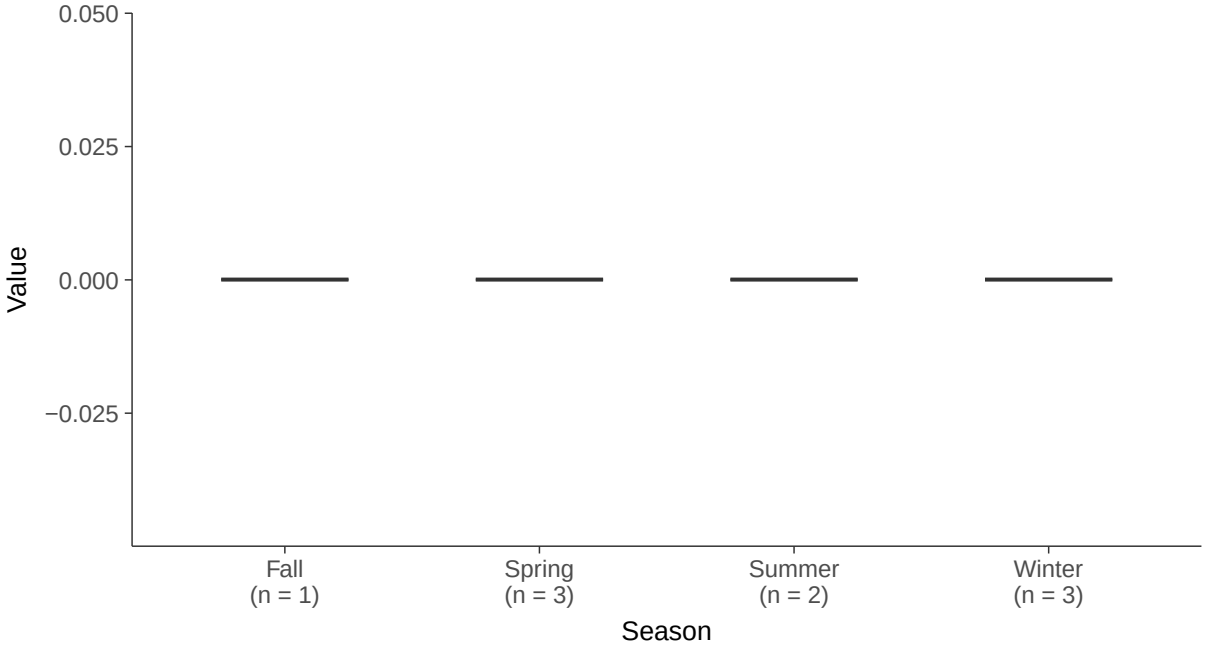
Boxplot

Beryllium, MW-08 (mg/L)



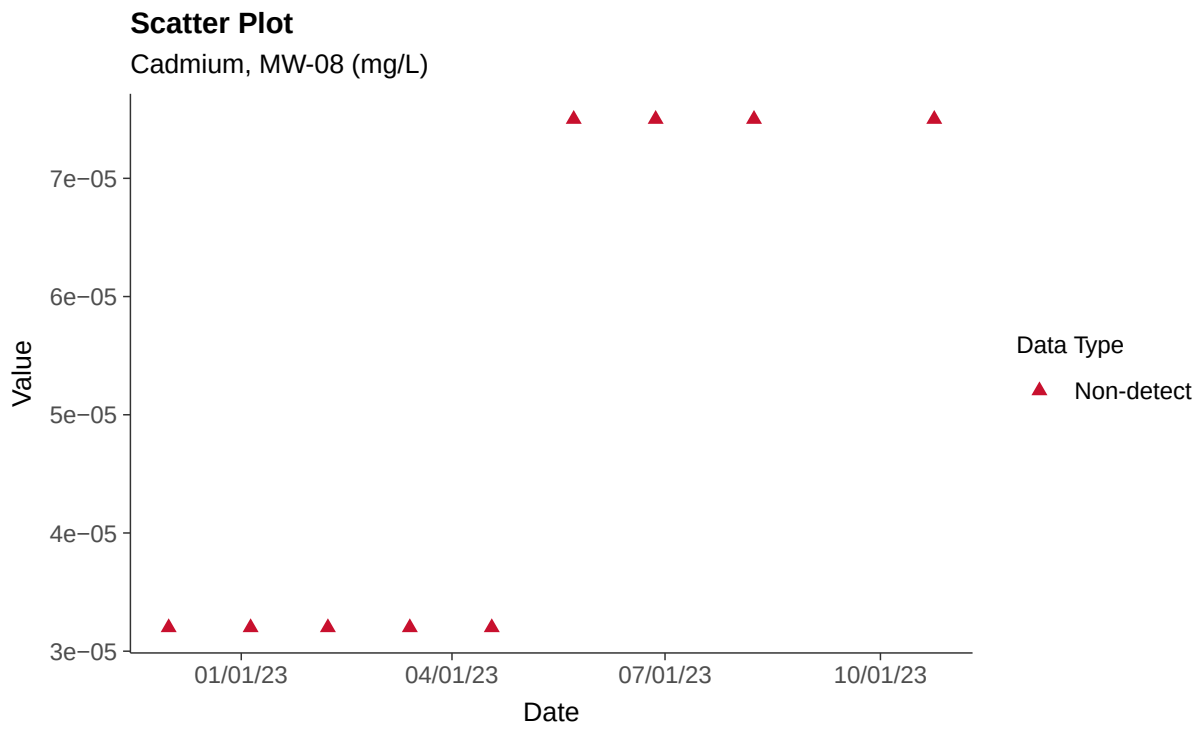
Boxplot by Season

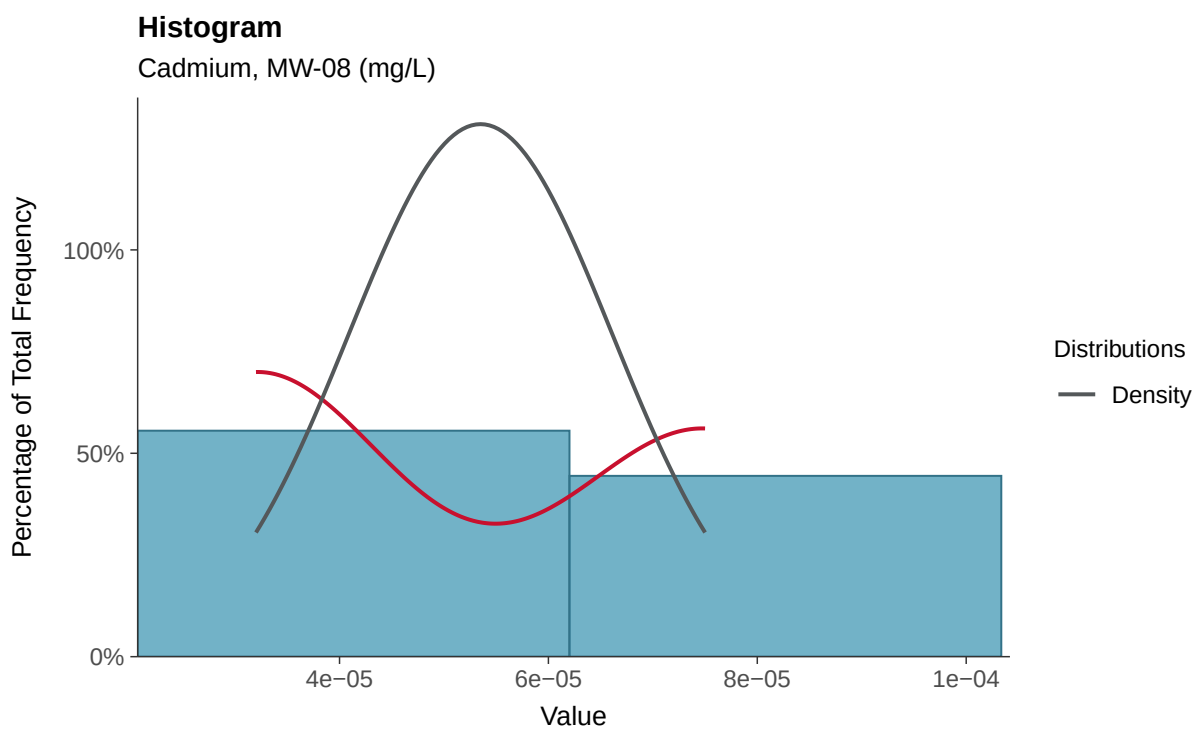
Beryllium, MW-08 (mg/L)



Appendix IV: Cadmium, MW-08

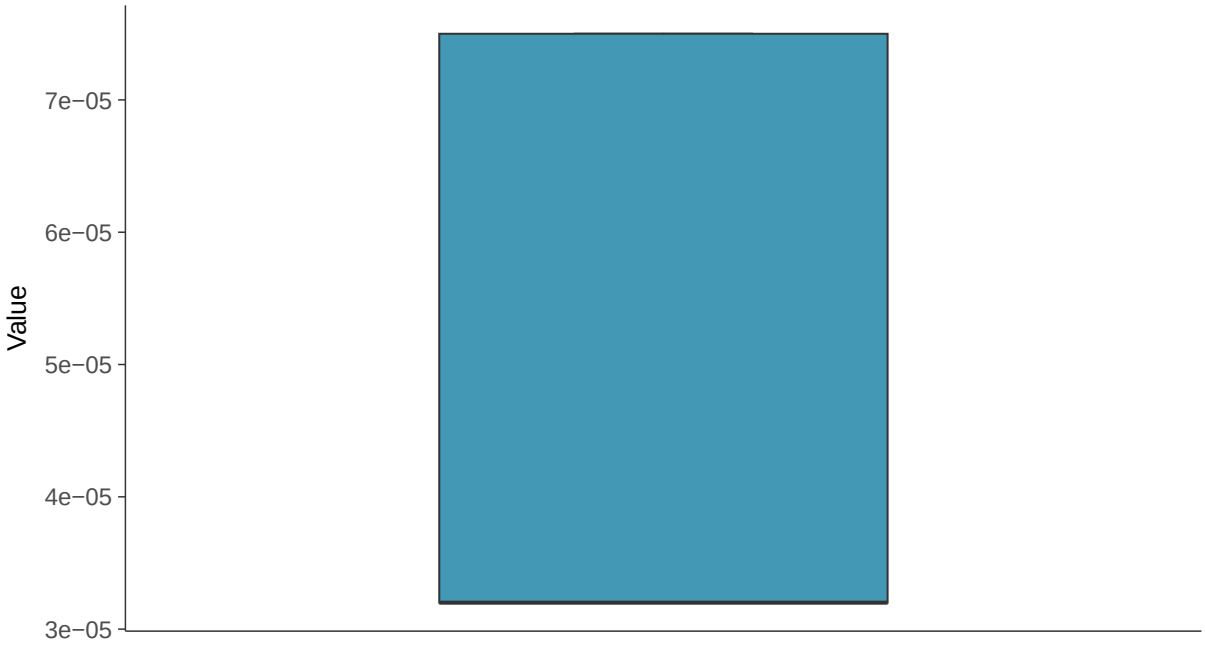
ID: 1_17_5_106





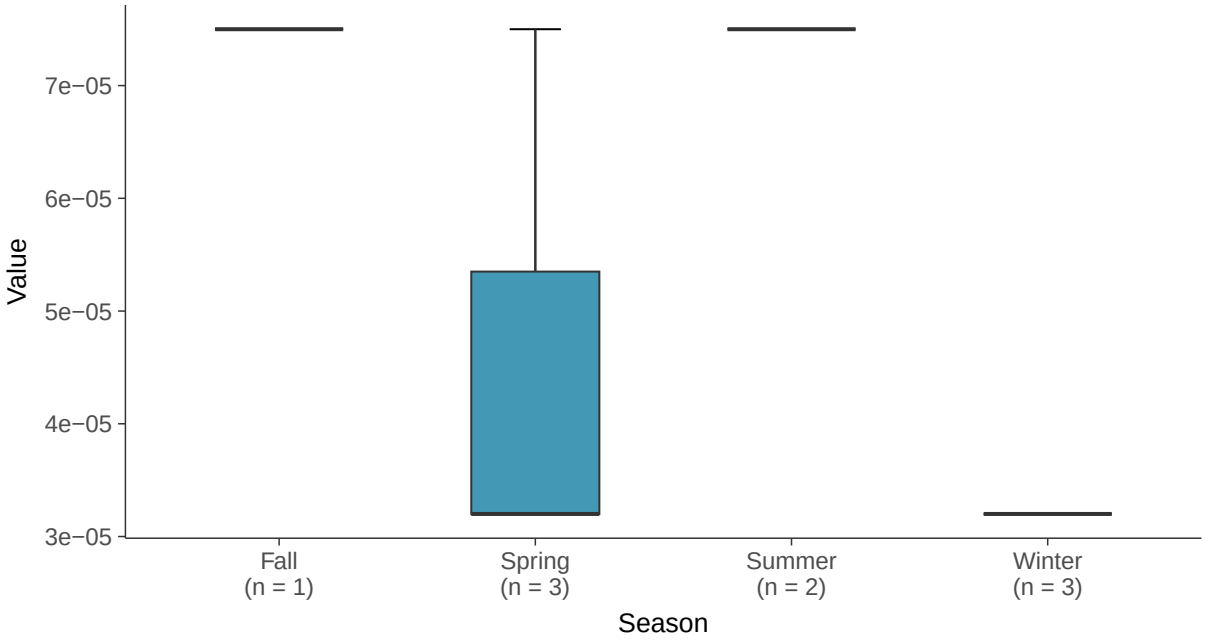
Boxplot

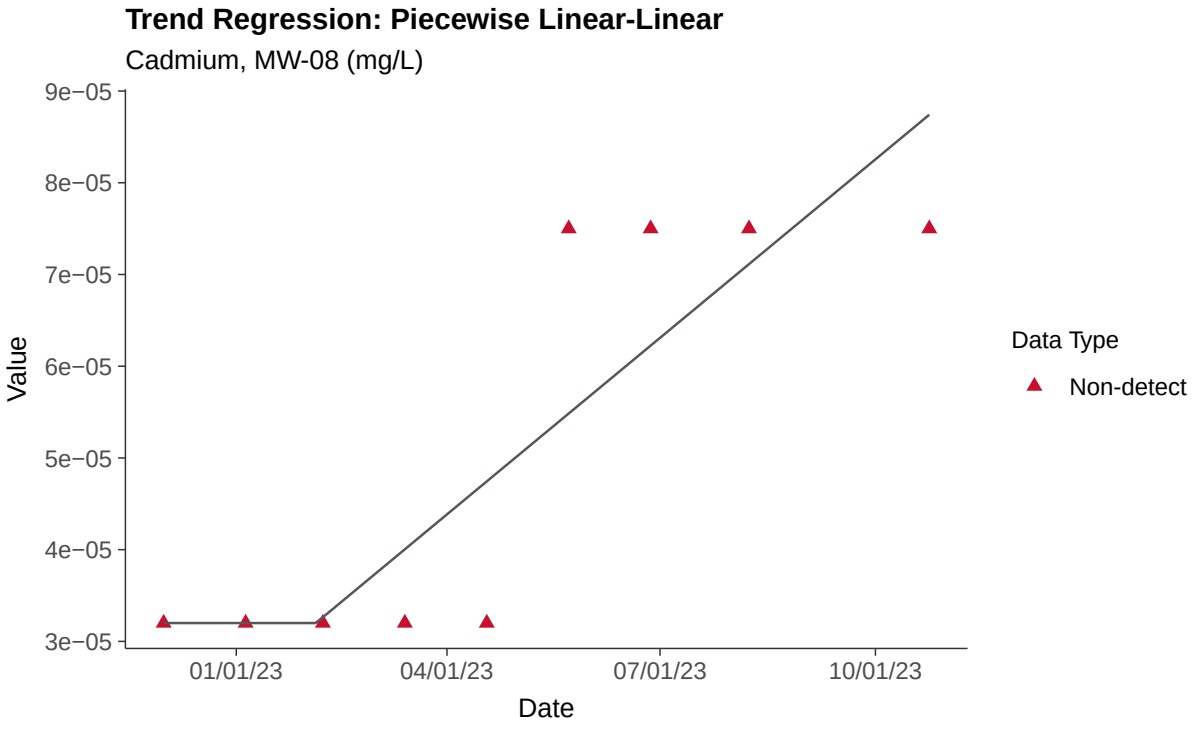
Cadmium, MW-08 (mg/L)

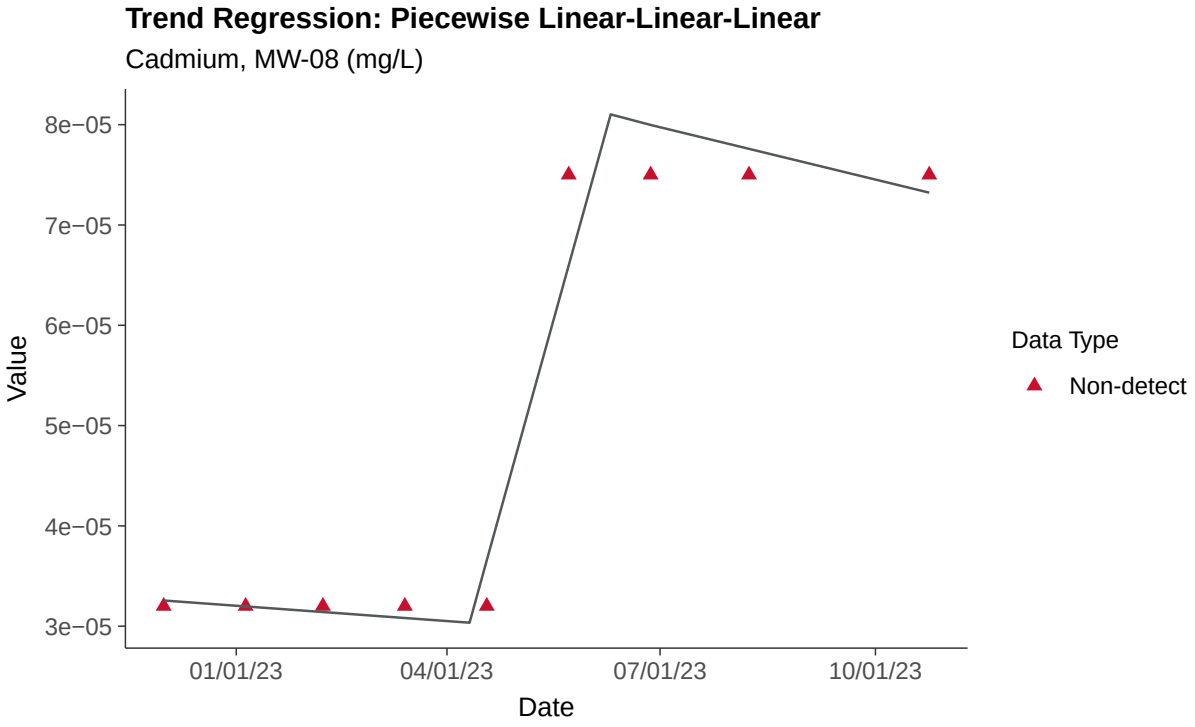


Boxplot by Season

Cadmium, MW-08 (mg/L)

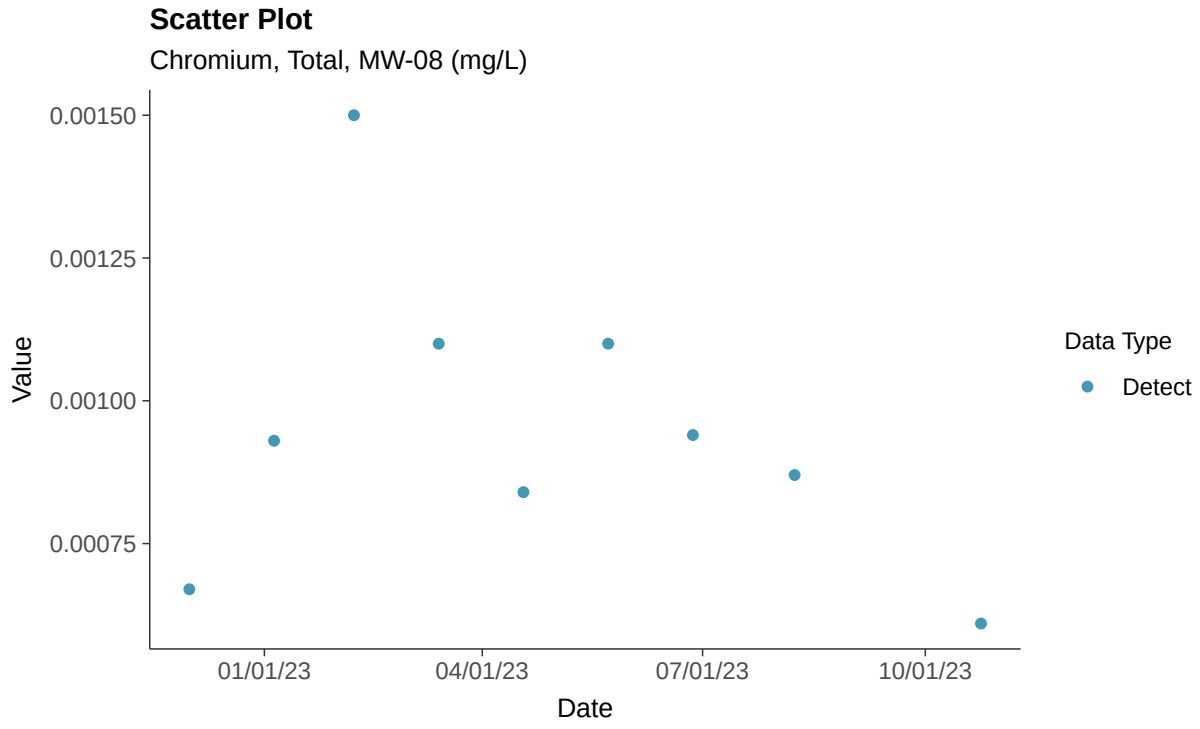


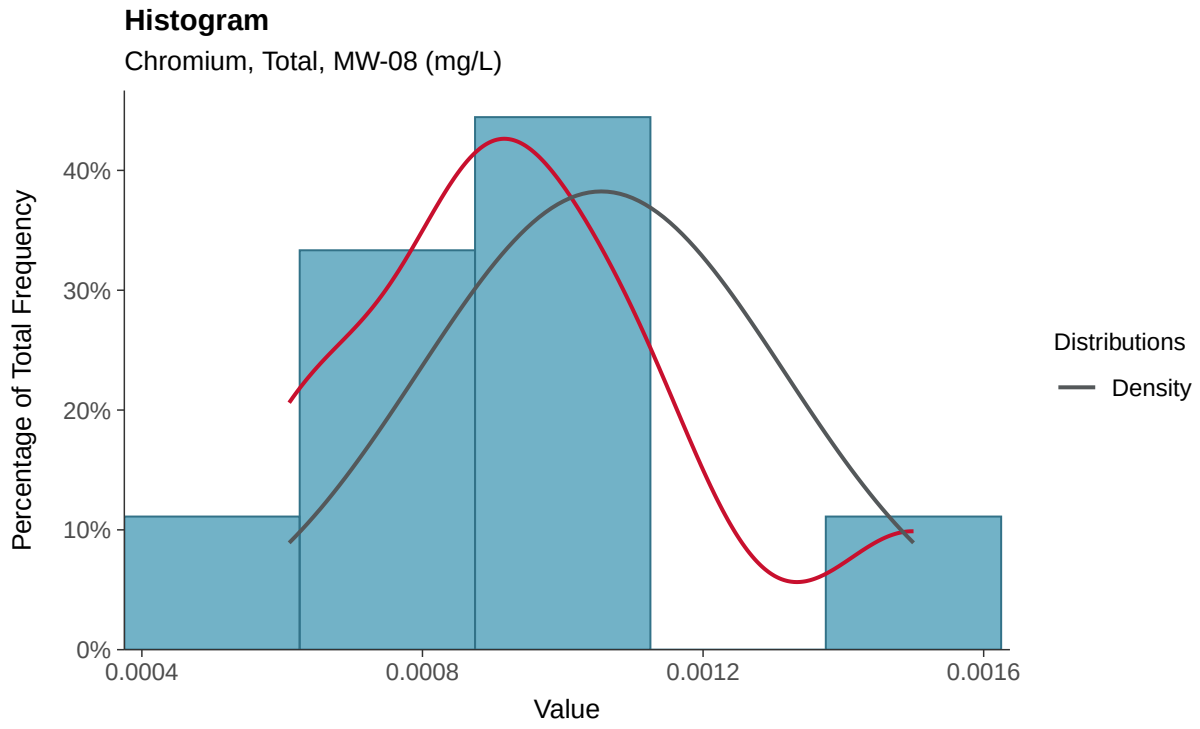

Trend Regression: Piecewise Linear-Linear
Cadmium, MW-08 (mg/L)
9e−05
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Cadmium, MW-08 (mg/L)
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Chromium, Total, MW-08

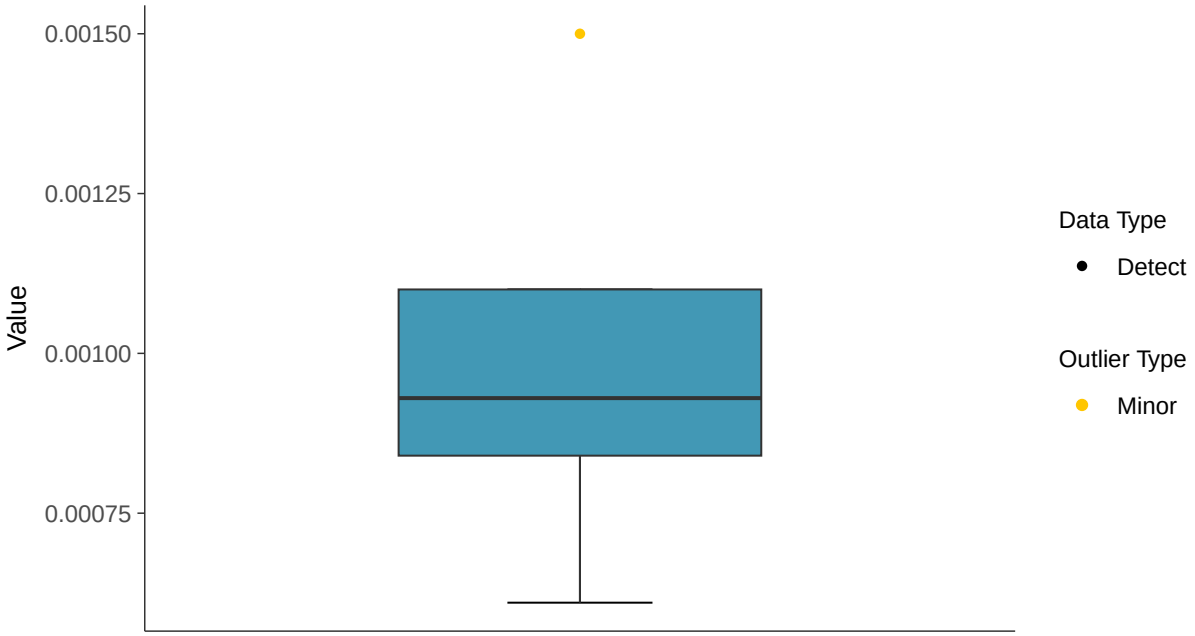
ID: 1_17_5_109





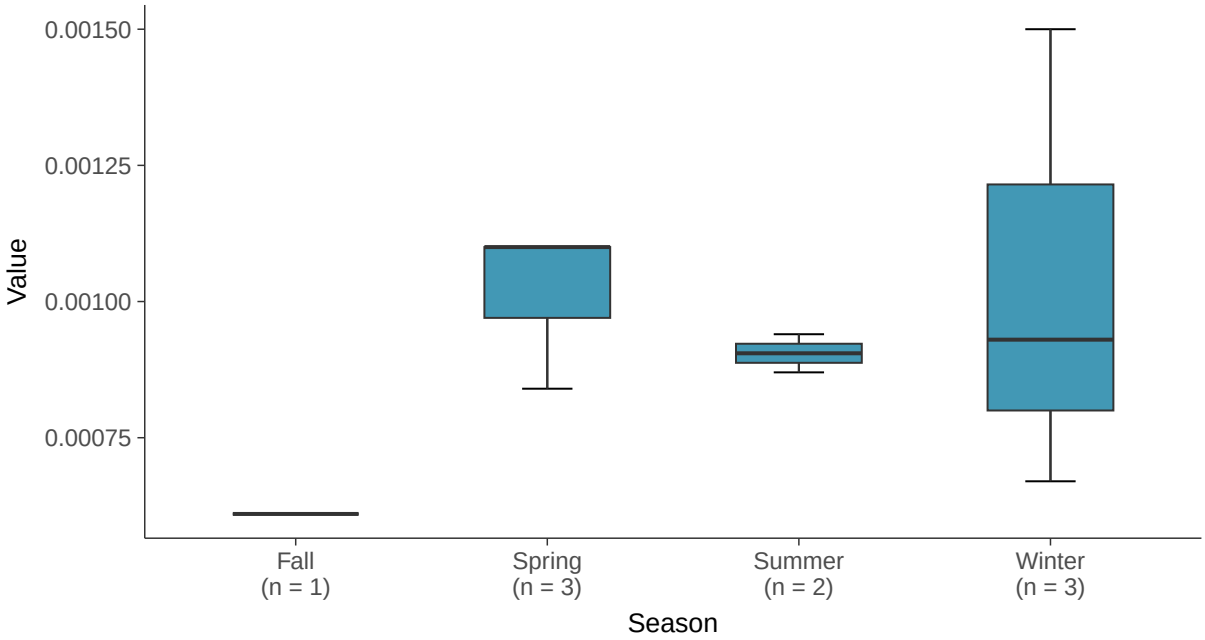
Boxplot

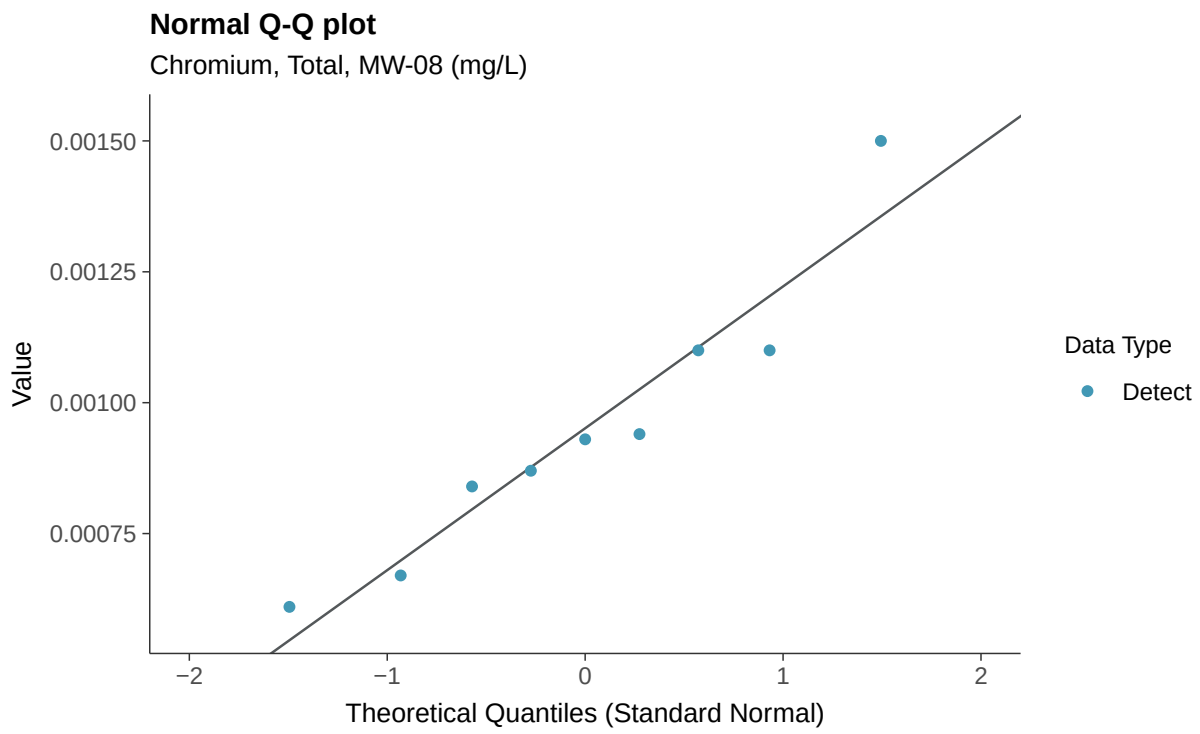
Chromium, Total, MW-08 (mg/L)

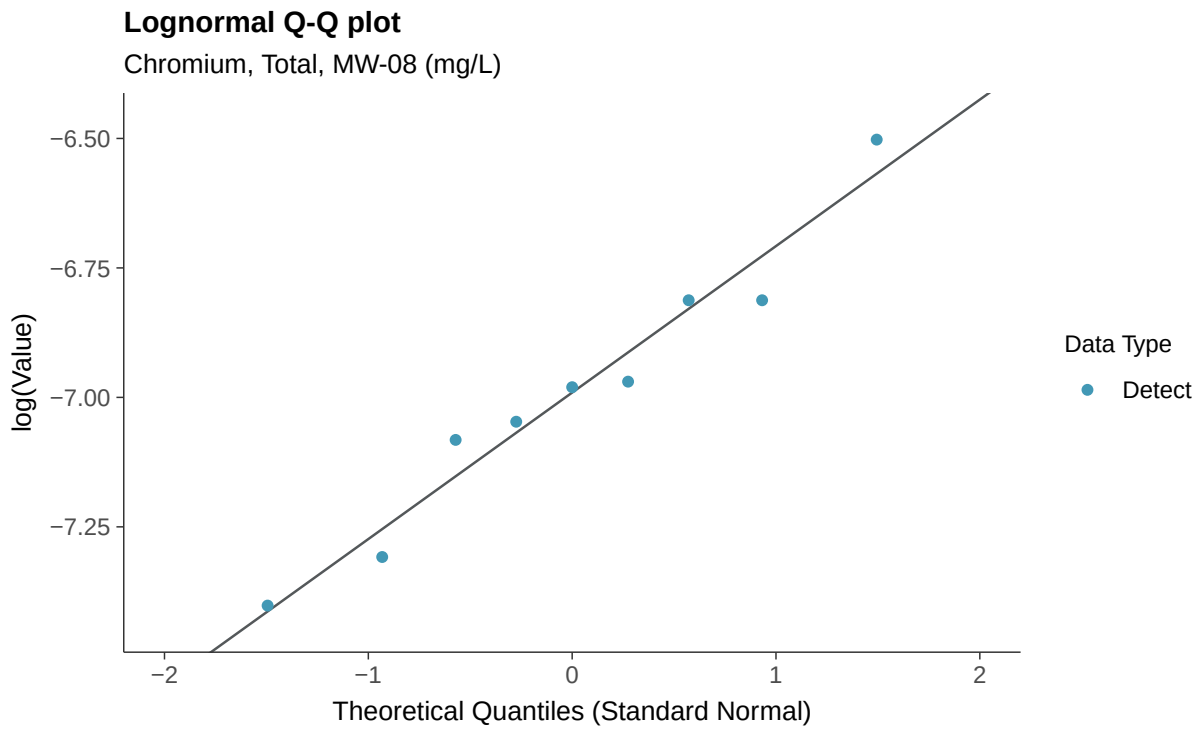


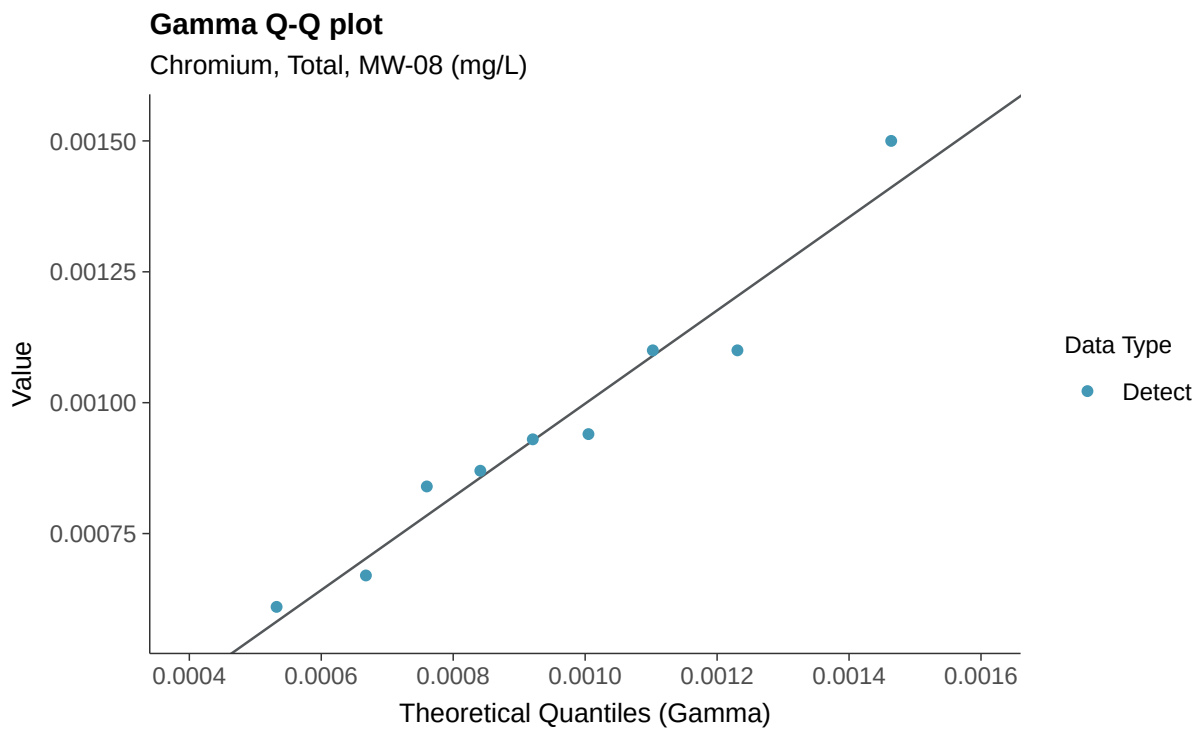
Boxplot by Season

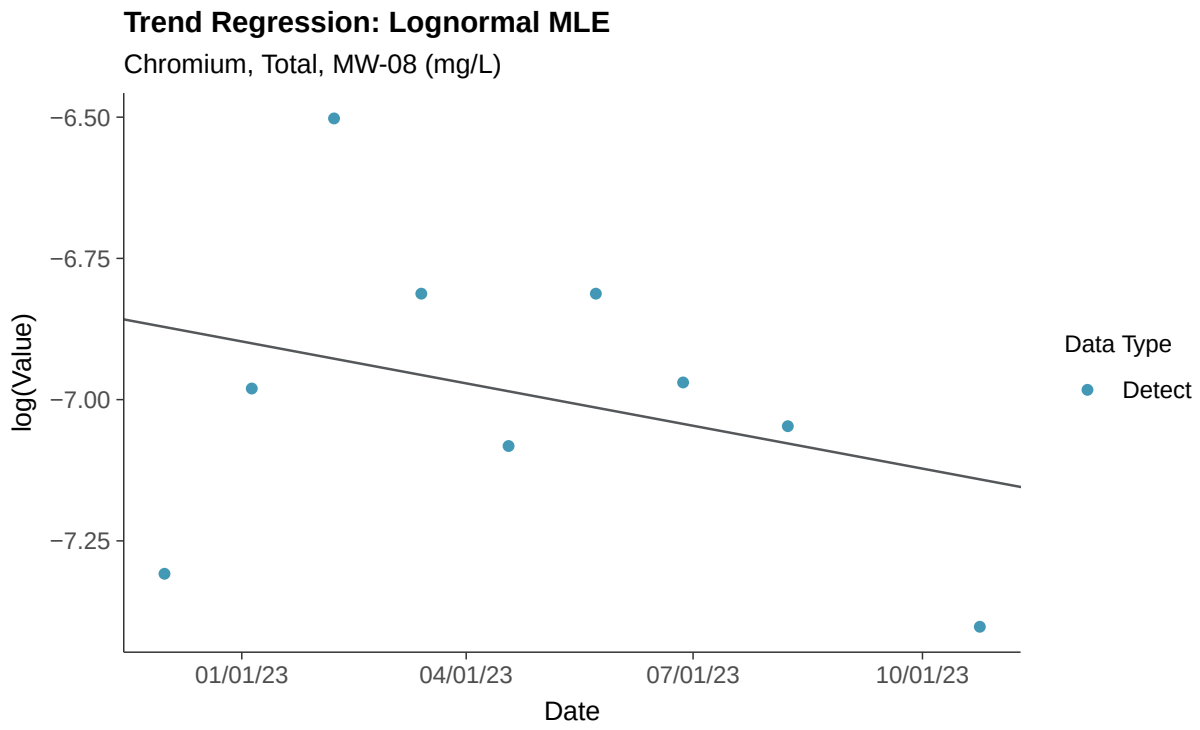
Chromium, Total, MW-08 (mg/L)




Normal Q-Q plot
Chromium, Total, MW-08 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

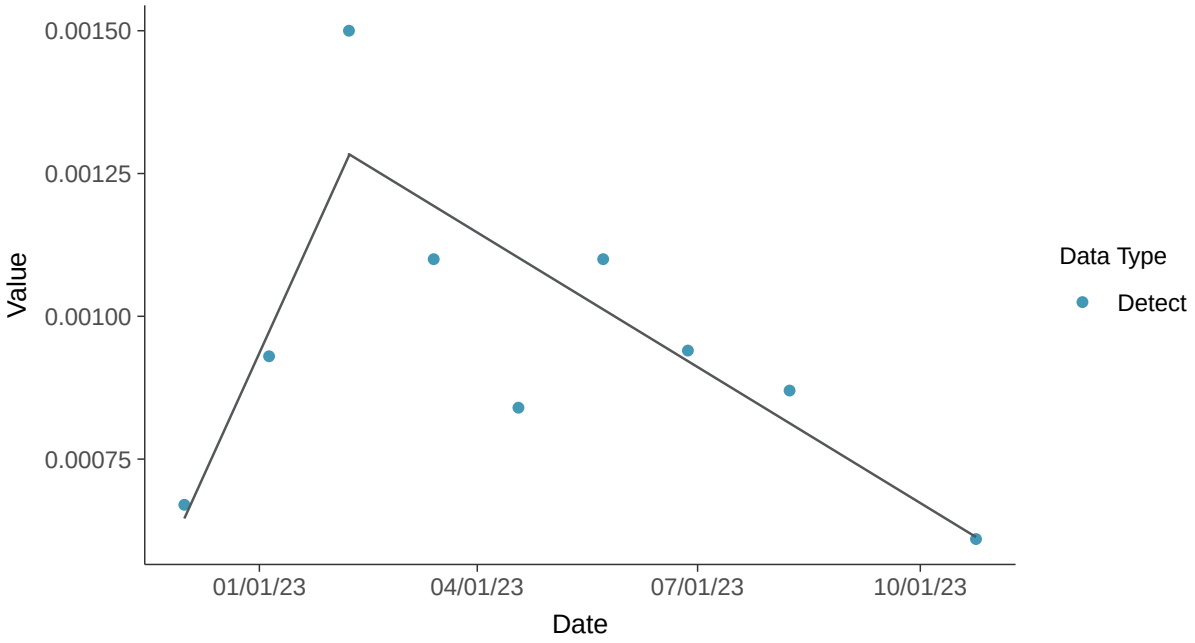

Lognormal Q-Q plot
Chromium, Total, MW-08 (mg/L)
log(Value)
−6.50
−6.75
−7.00
−7.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chromium, Total, MW-08 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
0.0004
0.0006
0.0008
0.0010
0.0012
0.0014
0.0016
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-08 (mg/L)
log(Value)
−6.50
−6.75
−7.00
−7.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

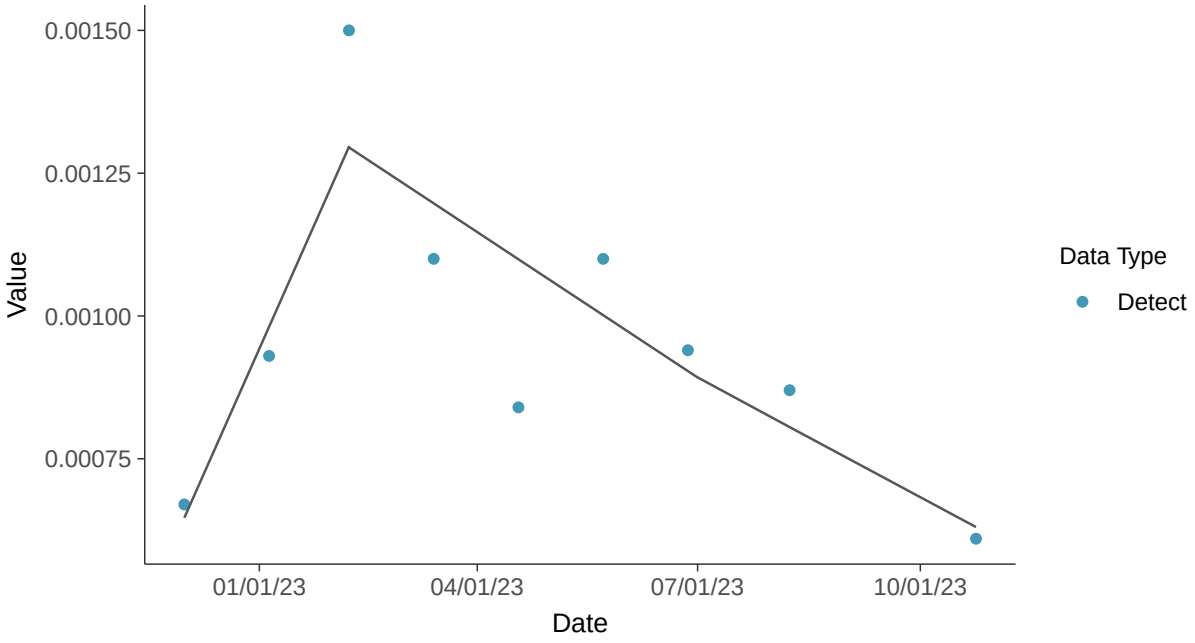
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-08 (mg/L)



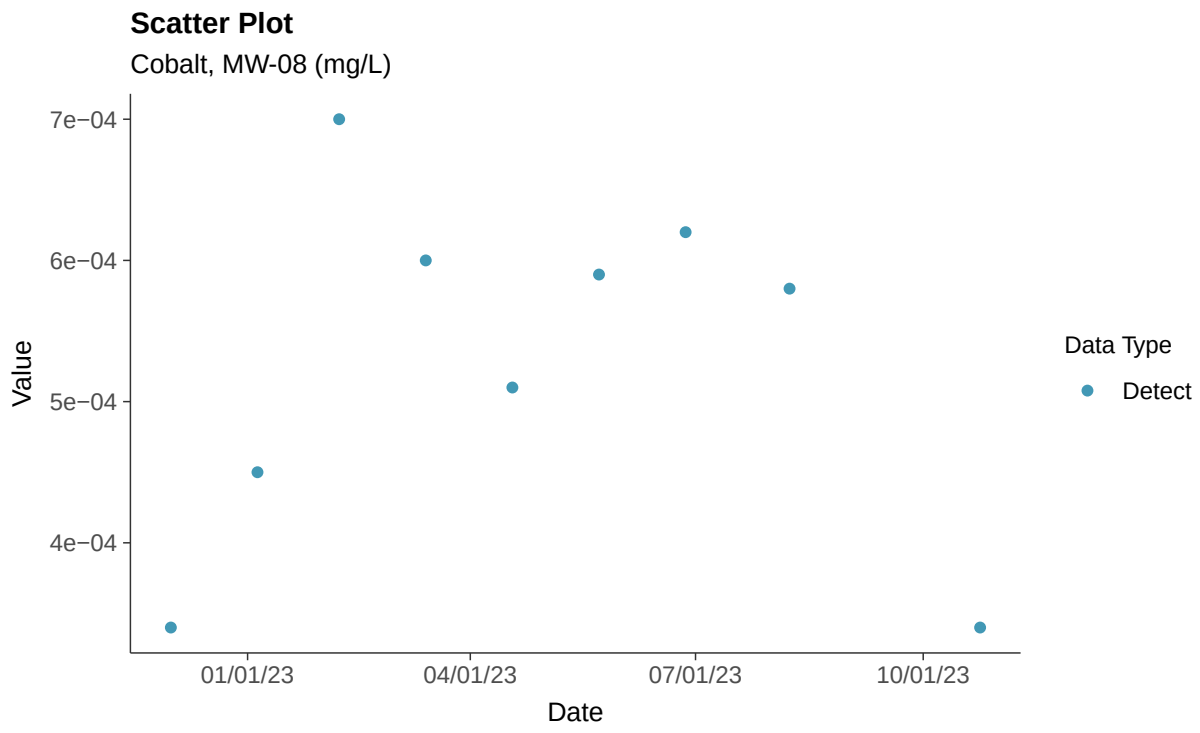
Trend Regression: Piecewise Linear-Linear-Linear

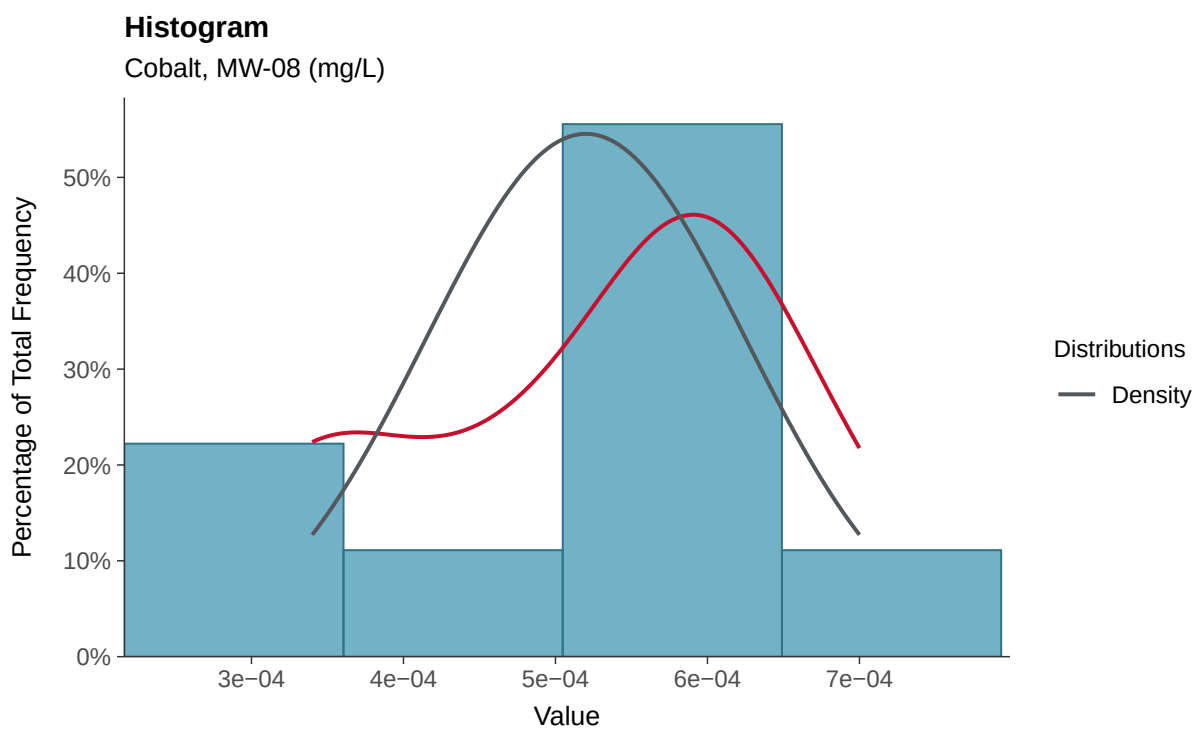
Chromium, Total, MW-08 (mg/L)



Appendix IV: Cobalt, MW-08

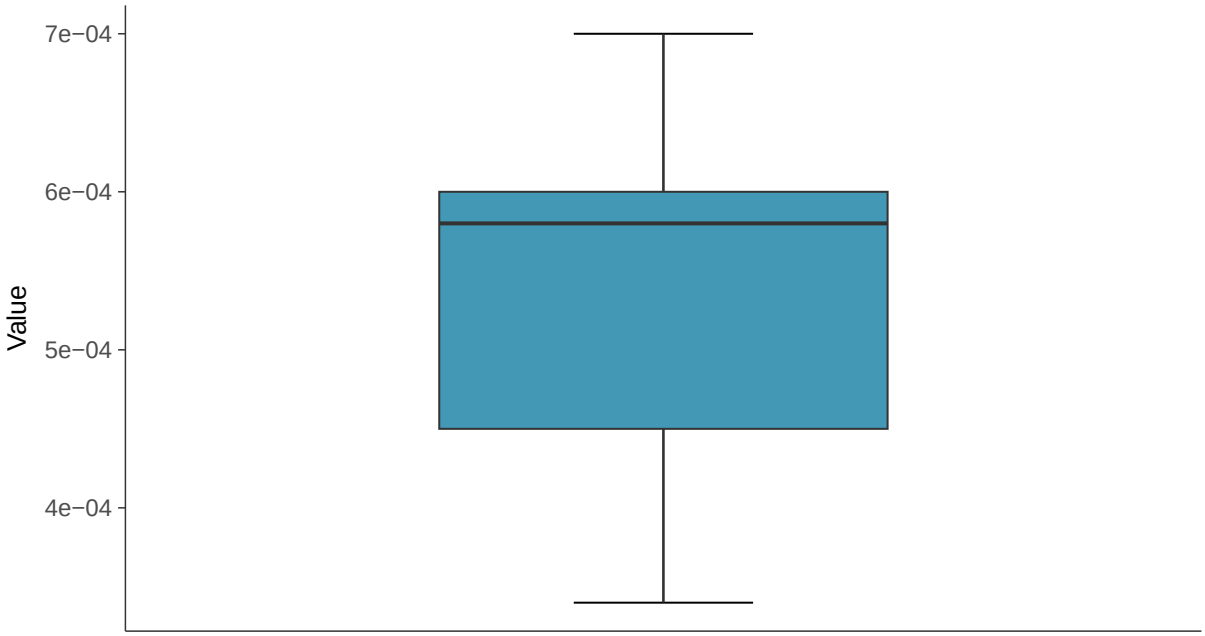
ID: 1_17_5_110





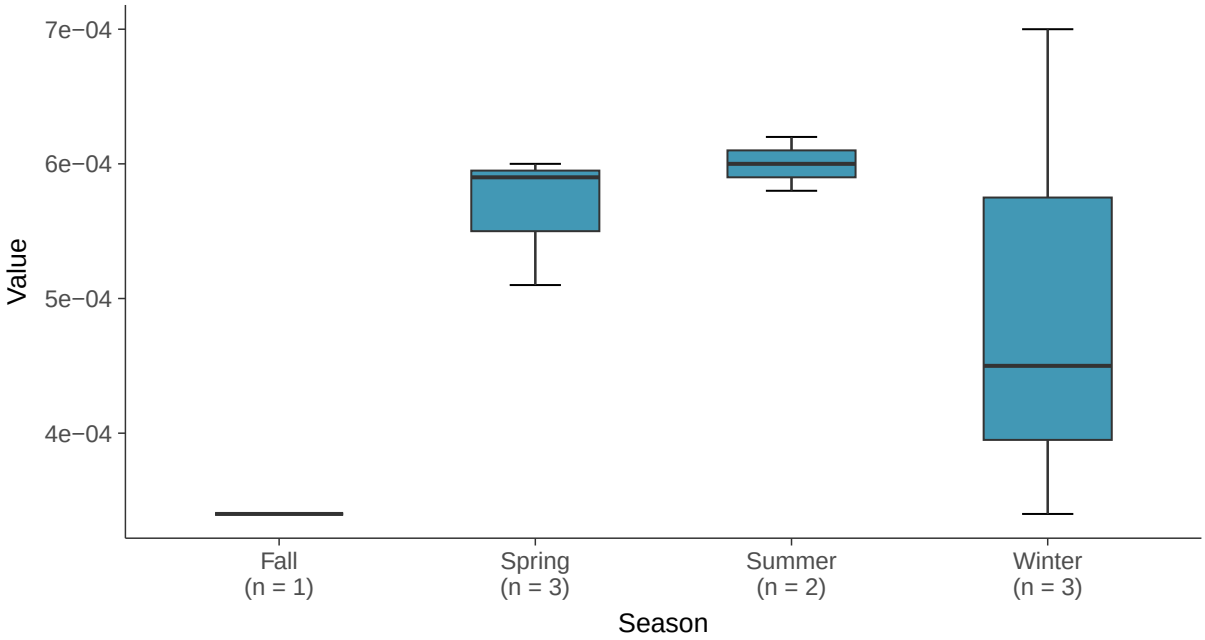
Boxplot

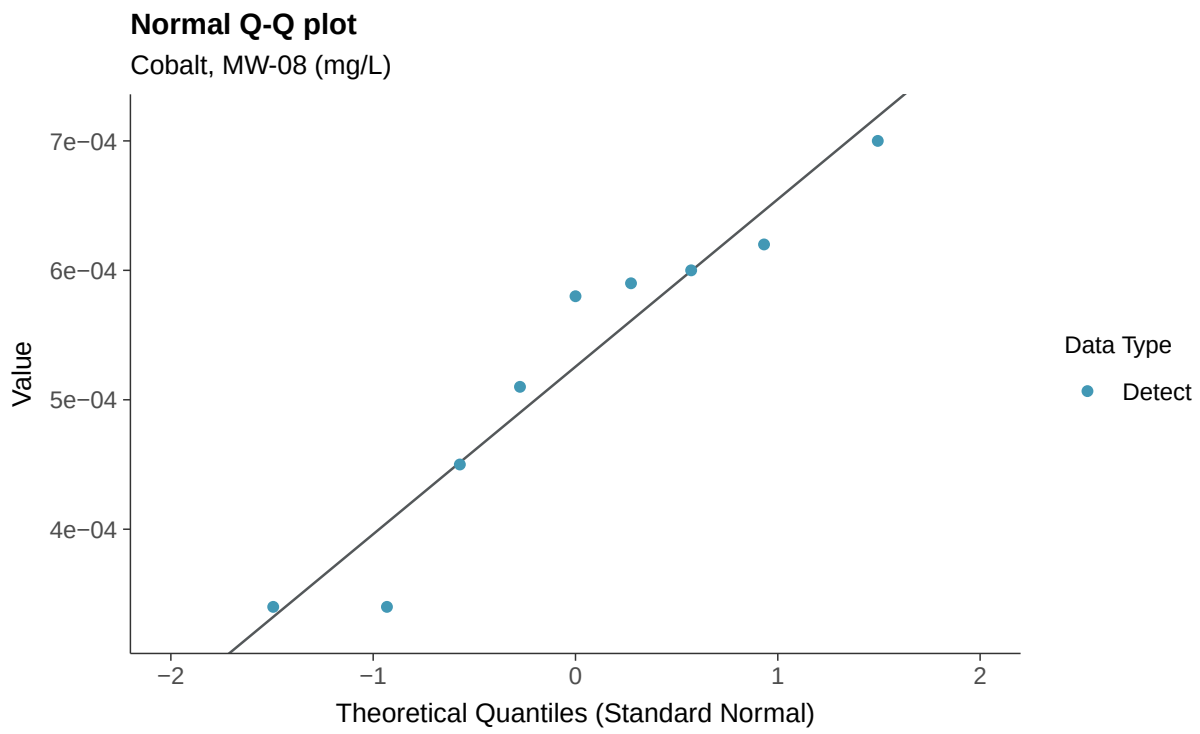
Cobalt, MW-08 (mg/L)

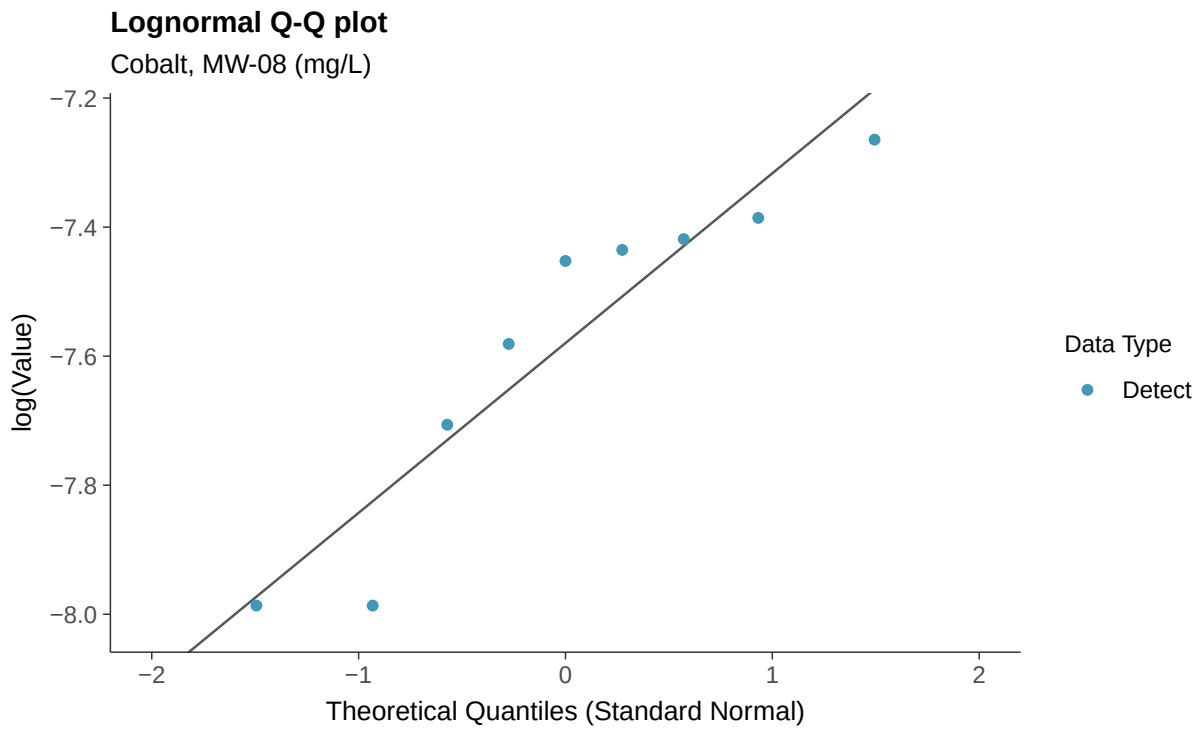


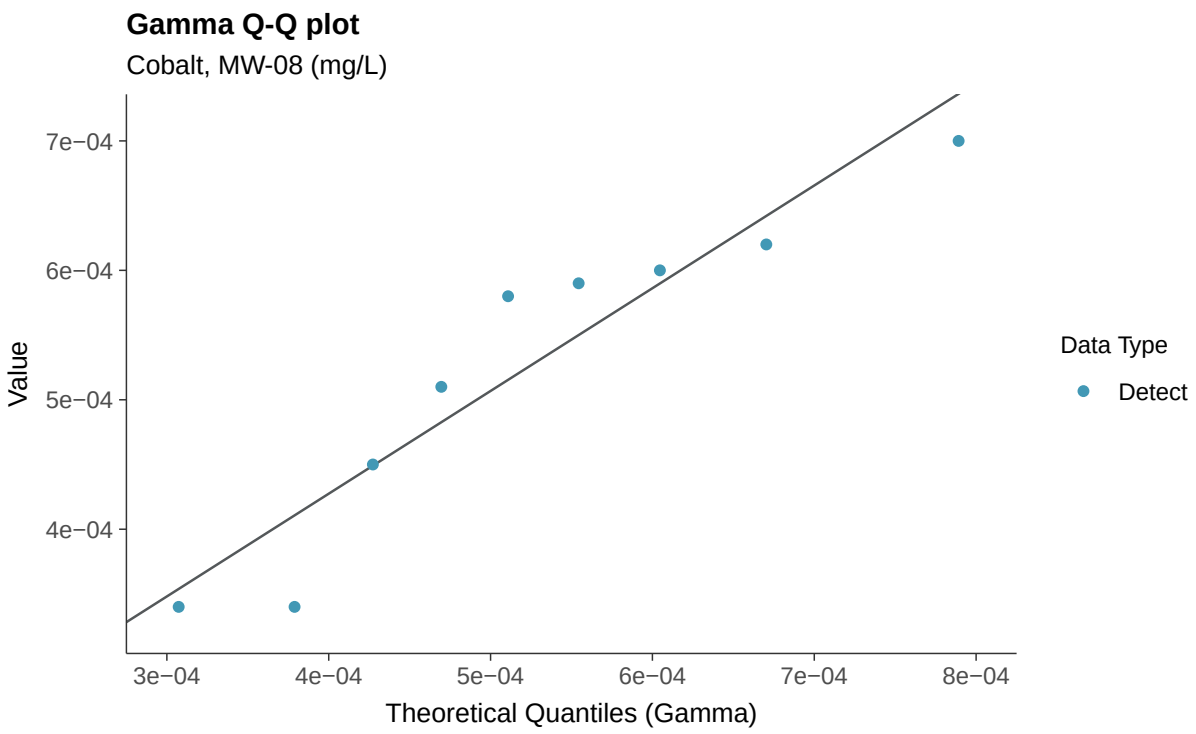
Boxplot by Season

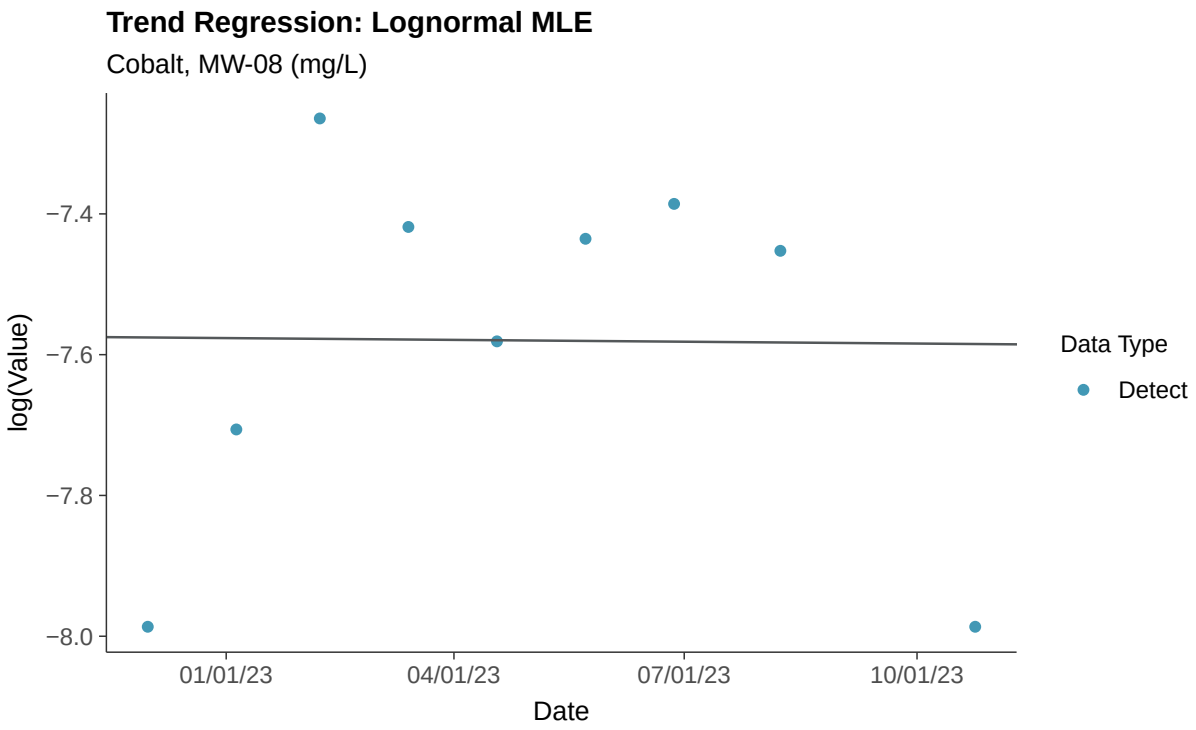
Cobalt, MW-08 (mg/L)




Normal Q-Q plot
Cobalt, MW-08 (mg/L)
Value
7e−04
6e−04
5e−04
4e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

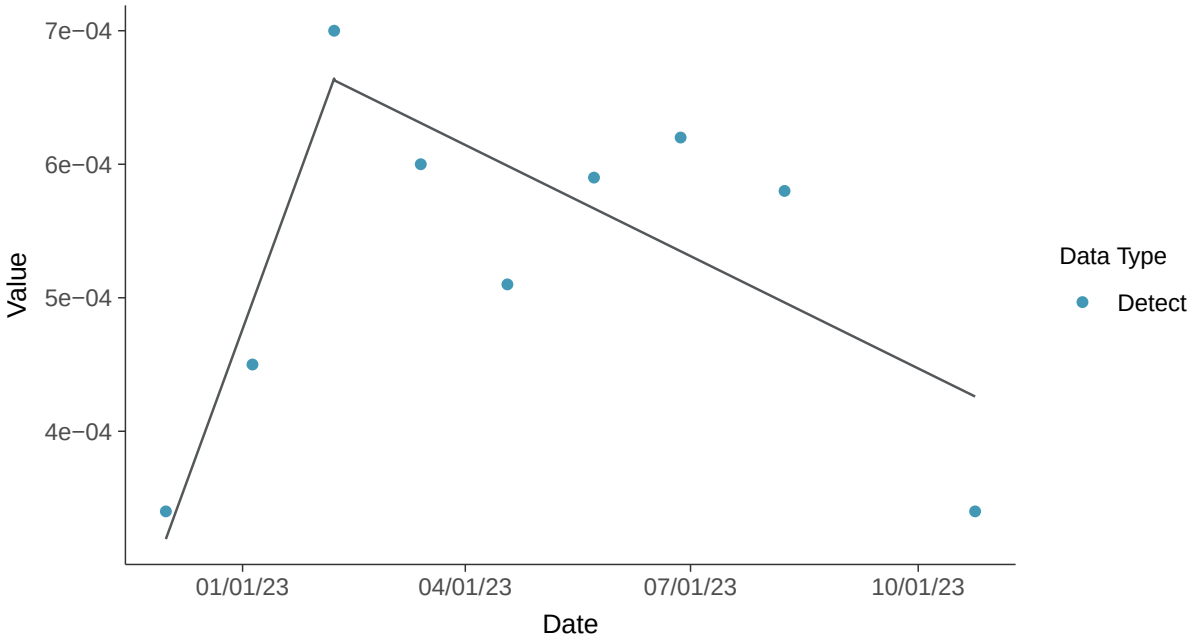

Lognormal Q-Q plot
Cobalt, MW-08 (mg/L)
log(Value)
−7.2
−7.4
−7.6
−7.8
−8.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-08 (mg/L)
Value
7e−04
6e−04
5e−04
4e−04
3e−04
4e−04
5e−04
6e−04
7e−04
8e−04
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-08 (mg/L)
log(Value)
−7.4
−7.6
−7.8
−8.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

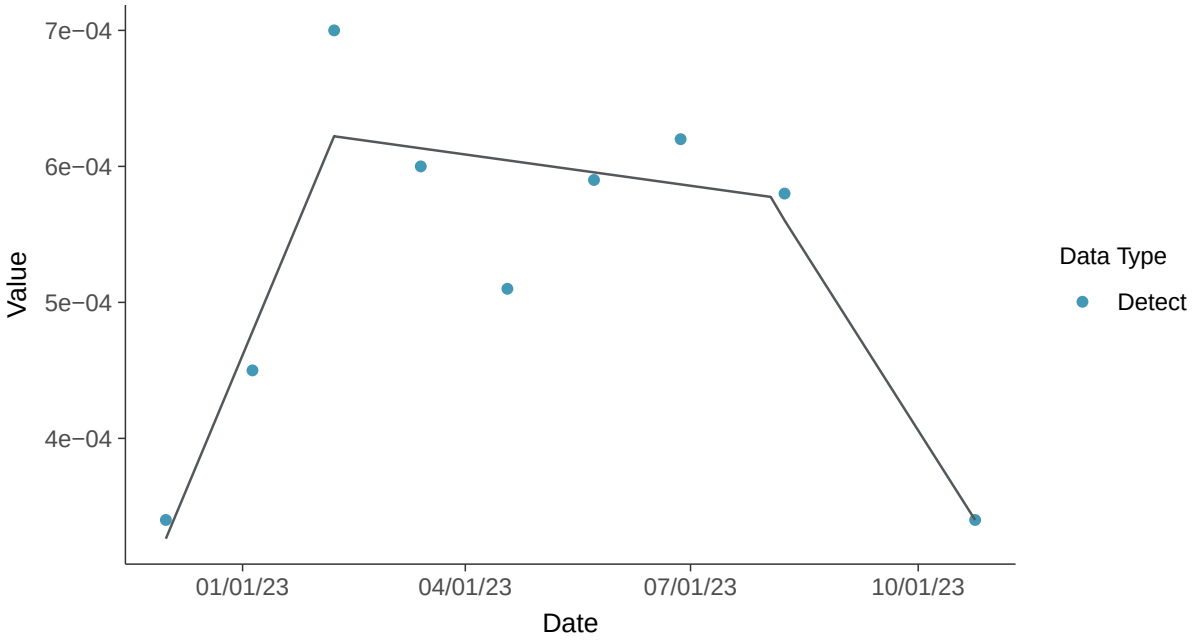
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-08 (mg/L)



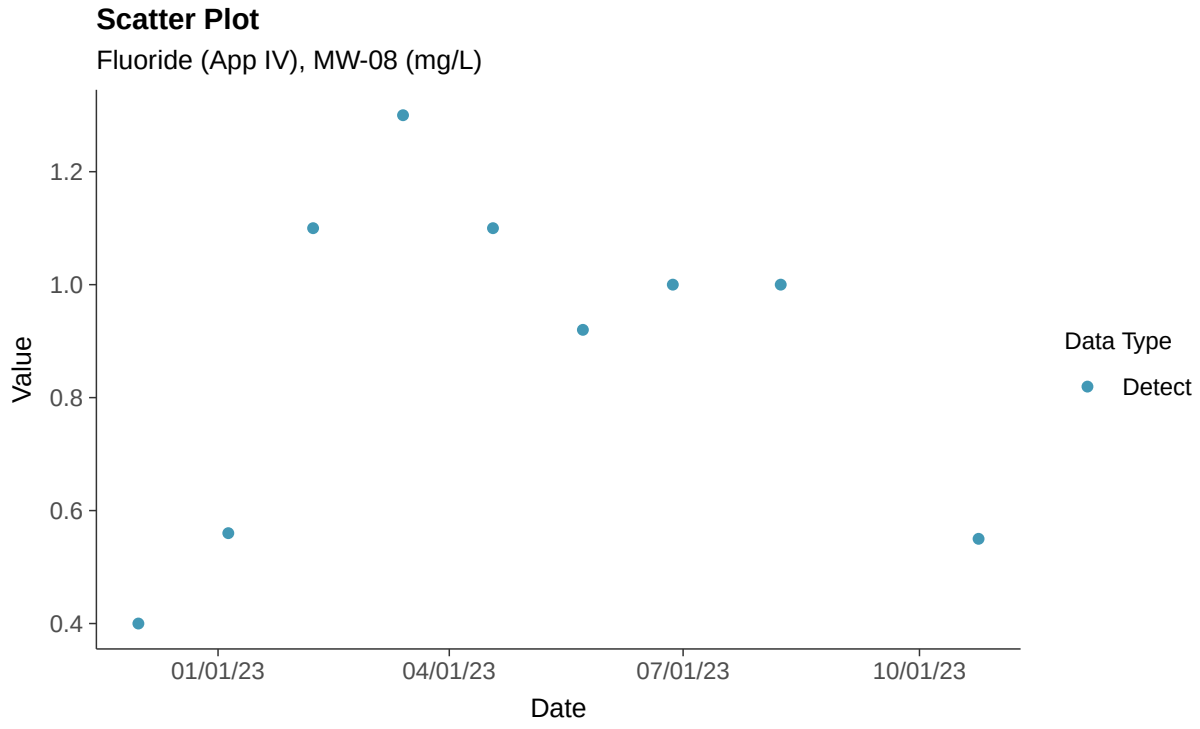
Trend Regression: Piecewise Linear-Linear-Linear

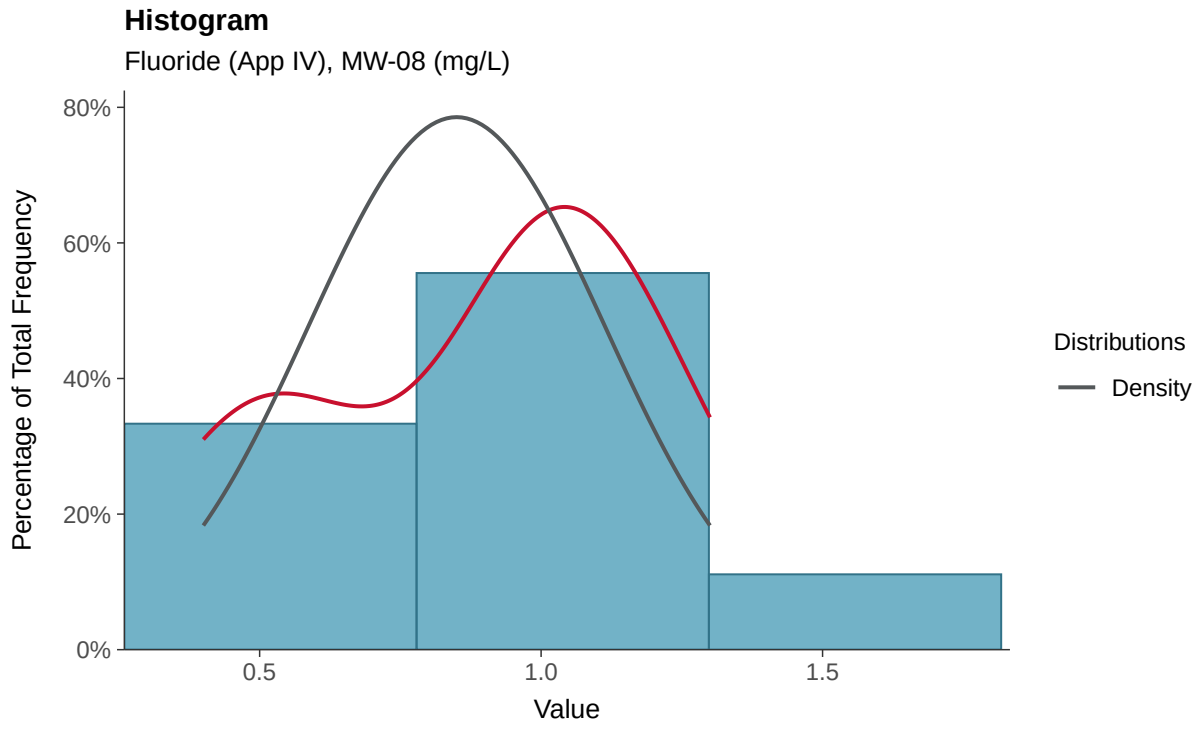
Cobalt, MW-08 (mg/L)



Appendix IV: Fluoride (App IV), MW-08

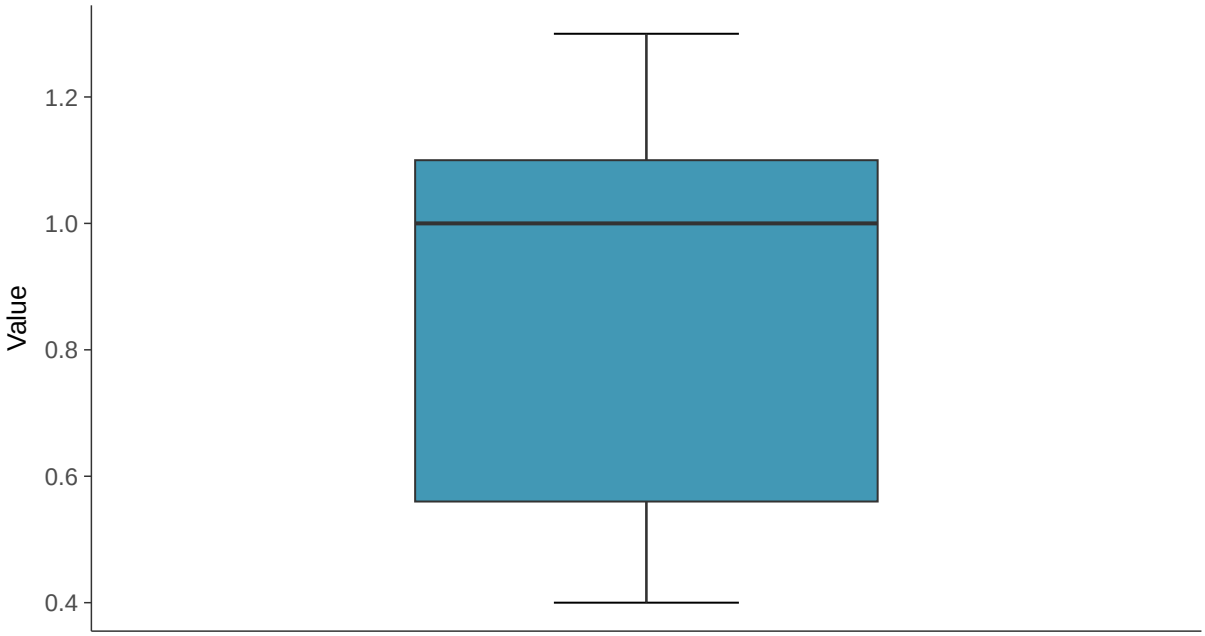
ID: 1_17_5_113





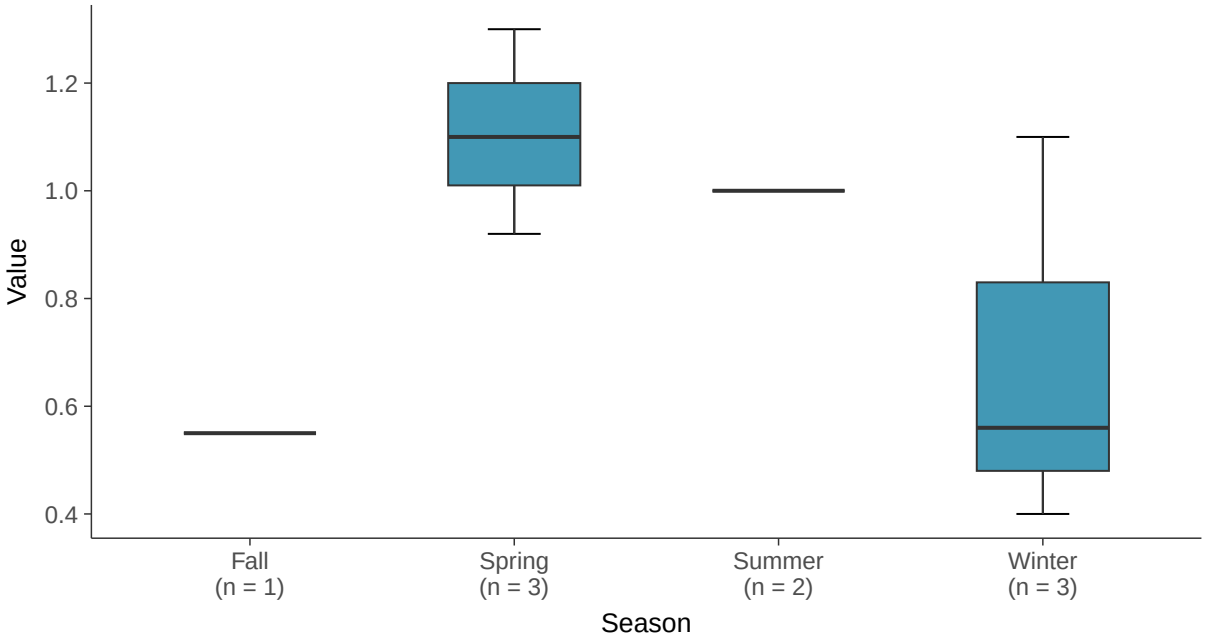
Boxplot

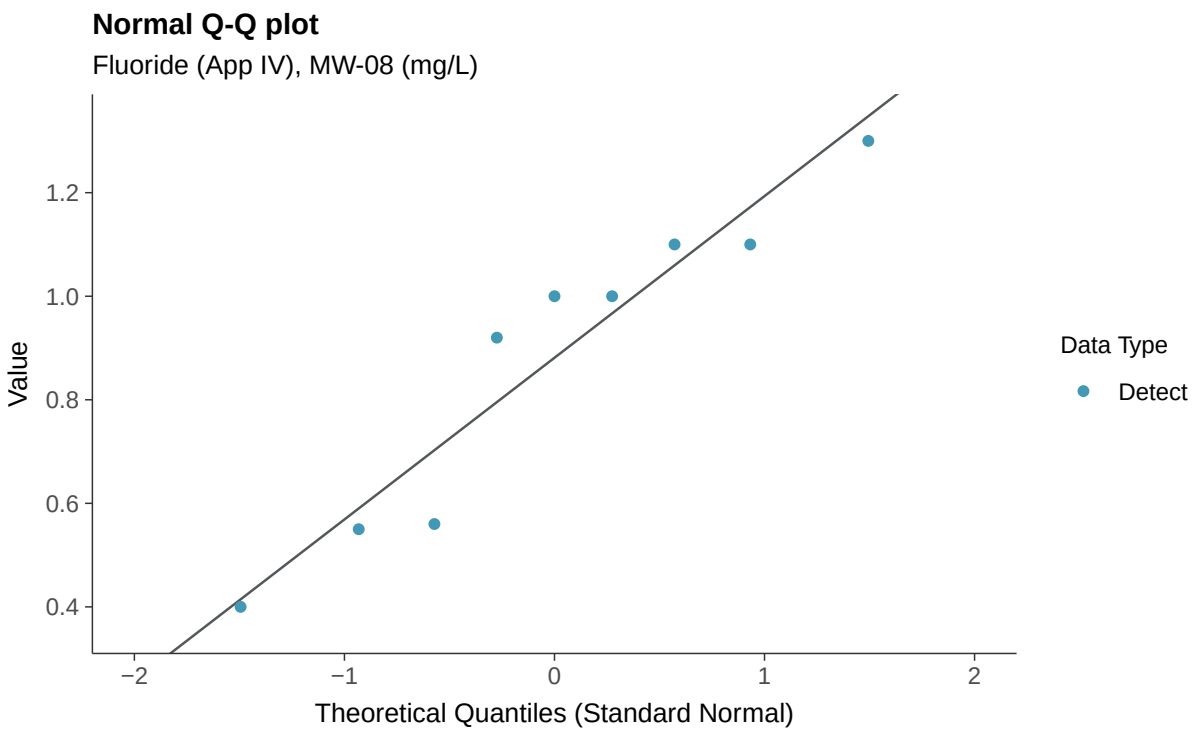
Fluoride (App IV), MW-08 (mg/L)

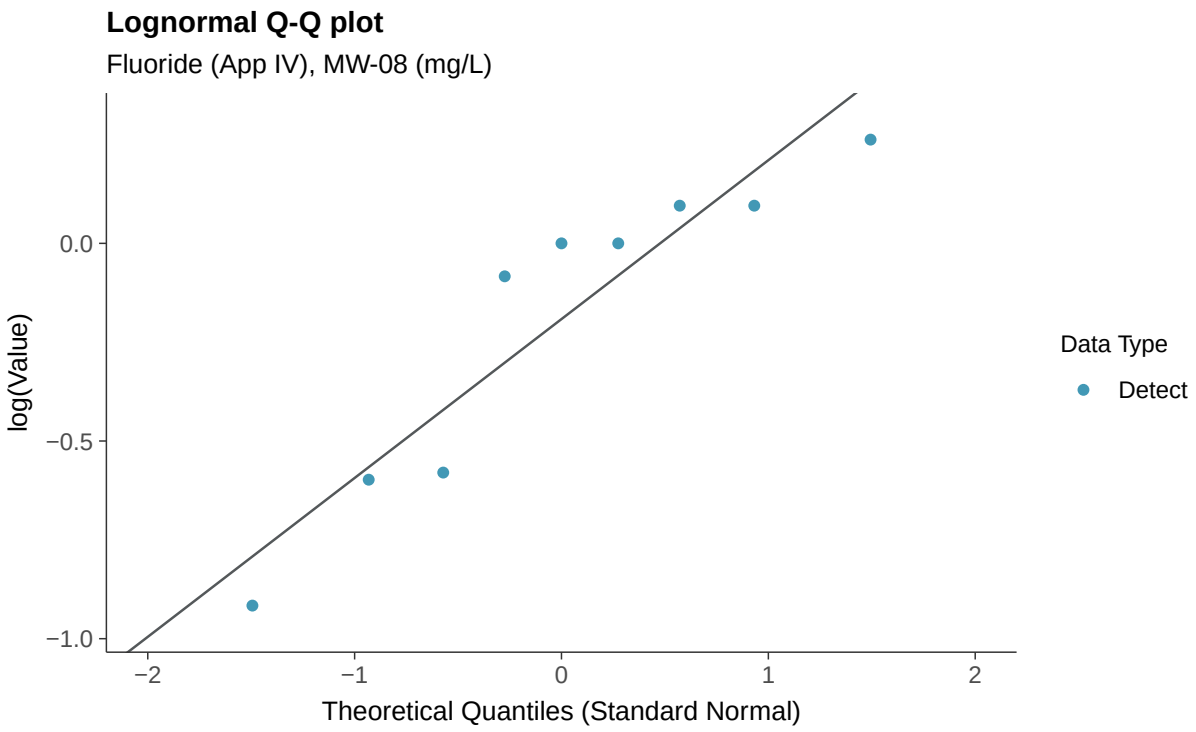


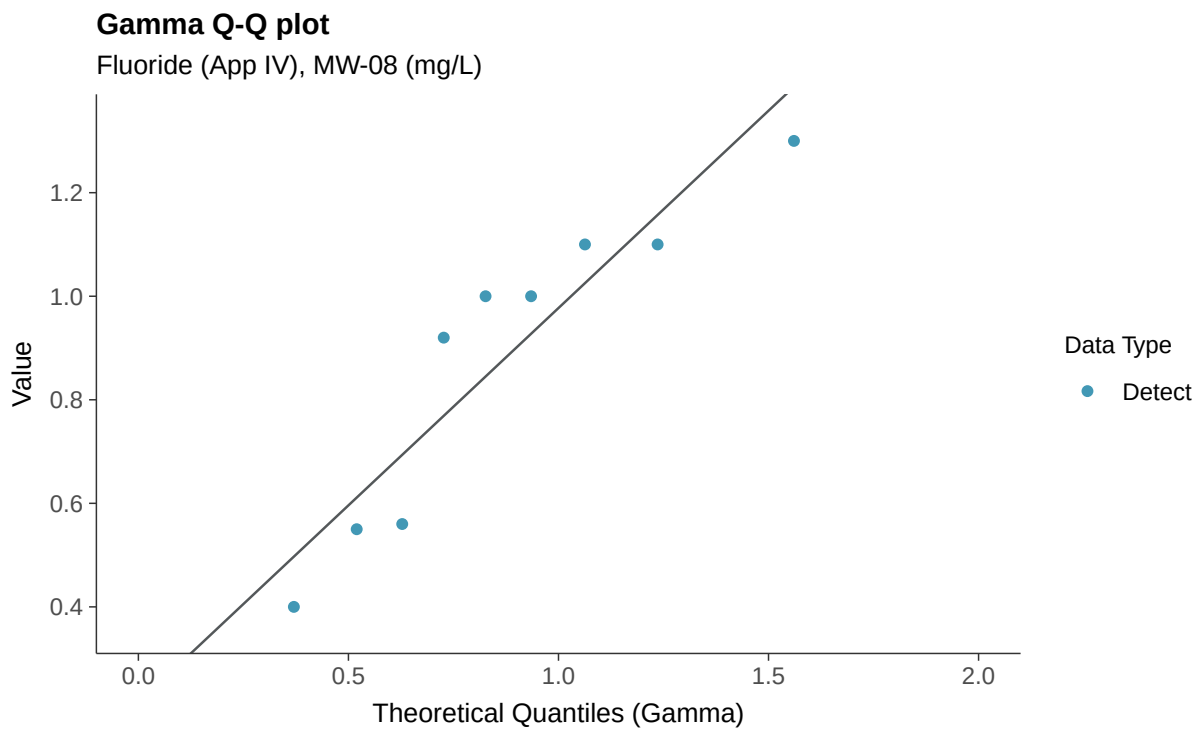
Boxplot by Season

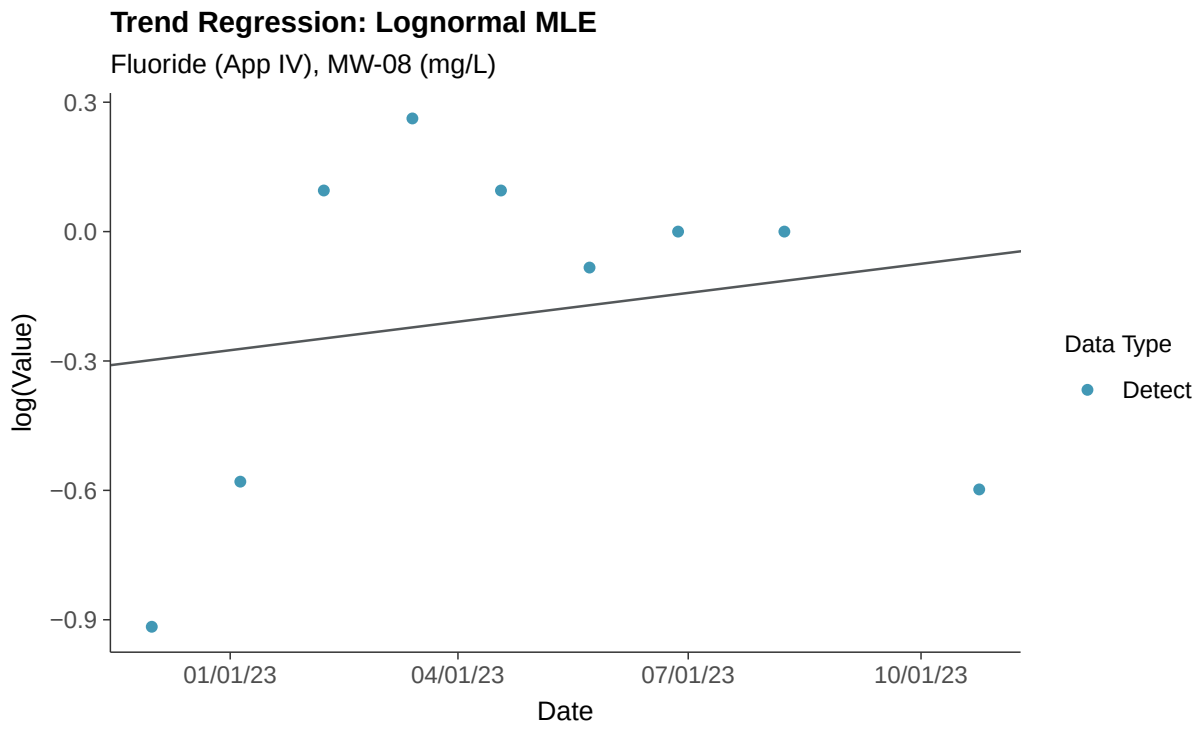
Fluoride (App IV), MW-08 (mg/L)

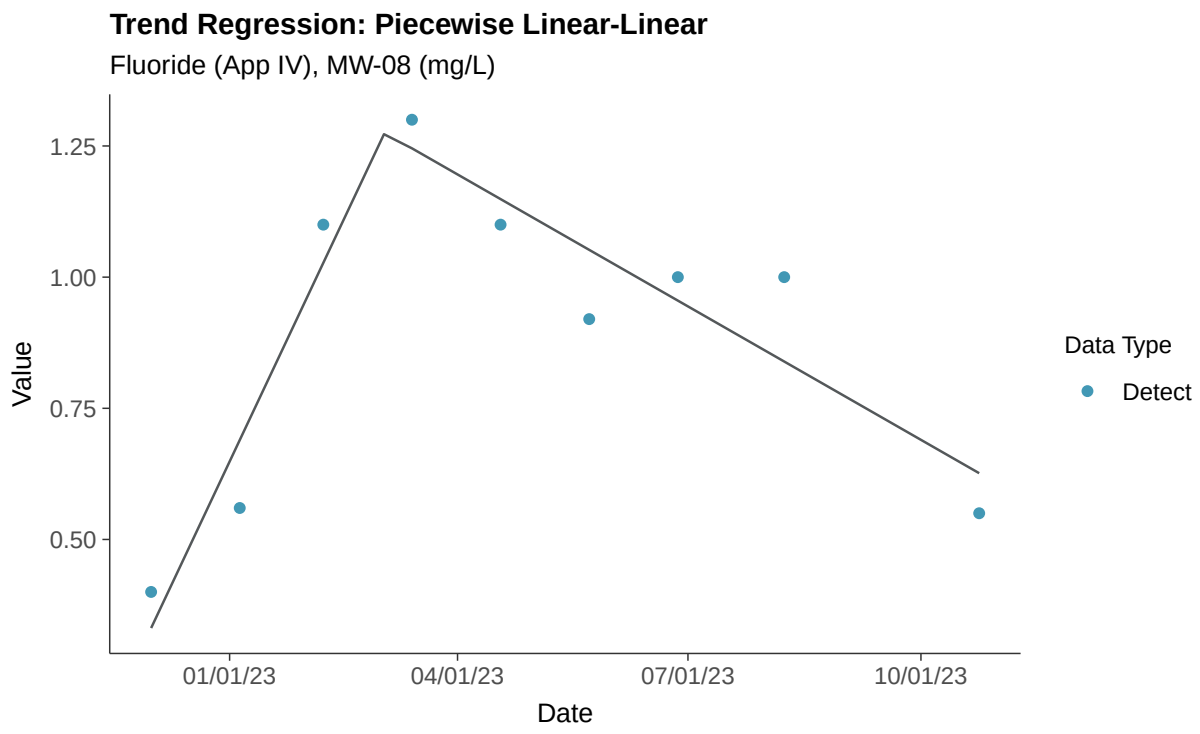



Normal Q-Q plot
Fluoride (App IV), MW-08 (mg/L)
Value
1.2
1.0
0.8
0.6
0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride (App IV), MW-08 (mg/L)
log(Value)
0.0
−0.5
−1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

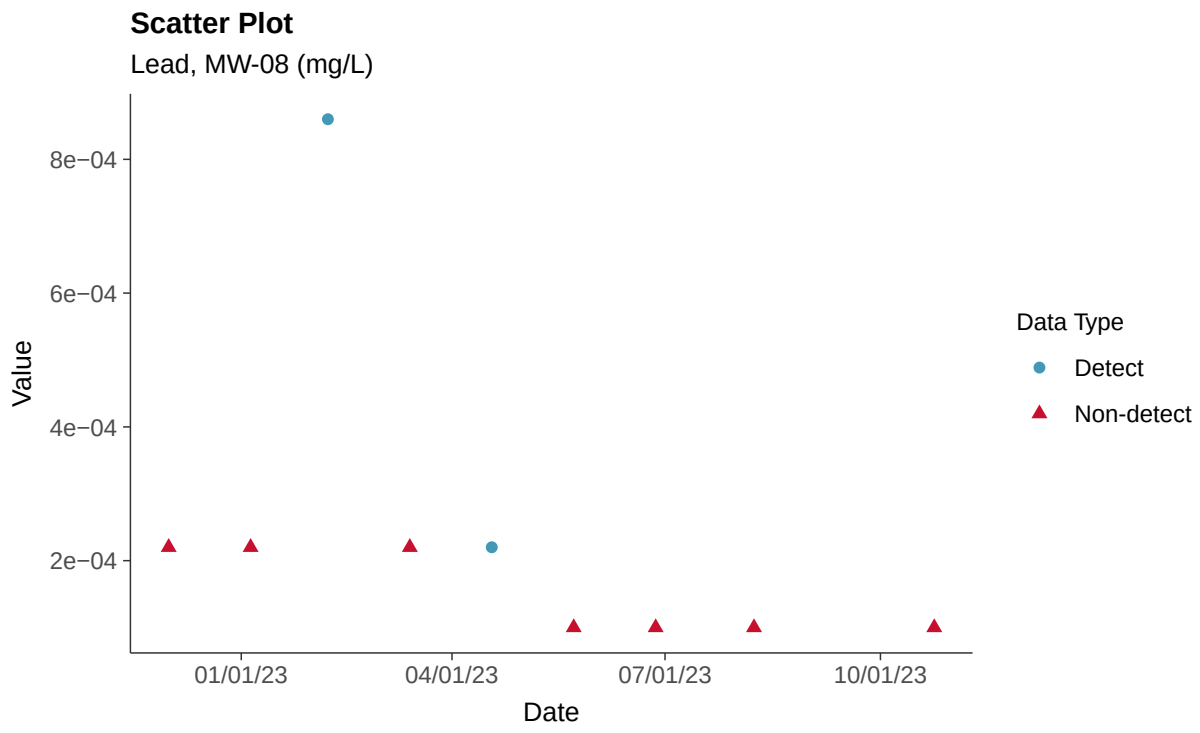

Gamma Q-Q plot
Fluoride (App IV), MW-08 (mg/L)
Value
1.2
1.0
0.8
0.6
0.4
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect

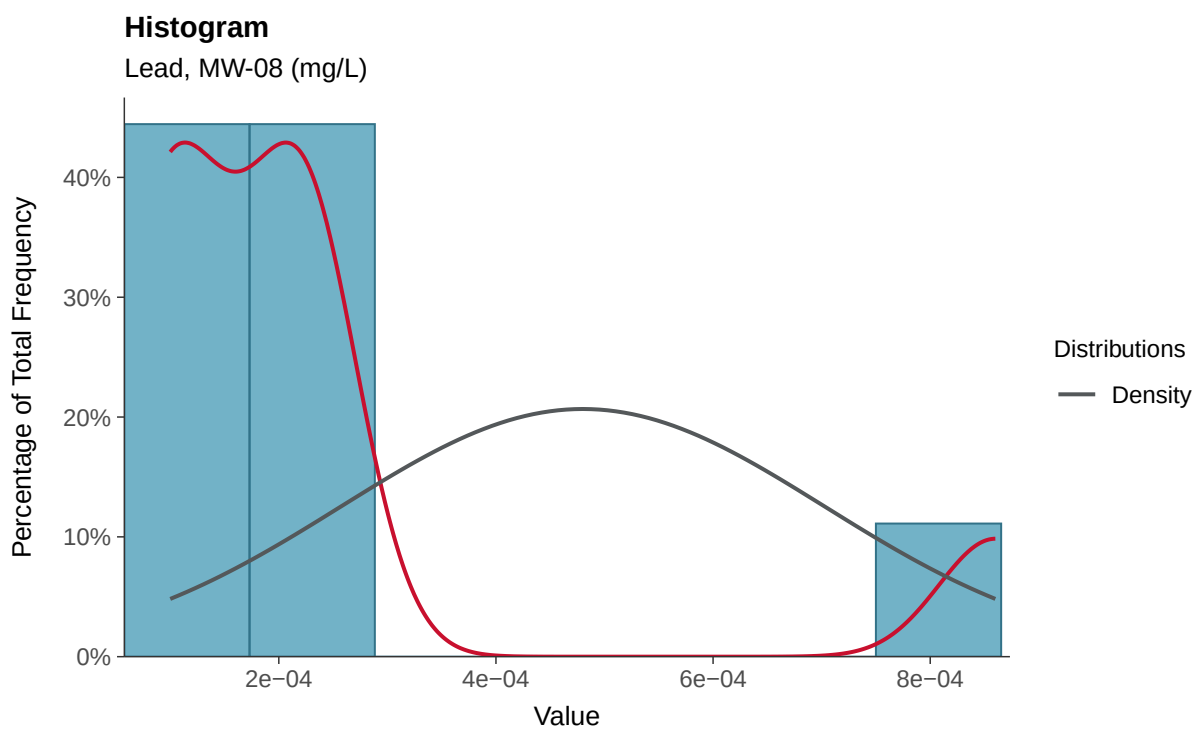

Trend Regression: Lognormal MLE
Fluoride (App IV), MW-08 (mg/L)
log(Value)
0.3
0.0
−0.3
−0.6
−0.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Fluoride (App IV), MW-08 (mg/L)
1.25
1.00
0.75
0.50
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lead, MW-08

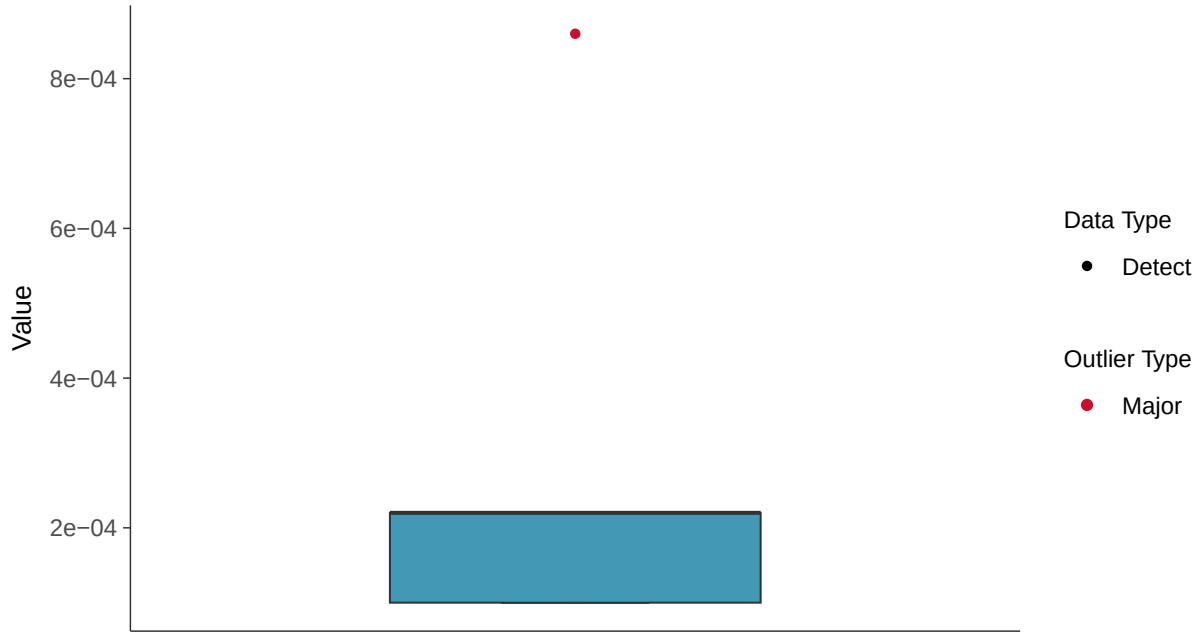
ID: 1_17_5_115





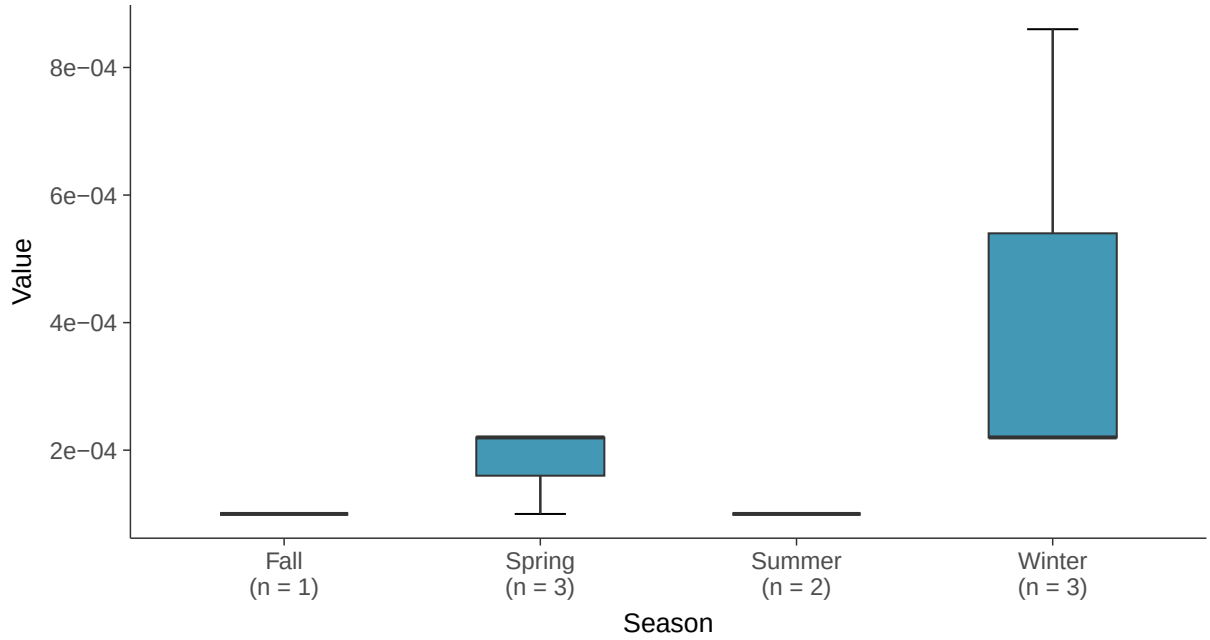
Boxplot

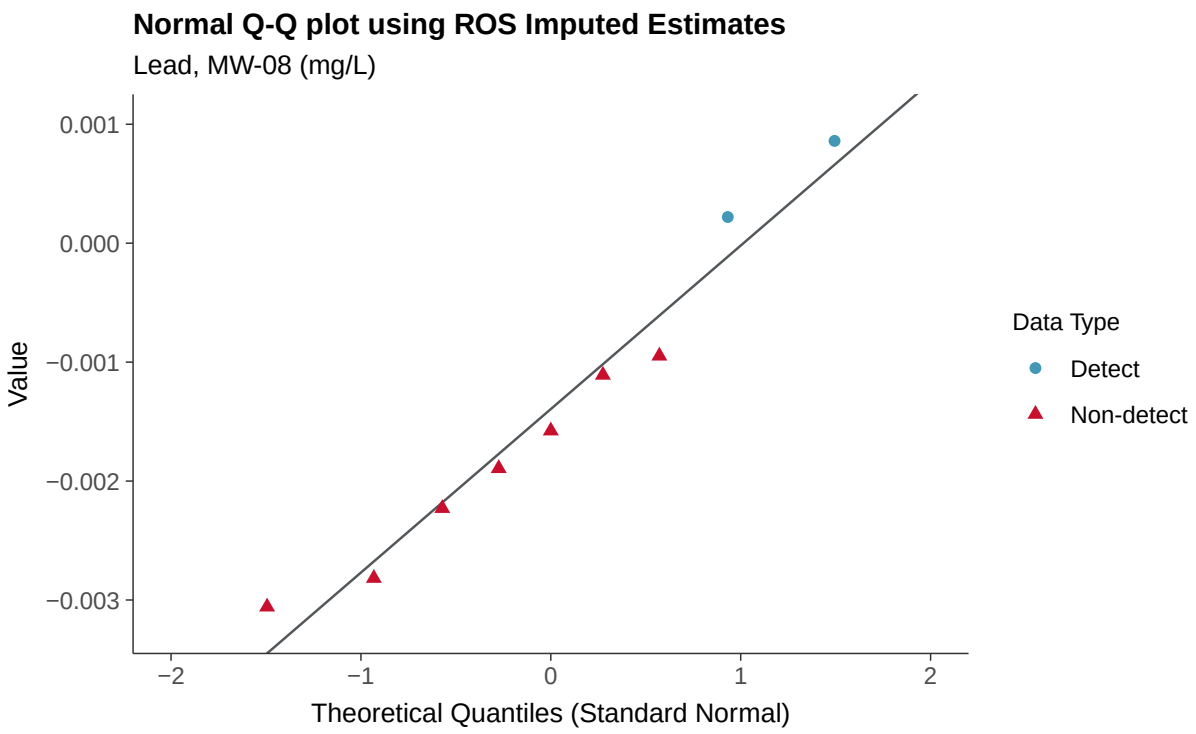
Lead, MW-08 (mg/L)

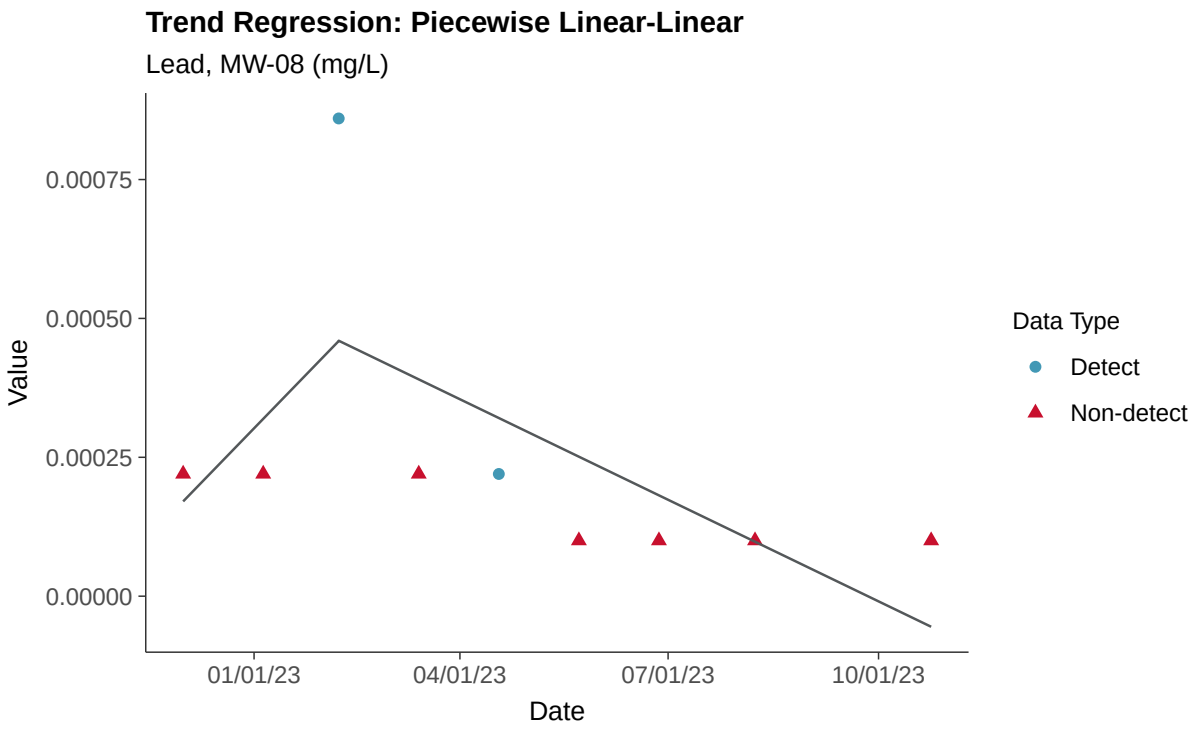


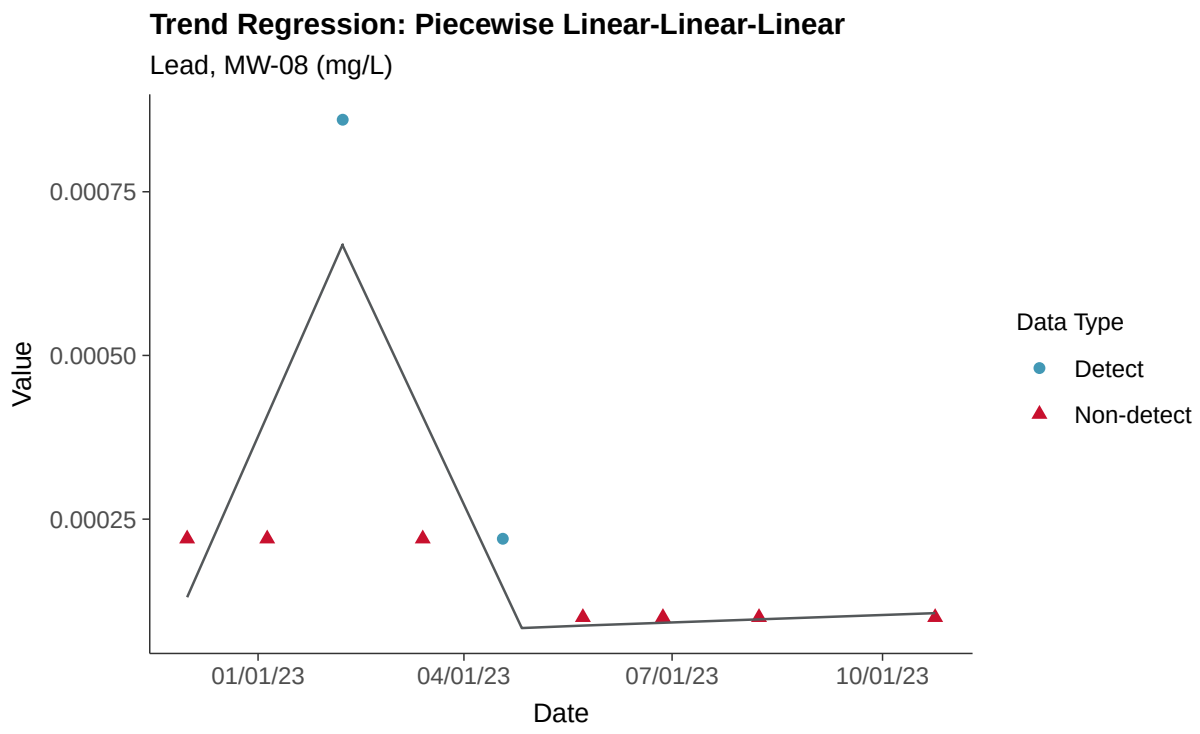
Boxplot by Season

Lead, MW-08 (mg/L)



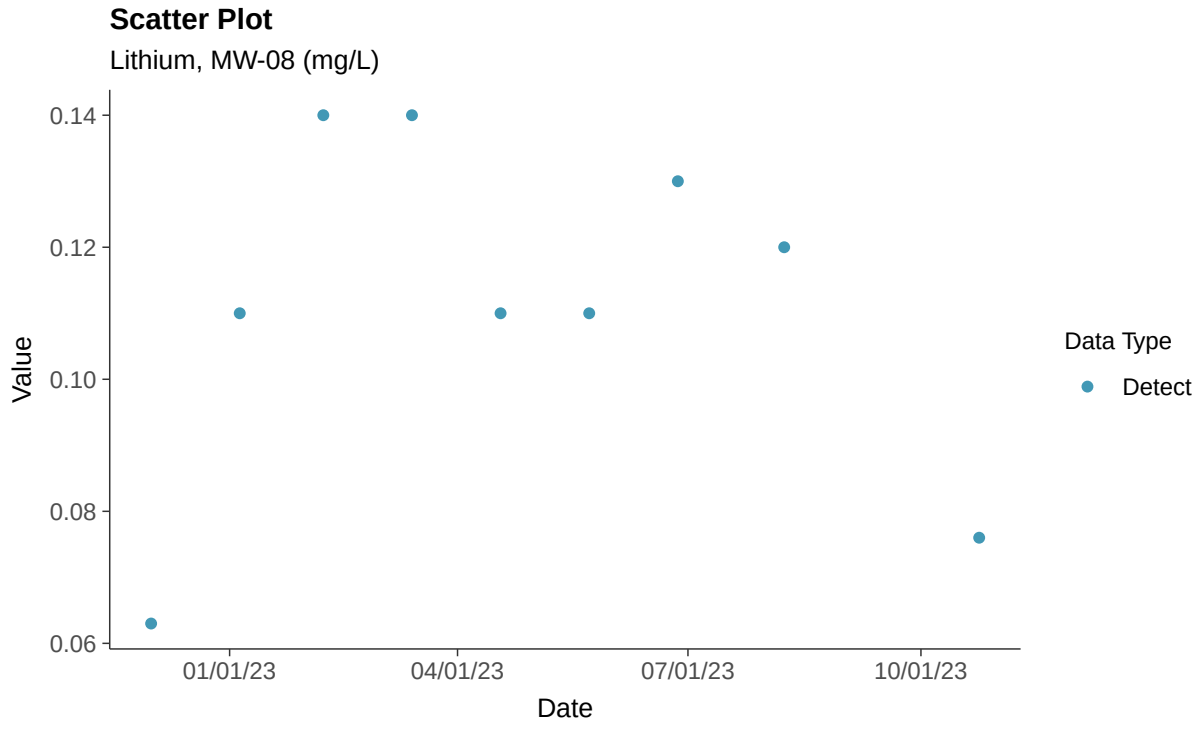

Normal Q-Q plot using ROS Imputed Estimates
Lead, MW-08 (mg/L)
Value
0.001
0.000
−0.001
−0.002
−0.003
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

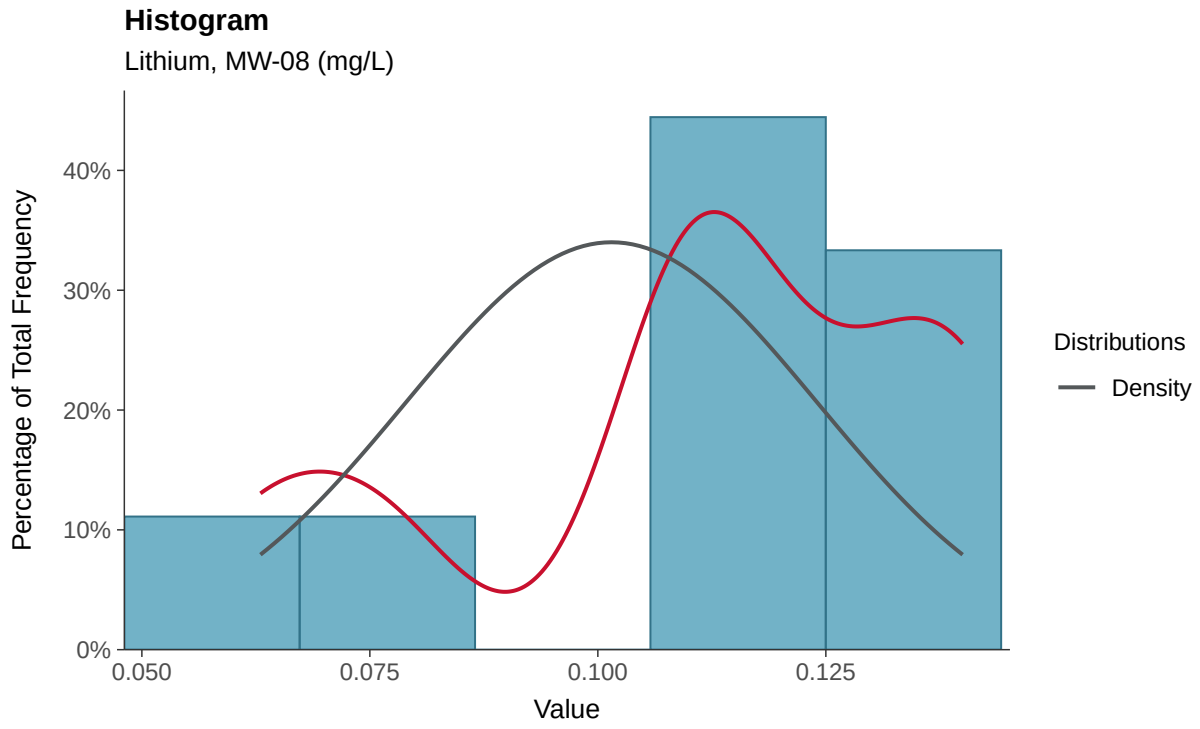

Trend Regression: Piecewise Linear-Linear
Lead, MW-08 (mg/L)
Value
0.00075
0.00050
0.00025
0.00000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-08 (mg/L)
0.00075
0.00050
0.00025
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lithium, MW-08

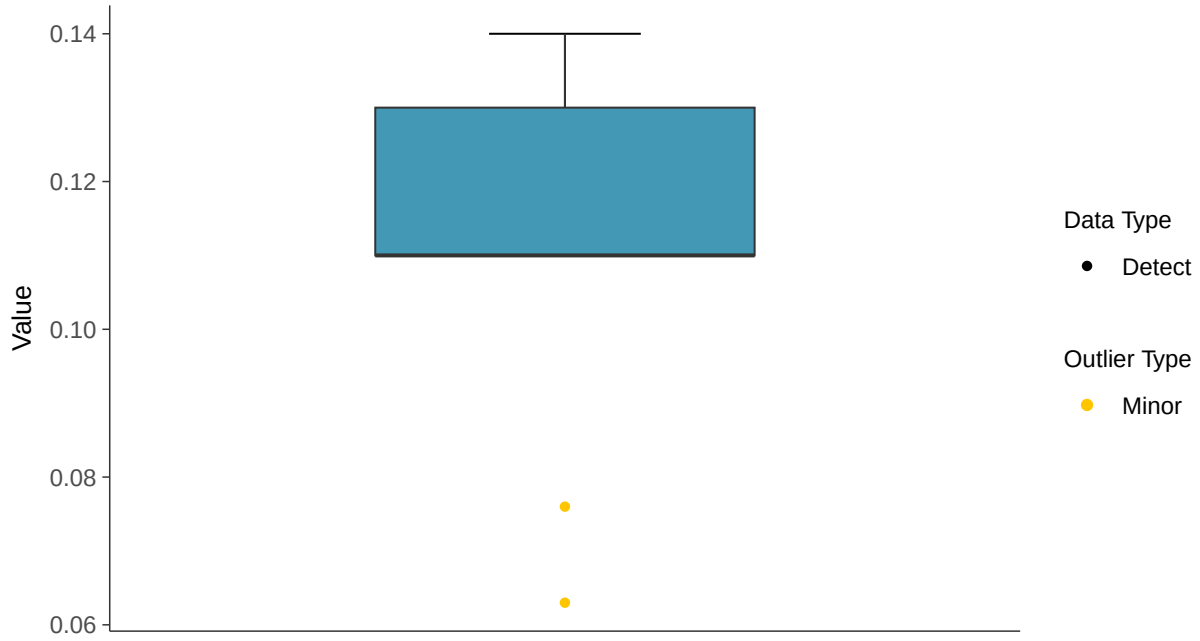
ID: 1_17_5_116





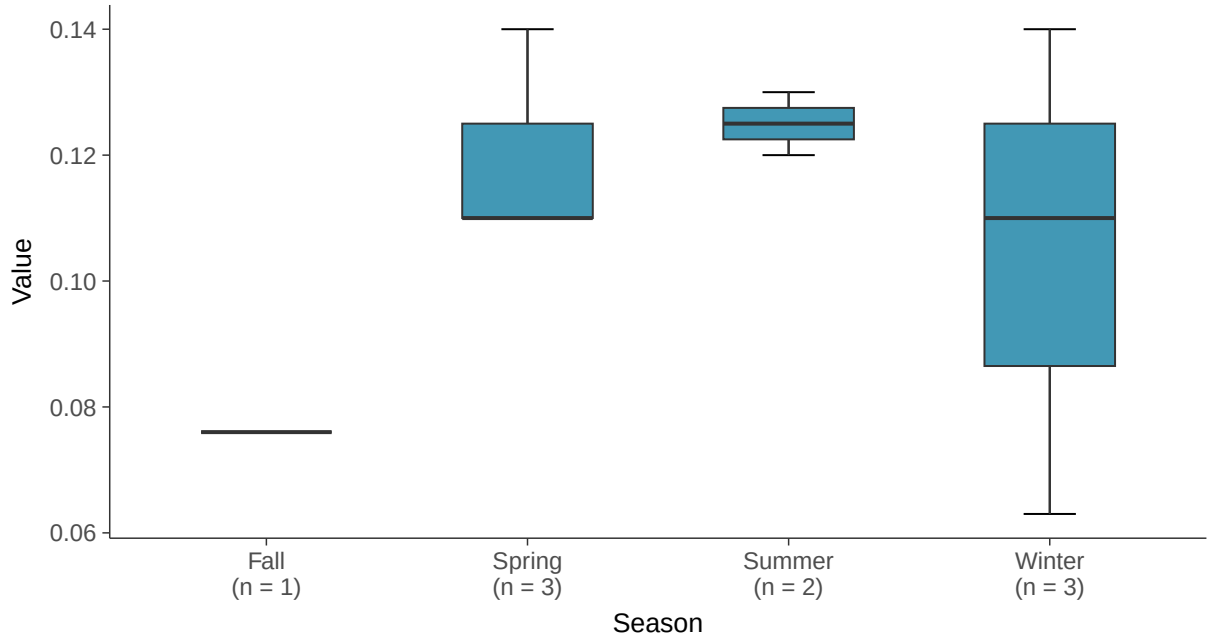
Boxplot

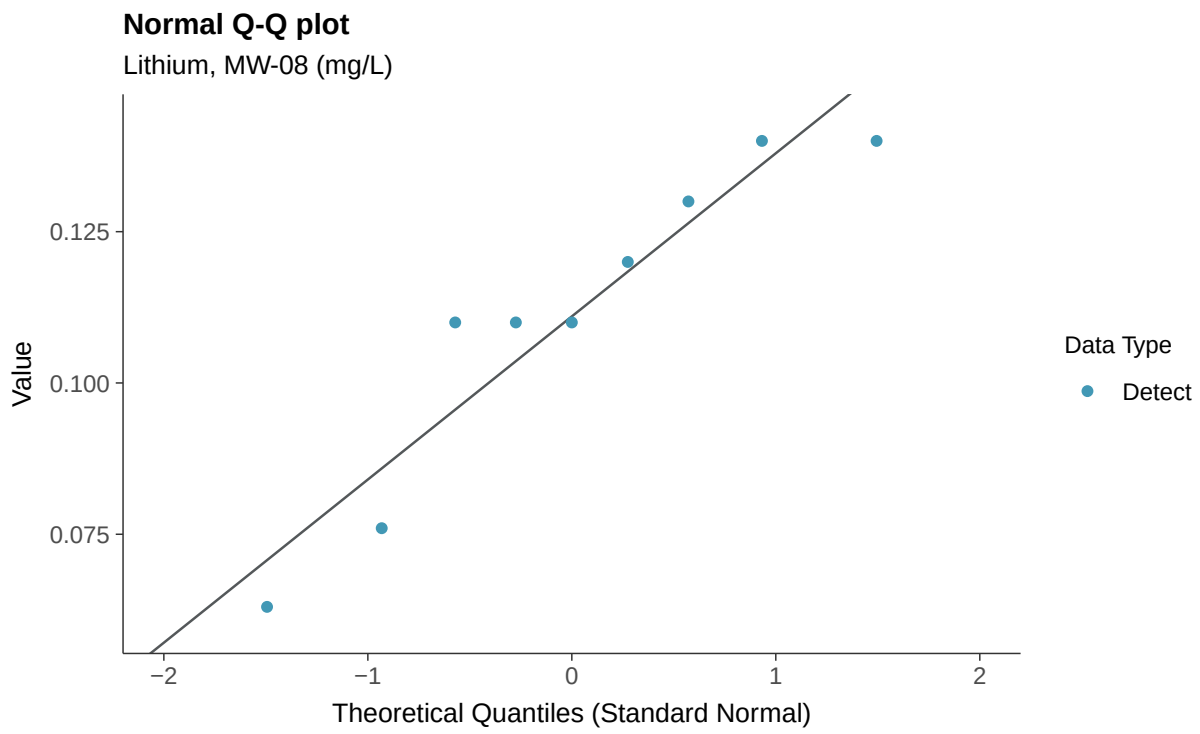
Lithium, MW-08 (mg/L)

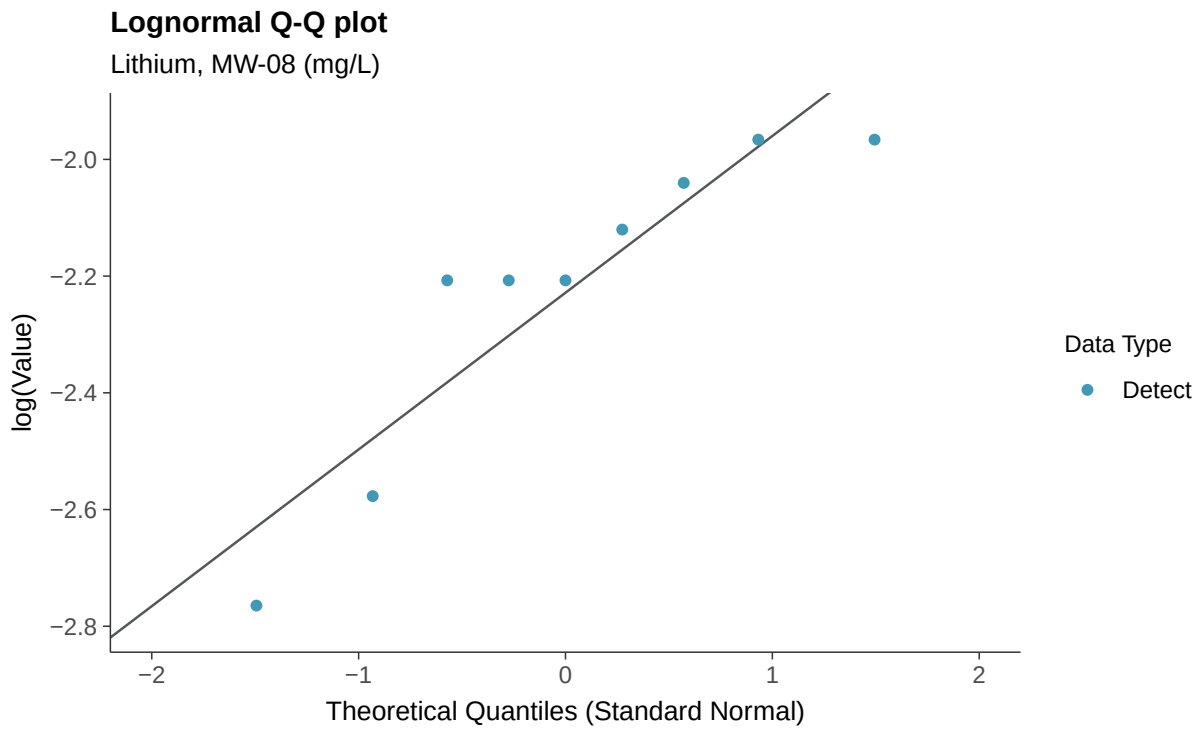


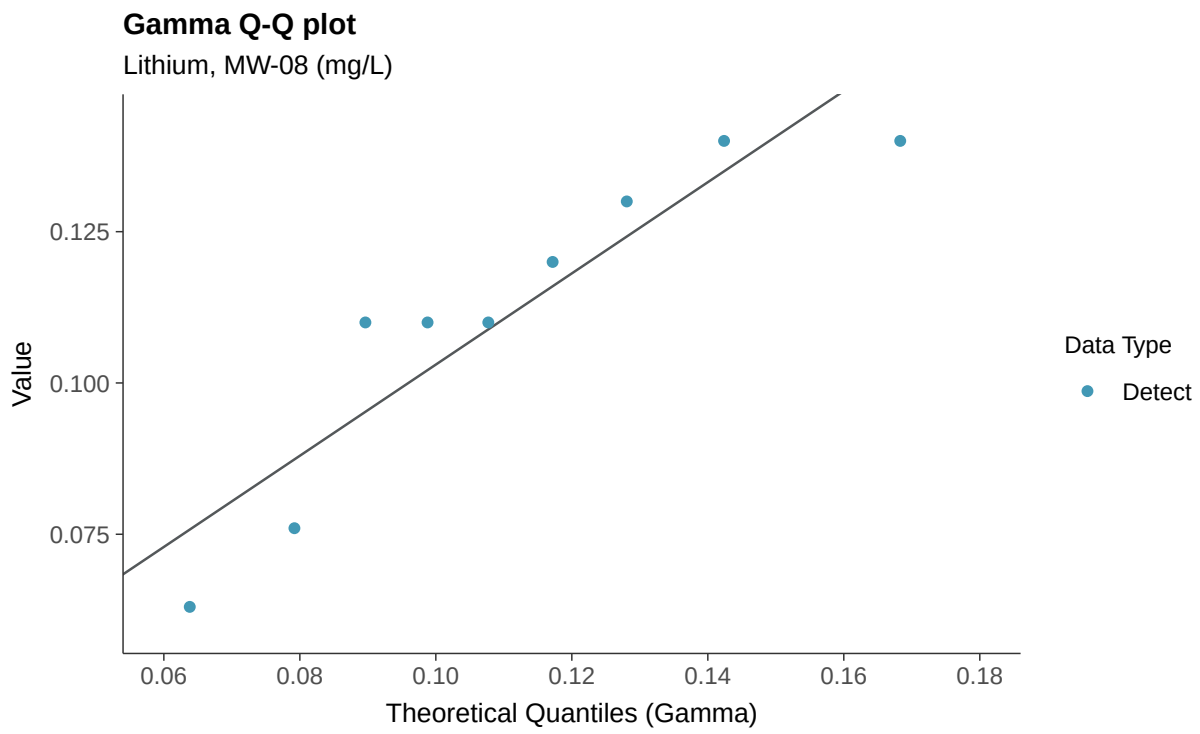
Boxplot by Season

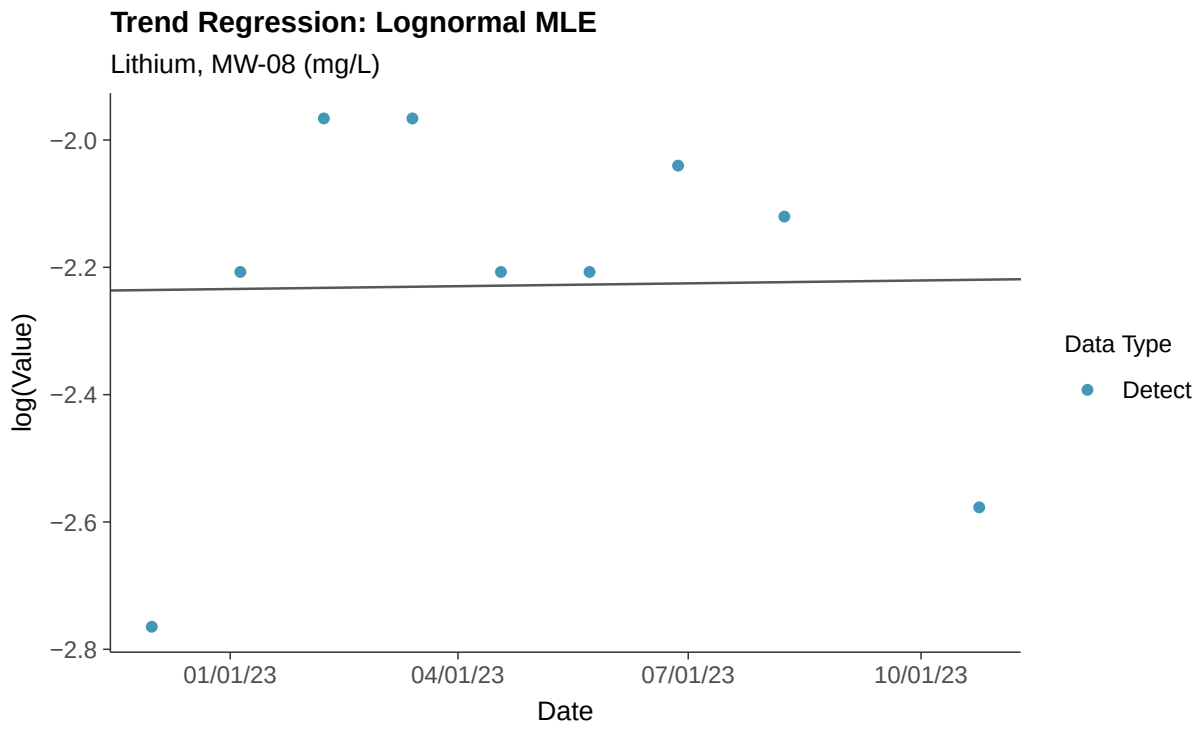
Lithium, MW-08 (mg/L)

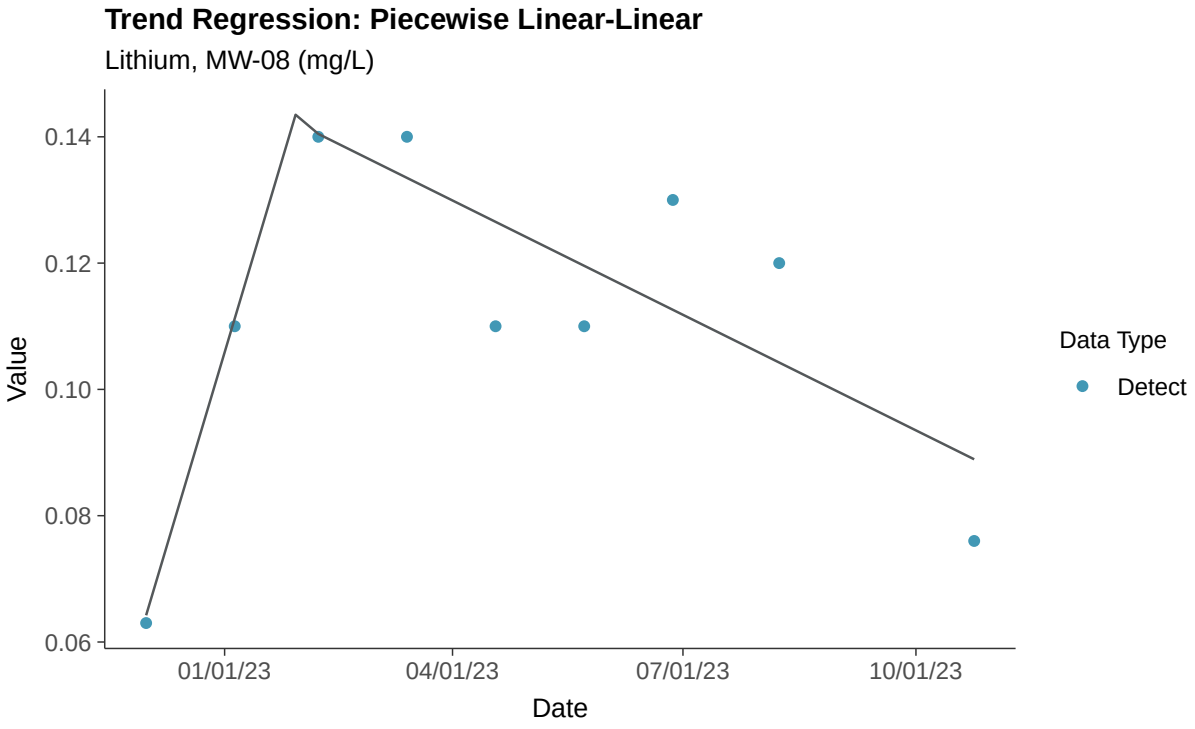



Normal Q-Q plot
Lithium, MW-08 (mg/L)
Value
0.125
0.100
0.075
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-08 (mg/L)
log(Value)
−2.0
−2.2
−2.4
−2.6
−2.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

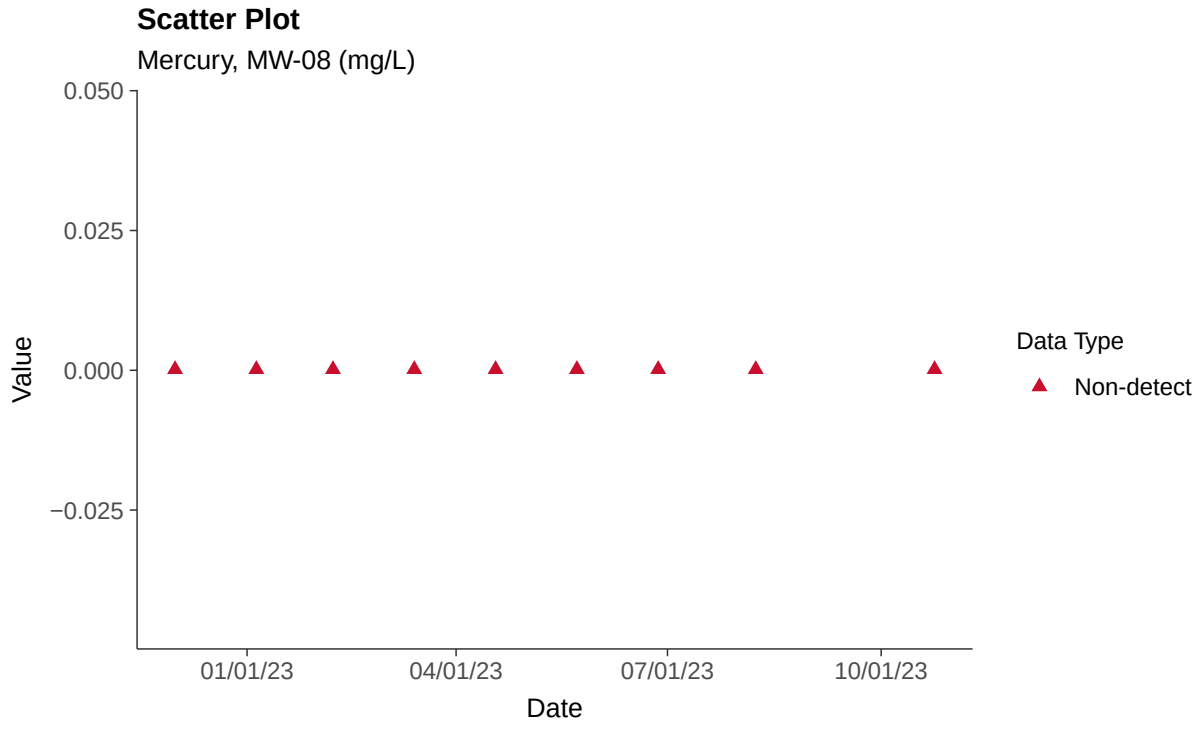

Gamma Q-Q plot
Lithium, MW-08 (mg/L)
Value
0.125
0.100
0.075
0.06
0.08
0.10
0.12
0.14
0.16
0.18
Theoretical Quantiles (Gamma)
Data Type
Detect

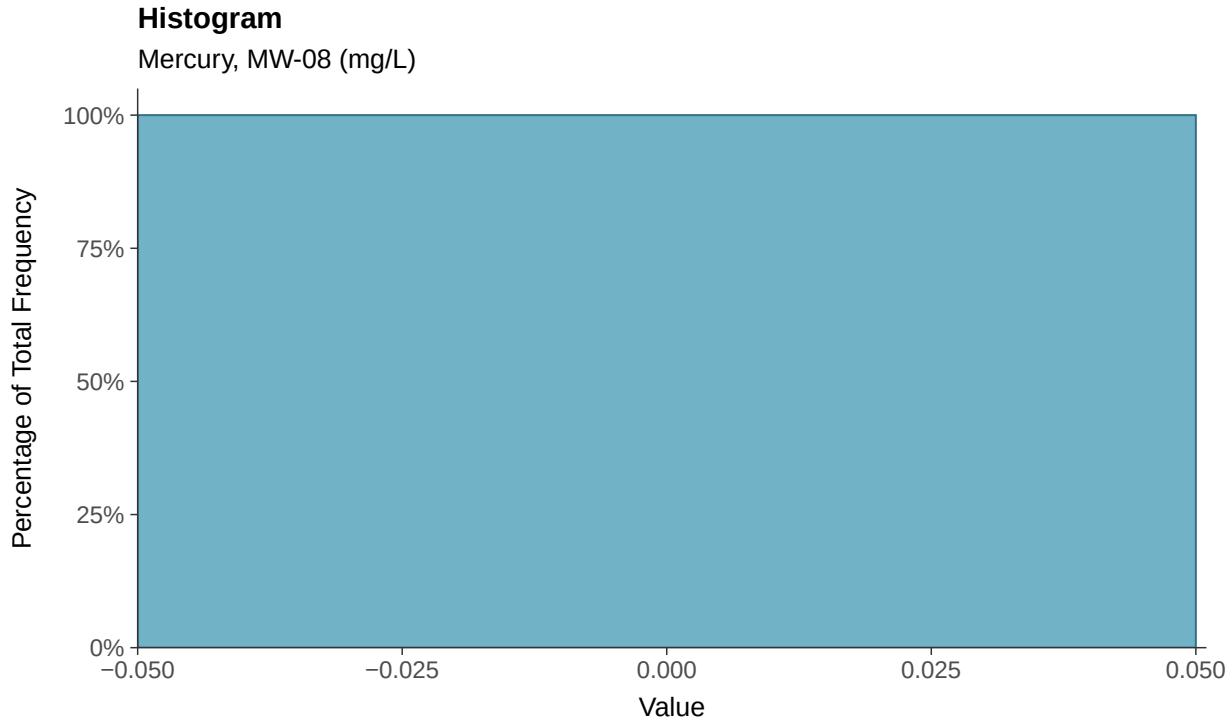

Trend Regression: Lognormal MLE
Lithium, MW-08 (mg/L)
log(Value)
−2.0
−2.2
−2.4
−2.6
−2.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Lithium, MW-08 (mg/L)
Value
0.14
0.12
0.10
0.08
0.06
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-08

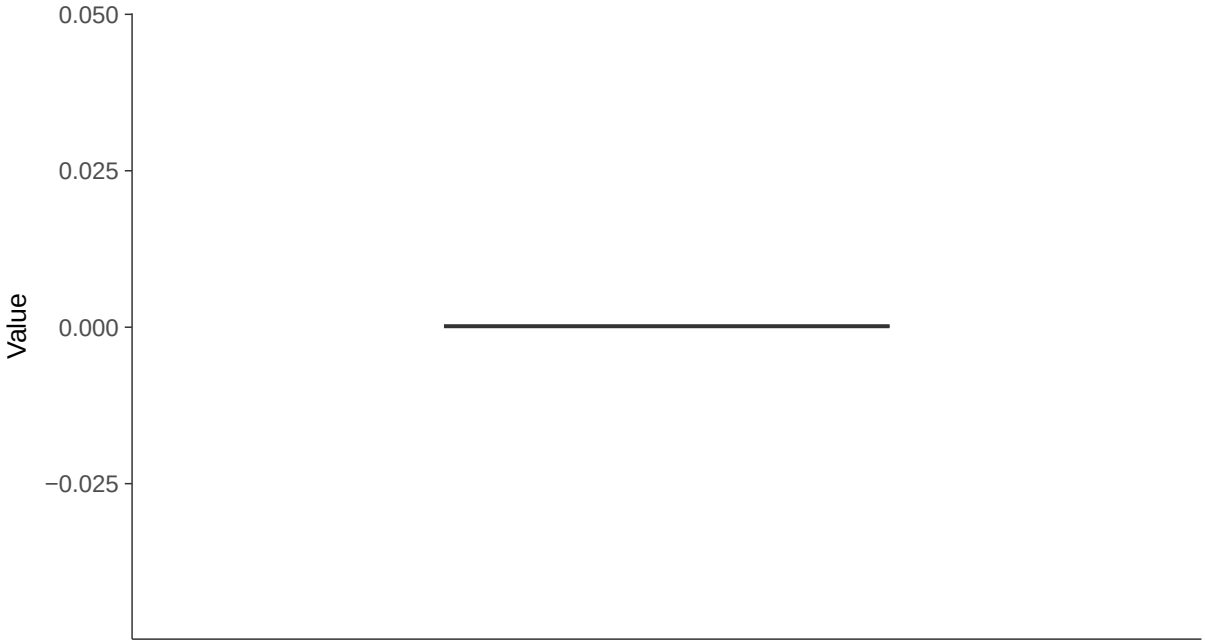
ID: 1_17_5_117





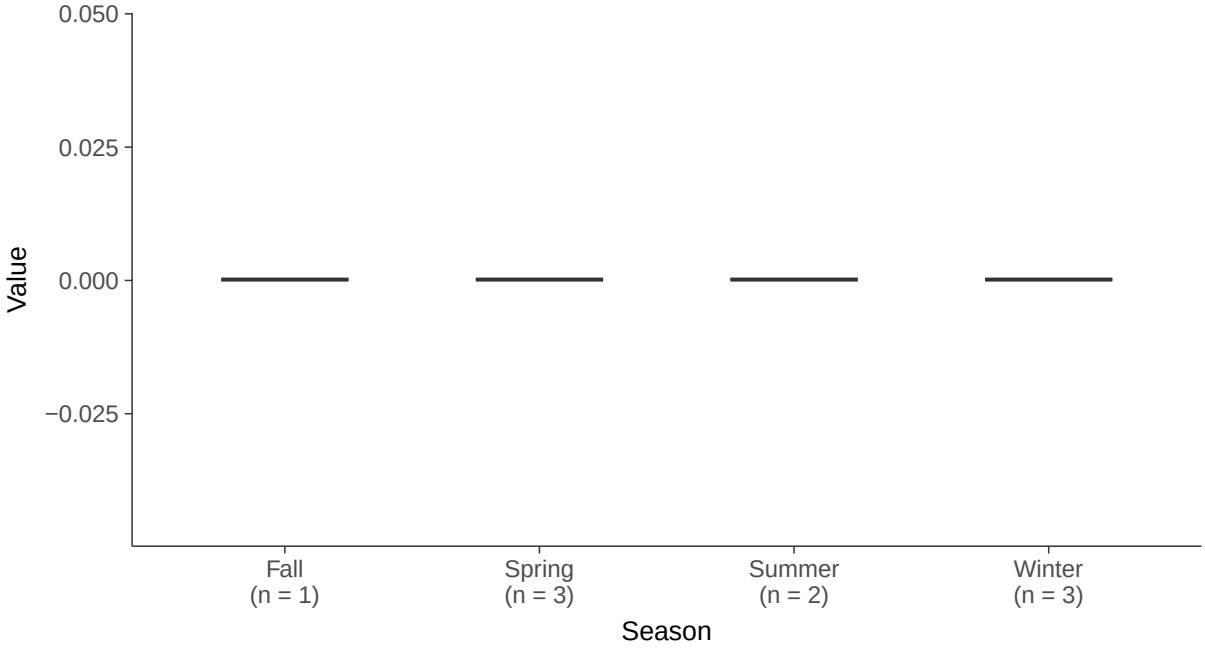
Boxplot

Mercury, MW-08 (mg/L)



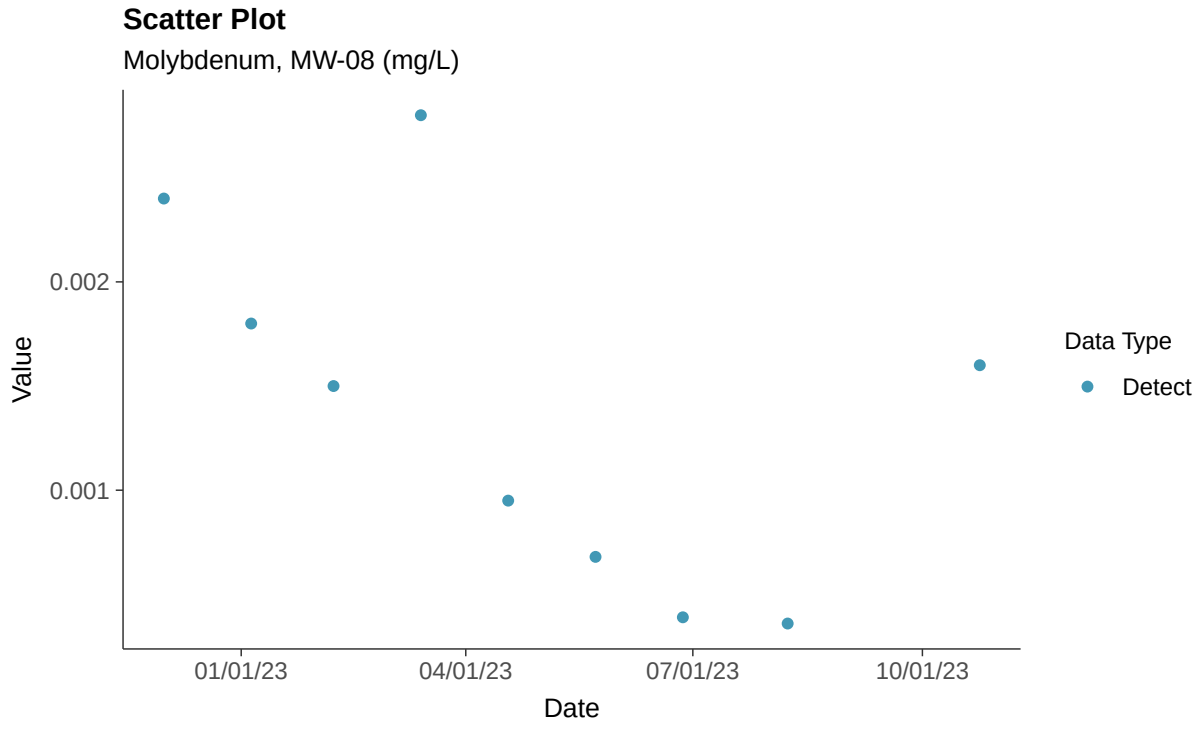
Boxplot by Season

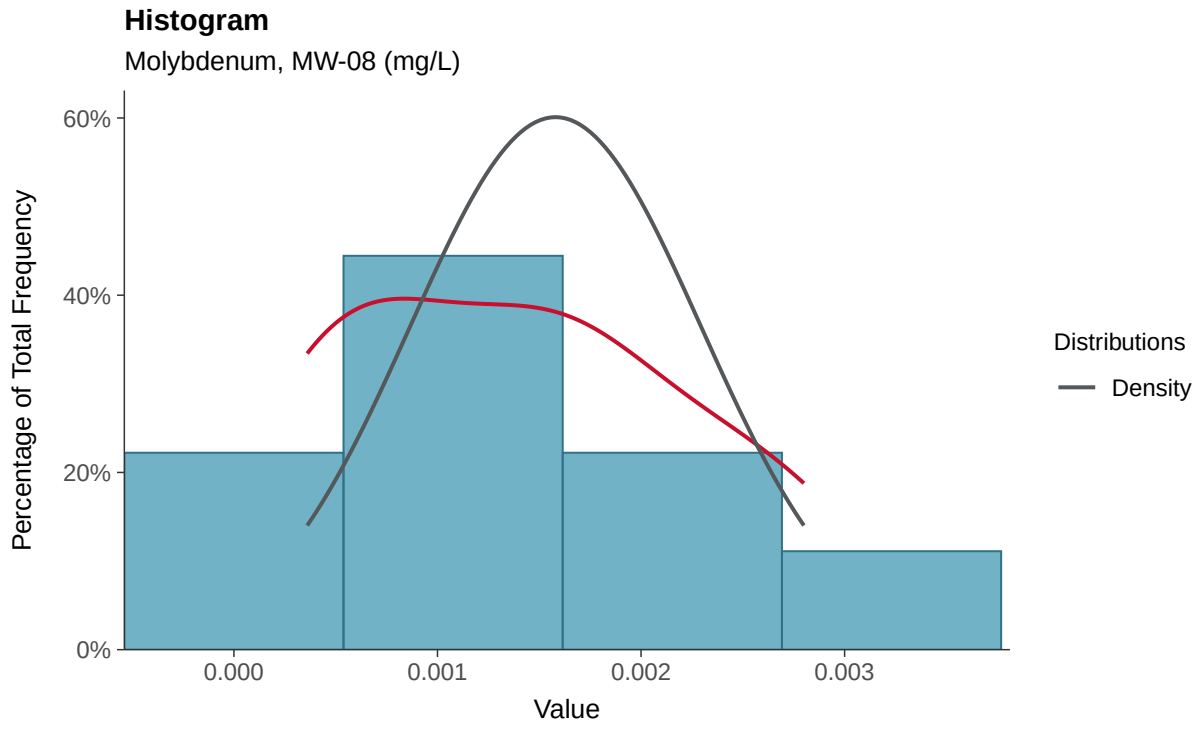
Mercury, MW-08 (mg/L)



Appendix IV: Molybdenum, MW-08

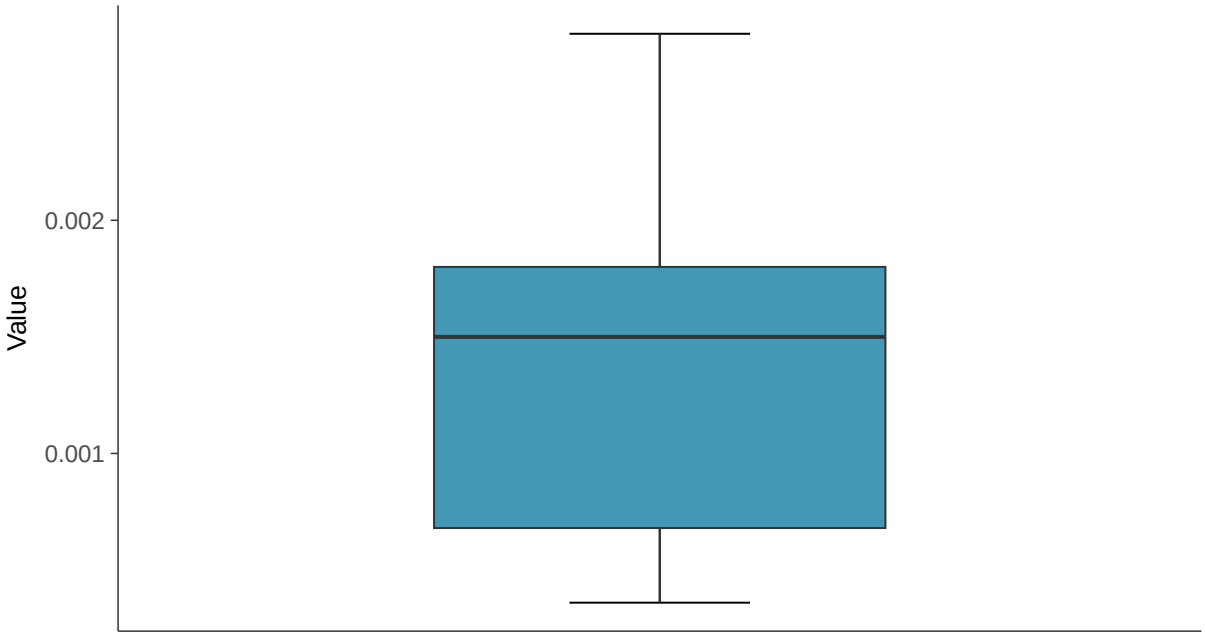
ID: 1_17_5_118





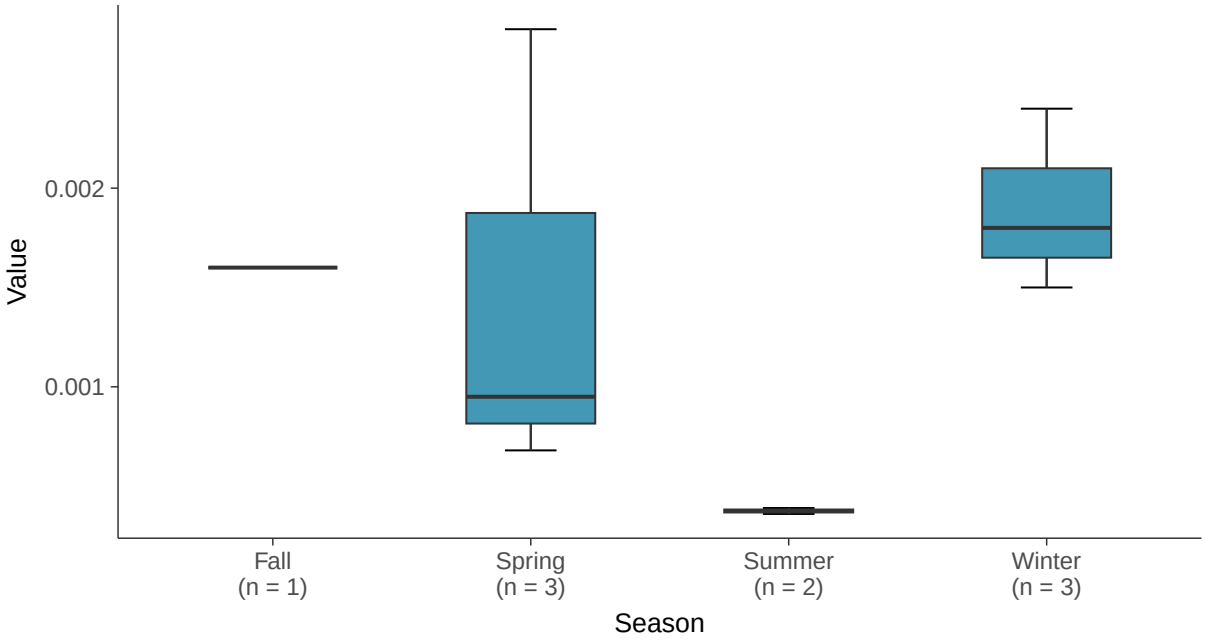
Boxplot

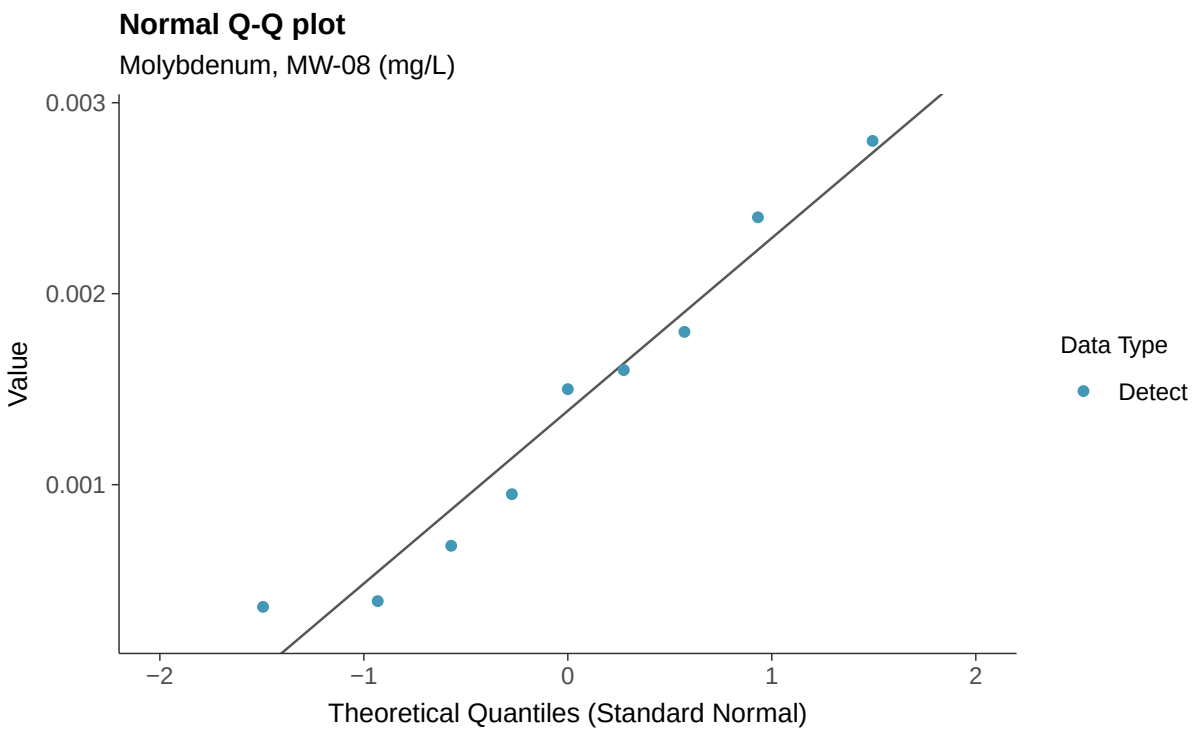
Molybdenum, MW-08 (mg/L)

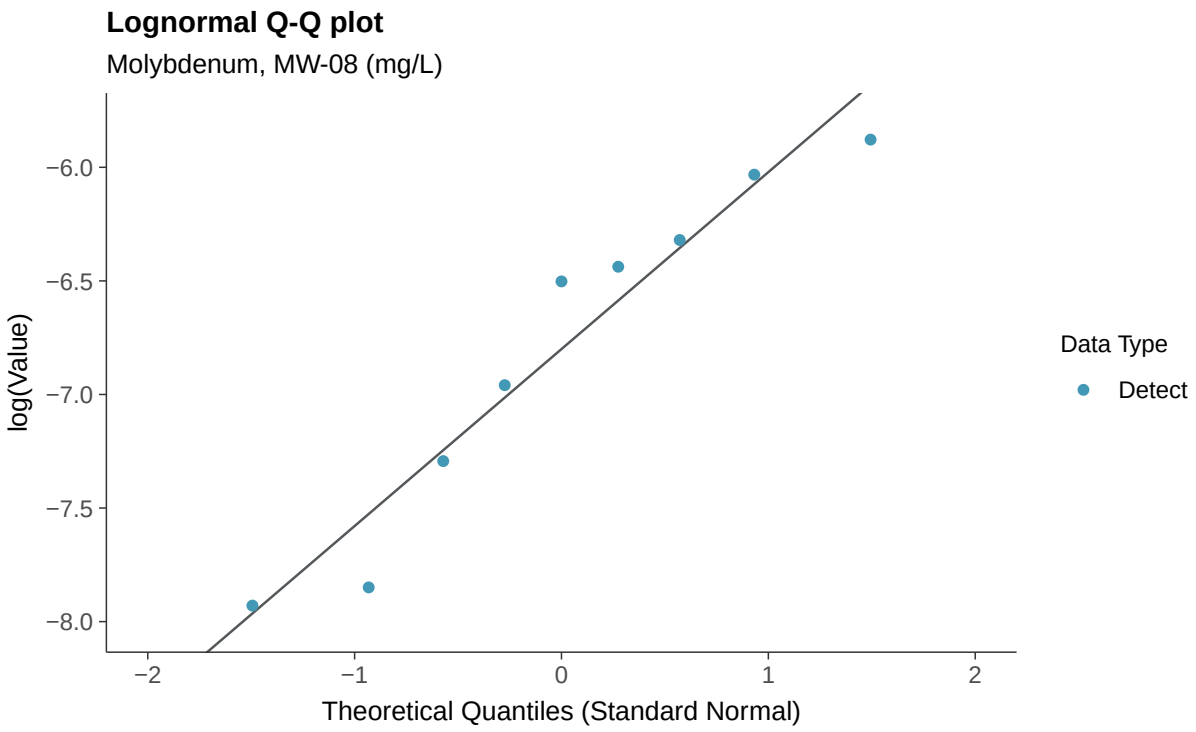


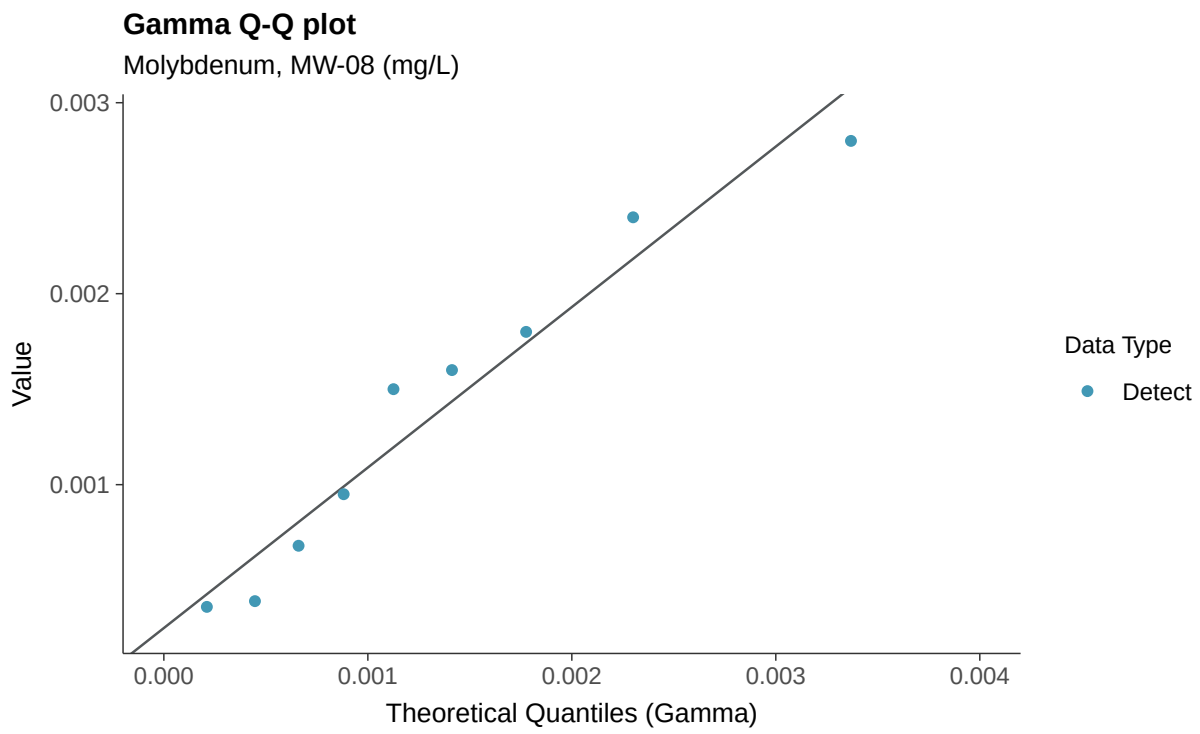
Boxplot by Season

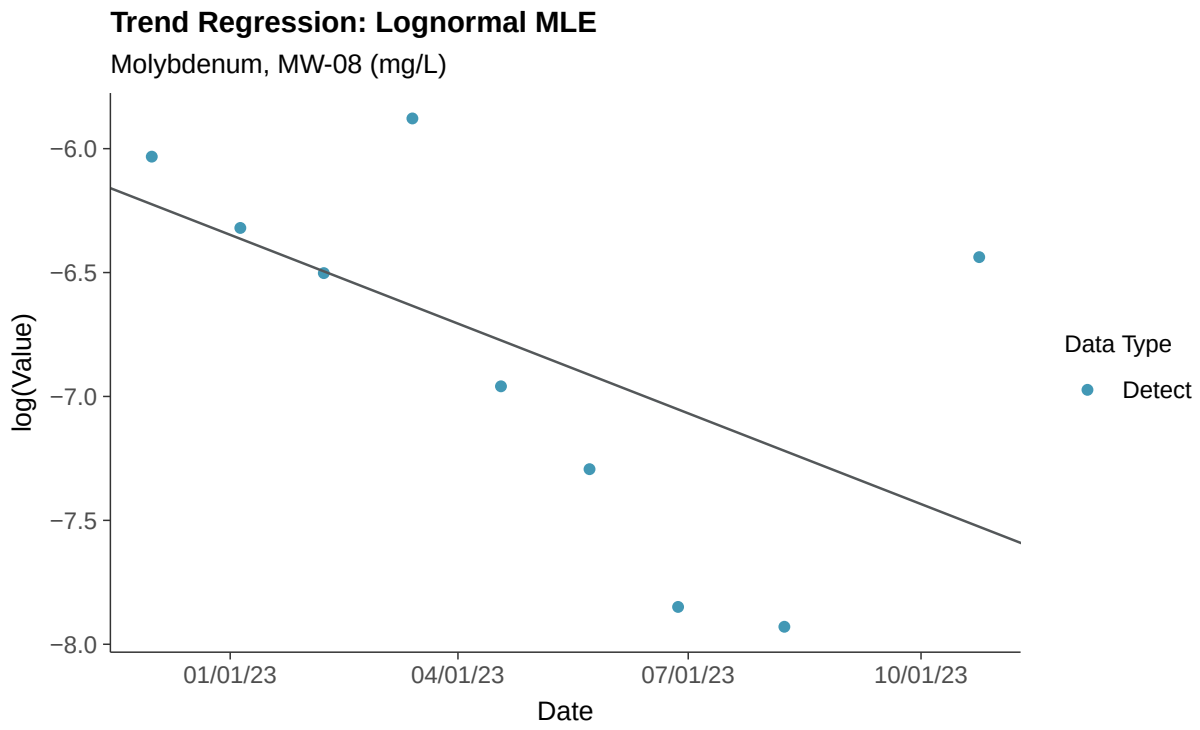
Molybdenum, MW-08 (mg/L)




Normal Q-Q plot
Molybdenum, MW-08 (mg/L)
0.003
0.002
0.001
Value
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

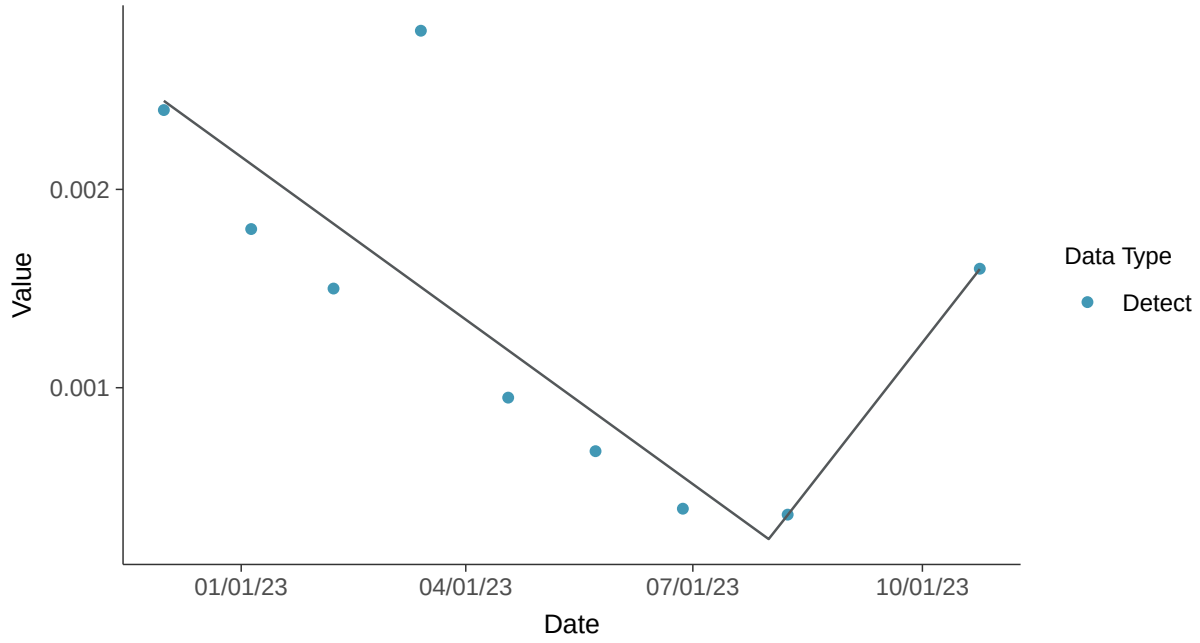

Lognormal Q-Q plot
Molybdenum, MW-08 (mg/L)
−6.0
−6.5
−7.0
−7.5
−8.0
log(Value)
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Molybdenum, MW-08 (mg/L)
0.003
0.002
0.001
Value
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Molybdenum, MW-08 (mg/L)
−6.0
−6.5
−7.0
−7.5
−8.0
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

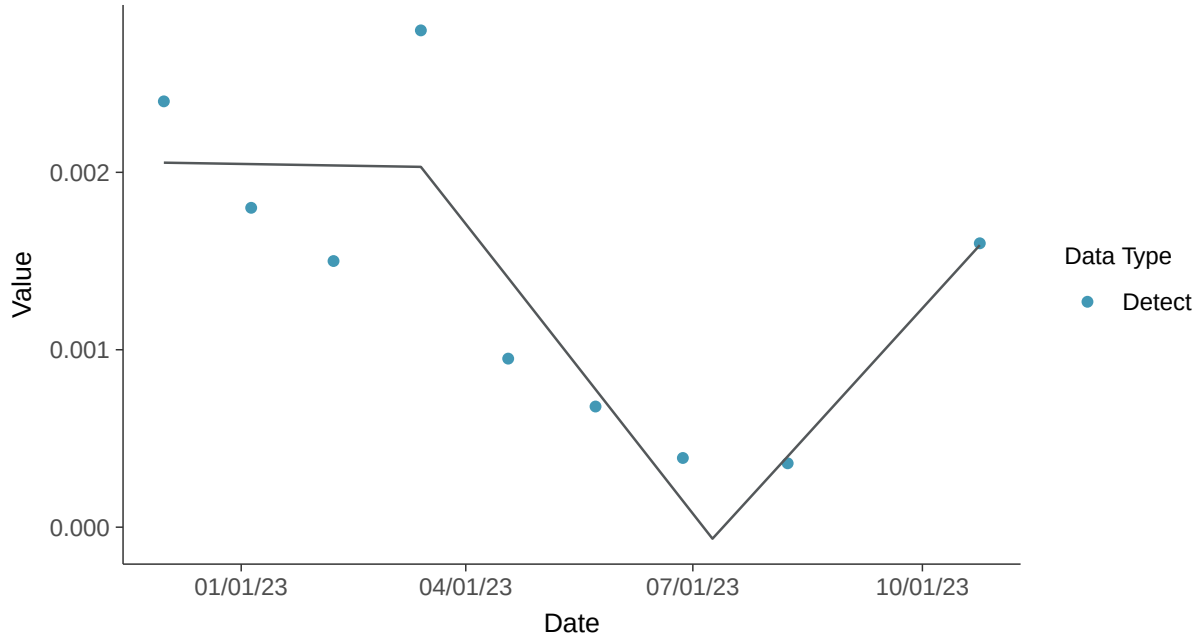
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-08 (mg/L)



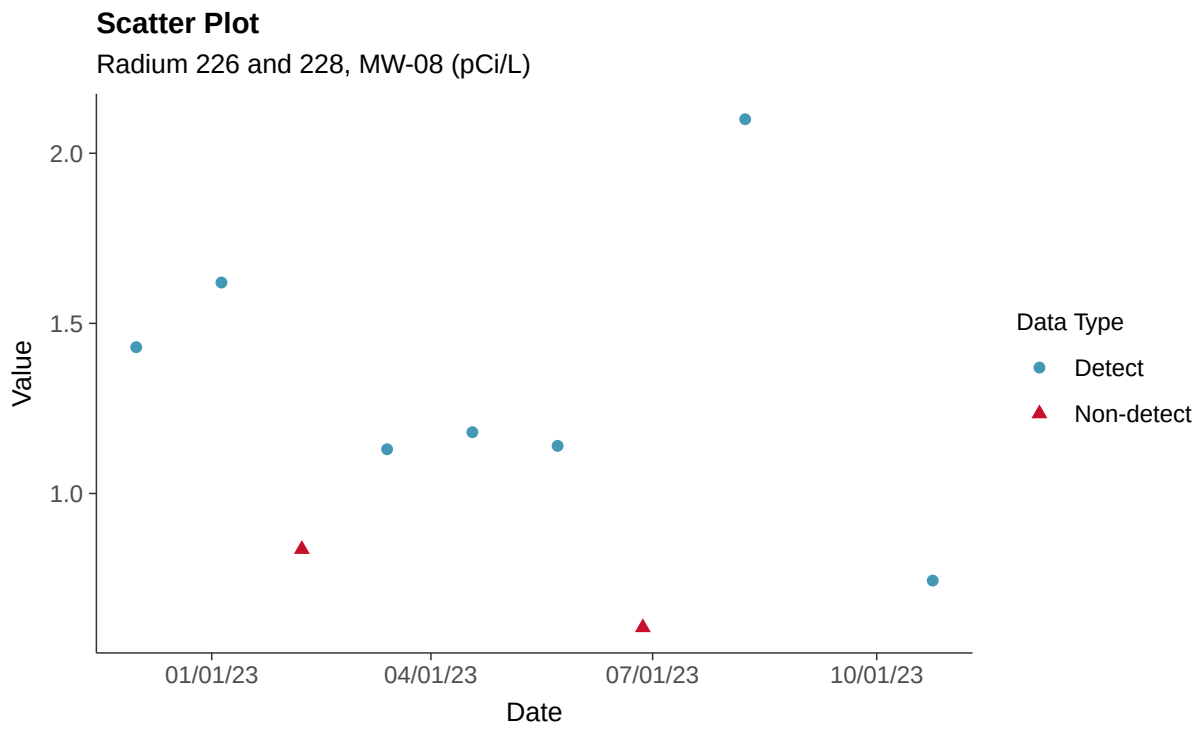
Trend Regression: Piecewise Linear-Linear-Linear

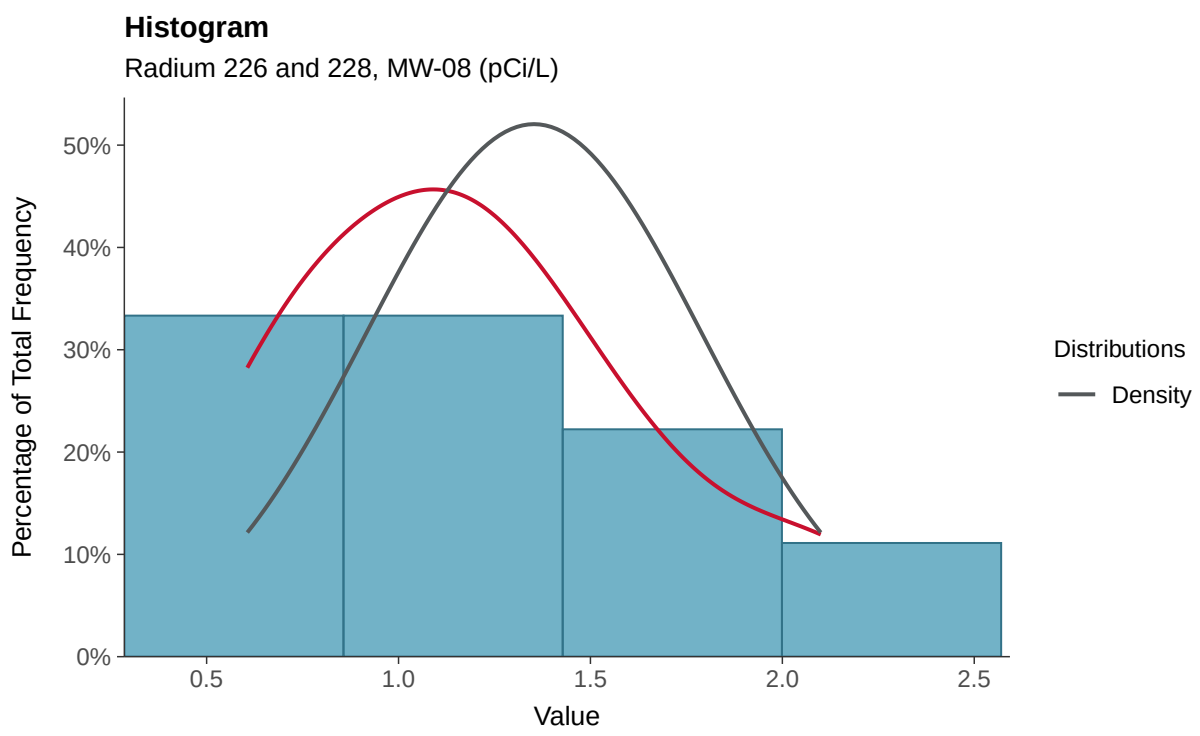
Molybdenum, MW-08 (mg/L)



Appendix IV: Radium 226 and 228, MW-08

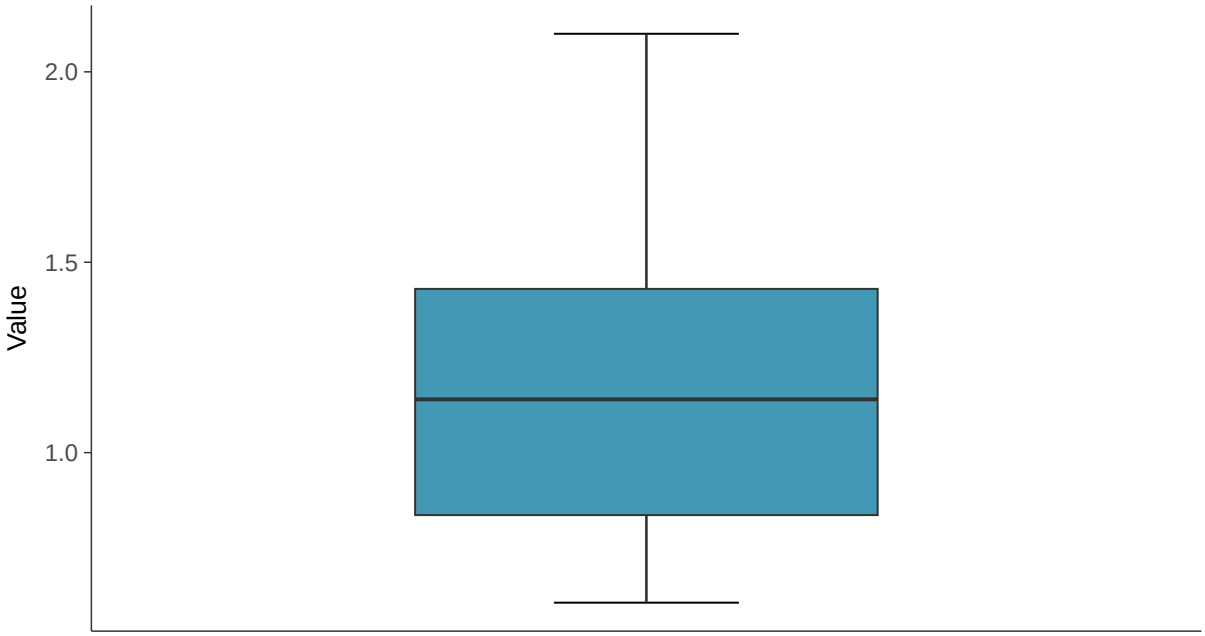
ID: 1_17_5_121





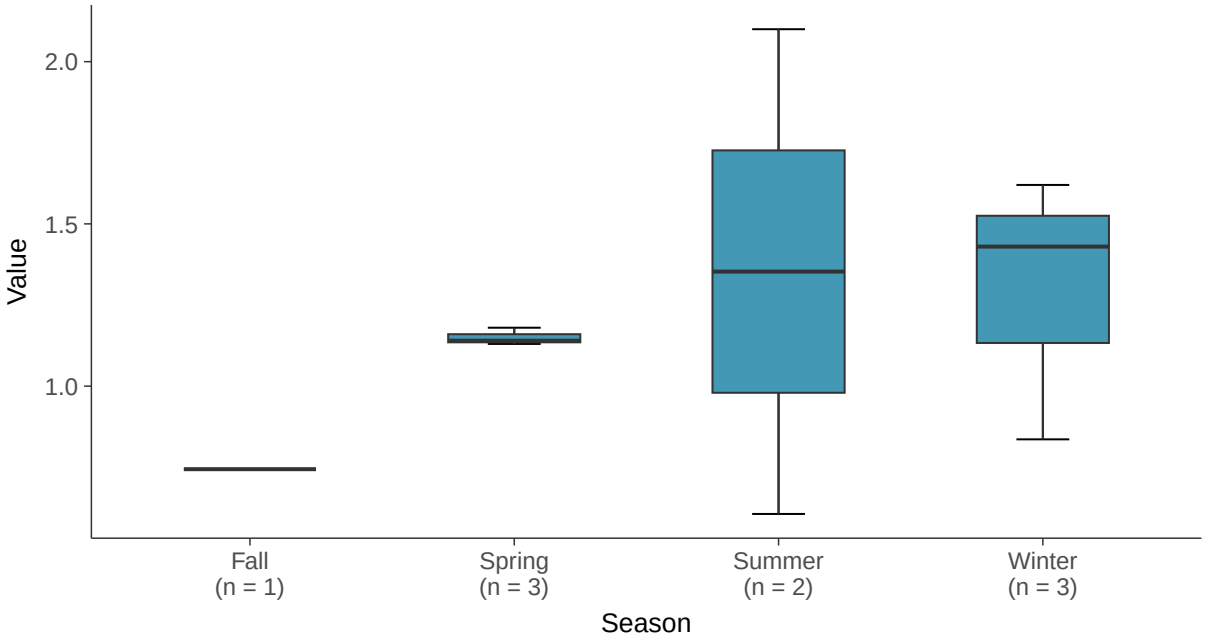
Boxplot

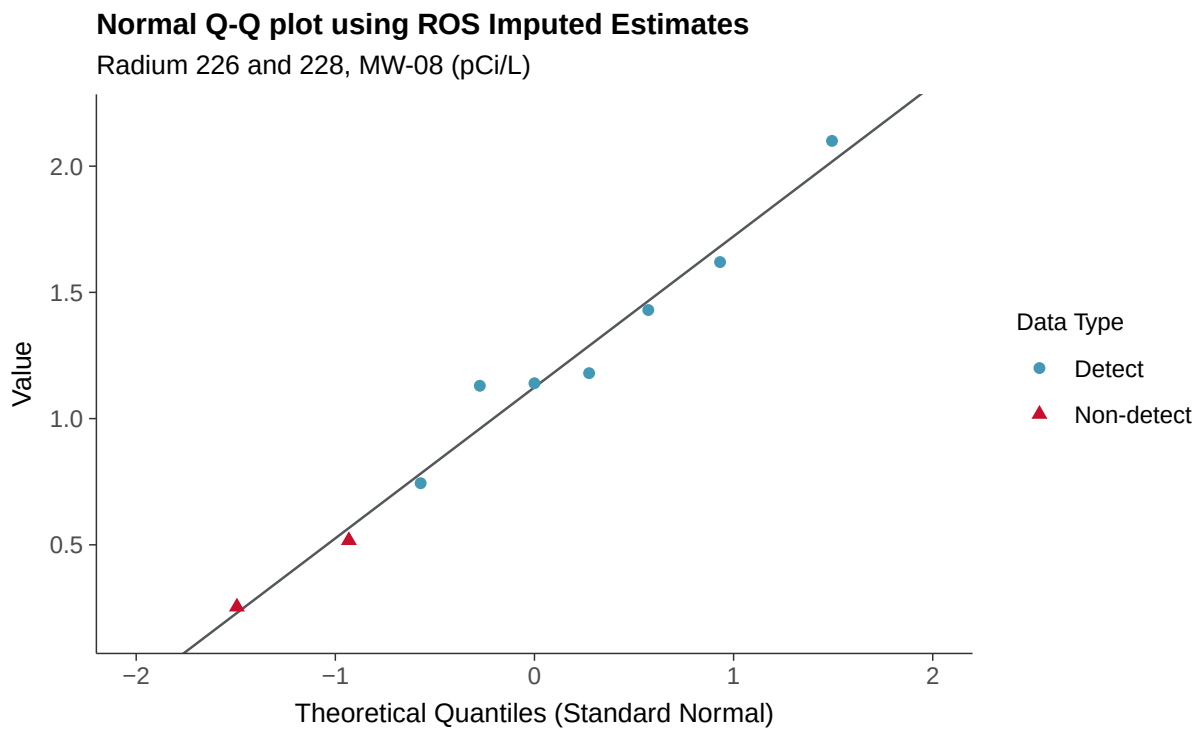
Radium 226 and 228, MW-08 (pCi/L)

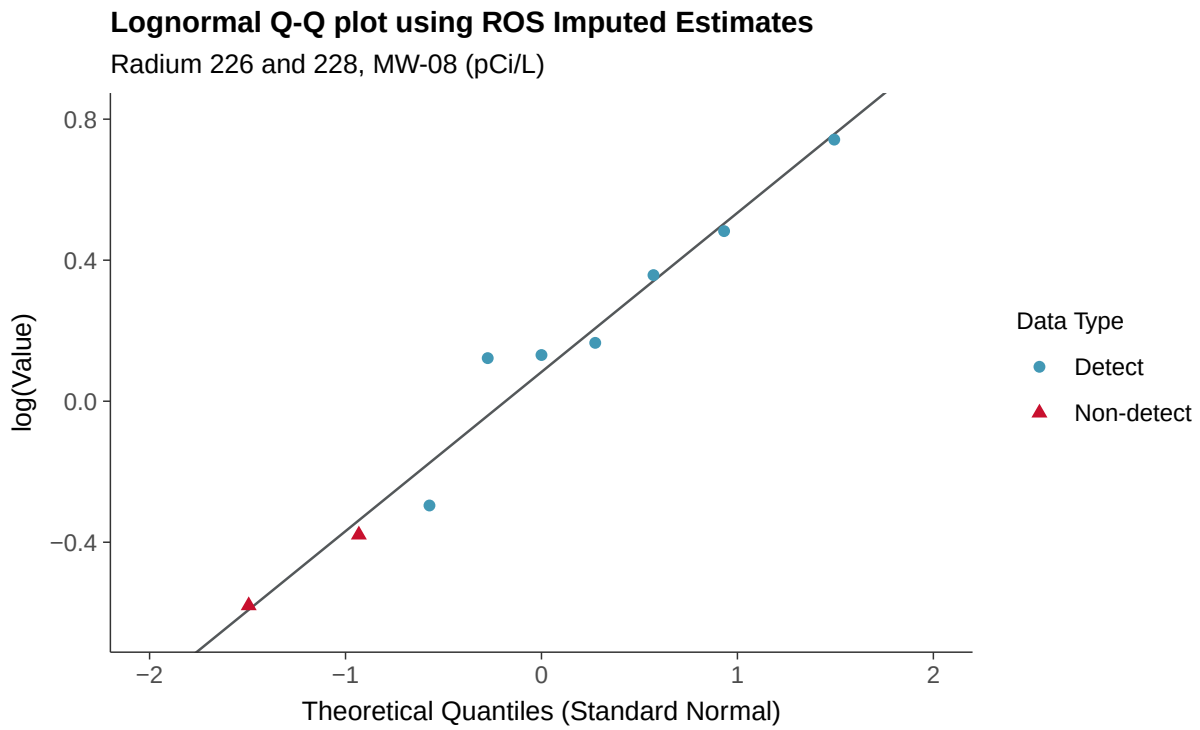


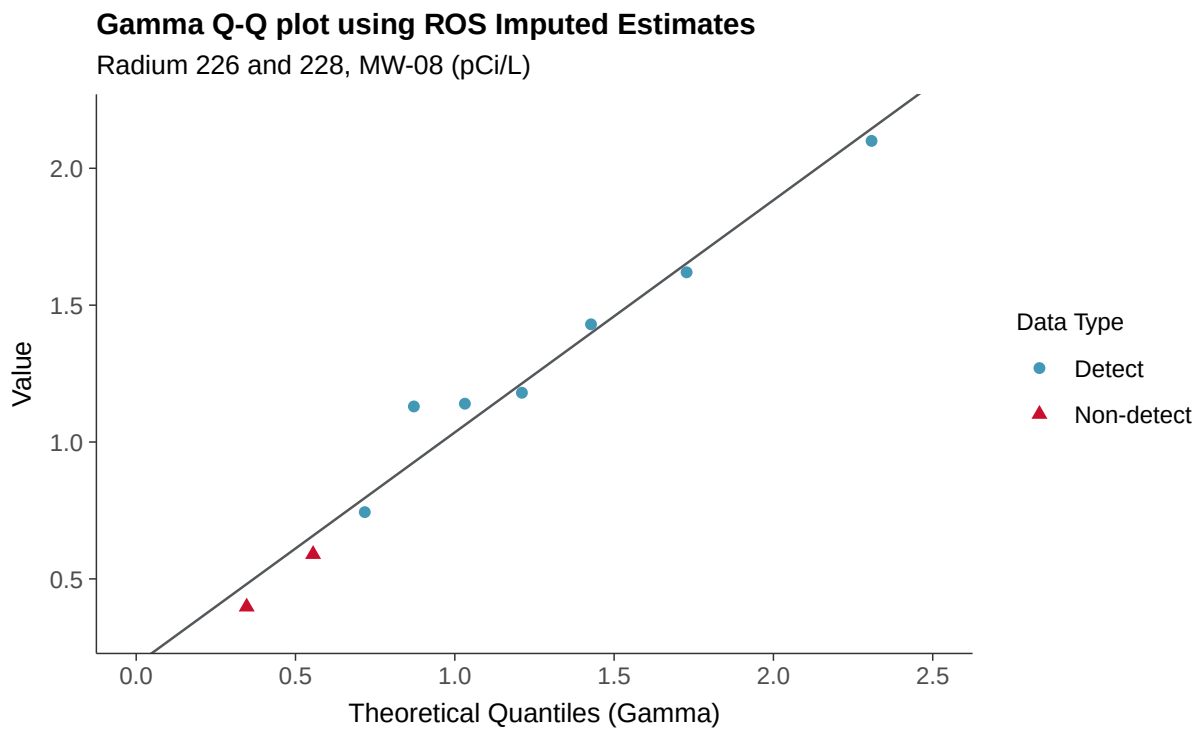
Boxplot by Season

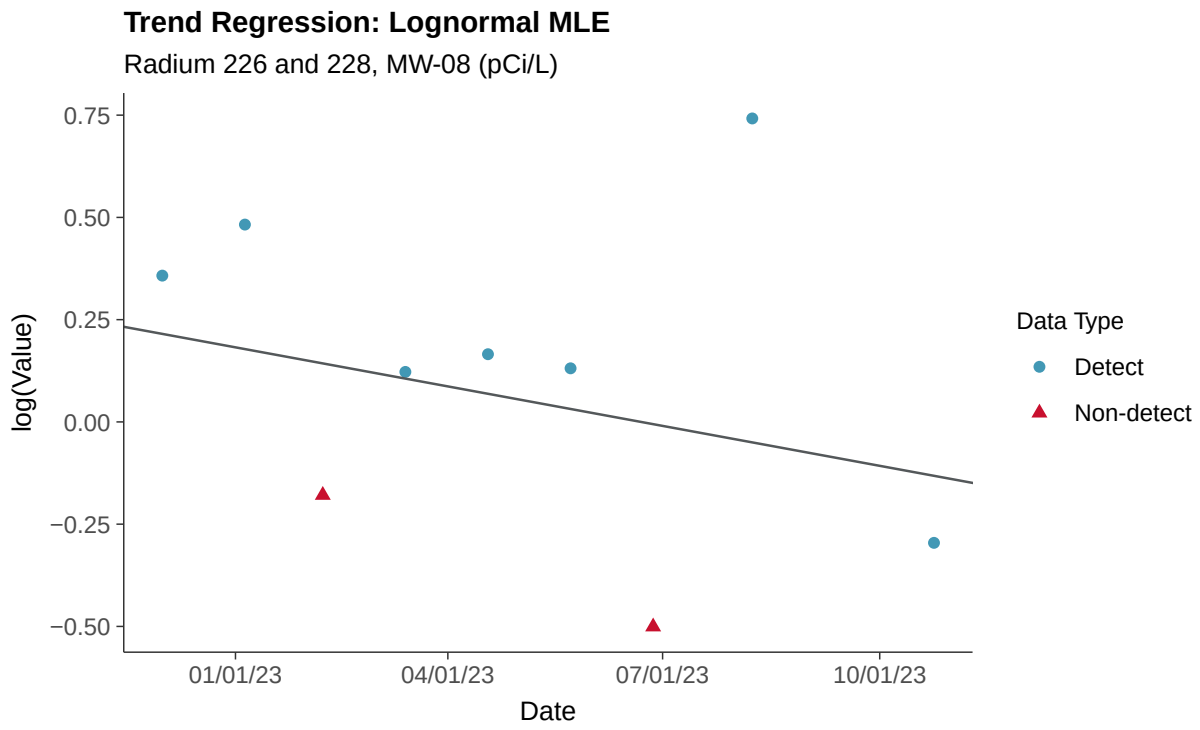
Radium 226 and 228, MW-08 (pCi/L)

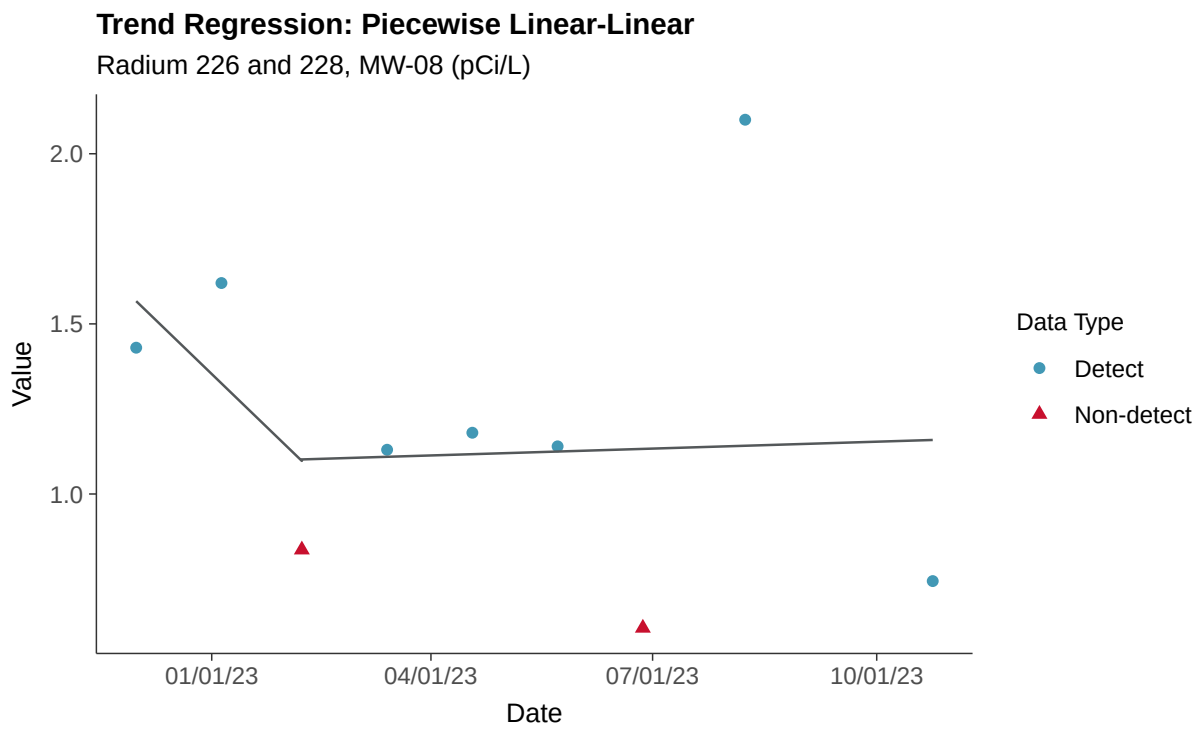



Normal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-08 (pCi/L)
Value
2.0
1.5
1.0
0.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-08 (pCi/L)
log(Value)
0.8
0.4
0.0
−0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

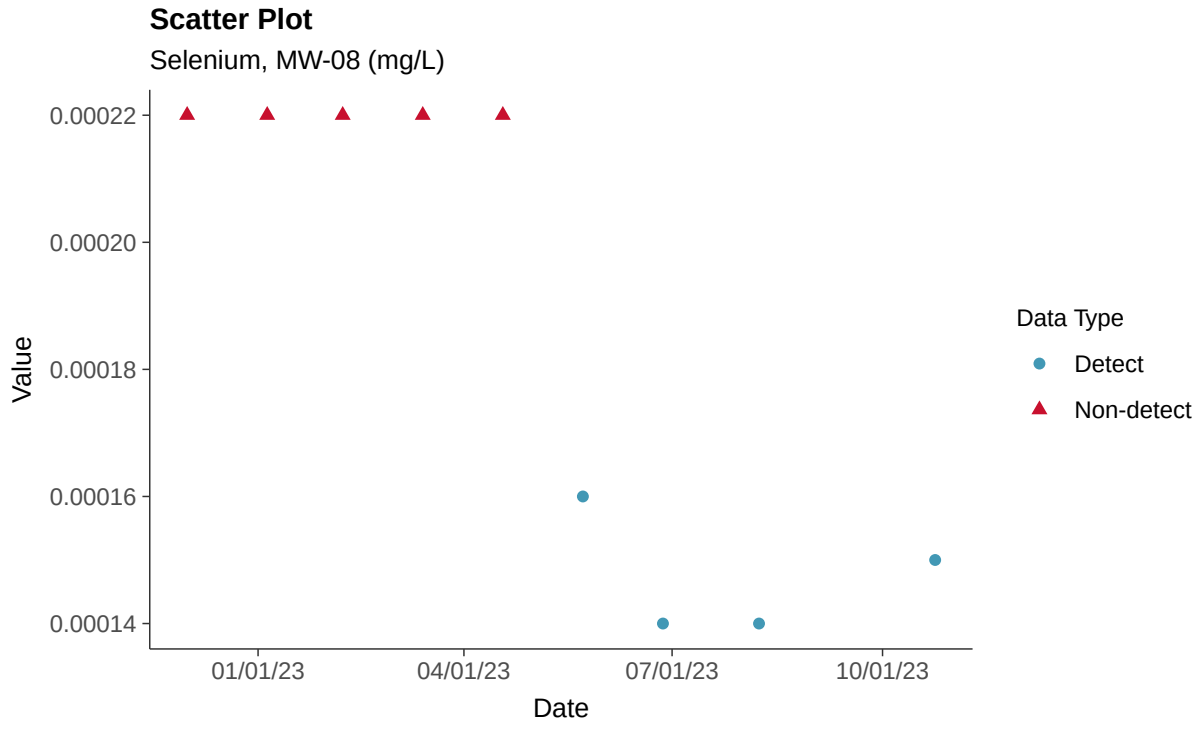

Gamma Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-08 (pCi/L)
Value
2.0
1.5
1.0
0.5
0.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

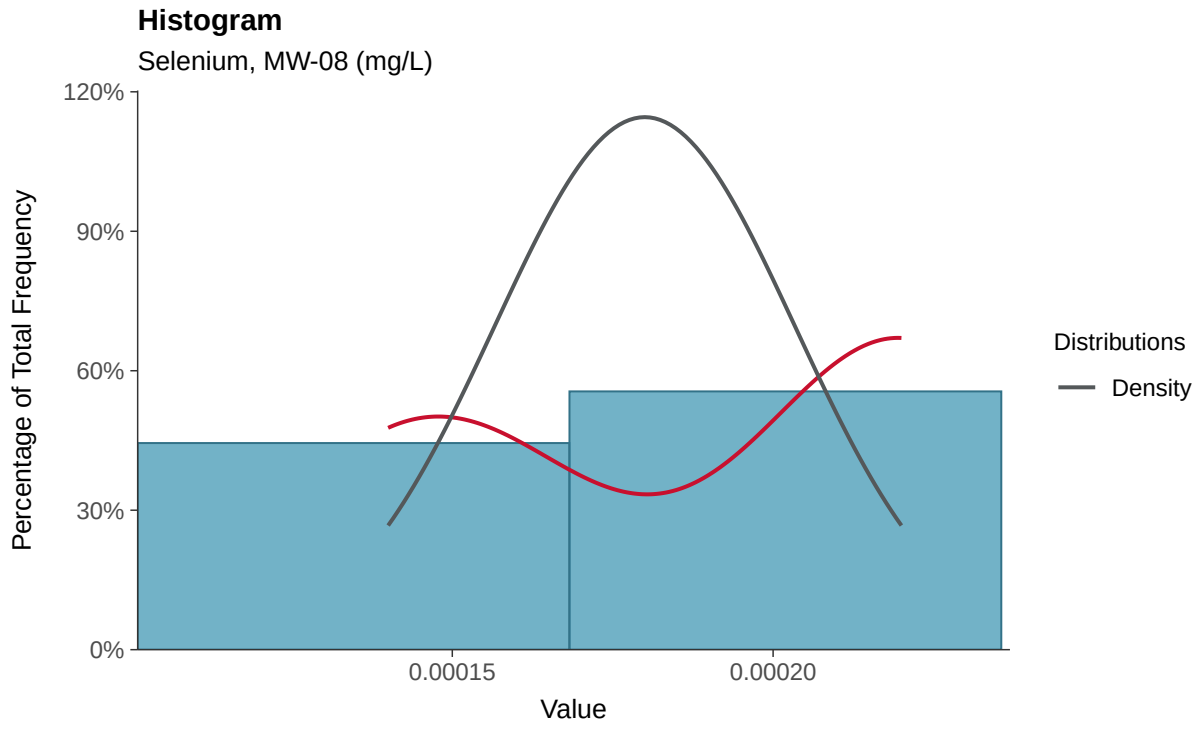

Trend Regression: Lognormal MLE
Radium 226 and 228, MW-08 (pCi/L)
log(Value)
0.75
0.50
0.25
0.00
−0.25
−0.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Radium 226 and 228, MW-08 (pCi/L)
2.0
1.5
1.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Selenium, MW-08

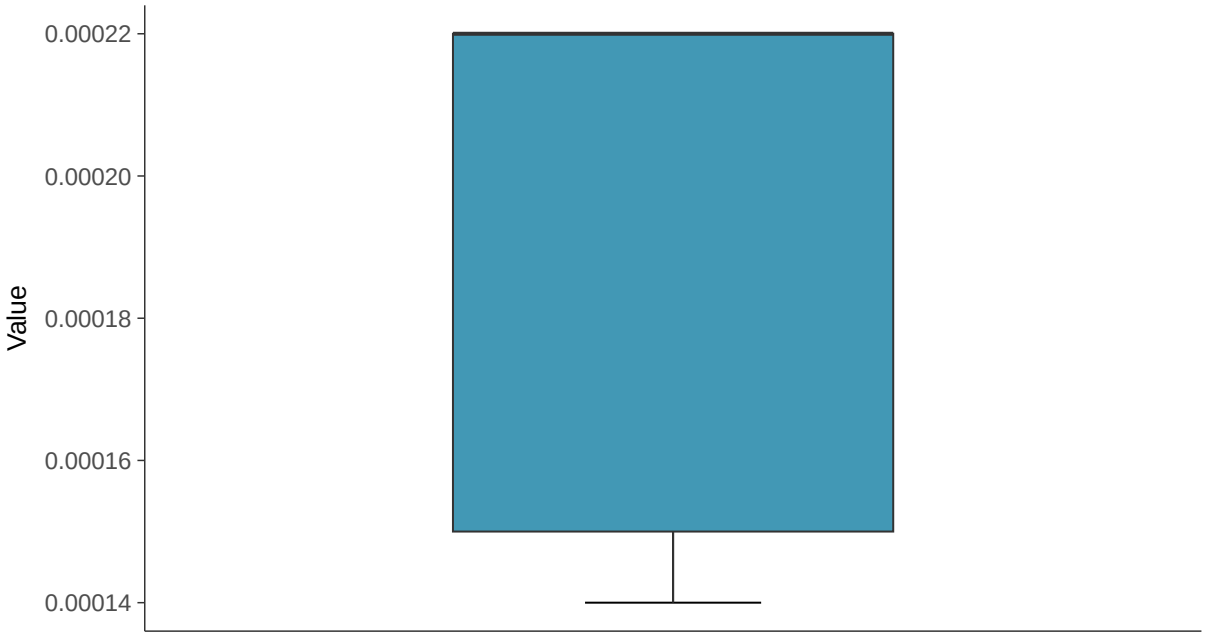
ID: 1_17_5_122





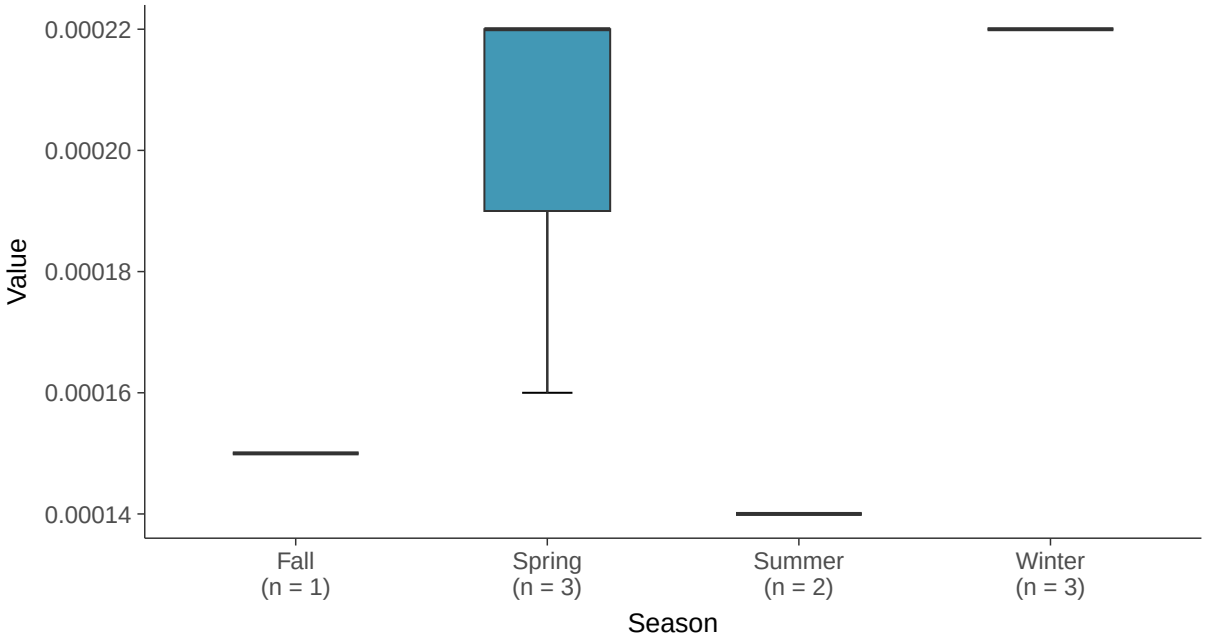
Boxplot

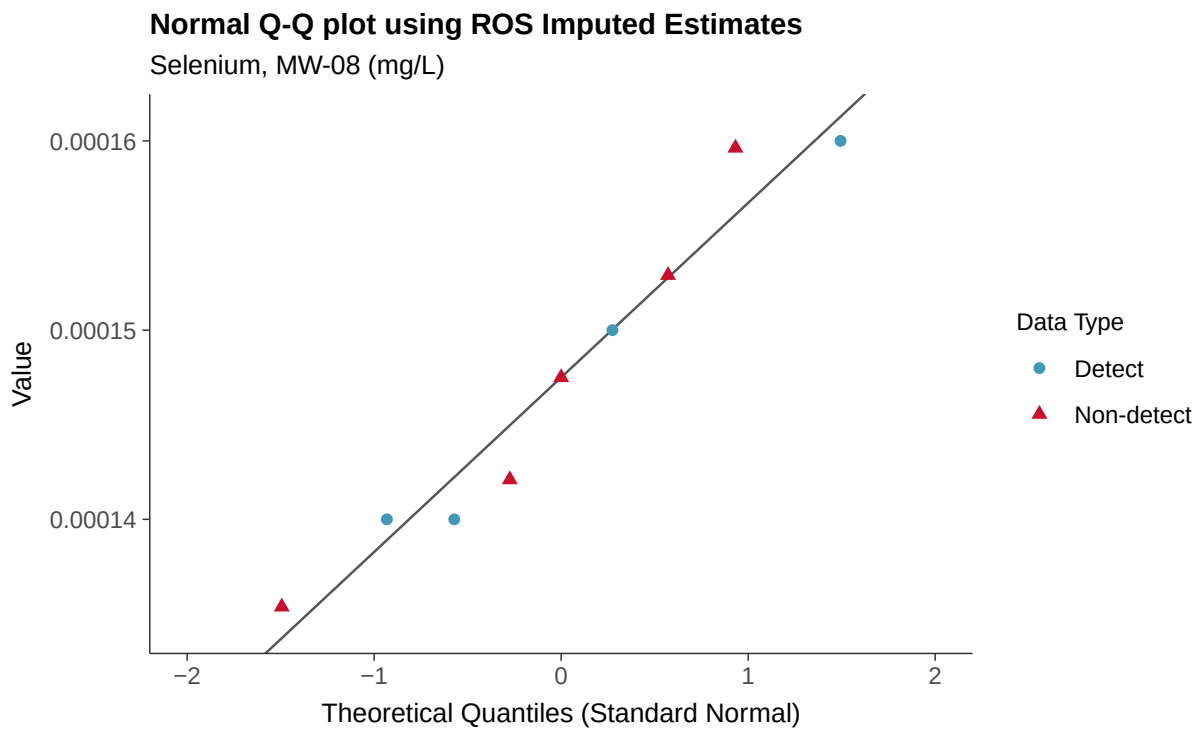
Selenium, MW-08 (mg/L)

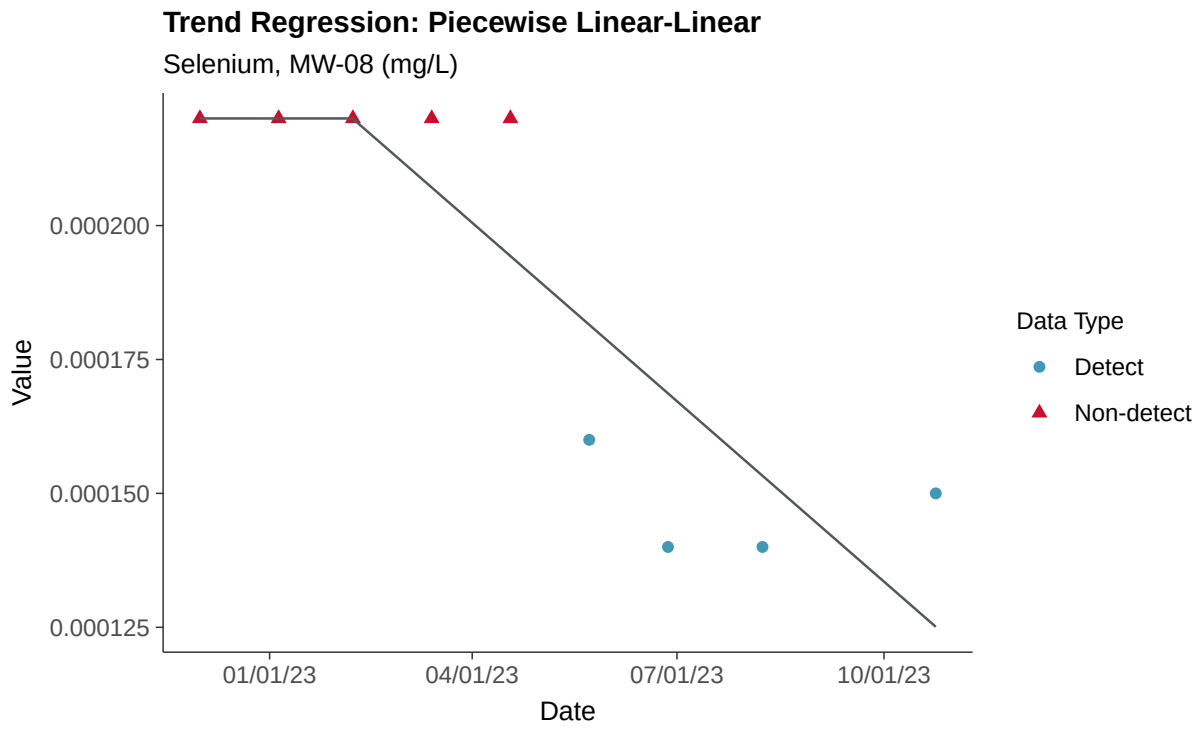


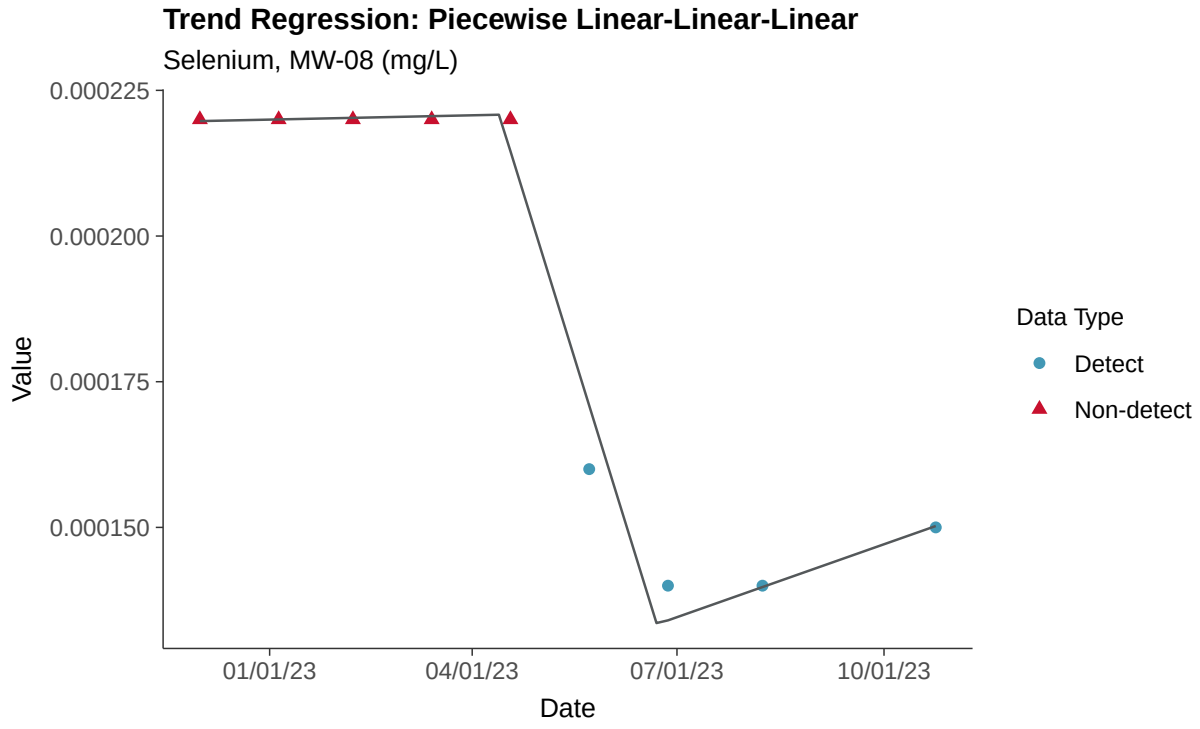
Boxplot by Season

Selenium, MW-08 (mg/L)



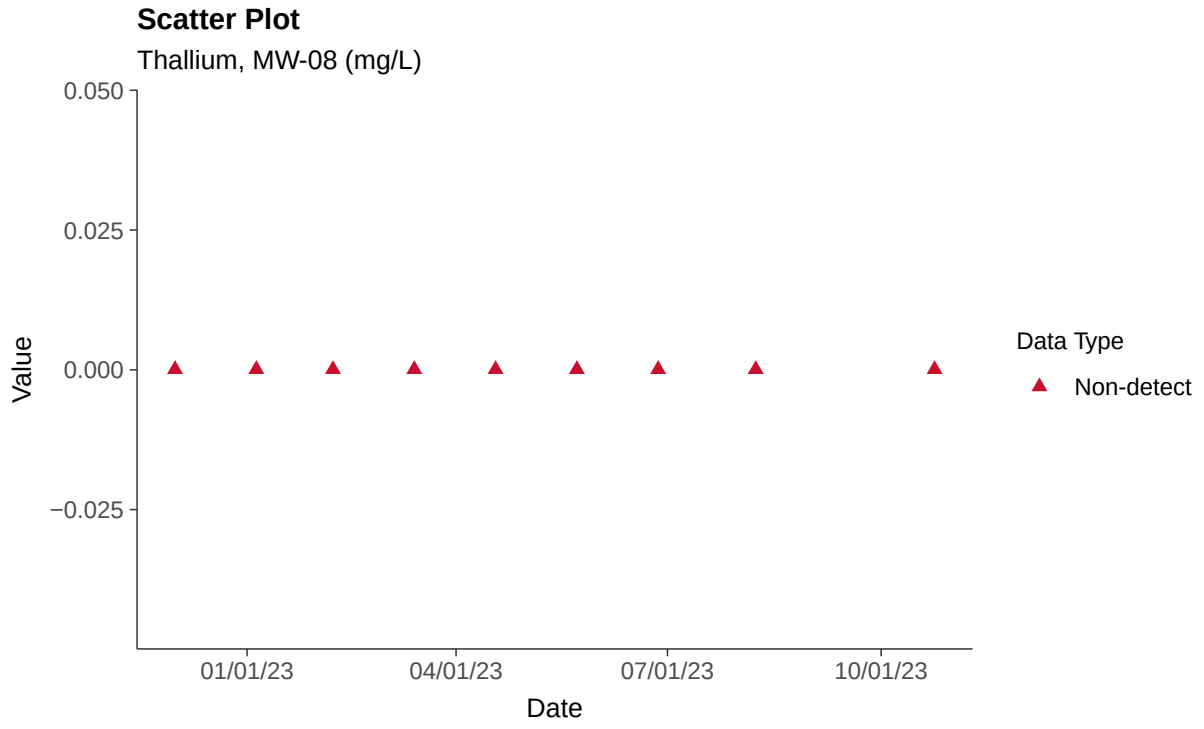

Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-08 (mg/L)
Value
0.00016
0.00015
0.00014
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

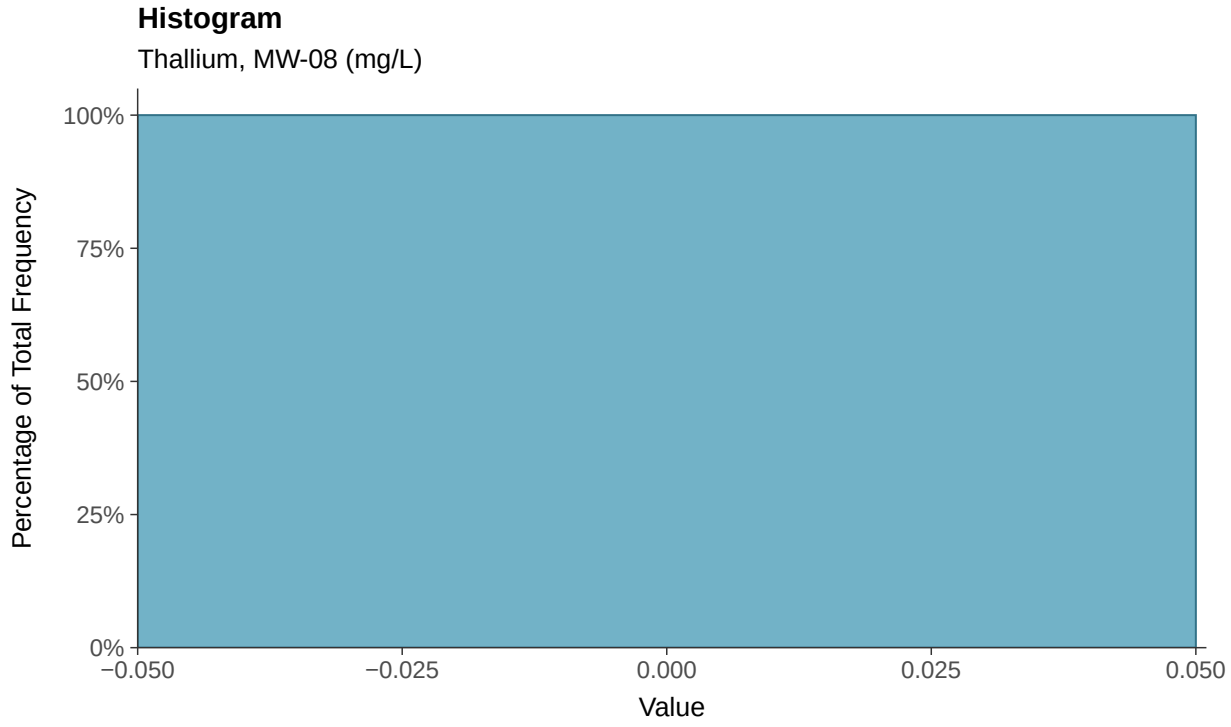

Trend Regression: Piecewise Linear-Linear
Selenium, MW-08 (mg/L)
Value
0.000200
0.000175
0.000150
0.000125
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-08 (mg/L)
0.000225
0.000200
0.000175
0.000150
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-08

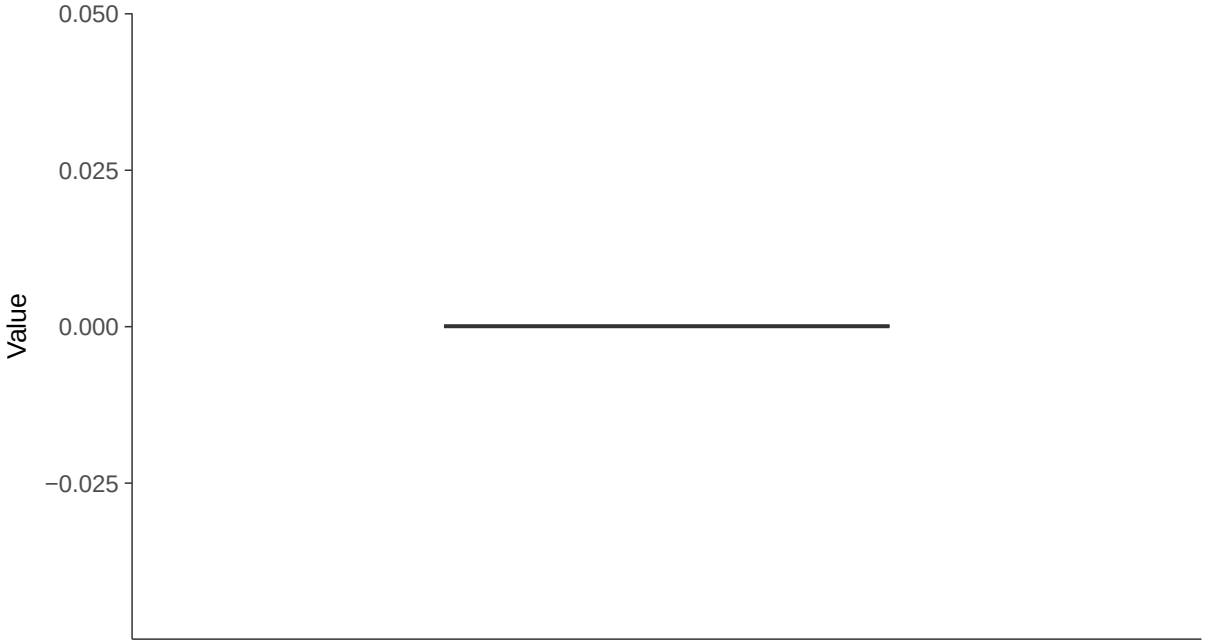
ID: 1_17_5_125





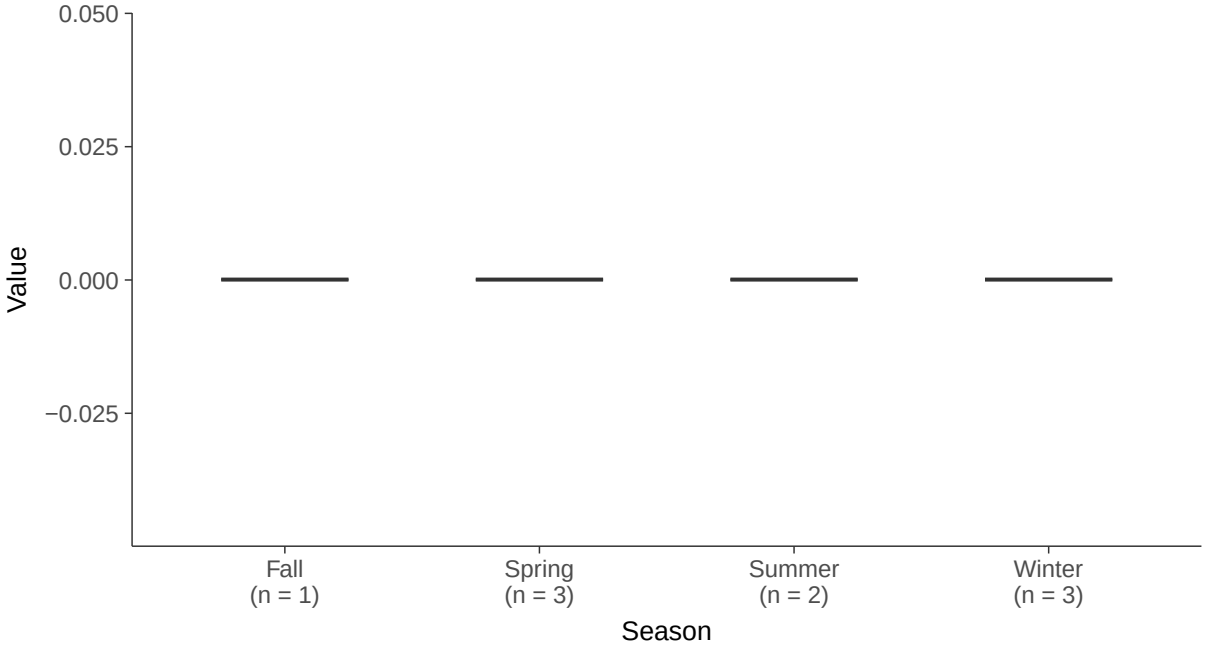
Boxplot

Thallium, MW-08 (mg/L)



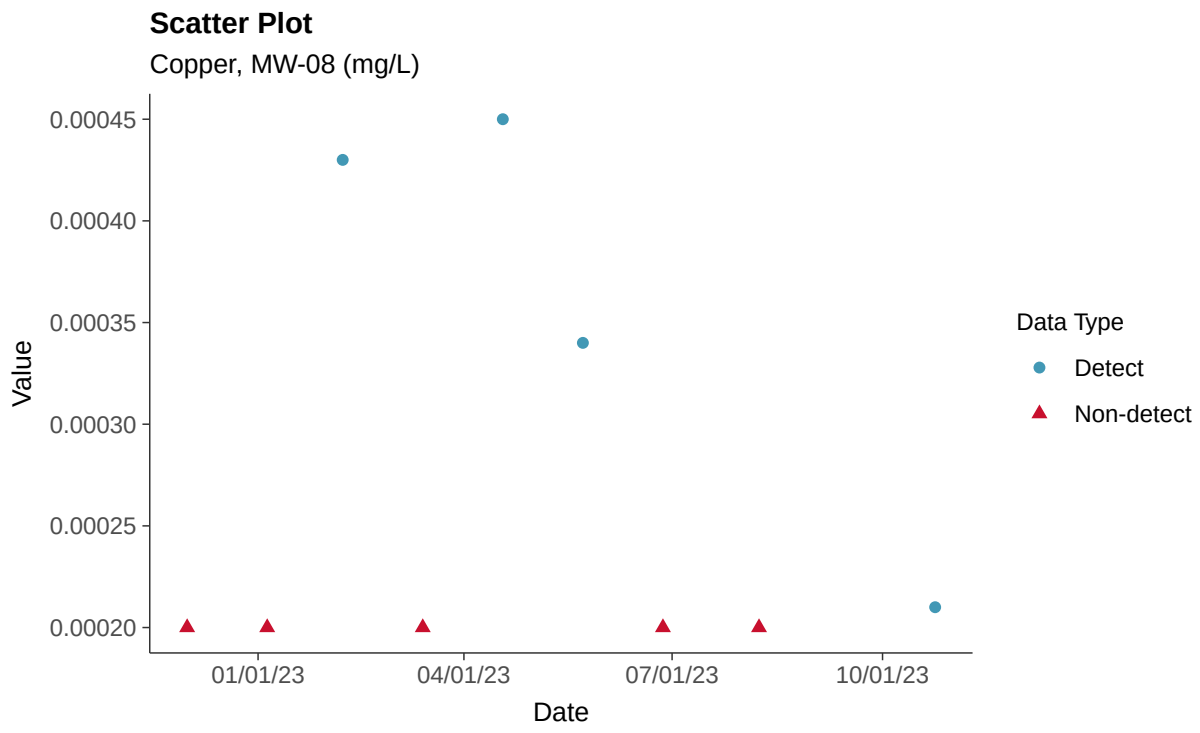
Boxplot by Season

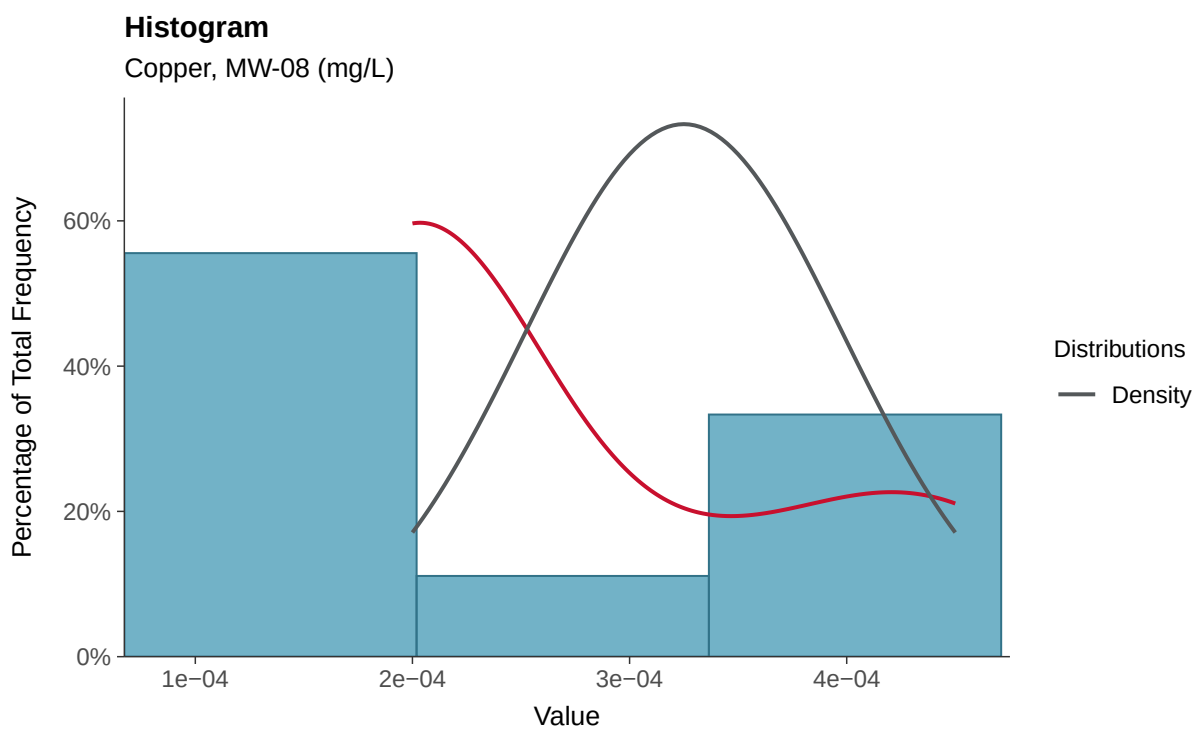
Thallium, MW-08 (mg/L)



Part 115: Copper, MW-08

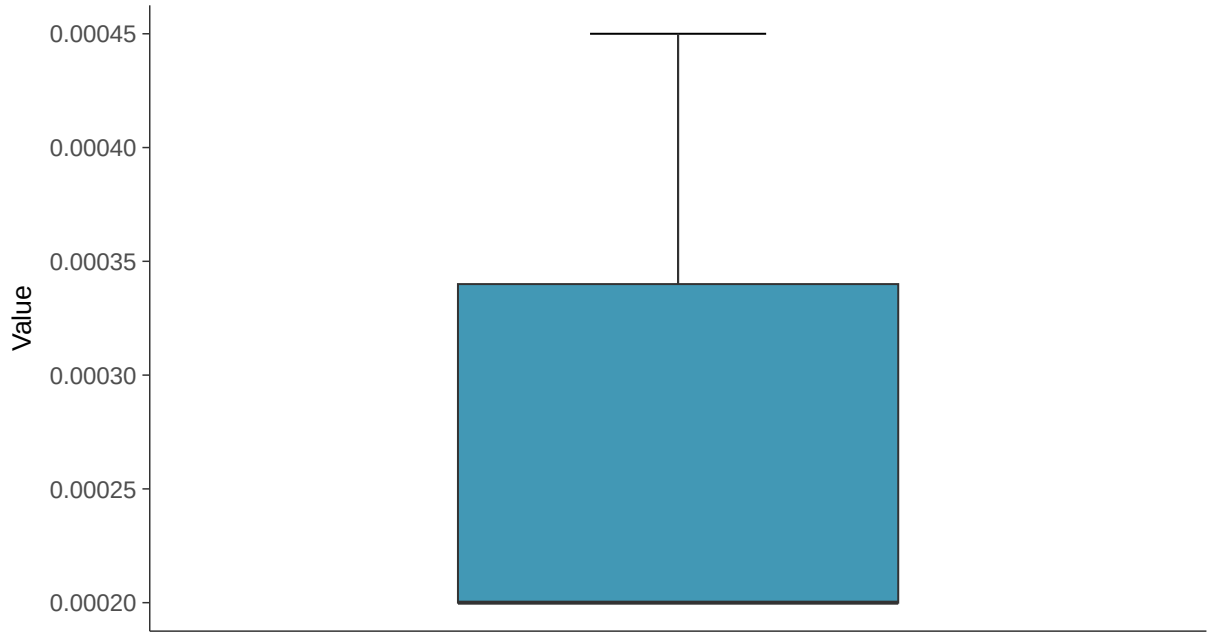
ID: 1_17_6_111





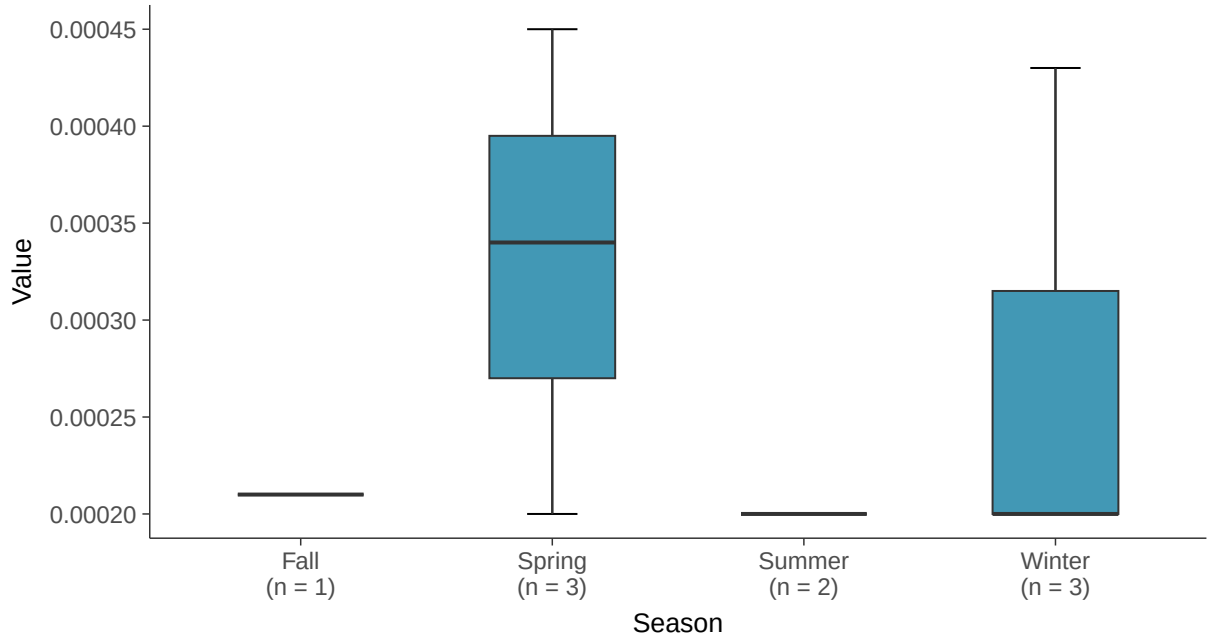
Boxplot

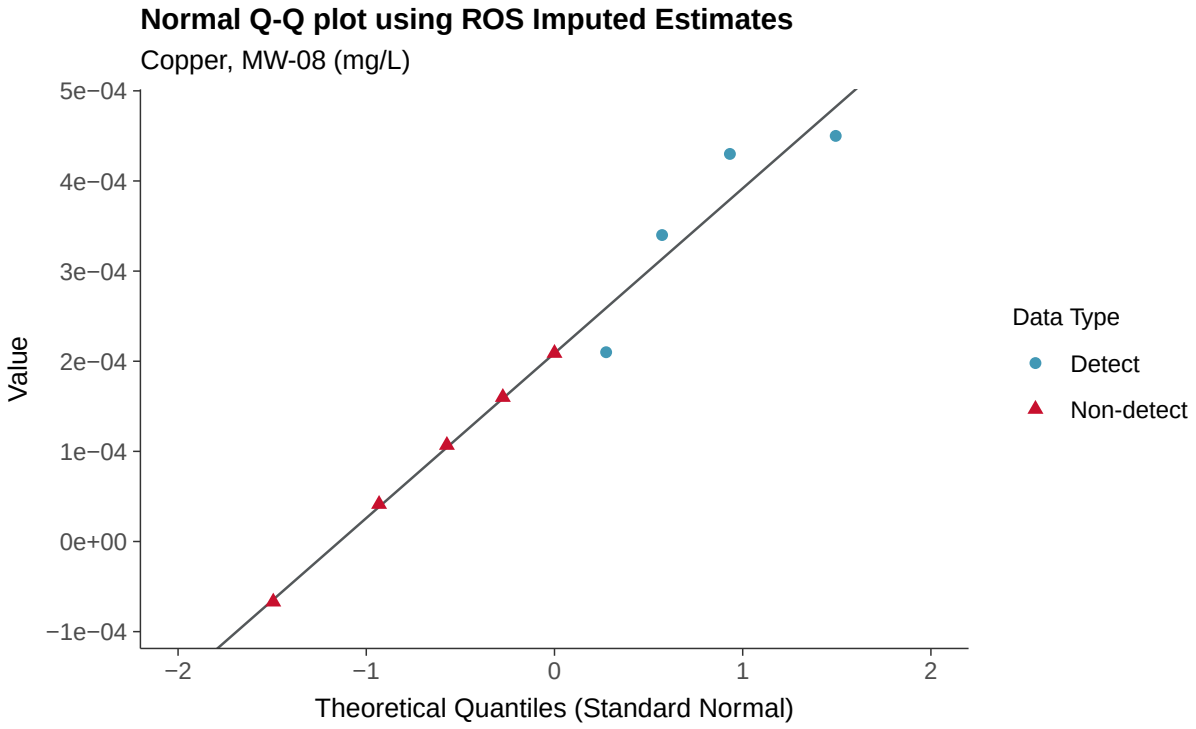
Copper, MW-08 (mg/L)

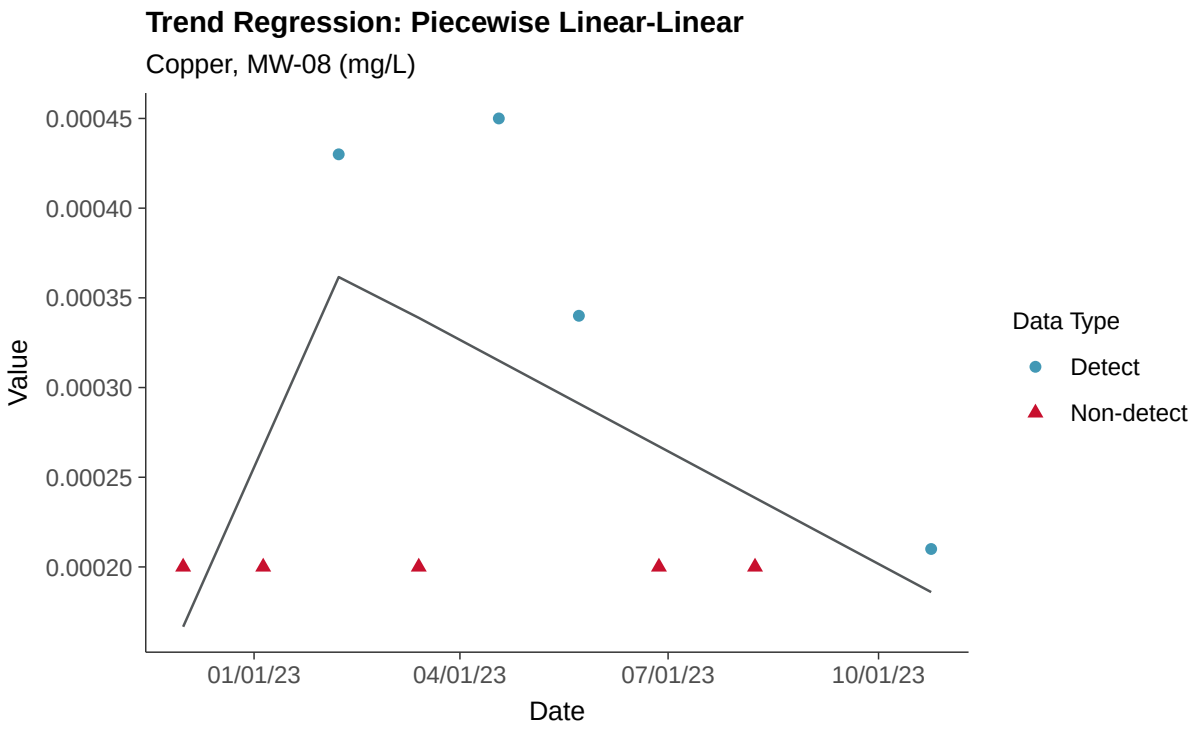


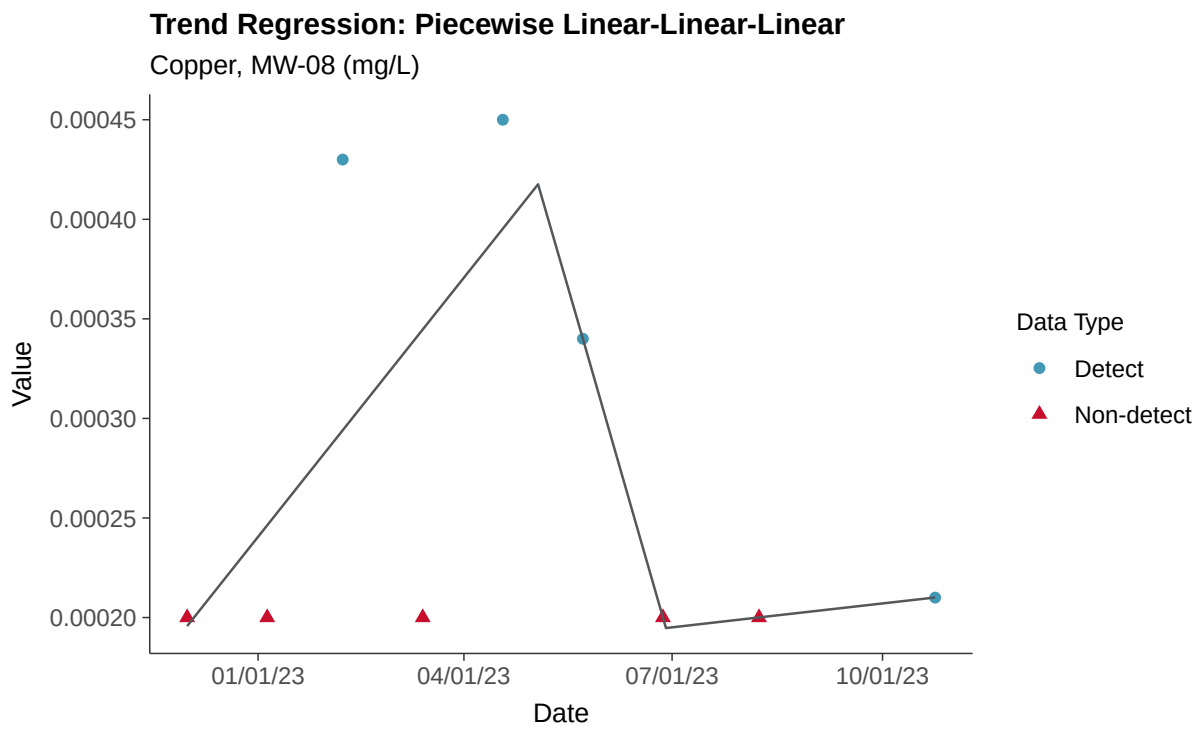
Boxplot by Season

Copper, MW-08 (mg/L)



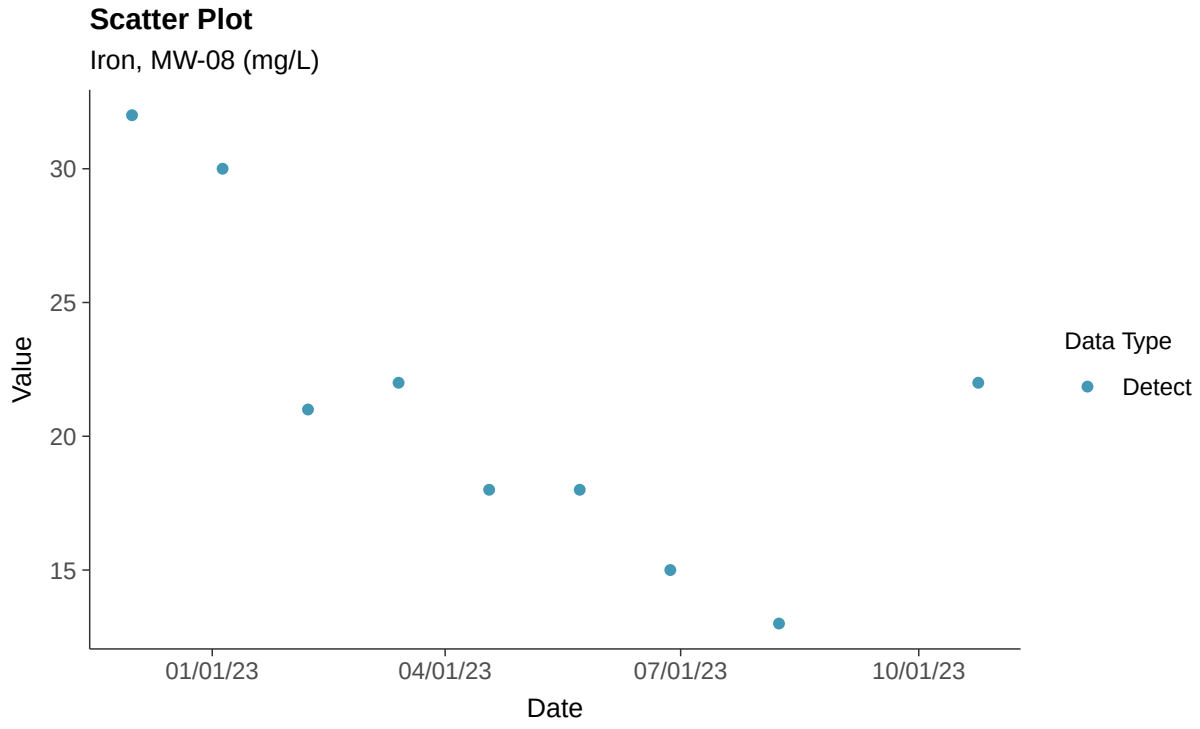

Normal Q-Q plot using ROS Imputed Estimates
Copper, MW-08 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
0e+00
−1e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

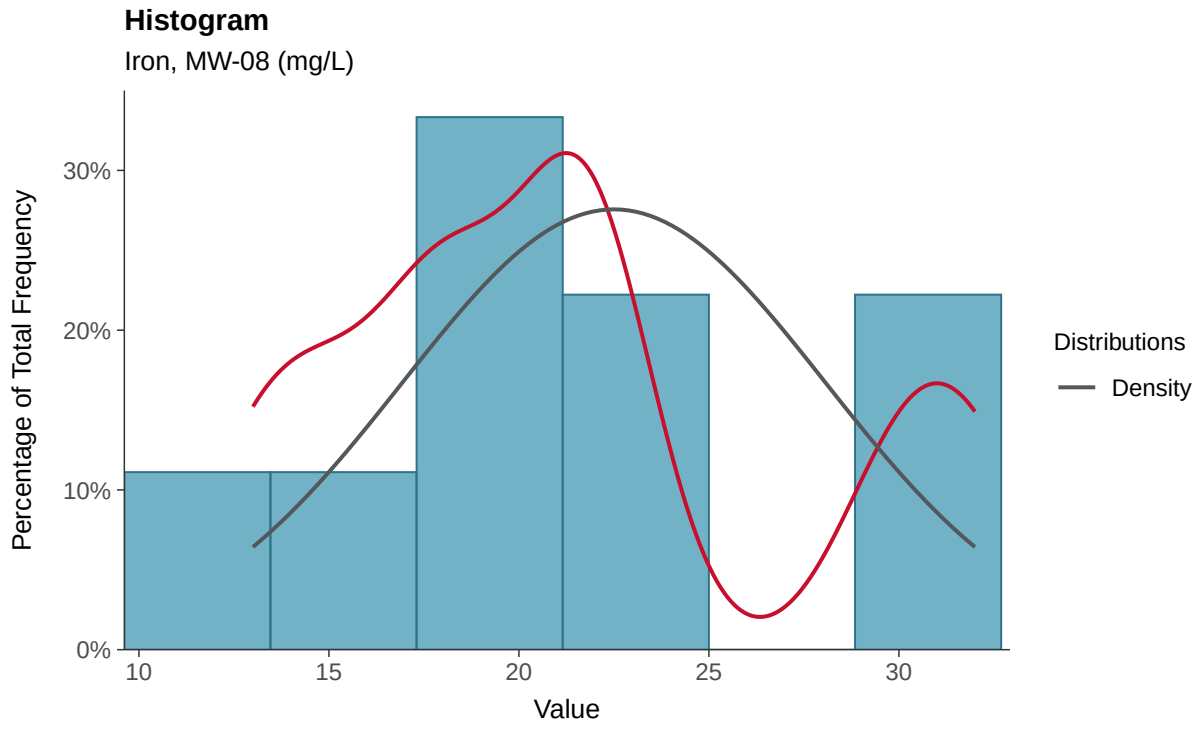

Trend Regression: Piecewise Linear-Linear
Copper, MW-08 (mg/L)
Value
0.00045
0.00040
0.00035
0.00030
0.00025
0.00020
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Copper, MW-08 (mg/L)
0.00045
0.00040
0.00035
0.00030
0.00025
0.00020
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-08

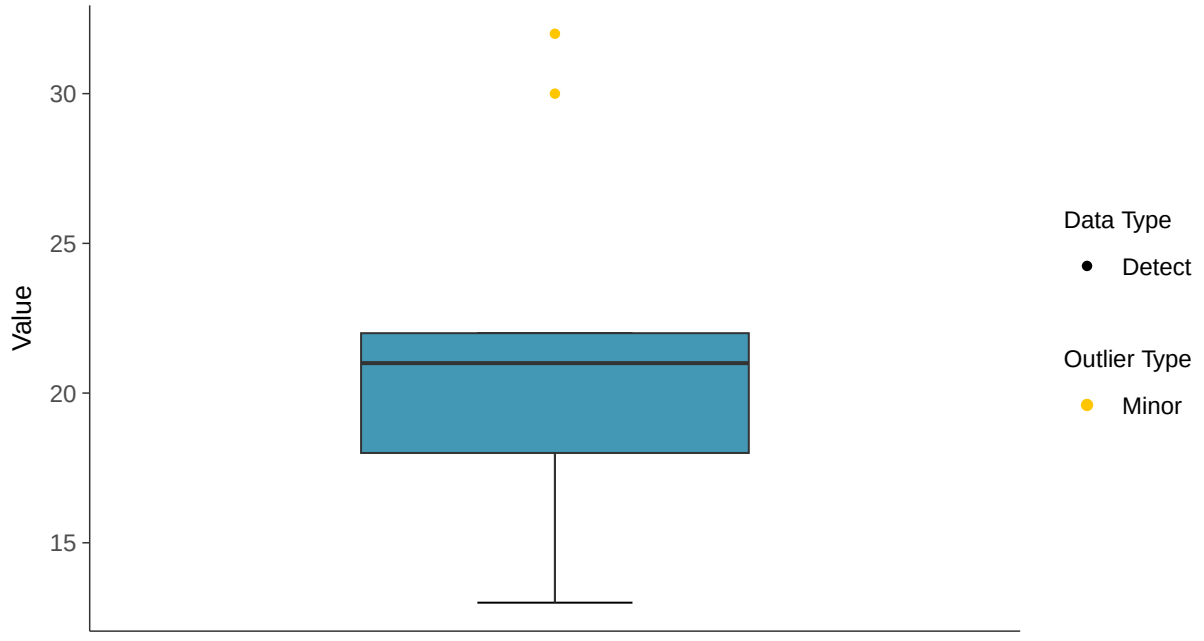
ID: 1_17_6_114





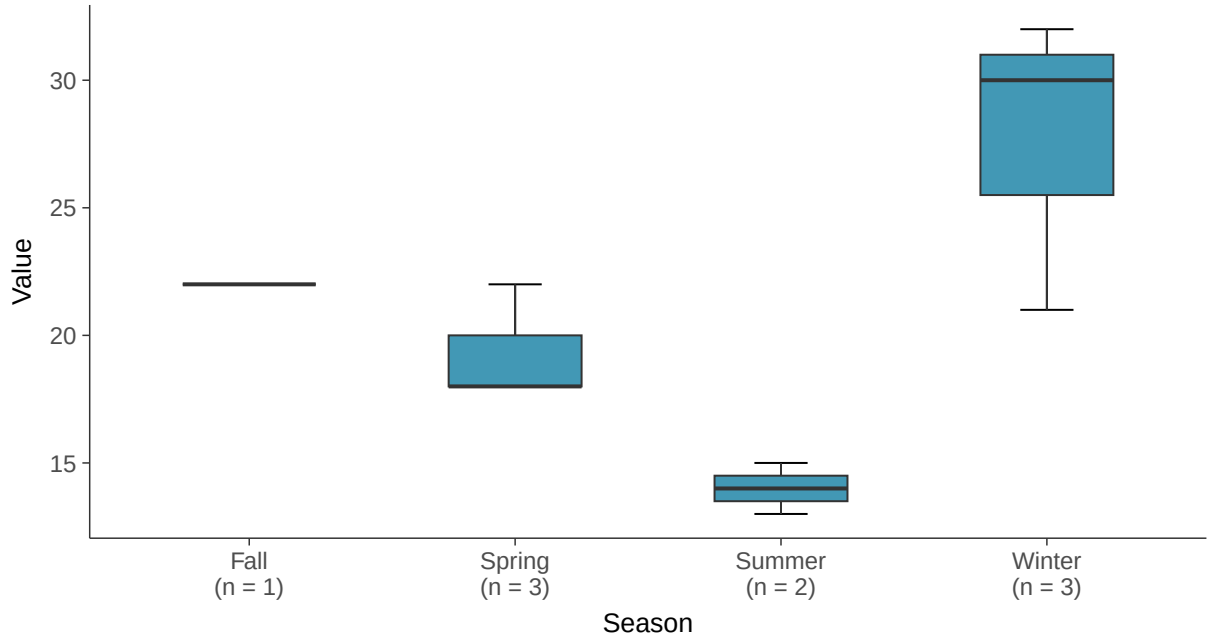
Boxplot

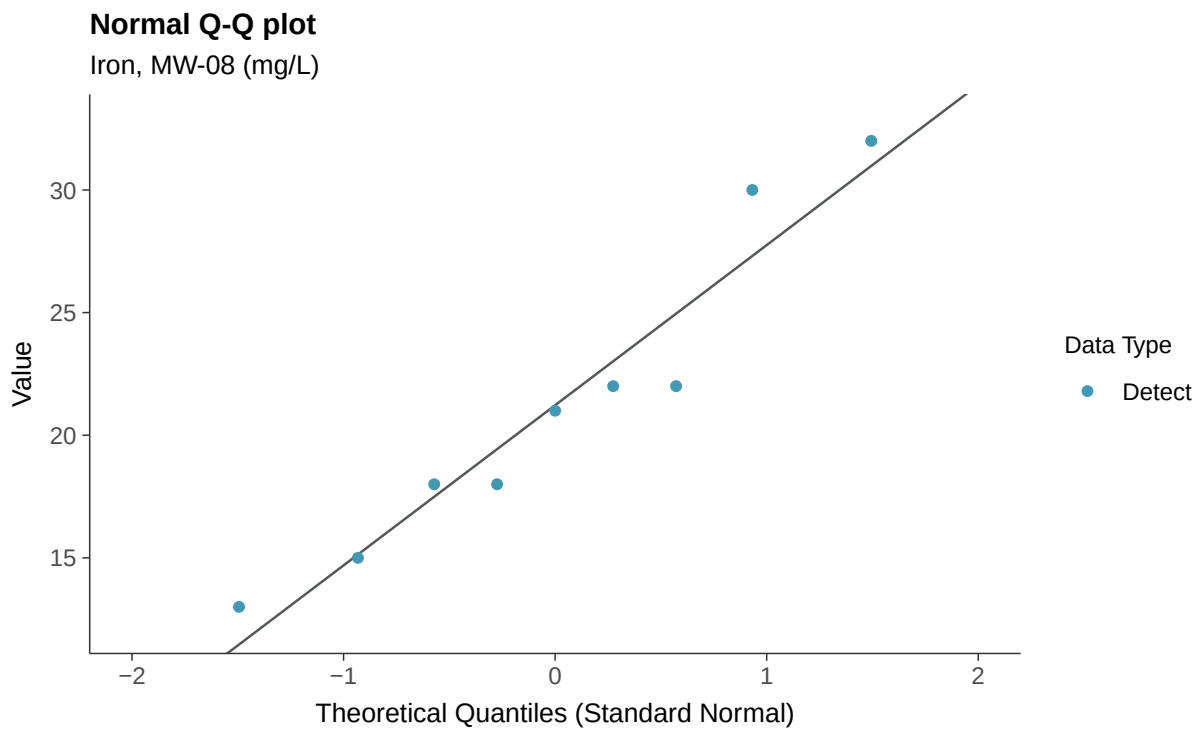
Iron, MW-08 (mg/L)

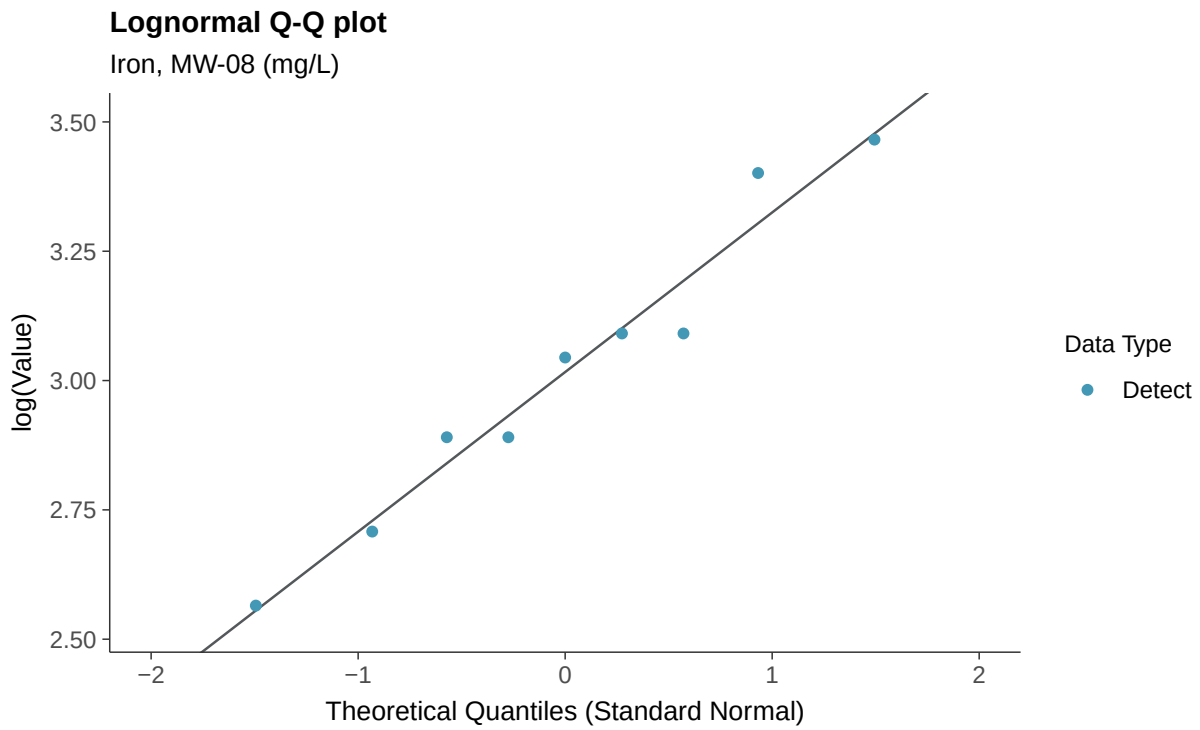


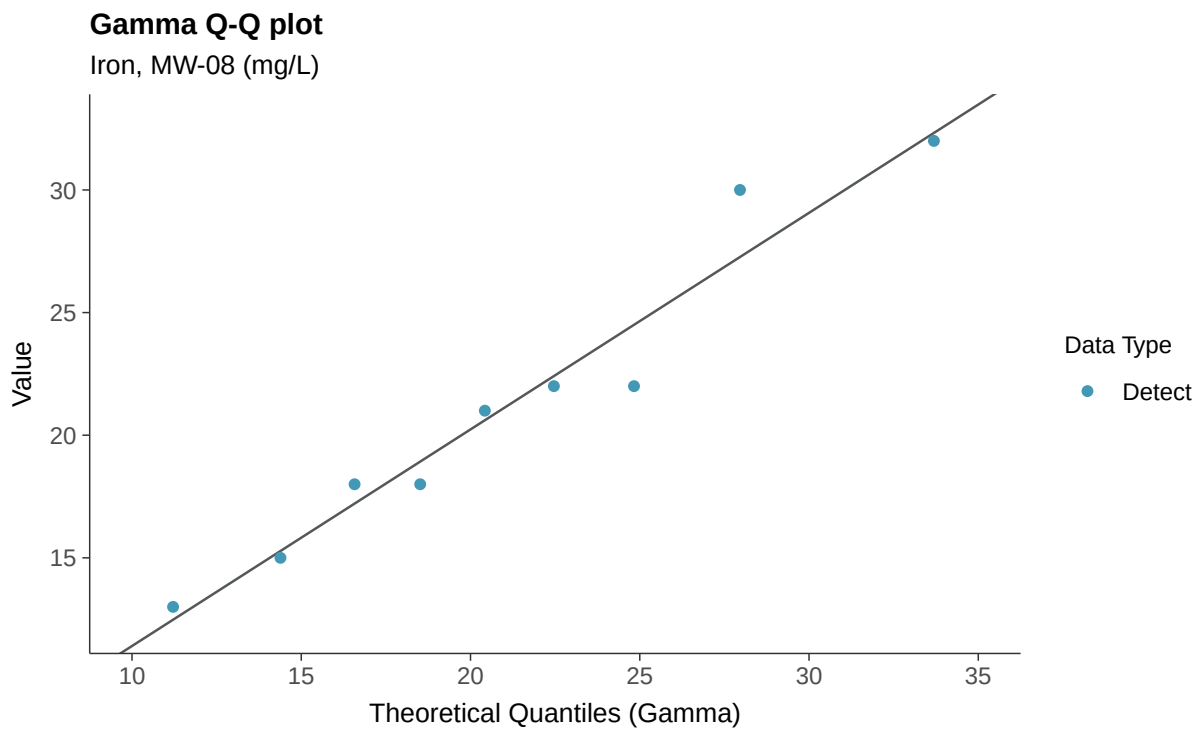
Boxplot by Season

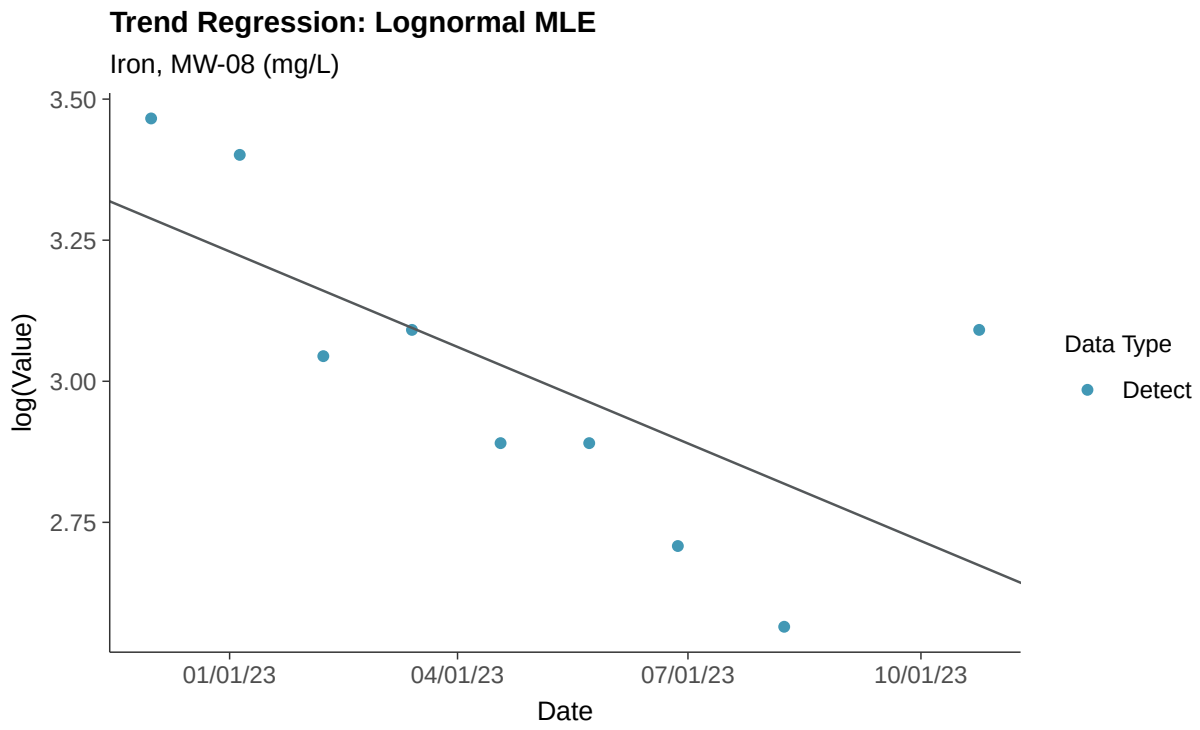
Iron, MW-08 (mg/L)




Normal Q-Q plot
Iron, MW-08 (mg/L)
Value
30
25
20
15
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

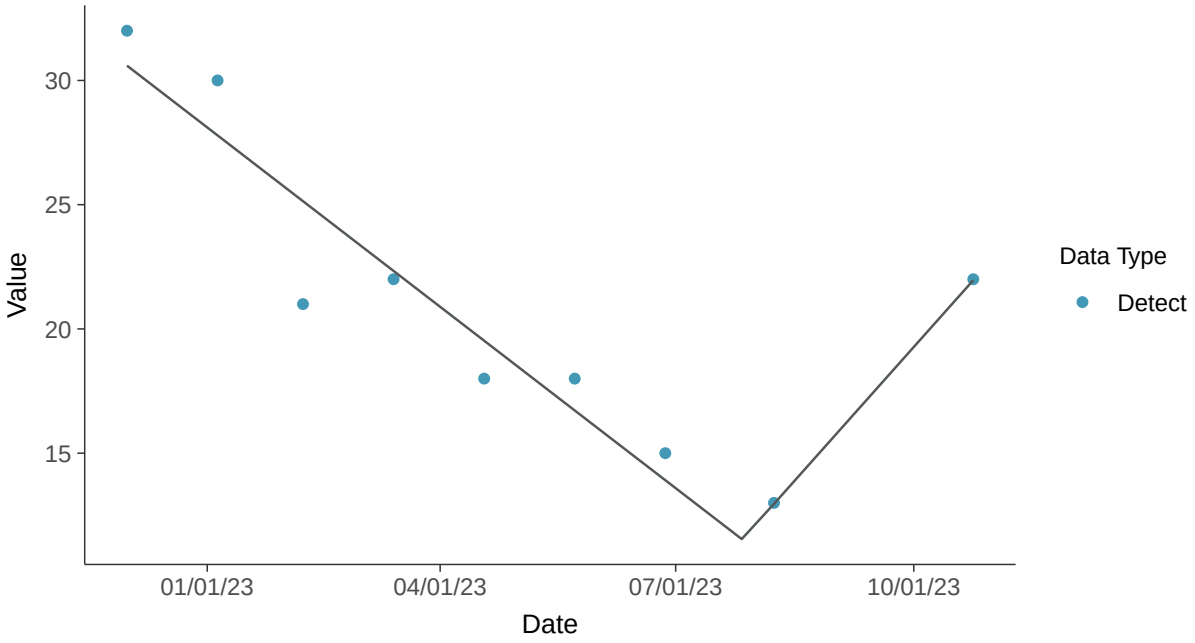

Lognormal Q-Q plot
Iron, MW-08 (mg/L)
log(Value)
3.50
3.25
3.00
2.75
2.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Iron, MW-08 (mg/L)
Value
30
25
20
15
10
15
20
25
30
35
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Iron, MW-08 (mg/L)
log(Value)
3.50
3.25
3.00
2.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

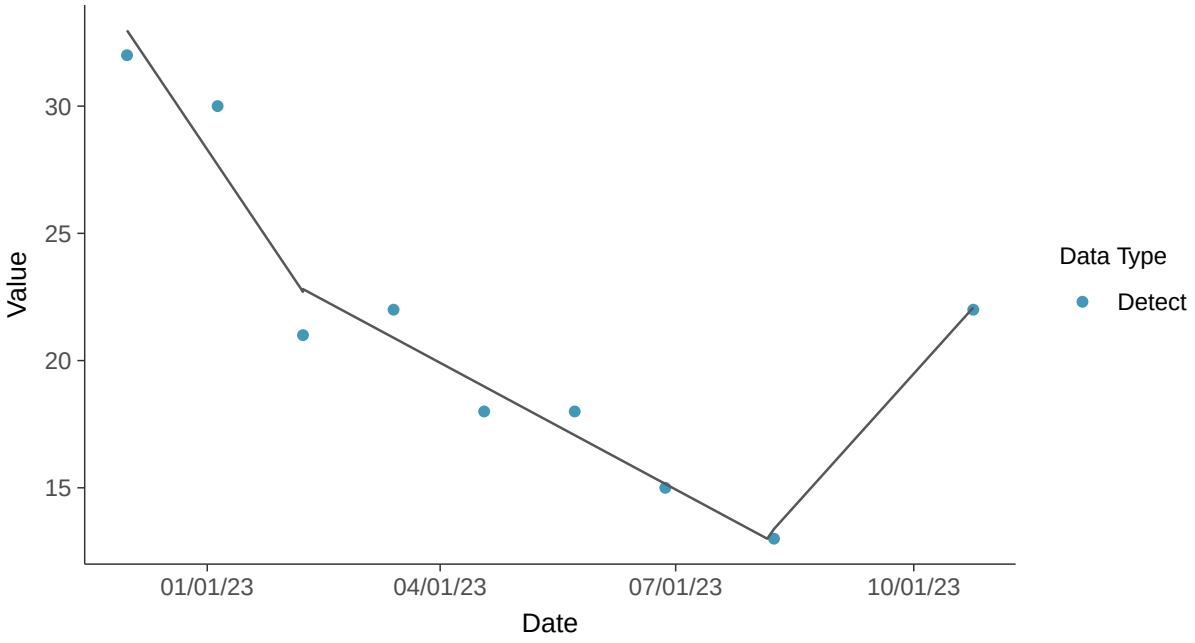
Trend Regression: Piecewise Linear-Linear

Iron, MW-08 (mg/L)



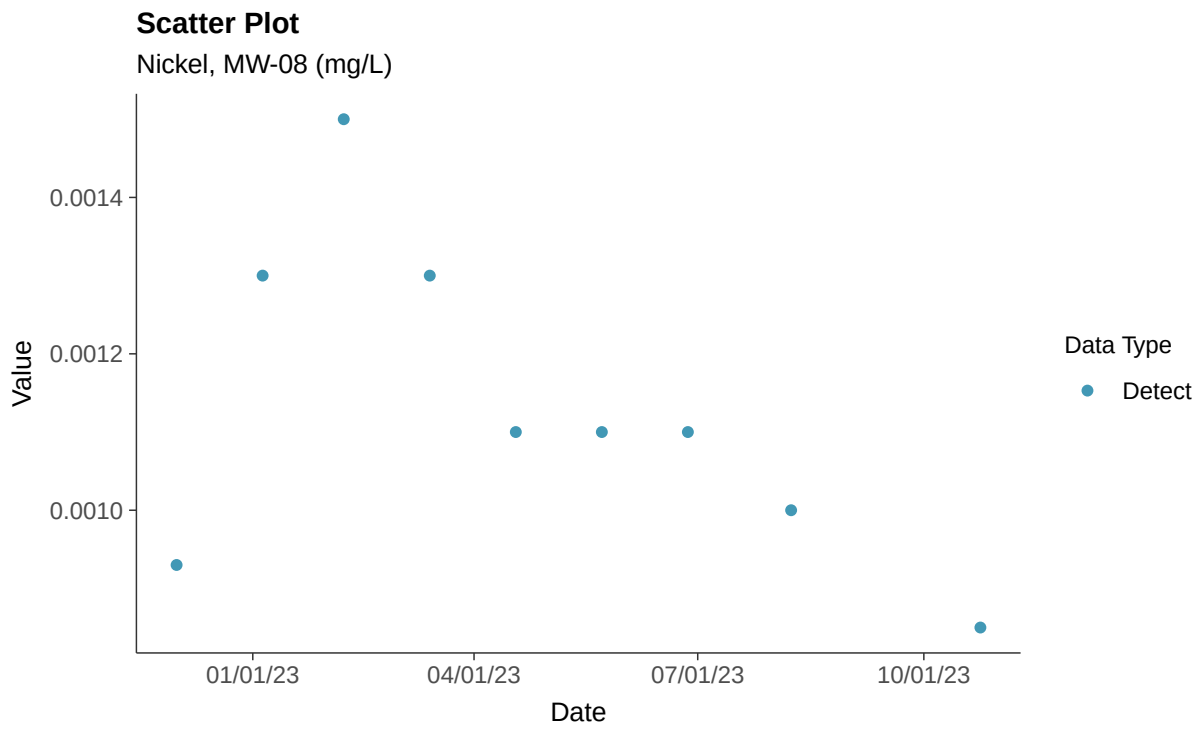
Trend Regression: Piecewise Linear-Linear-Linear

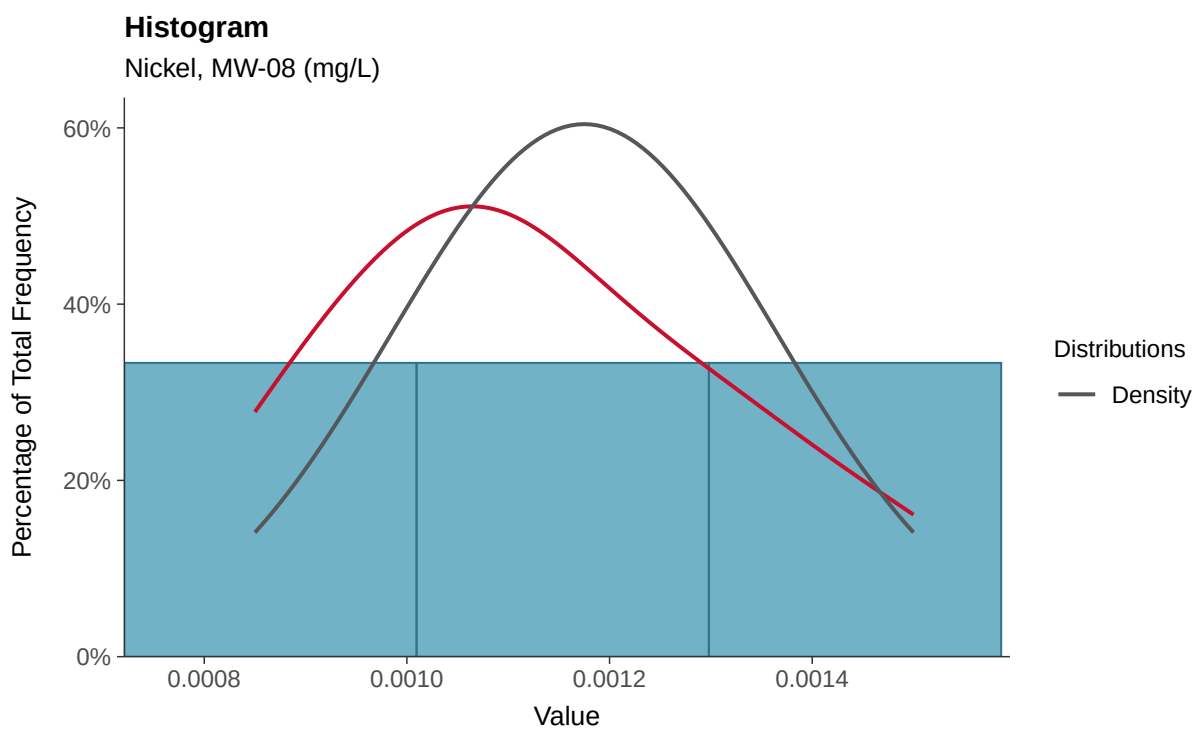
Iron, MW-08 (mg/L)



Part 115: Nickel, MW-08

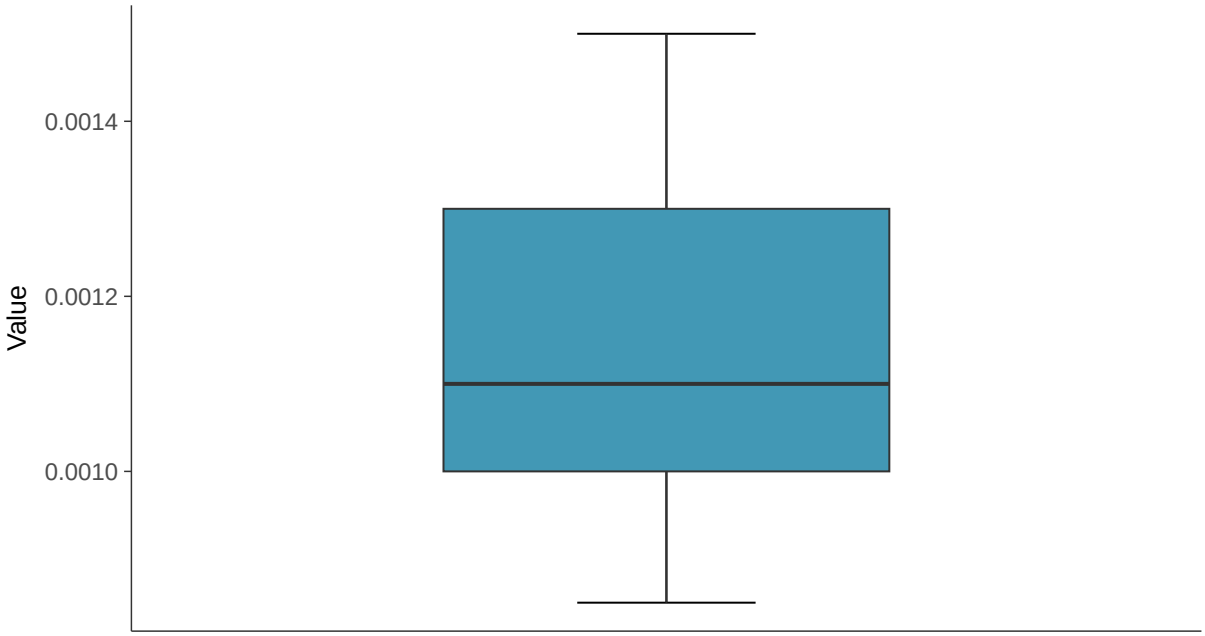
ID: 1_17_6_119





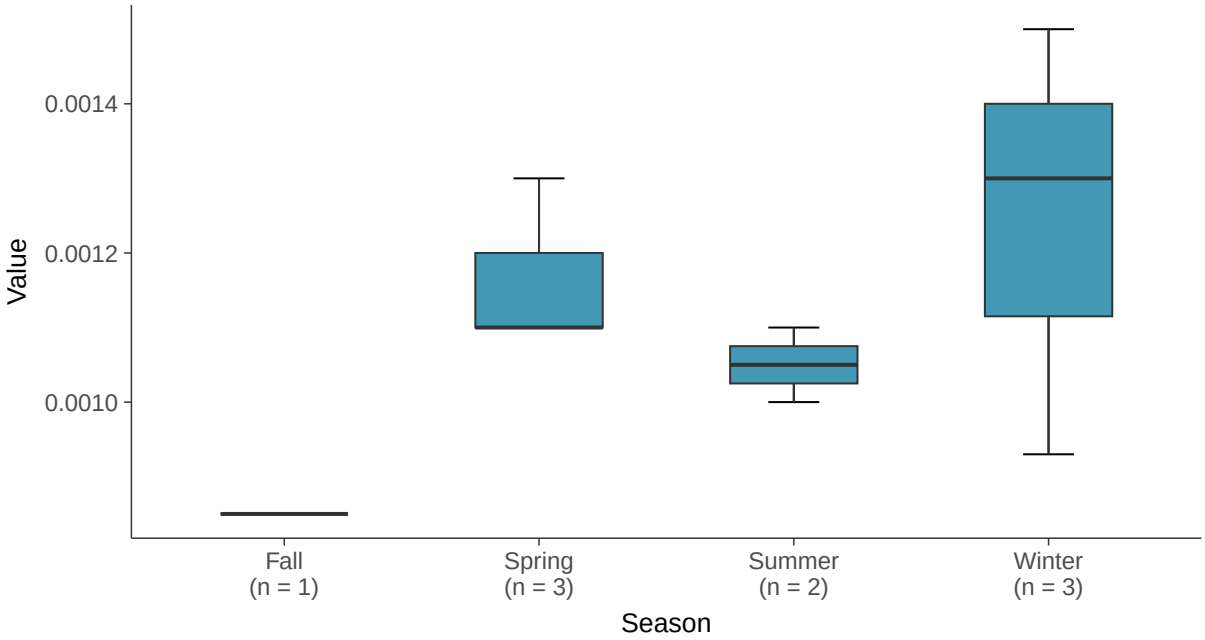
Boxplot

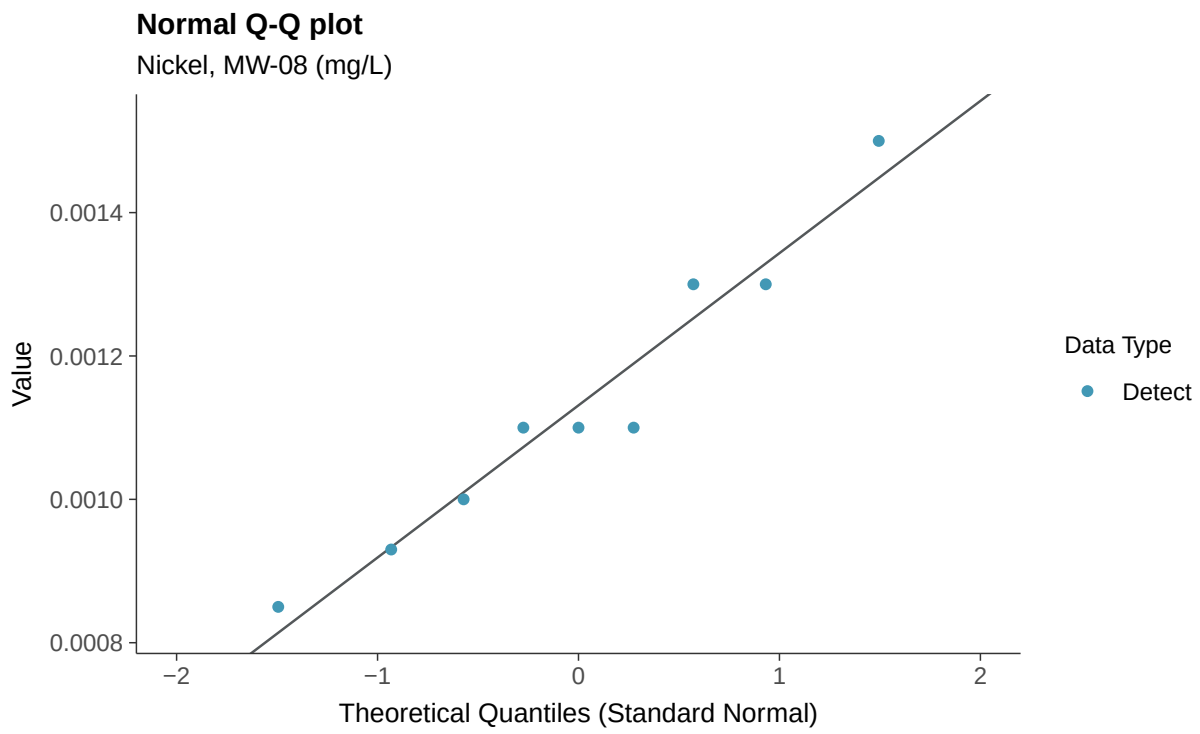
Nickel, MW-08 (mg/L)

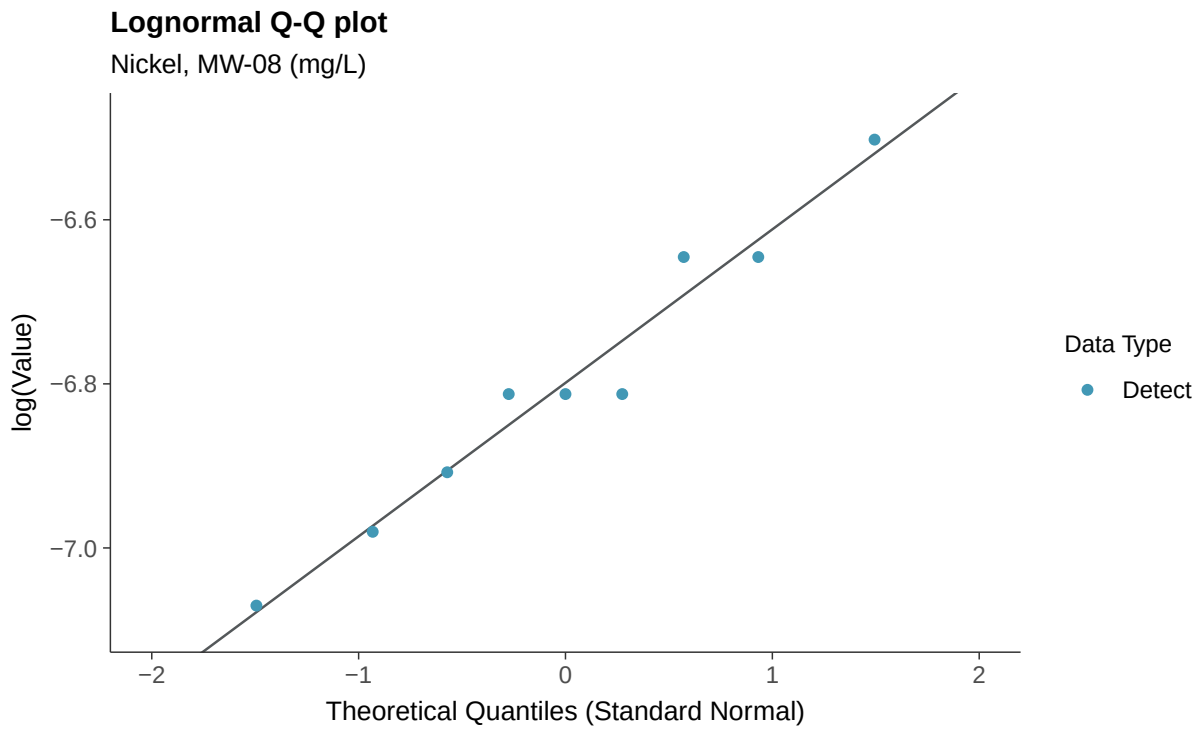


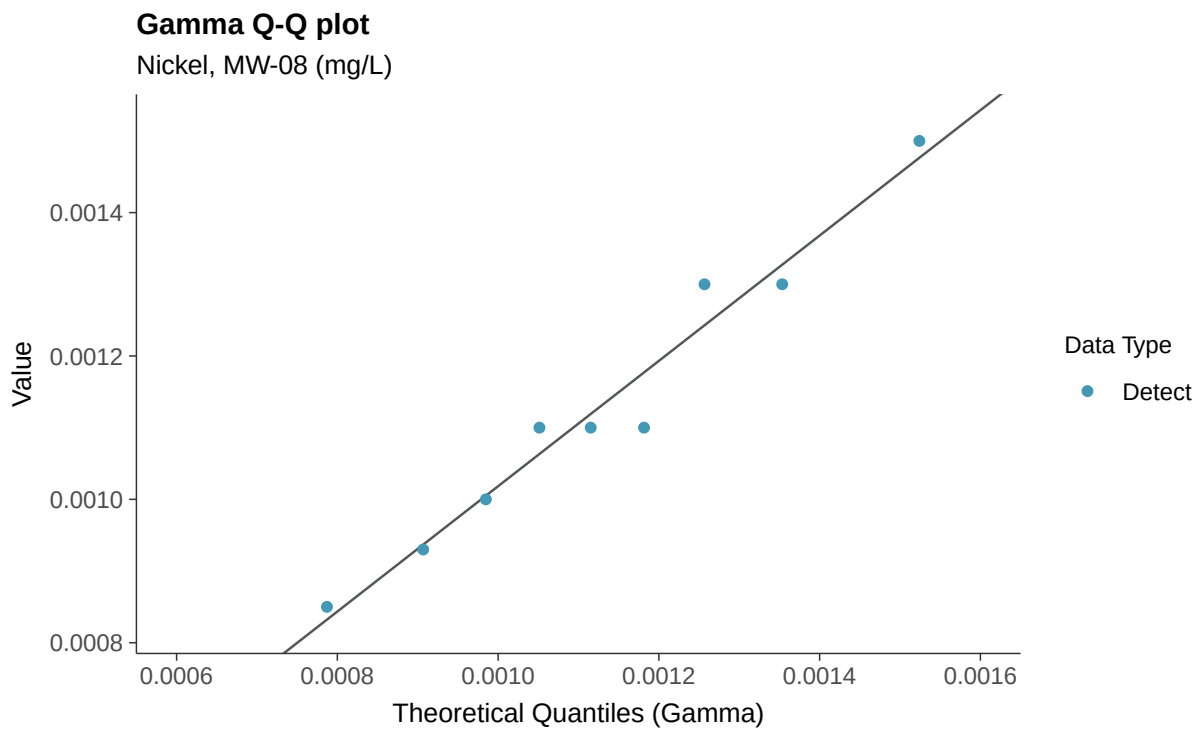
Boxplot by Season

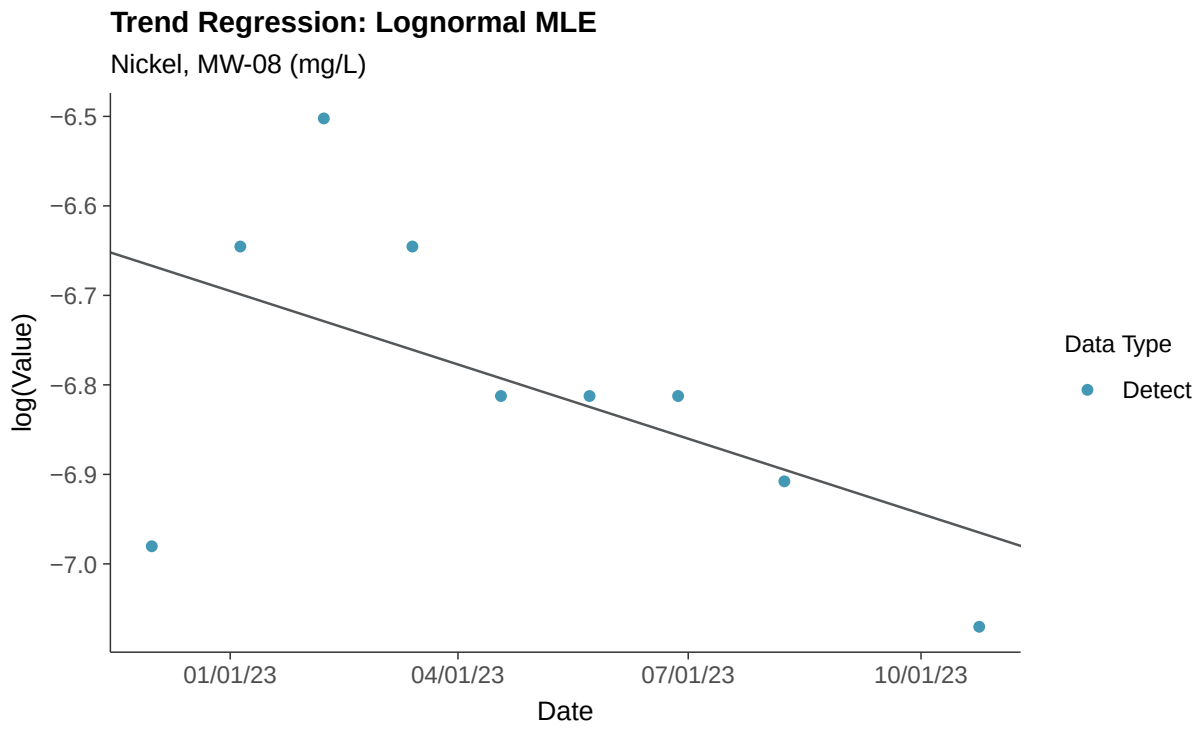
Nickel, MW-08 (mg/L)

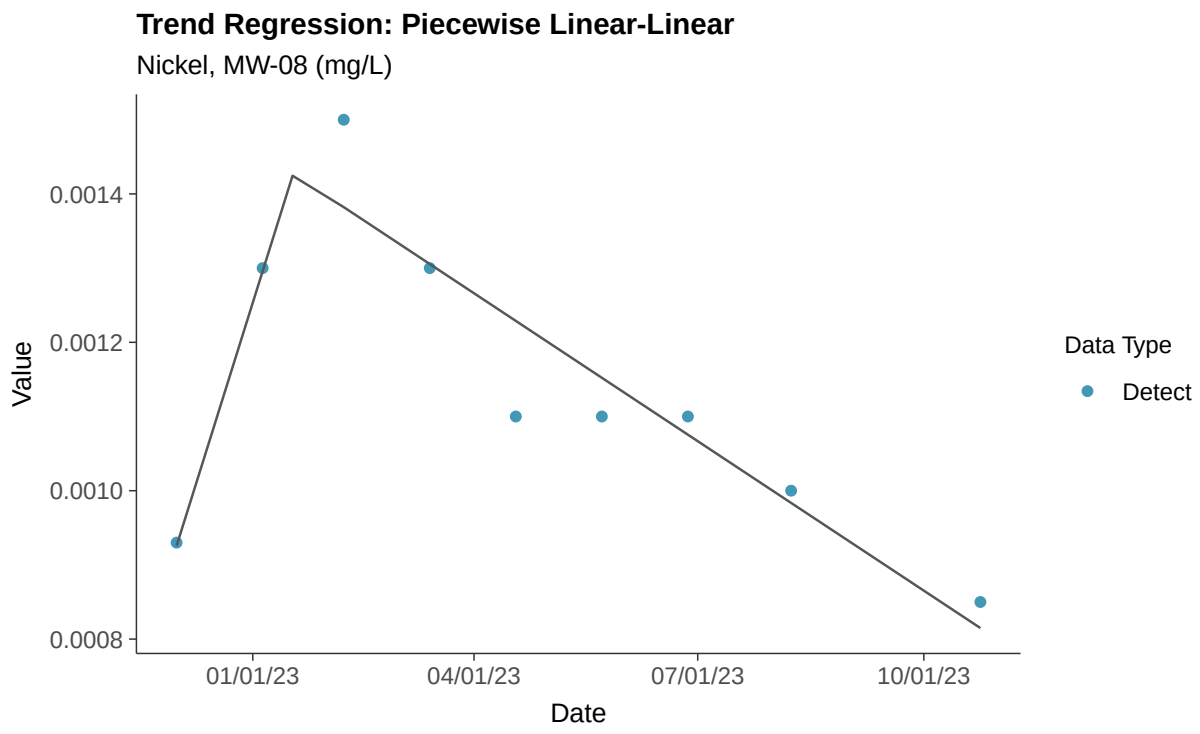


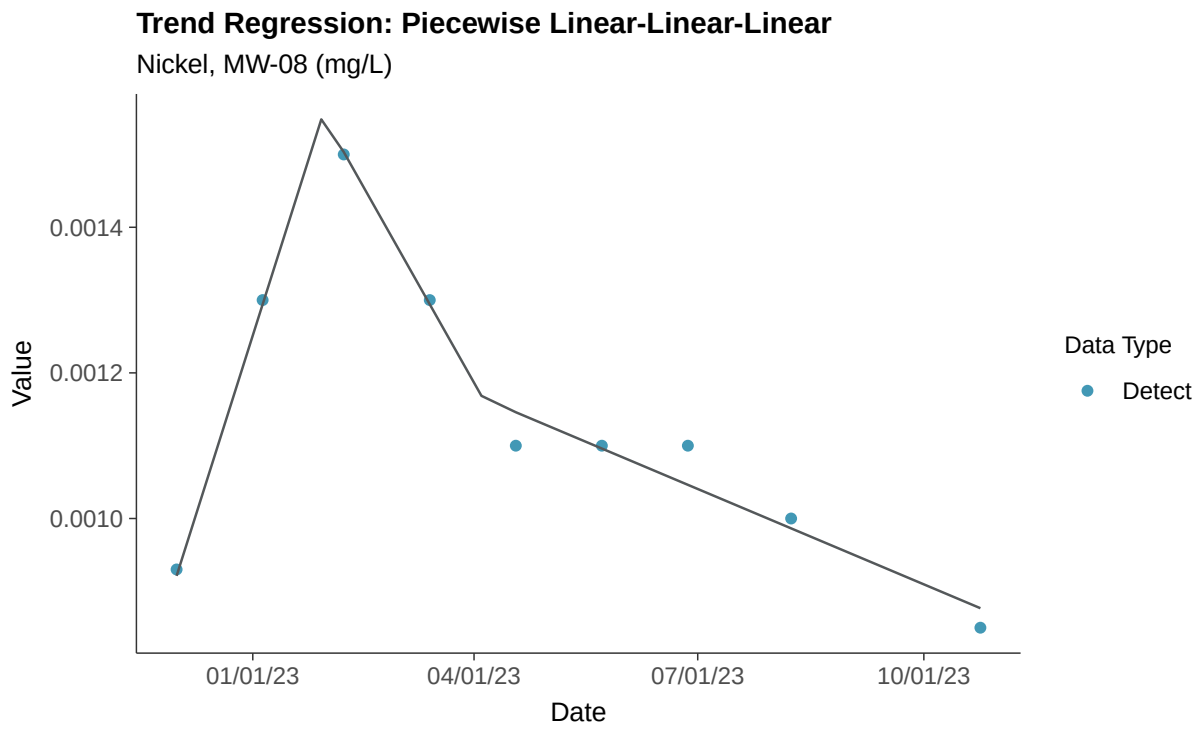

Normal Q-Q plot
Nickel, MW-08 (mg/L)
Value
0.0014
0.0012
0.0010
0.0008
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Nickel, MW-08 (mg/L)
log(Value)
−6.6
−6.8
−7.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Nickel, MW-08 (mg/L)
Value
0.0014
0.0012
0.0010
0.0008
0.0006
0.0008
0.0010
0.0012
0.0014
0.0016
Theoretical Quantiles (Gamma)
Data Type
Detect

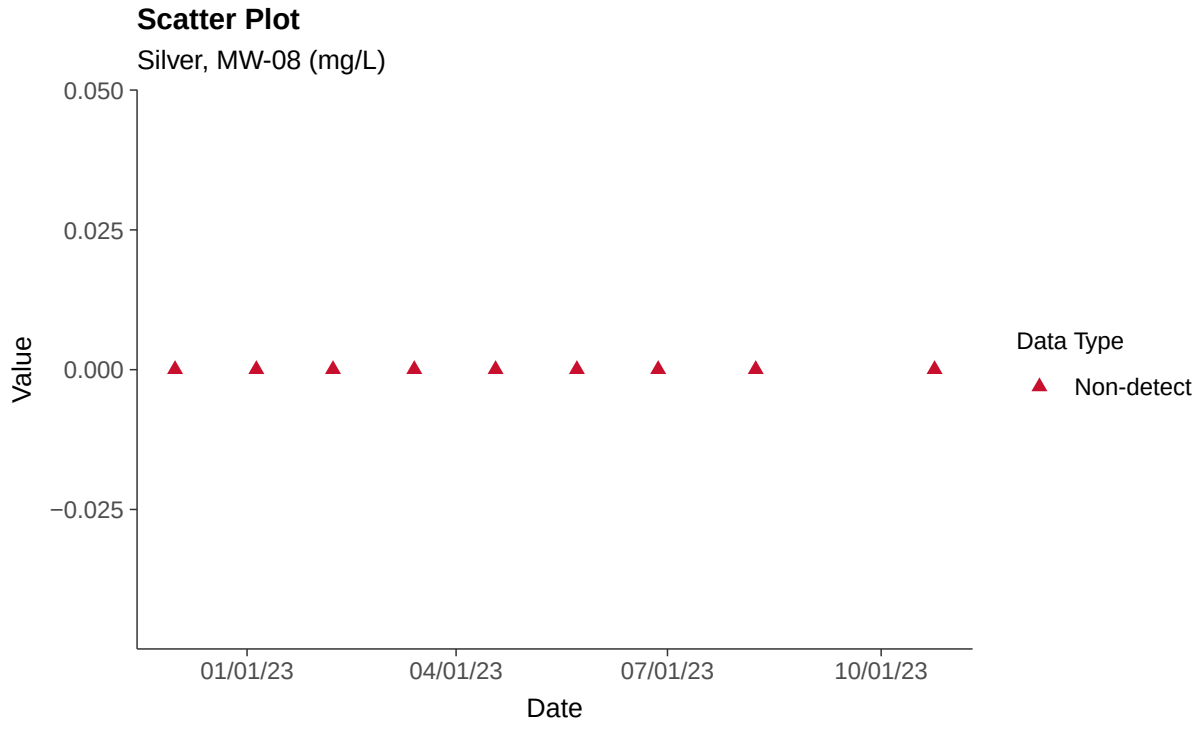

Trend Regression: Lognormal MLE
Nickel, MW-08 (mg/L)
log(Value)
−6.5
−6.6
−6.7
−6.8
−6.9
−7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

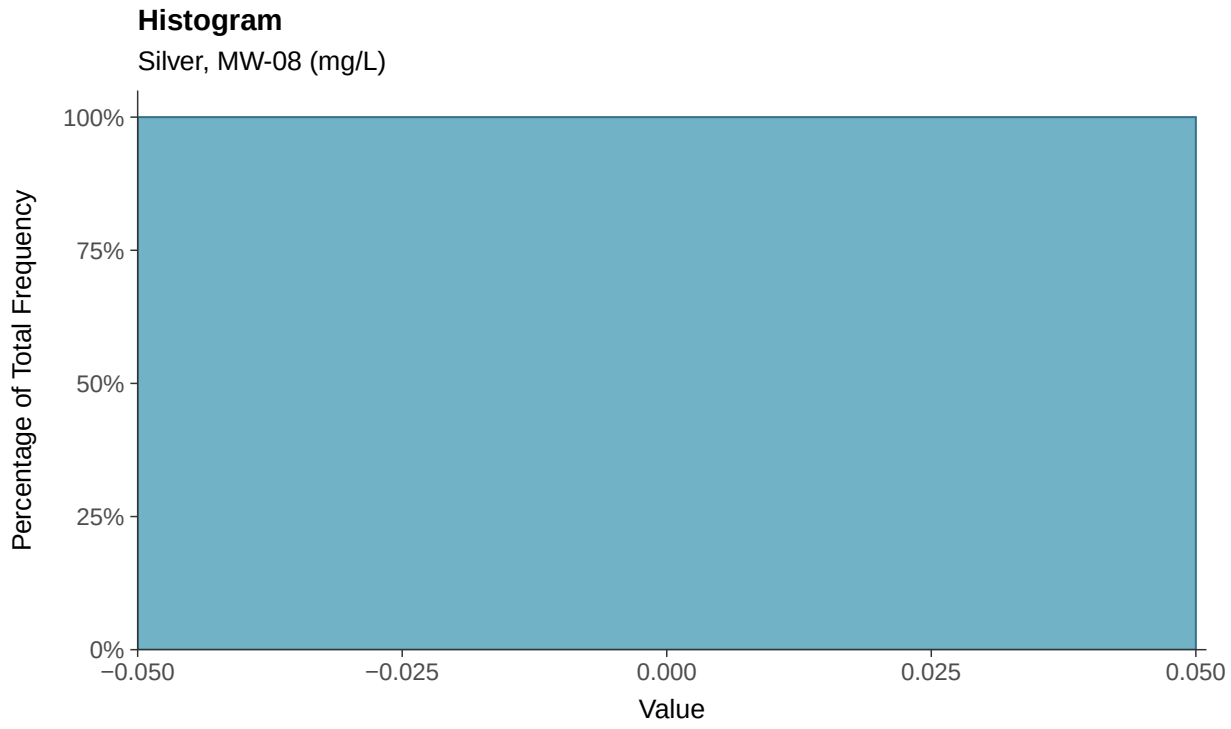

Trend Regression: Piecewise Linear-Linear
Nickel, MW-08 (mg/L)
Value
0.0014
0.0012
0.0010
0.0008
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-08 (mg/L)
Value
0.0014
0.0012
0.0010
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-08

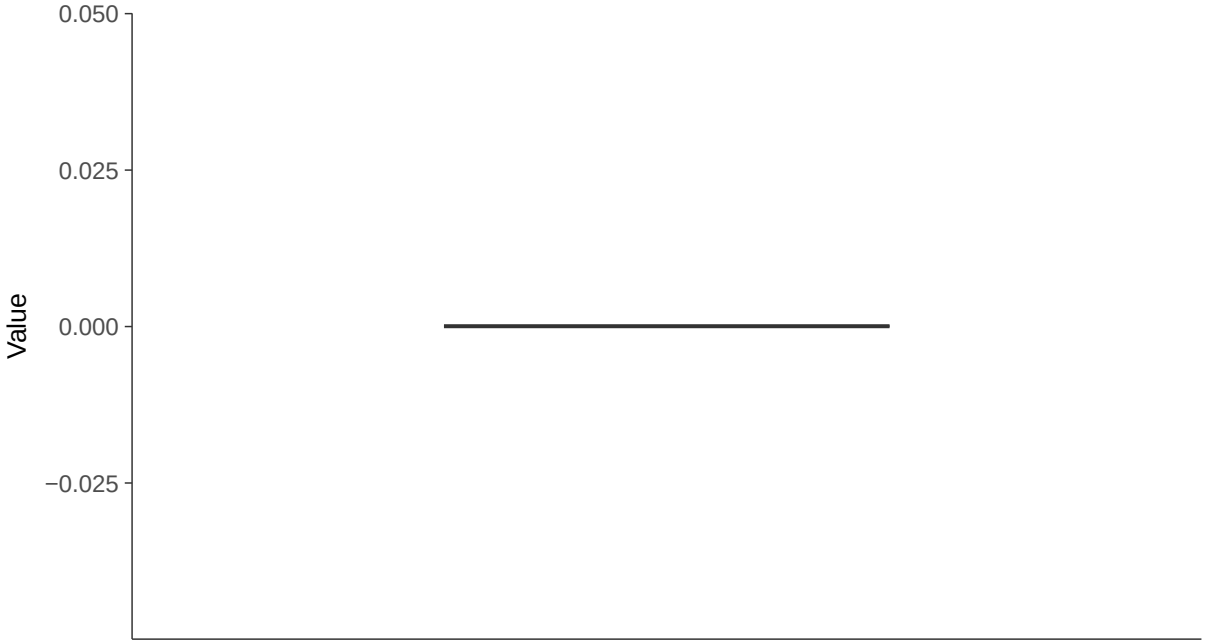
ID: 1_17_6_123





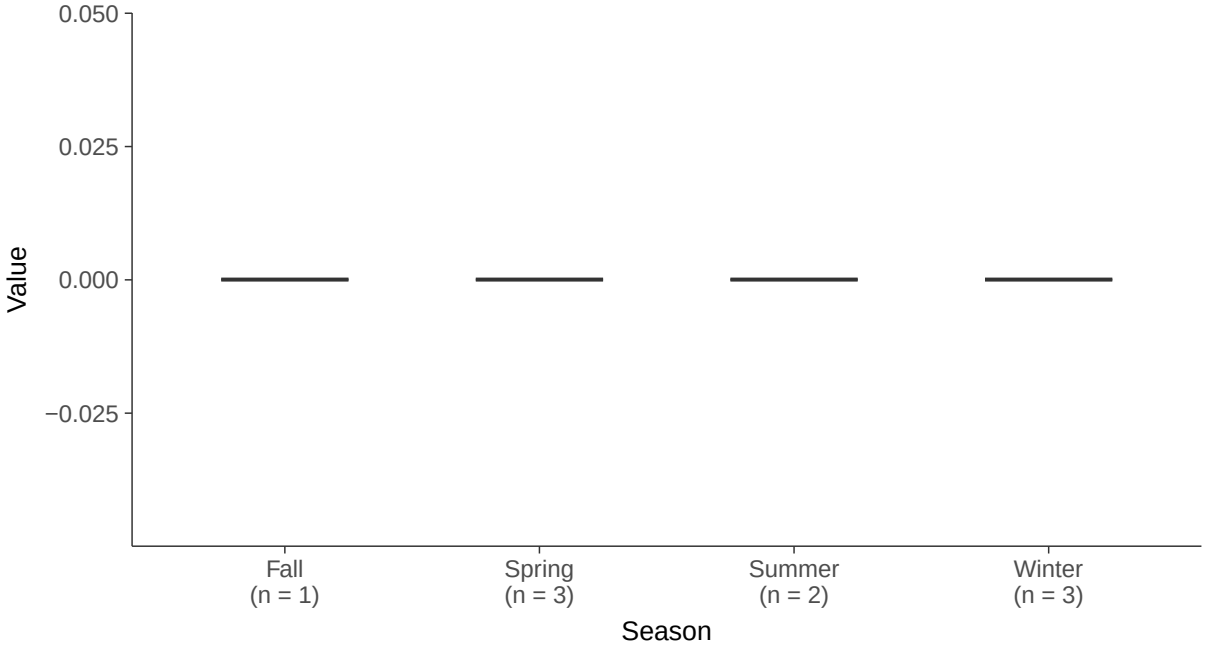
Boxplot

Silver, MW-08 (mg/L)



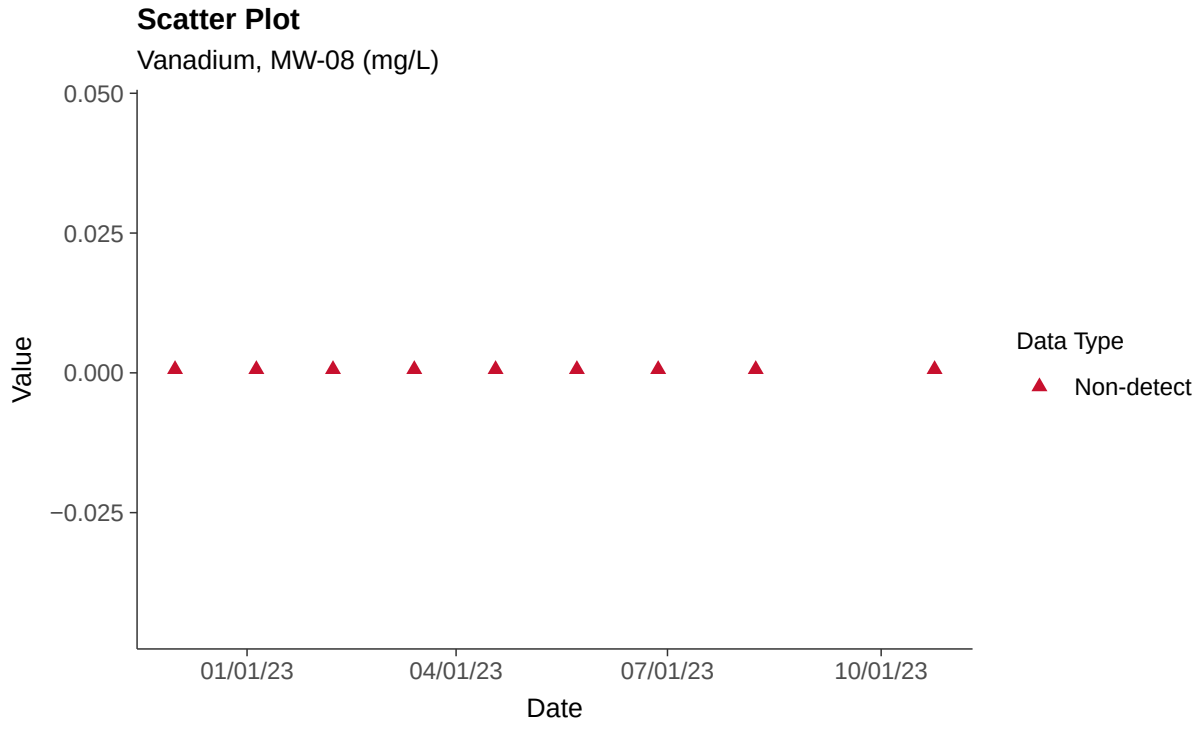
Boxplot by Season

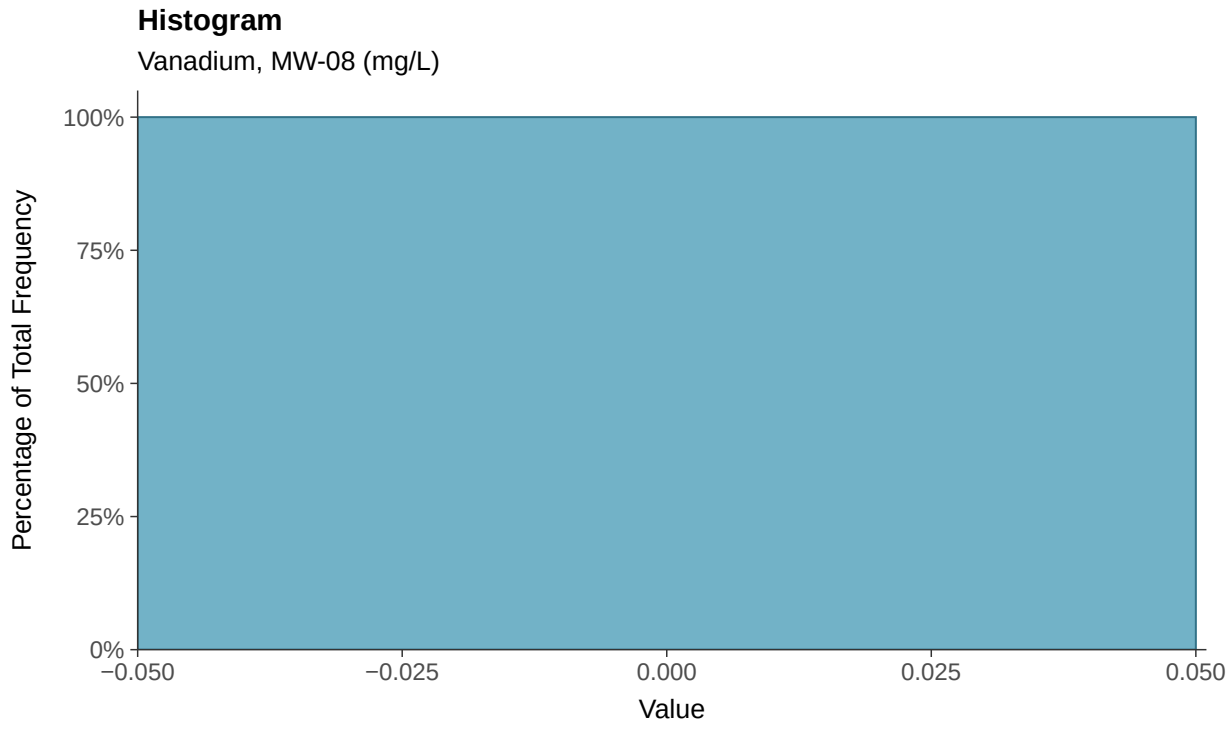
Silver, MW-08 (mg/L)



Part 115: Vanadium, MW-08

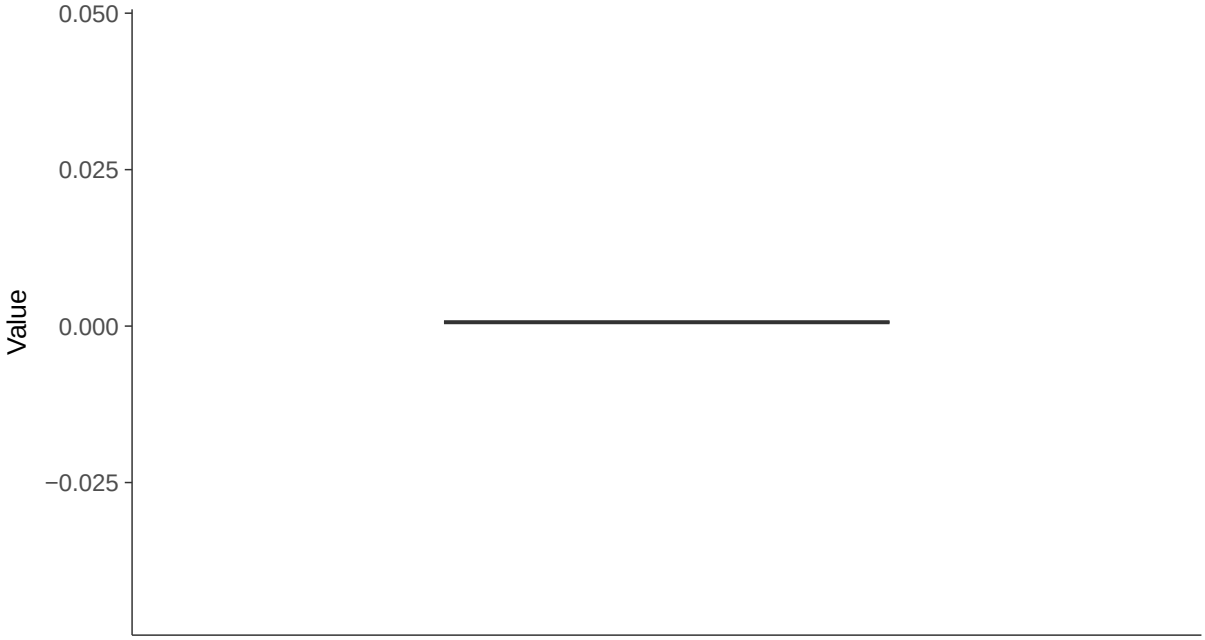
ID: 1_17_6_129





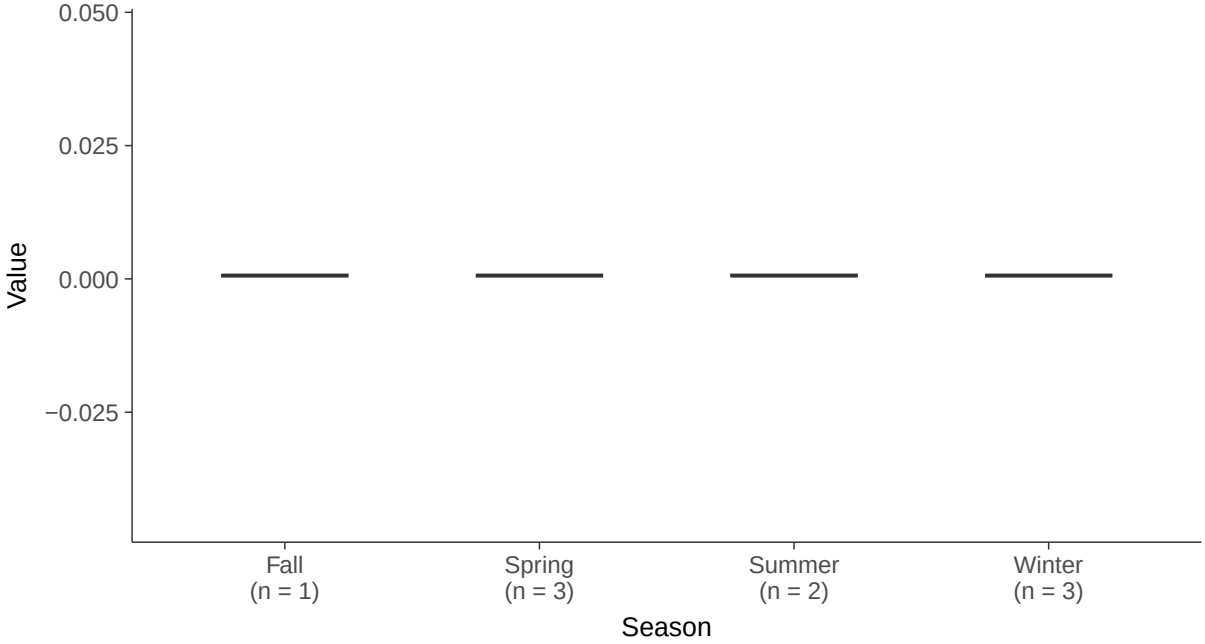
Boxplot

Vanadium, MW-08 (mg/L)



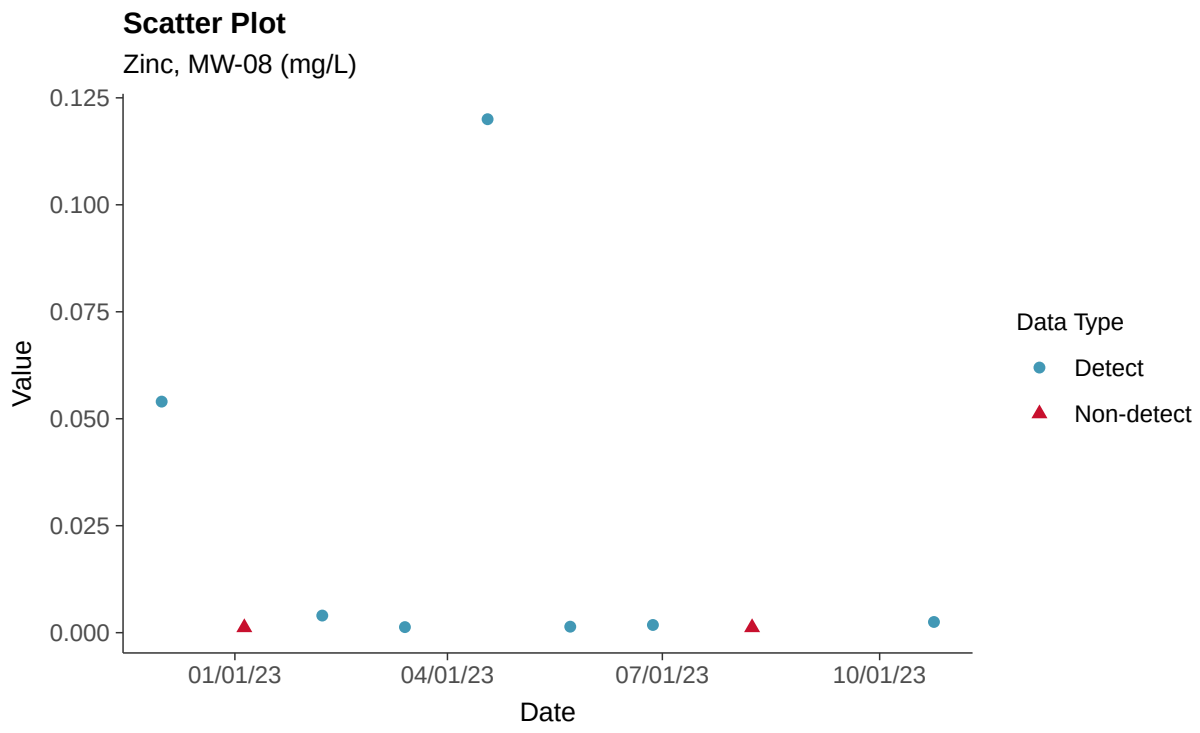
Boxplot by Season

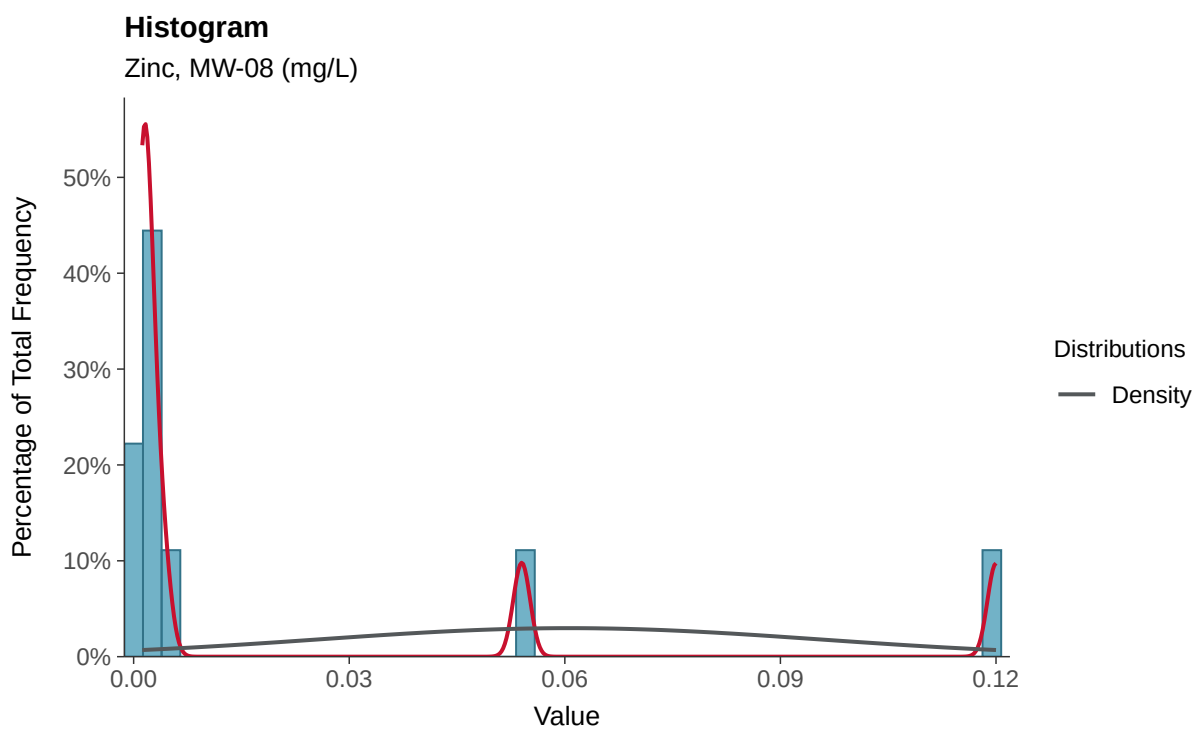
Vanadium, MW-08 (mg/L)

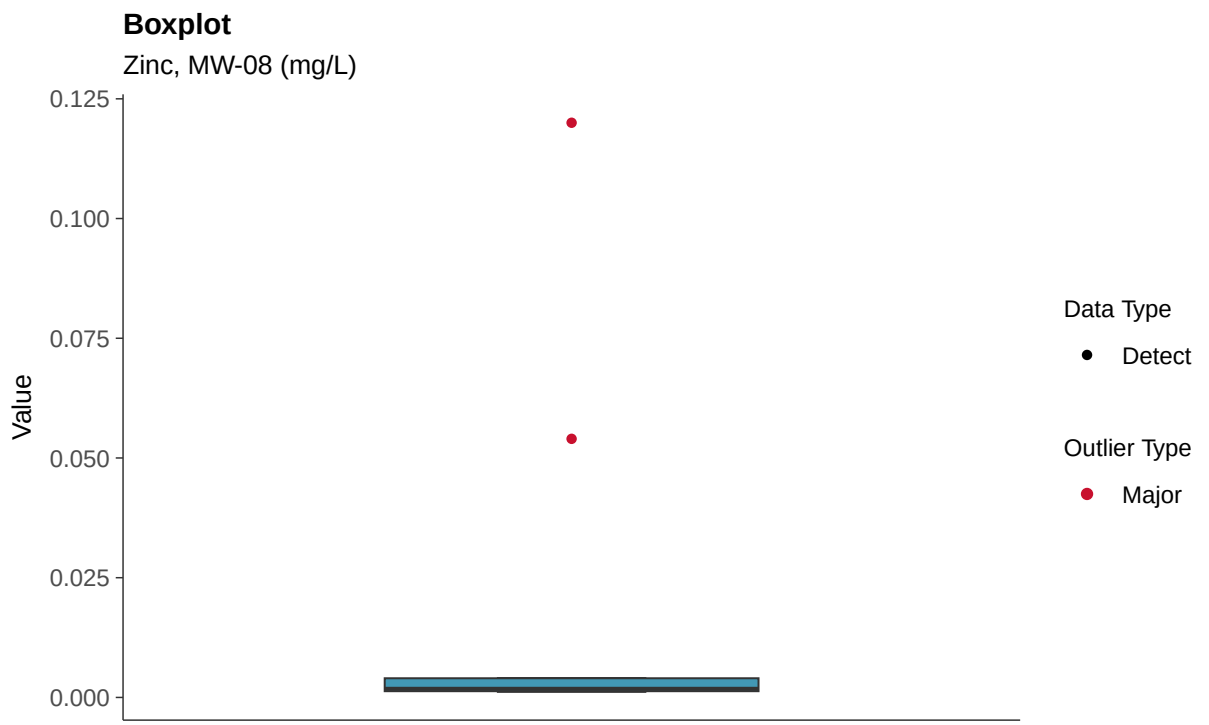


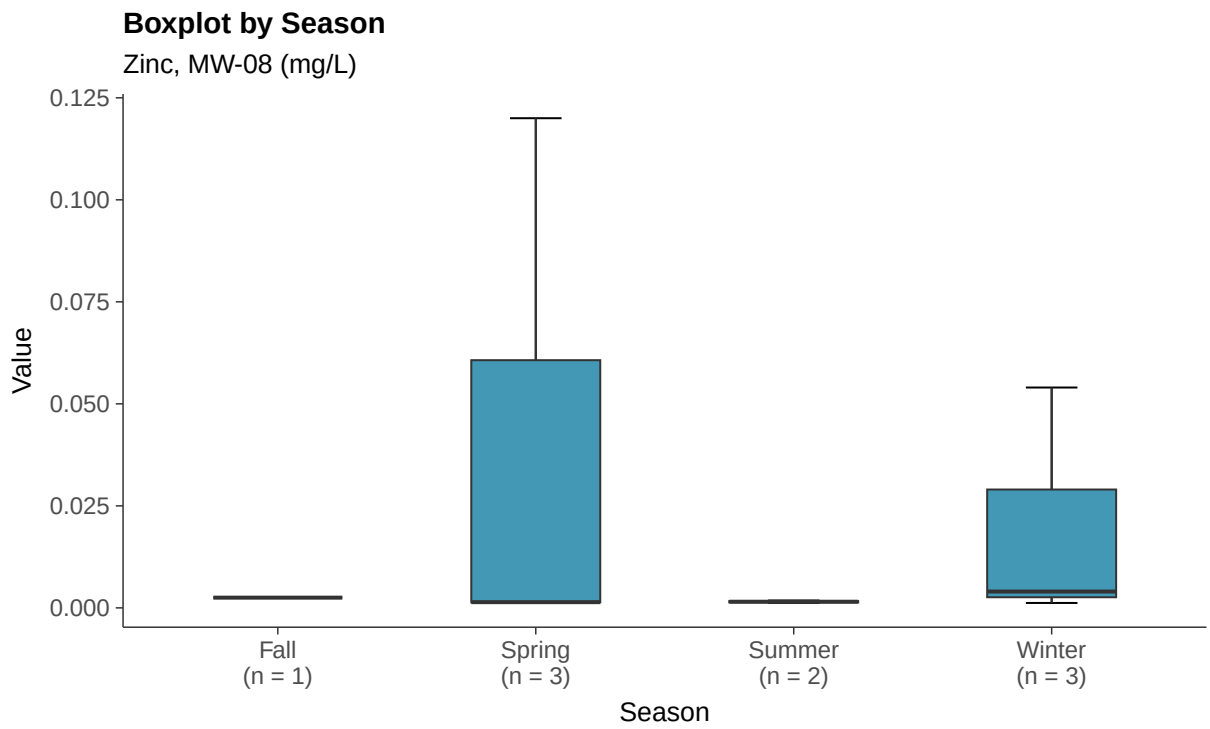
Part 115: Zinc, MW-08

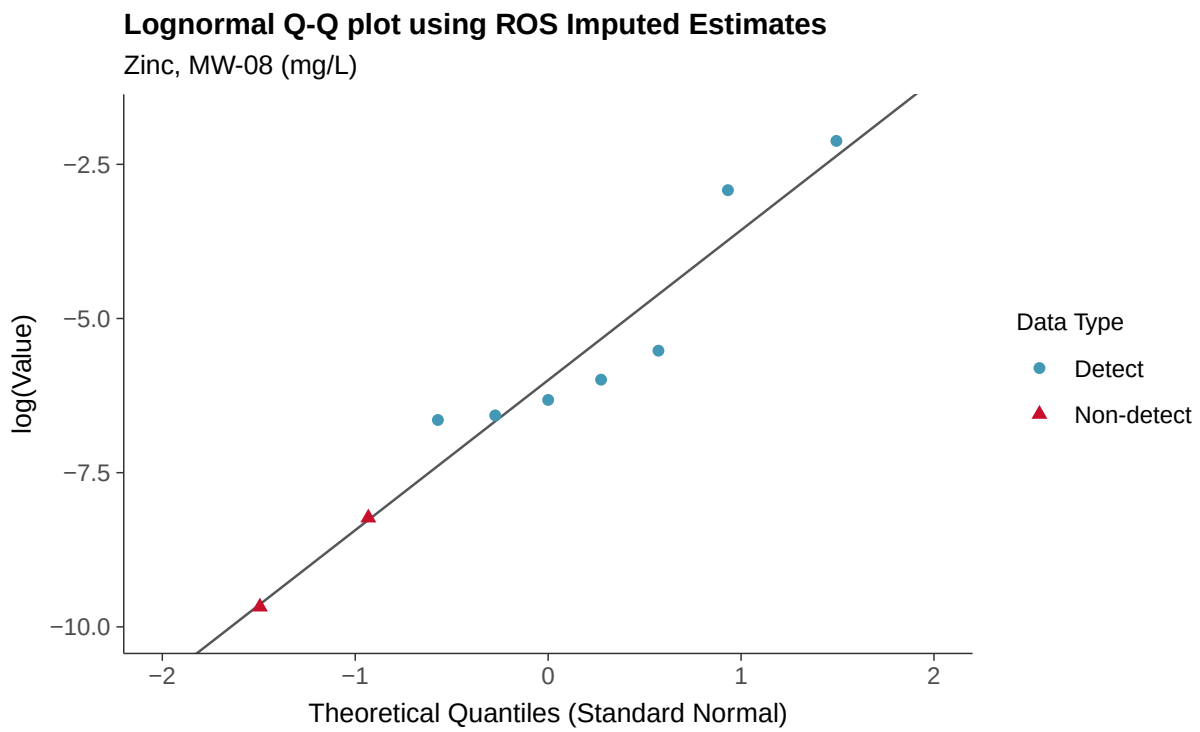
ID: 1_17_6_130

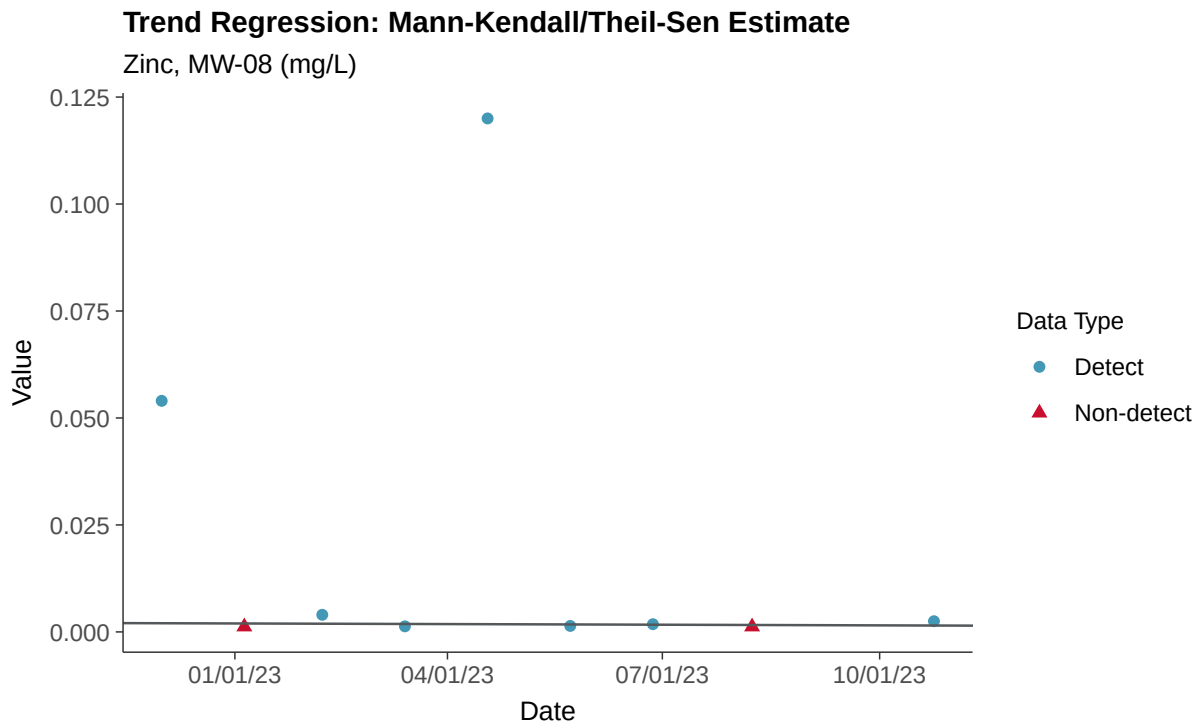





Boxplot
Zinc, MW-08 (mg/L)
Value
0.125
0.100
0.075
0.050
0.025
0.000
Data Type
Detect
Outlier Type
Major

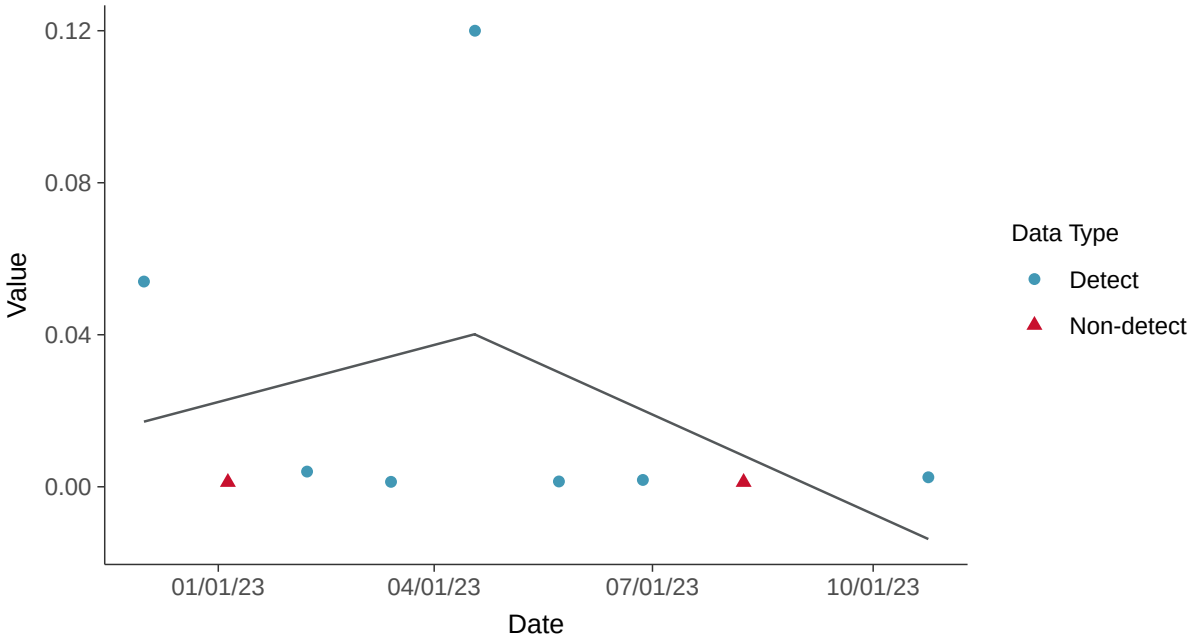

Boxplot by Season
Zinc, MW-08 (mg/L)
Value
0.125
0.100
0.075
0.050
0.025
0.000
Fall
(n = 1)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 3)
Season


Lognormal Q-Q plot using ROS Imputed Estimates
Zinc, MW-08 (mg/L)
log(Value)
−2.5
−5.0
−7.5
−10.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Zinc, MW-08 (mg/L)
Value
0.125
0.100
0.075
0.050
0.025
0.000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

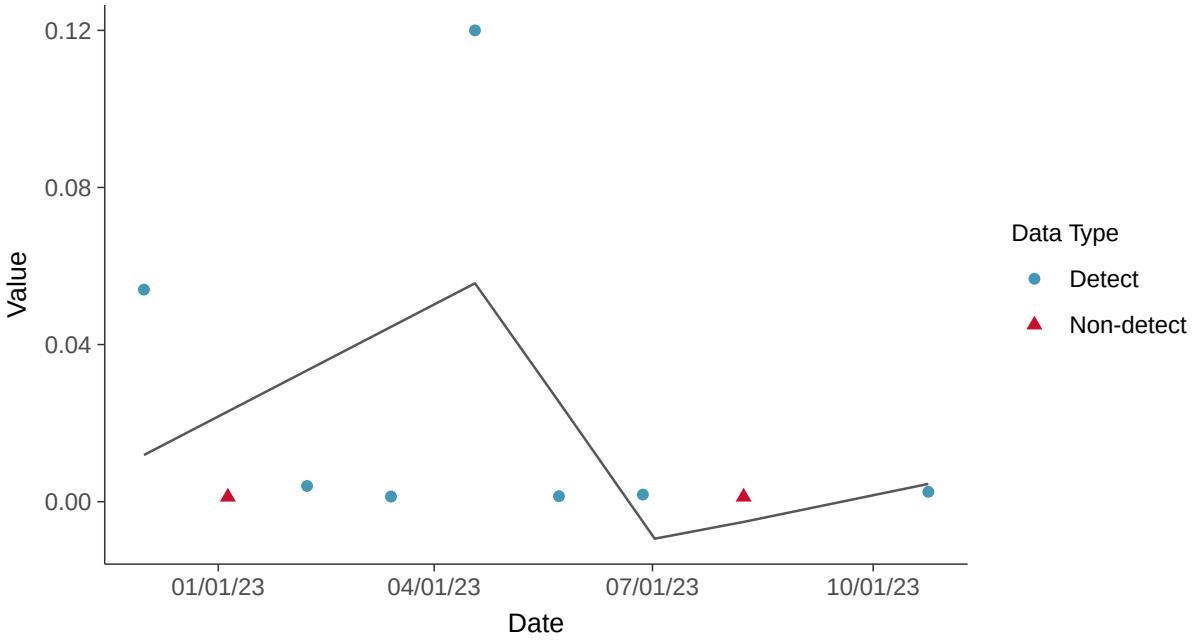
Trend Regression: Piecewise Linear-Linear

Zinc, MW-08 (mg/L)



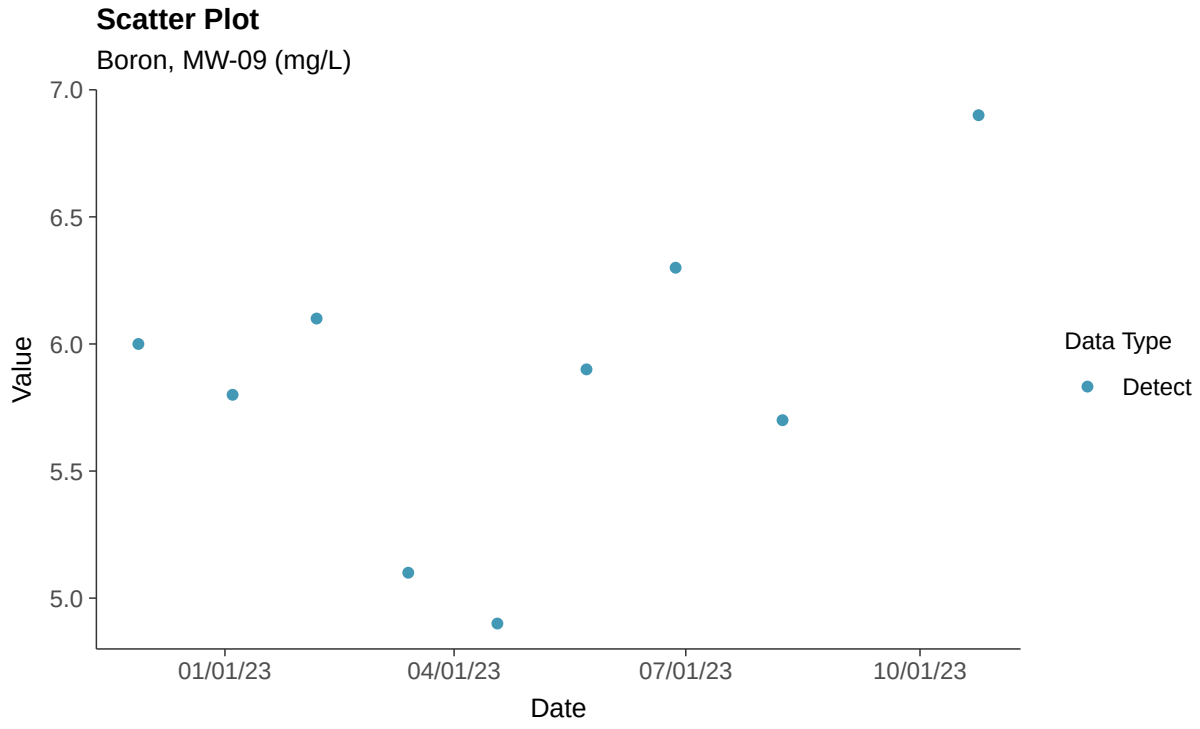
Trend Regression: Piecewise Linear-Linear-Linear

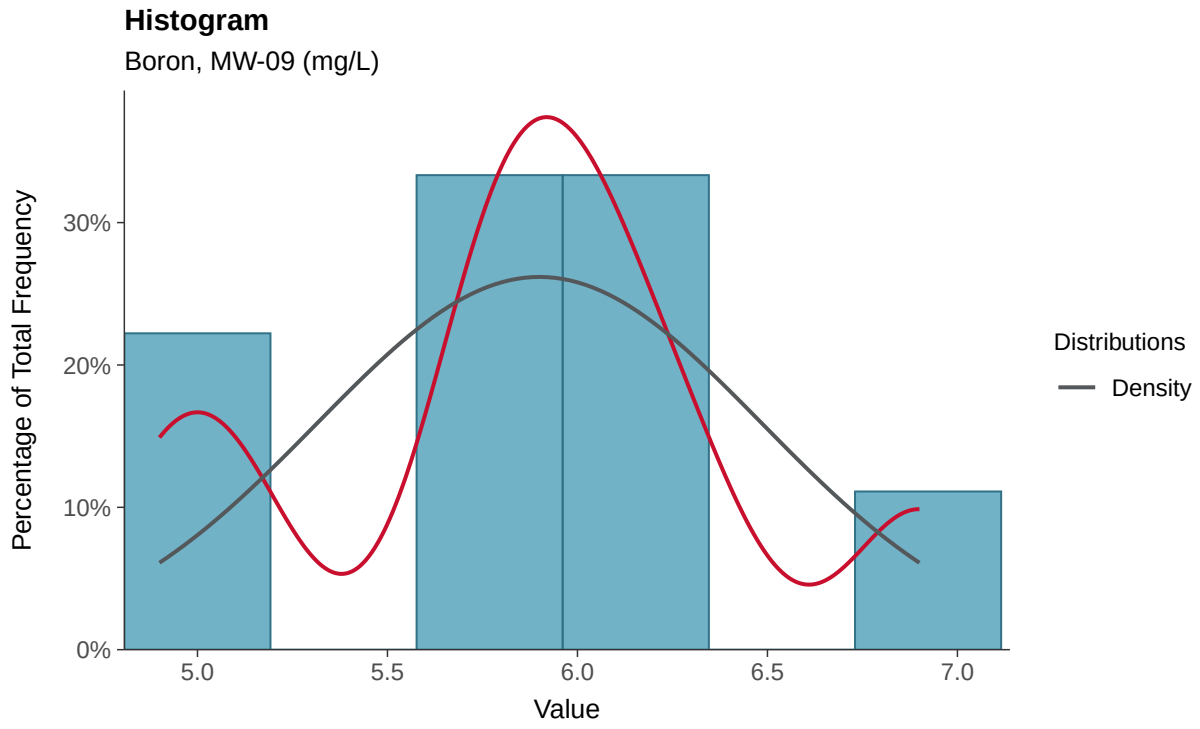
Zinc, MW-08 (mg/L)

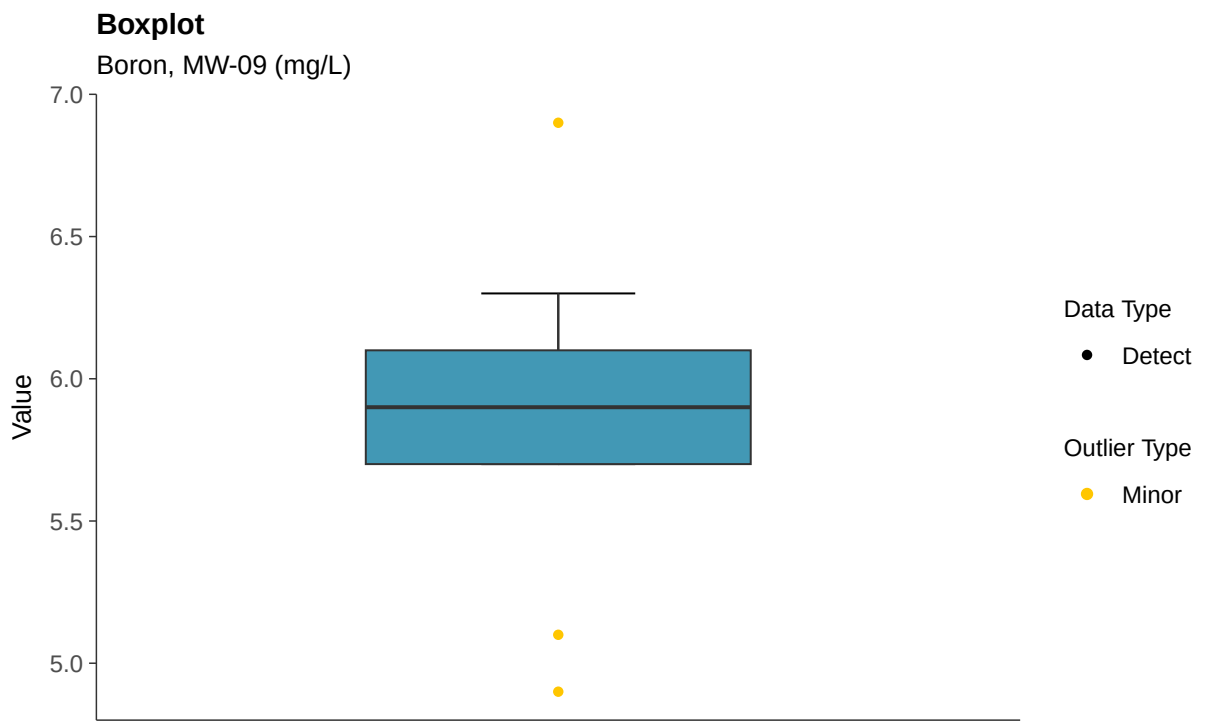


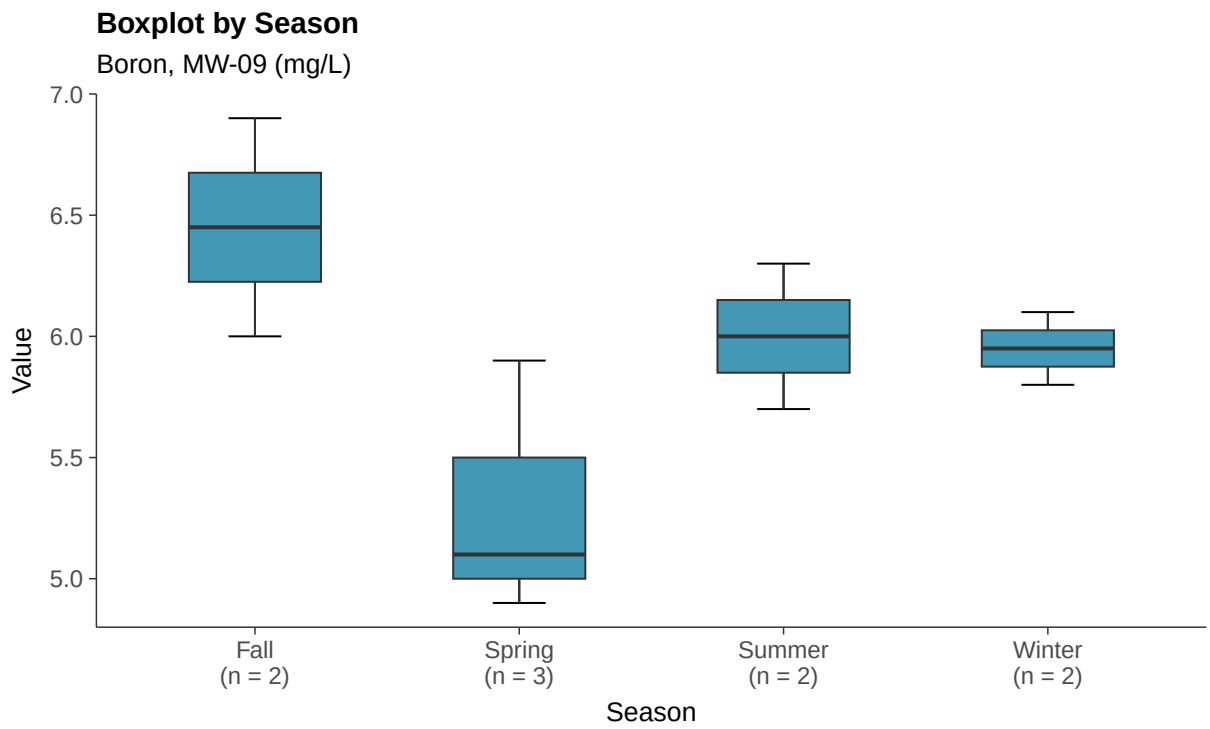
Appendix III: Boron, MW-09

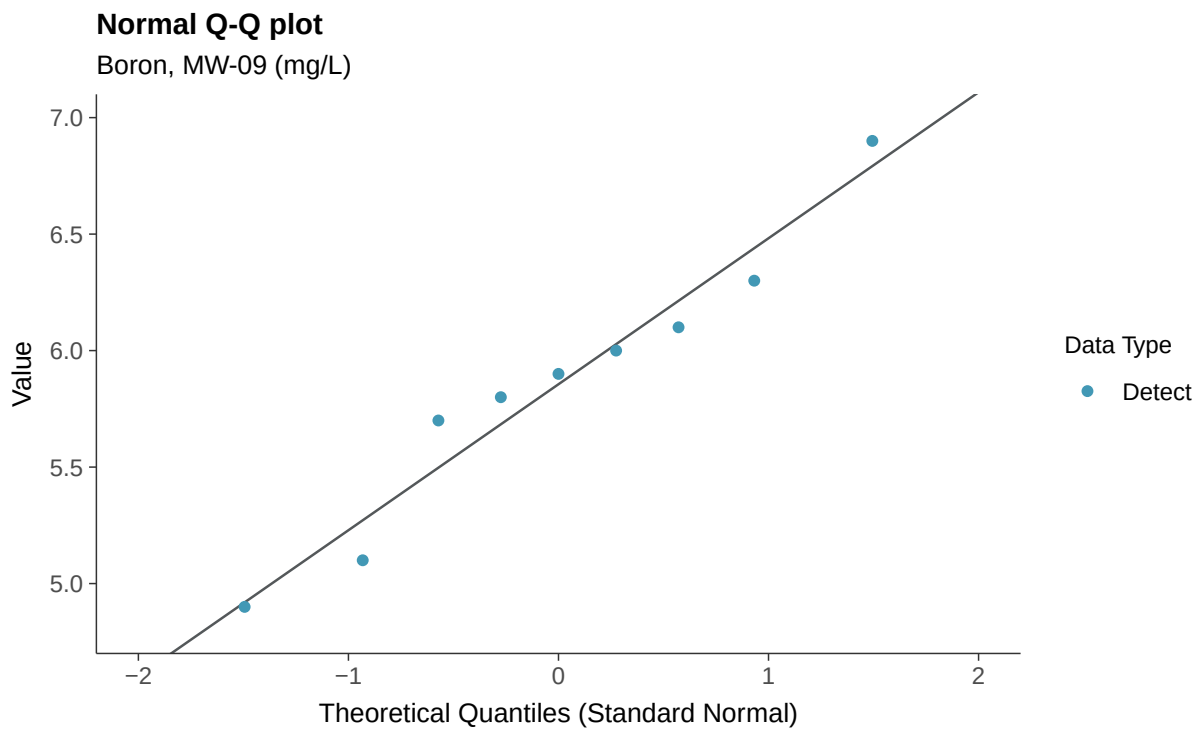
ID: 1_18_4_105

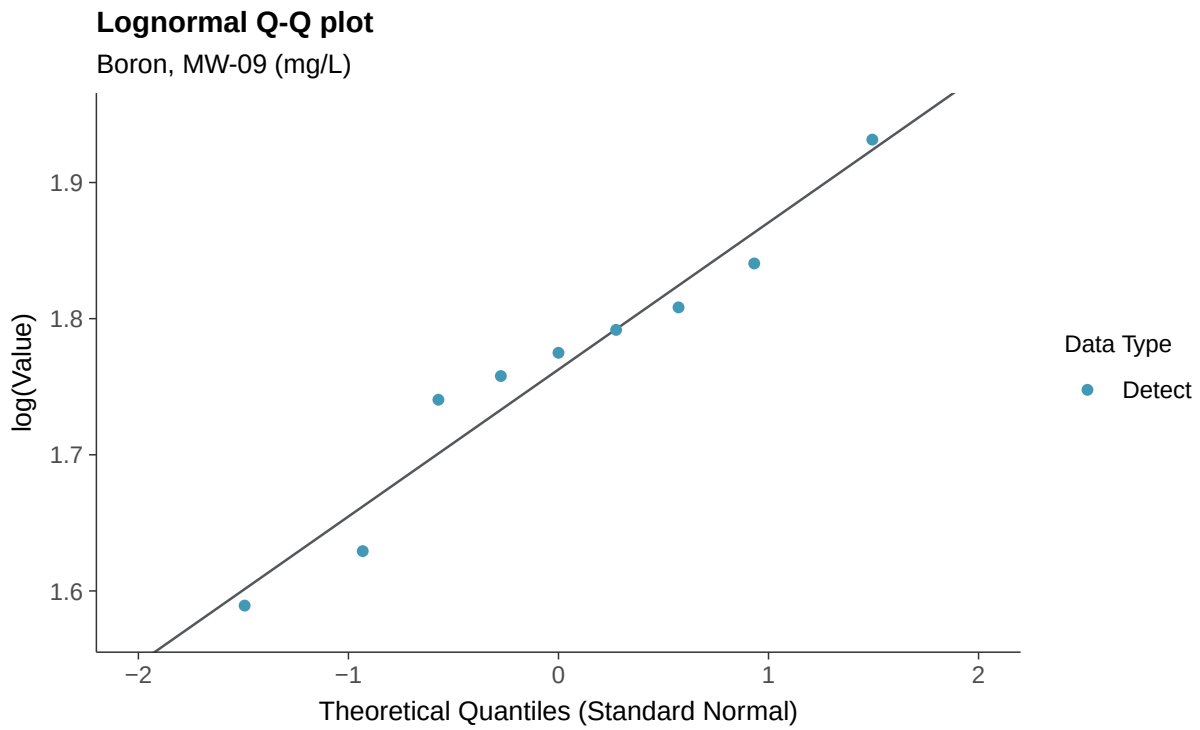


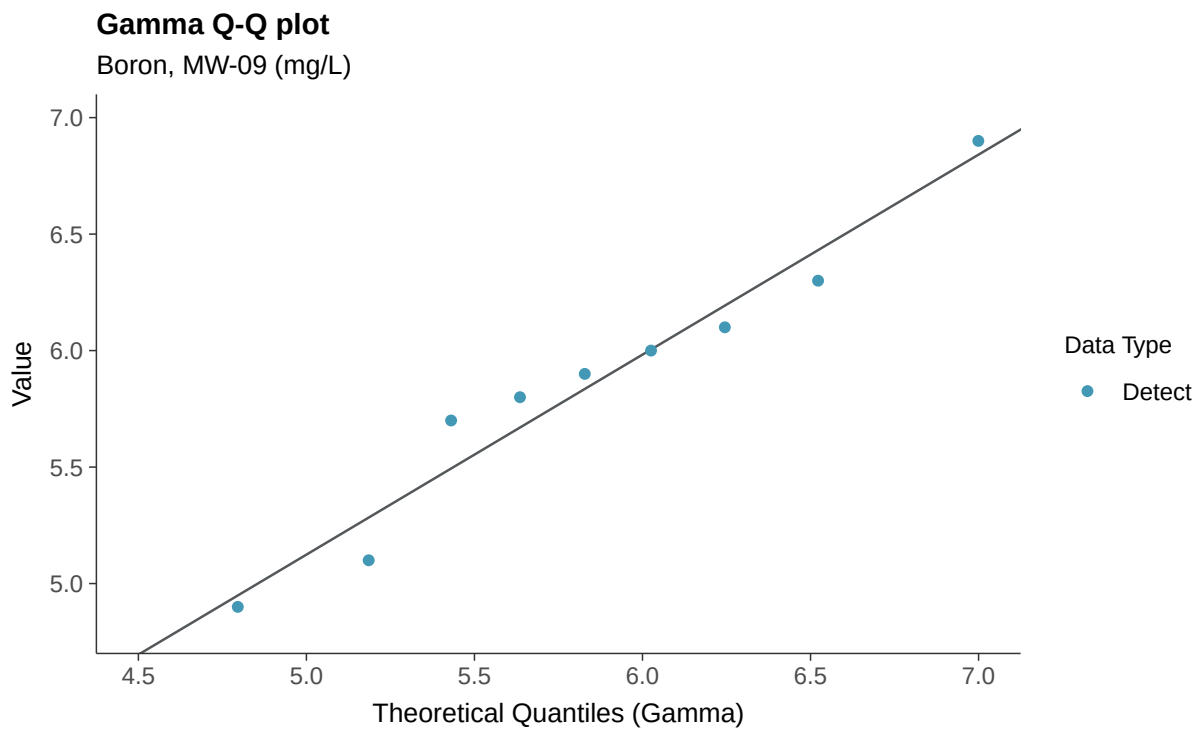


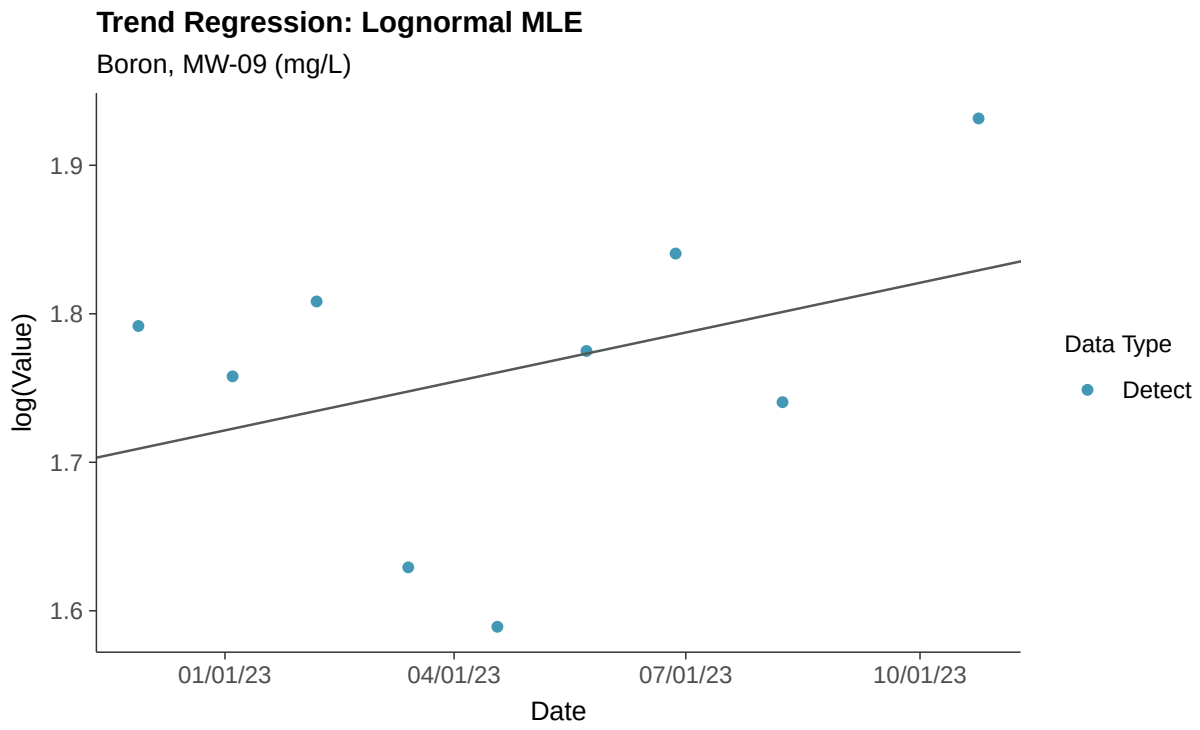

Boxplot
Boron, MW-09 (mg/L)
Value
7.0
6.5
6.0
5.5
5.0
Data Type
Detect
Outlier Type
Minor

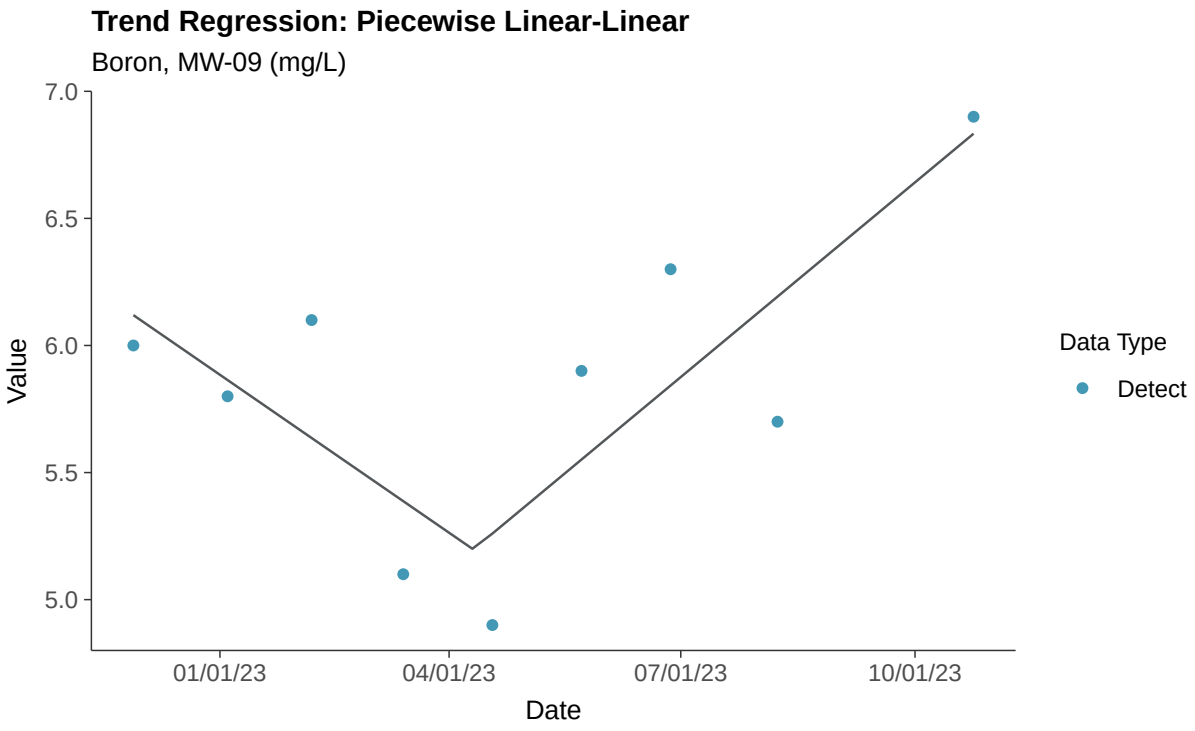

Boxplot by Season
Boron, MW-09 (mg/L)
Value
7.0
6.5
6.0
5.5
5.0
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Normal Q-Q plot
Boron, MW-09 (mg/L)
Value
7.0
6.5
6.0
5.5
5.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-09 (mg/L)
log(Value)
1.9
1.8
1.7
1.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

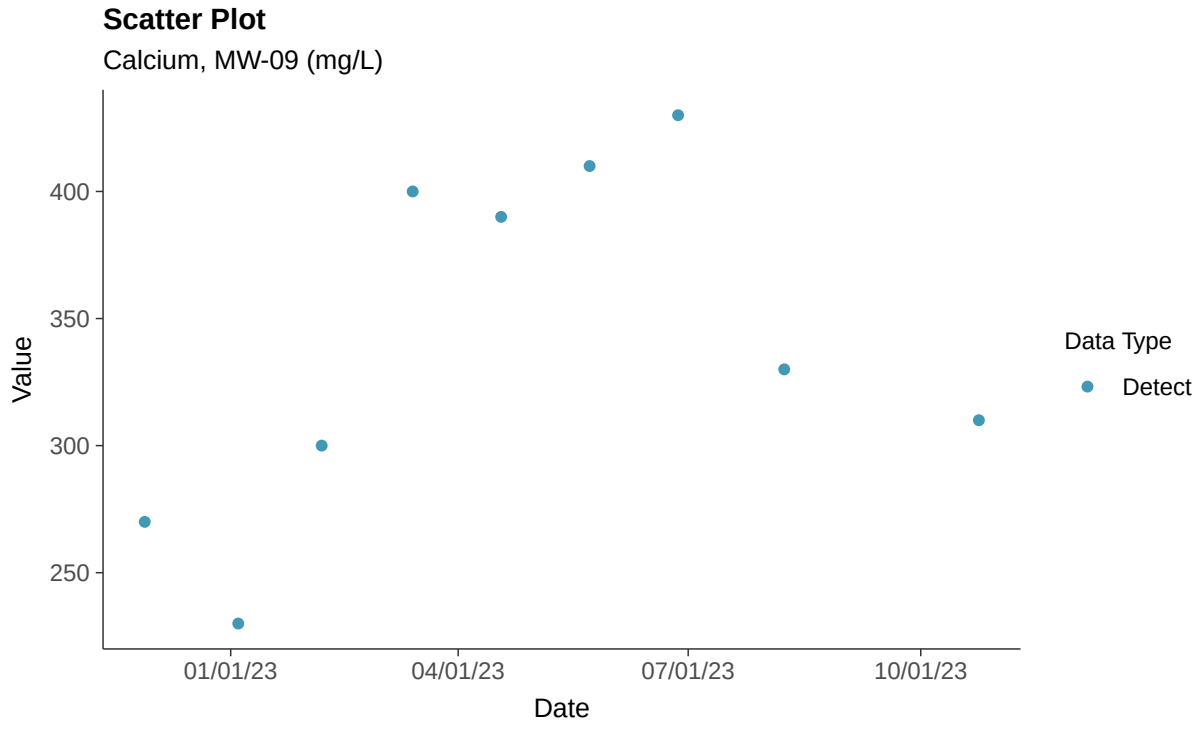

Gamma Q-Q plot
Boron, MW-09 (mg/L)
Value
7.0
6.5
6.0
5.5
5.0
4.5
5.0
5.5
6.0
6.5
7.0
Theoretical Quantiles (Gamma)
Data Type
Detect

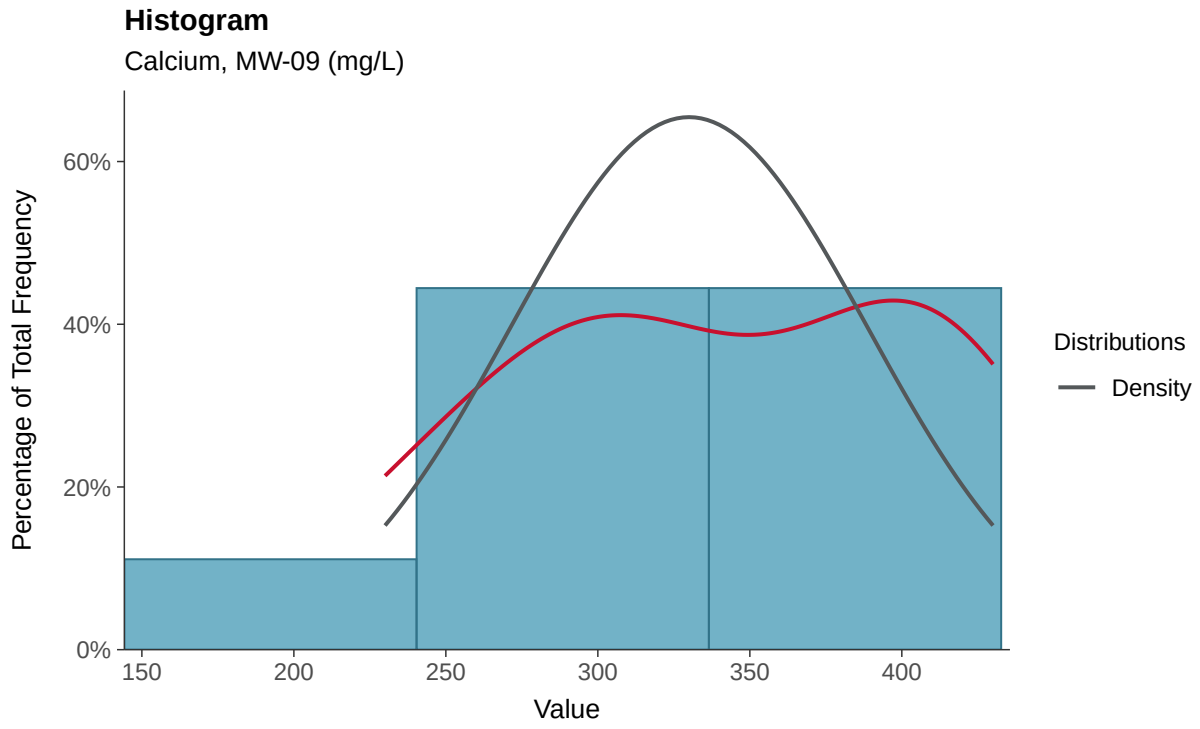

Trend Regression: Lognormal MLE
Boron, MW-09 (mg/L)
log(Value)
1.9
1.8
1.7
1.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Boron, MW-09 (mg/L)
7.0
6.5
6.0
5.5
5.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-09

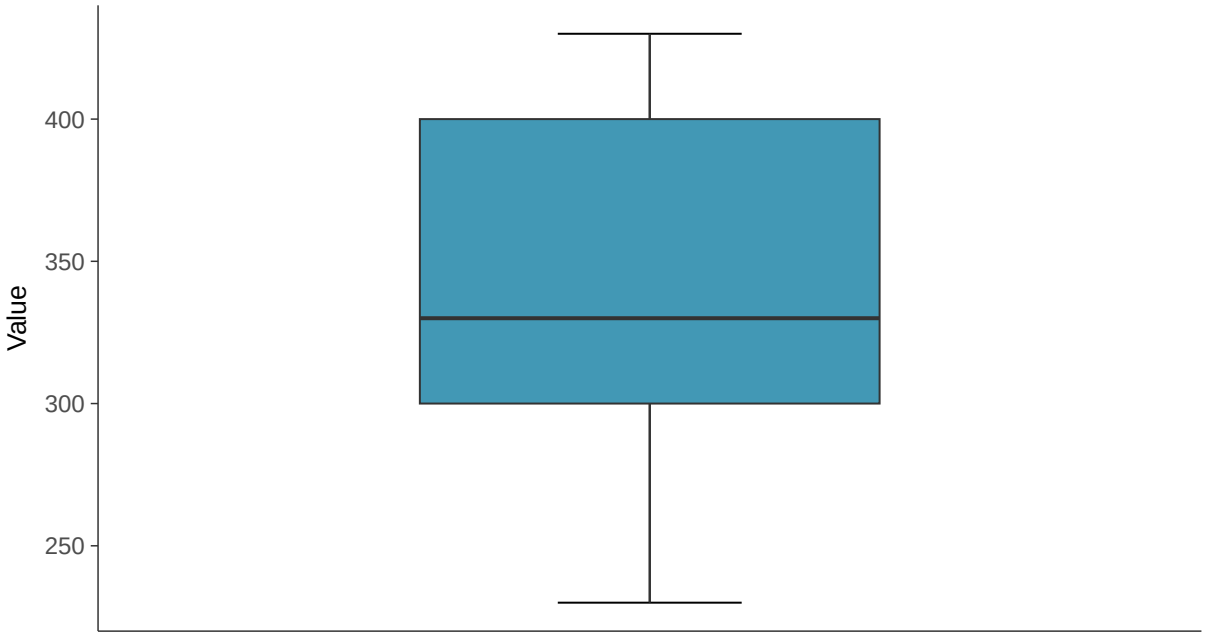
ID: 1_18_4_107





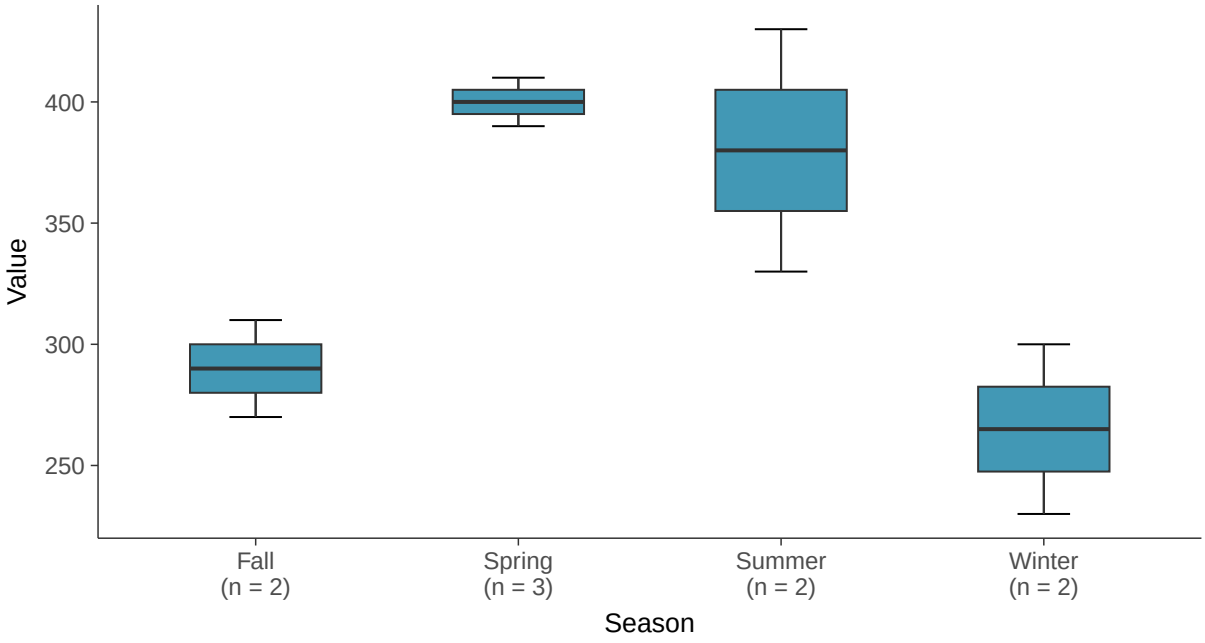
Boxplot

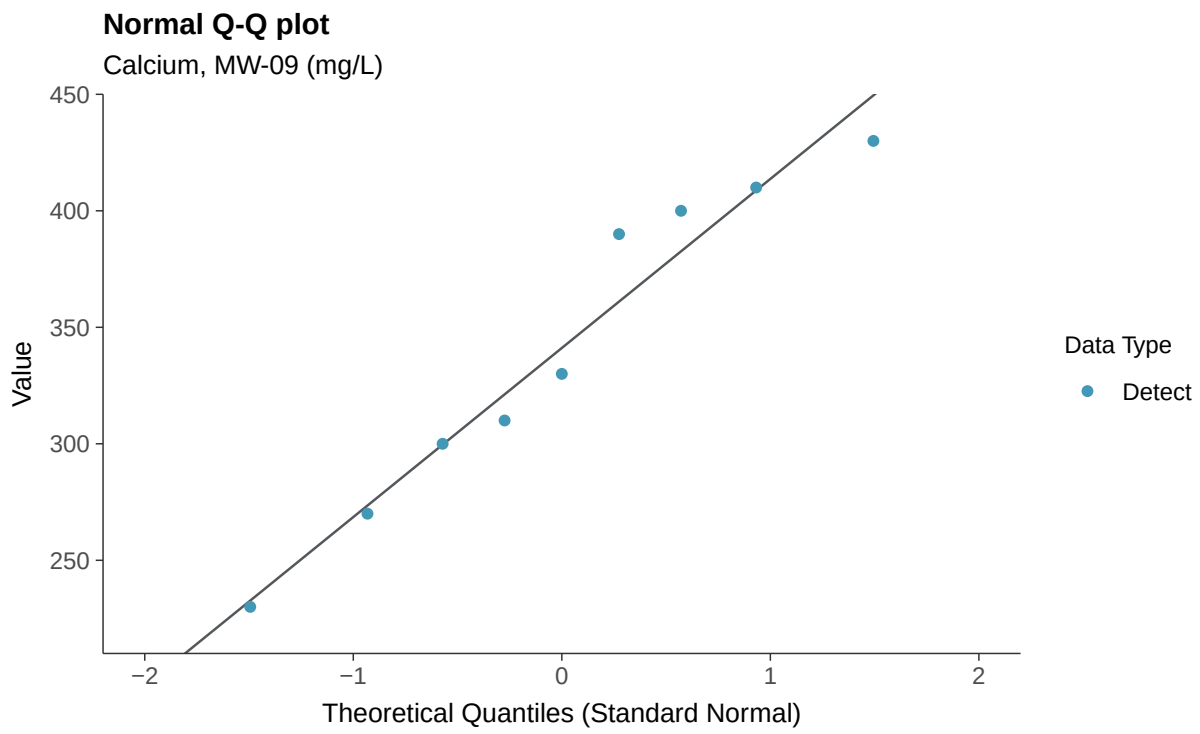
Calcium, MW-09 (mg/L)

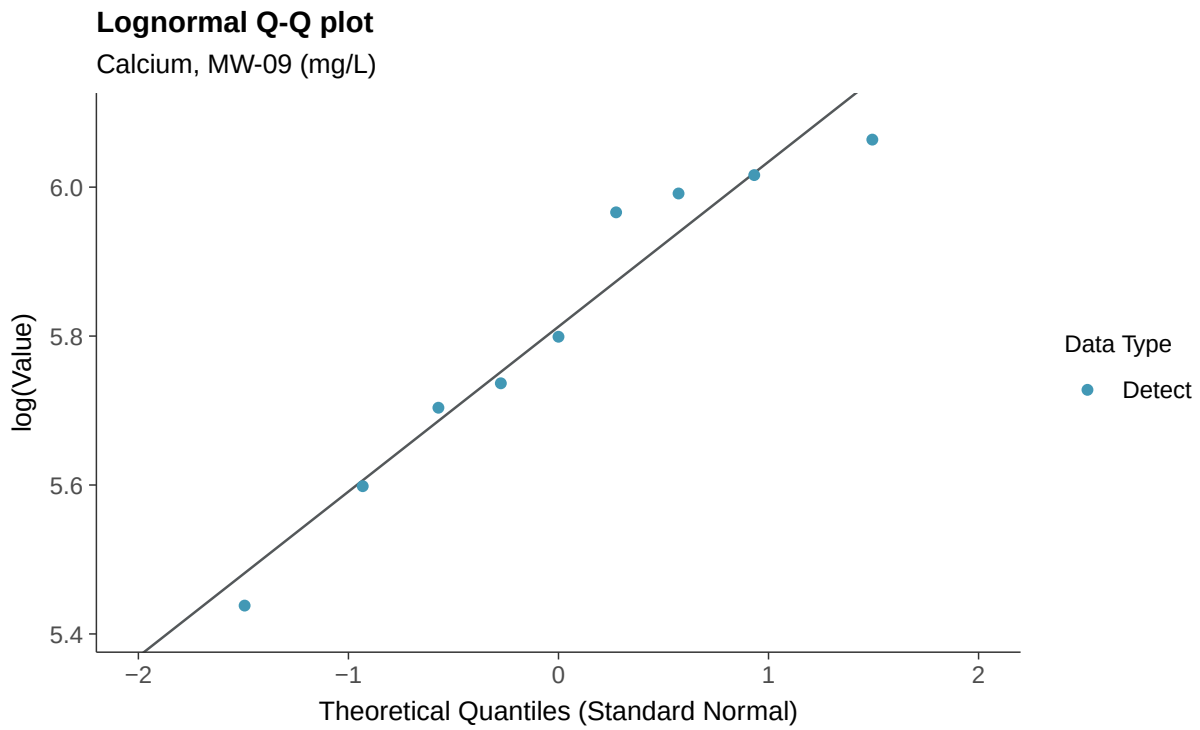


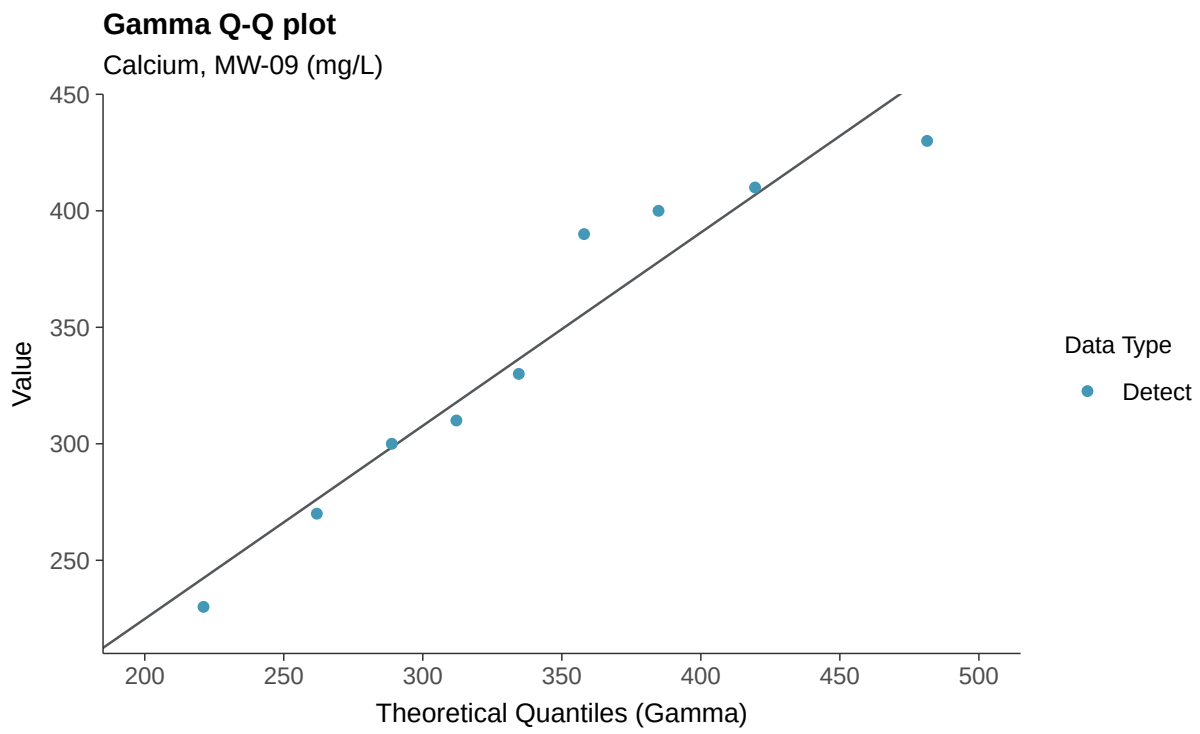
Boxplot by Season

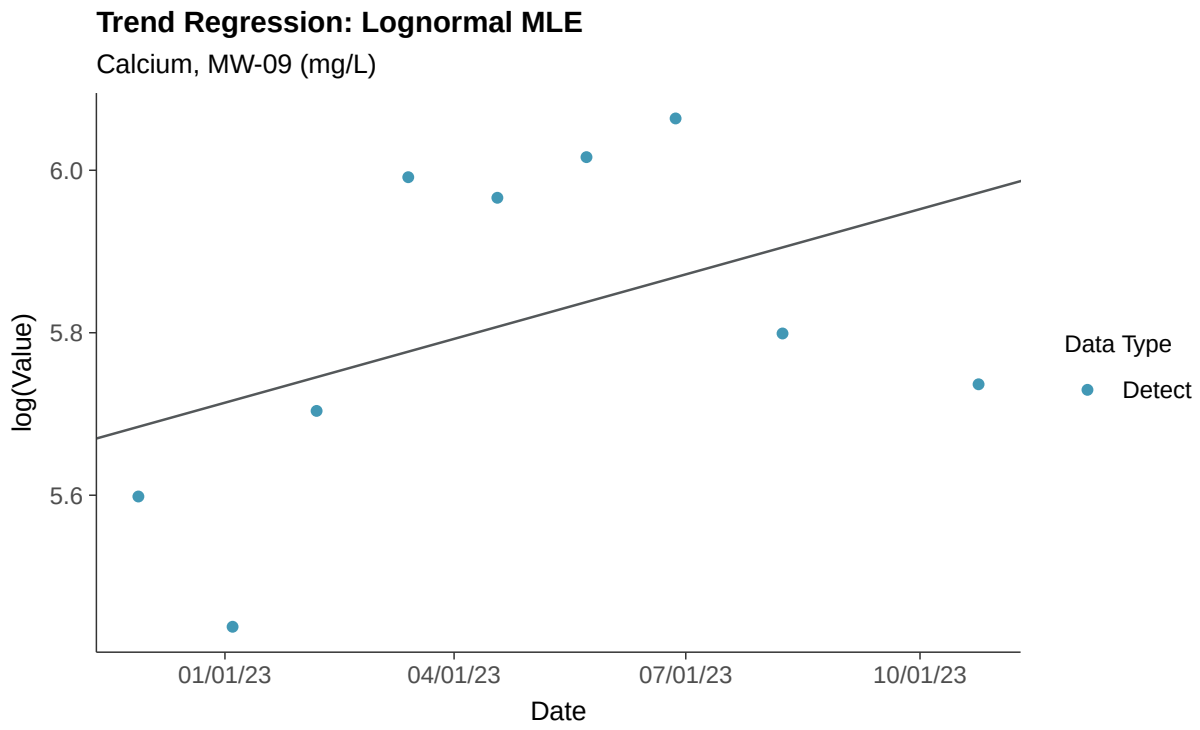
Calcium, MW-09 (mg/L)




Normal Q-Q plot
Calcium, MW-09 (mg/L)
Value
450
400
350
300
250
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

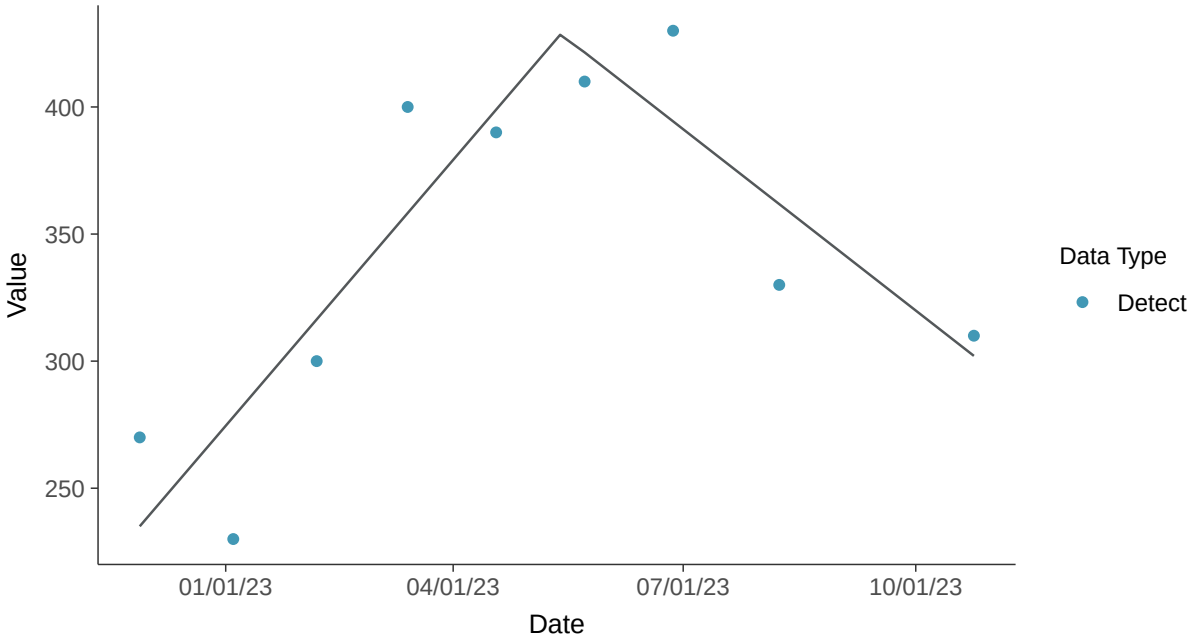

Lognormal Q-Q plot
Calcium, MW-09 (mg/L)
log(Value)
6.0
5.8
5.6
5.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-09 (mg/L)
Value
450
400
350
300
250
200
250
300
350
400
450
500
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-09 (mg/L)
log(Value)
6.0
5.8
5.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

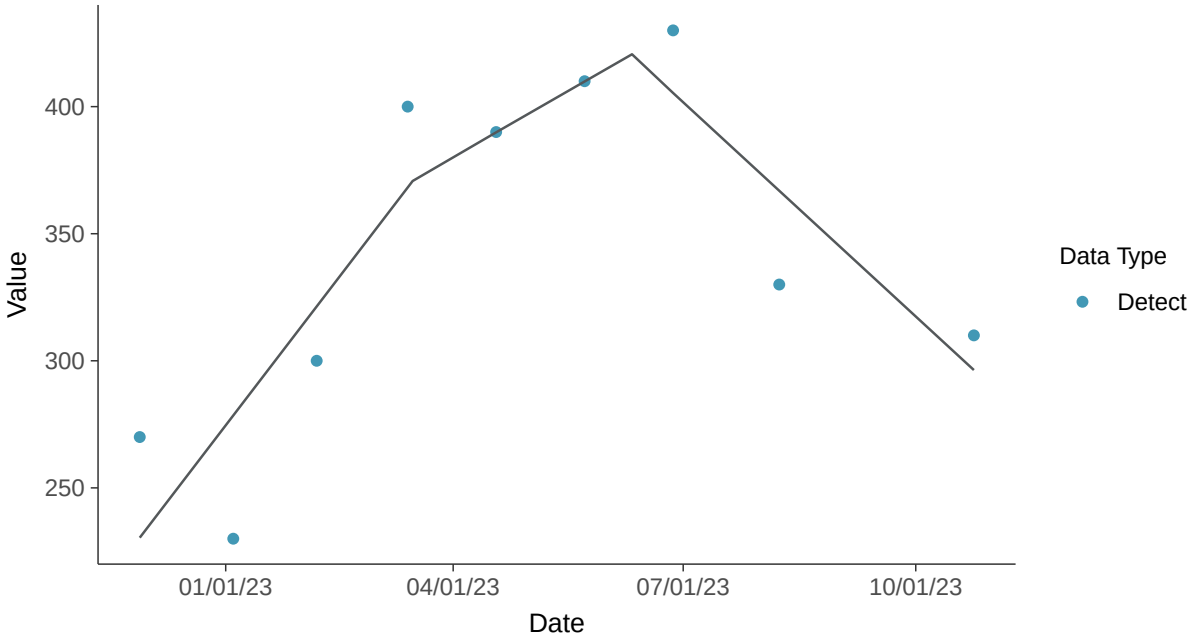
Trend Regression: Piecewise Linear-Linear

Calcium, MW-09 (mg/L)



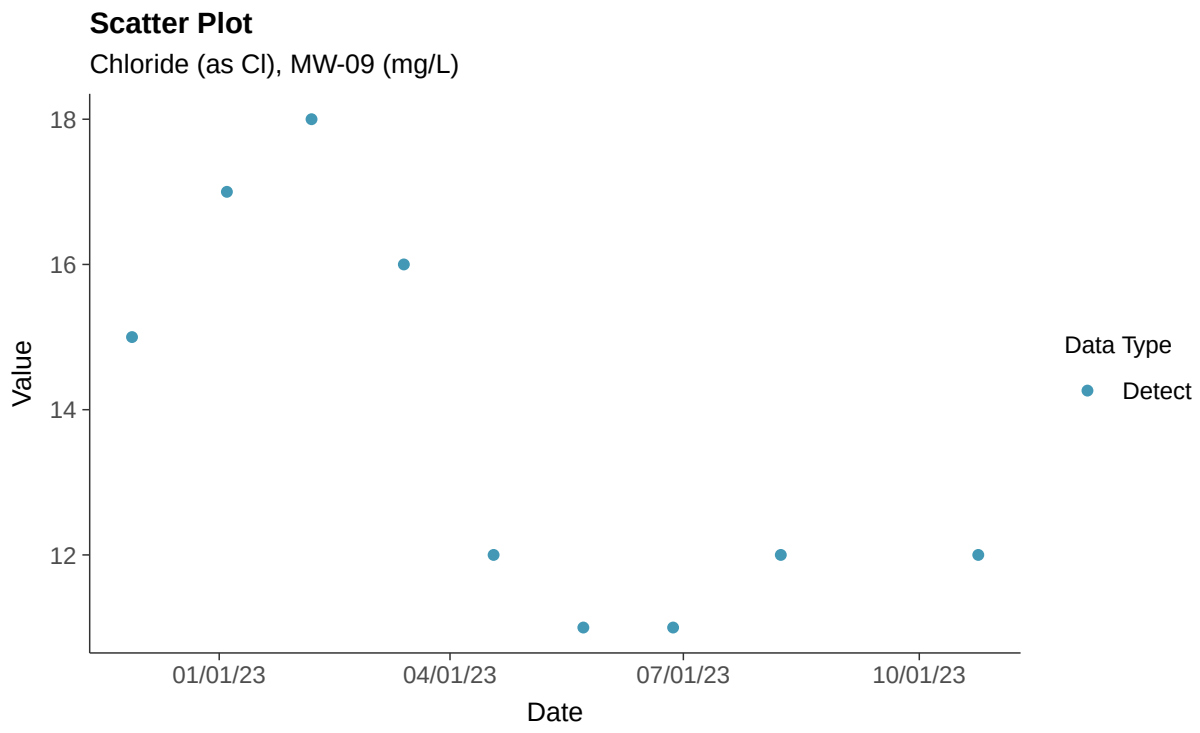
Trend Regression: Piecewise Linear-Linear-Linear

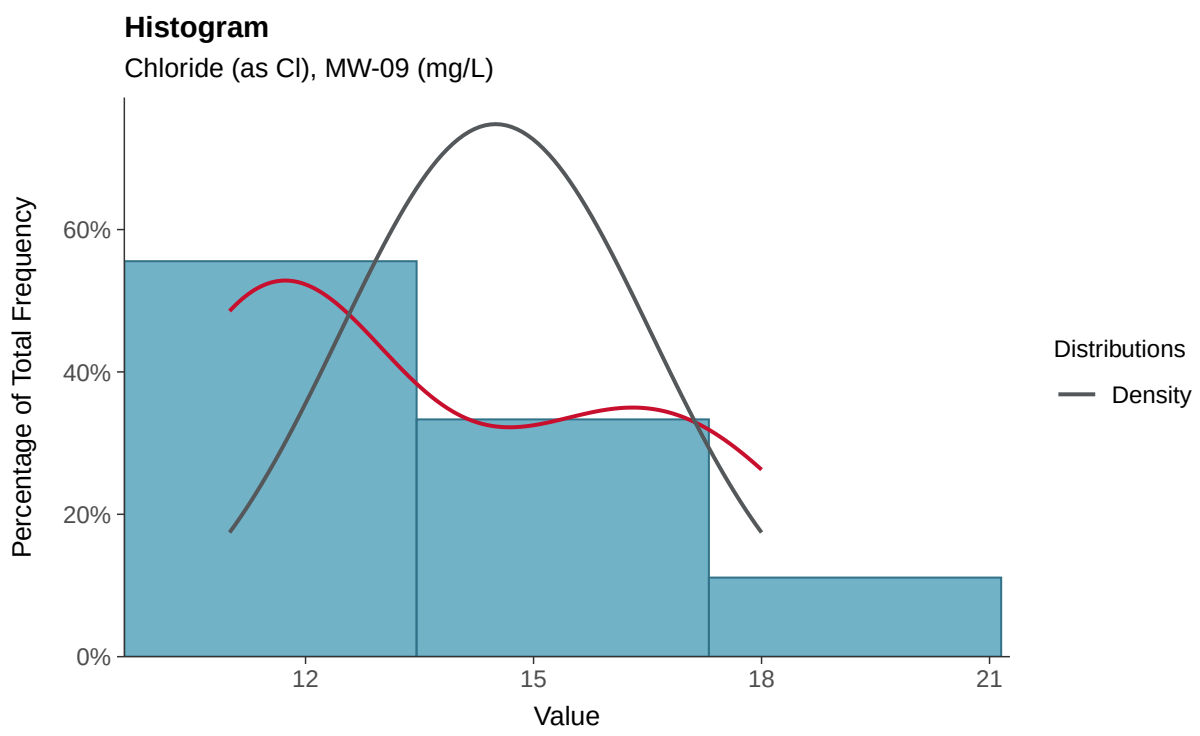
Calcium, MW-09 (mg/L)



Appendix III: Chloride (as Cl), MW-09

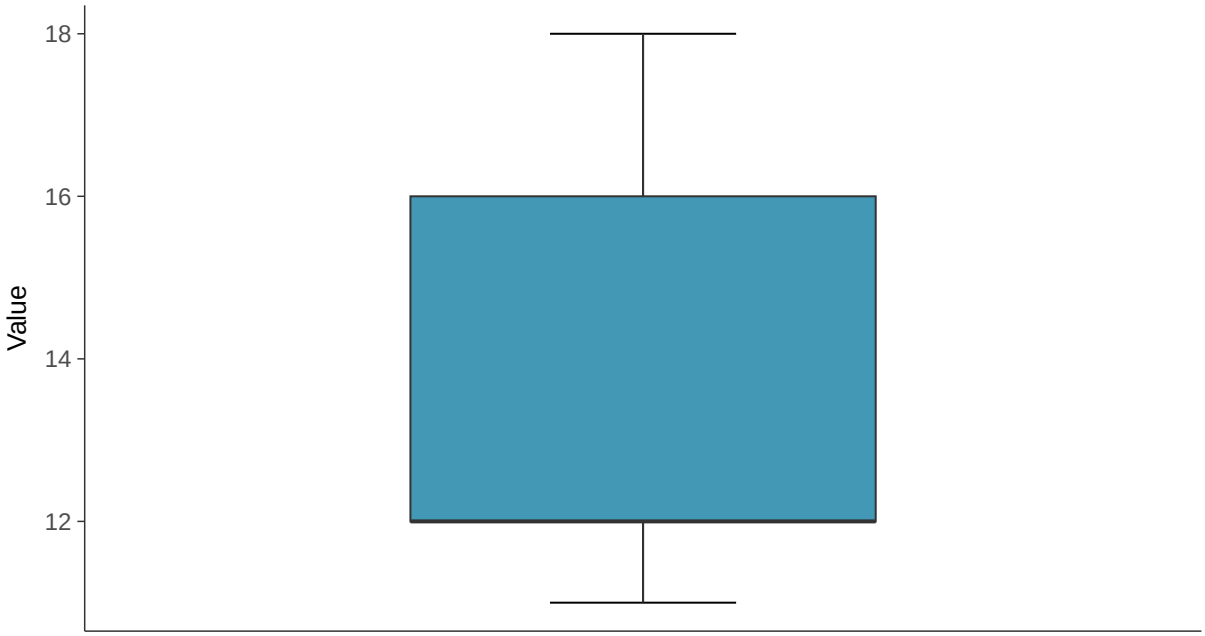
ID: 1_18_4_108





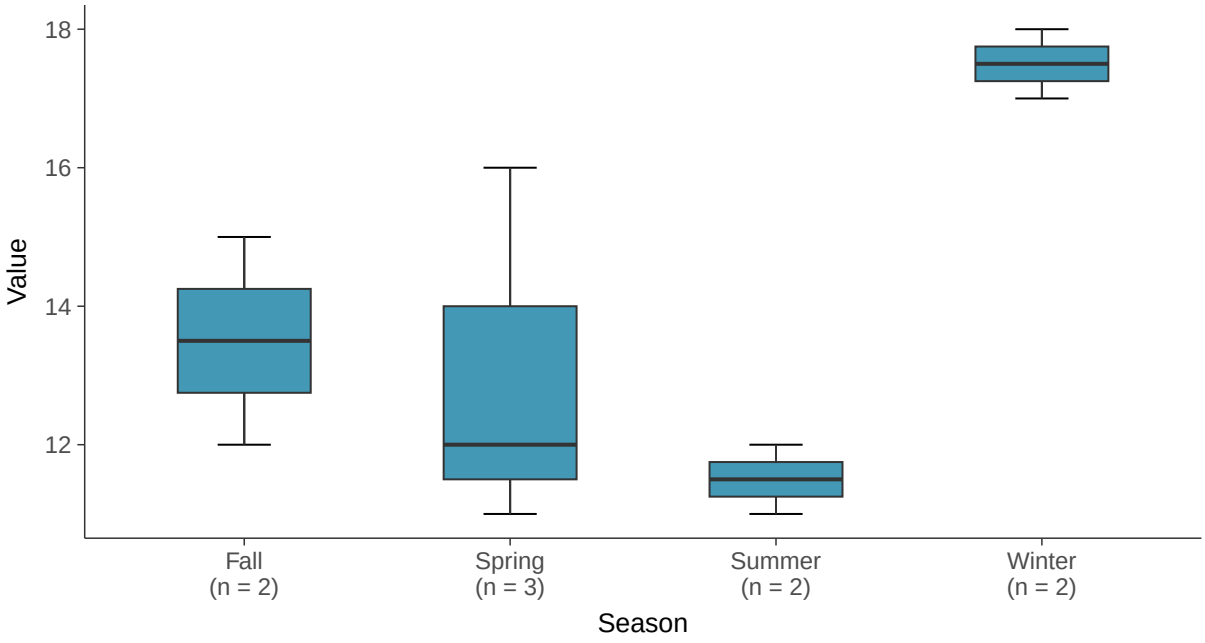
Boxplot

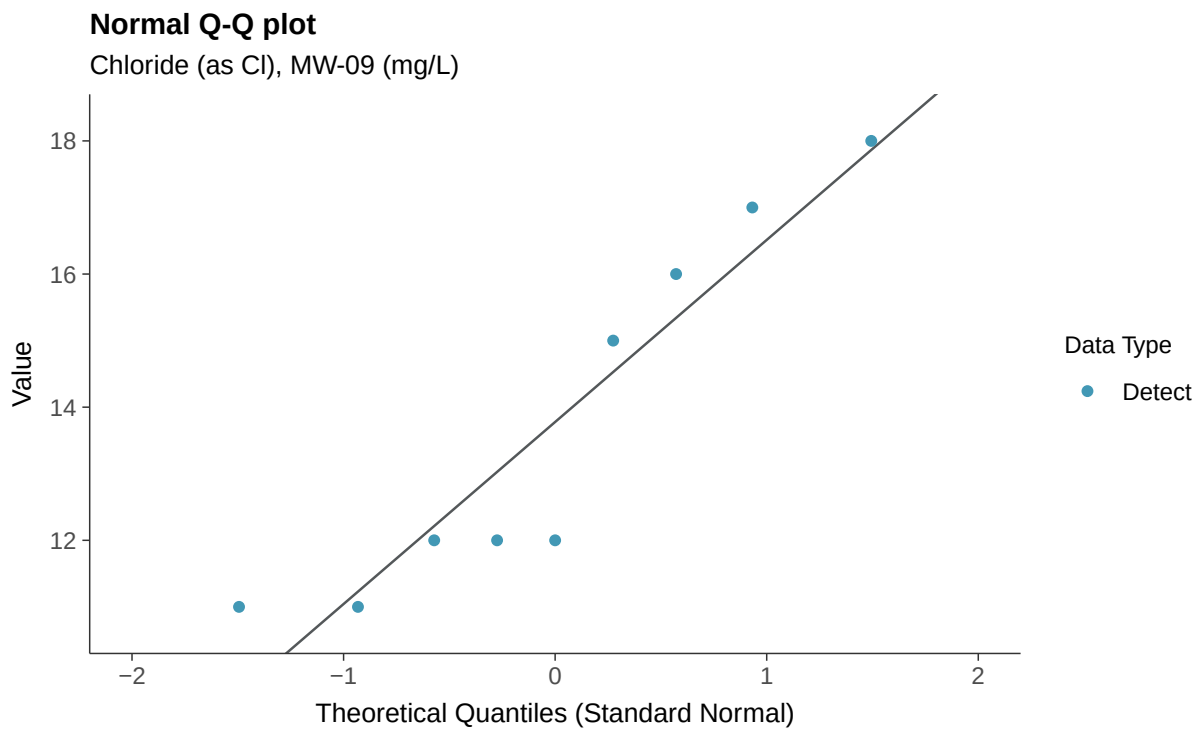
Chloride (as Cl), MW-09 (mg/L)

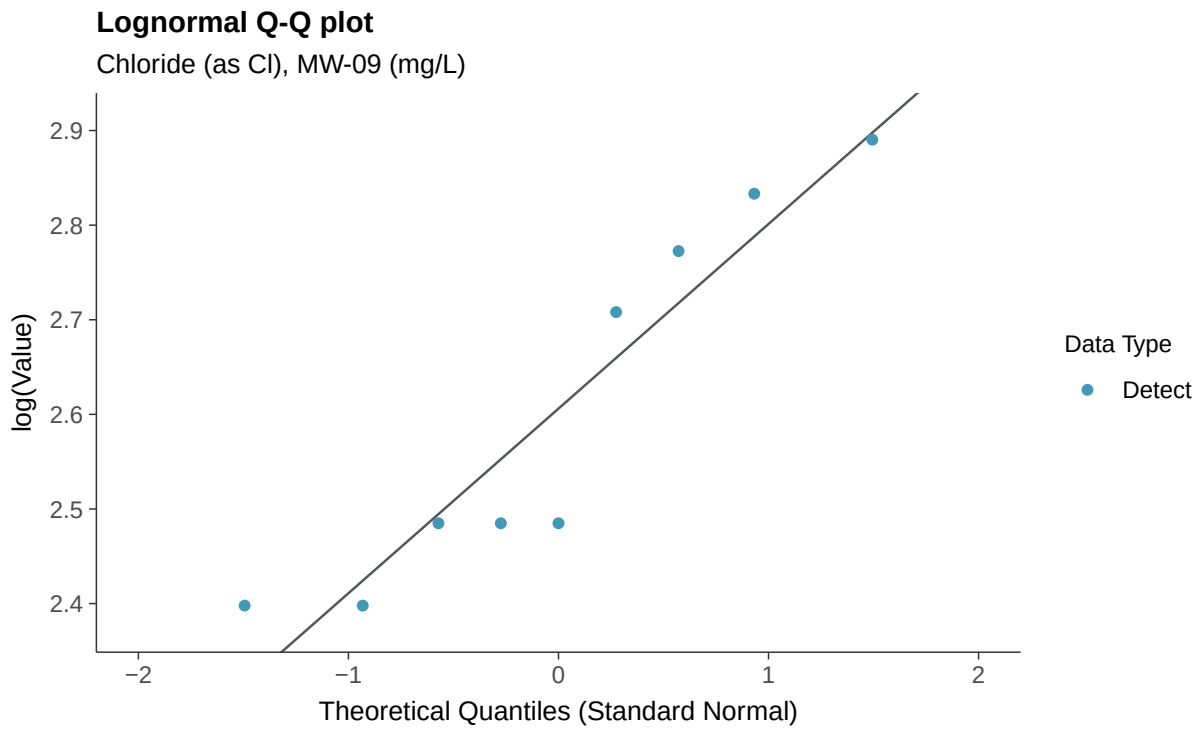


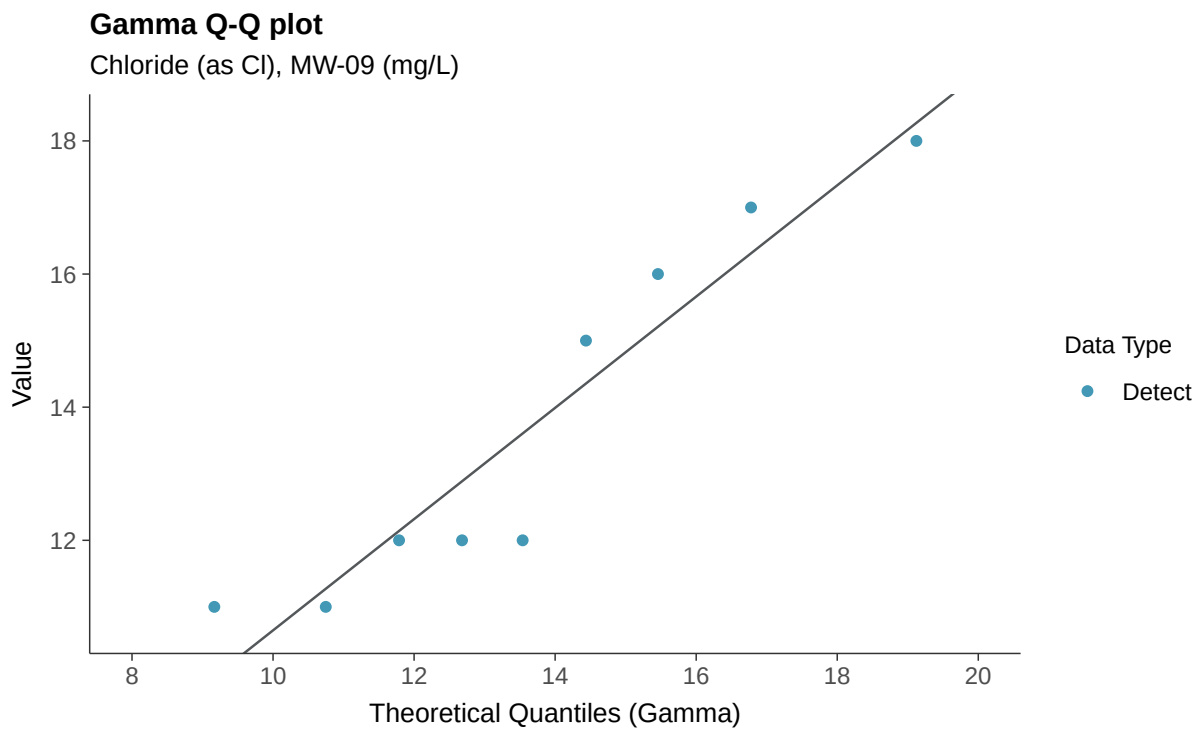
Boxplot by Season

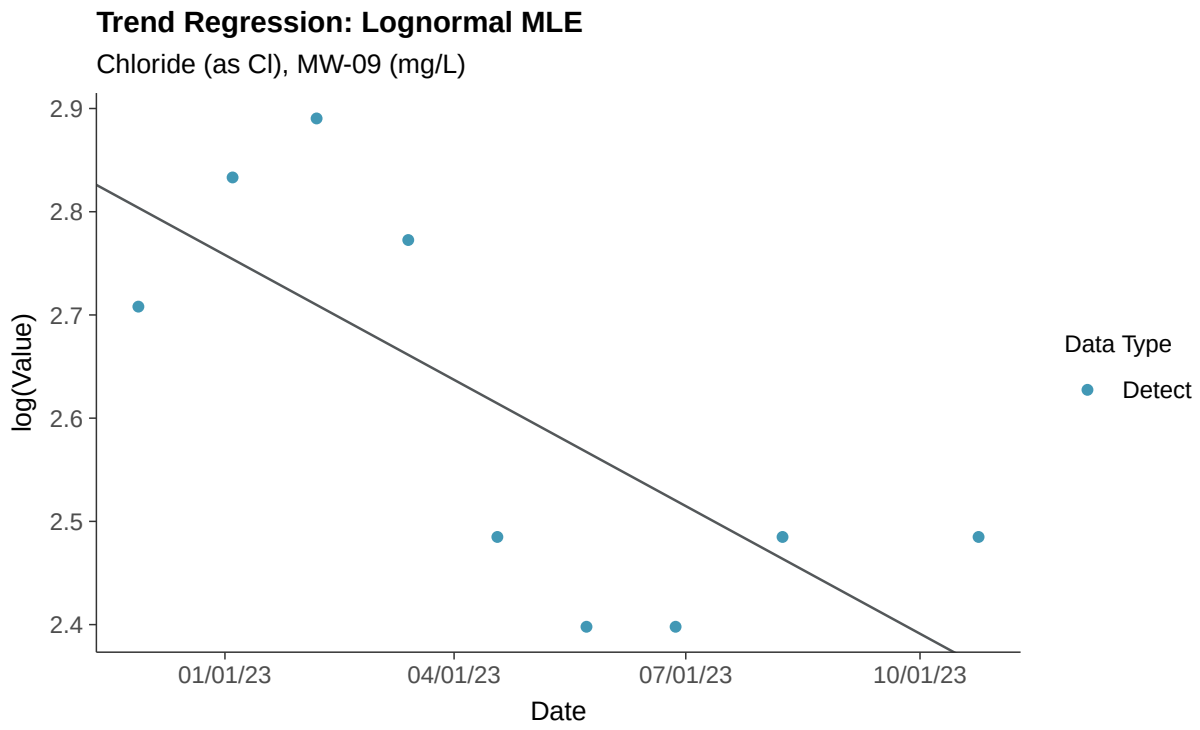
Chloride (as Cl), MW-09 (mg/L)




Normal Q-Q plot
Chloride (as Cl), MW-09 (mg/L)
Value
18
16
14
12
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

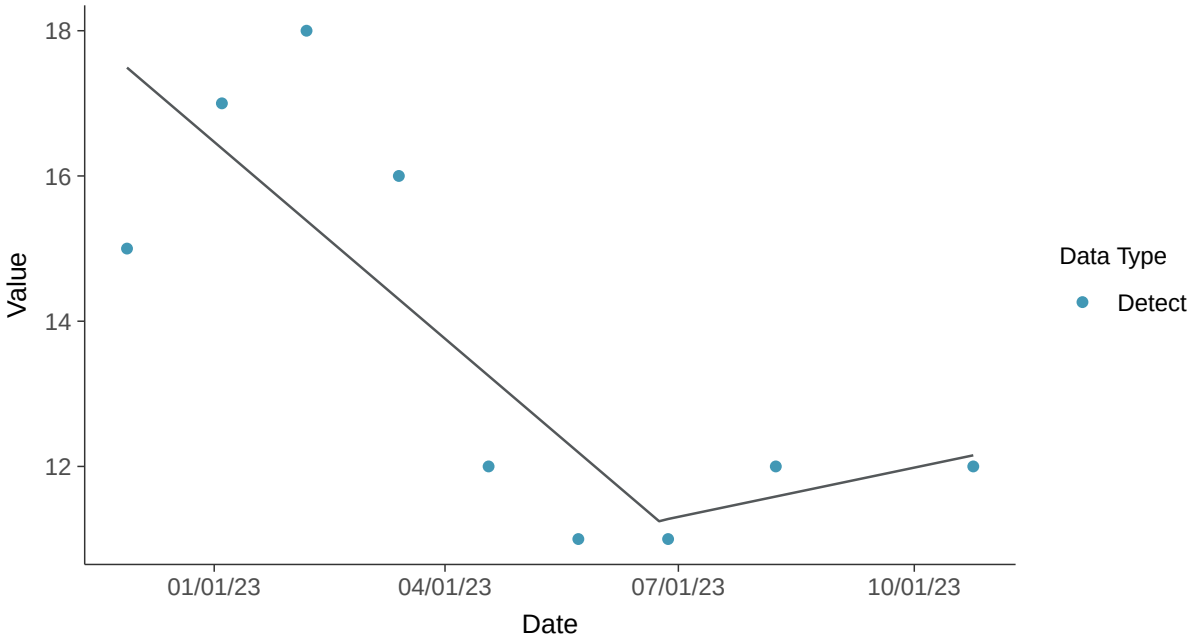

Lognormal Q-Q plot
Chloride (as Cl), MW-09 (mg/L)
log(Value)
2.9
2.8
2.7
2.6
2.5
2.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chloride (as Cl), MW-09 (mg/L)
Value
18
16
14
12
8
10
12
14
16
18
20
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chloride (as Cl), MW-09 (mg/L)
log(Value)
2.9
2.8
2.7
2.6
2.5
2.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

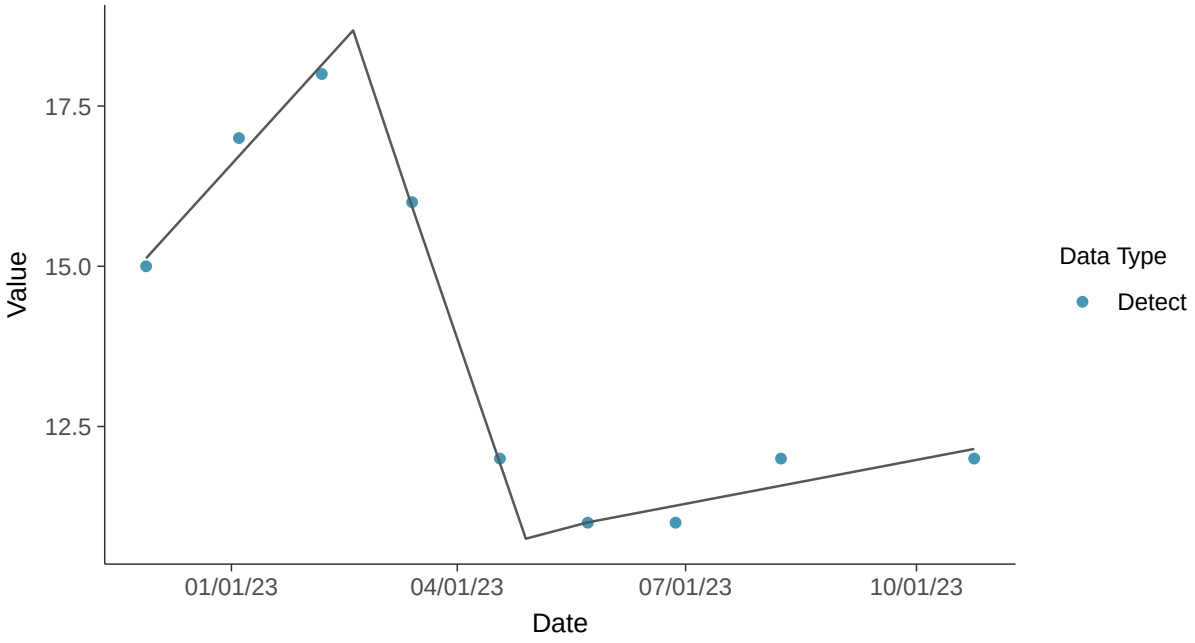
Trend Regression: Piecewise Linear-Linear

Chloride (as Cl), MW-09 (mg/L)



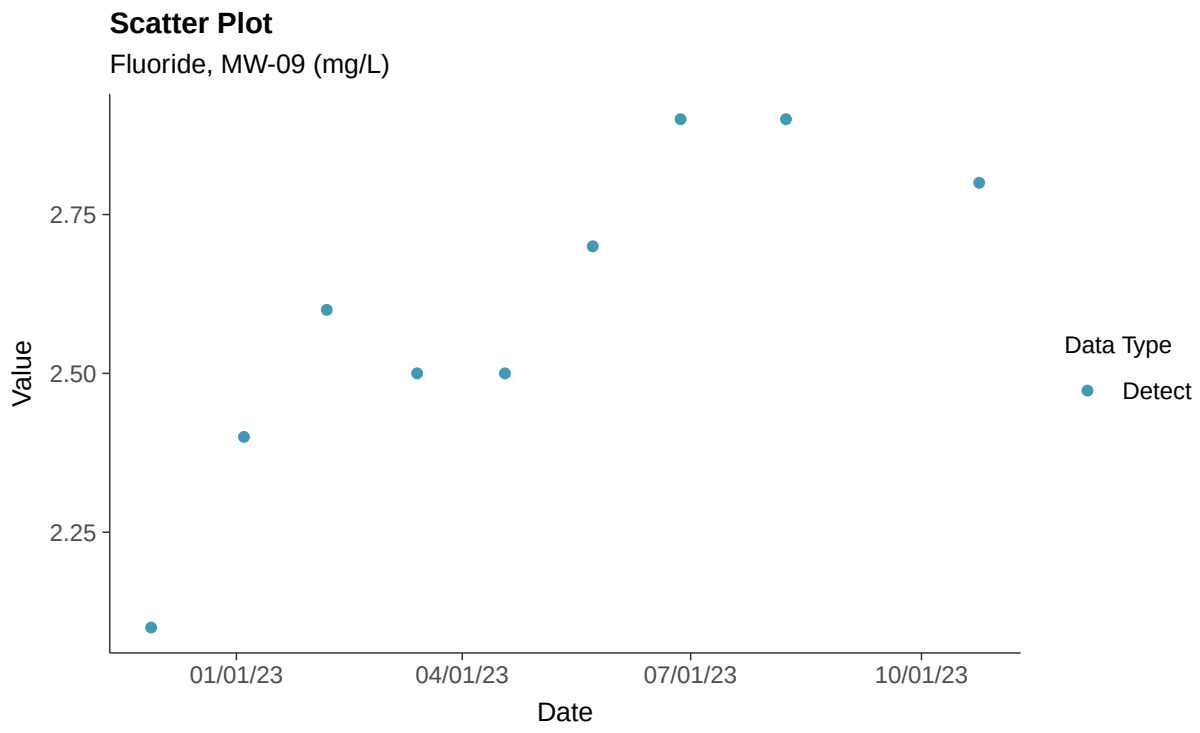
Trend Regression: Piecewise Linear-Linear-Linear

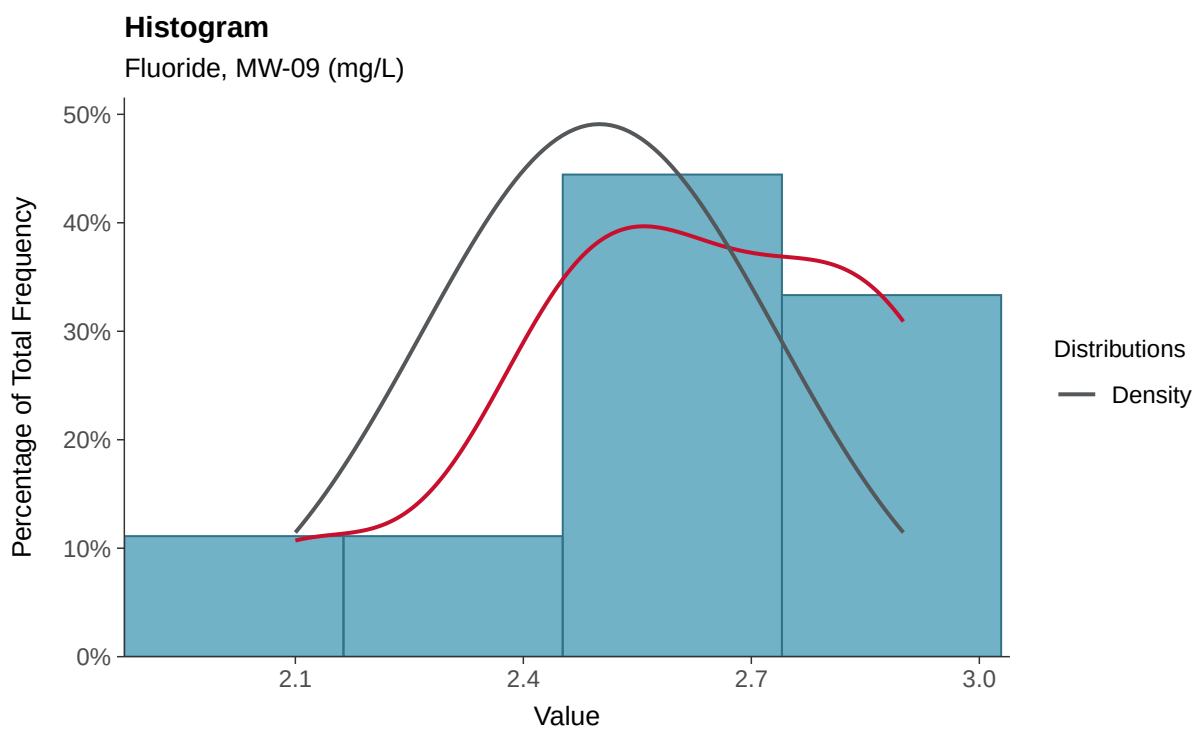
Chloride (as Cl), MW-09 (mg/L)



Appendix III: Fluoride, MW-09

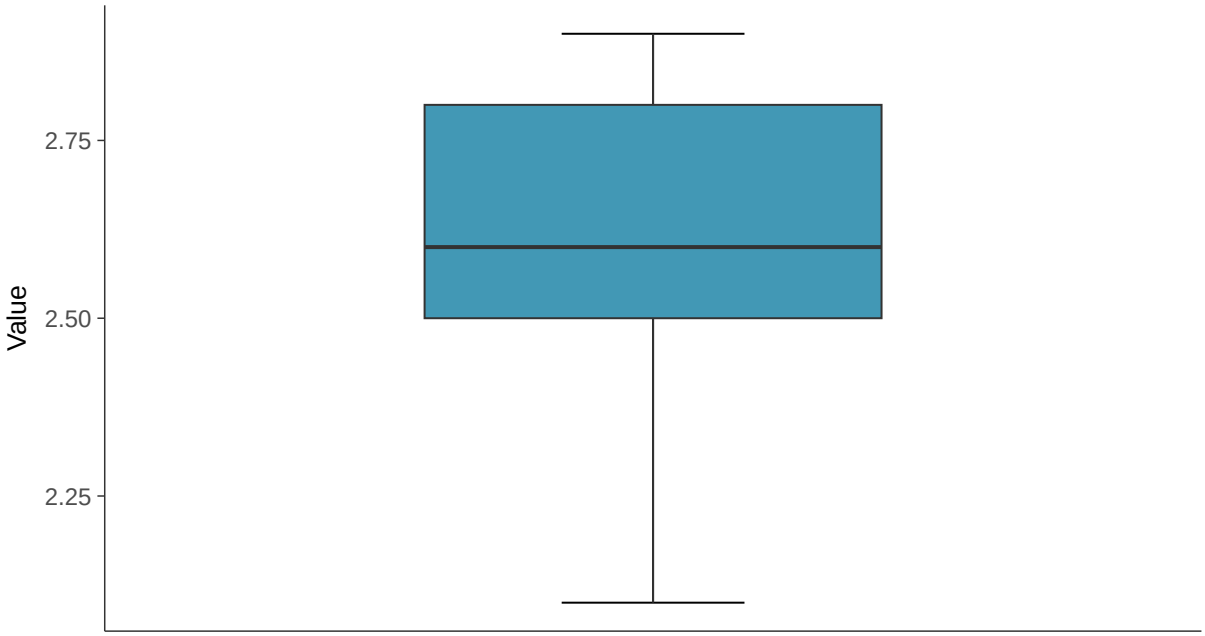
ID: 1_18_4_112





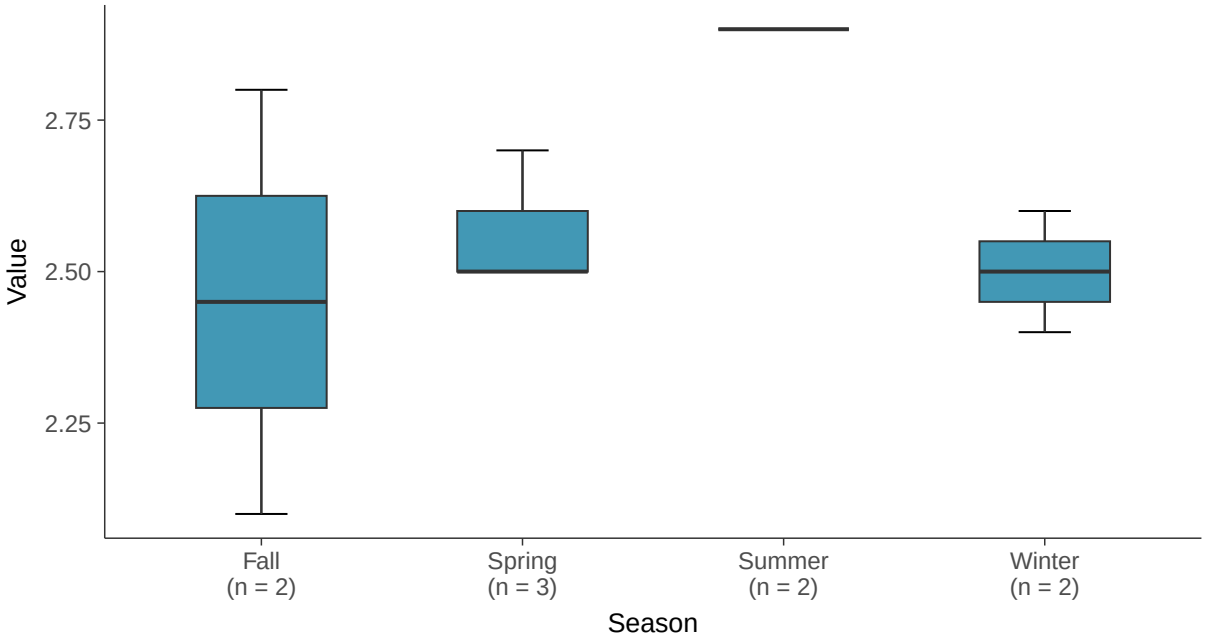
Boxplot

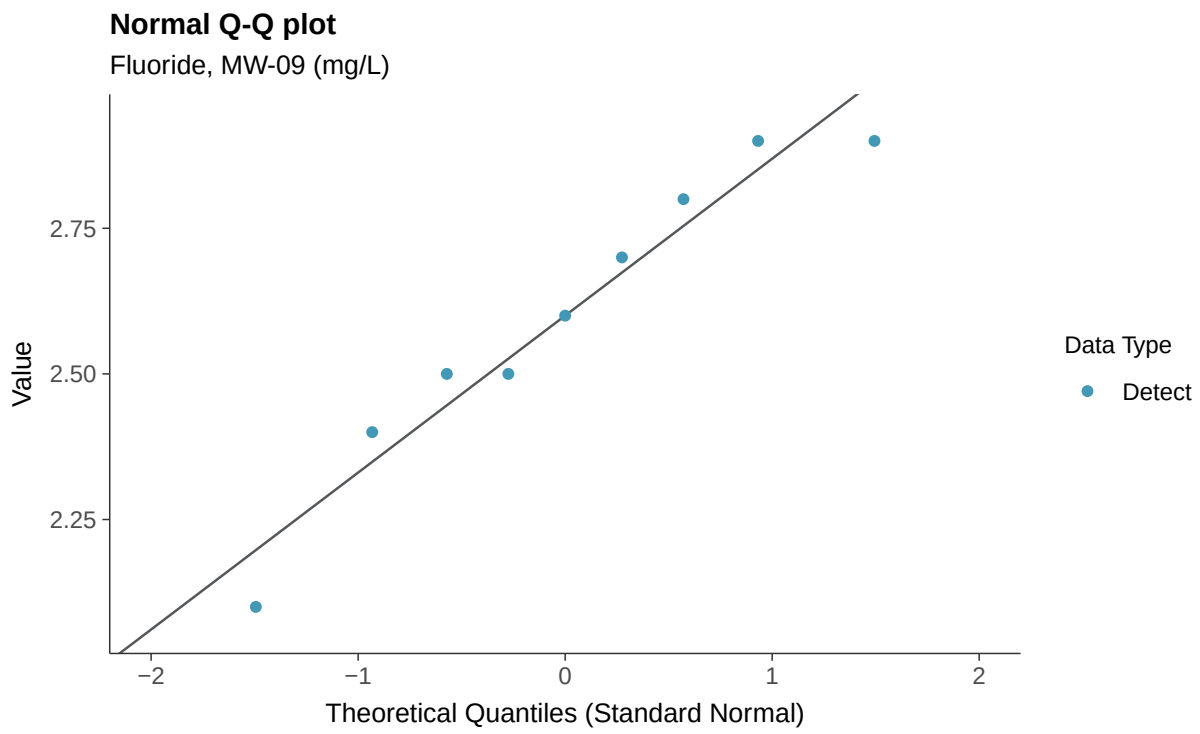
Fluoride, MW-09 (mg/L)

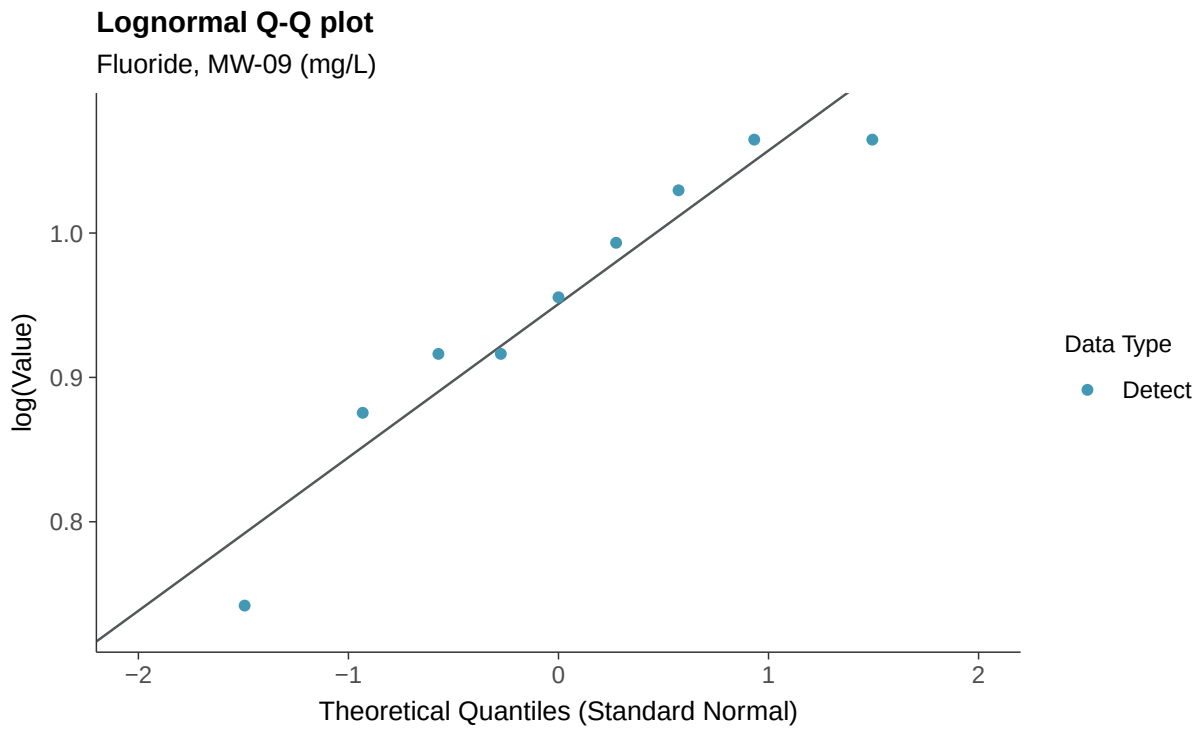


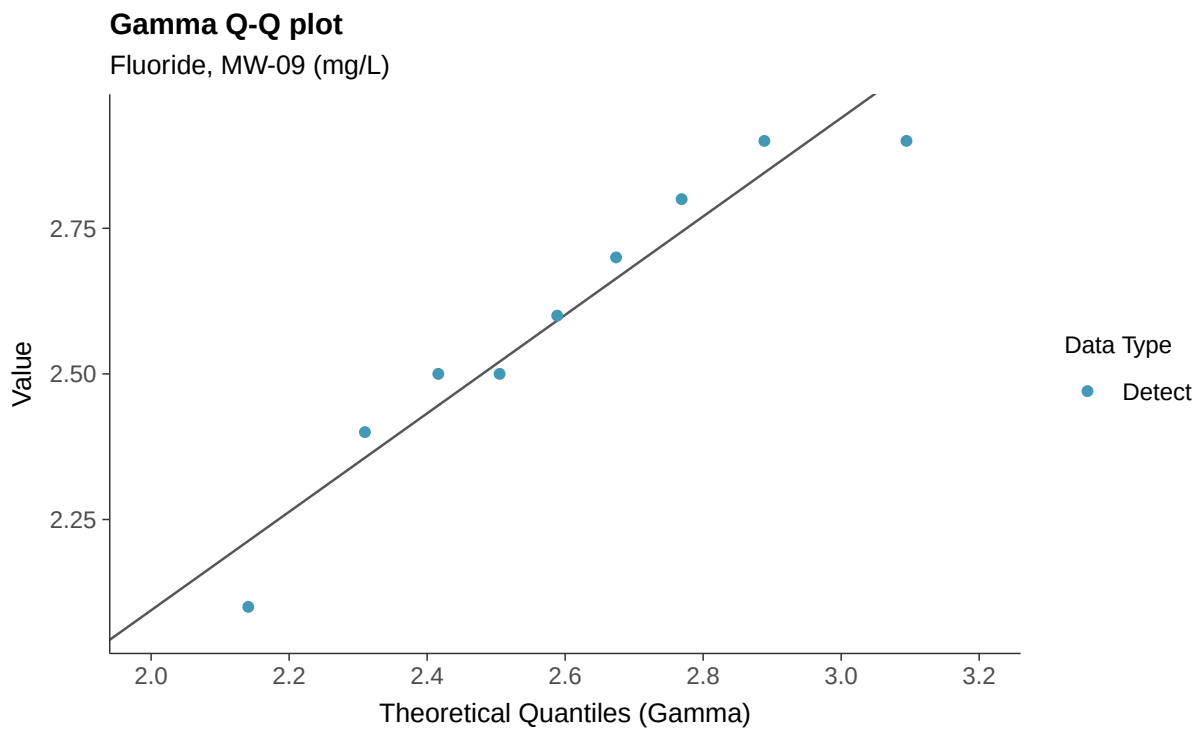
Boxplot by Season

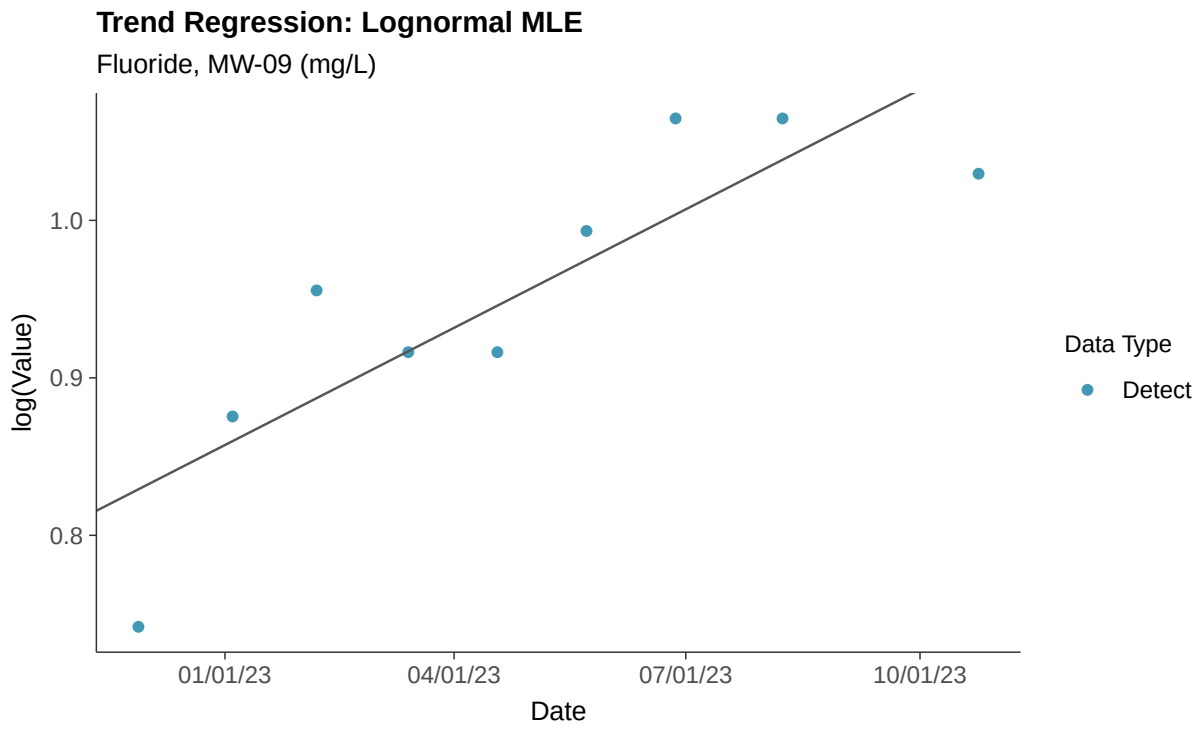
Fluoride, MW-09 (mg/L)

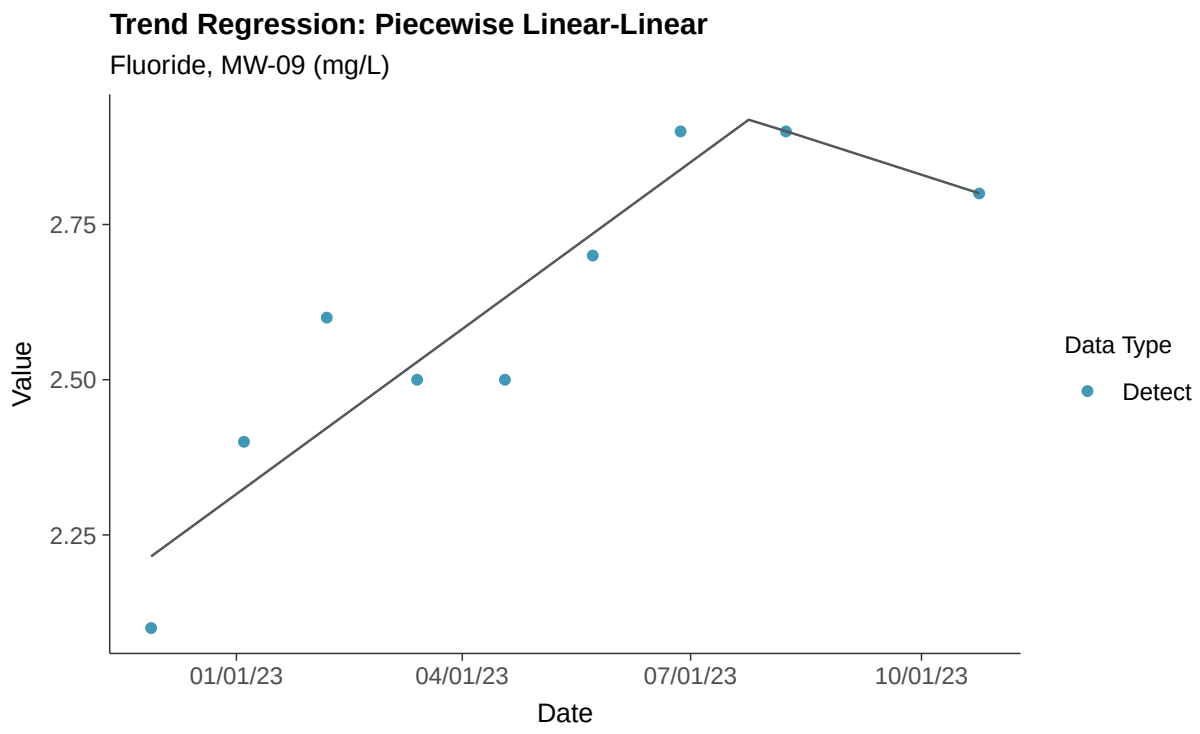



Normal Q-Q plot
Fluoride, MW-09 (mg/L)
Value
2.75
2.50
2.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride, MW-09 (mg/L)
log(Value)
1.0
0.9
0.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

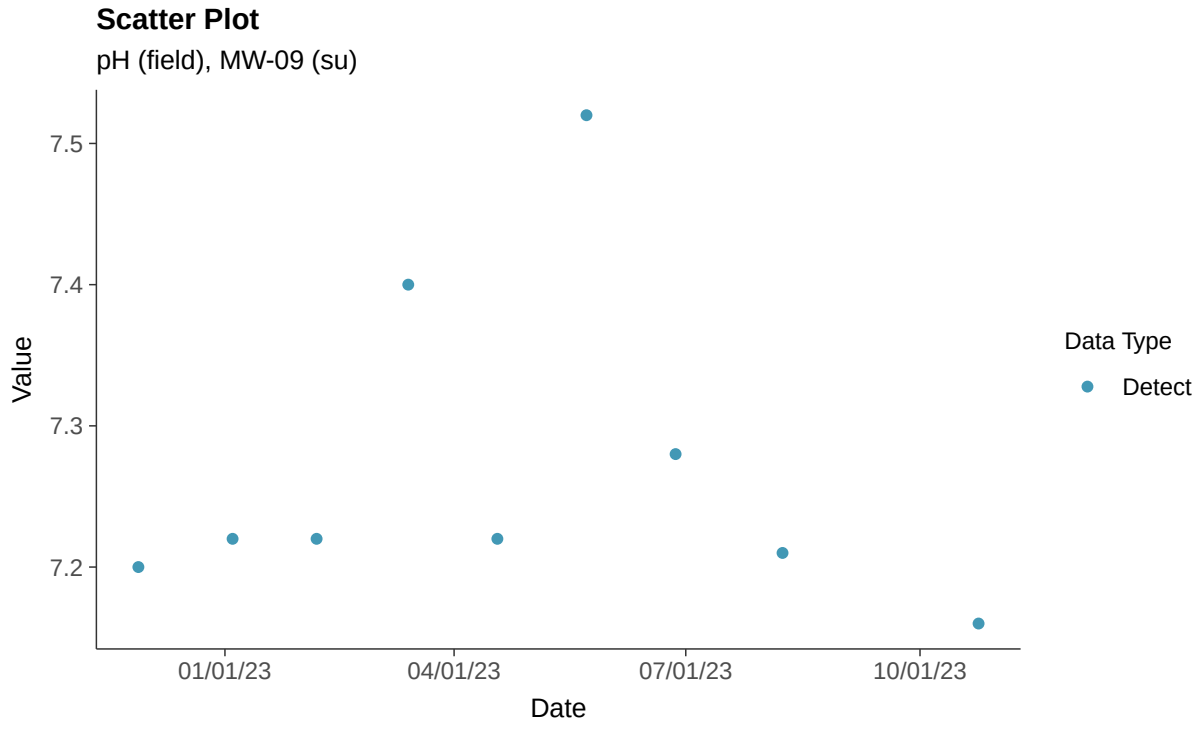

Gamma Q-Q plot
Fluoride, MW-09 (mg/L)
Value
2.75
2.50
2.25
2.0
2.2
2.4
2.6
2.8
3.0
3.2
Theoretical Quantiles (Gamma)
Data Type
Detect

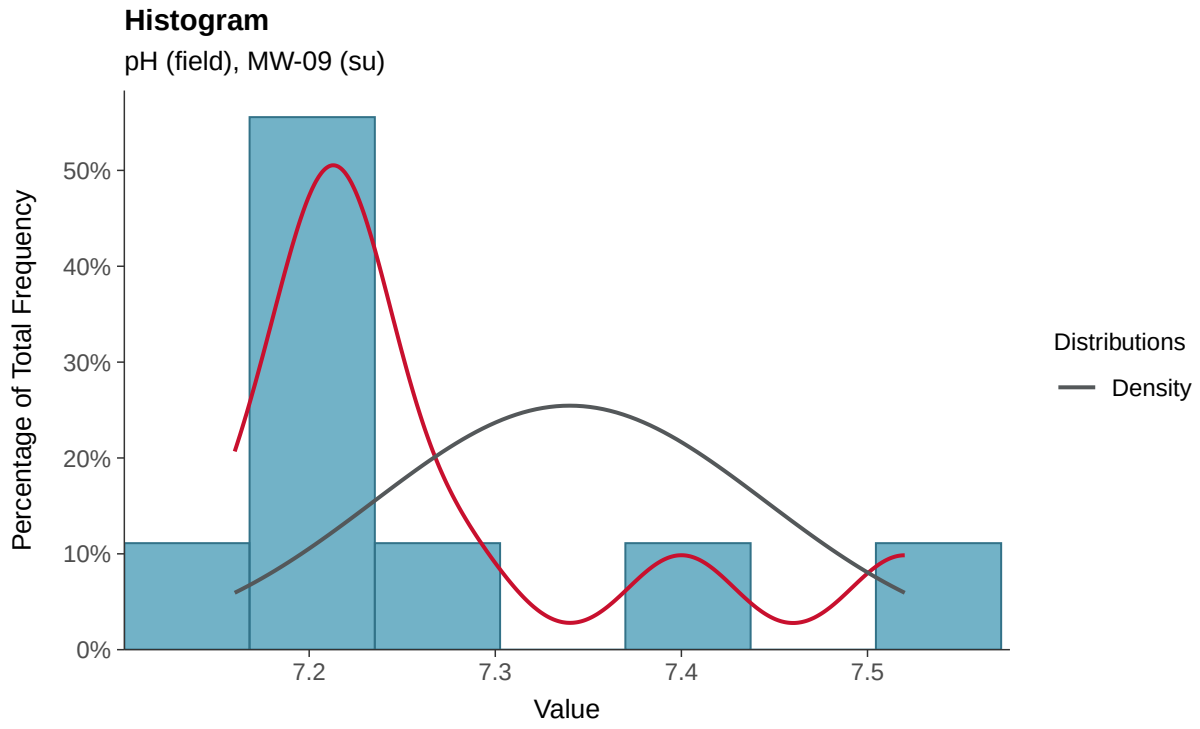

Trend Regression: Lognormal MLE
Fluoride, MW-09 (mg/L)
log(Value)
1.0
0.9
0.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Fluoride, MW-09 (mg/L)
Value
2.75
2.50
2.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: pH (field), MW-09

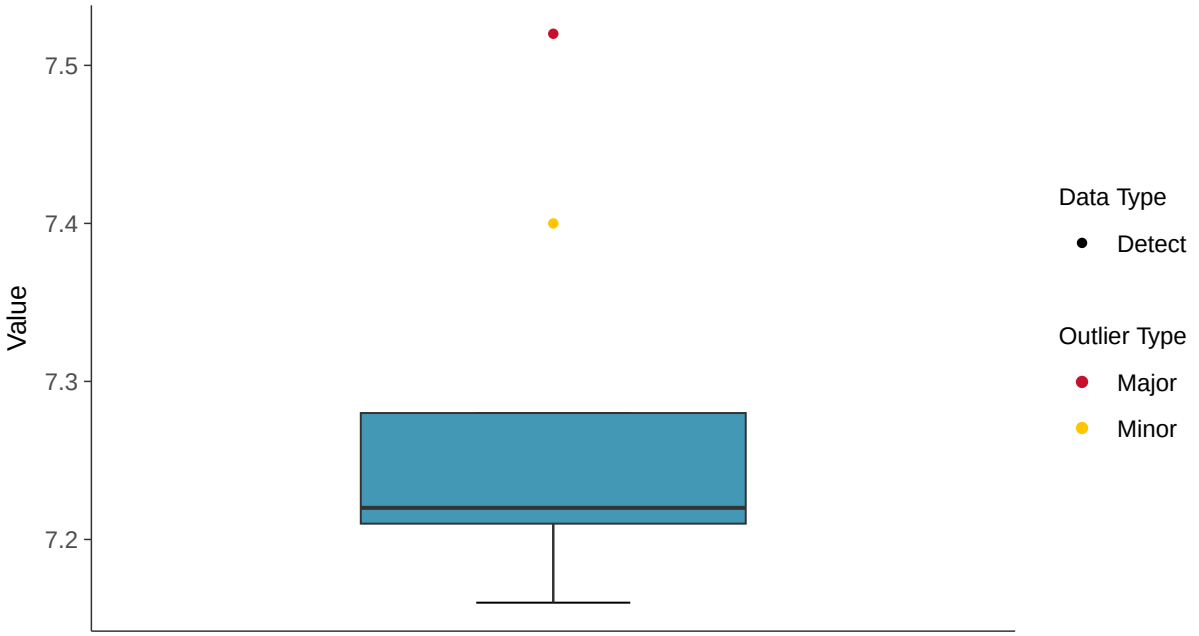
ID: 1_18_4_120





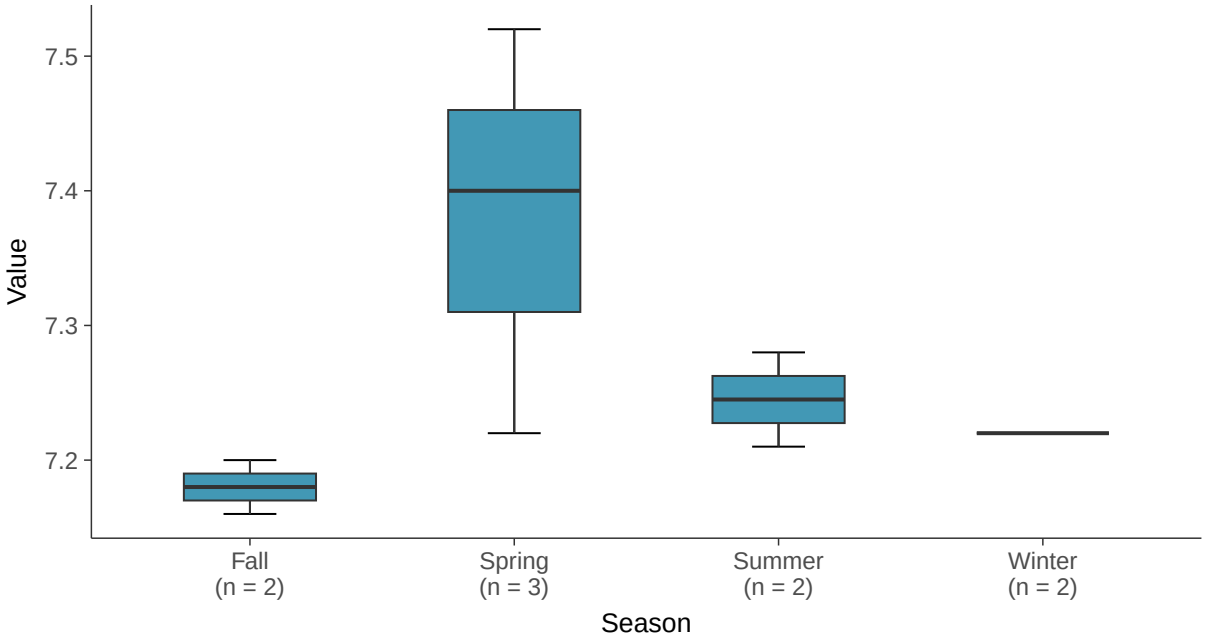
Boxplot

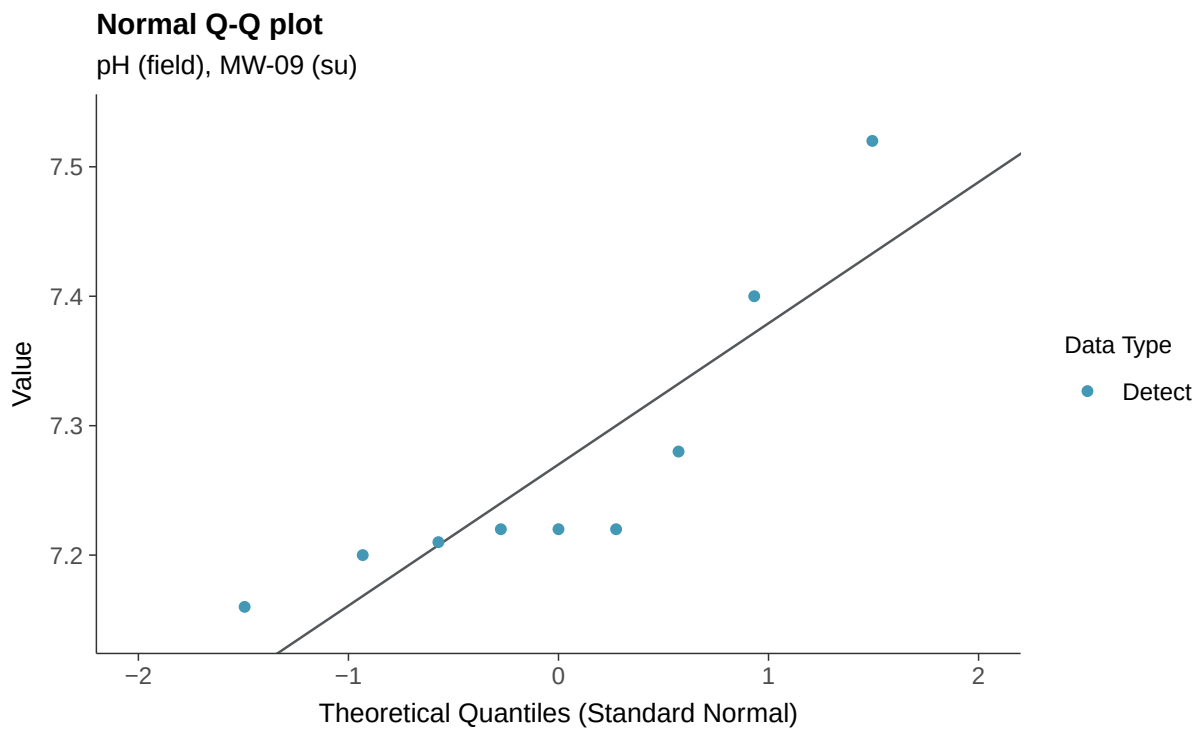
pH (field), MW-09 (su)

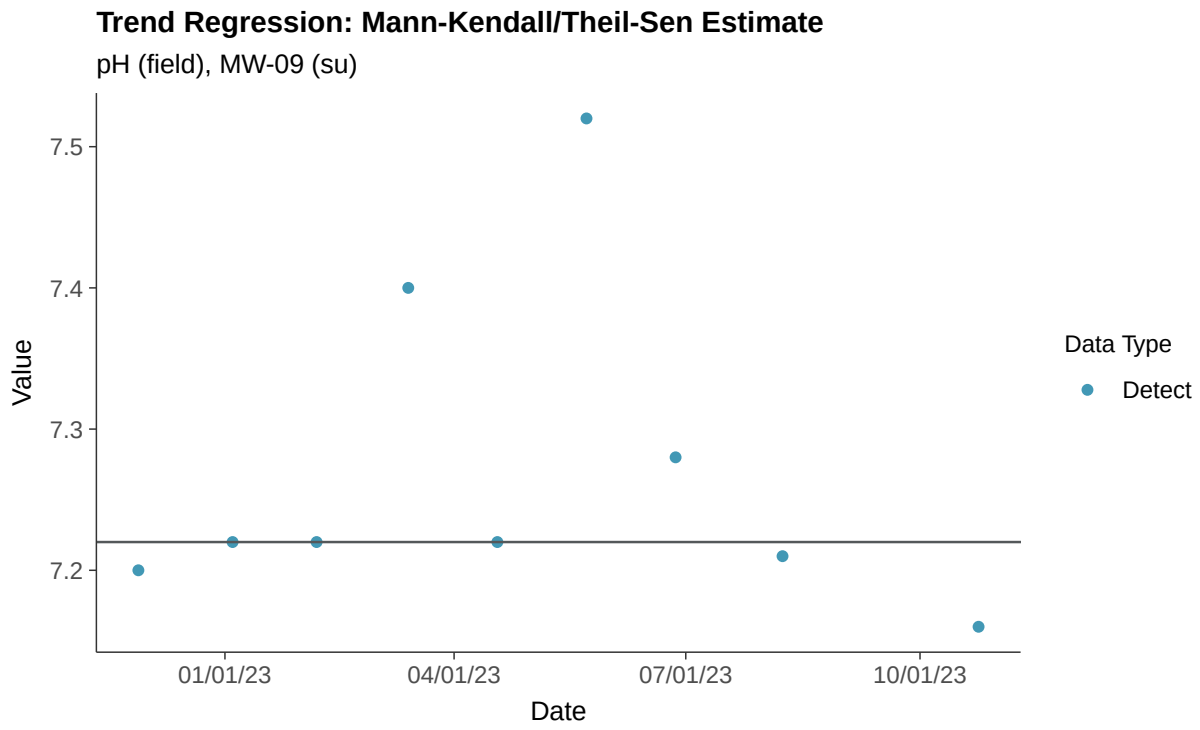


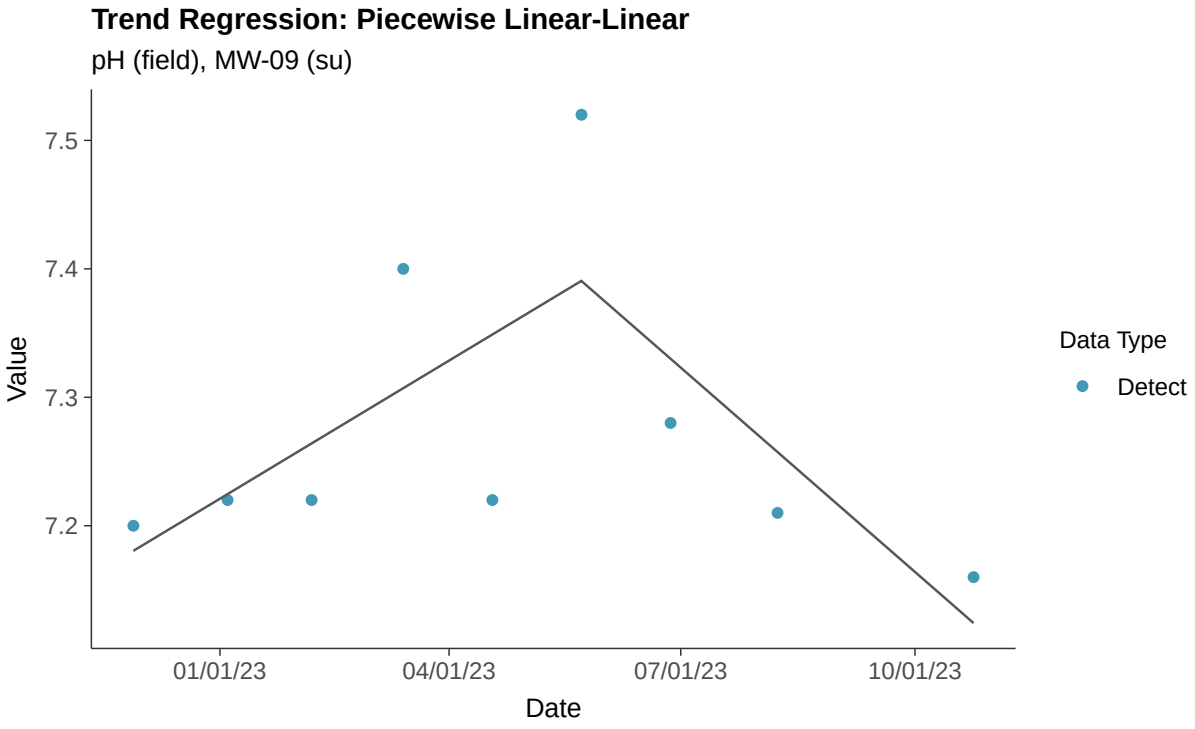
Boxplot by Season

pH (field), MW-09 (su)



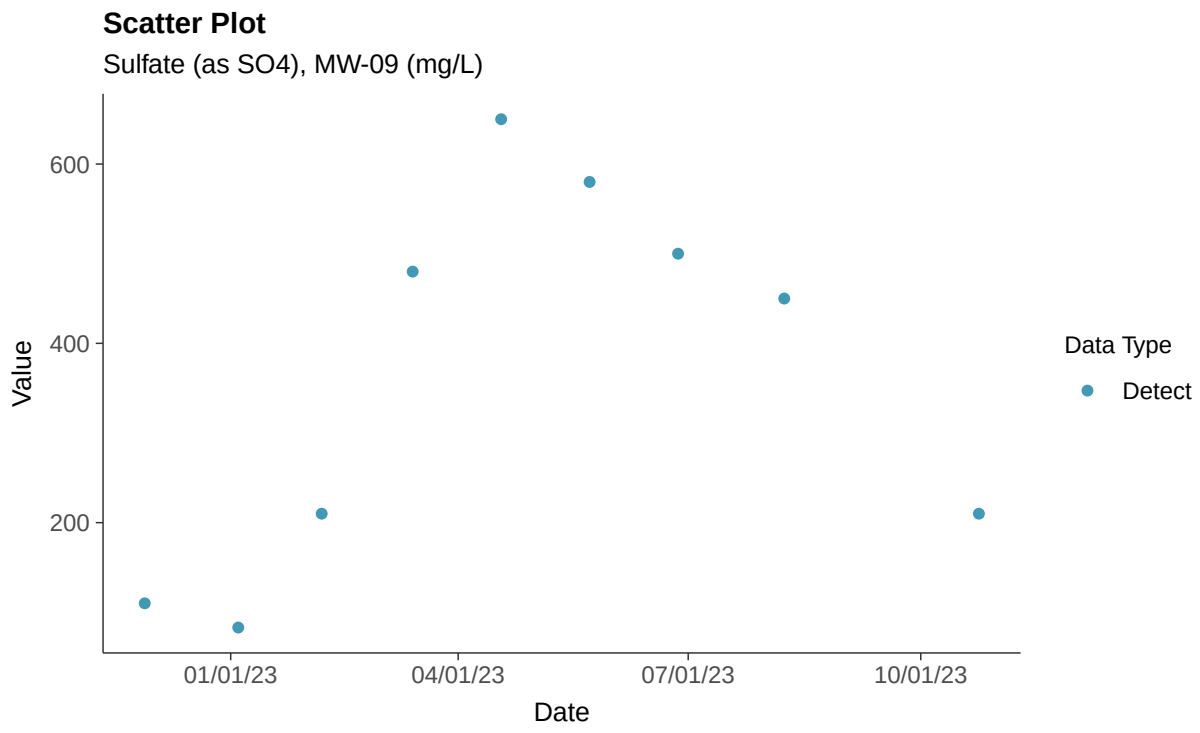

Normal Q-Q plot
pH (field), MW-09 (su)
Value
7.5
7.4
7.3
7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

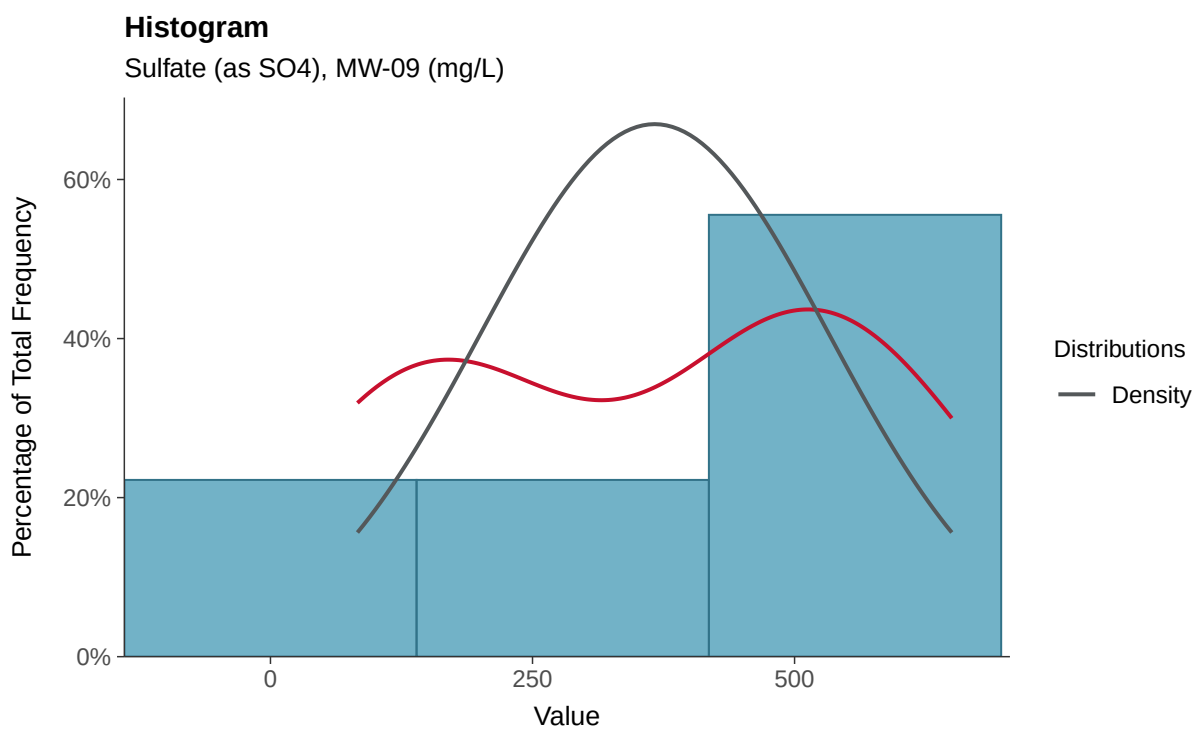

Trend Regression: Mann-Kendall/Theil-Sen Estimate
pH (field), MW-09 (su)
Value
7.5
7.4
7.3
7.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-09 (su)
7.5
7.4
7.3
7.2
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-09

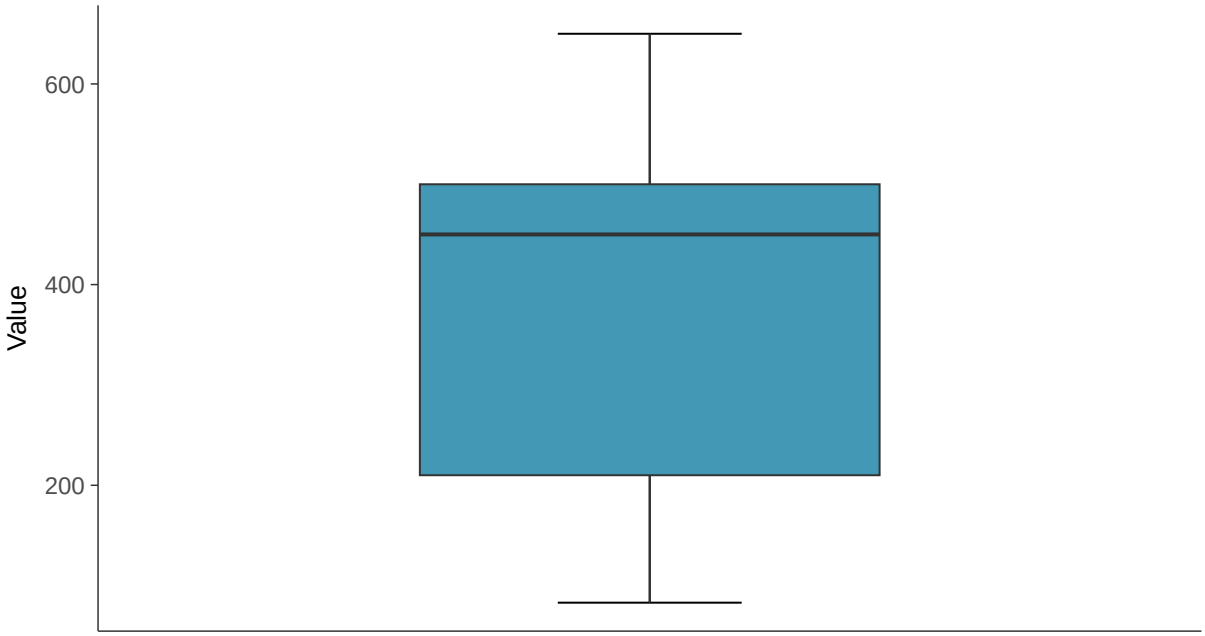
ID: 1_18_4_124





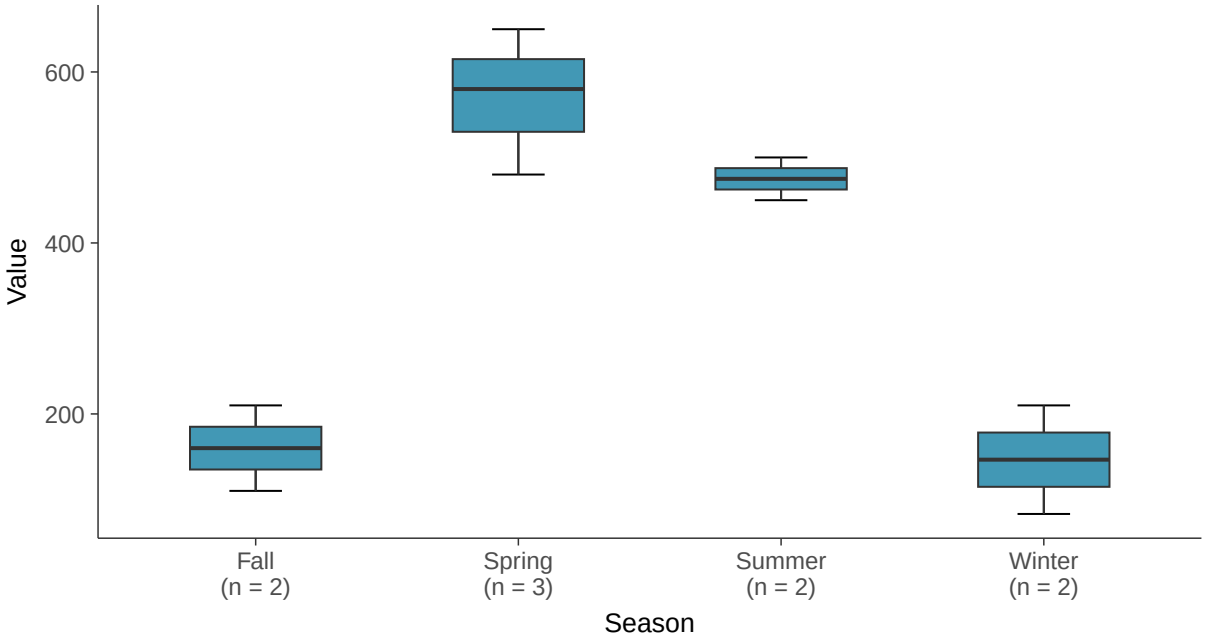
Boxplot

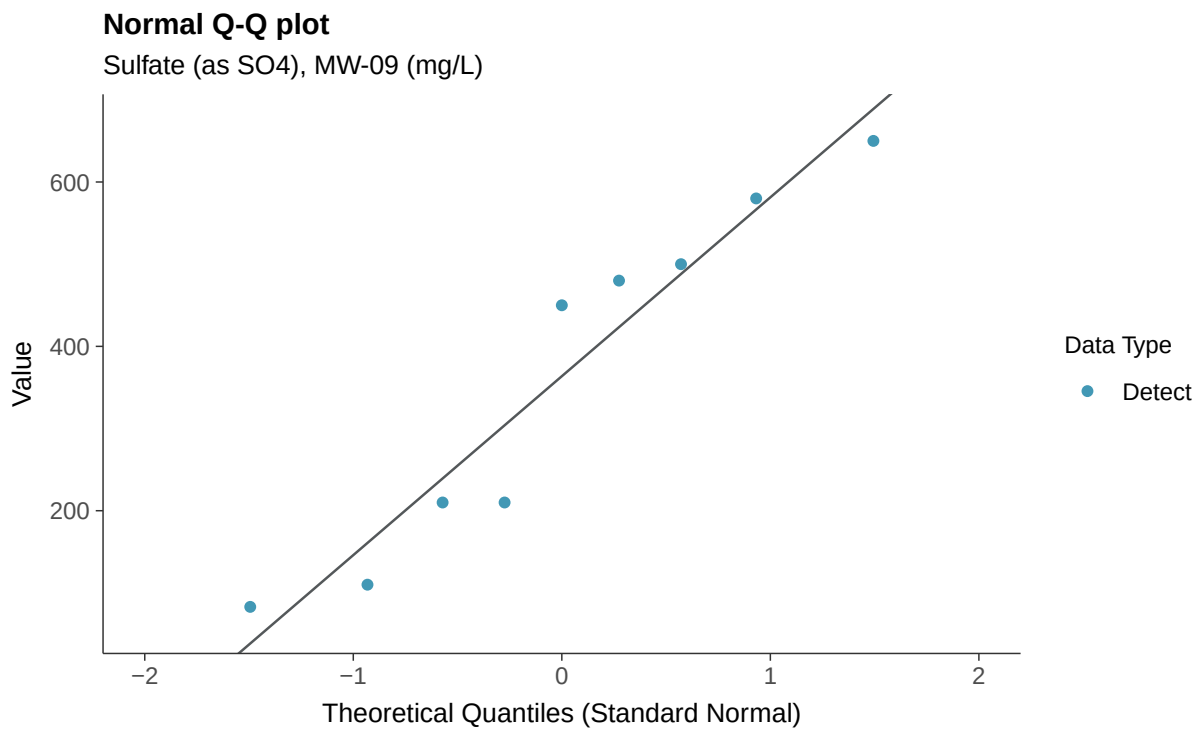
Sulfate (as SO4), MW-09 (mg/L)

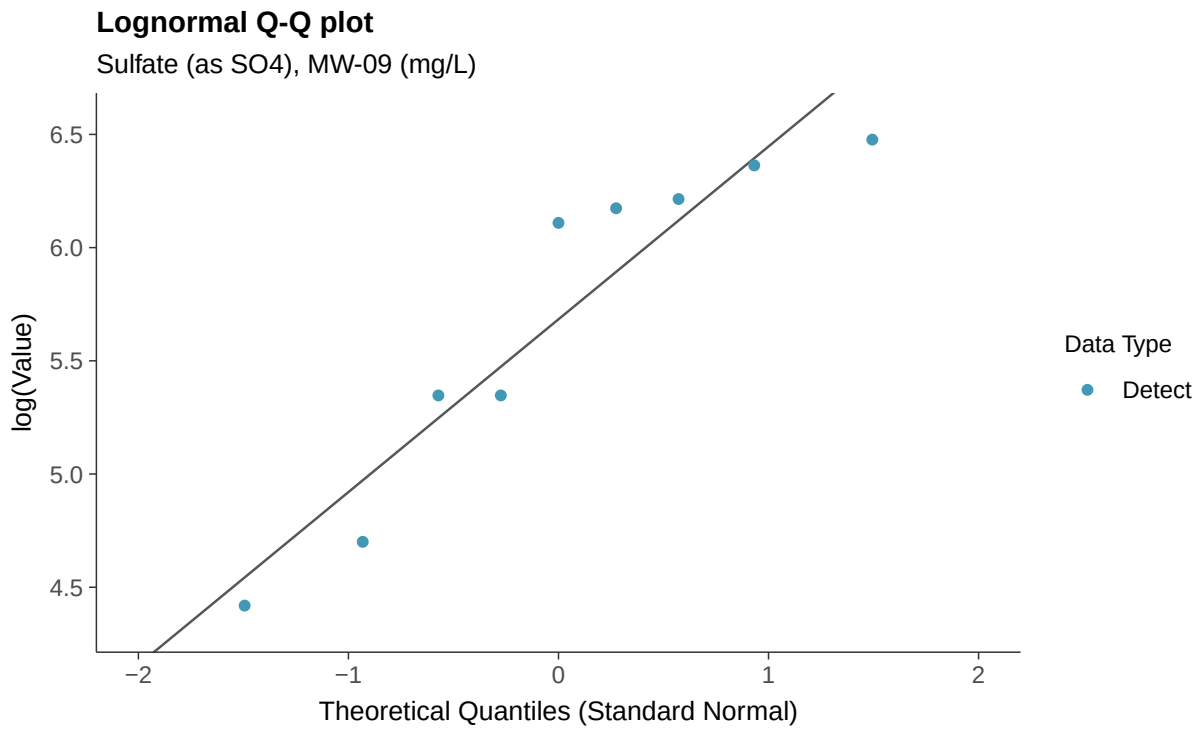


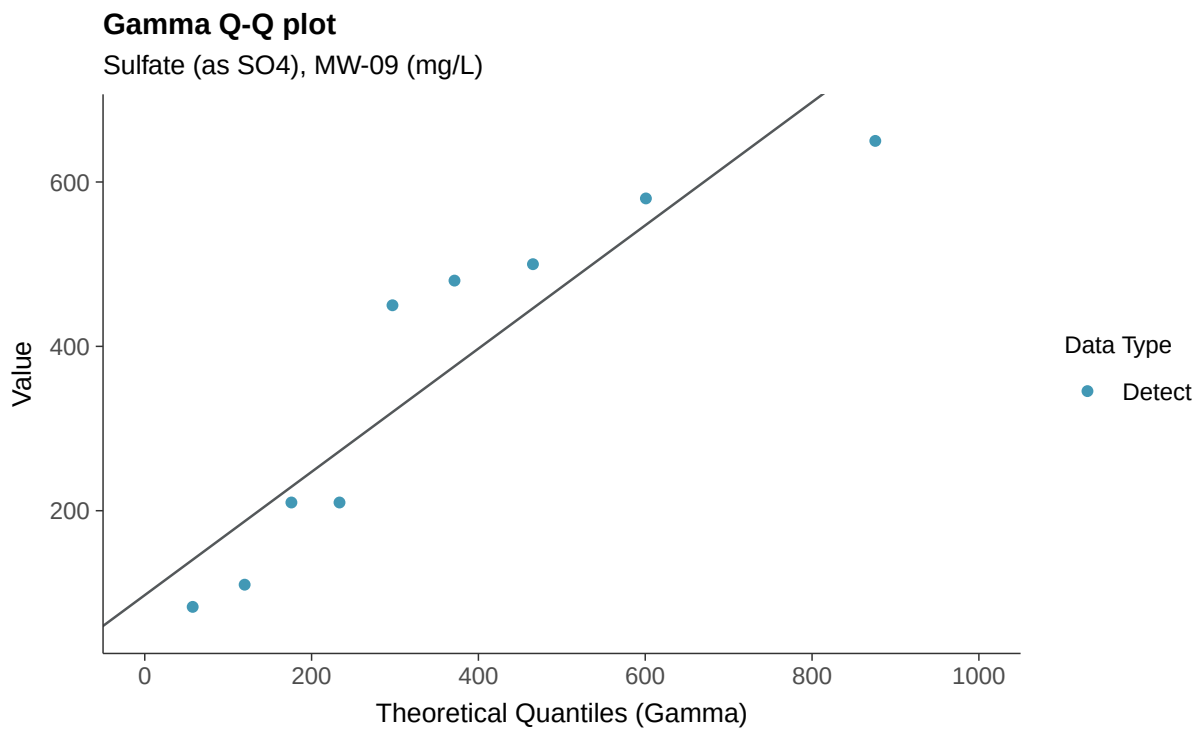
Boxplot by Season

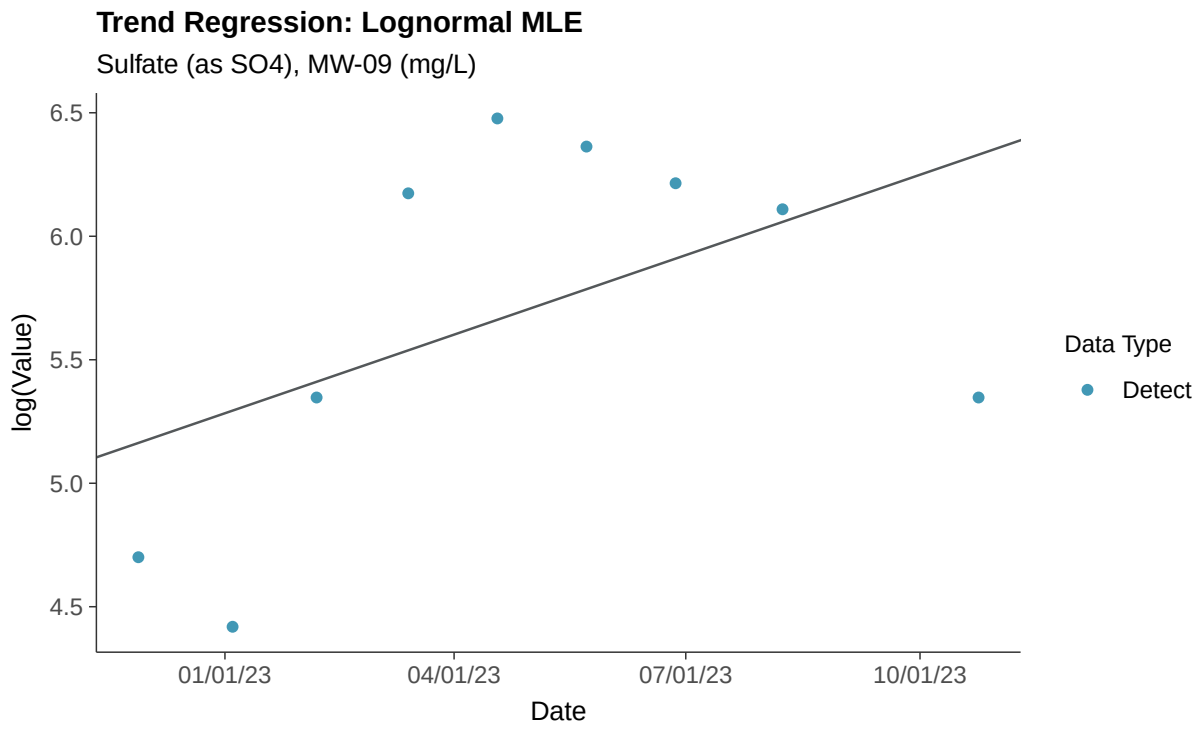
Sulfate (as SO4), MW-09 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-09 (mg/L)
Value
600
400
200
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

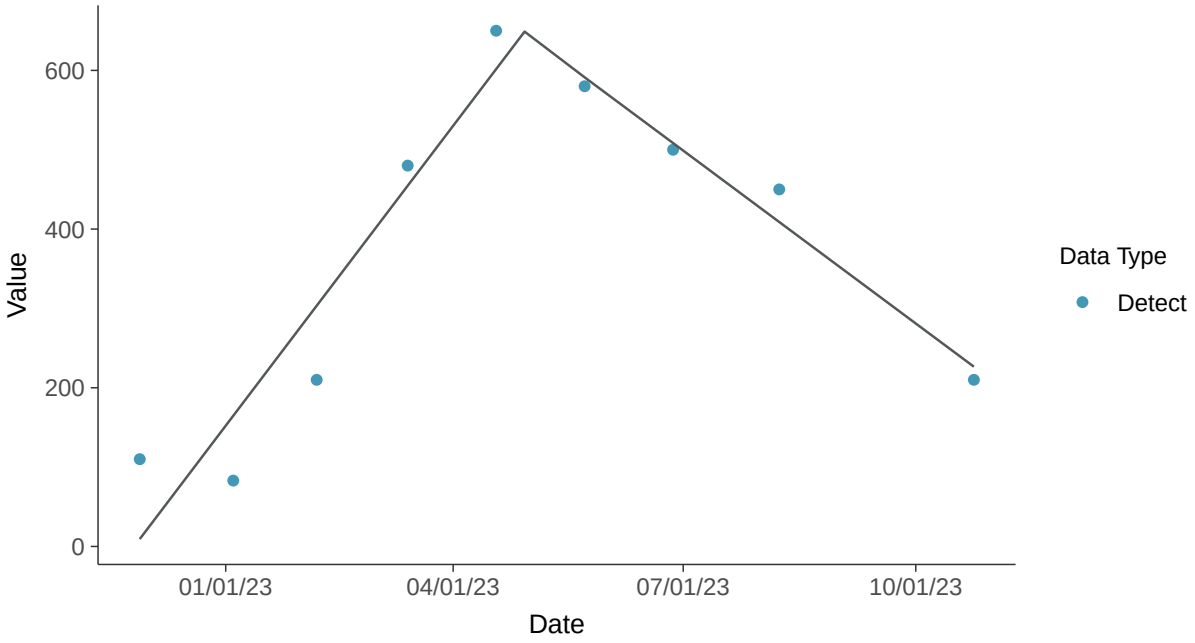

Lognormal Q-Q plot
Sulfate (as SO4), MW-09 (mg/L)
log(Value)
6.5
6.0
5.5
5.0
4.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-09 (mg/L)
Value
600
400
200
0
200
400
600
800
1000
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-09 (mg/L)
log(Value)
6.5
6.0
5.5
5.0
4.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

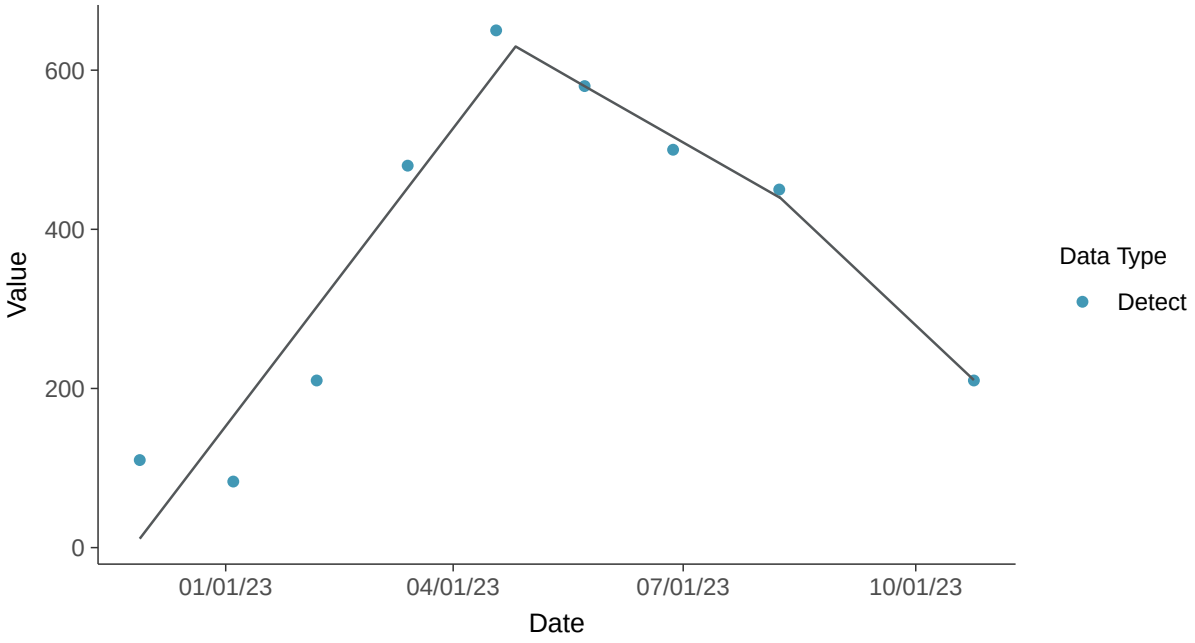
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-09 (mg/L)



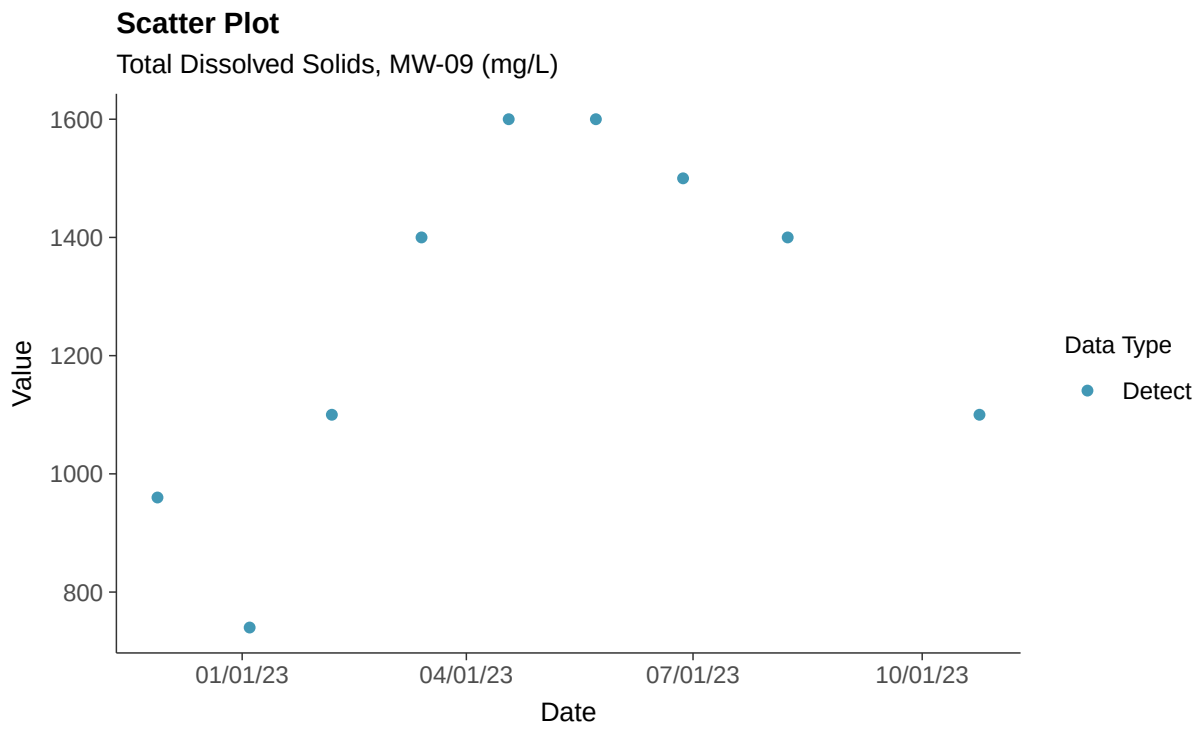
Trend Regression: Piecewise Linear-Linear-Linear

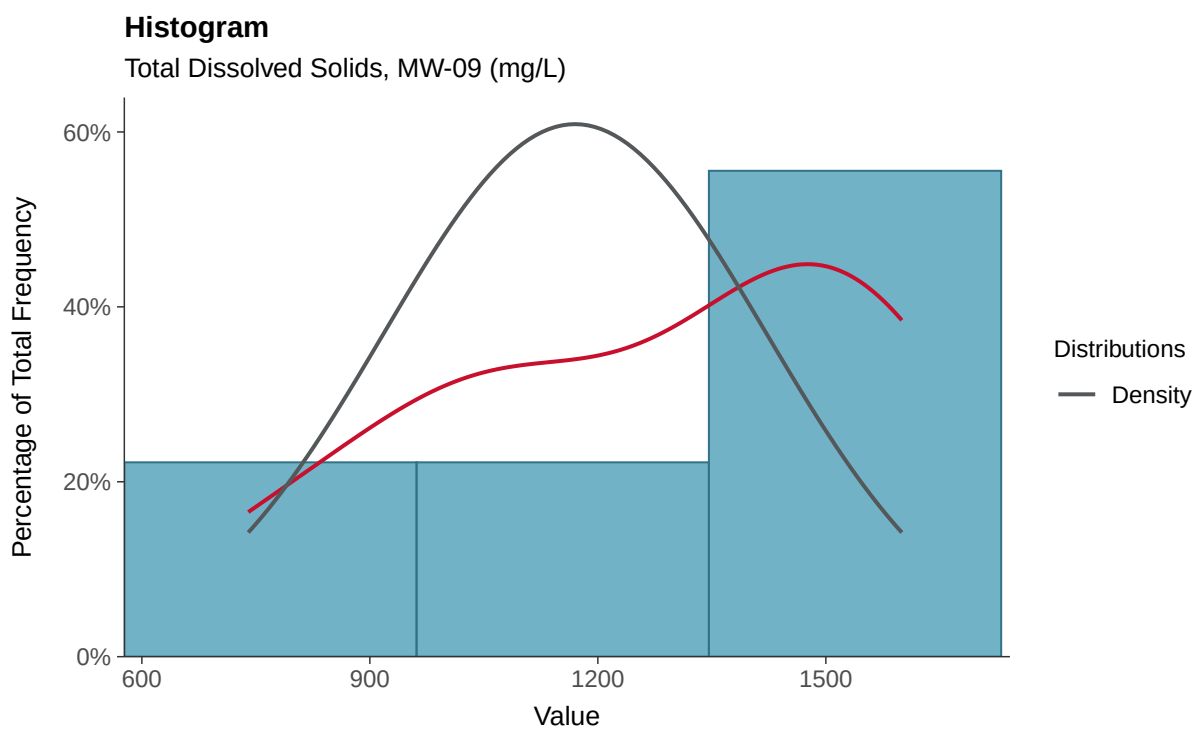
Sulfate (as SO4), MW-09 (mg/L)



Appendix III: Total Dissolved Solids, MW-09

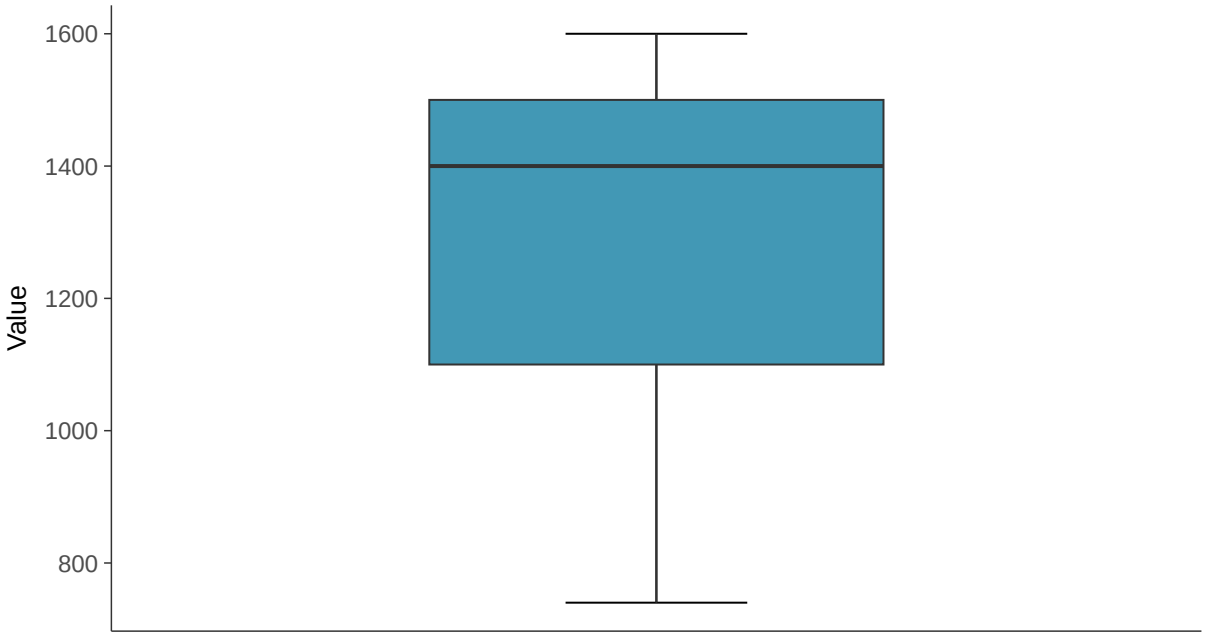
ID: 1_18_4_126





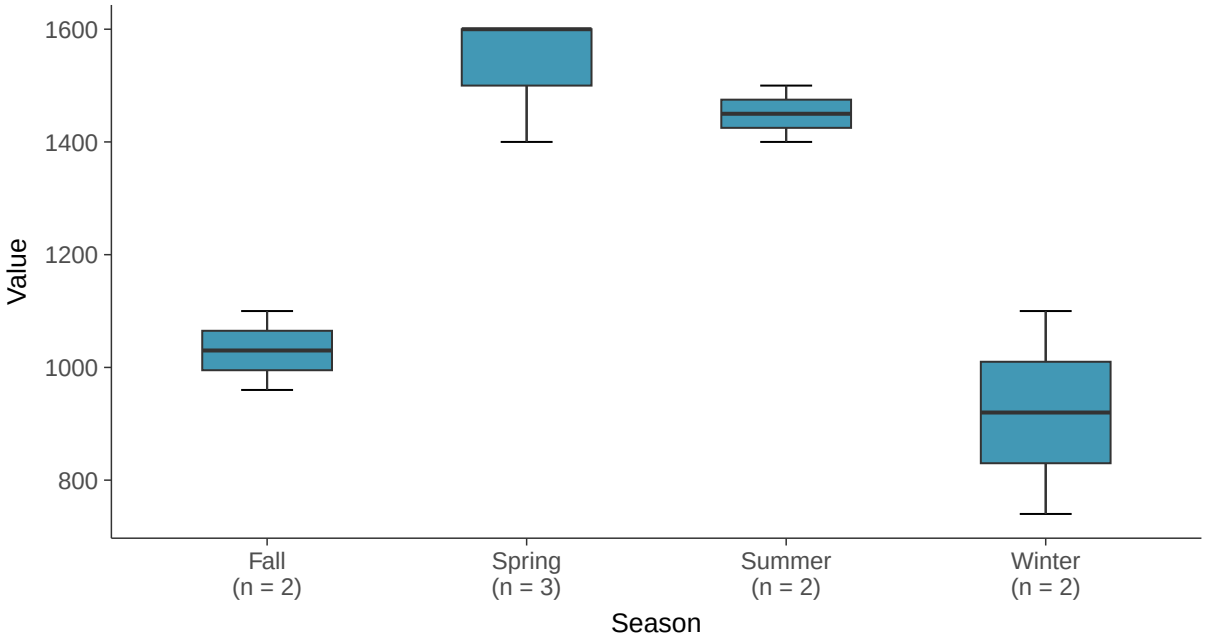
Boxplot

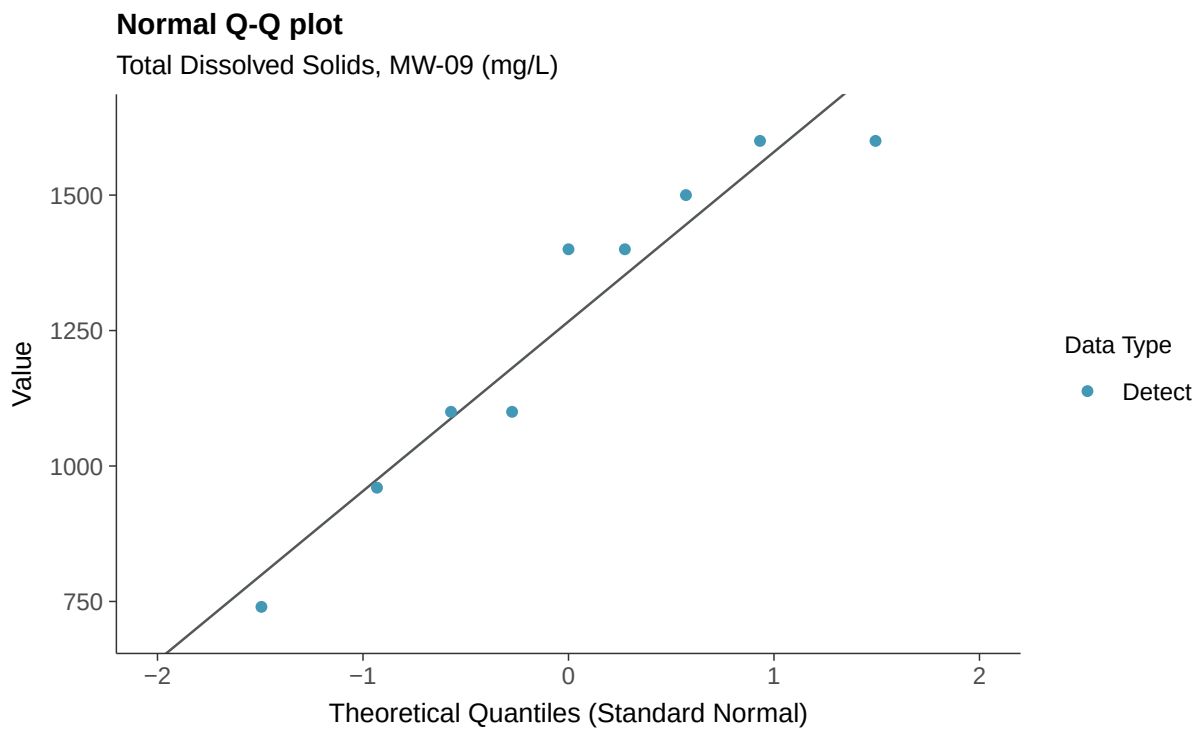
Total Dissolved Solids, MW-09 (mg/L)

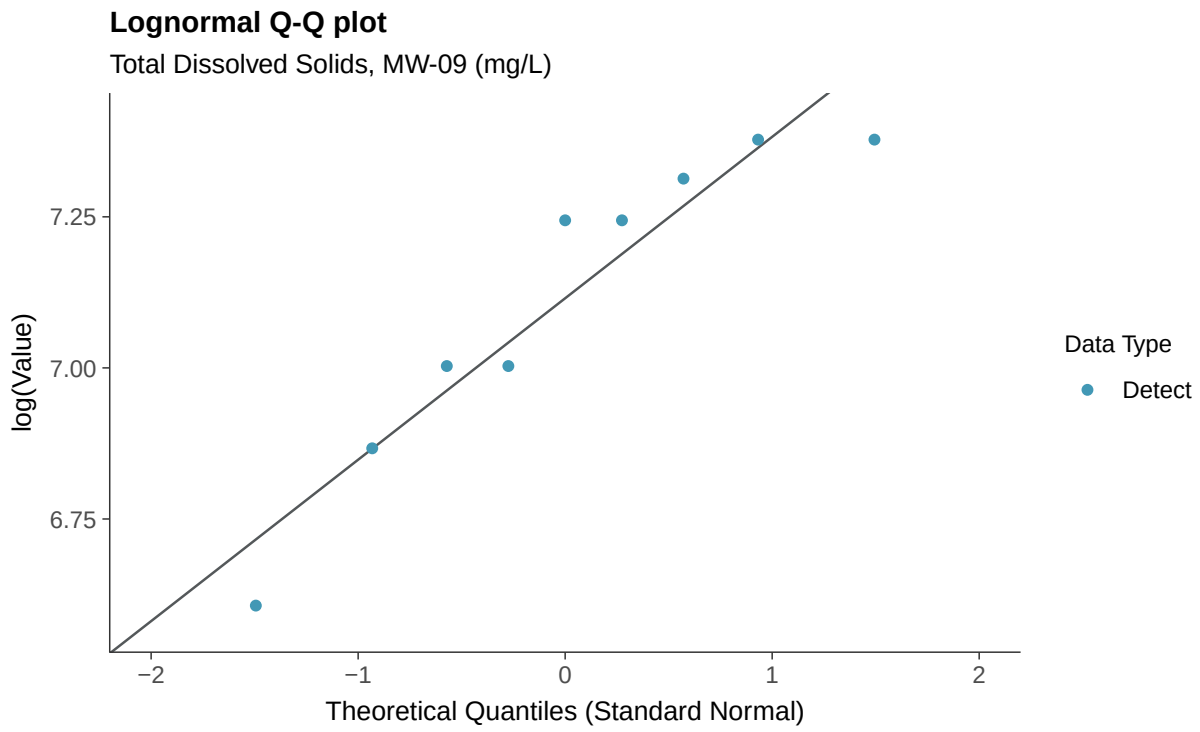


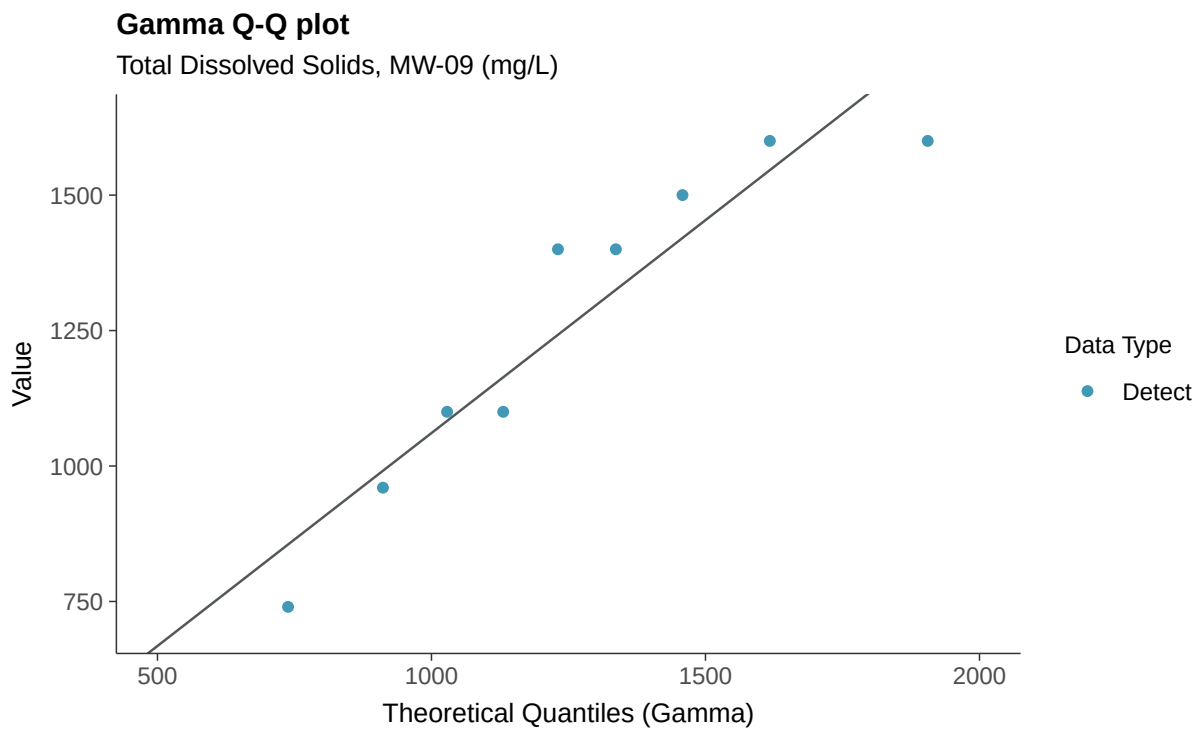
Boxplot by Season

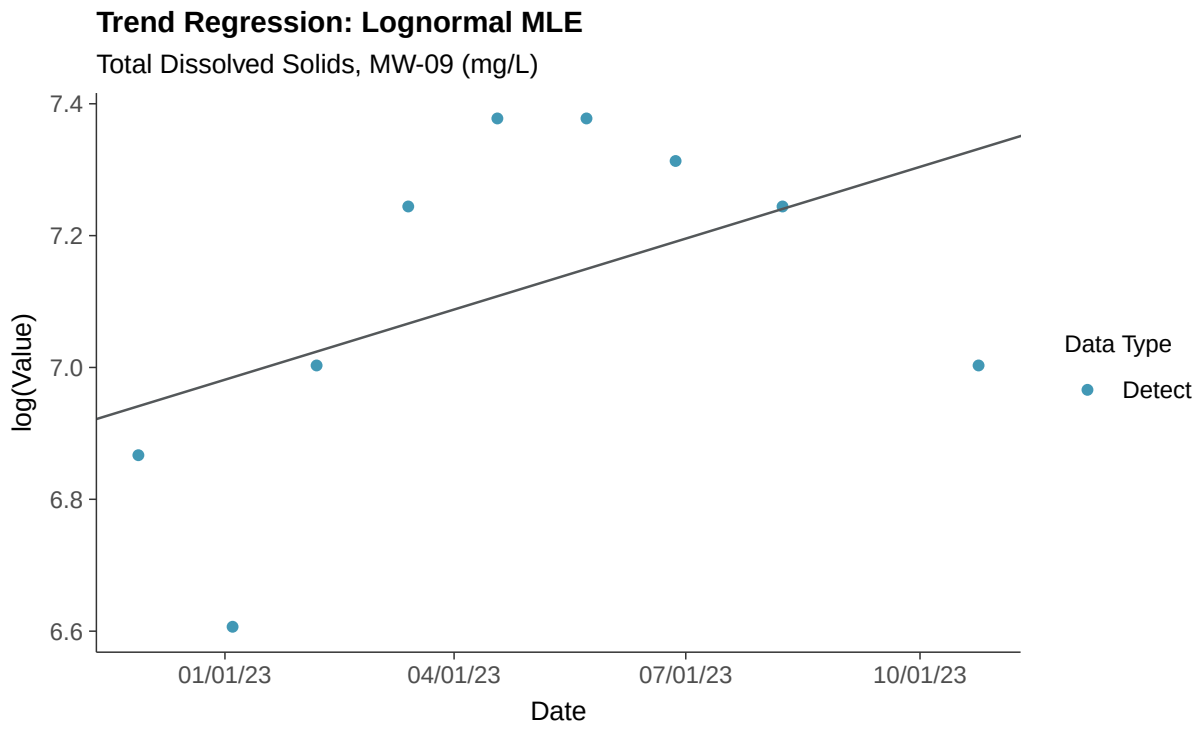
Total Dissolved Solids, MW-09 (mg/L)

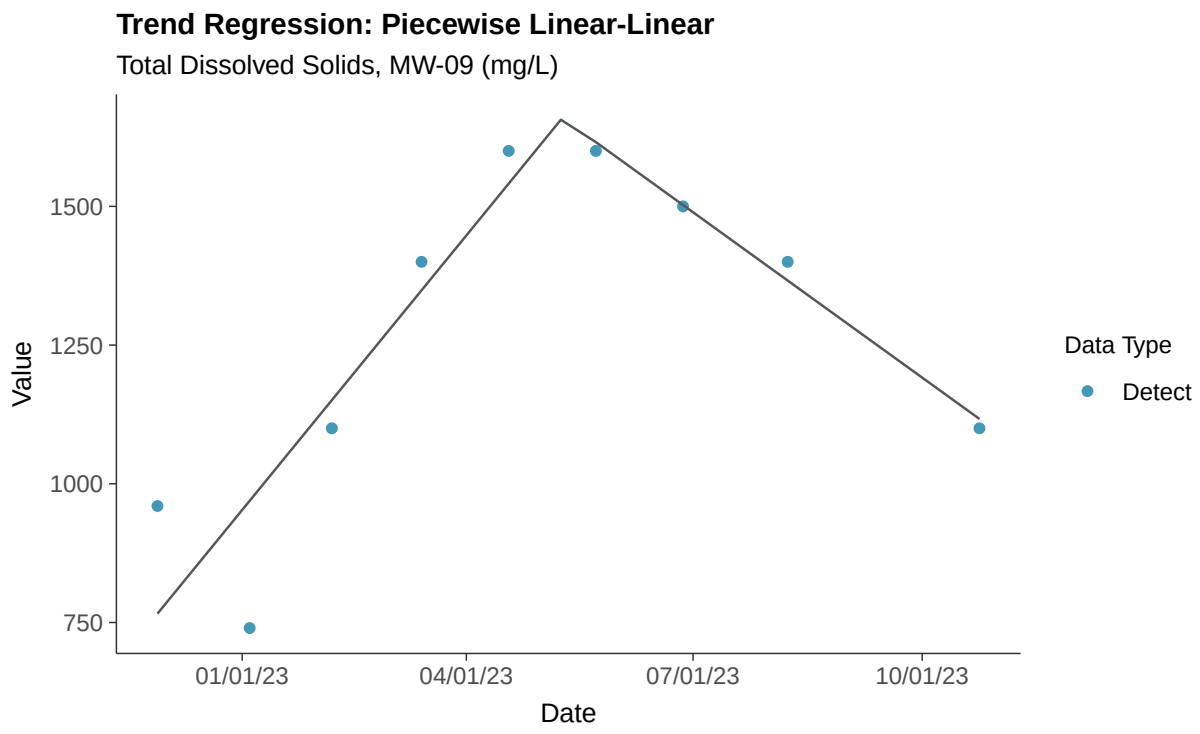



Normal Q-Q plot
Total Dissolved Solids, MW-09 (mg/L)
Value
1500
1250
1000
750
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Total Dissolved Solids, MW-09 (mg/L)
log(Value)
7.25
7.00
6.75
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

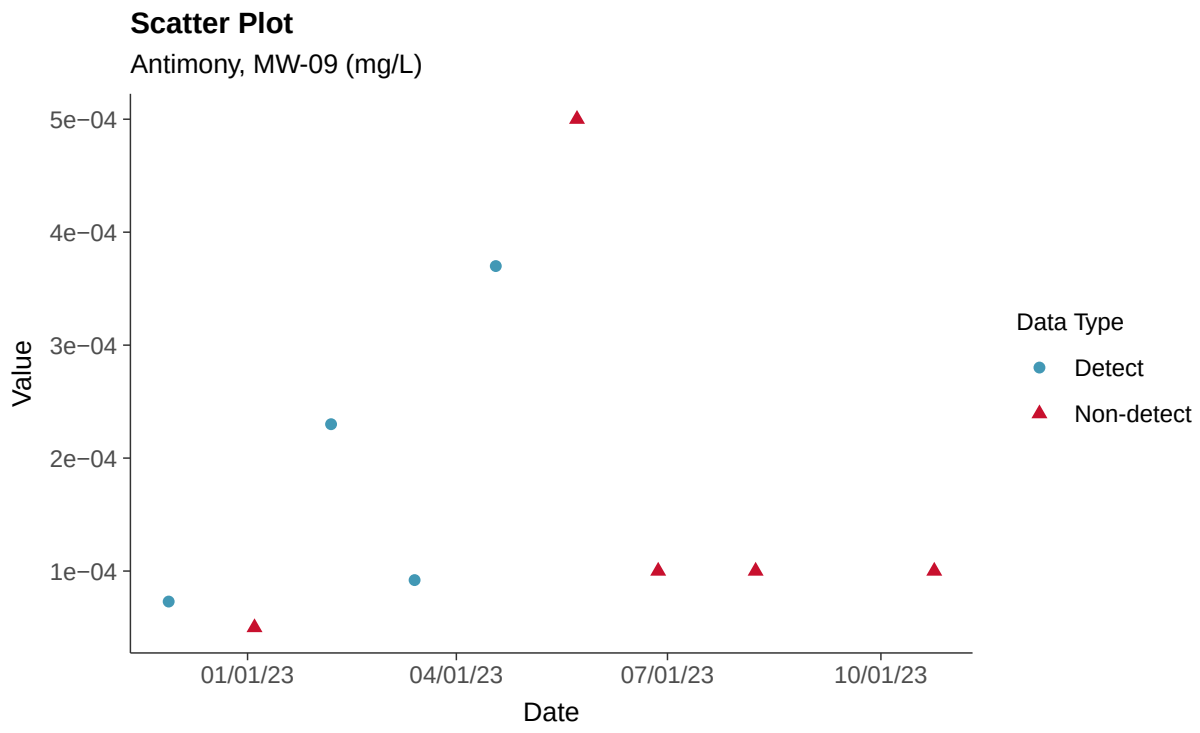

Gamma Q-Q plot
Total Dissolved Solids, MW-09 (mg/L)
Value
1500
1250
1000
750
500
1000
1500
2000
Theoretical Quantiles (Gamma)
Data Type
Detect

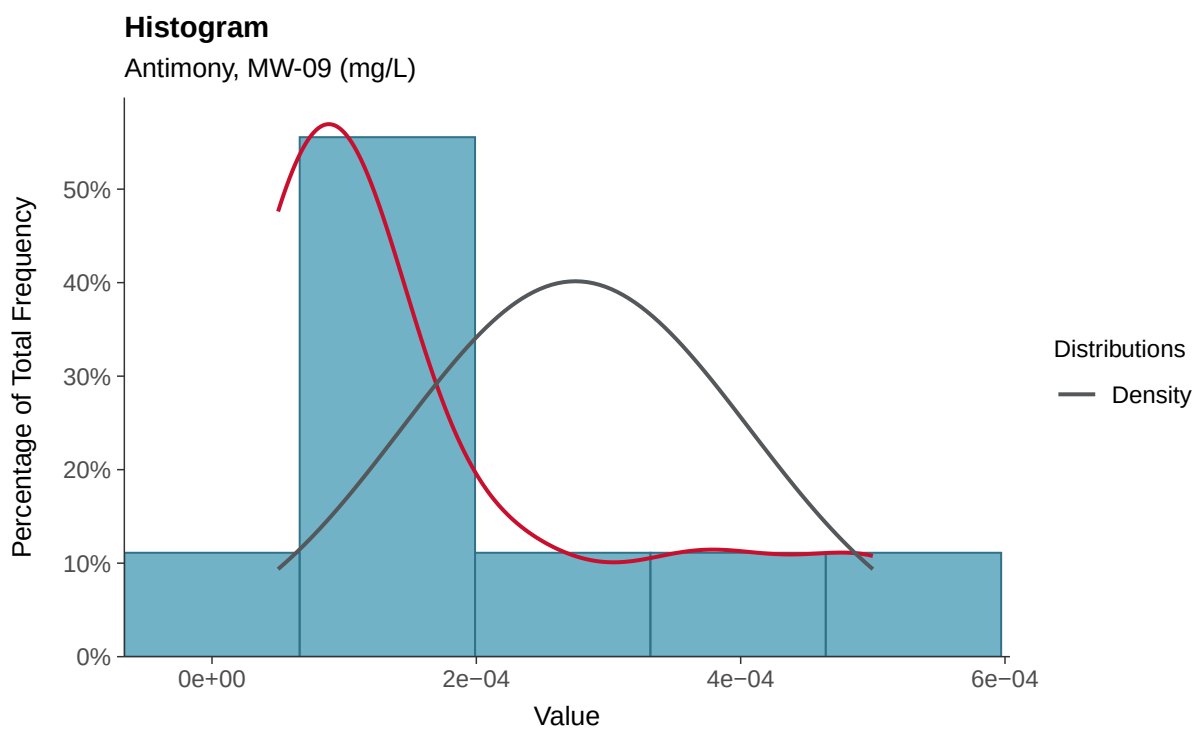

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-09 (mg/L)
log(Value)
7.4
7.2
7.0
6.8
6.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-09 (mg/L)
Value
1500
1250
1000
750
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-09

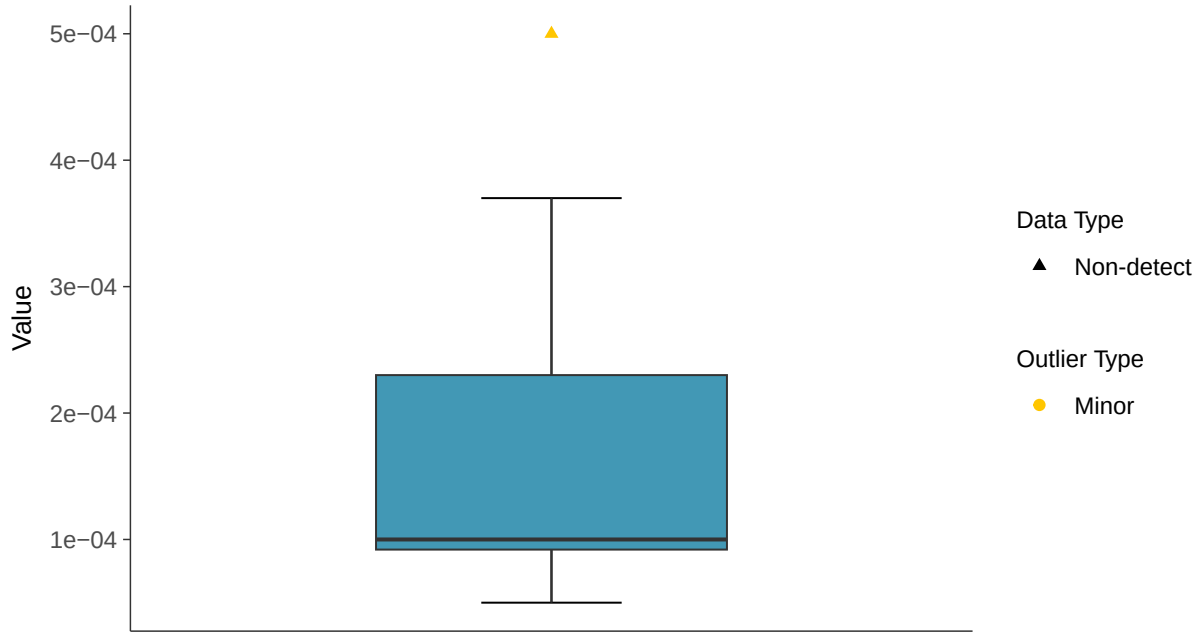
ID: 1_18_5_101





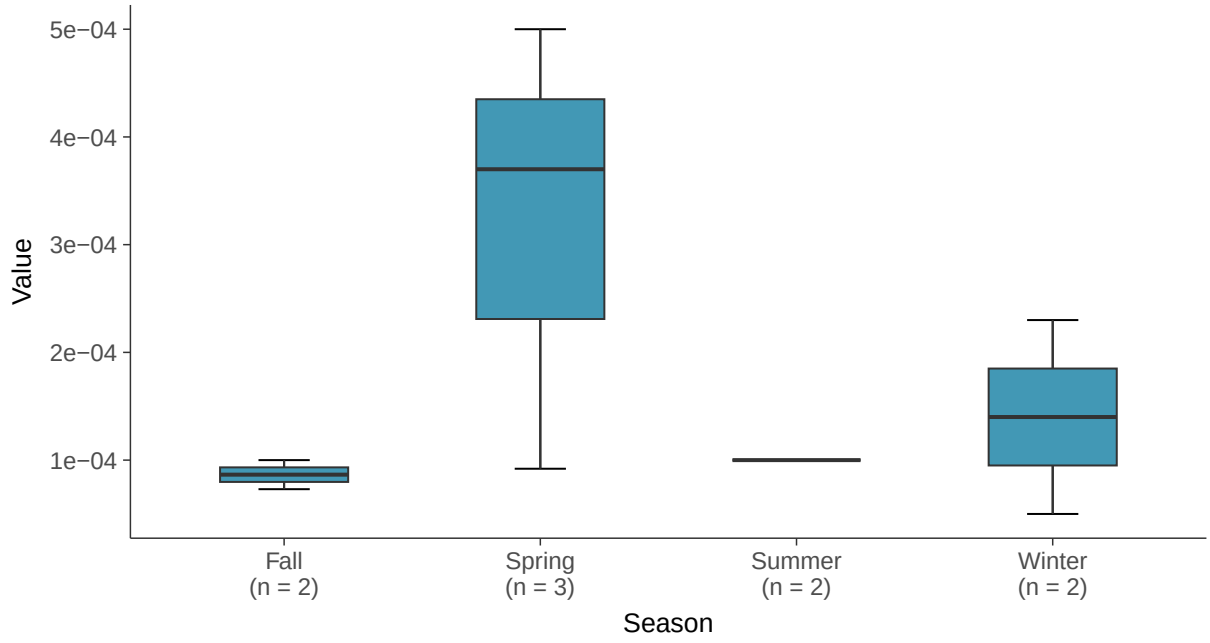
Boxplot

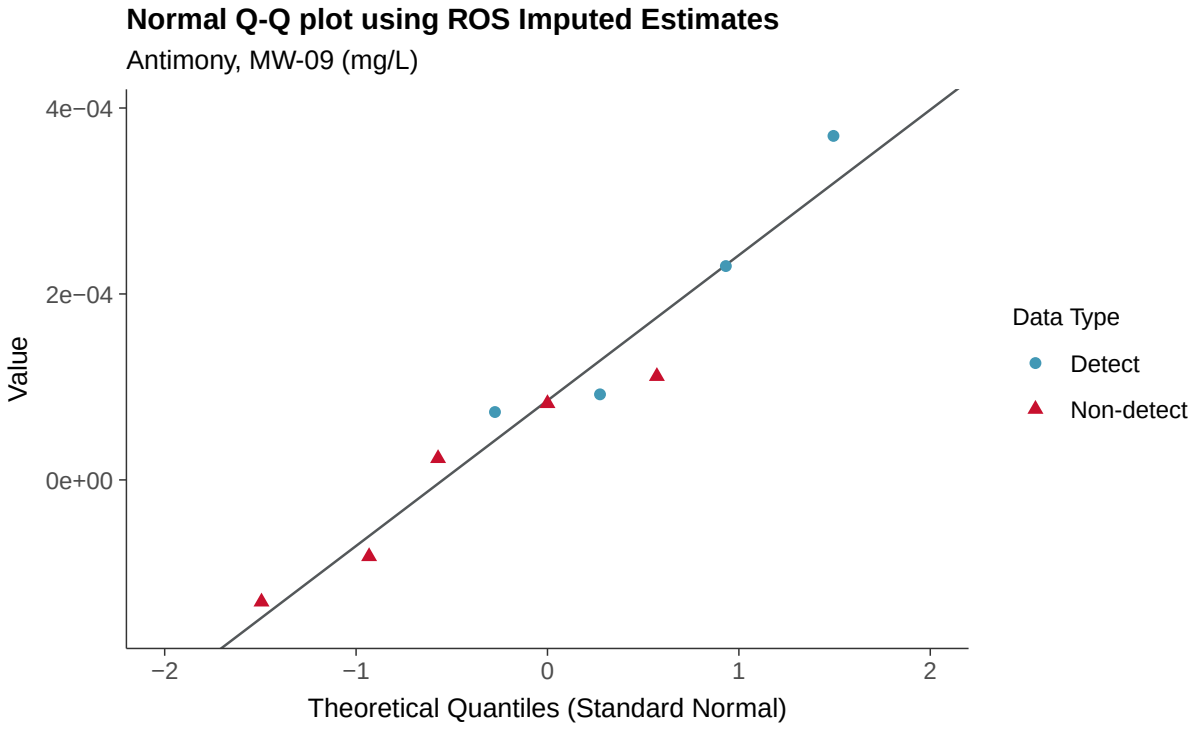
Antimony, MW-09 (mg/L)

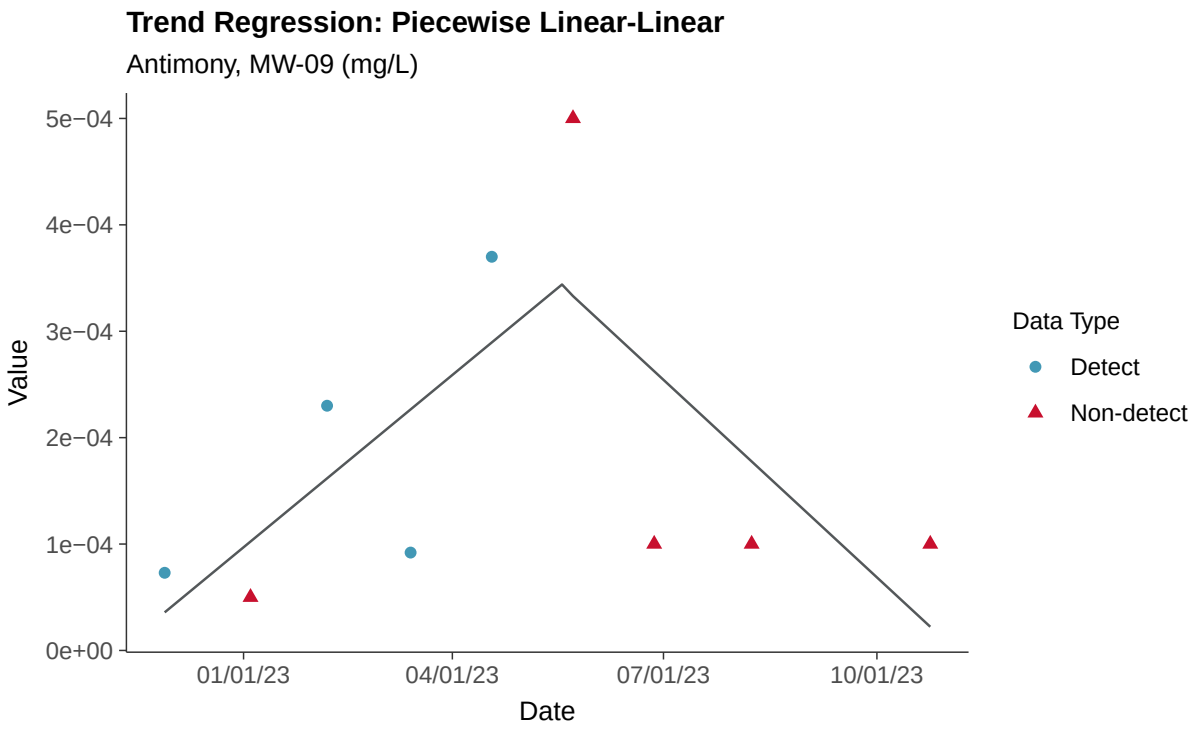


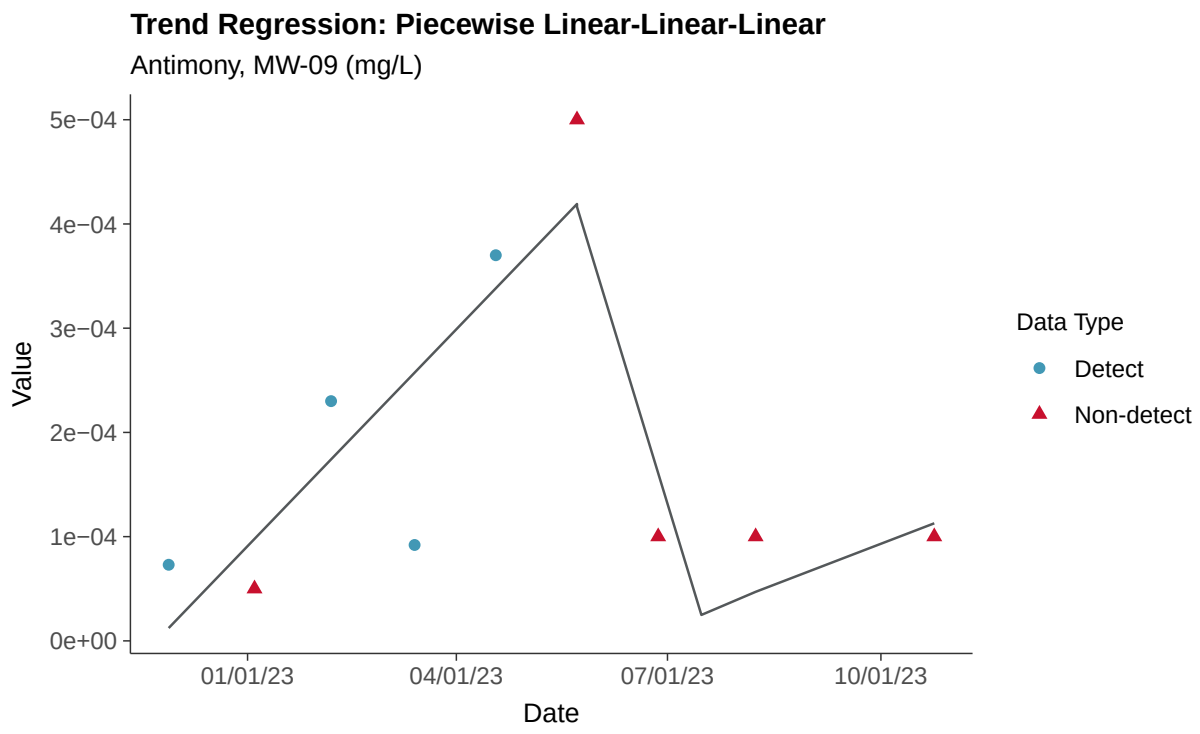
Boxplot by Season

Antimony, MW-09 (mg/L)



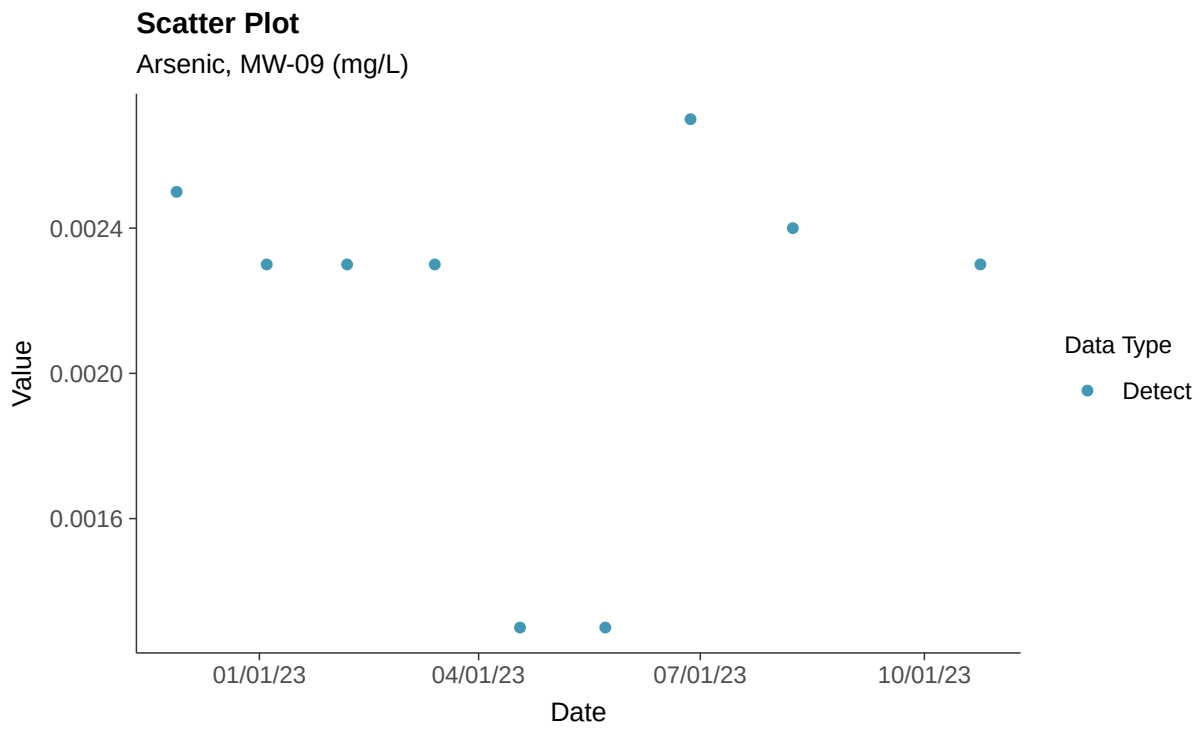

Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-09 (mg/L)
Value
4e−04
2e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

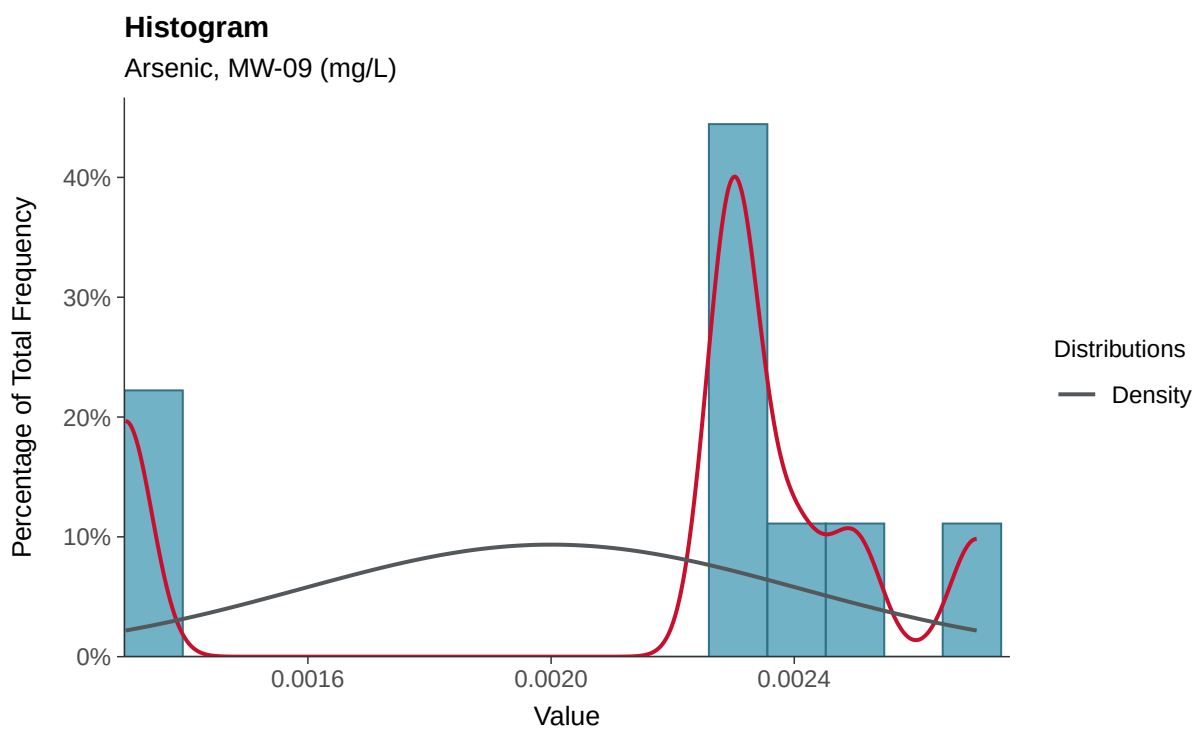

Trend Regression: Piecewise Linear-Linear
Antimony, MW-09 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-09 (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
0e+00
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-09

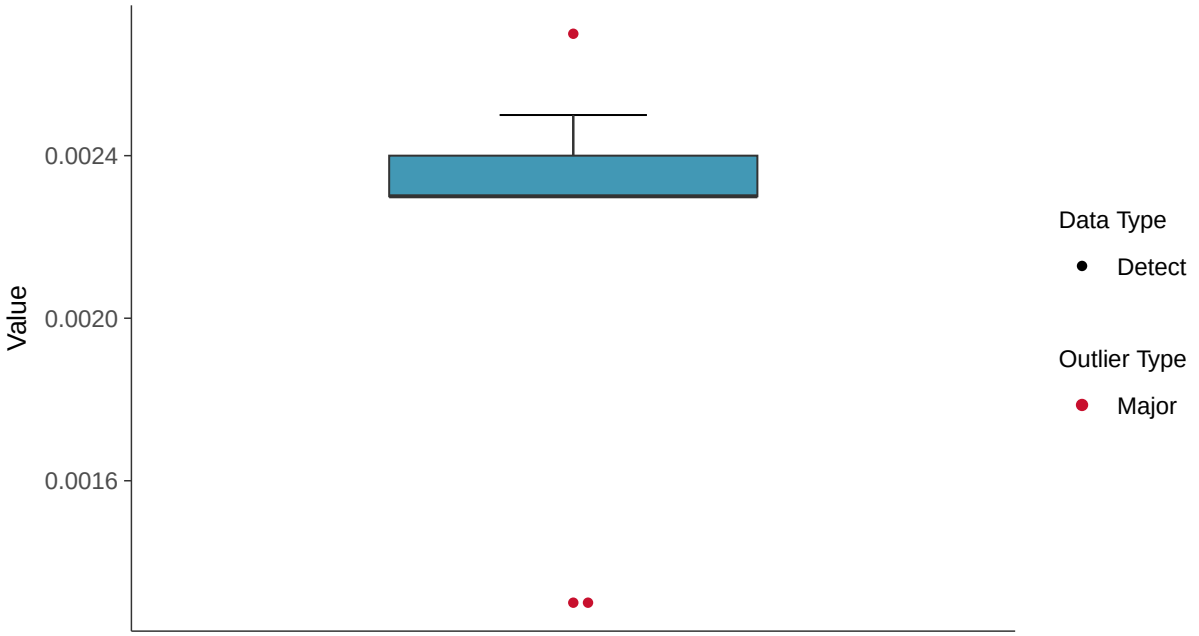
ID: 1_18_5_102





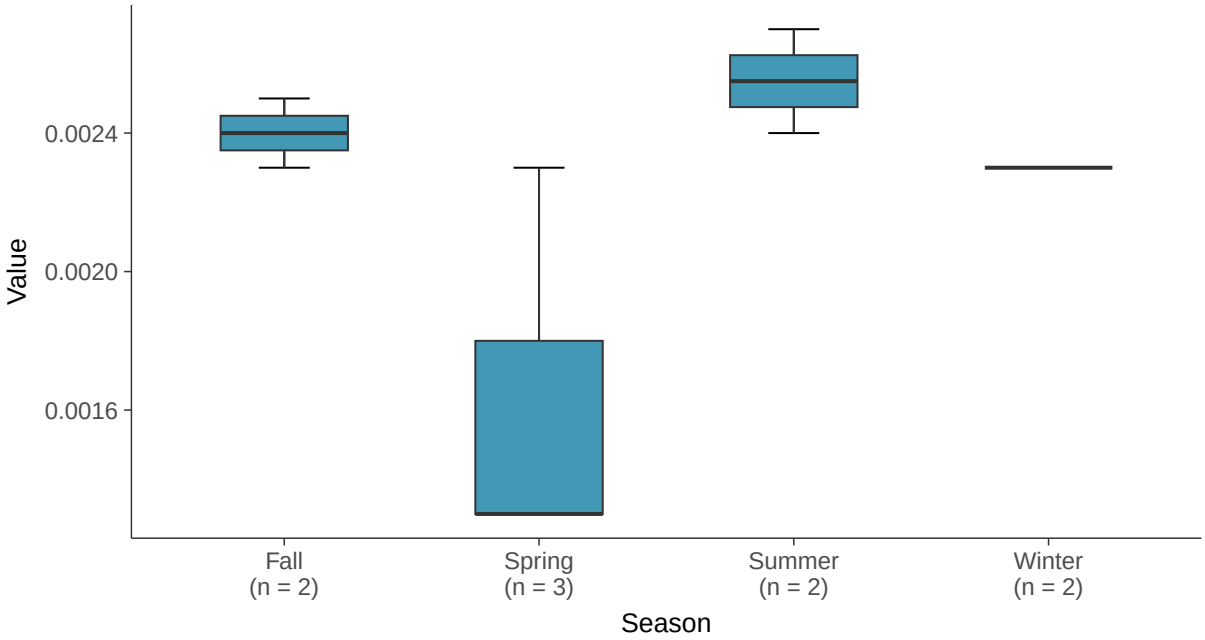
Boxplot

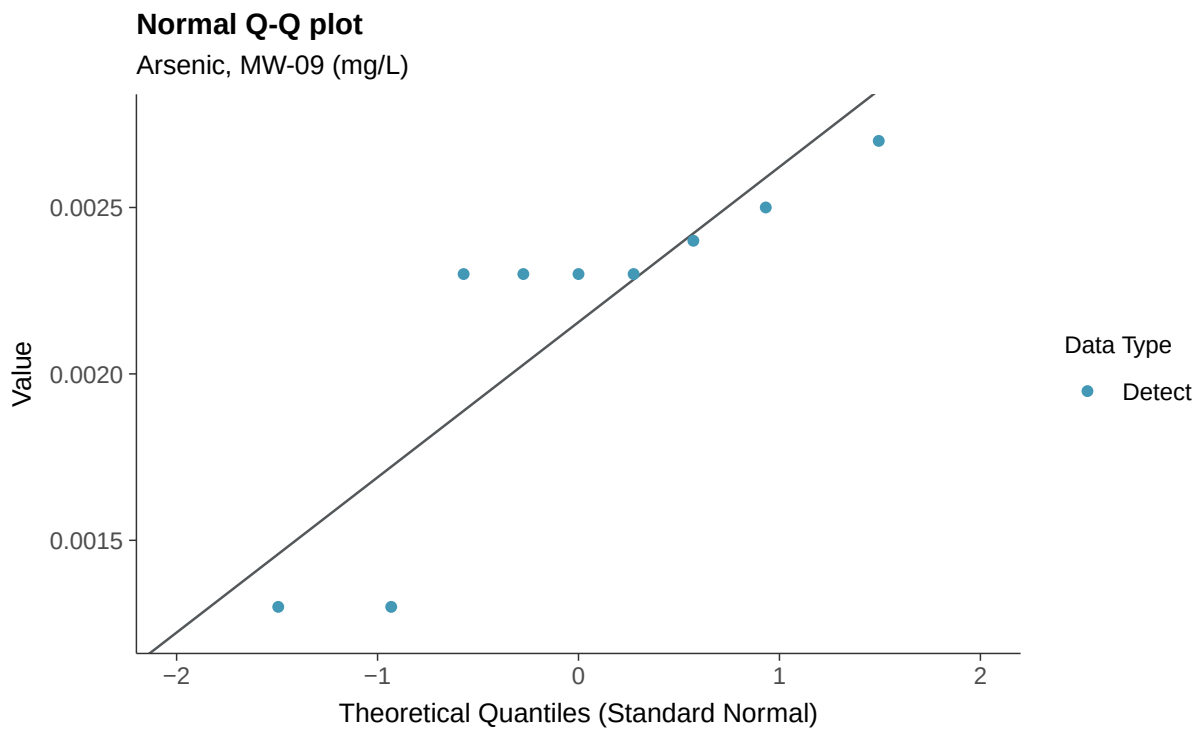
Arsenic, MW-09 (mg/L)

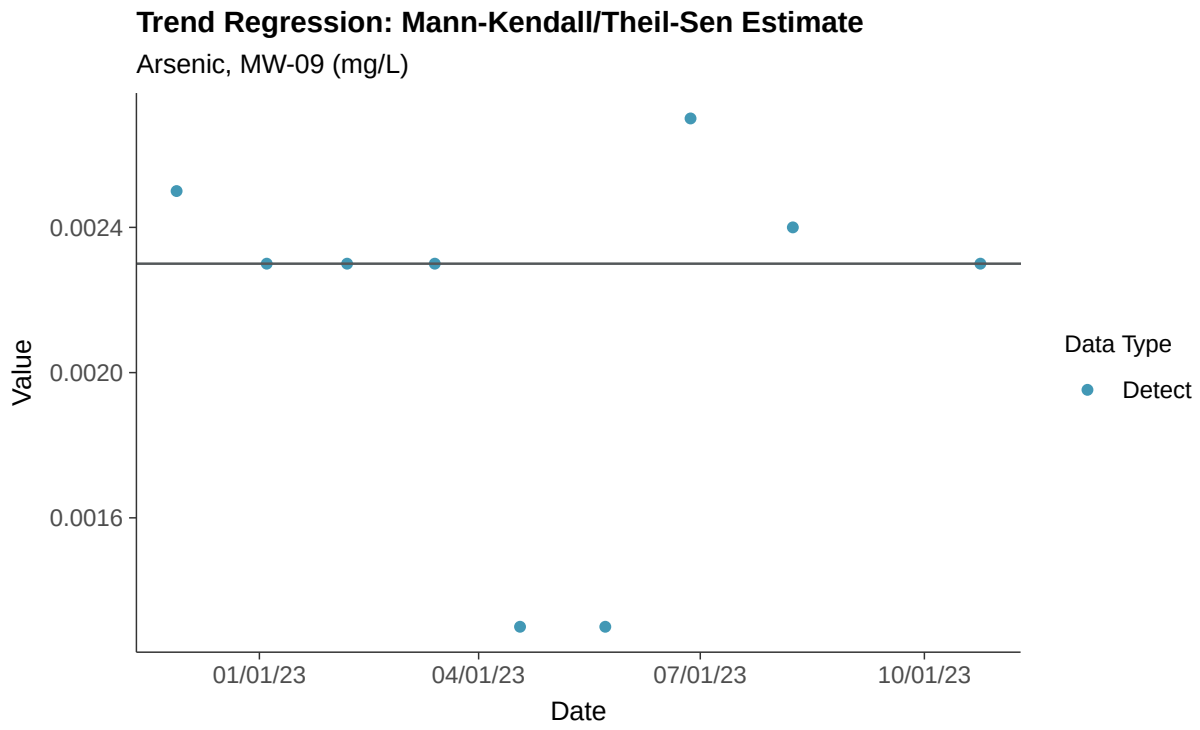


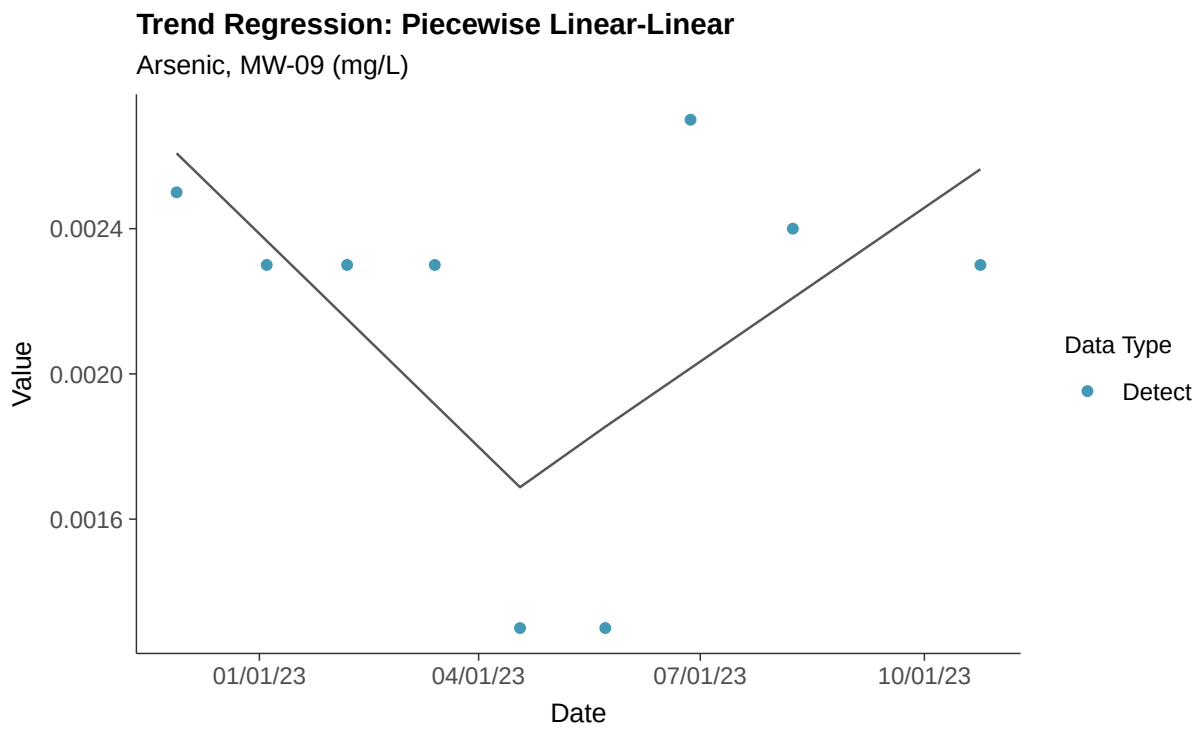
Boxplot by Season

Arsenic, MW-09 (mg/L)



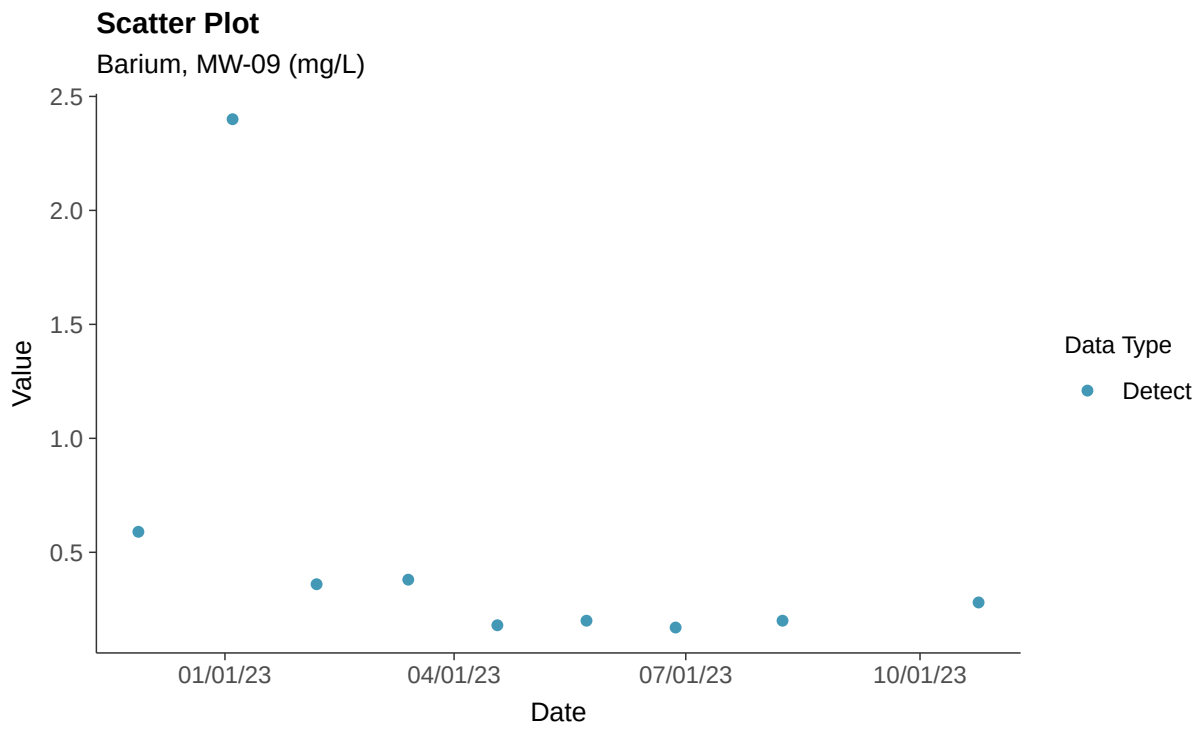

Normal Q-Q plot
Arsenic, MW-09 (mg/L)
Value
0.0025
0.0020
0.0015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

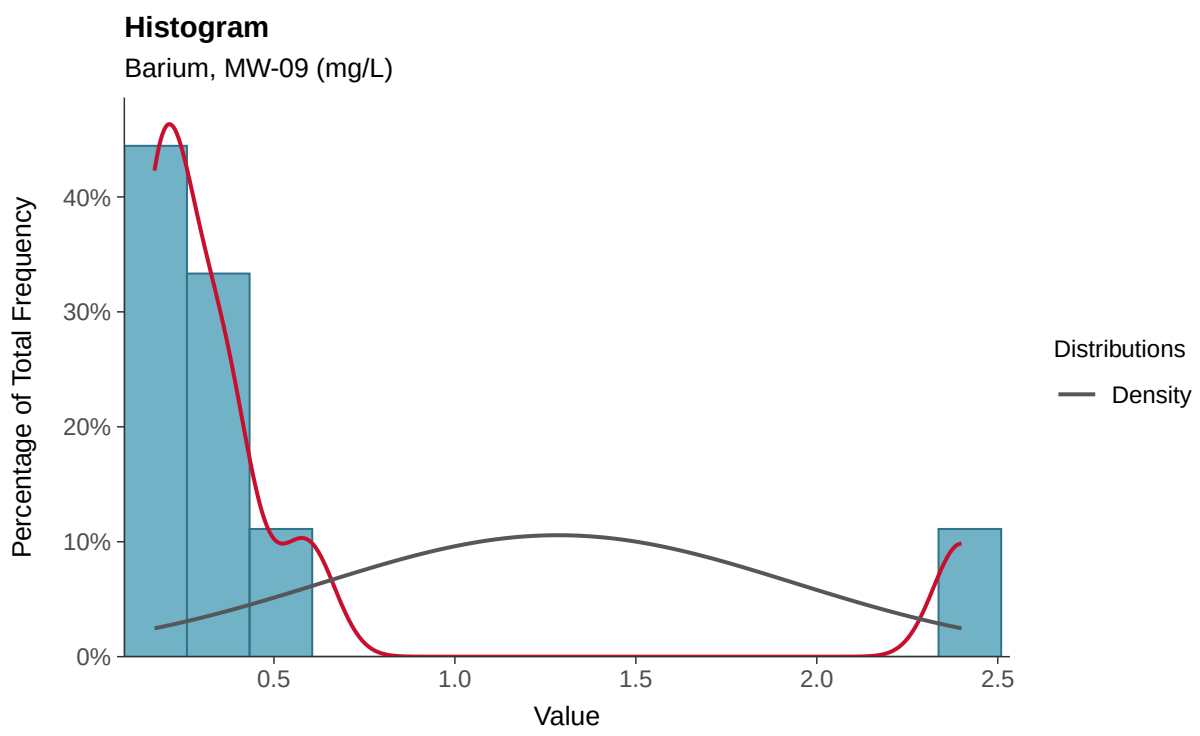

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Arsenic, MW-09 (mg/L)
Value
0.0024
0.0020
0.0016
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

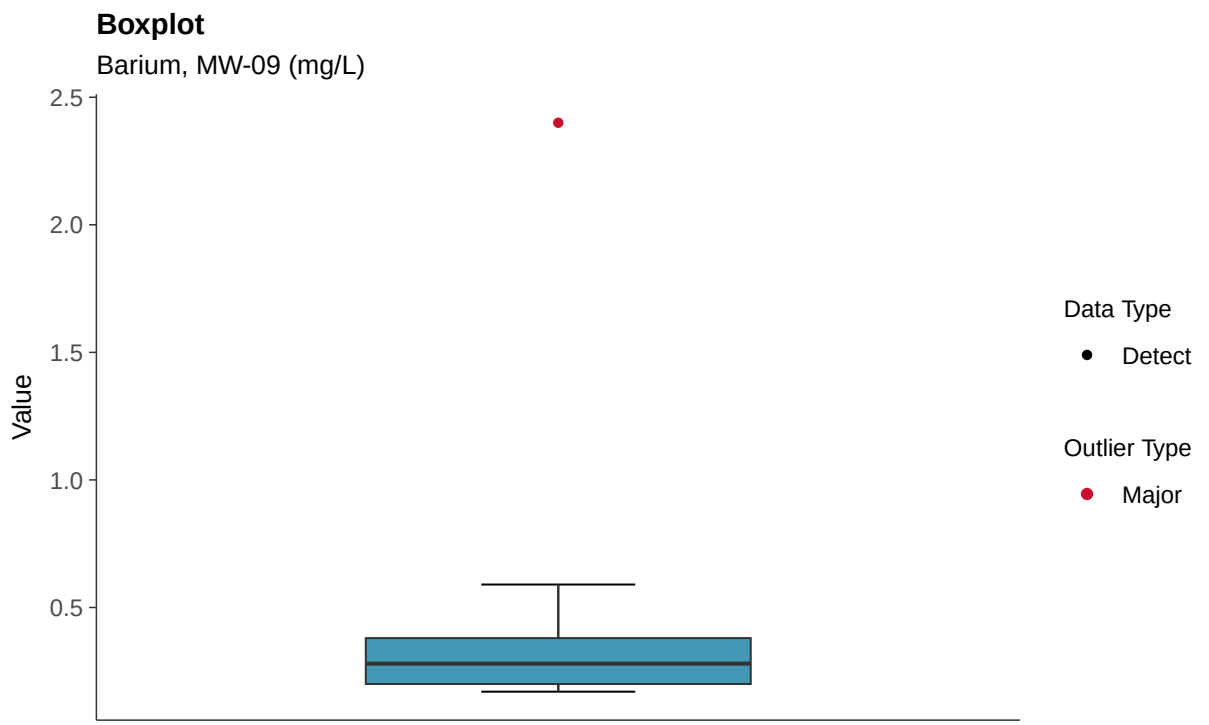

Trend Regression: Piecewise Linear-Linear
Arsenic, MW-09 (mg/L)
Value
0.0024
0.0020
0.0016
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

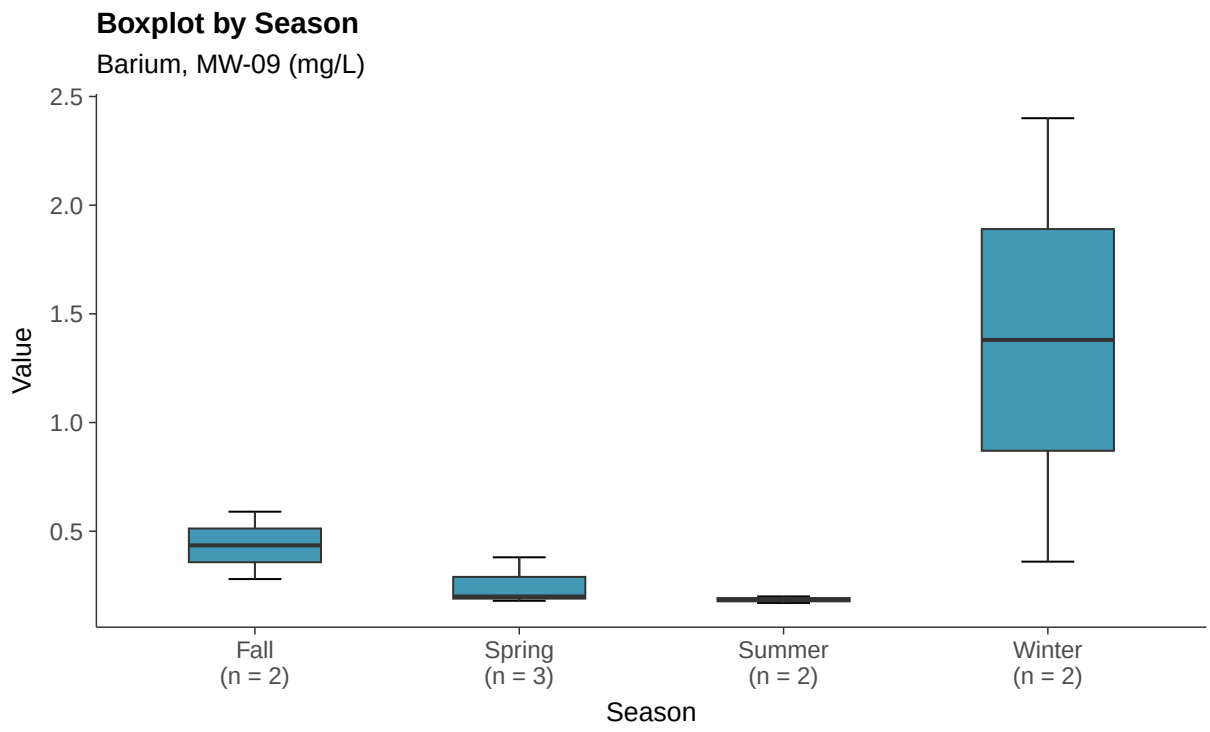
Appendix IV: Barium, MW-09

ID: 1_18_5_103



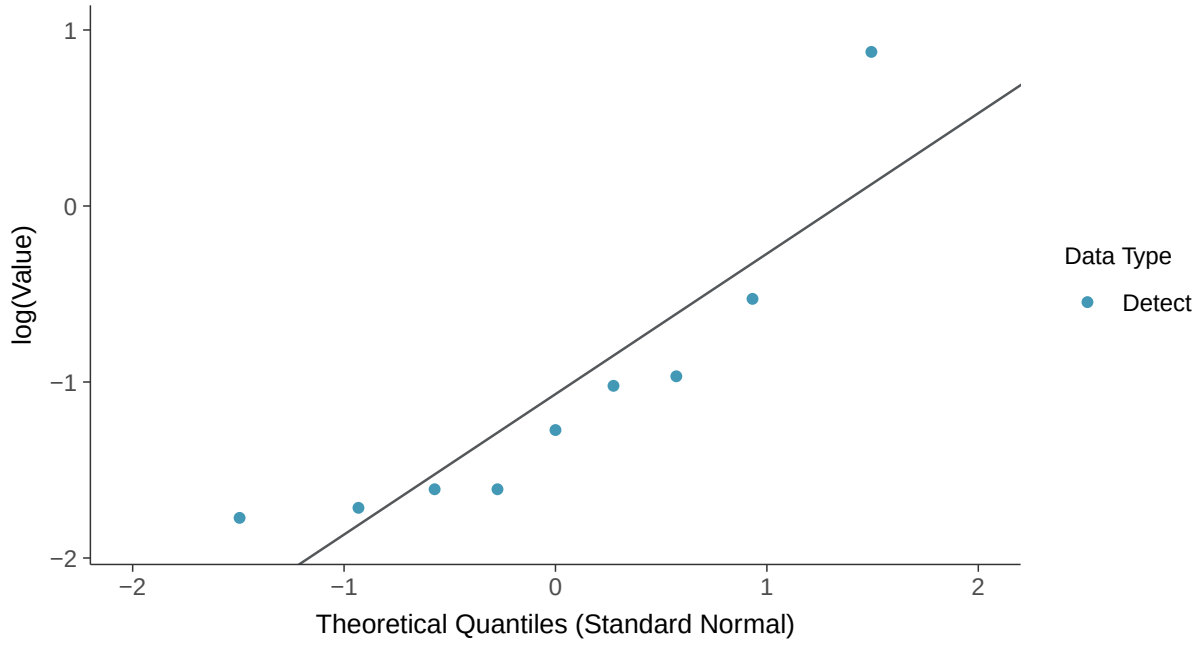



Boxplot
Barium, MW-09 (mg/L)
Value
2.5
2.0
1.5
1.0
0.5
Data Type
Detect
Outlier Type
Major


Boxplot by Season
Barium, MW-09 (mg/L)
Value
2.5
2.0
1.5
1.0
0.5
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

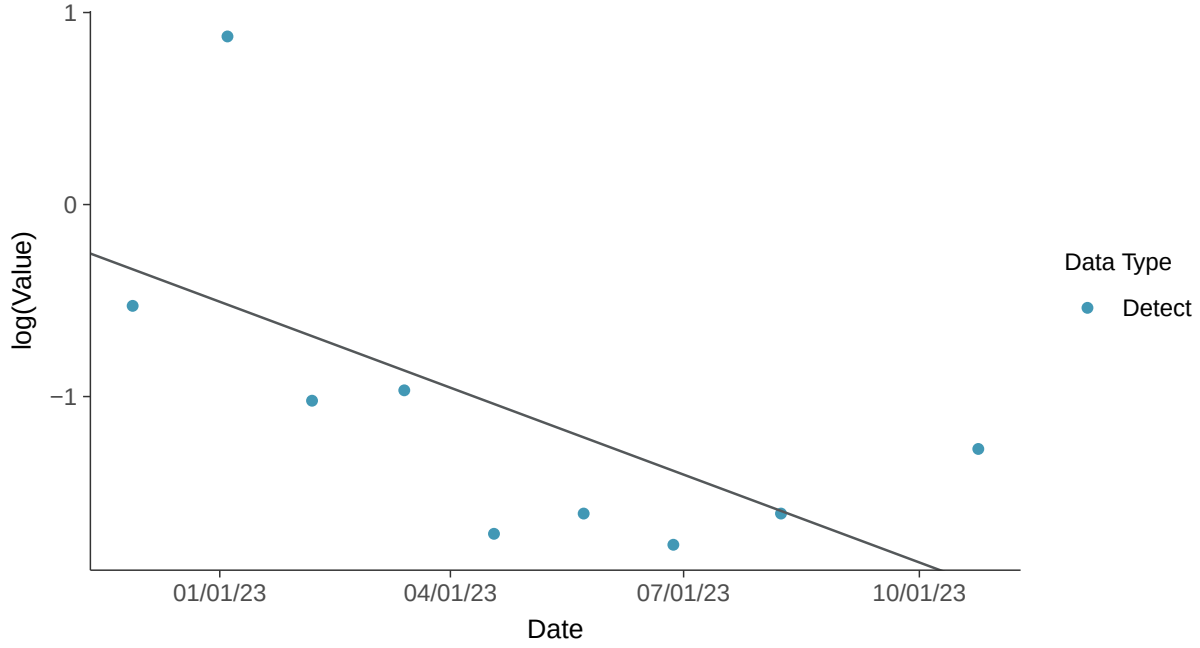
Lognormal Q-Q plot

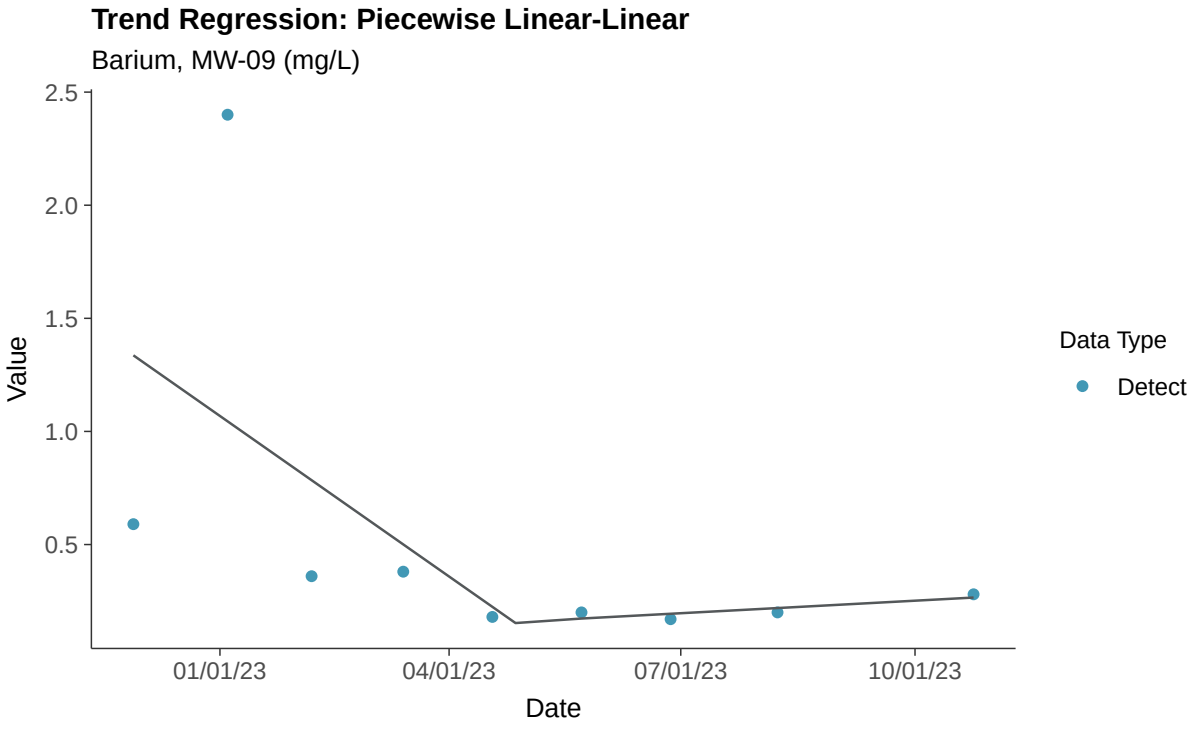
Barium, MW-09 (mg/L)

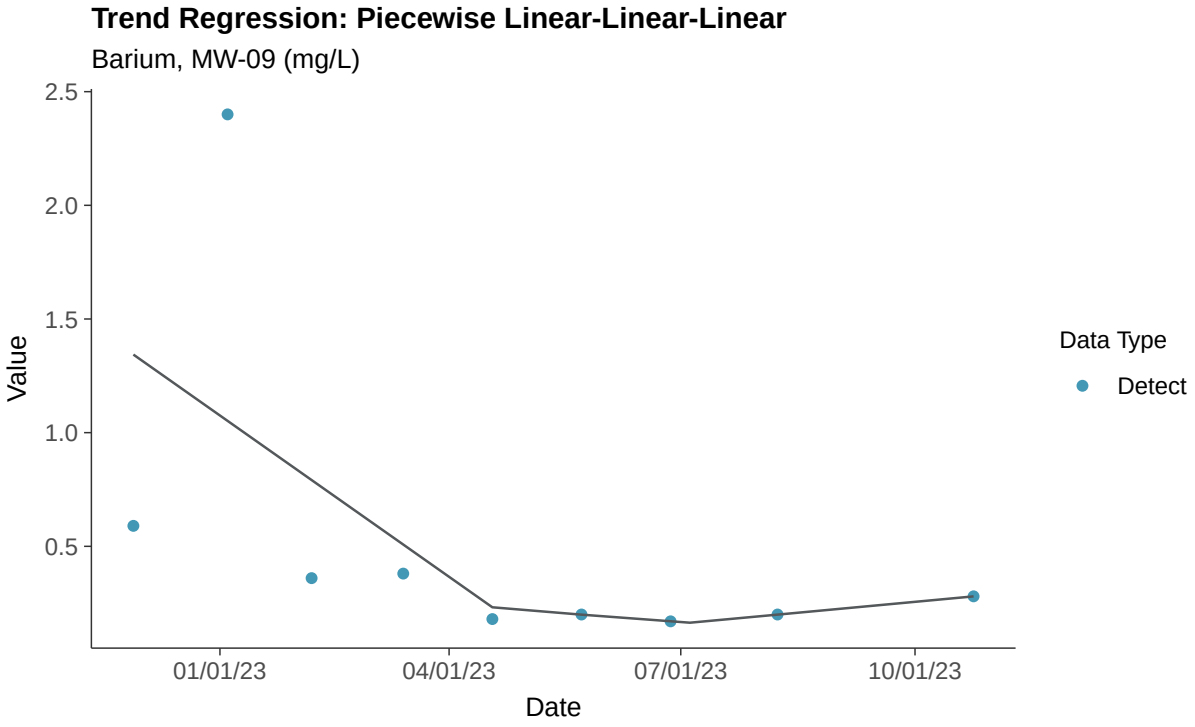


Trend Regression: Lognormal MLE

Barium, MW-09 (mg/L)

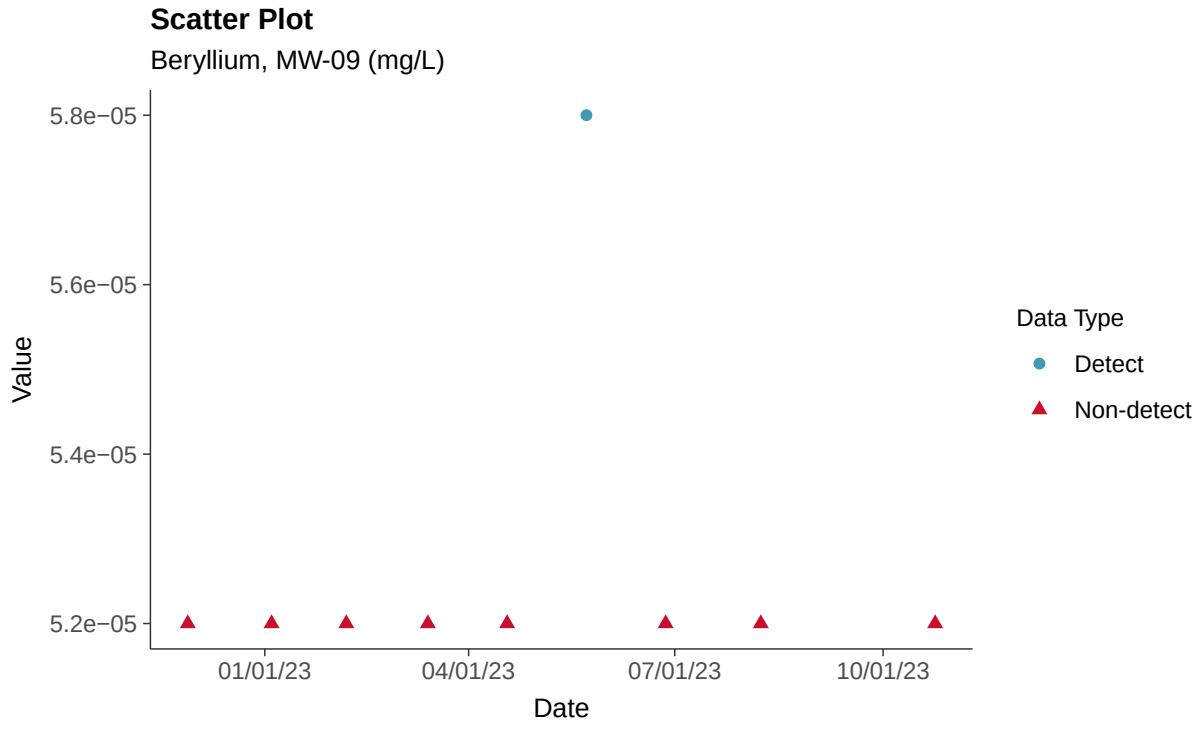


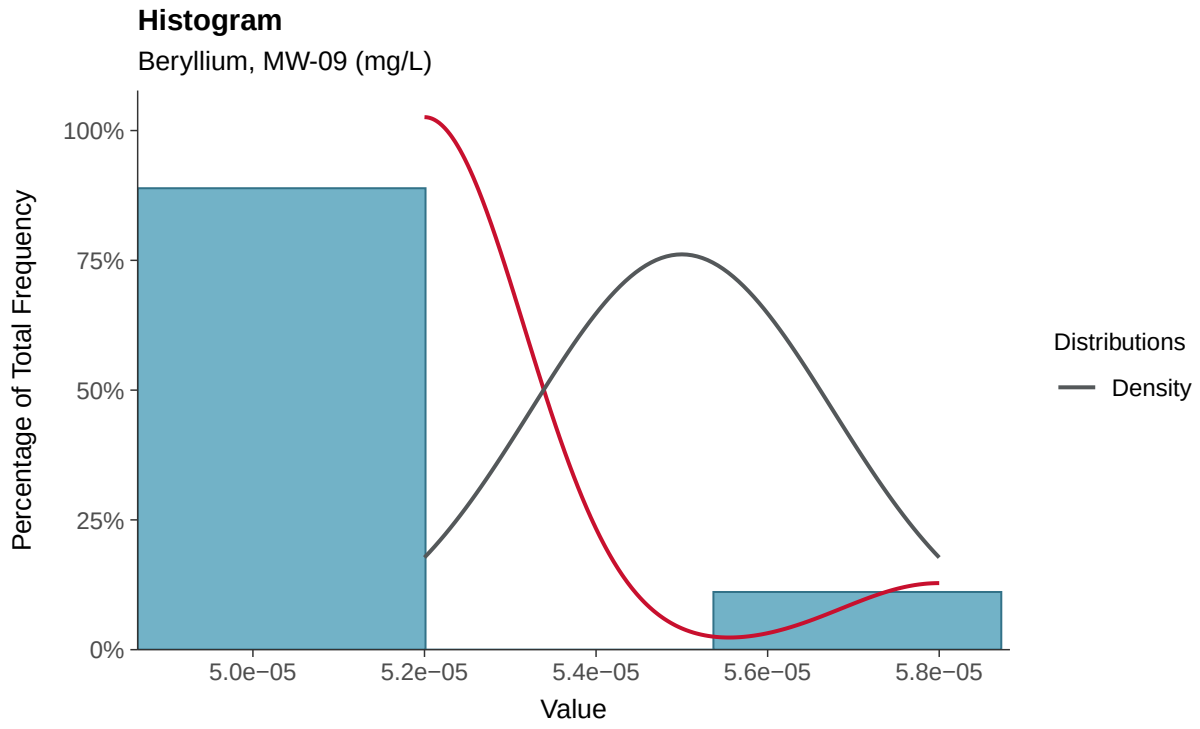

Trend Regression: Piecewise Linear-Linear
Barium, MW-09 (mg/L)
2.5
2.0
1.5
1.0
0.5
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

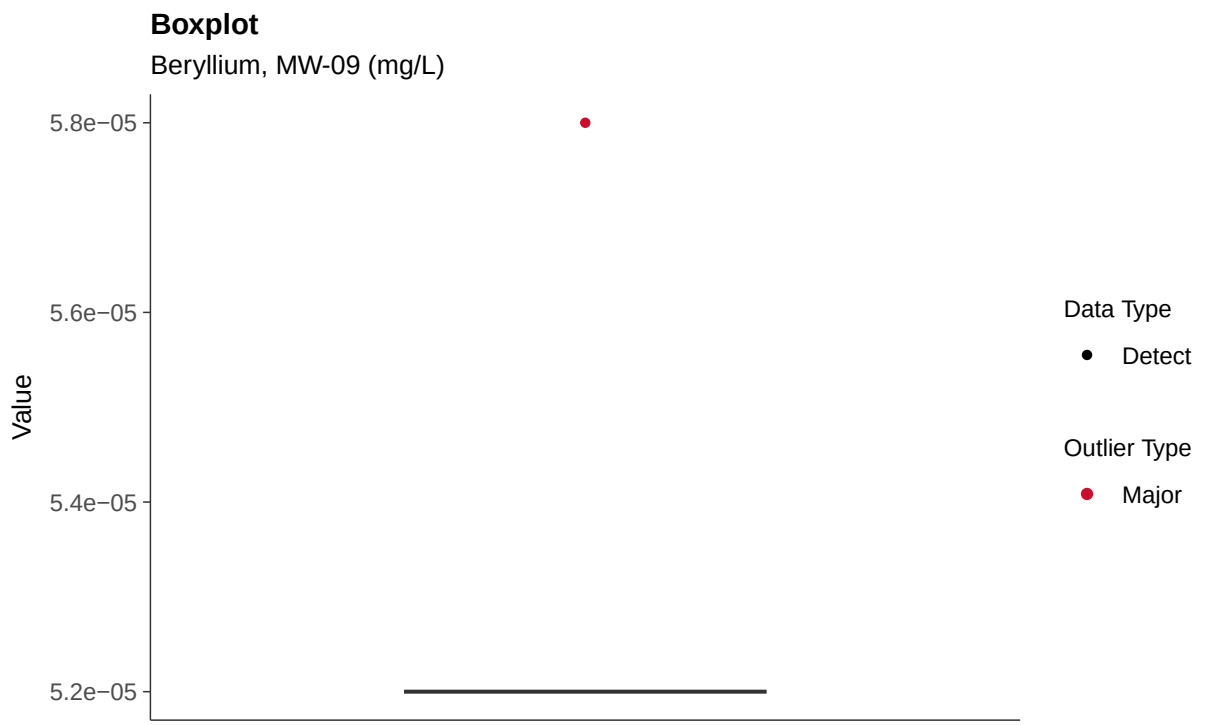

Trend Regression: Piecewise Linear-Linear-Linear
Barium, MW-09 (mg/L)
2.5
2.0
1.5
1.0
0.5
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

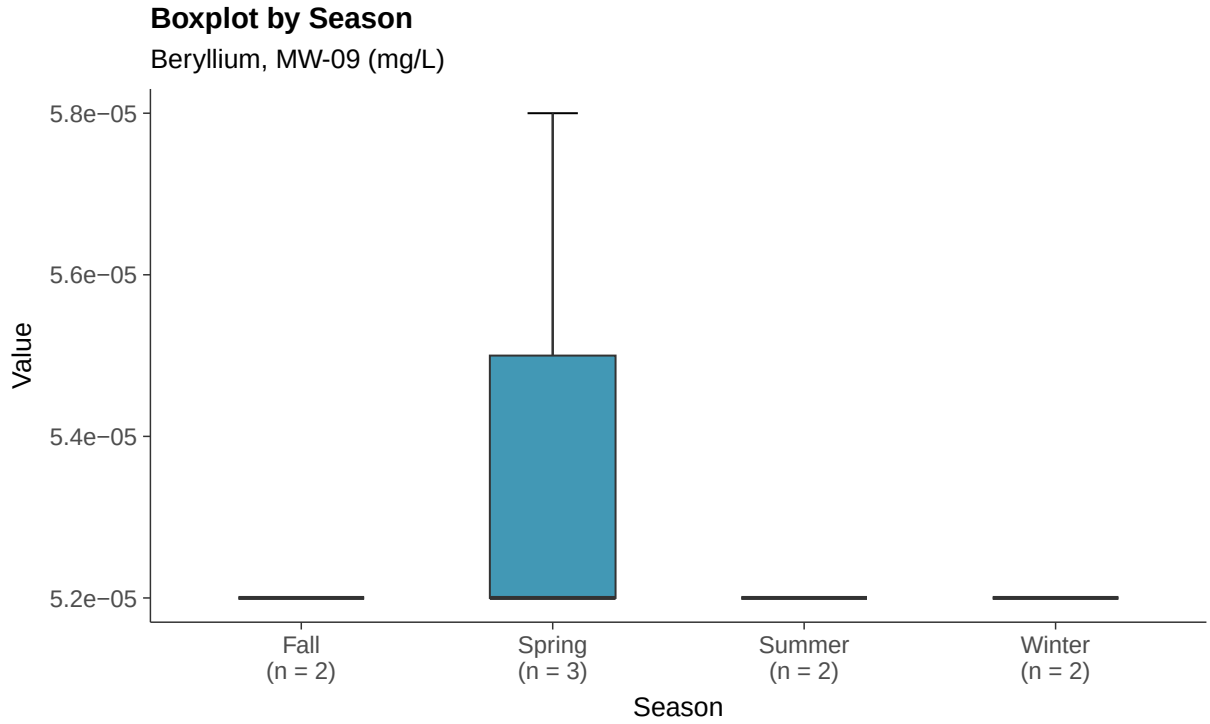
Appendix IV: Beryllium, MW-09

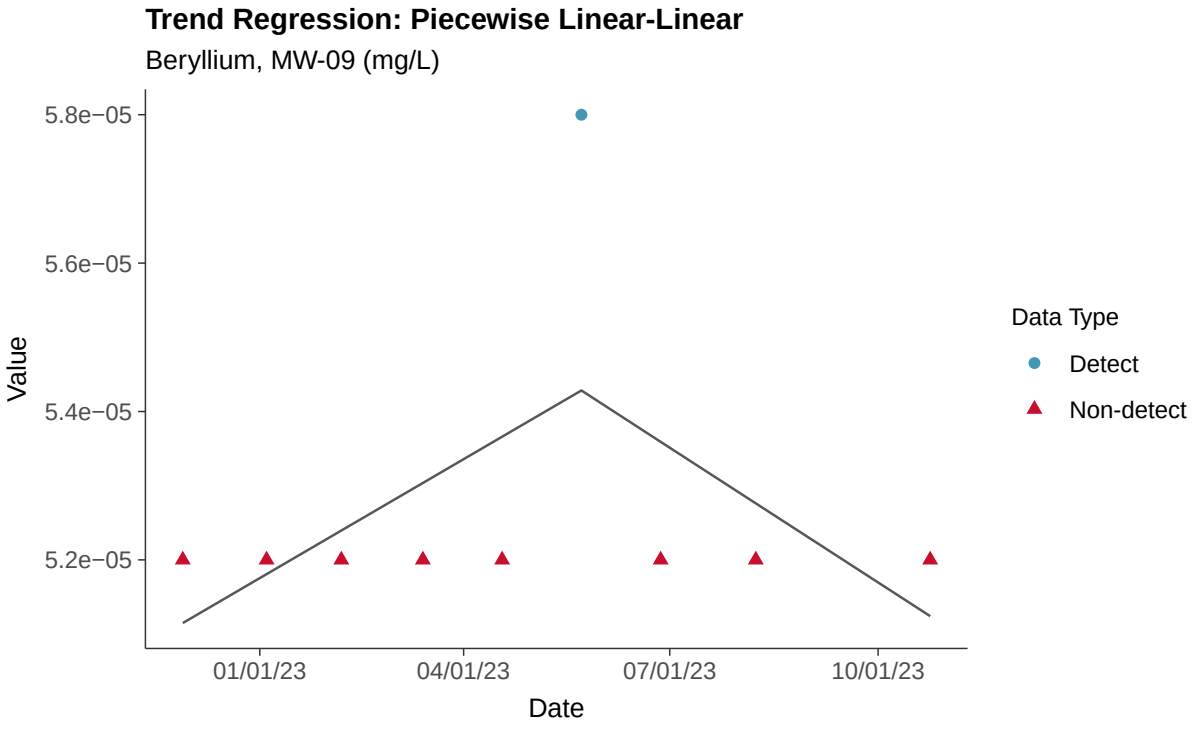
ID: 1_18_5_104

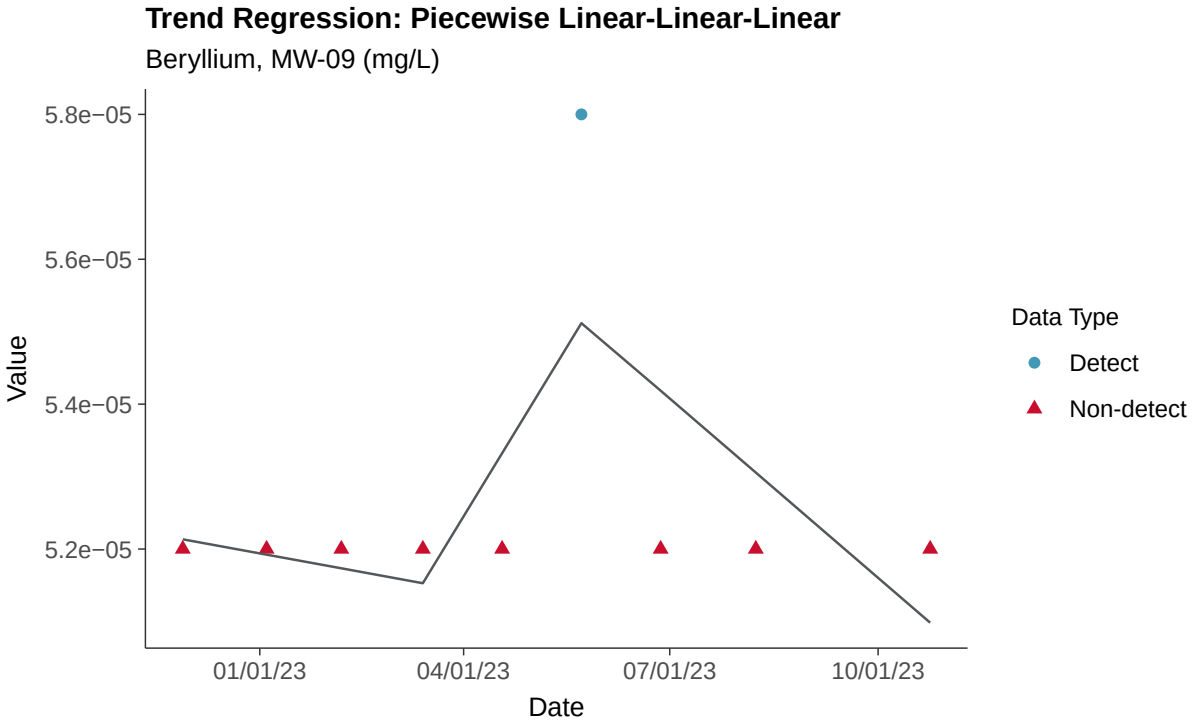





Boxplot
Beryllium, MW-09 (mg/L)
5.8e−05
5.6e−05
5.4e−05
5.2e−05
Value
Data Type
Detect
Outlier Type
Major

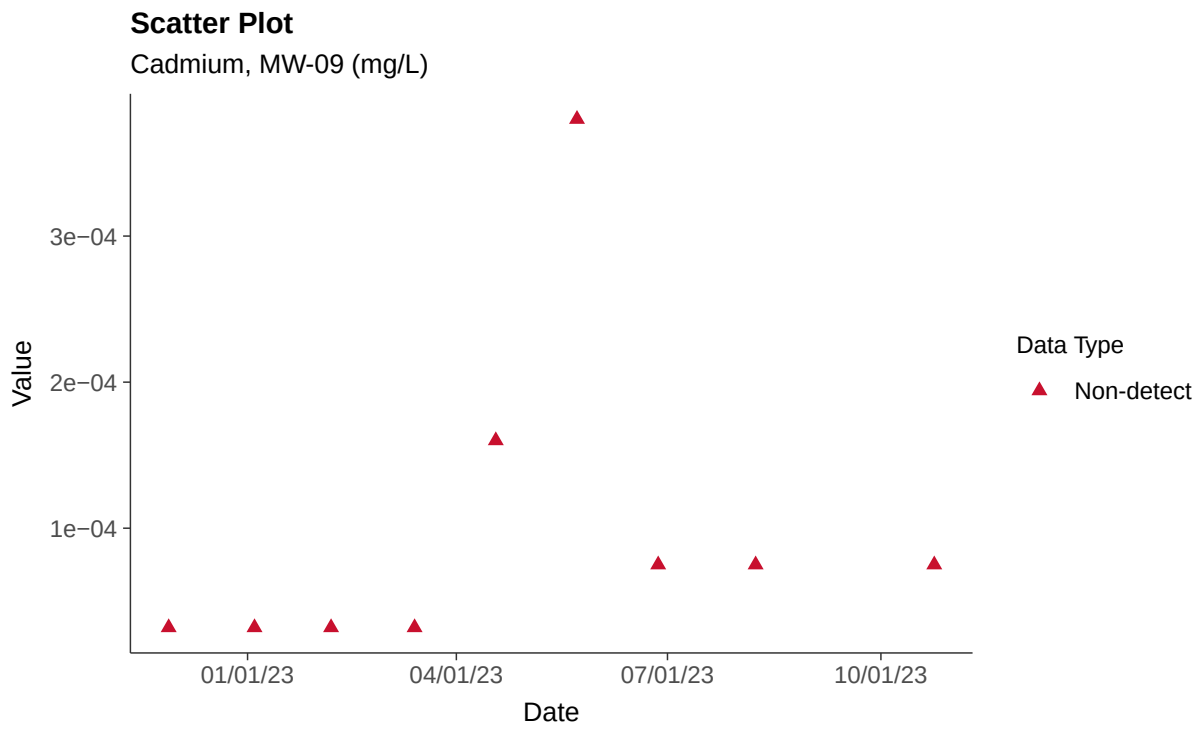

Boxplot by Season
Beryllium, MW-09 (mg/L)
5.8e−05
5.6e−05
5.4e−05
5.2e−05
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

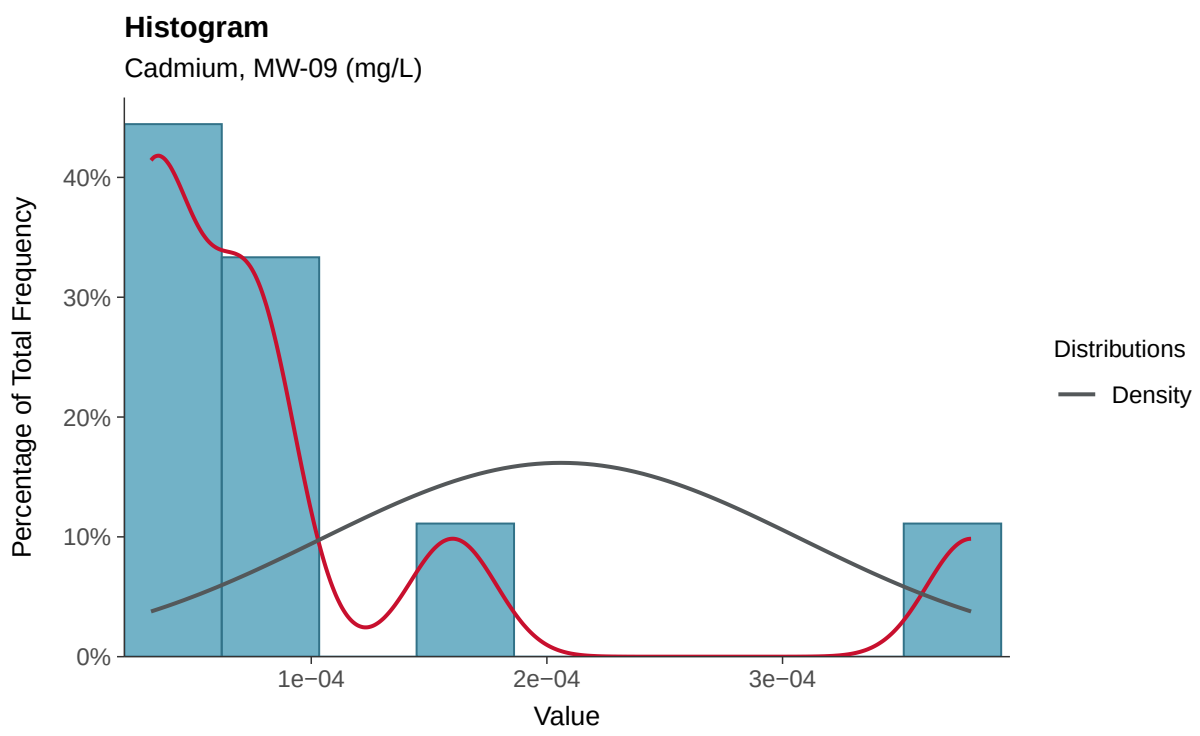

Trend Regression: Piecewise Linear-Linear
Beryllium, MW-09 (mg/L)
5.8e−05
5.6e−05
5.4e−05
5.2e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Beryllium, MW-09 (mg/L)
5.8e−05
5.6e−05
5.4e−05
5.2e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Cadmium, MW-09

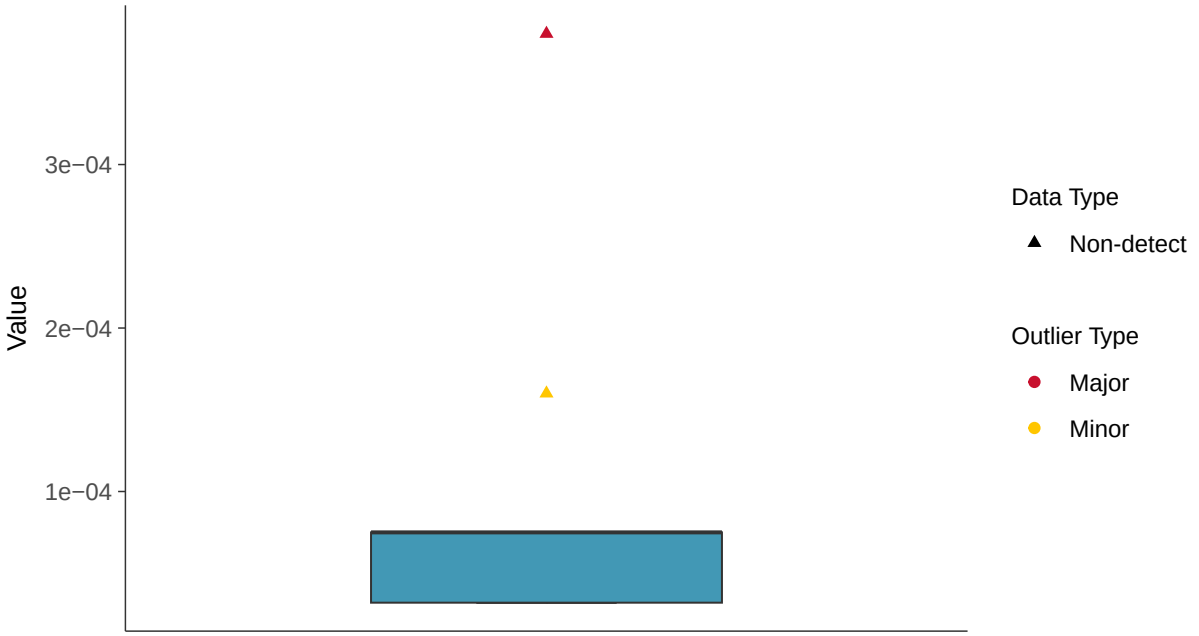
ID: 1_18_5_106





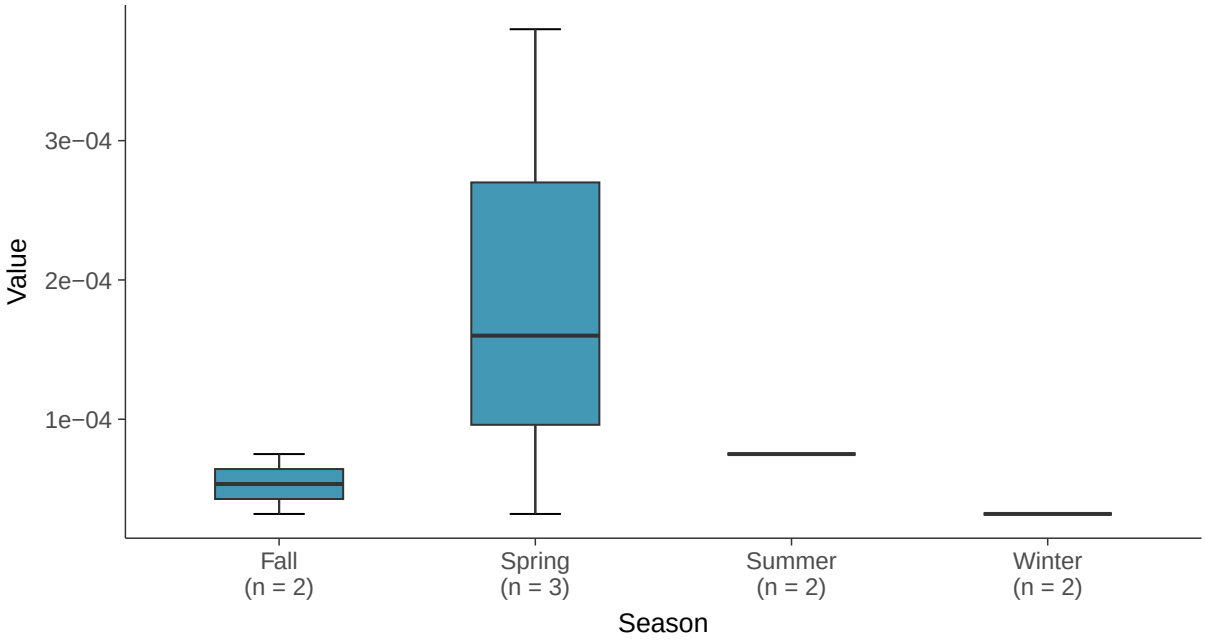
Boxplot

Cadmium, MW-09 (mg/L)



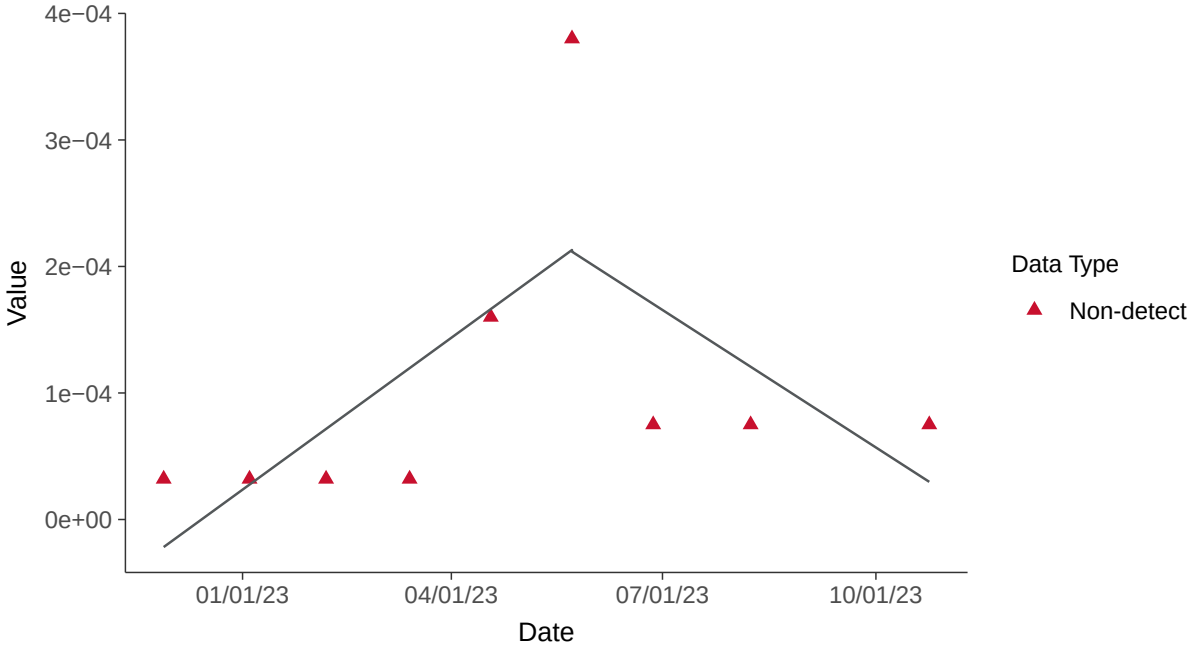
Boxplot by Season

Cadmium, MW-09 (mg/L)



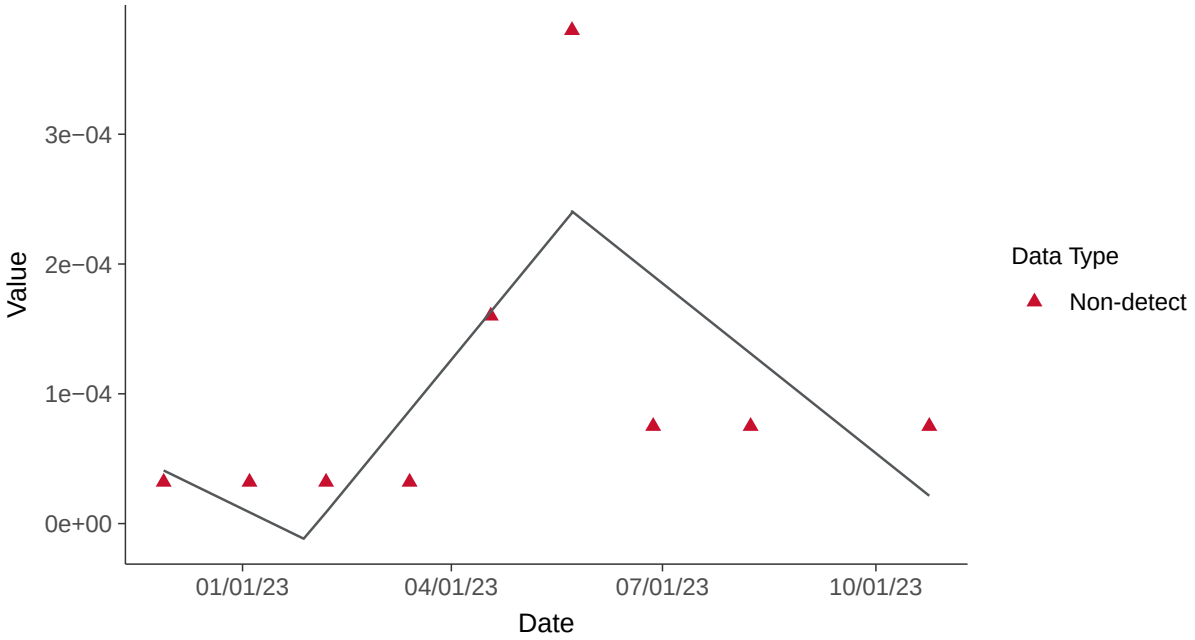
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-09 (mg/L)



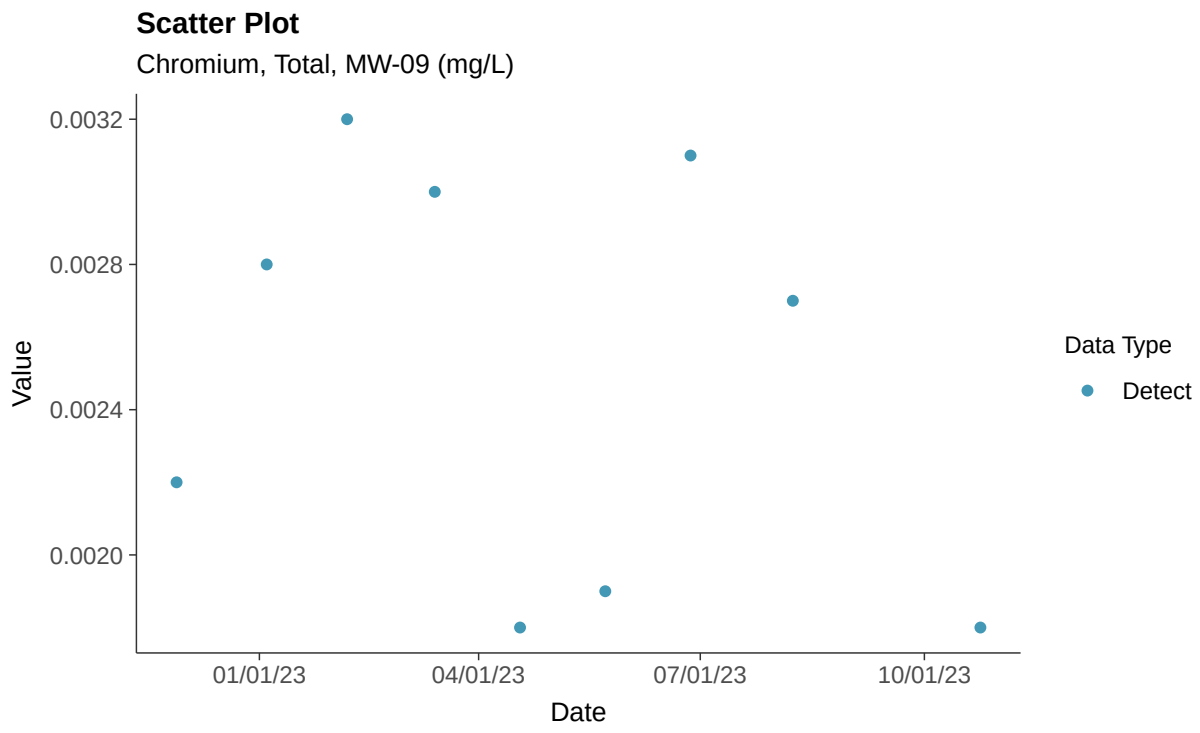
Trend Regression: Piecewise Linear-Linear-Linear

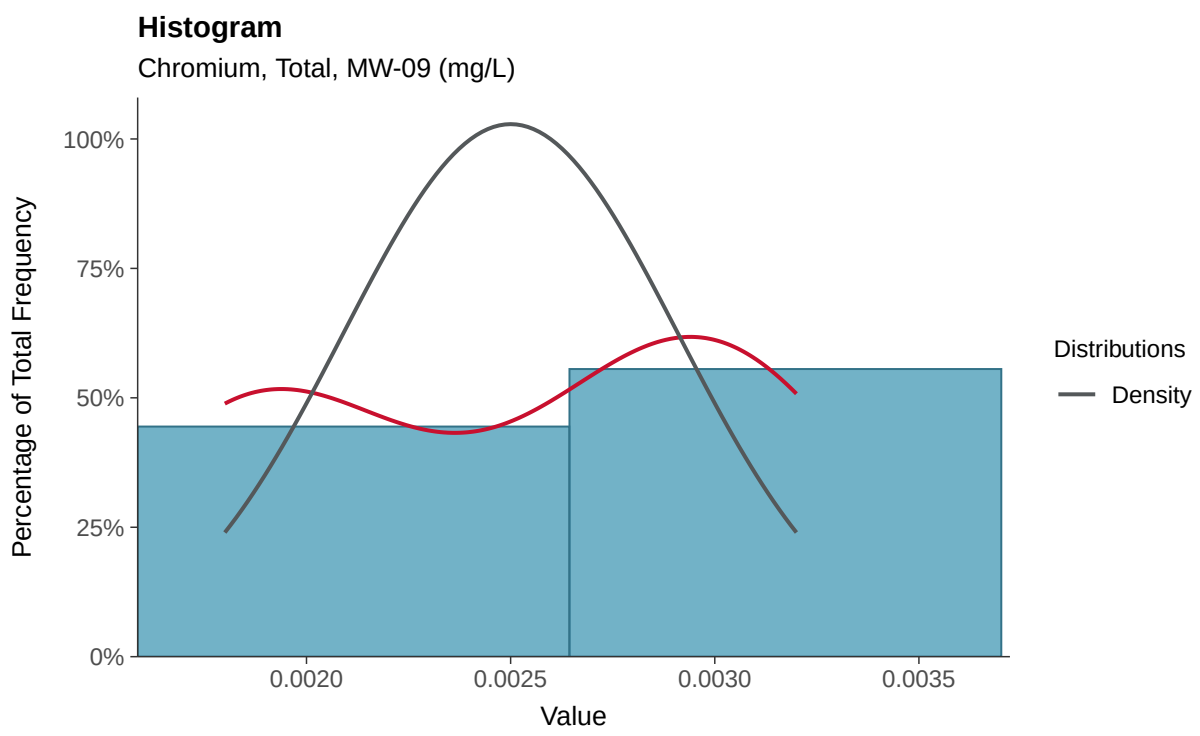
Cadmium, MW-09 (mg/L)



Appendix IV: Chromium, Total, MW-09

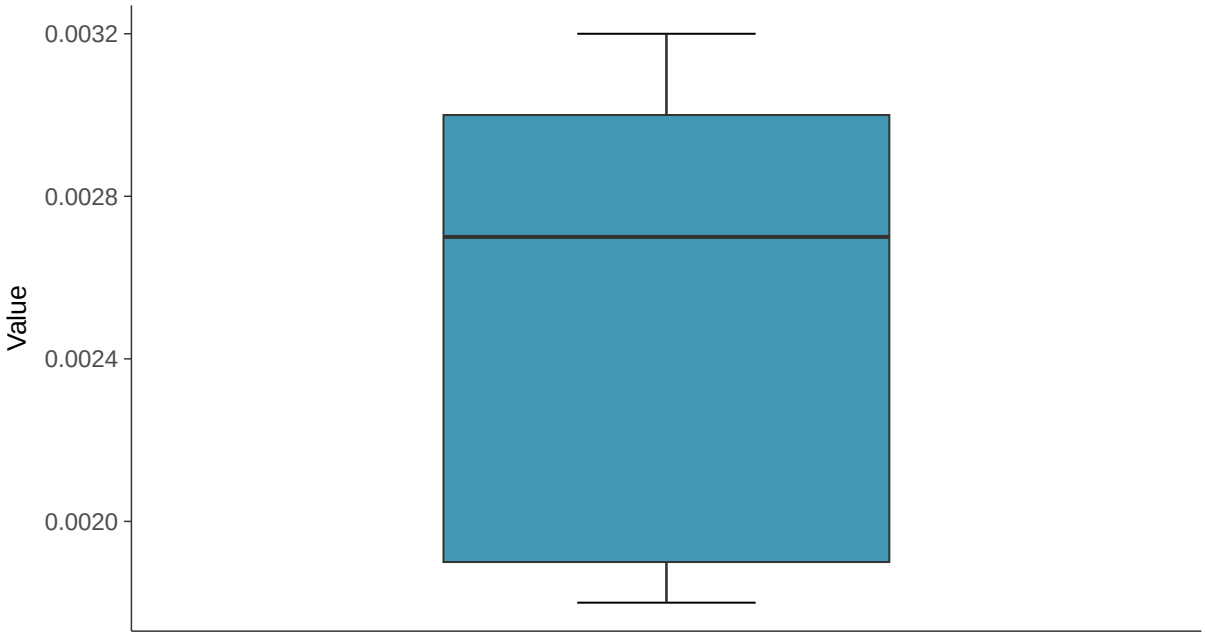
ID: 1_18_5_109





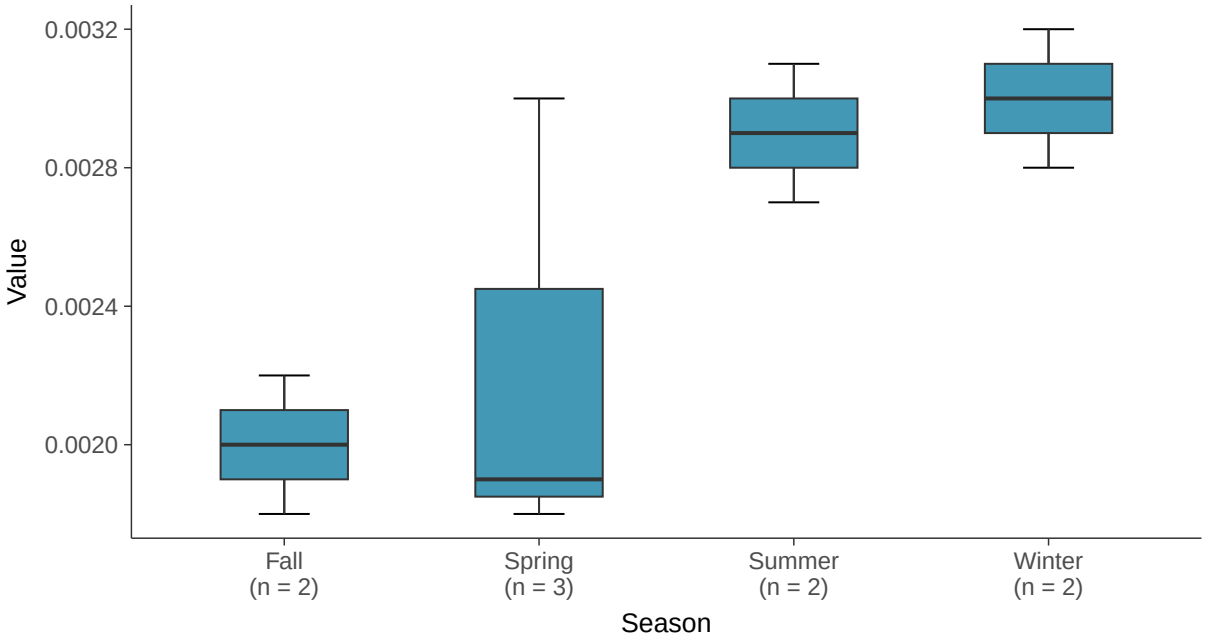
Boxplot

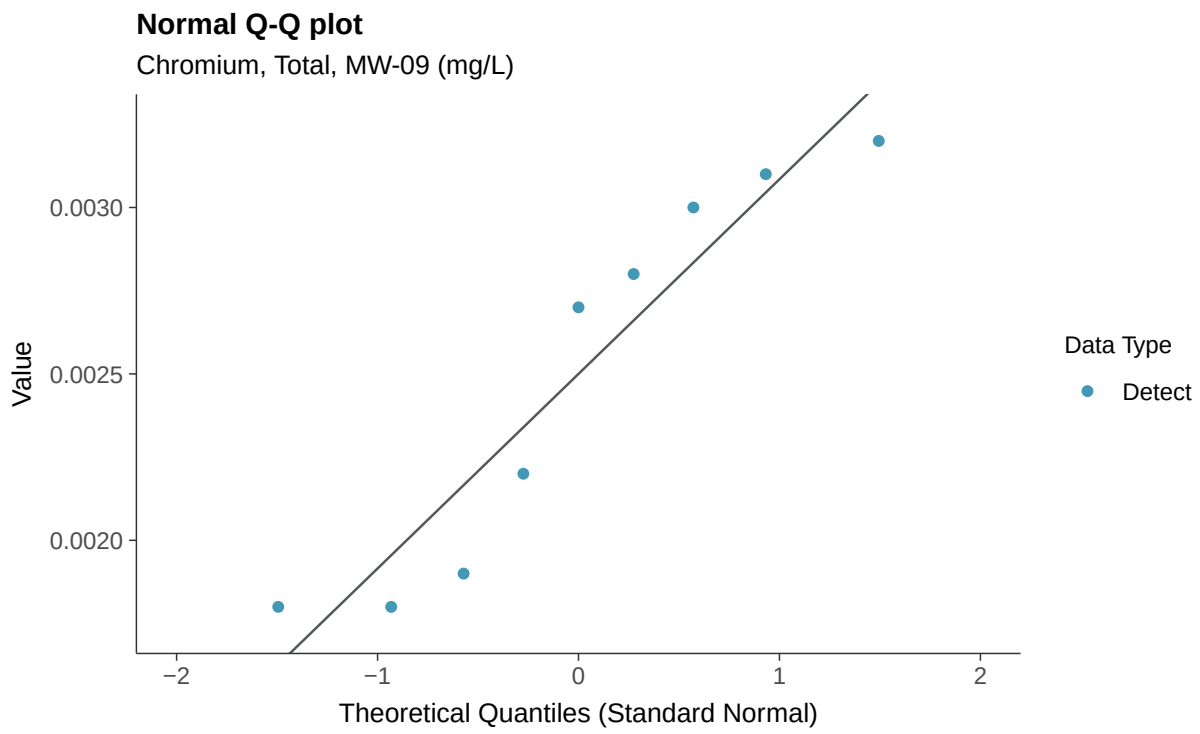
Chromium, Total, MW-09 (mg/L)

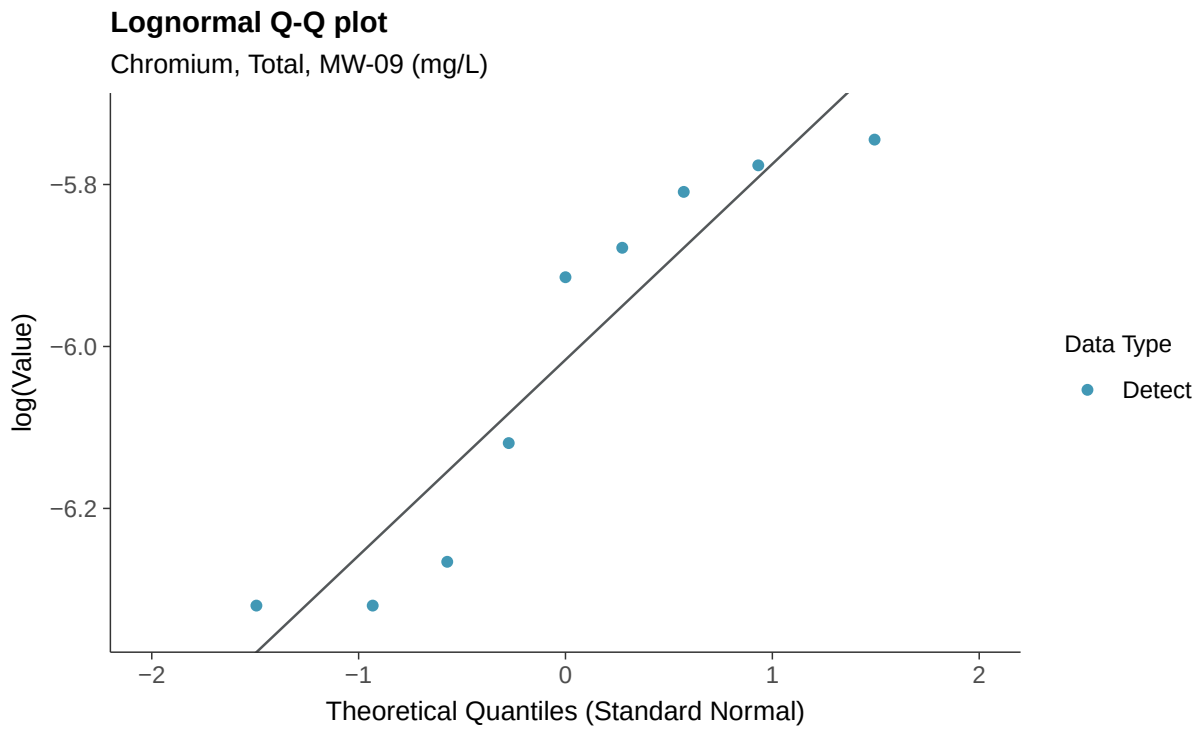


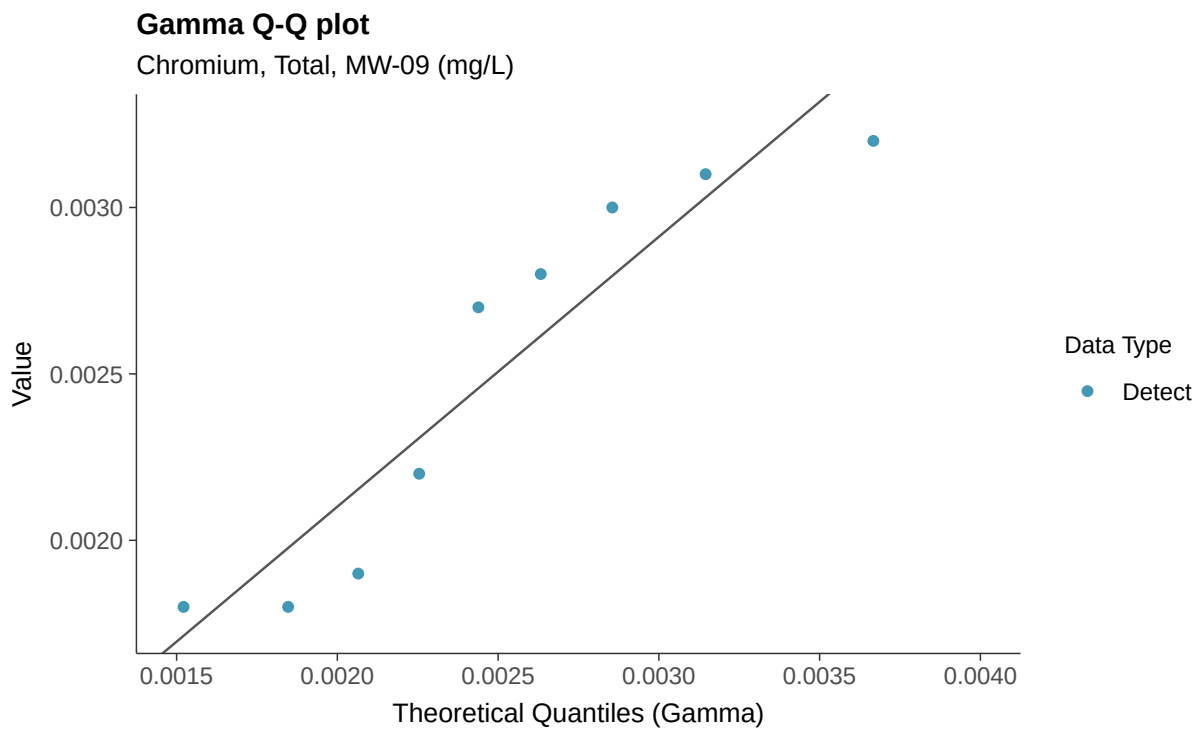
Boxplot by Season

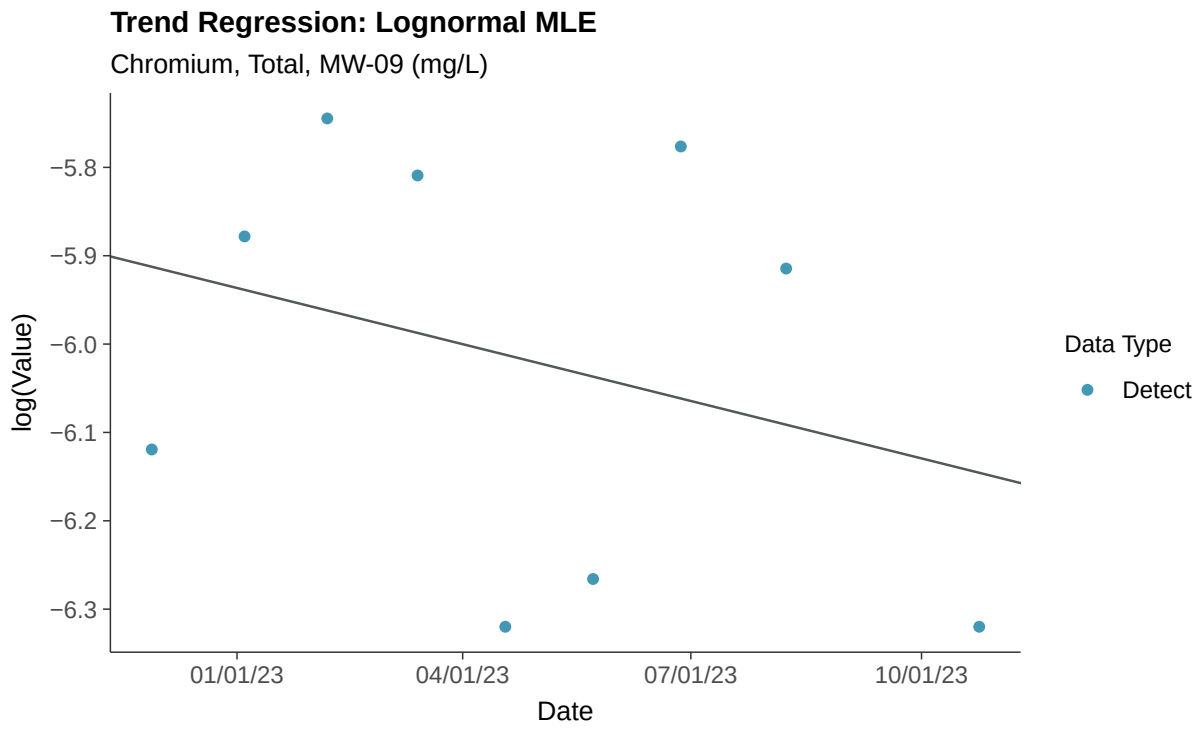
Chromium, Total, MW-09 (mg/L)

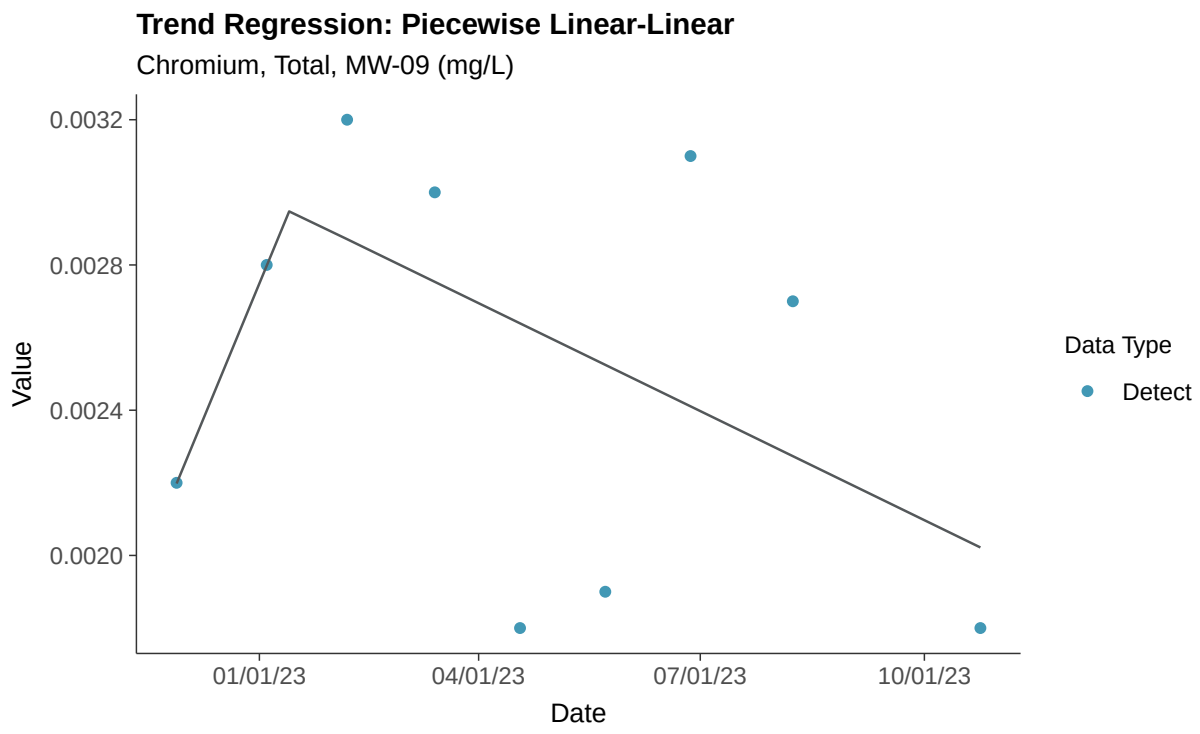



Normal Q-Q plot
Chromium, Total, MW-09 (mg/L)
Value
0.0030
0.0025
0.0020
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chromium, Total, MW-09 (mg/L)
log(Value)
−5.8
−6.0
−6.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

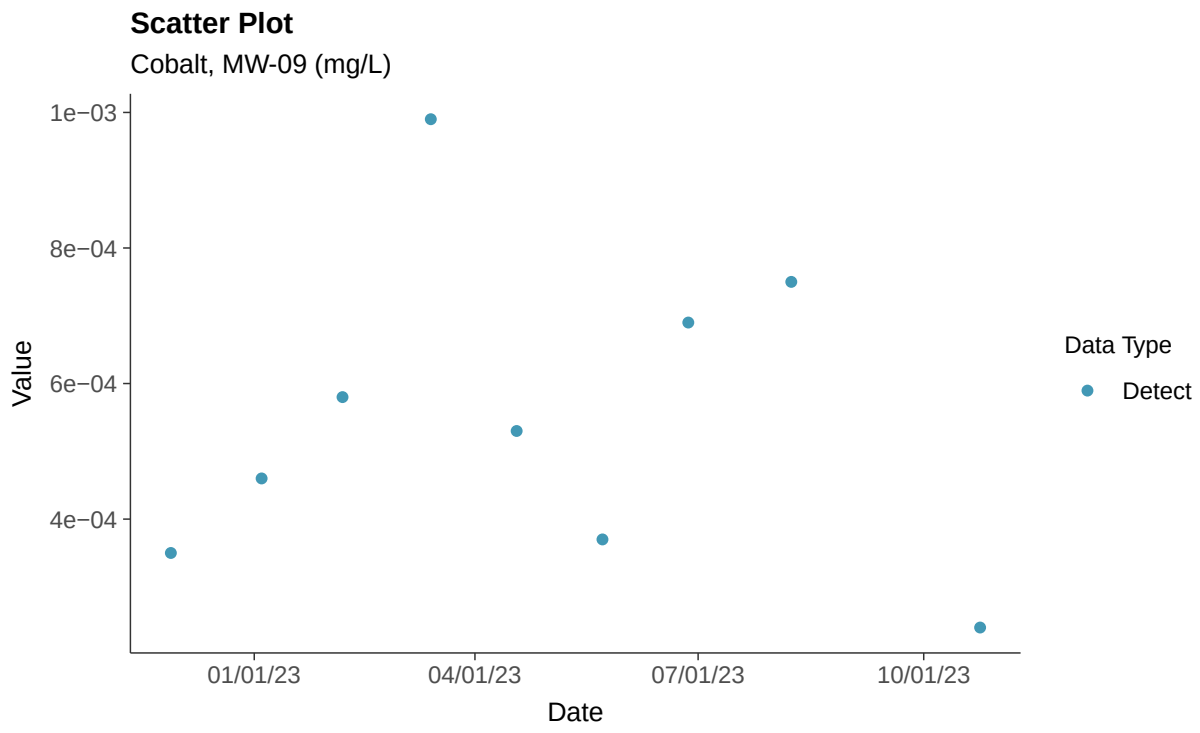

Gamma Q-Q plot
Chromium, Total, MW-09 (mg/L)
Value
0.0030
0.0025
0.0020
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
Theoretical Quantiles (Gamma)
Data Type
Detect

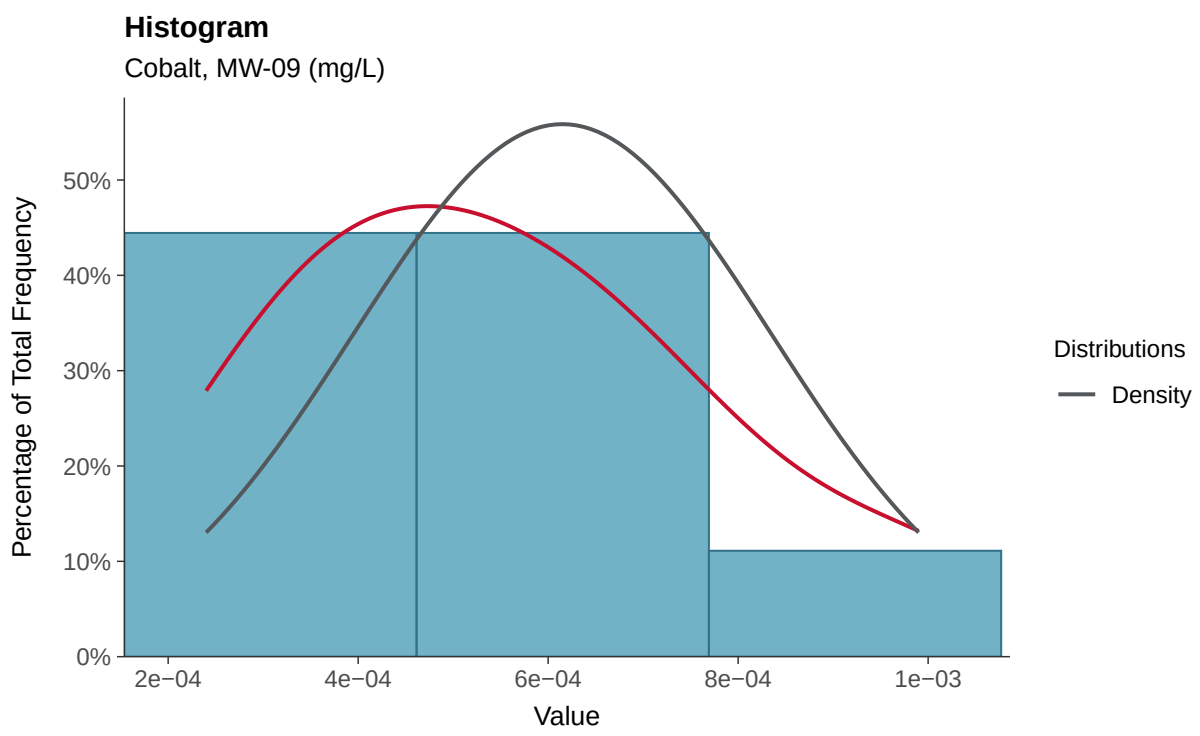

Trend Regression: Lognormal MLE
Chromium, Total, MW-09 (mg/L)
log(Value)
−5.8
−5.9
−6.0
−6.1
−6.2
−6.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chromium, Total, MW-09 (mg/L)
0.0032
0.0028
0.0024
0.0020
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Cobalt, MW-09

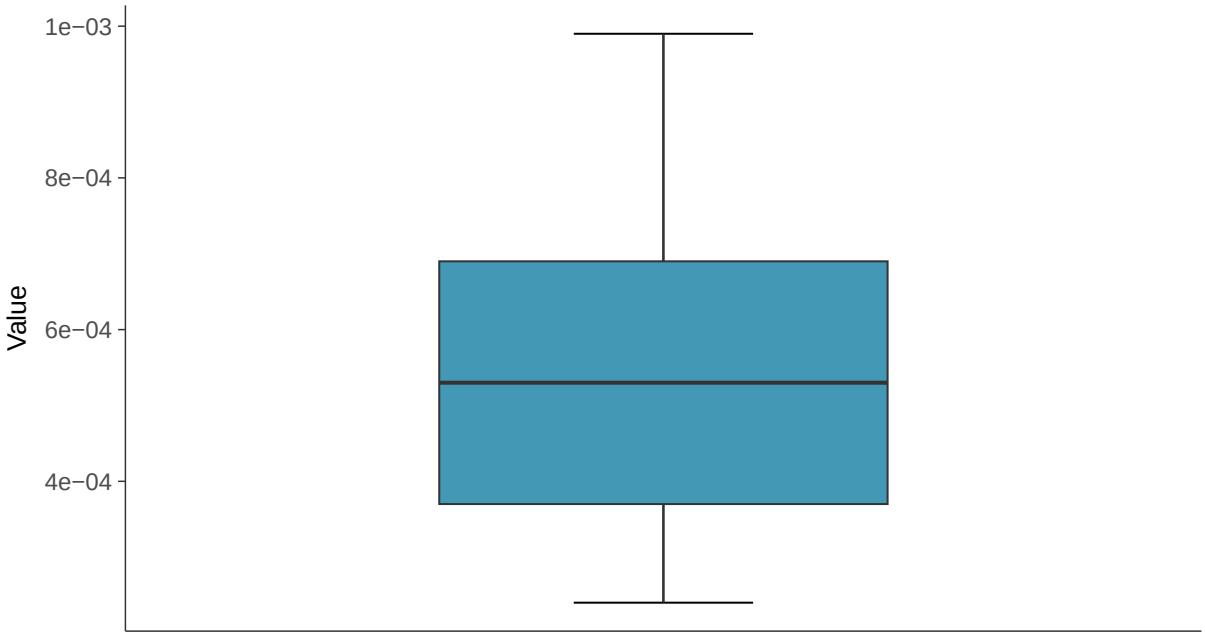
ID: 1_18_5_110





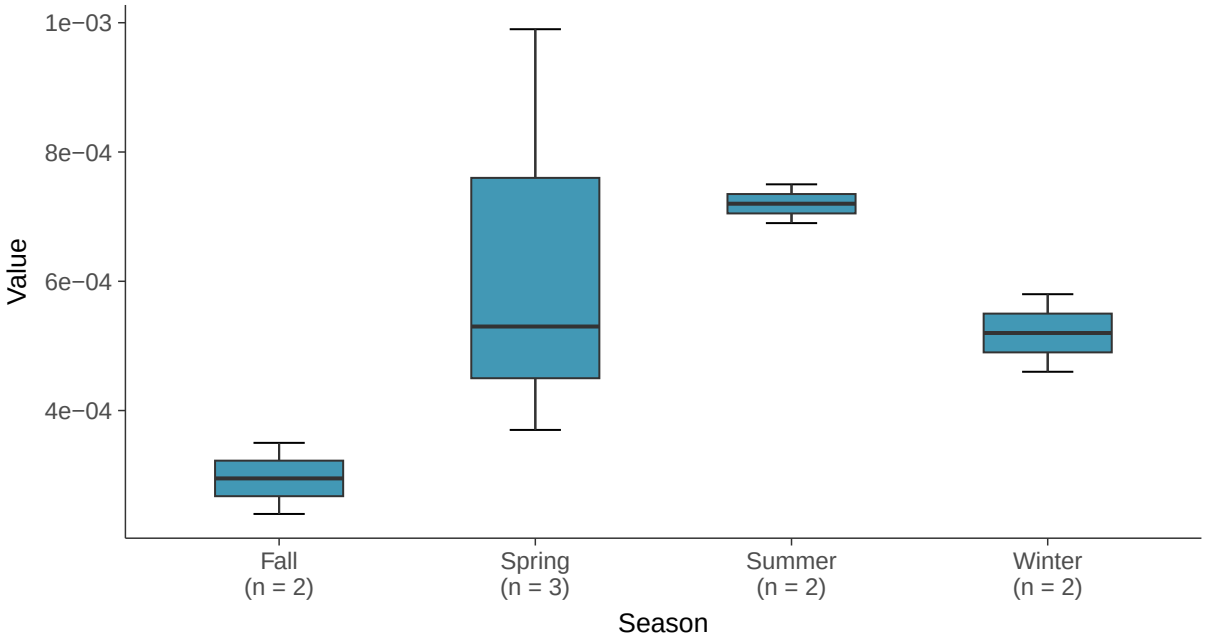
Boxplot

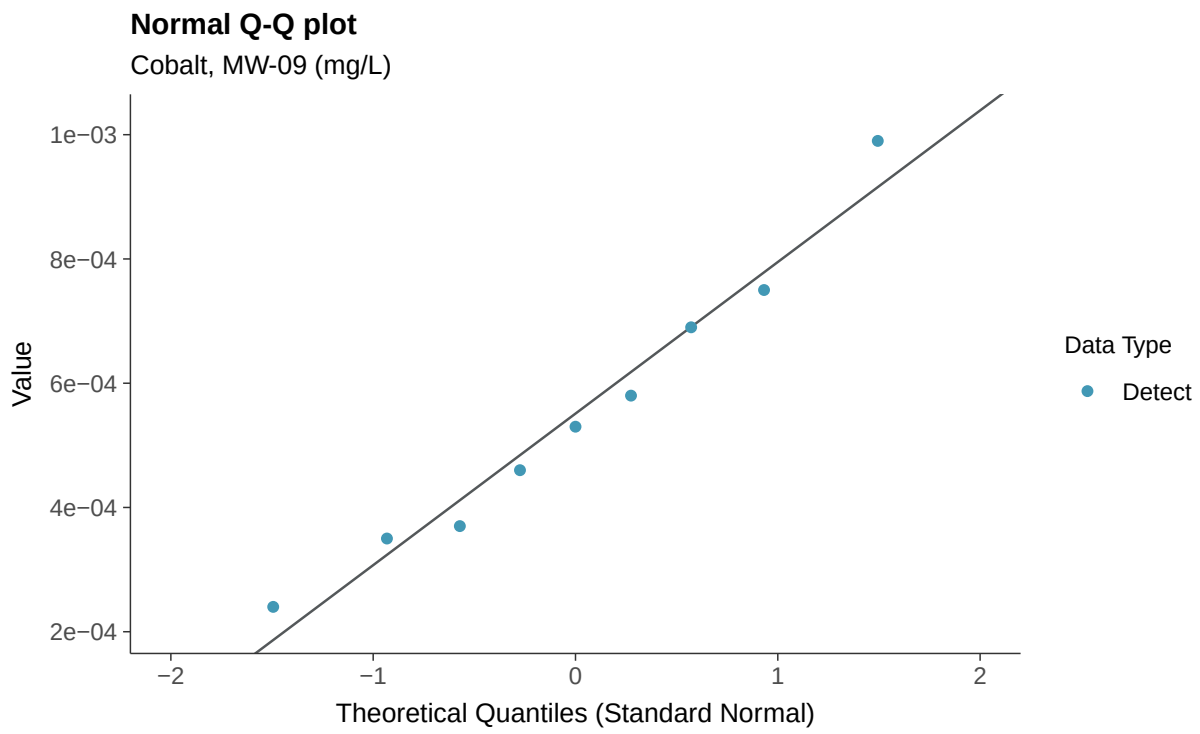
Cobalt, MW-09 (mg/L)

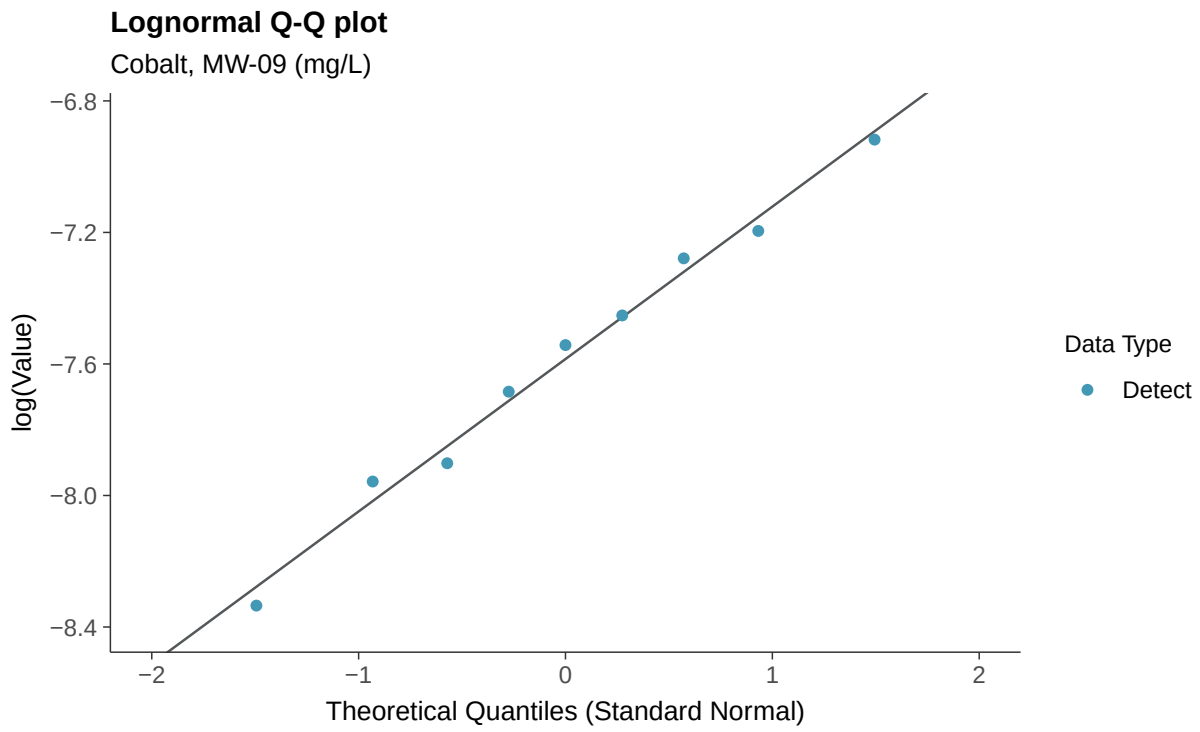


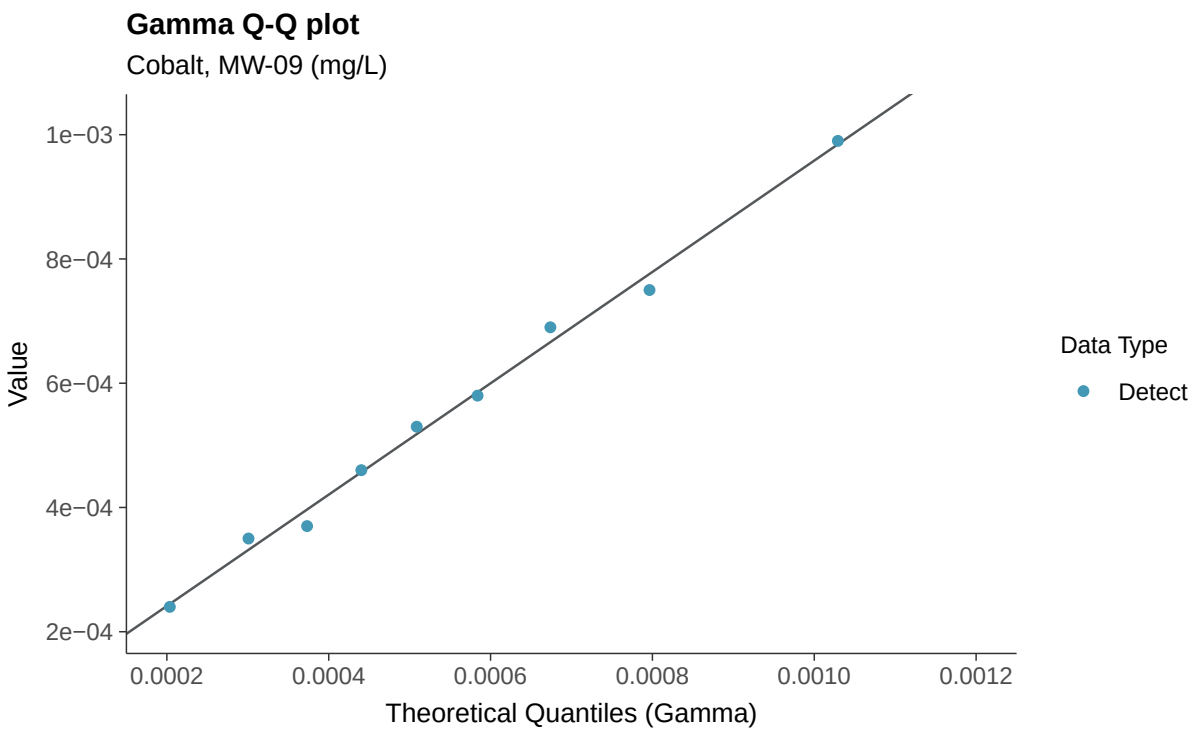
Boxplot by Season

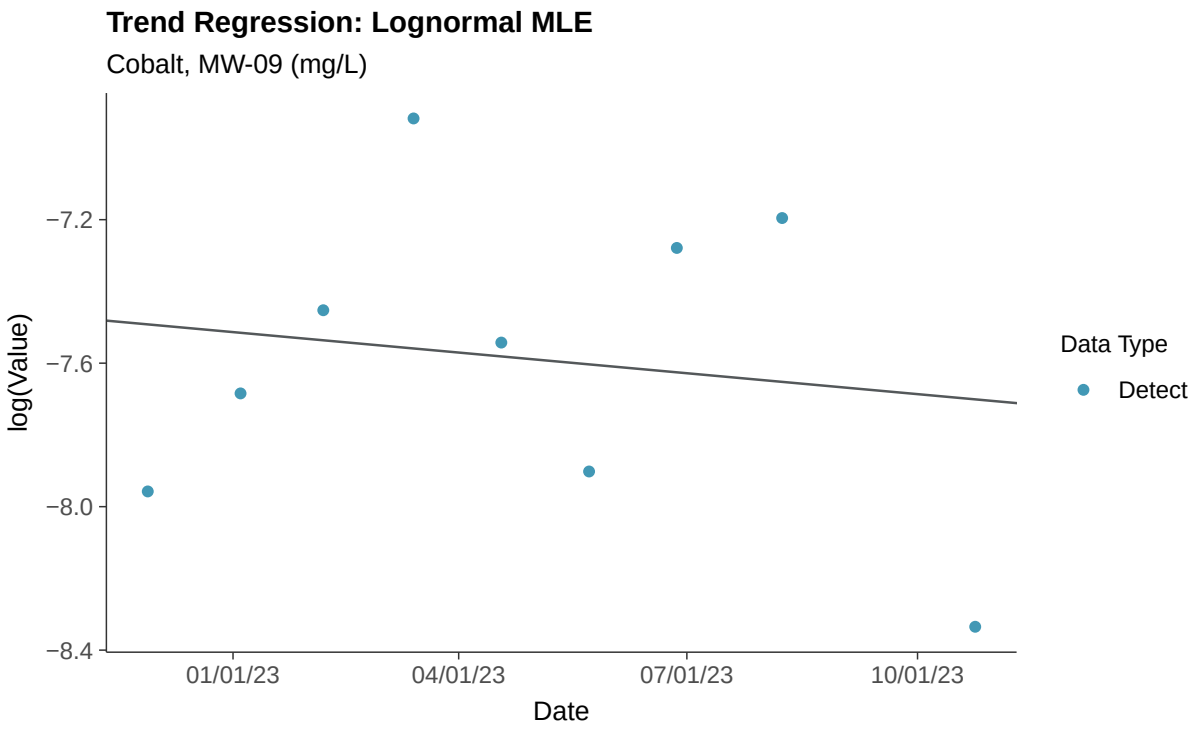
Cobalt, MW-09 (mg/L)




Normal Q-Q plot
Cobalt, MW-09 (mg/L)
Value
1e−03
8e−04
6e−04
4e−04
2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

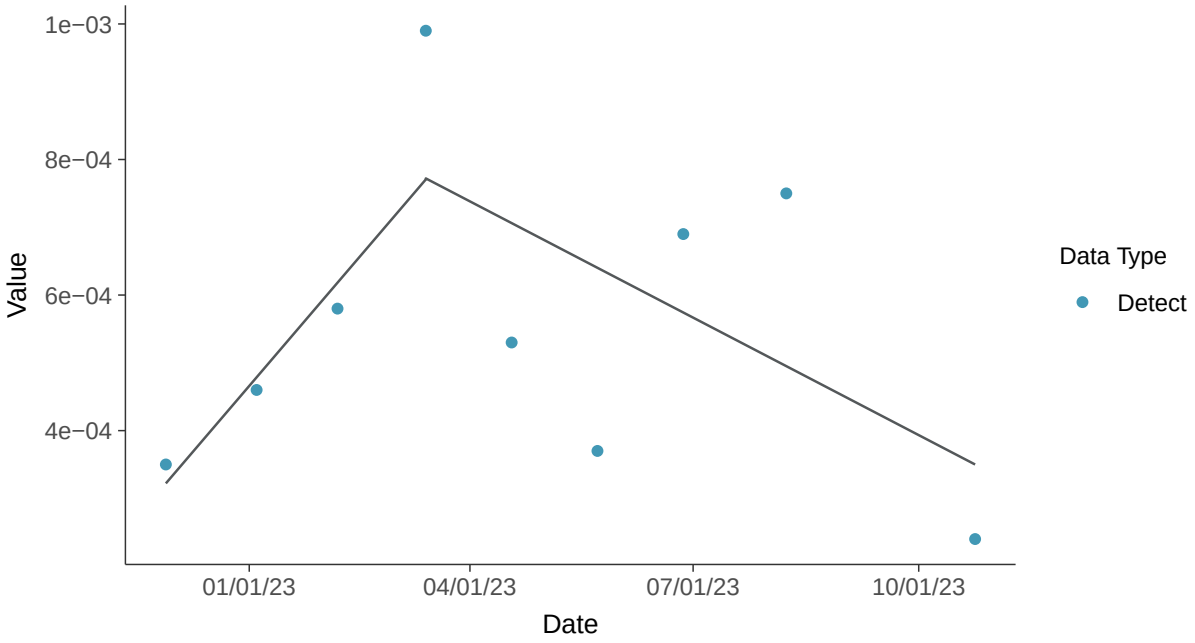

Lognormal Q-Q plot
Cobalt, MW-09 (mg/L)
log(Value)
−6.8
−7.2
−7.6
−8.0
−8.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-09 (mg/L)
Value
1e−03
8e−04
6e−04
4e−04
2e−04
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-09 (mg/L)
log(Value)
−7.2
−7.6
−8.0
−8.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

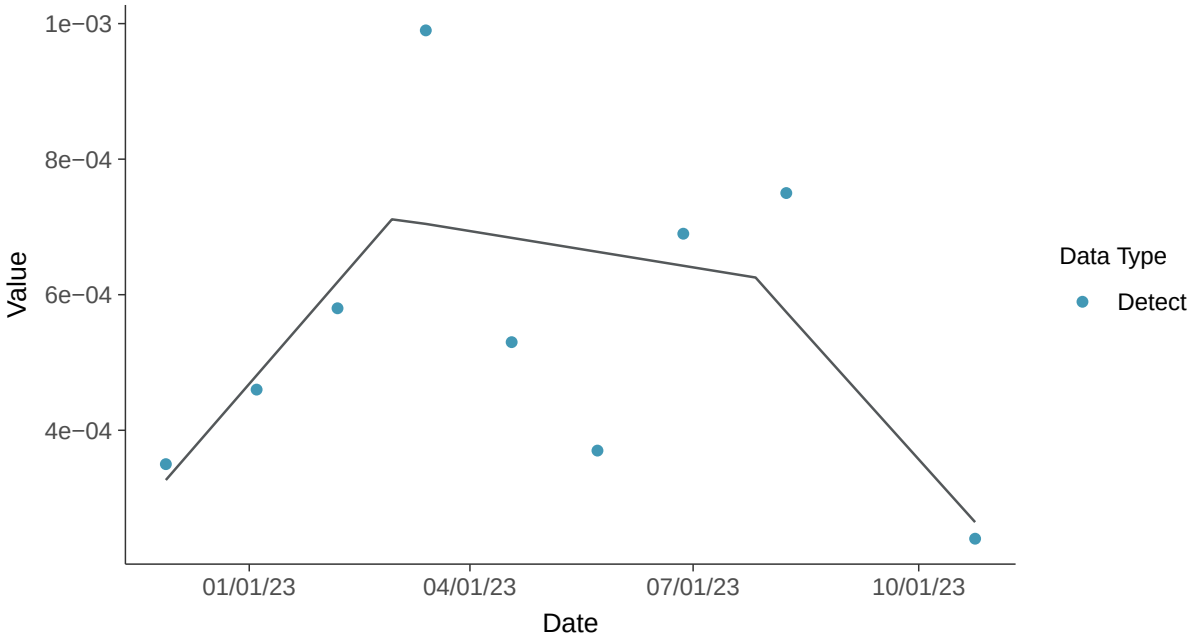
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-09 (mg/L)



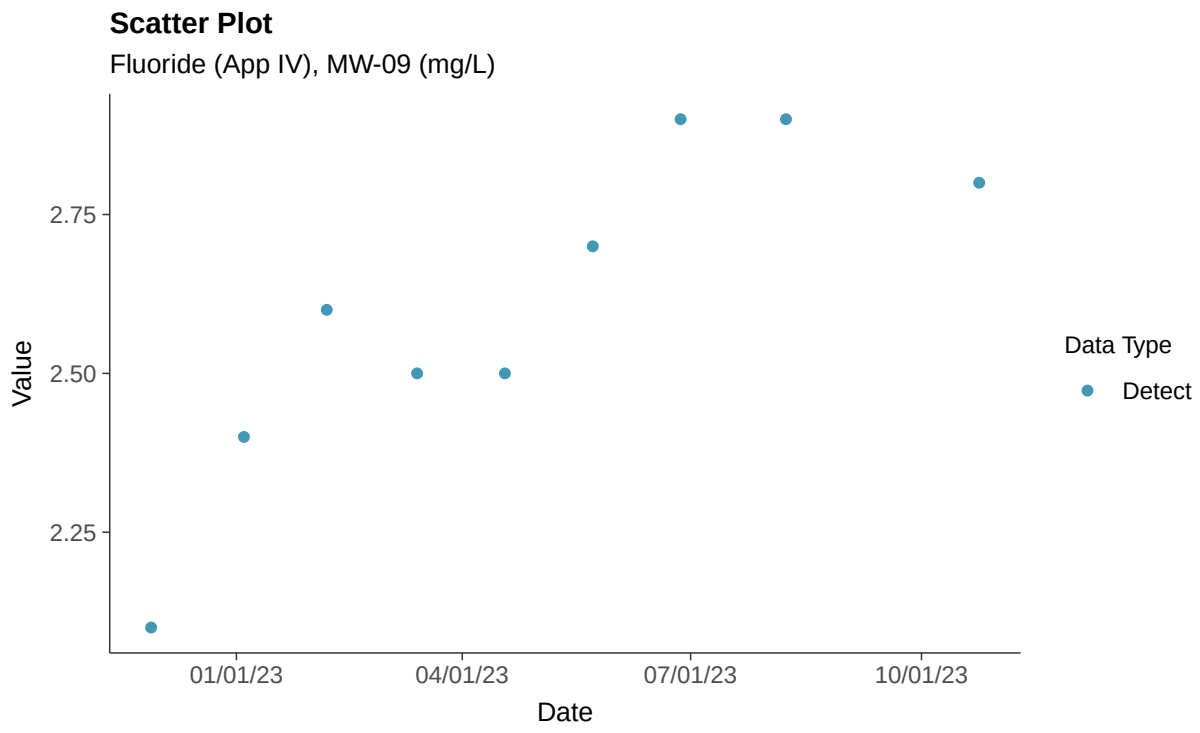
Trend Regression: Piecewise Linear-Linear-Linear

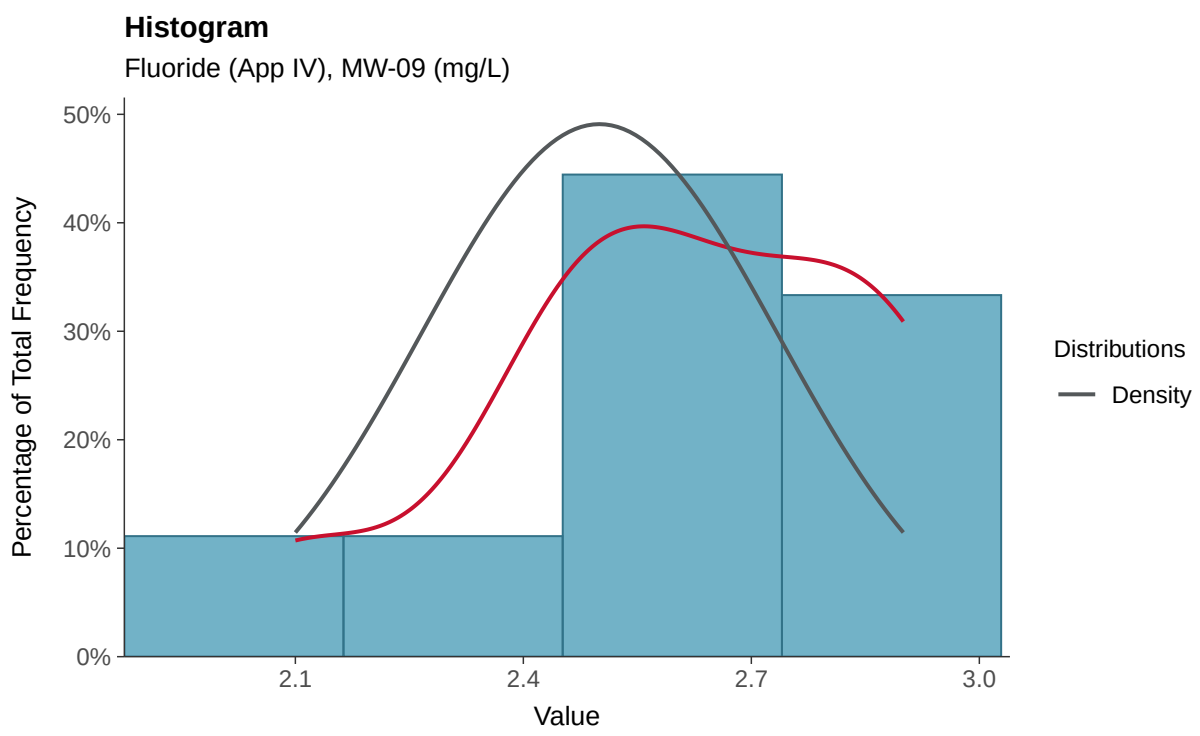
Cobalt, MW-09 (mg/L)



Appendix IV: Fluoride (App IV), MW-09

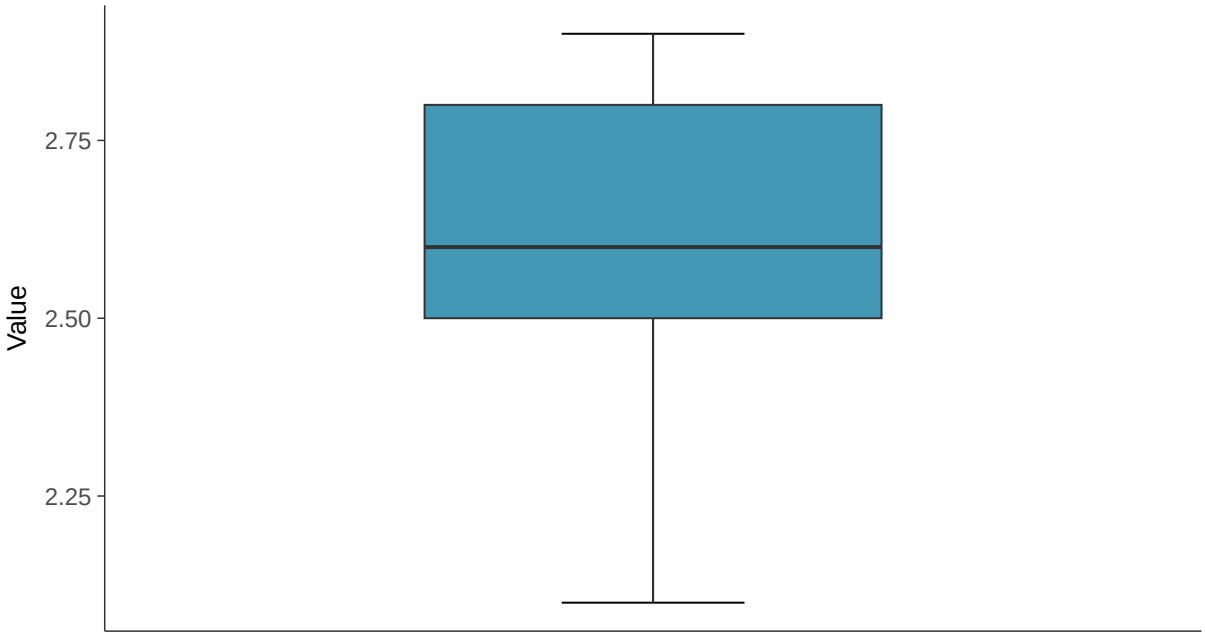
ID: 1_18_5_113





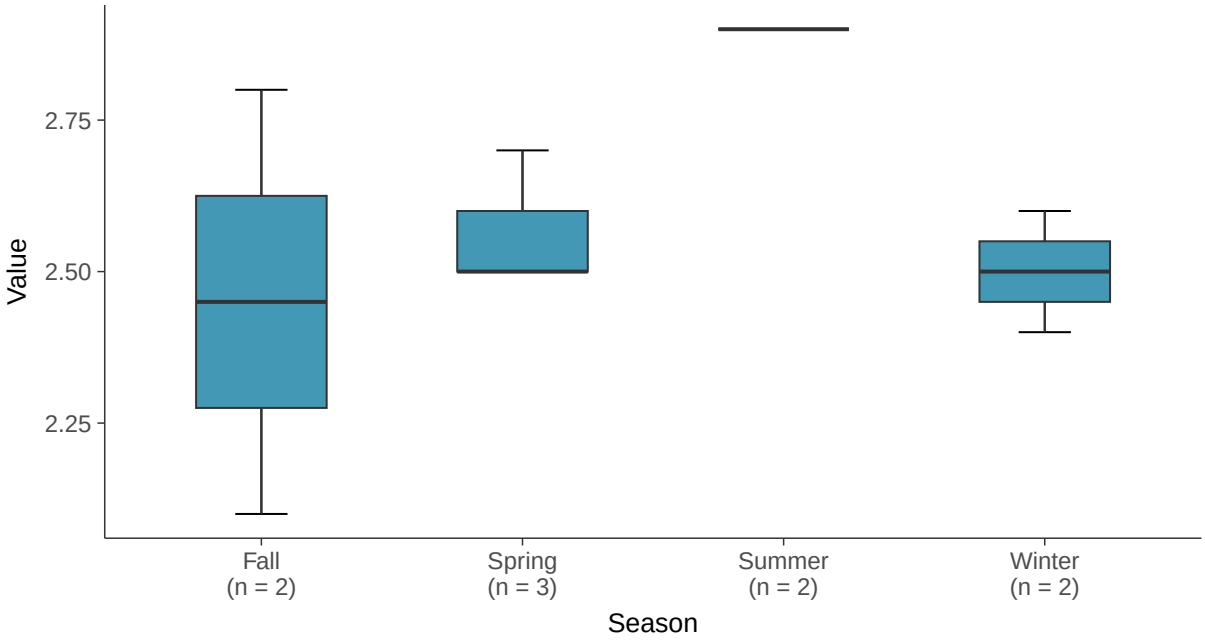
Boxplot

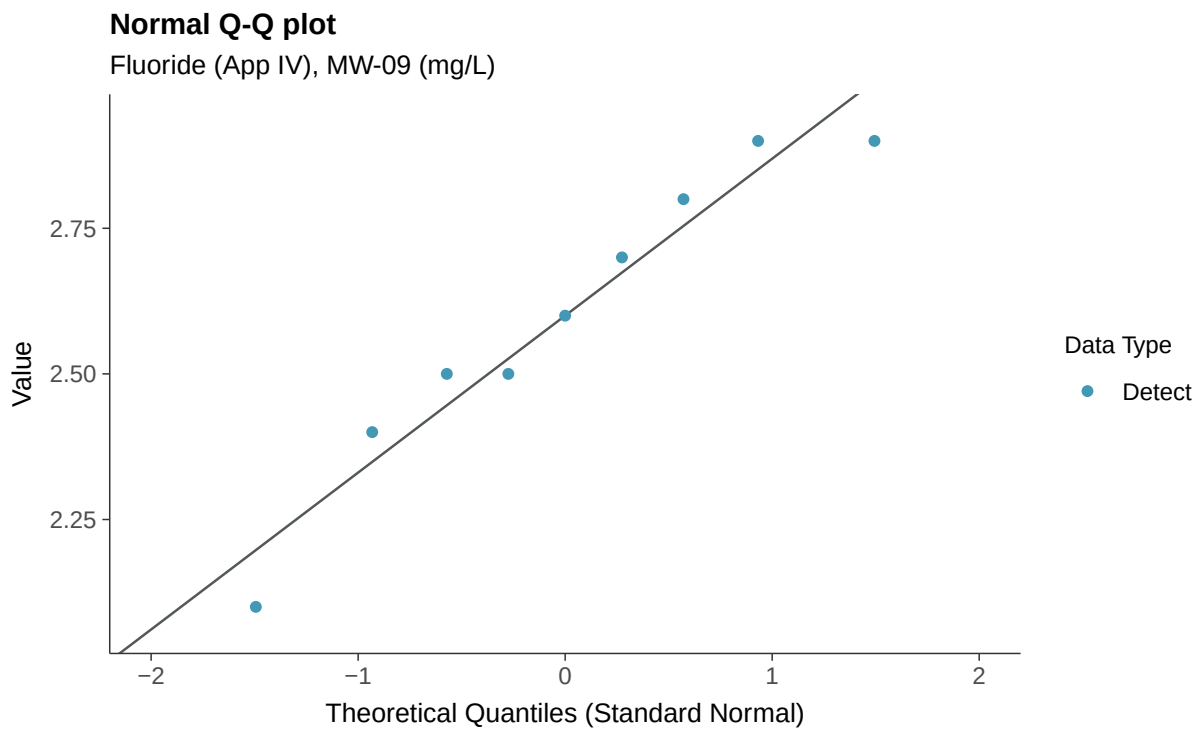
Fluoride (App IV), MW-09 (mg/L)

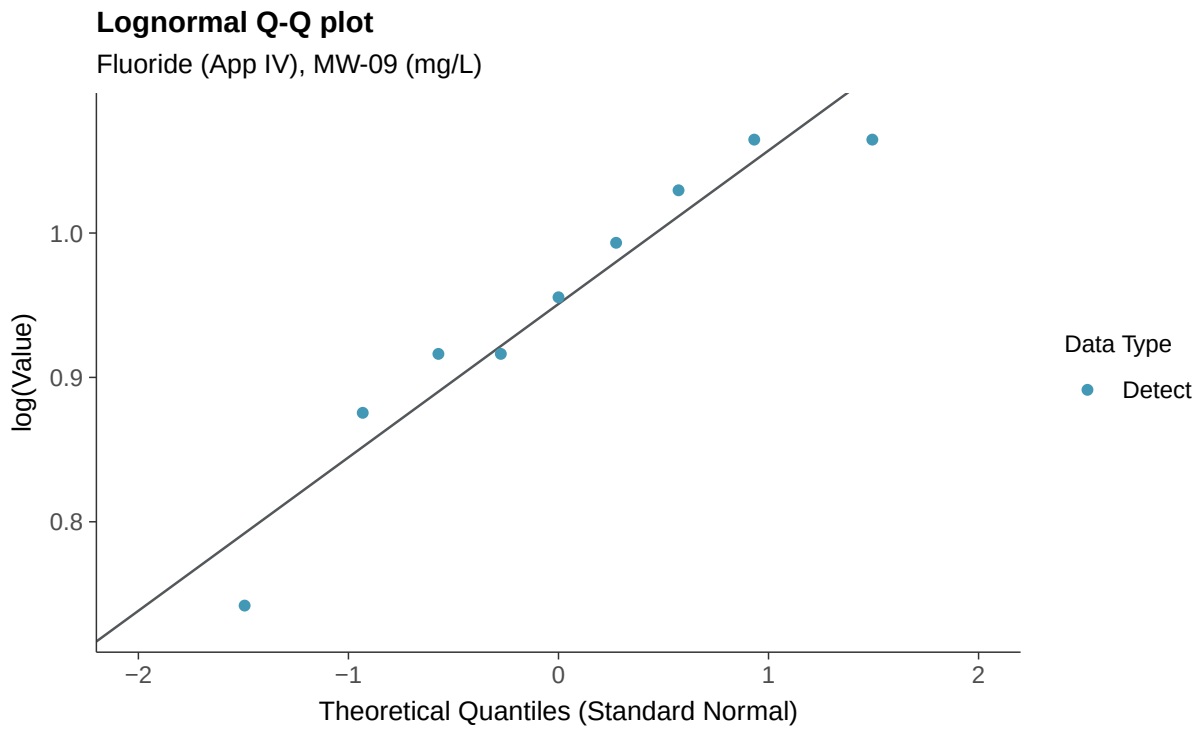


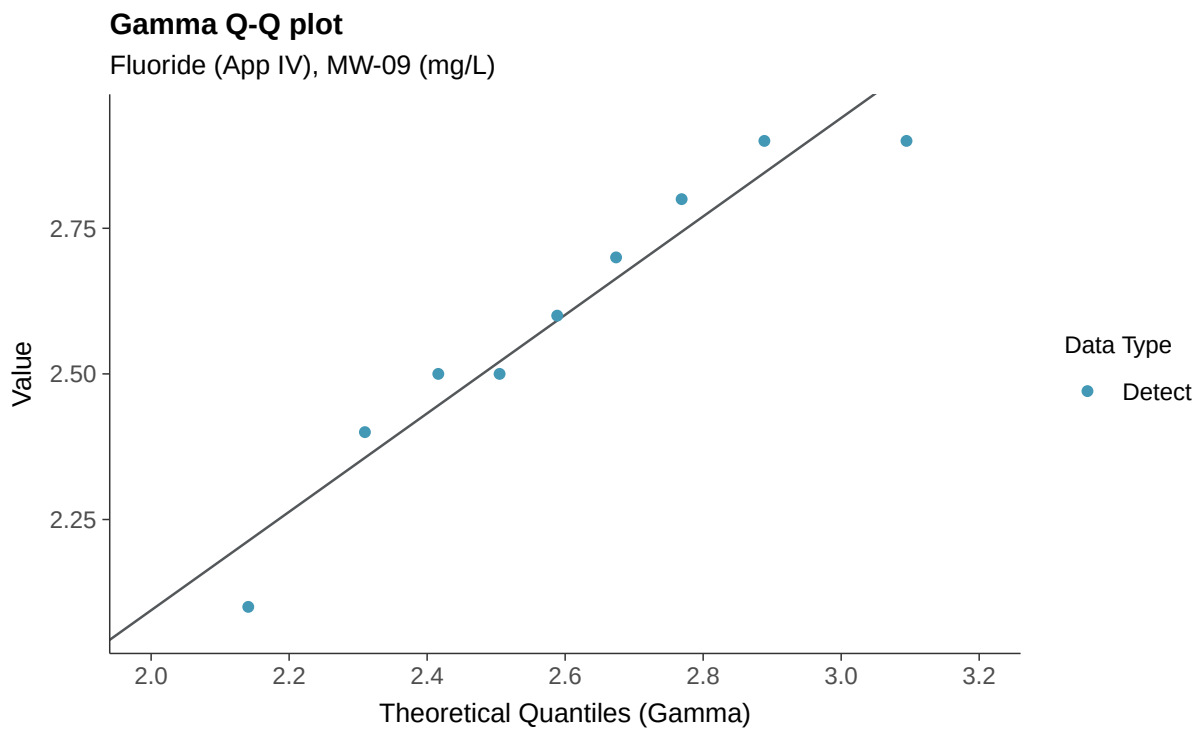
Boxplot by Season

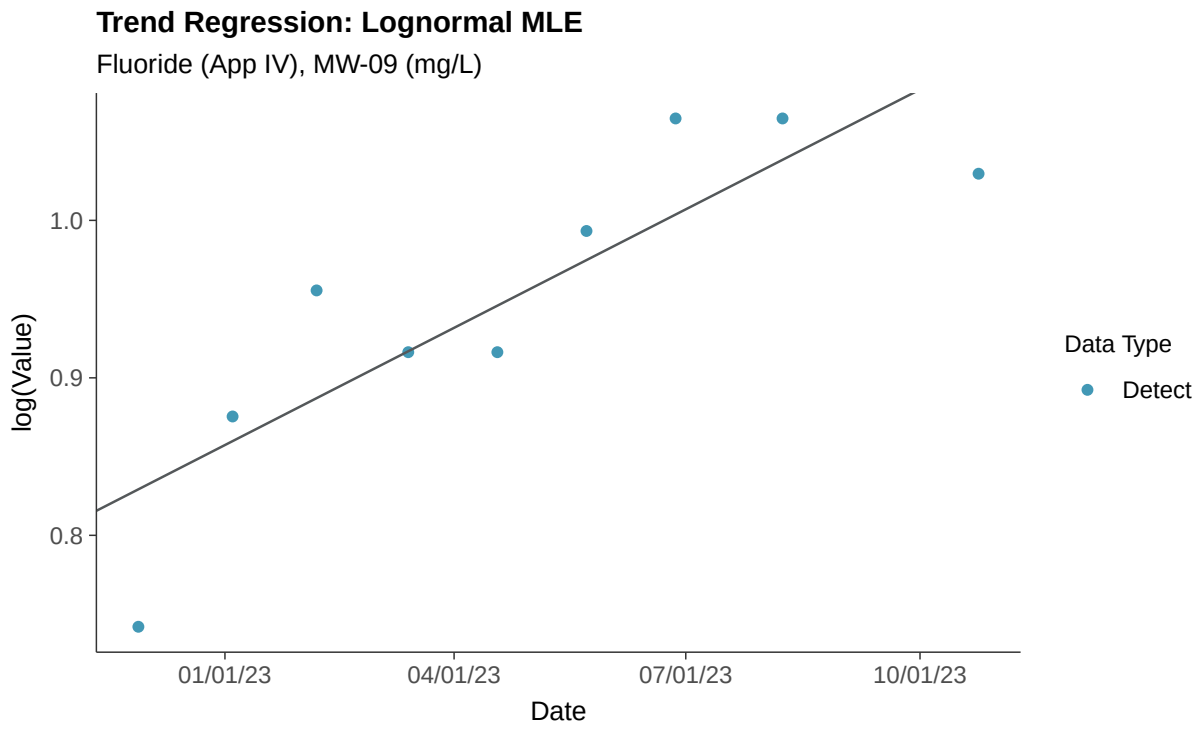
Fluoride (App IV), MW-09 (mg/L)

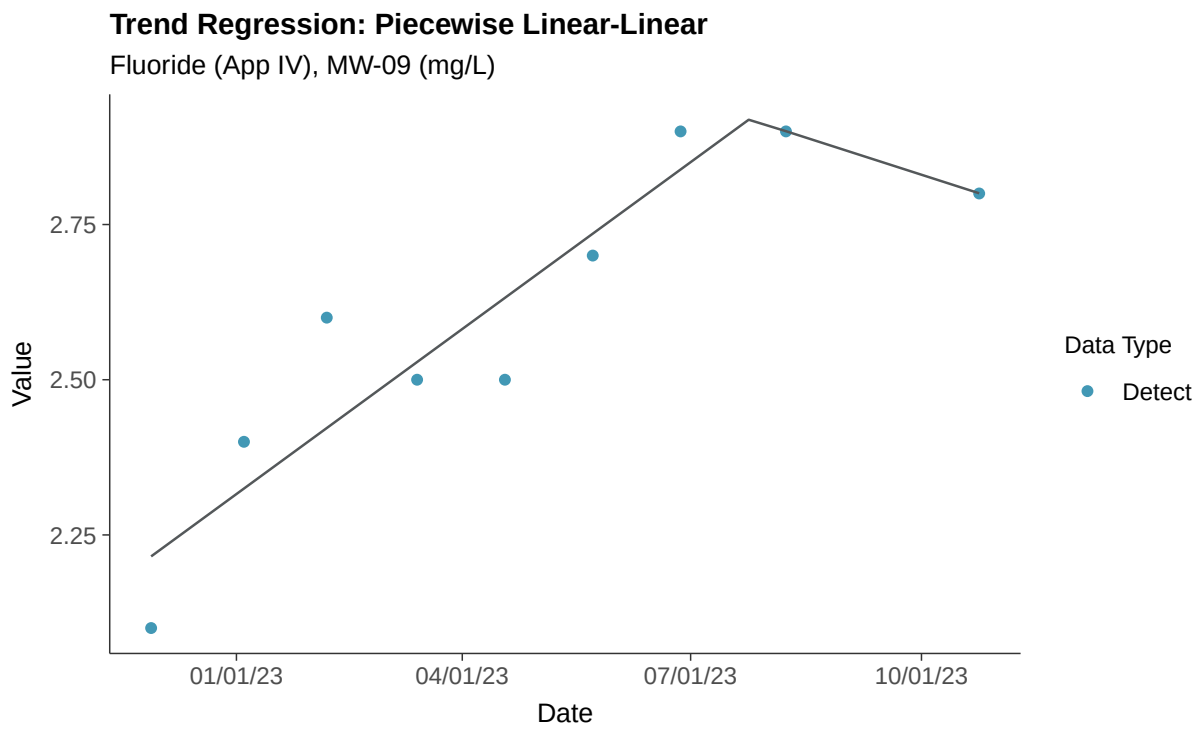



Normal Q-Q plot
Fluoride (App IV), MW-09 (mg/L)
Value
2.75
2.50
2.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride (App IV), MW-09 (mg/L)
log(Value)
1.0
0.9
0.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

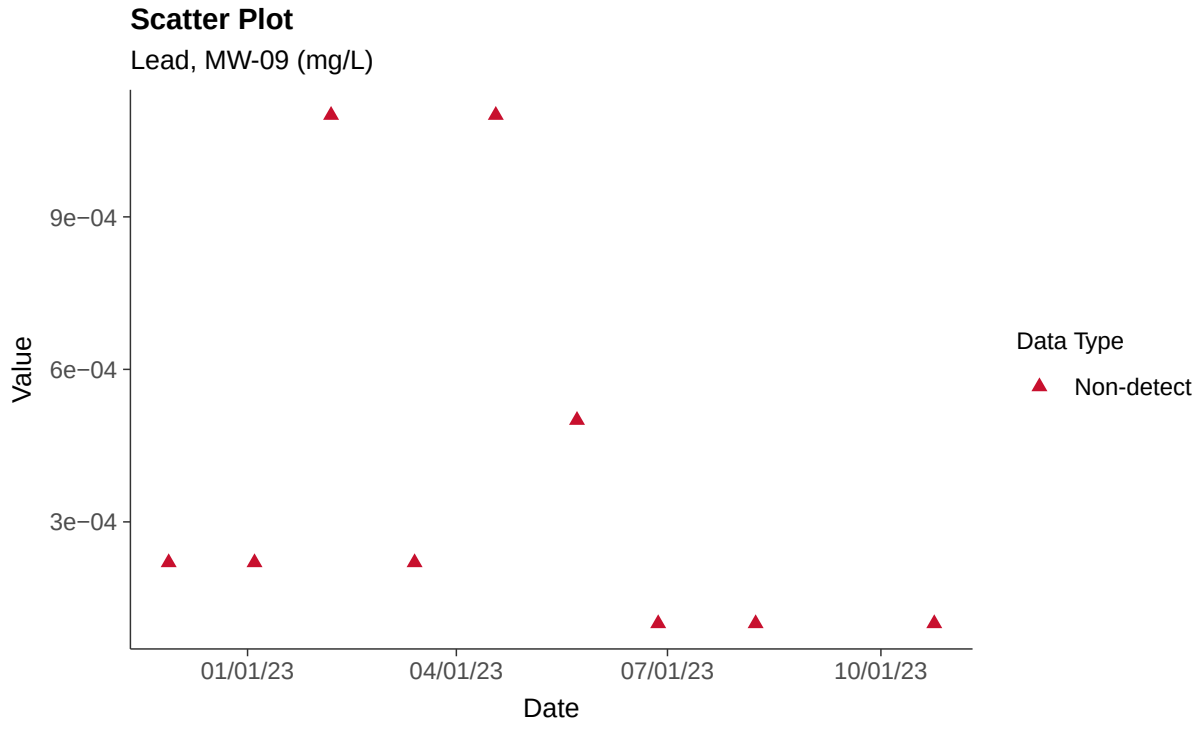

Gamma Q-Q plot
Fluoride (App IV), MW-09 (mg/L)
Value
2.75
2.50
2.25
2.0
2.2
2.4
2.6
2.8
3.0
3.2
Theoretical Quantiles (Gamma)
Data Type
Detect

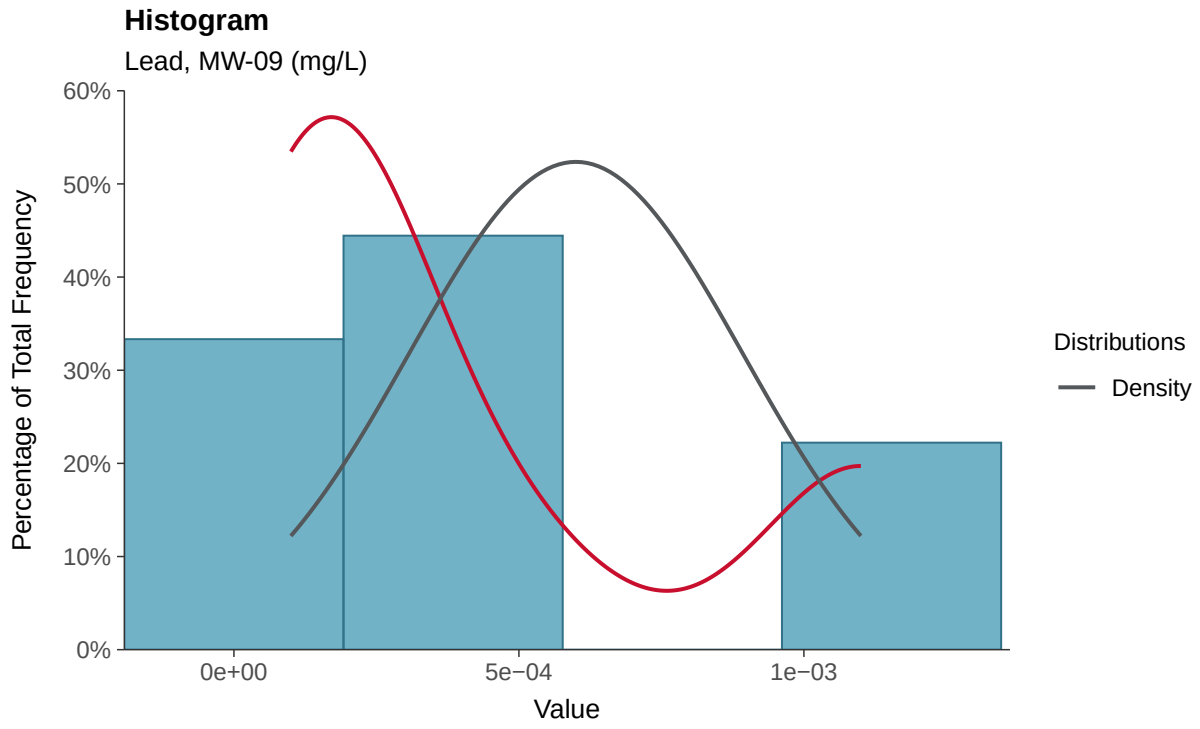

Trend Regression: Lognormal MLE
Fluoride (App IV), MW-09 (mg/L)
log(Value)
1.0
0.9
0.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Fluoride (App IV), MW-09 (mg/L)
Value
2.75
2.50
2.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lead, MW-09

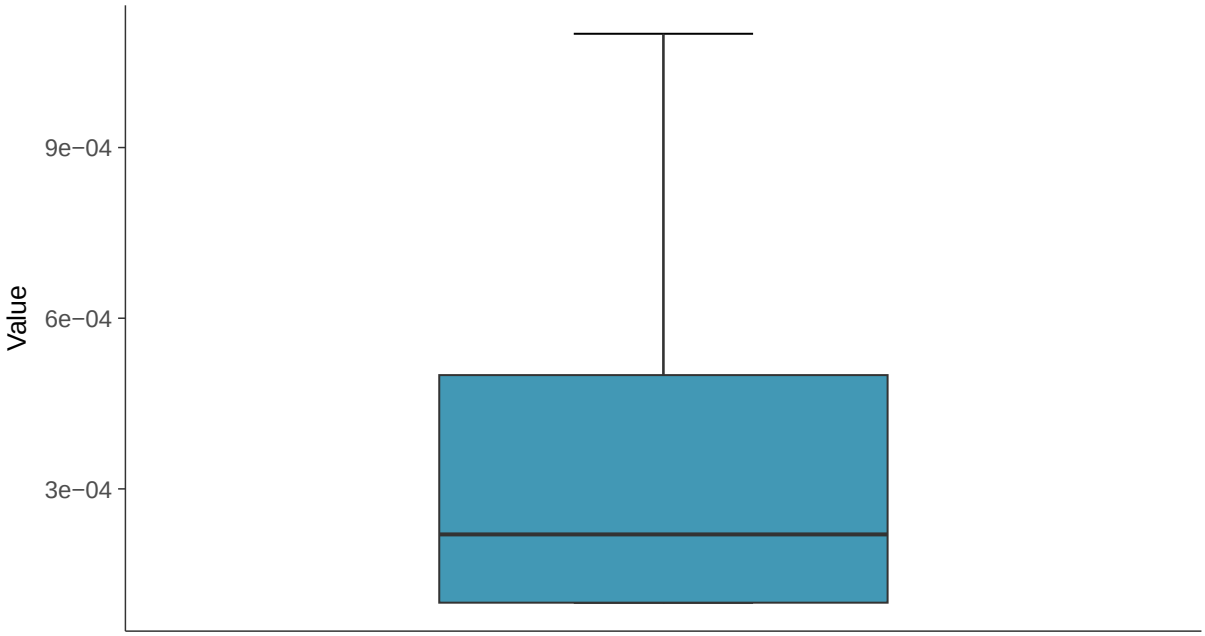
ID: 1_18_5_115





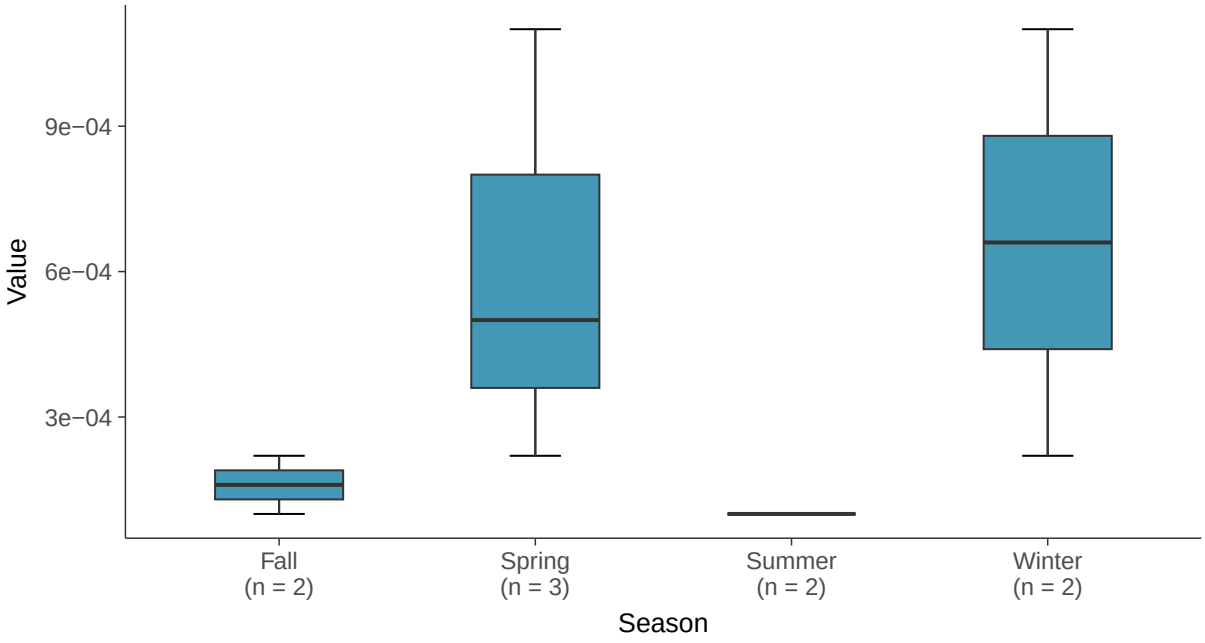
Boxplot

Lead, MW-09 (mg/L)



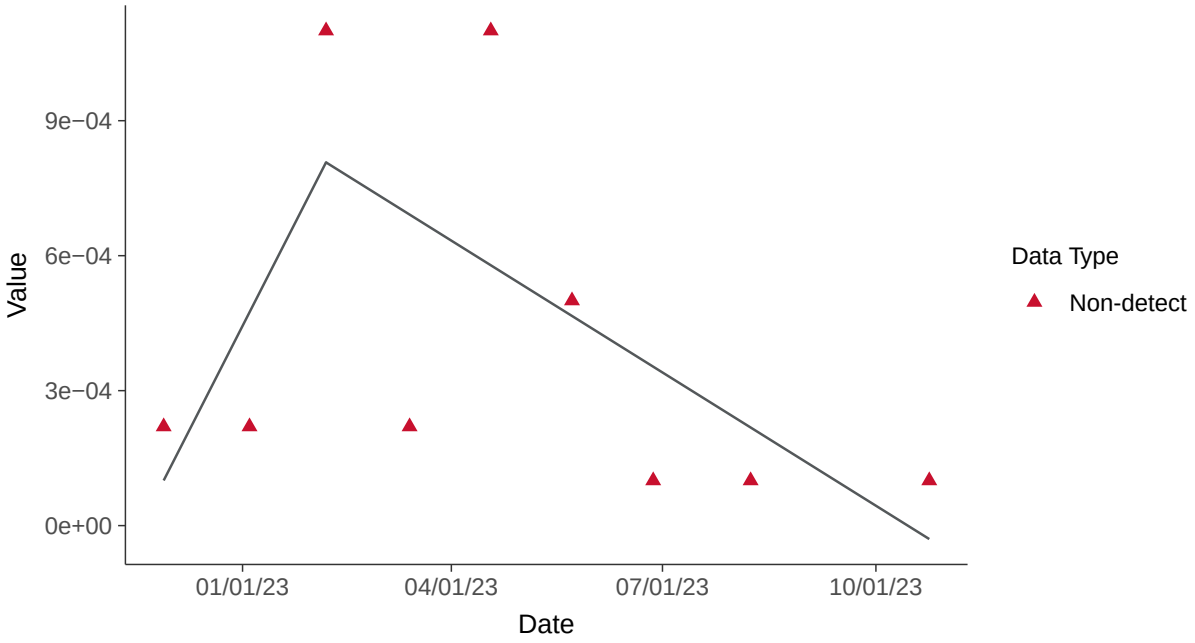
Boxplot by Season

Lead, MW-09 (mg/L)



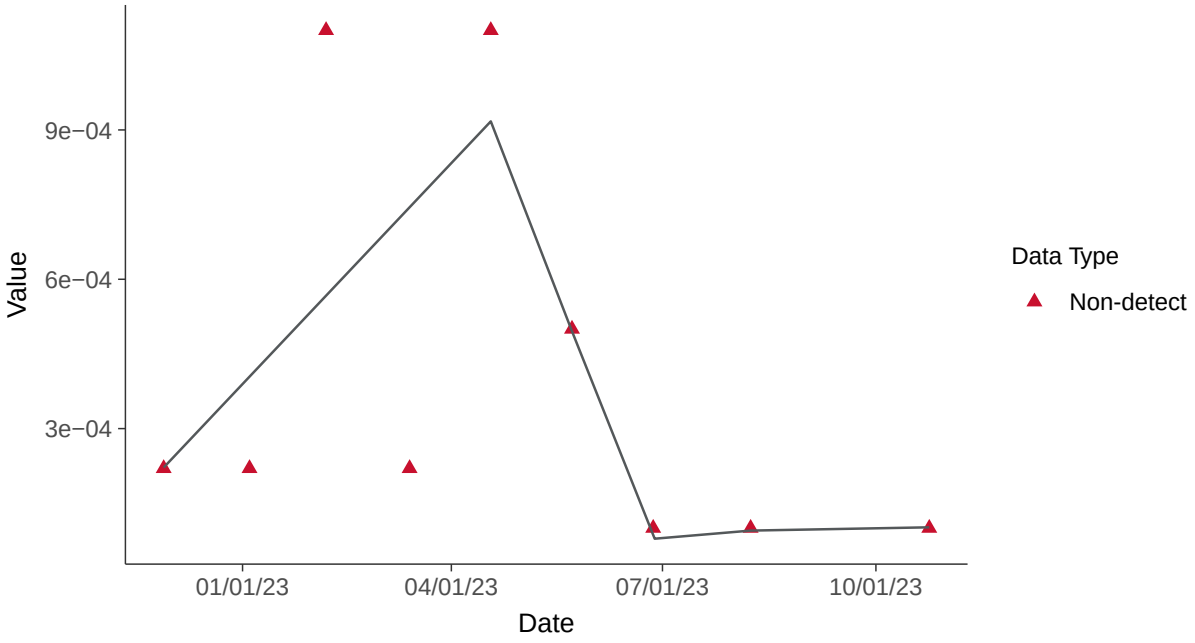
Trend Regression: Piecewise Linear-Linear

Lead, MW-09 (mg/L)



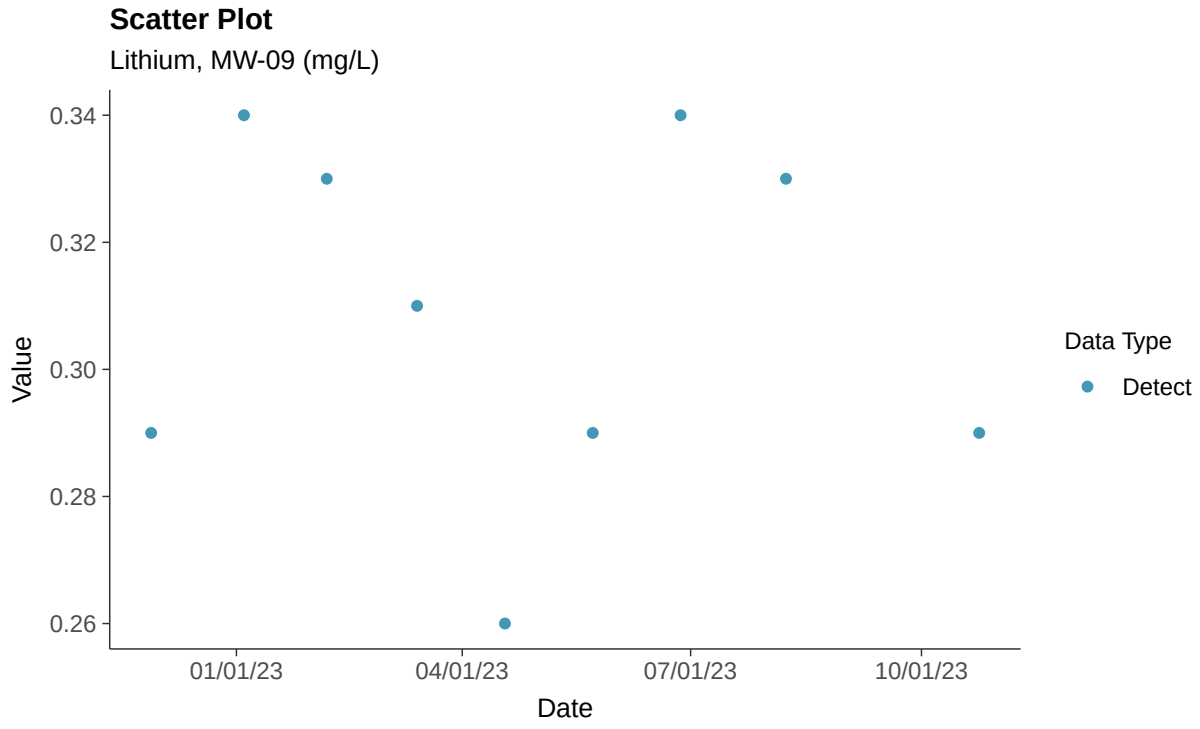
Trend Regression: Piecewise Linear-Linear-Linear

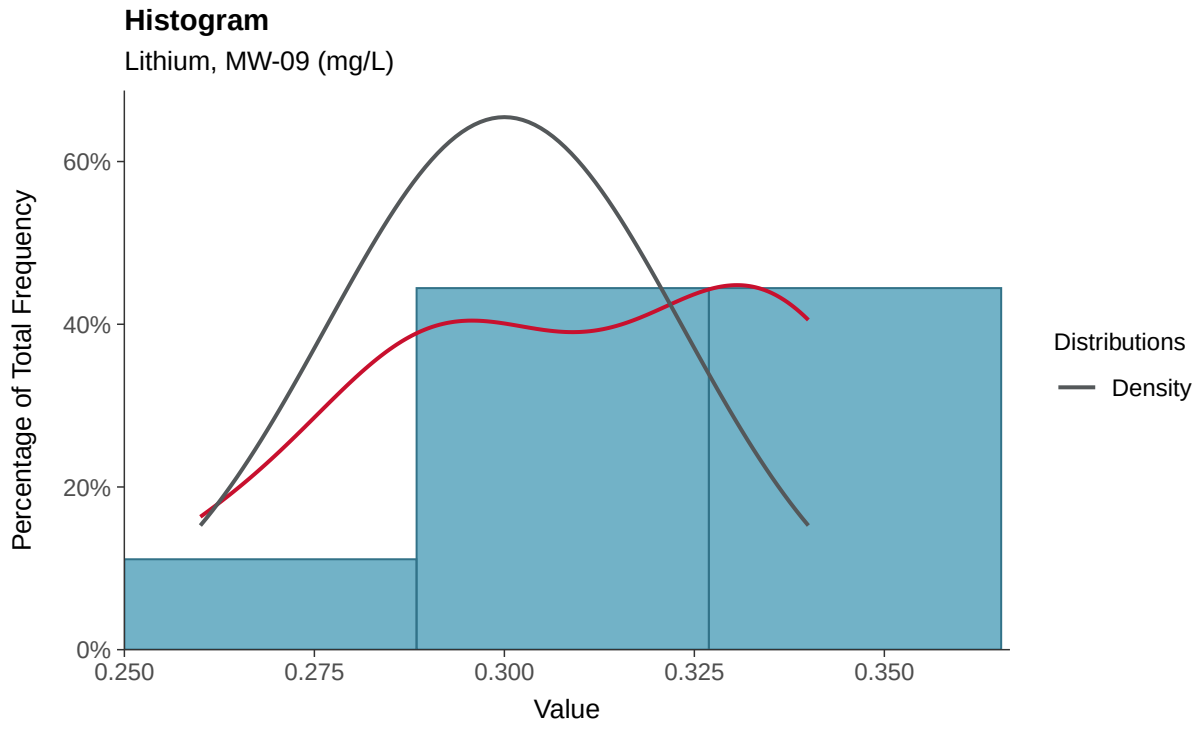
Lead, MW-09 (mg/L)



Appendix IV: Lithium, MW-09

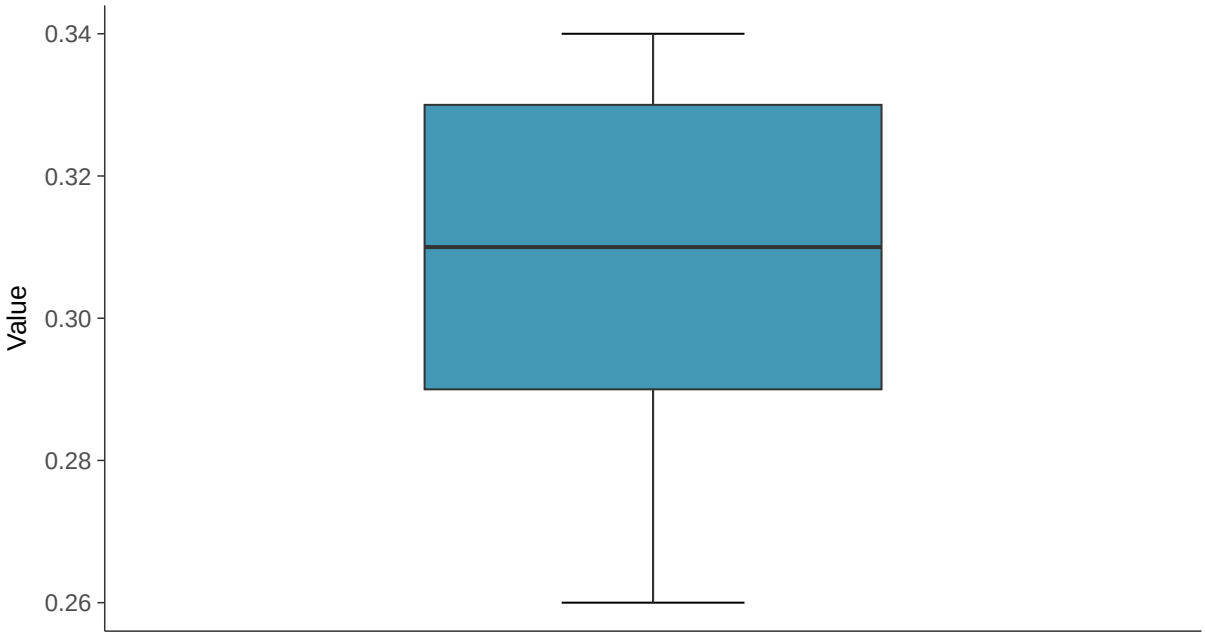
ID: 1_18_5_116





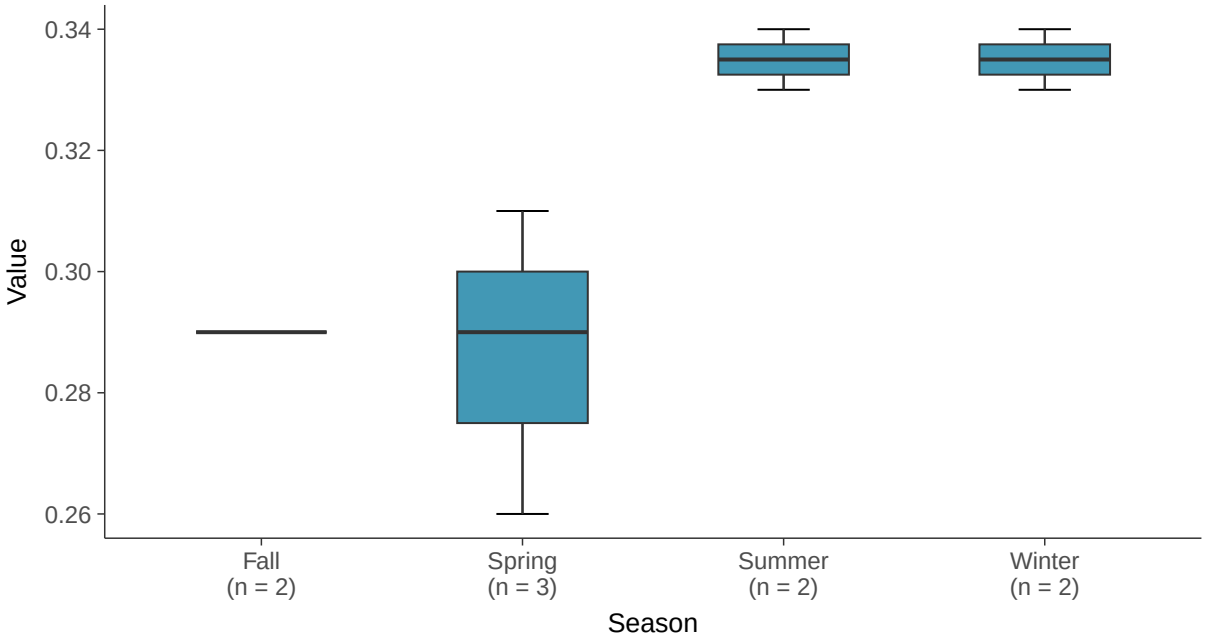
Boxplot

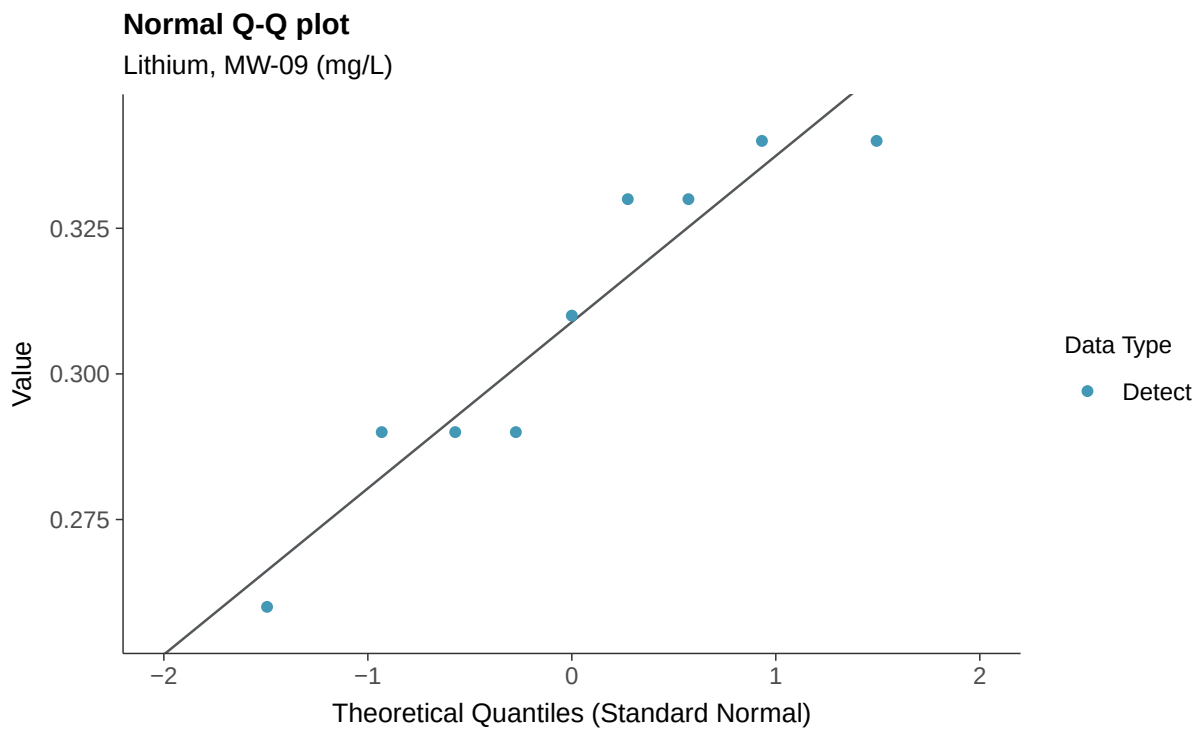
Lithium, MW-09 (mg/L)

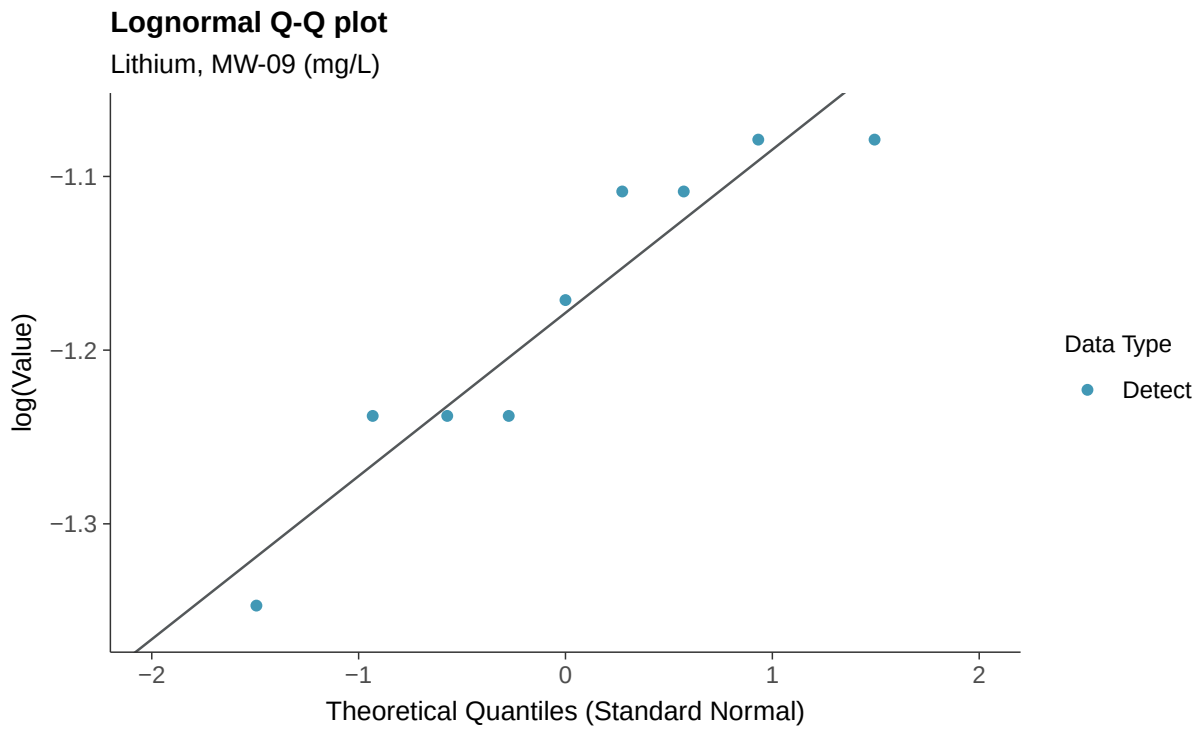


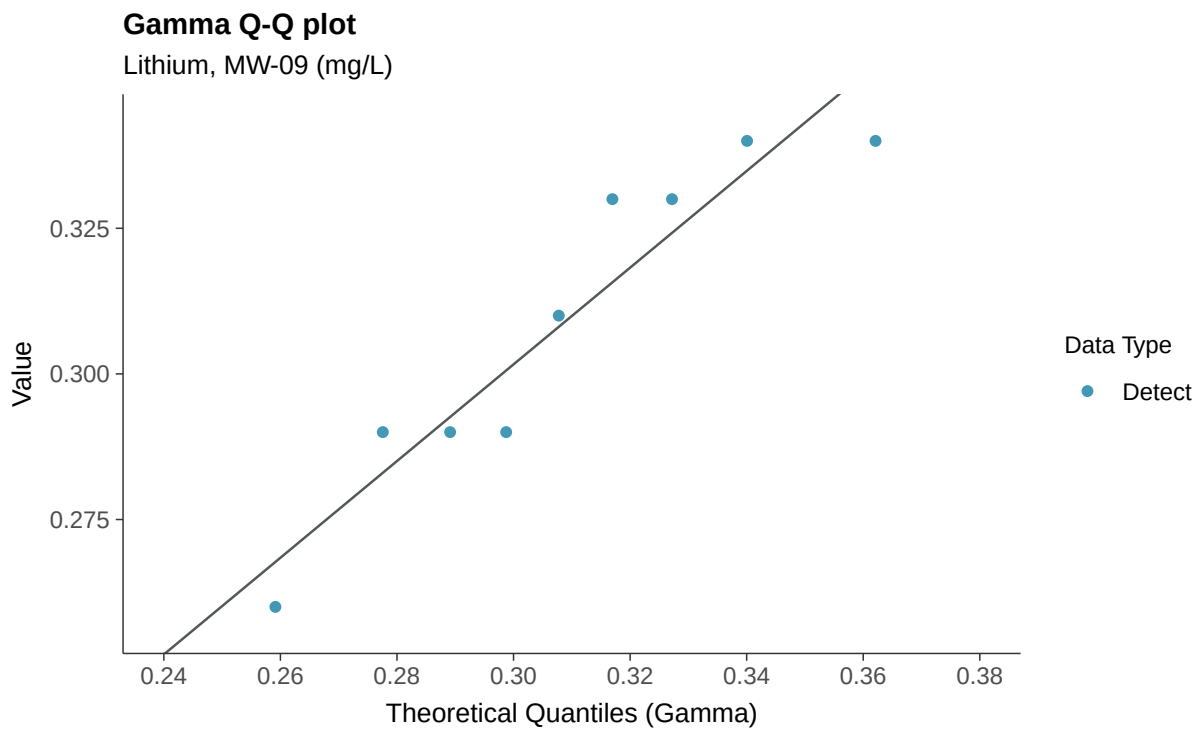
Boxplot by Season

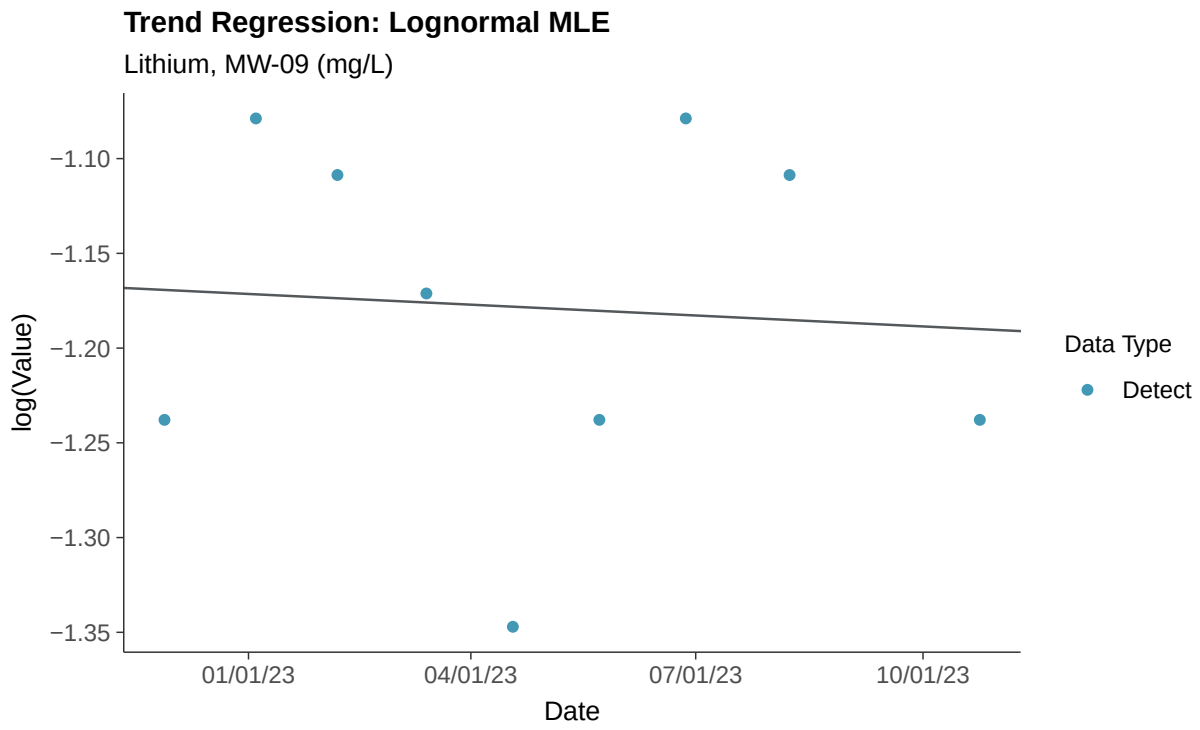
Lithium, MW-09 (mg/L)

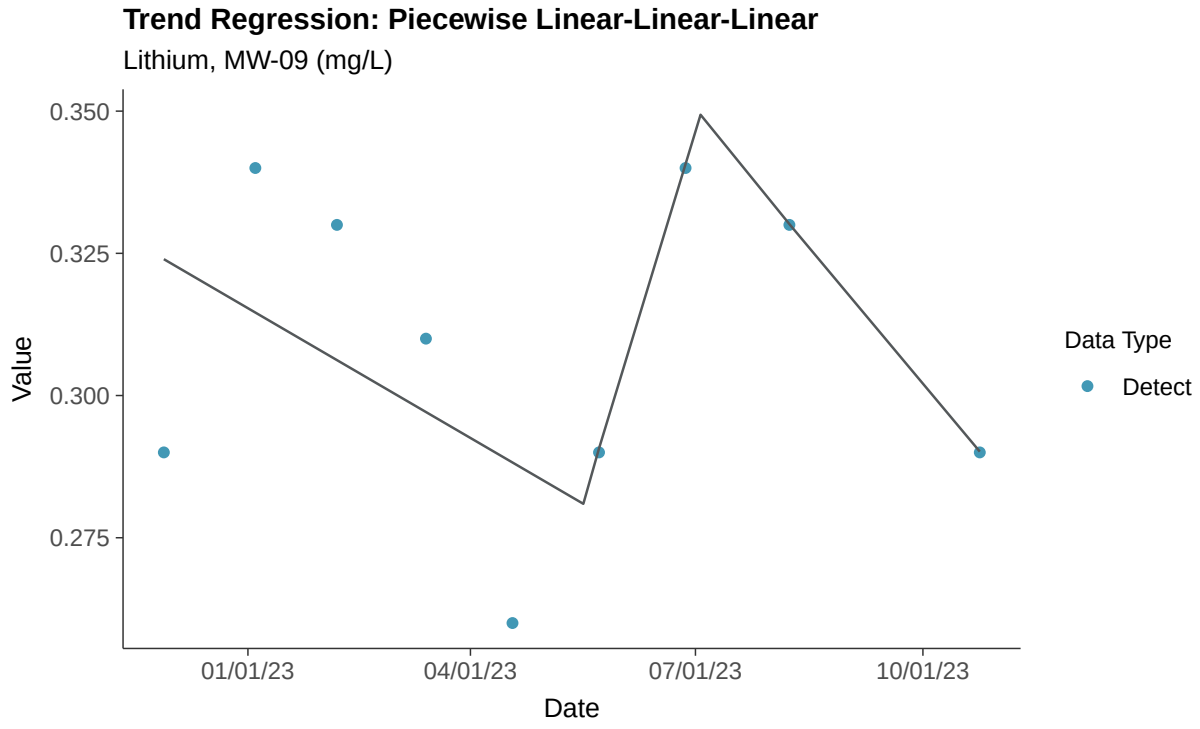



Normal Q-Q plot
Lithium, MW-09 (mg/L)
Value
0.325
0.300
0.275
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-09 (mg/L)
log(Value)
−1.1
−1.2
−1.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

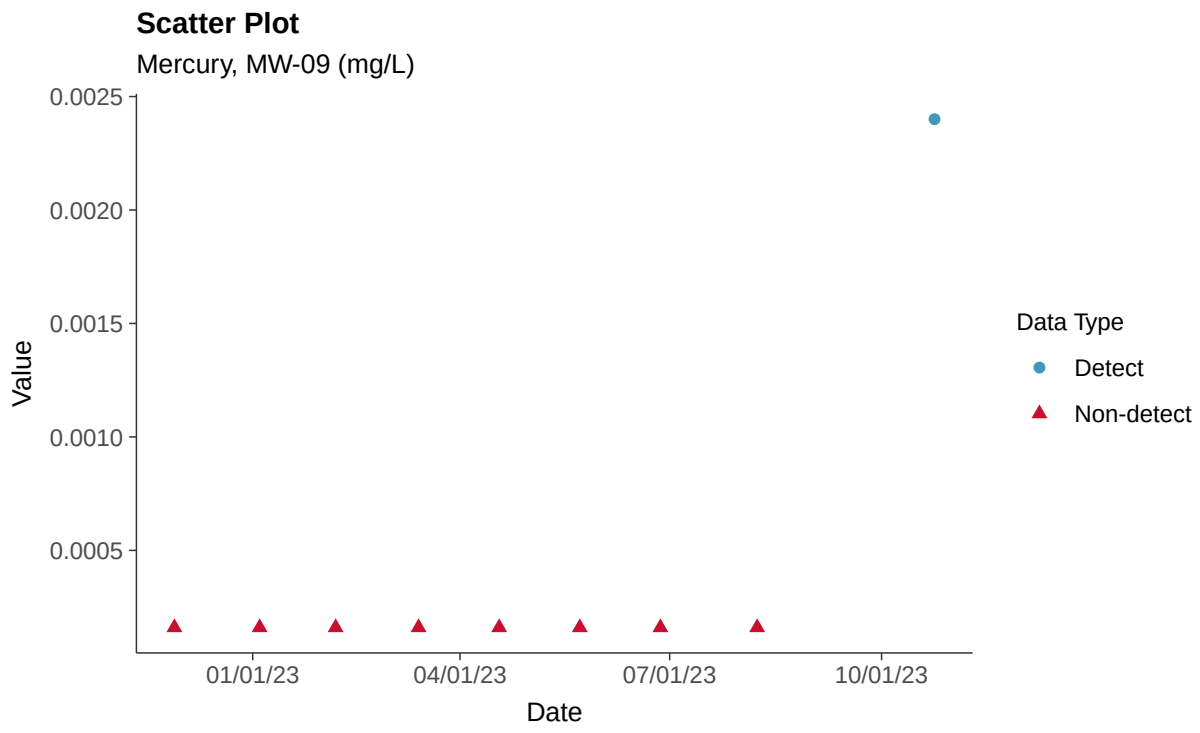

Gamma Q-Q plot
Lithium, MW-09 (mg/L)
Value
0.325
0.300
0.275
0.24
0.26
0.28
0.30
0.32
0.34
0.36
0.38
Theoretical Quantiles (Gamma)
Data Type
Detect

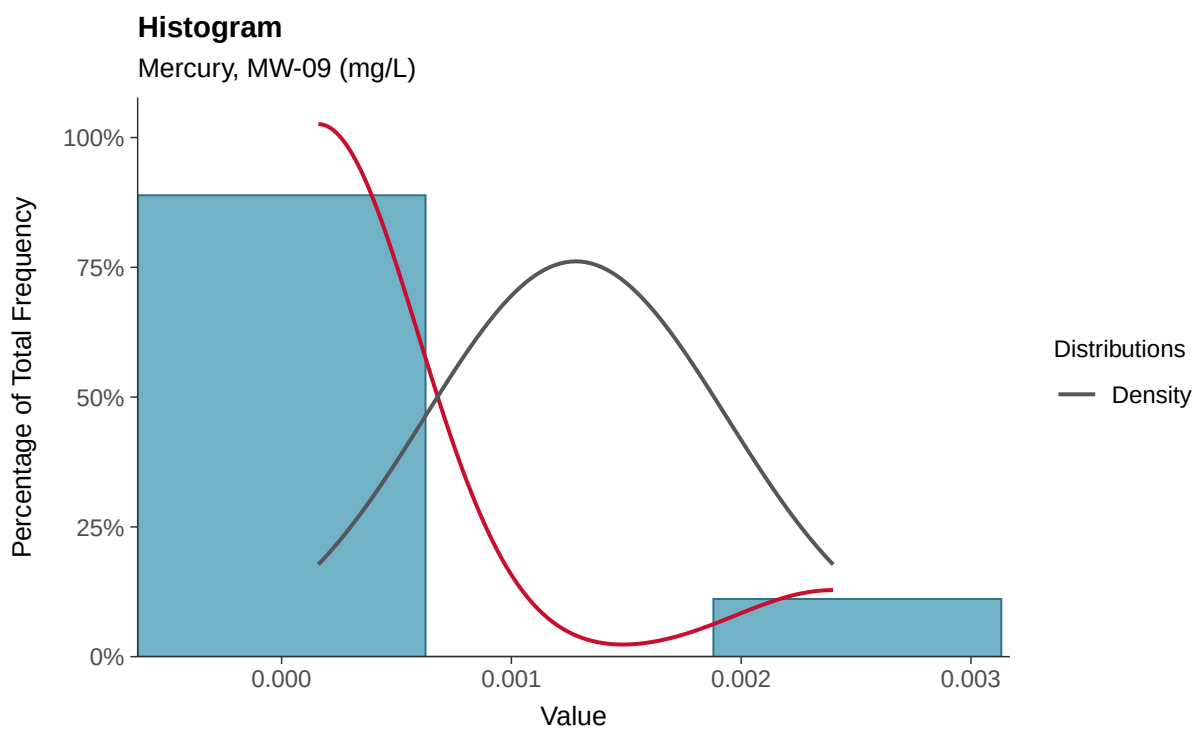

Trend Regression: Lognormal MLE
Lithium, MW-09 (mg/L)
log(Value)
−1.10
−1.15
−1.20
−1.25
−1.30
−1.35
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

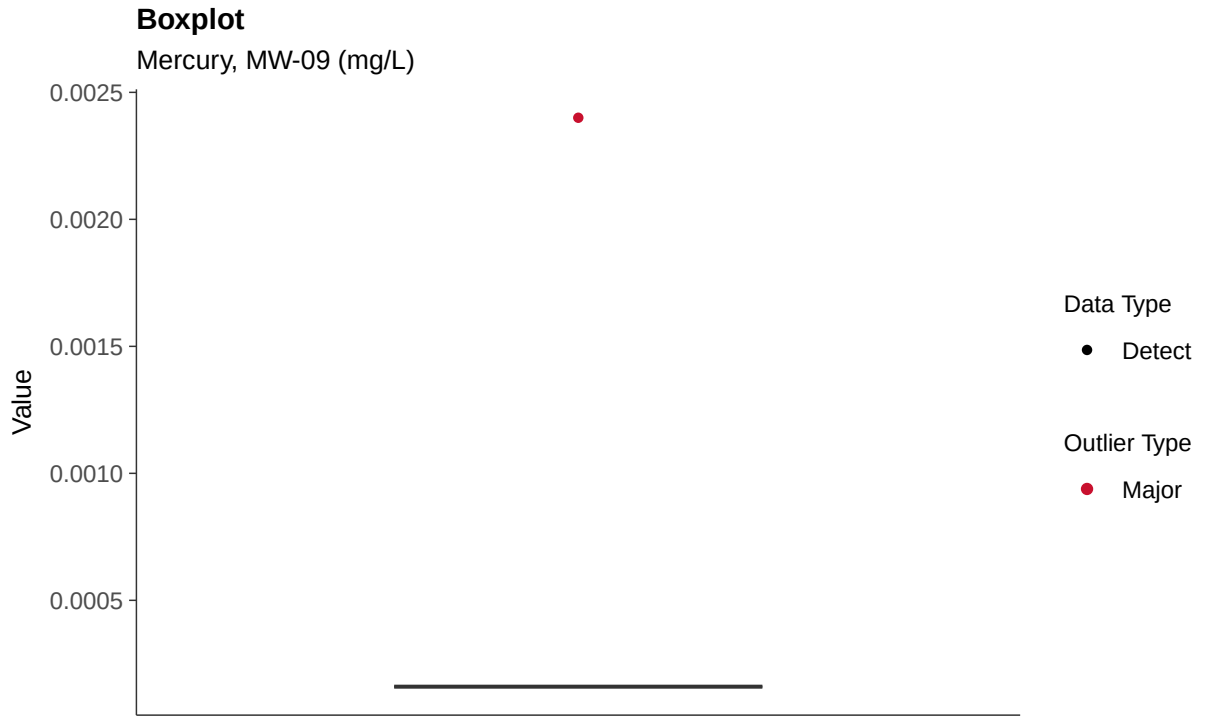

Trend Regression: Piecewise Linear-Linear-Linear
Lithium, MW-09 (mg/L)
0.350
0.325
0.300
0.275
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

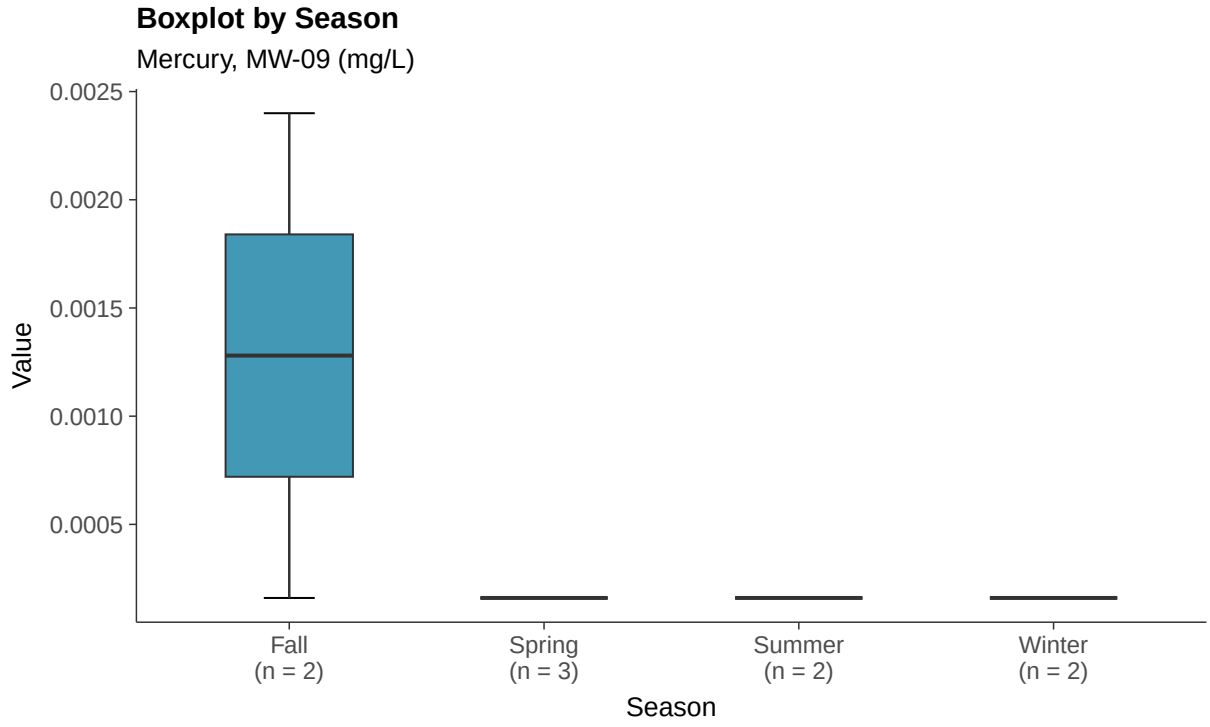
Appendix IV: Mercury, MW-09

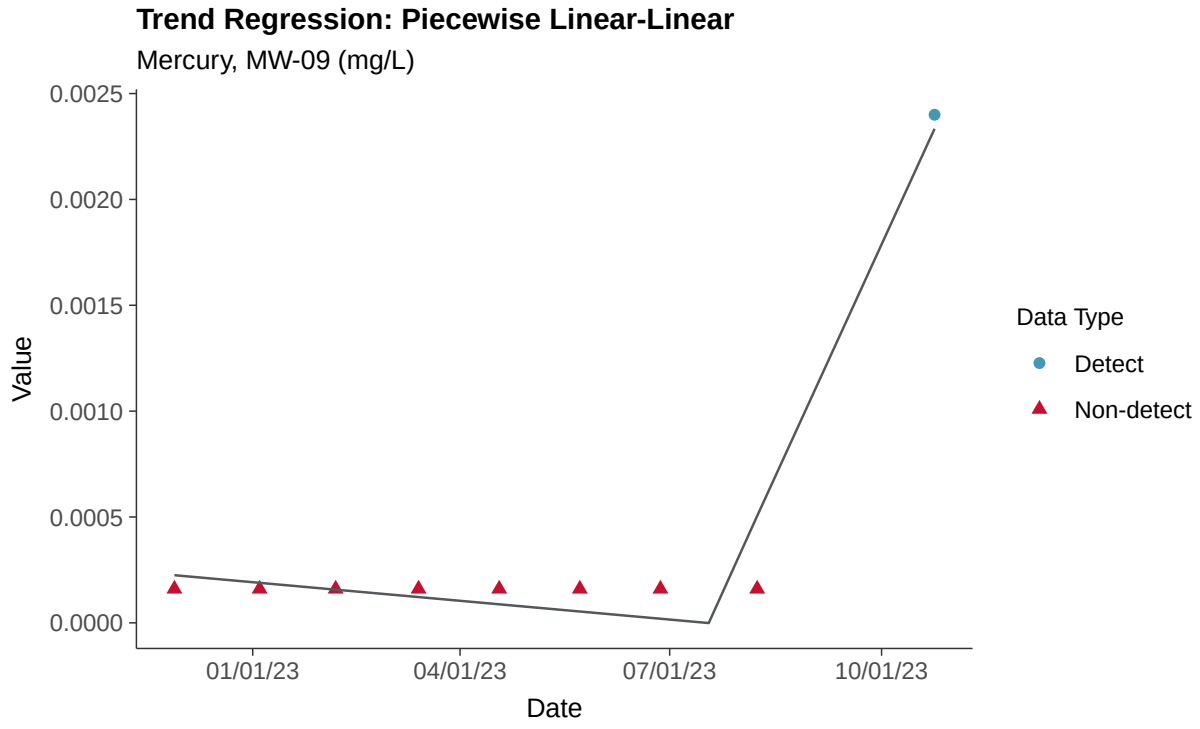
ID: 1_18_5_117





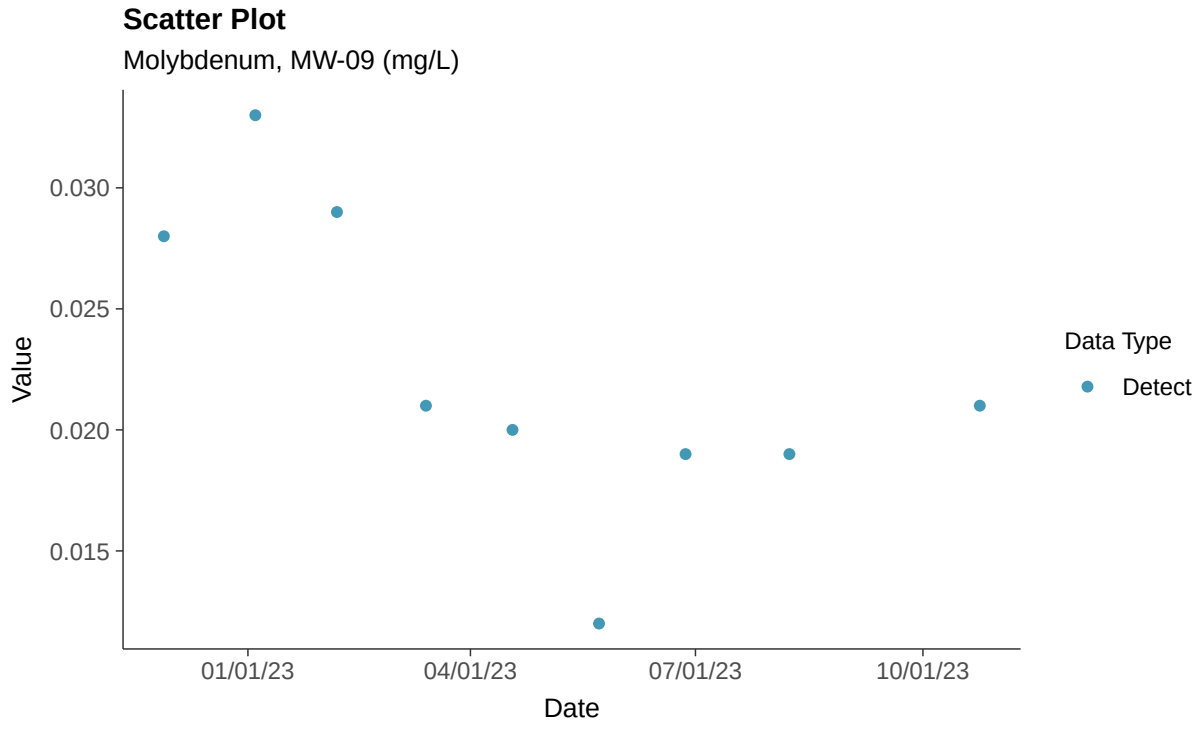

Boxplot
Mercury, MW-09 (mg/L)
0.0025
0.0020
0.0015
0.0010
0.0005
Value
Data Type
Detect
Outlier Type
Major

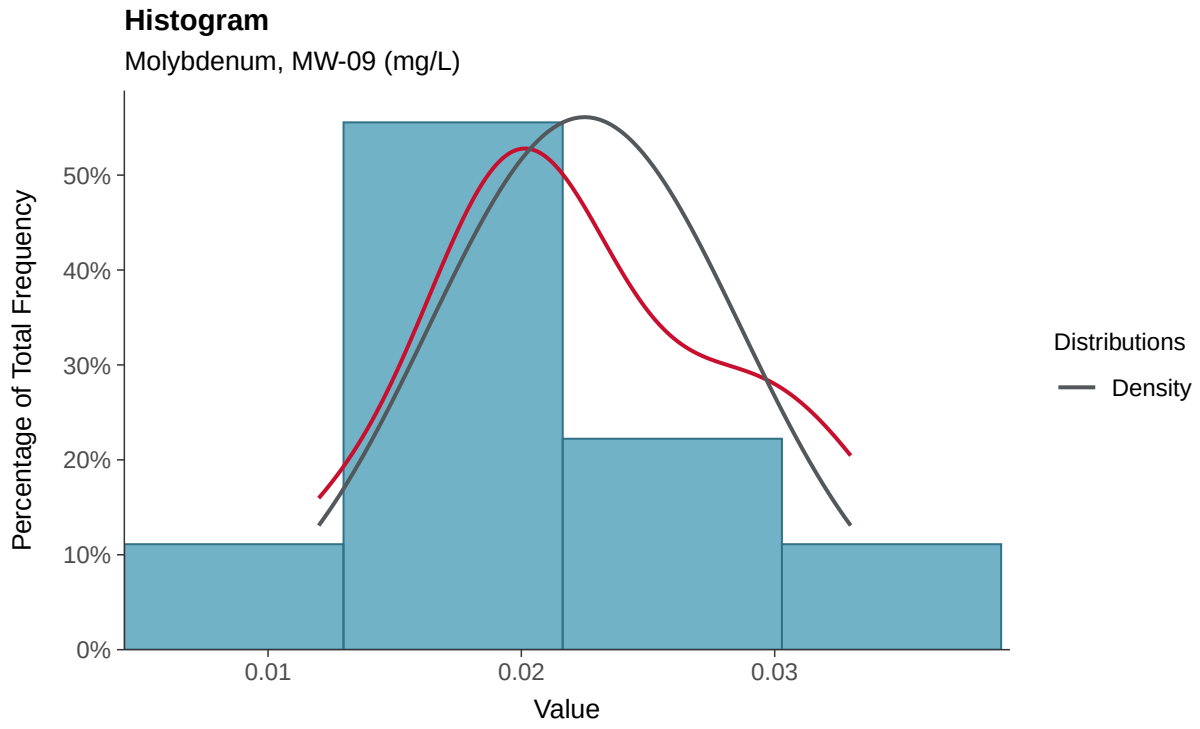

Boxplot by Season
Mercury, MW-09 (mg/L)
0.0025
0.0020
0.0015
0.0010
0.0005
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Trend Regression: Piecewise Linear-Linear
Mercury, MW-09 (mg/L)
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Molybdenum, MW-09

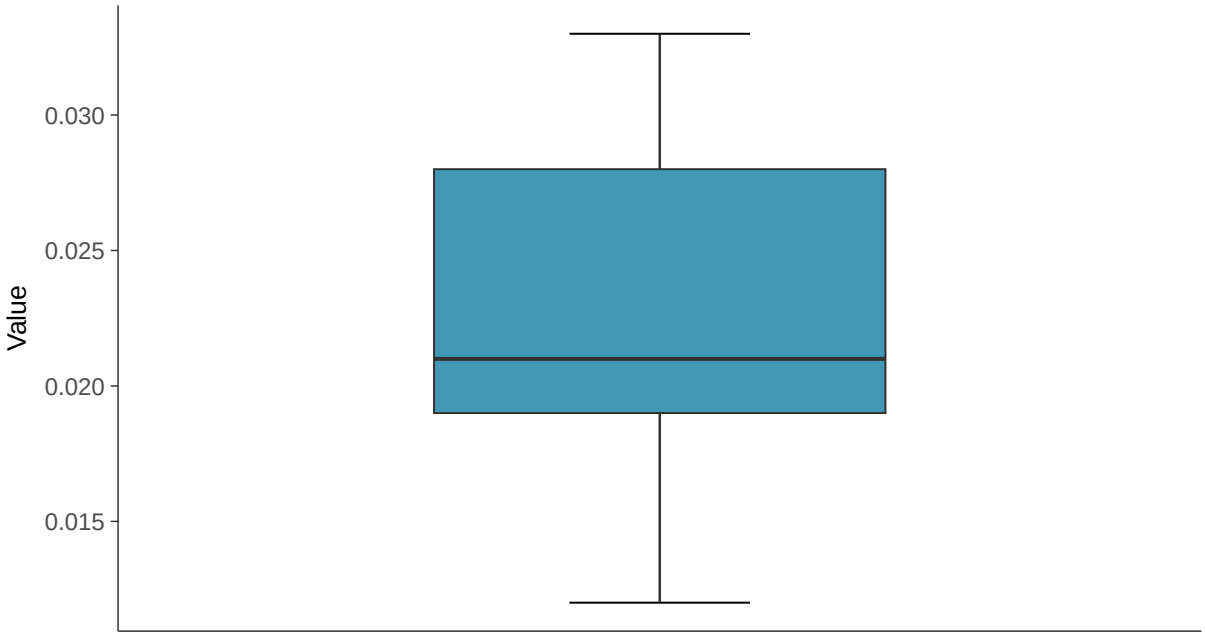
ID: 1_18_5_118





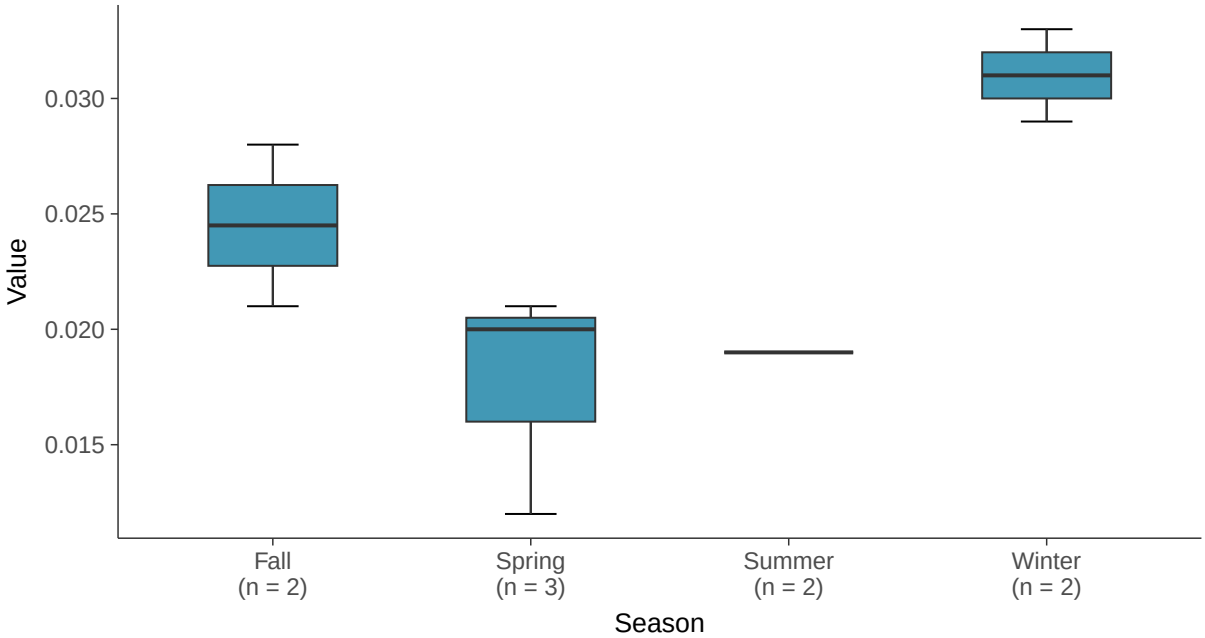
Boxplot

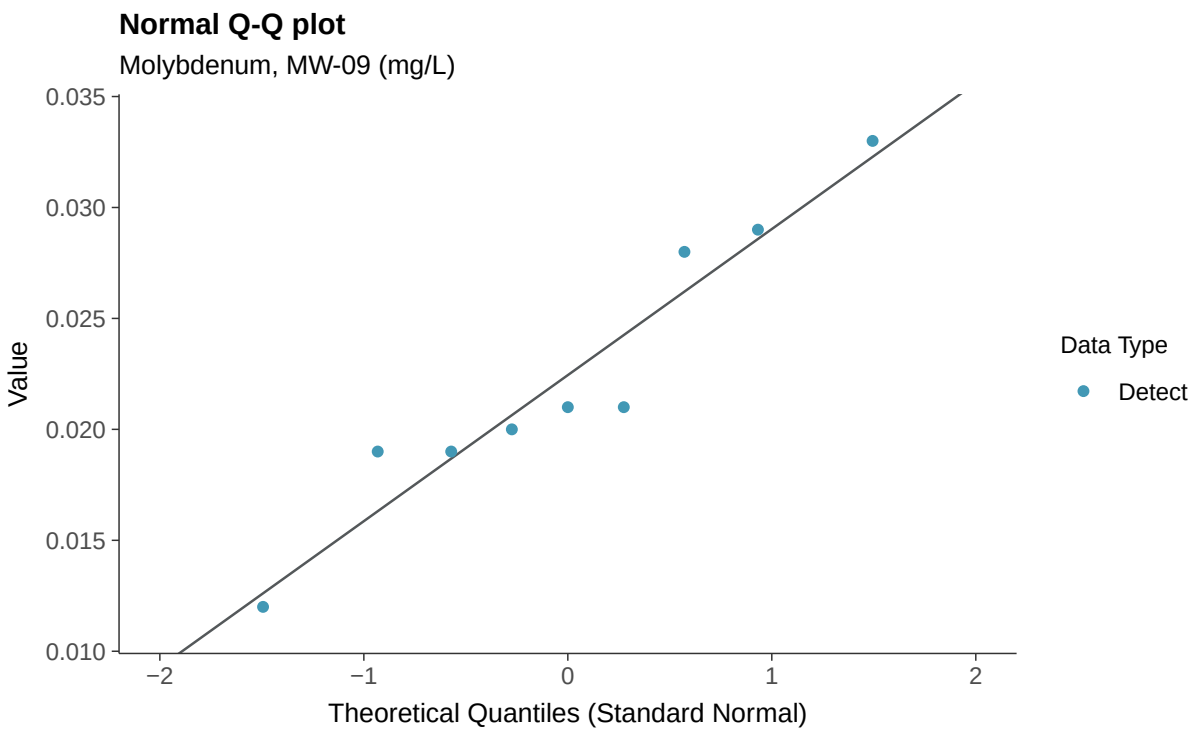
Molybdenum, MW-09 (mg/L)

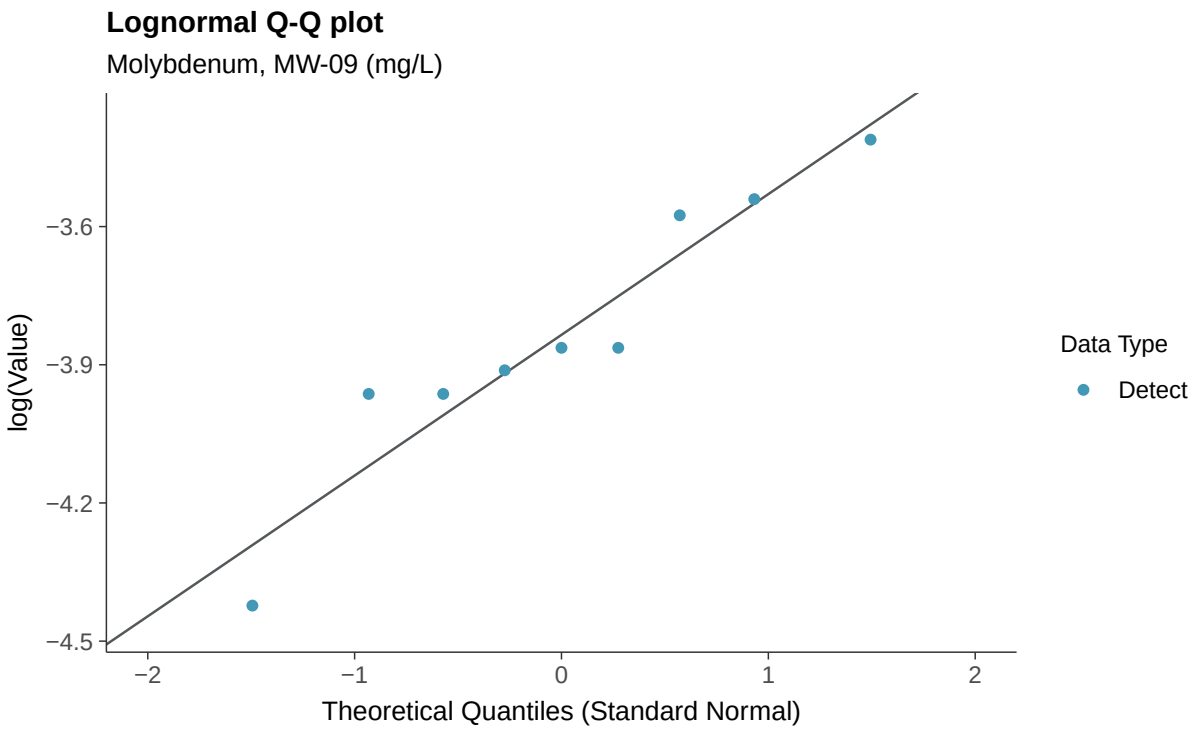


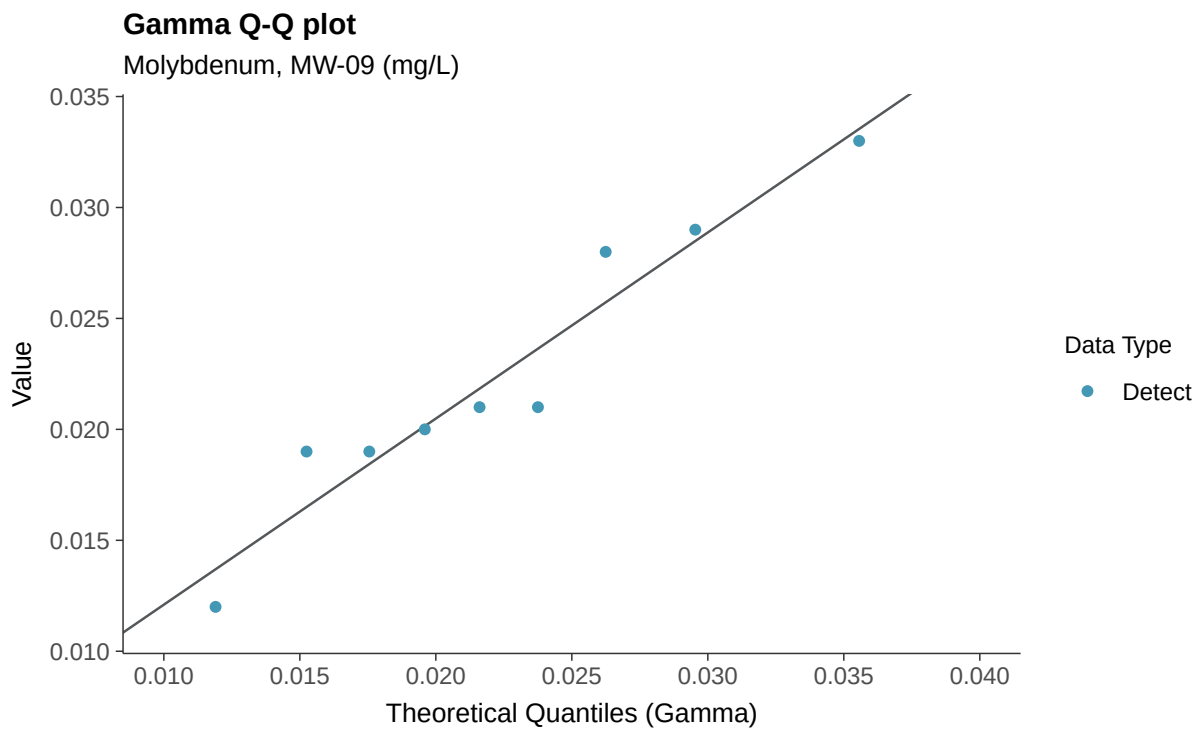
Boxplot by Season

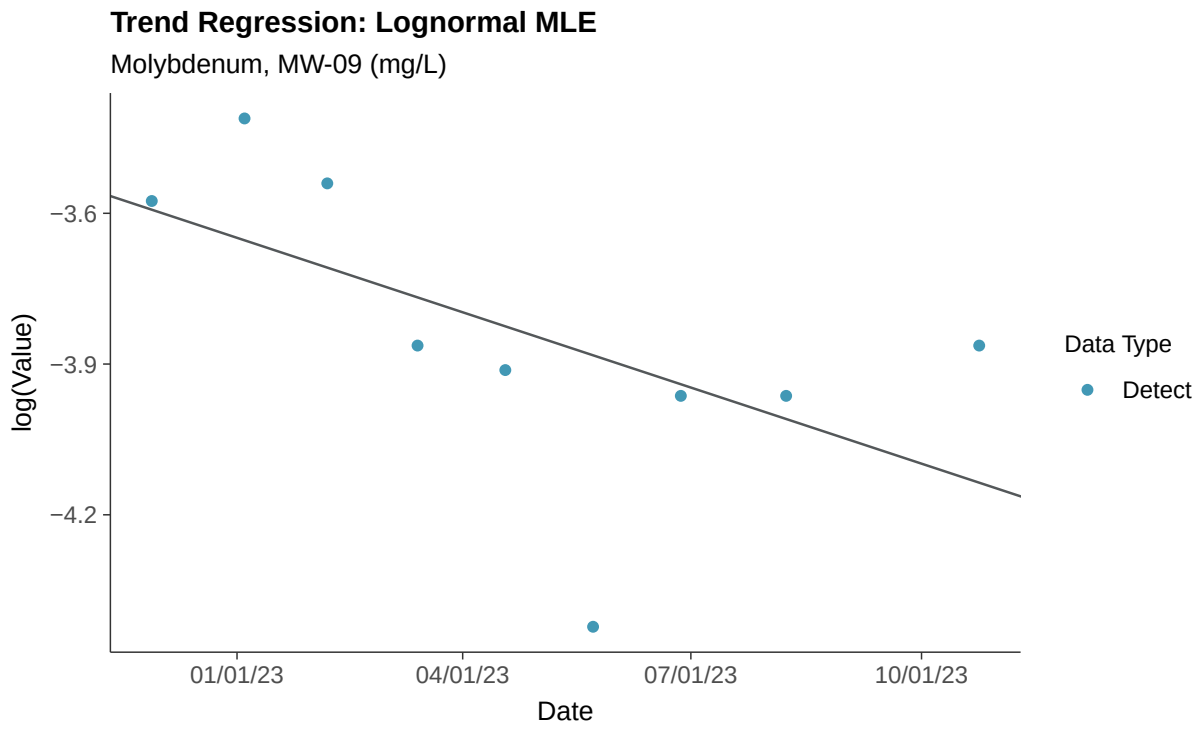
Molybdenum, MW-09 (mg/L)

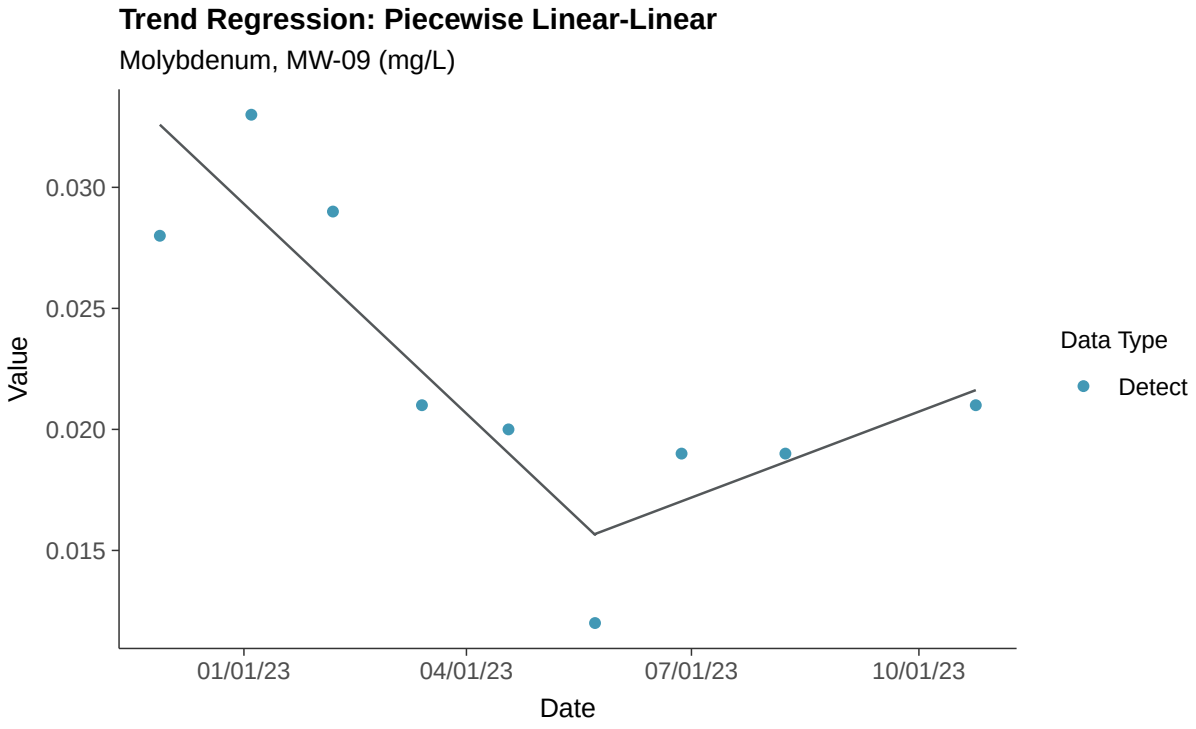



Normal Q-Q plot
Molybdenum, MW-09 (mg/L)
Value
0.035
0.030
0.025
0.020
0.015
0.010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Molybdenum, MW-09 (mg/L)
log(Value)
−3.6
−3.9
−4.2
−4.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

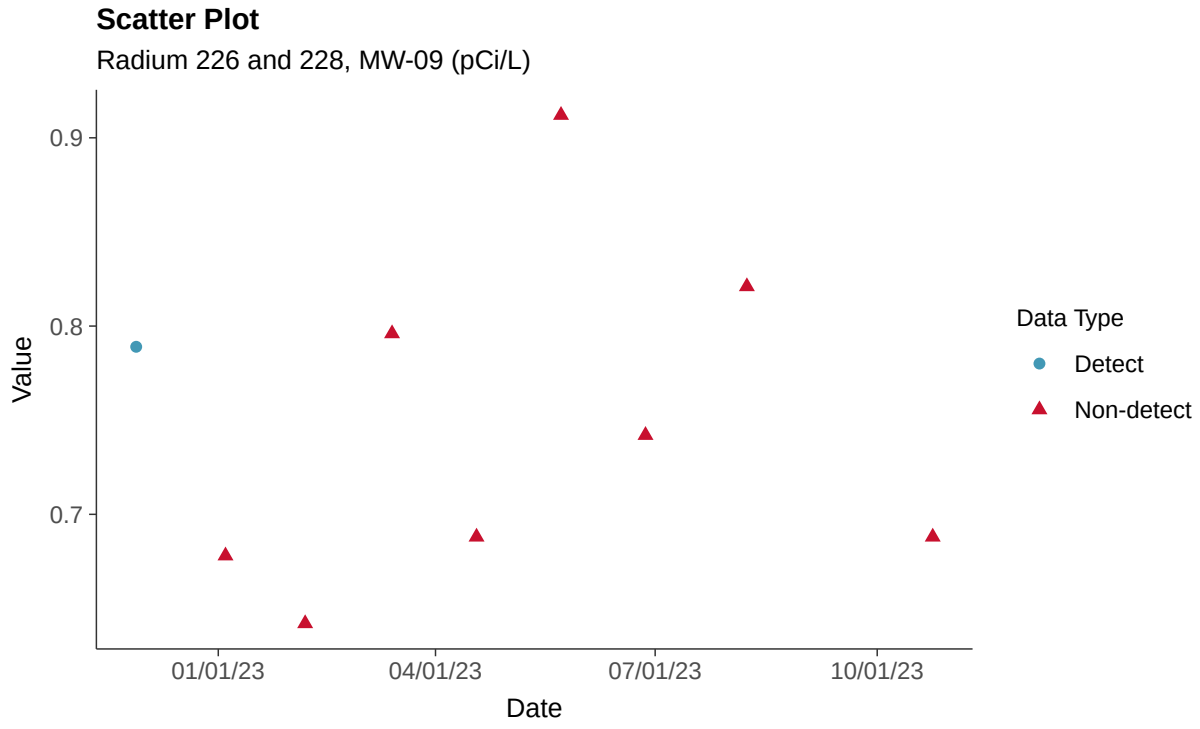

Gamma Q-Q plot
Molybdenum, MW-09 (mg/L)
Value
0.035
0.030
0.025
0.020
0.015
0.010
0.010
0.015
0.020
0.025
0.030
0.035
0.040
Theoretical Quantiles (Gamma)
Data Type
Detect

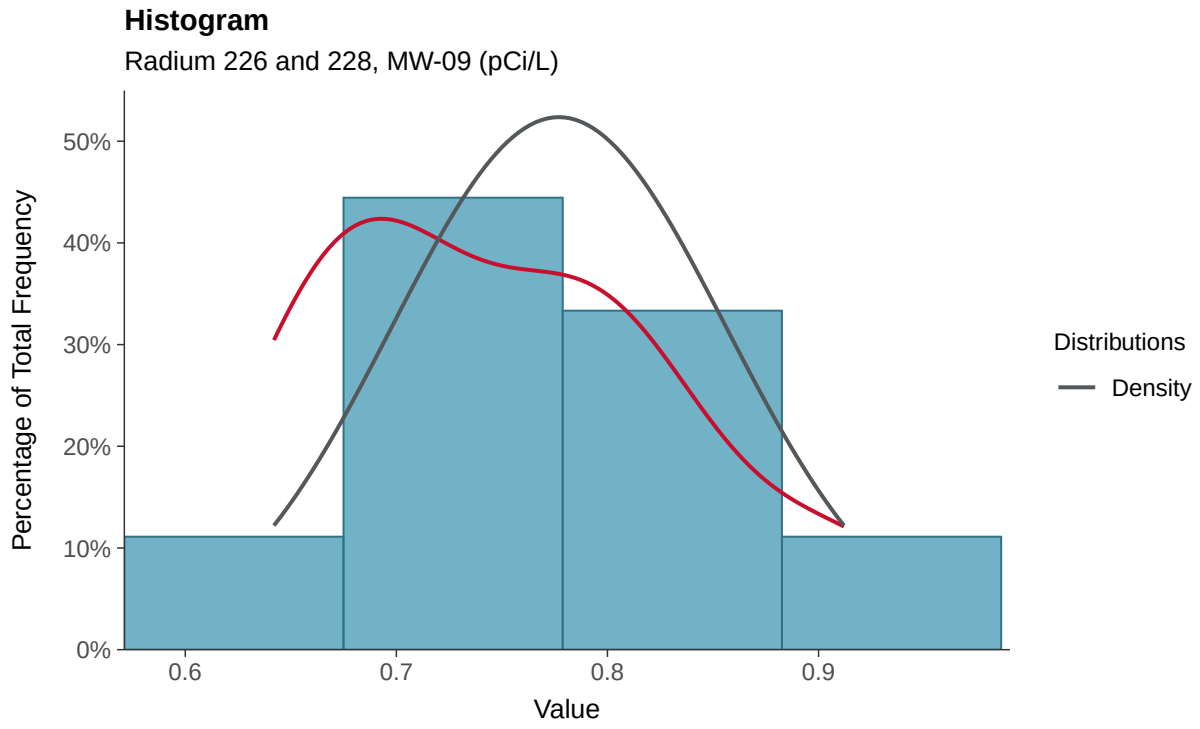

Trend Regression: Lognormal MLE
Molybdenum, MW-09 (mg/L)
log(Value)
−3.6
−3.9
−4.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-09 (mg/L)
Value
0.030
0.025
0.020
0.015
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Radium 226 and 228, MW-09

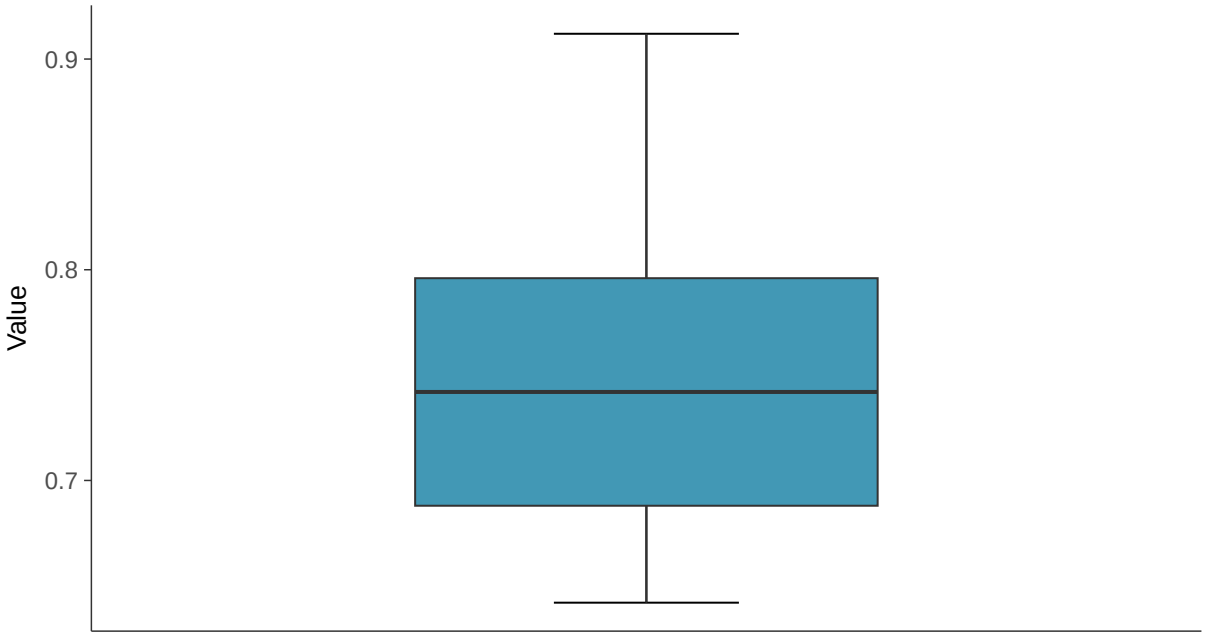
ID: 1_18_5_121





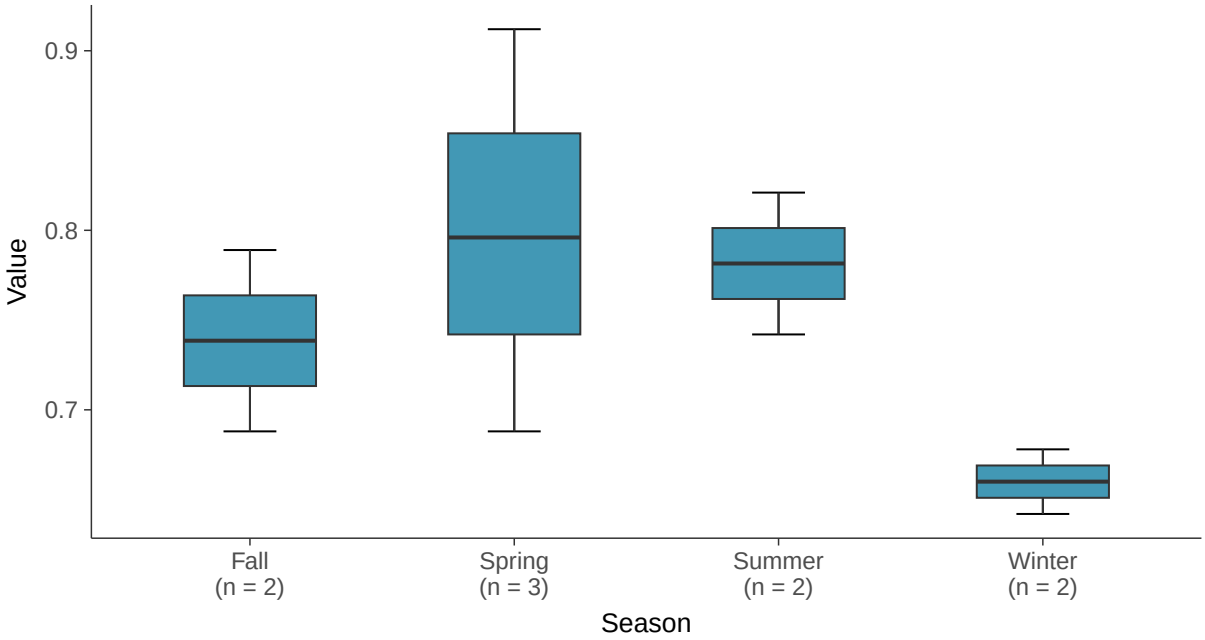
Boxplot

Radium 226 and 228, MW-09 (pCi/L)



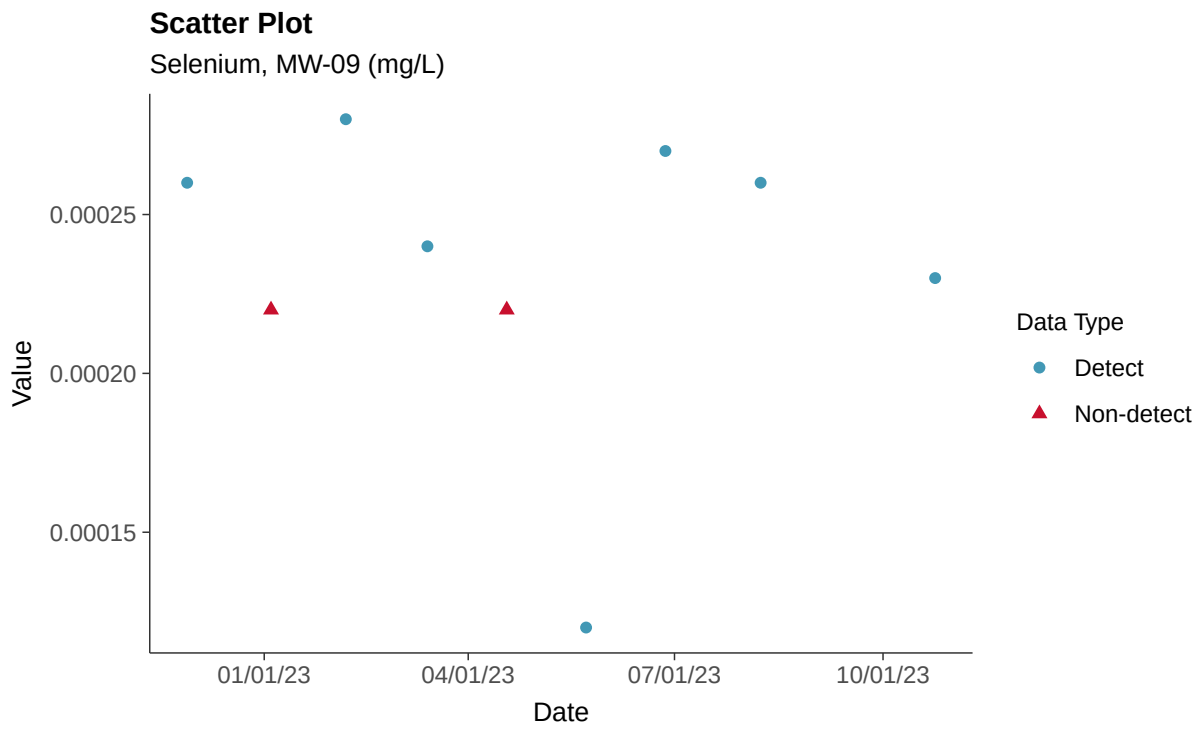
Boxplot by Season

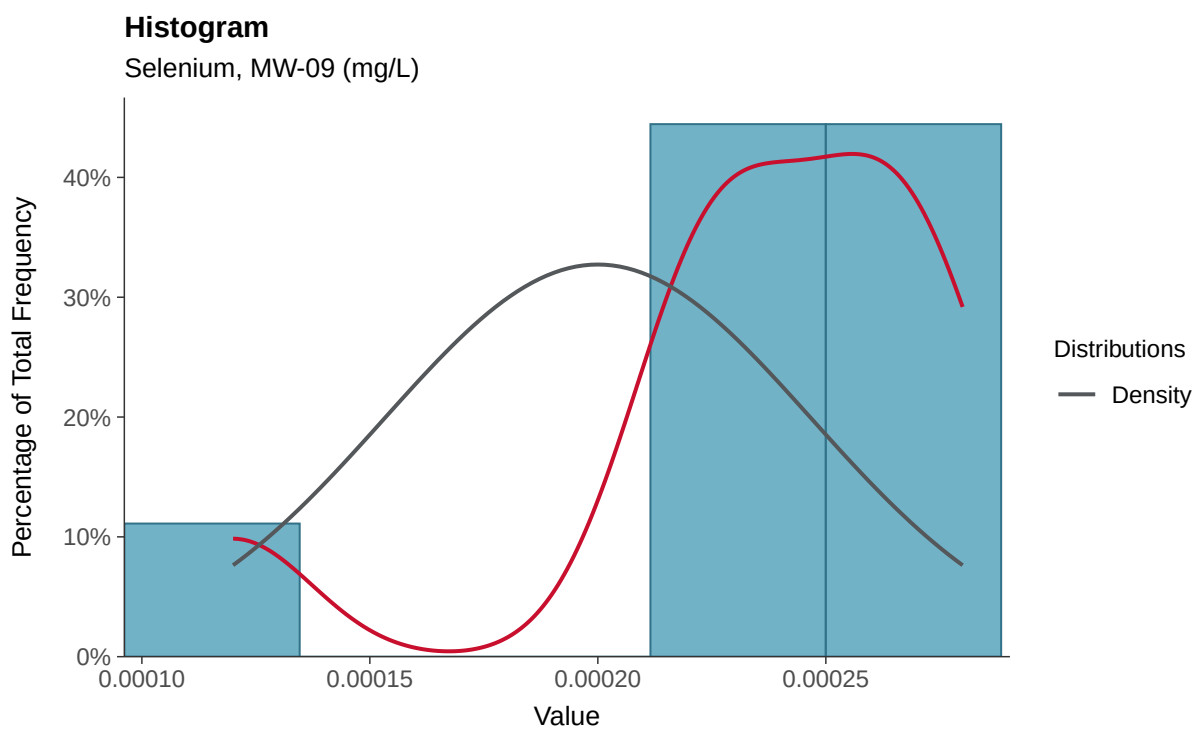
Radium 226 and 228, MW-09 (pCi/L)



Appendix IV: Selenium, MW-09

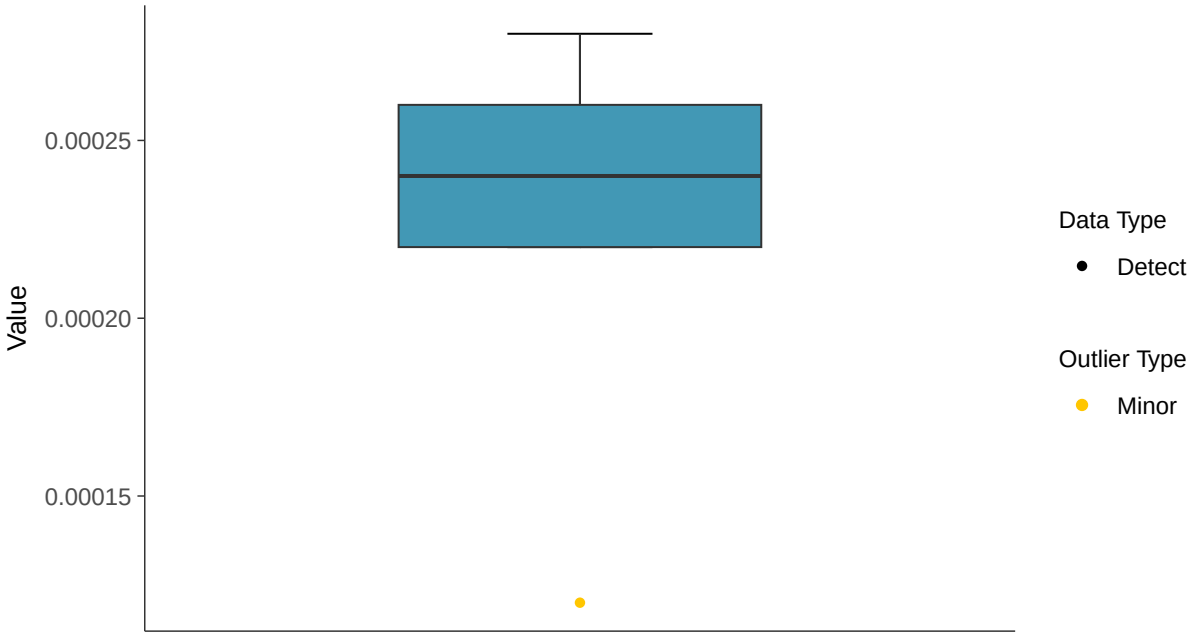
ID: 1_18_5_122





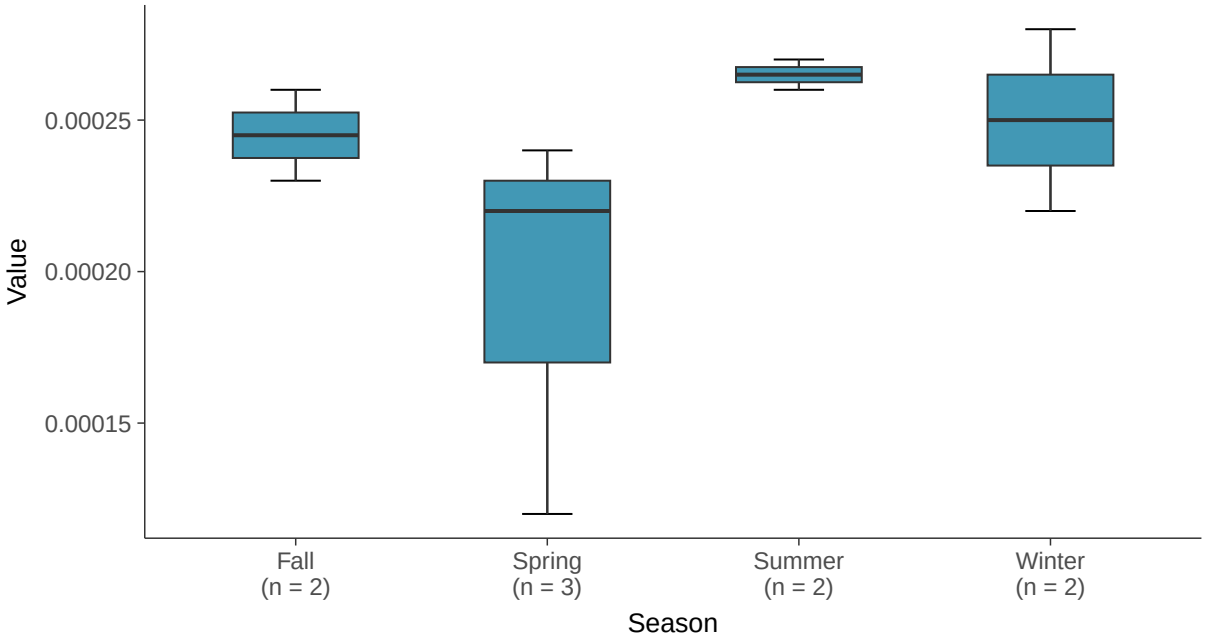
Boxplot

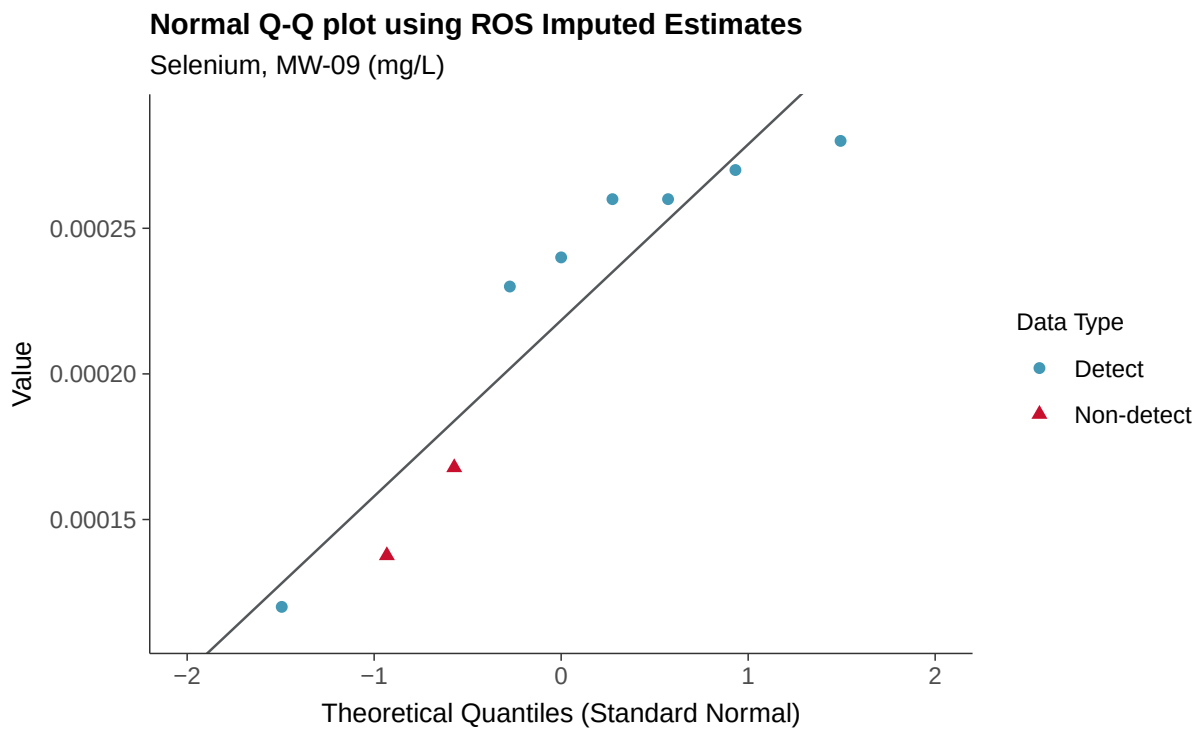
Selenium, MW-09 (mg/L)

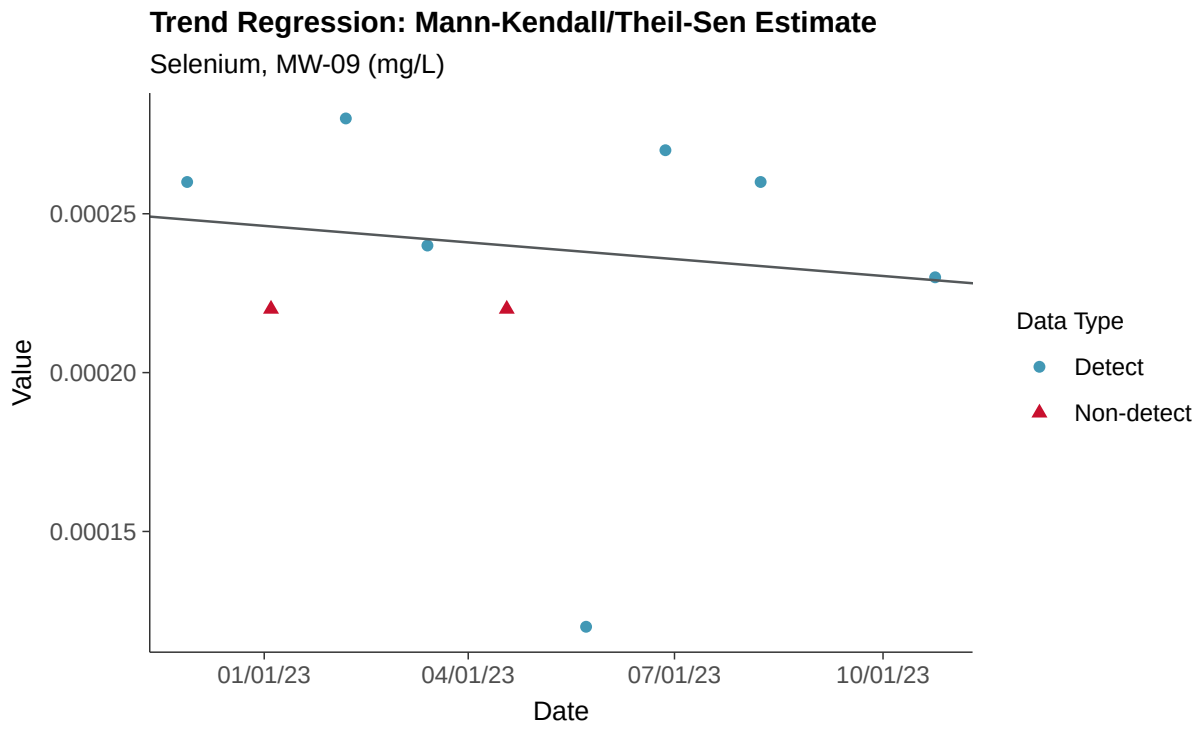


Boxplot by Season

Selenium, MW-09 (mg/L)

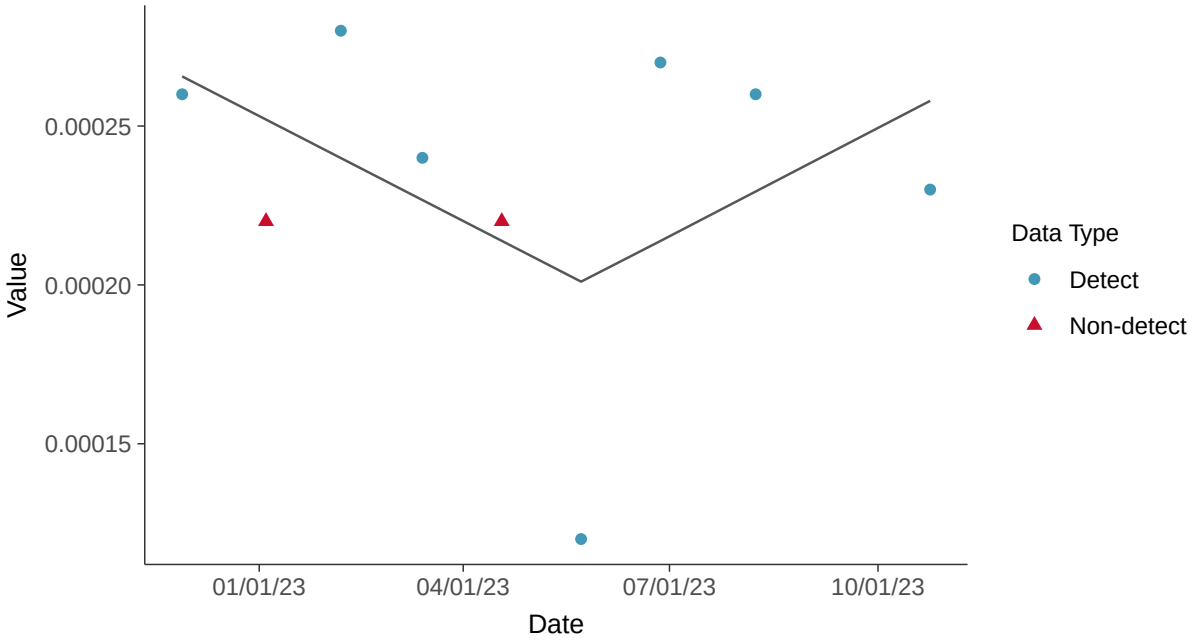



Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-09 (mg/L)
Value
0.00025
0.00020
0.00015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Selenium, MW-09 (mg/L)
Value
0.00025
0.00020
0.00015
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

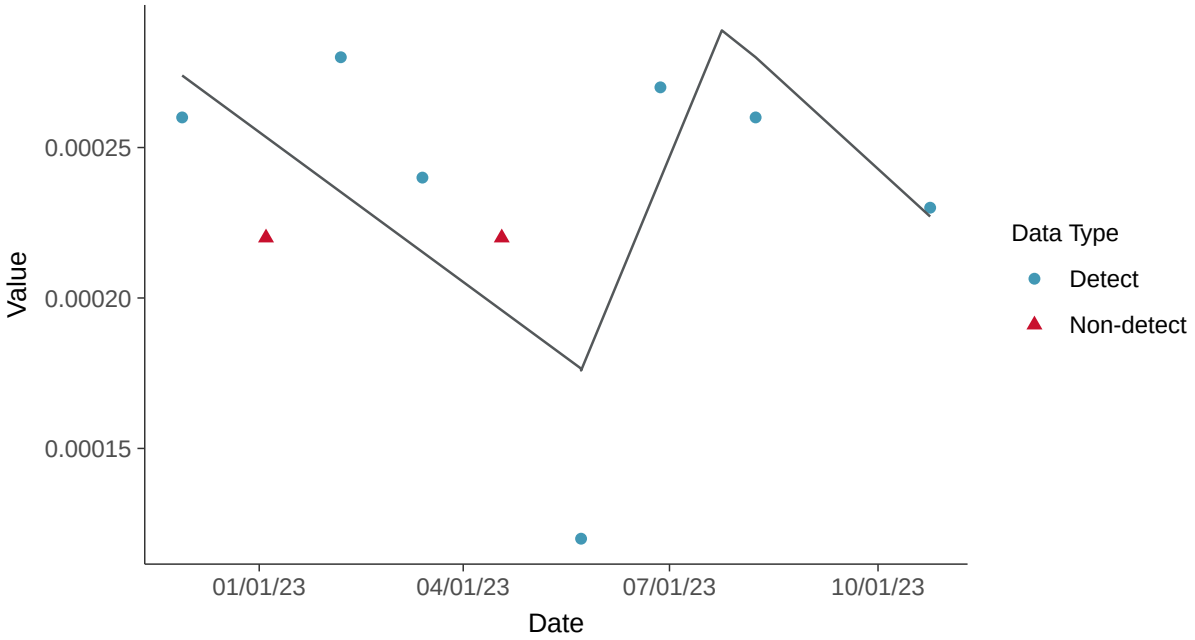
Trend Regression: Piecewise Linear-Linear

Selenium, MW-09 (mg/L)



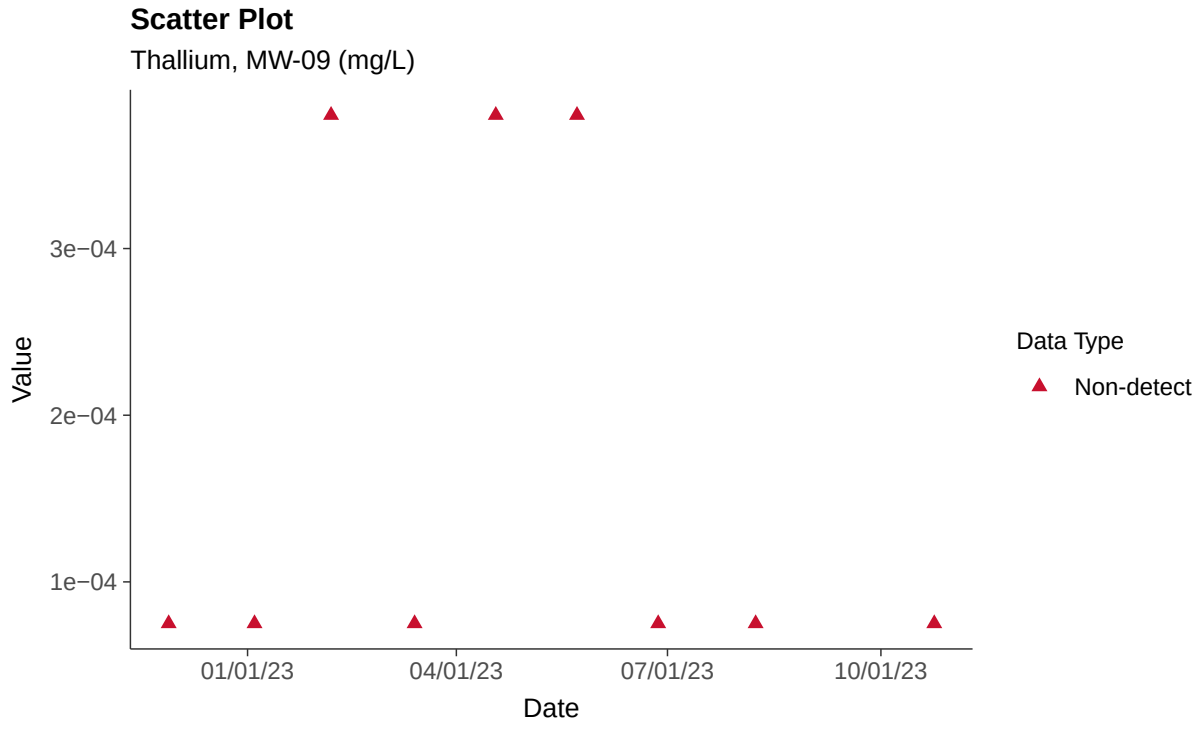
Trend Regression: Piecewise Linear-Linear-Linear

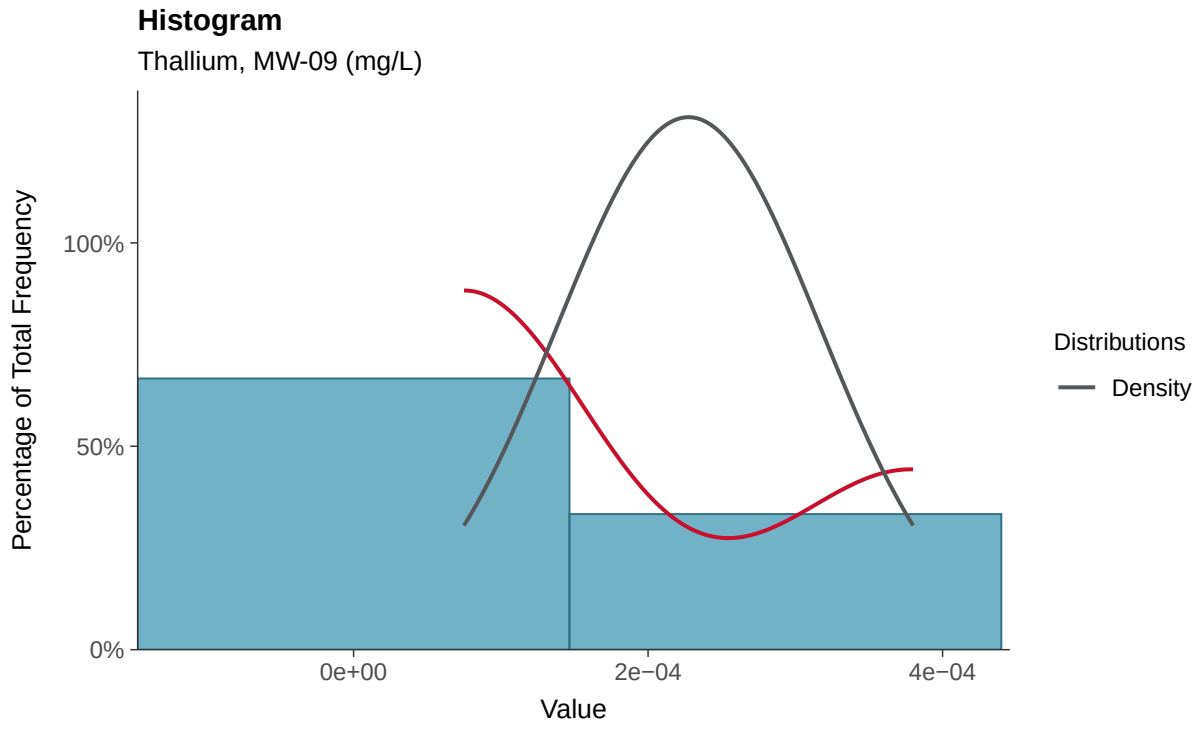
Selenium, MW-09 (mg/L)



Appendix IV: Thallium, MW-09

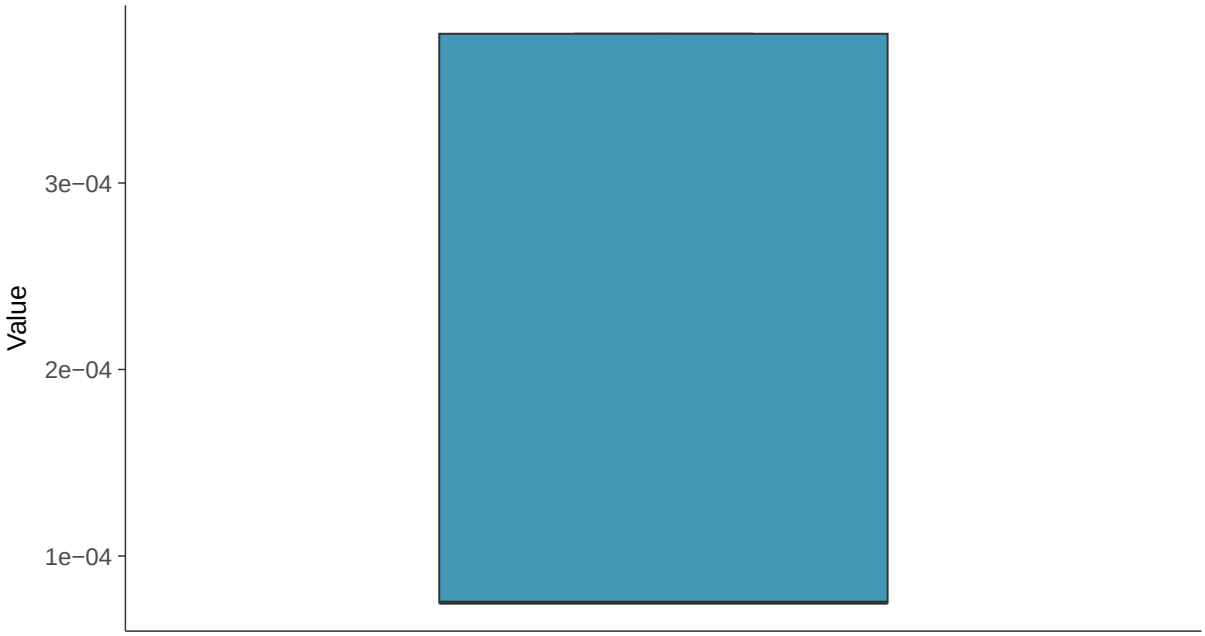
ID: 1_18_5_125





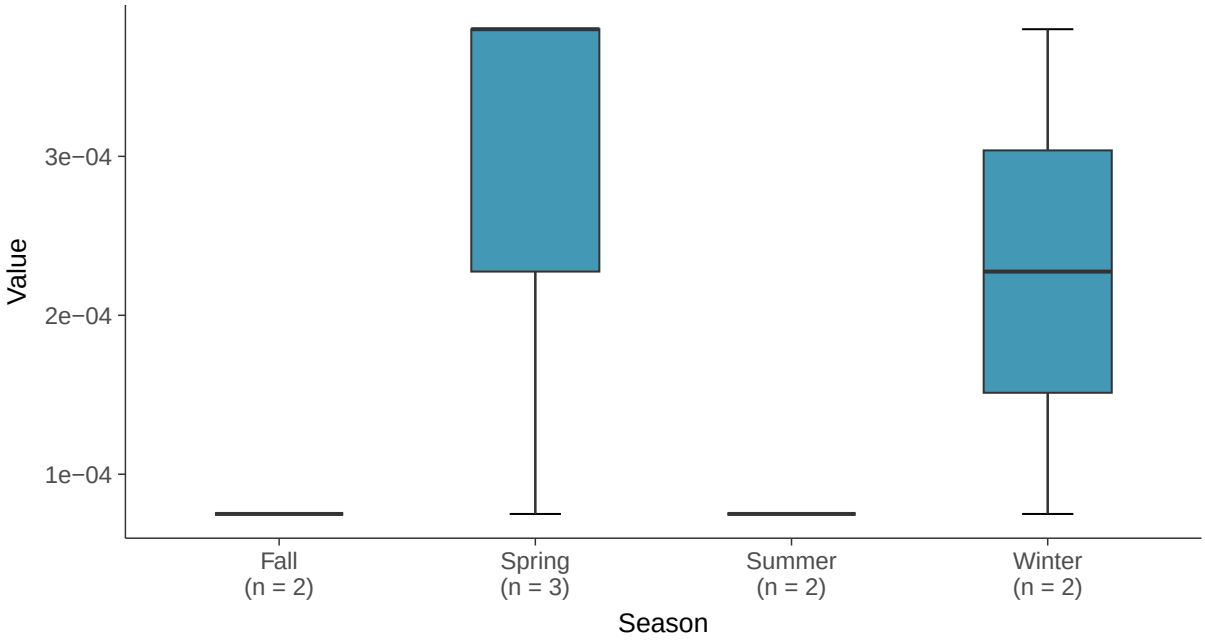
Boxplot

Thallium, MW-09 (mg/L)



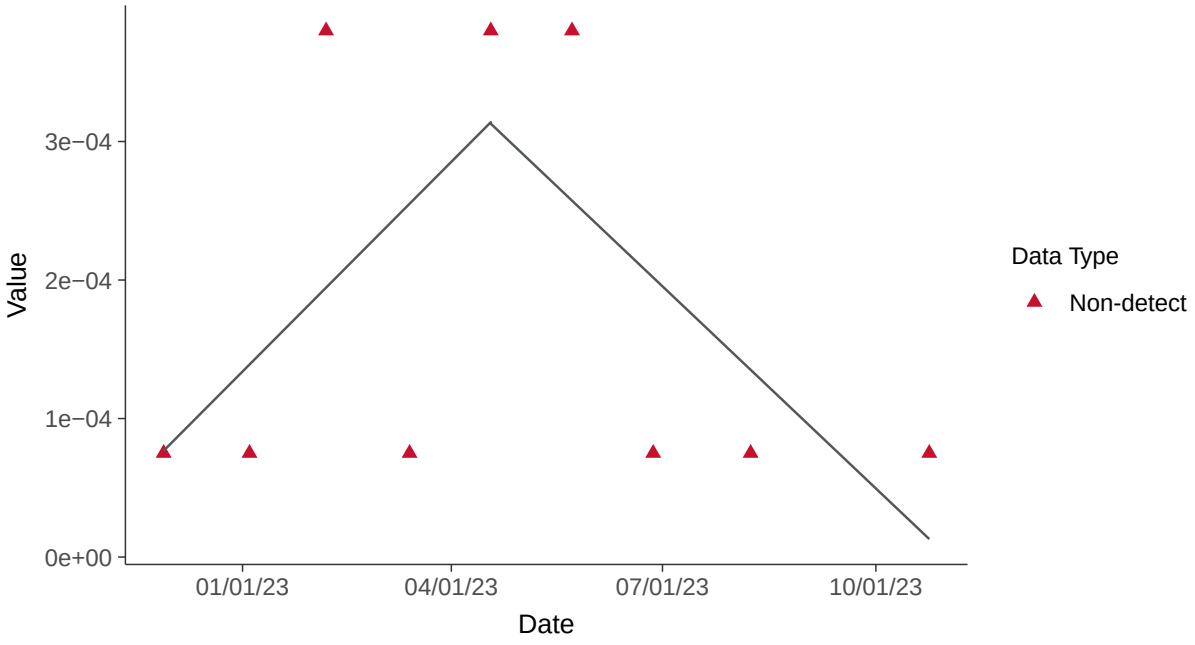
Boxplot by Season

Thallium, MW-09 (mg/L)



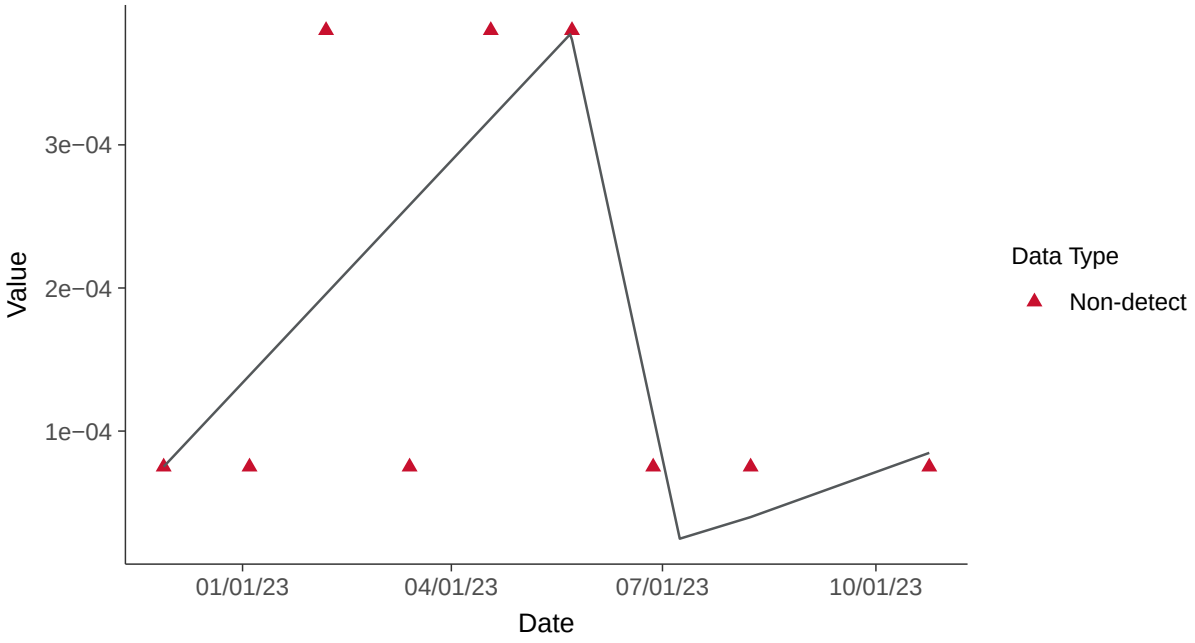
Trend Regression: Piecewise Linear-Linear

Thallium, MW-09 (mg/L)



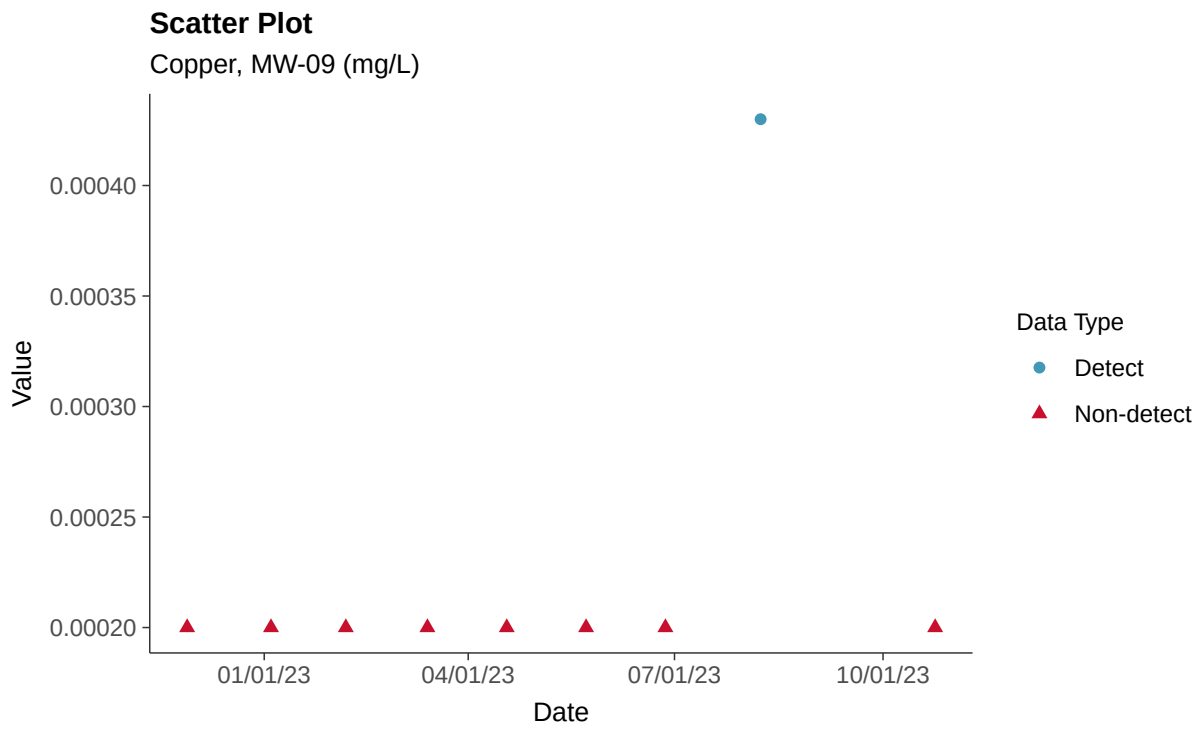
Trend Regression: Piecewise Linear-Linear-Linear

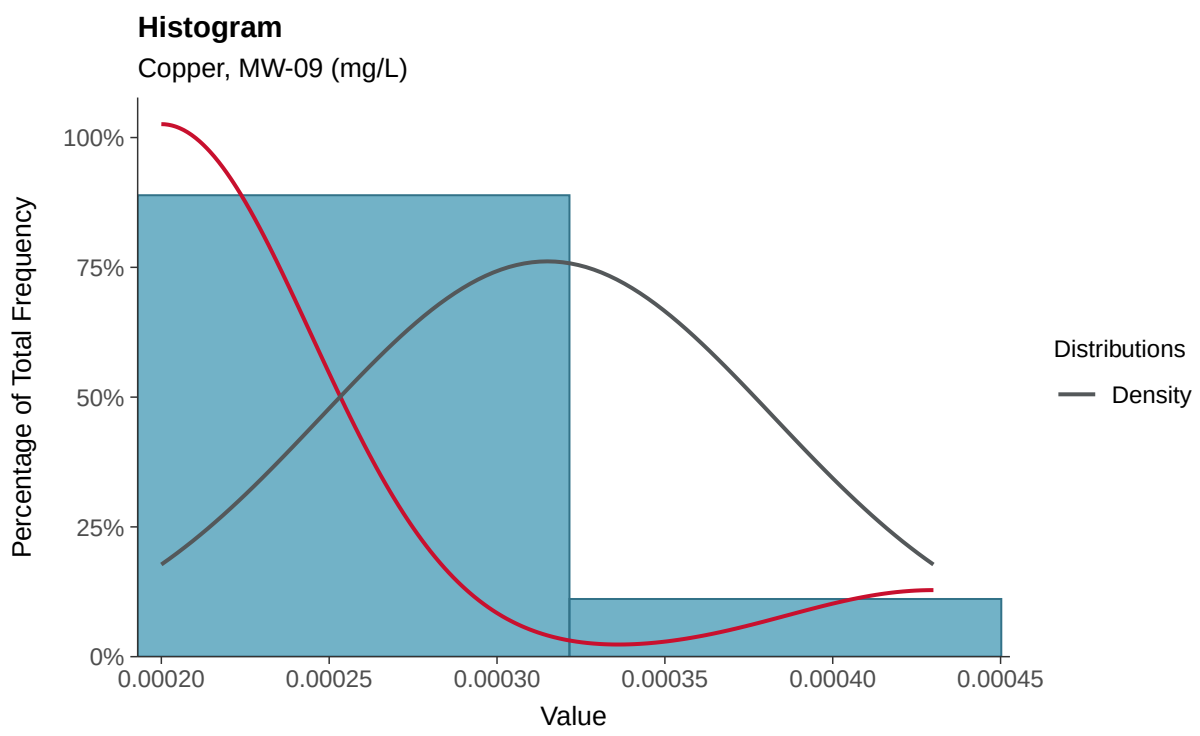
Thallium, MW-09 (mg/L)



Part 115: Copper, MW-09

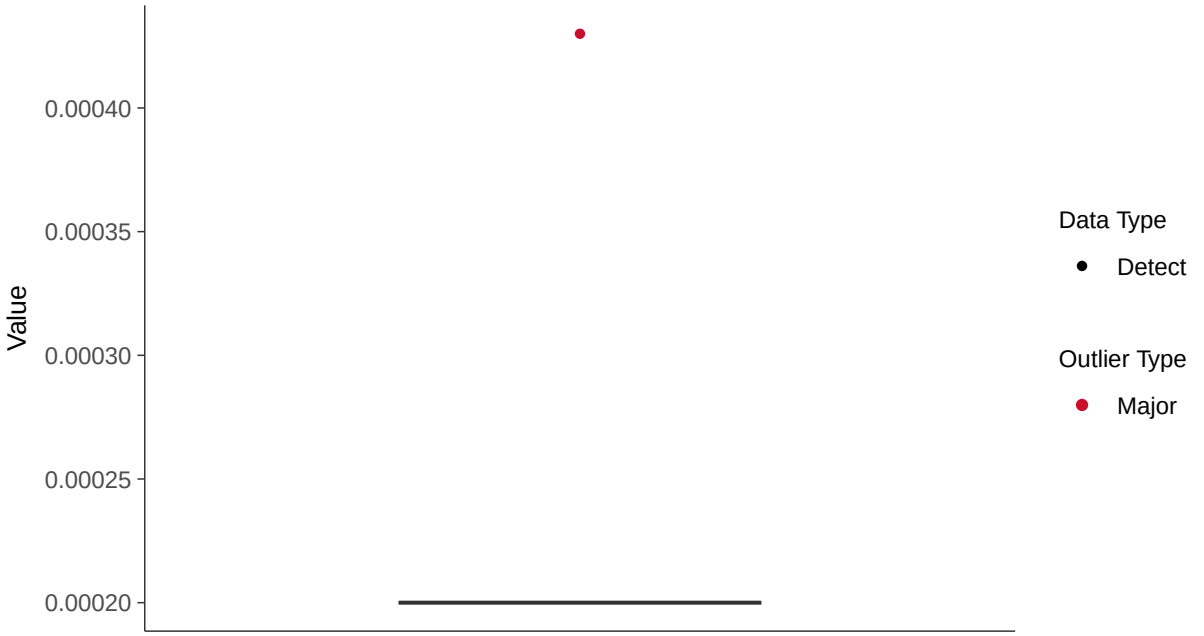
ID: 1_18_6_111





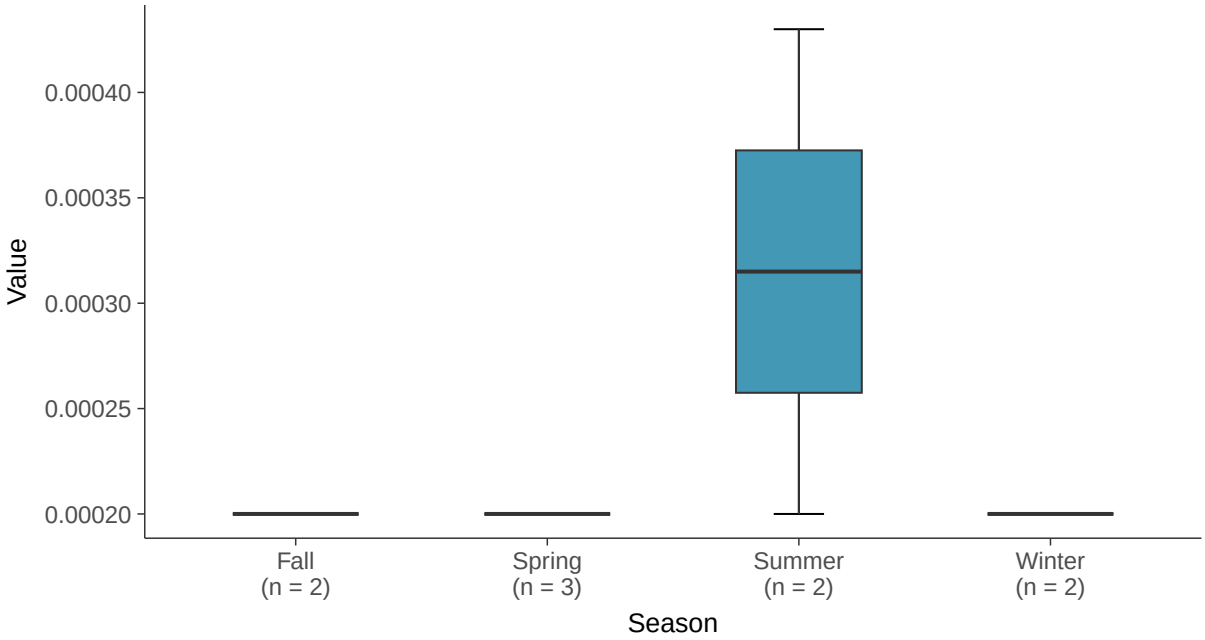
Boxplot

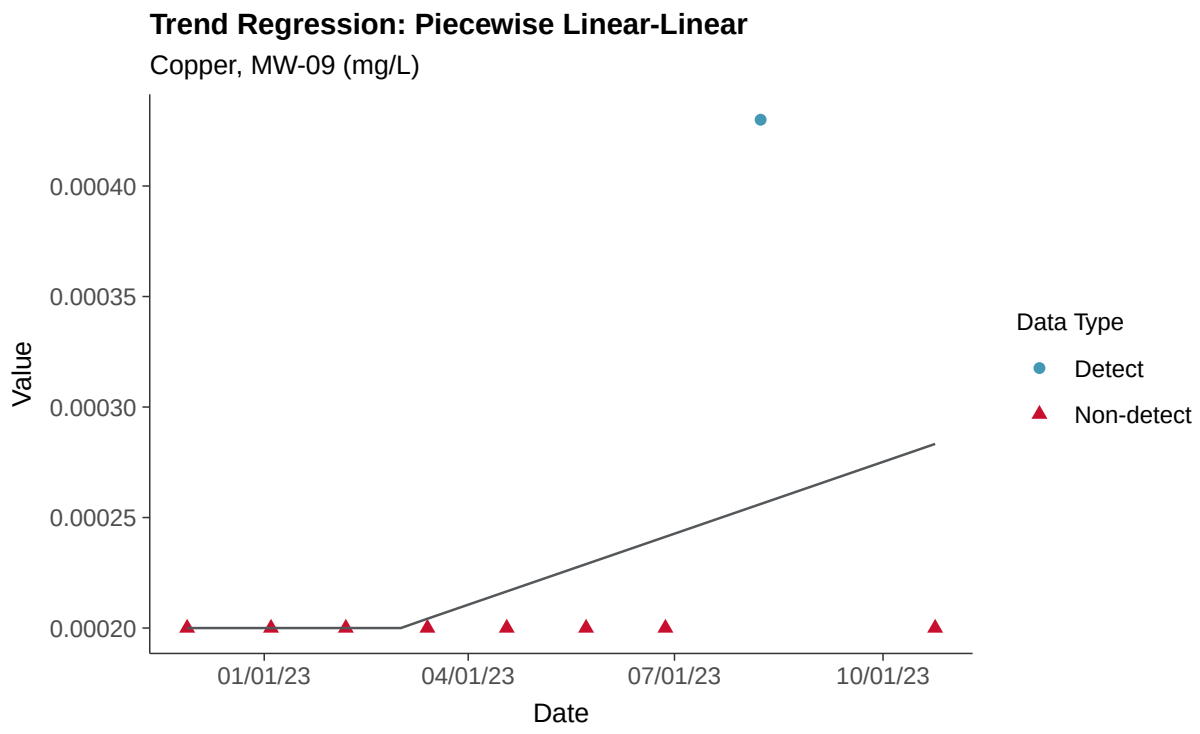
Copper, MW-09 (mg/L)

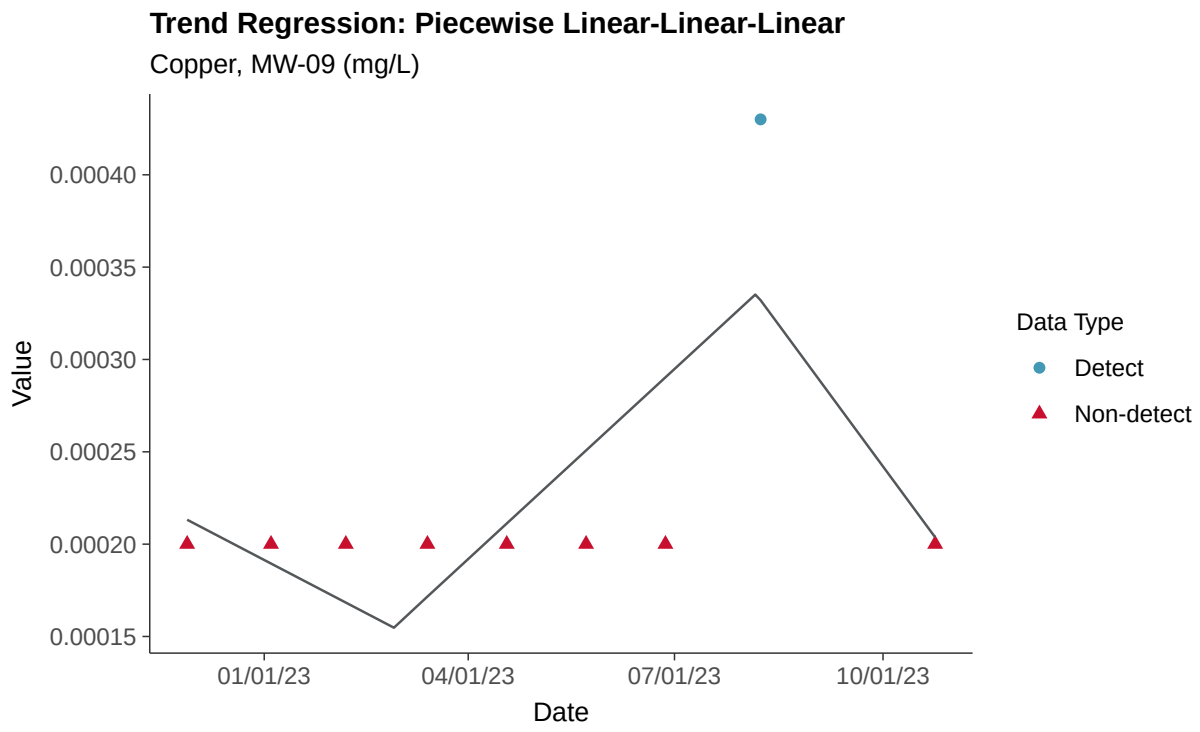


Boxplot by Season

Copper, MW-09 (mg/L)

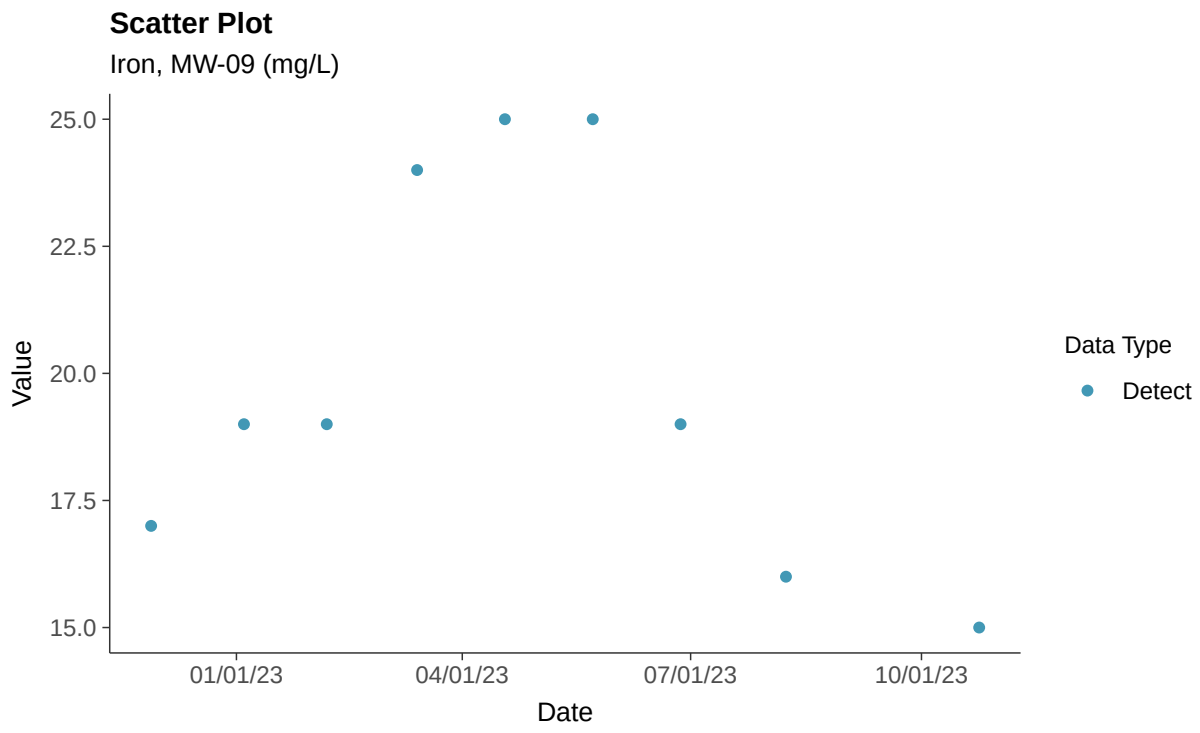


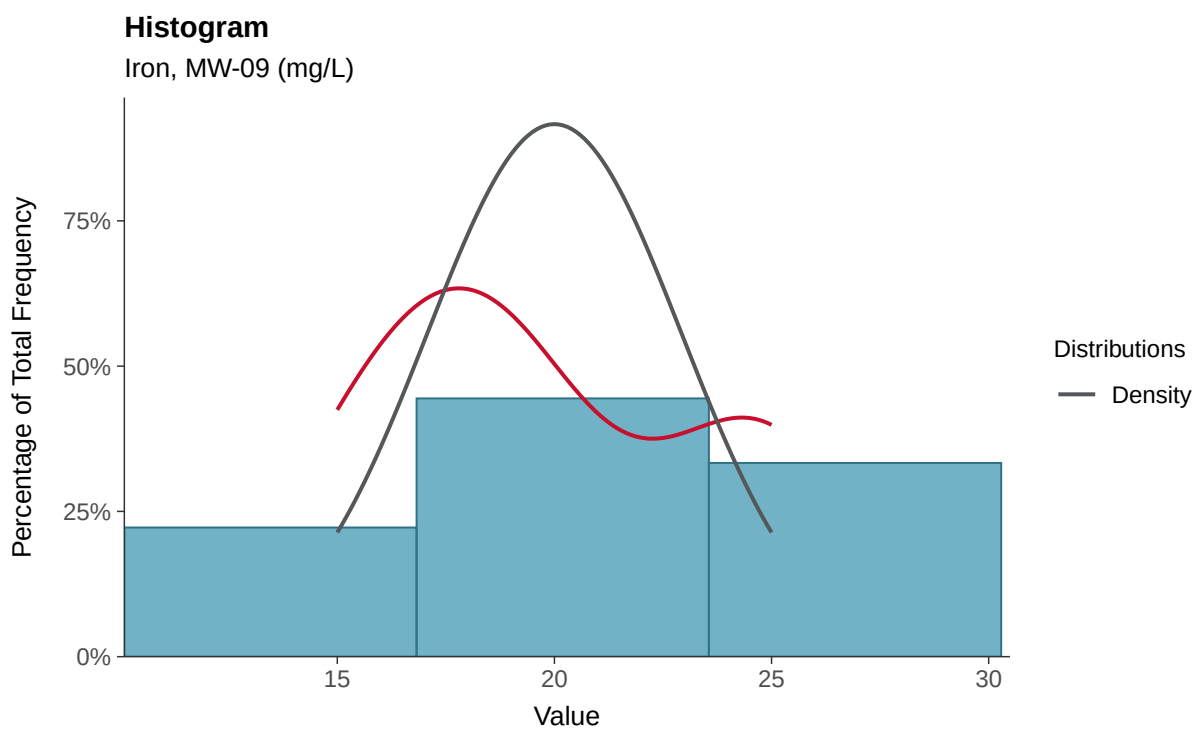

Trend Regression: Piecewise Linear-Linear
Copper, MW-09 (mg/L)
Value
0.00040
0.00035
0.00030
0.00025
0.00020
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Copper, MW-09 (mg/L)
Value
0.00040
0.00035
0.00030
0.00025
0.00020
0.00015
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-09

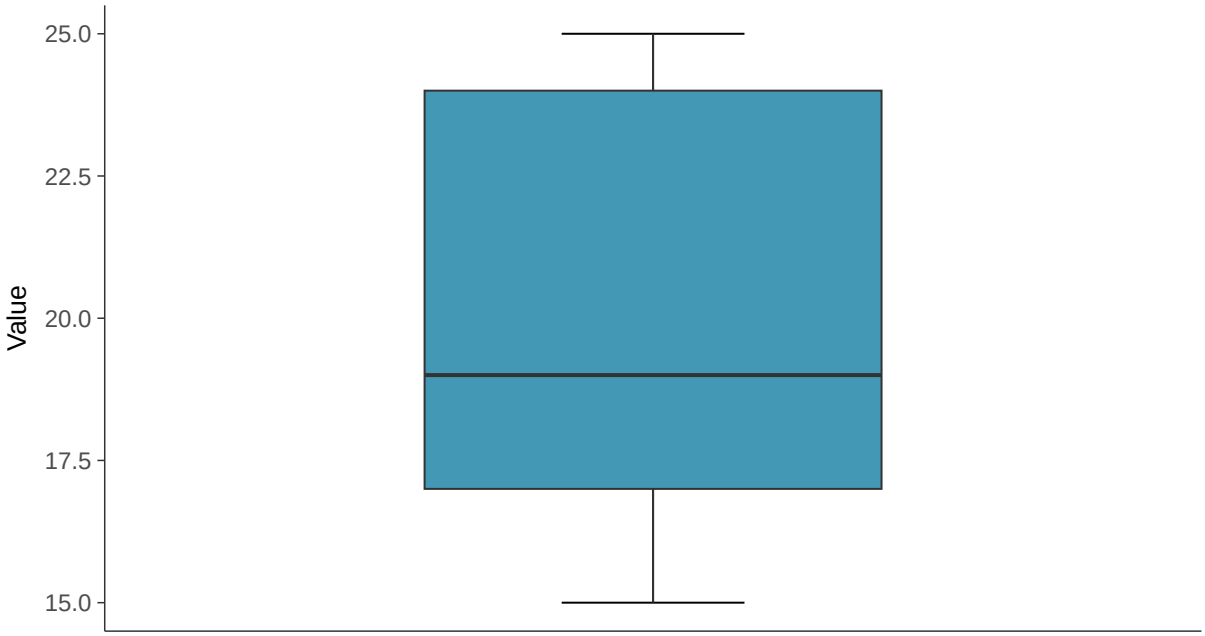
ID: 1_18_6_114





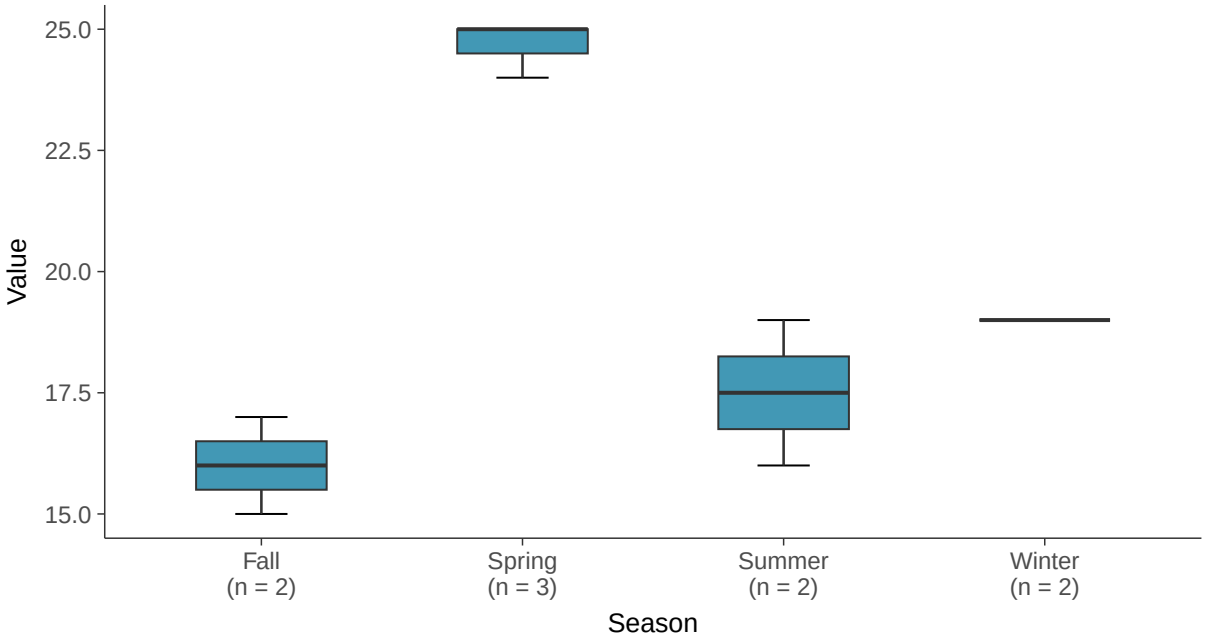
Boxplot

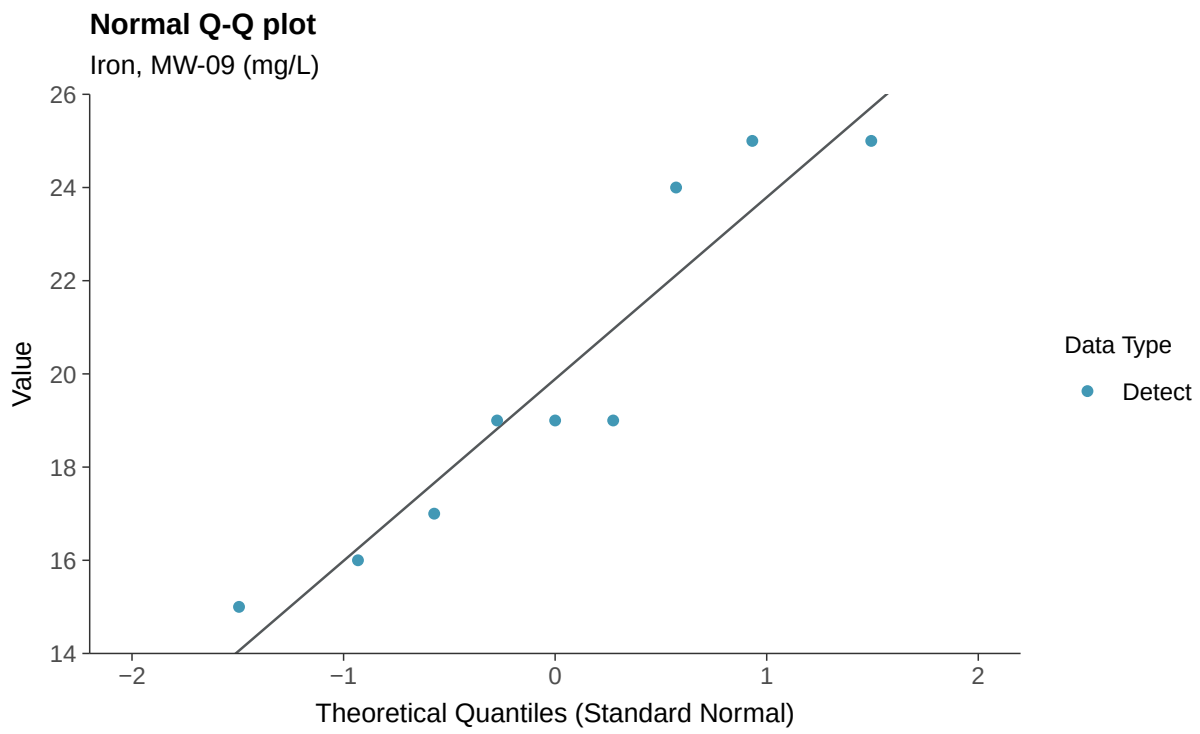
Iron, MW-09 (mg/L)

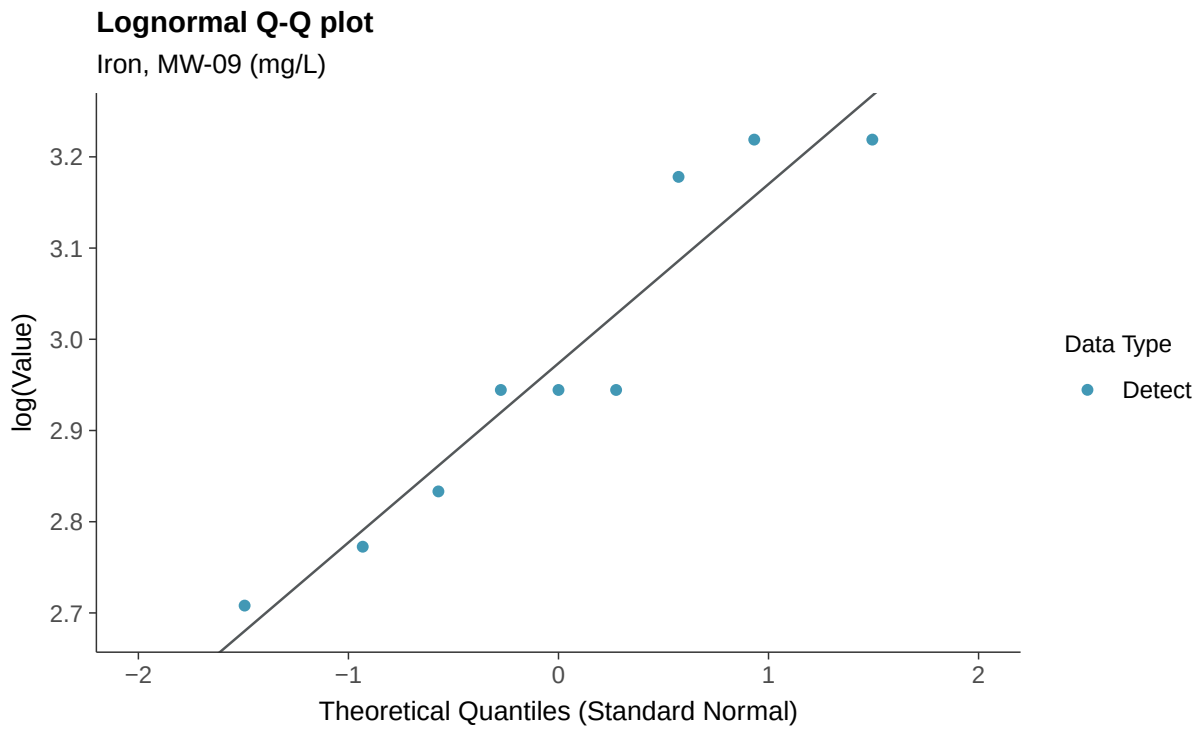


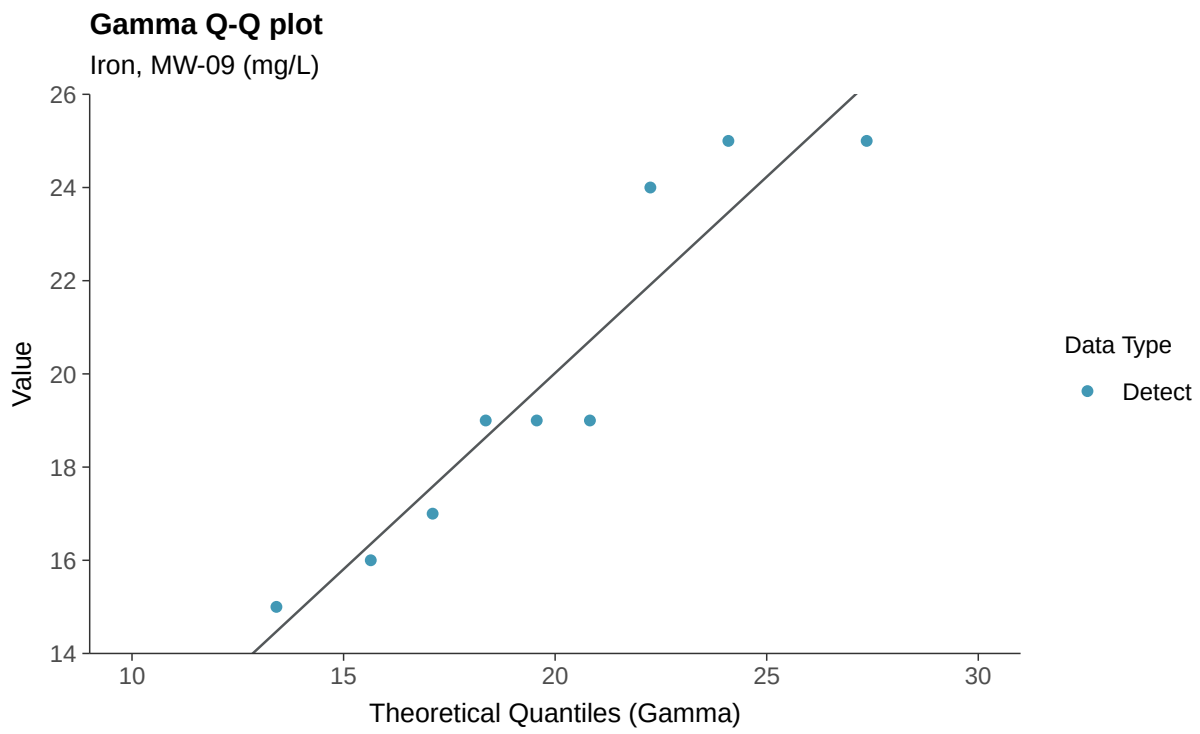
Boxplot by Season

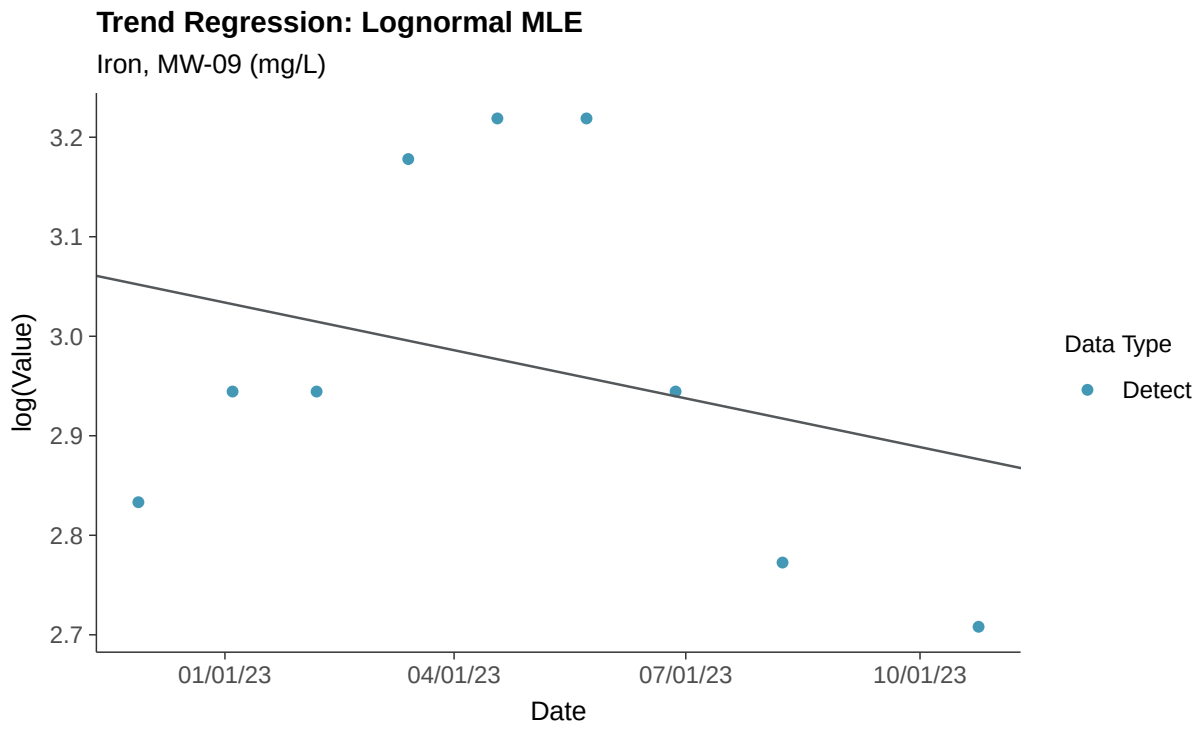
Iron, MW-09 (mg/L)

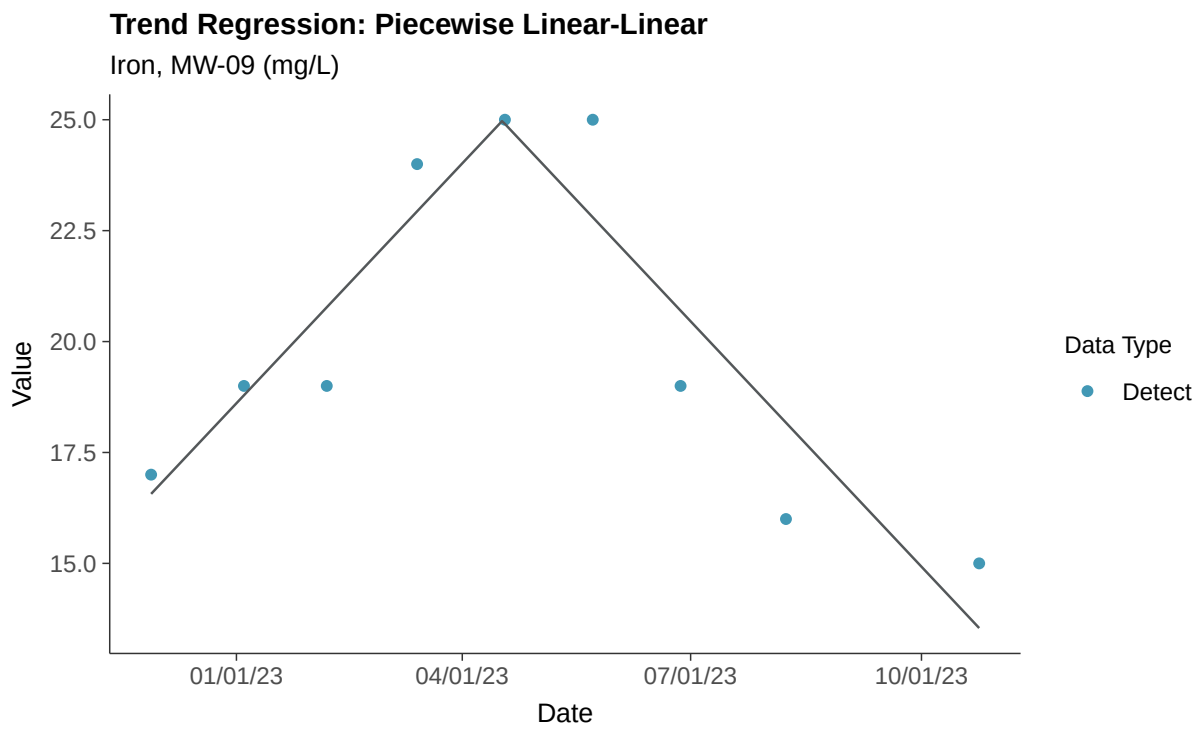


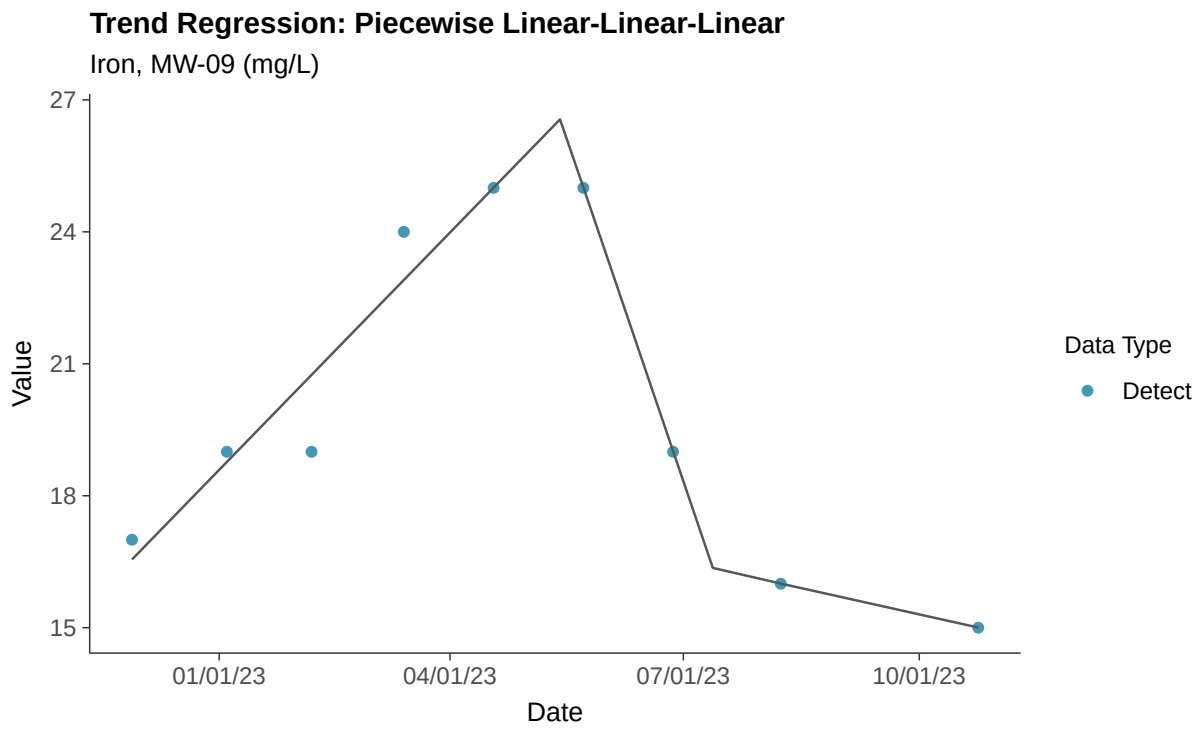

Normal Q-Q plot
Iron, MW-09 (mg/L)
Value
26
24
22
20
18
16
14
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-09 (mg/L)
log(Value)
3.2
3.1
3.0
2.9
2.8
2.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Iron, MW-09 (mg/L)
Value
26
24
22
20
18
16
14
10
15
20
25
30
Theoretical Quantiles (Gamma)
Data Type
Detect

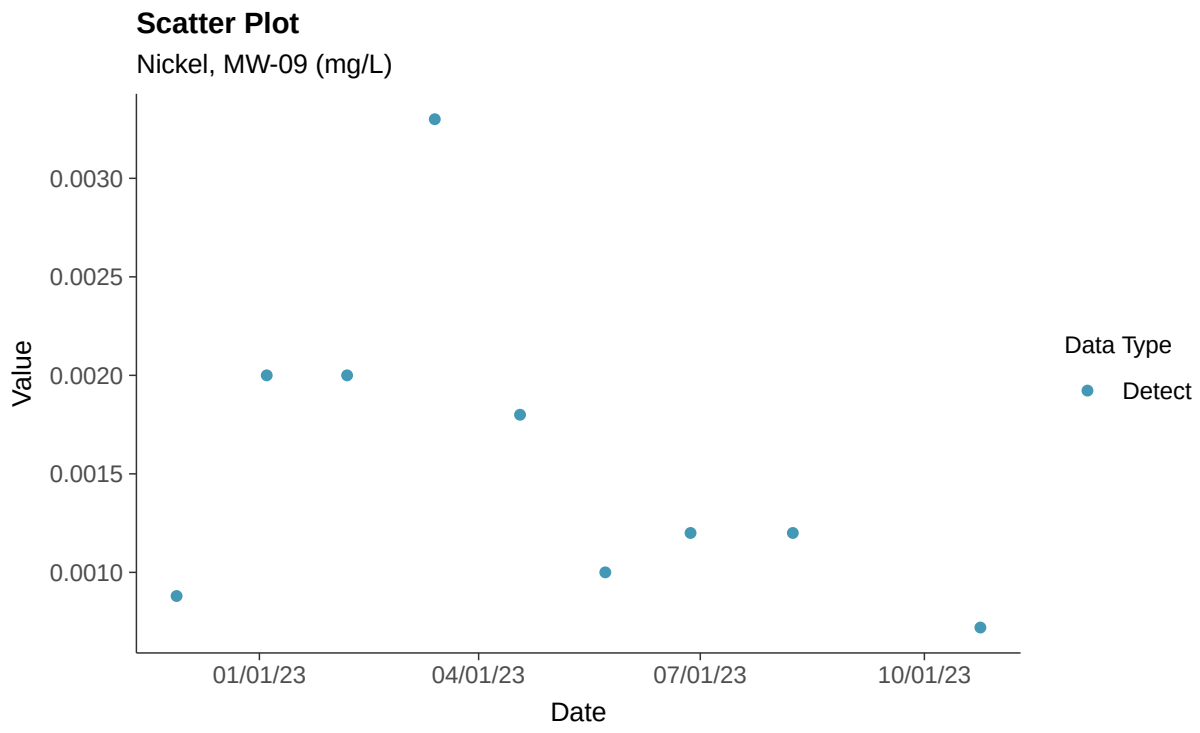

Trend Regression: Lognormal MLE
Iron, MW-09 (mg/L)
log(Value)
3.2
3.1
3.0
2.9
2.8
2.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

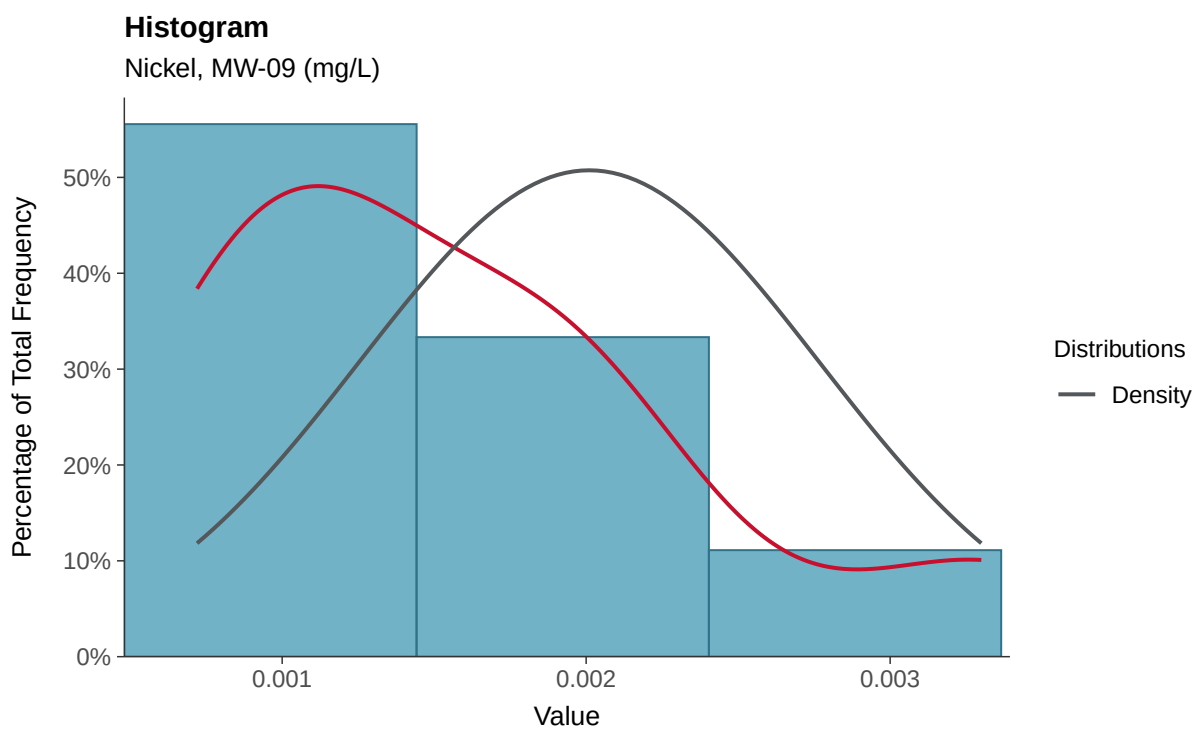

Trend Regression: Piecewise Linear-Linear
Iron, MW-09 (mg/L)
25.0
22.5
20.0
17.5
15.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Iron, MW-09 (mg/L)
27
24
21
18
15
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-09

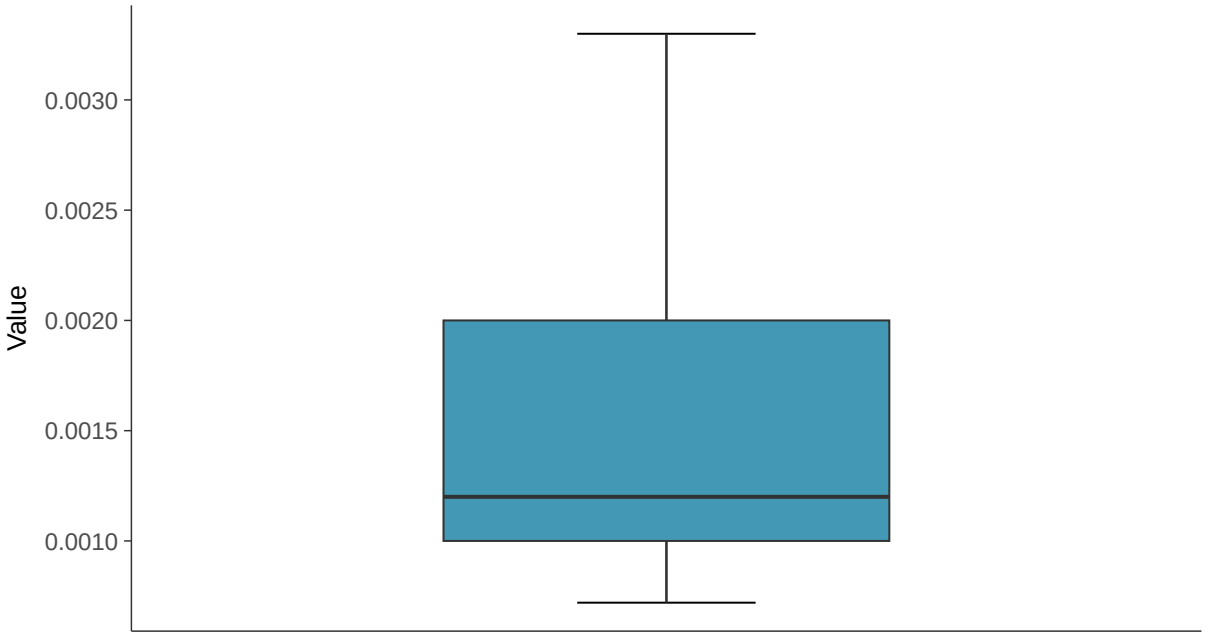
ID: 1_18_6_119





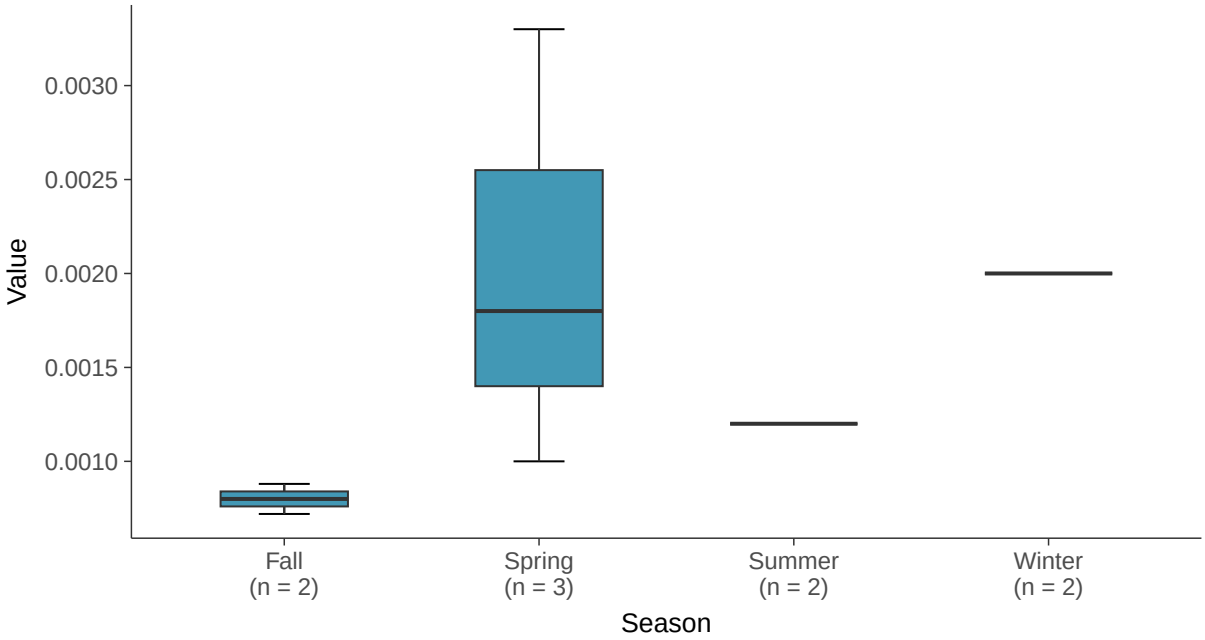
Boxplot

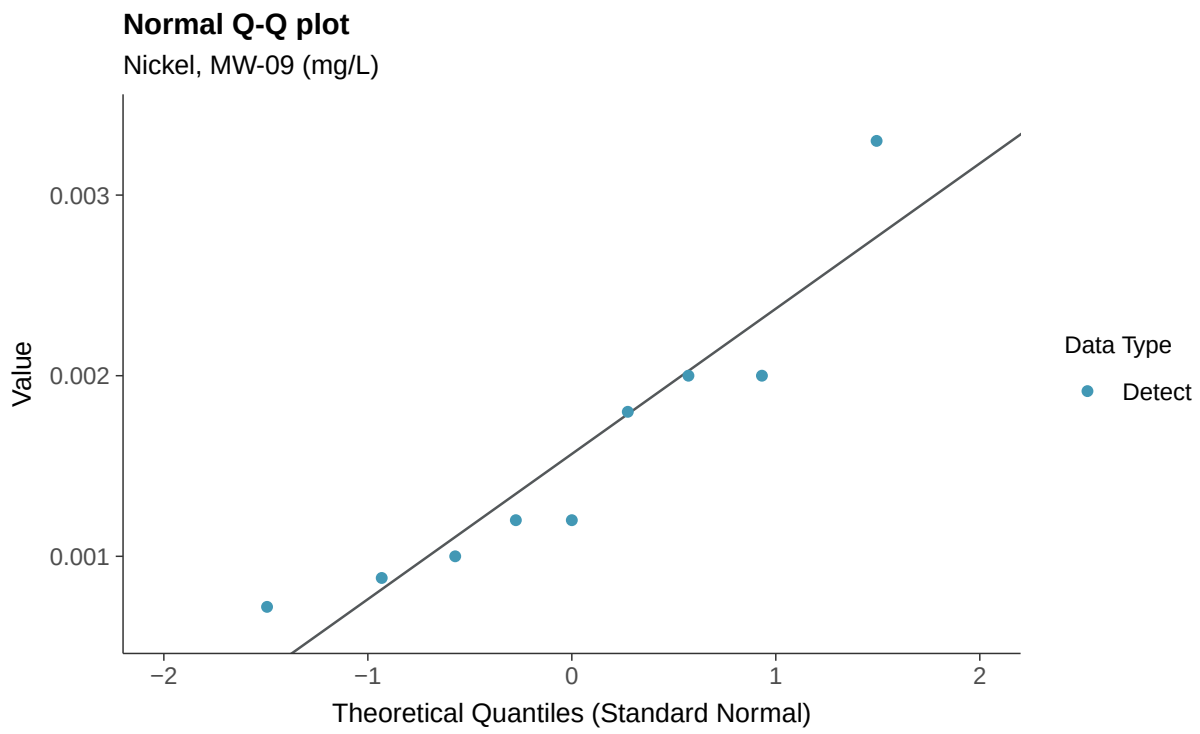
Nickel, MW-09 (mg/L)

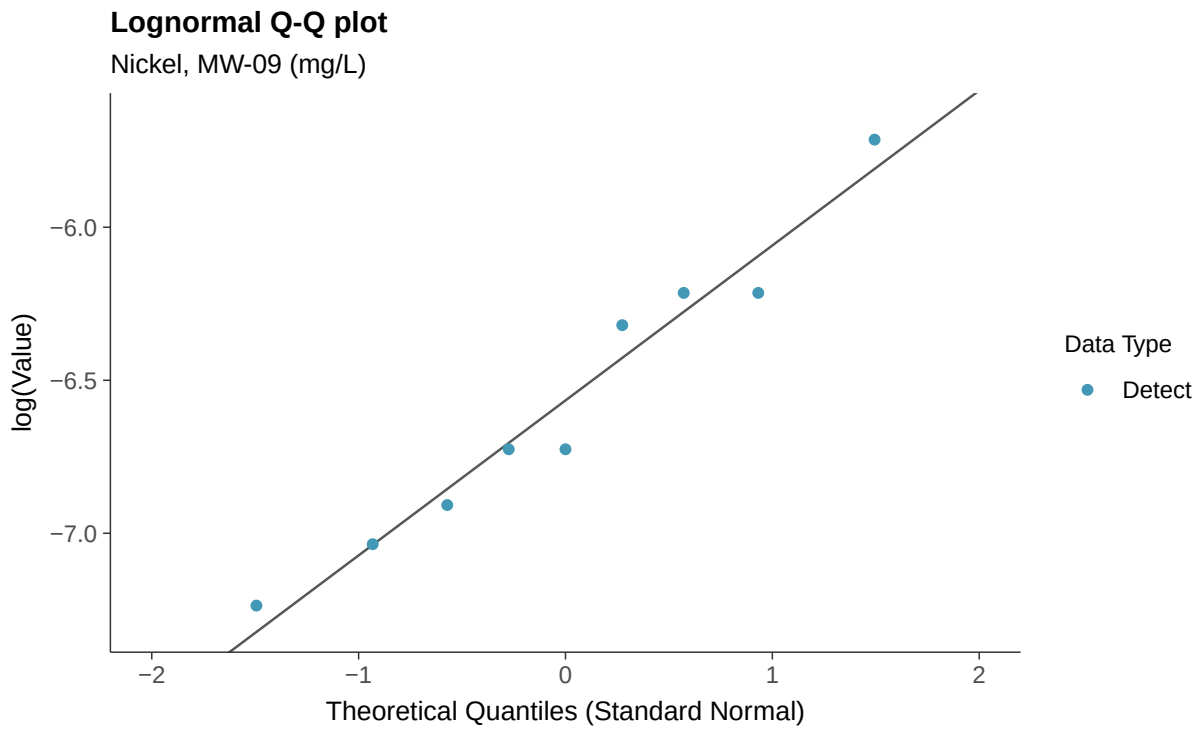


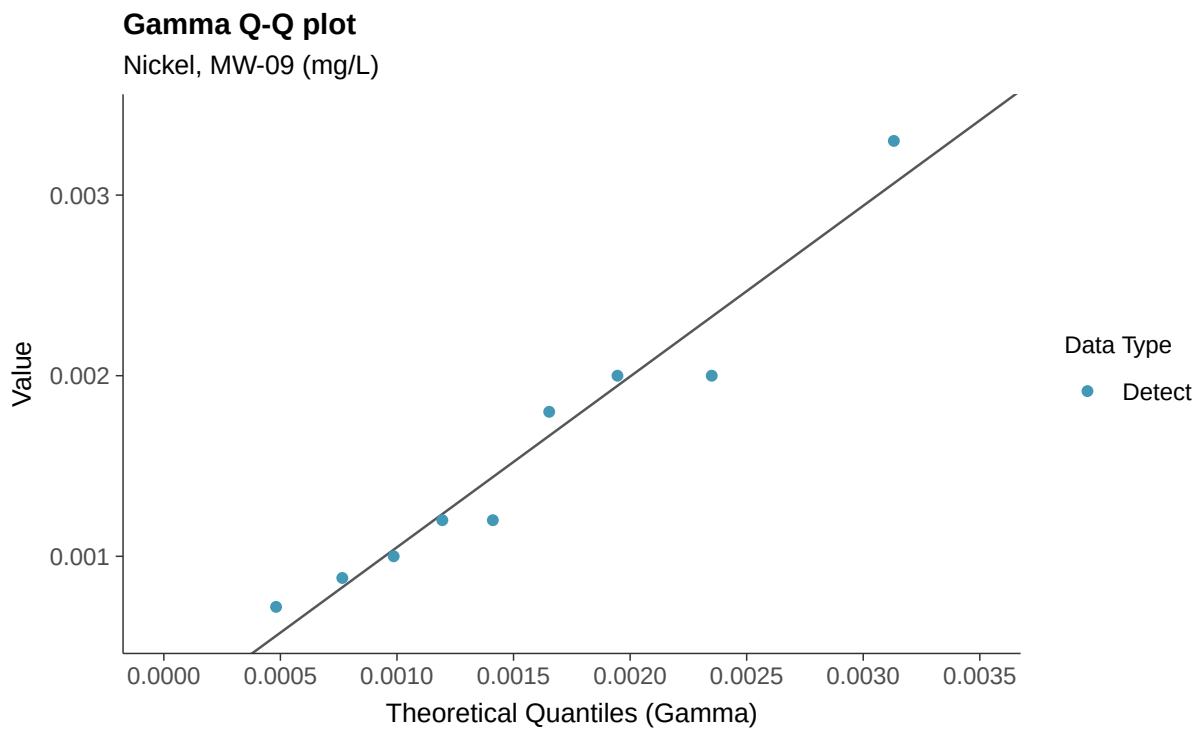
Boxplot by Season

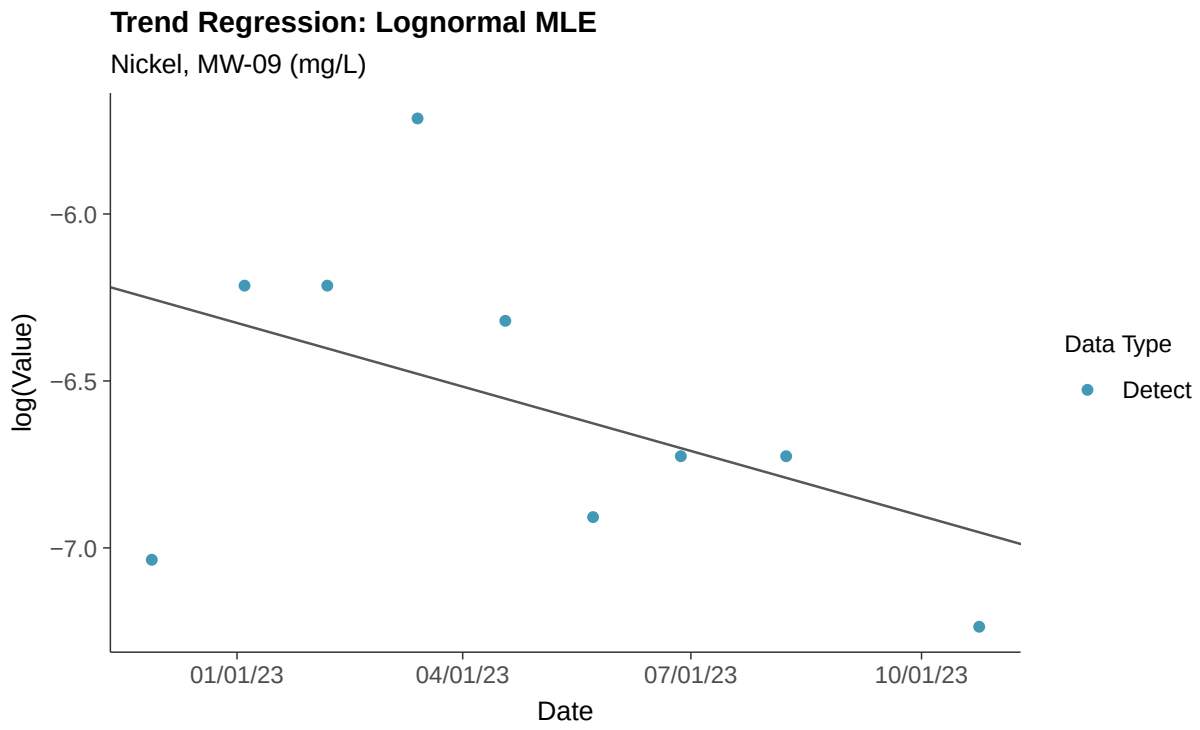
Nickel, MW-09 (mg/L)

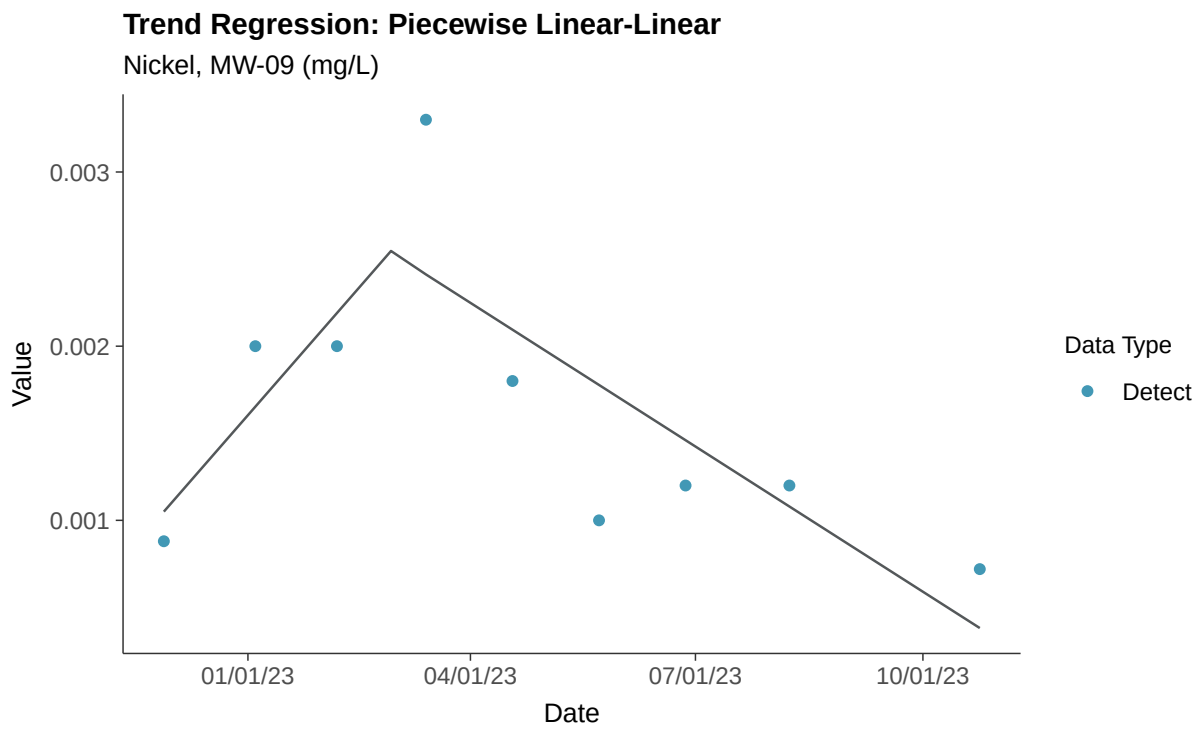


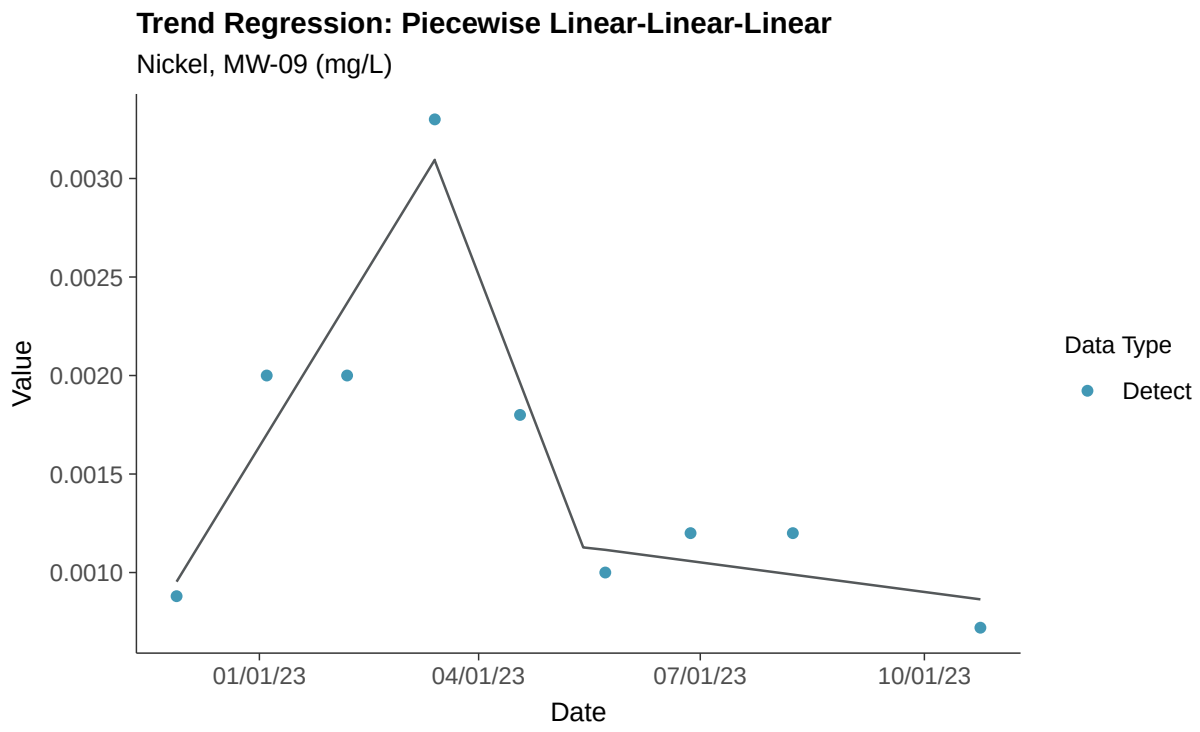

Normal Q-Q plot
Nickel, MW-09 (mg/L)
Value
0.003
0.002
0.001
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Nickel, MW-09 (mg/L)
log(Value)
−6.0
−6.5
−7.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Nickel, MW-09 (mg/L)
Value
0.003
0.002
0.001
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
Theoretical Quantiles (Gamma)
Data Type
Detect

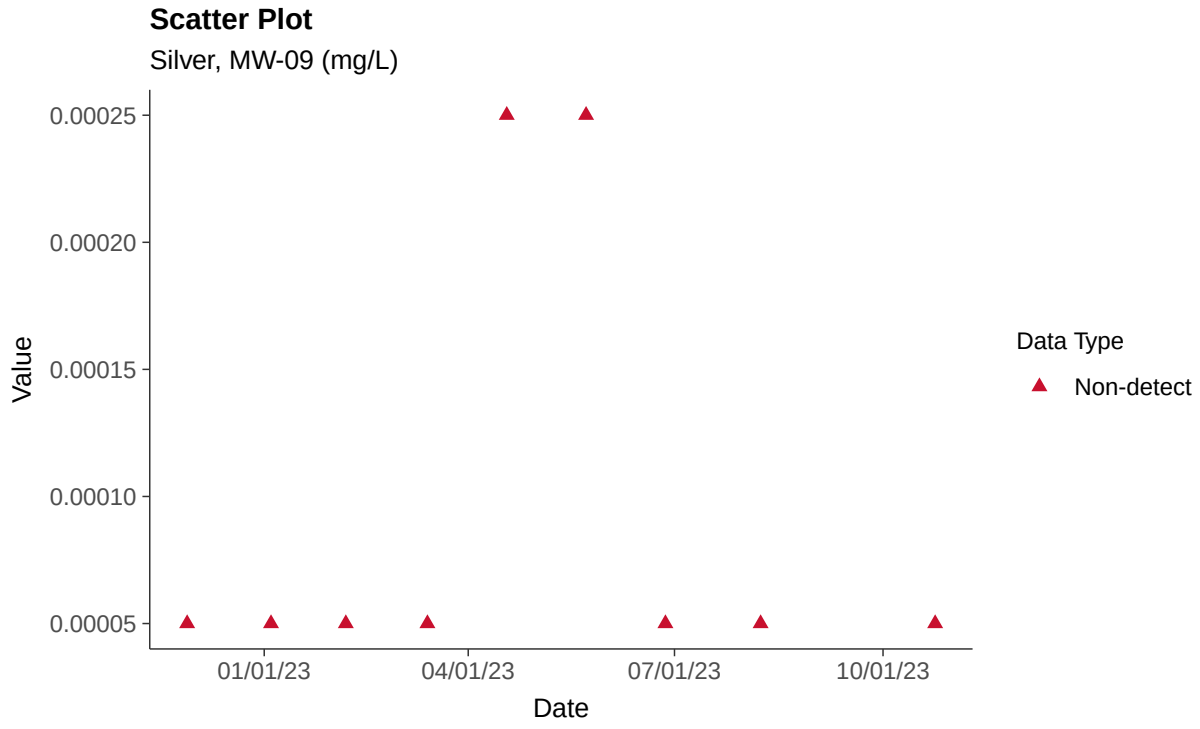

Trend Regression: Lognormal MLE
Nickel, MW-09 (mg/L)
log(Value)
−6.0
−6.5
−7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

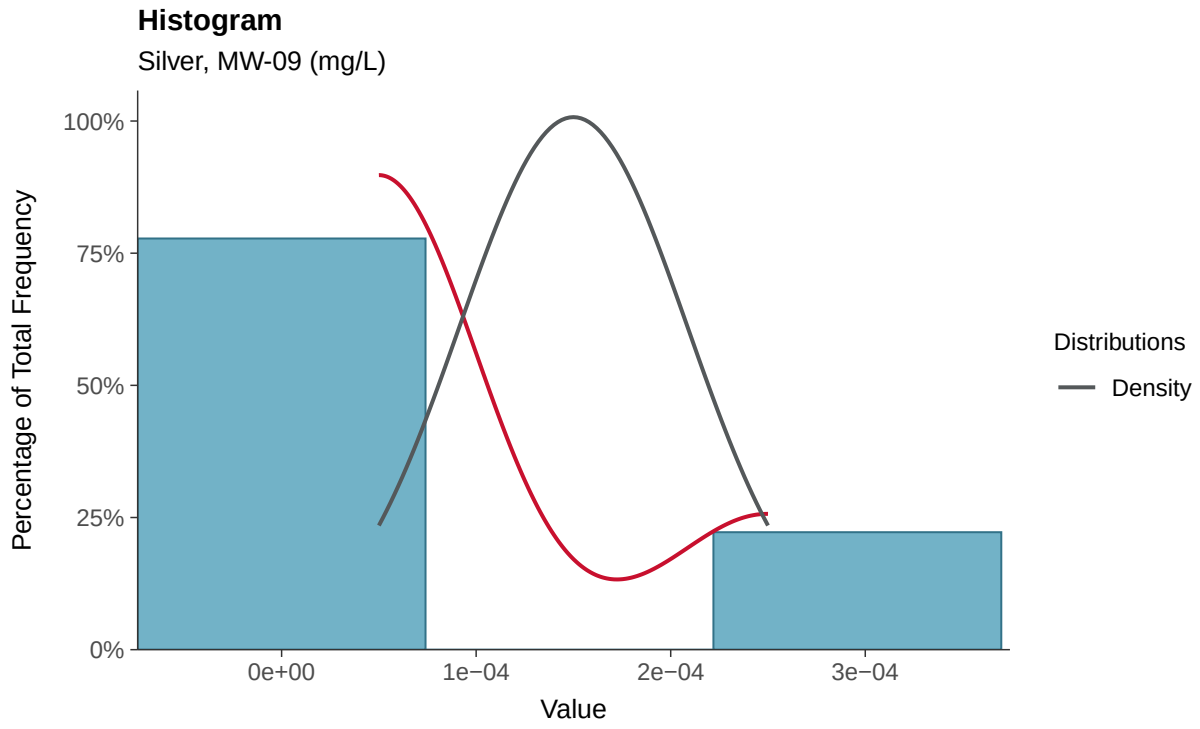

Trend Regression: Piecewise Linear-Linear
Nickel, MW-09 (mg/L)
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-09 (mg/L)
0.0030
0.0025
0.0020
0.0015
0.0010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-09

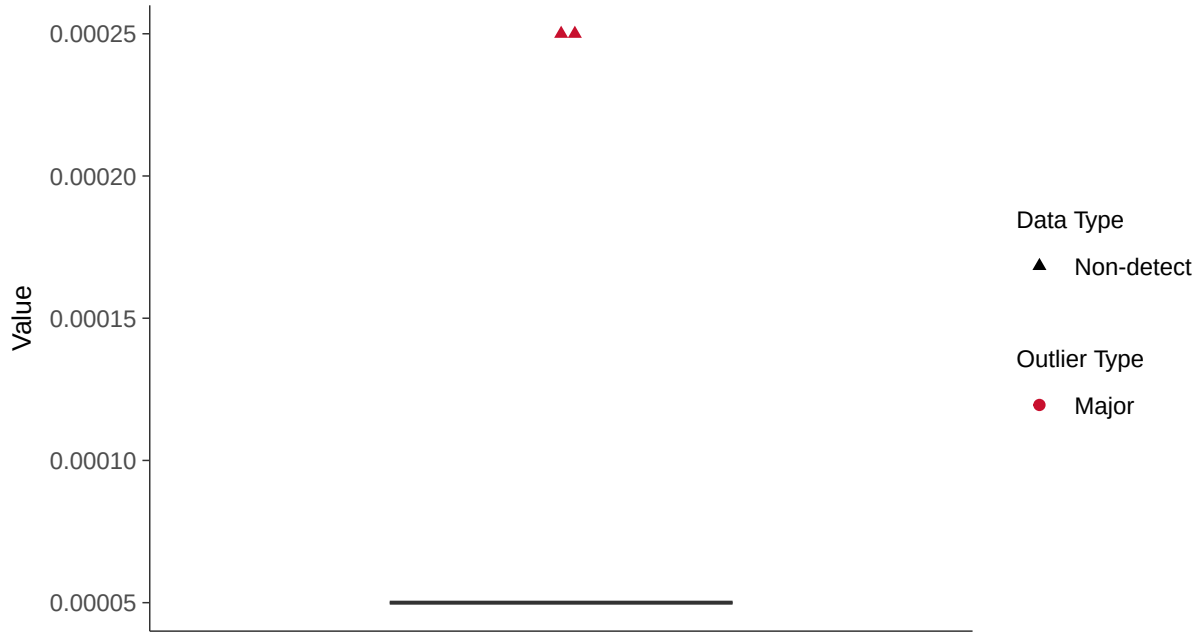
ID: 1_18_6_123





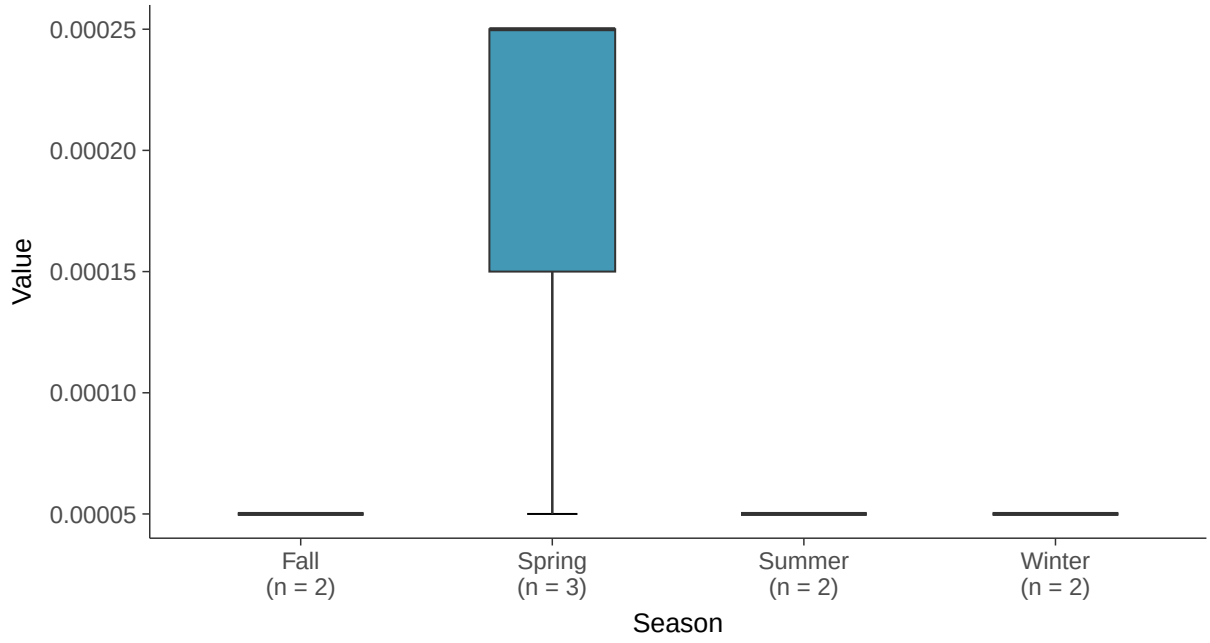
Boxplot

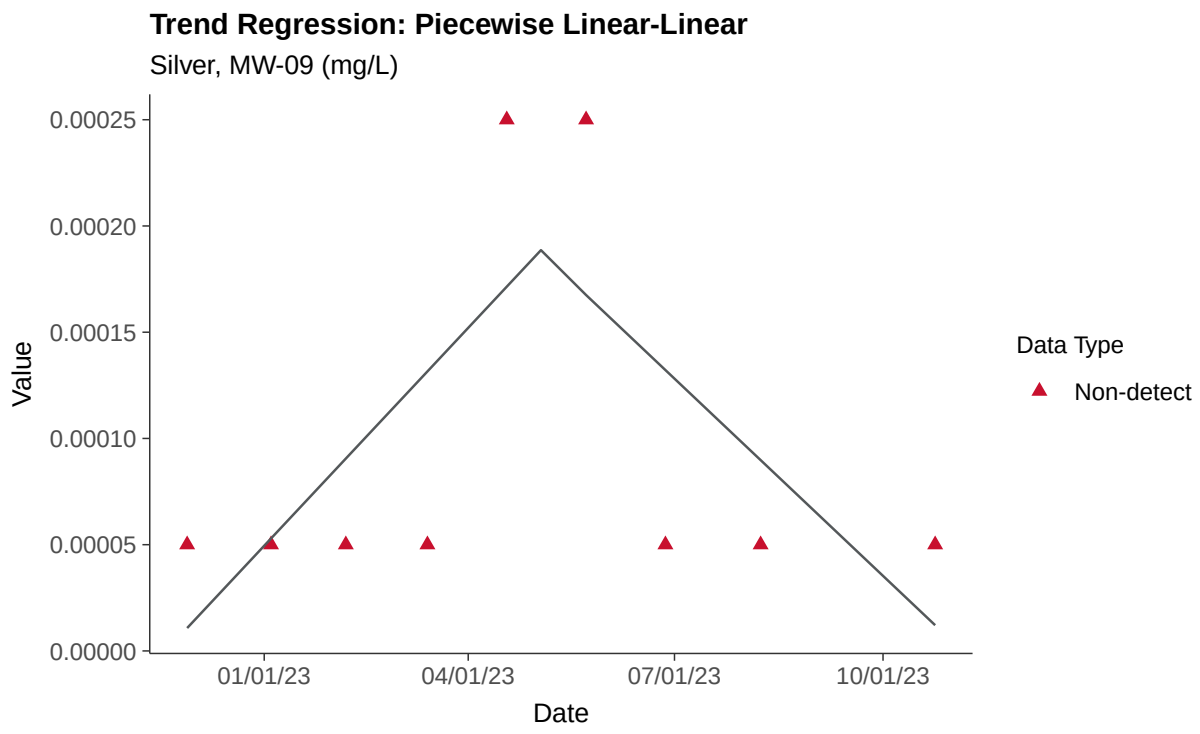
Silver, MW-09 (mg/L)

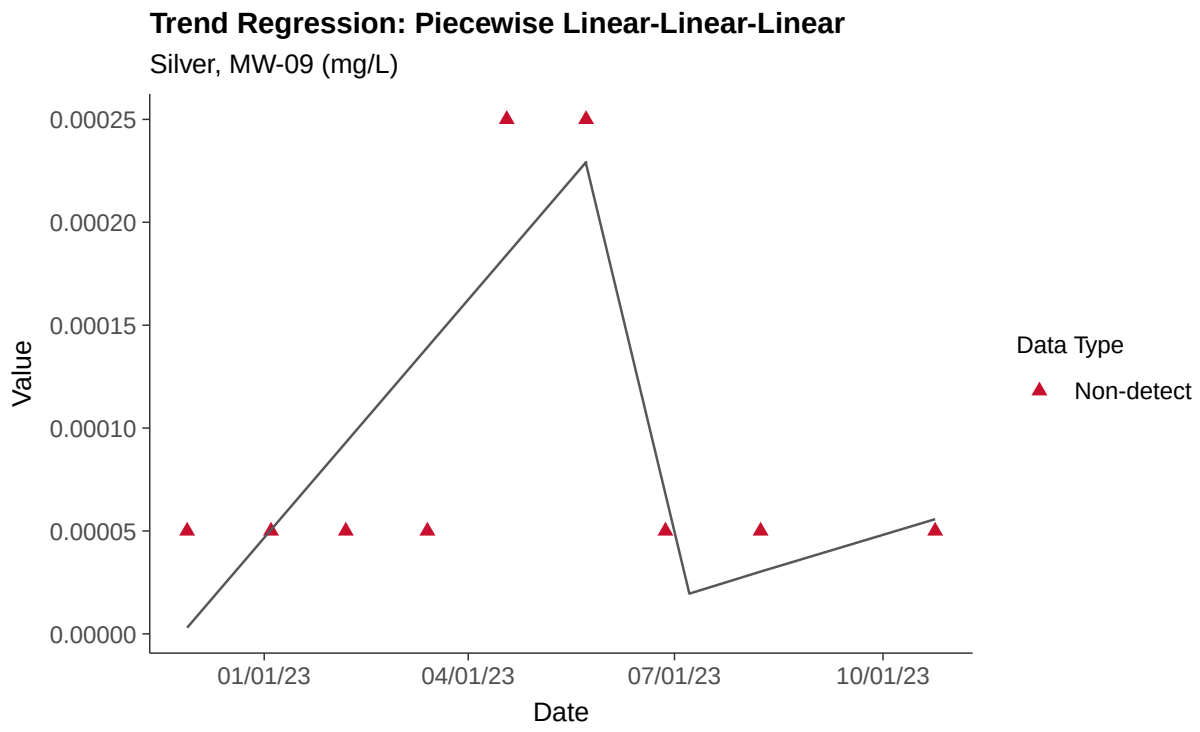


Boxplot by Season

Silver, MW-09 (mg/L)

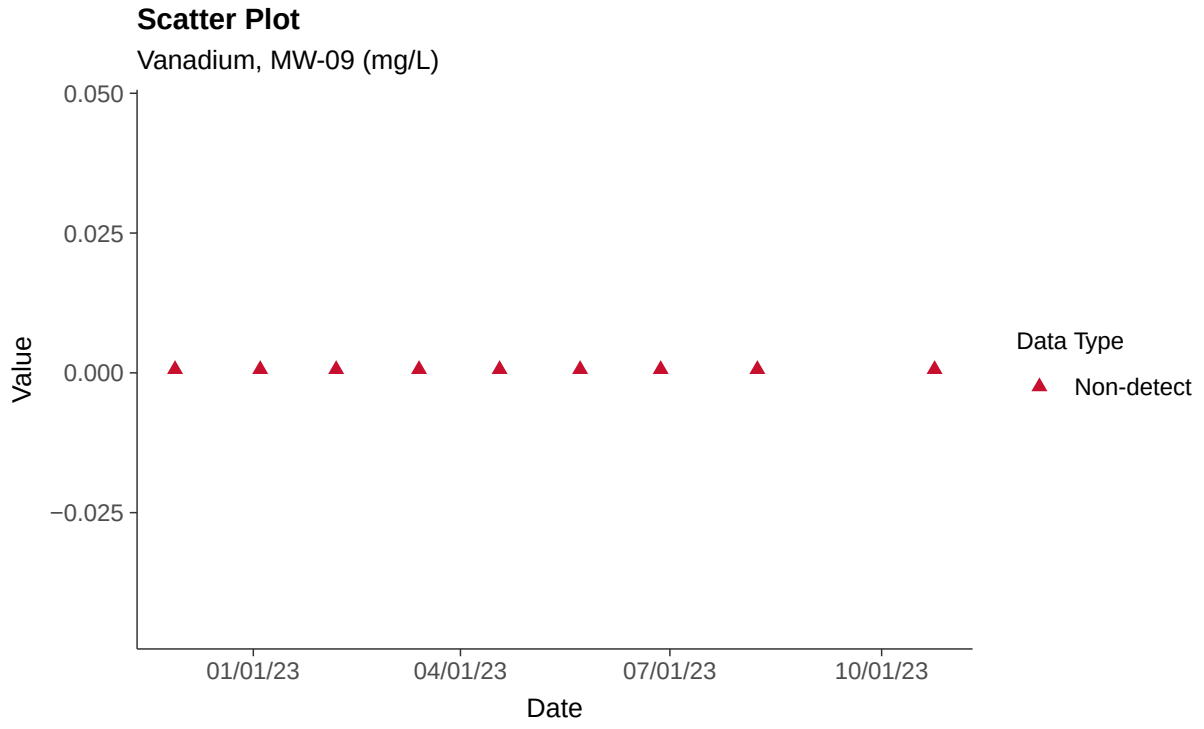


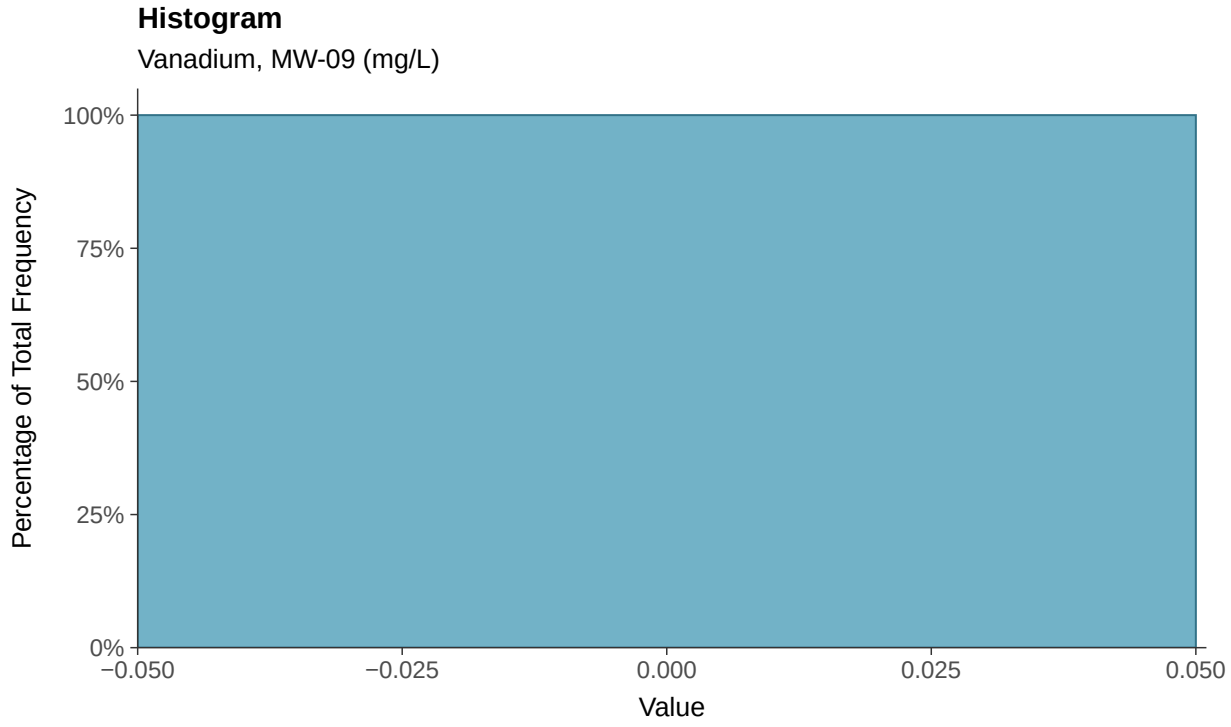

Trend Regression: Piecewise Linear-Linear
Silver, MW-09 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-09 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-09

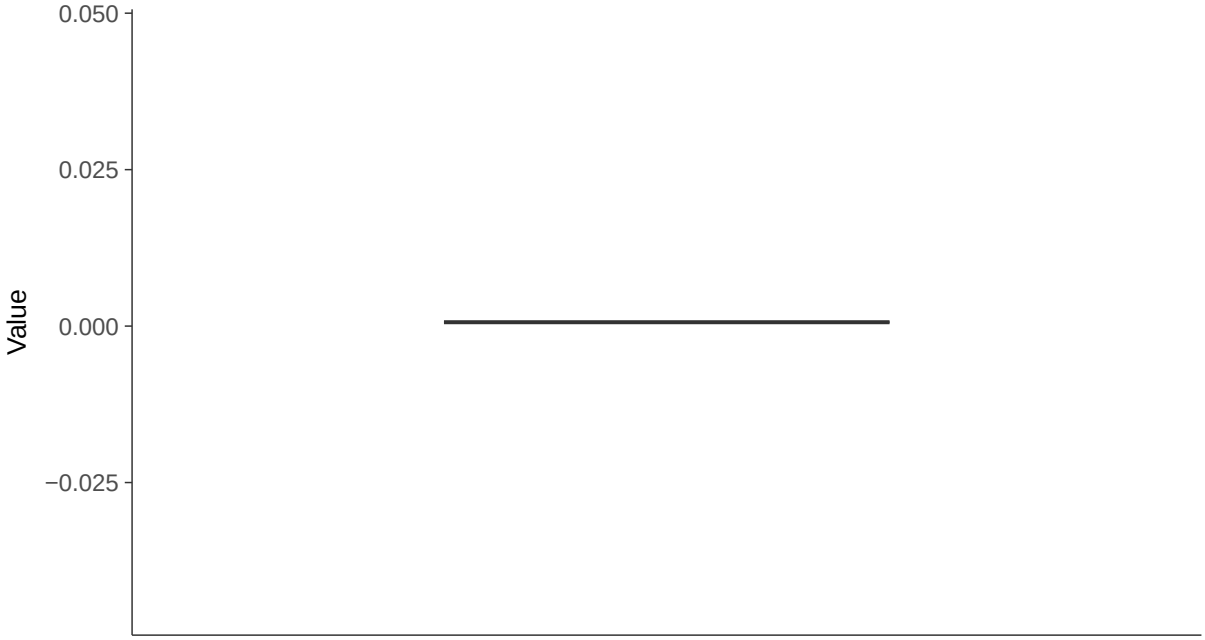
ID: 1_18_6_129





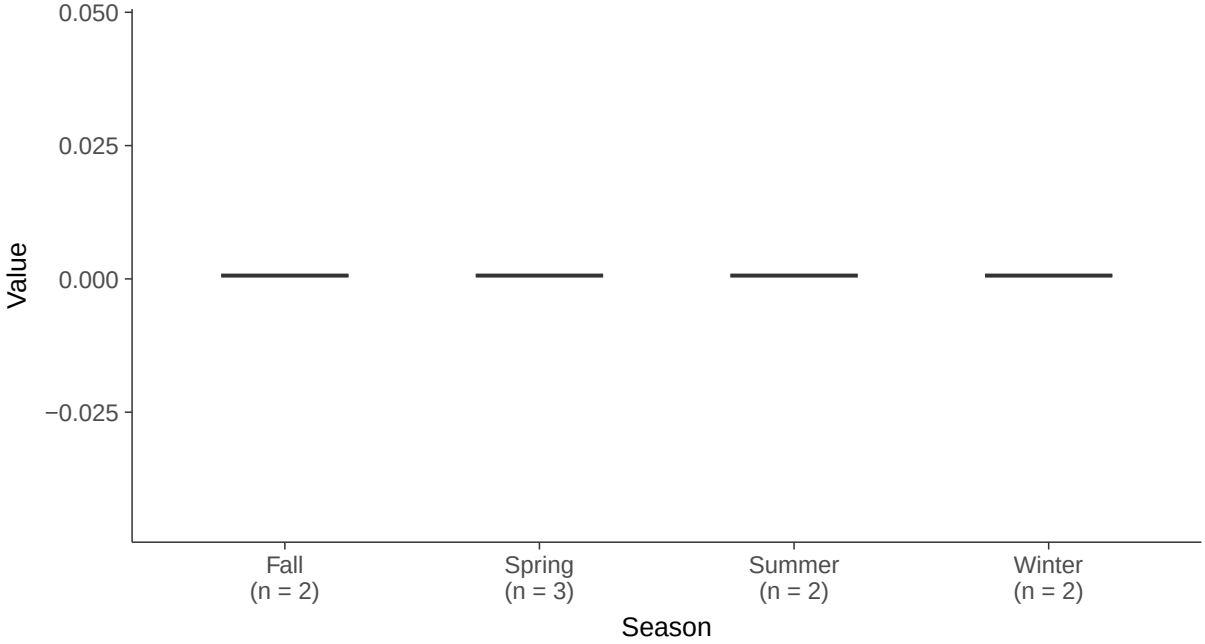
Boxplot

Vanadium, MW-09 (mg/L)



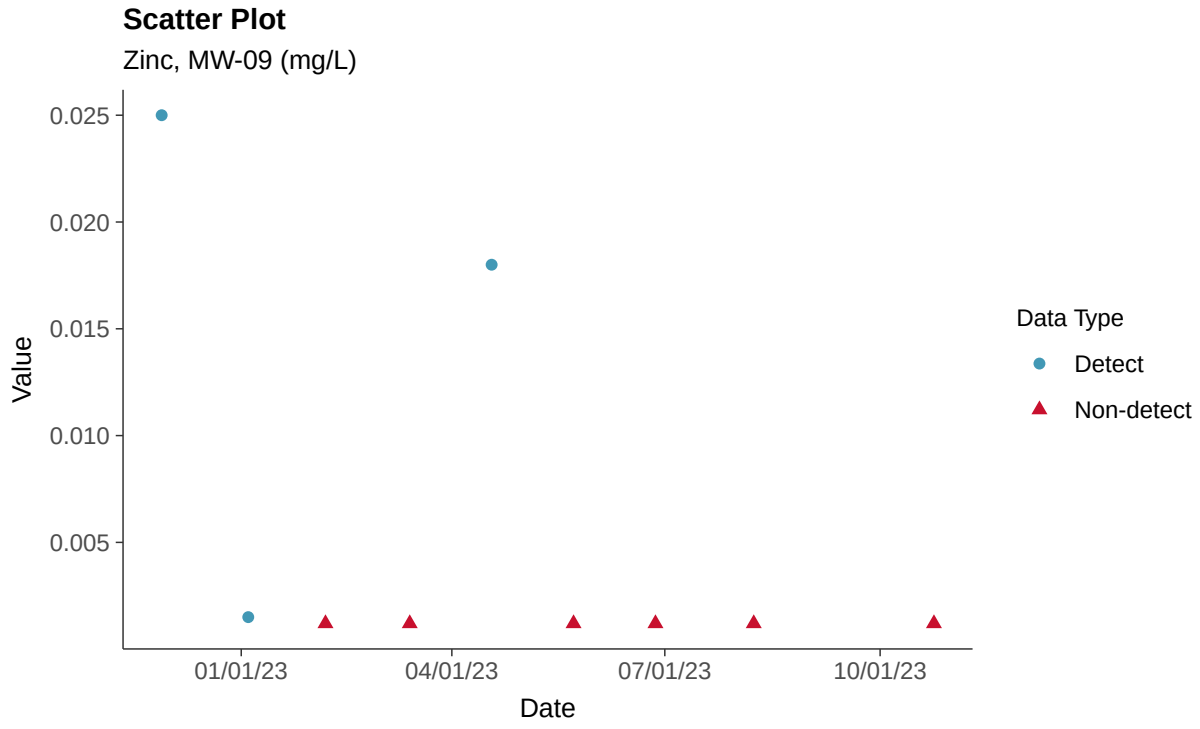
Boxplot by Season

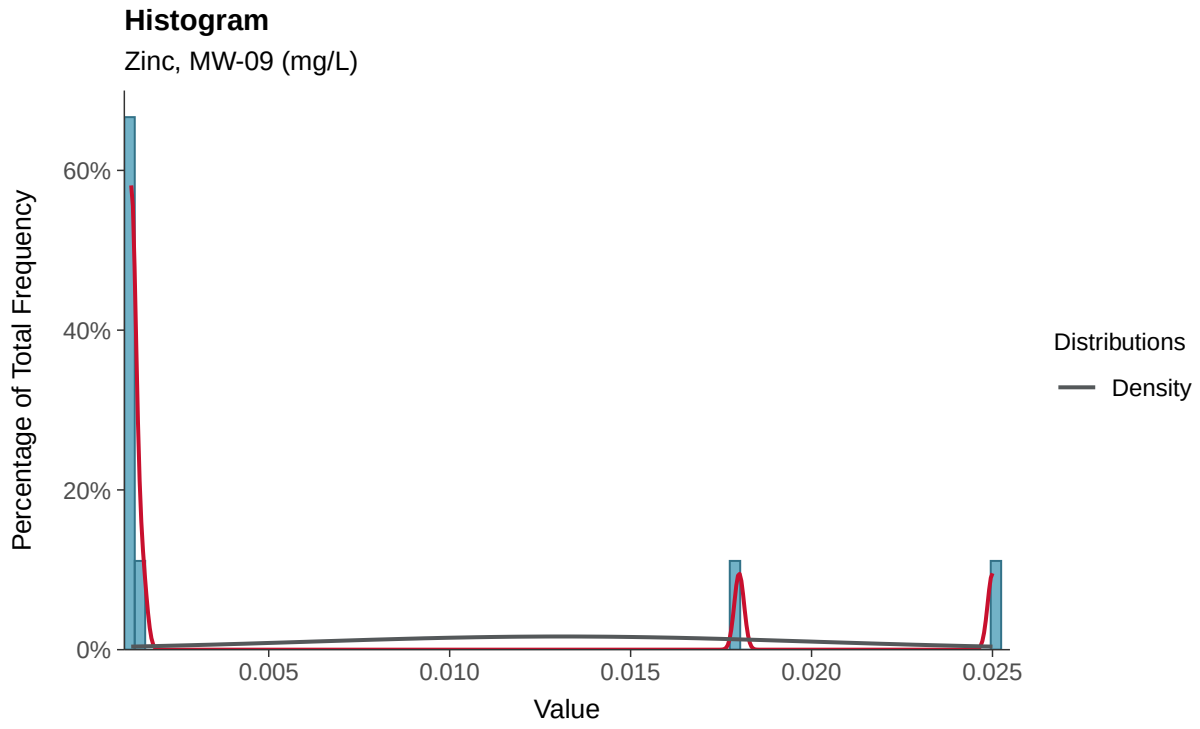
Vanadium, MW-09 (mg/L)



Part 115: Zinc, MW-09

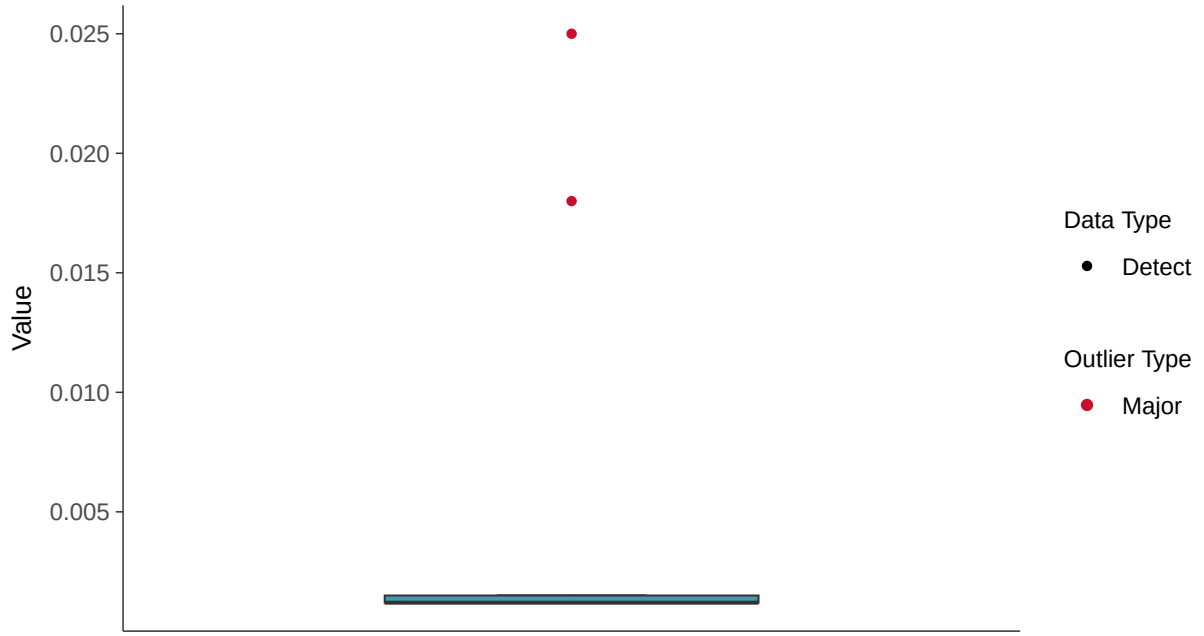
ID: 1_18_6_130





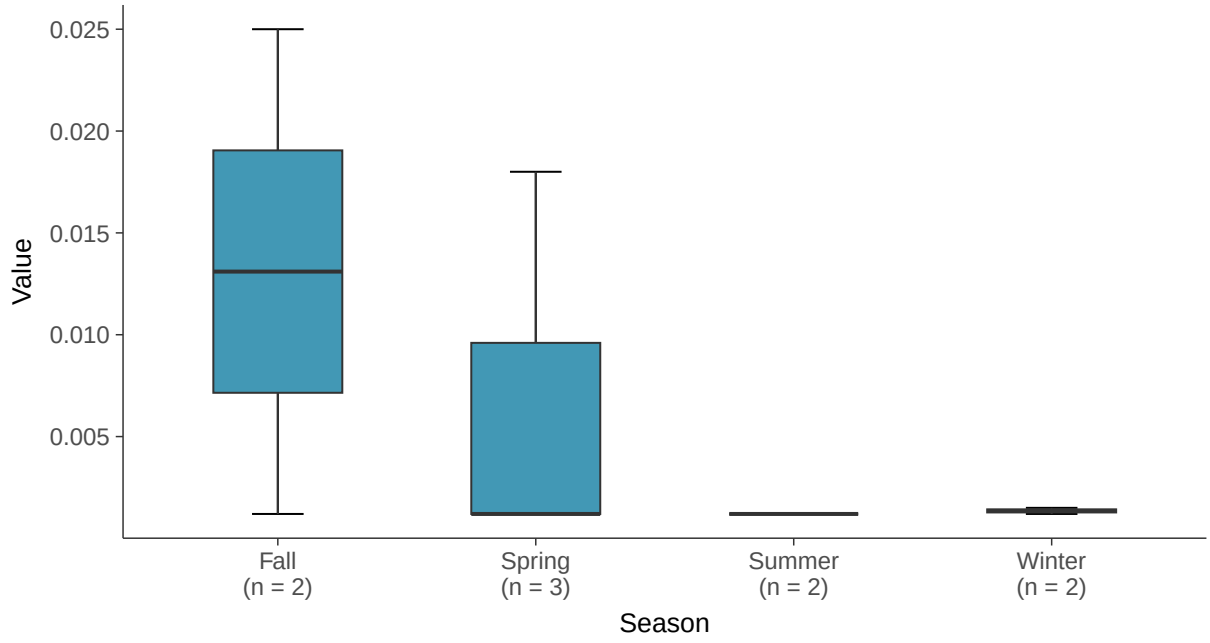
Boxplot

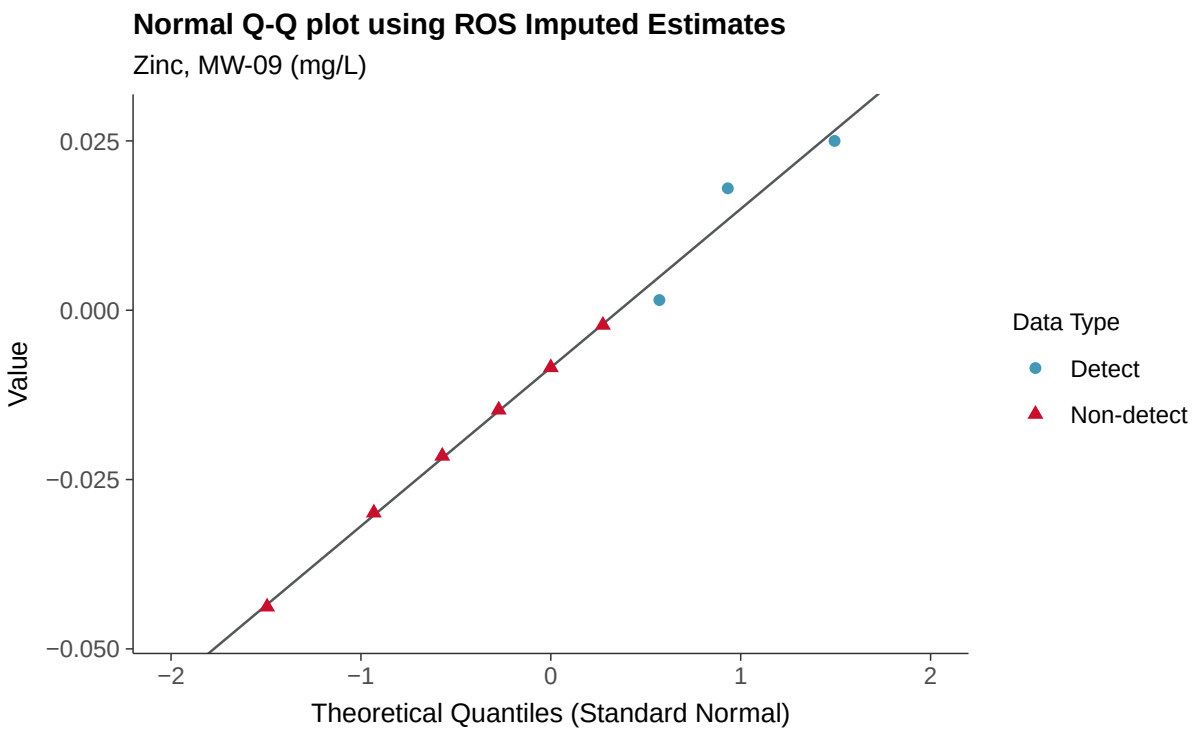
Zinc, MW-09 (mg/L)



Boxplot by Season

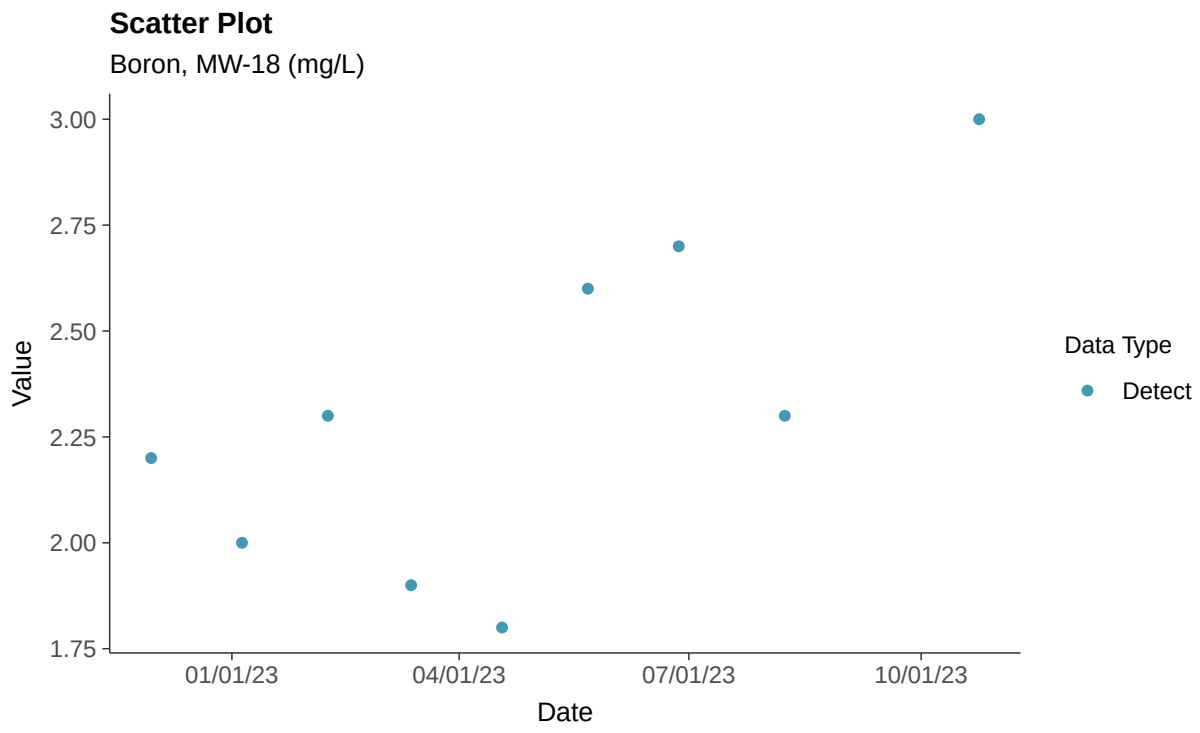
Zinc, MW-09 (mg/L)

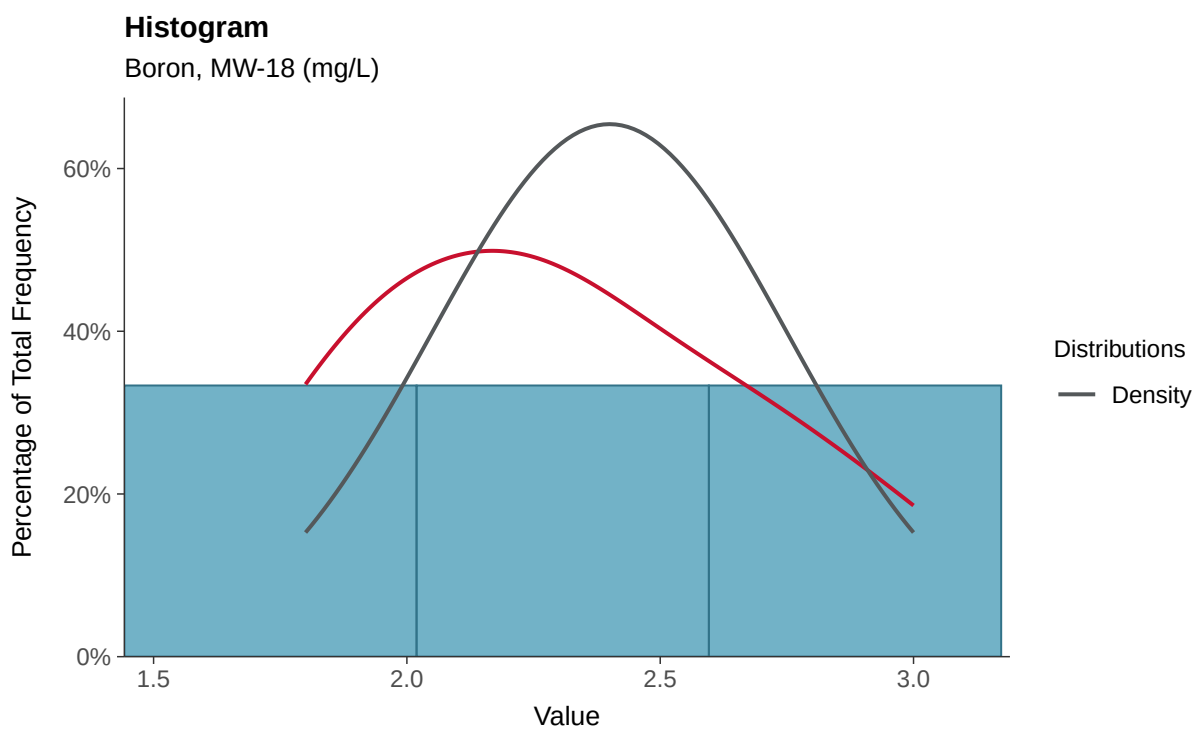



Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-09 (mg/L)
Value
0.025
0.000
−0.025
−0.050
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

Appendix III: Boron, MW-18

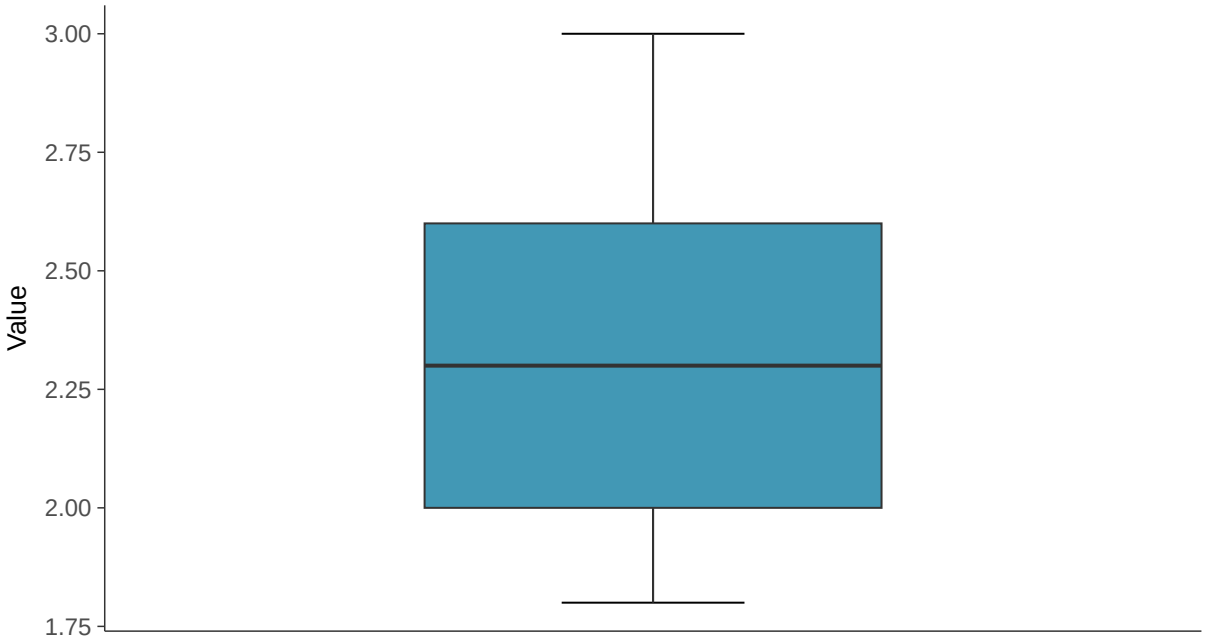
ID: 1_22_4_105





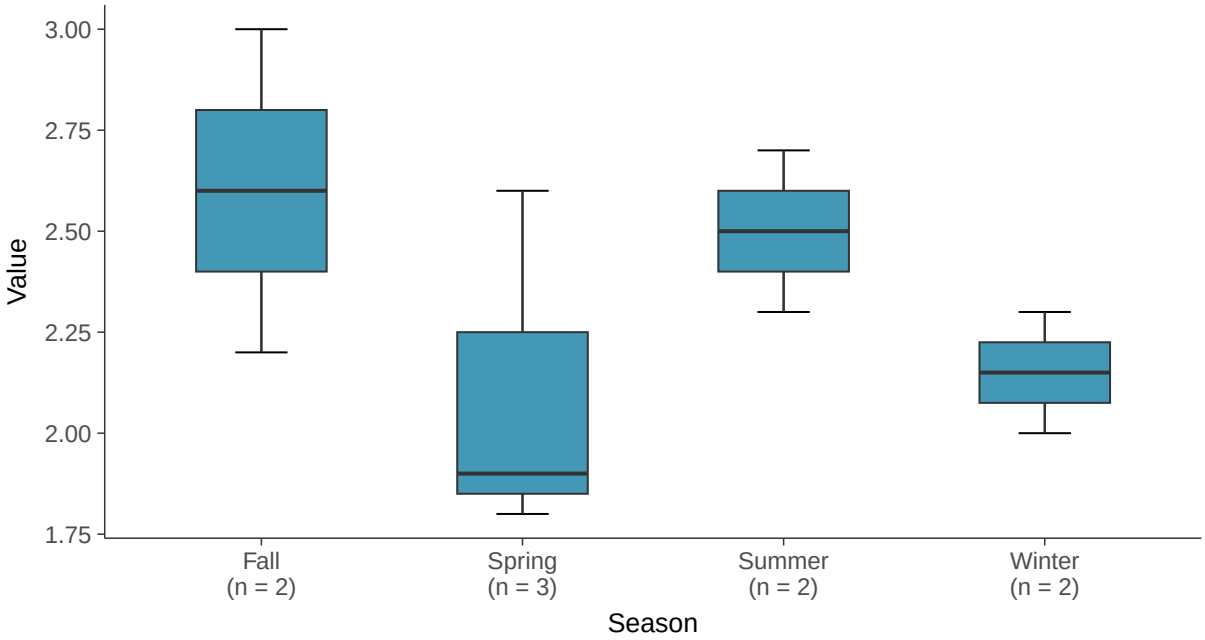
Boxplot

Boron, MW-18 (mg/L)



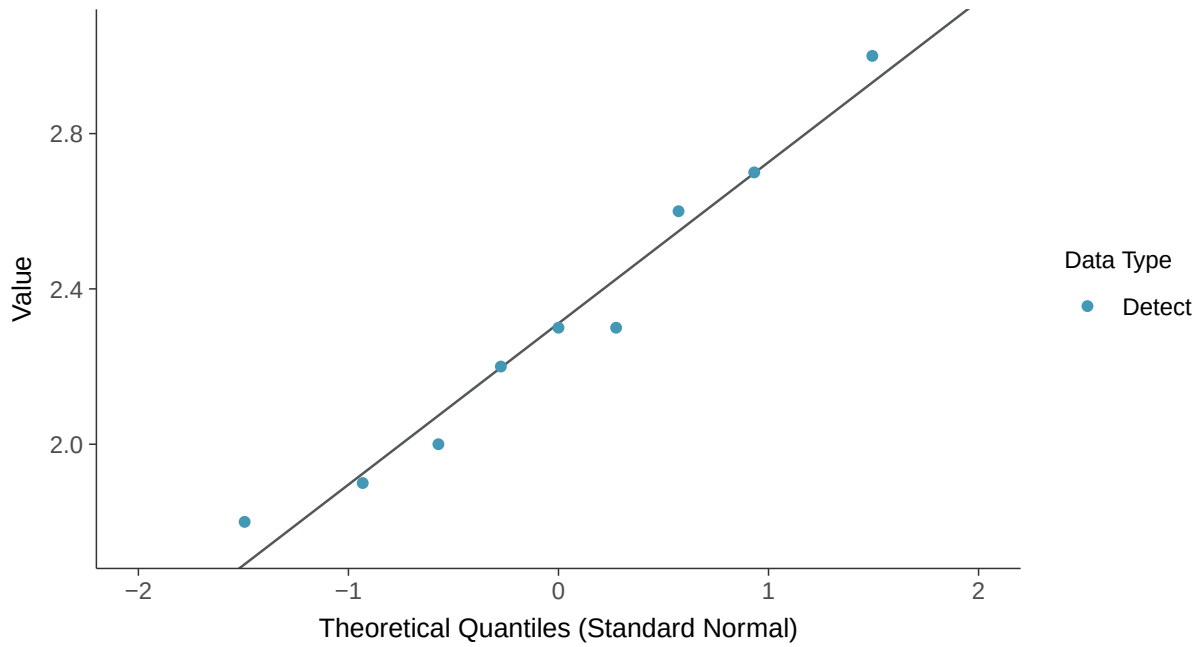
Boxplot by Season

Boron, MW-18 (mg/L)



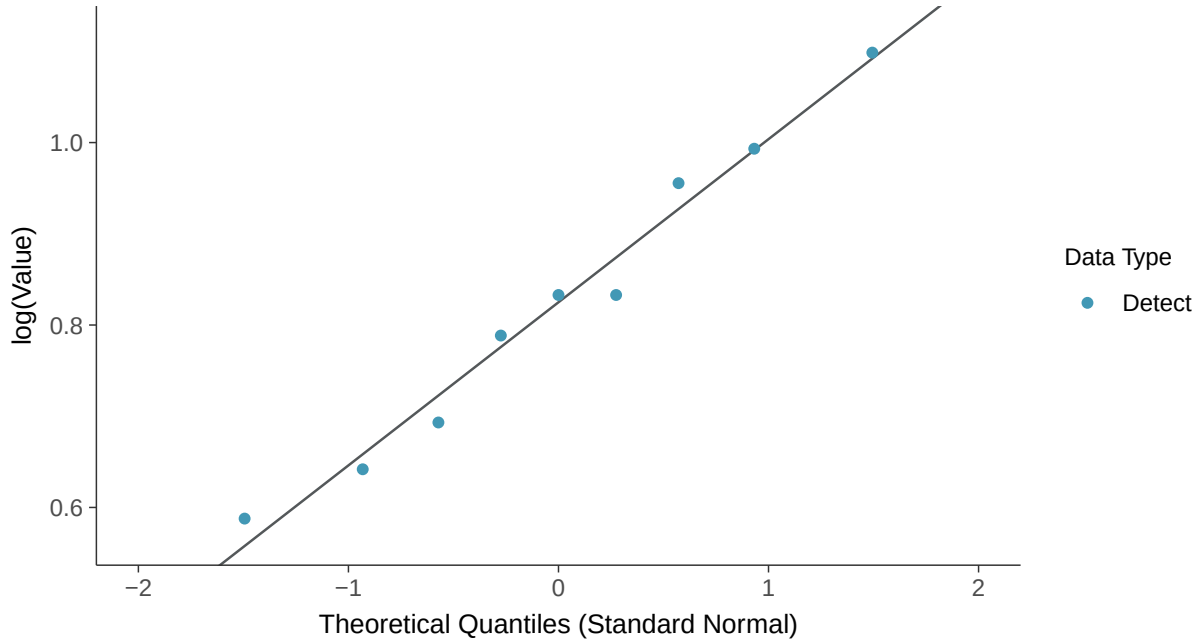
Normal Q-Q plot

Boron, MW-18 (mg/L)



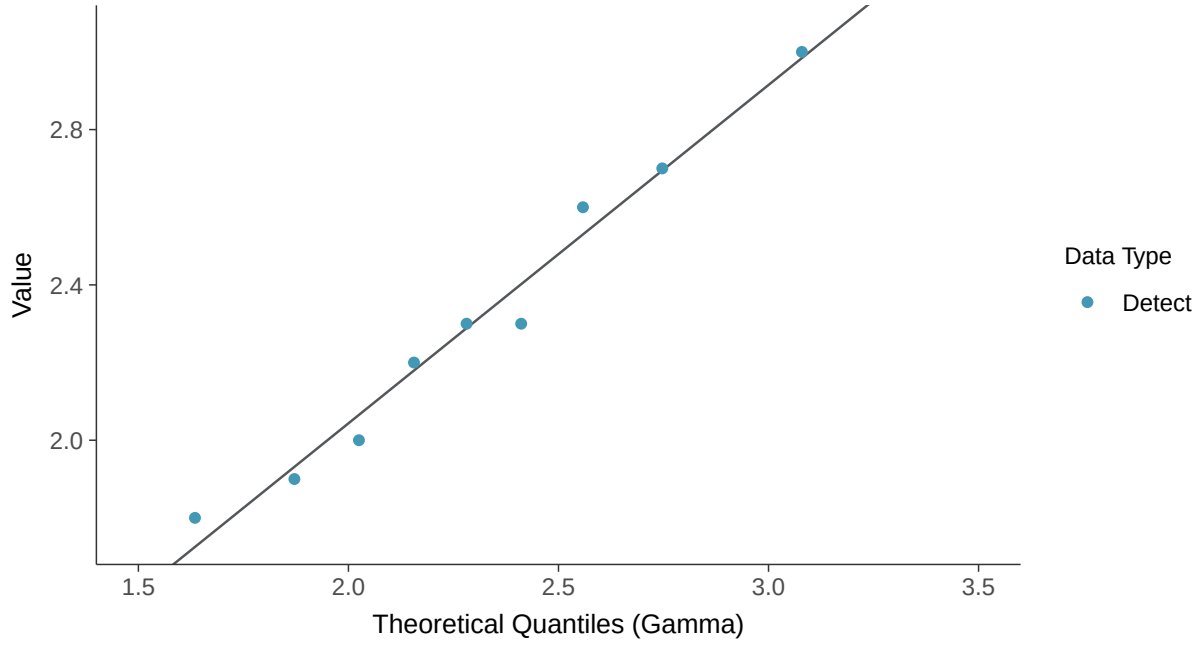
Lognormal Q-Q plot

Boron, MW-18 (mg/L)



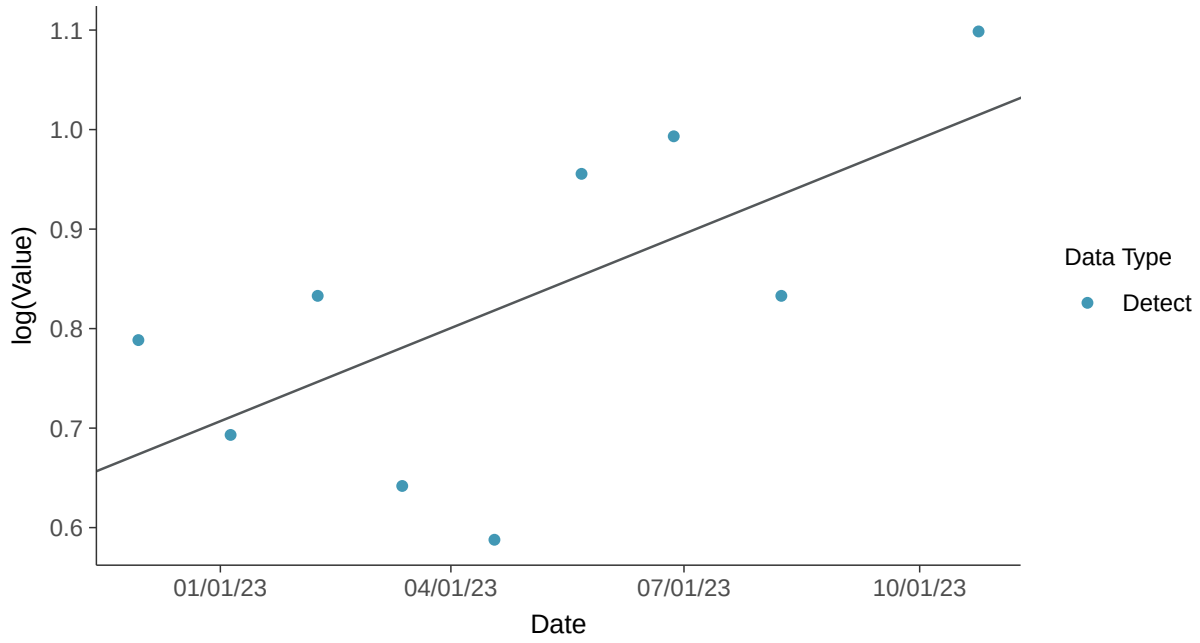
Gamma Q-Q plot

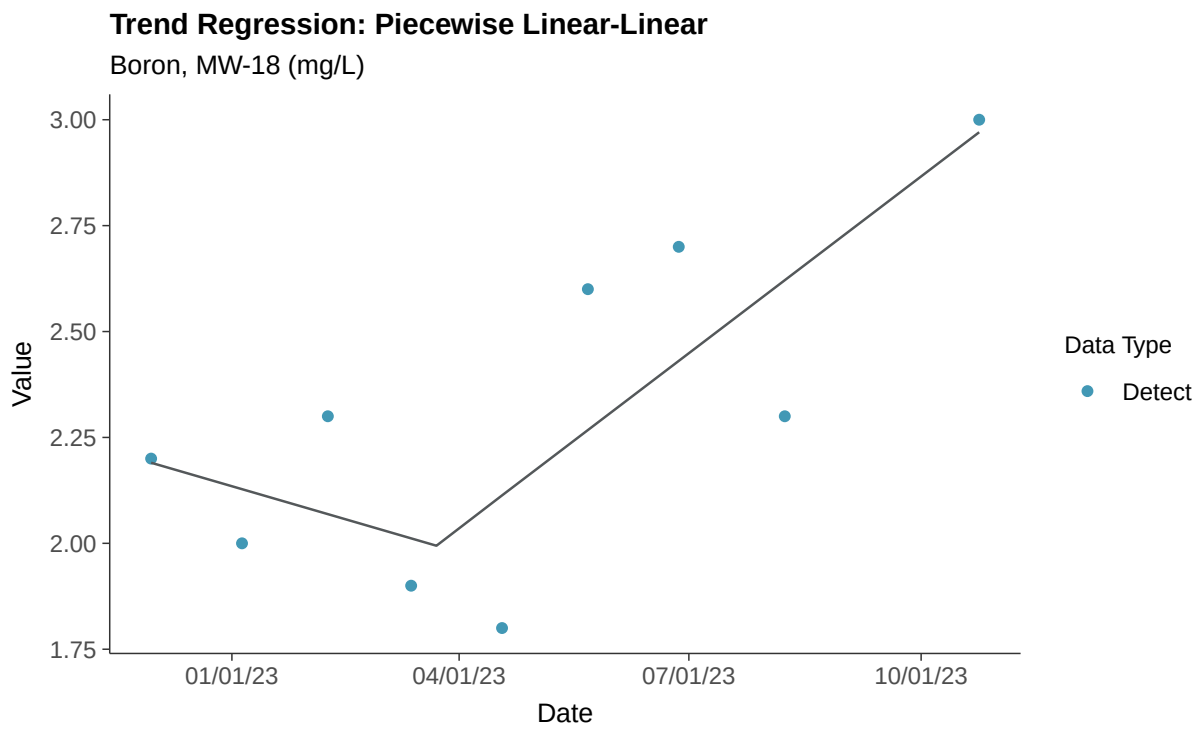
Boron, MW-18 (mg/L)



Trend Regression: Lognormal MLE

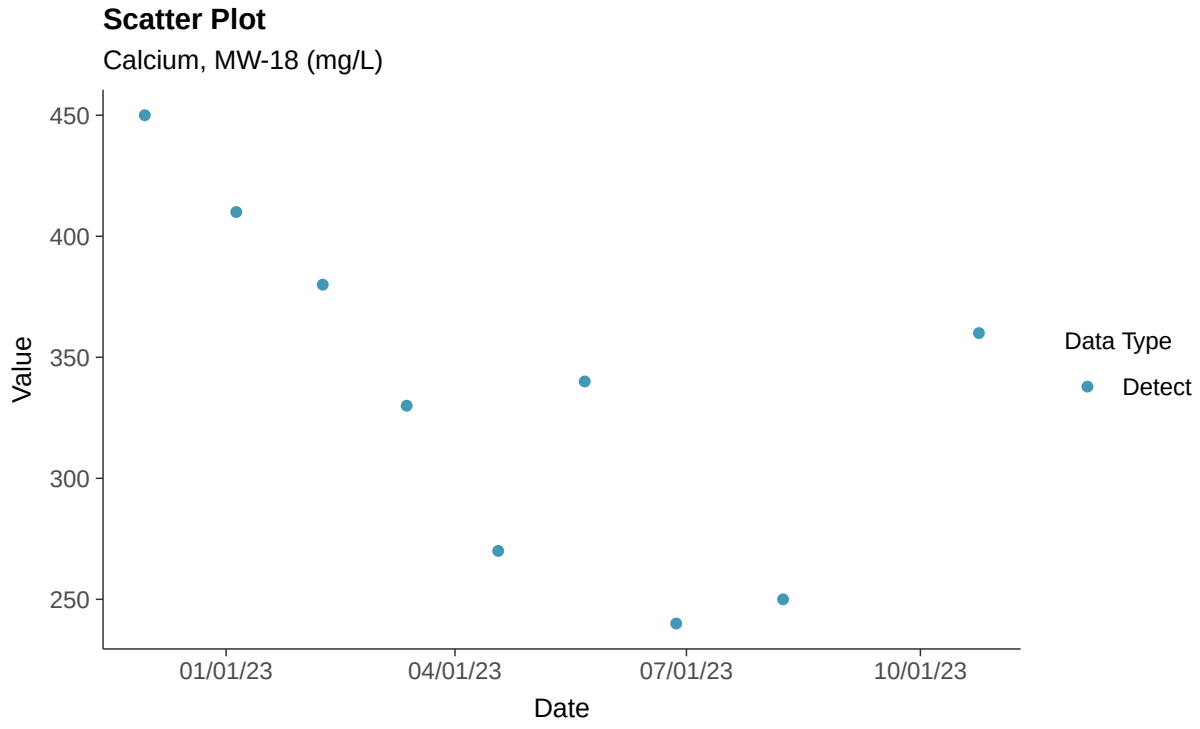
Boron, MW-18 (mg/L)

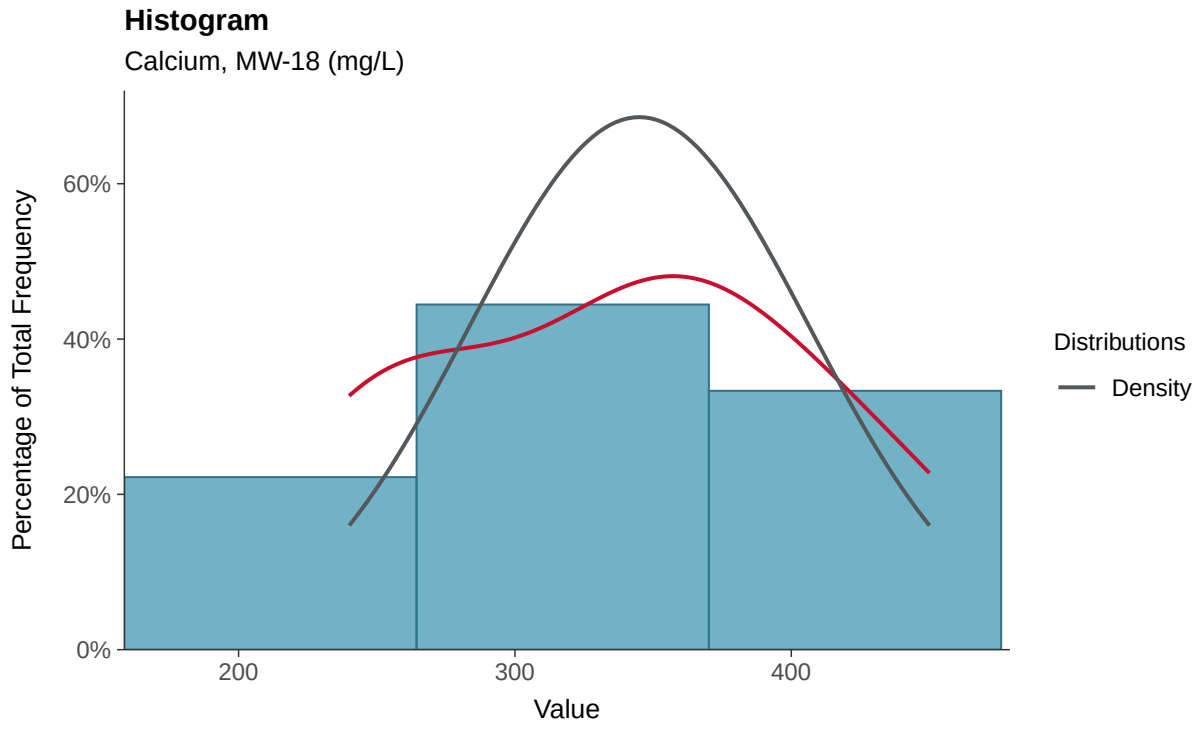



Trend Regression: Piecewise Linear-Linear
Boron, MW-18 (mg/L)
3.00
2.75
2.50
2.25
2.00
1.75
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-18

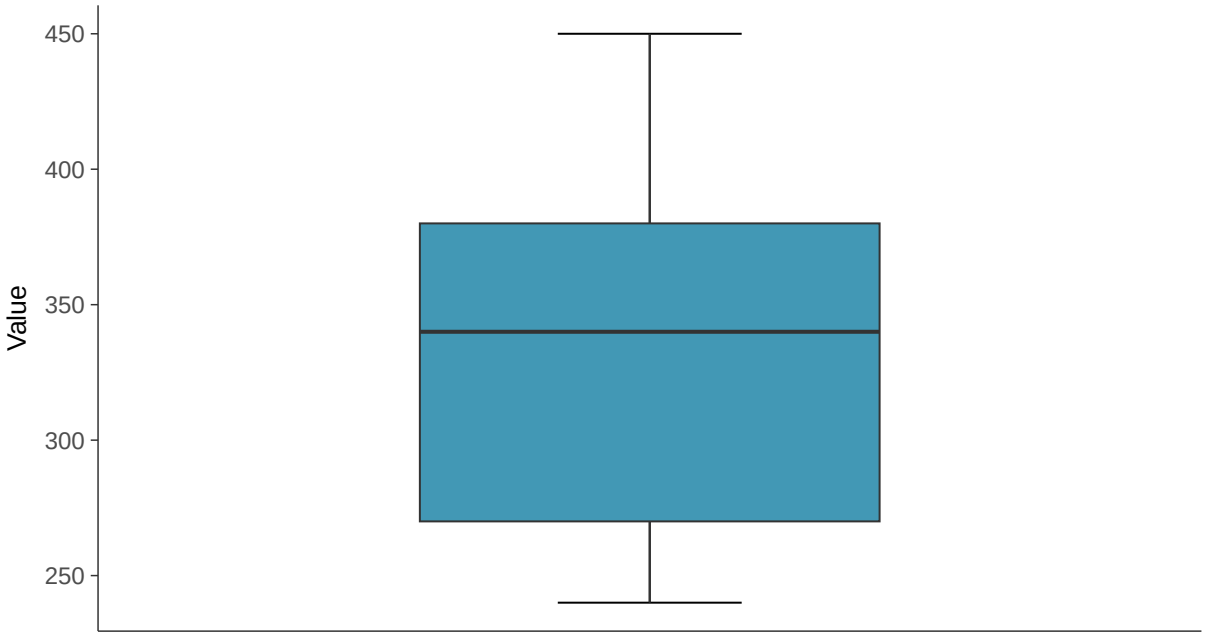
ID: 1_22_4_107





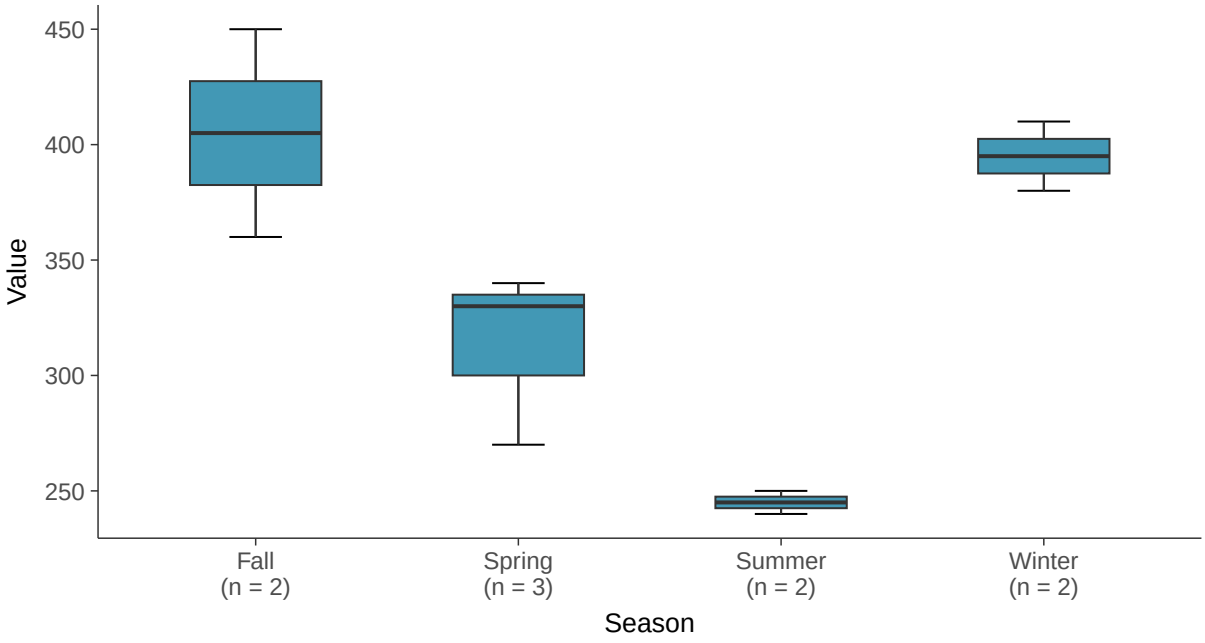
Boxplot

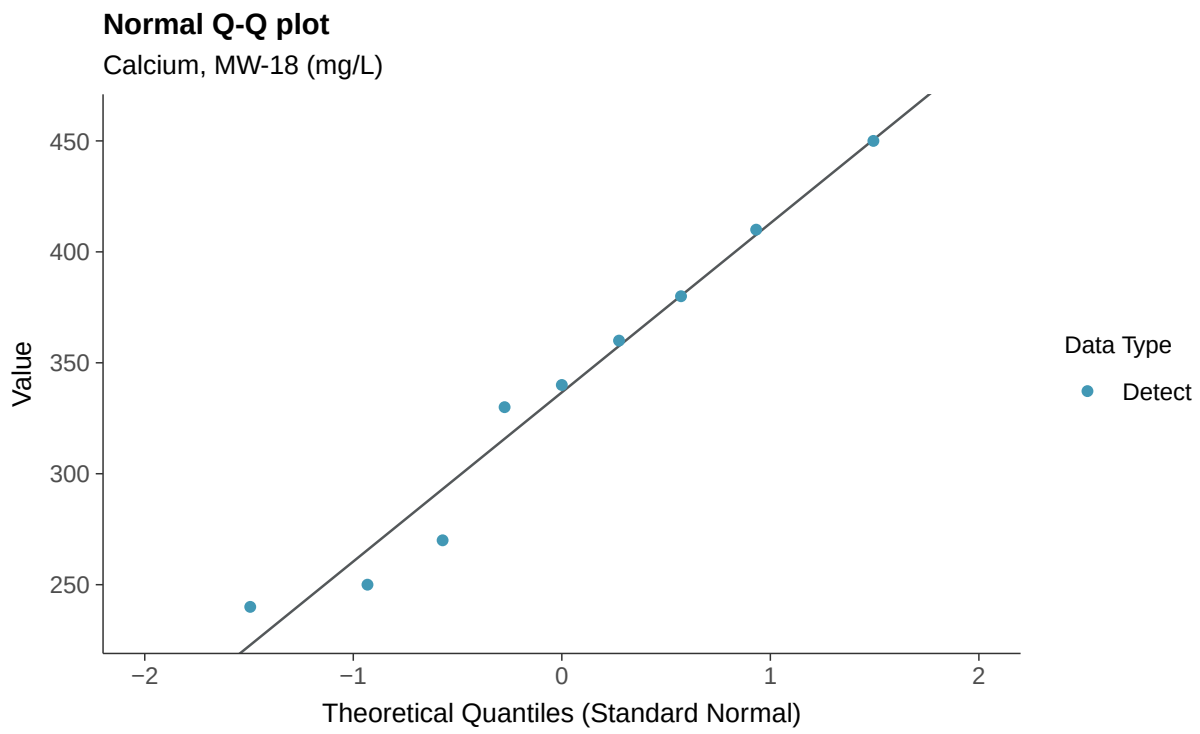
Calcium, MW-18 (mg/L)

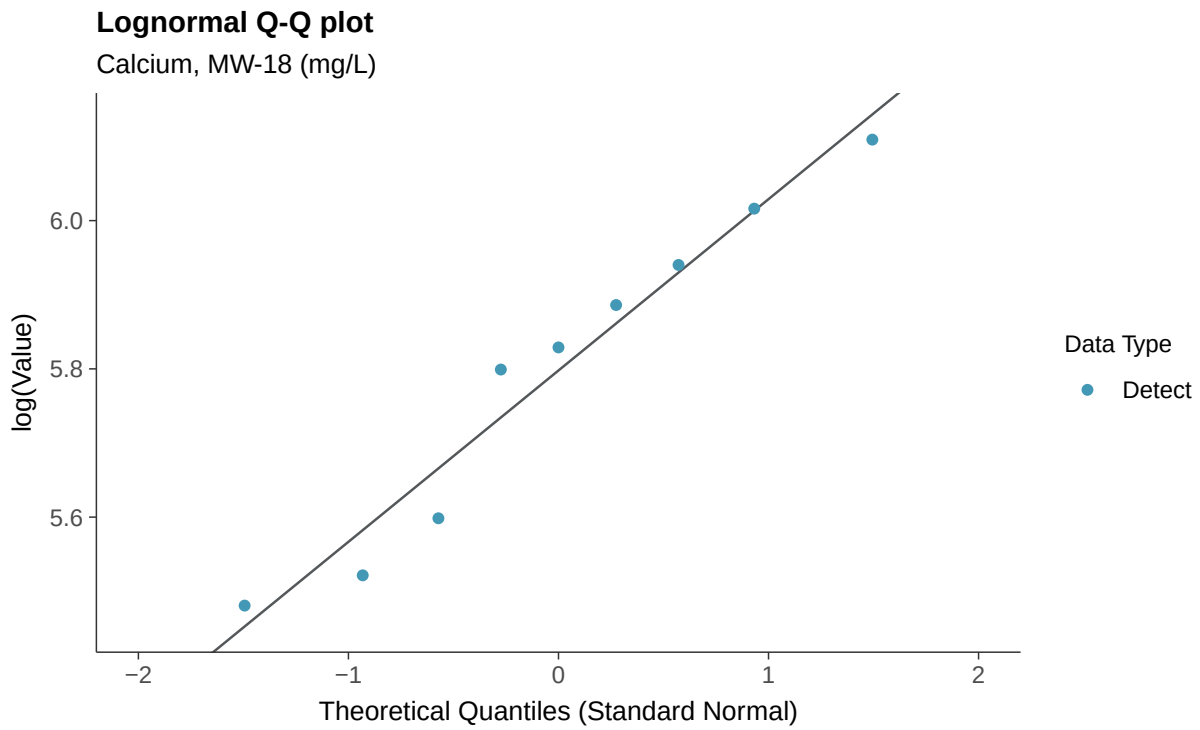


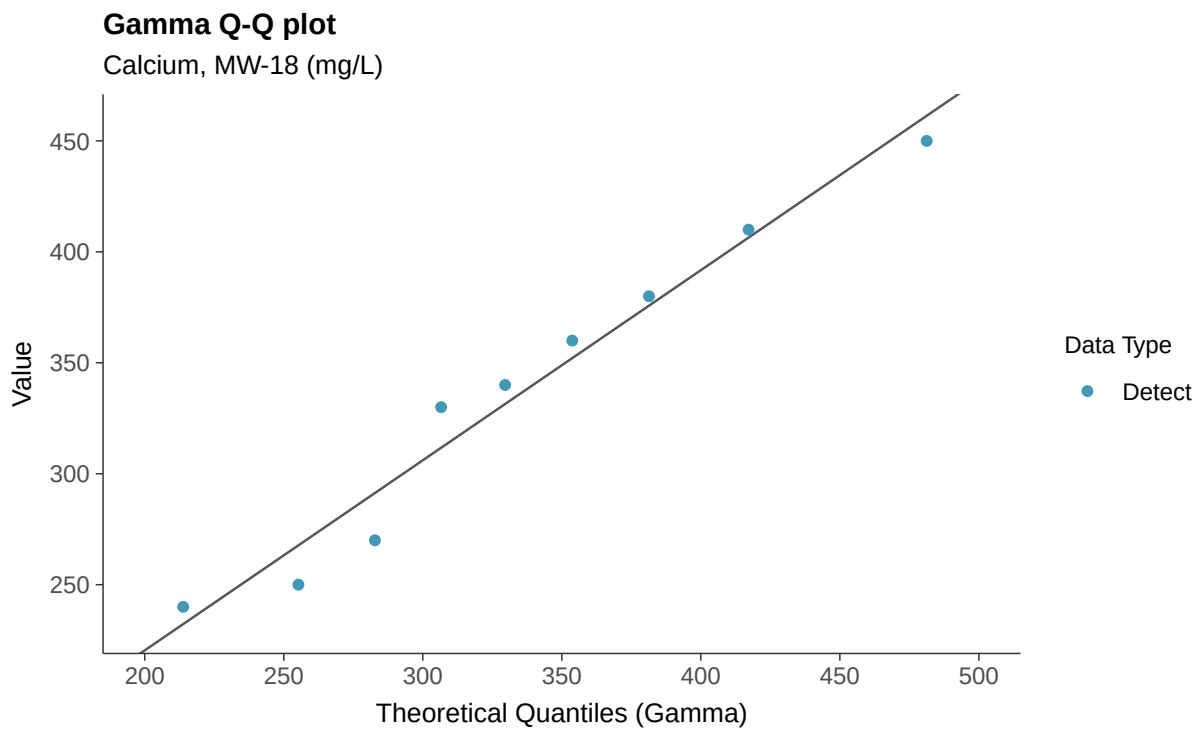
Boxplot by Season

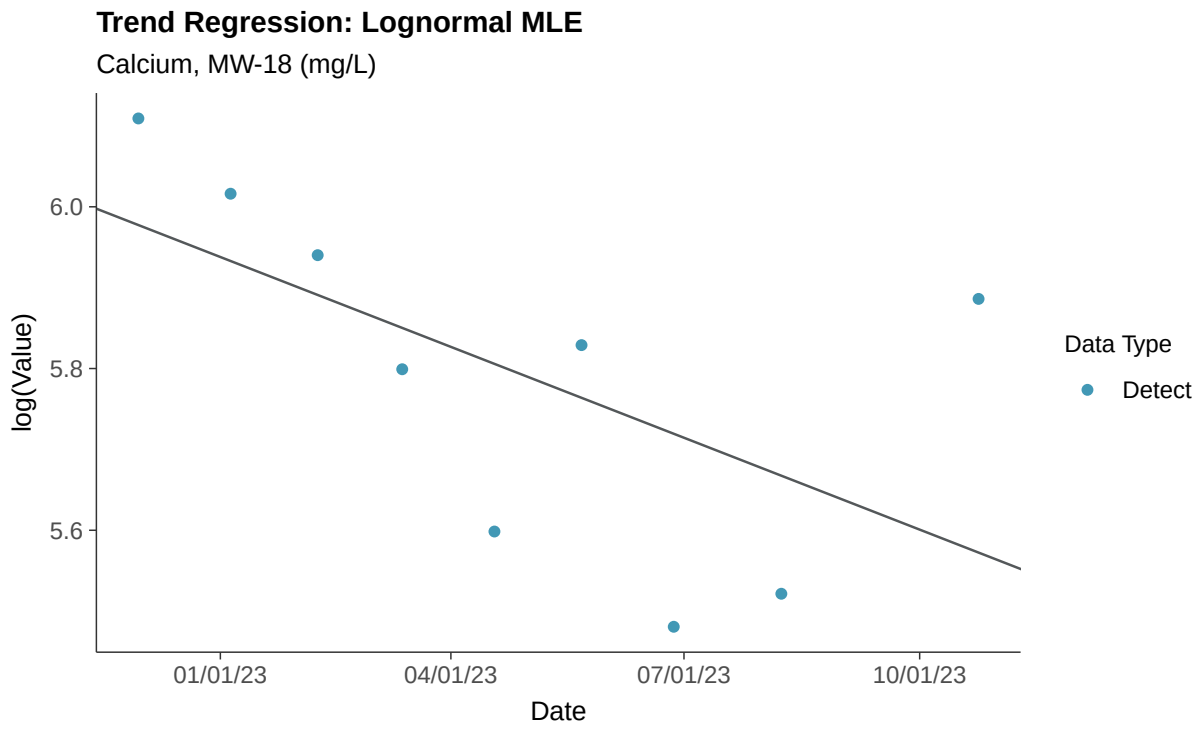
Calcium, MW-18 (mg/L)




Normal Q-Q plot
Calcium, MW-18 (mg/L)
Value
450
400
350
300
250
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

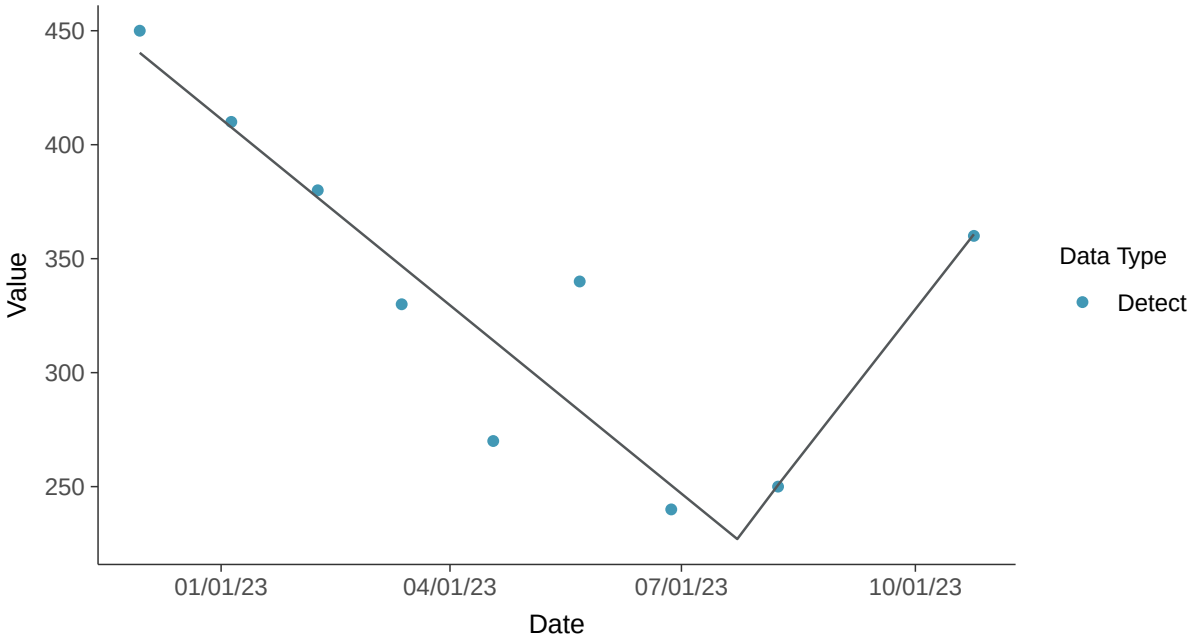

Lognormal Q-Q plot
Calcium, MW-18 (mg/L)
log(Value)
6.0
5.8
5.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-18 (mg/L)
Value
450
400
350
300
250
200
250
300
350
400
450
500
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-18 (mg/L)
log(Value)
6.0
5.8
5.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

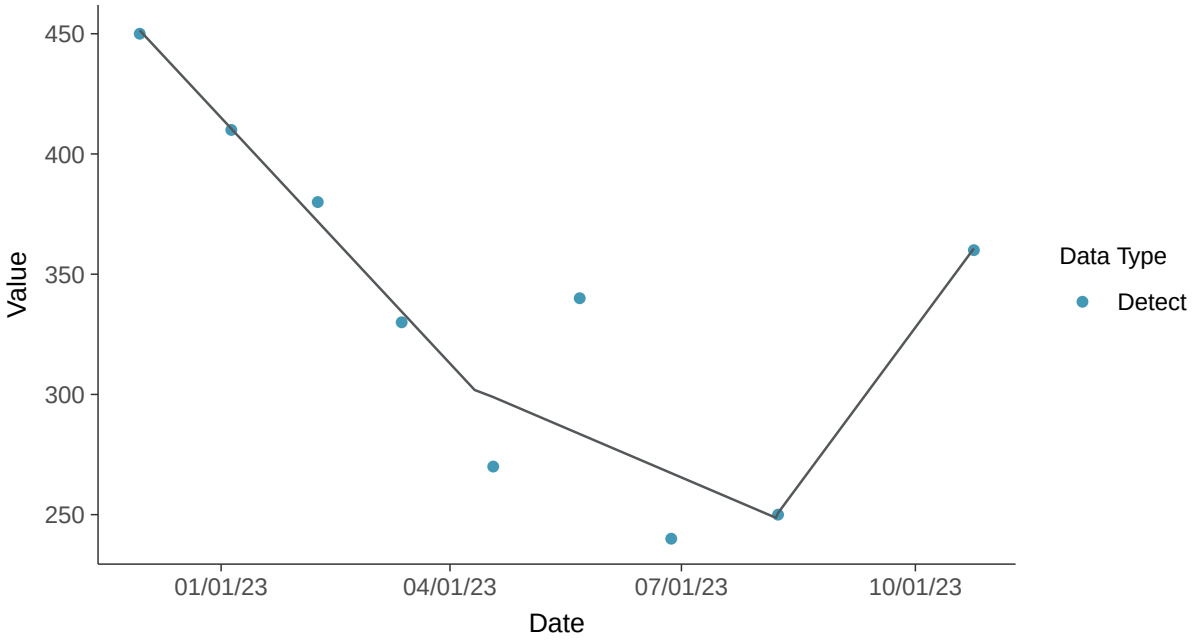
Trend Regression: Piecewise Linear-Linear

Calcium, MW-18 (mg/L)



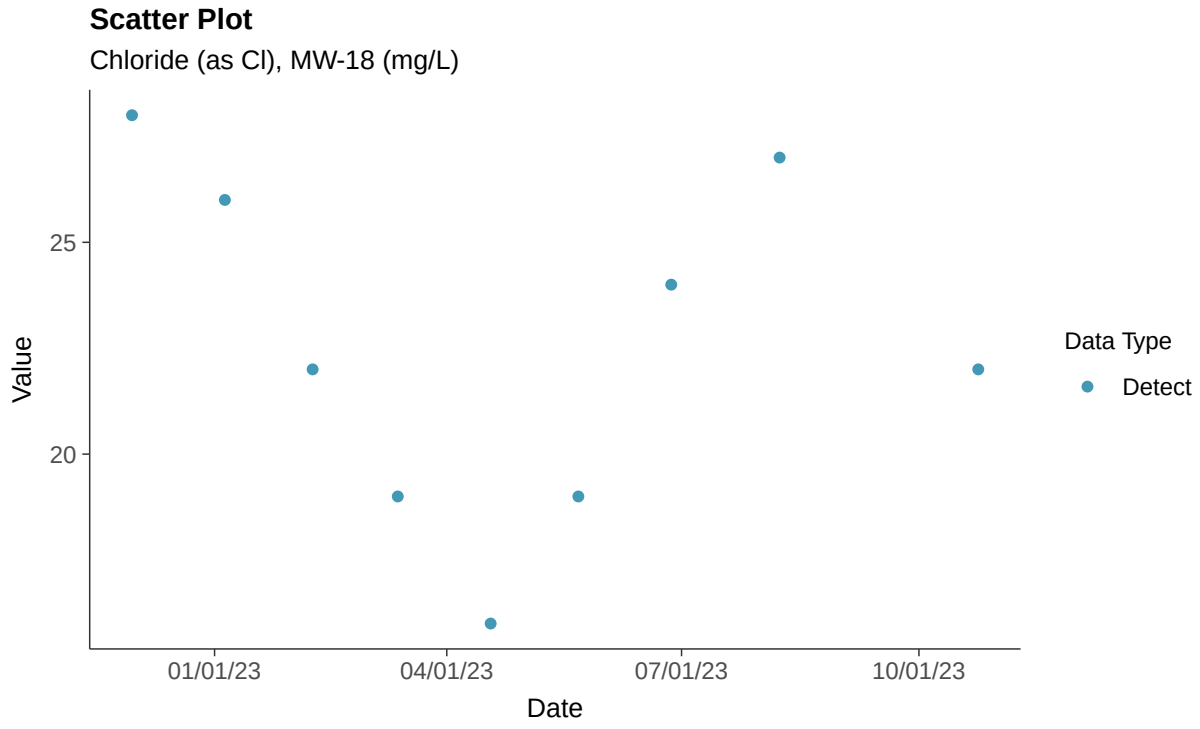
Trend Regression: Piecewise Linear-Linear-Linear

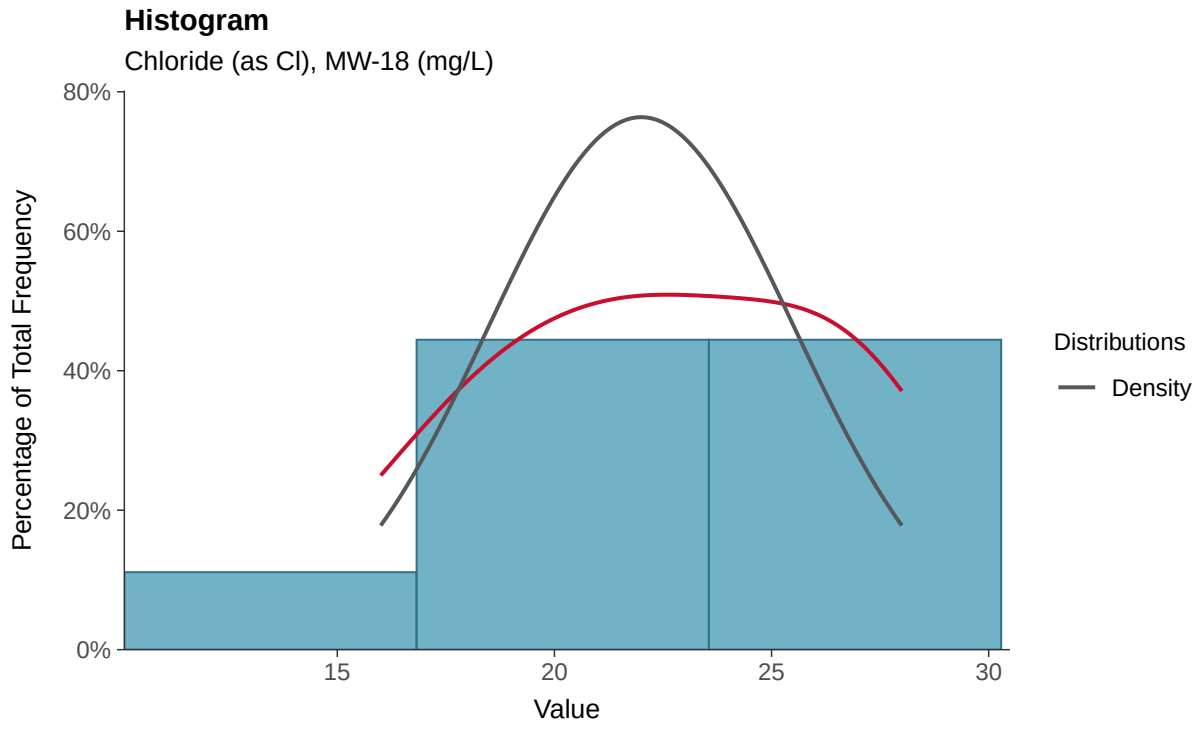
Calcium, MW-18 (mg/L)



Appendix III: Chloride (as Cl), MW-18

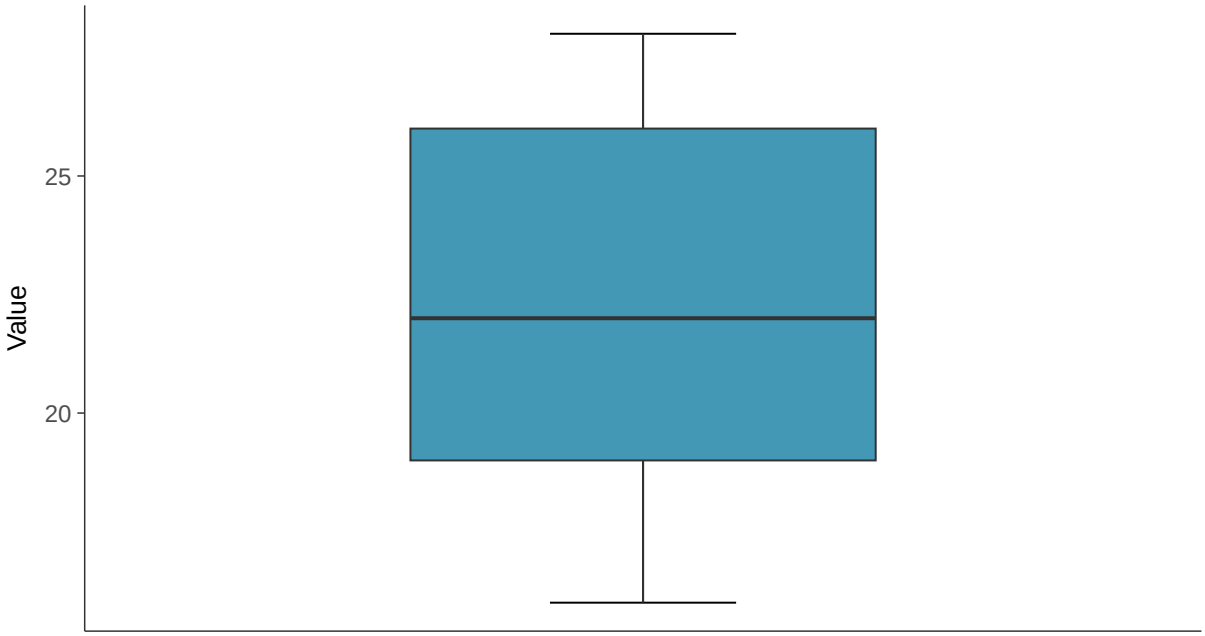
ID: 1_22_4_108





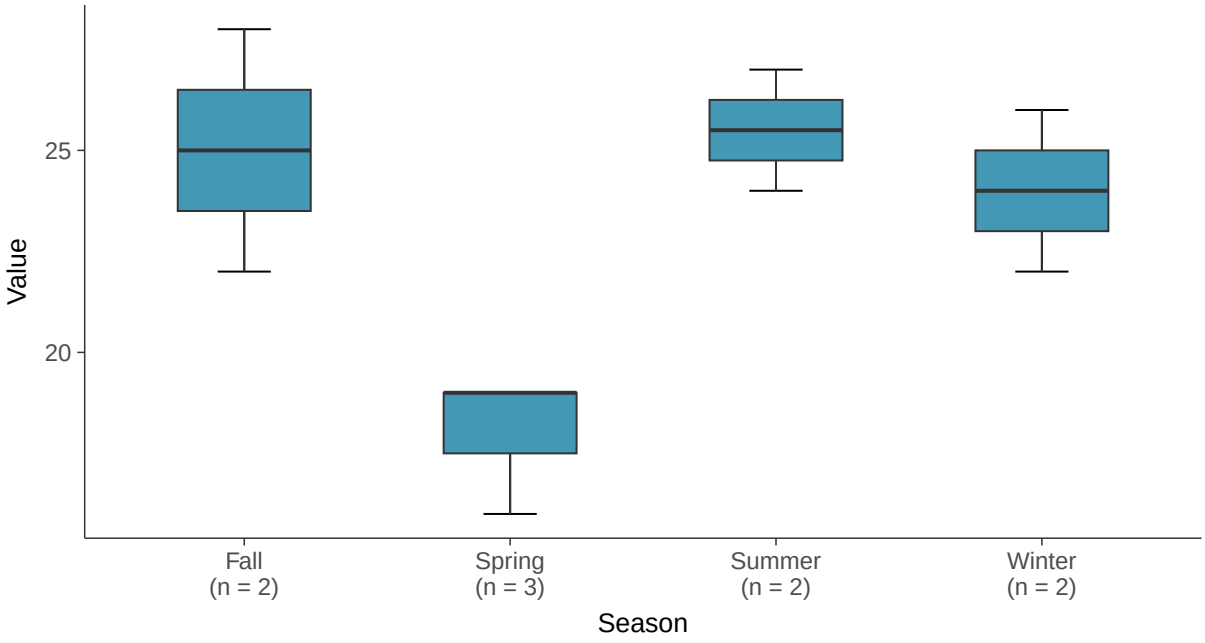
Boxplot

Chloride (as Cl), MW-18 (mg/L)



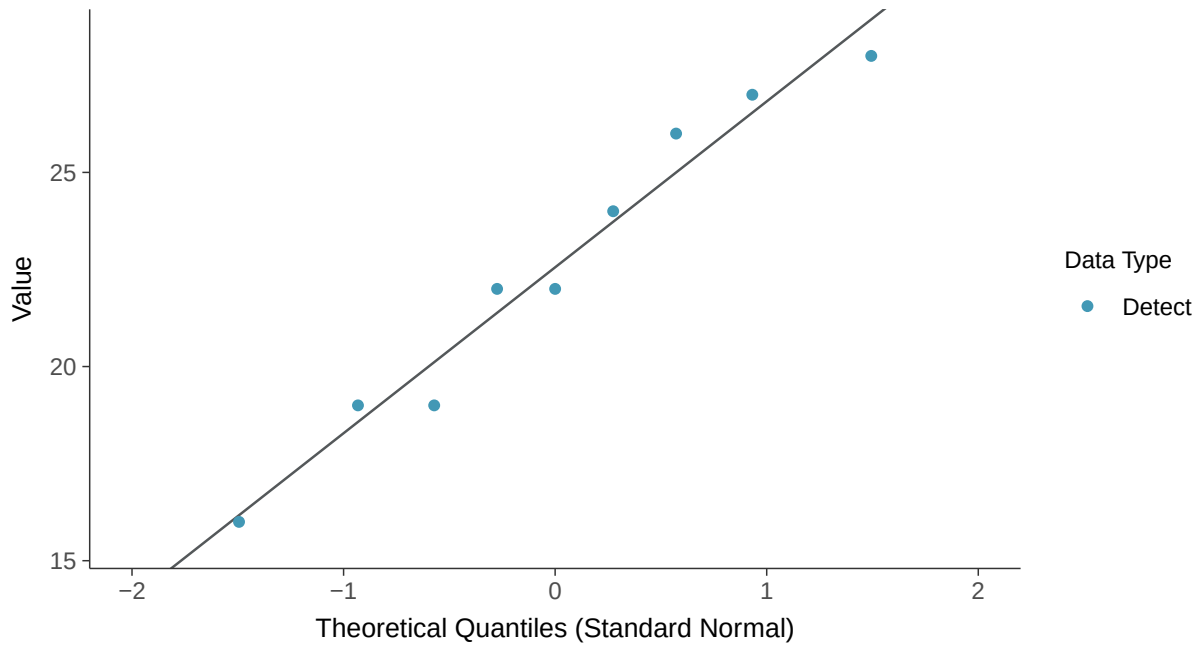
Boxplot by Season

Chloride (as Cl), MW-18 (mg/L)



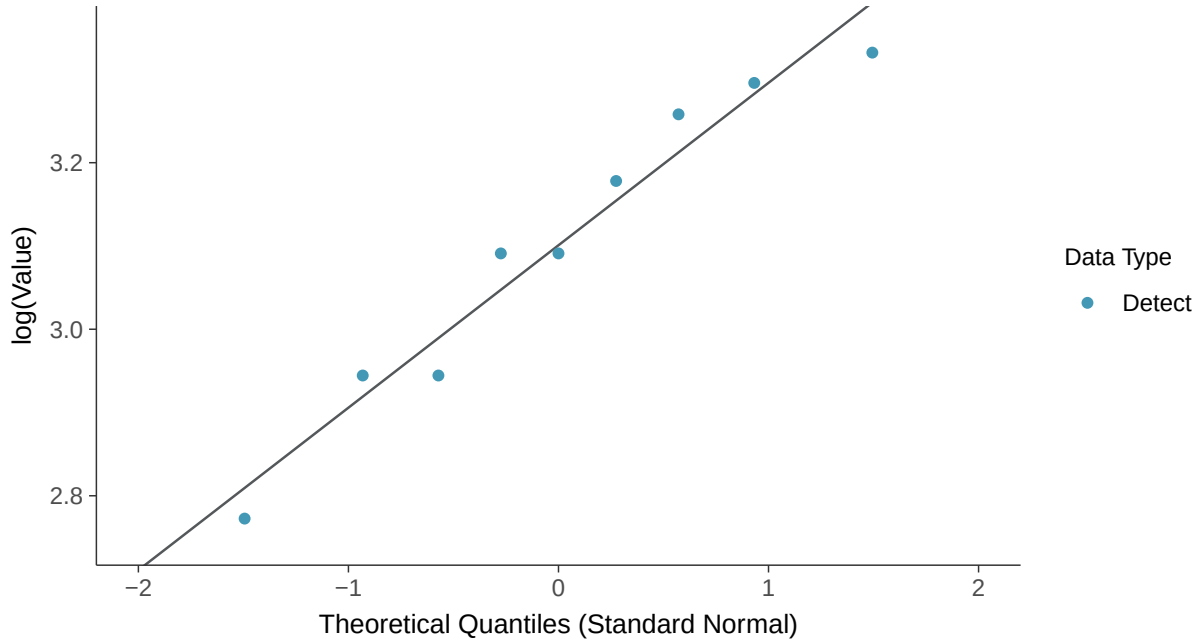
Normal Q-Q plot

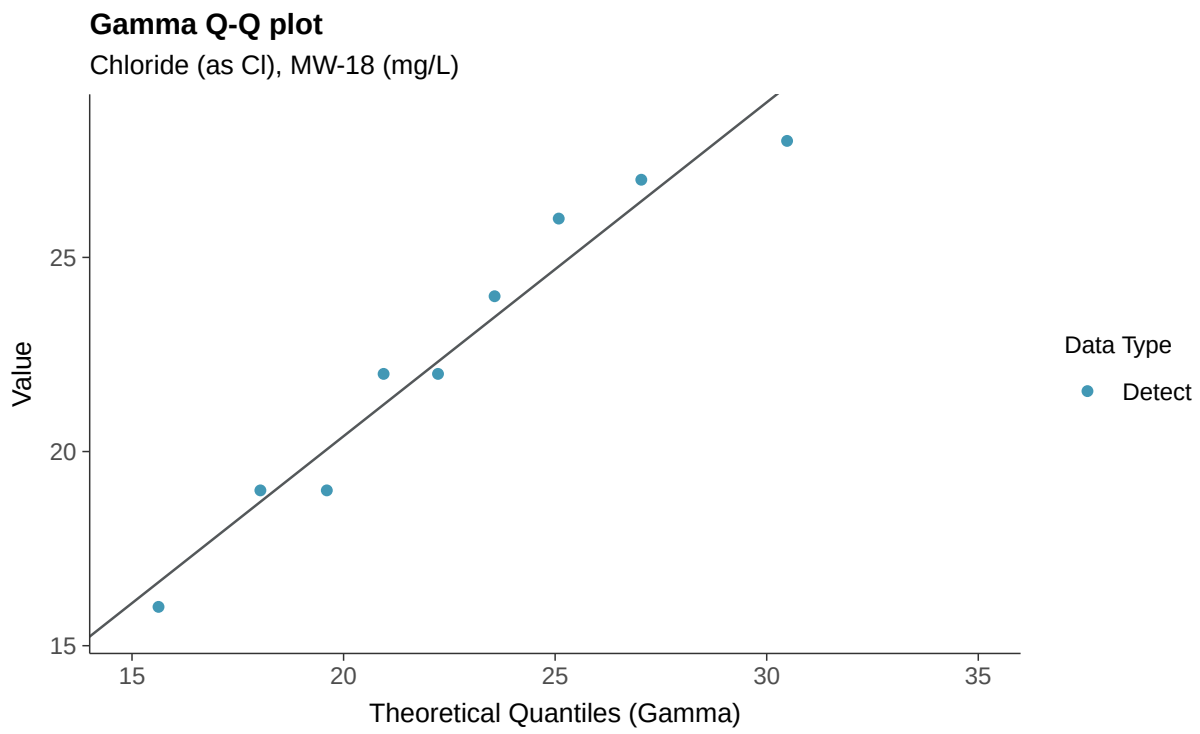
Chloride (as Cl), MW-18 (mg/L)

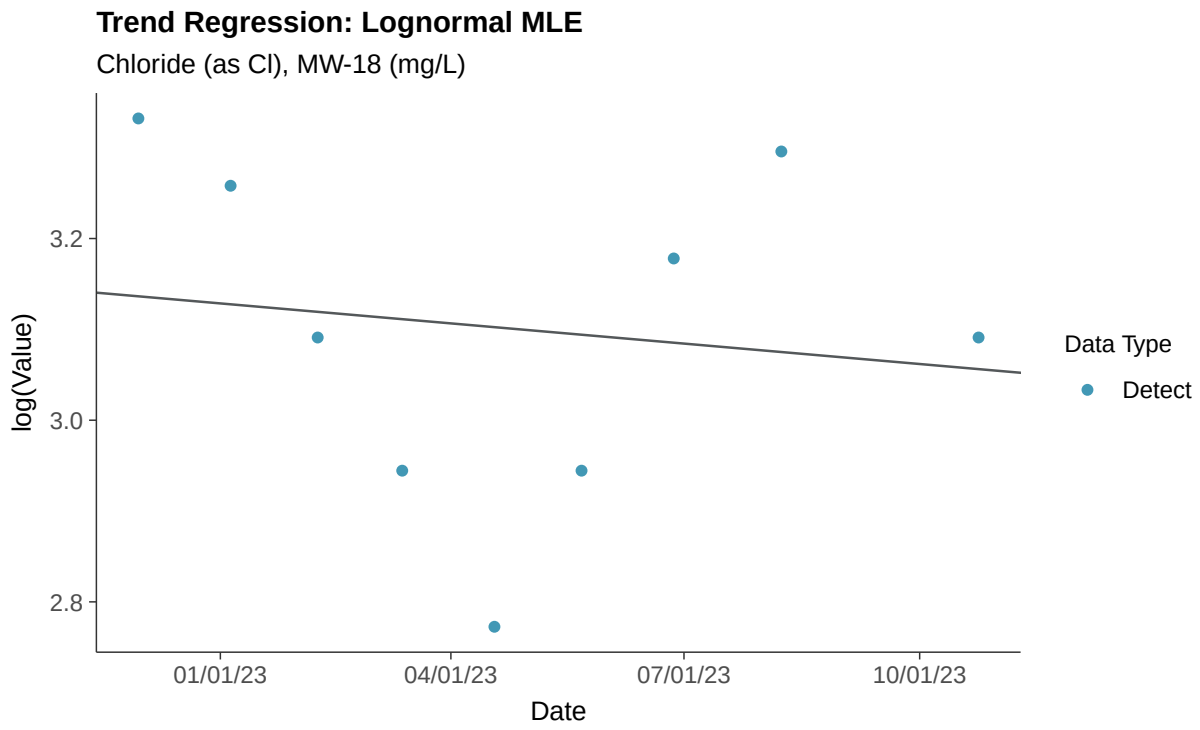


Lognormal Q-Q plot

Chloride (as Cl), MW-18 (mg/L)

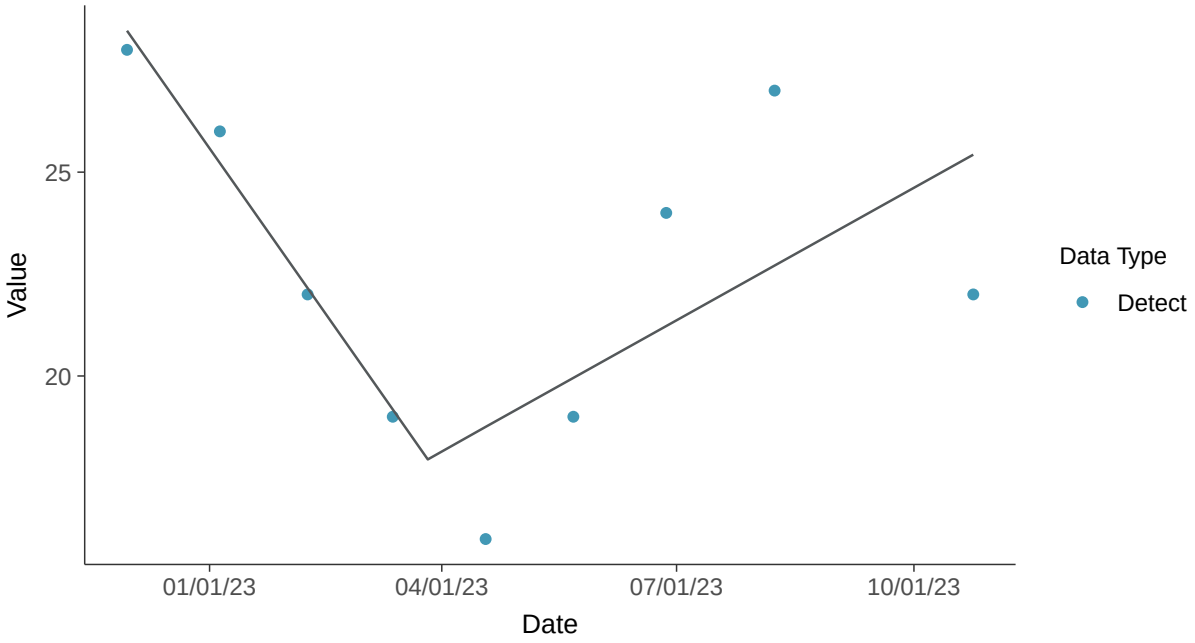



Gamma Q-Q plot
Chloride (as Cl), MW-18 (mg/L)
Value
25
20
15
15
20
25
30
35
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chloride (as Cl), MW-18 (mg/L)
log(Value)
3.2
3.0
2.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

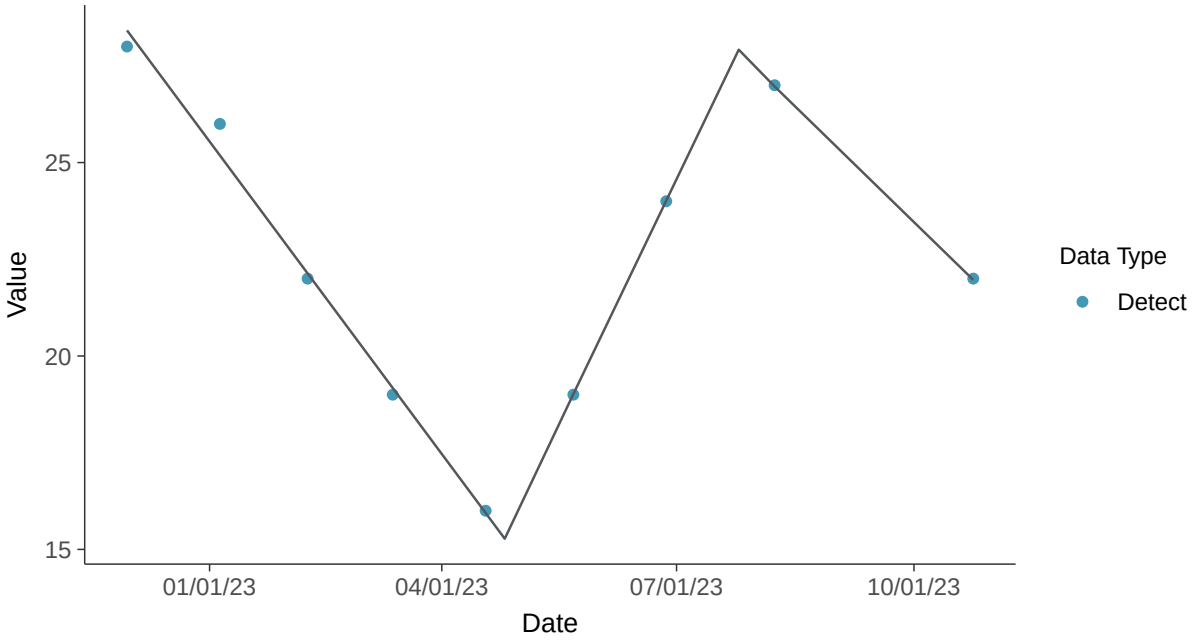
Trend Regression: Piecewise Linear-Linear

Chloride (as Cl), MW-18 (mg/L)



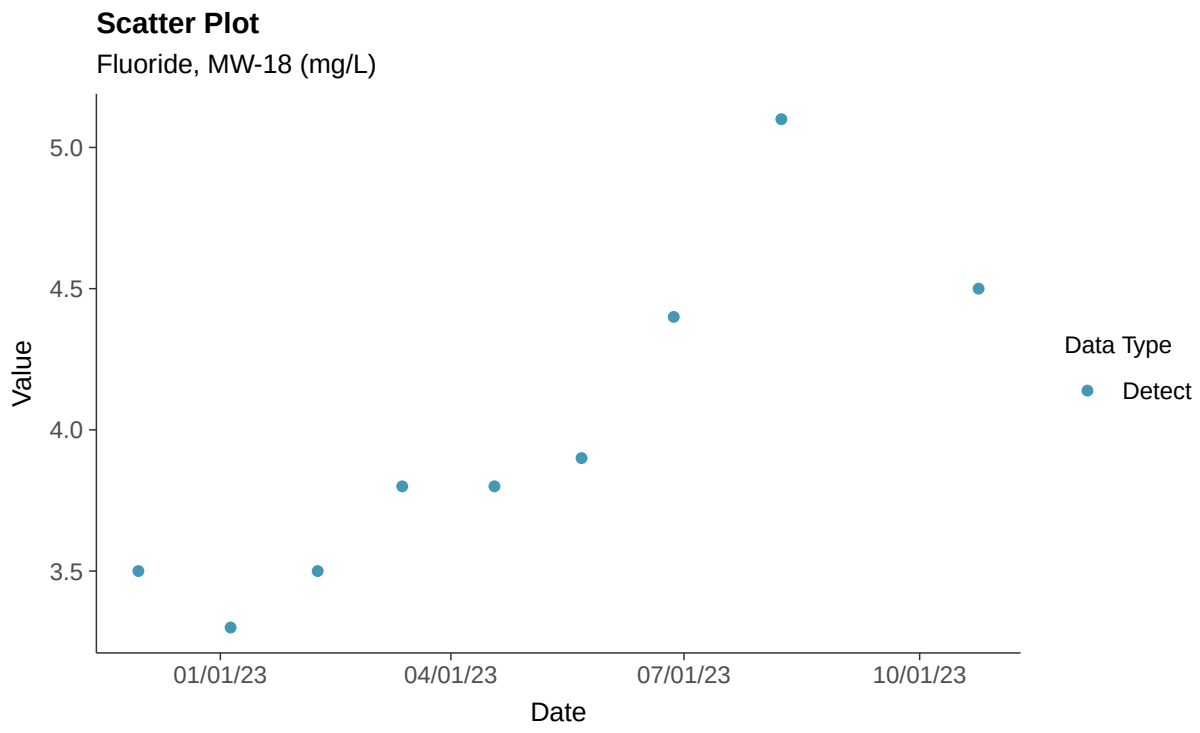
Trend Regression: Piecewise Linear-Linear-Linear

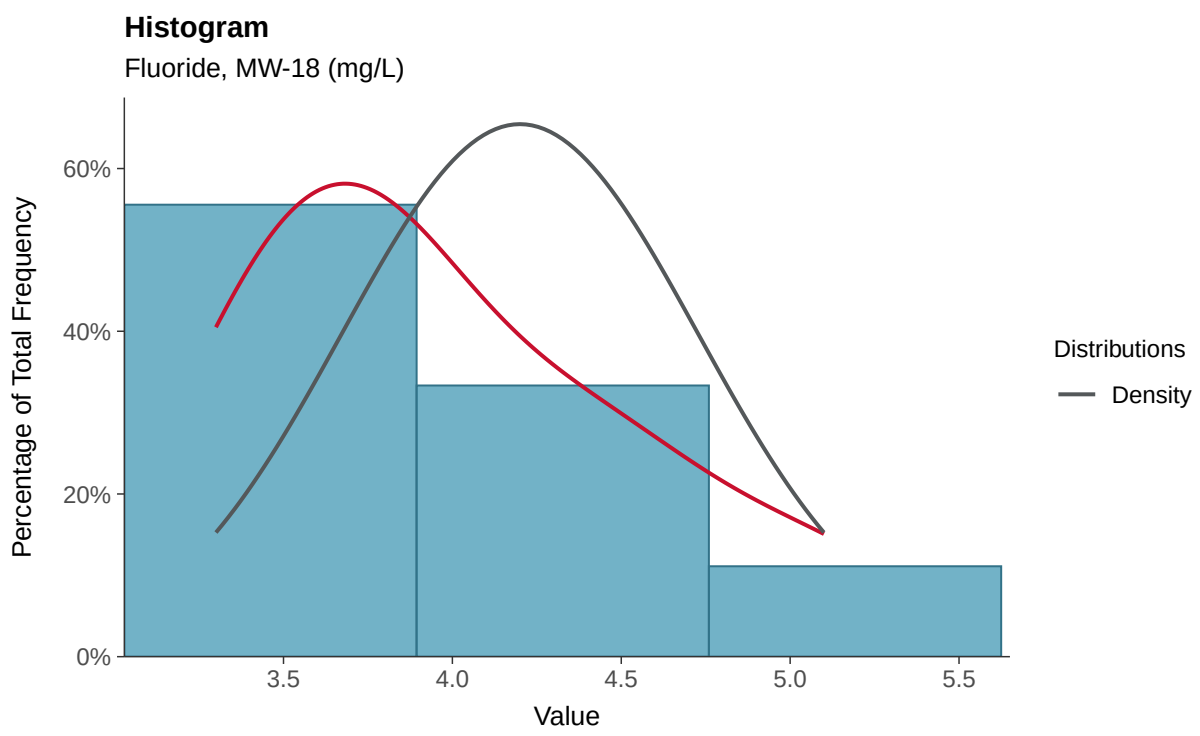
Chloride (as Cl), MW-18 (mg/L)



Appendix III: Fluoride, MW-18

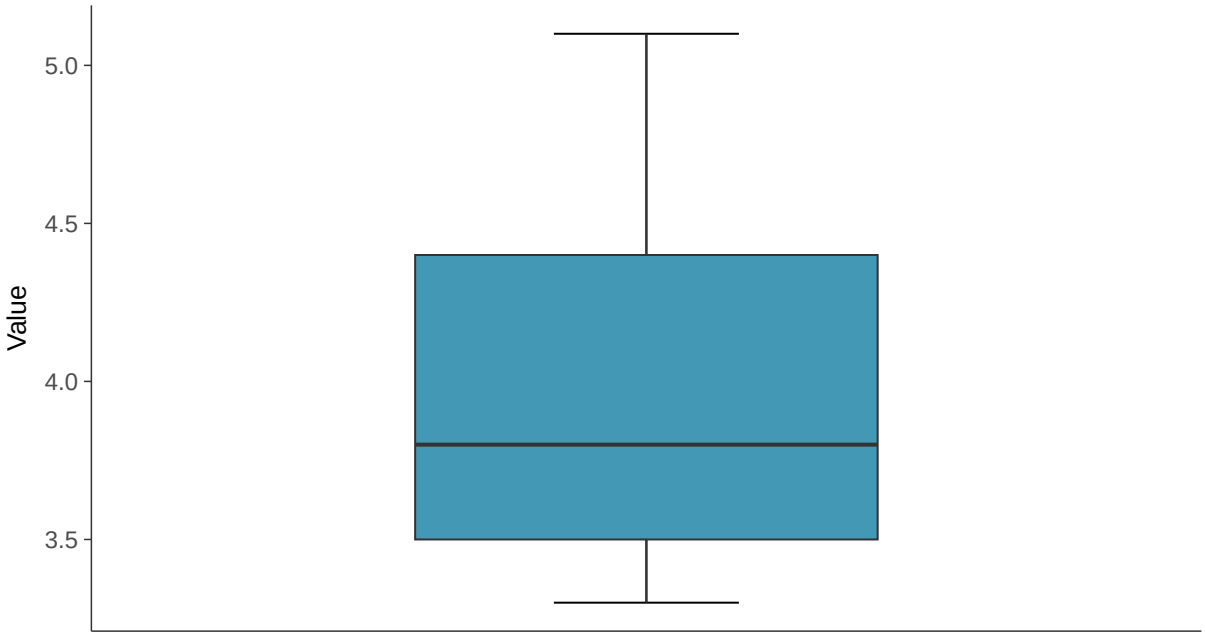
ID: 1_22_4_112





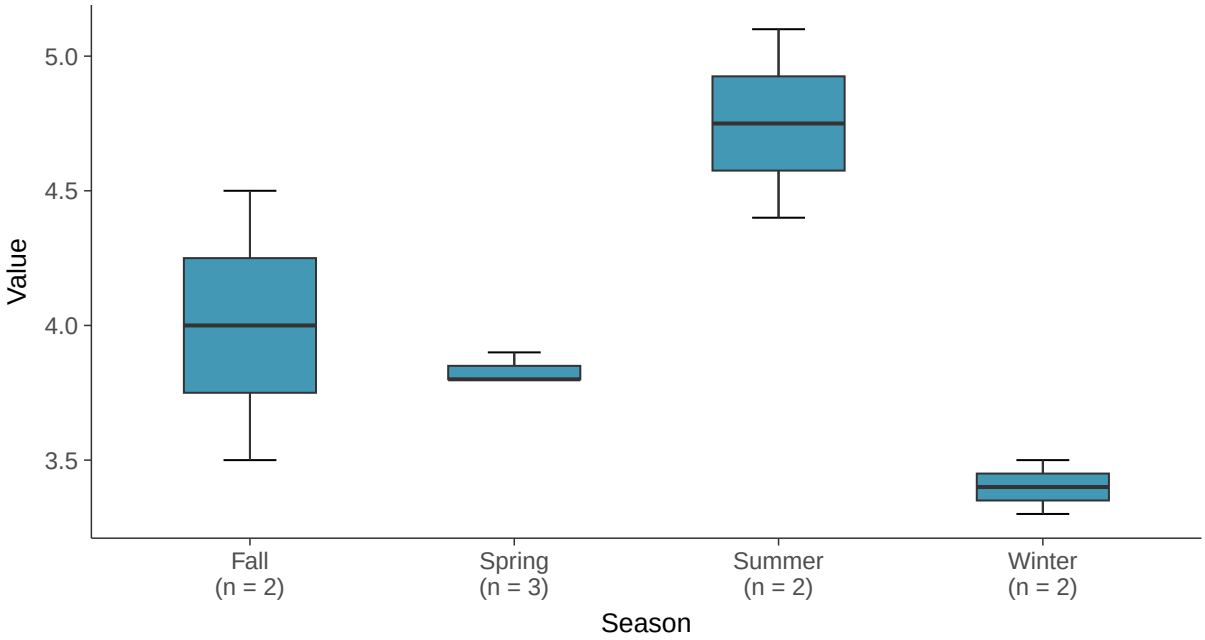
Boxplot

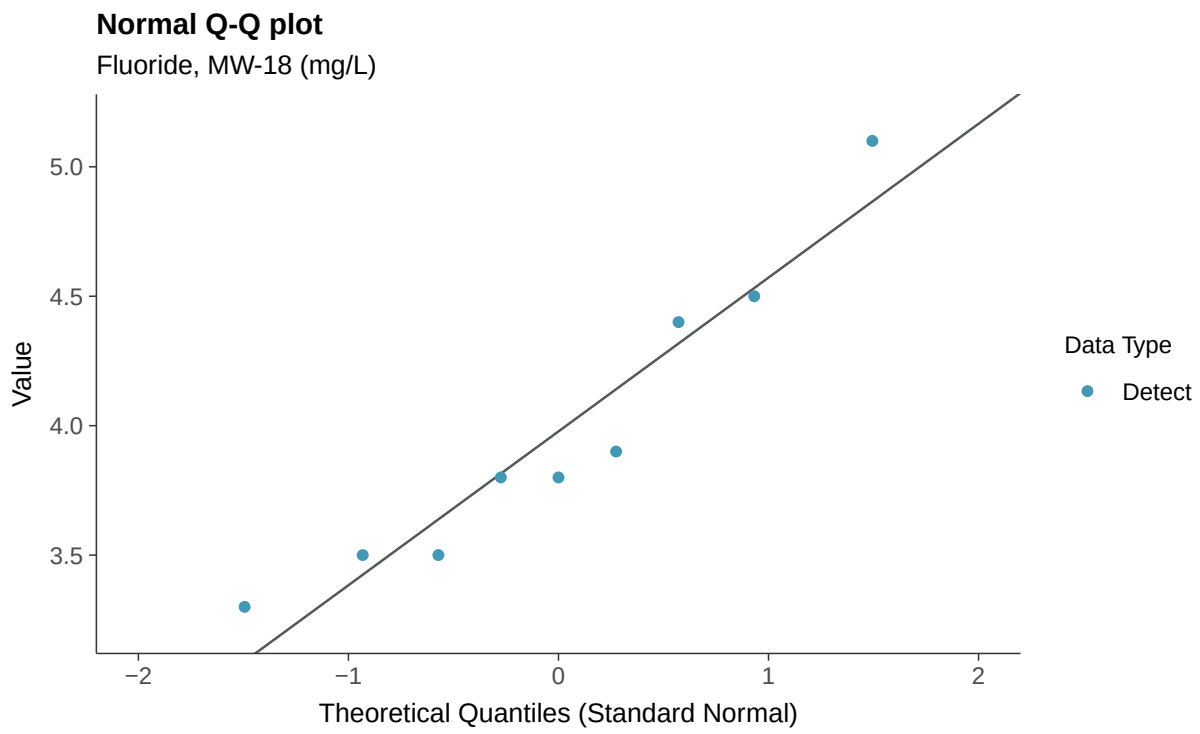
Fluoride, MW-18 (mg/L)

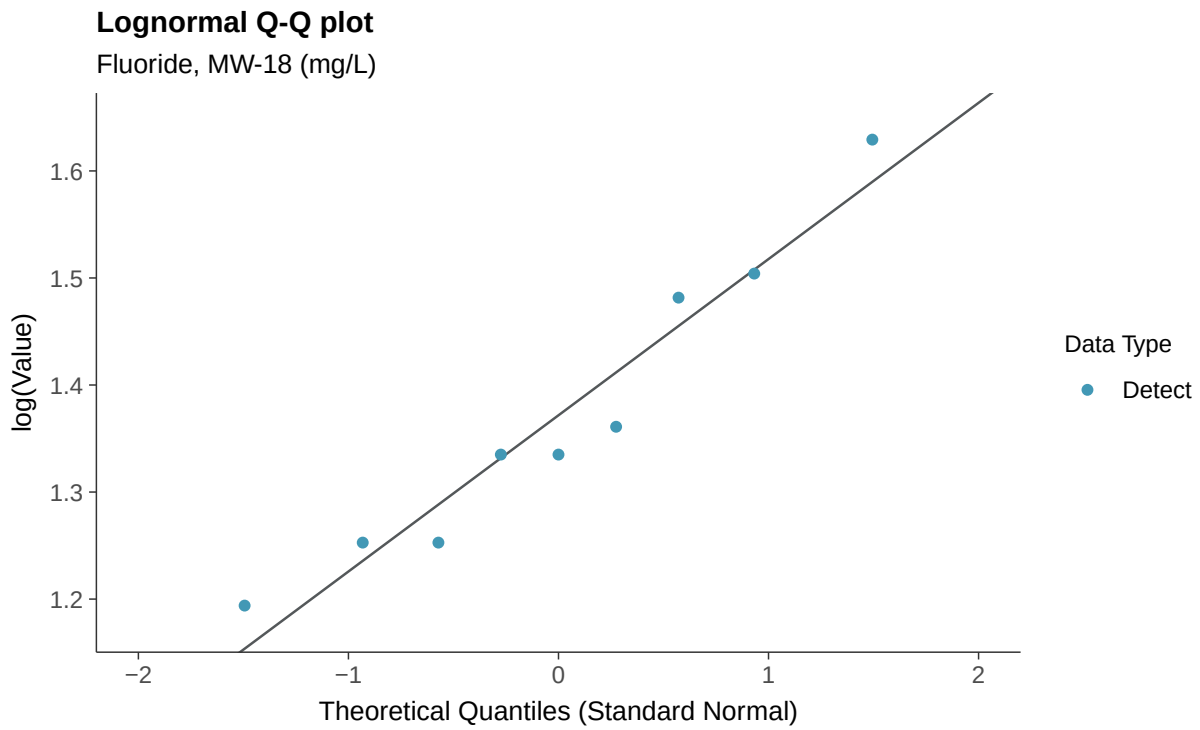


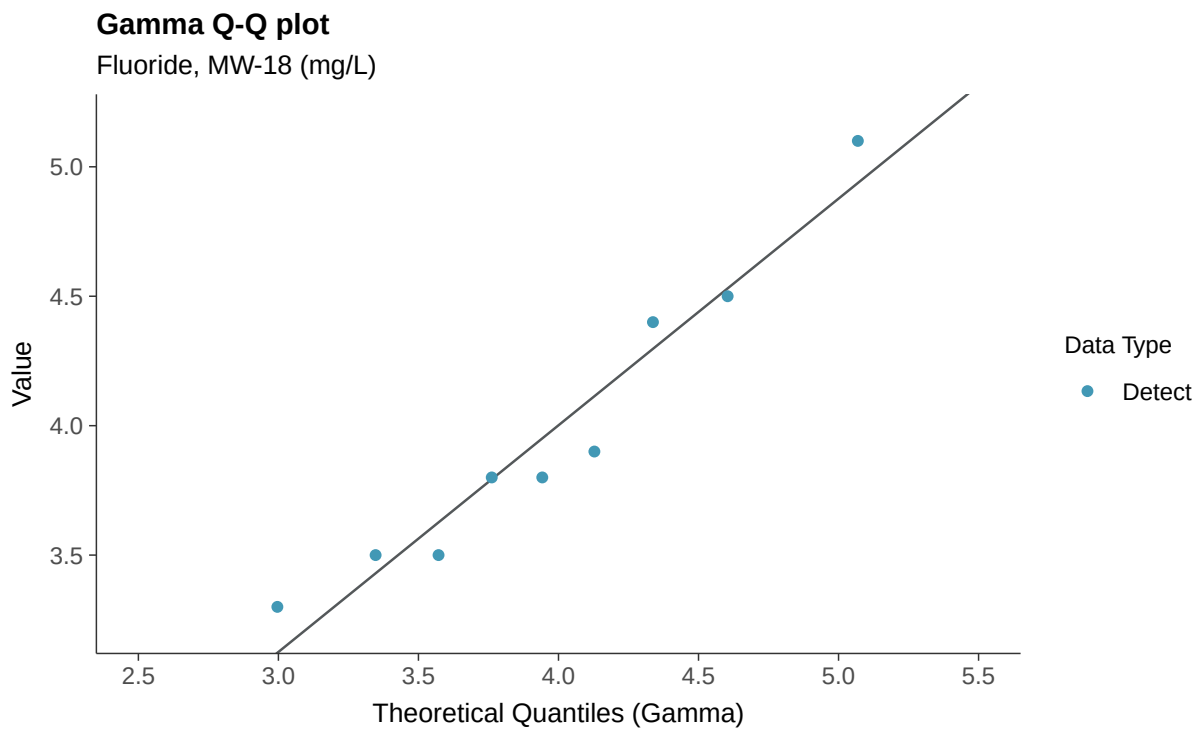
Boxplot by Season

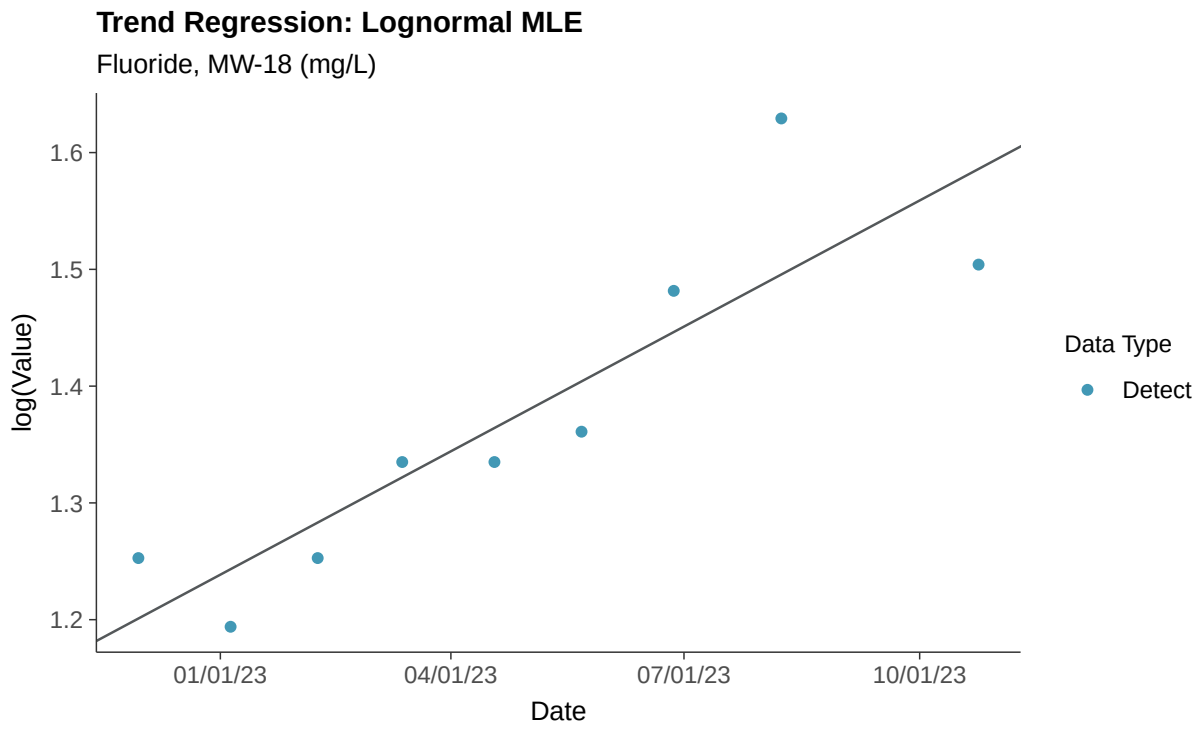
Fluoride, MW-18 (mg/L)




Normal Q-Q plot
Fluoride, MW-18 (mg/L)
Value
5.0
4.5
4.0
3.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

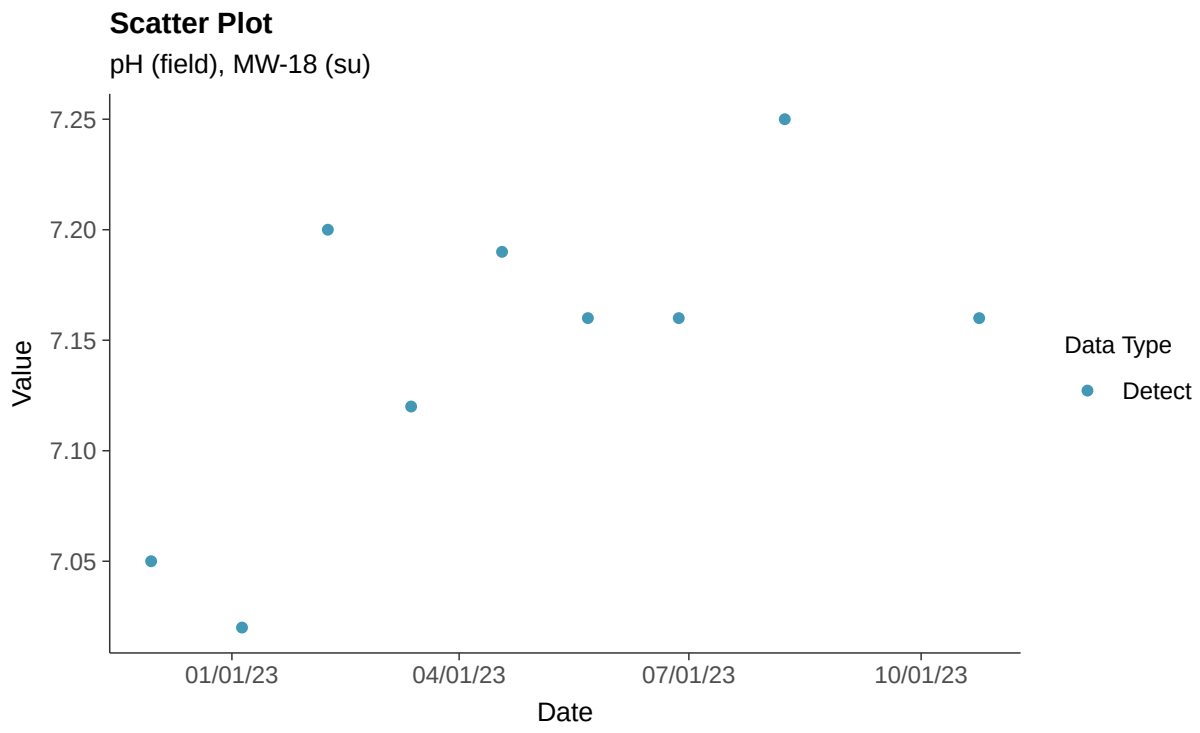

Lognormal Q-Q plot
Fluoride, MW-18 (mg/L)
log(Value)
1.6
1.5
1.4
1.3
1.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

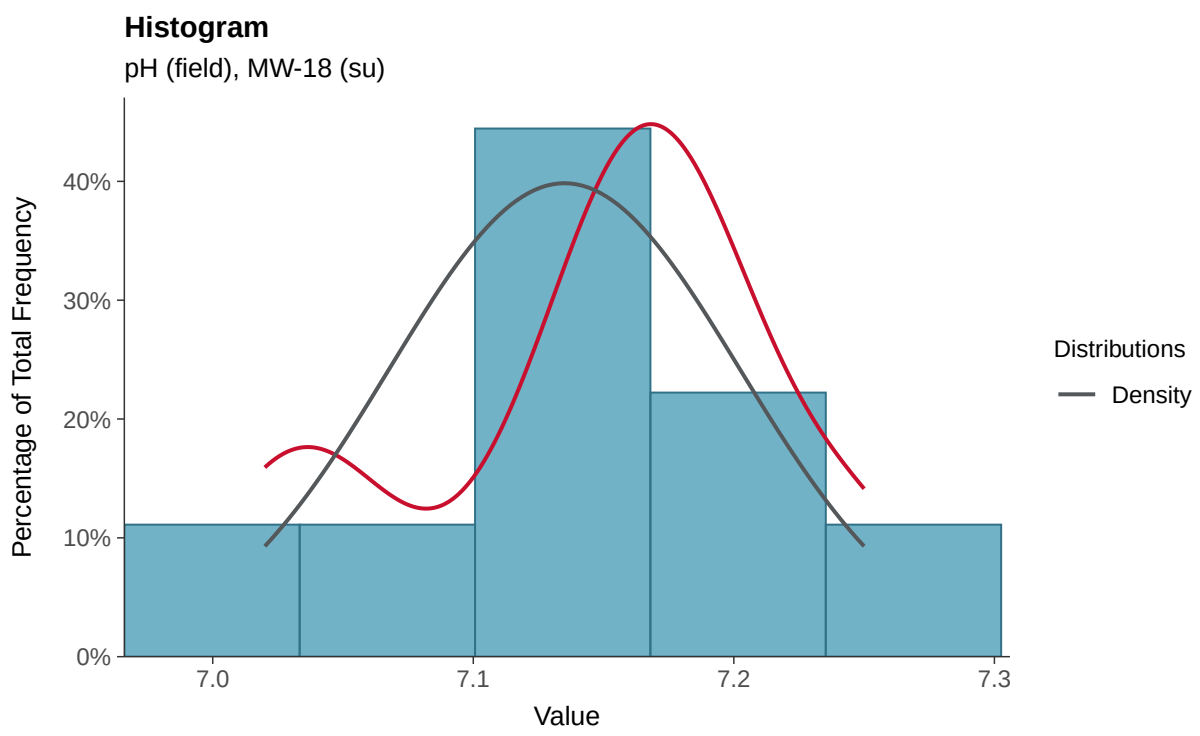

Gamma Q-Q plot
Fluoride, MW-18 (mg/L)
Value
5.0
4.5
4.0
3.5
2.5
3.0
3.5
4.0
4.5
5.0
5.5
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride, MW-18 (mg/L)
log(Value)
1.6
1.5
1.4
1.3
1.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: pH (field), MW-18

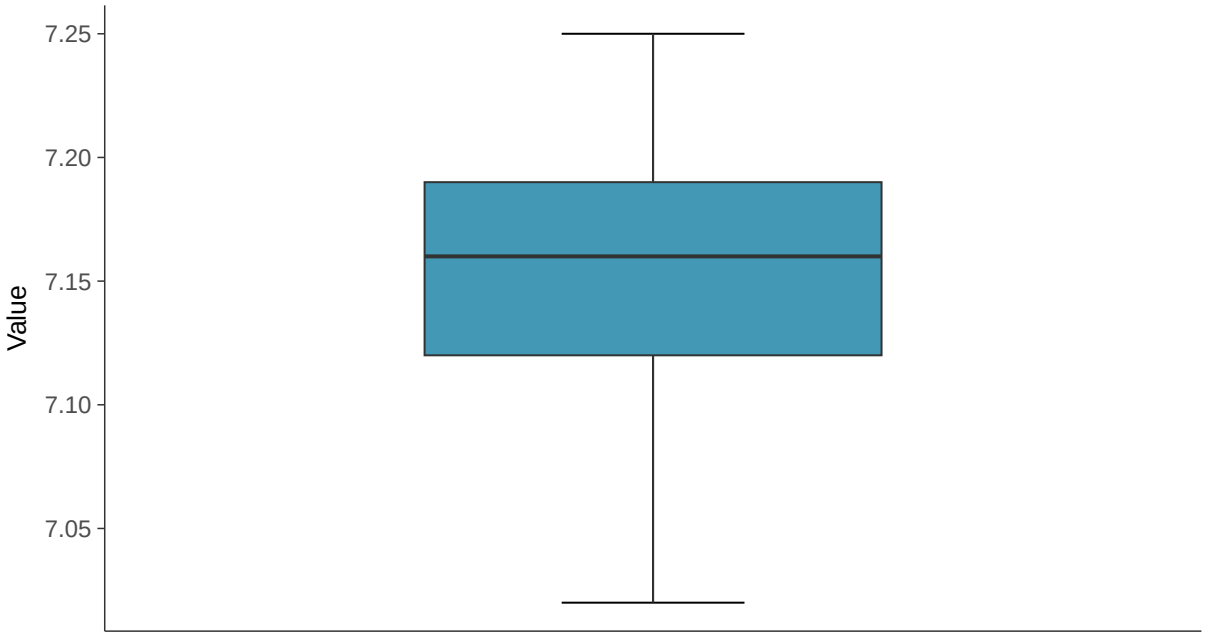
ID: 1_22_4_120





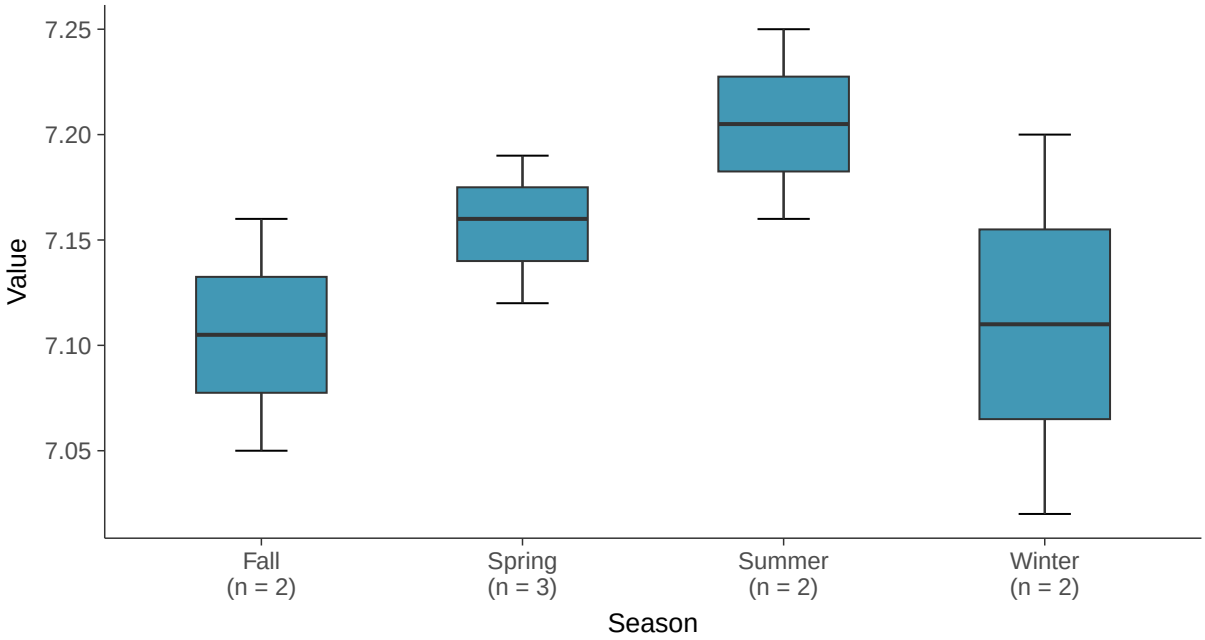
Boxplot

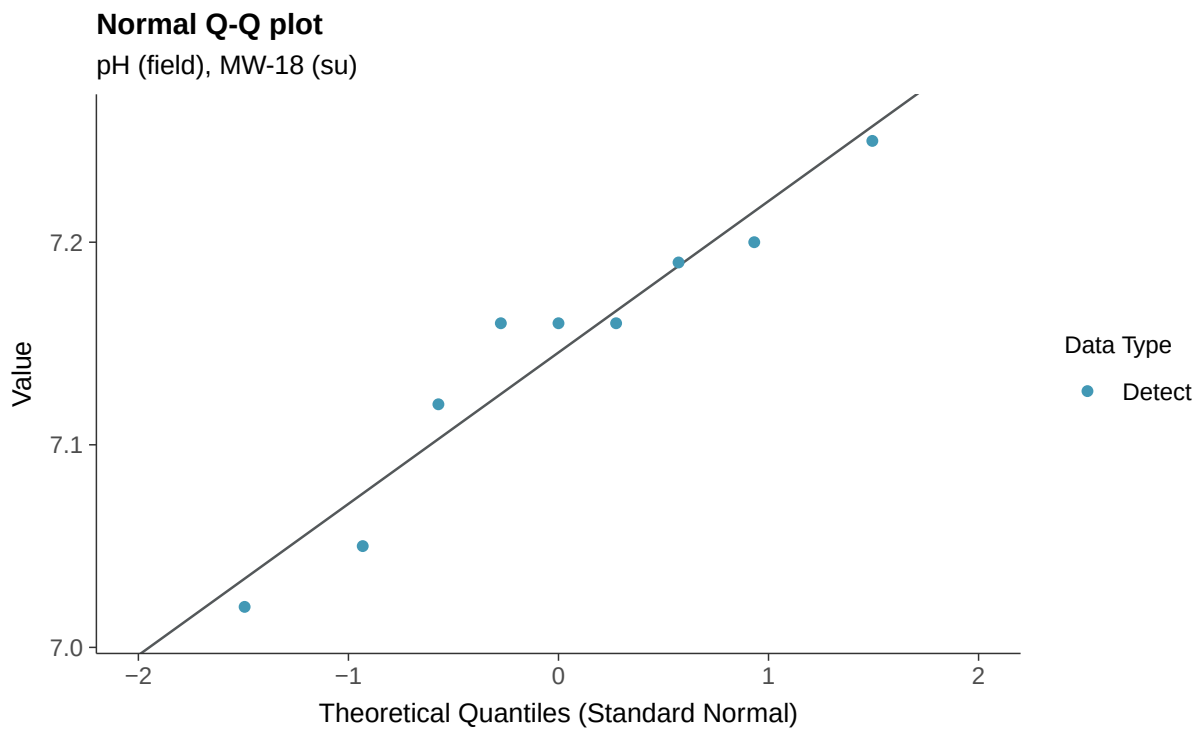
pH (field), MW-18 (su)

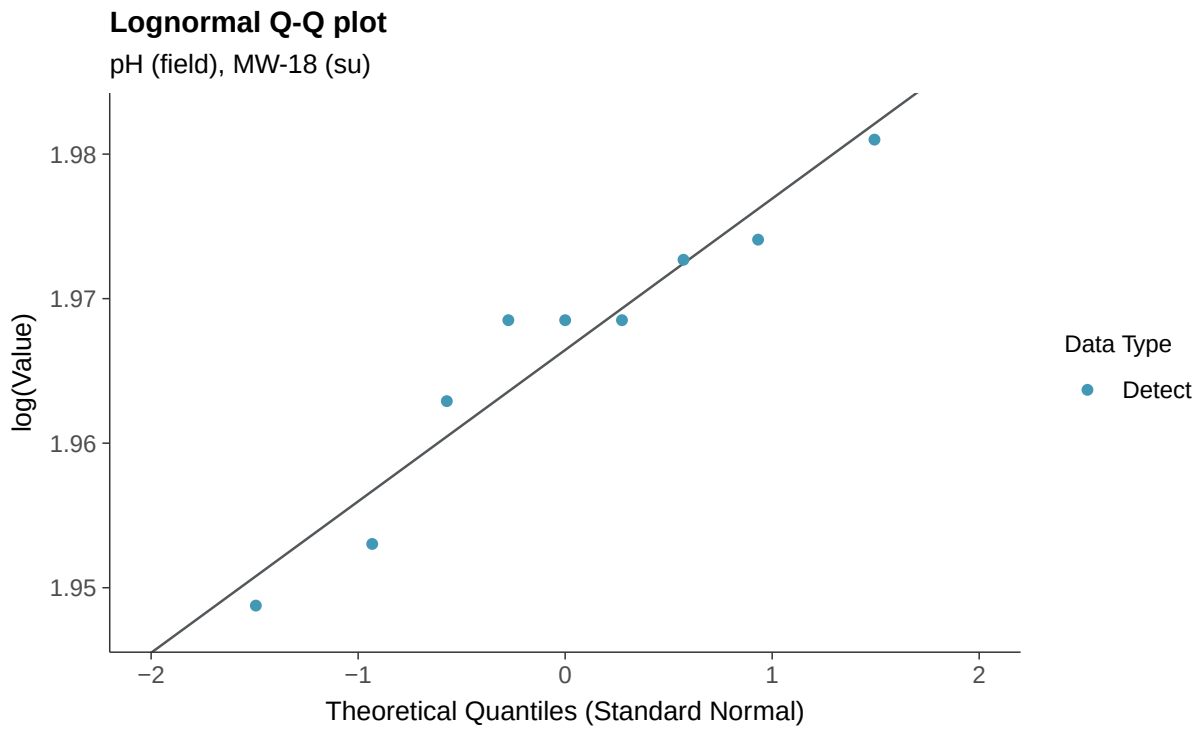


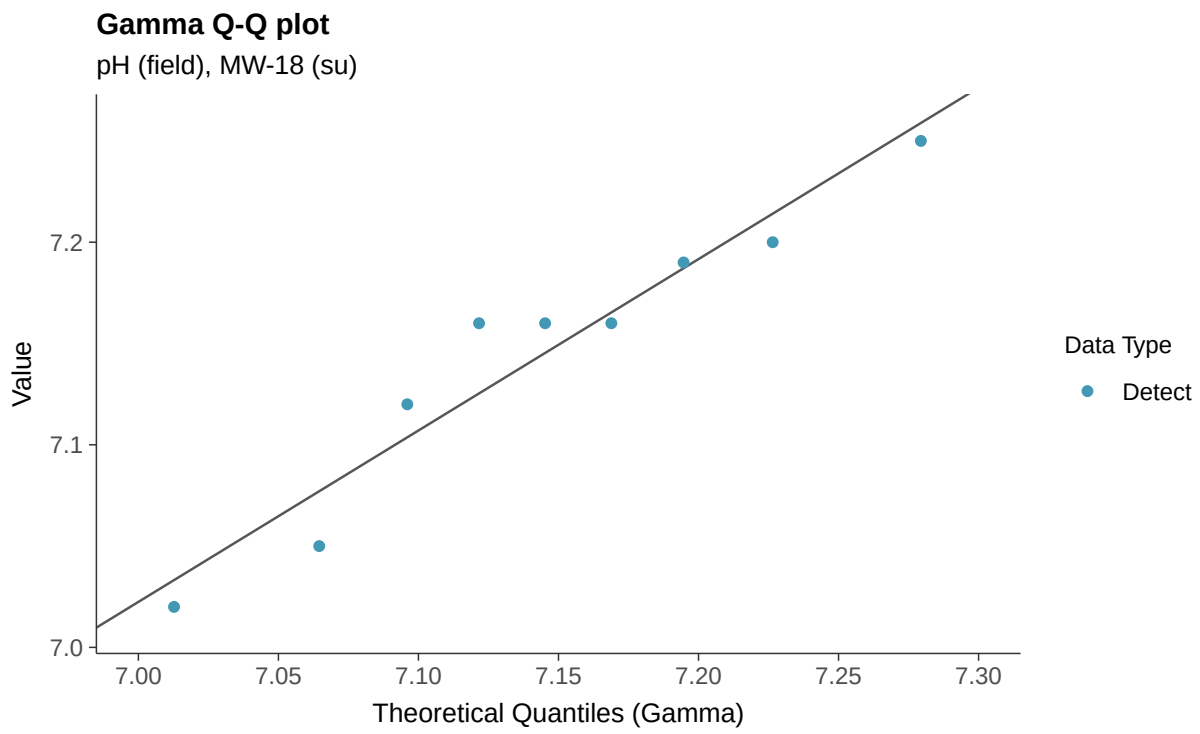
Boxplot by Season

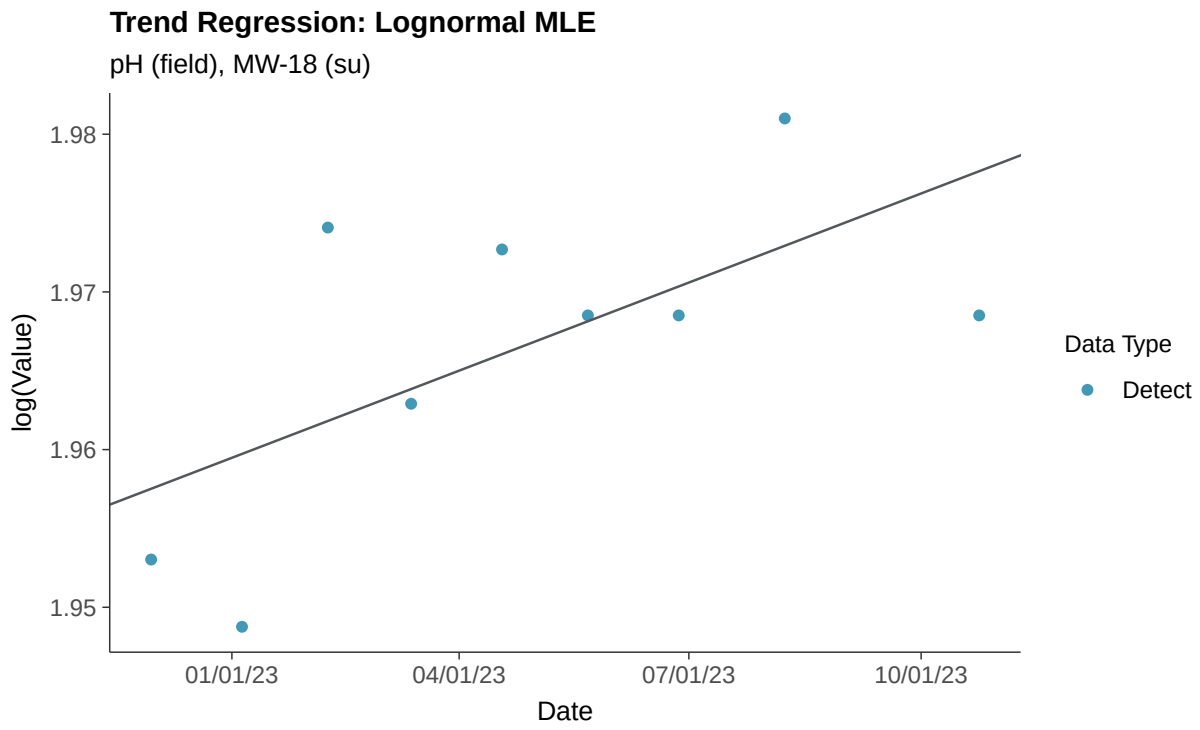
pH (field), MW-18 (su)

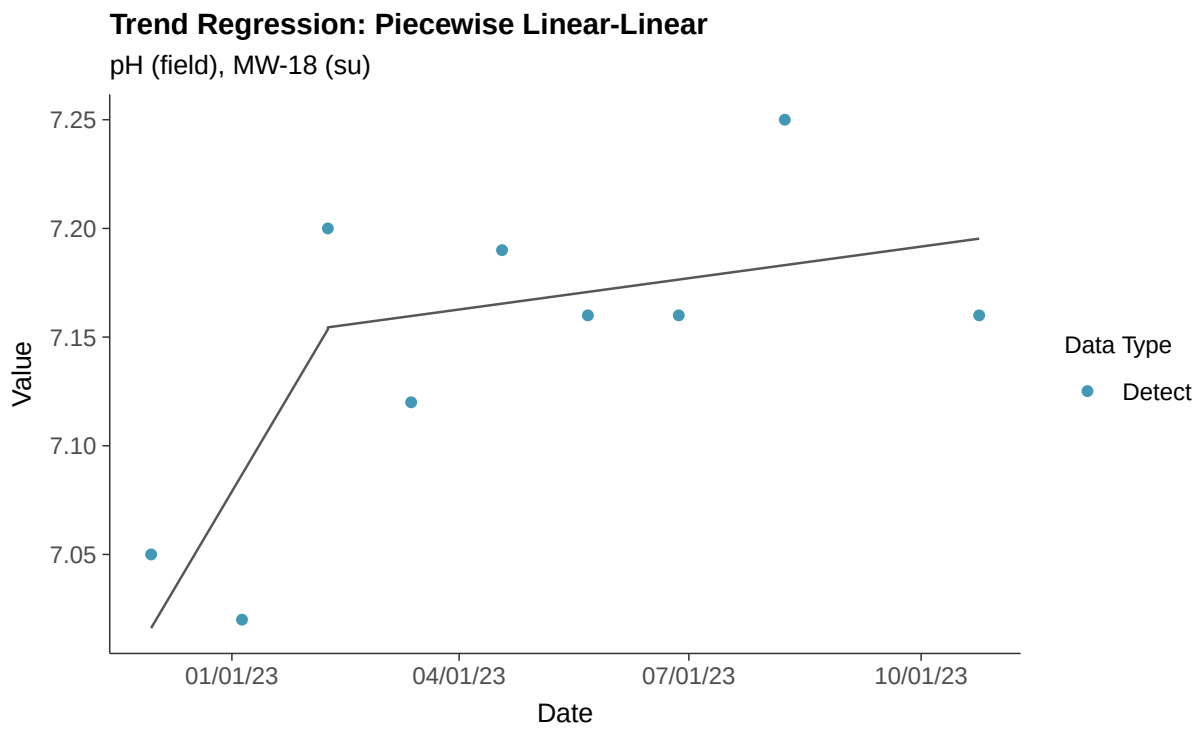



Normal Q-Q plot
pH (field), MW-18 (su)
Value
7.2
7.1
7.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
pH (field), MW-18 (su)
log(Value)
1.98
1.97
1.96
1.95
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

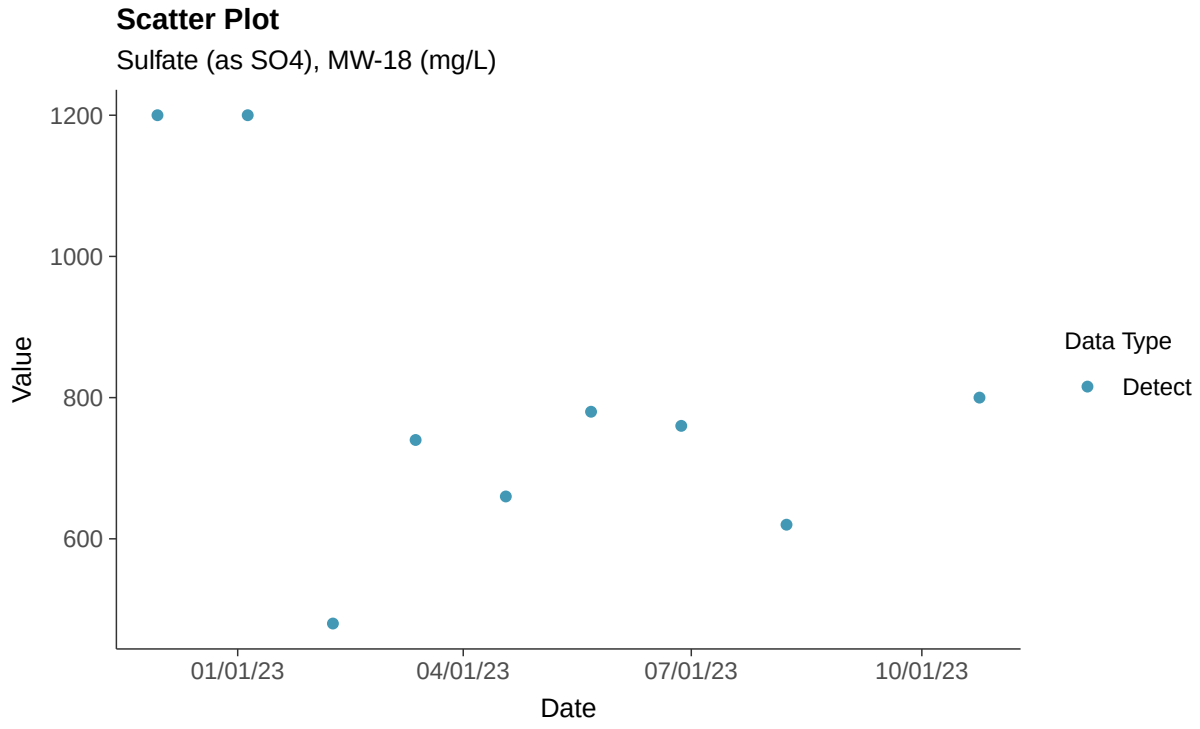

Gamma Q-Q plot
pH (field), MW-18 (su)
Value
7.0
7.1
7.2
7.00
7.05
7.10
7.15
7.20
7.25
7.30
Theoretical Quantiles (Gamma)
Data Type
Detect

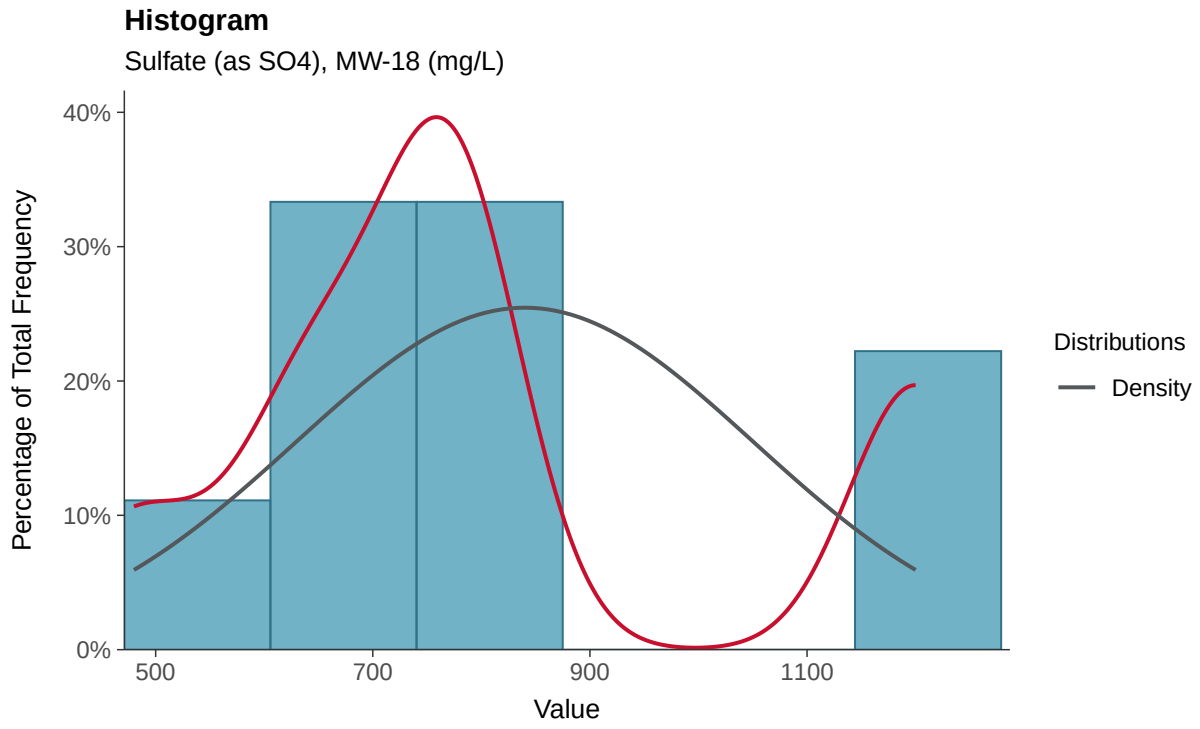

Trend Regression: Lognormal MLE
pH (field), MW-18 (su)
log(Value)
1.95
1.96
1.97
1.98
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-18 (su)
7.25
7.20
7.15
7.10
7.05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-18

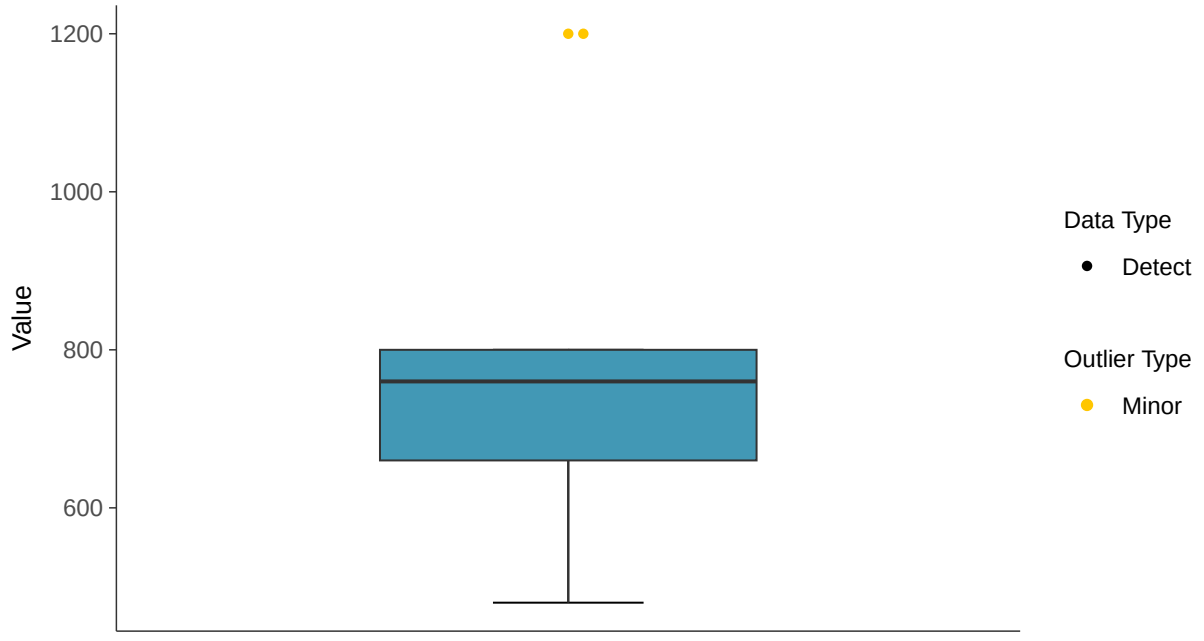
ID: 1_22_4_124





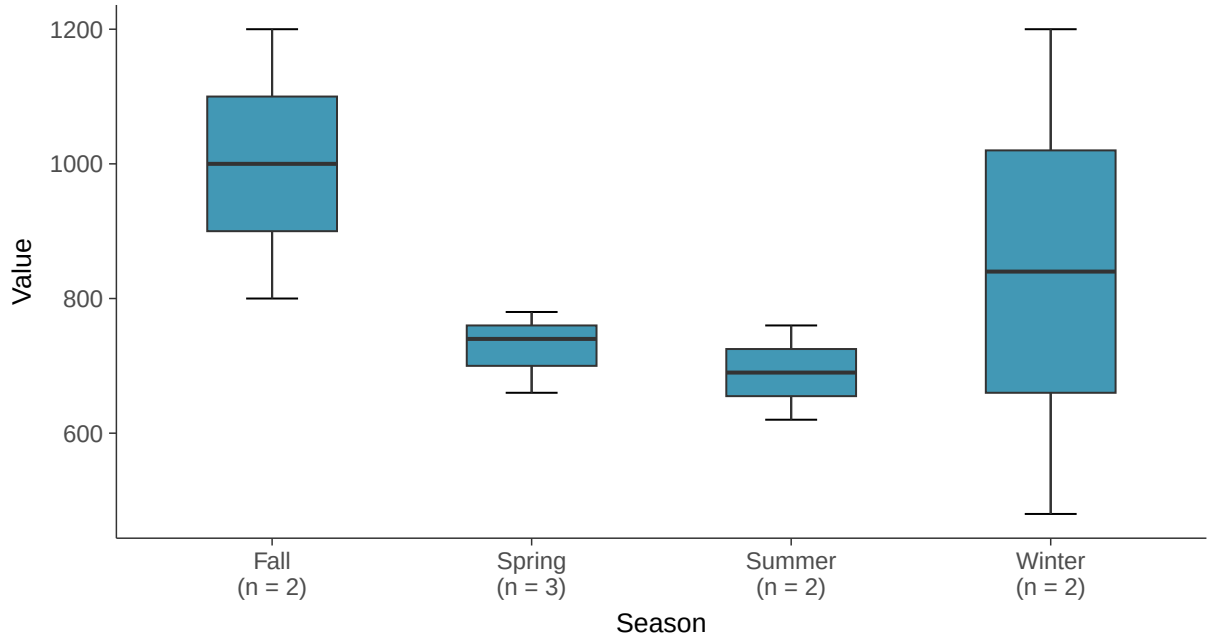
Boxplot

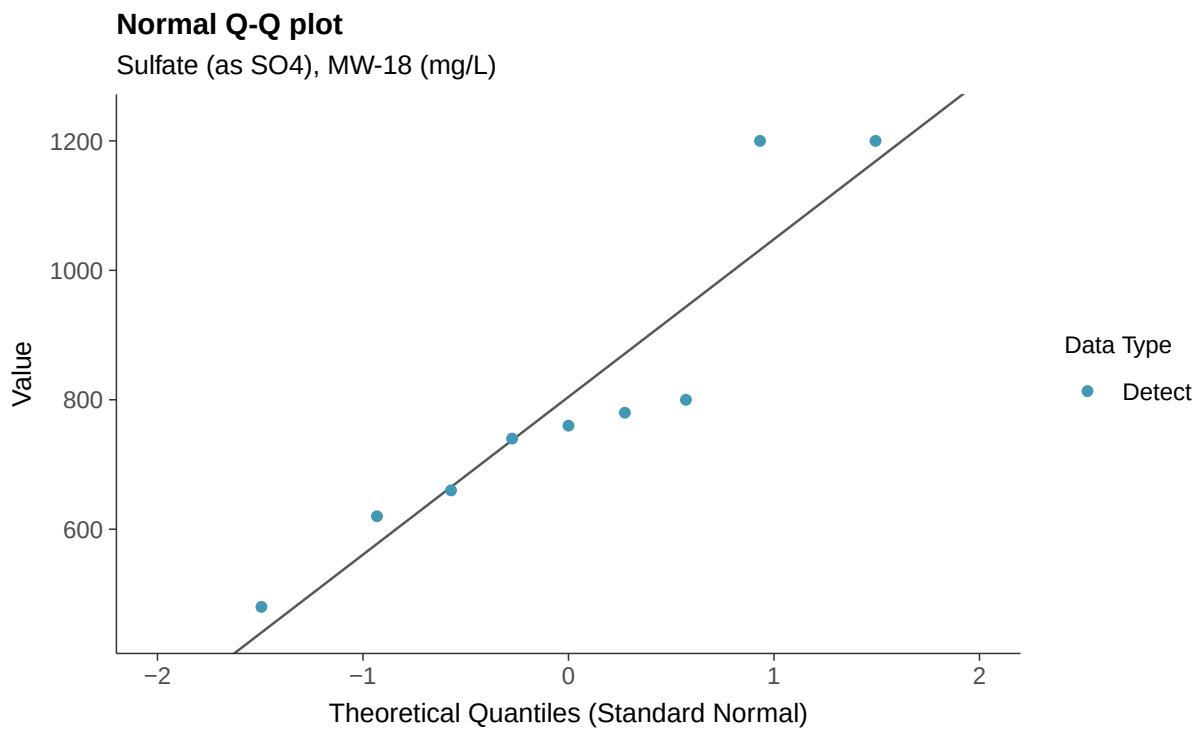
Sulfate (as SO4), MW-18 (mg/L)

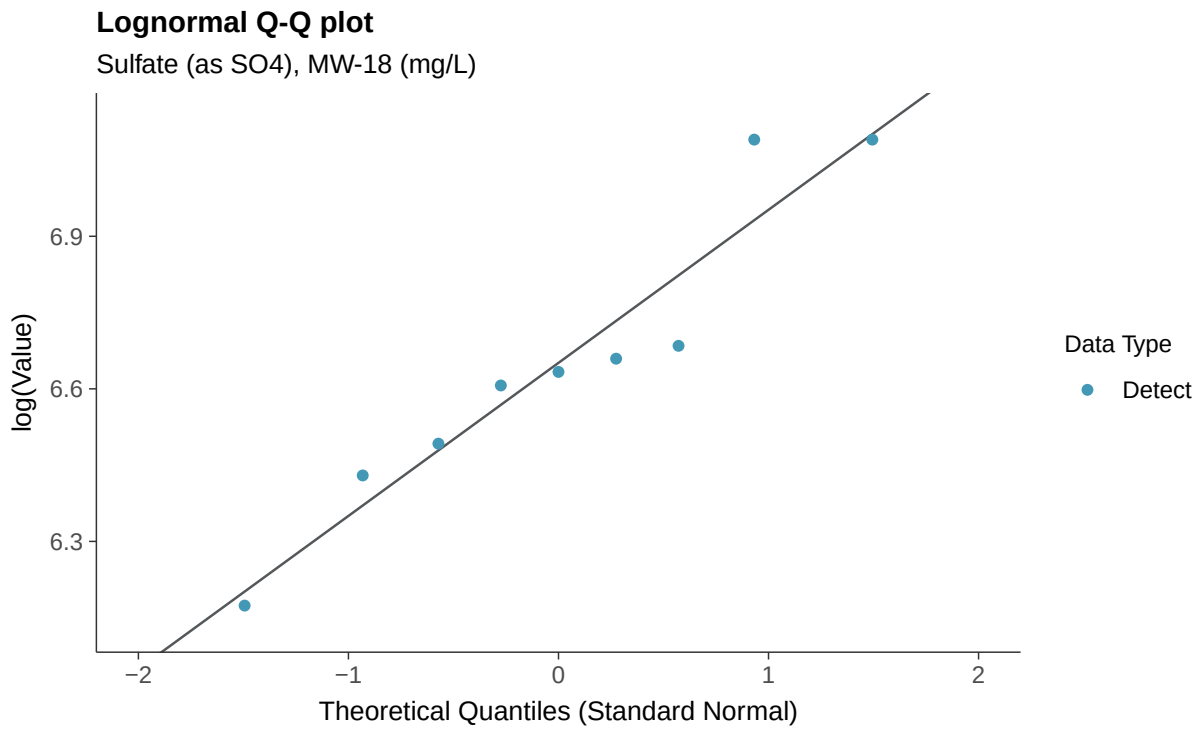


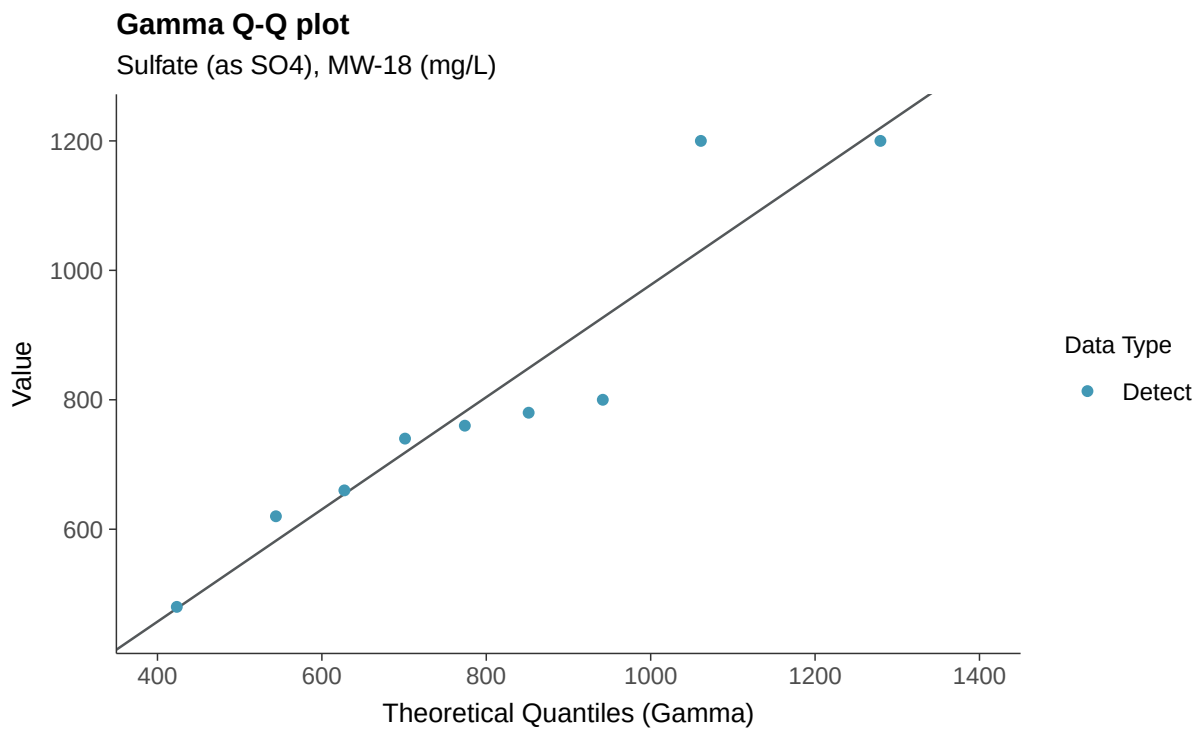
Boxplot by Season

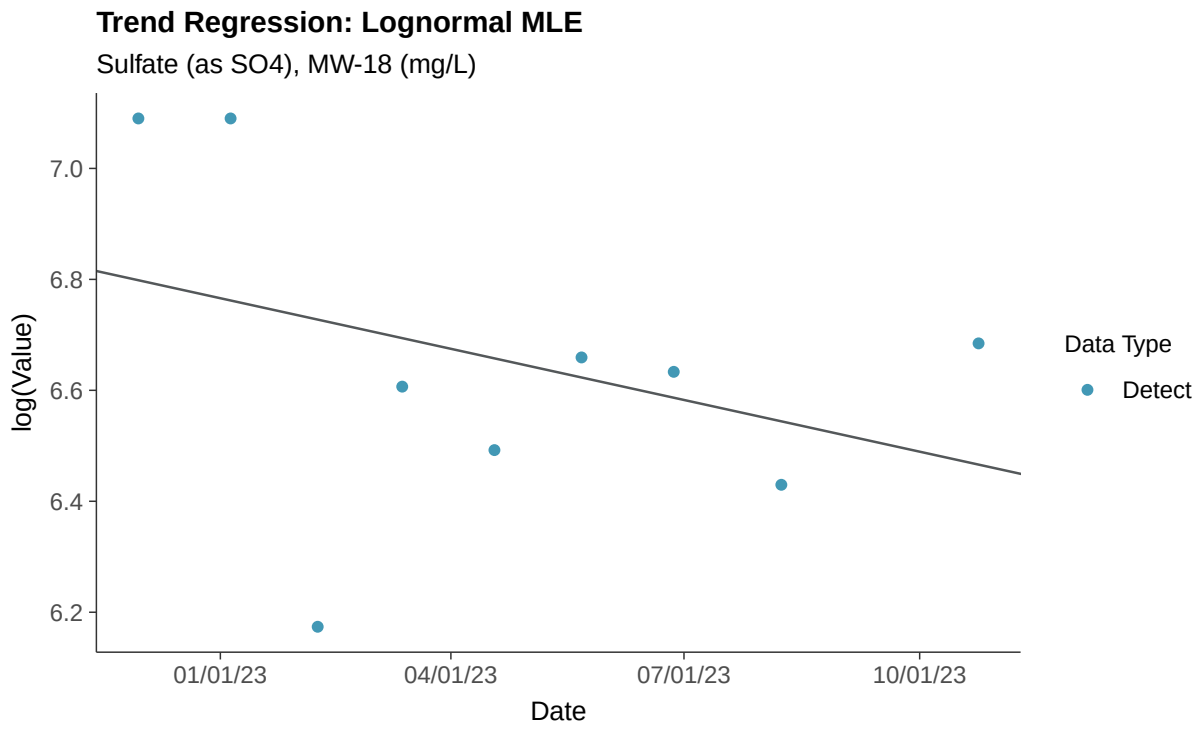
Sulfate (as SO4), MW-18 (mg/L)

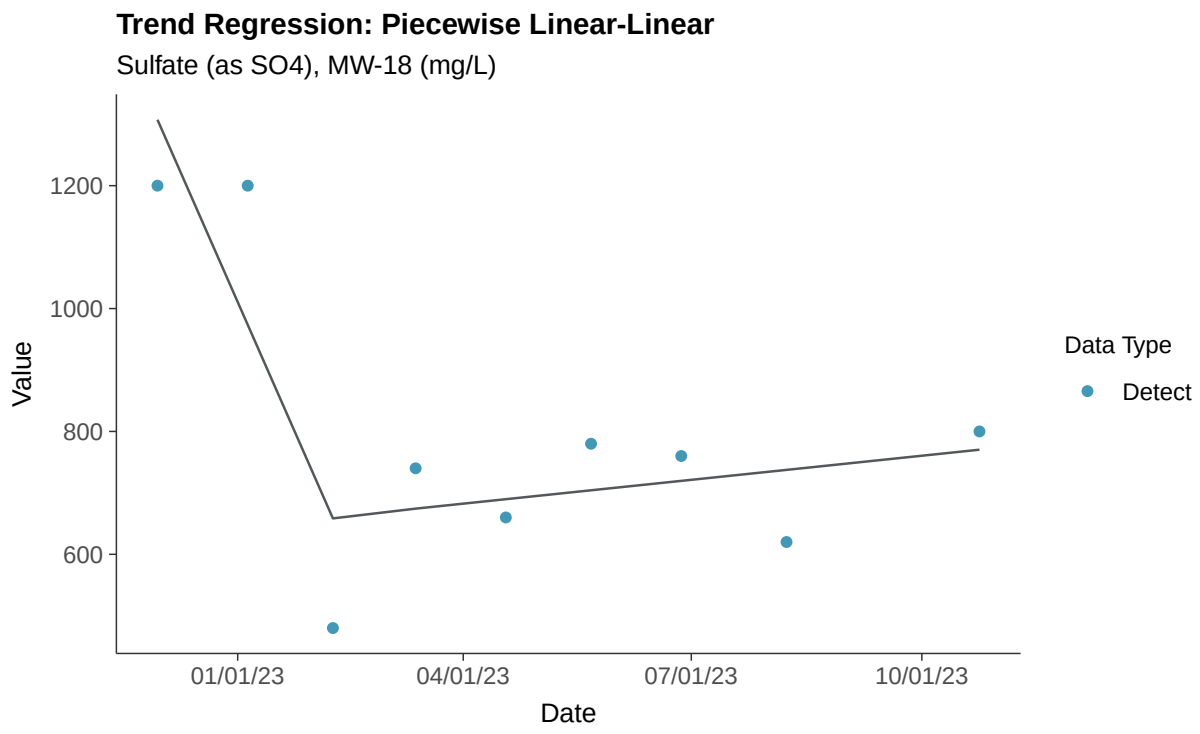



Normal Q-Q plot
Sulfate (as SO4), MW-18 (mg/L)
Value
1200
1000
800
600
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Sulfate (as SO4), MW-18 (mg/L)
log(Value)
6.9
6.6
6.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

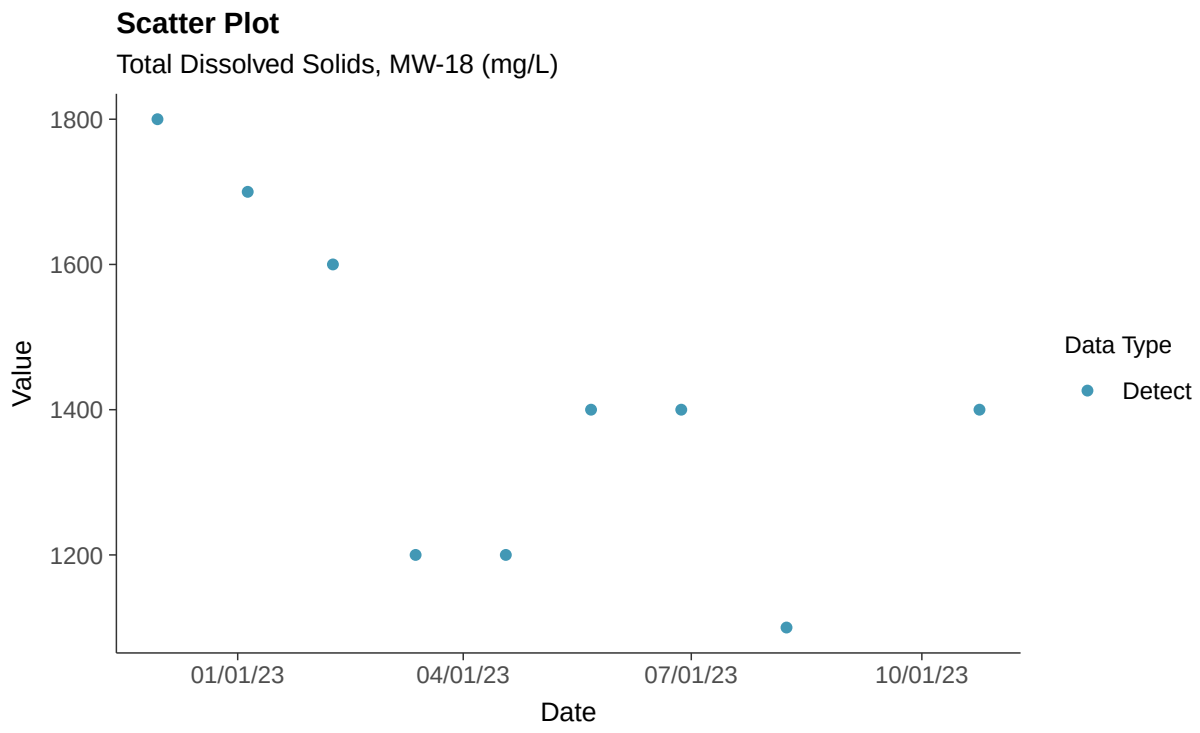

Gamma Q-Q plot
Sulfate (as SO4), MW-18 (mg/L)
Value
1200
1000
800
600
400
600
800
1000
1200
1400
Theoretical Quantiles (Gamma)
Data Type
Detect

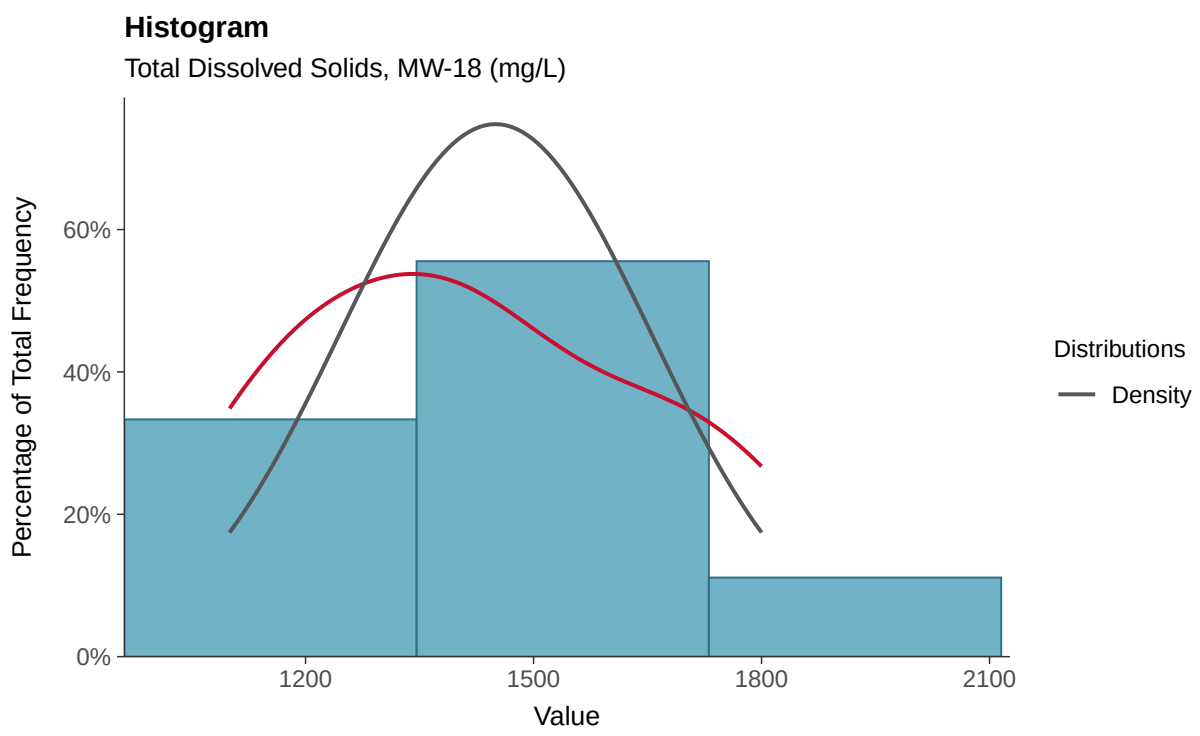

Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-18 (mg/L)
log(Value)
7.0
6.8
6.6
6.4
6.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Sulfate (as SO4), MW-18 (mg/L)
Value
1200
1000
800
600
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Total Dissolved Solids, MW-18

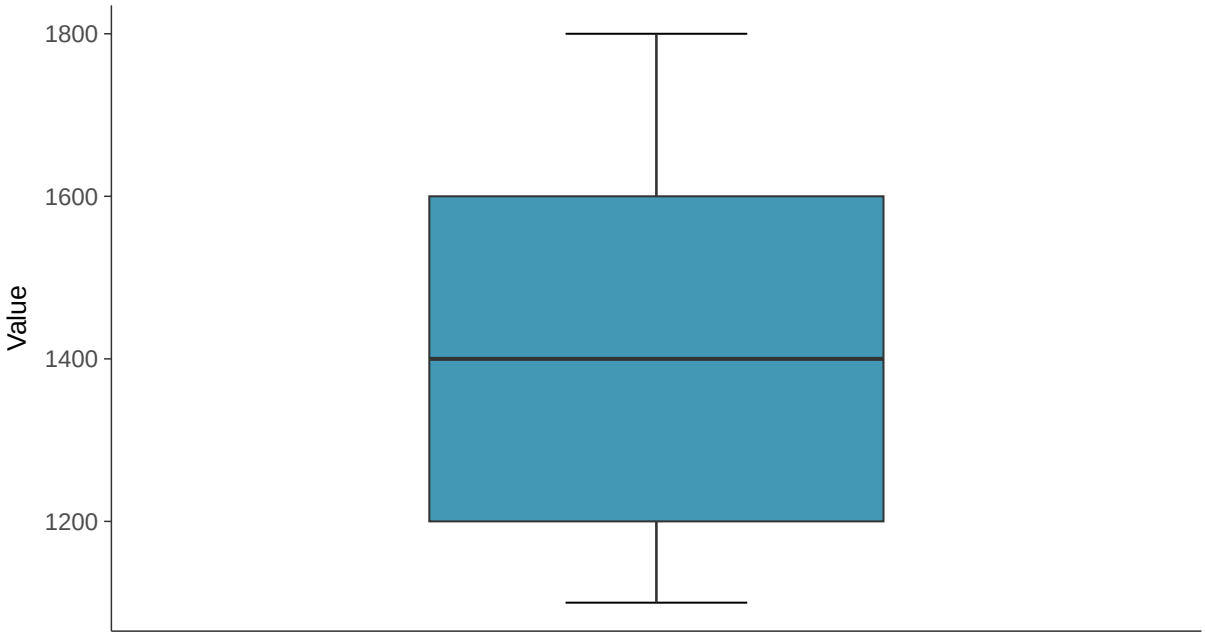
ID: 1_22_4_126





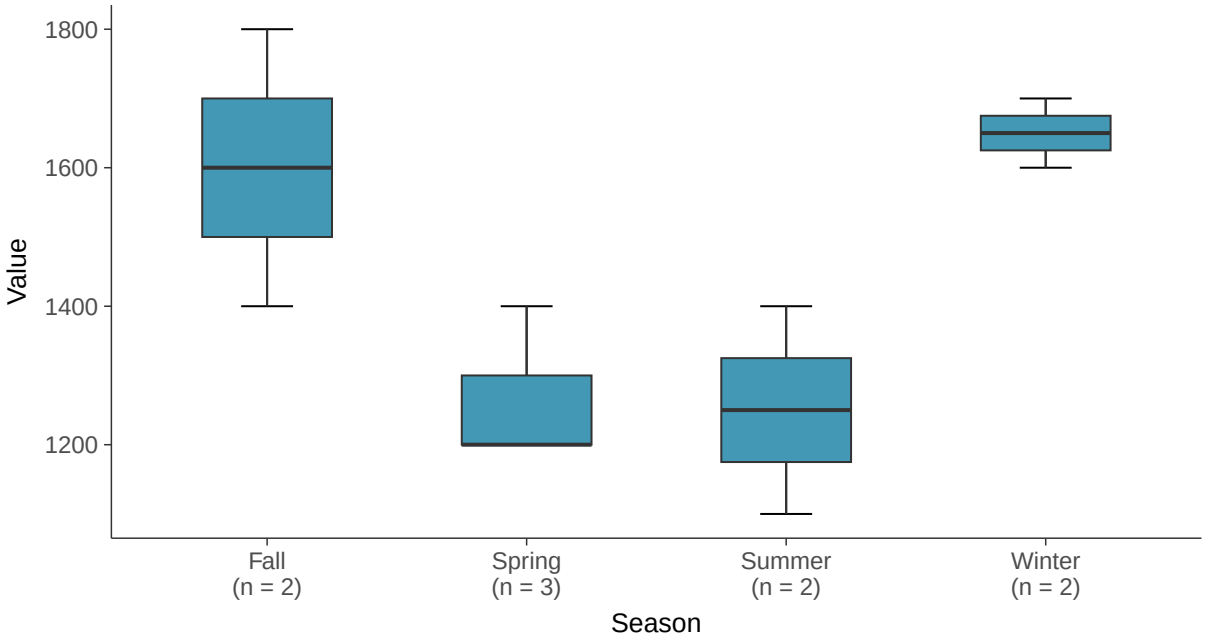
Boxplot

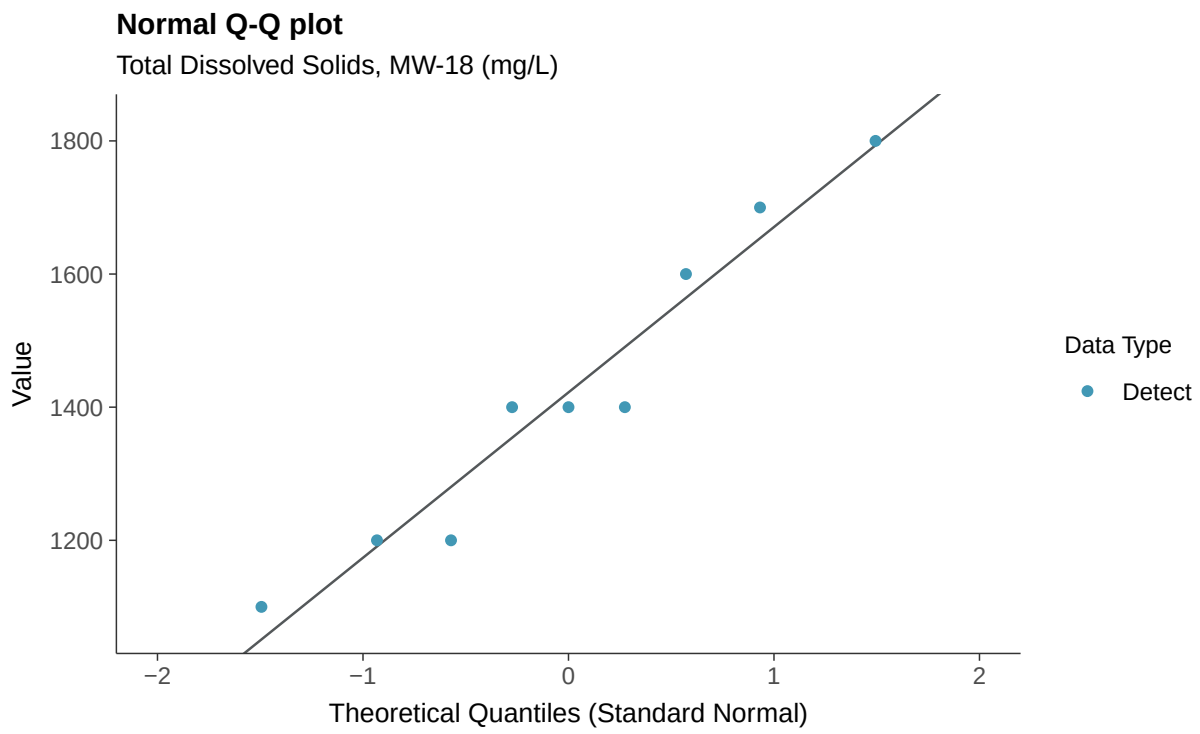
Total Dissolved Solids, MW-18 (mg/L)

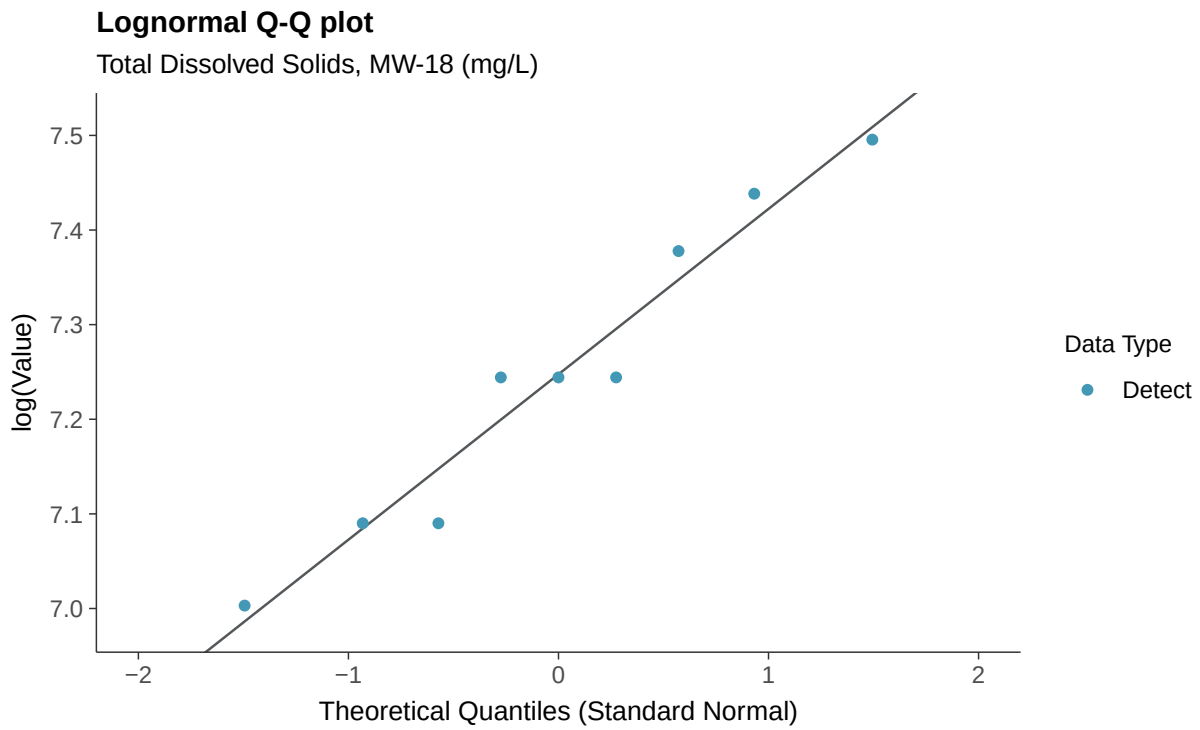


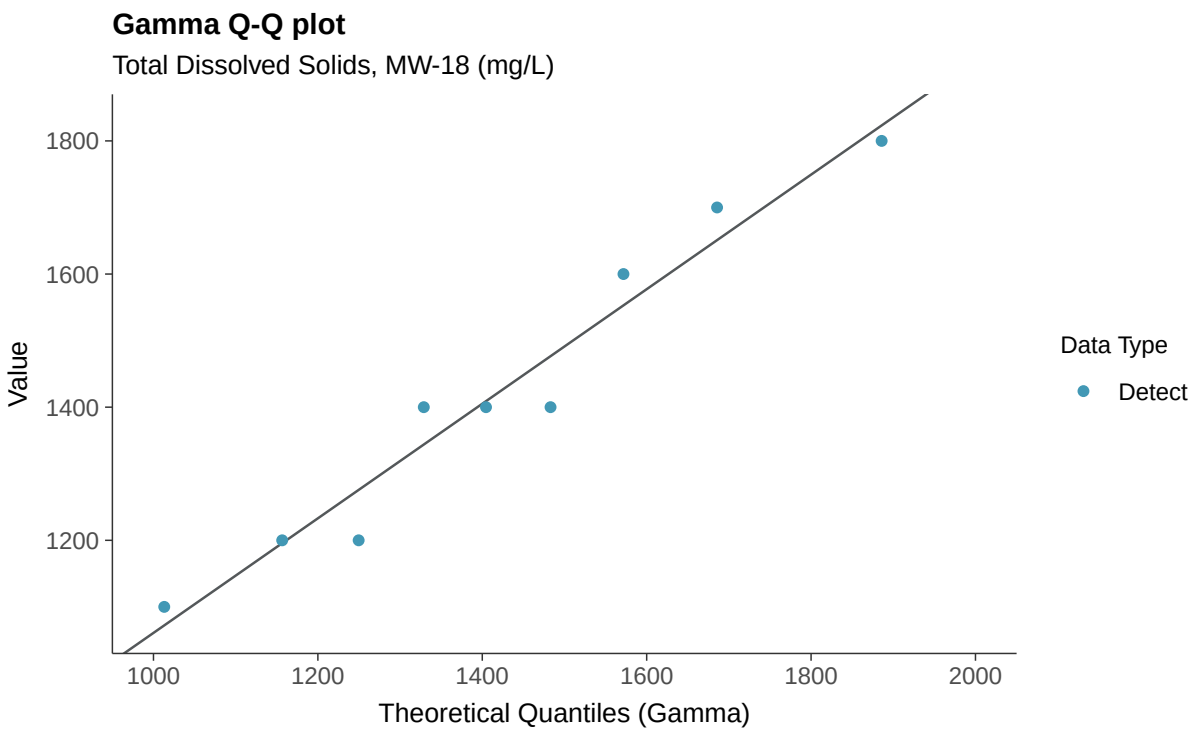
Boxplot by Season

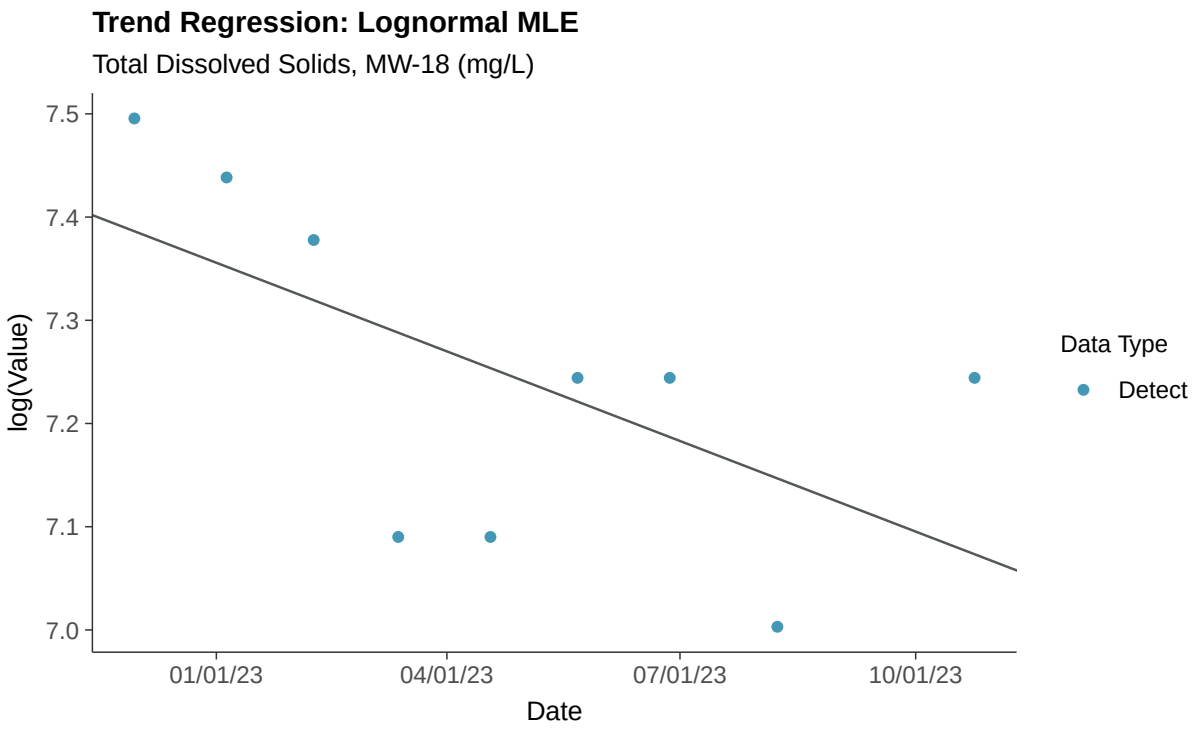
Total Dissolved Solids, MW-18 (mg/L)

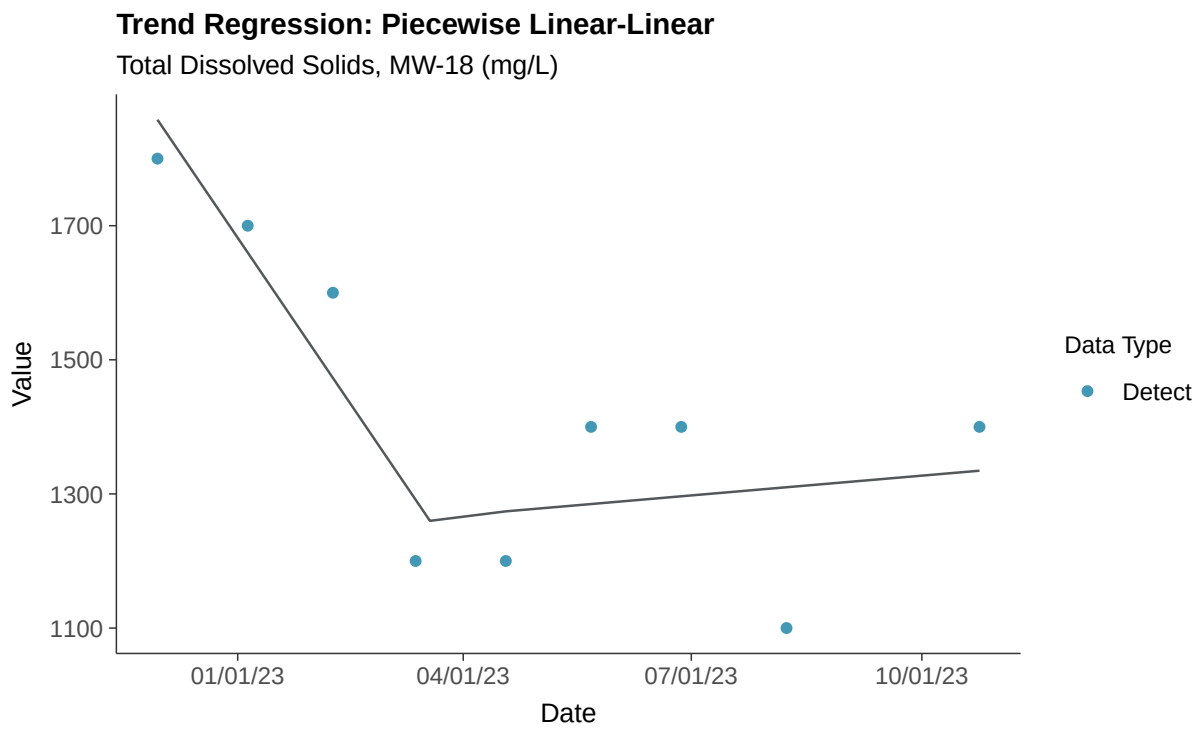



Normal Q-Q plot
Total Dissolved Solids, MW-18 (mg/L)
Value
1800
1600
1400
1200
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Total Dissolved Solids, MW-18 (mg/L)
log(Value)
7.5
7.4
7.3
7.2
7.1
7.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

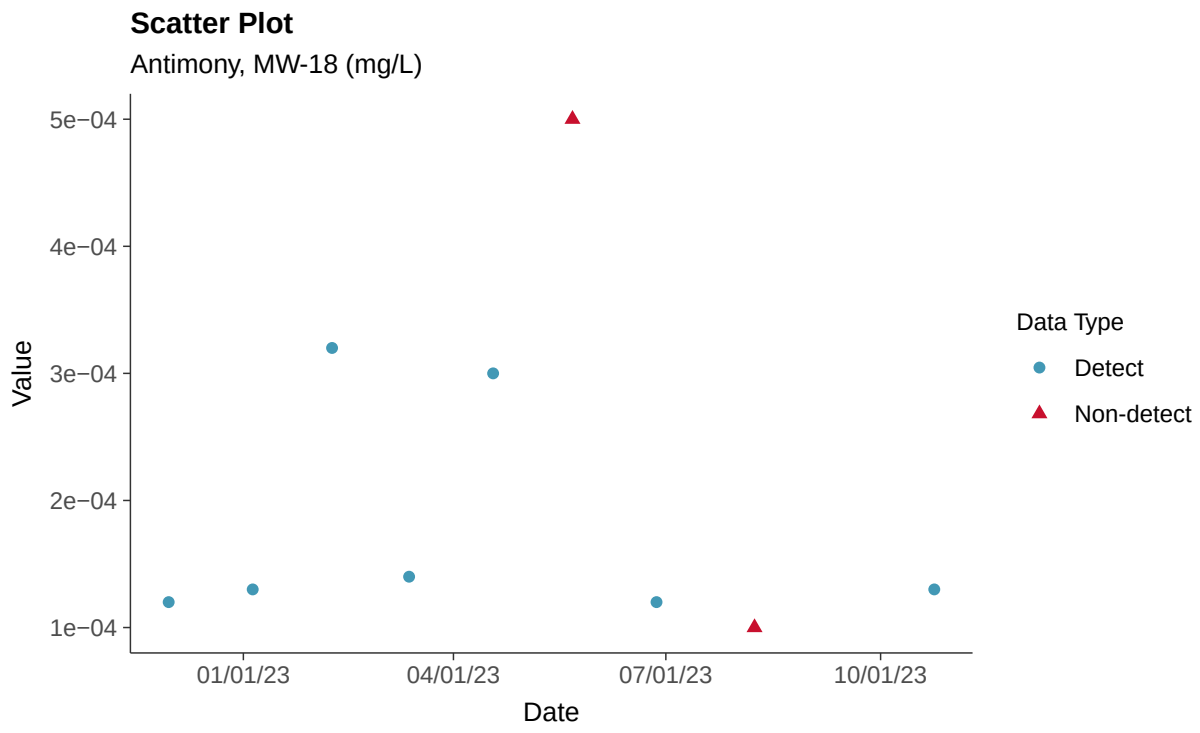

Gamma Q-Q plot
Total Dissolved Solids, MW-18 (mg/L)
Value
1800
1600
1400
1200
1000
1200
1400
1600
1800
2000
Theoretical Quantiles (Gamma)
Data Type
Detect

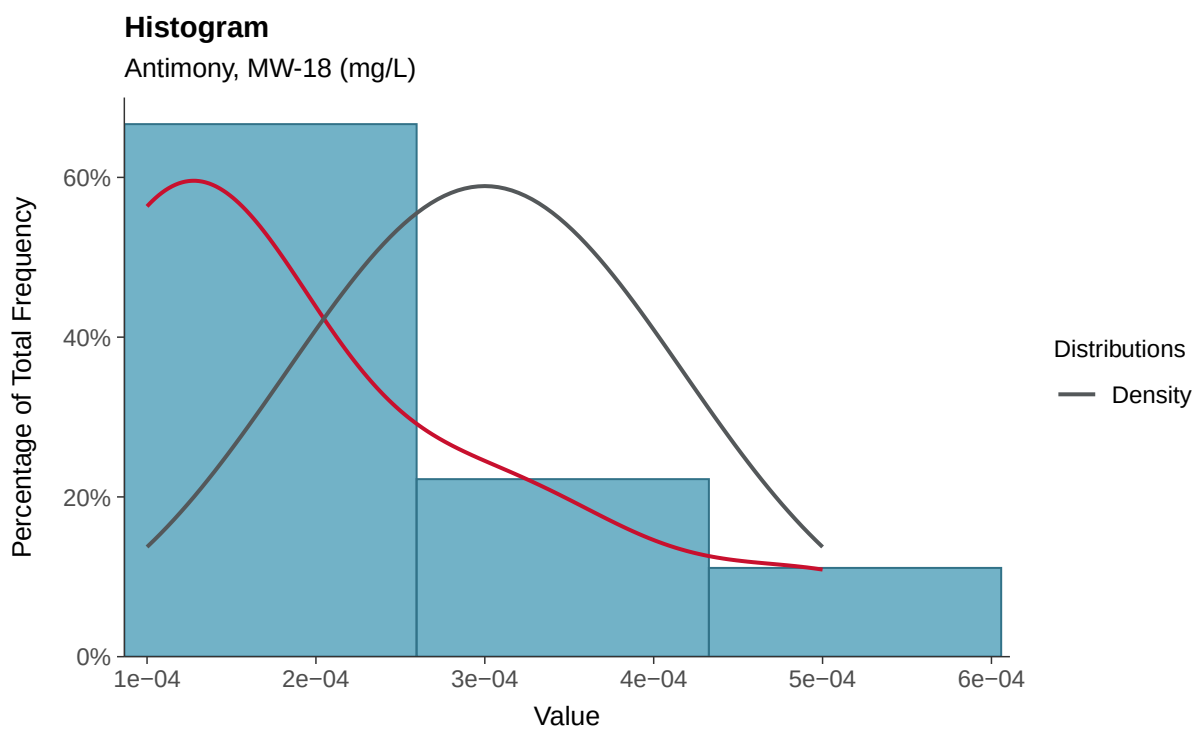

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-18 (mg/L)
log(Value)
7.5
7.4
7.3
7.2
7.1
7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-18 (mg/L)
Value
1700
1500
1300
1100
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-18

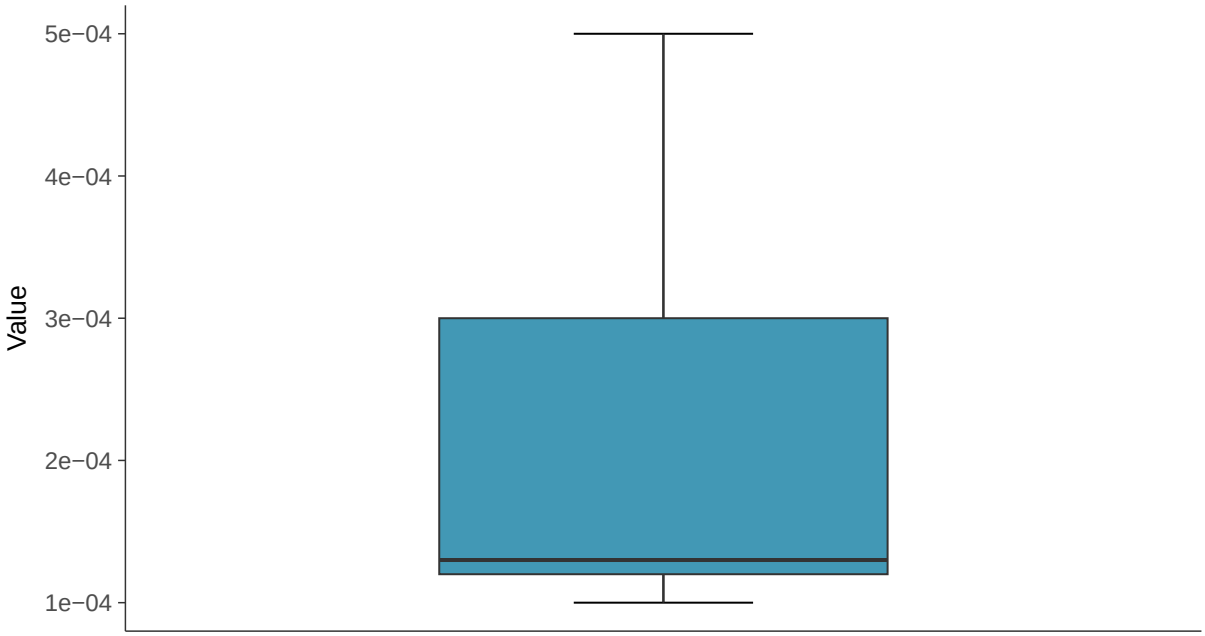
ID: 1_22_5_101





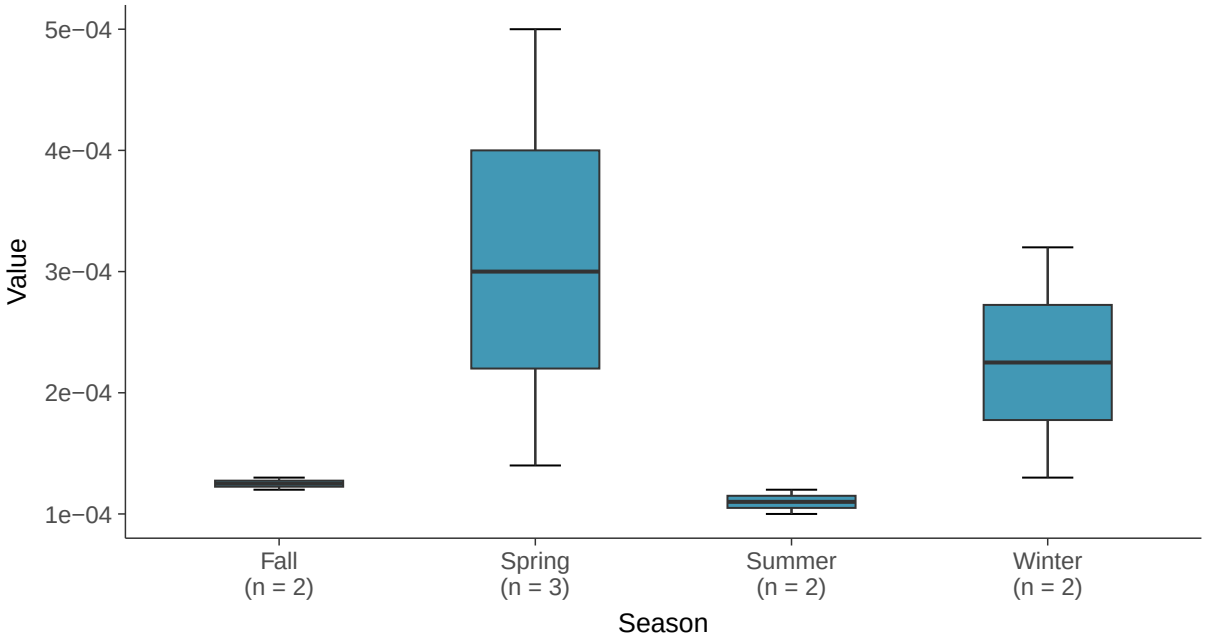
Boxplot

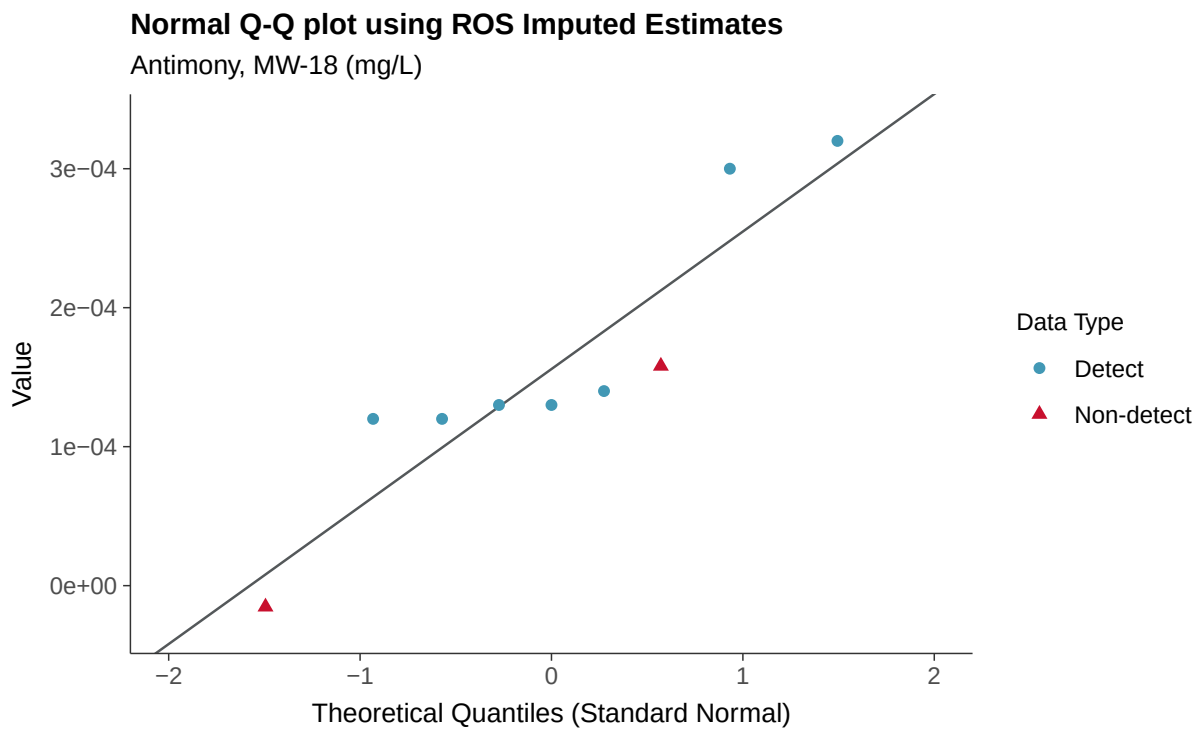
Antimony, MW-18 (mg/L)

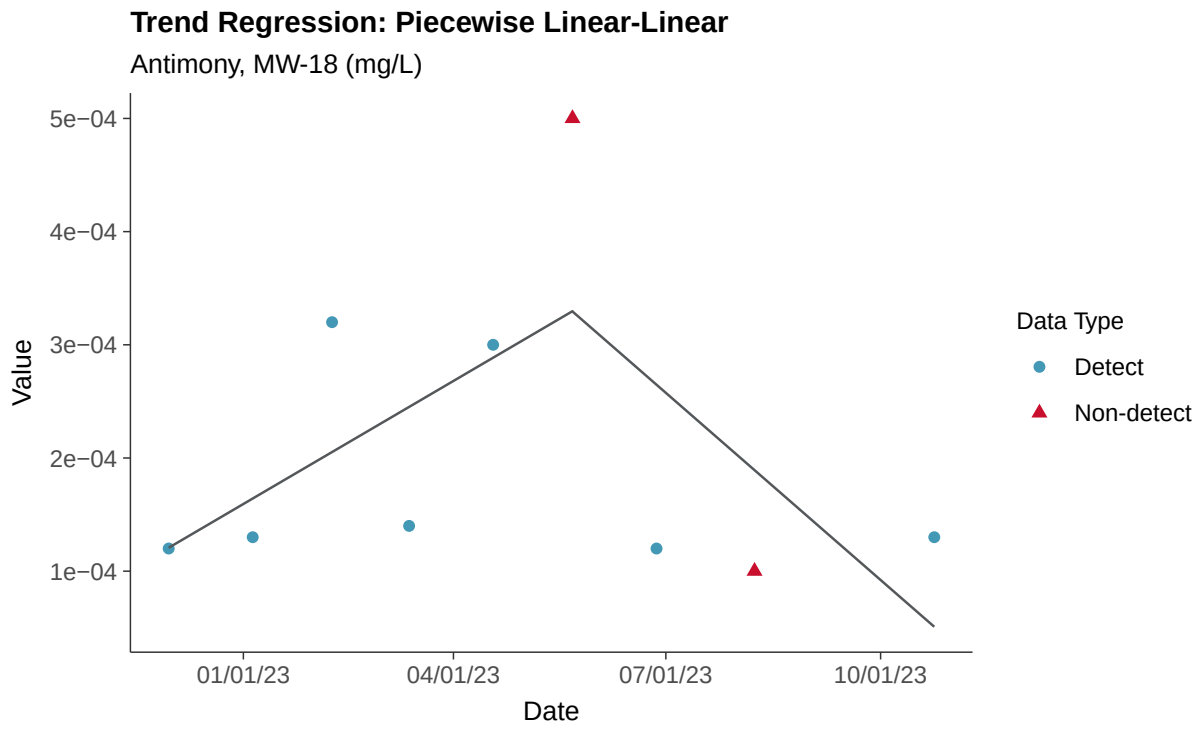


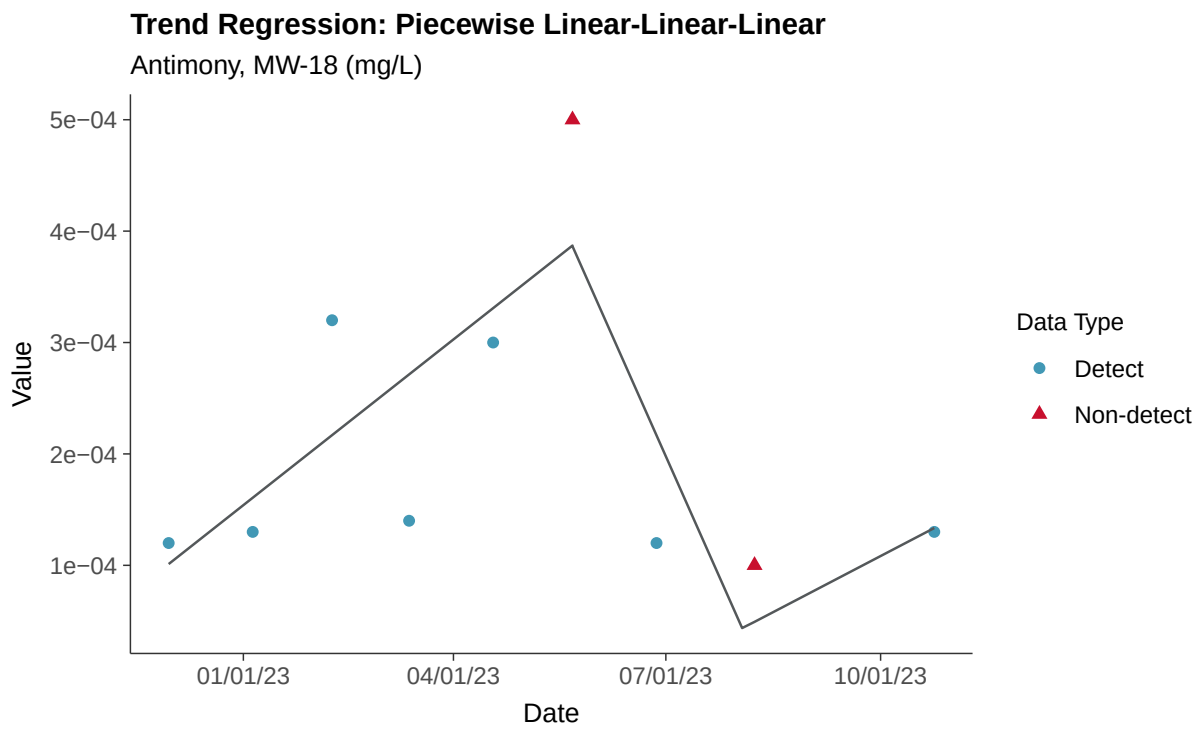
Boxplot by Season

Antimony, MW-18 (mg/L)



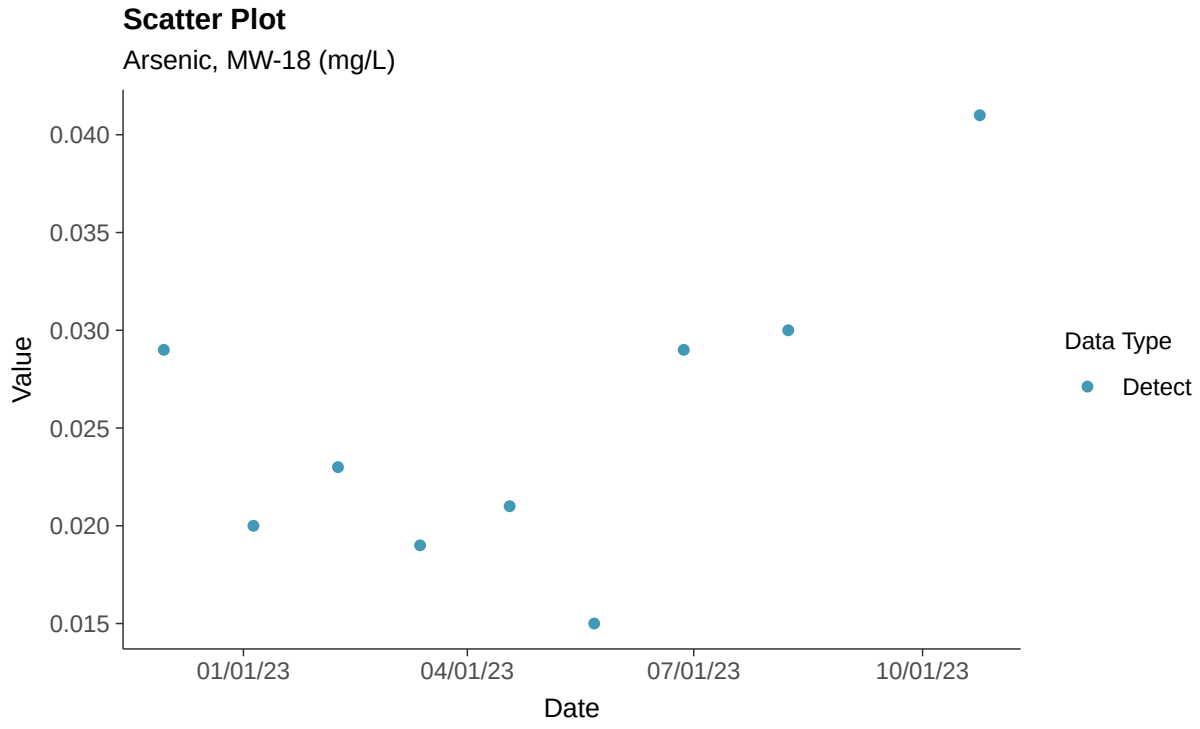

Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-18 (mg/L)
Value
3e−04
2e−04
1e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

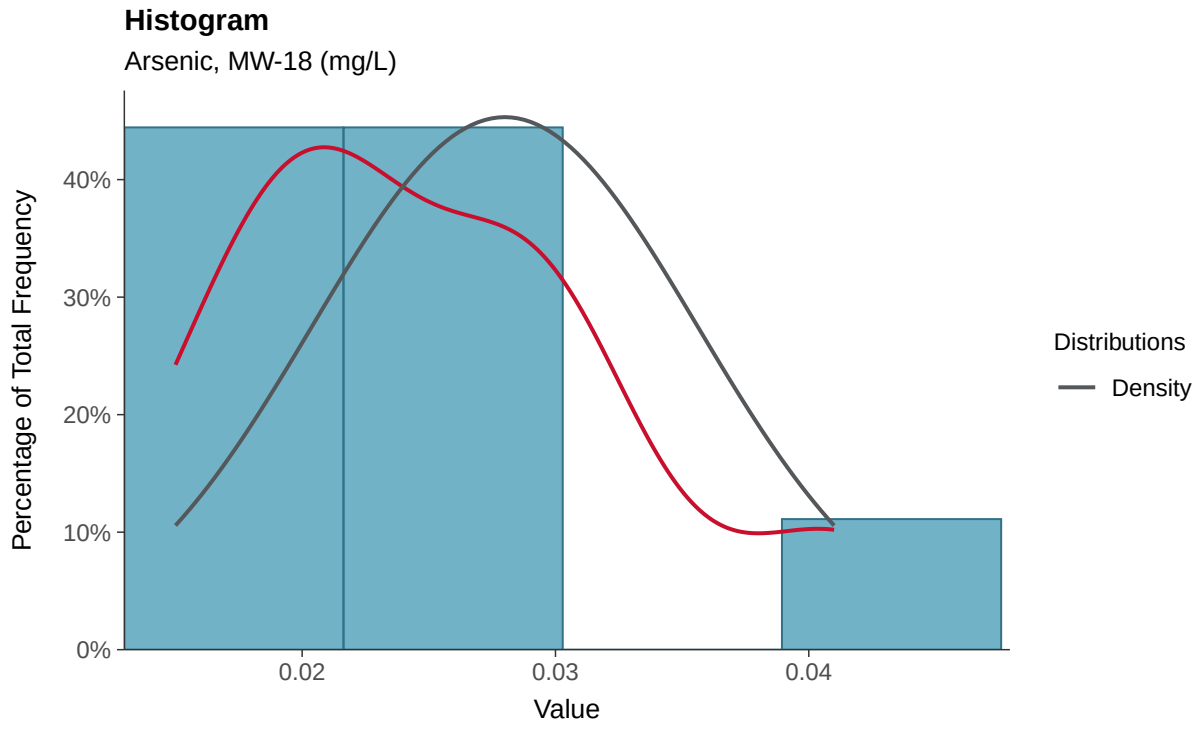

Trend Regression: Piecewise Linear-Linear
Antimony, MW-18 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-18 (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-18

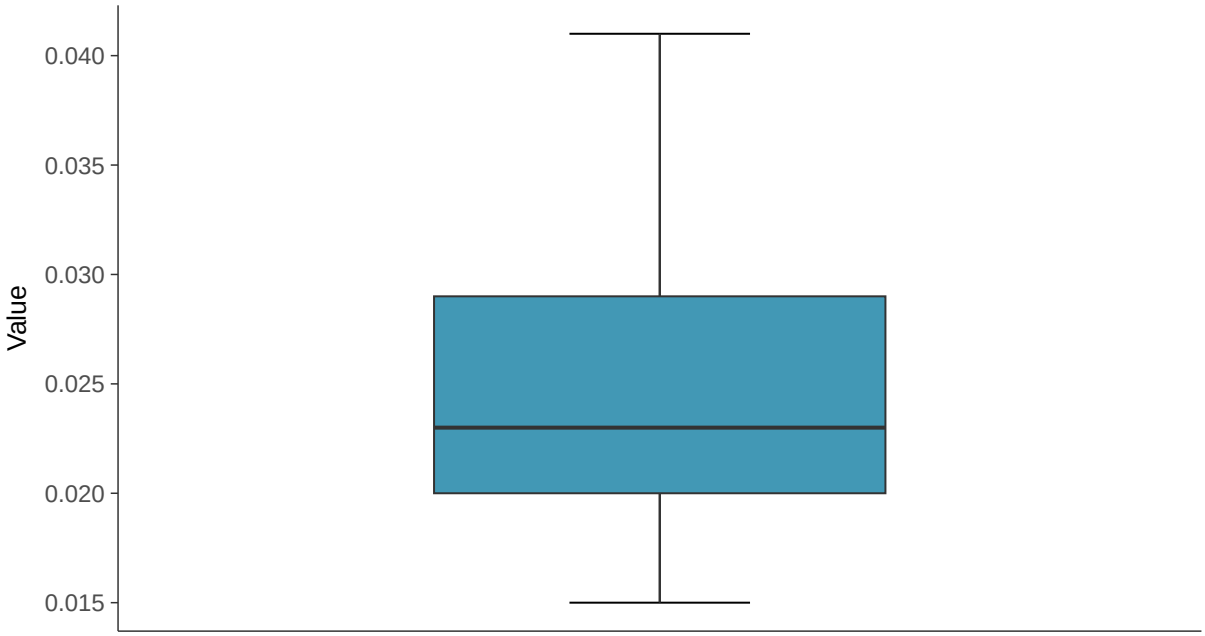
ID: 1_22_5_102





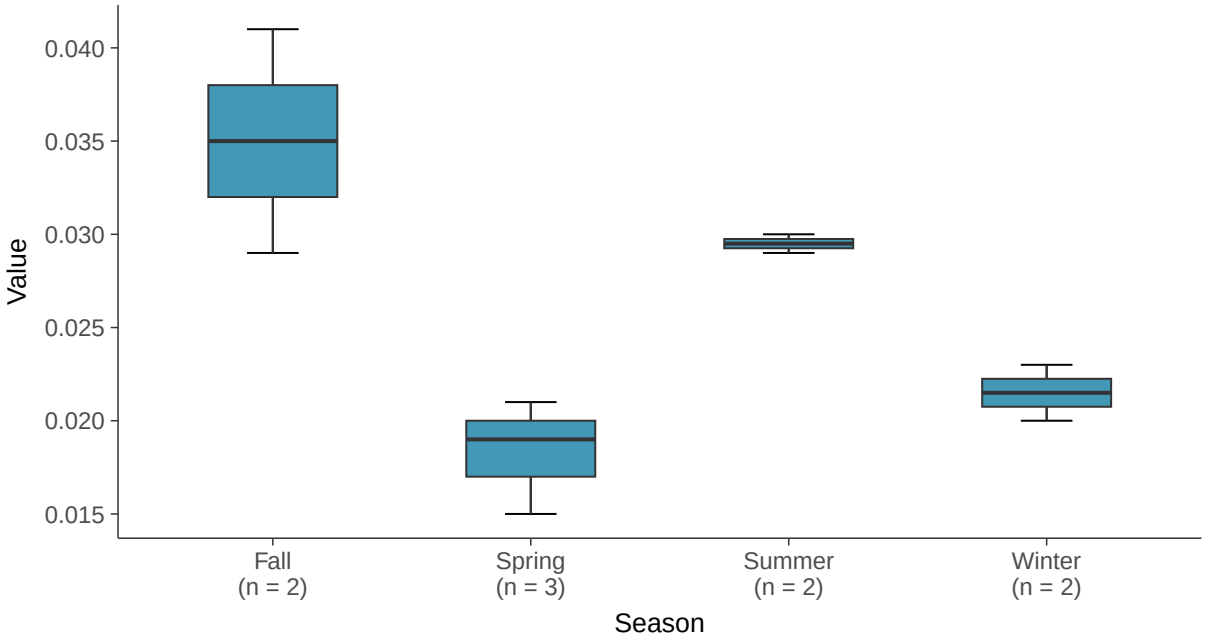
Boxplot

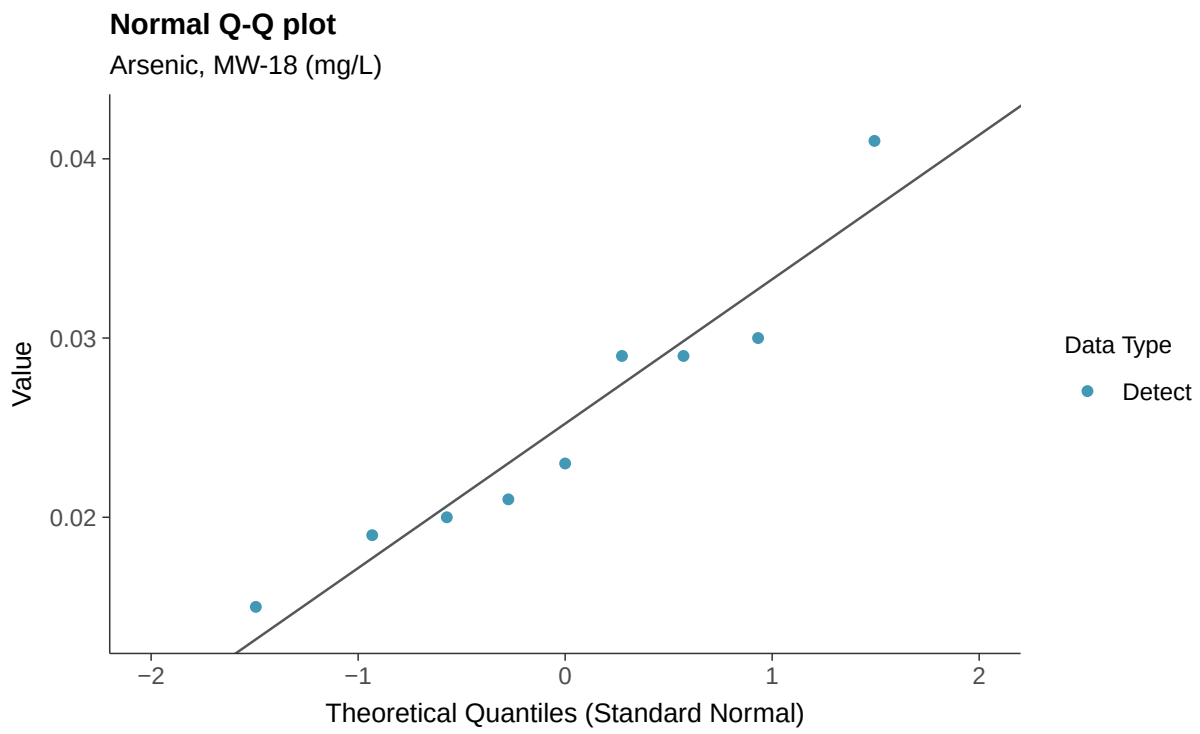
Arsenic, MW-18 (mg/L)

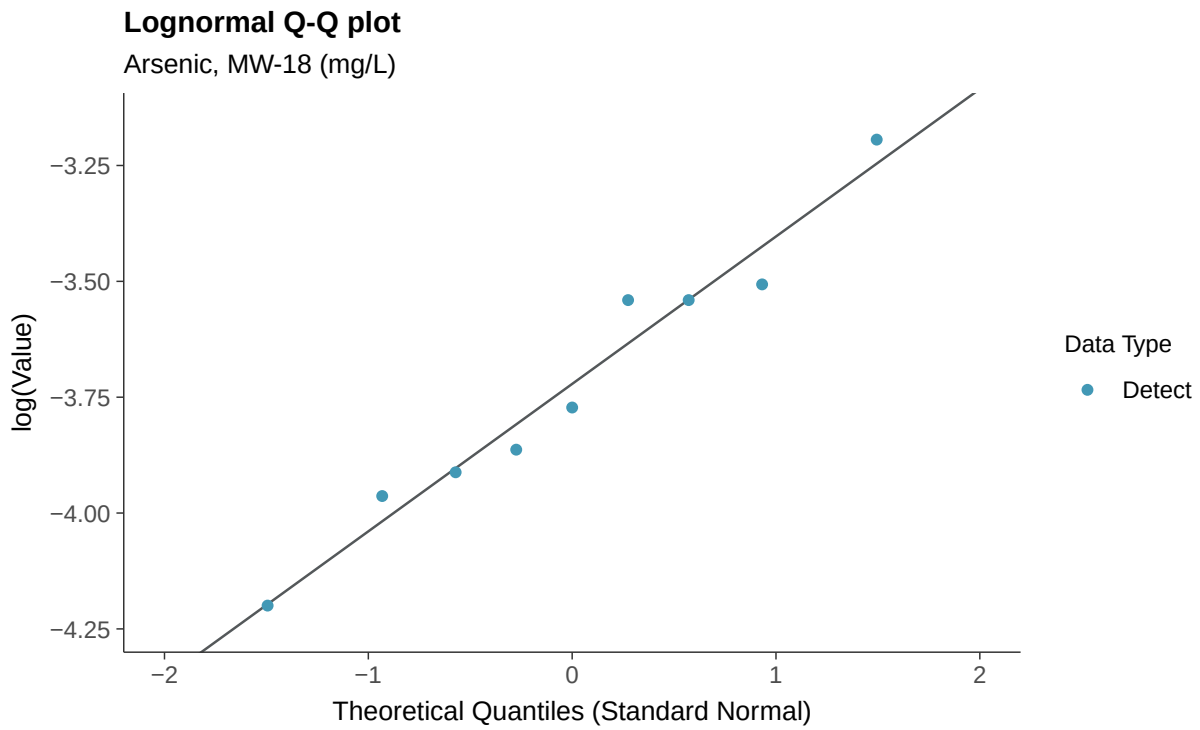


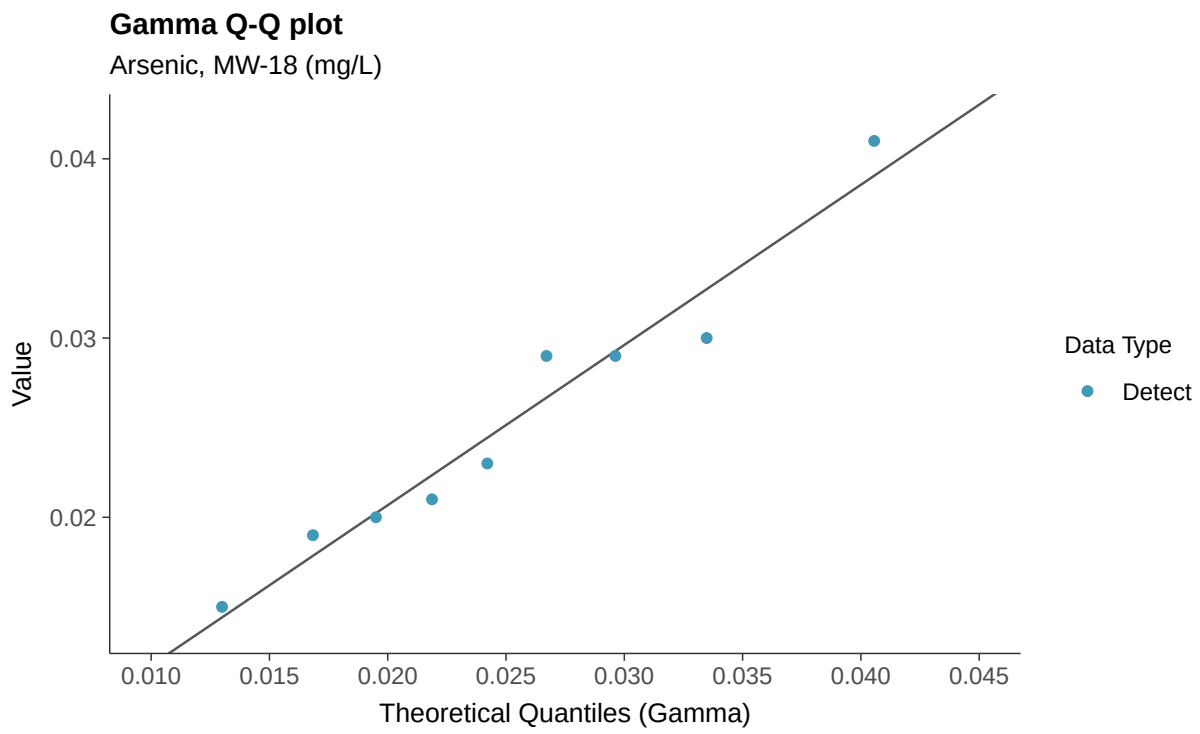
Boxplot by Season

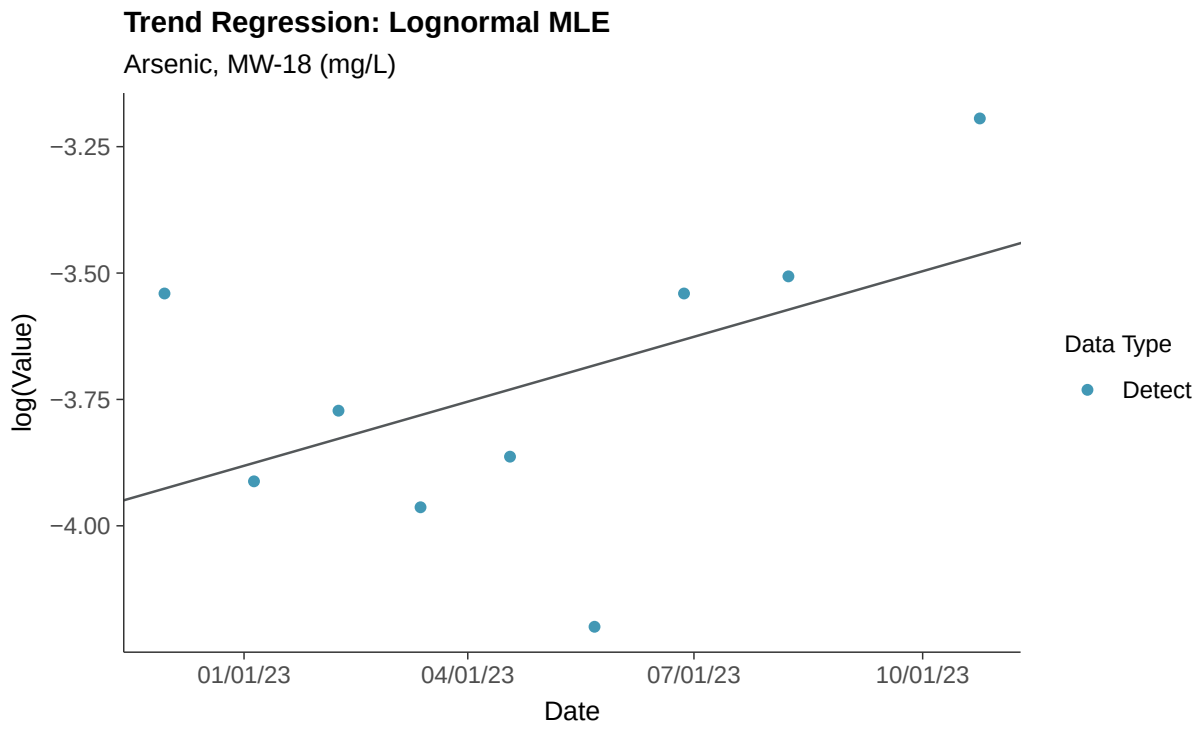
Arsenic, MW-18 (mg/L)

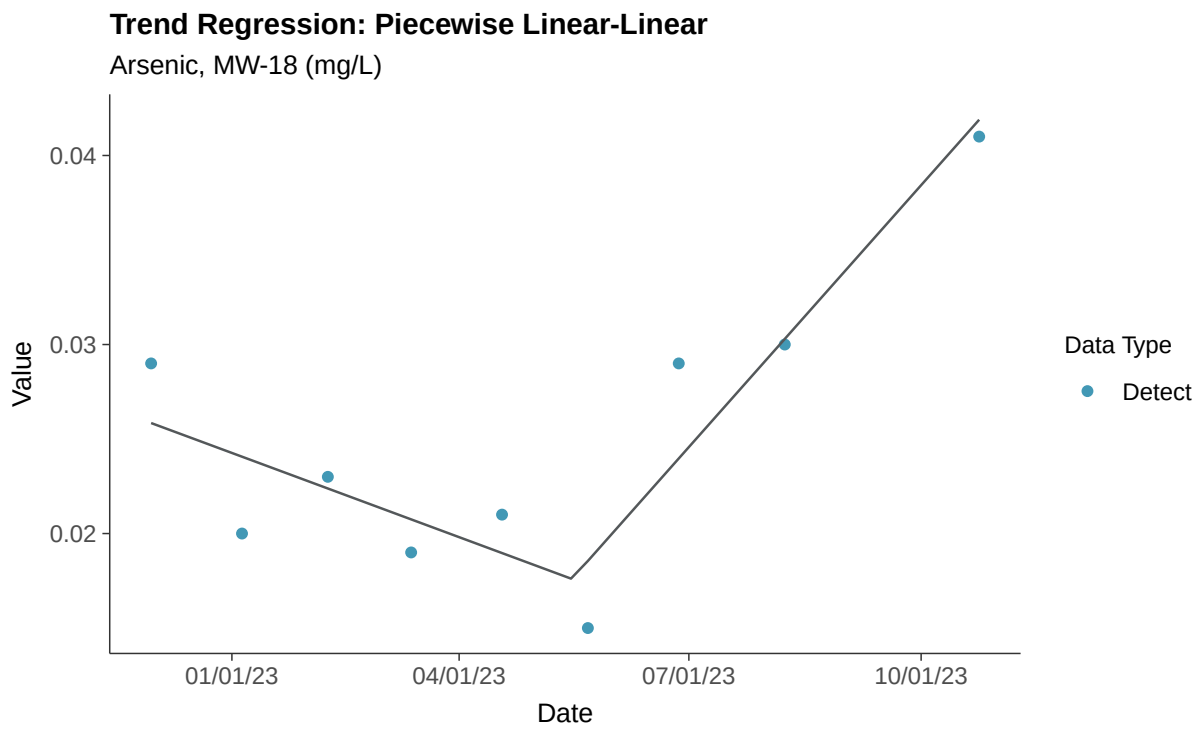



Normal Q-Q plot
Arsenic, MW-18 (mg/L)
Value
0.04
0.03
0.02
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Arsenic, MW-18 (mg/L)
log(Value)
−3.25
−3.50
−3.75
−4.00
−4.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

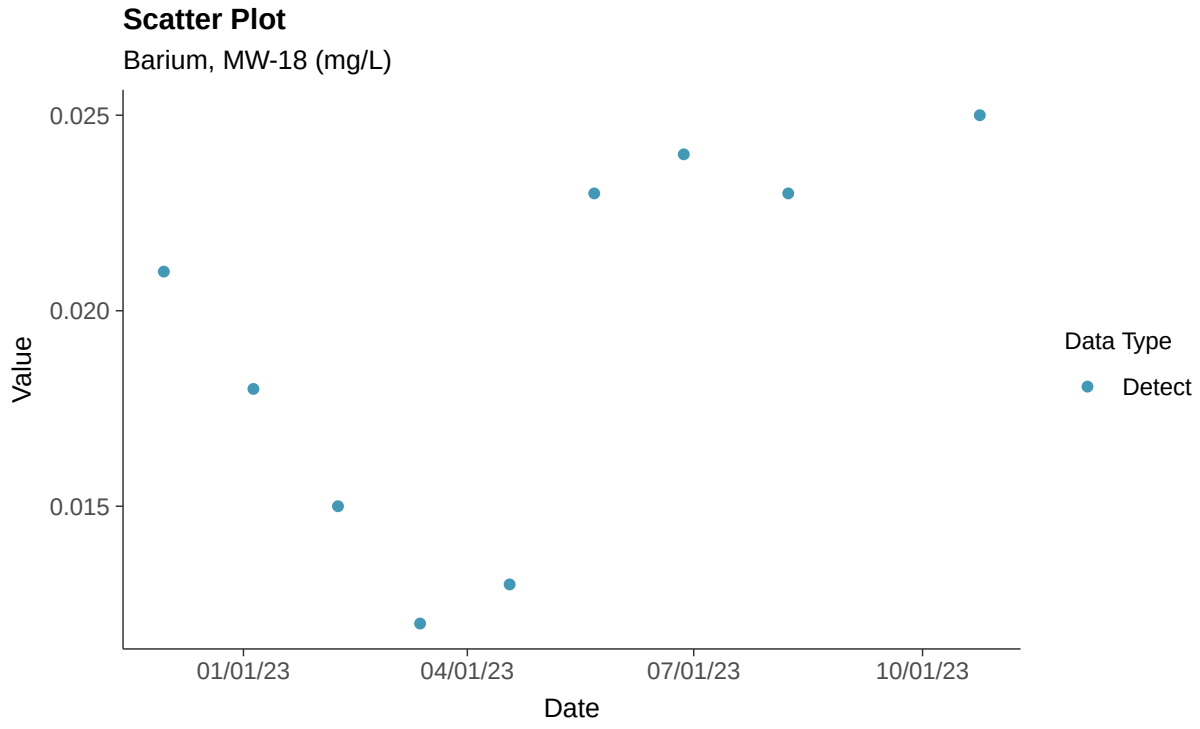

Gamma Q-Q plot
Arsenic, MW-18 (mg/L)
Value
0.04
0.03
0.02
0.010
0.015
0.020
0.025
0.030
0.035
0.040
0.045
Theoretical Quantiles (Gamma)
Data Type
Detect

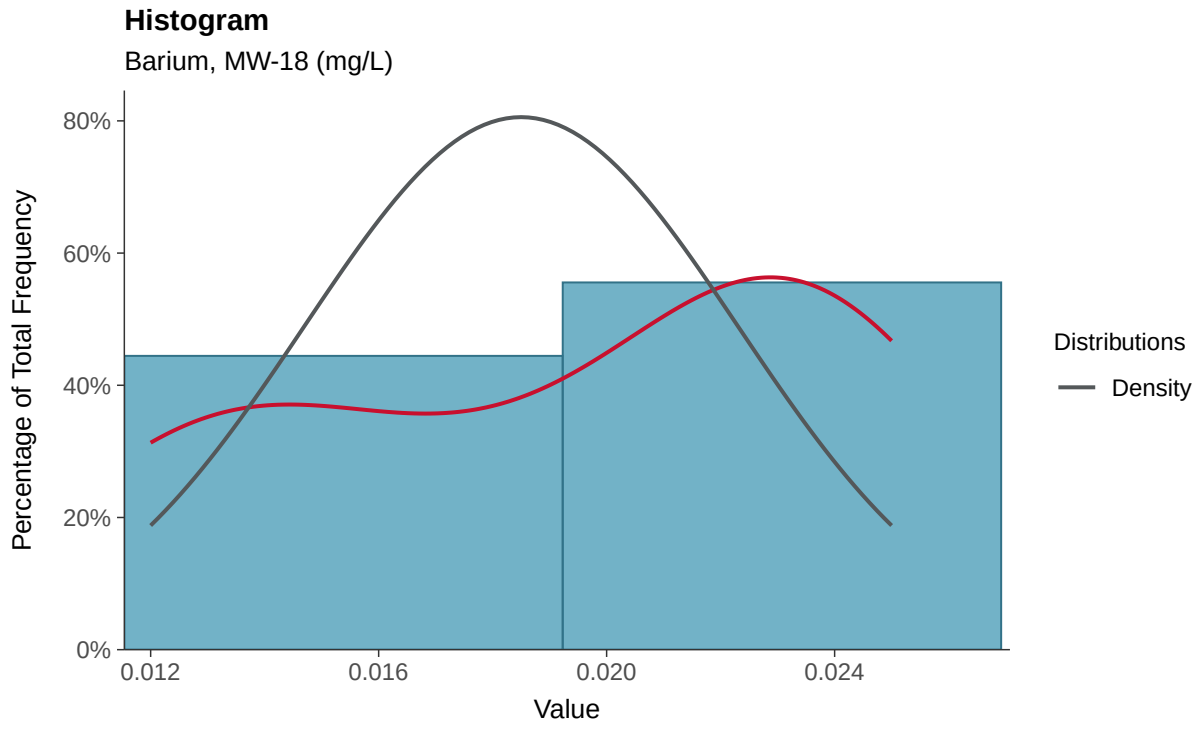

Trend Regression: Lognormal MLE
Arsenic, MW-18 (mg/L)
log(Value)
−3.25
−3.50
−3.75
−4.00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Arsenic, MW-18 (mg/L)
0.04
0.03
0.02
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-18

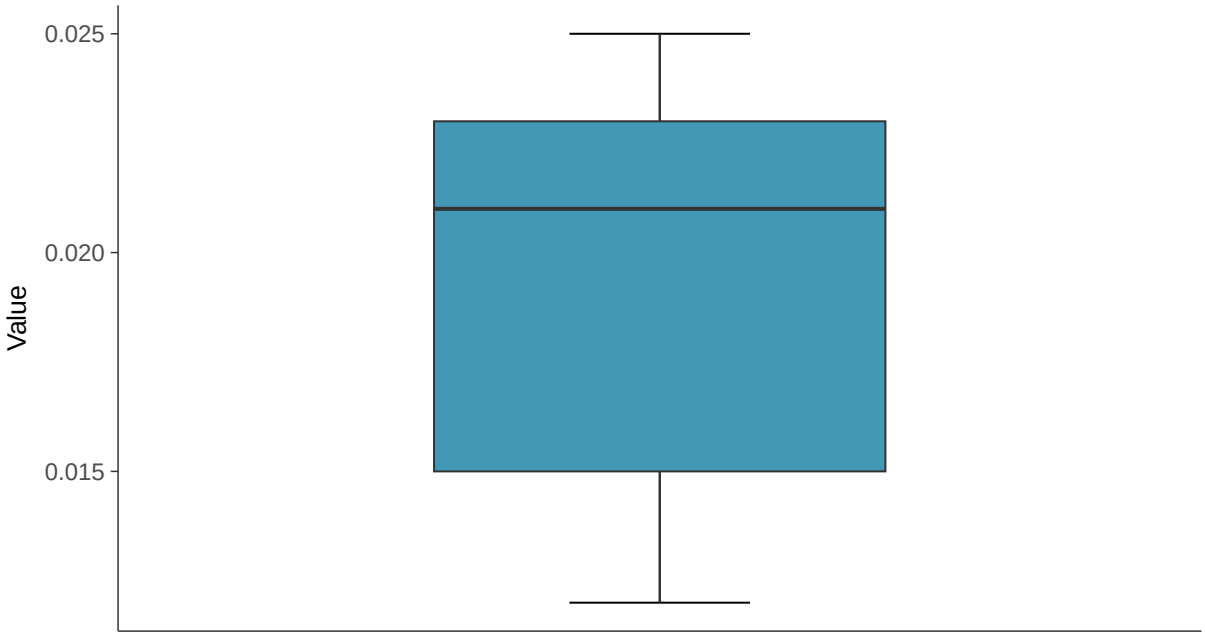
ID: 1_22_5_103





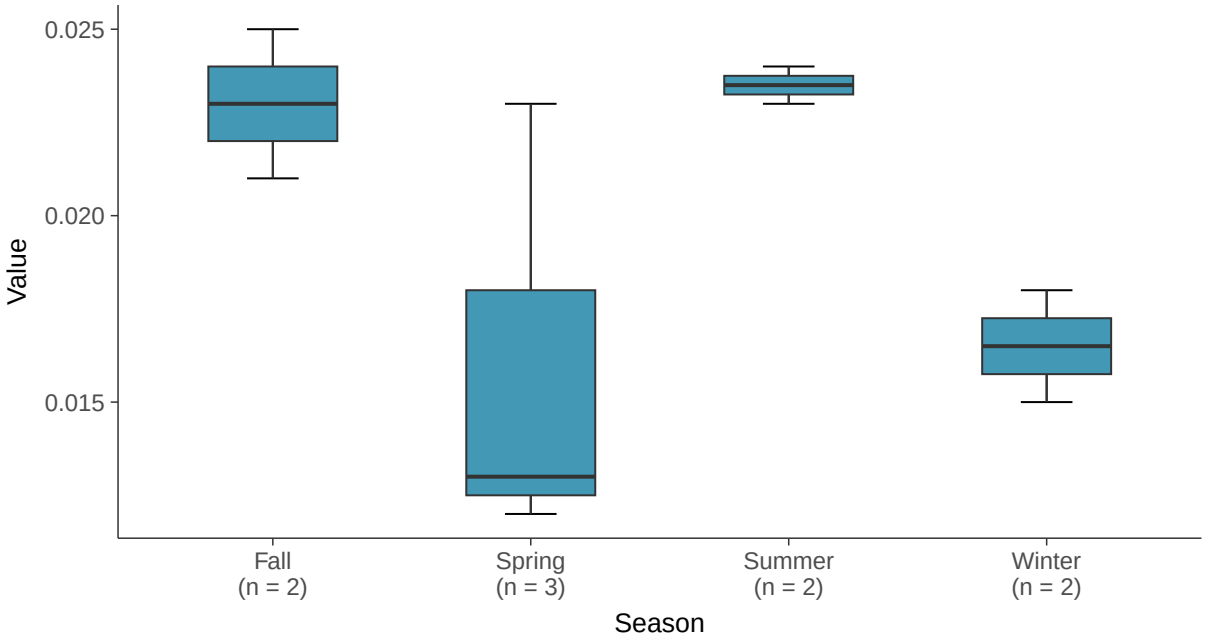
Boxplot

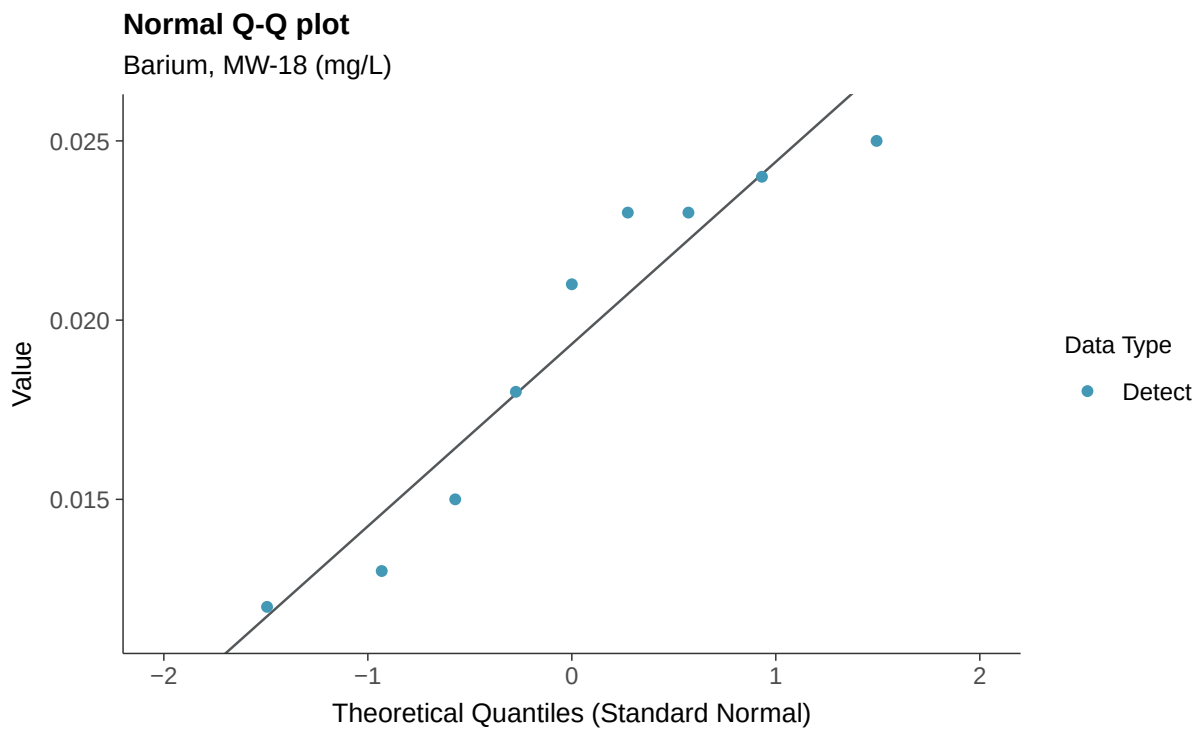
Barium, MW-18 (mg/L)

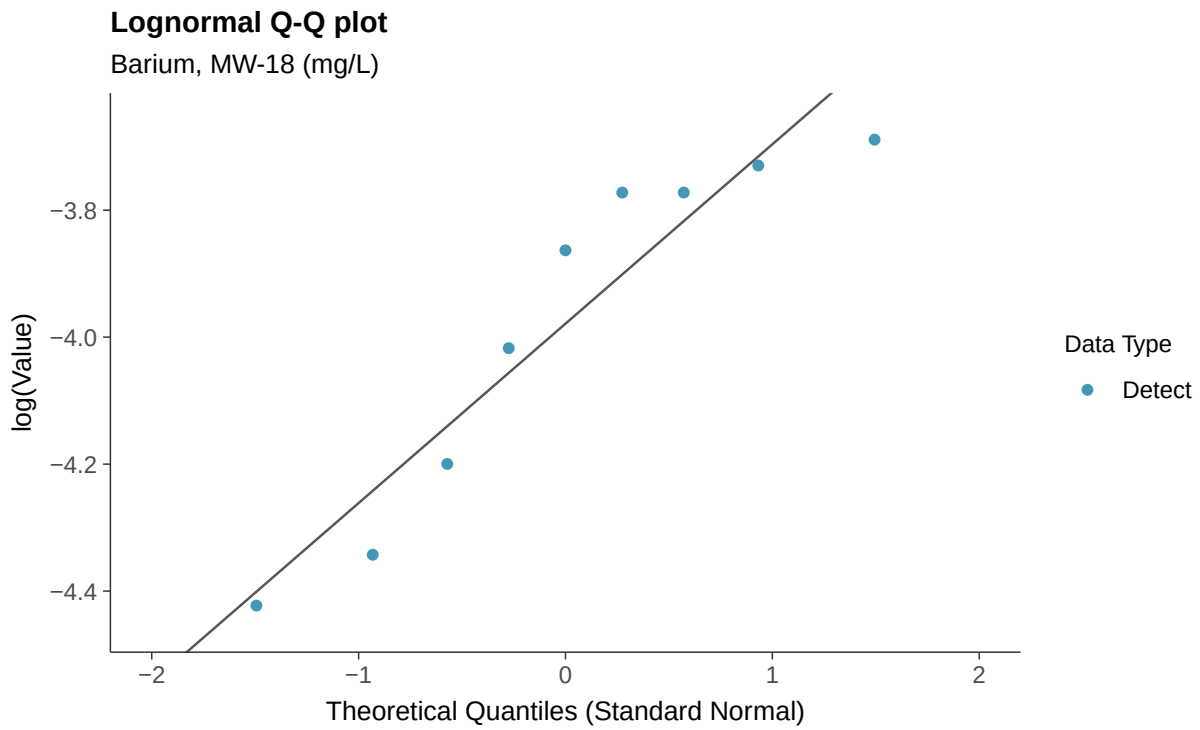


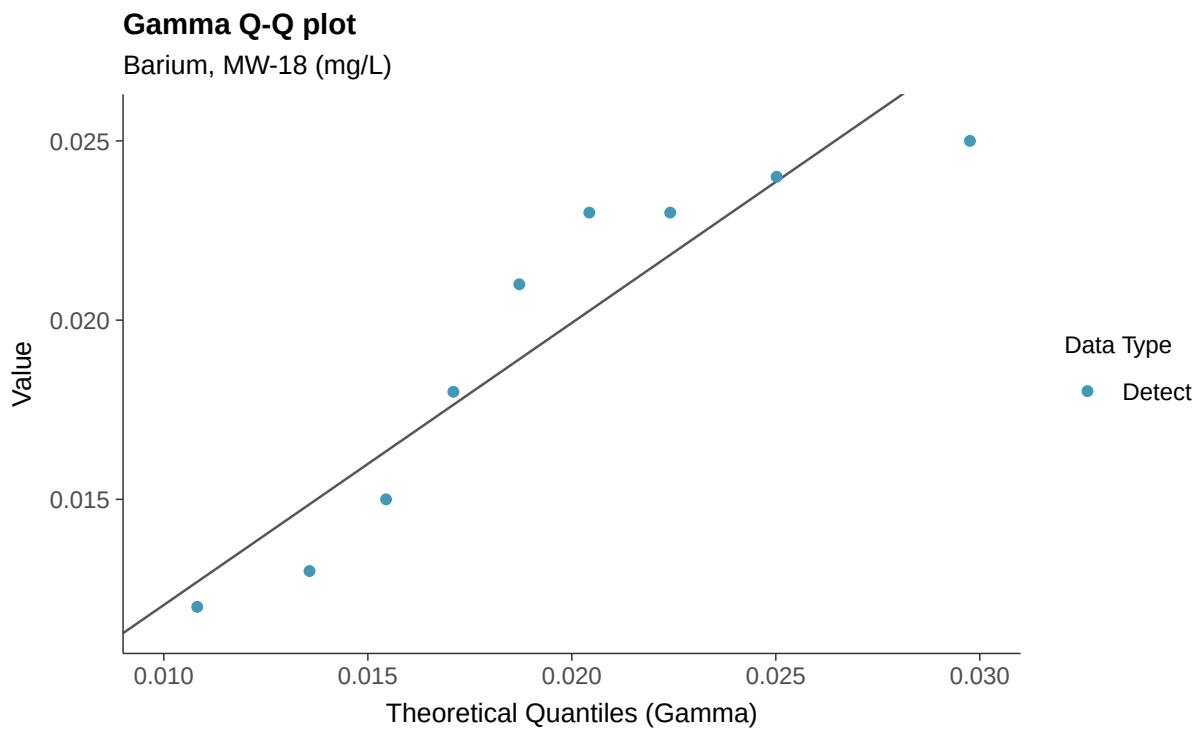
Boxplot by Season

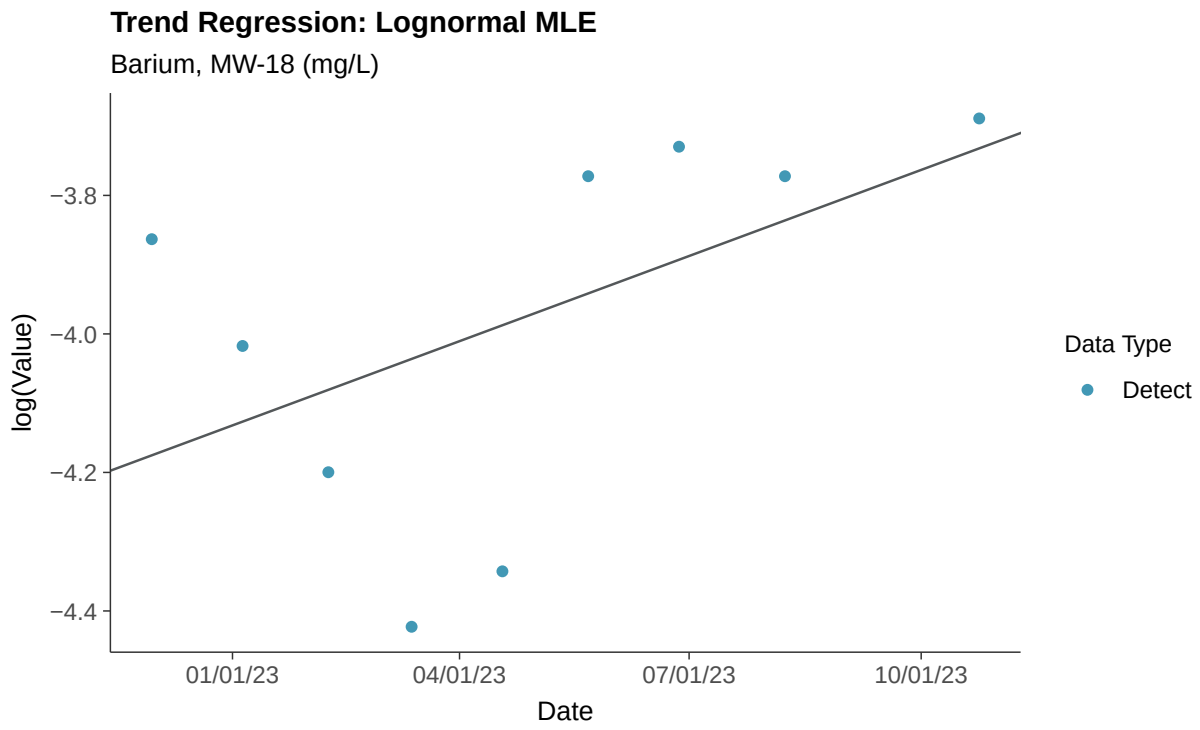
Barium, MW-18 (mg/L)




Normal Q-Q plot
Barium, MW-18 (mg/L)
Value
0.025
0.020
0.015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

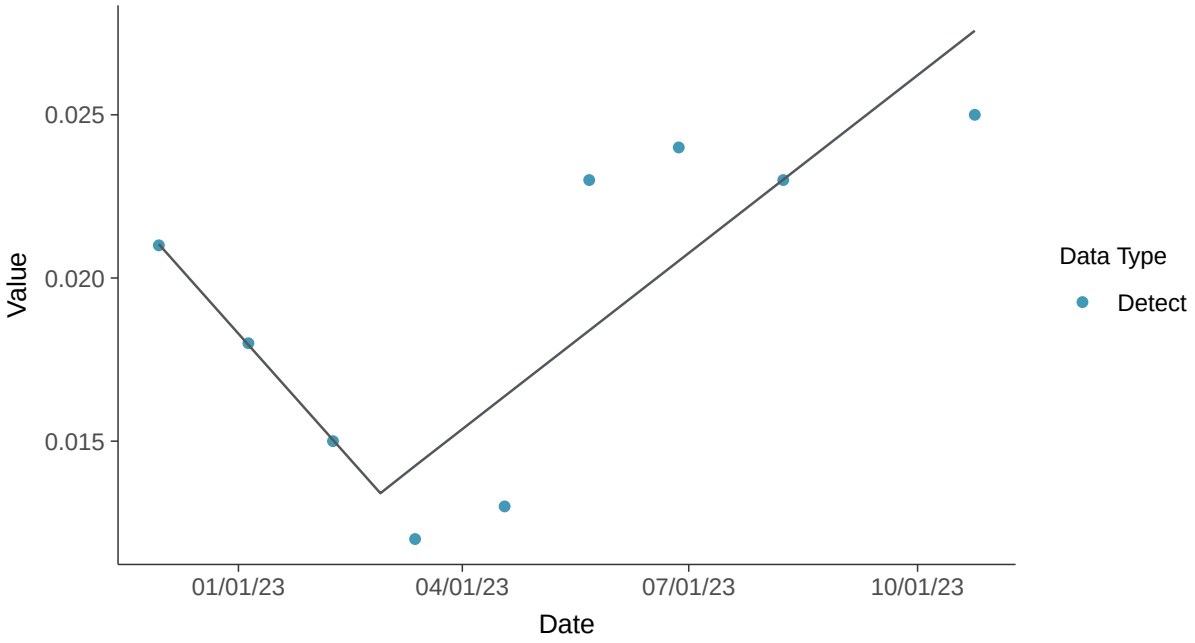

Lognormal Q-Q plot
Barium, MW-18 (mg/L)
log(Value)
−3.8
−4.0
−4.2
−4.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Barium, MW-18 (mg/L)
Value
0.025
0.020
0.015
0.010
0.015
0.020
0.025
0.030
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Barium, MW-18 (mg/L)
log(Value)
−3.8
−4.0
−4.2
−4.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

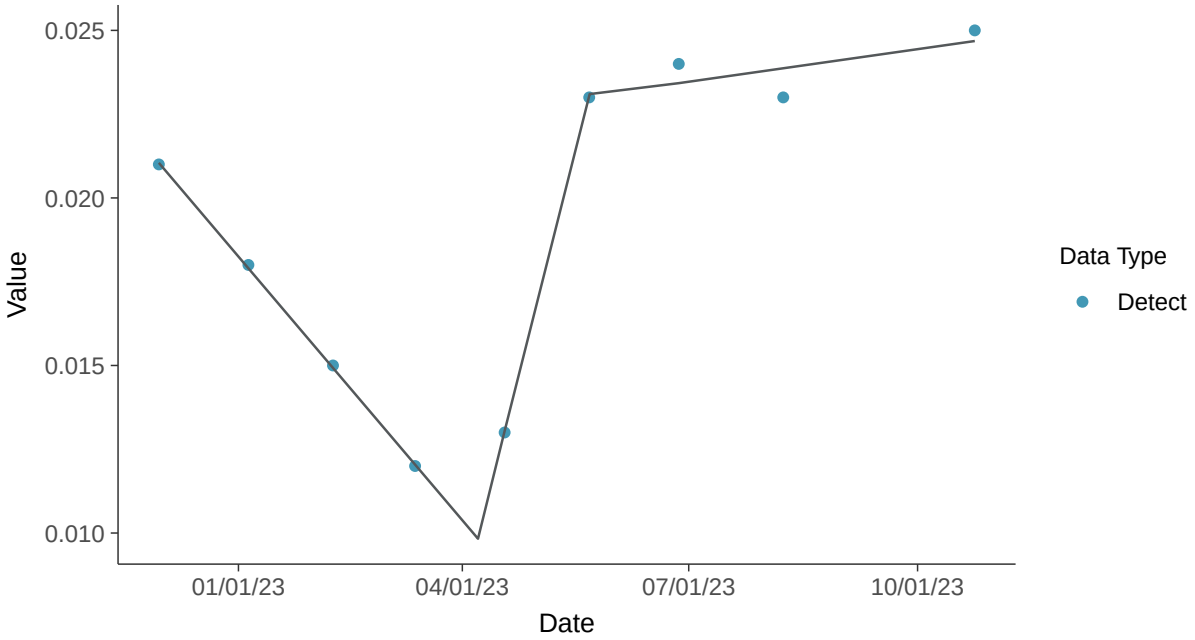
Trend Regression: Piecewise Linear-Linear

Barium, MW-18 (mg/L)



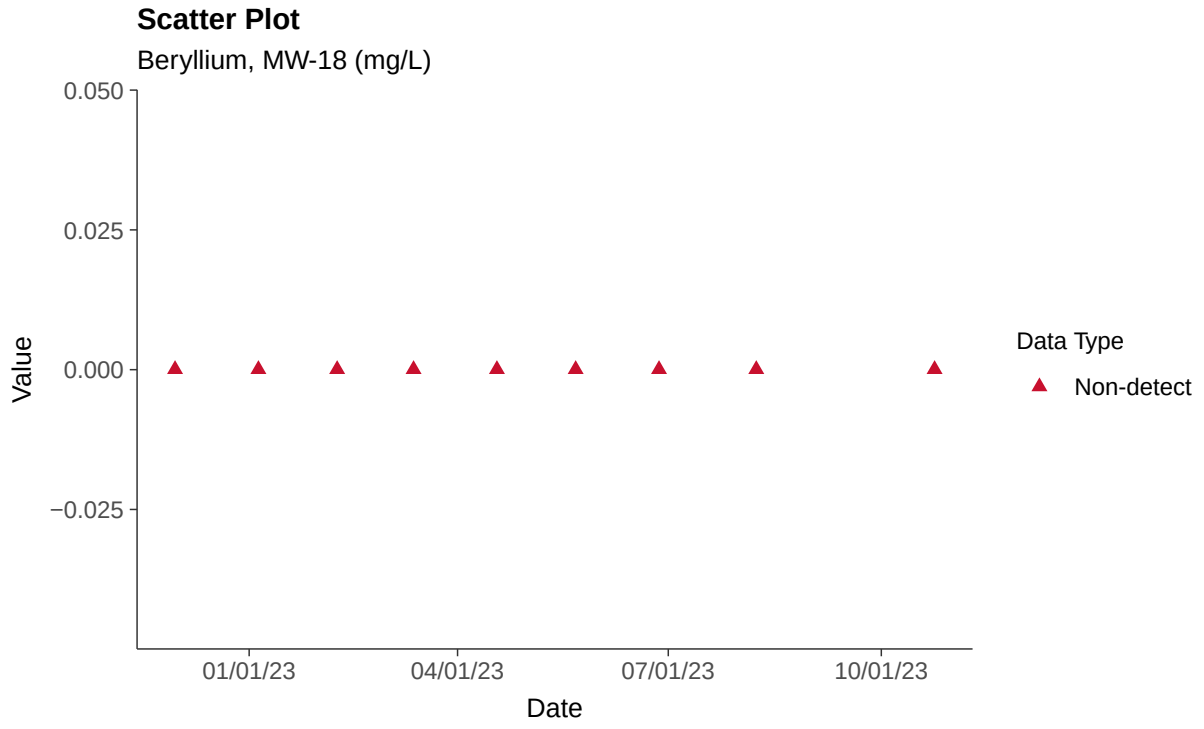
Trend Regression: Piecewise Linear-Linear-Linear

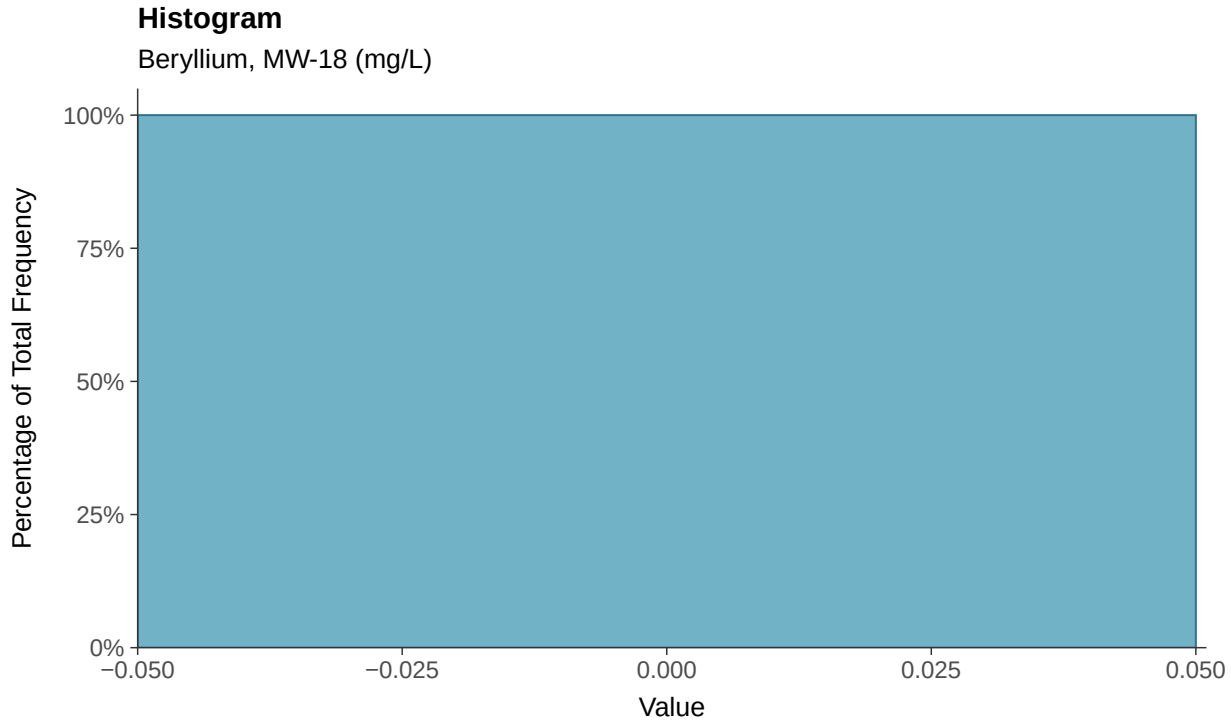
Barium, MW-18 (mg/L)



Appendix IV: Beryllium, MW-18

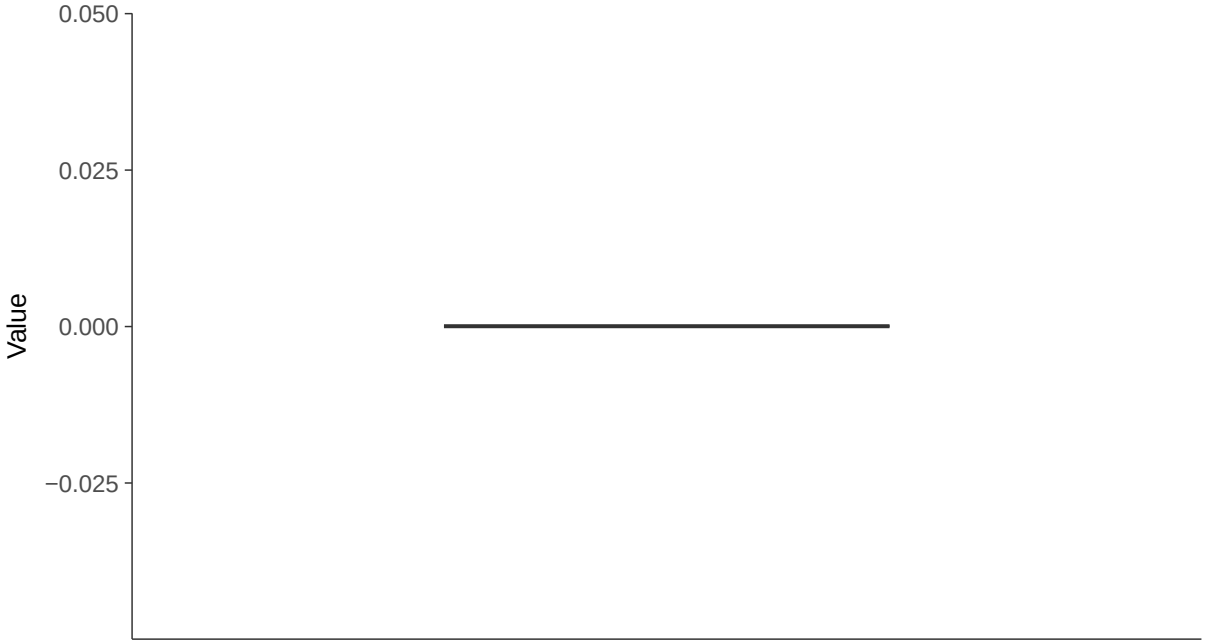
ID: 1_22_5_104





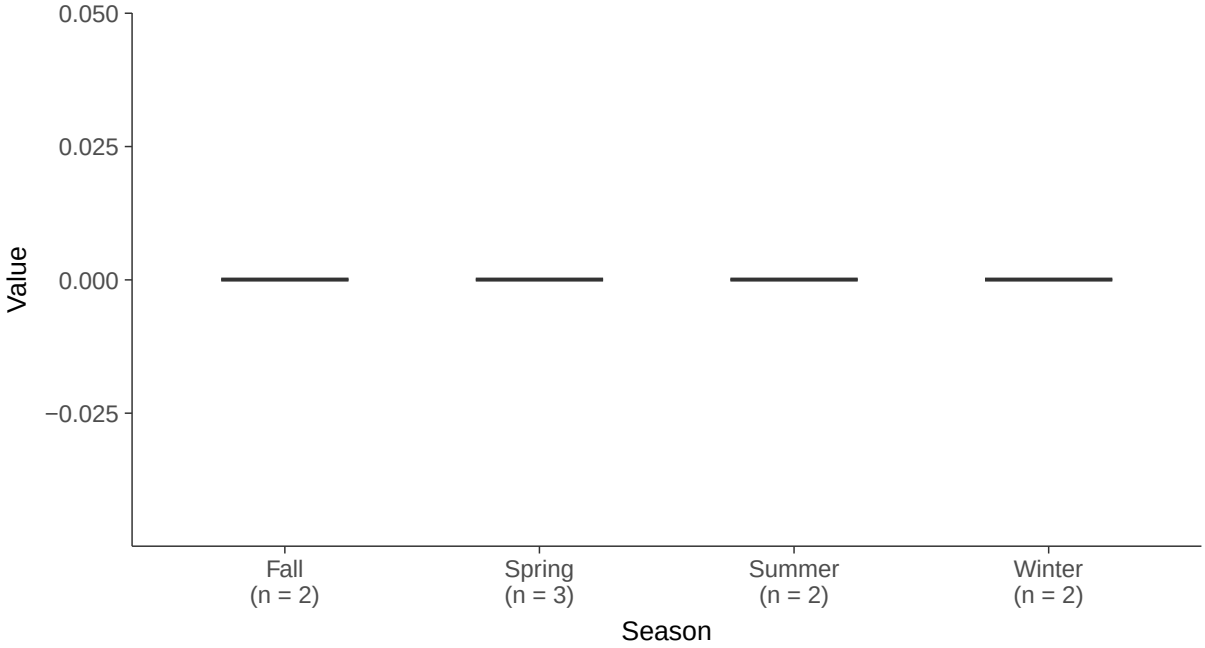
Boxplot

Beryllium, MW-18 (mg/L)



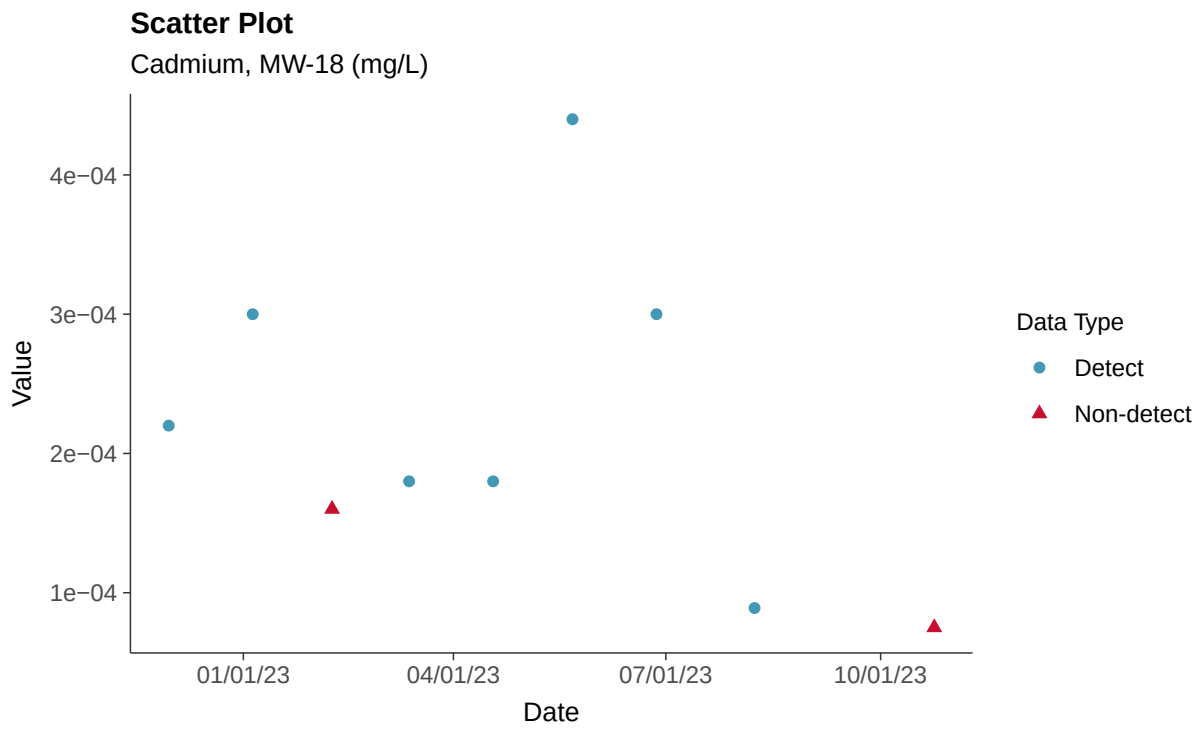
Boxplot by Season

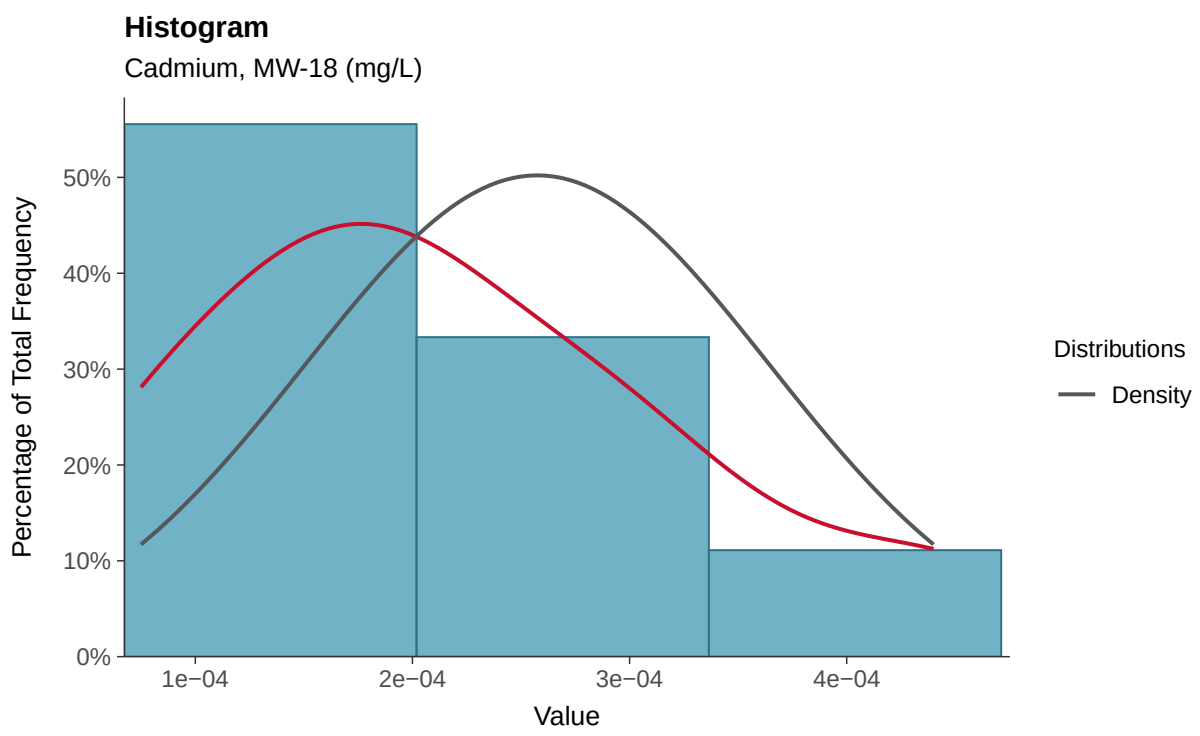
Beryllium, MW-18 (mg/L)



Appendix IV: Cadmium, MW-18

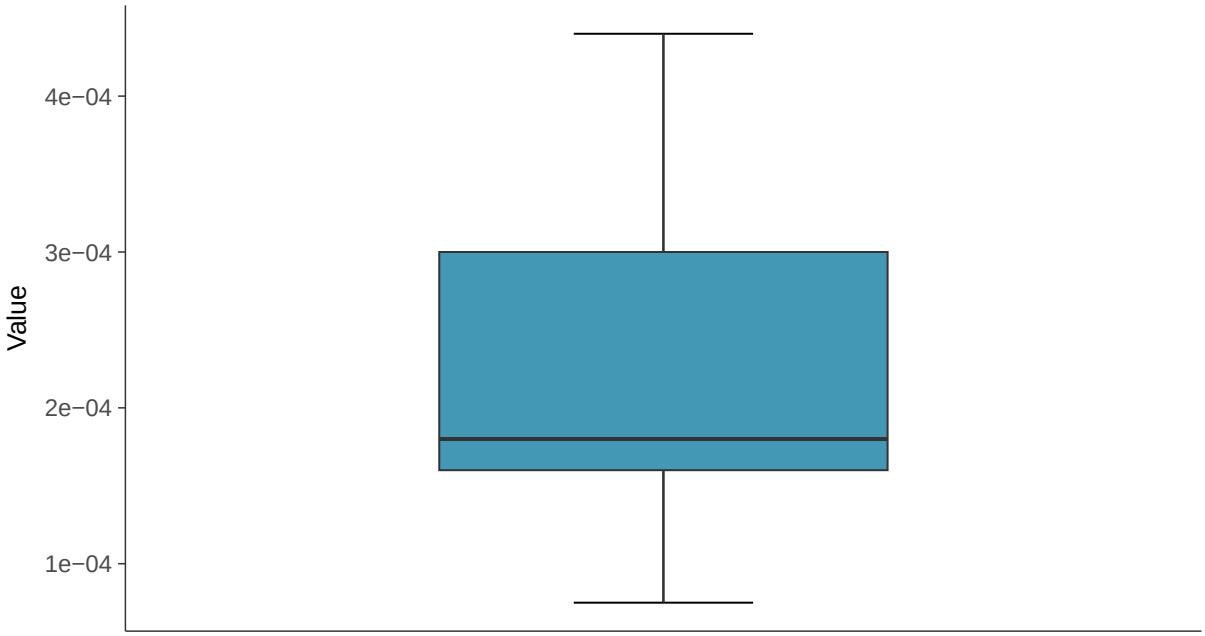
ID: 1_22_5_106





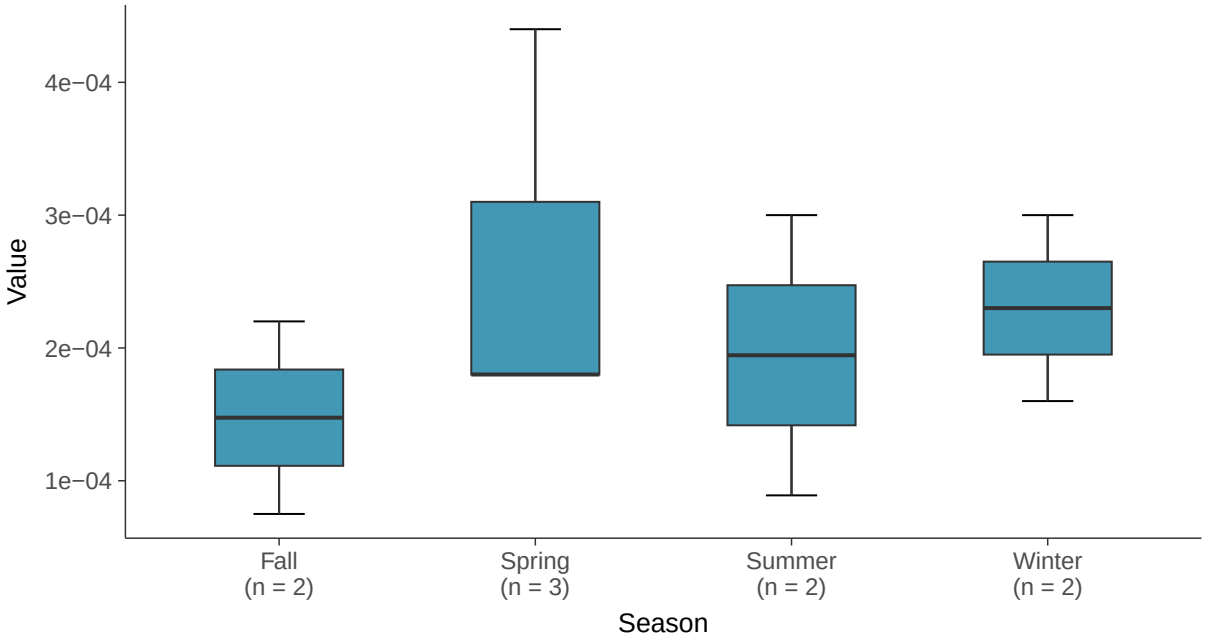
Boxplot

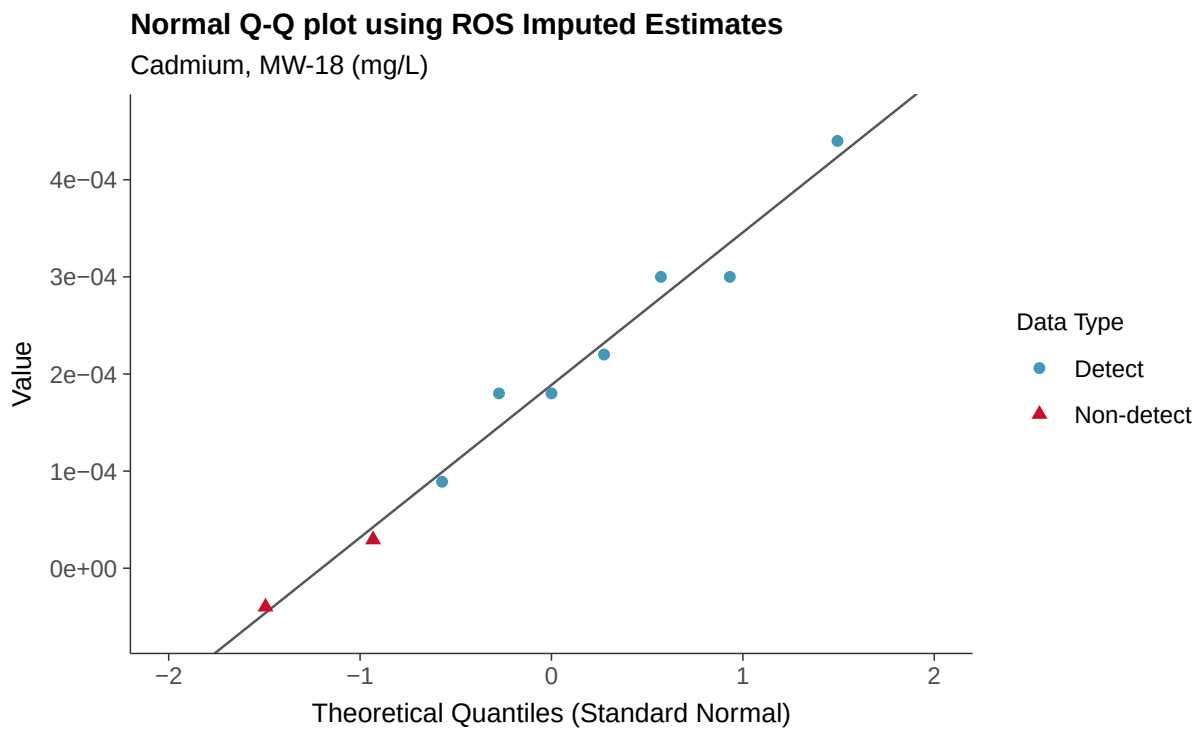
Cadmium, MW-18 (mg/L)

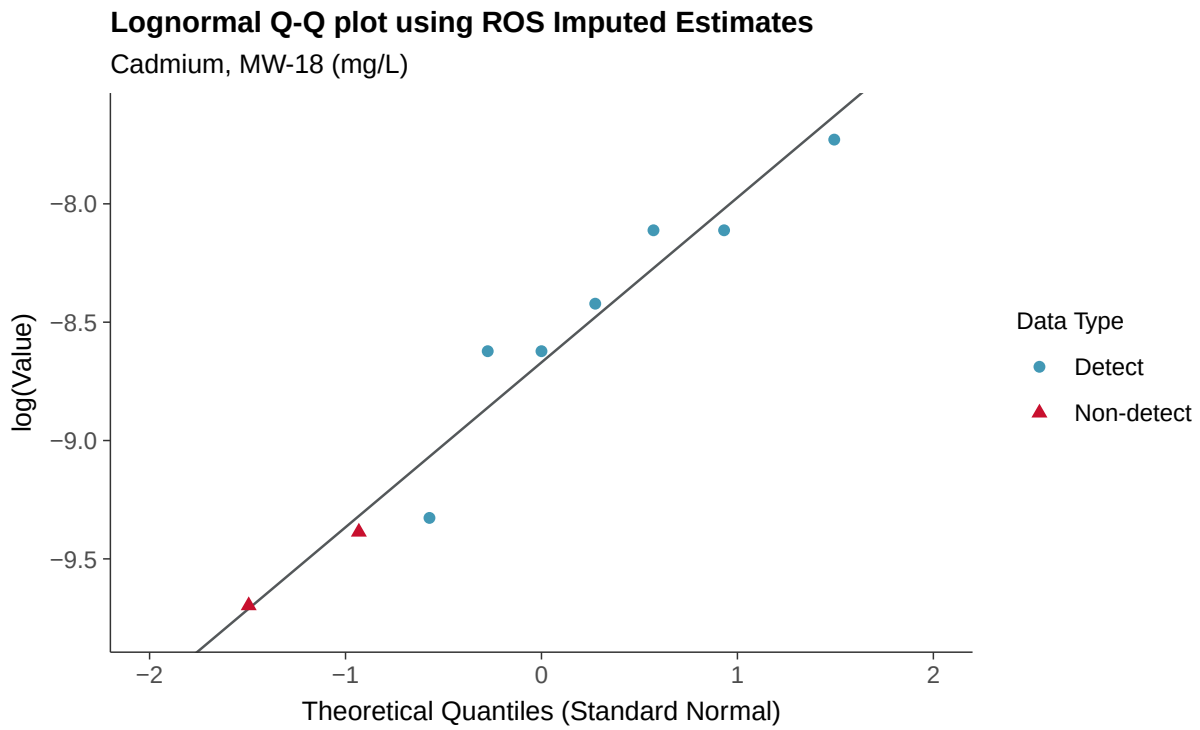


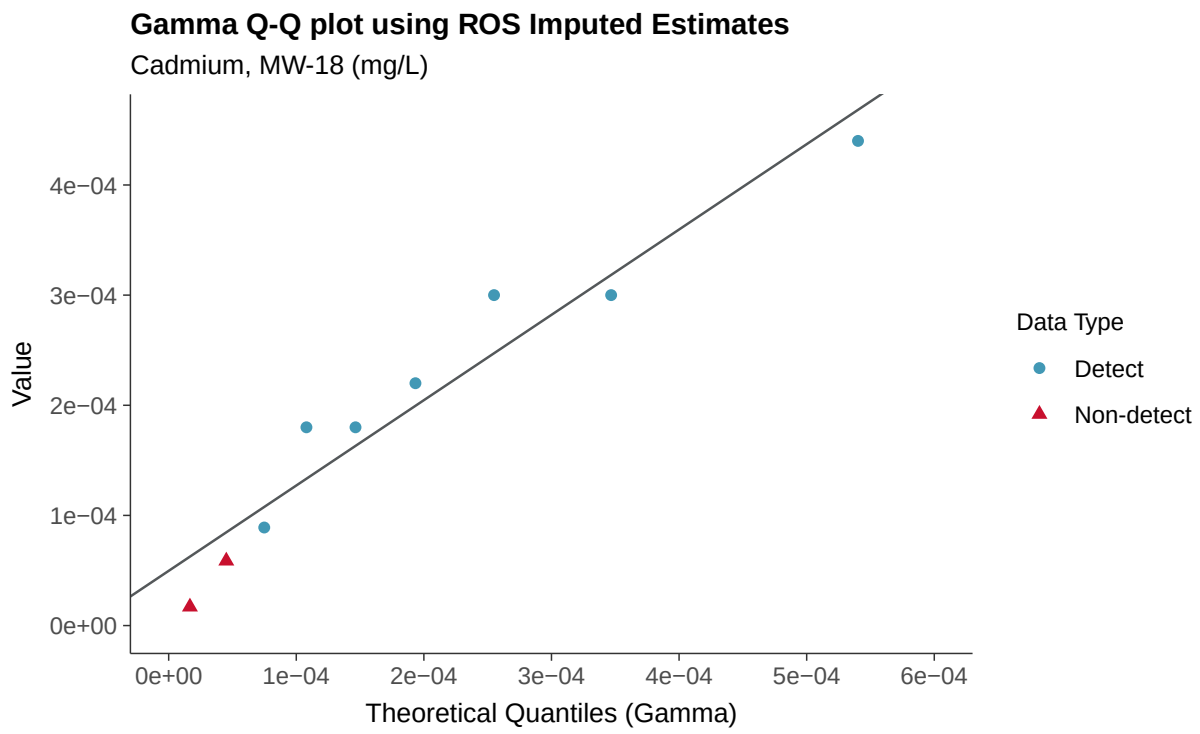
Boxplot by Season

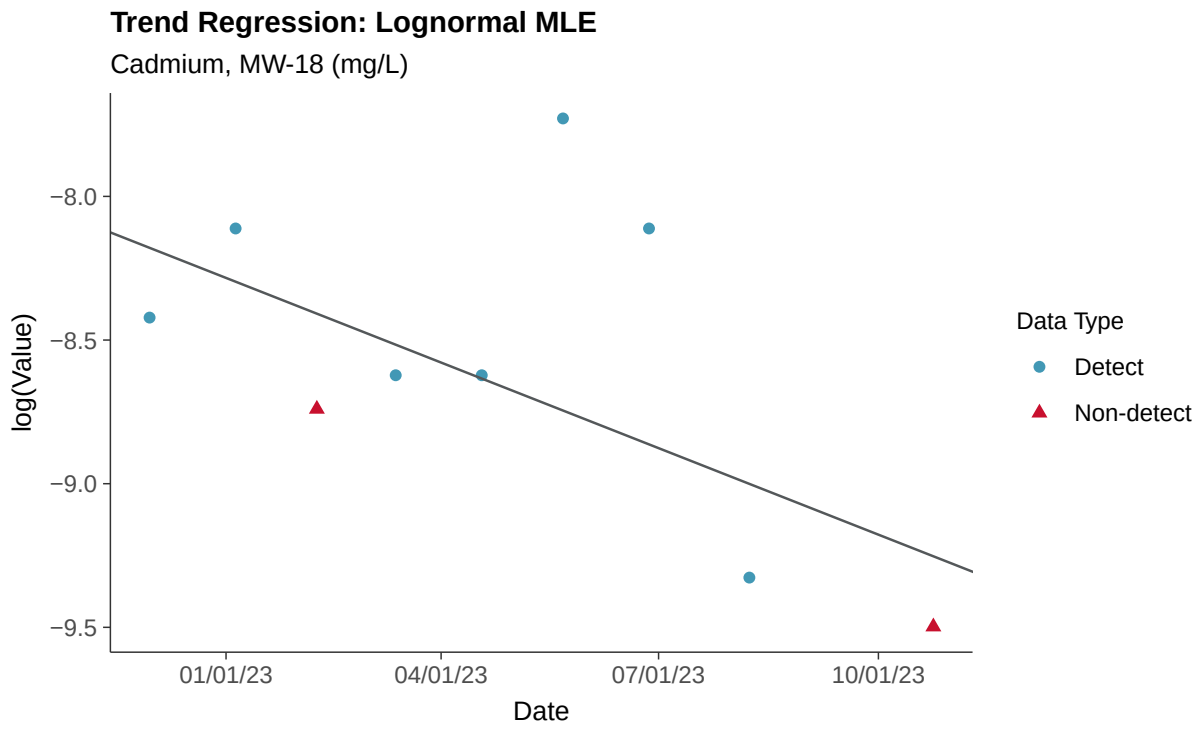
Cadmium, MW-18 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Cadmium, MW-18 (mg/L)
Value
4e−04
3e−04
2e−04
1e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

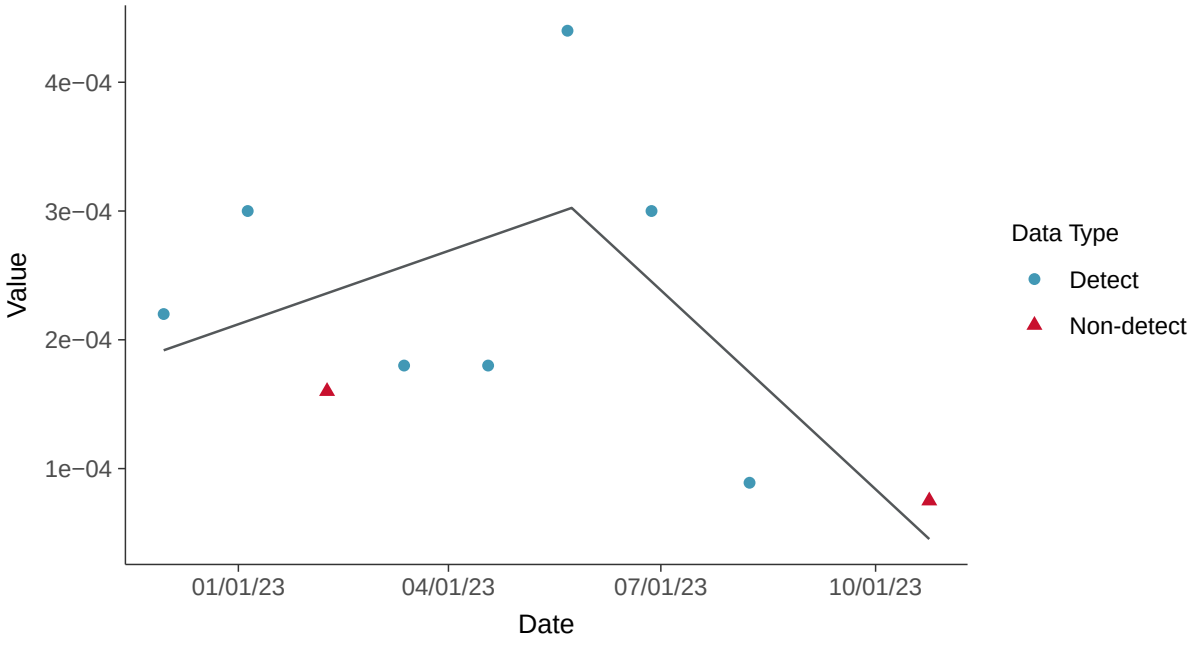

Lognormal Q-Q plot using ROS Imputed Estimates
Cadmium, MW-18 (mg/L)
log(Value)
−8.0
−8.5
−9.0
−9.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Cadmium, MW-18 (mg/L)
Value
4e−04
3e−04
2e−04
1e−04
0e+00
0e+00
1e−04
2e−04
3e−04
4e−04
5e−04
6e−04
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Cadmium, MW-18 (mg/L)
log(Value)
−8.0
−8.5
−9.0
−9.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

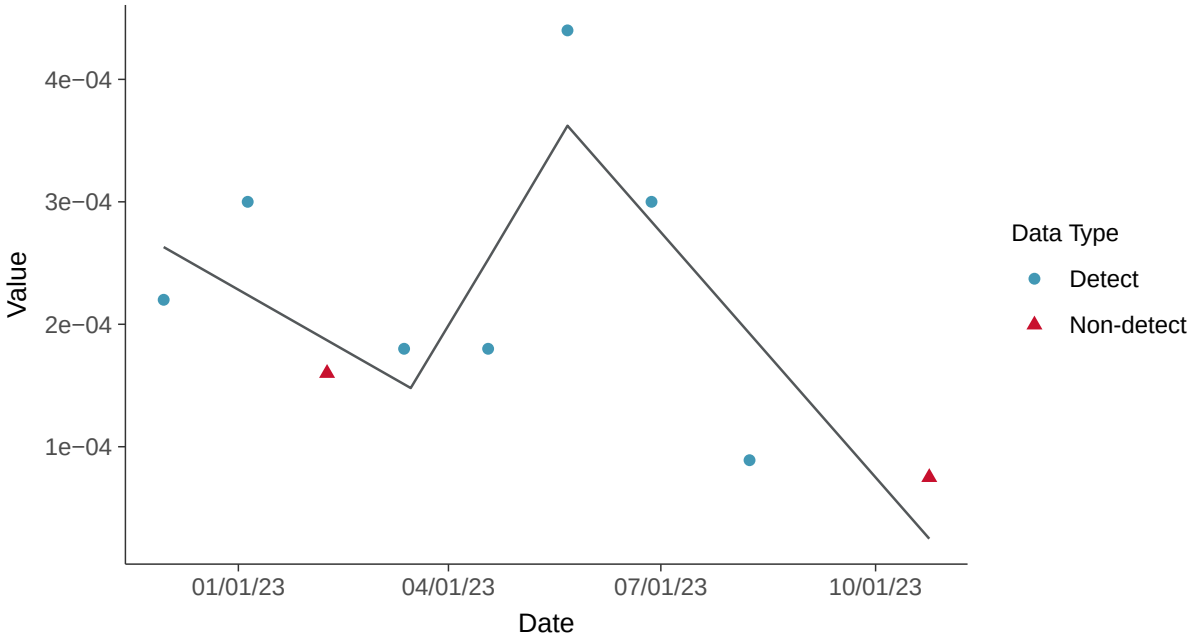
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-18 (mg/L)



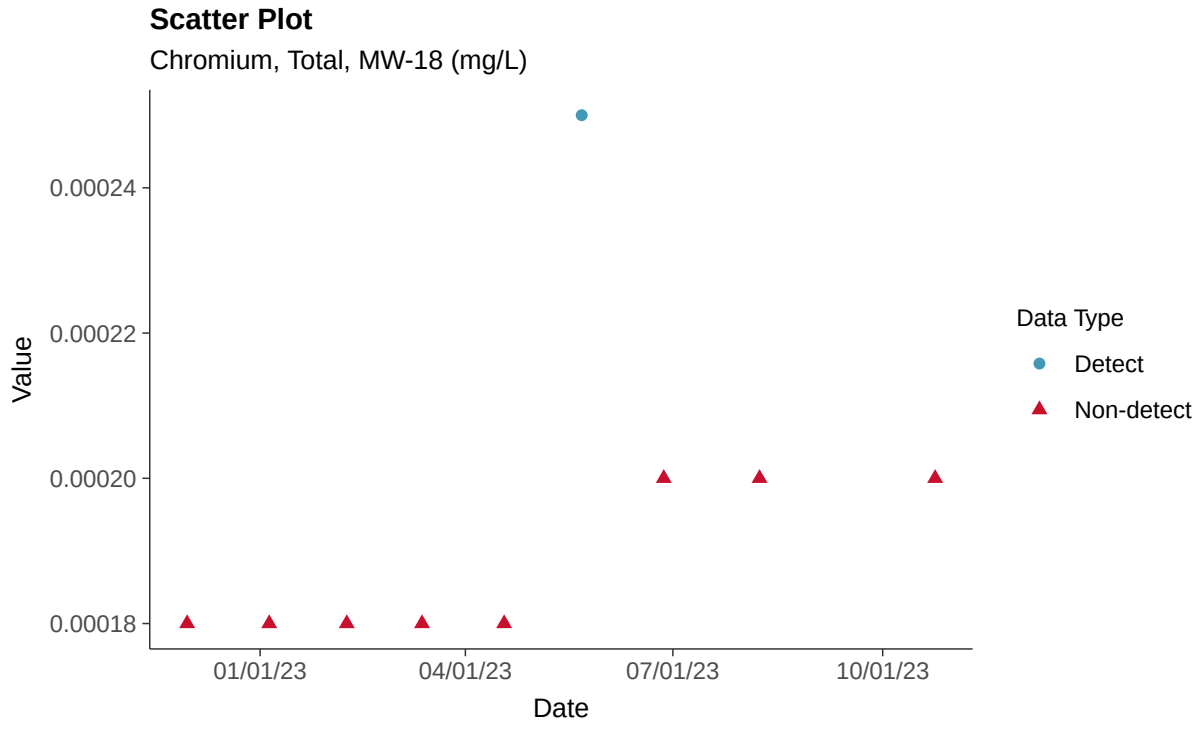
Trend Regression: Piecewise Linear-Linear-Linear

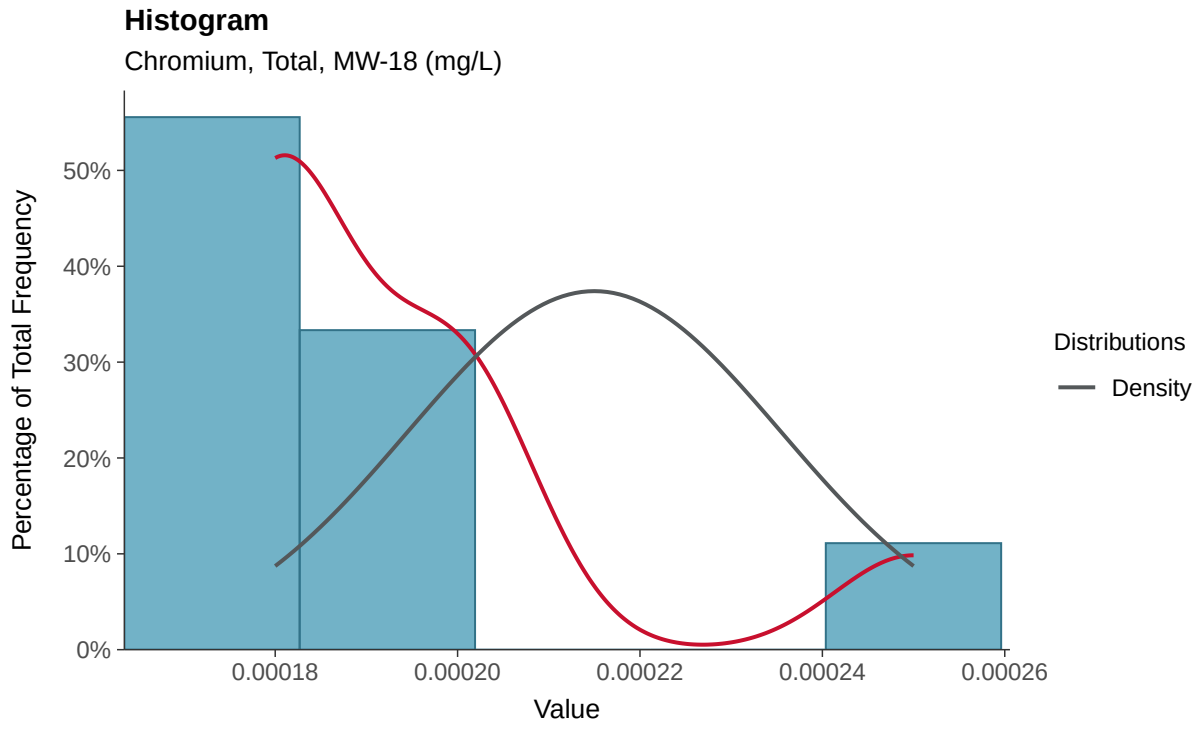
Cadmium, MW-18 (mg/L)



Appendix IV: Chromium, Total, MW-18

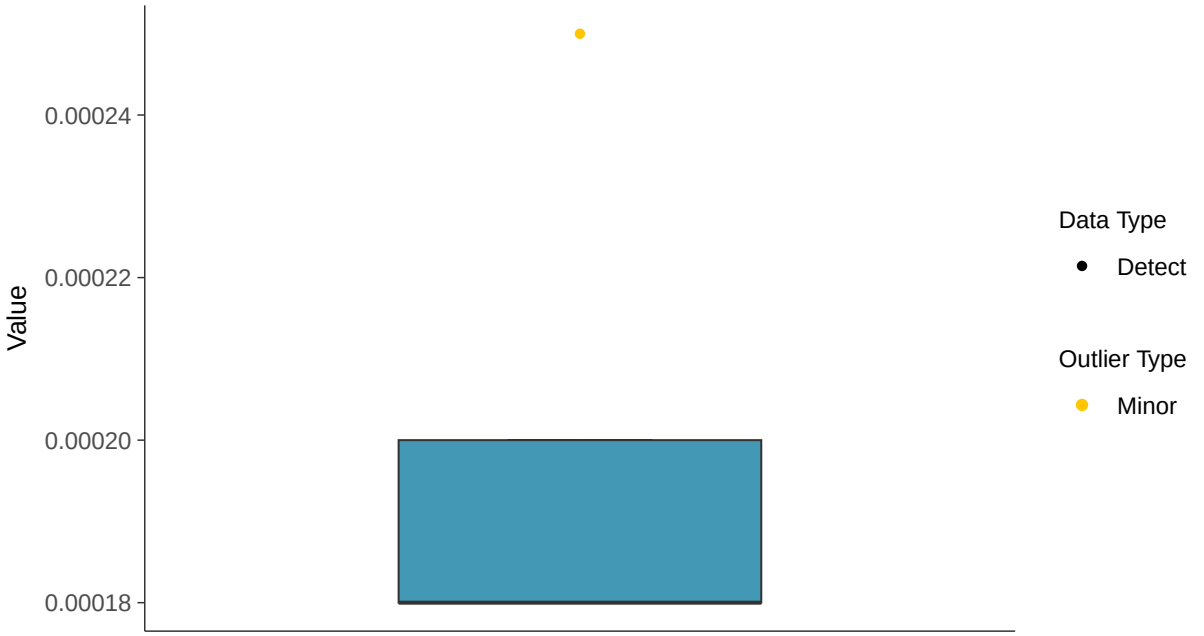
ID: 1_22_5_109





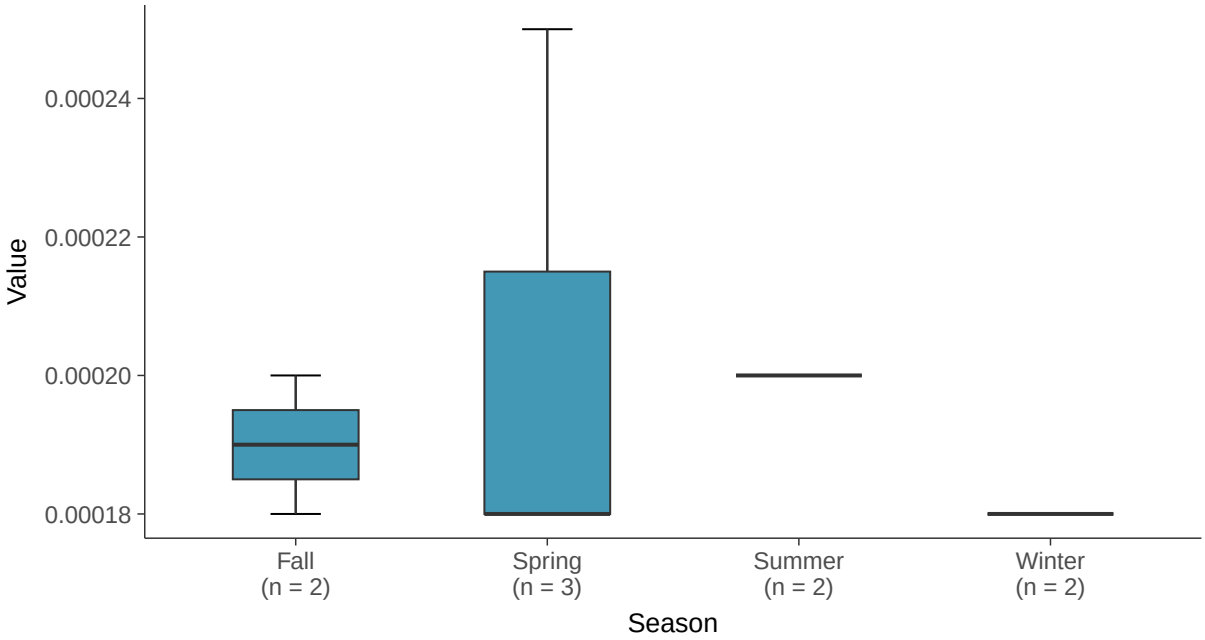
Boxplot

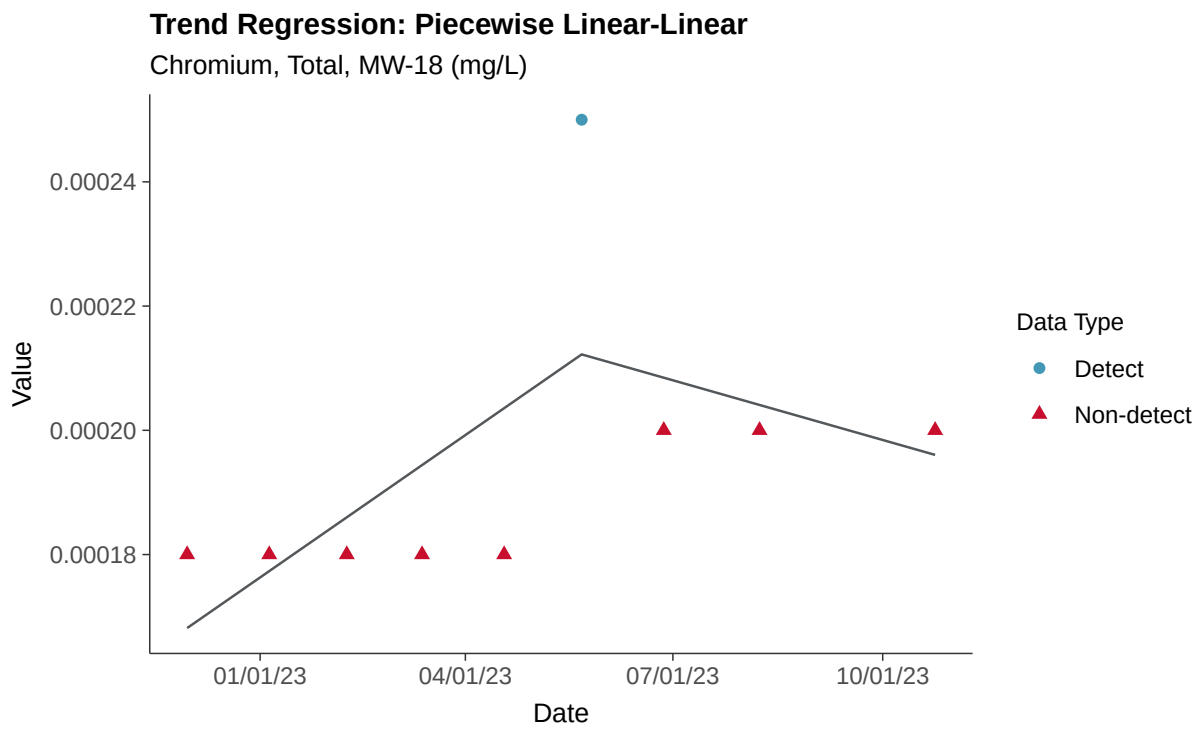
Chromium, Total, MW-18 (mg/L)

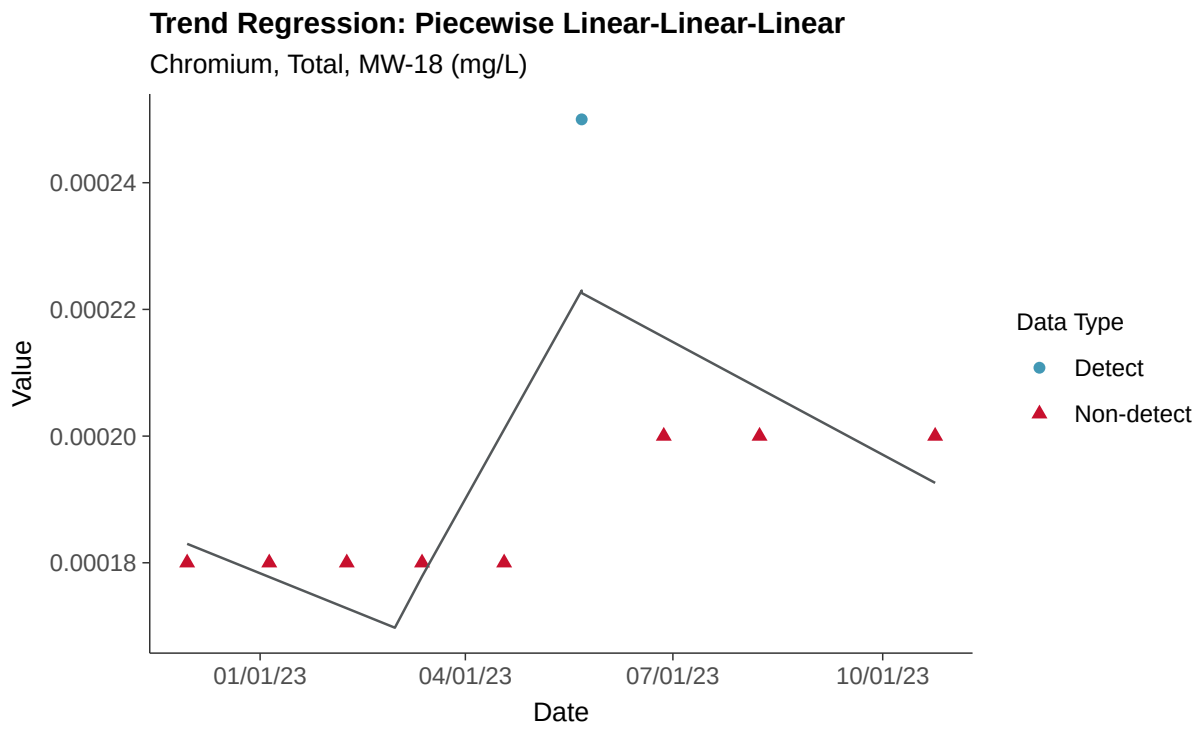


Boxplot by Season

Chromium, Total, MW-18 (mg/L)

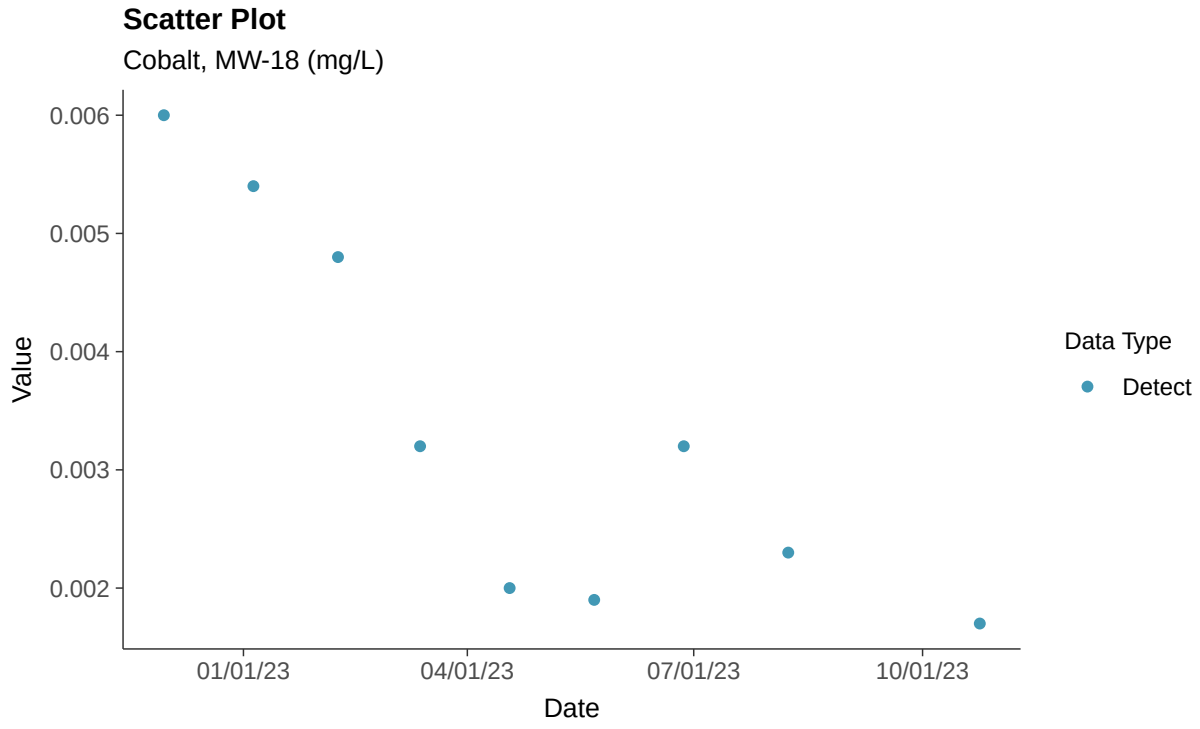


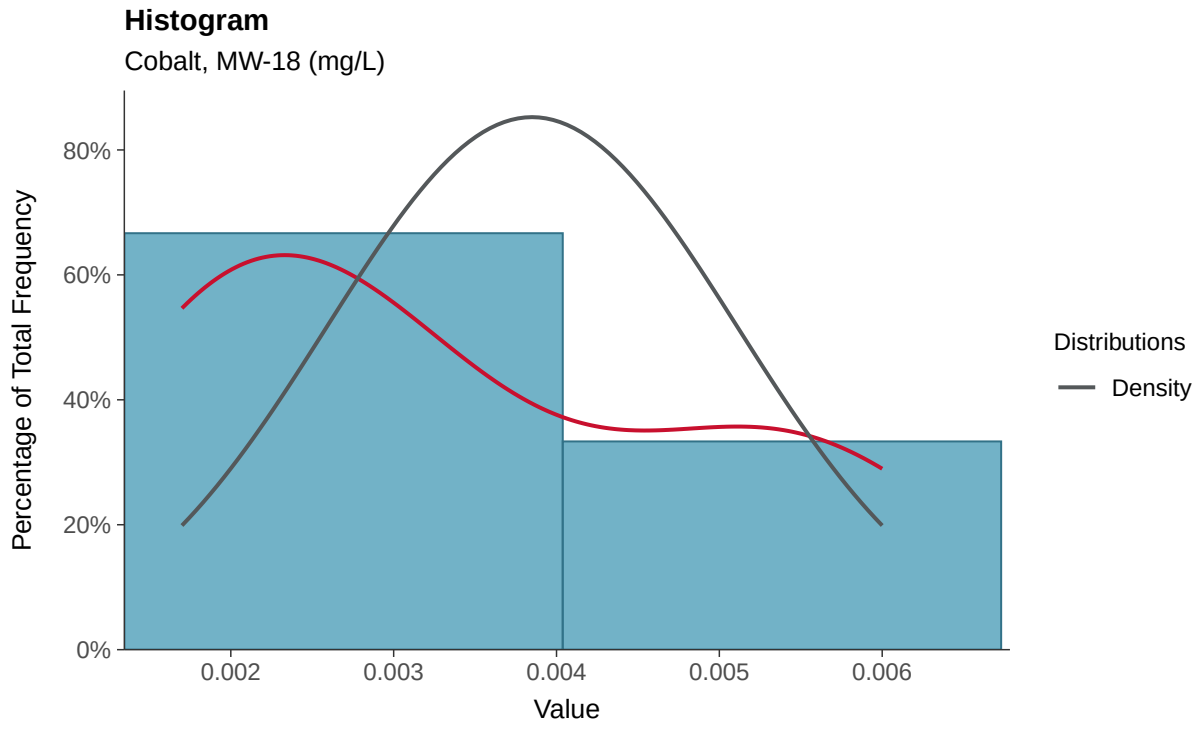

Trend Regression: Piecewise Linear-Linear
Chromium, Total, MW-18 (mg/L)
Value
0.00024
0.00022
0.00020
0.00018
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Chromium, Total, MW-18 (mg/L)
Value
0.00024
0.00022
0.00020
0.00018
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Cobalt, MW-18

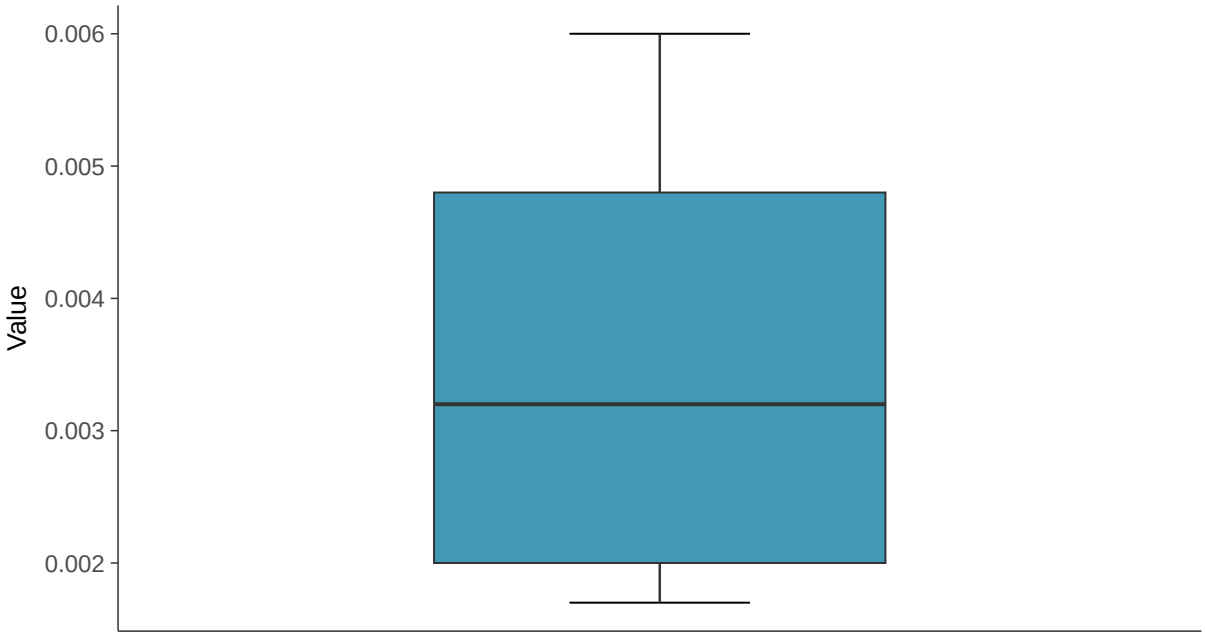
ID: 1_22_5_110





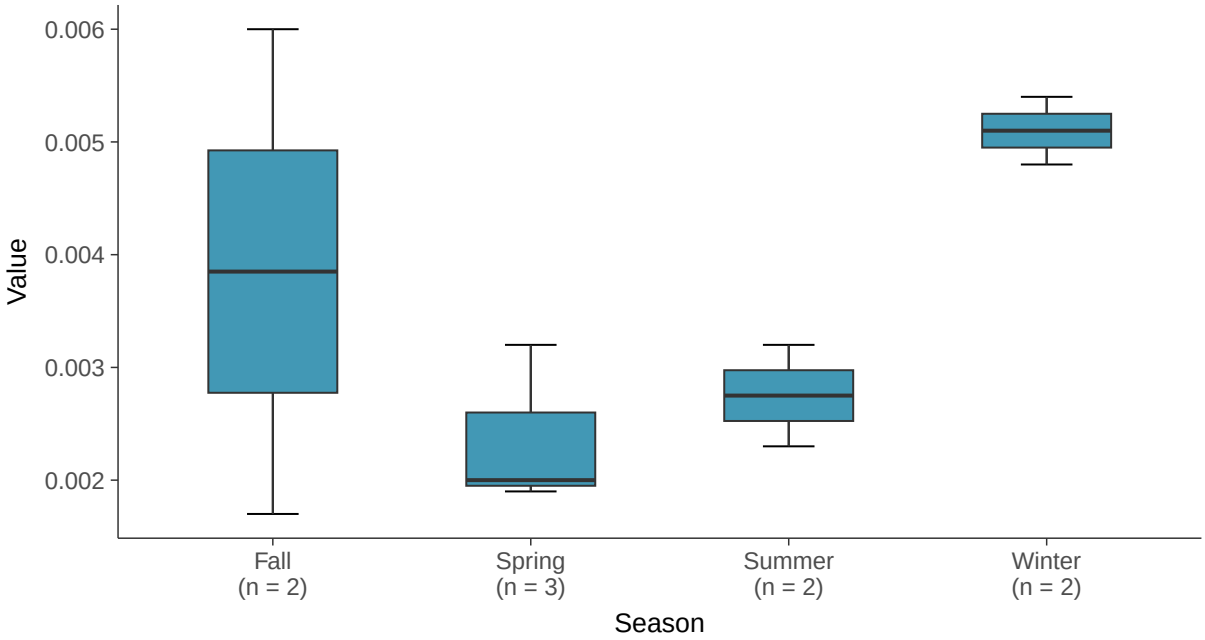
Boxplot

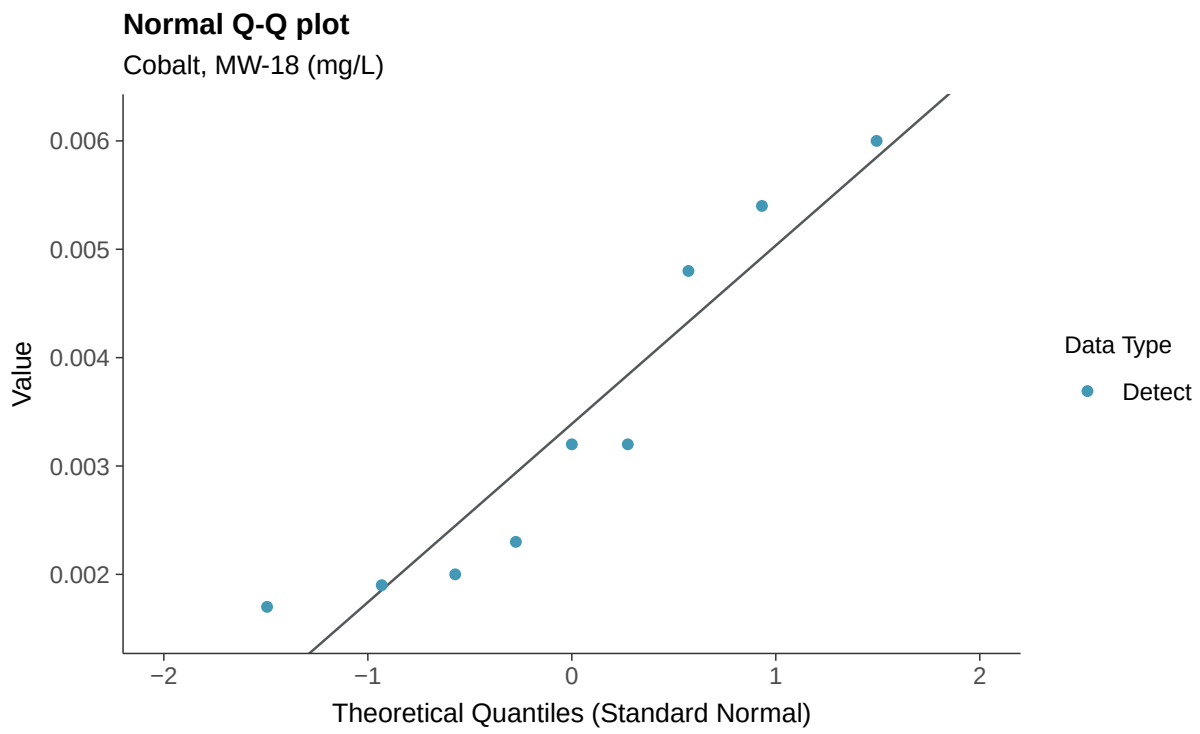
Cobalt, MW-18 (mg/L)

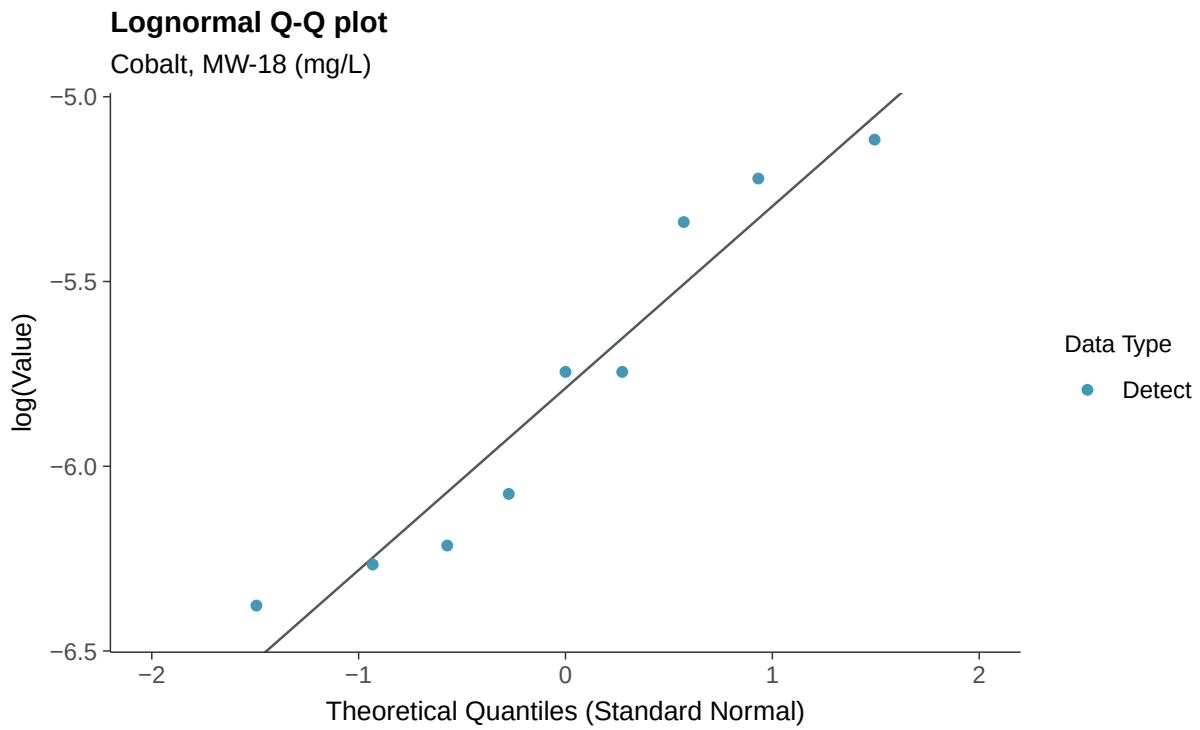


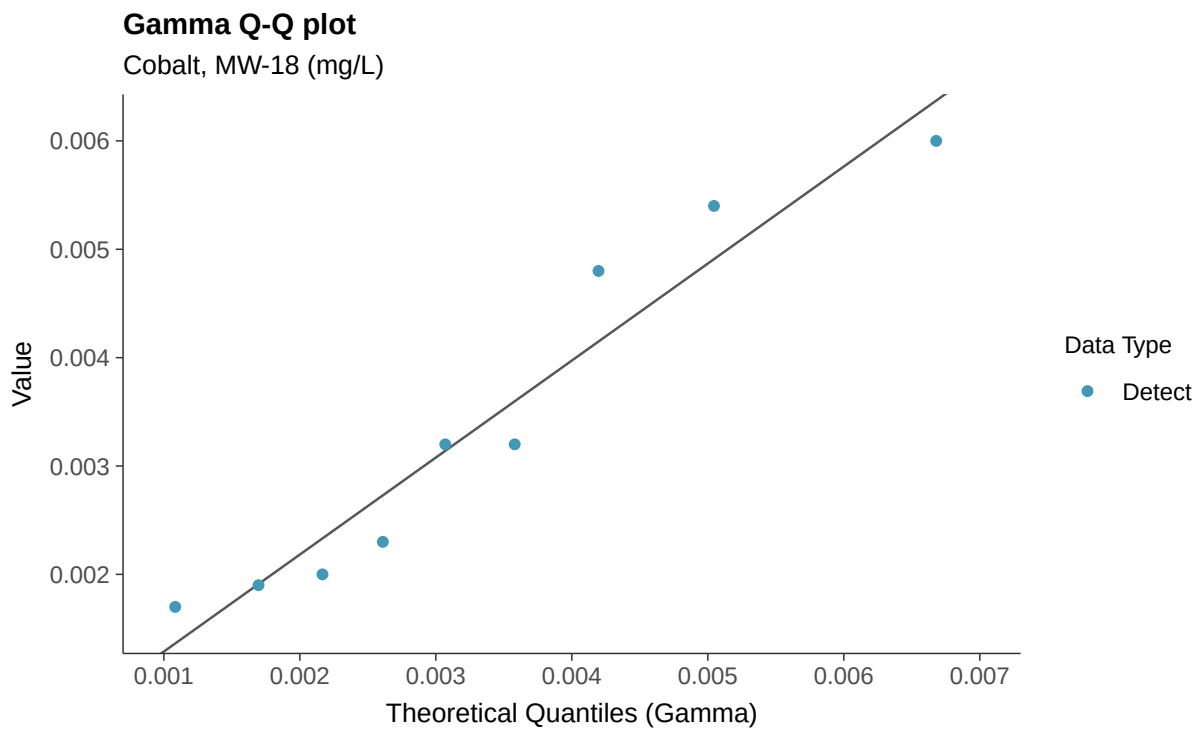
Boxplot by Season

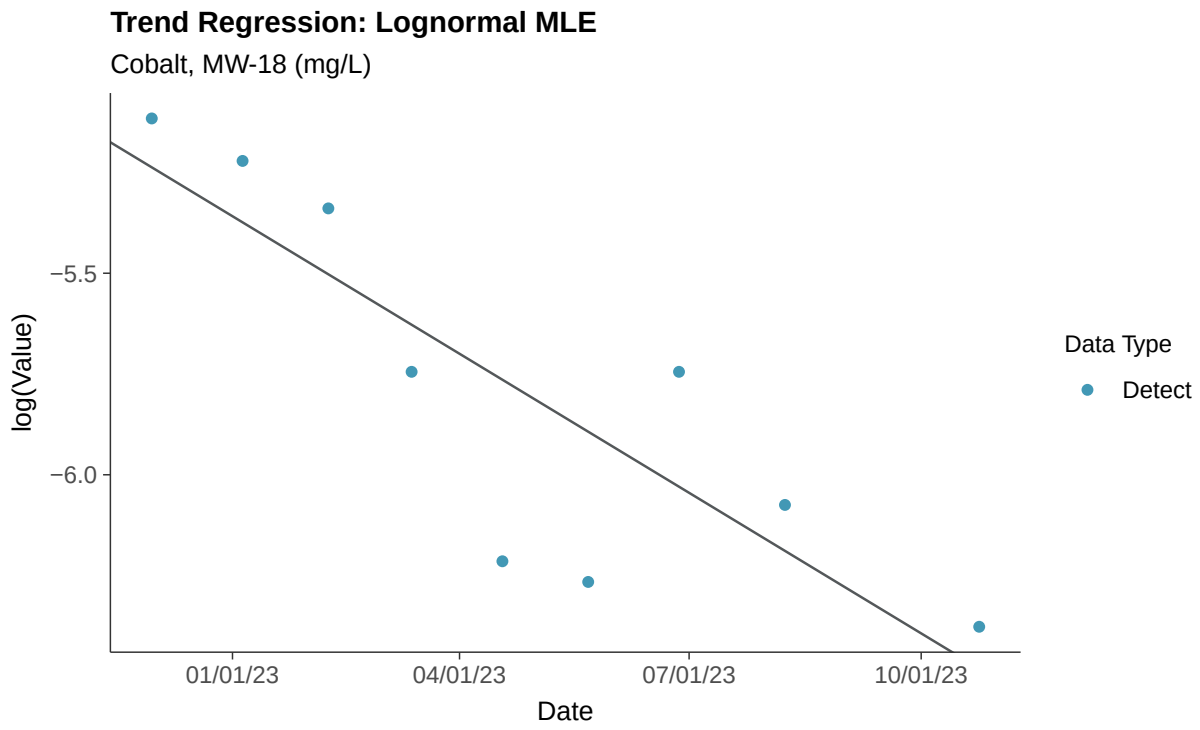
Cobalt, MW-18 (mg/L)

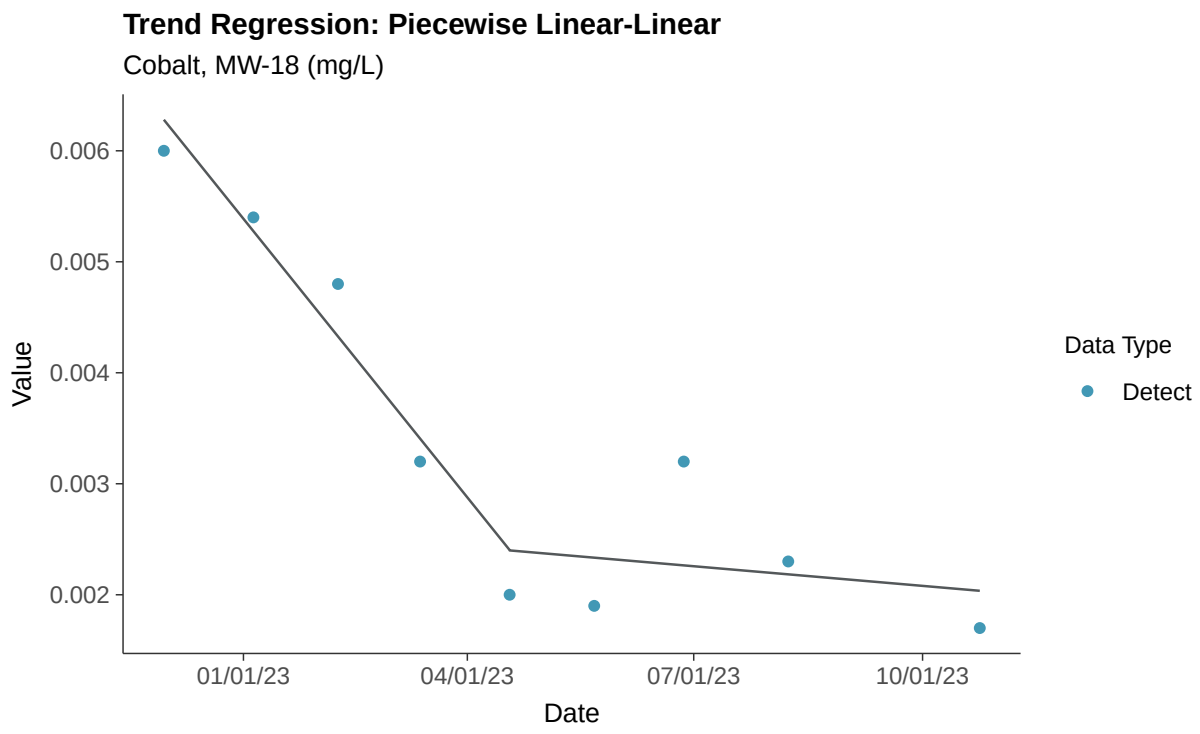



Normal Q-Q plot
Cobalt, MW-18 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Cobalt, MW-18 (mg/L)
log(Value)
−5.0
−5.5
−6.0
−6.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

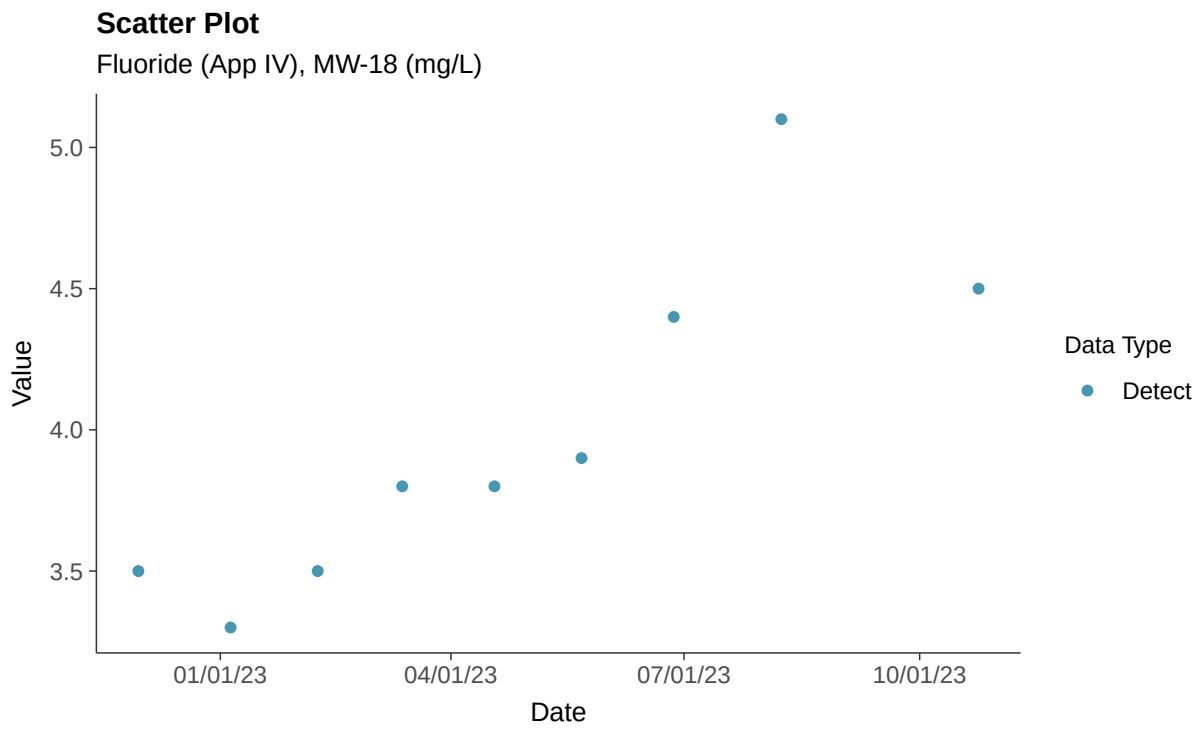

Gamma Q-Q plot
Cobalt, MW-18 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
0.001
0.002
0.003
0.004
0.005
0.006
0.007
Theoretical Quantiles (Gamma)
Data Type
Detect

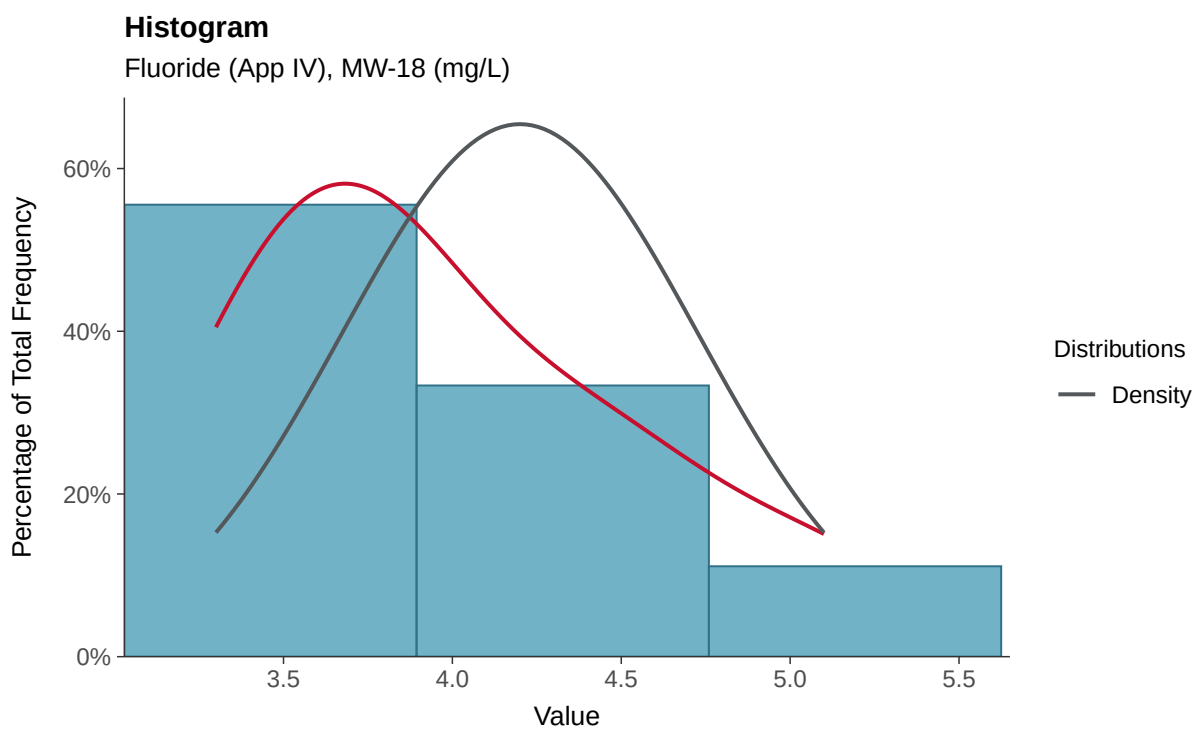

Trend Regression: Lognormal MLE
Cobalt, MW-18 (mg/L)
log(Value)
−5.5
−6.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Cobalt, MW-18 (mg/L)
0.006
0.005
0.004
0.003
0.002
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-18

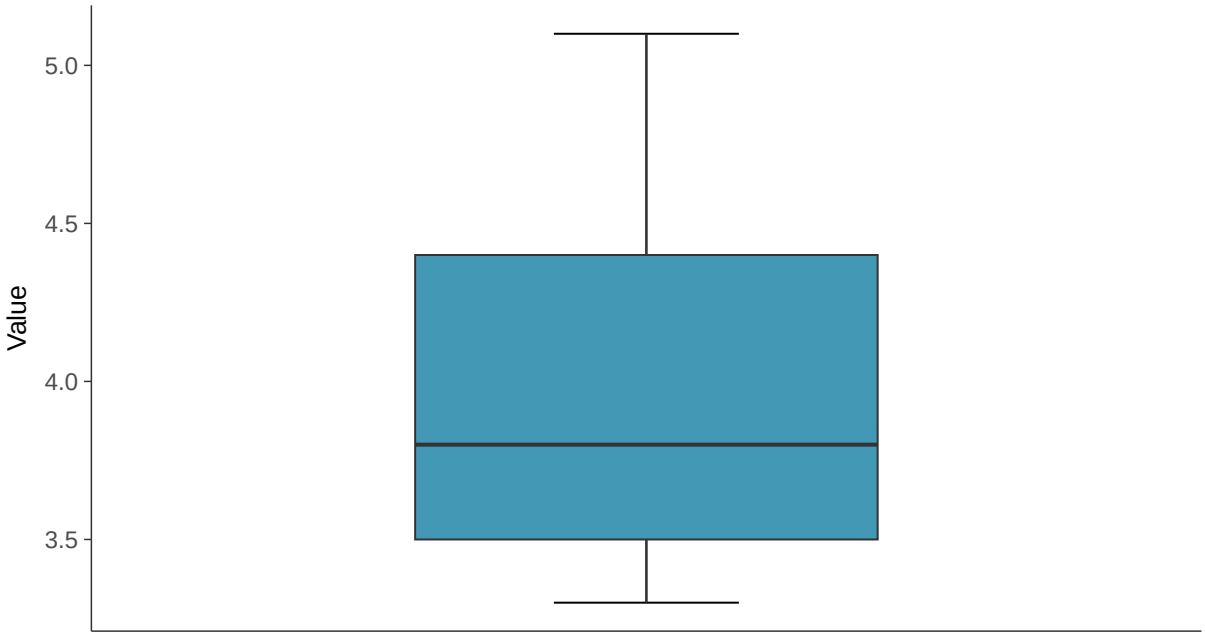
ID: 1_22_5_113





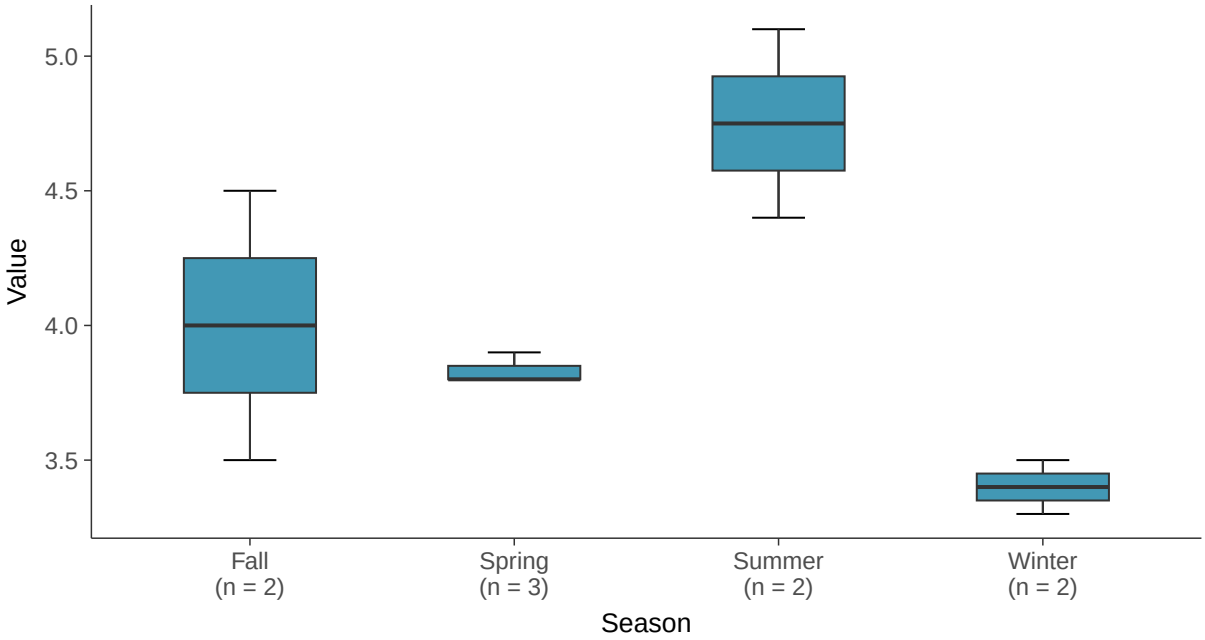
Boxplot

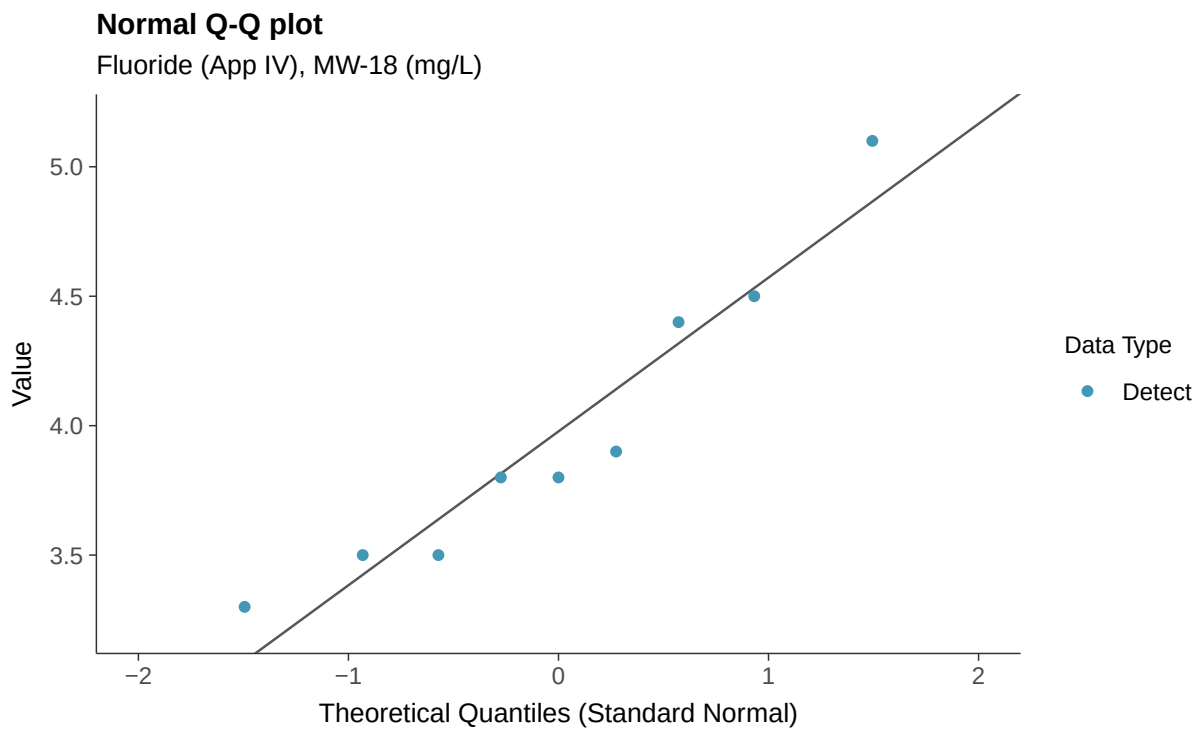
Fluoride (App IV), MW-18 (mg/L)

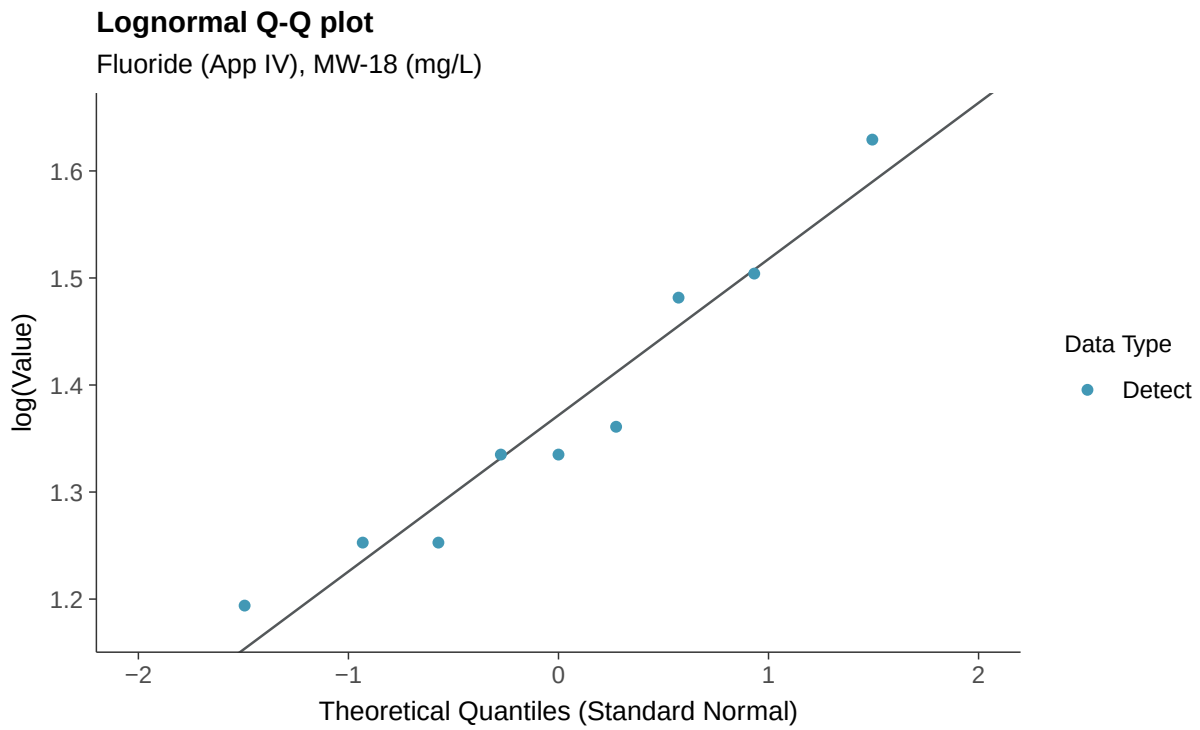


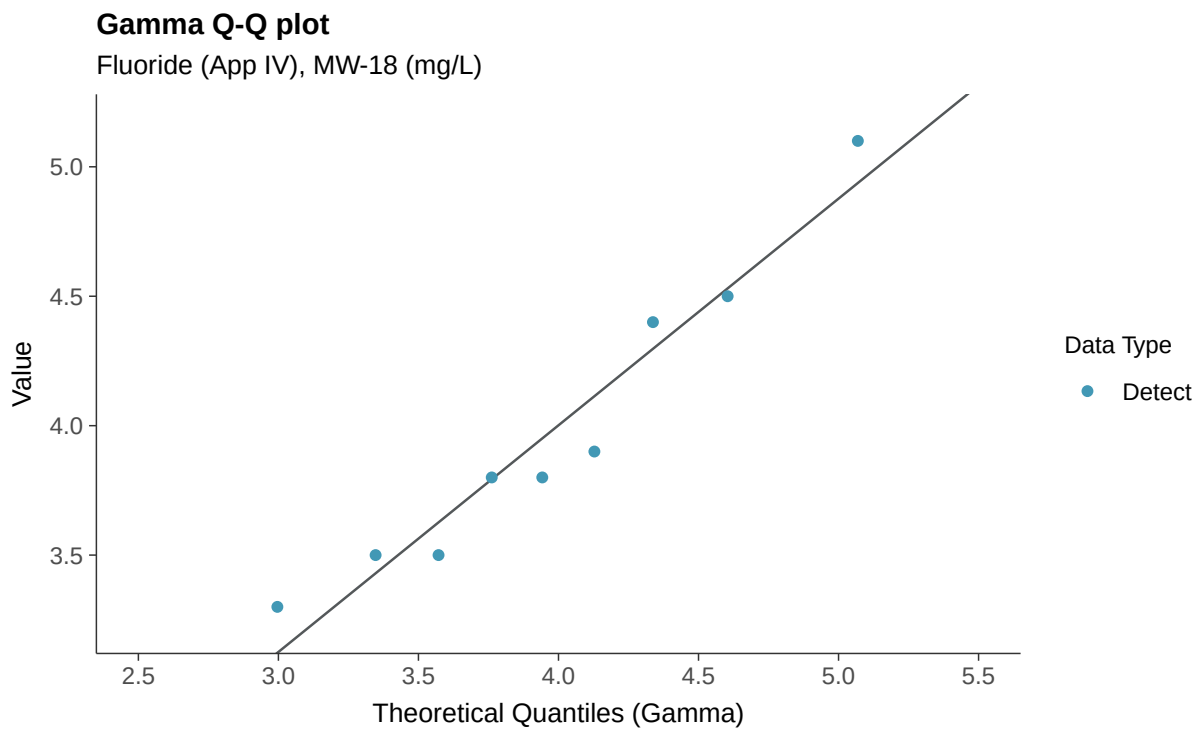
Boxplot by Season

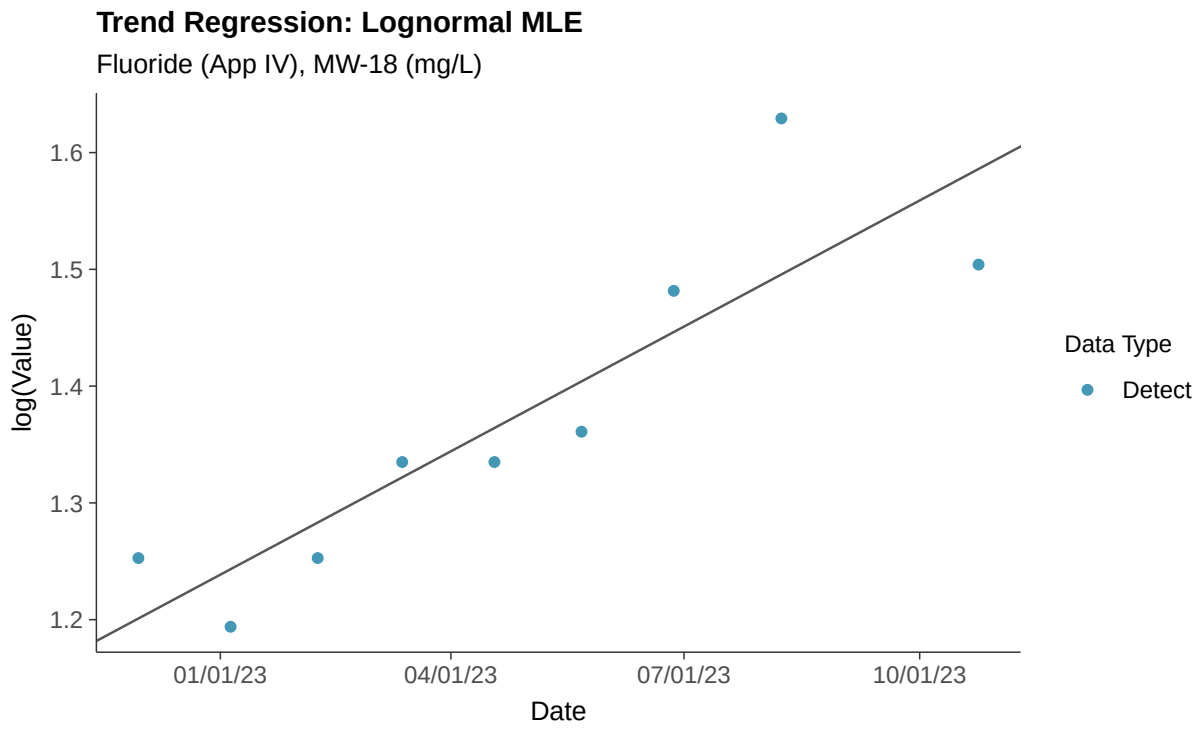
Fluoride (App IV), MW-18 (mg/L)




Normal Q-Q plot
Fluoride (App IV), MW-18 (mg/L)
Value
5.0
4.5
4.0
3.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

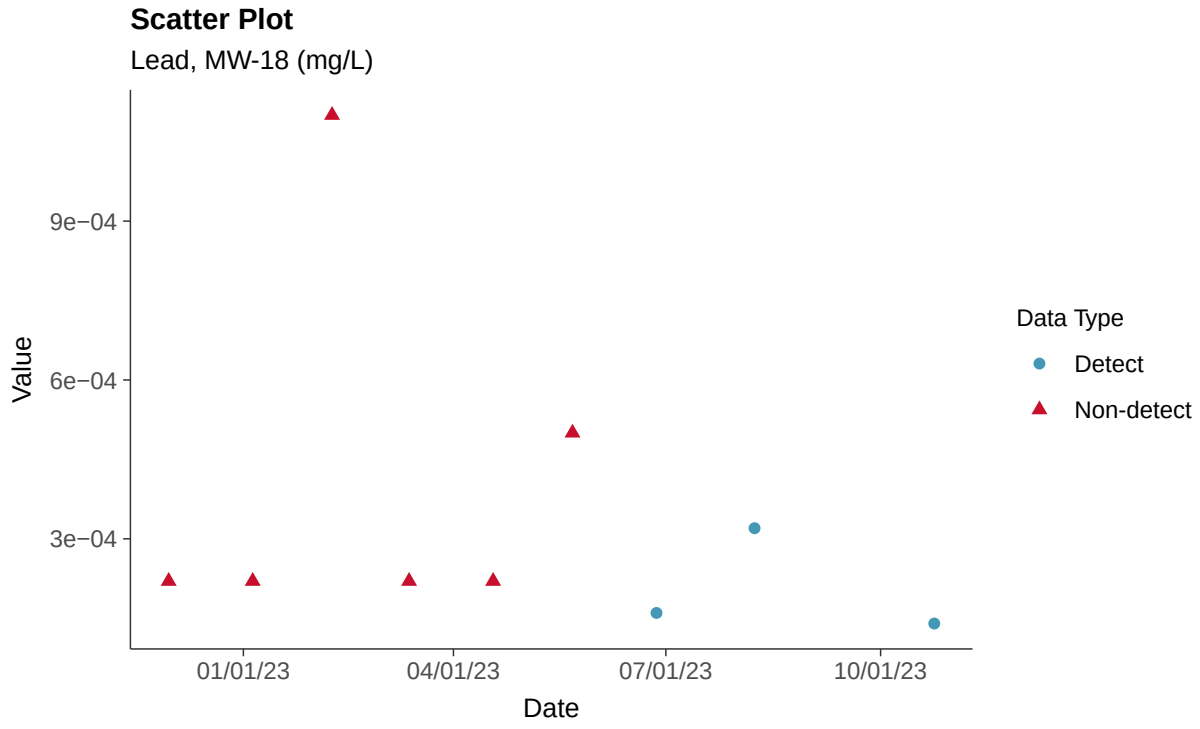

Lognormal Q-Q plot
Fluoride (App IV), MW-18 (mg/L)
log(Value)
1.6
1.5
1.4
1.3
1.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

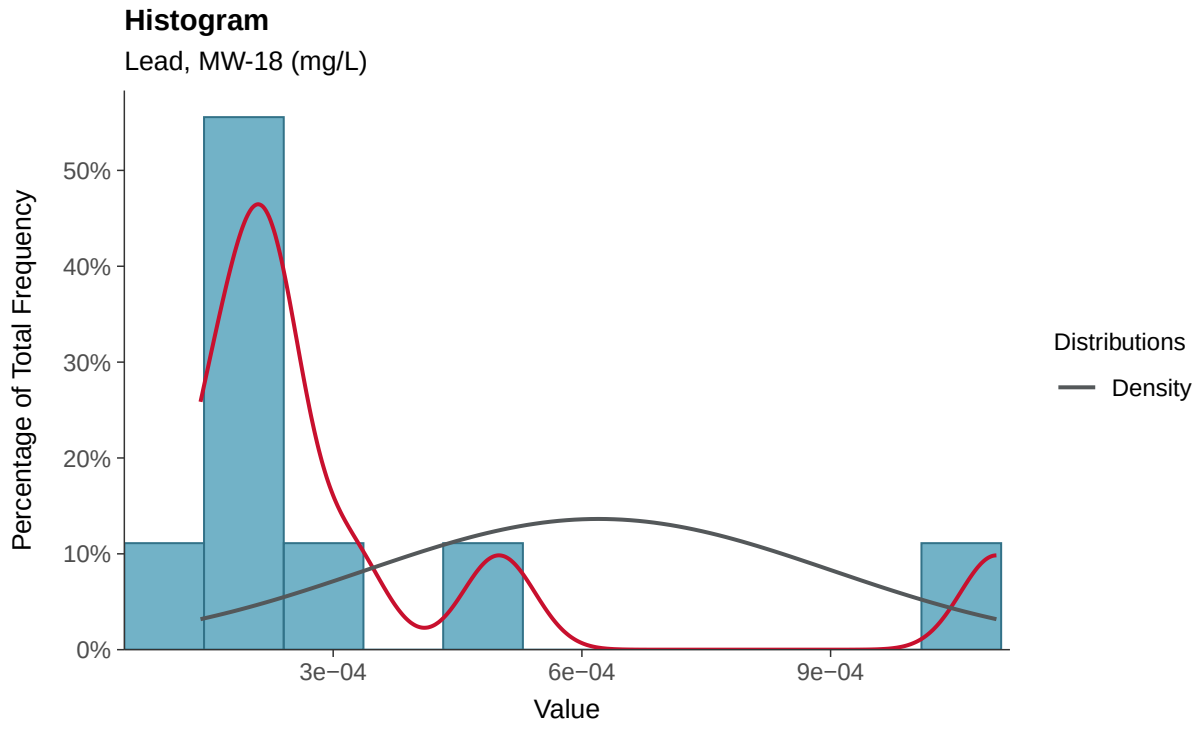

Gamma Q-Q plot
Fluoride (App IV), MW-18 (mg/L)
Value
5.0
4.5
4.0
3.5
2.5
3.0
3.5
4.0
4.5
5.0
5.5
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-18 (mg/L)
log(Value)
1.6
1.5
1.4
1.3
1.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lead, MW-18

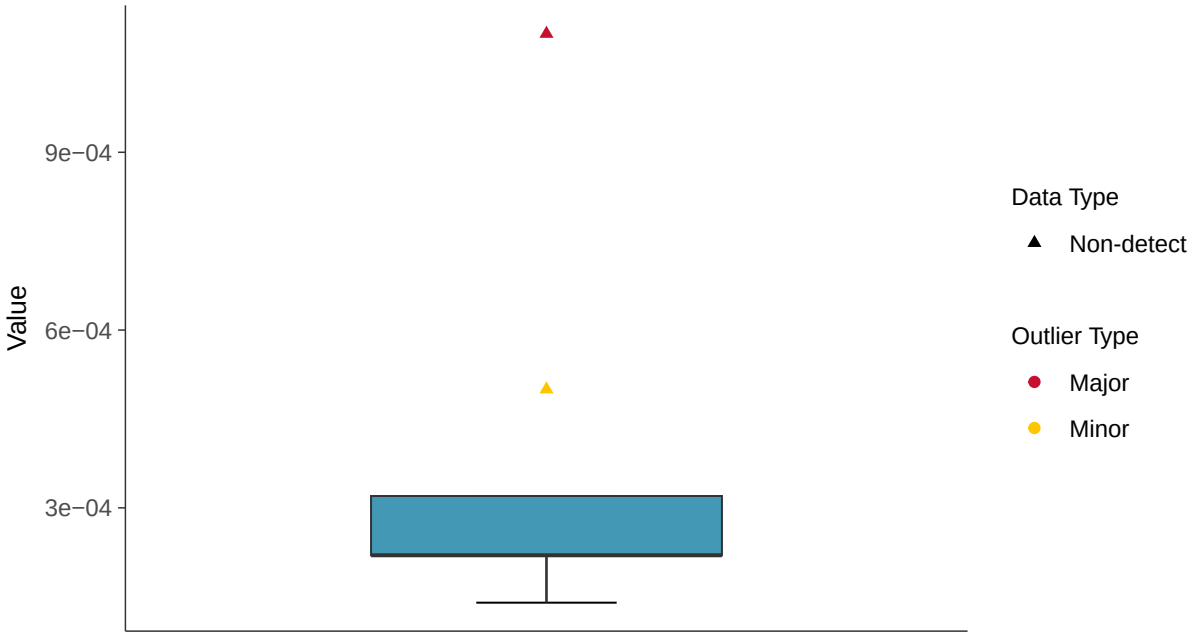
ID: 1_22_5_115





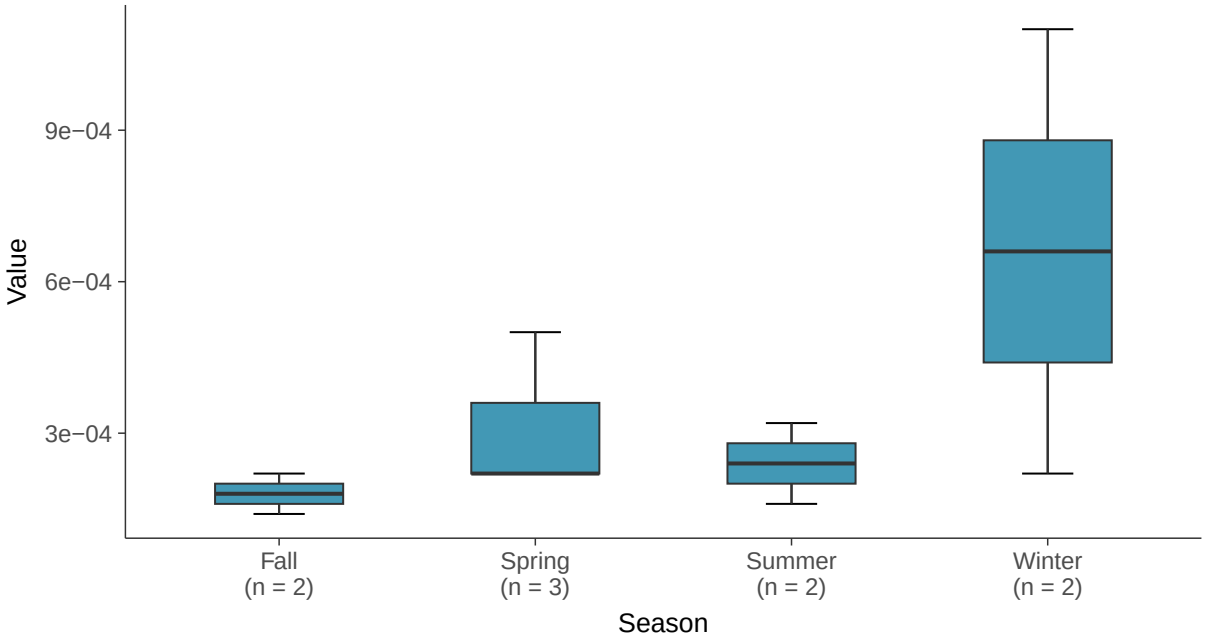
Boxplot

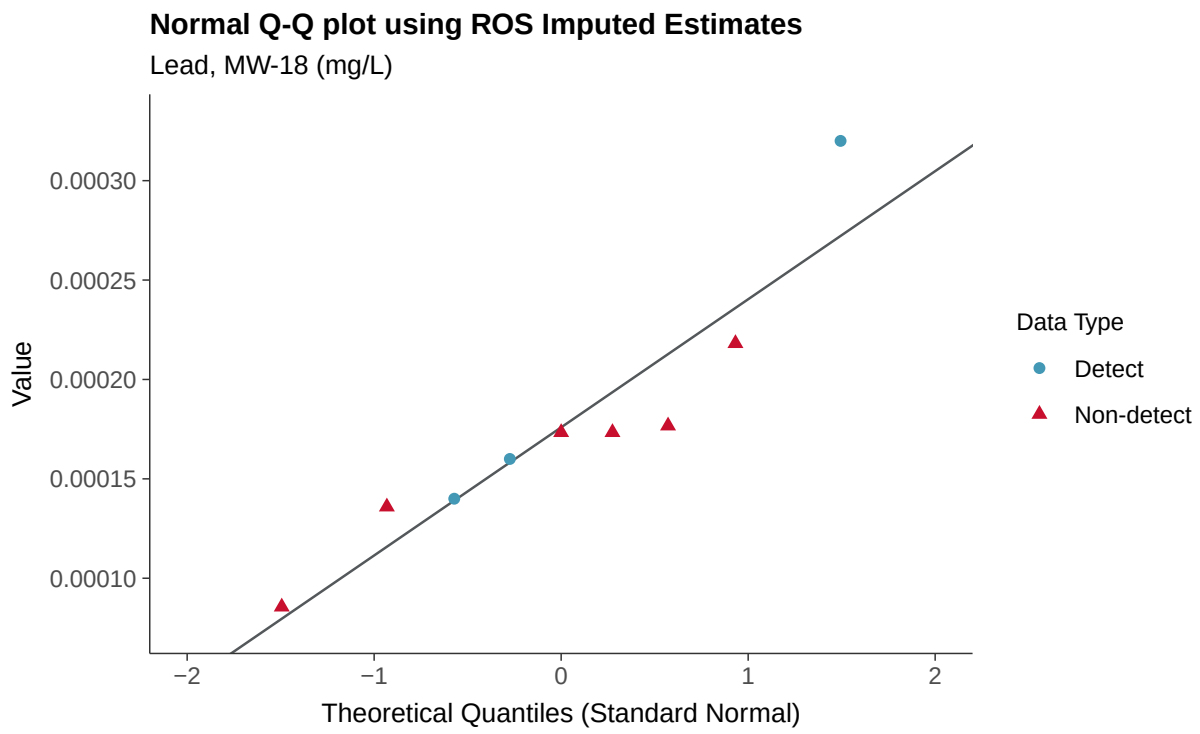
Lead, MW-18 (mg/L)

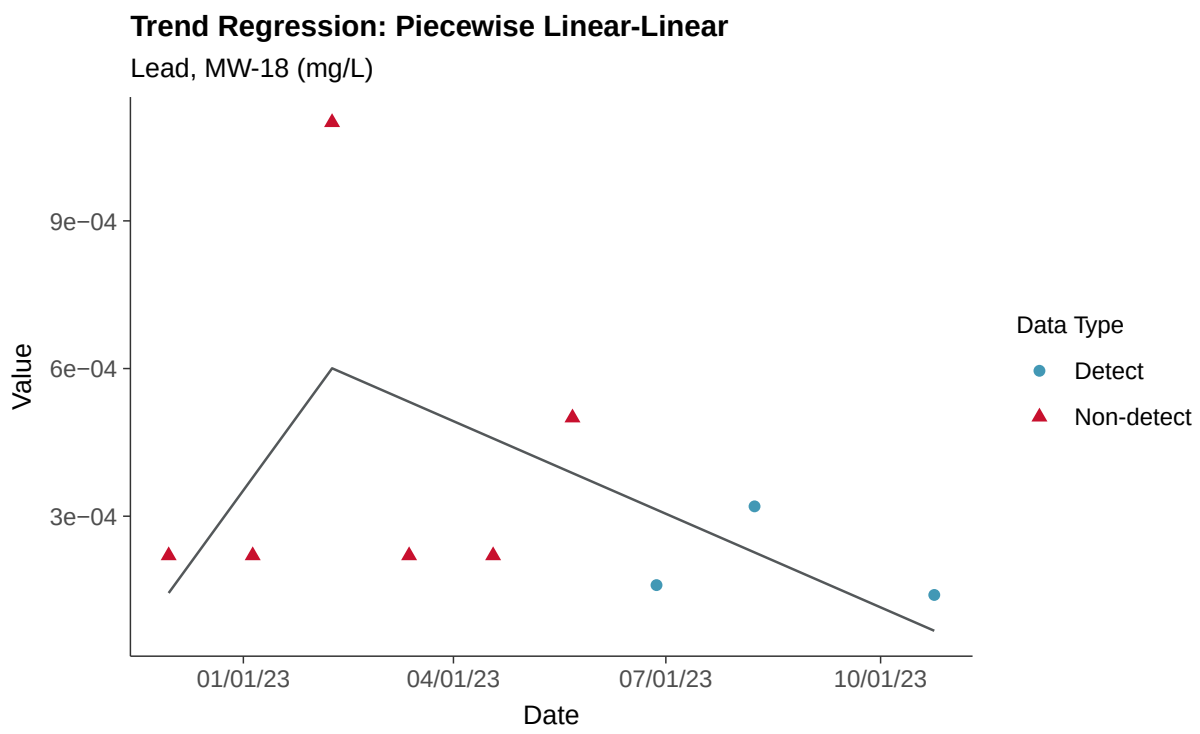


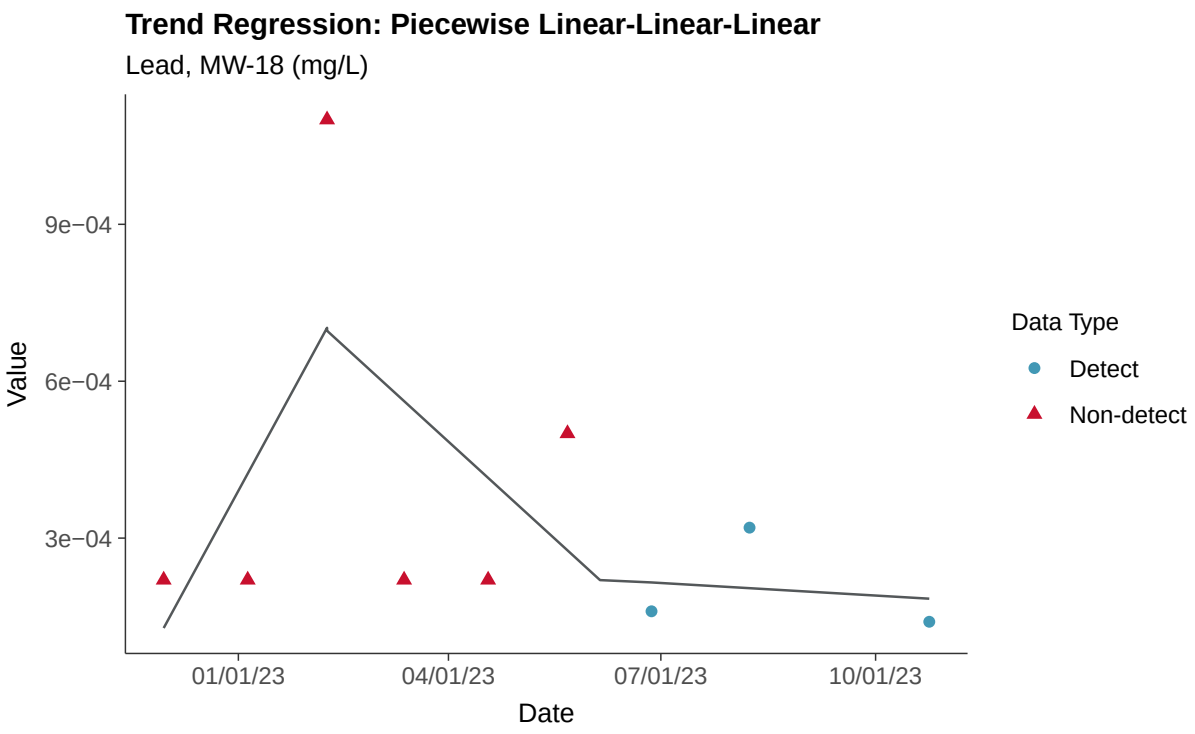
Boxplot by Season

Lead, MW-18 (mg/L)



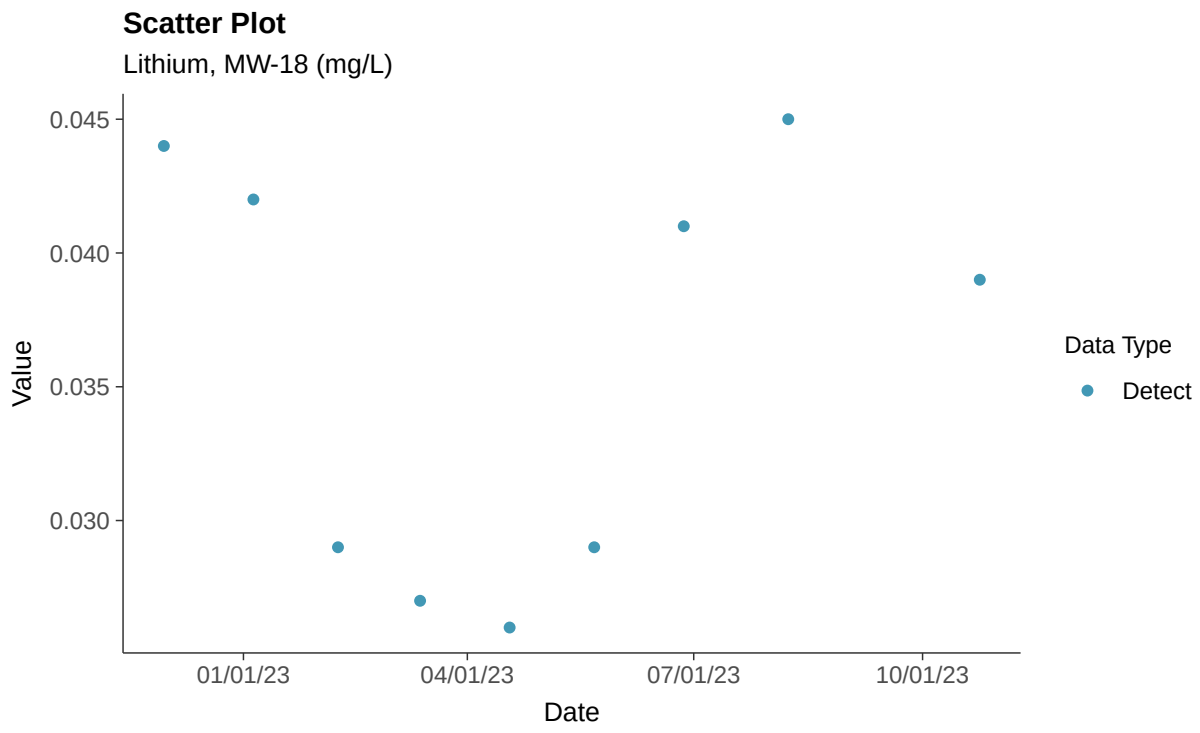

Normal Q-Q plot using ROS Imputed Estimates
Lead, MW-18 (mg/L)
Value
0.00030
0.00025
0.00020
0.00015
0.00010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

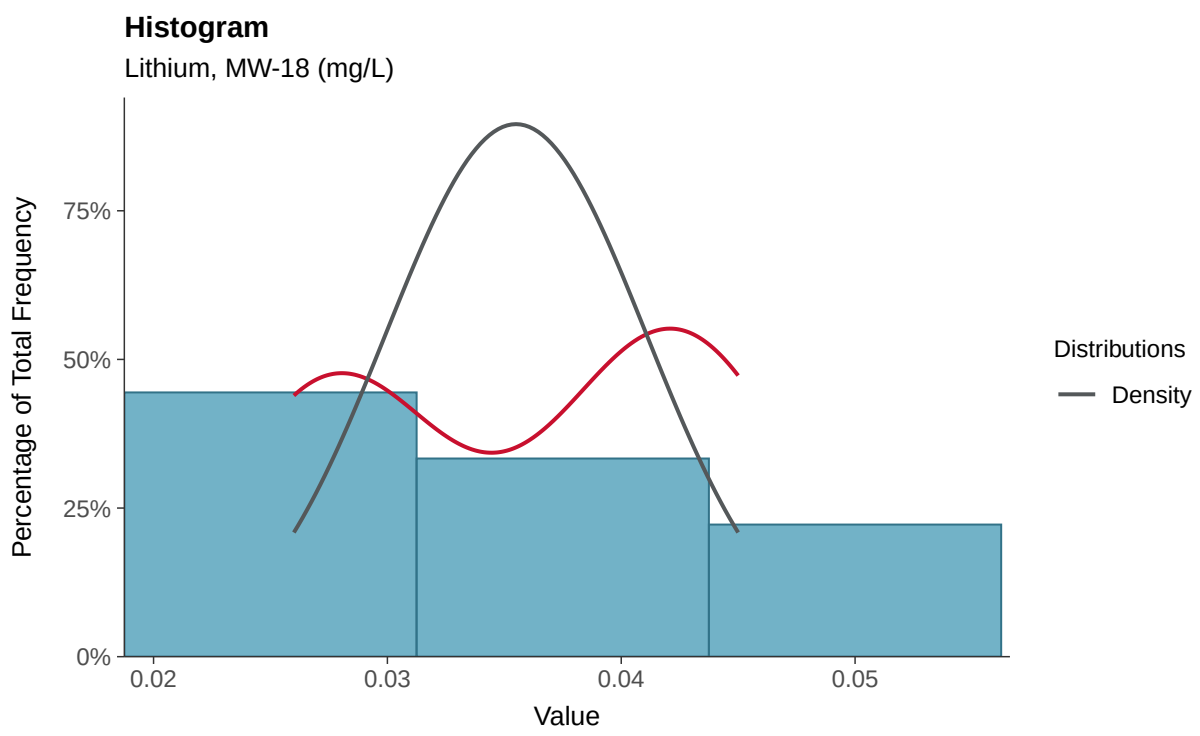

Trend Regression: Piecewise Linear-Linear
Lead, MW-18 (mg/L)
Value
9e−04
6e−04
3e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-18 (mg/L)
Value
9e−04
6e−04
3e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lithium, MW-18

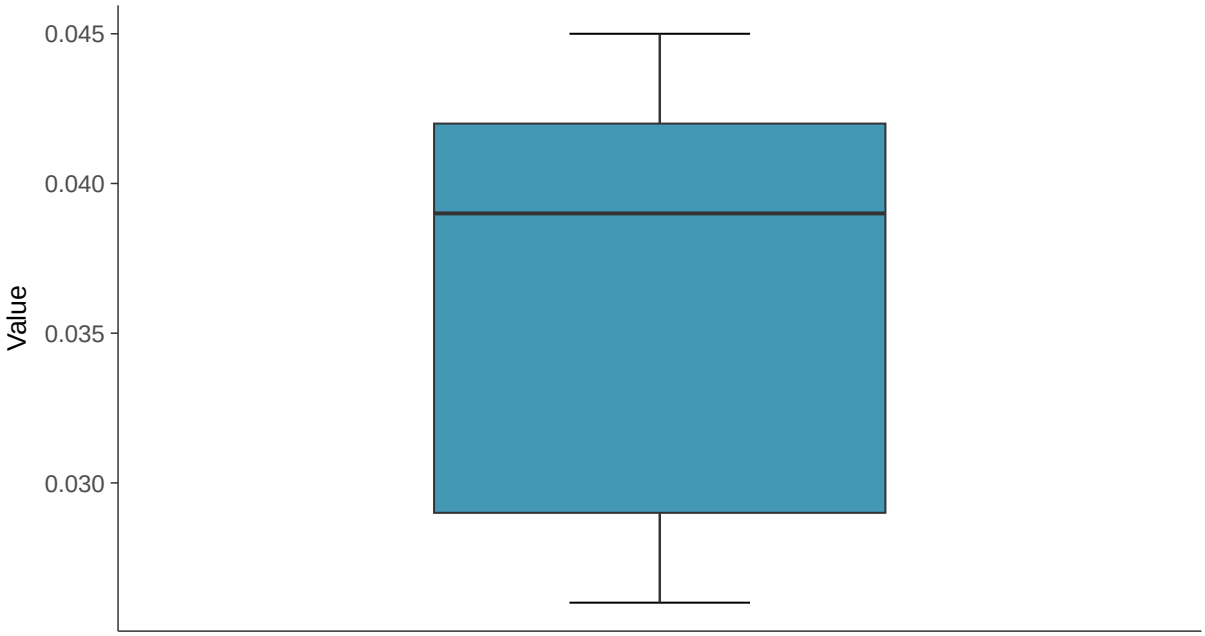
ID: 1_22_5_116





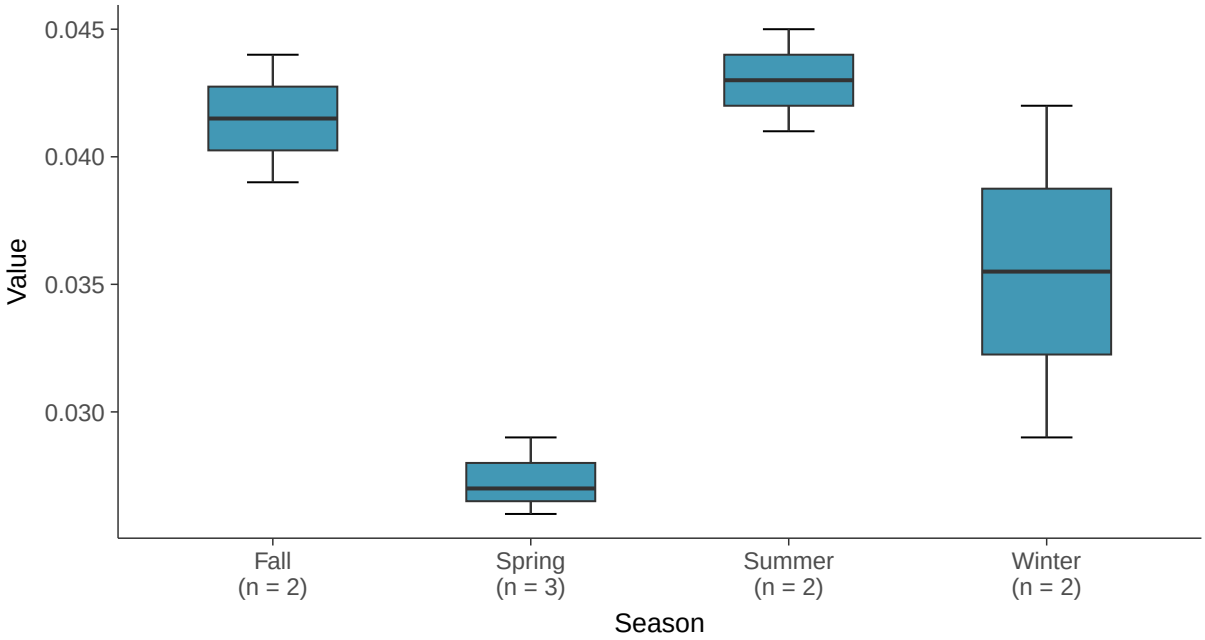
Boxplot

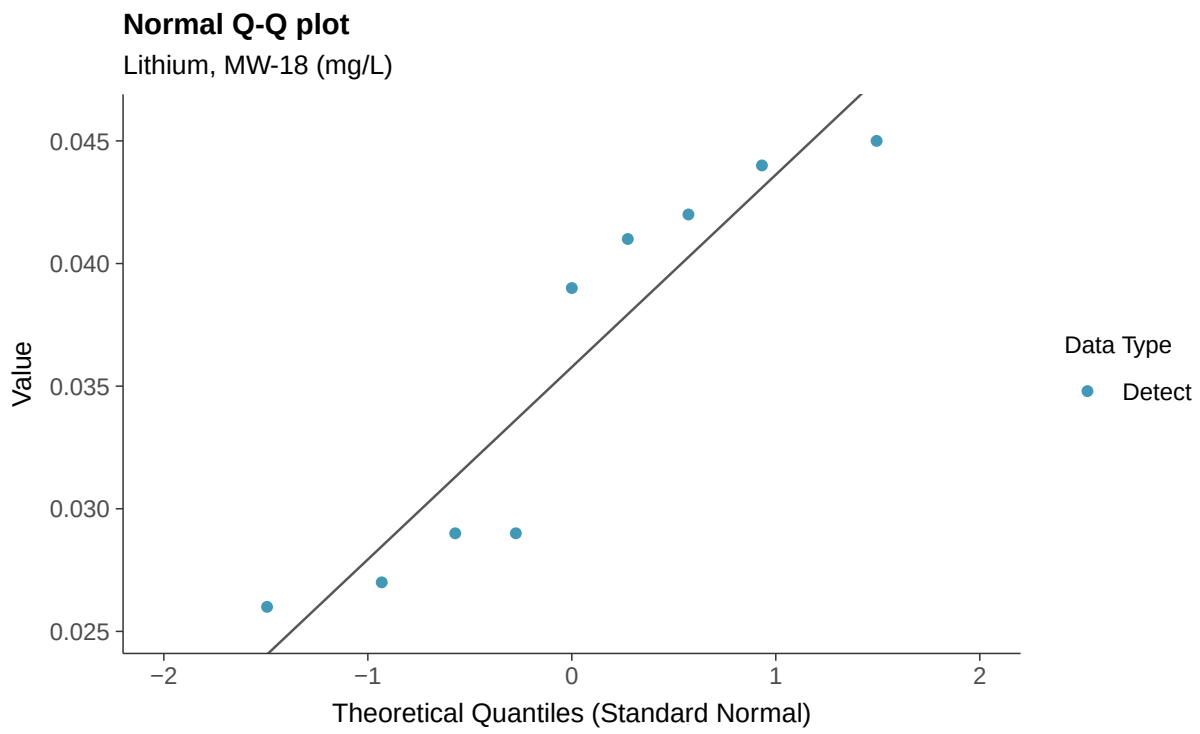
Lithium, MW-18 (mg/L)

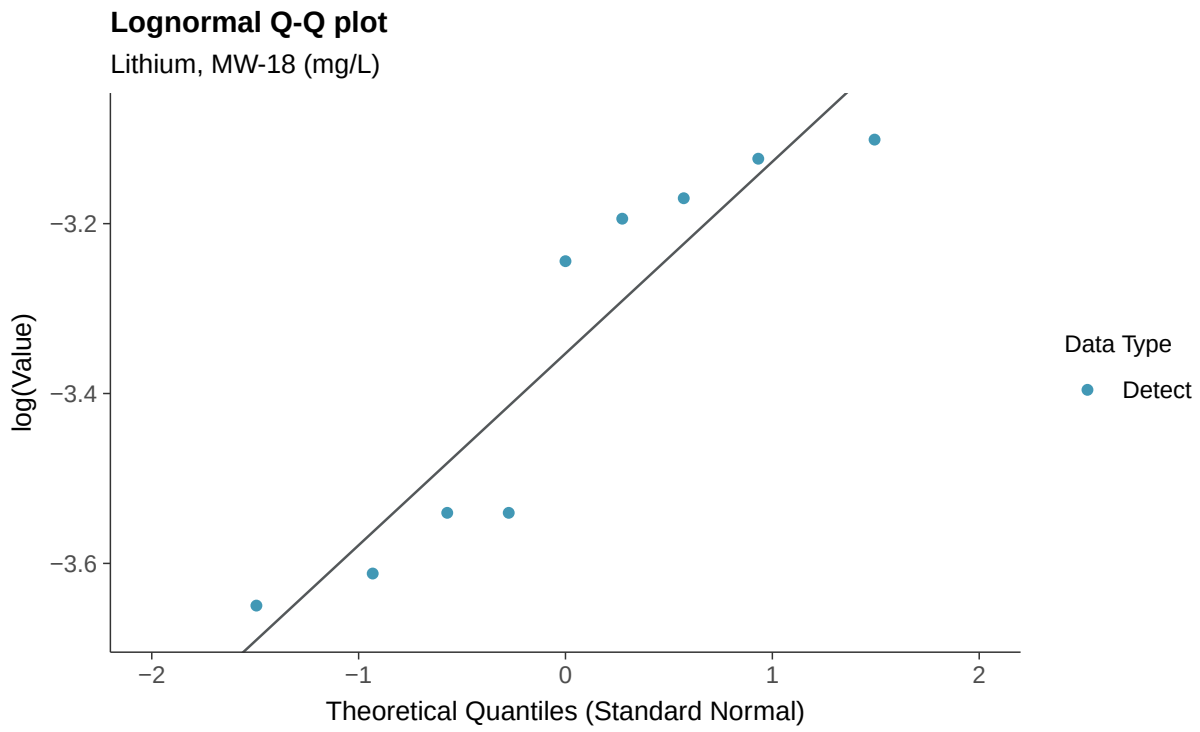


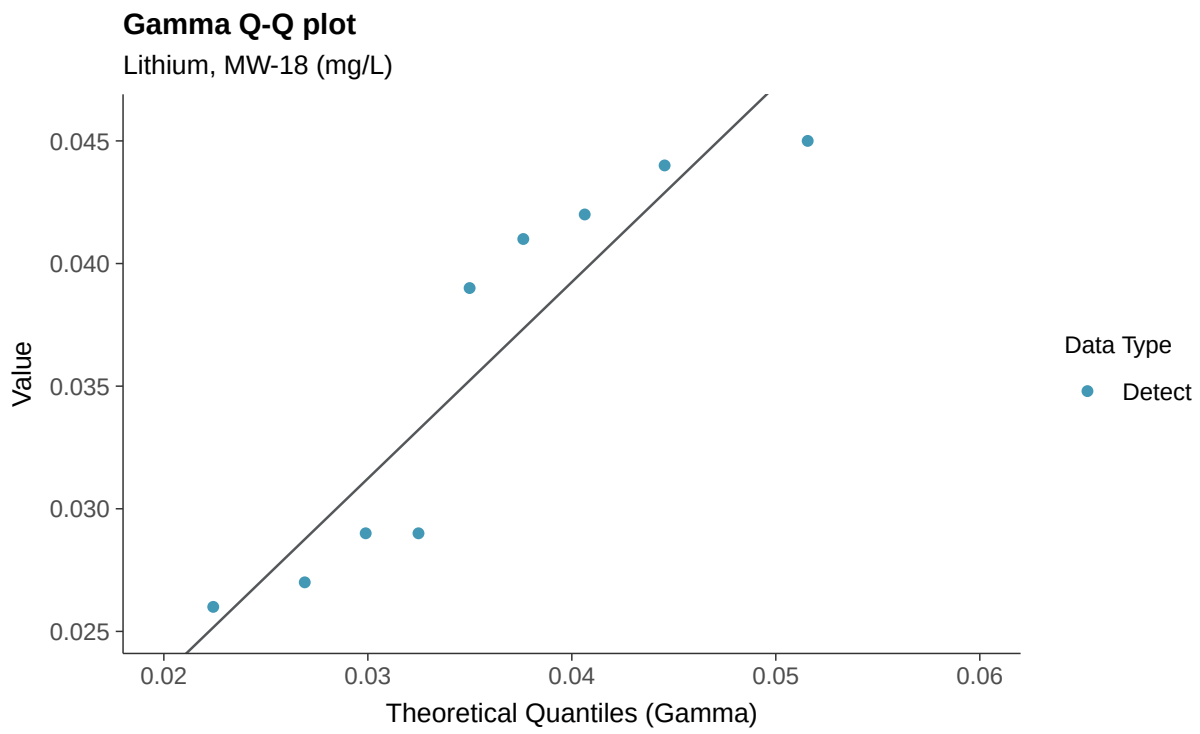
Boxplot by Season

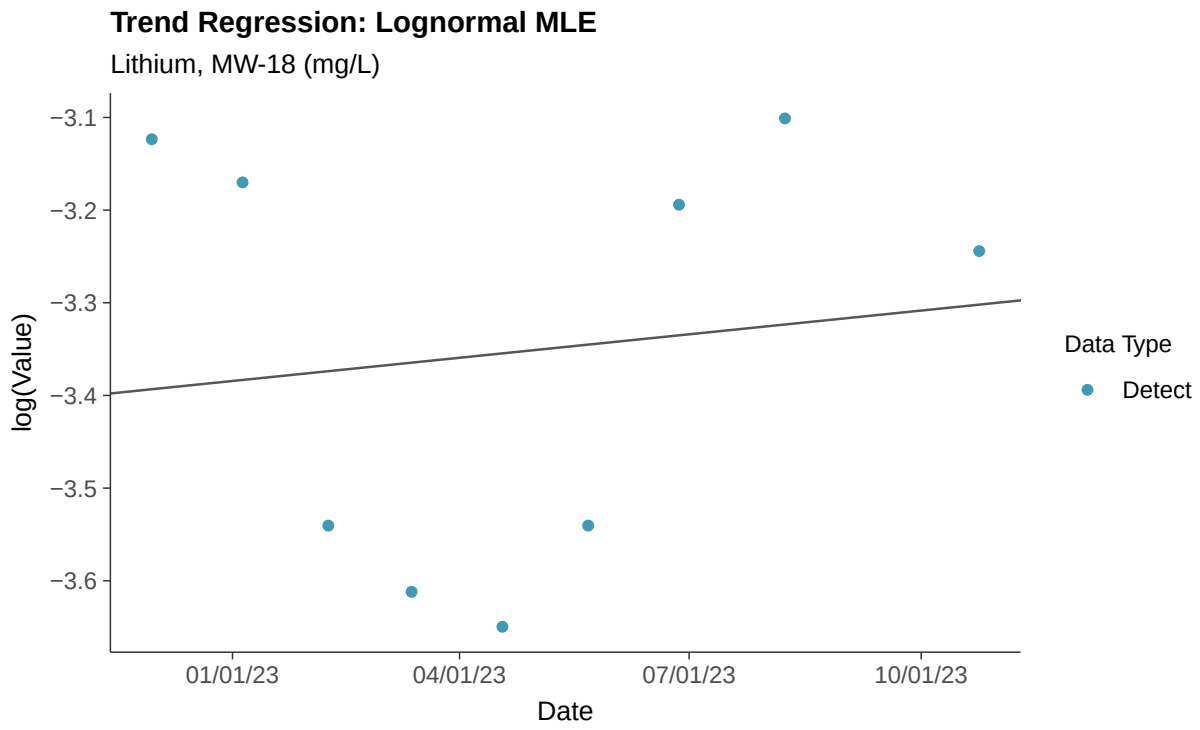
Lithium, MW-18 (mg/L)

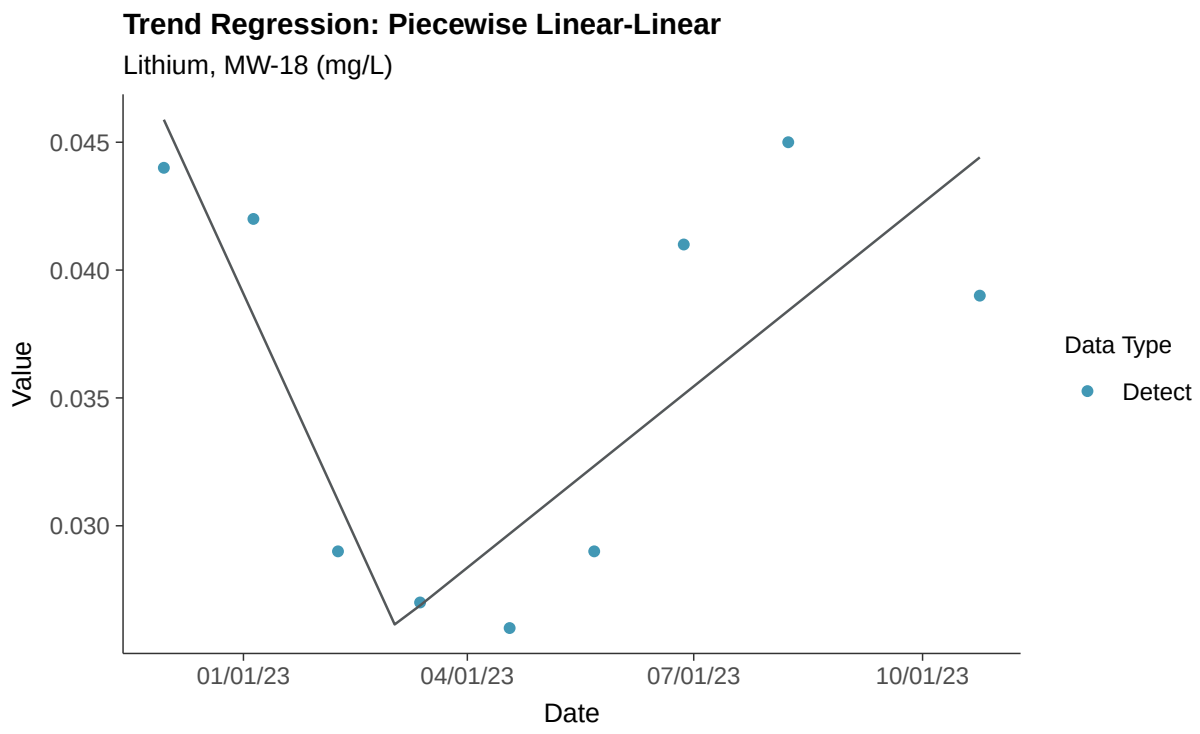


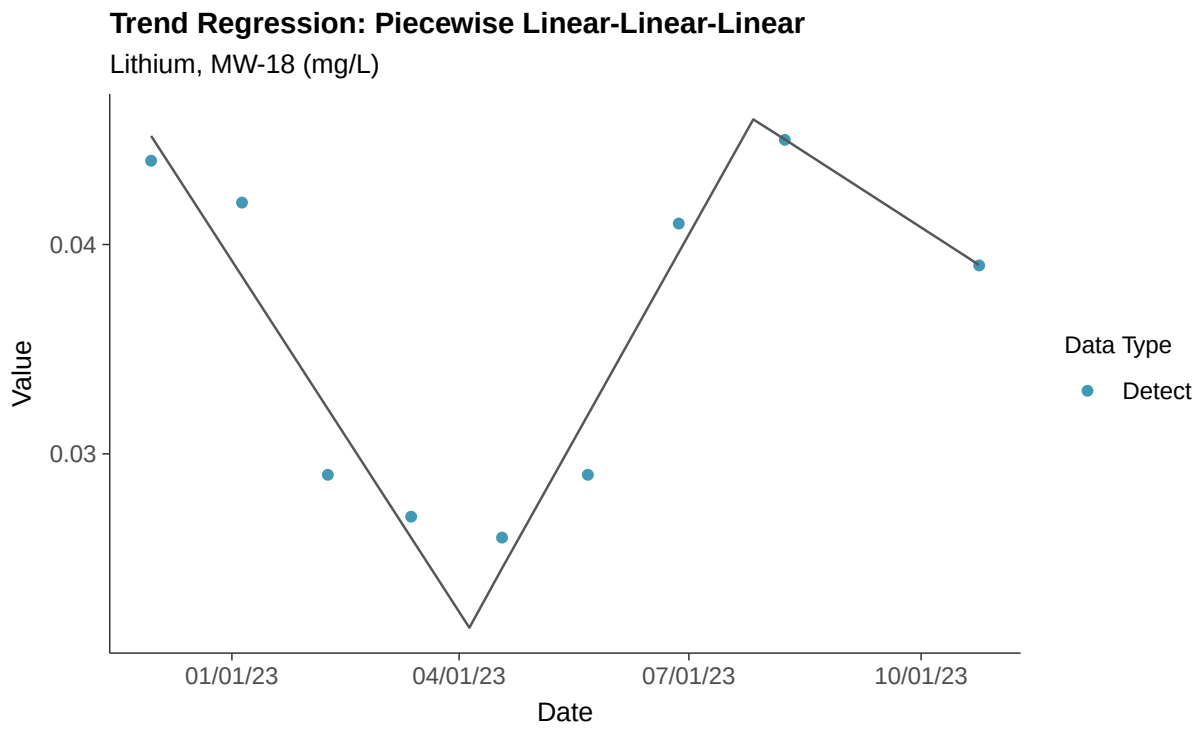

Normal Q-Q plot
Lithium, MW-18 (mg/L)
Value
0.045
0.040
0.035
0.030
0.025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-18 (mg/L)
log(Value)
−3.2
−3.4
−3.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Lithium, MW-18 (mg/L)
Value
0.045
0.040
0.035
0.030
0.025
0.02
0.03
0.04
0.05
0.06
Theoretical Quantiles (Gamma)
Data Type
Detect

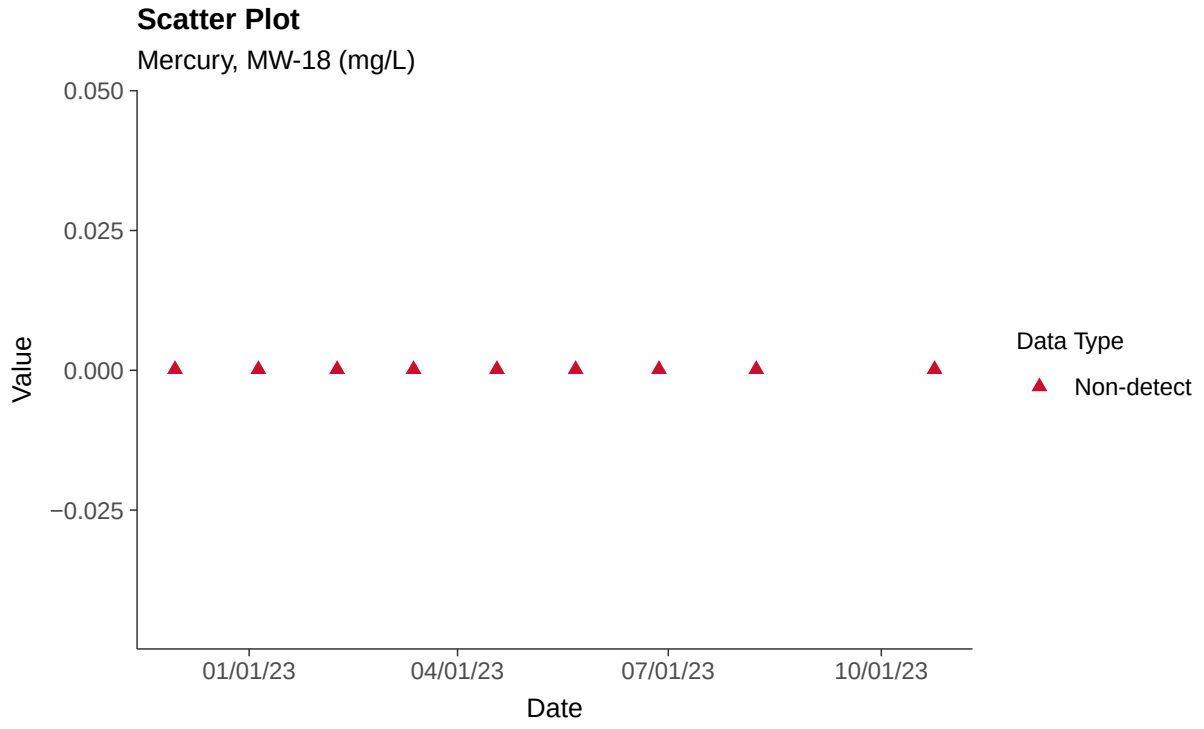

Trend Regression: Lognormal MLE
Lithium, MW-18 (mg/L)
log(Value)
−3.1
−3.2
−3.3
−3.4
−3.5
−3.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

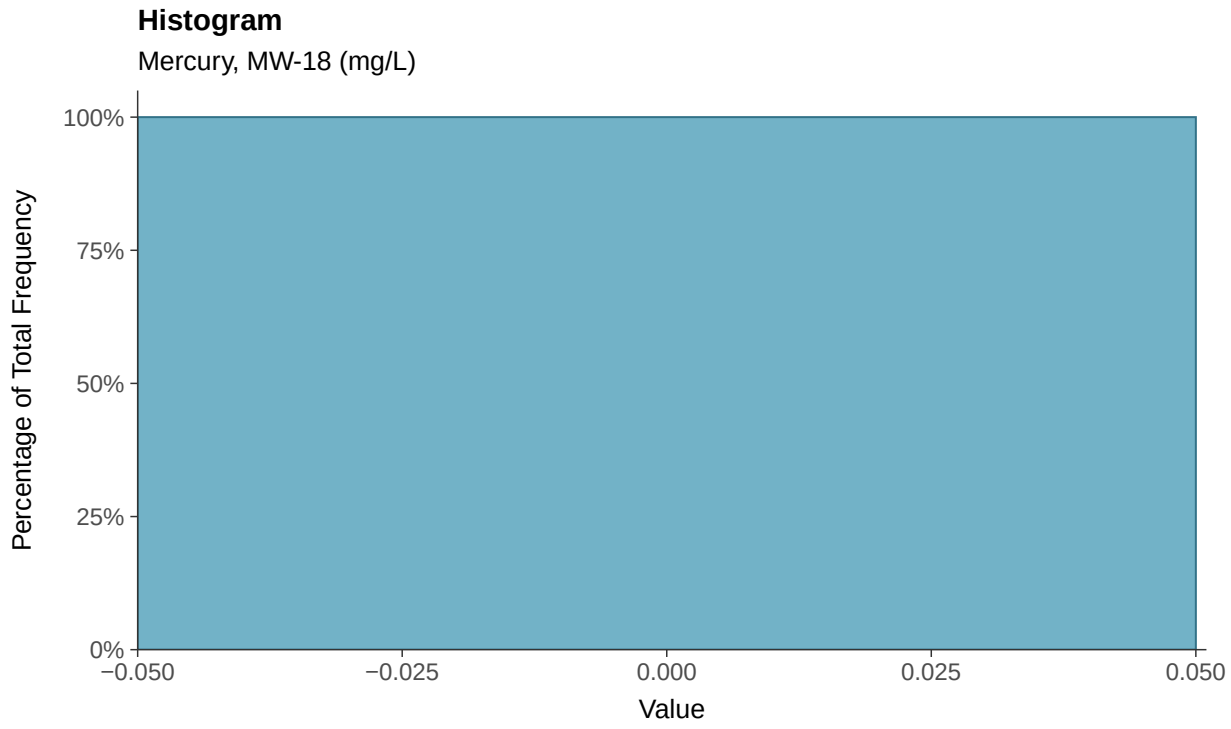

Trend Regression: Piecewise Linear-Linear
Lithium, MW-18 (mg/L)
0.045
0.040
0.035
0.030
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Lithium, MW-18 (mg/L)
0.04
0.03
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-18

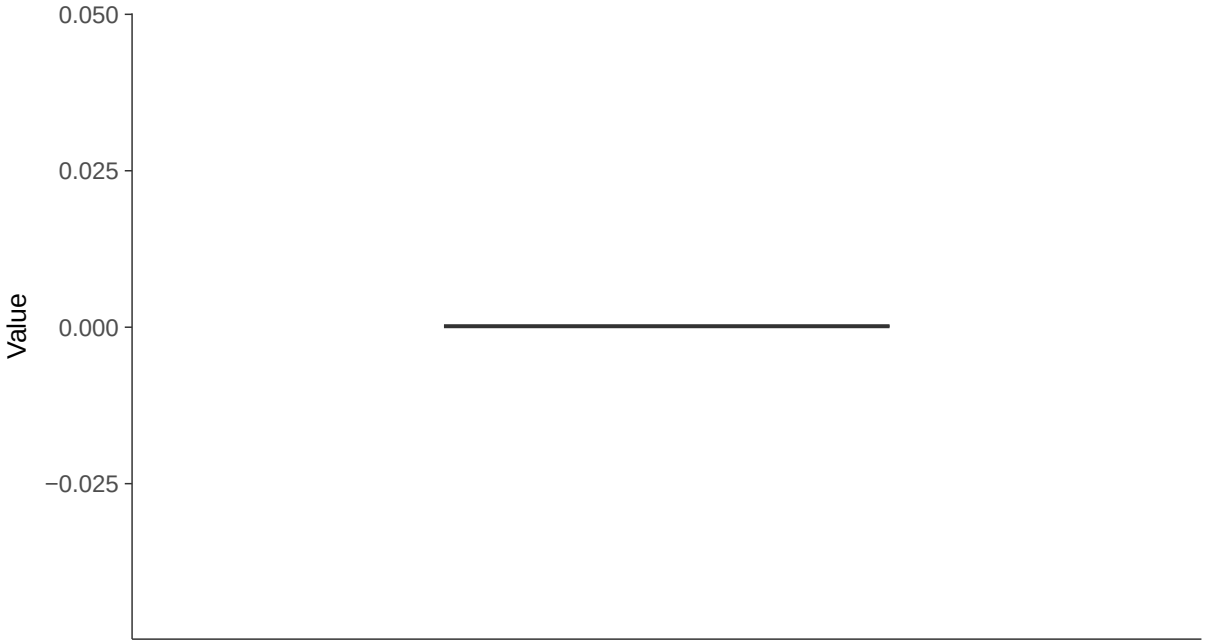
ID: 1_22_5_117





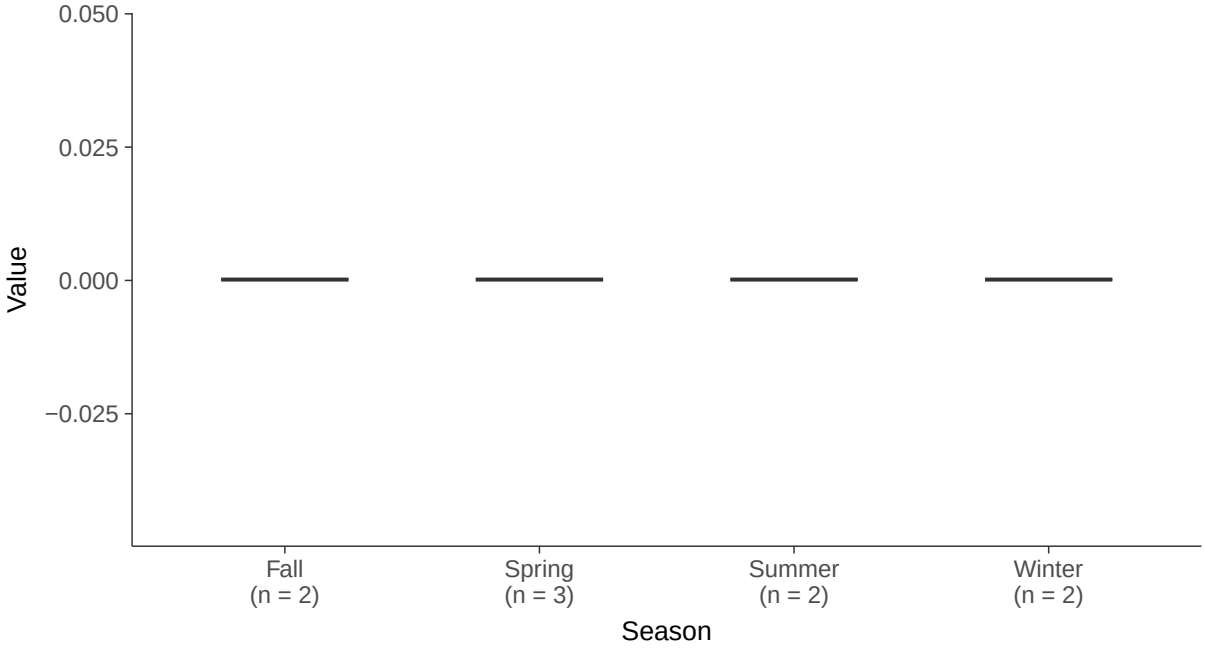
Boxplot

Mercury, MW-18 (mg/L)



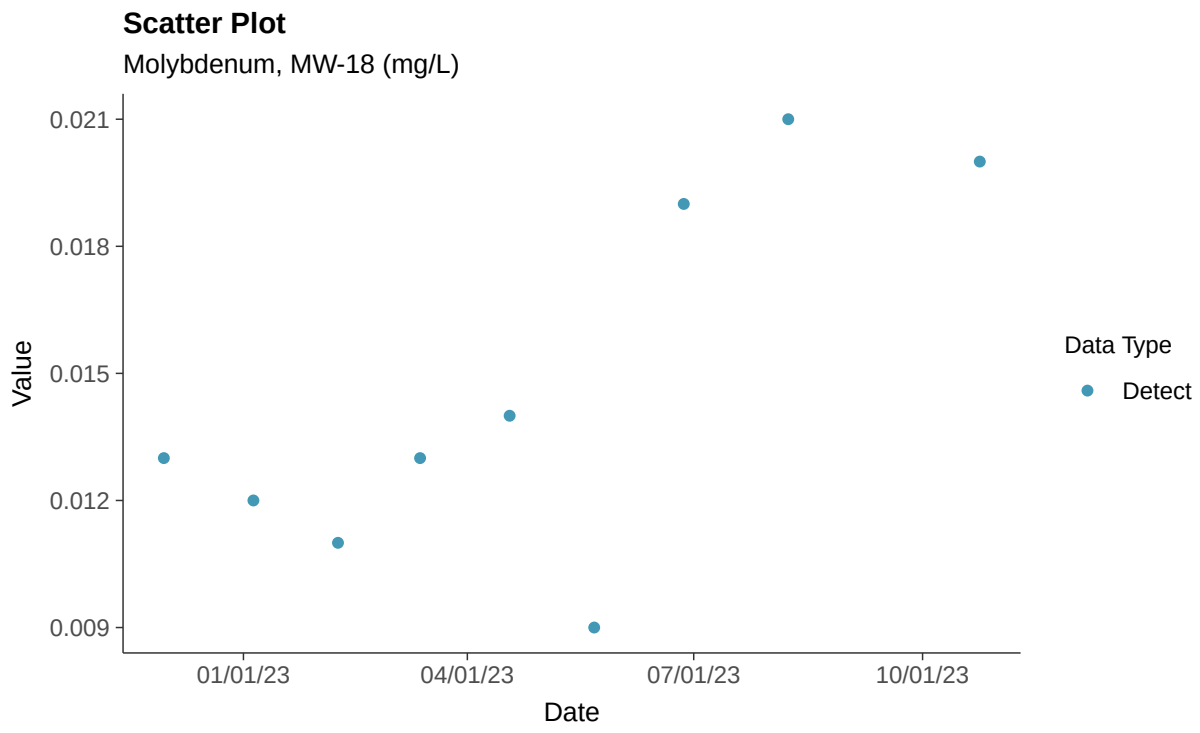
Boxplot by Season

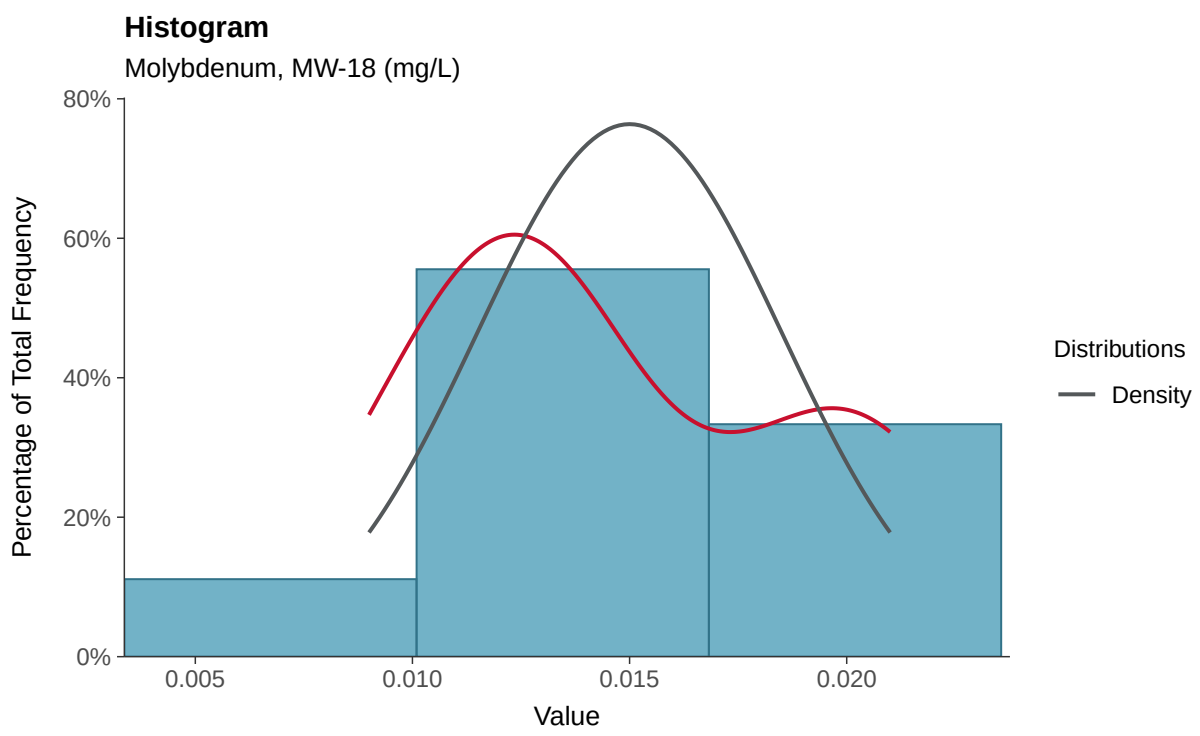
Mercury, MW-18 (mg/L)



Appendix IV: Molybdenum, MW-18

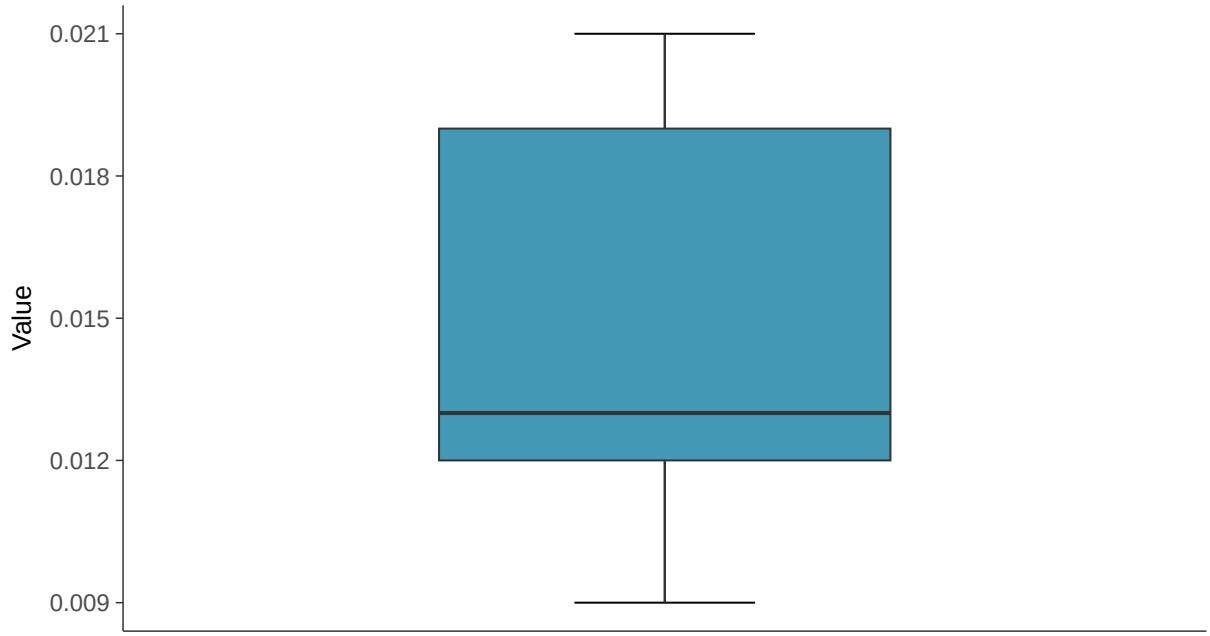
ID: 1_22_5_118





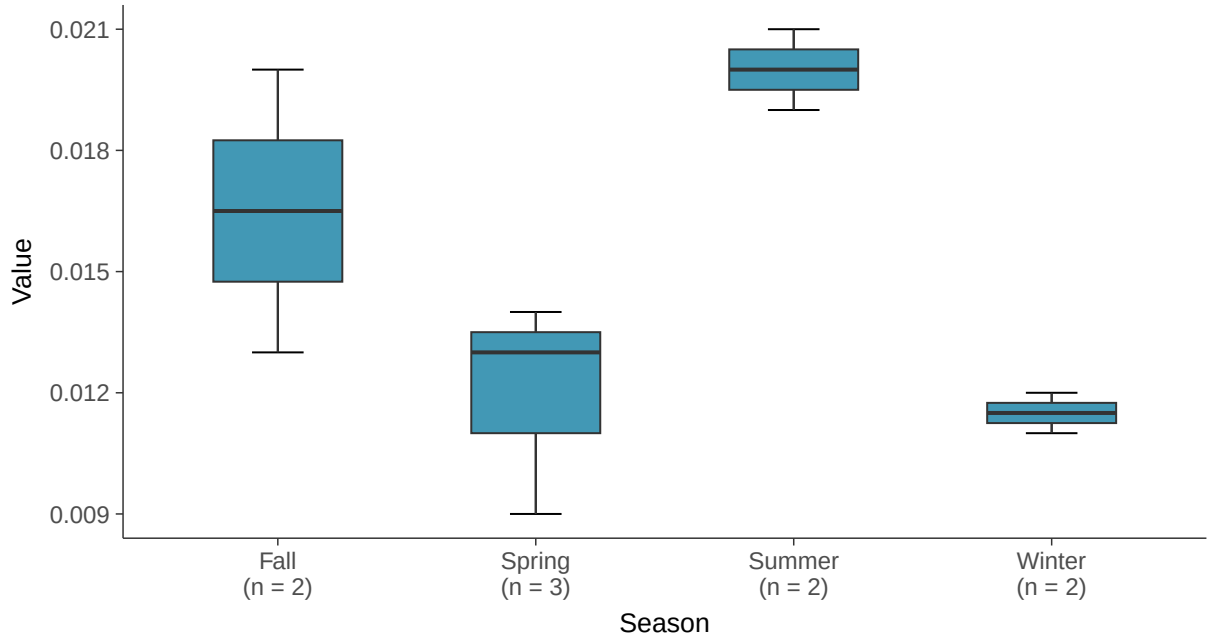
Boxplot

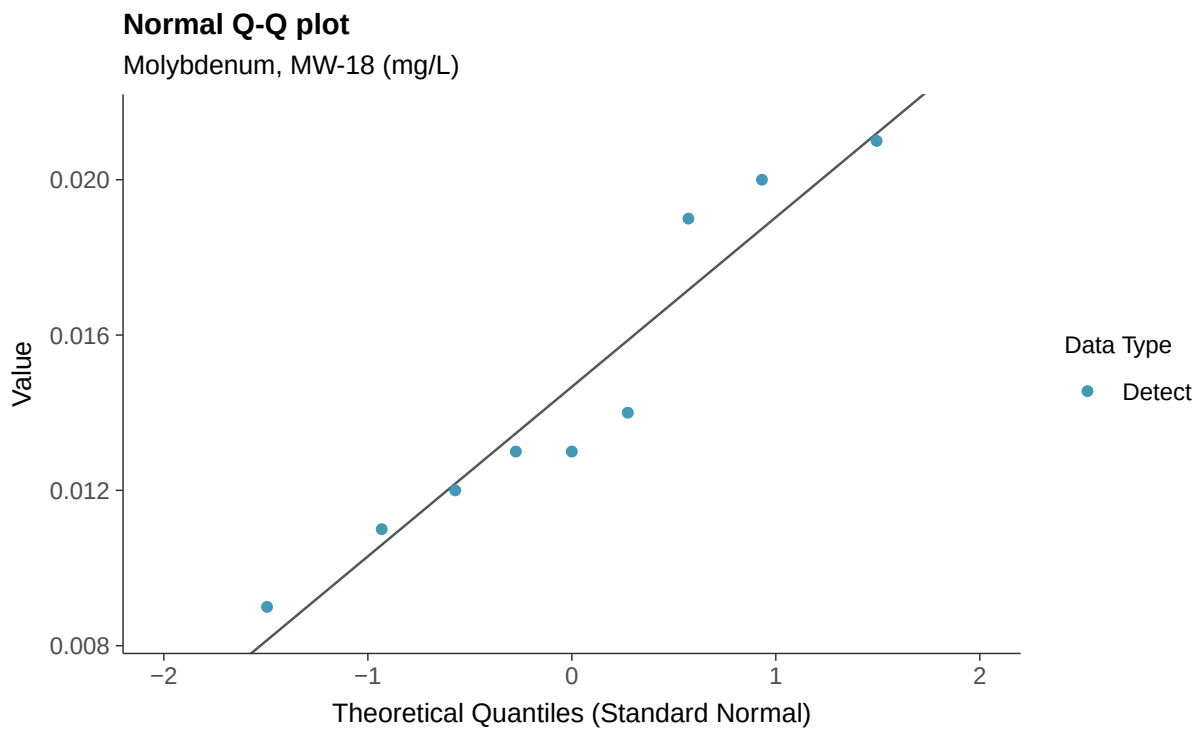
Molybdenum, MW-18 (mg/L)

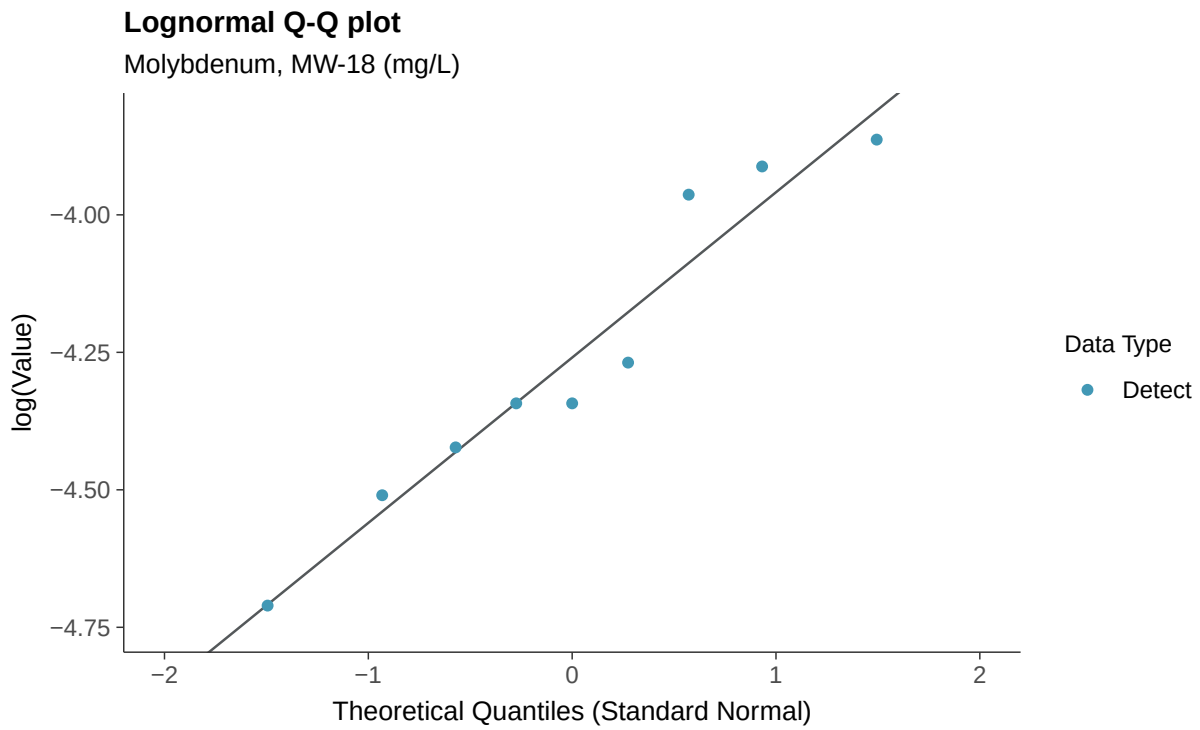


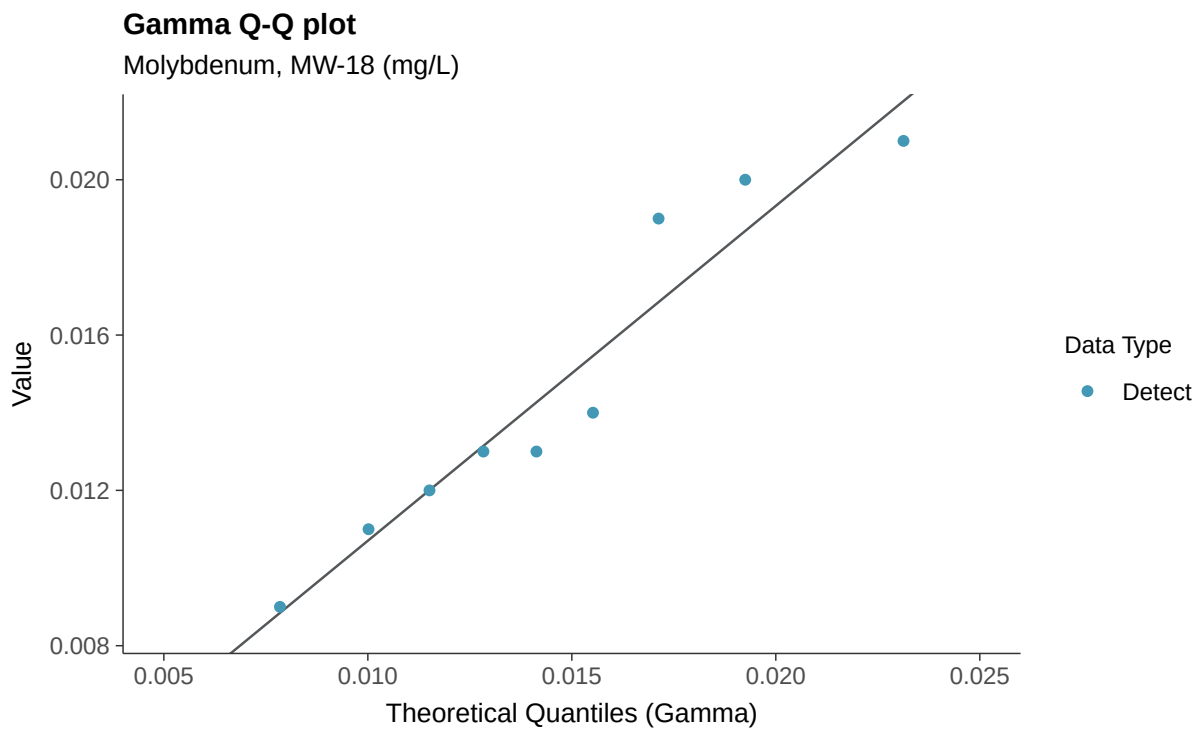
Boxplot by Season

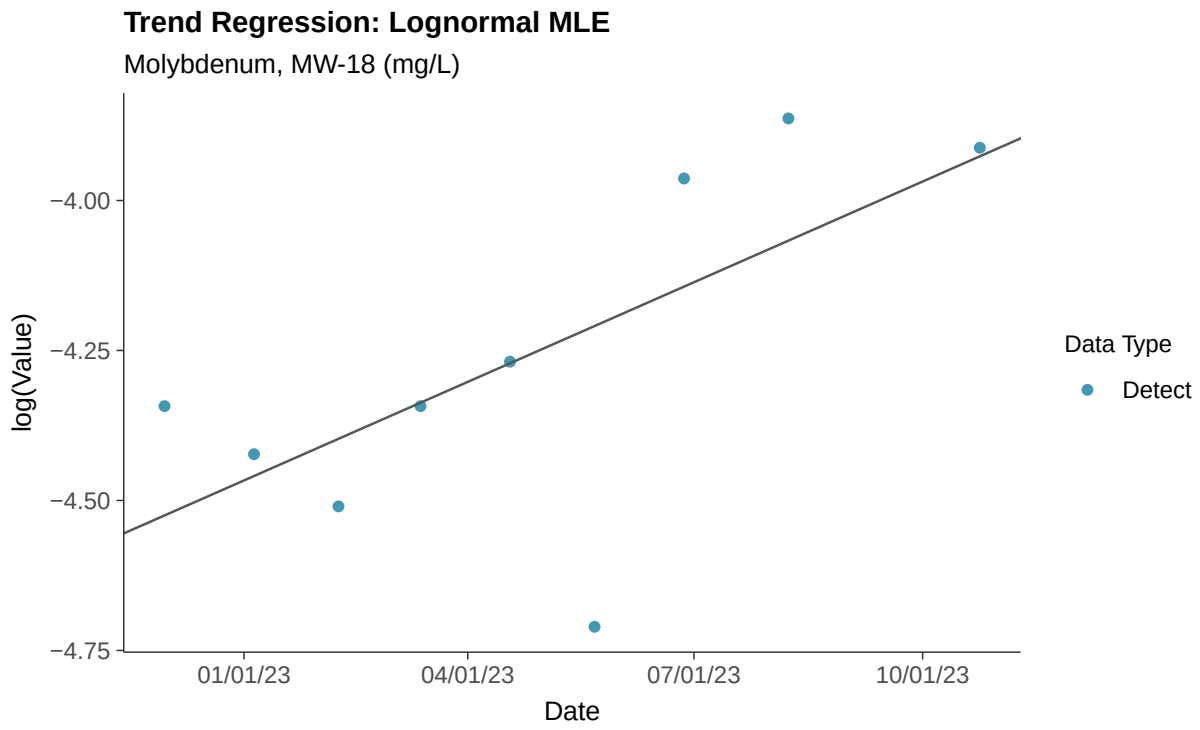
Molybdenum, MW-18 (mg/L)

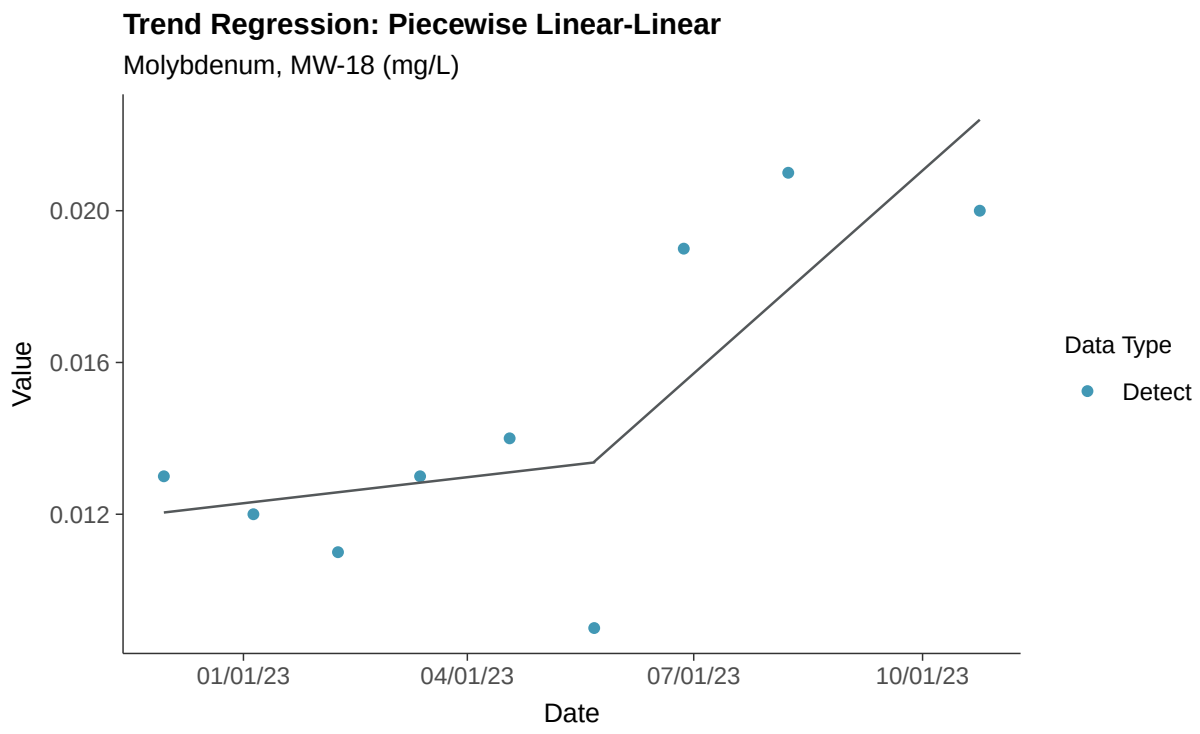



Normal Q-Q plot
Molybdenum, MW-18 (mg/L)
Value
0.020
0.016
0.012
0.008
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Molybdenum, MW-18 (mg/L)
log(Value)
−4.00
−4.25
−4.50
−4.75
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

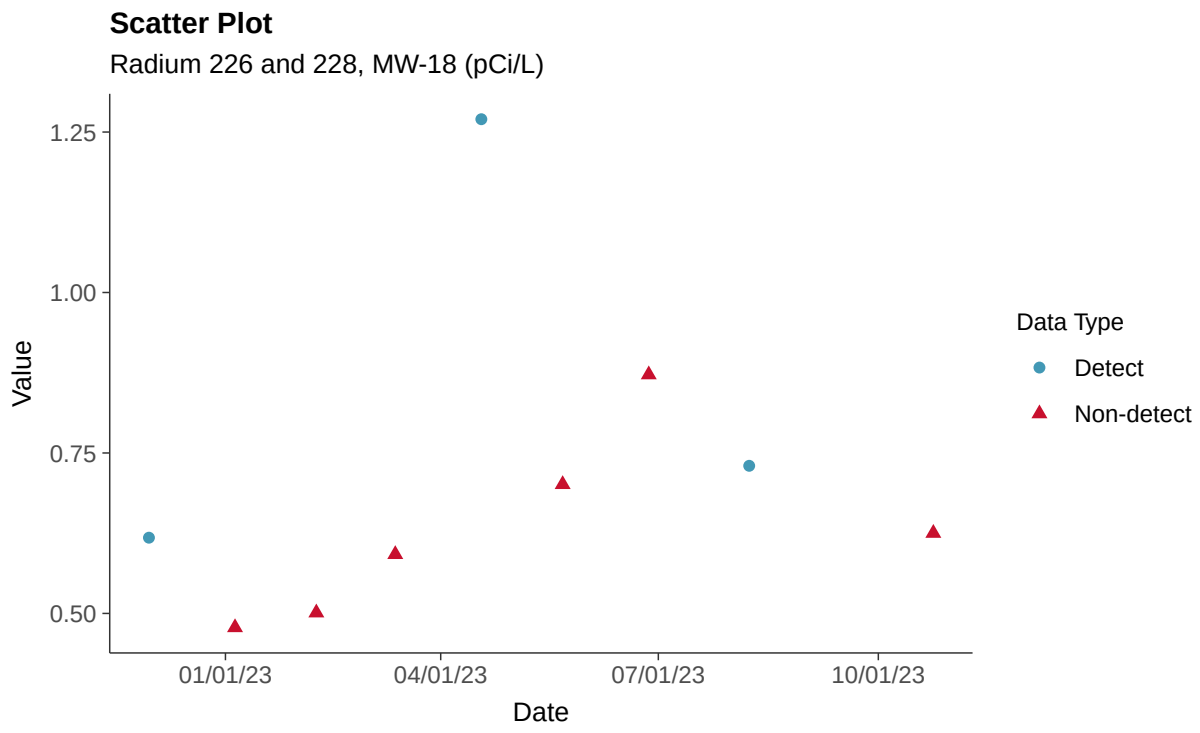

Gamma Q-Q plot
Molybdenum, MW-18 (mg/L)
Value
0.020
0.016
0.012
0.008
0.005
0.010
0.015
0.020
0.025
Theoretical Quantiles (Gamma)
Data Type
Detect

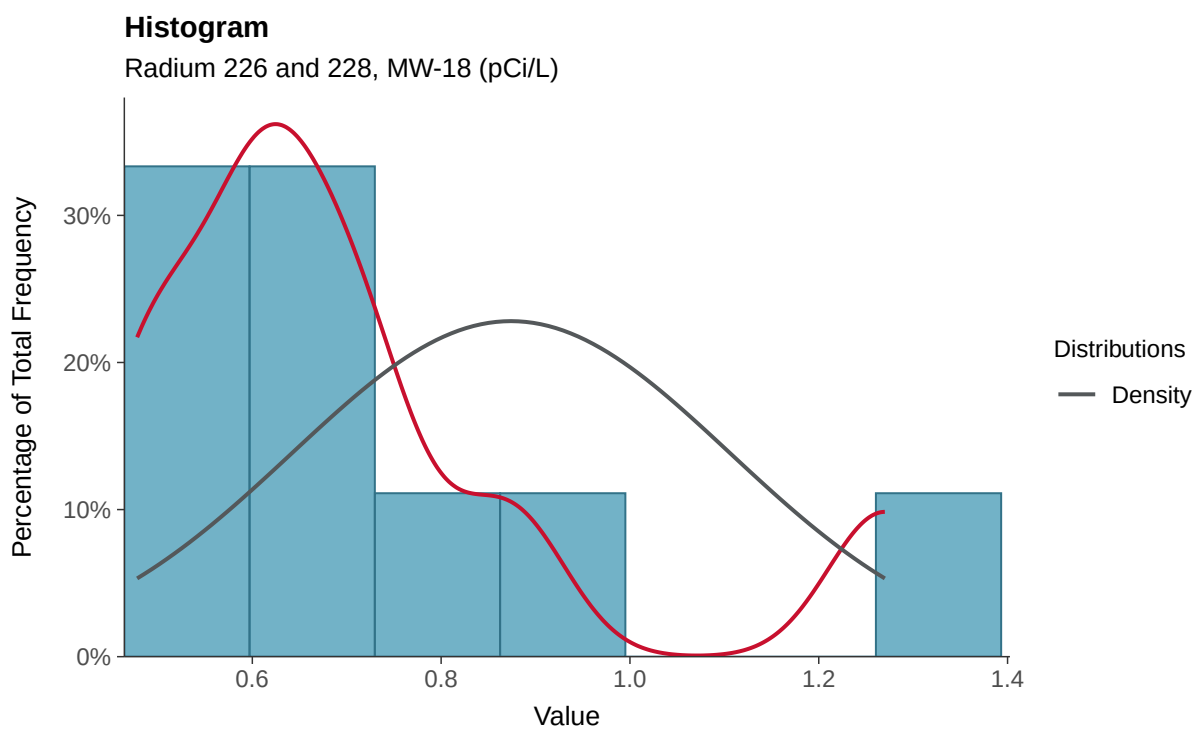

Trend Regression: Lognormal MLE
Molybdenum, MW-18 (mg/L)
log(Value)
−4.00
−4.25
−4.50
−4.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-18 (mg/L)
Value
0.020
0.016
0.012
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Radium 226 and 228, MW-18

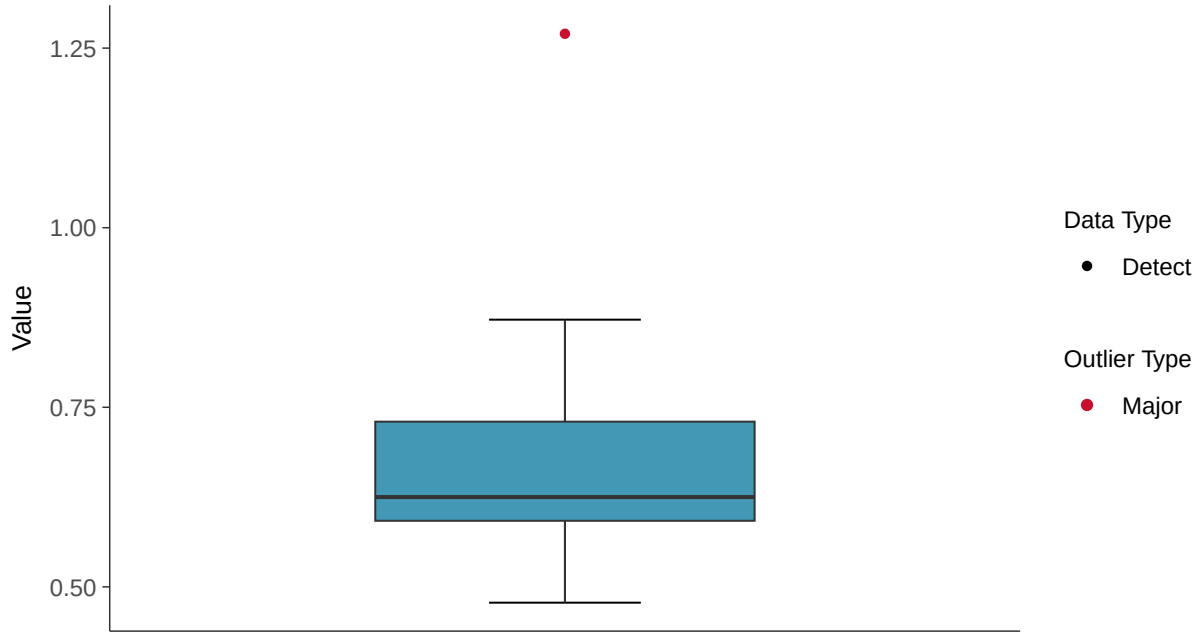
ID: 1_22_5_121





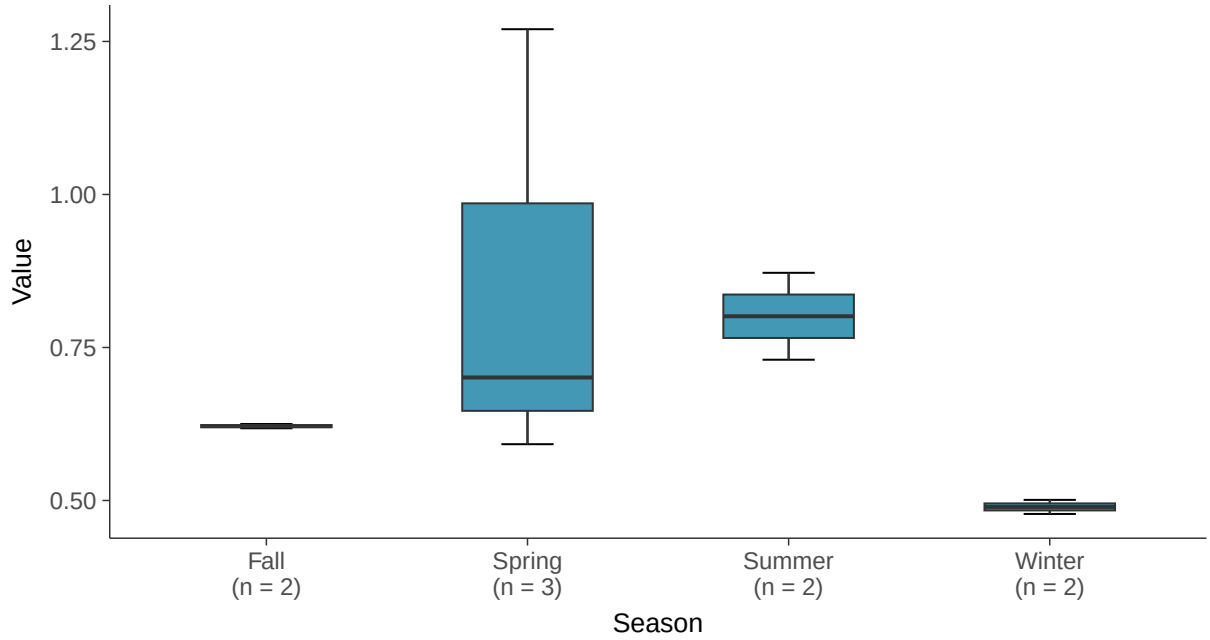
Boxplot

Radium 226 and 228, MW-18 (pCi/L)



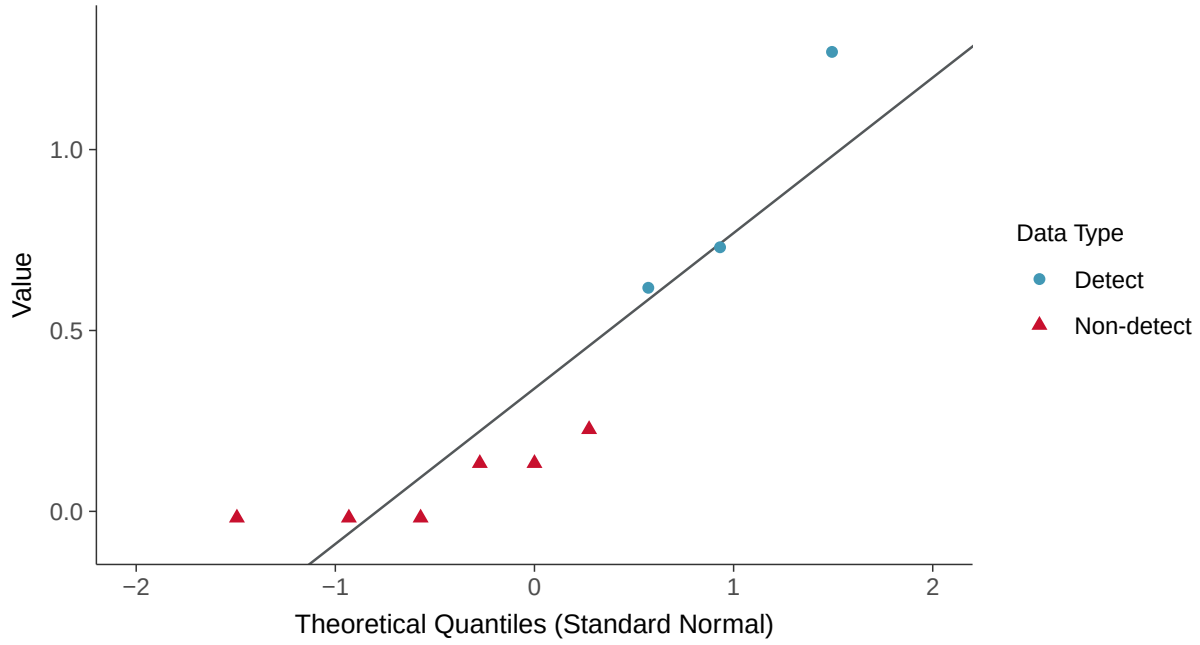
Boxplot by Season

Radium 226 and 228, MW-18 (pCi/L)



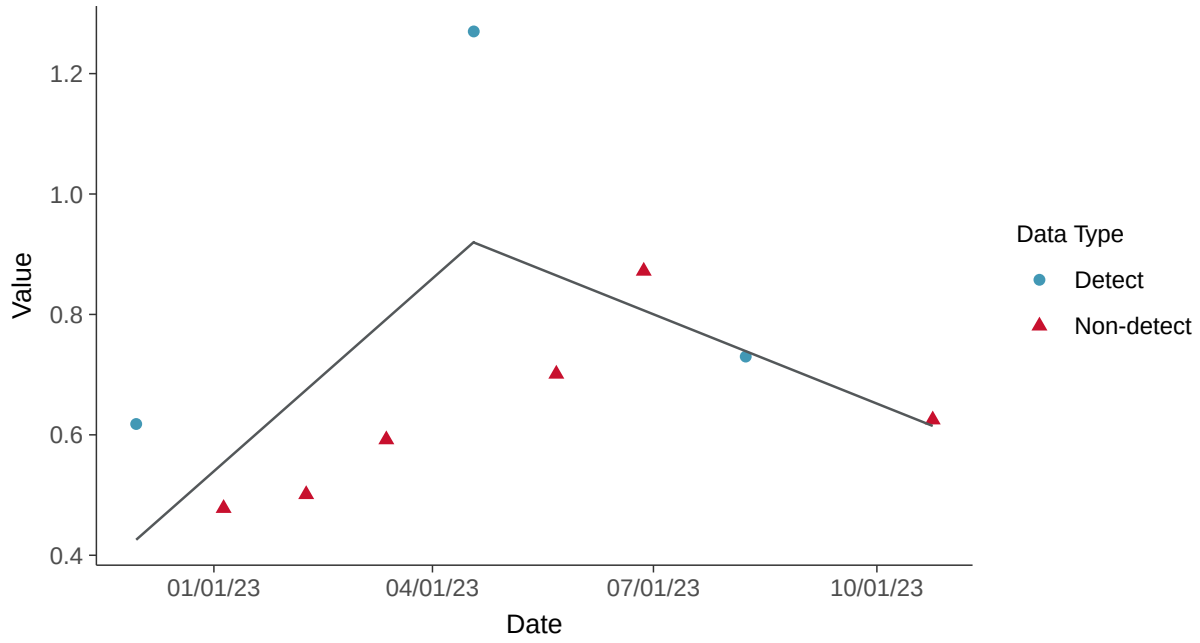
Normal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-18 (pCi/L)



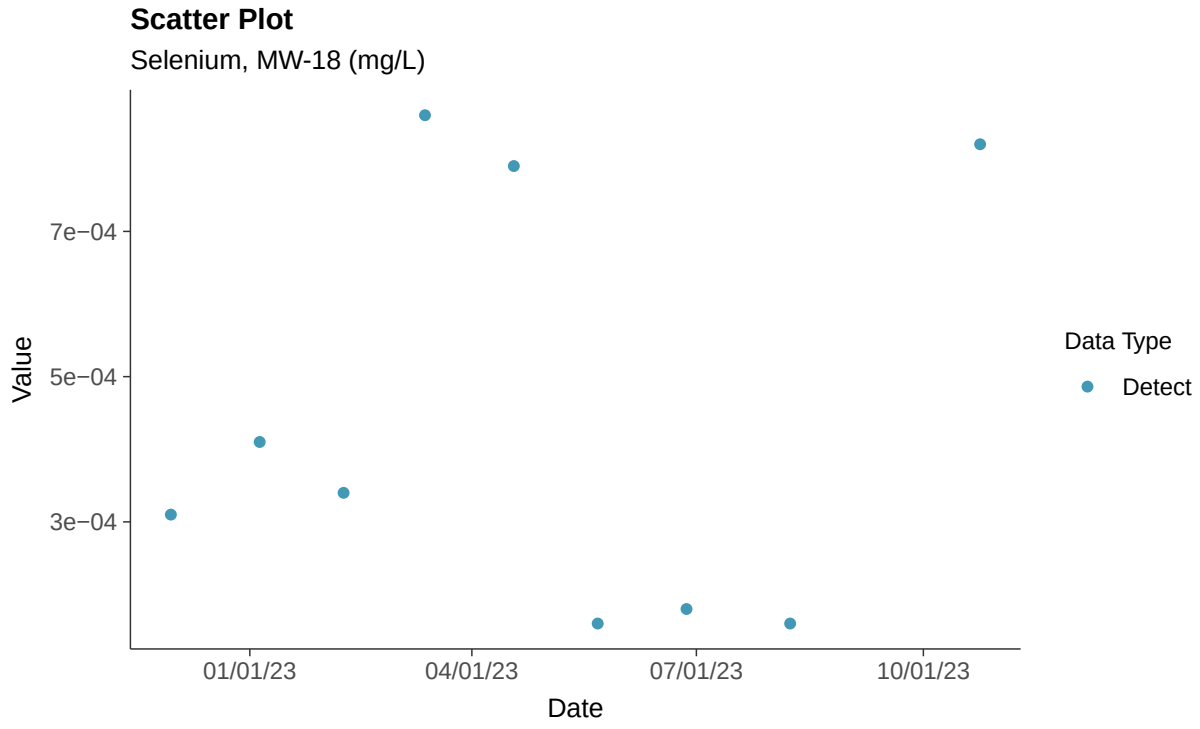
Trend Regression: Piecewise Linear-Linear

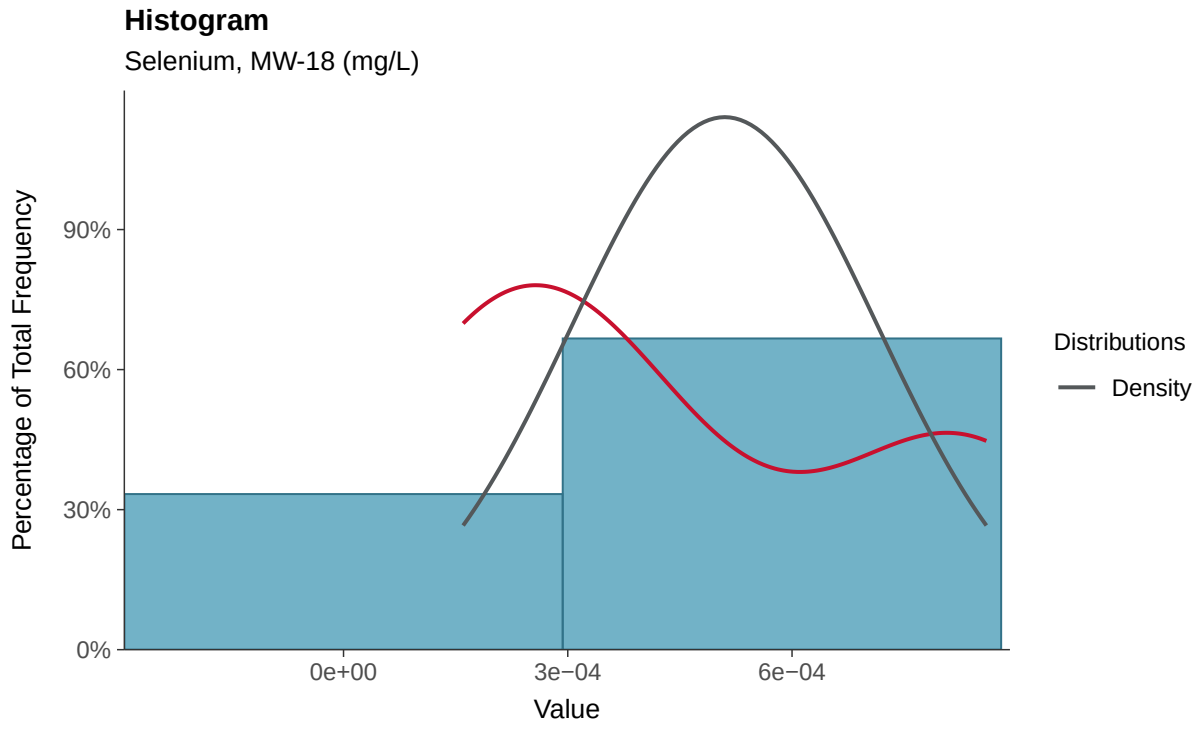
Radium 226 and 228, MW-18 (pCi/L)



Appendix IV: Selenium, MW-18

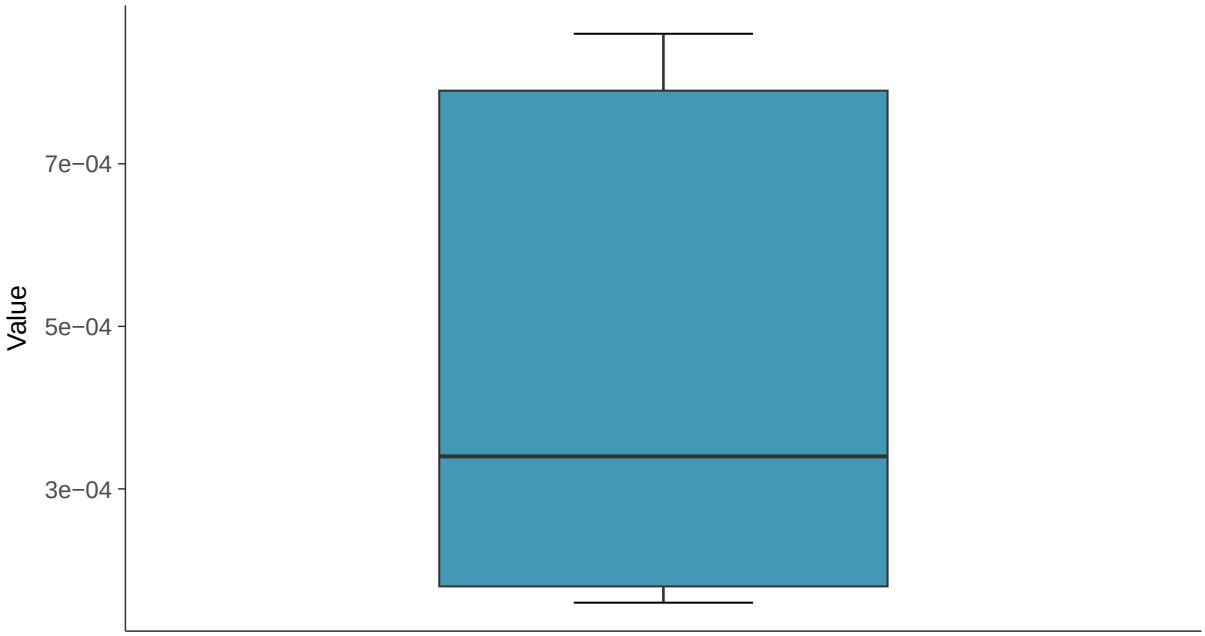
ID: 1_22_5_122





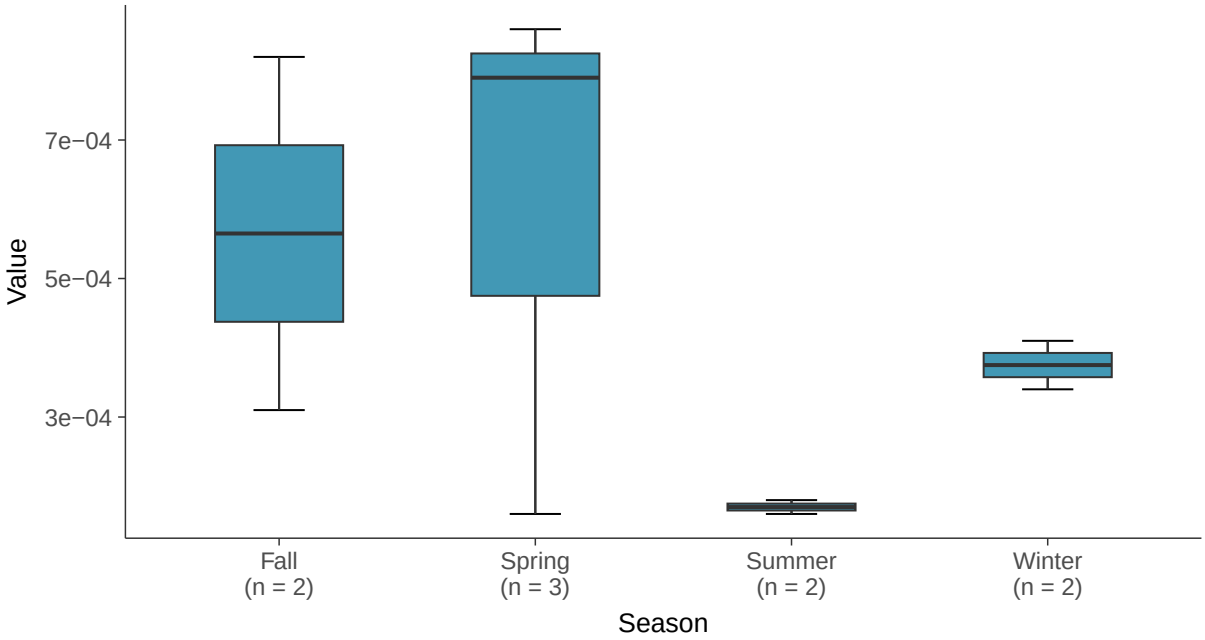
Boxplot

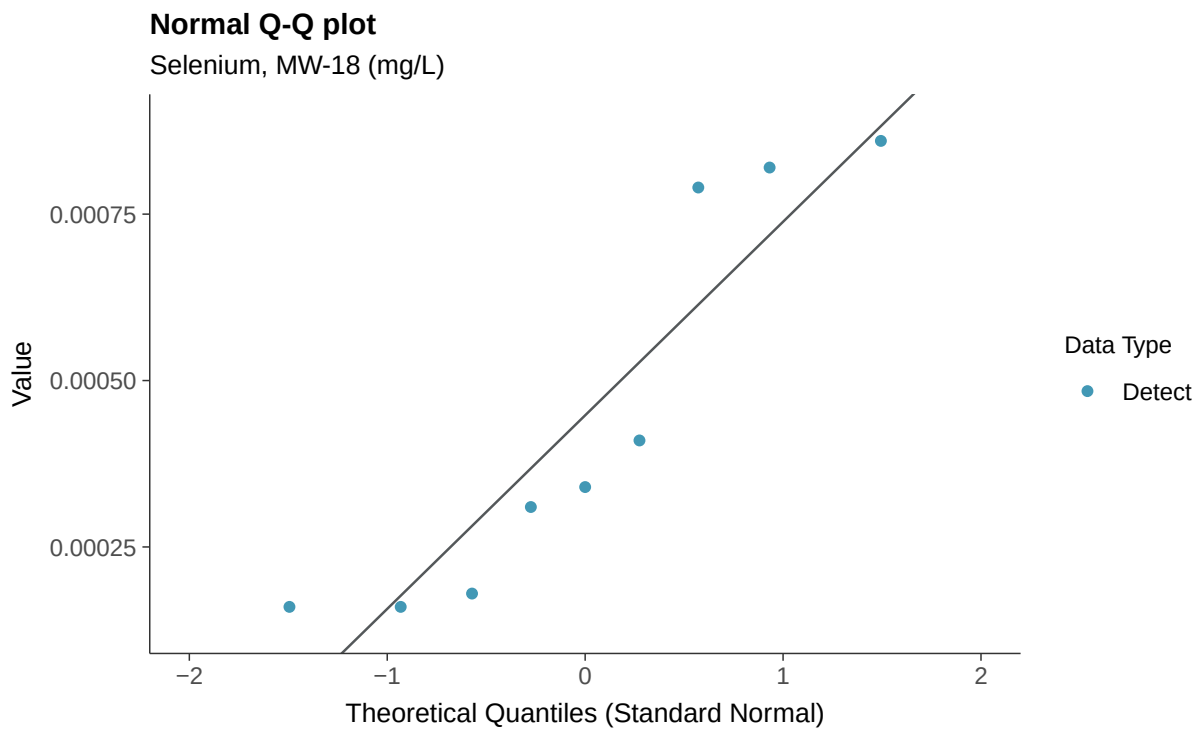
Selenium, MW-18 (mg/L)

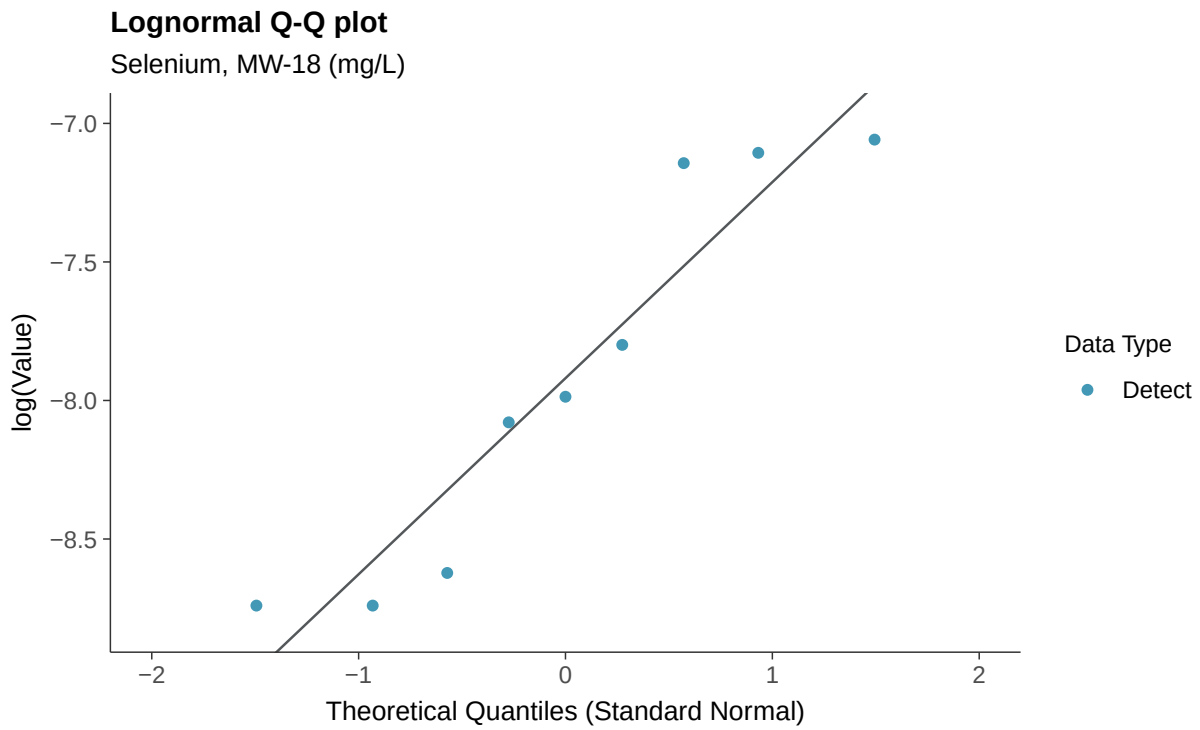


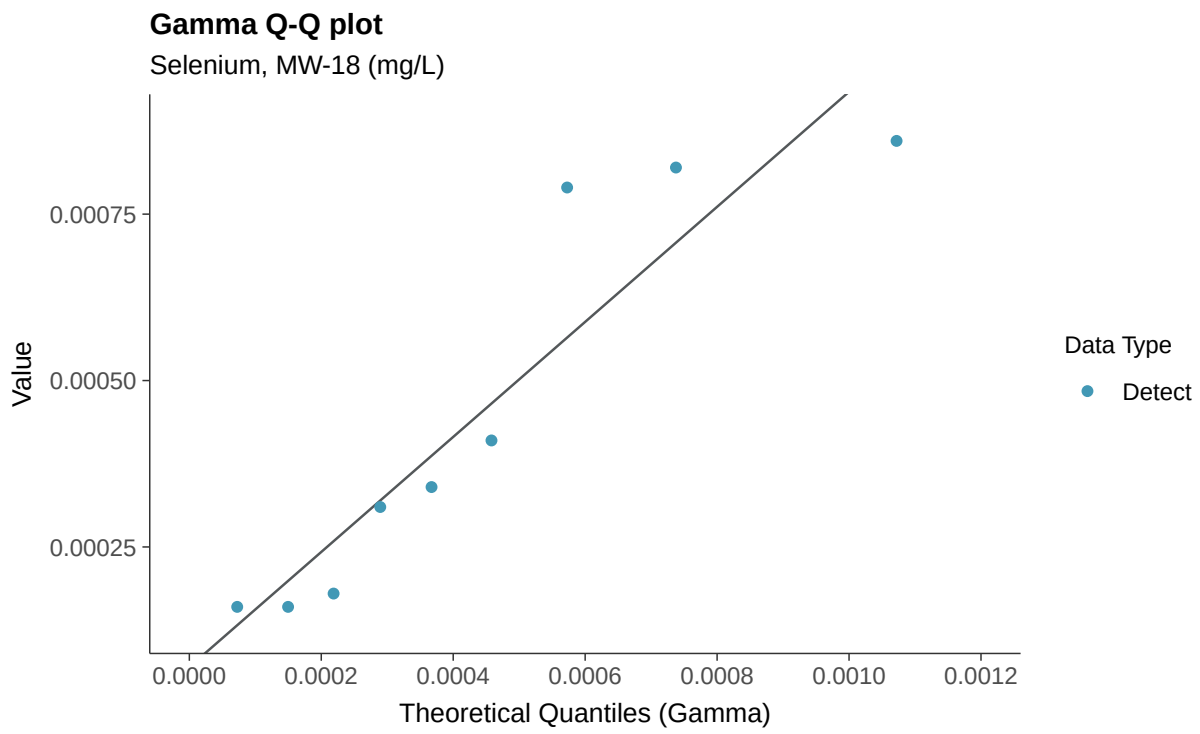
Boxplot by Season

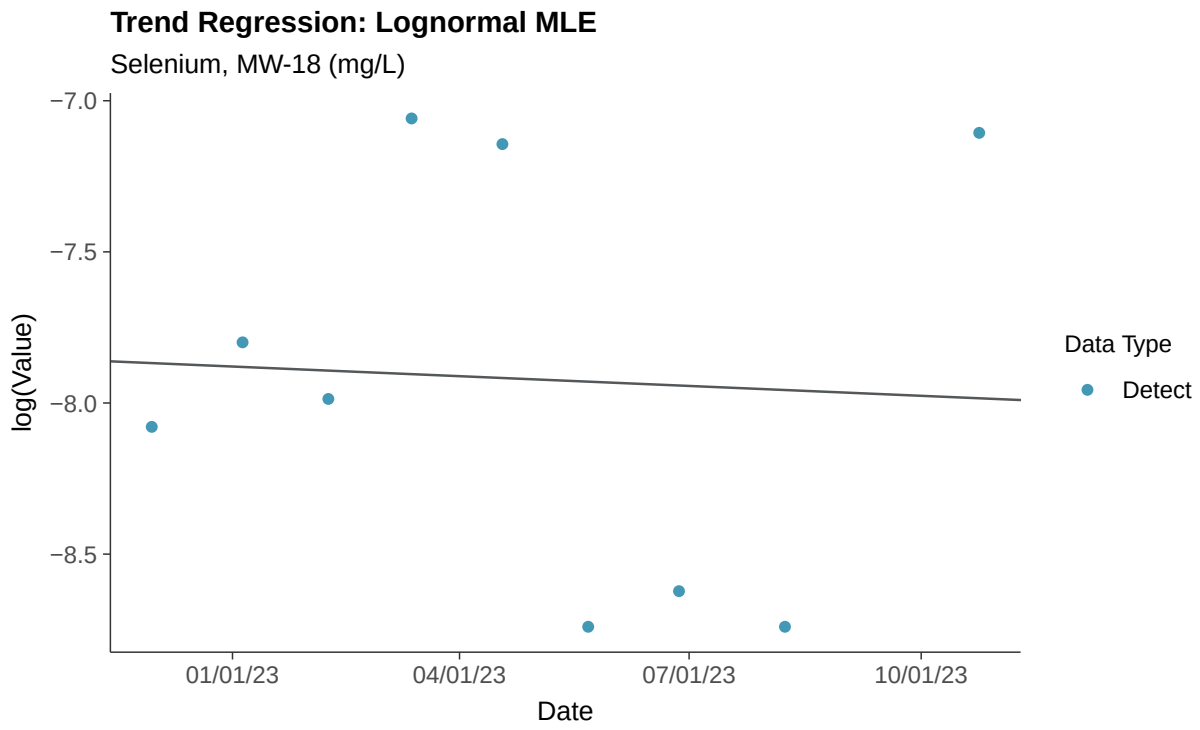
Selenium, MW-18 (mg/L)




Normal Q-Q plot
Selenium, MW-18 (mg/L)
Value
0.00075
0.00050
0.00025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

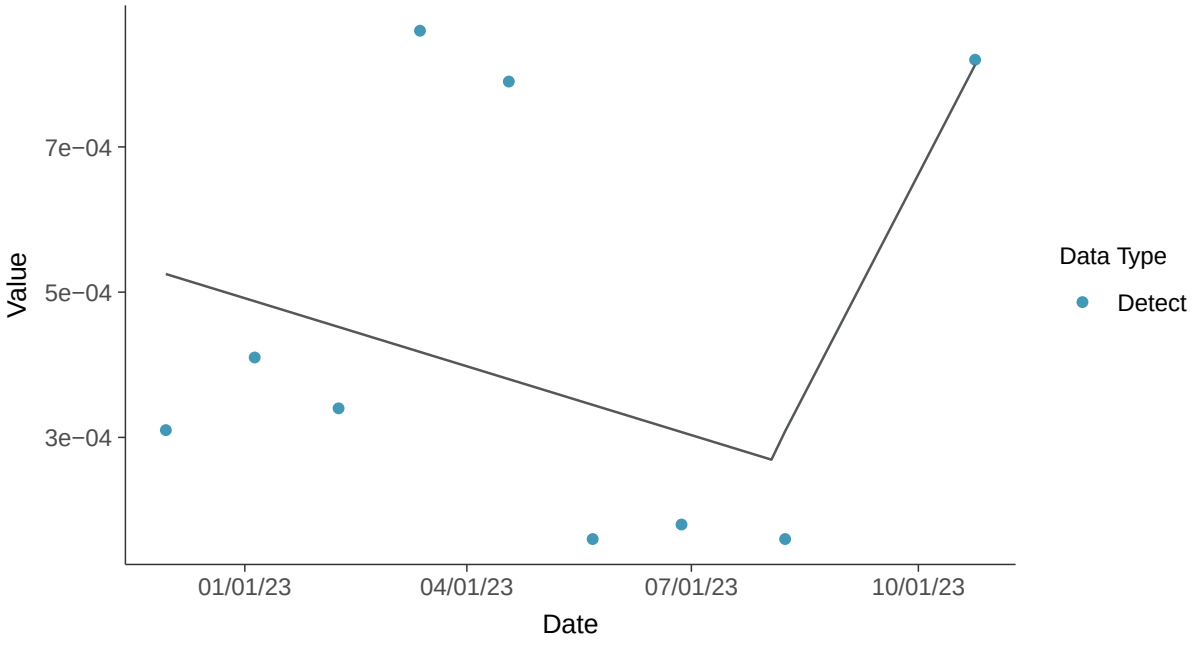

Lognormal Q-Q plot
Selenium, MW-18 (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Selenium, MW-18 (mg/L)
Value
0.00075
0.00050
0.00025
0.0000
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Selenium, MW-18 (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

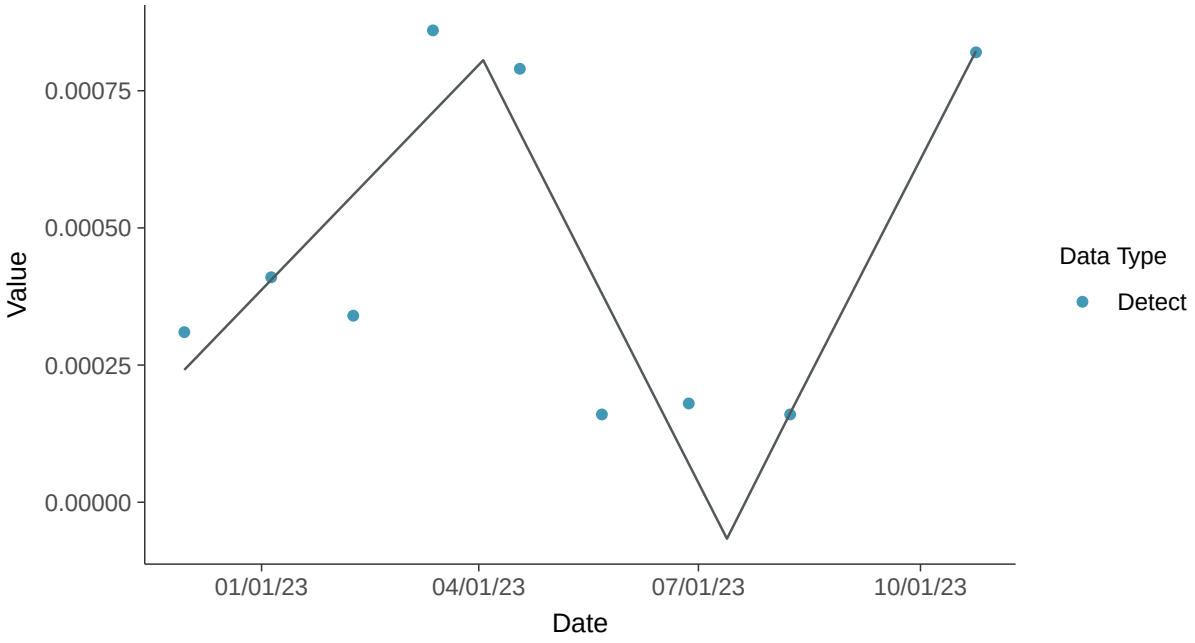
Trend Regression: Piecewise Linear-Linear

Selenium, MW-18 (mg/L)



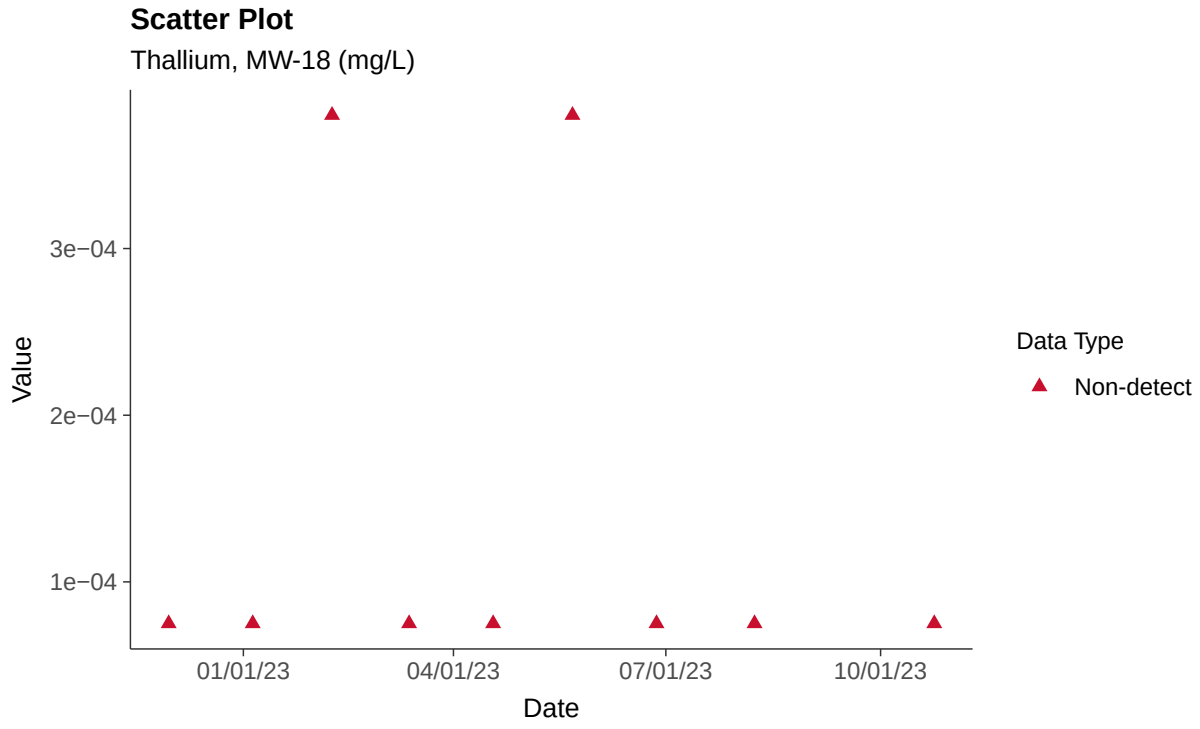
Trend Regression: Piecewise Linear-Linear-Linear

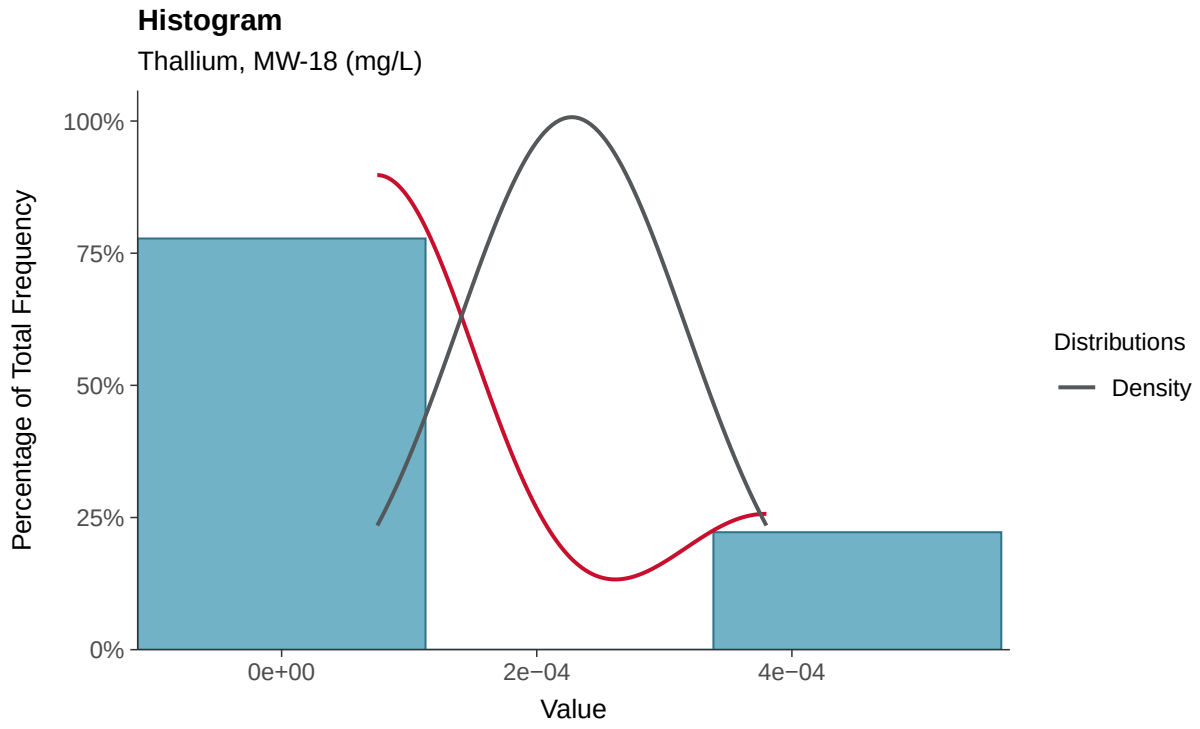
Selenium, MW-18 (mg/L)



Appendix IV: Thallium, MW-18

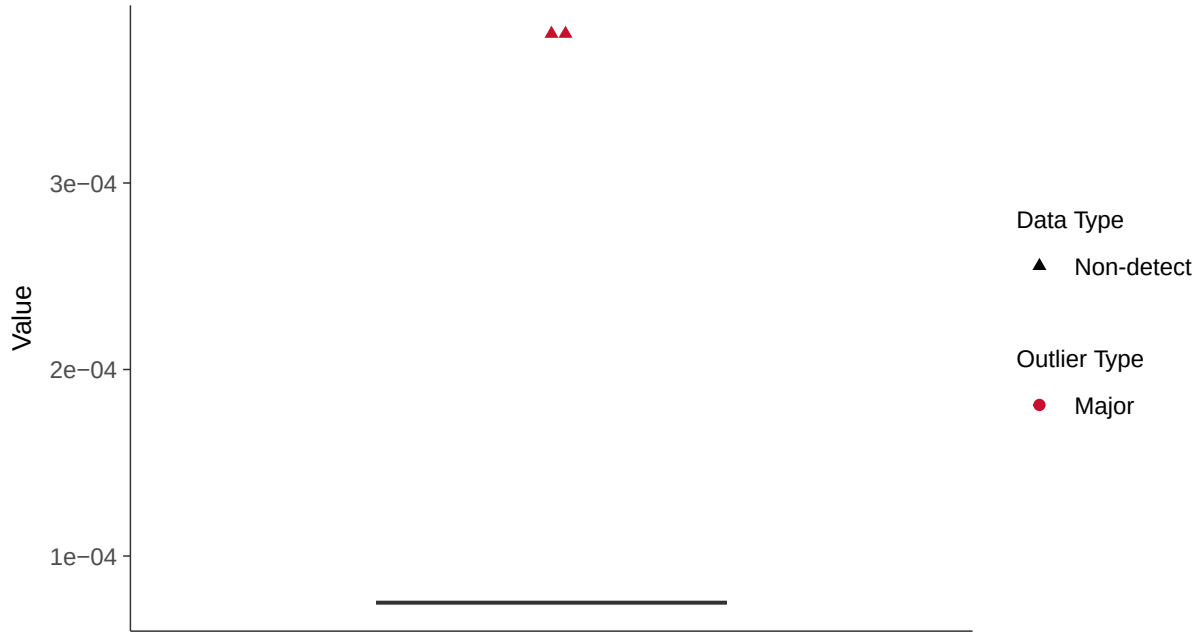
ID: 1_22_5_125





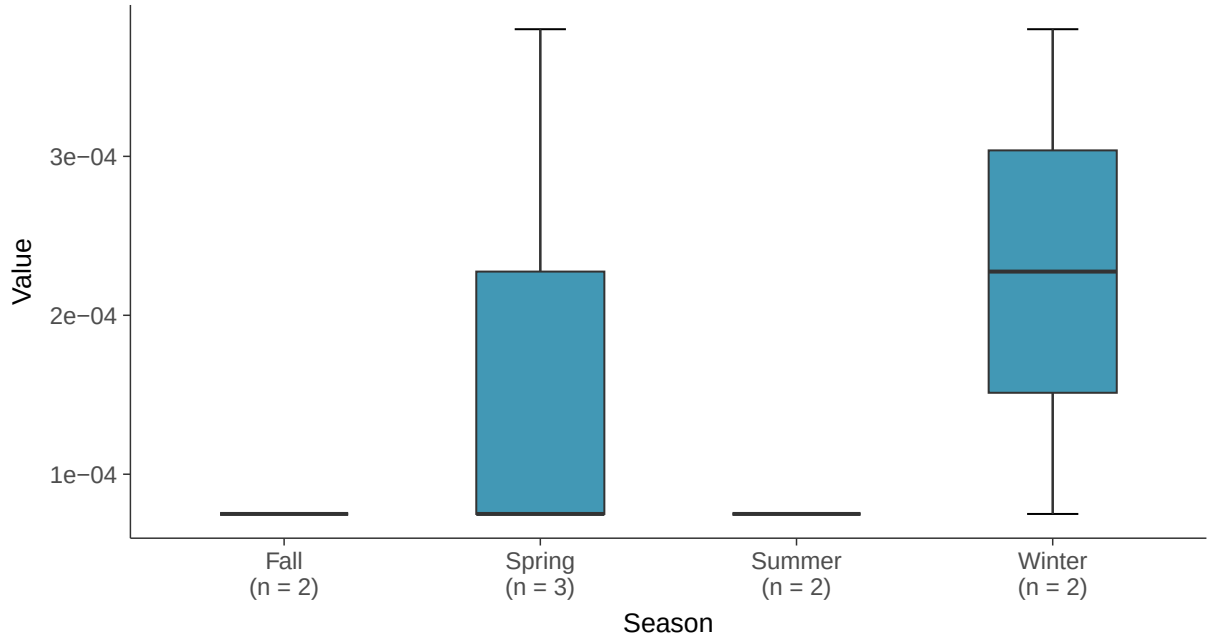
Boxplot

Thallium, MW-18 (mg/L)



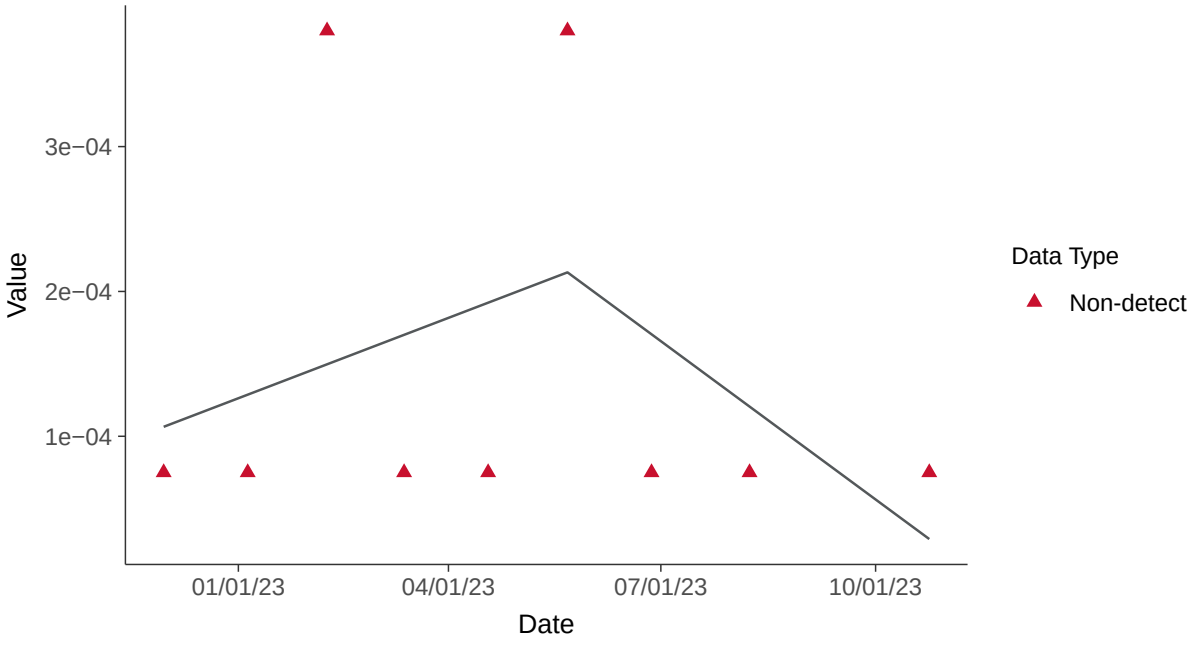
Boxplot by Season

Thallium, MW-18 (mg/L)



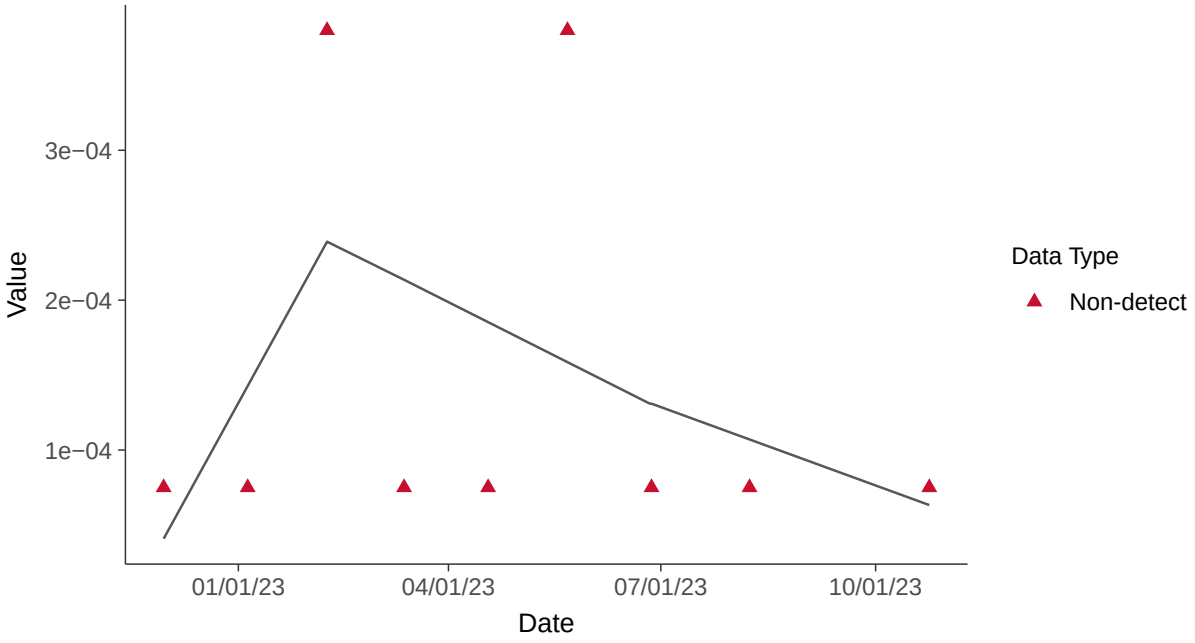
Trend Regression: Piecewise Linear-Linear

Thallium, MW-18 (mg/L)



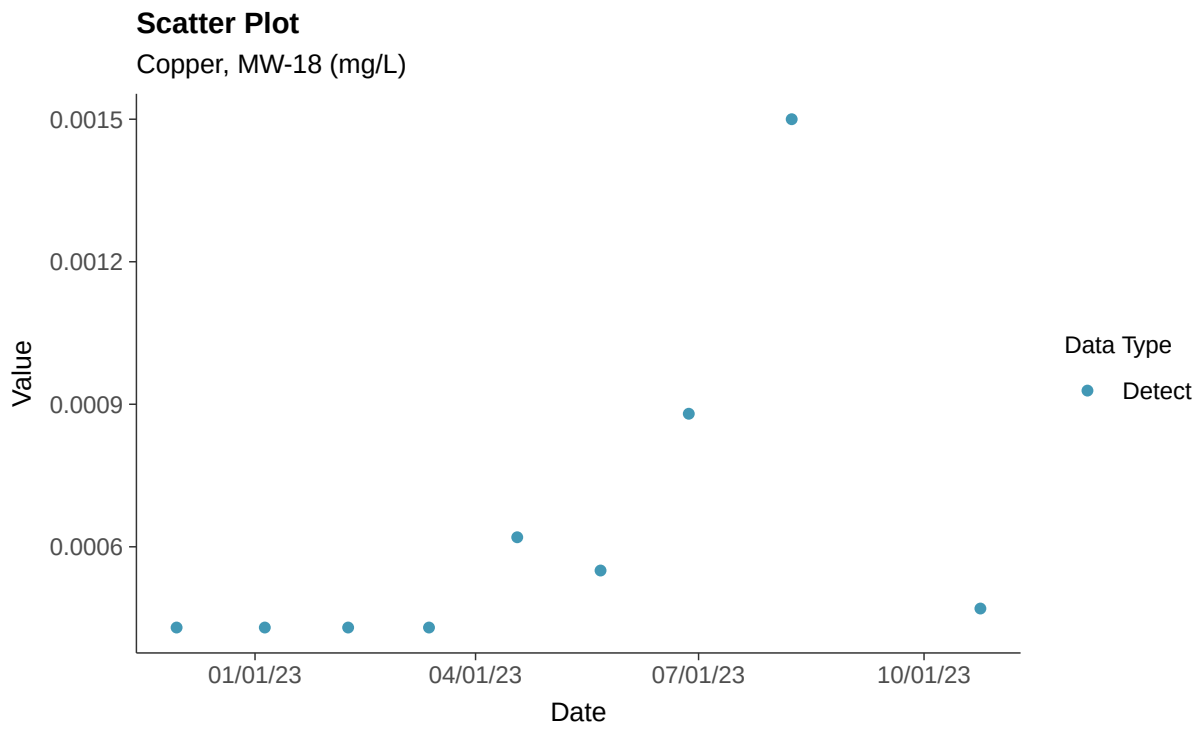
Trend Regression: Piecewise Linear-Linear-Linear

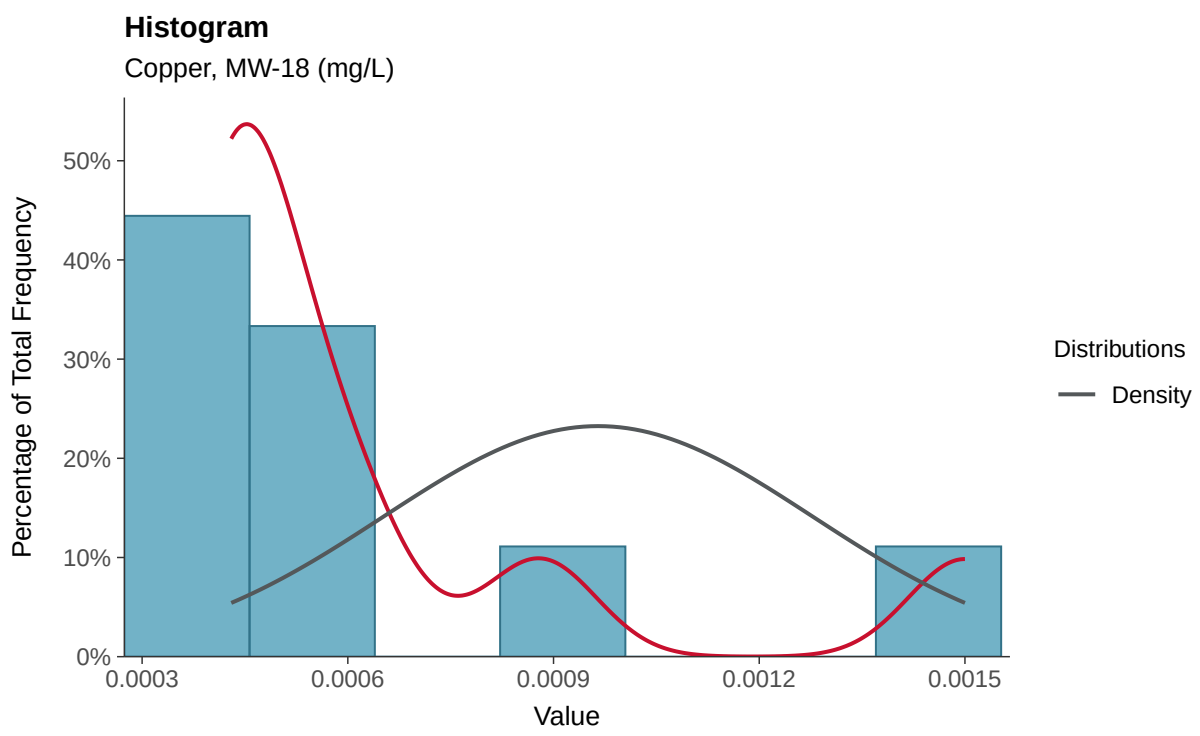
Thallium, MW-18 (mg/L)



Part 115: Copper, MW-18

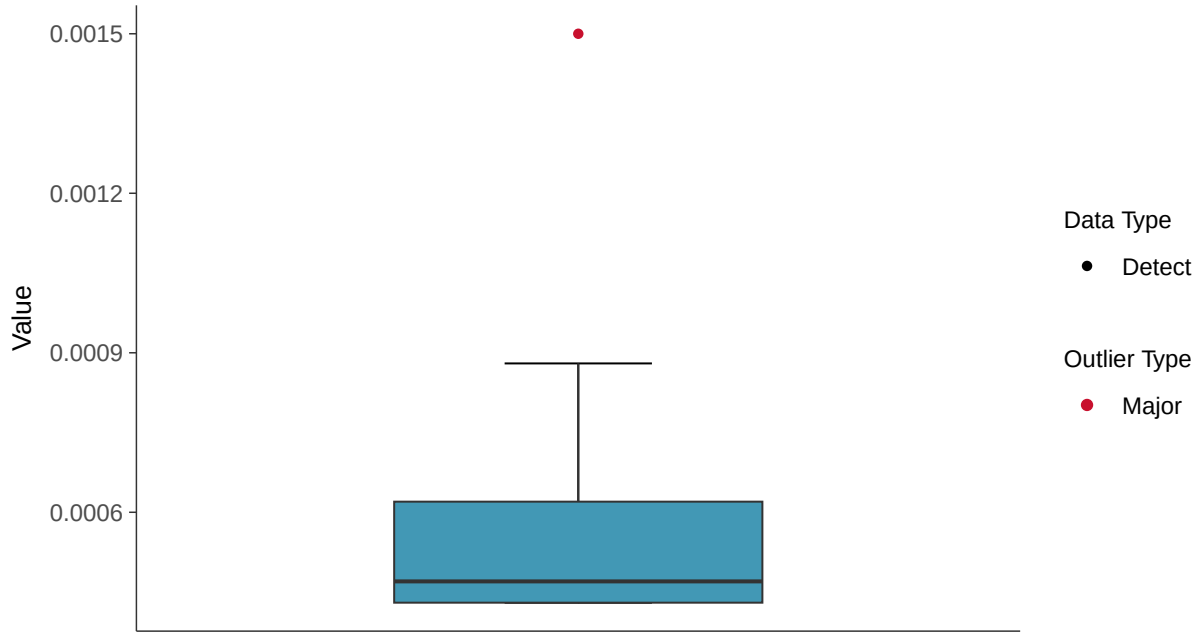
ID: 1_22_6_111





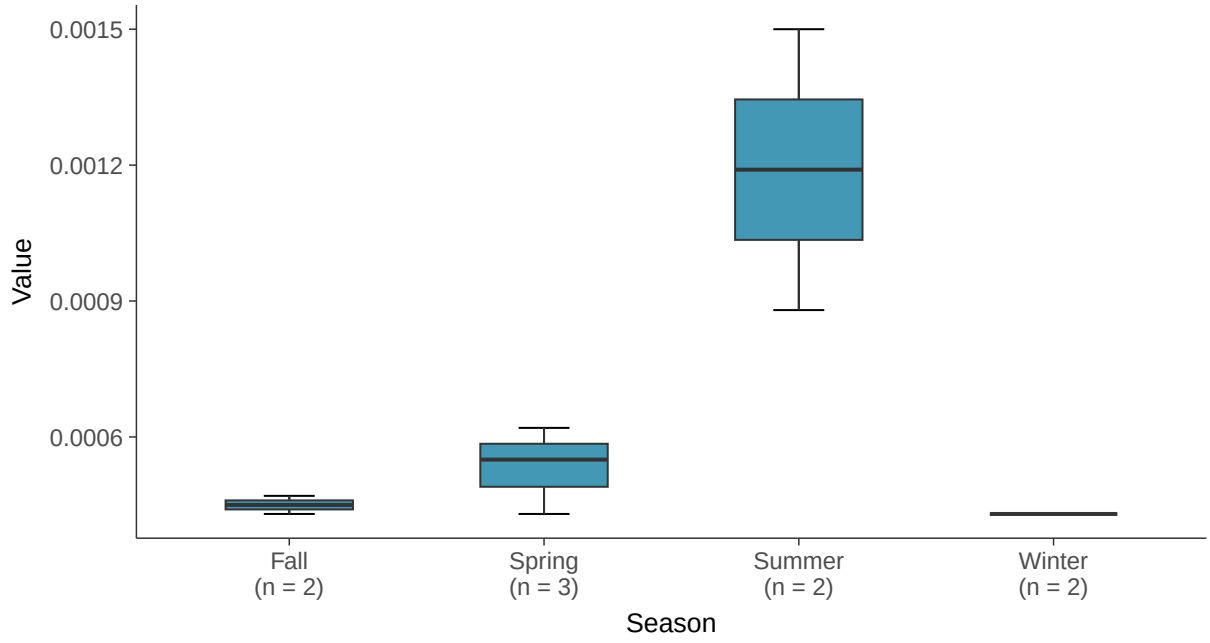
Boxplot

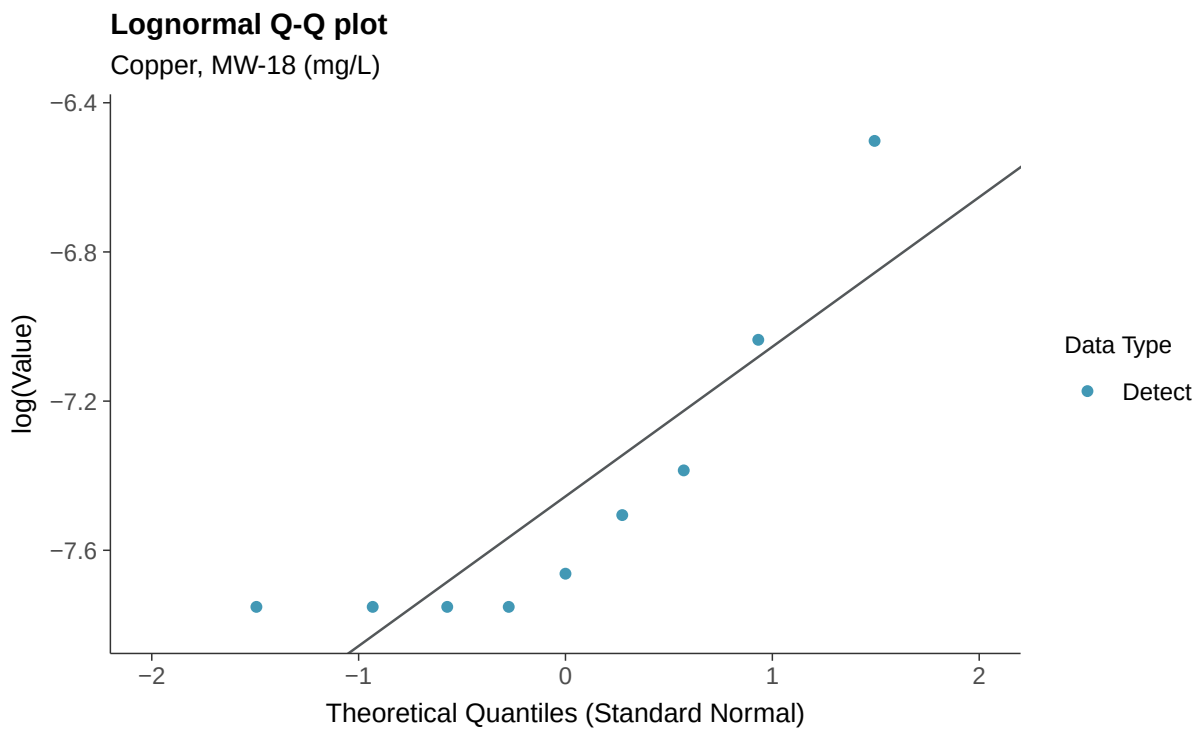
Copper, MW-18 (mg/L)

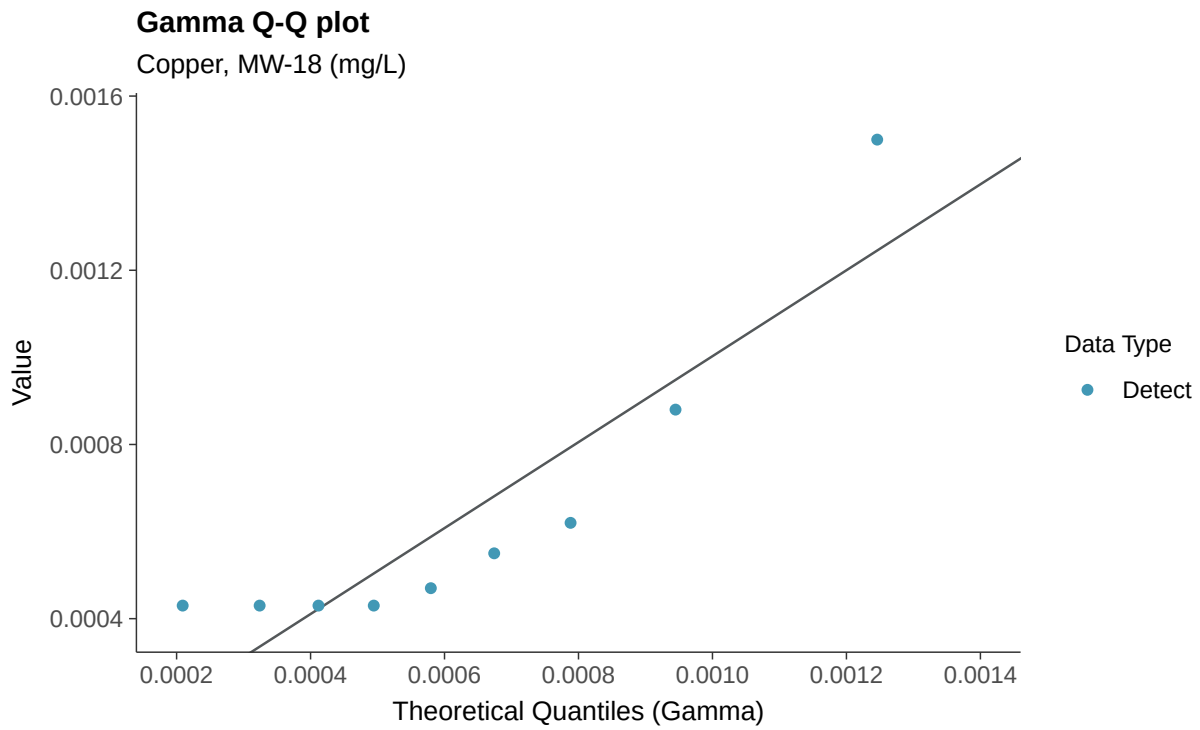


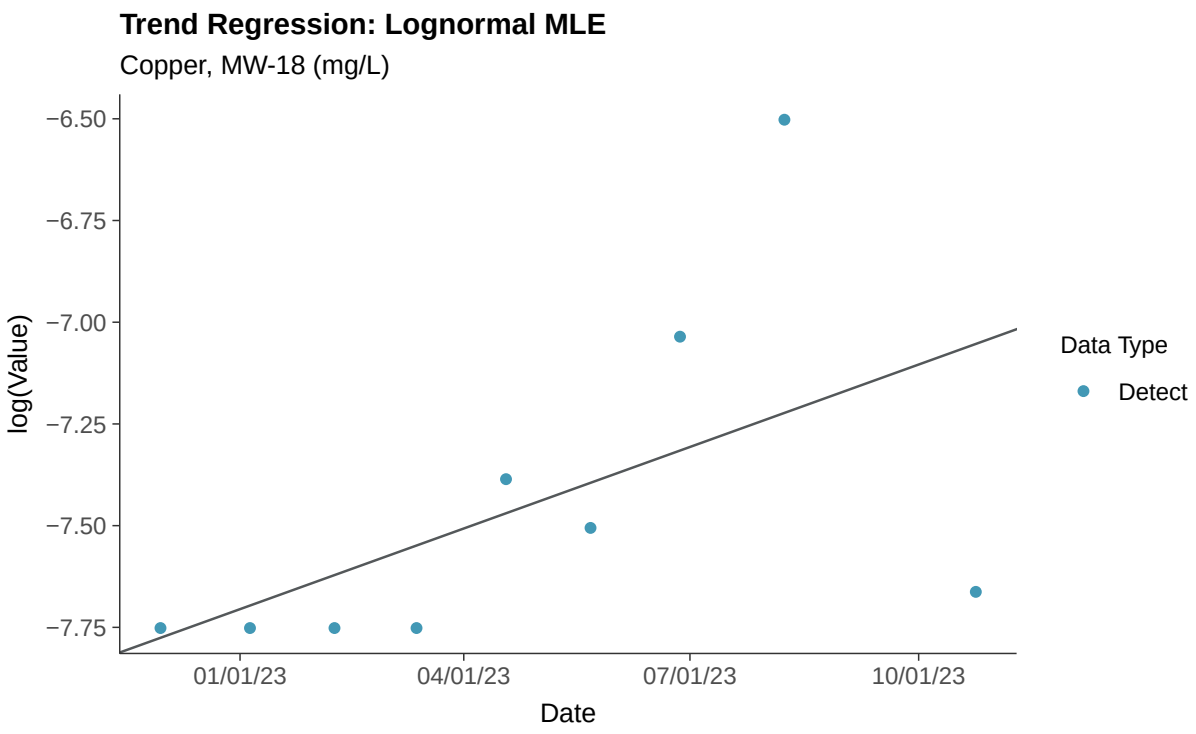
Boxplot by Season

Copper, MW-18 (mg/L)



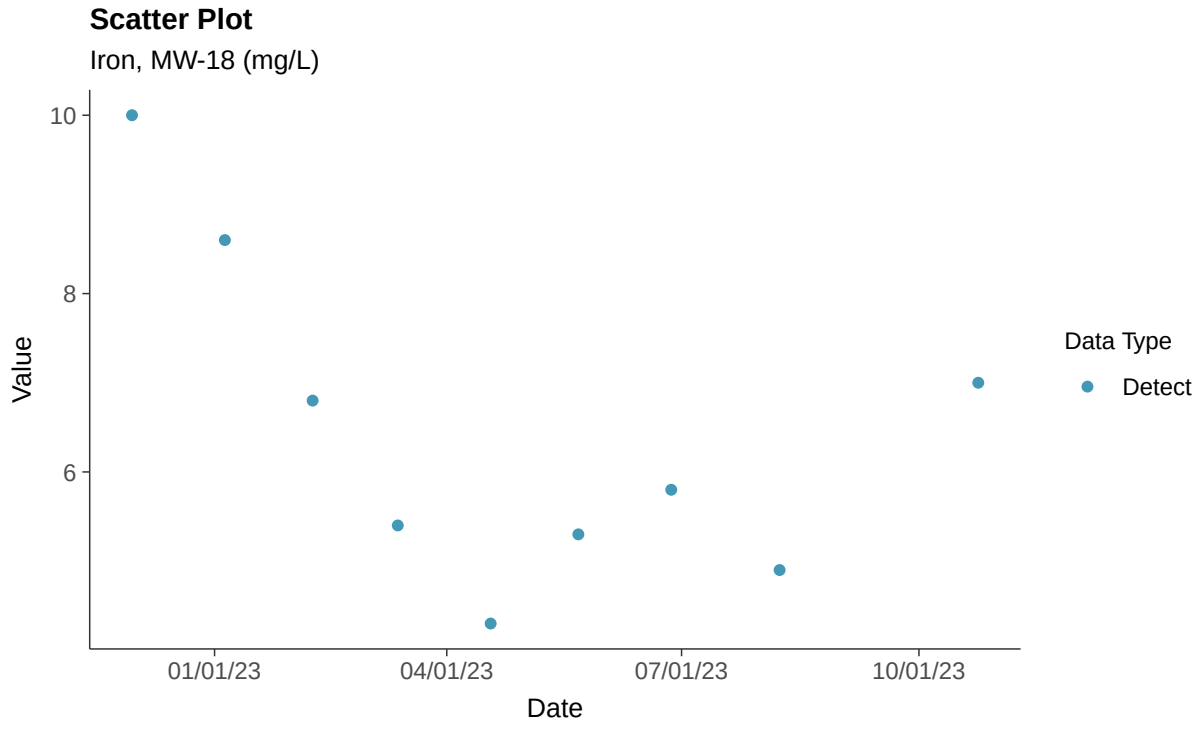

Lognormal Q-Q plot
Copper, MW-18 (mg/L)
log(Value)
−6.4
−6.8
−7.2
−7.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

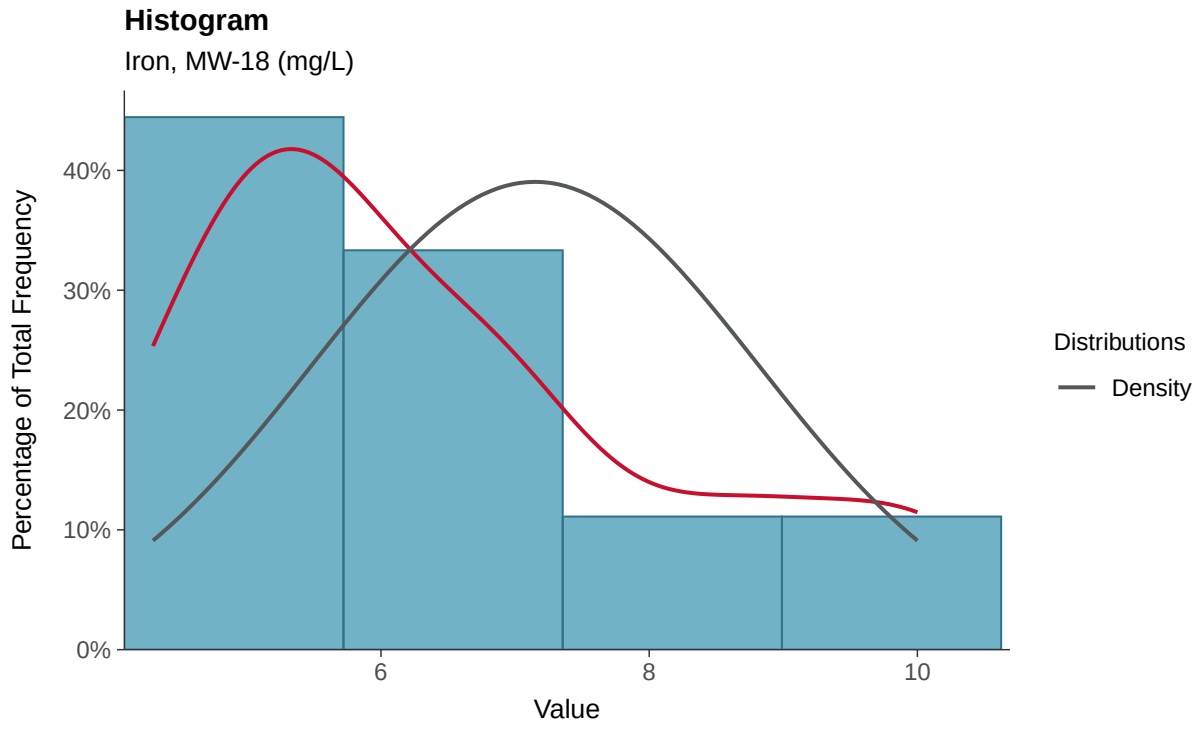

Gamma Q-Q plot
Copper, MW-18 (mg/L)
Value
0.0016
0.0012
0.0008
0.0004
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
0.0014
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Copper, MW-18 (mg/L)
−6.50
−6.75
−7.00
−7.25
−7.50
−7.75
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Iron, MW-18

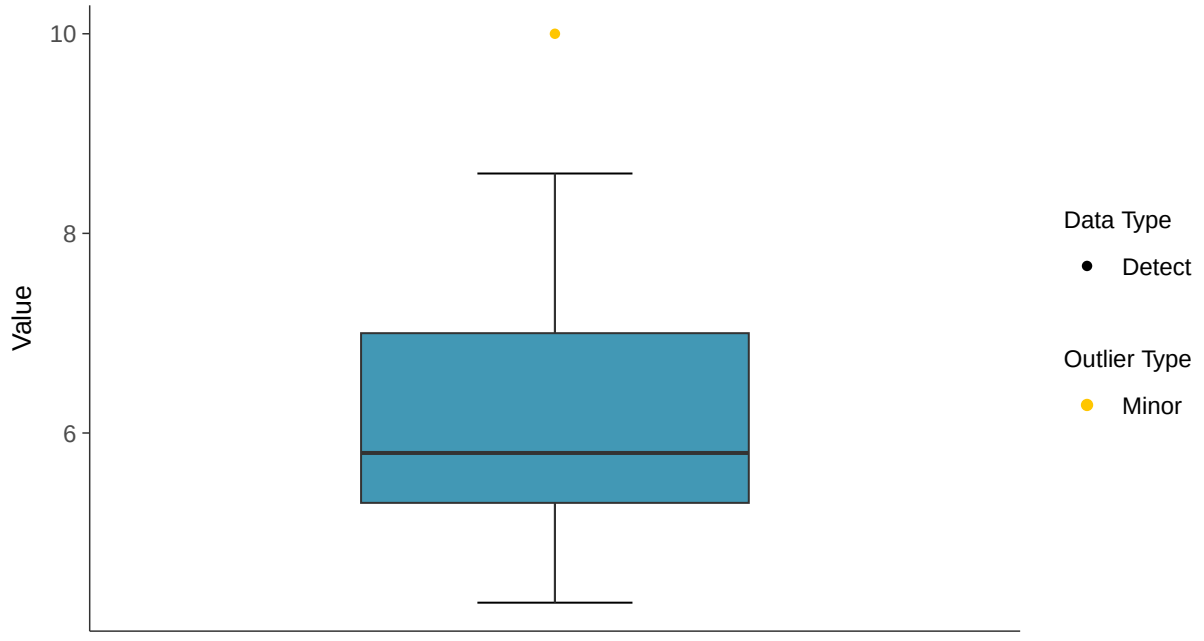
ID: 1_22_6_114





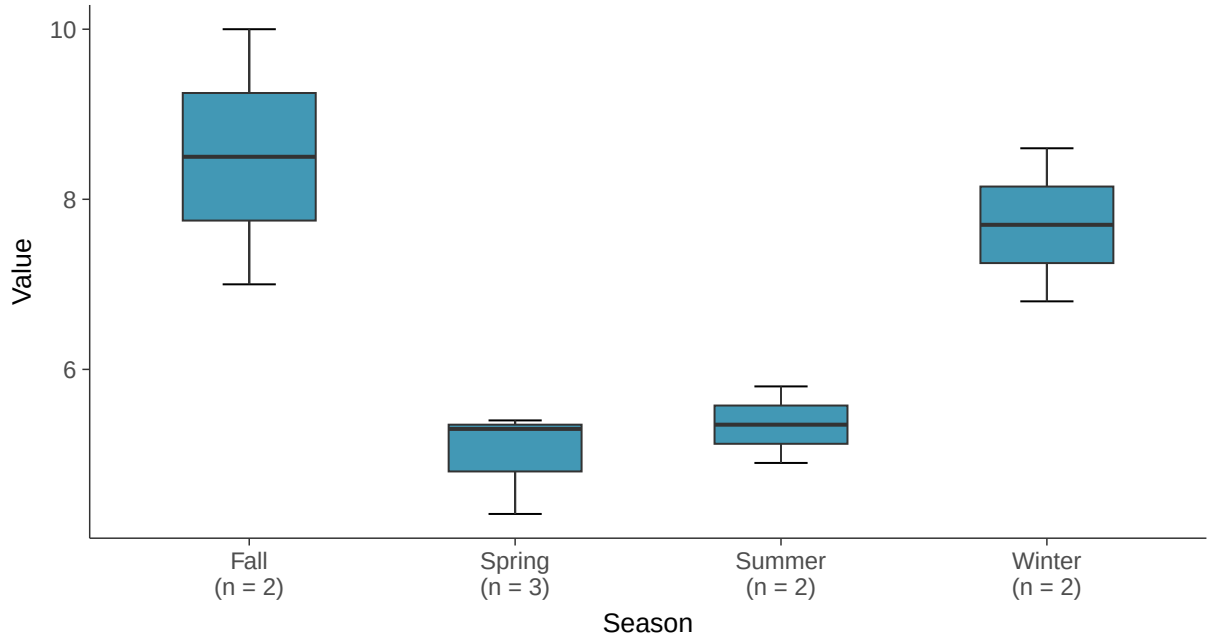
Boxplot

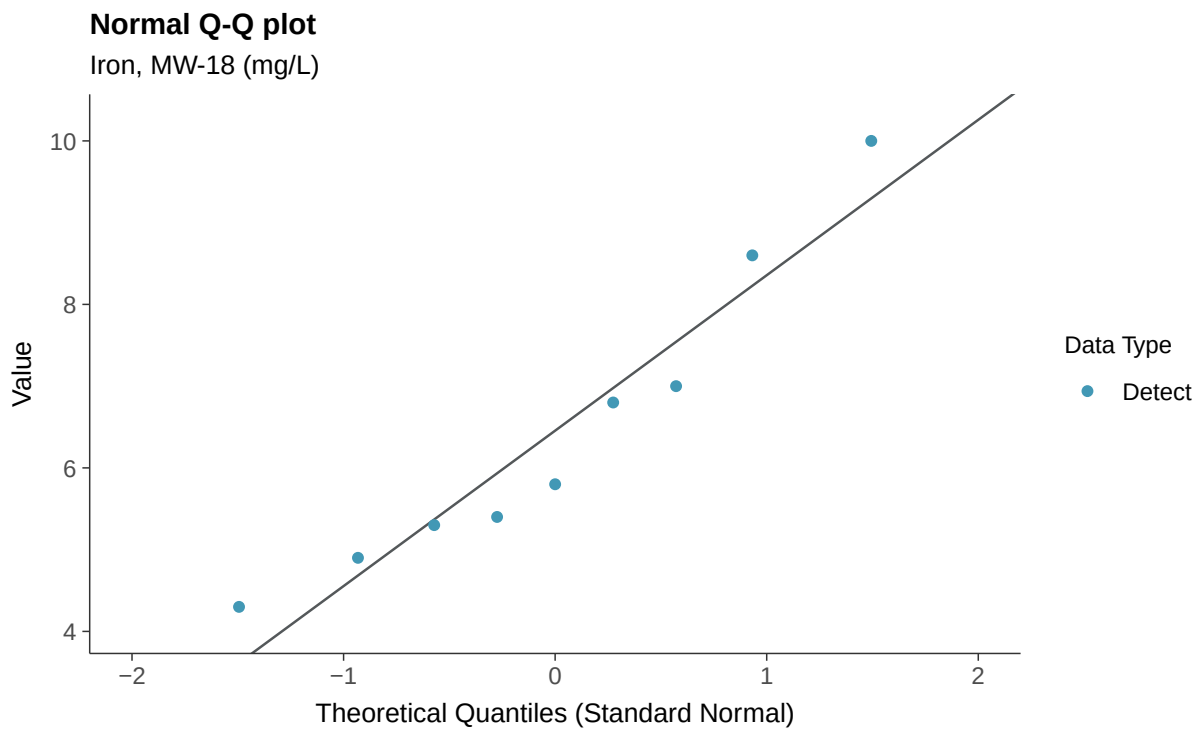
Iron, MW-18 (mg/L)

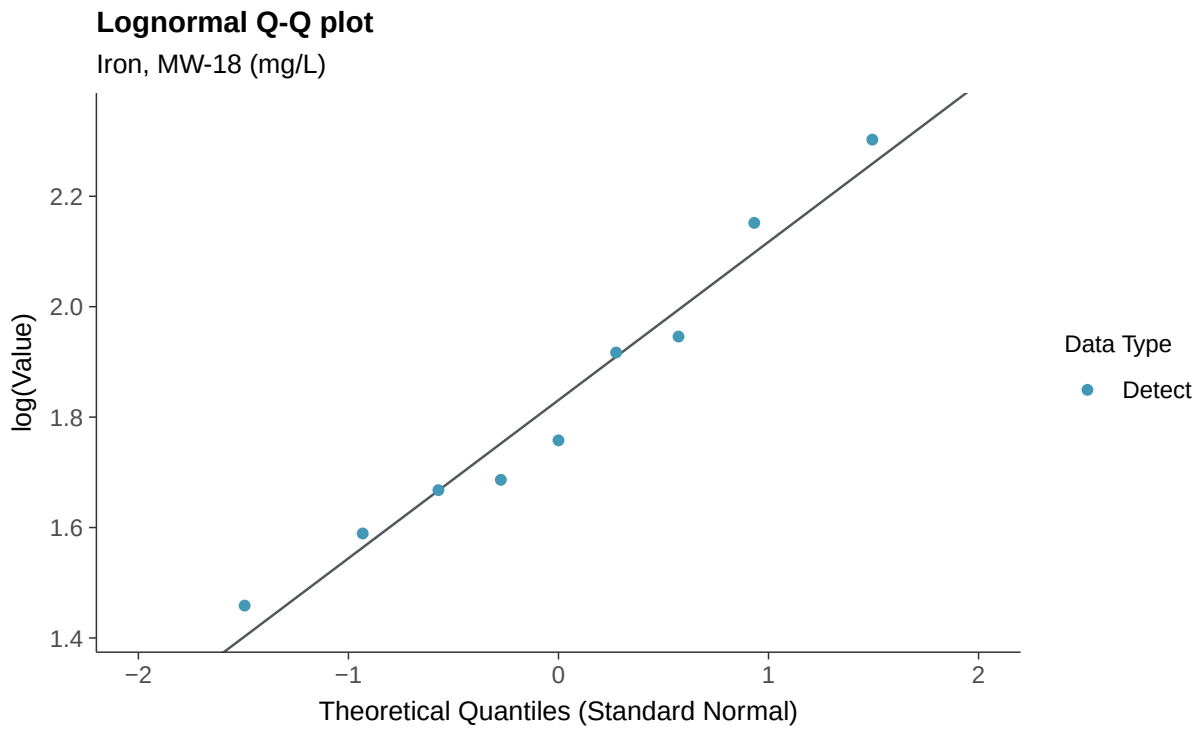


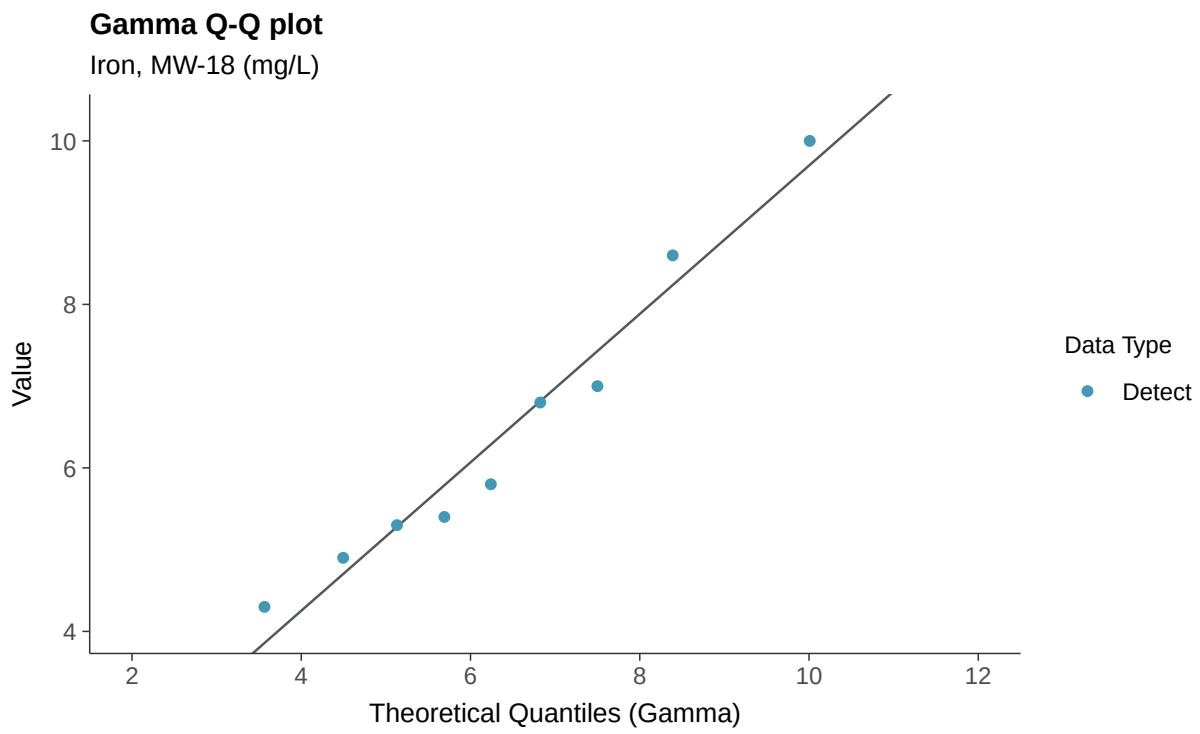
Boxplot by Season

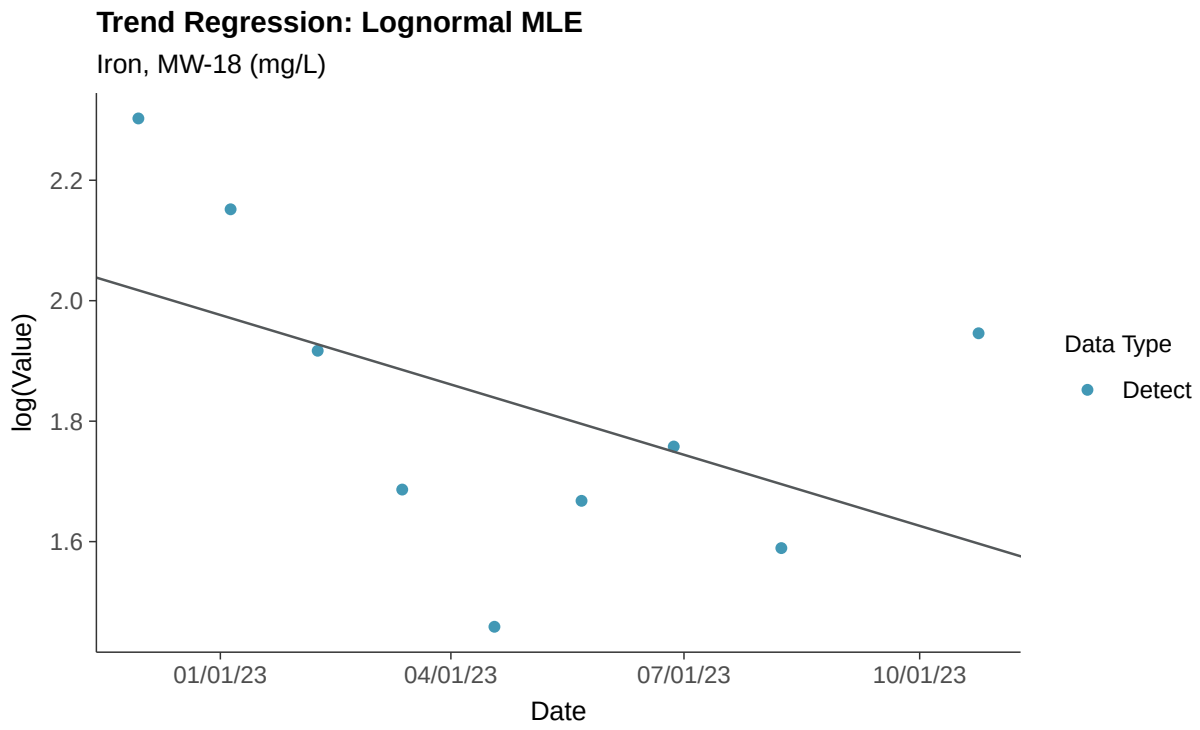
Iron, MW-18 (mg/L)

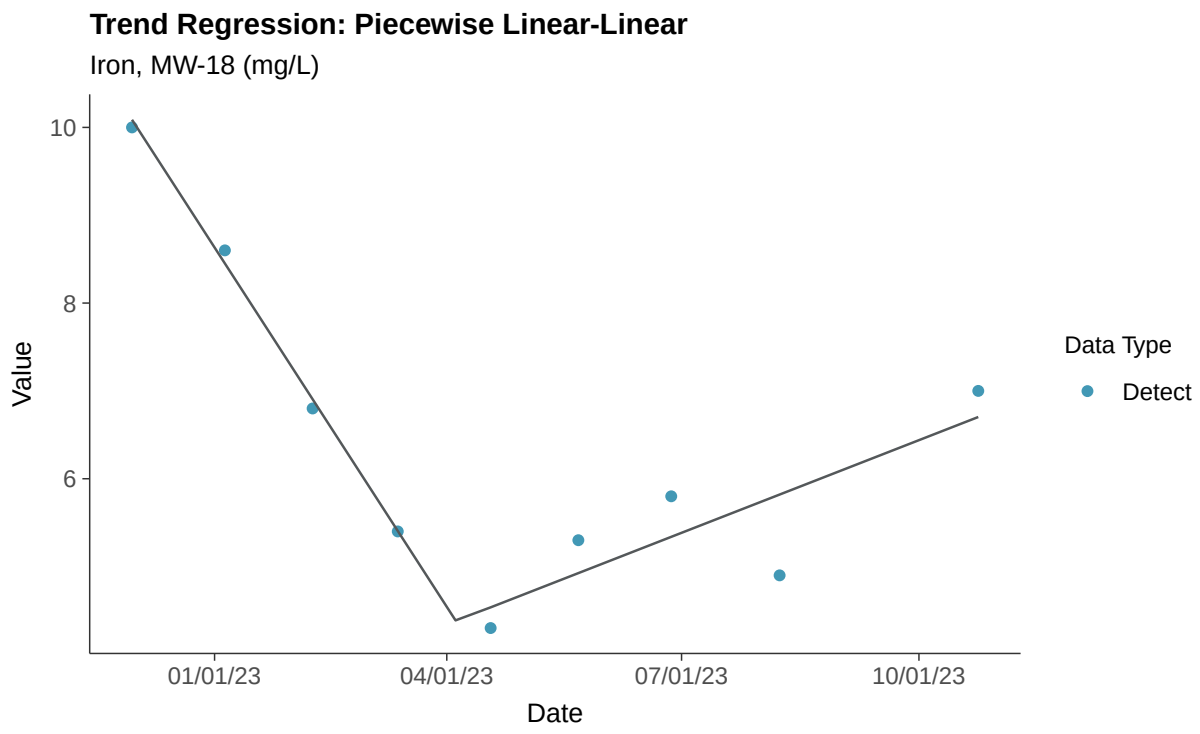



Normal Q-Q plot
Iron, MW-18 (mg/L)
Value
10
8
6
4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-18 (mg/L)
log(Value)
2.2
2.0
1.8
1.6
1.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

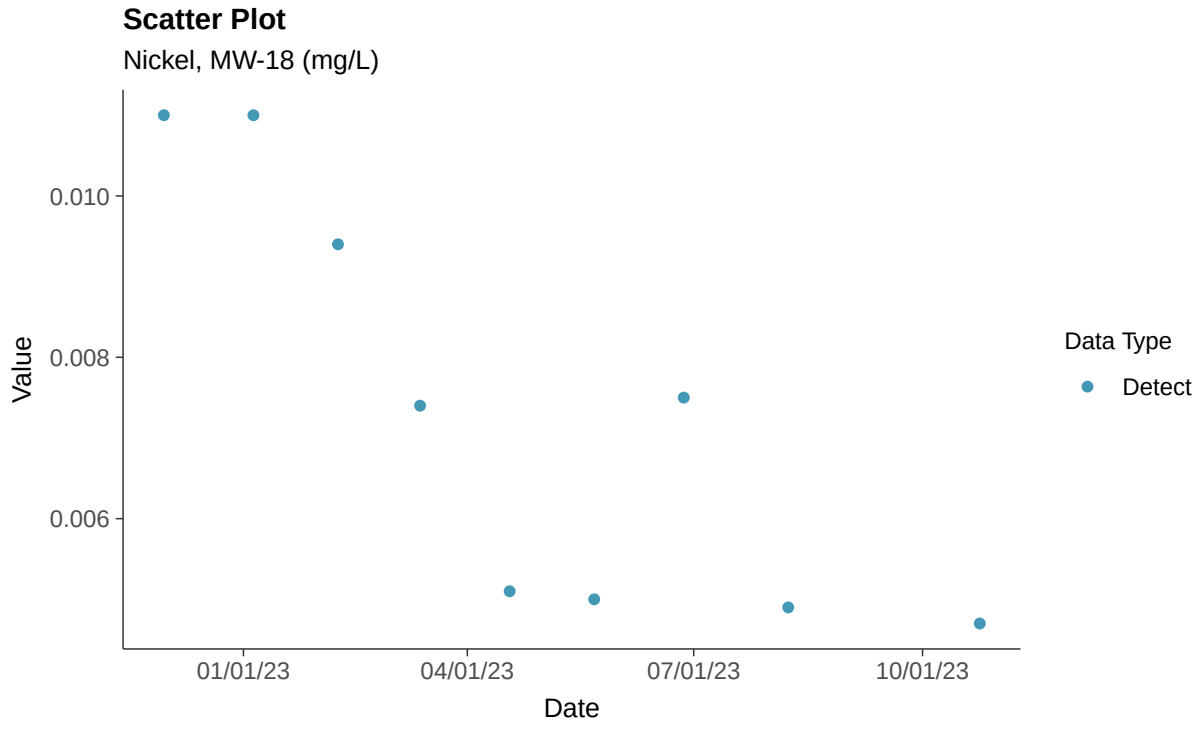

Gamma Q-Q plot
Iron, MW-18 (mg/L)
Value
10
8
6
4
2
4
6
8
10
12
Theoretical Quantiles (Gamma)
Data Type
Detect

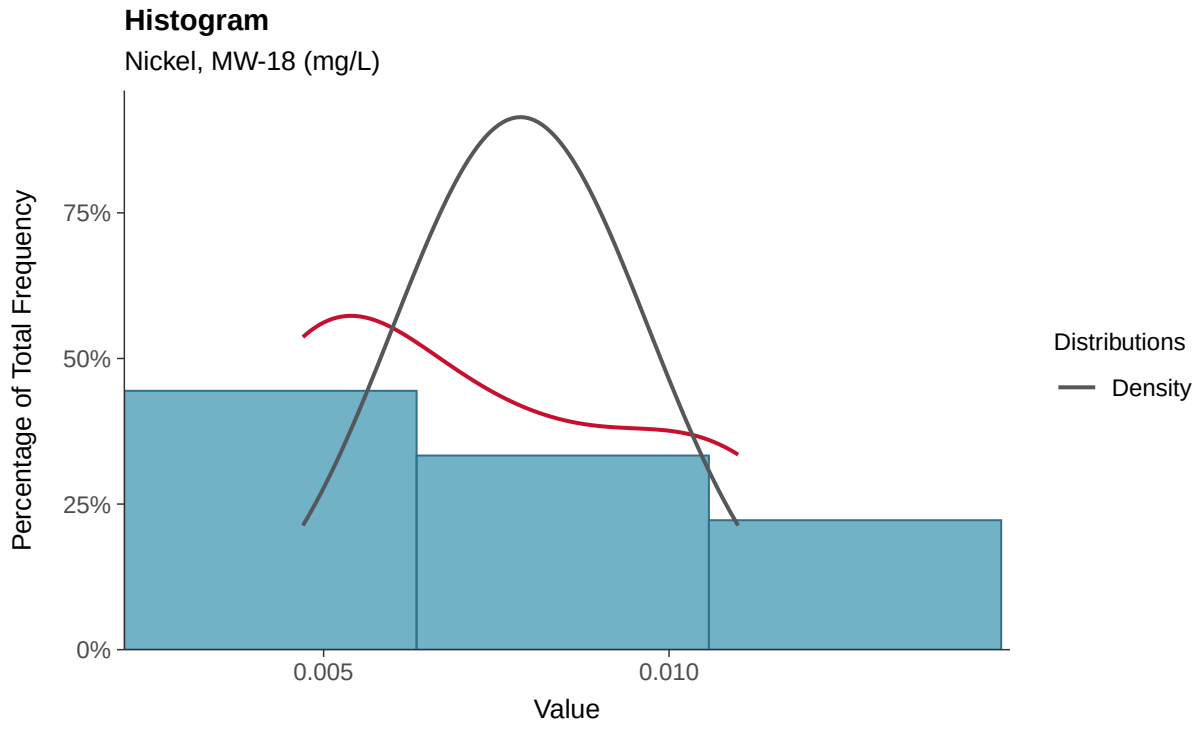

Trend Regression: Lognormal MLE
Iron, MW-18 (mg/L)
log(Value)
2.2
2.0
1.8
1.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-18 (mg/L)
10
8
6
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-18

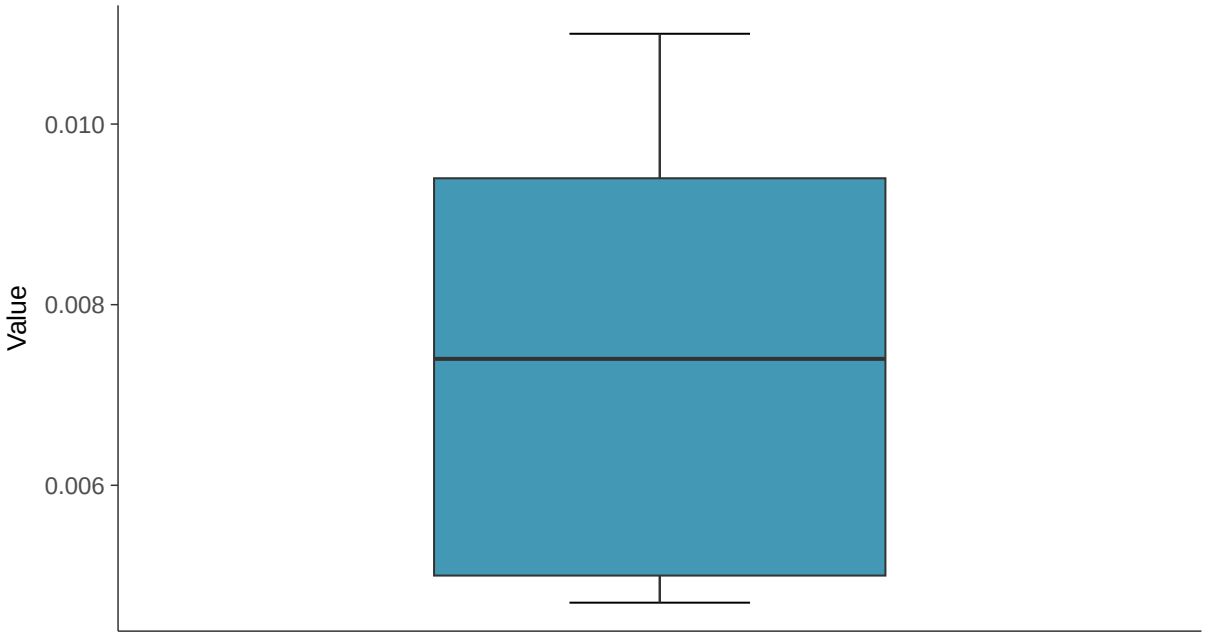
ID: 1_22_6_119





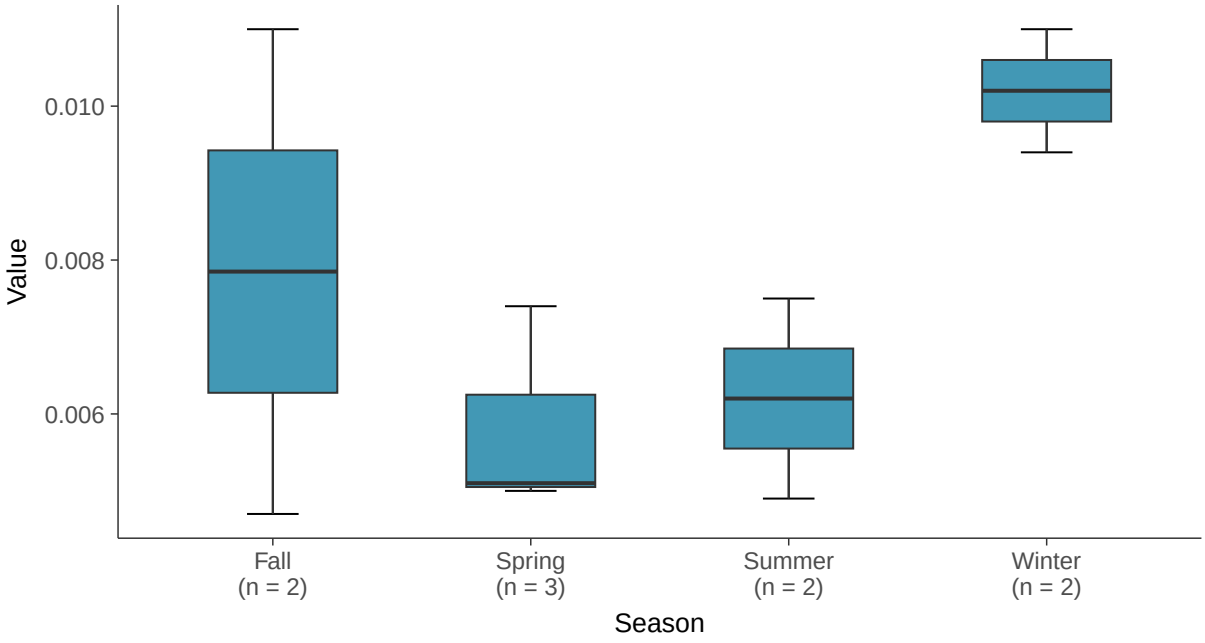
Boxplot

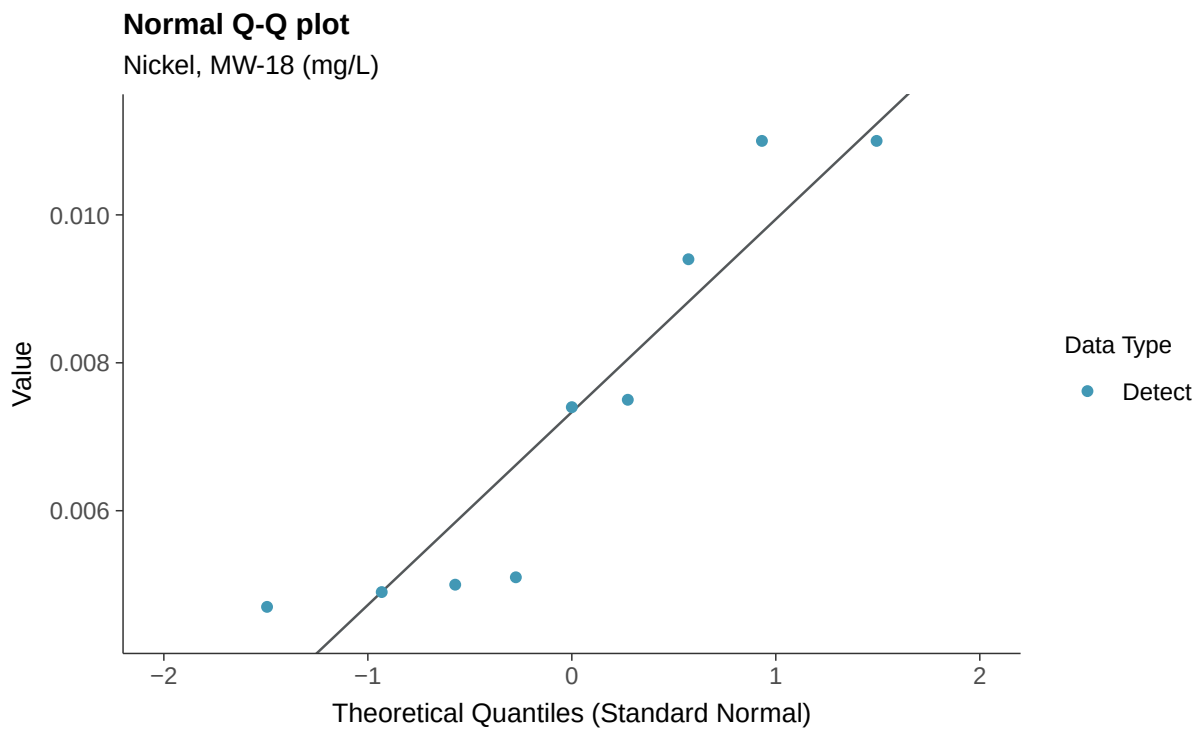
Nickel, MW-18 (mg/L)

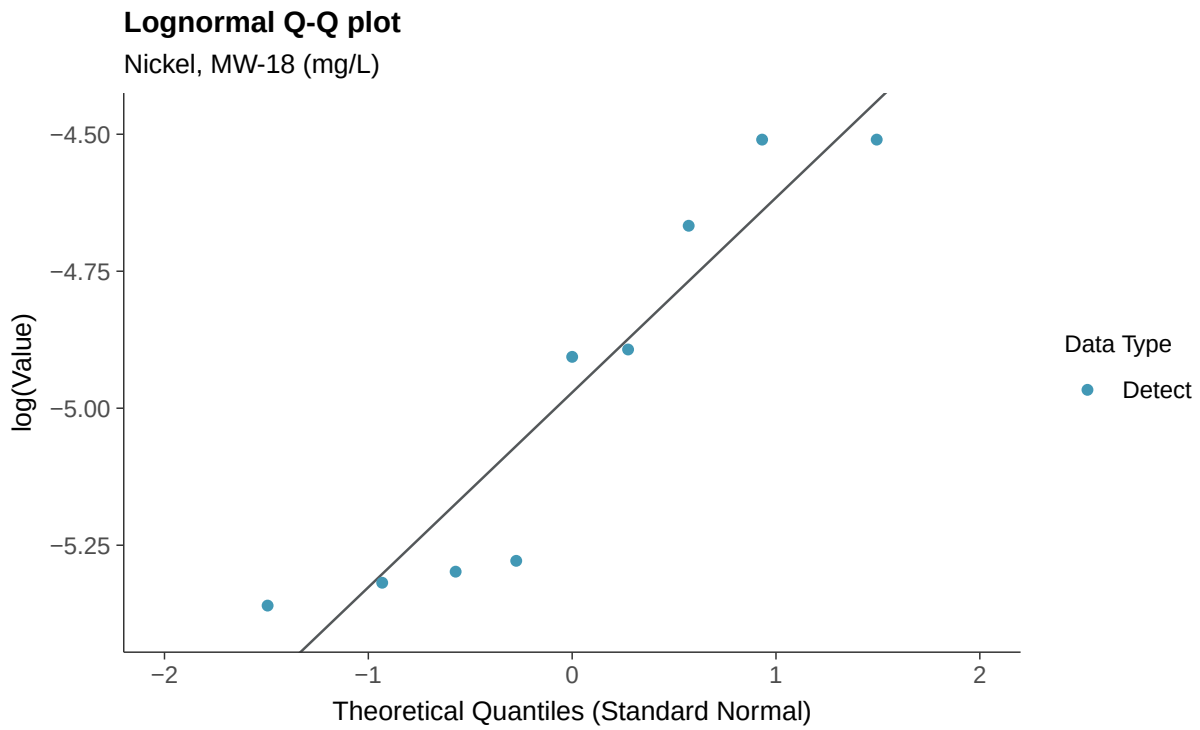


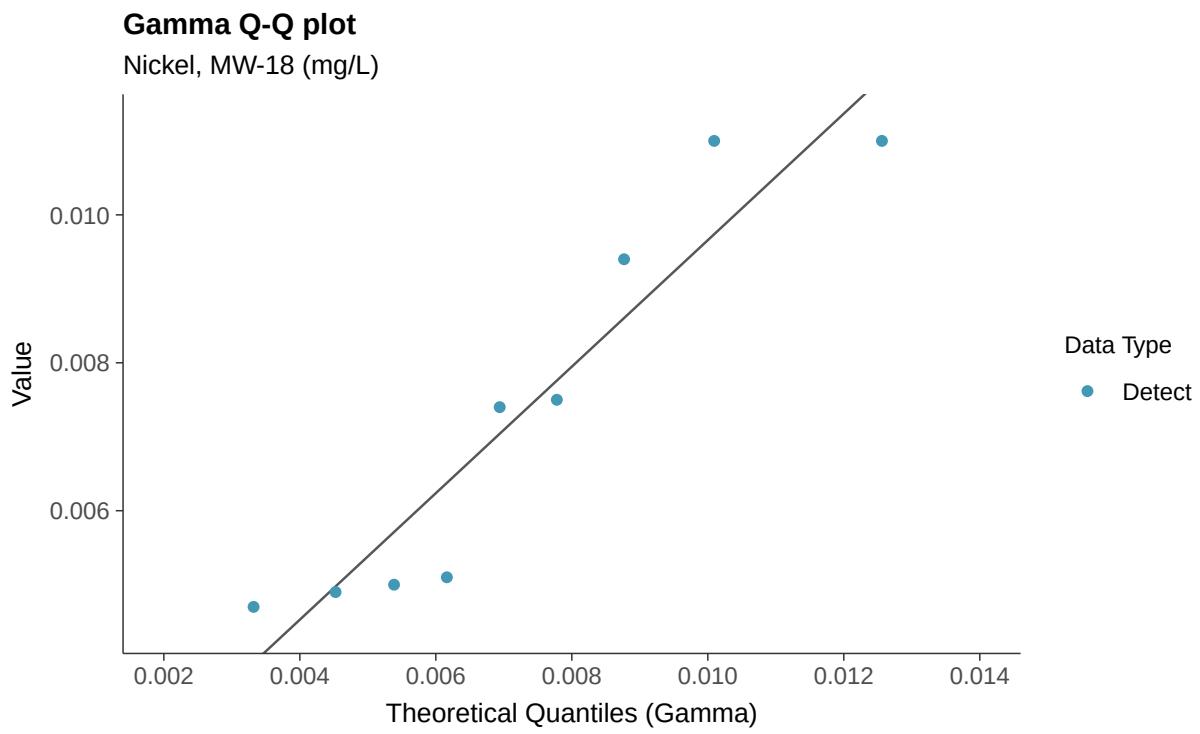
Boxplot by Season

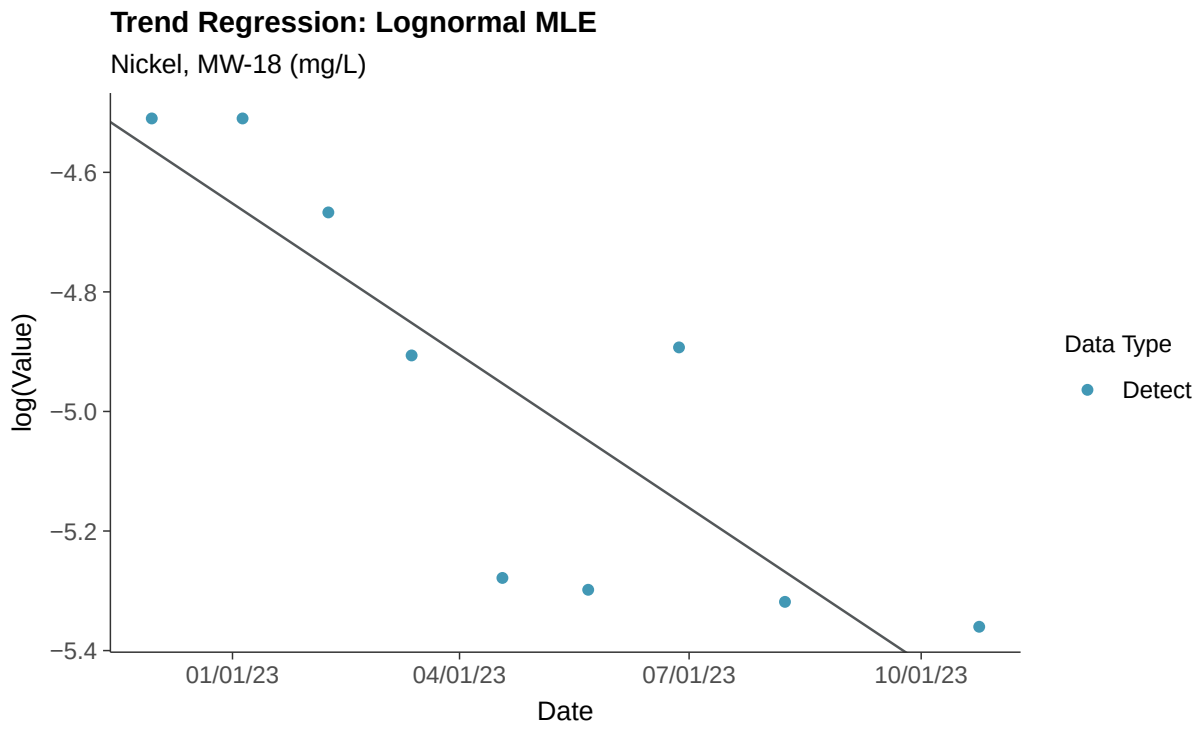
Nickel, MW-18 (mg/L)

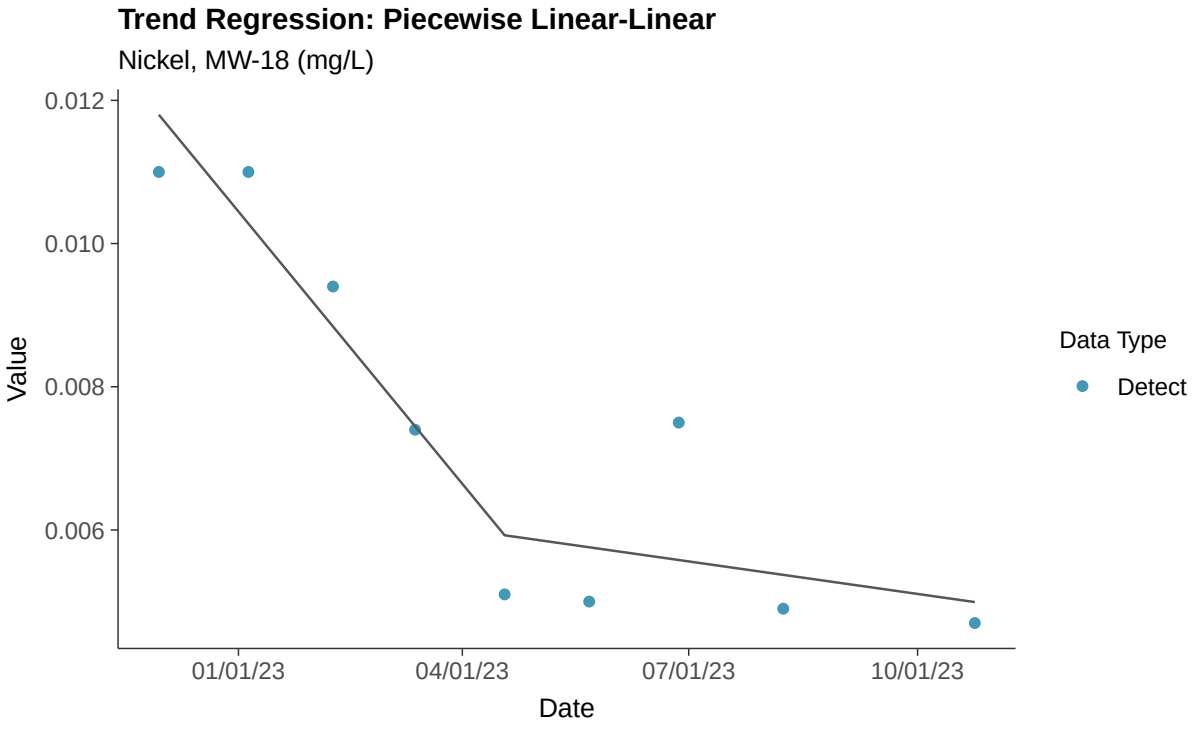



Normal Q-Q plot
Nickel, MW-18 (mg/L)
Value
0.010
0.008
0.006
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Nickel, MW-18 (mg/L)
log(Value)
−4.50
−4.75
−5.00
−5.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

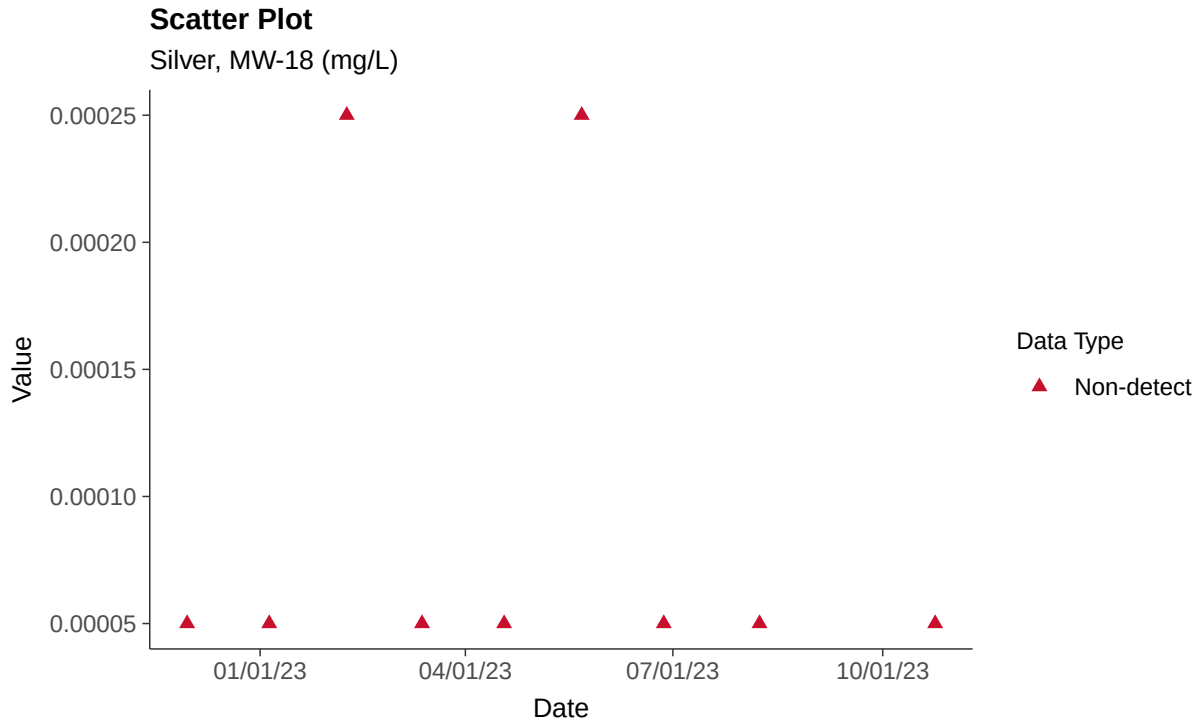

Gamma Q-Q plot
Nickel, MW-18 (mg/L)
Value
0.010
0.008
0.006
0.002
0.004
0.006
0.008
0.010
0.012
0.014
Theoretical Quantiles (Gamma)
Data Type
Detect

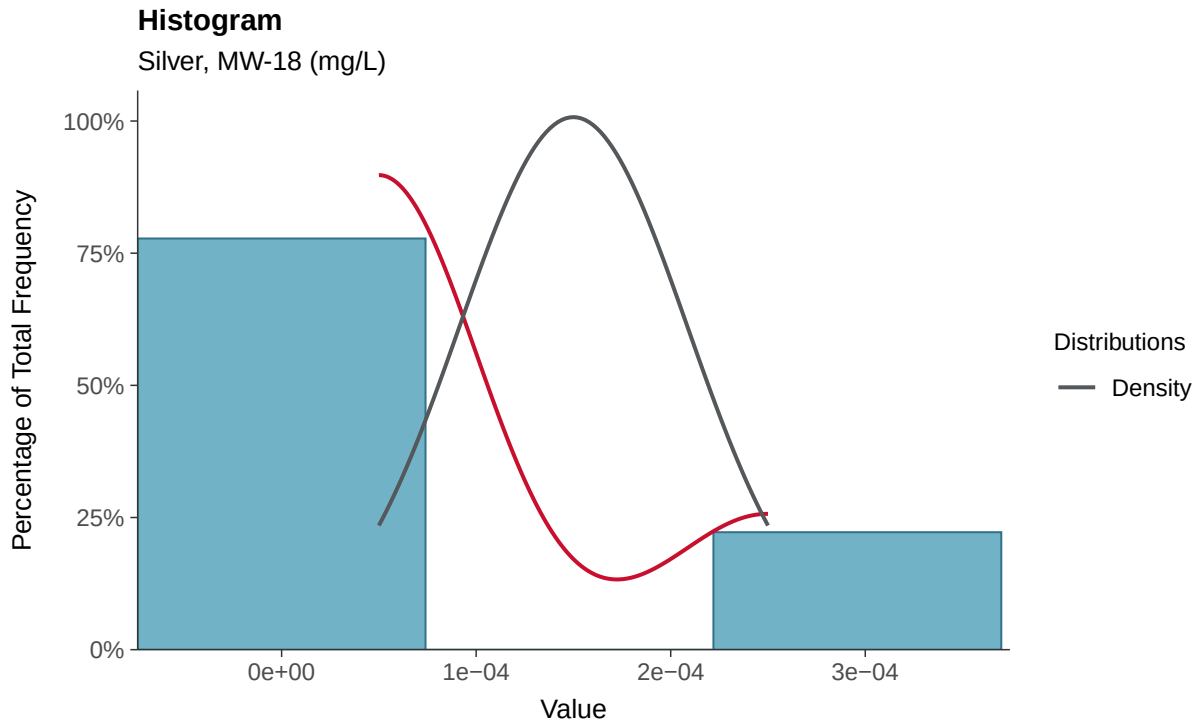

Trend Regression: Lognormal MLE
Nickel, MW-18 (mg/L)
log(Value)
−4.6
−4.8
−5.0
−5.2
−5.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Nickel, MW-18 (mg/L)
0.012
0.010
0.008
0.006
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-18

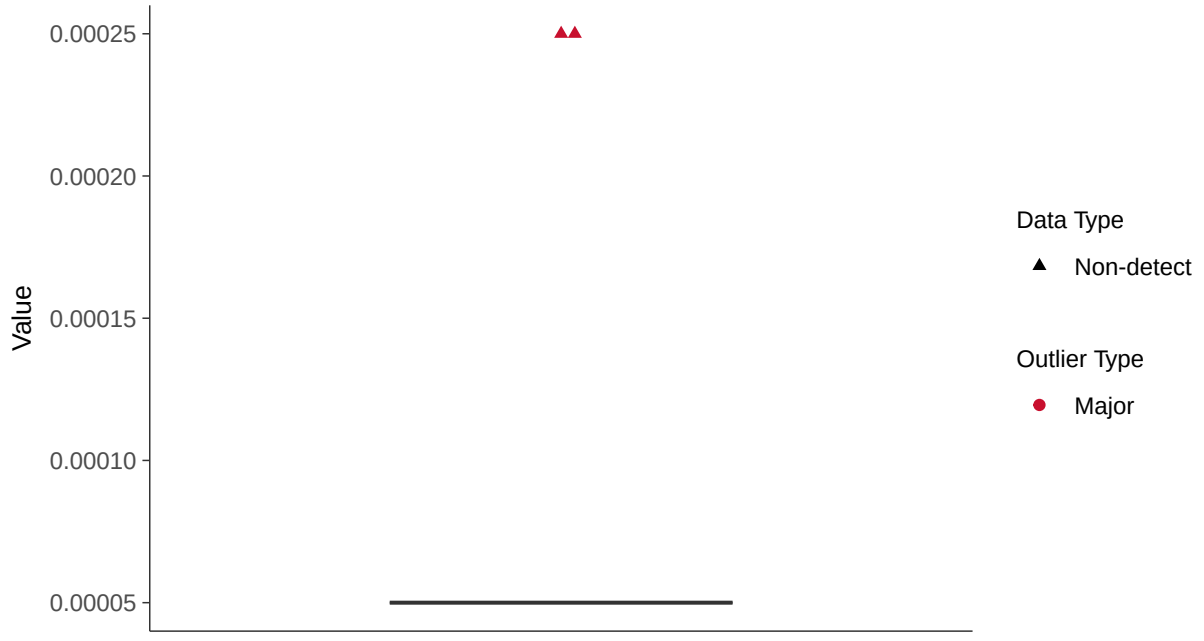
ID: 1_22_6_123





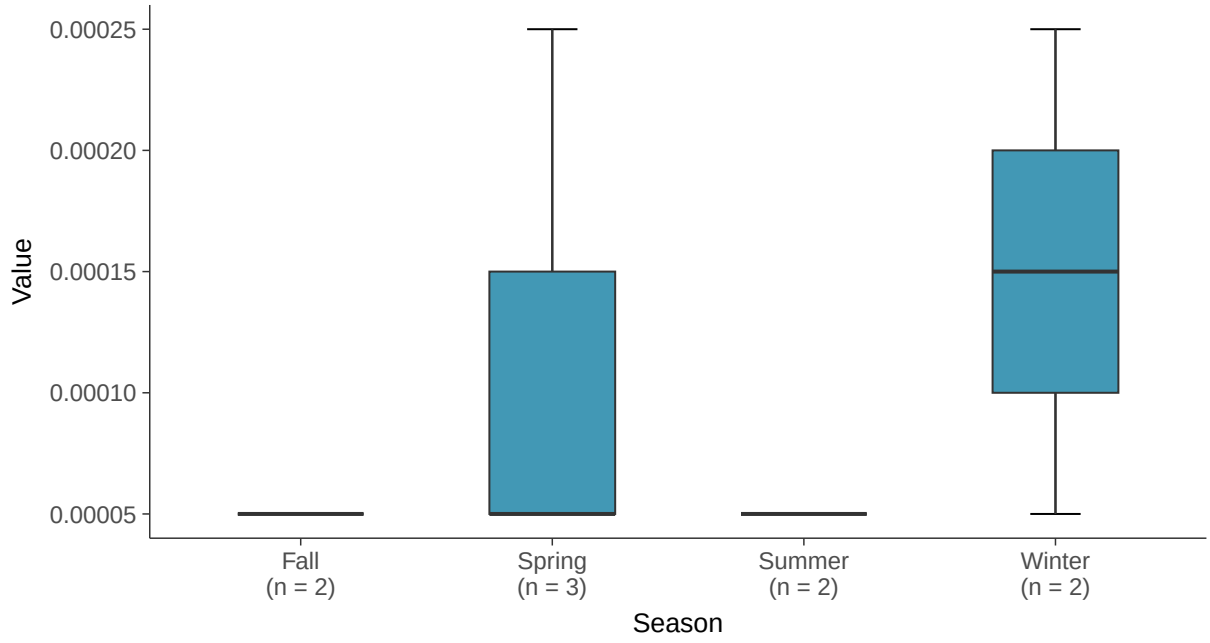
Boxplot

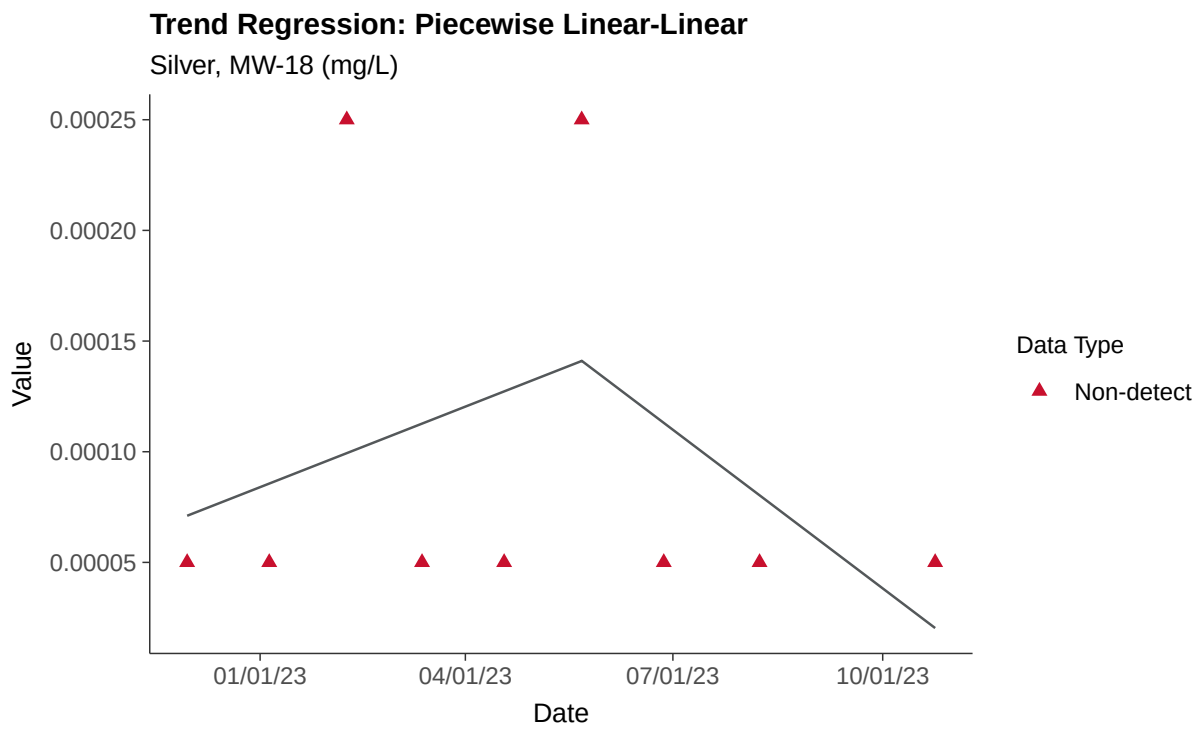
Silver, MW-18 (mg/L)

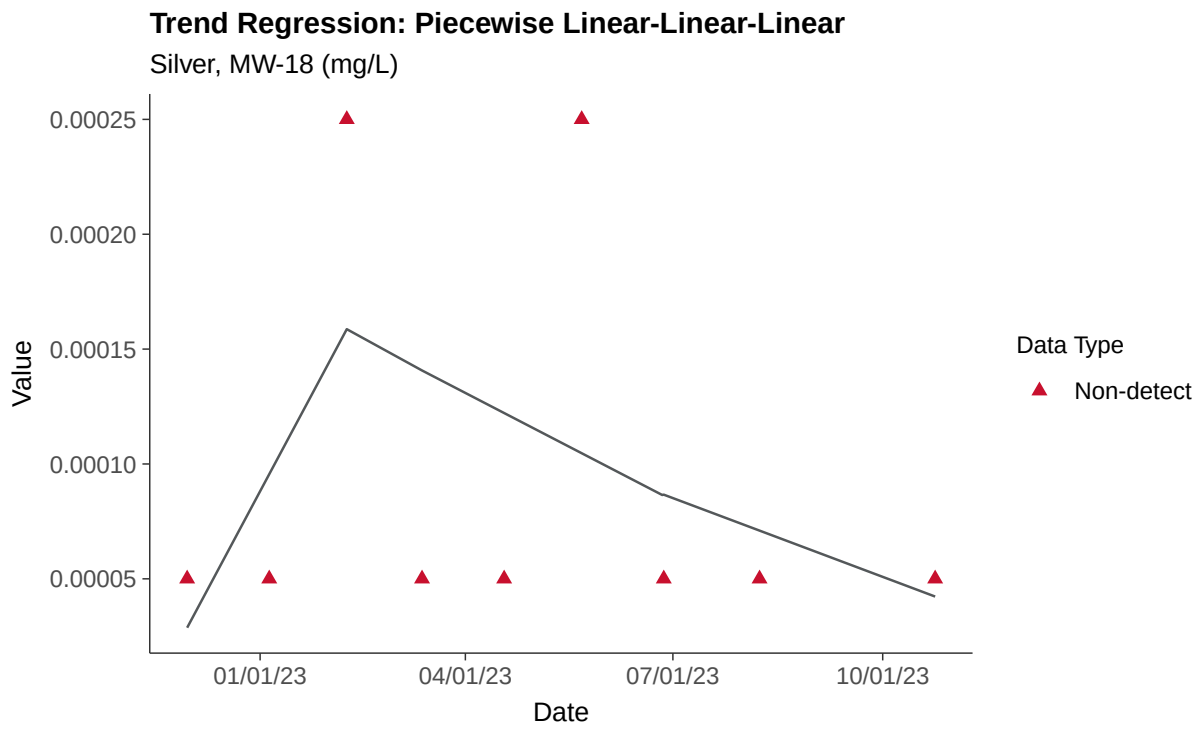


Boxplot by Season

Silver, MW-18 (mg/L)

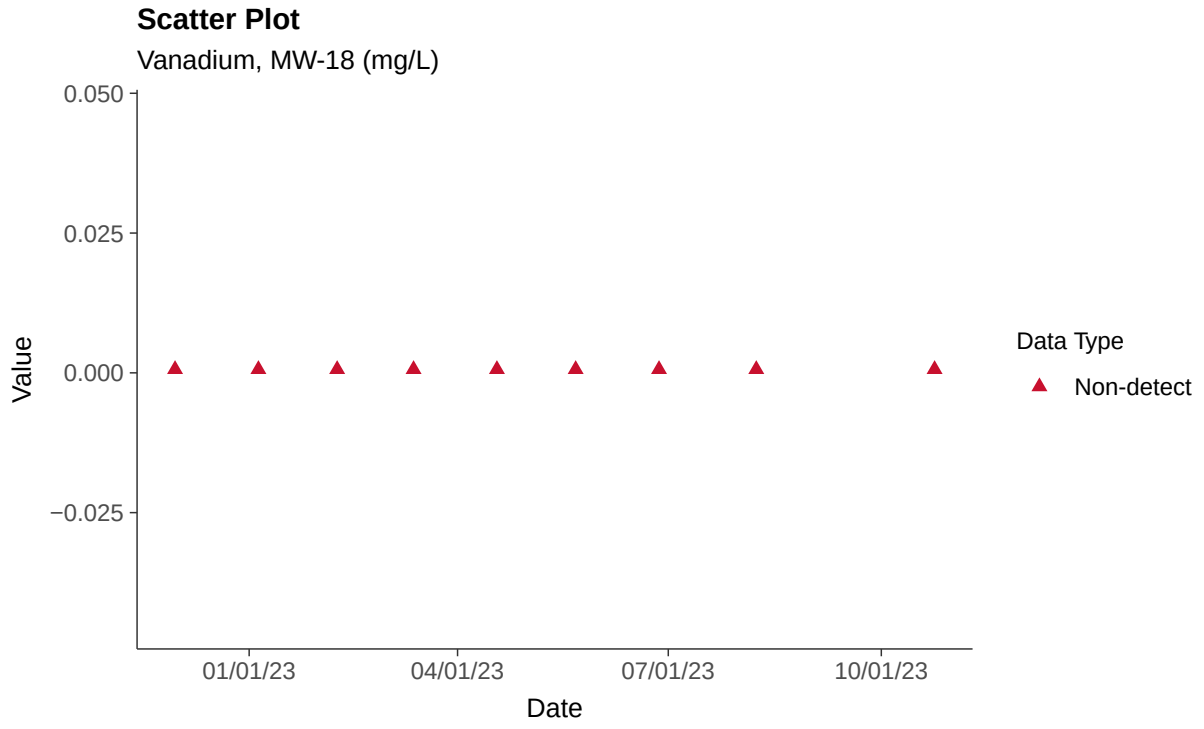


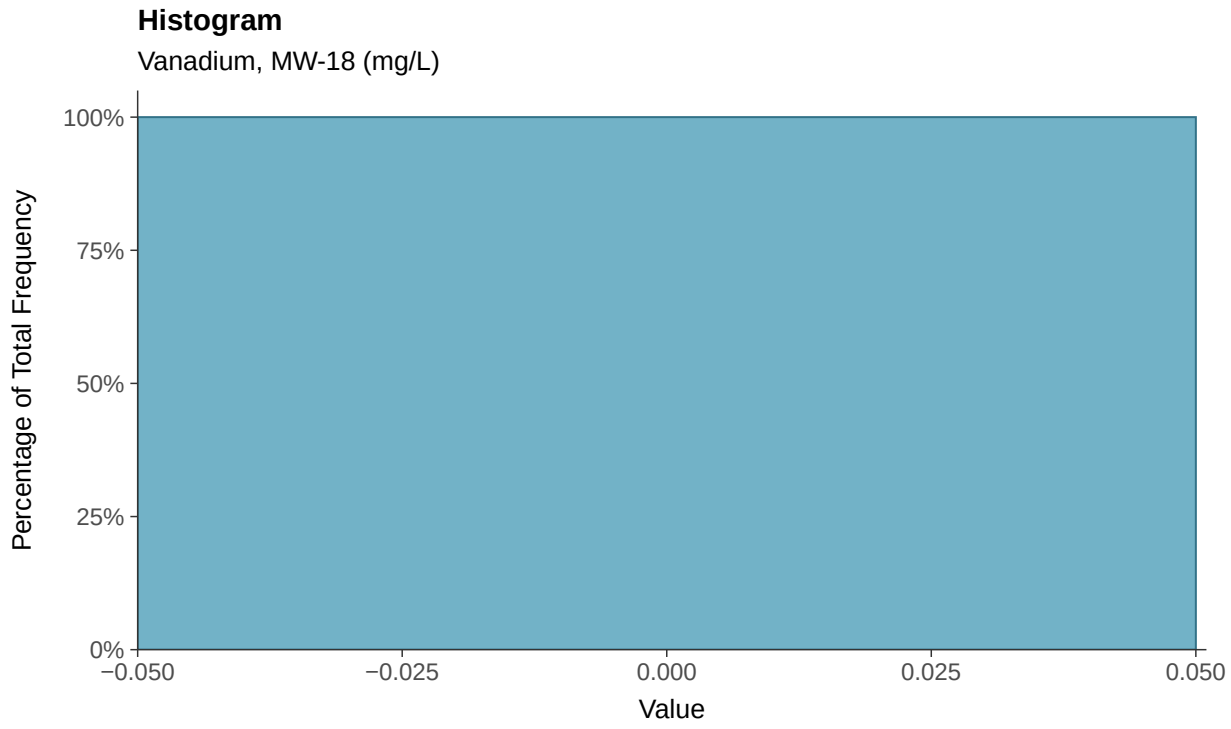

Trend Regression: Piecewise Linear-Linear
Silver, MW-18 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-18 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-18

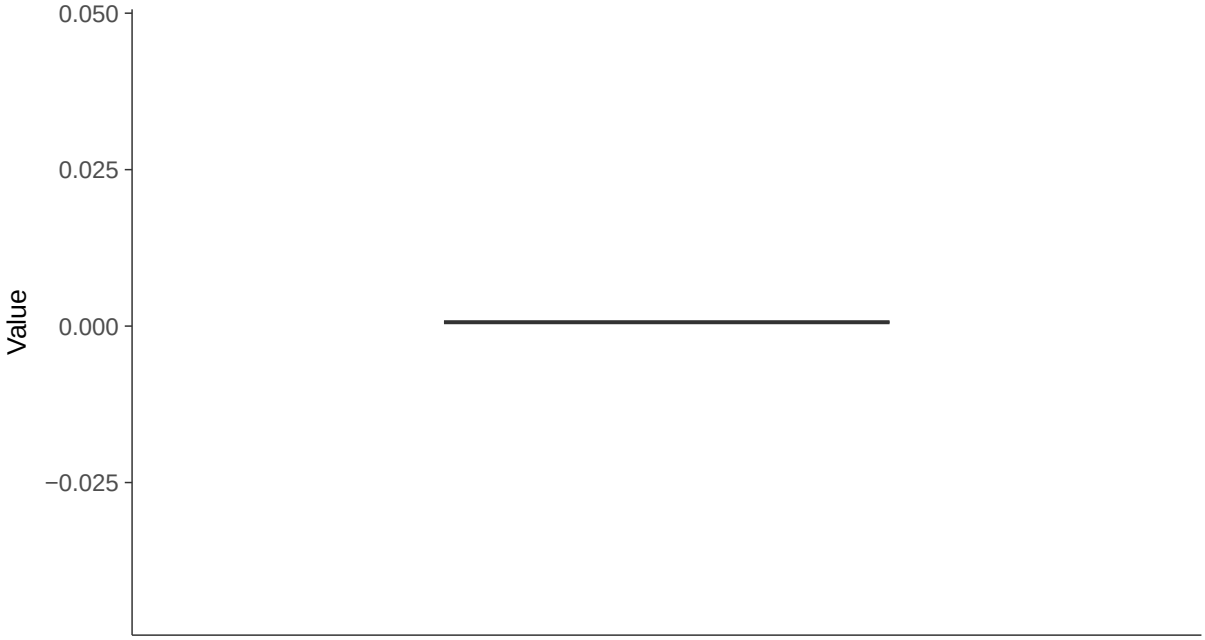
ID: 1_22_6_129





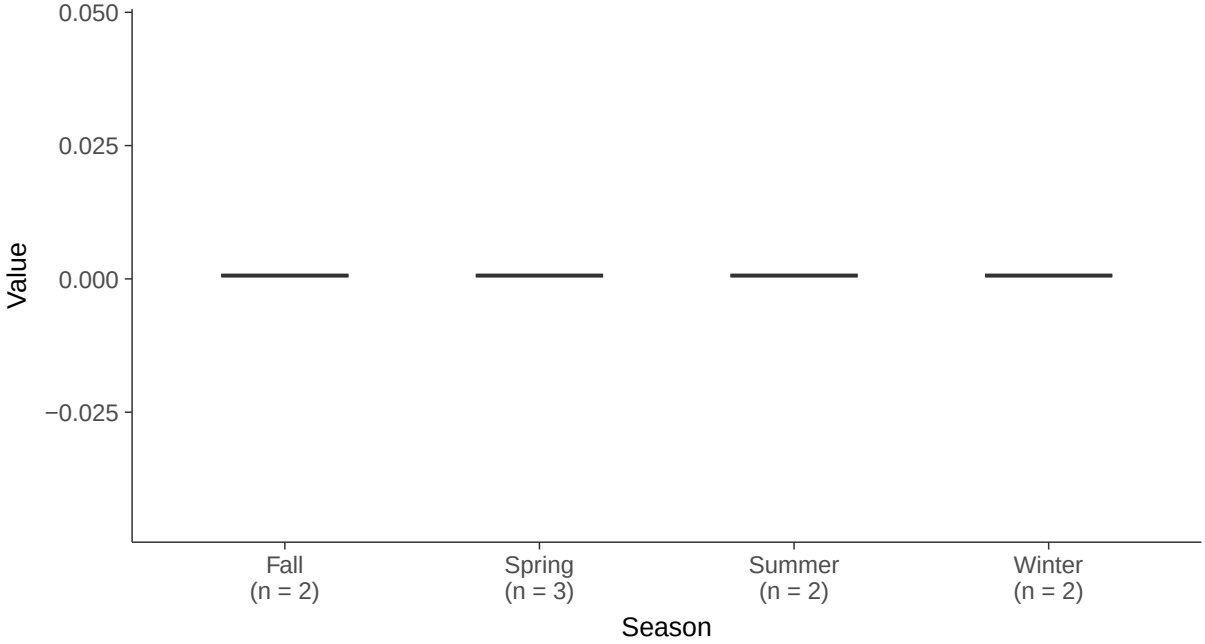
Boxplot

Vanadium, MW-18 (mg/L)



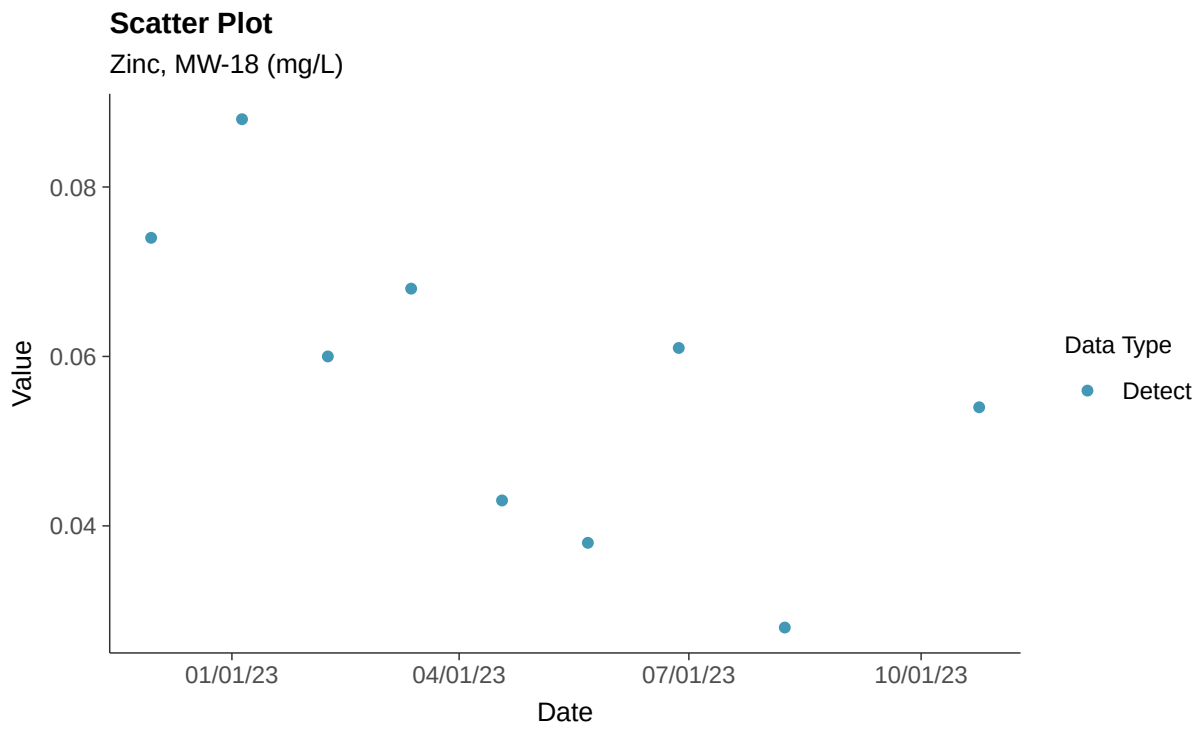
Boxplot by Season

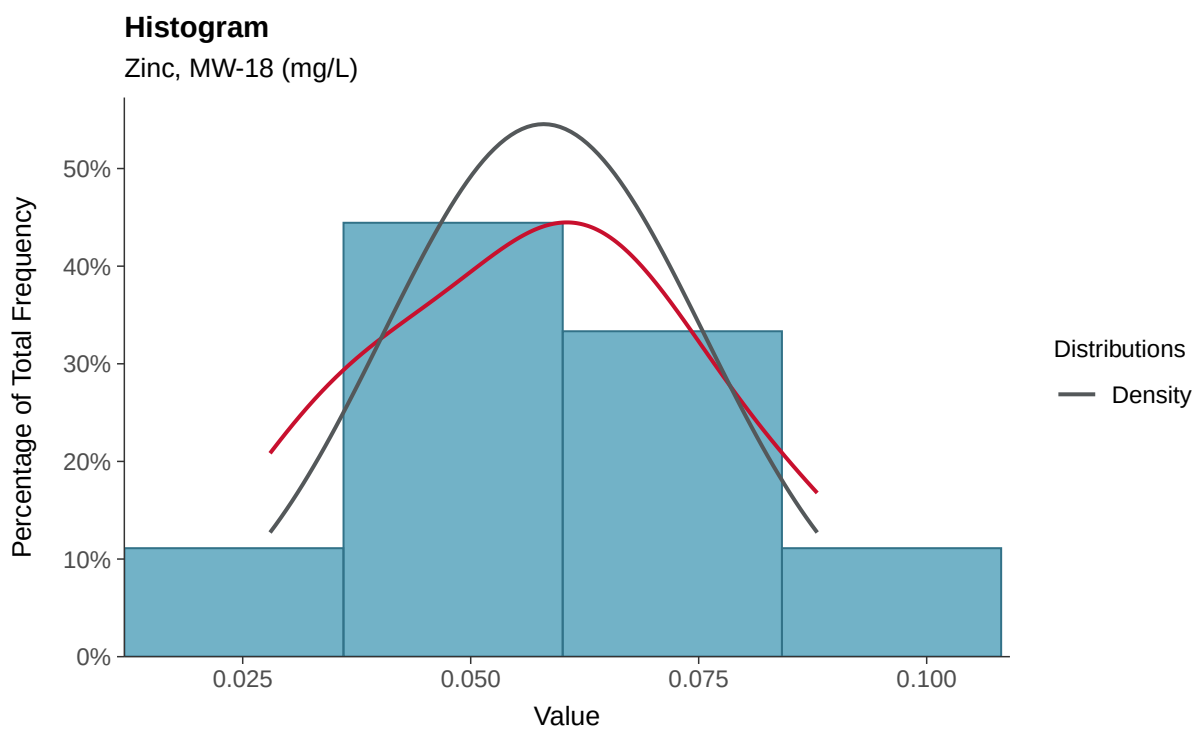
Vanadium, MW-18 (mg/L)



Part 115: Zinc, MW-18

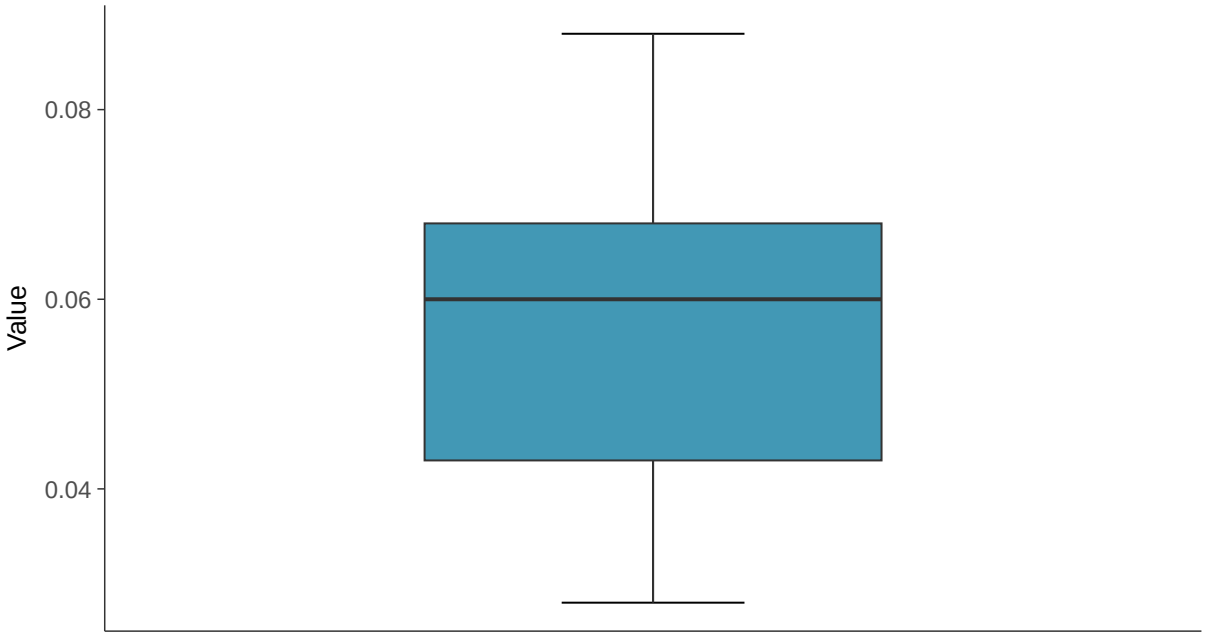
ID: 1_22_6_130





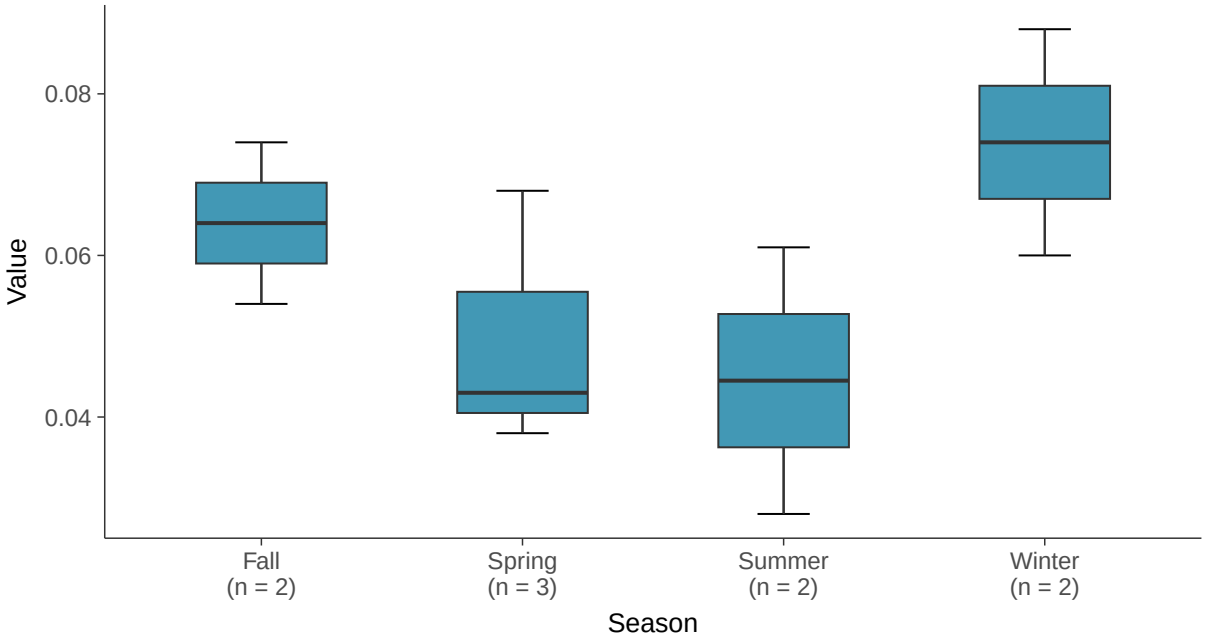
Boxplot

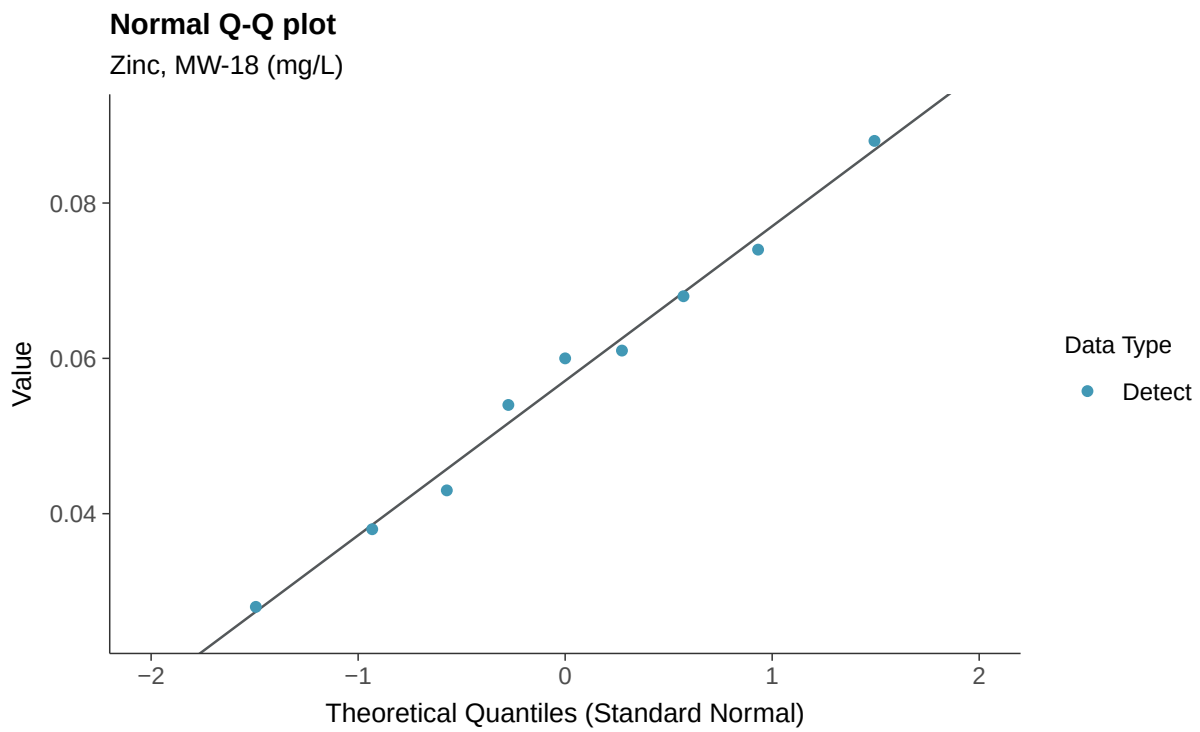
Zinc, MW-18 (mg/L)

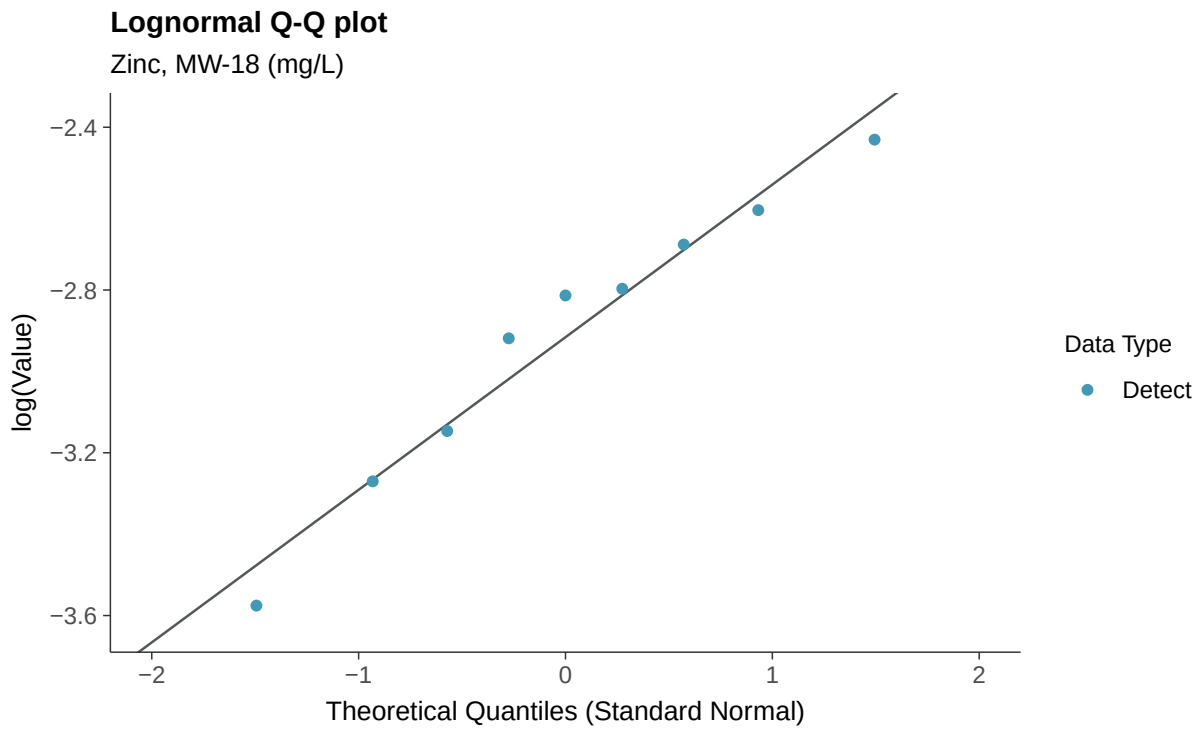


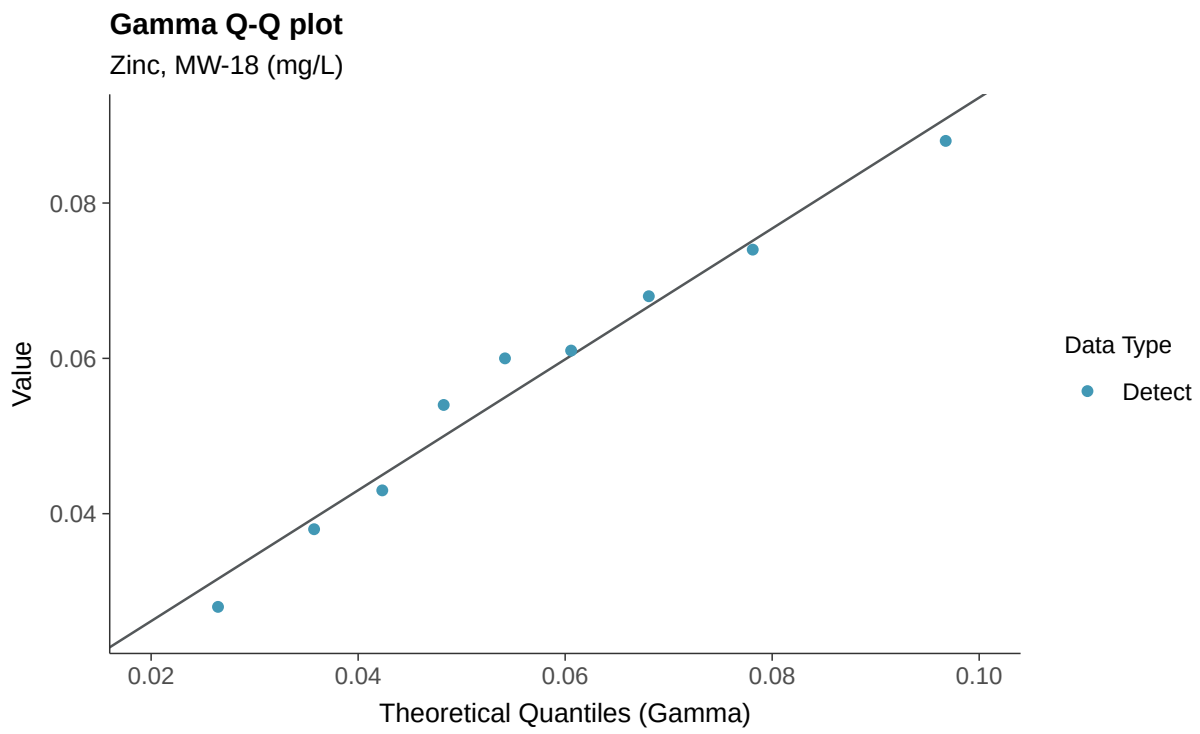
Boxplot by Season

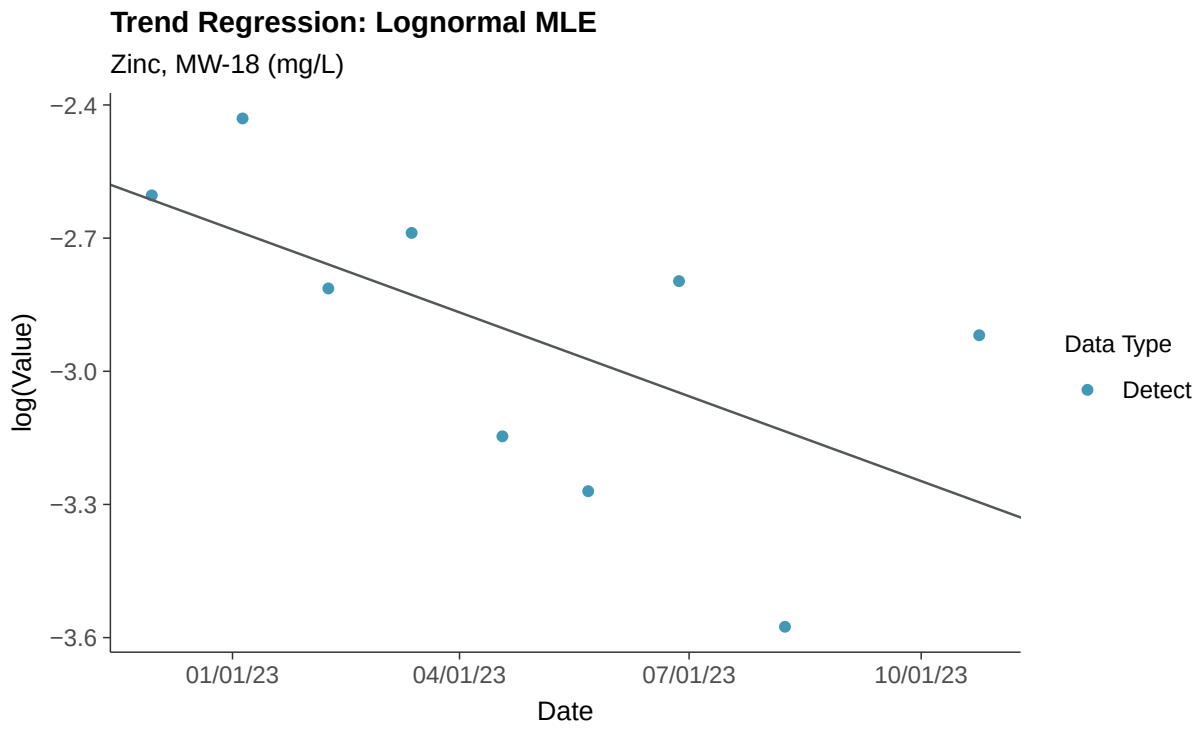
Zinc, MW-18 (mg/L)




Normal Q-Q plot
Zinc, MW-18 (mg/L)
Value
0.08
0.06
0.04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

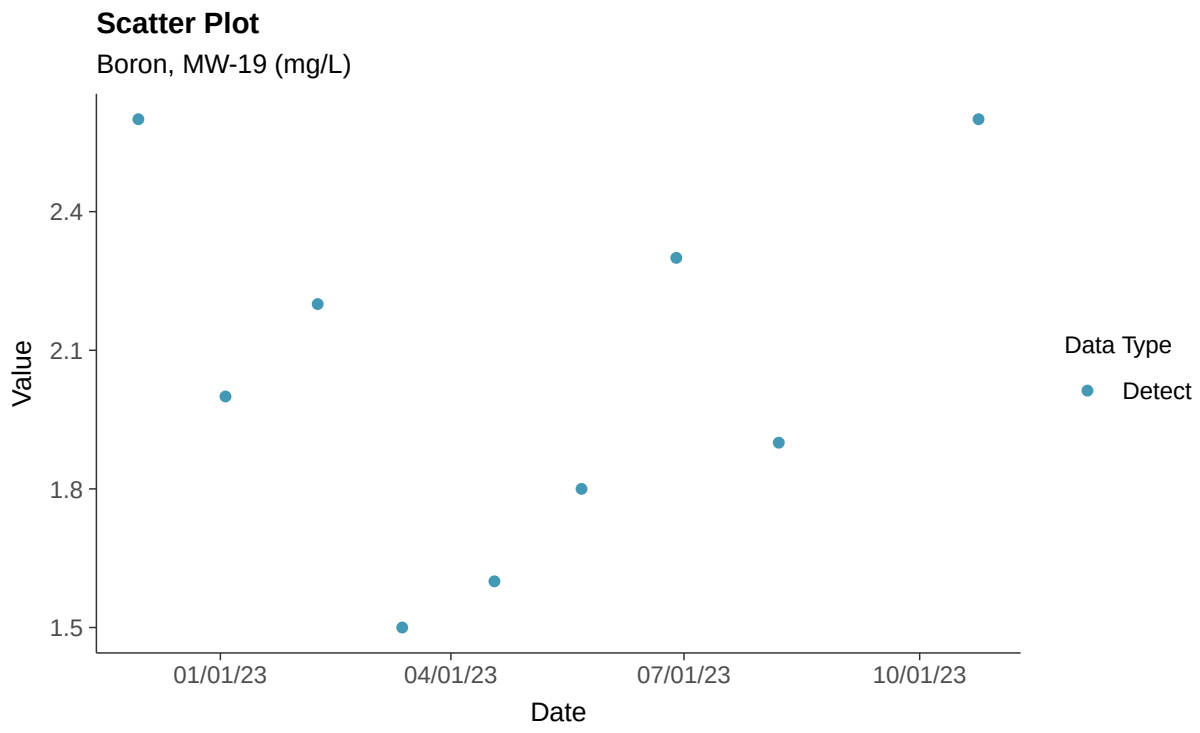

Lognormal Q-Q plot
Zinc, MW-18 (mg/L)
log(Value)
−2.4
−2.8
−3.2
−3.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

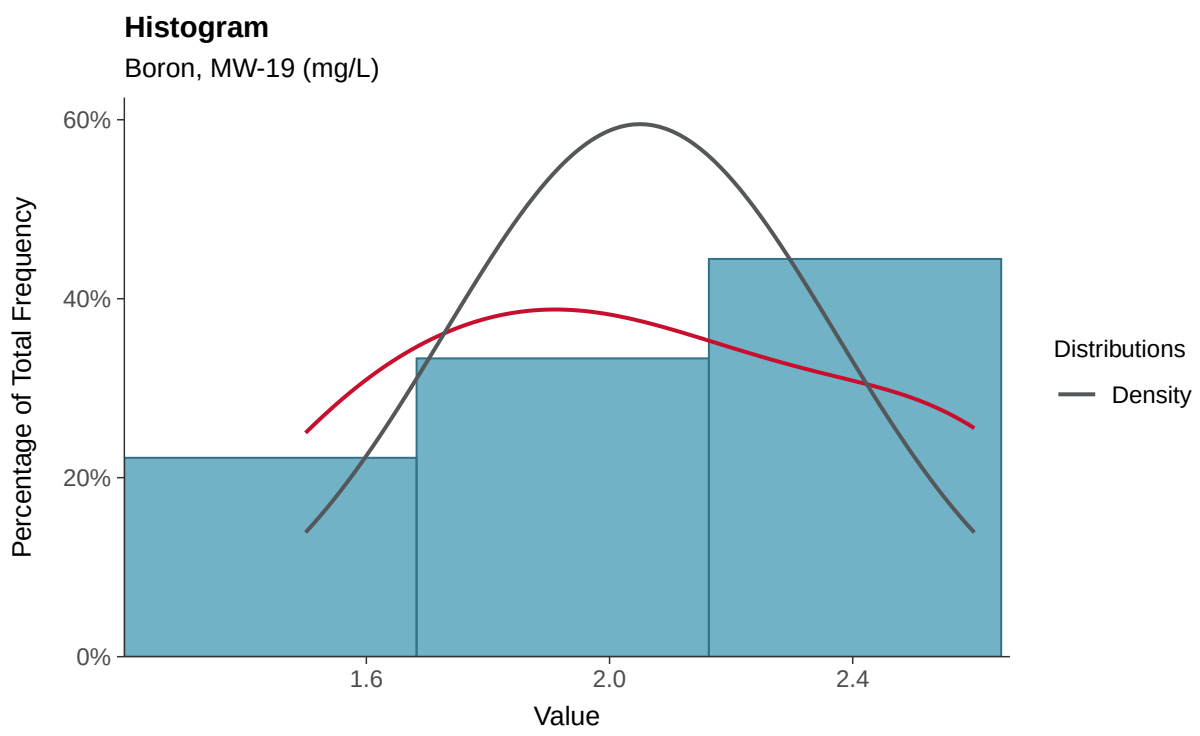

Gamma Q-Q plot
Zinc, MW-18 (mg/L)
Value
0.08
0.06
0.04
0.02
0.04
0.06
0.08
0.10
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Zinc, MW-18 (mg/L)
log(Value)
−2.4
−2.7
−3.0
−3.3
−3.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Boron, MW-19

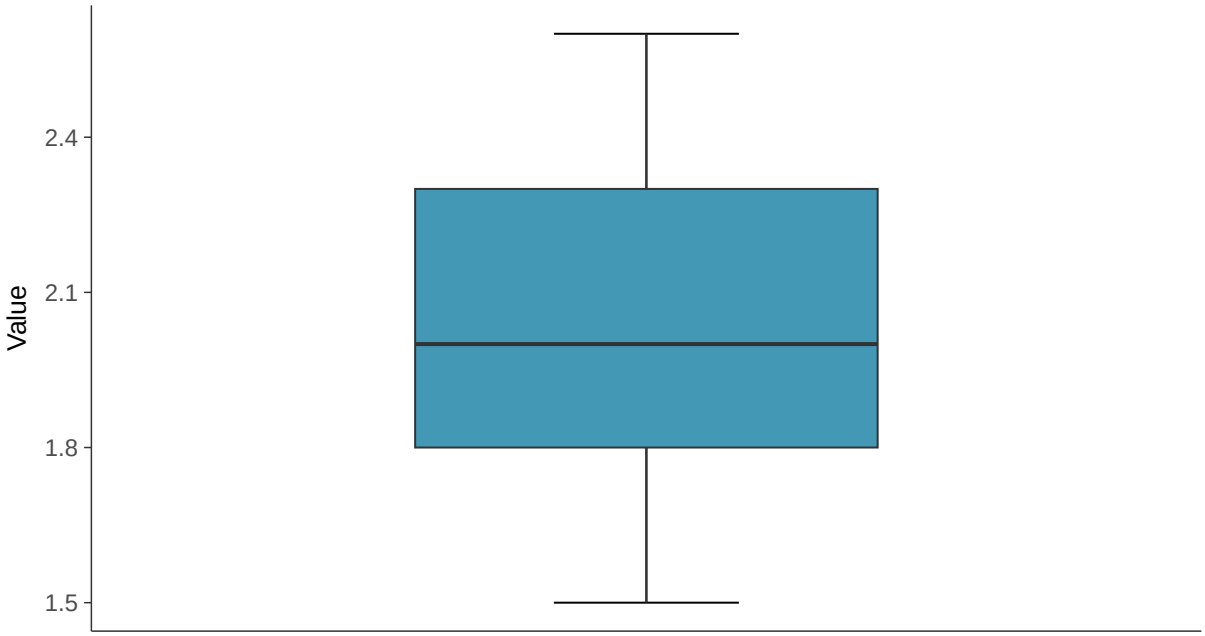
ID: 1_23_4_105





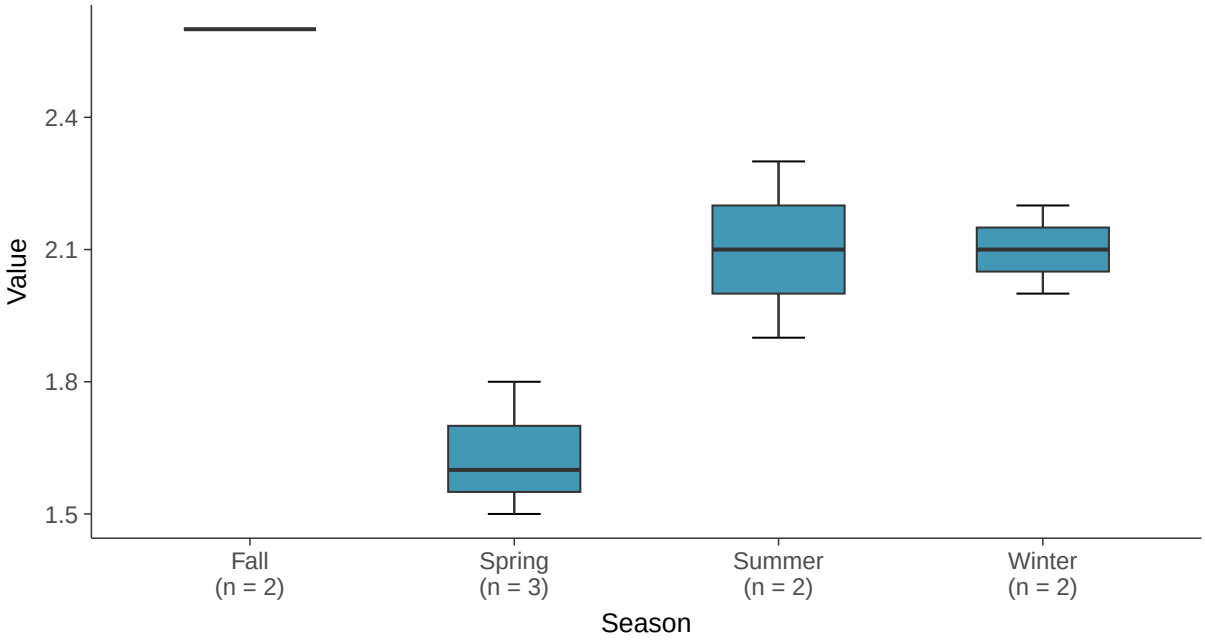
Boxplot

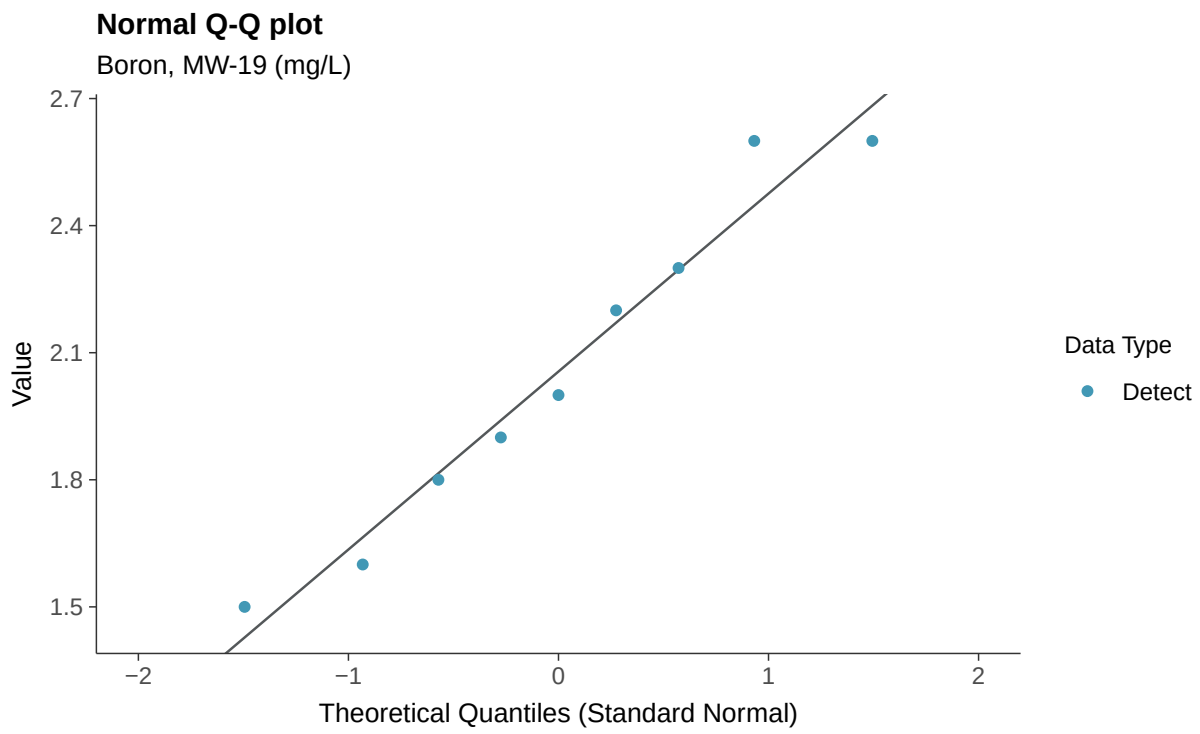
Boron, MW-19 (mg/L)

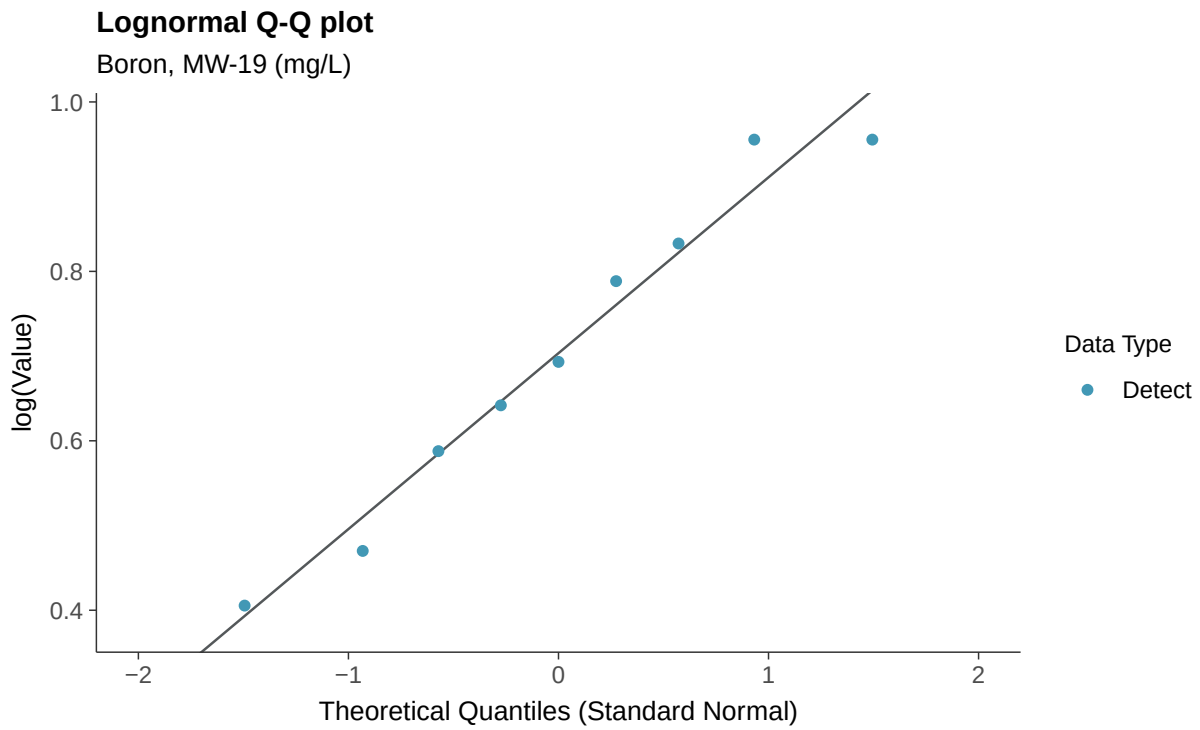


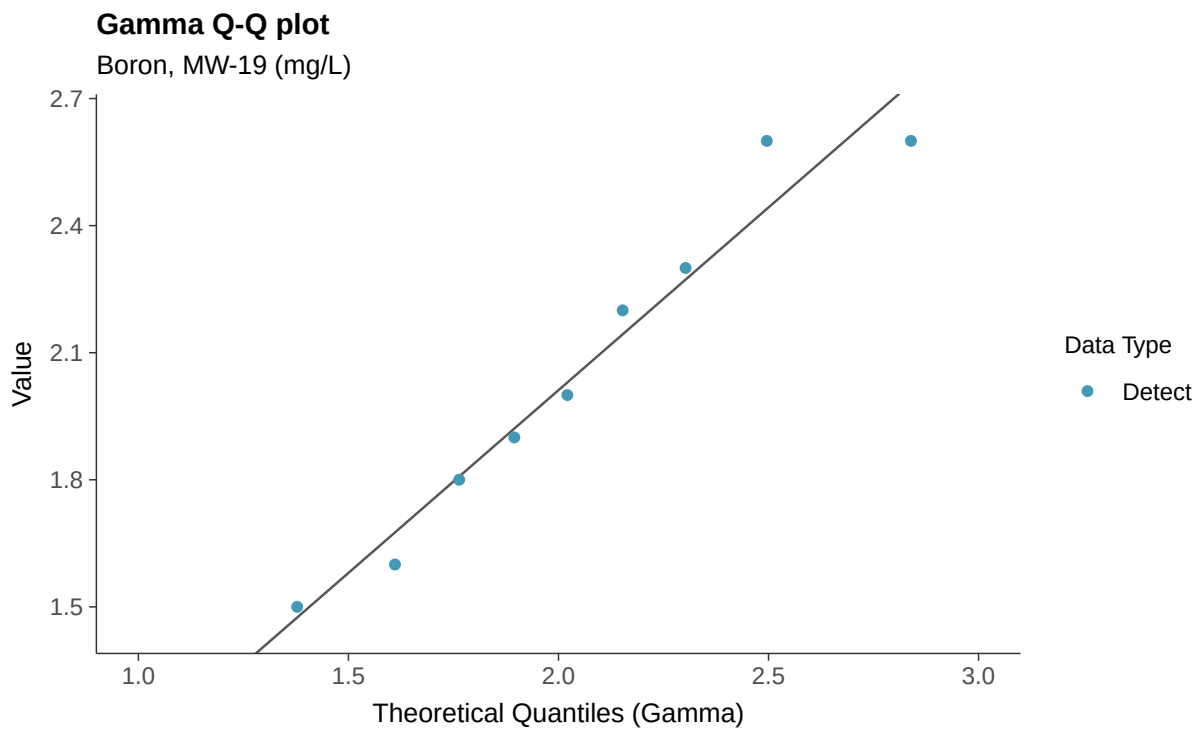
Boxplot by Season

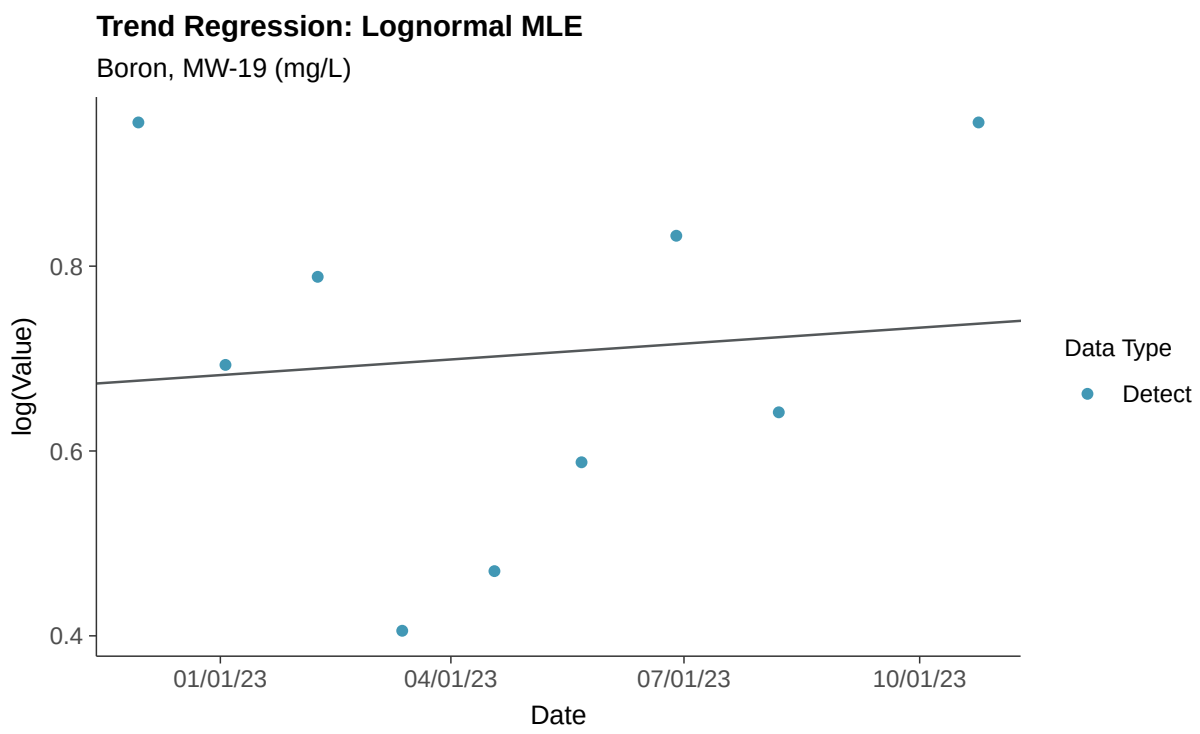
Boron, MW-19 (mg/L)

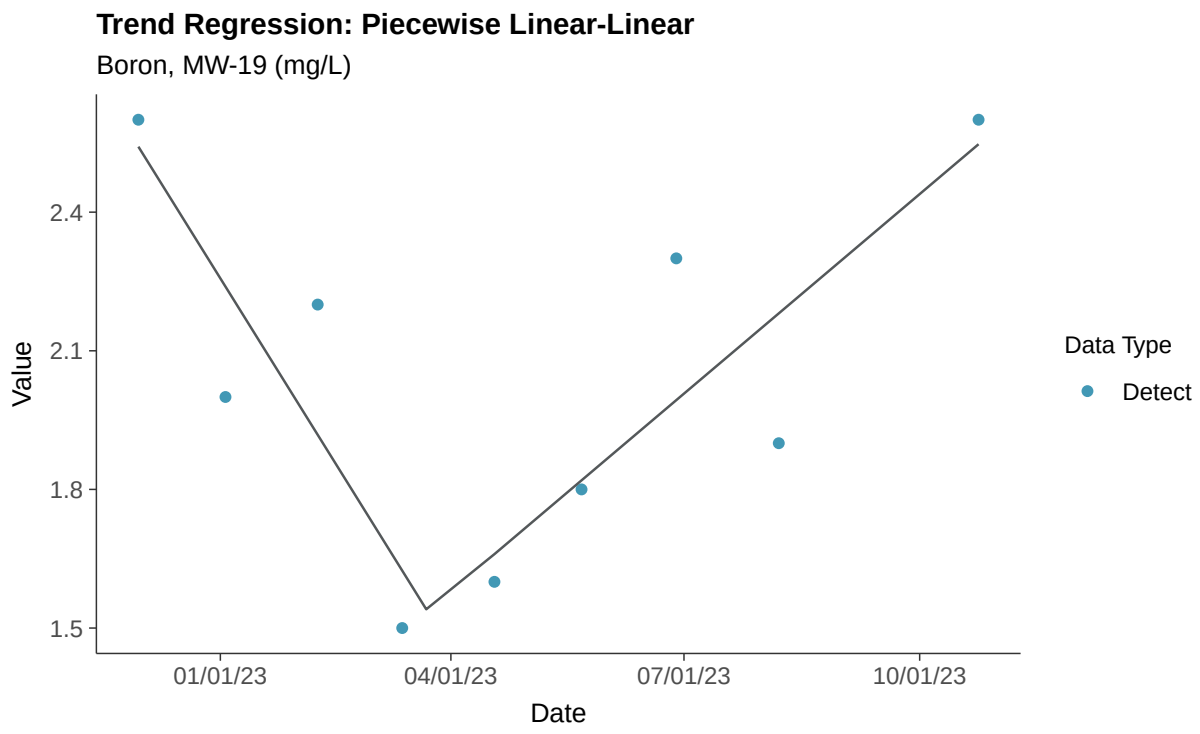



Normal Q-Q plot
Boron, MW-19 (mg/L)
Value
2.7
2.4
2.1
1.8
1.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-19 (mg/L)
log(Value)
1.0
0.8
0.6
0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

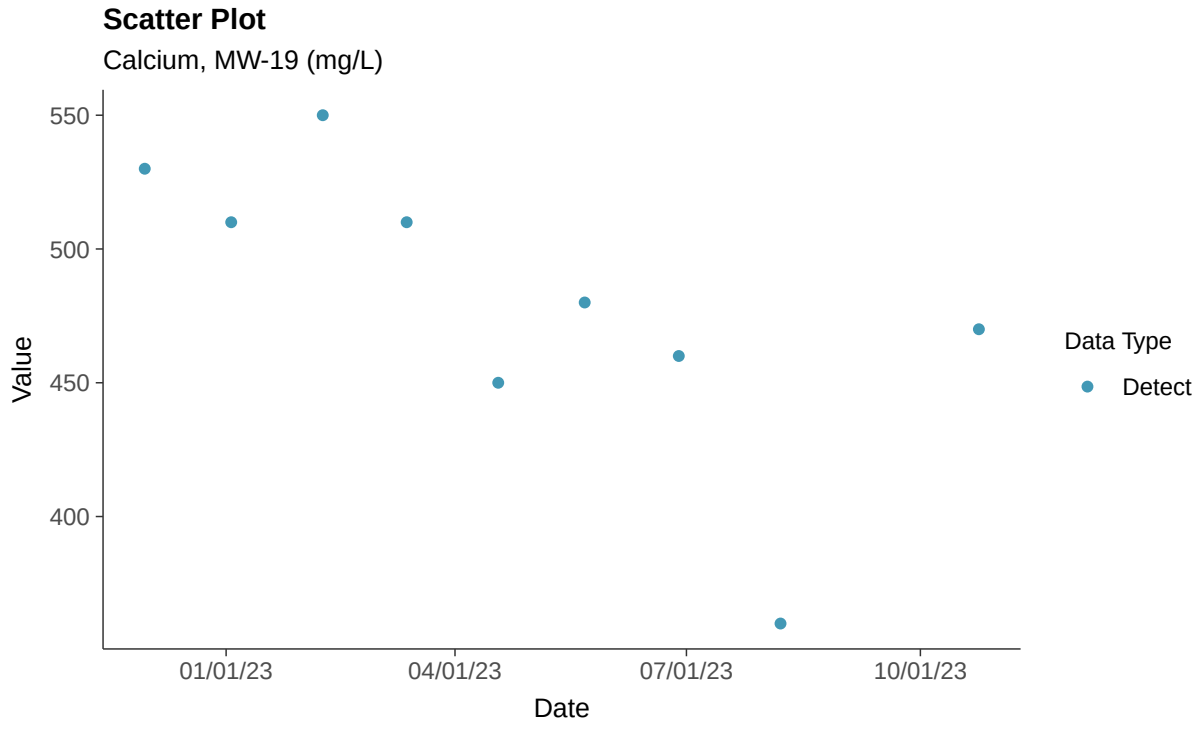

Gamma Q-Q plot
Boron, MW-19 (mg/L)
Value
2.7
2.4
2.1
1.8
1.5
1.0
1.5
2.0
2.5
3.0
Theoretical Quantiles (Gamma)
Data Type
Detect

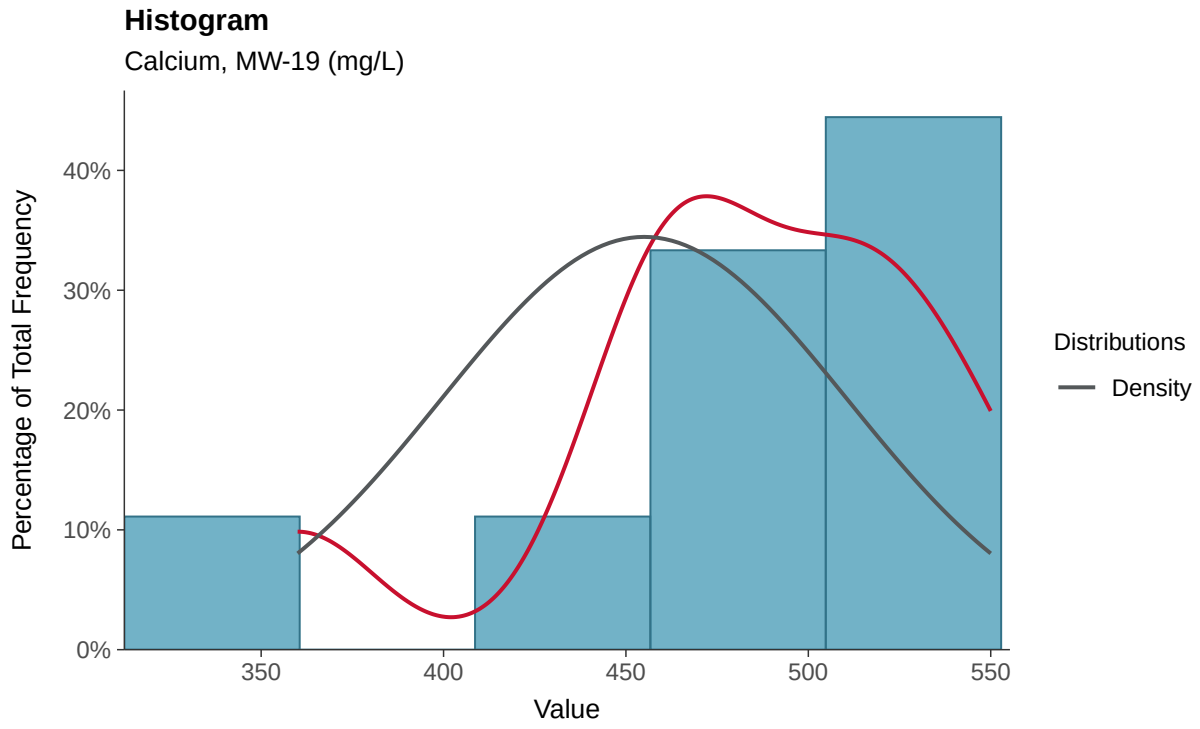

Trend Regression: Lognormal MLE
Boron, MW-19 (mg/L)
log(Value)
0.8
0.6
0.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Boron, MW-19 (mg/L)
Value
2.4
2.1
1.8
1.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-19

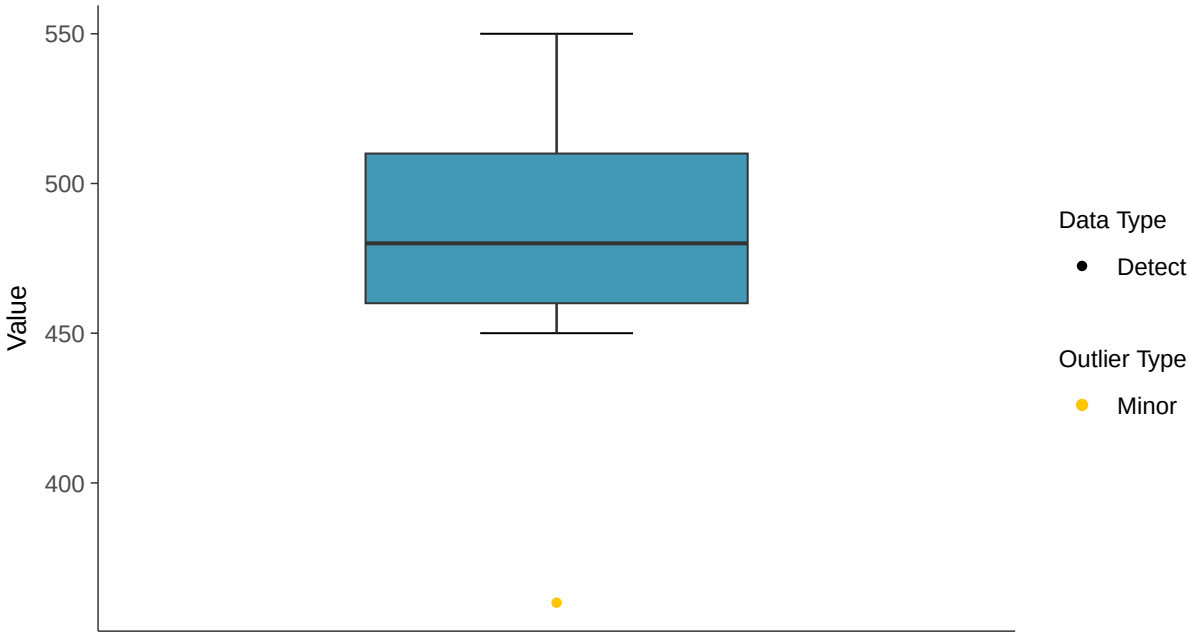
ID: 1_23_4_107





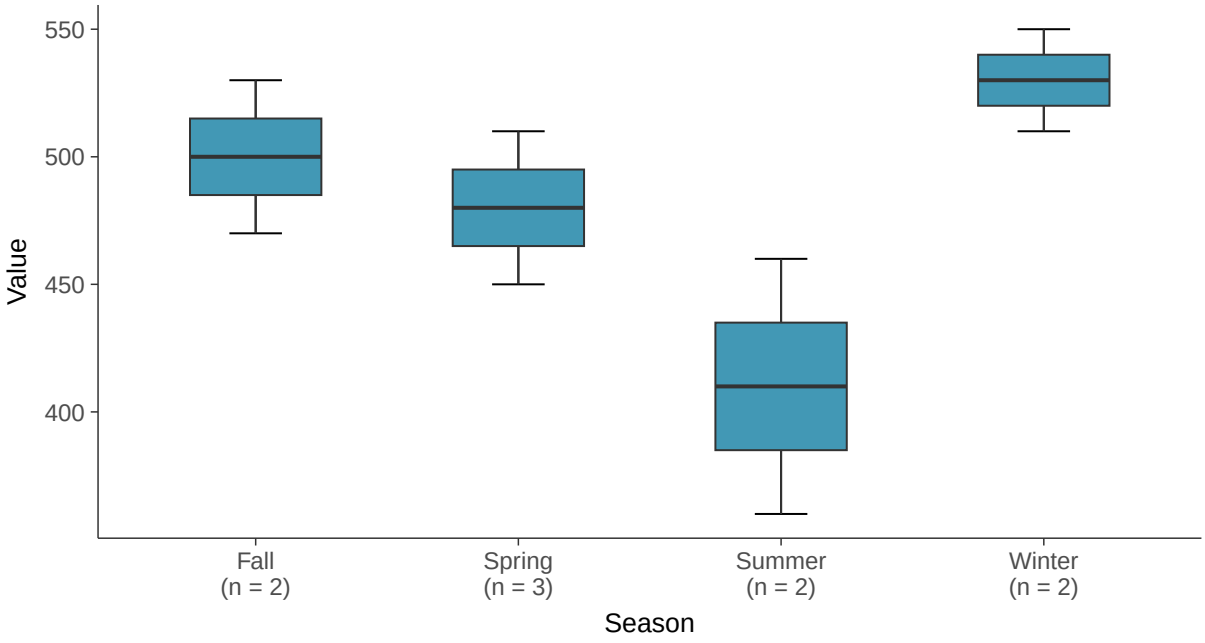
Boxplot

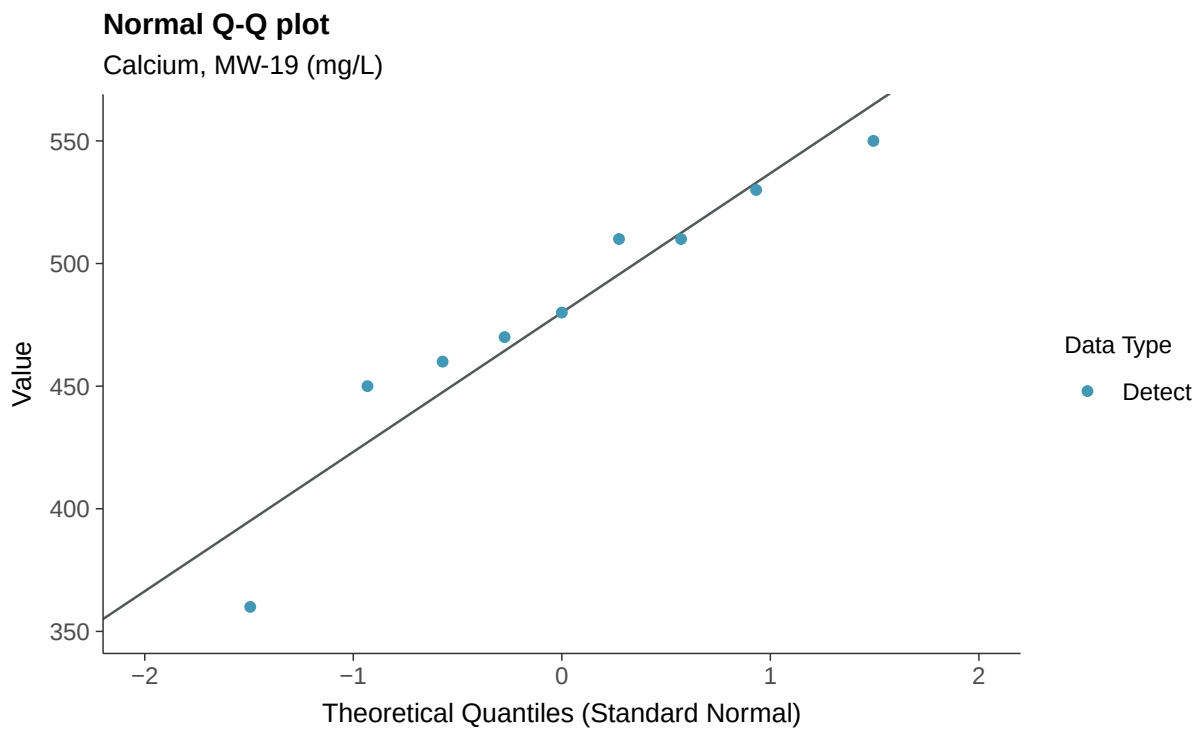
Calcium, MW-19 (mg/L)

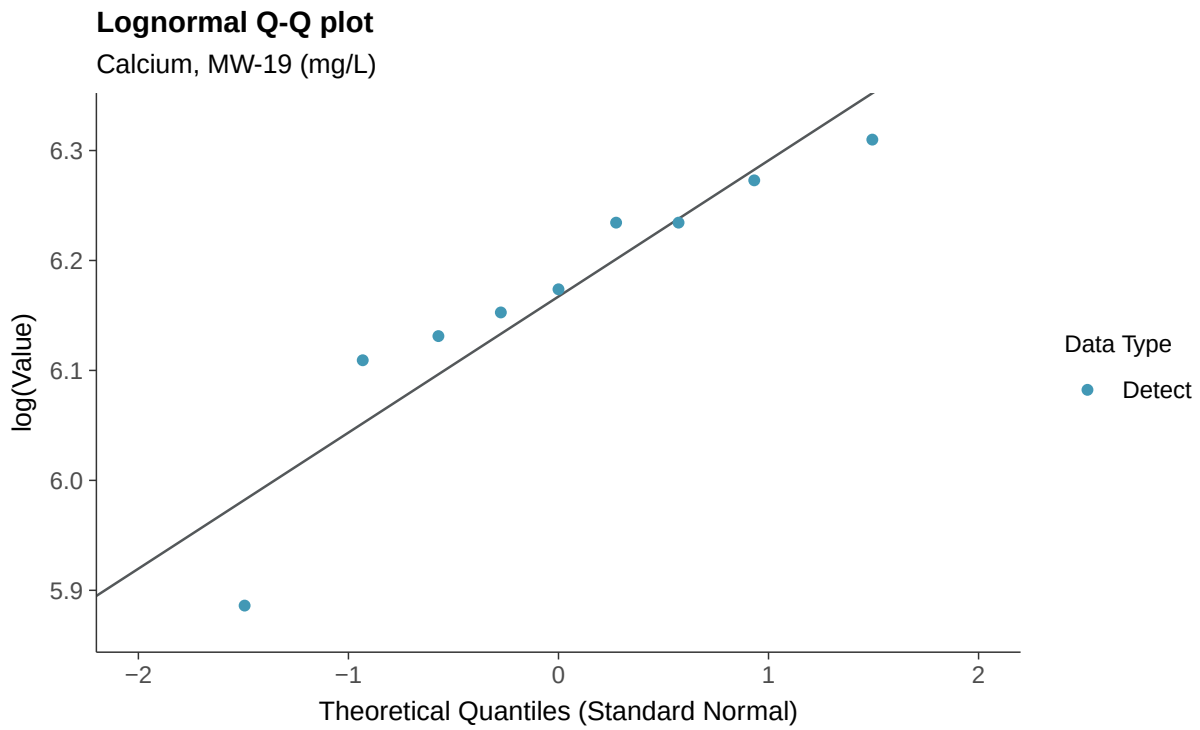


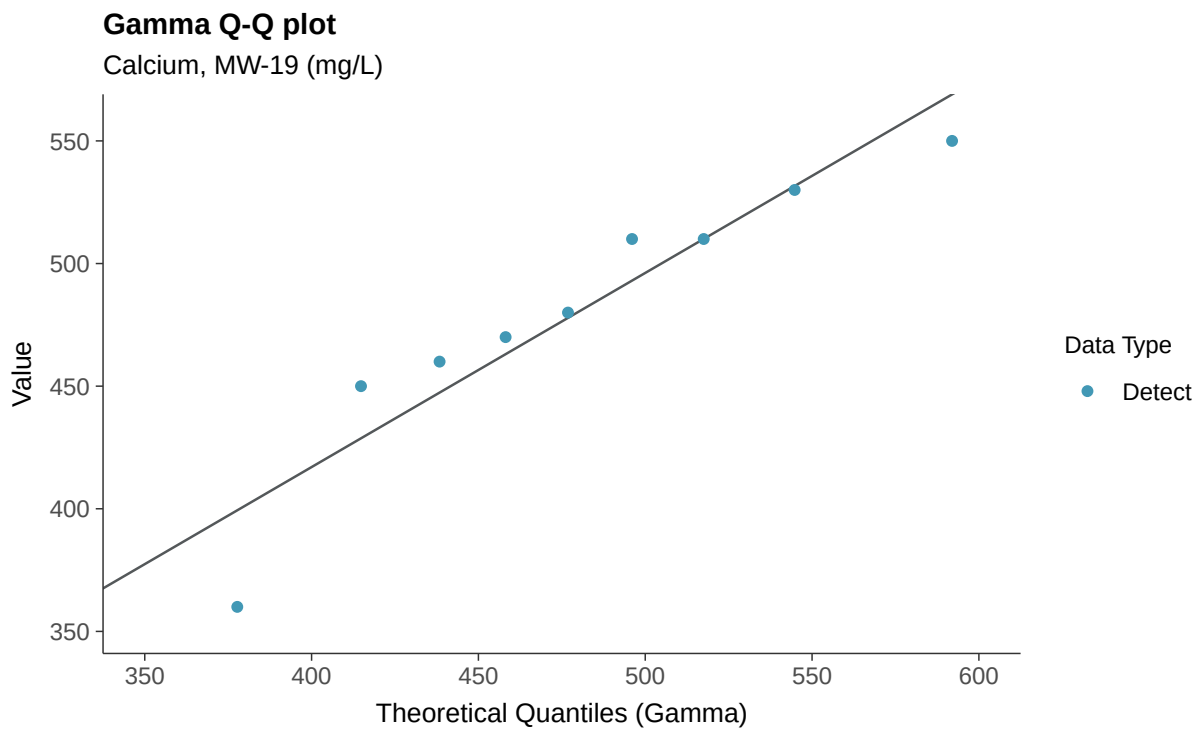
Boxplot by Season

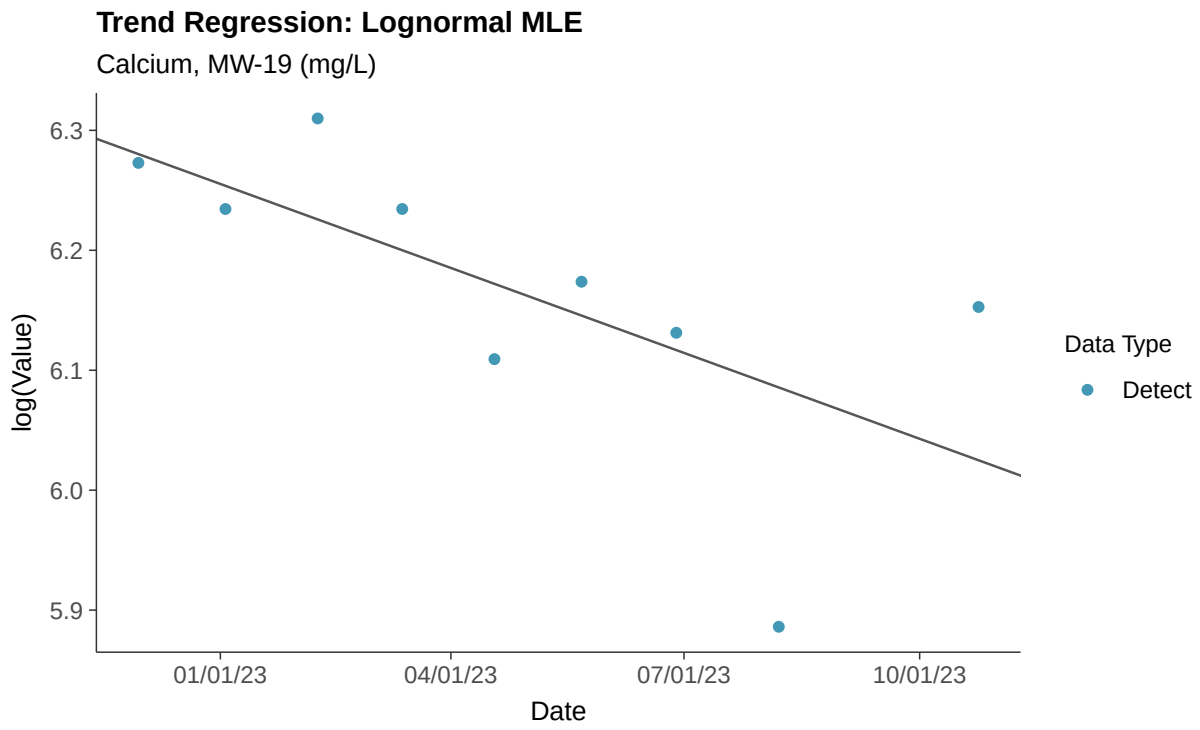
Calcium, MW-19 (mg/L)




Normal Q-Q plot
Calcium, MW-19 (mg/L)
Value
550
500
450
400
350
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

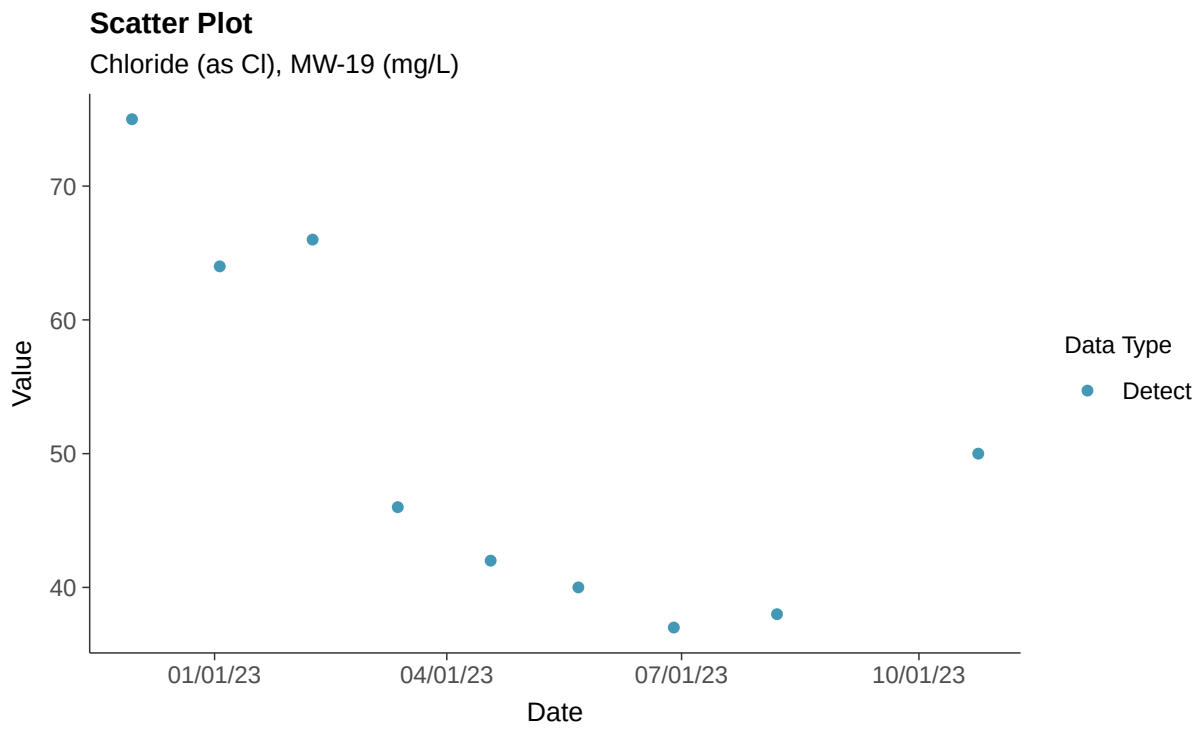

Lognormal Q-Q plot
Calcium, MW-19 (mg/L)
log(Value)
6.3
6.2
6.1
6.0
5.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

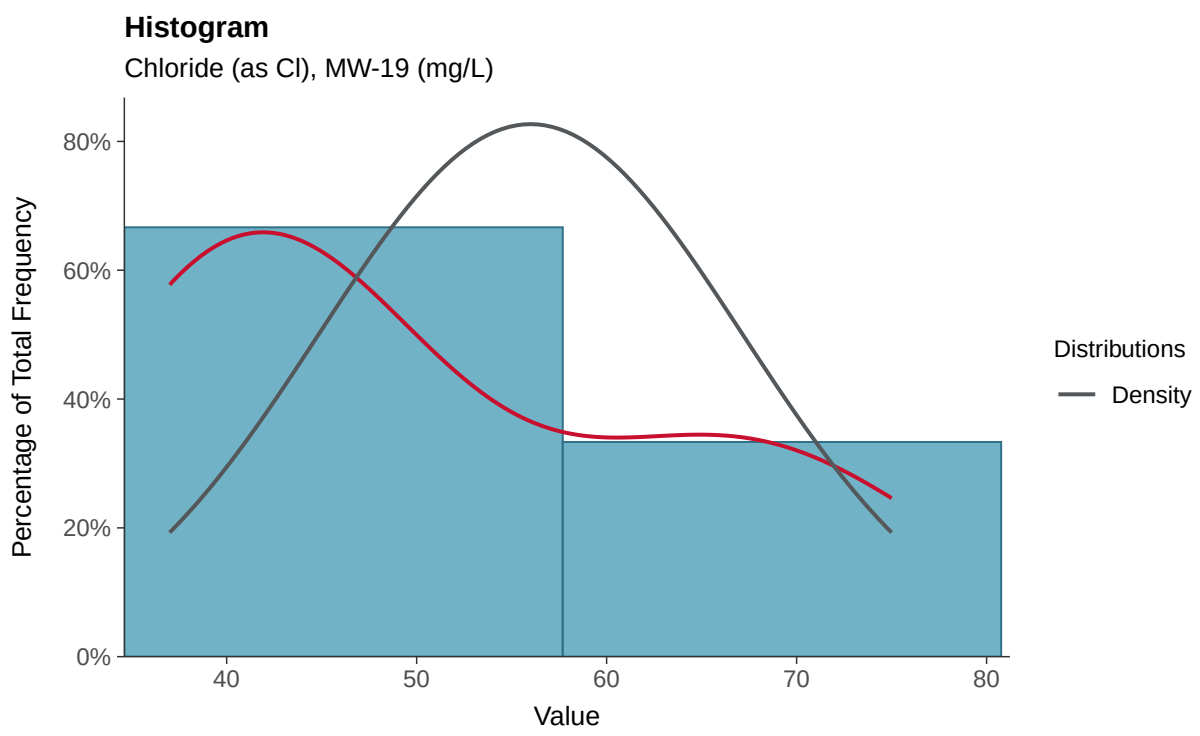

Gamma Q-Q plot
Calcium, MW-19 (mg/L)
Value
550
500
450
400
350
350
400
450
500
550
600
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-19 (mg/L)
log(Value)
6.3
6.2
6.1
6.0
5.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-19

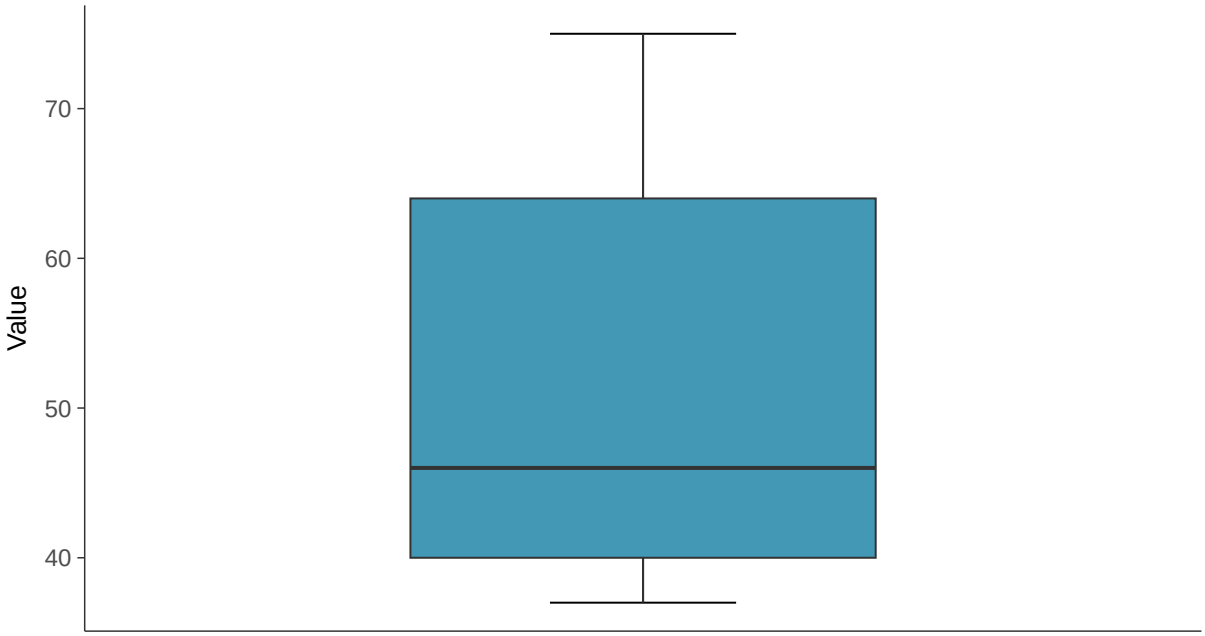
ID: 1_23_4_108





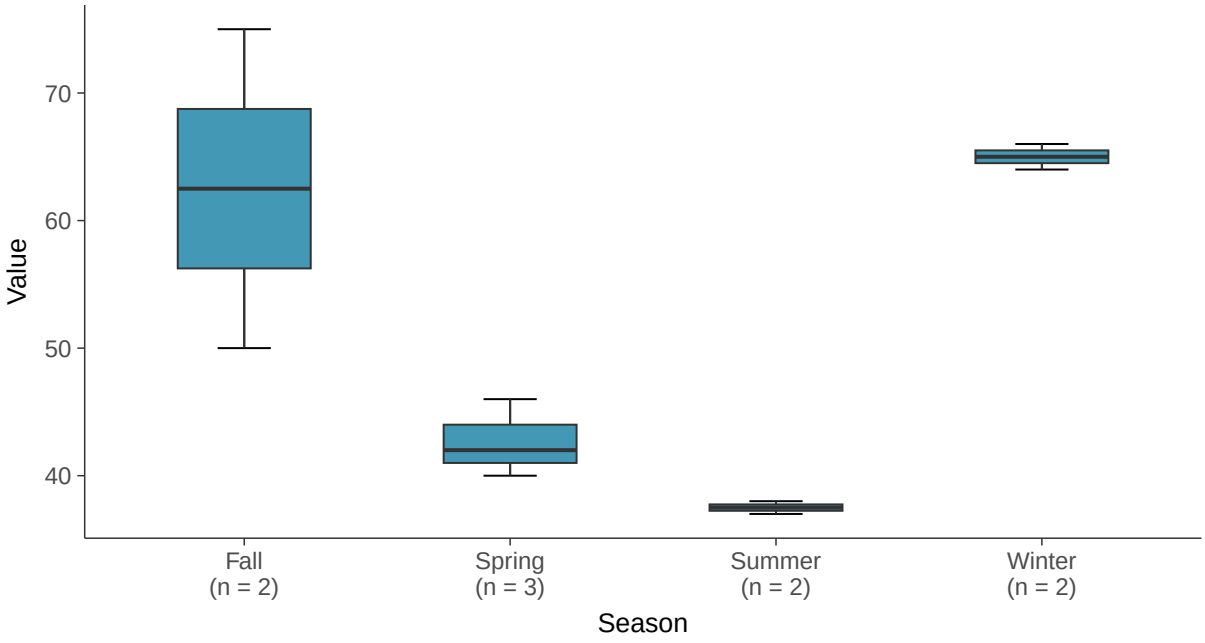
Boxplot

Chloride (as Cl), MW-19 (mg/L)



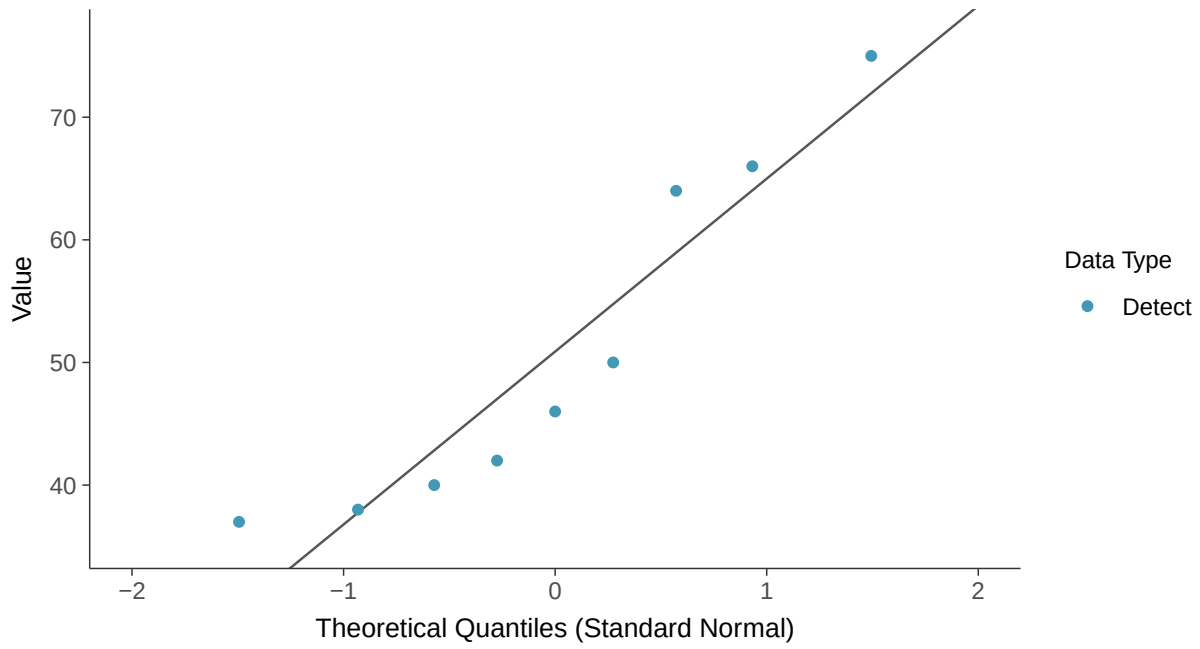
Boxplot by Season

Chloride (as Cl), MW-19 (mg/L)



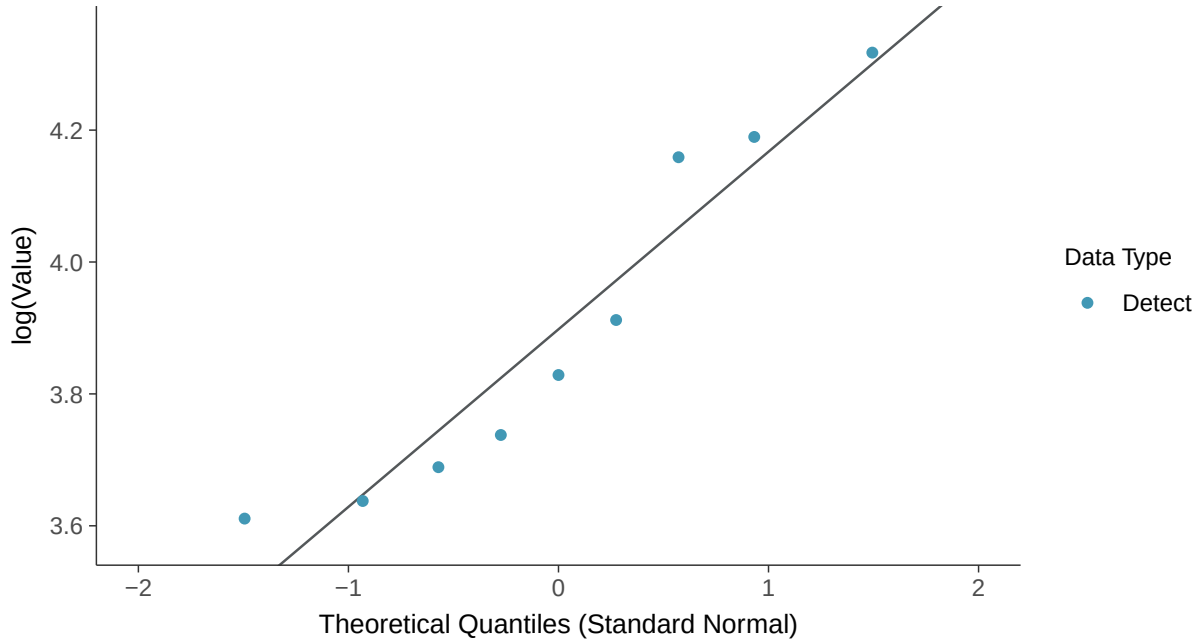
Normal Q-Q plot

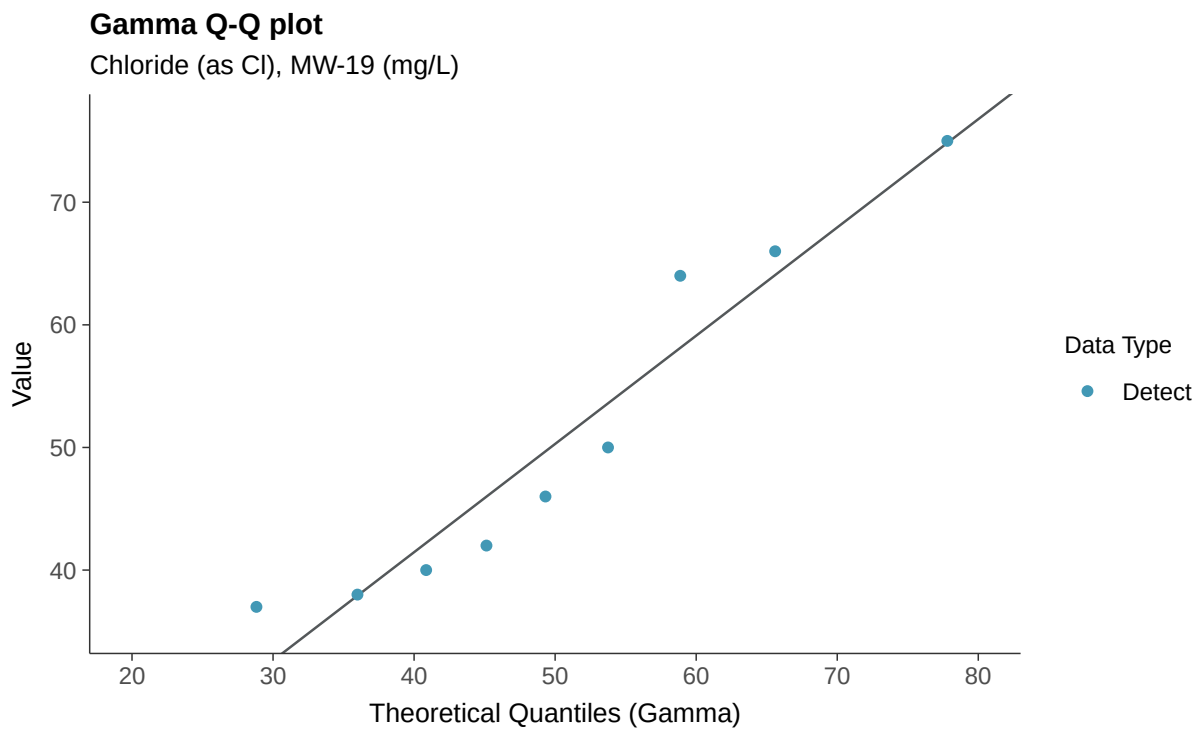
Chloride (as Cl), MW-19 (mg/L)

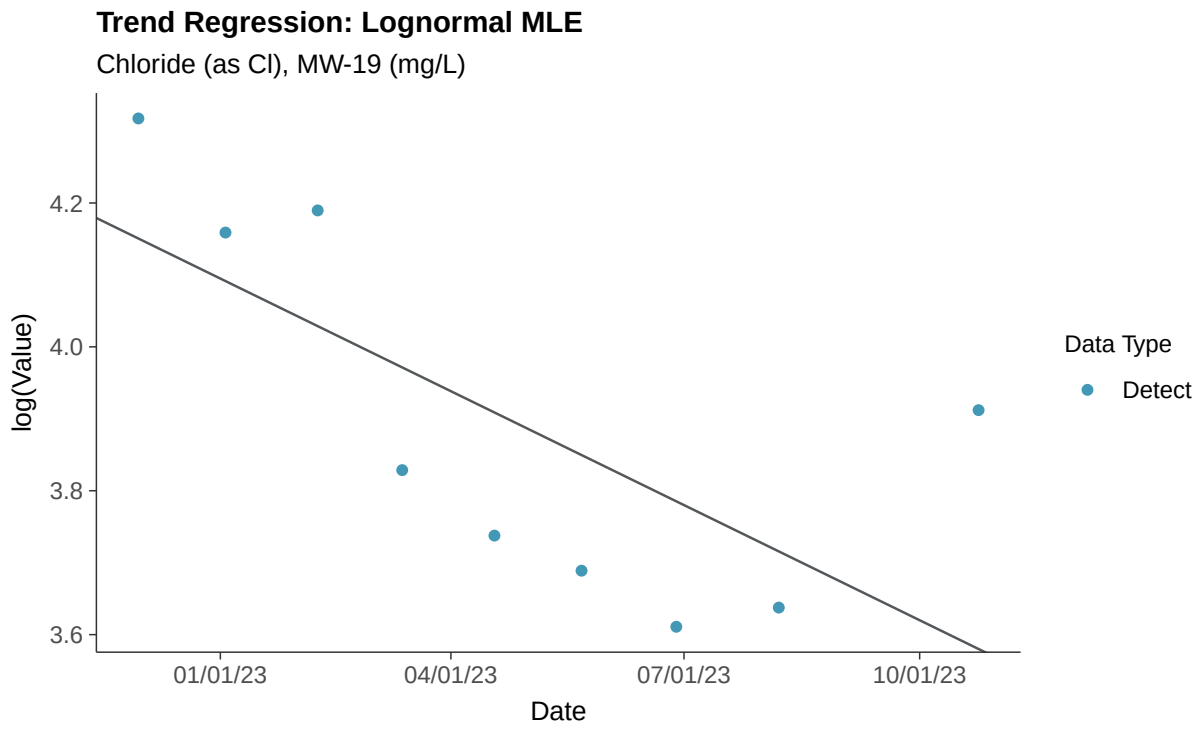


Lognormal Q-Q plot

Chloride (as Cl), MW-19 (mg/L)

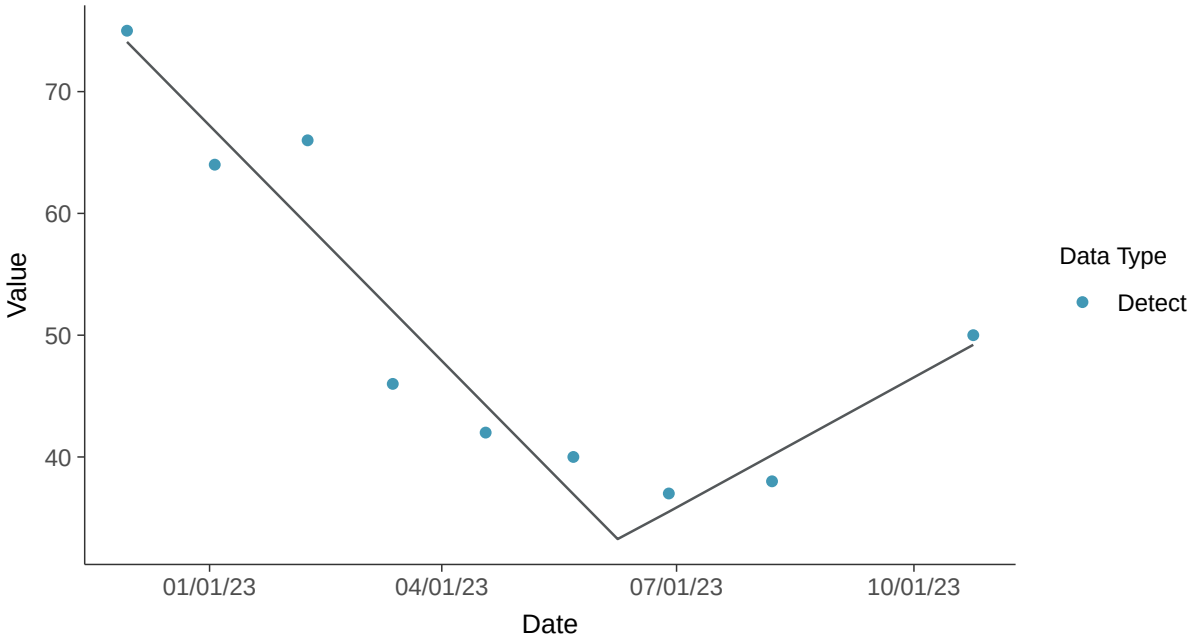



Gamma Q-Q plot
Chloride (as Cl), MW-19 (mg/L)
Value
70
60
50
40
20
30
40
50
60
70
80
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chloride (as Cl), MW-19 (mg/L)
log(Value)
4.2
4.0
3.8
3.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

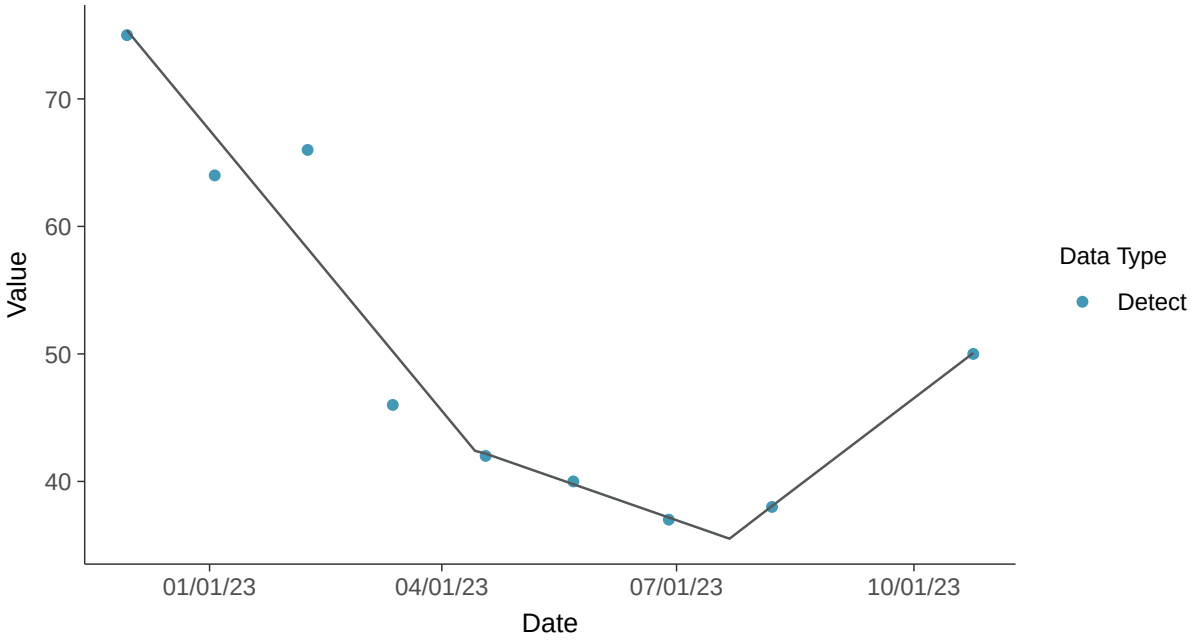
Trend Regression: Piecewise Linear-Linear

Chloride (as Cl), MW-19 (mg/L)



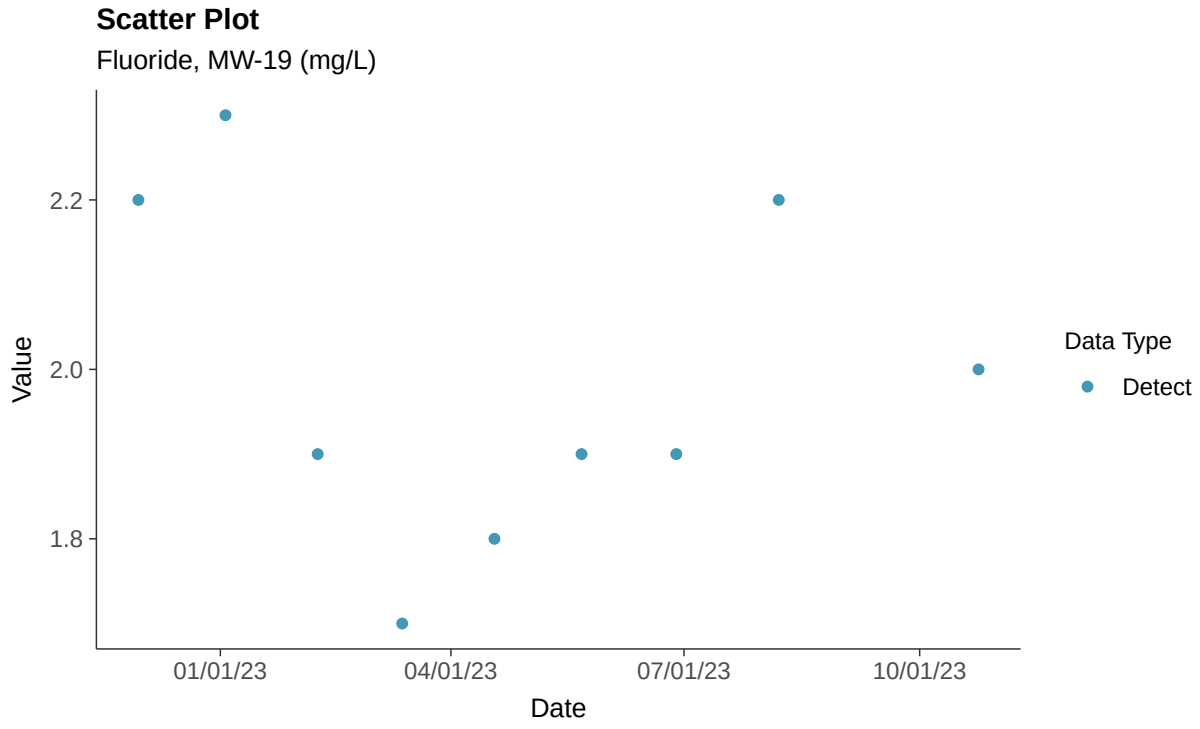
Trend Regression: Piecewise Linear-Linear-Linear

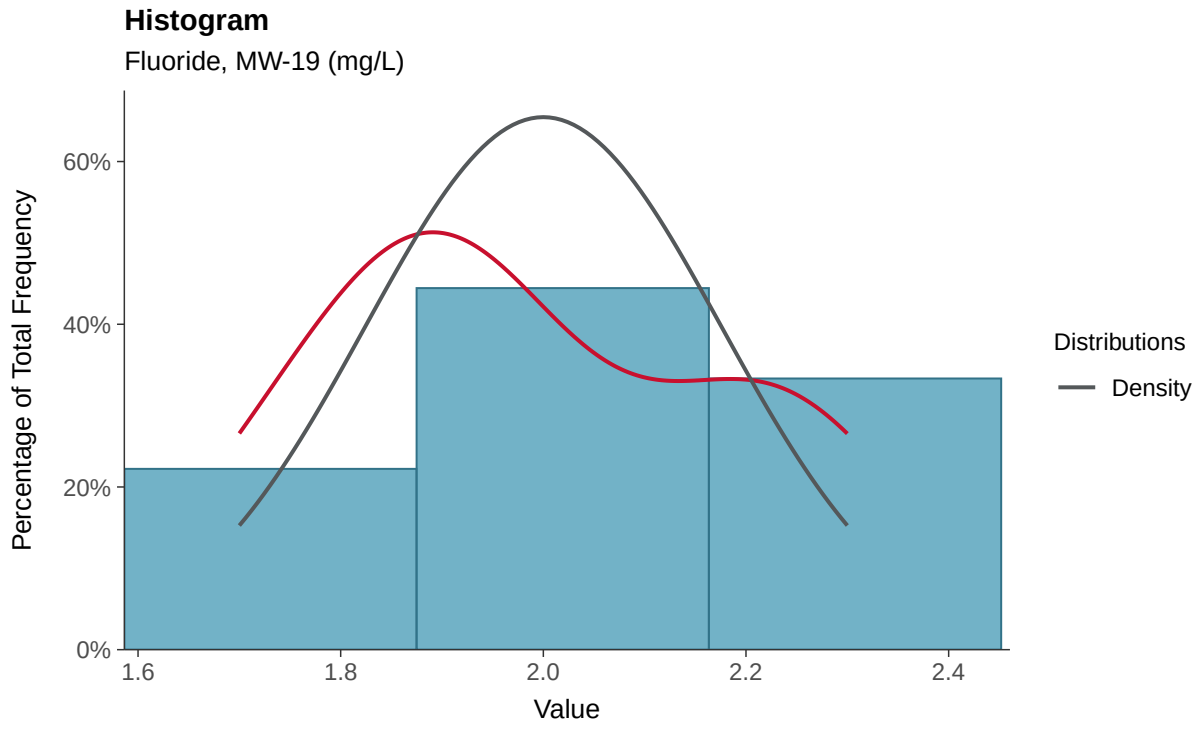
Chloride (as Cl), MW-19 (mg/L)



Appendix III: Fluoride, MW-19

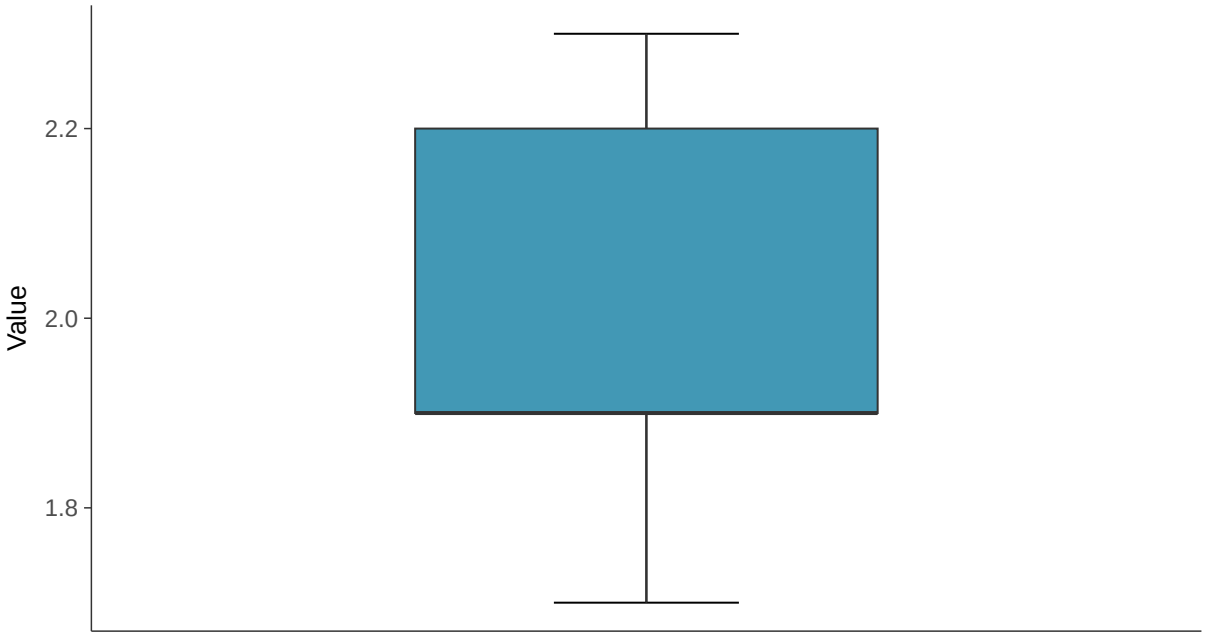
ID: 1_23_4_112





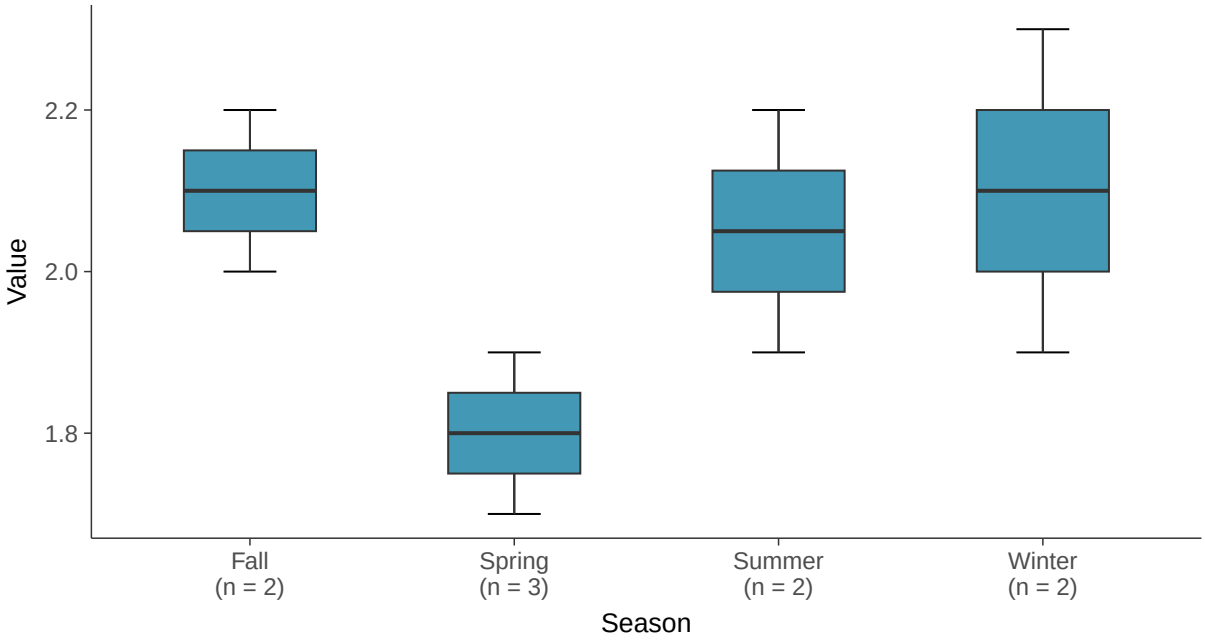
Boxplot

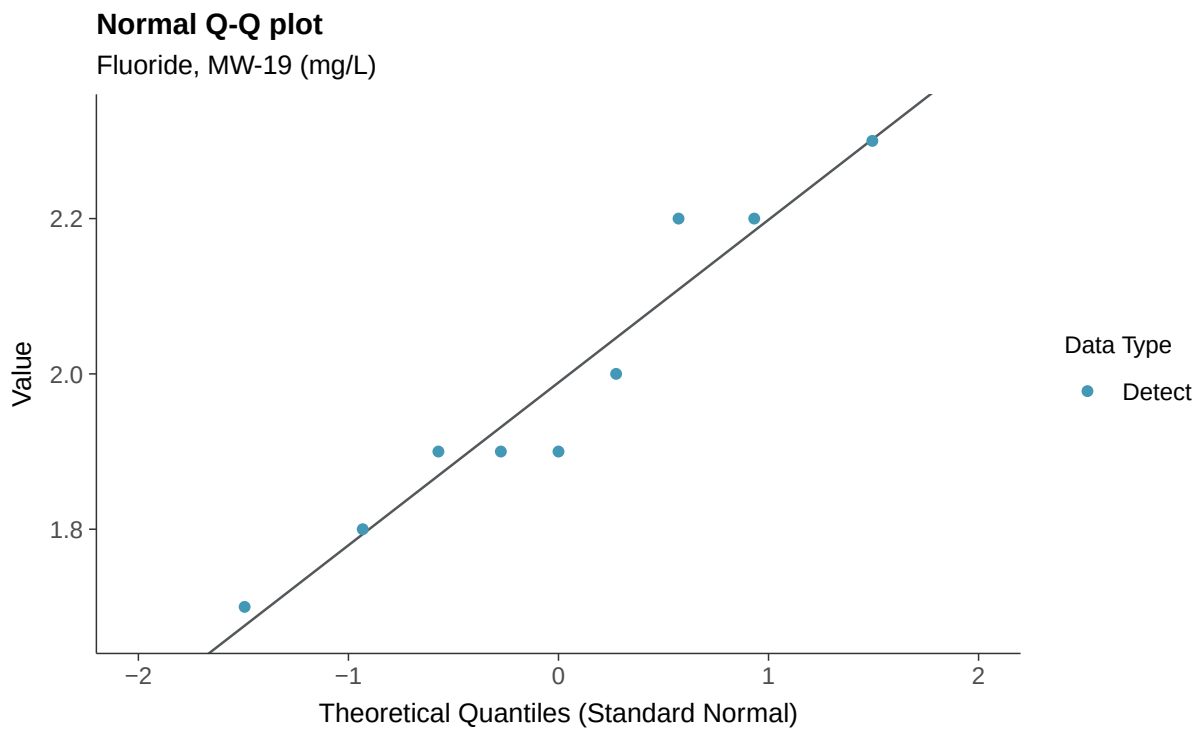
Fluoride, MW-19 (mg/L)

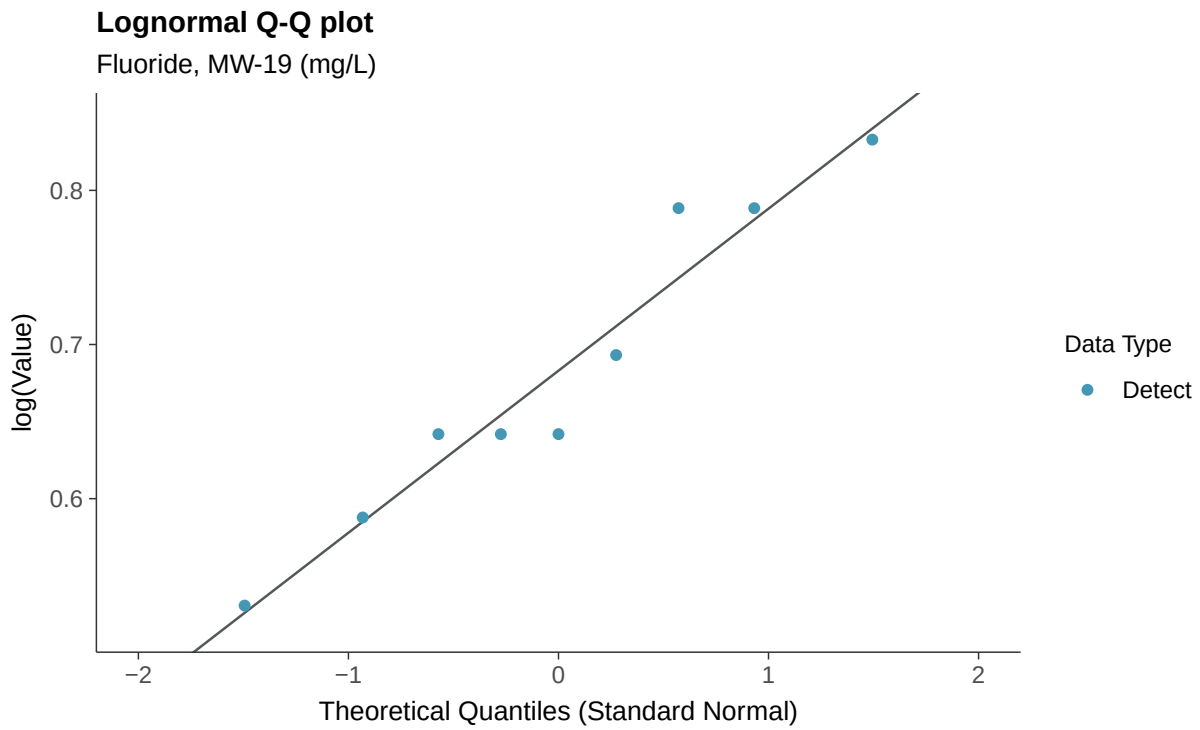


Boxplot by Season

Fluoride, MW-19 (mg/L)

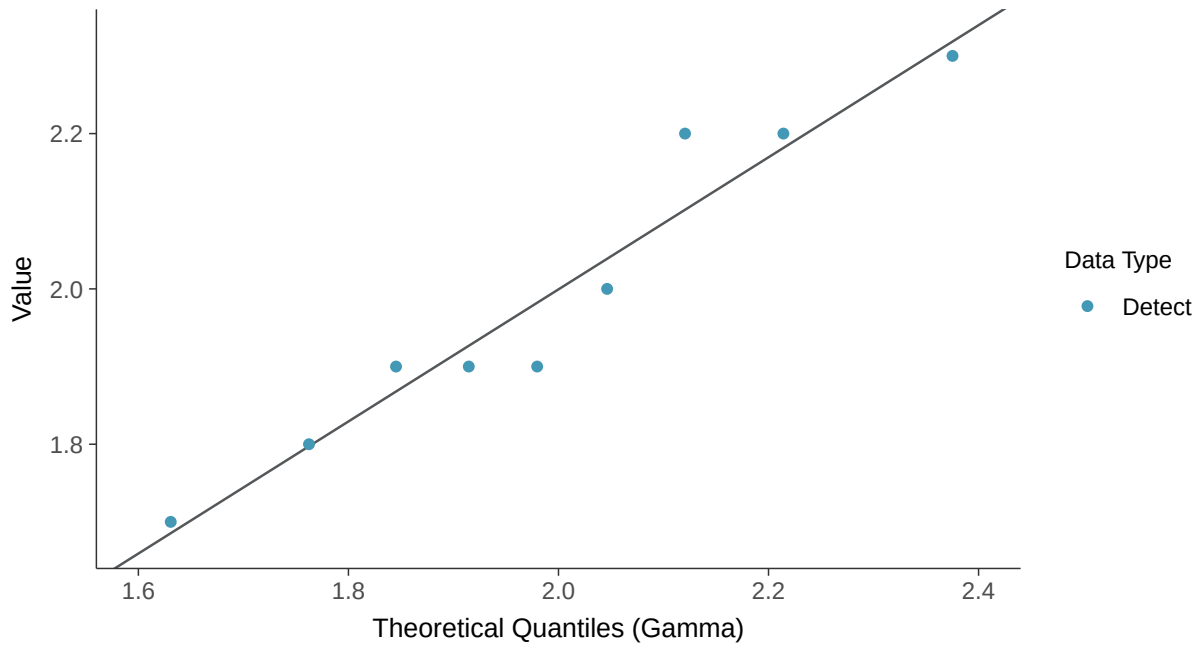



Normal Q-Q plot
Fluoride, MW-19 (mg/L)
Value
2.2
2.0
1.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride, MW-19 (mg/L)
log(Value)
0.8
0.7
0.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

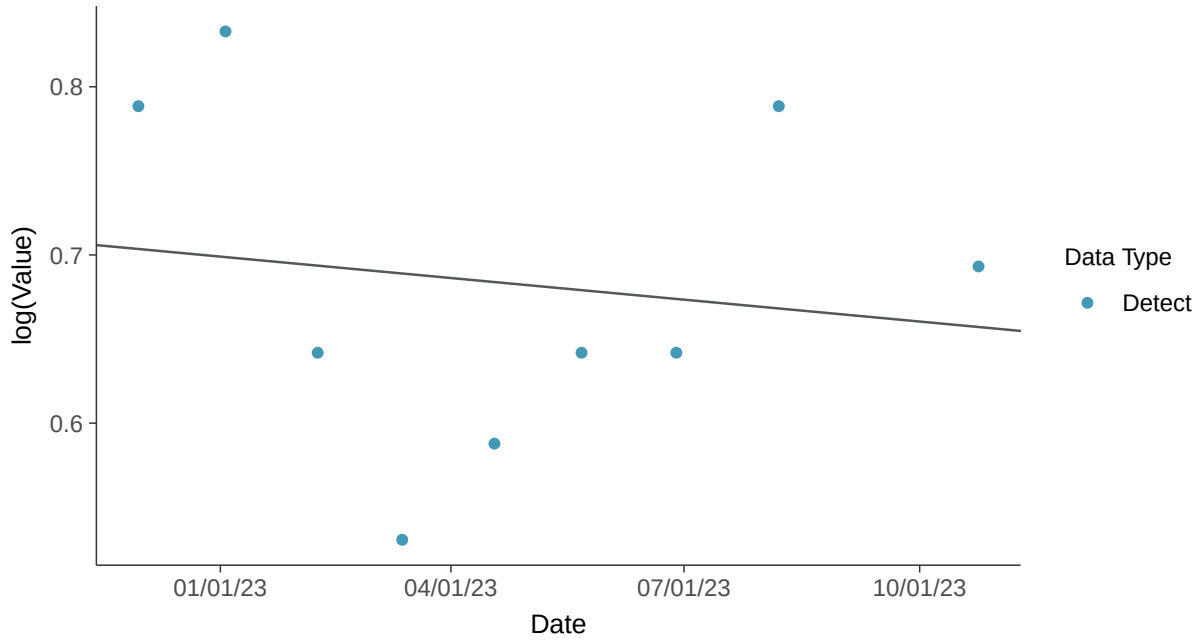
Gamma Q-Q plot

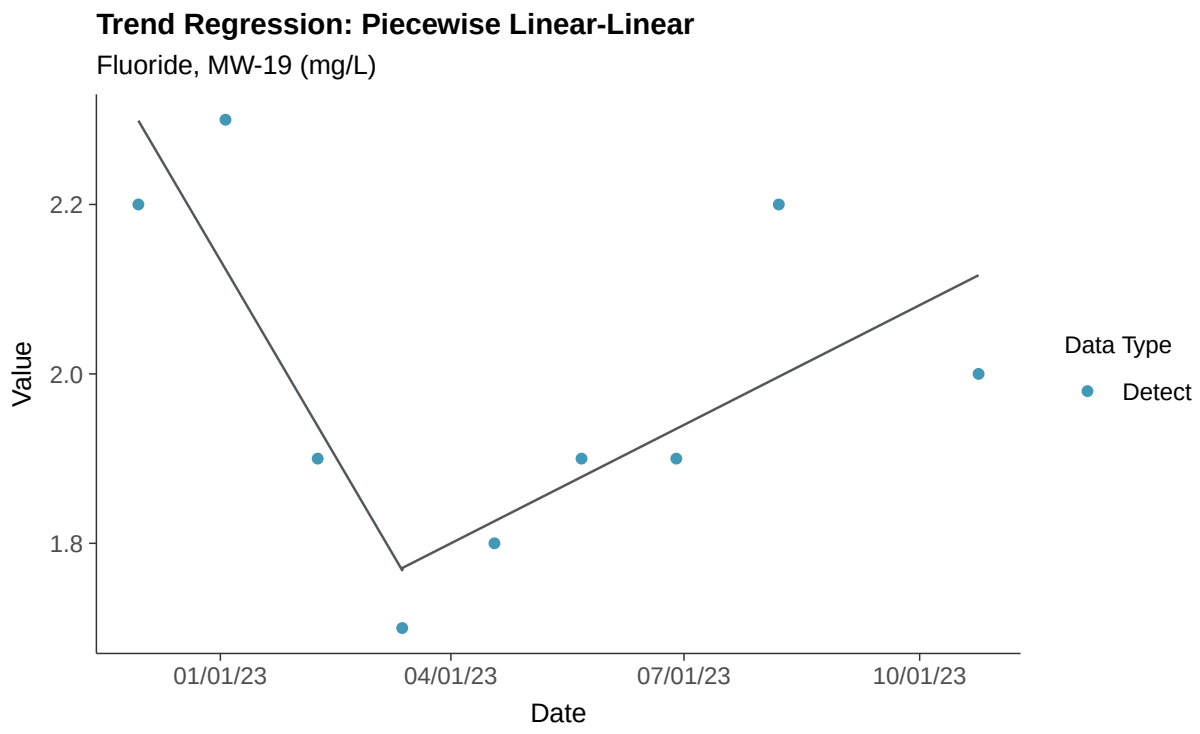
Fluoride, MW-19 (mg/L)



Trend Regression: Lognormal MLE

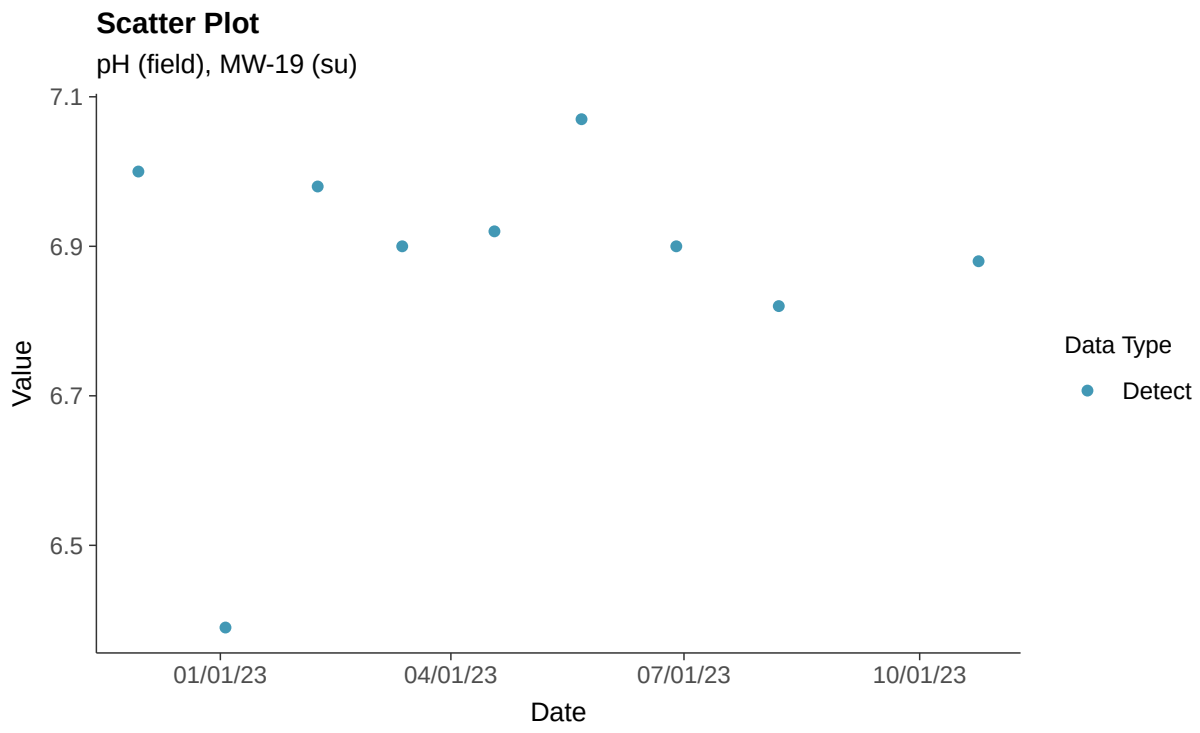
Fluoride, MW-19 (mg/L)

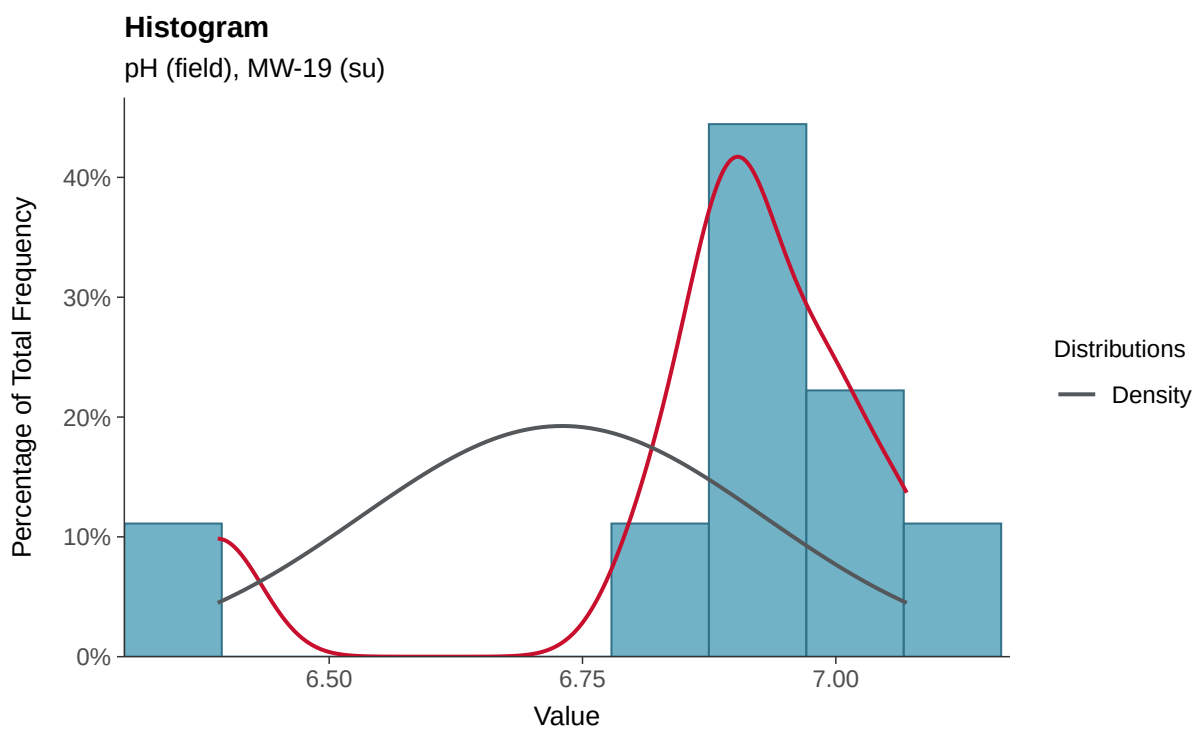


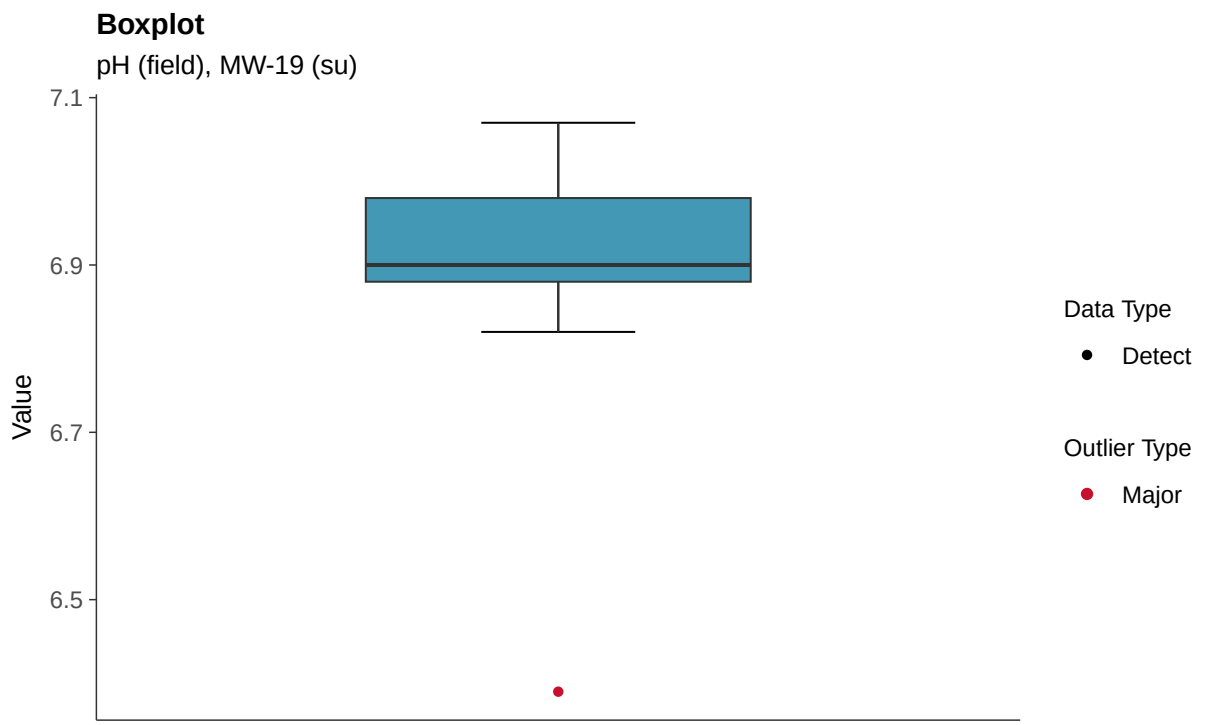

Trend Regression: Piecewise Linear-Linear
Fluoride, MW-19 (mg/L)
Value
2.2
2.0
1.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

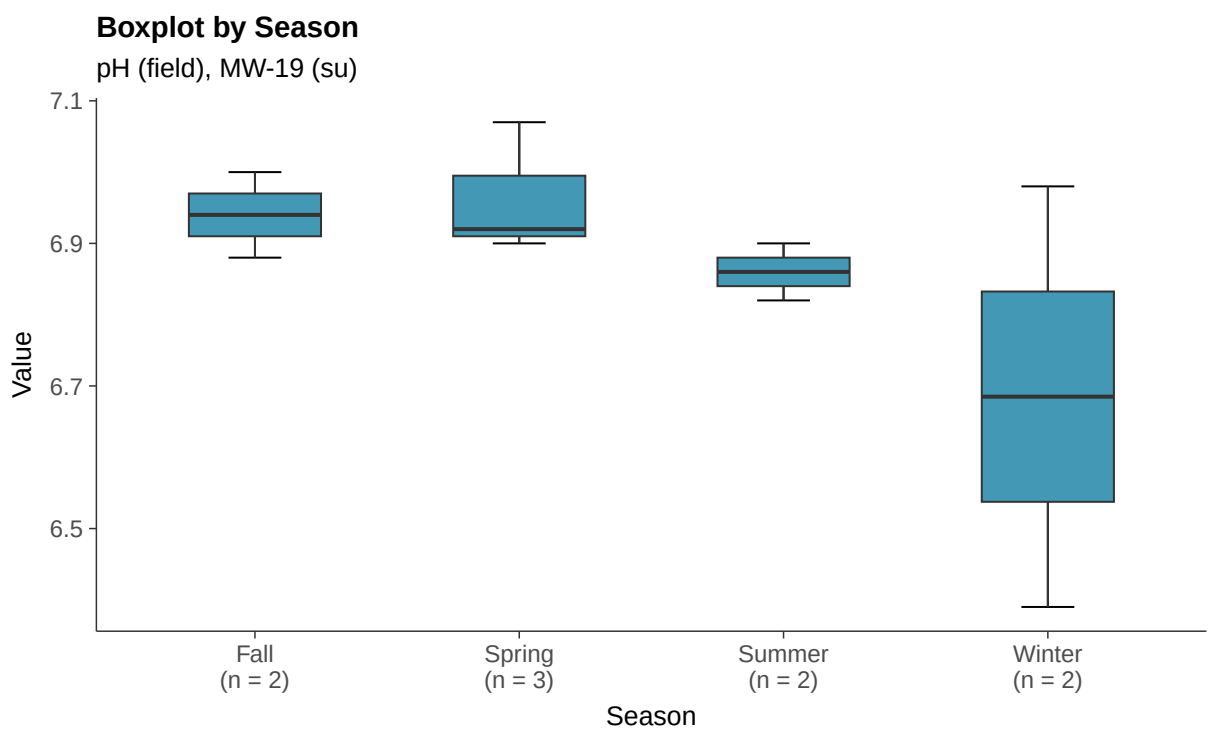
Appendix III: pH (field), MW-19

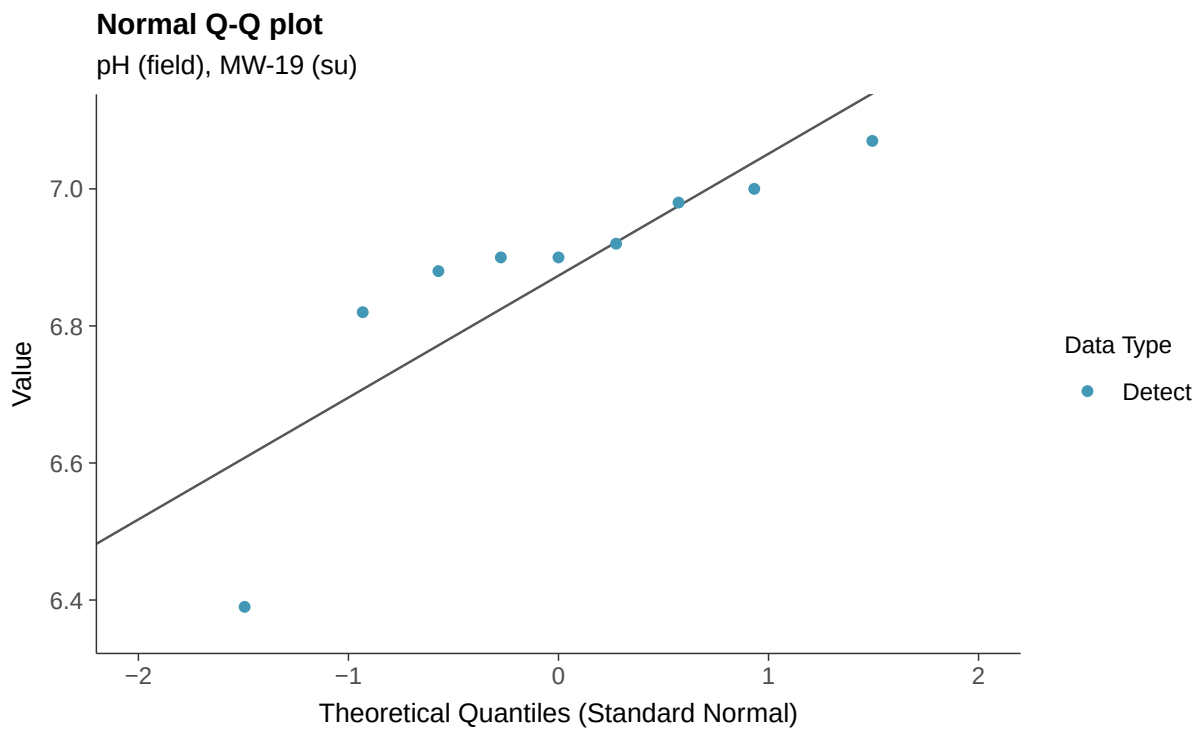
ID: 1_23_4_120

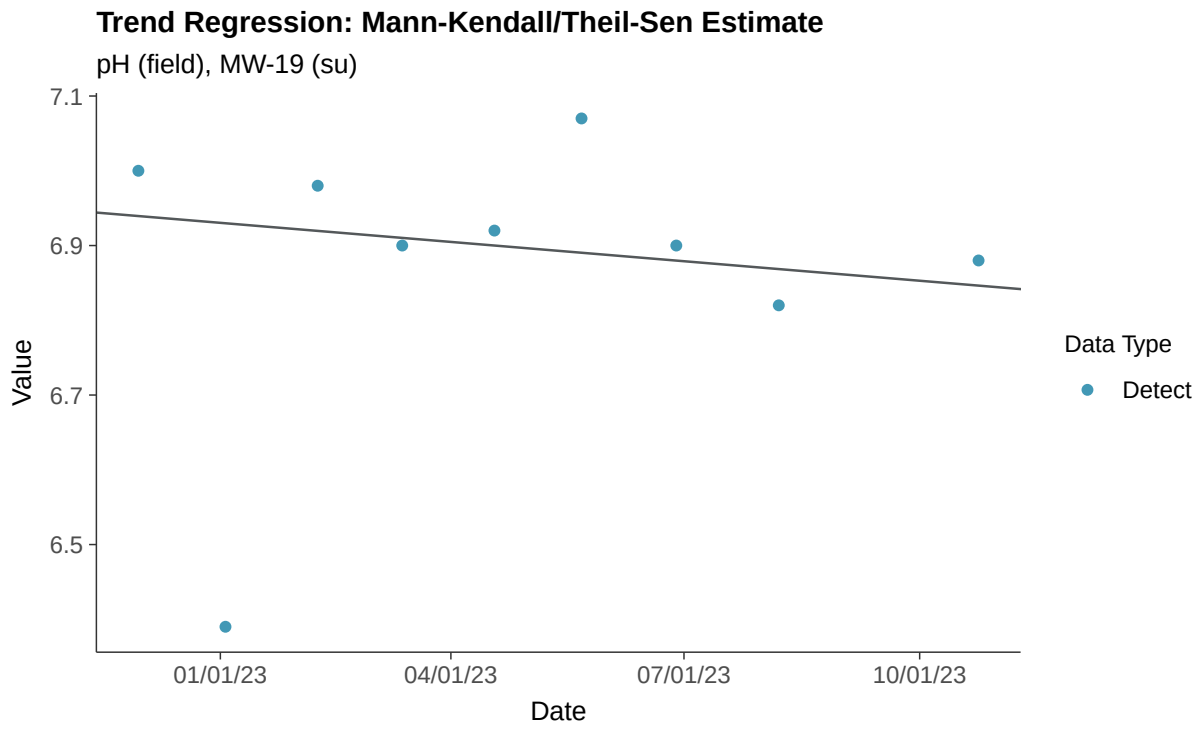


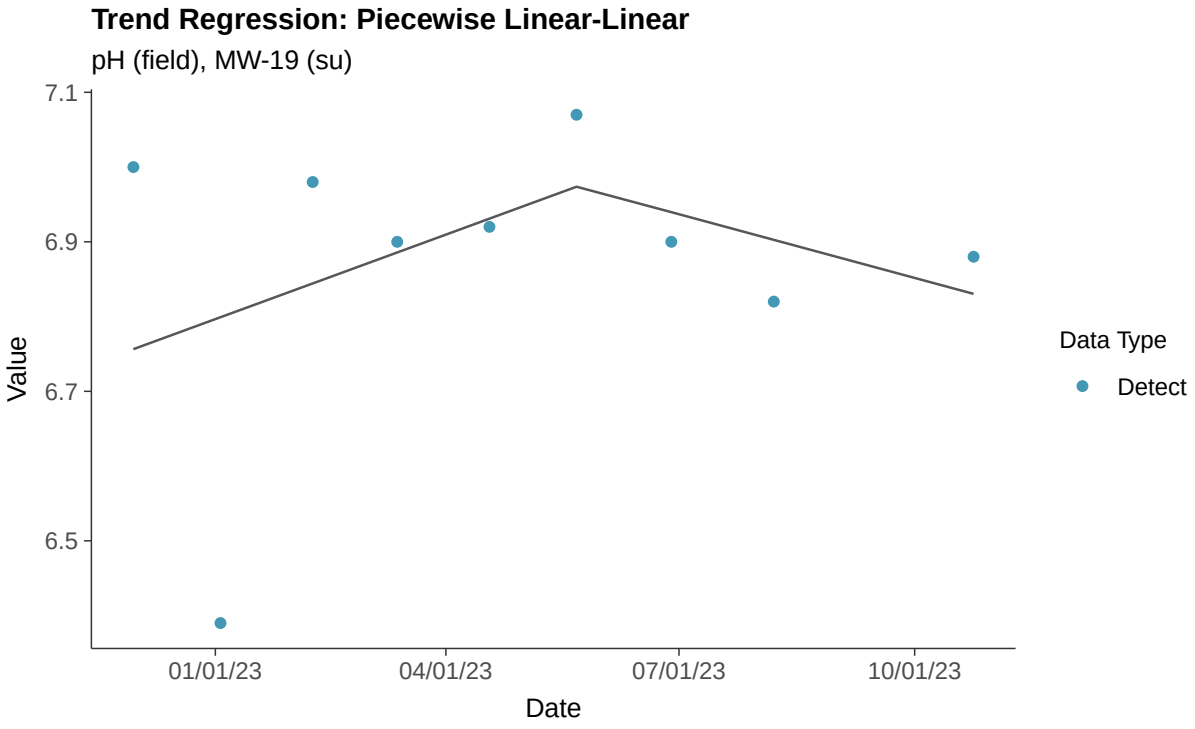



Boxplot
pH (field), MW-19 (su)
7.1
6.9
6.7
6.5
Value
Data Type
Detect
Outlier Type
Major


Boxplot by Season
pH (field), MW-19 (su)
7.1
6.9
6.7
6.5
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

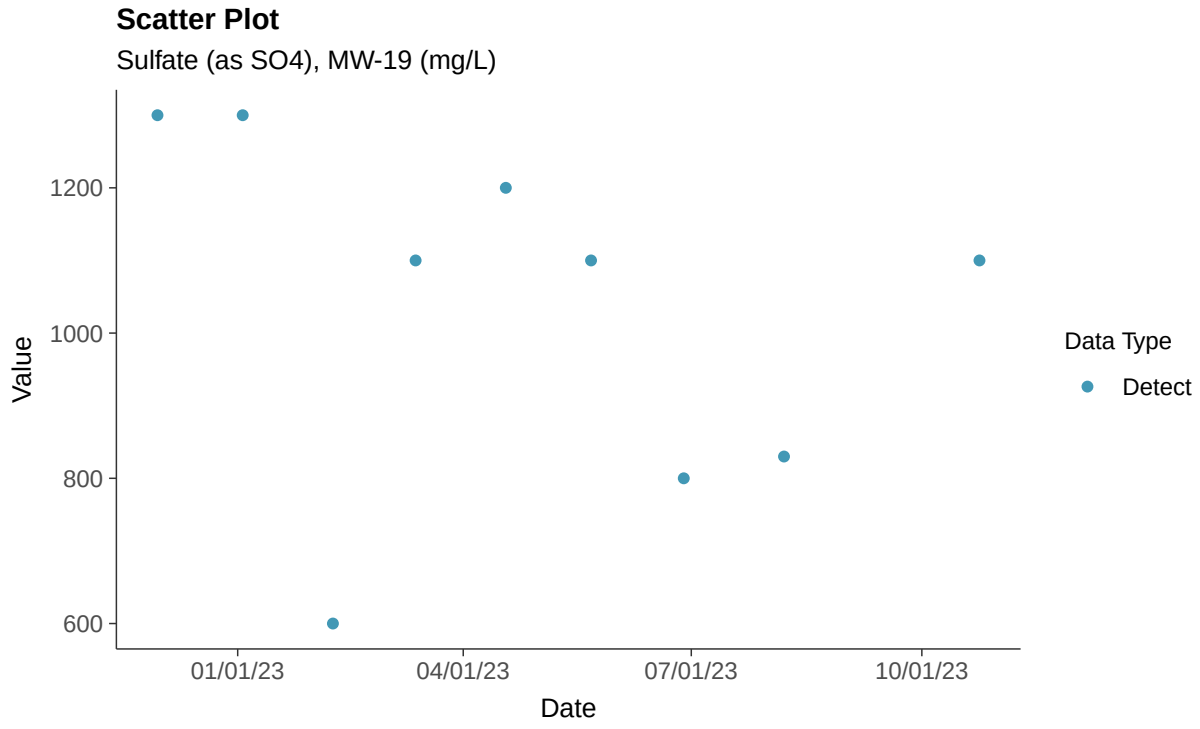

Normal Q-Q plot
pH (field), MW-19 (su)
Value
7.0
6.8
6.6
6.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

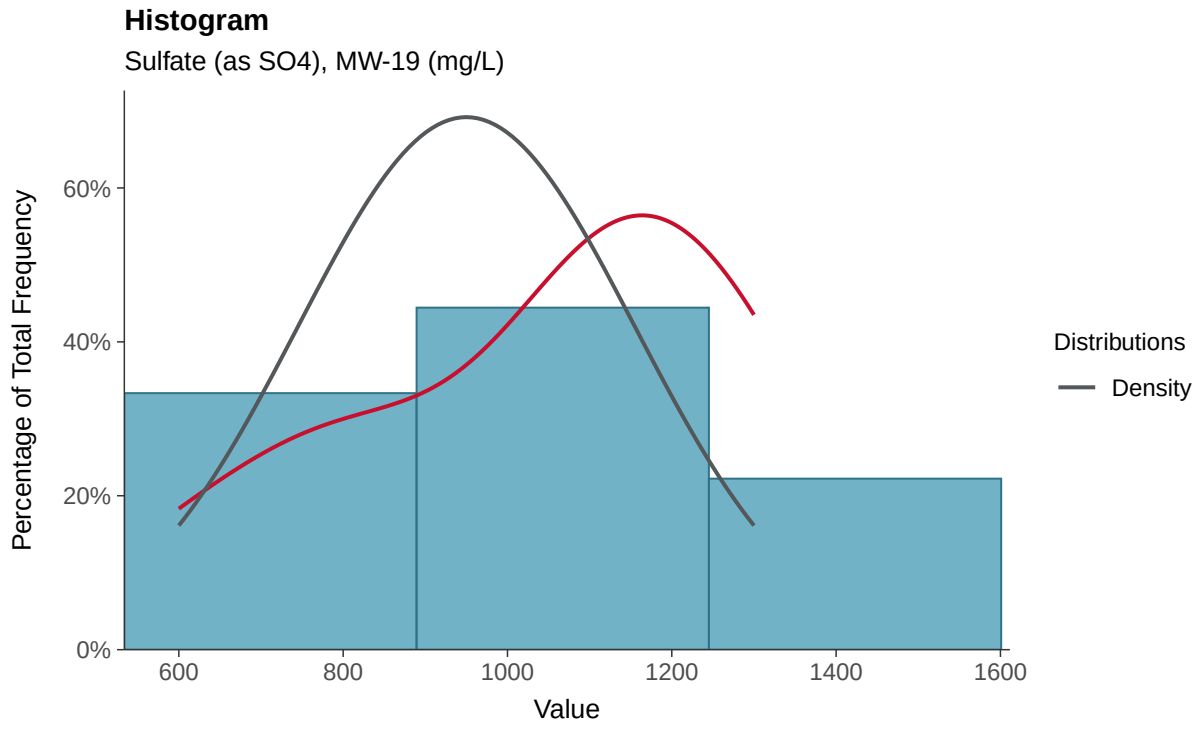

Trend Regression: Mann-Kendall/Theil-Sen Estimate
pH (field), MW-19 (su)
Value
7.1
6.9
6.7
6.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-19 (su)
7.1
6.9
6.7
6.5
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-19

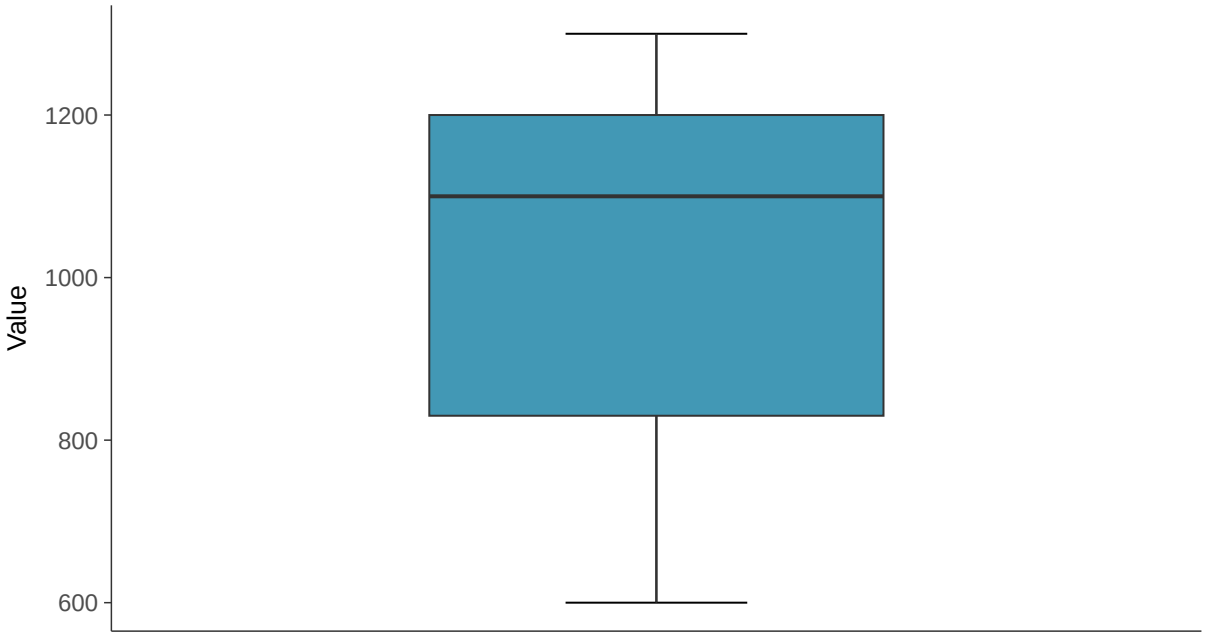
ID: 1_23_4_124





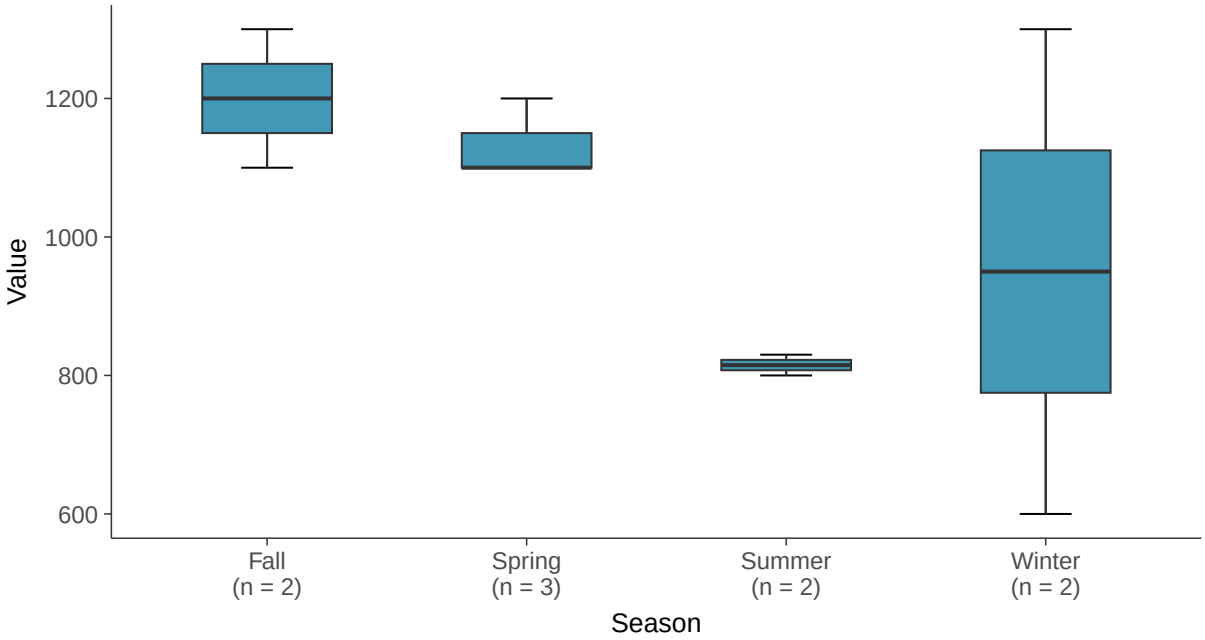
Boxplot

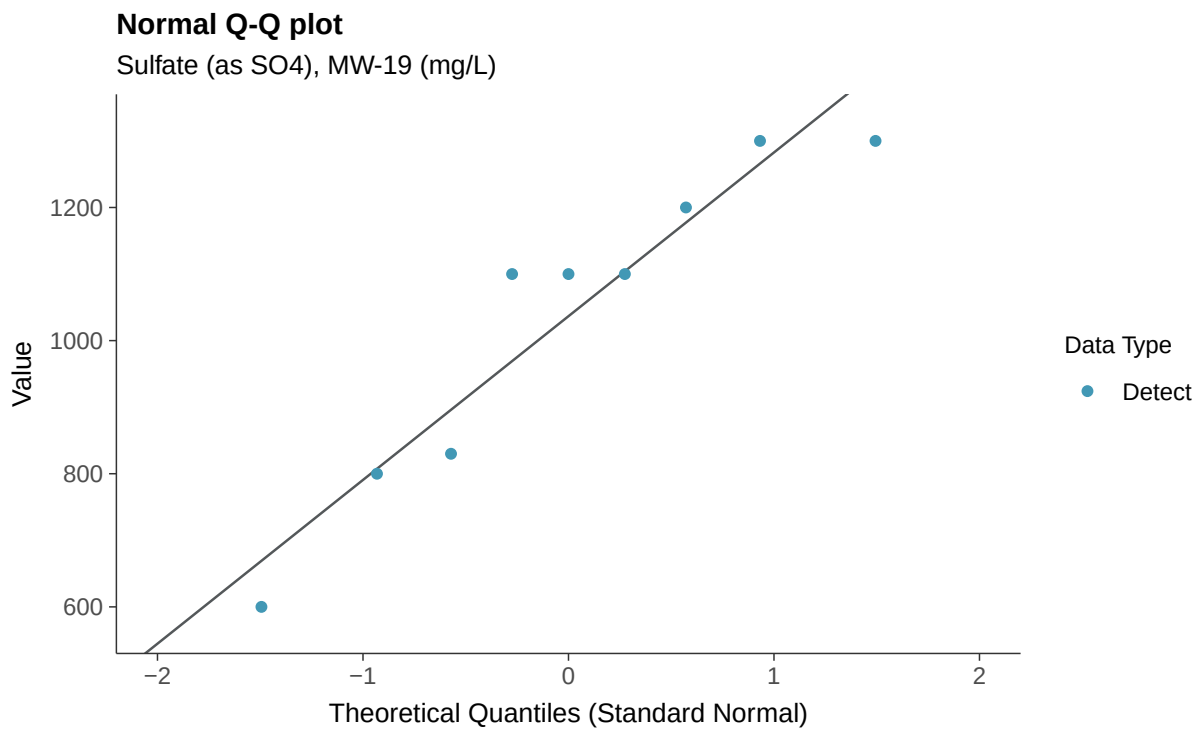
Sulfate (as SO4), MW-19 (mg/L)

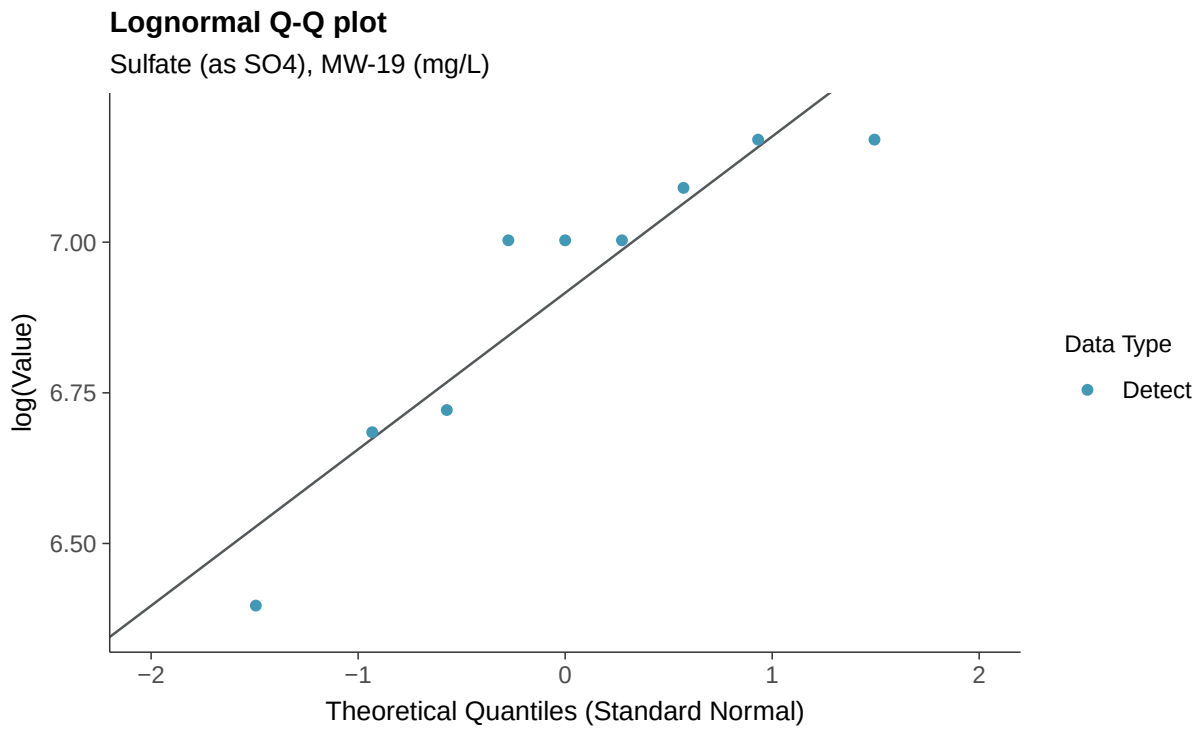


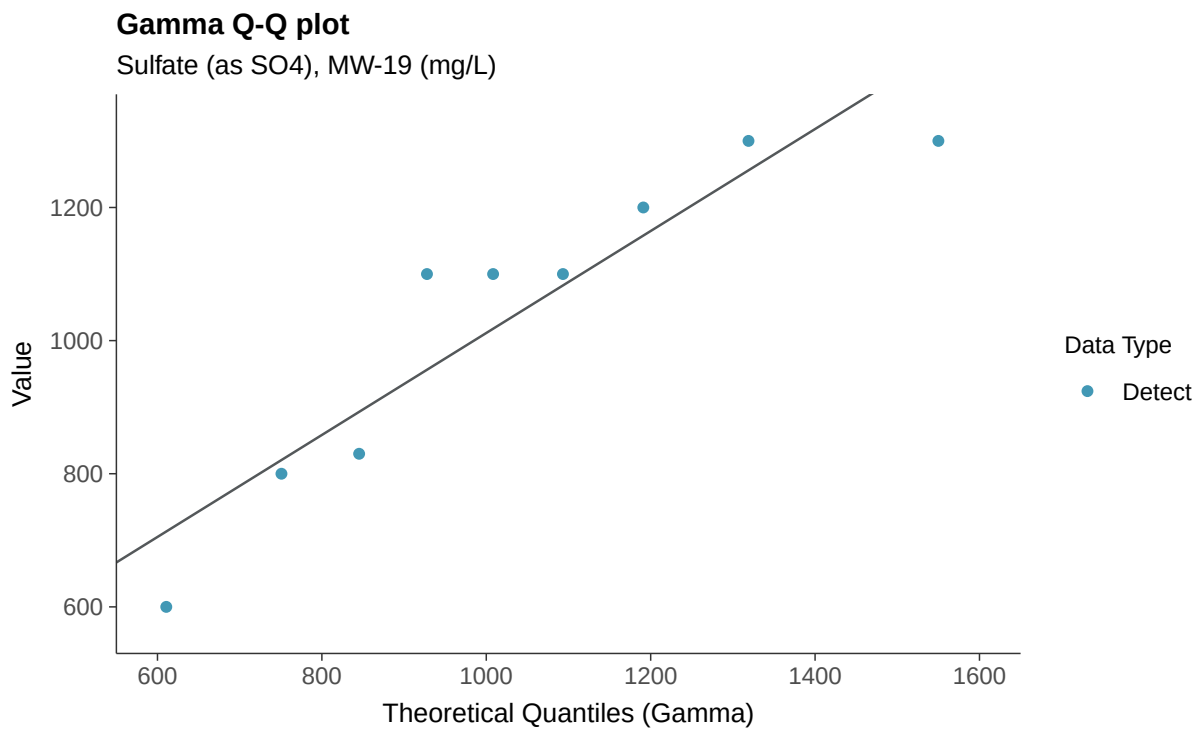
Boxplot by Season

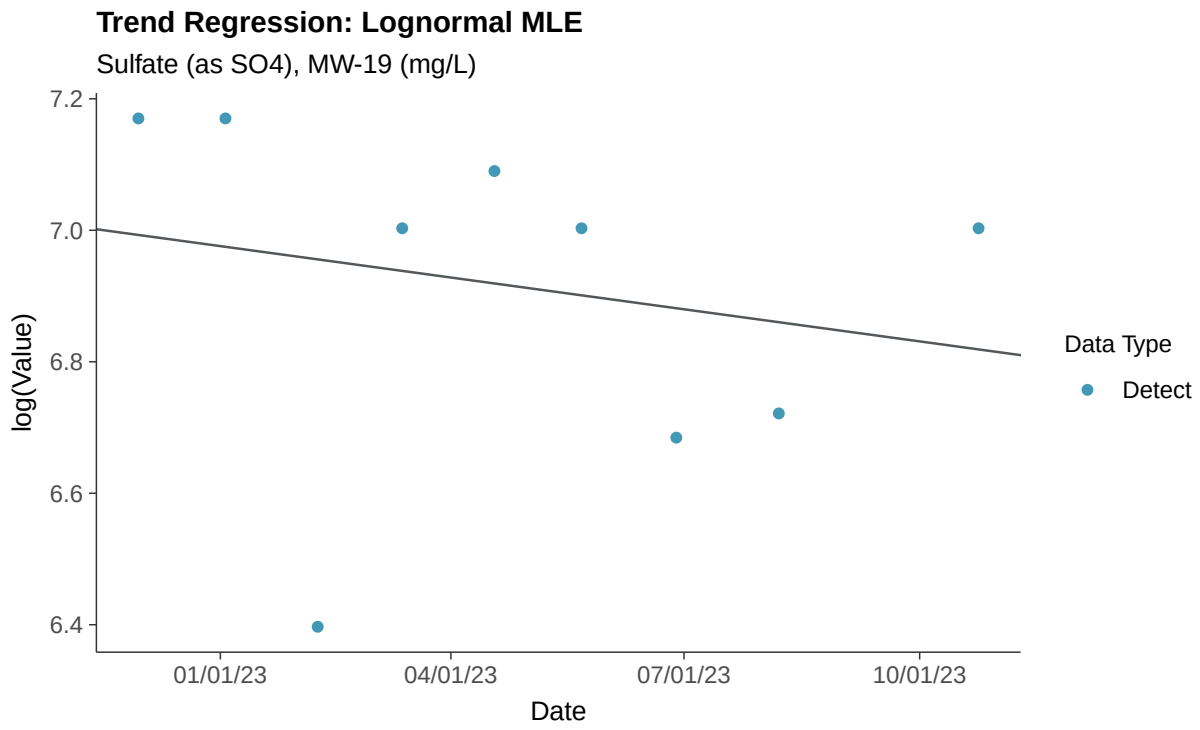
Sulfate (as SO4), MW-19 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-19 (mg/L)
Value
1200
1000
800
600
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

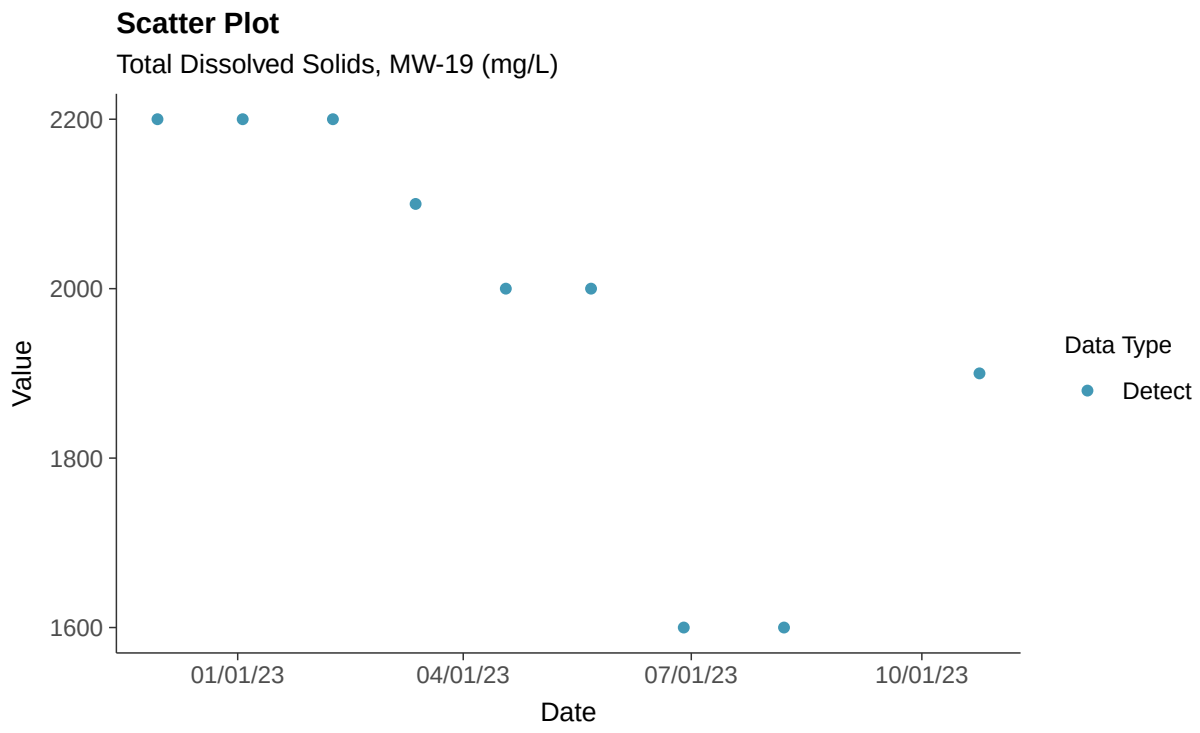

Lognormal Q-Q plot
Sulfate (as SO4), MW-19 (mg/L)
log(Value)
7.00
6.75
6.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

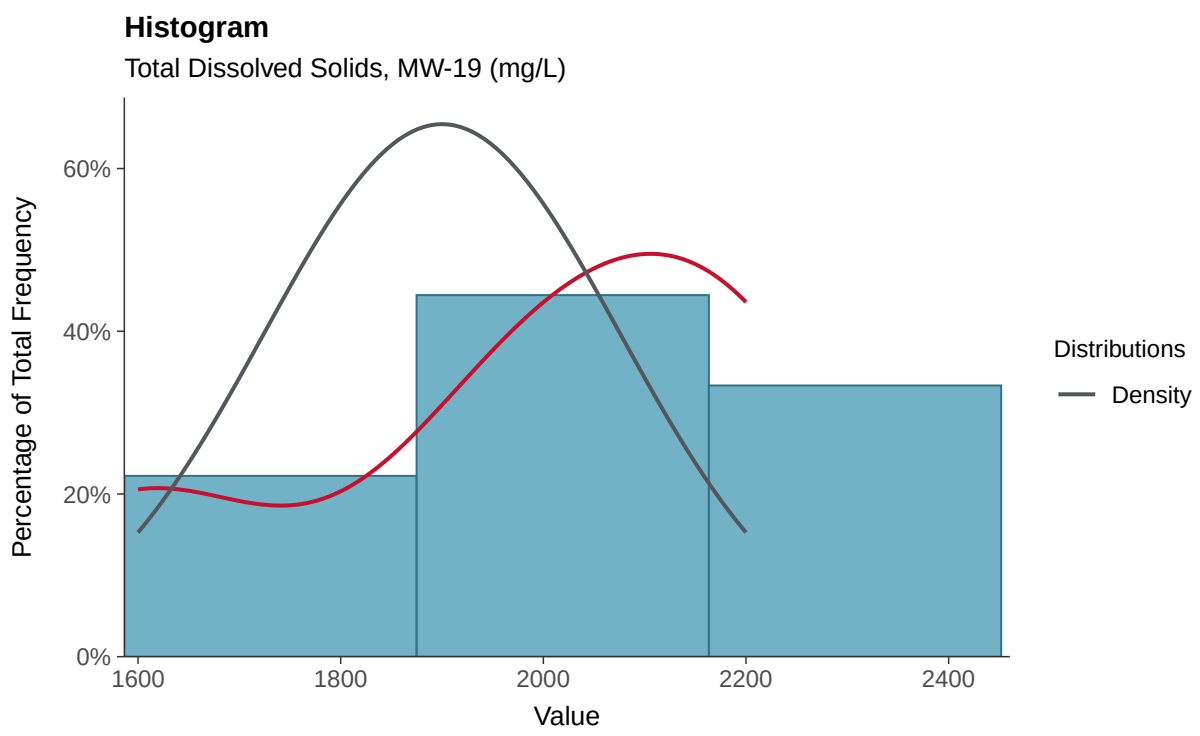

Gamma Q-Q plot
Sulfate (as SO4), MW-19 (mg/L)
Value
1200
1000
800
600
600
800
1000
1200
1400
1600
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-19 (mg/L)
log(Value)
7.2
7.0
6.8
6.6
6.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Total Dissolved Solids, MW-19

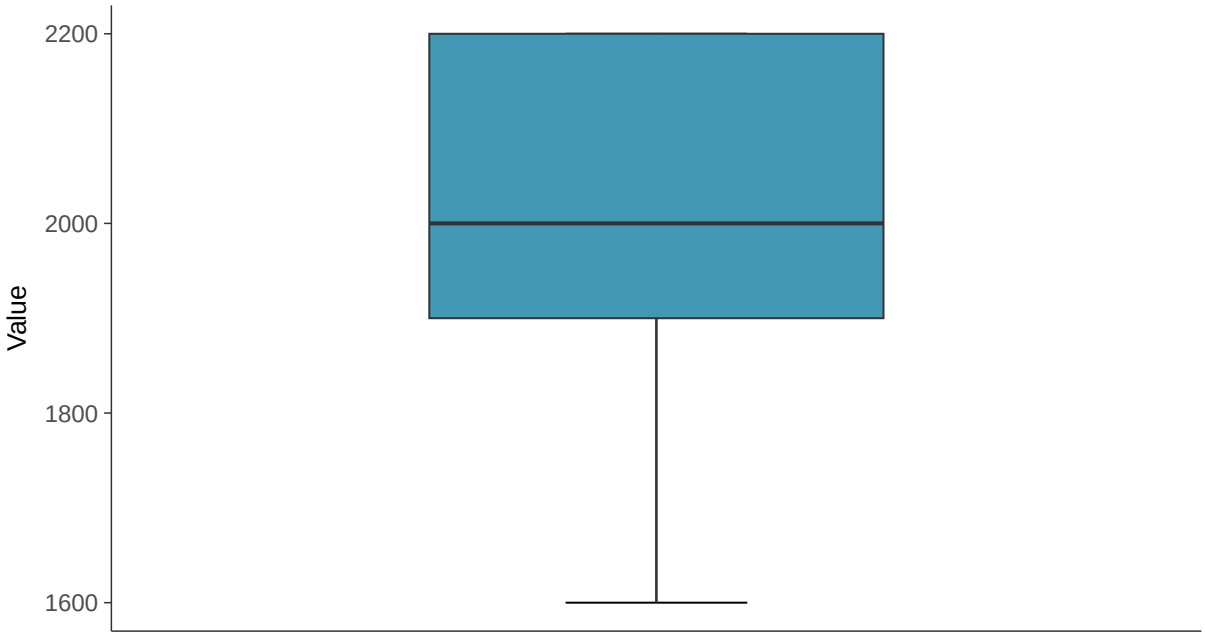
ID: 1_23_4_126





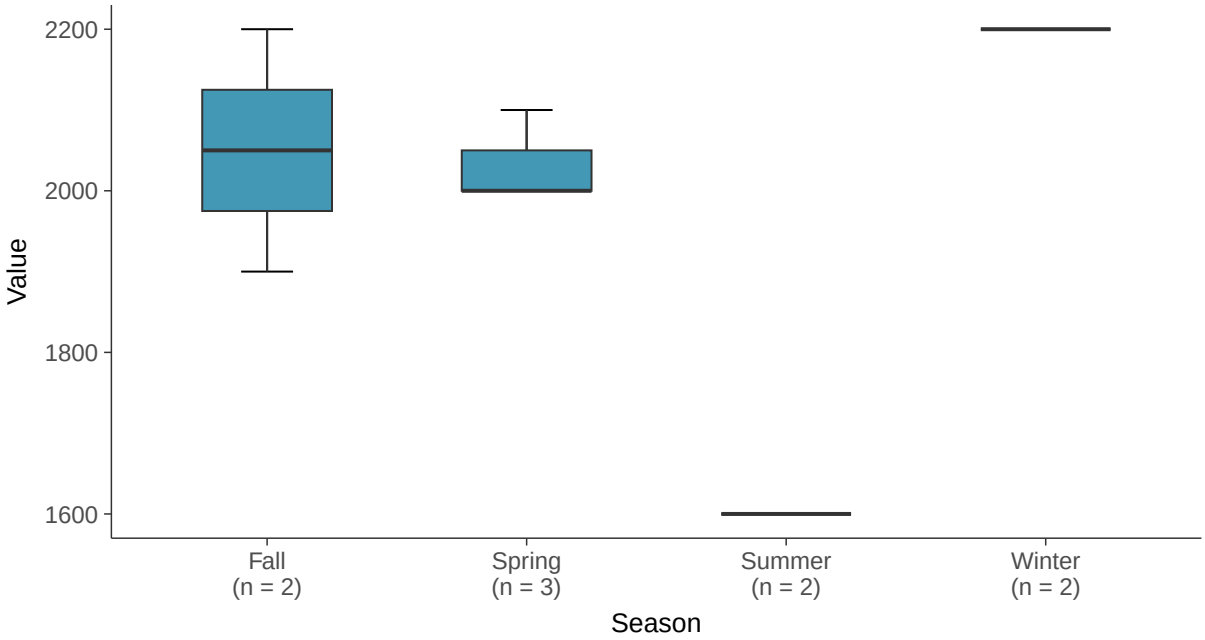
Boxplot

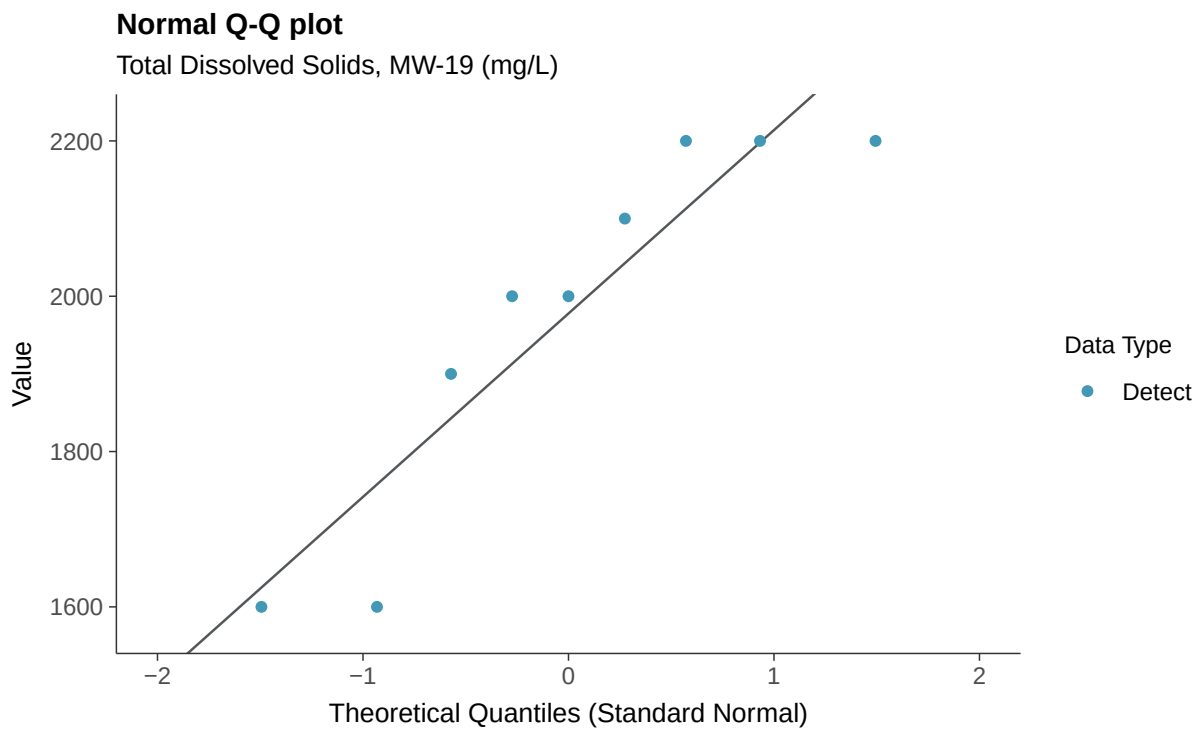
Total Dissolved Solids, MW-19 (mg/L)

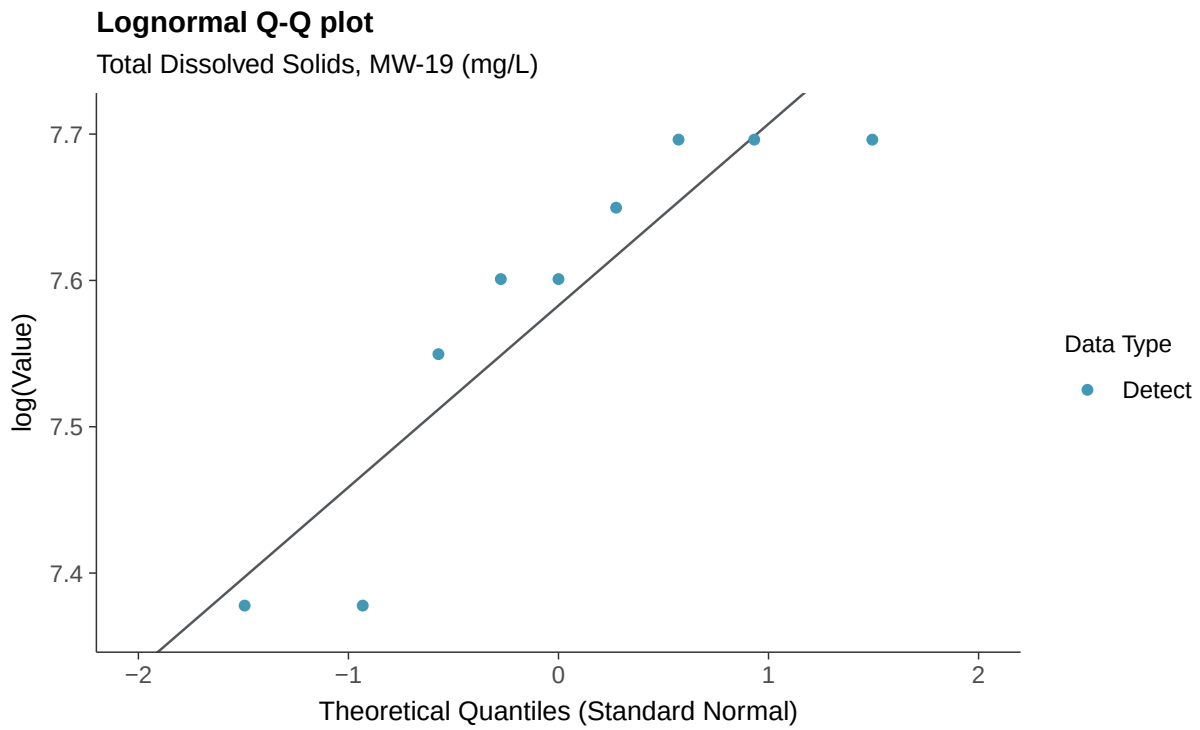


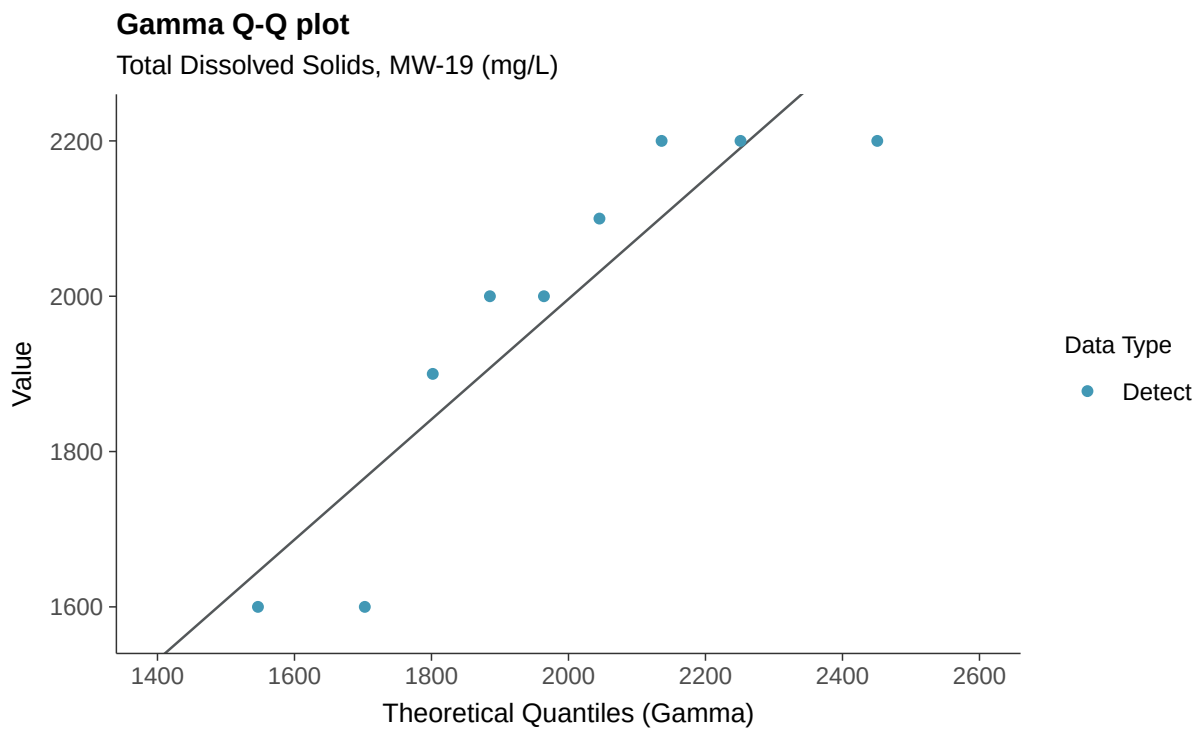
Boxplot by Season

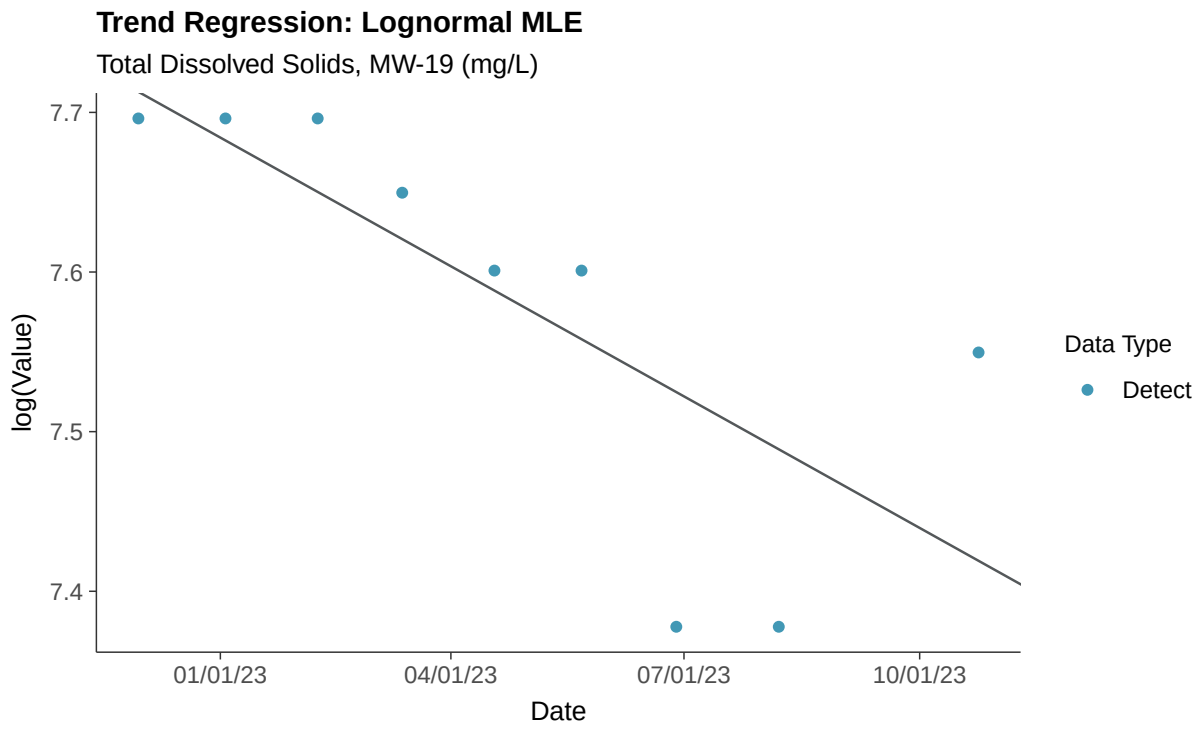
Total Dissolved Solids, MW-19 (mg/L)




Normal Q-Q plot
Total Dissolved Solids, MW-19 (mg/L)
Value
2200
2000
1800
1600
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

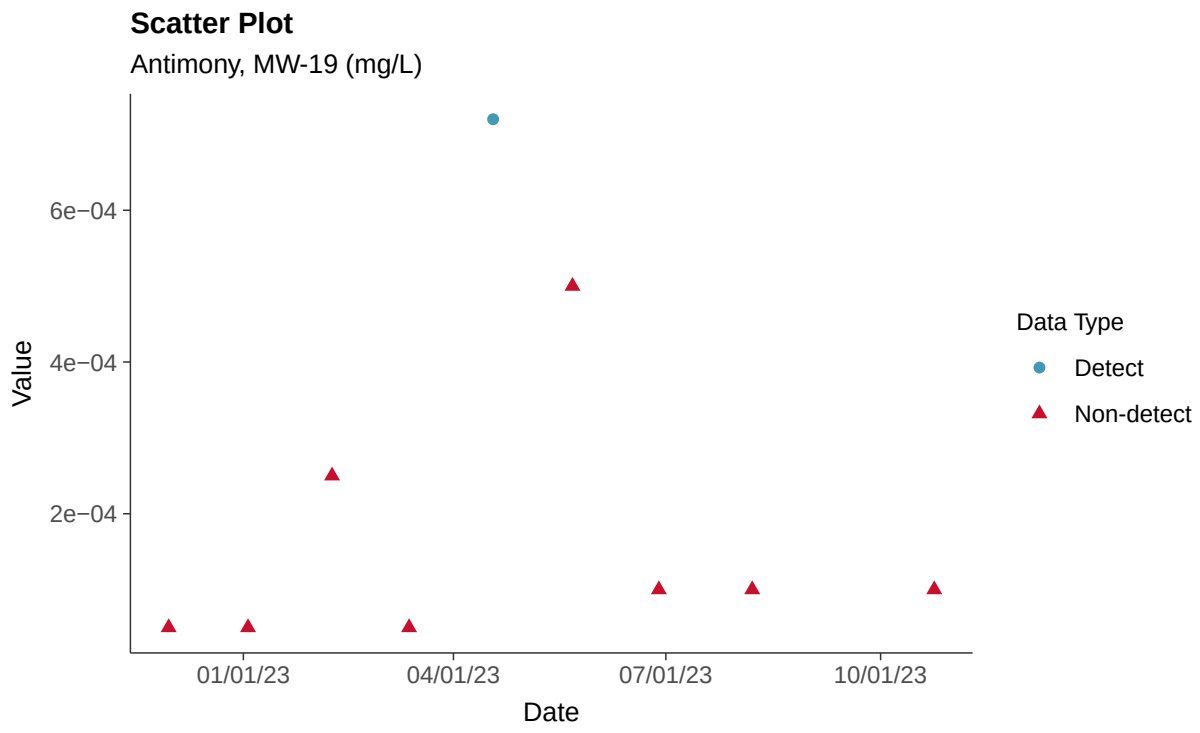

Lognormal Q-Q plot
Total Dissolved Solids, MW-19 (mg/L)
log(Value)
7.7
7.6
7.5
7.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

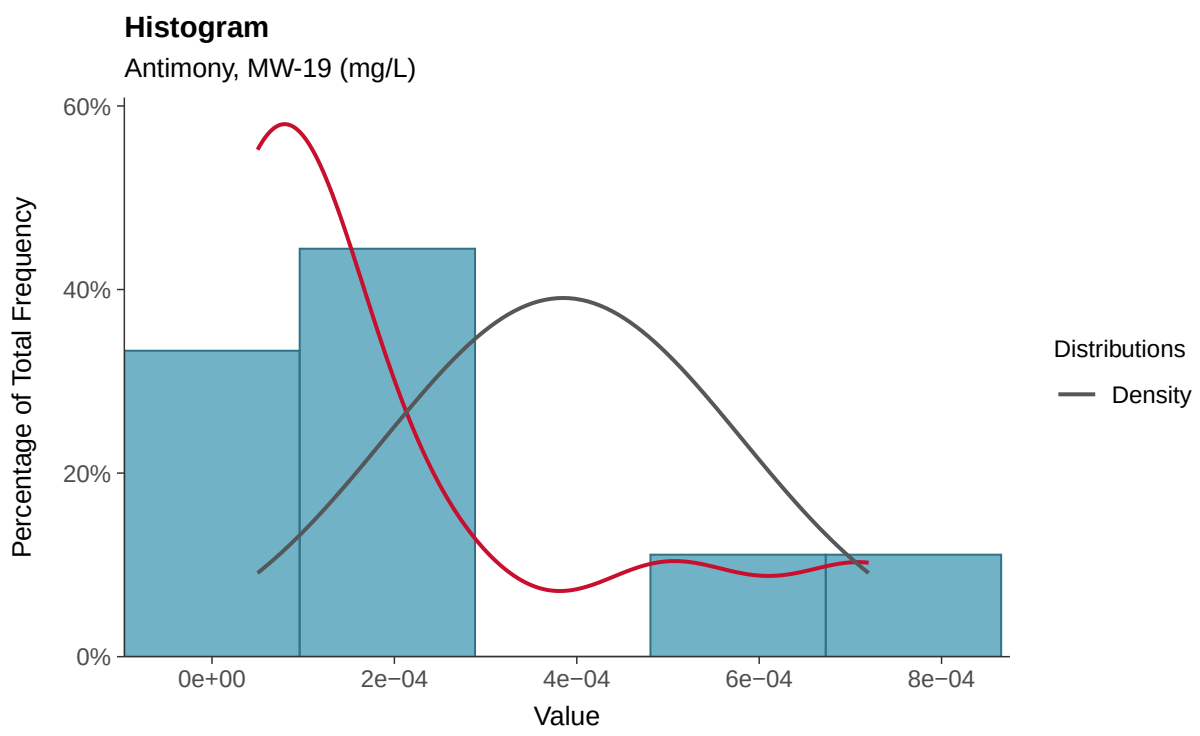

Gamma Q-Q plot
Total Dissolved Solids, MW-19 (mg/L)
Value
2200
2000
1800
1600
1400
1600
1800
2000
2200
2400
2600
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-19 (mg/L)
log(Value)
7.7
7.6
7.5
7.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-19

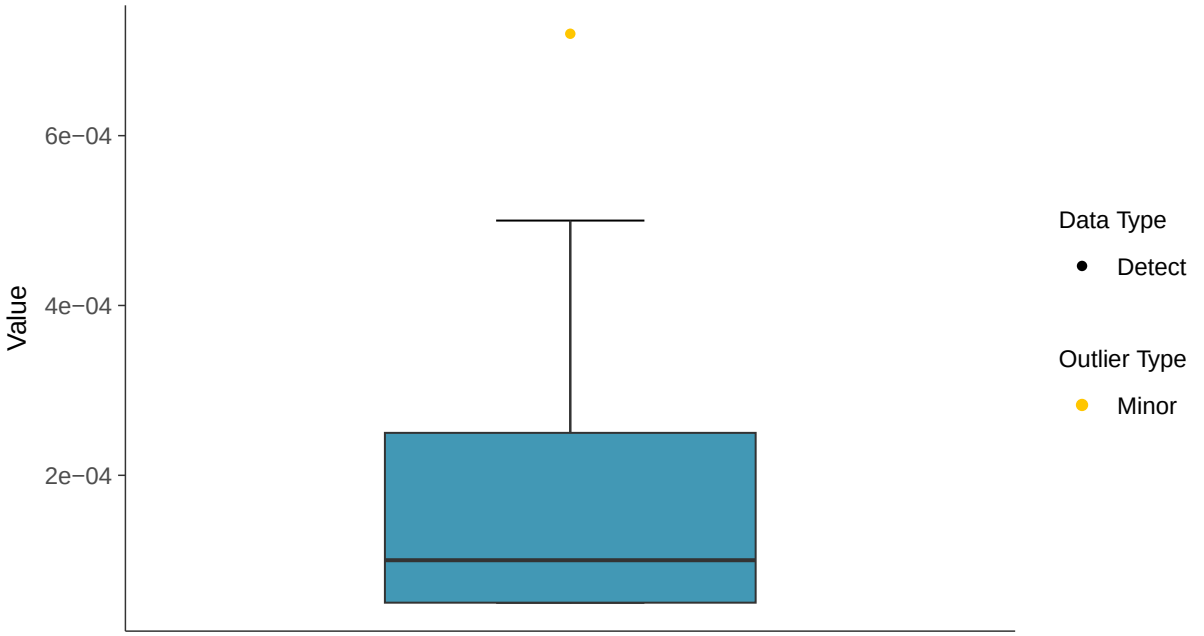
ID: 1_23_5_101





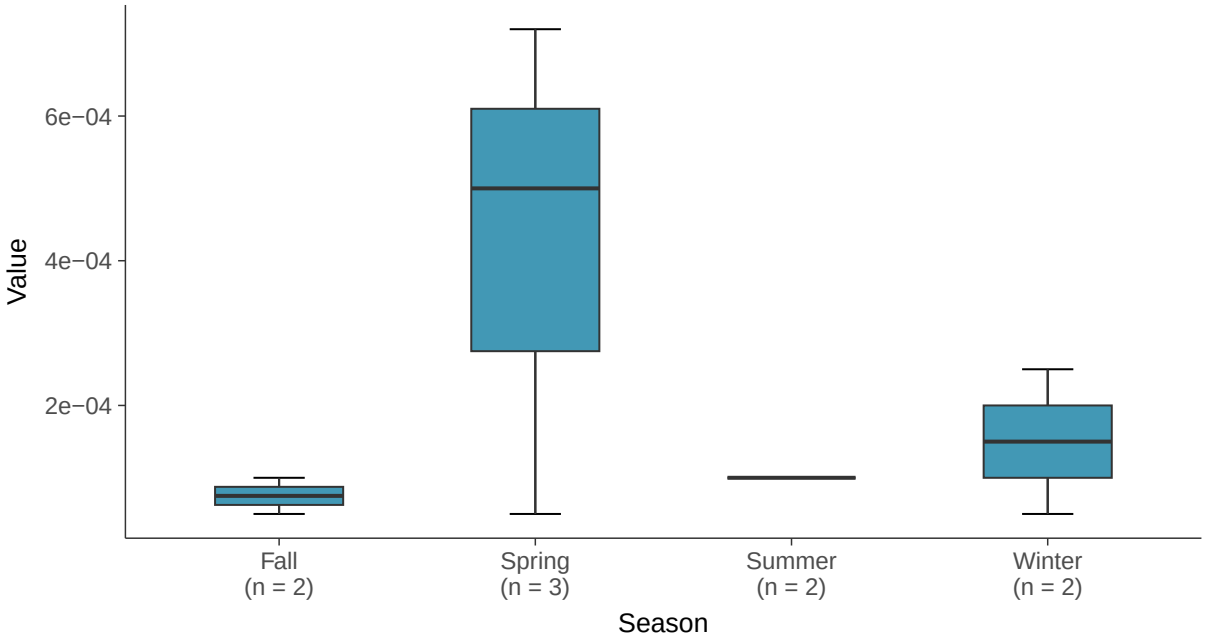
Boxplot

Antimony, MW-19 (mg/L)



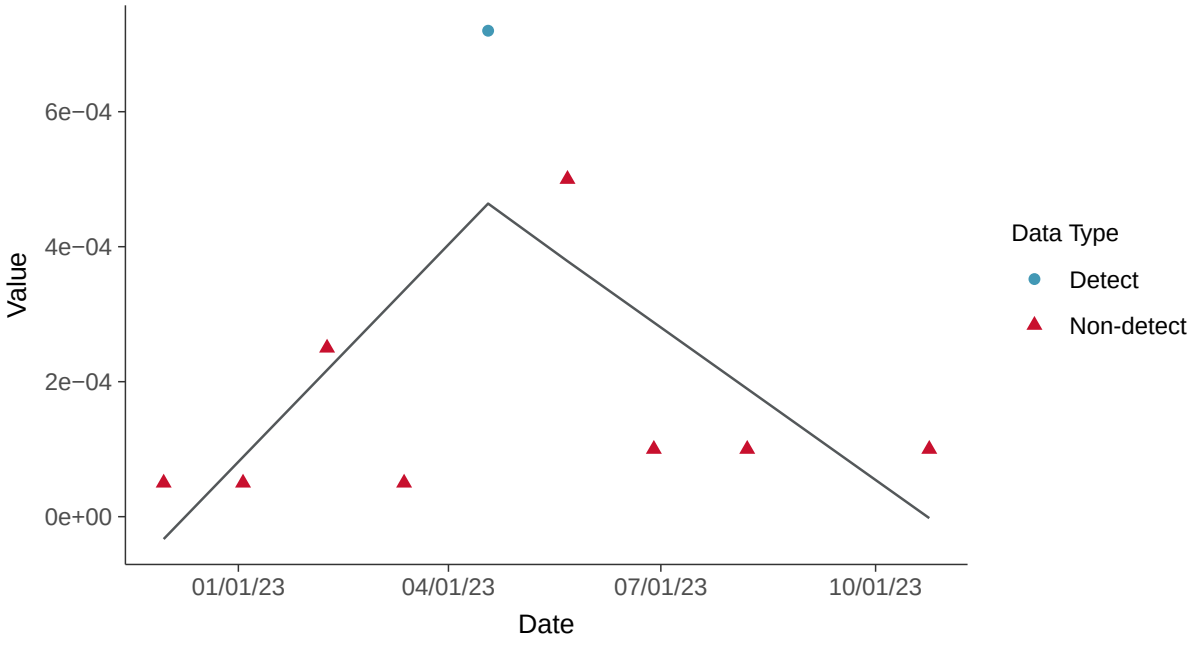
Boxplot by Season

Antimony, MW-19 (mg/L)



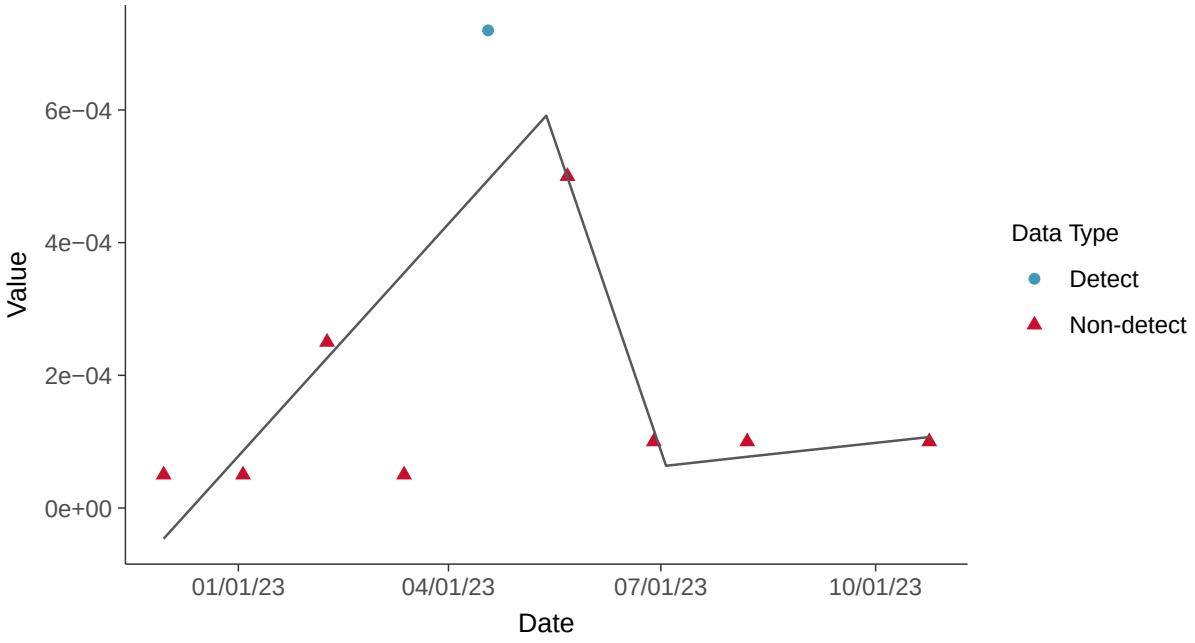
Trend Regression: Piecewise Linear-Linear

Antimony, MW-19 (mg/L)



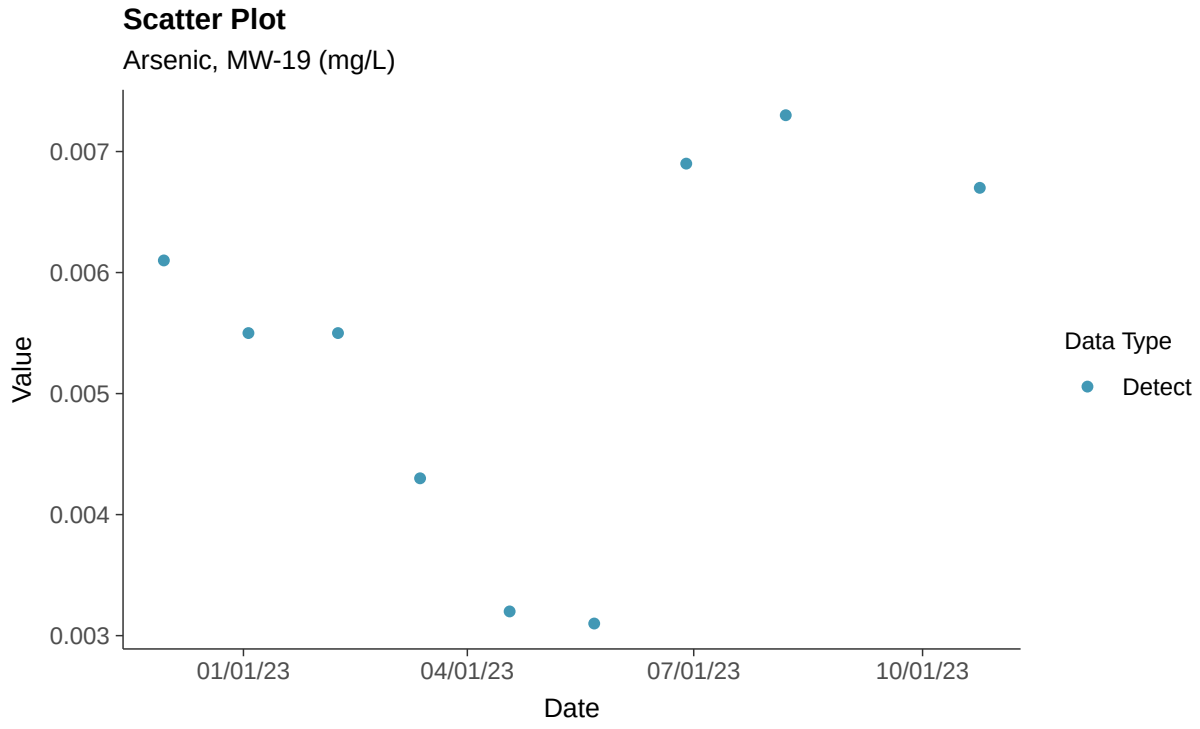
Trend Regression: Piecewise Linear-Linear-Linear

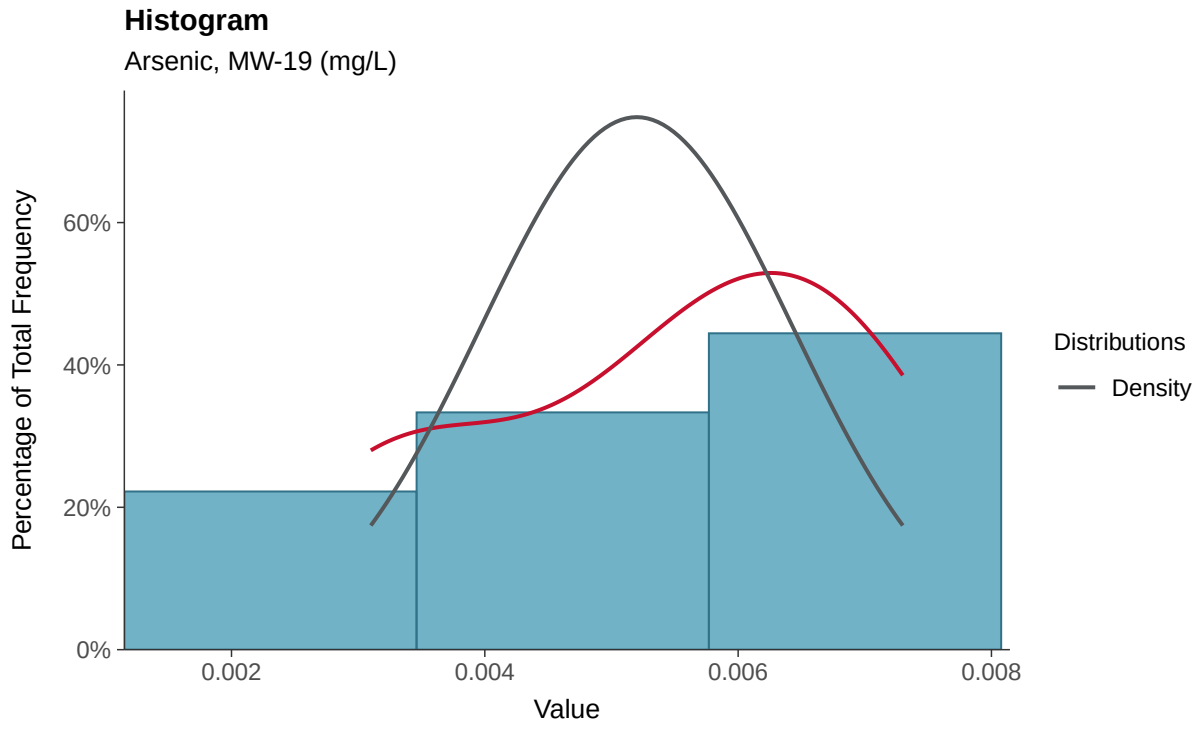
Antimony, MW-19 (mg/L)



Appendix IV: Arsenic, MW-19

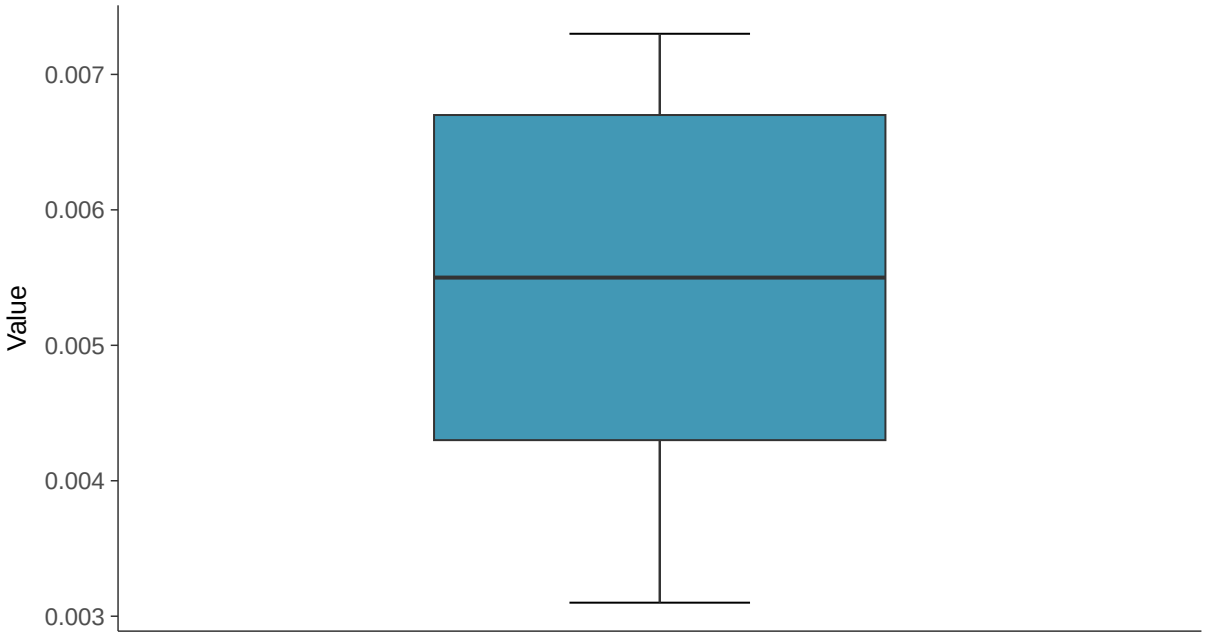
ID: 1_23_5_102





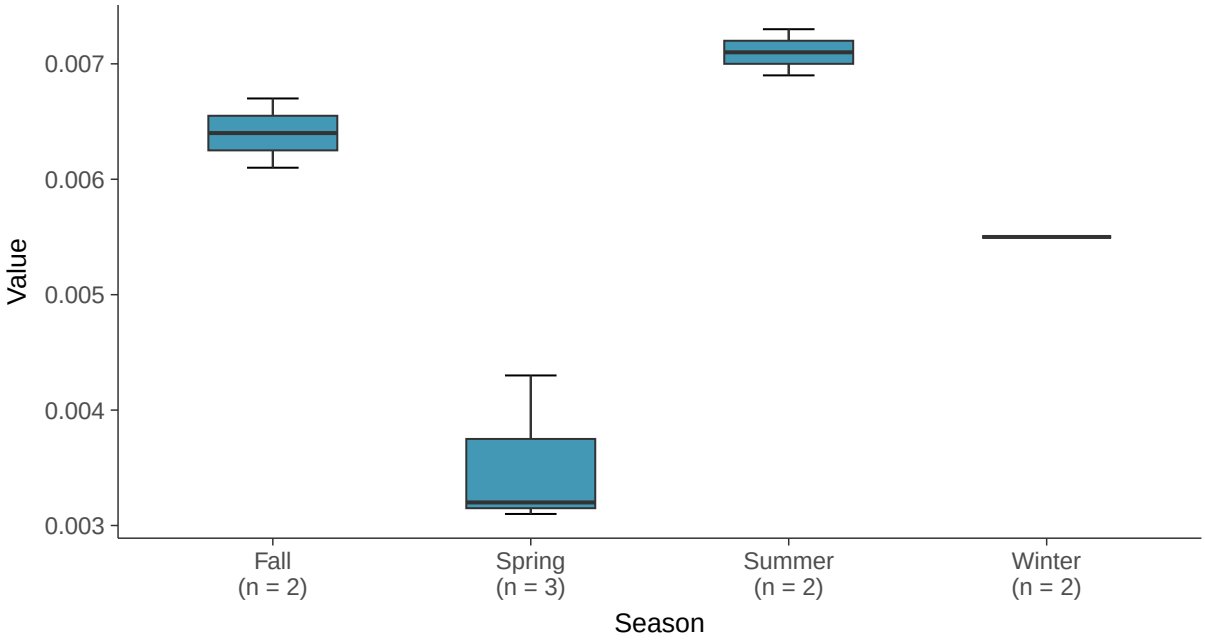
Boxplot

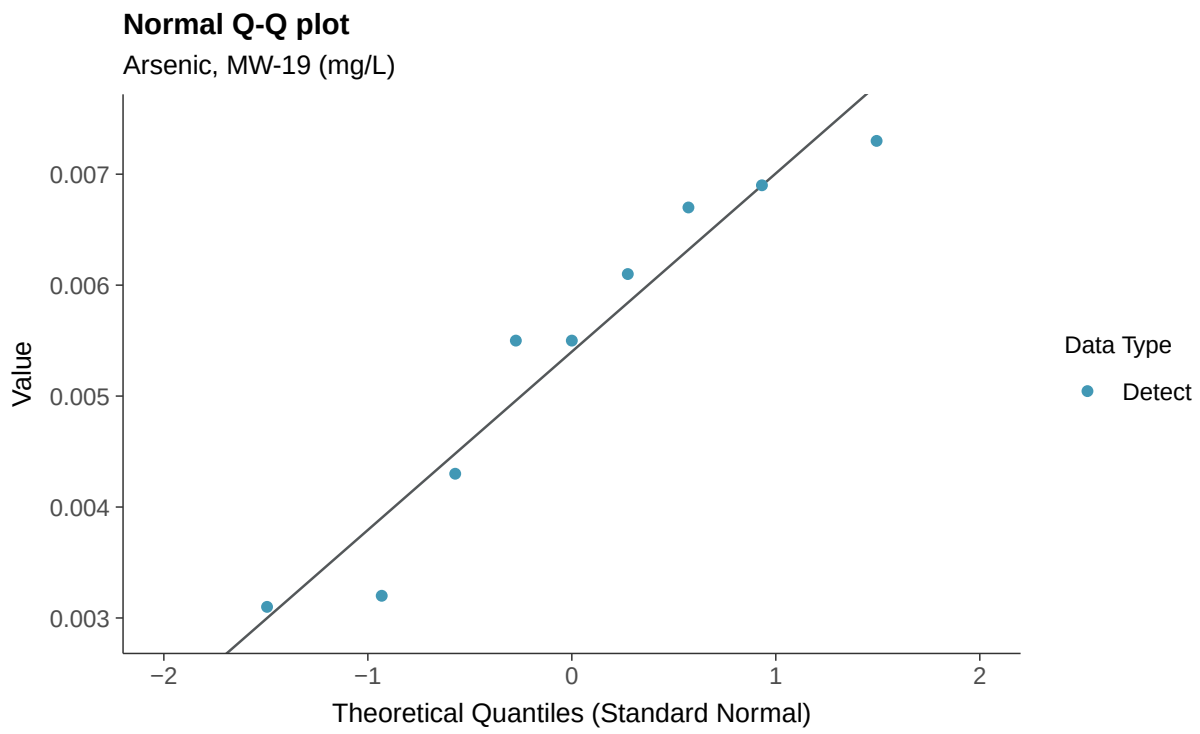
Arsenic, MW-19 (mg/L)

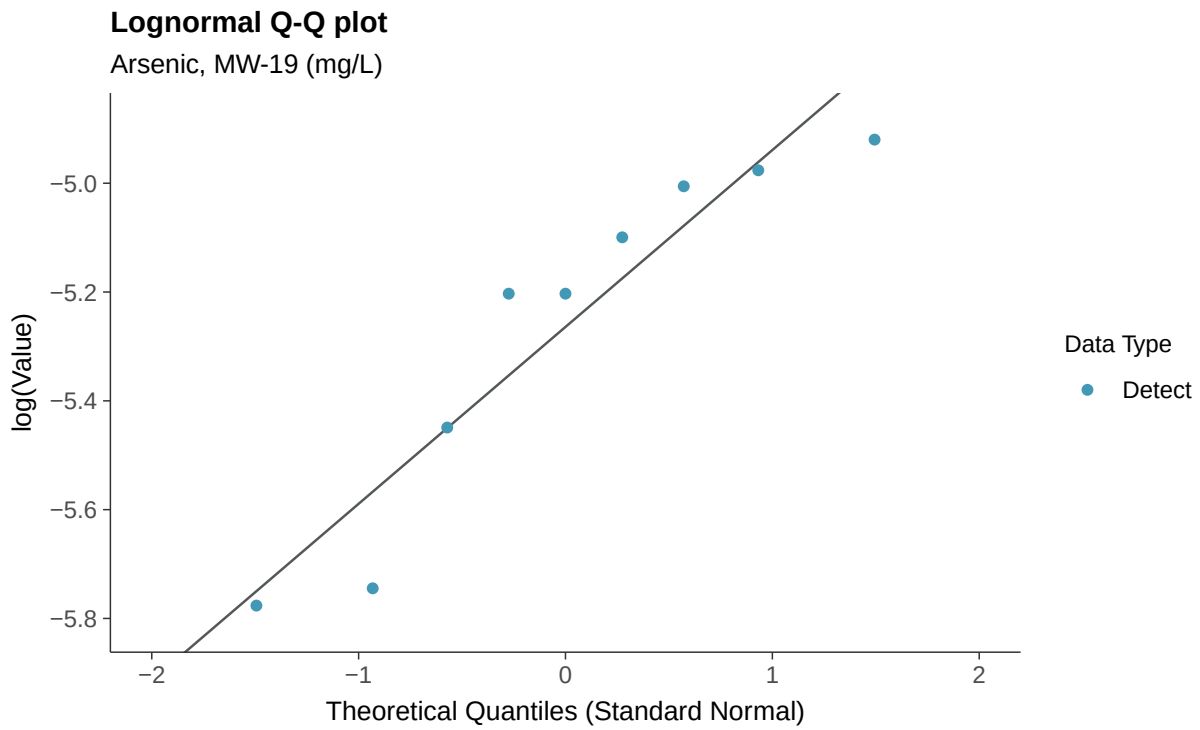


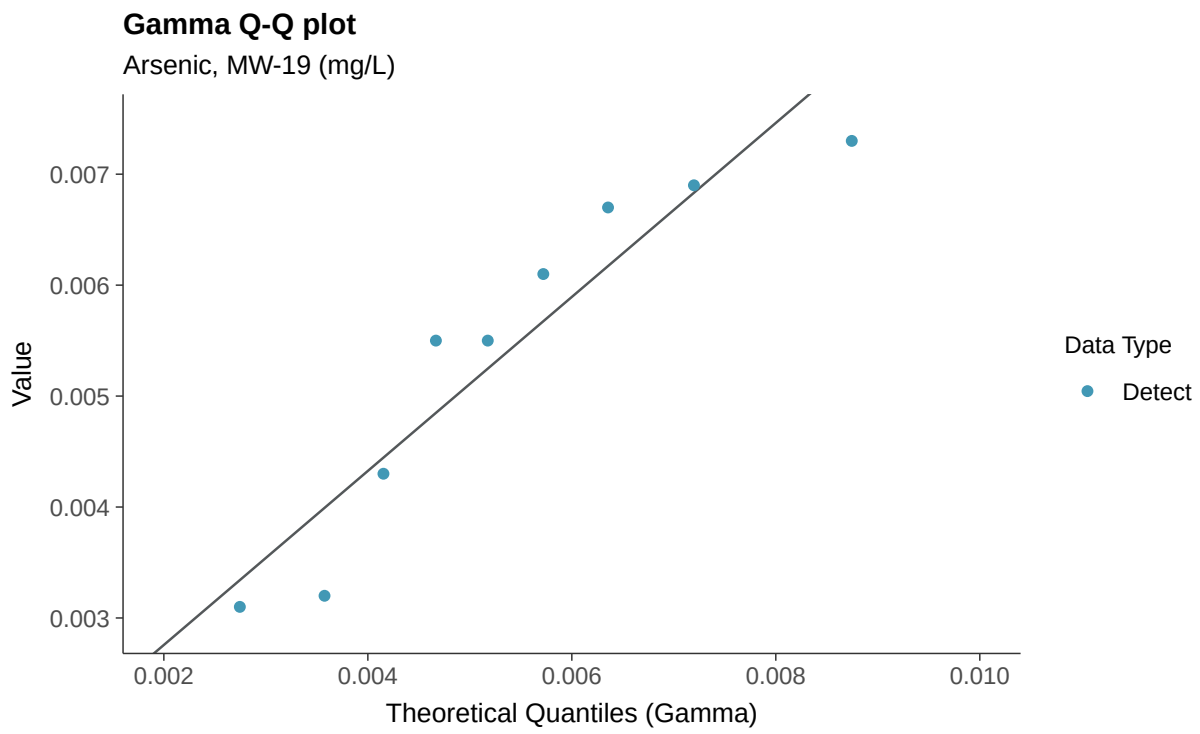
Boxplot by Season

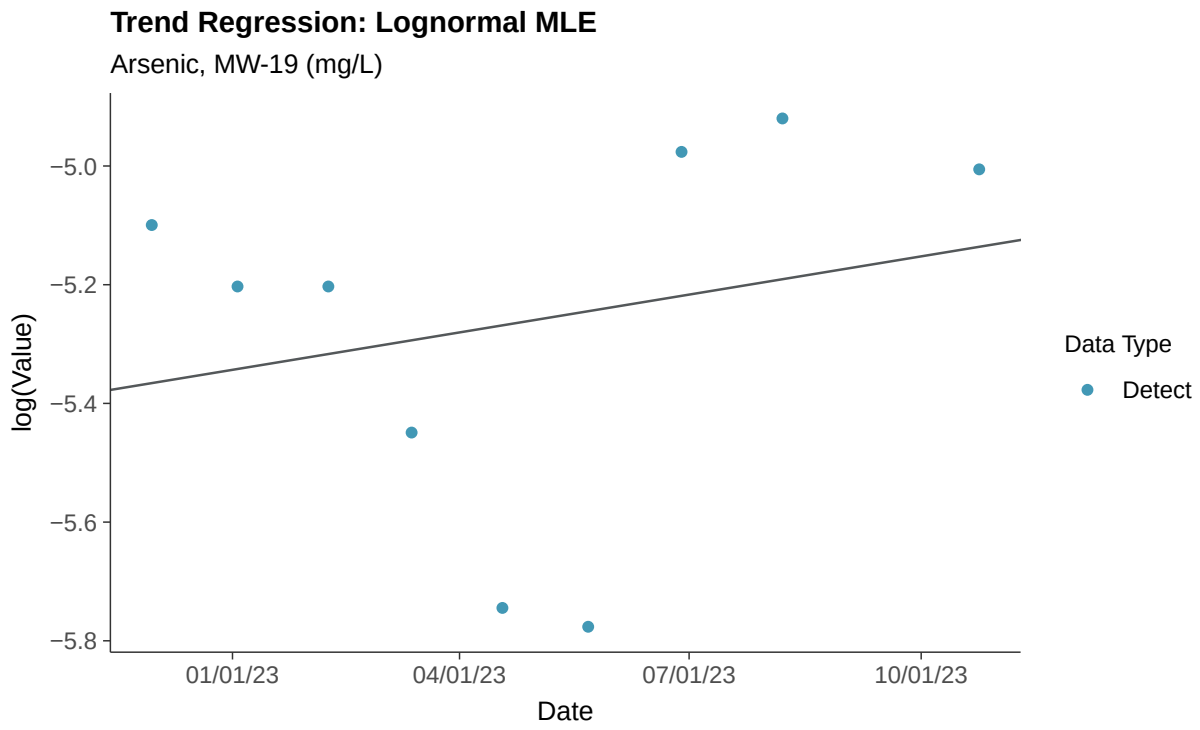
Arsenic, MW-19 (mg/L)

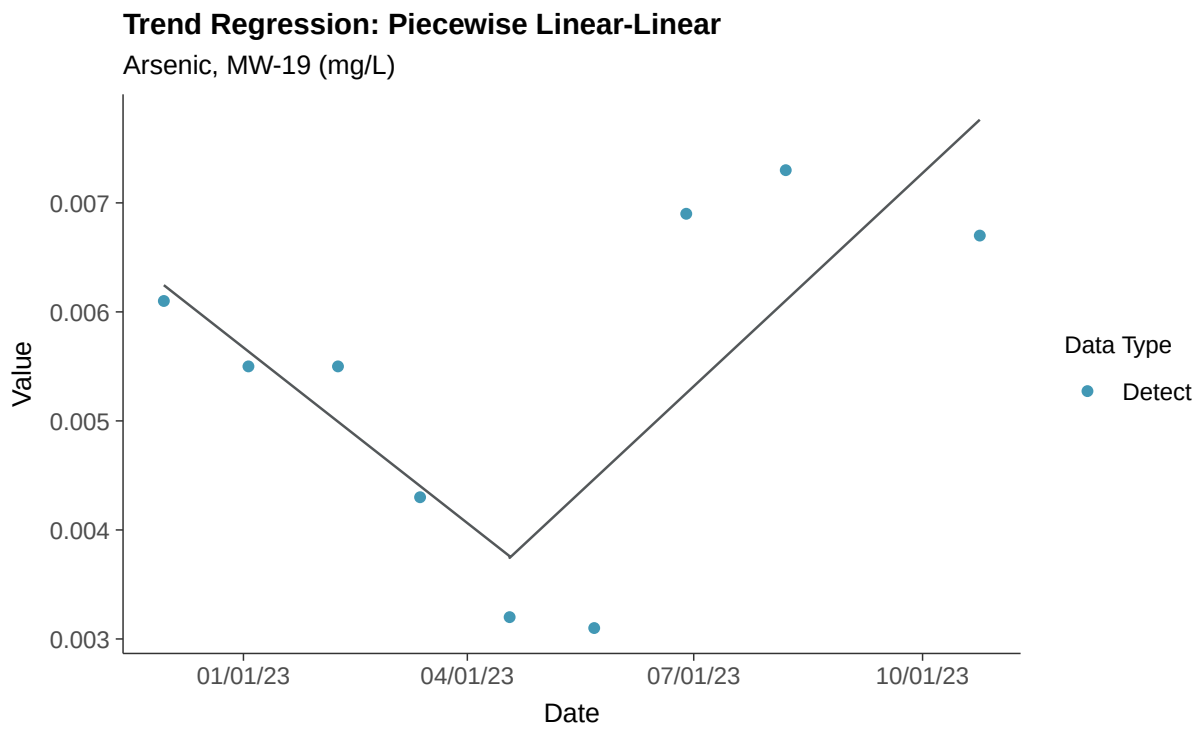


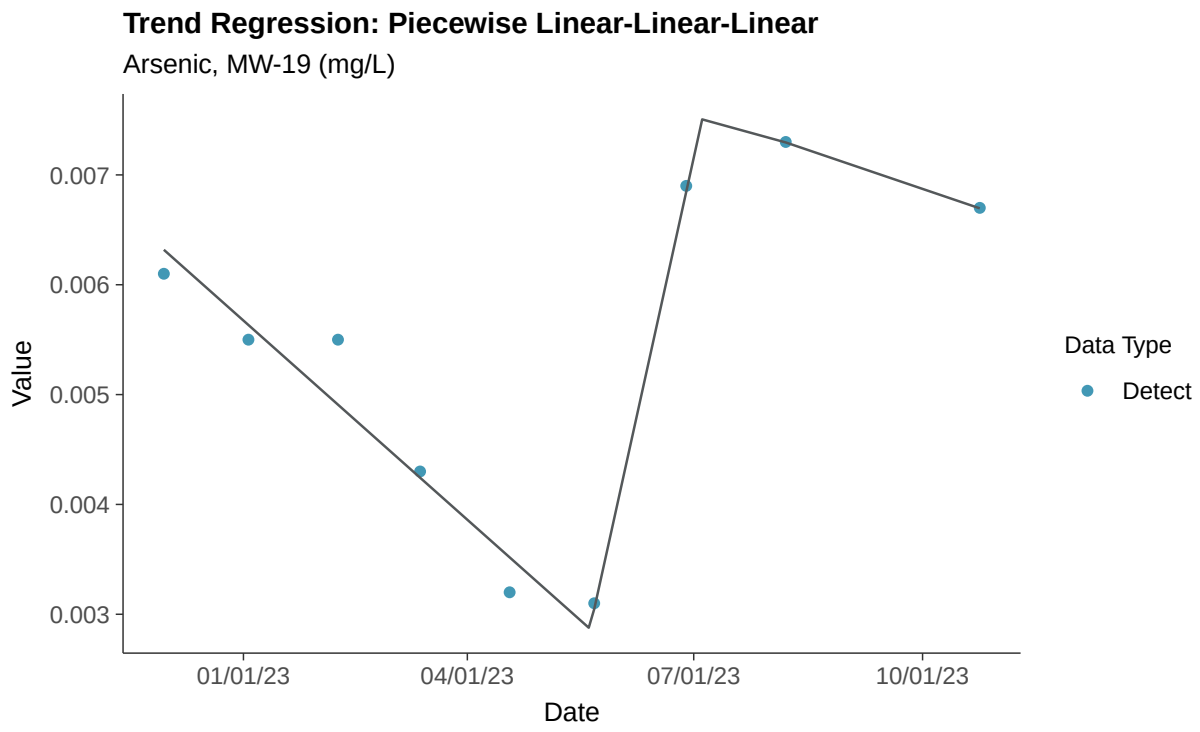

Normal Q-Q plot
Arsenic, MW-19 (mg/L)
Value
0.007
0.006
0.005
0.004
0.003
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Arsenic, MW-19 (mg/L)
log(Value)
−5.0
−5.2
−5.4
−5.6
−5.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-19 (mg/L)
Value
0.007
0.006
0.005
0.004
0.003
0.002
0.004
0.006
0.008
0.010
Theoretical Quantiles (Gamma)
Data Type
Detect

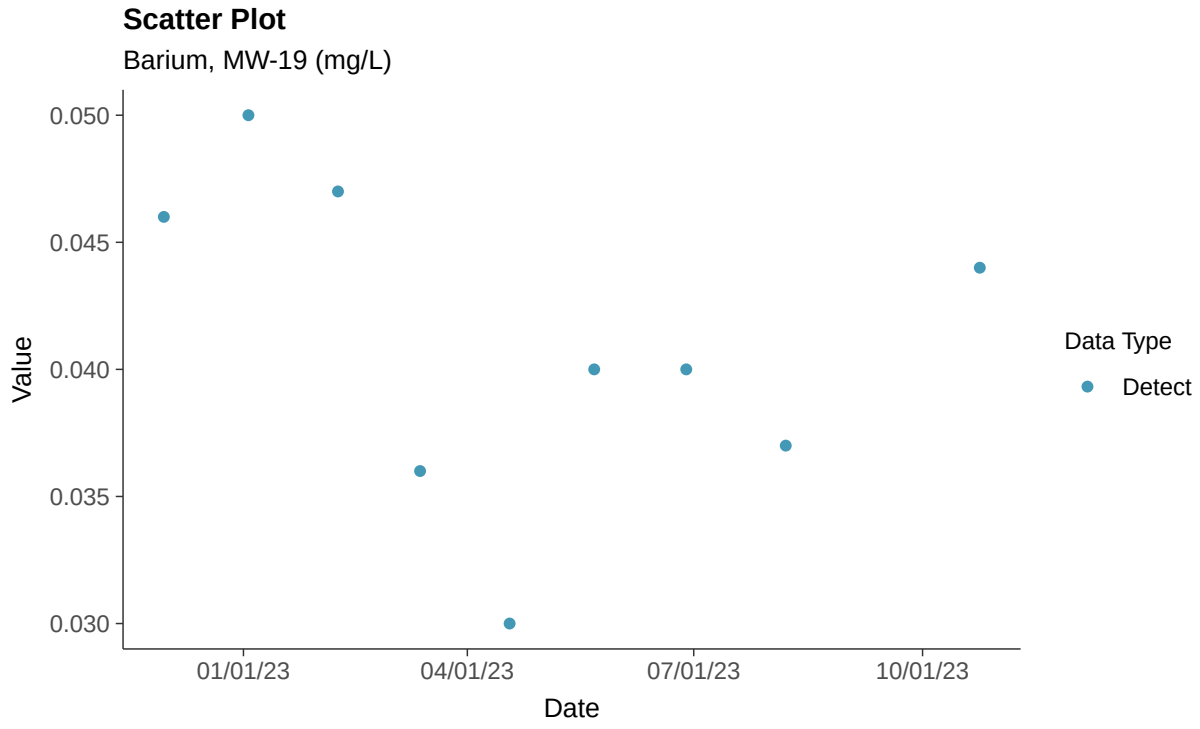

Trend Regression: Lognormal MLE
Arsenic, MW-19 (mg/L)
log(Value)
−5.0
−5.2
−5.4
−5.6
−5.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

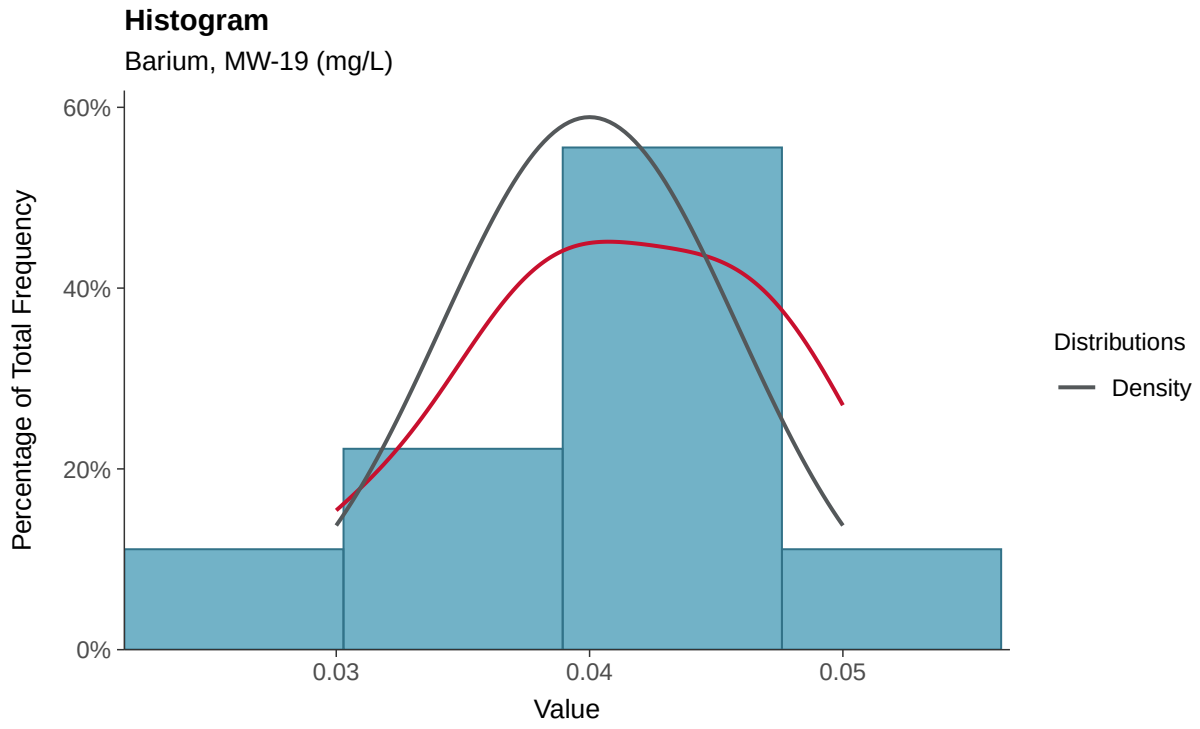

Trend Regression: Piecewise Linear-Linear
Arsenic, MW-19 (mg/L)
Value
0.007
0.006
0.005
0.004
0.003
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Arsenic, MW-19 (mg/L)
Value
0.007
0.006
0.005
0.004
0.003
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-19

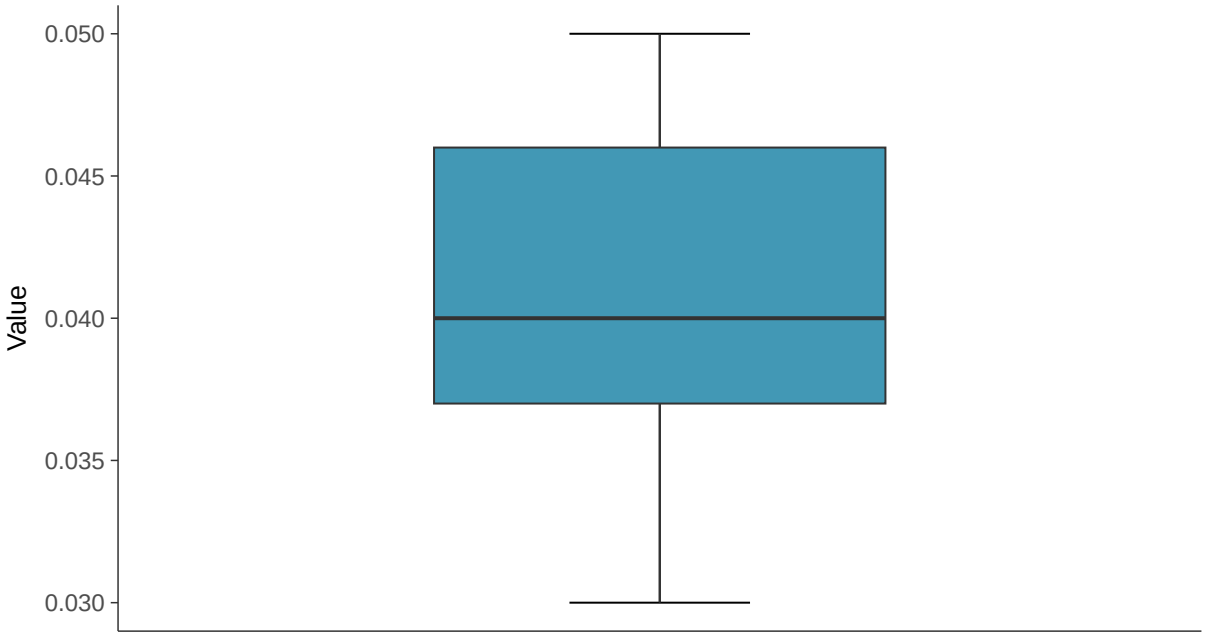
ID: 1_23_5_103





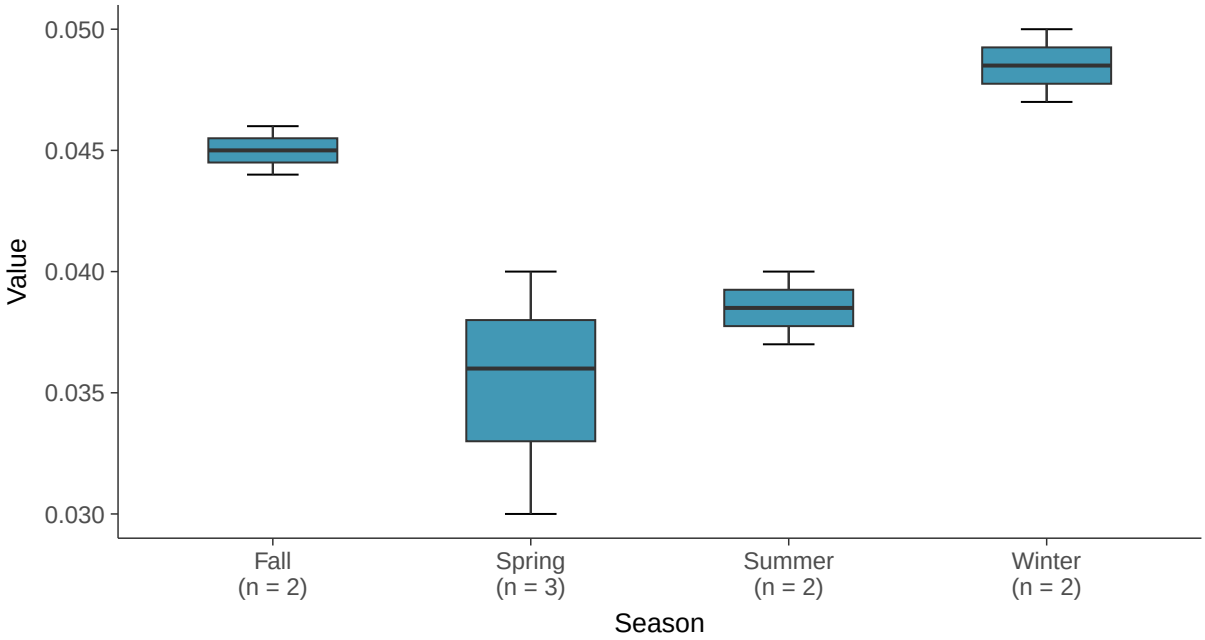
Boxplot

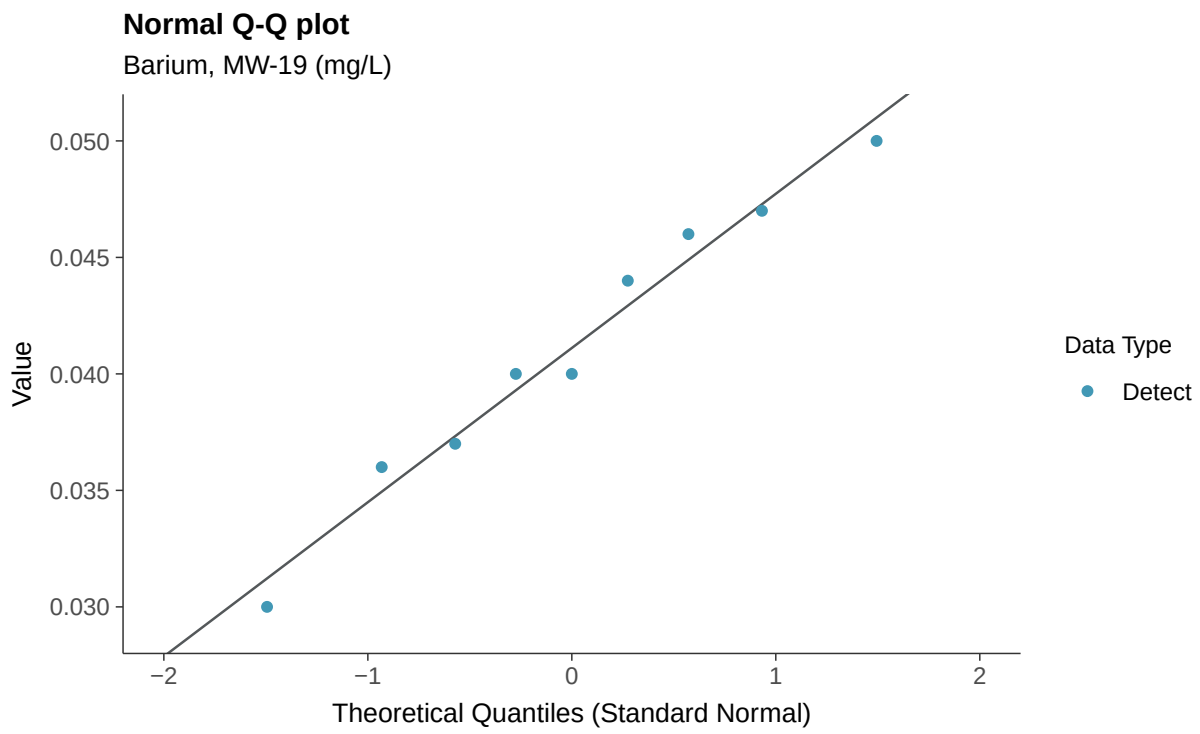
Barium, MW-19 (mg/L)

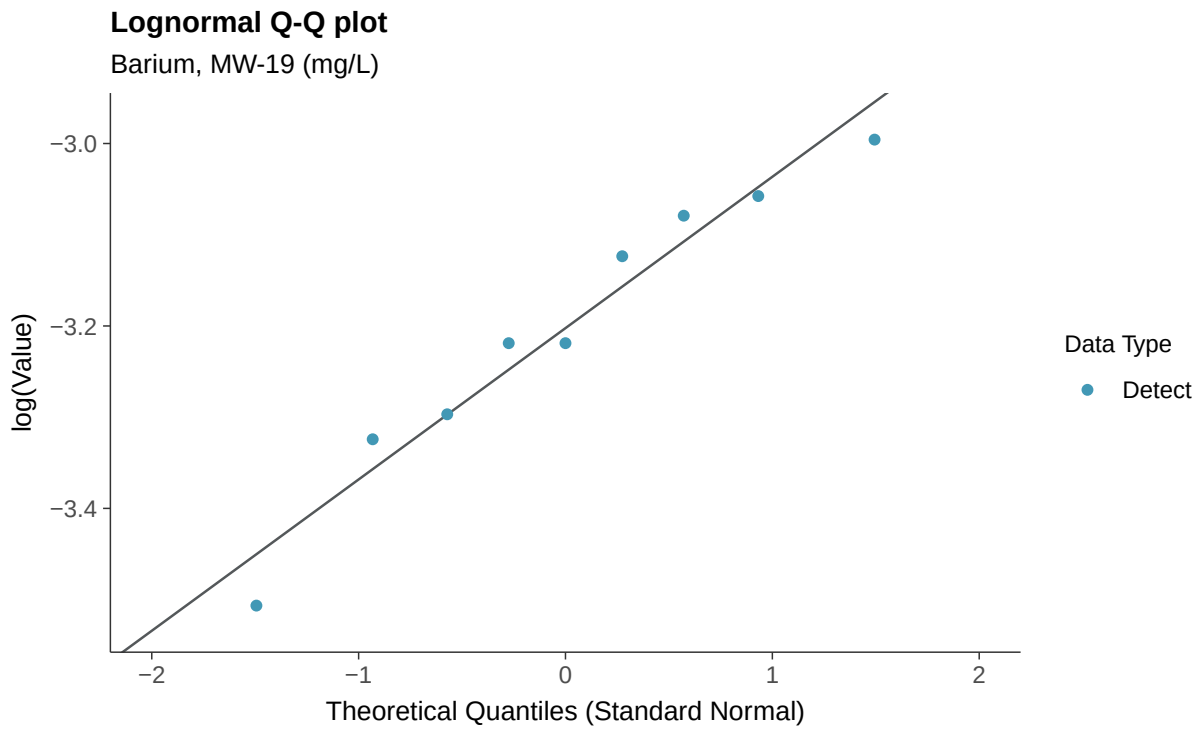


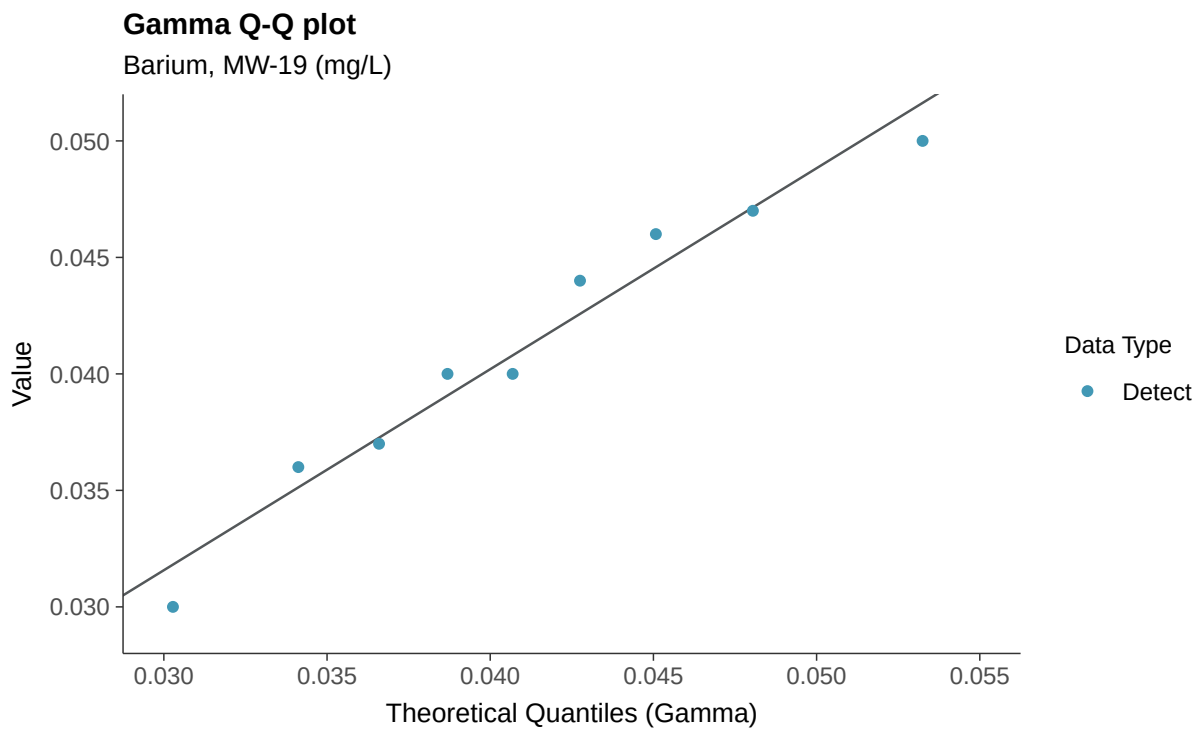
Boxplot by Season

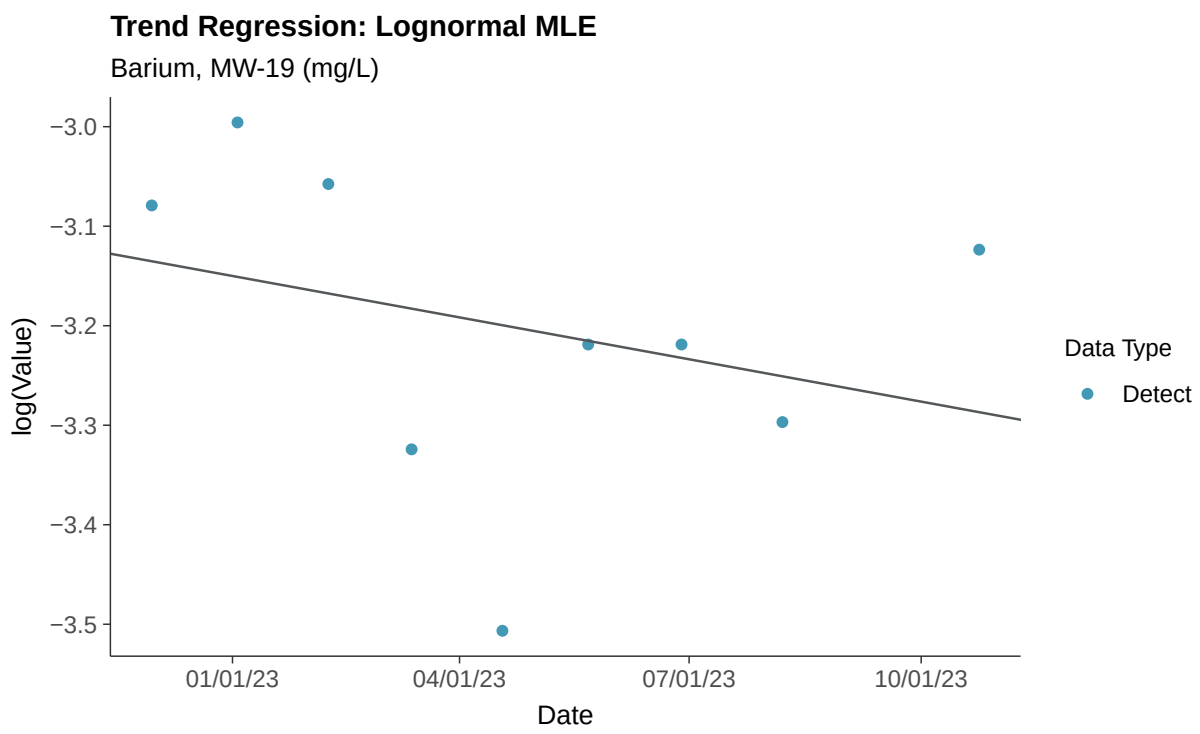
Barium, MW-19 (mg/L)

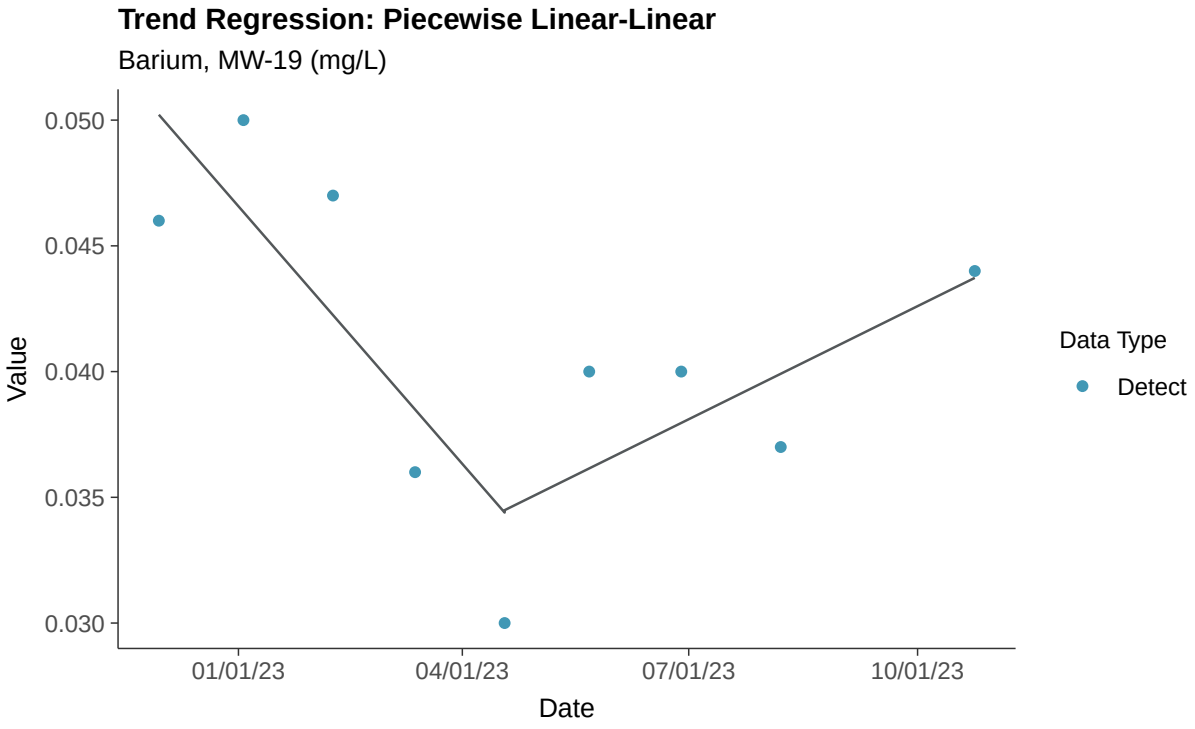


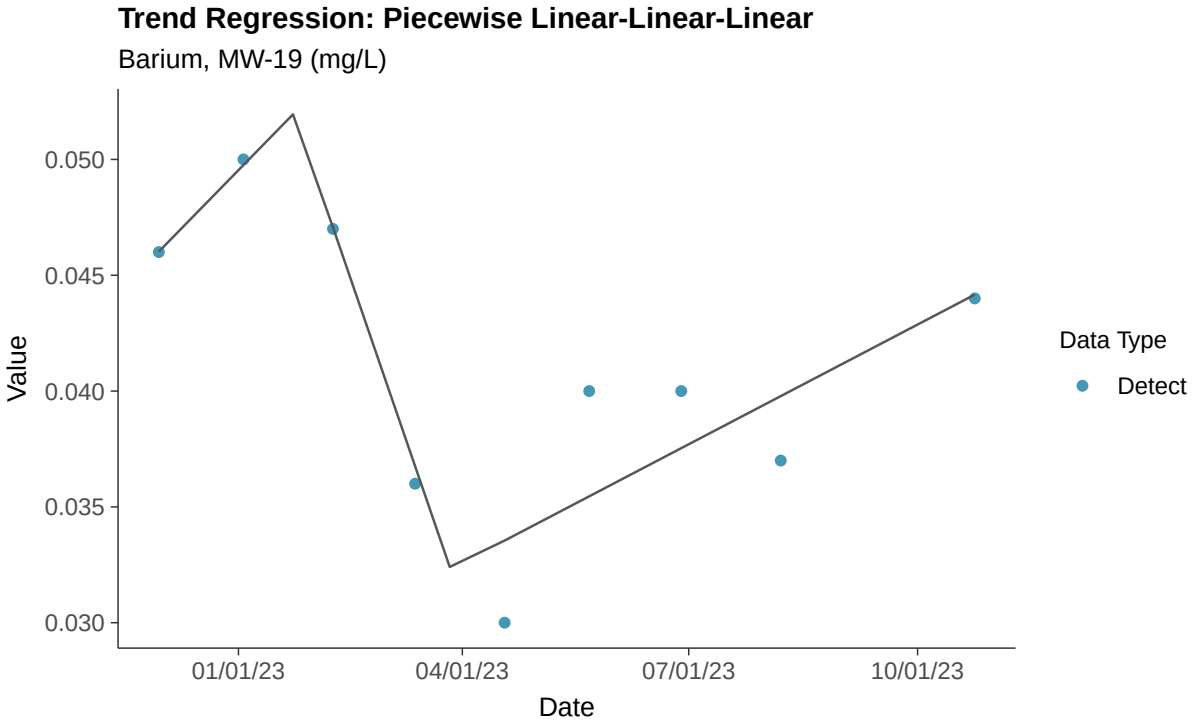

Normal Q-Q plot
Barium, MW-19 (mg/L)
Value
0.050
0.045
0.040
0.035
0.030
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Barium, MW-19 (mg/L)
log(Value)
−3.0
−3.2
−3.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Barium, MW-19 (mg/L)
Value
0.050
0.045
0.040
0.035
0.030
0.030
0.035
0.040
0.045
0.050
0.055
Theoretical Quantiles (Gamma)
Data Type
Detect

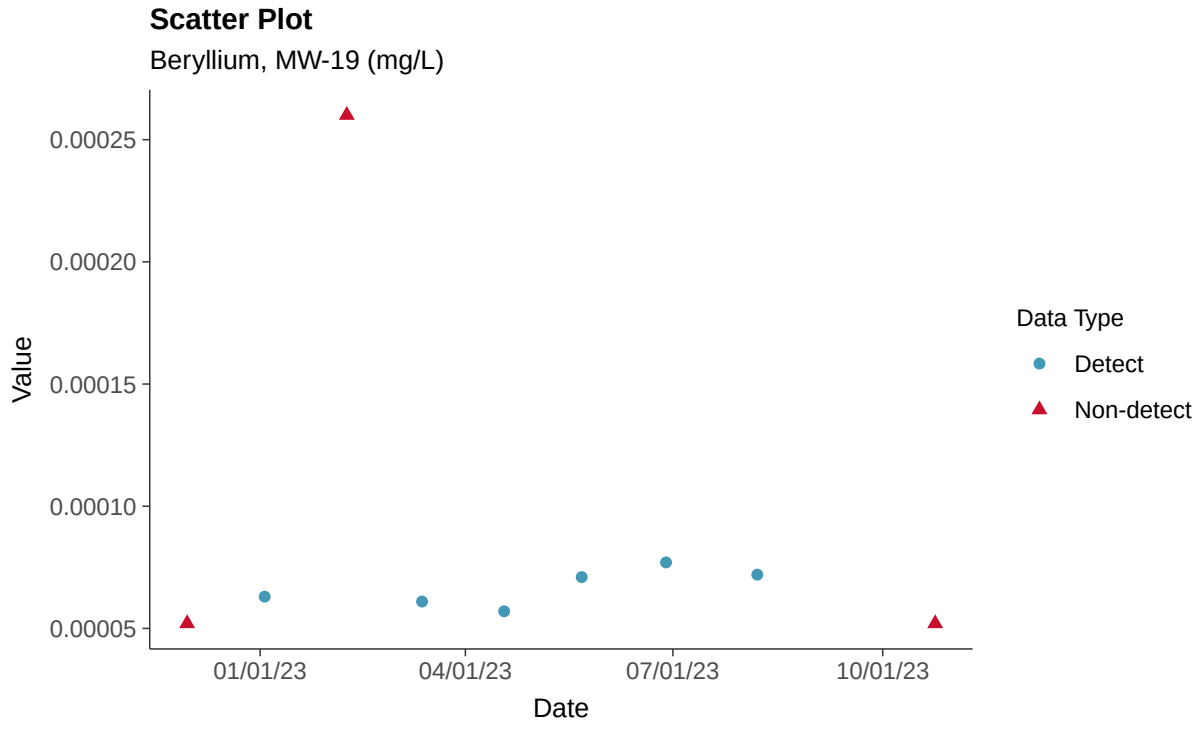

Trend Regression: Lognormal MLE
Barium, MW-19 (mg/L)
log(Value)
−3.0
−3.1
−3.2
−3.3
−3.4
−3.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

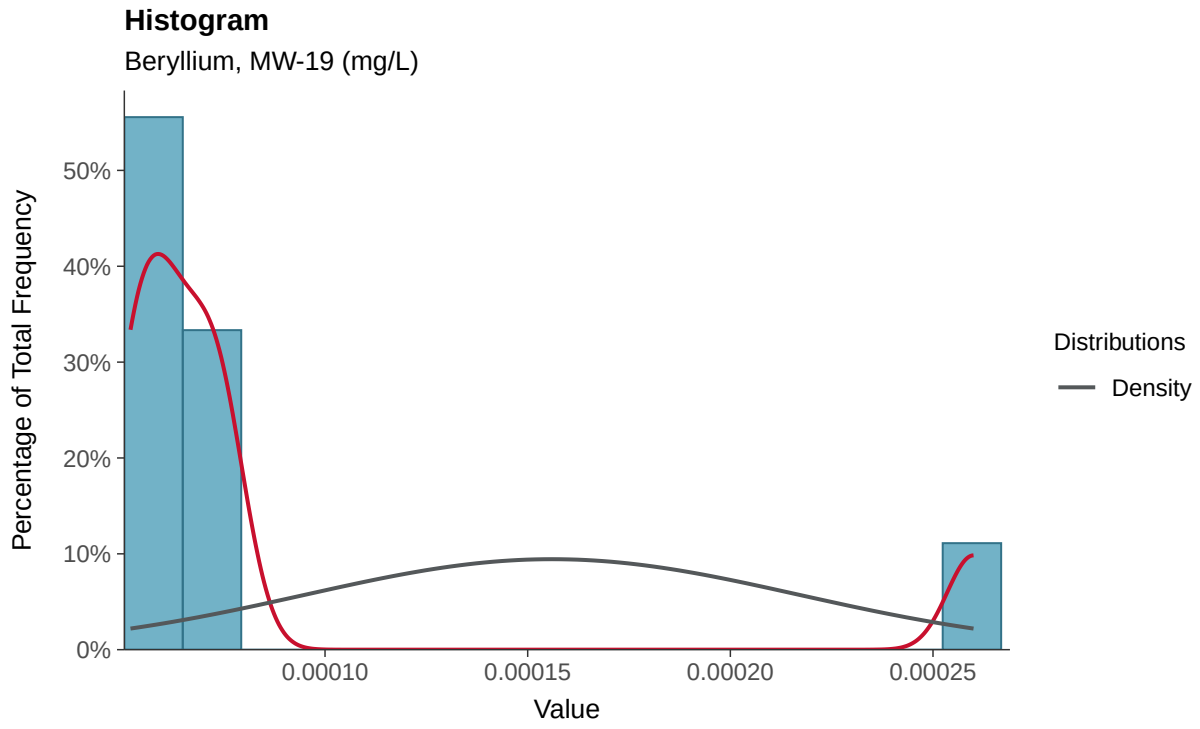

Trend Regression: Piecewise Linear-Linear
Barium, MW-19 (mg/L)
0.050
0.045
0.040
0.035
0.030
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Barium, MW-19 (mg/L)
0.050
0.045
0.040
0.035
0.030
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-19

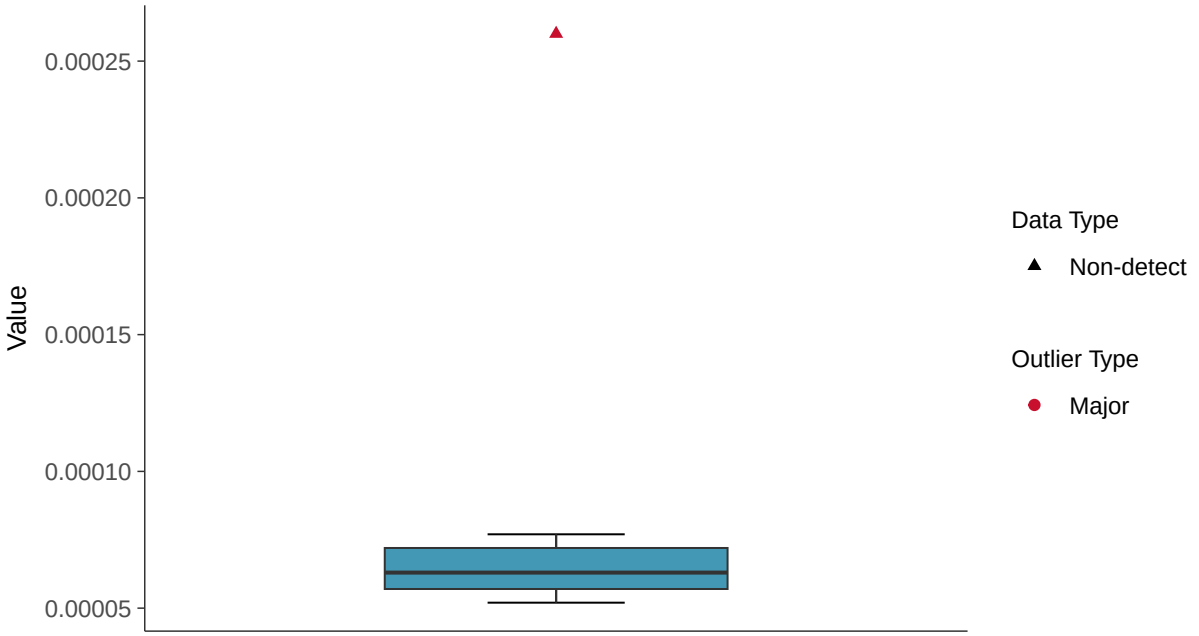
ID: 1_23_5_104





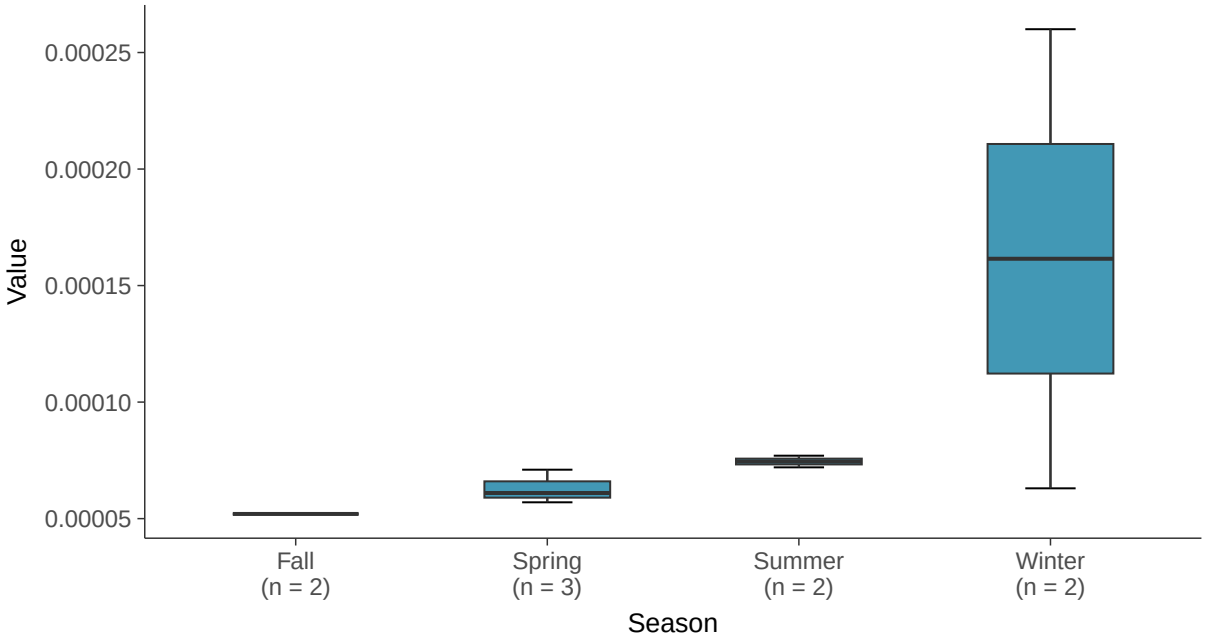
Boxplot

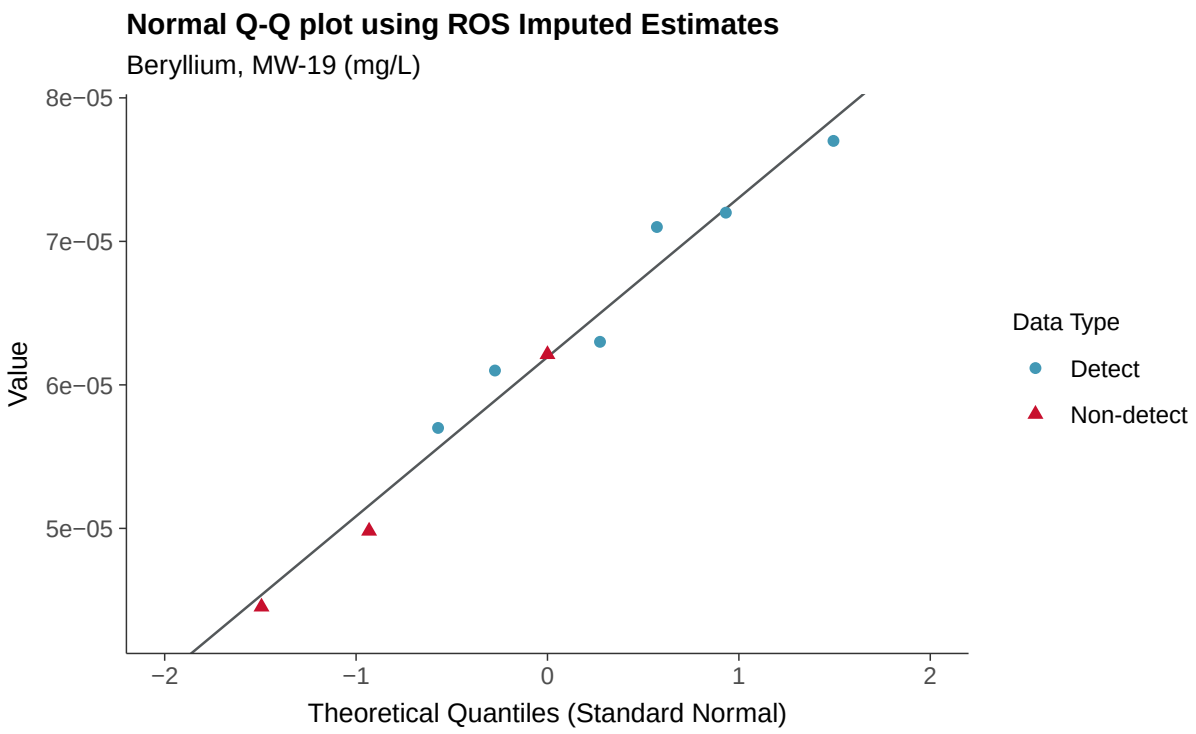
Beryllium, MW-19 (mg/L)

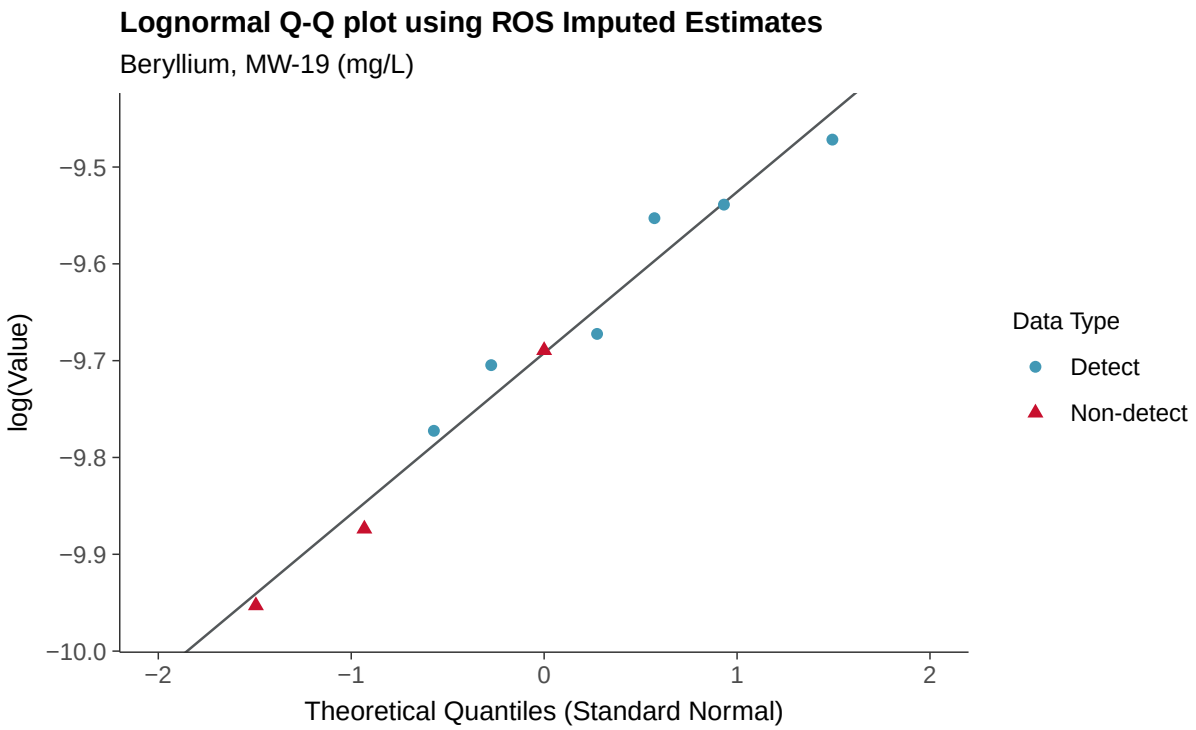


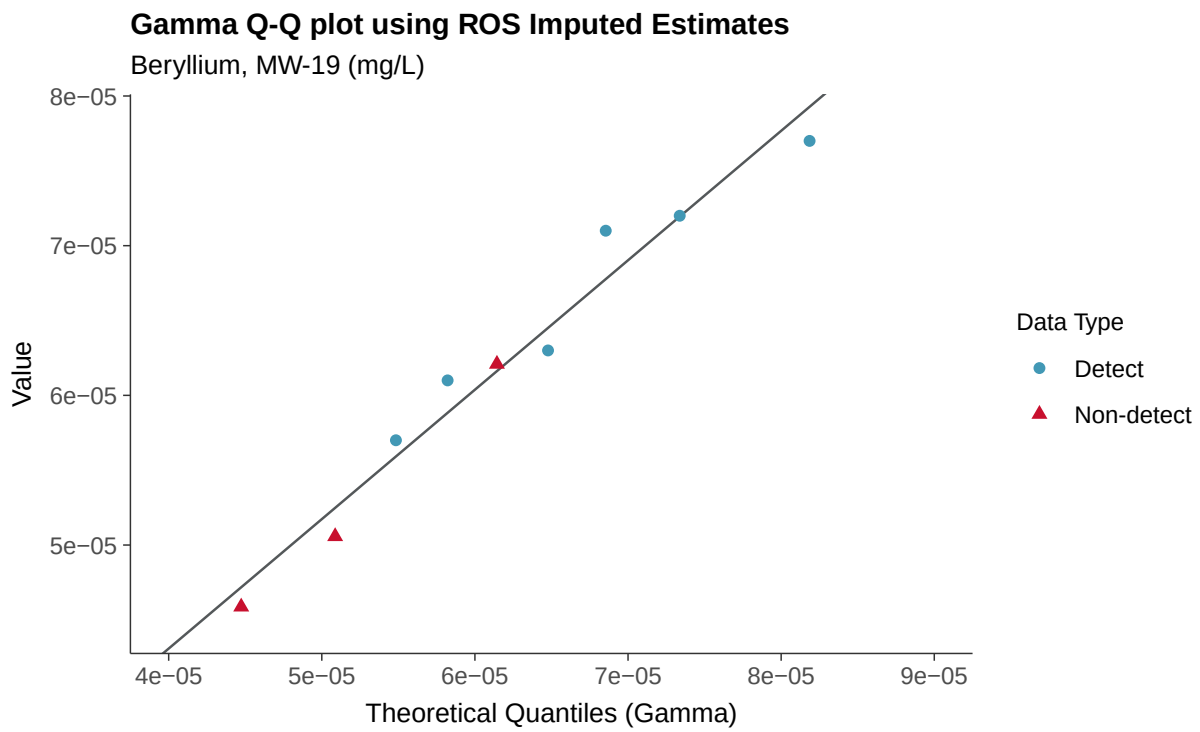
Boxplot by Season

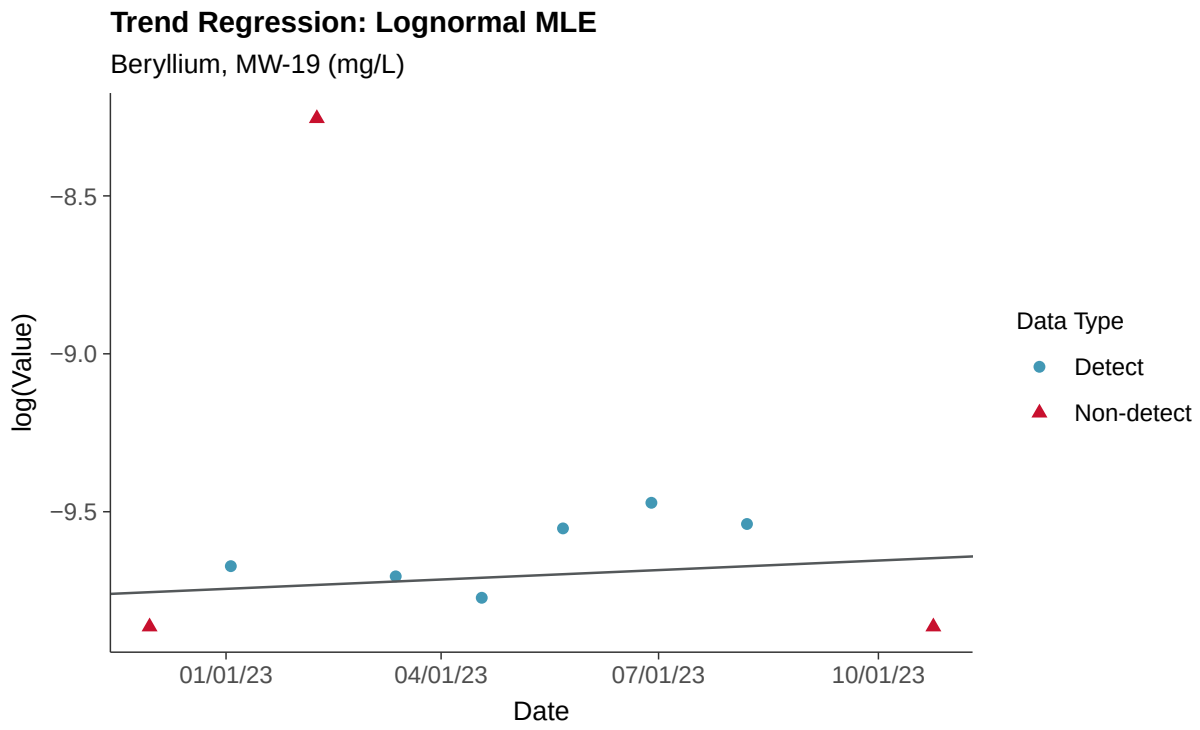
Beryllium, MW-19 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Beryllium, MW-19 (mg/L)
Value
8e−05
7e−05
6e−05
5e−05
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

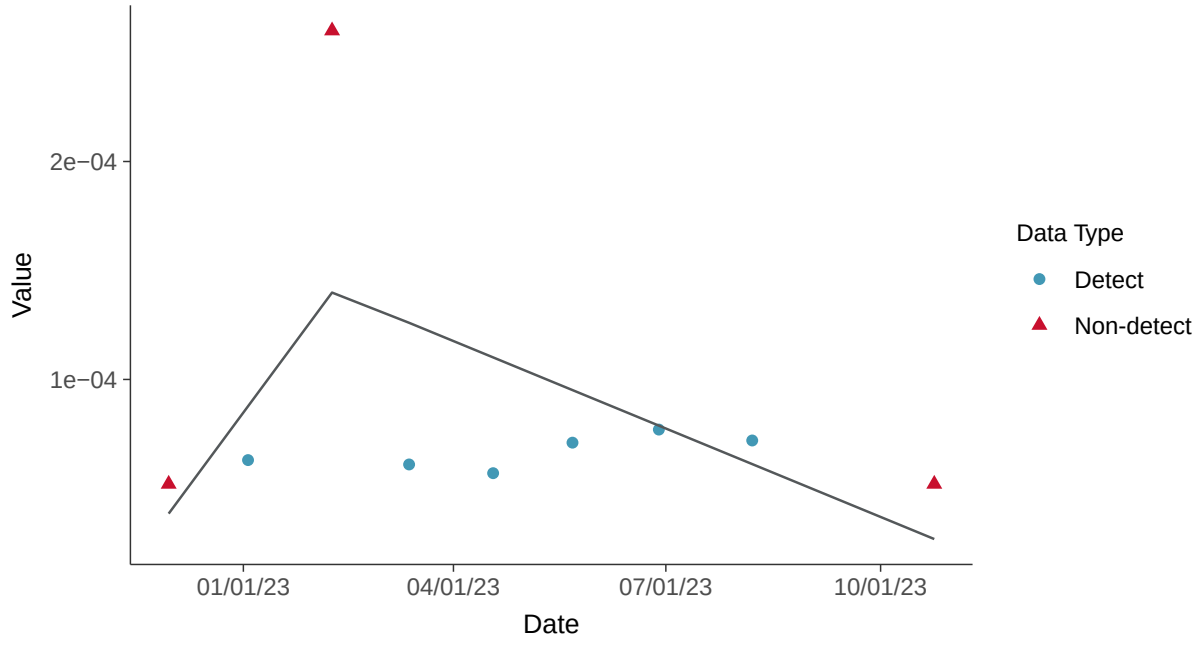

Lognormal Q-Q plot using ROS Imputed Estimates
Beryllium, MW-19 (mg/L)
log(Value)
−9.5
−9.6
−9.7
−9.8
−9.9
−10.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Beryllium, MW-19 (mg/L)
8e−05
7e−05
6e−05
5e−05
Value
4e−05
5e−05
6e−05
7e−05
8e−05
9e−05
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Beryllium, MW-19 (mg/L)
−8.5
−9.0
−9.5
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

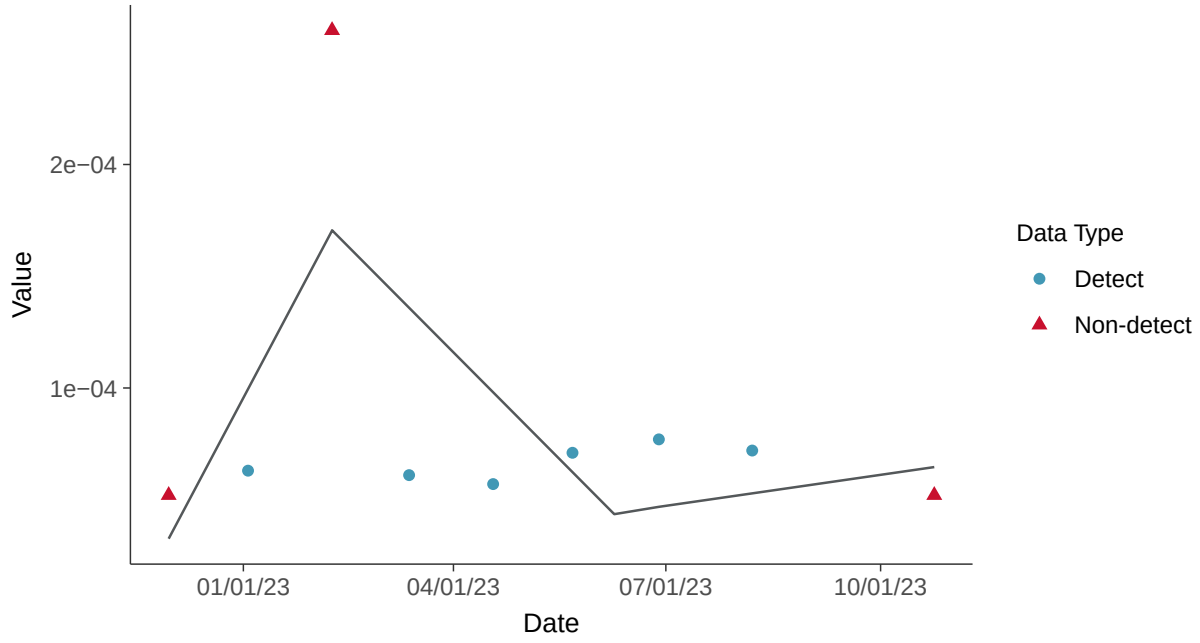
Trend Regression: Piecewise Linear-Linear

Beryllium, MW-19 (mg/L)



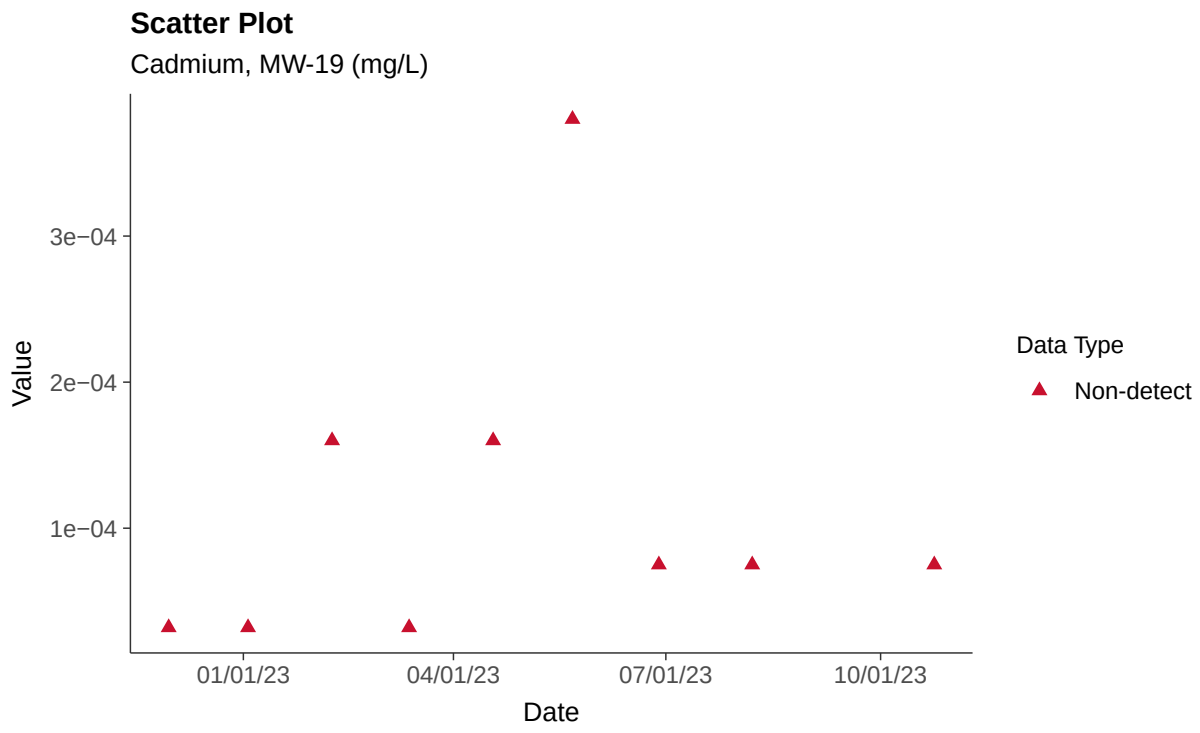
Trend Regression: Piecewise Linear-Linear-Linear

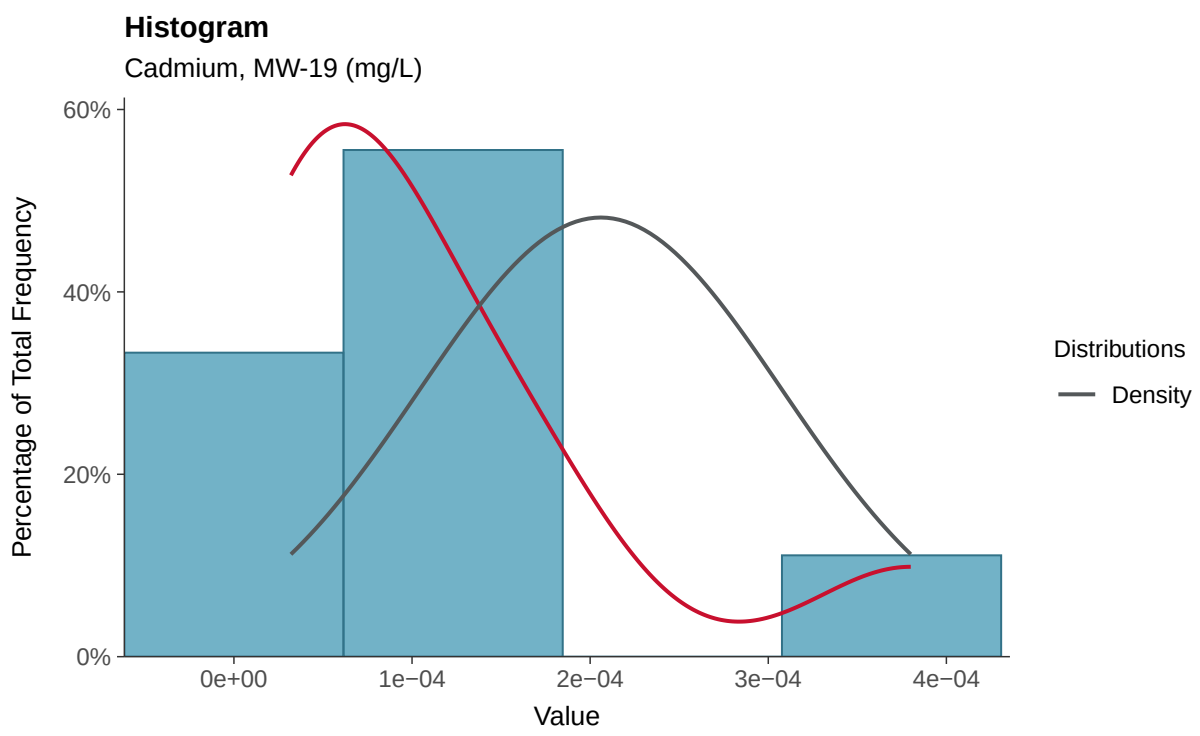
Beryllium, MW-19 (mg/L)



Appendix IV: Cadmium, MW-19

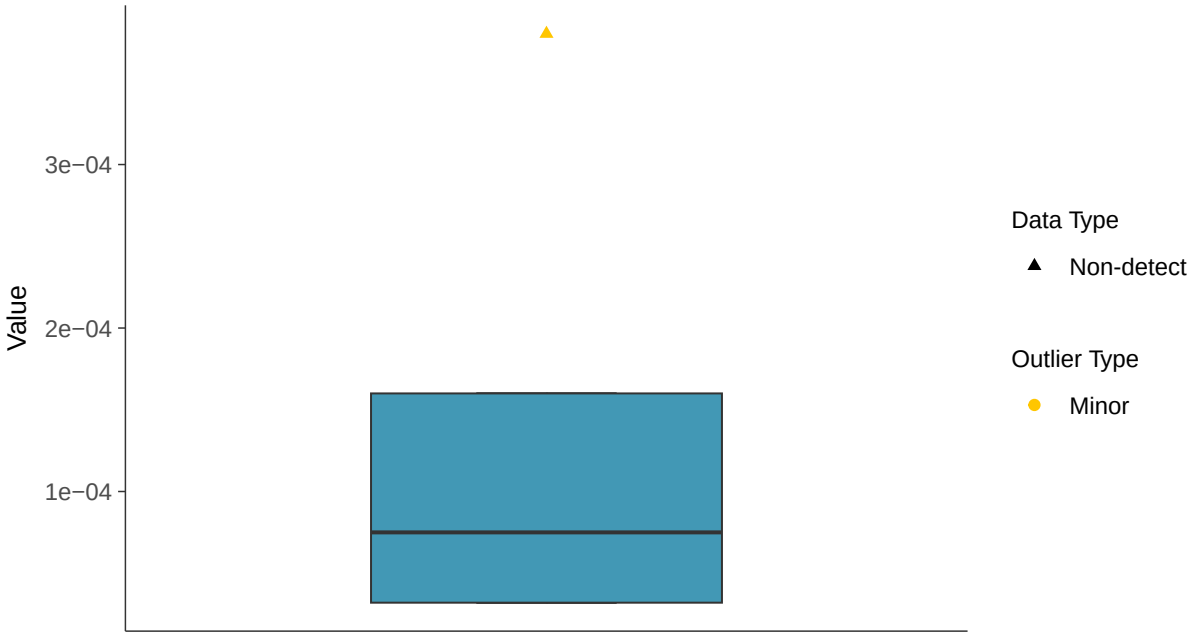
ID: 1_23_5_106





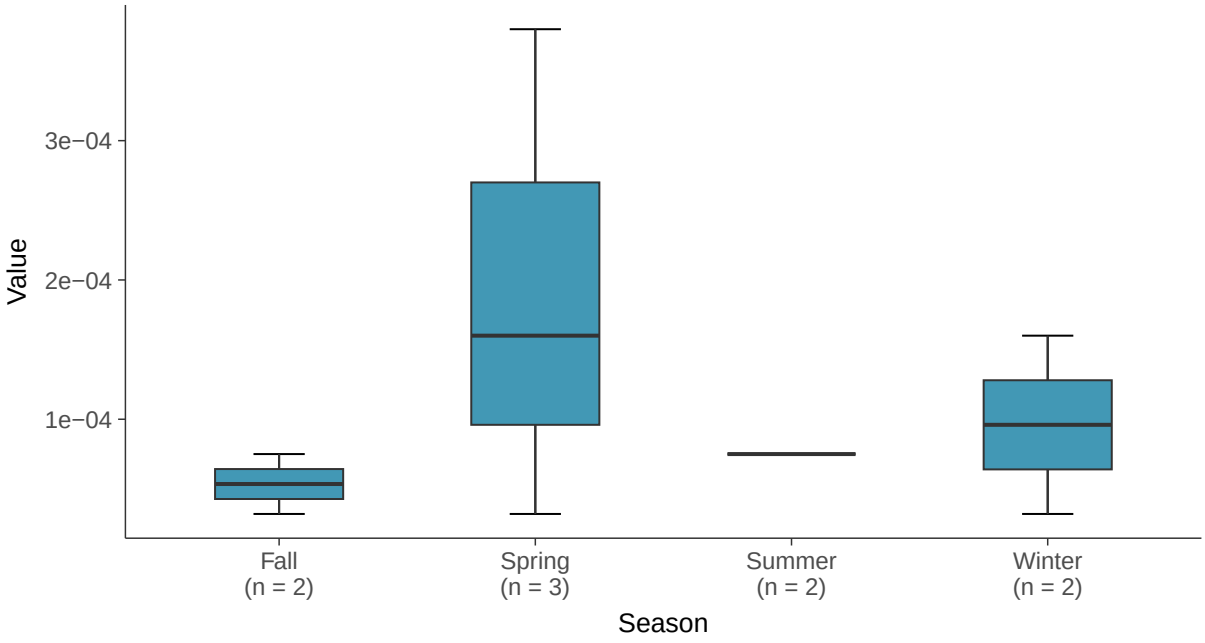
Boxplot

Cadmium, MW-19 (mg/L)



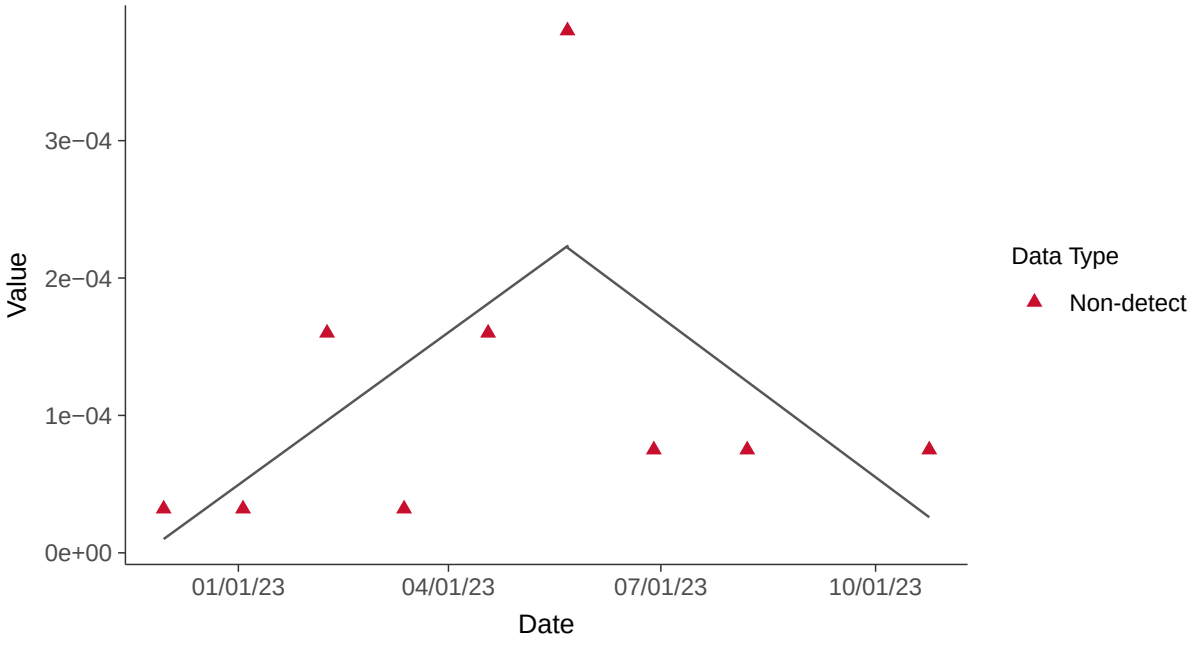
Boxplot by Season

Cadmium, MW-19 (mg/L)



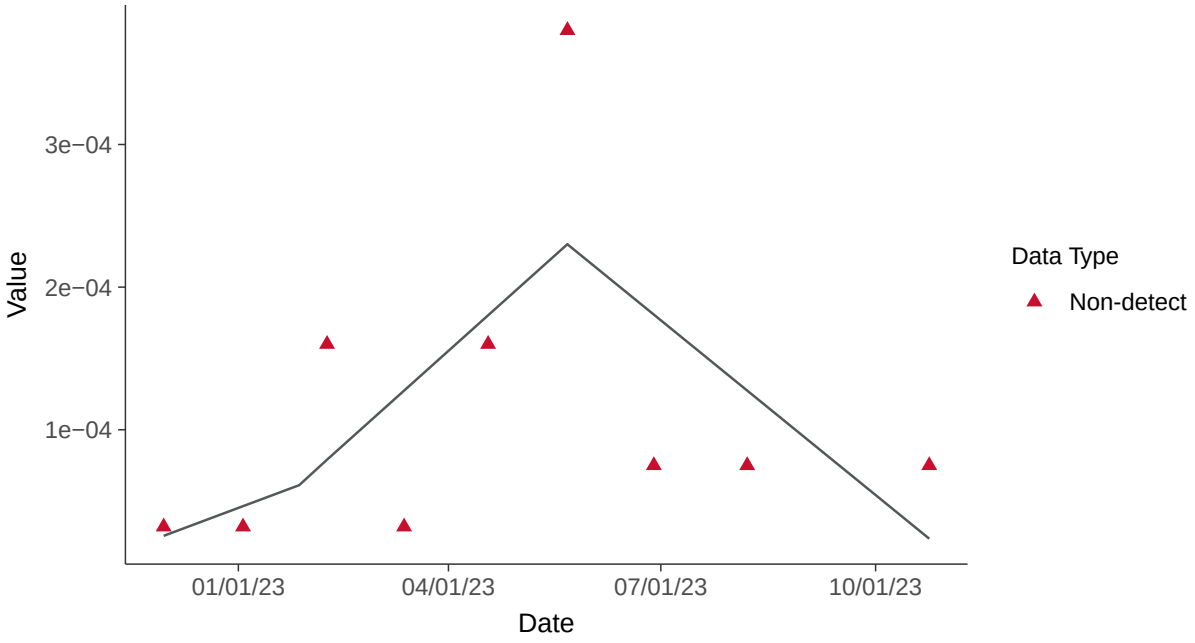
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-19 (mg/L)



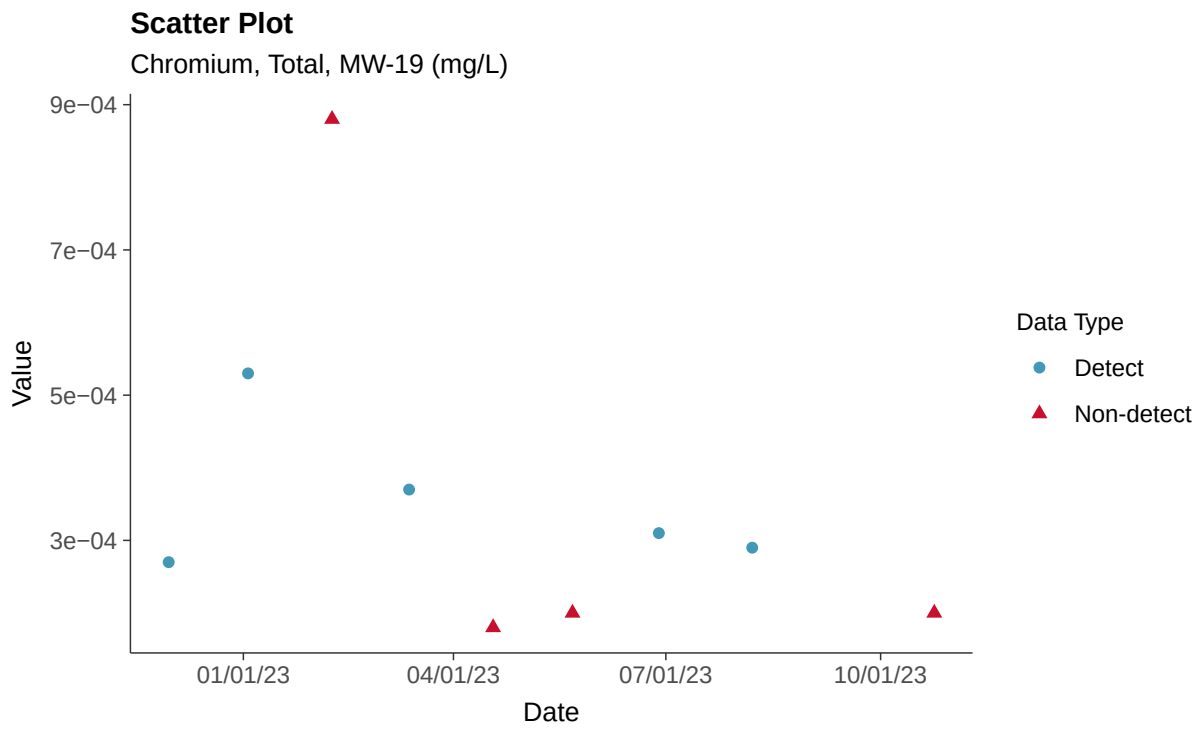
Trend Regression: Piecewise Linear-Linear-Linear

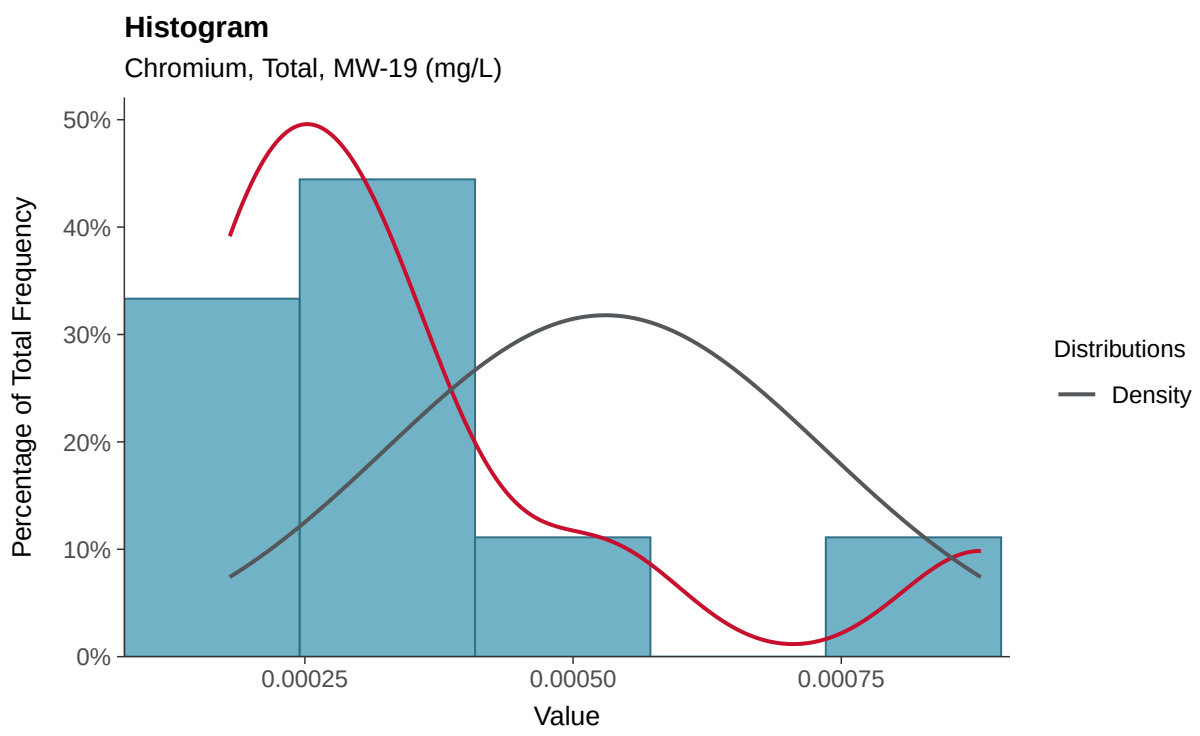
Cadmium, MW-19 (mg/L)



Appendix IV: Chromium, Total, MW-19

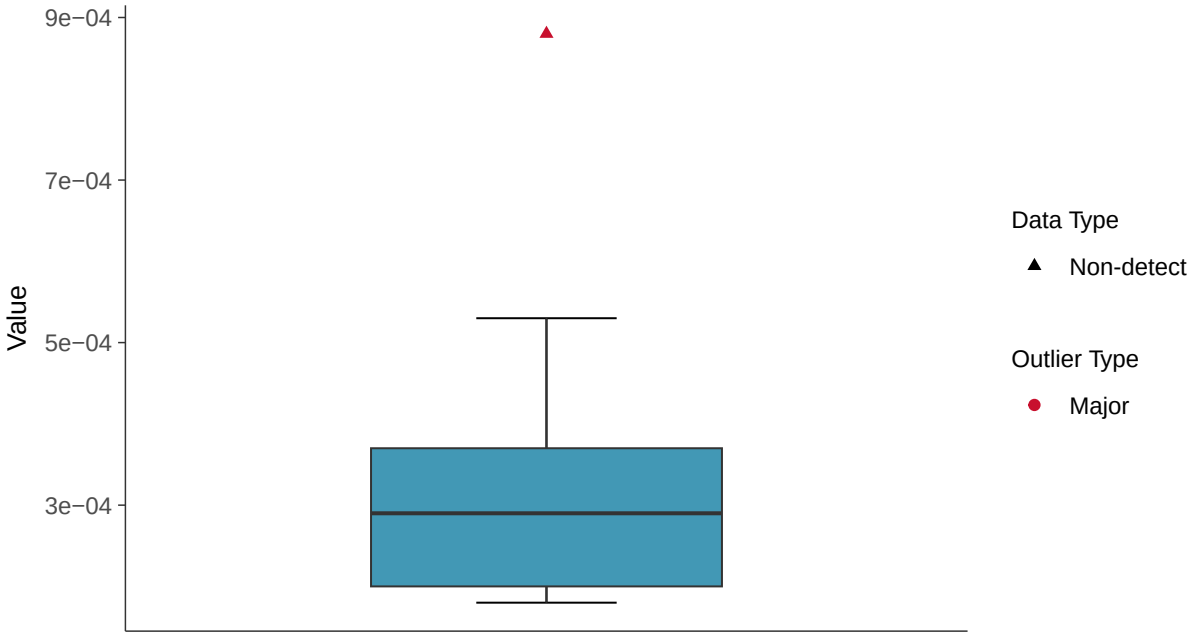
ID: 1_23_5_109





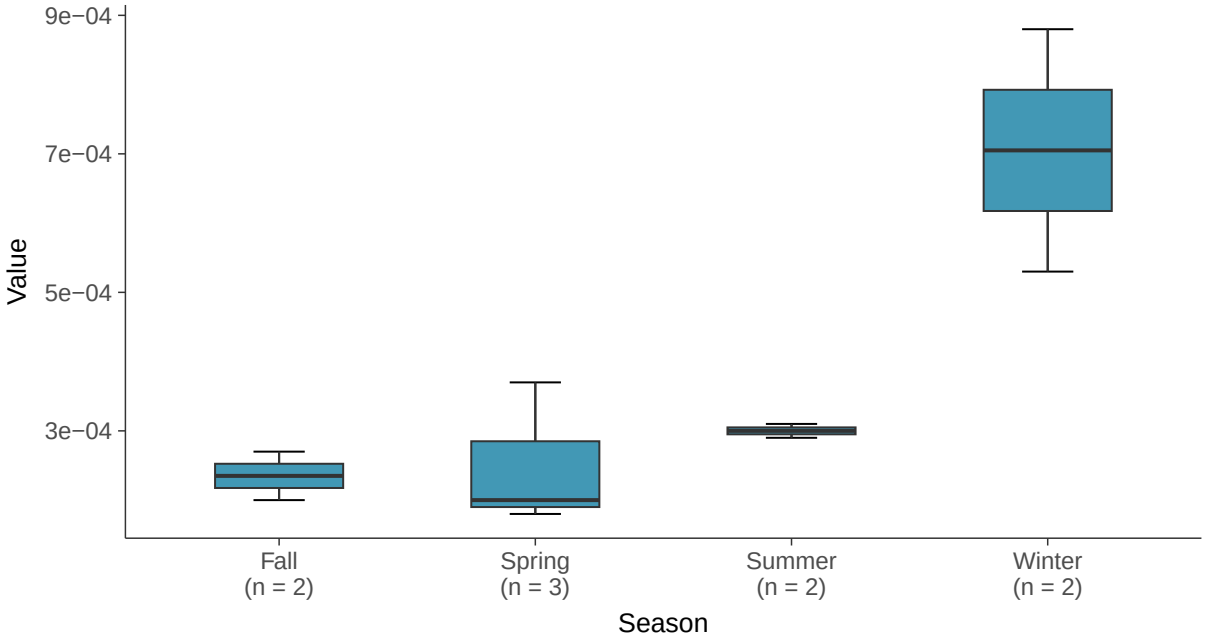
Boxplot

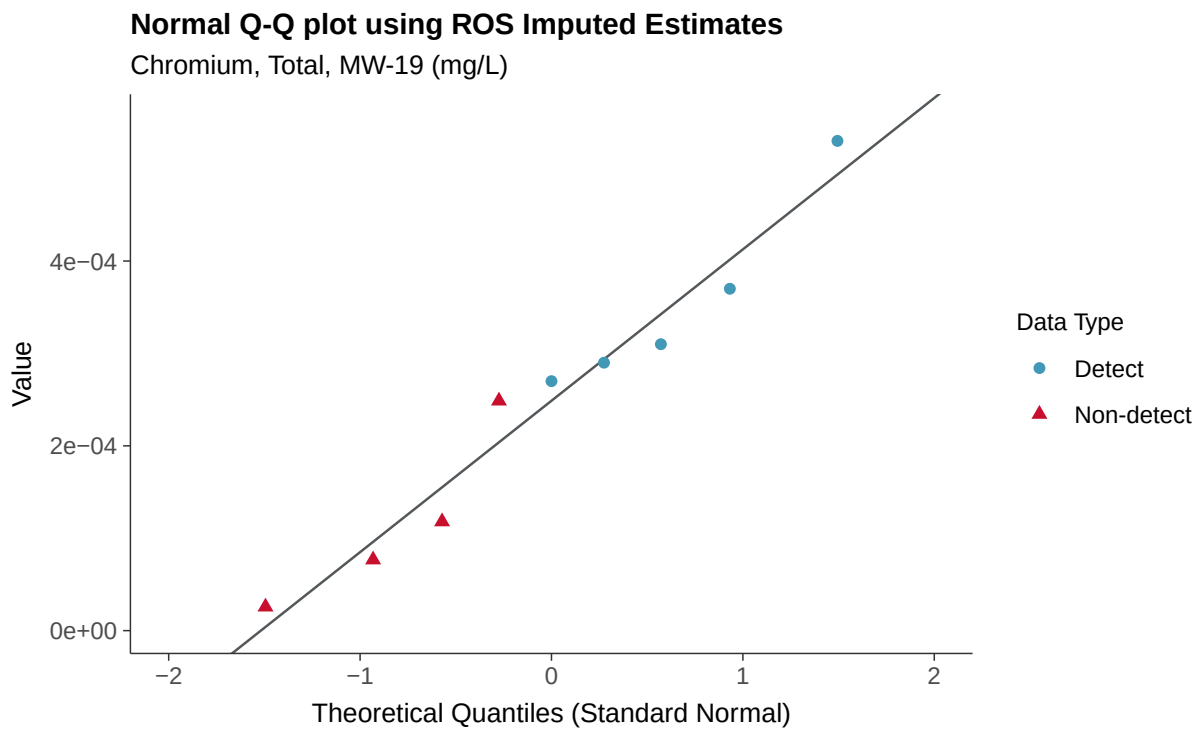
Chromium, Total, MW-19 (mg/L)

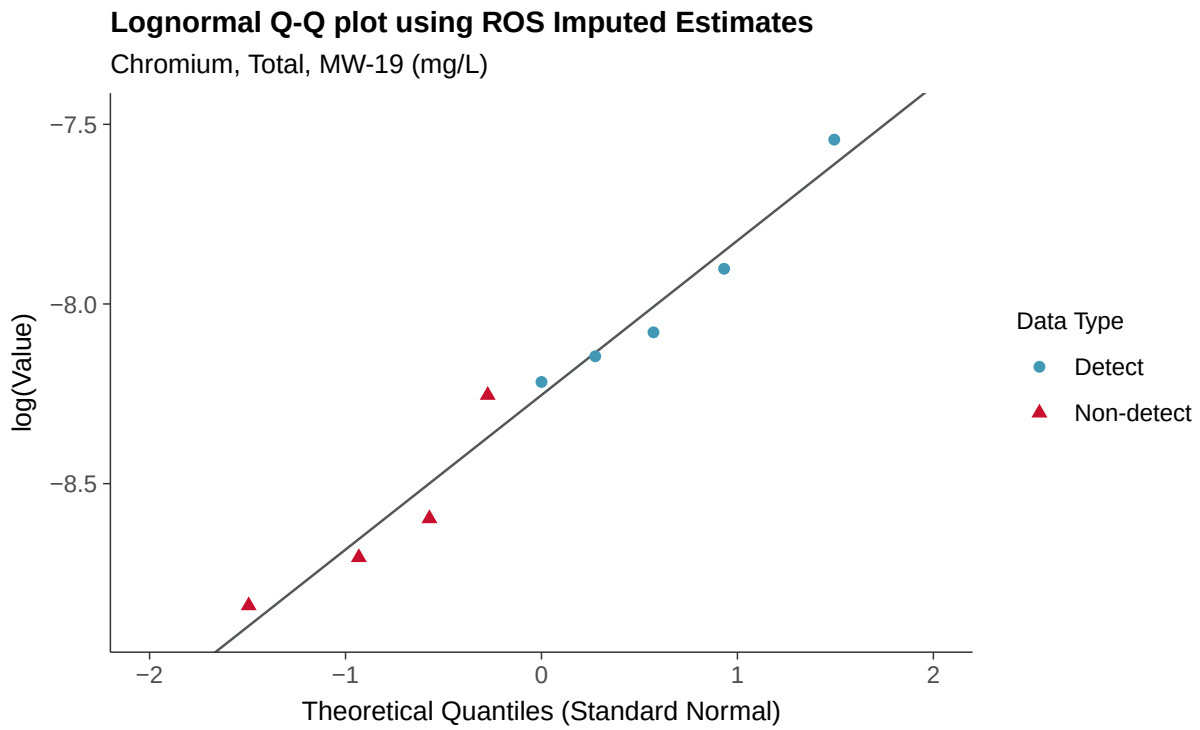


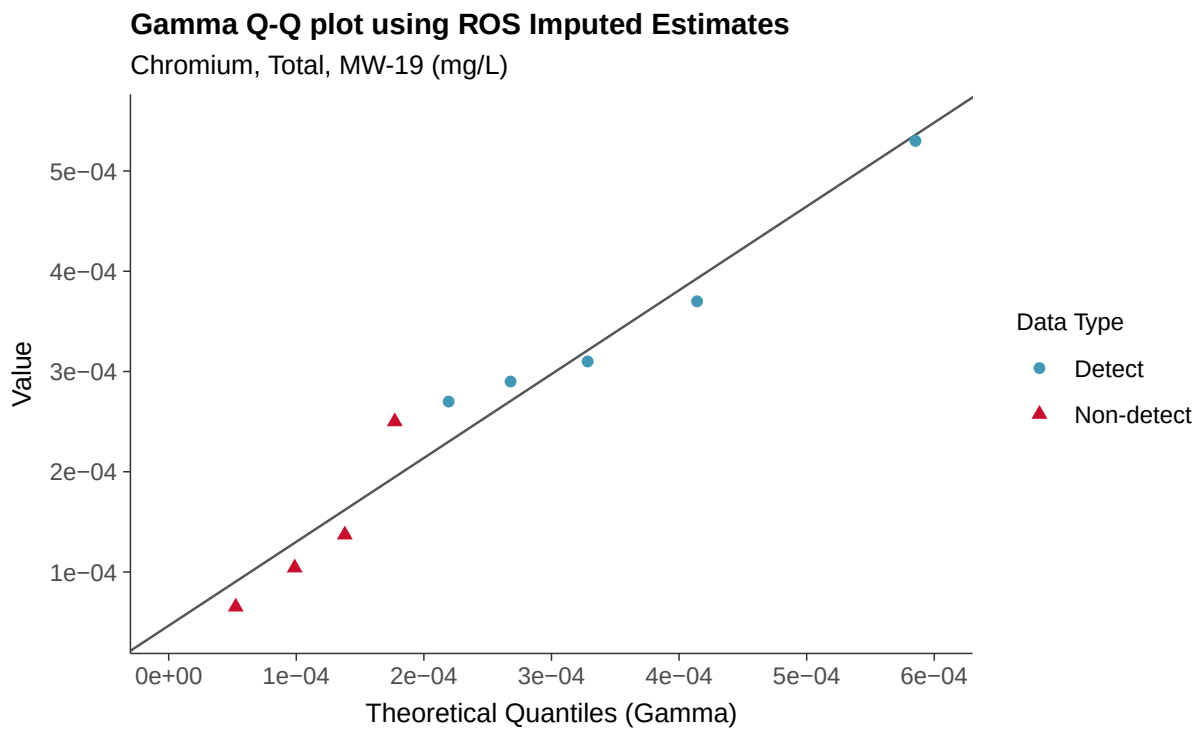
Boxplot by Season

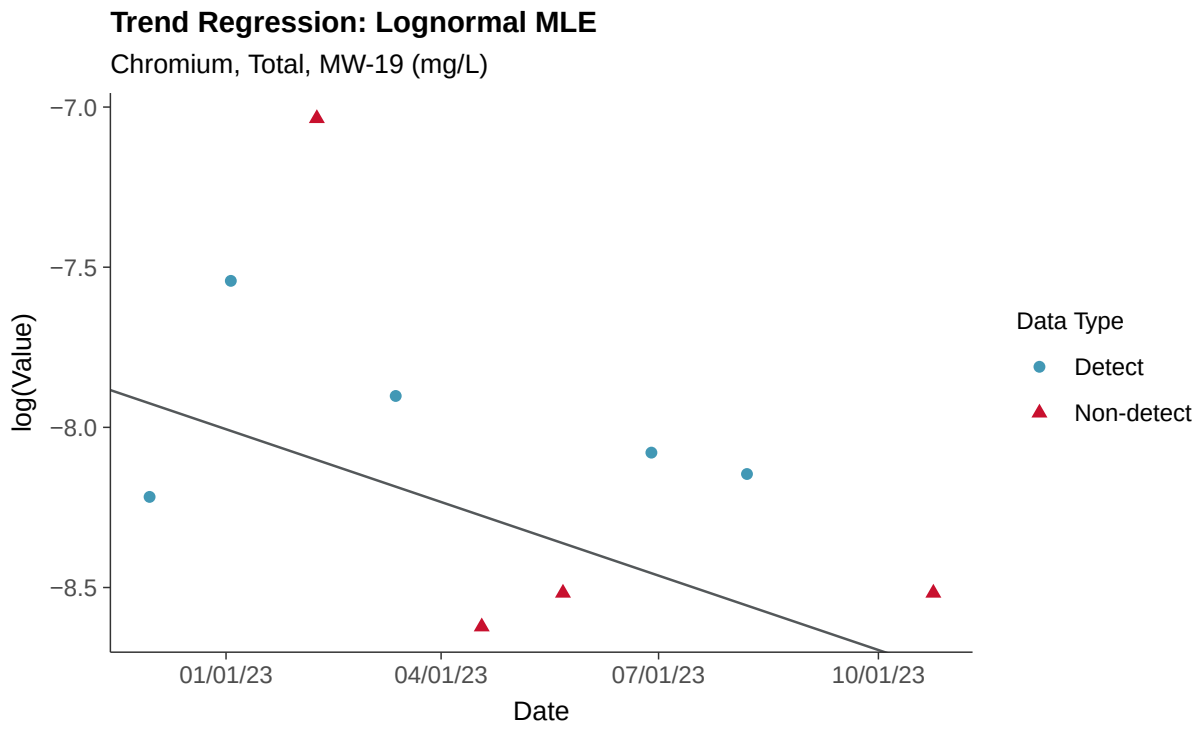
Chromium, Total, MW-19 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Chromium, Total, MW-19 (mg/L)
Value
4e−04
2e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

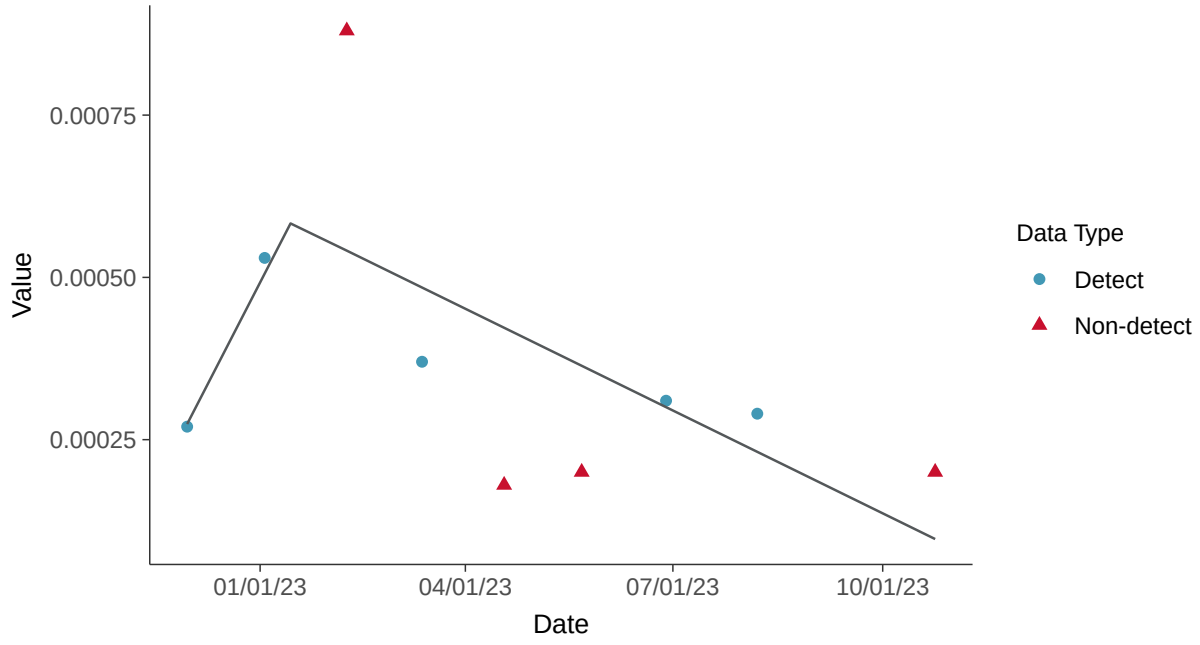

Lognormal Q-Q plot using ROS Imputed Estimates
Chromium, Total, MW-19 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Chromium, Total, MW-19 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
0e+00
1e−04
2e−04
3e−04
4e−04
5e−04
6e−04
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-19 (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

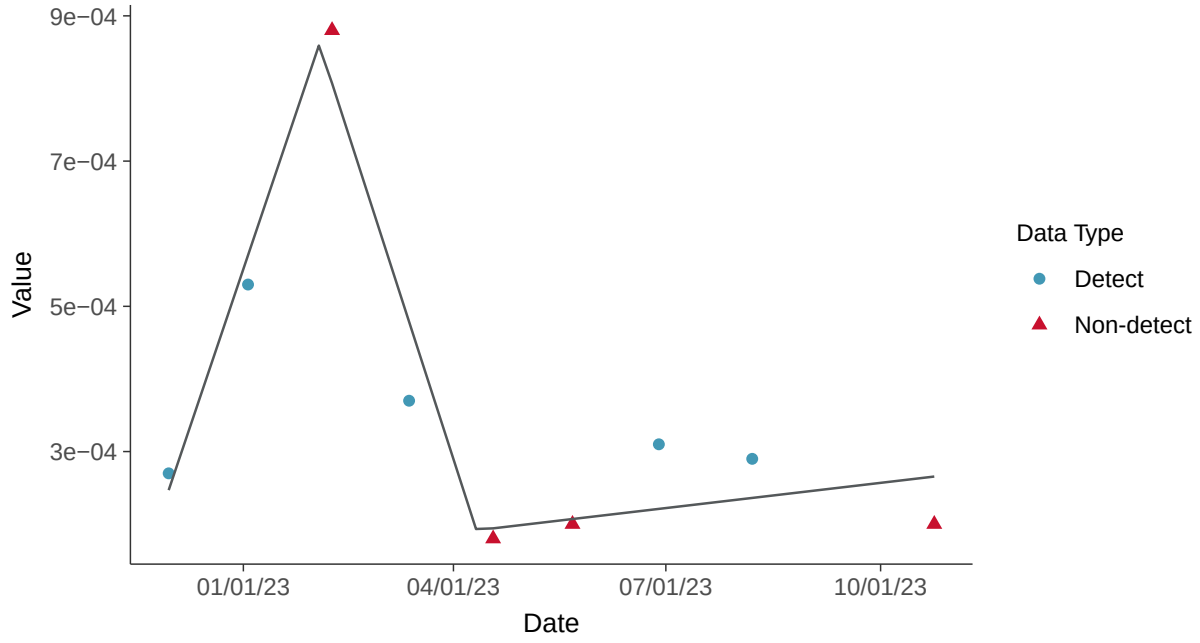
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-19 (mg/L)



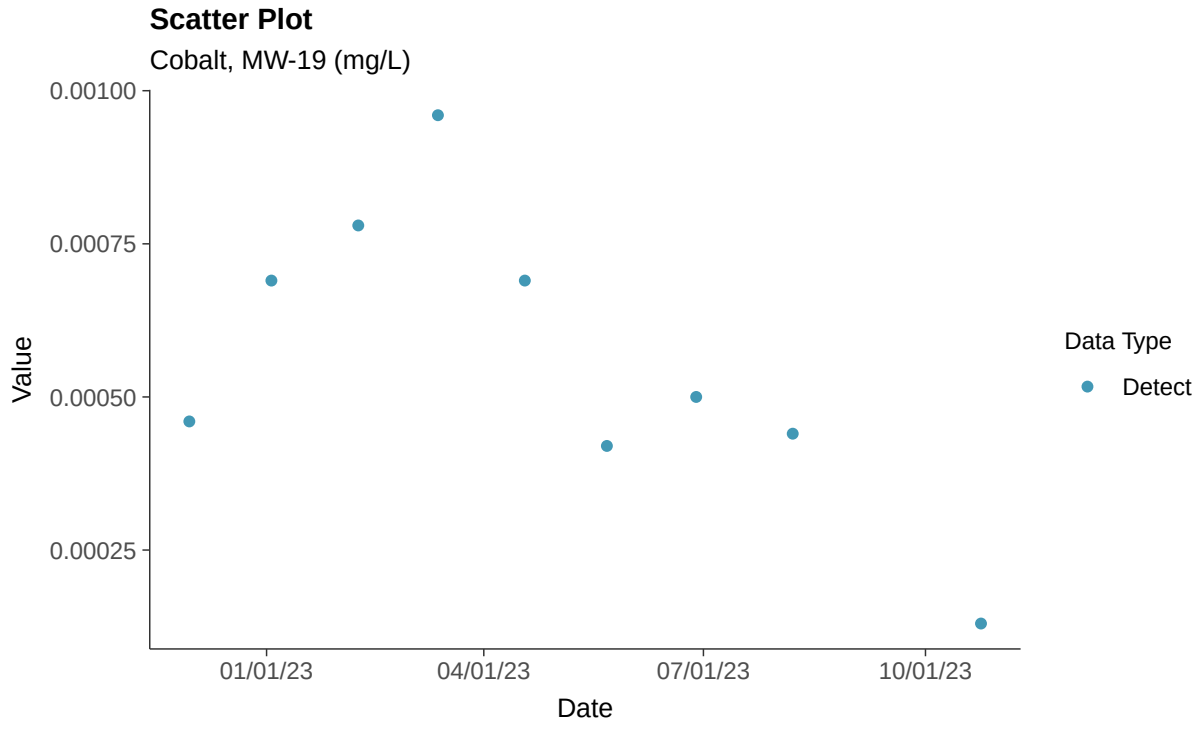
Trend Regression: Piecewise Linear-Linear-Linear

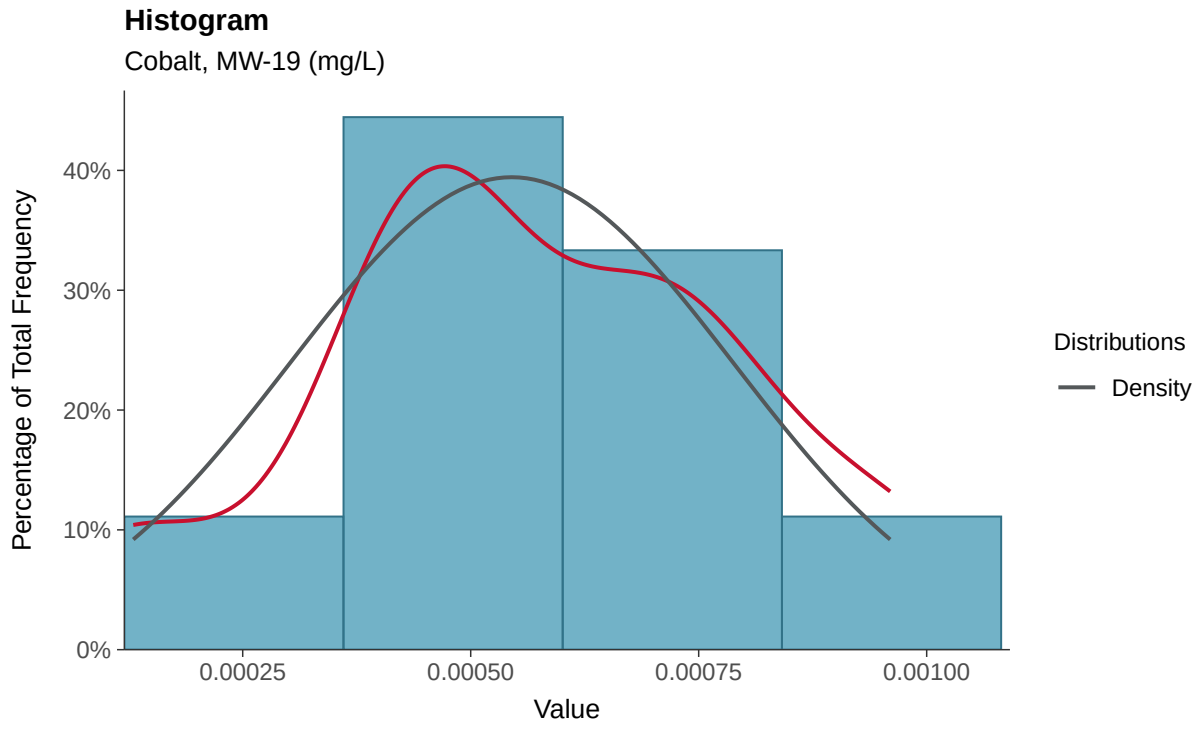
Chromium, Total, MW-19 (mg/L)

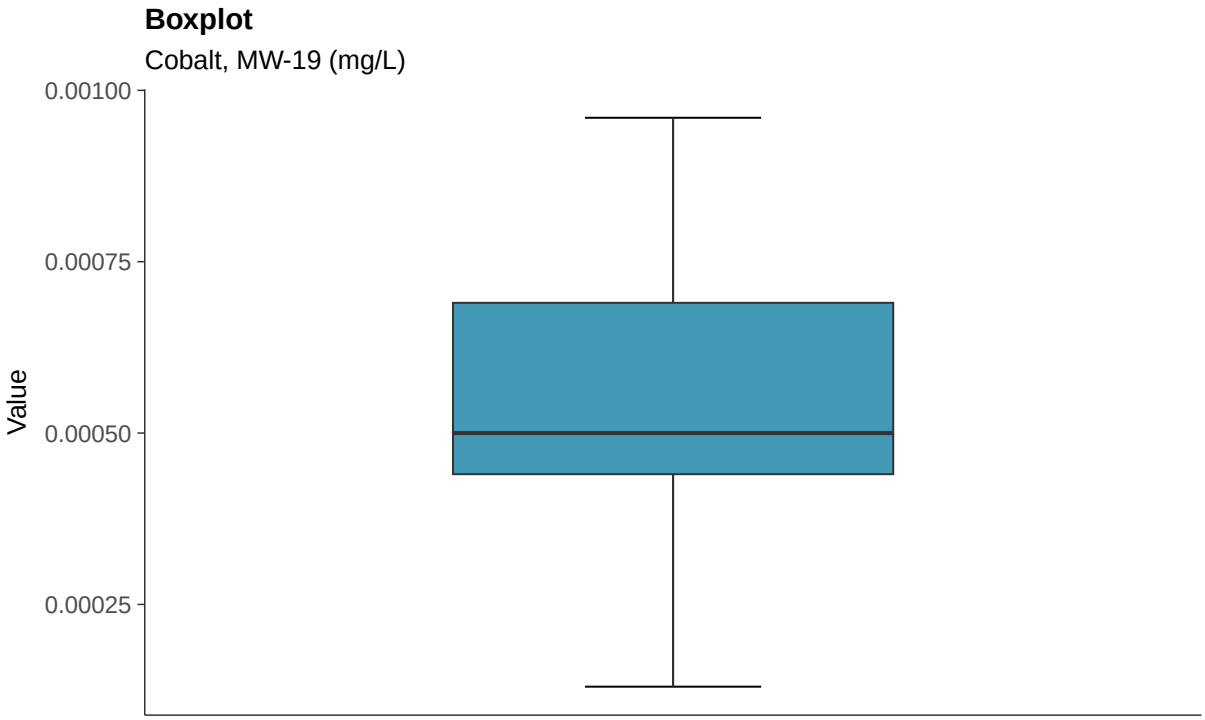


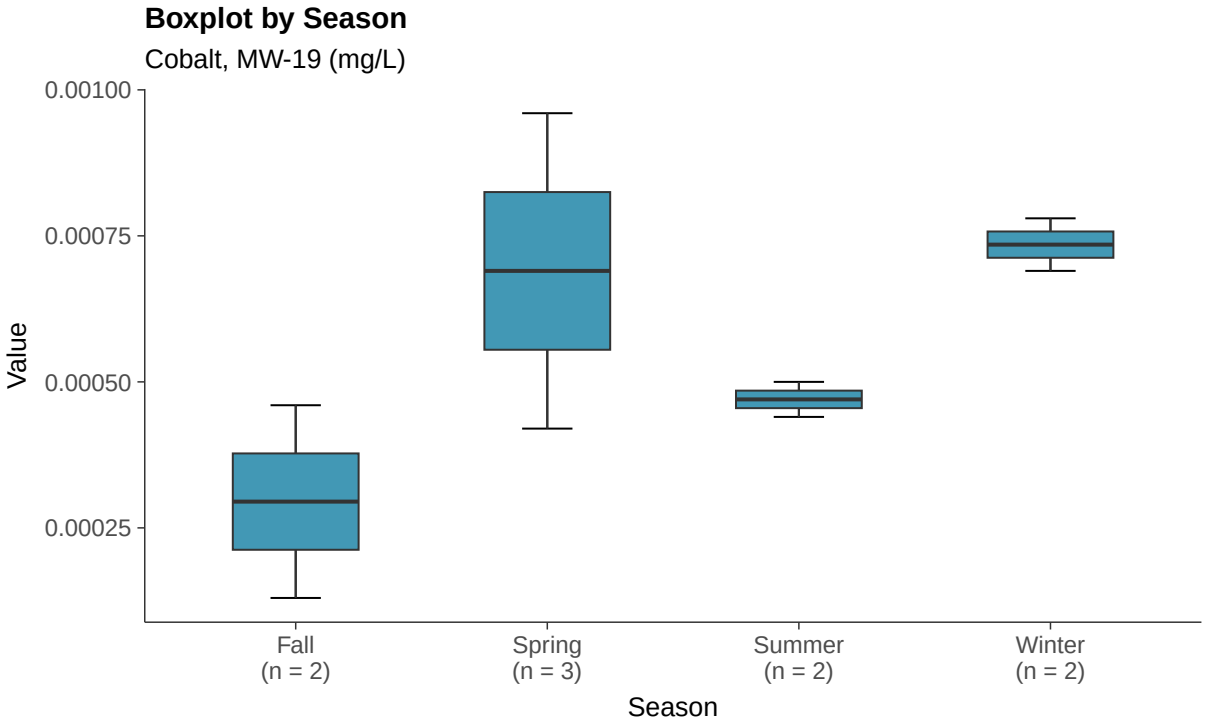
Appendix IV: Cobalt, MW-19

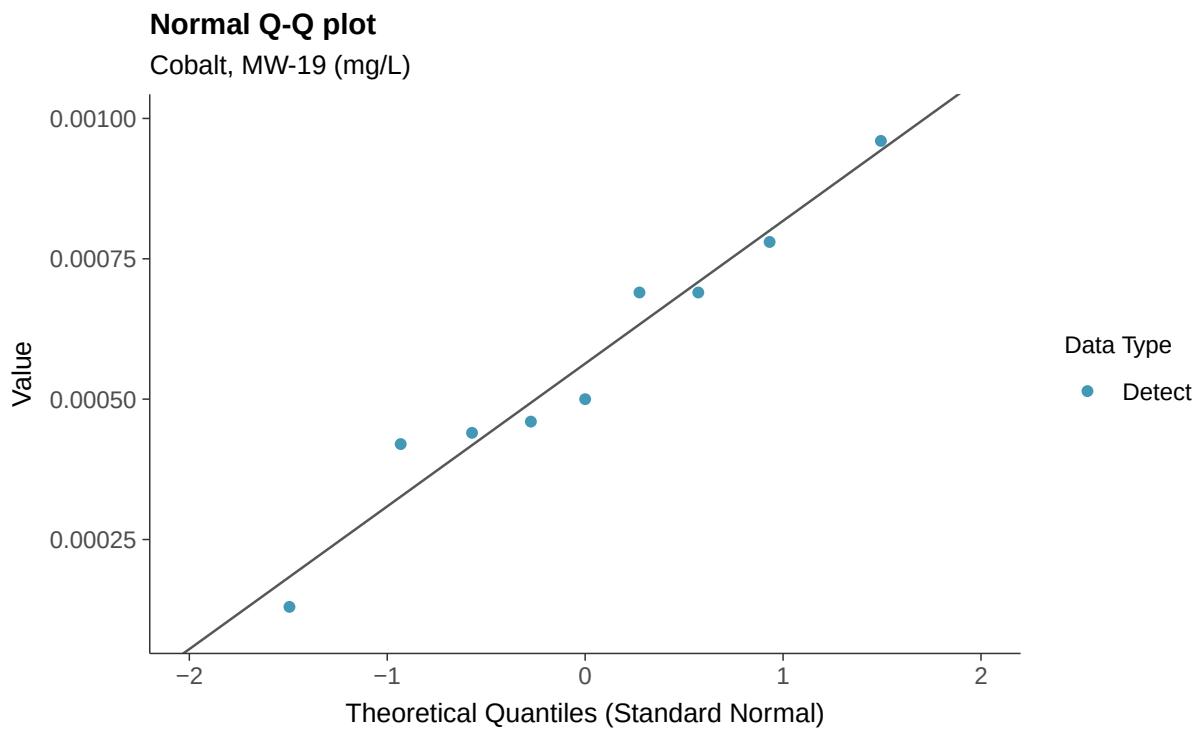
ID: 1_23_5_110

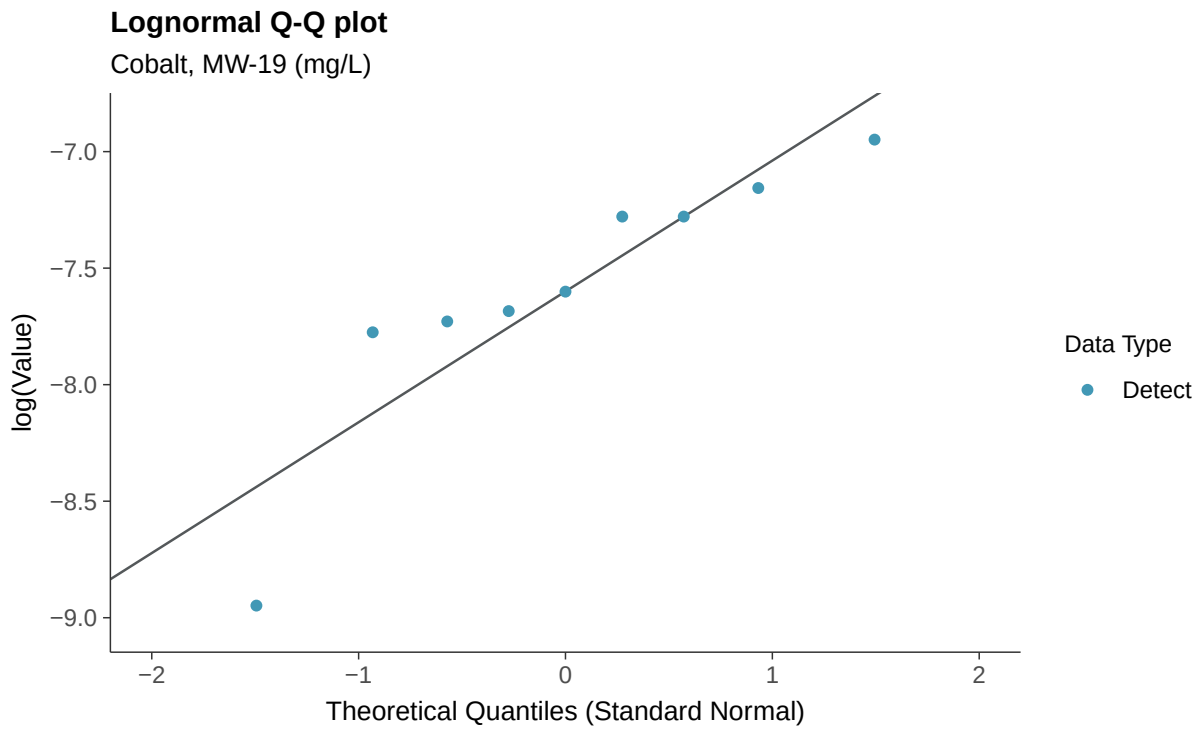


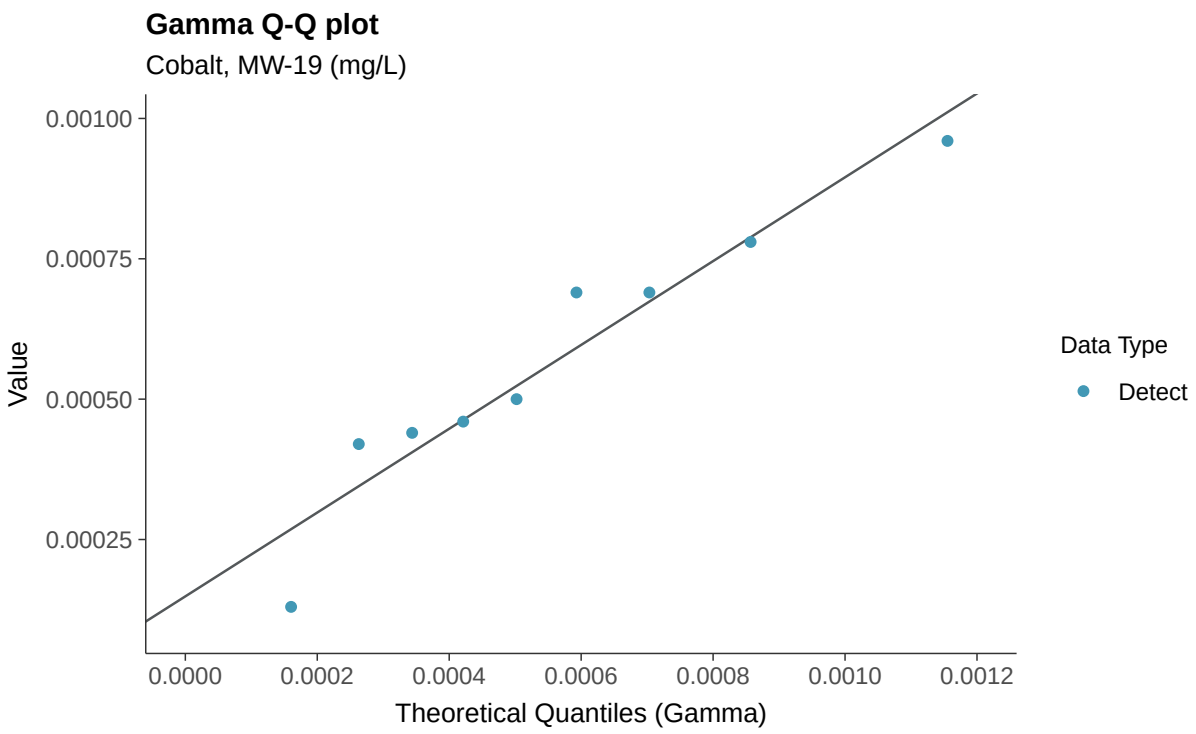


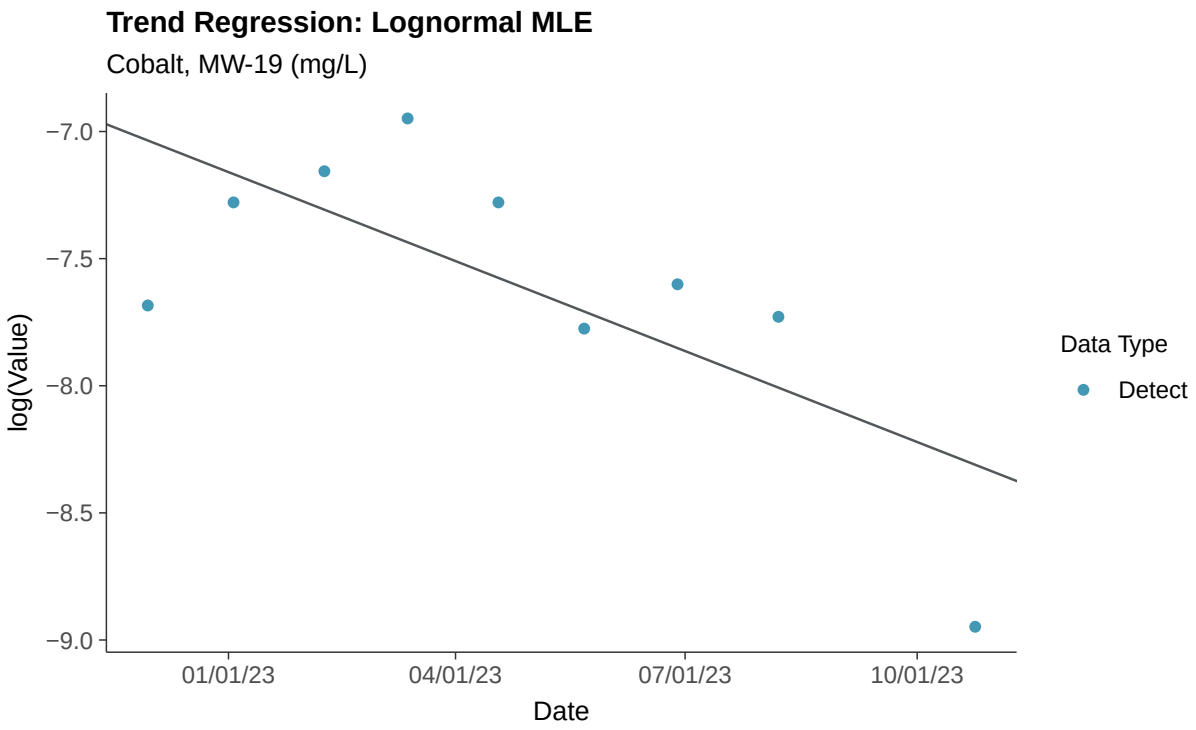

Boxplot
Cobalt, MW-19 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value

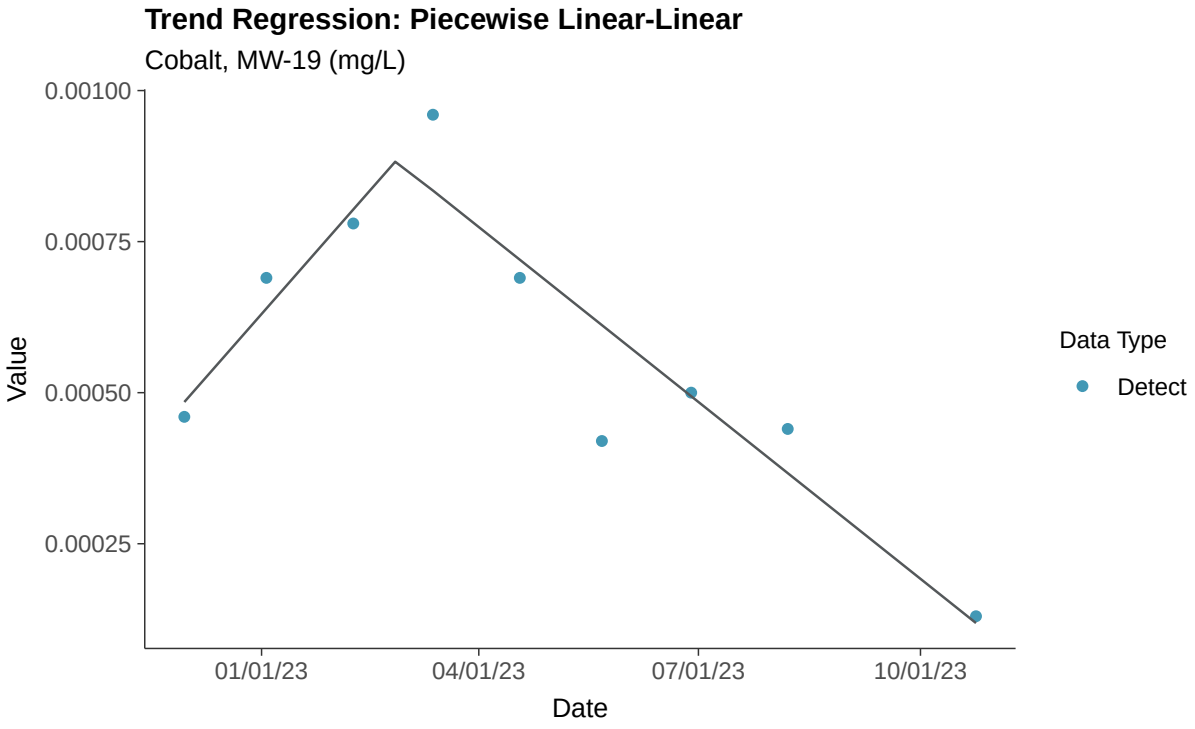

Boxplot by Season
Cobalt, MW-19 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

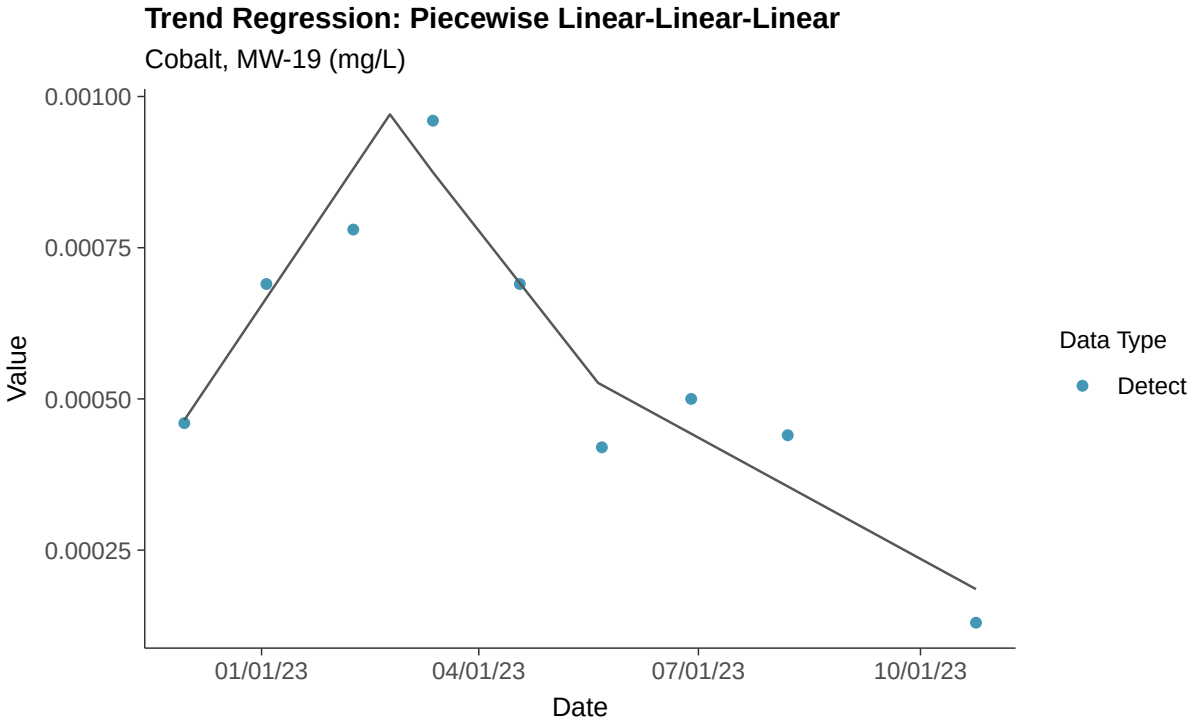

Normal Q-Q plot
Cobalt, MW-19 (mg/L)
Value
0.00100
0.00075
0.00050
0.00025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Cobalt, MW-19 (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
−9.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-19 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value
0.0000
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect

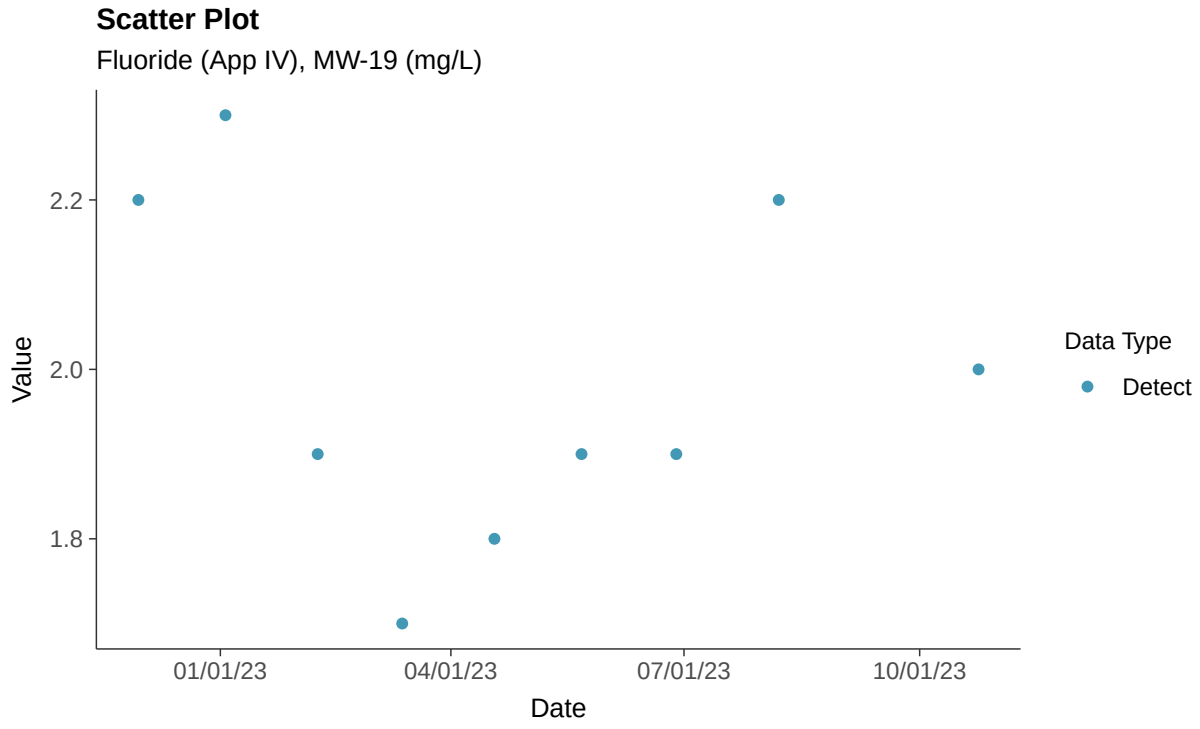

Trend Regression: Lognormal MLE
Cobalt, MW-19 (mg/L)
−7.0
−7.5
−8.0
−8.5
−9.0
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

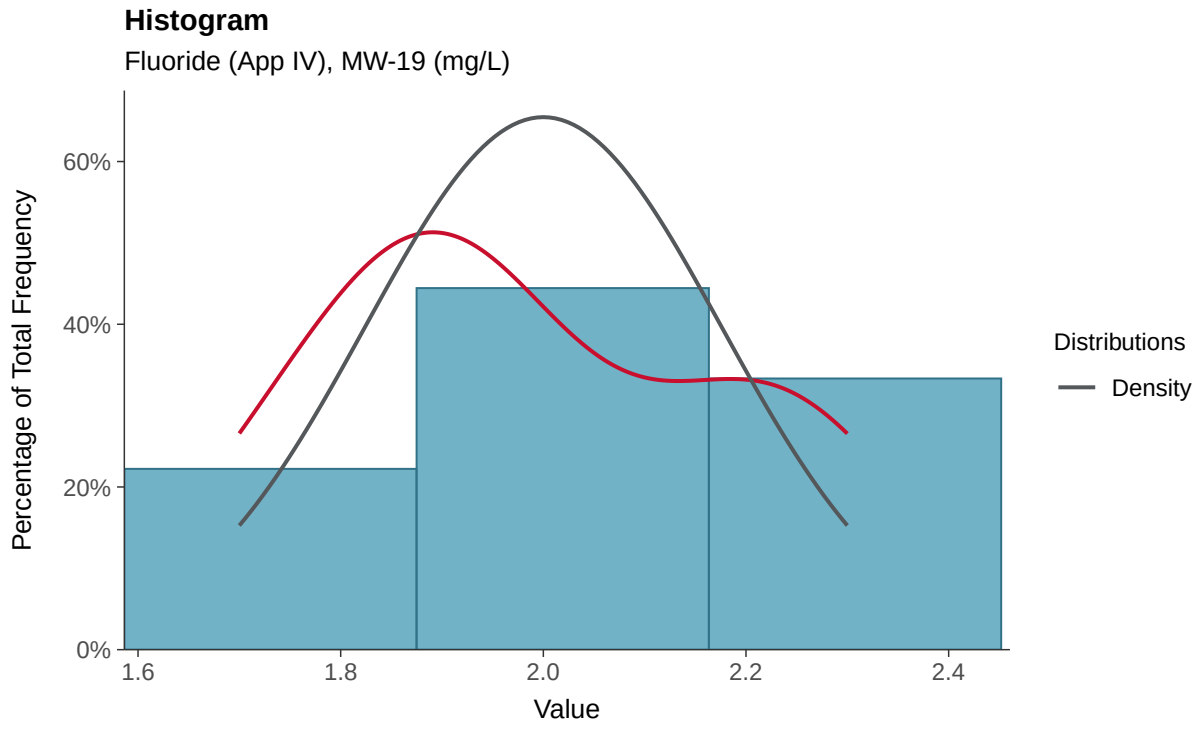

Trend Regression: Piecewise Linear-Linear
Cobalt, MW-19 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Cobalt, MW-19 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-19

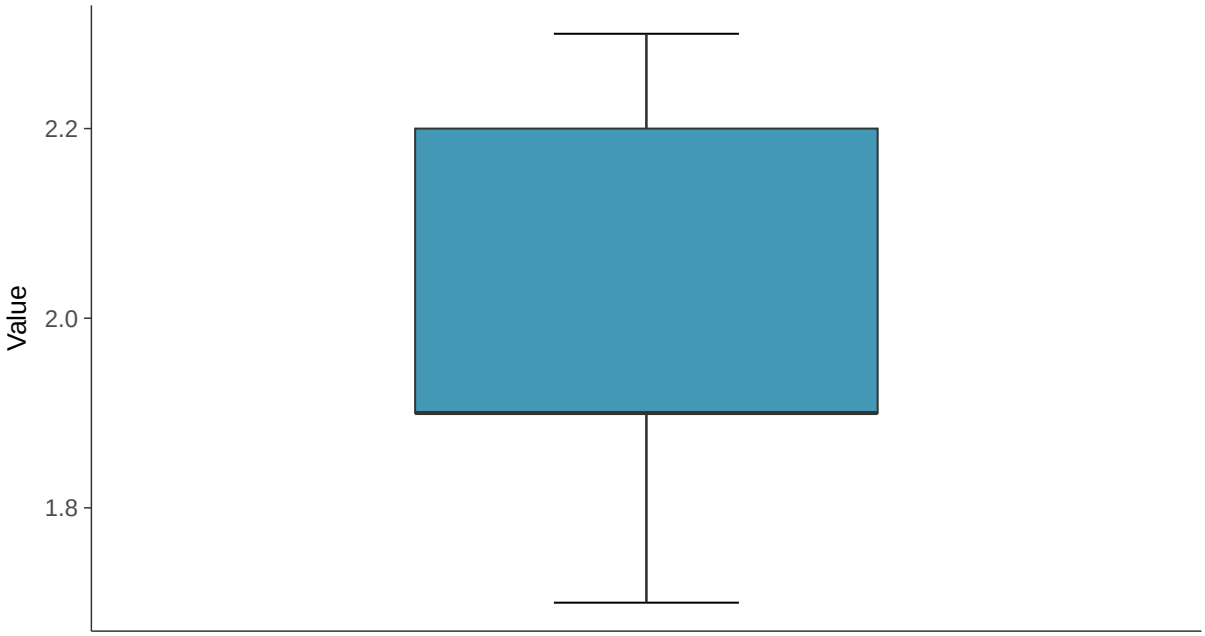
ID: 1_23_5_113





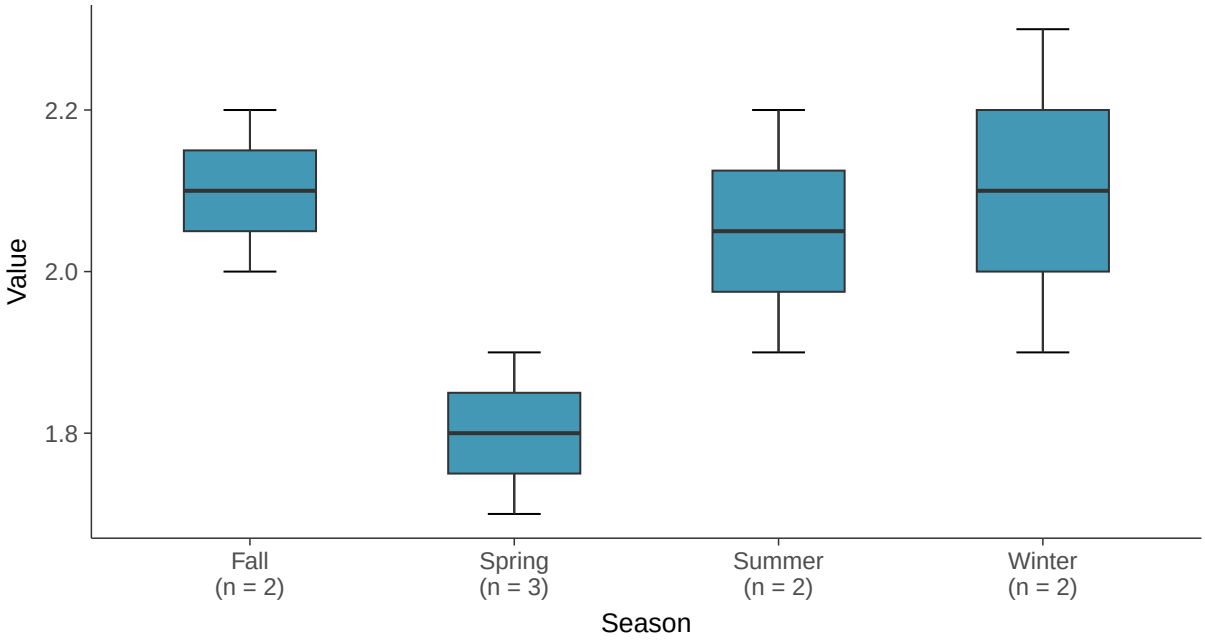
Boxplot

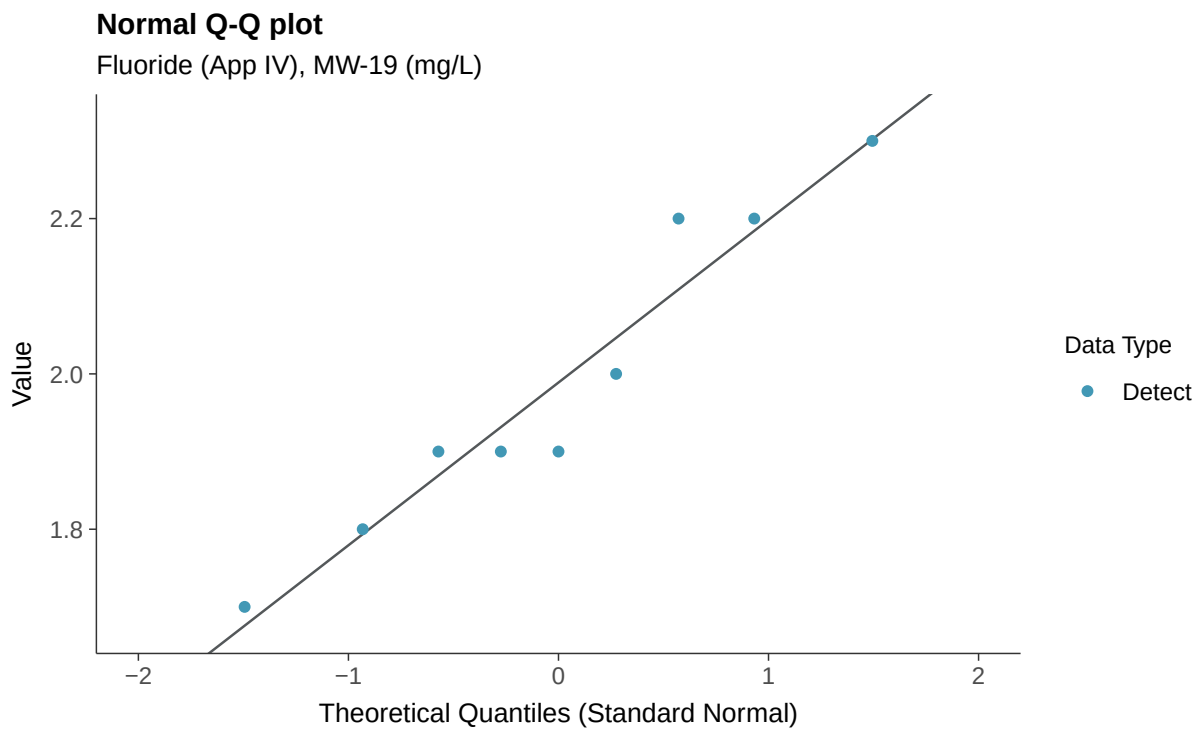
Fluoride (App IV), MW-19 (mg/L)

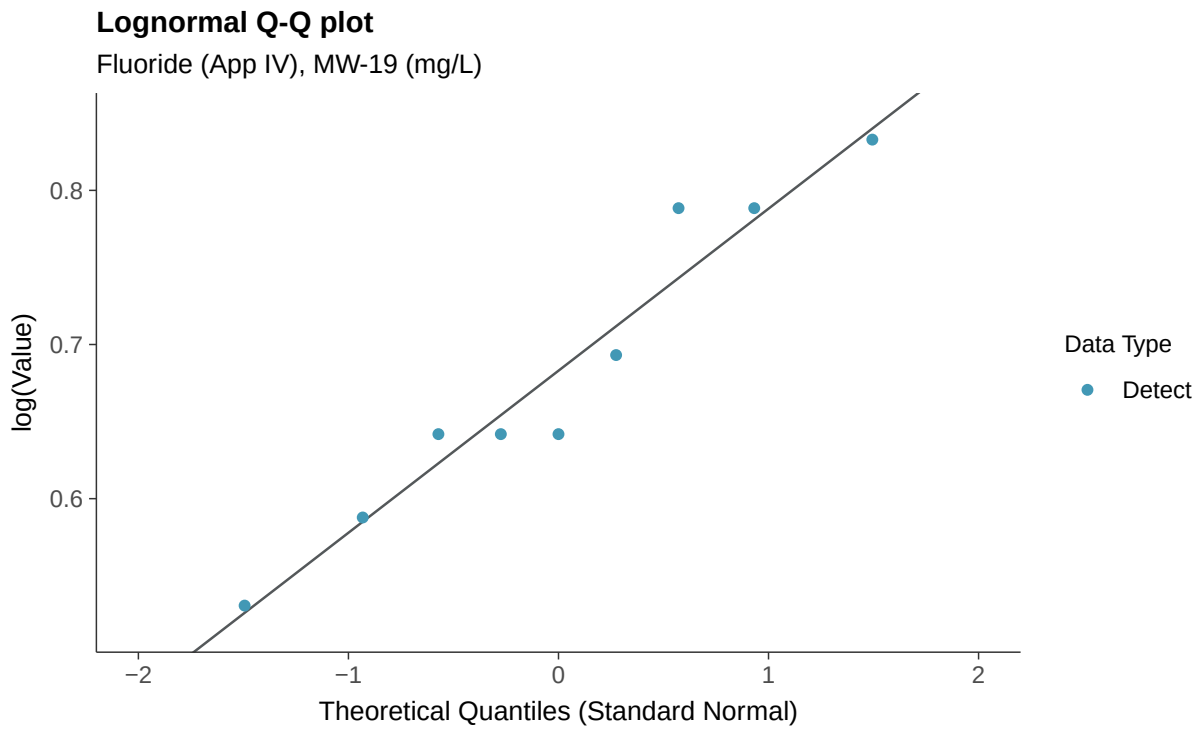


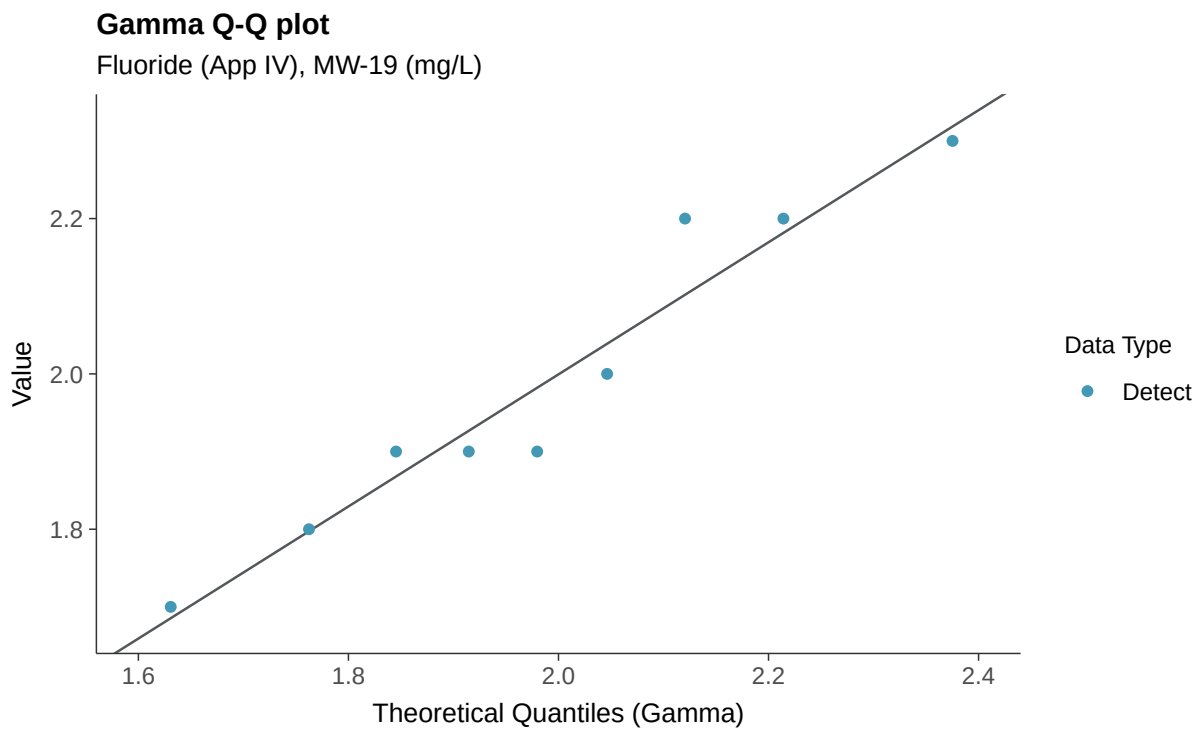
Boxplot by Season

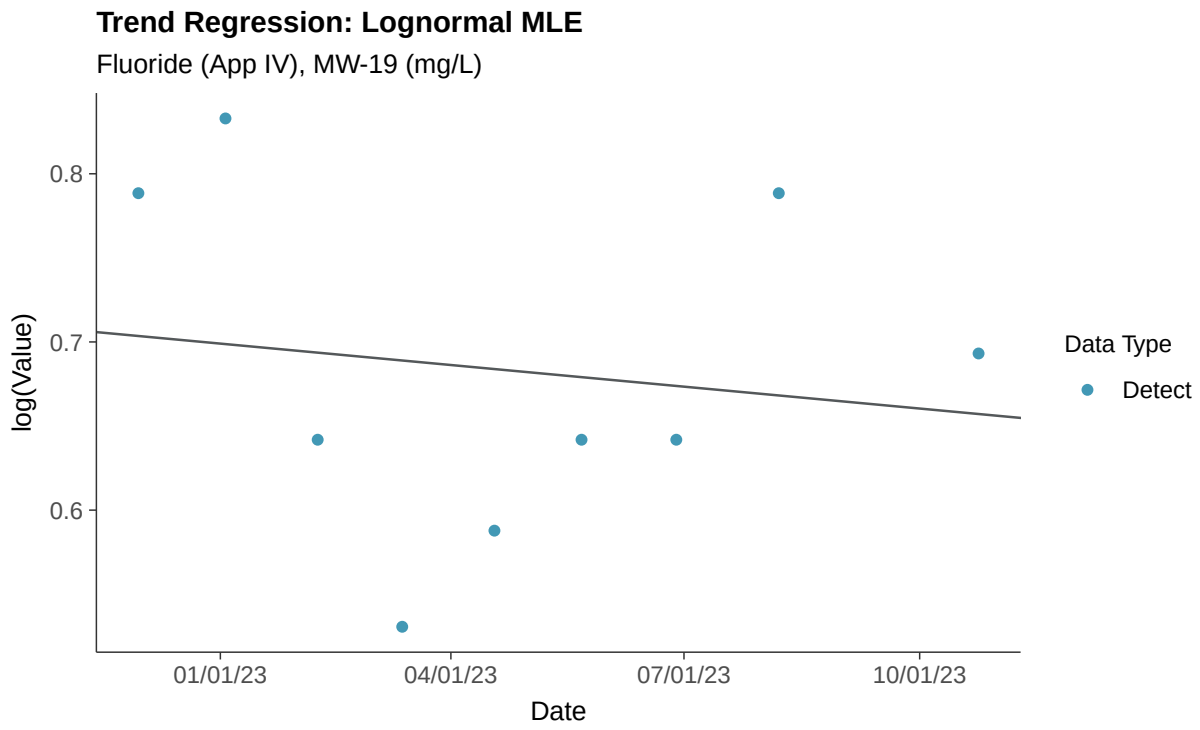
Fluoride (App IV), MW-19 (mg/L)

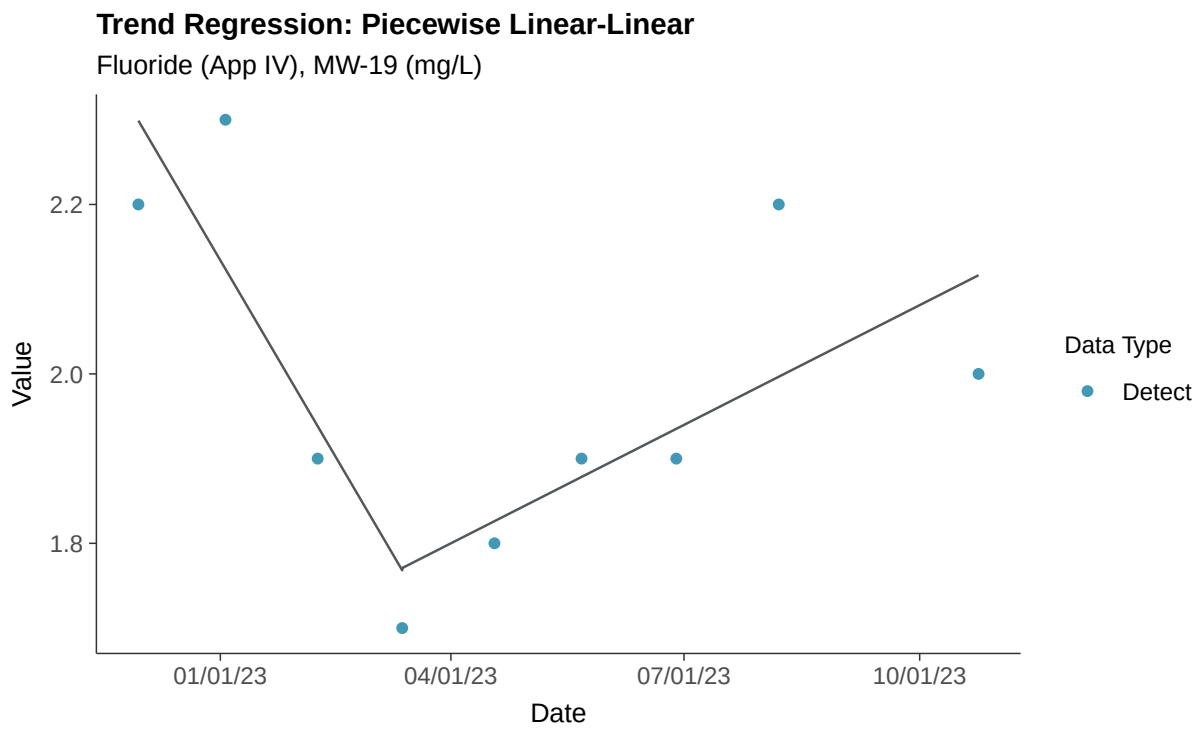



Normal Q-Q plot
Fluoride (App IV), MW-19 (mg/L)
Value
2.2
2.0
1.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride (App IV), MW-19 (mg/L)
log(Value)
0.8
0.7
0.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

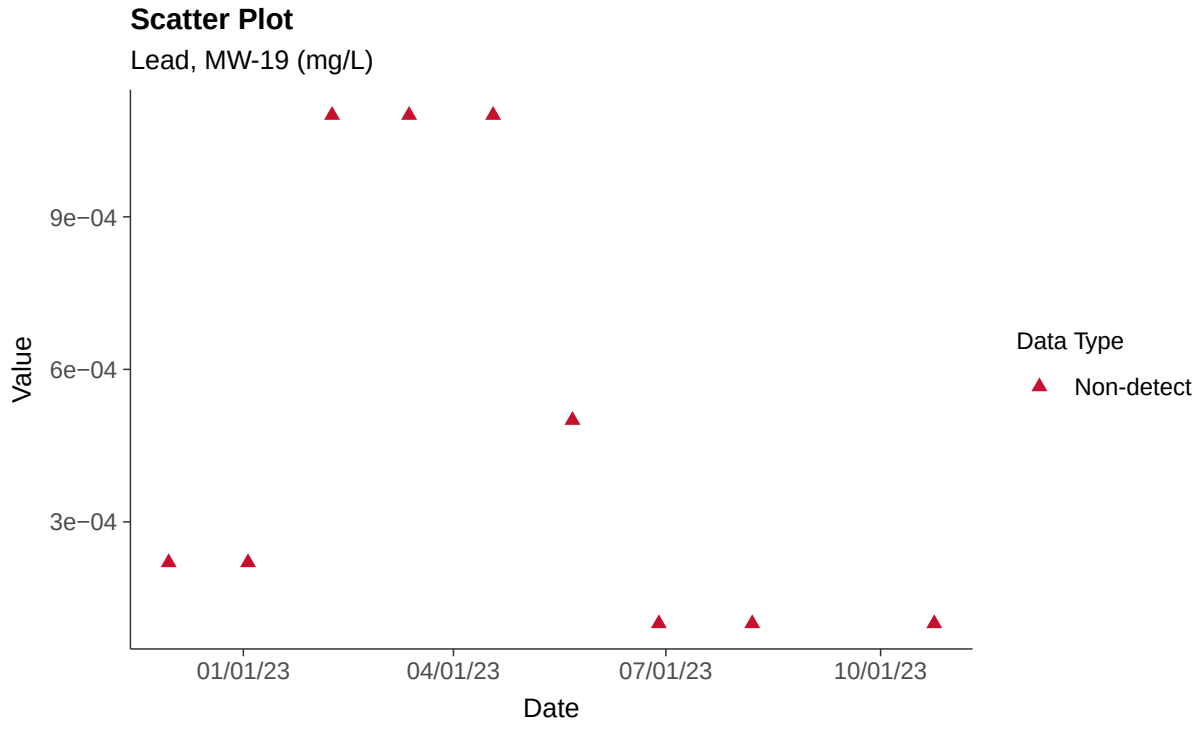

Gamma Q-Q plot
Fluoride (App IV), MW-19 (mg/L)
Value
2.2
2.0
1.8
1.6
1.8
2.0
2.2
2.4
Theoretical Quantiles (Gamma)
Data Type
Detect

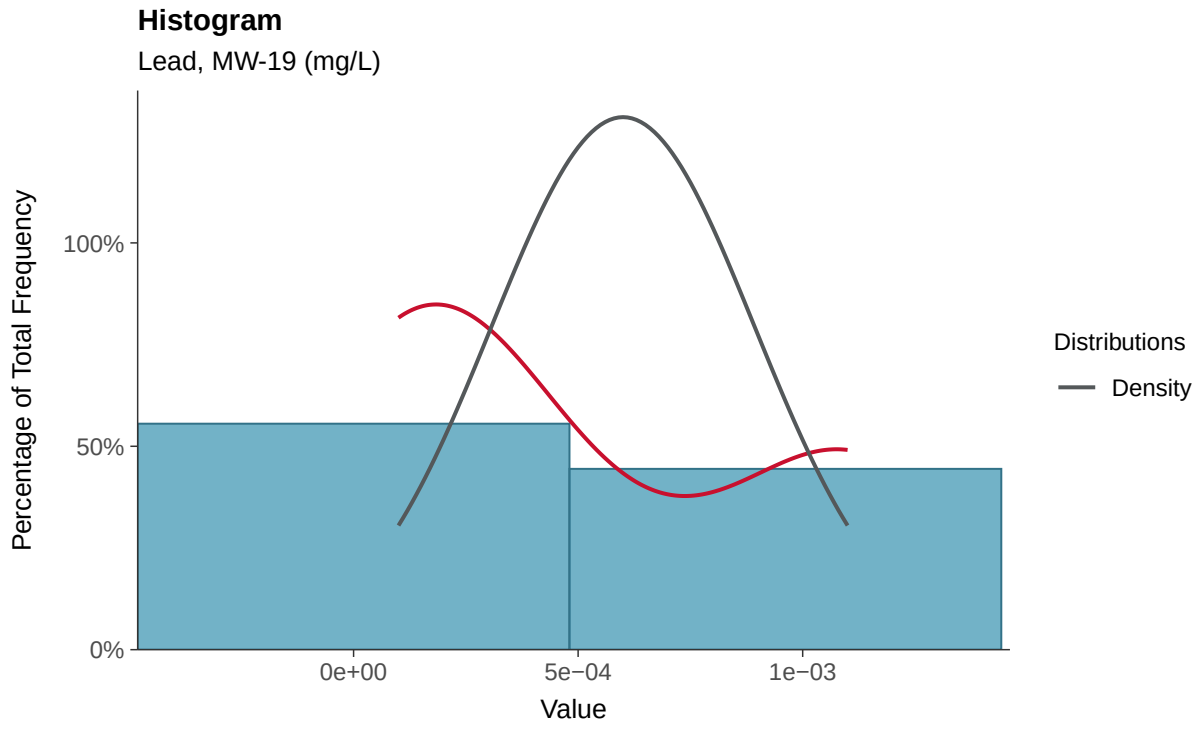

Trend Regression: Lognormal MLE
Fluoride (App IV), MW-19 (mg/L)
log(Value)
0.8
0.7
0.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Fluoride (App IV), MW-19 (mg/L)
Value
2.2
2.0
1.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lead, MW-19

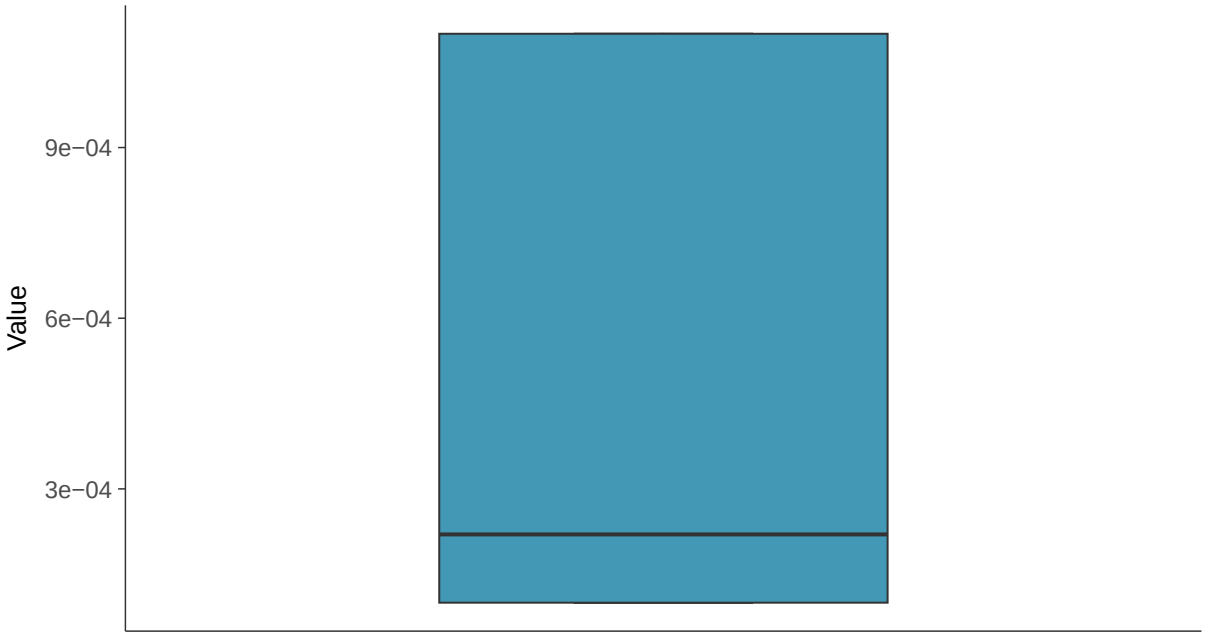
ID: 1_23_5_115





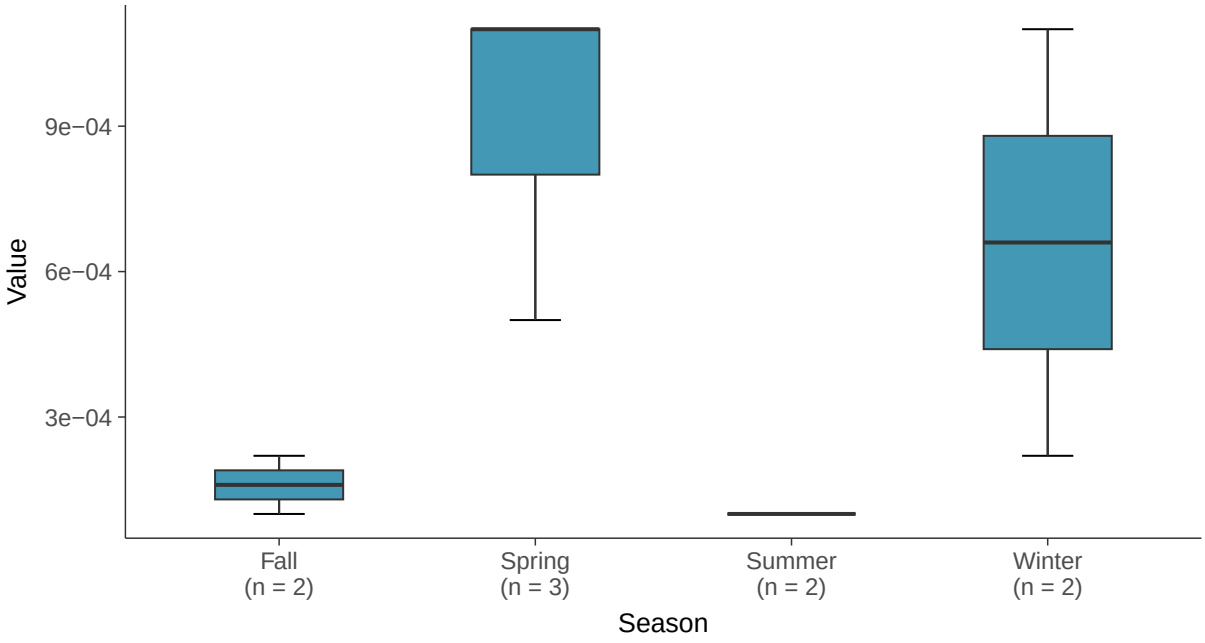
Boxplot

Lead, MW-19 (mg/L)



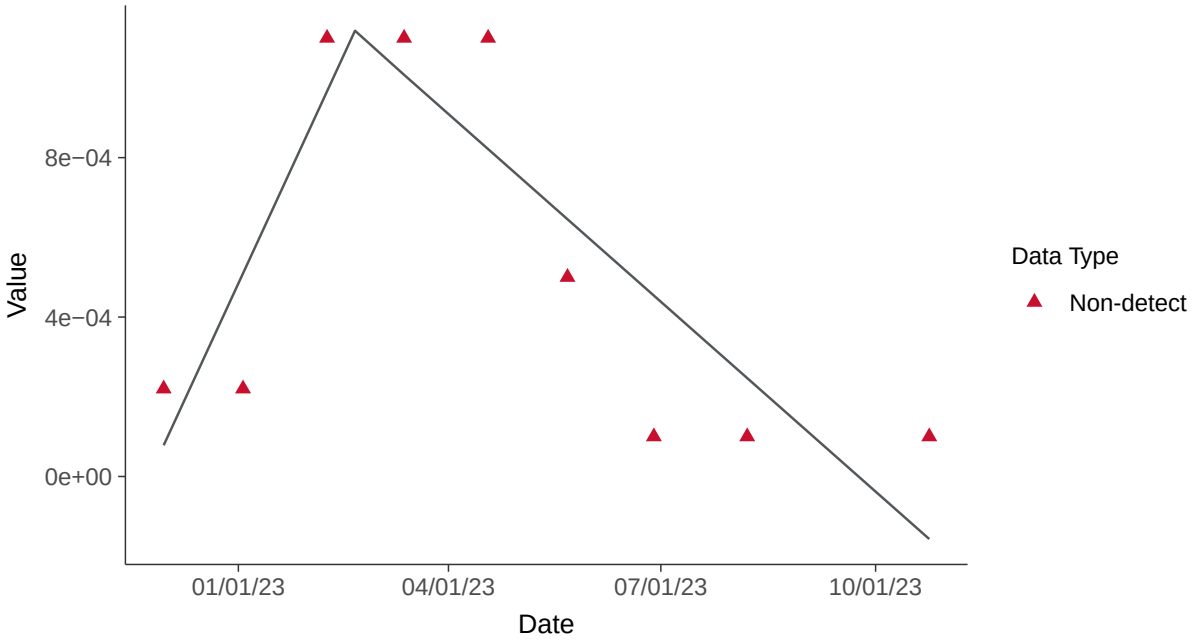
Boxplot by Season

Lead, MW-19 (mg/L)



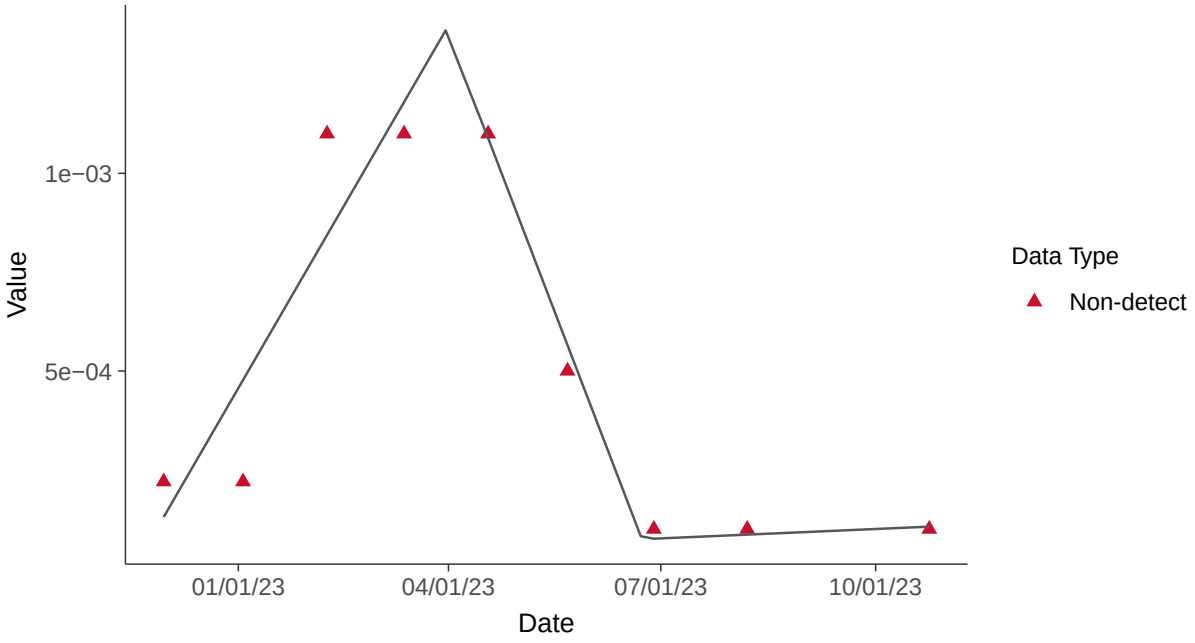
Trend Regression: Piecewise Linear-Linear

Lead, MW-19 (mg/L)



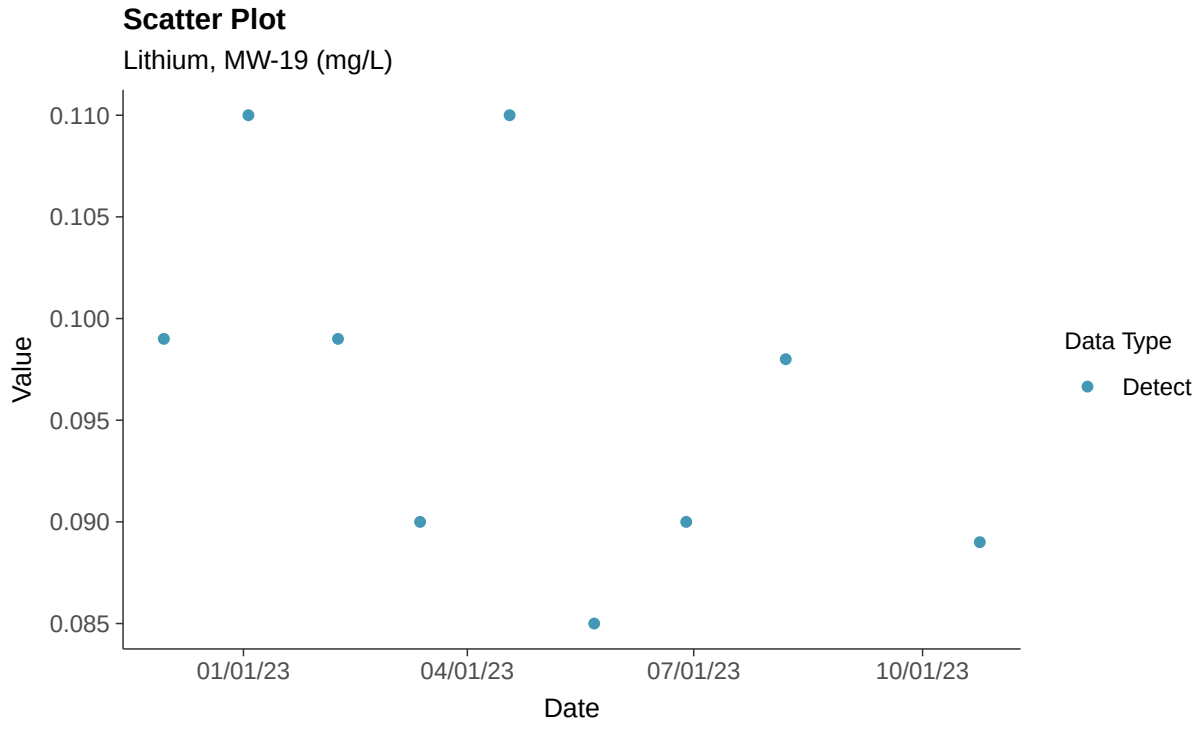
Trend Regression: Piecewise Linear-Linear-Linear

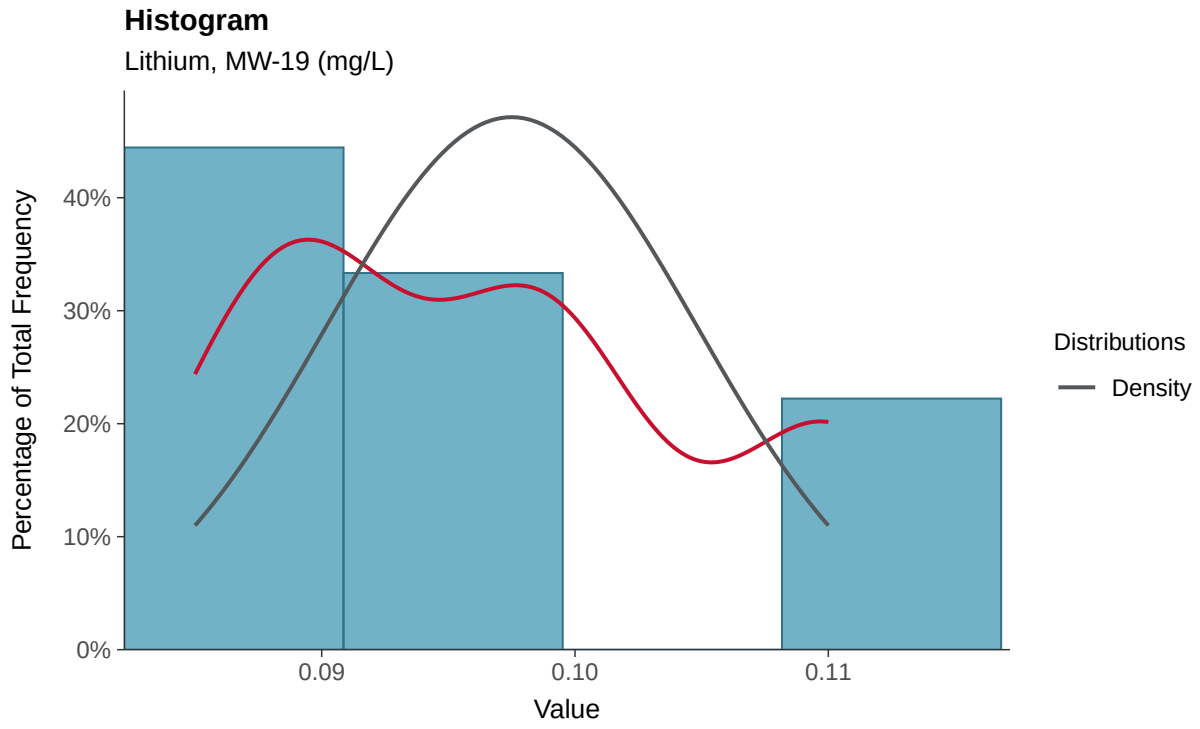
Lead, MW-19 (mg/L)



Appendix IV: Lithium, MW-19

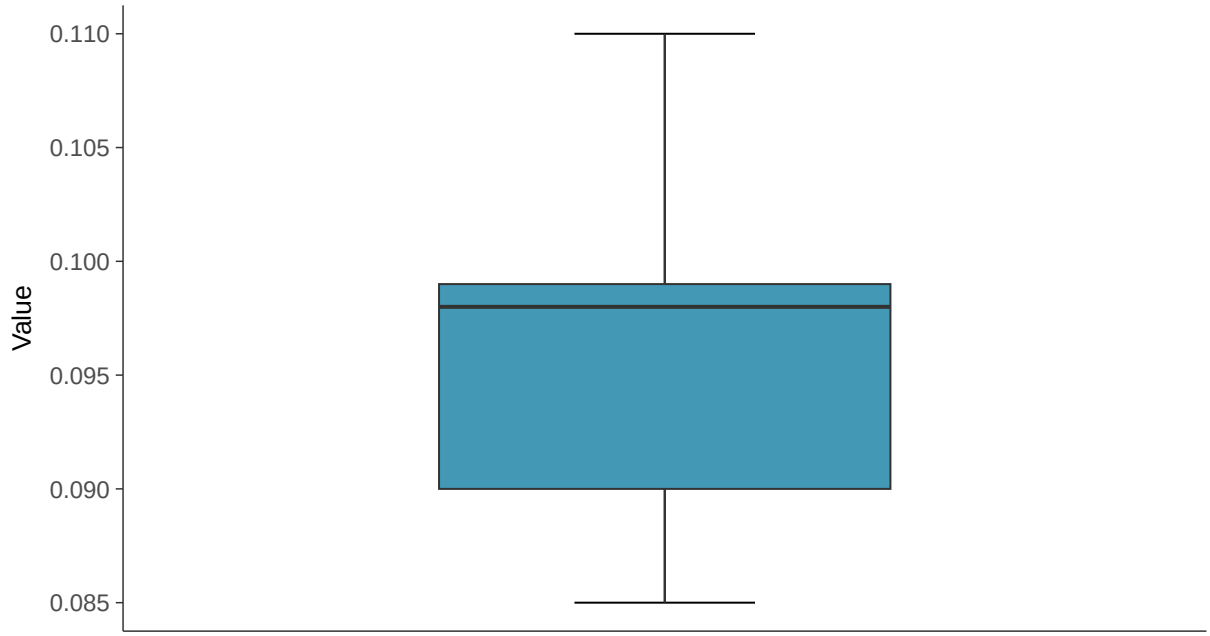
ID: 1_23_5_116





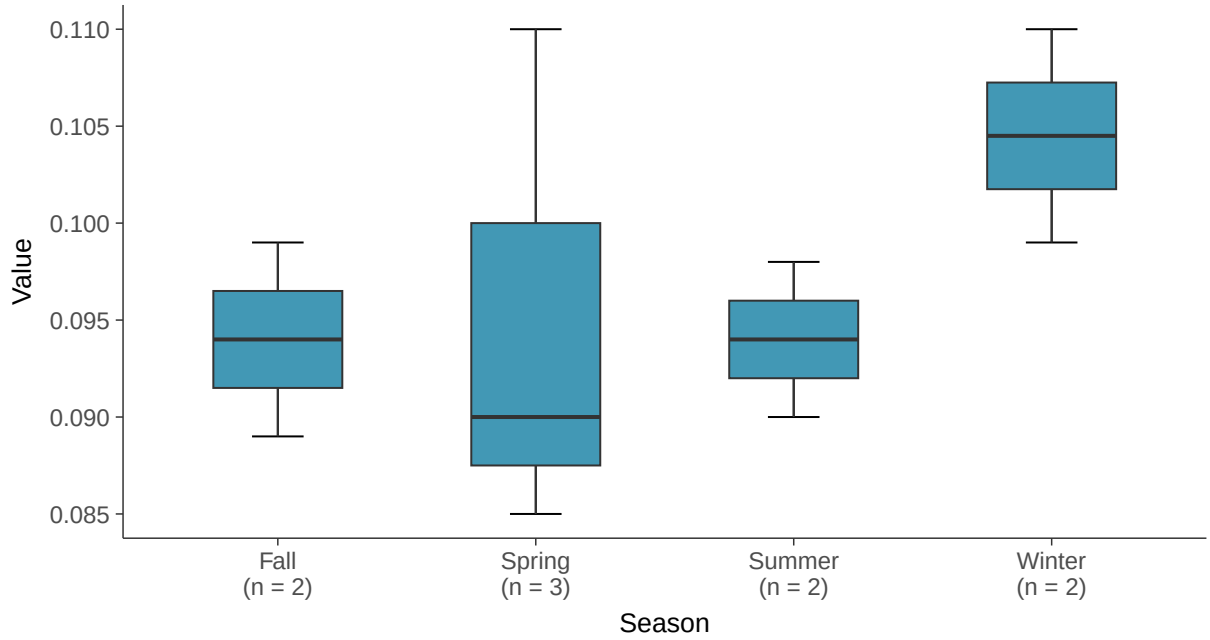
Boxplot

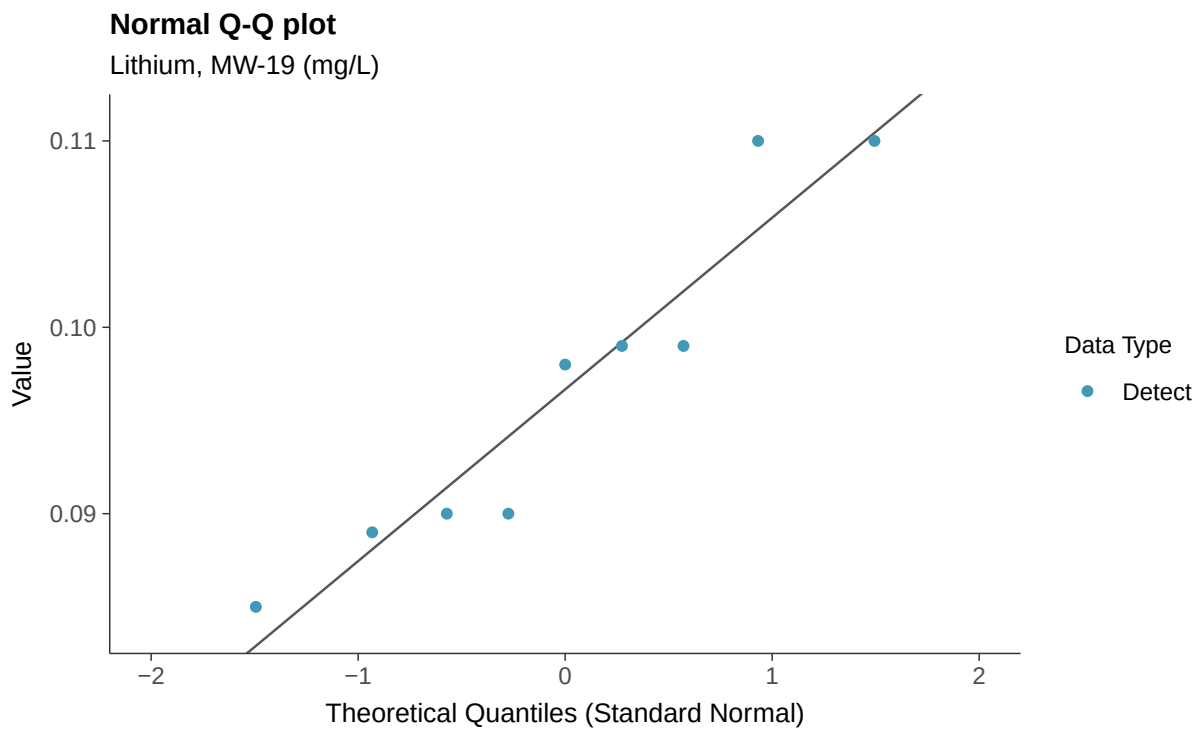
Lithium, MW-19 (mg/L)

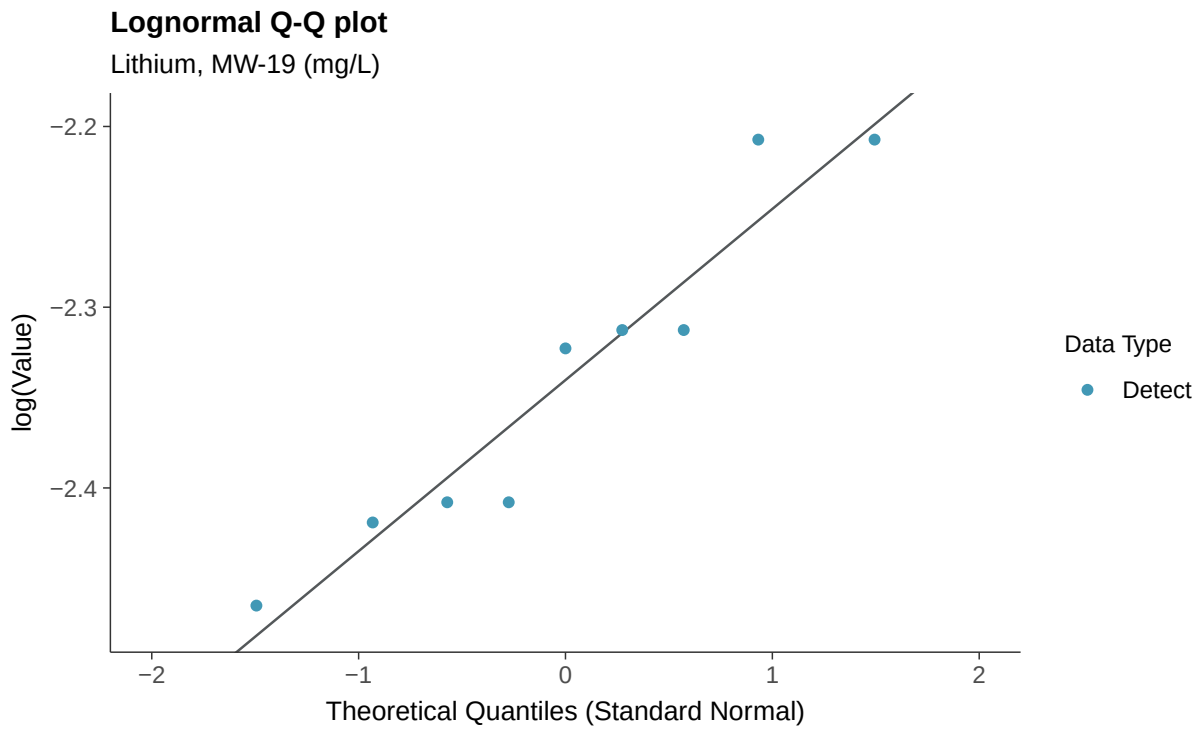


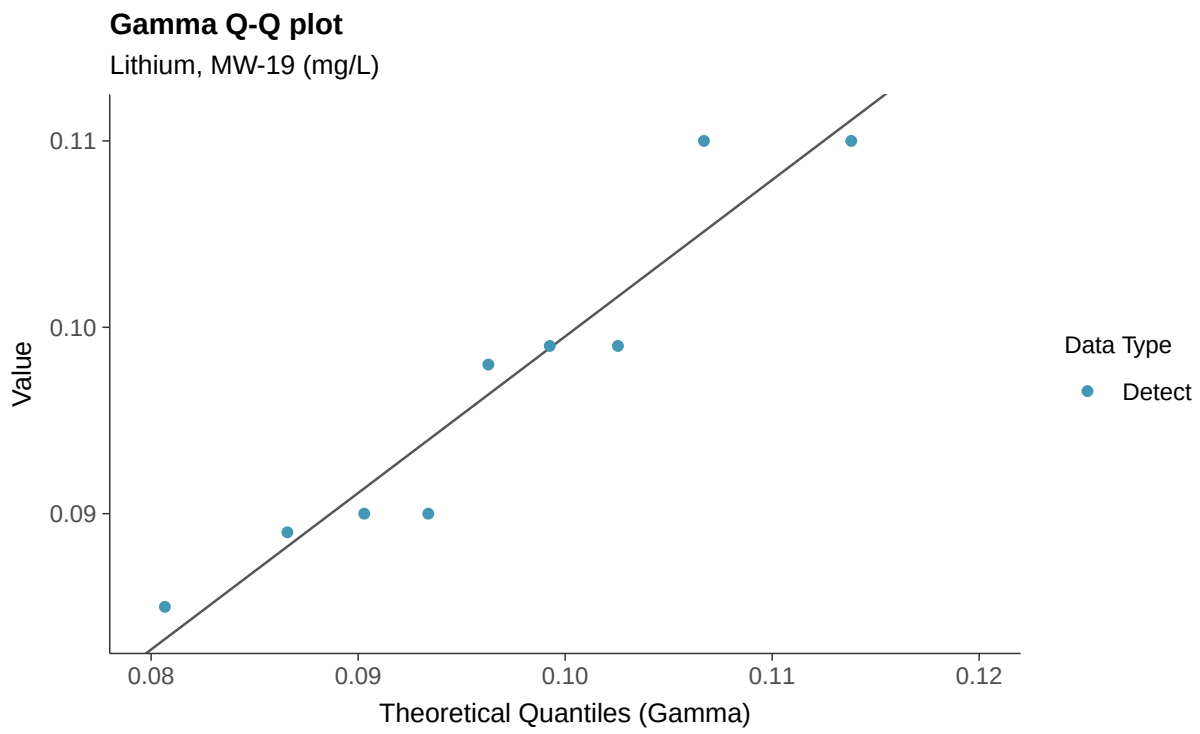
Boxplot by Season

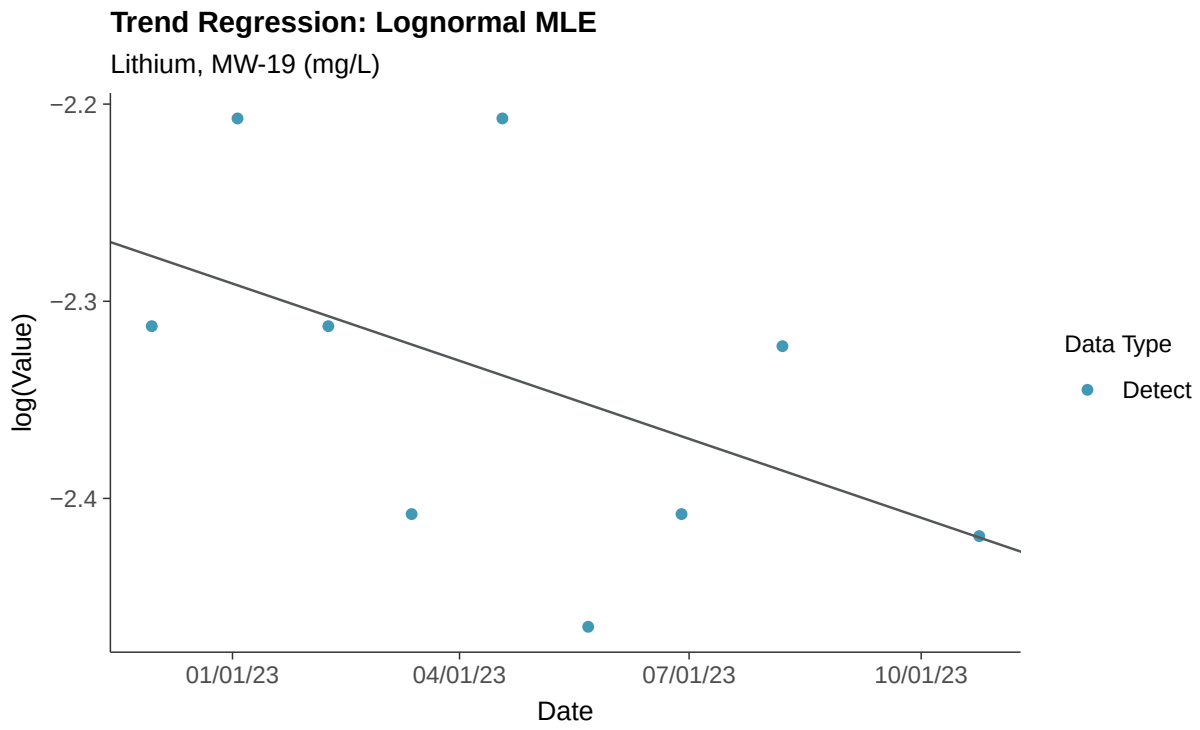
Lithium, MW-19 (mg/L)

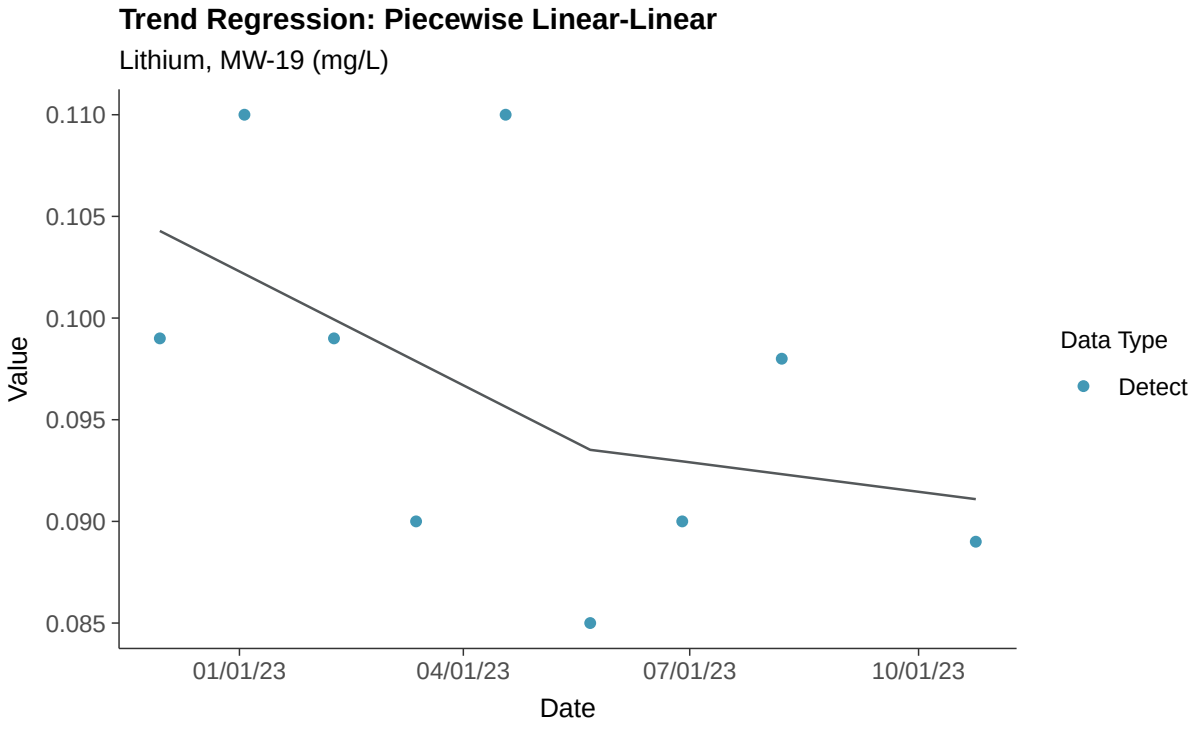



Normal Q-Q plot
Lithium, MW-19 (mg/L)
Value
0.11
0.10
0.09
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-19 (mg/L)
log(Value)
−2.2
−2.3
−2.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

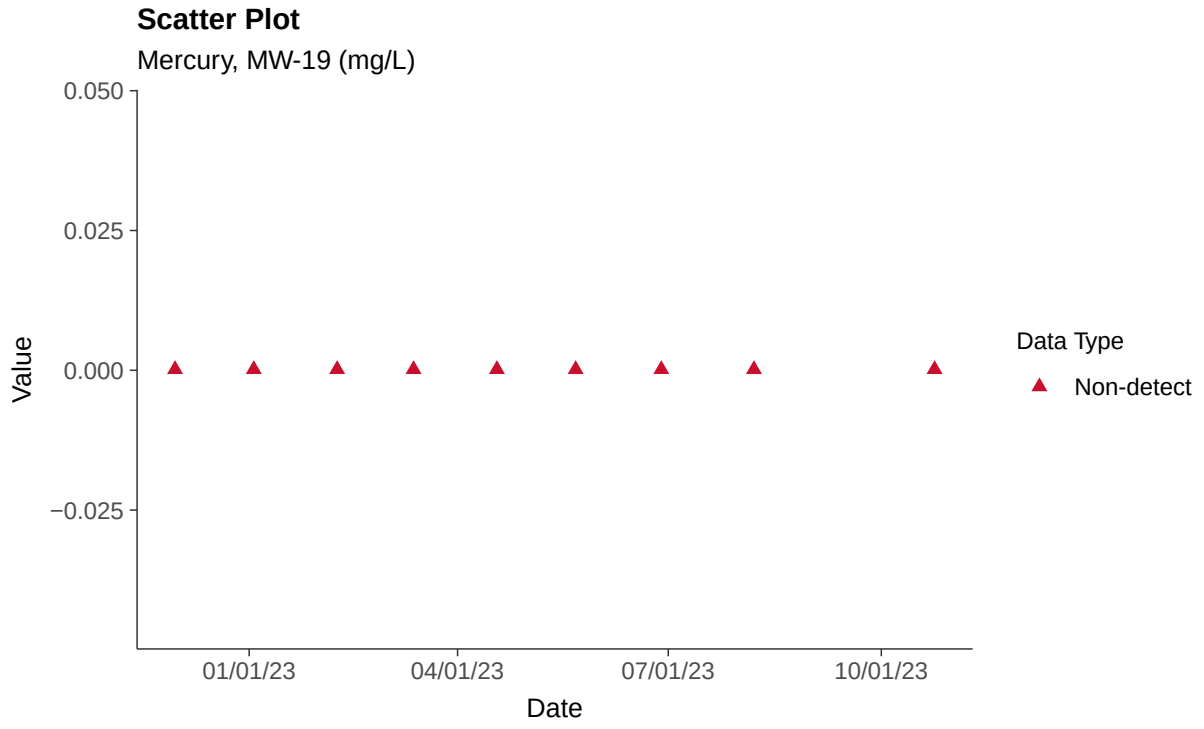

Gamma Q-Q plot
Lithium, MW-19 (mg/L)
Value
0.11
0.10
0.09
0.08
0.09
0.10
0.11
0.12
Theoretical Quantiles (Gamma)
Data Type
Detect

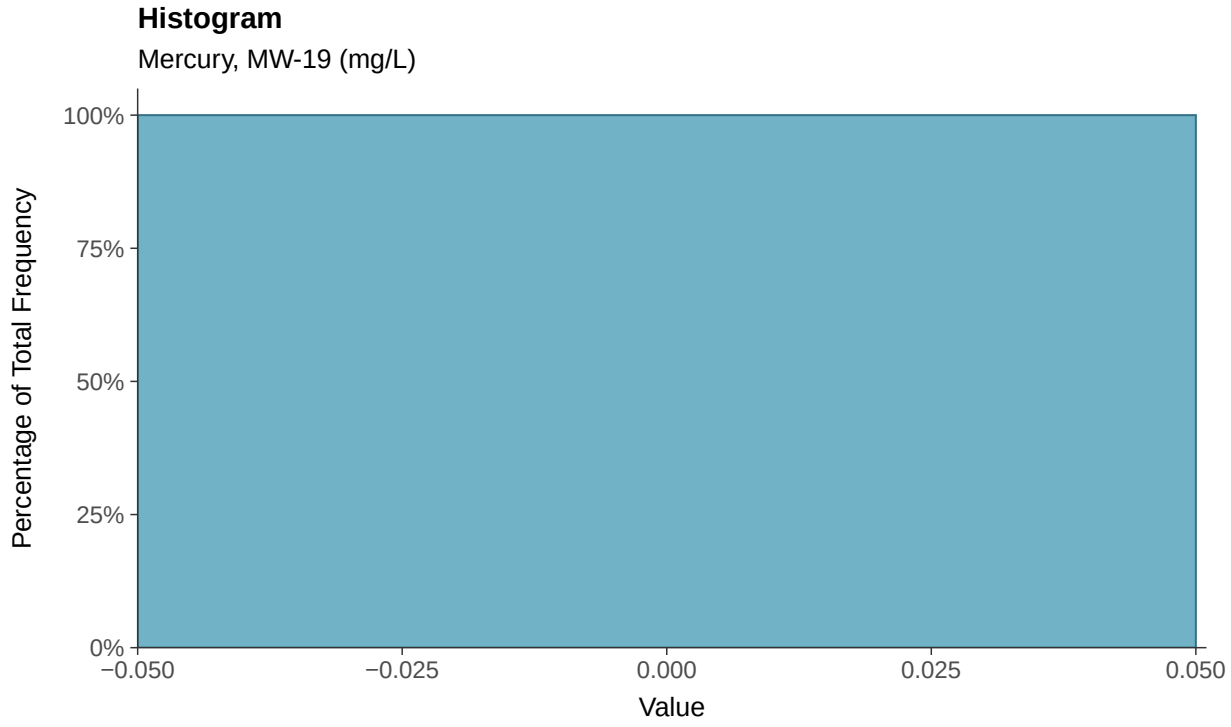

Trend Regression: Lognormal MLE
Lithium, MW-19 (mg/L)
log(Value)
−2.2
−2.3
−2.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

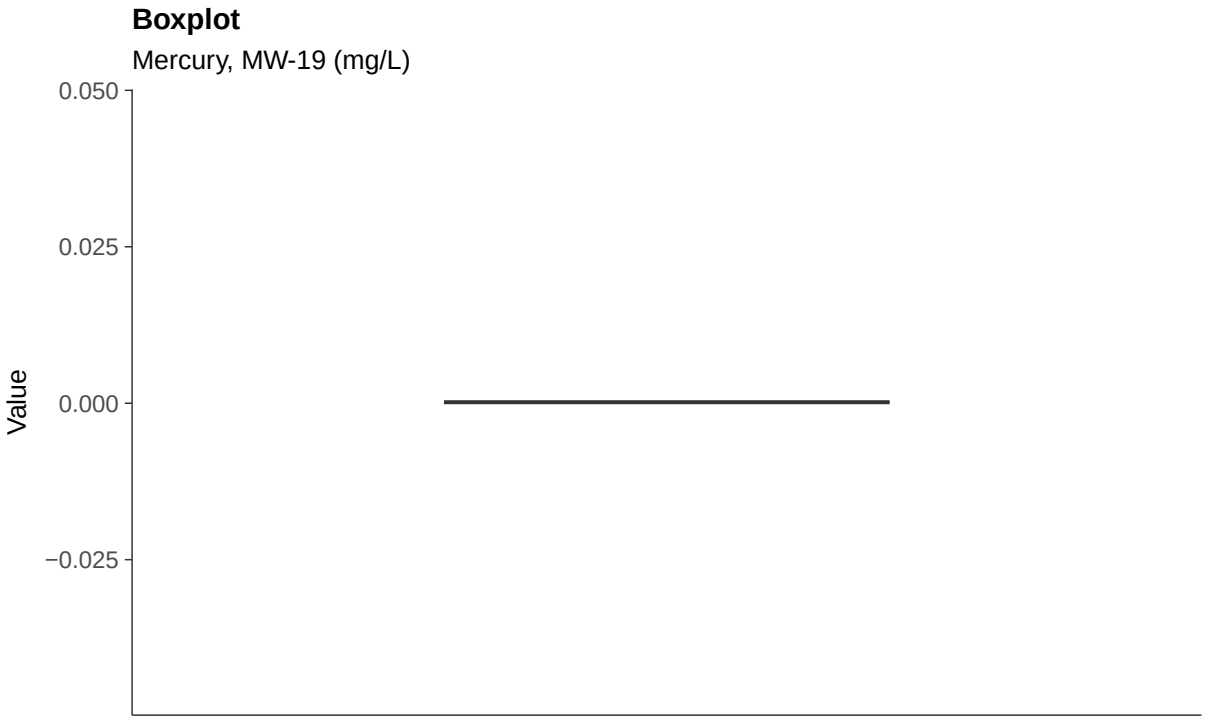

Trend Regression: Piecewise Linear-Linear
Lithium, MW-19 (mg/L)
0.110
0.105
0.100
0.095
0.090
0.085
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

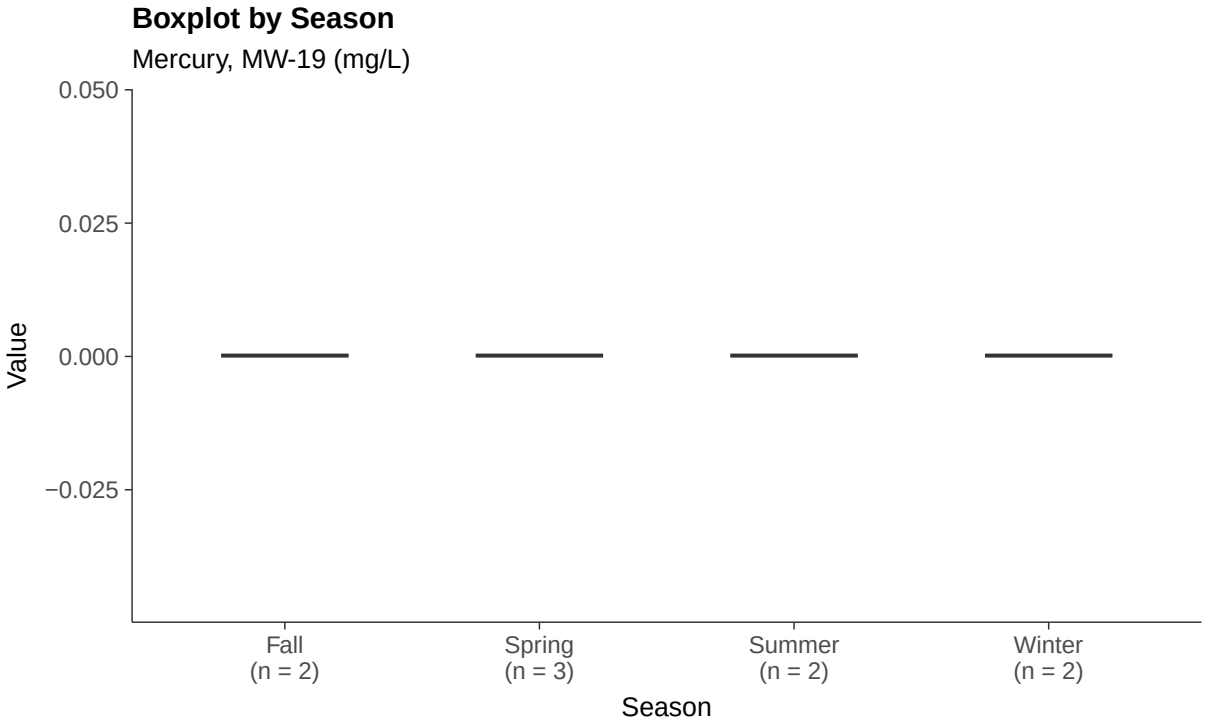
Appendix IV: Mercury, MW-19

ID: 1_23_5_117



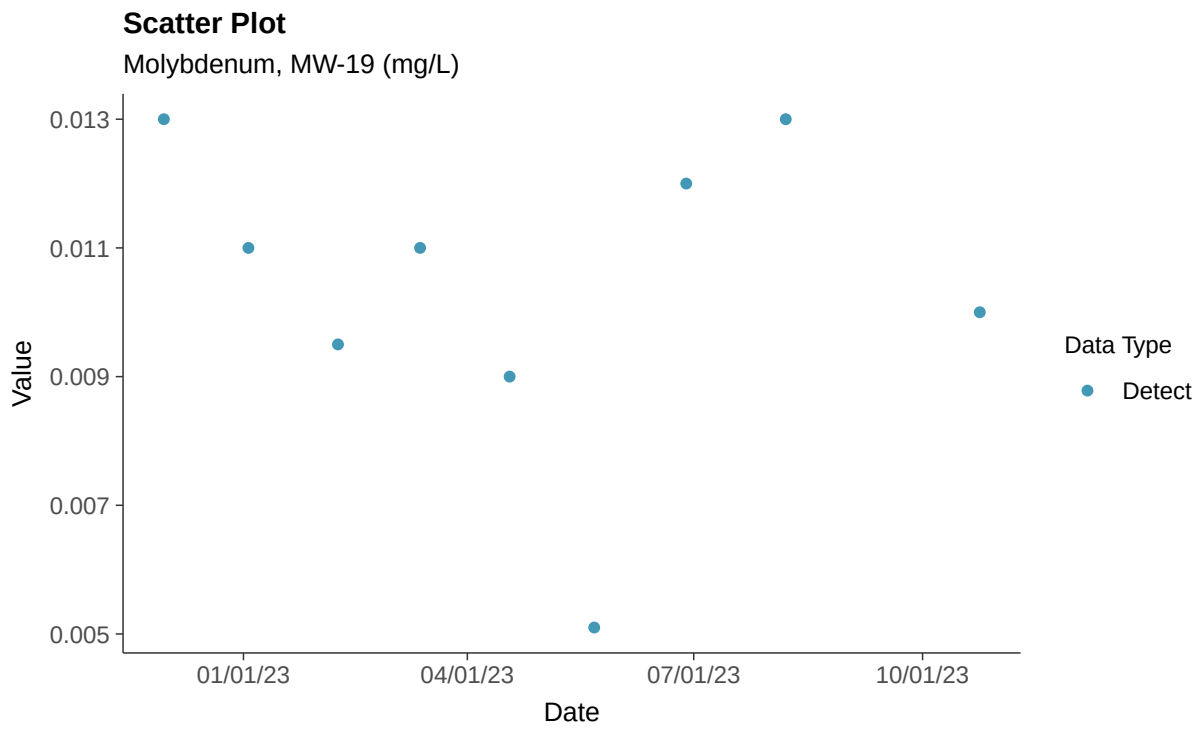


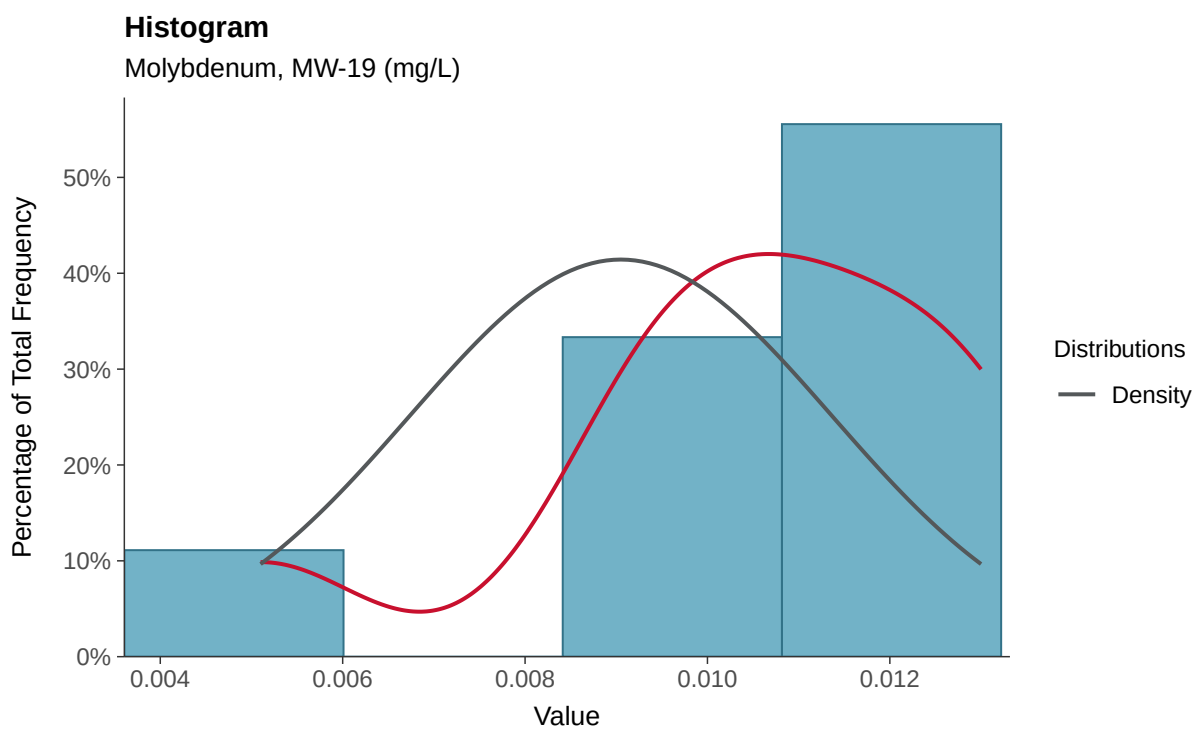

Boxplot
Mercury, MW-19 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Mercury, MW-19 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

Appendix IV: Molybdenum, MW-19

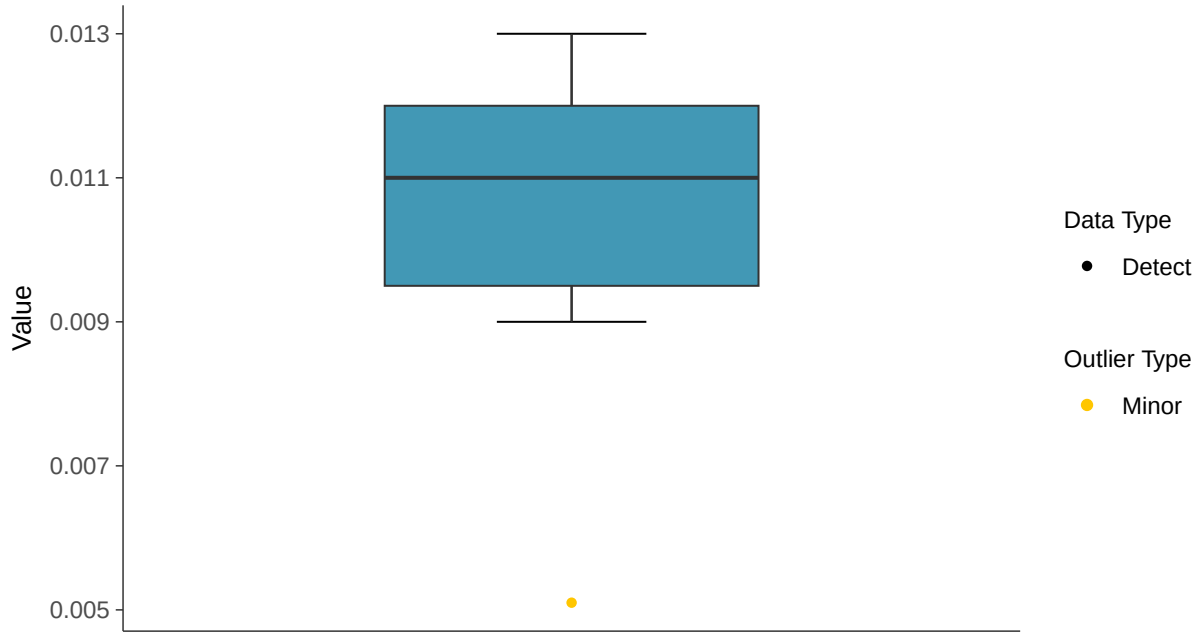
ID: 1_23_5_118





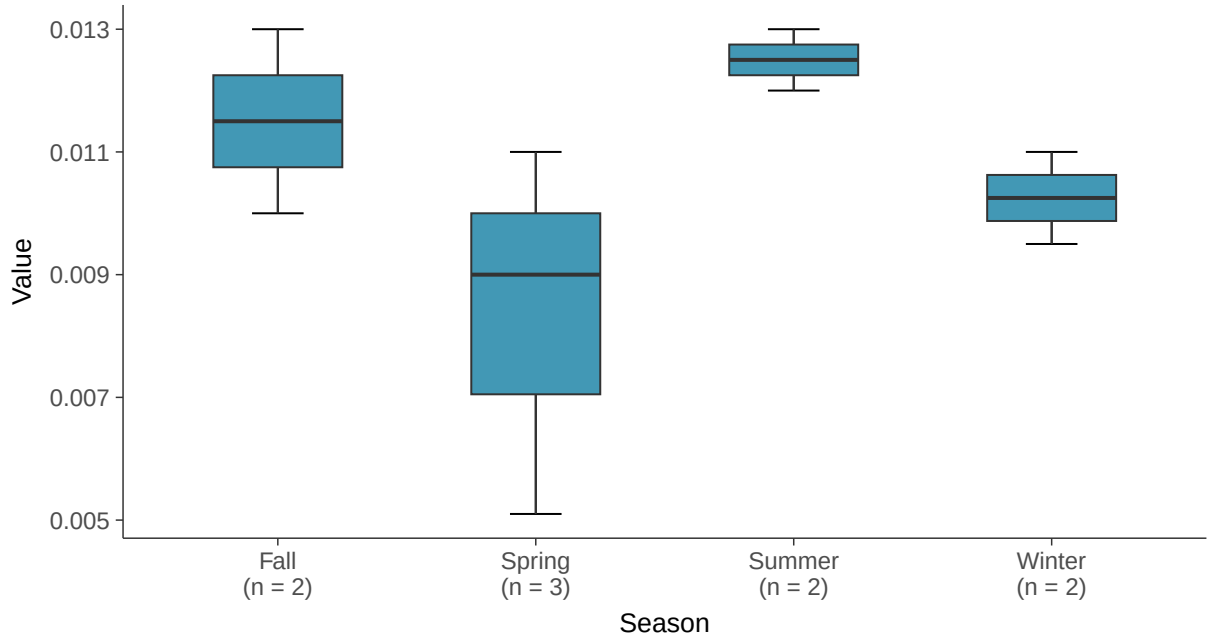
Boxplot

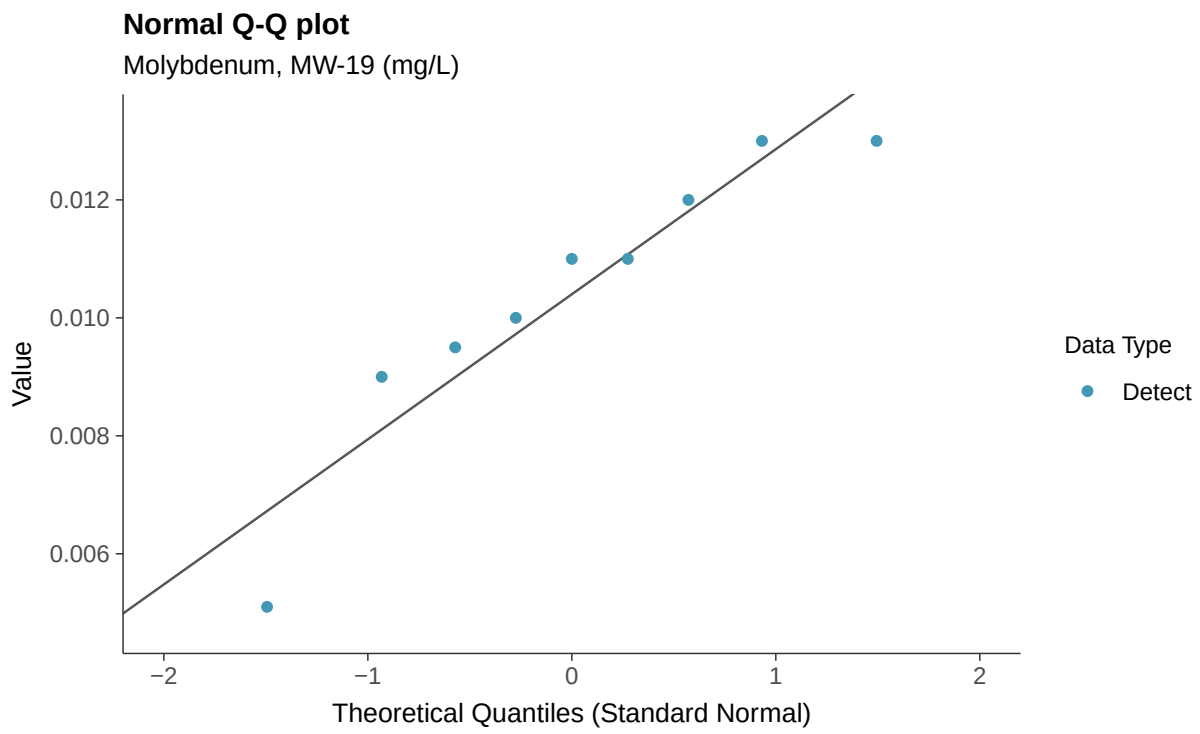
Molybdenum, MW-19 (mg/L)

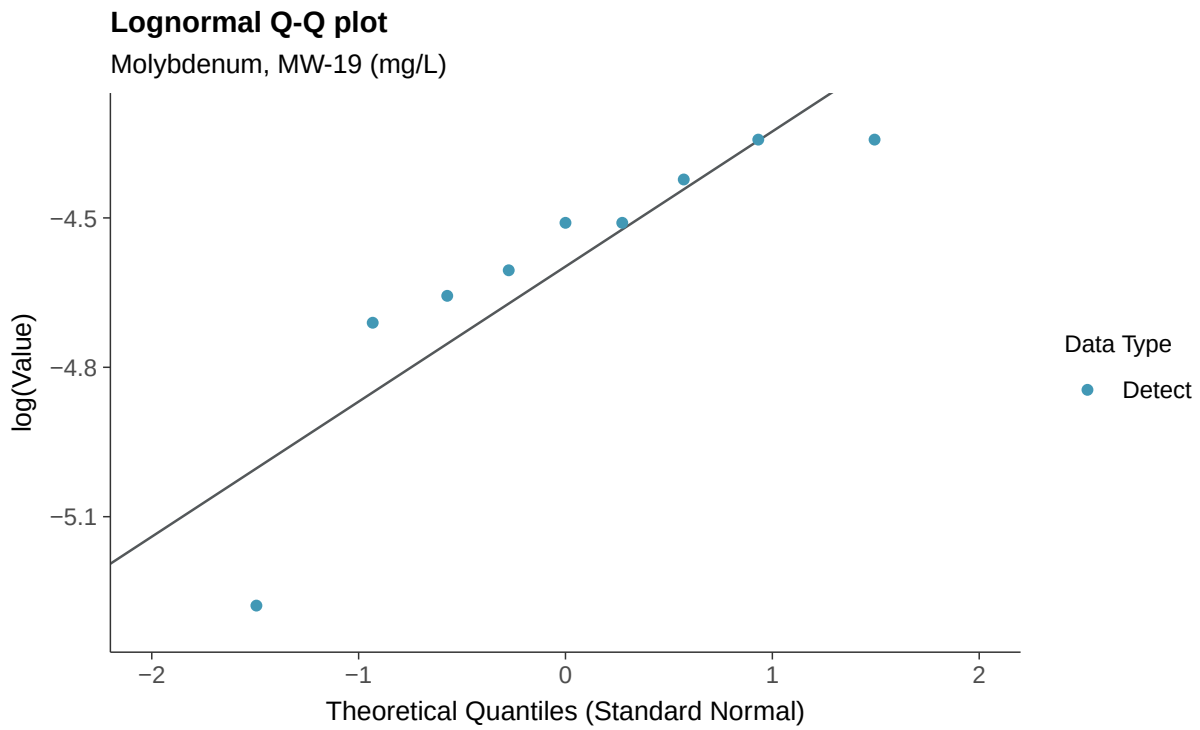


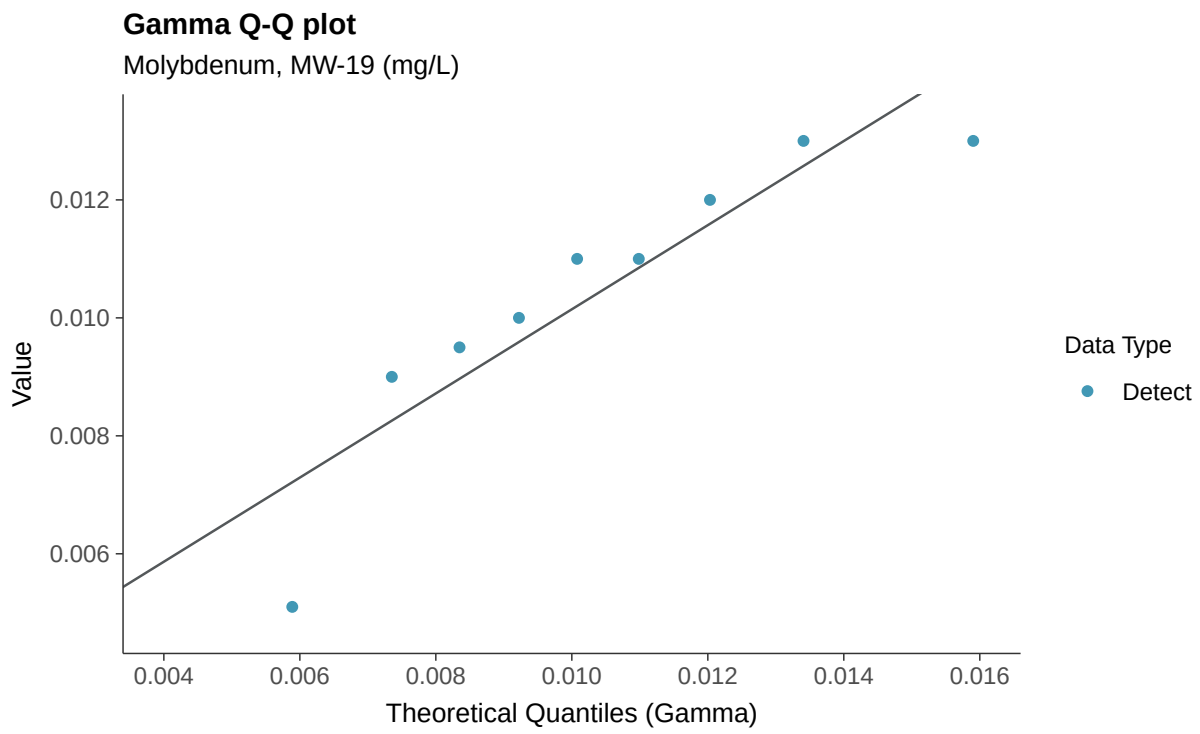
Boxplot by Season

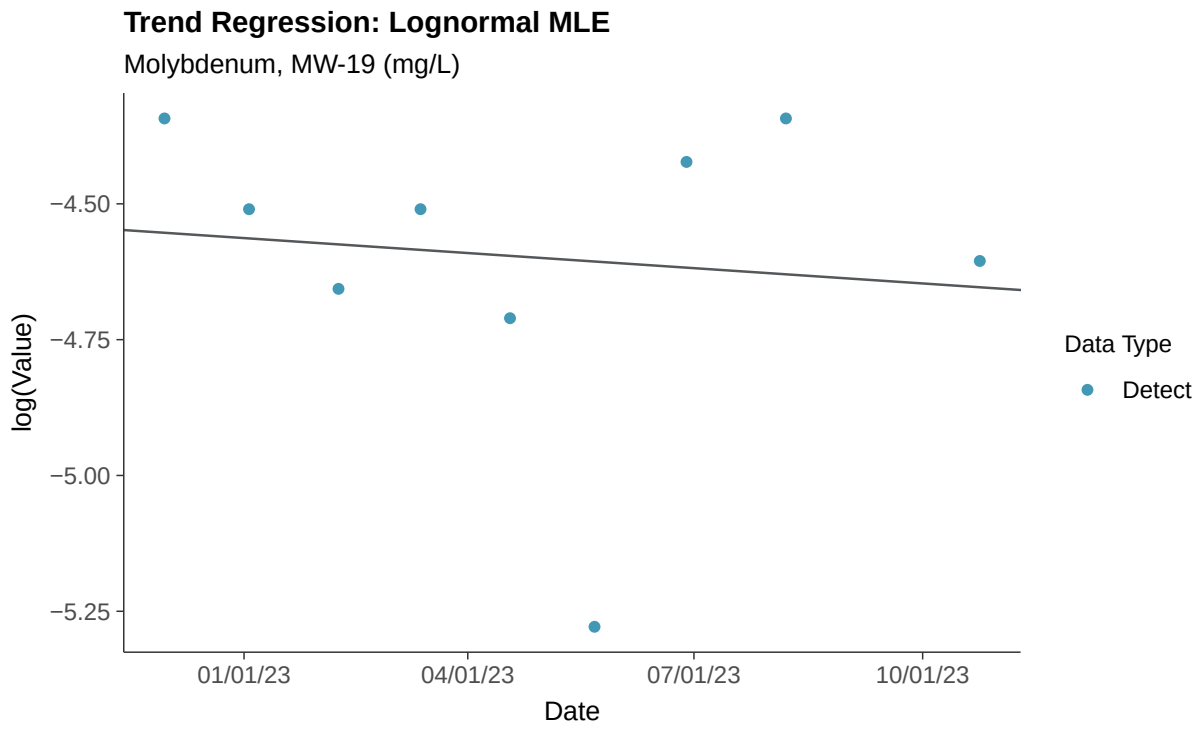
Molybdenum, MW-19 (mg/L)

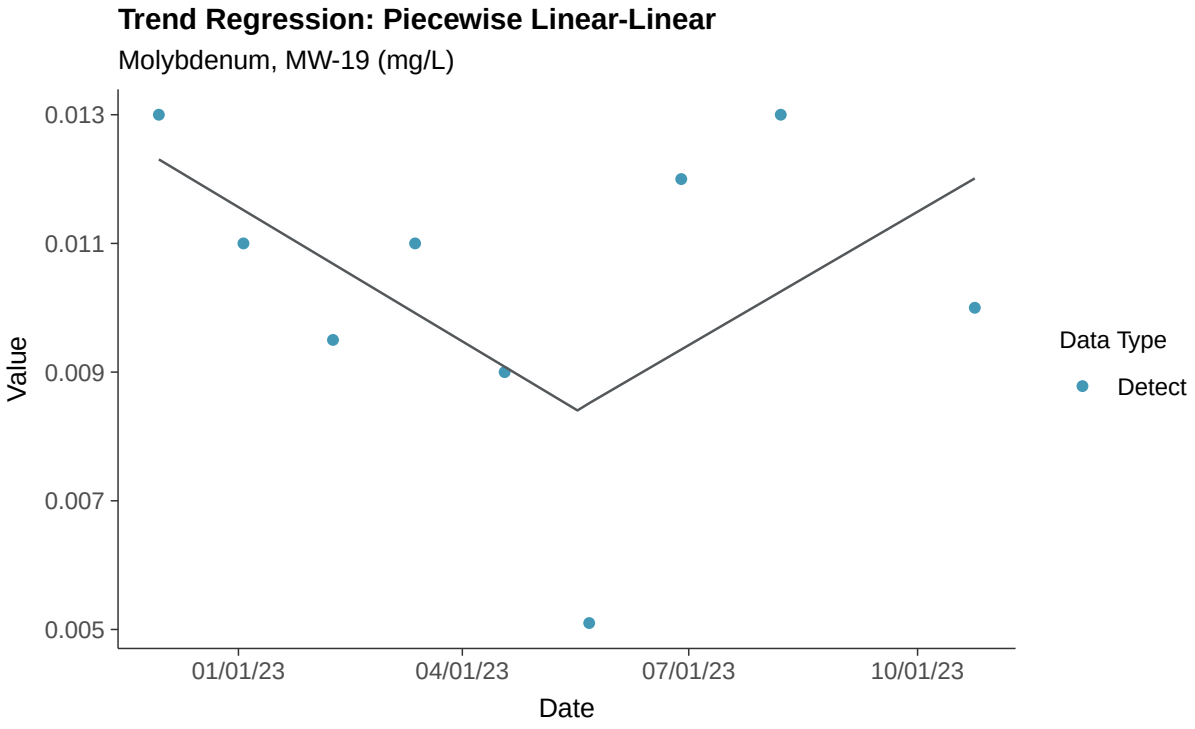



Normal Q-Q plot
Molybdenum, MW-19 (mg/L)
Value
0.012
0.010
0.008
0.006
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Molybdenum, MW-19 (mg/L)
log(Value)
−4.5
−4.8
−5.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

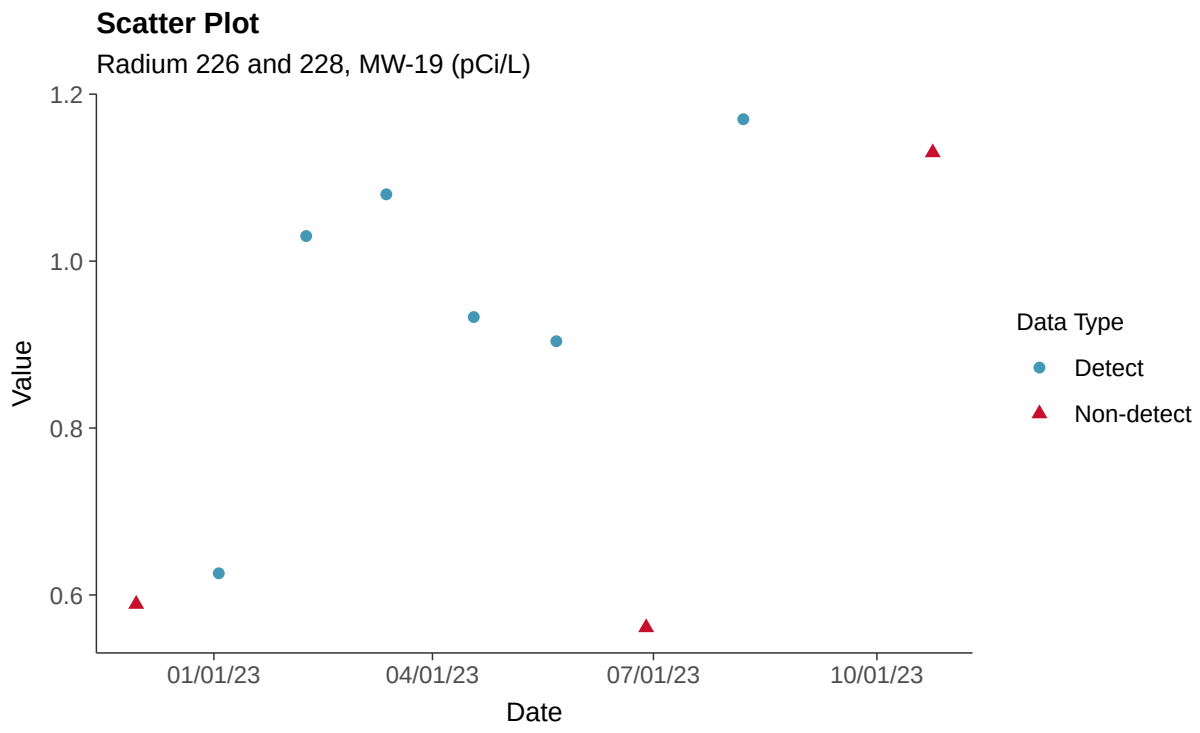

Gamma Q-Q plot
Molybdenum, MW-19 (mg/L)
Value
0.012
0.010
0.008
0.006
0.004
0.006
0.008
0.010
0.012
0.014
0.016
Theoretical Quantiles (Gamma)
Data Type
Detect

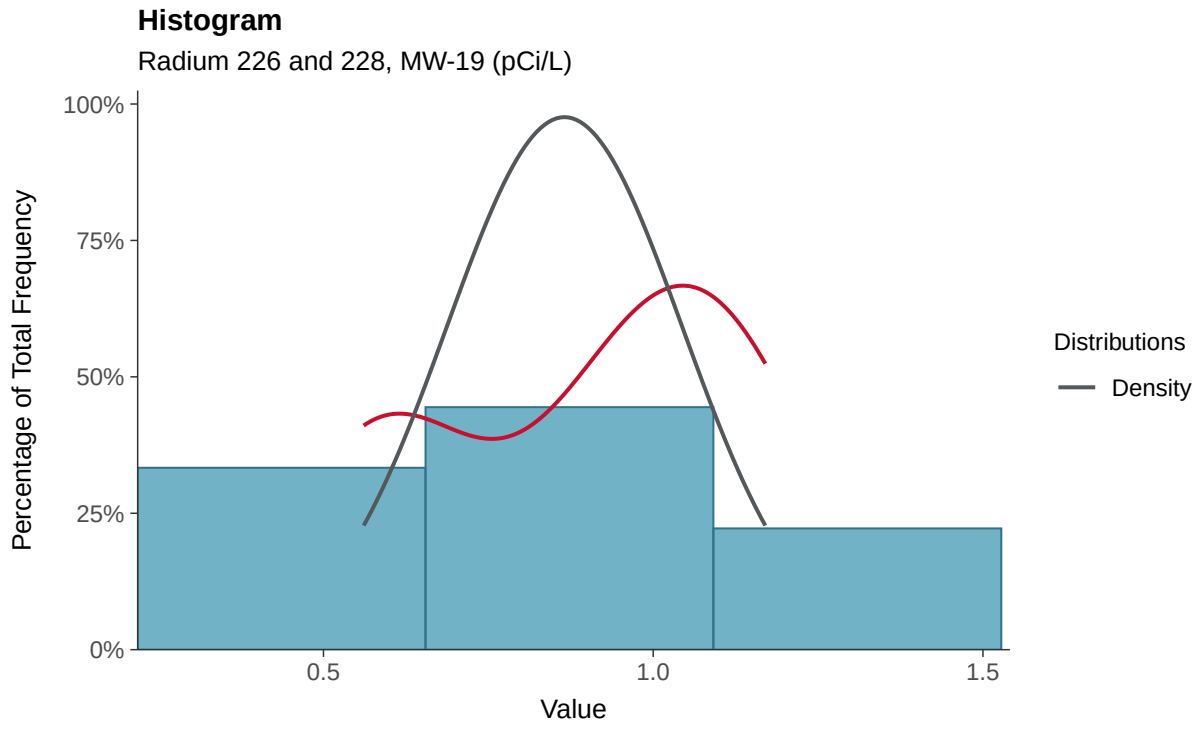

Trend Regression: Lognormal MLE
Molybdenum, MW-19 (mg/L)
log(Value)
−4.50
−4.75
−5.00
−5.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-19 (mg/L)
0.013
0.011
0.009
0.007
0.005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Radium 226 and 228, MW-19

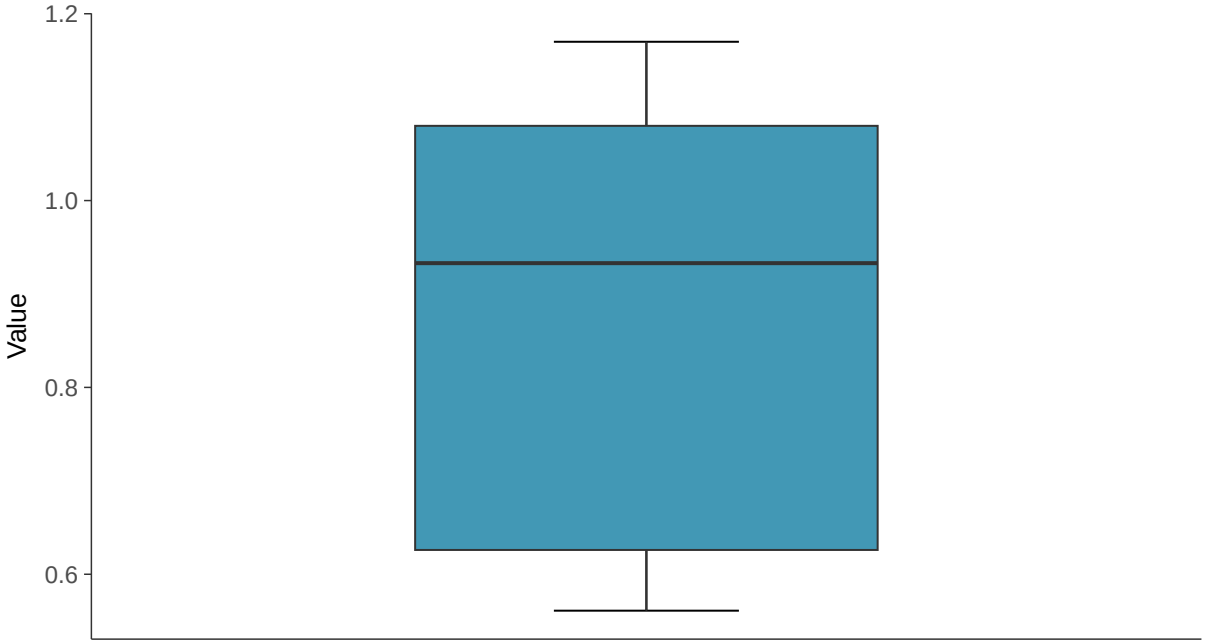
ID: 1_23_5_121





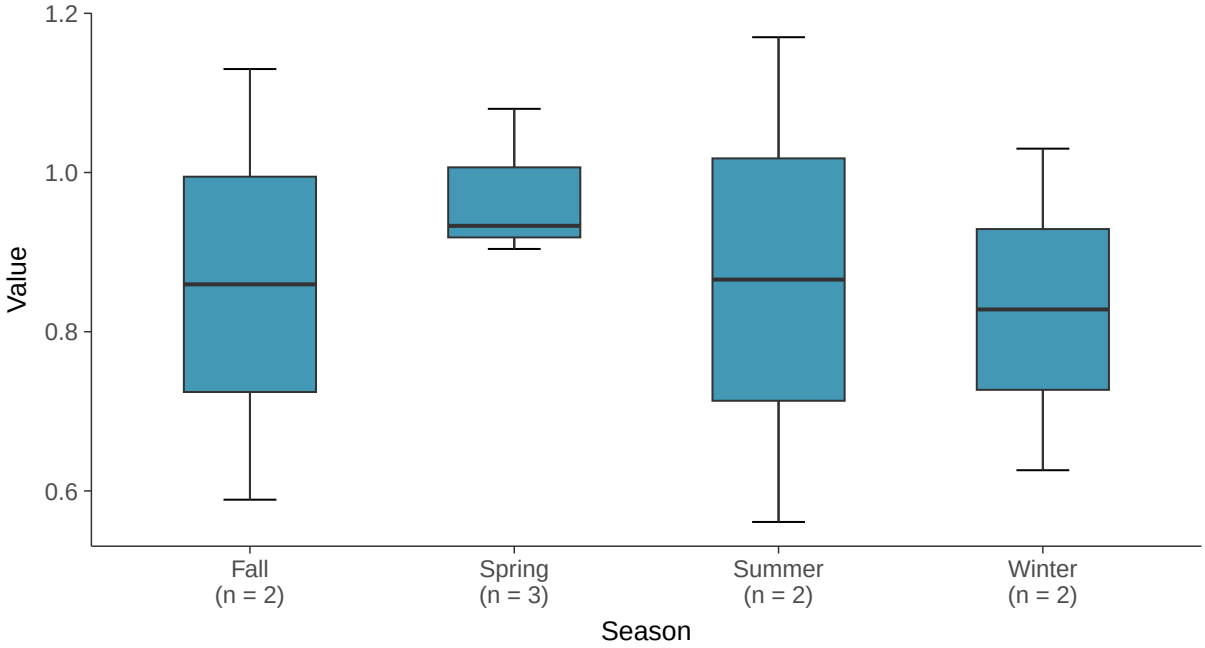
Boxplot

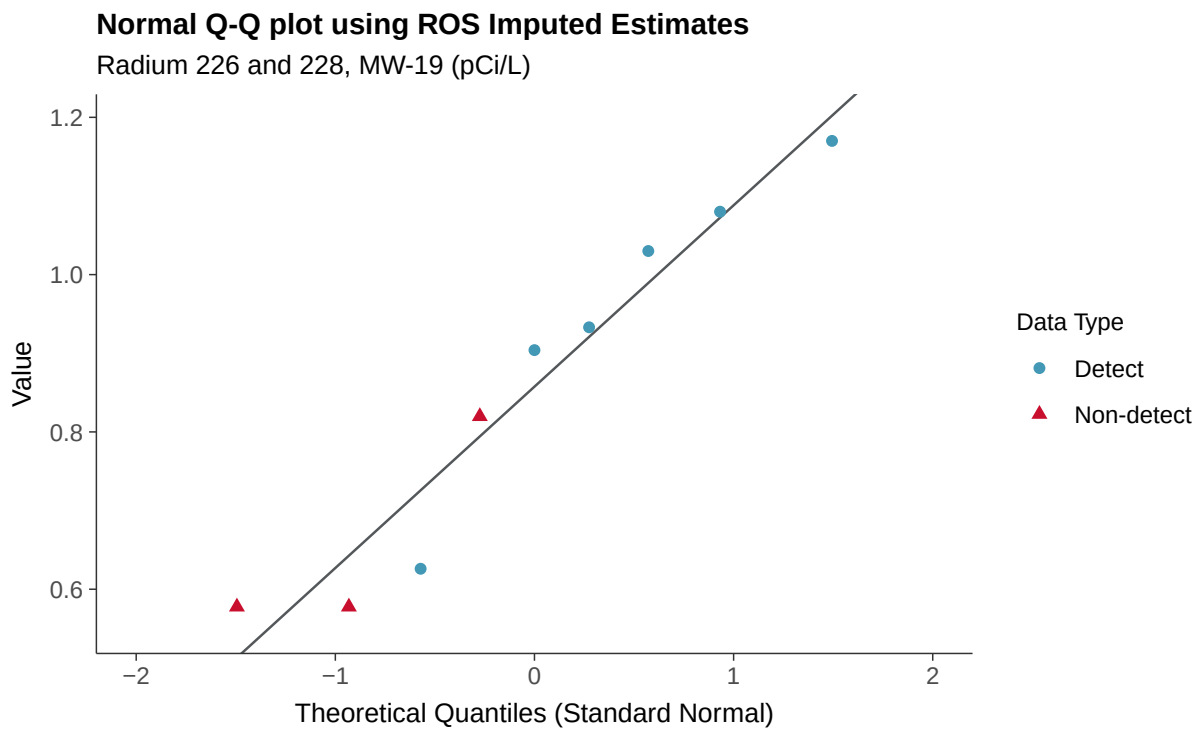
Radium 226 and 228, MW-19 (pCi/L)

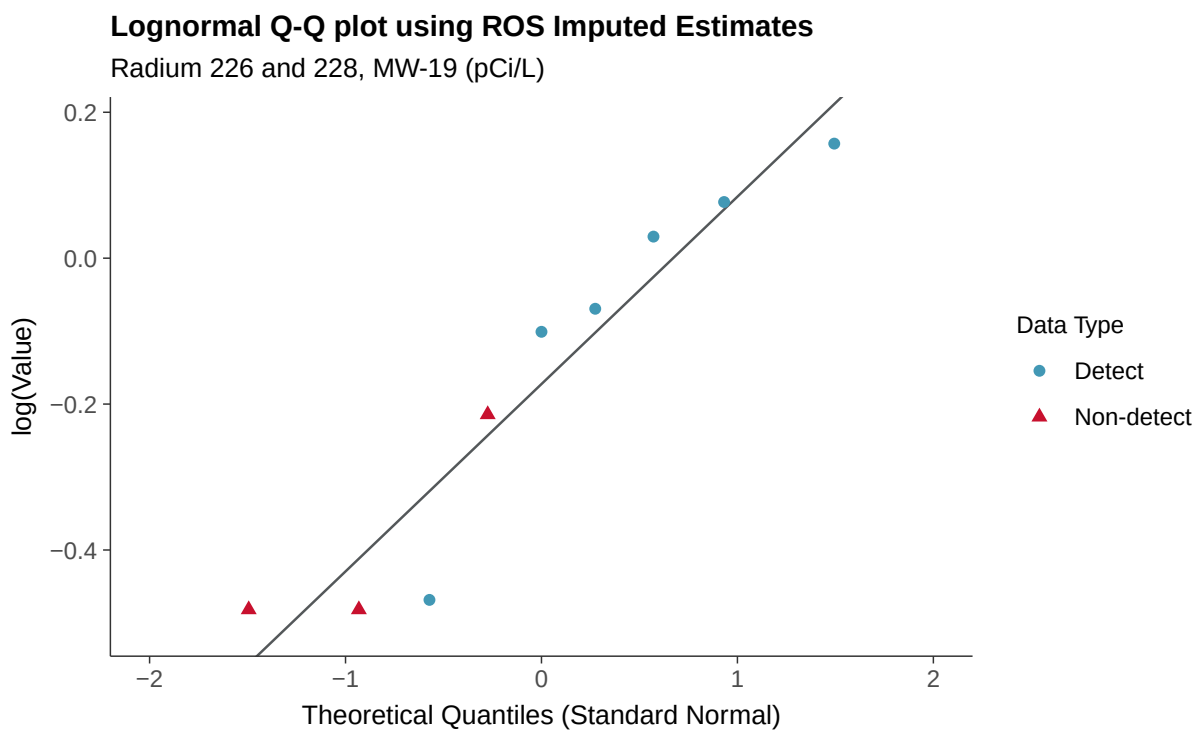


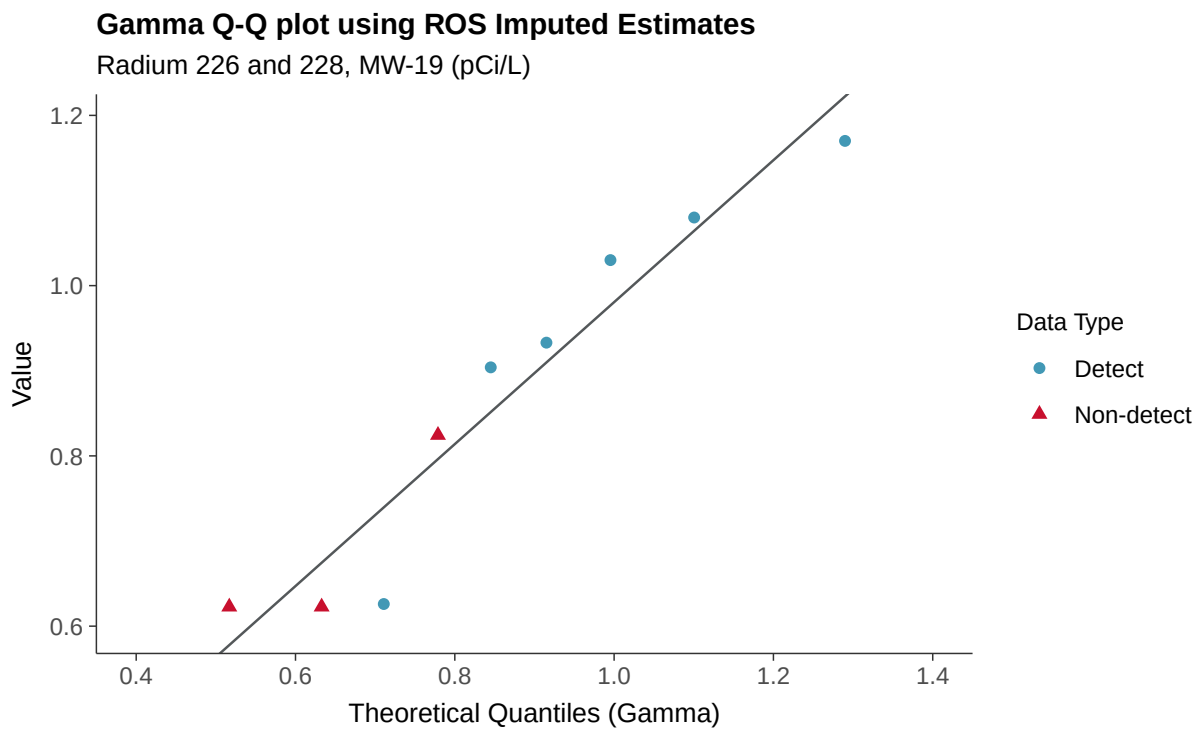
Boxplot by Season

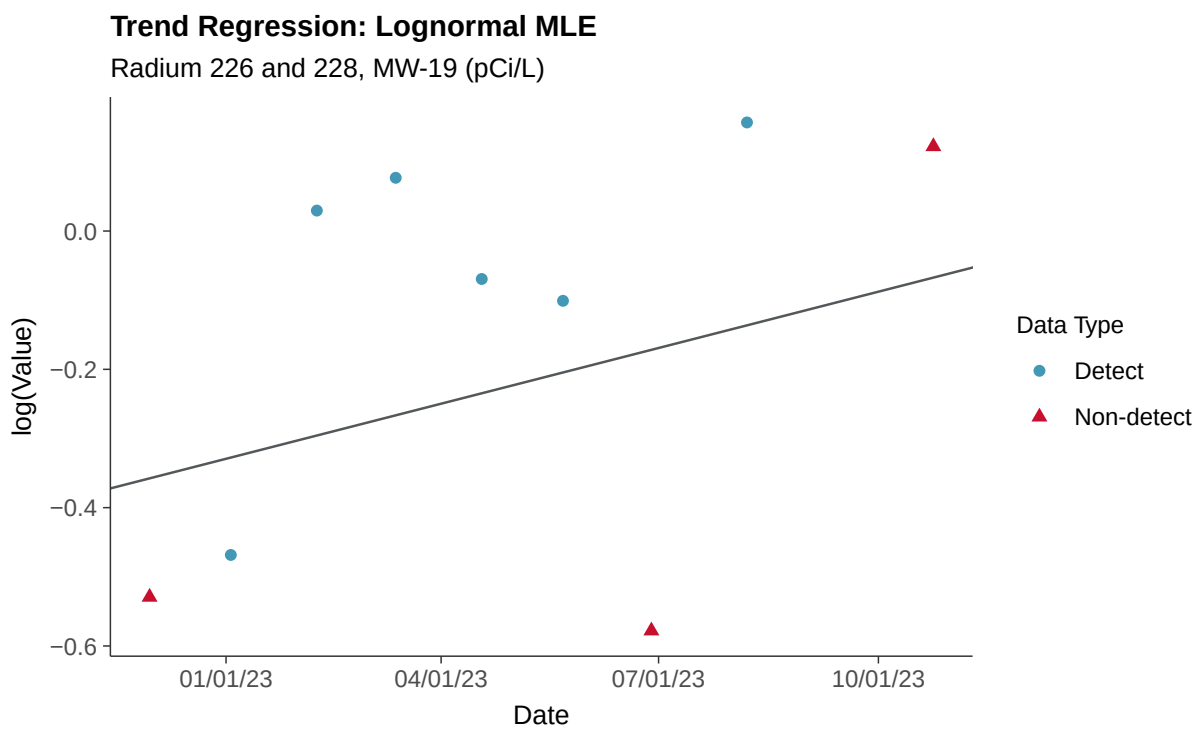
Radium 226 and 228, MW-19 (pCi/L)




Normal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-19 (pCi/L)
Value
1.2
1.0
0.8
0.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

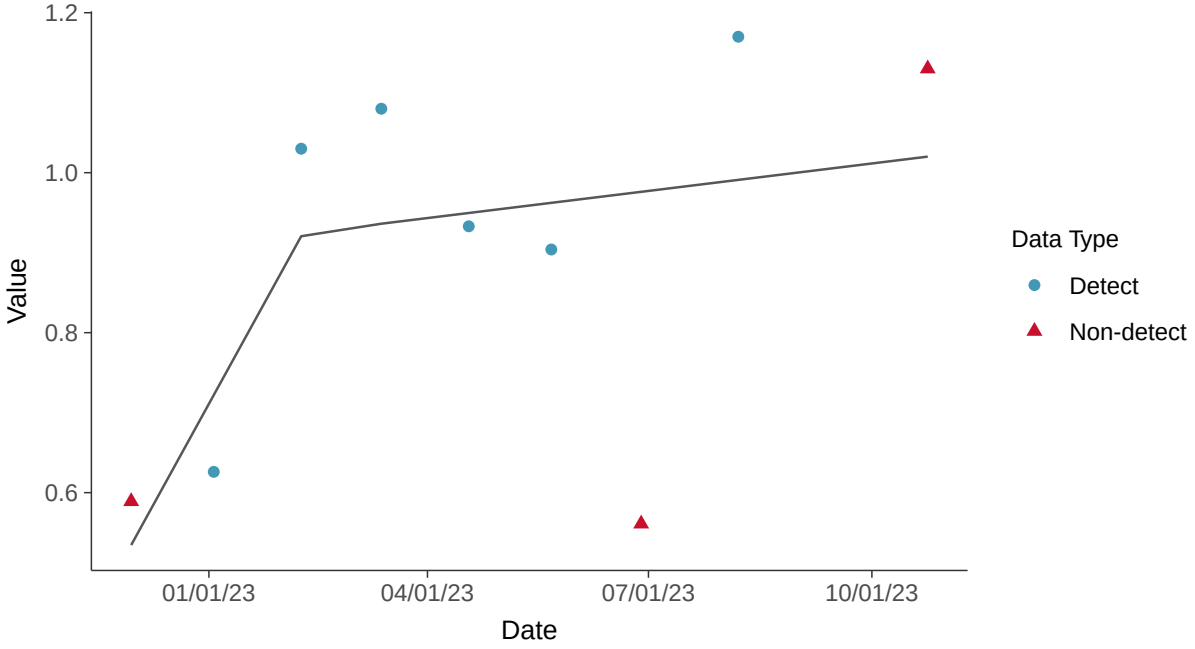

Lognormal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-19 (pCi/L)
log(Value)
0.2
0.0
−0.2
−0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-19 (pCi/L)
Value
1.2
1.0
0.8
0.6
0.4
0.6
0.8
1.0
1.2
1.4
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Radium 226 and 228, MW-19 (pCi/L)
log(Value)
0.0
−0.2
−0.4
−0.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

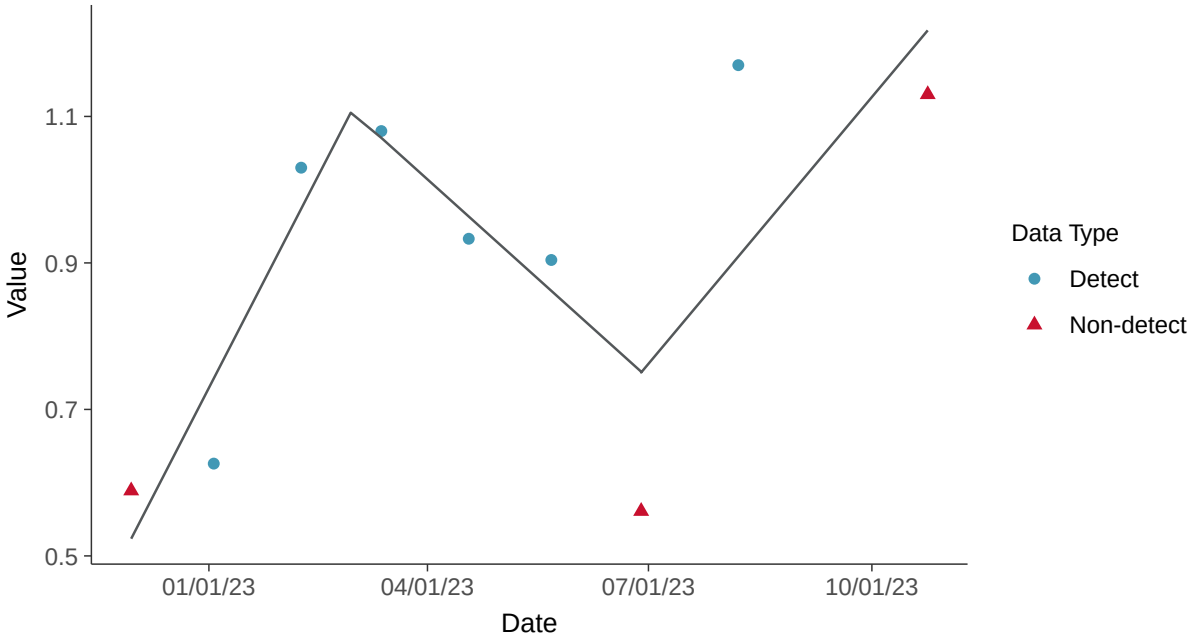
Trend Regression: Piecewise Linear-Linear

Radium 226 and 228, MW-19 (pCi/L)



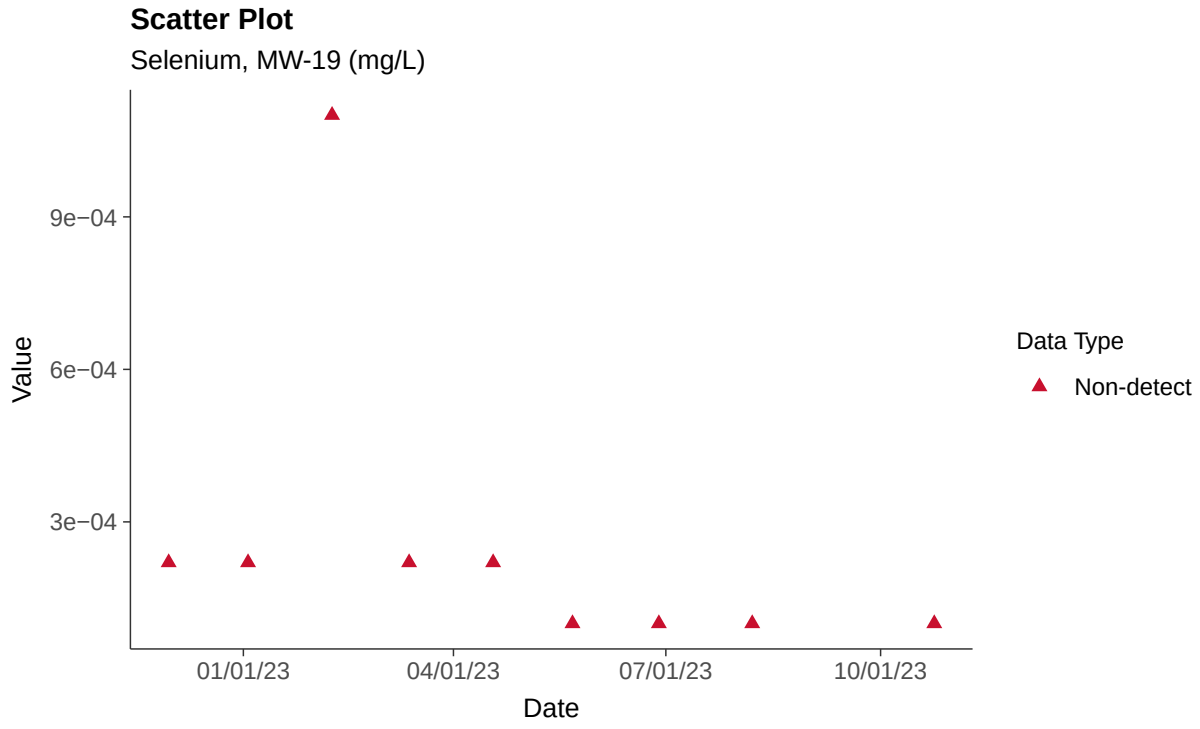
Trend Regression: Piecewise Linear-Linear-Linear

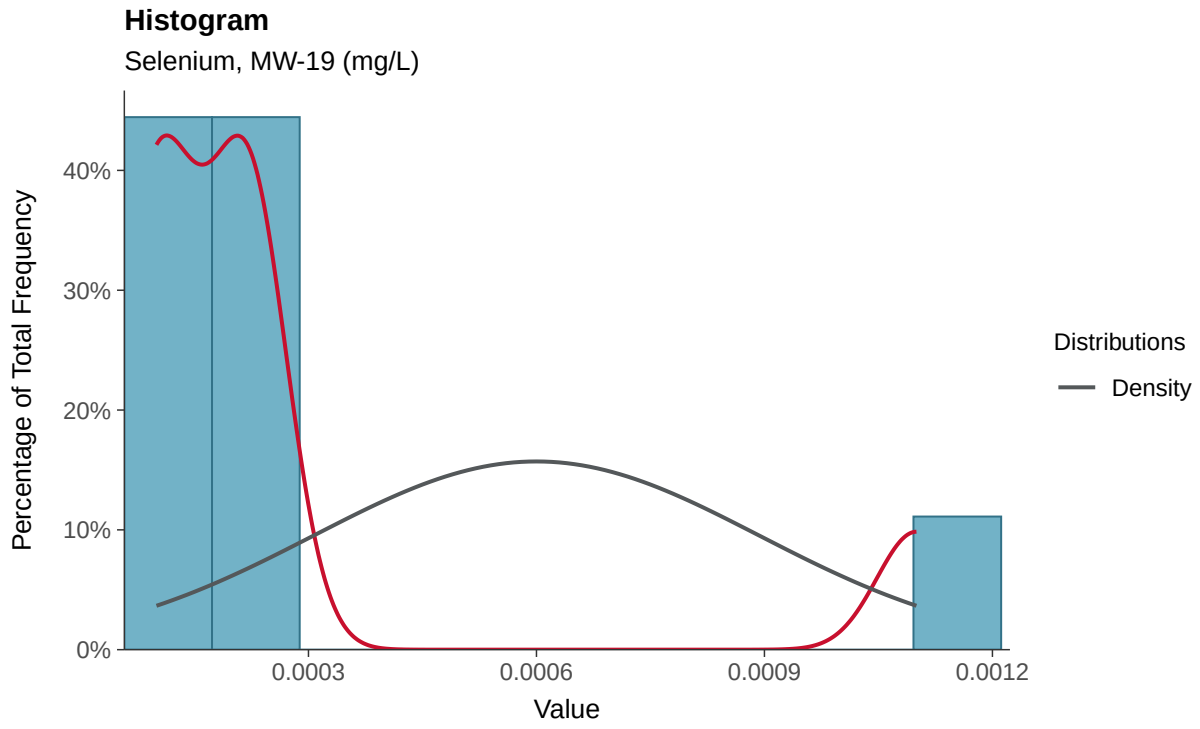
Radium 226 and 228, MW-19 (pCi/L)



Appendix IV: Selenium, MW-19

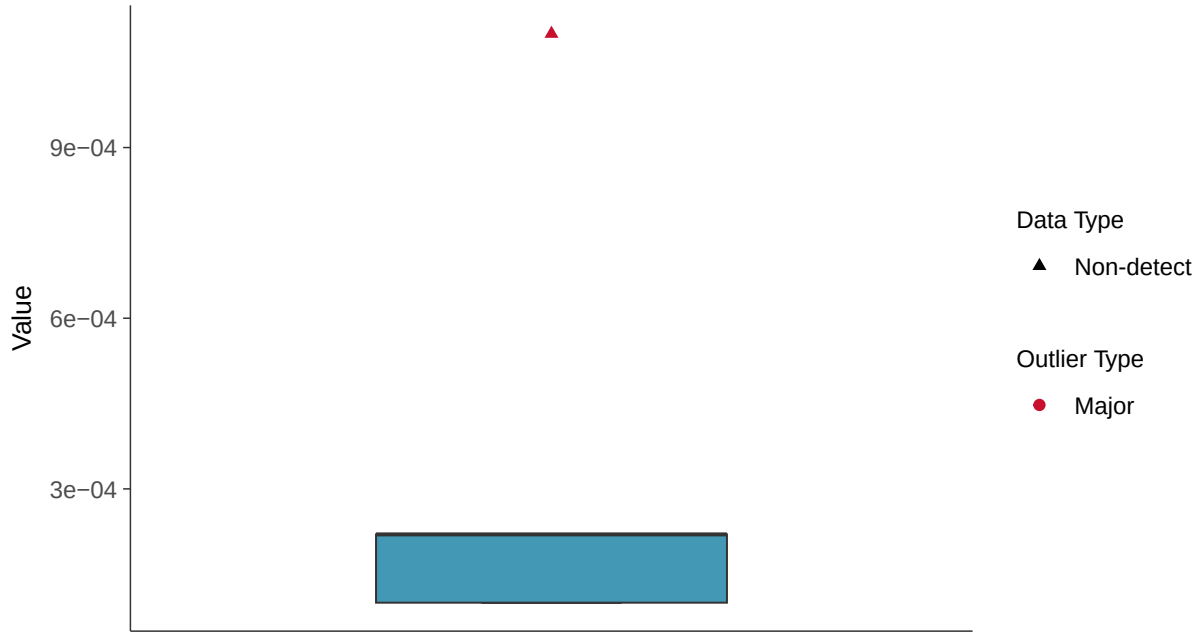
ID: 1_23_5_122





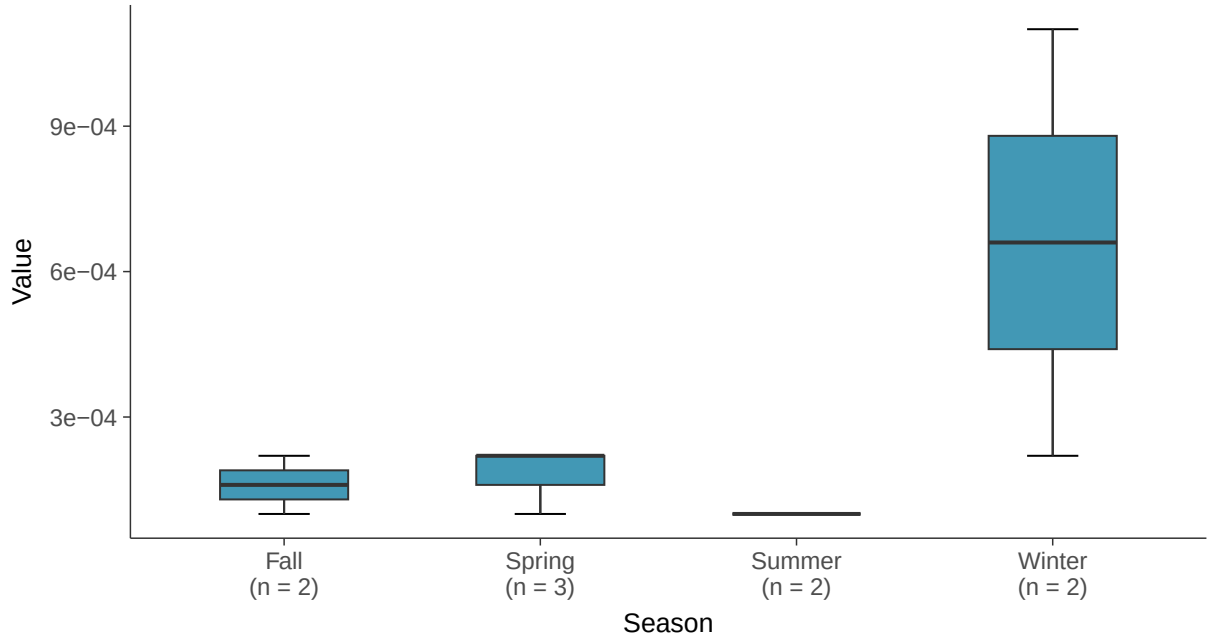
Boxplot

Selenium, MW-19 (mg/L)



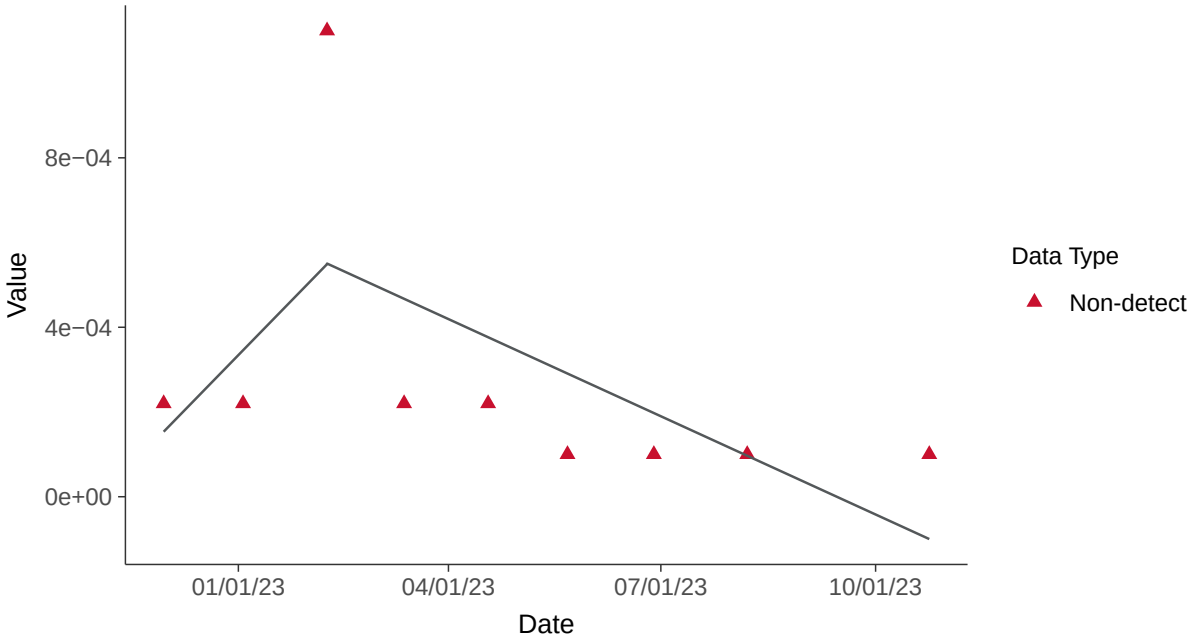
Boxplot by Season

Selenium, MW-19 (mg/L)



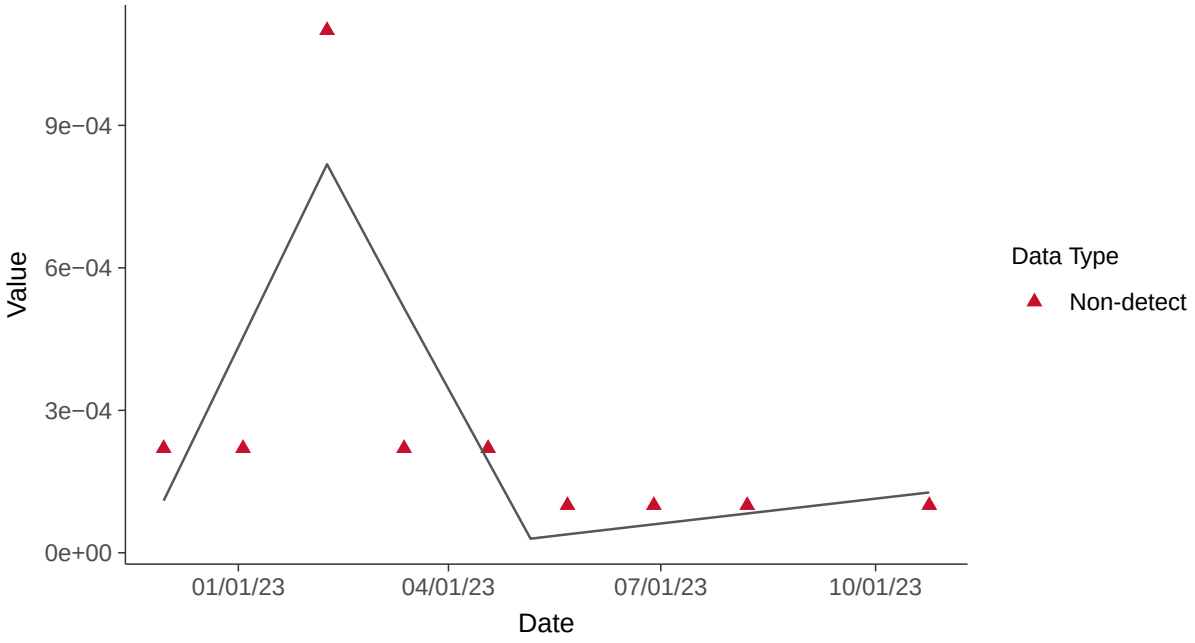
Trend Regression: Piecewise Linear-Linear

Selenium, MW-19 (mg/L)



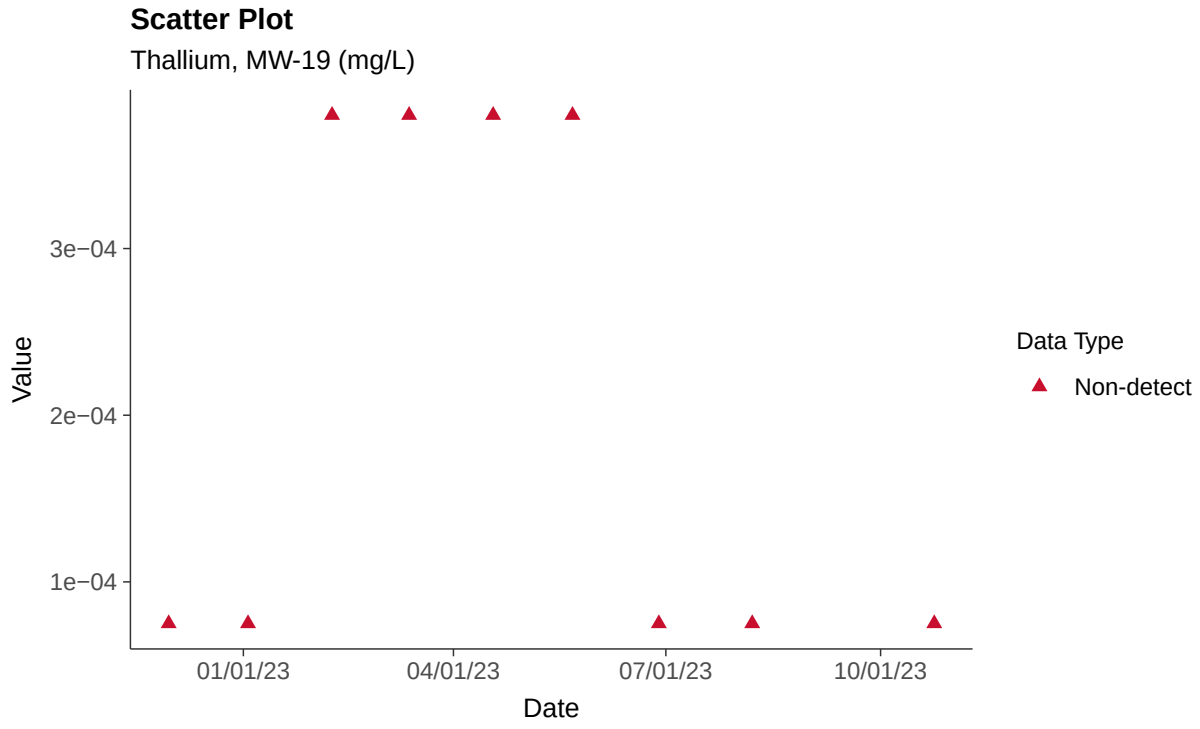
Trend Regression: Piecewise Linear-Linear-Linear

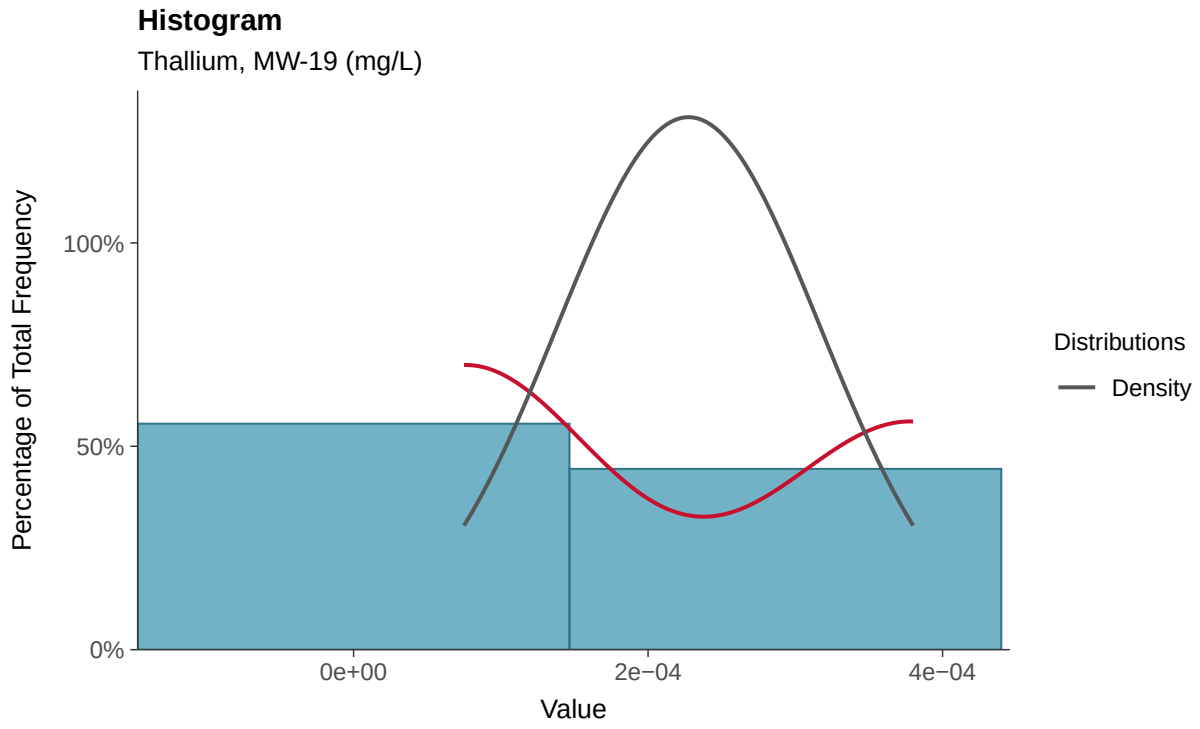
Selenium, MW-19 (mg/L)



Appendix IV: Thallium, MW-19

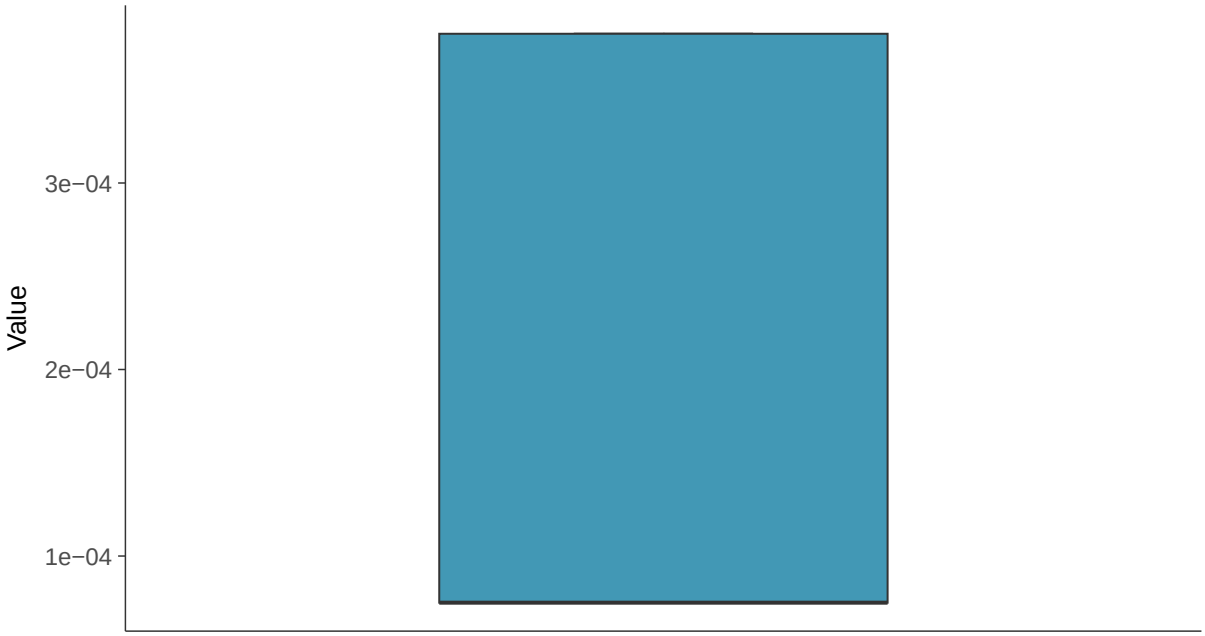
ID: 1_23_5_125





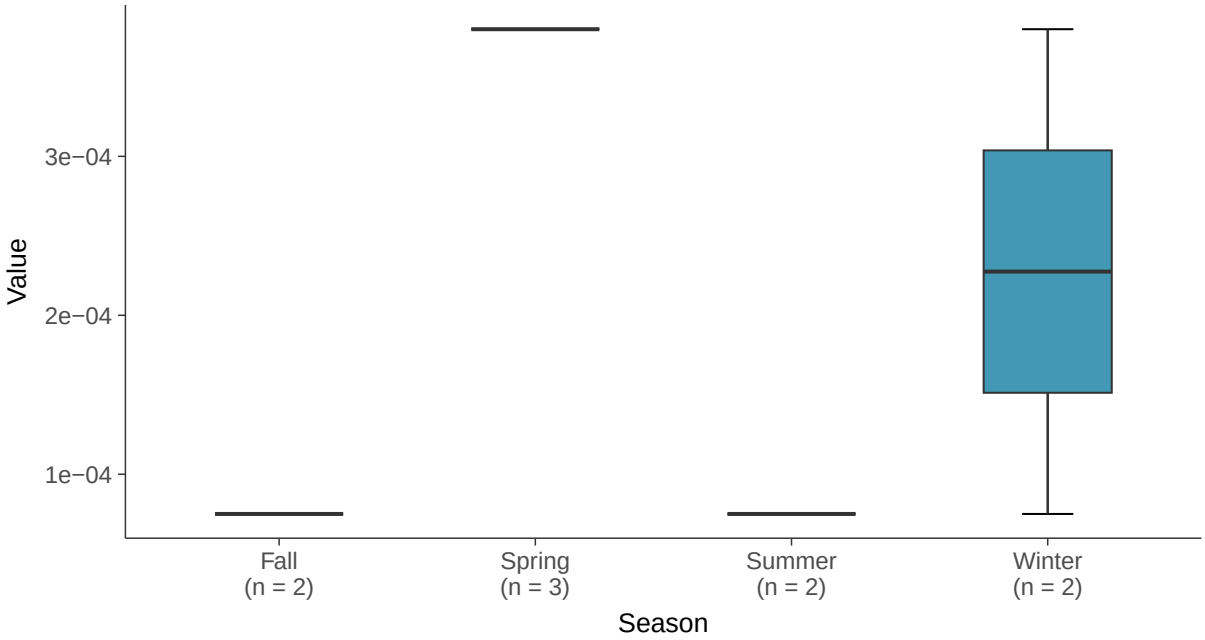
Boxplot

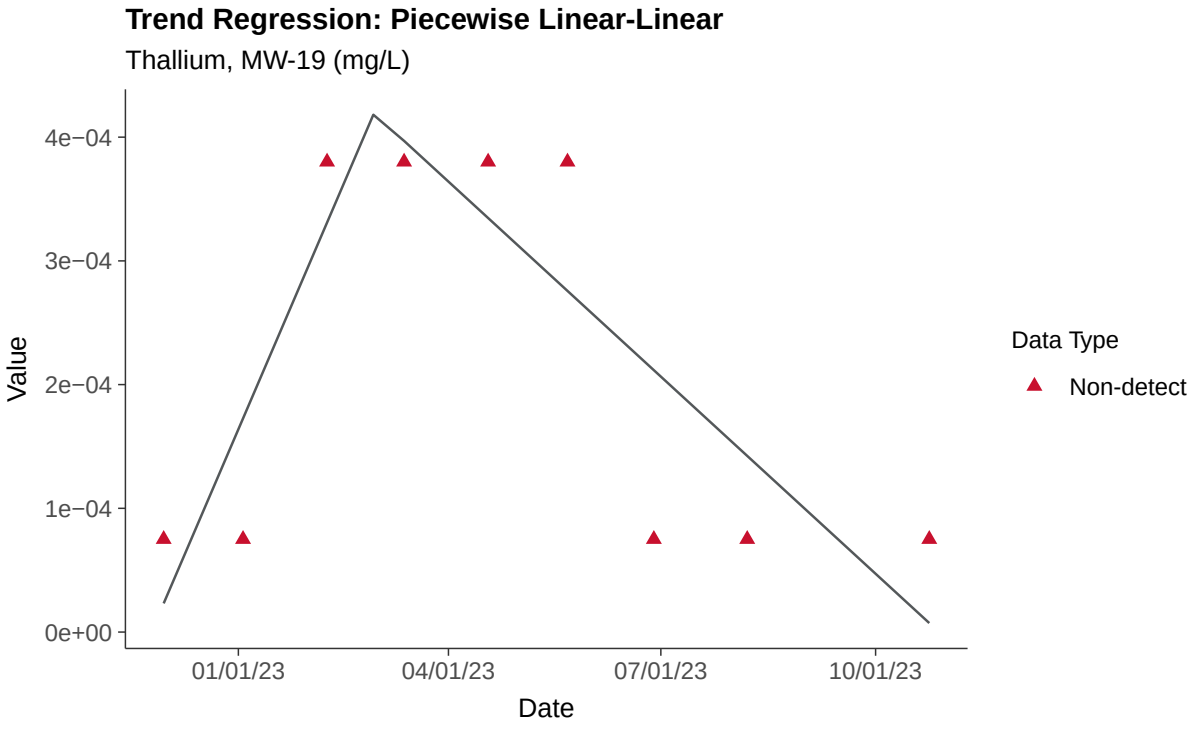
Thallium, MW-19 (mg/L)

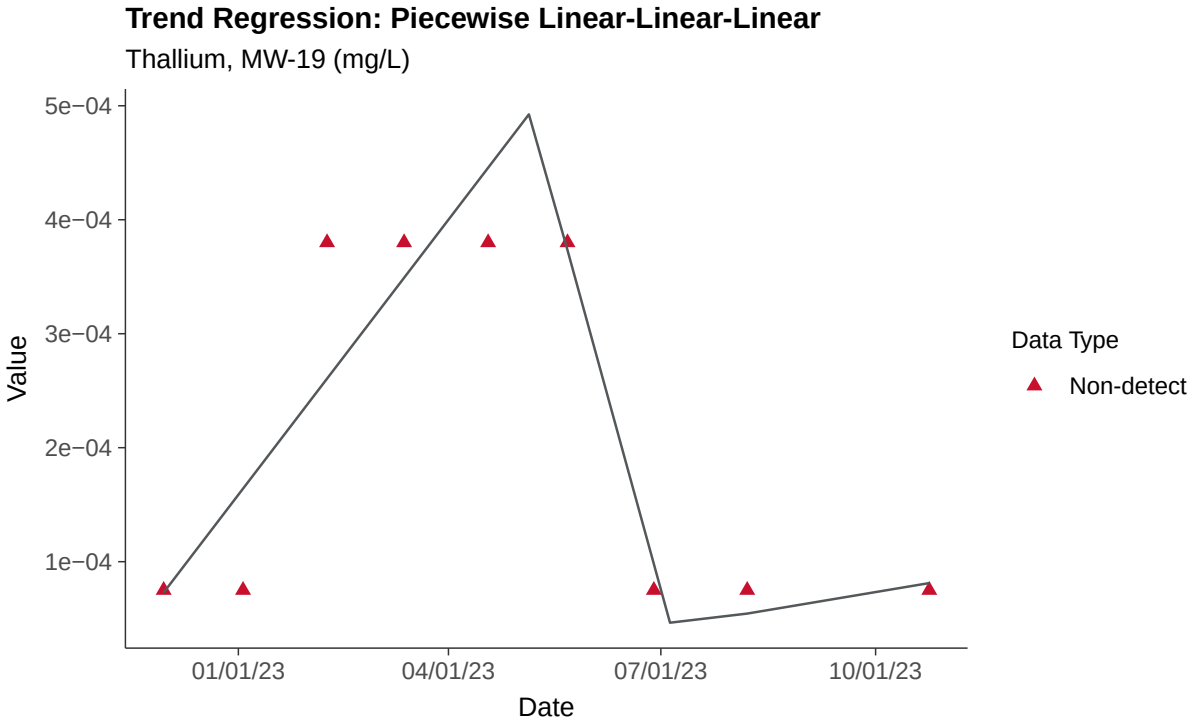


Boxplot by Season

Thallium, MW-19 (mg/L)

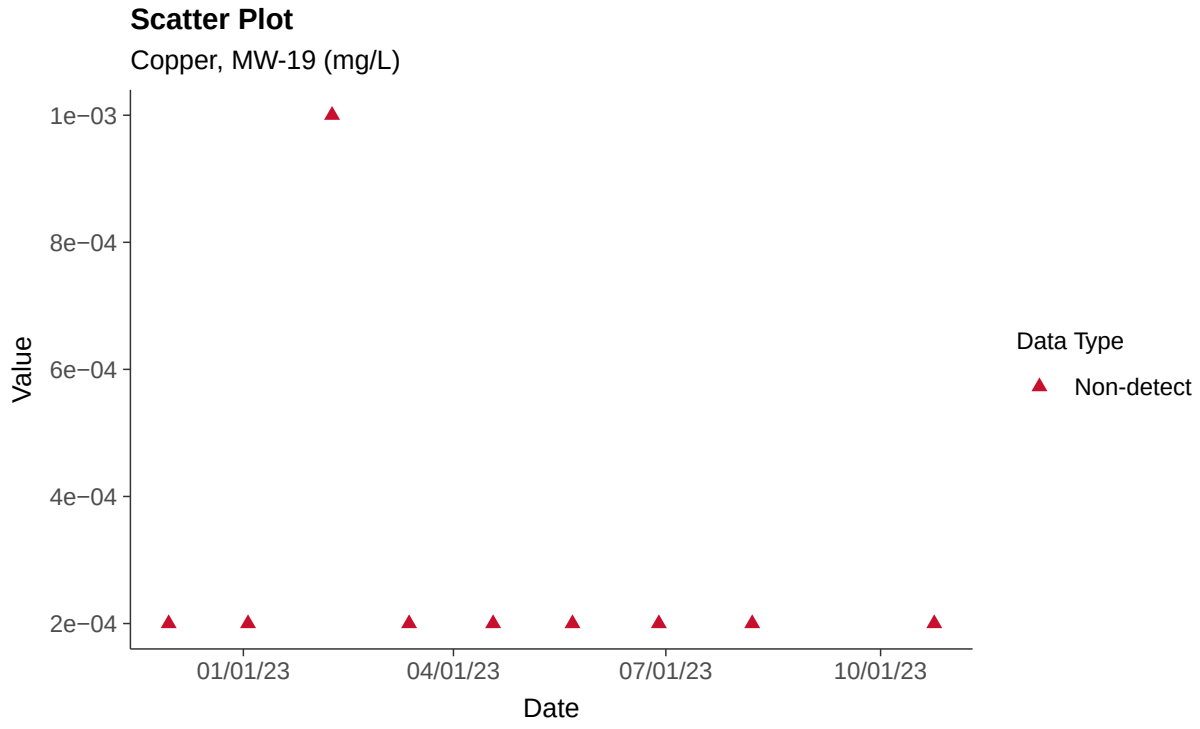


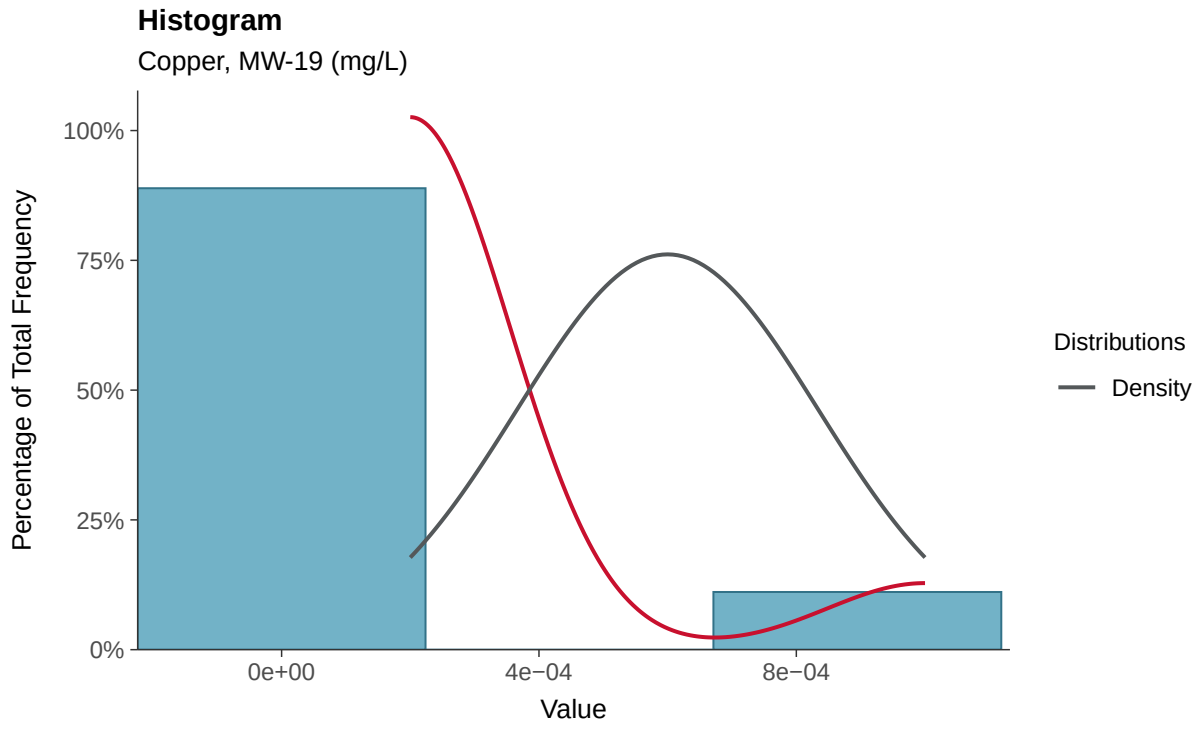

Trend Regression: Piecewise Linear-Linear
Thallium, MW-19 (mg/L)
Value
4e−04
3e−04
2e−04
1e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Thallium, MW-19 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Copper, MW-19

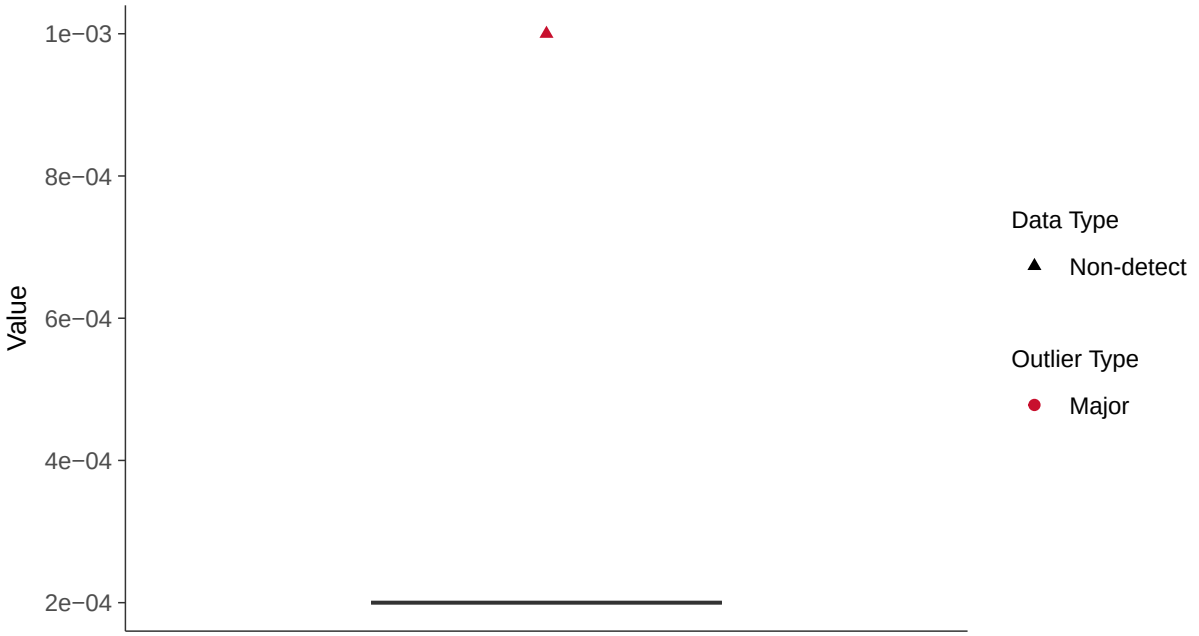
ID: 1_23_6_111





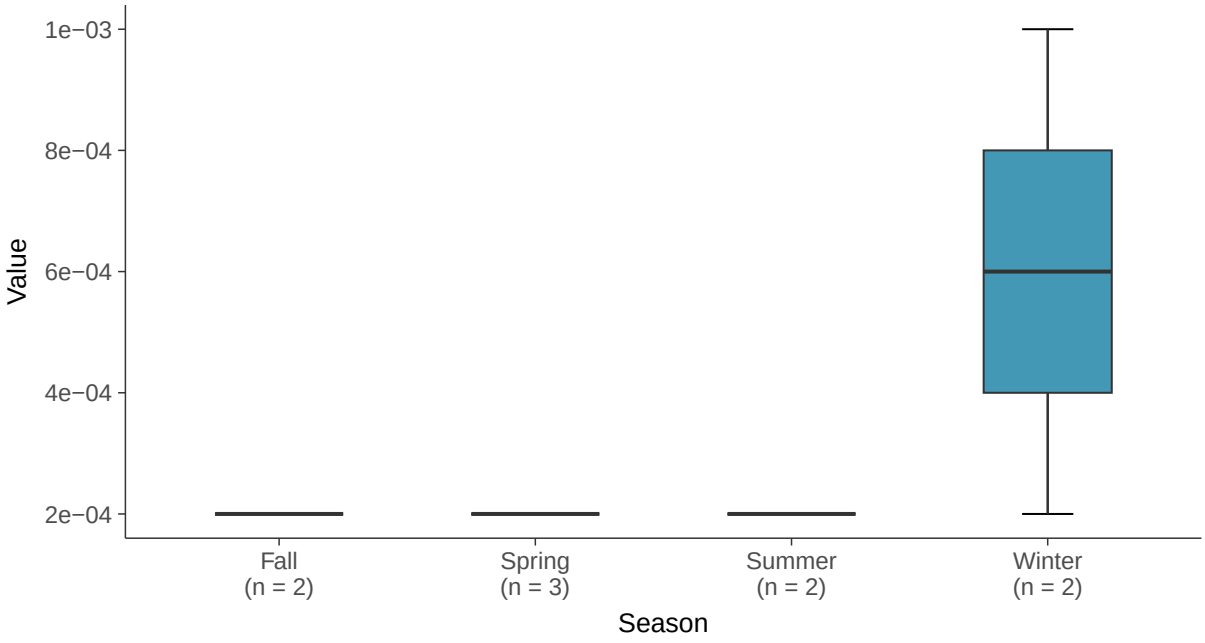
Boxplot

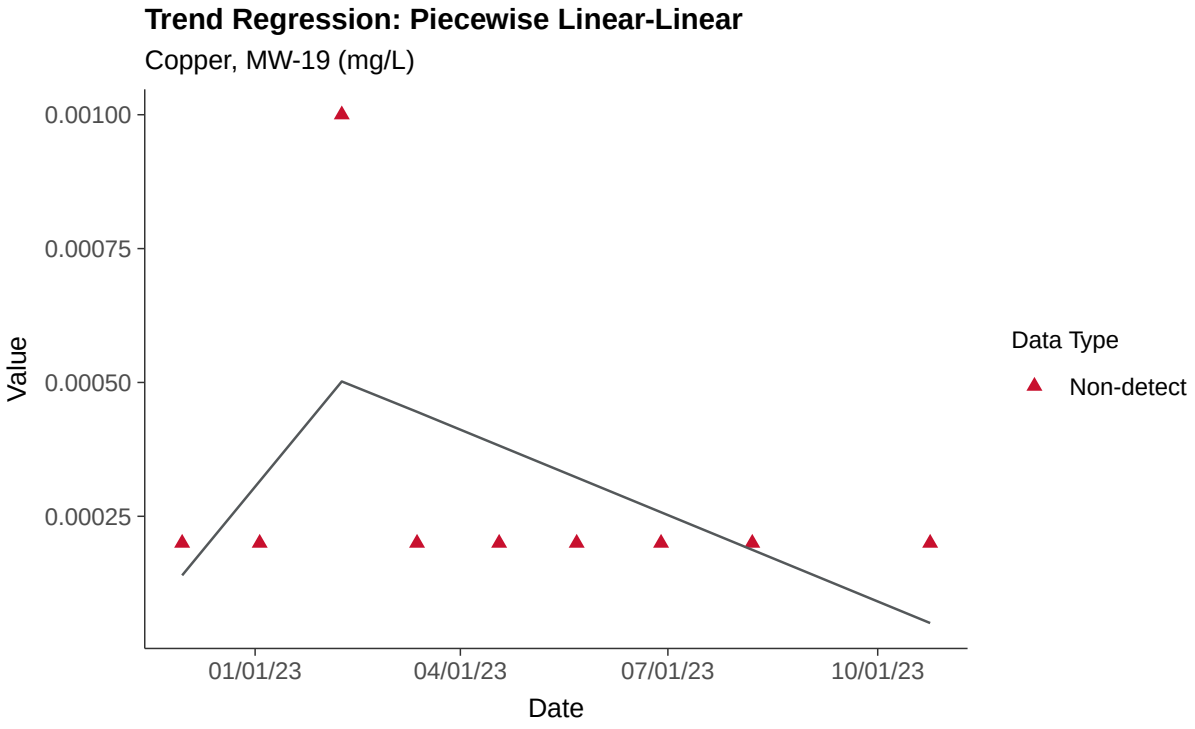
Copper, MW-19 (mg/L)



Boxplot by Season

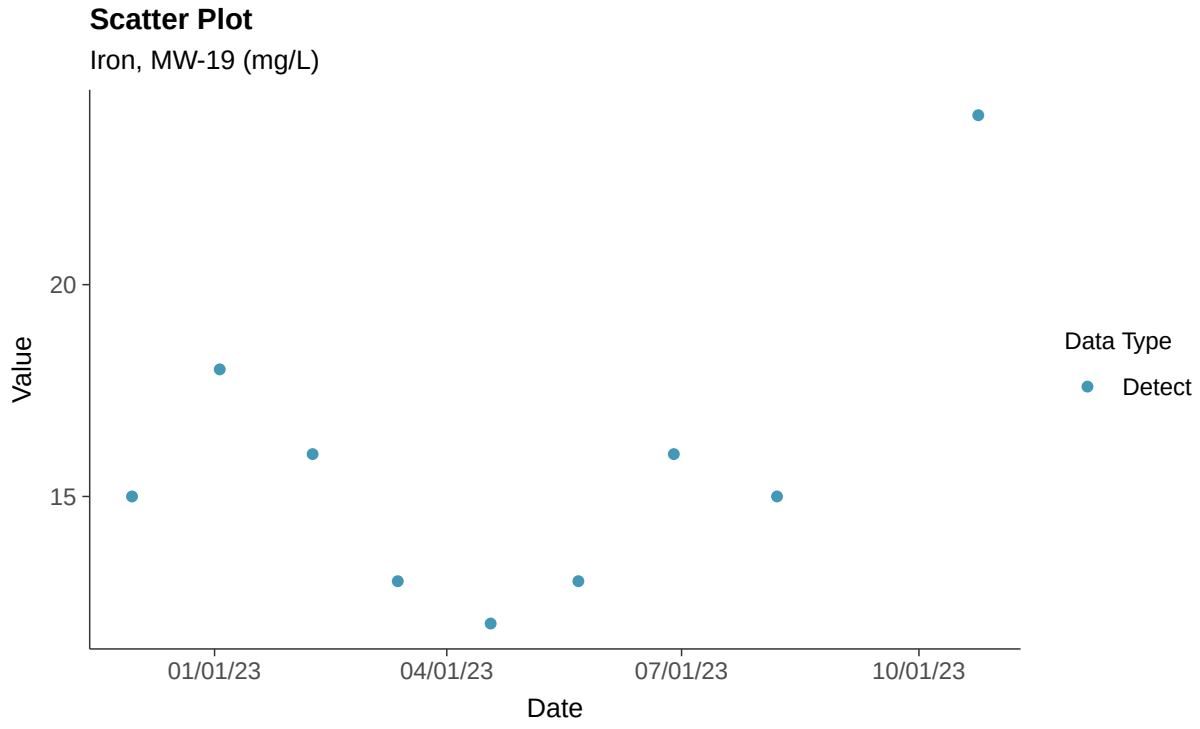
Copper, MW-19 (mg/L)

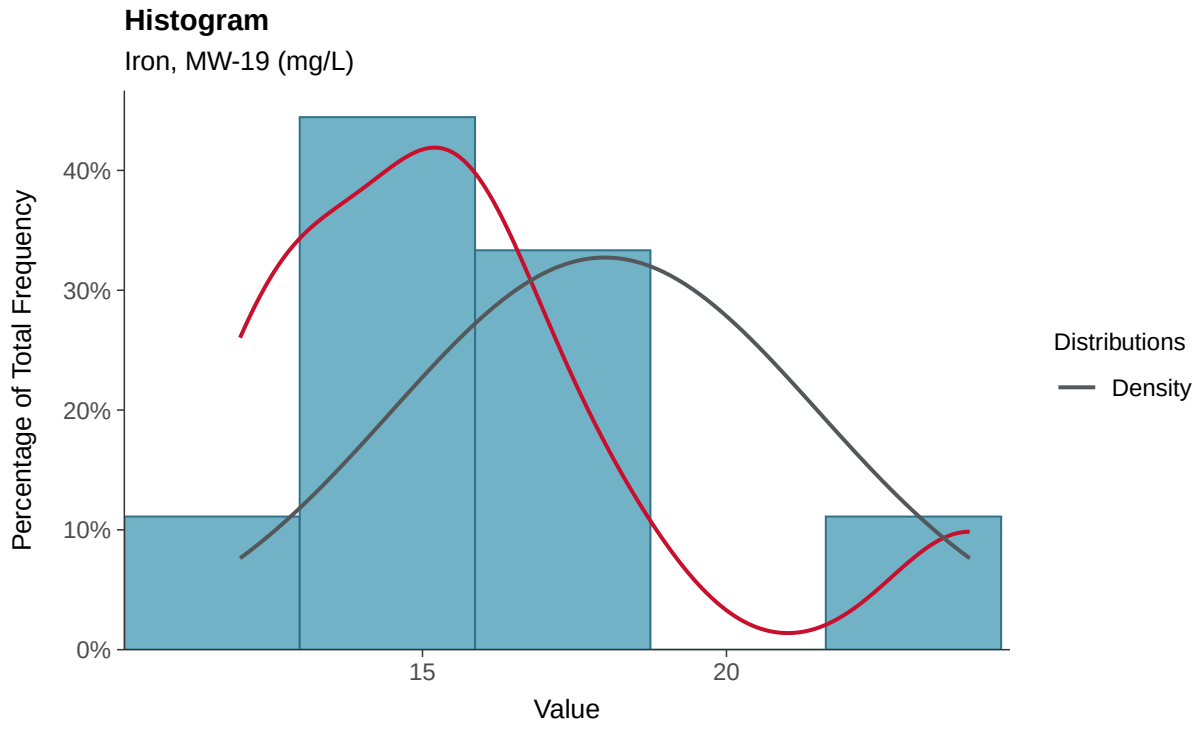



Trend Regression: Piecewise Linear-Linear
Copper, MW-19 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Iron, MW-19

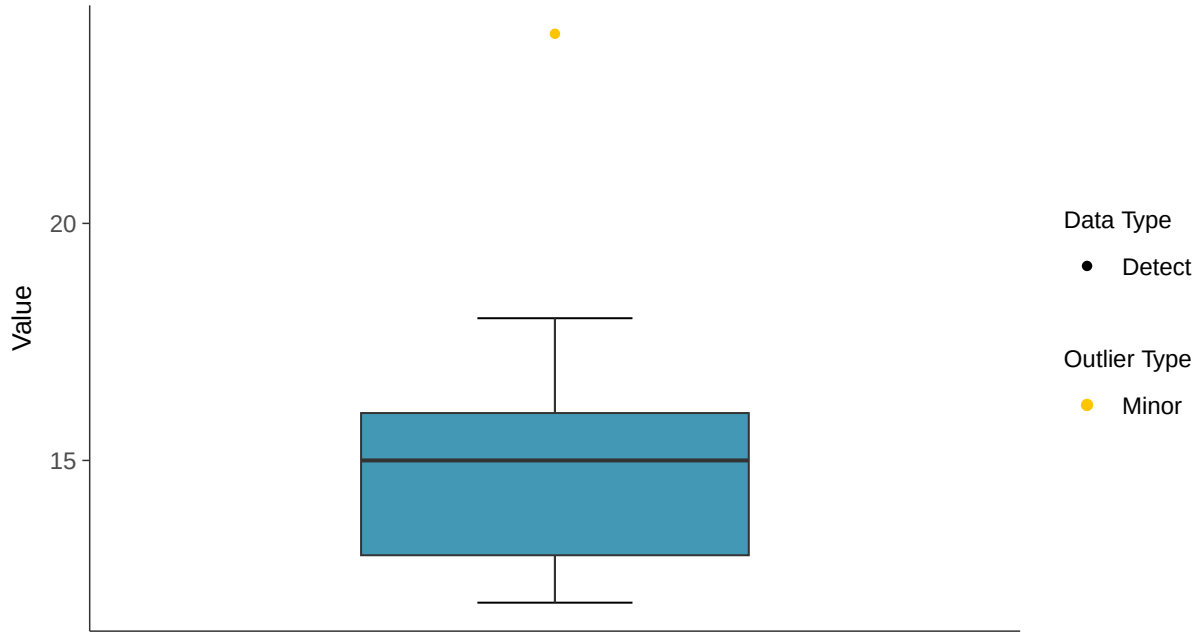
ID: 1_23_6_114





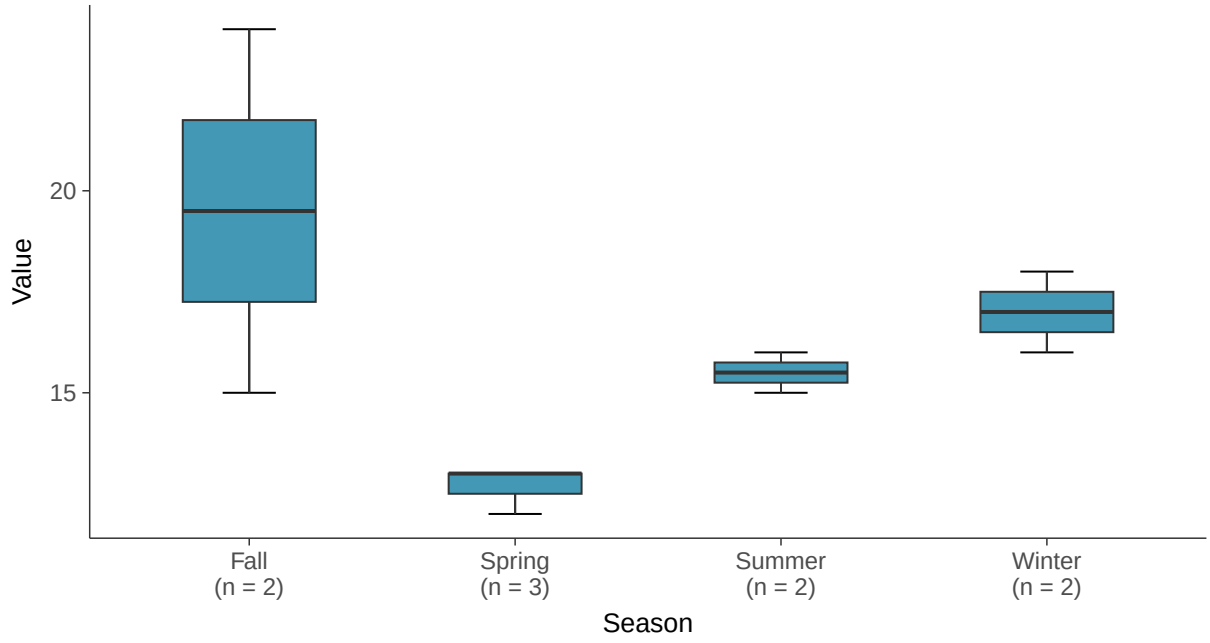
Boxplot

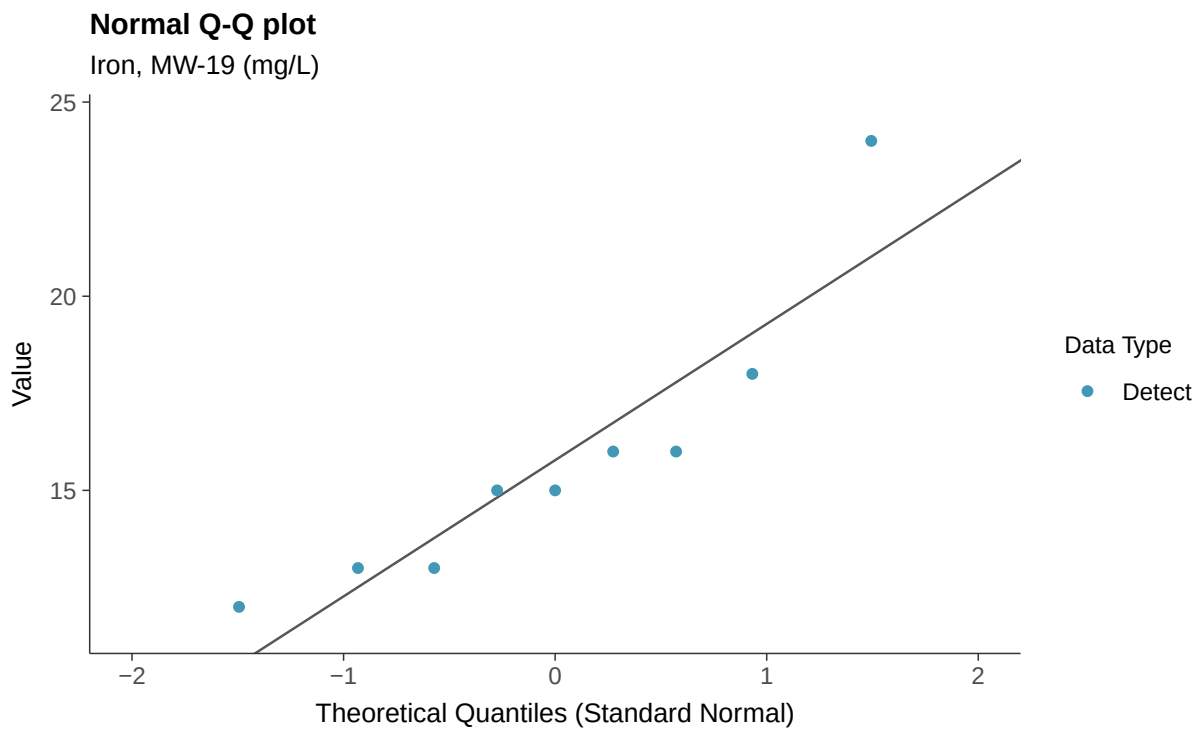
Iron, MW-19 (mg/L)

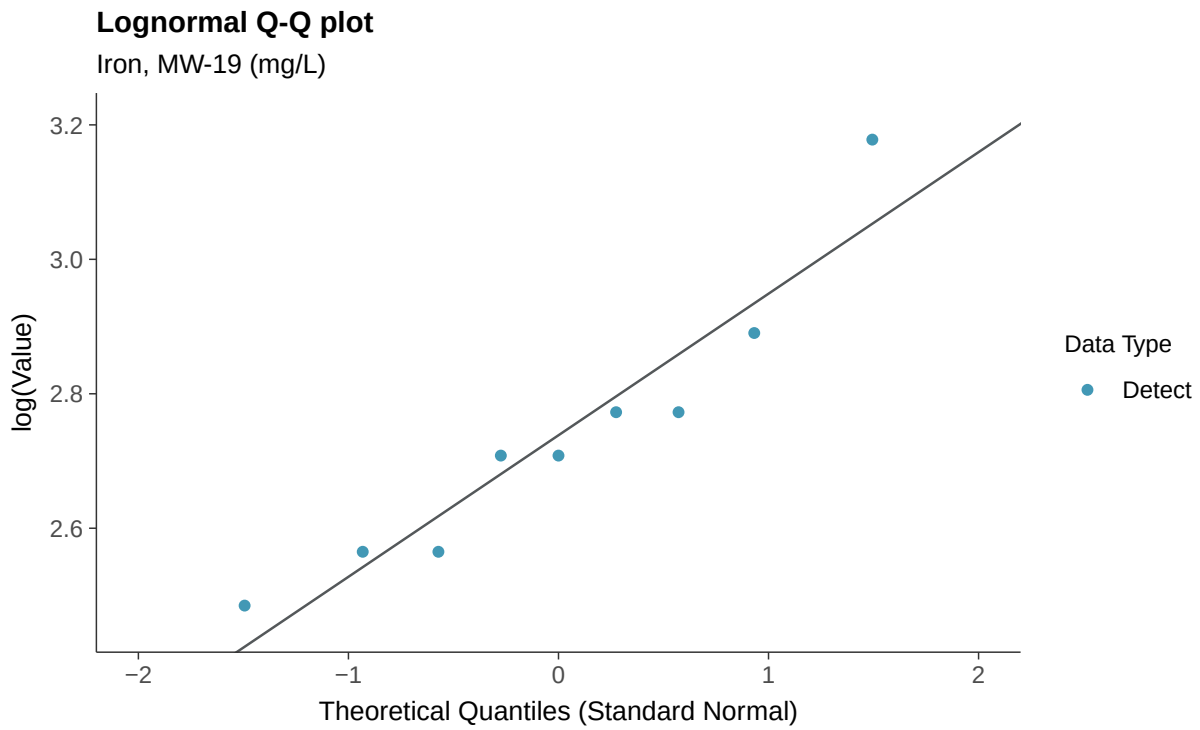


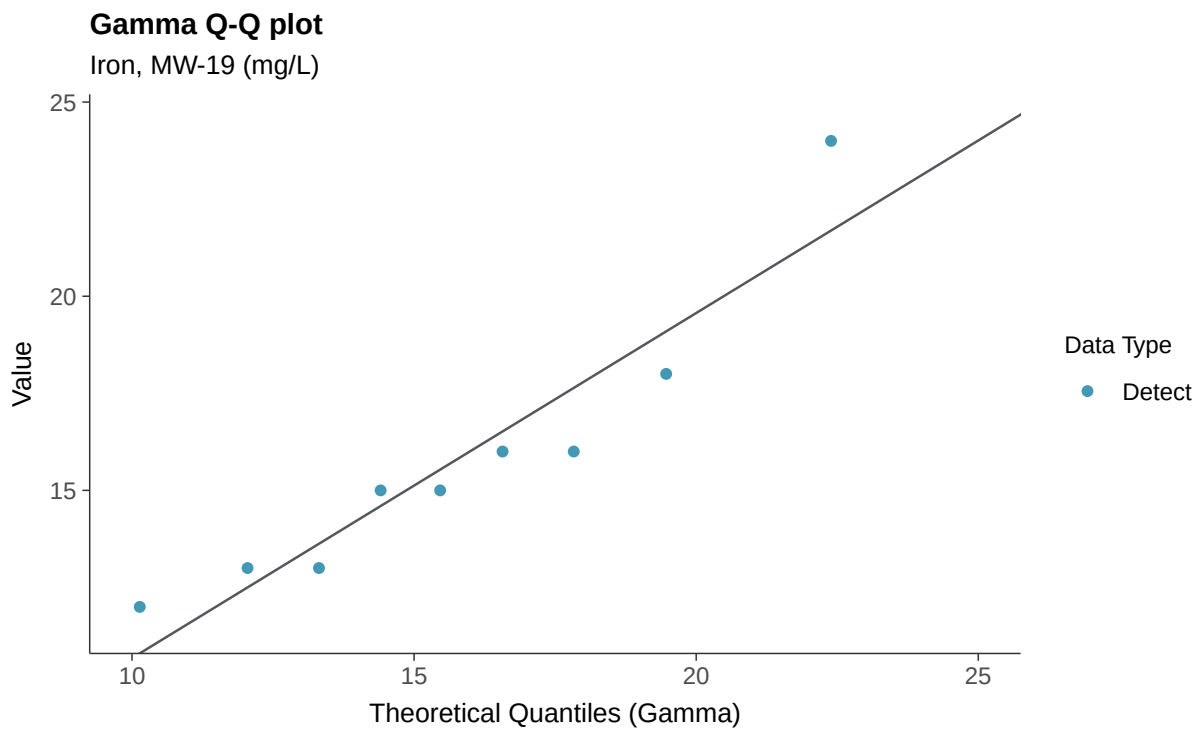
Boxplot by Season

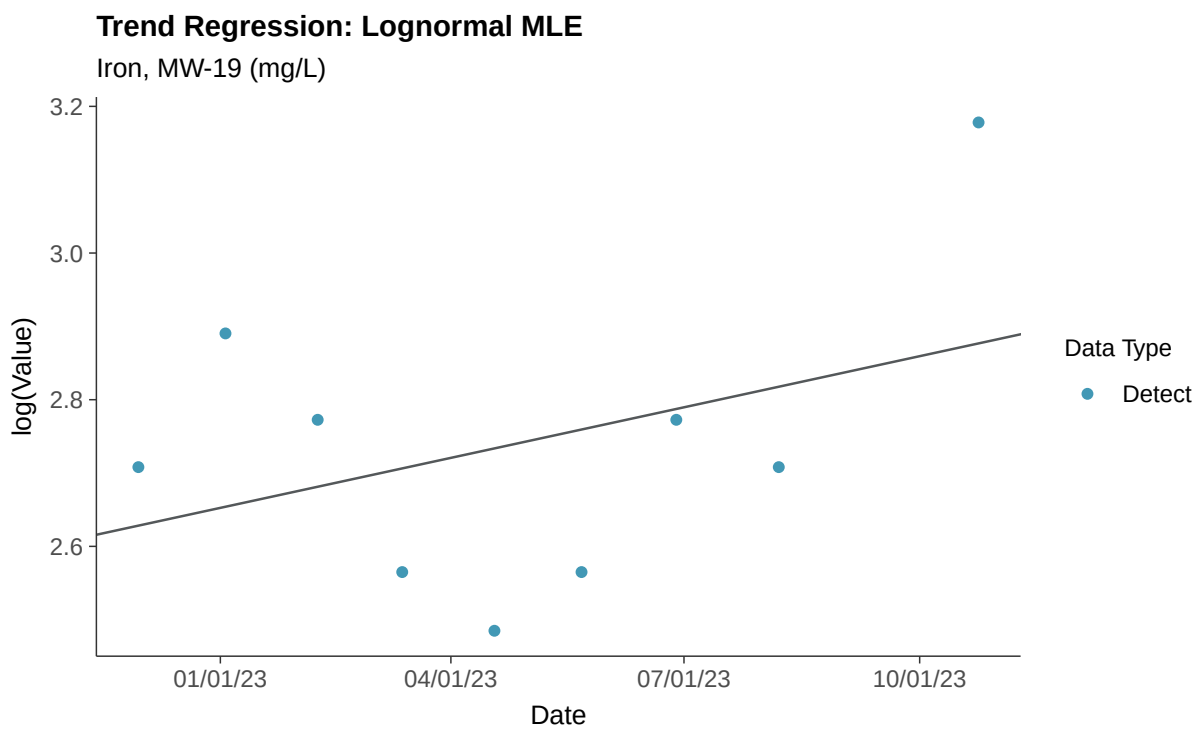
Iron, MW-19 (mg/L)

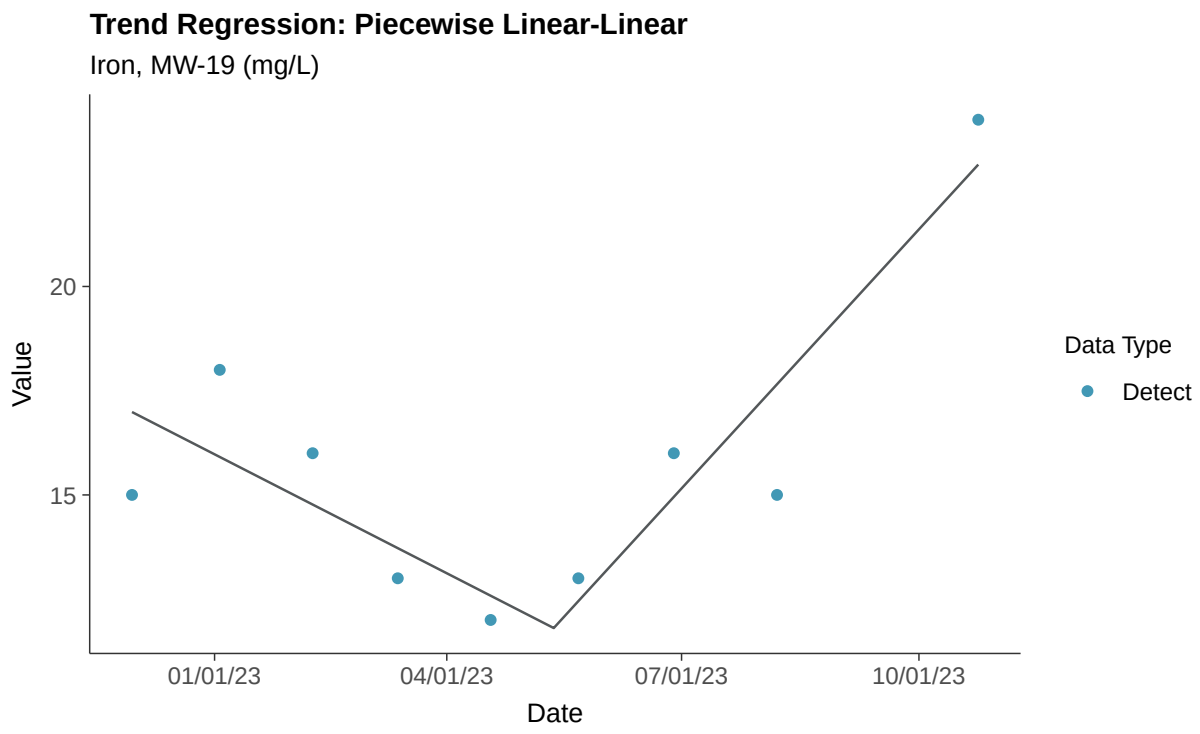



Normal Q-Q plot
Iron, MW-19 (mg/L)
Value
25
20
15
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-19 (mg/L)
log(Value)
3.2
3.0
2.8
2.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

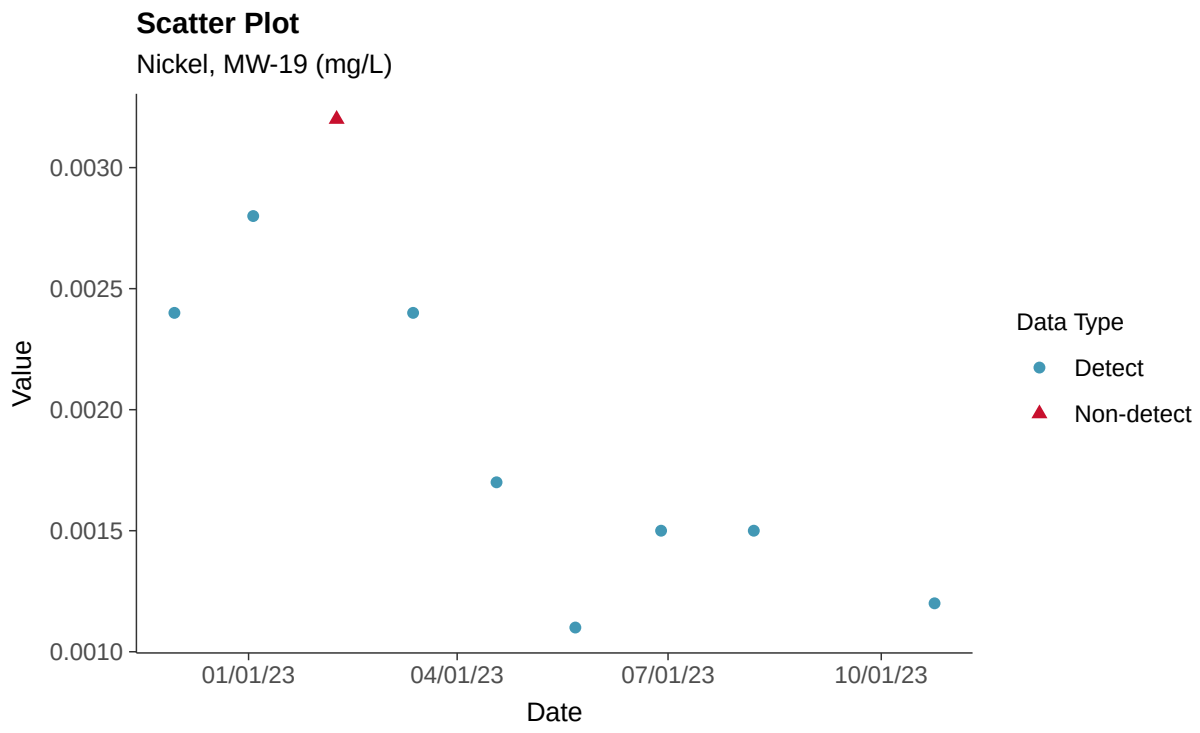

Gamma Q-Q plot
Iron, MW-19 (mg/L)
Value
25
20
15
10
15
20
25
Theoretical Quantiles (Gamma)
Data Type
Detect

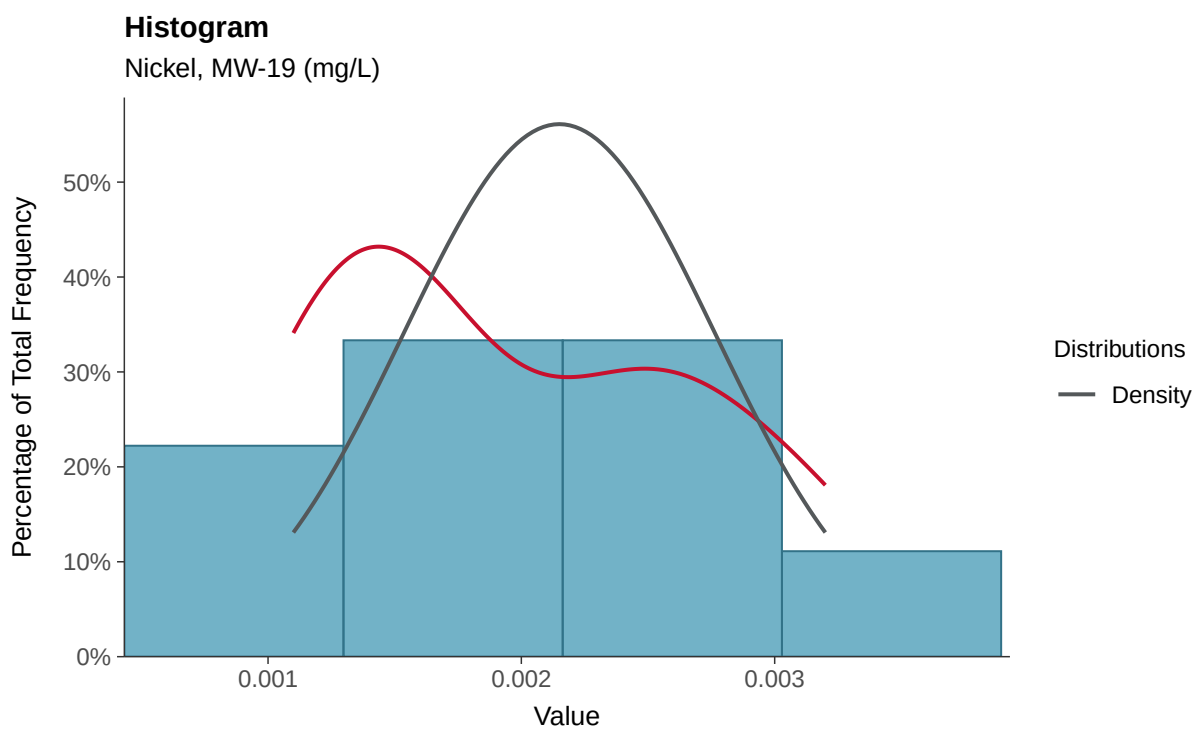

Trend Regression: Lognormal MLE
Iron, MW-19 (mg/L)
log(Value)
3.2
3.0
2.8
2.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-19 (mg/L)
Value
20
15
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-19

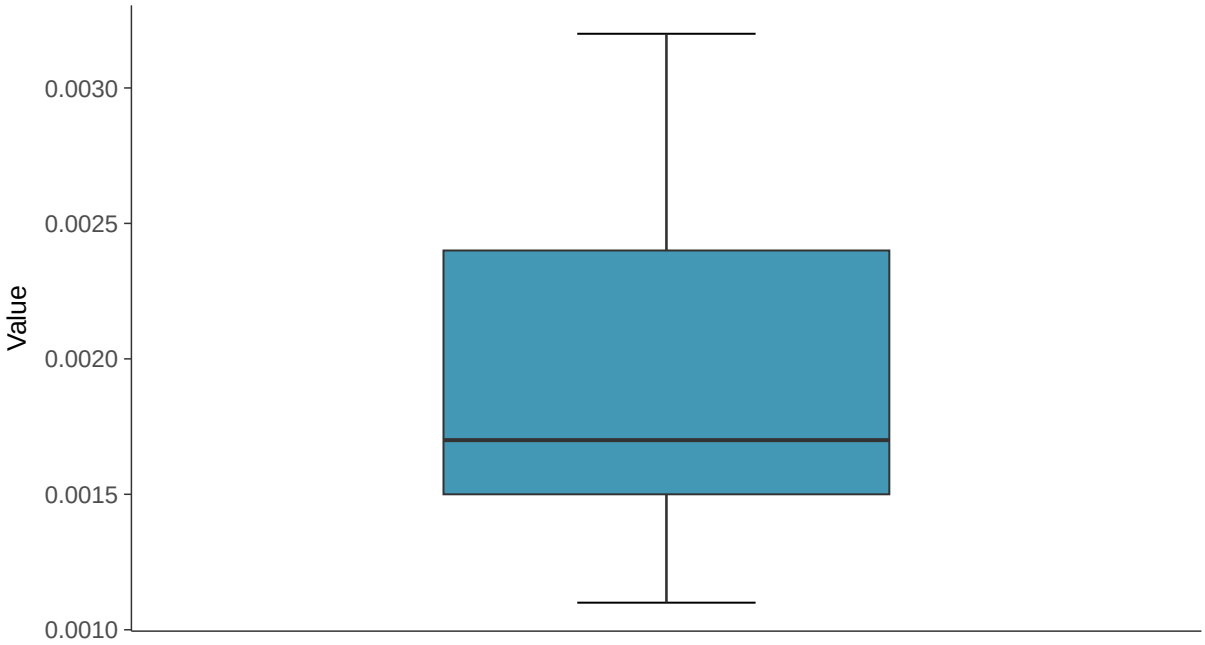
ID: 1_23_6_119





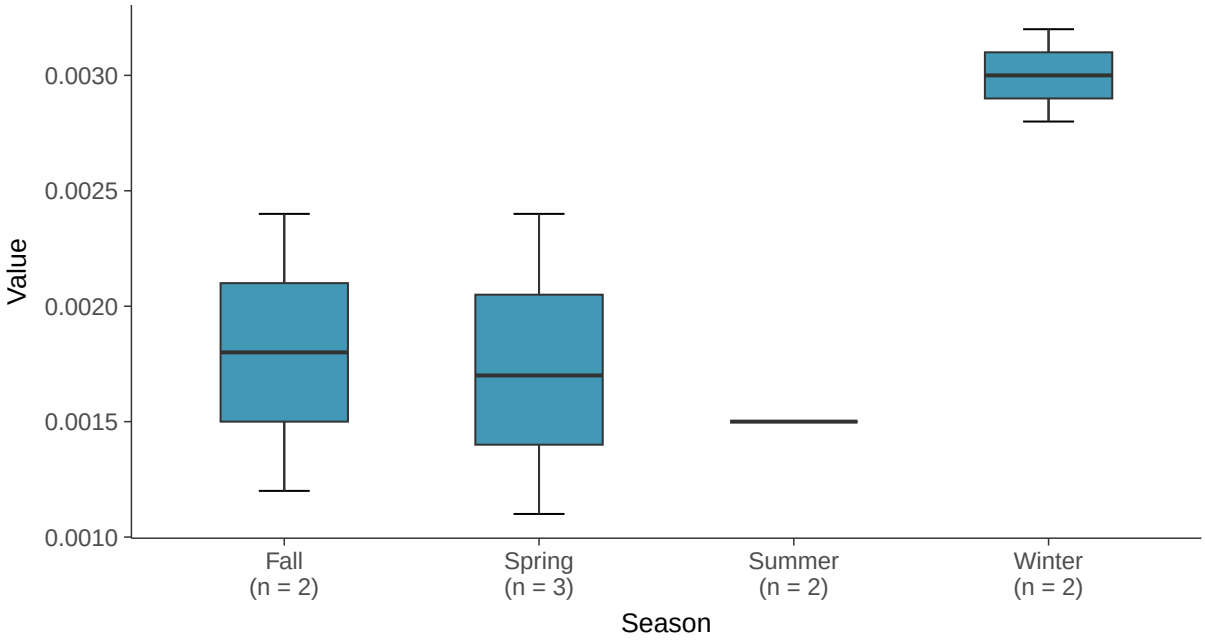
Boxplot

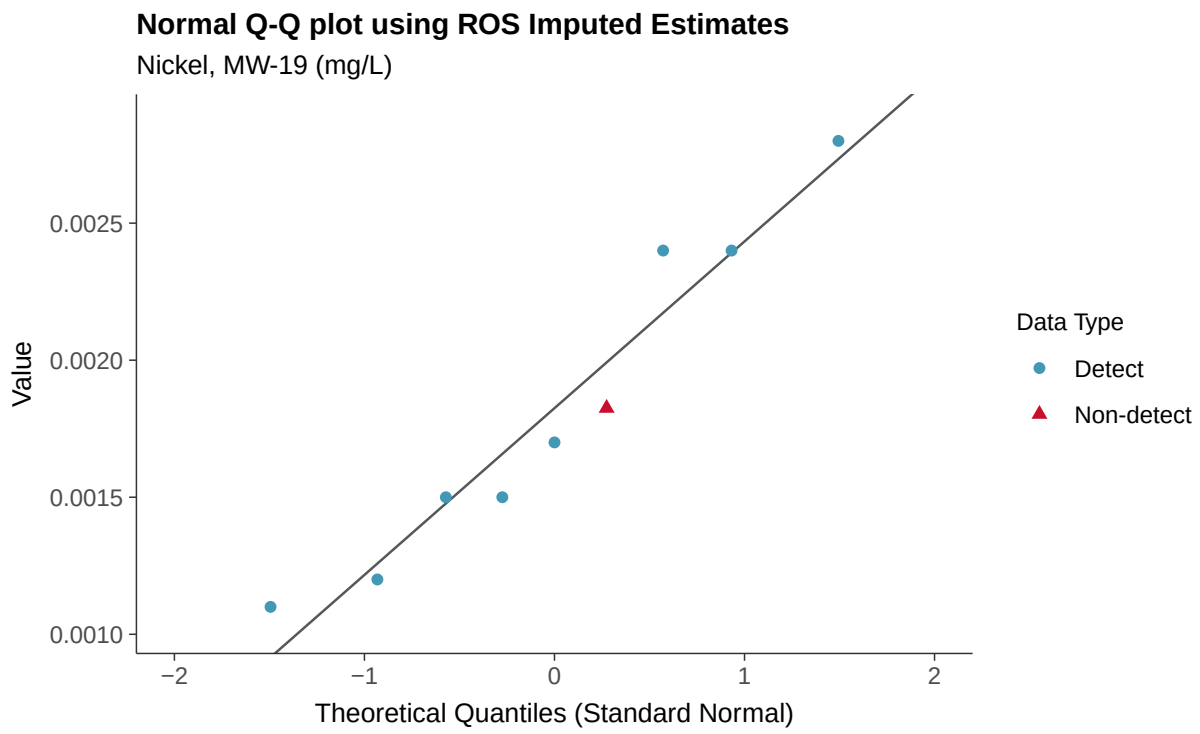
Nickel, MW-19 (mg/L)

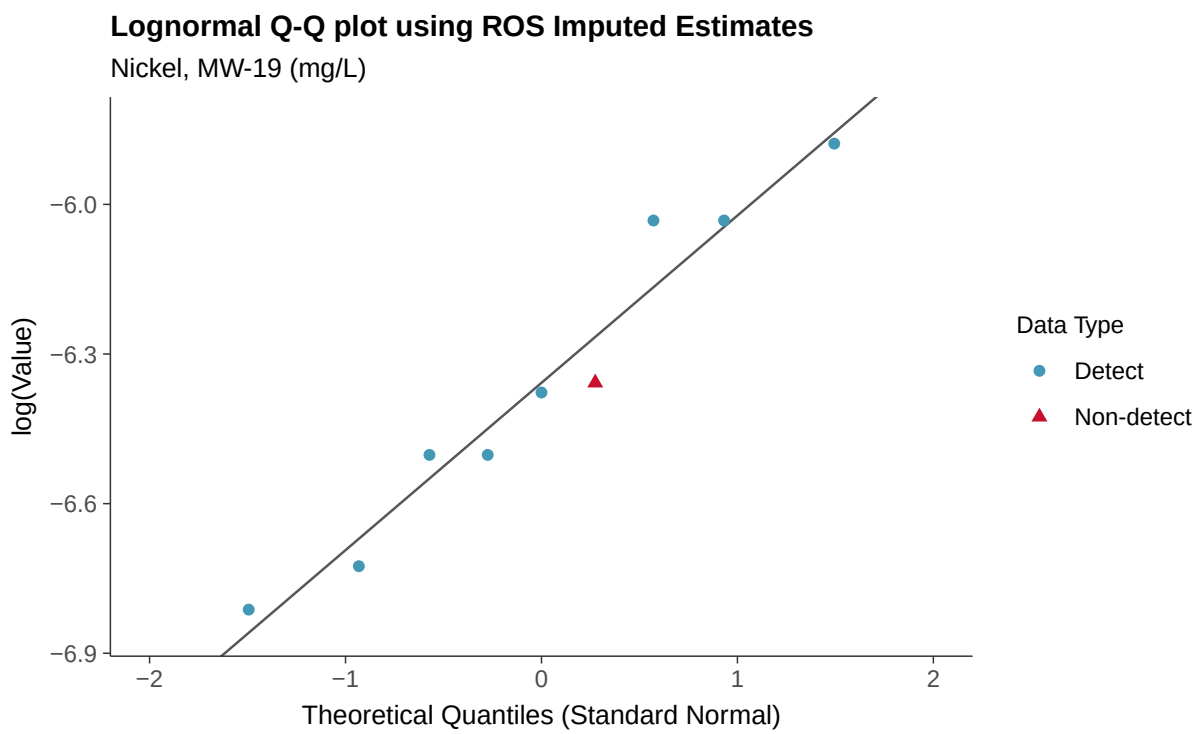


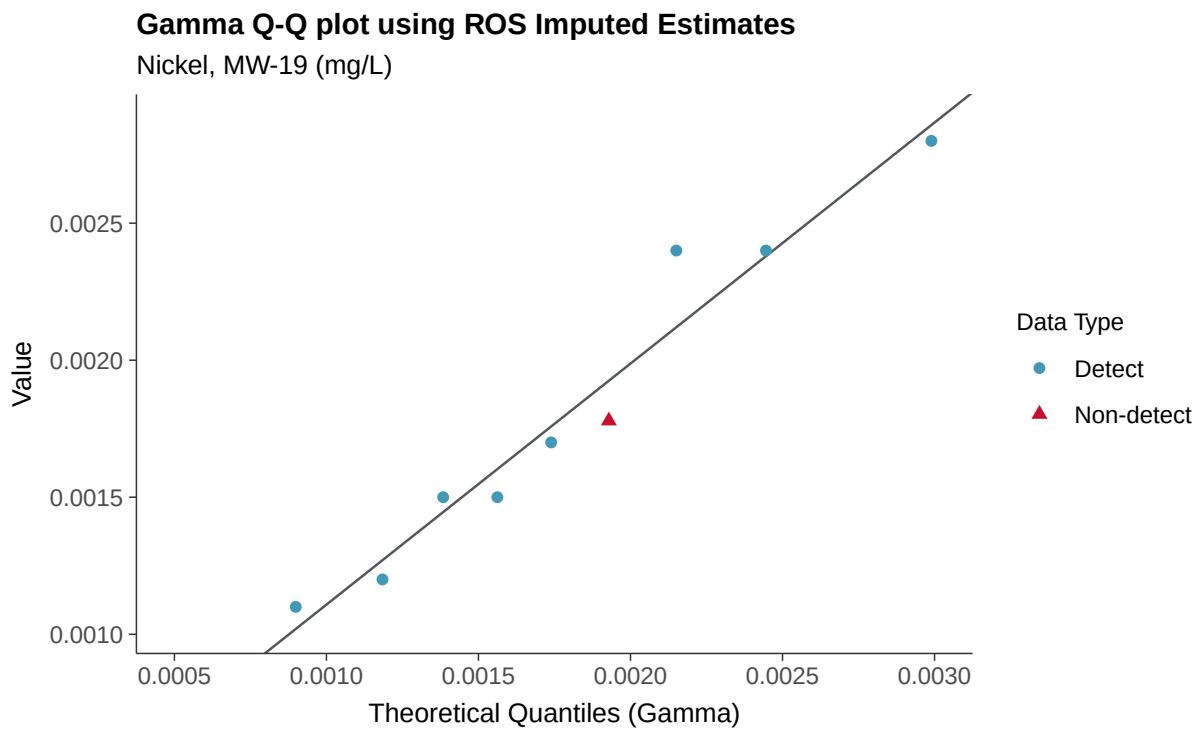
Boxplot by Season

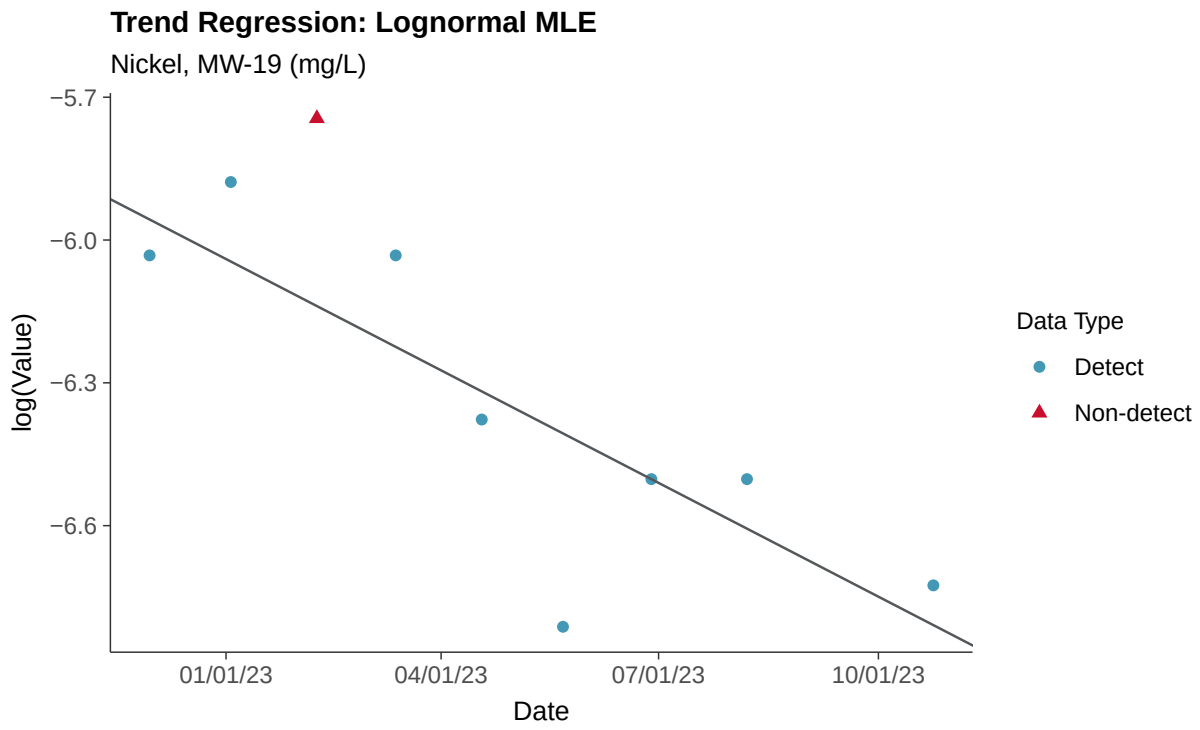
Nickel, MW-19 (mg/L)

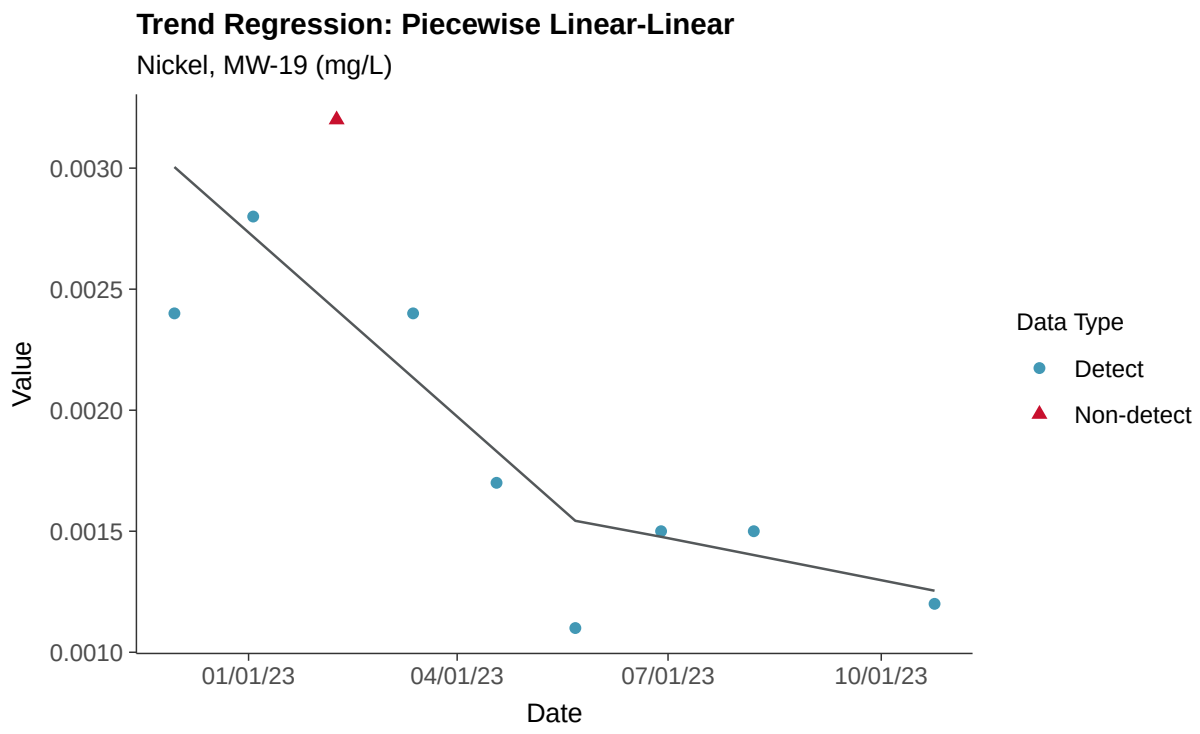


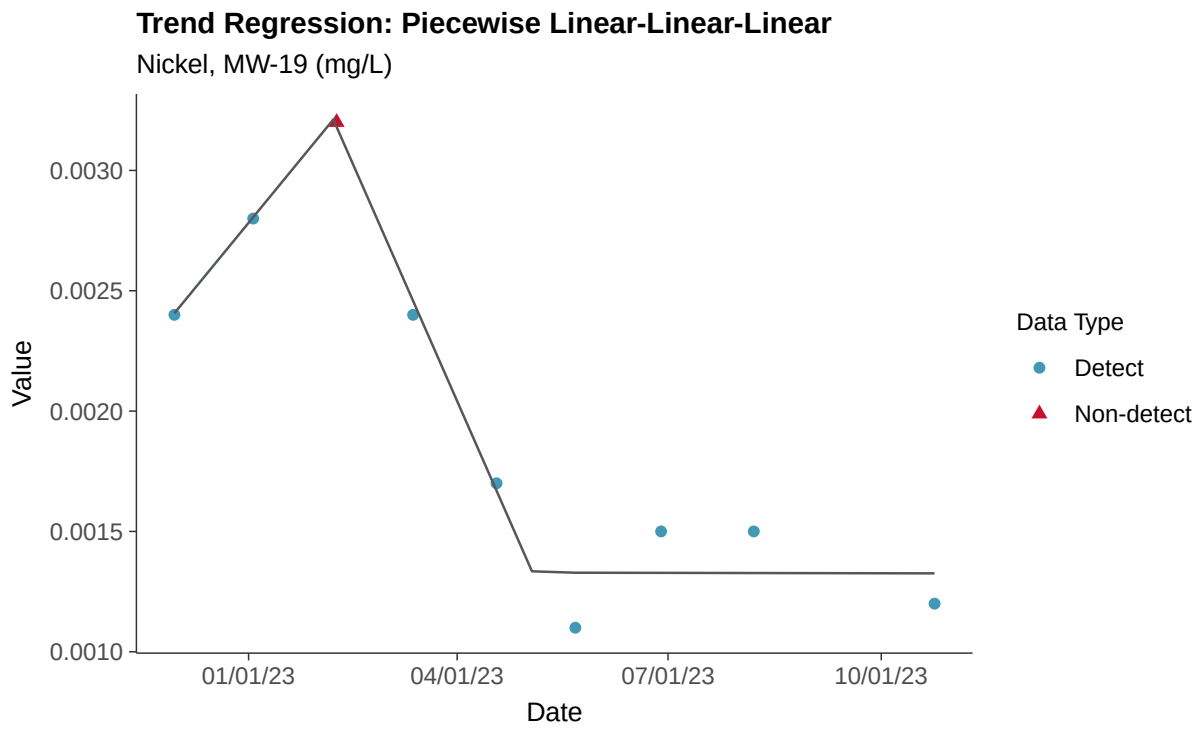

Normal Q-Q plot using ROS Imputed Estimates
Nickel, MW-19 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Nickel, MW-19 (mg/L)
log(Value)
−6.0
−6.3
−6.6
−6.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Nickel, MW-19 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

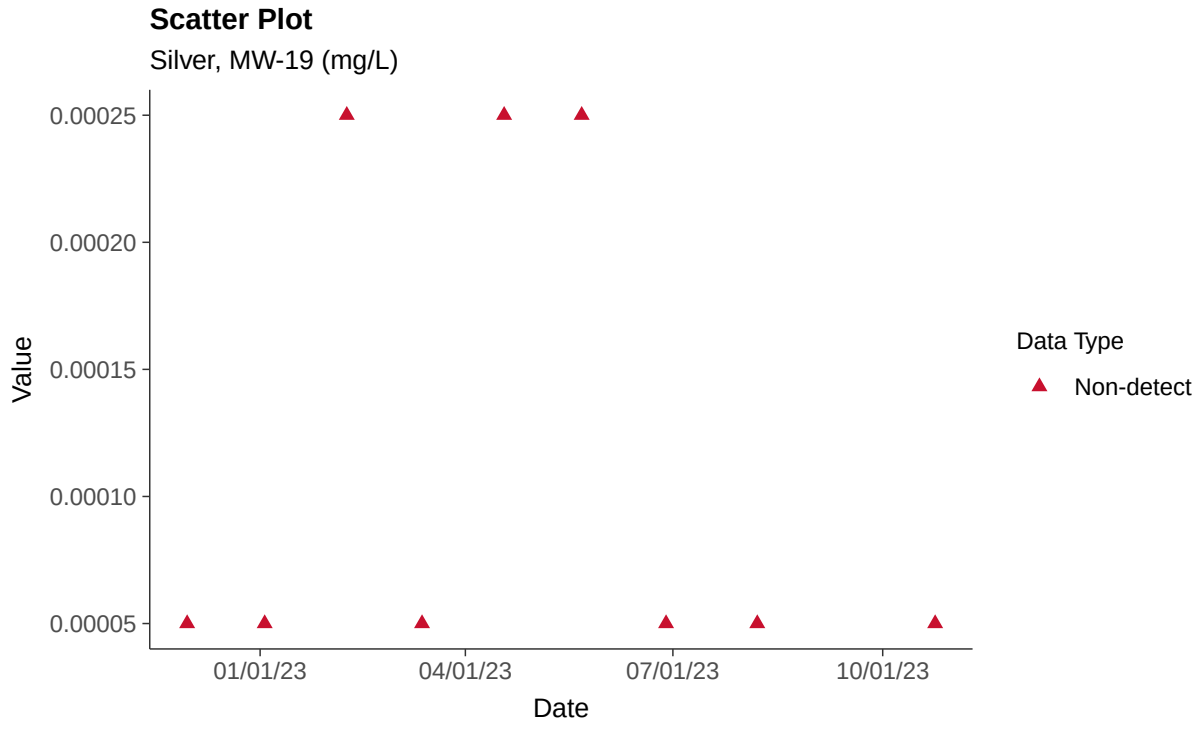

Trend Regression: Lognormal MLE
Nickel, MW-19 (mg/L)
log(Value)
−5.7
−6.0
−6.3
−6.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

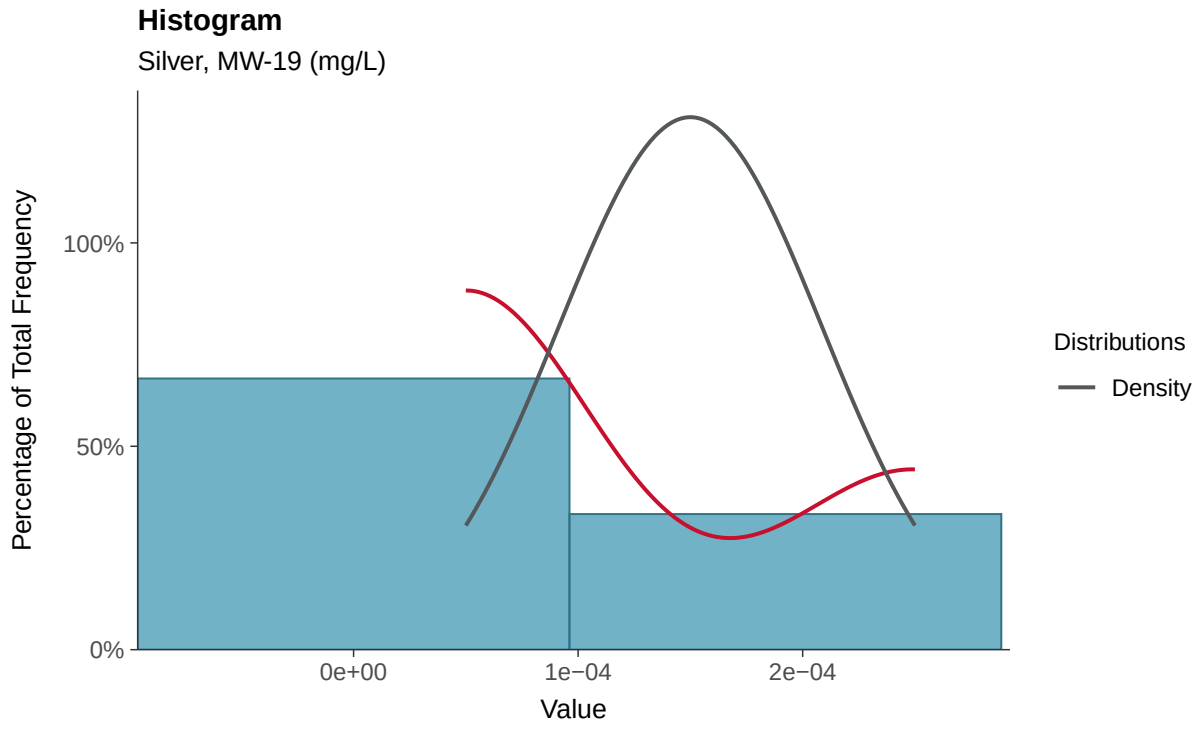

Trend Regression: Piecewise Linear-Linear
Nickel, MW-19 (mg/L)
Value
0.0030
0.0025
0.0020
0.0015
0.0010
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-19 (mg/L)
Value
0.0030
0.0025
0.0020
0.0015
0.0010
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Silver, MW-19

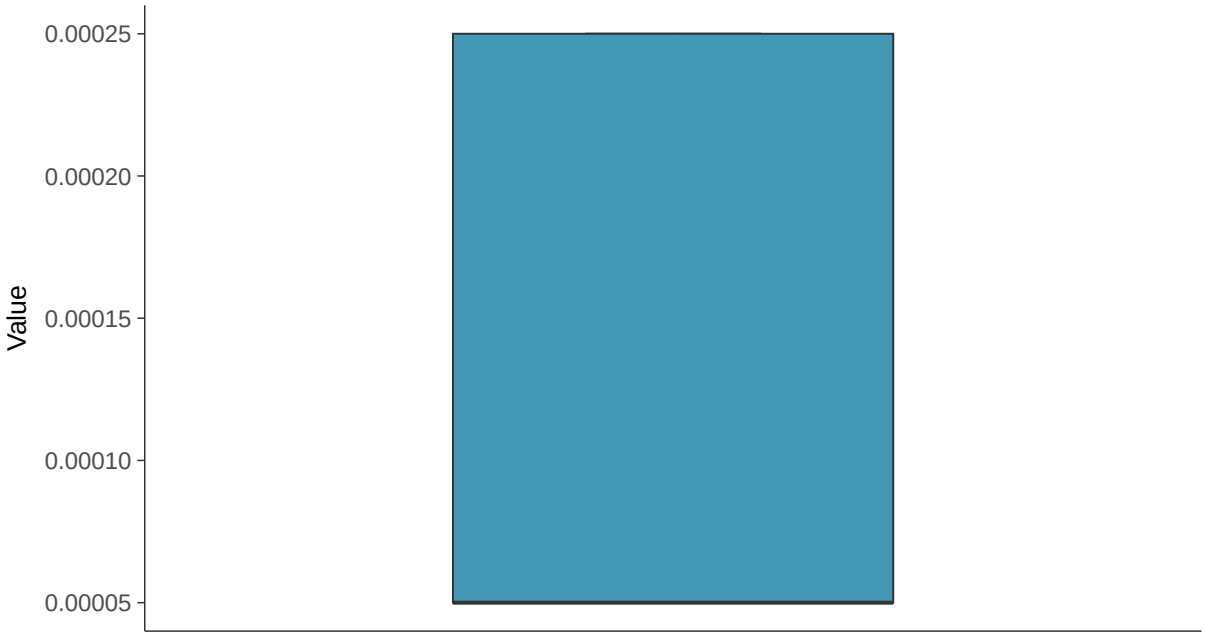
ID: 1_23_6_123





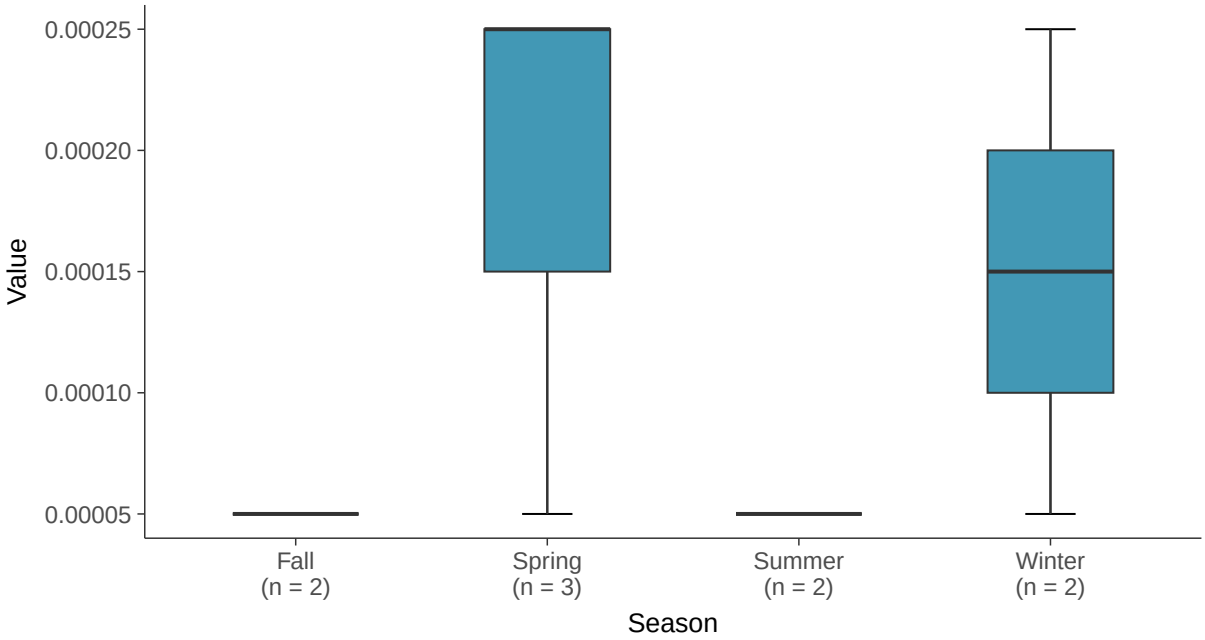
Boxplot

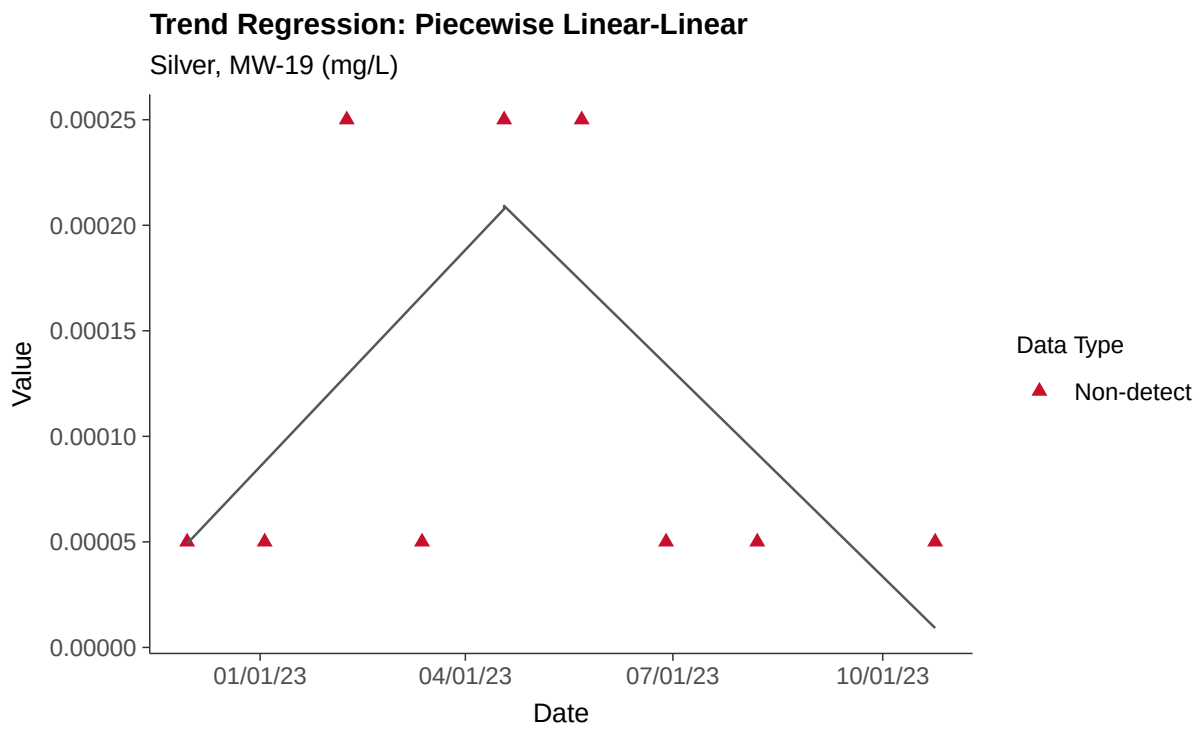
Silver, MW-19 (mg/L)

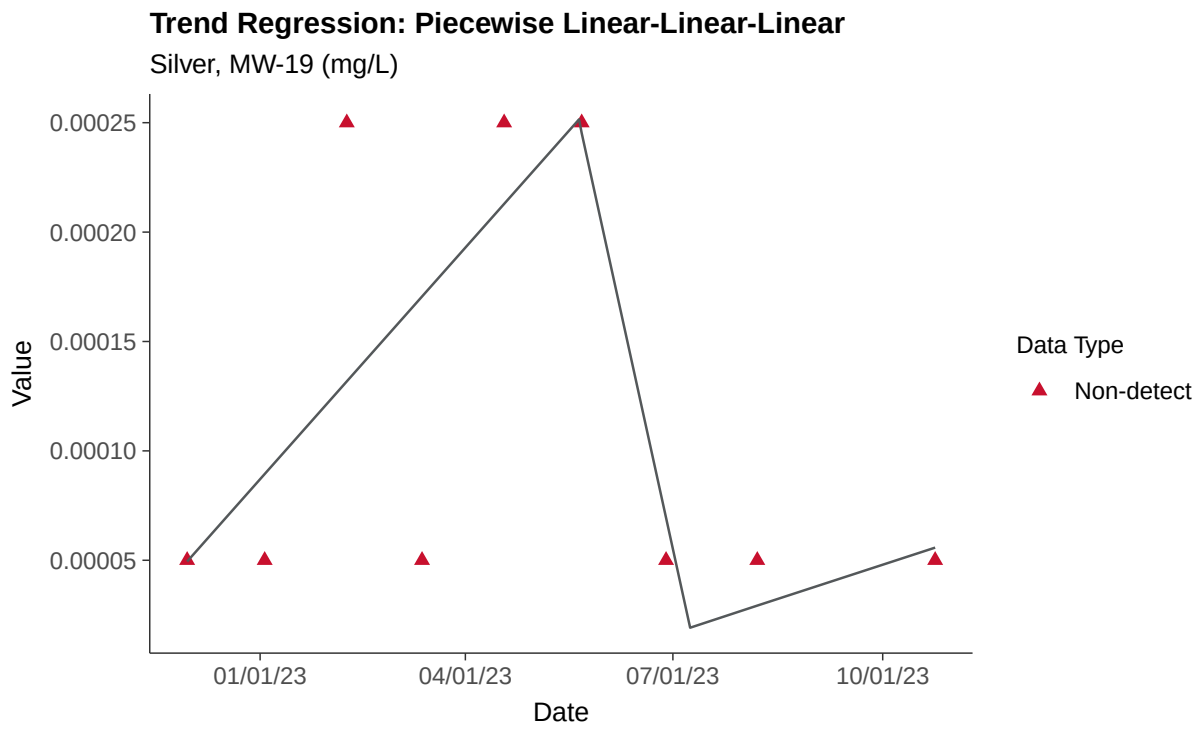


Boxplot by Season

Silver, MW-19 (mg/L)

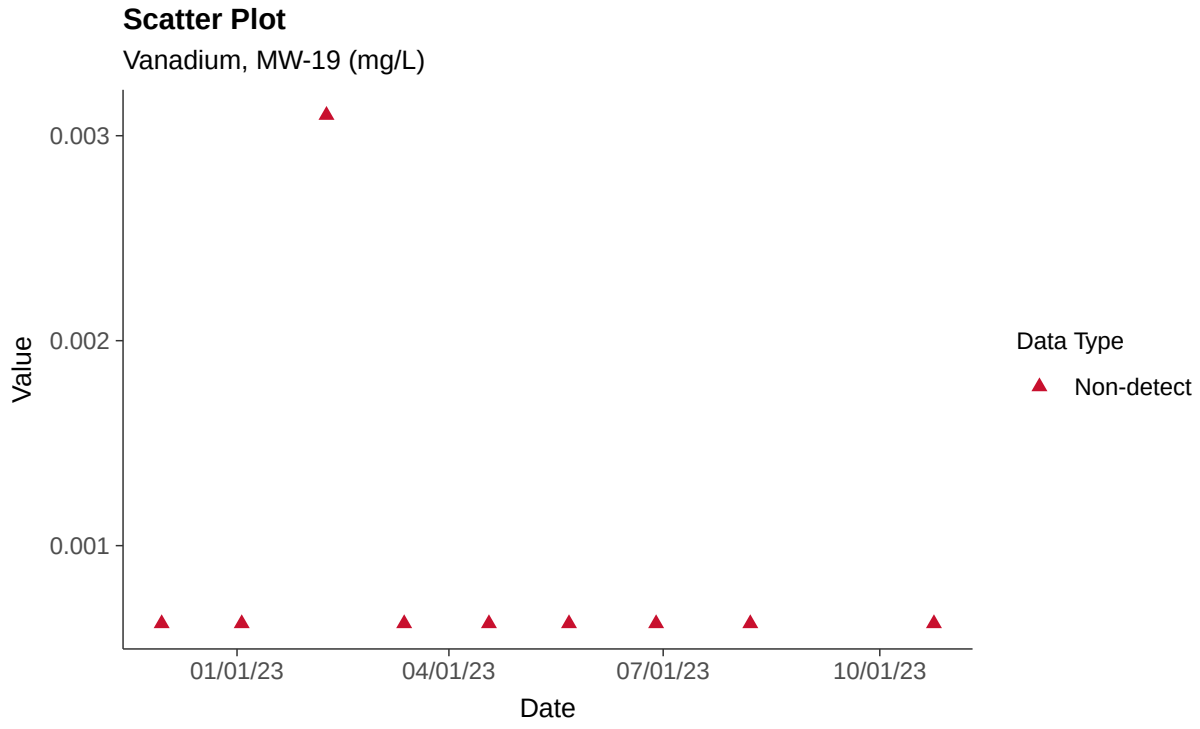


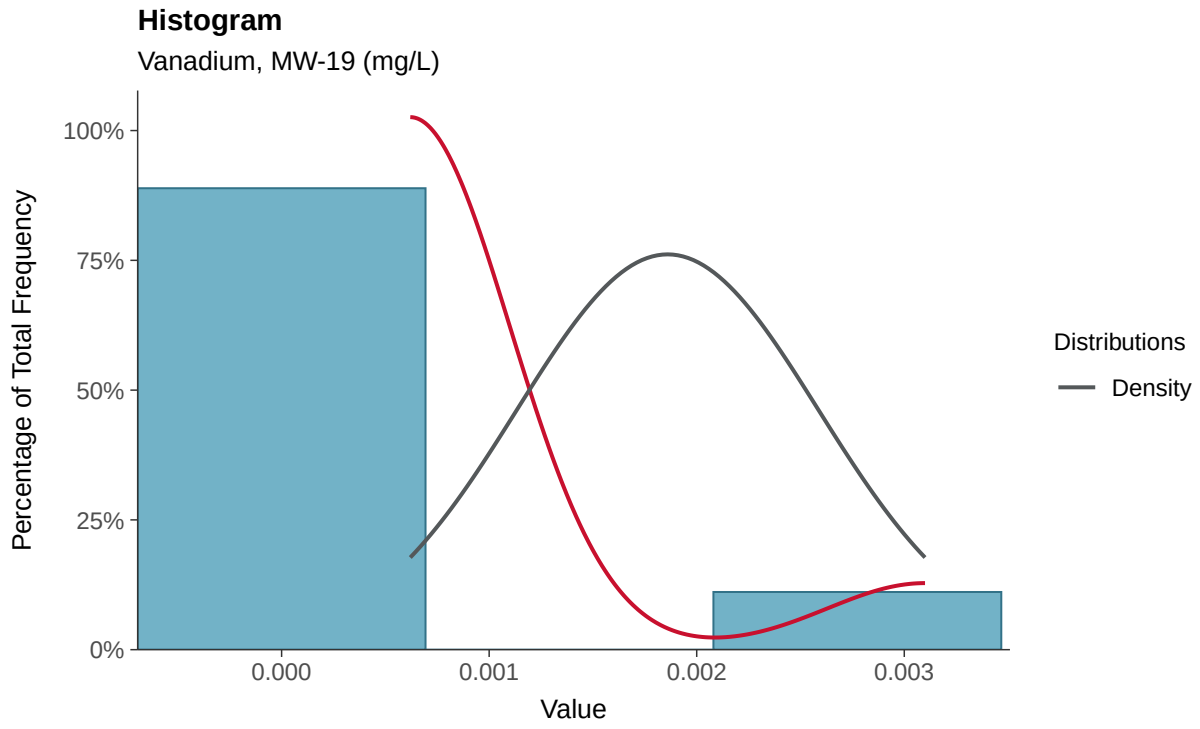

Trend Regression: Piecewise Linear-Linear
Silver, MW-19 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-19 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-19

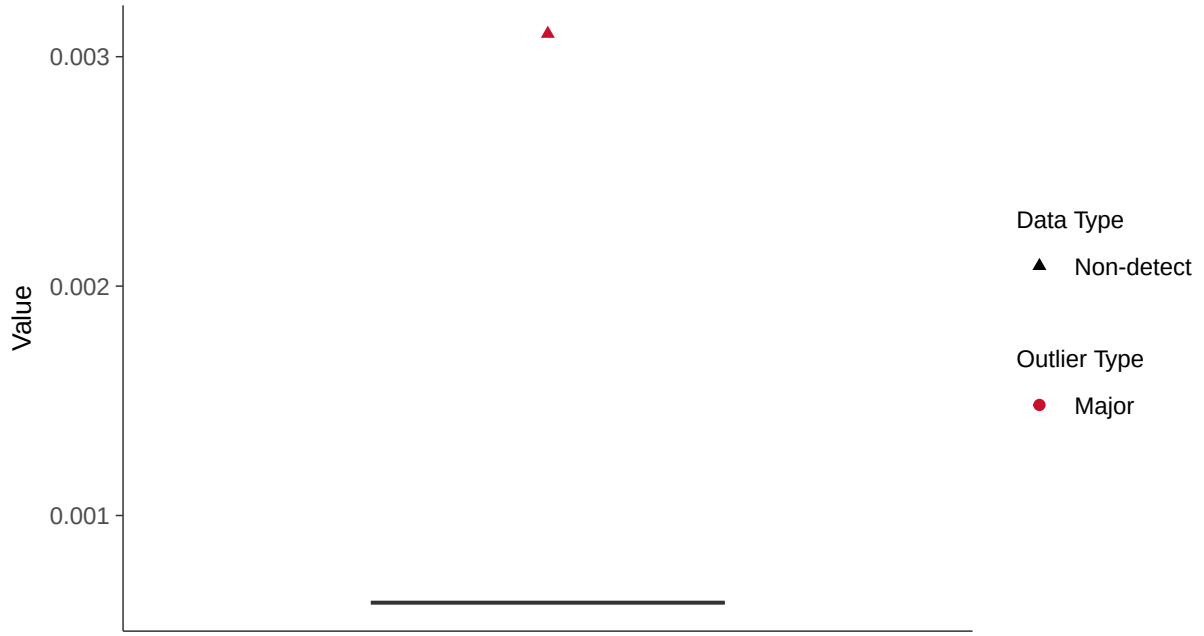
ID: 1_23_6_129





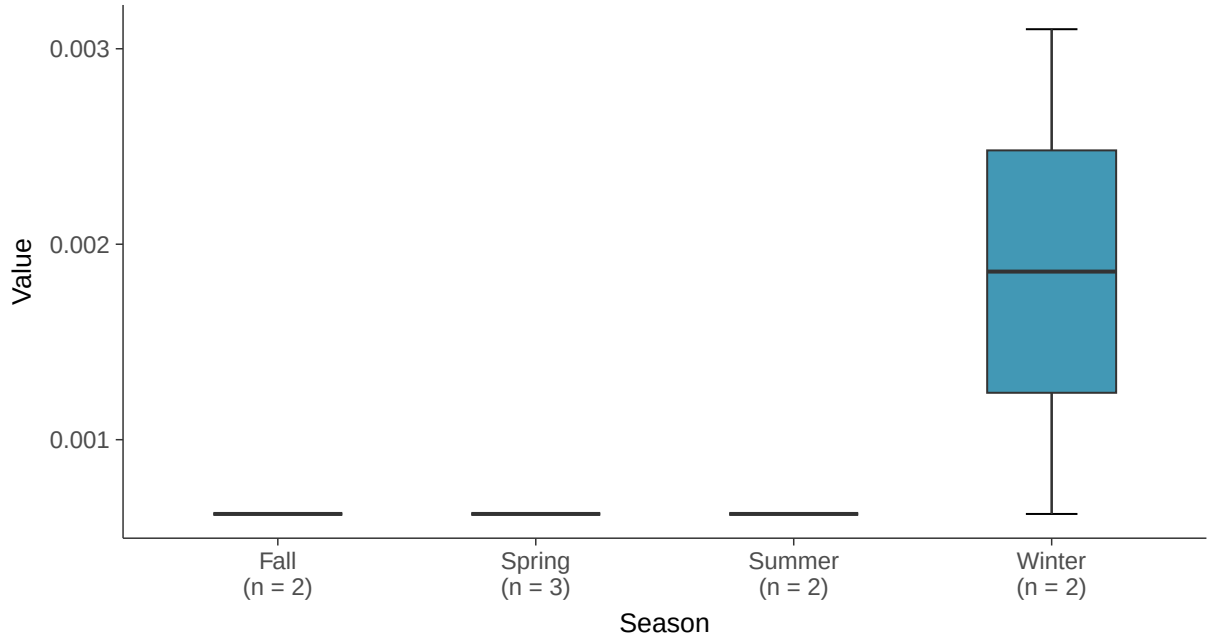
Boxplot

Vanadium, MW-19 (mg/L)



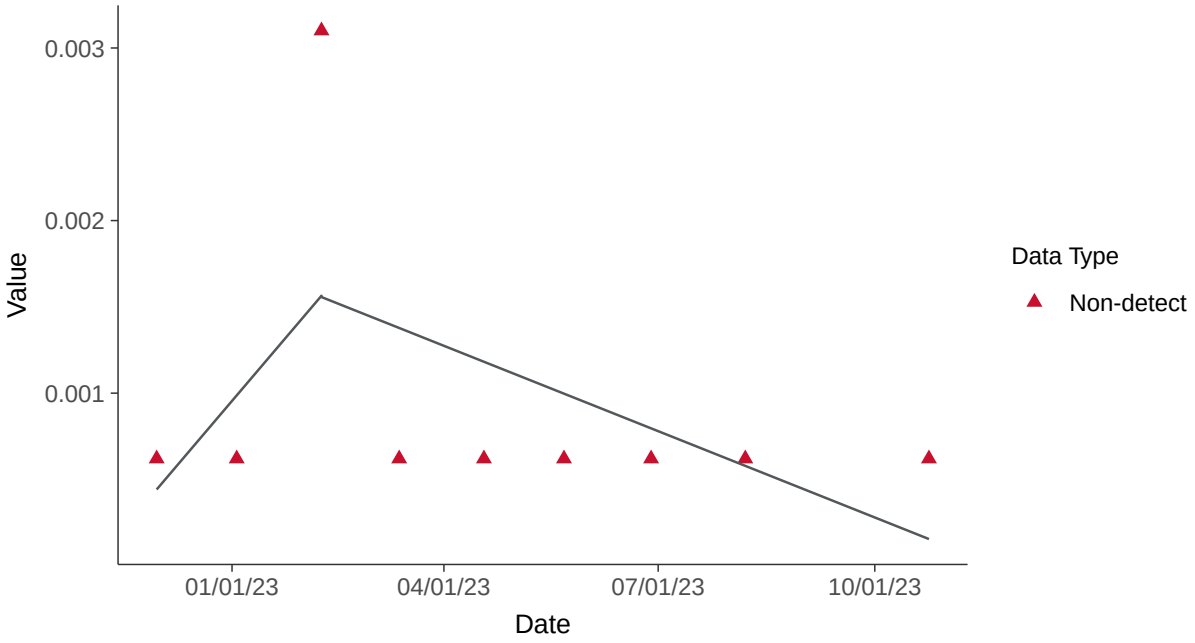
Boxplot by Season

Vanadium, MW-19 (mg/L)



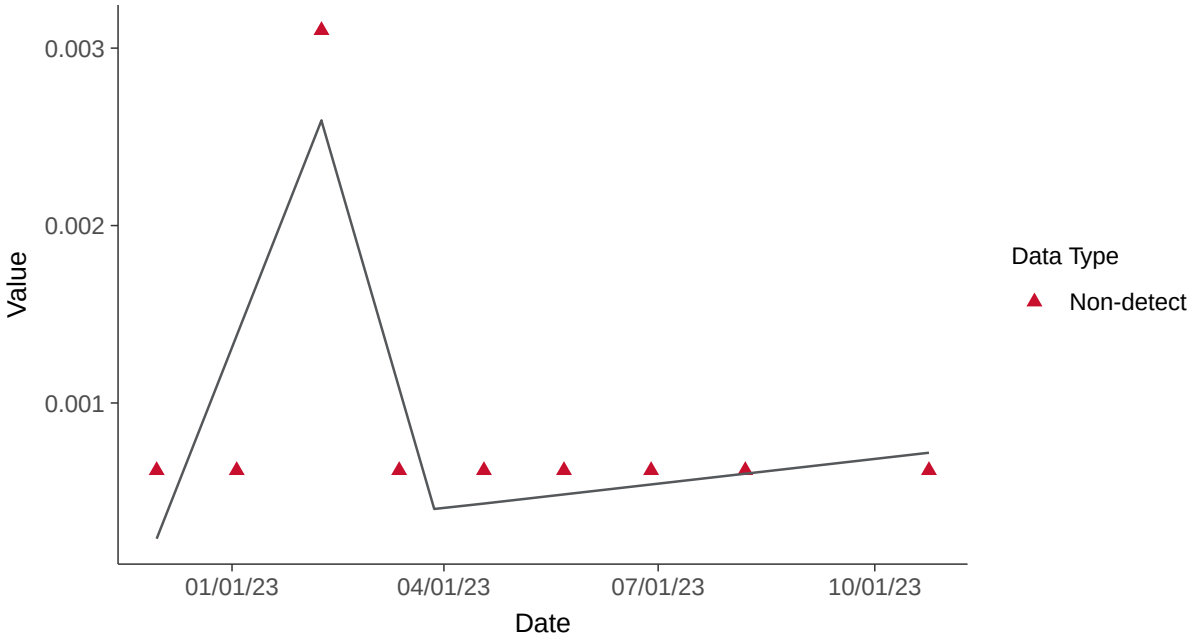
Trend Regression: Piecewise Linear-Linear

Vanadium, MW-19 (mg/L)



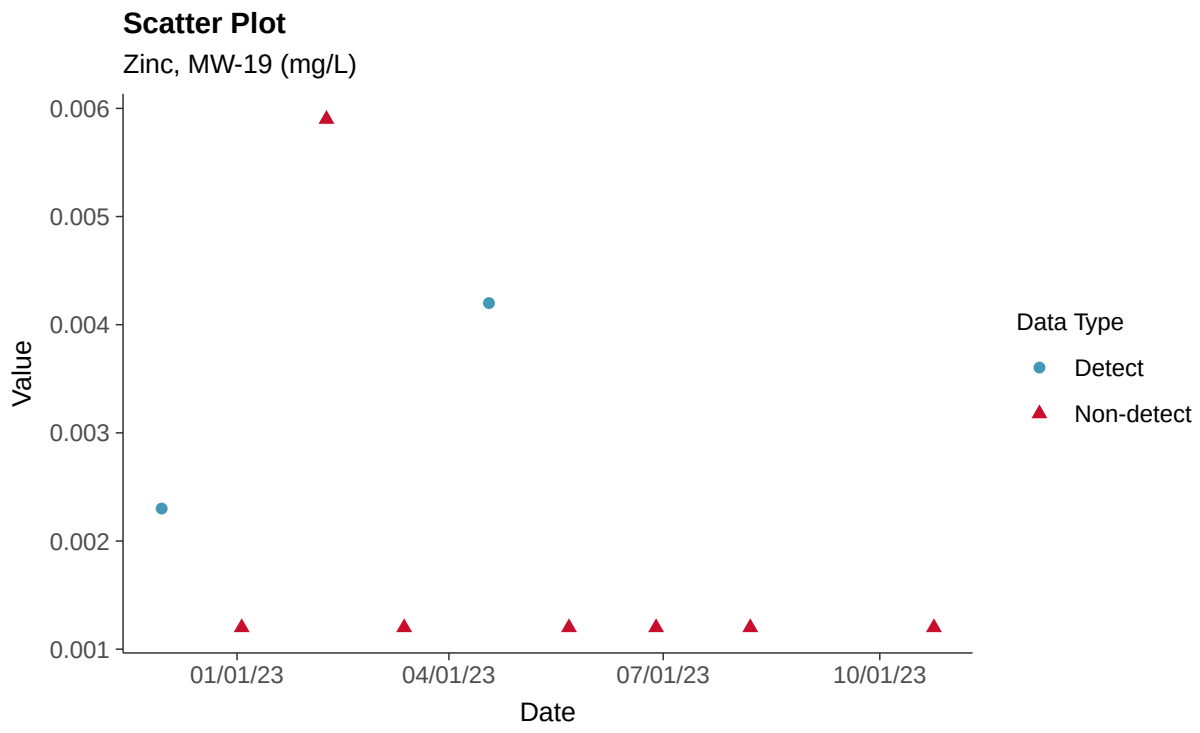
Trend Regression: Piecewise Linear-Linear-Linear

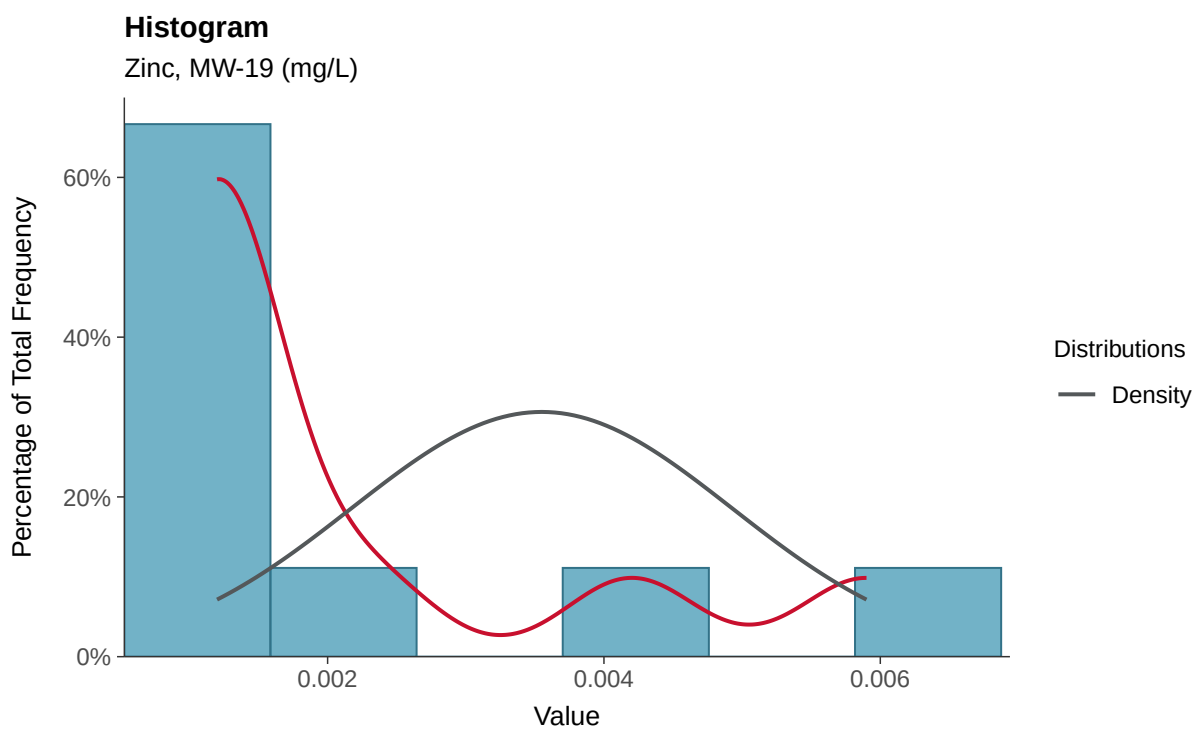
Vanadium, MW-19 (mg/L)

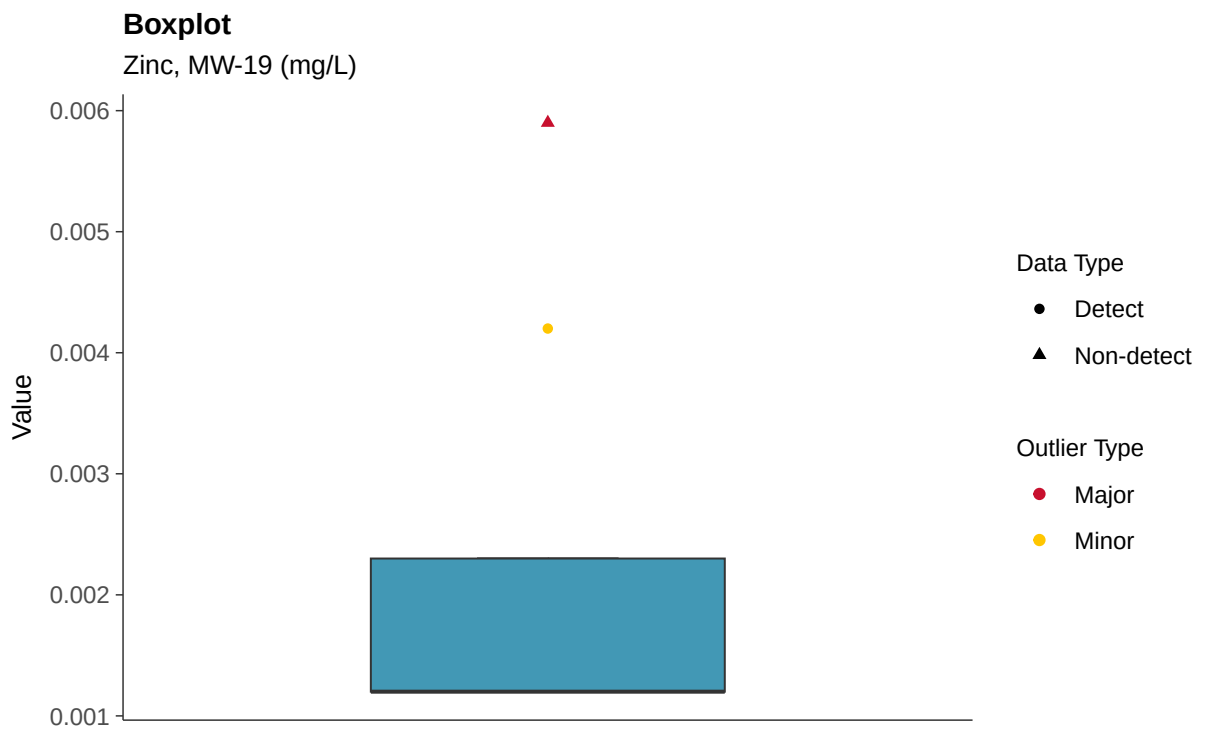


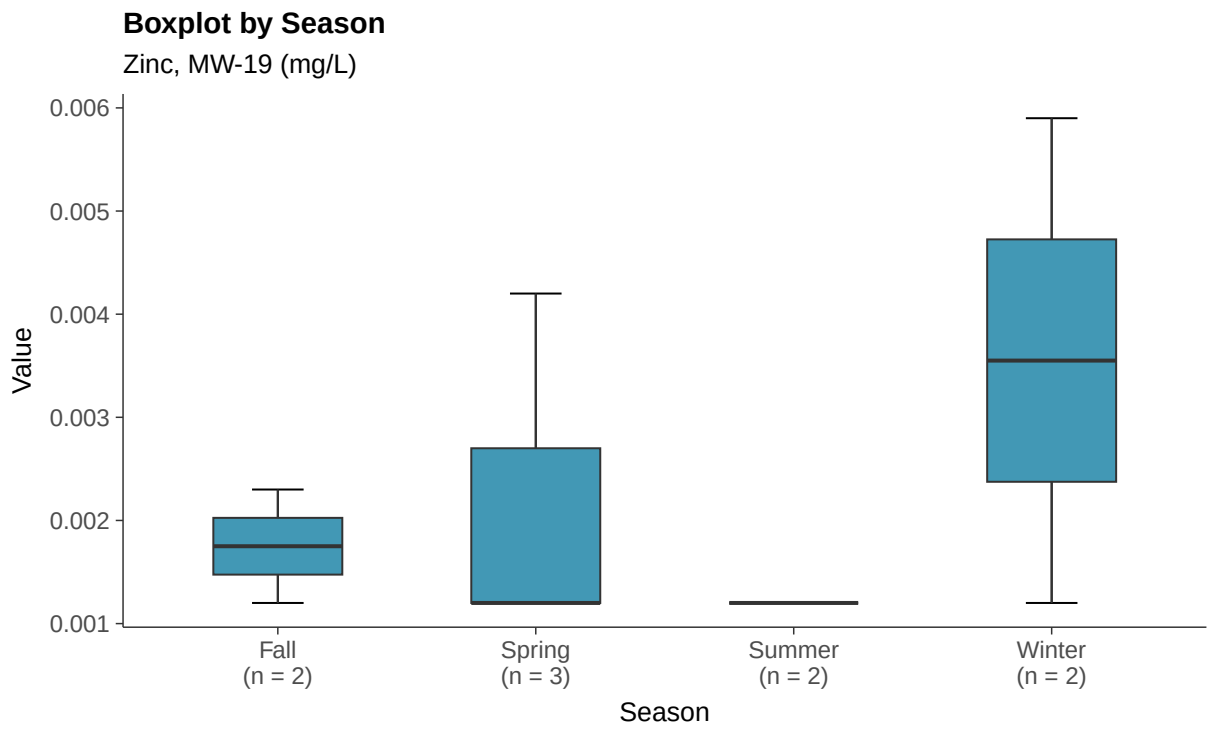
Part 115: Zinc, MW-19

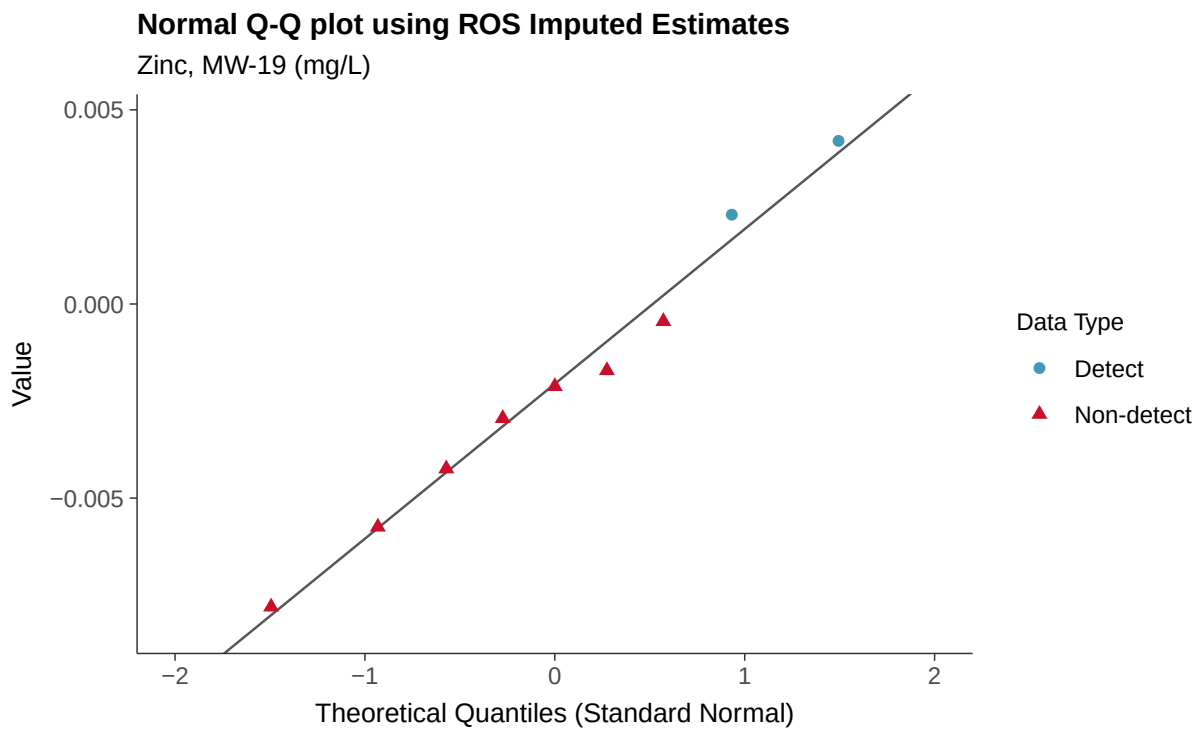
ID: 1_23_6_130

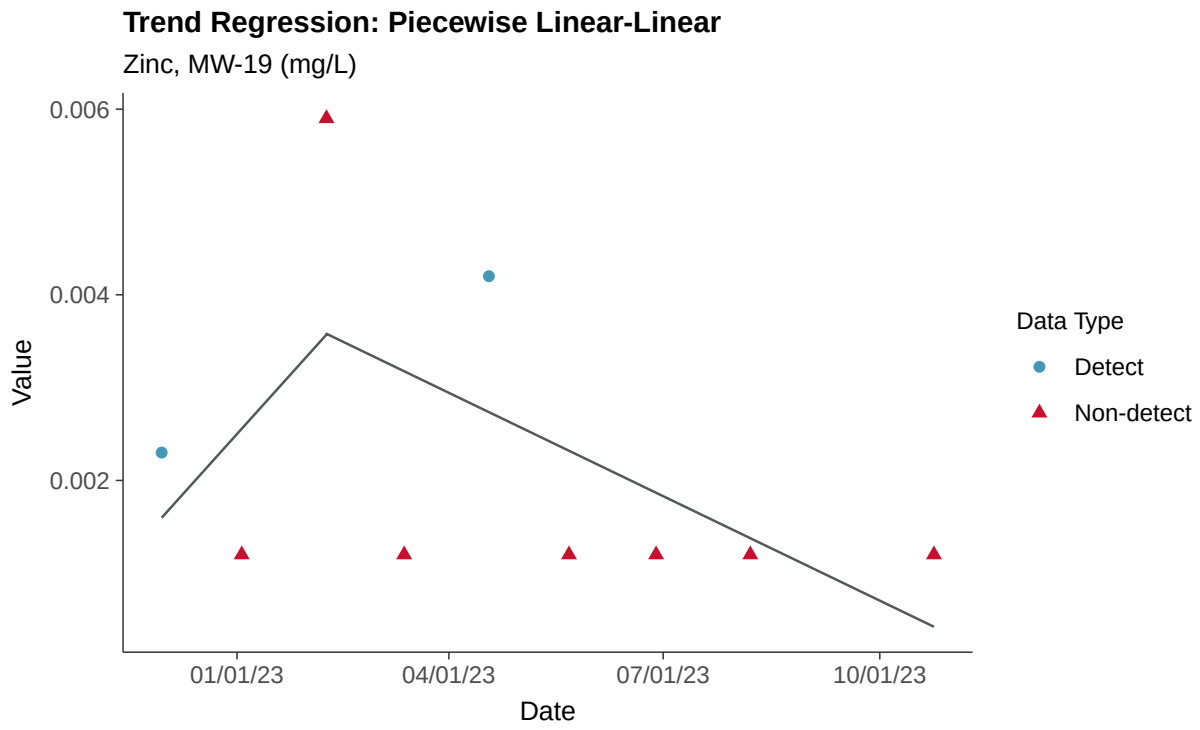


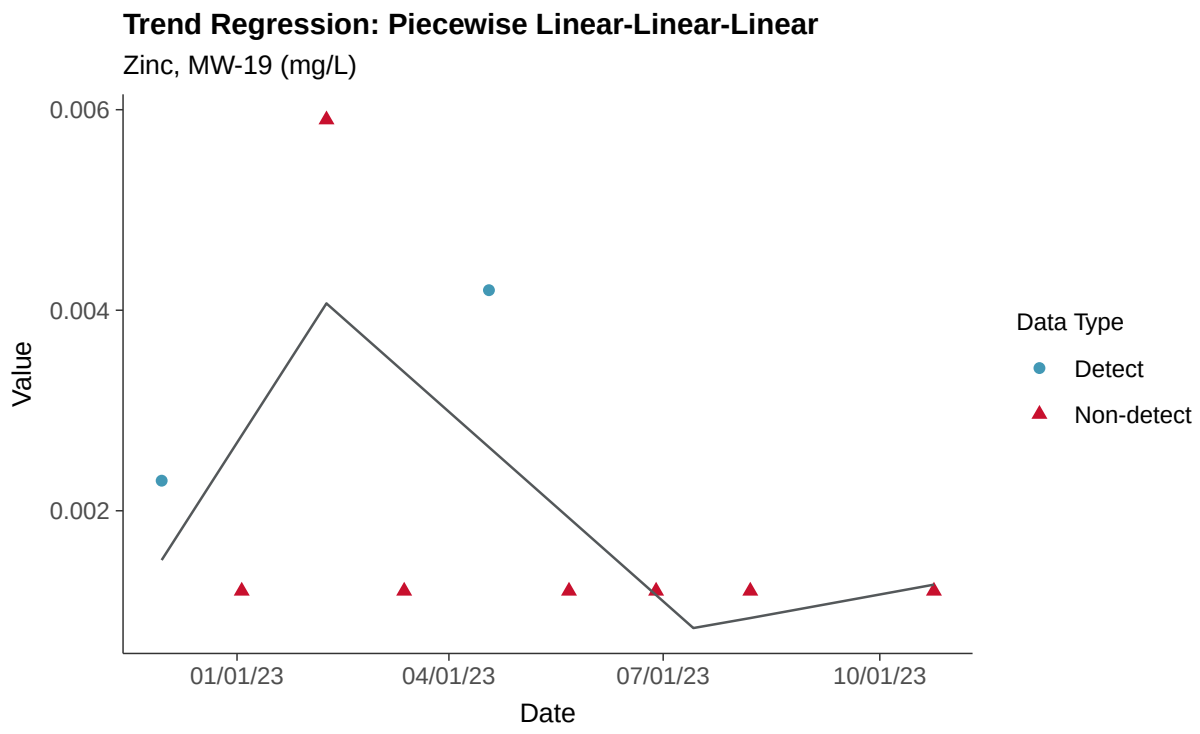



Boxplot
Zinc, MW-19 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
0.001
Data Type
Detect
Non-detect
Outlier Type
Major
Minor


Boxplot by Season
Zinc, MW-19 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
0.001
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

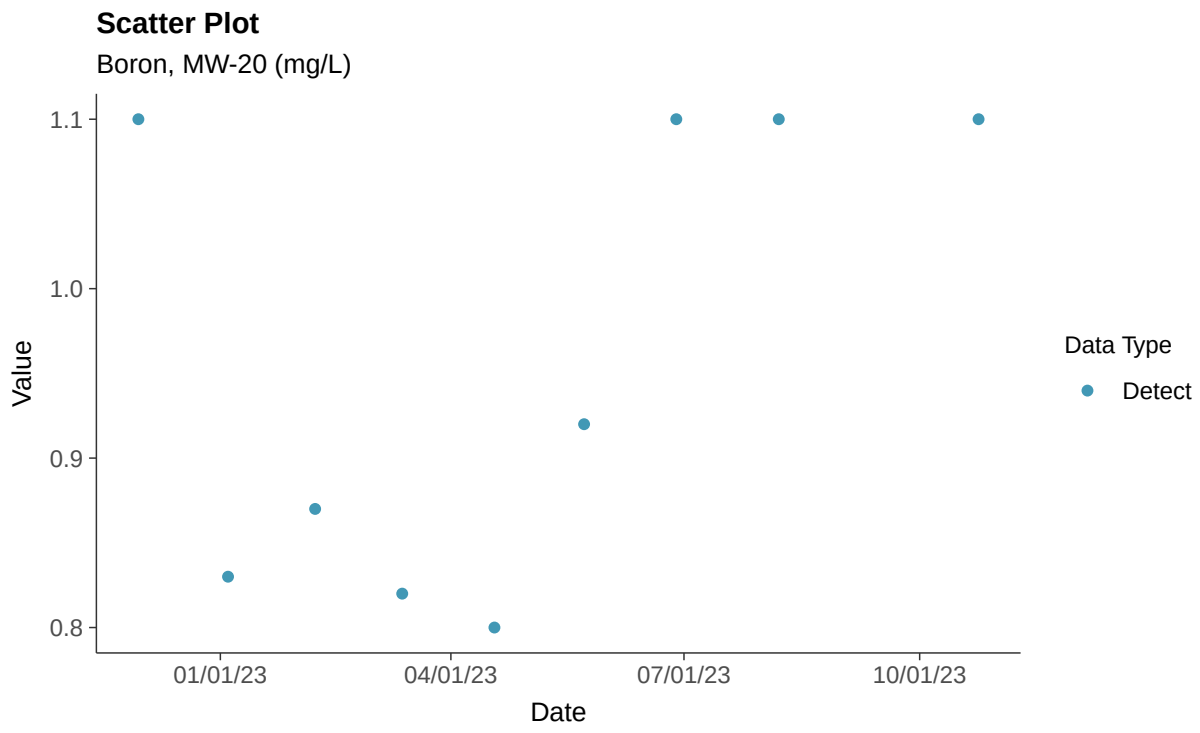

Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-19 (mg/L)
0.005
0.000
−0.005
Value
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

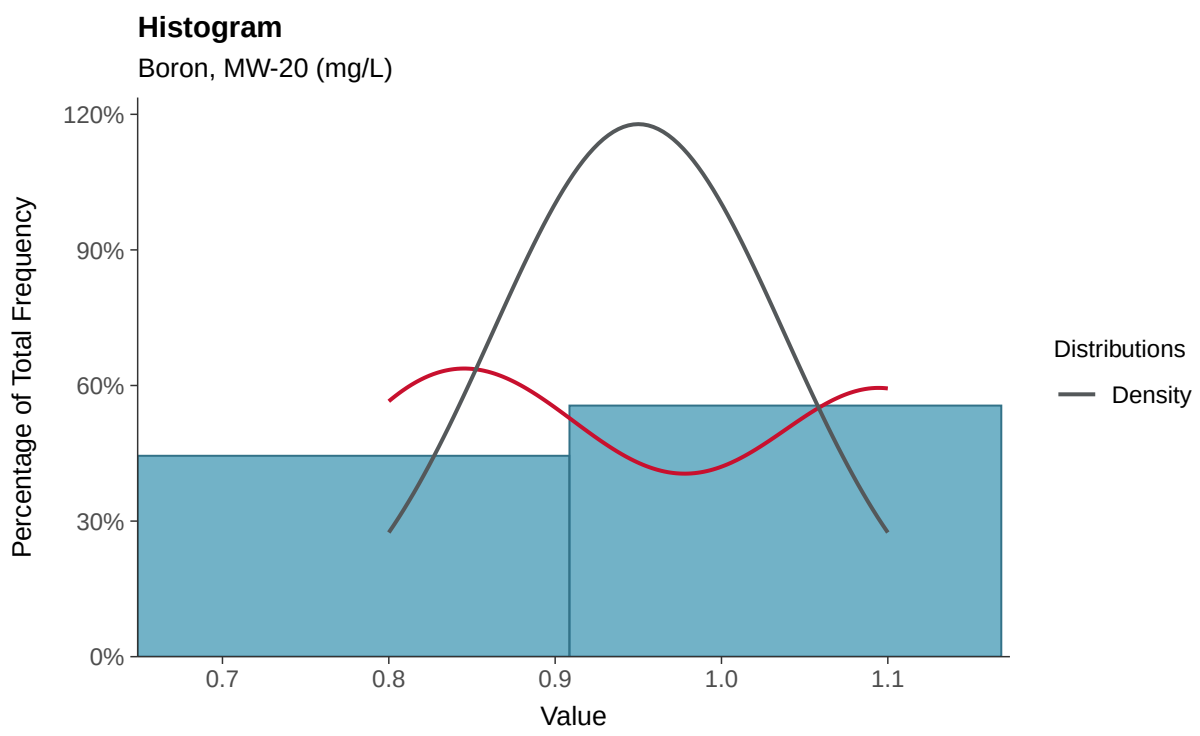

Trend Regression: Piecewise Linear-Linear
Zinc, MW-19 (mg/L)
0.006
0.004
0.002
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Zinc, MW-19 (mg/L)
0.006
0.004
0.002
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Boron, MW-20

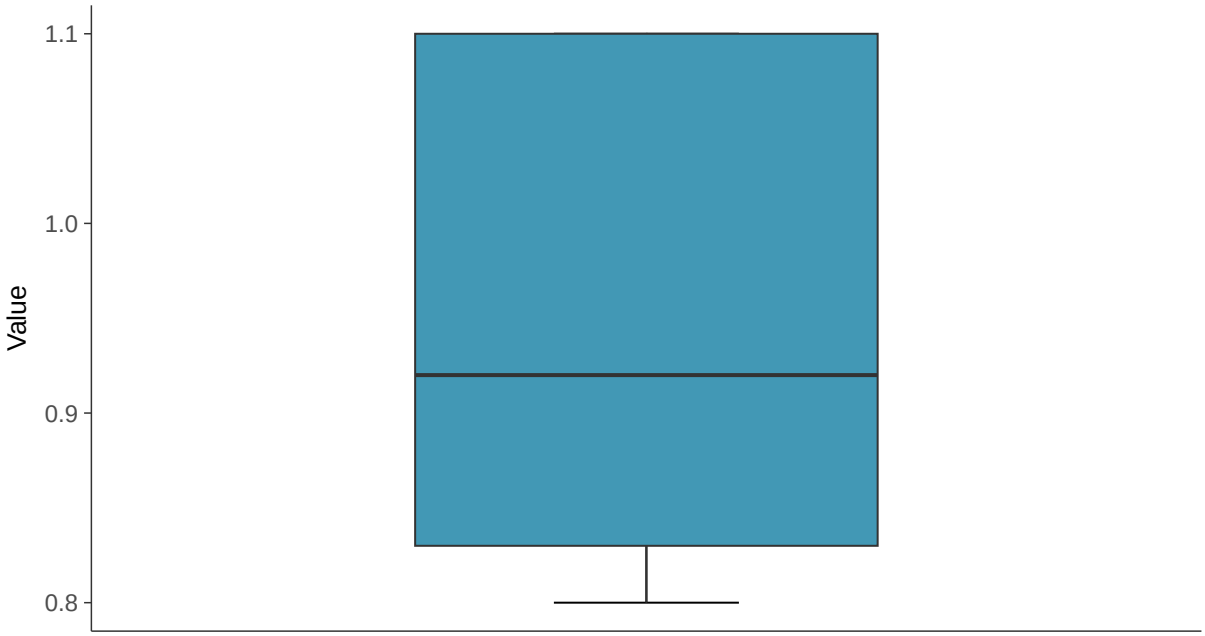
ID: 1_24_4_105





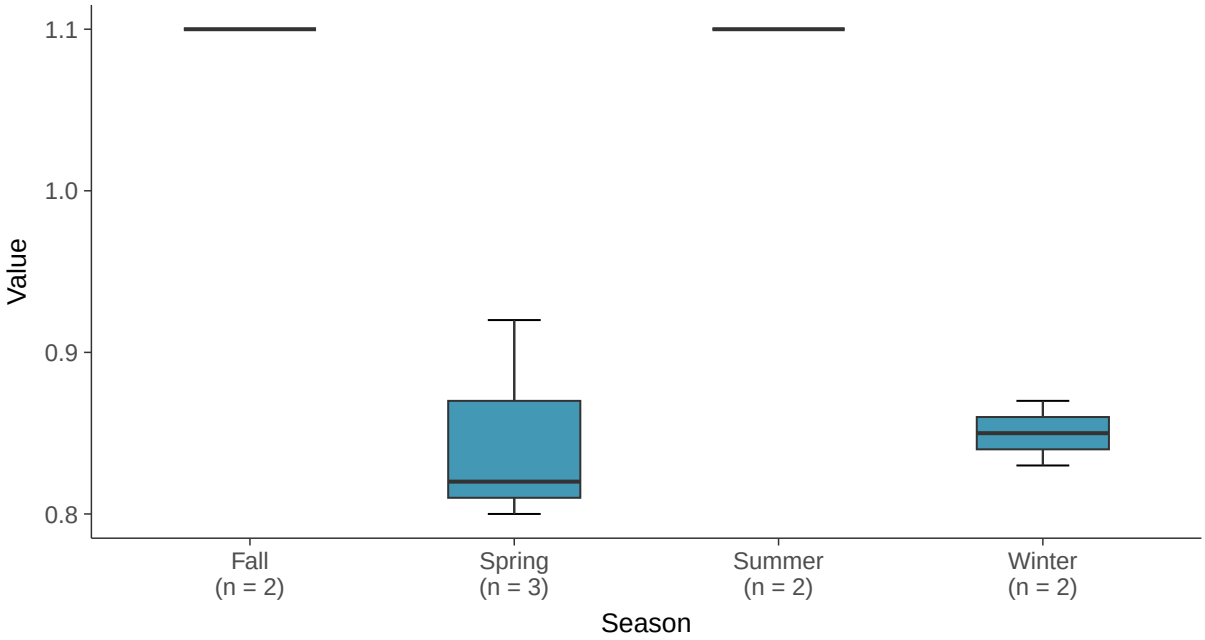
Boxplot

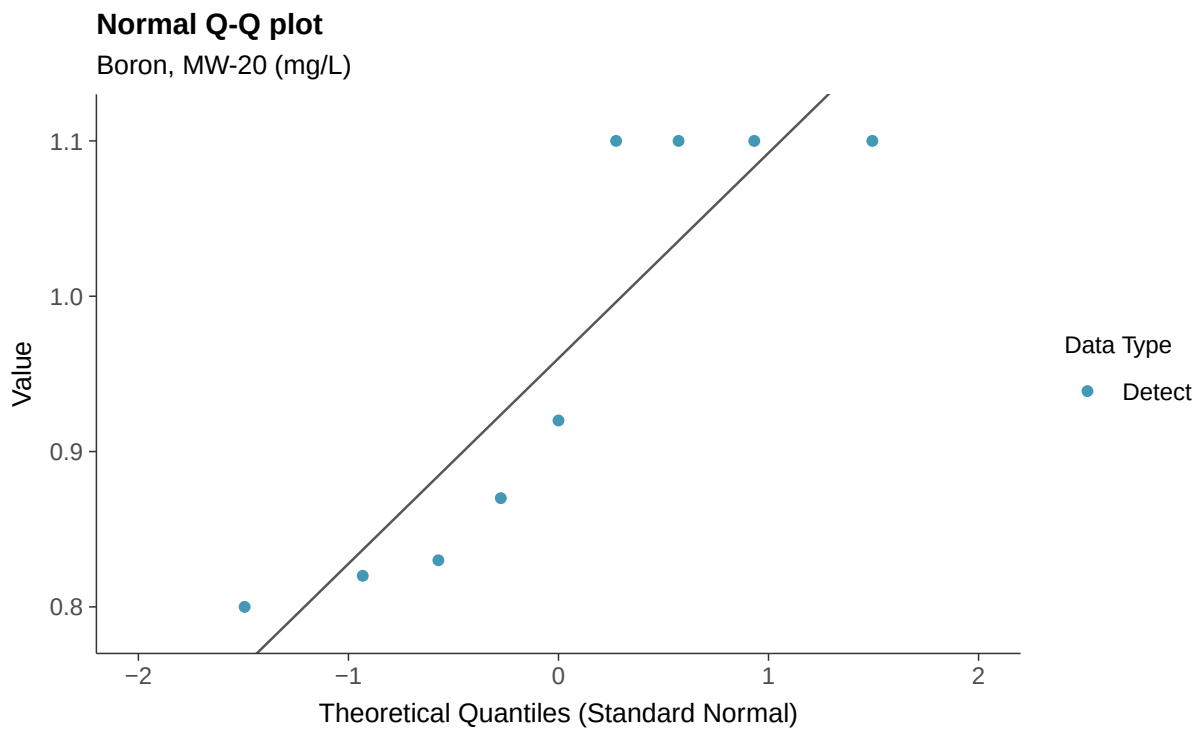
Boron, MW-20 (mg/L)

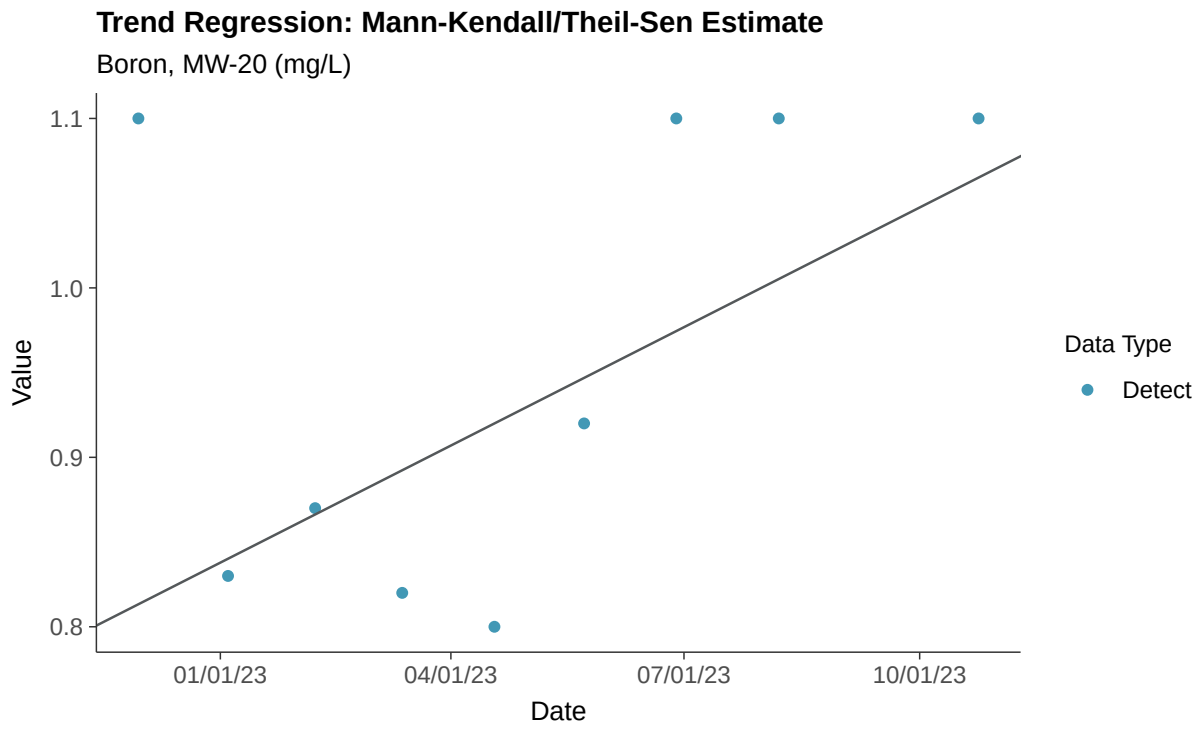


Boxplot by Season

Boron, MW-20 (mg/L)

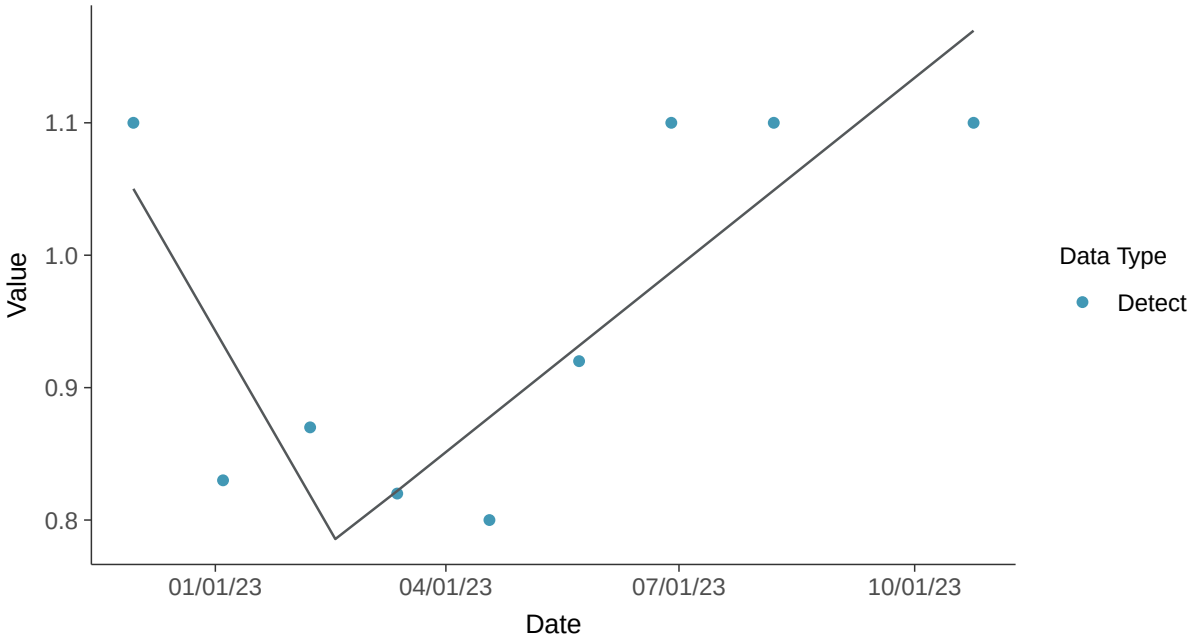



Normal Q-Q plot
Boron, MW-20 (mg/L)
Value
1.1
1.0
0.9
0.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Boron, MW-20 (mg/L)
Value
1.1
1.0
0.9
0.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

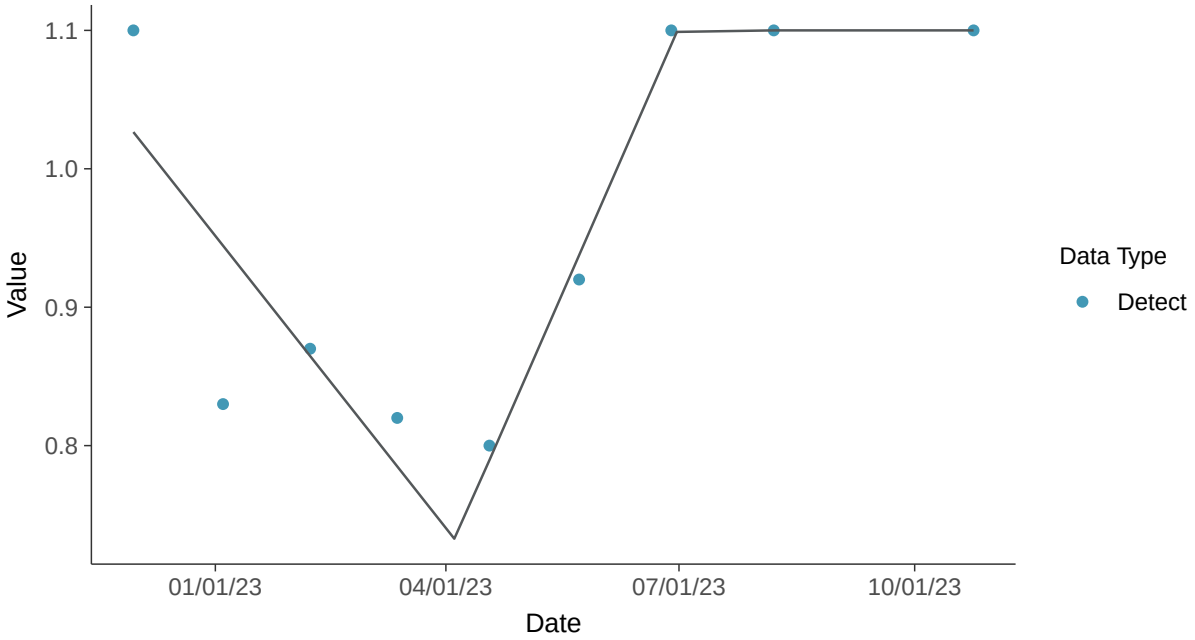
Trend Regression: Piecewise Linear-Linear

Boron, MW-20 (mg/L)



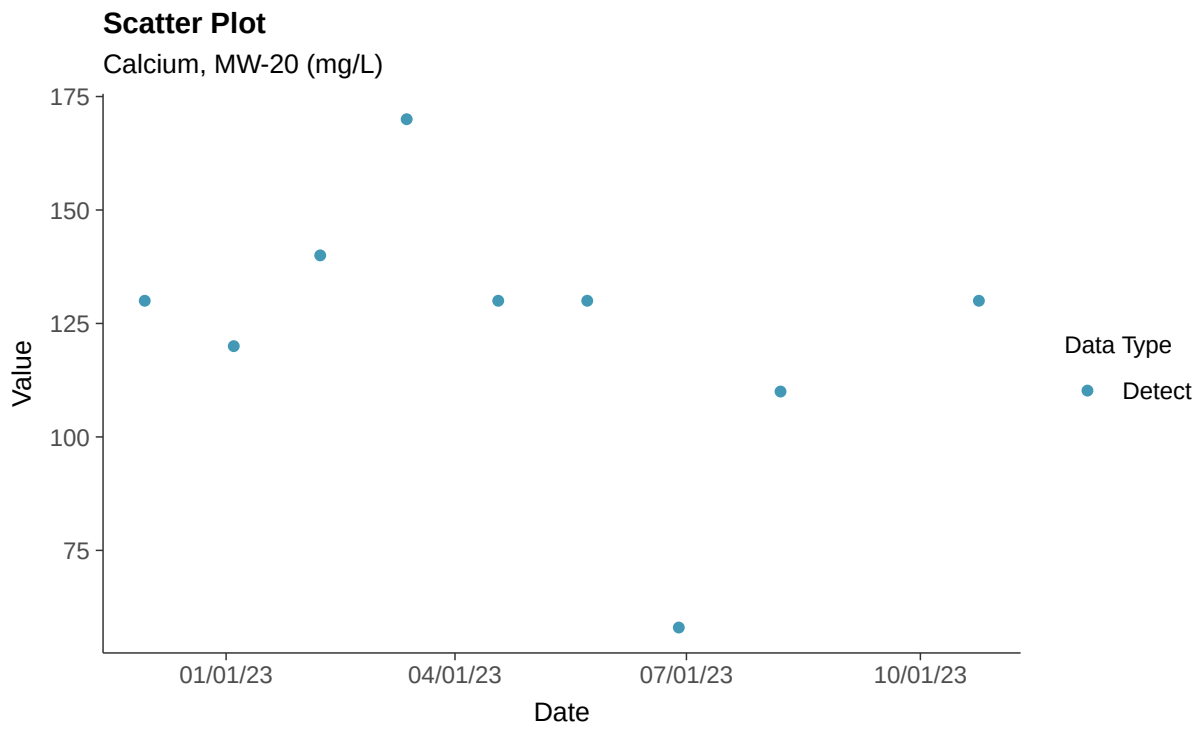
Trend Regression: Piecewise Linear-Linear-Linear

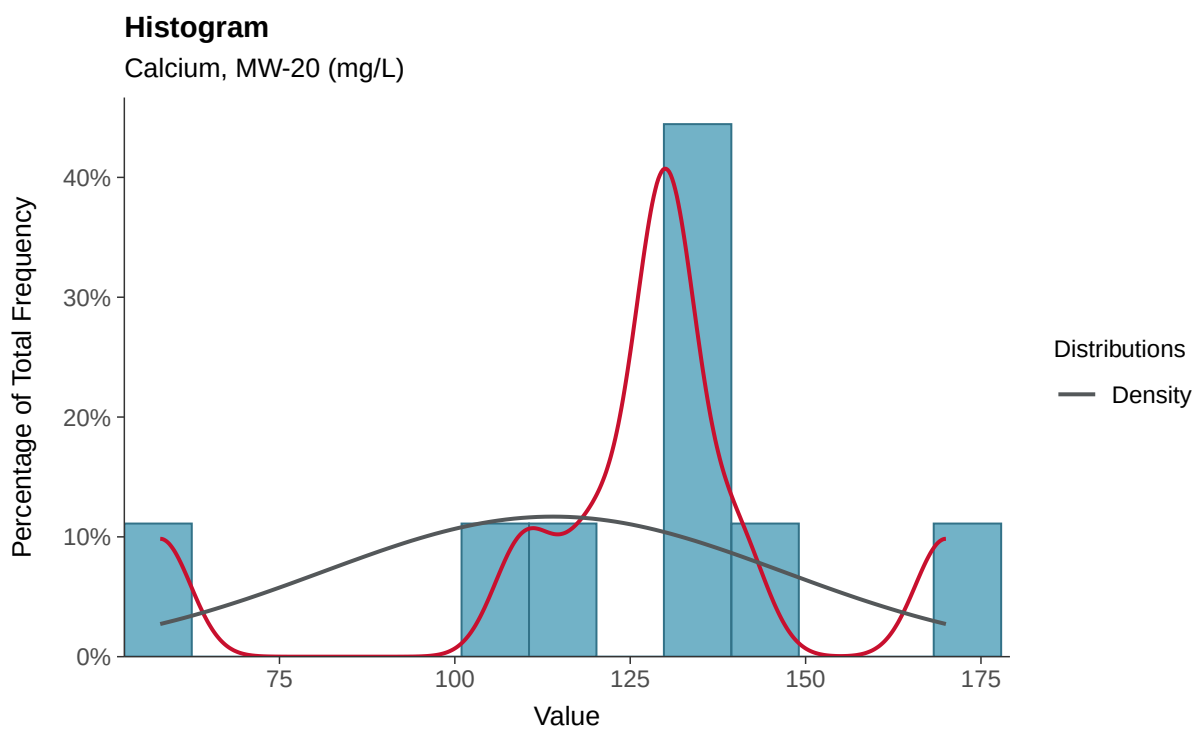
Boron, MW-20 (mg/L)



Appendix III: Calcium, MW-20

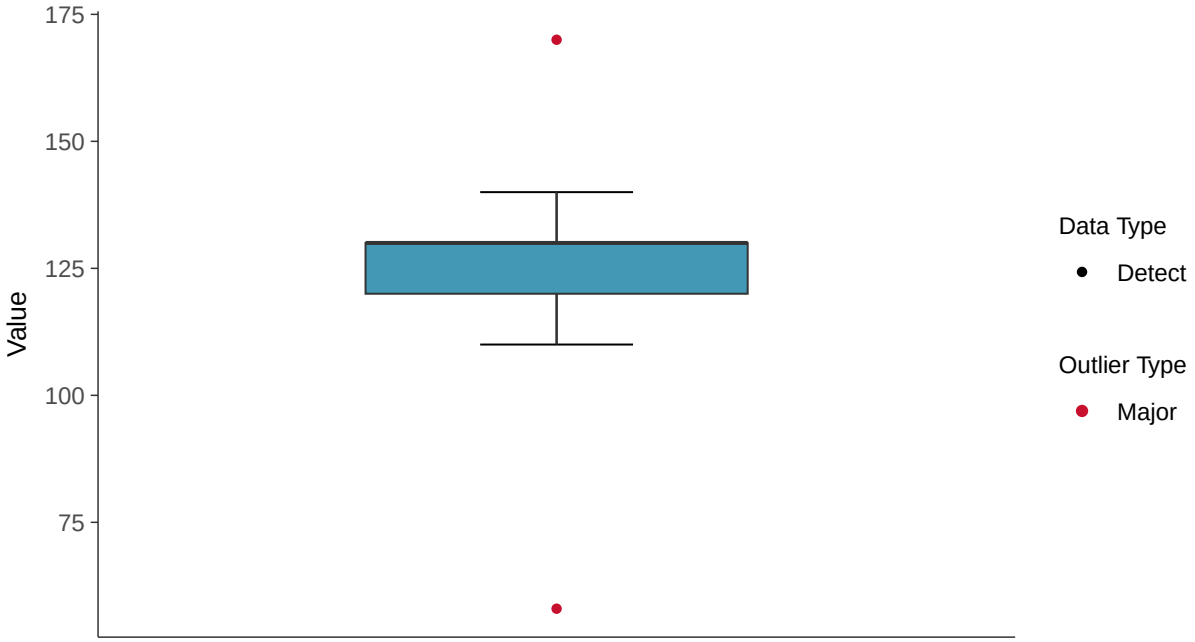
ID: 1_24_4_107





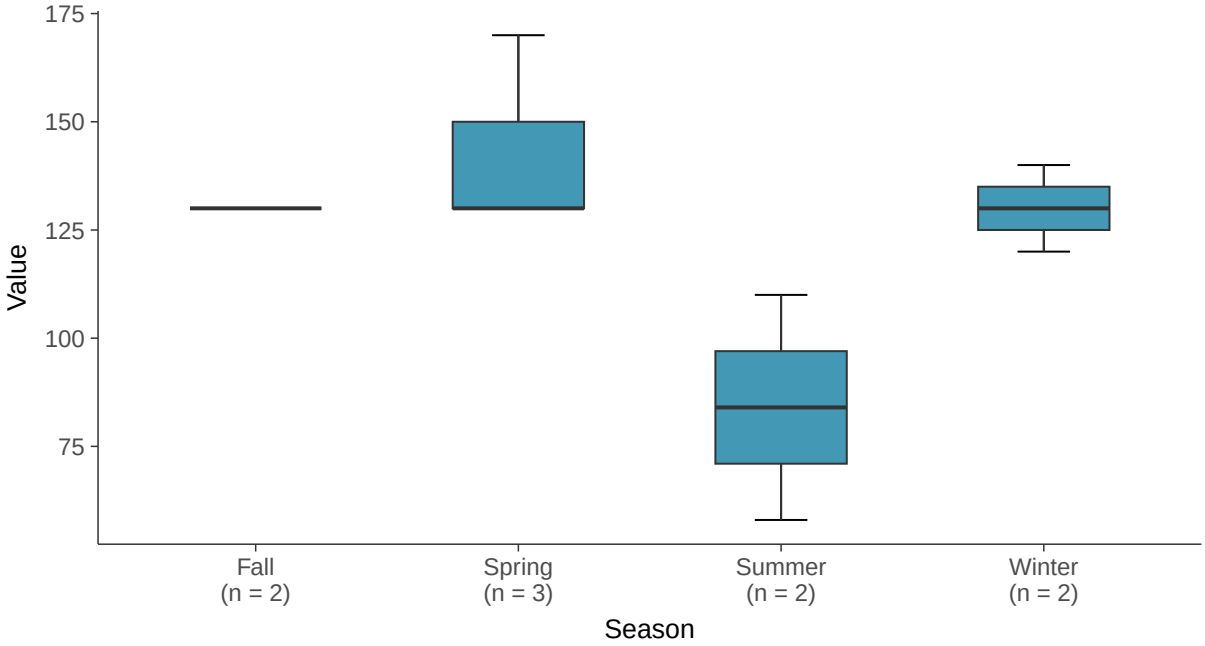
Boxplot

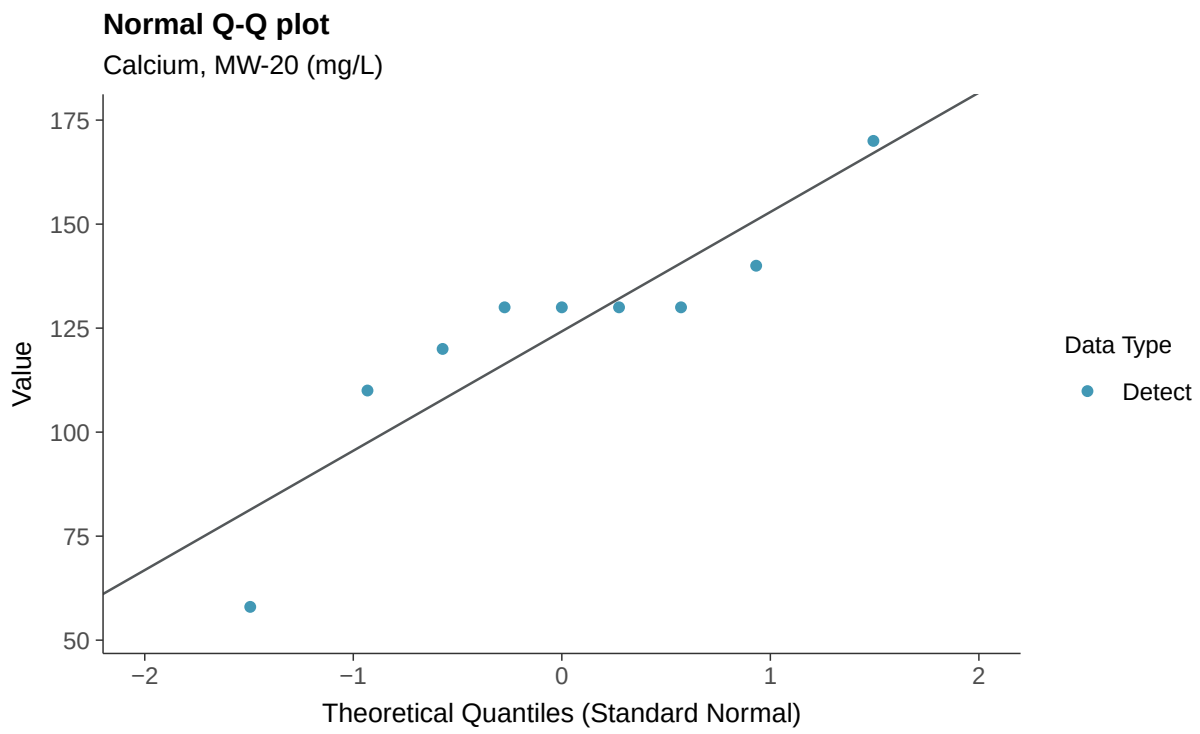
Calcium, MW-20 (mg/L)

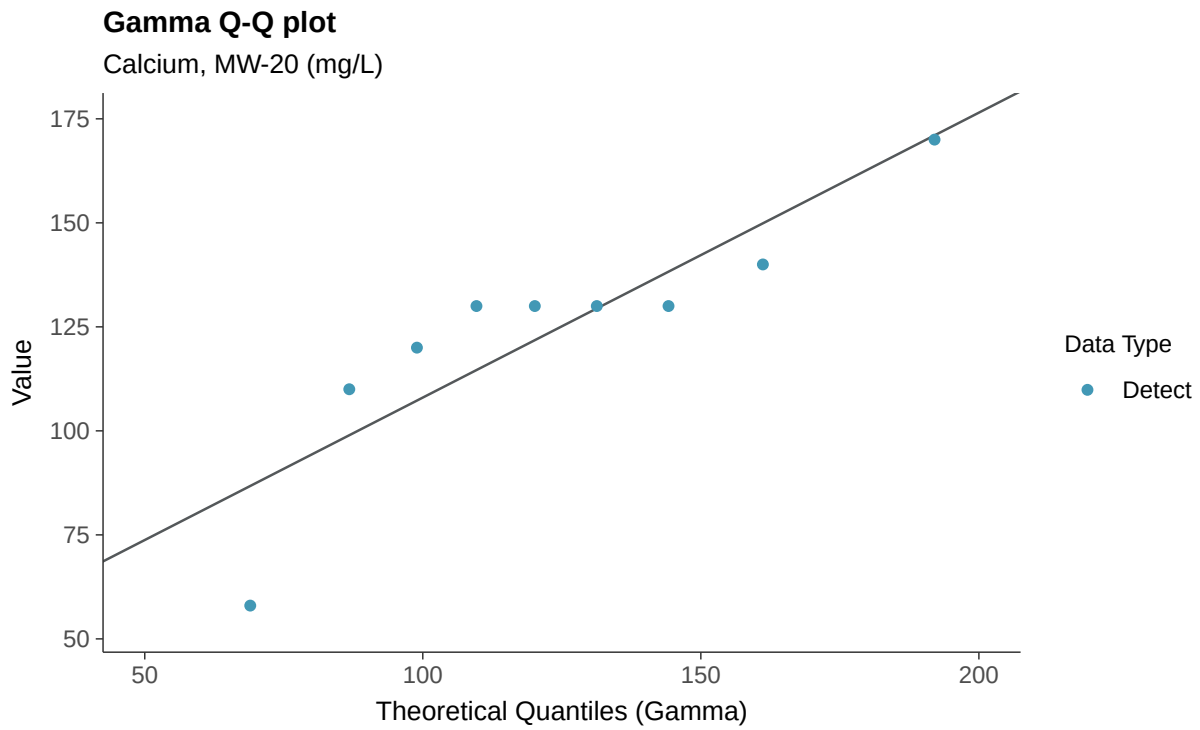


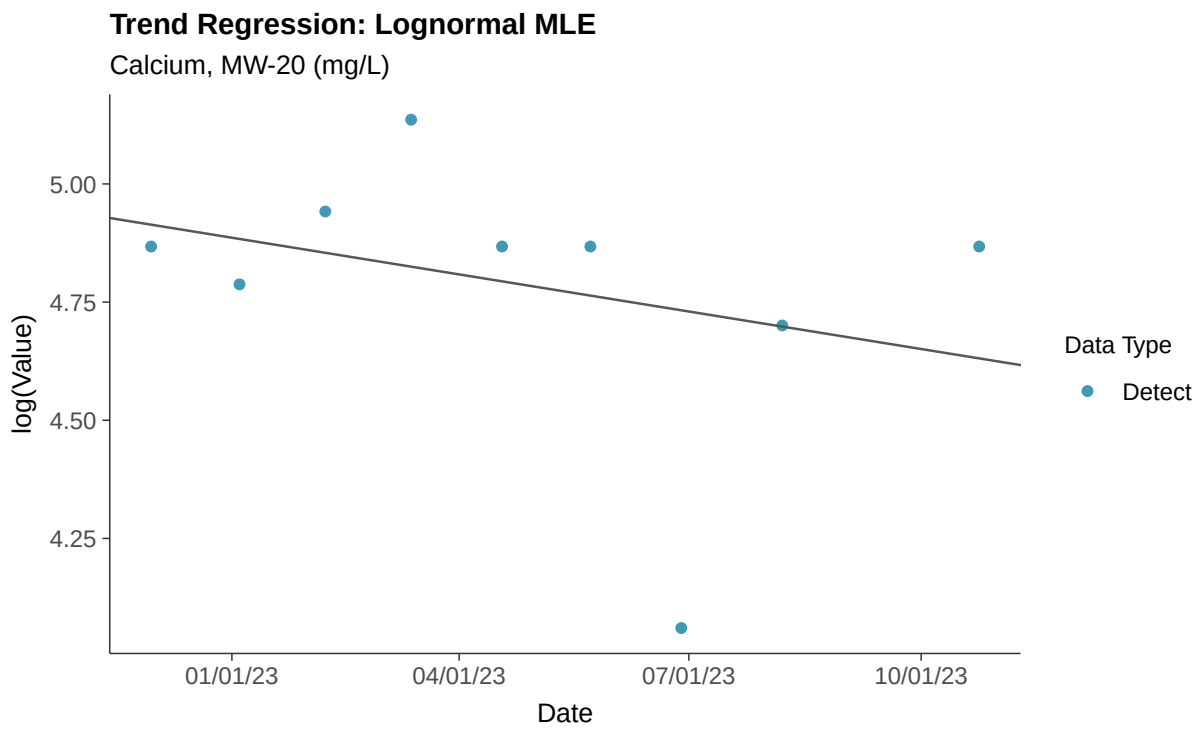
Boxplot by Season

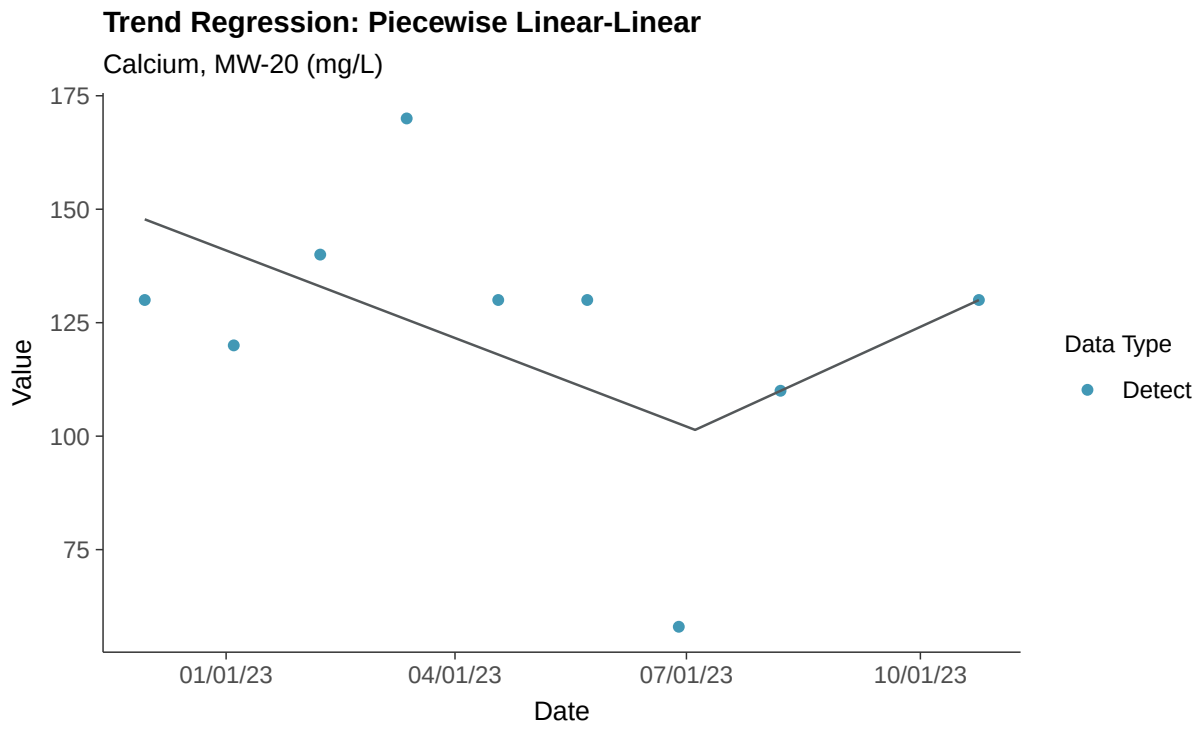
Calcium, MW-20 (mg/L)

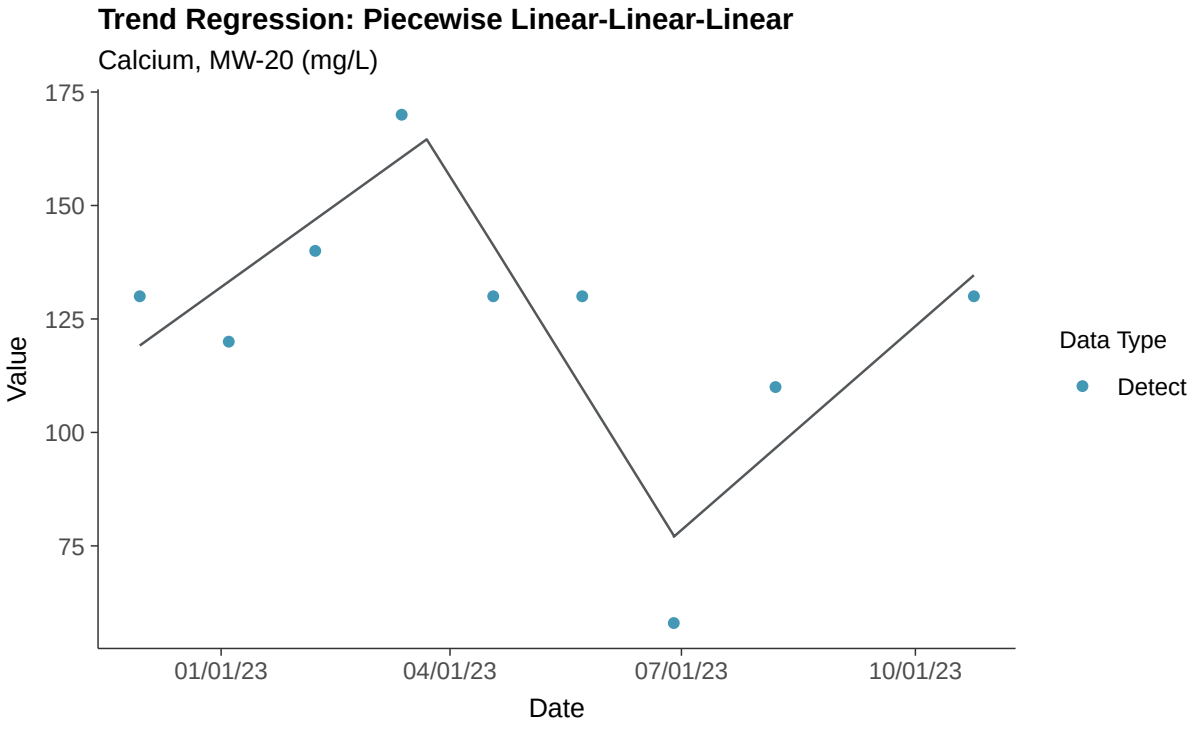



Normal Q-Q plot
Calcium, MW-20 (mg/L)
Value
175
150
125
100
75
50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-20 (mg/L)
Value
175
150
125
100
75
50
50
100
150
200
Theoretical Quantiles (Gamma)
Data Type
Detect

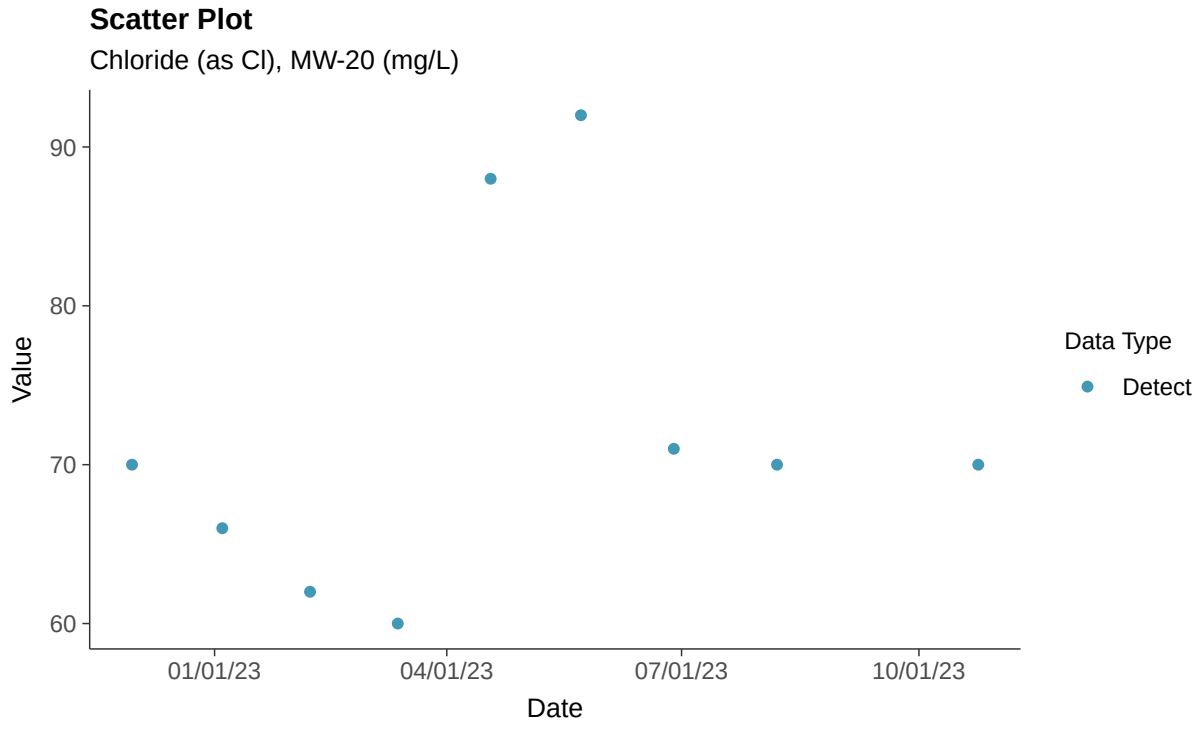

Trend Regression: Lognormal MLE
Calcium, MW-20 (mg/L)
log(Value)
5.00
4.75
4.50
4.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

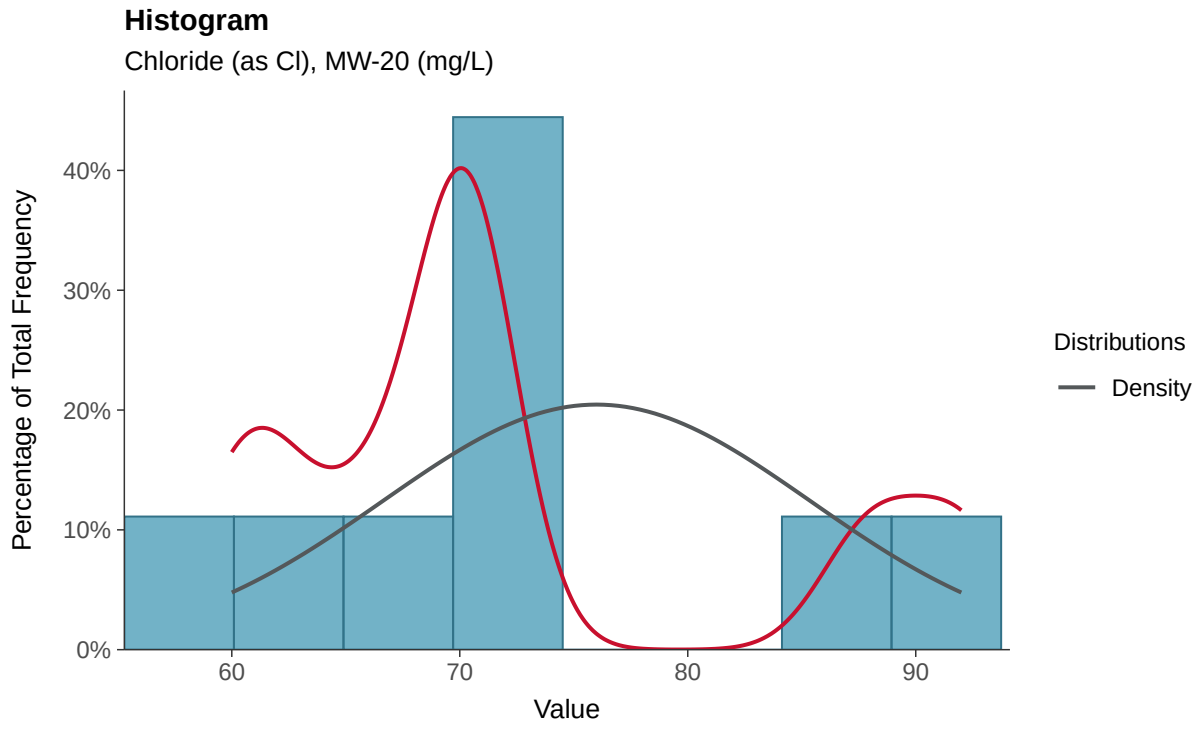

Trend Regression: Piecewise Linear-Linear
Calcium, MW-20 (mg/L)
Value
175
150
125
100
75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Calcium, MW-20 (mg/L)
175
150
125
100
75
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-20

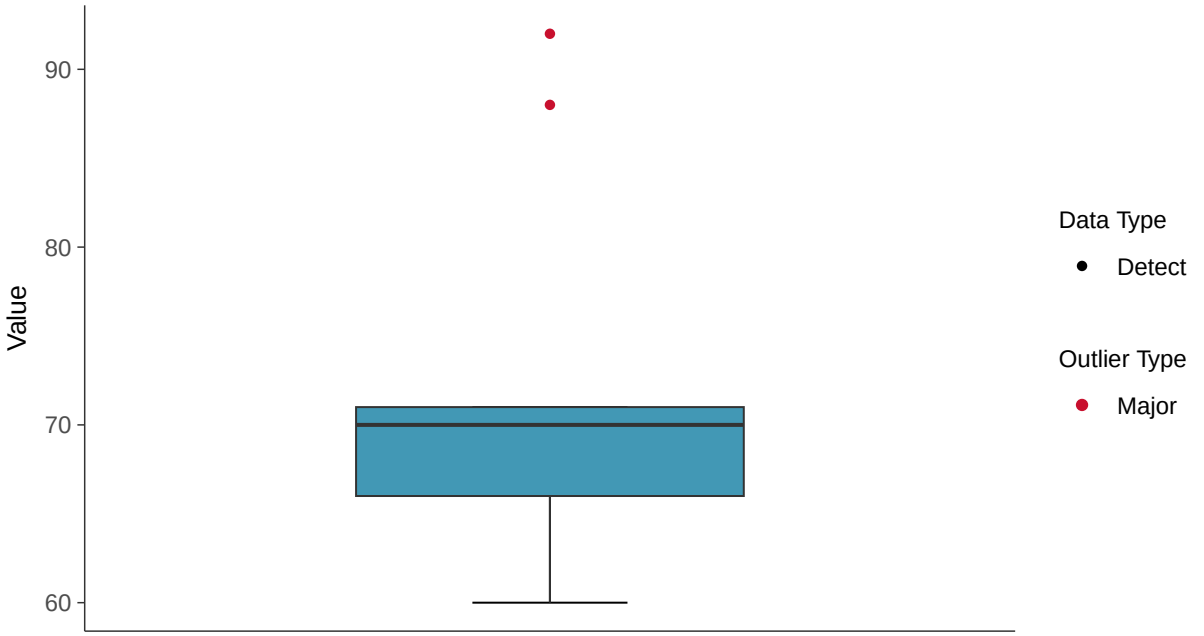
ID: 1_24_4_108





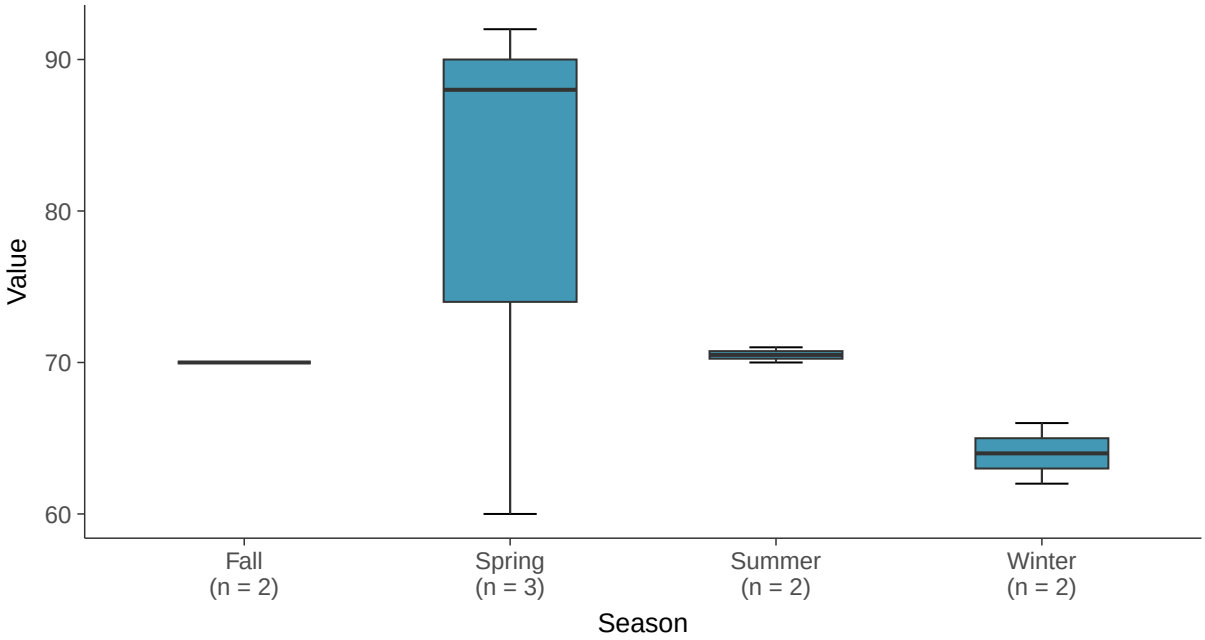
Boxplot

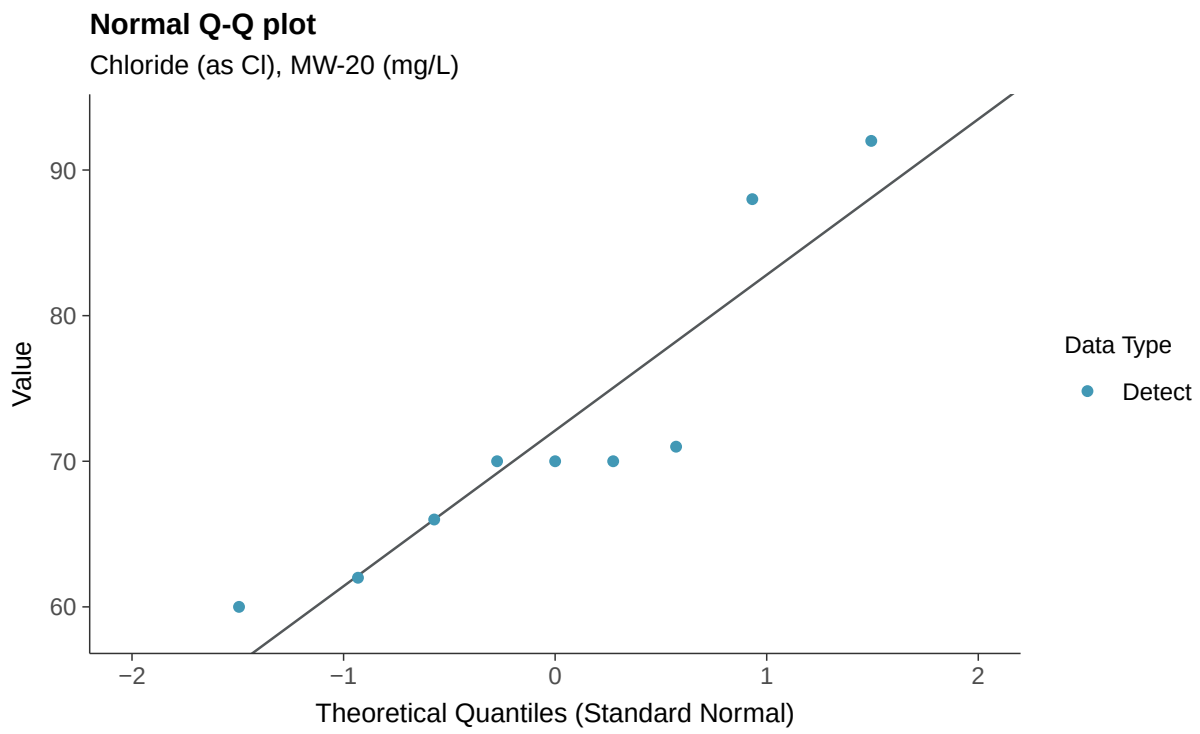
Chloride (as Cl), MW-20 (mg/L)

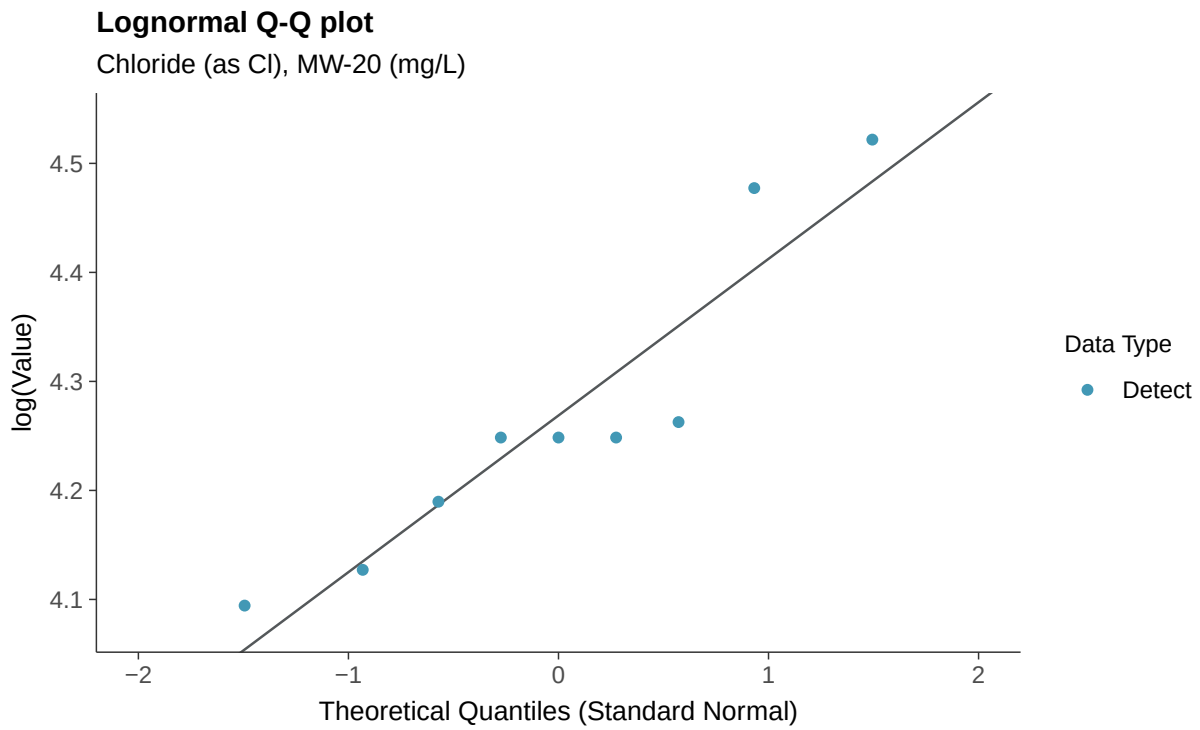


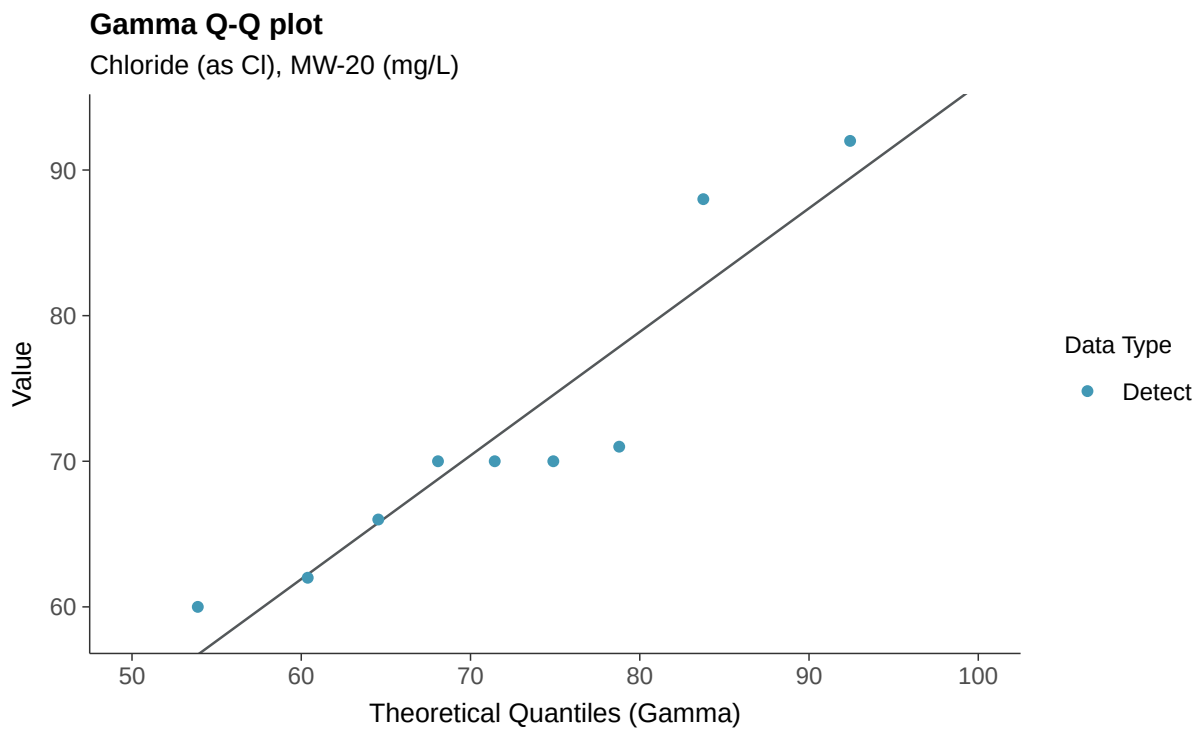
Boxplot by Season

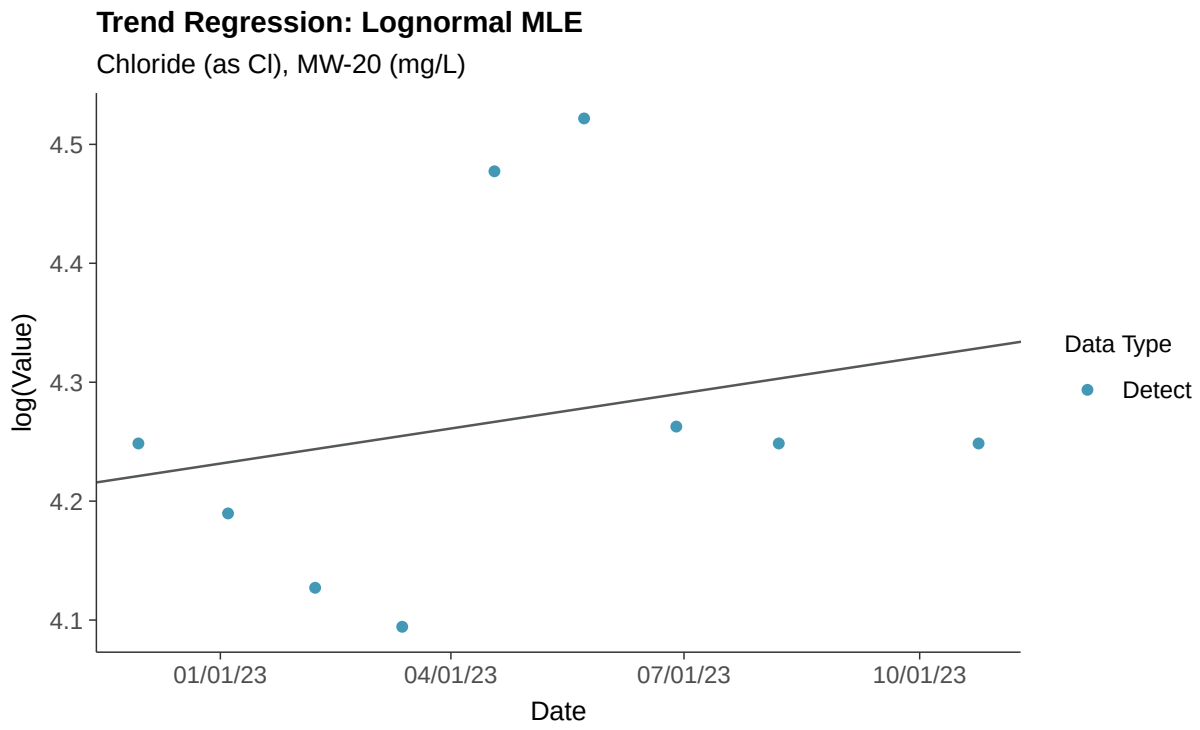
Chloride (as Cl), MW-20 (mg/L)

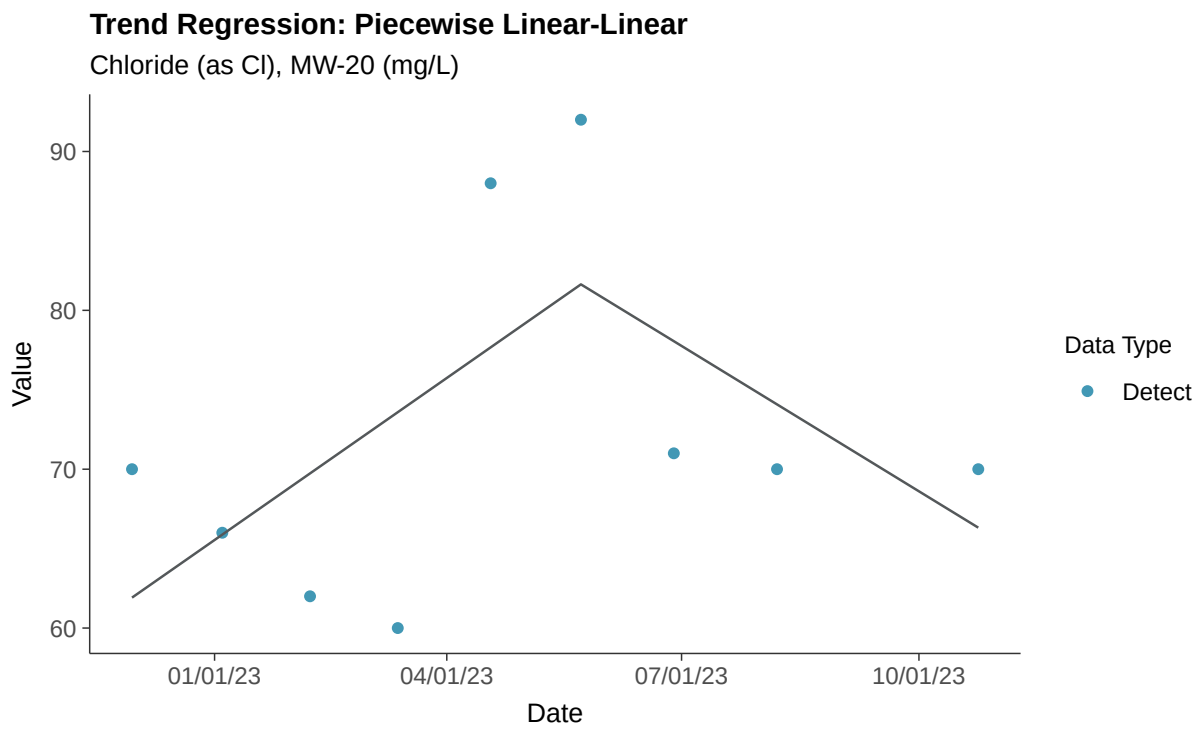



Normal Q-Q plot
Chloride (as Cl), MW-20 (mg/L)
Value
90
80
70
60
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chloride (as Cl), MW-20 (mg/L)
log(Value)
4.5
4.4
4.3
4.2
4.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

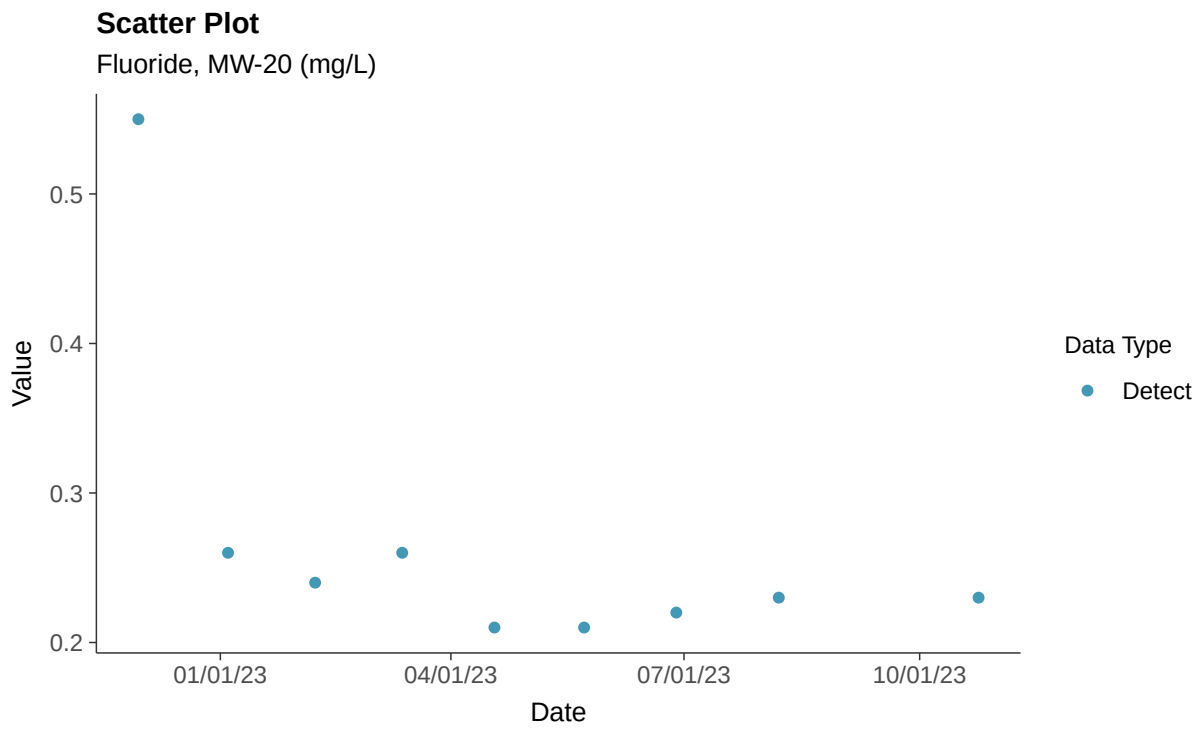

Gamma Q-Q plot
Chloride (as Cl), MW-20 (mg/L)
Value
90
80
70
60
50
60
70
80
90
100
Theoretical Quantiles (Gamma)
Data Type
Detect

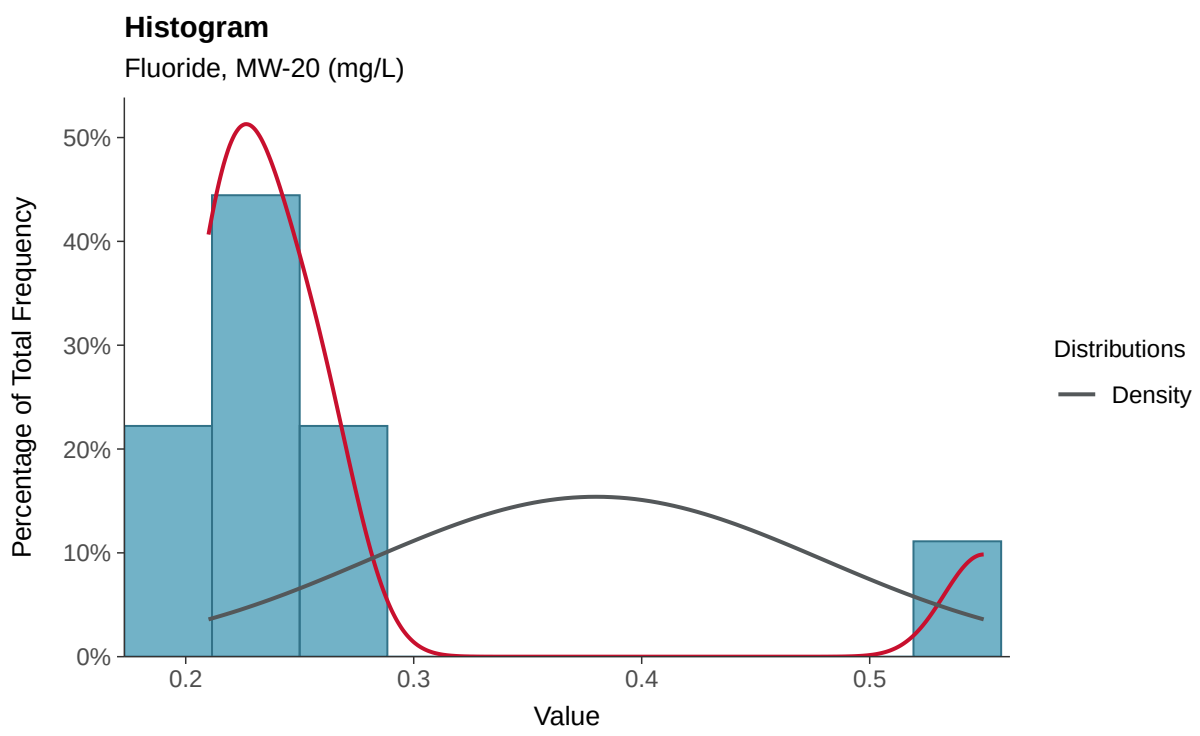

Trend Regression: Lognormal MLE
Chloride (as Cl), MW-20 (mg/L)
log(Value)
4.5
4.4
4.3
4.2
4.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-20 (mg/L)
Value
90
80
70
60
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-20

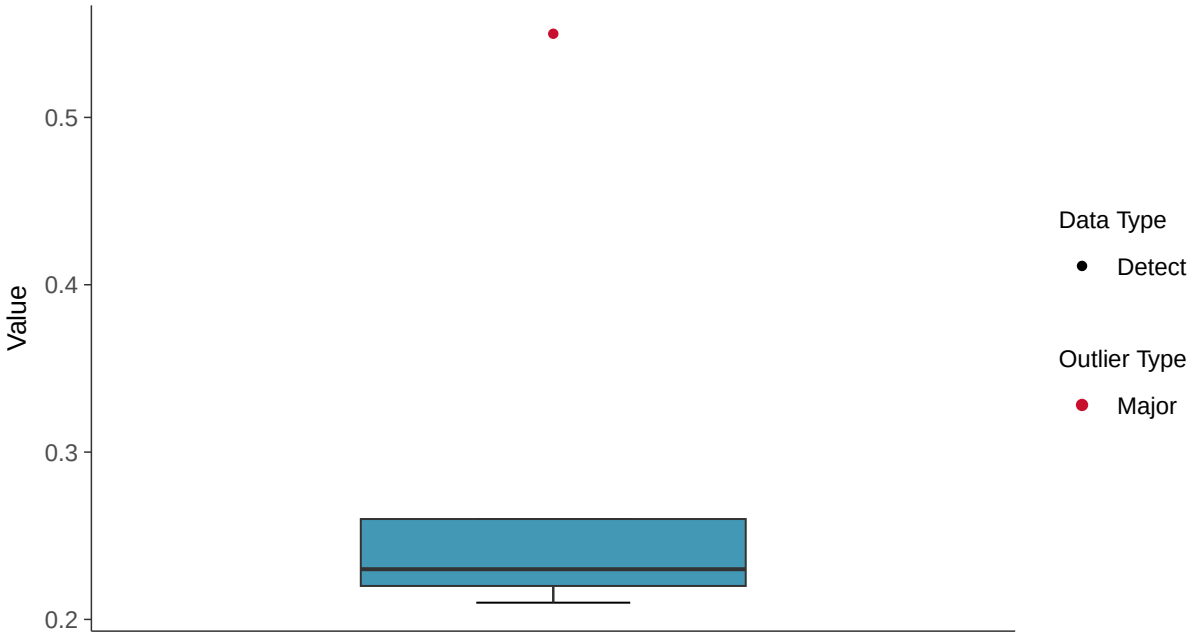
ID: 1_24_4_112





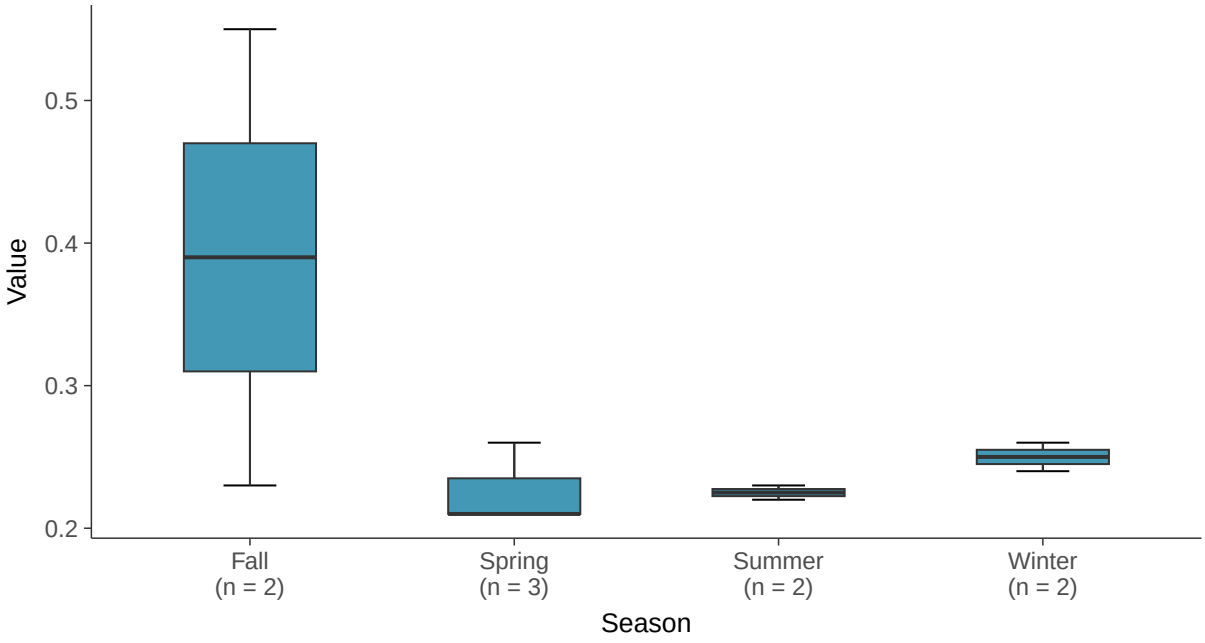
Boxplot

Fluoride, MW-20 (mg/L)



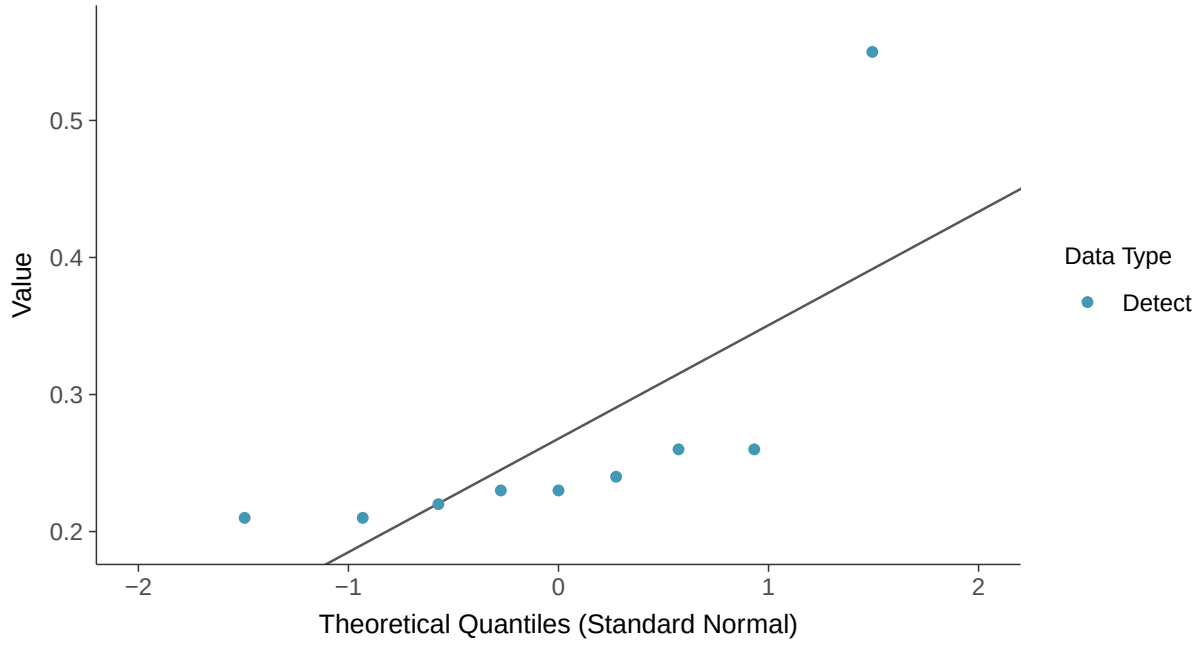
Boxplot by Season

Fluoride, MW-20 (mg/L)



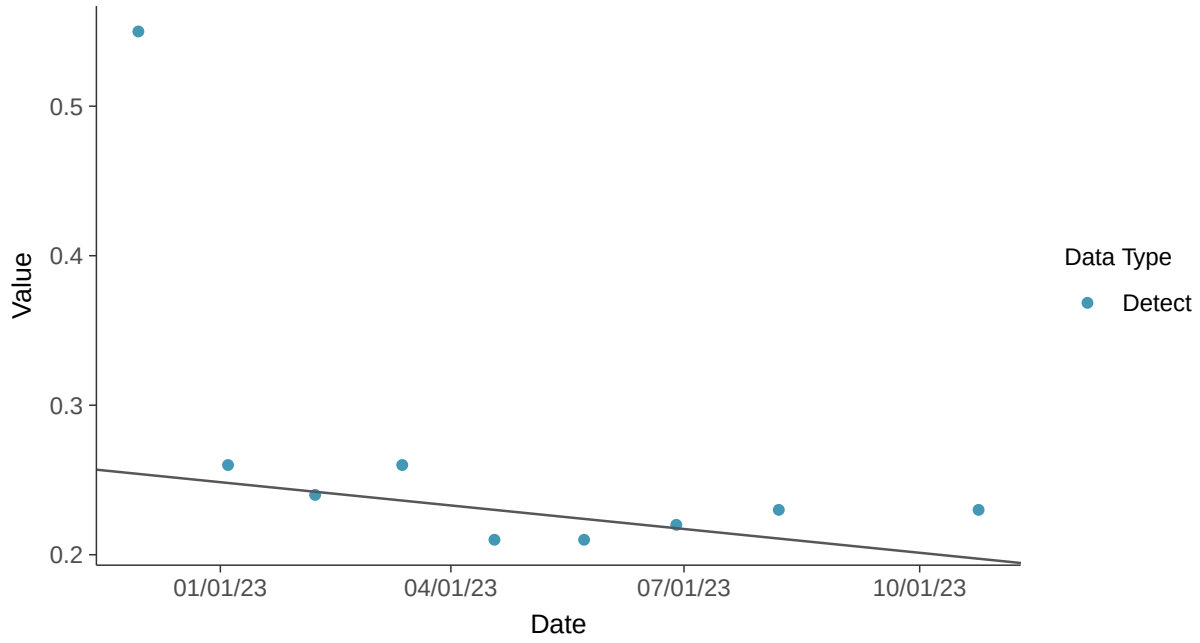
Normal Q-Q plot

Fluoride, MW-20 (mg/L)



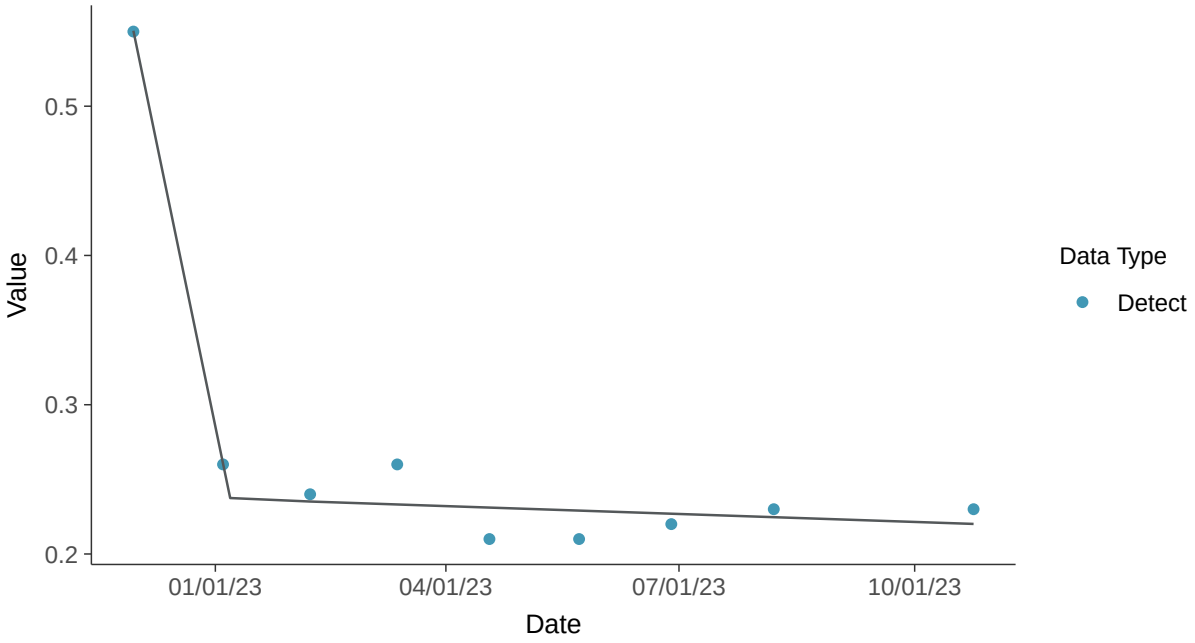
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Fluoride, MW-20 (mg/L)



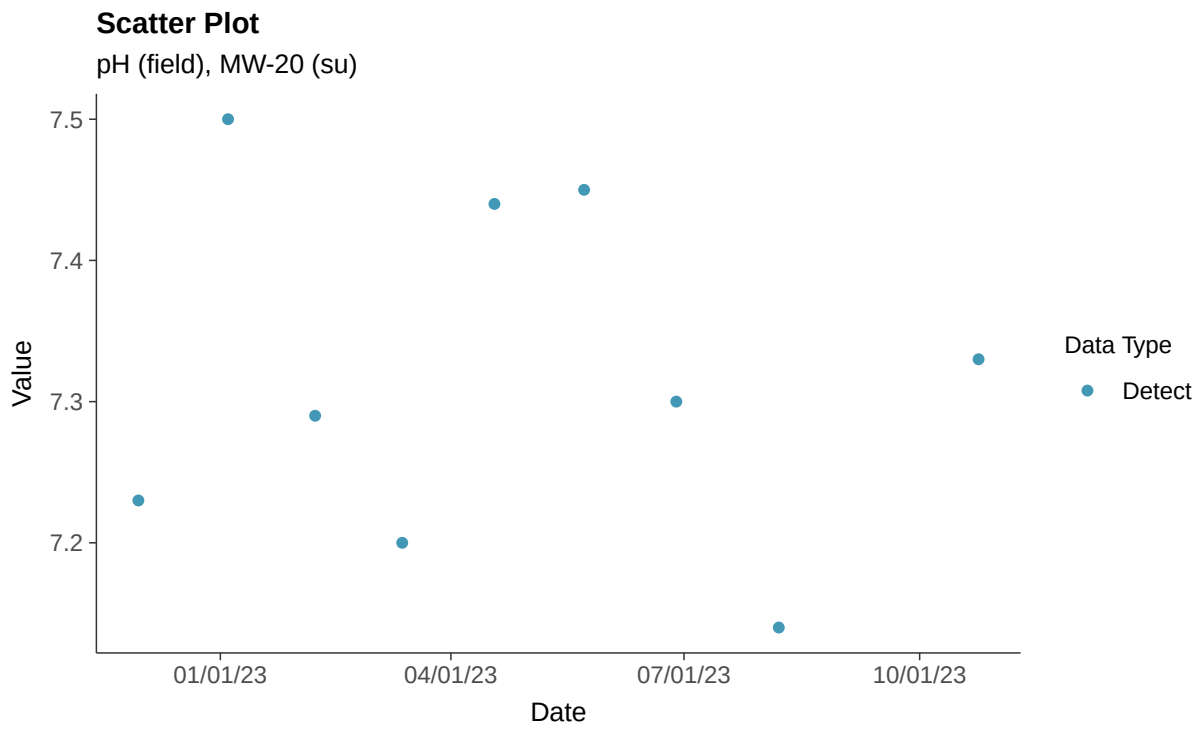
Trend Regression: Piecewise Linear-Linear

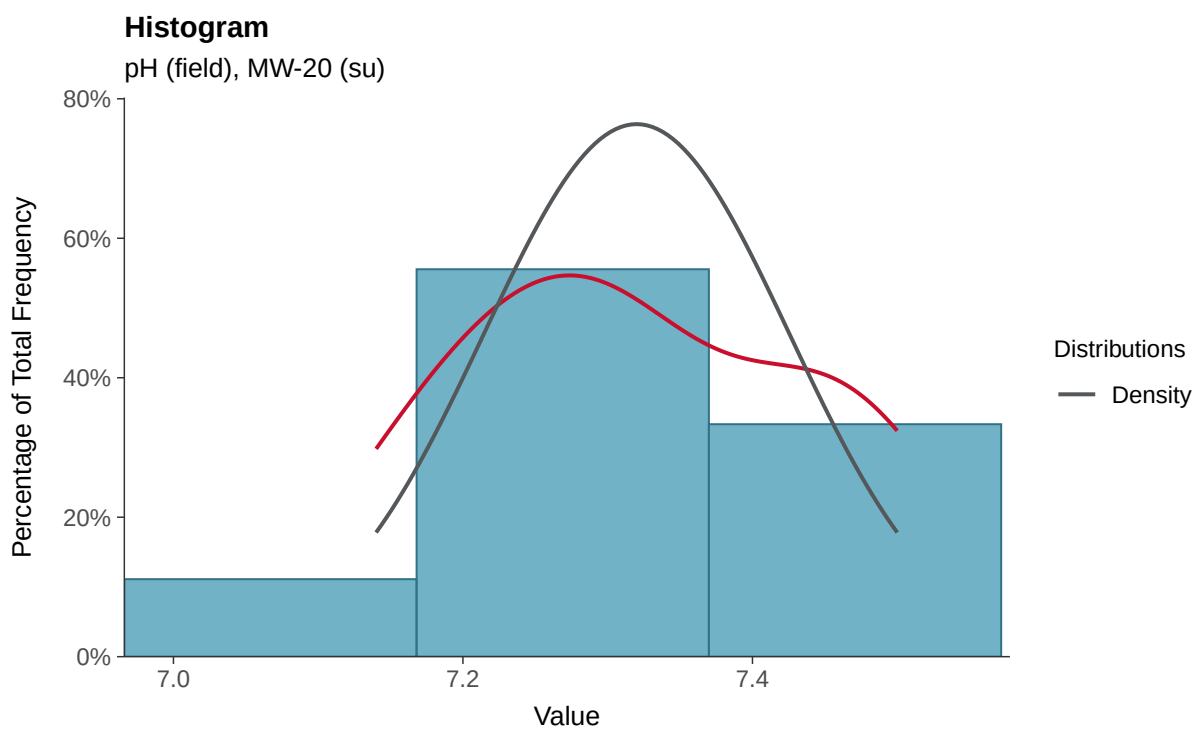
Fluoride, MW-20 (mg/L)



Appendix III: pH (field), MW-20

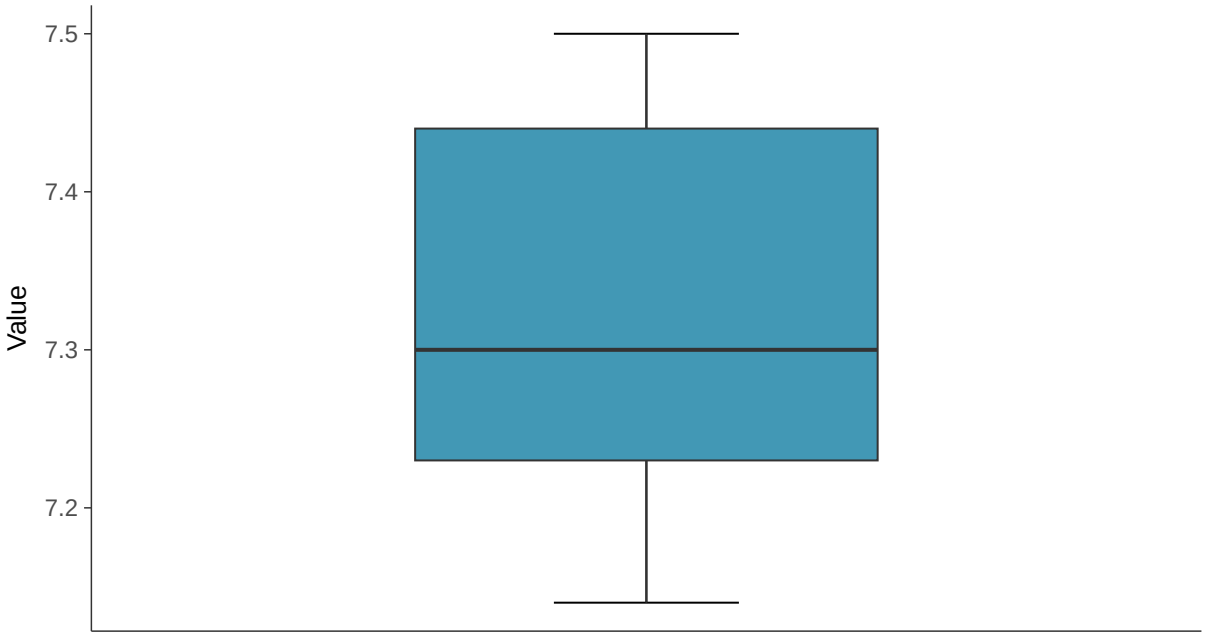
ID: 1_24_4_120





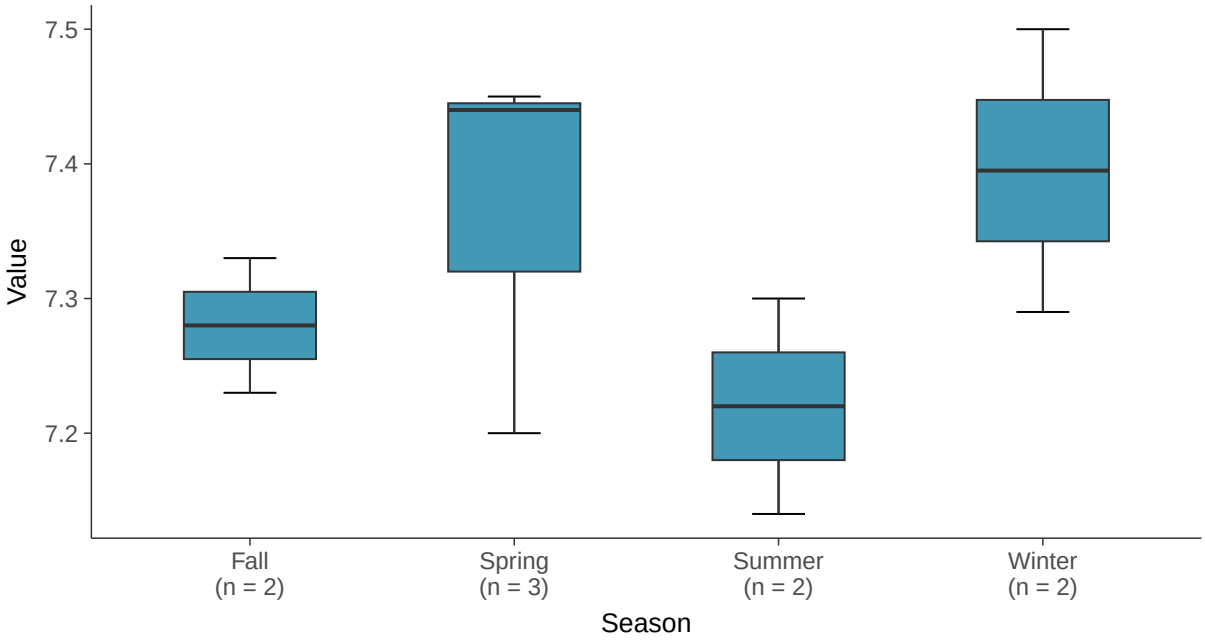
Boxplot

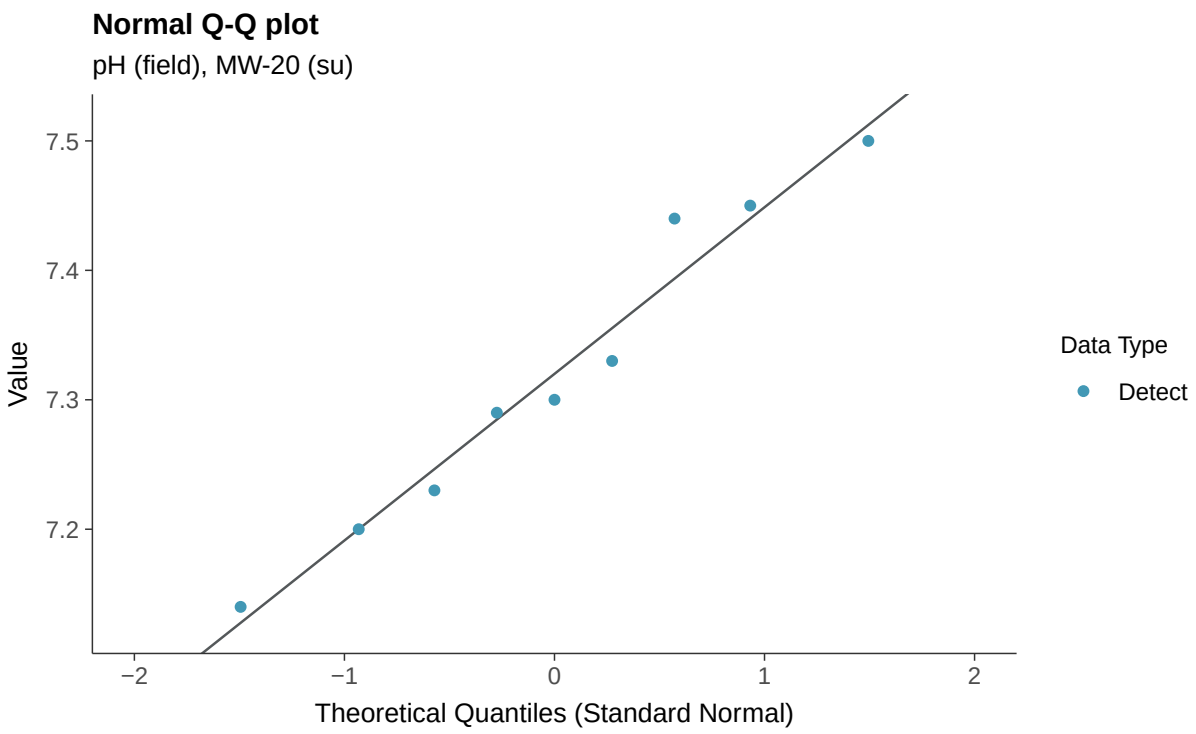
pH (field), MW-20 (su)

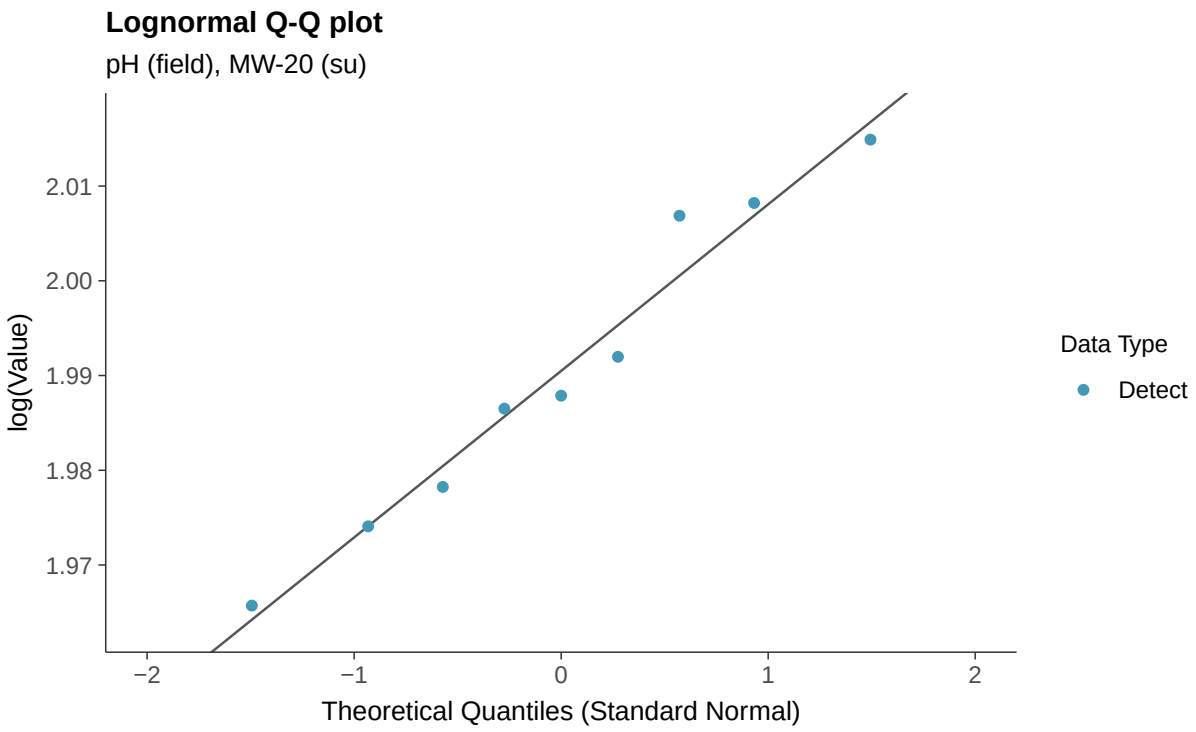


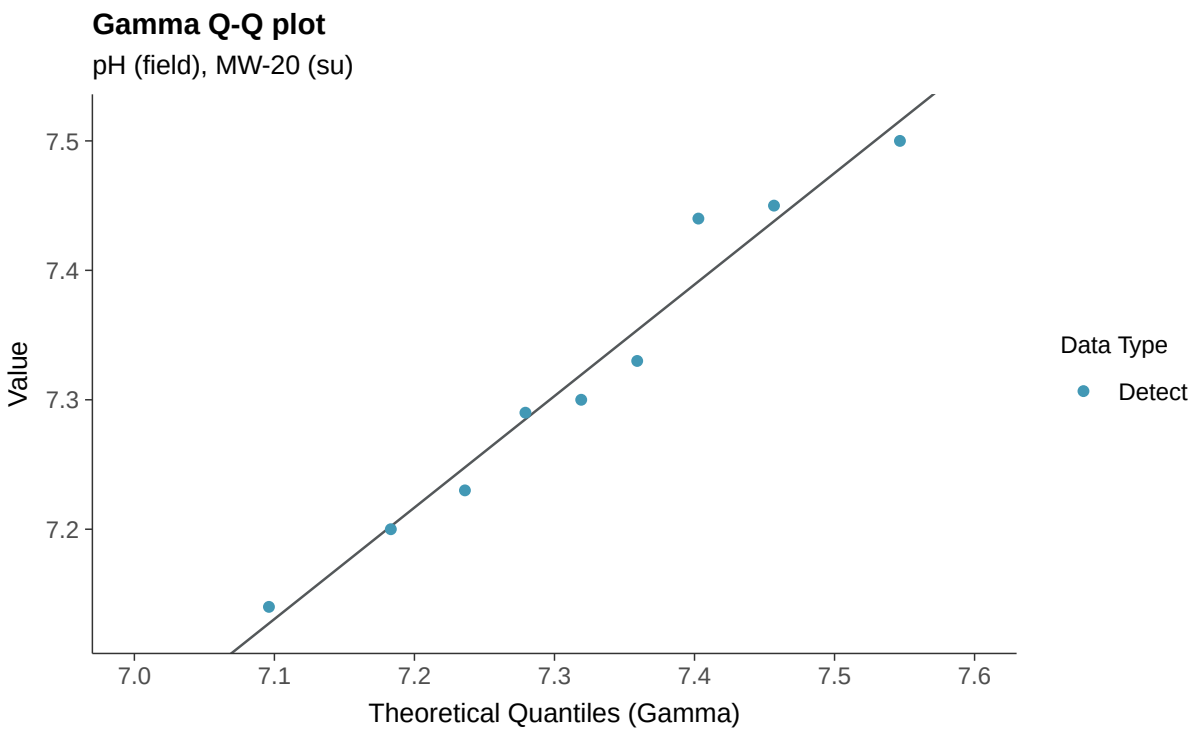
Boxplot by Season

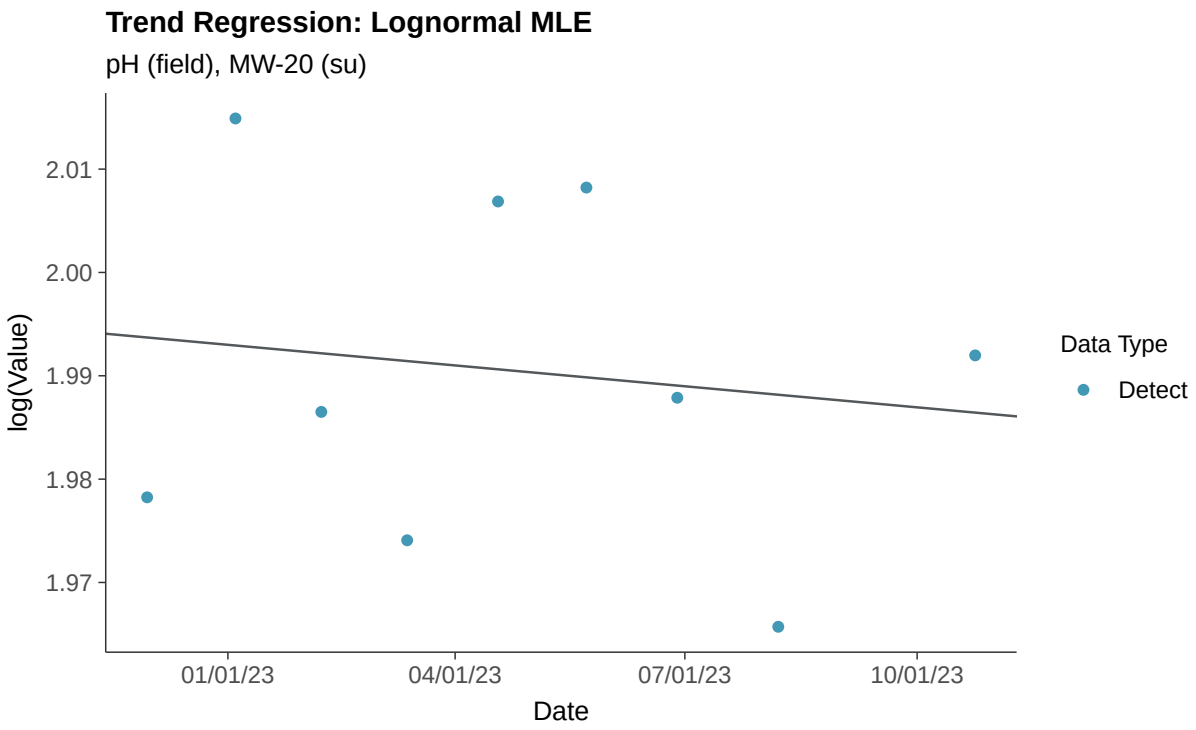
pH (field), MW-20 (su)

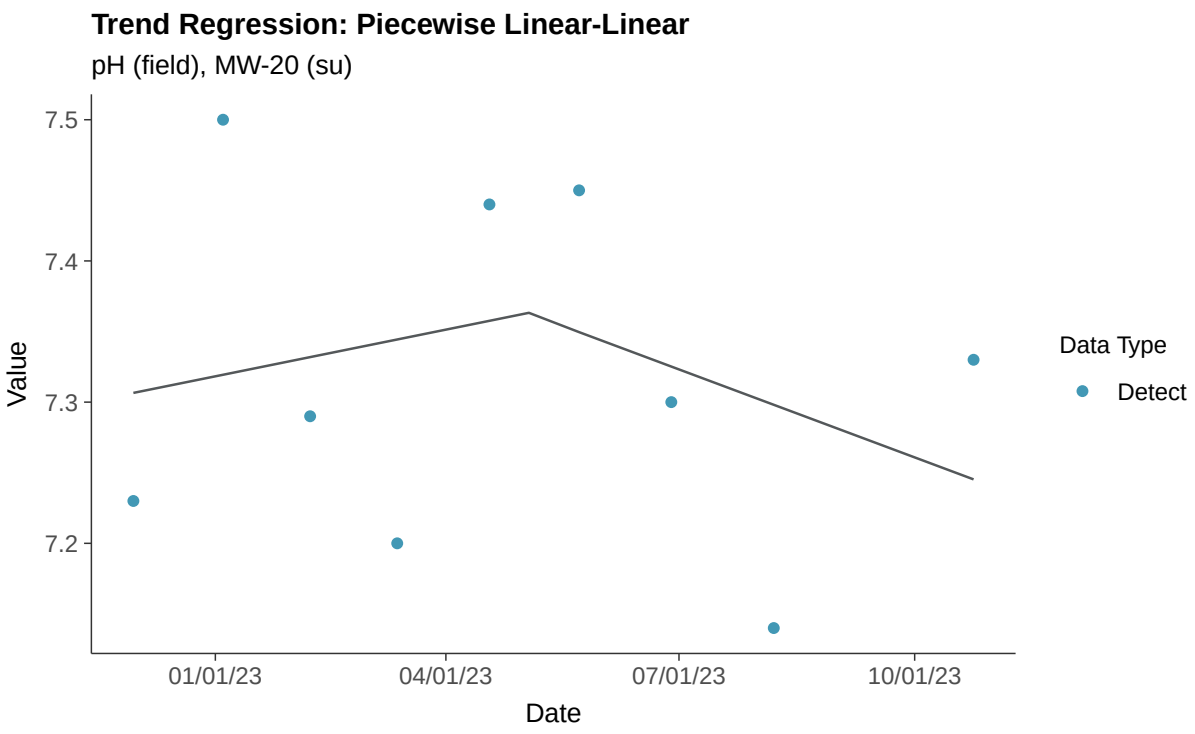



Normal Q-Q plot
pH (field), MW-20 (su)
Value
7.5
7.4
7.3
7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
pH (field), MW-20 (su)
log(Value)
2.01
2.00
1.99
1.98
1.97
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

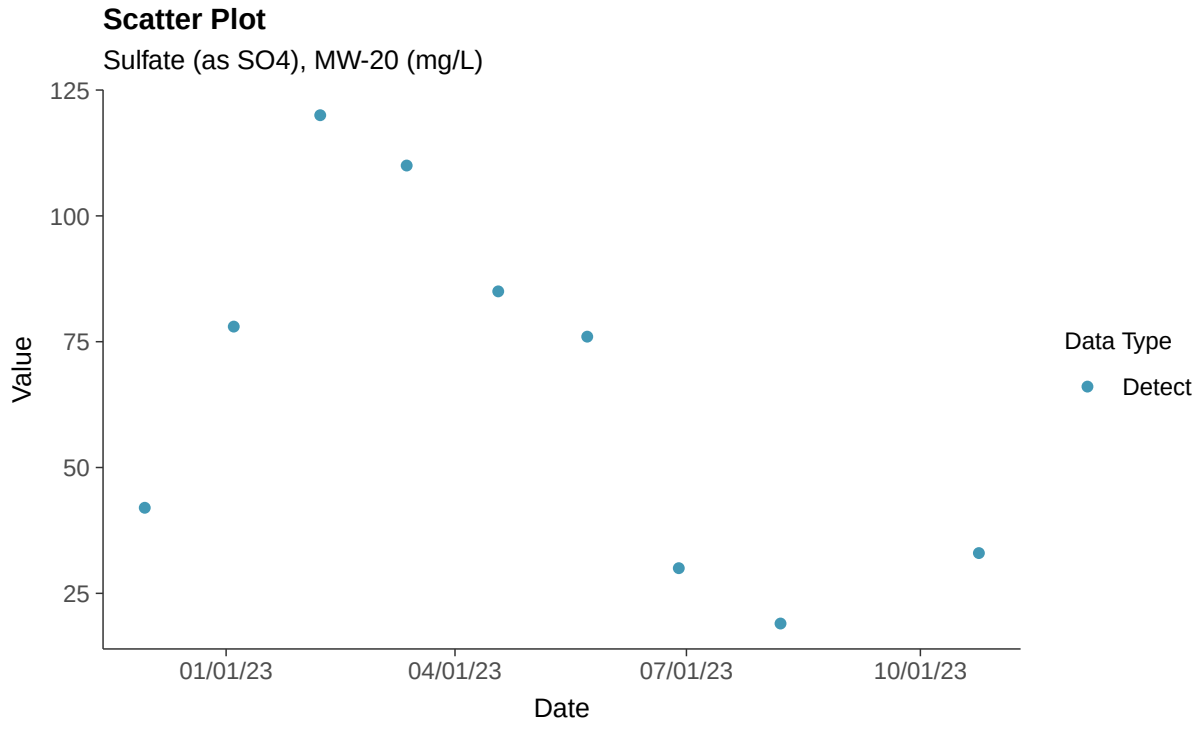

Gamma Q-Q plot
pH (field), MW-20 (su)
Value
7.5
7.4
7.3
7.2
7.0
7.1
7.2
7.3
7.4
7.5
7.6
Theoretical Quantiles (Gamma)
Data Type
Detect

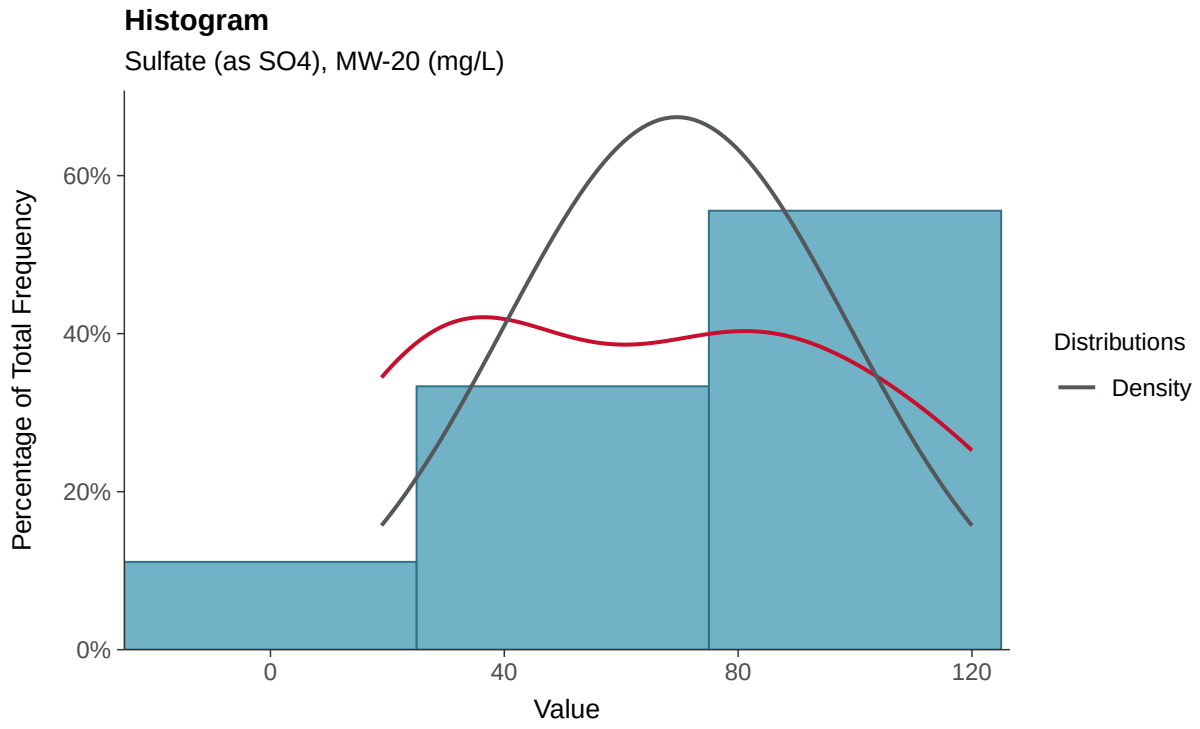

Trend Regression: Lognormal MLE
pH (field), MW-20 (su)
log(Value)
2.01
2.00
1.99
1.98
1.97
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-20 (su)
7.5
7.4
7.3
7.2
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-20

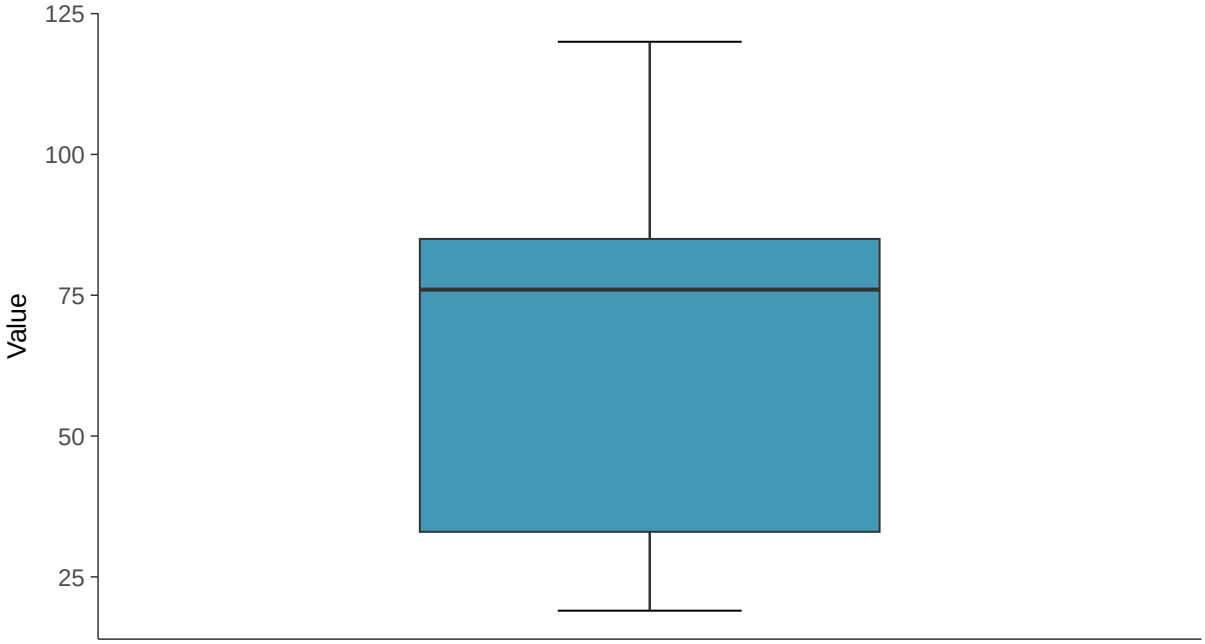
ID: 1_24_4_124





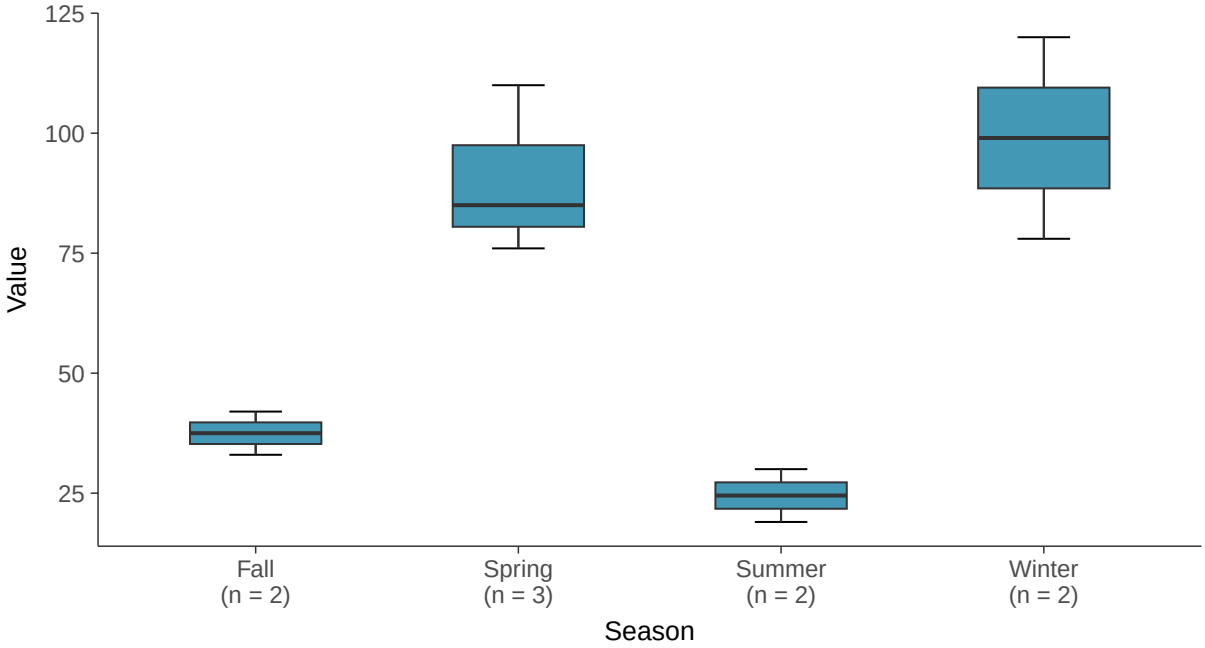
Boxplot

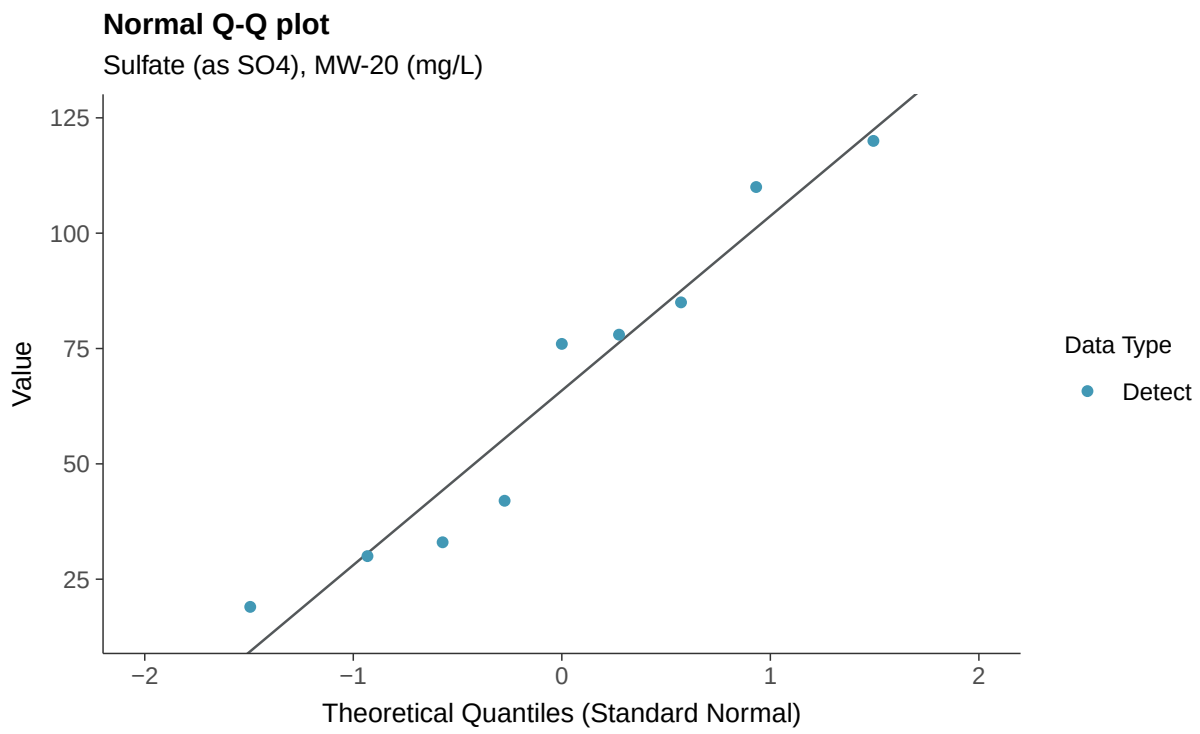
Sulfate (as SO4), MW-20 (mg/L)

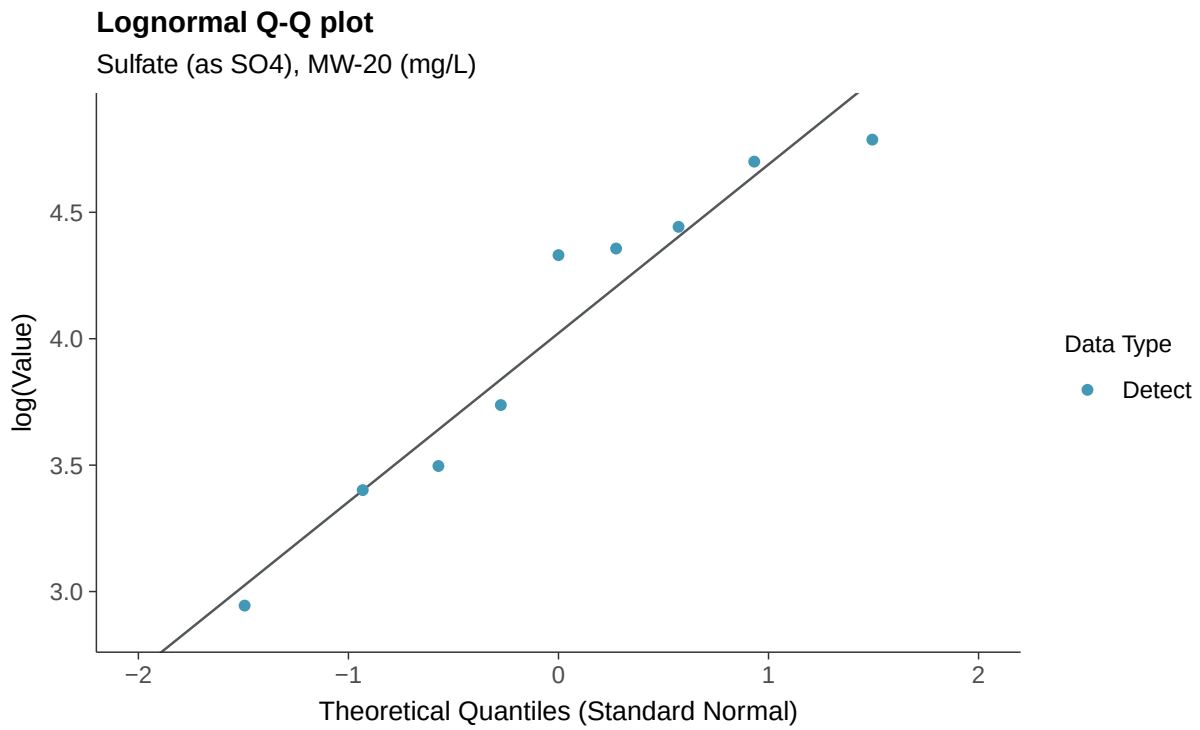


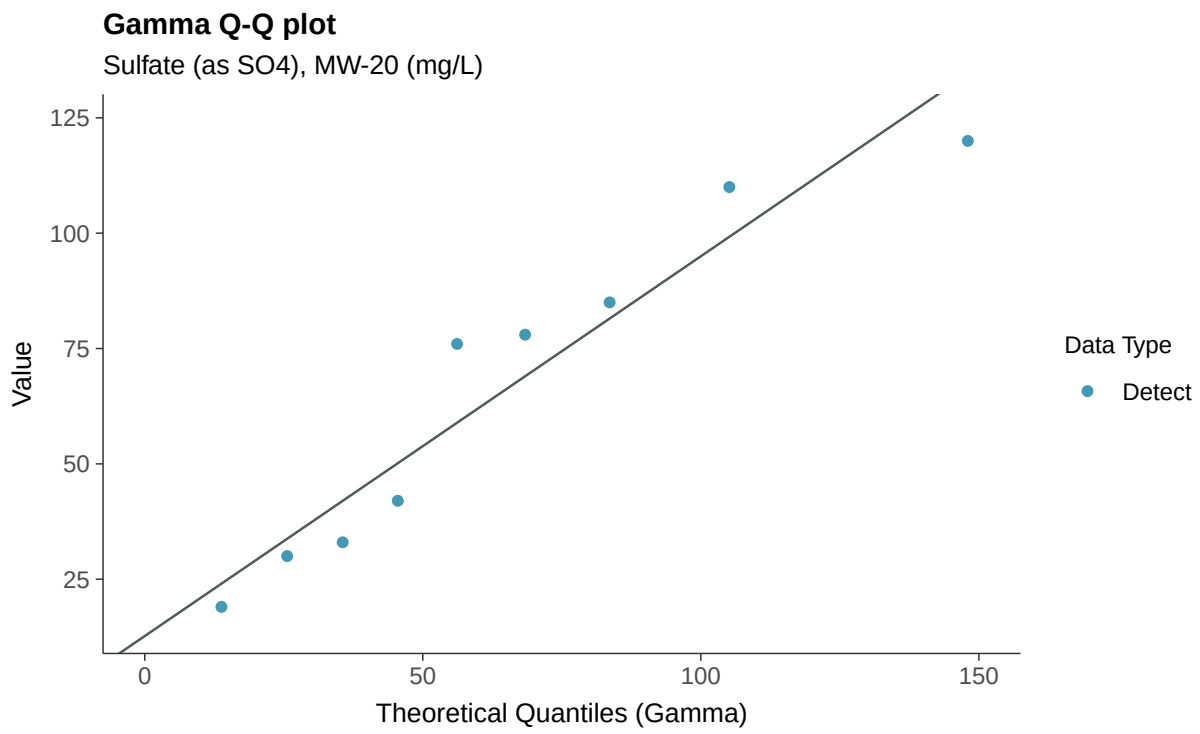
Boxplot by Season

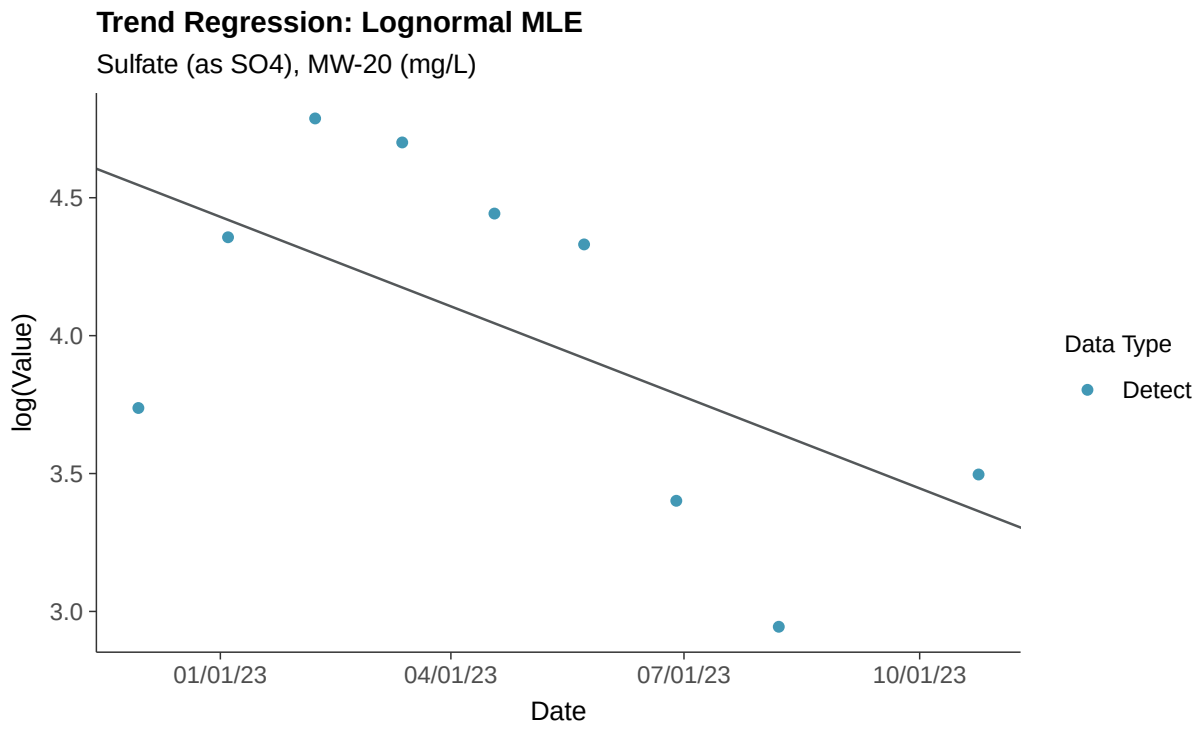
Sulfate (as SO4), MW-20 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-20 (mg/L)
Value
125
100
75
50
25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

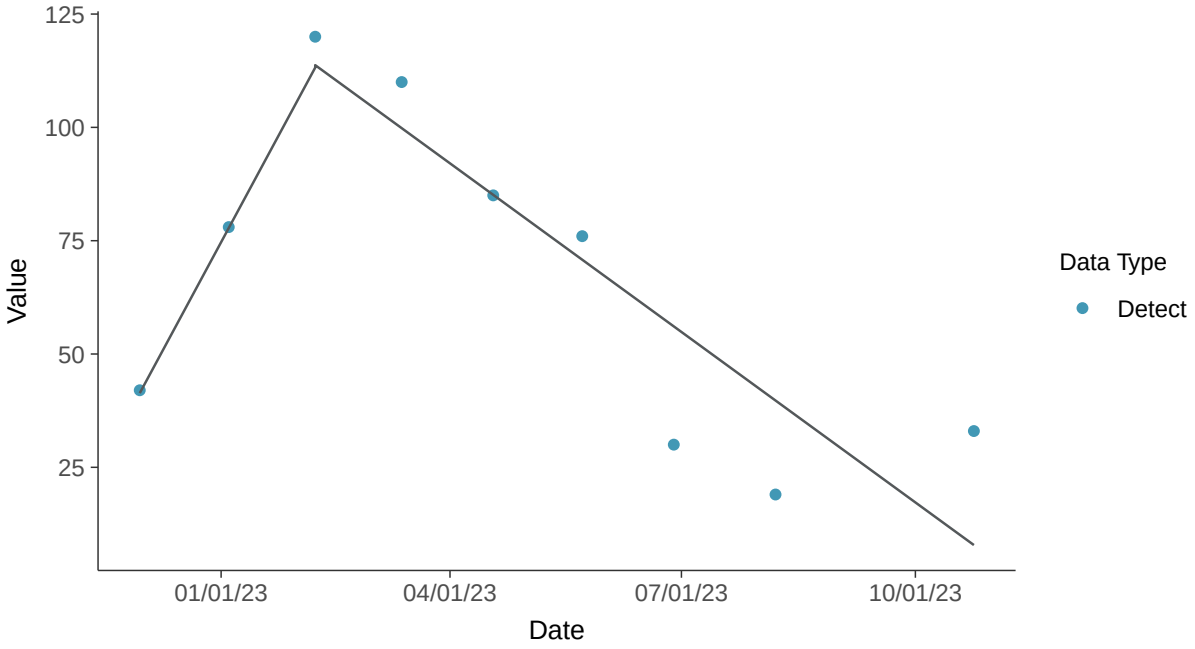

Lognormal Q-Q plot
Sulfate (as SO4), MW-20 (mg/L)
log(Value)
4.5
4.0
3.5
3.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-20 (mg/L)
Value
125
100
75
50
25
0
50
100
150
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-20 (mg/L)
log(Value)
4.5
4.0
3.5
3.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

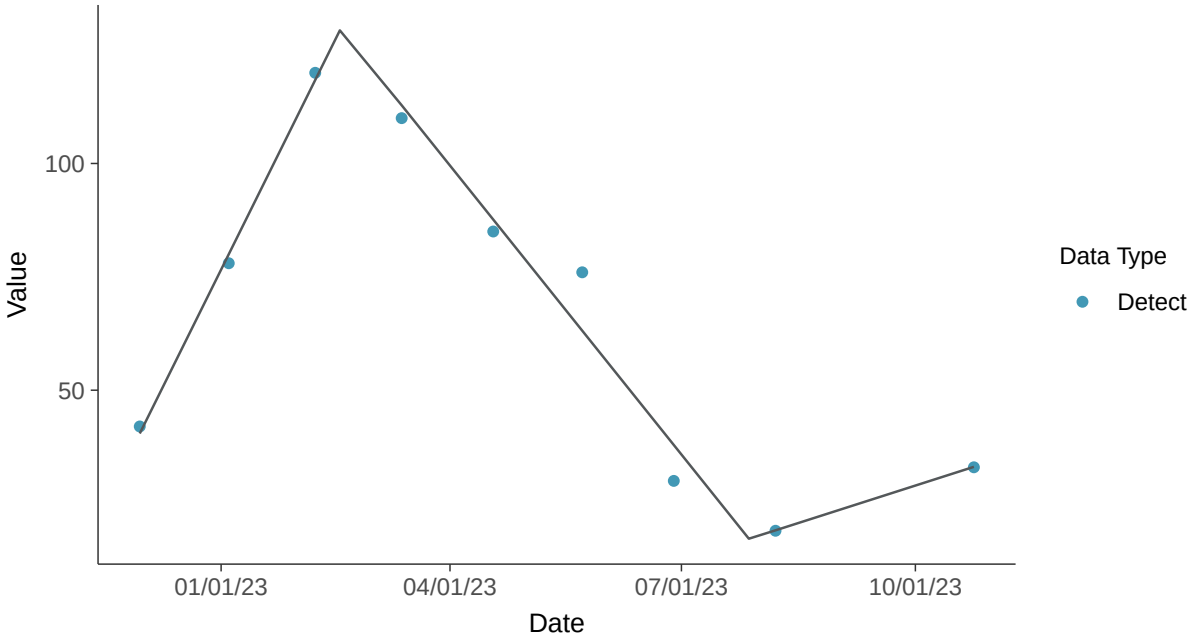
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-20 (mg/L)



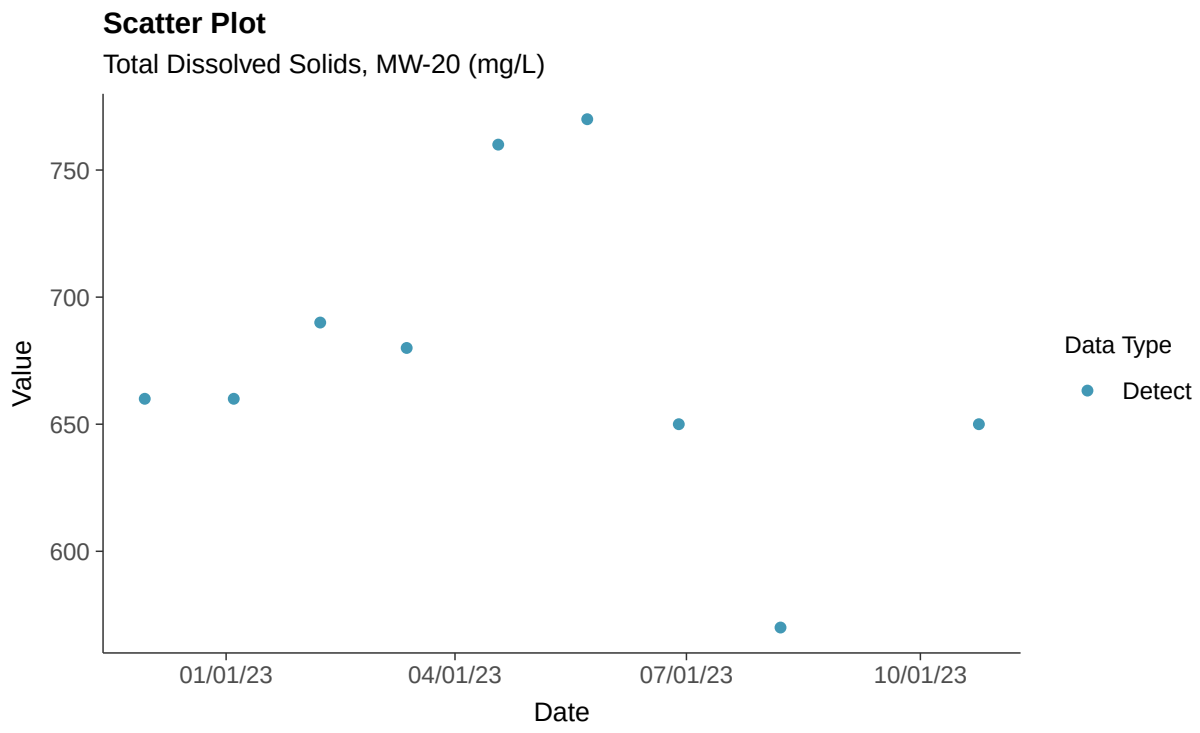
Trend Regression: Piecewise Linear-Linear-Linear

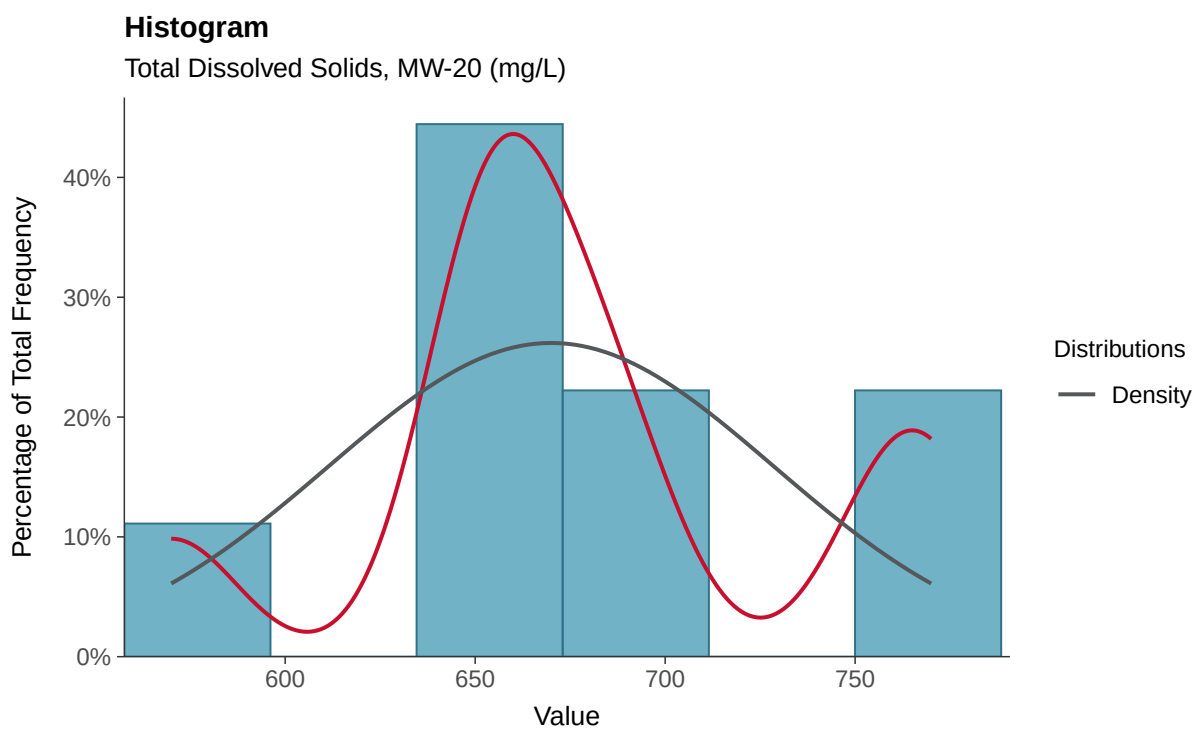
Sulfate (as SO4), MW-20 (mg/L)



Appendix III: Total Dissolved Solids, MW-20

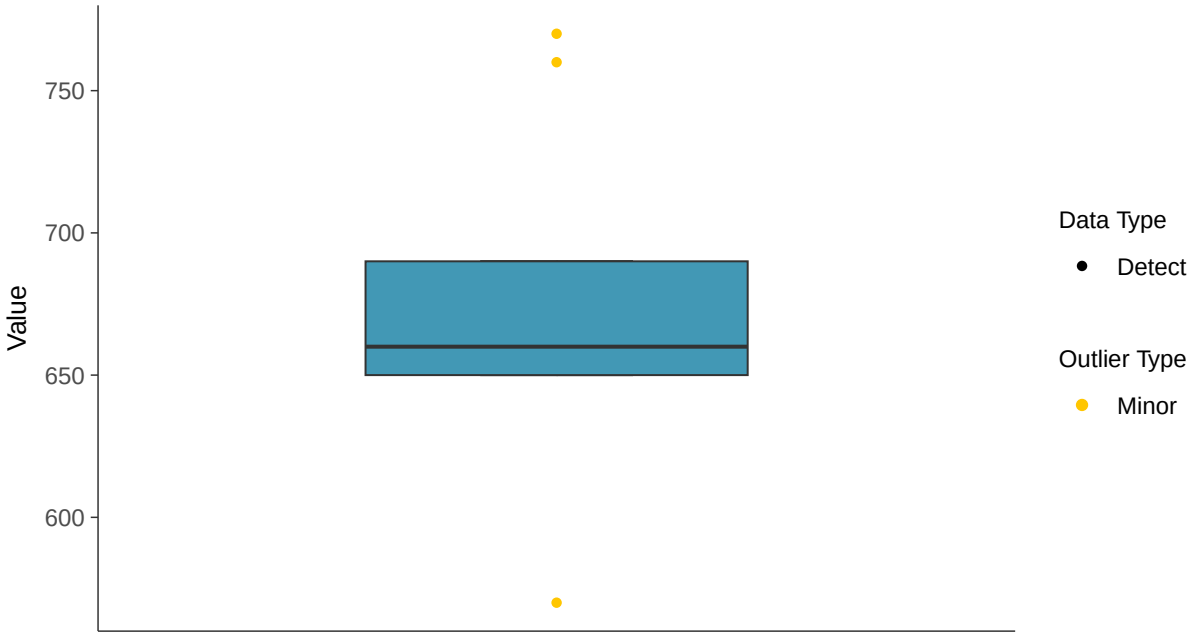
ID: 1_24_4_126





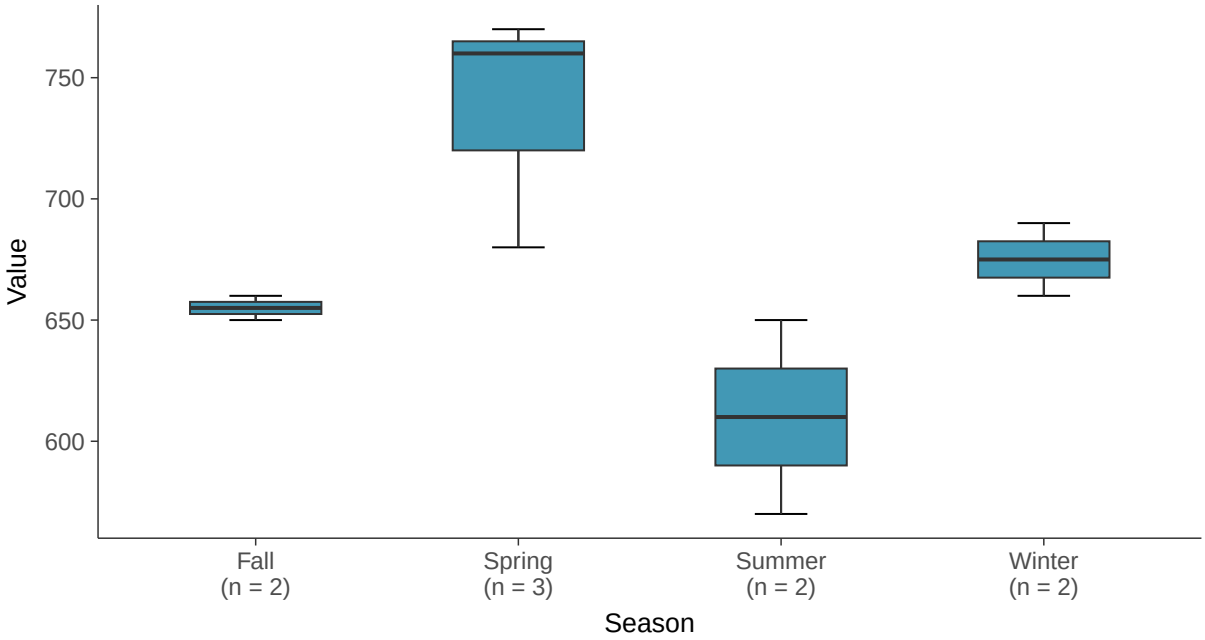
Boxplot

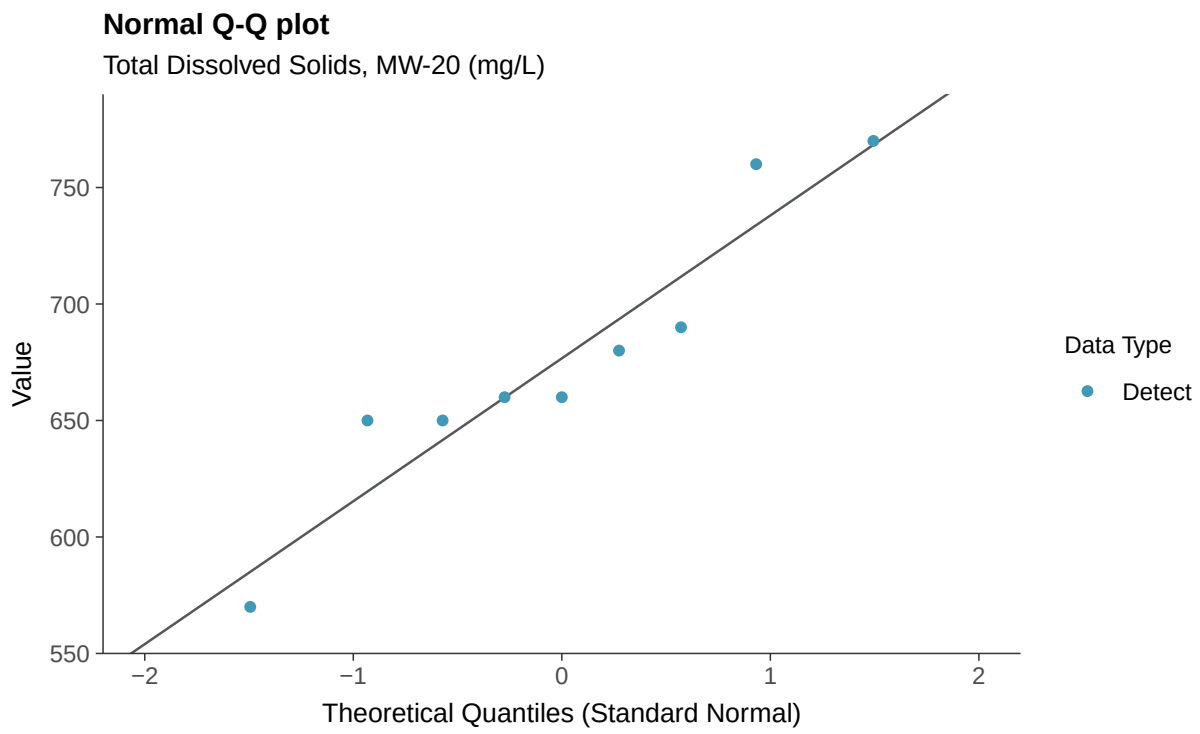
Total Dissolved Solids, MW-20 (mg/L)

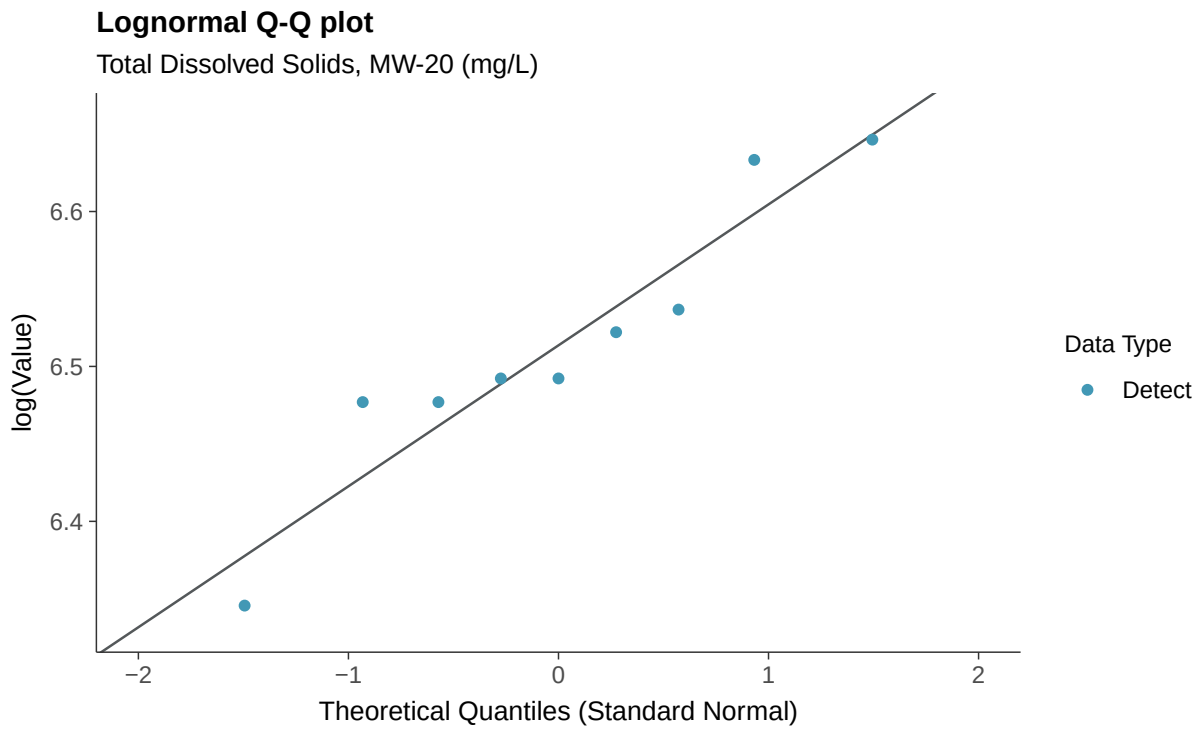


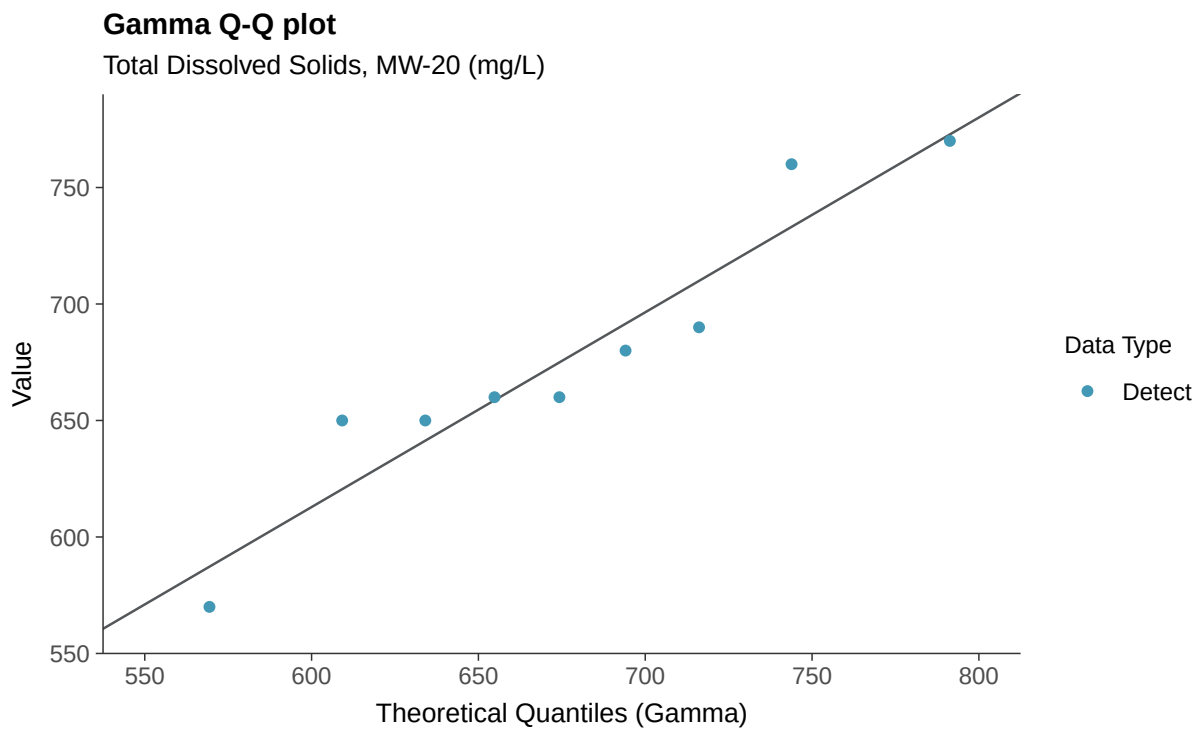
Boxplot by Season

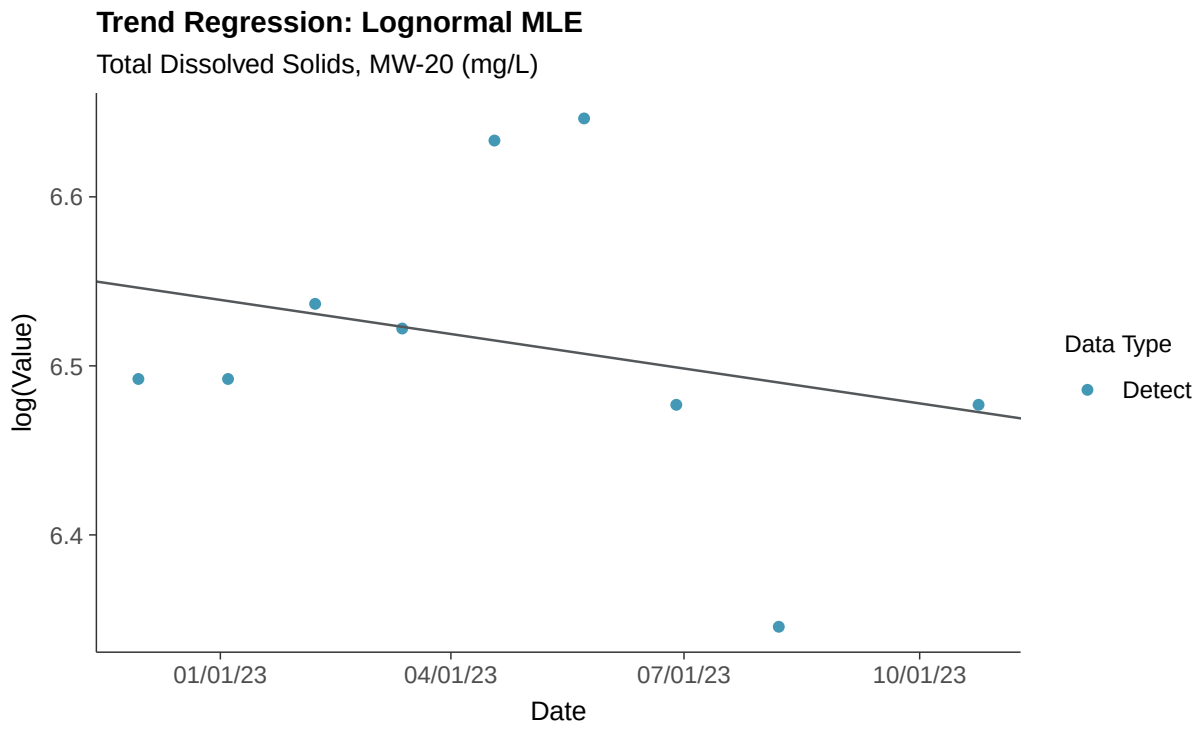
Total Dissolved Solids, MW-20 (mg/L)

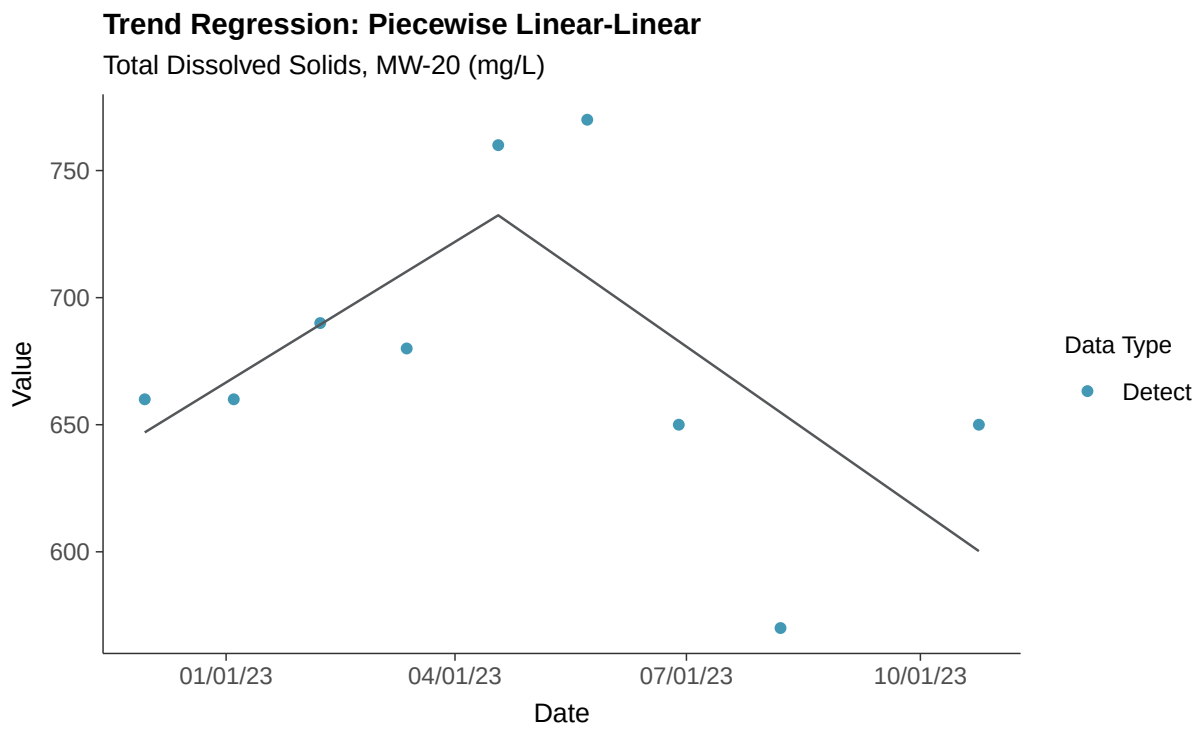



Normal Q-Q plot
Total Dissolved Solids, MW-20 (mg/L)
Value
750
700
650
600
550
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Total Dissolved Solids, MW-20 (mg/L)
log(Value)
6.6
6.5
6.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

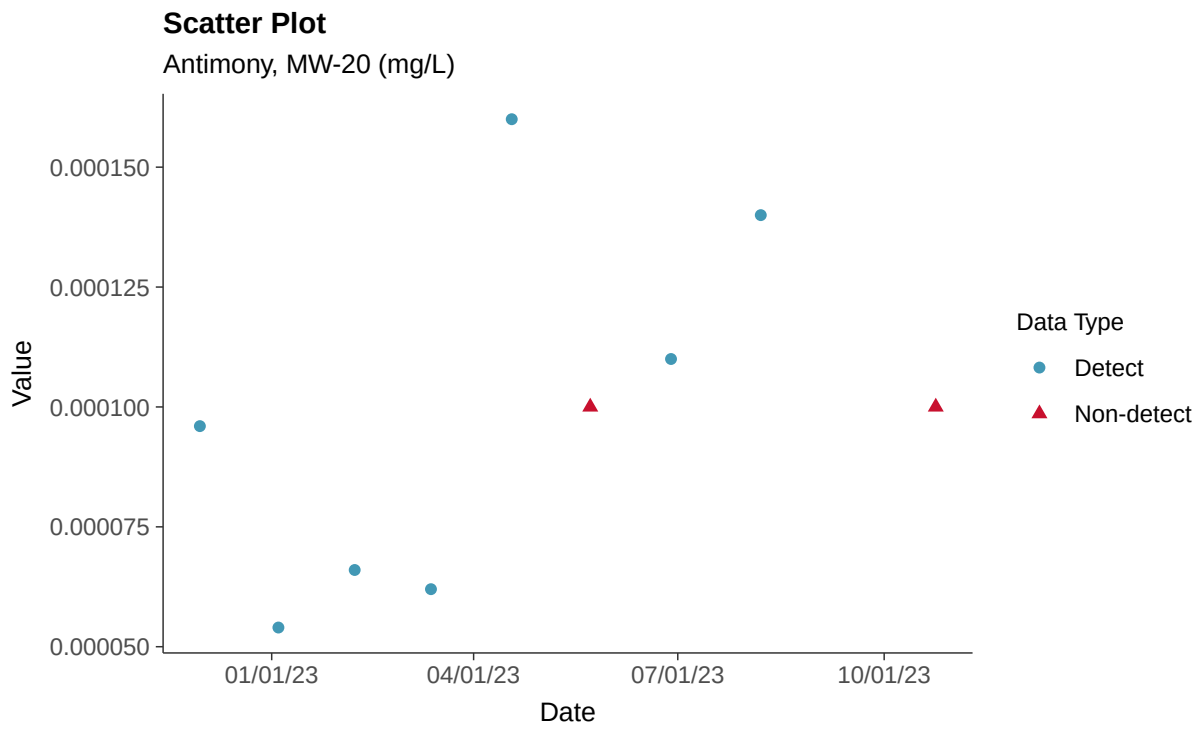

Gamma Q-Q plot
Total Dissolved Solids, MW-20 (mg/L)
Value
750
700
650
600
550
550
600
650
700
750
800
Theoretical Quantiles (Gamma)
Data Type
Detect

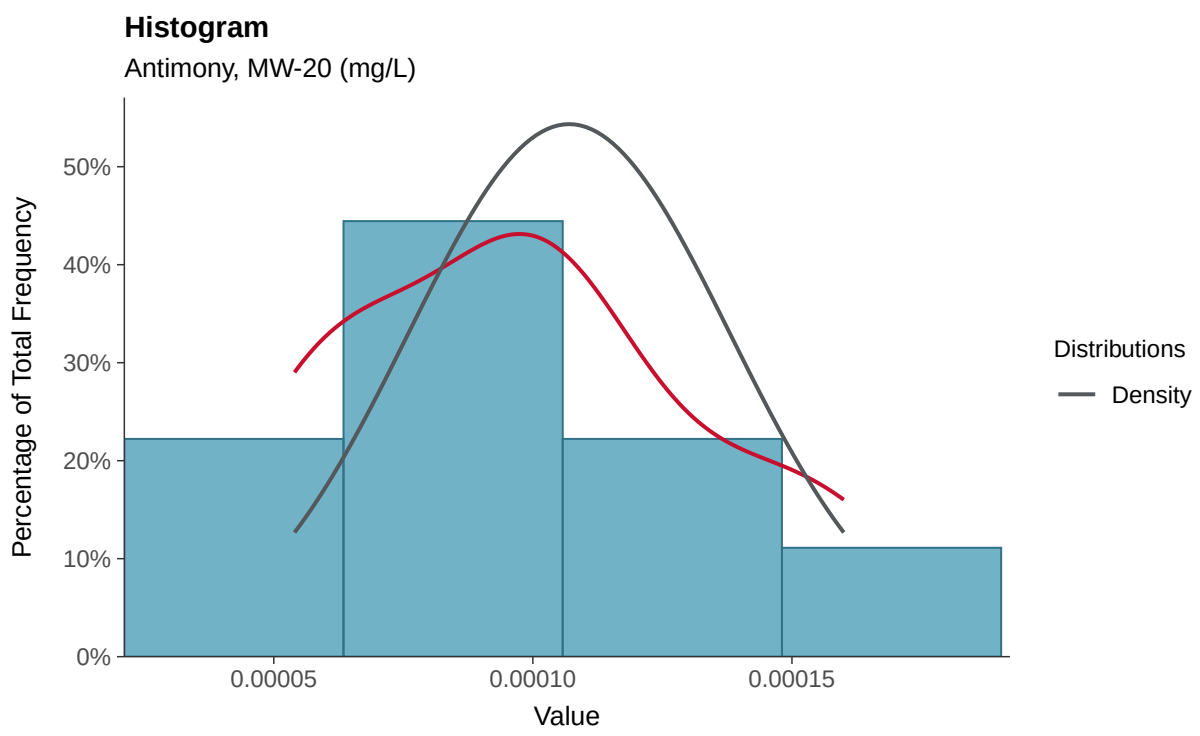

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-20 (mg/L)
log(Value)
6.6
6.5
6.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-20 (mg/L)
Value
750
700
650
600
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-20

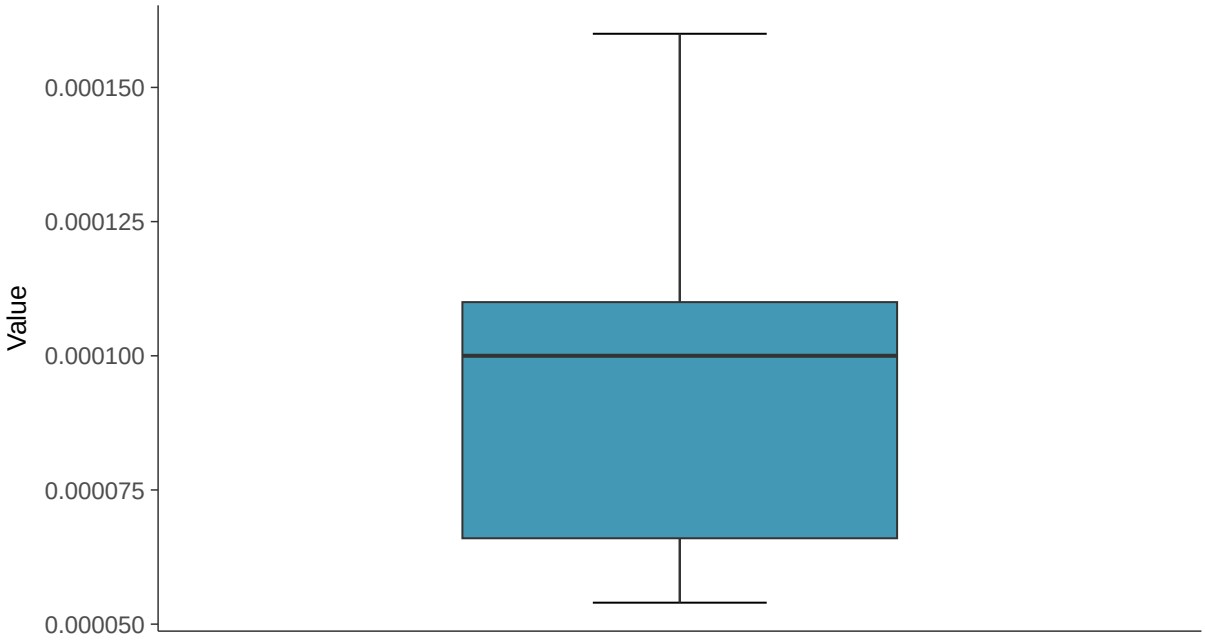
ID: 1_24_5_101





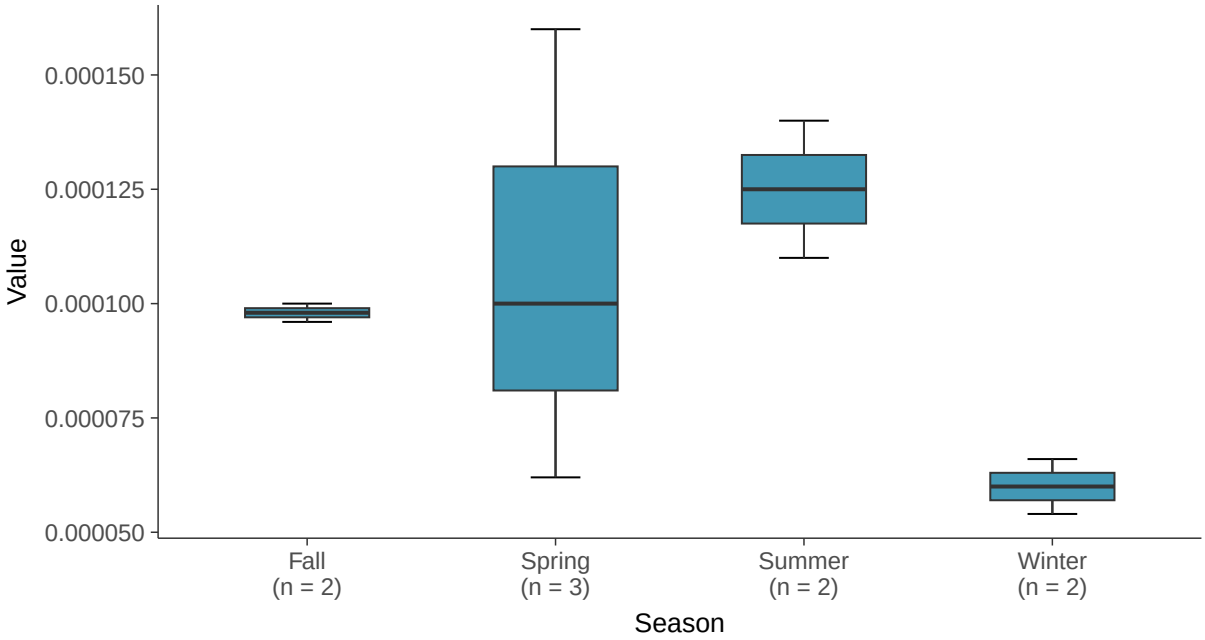
Boxplot

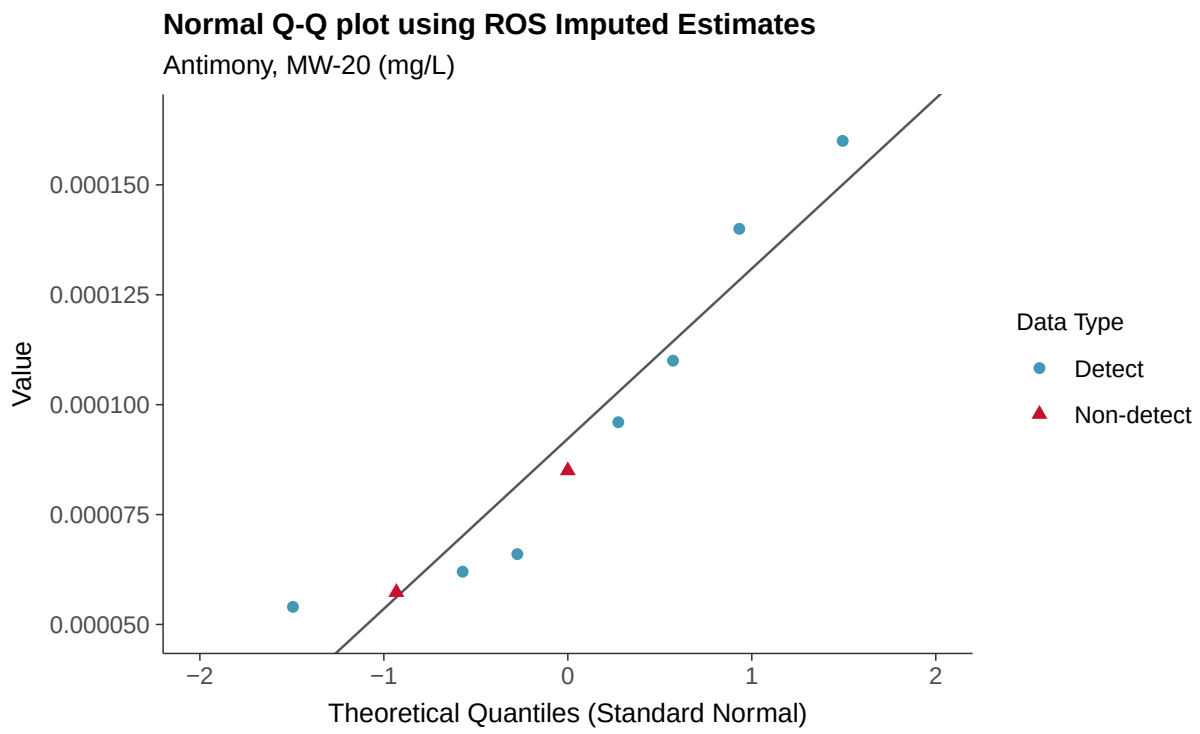
Antimony, MW-20 (mg/L)

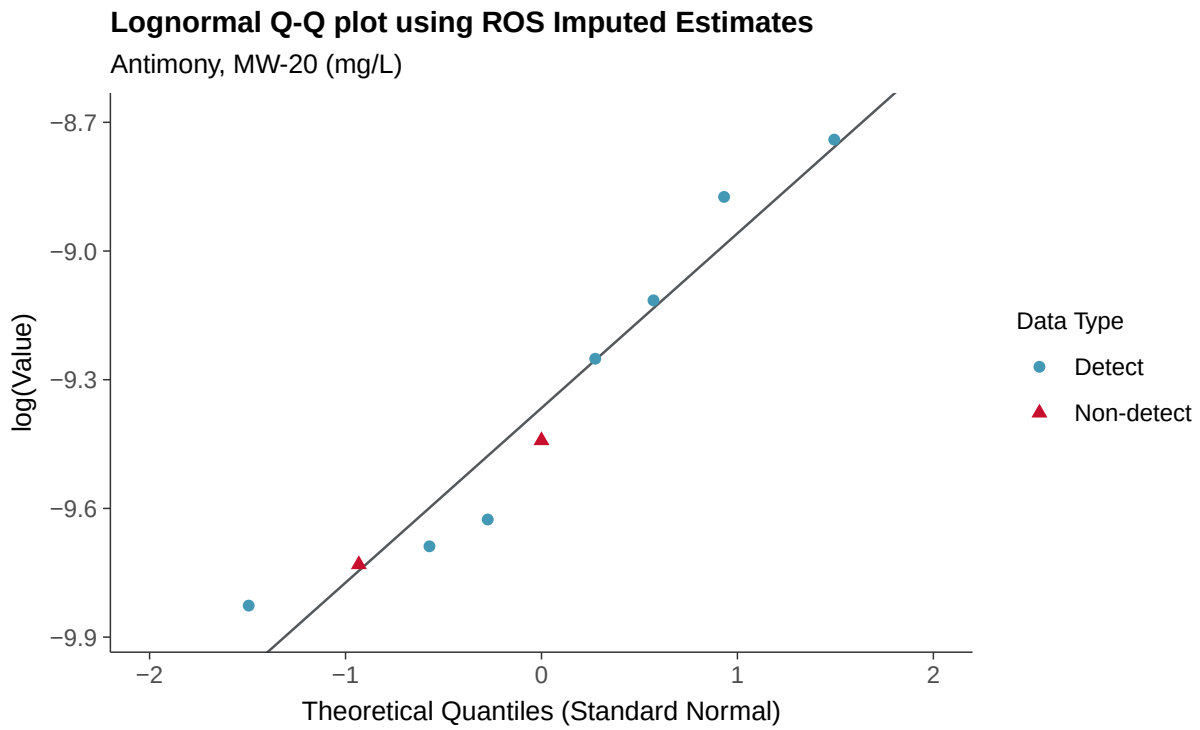


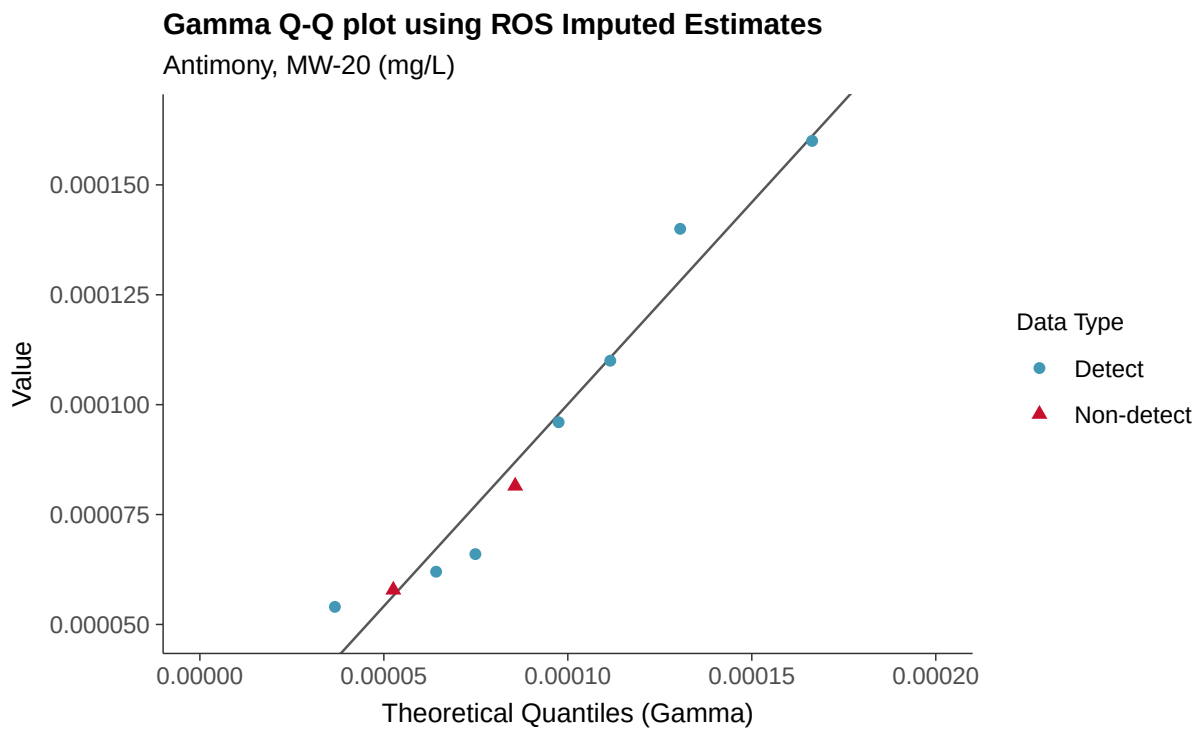
Boxplot by Season

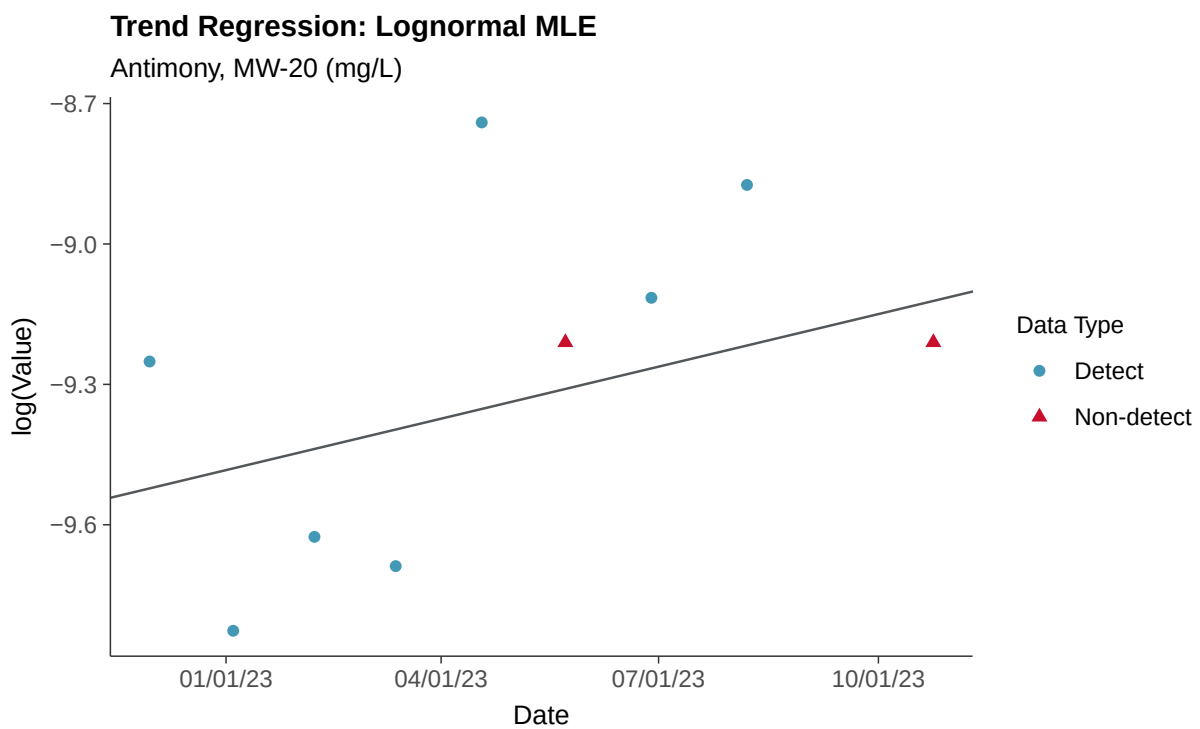
Antimony, MW-20 (mg/L)

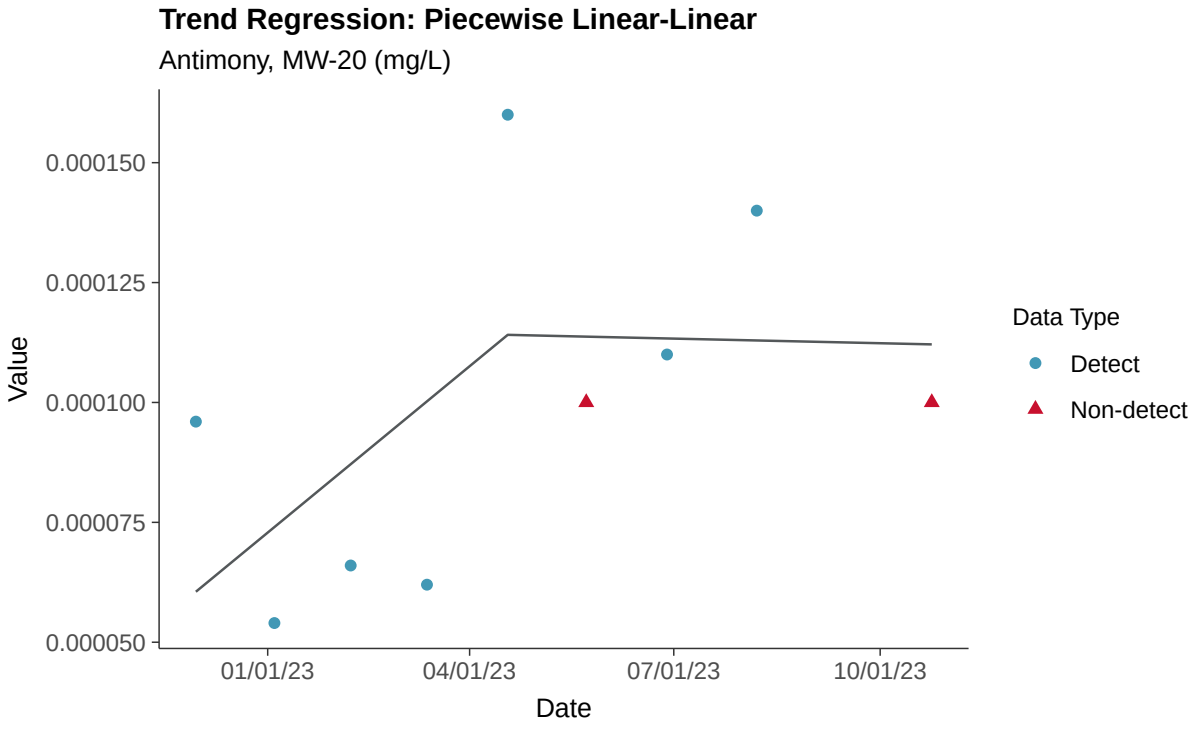



Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-20 (mg/L)
Value
0.000150
0.000125
0.000100
0.000075
0.000050
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Antimony, MW-20 (mg/L)
log(Value)
−8.7
−9.0
−9.3
−9.6
−9.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

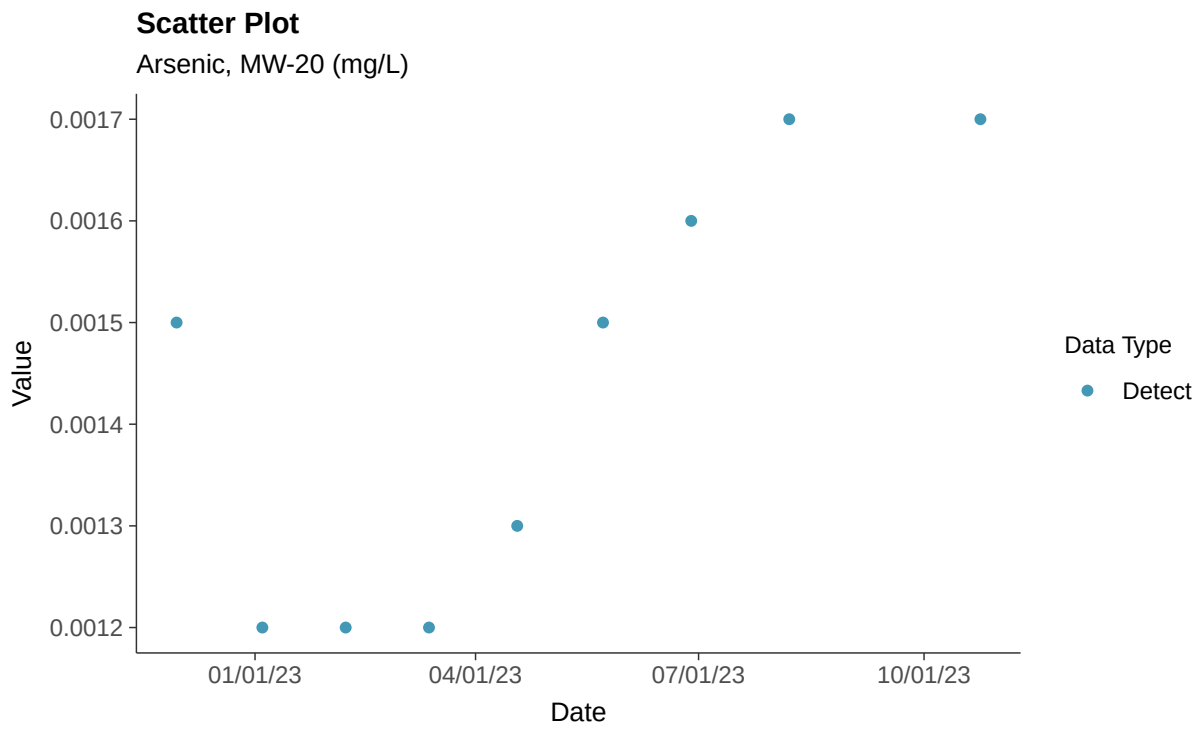

Gamma Q-Q plot using ROS Imputed Estimates
Antimony, MW-20 (mg/L)
Value
0.000150
0.000125
0.000100
0.000075
0.000050
0.00000
0.00005
0.00010
0.00015
0.00020
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

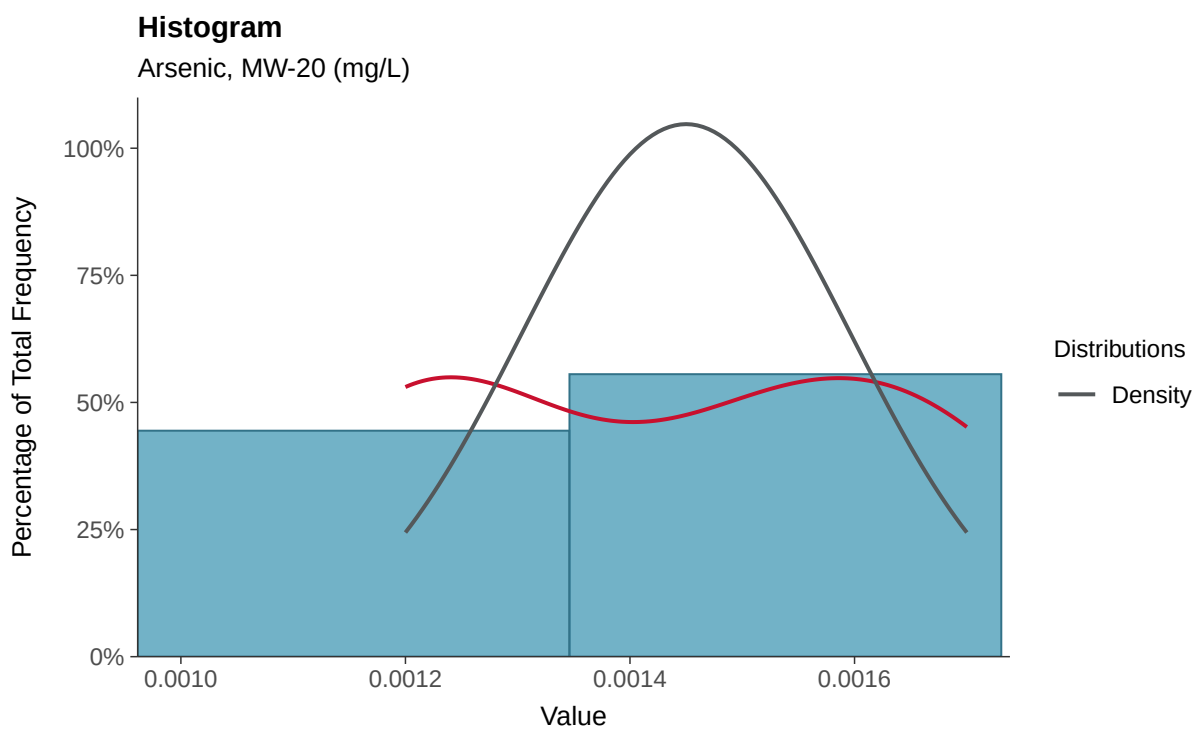

Trend Regression: Lognormal MLE
Antimony, MW-20 (mg/L)
log(Value)
−8.7
−9.0
−9.3
−9.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Antimony, MW-20 (mg/L)
Value
0.000150
0.000125
0.000100
0.000075
0.000050
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-20

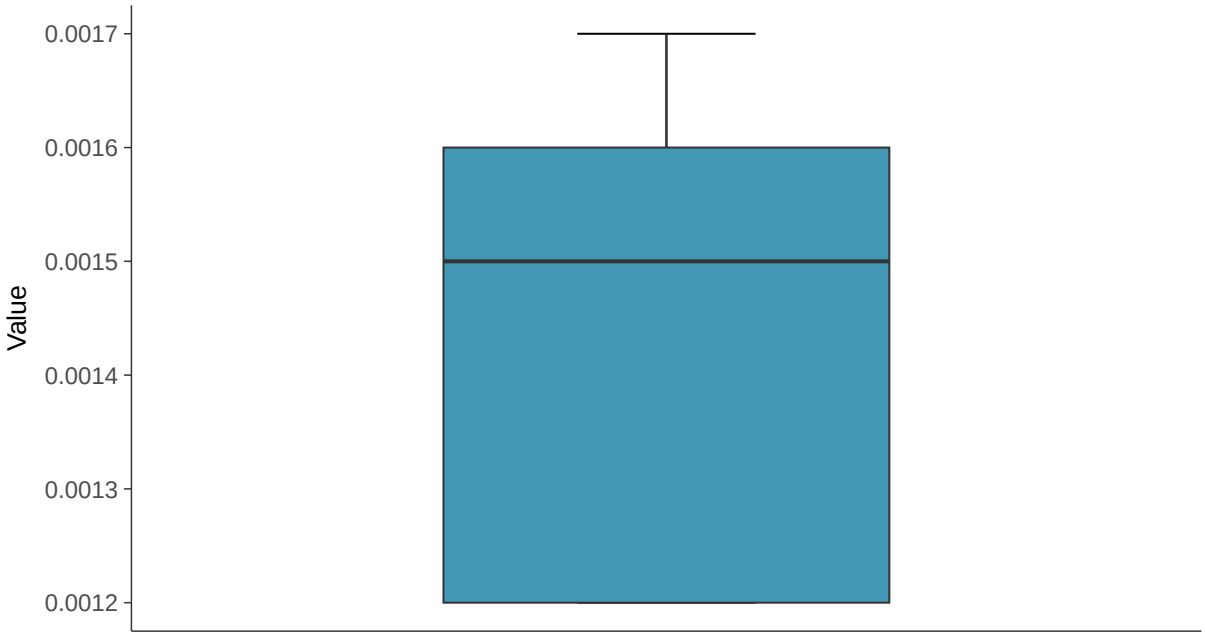
ID: 1_24_5_102





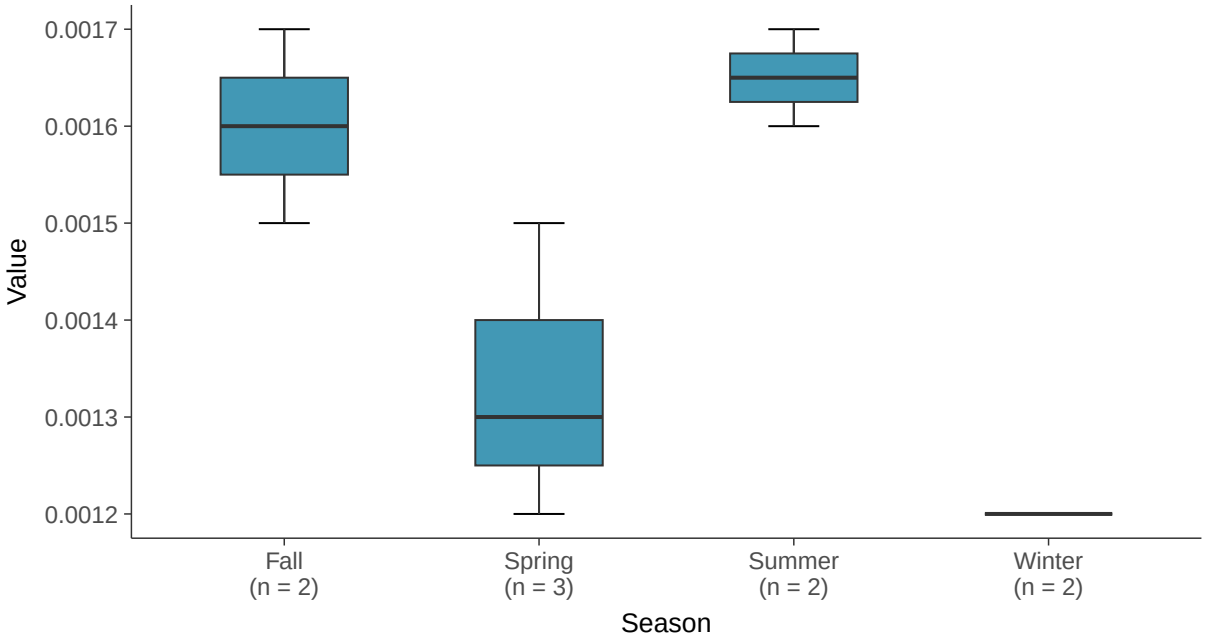
Boxplot

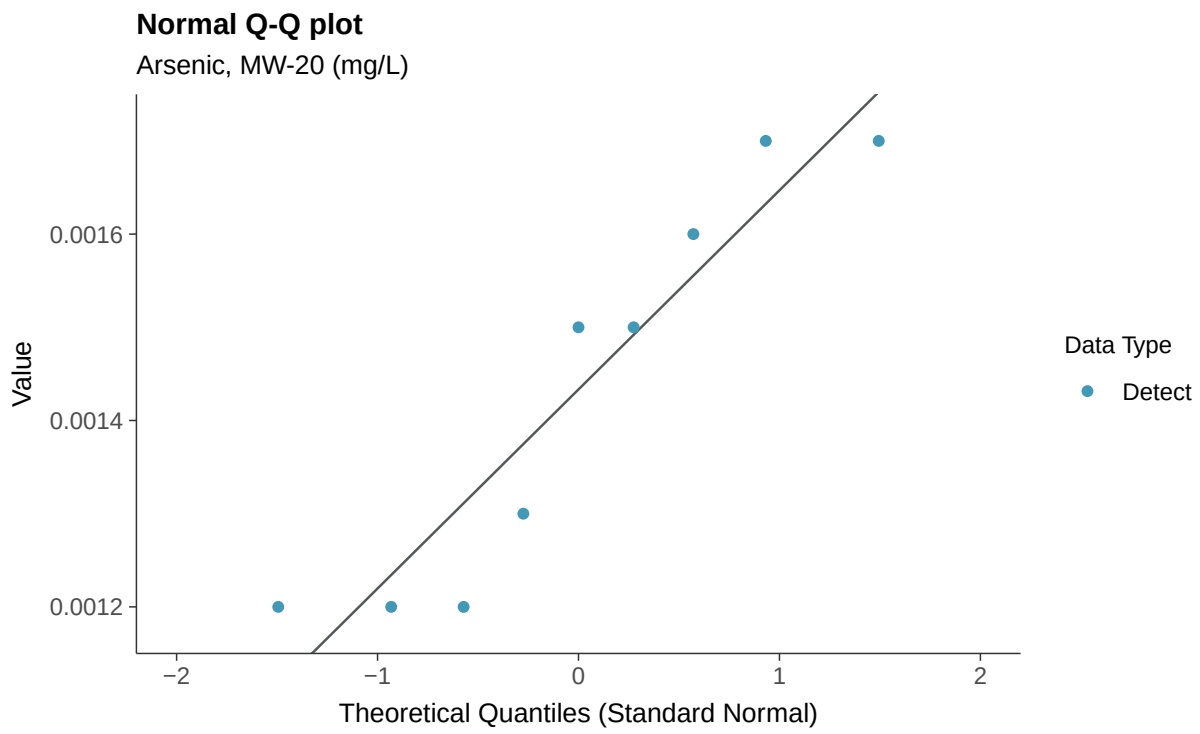
Arsenic, MW-20 (mg/L)

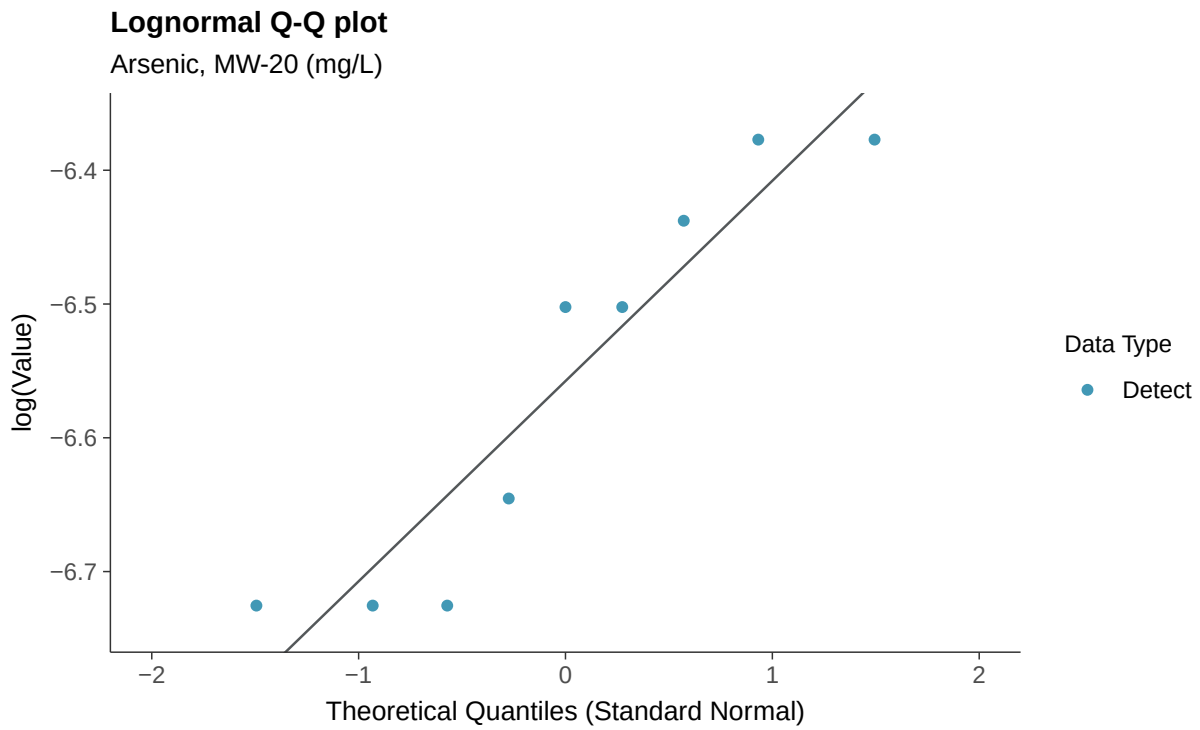


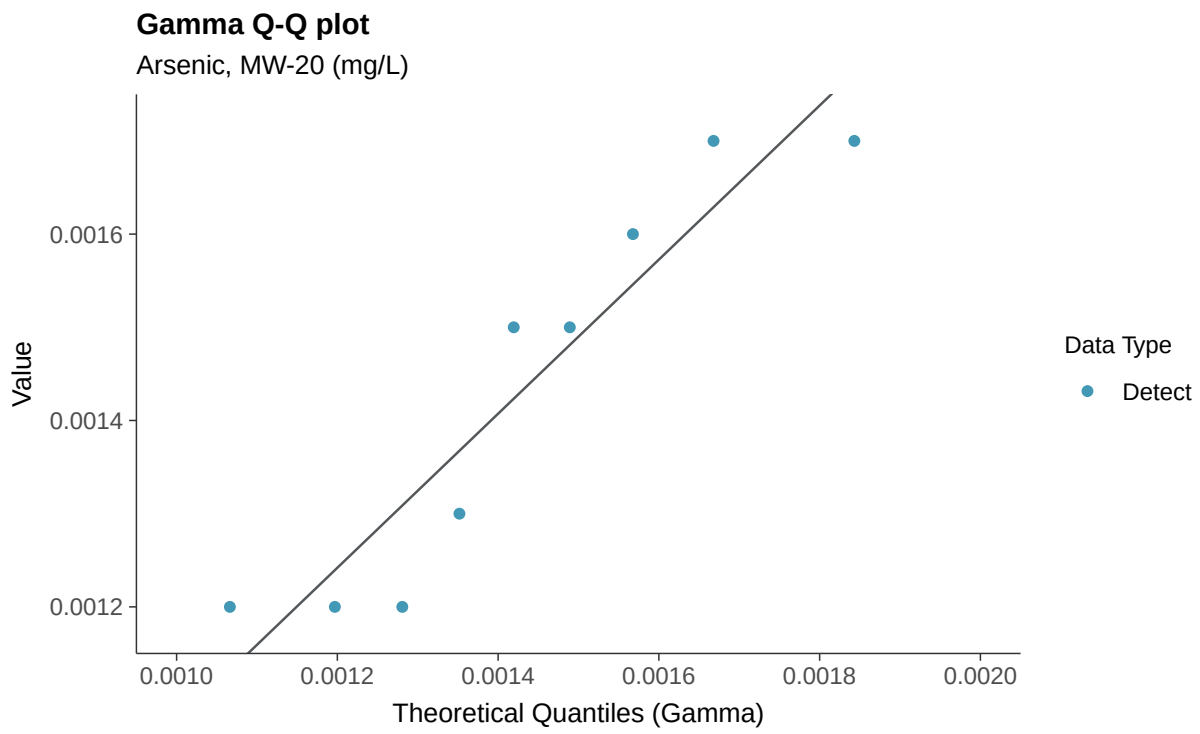
Boxplot by Season

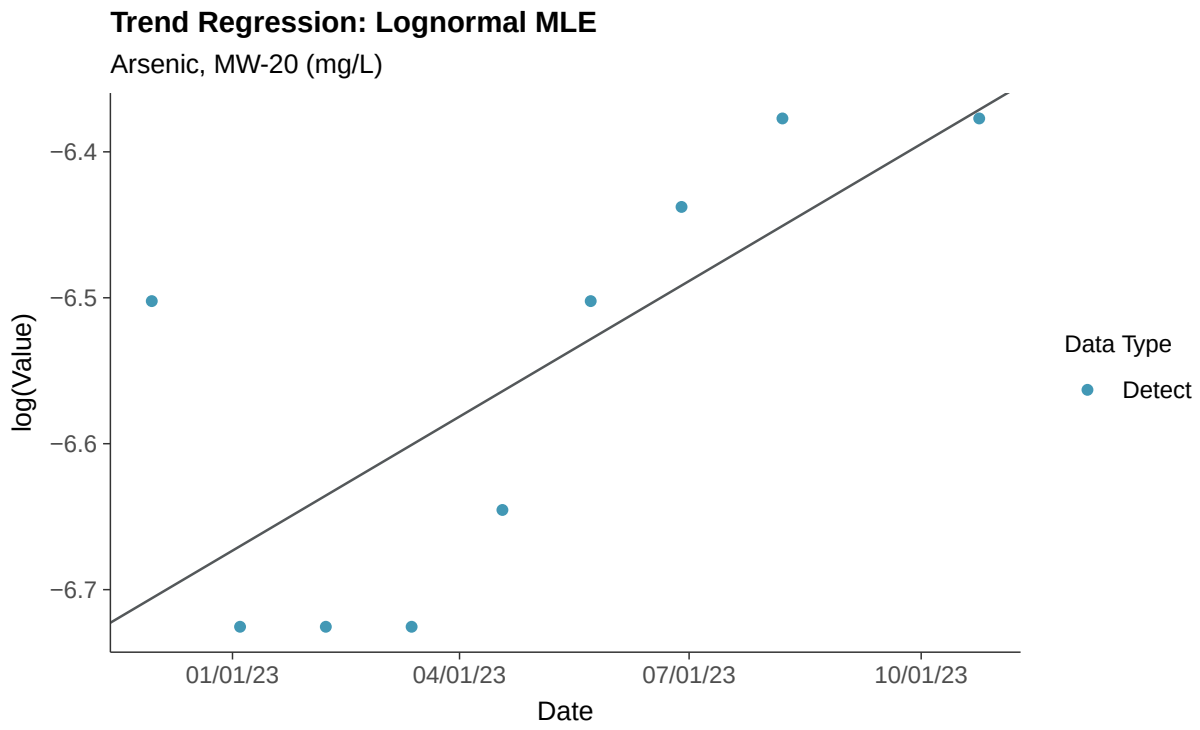
Arsenic, MW-20 (mg/L)

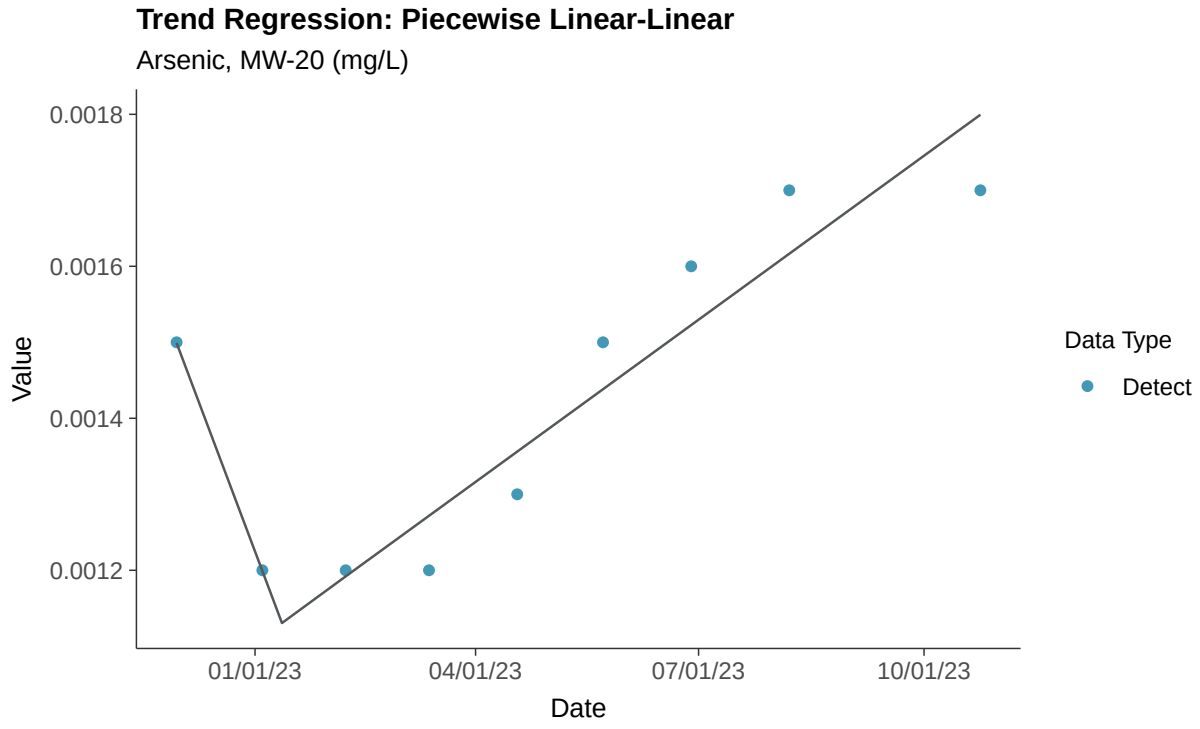


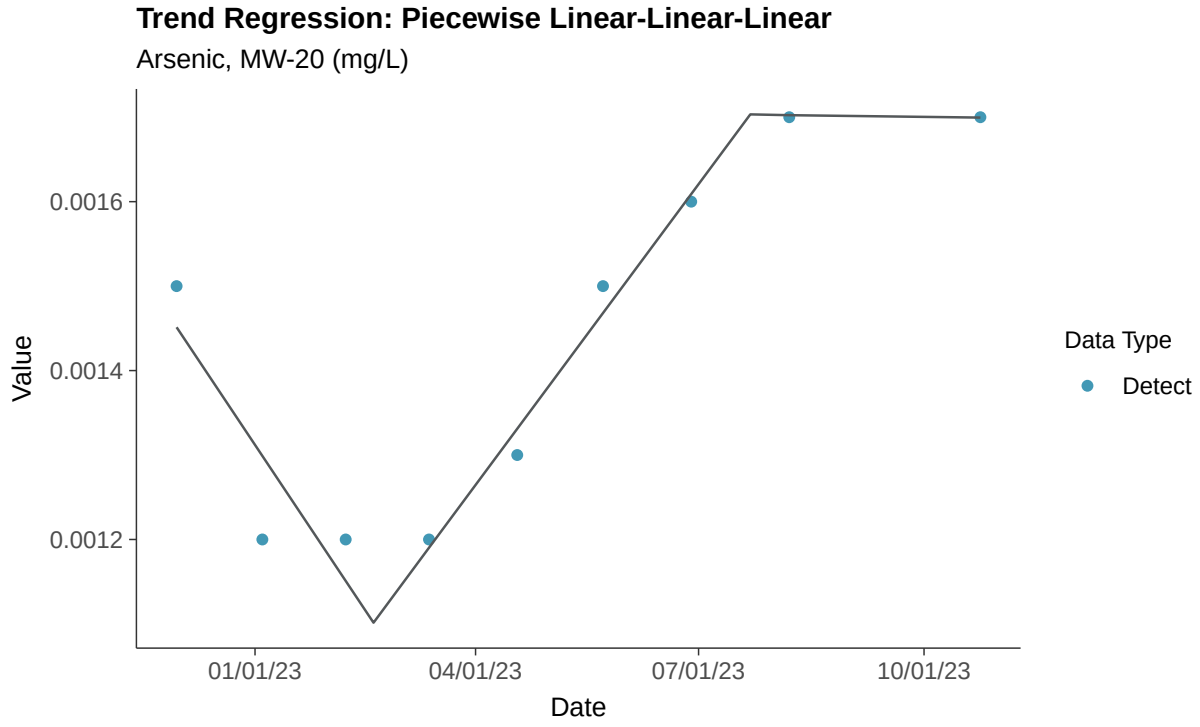

Normal Q-Q plot
Arsenic, MW-20 (mg/L)
Value
0.0016
0.0014
0.0012
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Arsenic, MW-20 (mg/L)
log(Value)
−6.4
−6.5
−6.6
−6.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-20 (mg/L)
Value
0.0016
0.0014
0.0012
0.0010
0.0012
0.0014
0.0016
0.0018
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect

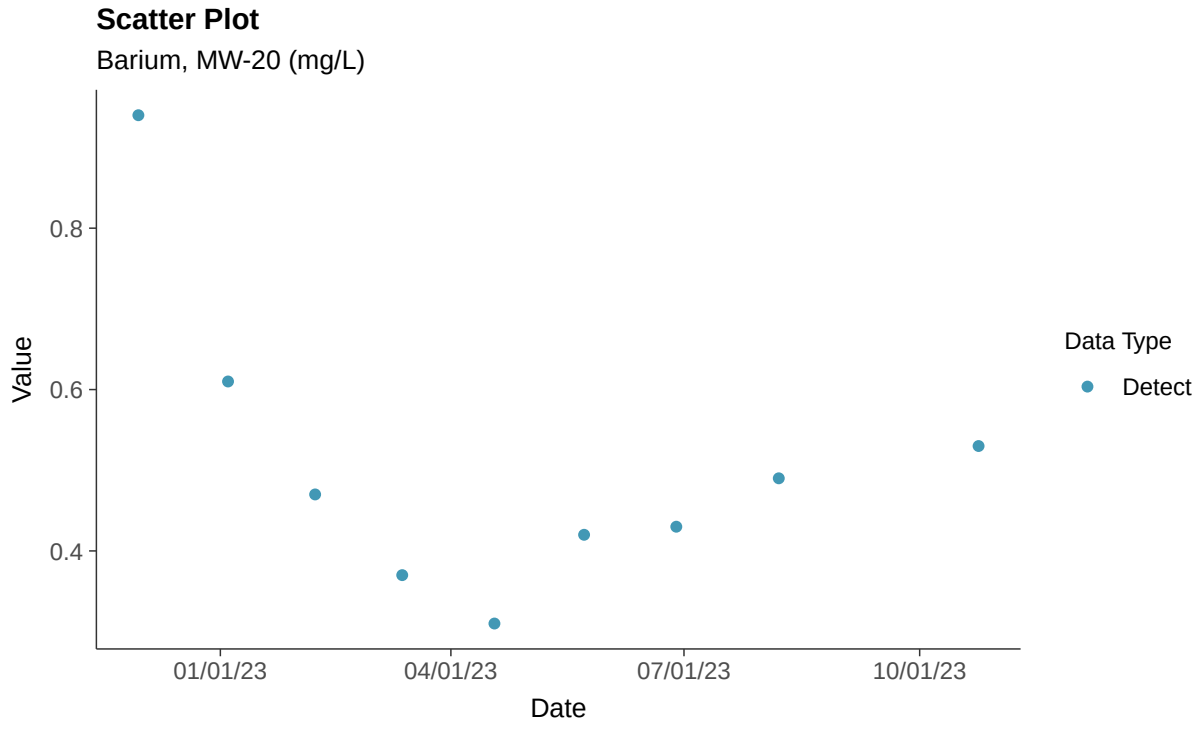

Trend Regression: Lognormal MLE
Arsenic, MW-20 (mg/L)
log(Value)
−6.4
−6.5
−6.6
−6.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

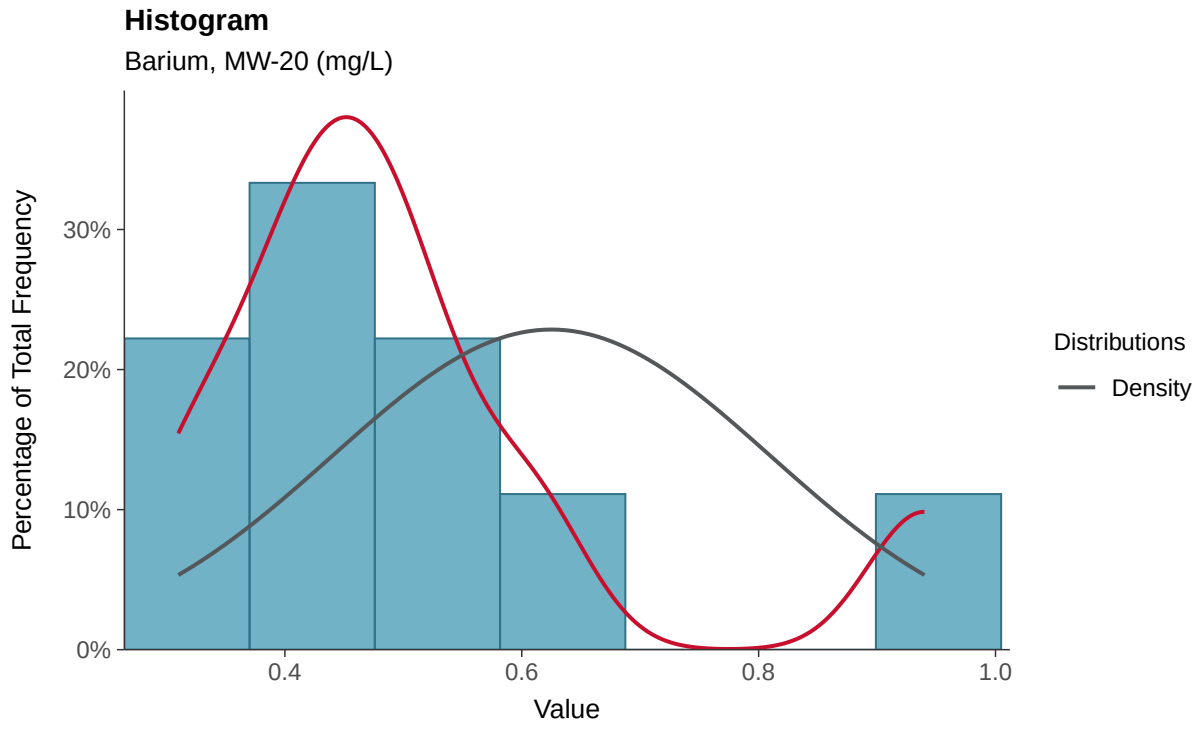

Trend Regression: Piecewise Linear-Linear
Arsenic, MW-20 (mg/L)
0.0018
0.0016
0.0014
0.0012
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Arsenic, MW-20 (mg/L)
0.0016
0.0014
0.0012
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-20

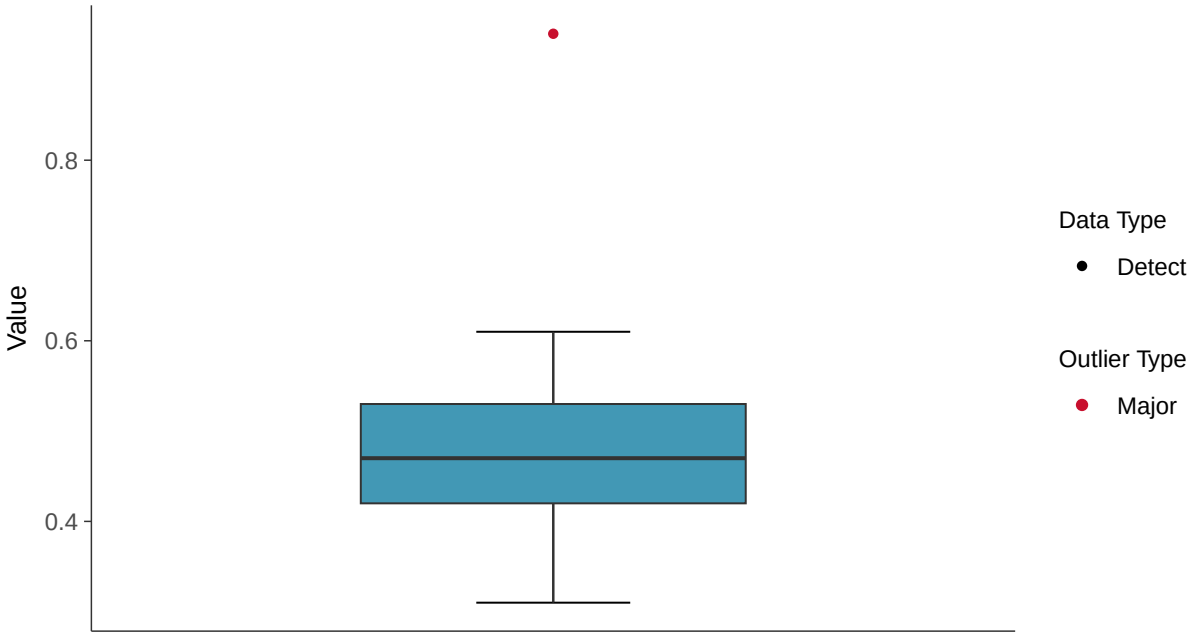
ID: 1_24_5_103





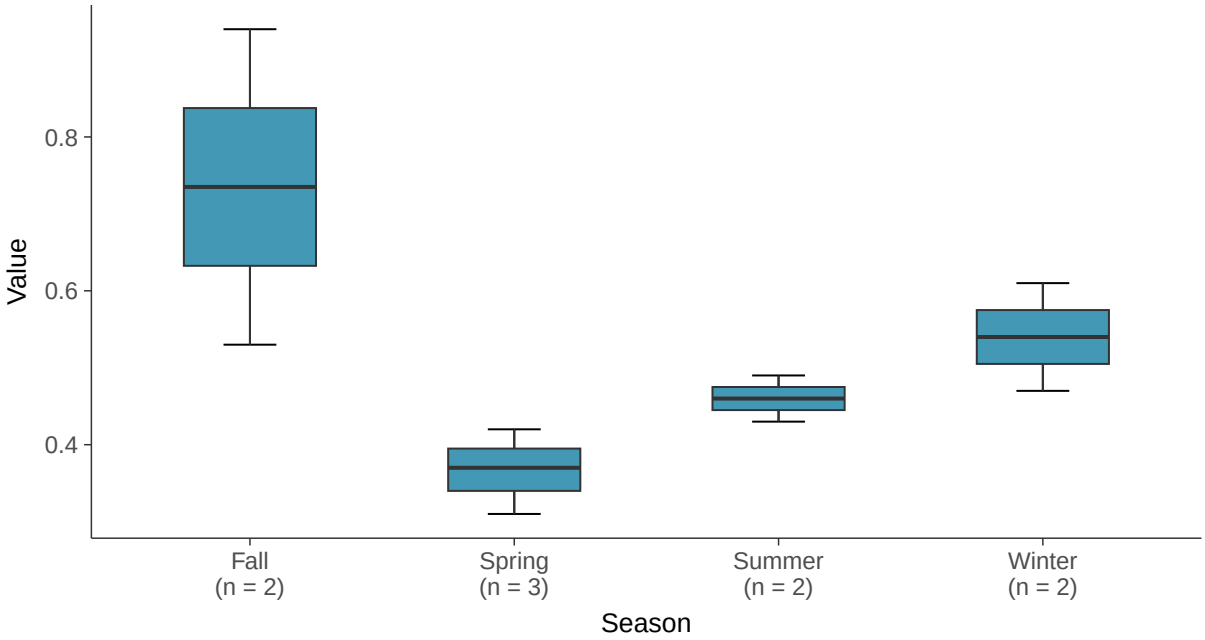
Boxplot

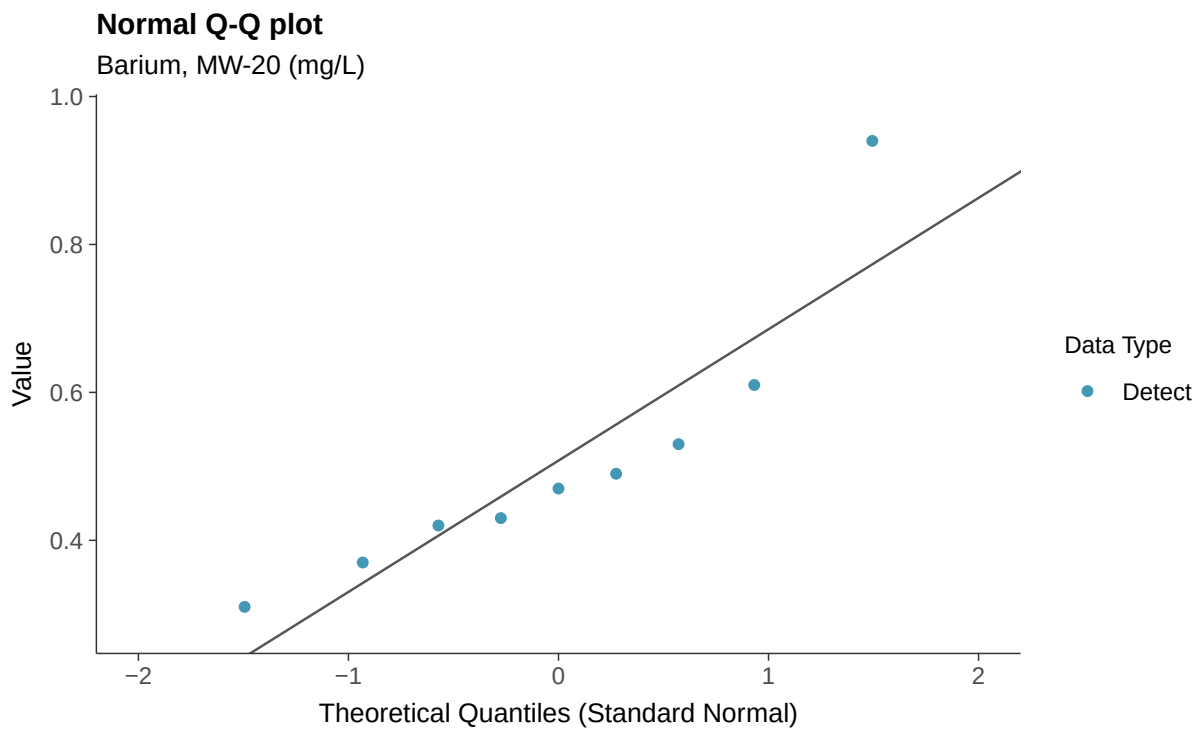
Barium, MW-20 (mg/L)

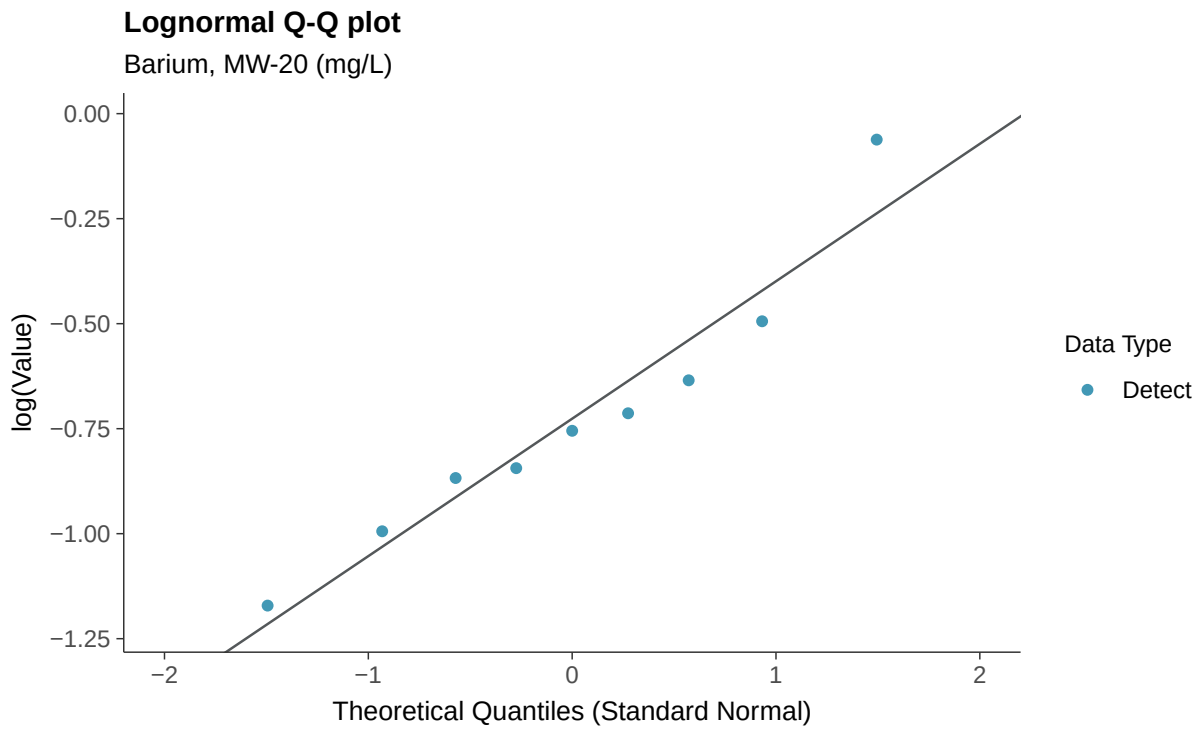


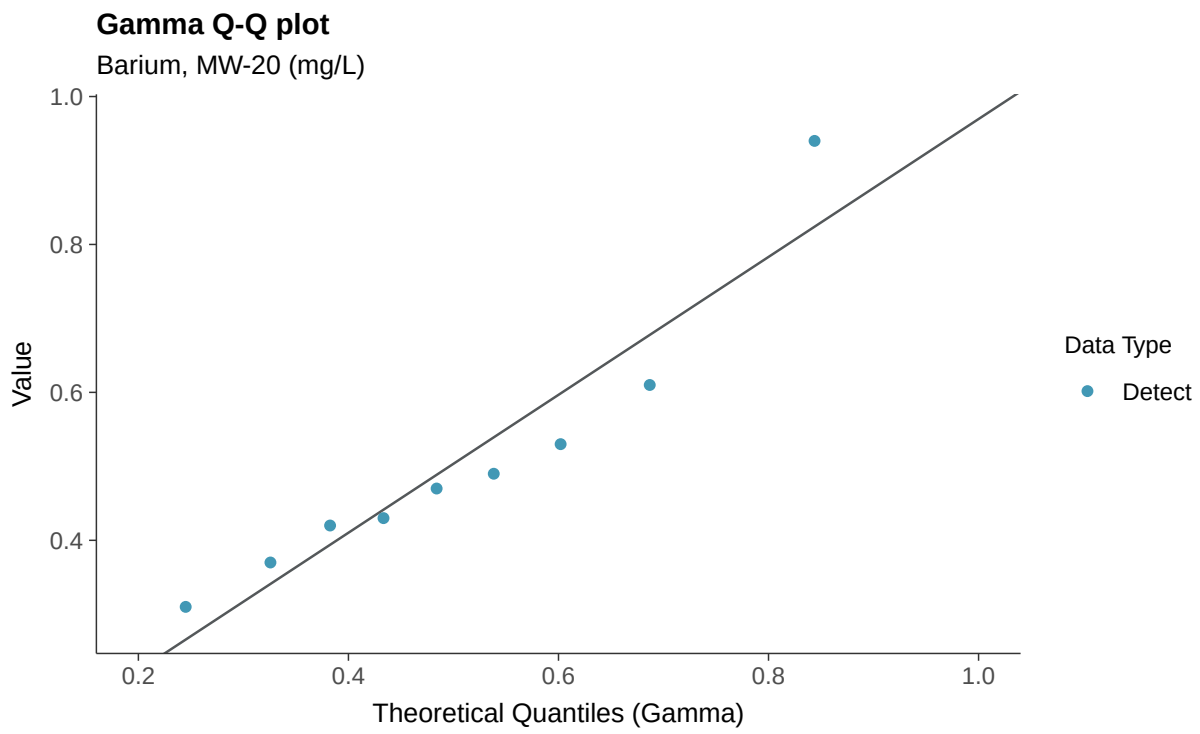
Boxplot by Season

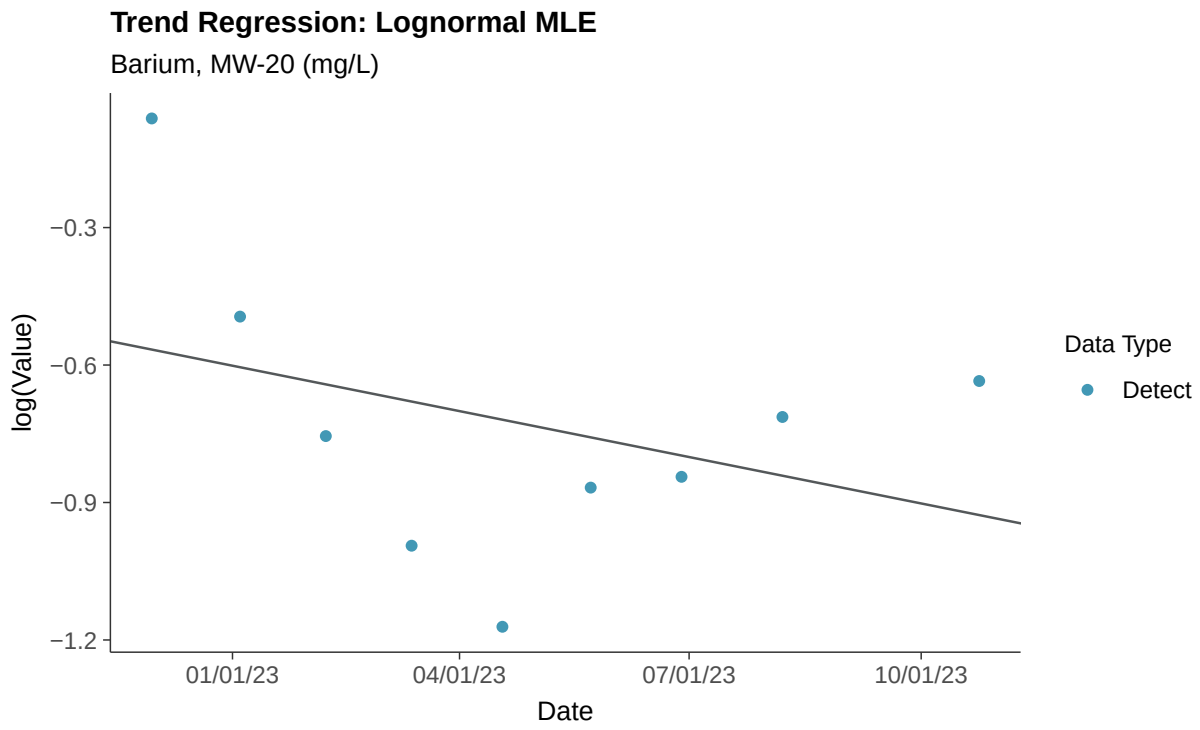
Barium, MW-20 (mg/L)

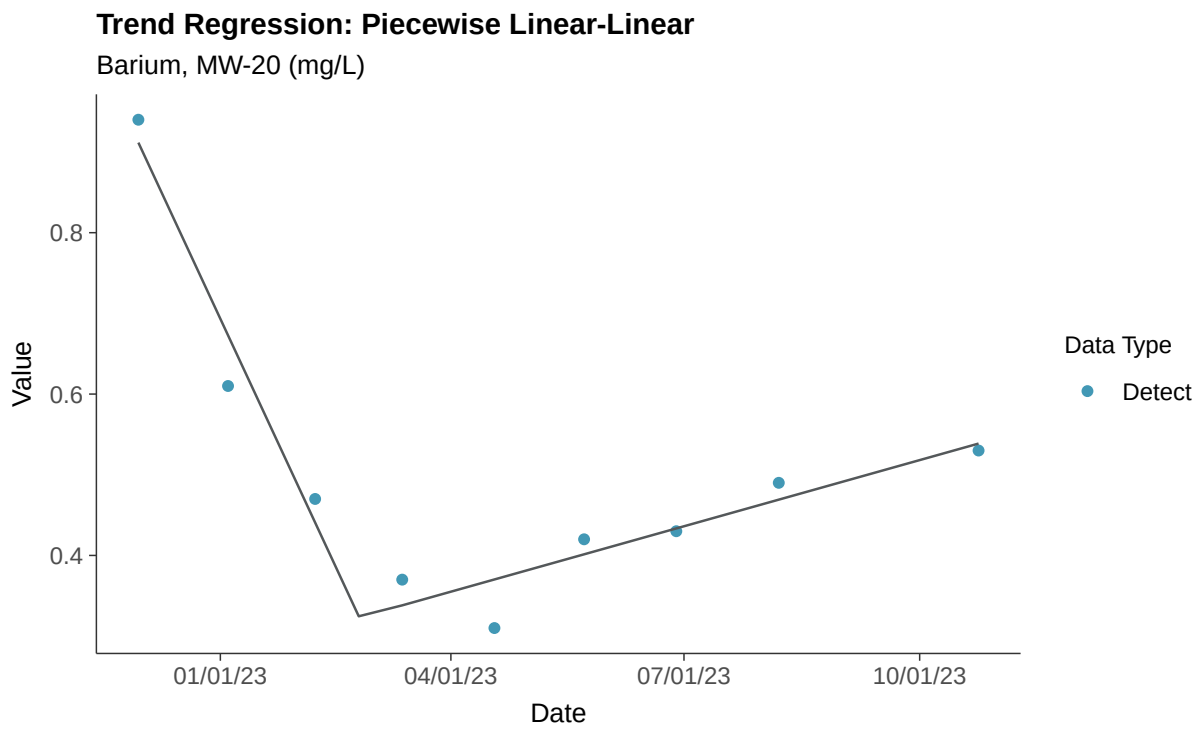



Normal Q-Q plot
Barium, MW-20 (mg/L)
Value
1.0
0.8
0.6
0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Barium, MW-20 (mg/L)
log(Value)
0.00
−0.25
−0.50
−0.75
−1.00
−1.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

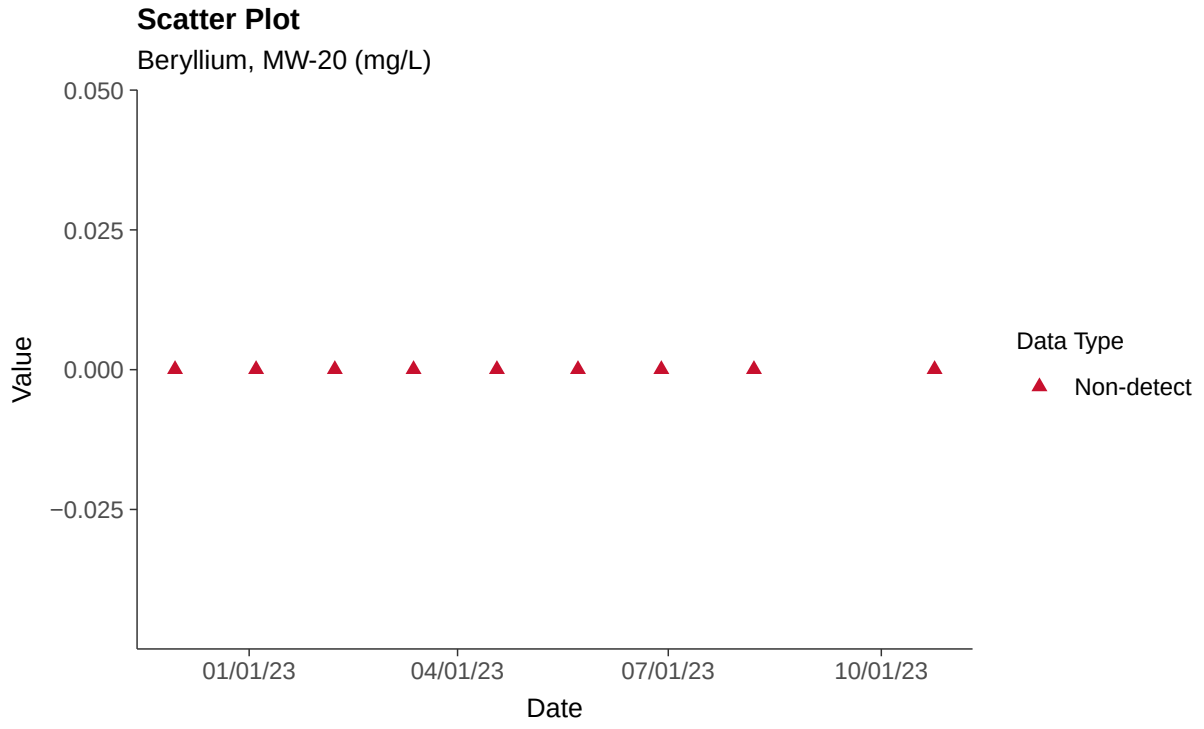

Gamma Q-Q plot
Barium, MW-20 (mg/L)
Value
1.0
0.8
0.6
0.4
0.2
0.4
0.6
0.8
1.0
Theoretical Quantiles (Gamma)
Data Type
Detect

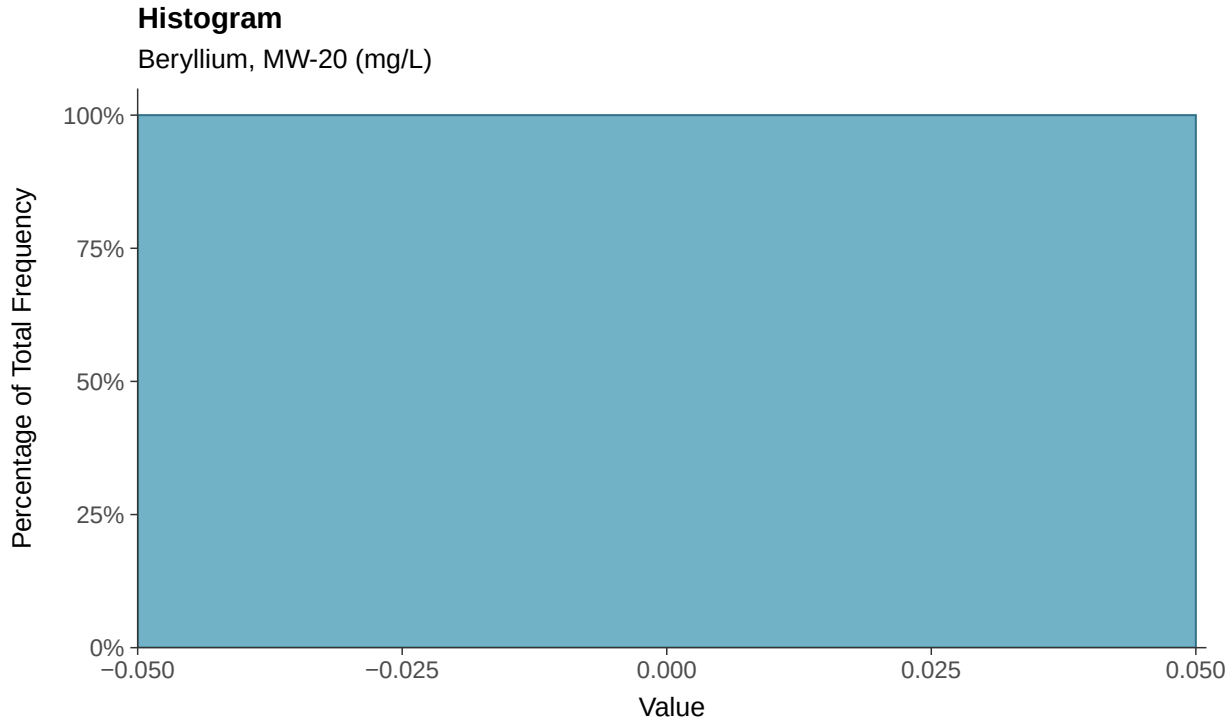

Trend Regression: Lognormal MLE
Barium, MW-20 (mg/L)
log(Value)
−0.3
−0.6
−0.9
−1.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Barium, MW-20 (mg/L)
Value
0.8
0.6
0.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-20

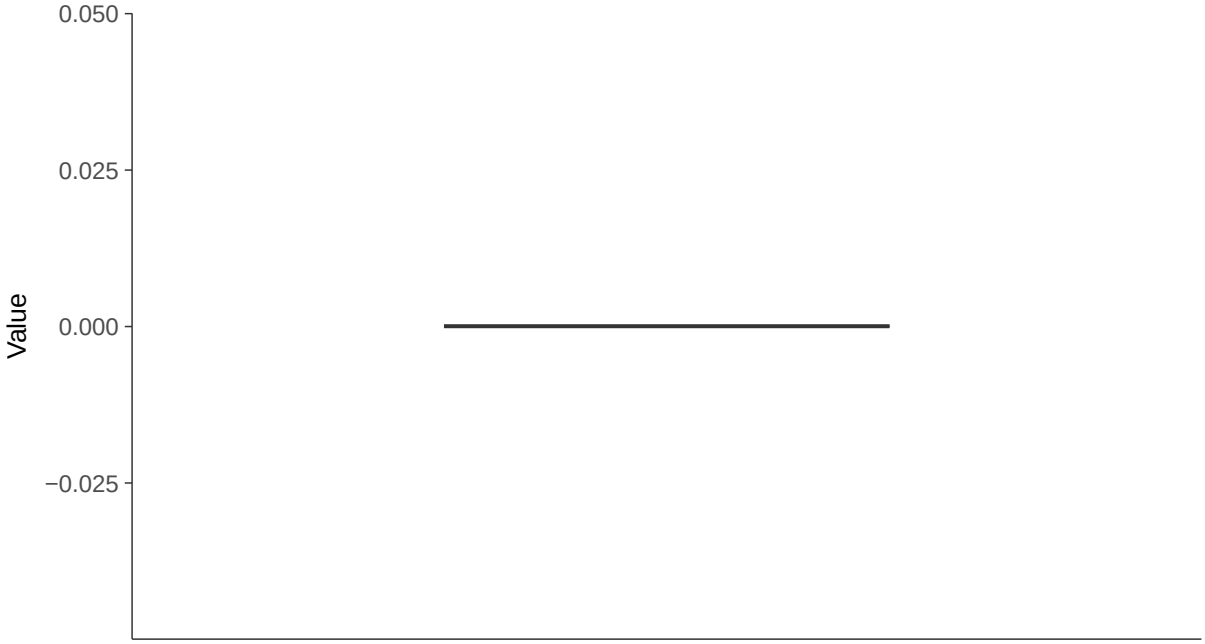
ID: 1_24_5_104





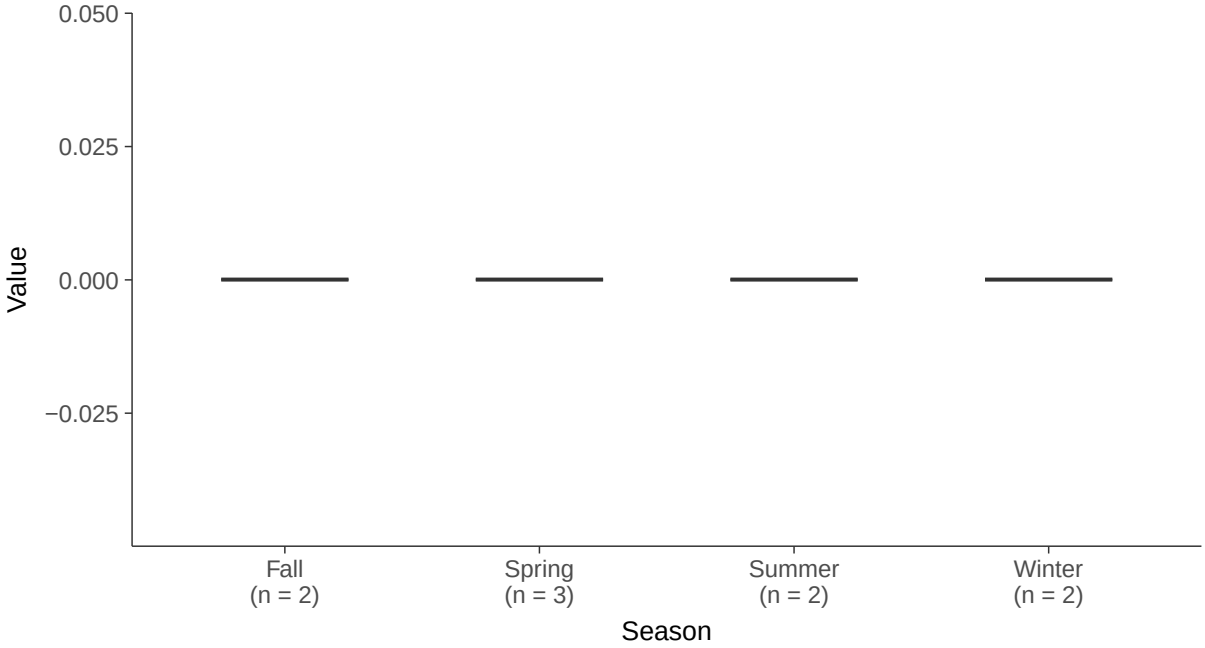
Boxplot

Beryllium, MW-20 (mg/L)



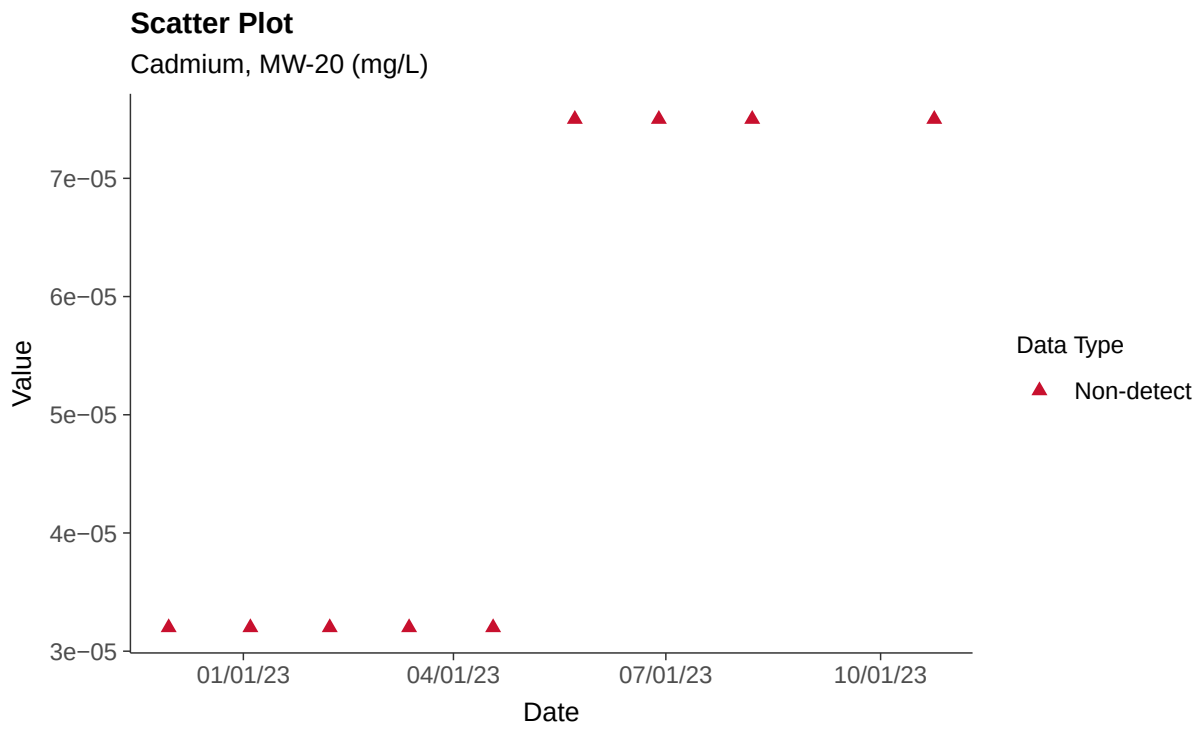
Boxplot by Season

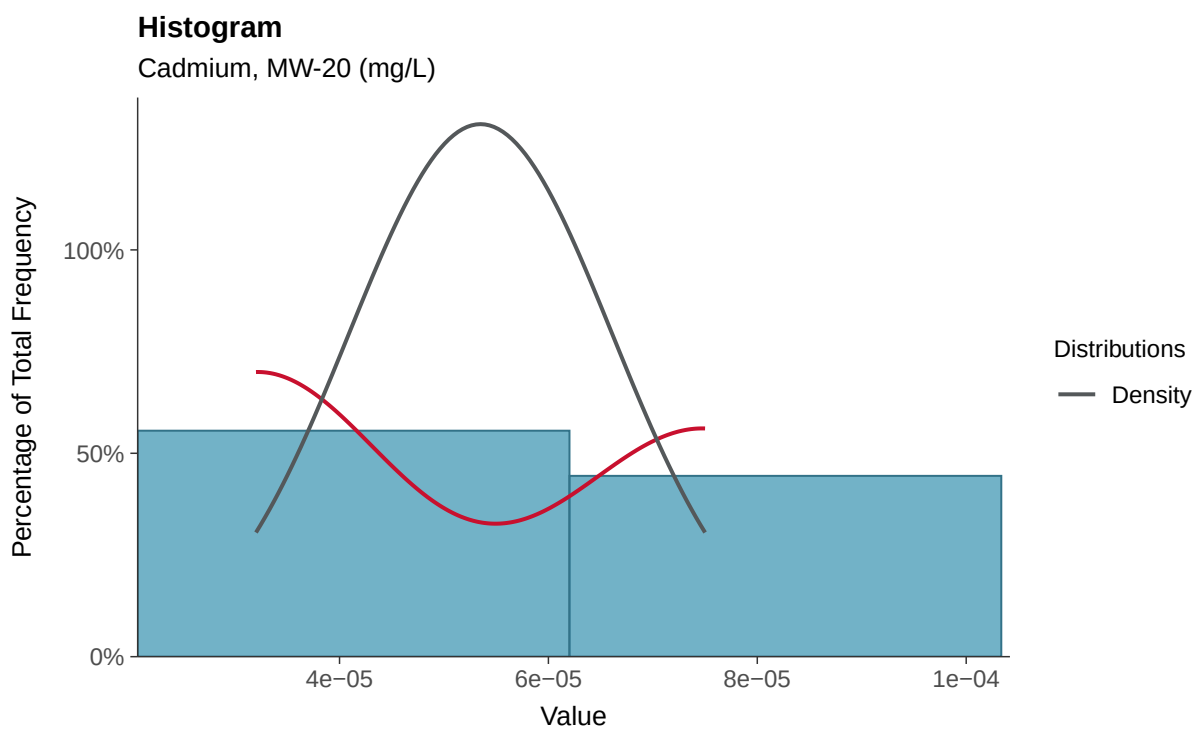
Beryllium, MW-20 (mg/L)



Appendix IV: Cadmium, MW-20

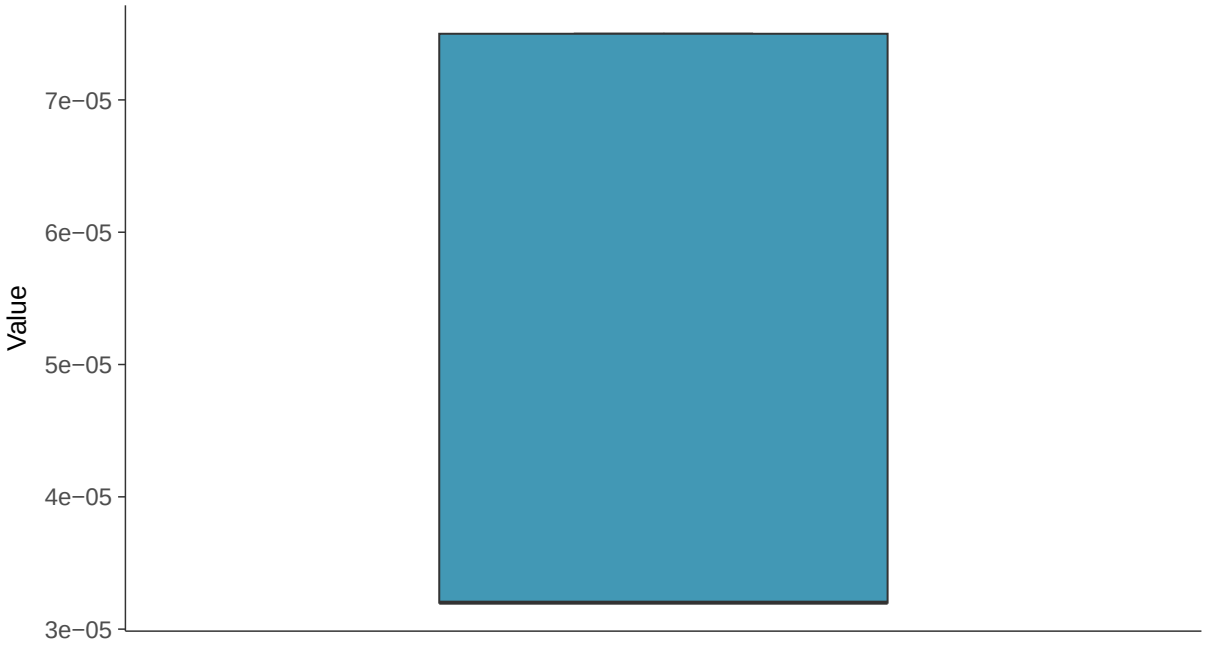
ID: 1_24_5_106





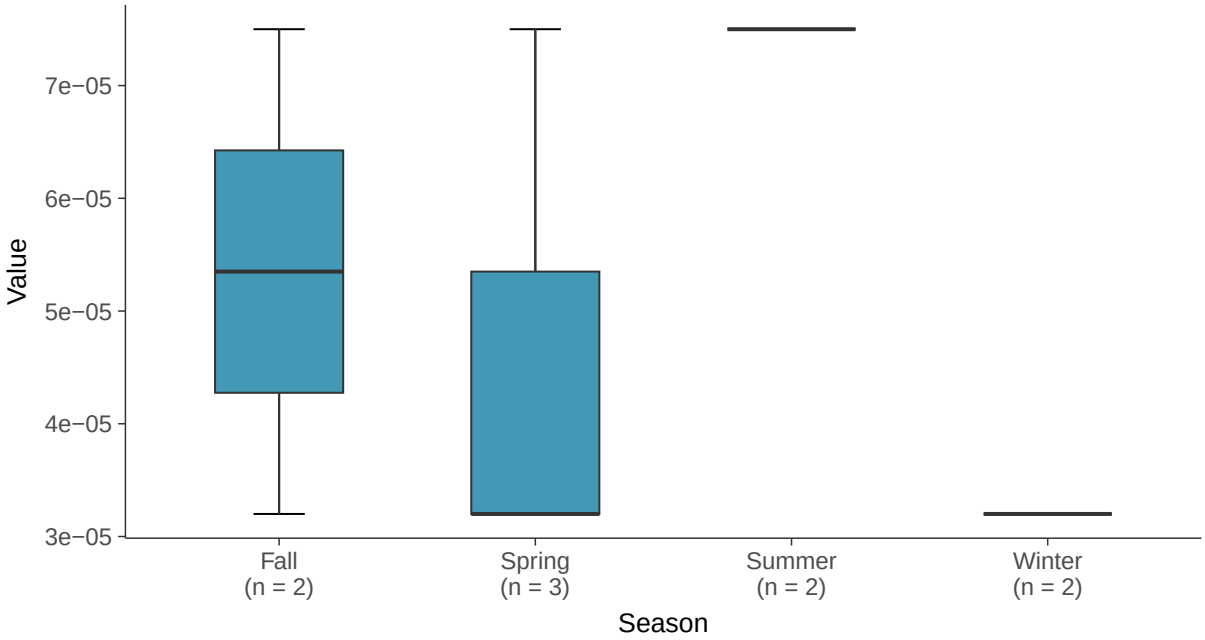
Boxplot

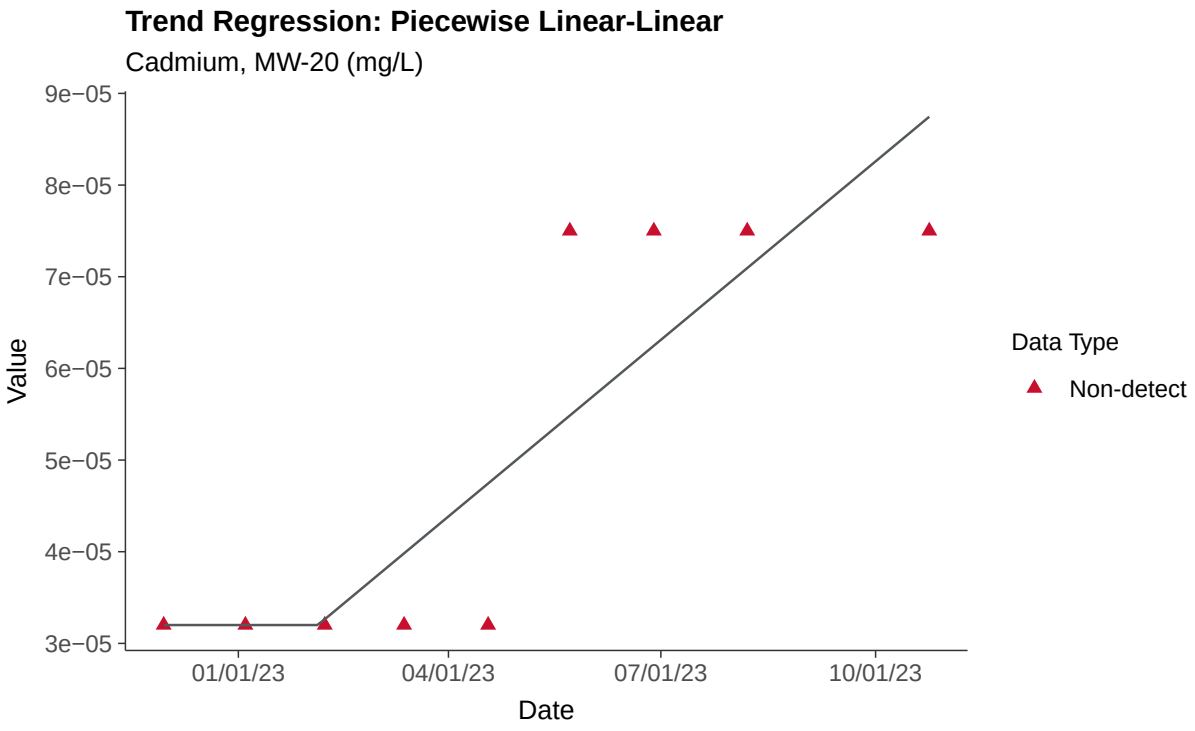
Cadmium, MW-20 (mg/L)

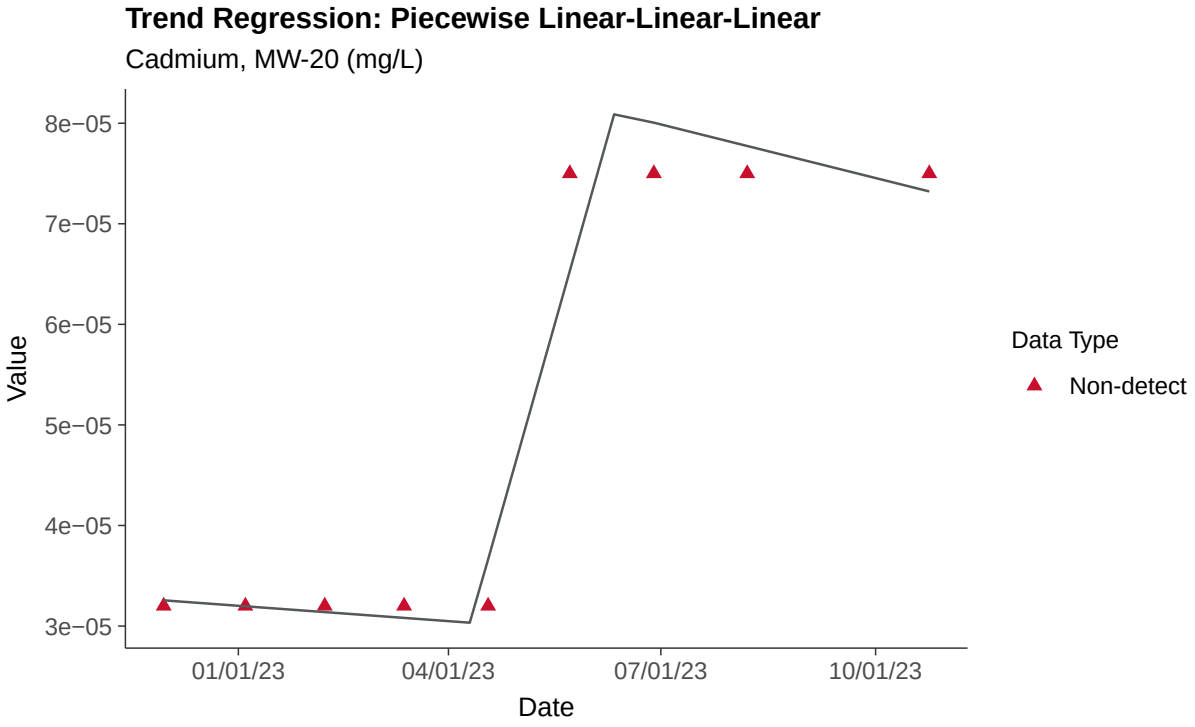


Boxplot by Season

Cadmium, MW-20 (mg/L)

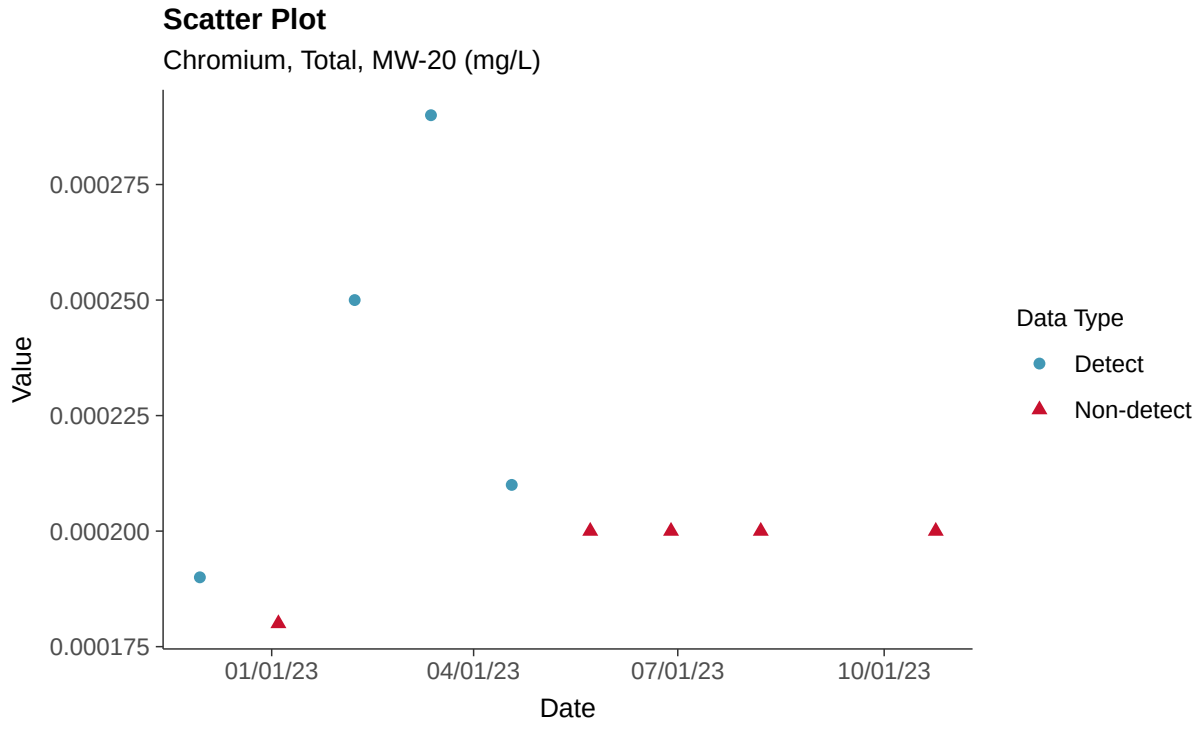


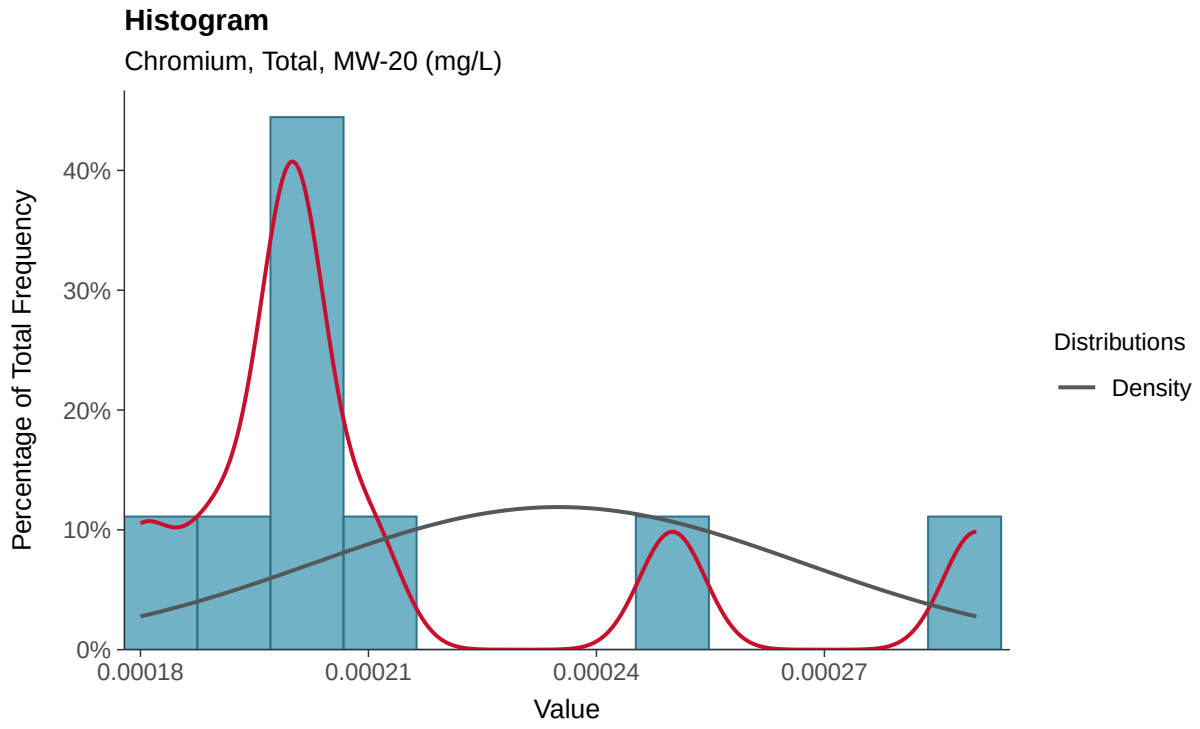

Trend Regression: Piecewise Linear-Linear
Cadmium, MW-20 (mg/L)
9e−05
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Cadmium, MW-20 (mg/L)
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Chromium, Total, MW-20

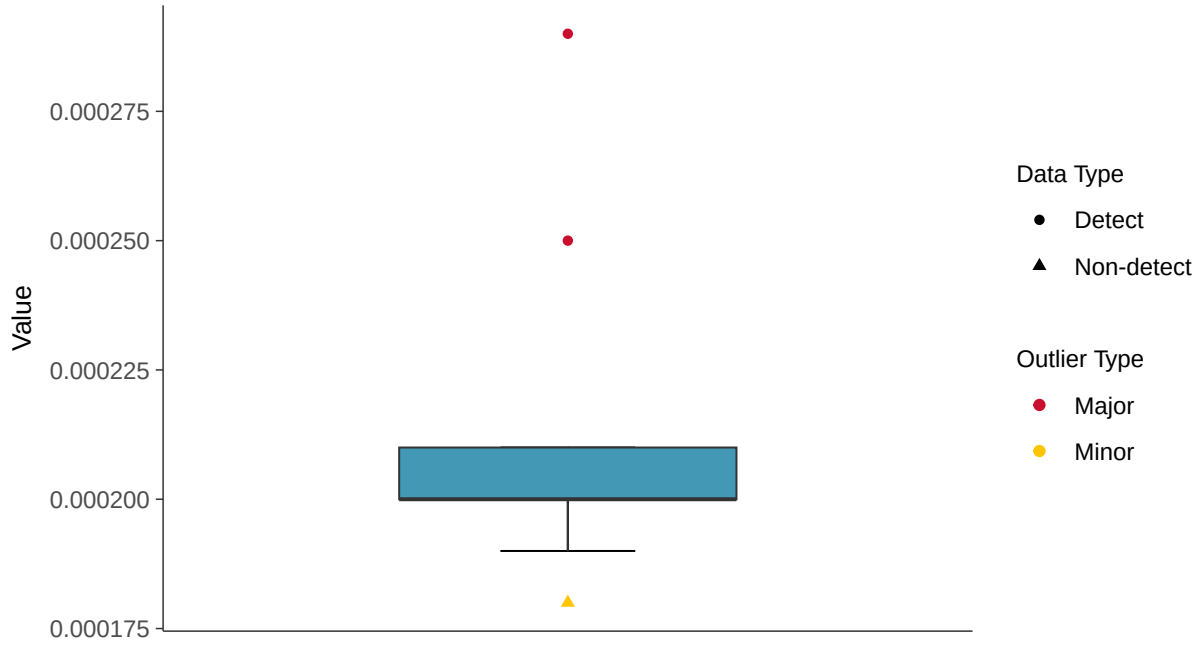
ID: 1_24_5_109





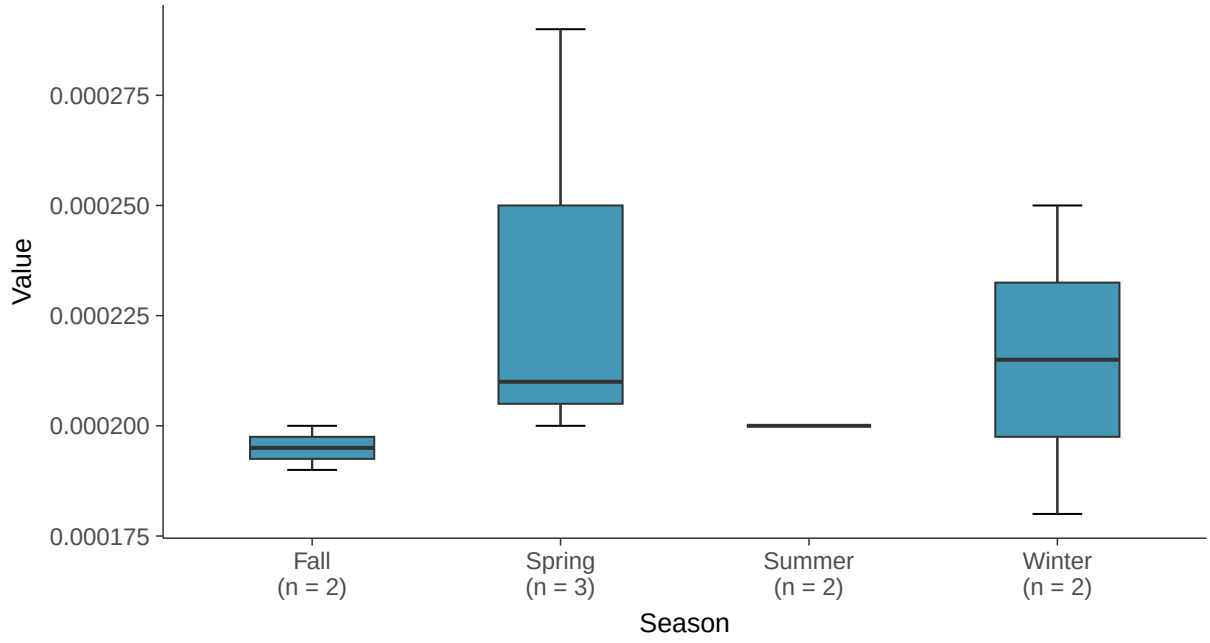
Boxplot

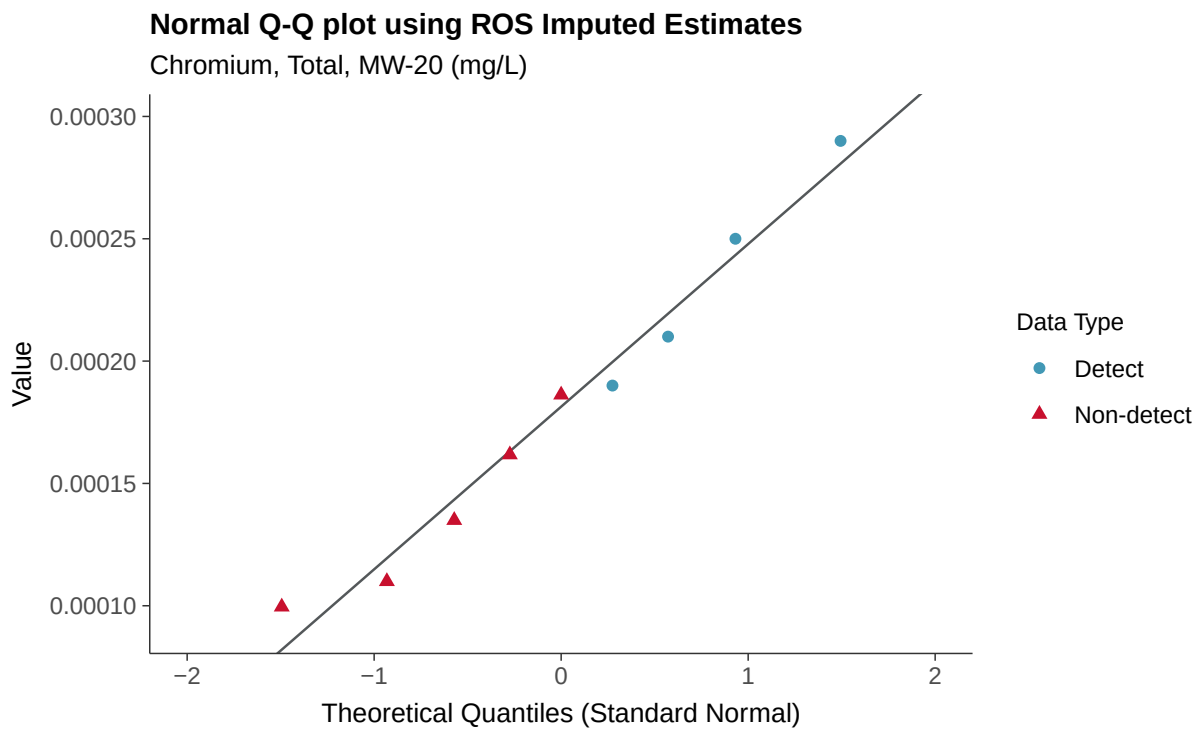
Chromium, Total, MW-20 (mg/L)

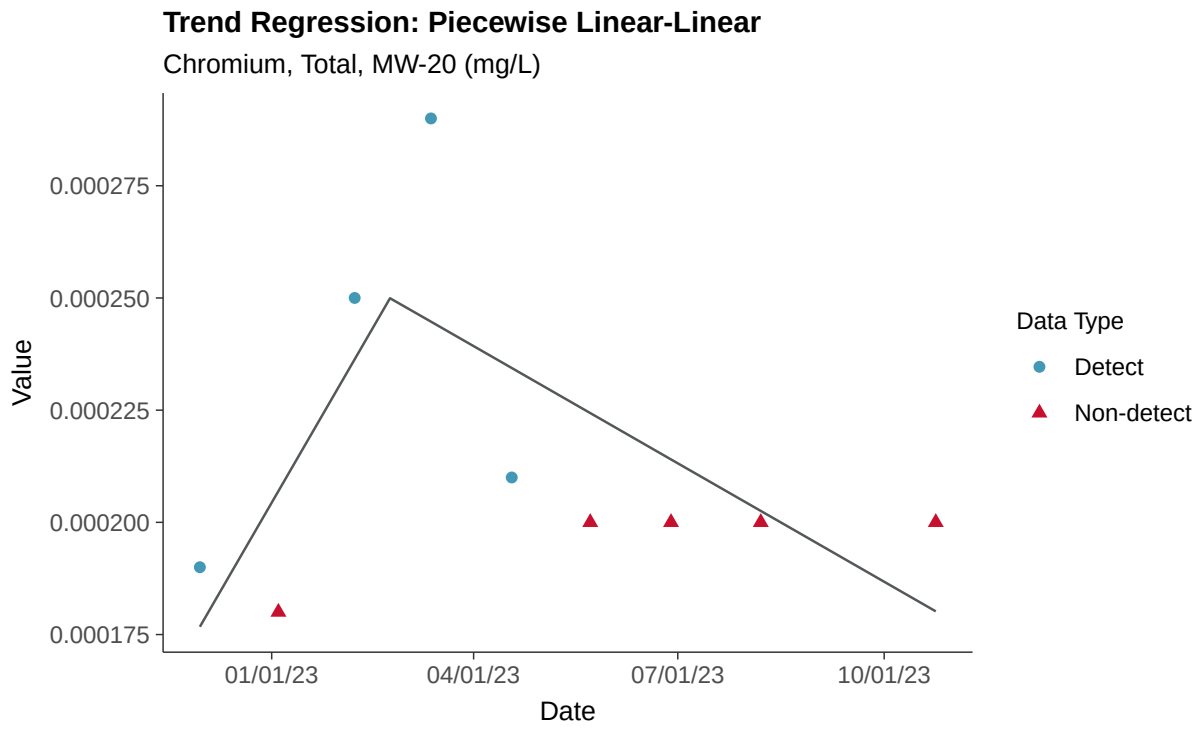


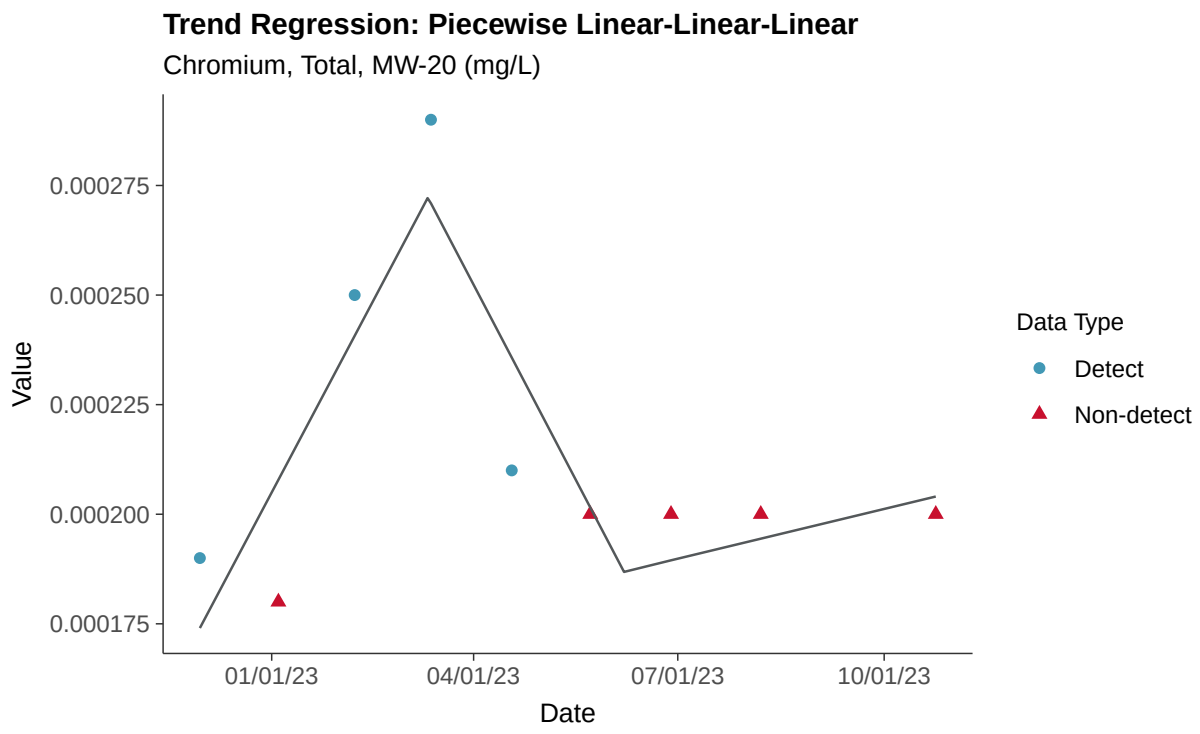
Boxplot by Season

Chromium, Total, MW-20 (mg/L)



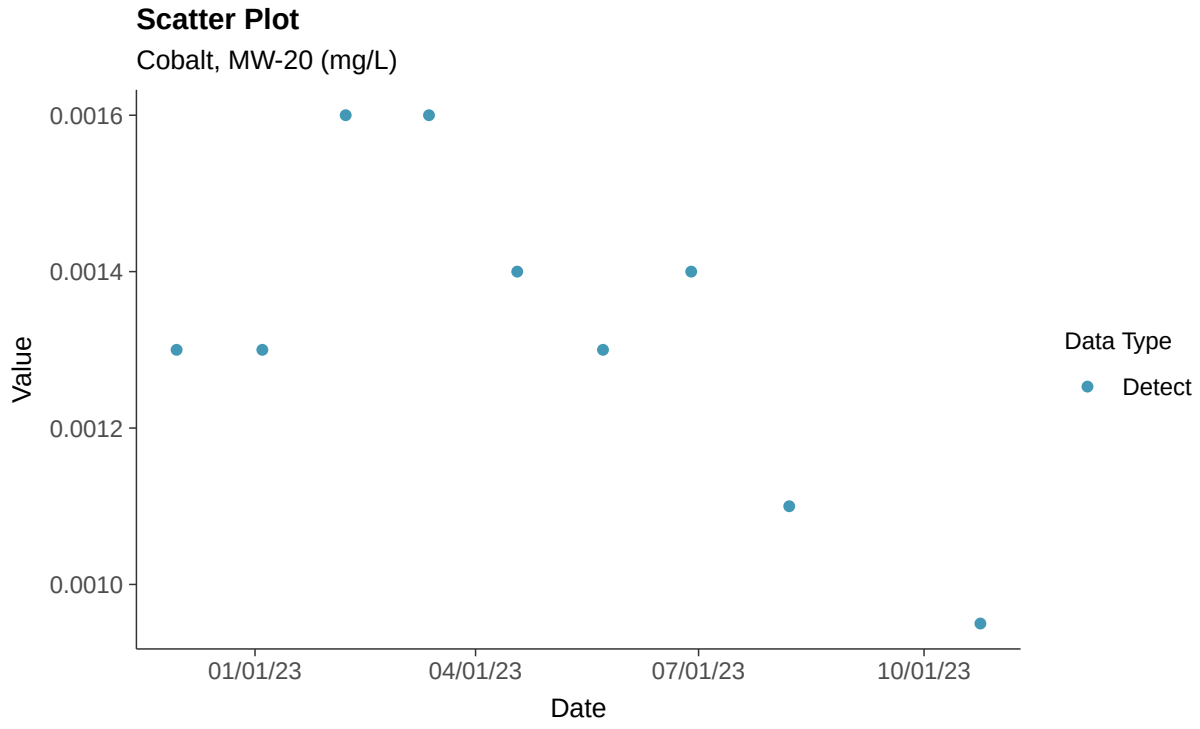

Normal Q-Q plot using ROS Imputed Estimates
Chromium, Total, MW-20 (mg/L)
Value
0.00030
0.00025
0.00020
0.00015
0.00010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

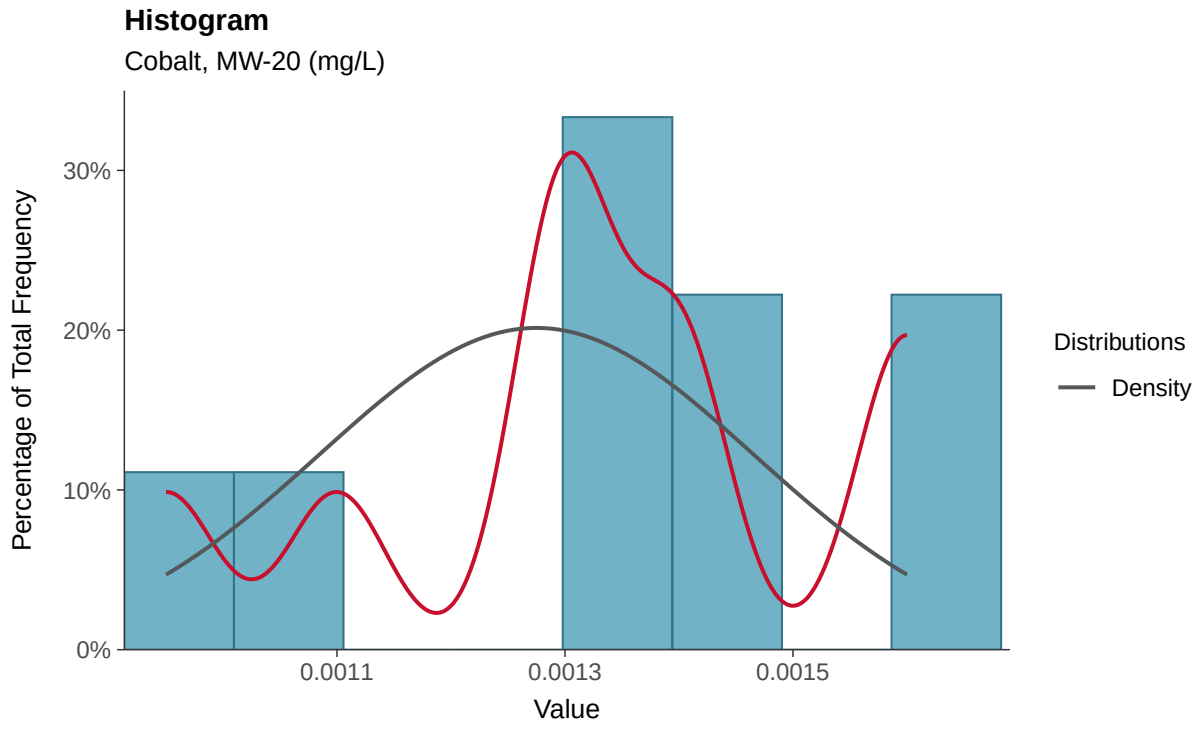

Trend Regression: Piecewise Linear-Linear
Chromium, Total, MW-20 (mg/L)
Value
0.000275
0.000250
0.000225
0.000200
0.000175
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

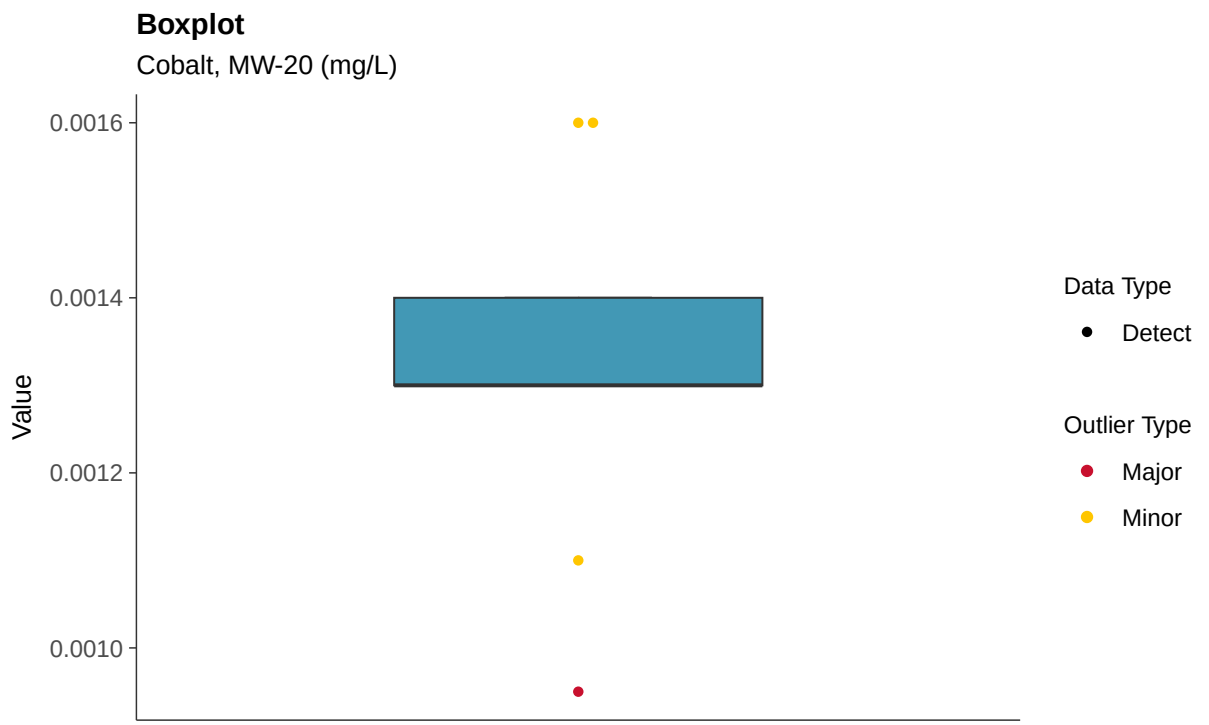

Trend Regression: Piecewise Linear-Linear-Linear
Chromium, Total, MW-20 (mg/L)
Value
0.000275
0.000250
0.000225
0.000200
0.000175
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

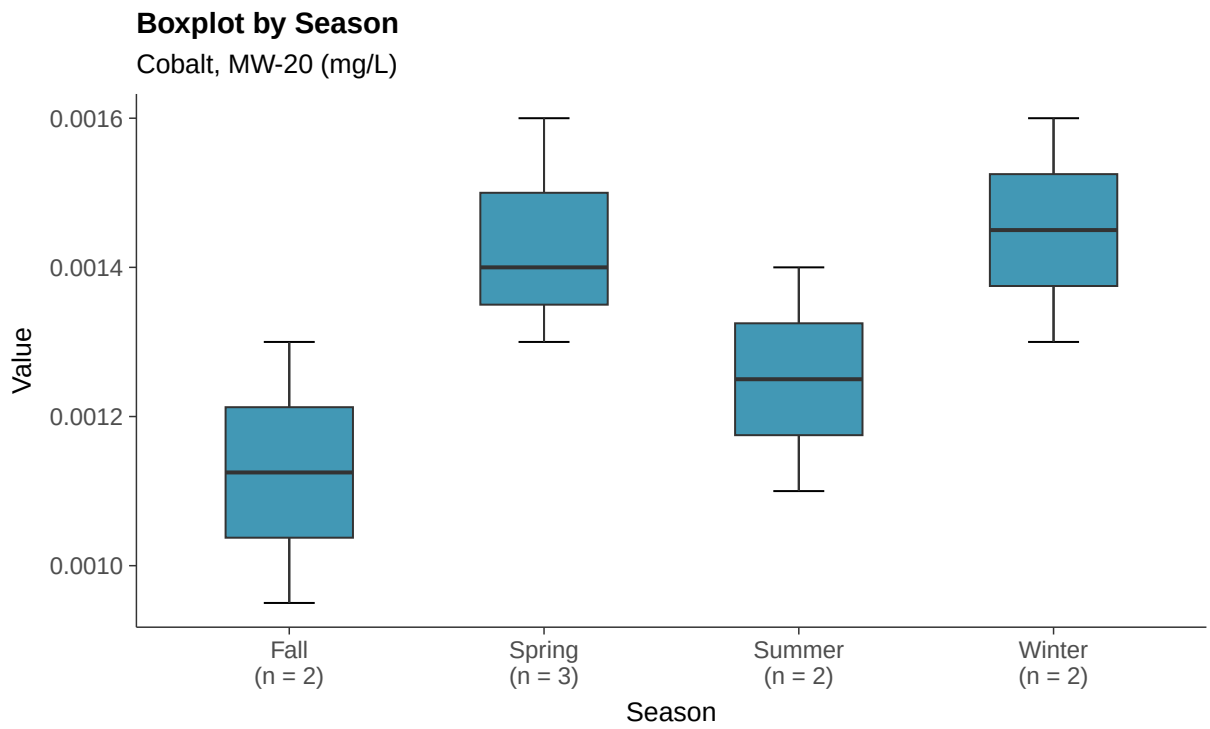
Appendix IV: Cobalt, MW-20

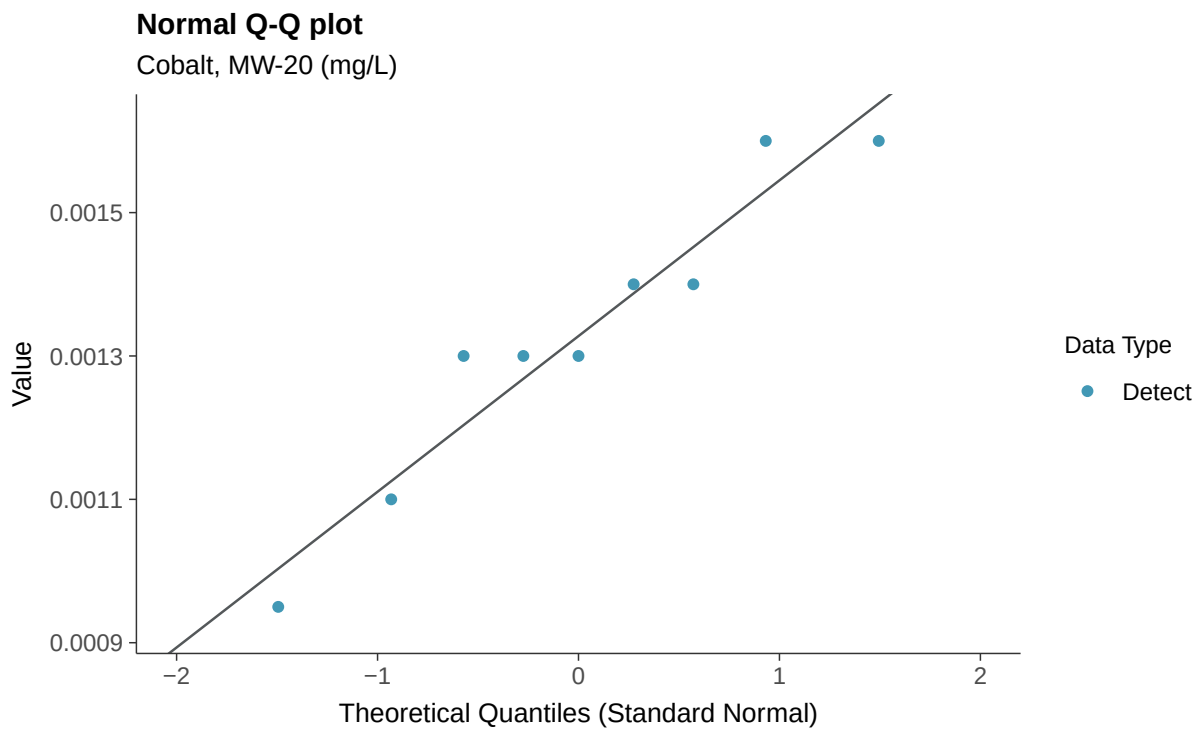
ID: 1_24_5_110

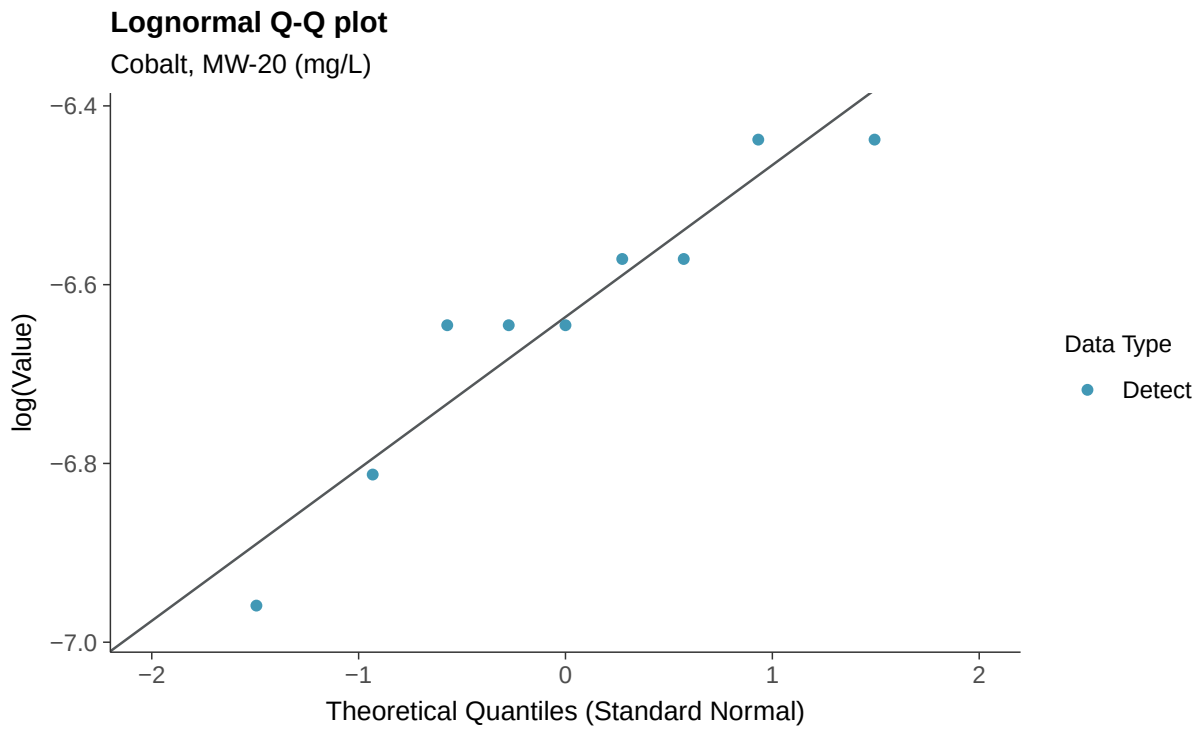


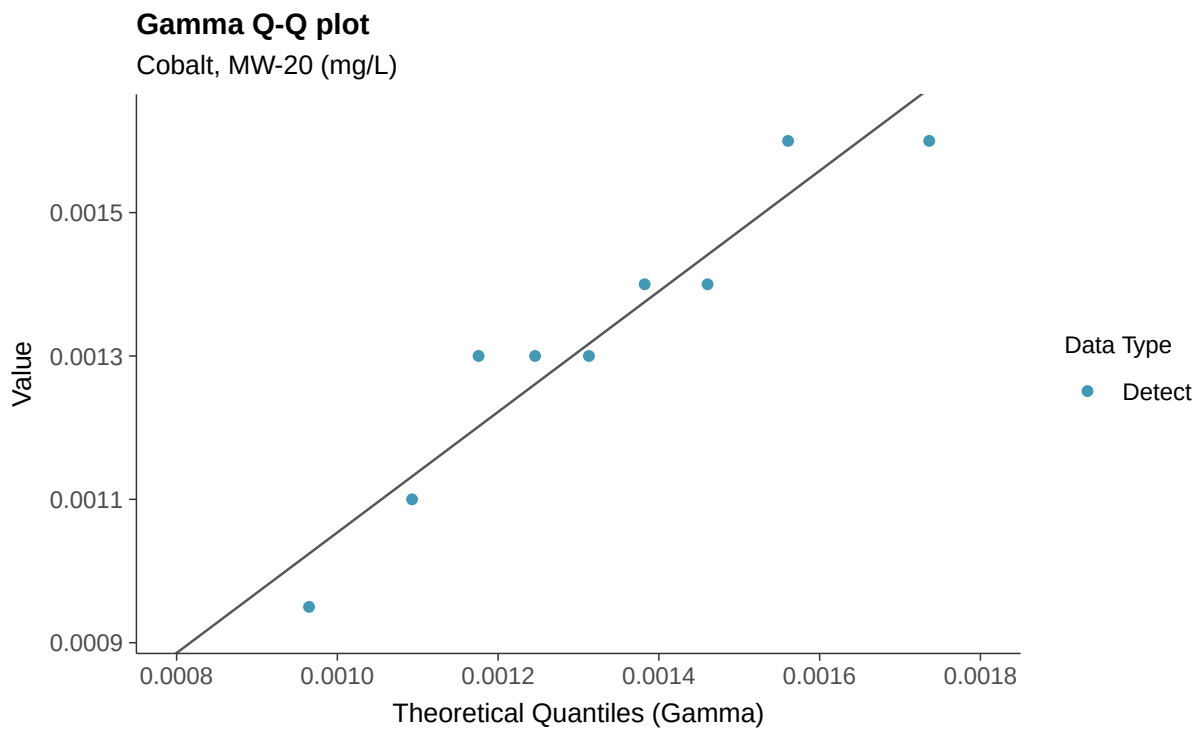


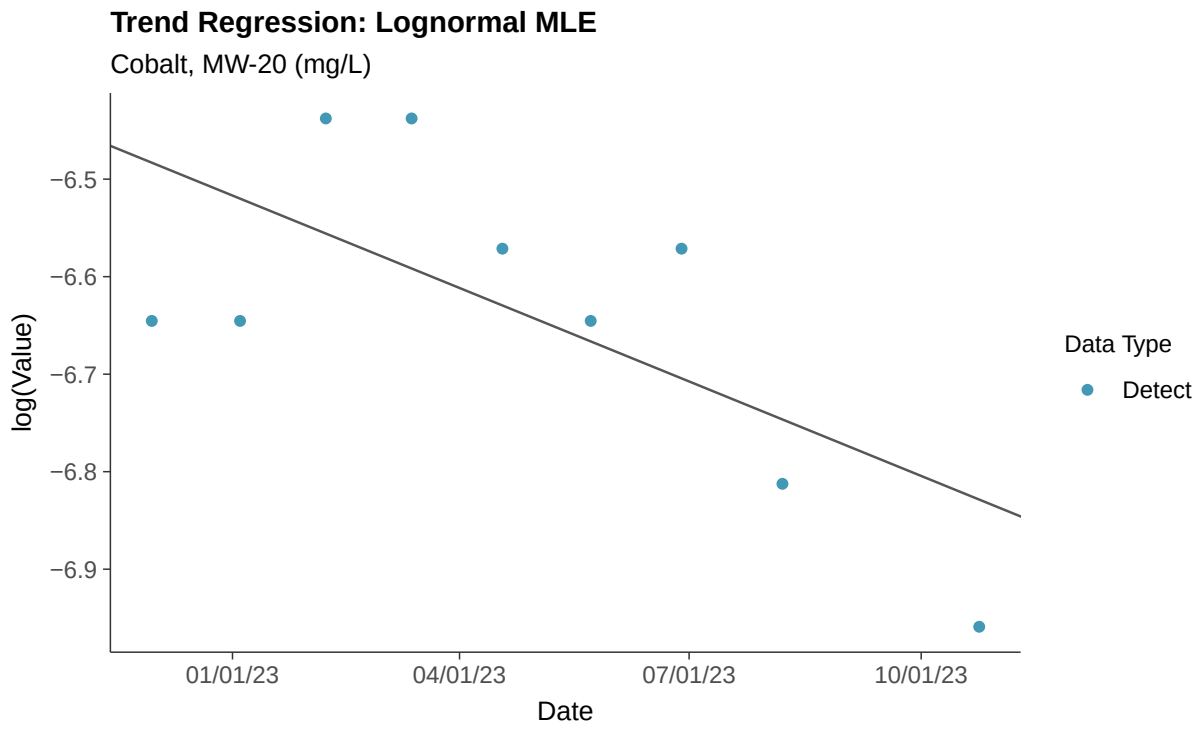

Boxplot
Cobalt, MW-20 (mg/L)
Value
0.0016
0.0014
0.0012
0.0010
Data Type
Detect
Outlier Type
Major
Minor


Boxplot by Season
Cobalt, MW-20 (mg/L)
Value
0.0016
0.0014
0.0012
0.0010
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Normal Q-Q plot
Cobalt, MW-20 (mg/L)
Value
0.0015
0.0013
0.0011
0.0009
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

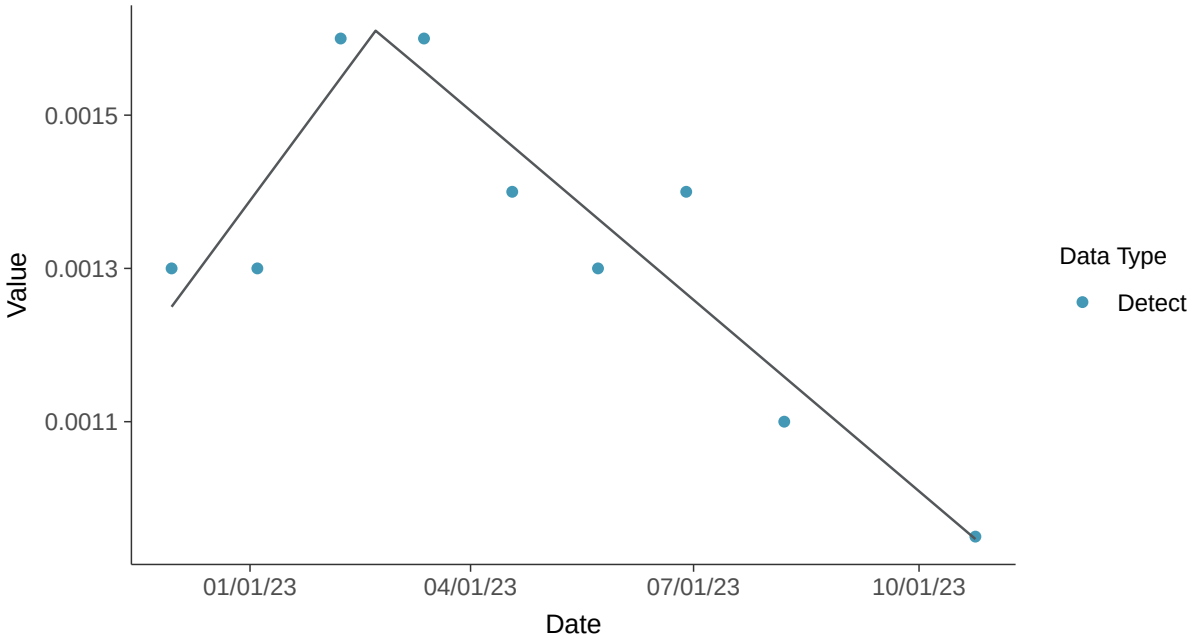

Lognormal Q-Q plot
Cobalt, MW-20 (mg/L)
log(Value)
−6.4
−6.6
−6.8
−7.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-20 (mg/L)
Value
0.0015
0.0013
0.0011
0.0009
0.0008
0.0010
0.0012
0.0014
0.0016
0.0018
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-20 (mg/L)
log(Value)
−6.5
−6.6
−6.7
−6.8
−6.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

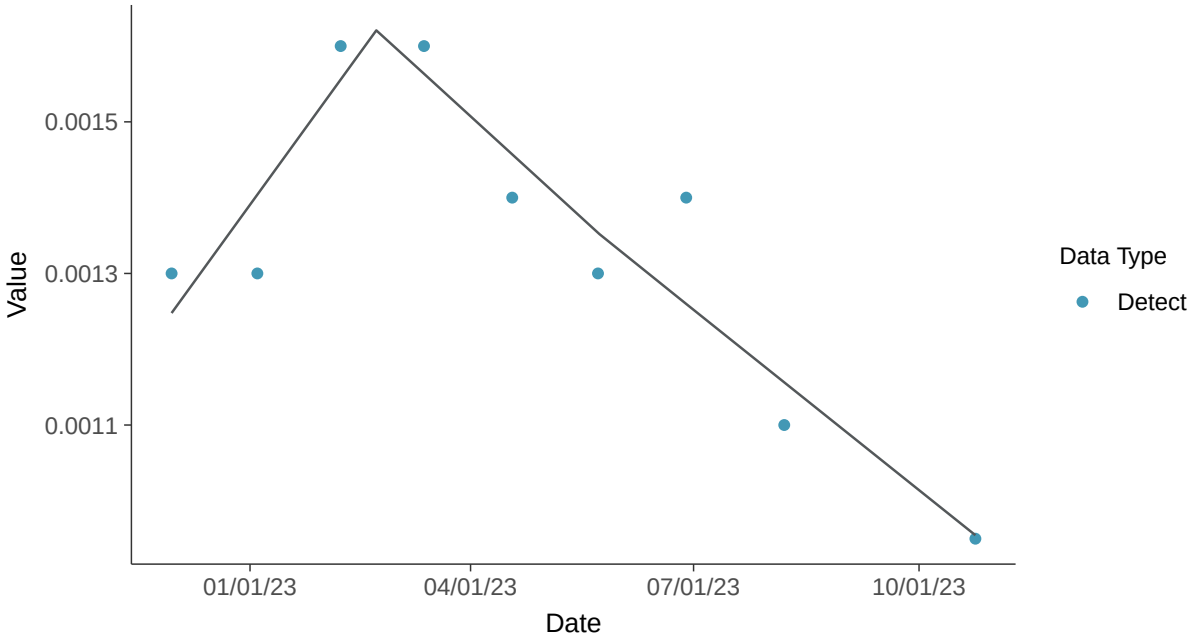
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-20 (mg/L)



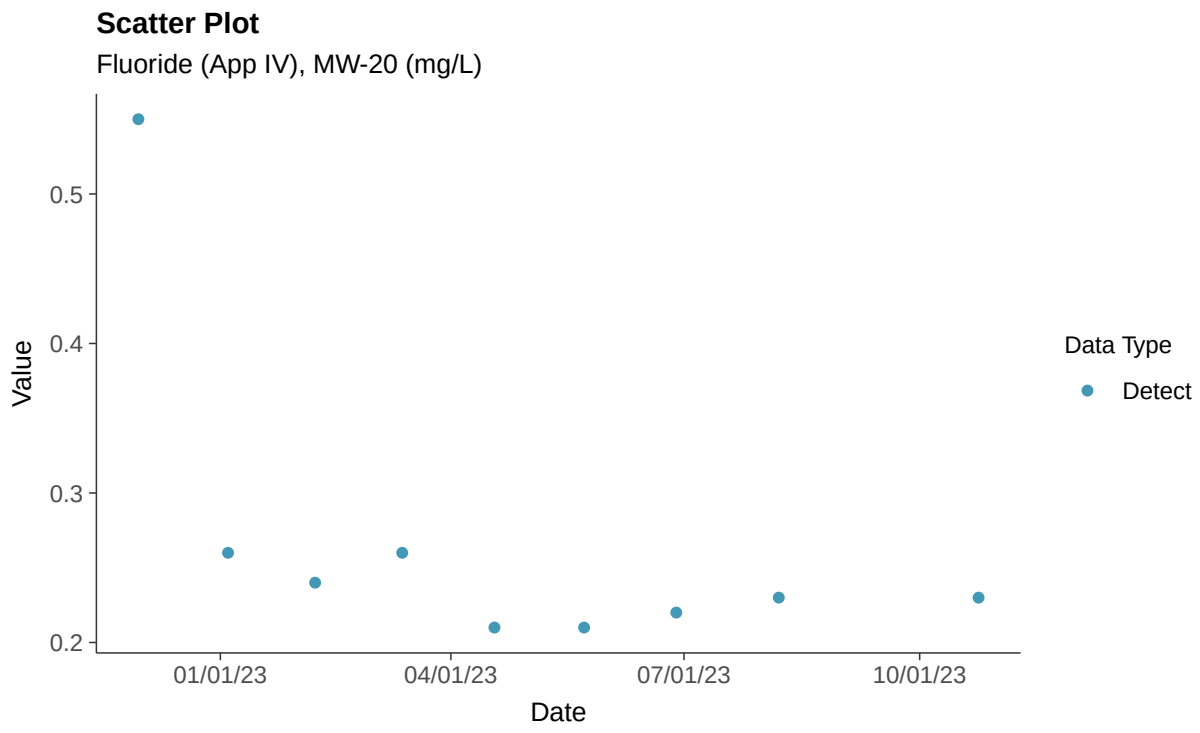
Trend Regression: Piecewise Linear-Linear-Linear

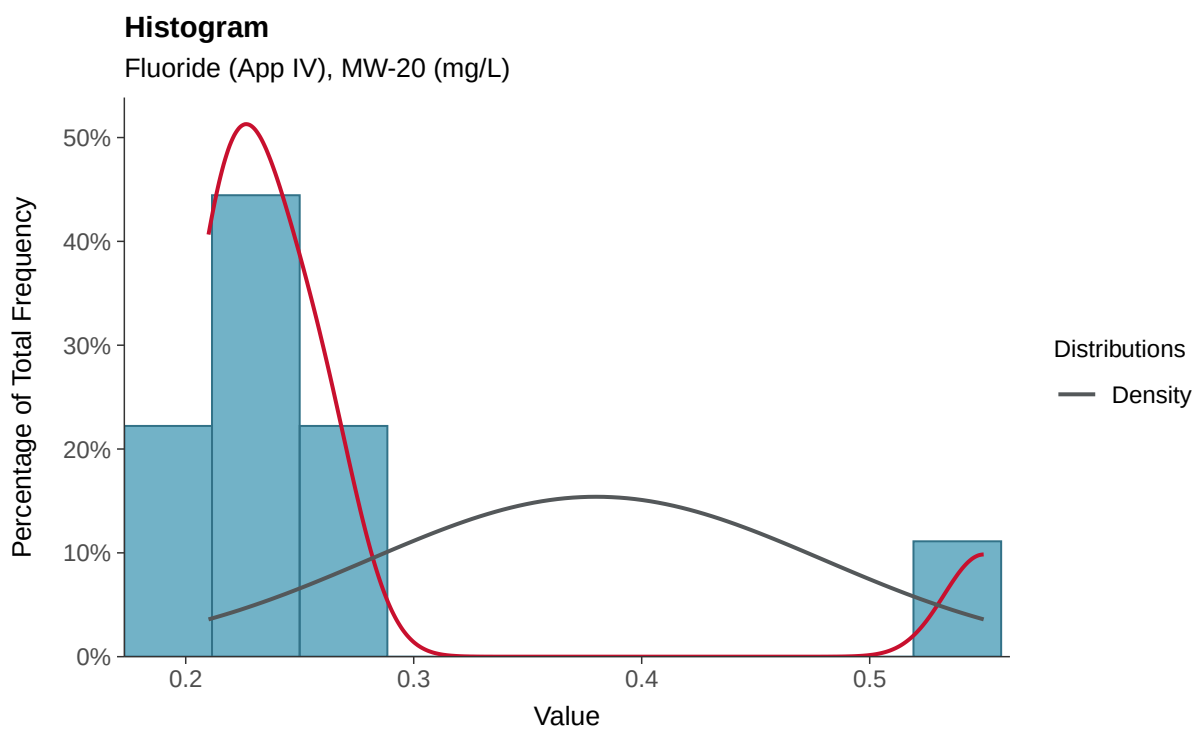
Cobalt, MW-20 (mg/L)



Appendix IV: Fluoride (App IV), MW-20

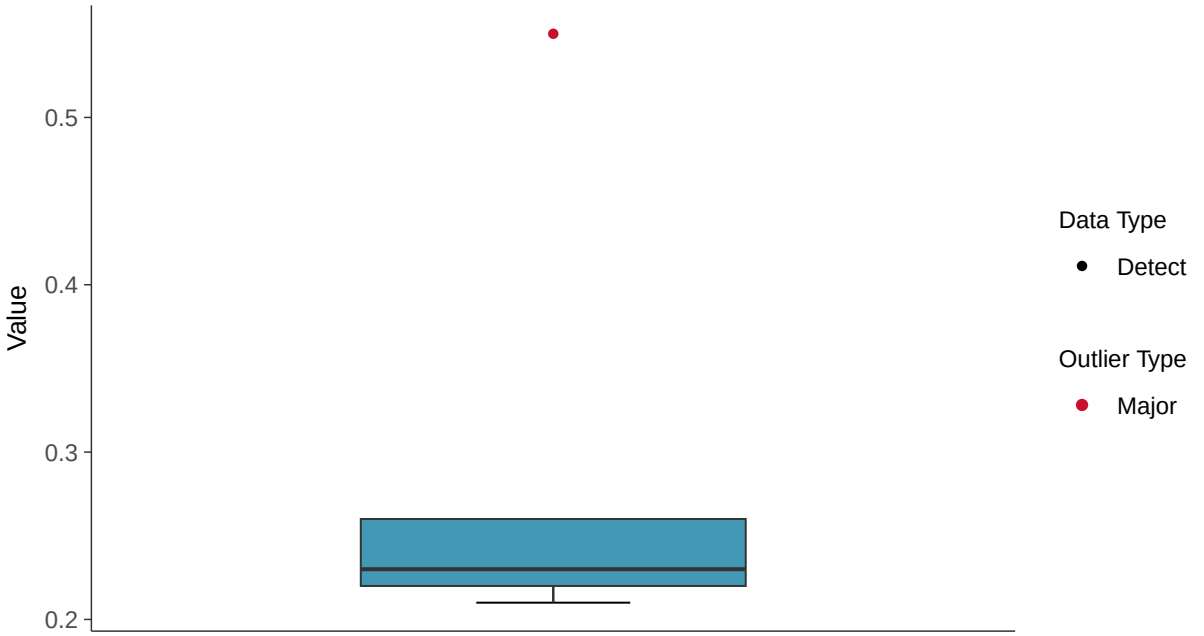
ID: 1_24_5_113





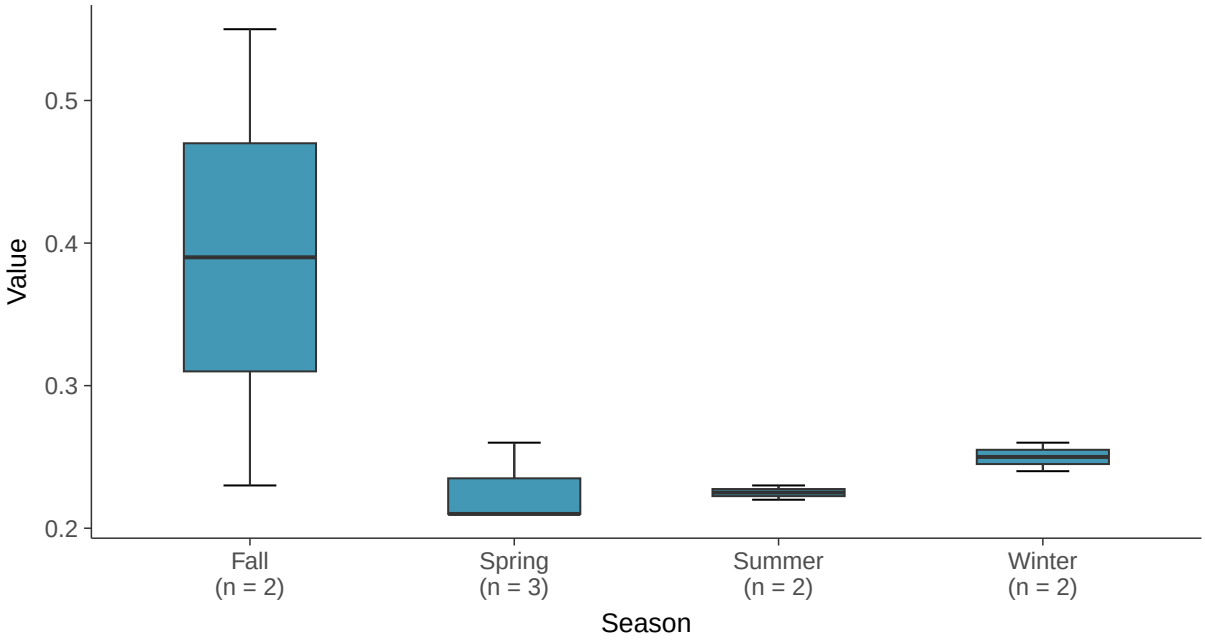
Boxplot

Fluoride (App IV), MW-20 (mg/L)



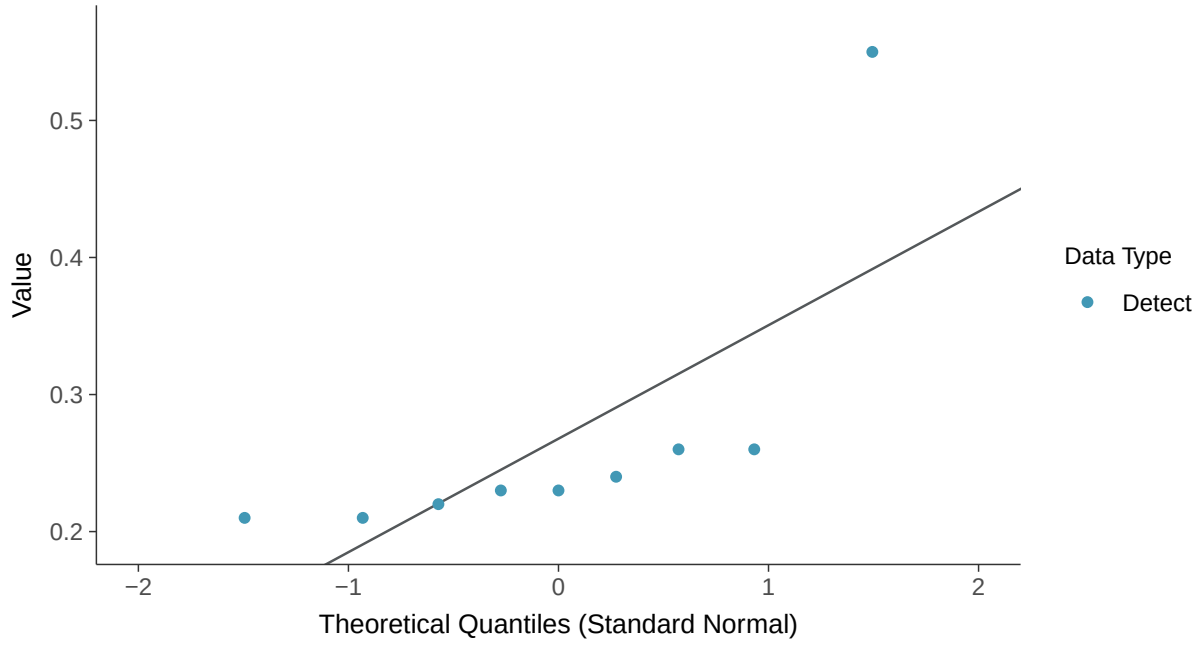
Boxplot by Season

Fluoride (App IV), MW-20 (mg/L)



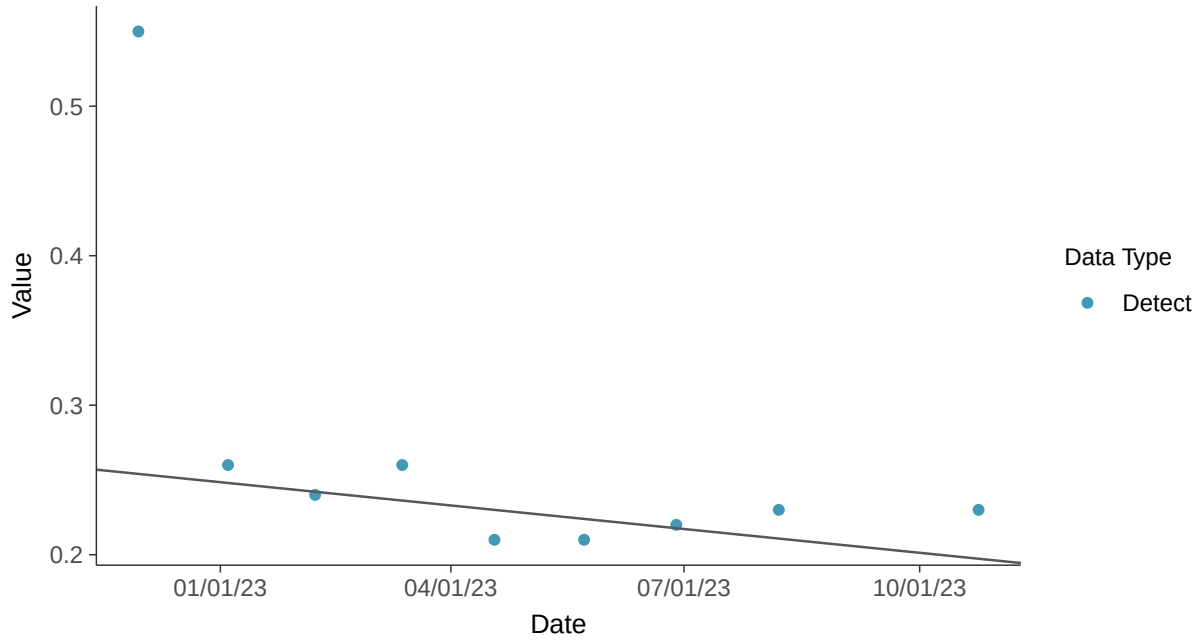
Normal Q-Q plot

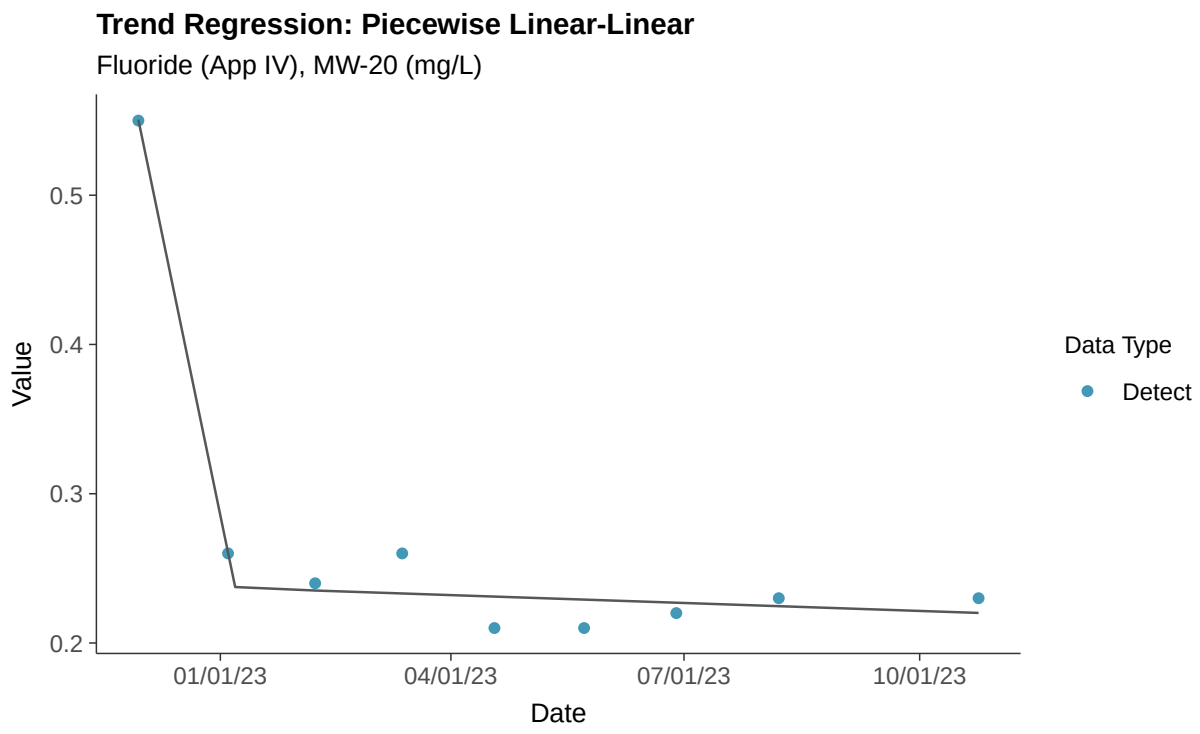
Fluoride (App IV), MW-20 (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

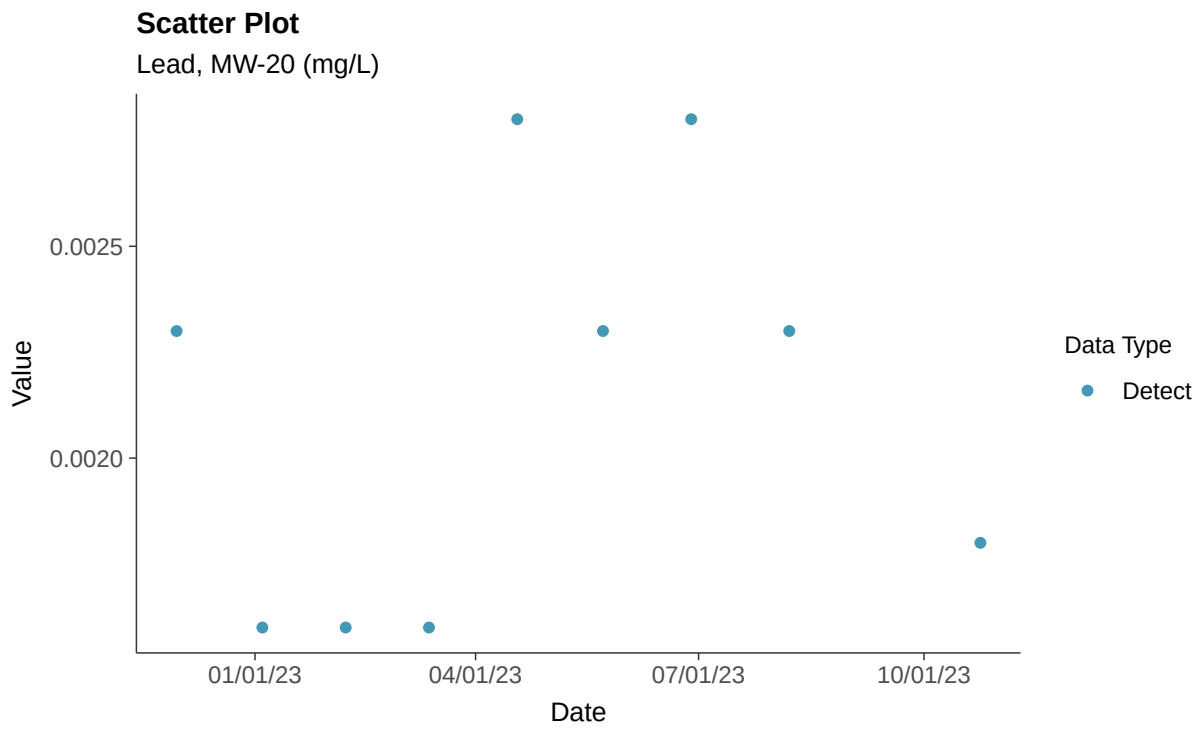
Fluoride (App IV), MW-20 (mg/L)

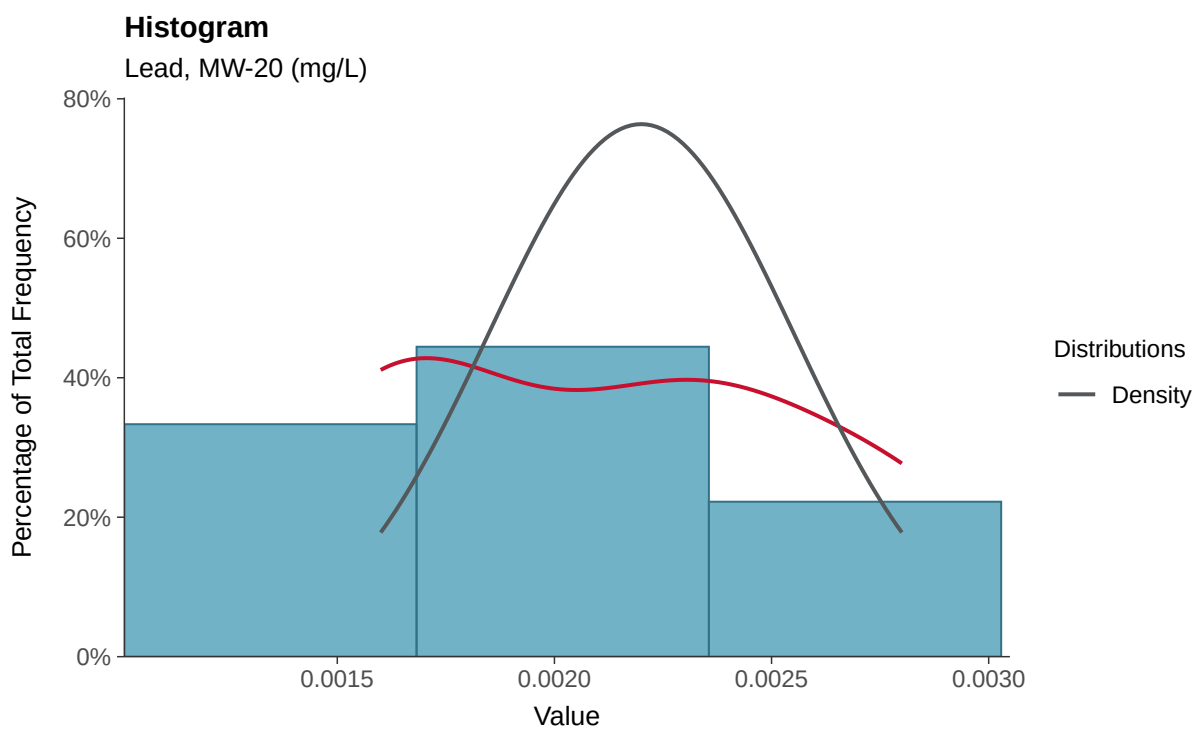



Trend Regression: Piecewise Linear-Linear
Fluoride (App IV), MW-20 (mg/L)
Value
0.5
0.4
0.3
0.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lead, MW-20

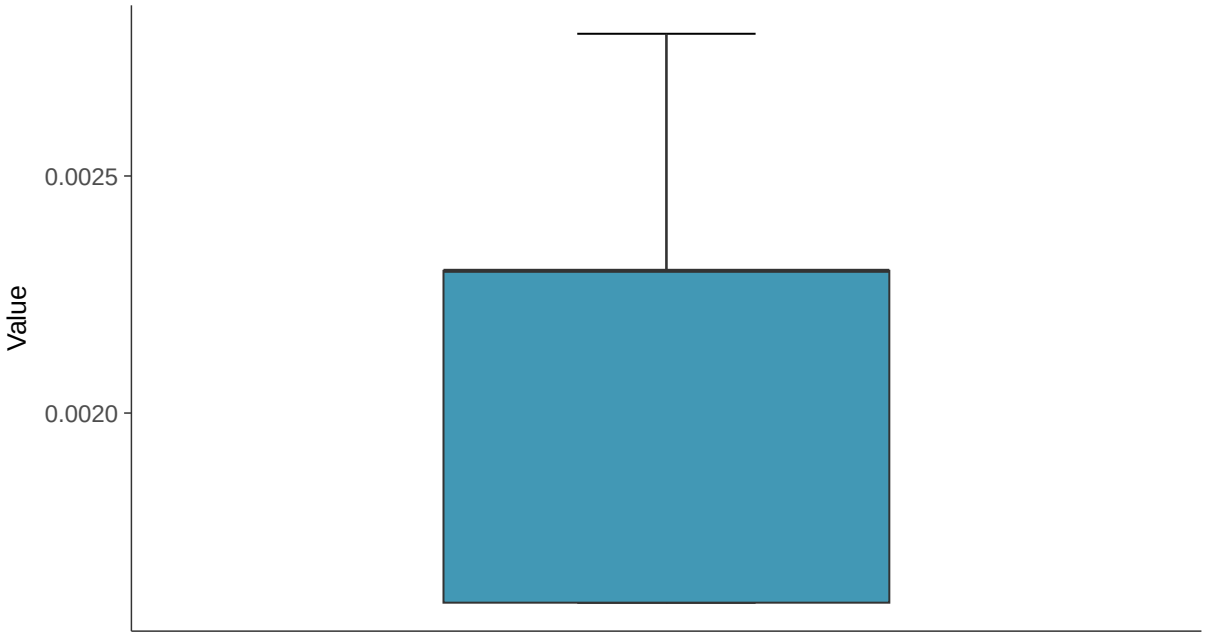
ID: 1_24_5_115





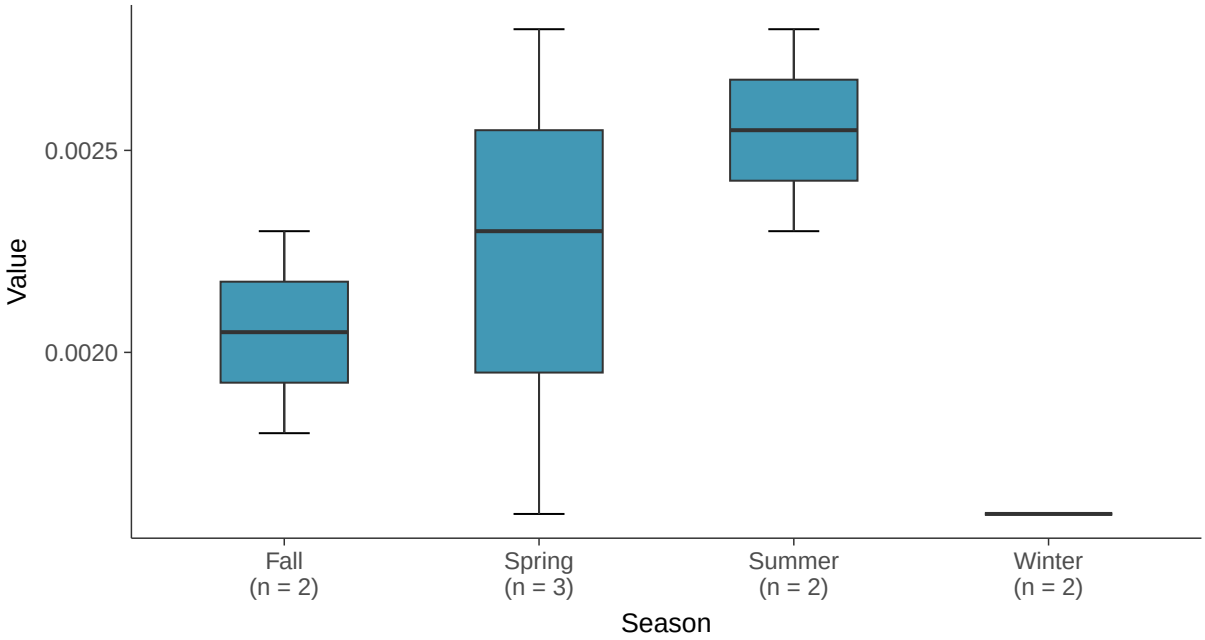
Boxplot

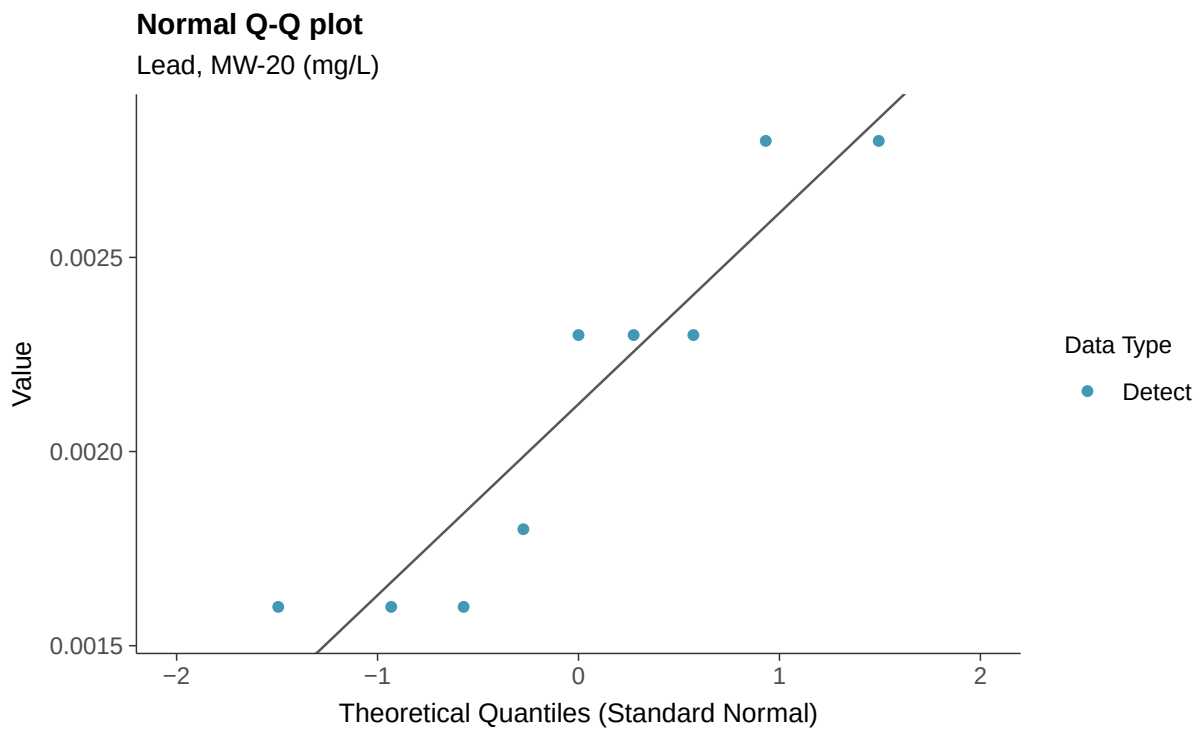
Lead, MW-20 (mg/L)

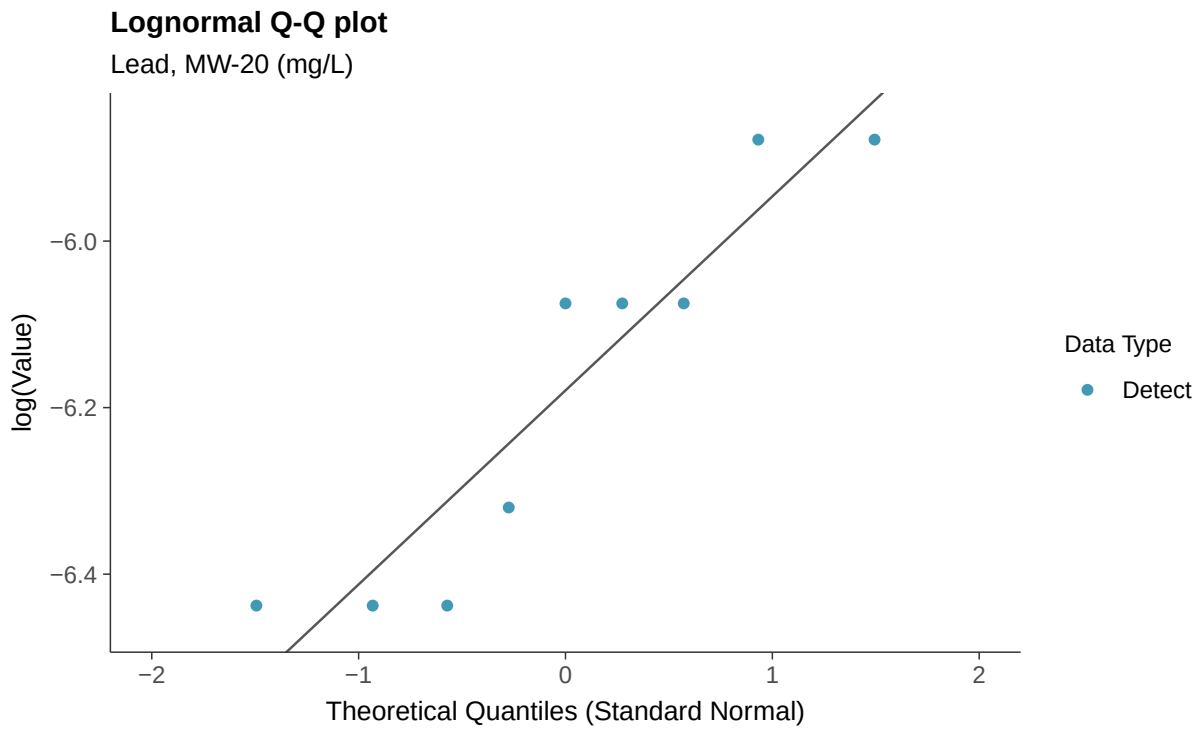


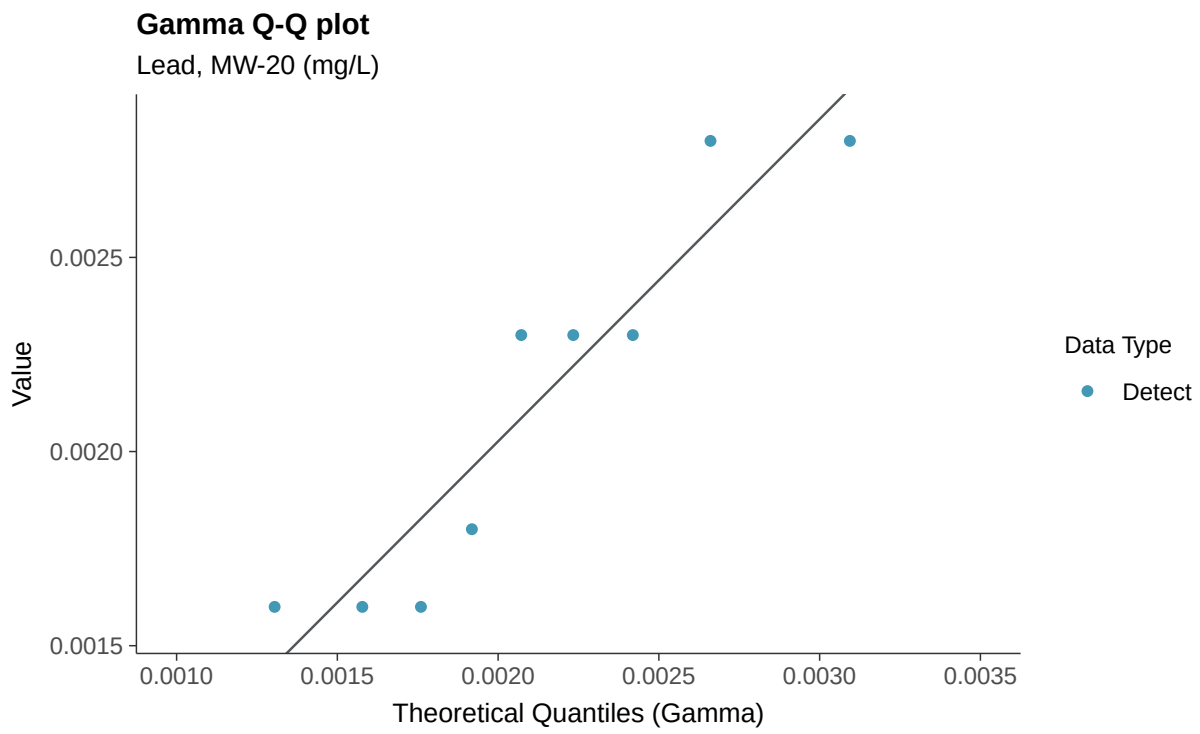
Boxplot by Season

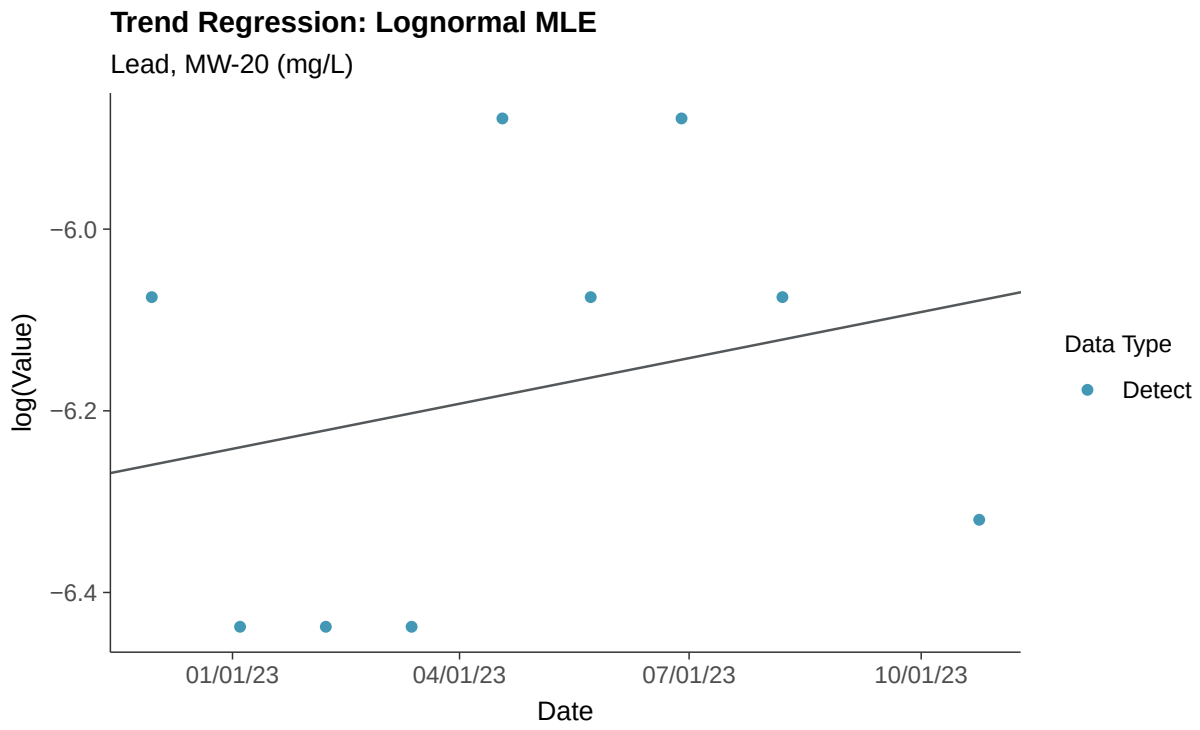
Lead, MW-20 (mg/L)

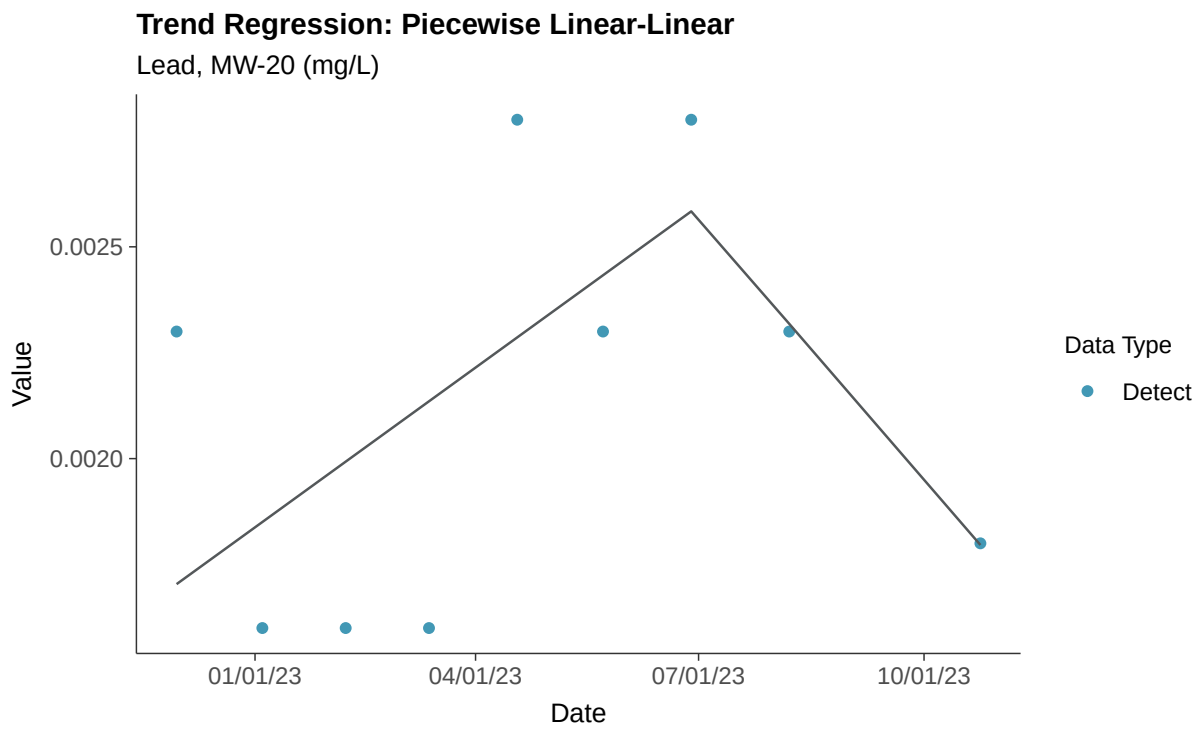


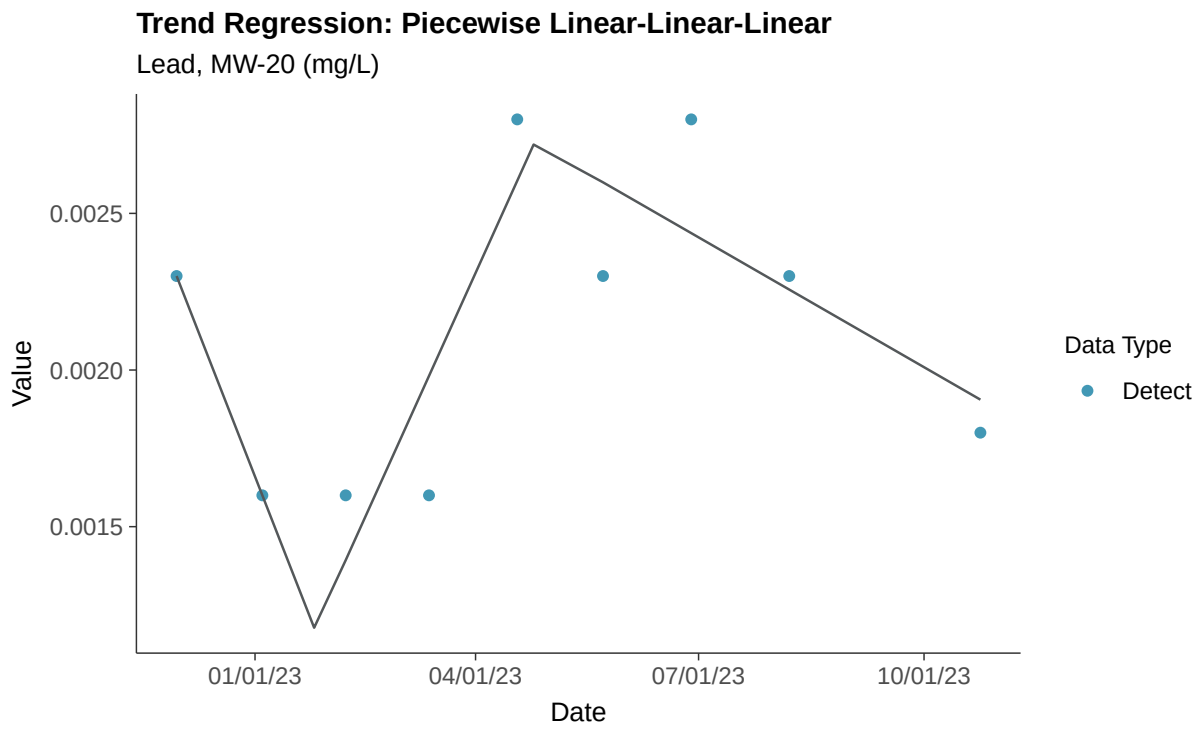

Normal Q-Q plot
Lead, MW-20 (mg/L)
Value
0.0025
0.0020
0.0015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lead, MW-20 (mg/L)
log(Value)
−6.0
−6.2
−6.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Lead, MW-20 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
Theoretical Quantiles (Gamma)
Data Type
Detect

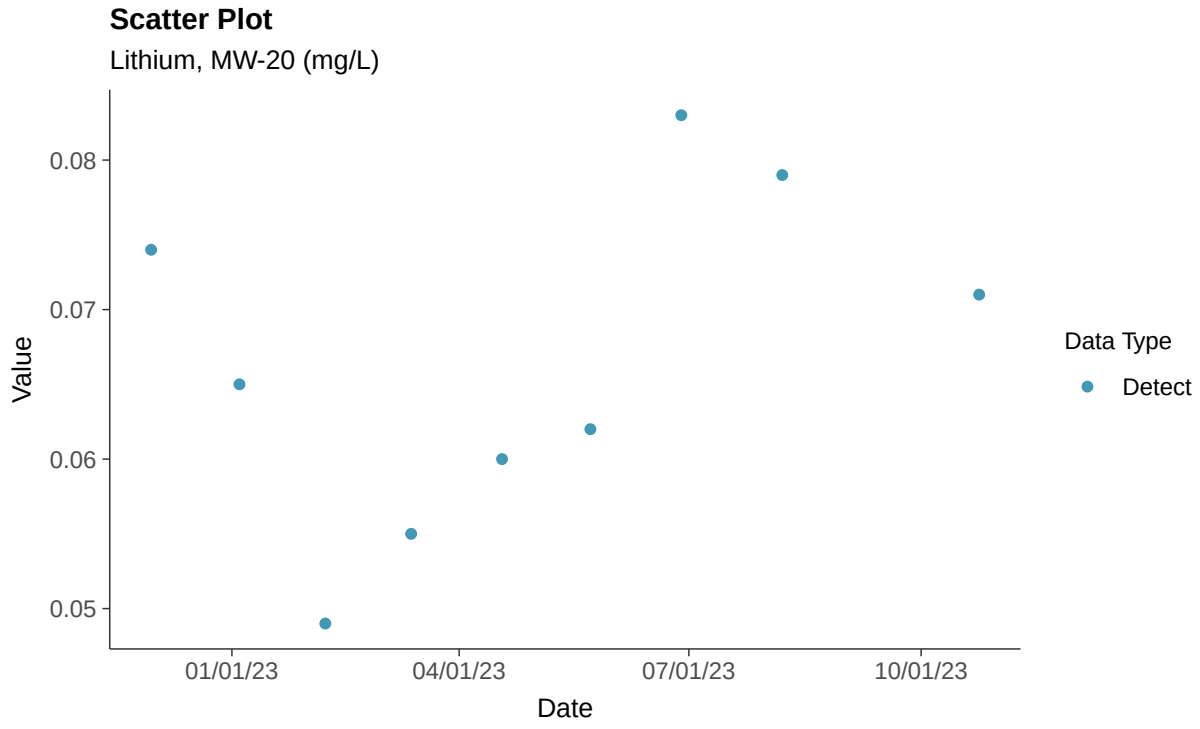

Trend Regression: Lognormal MLE
Lead, MW-20 (mg/L)
log(Value)
−6.0
−6.2
−6.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

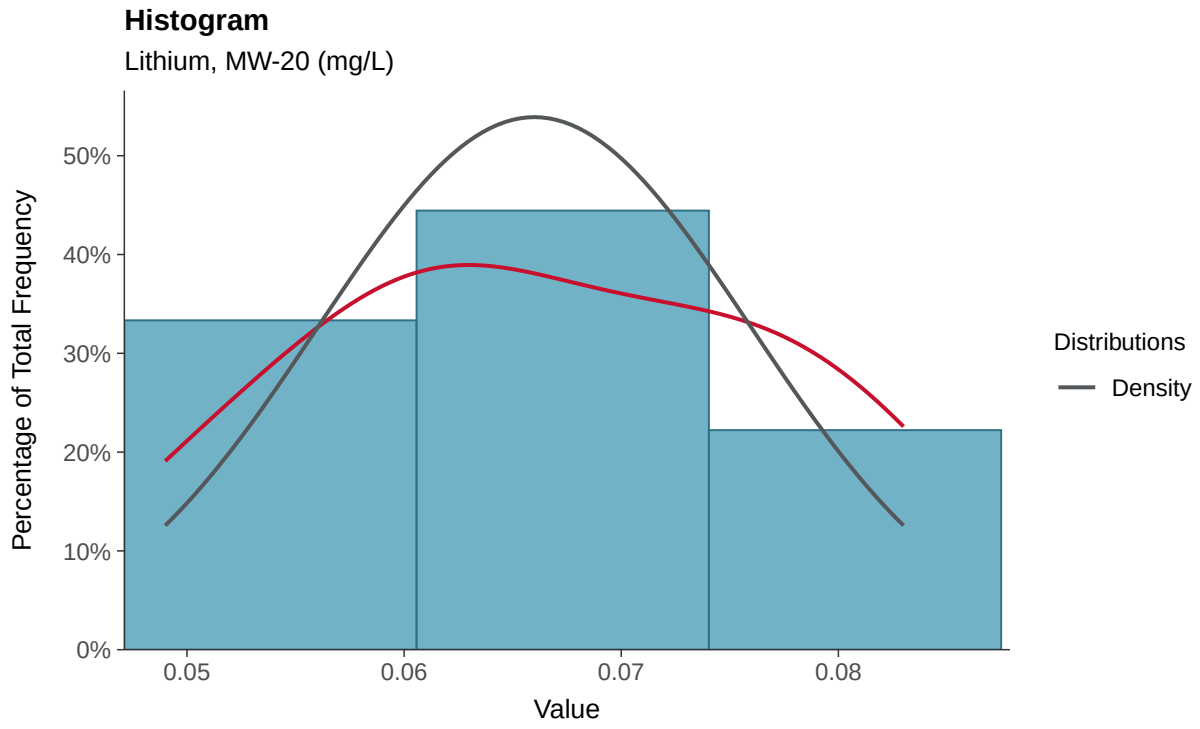

Trend Regression: Piecewise Linear-Linear
Lead, MW-20 (mg/L)
Value
0.0025
0.0020
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-20 (mg/L)
Value
0.0025
0.0020
0.0015
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lithium, MW-20

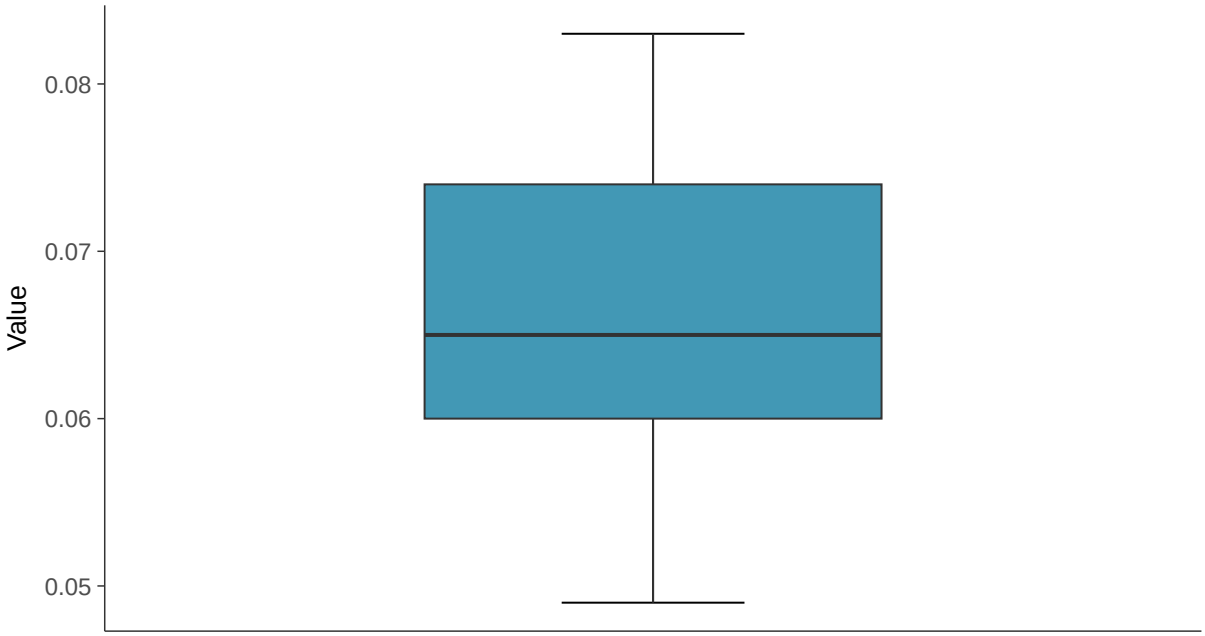
ID: 1_24_5_116





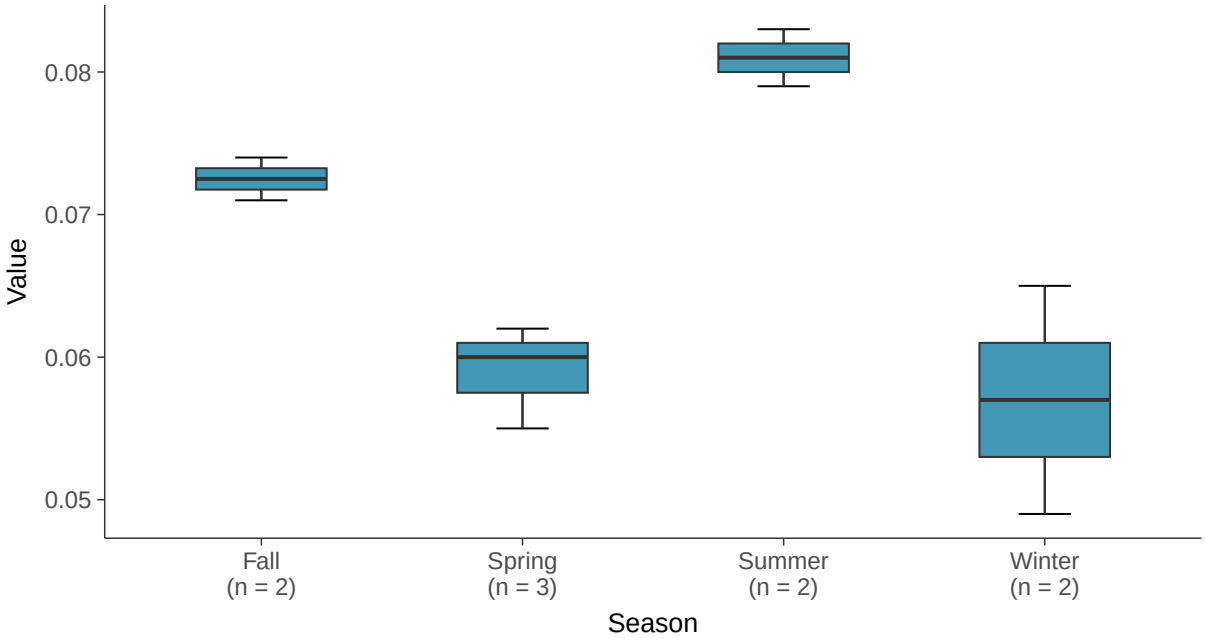
Boxplot

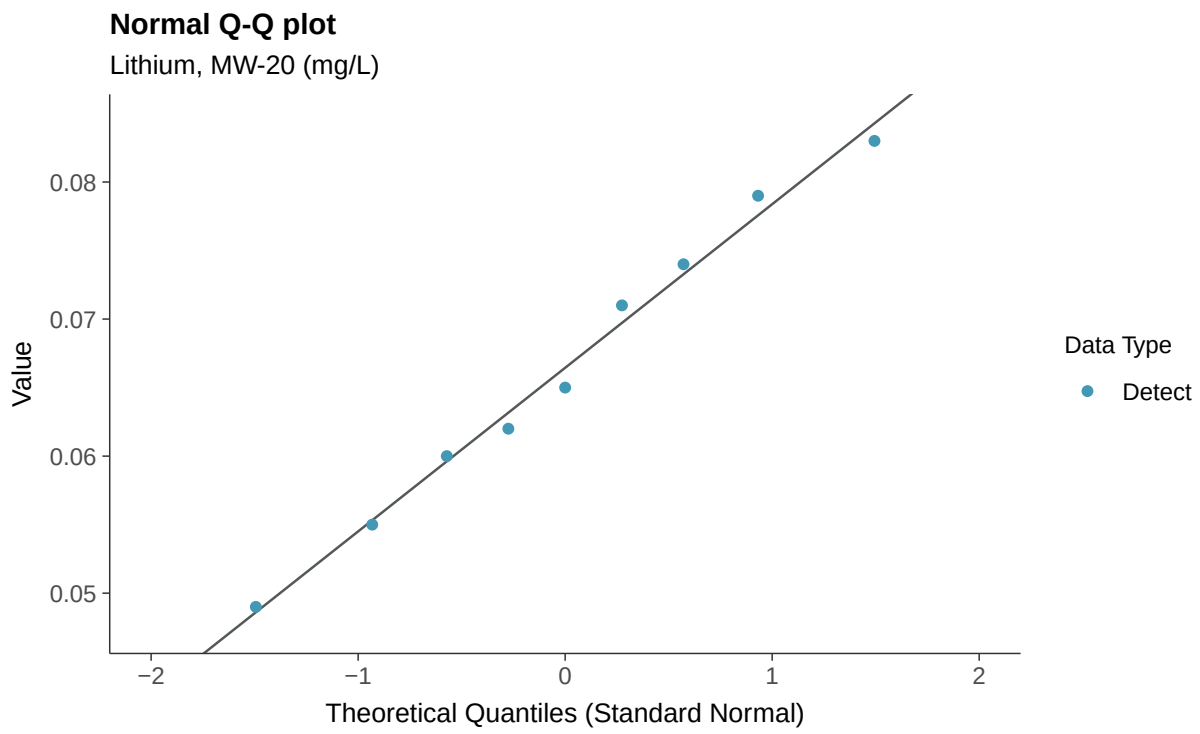
Lithium, MW-20 (mg/L)

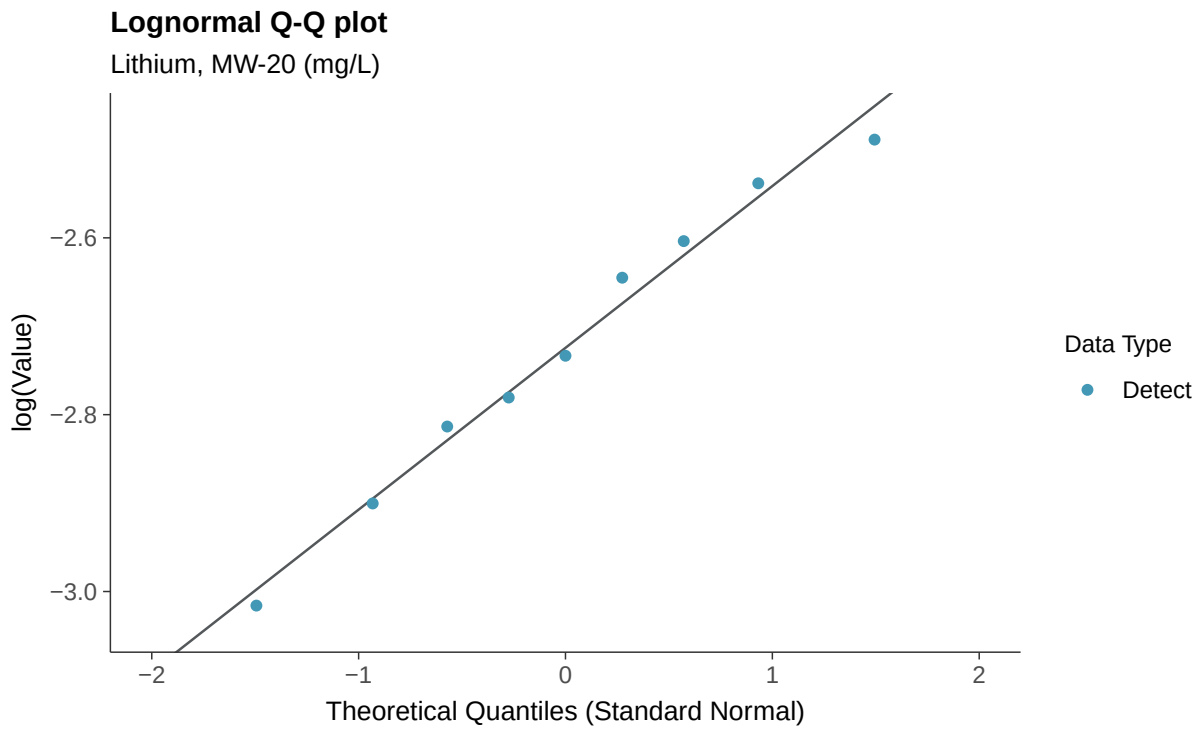


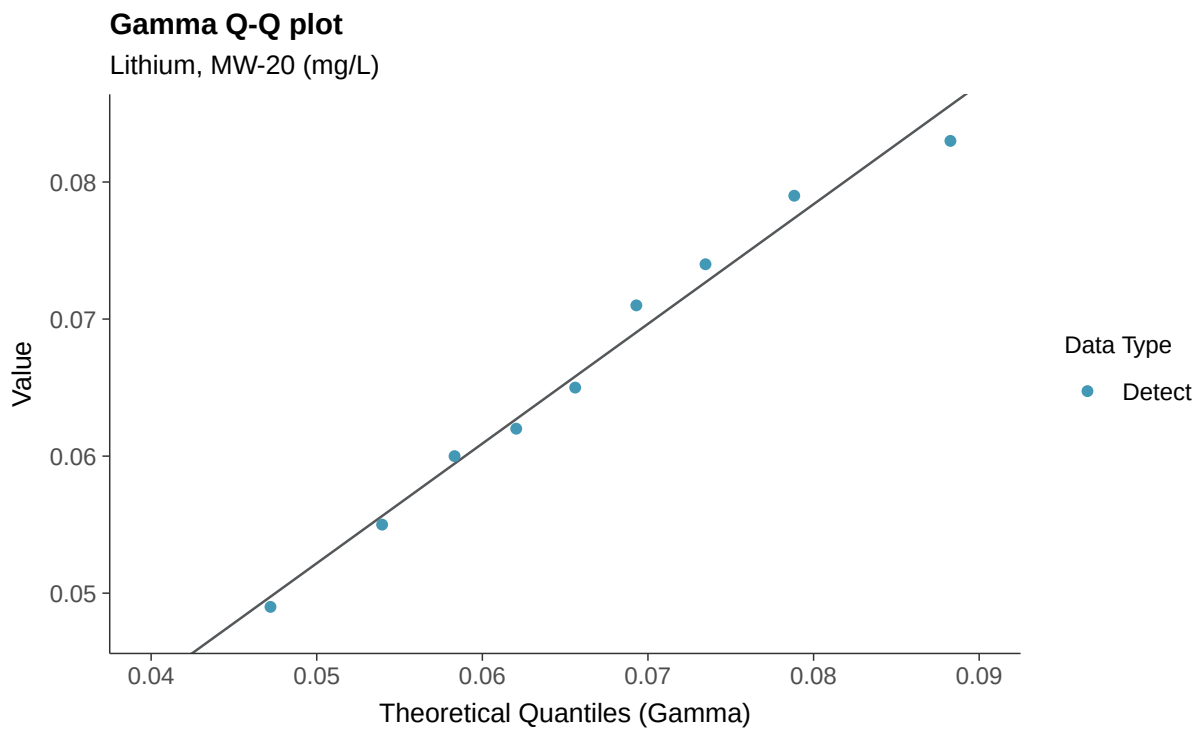
Boxplot by Season

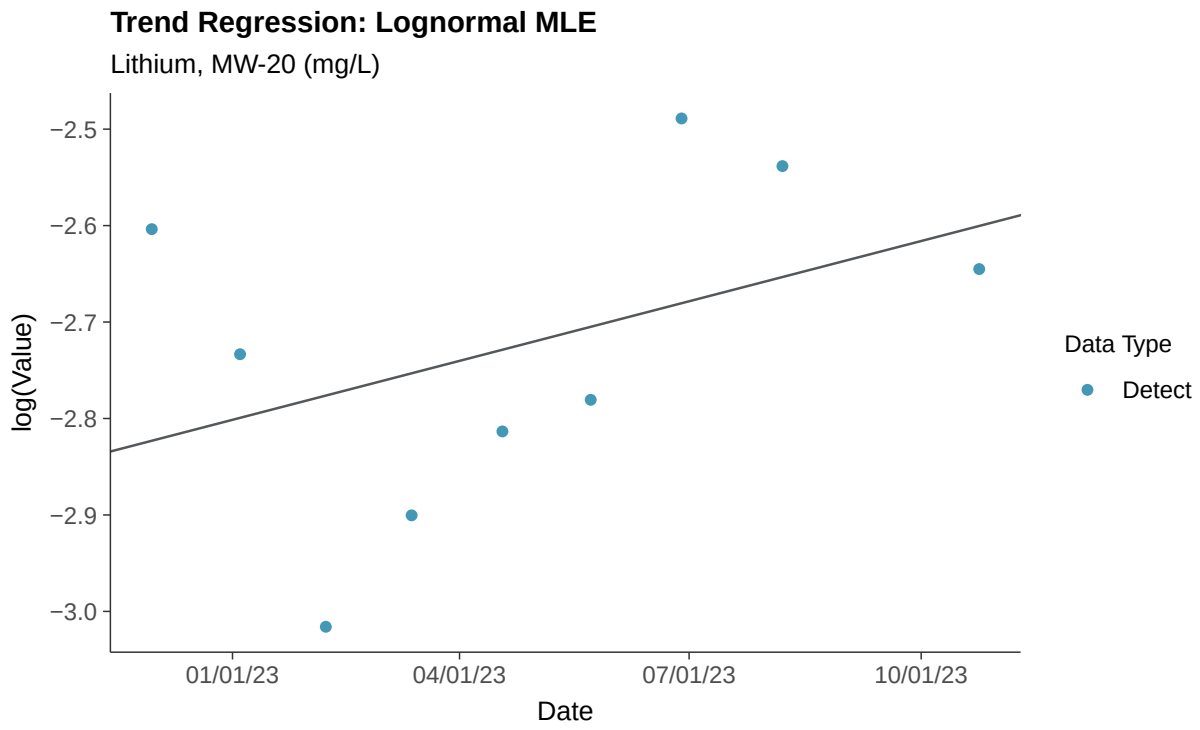
Lithium, MW-20 (mg/L)

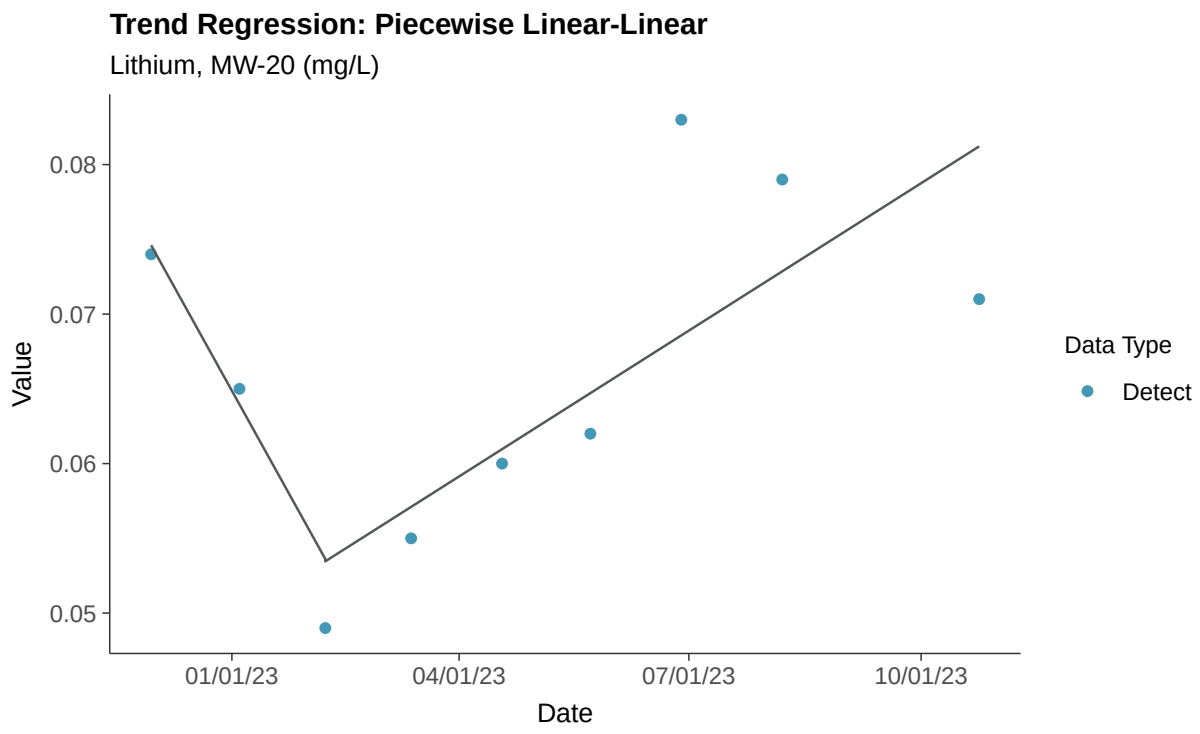


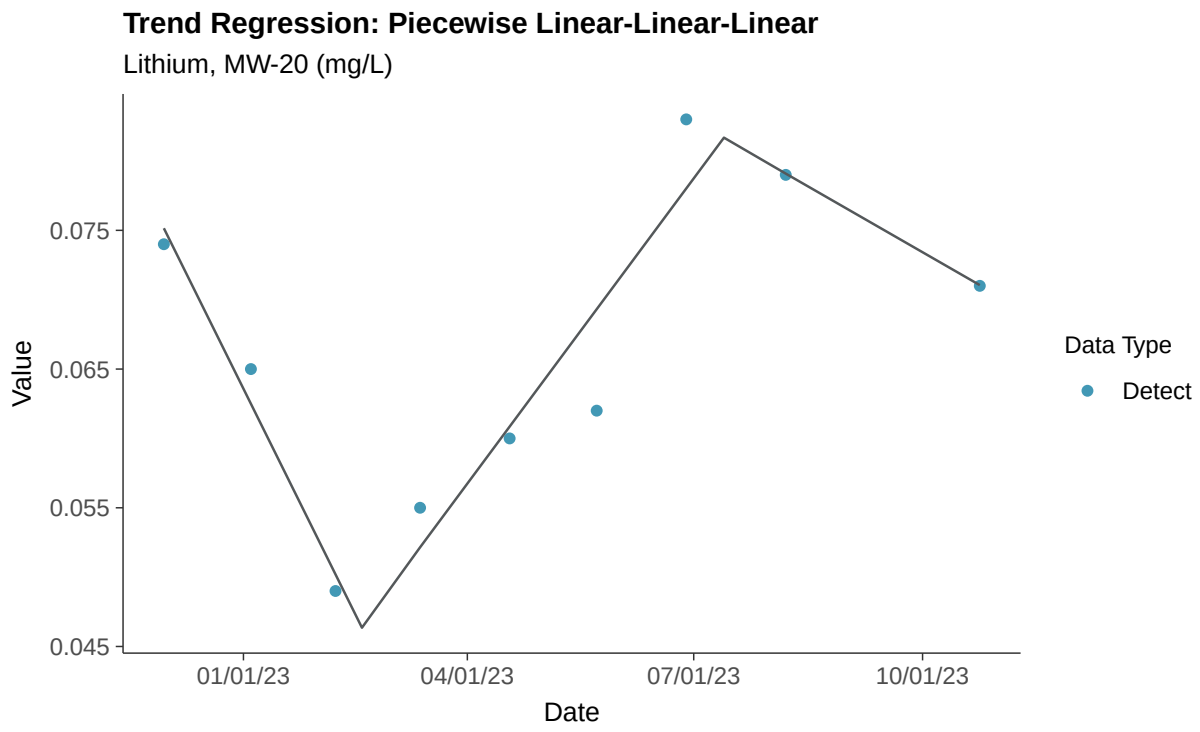

Normal Q-Q plot
Lithium, MW-20 (mg/L)
Value
0.08
0.07
0.06
0.05
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-20 (mg/L)
log(Value)
−2.6
−2.8
−3.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Lithium, MW-20 (mg/L)
Value
0.08
0.07
0.06
0.05
0.04
0.05
0.06
0.07
0.08
0.09
Theoretical Quantiles (Gamma)
Data Type
Detect

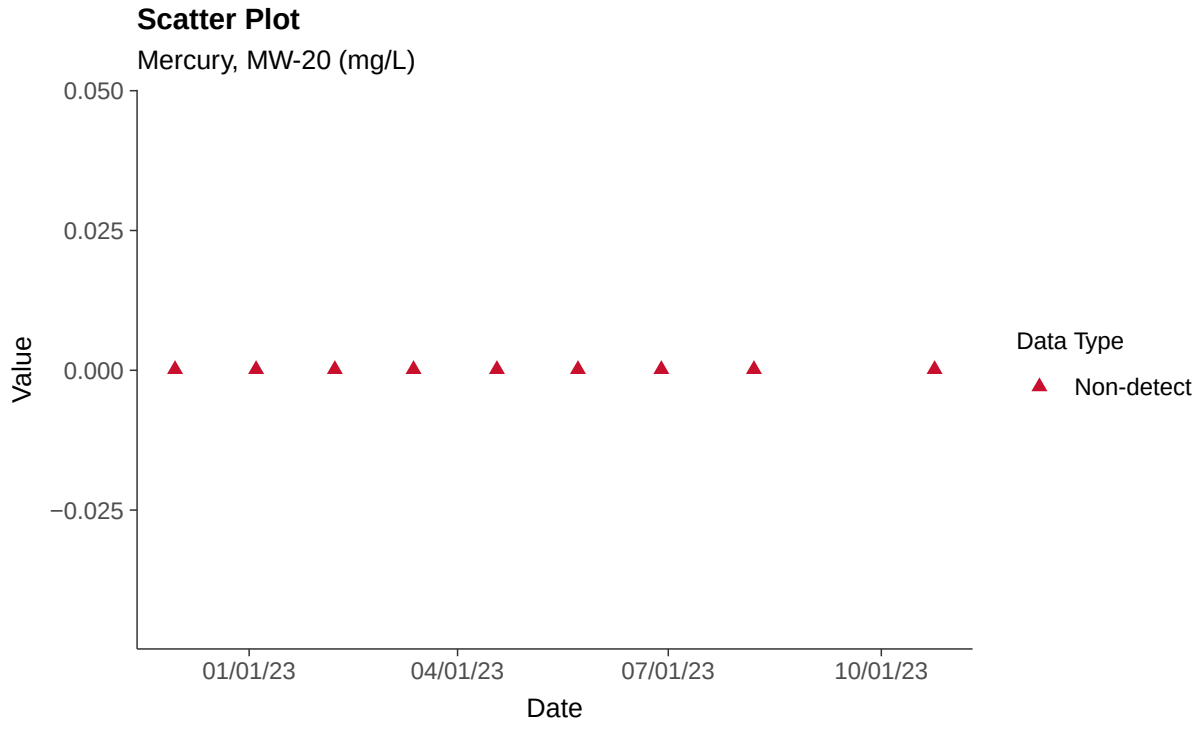

Trend Regression: Lognormal MLE
Lithium, MW-20 (mg/L)
log(Value)
−2.5
−2.6
−2.7
−2.8
−2.9
−3.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

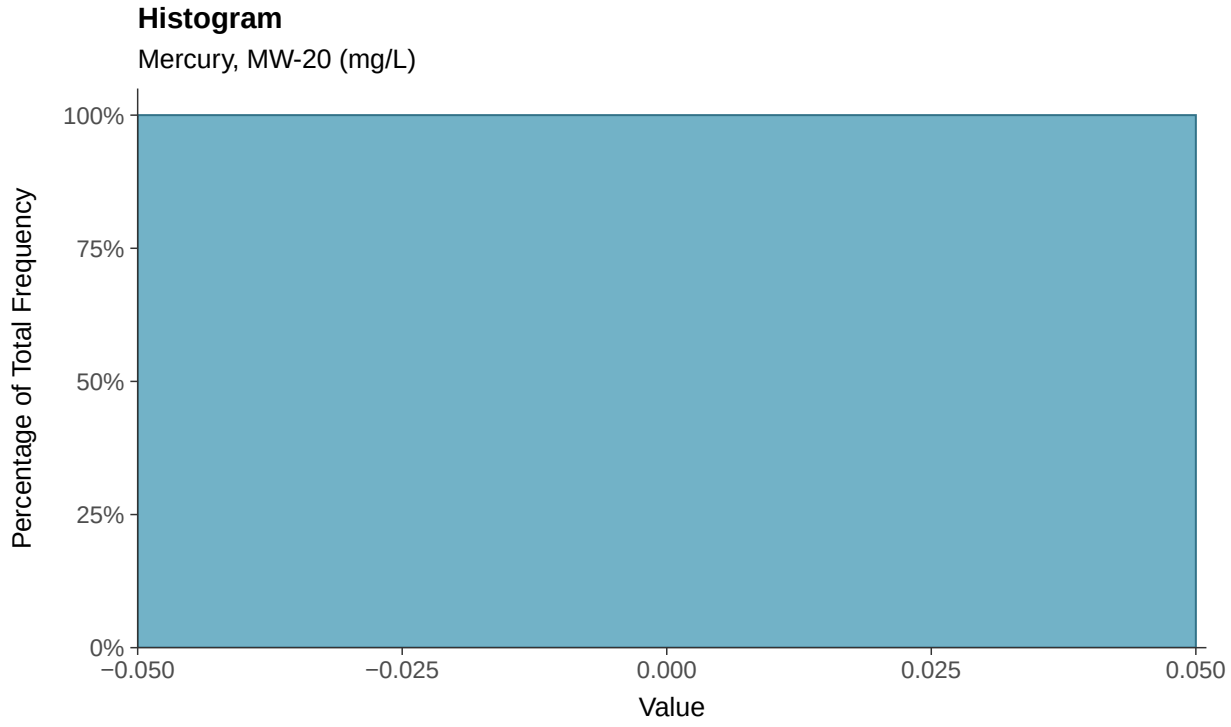

Trend Regression: Piecewise Linear-Linear
Lithium, MW-20 (mg/L)
Value
0.08
0.07
0.06
0.05
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Lithium, MW-20 (mg/L)
Value
0.075
0.065
0.055
0.045
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-20

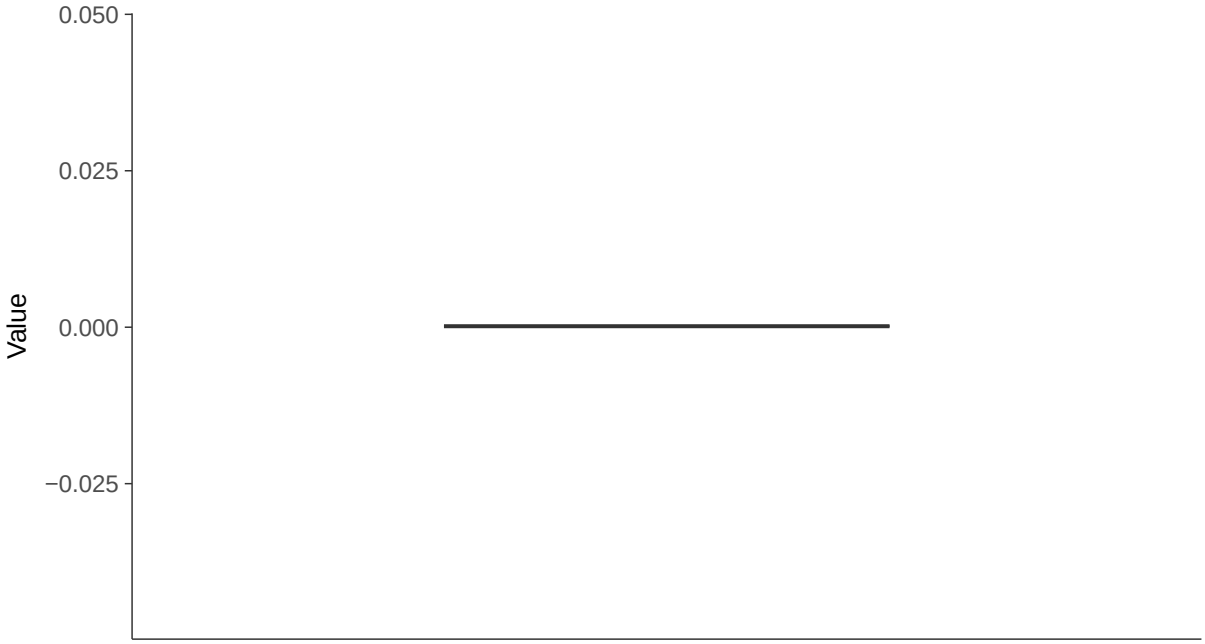
ID: 1_24_5_117





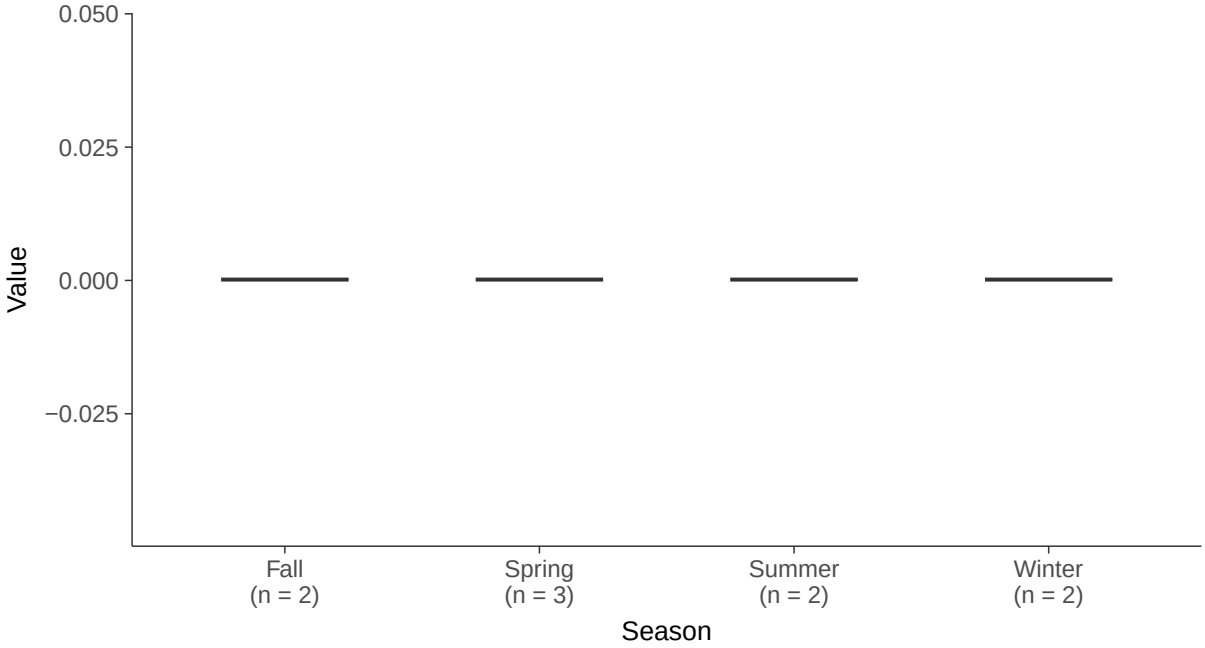
Boxplot

Mercury, MW-20 (mg/L)



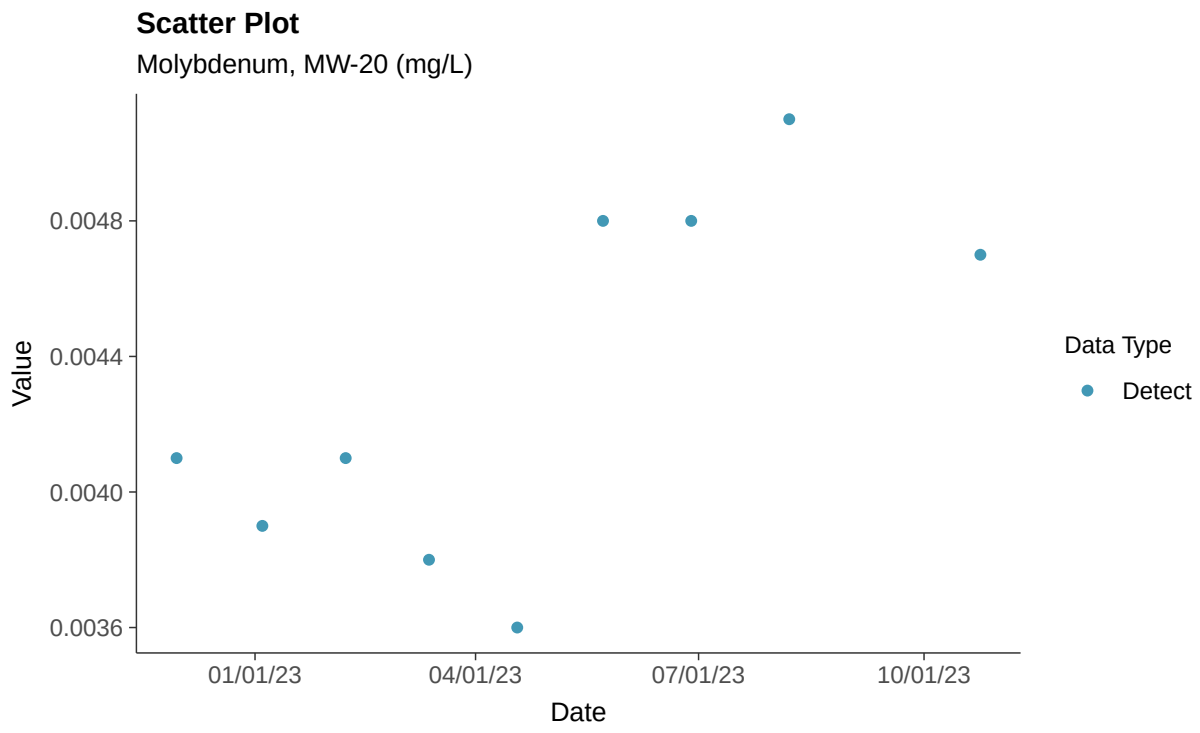
Boxplot by Season

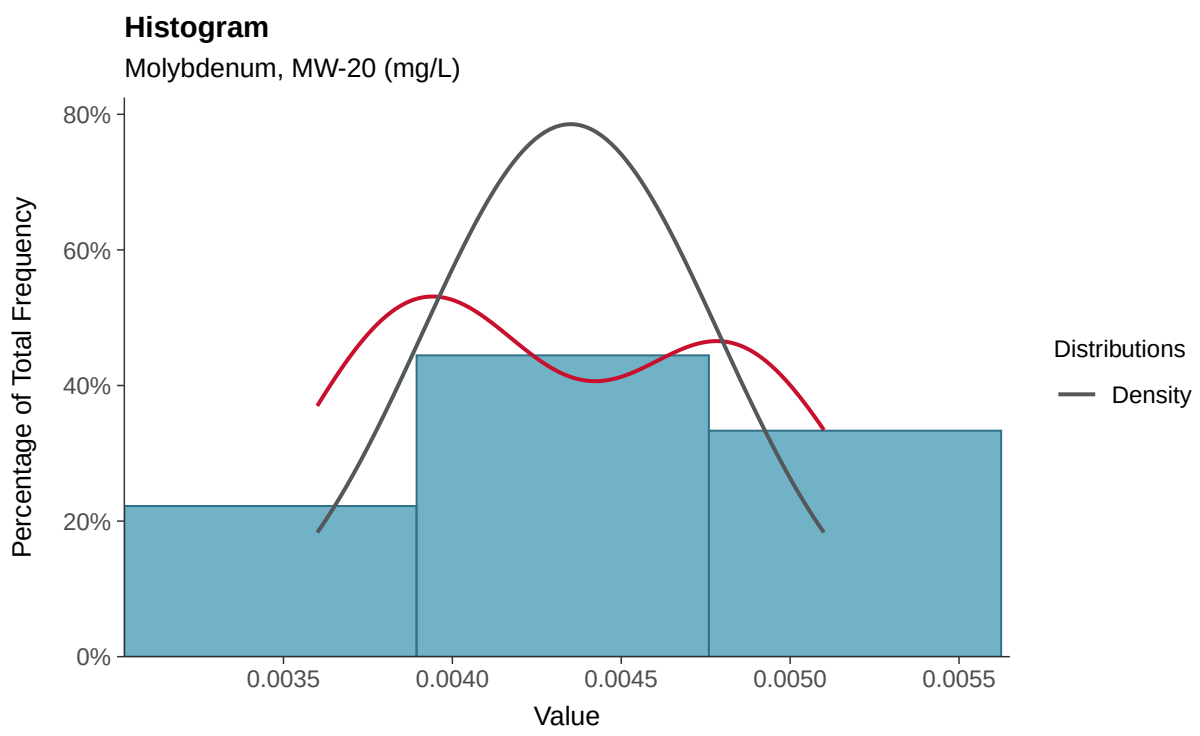
Mercury, MW-20 (mg/L)



Appendix IV: Molybdenum, MW-20

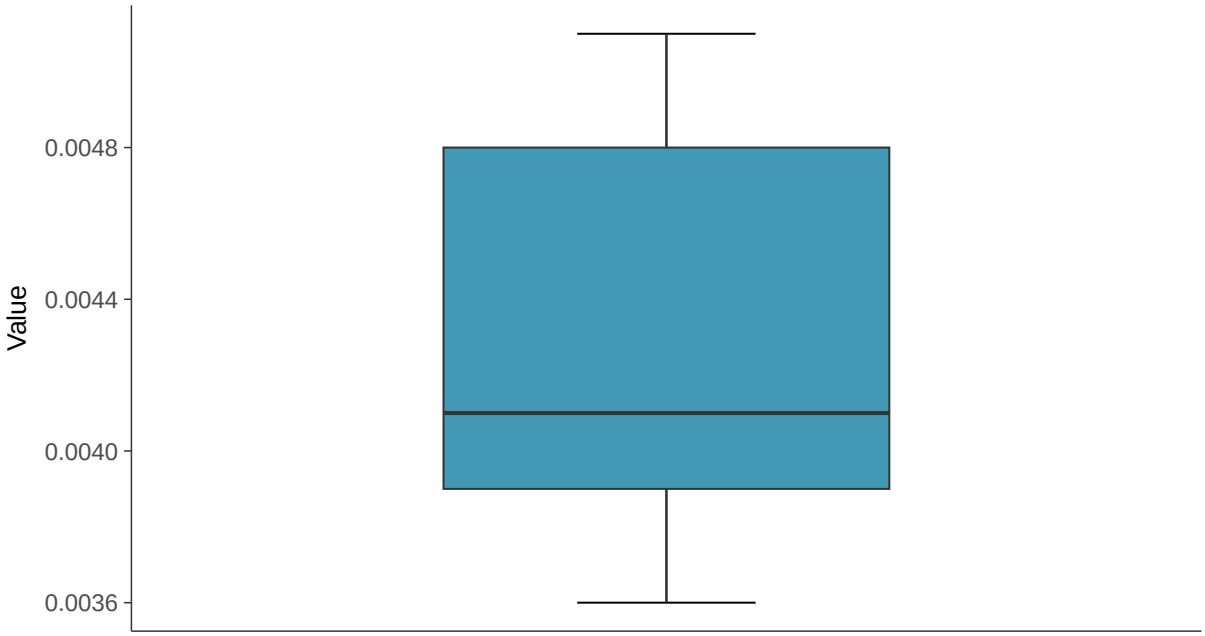
ID: 1_24_5_118





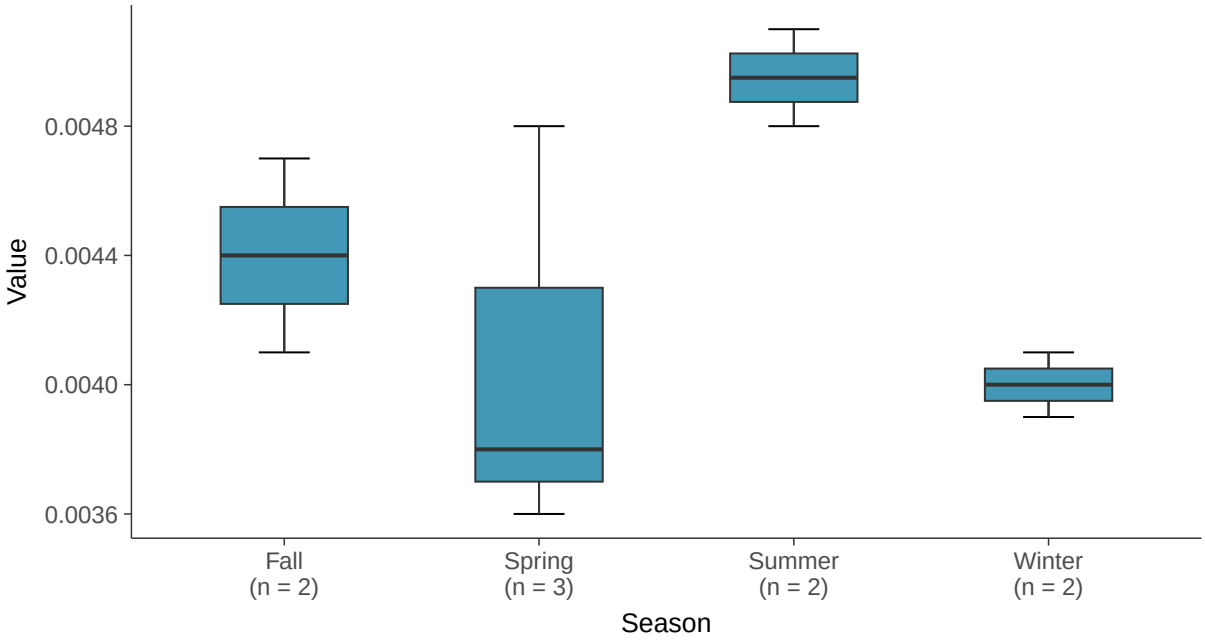
Boxplot

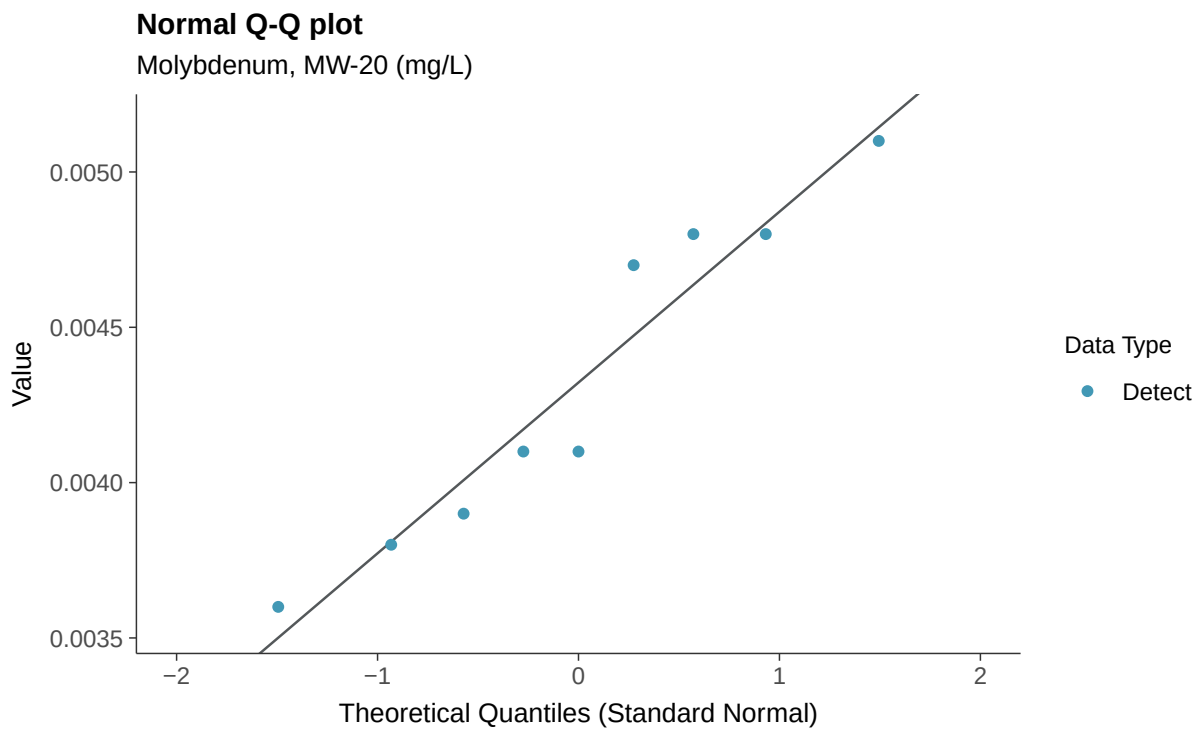
Molybdenum, MW-20 (mg/L)

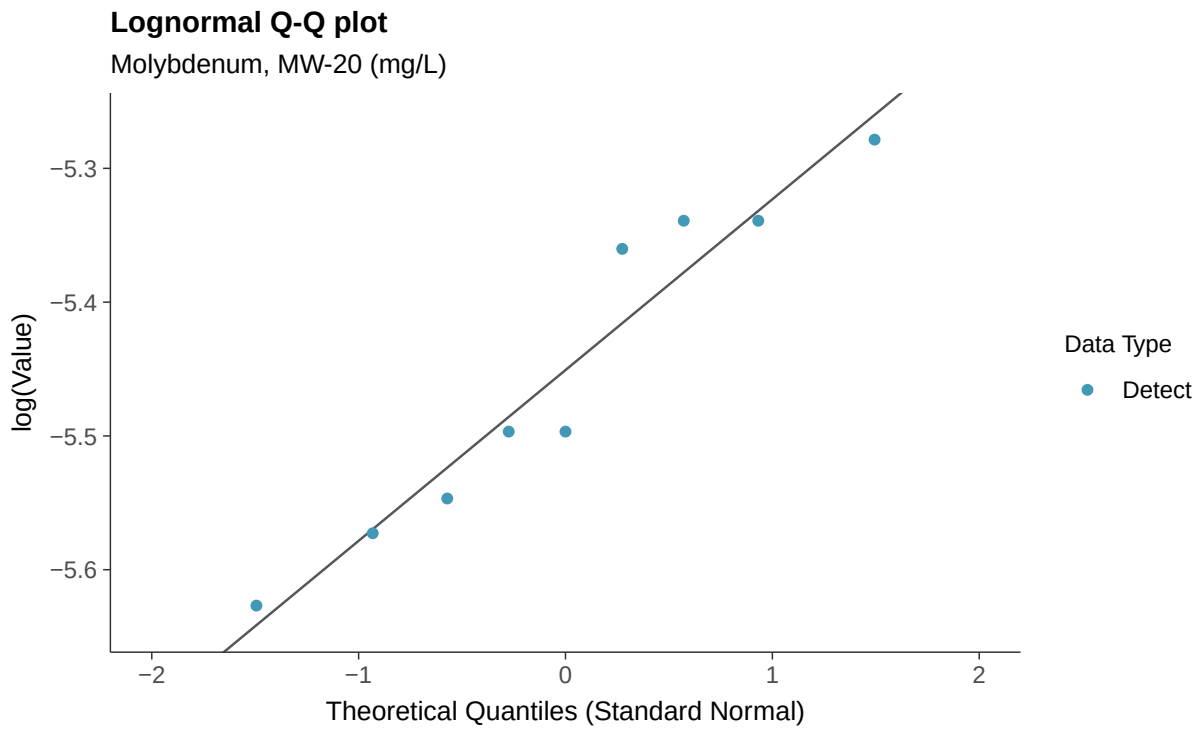


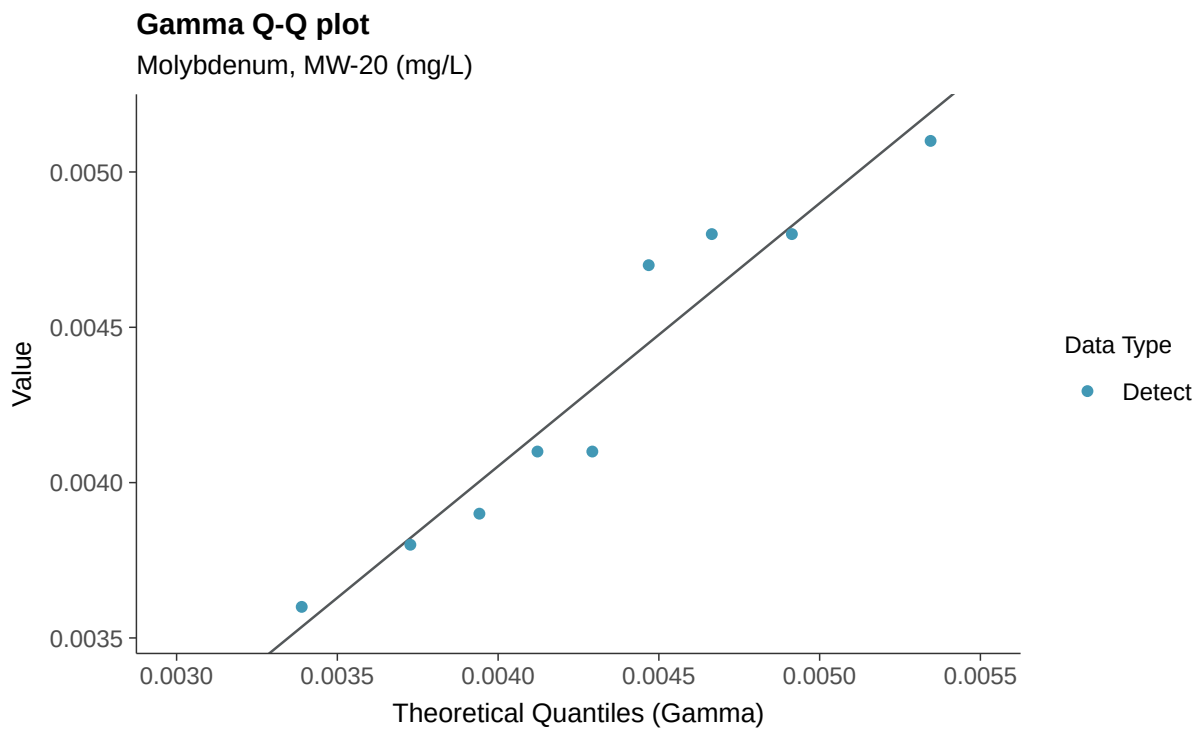
Boxplot by Season

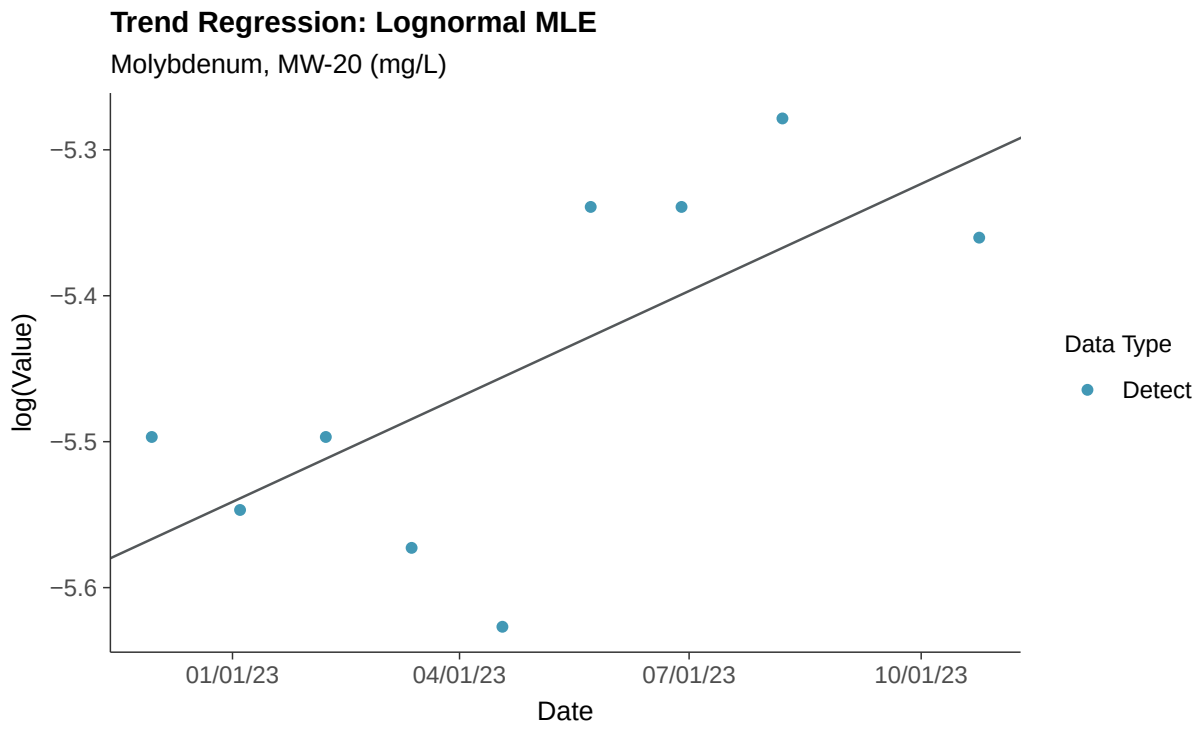
Molybdenum, MW-20 (mg/L)

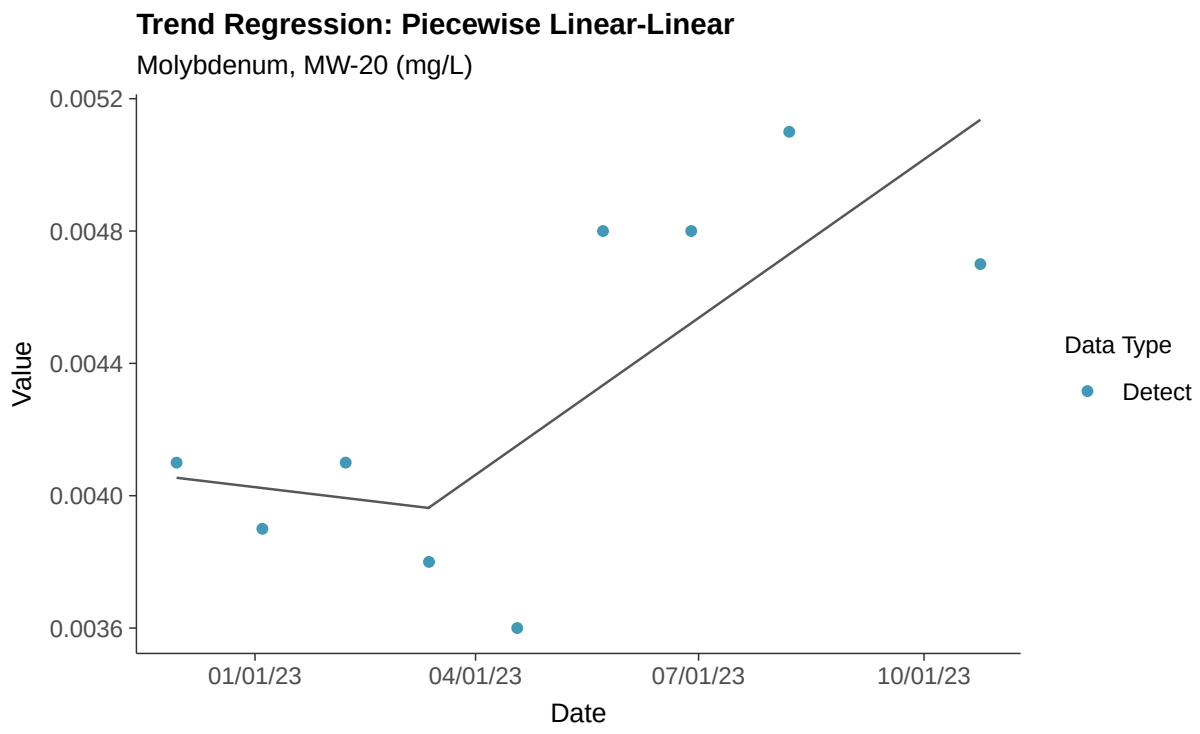


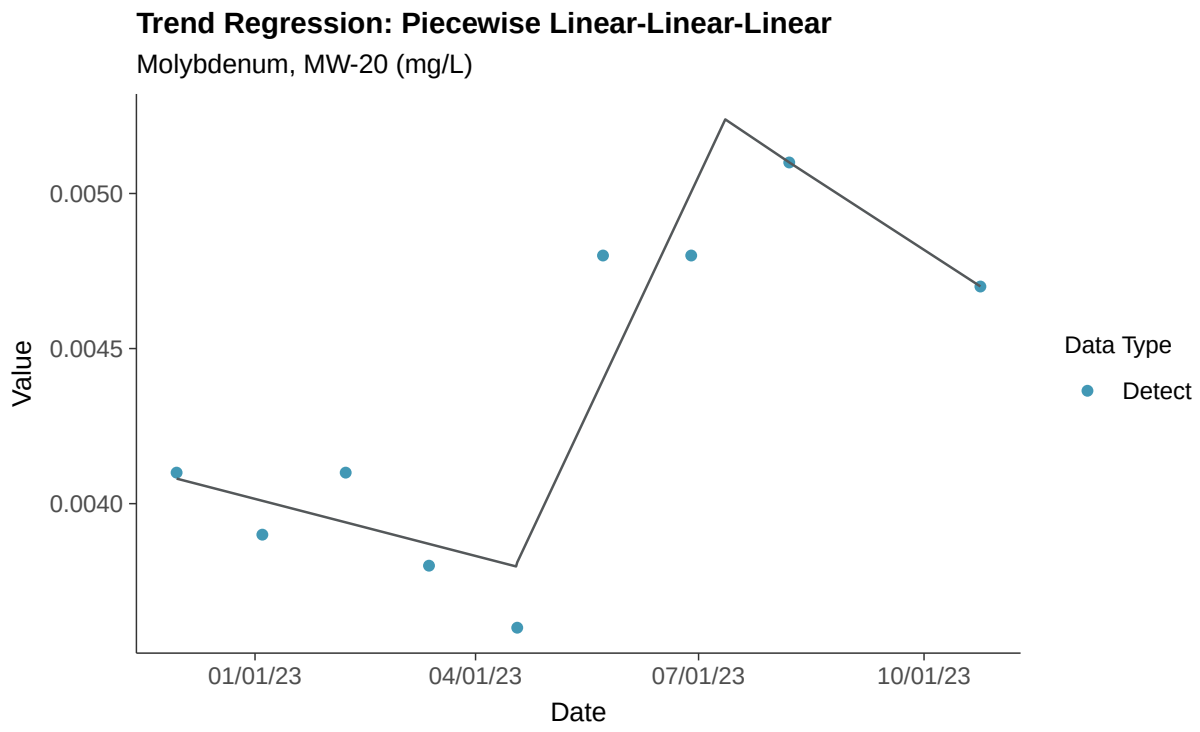

Normal Q-Q plot
Molybdenum, MW-20 (mg/L)
Value
0.0050
0.0045
0.0040
0.0035
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Molybdenum, MW-20 (mg/L)
log(Value)
−5.3
−5.4
−5.5
−5.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Molybdenum, MW-20 (mg/L)
Value
0.0050
0.0045
0.0040
0.0035
0.0030
0.0035
0.0040
0.0045
0.0050
0.0055
Theoretical Quantiles (Gamma)
Data Type
Detect

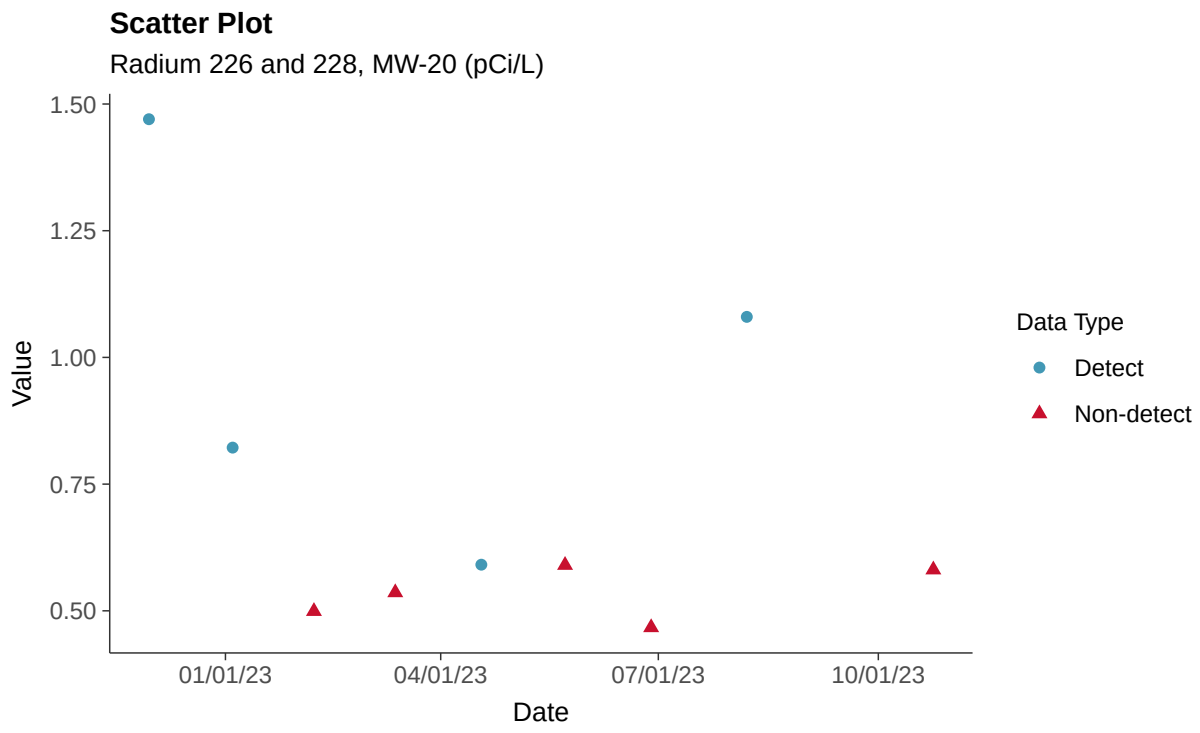

Trend Regression: Lognormal MLE
Molybdenum, MW-20 (mg/L)
log(Value)
−5.3
−5.4
−5.5
−5.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

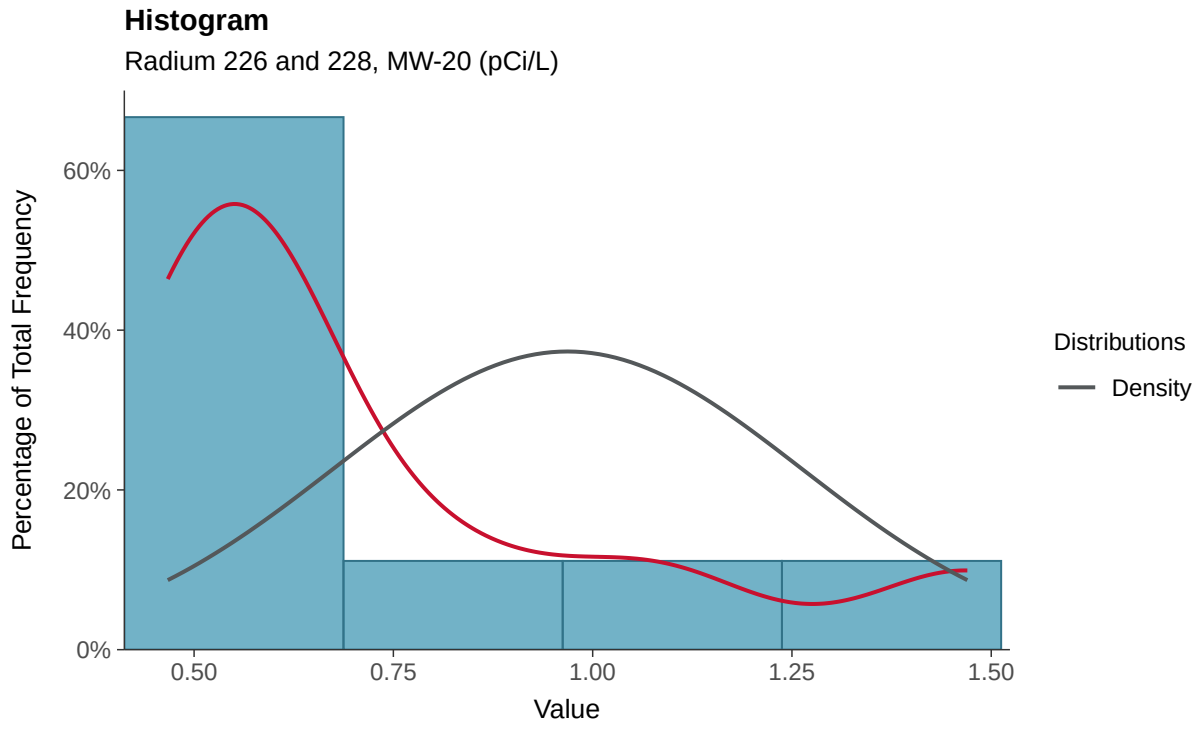

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-20 (mg/L)
0.0052
0.0048
0.0044
0.0040
0.0036
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-20 (mg/L)
0.0050
0.0045
0.0040
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Radium 226 and 228, MW-20

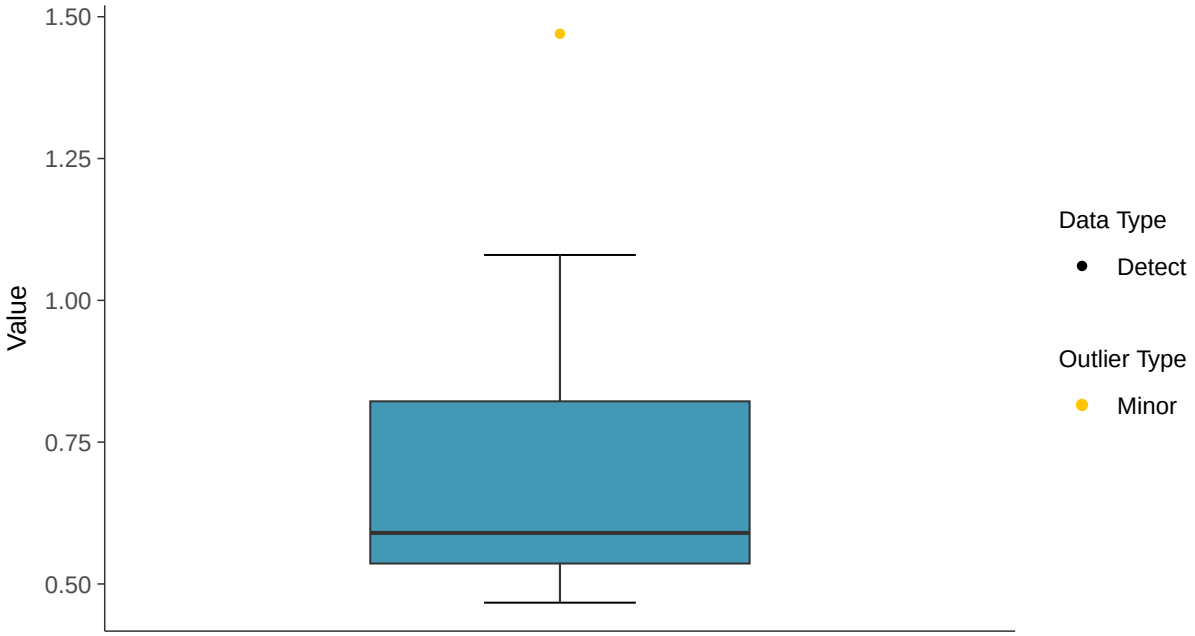
ID: 1_24_5_121





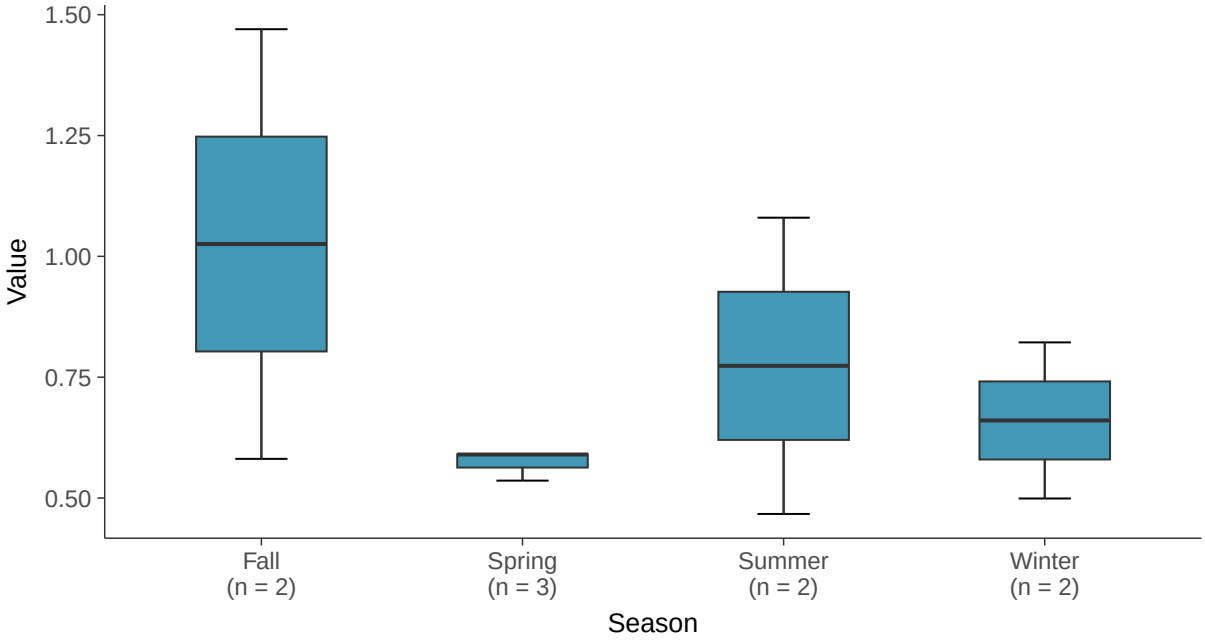
Boxplot

Radium 226 and 228, MW-20 (pCi/L)



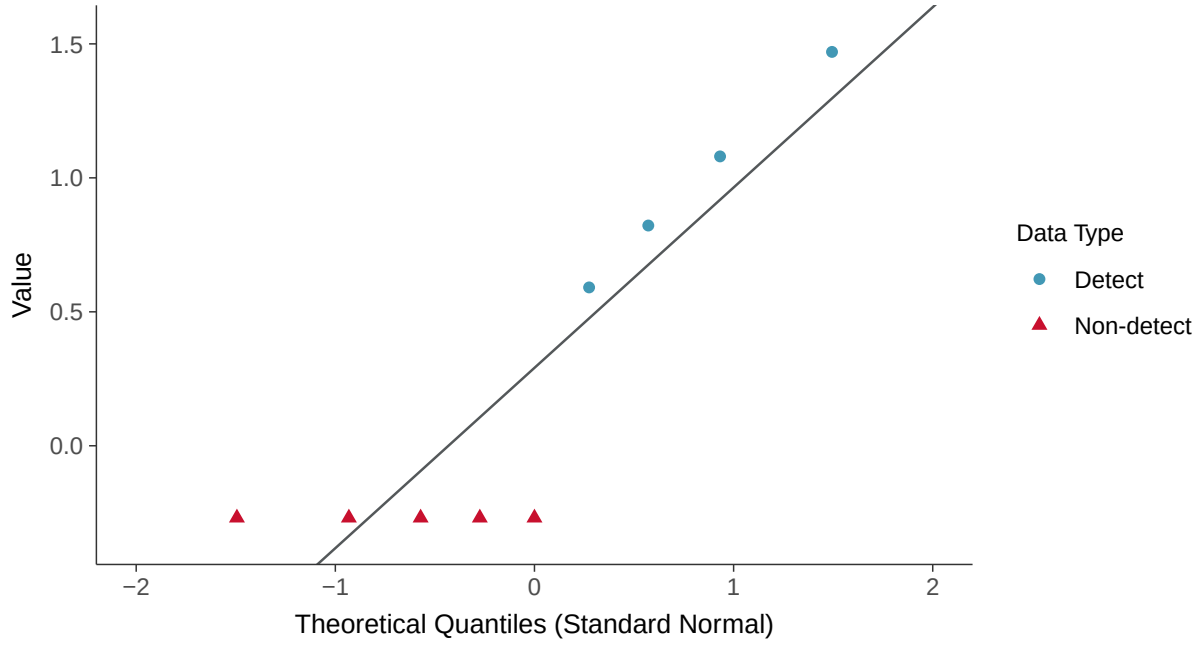
Boxplot by Season

Radium 226 and 228, MW-20 (pCi/L)



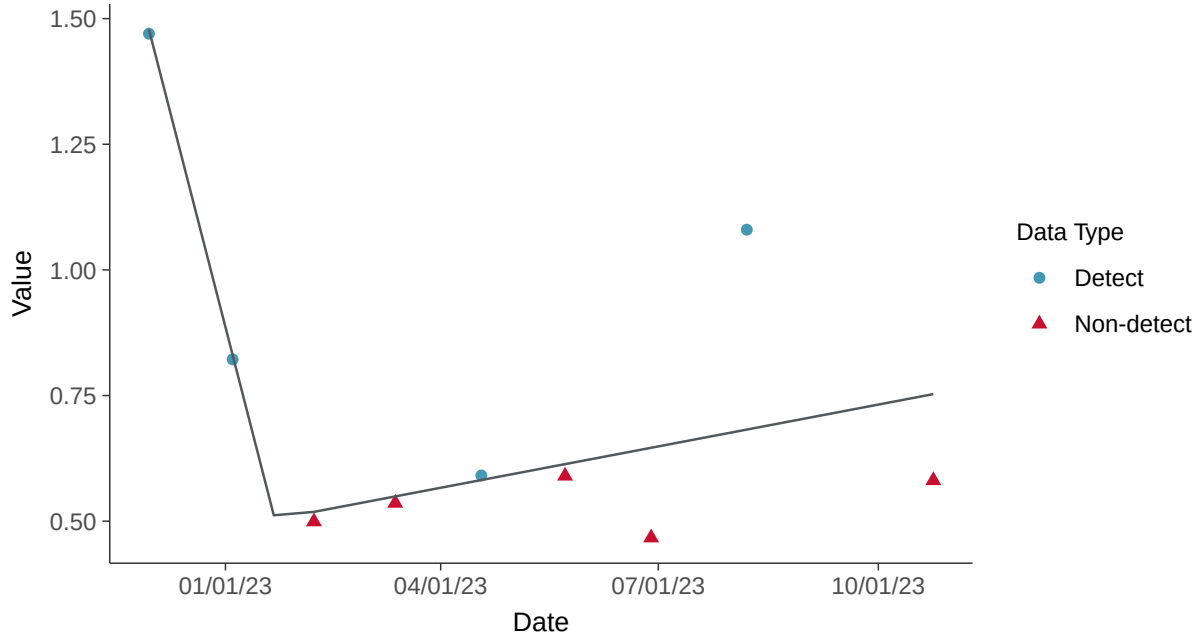
Normal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-20 (pCi/L)



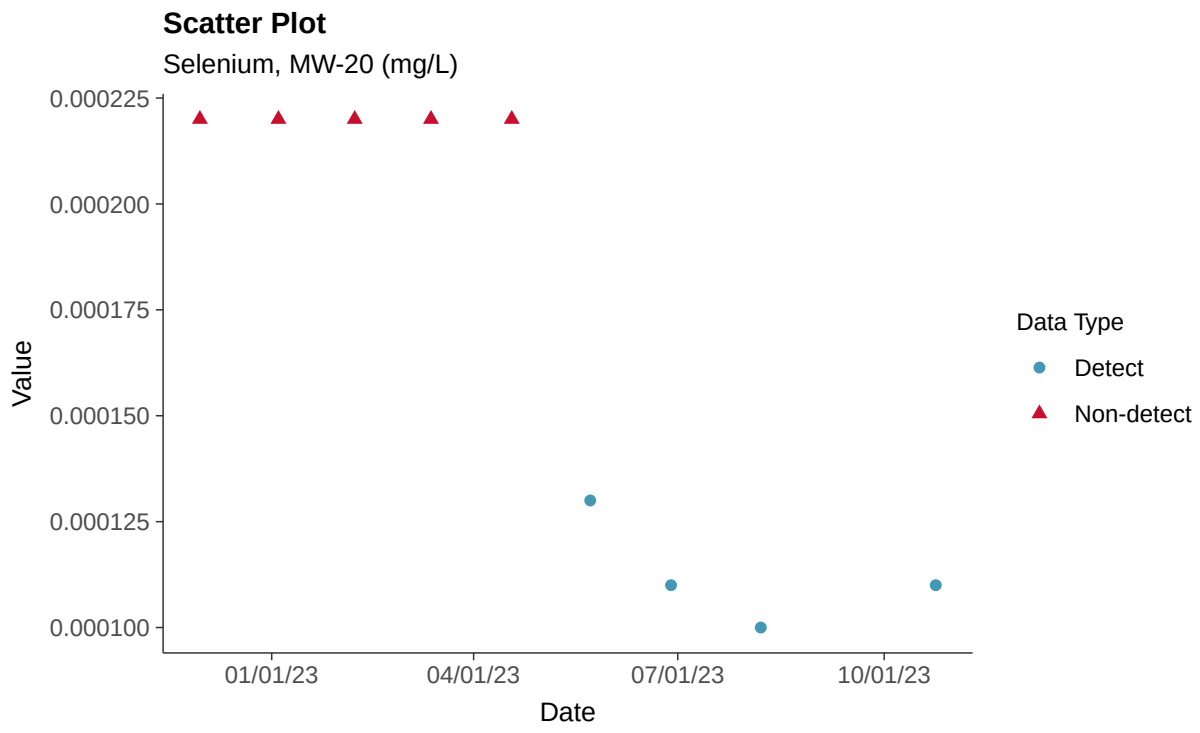
Trend Regression: Piecewise Linear-Linear

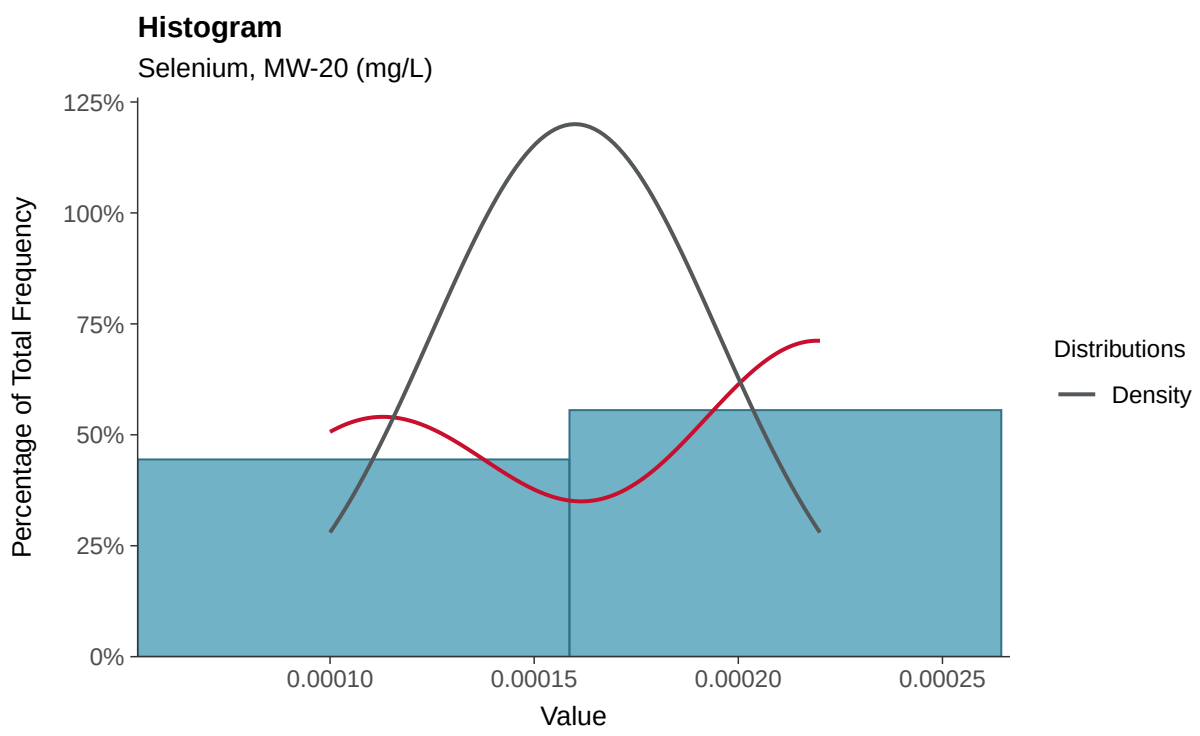
Radium 226 and 228, MW-20 (pCi/L)



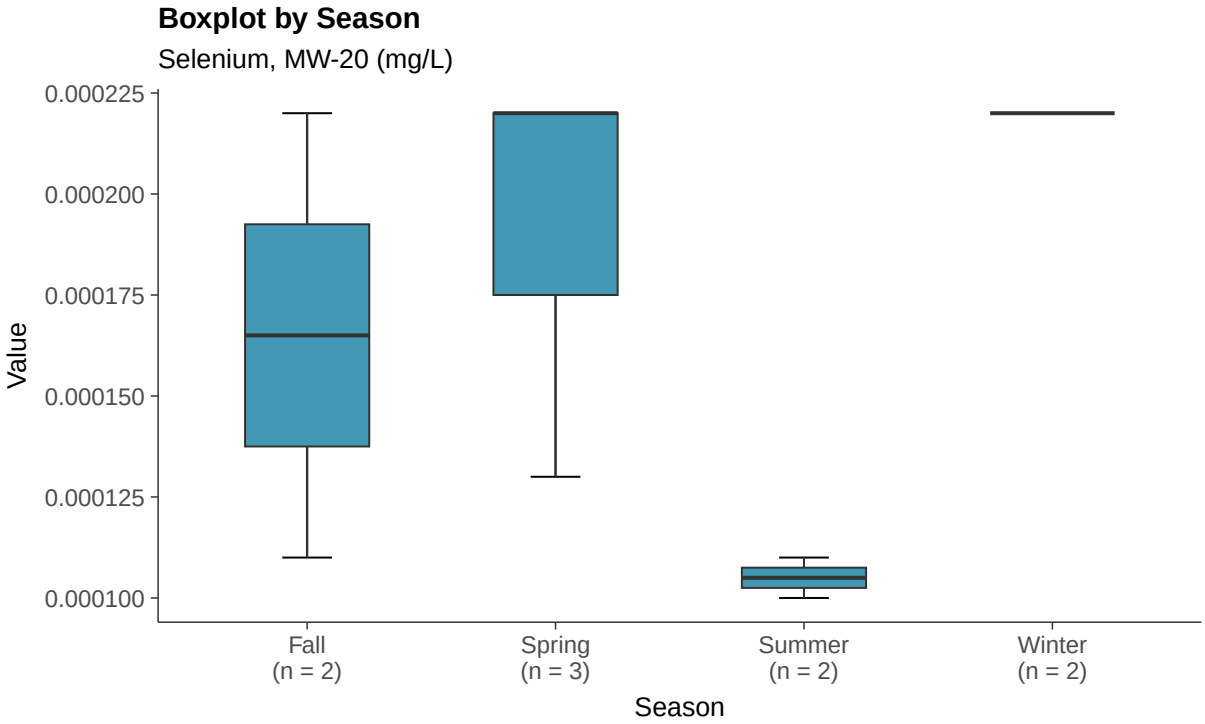
Appendix IV: Selenium, MW-20

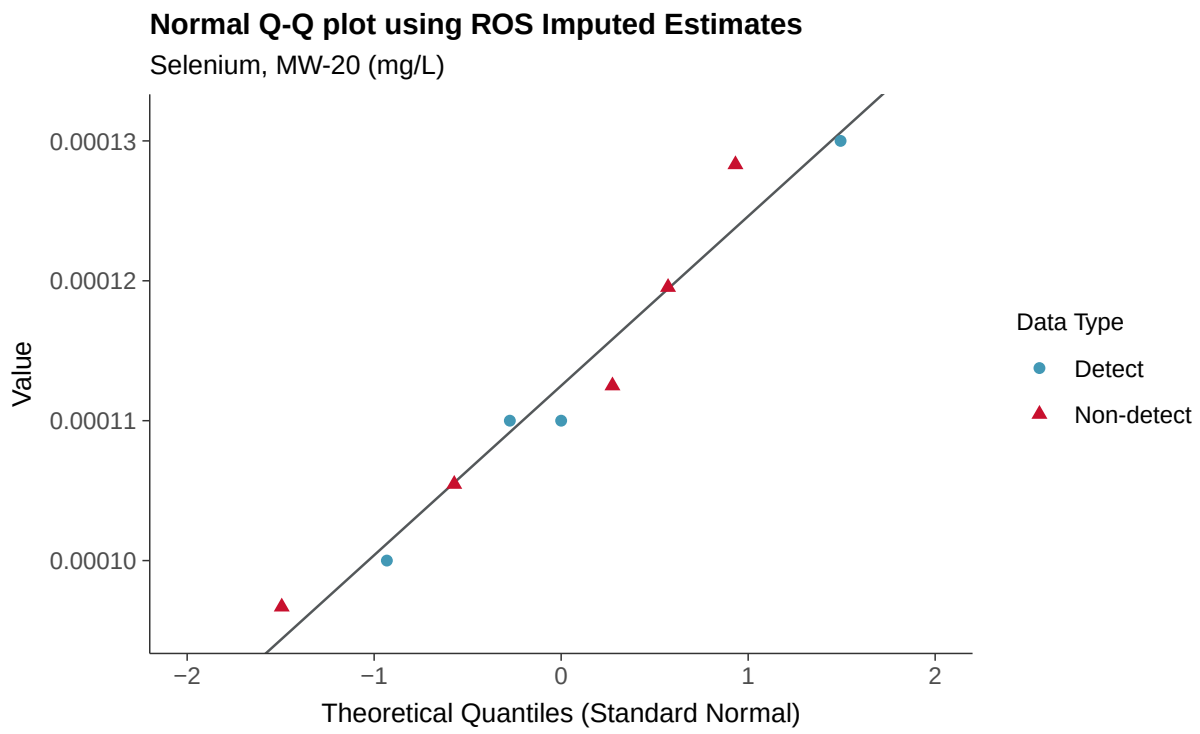
ID: 1_24_5_122

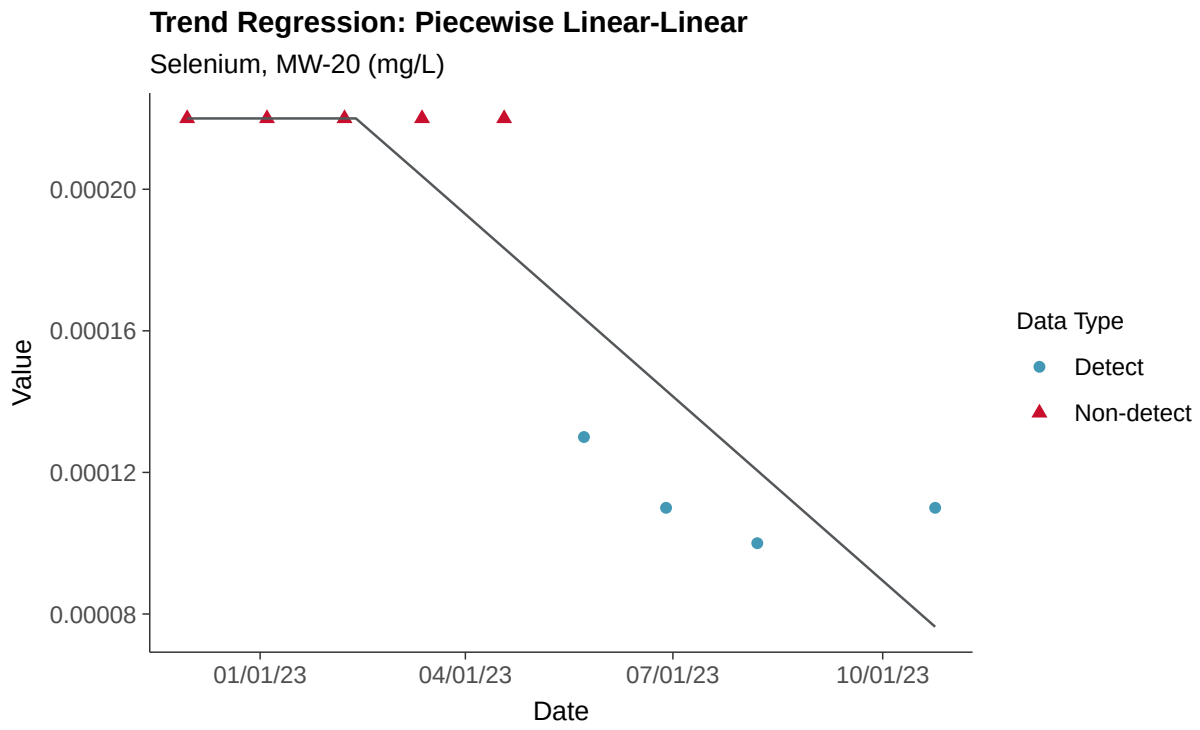


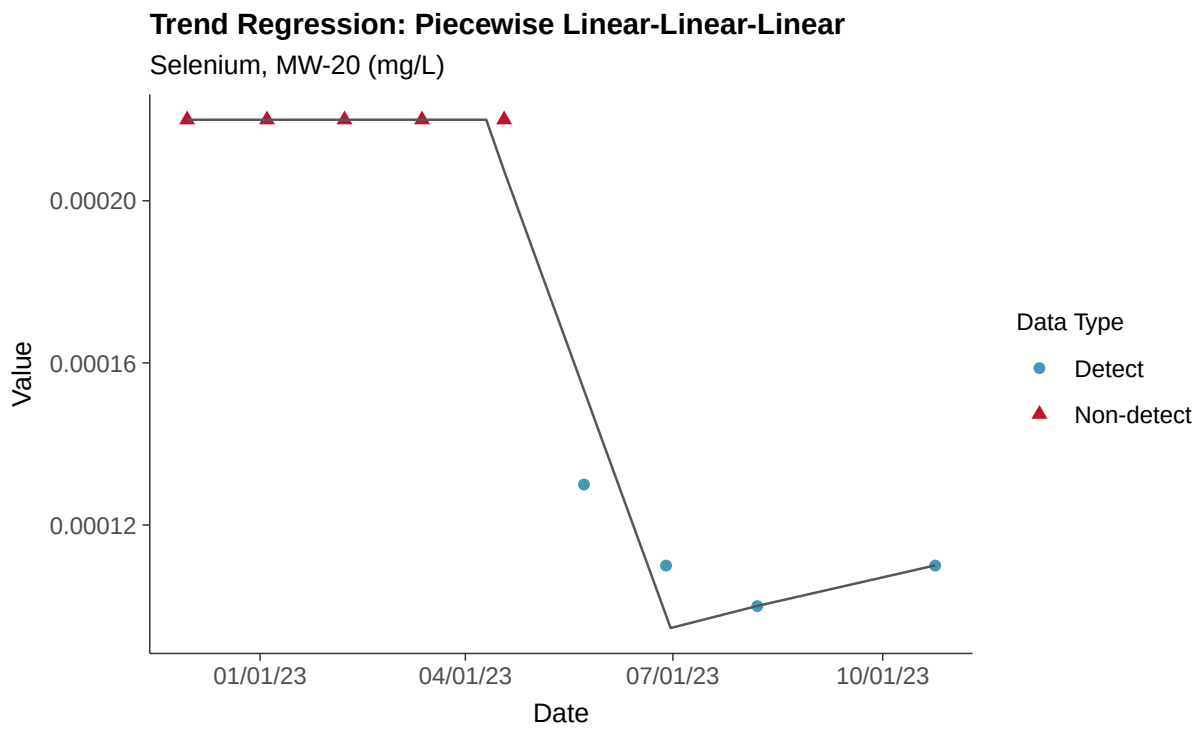


Boxplot
Selenium, MW-20 (mg/L)
Value
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100


Boxplot by Season
Selenium, MW-20 (mg/L)
Value
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

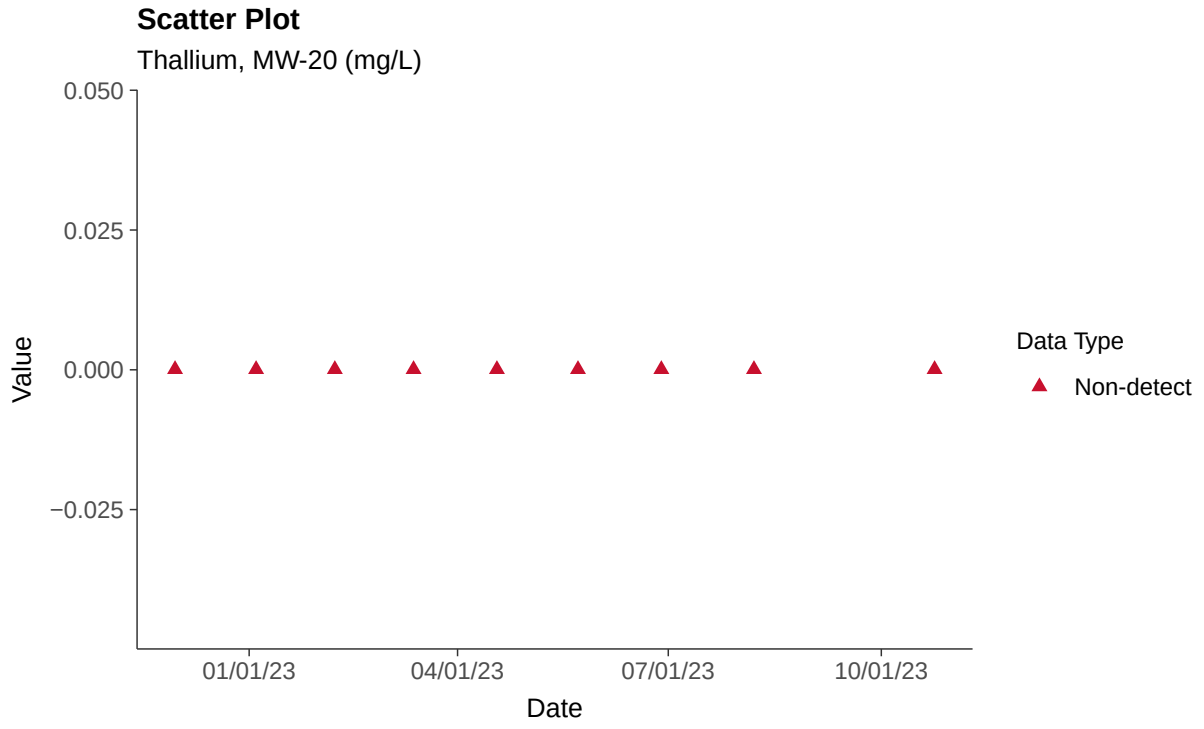

Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-20 (mg/L)
Value
0.00013
0.00012
0.00011
0.00010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

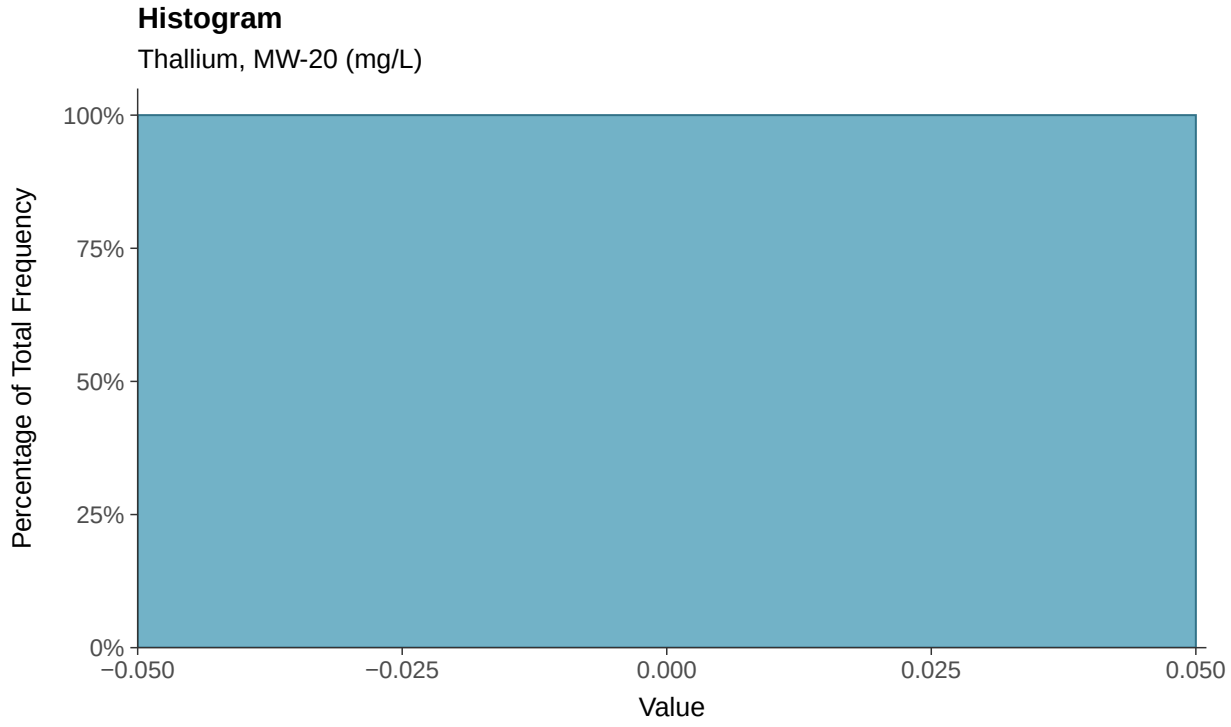

Trend Regression: Piecewise Linear-Linear
Selenium, MW-20 (mg/L)
Value
0.00020
0.00016
0.00012
0.00008
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

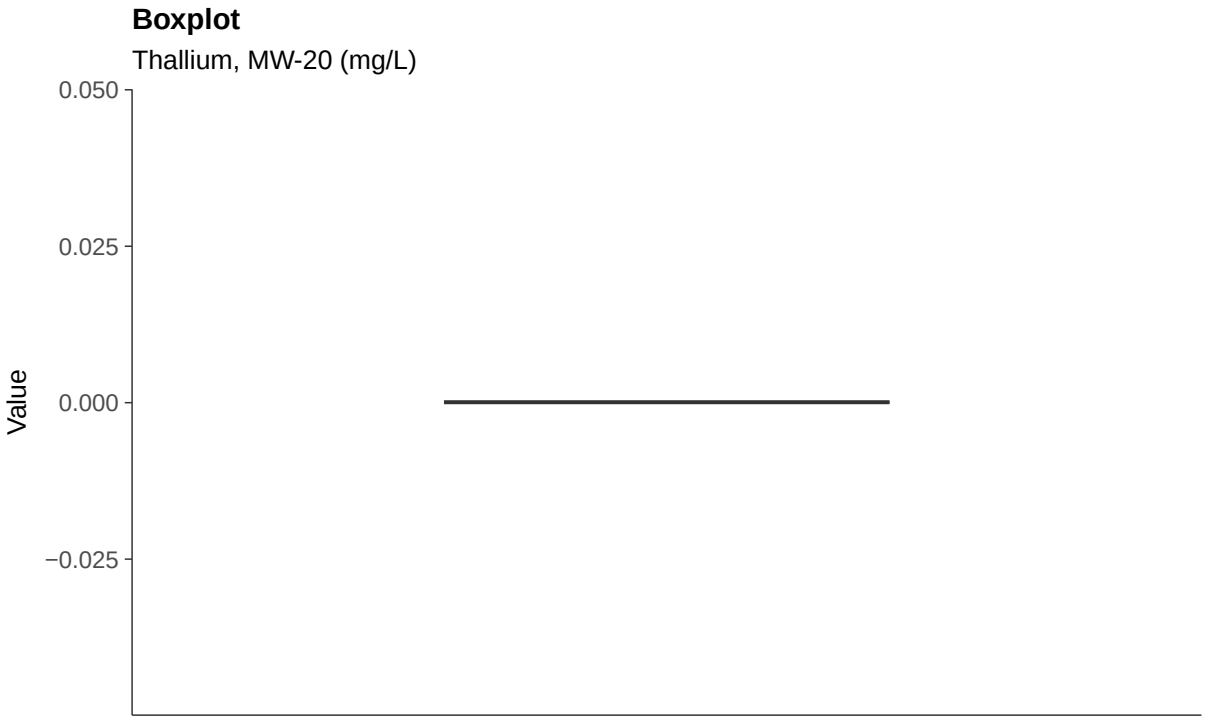

Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-20 (mg/L)
Value
0.00020
0.00016
0.00012
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

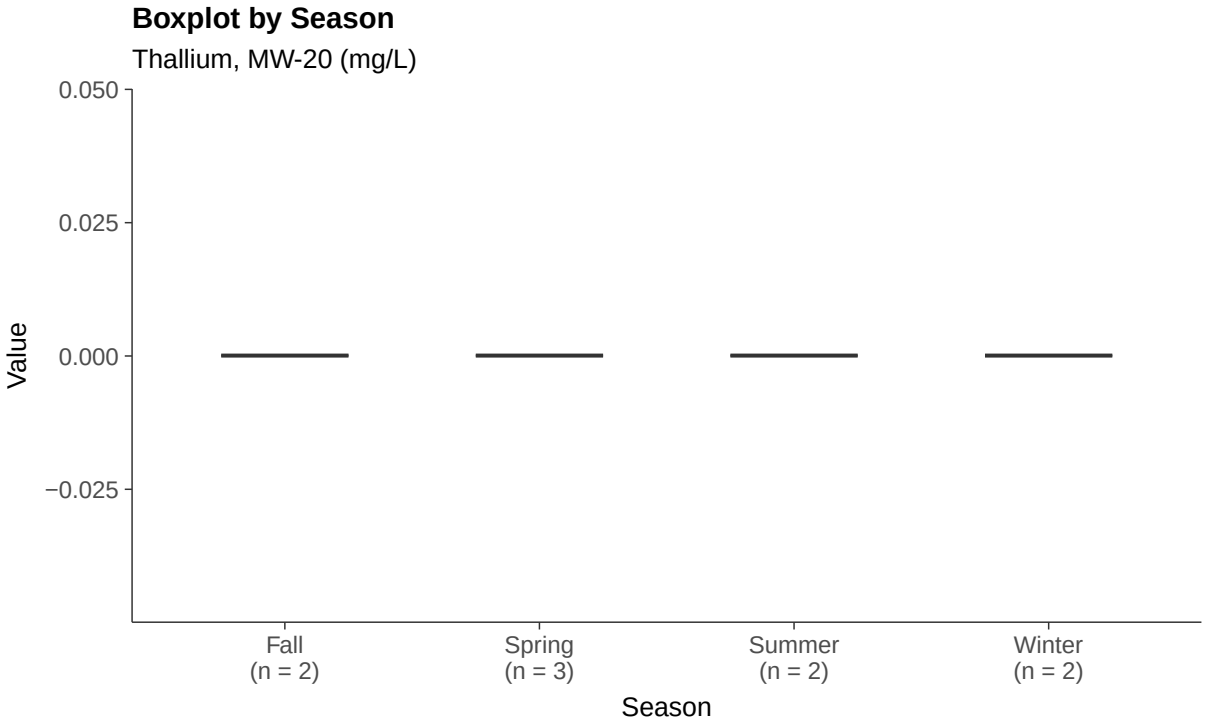
Appendix IV: Thallium, MW-20

ID: 1_24_5_125



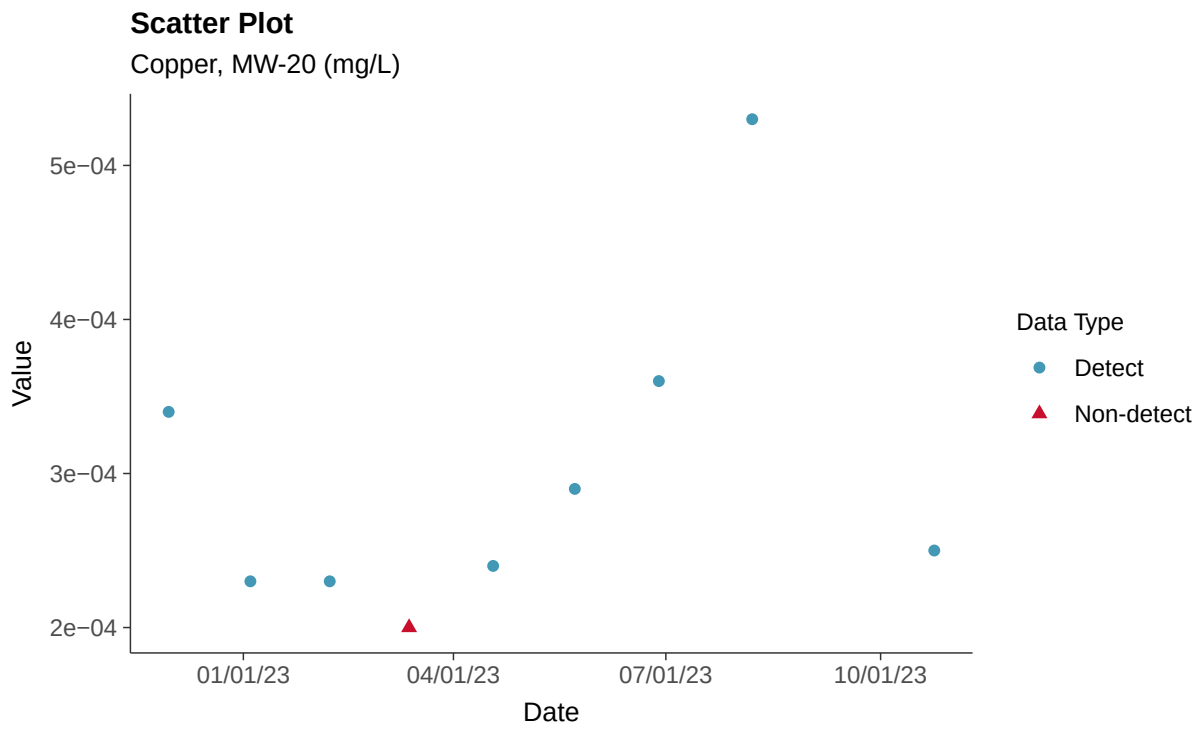


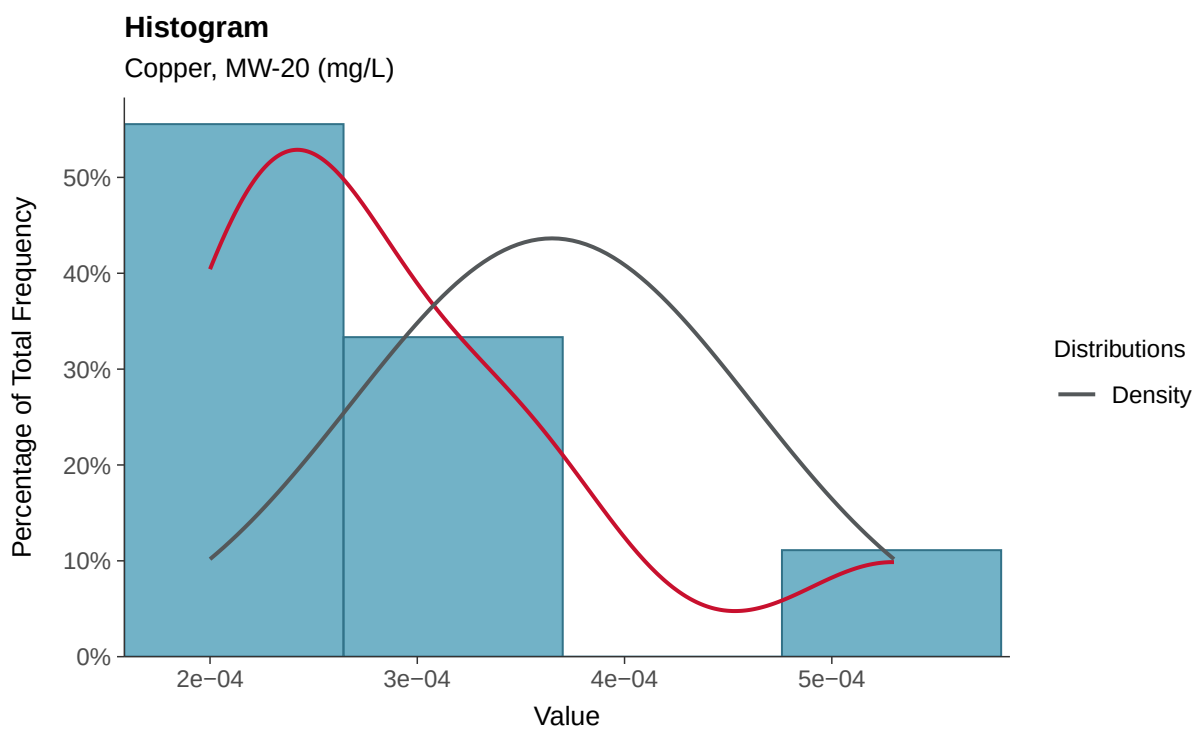

Boxplot
Thallium, MW-20 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Thallium, MW-20 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

Part 115: Copper, MW-20

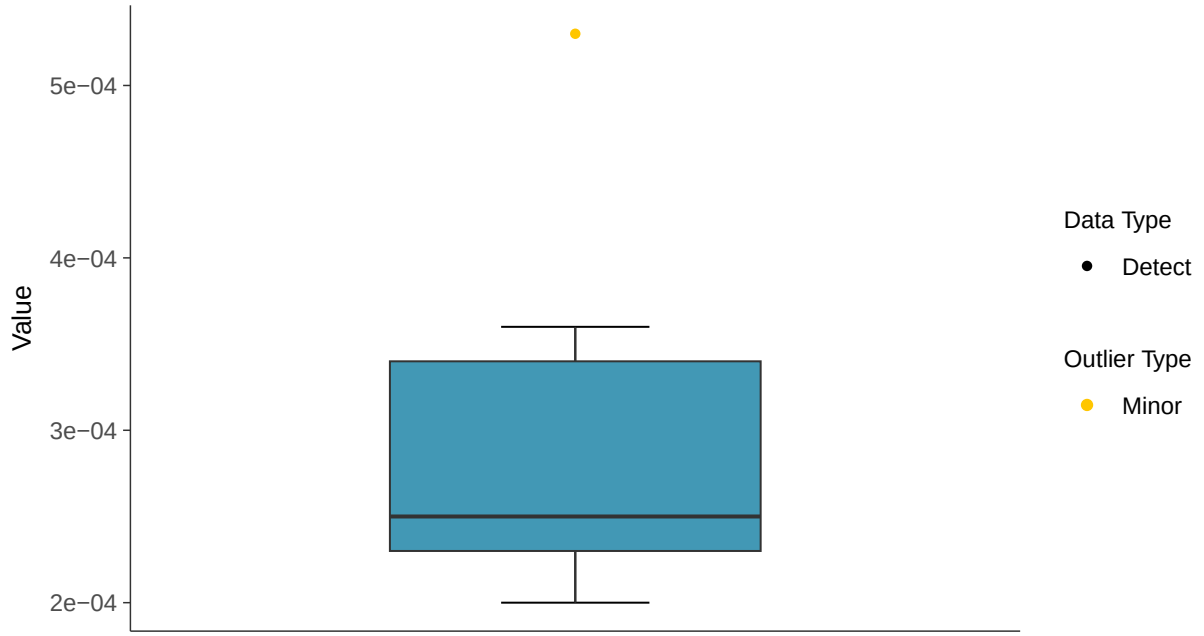
ID: 1_24_6_111





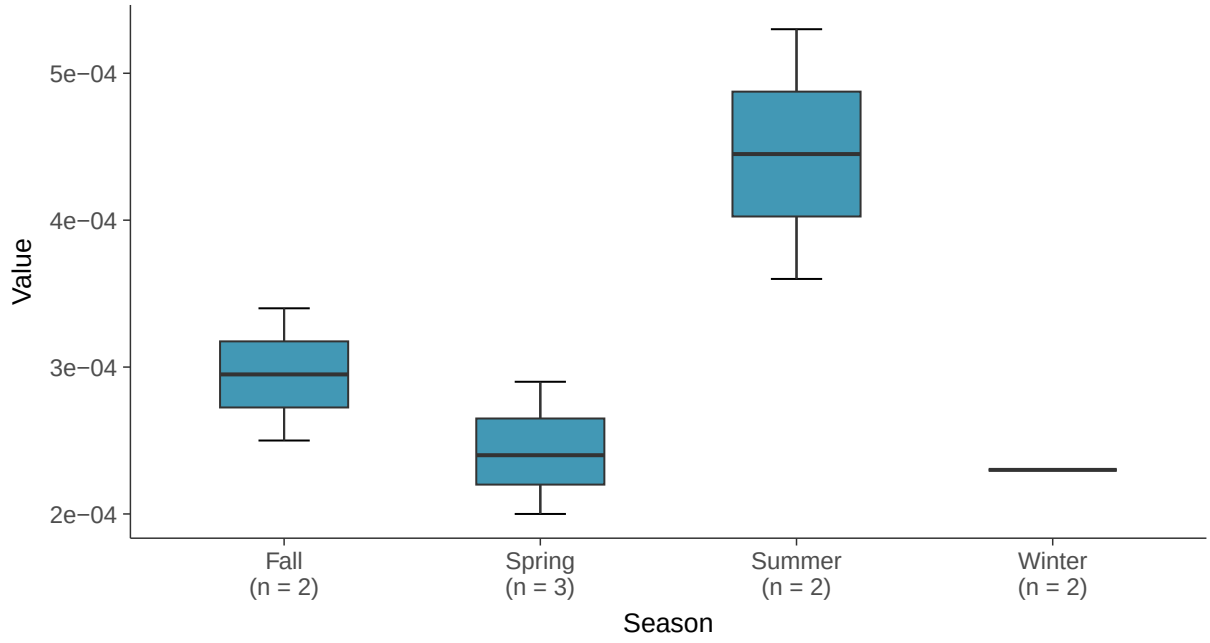
Boxplot

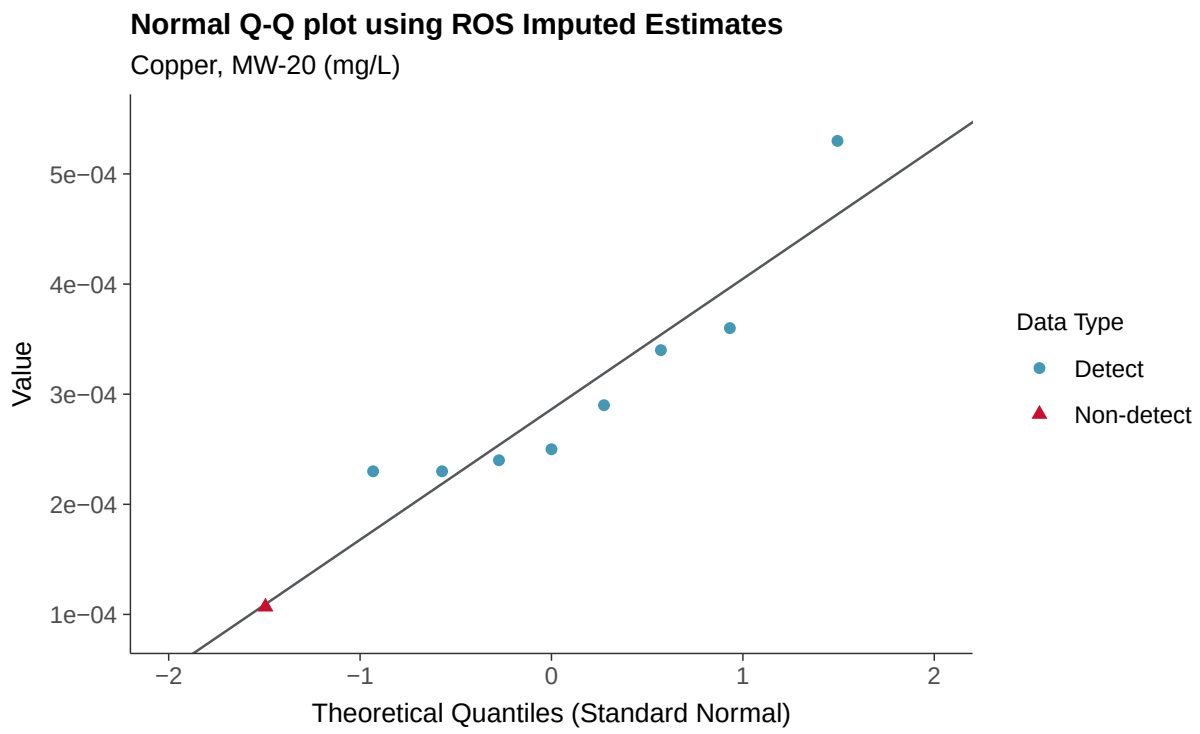
Copper, MW-20 (mg/L)

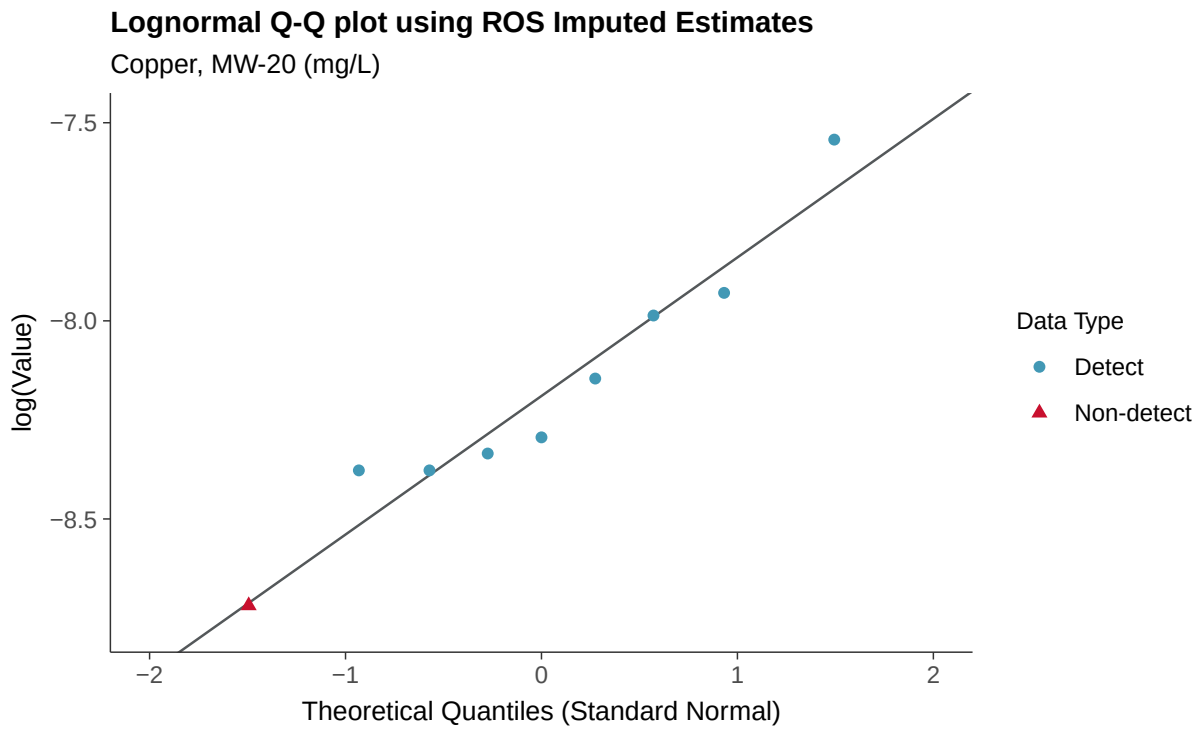


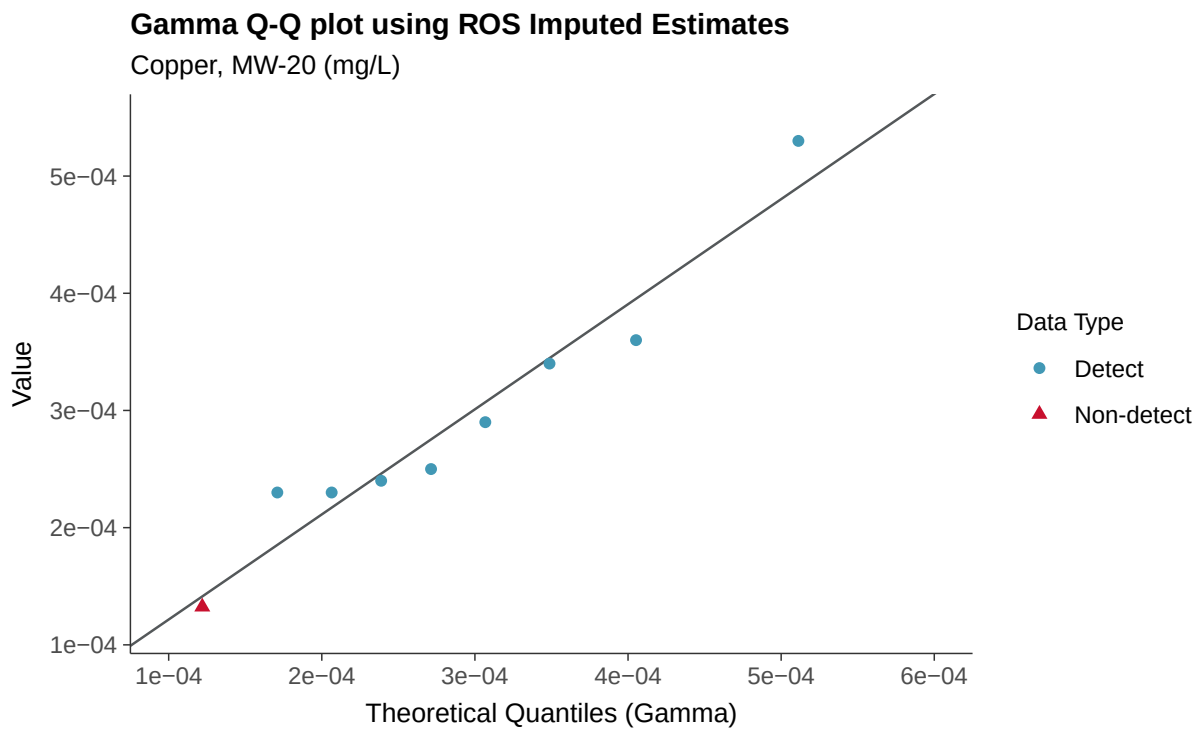
Boxplot by Season

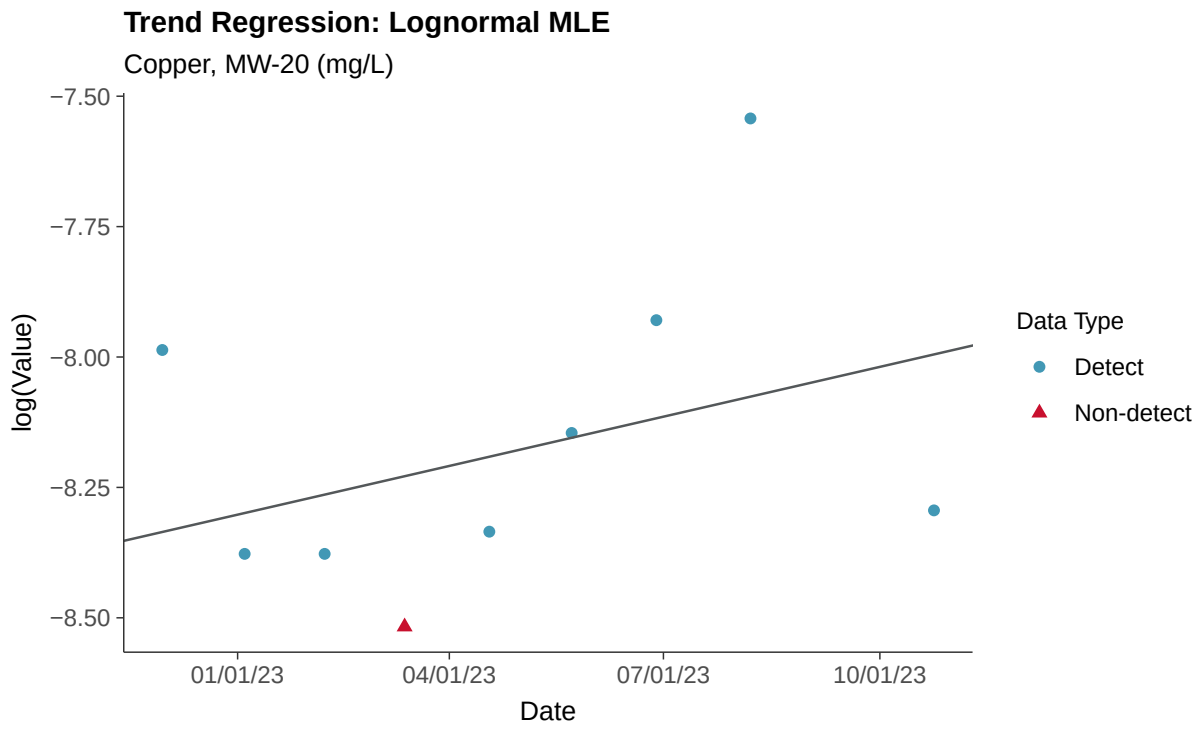
Copper, MW-20 (mg/L)

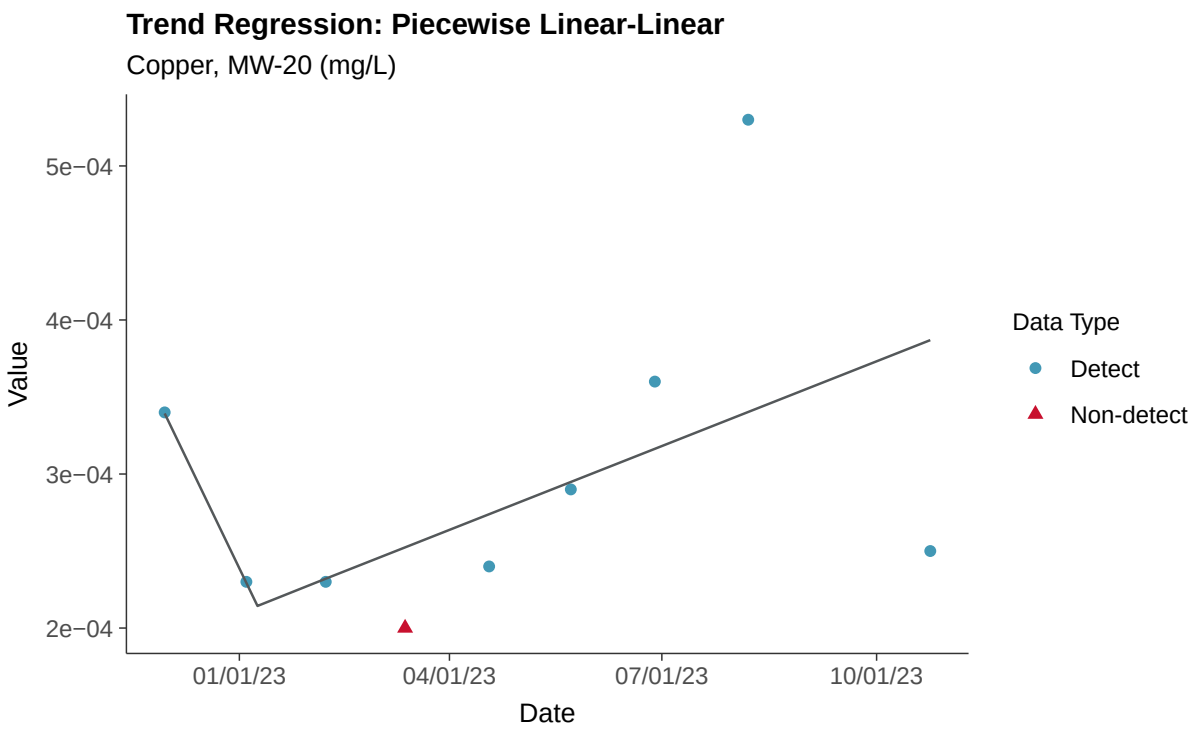



Normal Q-Q plot using ROS Imputed Estimates
Copper, MW-20 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Copper, MW-20 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

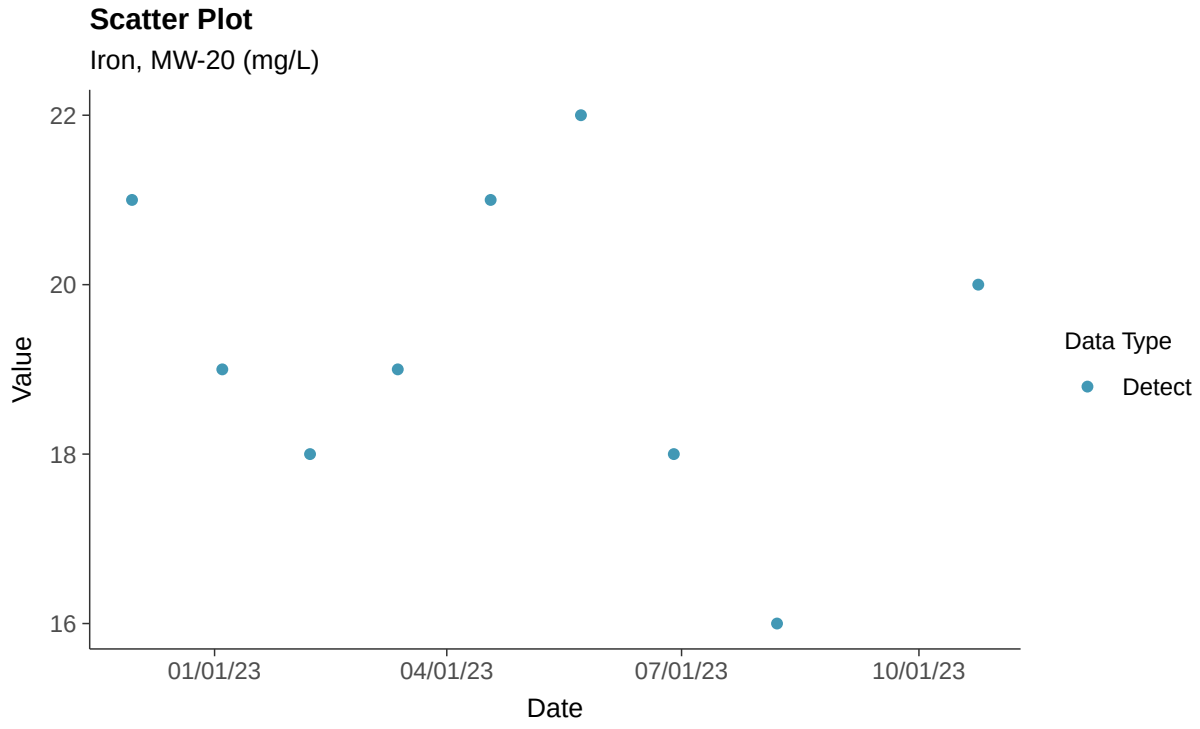

Gamma Q-Q plot using ROS Imputed Estimates
Copper, MW-20 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
1e−04
2e−04
3e−04
4e−04
5e−04
6e−04
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

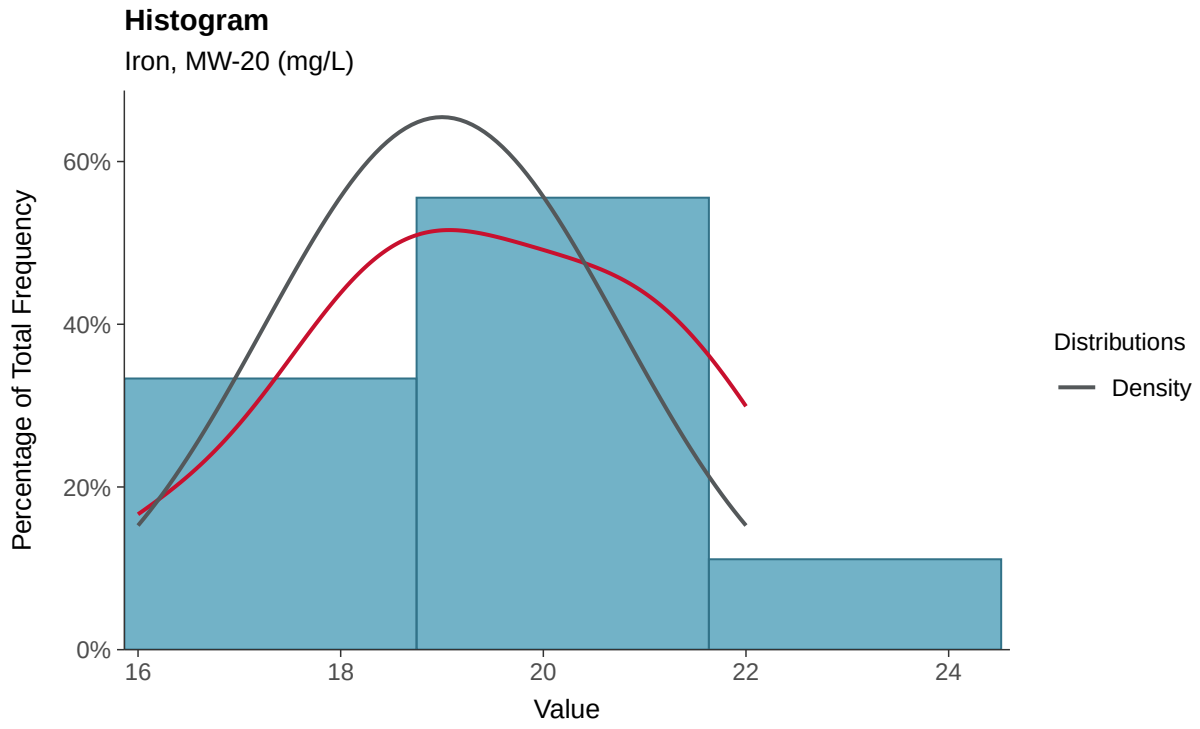

Trend Regression: Lognormal MLE
Copper, MW-20 (mg/L)
log(Value)
−7.50
−7.75
−8.00
−8.25
−8.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Copper, MW-20 (mg/L)
5e−04
4e−04
3e−04
2e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-20

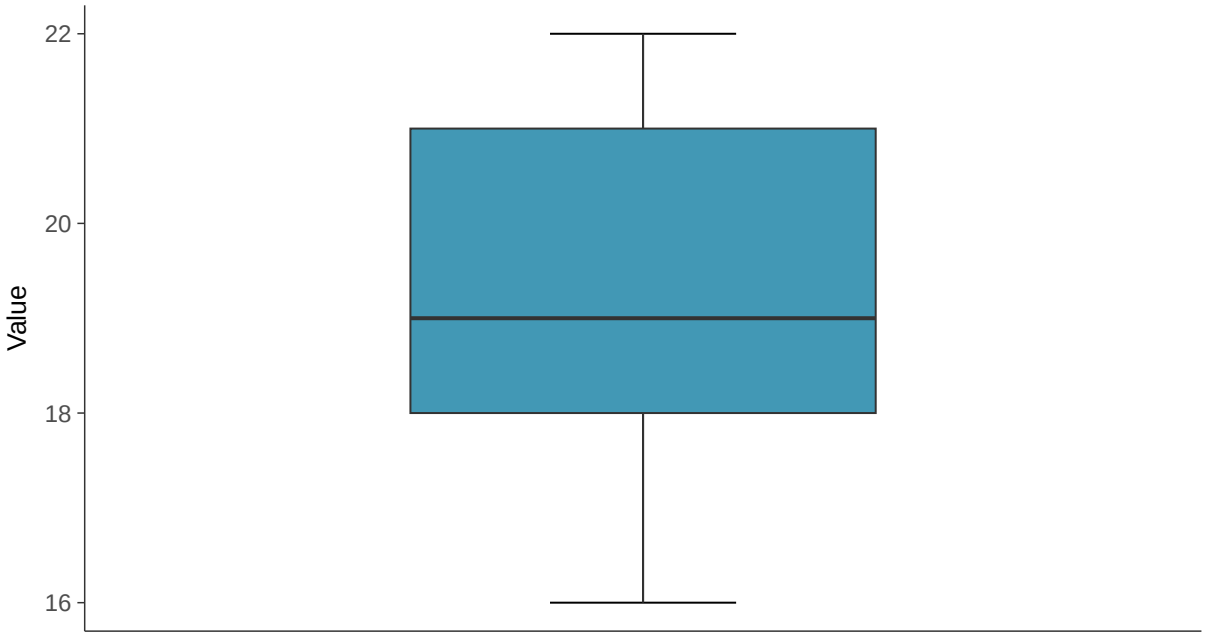
ID: 1_24_6_114





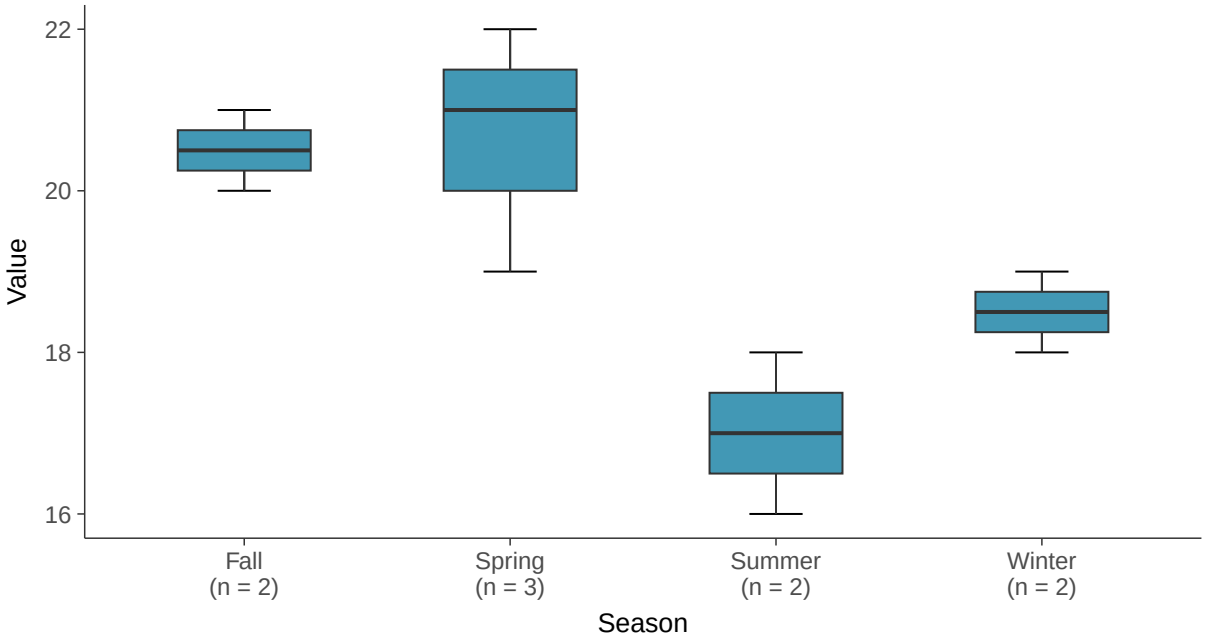
Boxplot

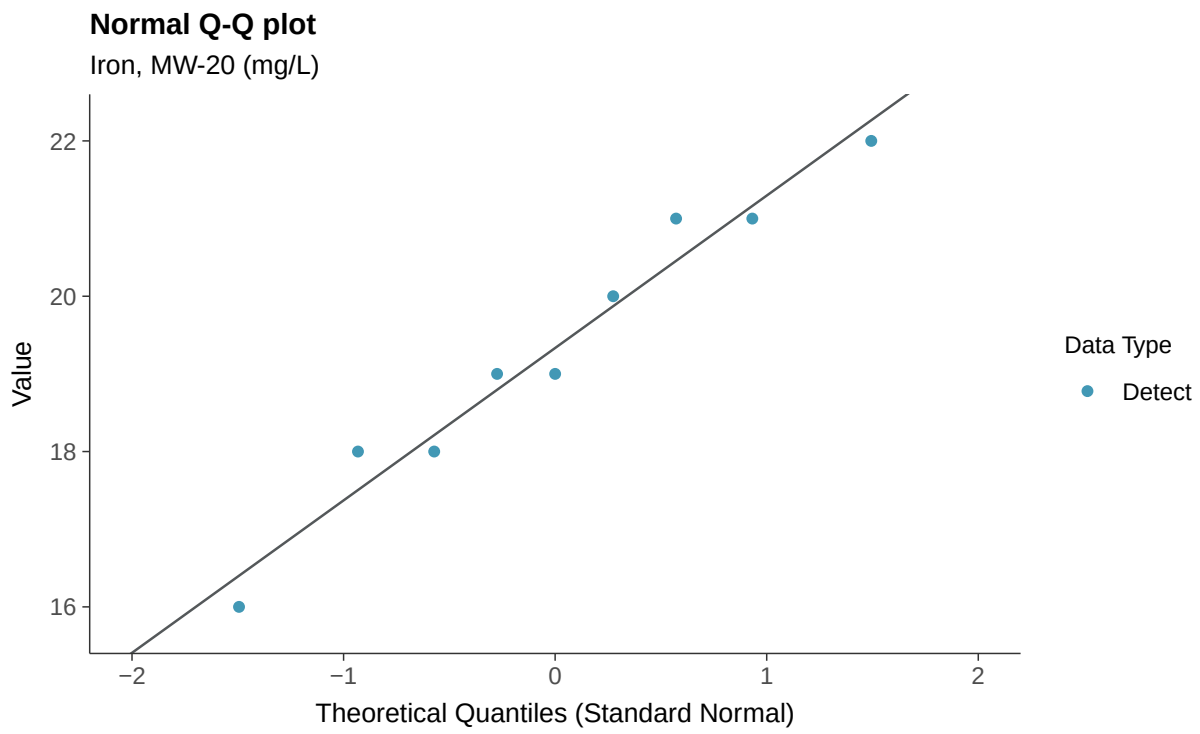
Iron, MW-20 (mg/L)

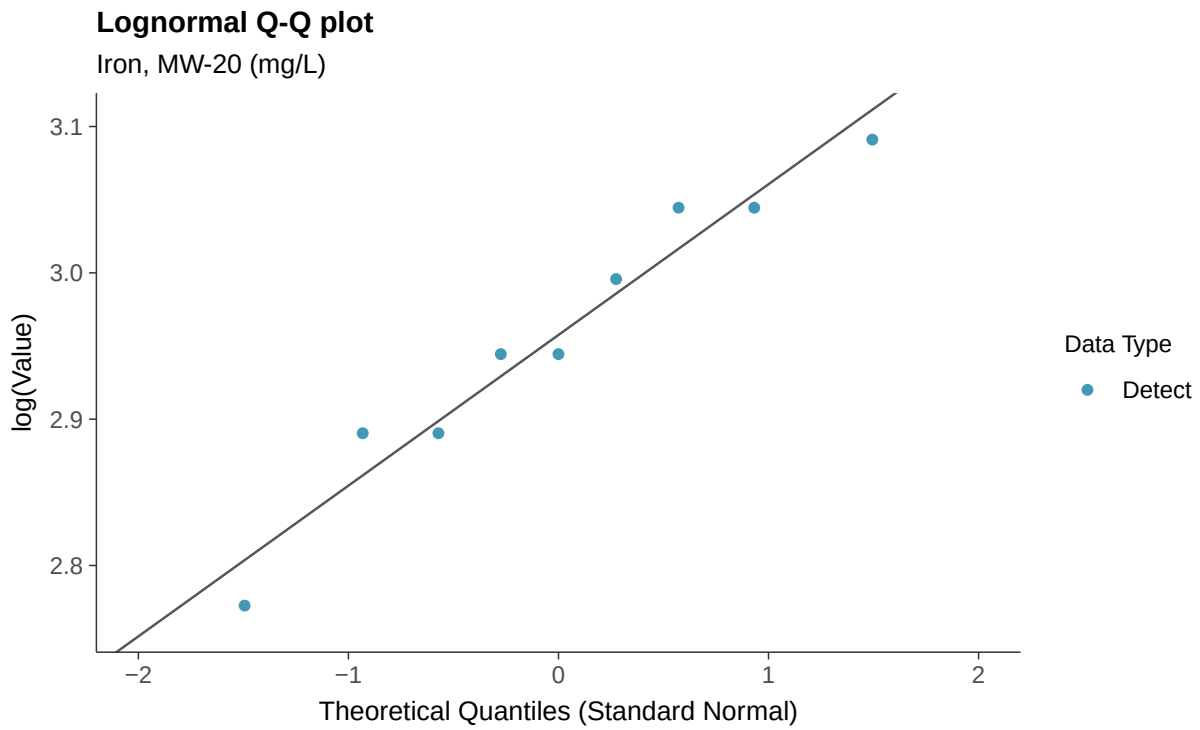


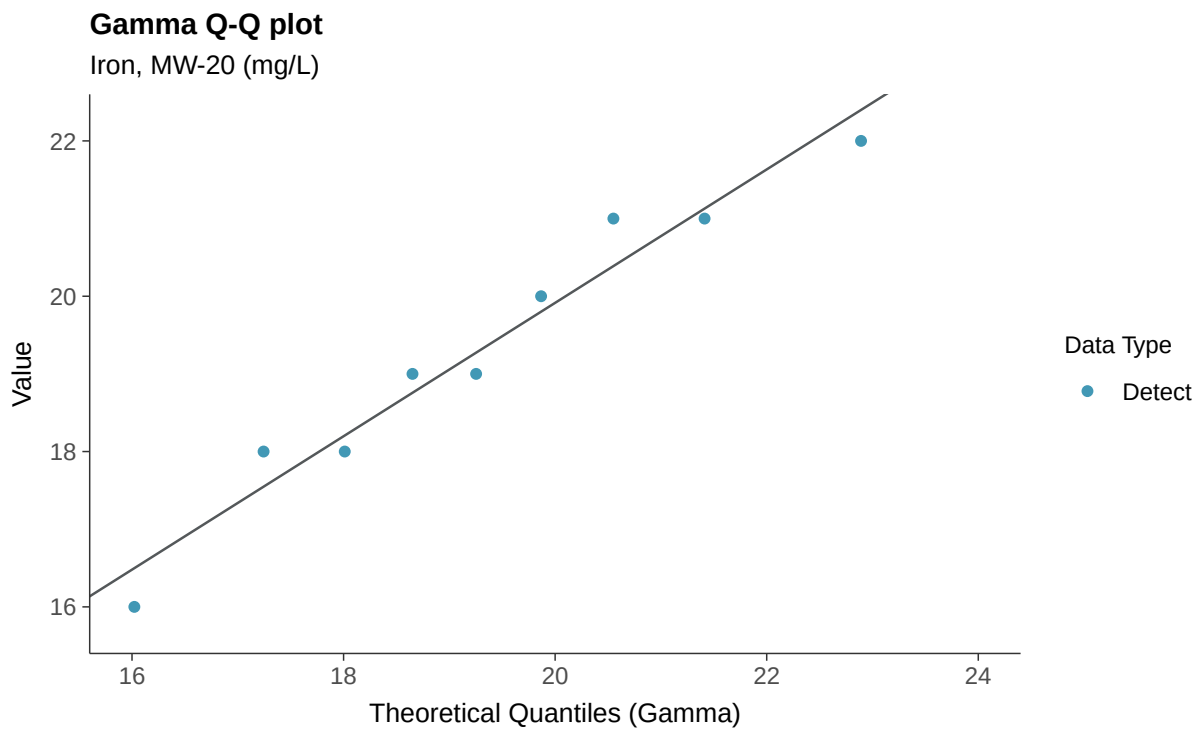
Boxplot by Season

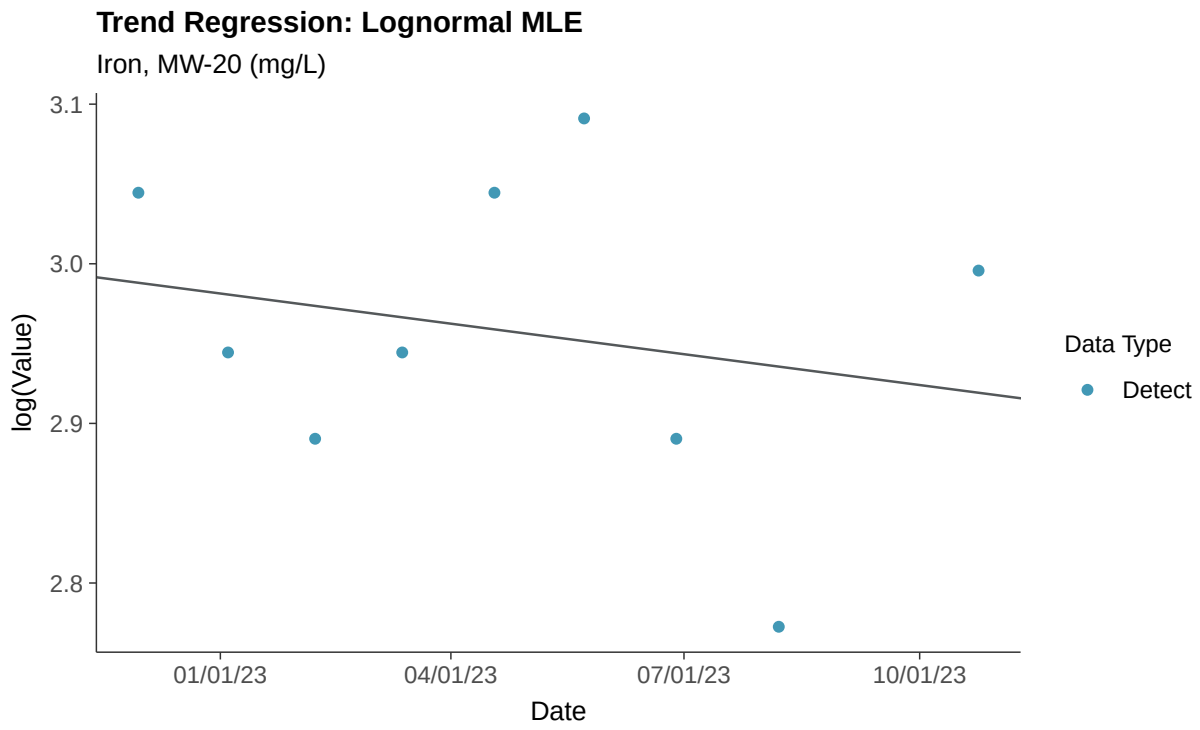
Iron, MW-20 (mg/L)




Normal Q-Q plot
Iron, MW-20 (mg/L)
Value
22
20
18
16
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

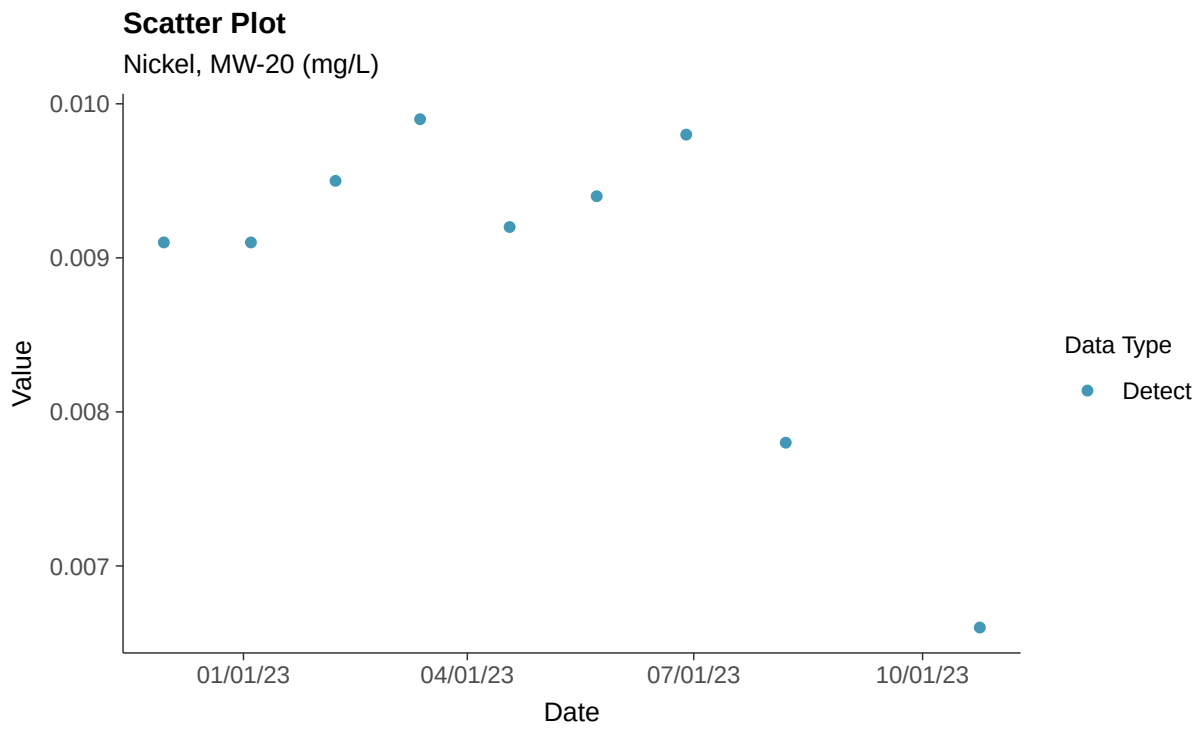

Lognormal Q-Q plot
Iron, MW-20 (mg/L)
log(Value)
3.1
3.0
2.9
2.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

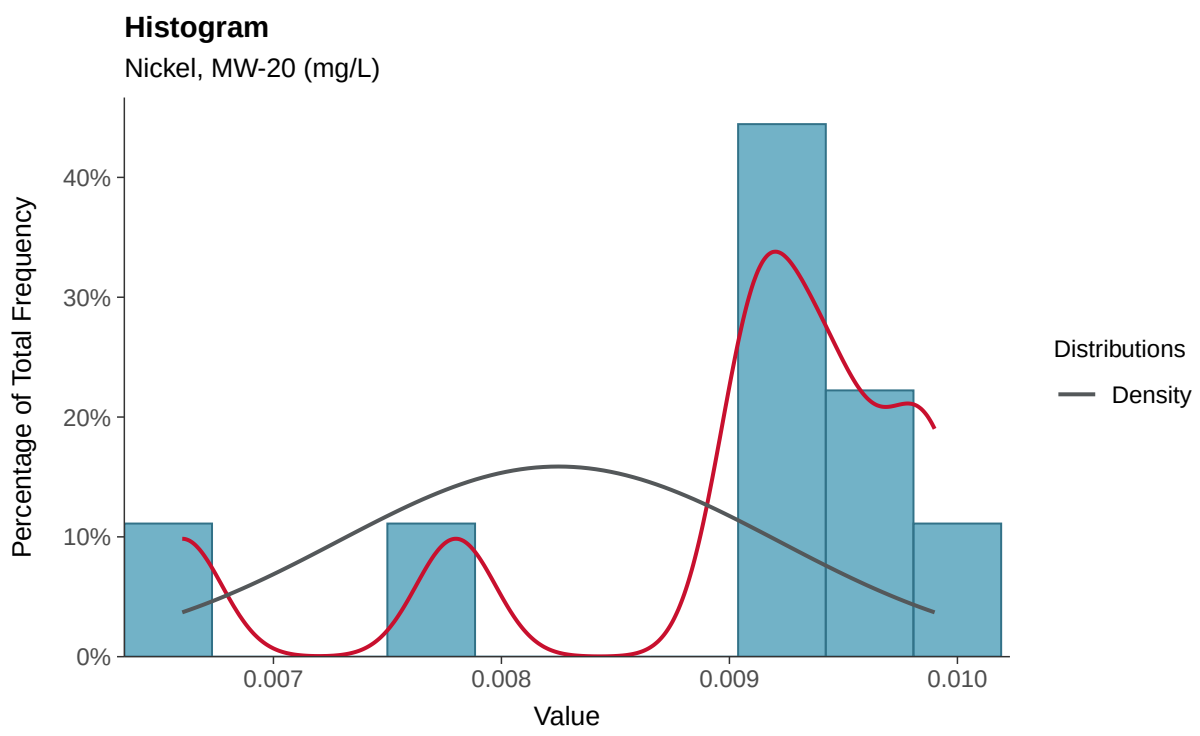

Gamma Q-Q plot
Iron, MW-20 (mg/L)
Value
22
20
18
16
16
18
20
22
24
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Iron, MW-20 (mg/L)
log(Value)
3.1
3.0
2.9
2.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-20

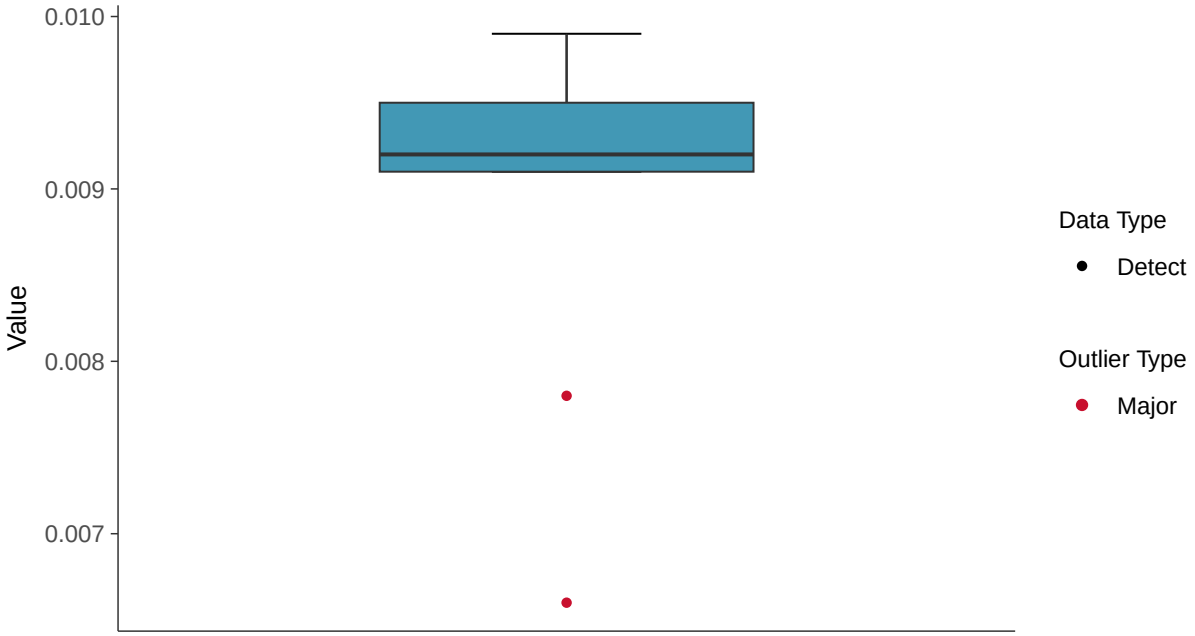
ID: 1_24_6_119





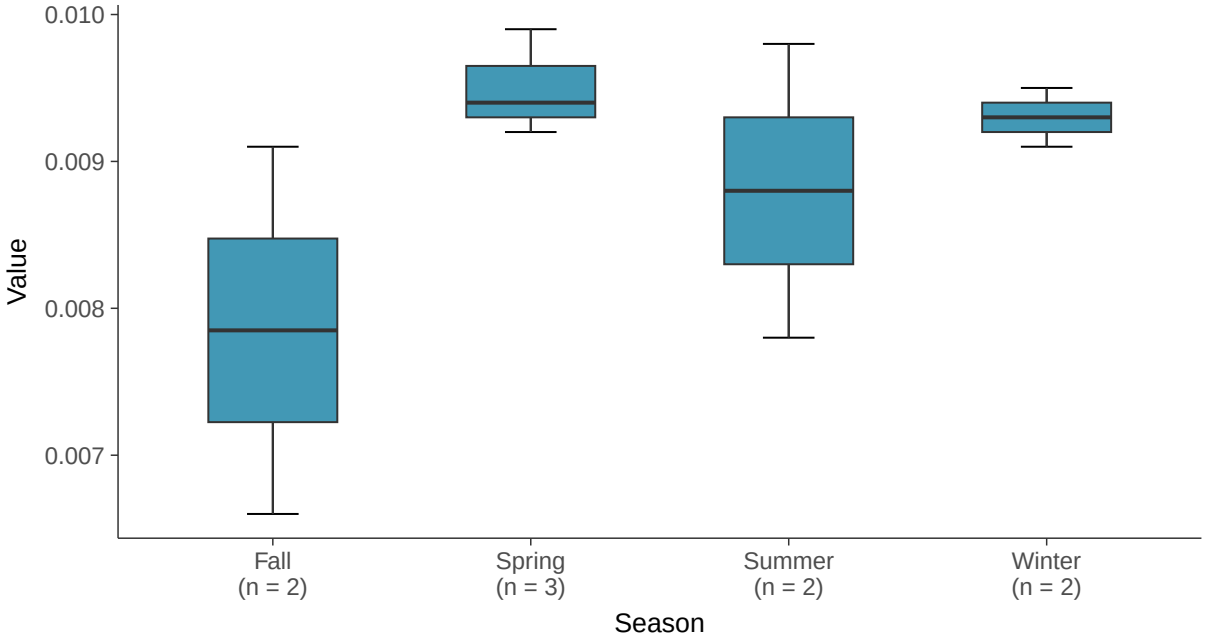
Boxplot

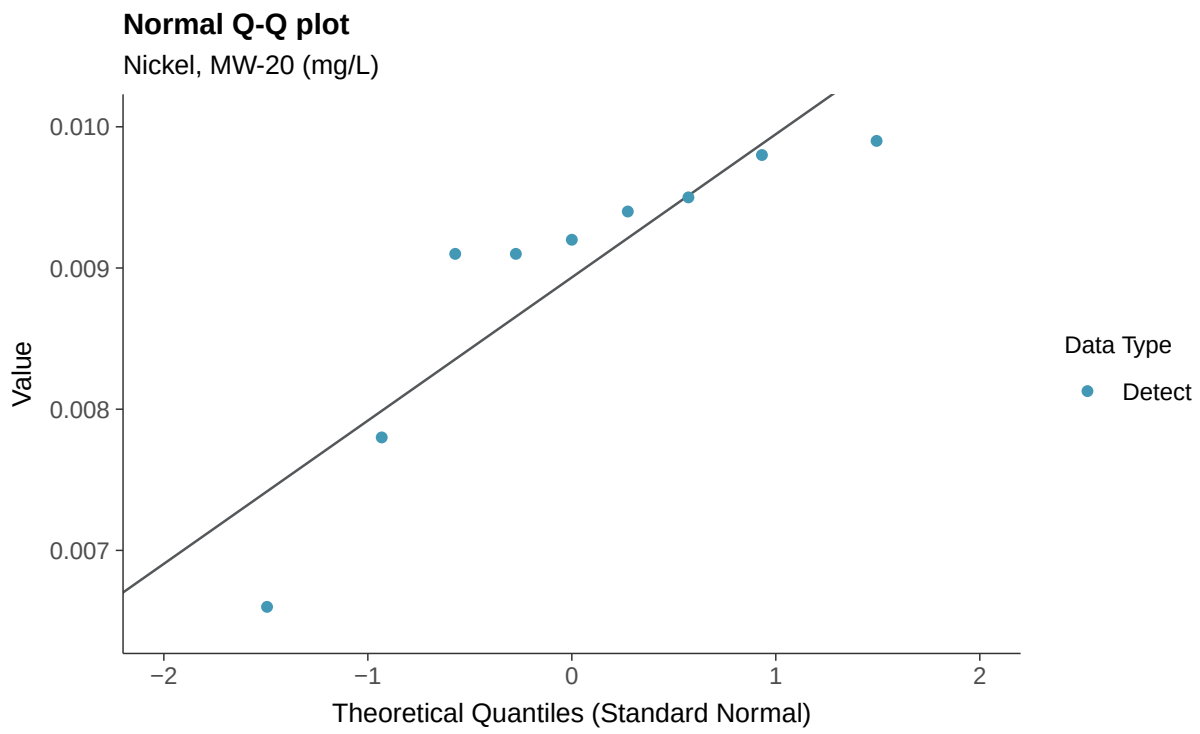
Nickel, MW-20 (mg/L)

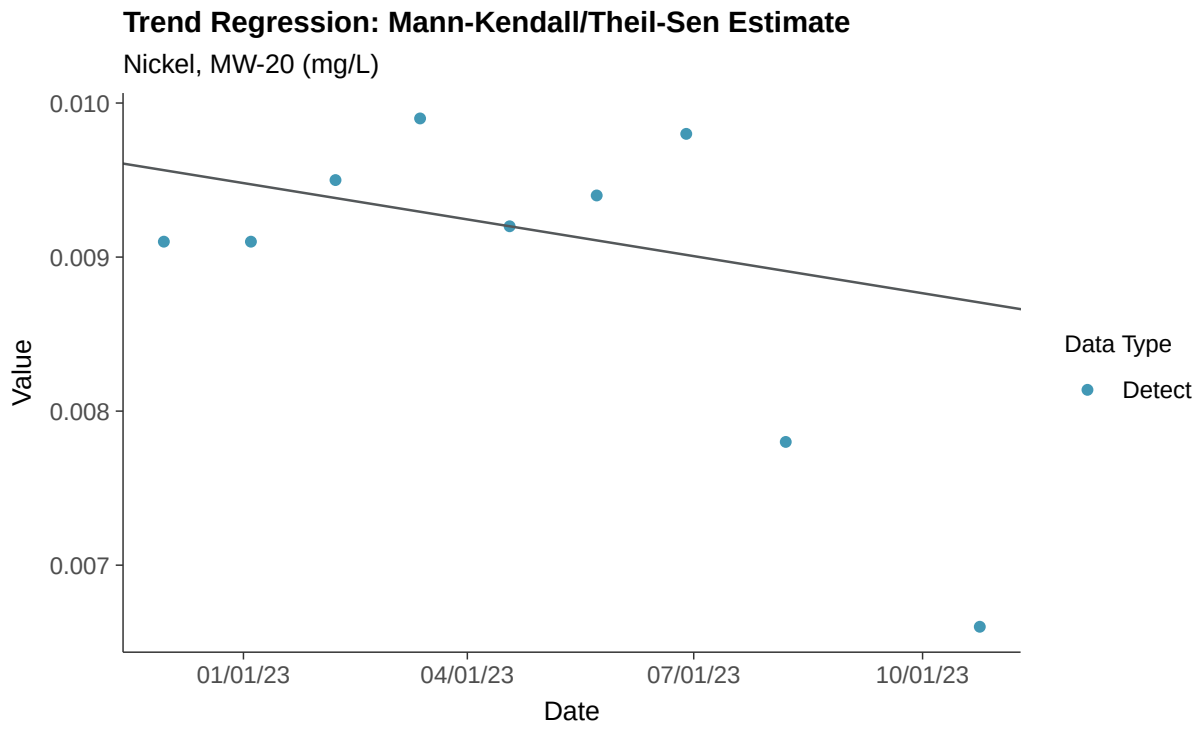


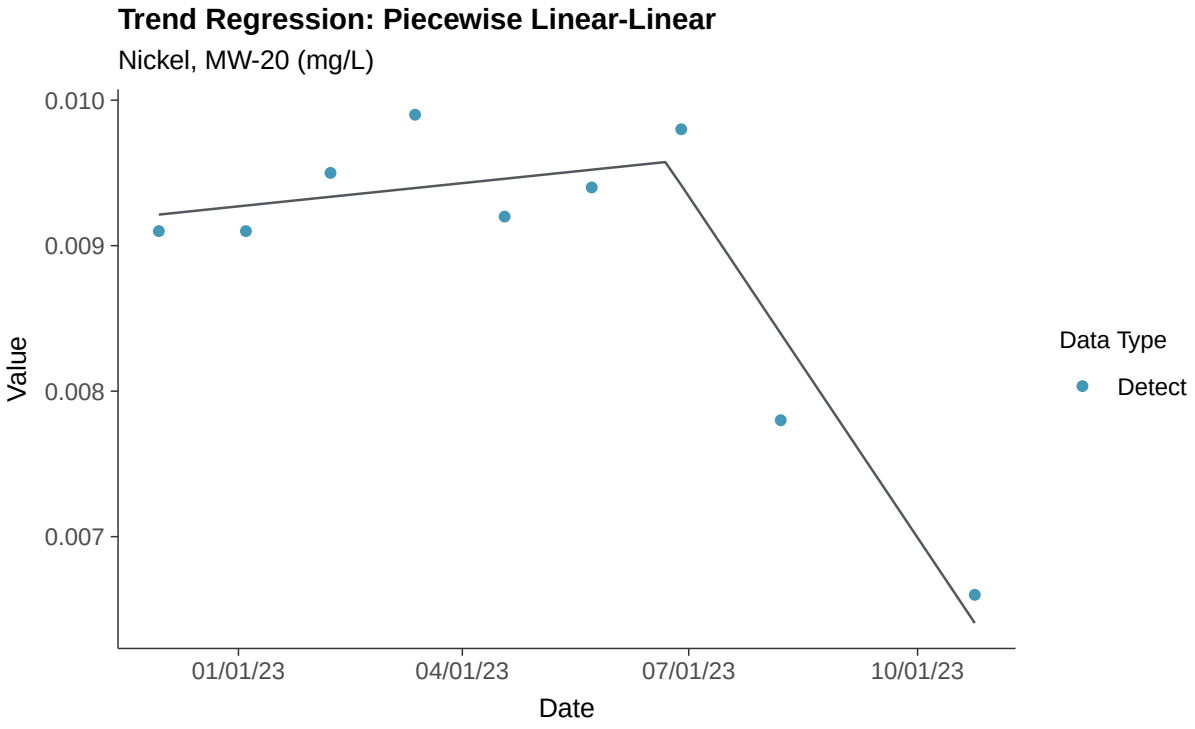
Boxplot by Season

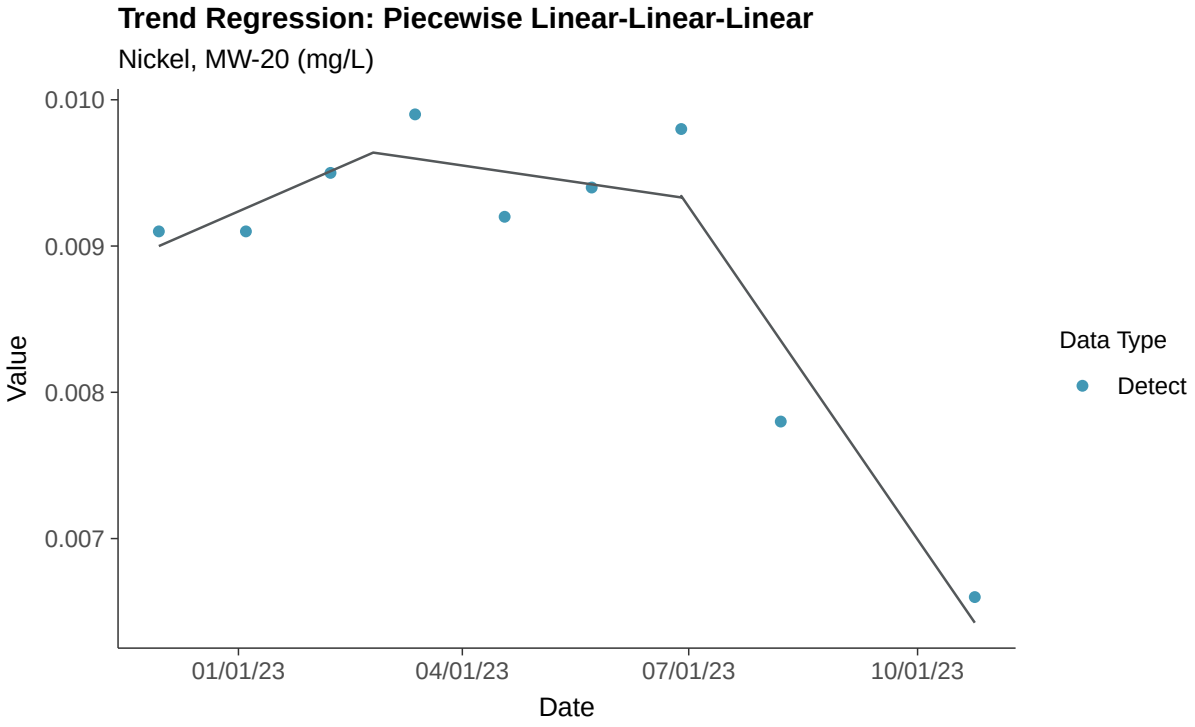
Nickel, MW-20 (mg/L)




Normal Q-Q plot
Nickel, MW-20 (mg/L)
Value
0.010
0.009
0.008
0.007
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

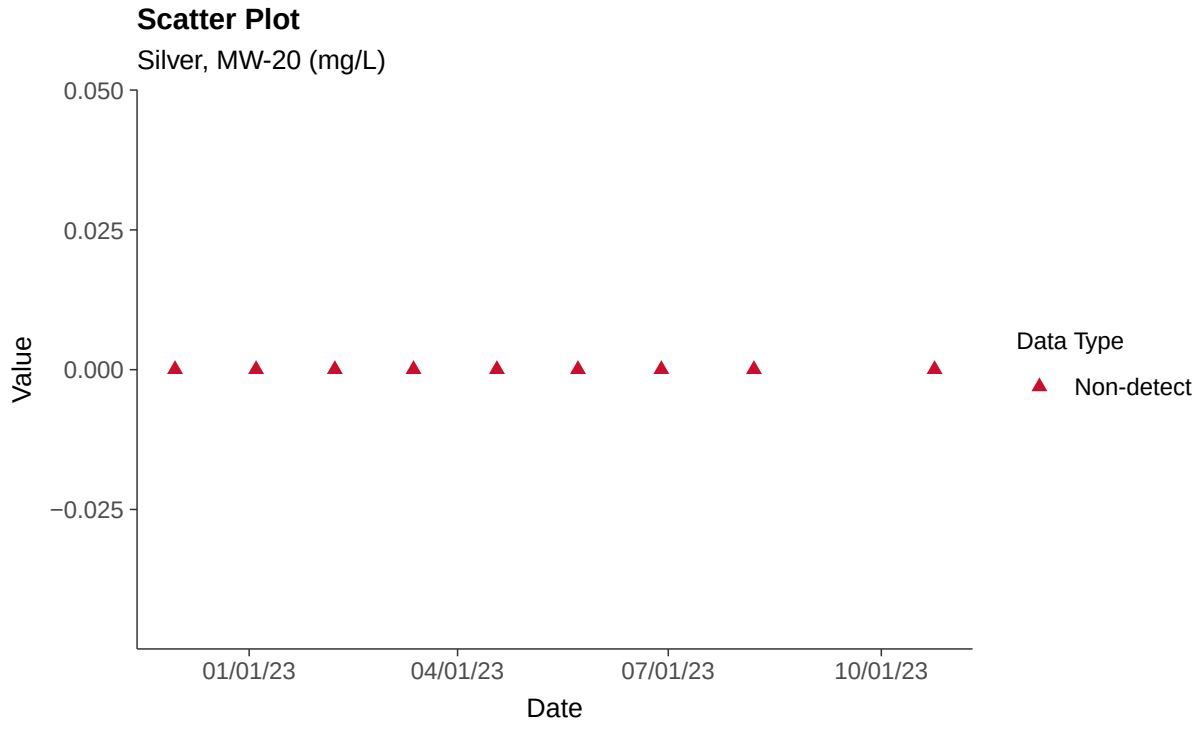

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Nickel, MW-20 (mg/L)
Value
0.010
0.009
0.008
0.007
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

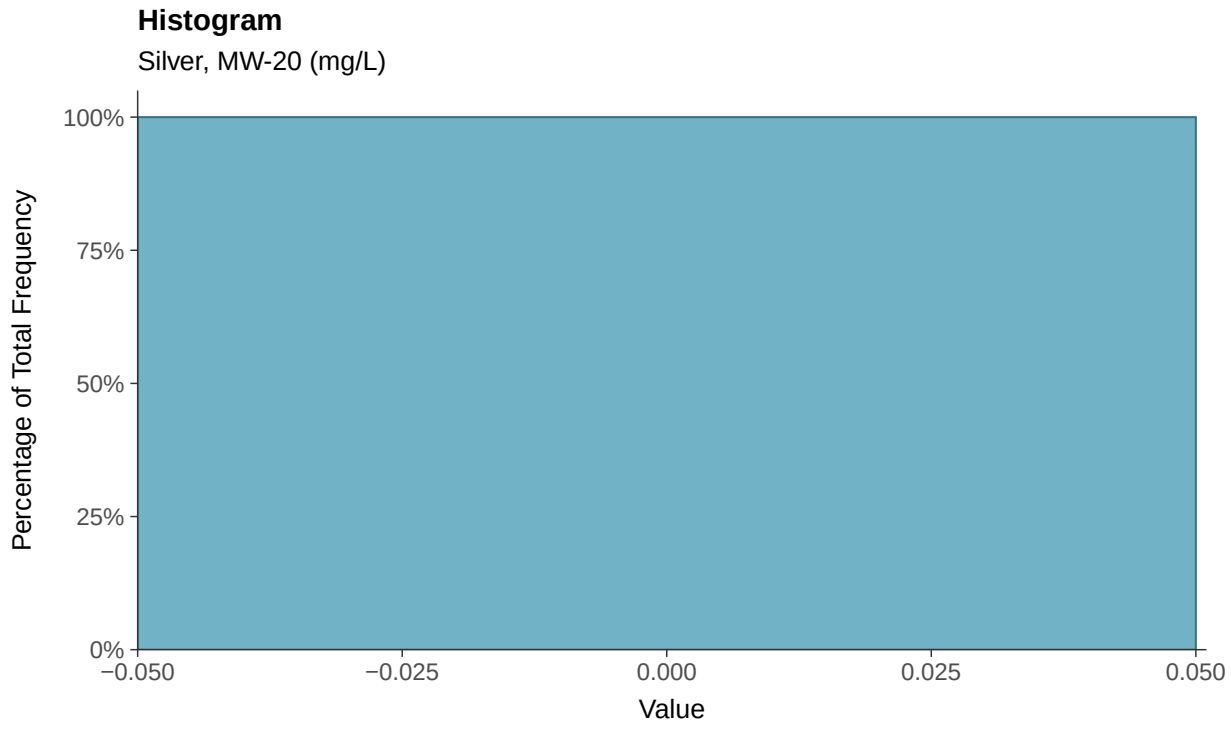

Trend Regression: Piecewise Linear-Linear
Nickel, MW-20 (mg/L)
0.010
0.009
0.008
0.007
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-20 (mg/L)
0.010
0.009
0.008
0.007
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-20

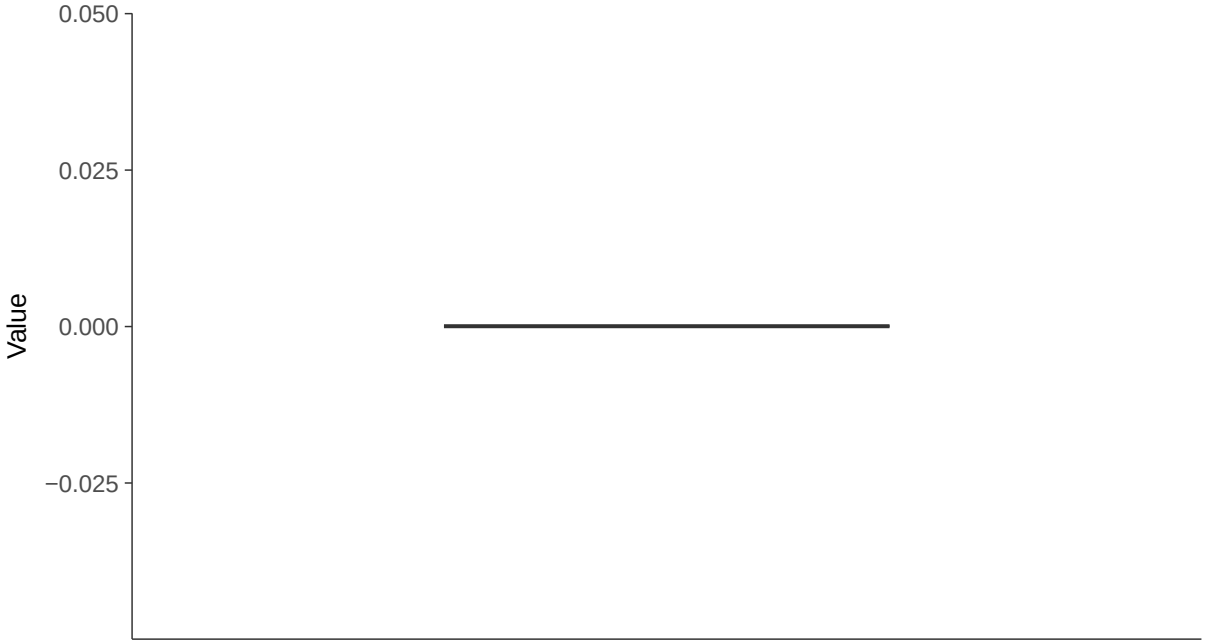
ID: 1_24_6_123





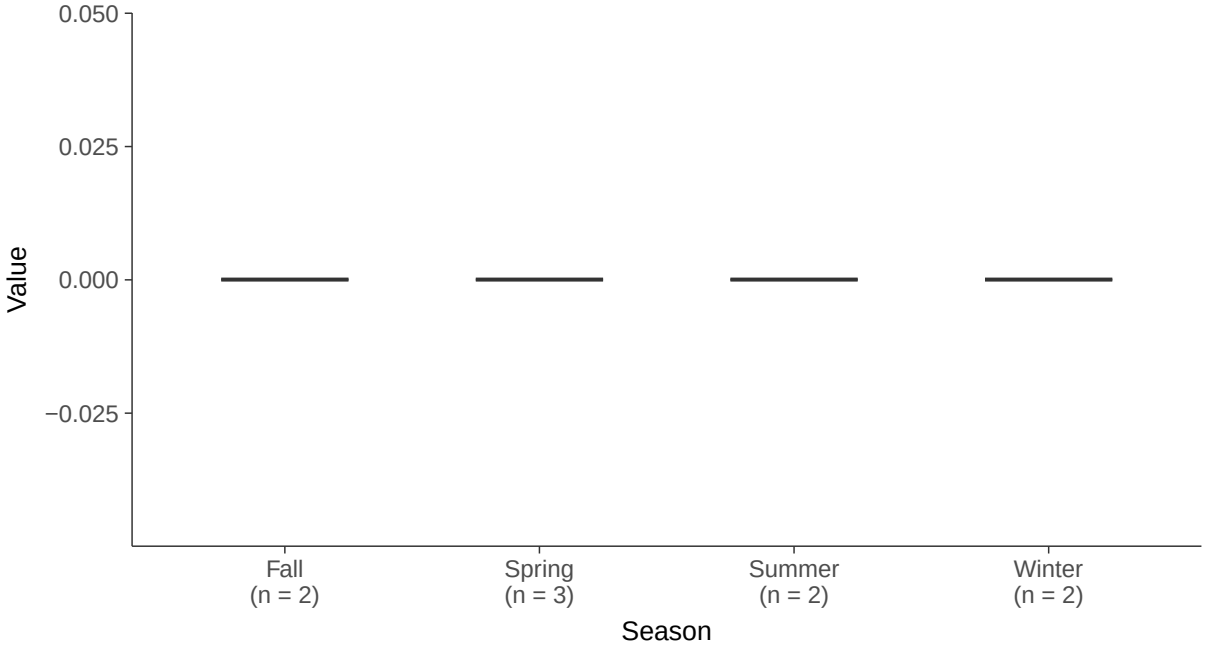
Boxplot

Silver, MW-20 (mg/L)



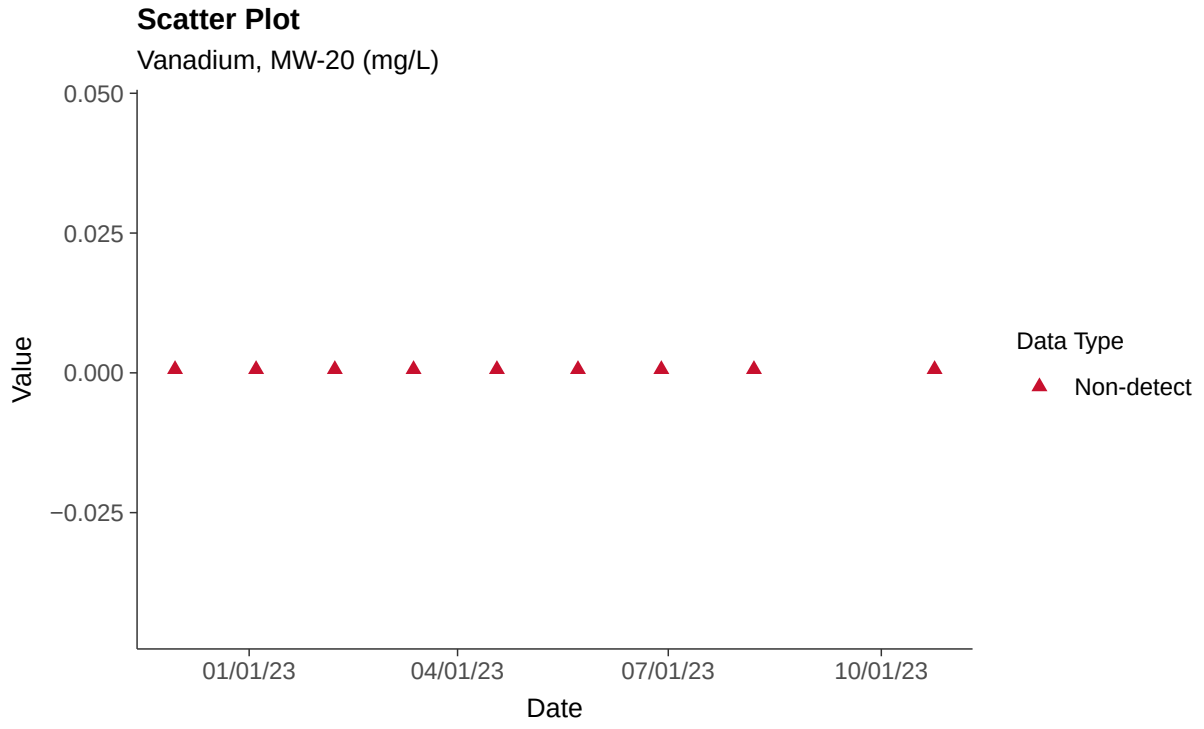
Boxplot by Season

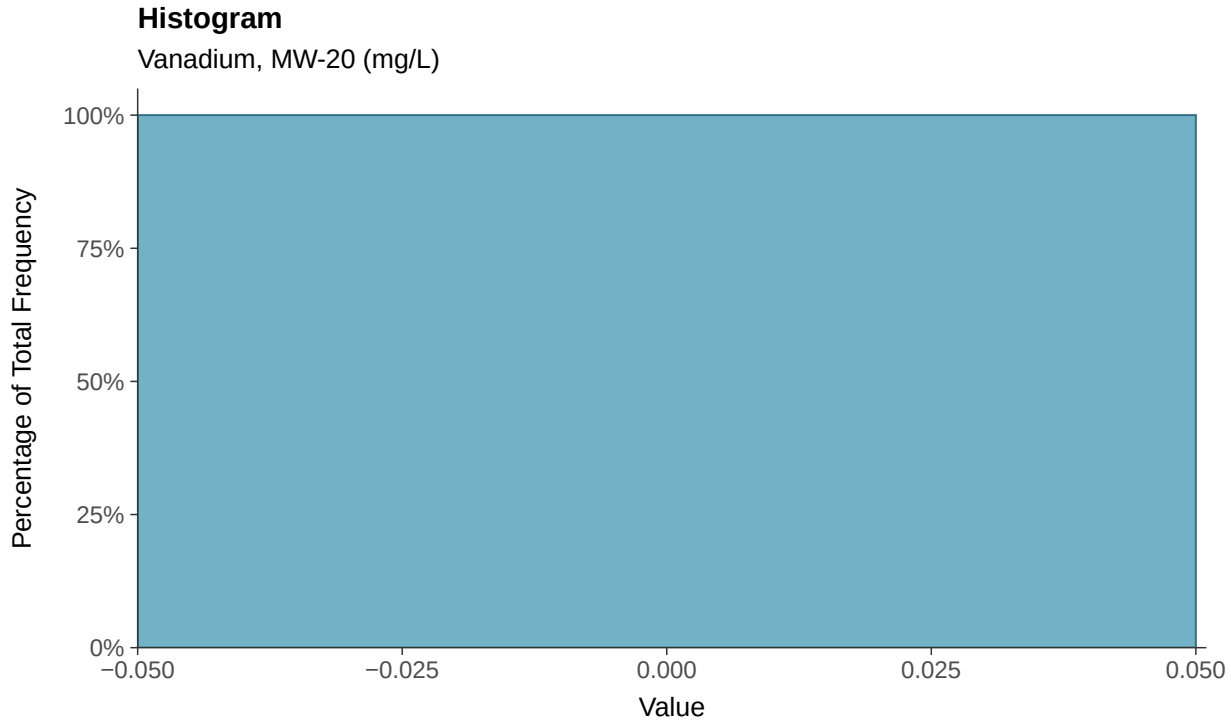
Silver, MW-20 (mg/L)



Part 115: Vanadium, MW-20

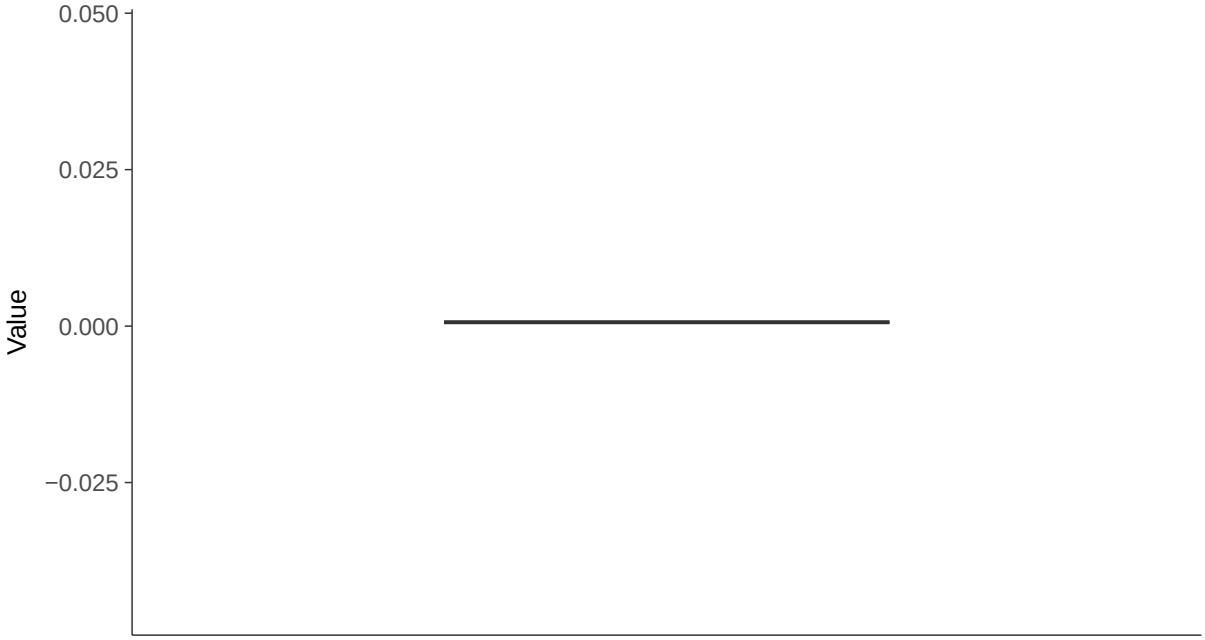
ID: 1_24_6_129





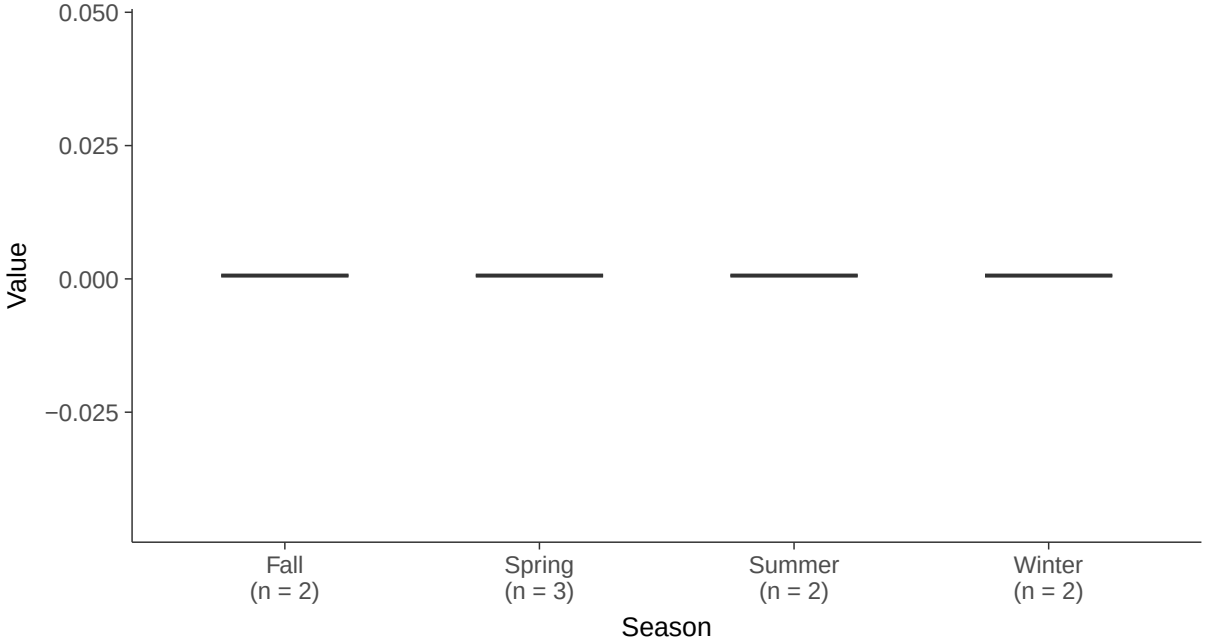
Boxplot

Vanadium, MW-20 (mg/L)



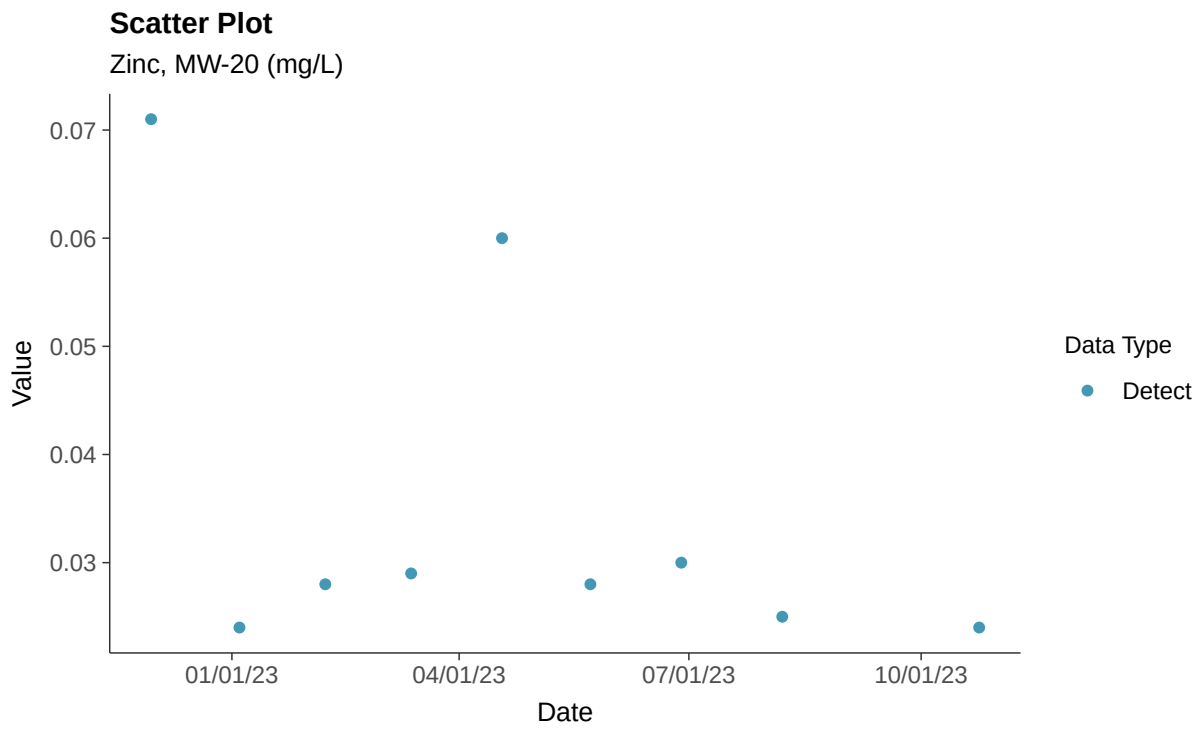
Boxplot by Season

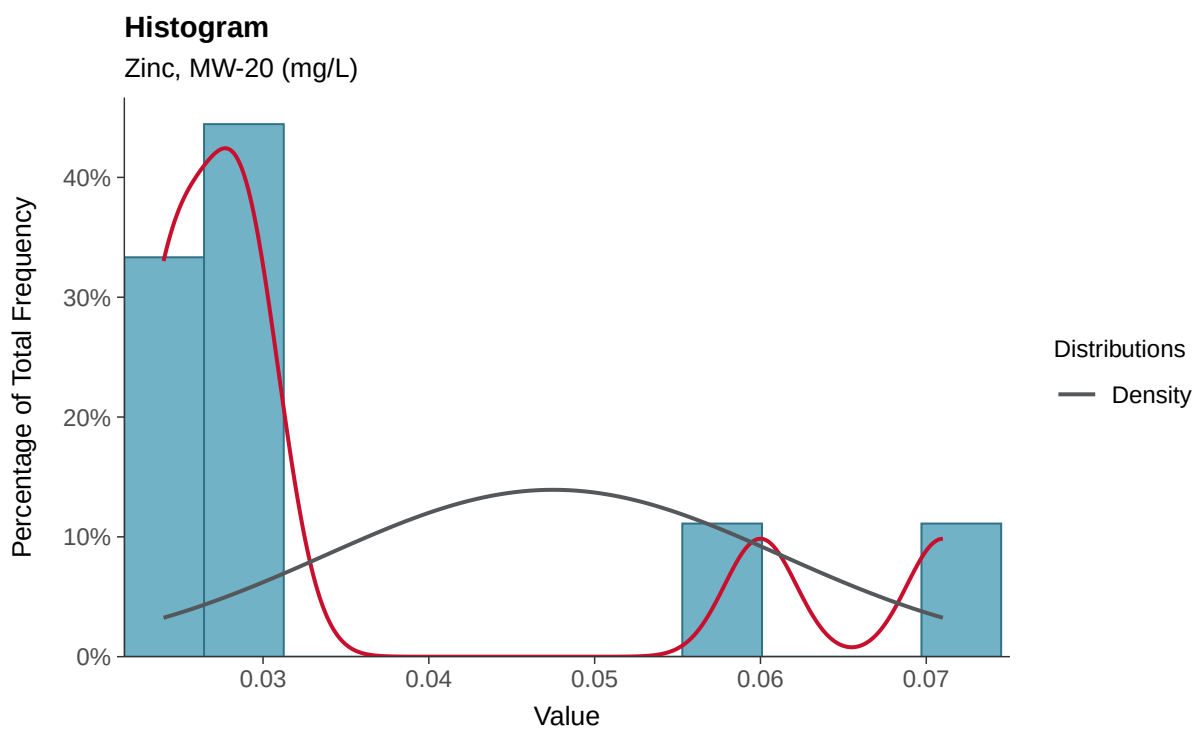
Vanadium, MW-20 (mg/L)

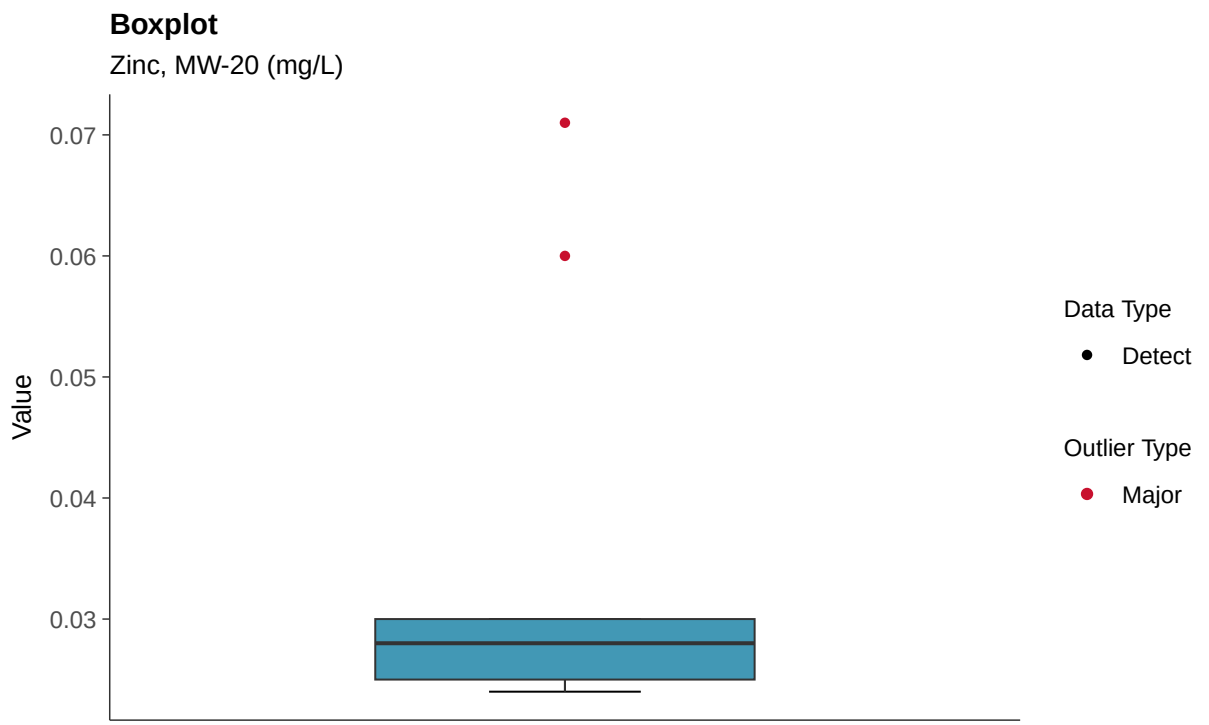


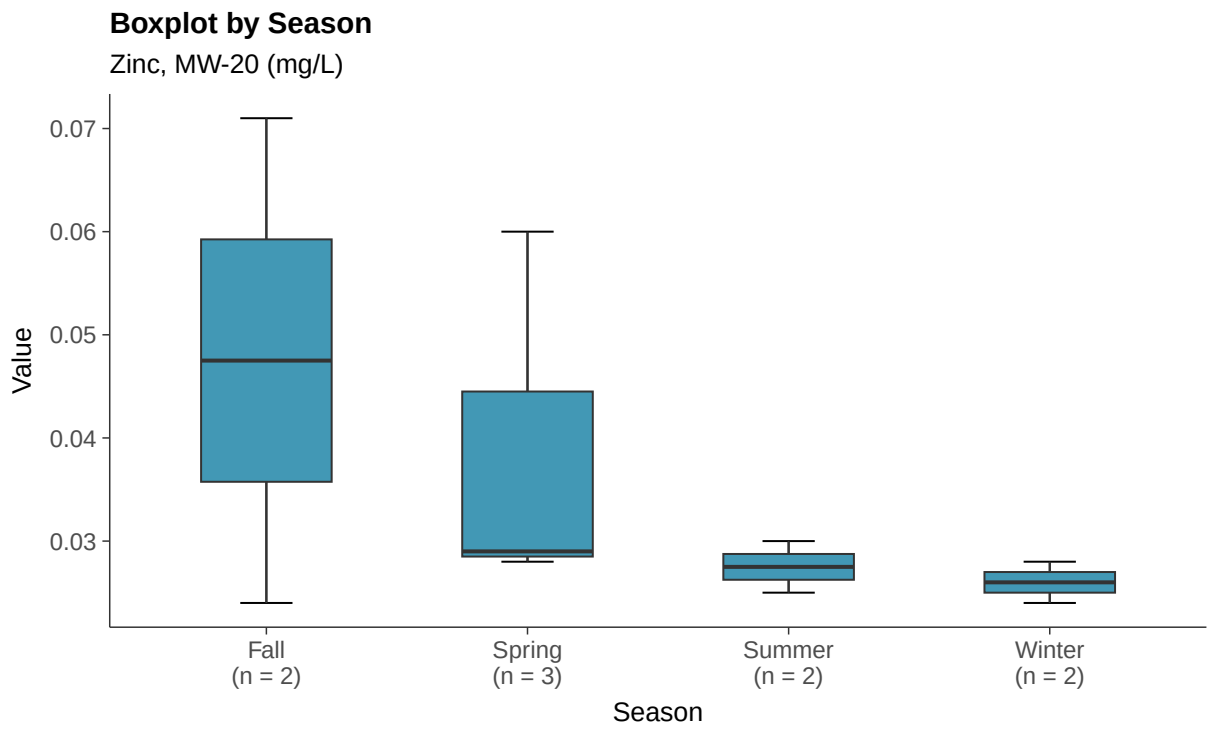
Part 115: Zinc, MW-20

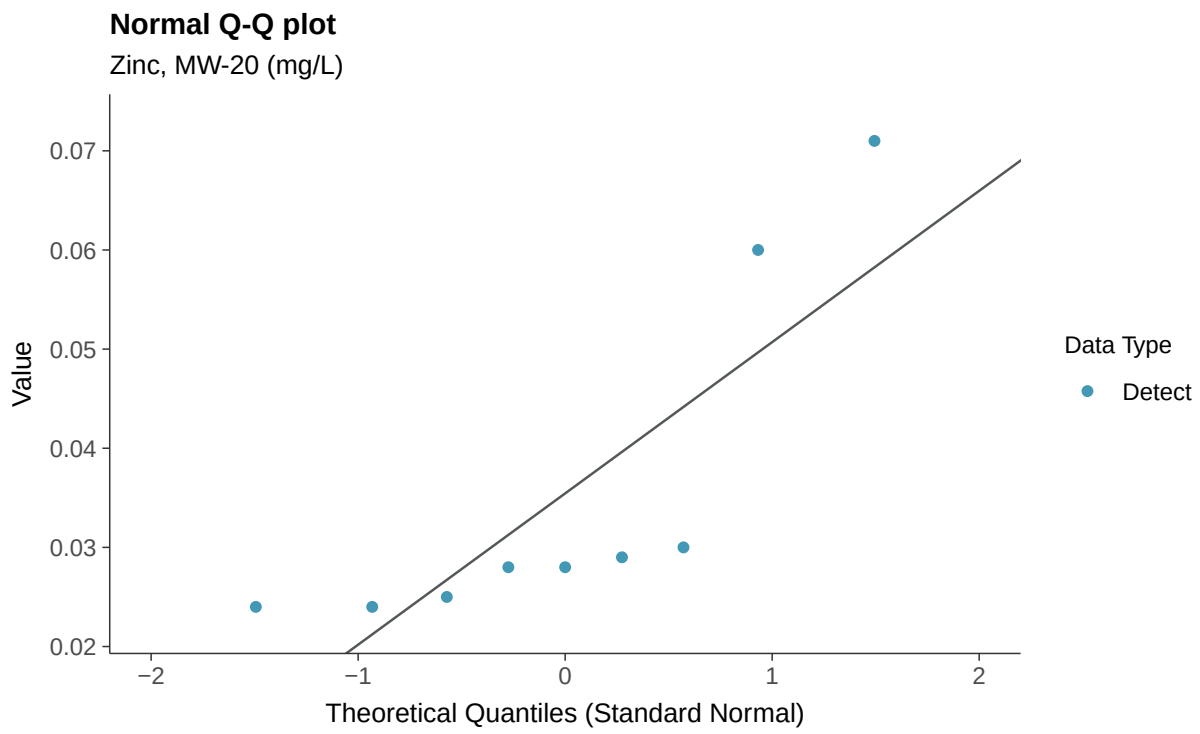
ID: 1_24_6_130

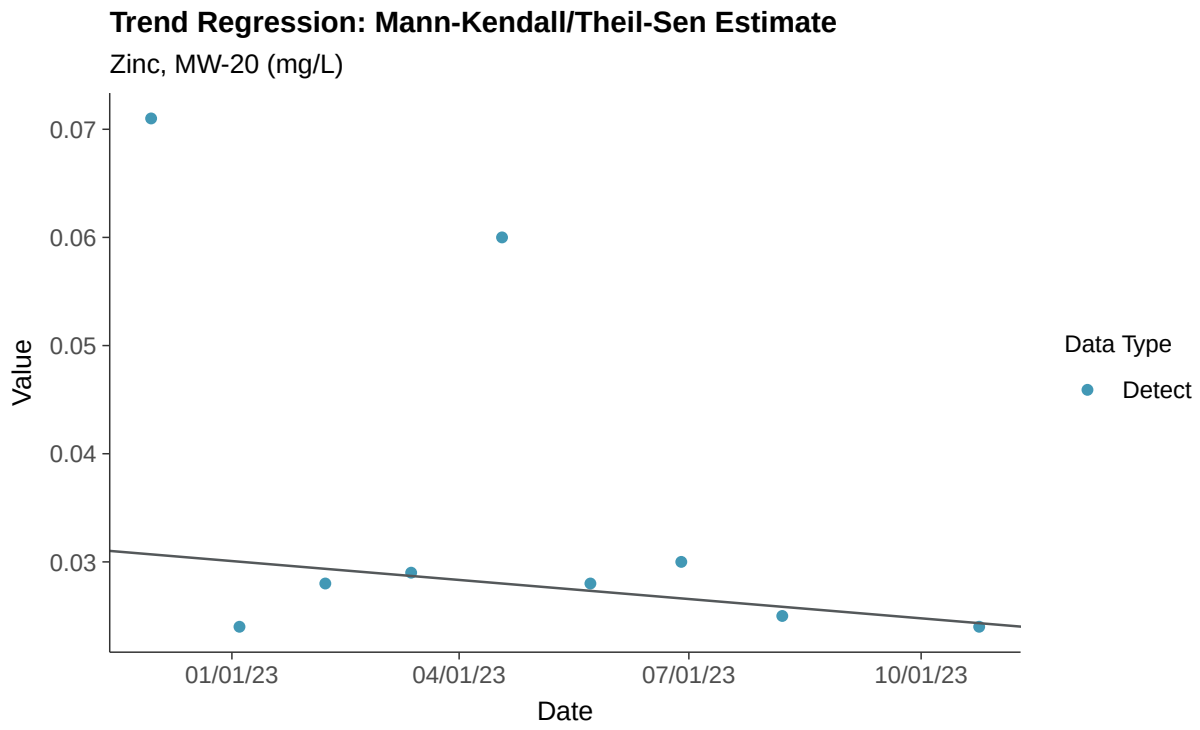





Boxplot
Zinc, MW-20 (mg/L)
Value
0.07
0.06
0.05
0.04
0.03
Data Type
Detect
Outlier Type
Major

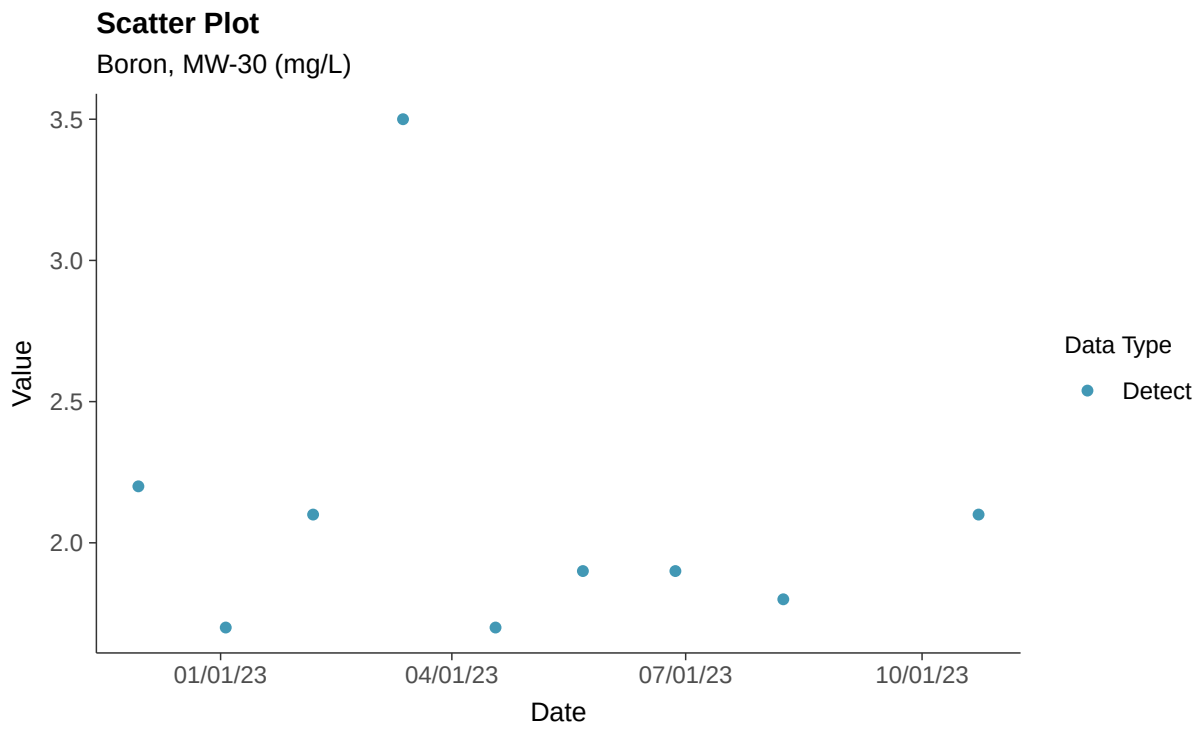

Boxplot by Season
Zinc, MW-20 (mg/L)
Value
0.07
0.06
0.05
0.04
0.03
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

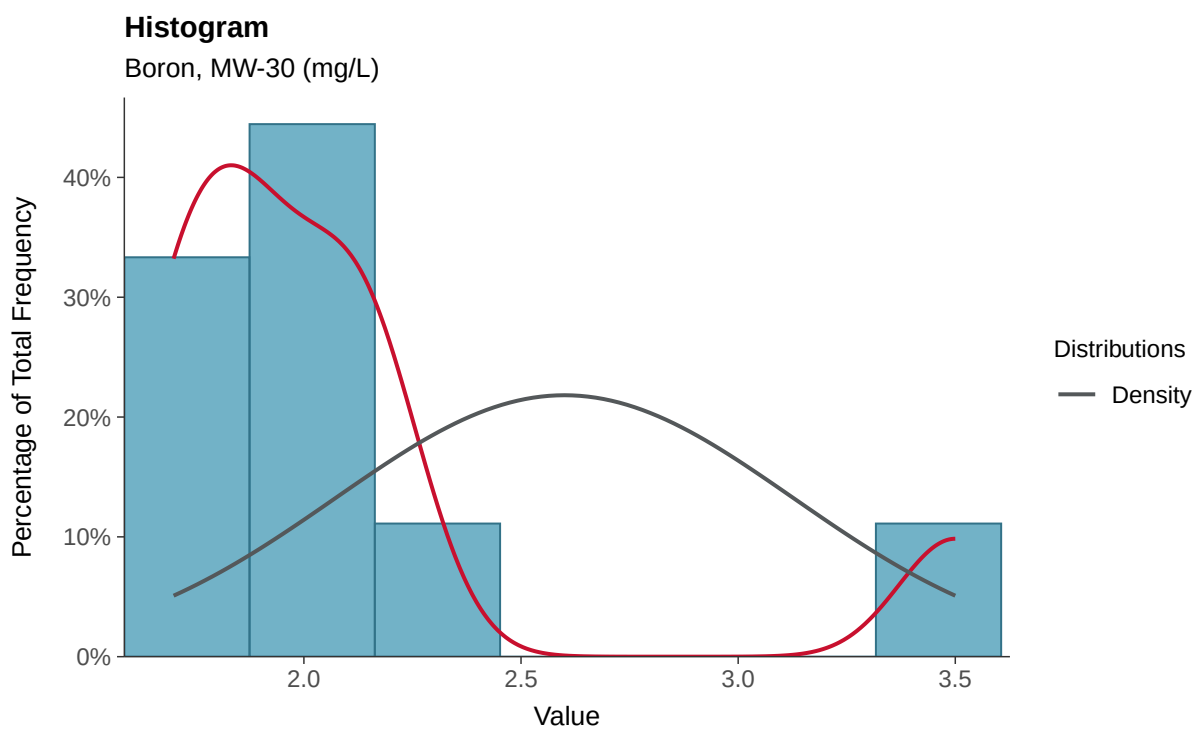

Normal Q-Q plot
Zinc, MW-20 (mg/L)
Value
0.07
0.06
0.05
0.04
0.03
0.02
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Zinc, MW-20 (mg/L)
Value
0.07
0.06
0.05
0.04
0.03
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Boron, MW-30

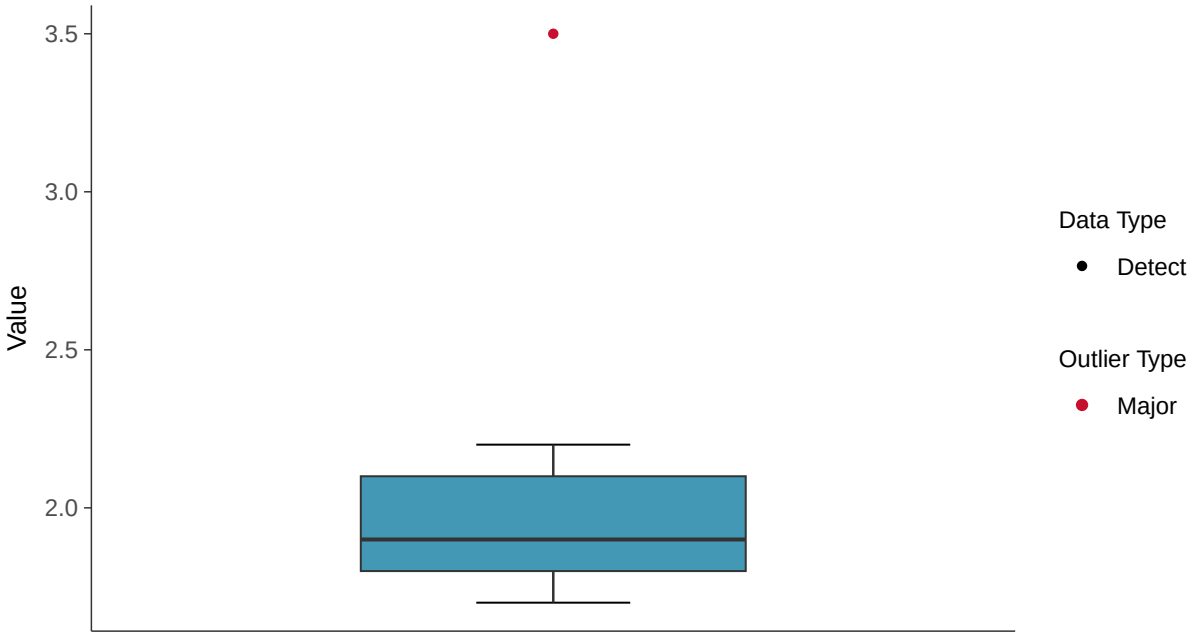
ID: 1_25_4_105





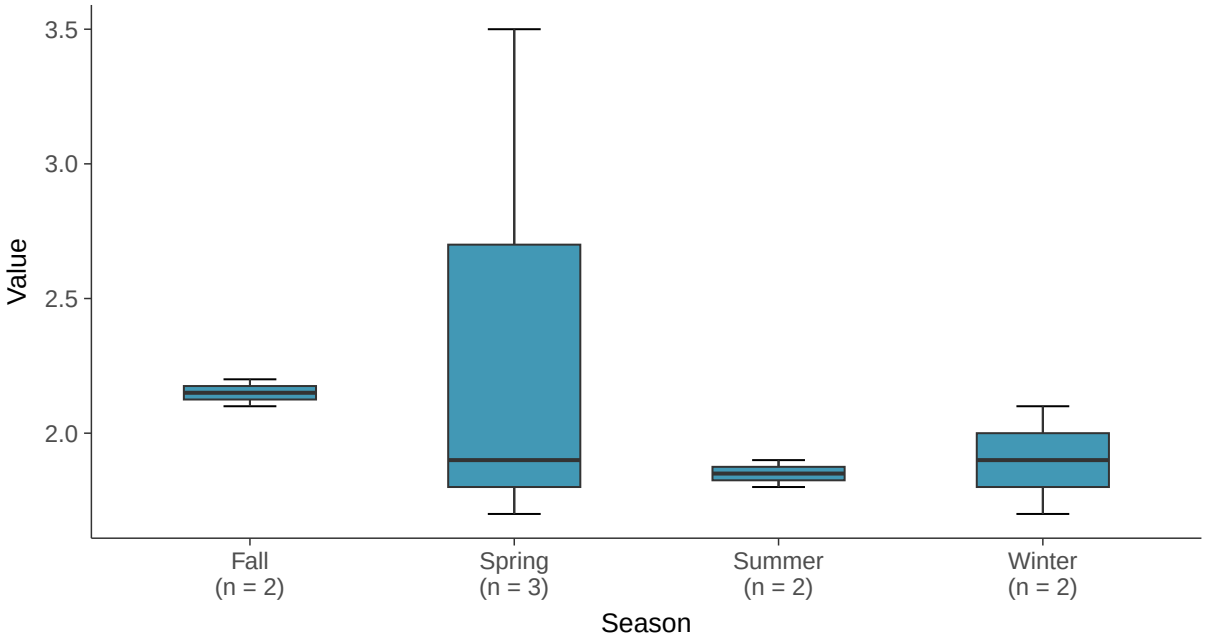
Boxplot

Boron, MW-30 (mg/L)



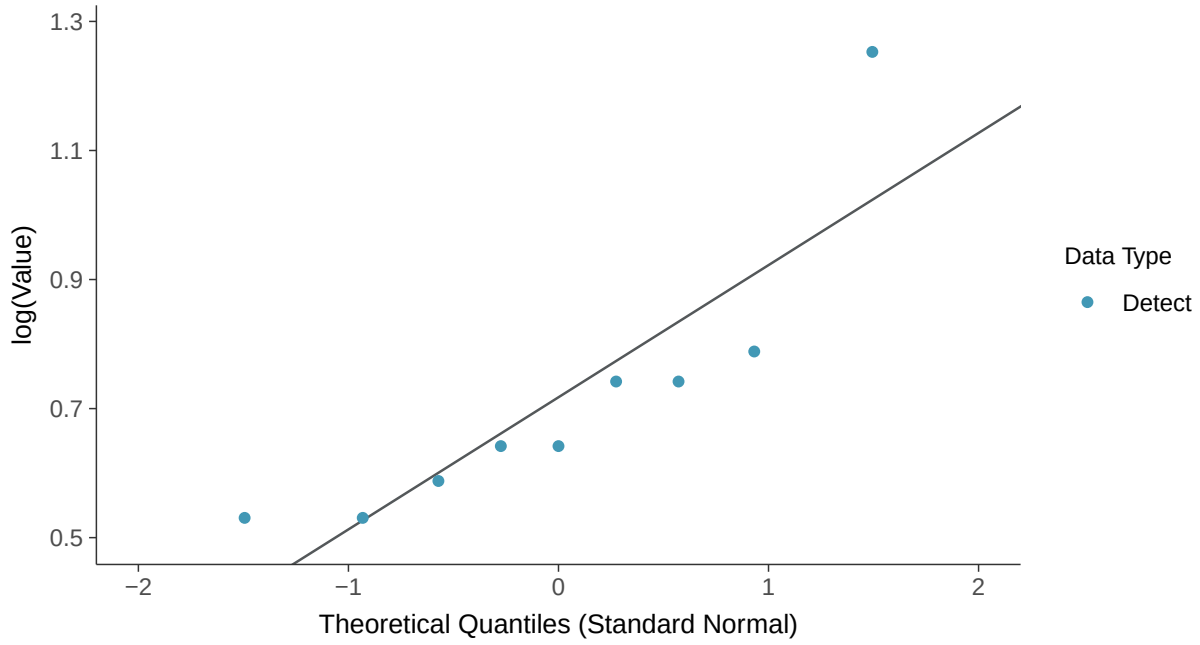
Boxplot by Season

Boron, MW-30 (mg/L)



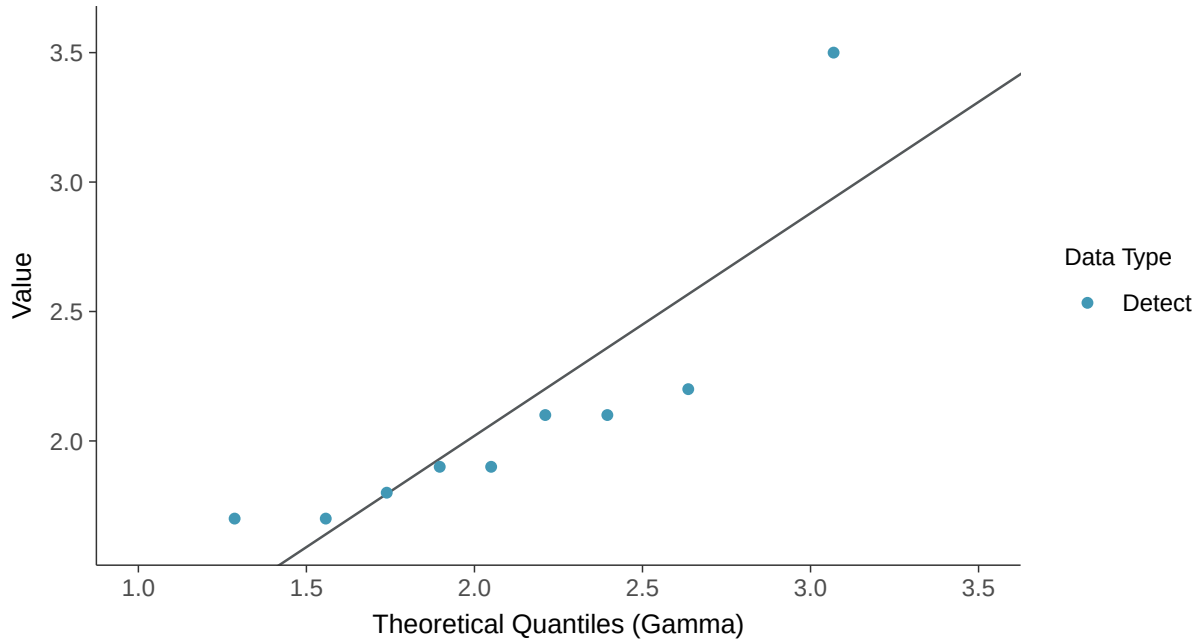
Lognormal Q-Q plot

Boron, MW-30 (mg/L)



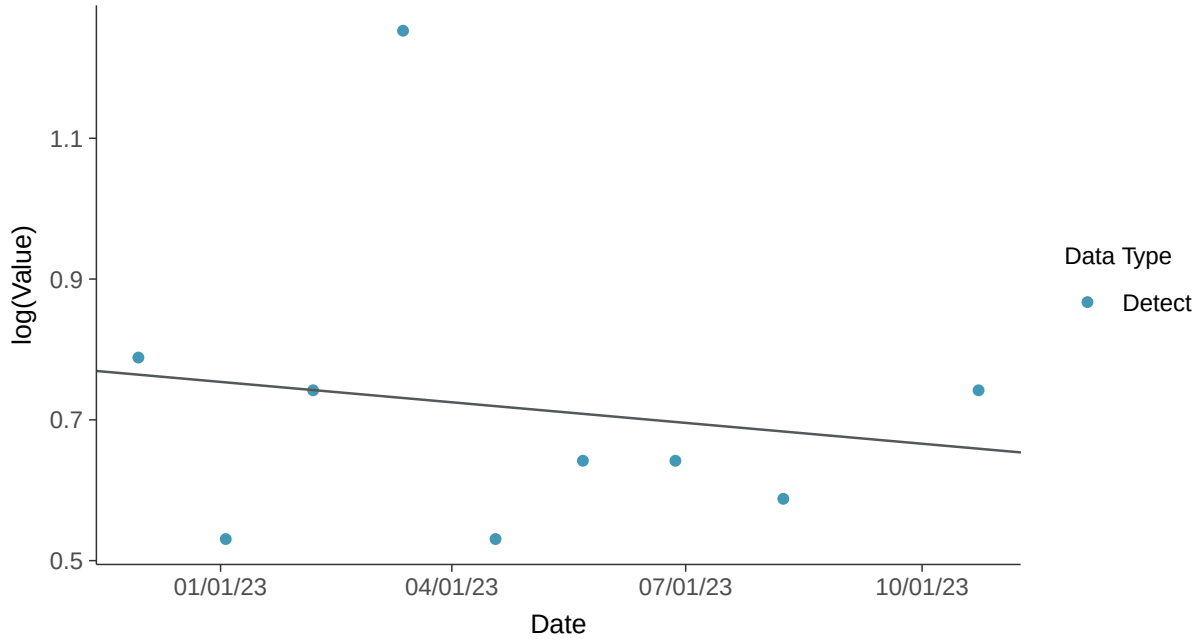
Gamma Q-Q plot

Boron, MW-30 (mg/L)



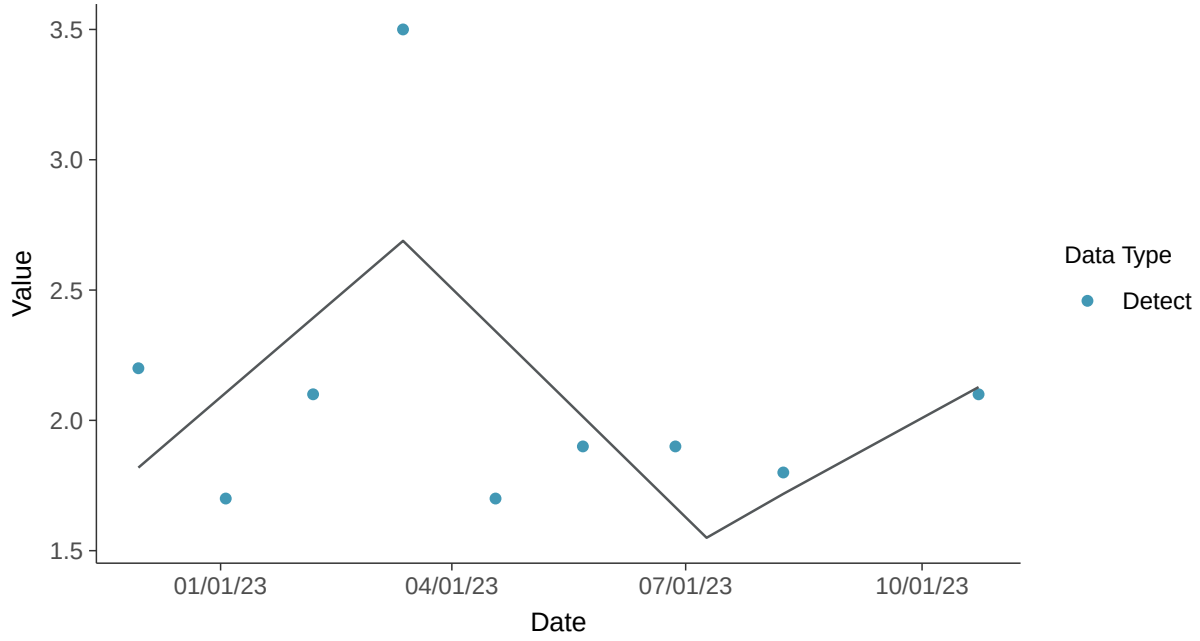
Trend Regression: Lognormal MLE

Boron, MW-30 (mg/L)



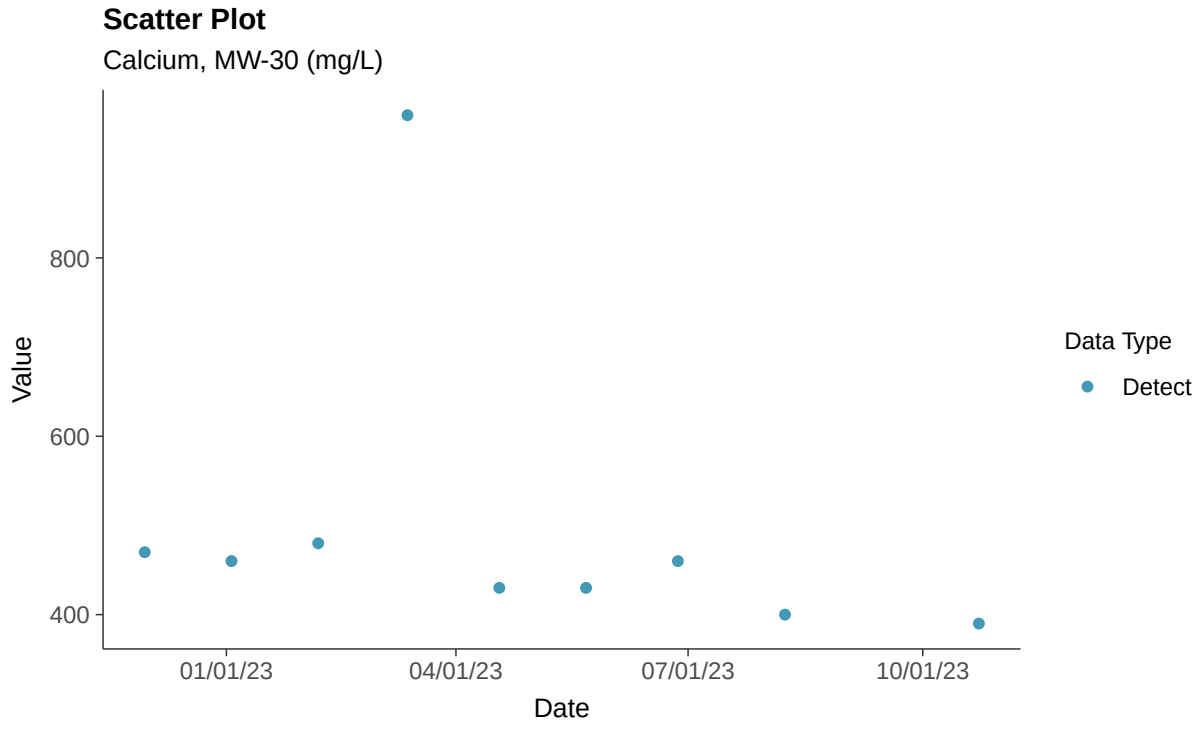
Trend Regression: Piecewise Linear-Linear-Linear

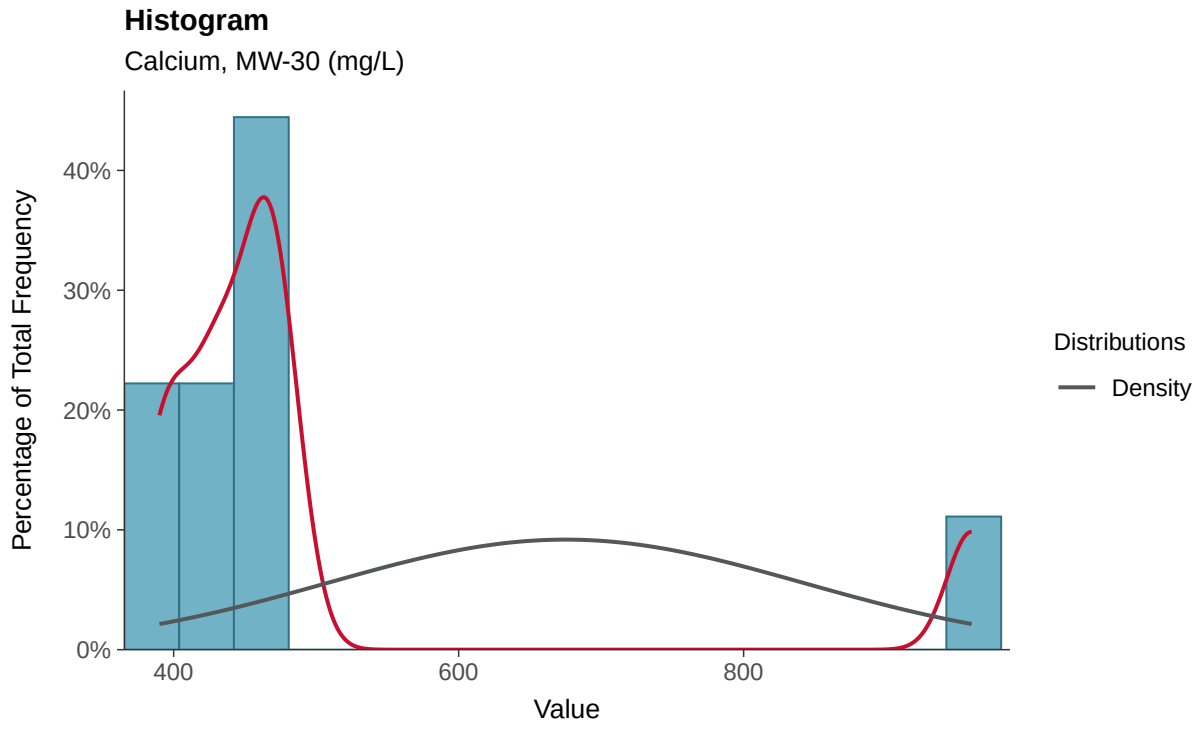
Boron, MW-30 (mg/L)



Appendix III: Calcium, MW-30

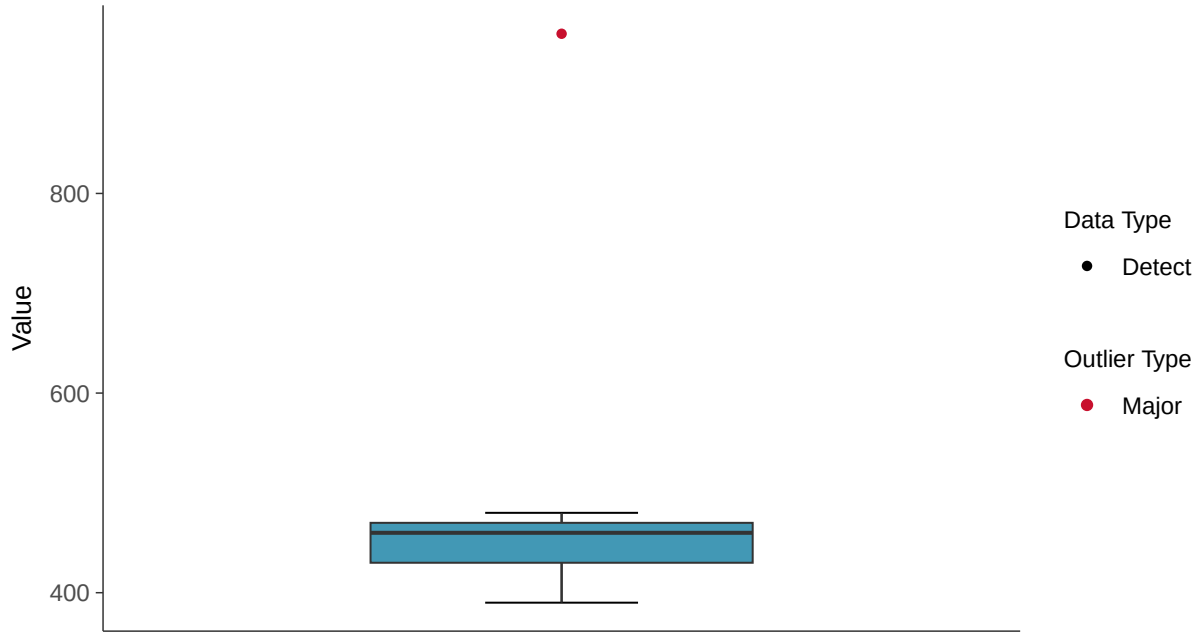
ID: 1_25_4_107





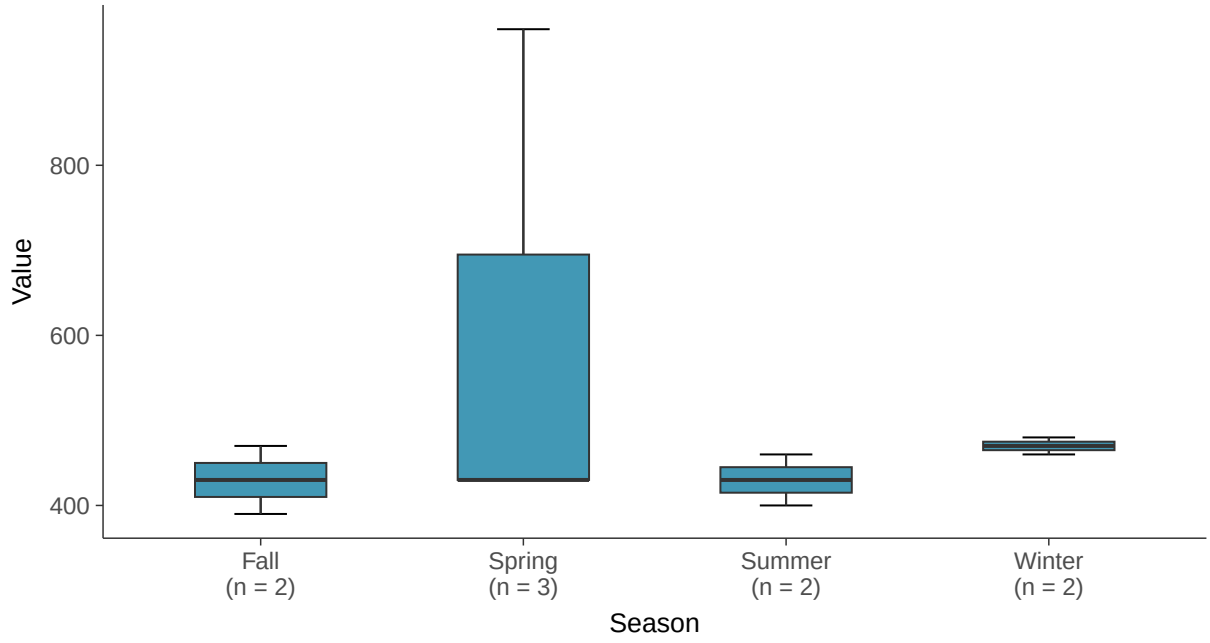
Boxplot

Calcium, MW-30 (mg/L)



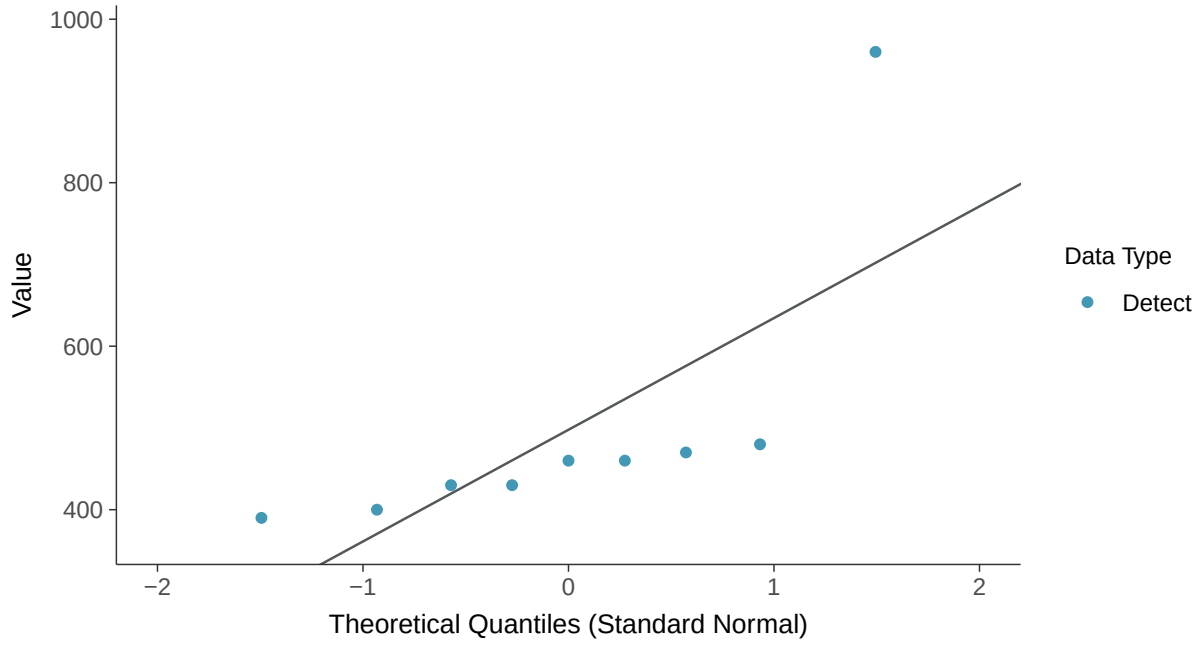
Boxplot by Season

Calcium, MW-30 (mg/L)



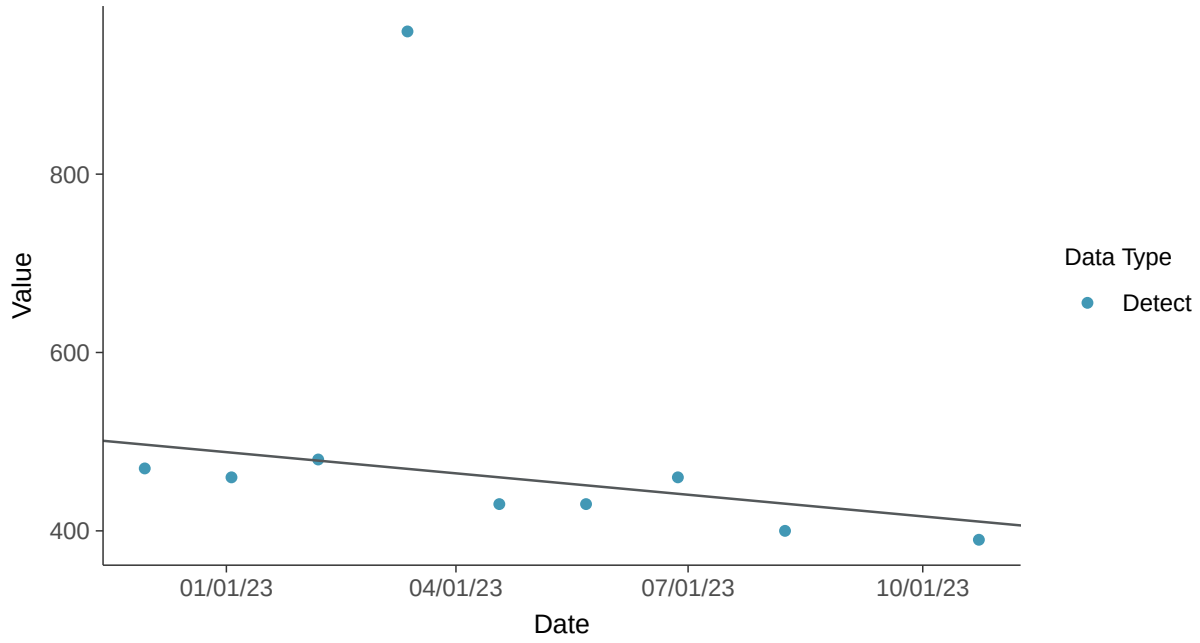
Normal Q-Q plot

Calcium, MW-30 (mg/L)



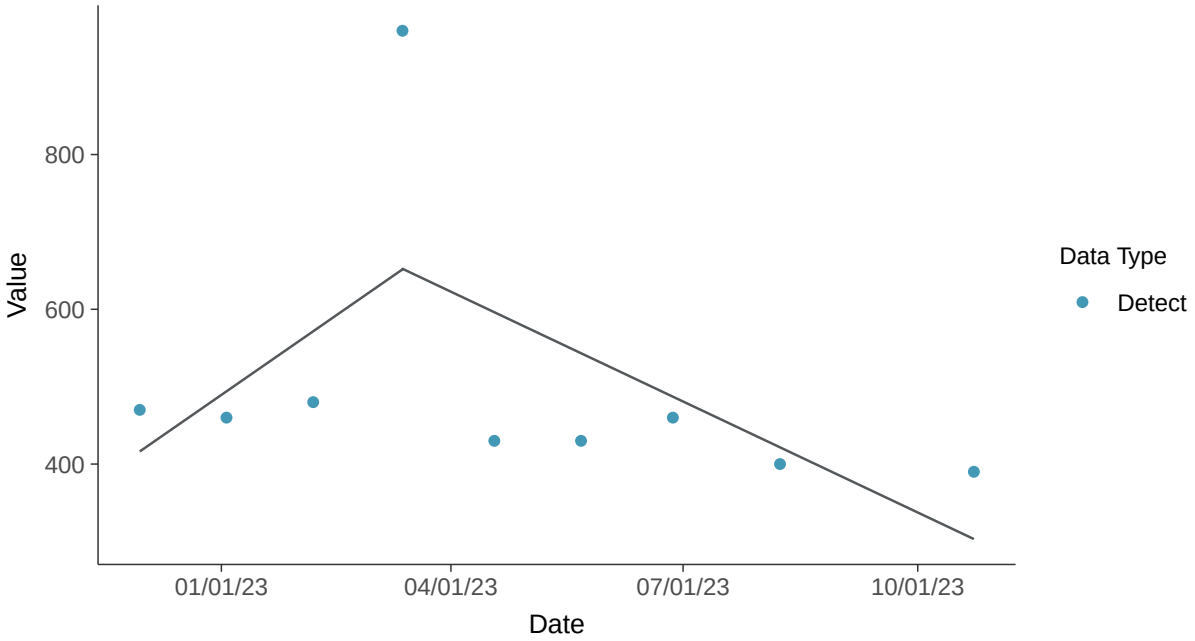
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Calcium, MW-30 (mg/L)



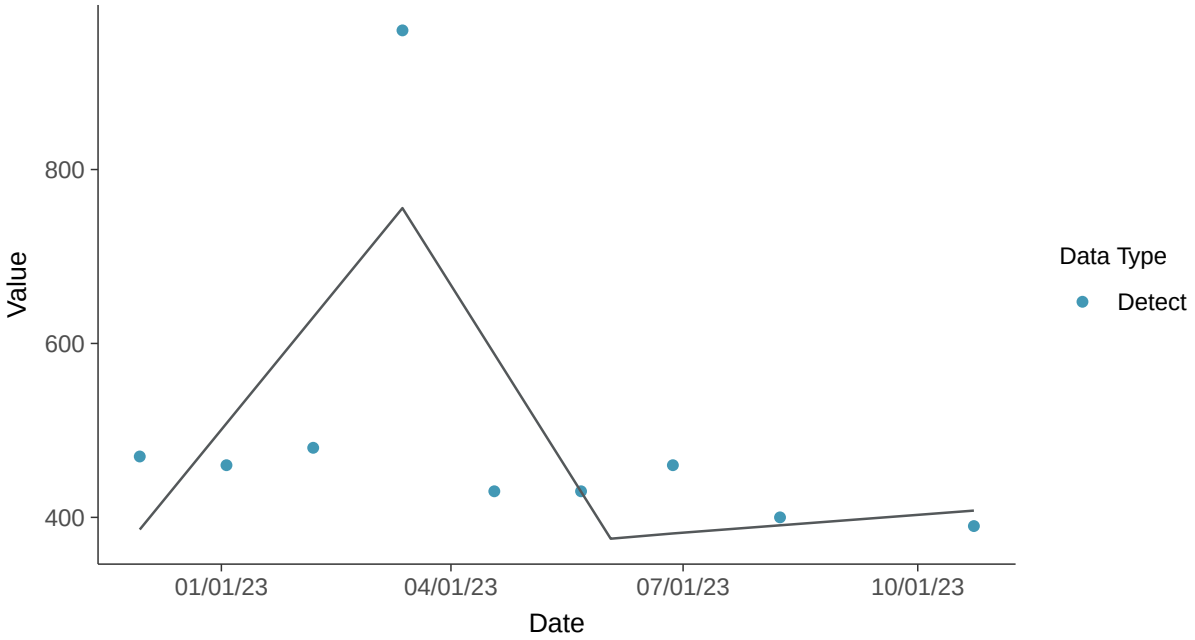
Trend Regression: Piecewise Linear-Linear

Calcium, MW-30 (mg/L)



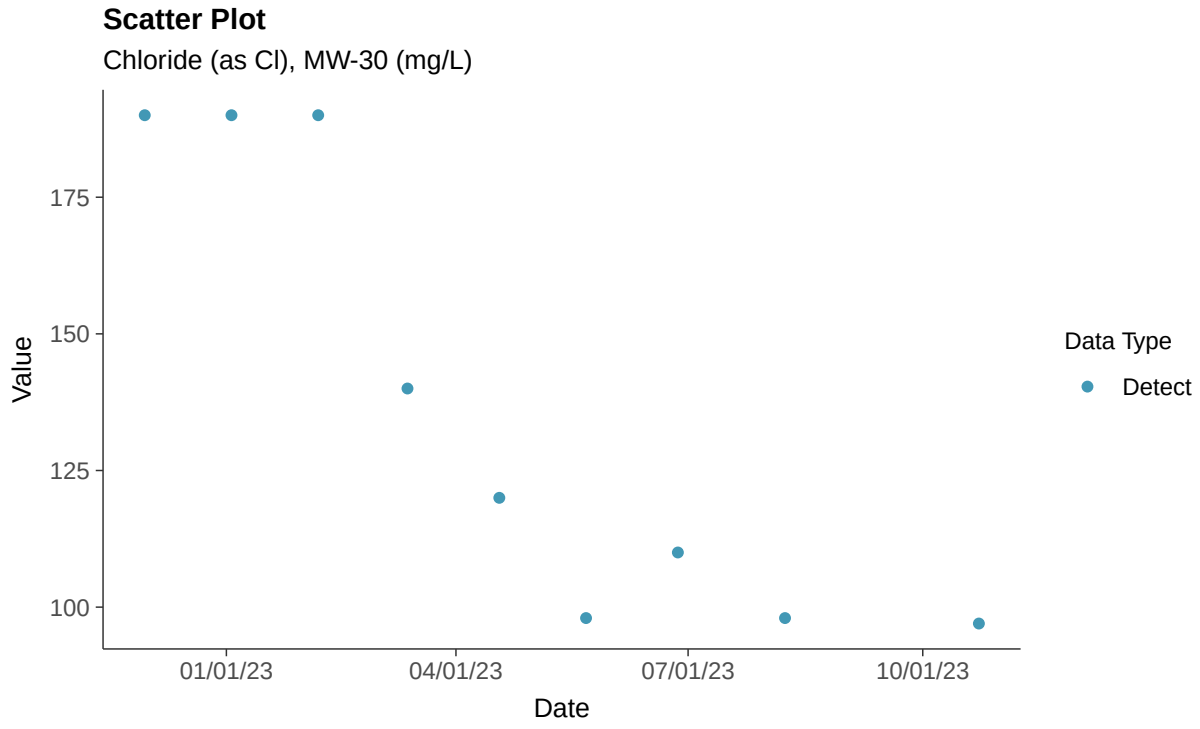
Trend Regression: Piecewise Linear-Linear-Linear

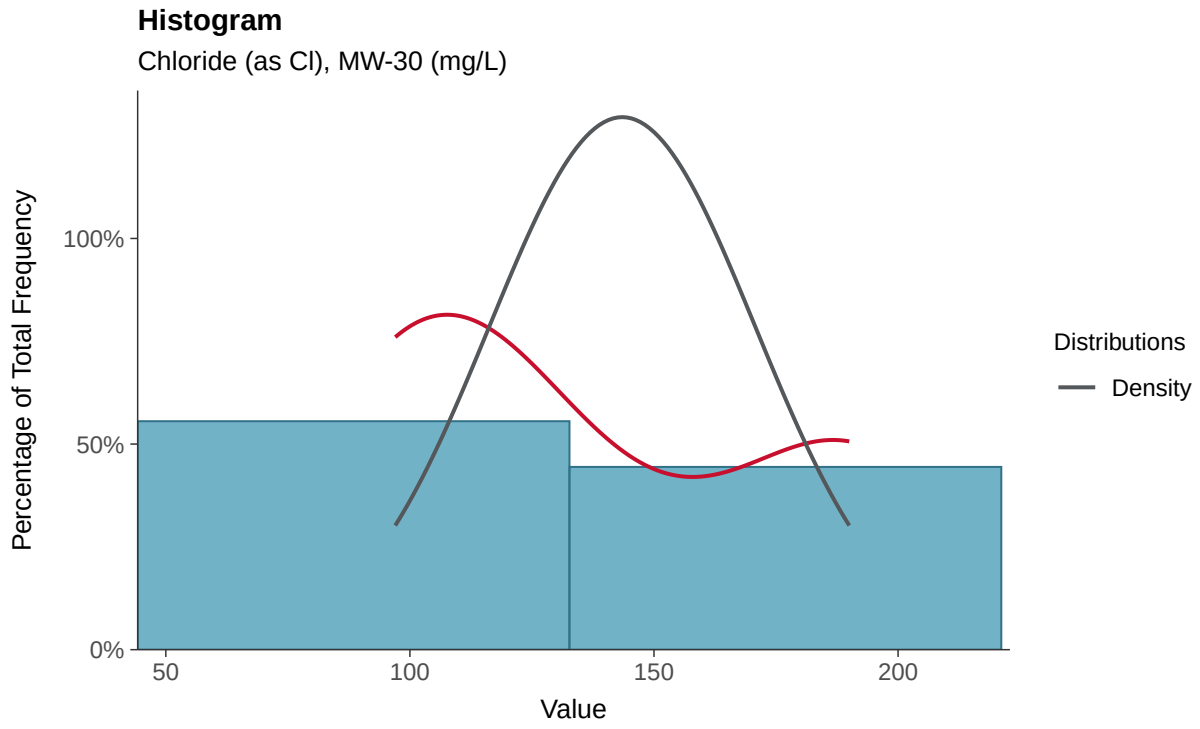
Calcium, MW-30 (mg/L)



Appendix III: Chloride (as Cl), MW-30

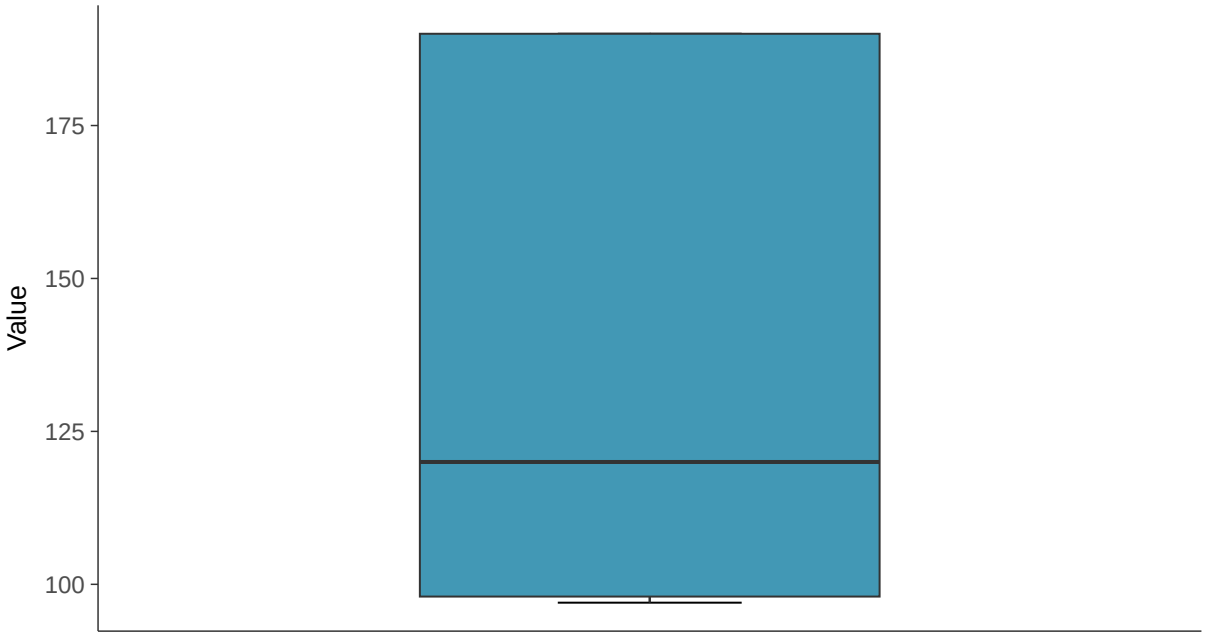
ID: 1_25_4_108





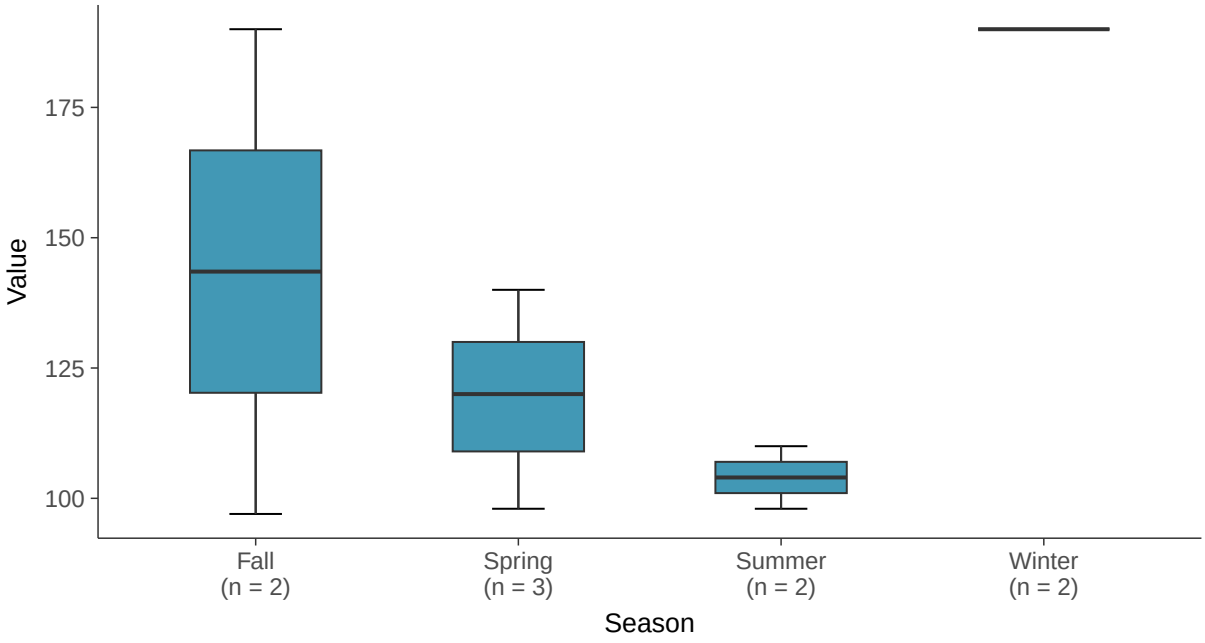
Boxplot

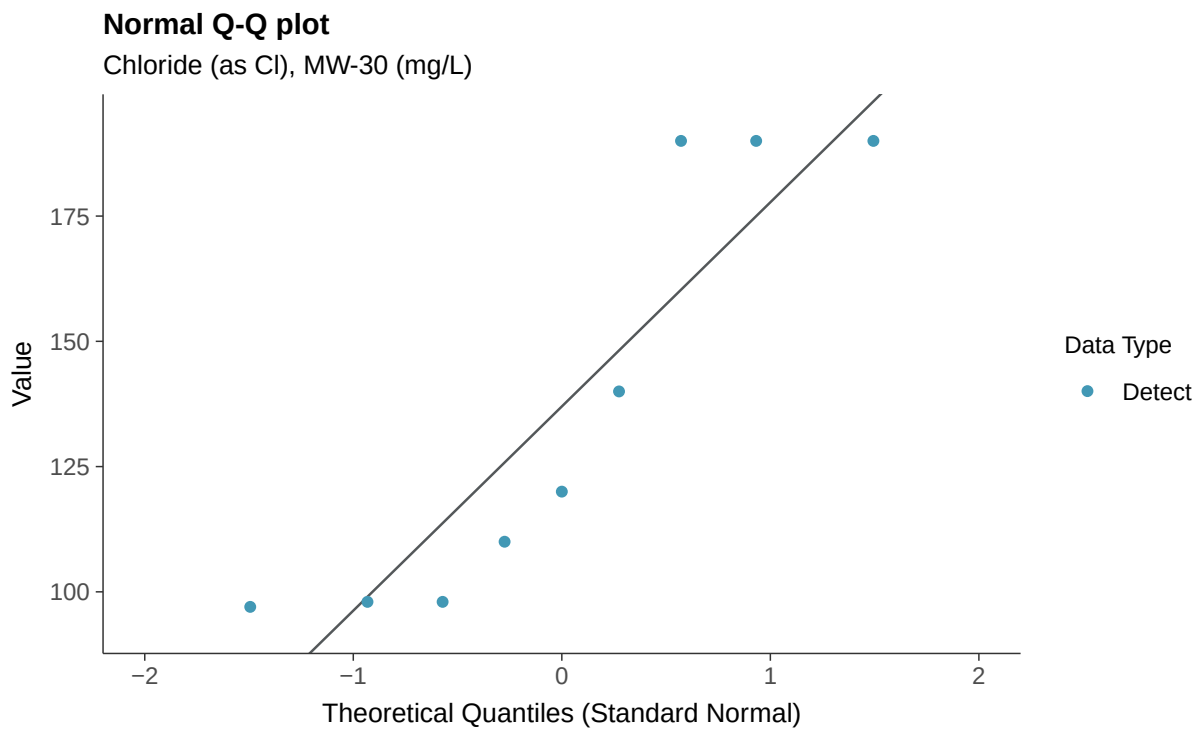
Chloride (as Cl), MW-30 (mg/L)

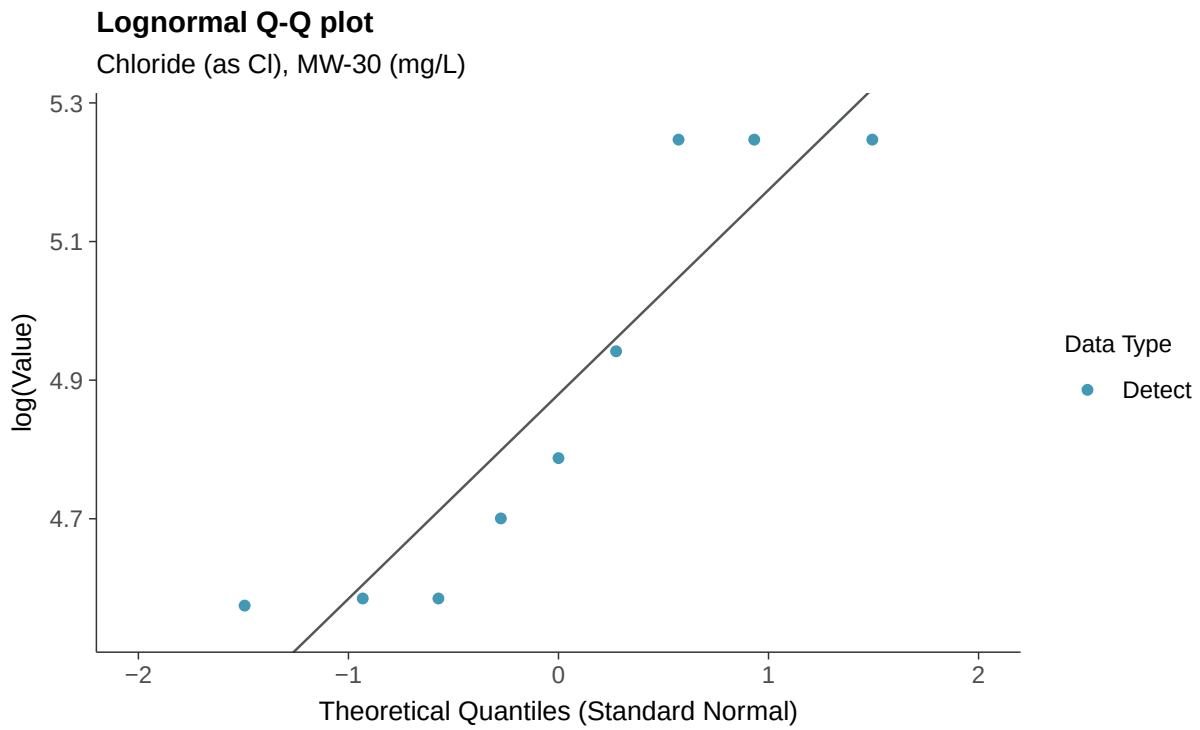


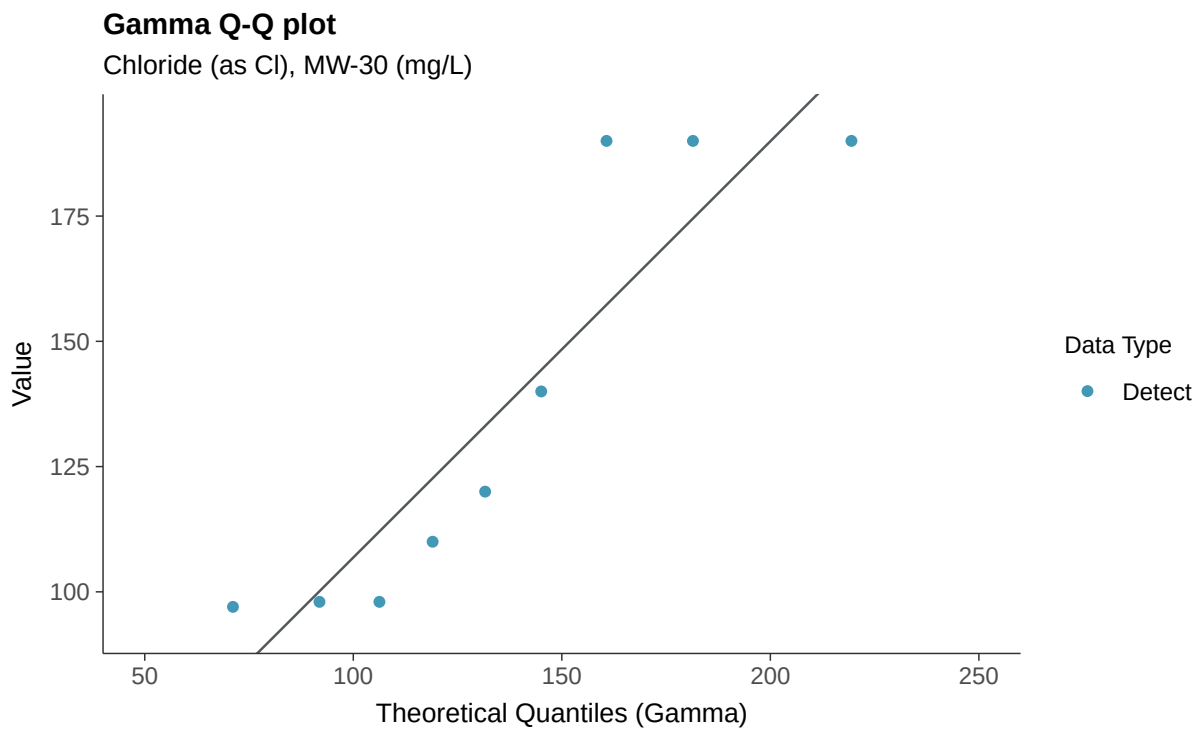
Boxplot by Season

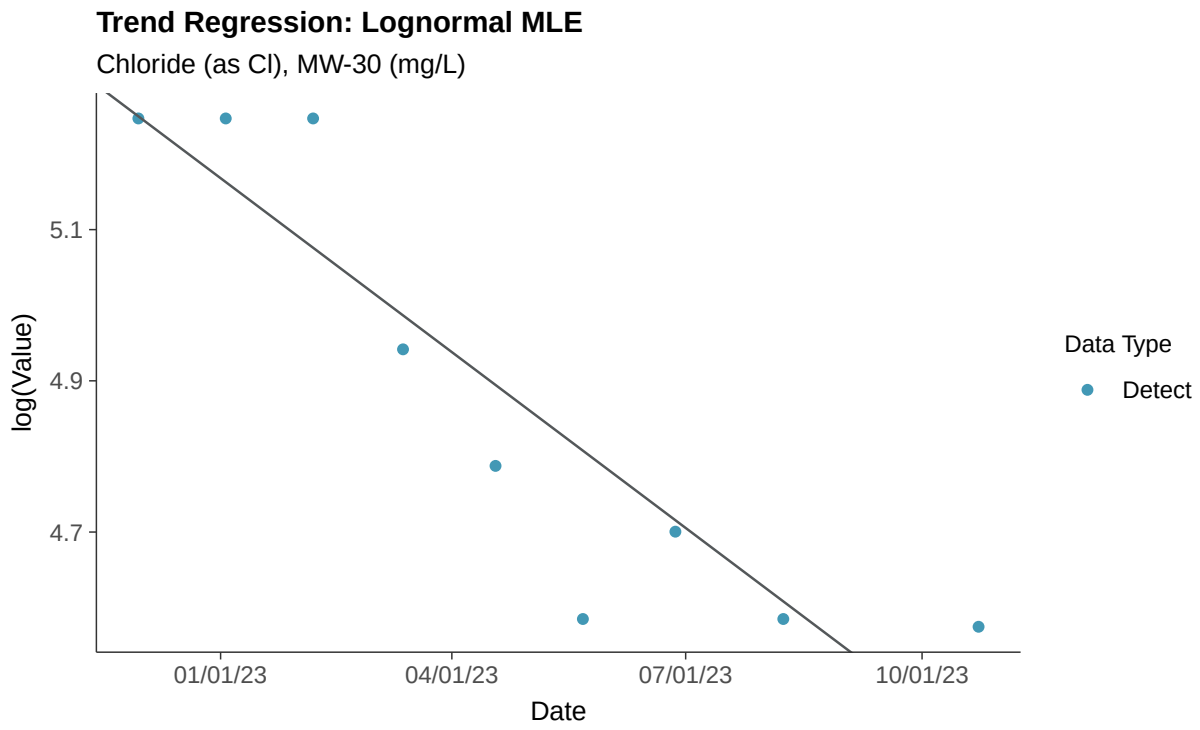
Chloride (as Cl), MW-30 (mg/L)

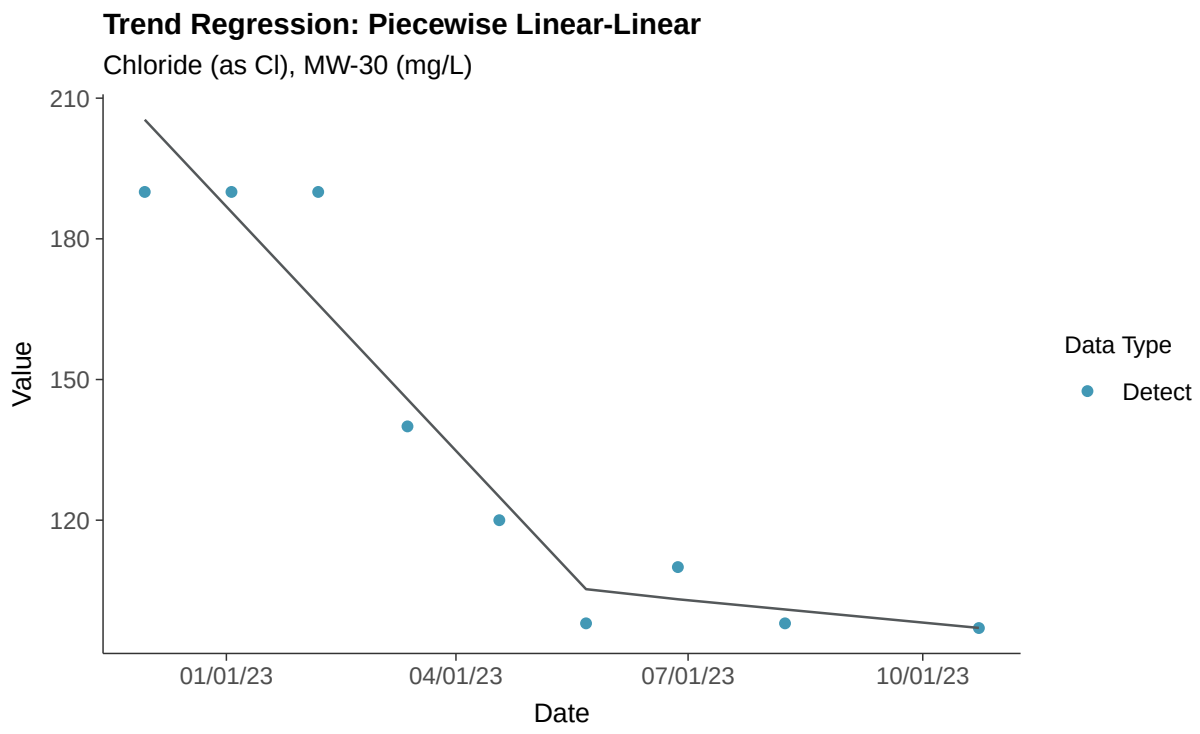



Normal Q-Q plot
Chloride (as Cl), MW-30 (mg/L)
Value
175
150
125
100
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chloride (as Cl), MW-30 (mg/L)
log(Value)
5.3
5.1
4.9
4.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

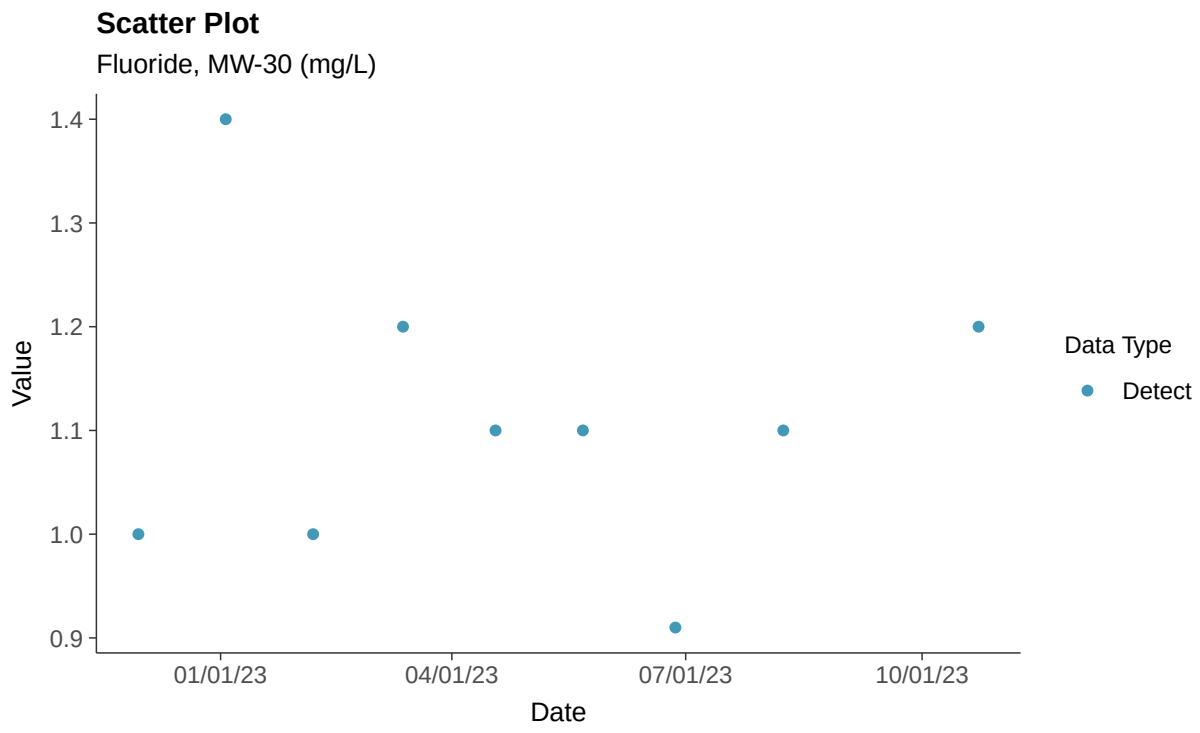

Gamma Q-Q plot
Chloride (as Cl), MW-30 (mg/L)
Value
175
150
125
100
50
100
150
200
250
Theoretical Quantiles (Gamma)
Data Type
Detect

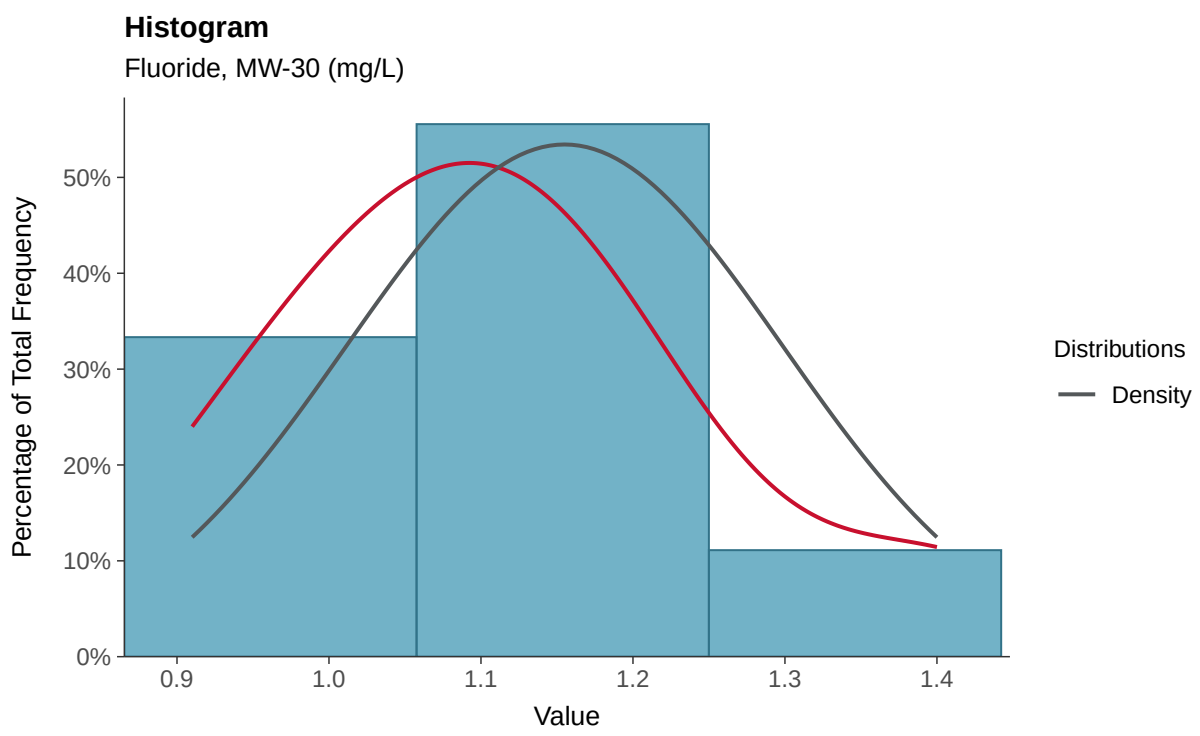

Trend Regression: Lognormal MLE
Chloride (as Cl), MW-30 (mg/L)
log(Value)
5.1
4.9
4.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-30 (mg/L)
210
180
150
120
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-30

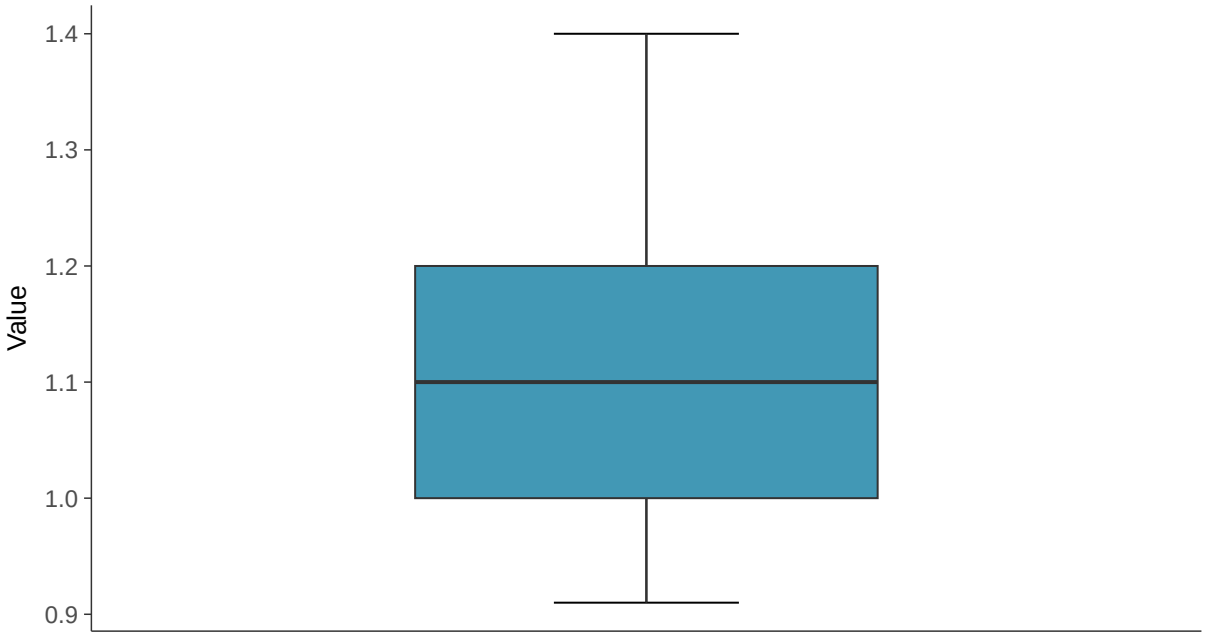
ID: 1_25_4_112





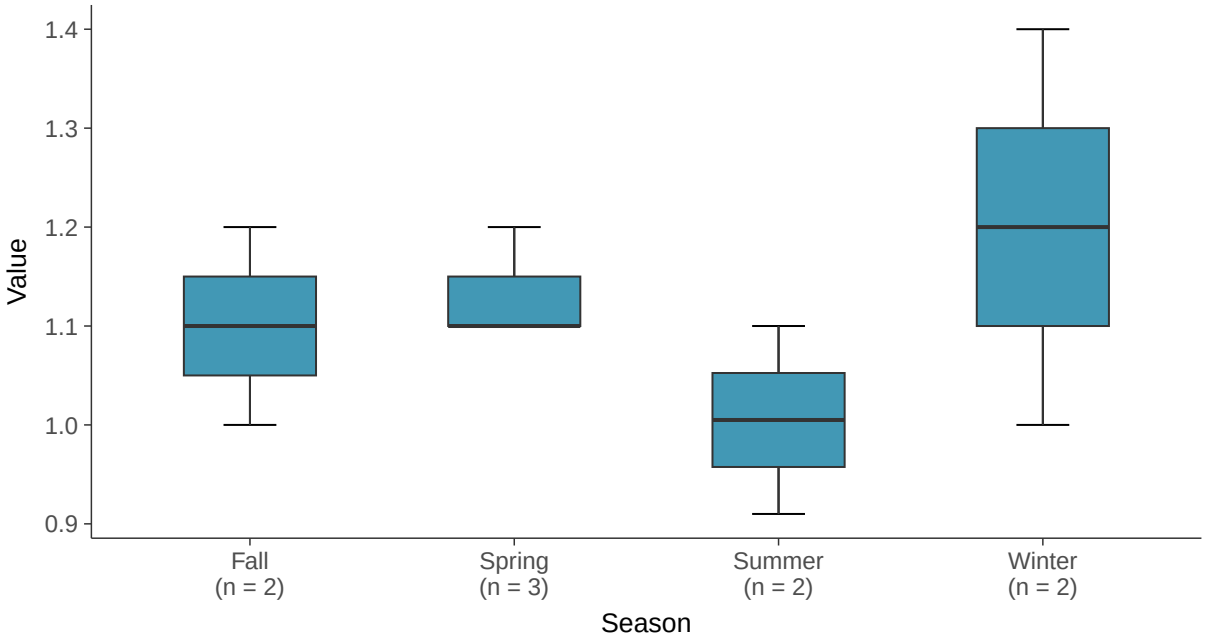
Boxplot

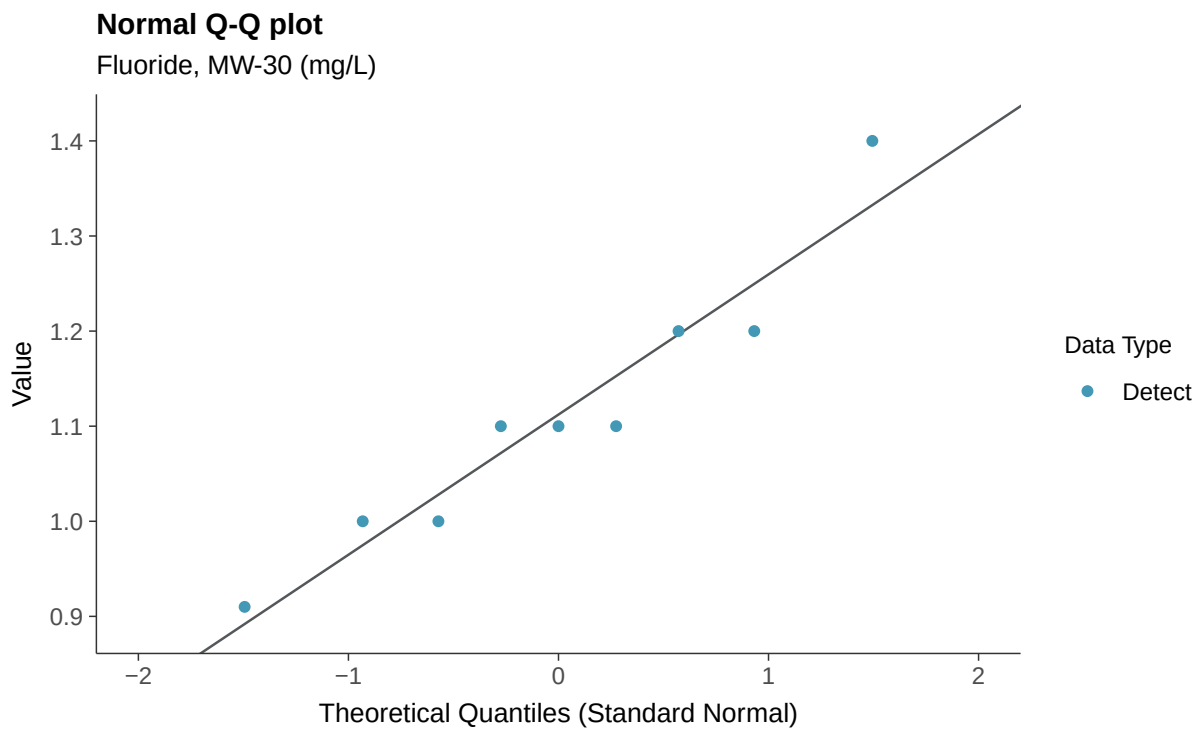
Fluoride, MW-30 (mg/L)

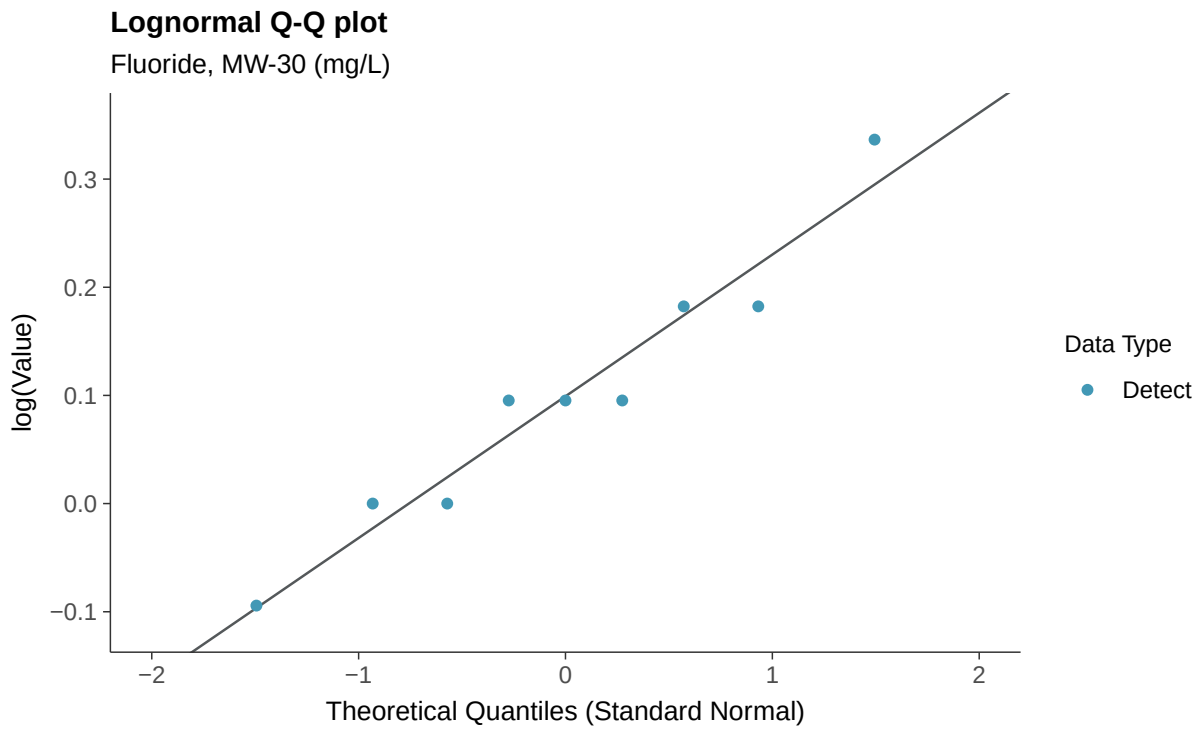


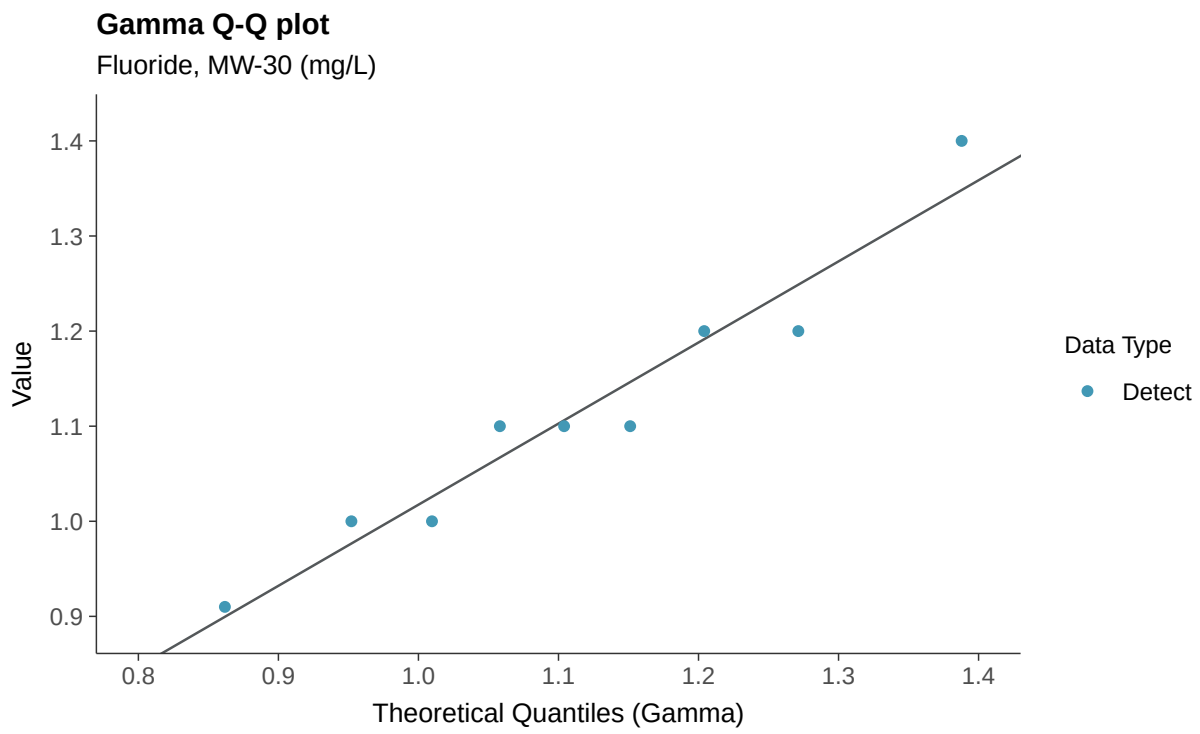
Boxplot by Season

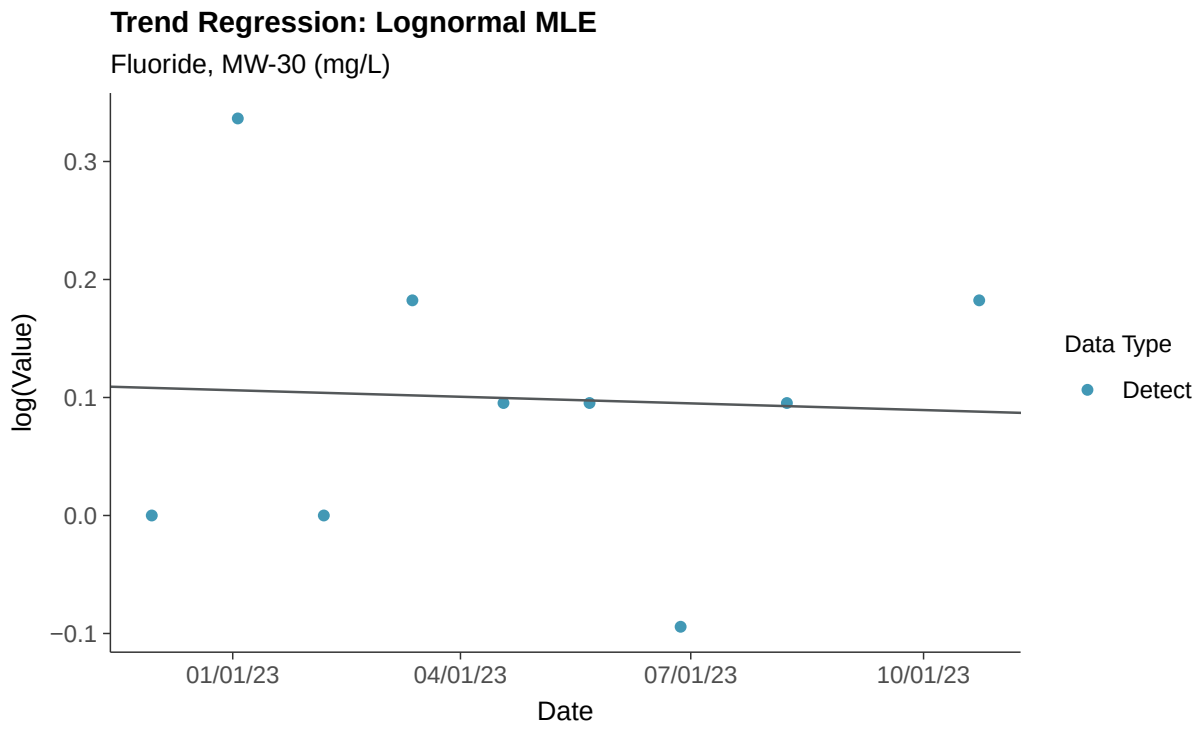
Fluoride, MW-30 (mg/L)




Normal Q-Q plot
Fluoride, MW-30 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
0.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

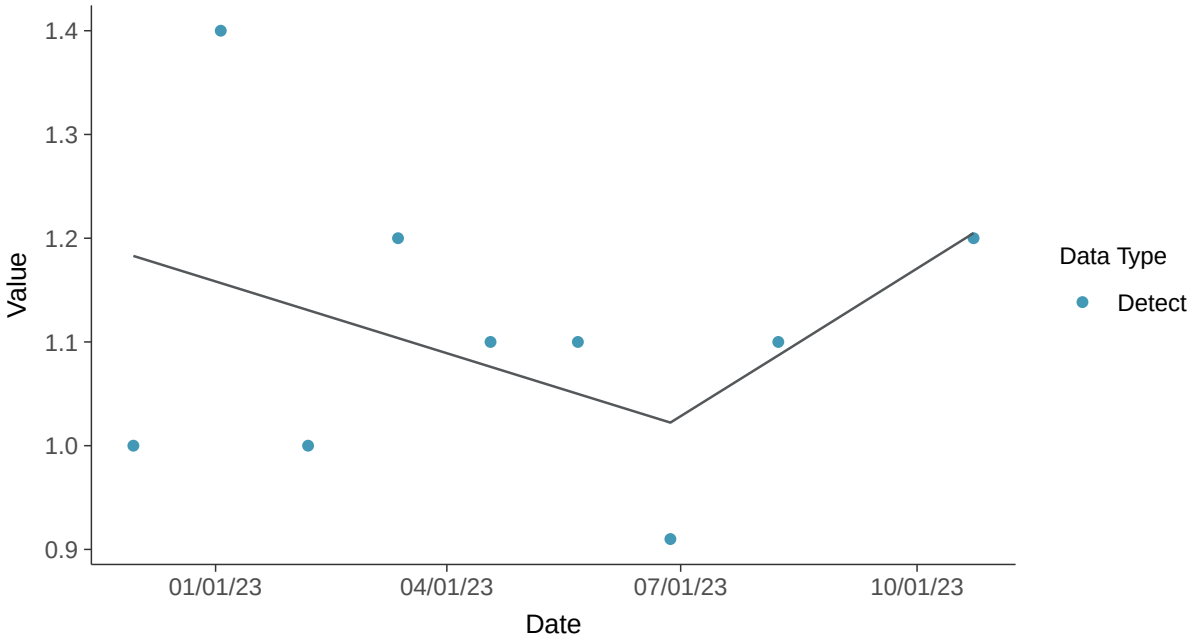

Lognormal Q-Q plot
Fluoride, MW-30 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
−0.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride, MW-30 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.9
1.0
1.1
1.2
1.3
1.4
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride, MW-30 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
−0.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

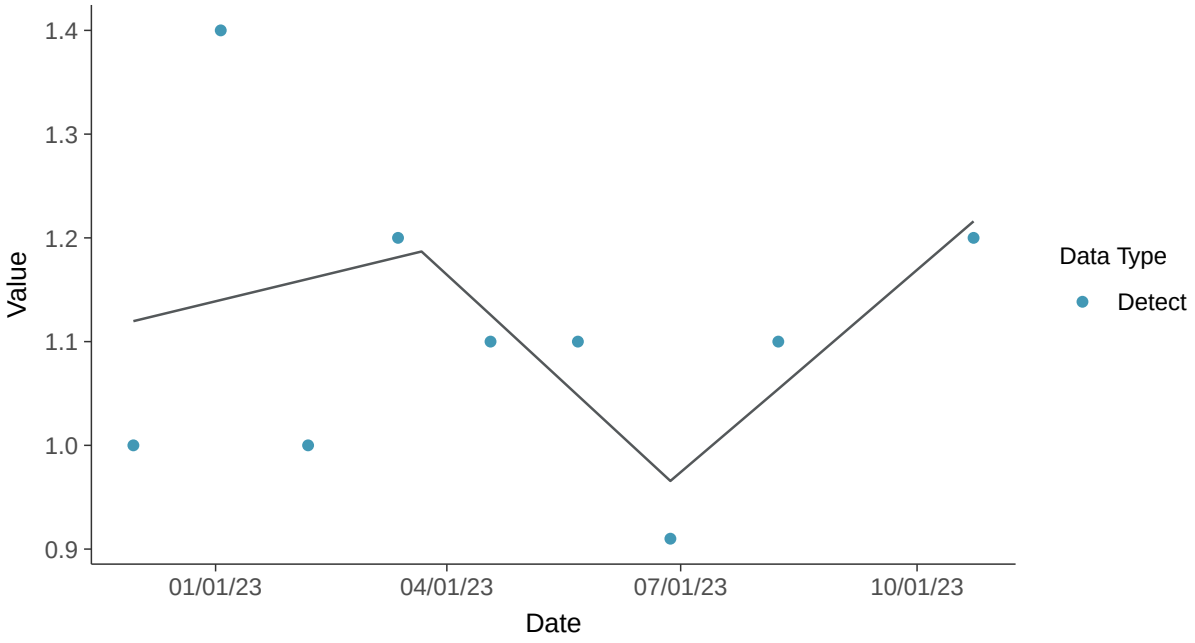
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-30 (mg/L)



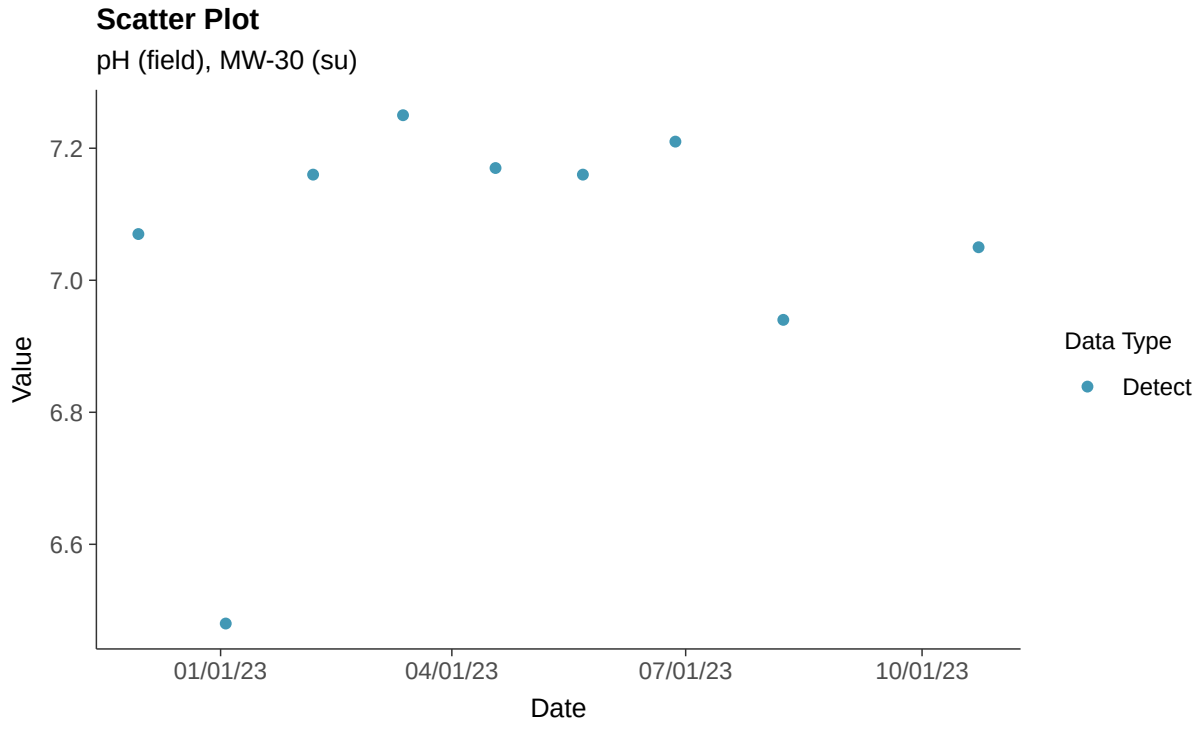
Trend Regression: Piecewise Linear-Linear-Linear

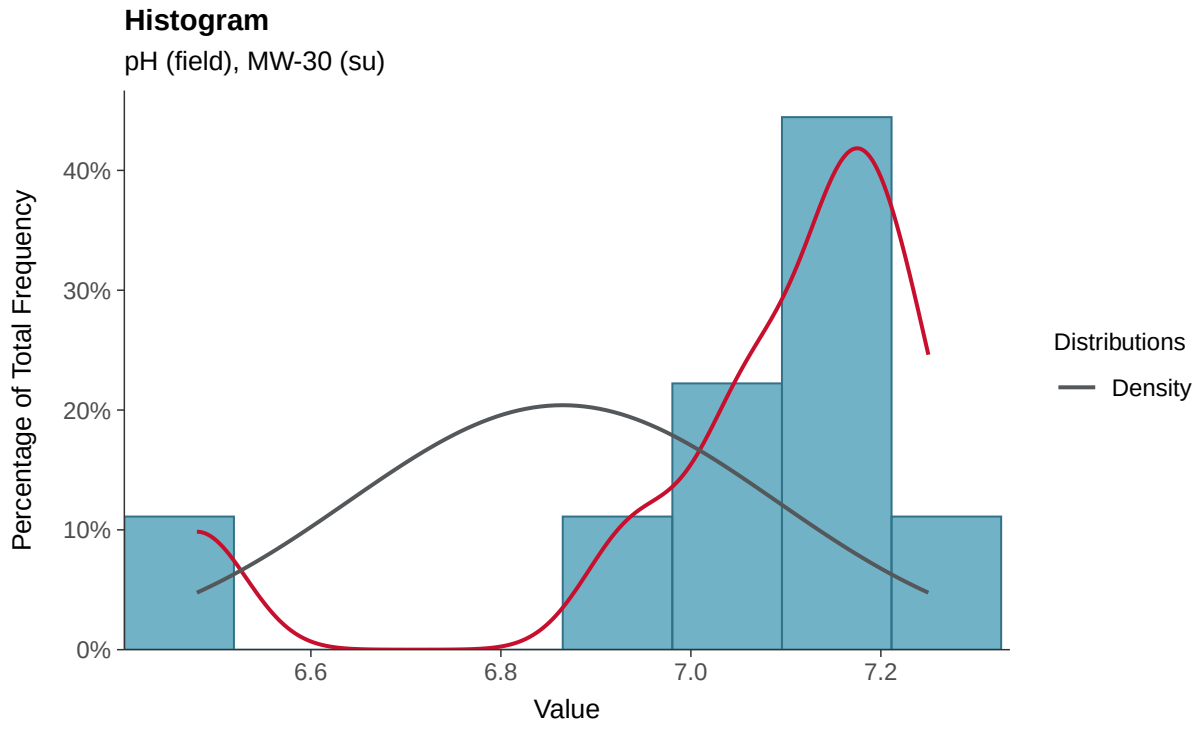
Fluoride, MW-30 (mg/L)



Appendix III: pH (field), MW-30

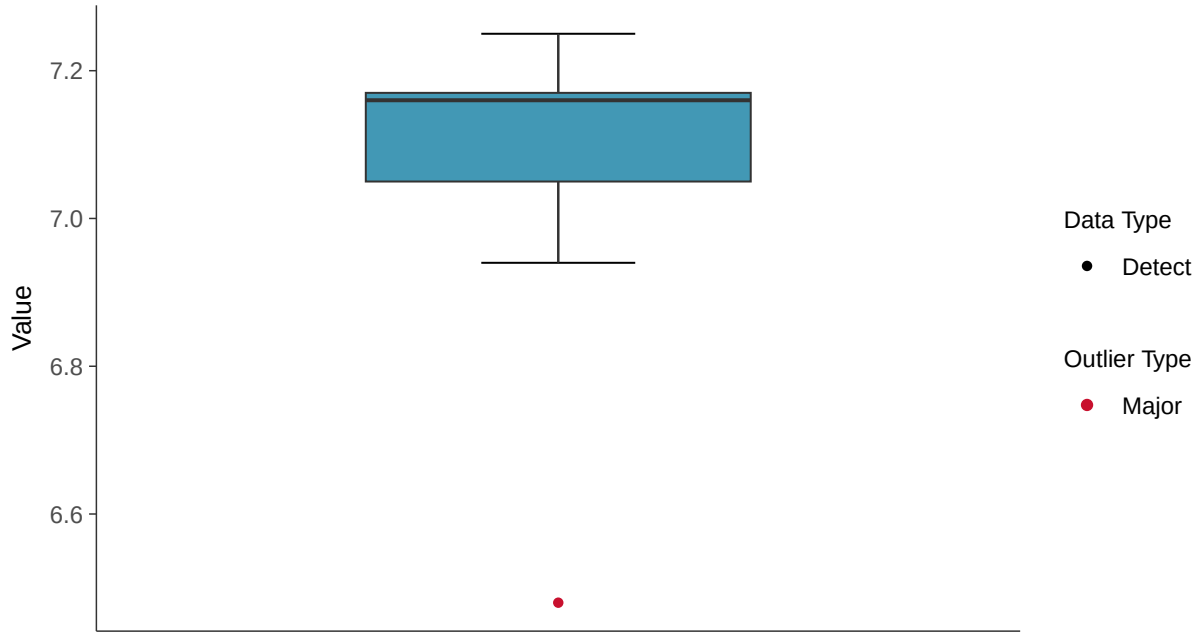
ID: 1_25_4_120





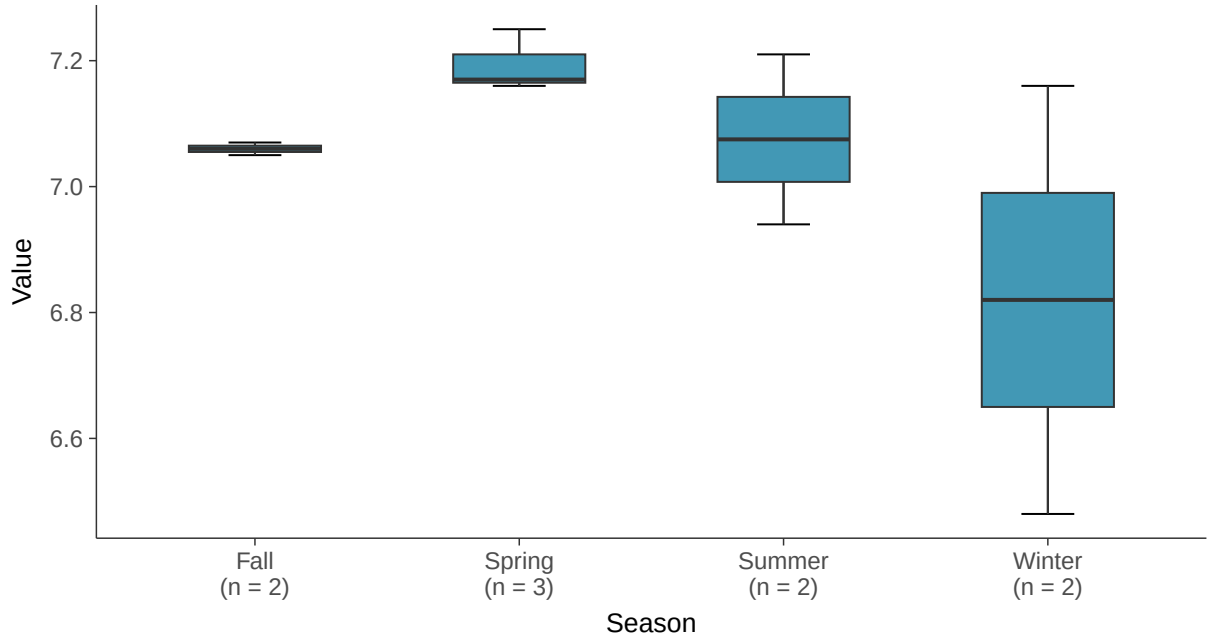
Boxplot

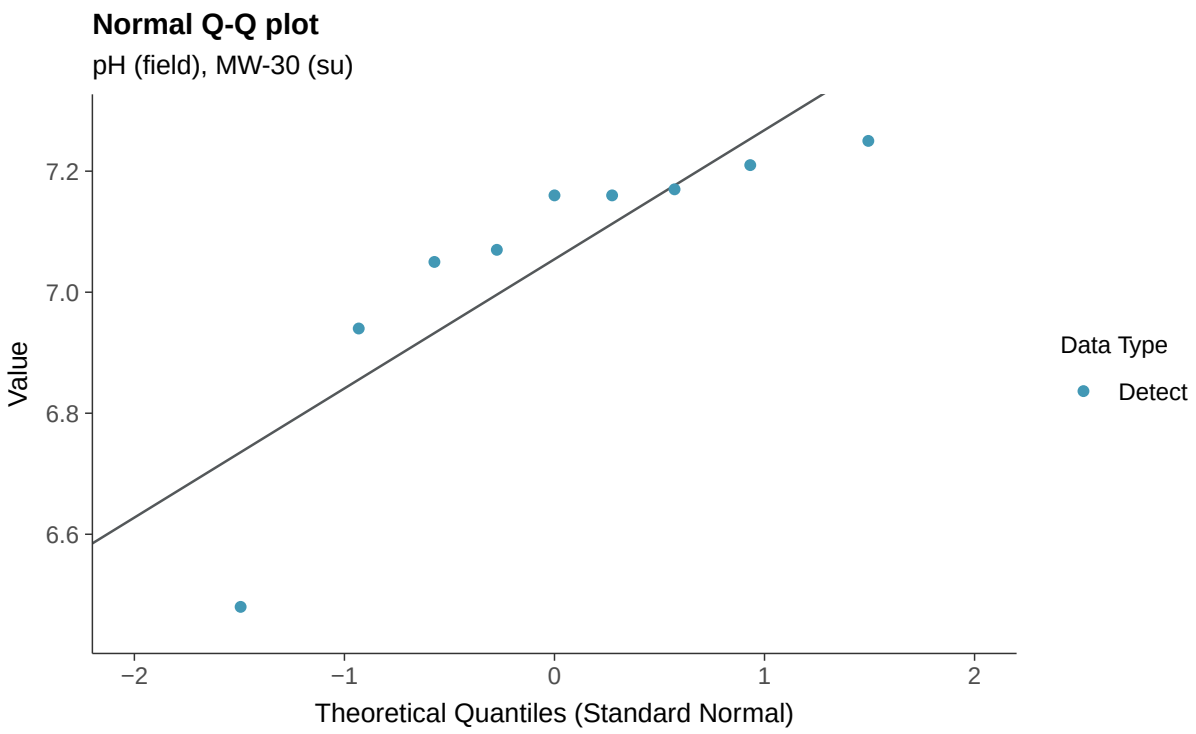
pH (field), MW-30 (su)

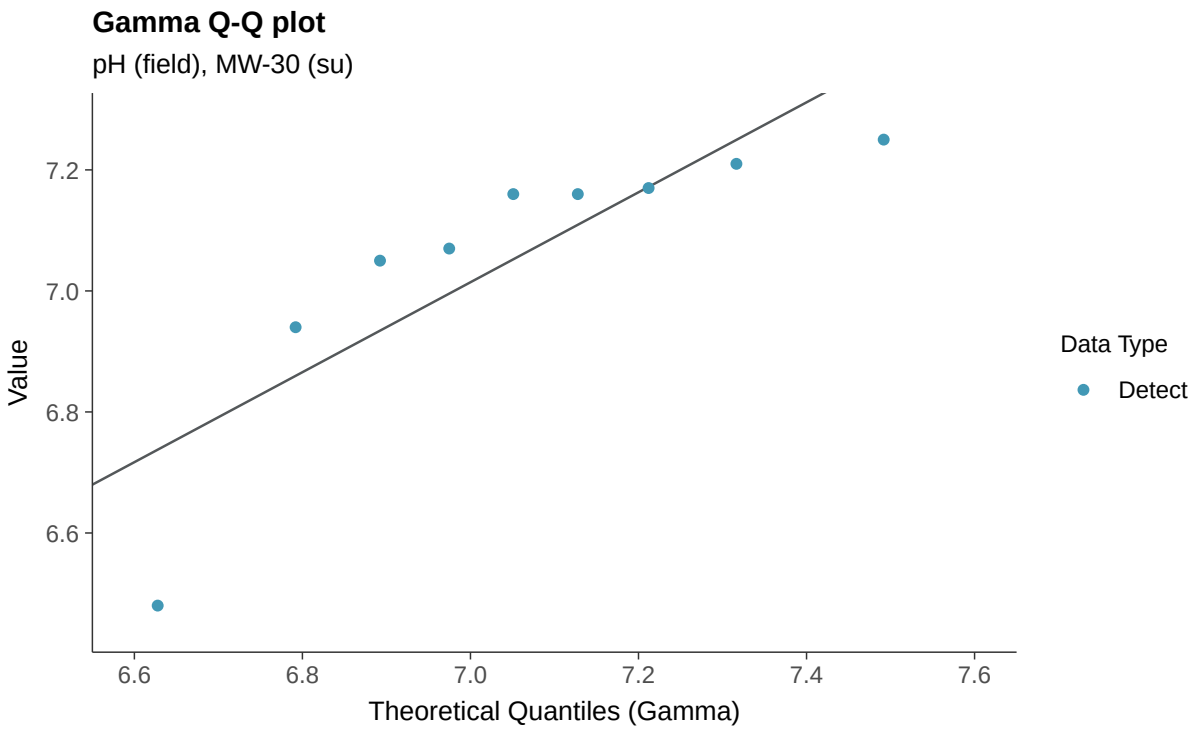


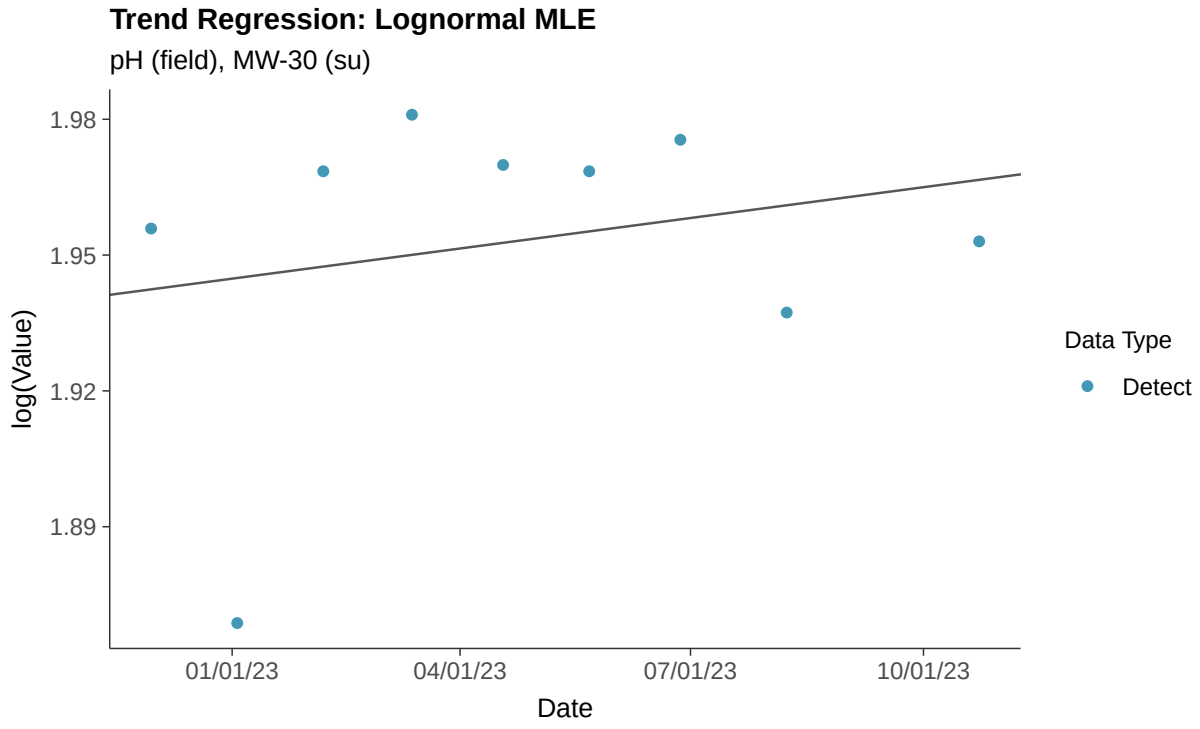
Boxplot by Season

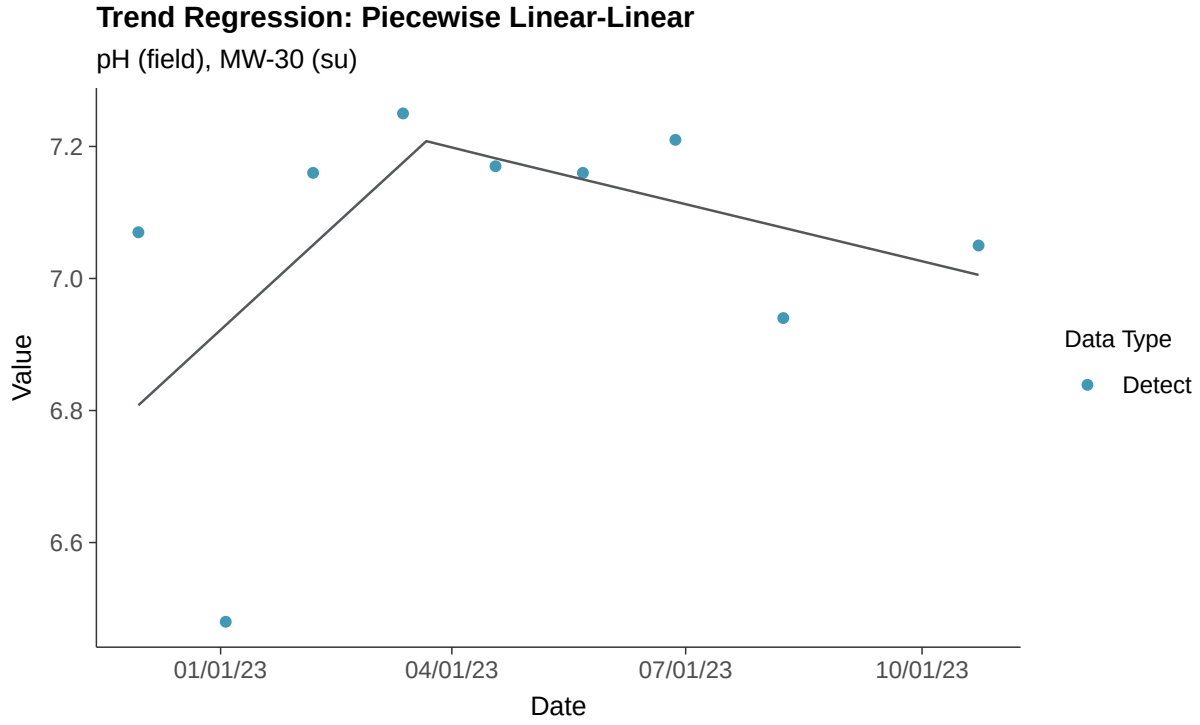
pH (field), MW-30 (su)




Normal Q-Q plot
pH (field), MW-30 (su)
Value
7.2
7.0
6.8
6.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

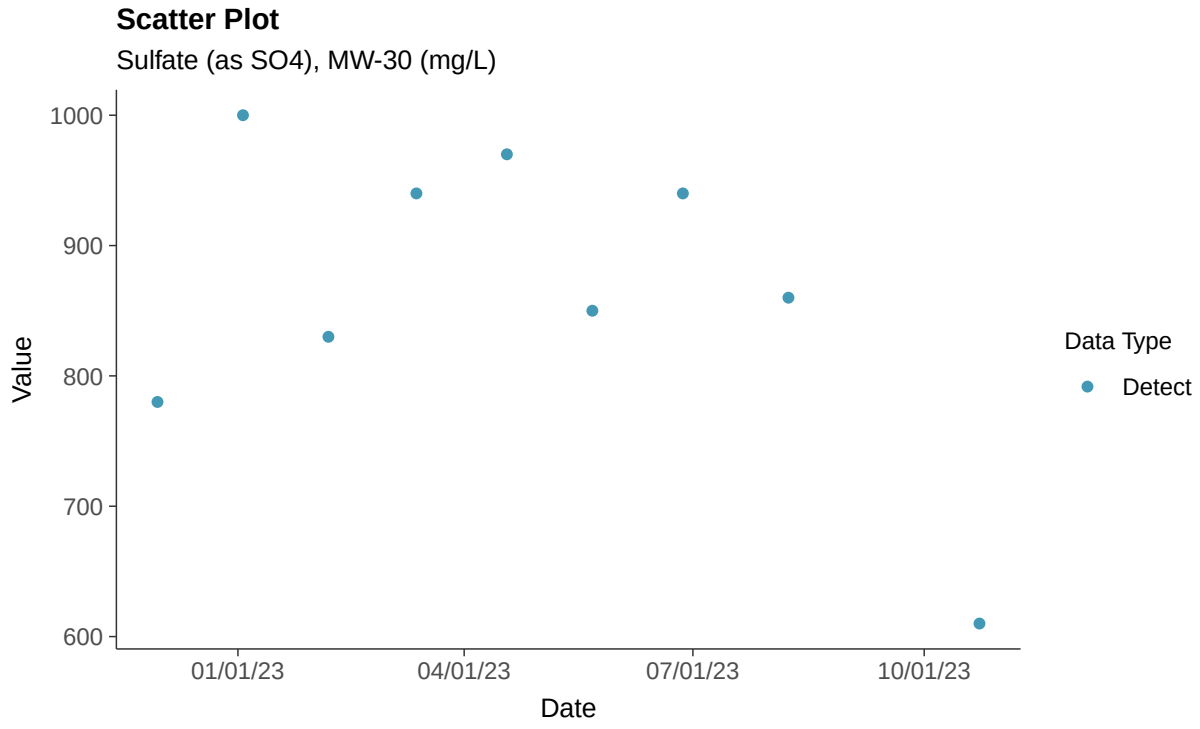

Gamma Q-Q plot
pH (field), MW-30 (su)
Value
7.2
7.0
6.8
6.6
6.6
6.8
7.0
7.2
7.4
7.6
Theoretical Quantiles (Gamma)
Data Type
Detect

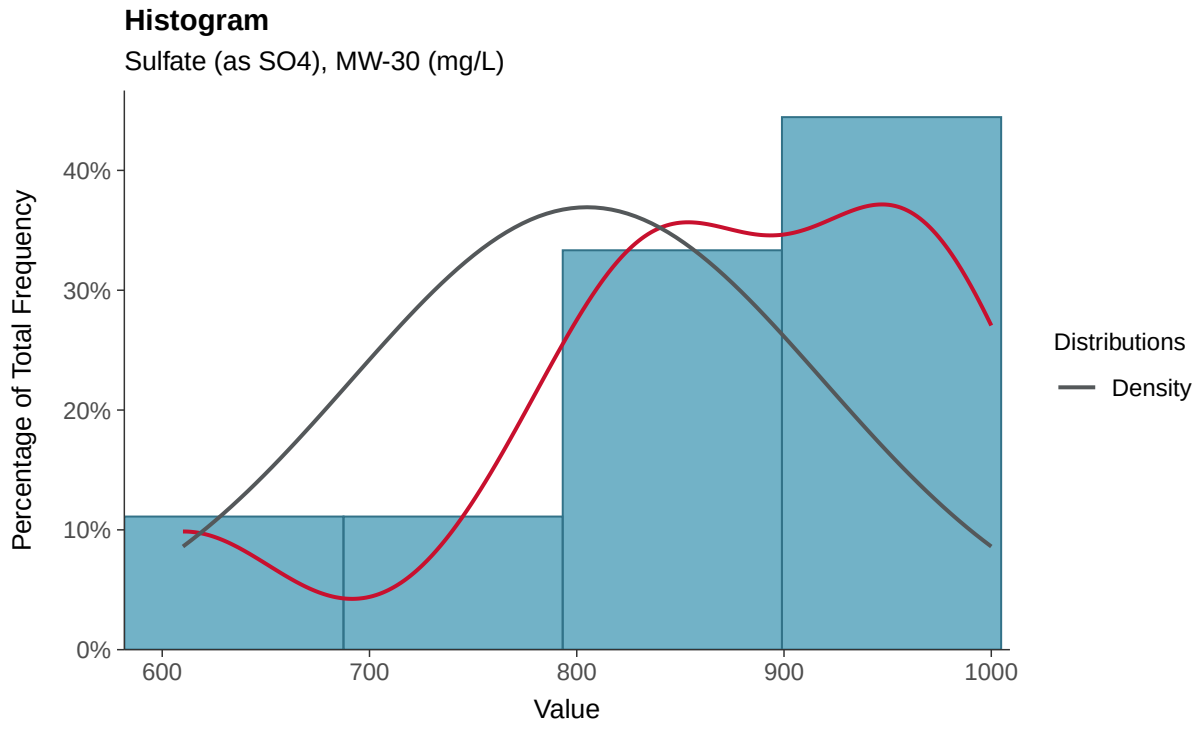

Trend Regression: Lognormal MLE
pH (field), MW-30 (su)
1.98
1.95
1.92
1.89
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-30 (su)
7.2
7.0
6.8
6.6
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-30

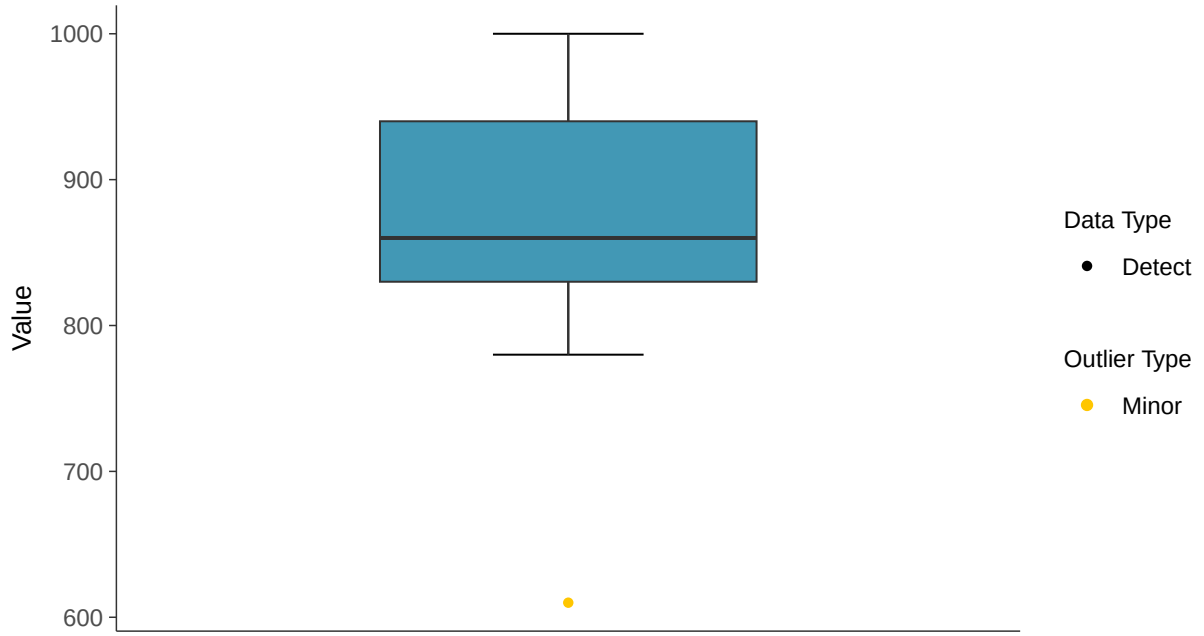
ID: 1_25_4_124





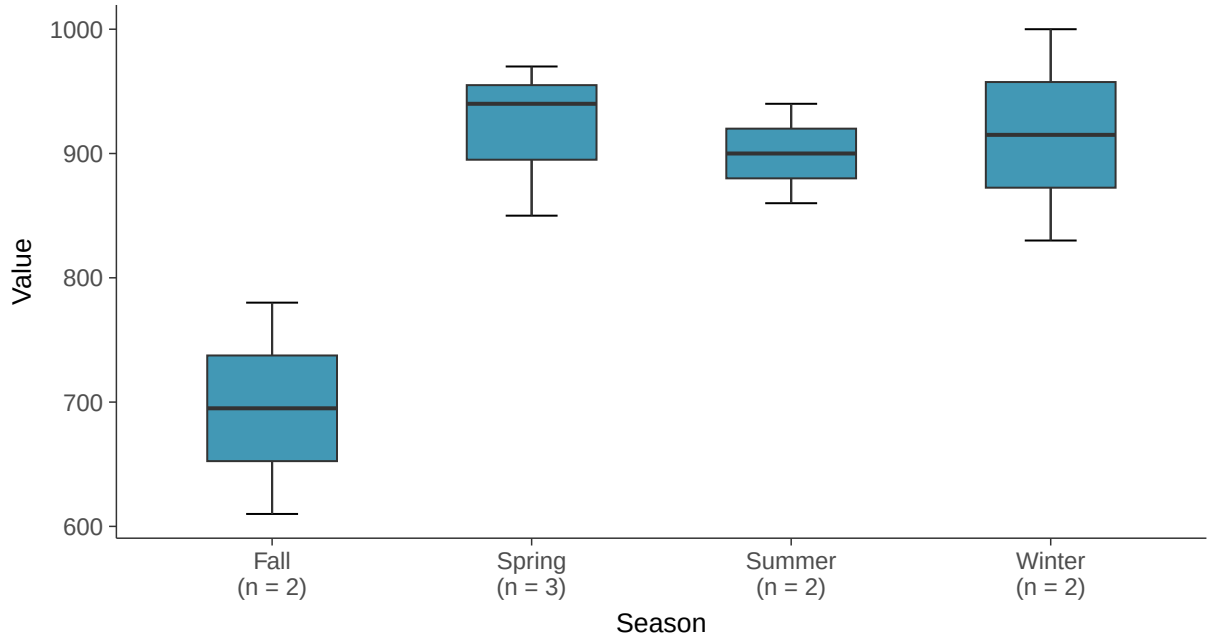
Boxplot

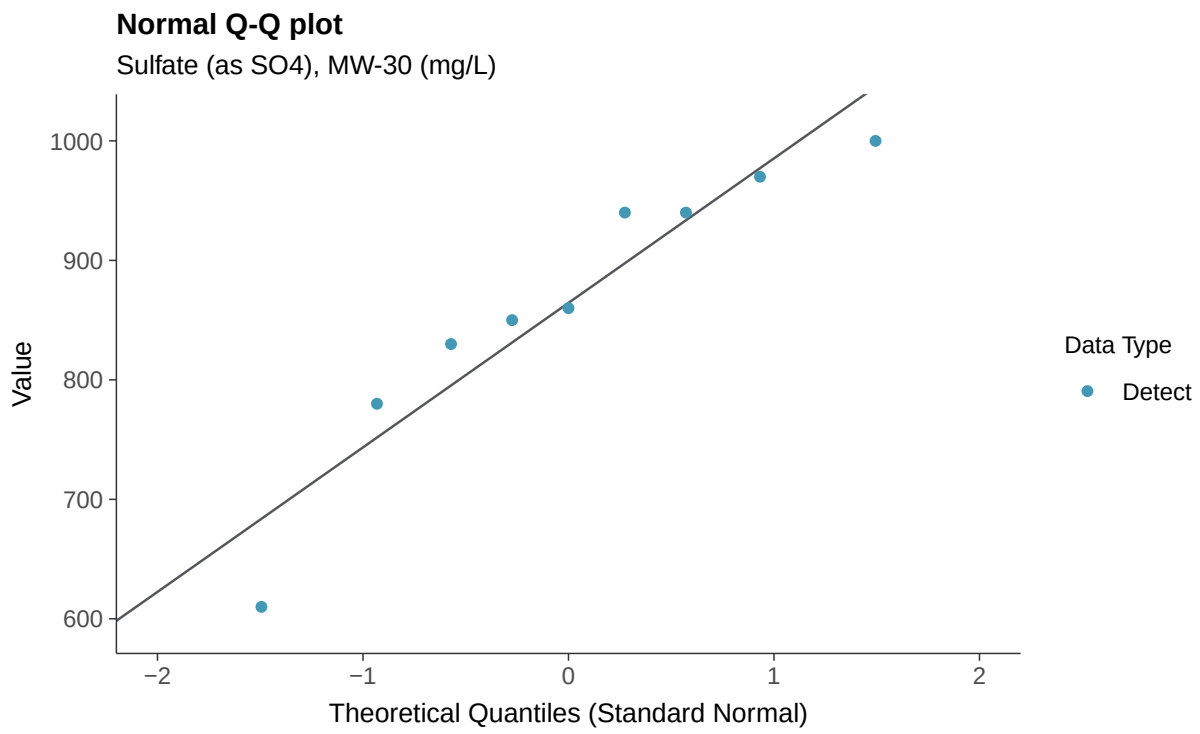
Sulfate (as SO4), MW-30 (mg/L)

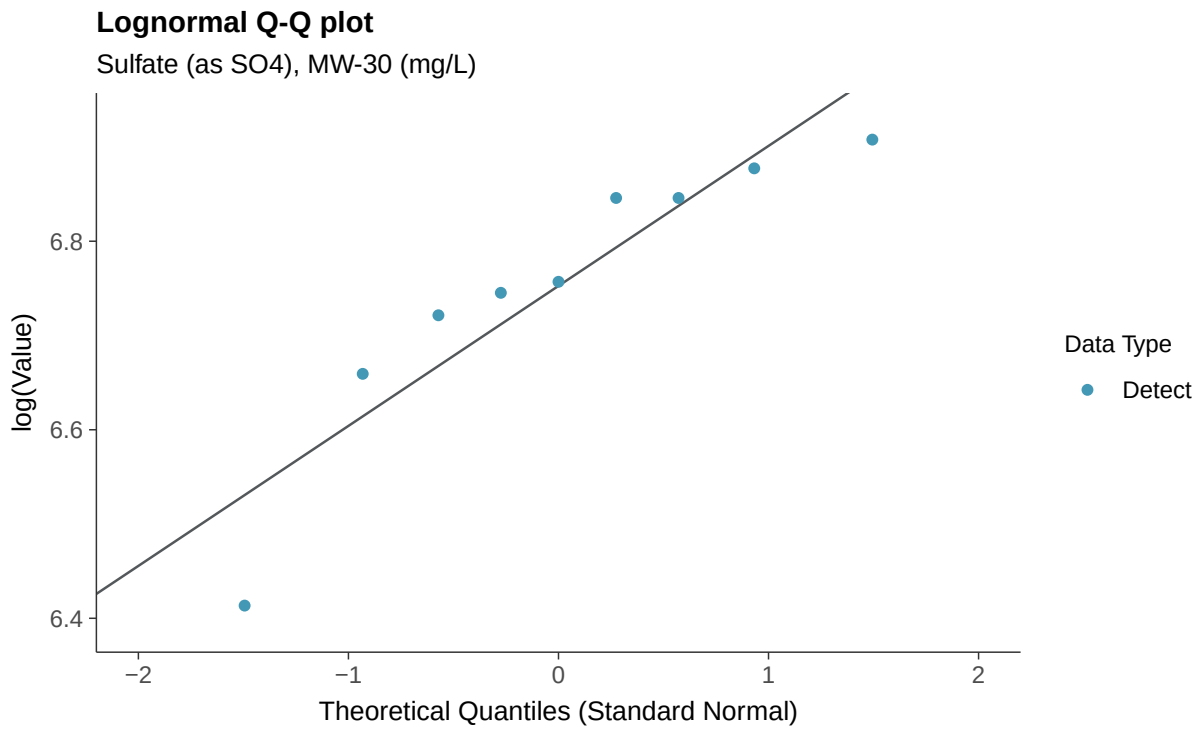


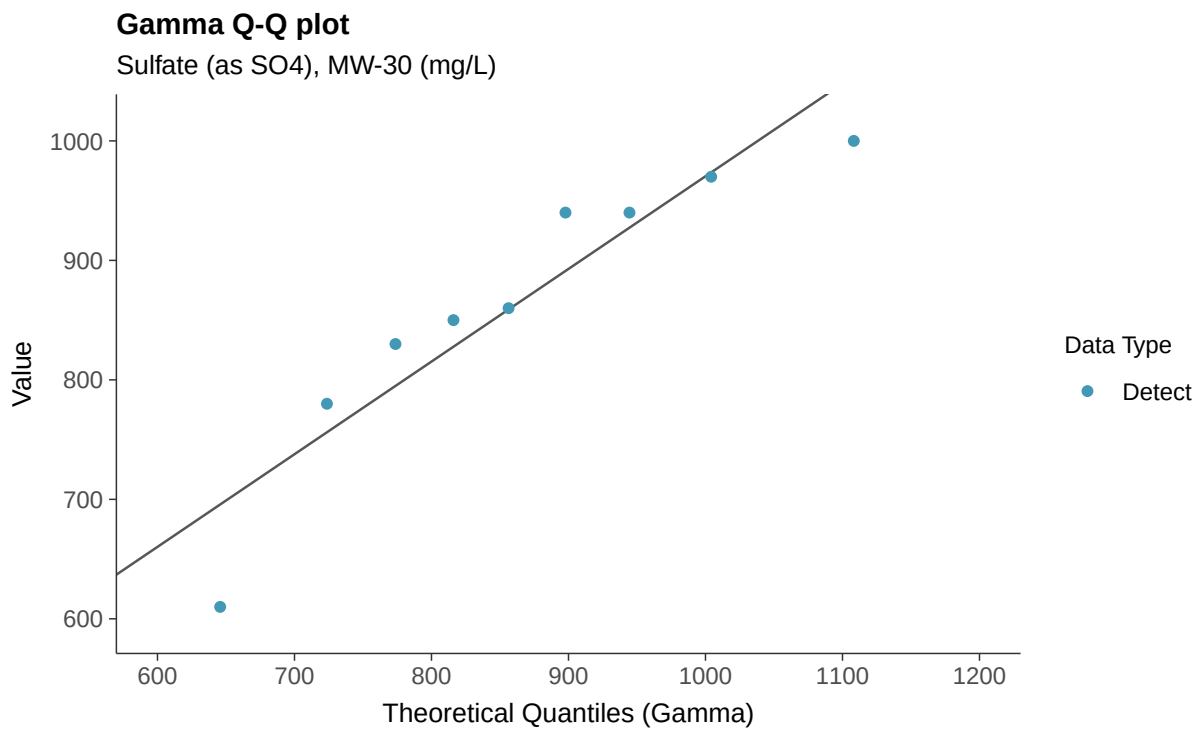
Boxplot by Season

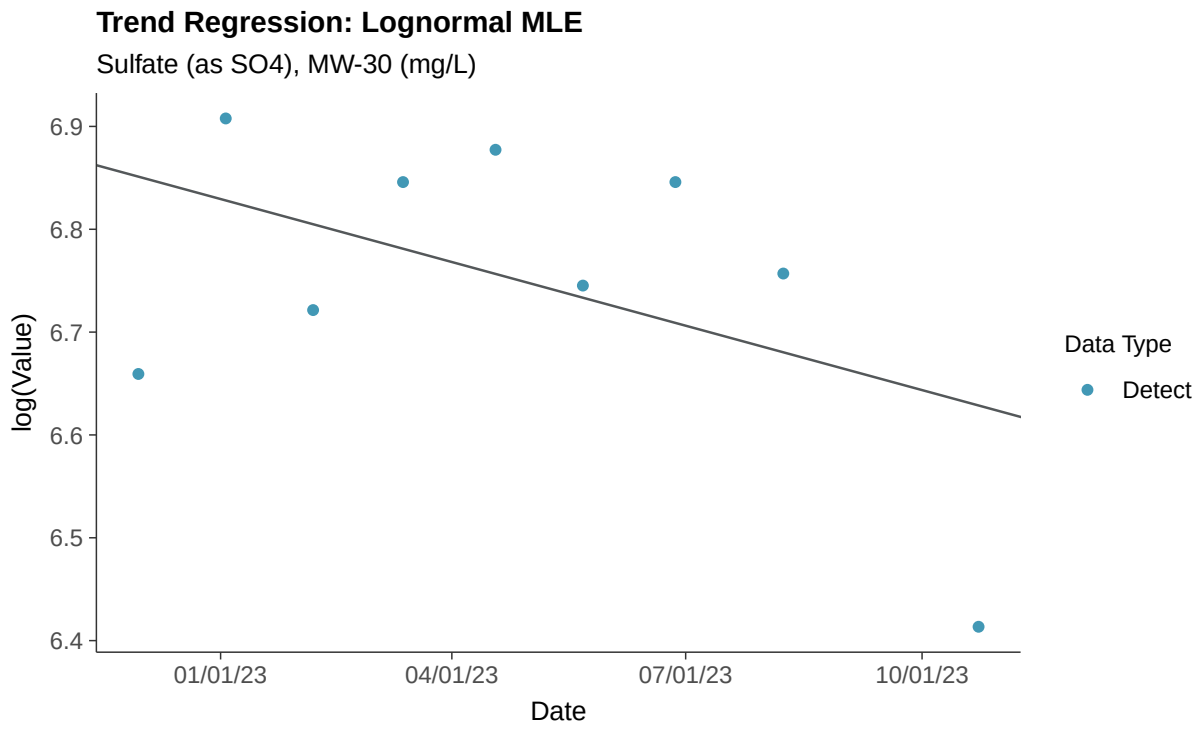
Sulfate (as SO4), MW-30 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-30 (mg/L)
Value
1000
900
800
700
600
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

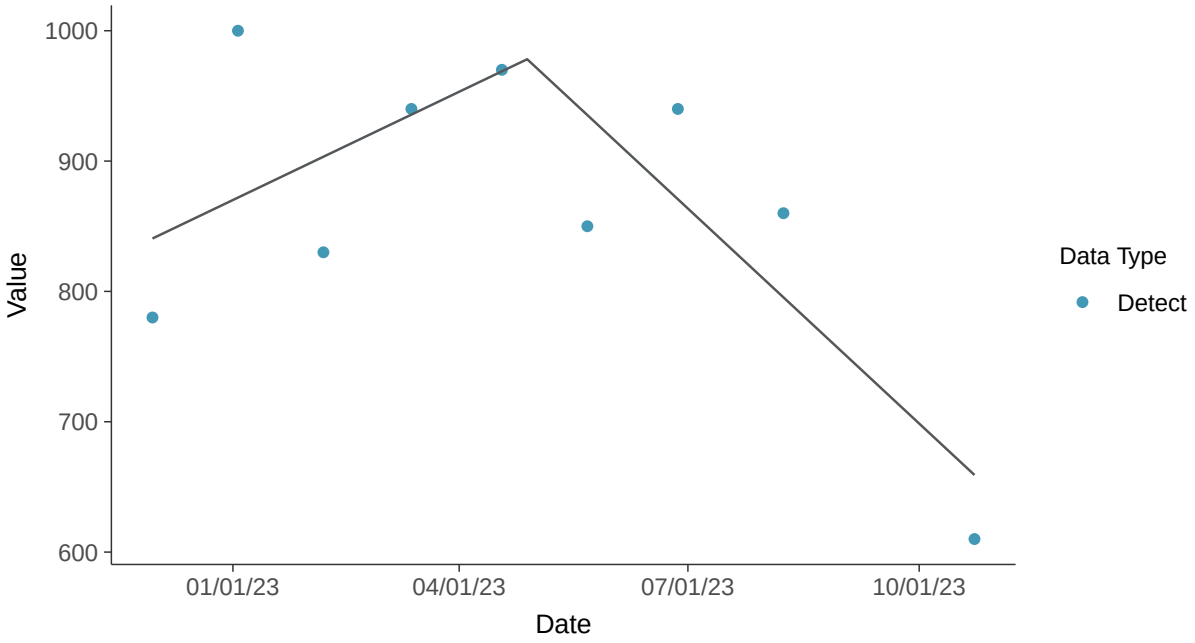

Lognormal Q-Q plot
Sulfate (as SO4), MW-30 (mg/L)
log(Value)
6.8
6.6
6.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-30 (mg/L)
Value
1000
900
800
700
600
600
700
800
900
1000
1100
1200
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-30 (mg/L)
log(Value)
6.9
6.8
6.7
6.6
6.5
6.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

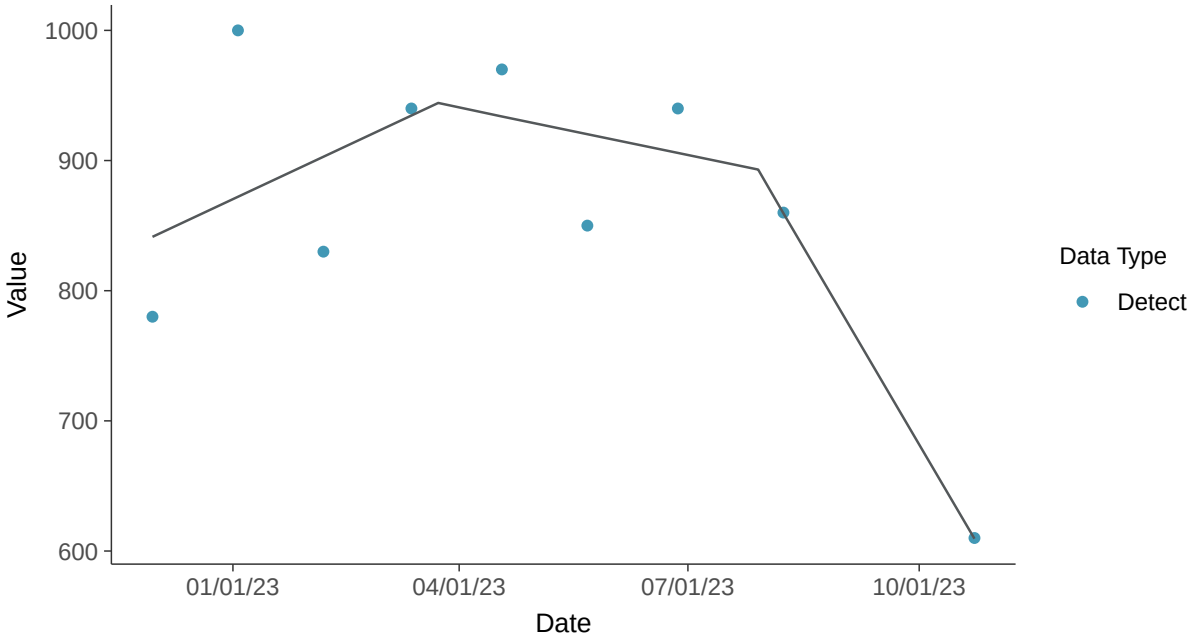
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-30 (mg/L)



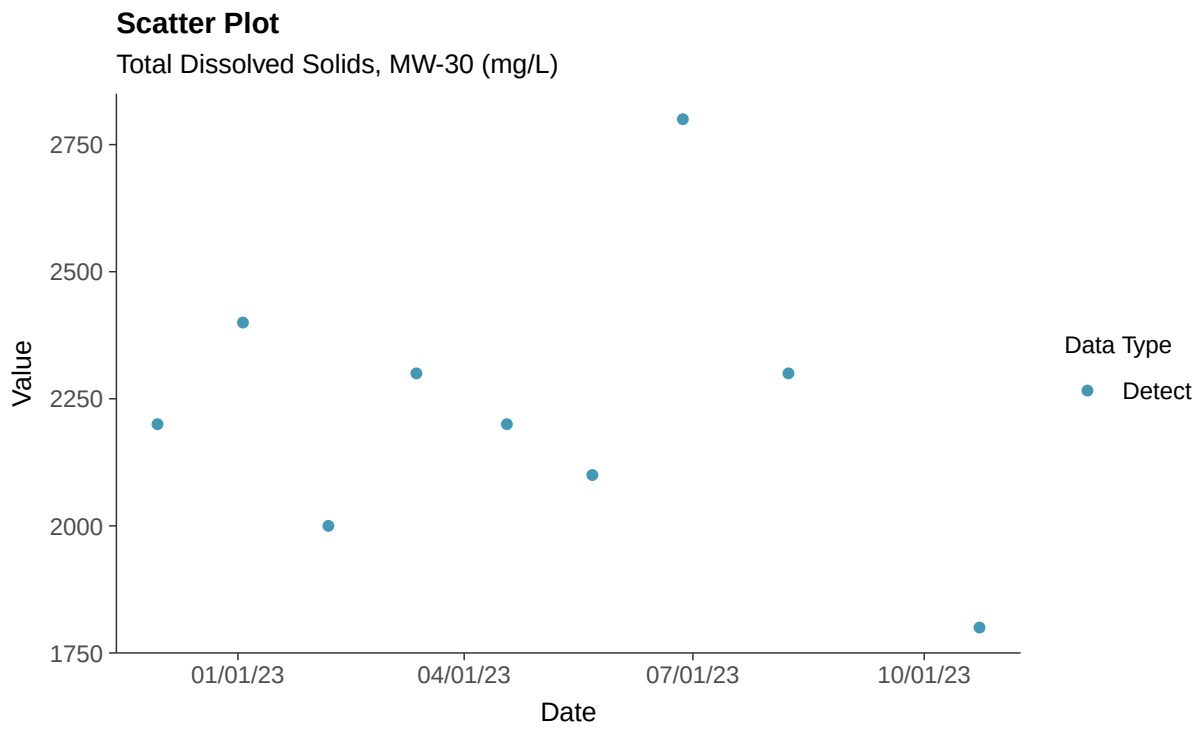
Trend Regression: Piecewise Linear-Linear-Linear

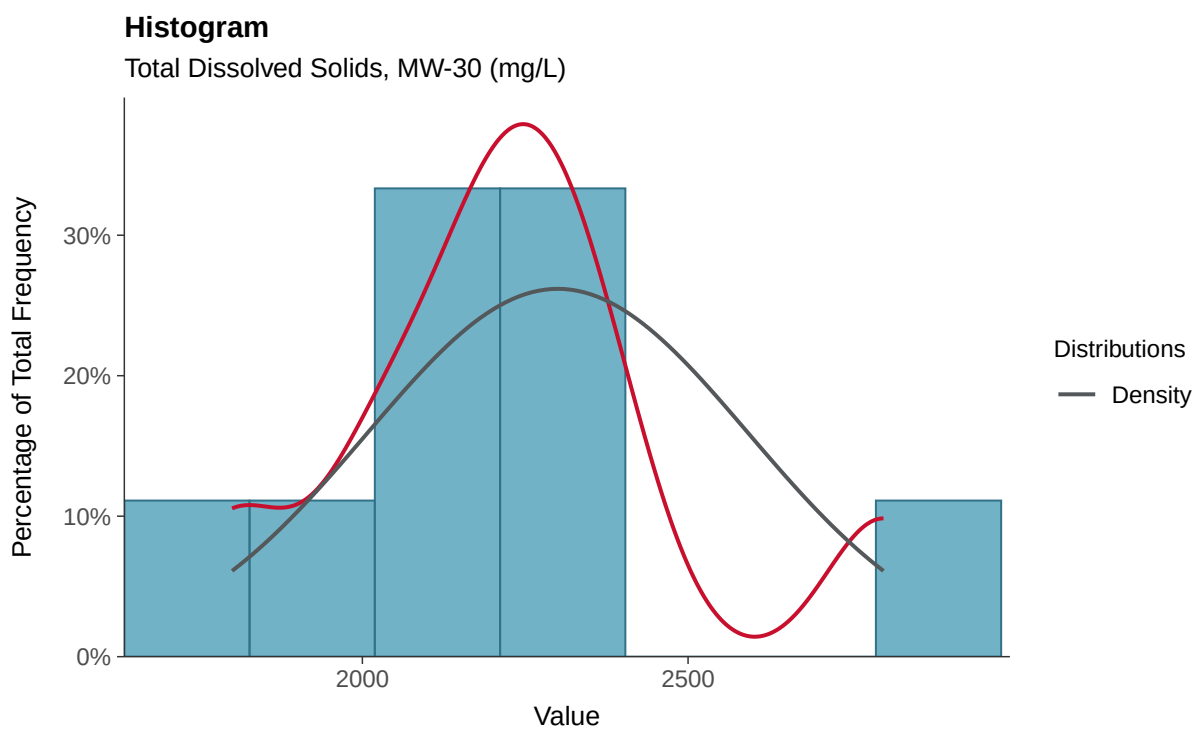
Sulfate (as SO4), MW-30 (mg/L)



Appendix III: Total Dissolved Solids, MW-30

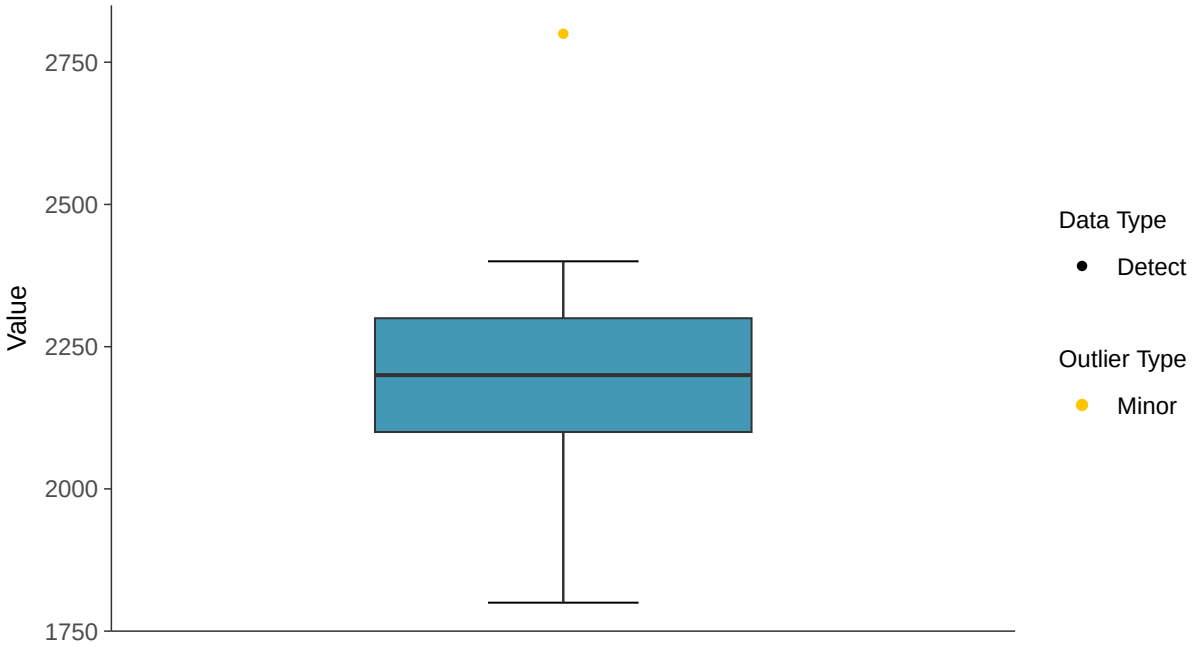
ID: 1_25_4_126





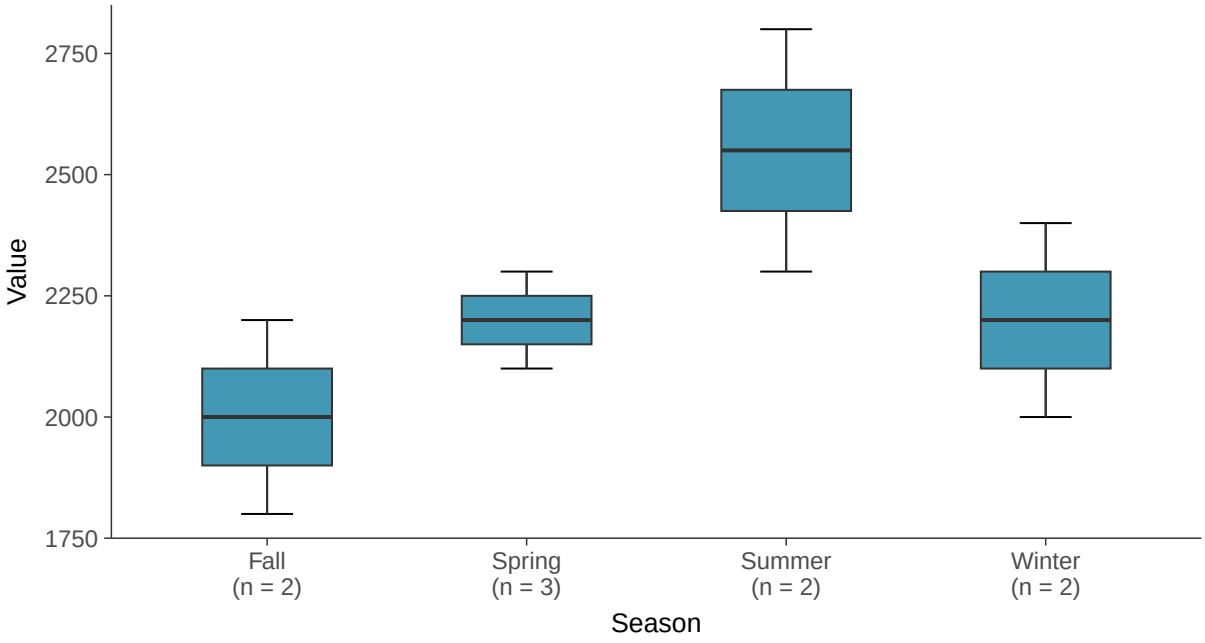
Boxplot

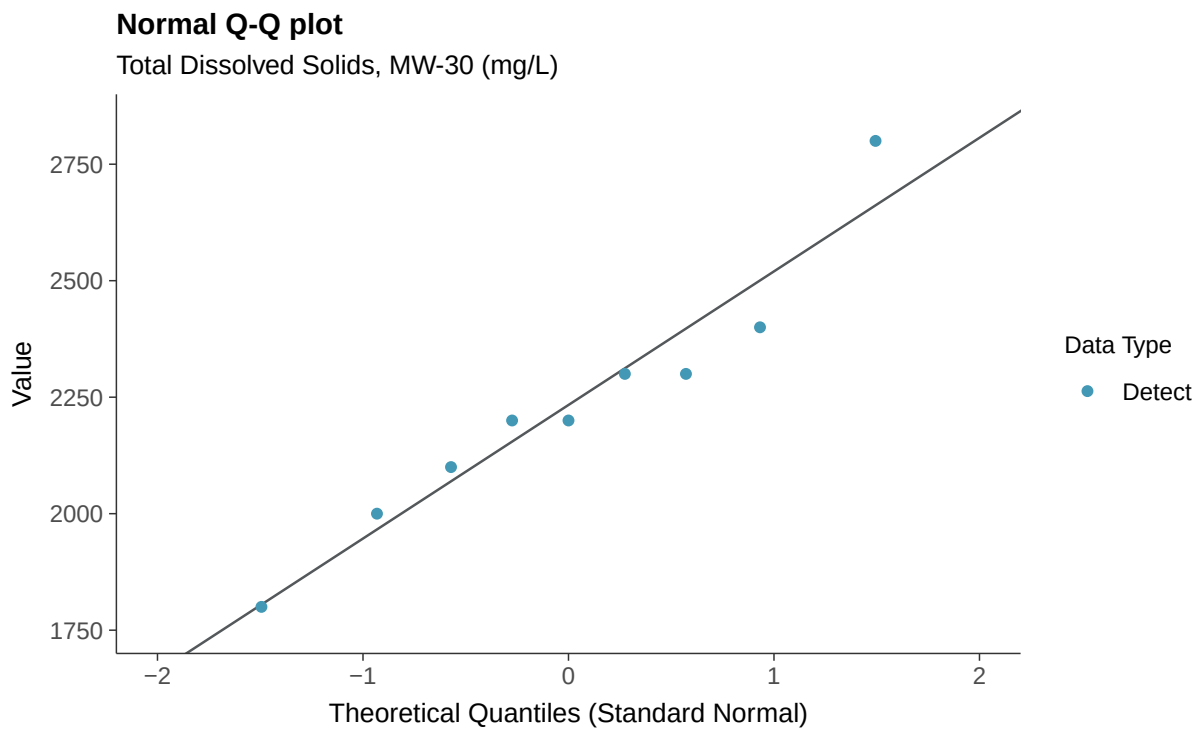
Total Dissolved Solids, MW-30 (mg/L)

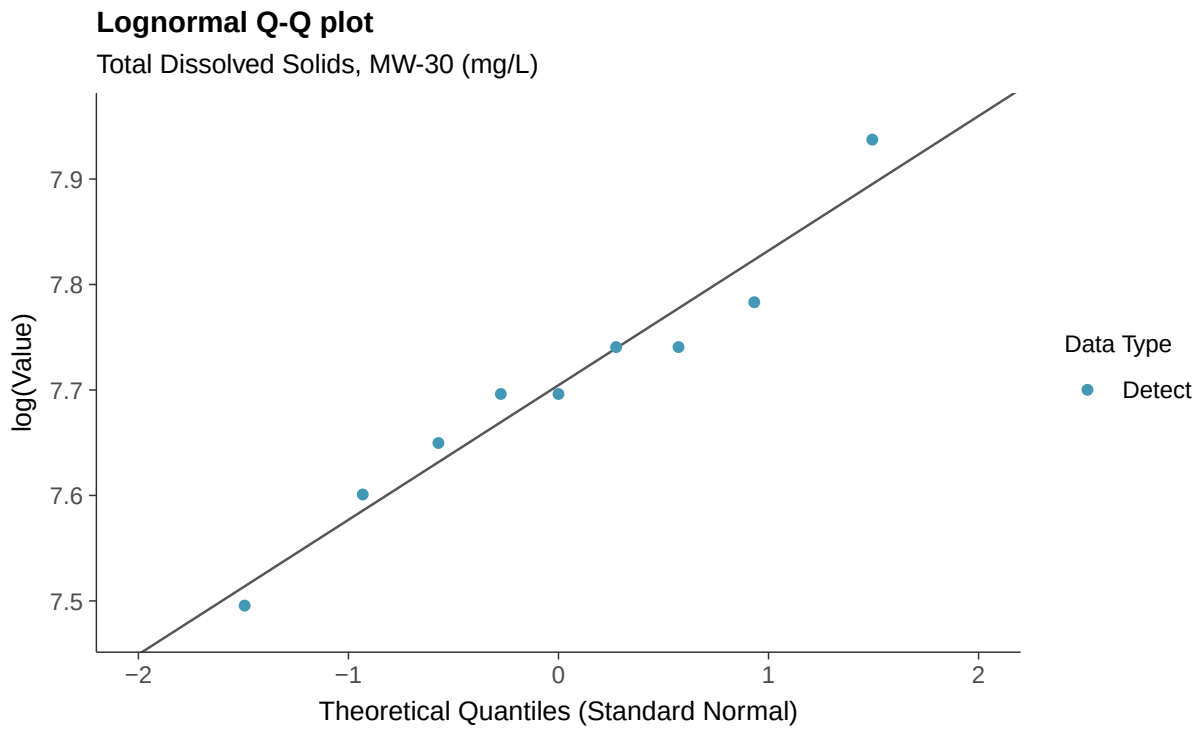


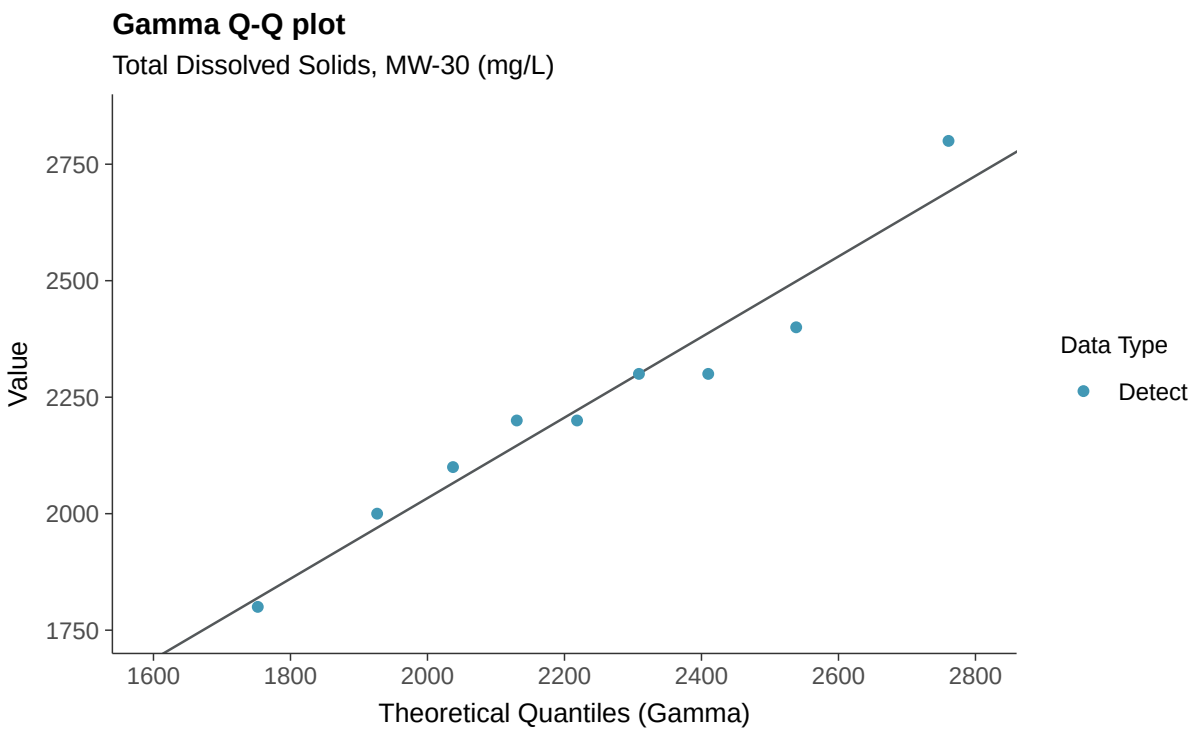
Boxplot by Season

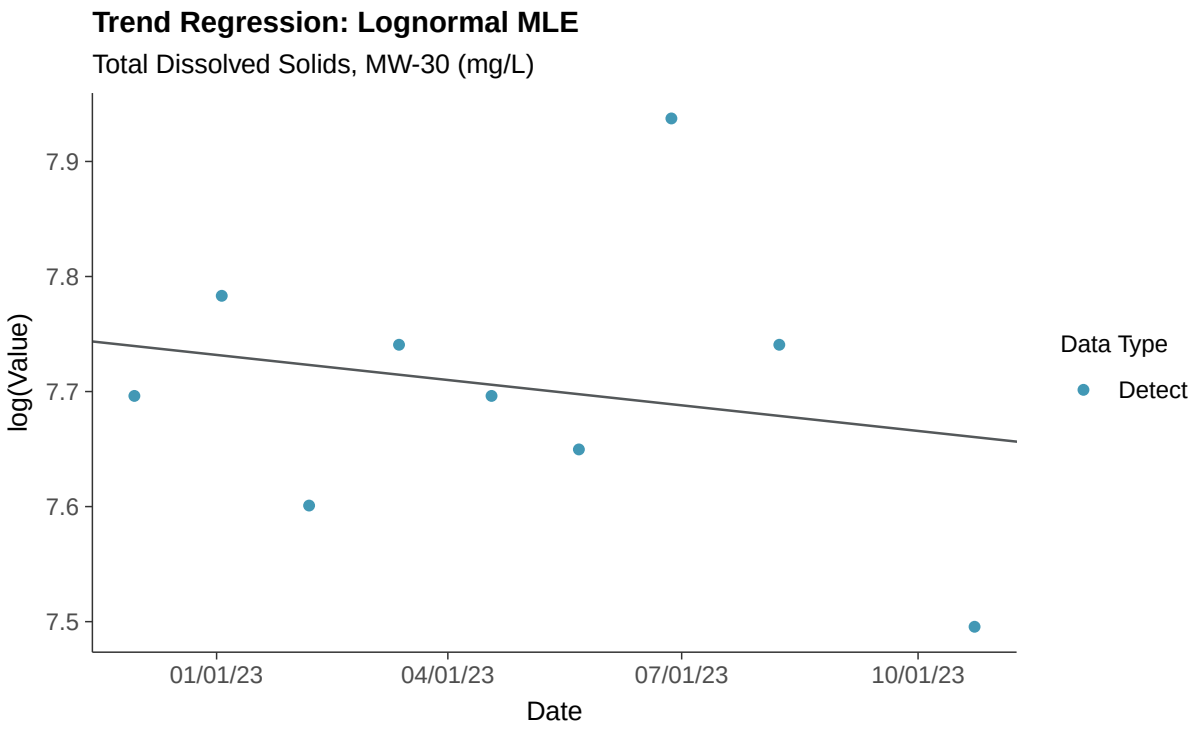
Total Dissolved Solids, MW-30 (mg/L)

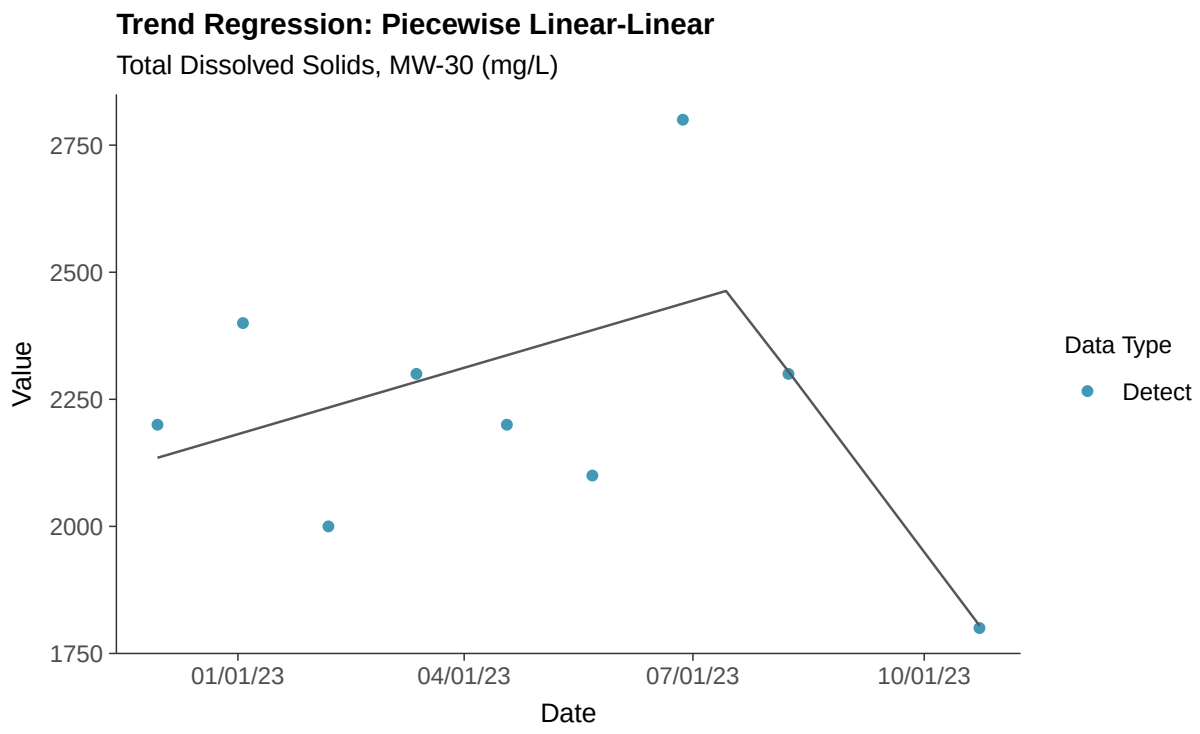



Normal Q-Q plot
Total Dissolved Solids, MW-30 (mg/L)
Value
2750
2500
2250
2000
1750
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Total Dissolved Solids, MW-30 (mg/L)
log(Value)
7.9
7.8
7.7
7.6
7.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

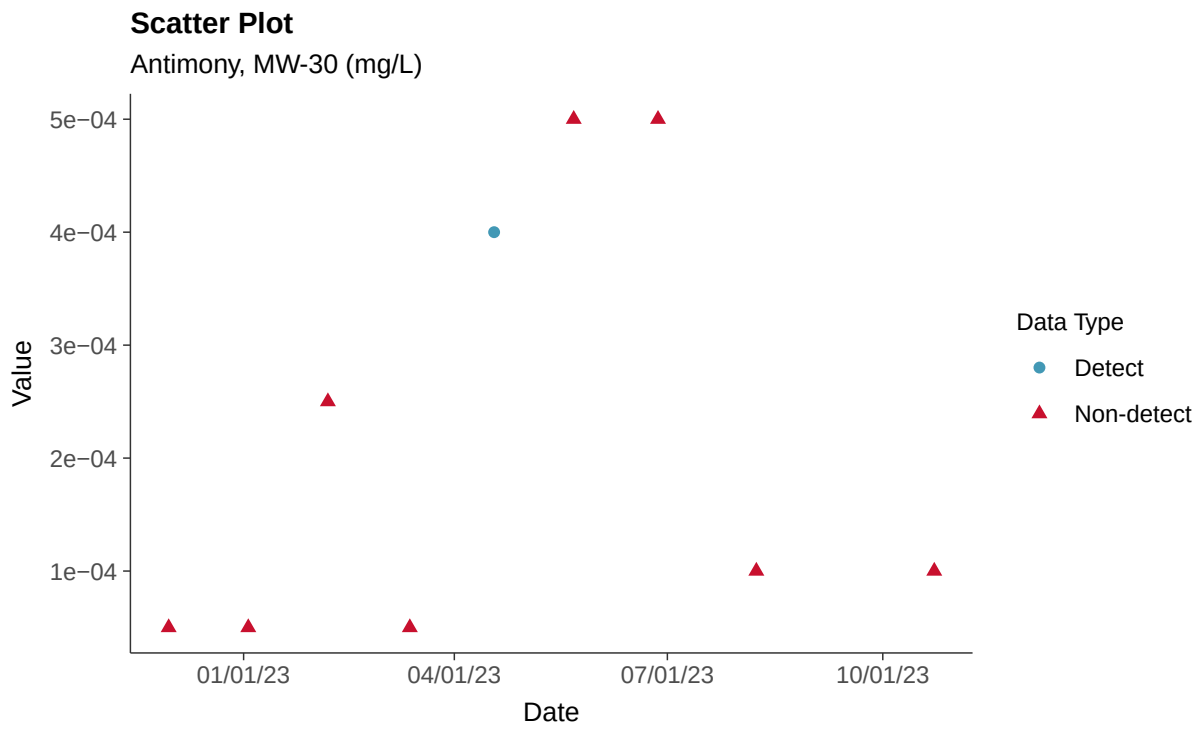

Gamma Q-Q plot
Total Dissolved Solids, MW-30 (mg/L)
Value
2750
2500
2250
2000
1750
1600
1800
2000
2200
2400
2600
2800
Theoretical Quantiles (Gamma)
Data Type
Detect

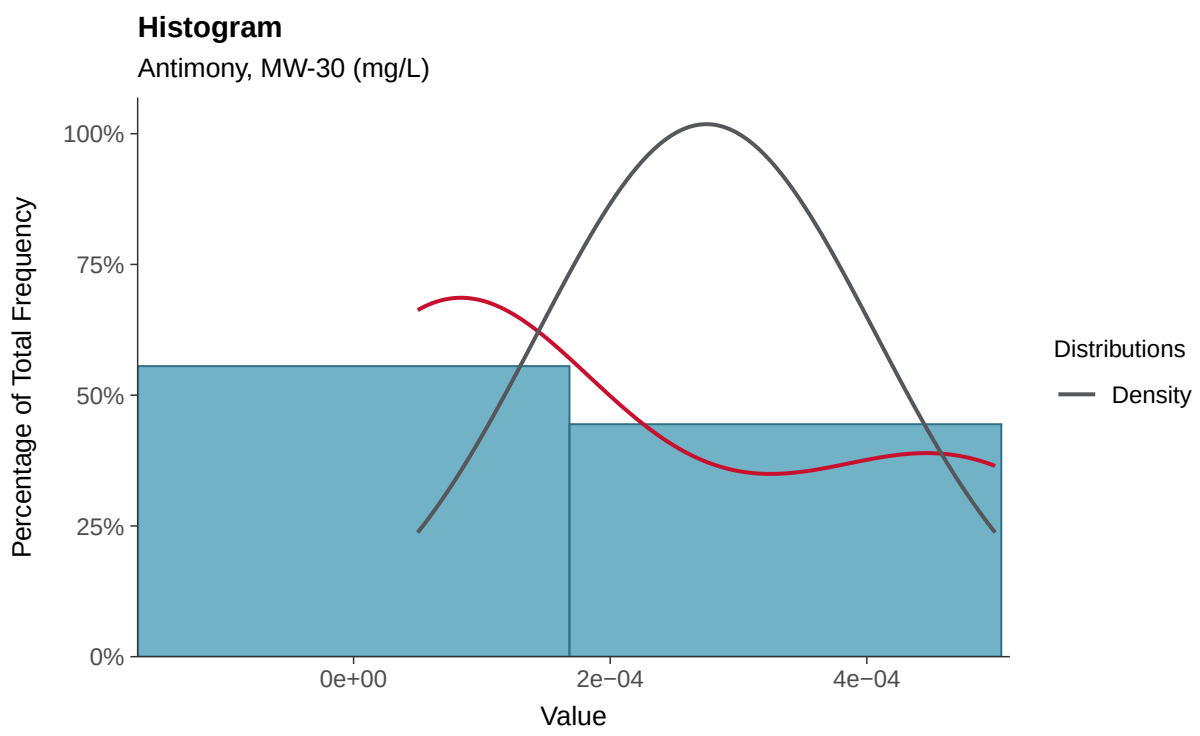

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-30 (mg/L)
log(Value)
7.9
7.8
7.7
7.6
7.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-30 (mg/L)
Value
2750
2500
2250
2000
1750
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-30

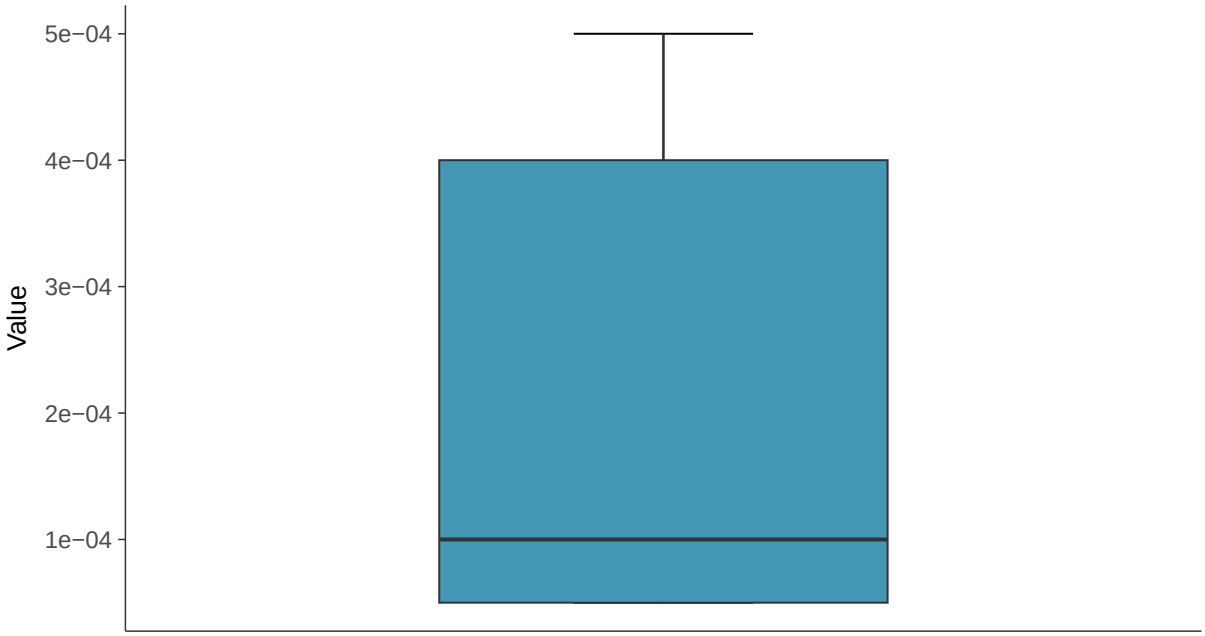
ID: 1_25_5_101





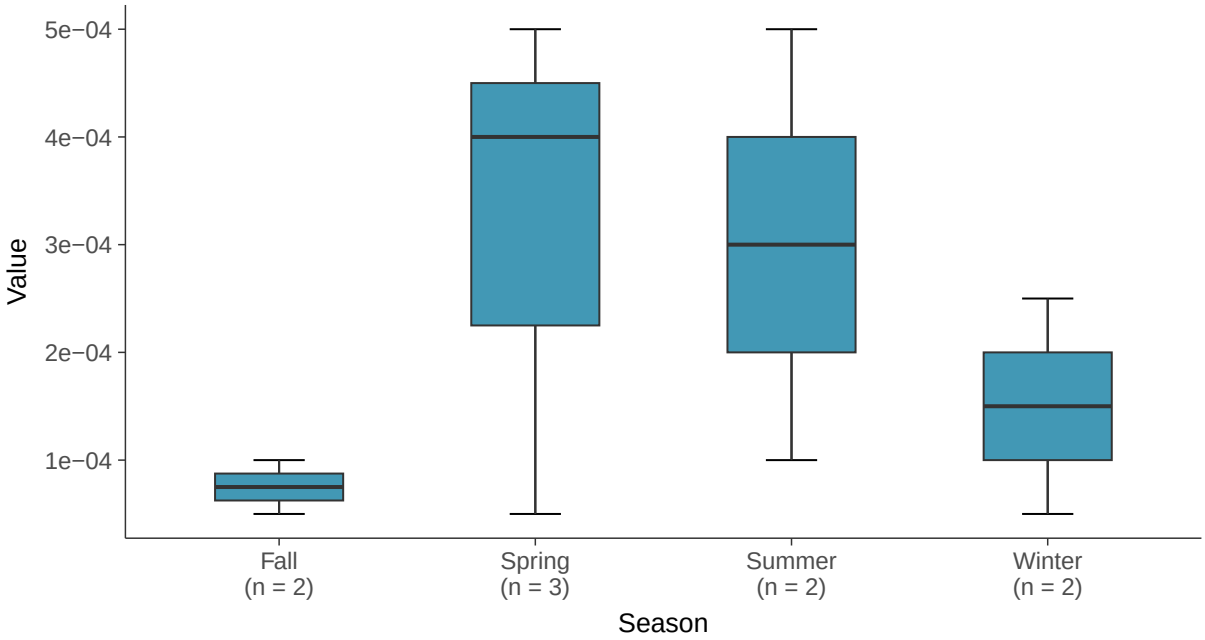
Boxplot

Antimony, MW-30 (mg/L)



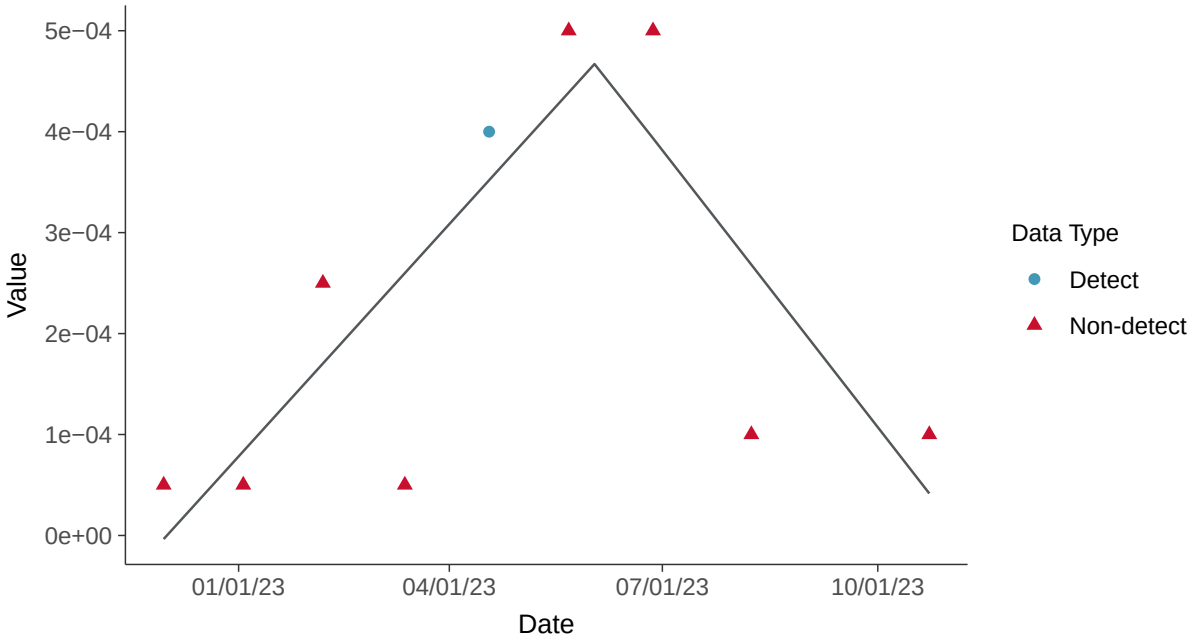
Boxplot by Season

Antimony, MW-30 (mg/L)



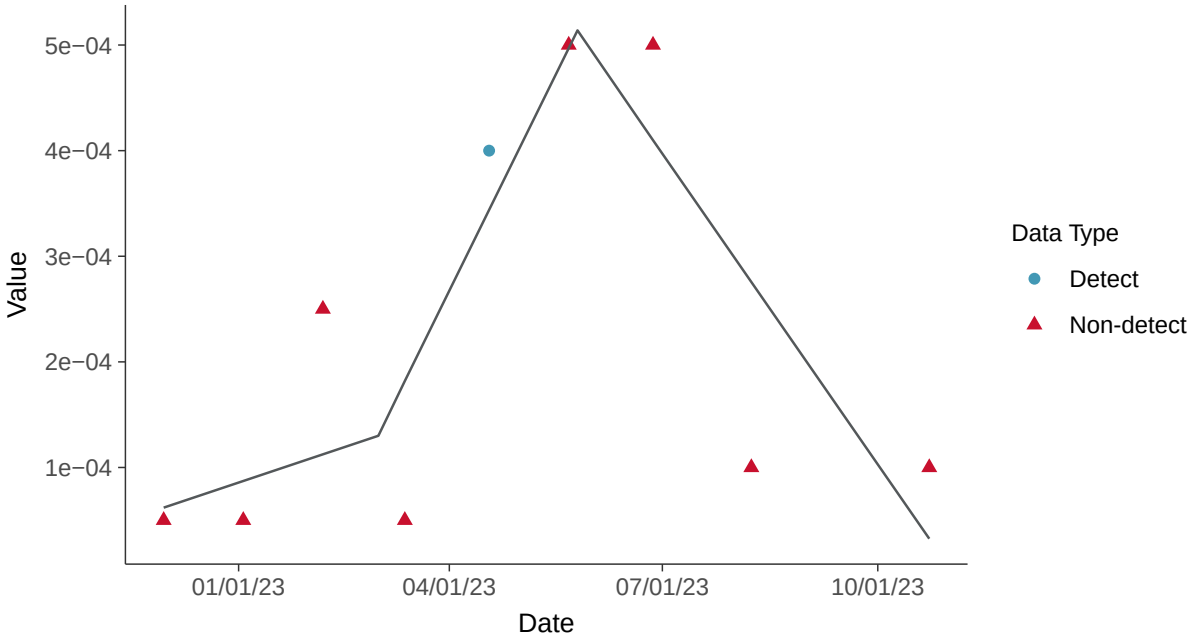
Trend Regression: Piecewise Linear-Linear

Antimony, MW-30 (mg/L)



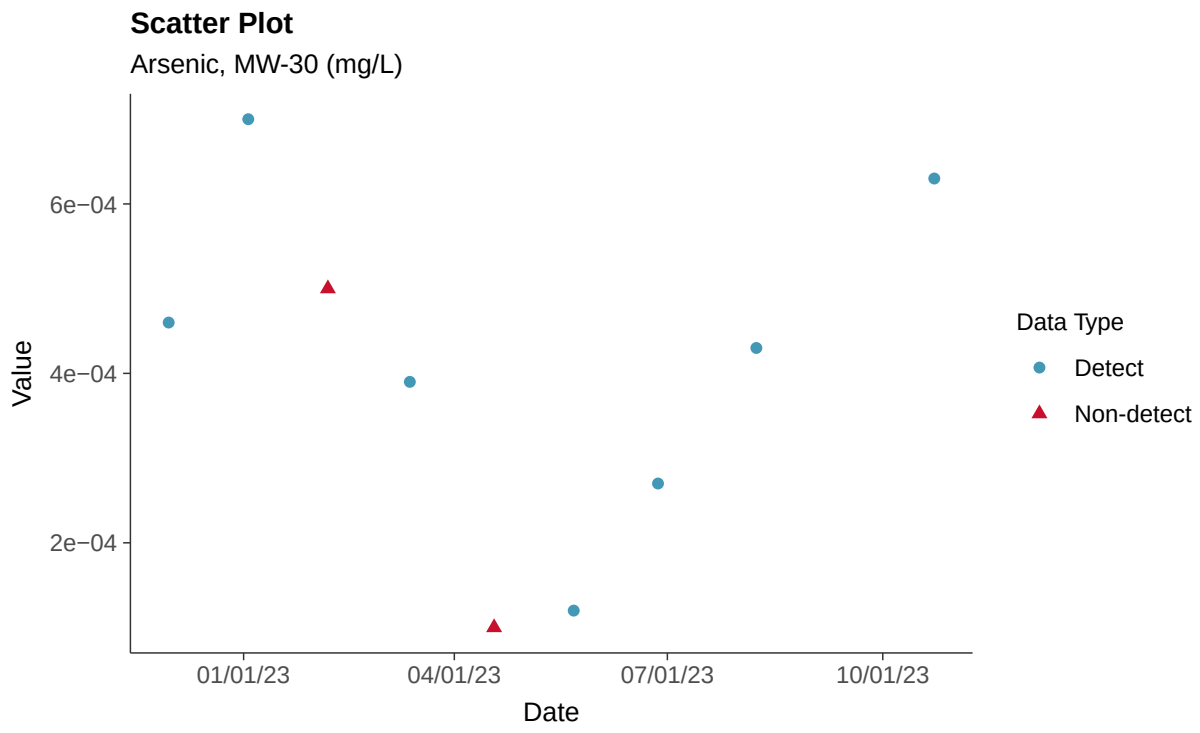
Trend Regression: Piecewise Linear-Linear-Linear

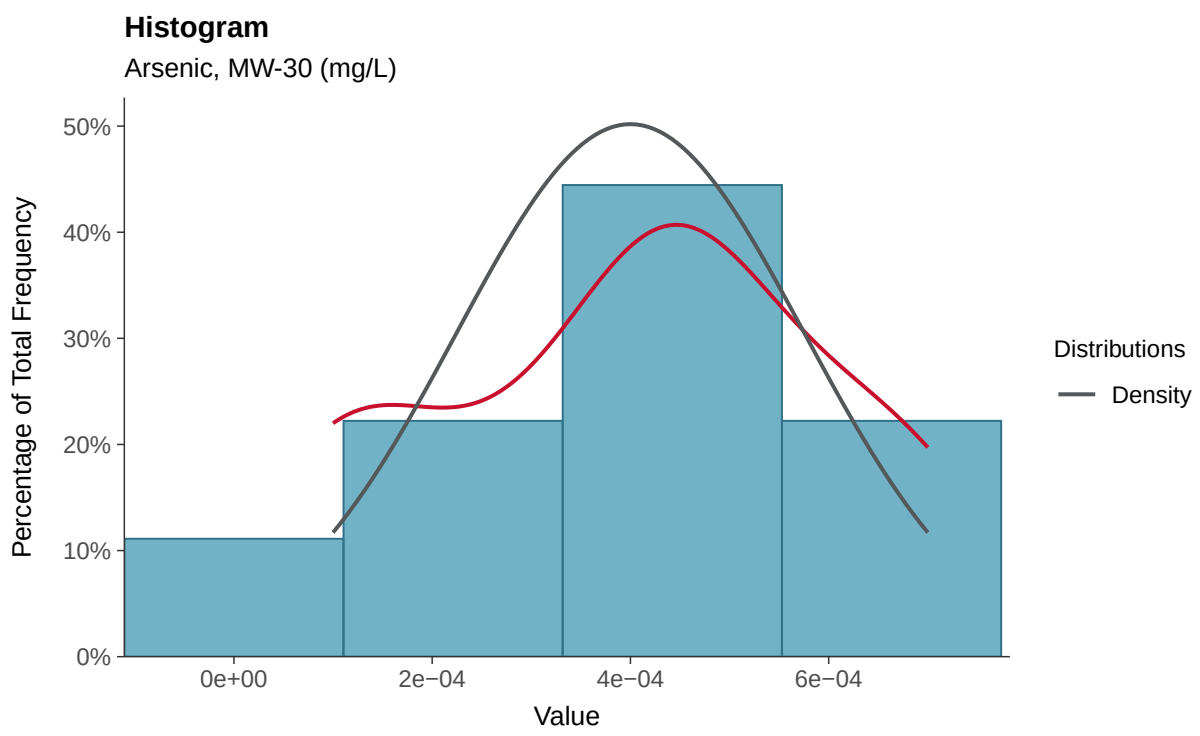
Antimony, MW-30 (mg/L)



Appendix IV: Arsenic, MW-30

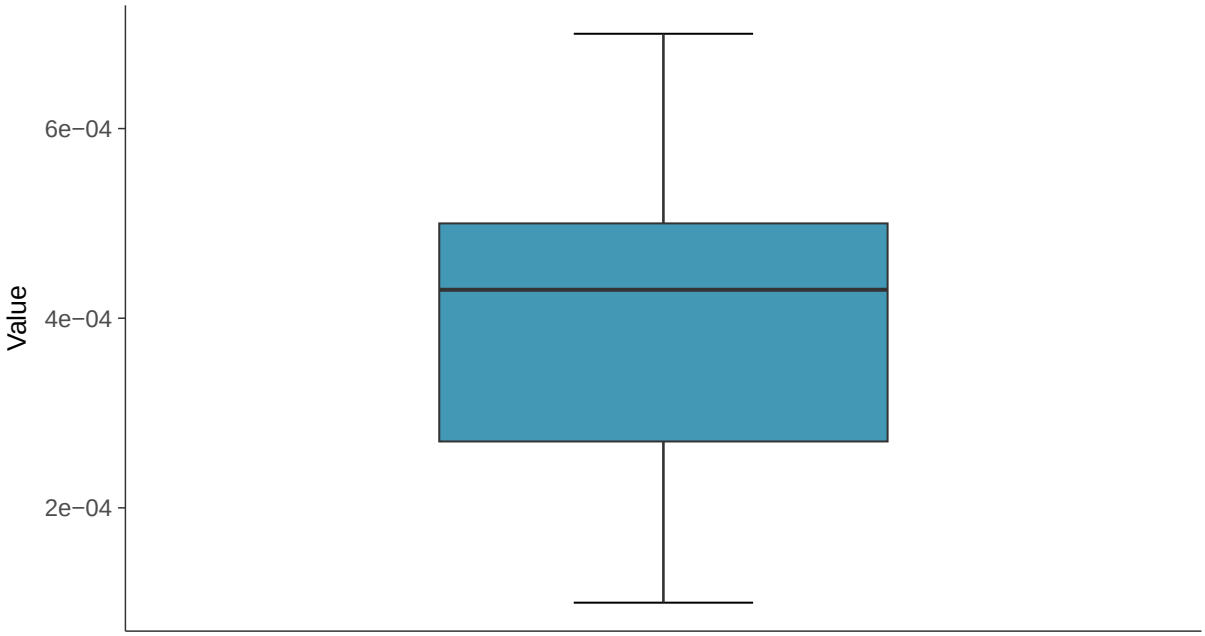
ID: 1_25_5_102





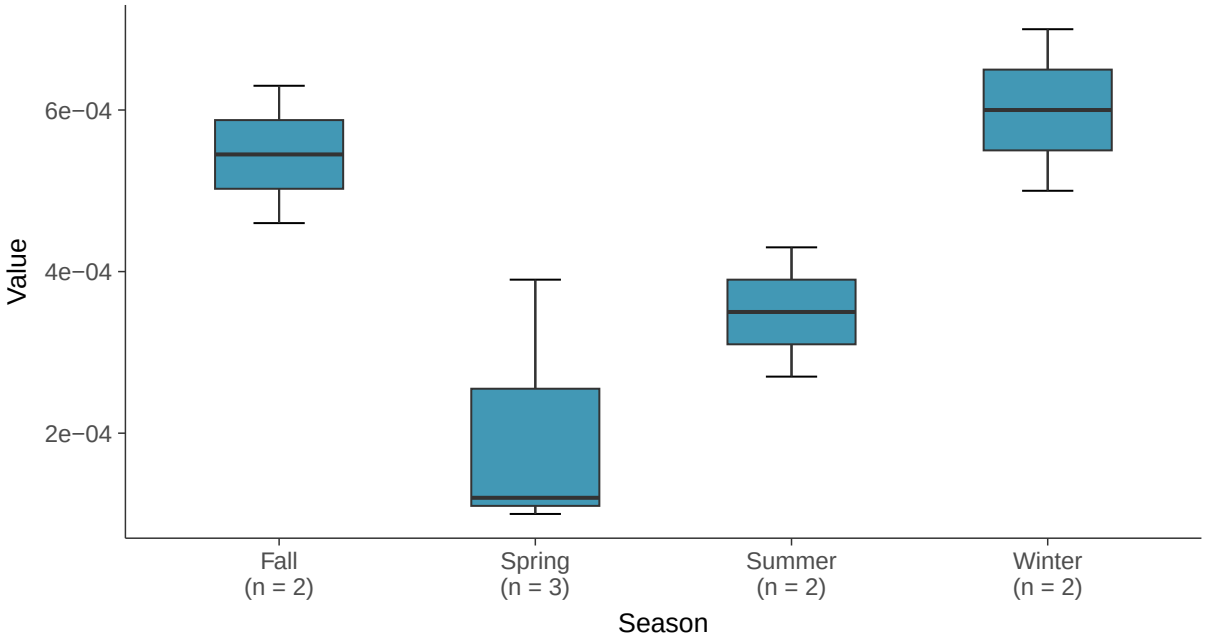
Boxplot

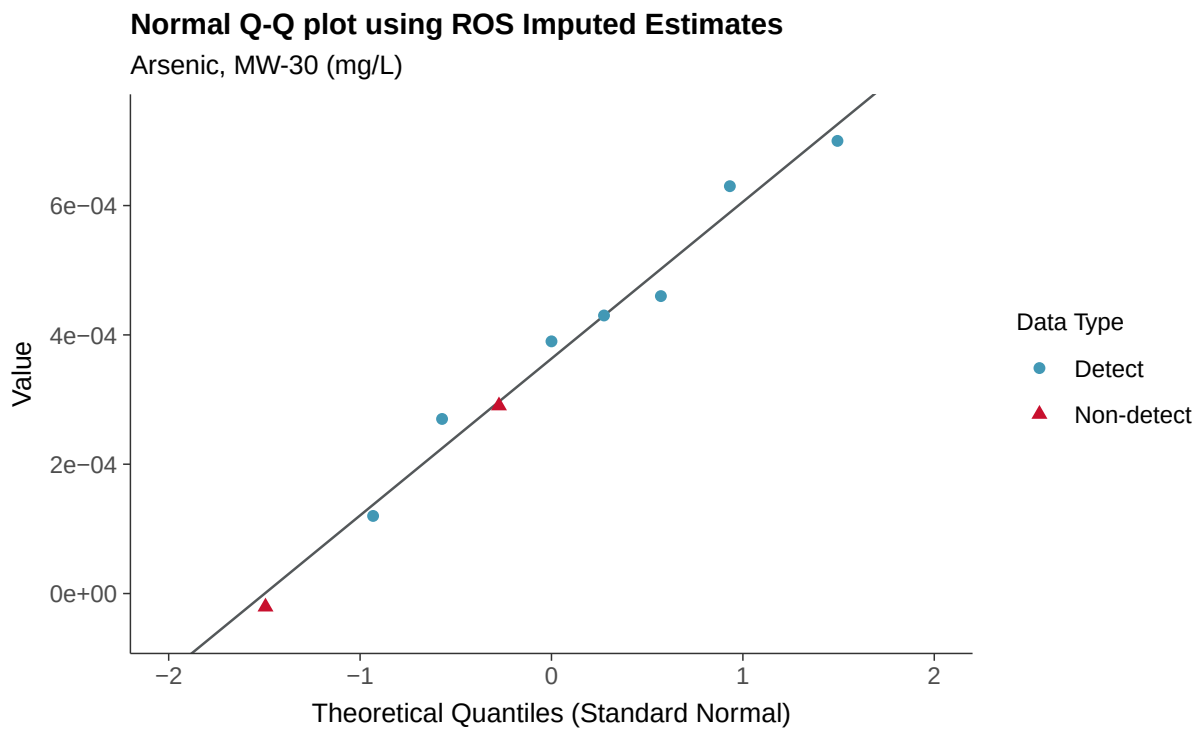
Arsenic, MW-30 (mg/L)

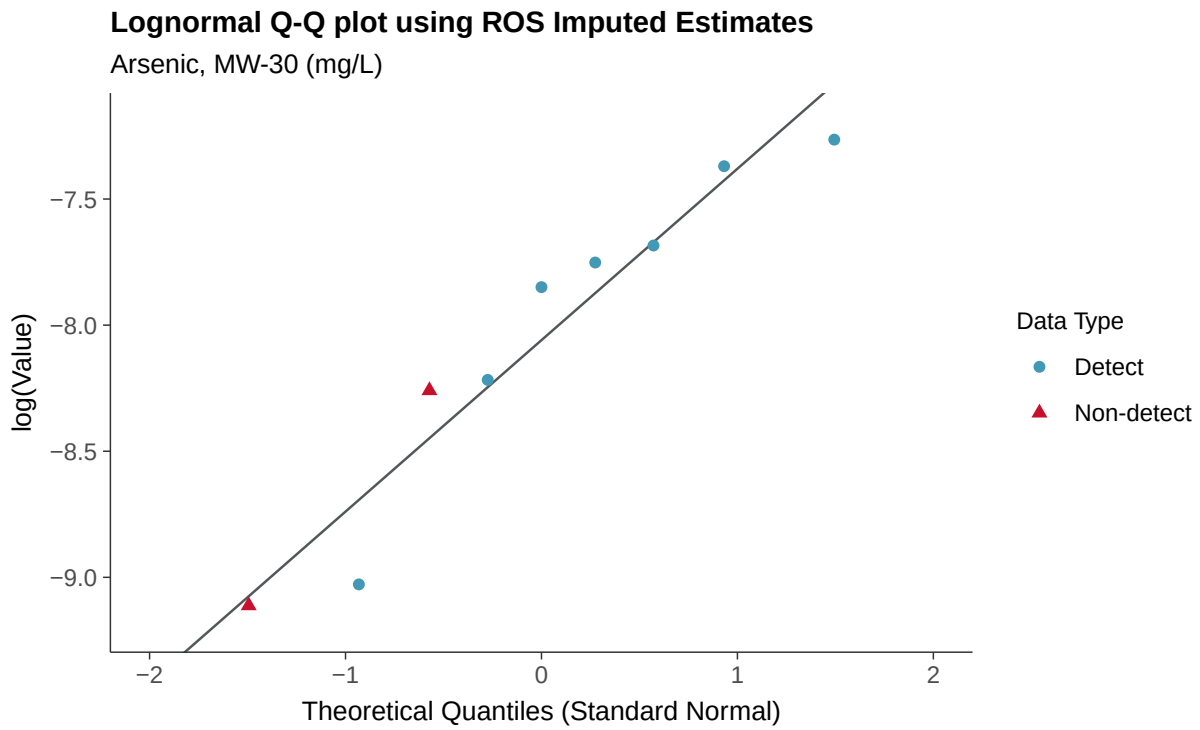


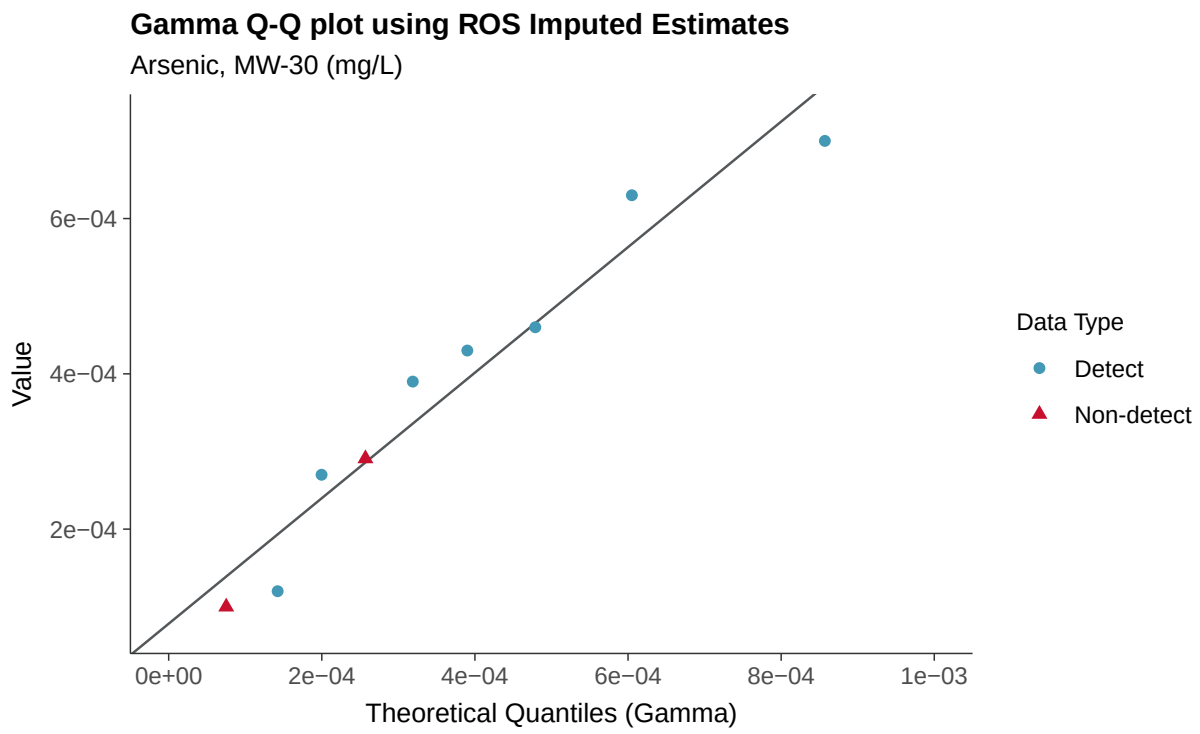
Boxplot by Season

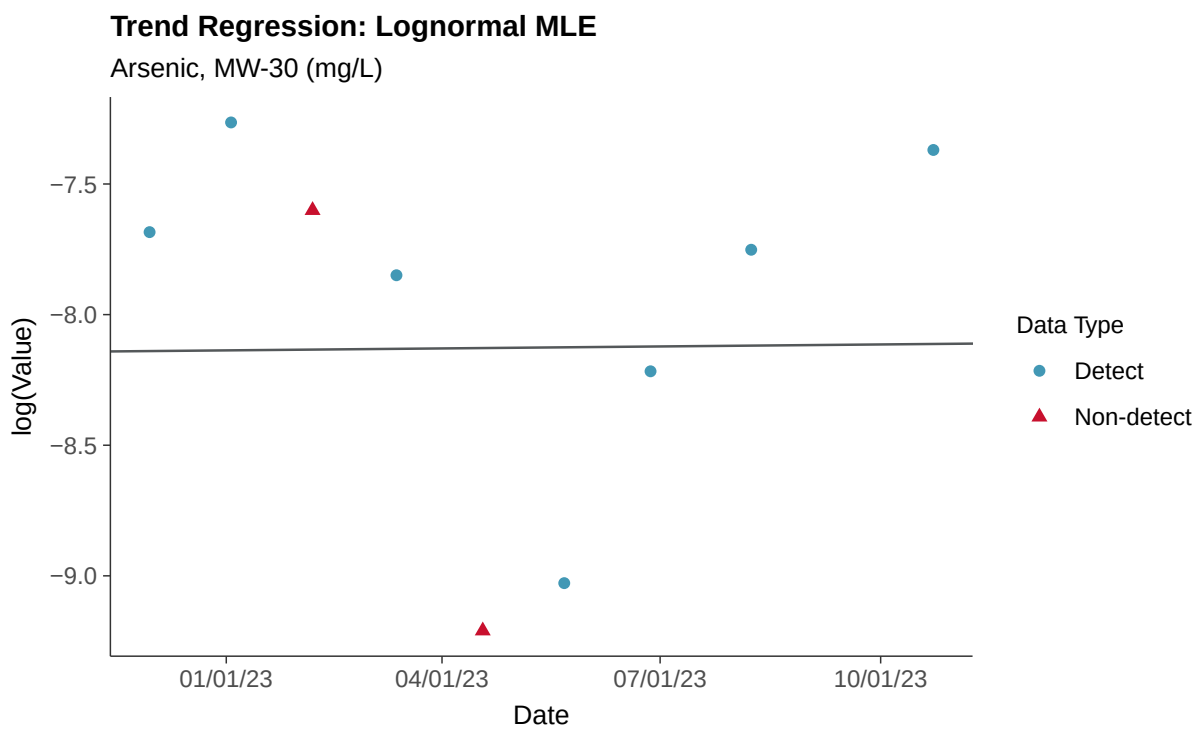
Arsenic, MW-30 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Arsenic, MW-30 (mg/L)
Value
6e−04
4e−04
2e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

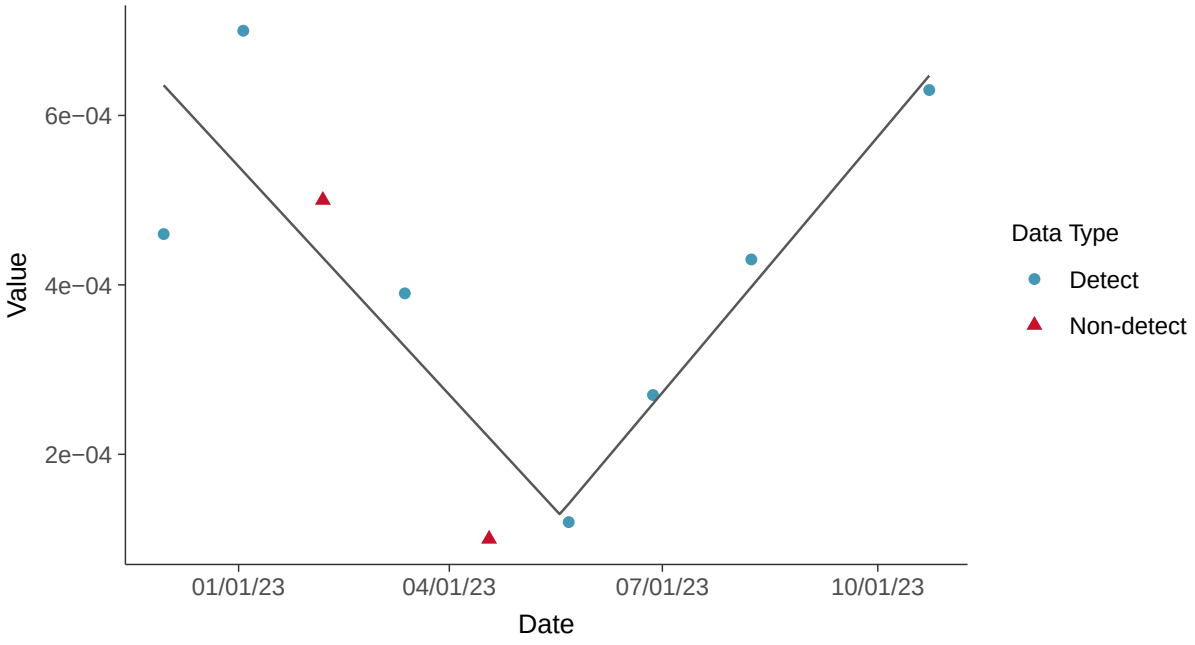

Lognormal Q-Q plot using ROS Imputed Estimates
Arsenic, MW-30 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−9.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Arsenic, MW-30 (mg/L)
Value
6e−04
4e−04
2e−04
0e+00
2e−04
4e−04
6e−04
8e−04
1e−03
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Arsenic, MW-30 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−9.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

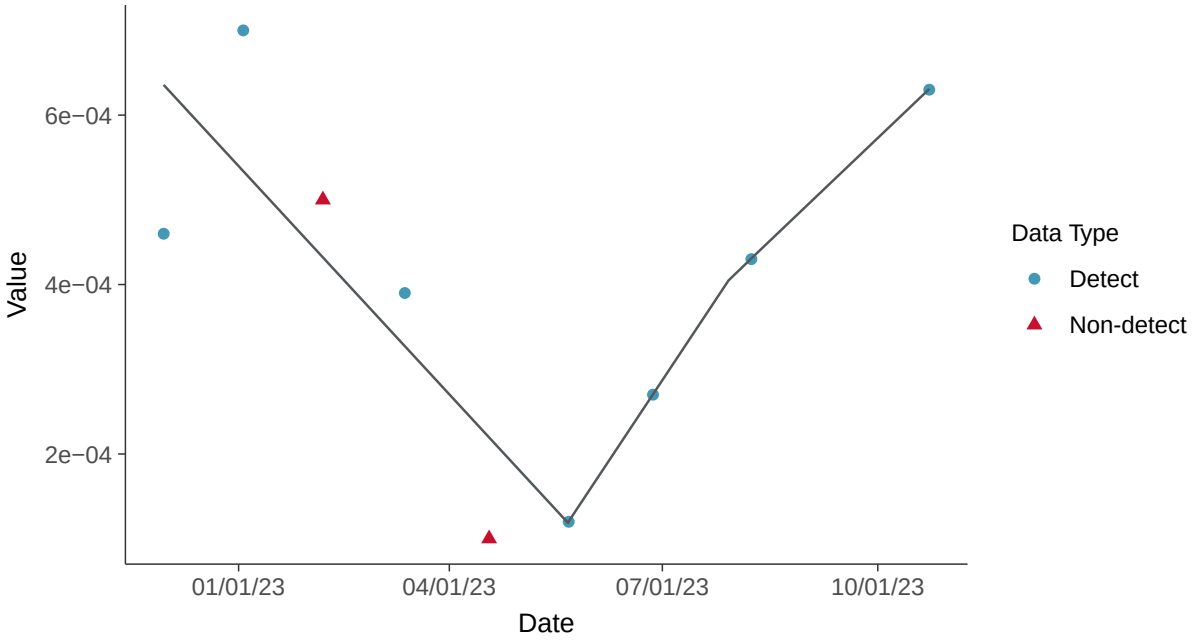
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-30 (mg/L)



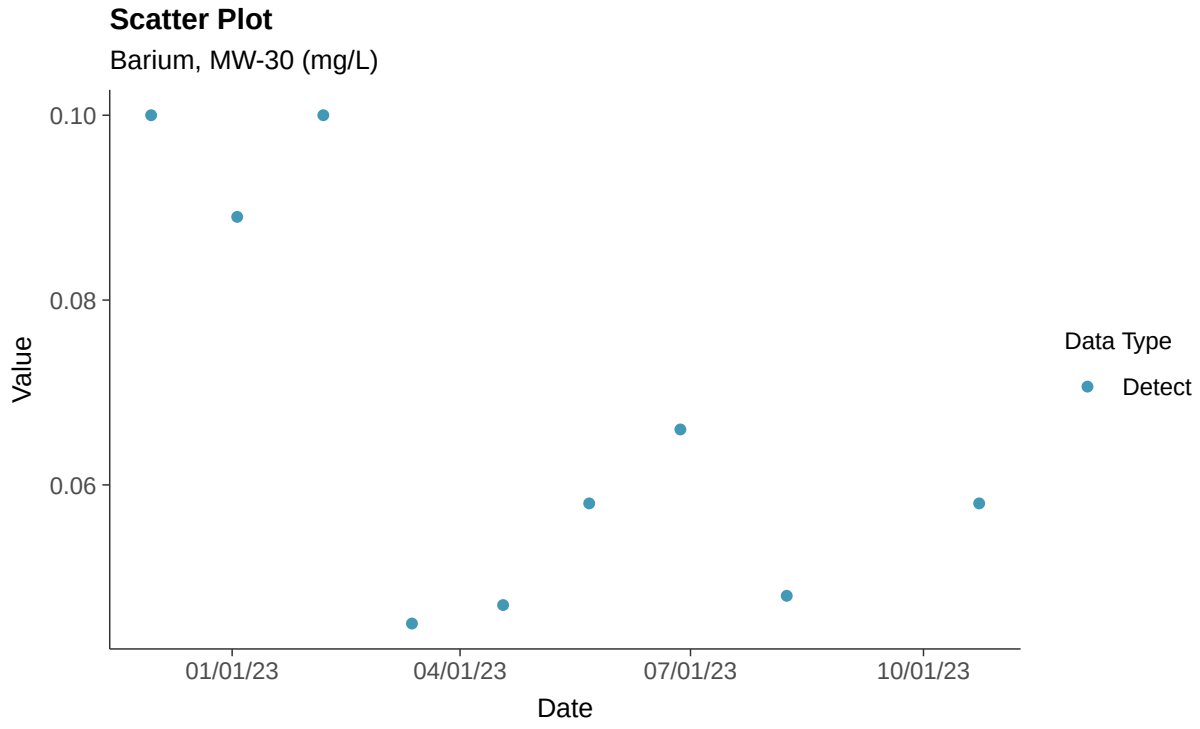
Trend Regression: Piecewise Linear-Linear-Linear

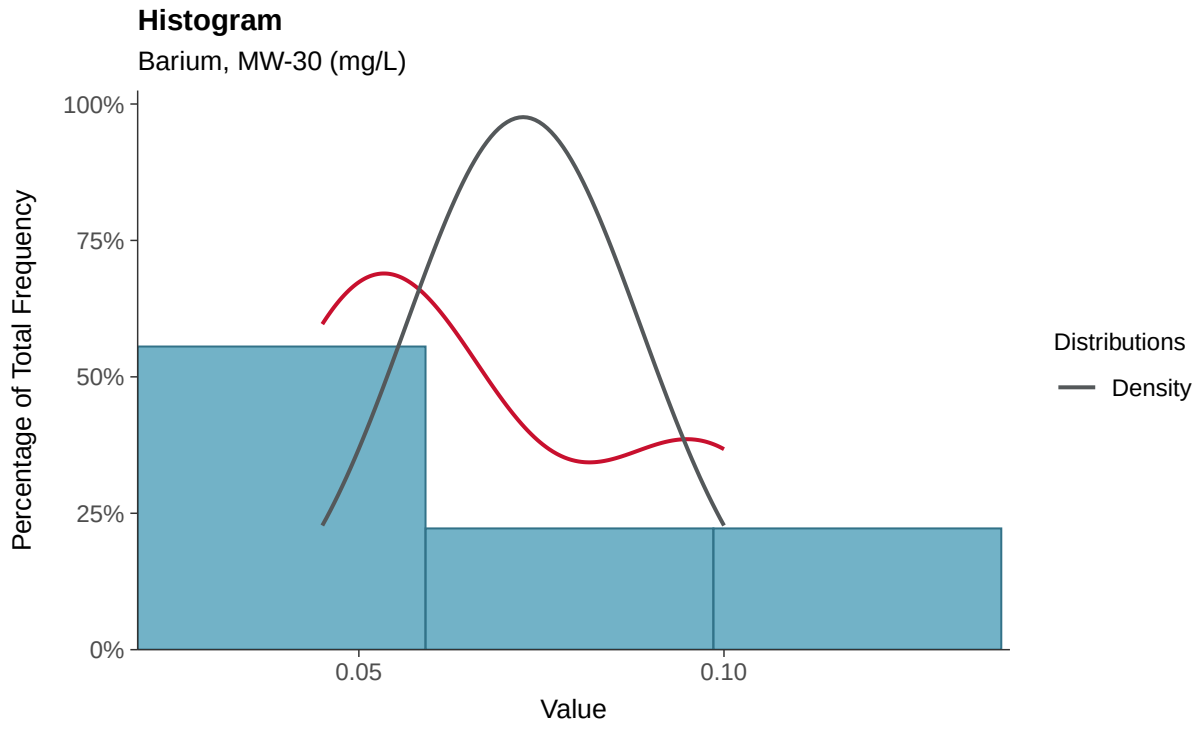
Arsenic, MW-30 (mg/L)



Appendix IV: Barium, MW-30

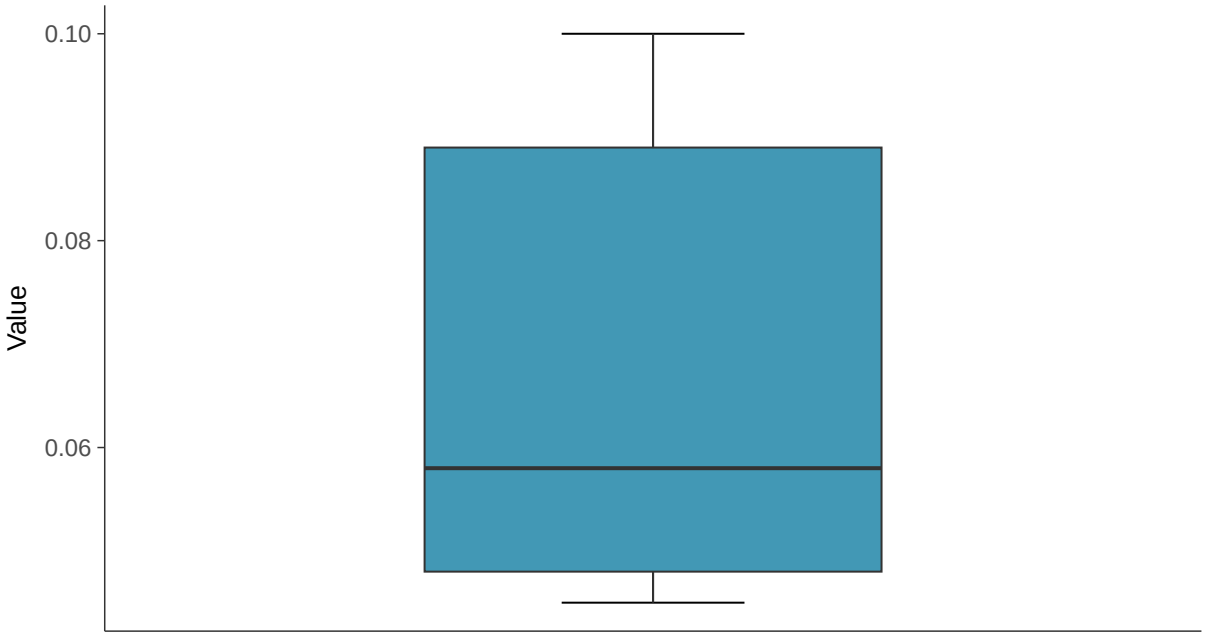
ID: 1_25_5_103





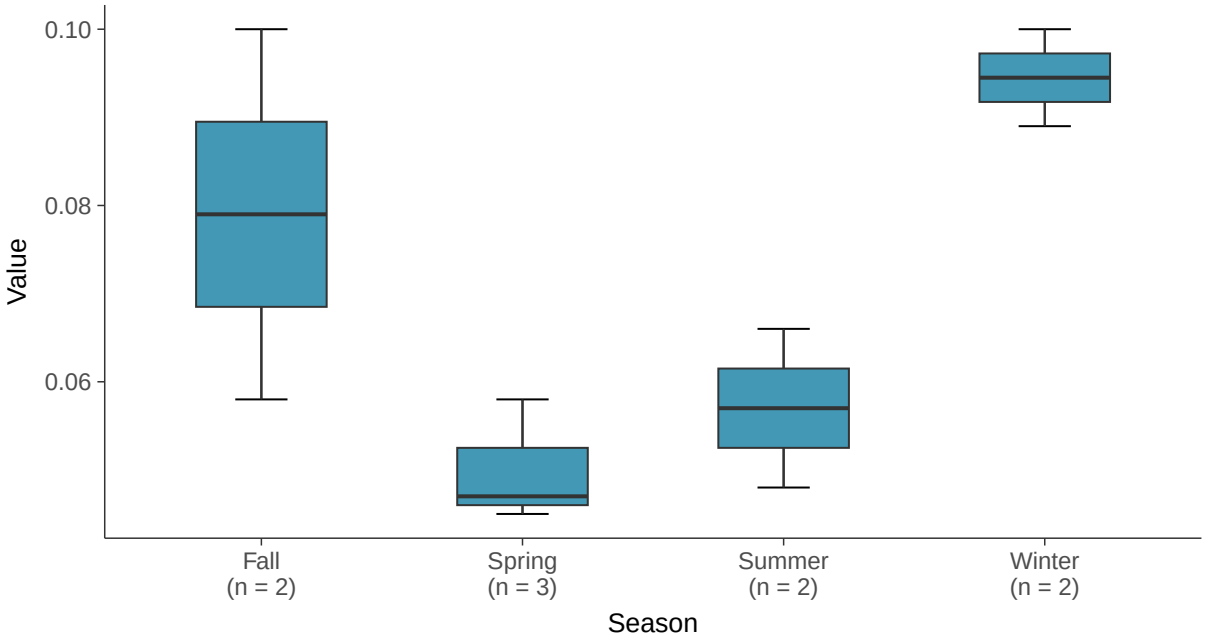
Boxplot

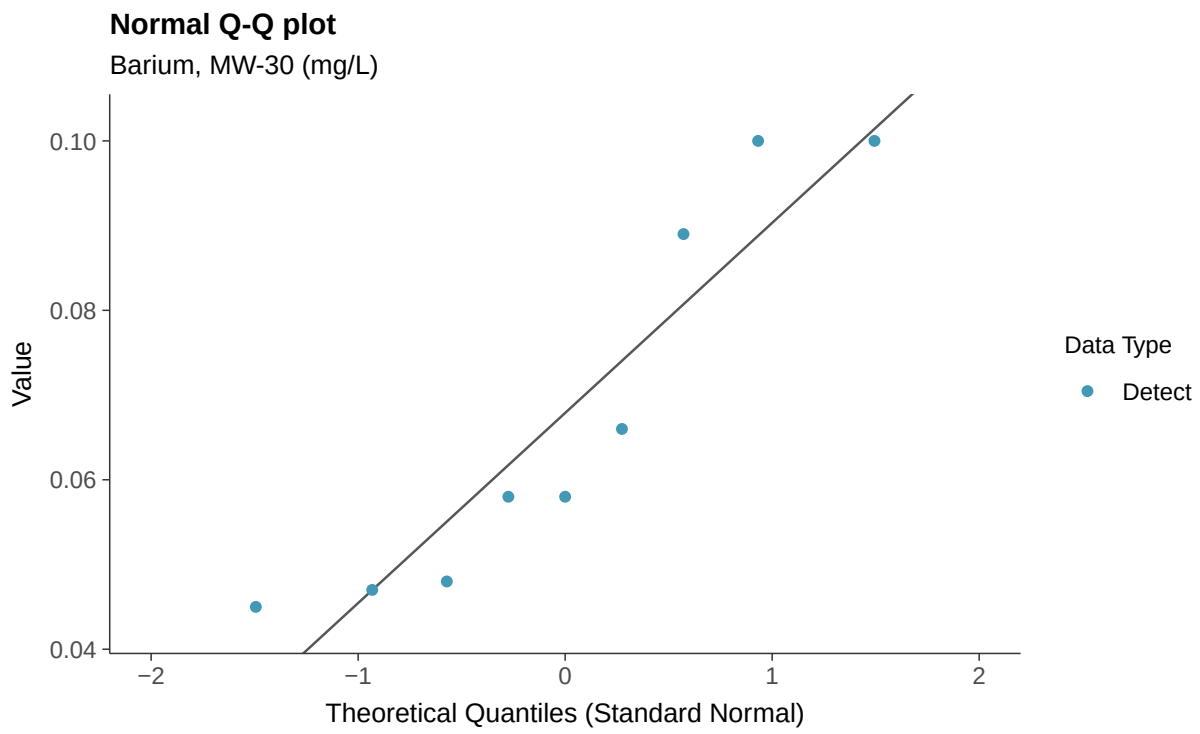
Barium, MW-30 (mg/L)

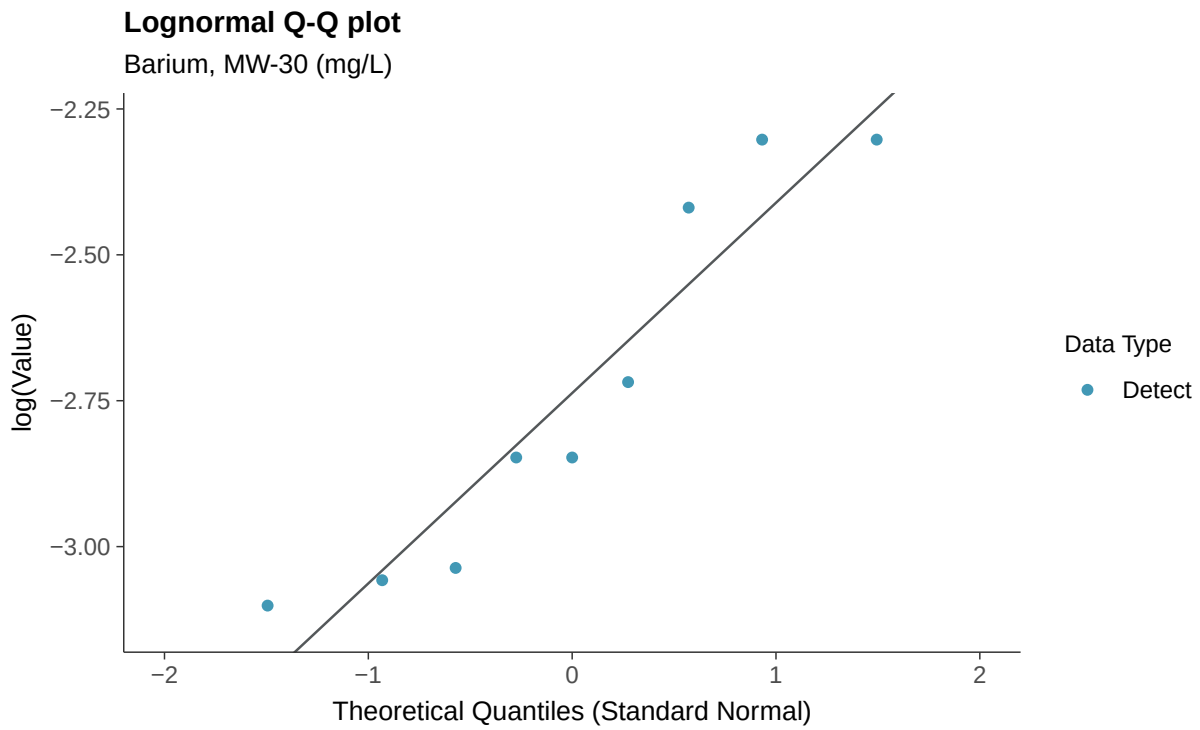


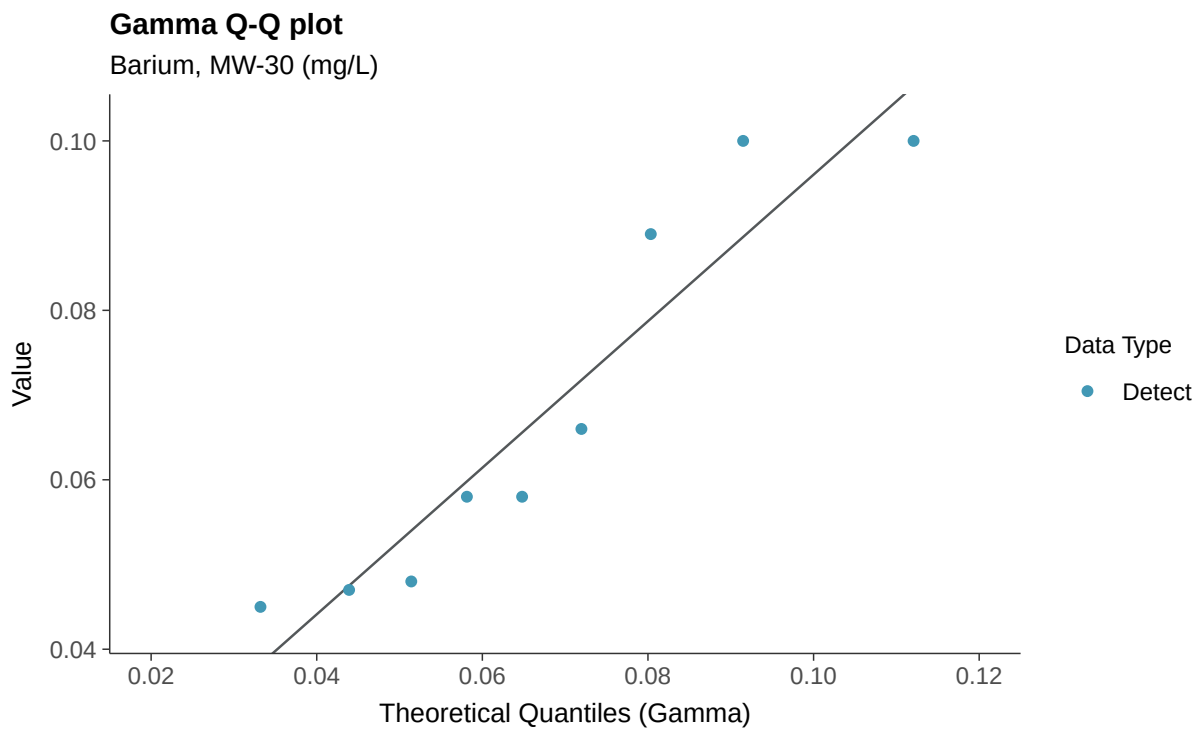
Boxplot by Season

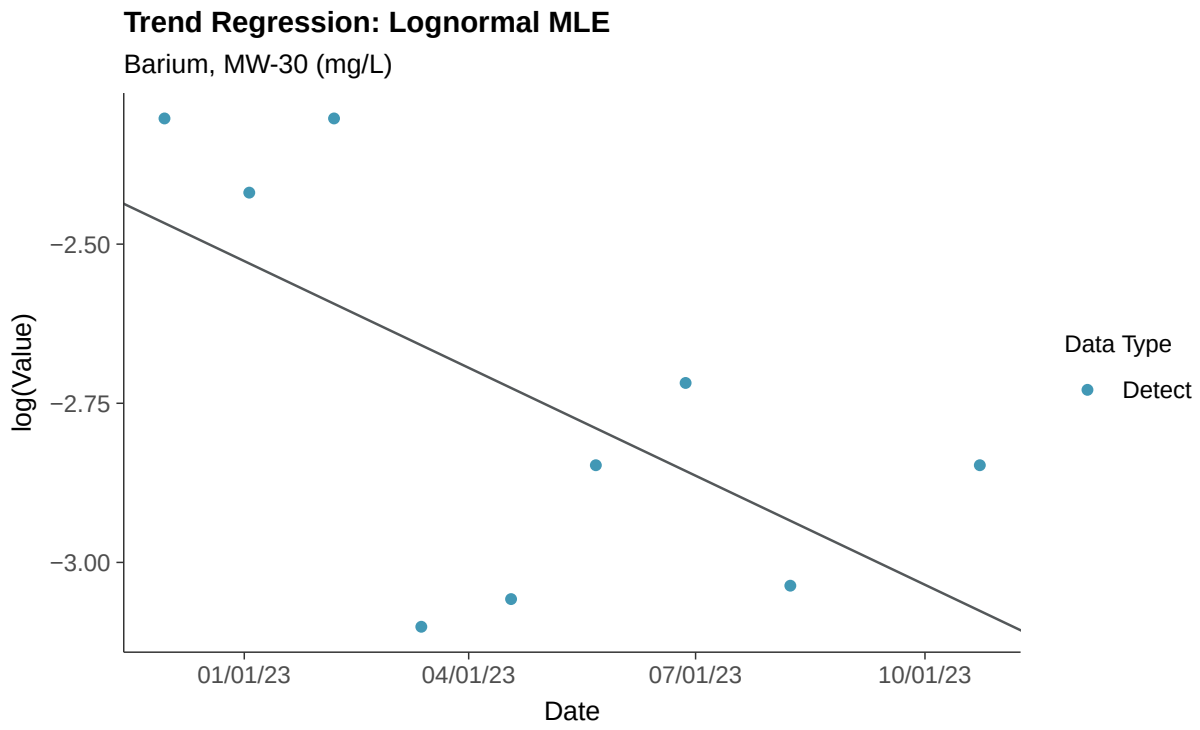
Barium, MW-30 (mg/L)




Normal Q-Q plot
Barium, MW-30 (mg/L)
Value
0.10
0.08
0.06
0.04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

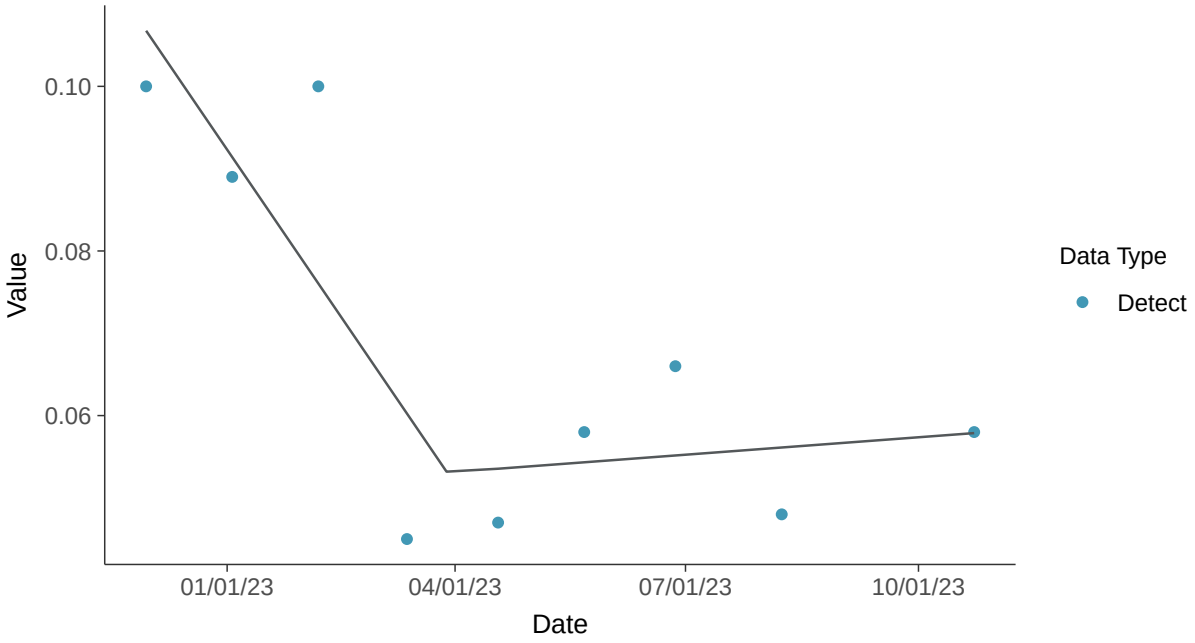

Lognormal Q-Q plot
Barium, MW-30 (mg/L)
log(Value)
−2.25
−2.50
−2.75
−3.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Barium, MW-30 (mg/L)
Value
0.10
0.08
0.06
0.04
0.02
0.04
0.06
0.08
0.10
0.12
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Barium, MW-30 (mg/L)
log(Value)
−2.50
−2.75
−3.00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

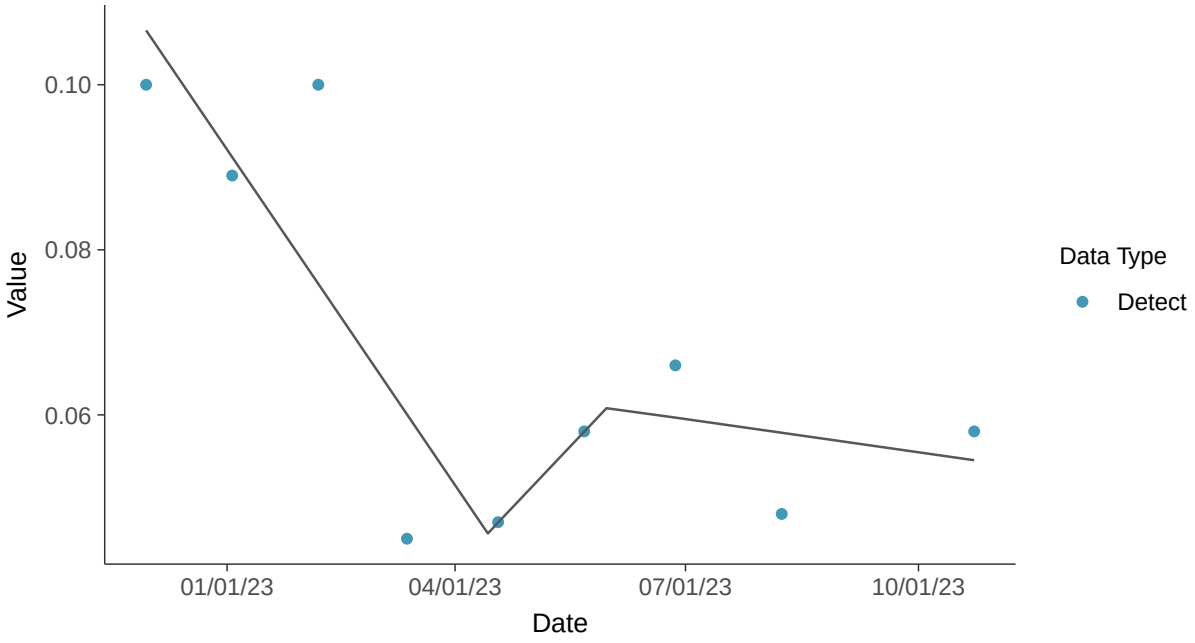
Trend Regression: Piecewise Linear-Linear

Barium, MW-30 (mg/L)



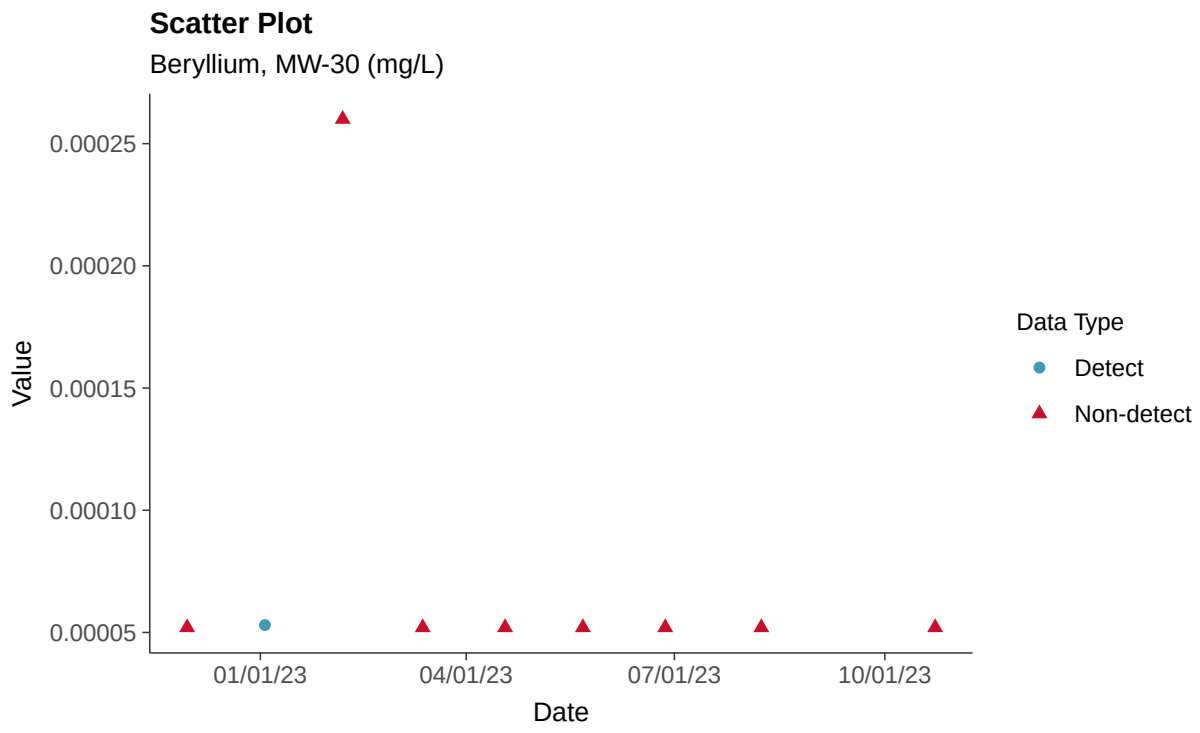
Trend Regression: Piecewise Linear-Linear-Linear

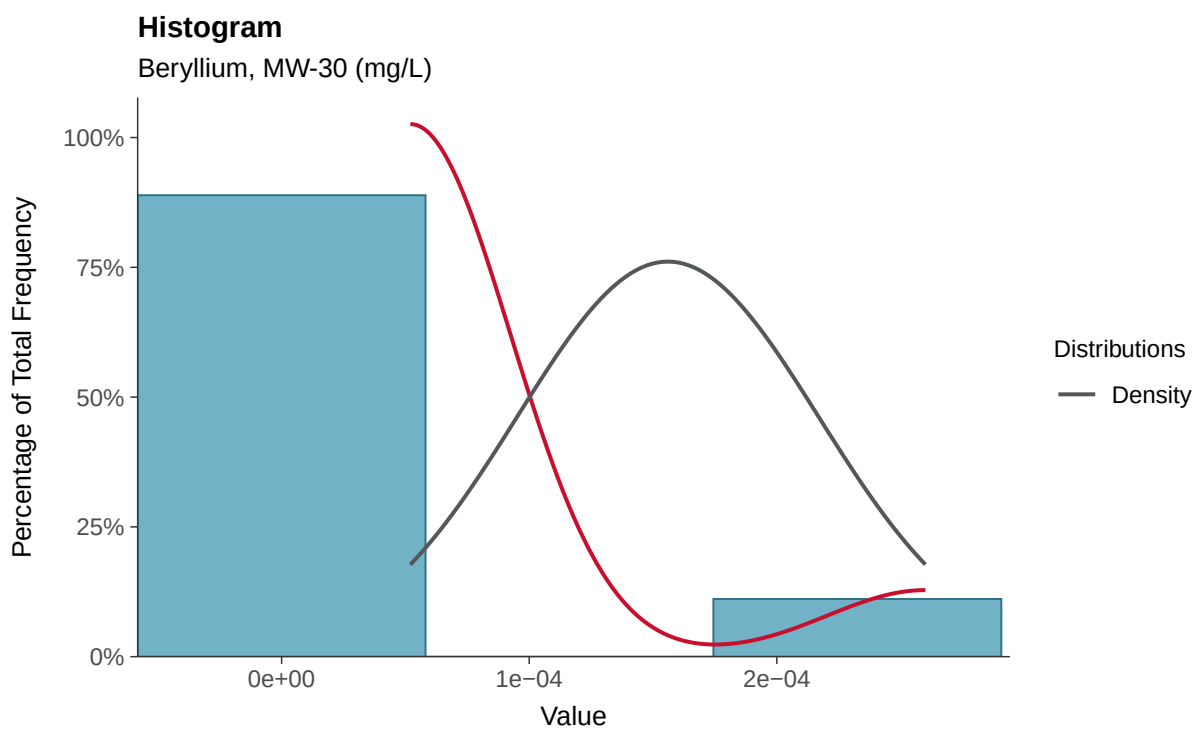
Barium, MW-30 (mg/L)



Appendix IV: Beryllium, MW-30

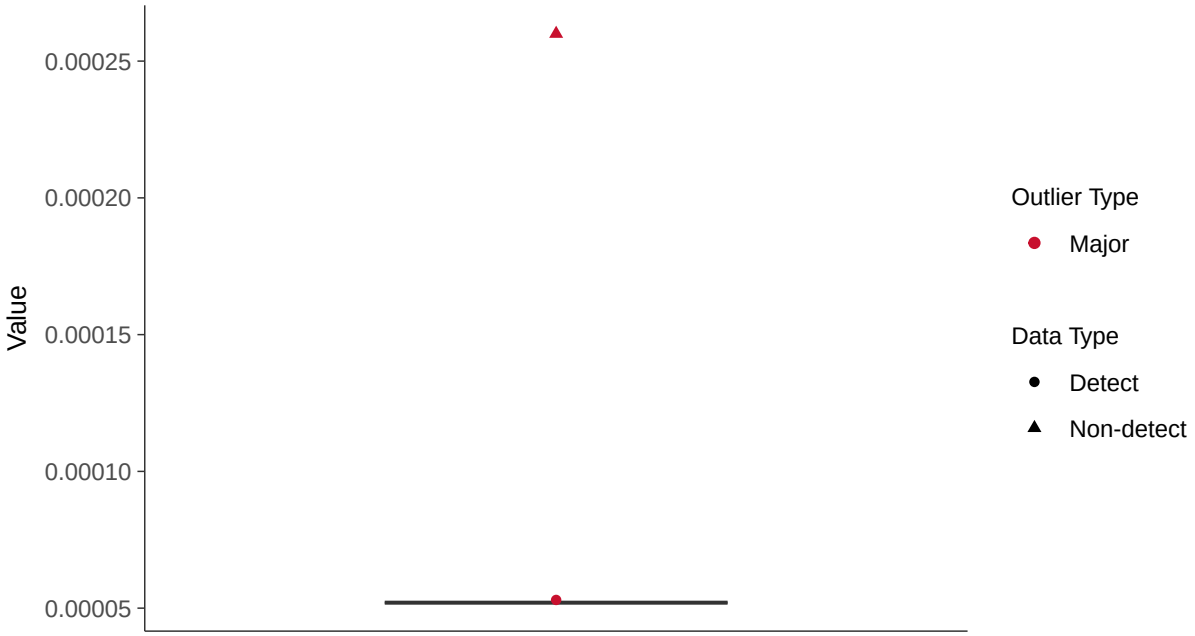
ID: 1_25_5_104





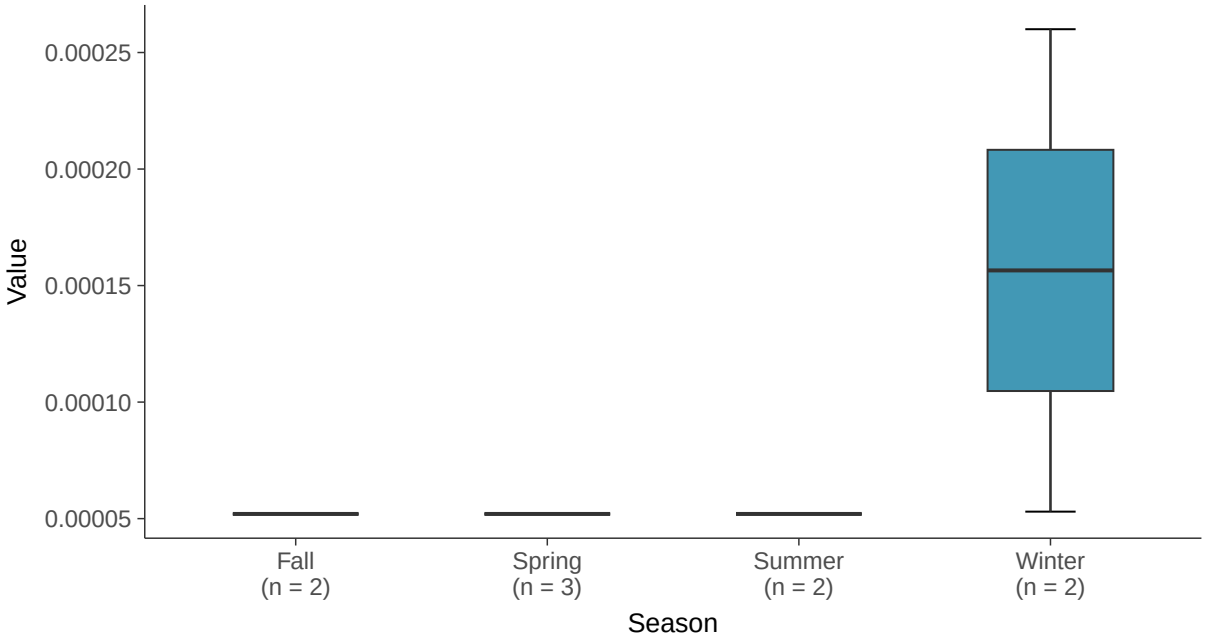
Boxplot

Beryllium, MW-30 (mg/L)



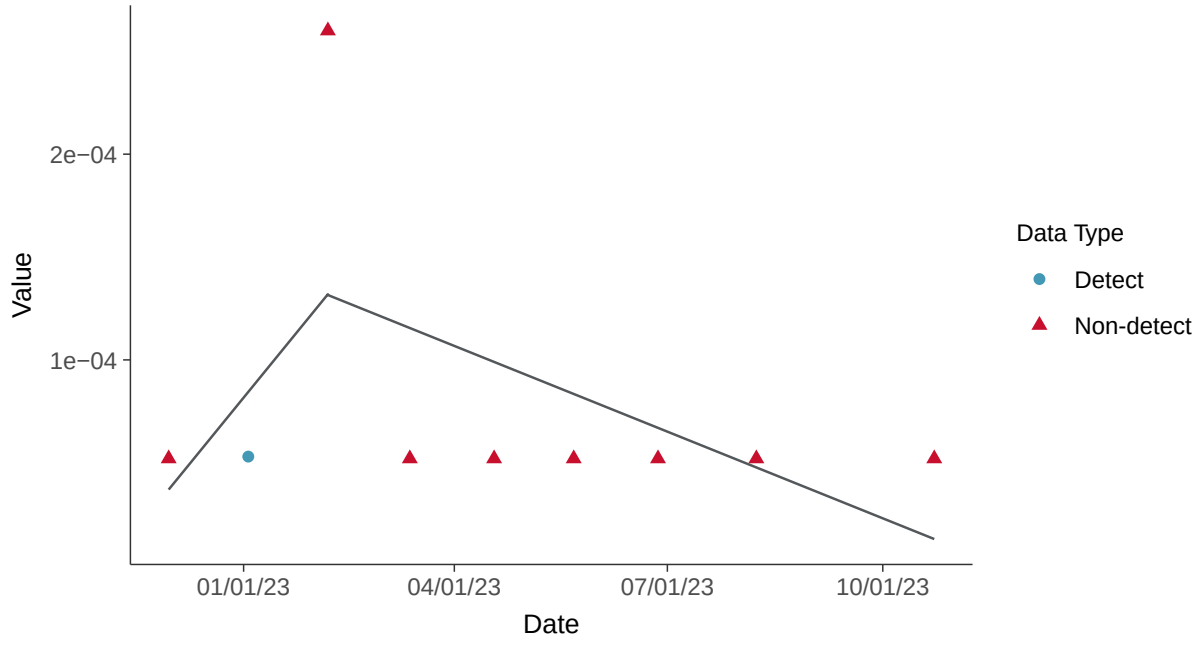
Boxplot by Season

Beryllium, MW-30 (mg/L)



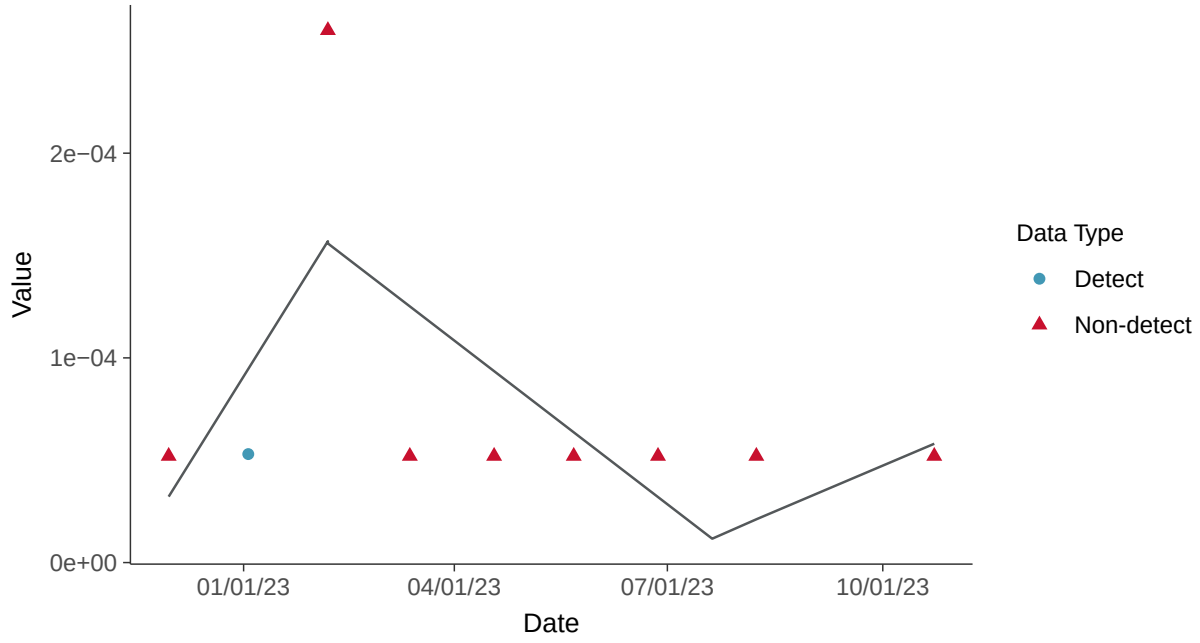
Trend Regression: Piecewise Linear-Linear

Beryllium, MW-30 (mg/L)



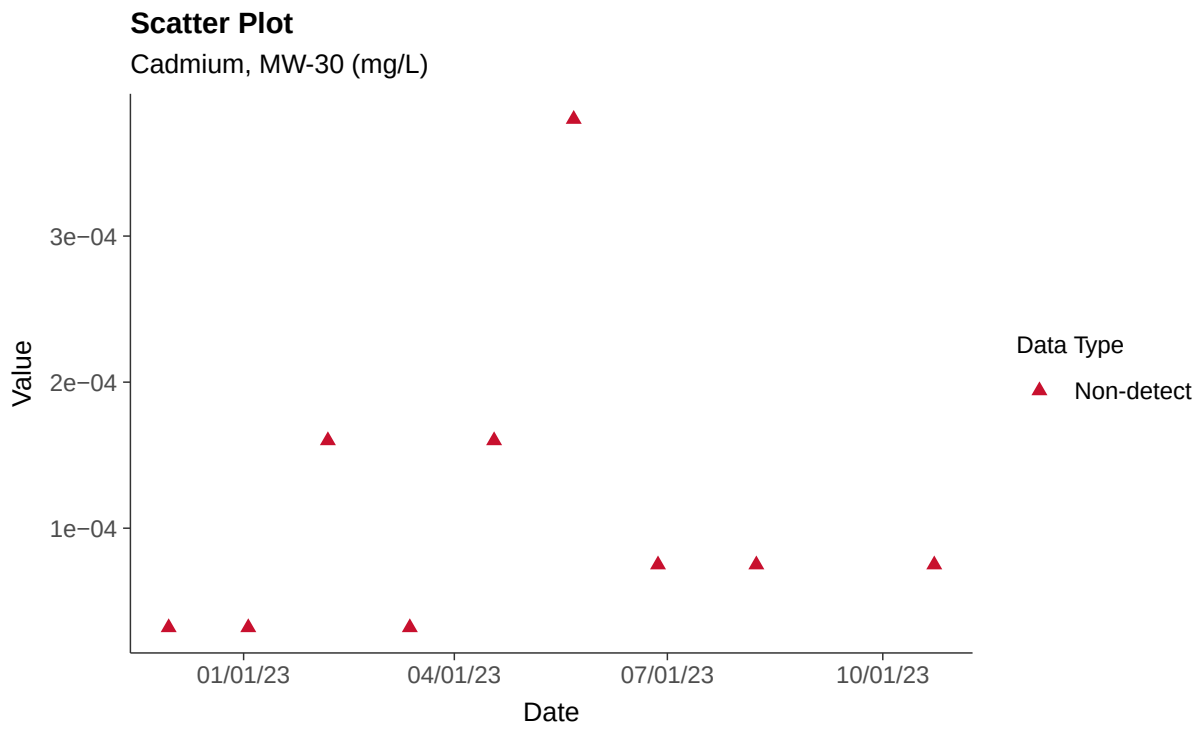
Trend Regression: Piecewise Linear-Linear-Linear

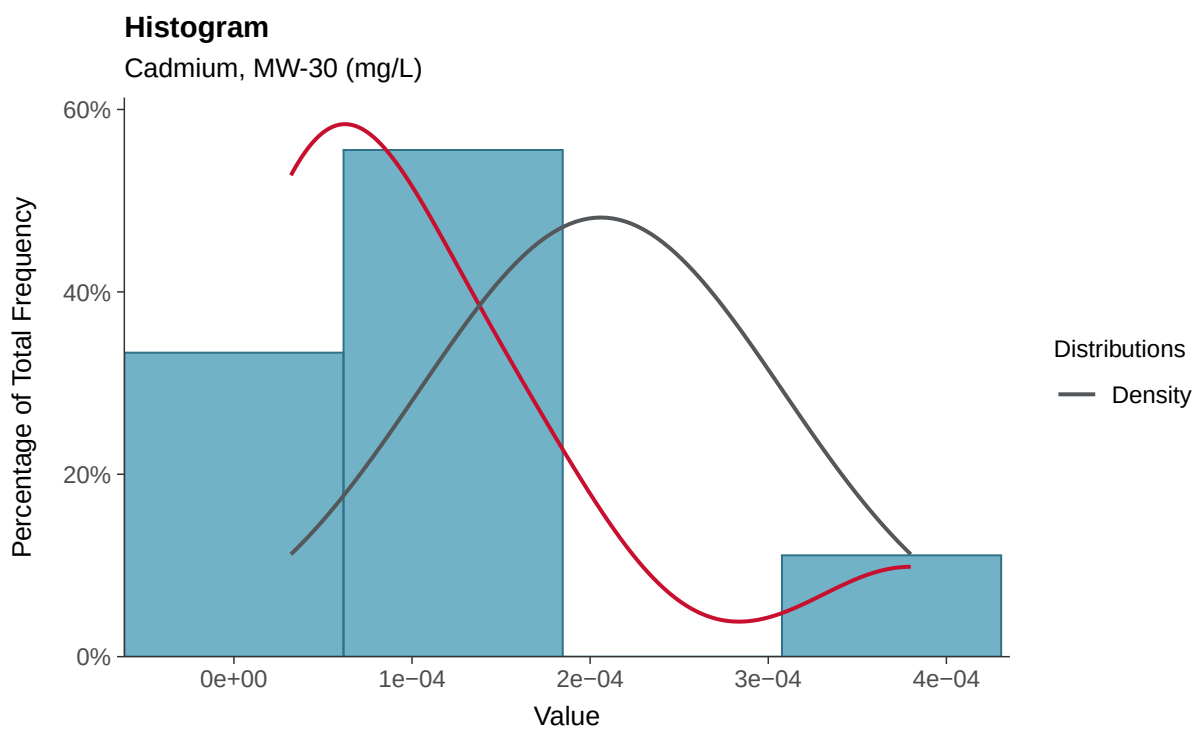
Beryllium, MW-30 (mg/L)



Appendix IV: Cadmium, MW-30

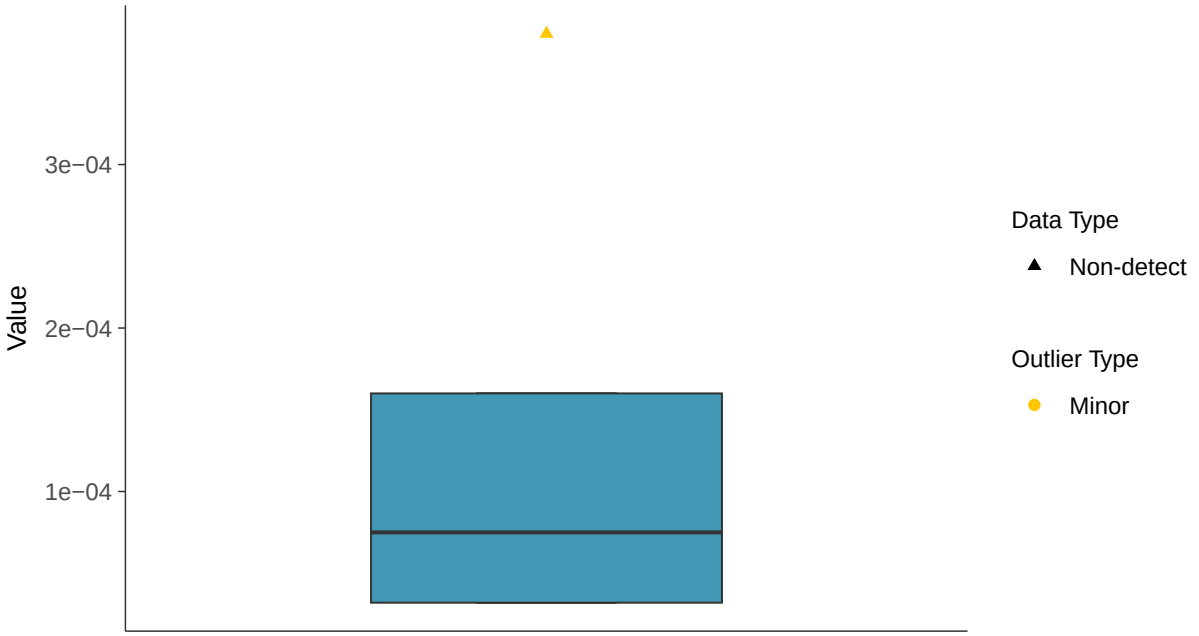
ID: 1_25_5_106





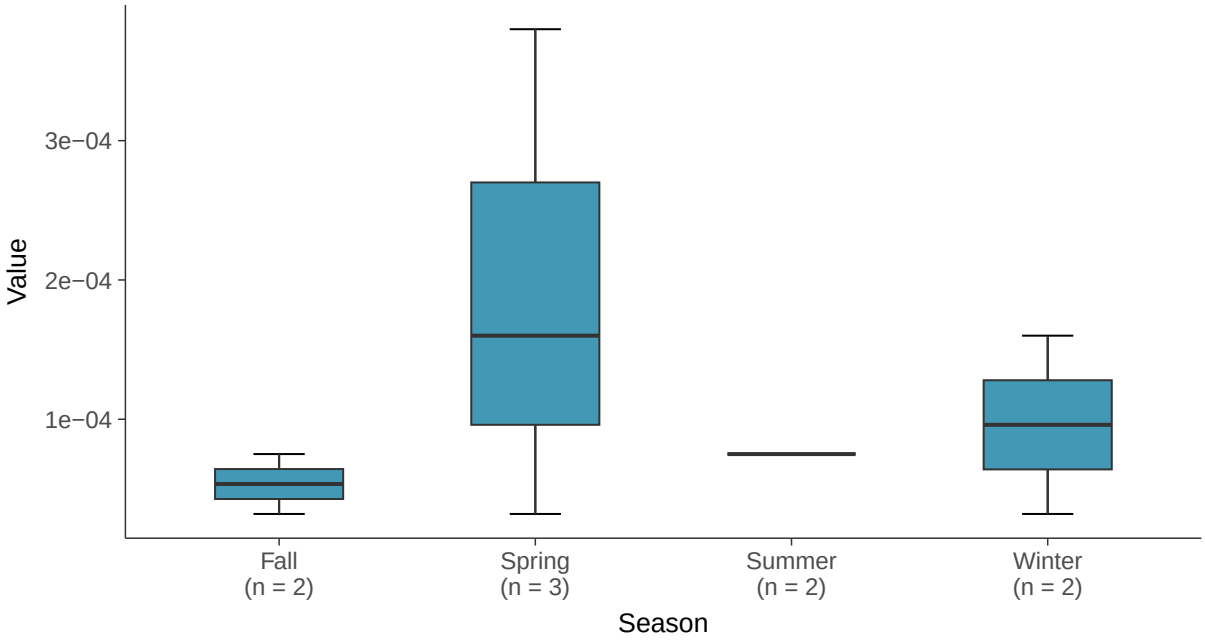
Boxplot

Cadmium, MW-30 (mg/L)



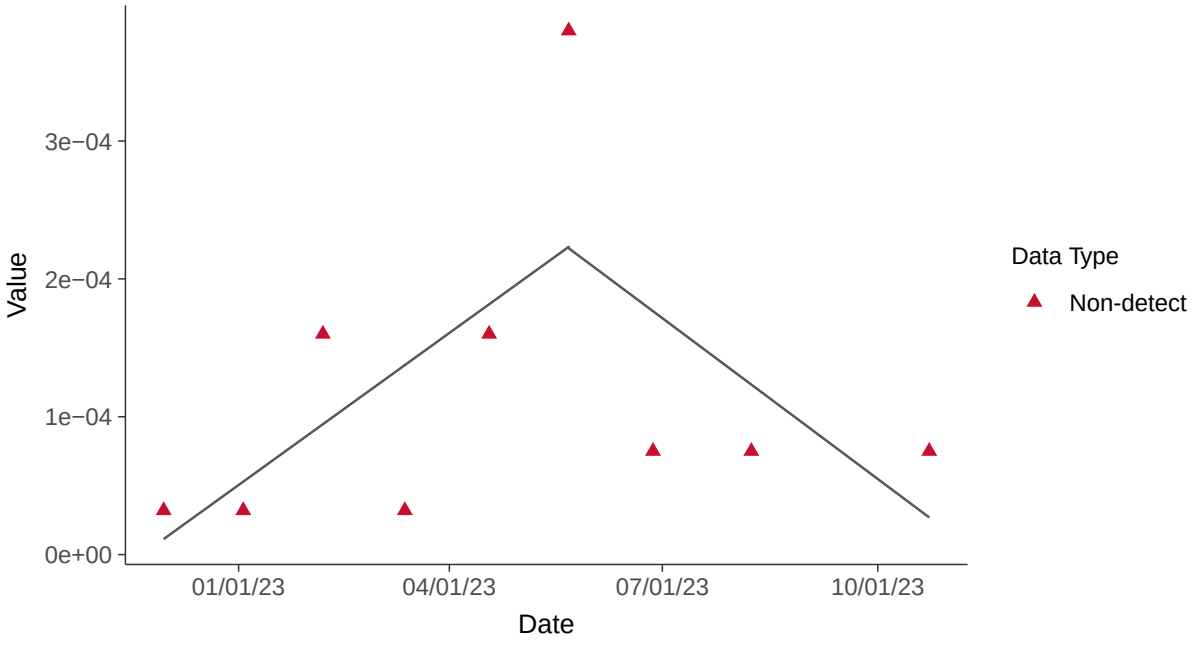
Boxplot by Season

Cadmium, MW-30 (mg/L)



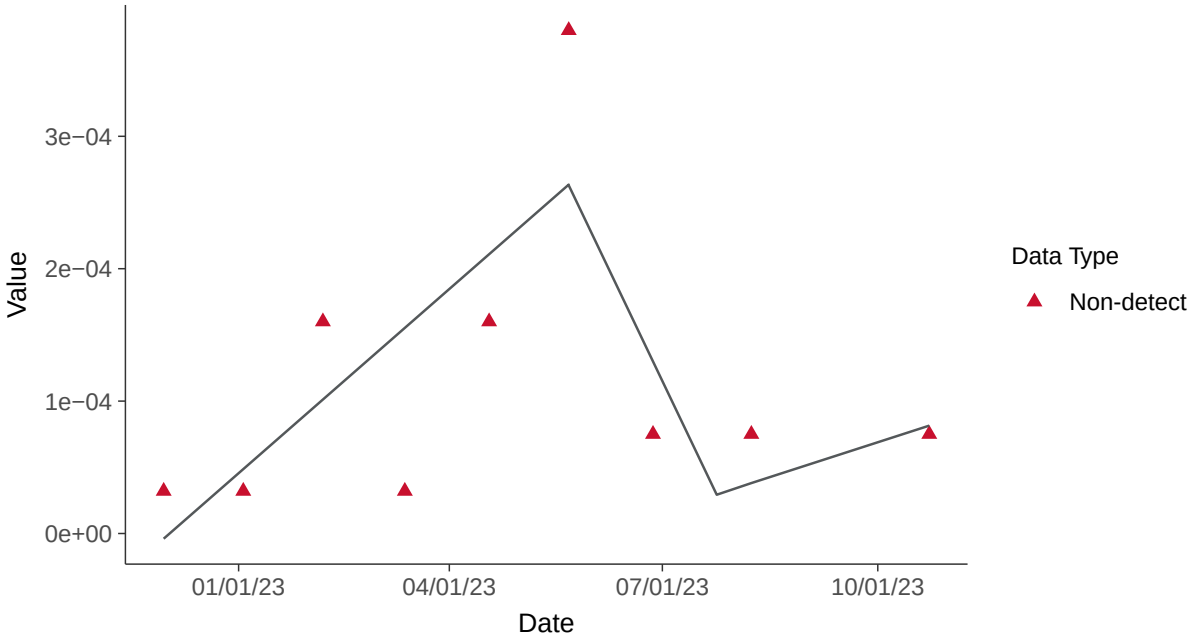
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-30 (mg/L)



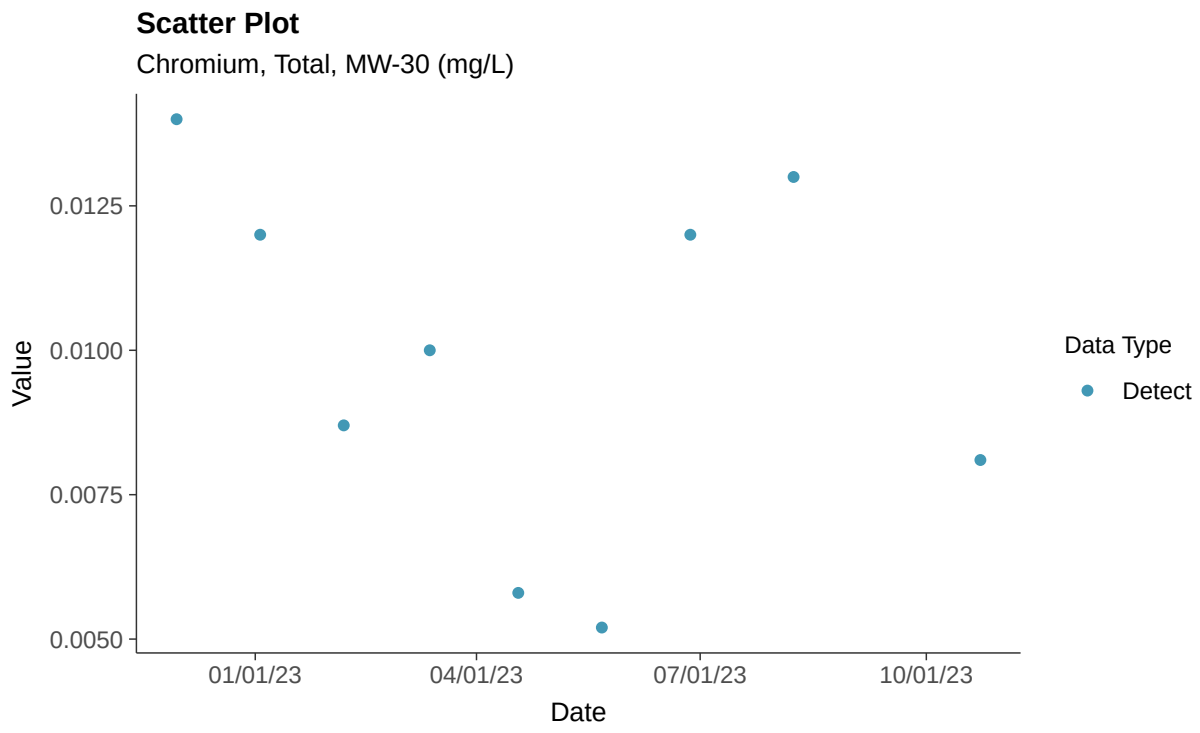
Trend Regression: Piecewise Linear-Linear-Linear

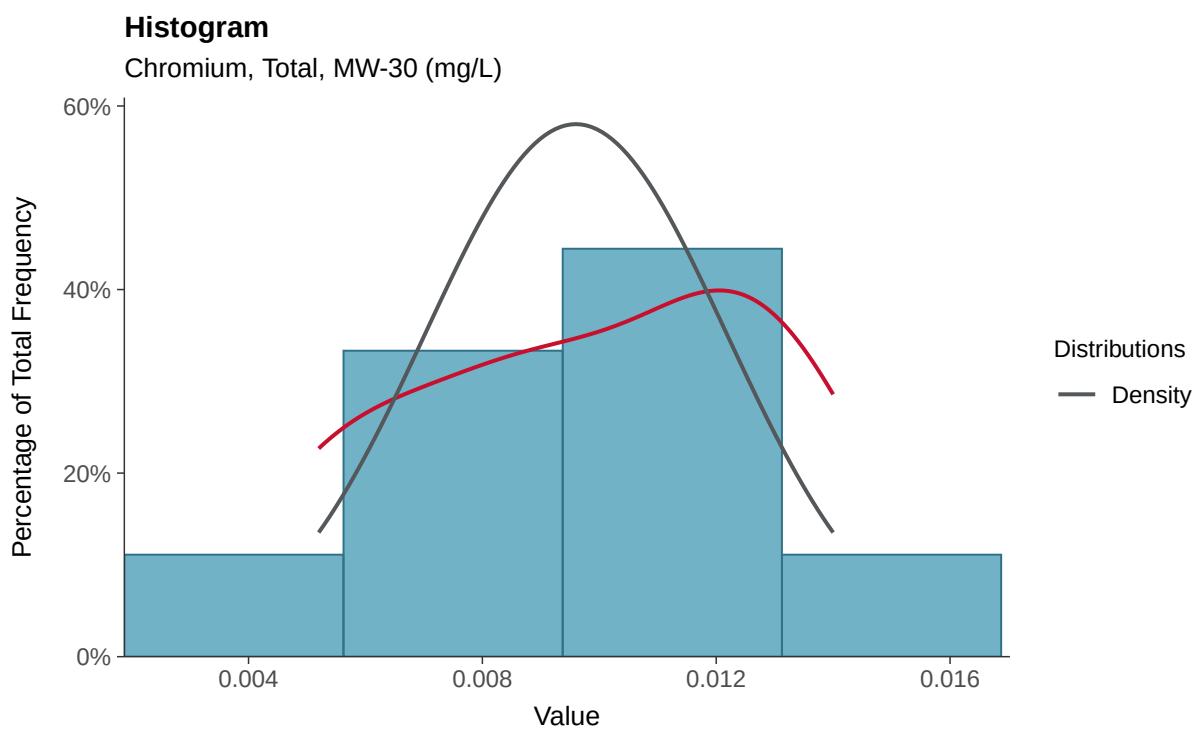
Cadmium, MW-30 (mg/L)



Appendix IV: Chromium, Total, MW-30

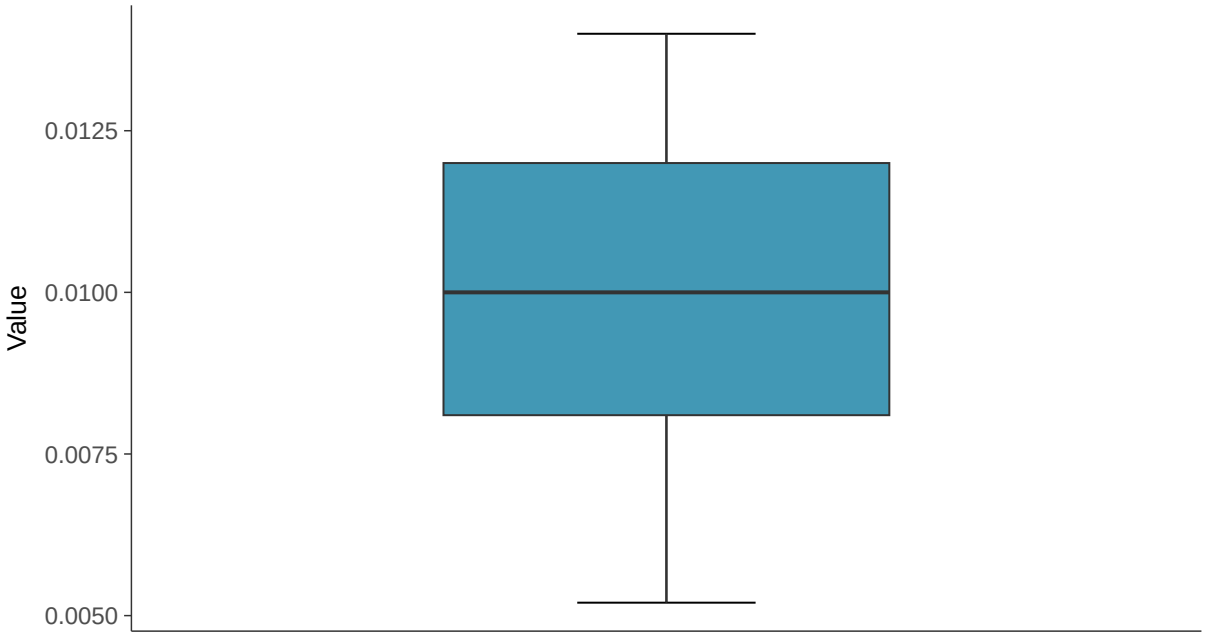
ID: 1_25_5_109





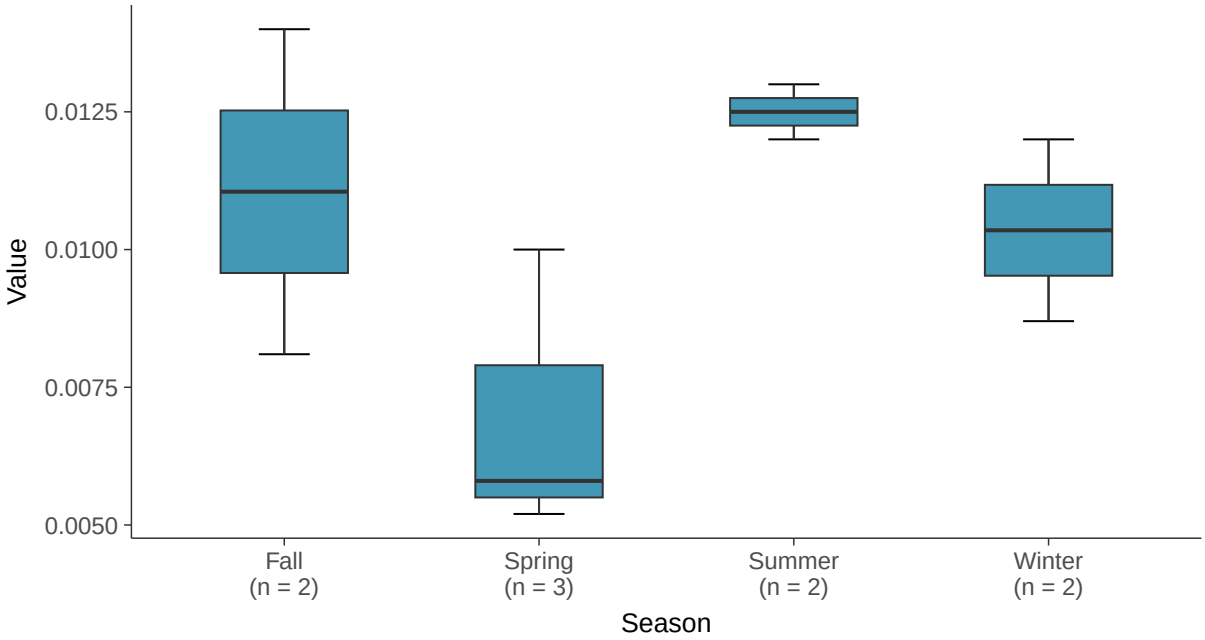
Boxplot

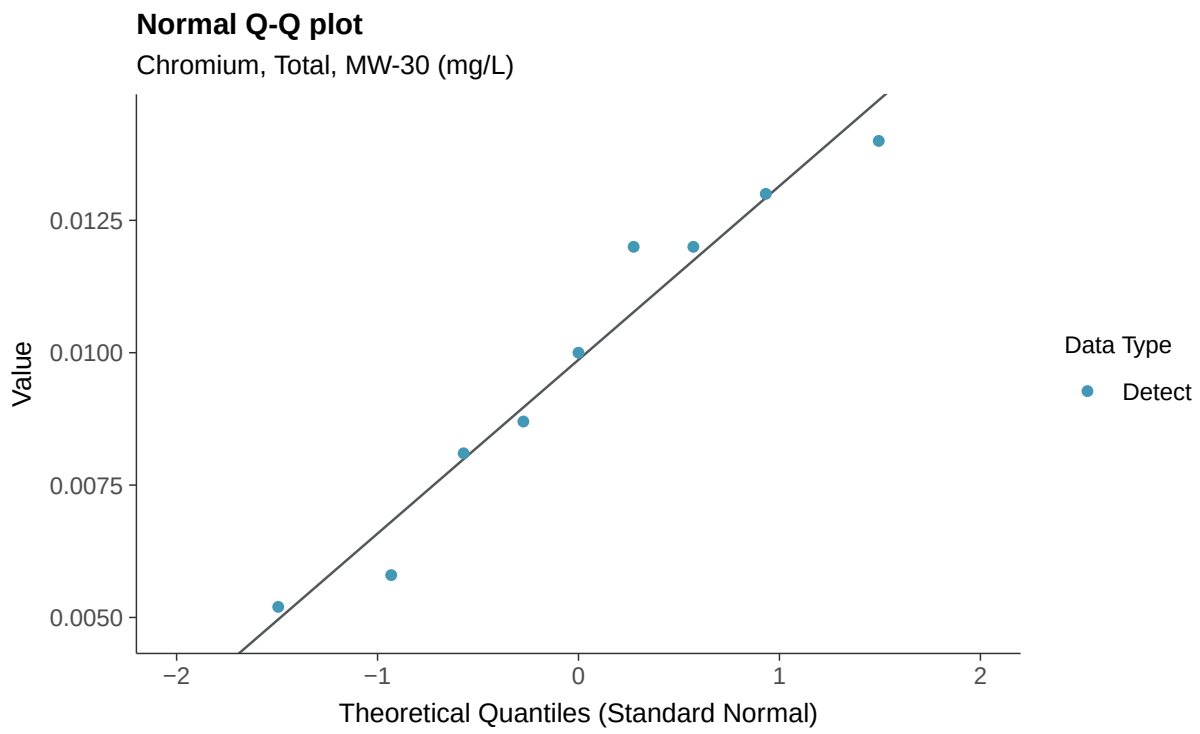
Chromium, Total, MW-30 (mg/L)

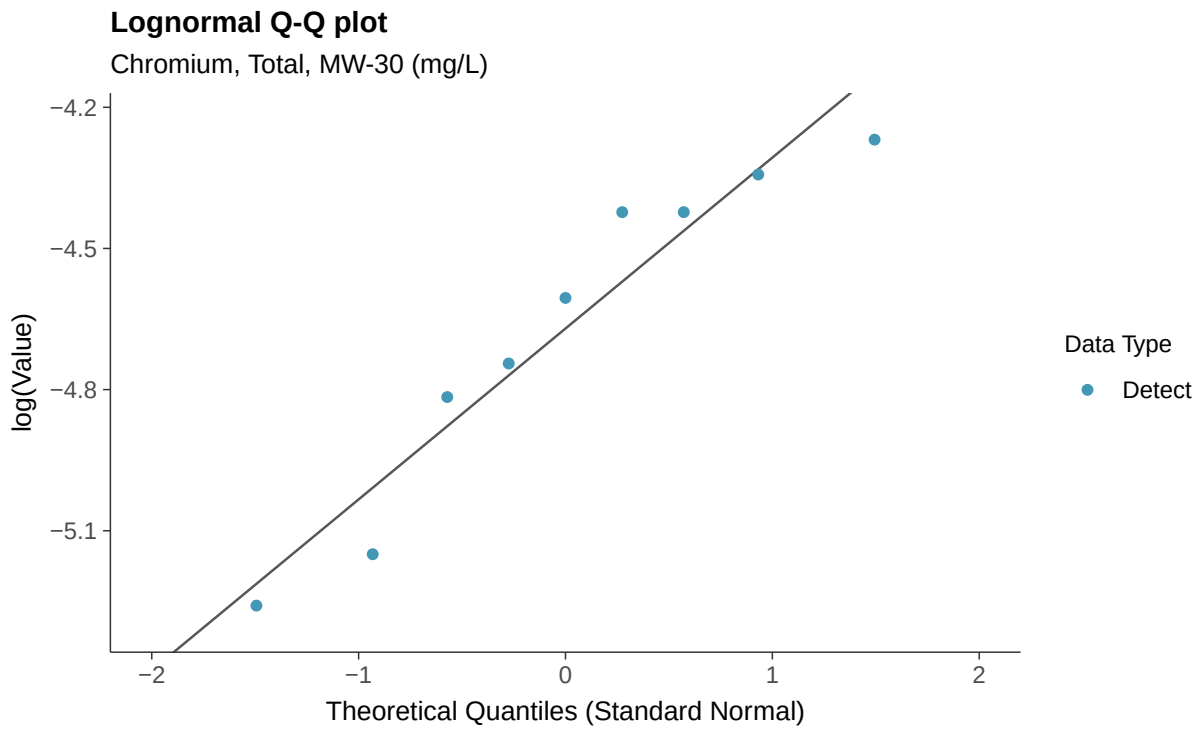


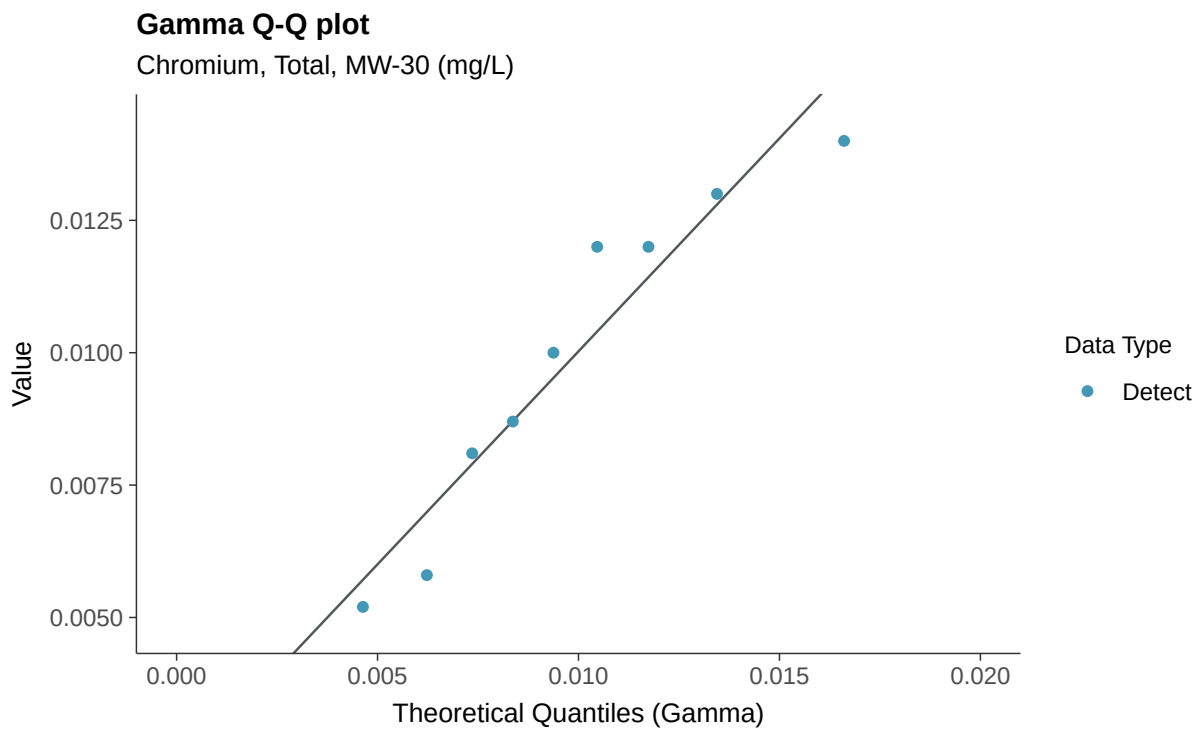
Boxplot by Season

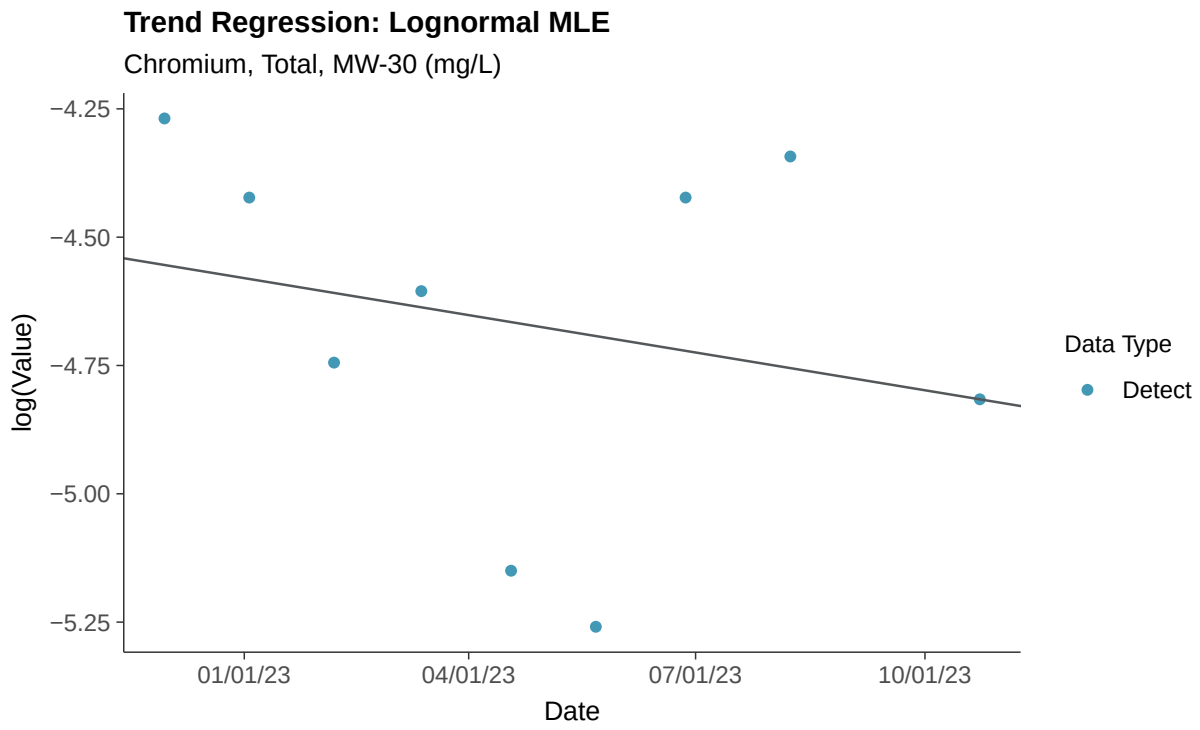
Chromium, Total, MW-30 (mg/L)

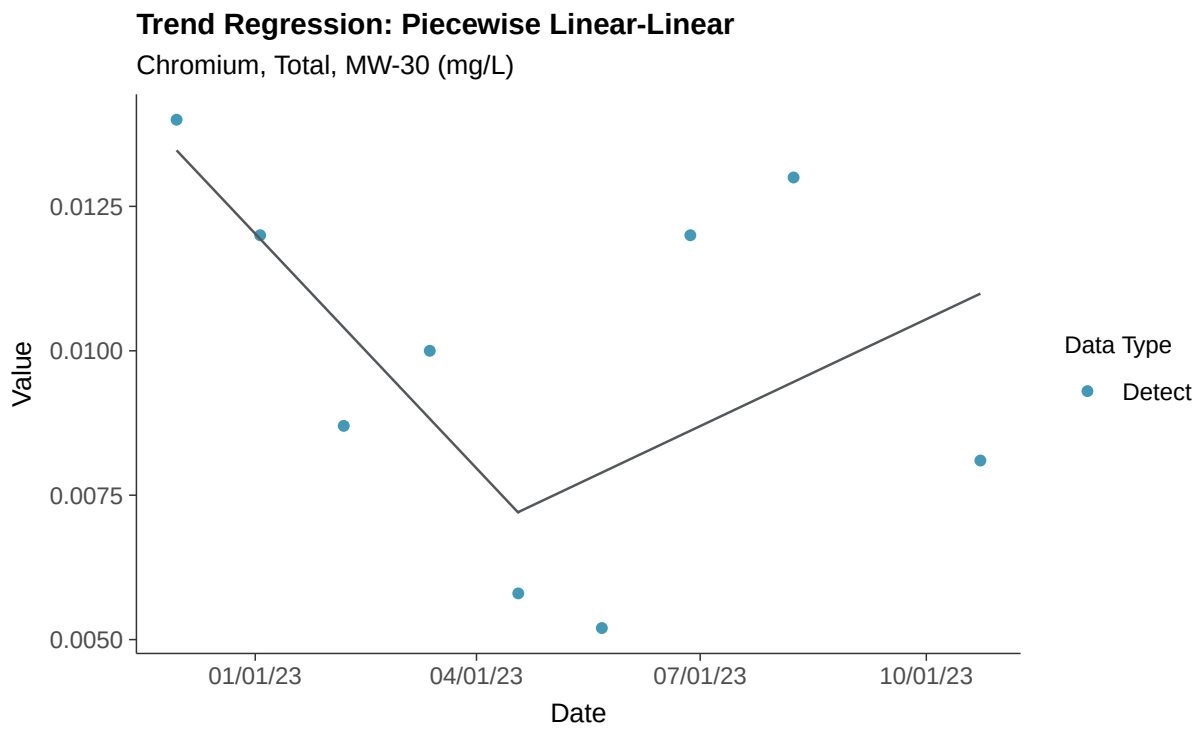


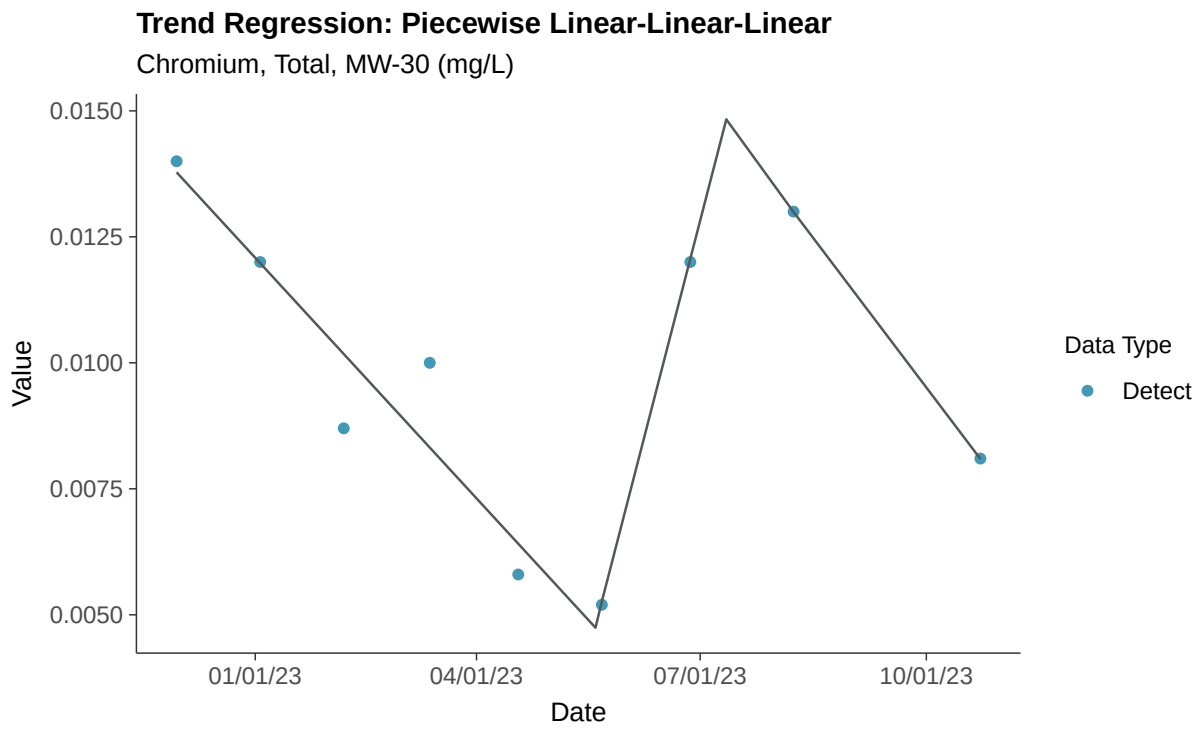

Normal Q-Q plot
Chromium, Total, MW-30 (mg/L)
Value
0.0125
0.0100
0.0075
0.0050
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chromium, Total, MW-30 (mg/L)
log(Value)
−4.2
−4.5
−4.8
−5.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chromium, Total, MW-30 (mg/L)
Value
0.0125
0.0100
0.0075
0.0050
0.000
0.005
0.010
0.015
0.020
Theoretical Quantiles (Gamma)
Data Type
Detect

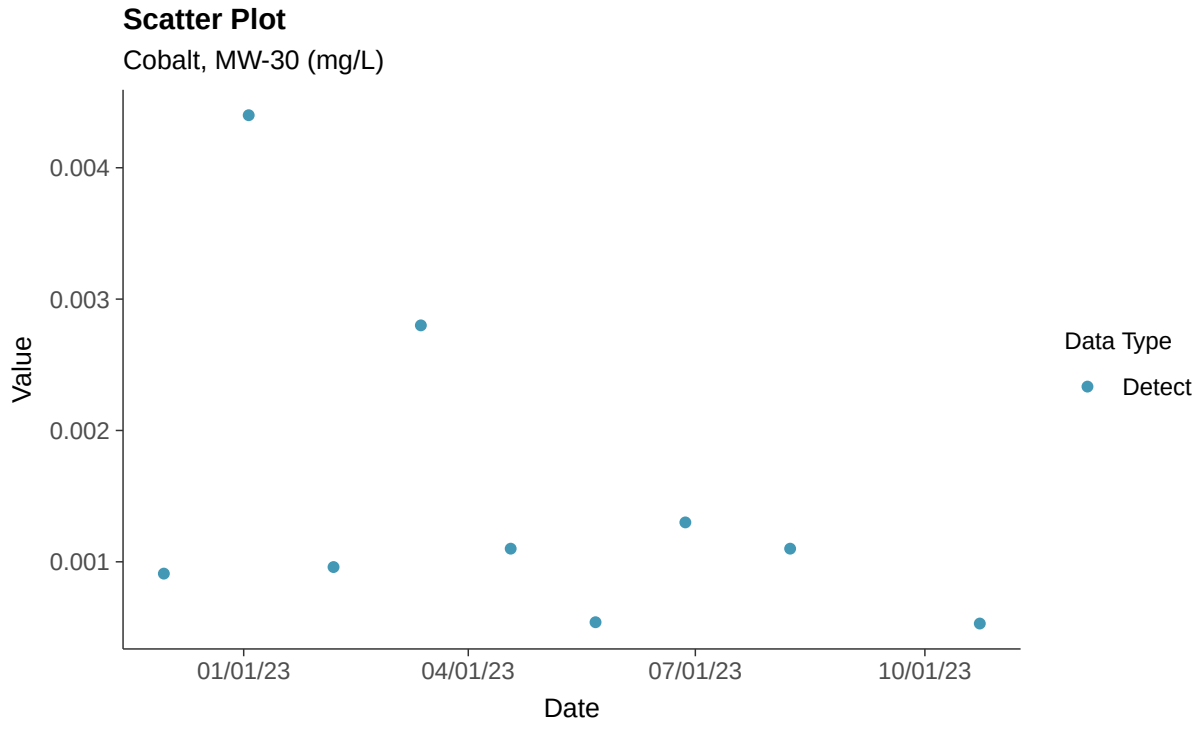

Trend Regression: Lognormal MLE
Chromium, Total, MW-30 (mg/L)
log(Value)
−4.25
−4.50
−4.75
−5.00
−5.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

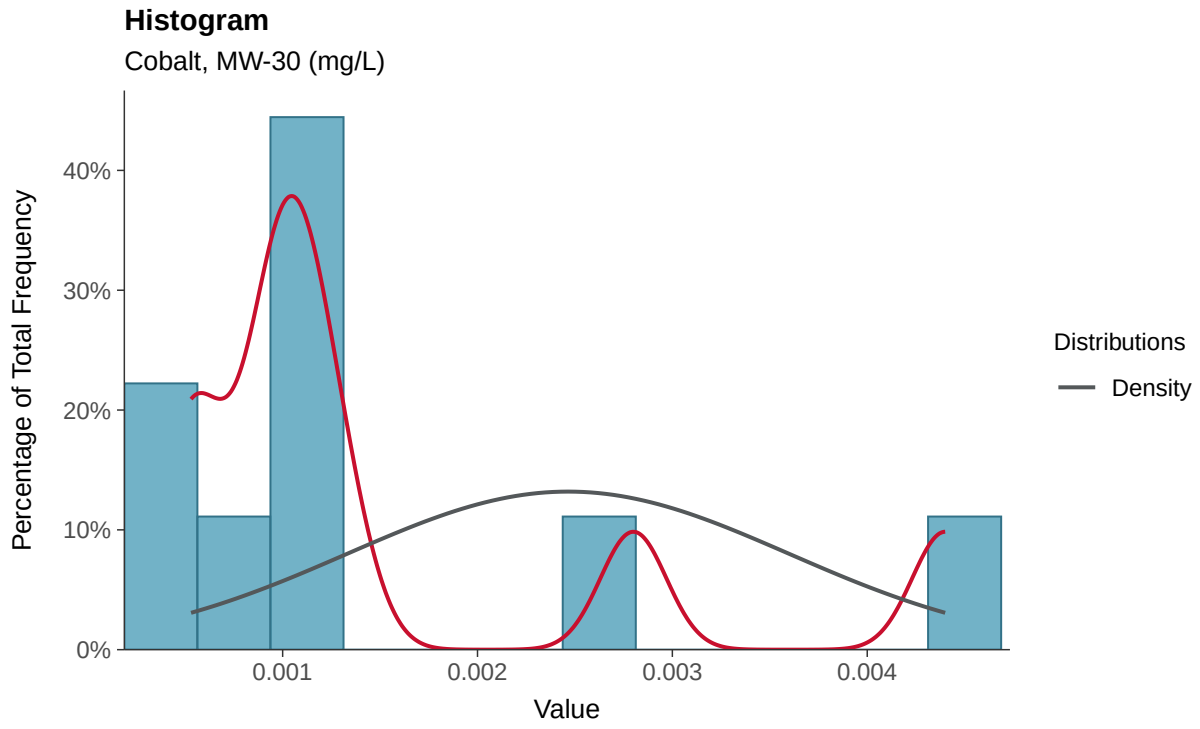

Trend Regression: Piecewise Linear-Linear
Chromium, Total, MW-30 (mg/L)
Value
0.0125
0.0100
0.0075
0.0050
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Chromium, Total, MW-30 (mg/L)
Value
0.0150
0.0125
0.0100
0.0075
0.0050
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Cobalt, MW-30

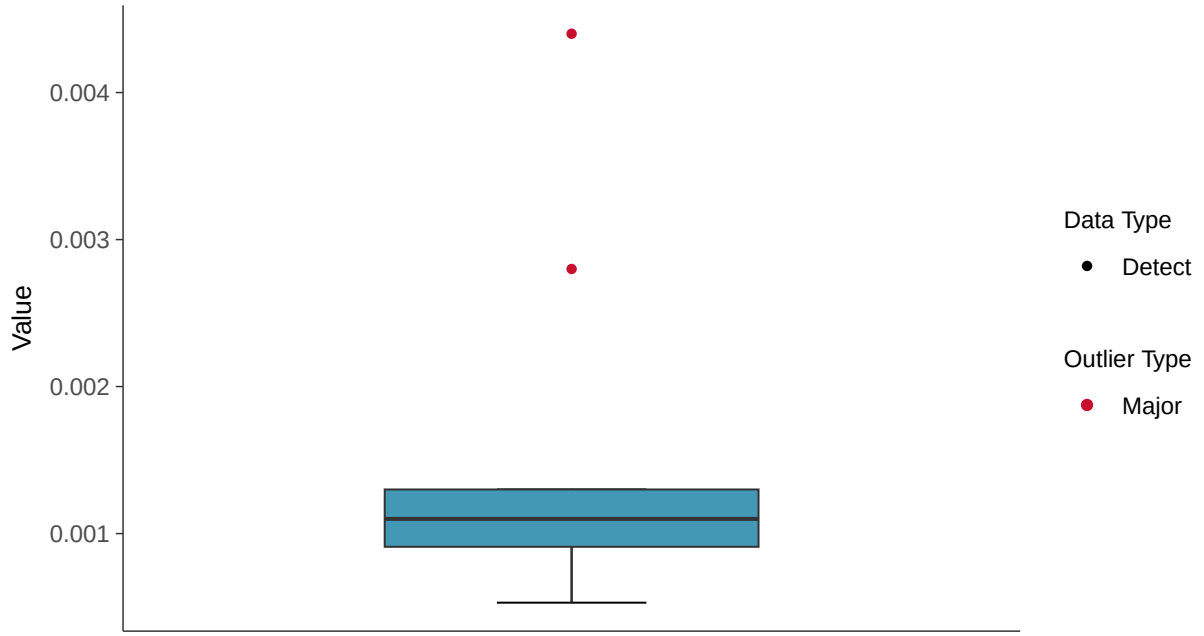
ID: 1_25_5_110





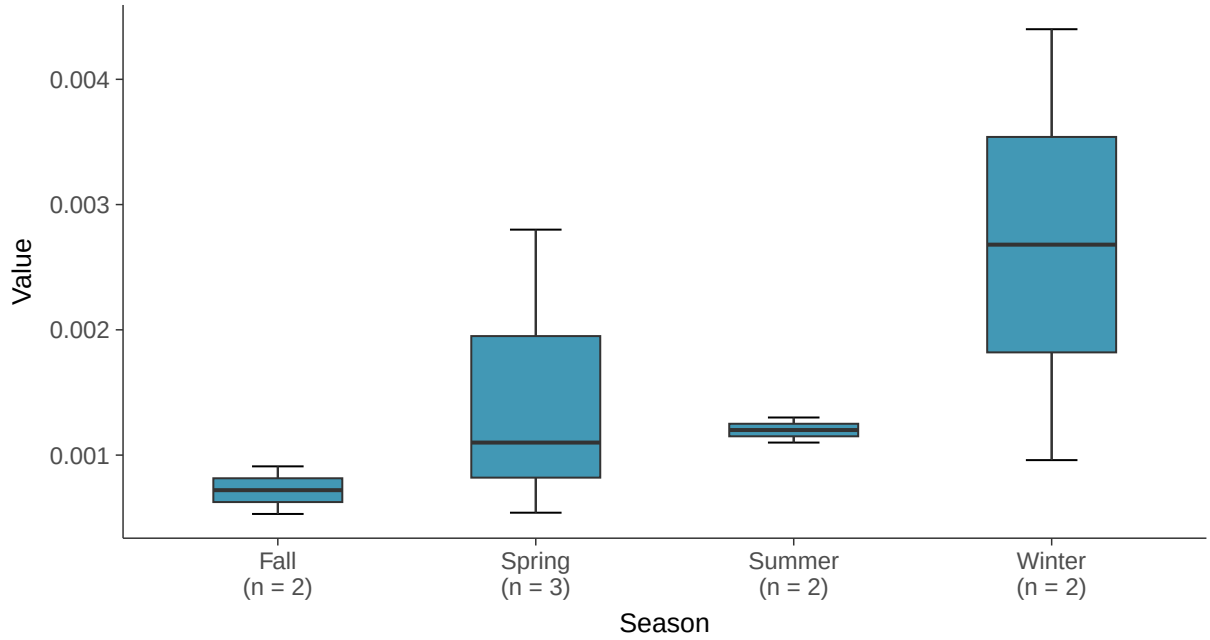
Boxplot

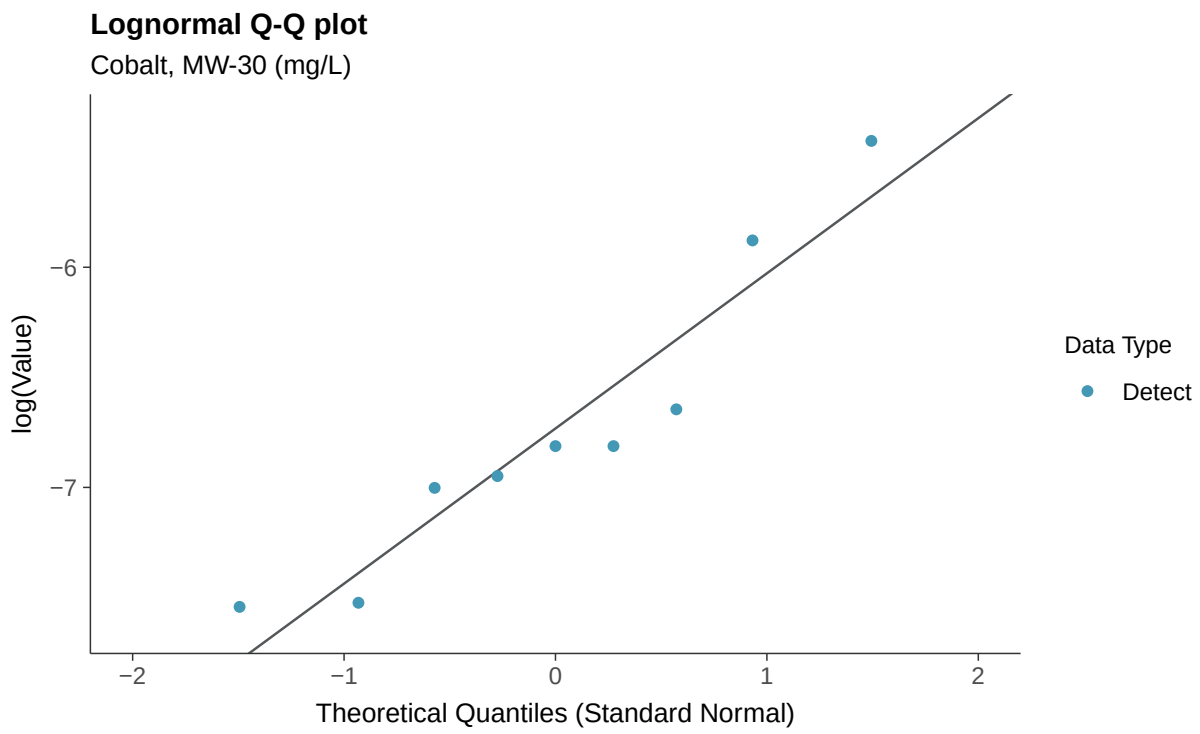
Cobalt, MW-30 (mg/L)

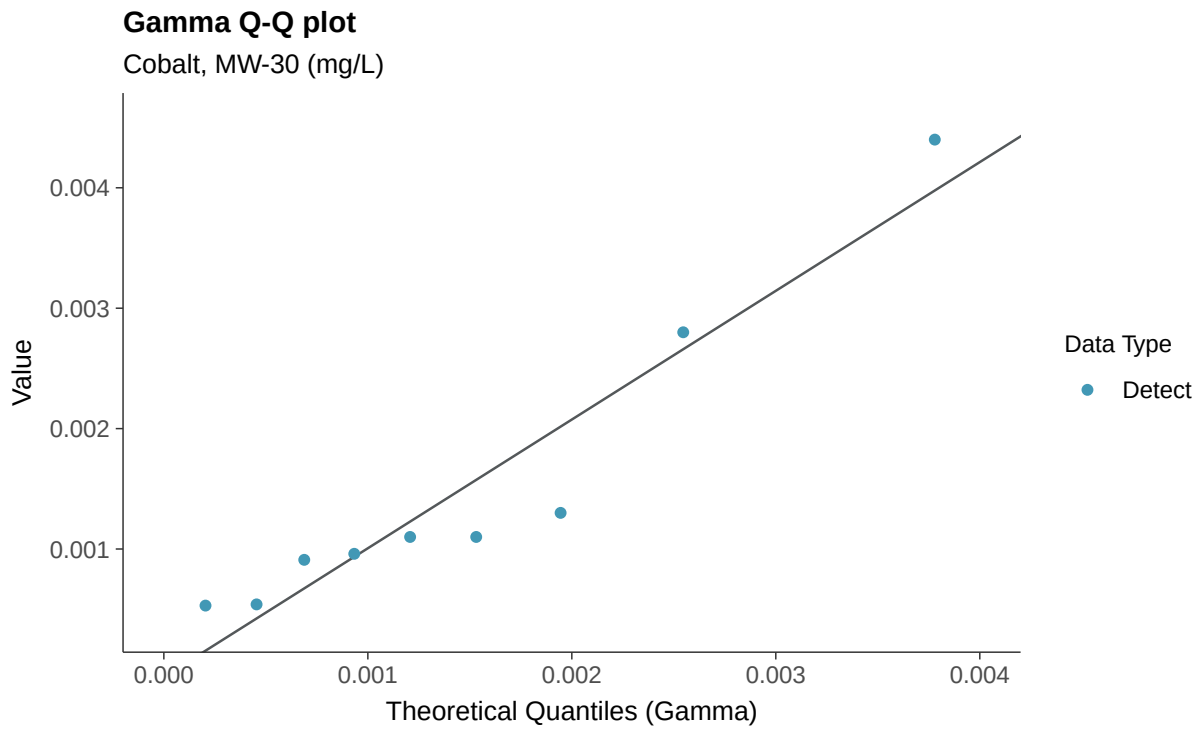


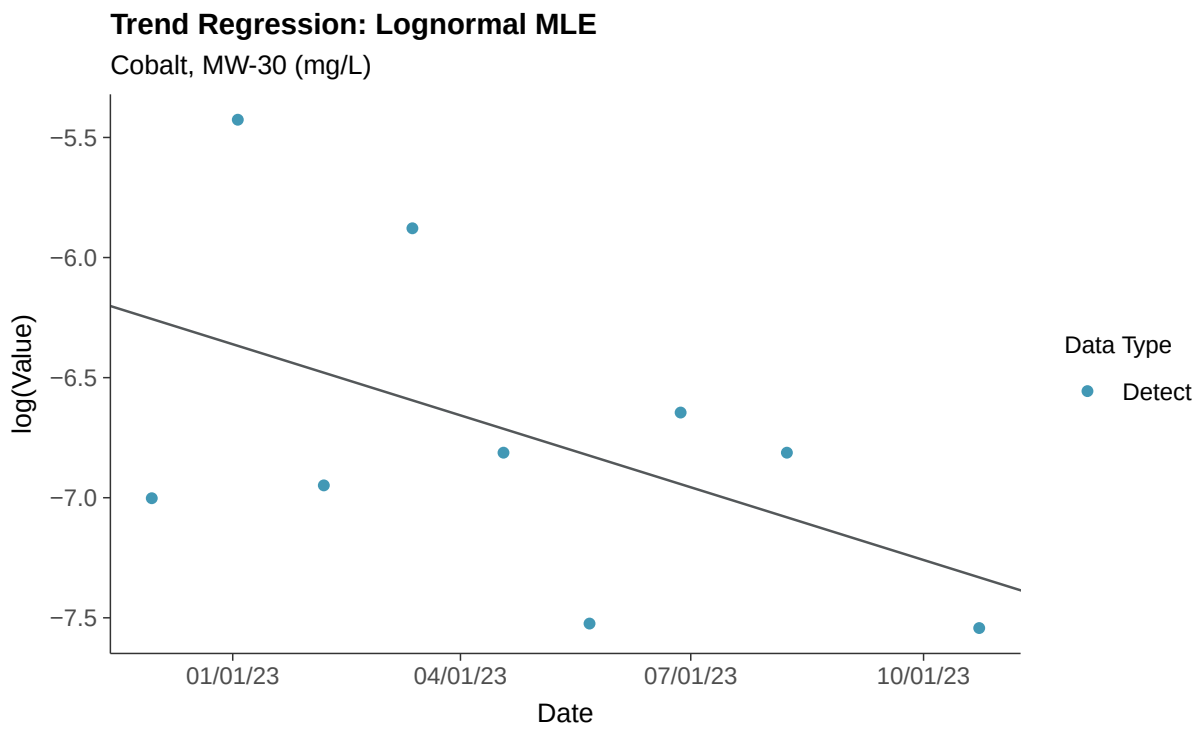
Boxplot by Season

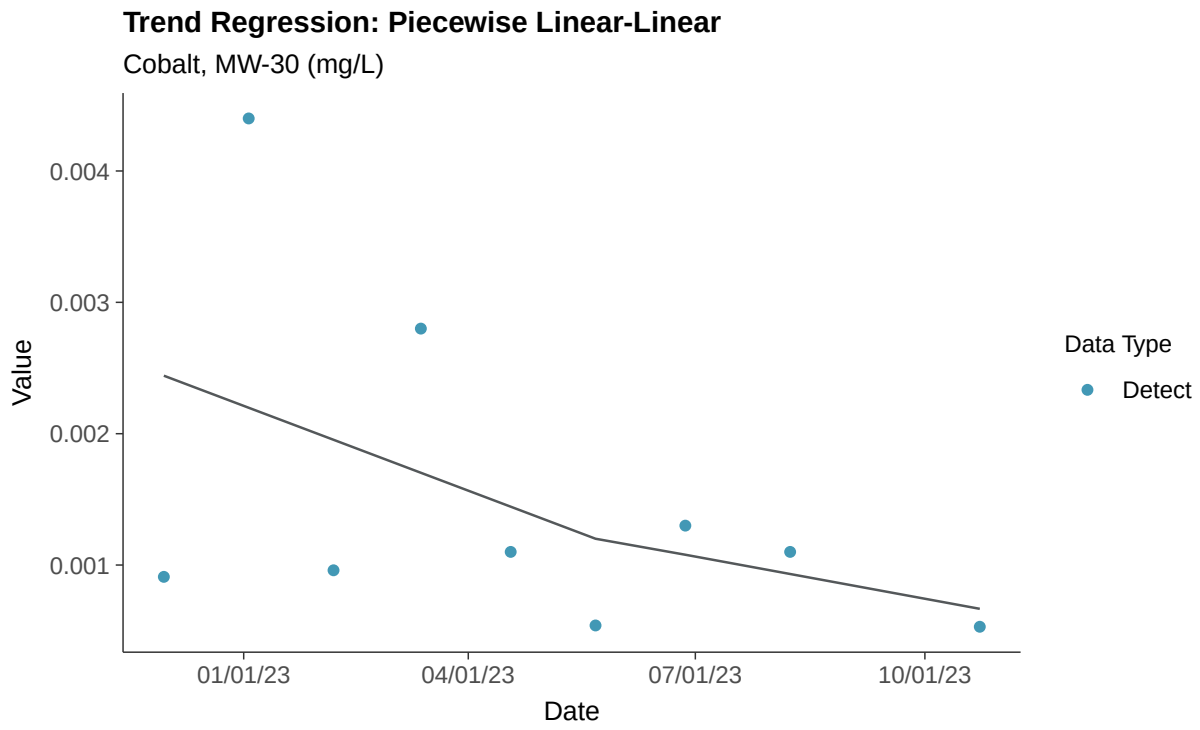
Cobalt, MW-30 (mg/L)




Lognormal Q-Q plot
Cobalt, MW-30 (mg/L)
log(Value)
−6
−7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

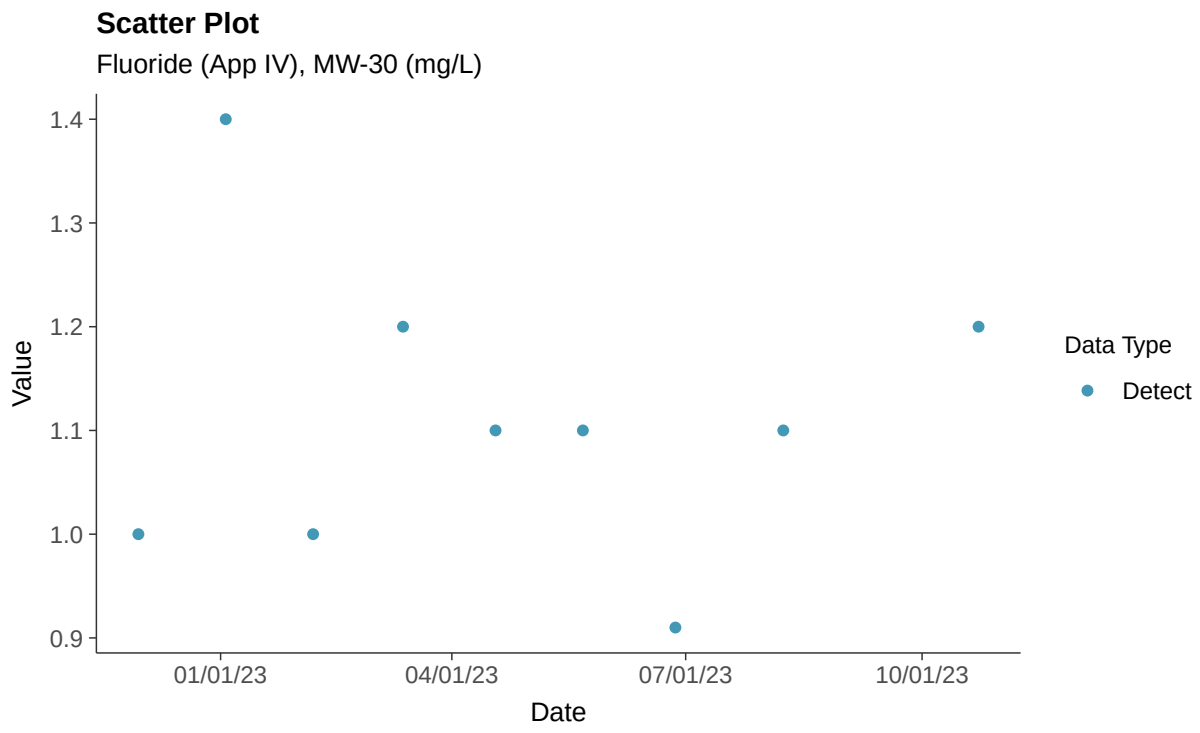

Gamma Q-Q plot
Cobalt, MW-30 (mg/L)
Value
0.004
0.003
0.002
0.001
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect

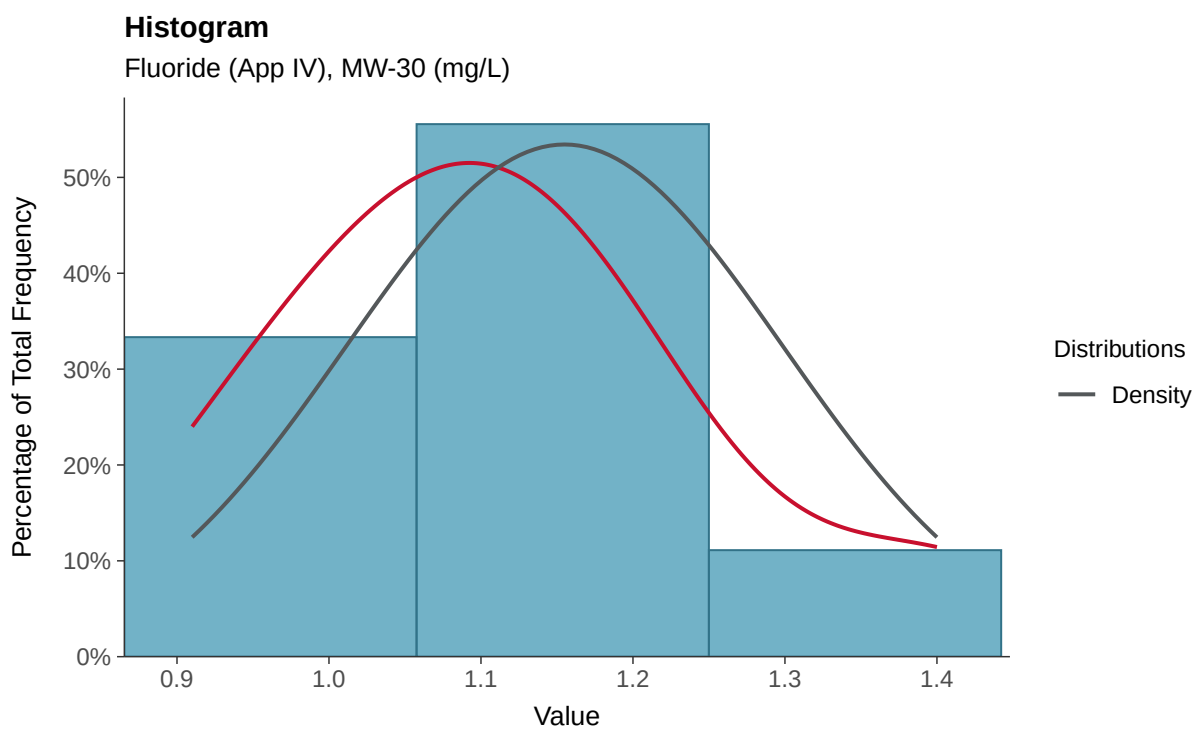

Trend Regression: Lognormal MLE
Cobalt, MW-30 (mg/L)
log(Value)
−5.5
−6.0
−6.5
−7.0
−7.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Cobalt, MW-30 (mg/L)
Value
0.004
0.003
0.002
0.001
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-30

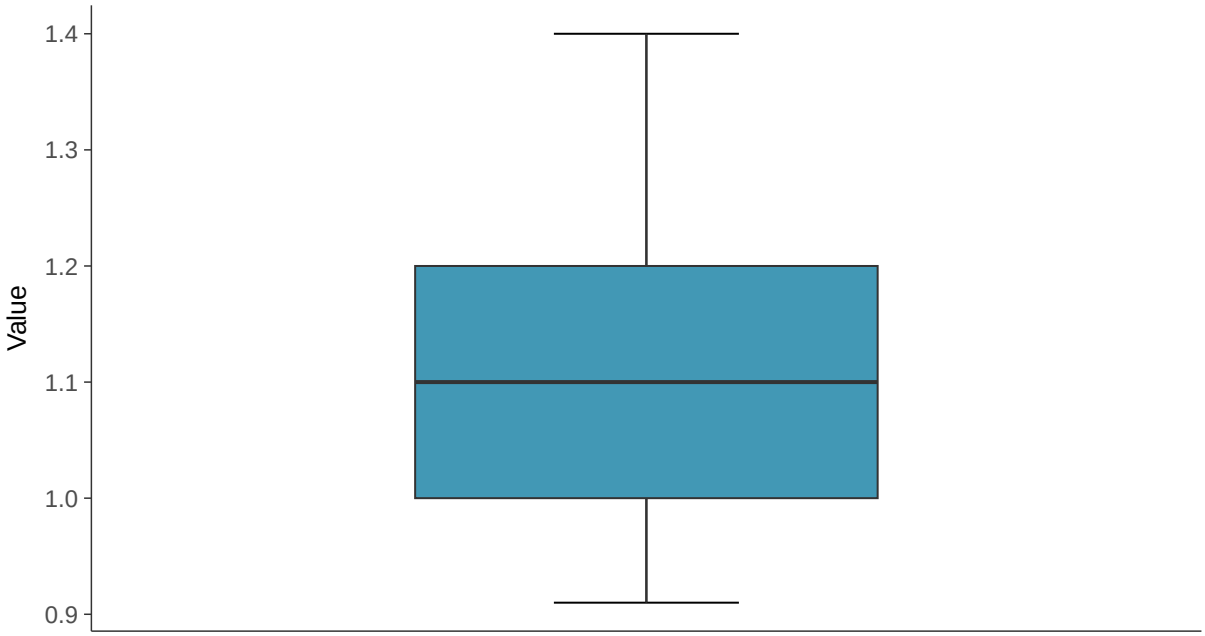
ID: 1_25_5_113





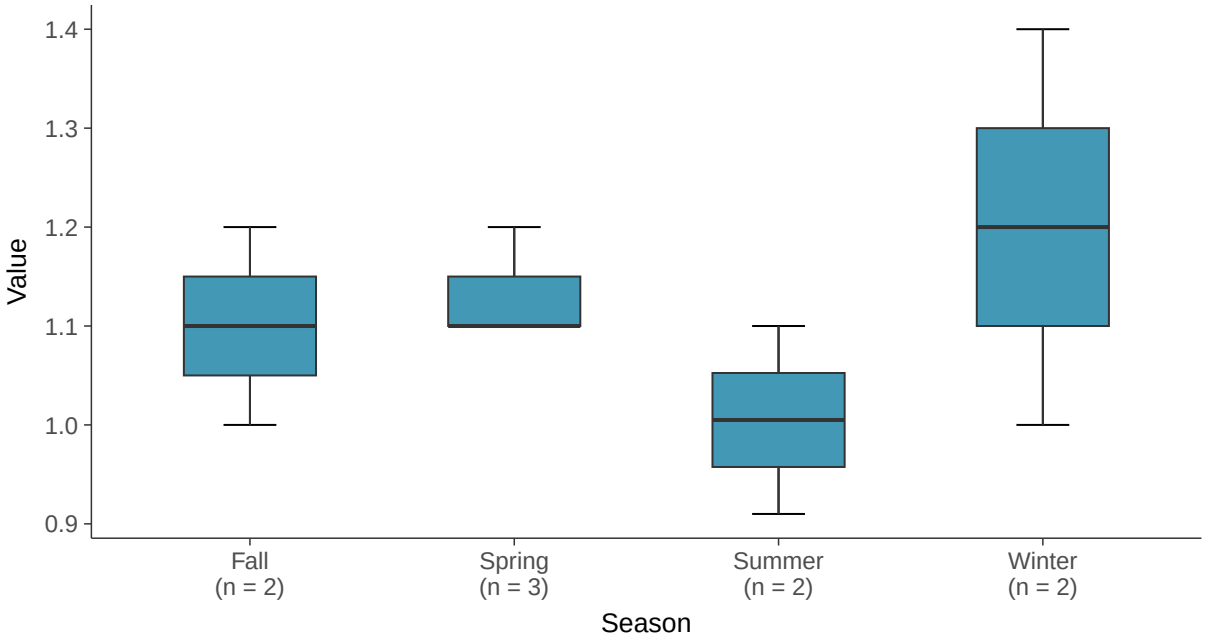
Boxplot

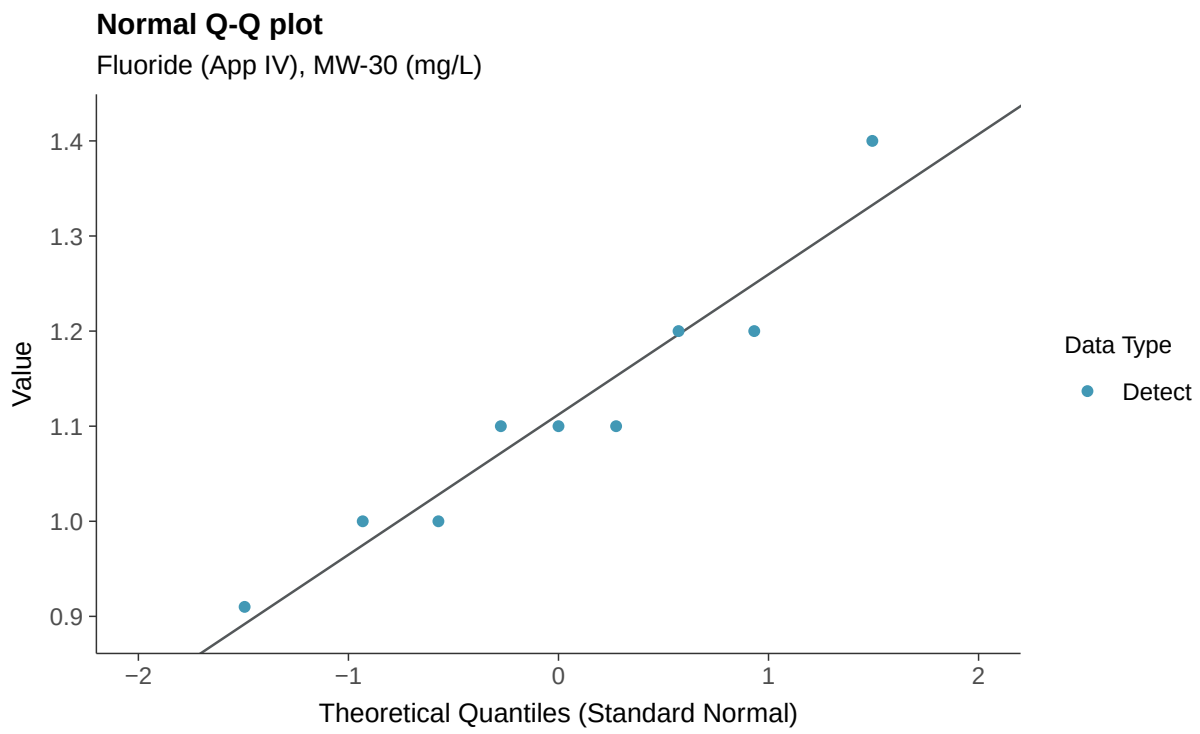
Fluoride (App IV), MW-30 (mg/L)

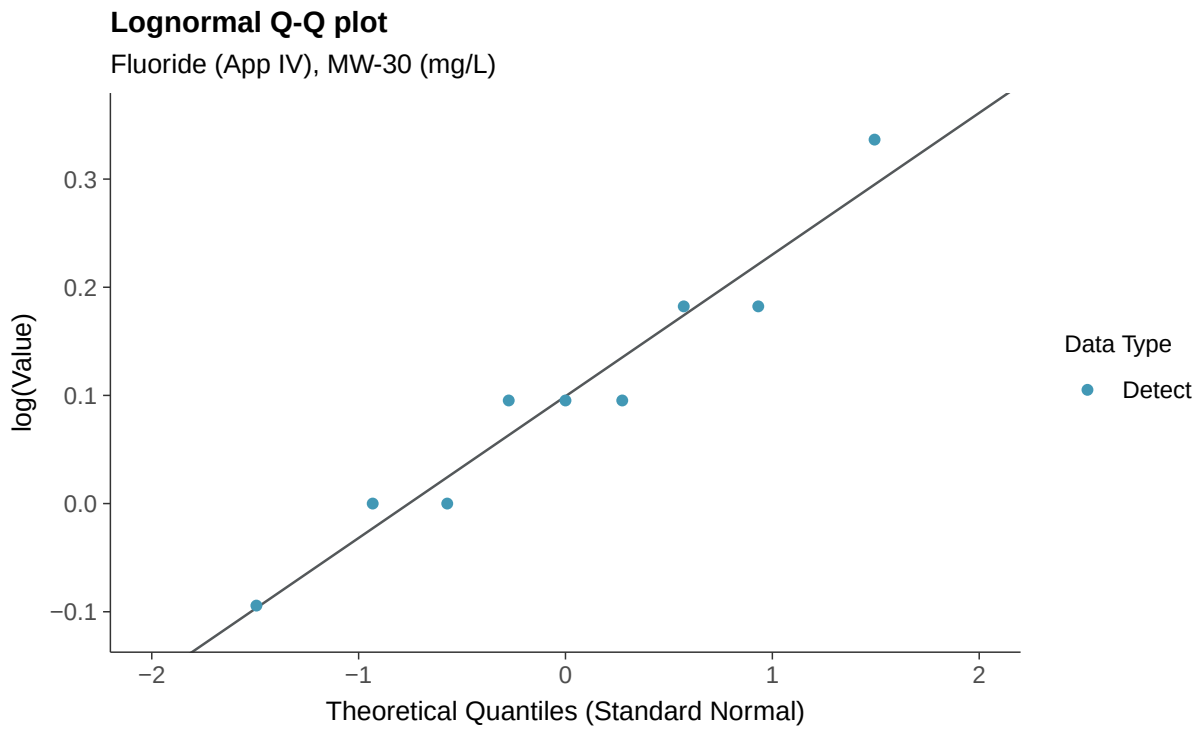


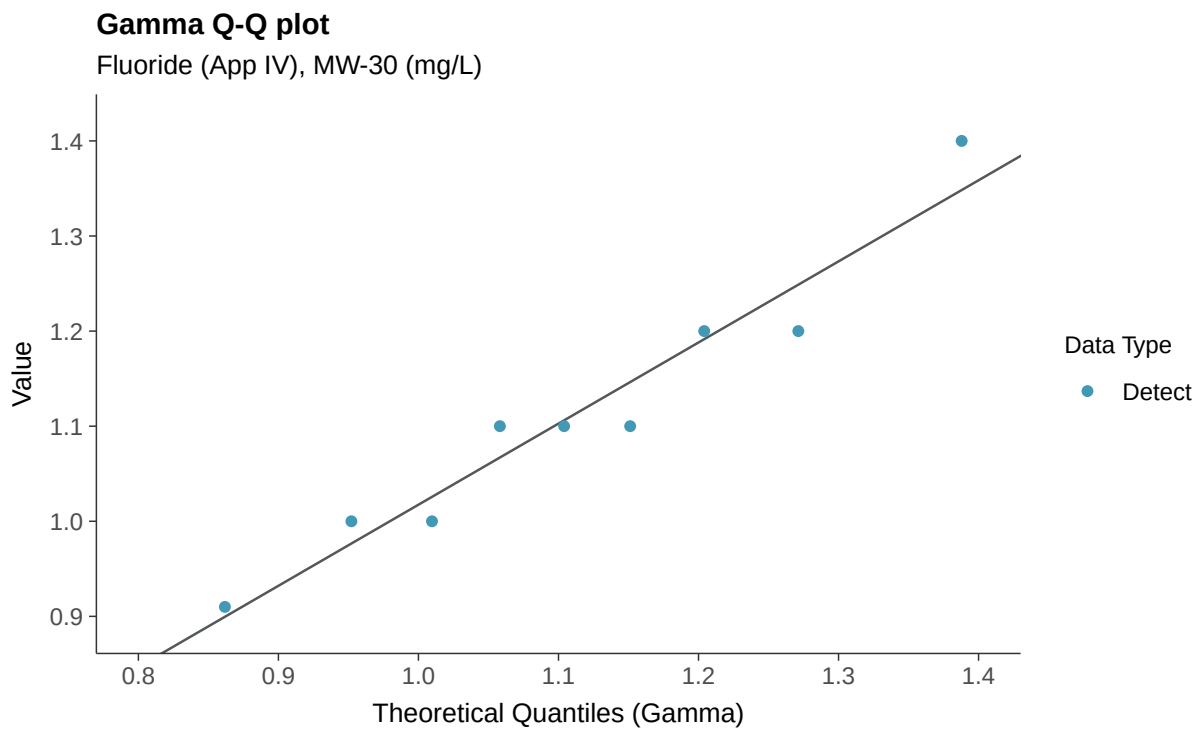
Boxplot by Season

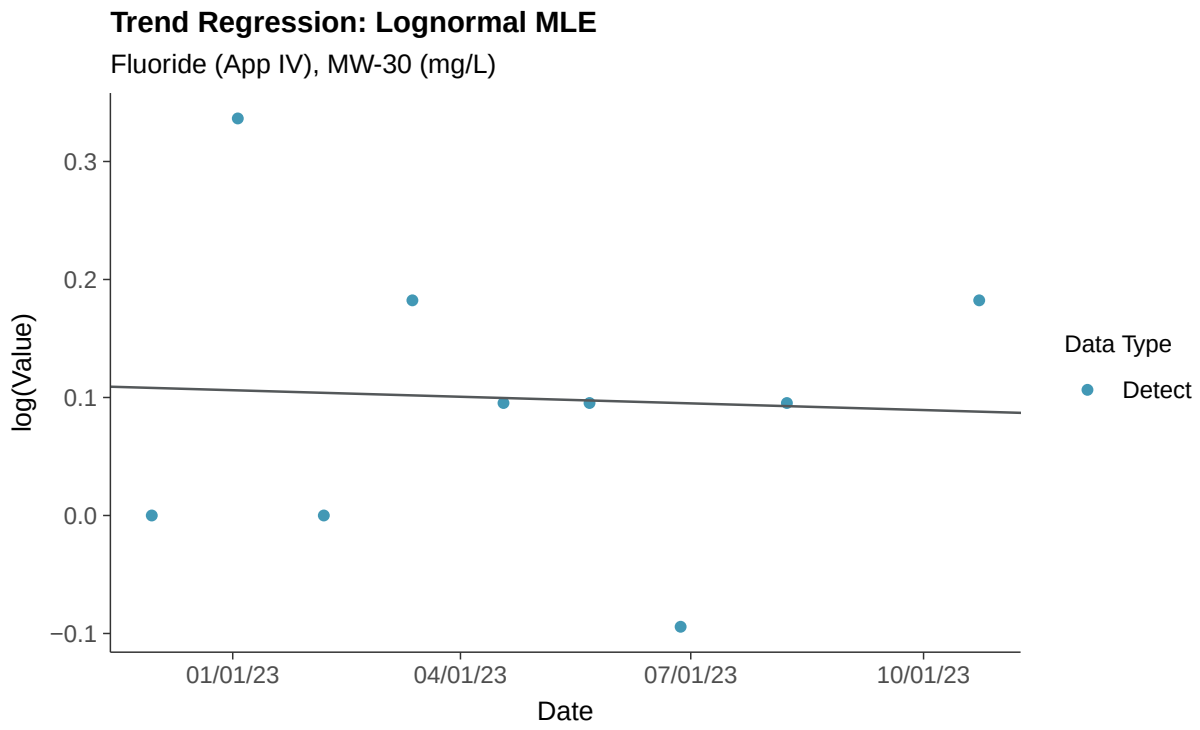
Fluoride (App IV), MW-30 (mg/L)




Normal Q-Q plot
Fluoride (App IV), MW-30 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
0.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

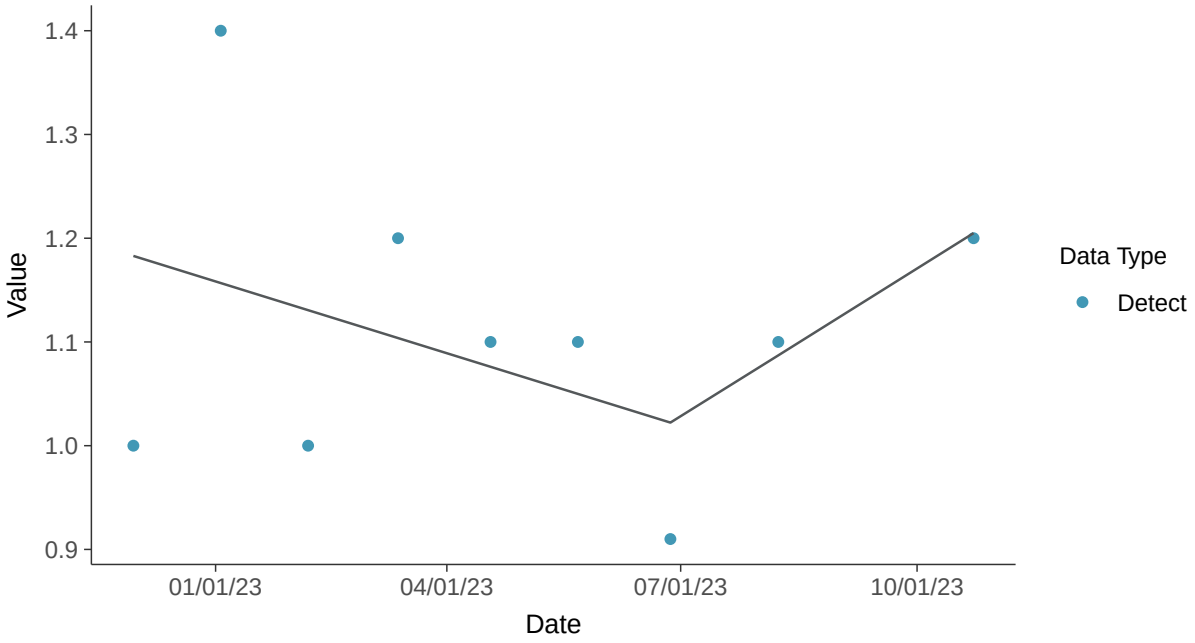

Lognormal Q-Q plot
Fluoride (App IV), MW-30 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
−0.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride (App IV), MW-30 (mg/L)
Value
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.9
1.0
1.1
1.2
1.3
1.4
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-30 (mg/L)
log(Value)
0.3
0.2
0.1
0.0
−0.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

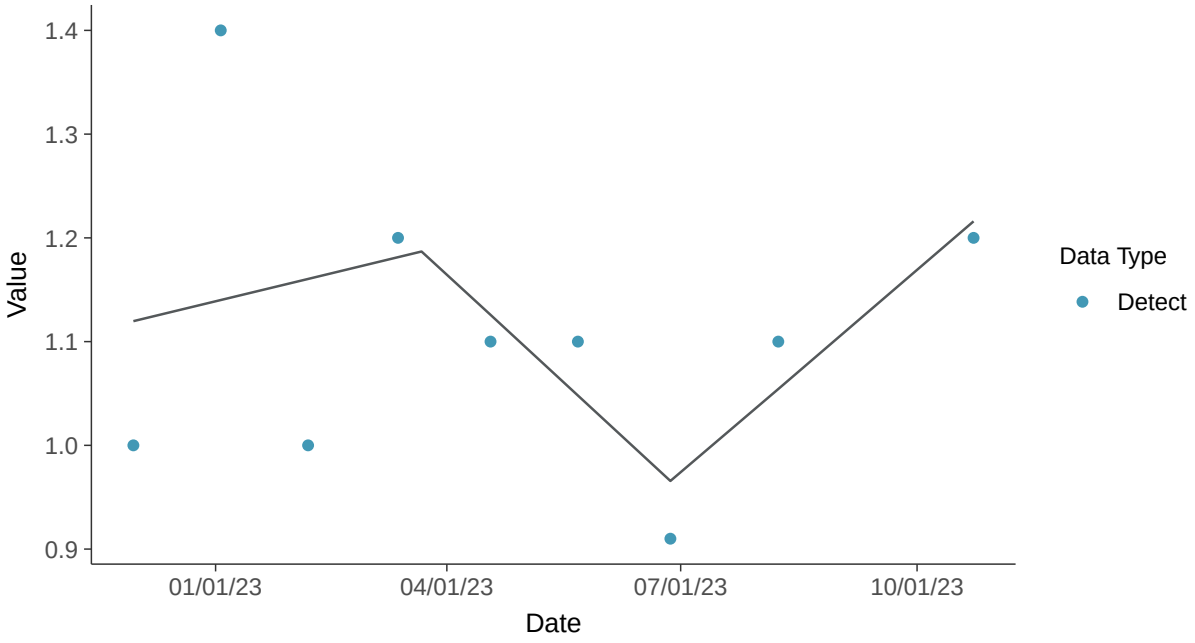
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-30 (mg/L)



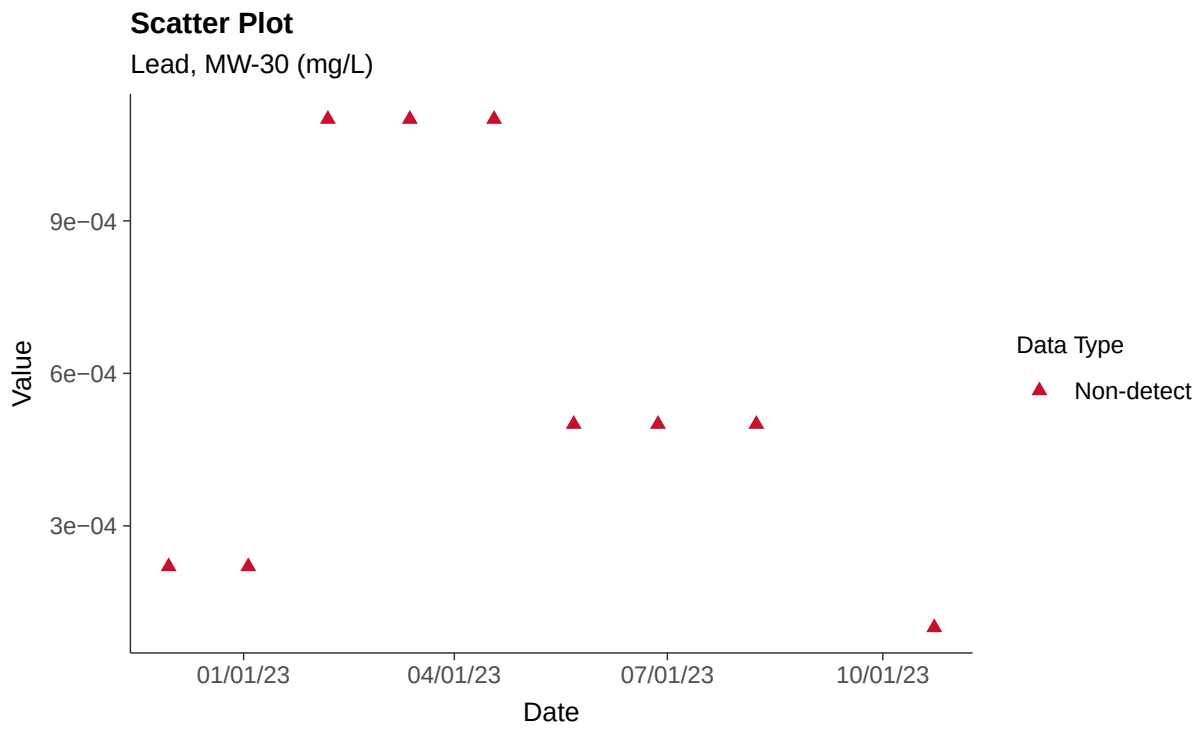
Trend Regression: Piecewise Linear-Linear-Linear

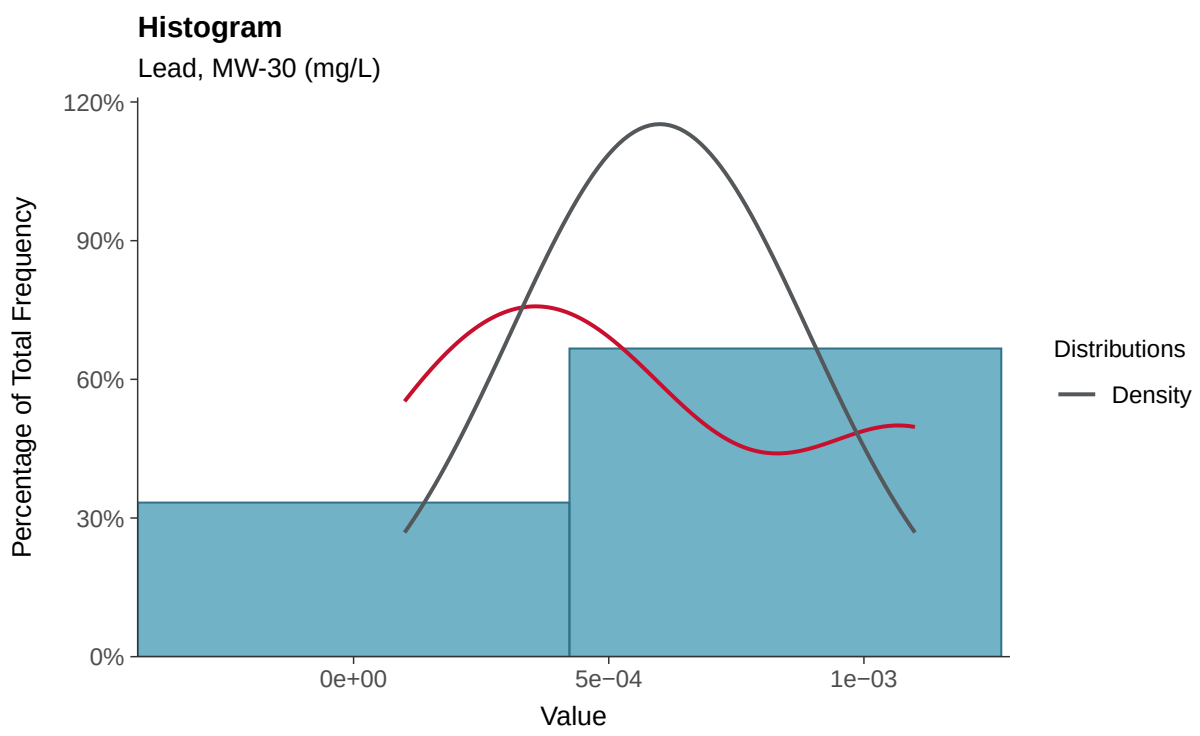
Fluoride (App IV), MW-30 (mg/L)



Appendix IV: Lead, MW-30

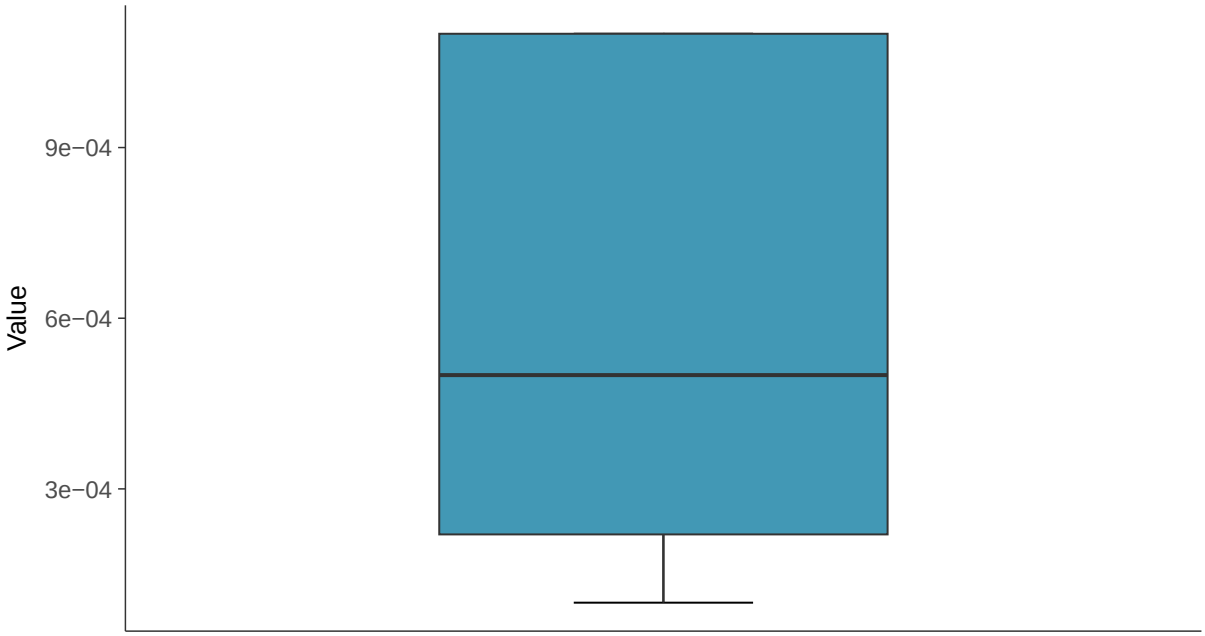
ID: 1_25_5_115





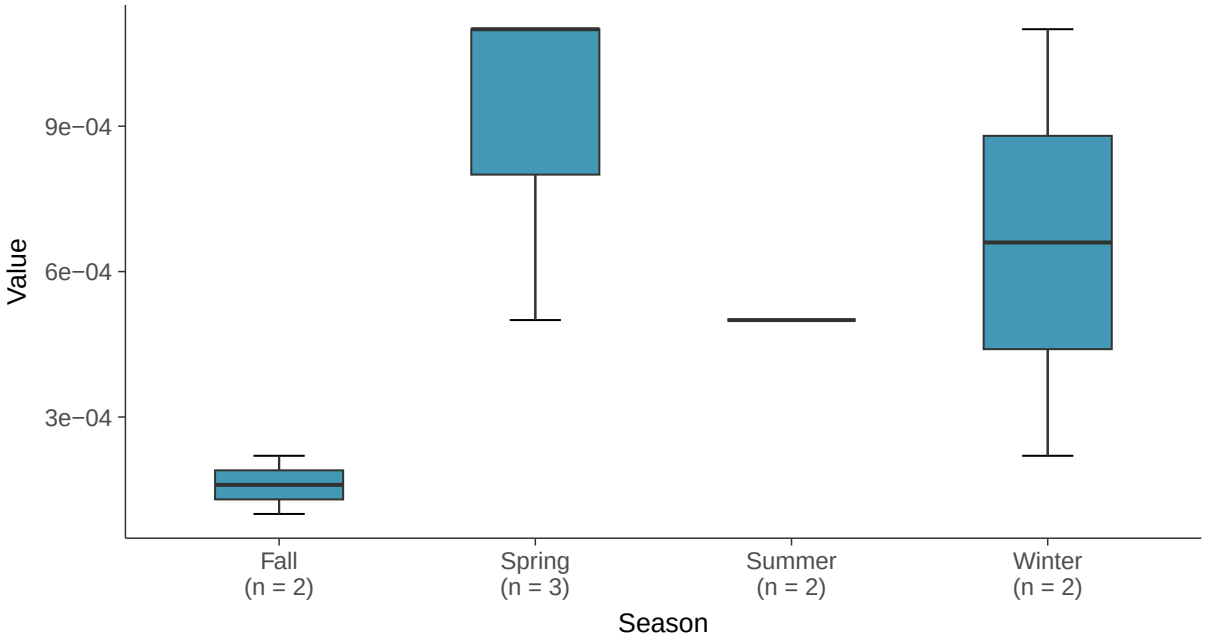
Boxplot

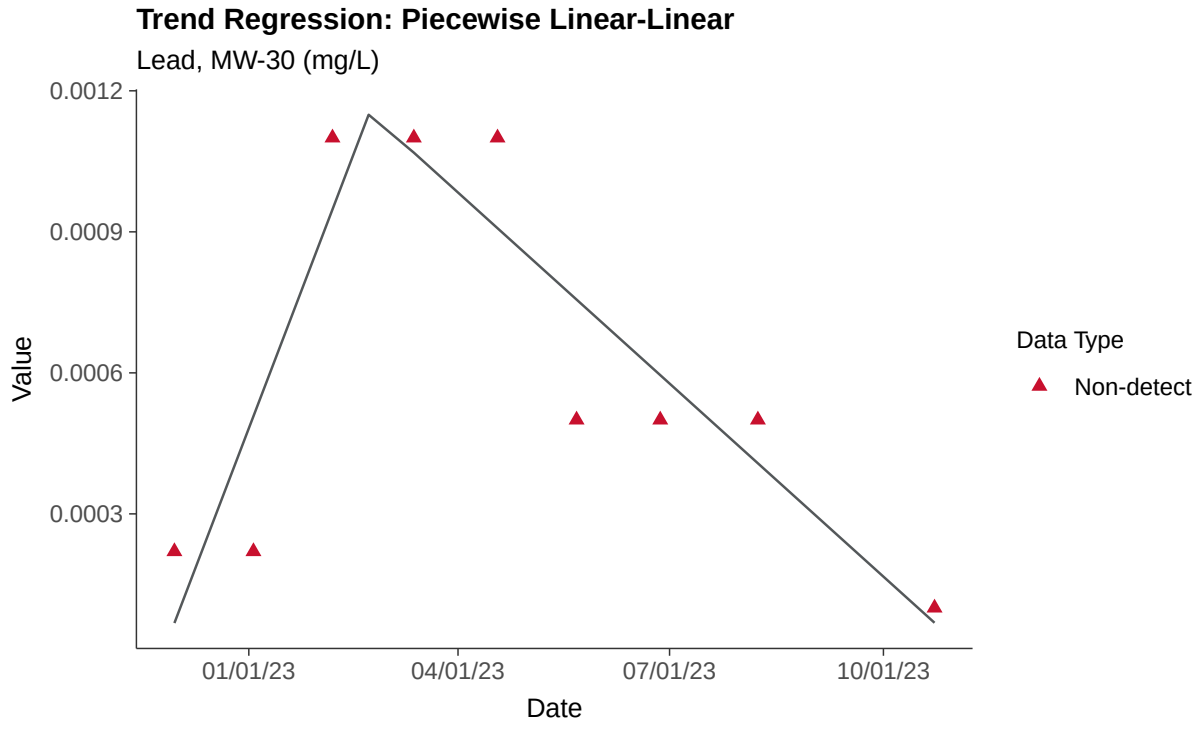
Lead, MW-30 (mg/L)

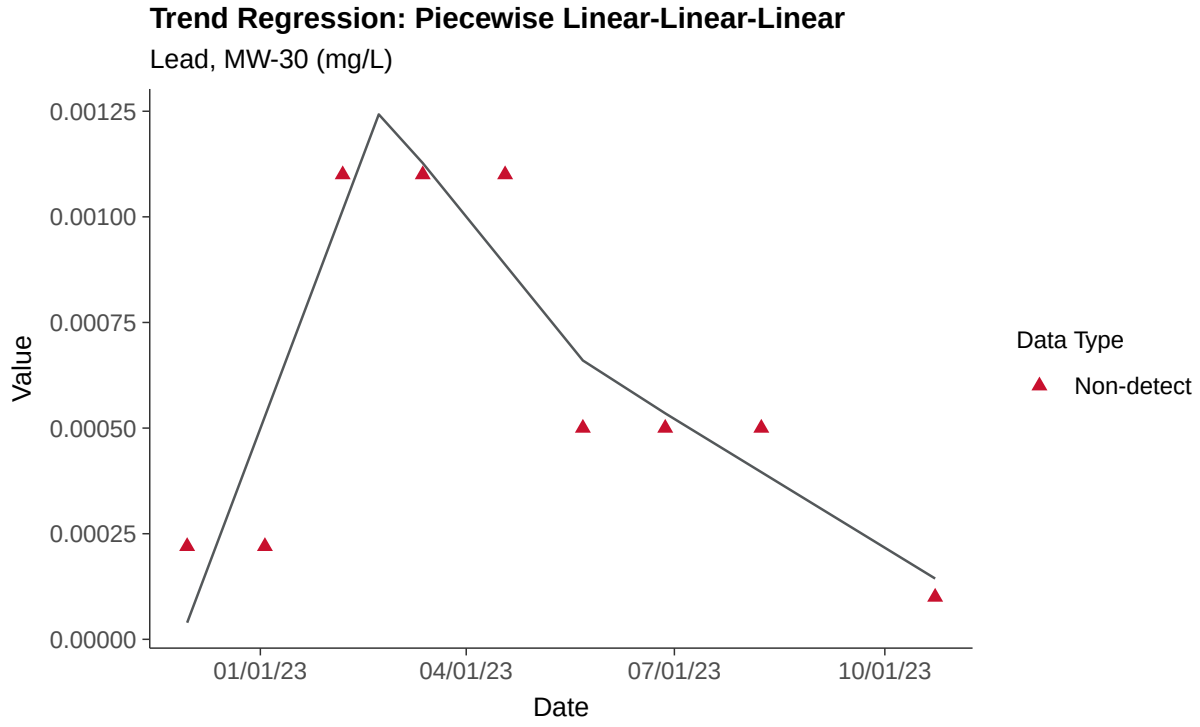


Boxplot by Season

Lead, MW-30 (mg/L)

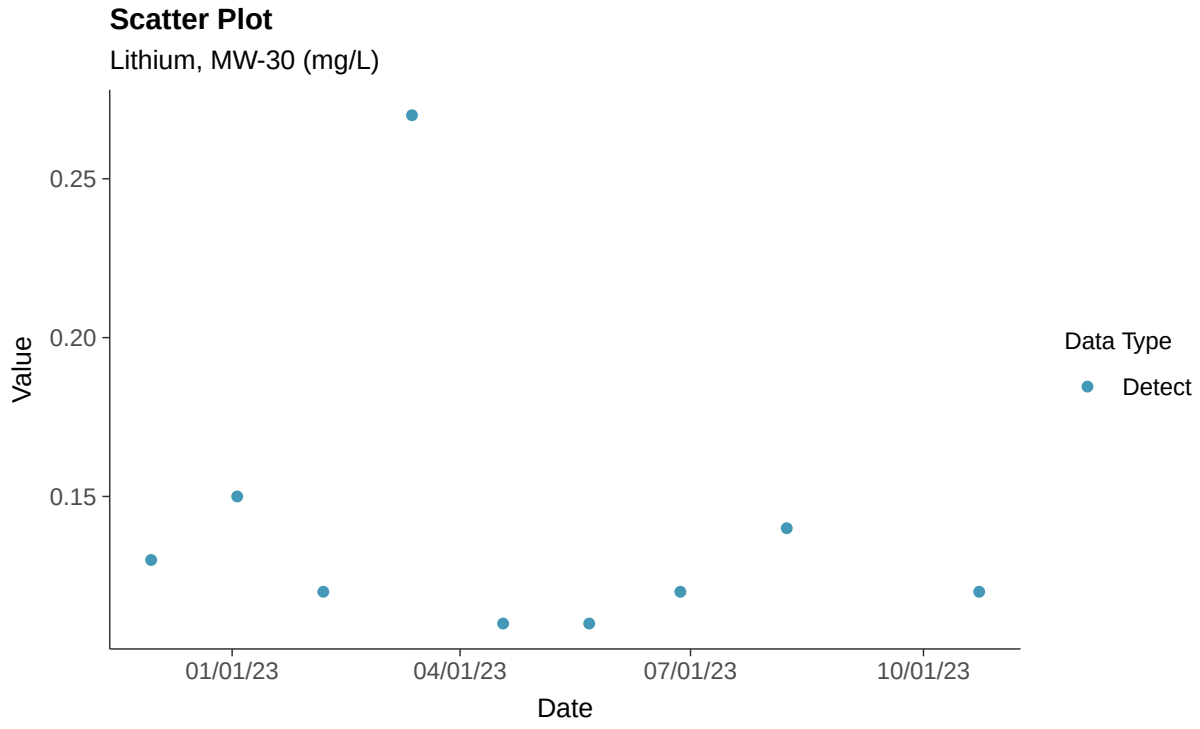


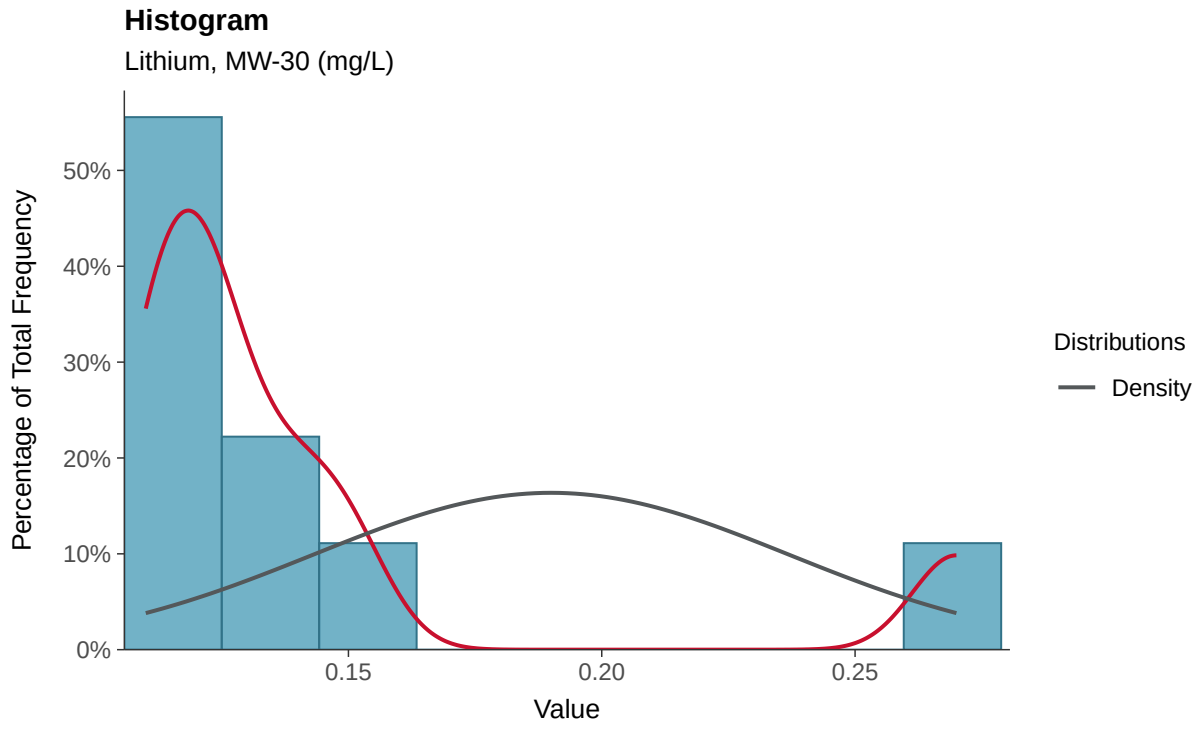

Trend Regression: Piecewise Linear-Linear
Lead, MW-30 (mg/L)
0.0012
0.0009
0.0006
0.0003
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-30 (mg/L)
0.00125
0.00100
0.00075
0.00050
0.00025
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Lithium, MW-30

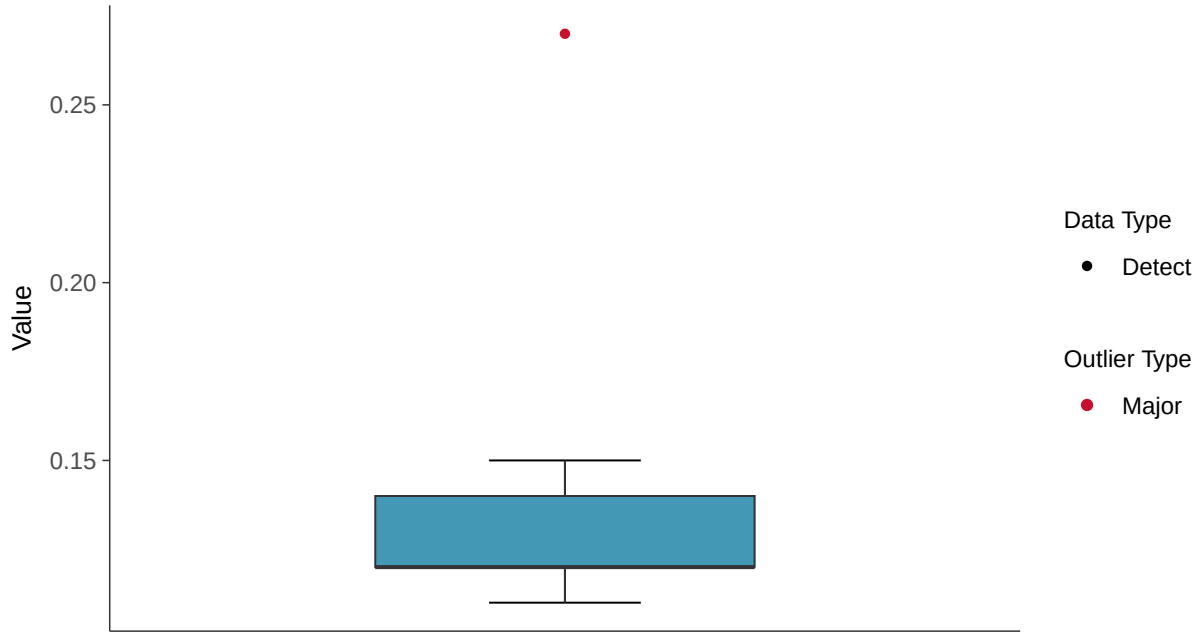
ID: 1_25_5_116





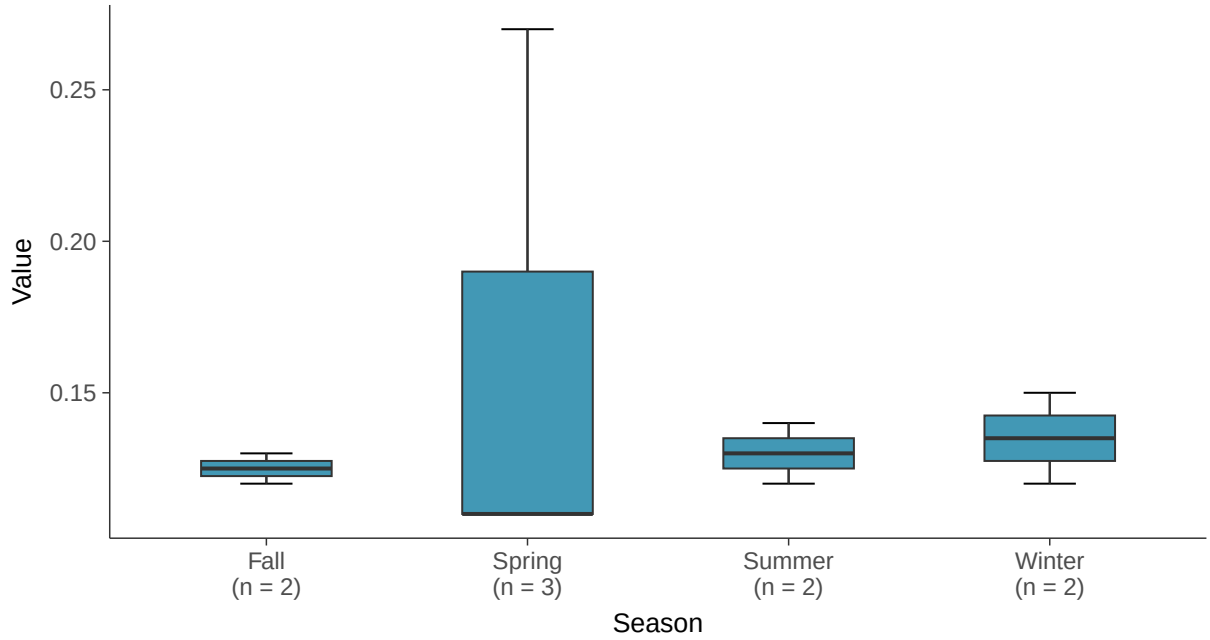
Boxplot

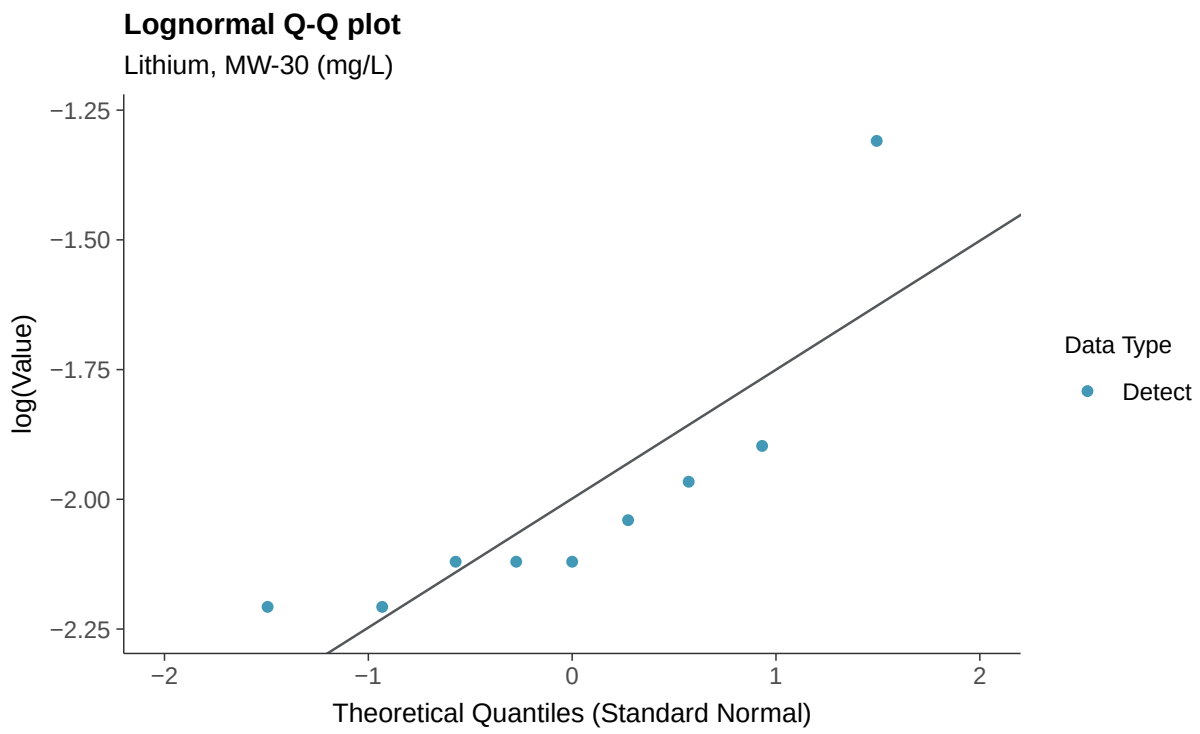
Lithium, MW-30 (mg/L)

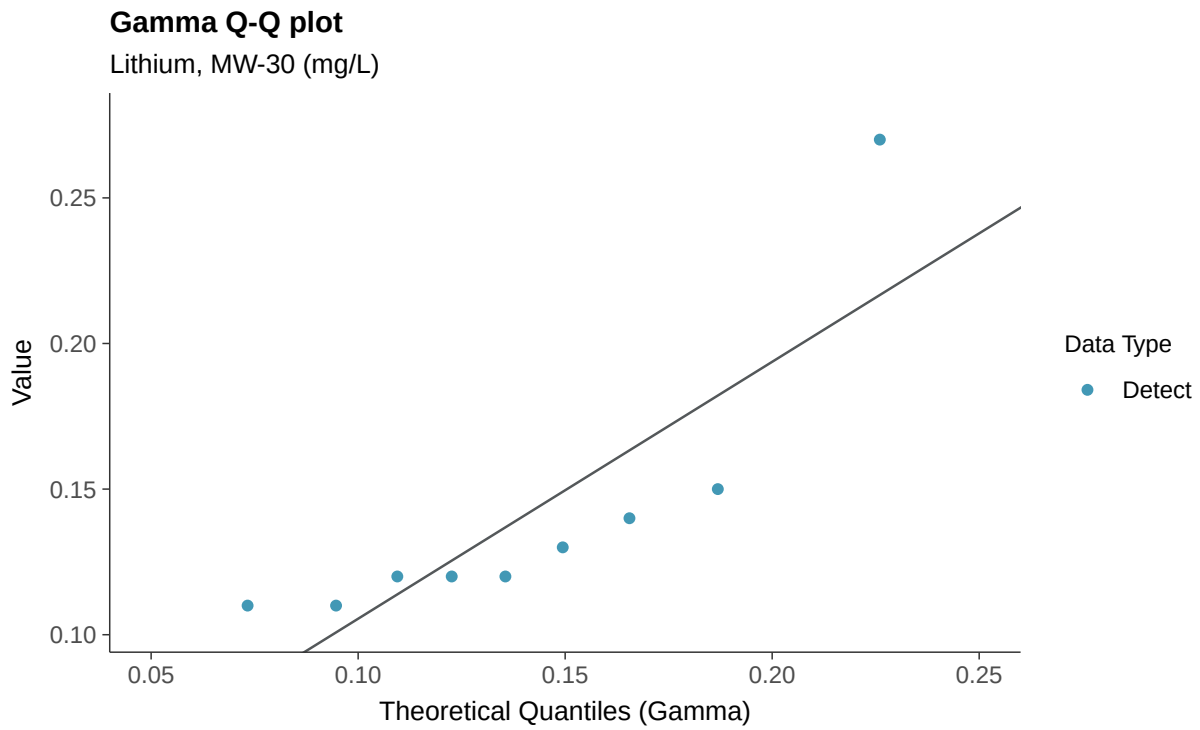


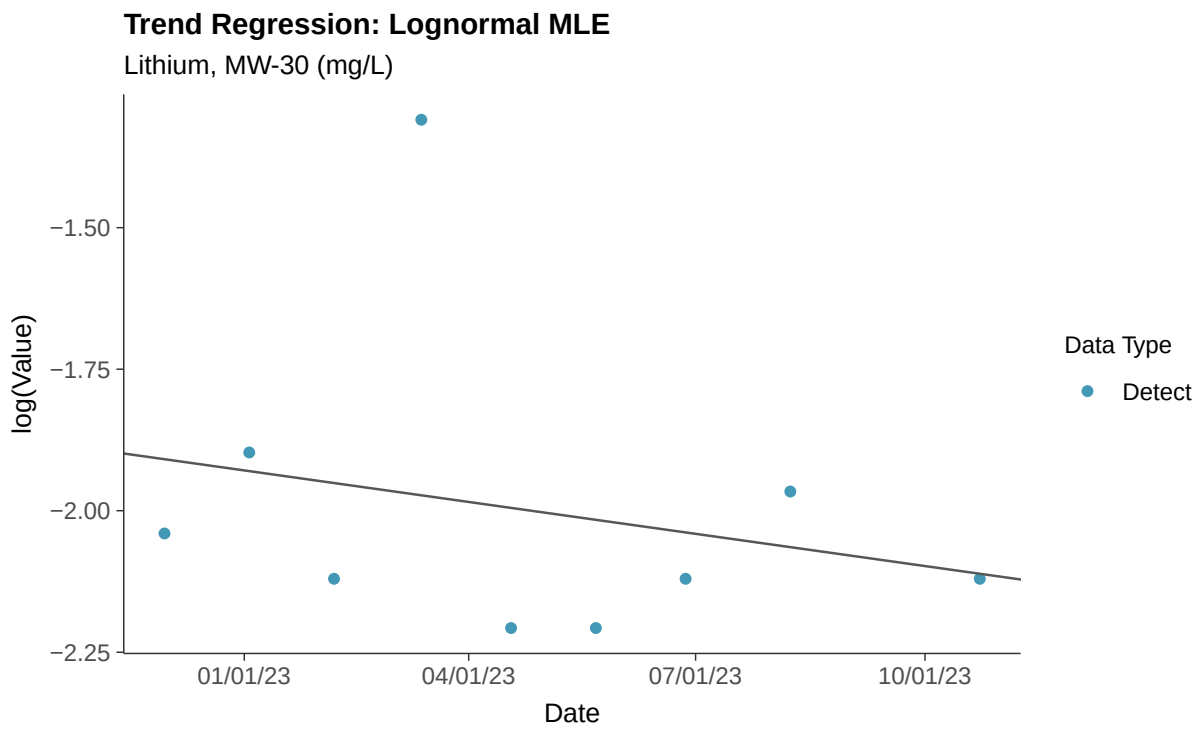
Boxplot by Season

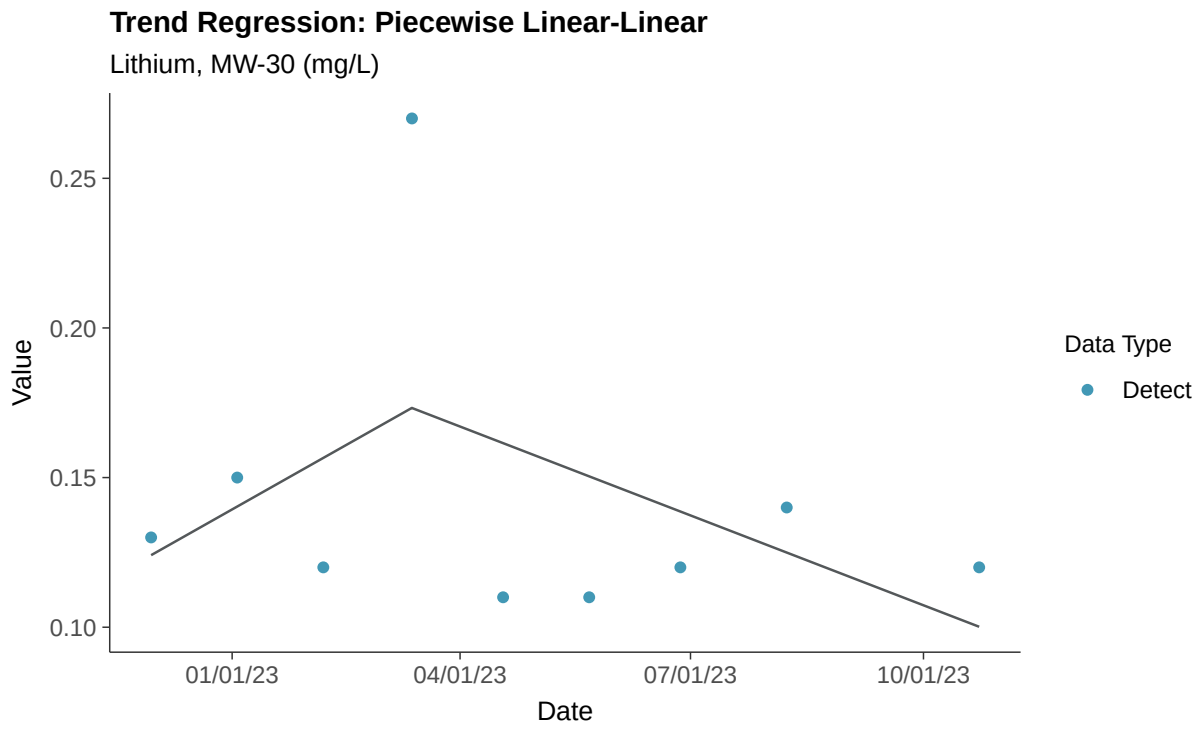
Lithium, MW-30 (mg/L)

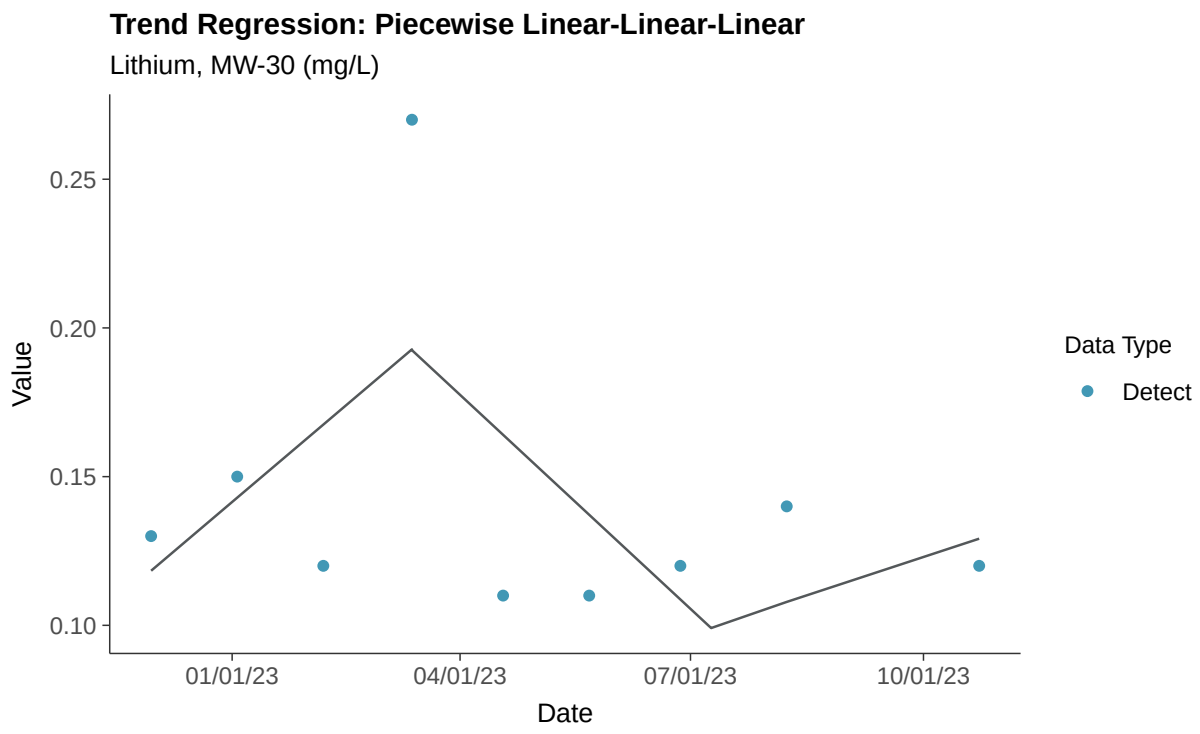



Lognormal Q-Q plot
Lithium, MW-30 (mg/L)
log(Value)
−1.25
−1.50
−1.75
−2.00
−2.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Lithium, MW-30 (mg/L)
Value
0.25
0.20
0.15
0.10
0.05
0.10
0.15
0.20
0.25
Theoretical Quantiles (Gamma)
Data Type
Detect

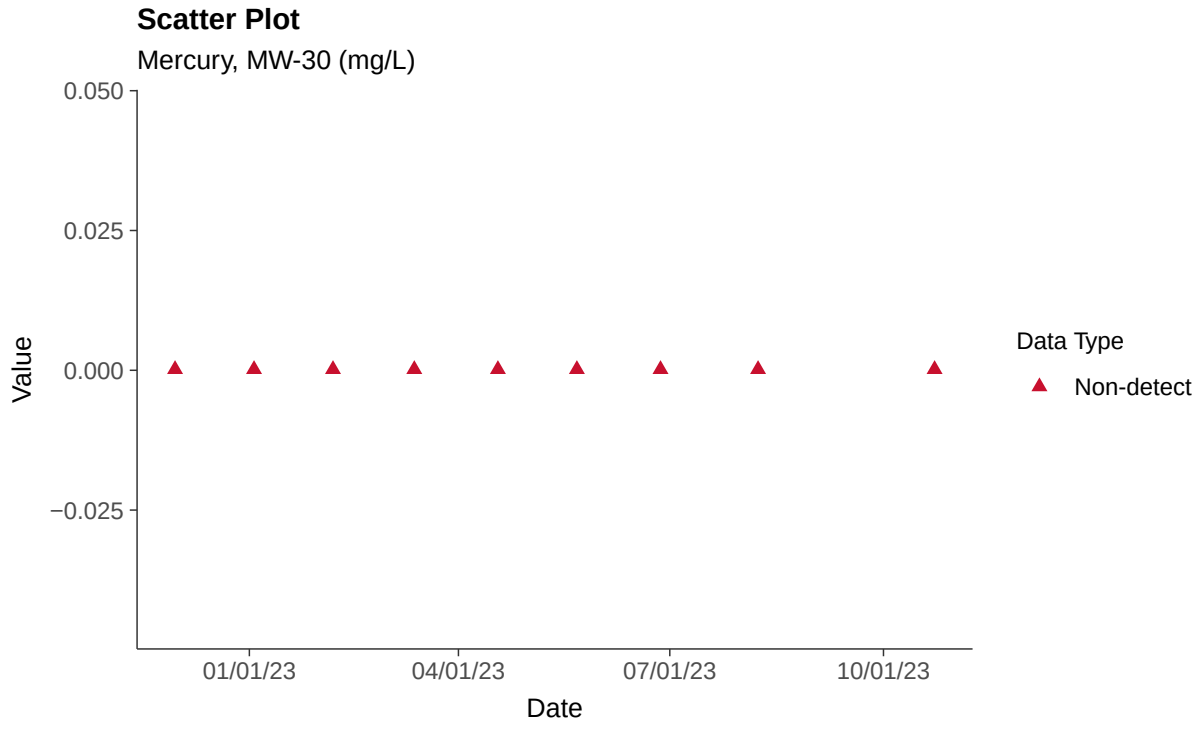

Trend Regression: Lognormal MLE
Lithium, MW-30 (mg/L)
log(Value)
−1.50
−1.75
−2.00
−2.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

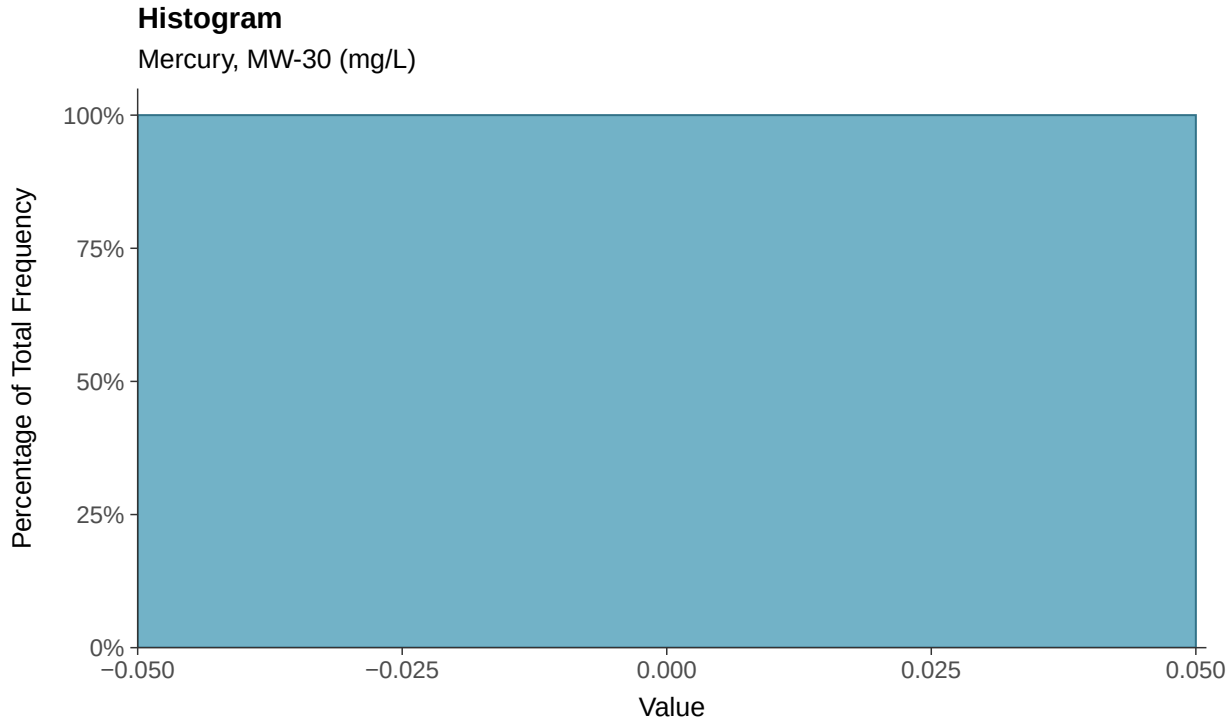

Trend Regression: Piecewise Linear-Linear
Lithium, MW-30 (mg/L)
Value
0.25
0.20
0.15
0.10
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

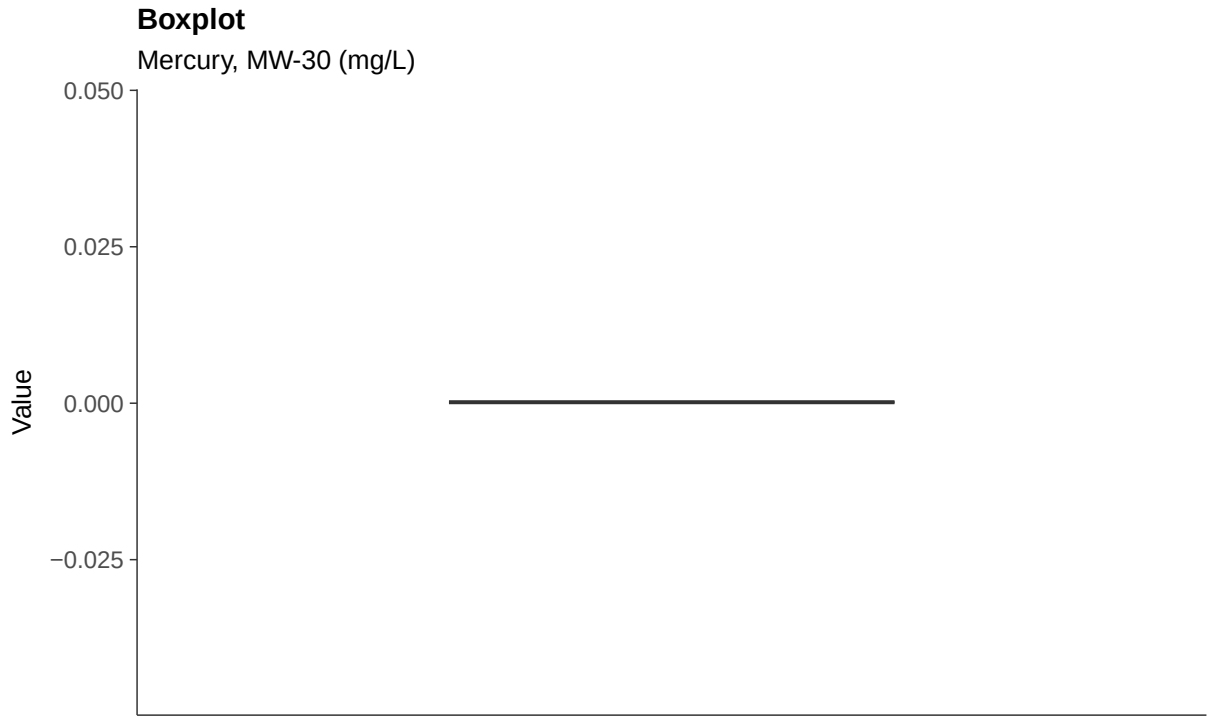

Trend Regression: Piecewise Linear-Linear-Linear
Lithium, MW-30 (mg/L)
Value
0.25
0.20
0.15
0.10
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

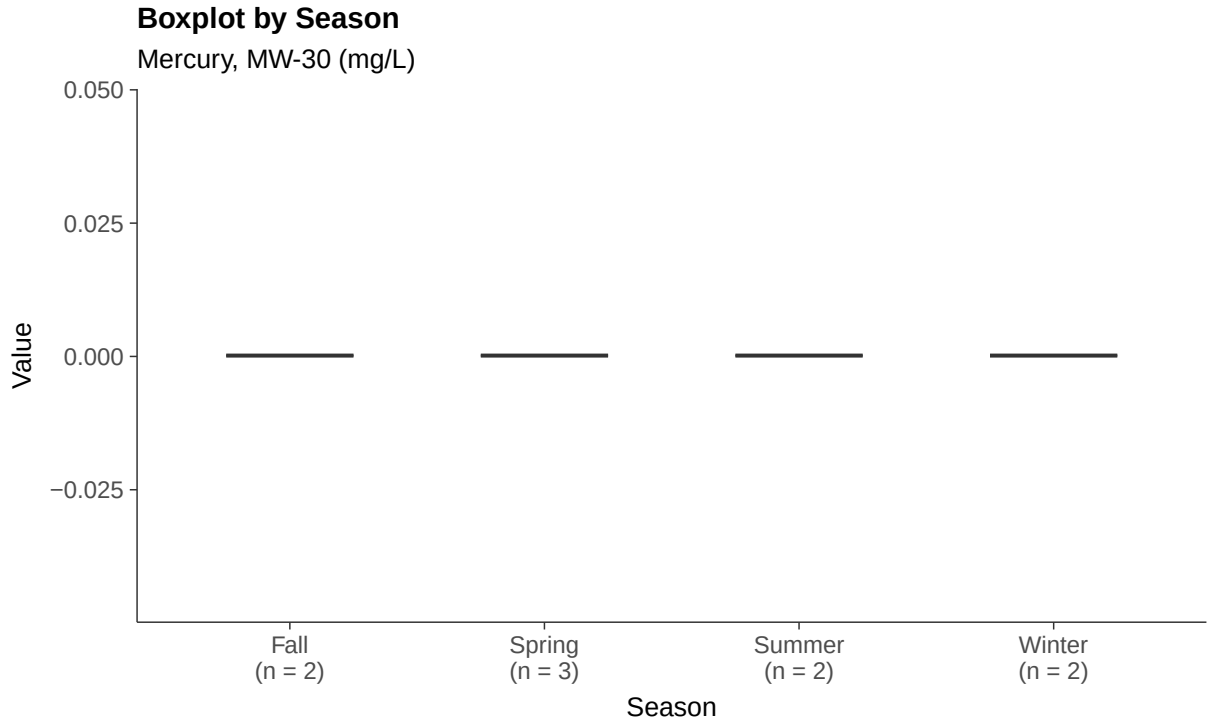
Appendix IV: Mercury, MW-30

ID: 1_25_5_117



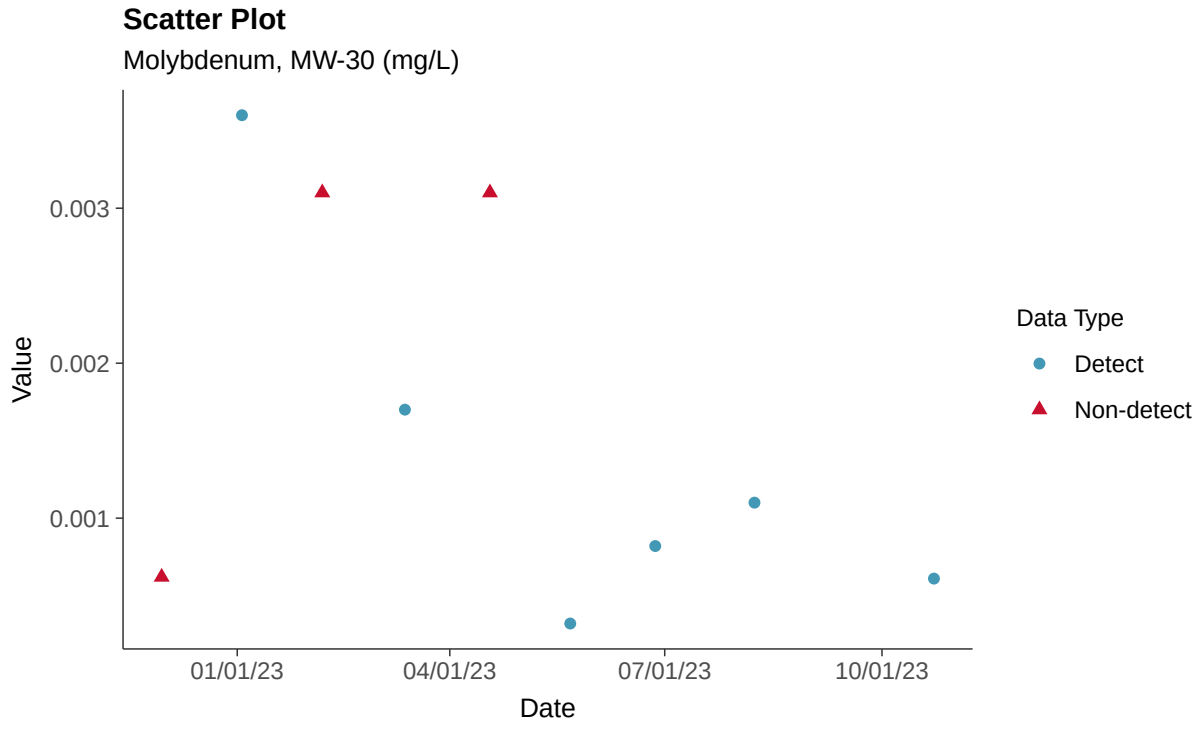


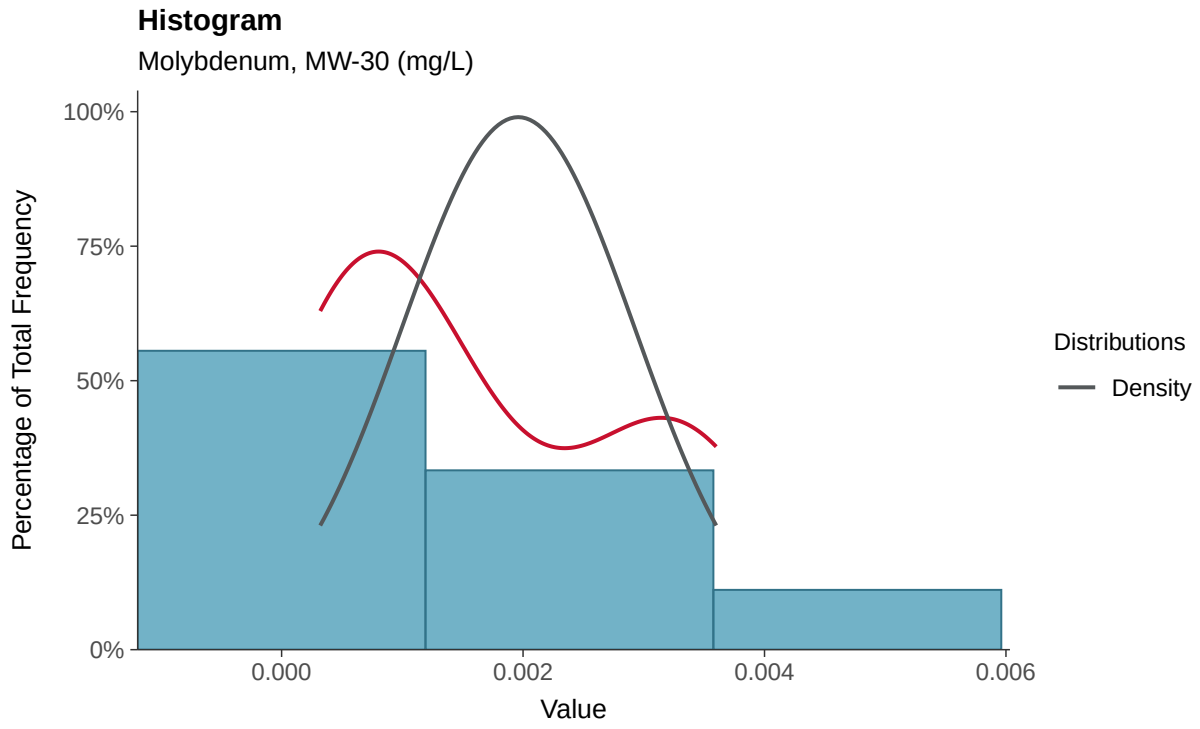

Boxplot
Mercury, MW-30 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Mercury, MW-30 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

Appendix IV: Molybdenum, MW-30

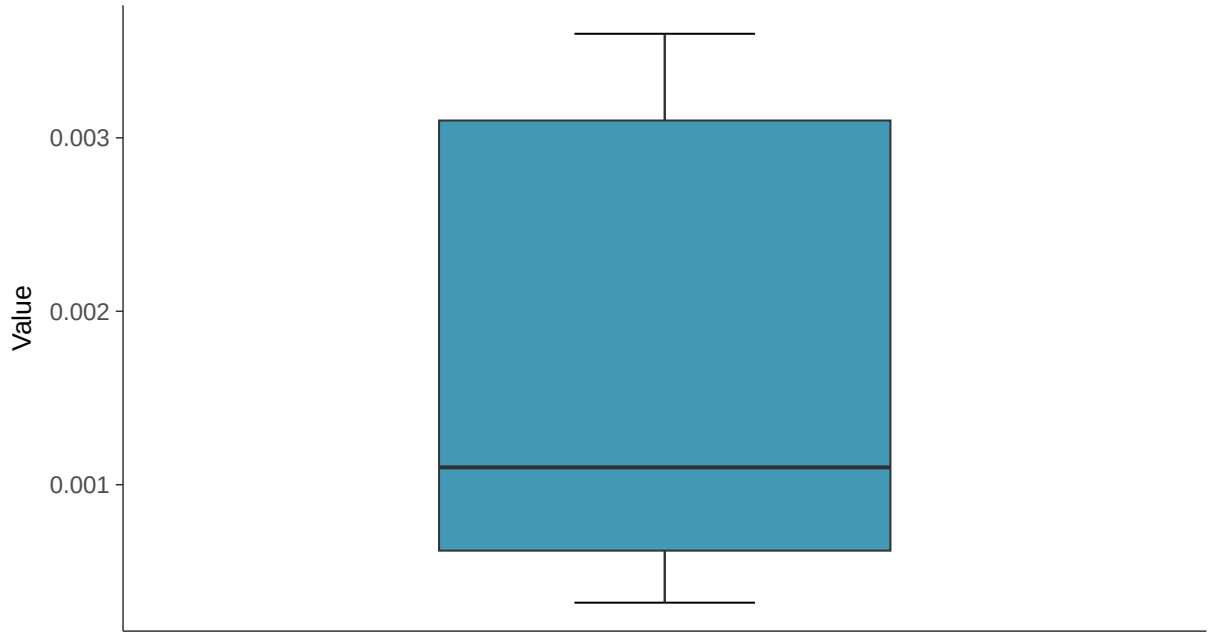
ID: 1_25_5_118





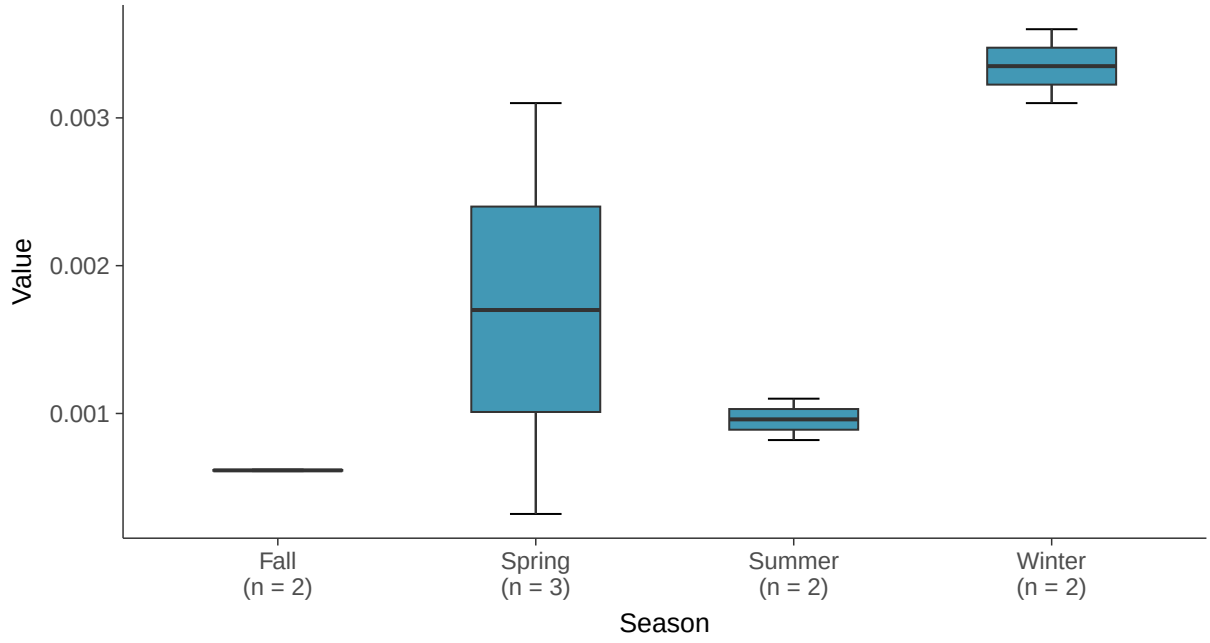
Boxplot

Molybdenum, MW-30 (mg/L)



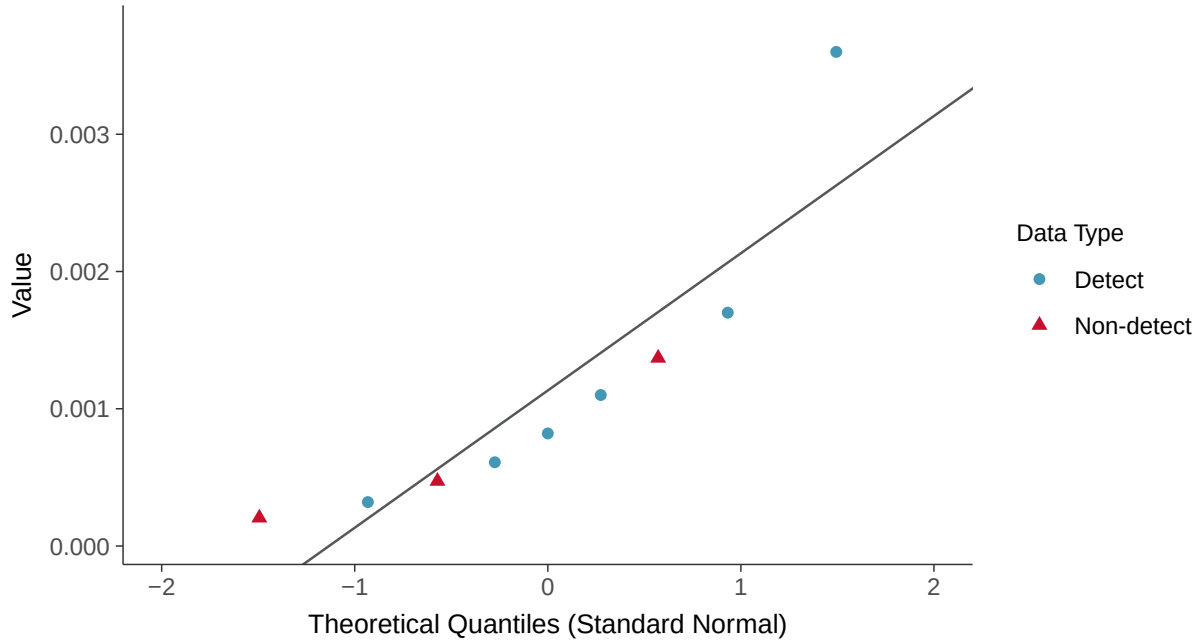
Boxplot by Season

Molybdenum, MW-30 (mg/L)



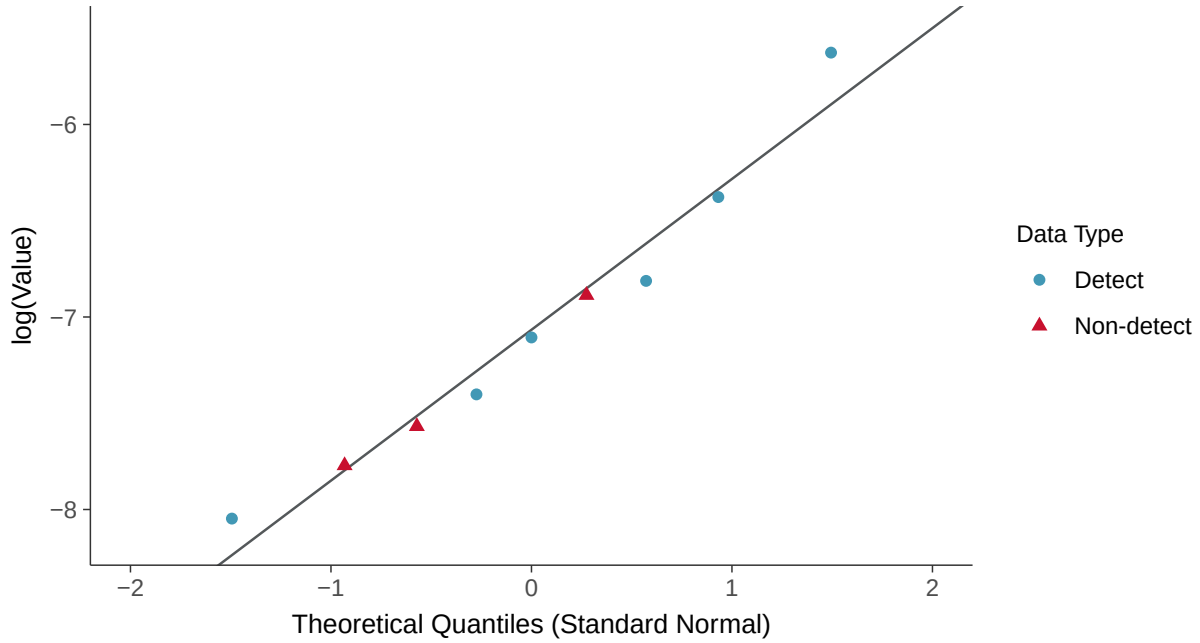
Normal Q-Q plot using ROS Imputed Estimates

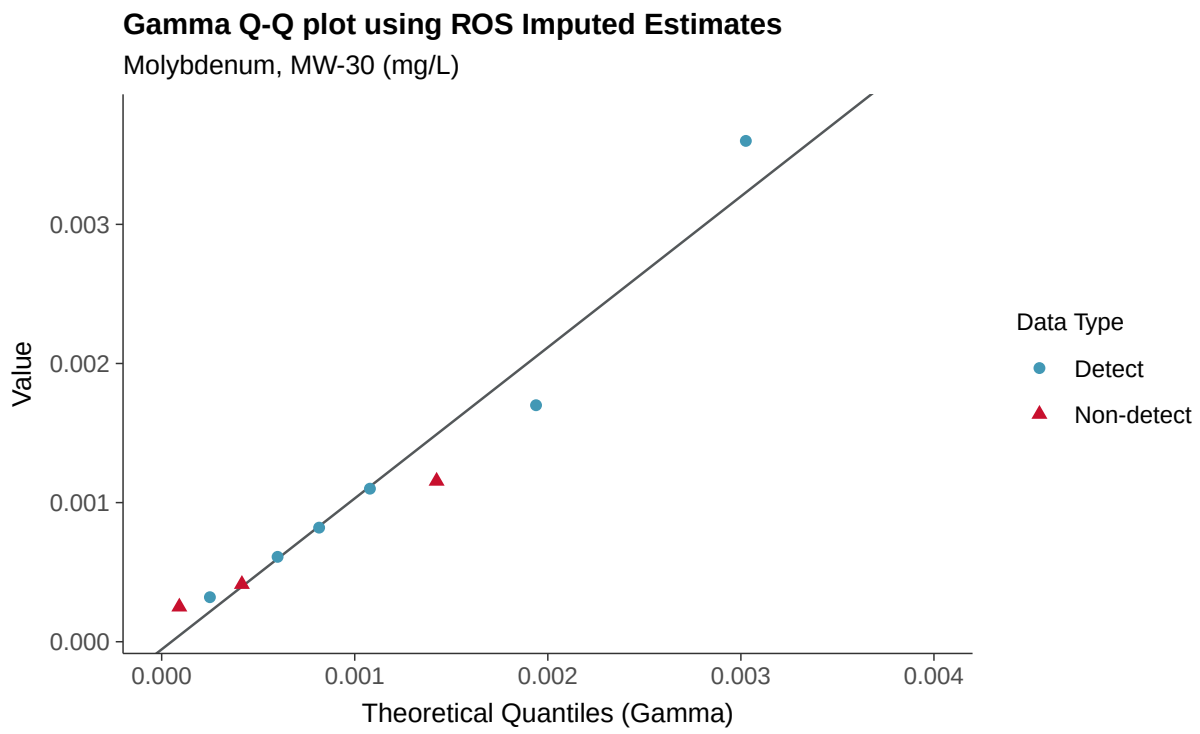
Molybdenum, MW-30 (mg/L)

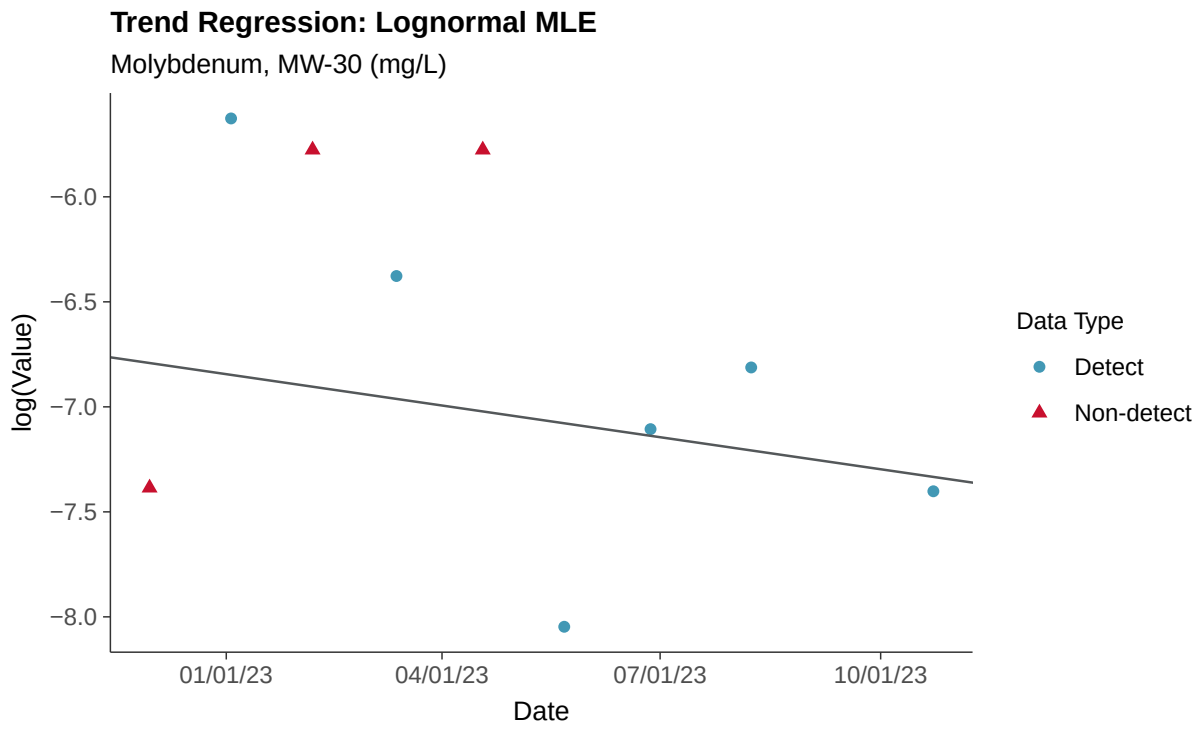


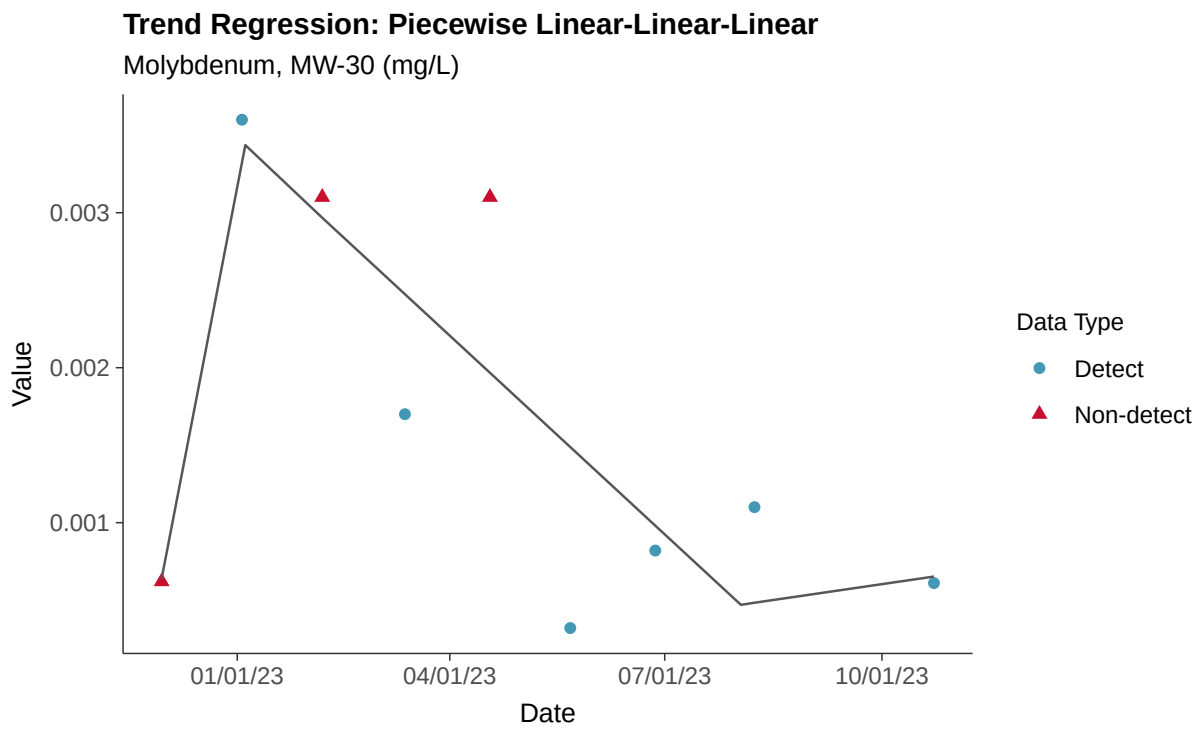
Lognormal Q-Q plot using ROS Imputed Estimates

Molybdenum, MW-30 (mg/L)



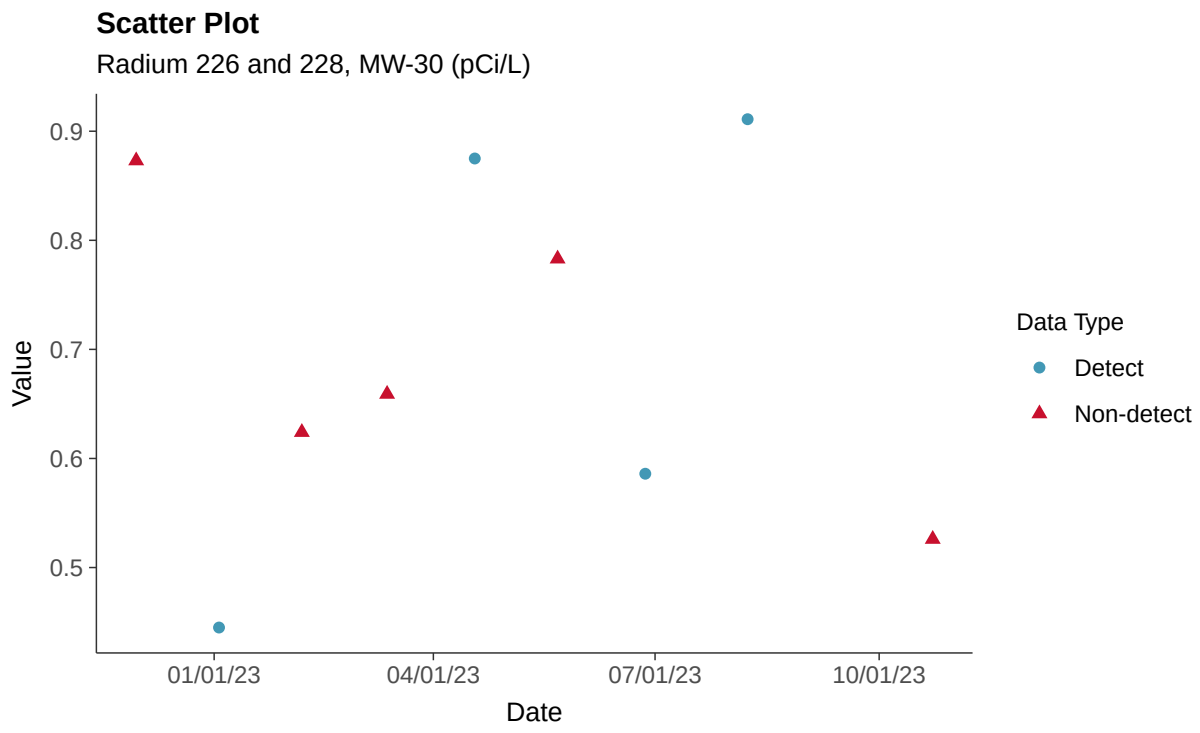

Gamma Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-30 (mg/L)
Value
0.000
0.001
0.002
0.003
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

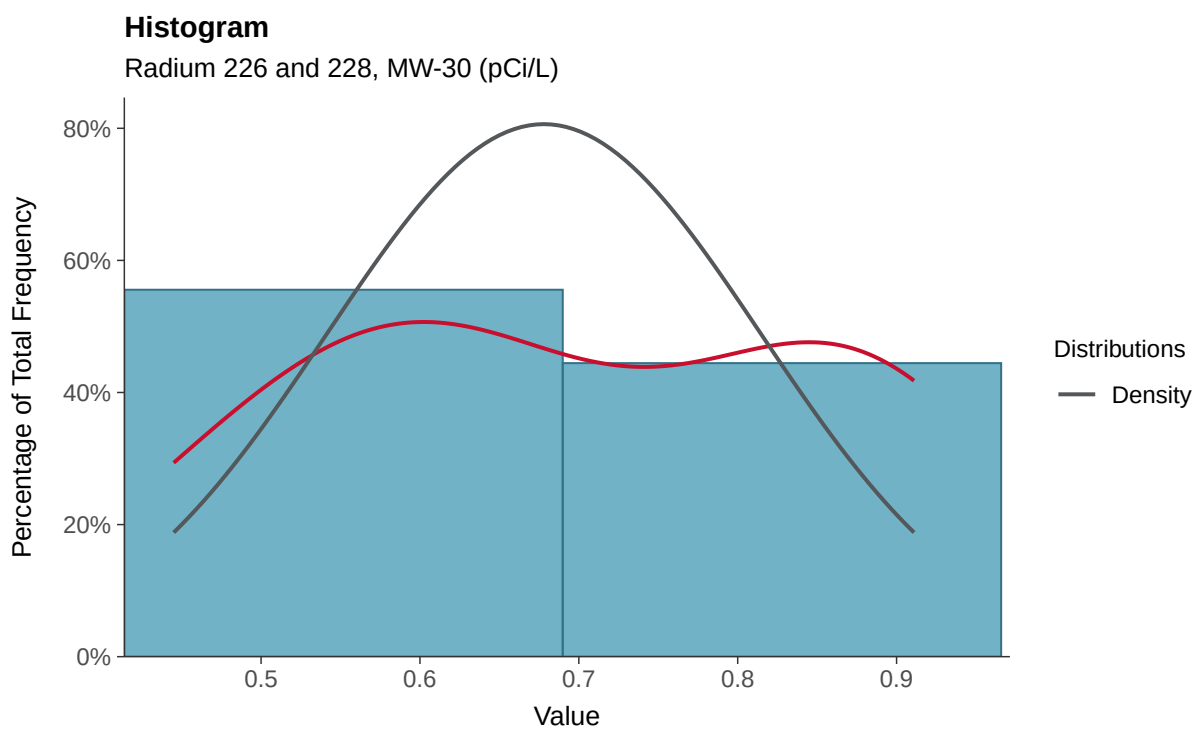

Trend Regression: Lognormal MLE
Molybdenum, MW-30 (mg/L)
log(Value)
−6.0
−6.5
−7.0
−7.5
−8.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-30 (mg/L)
Value
0.003
0.002
0.001
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Radium 226 and 228, MW-30

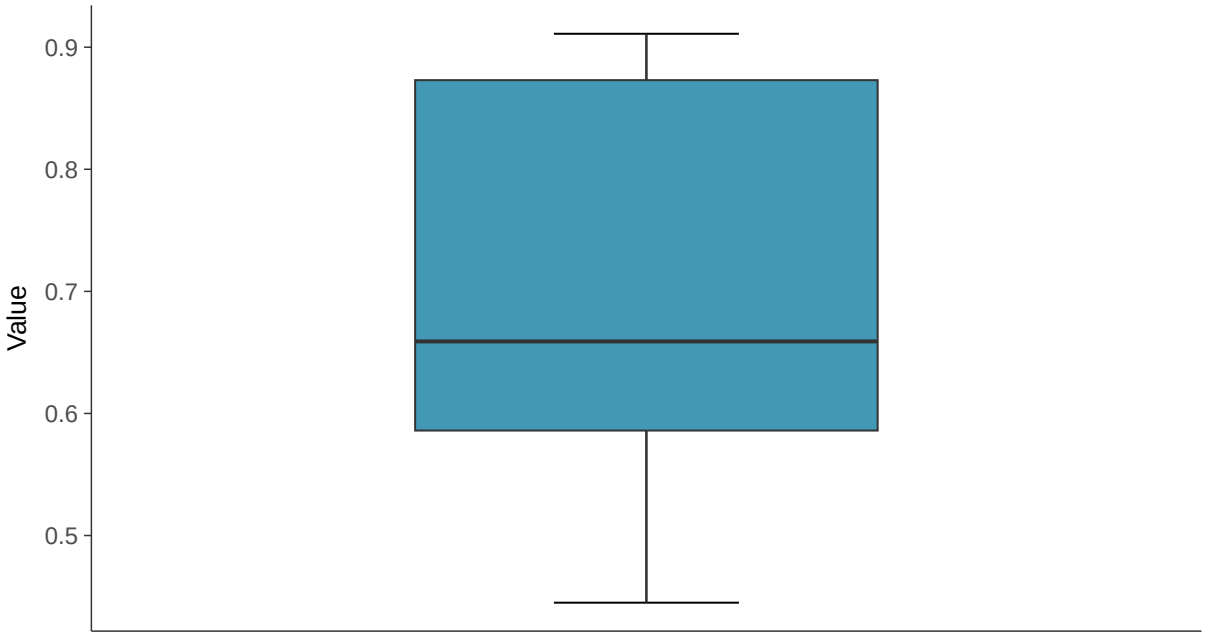
ID: 1_25_5_121





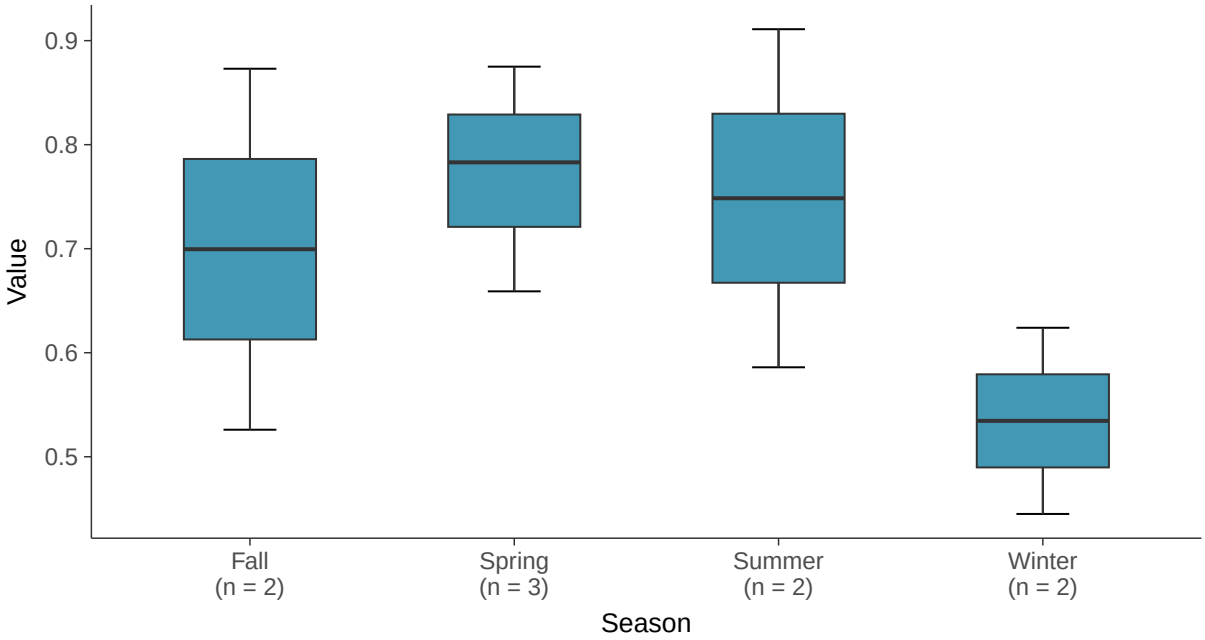
Boxplot

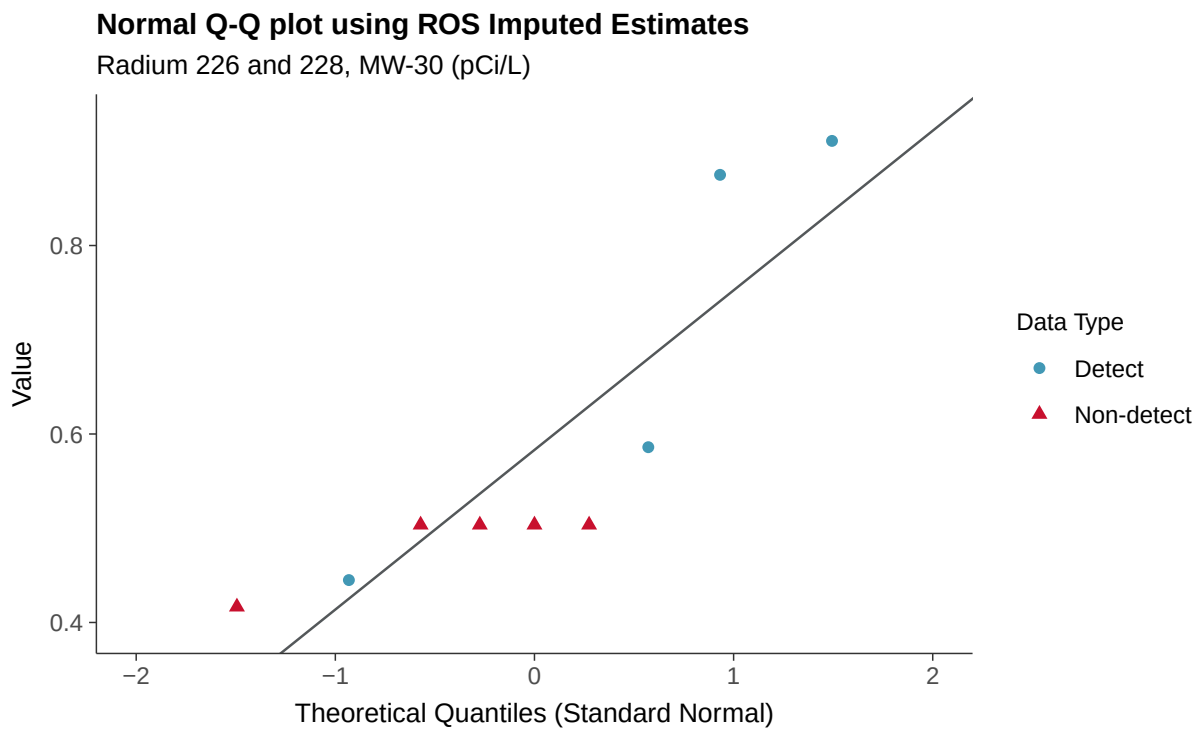
Radium 226 and 228, MW-30 (pCi/L)



Boxplot by Season

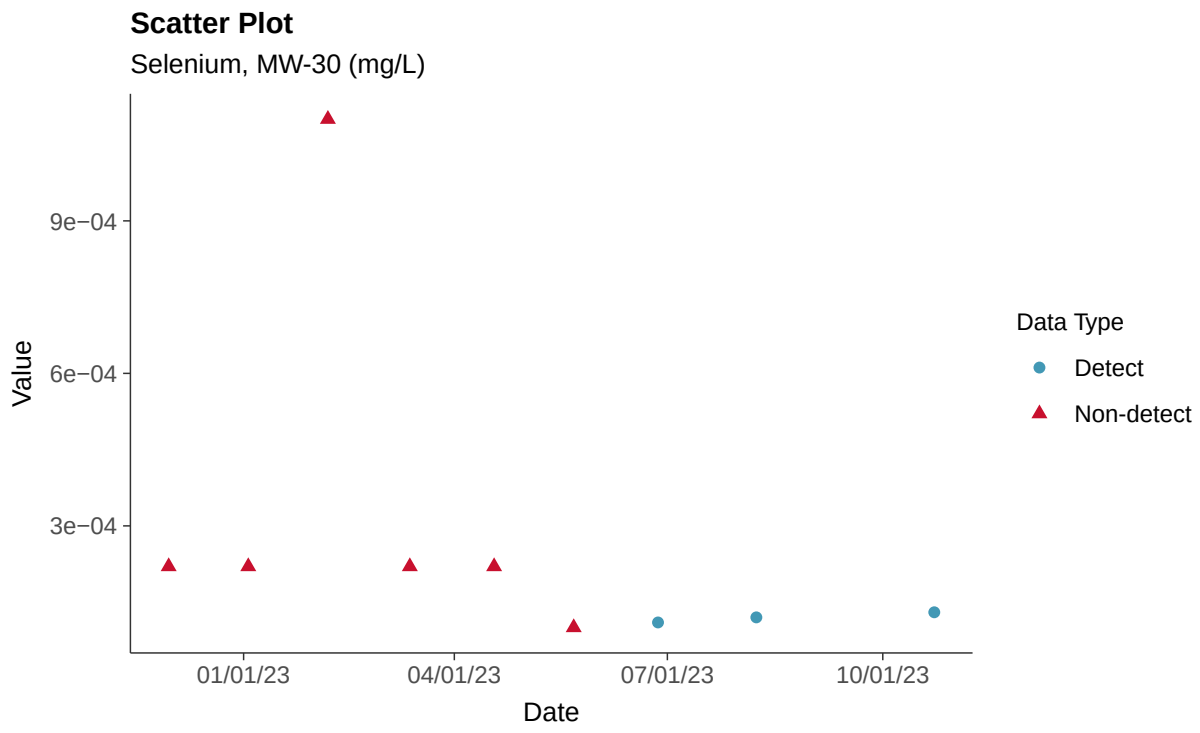
Radium 226 and 228, MW-30 (pCi/L)

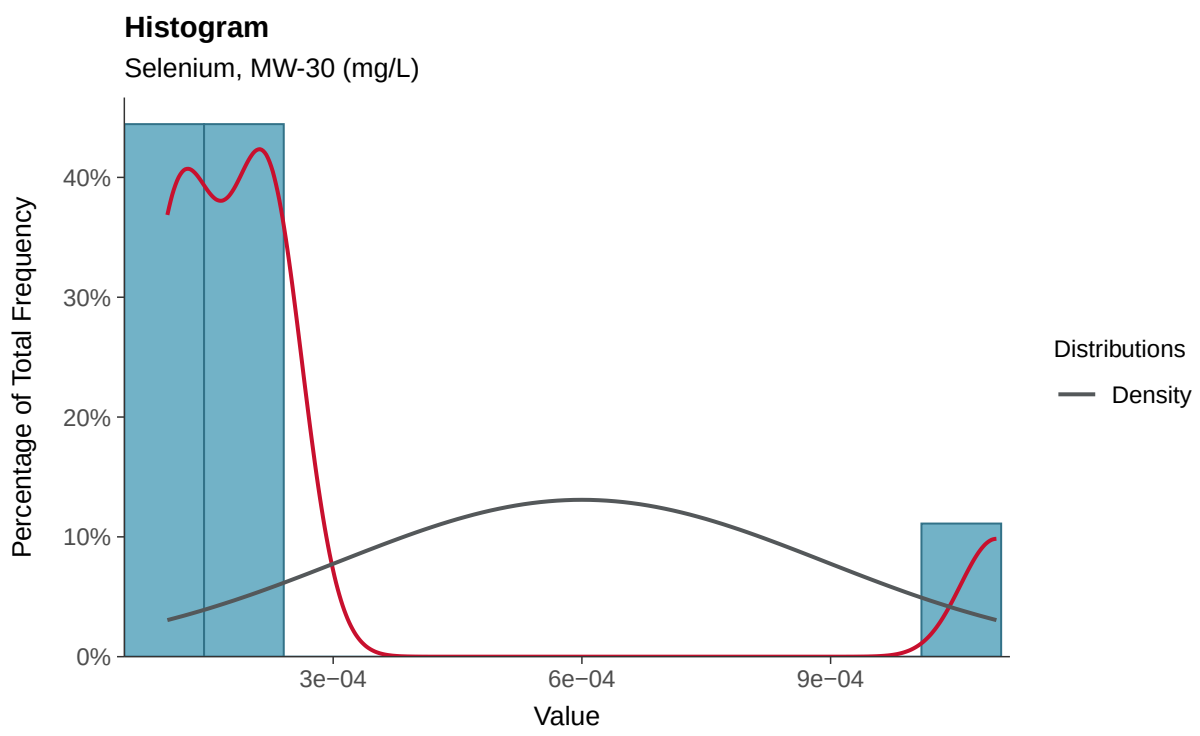



Normal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-30 (pCi/L)
Value
0.8
0.6
0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

Appendix IV: Selenium, MW-30

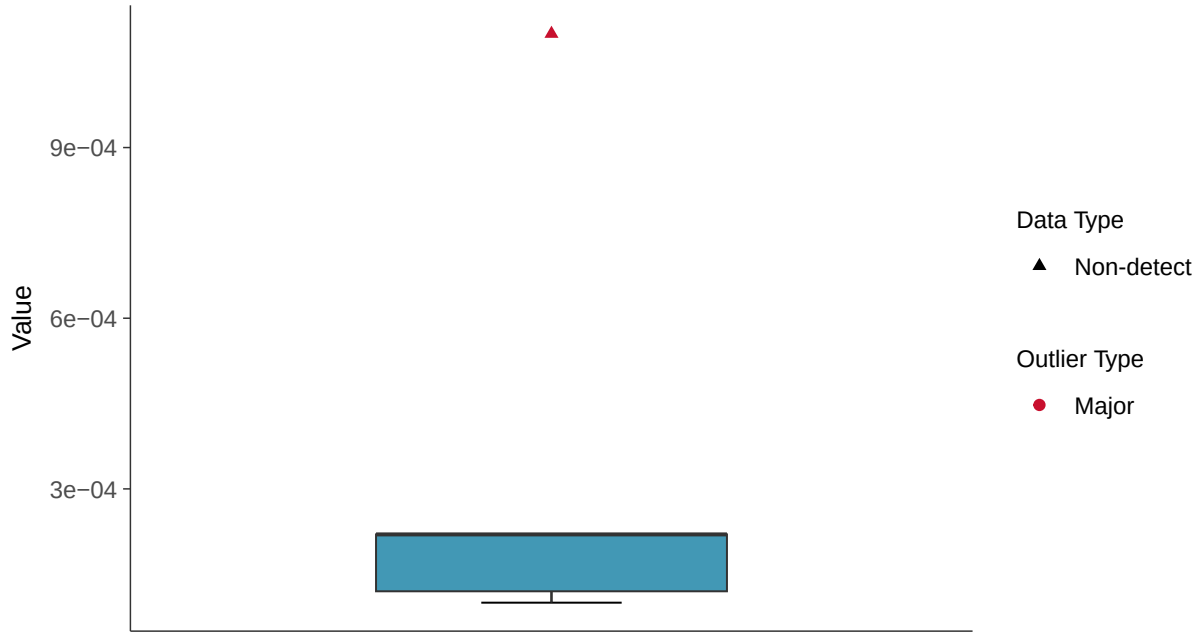
ID: 1_25_5_122





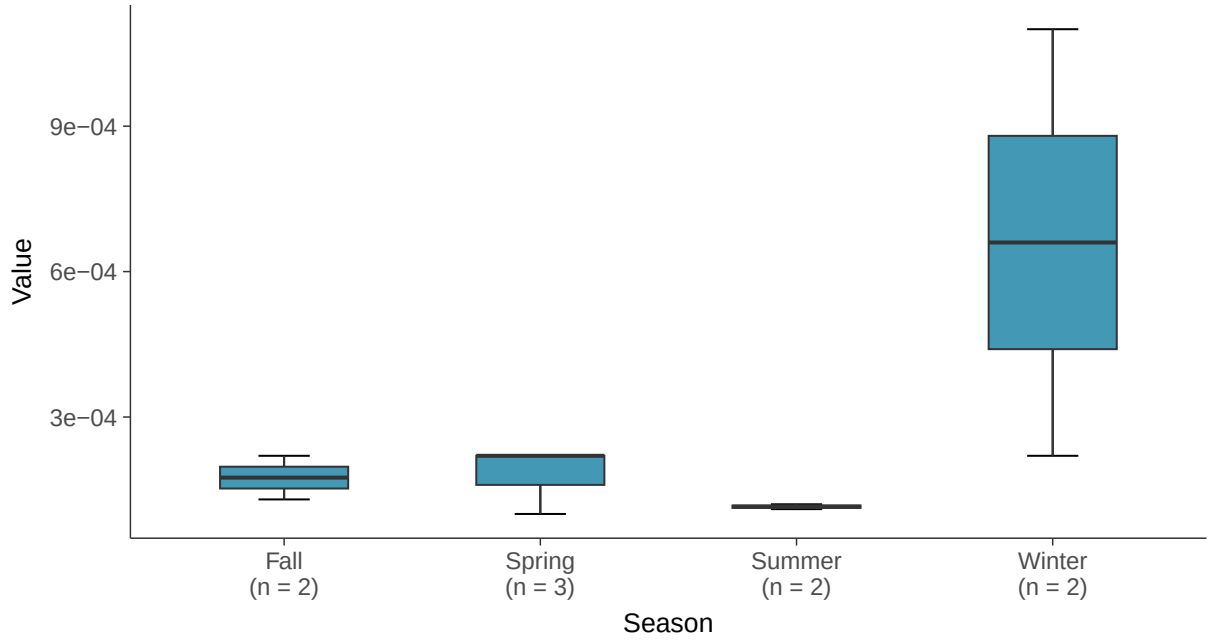
Boxplot

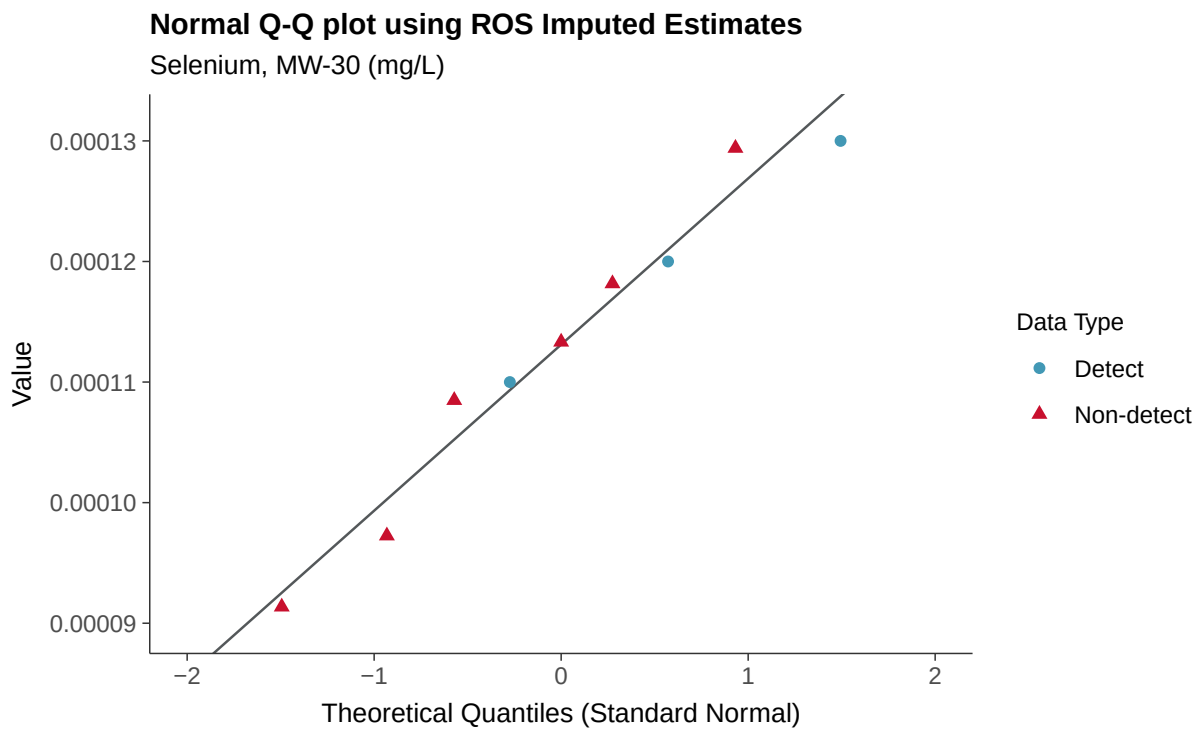
Selenium, MW-30 (mg/L)

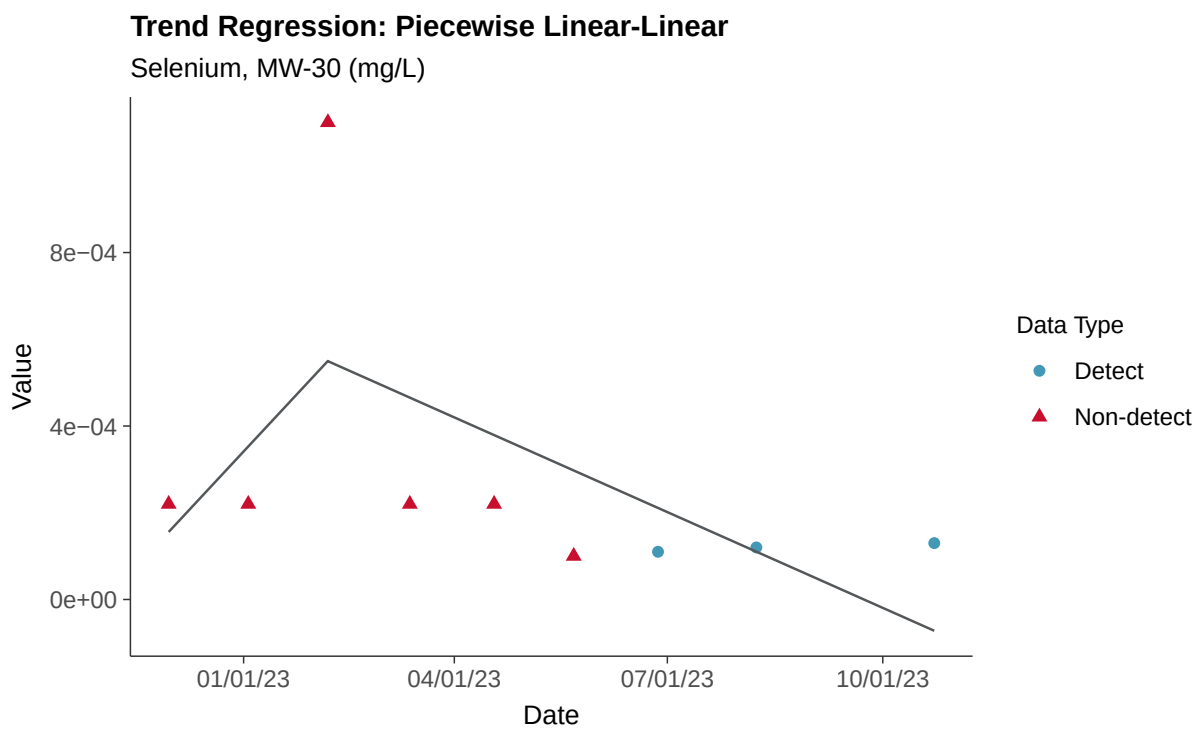


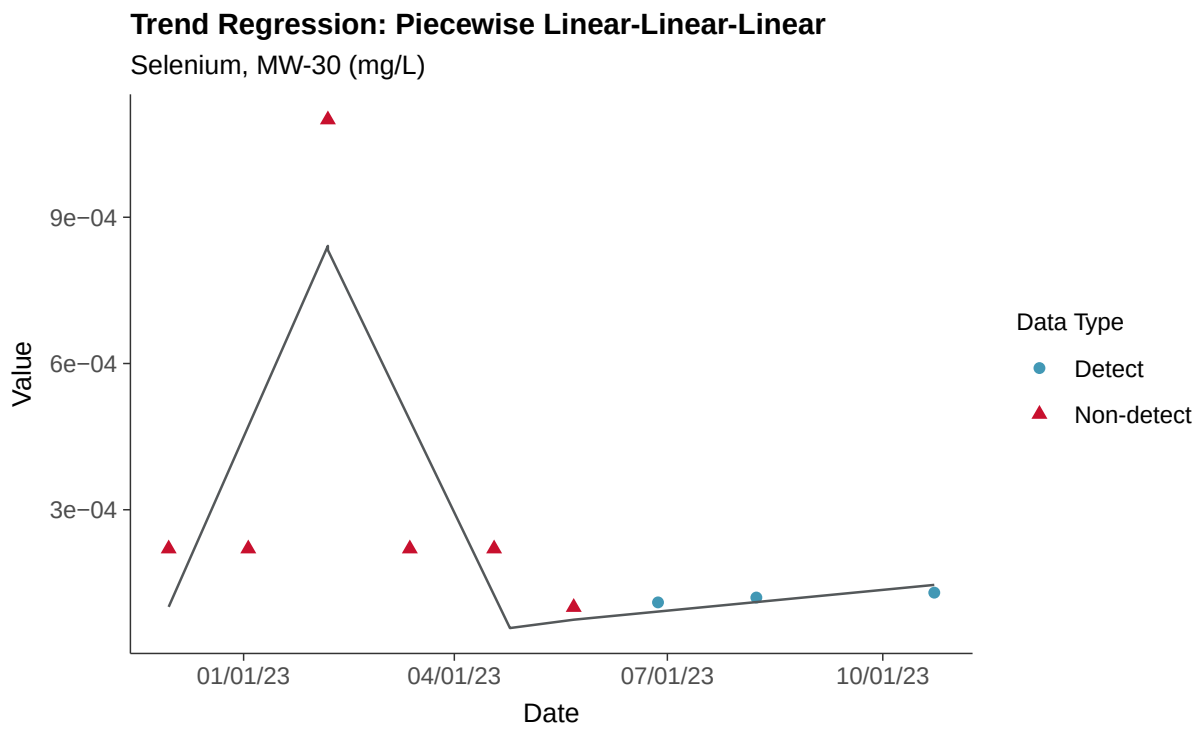
Boxplot by Season

Selenium, MW-30 (mg/L)



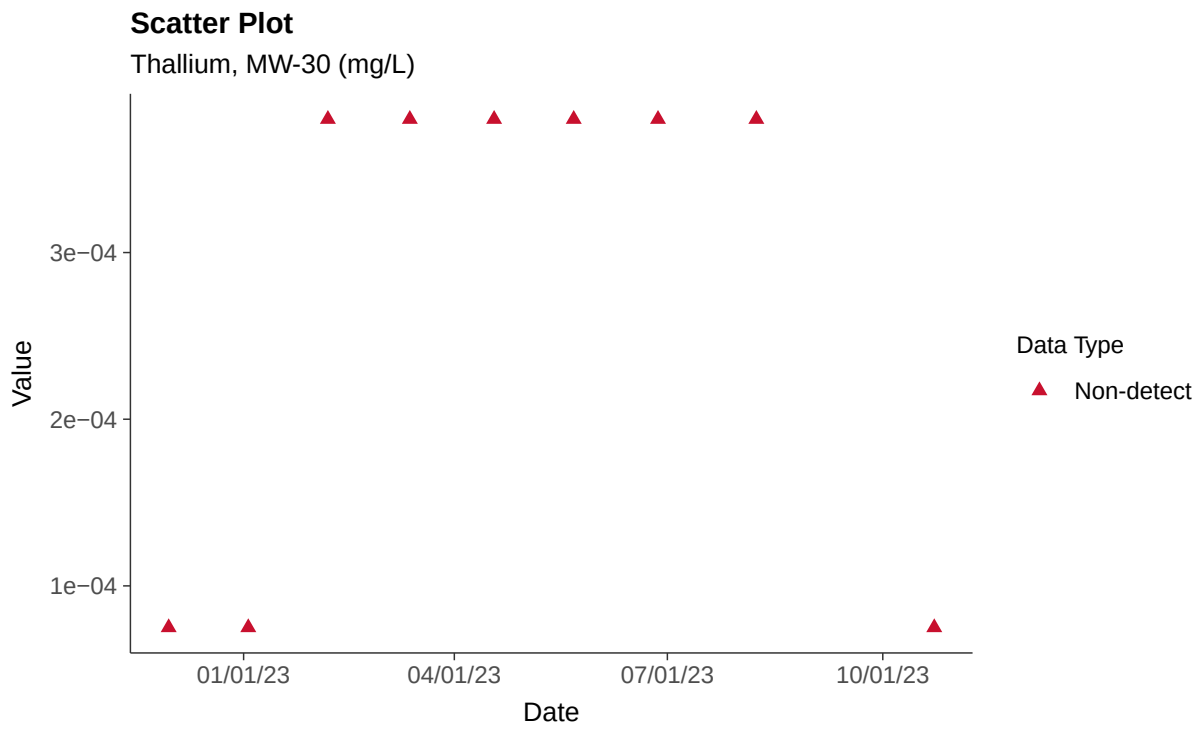

Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-30 (mg/L)
Value
0.00013
0.00012
0.00011
0.00010
0.00009
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

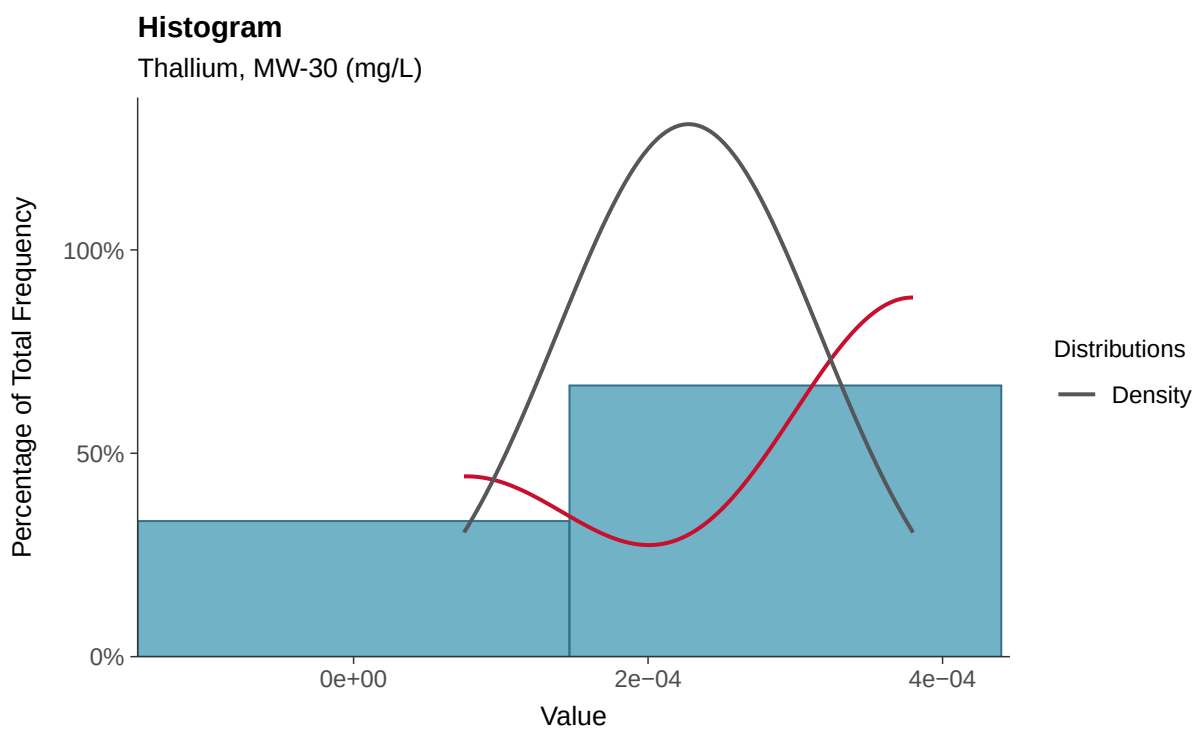

Trend Regression: Piecewise Linear-Linear
Selenium, MW-30 (mg/L)
Value
8e−04
4e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-30 (mg/L)
Value
9e−04
6e−04
3e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-30

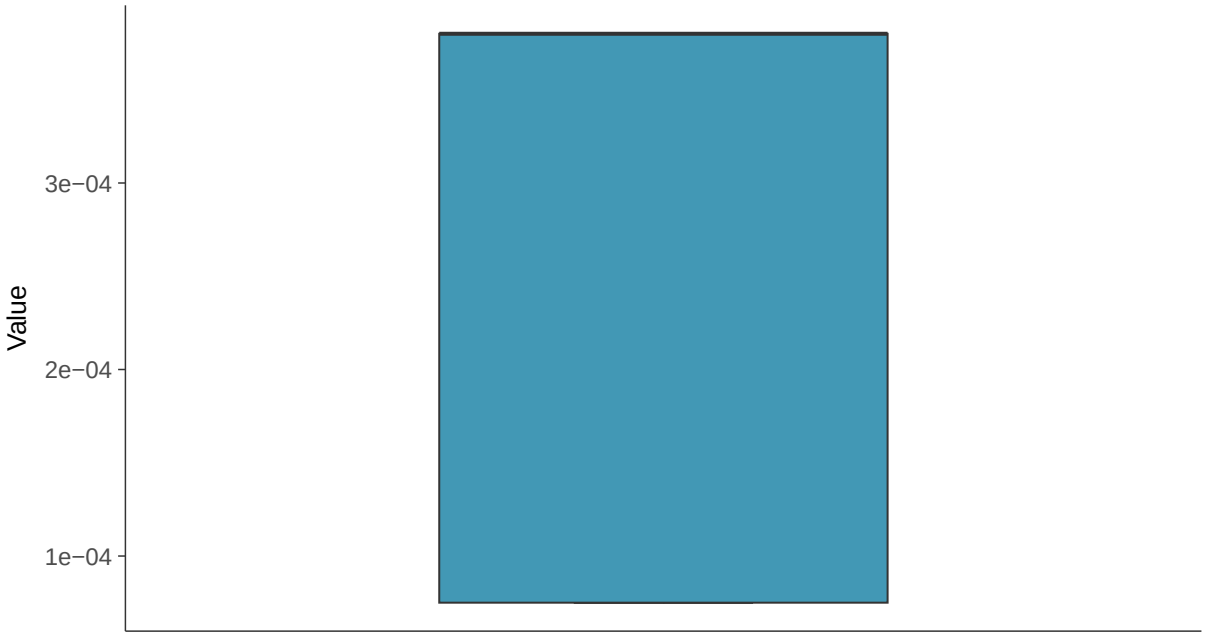
ID: 1_25_5_125





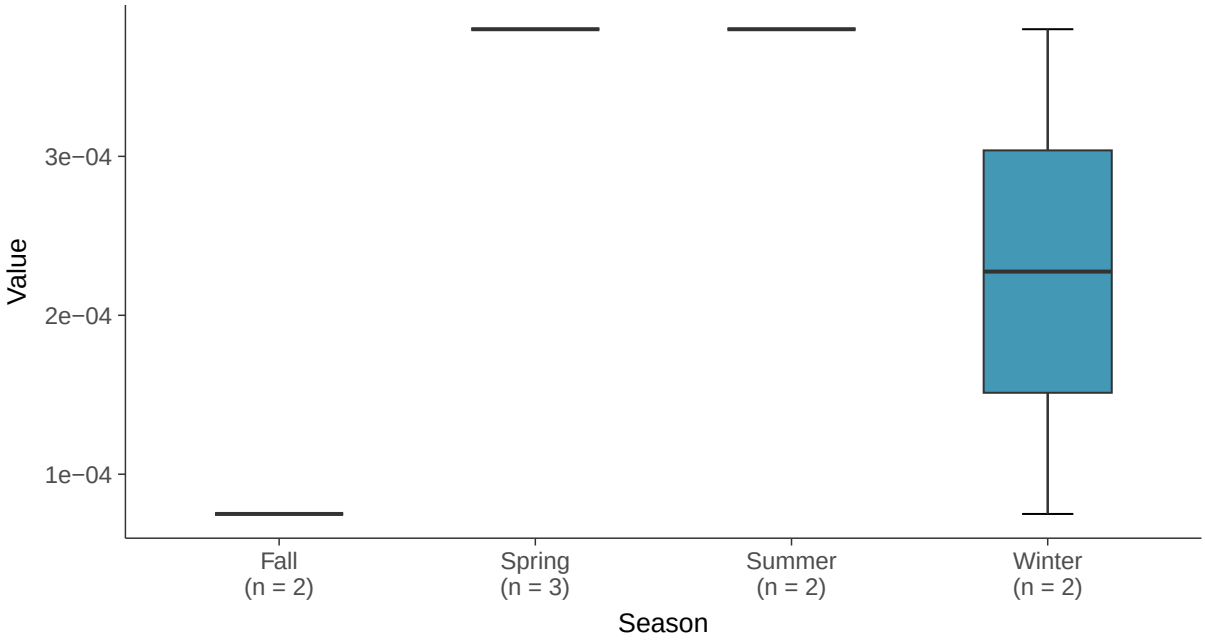
Boxplot

Thallium, MW-30 (mg/L)



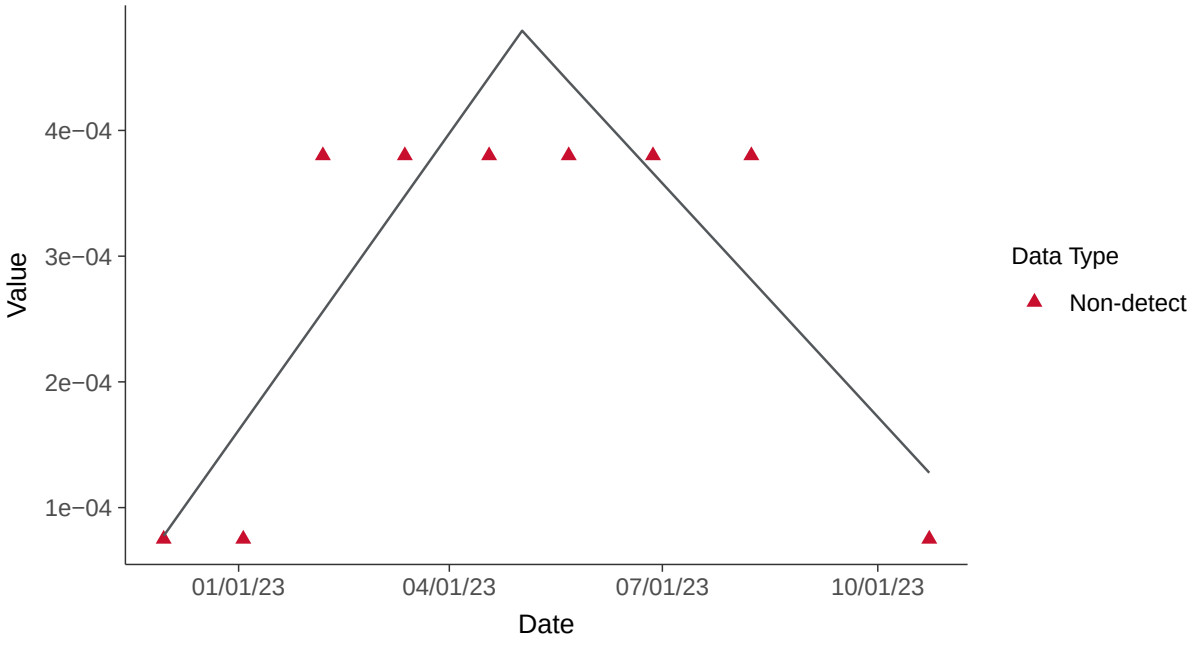
Boxplot by Season

Thallium, MW-30 (mg/L)



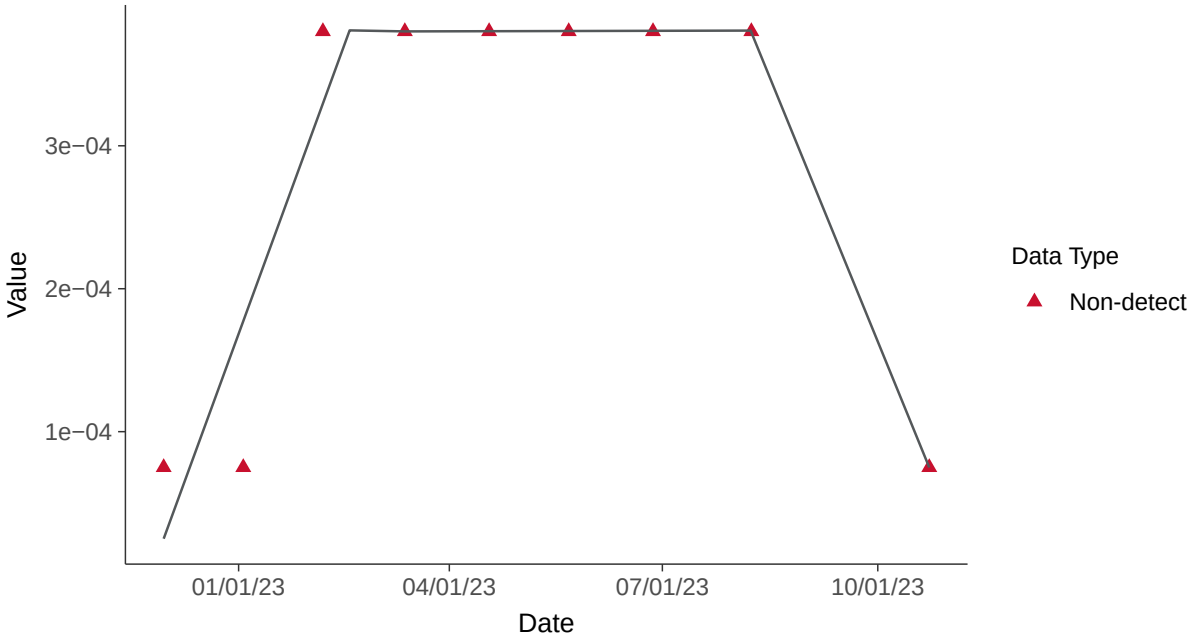
Trend Regression: Piecewise Linear-Linear

Thallium, MW-30 (mg/L)



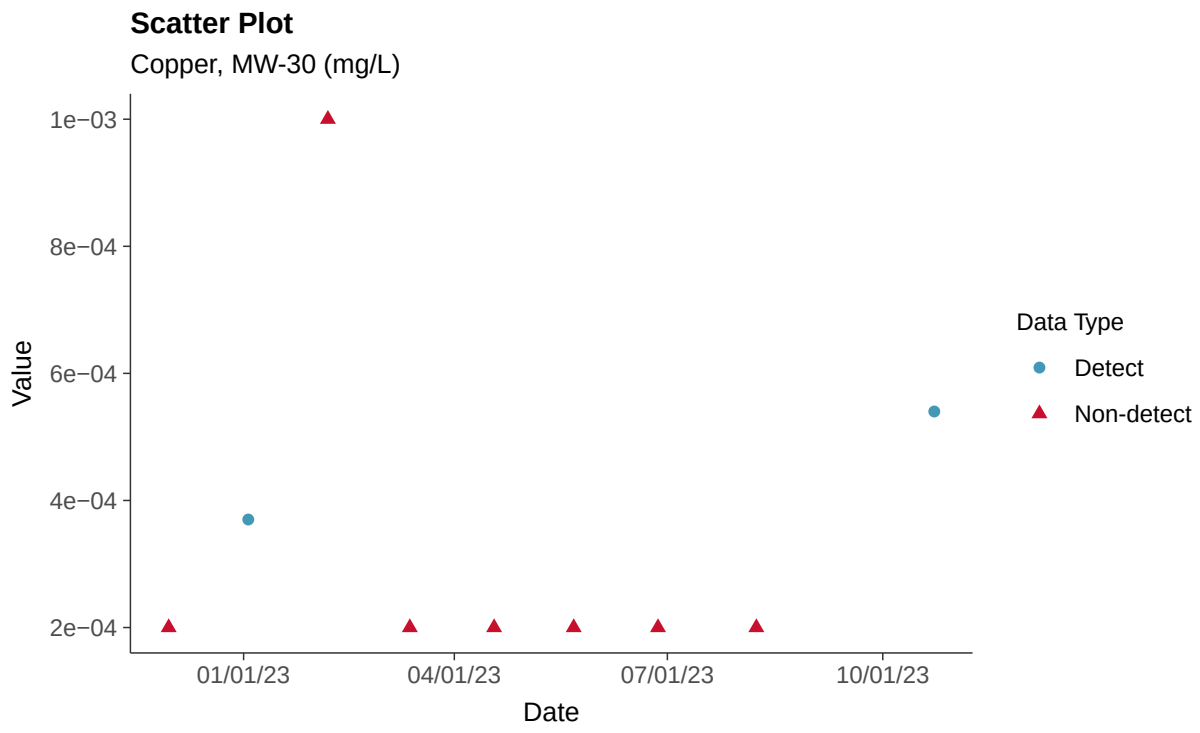
Trend Regression: Piecewise Linear-Linear-Linear

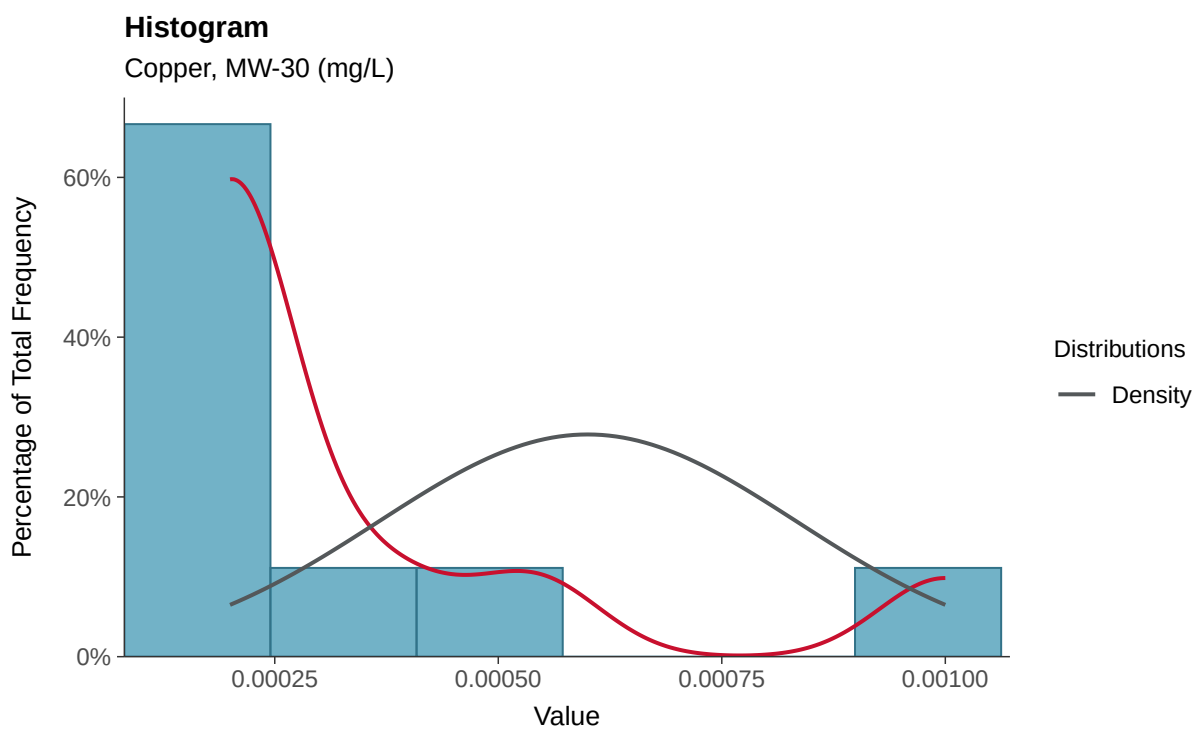
Thallium, MW-30 (mg/L)



Part 115: Copper, MW-30

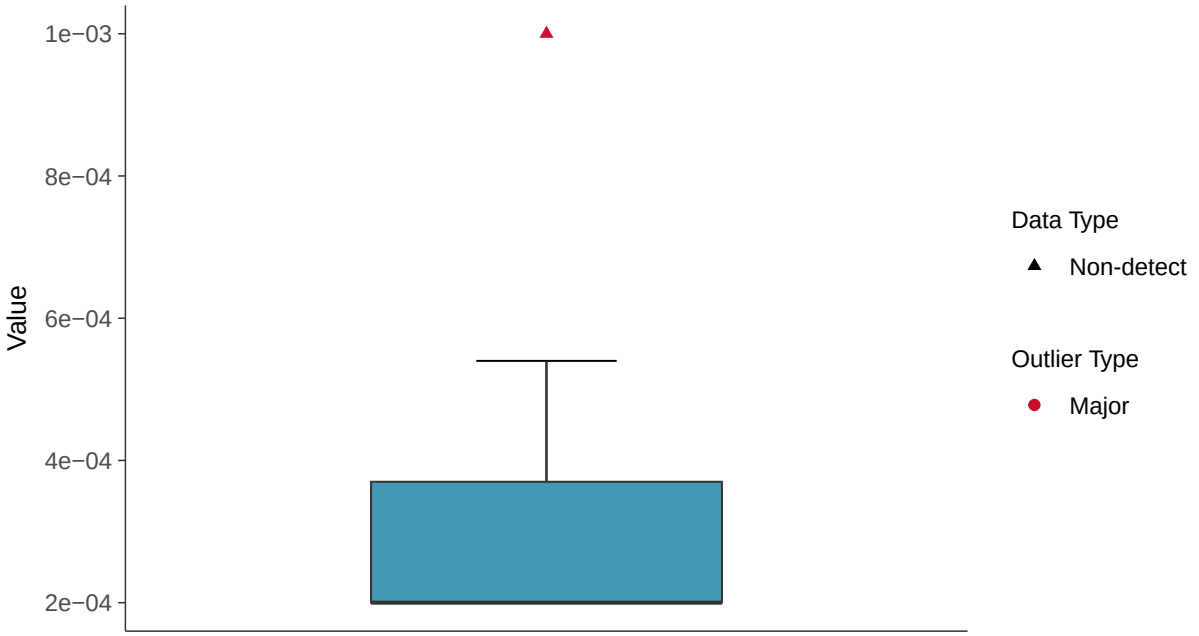
ID: 1_25_6_111





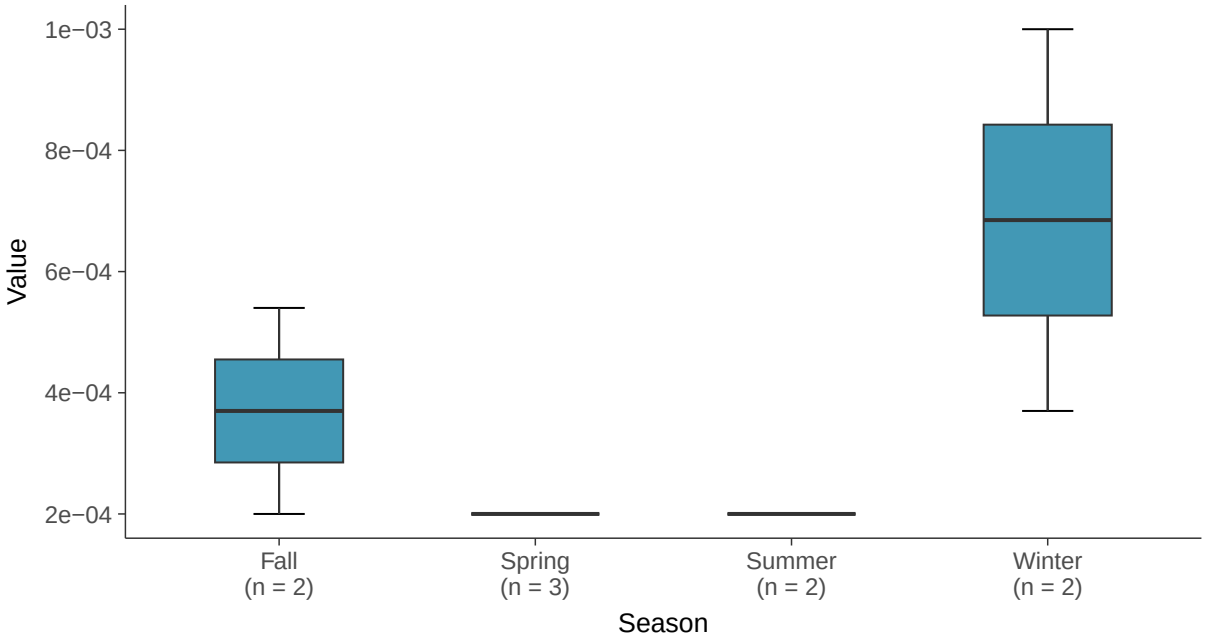
Boxplot

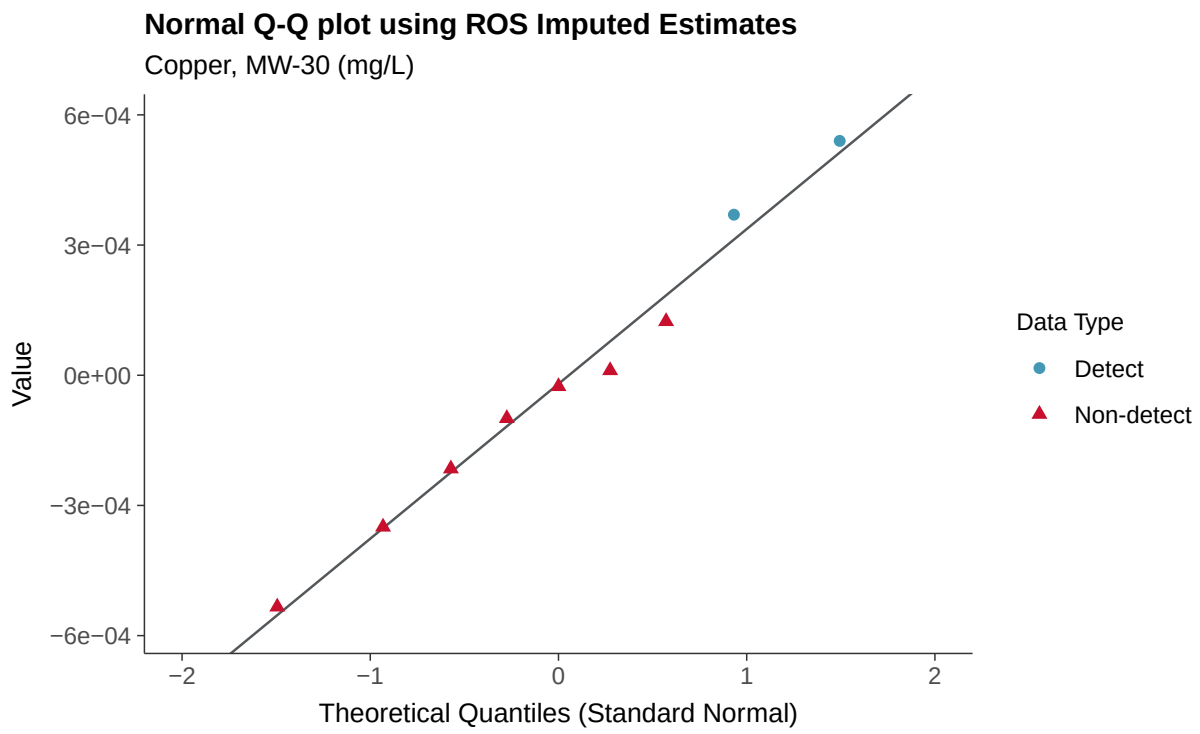
Copper, MW-30 (mg/L)

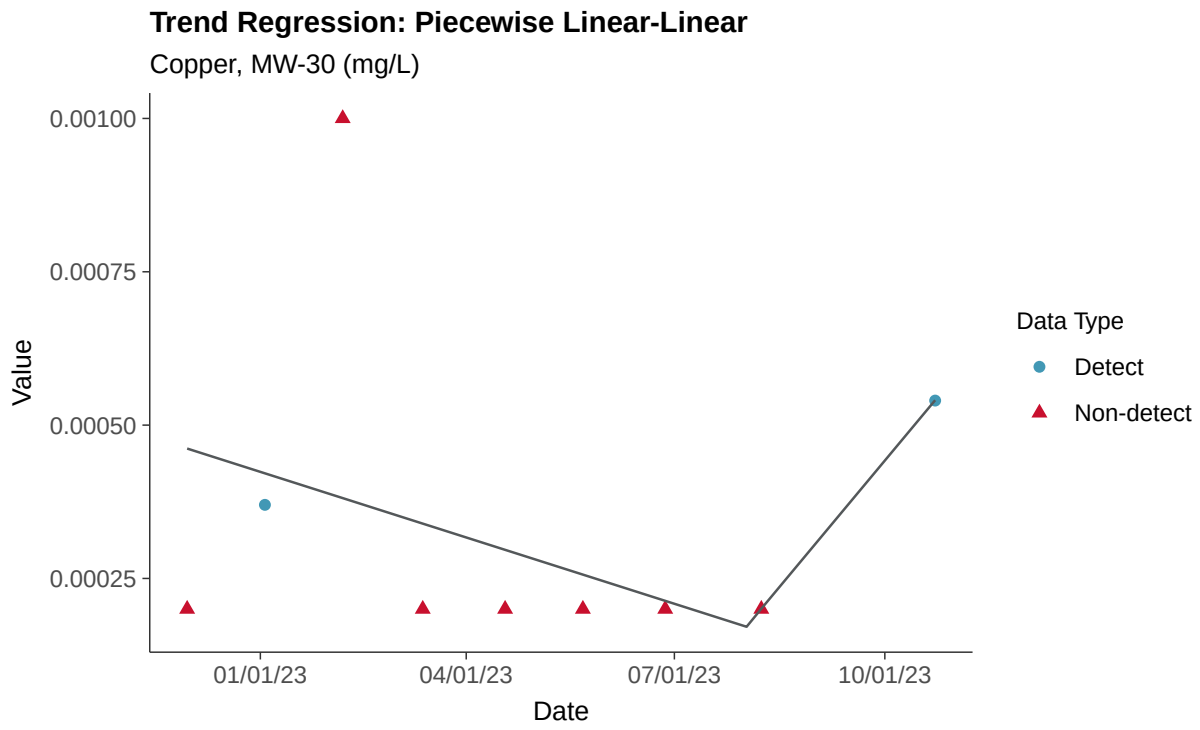


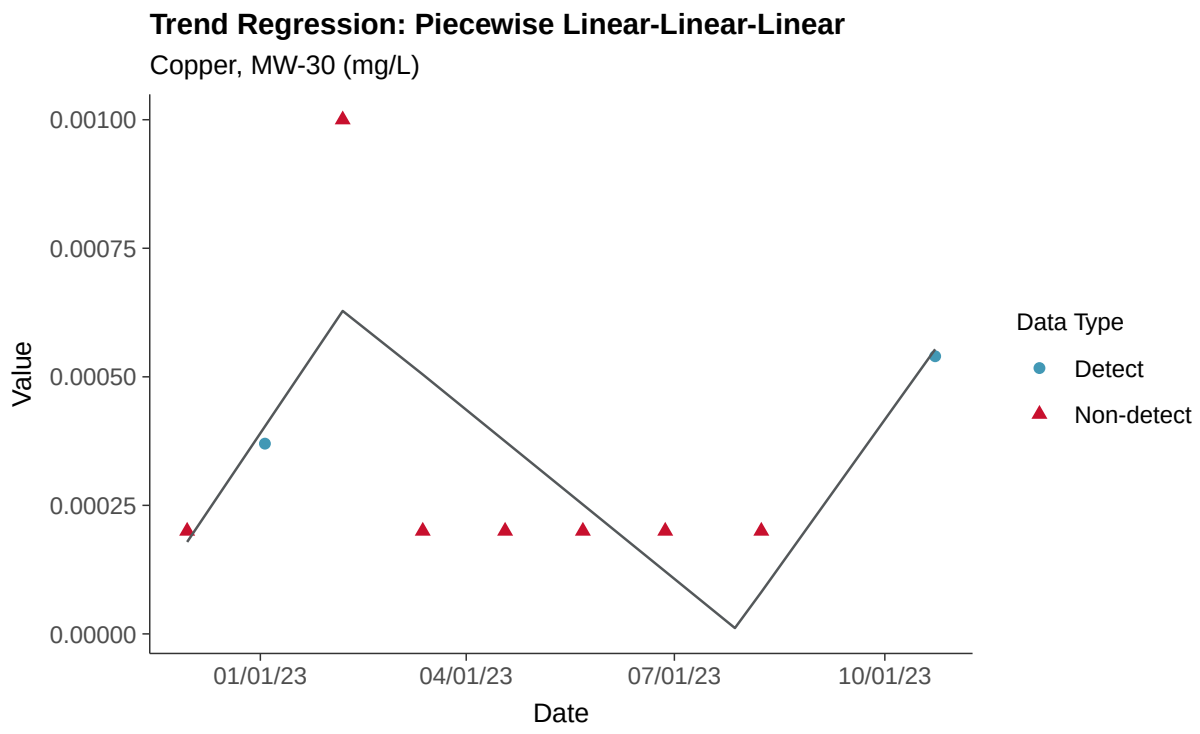
Boxplot by Season

Copper, MW-30 (mg/L)



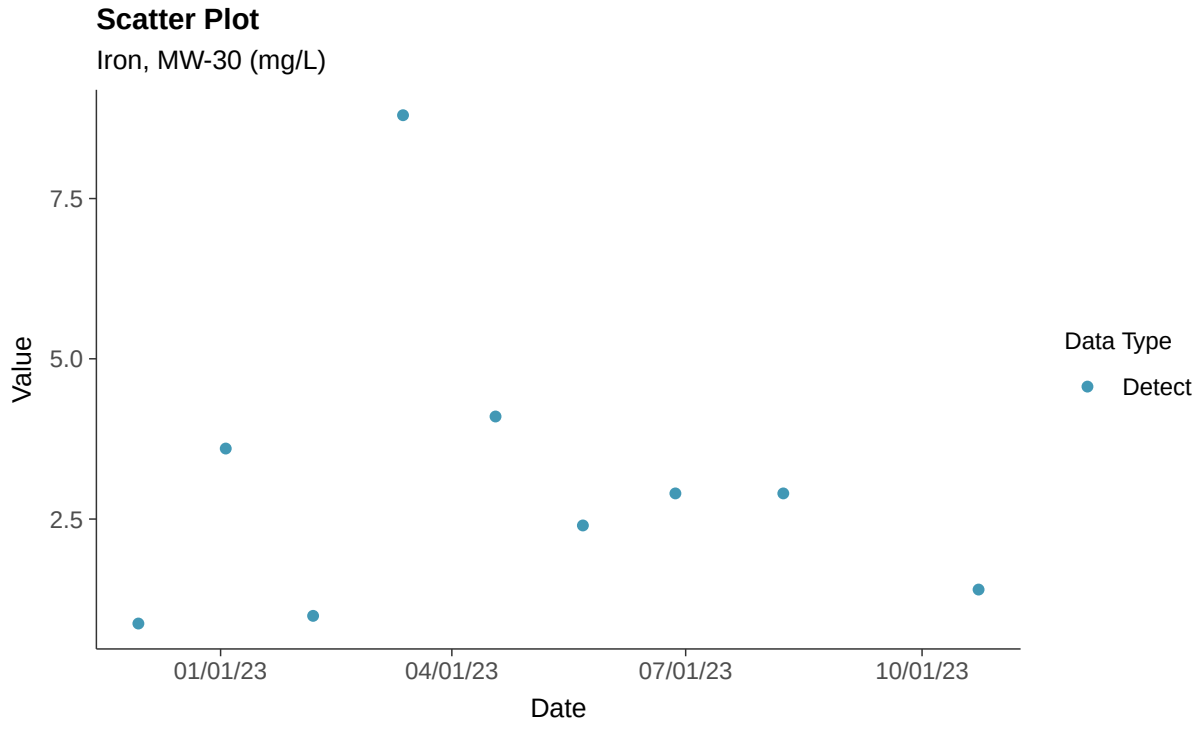

Normal Q-Q plot using ROS Imputed Estimates
Copper, MW-30 (mg/L)
6e−04
3e−04
0e+00
−3e−04
−6e−04
Value
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

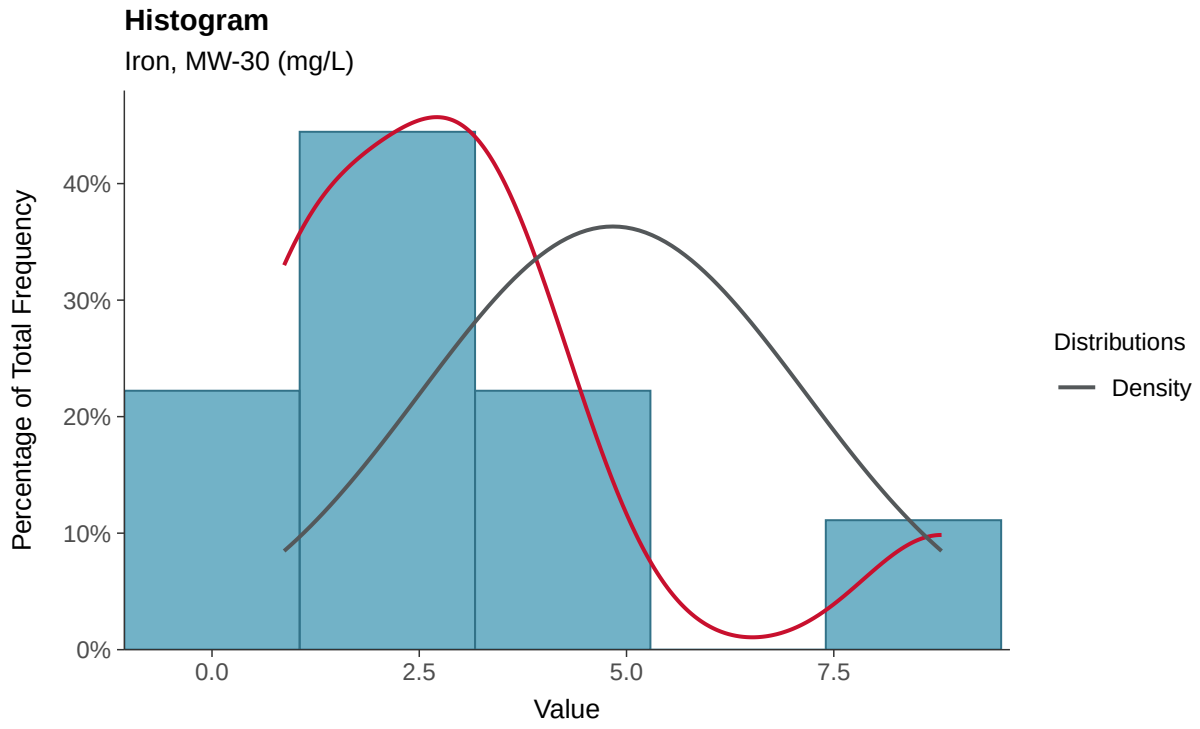

Trend Regression: Piecewise Linear-Linear
Copper, MW-30 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Copper, MW-30 (mg/L)
0.00100
0.00075
0.00050
0.00025
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-30

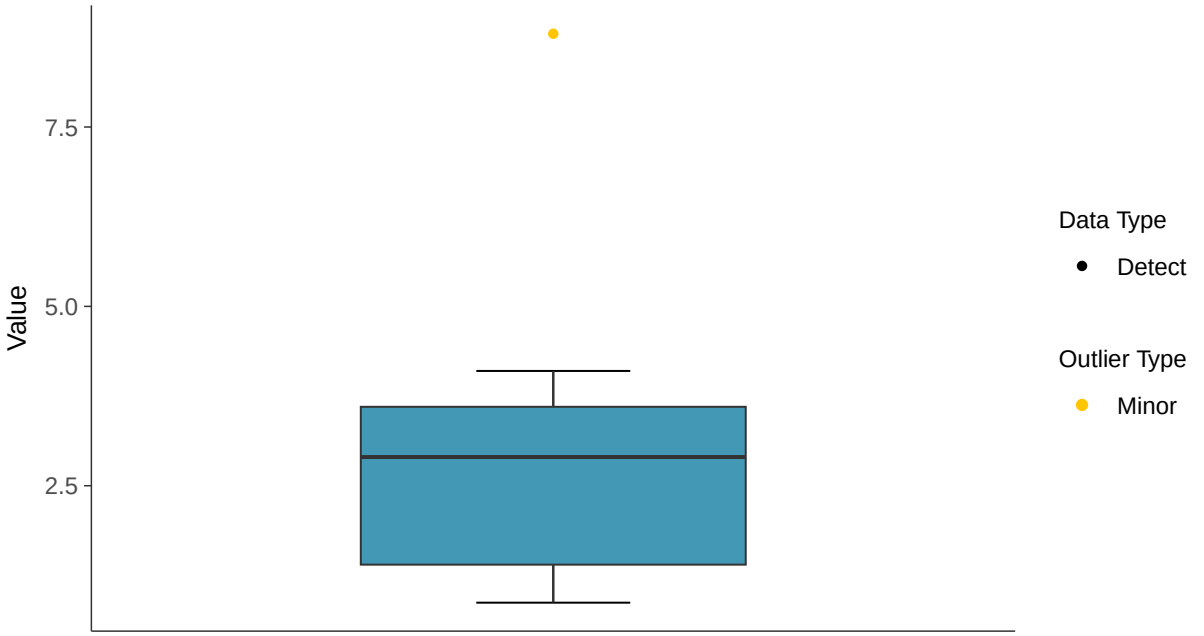
ID: 1_25_6_114





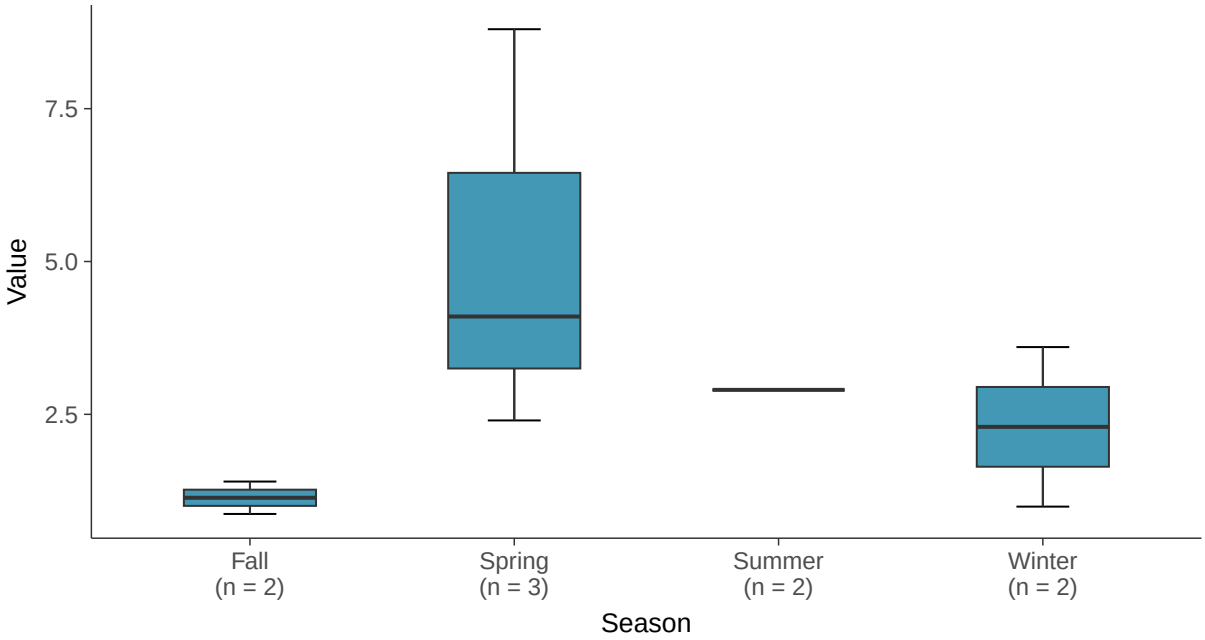
Boxplot

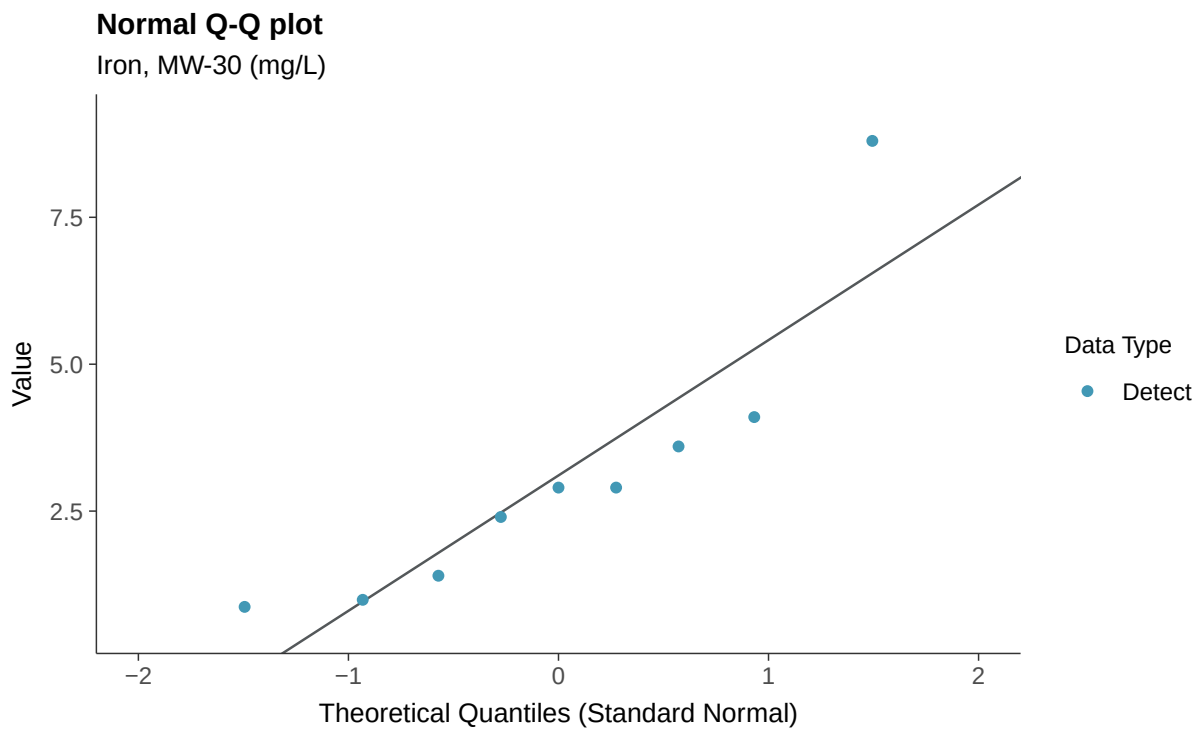
Iron, MW-30 (mg/L)

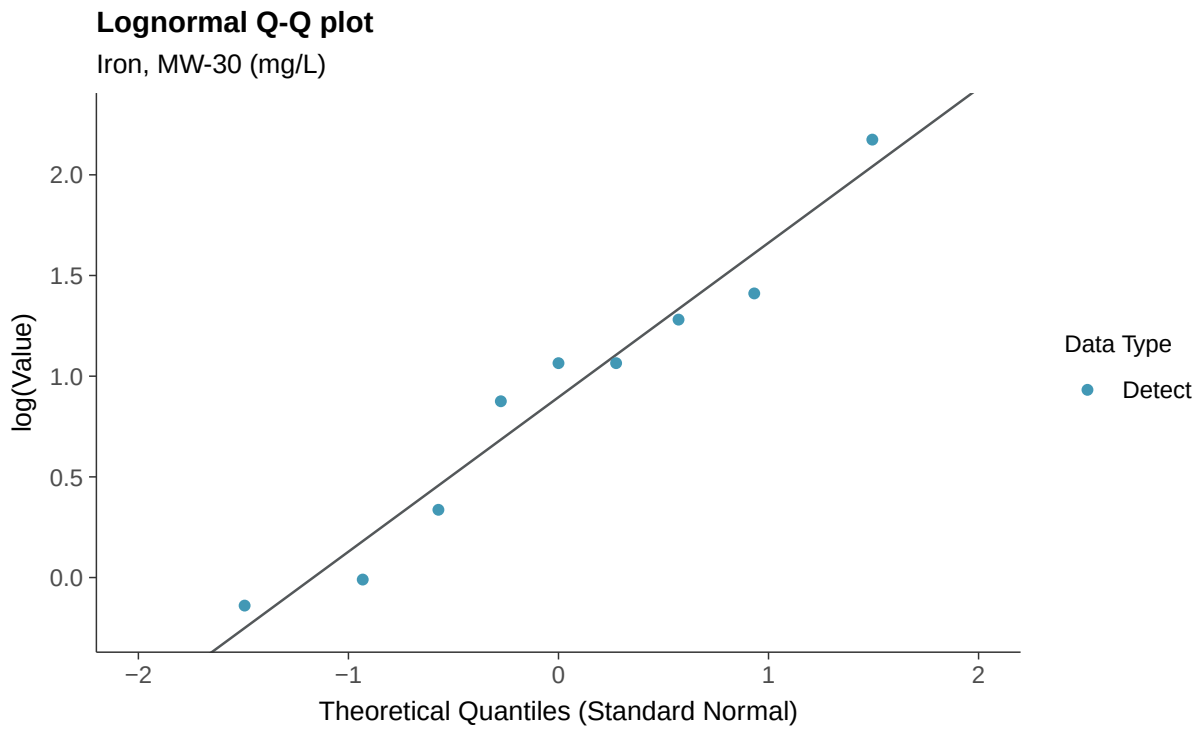


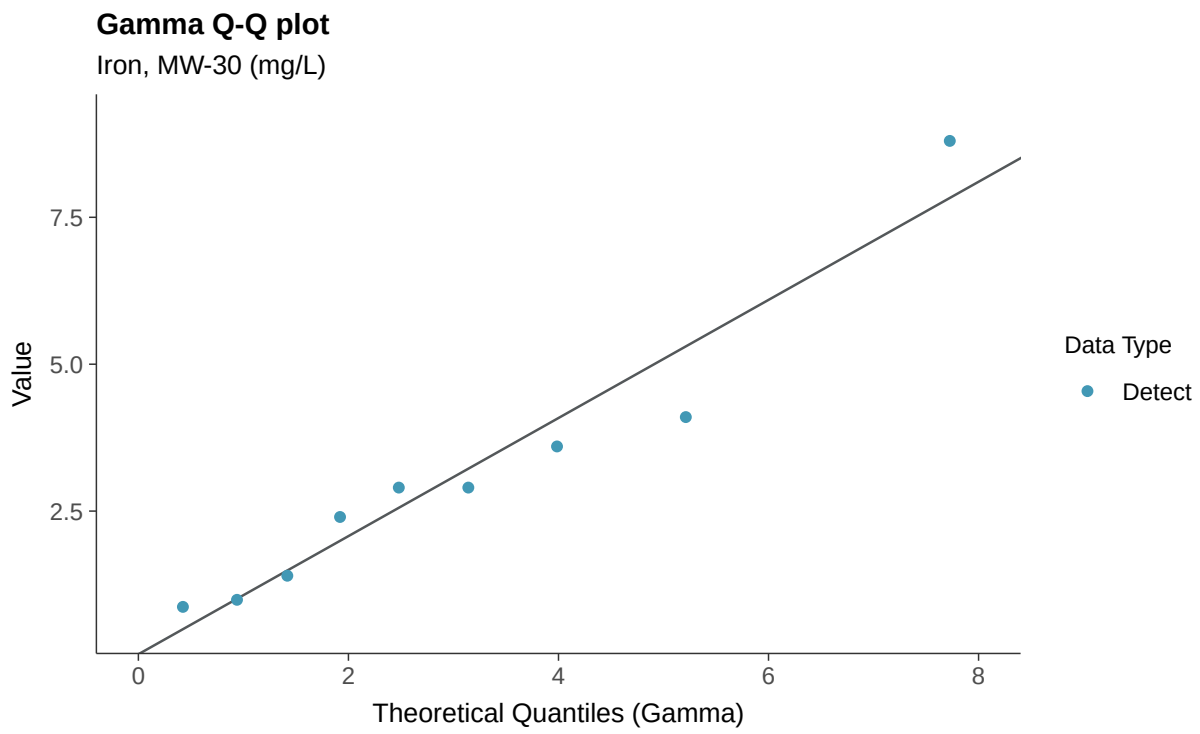
Boxplot by Season

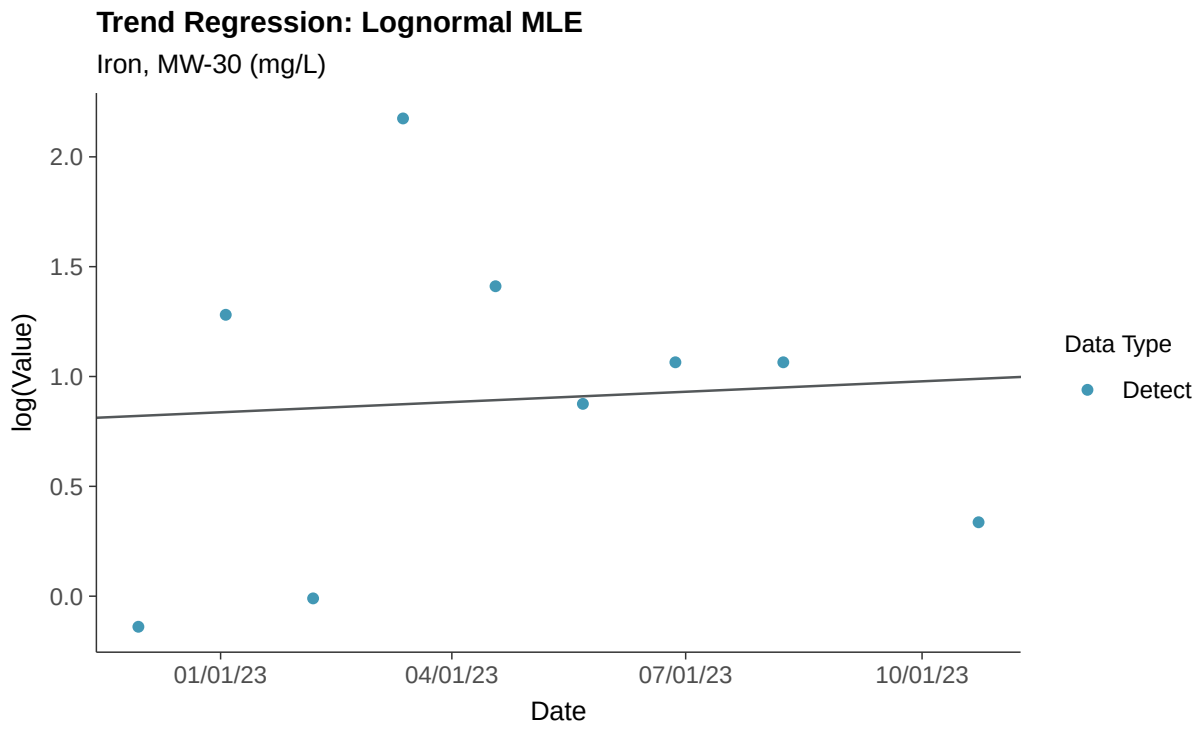
Iron, MW-30 (mg/L)




Normal Q-Q plot
Iron, MW-30 (mg/L)
Value
7.5
5.0
2.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

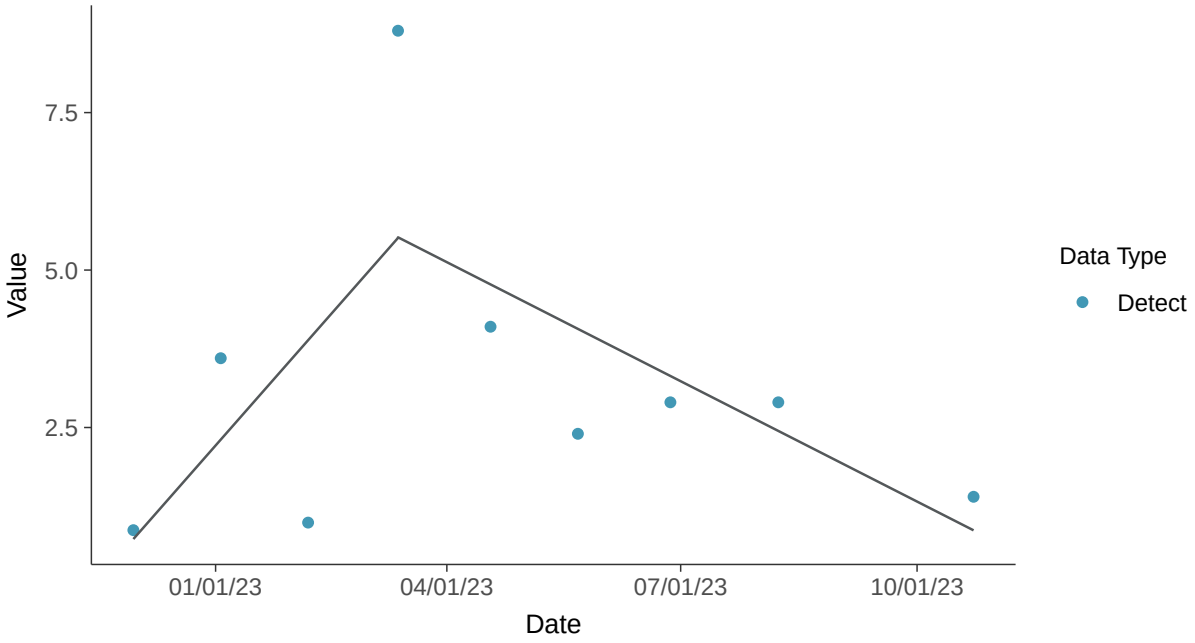

Lognormal Q-Q plot
Iron, MW-30 (mg/L)
log(Value)
2.0
1.5
1.0
0.5
0.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Iron, MW-30 (mg/L)
Value
7.5
5.0
2.5
0
2
4
6
8
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Iron, MW-30 (mg/L)
log(Value)
2.0
1.5
1.0
0.5
0.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

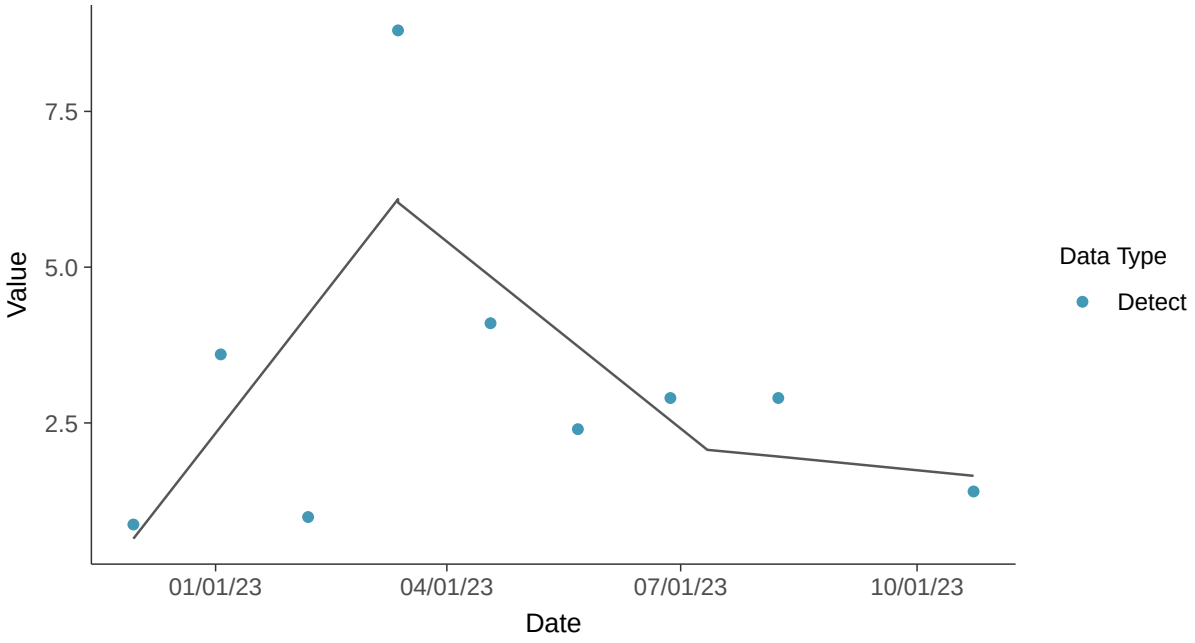
Trend Regression: Piecewise Linear-Linear

Iron, MW-30 (mg/L)



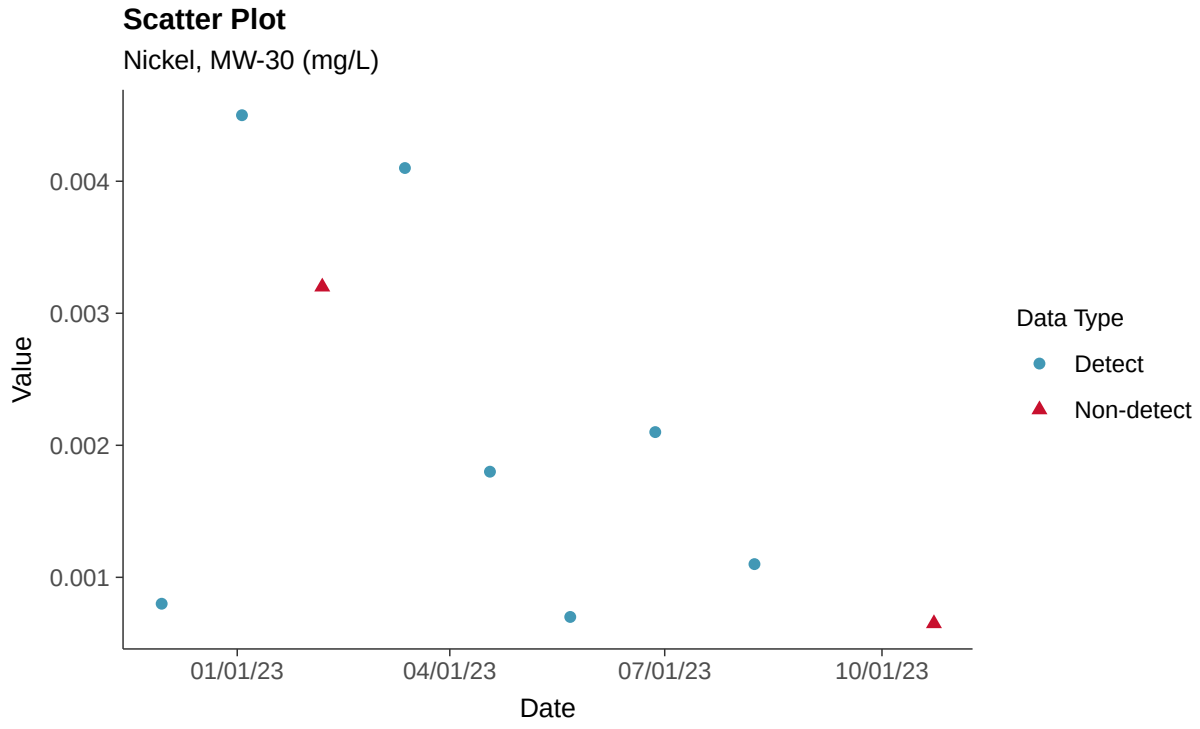
Trend Regression: Piecewise Linear-Linear-Linear

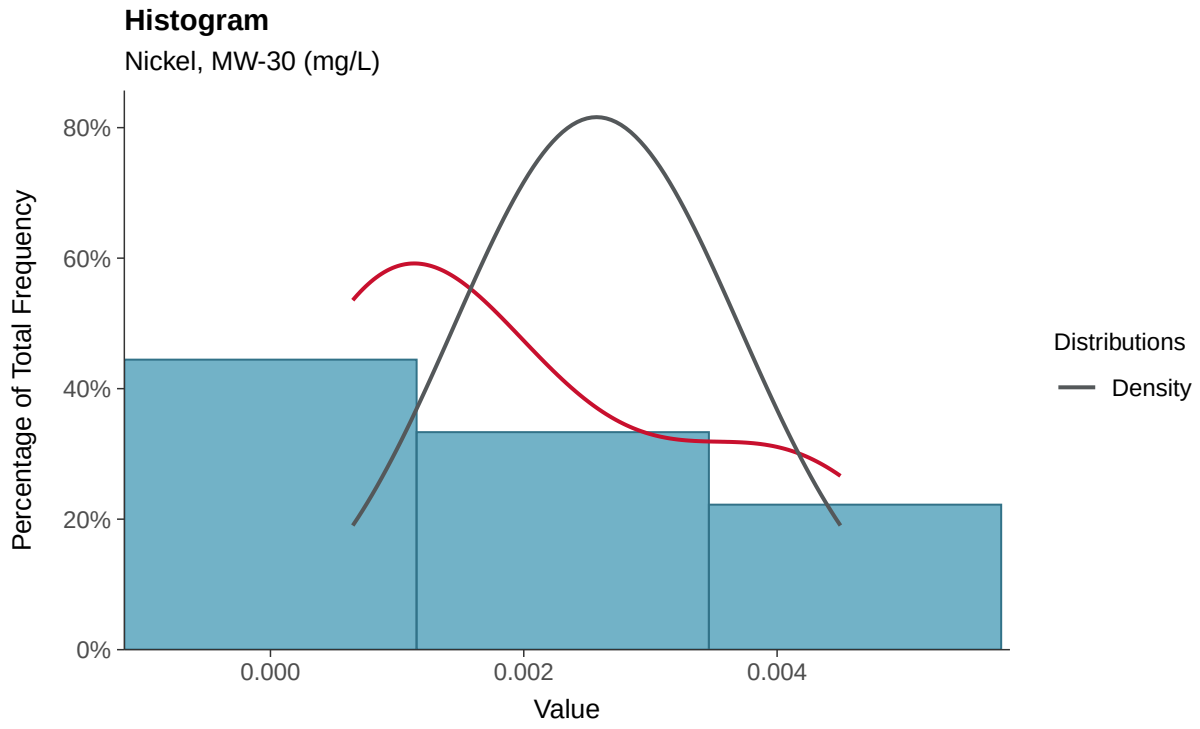
Iron, MW-30 (mg/L)



Part 115: Nickel, MW-30

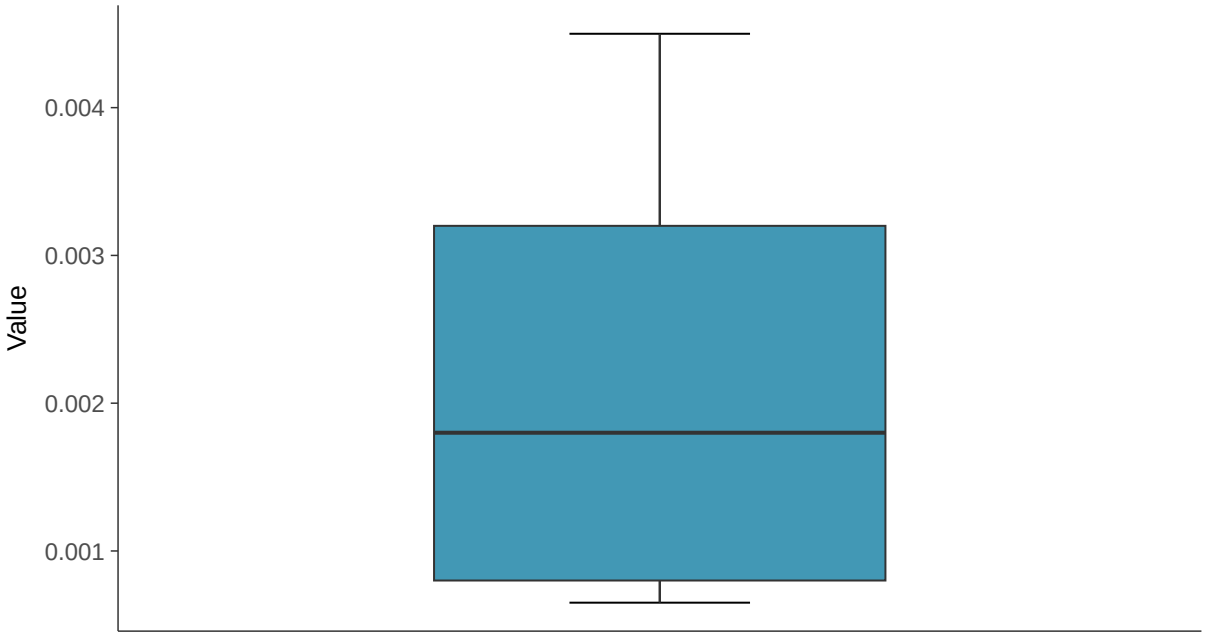
ID: 1_25_6_119





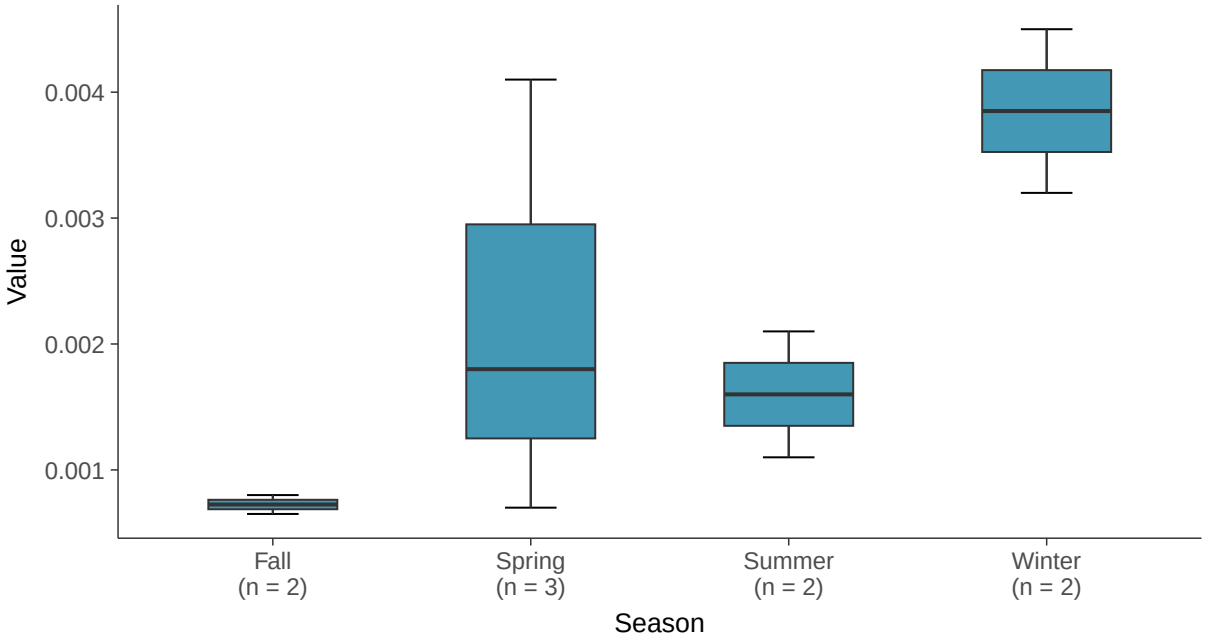
Boxplot

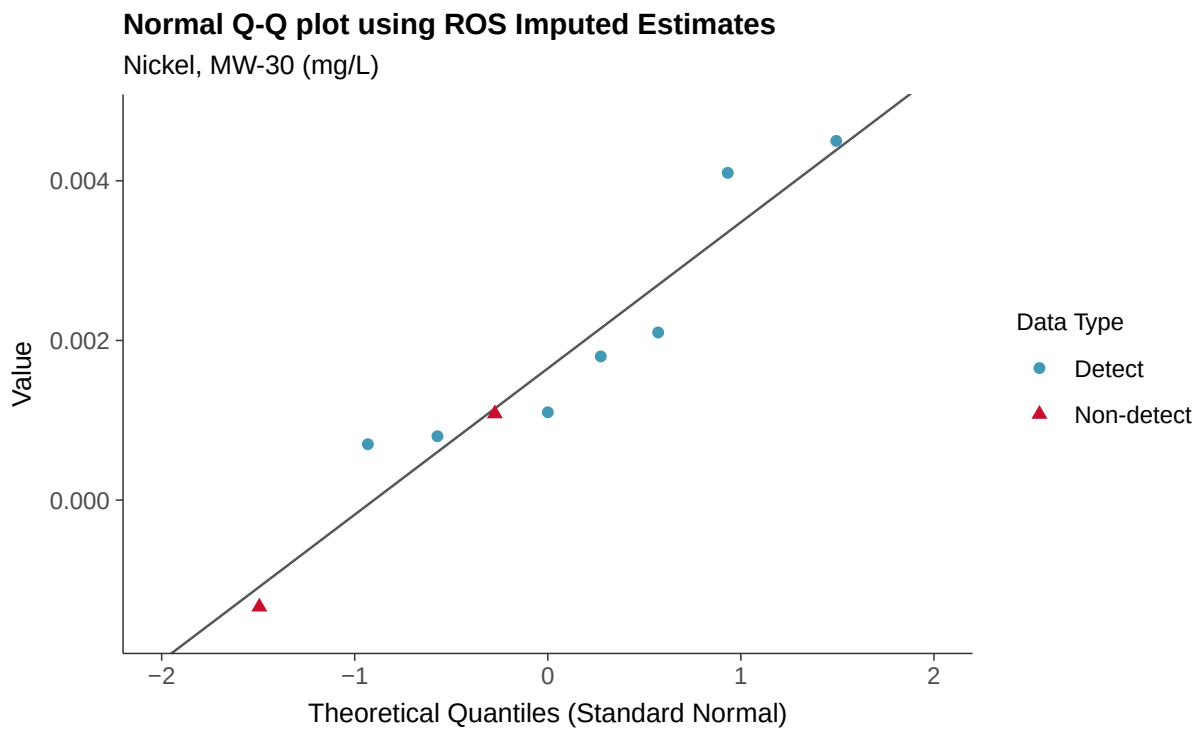
Nickel, MW-30 (mg/L)

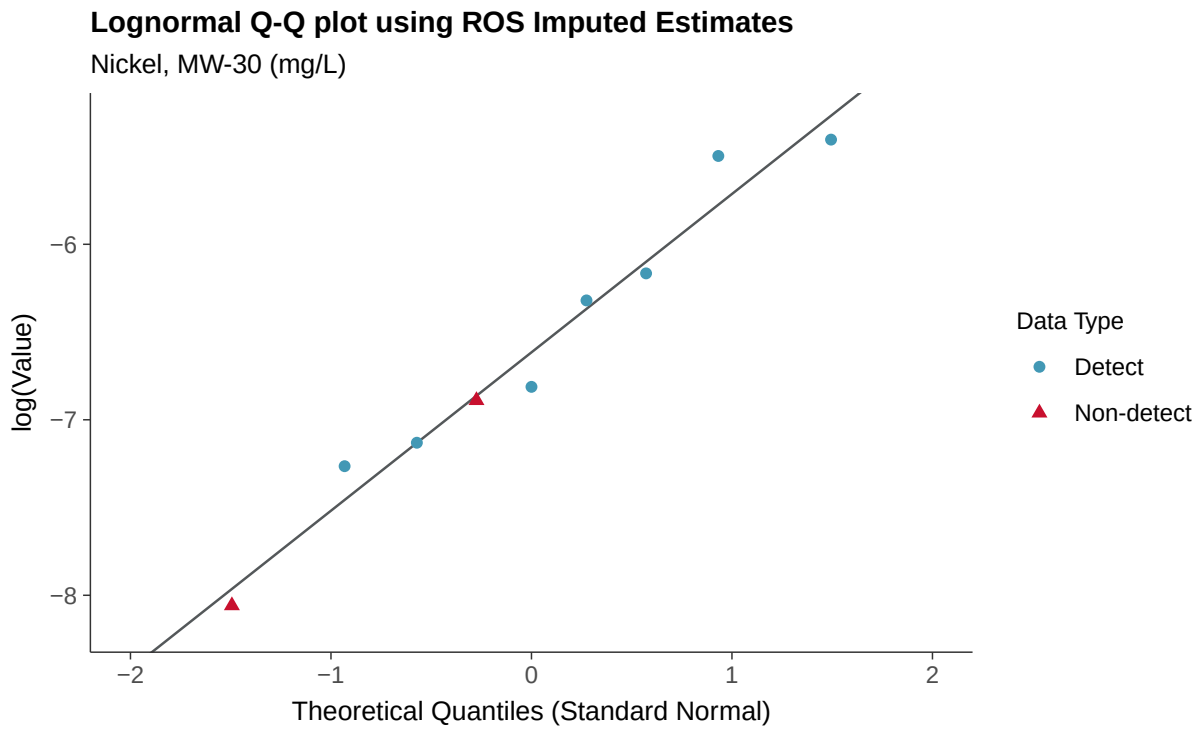


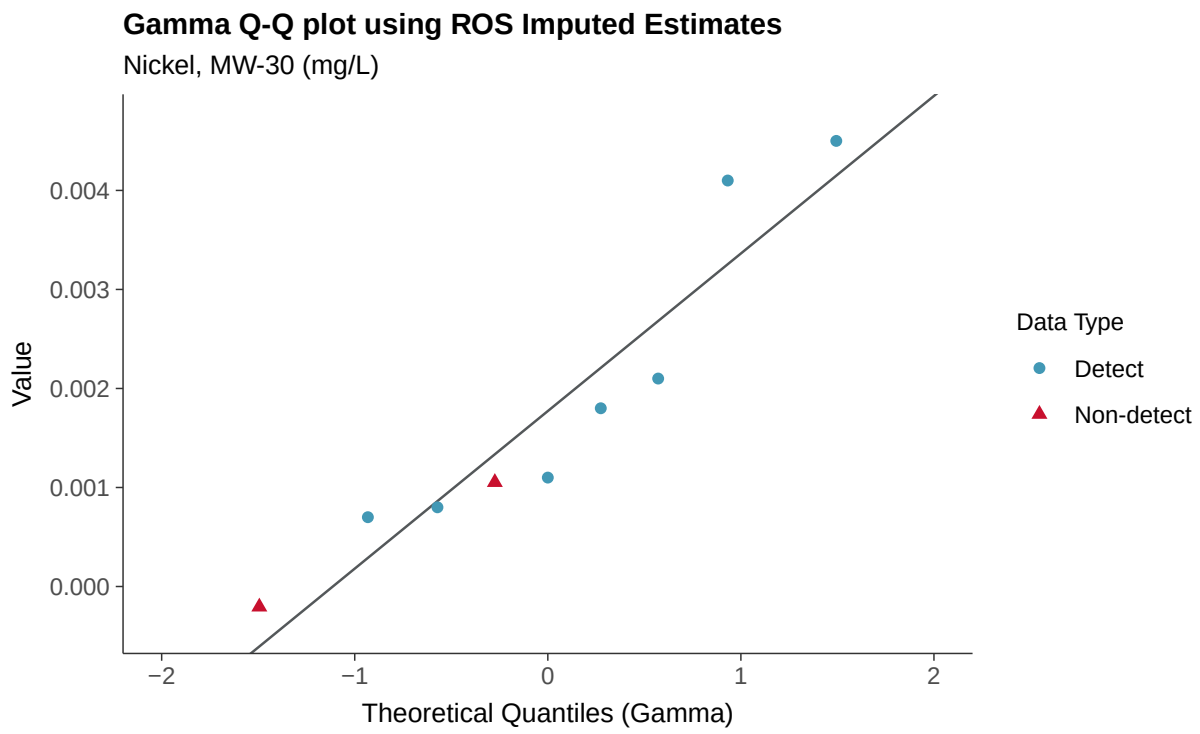
Boxplot by Season

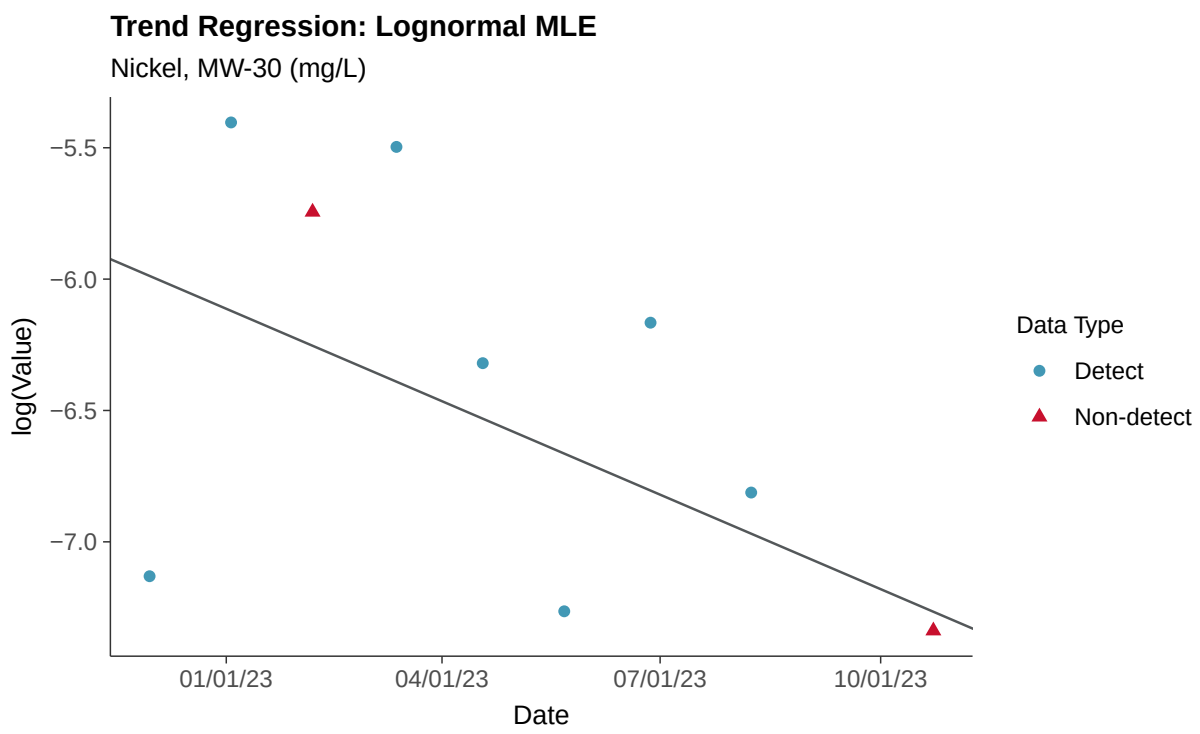
Nickel, MW-30 (mg/L)

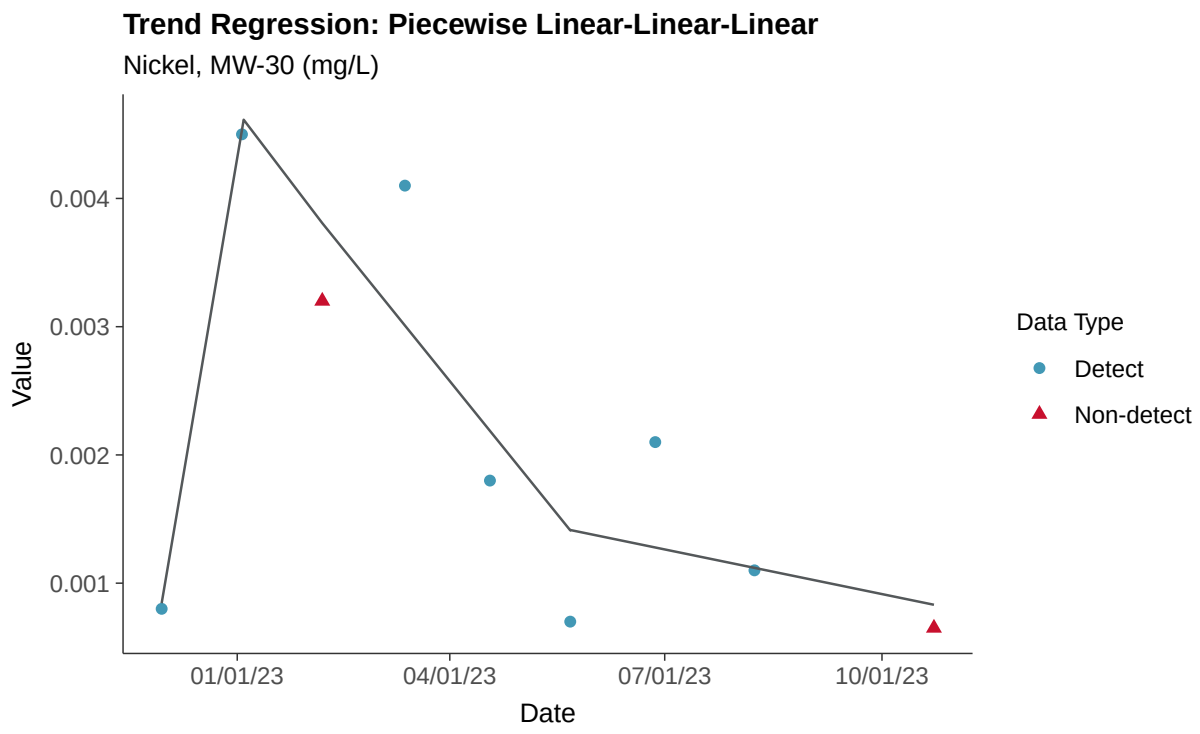



Normal Q-Q plot using ROS Imputed Estimates
Nickel, MW-30 (mg/L)
Value
0.004
0.002
0.000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Nickel, MW-30 (mg/L)
log(Value)
−6
−7
−8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

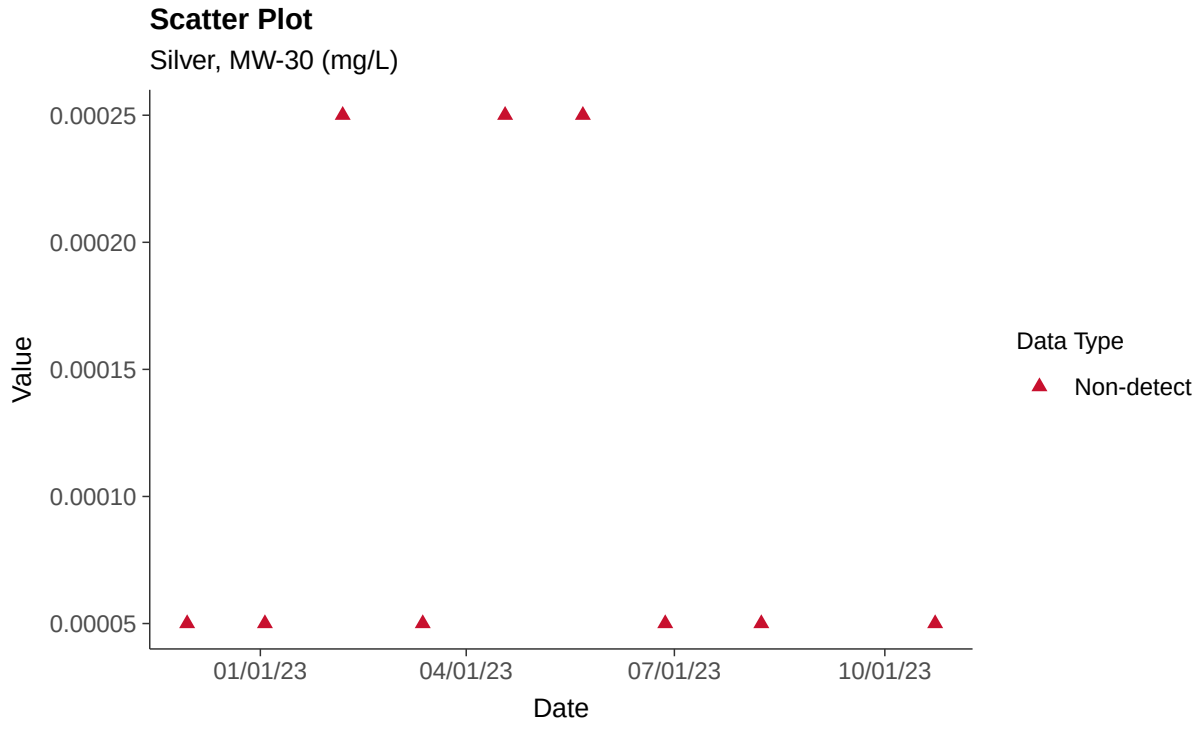

Gamma Q-Q plot using ROS Imputed Estimates
Nickel, MW-30 (mg/L)
Value
0.004
0.003
0.002
0.001
0.000
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

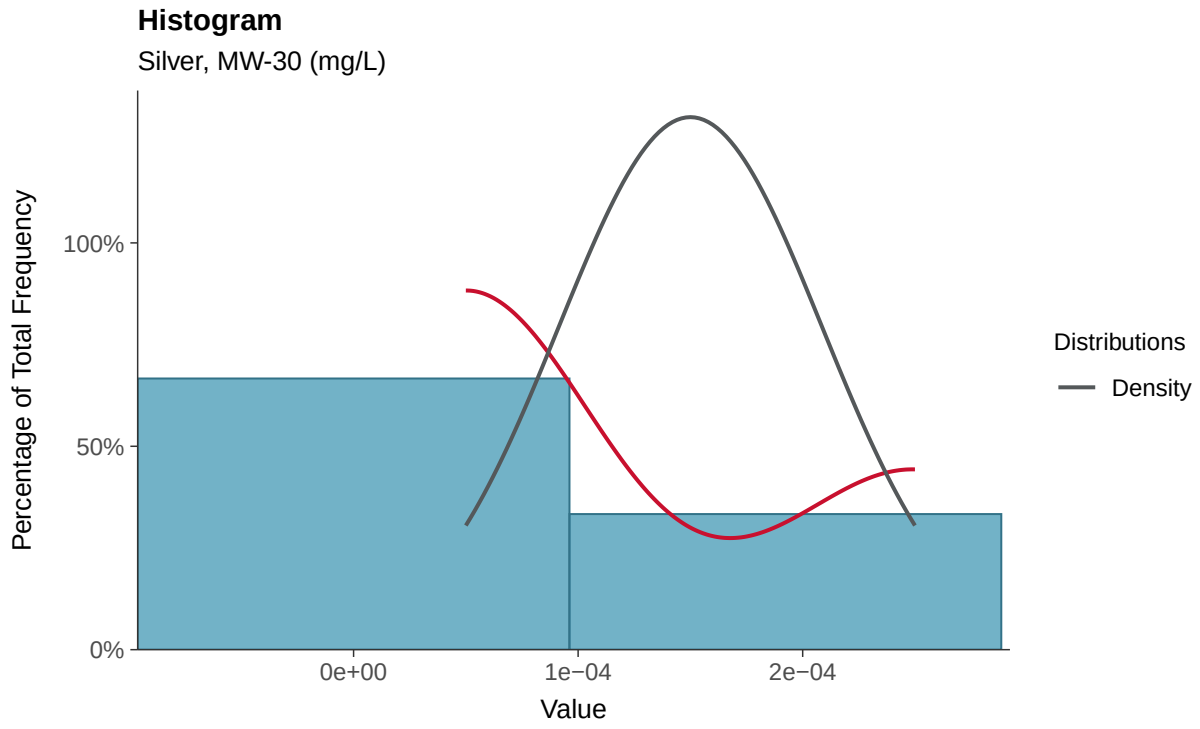

Trend Regression: Lognormal MLE
Nickel, MW-30 (mg/L)
log(Value)
−5.5
−6.0
−6.5
−7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-30 (mg/L)
Value
0.004
0.003
0.002
0.001
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Silver, MW-30

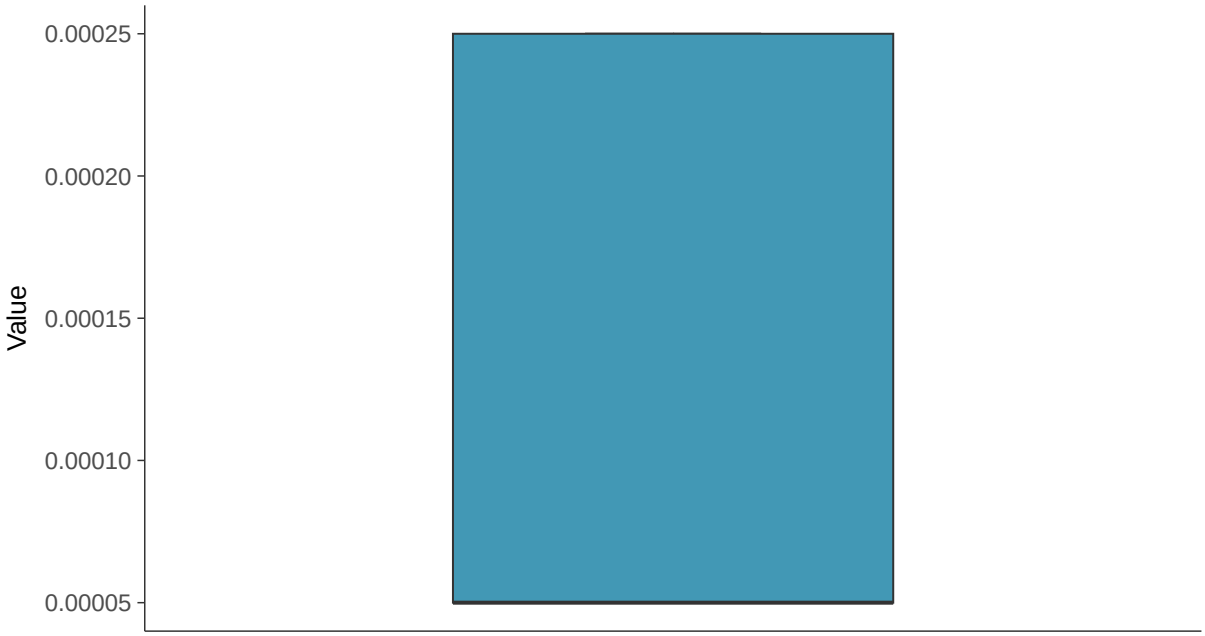
ID: 1_25_6_123





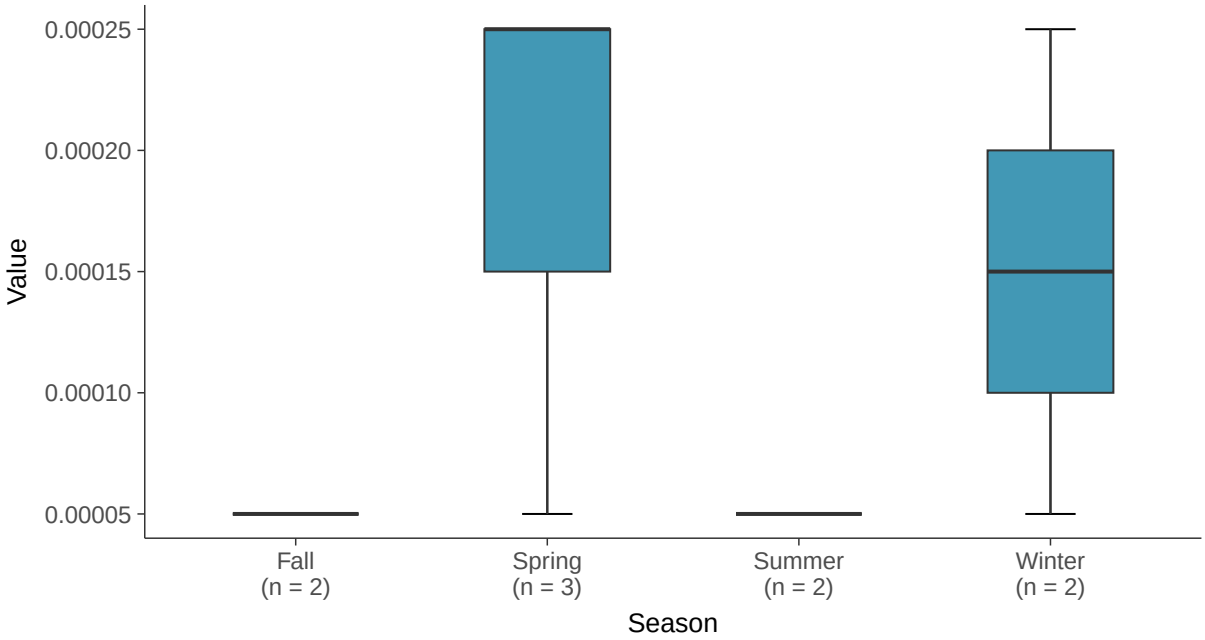
Boxplot

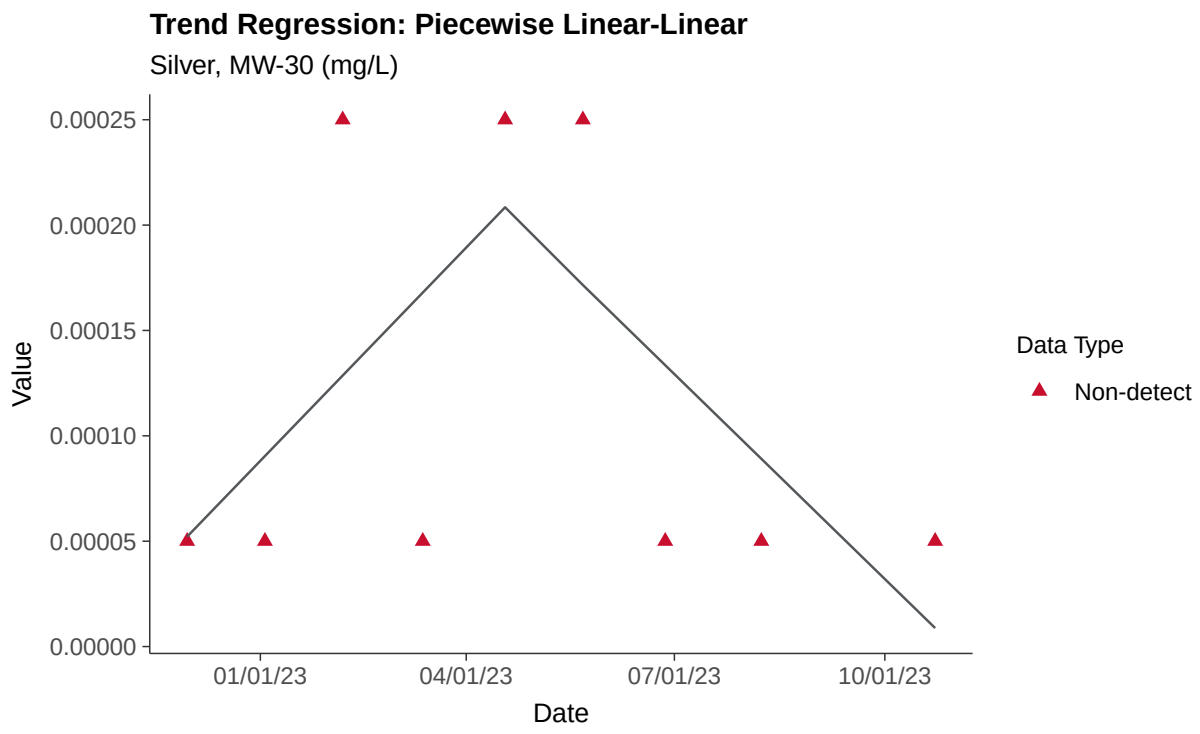
Silver, MW-30 (mg/L)

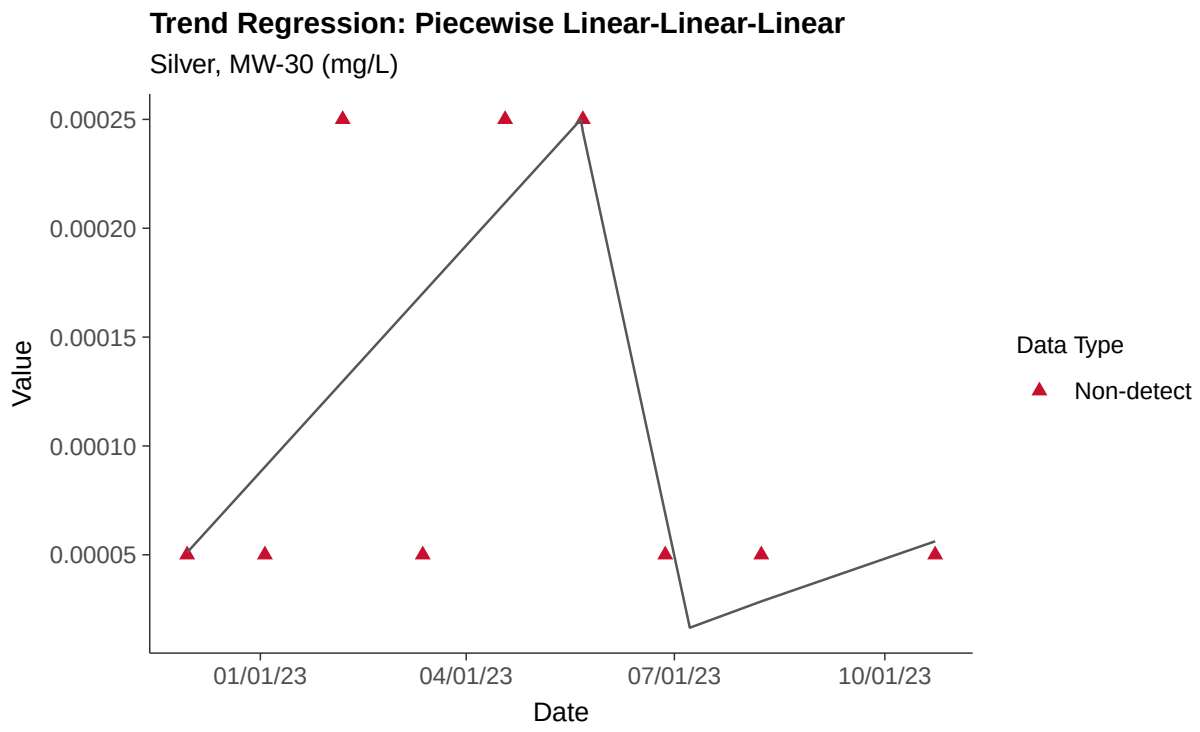


Boxplot by Season

Silver, MW-30 (mg/L)

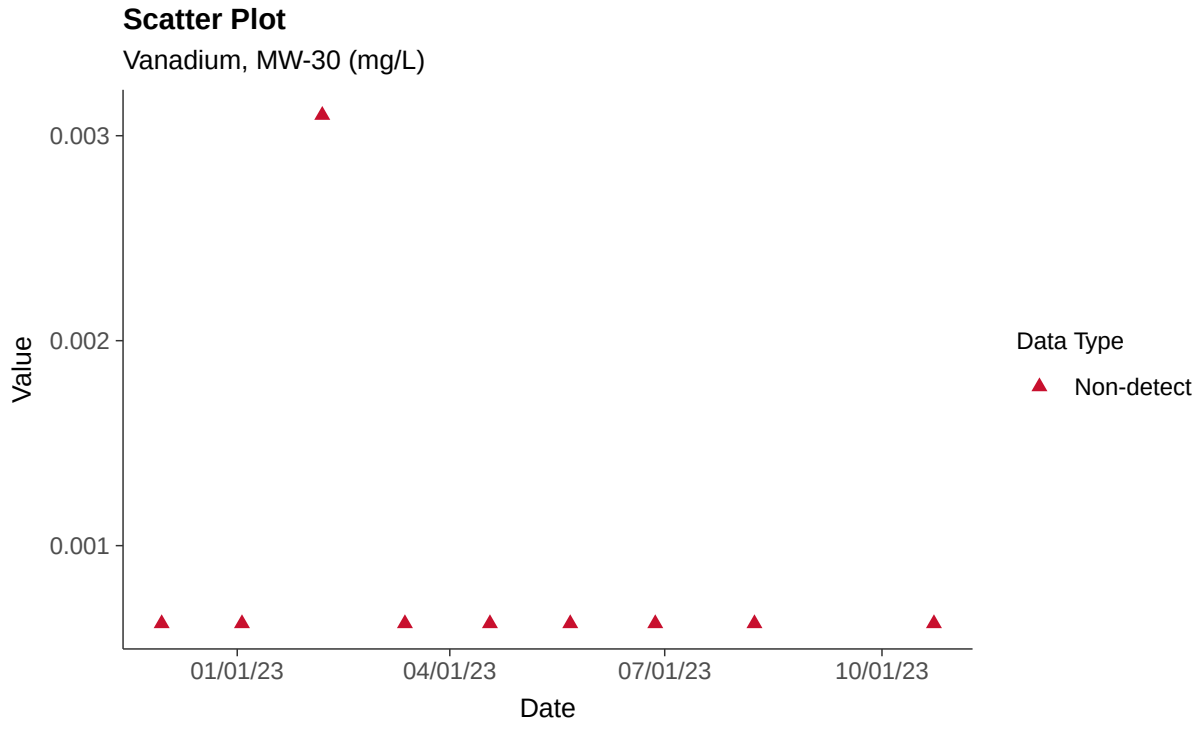


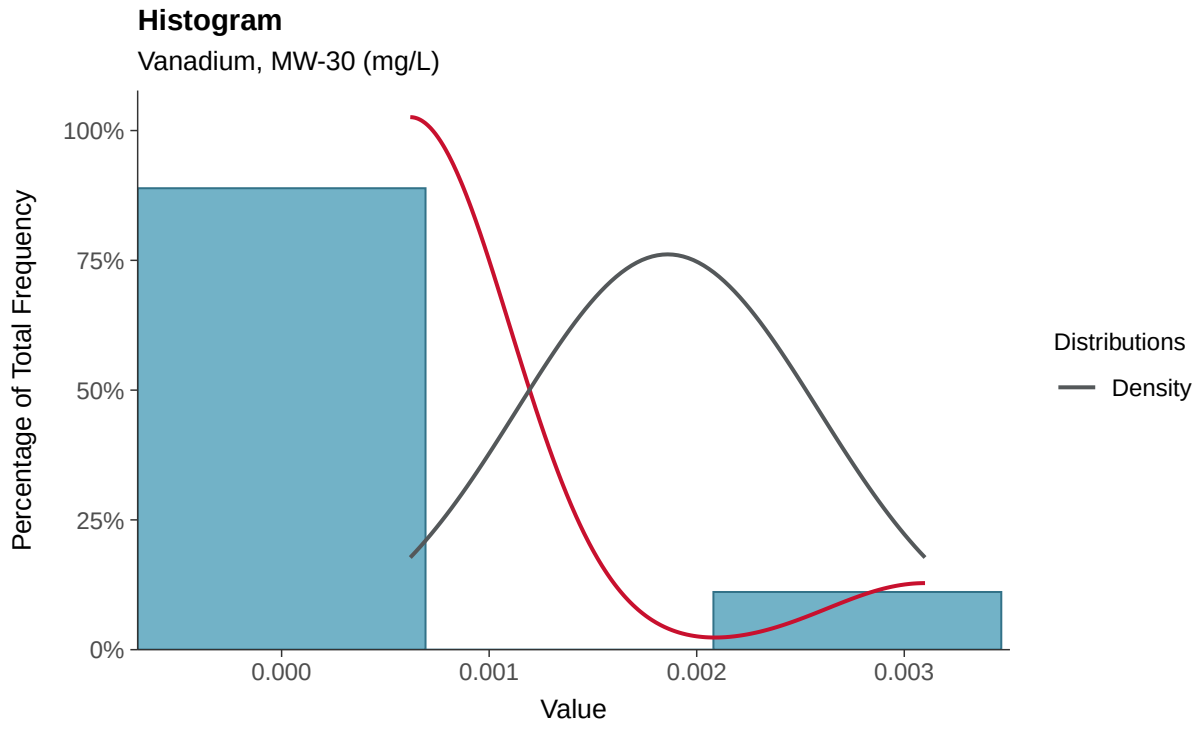

Trend Regression: Piecewise Linear-Linear
Silver, MW-30 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-30 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-30

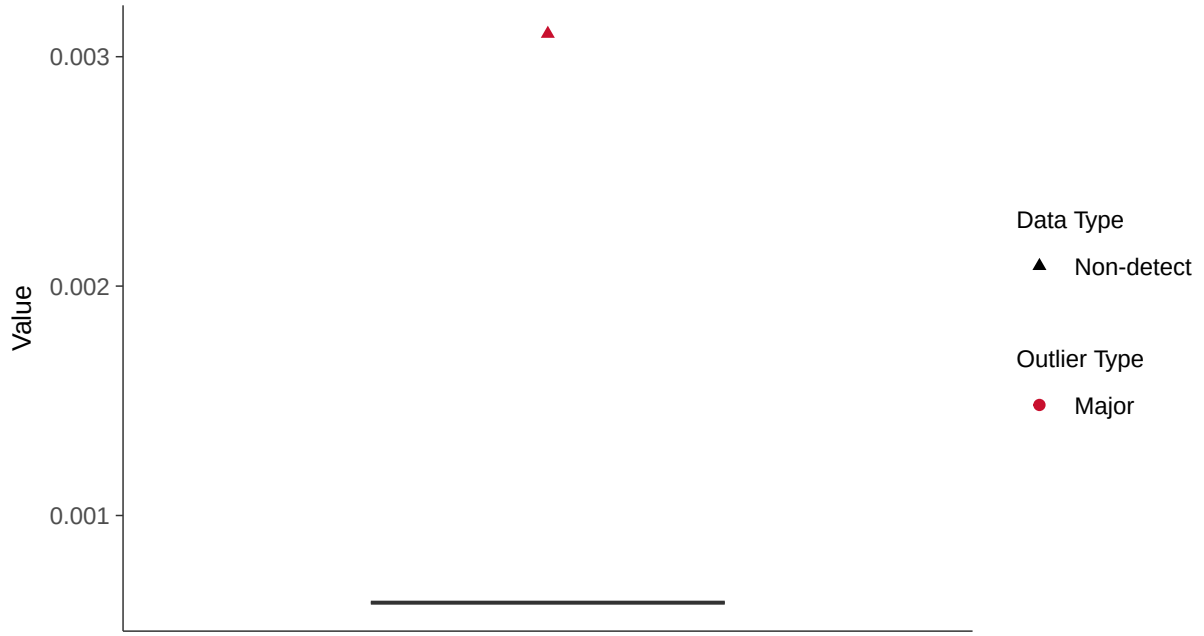
ID: 1_25_6_129





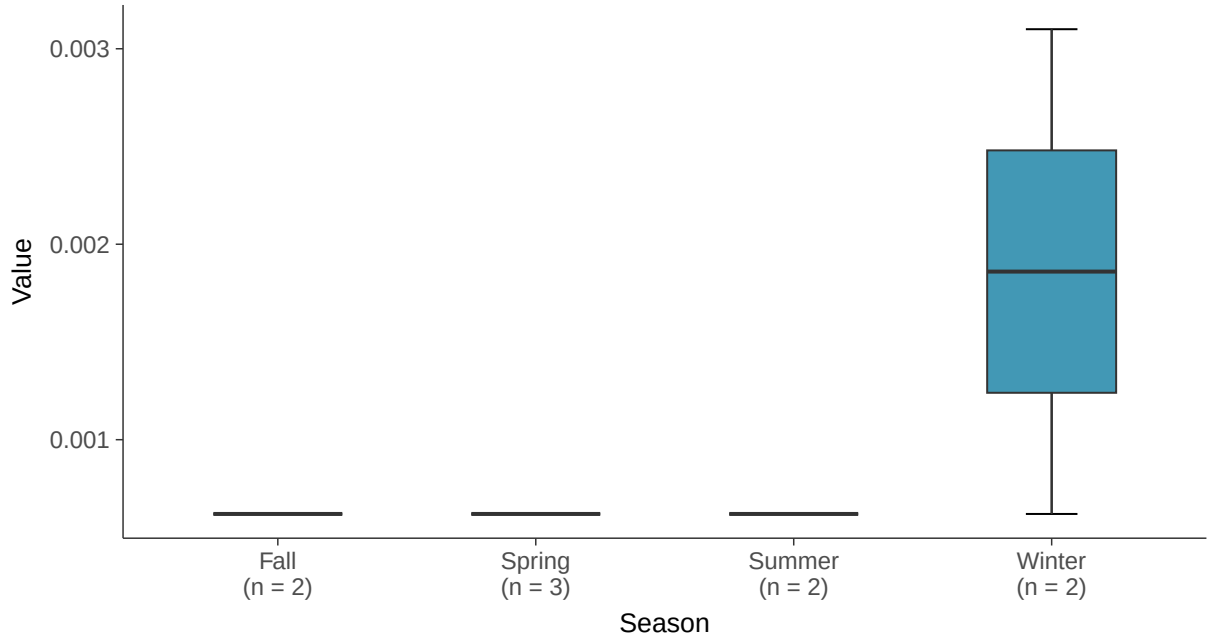
Boxplot

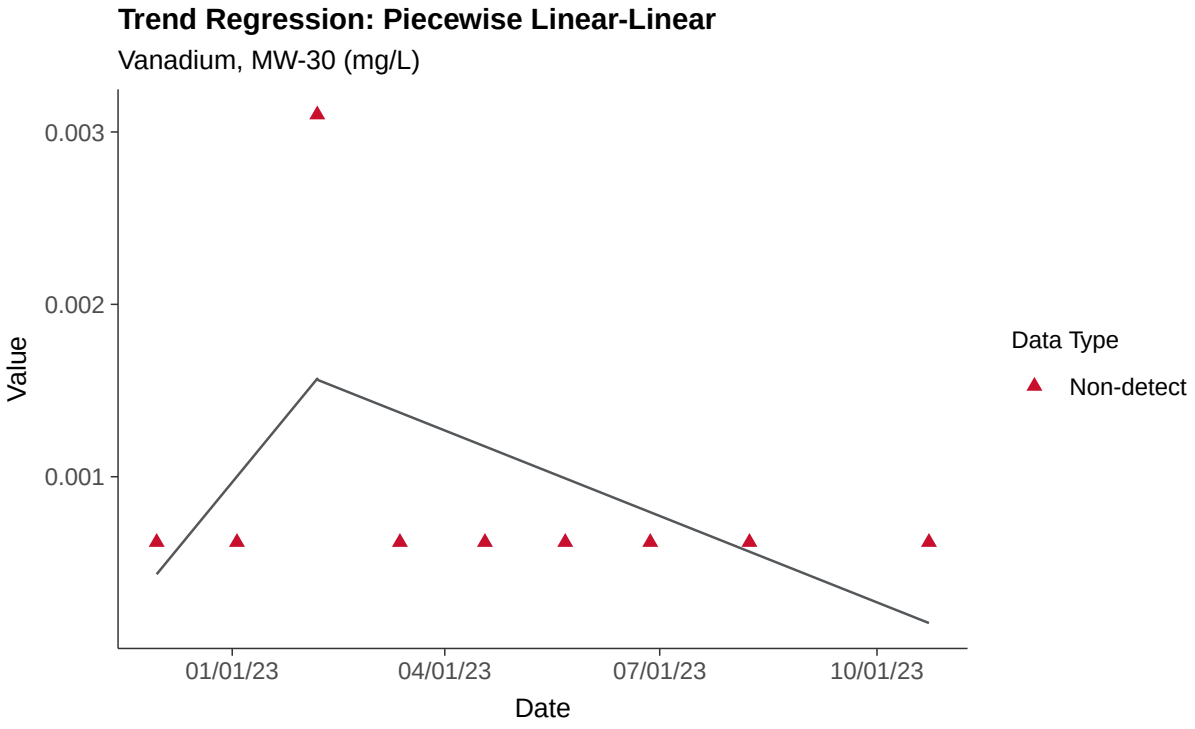
Vanadium, MW-30 (mg/L)

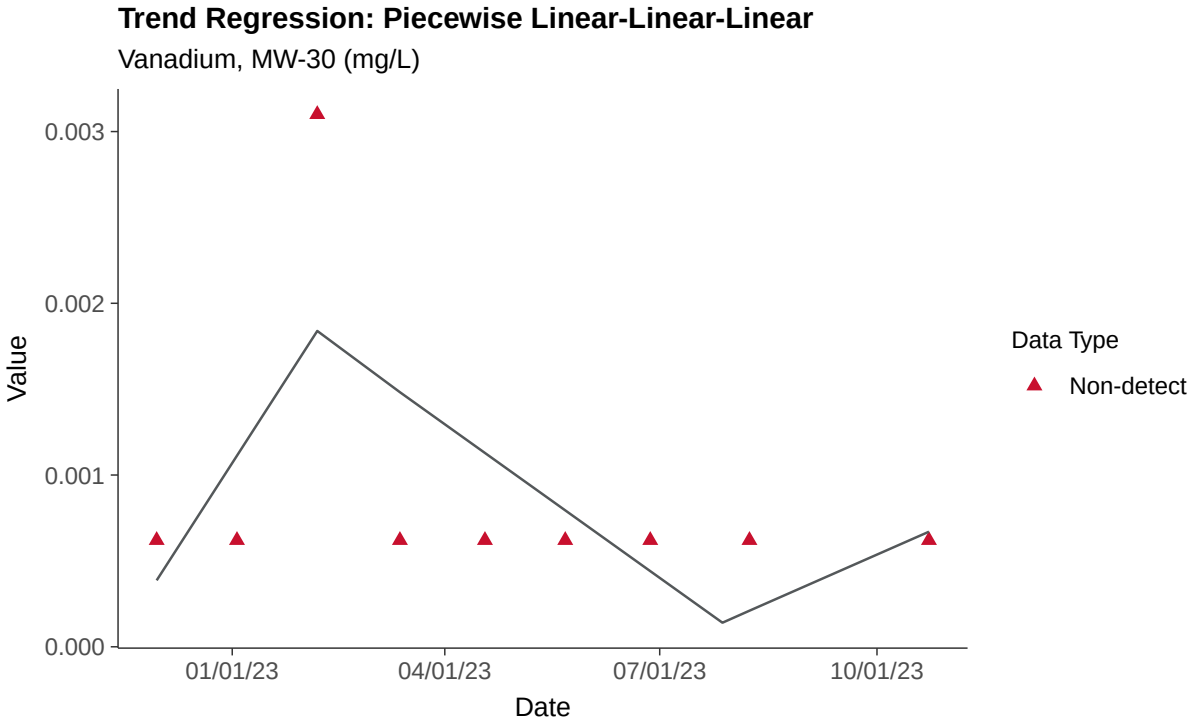


Boxplot by Season

Vanadium, MW-30 (mg/L)

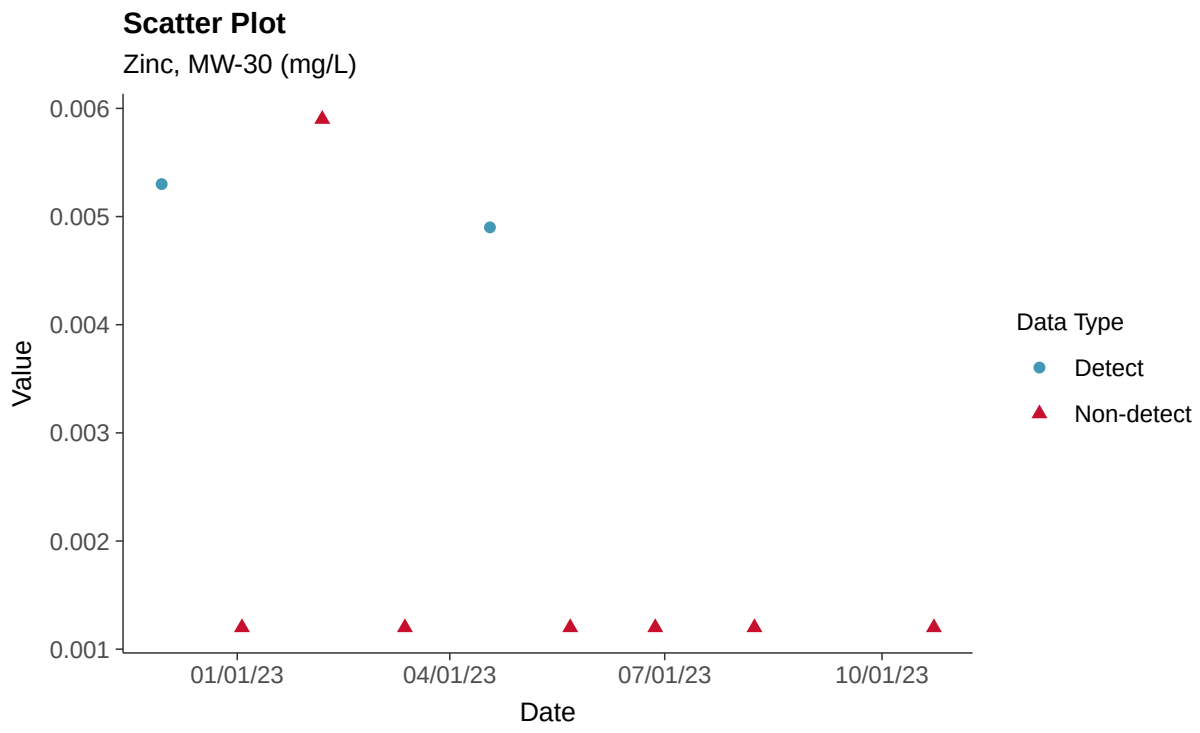


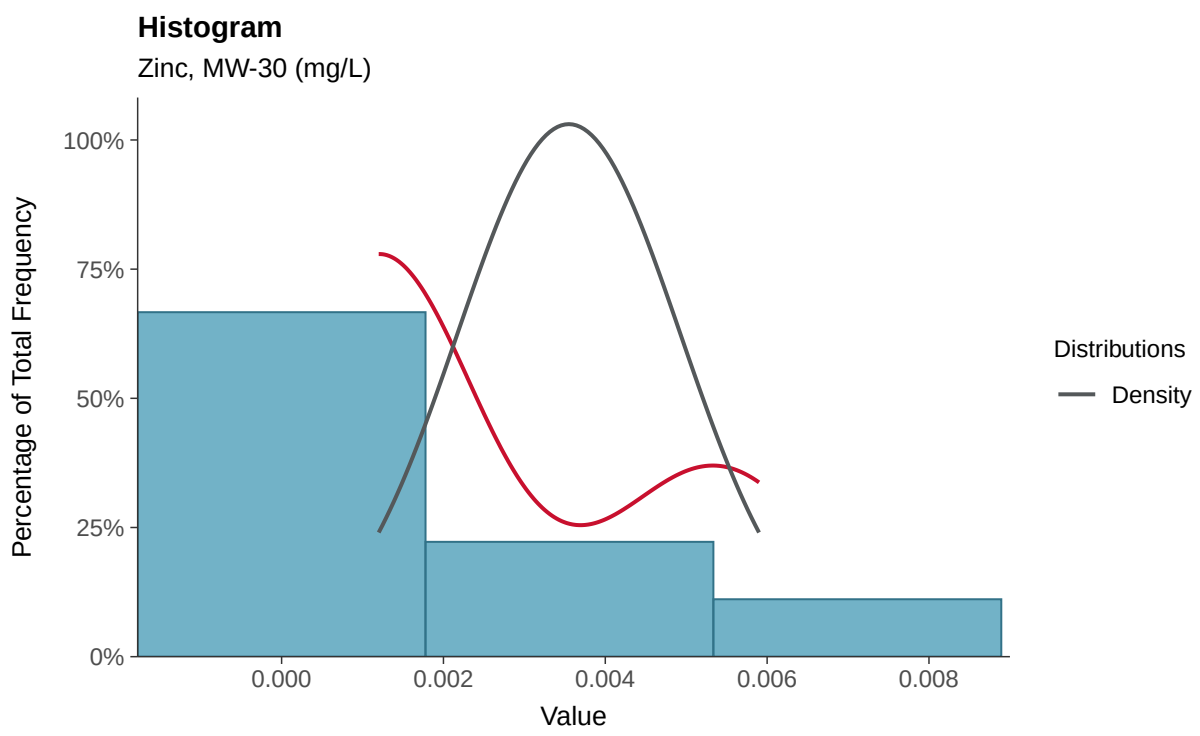

Trend Regression: Piecewise Linear-Linear
Vanadium, MW-30 (mg/L)
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Vanadium, MW-30 (mg/L)
0.003
0.002
0.001
0.000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Zinc, MW-30

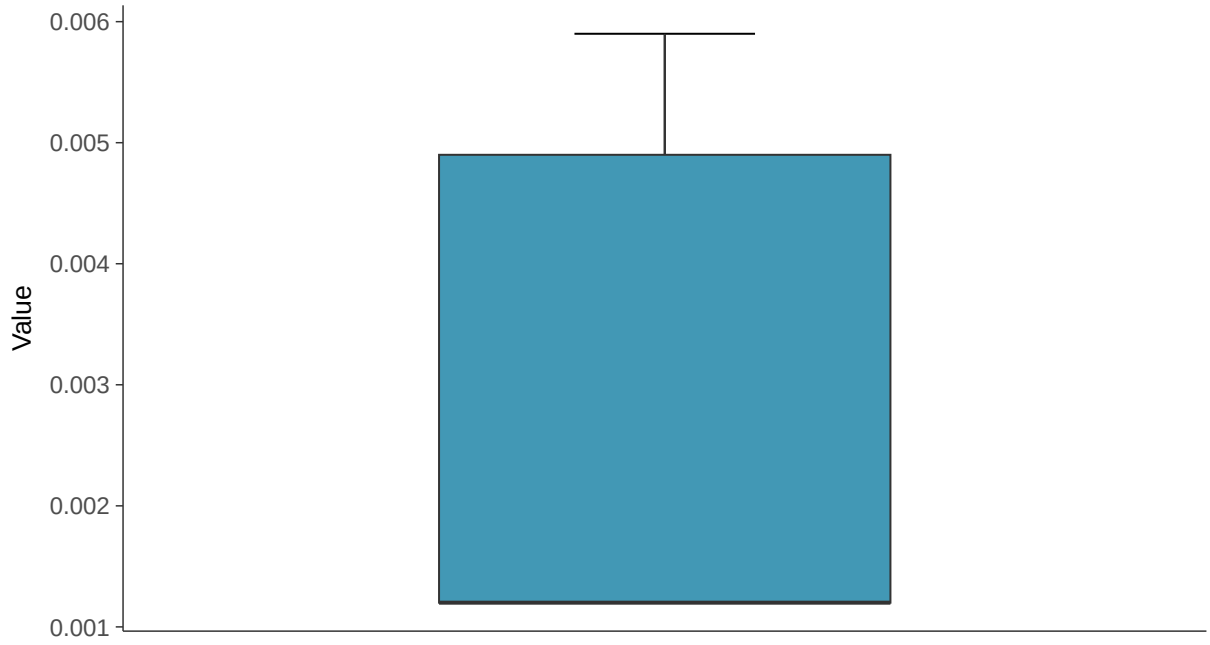
ID: 1_25_6_130





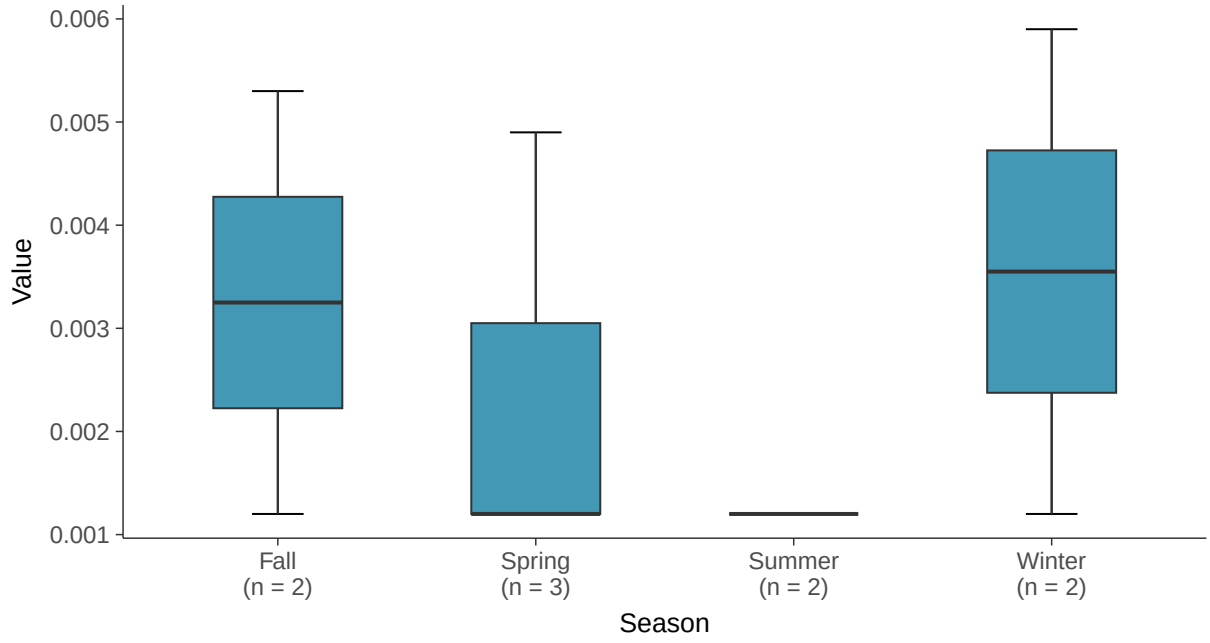
Boxplot

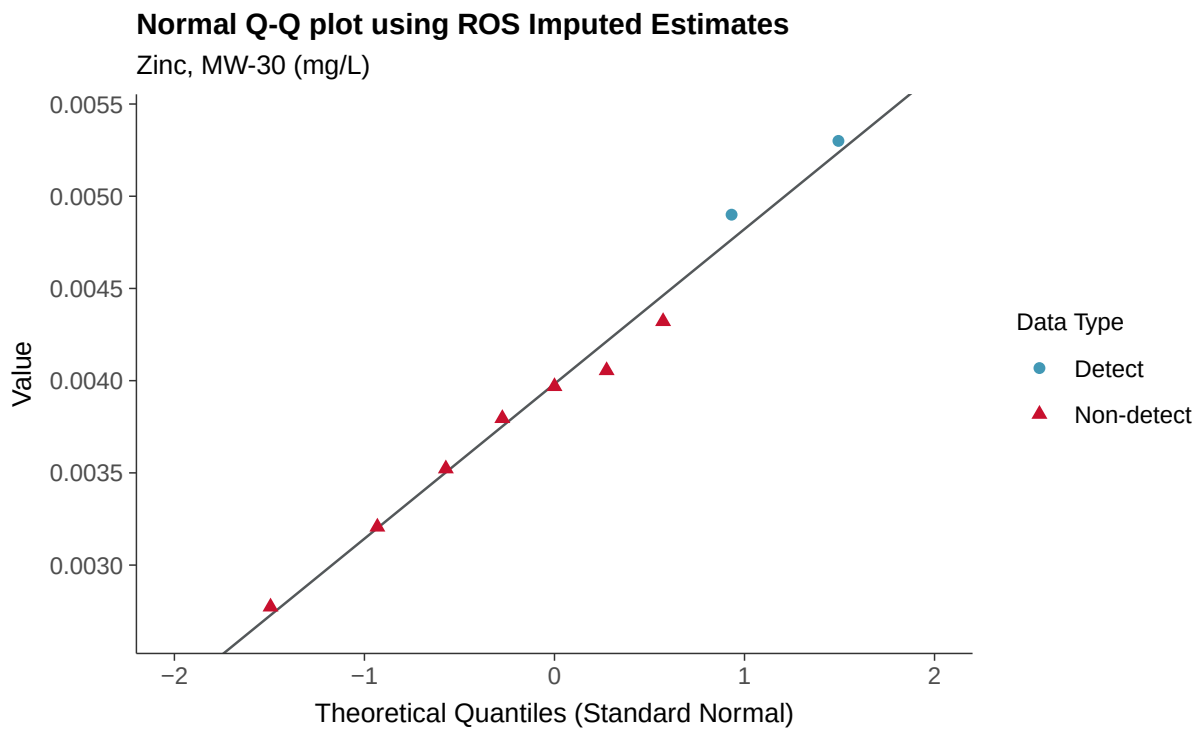
Zinc, MW-30 (mg/L)

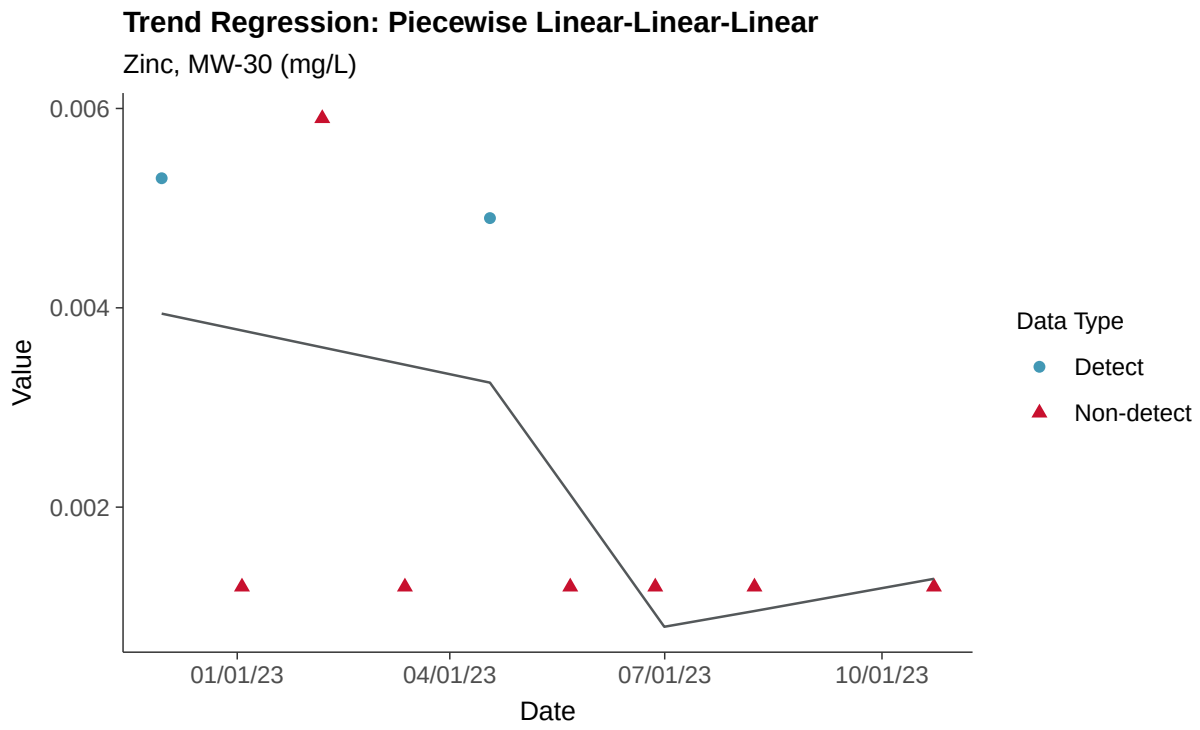


Boxplot by Season

Zinc, MW-30 (mg/L)

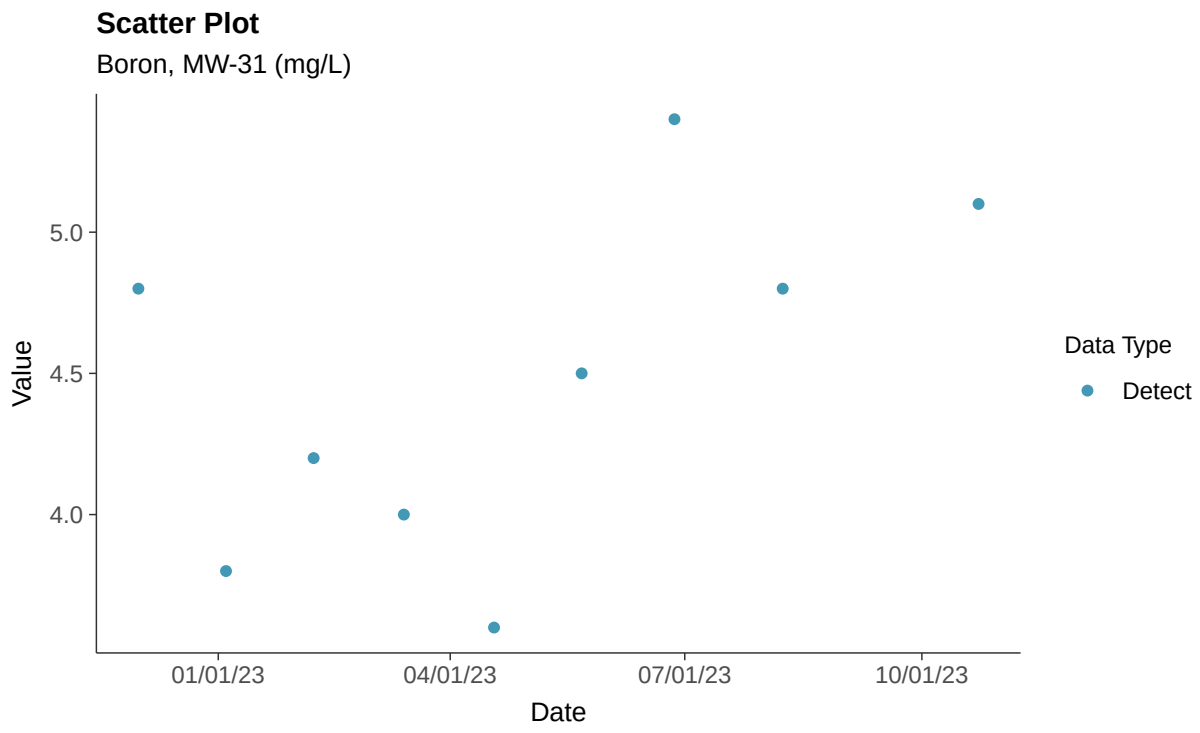


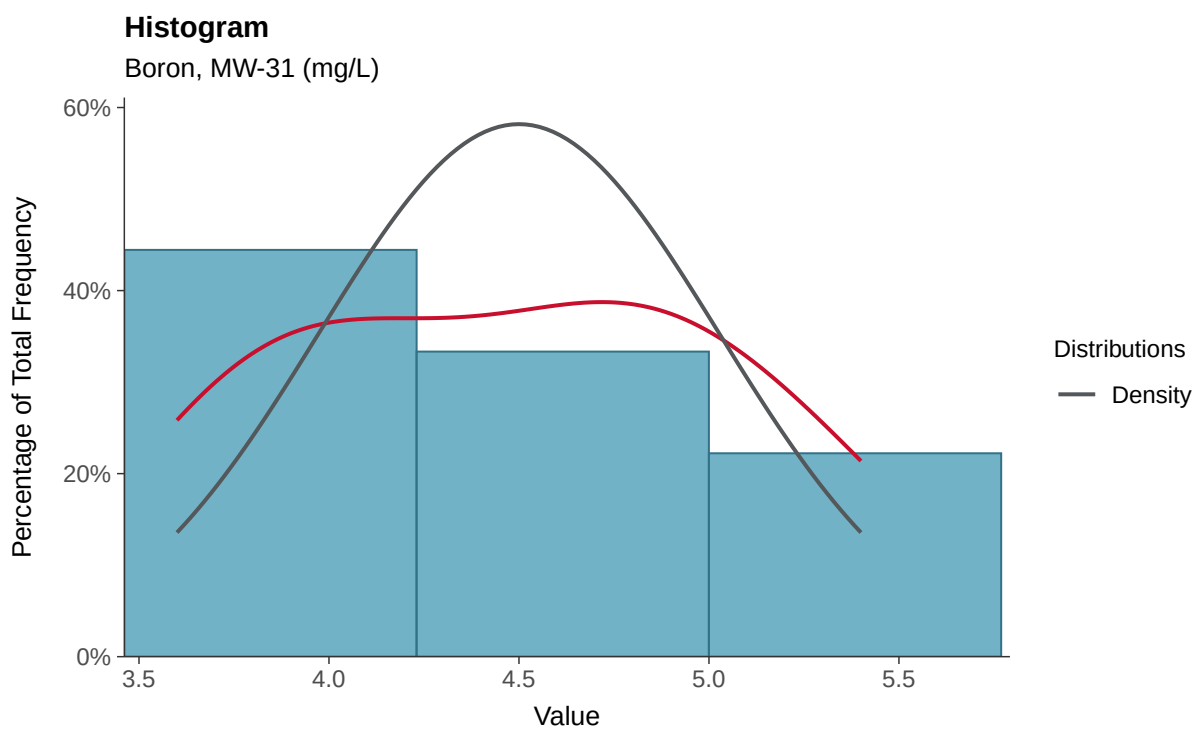

Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-30 (mg/L)
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
Value
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Zinc, MW-30 (mg/L)
0.006
0.004
0.002
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Boron, MW-31

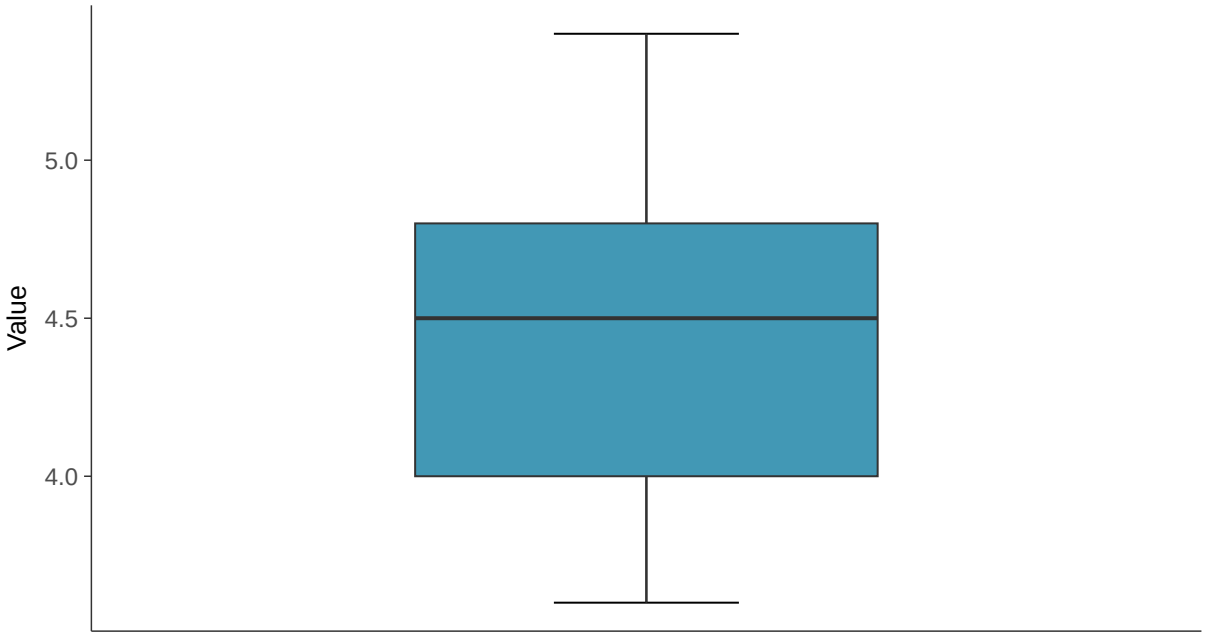
ID: 1_26_4_105





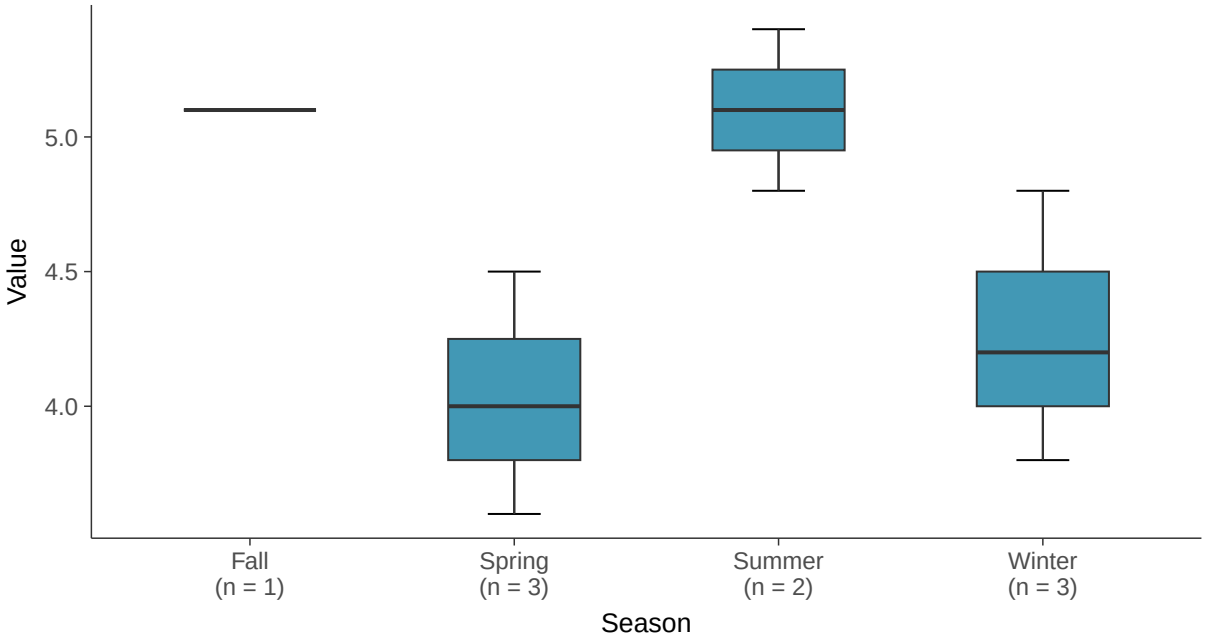
Boxplot

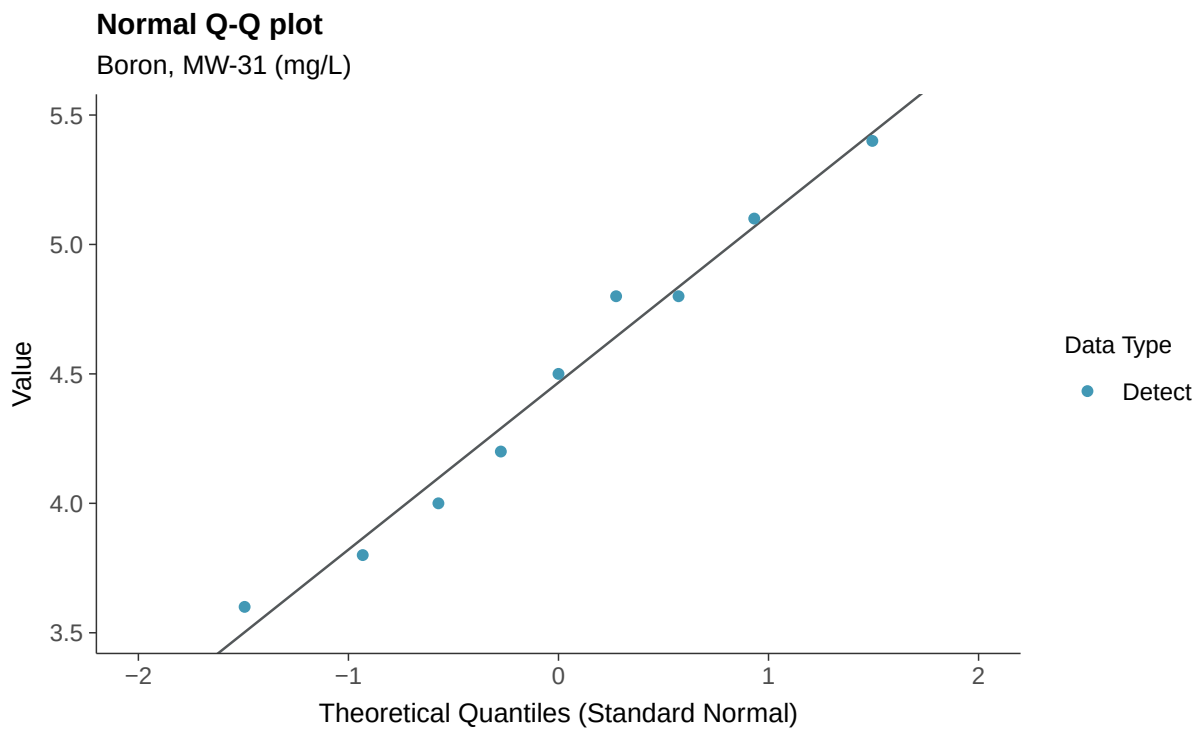
Boron, MW-31 (mg/L)

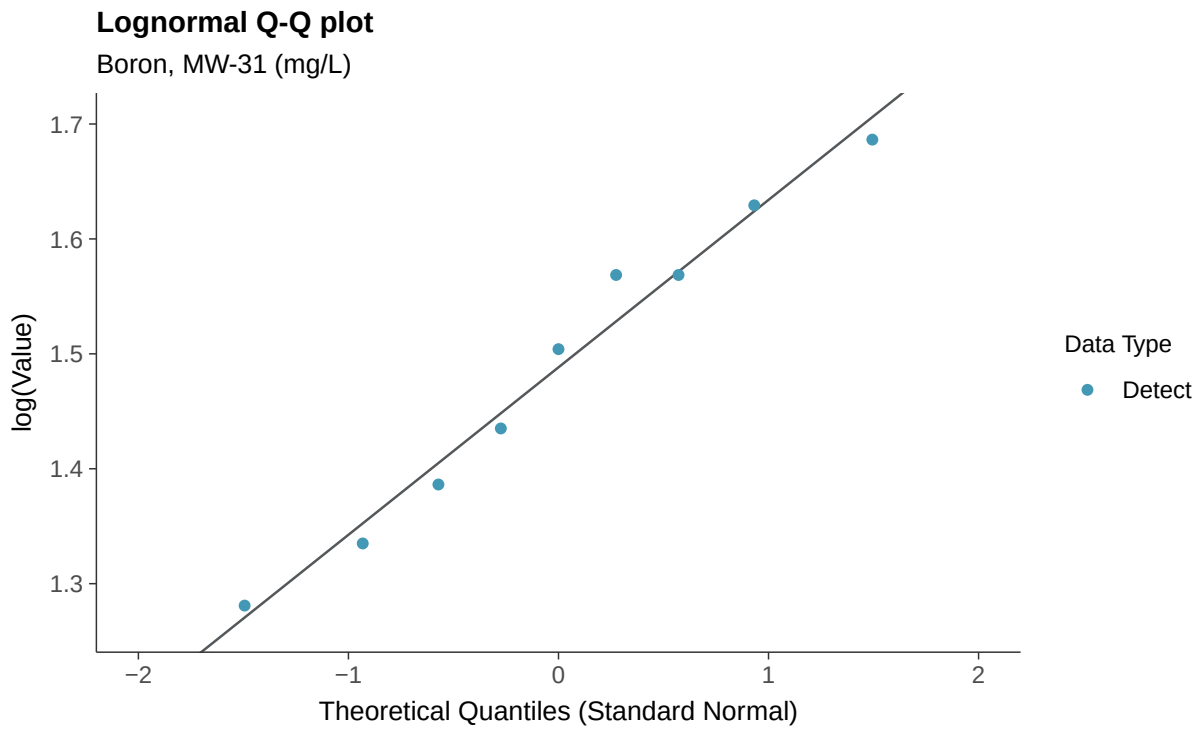


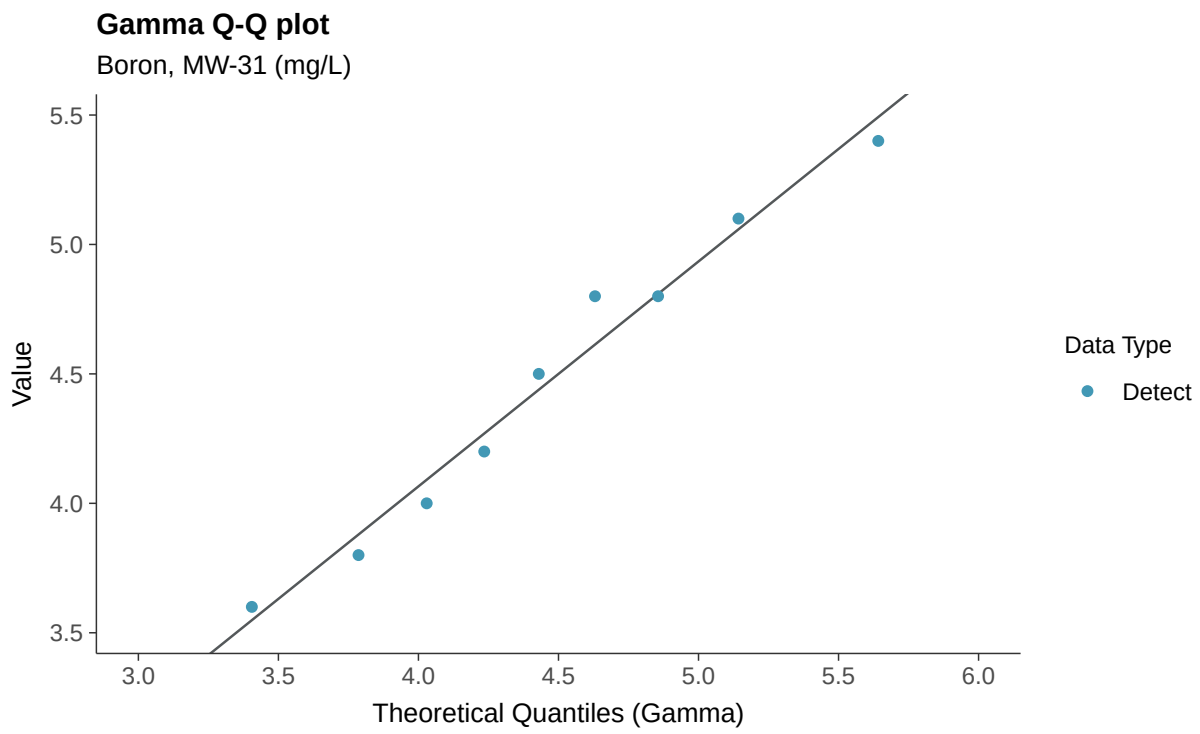
Boxplot by Season

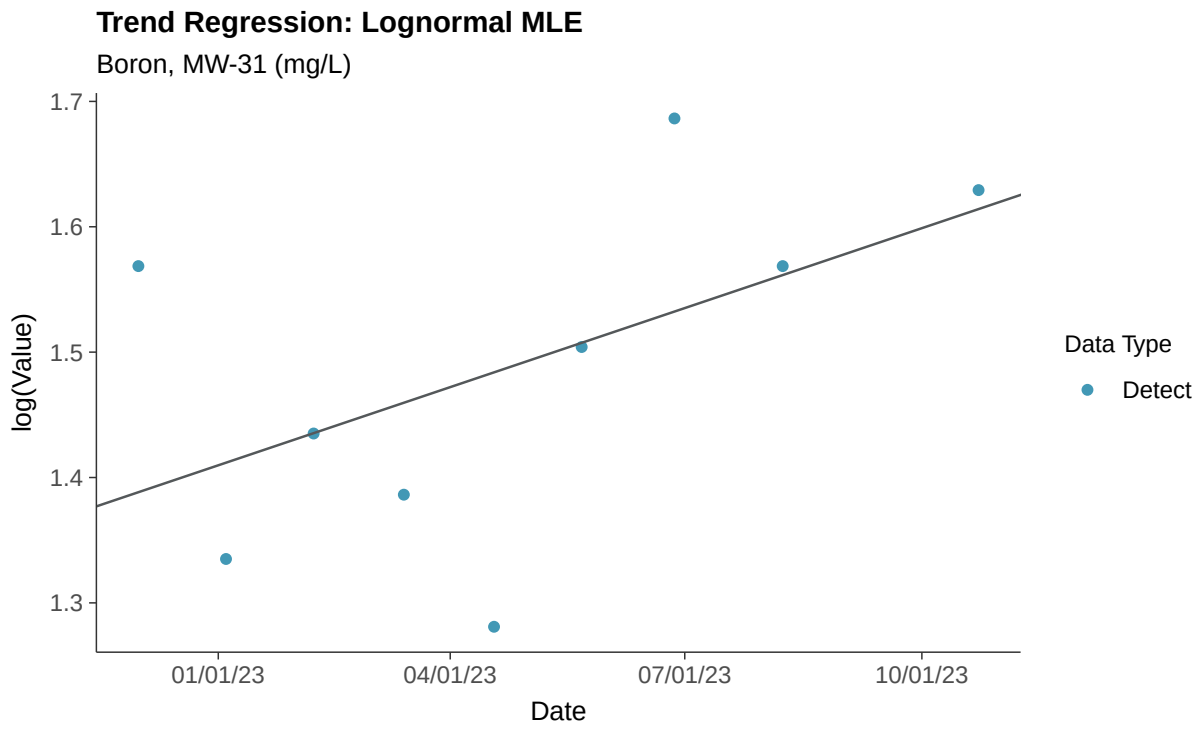
Boron, MW-31 (mg/L)

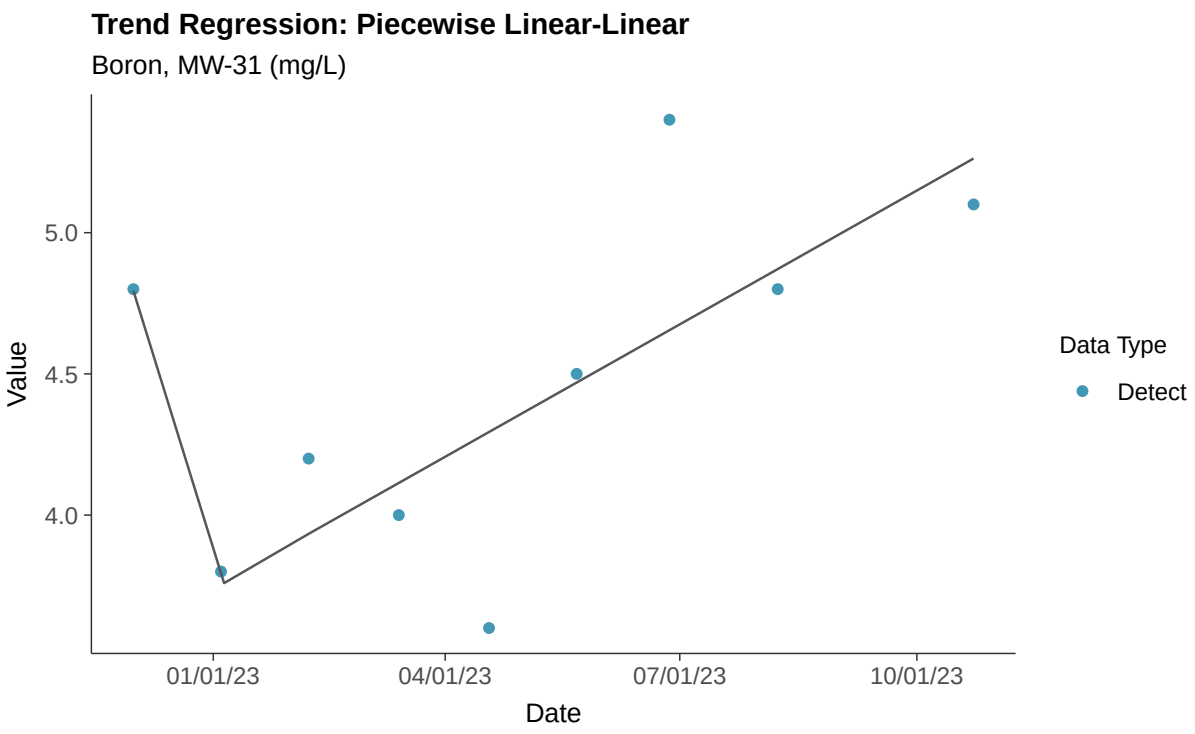



Normal Q-Q plot
Boron, MW-31 (mg/L)
Value
5.5
5.0
4.5
4.0
3.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-31 (mg/L)
log(Value)
1.7
1.6
1.5
1.4
1.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

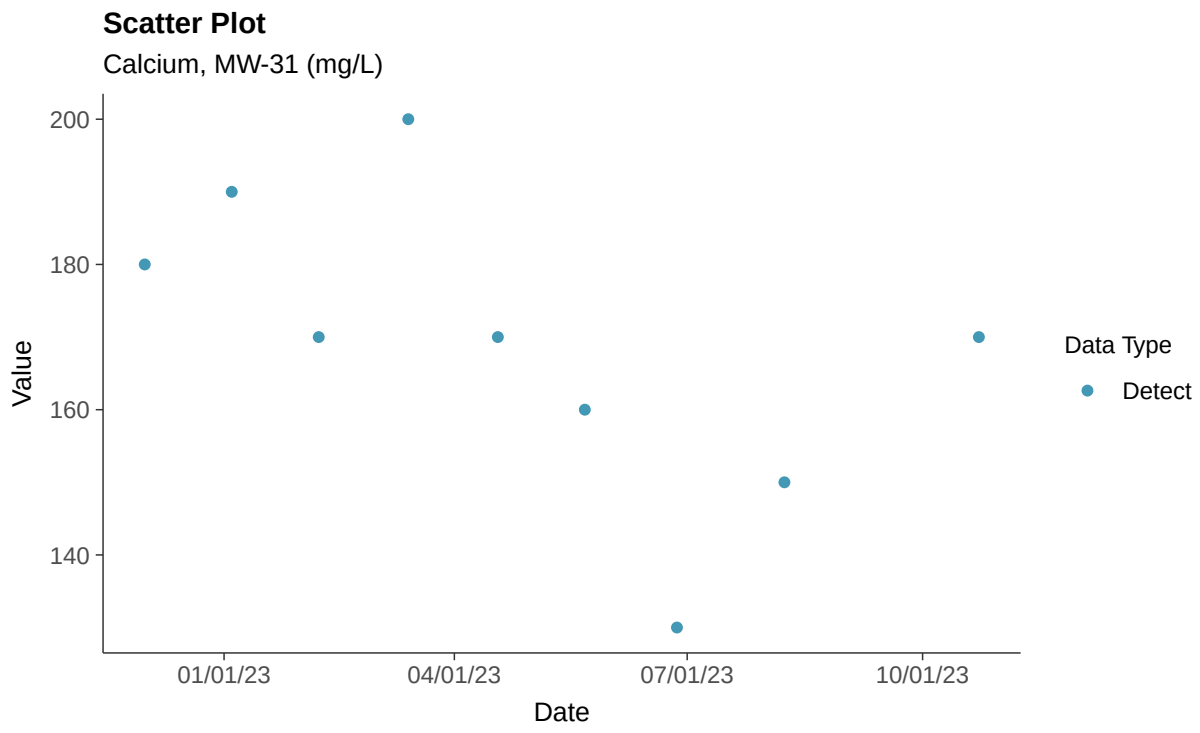

Gamma Q-Q plot
Boron, MW-31 (mg/L)
Value
5.5
5.0
4.5
4.0
3.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
Theoretical Quantiles (Gamma)
Data Type
Detect

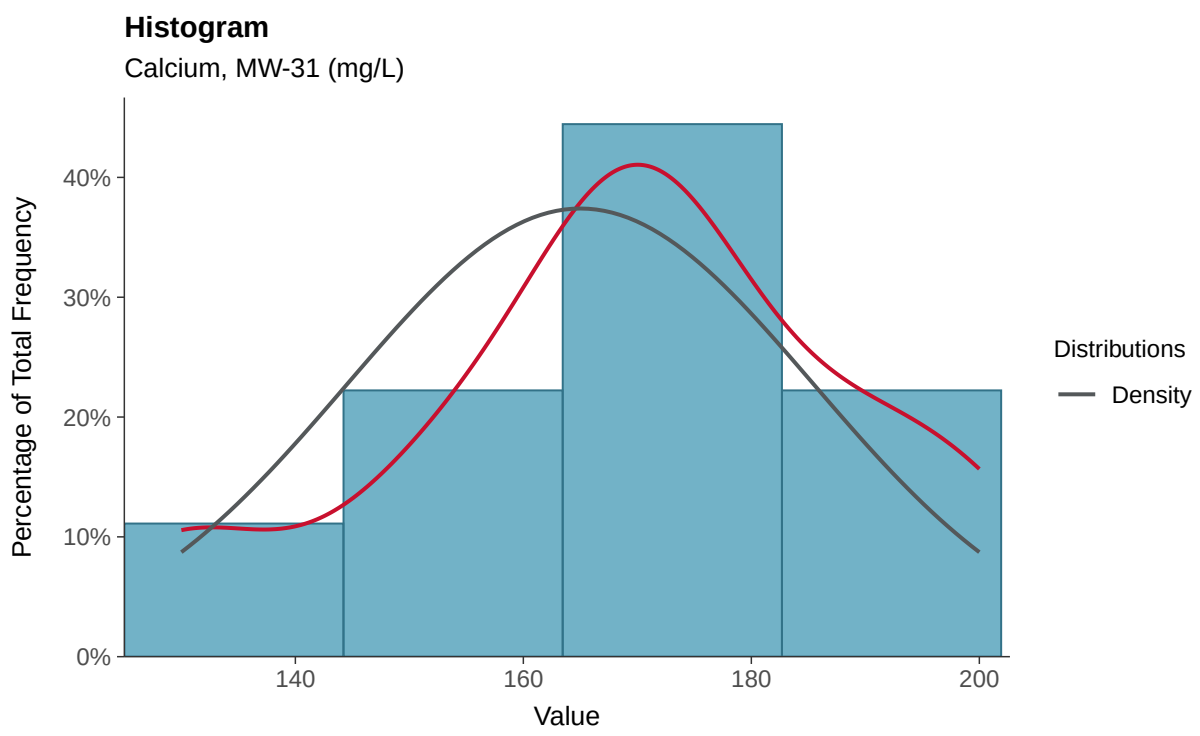

Trend Regression: Lognormal MLE
Boron, MW-31 (mg/L)
log(Value)
1.7
1.6
1.5
1.4
1.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Boron, MW-31 (mg/L)
Value
5.0
4.5
4.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-31

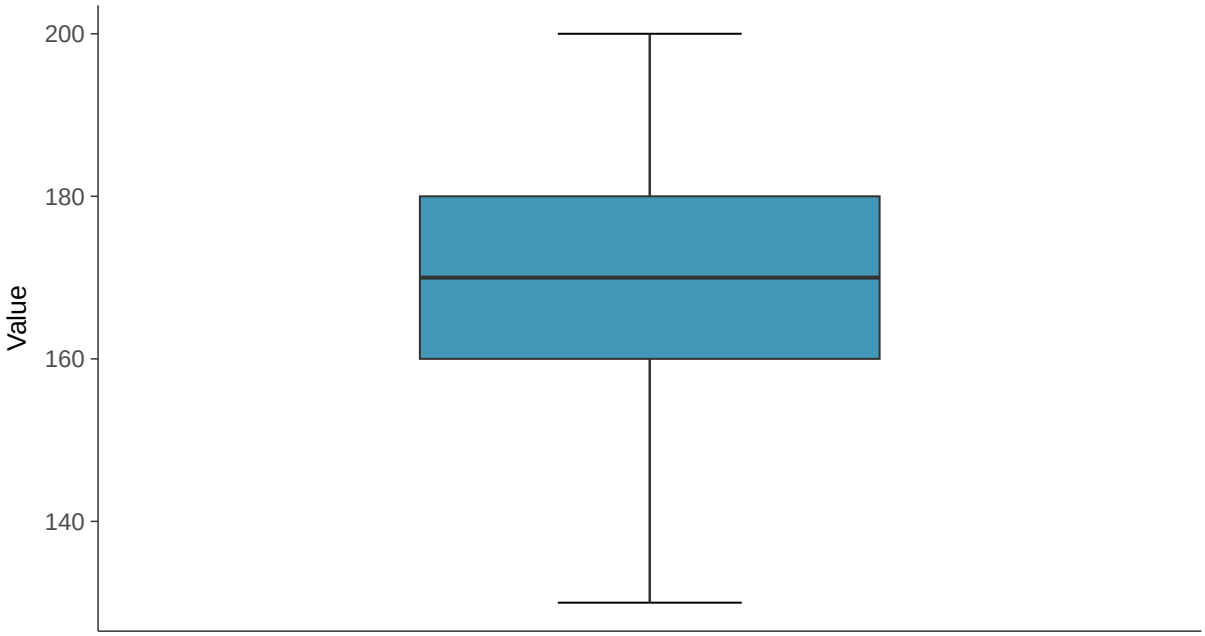
ID: 1_26_4_107





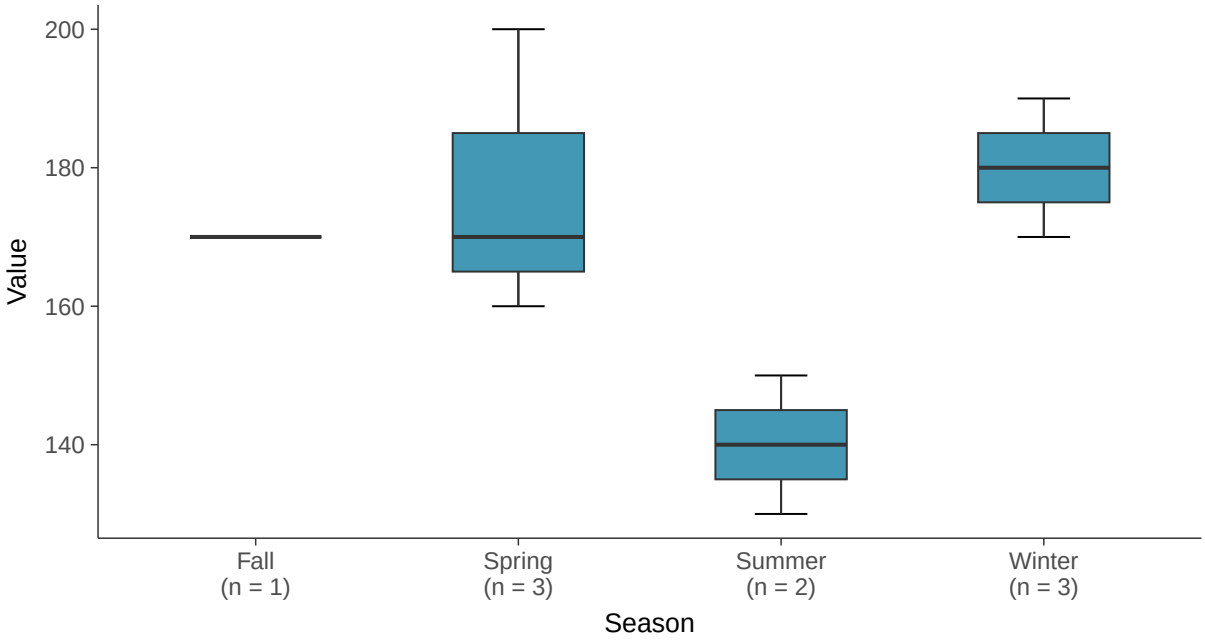
Boxplot

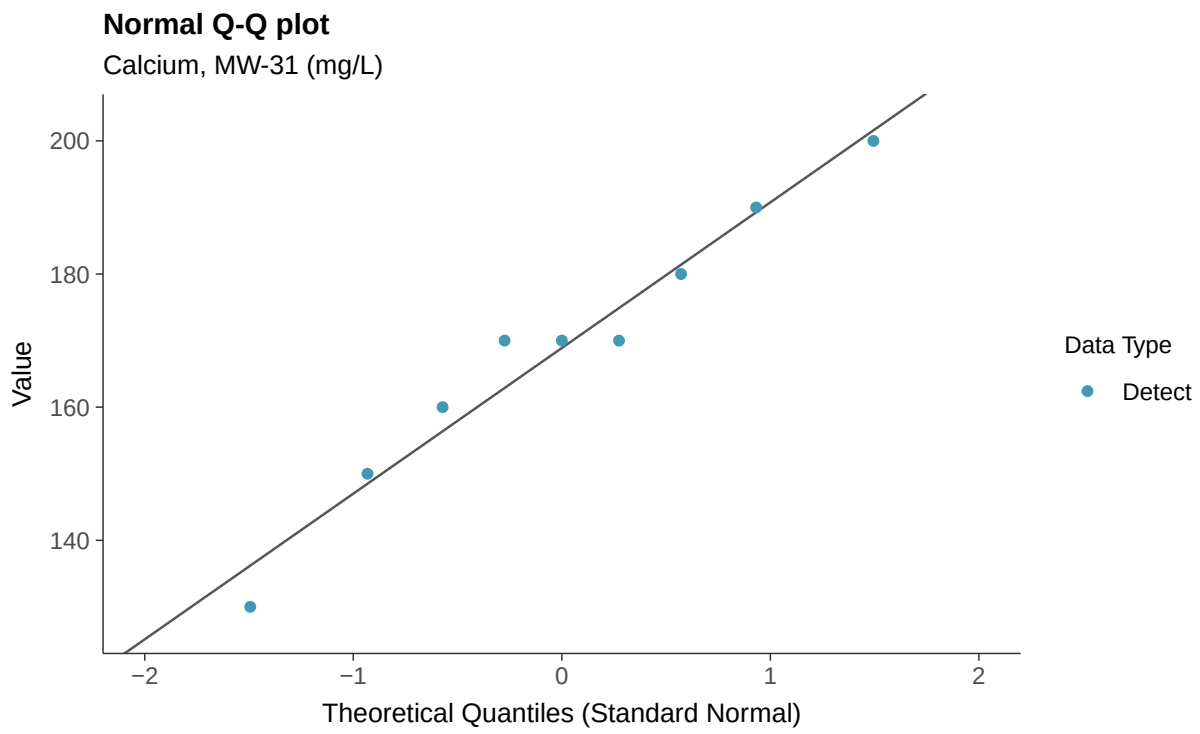
Calcium, MW-31 (mg/L)

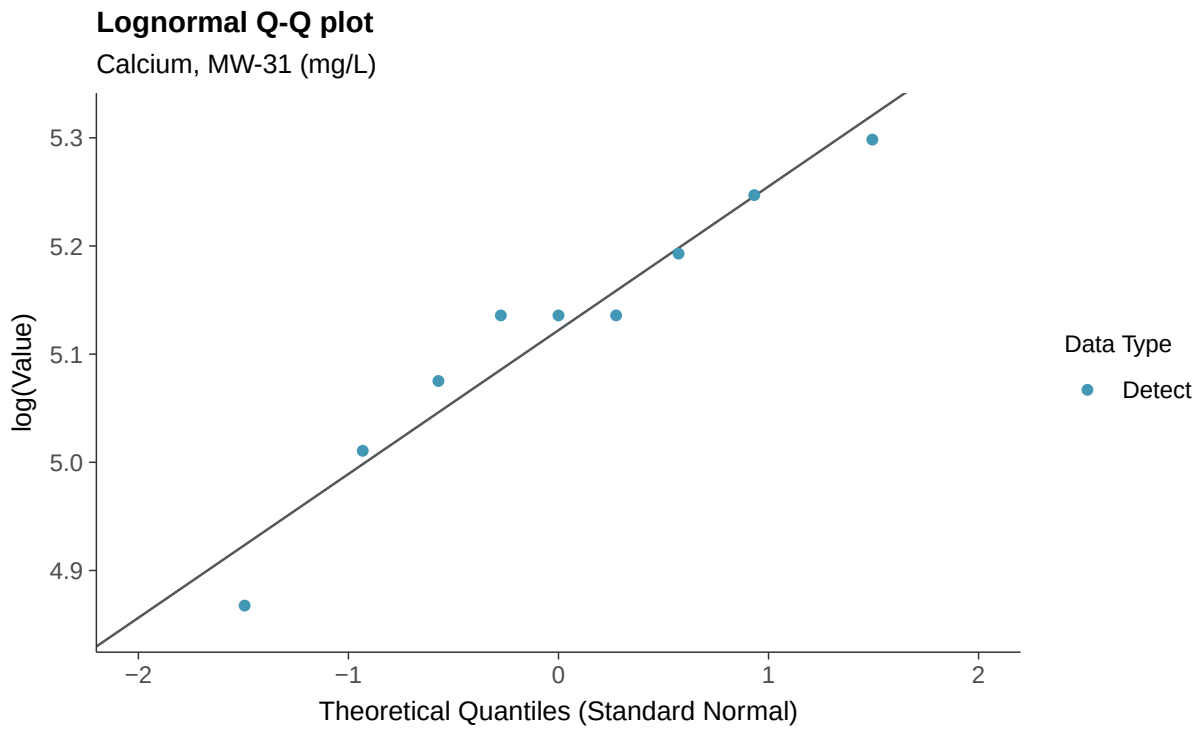


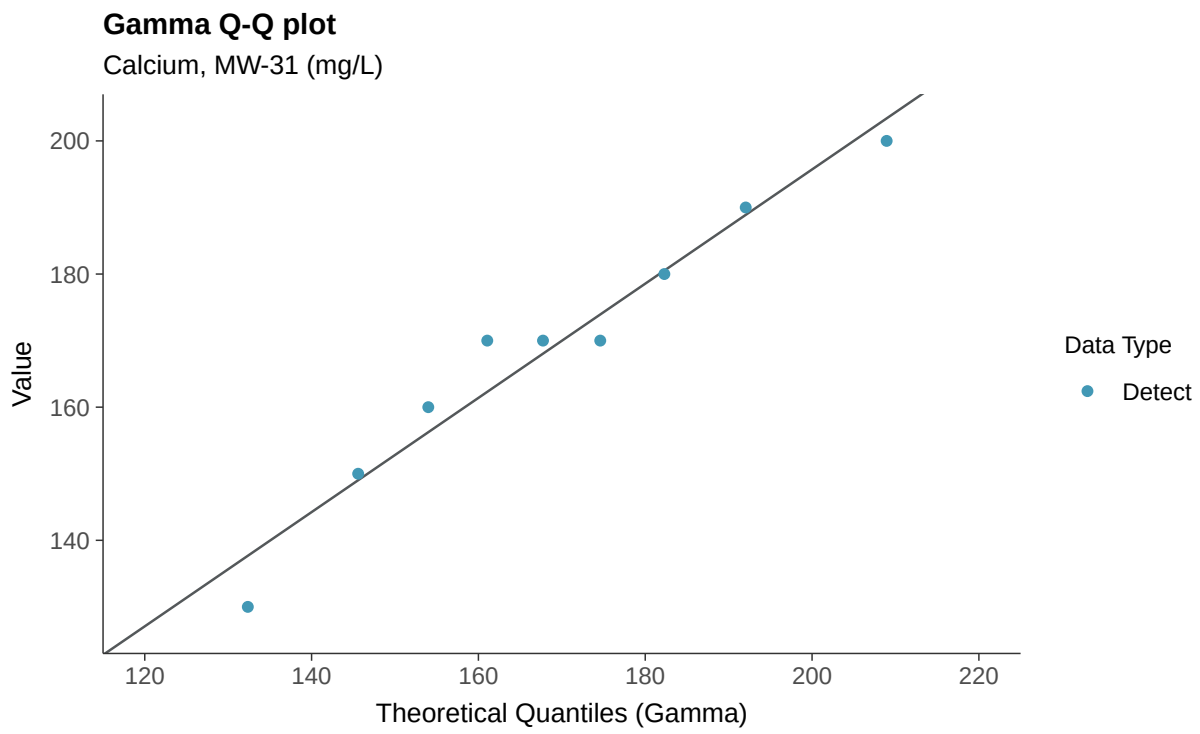
Boxplot by Season

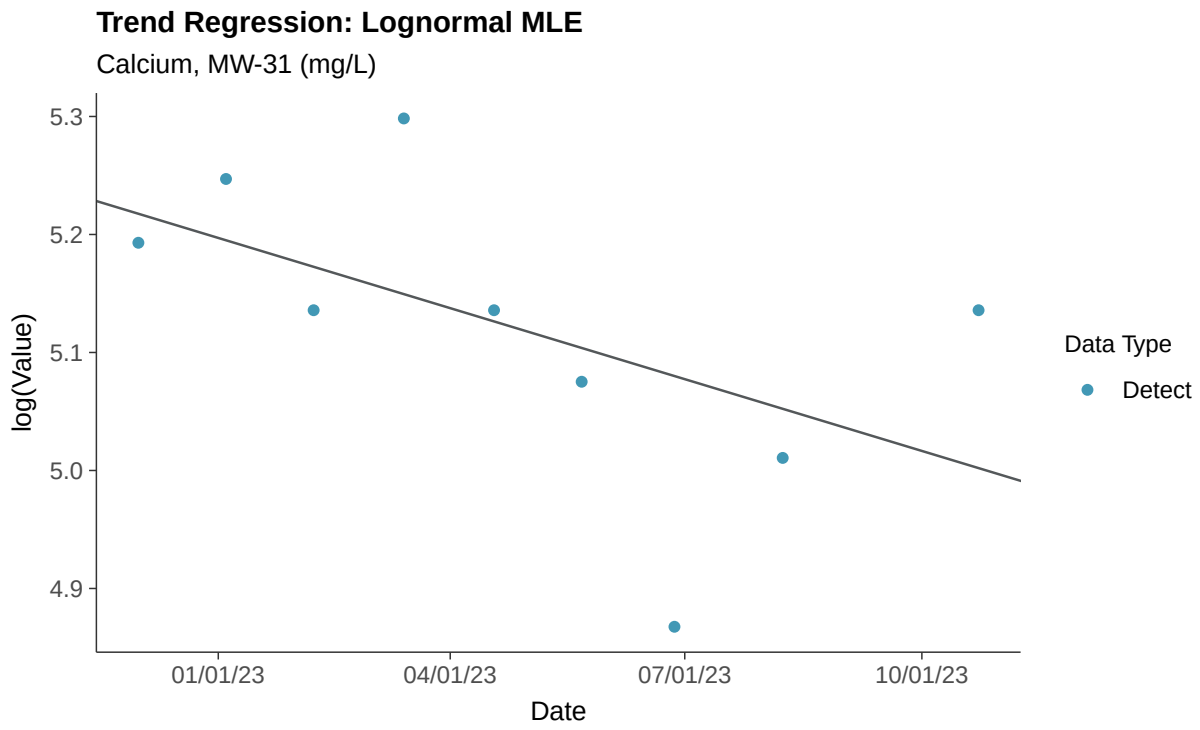
Calcium, MW-31 (mg/L)




Normal Q-Q plot
Calcium, MW-31 (mg/L)
Value
200
180
160
140
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

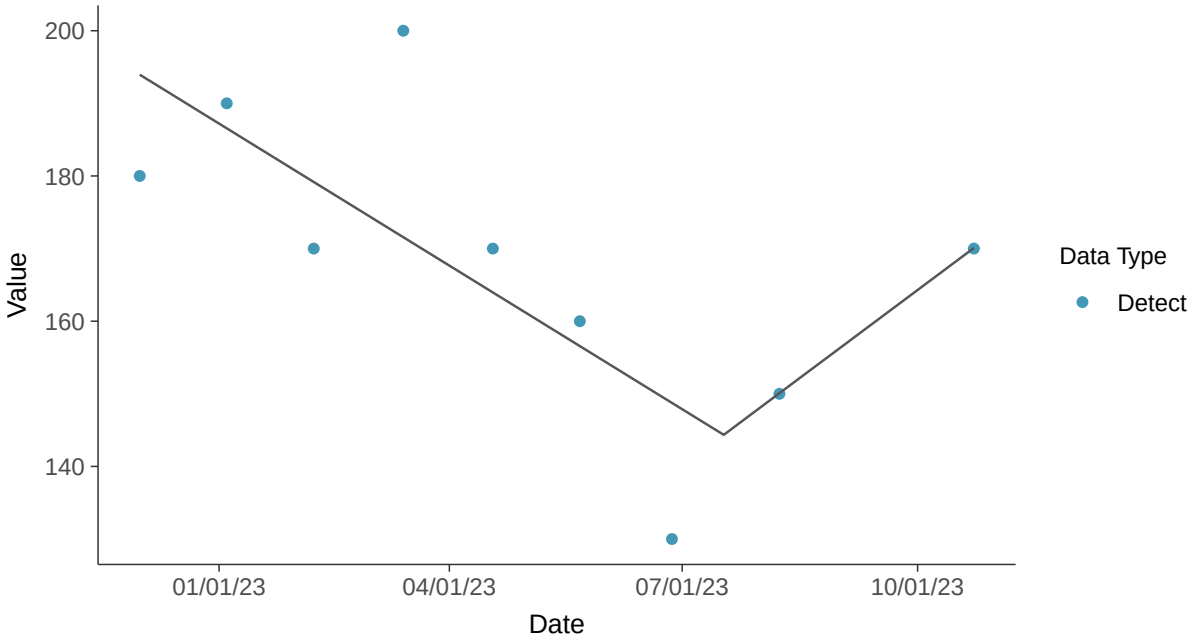

Lognormal Q-Q plot
Calcium, MW-31 (mg/L)
log(Value)
5.3
5.2
5.1
5.0
4.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-31 (mg/L)
Value
200
180
160
140
120
140
160
180
200
220
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-31 (mg/L)
log(Value)
5.3
5.2
5.1
5.0
4.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

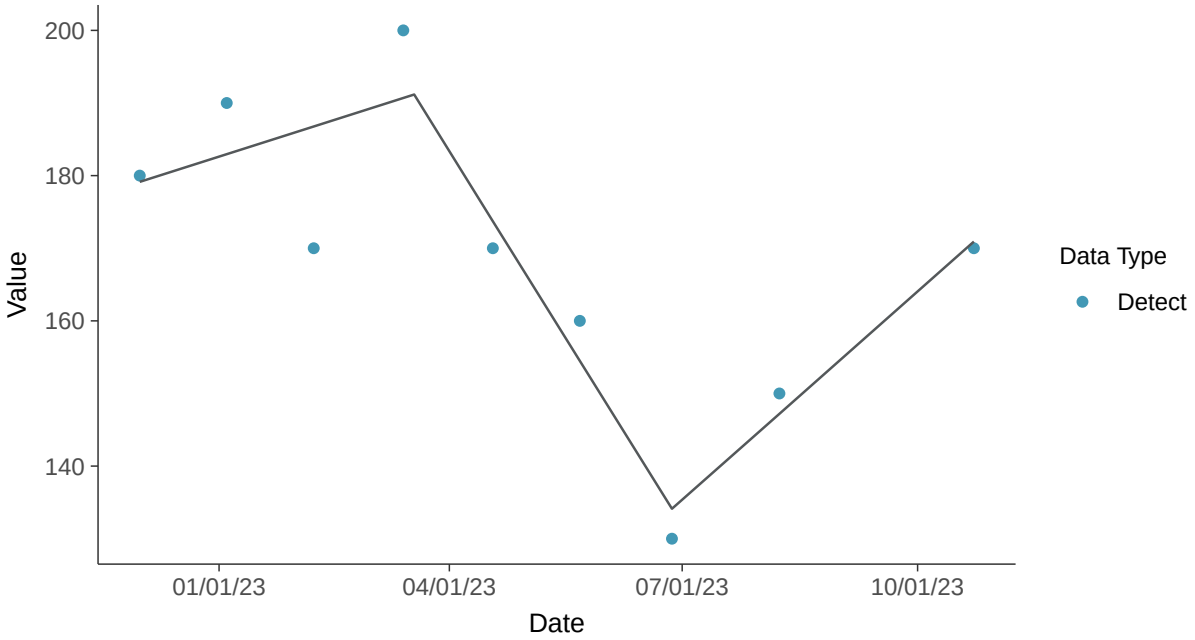
Trend Regression: Piecewise Linear-Linear

Calcium, MW-31 (mg/L)



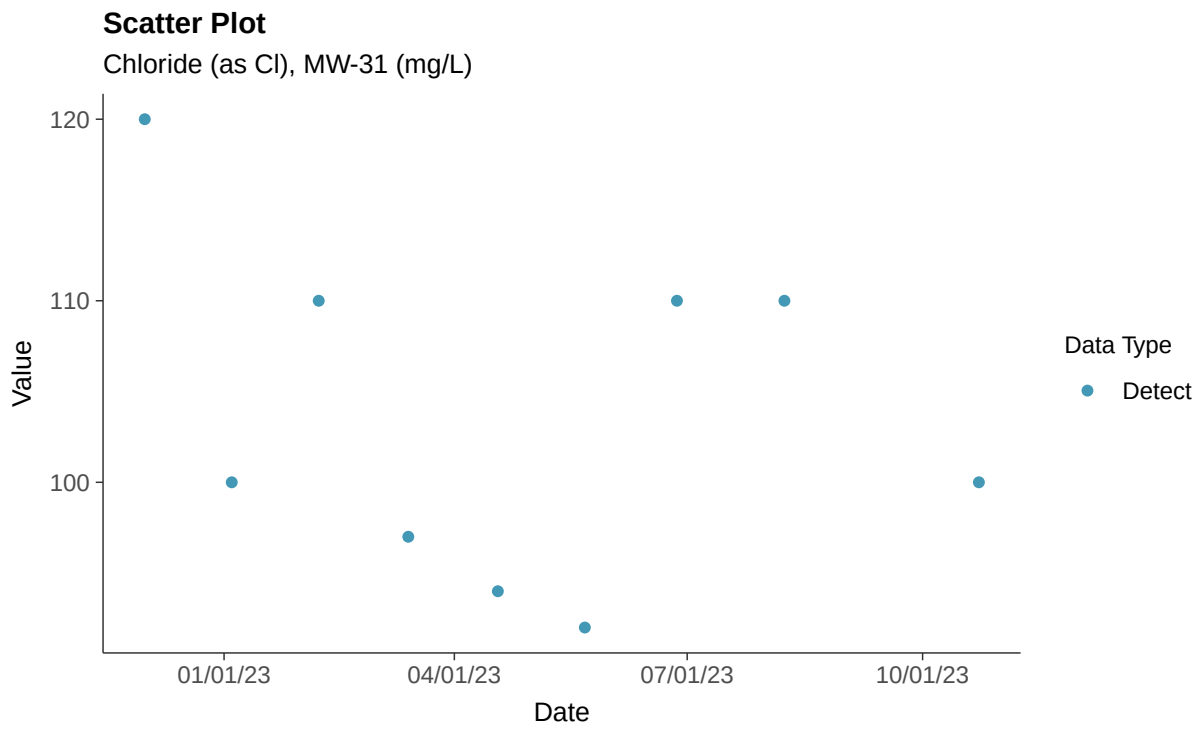
Trend Regression: Piecewise Linear-Linear-Linear

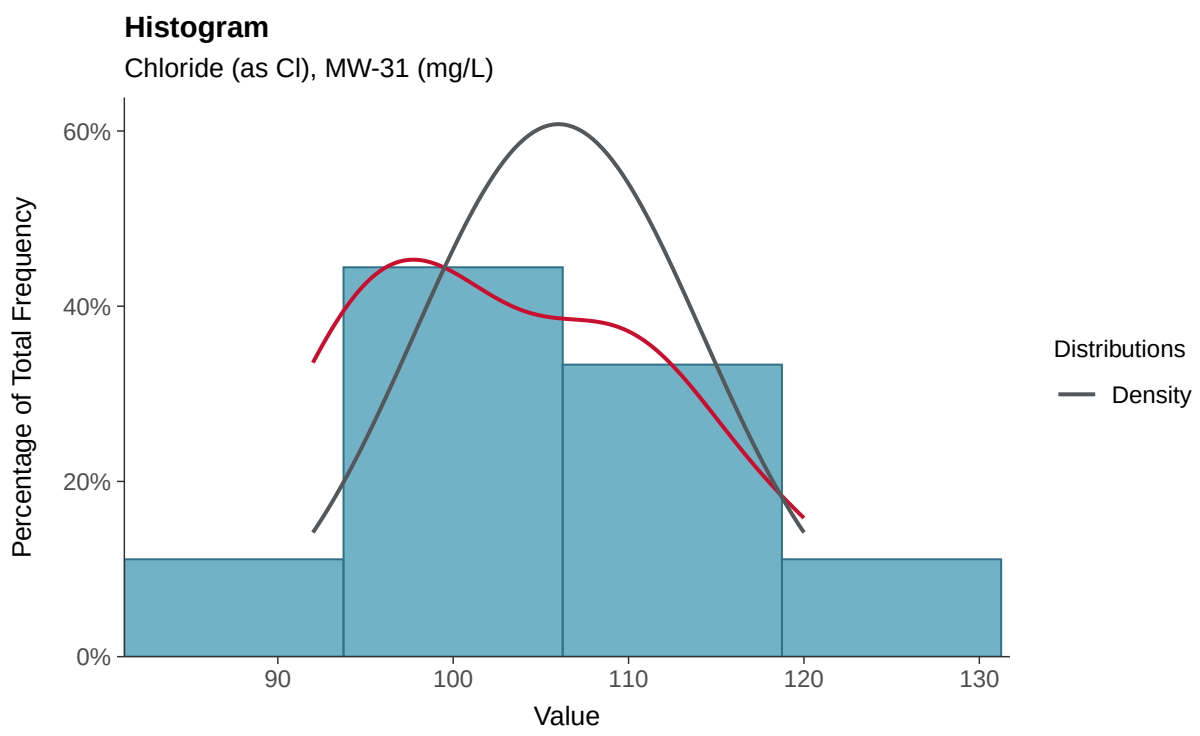
Calcium, MW-31 (mg/L)



Appendix III: Chloride (as Cl), MW-31

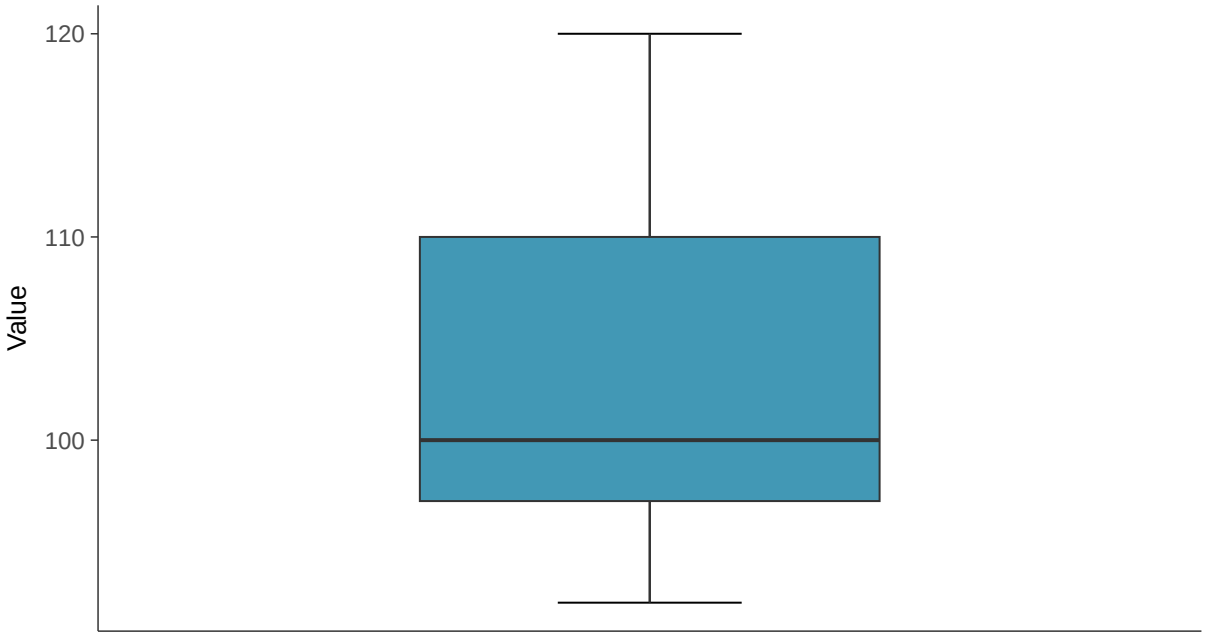
ID: 1_26_4_108





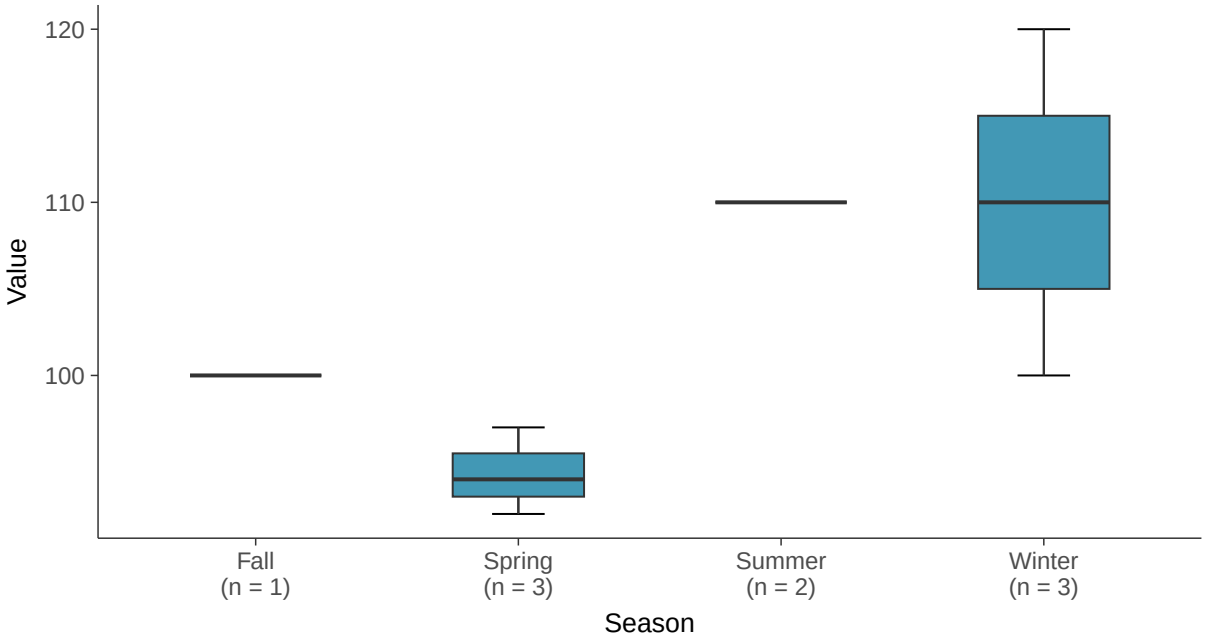
Boxplot

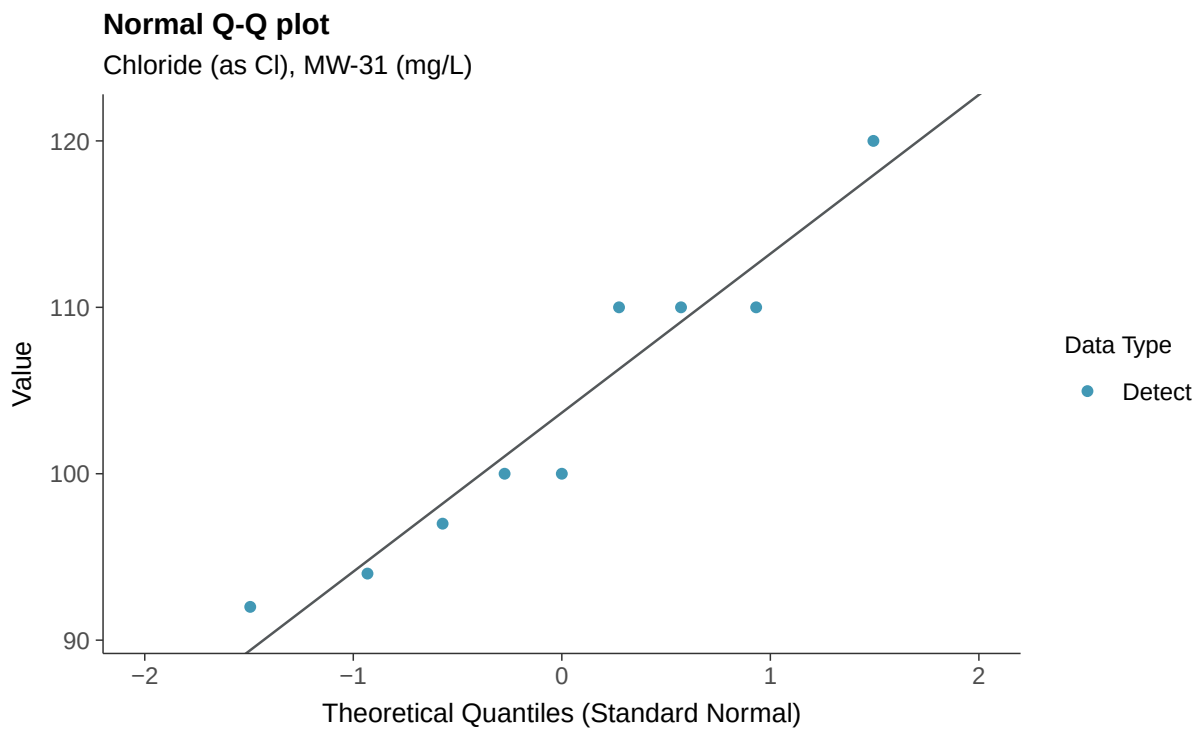
Chloride (as Cl), MW-31 (mg/L)

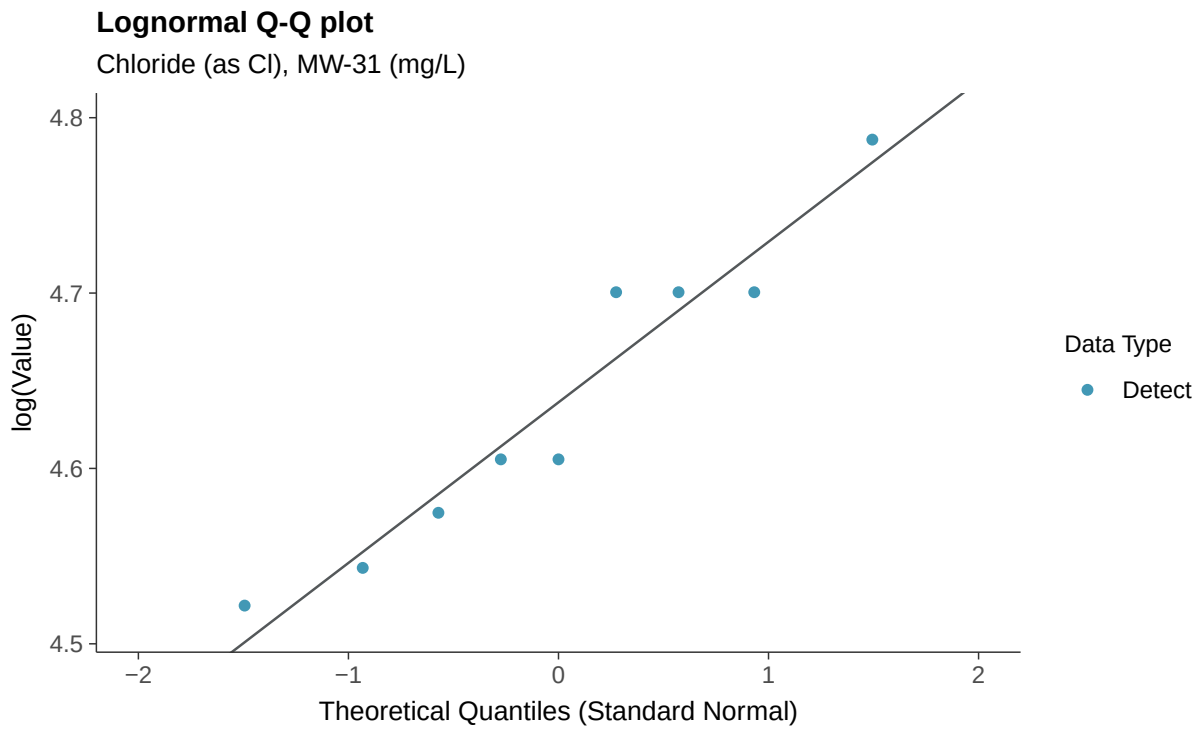


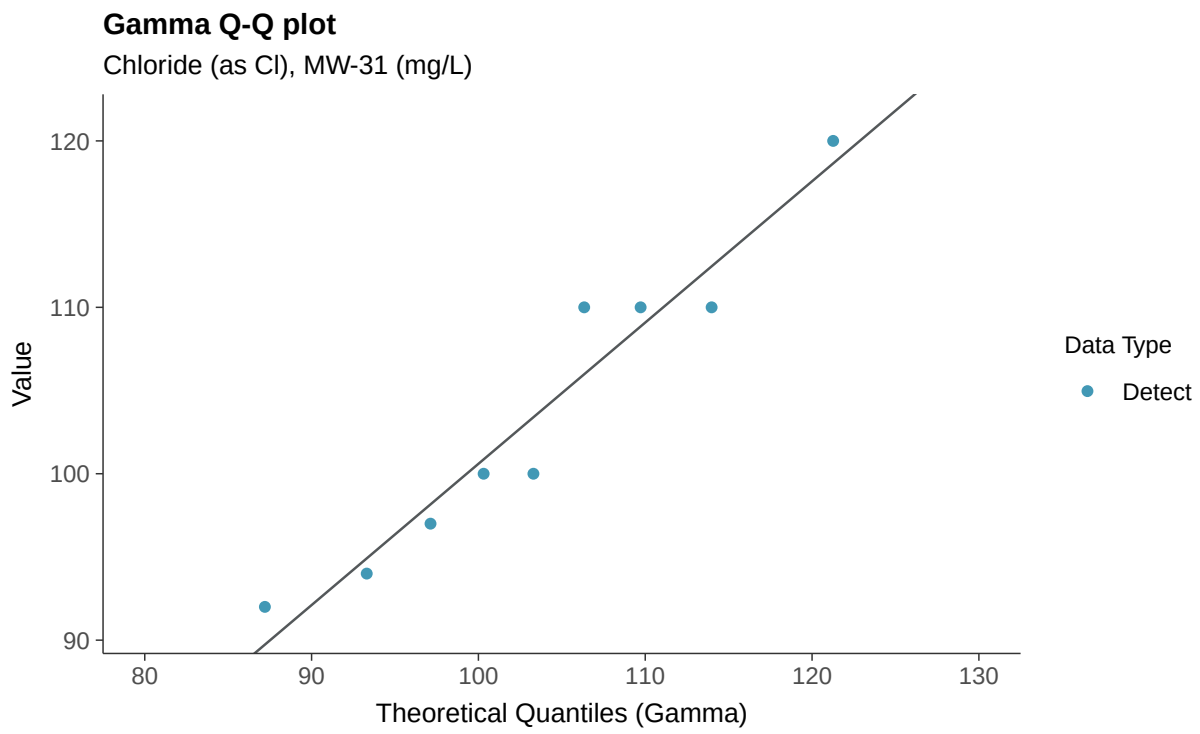
Boxplot by Season

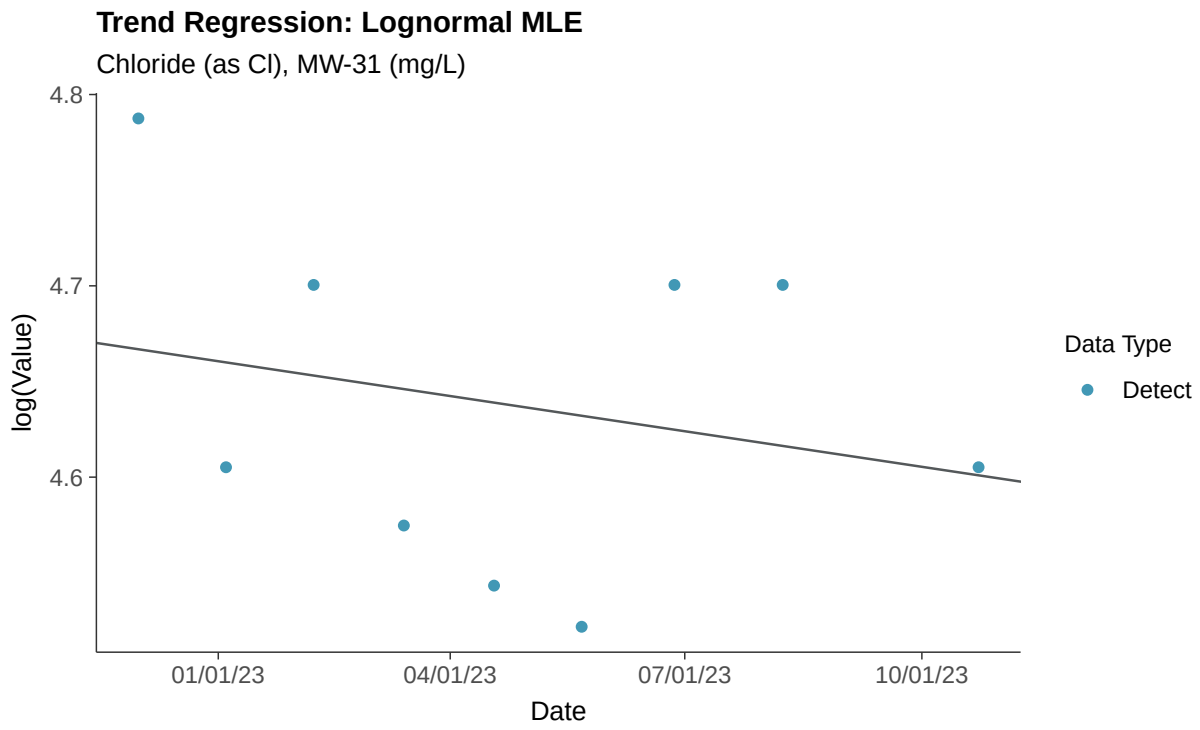
Chloride (as Cl), MW-31 (mg/L)




Normal Q-Q plot
Chloride (as Cl), MW-31 (mg/L)
Value
120
110
100
90
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

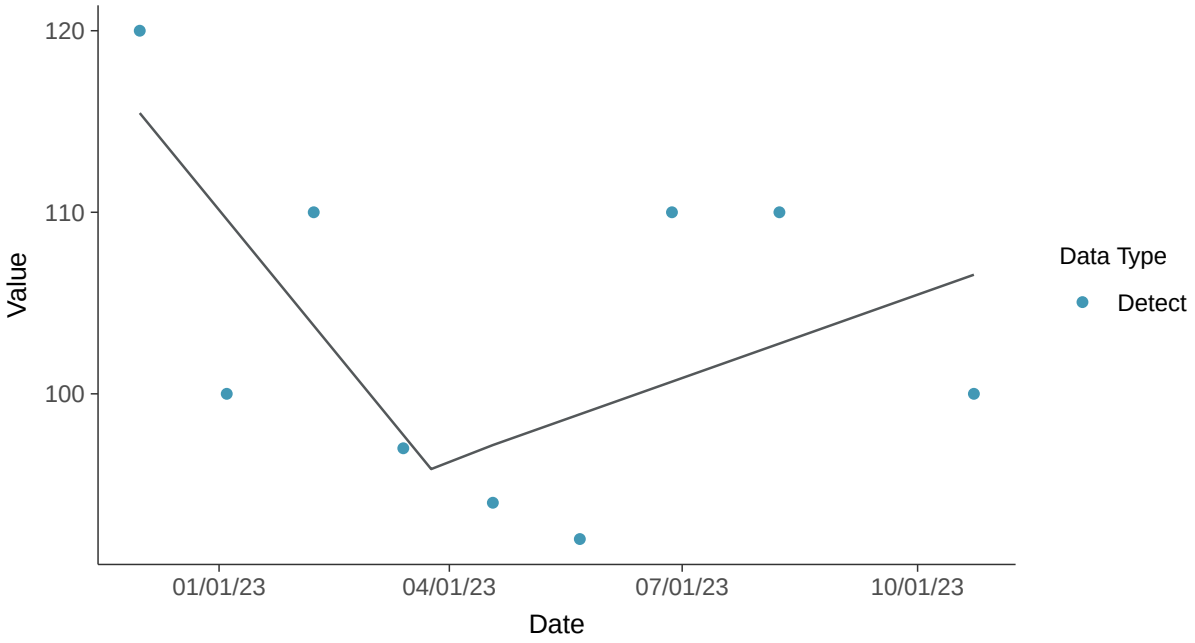

Lognormal Q-Q plot
Chloride (as Cl), MW-31 (mg/L)
log(Value)
4.8
4.7
4.6
4.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chloride (as Cl), MW-31 (mg/L)
Value
120
110
100
90
80
90
100
110
120
130
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chloride (as Cl), MW-31 (mg/L)
log(Value)
4.8
4.7
4.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

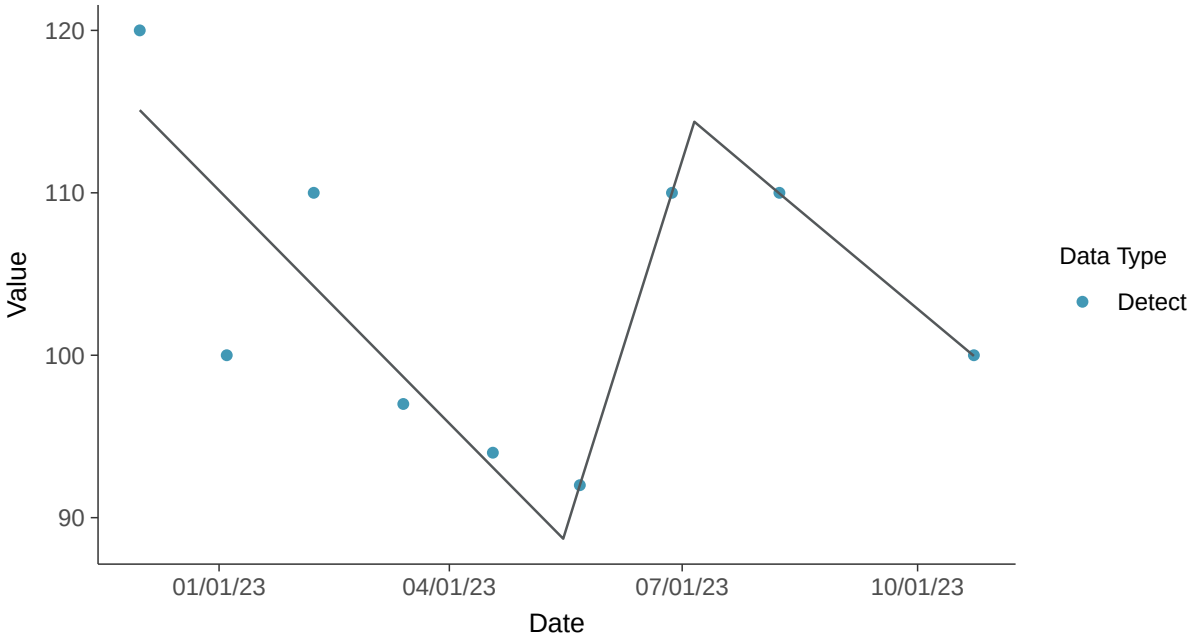
Trend Regression: Piecewise Linear-Linear

Chloride (as Cl), MW-31 (mg/L)



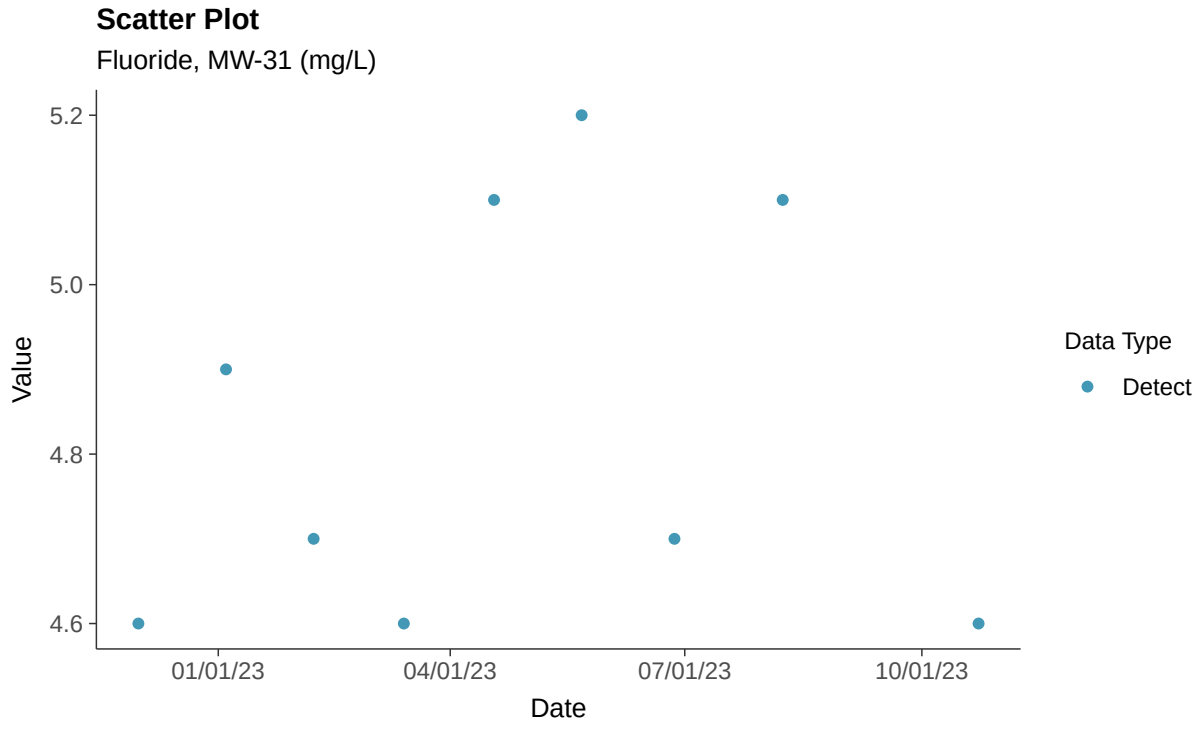
Trend Regression: Piecewise Linear-Linear-Linear

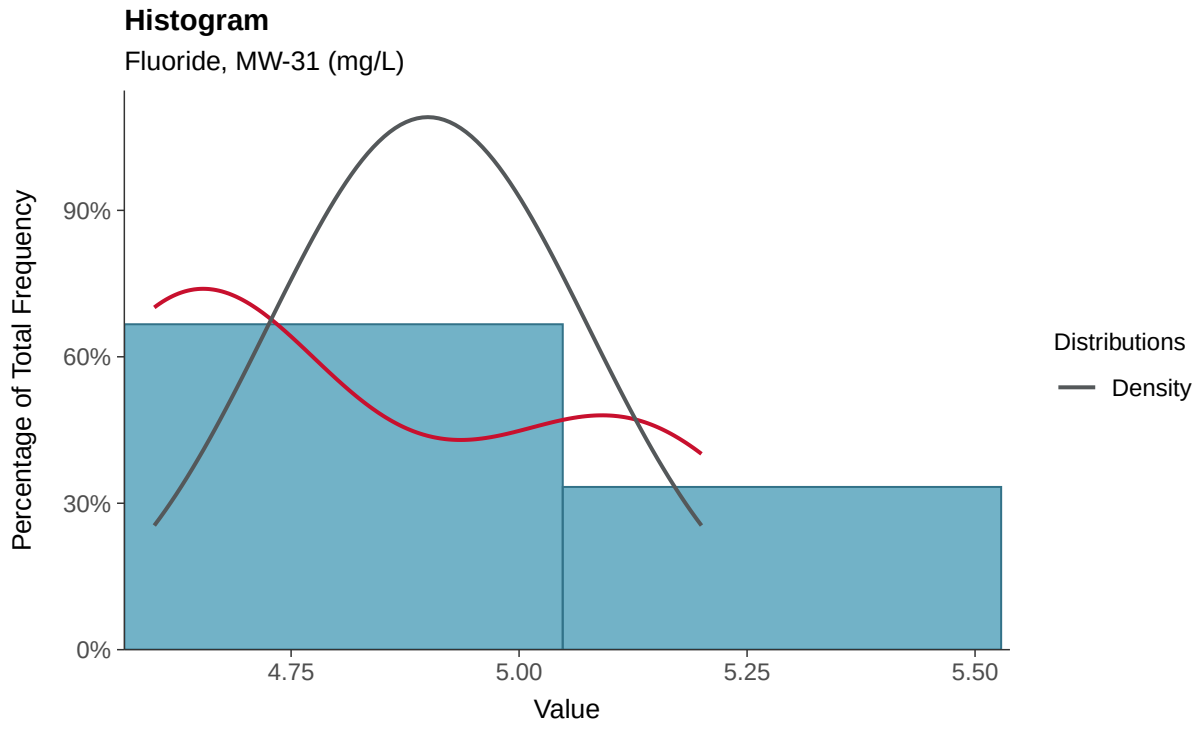
Chloride (as Cl), MW-31 (mg/L)



Appendix III: Fluoride, MW-31

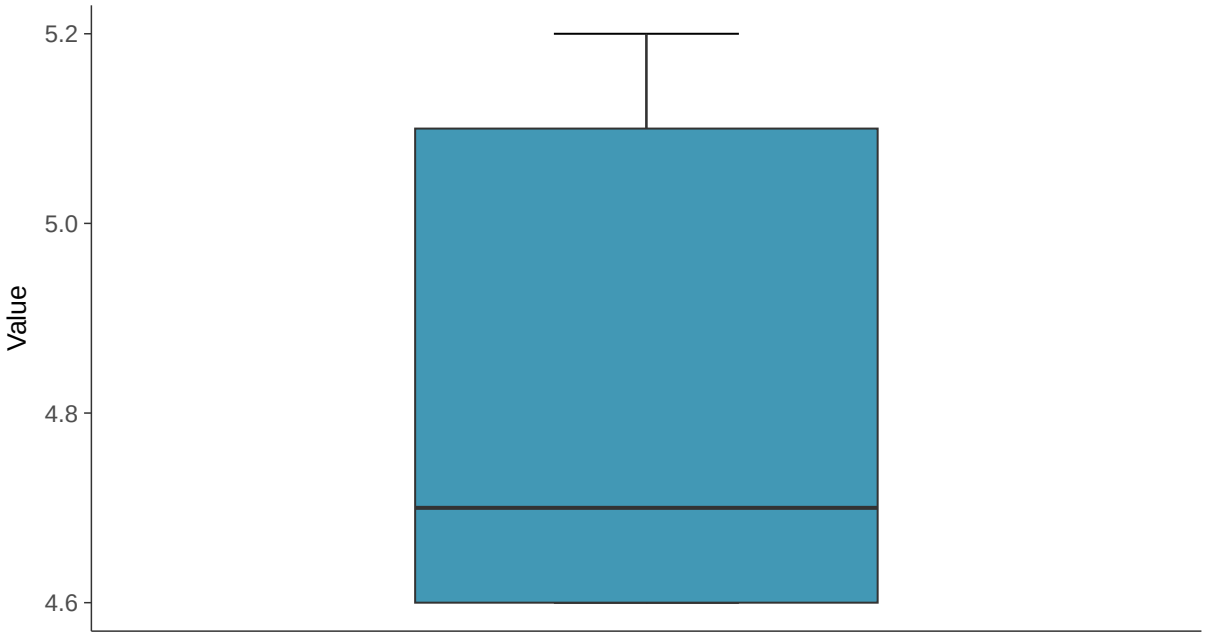
ID: 1_26_4_112





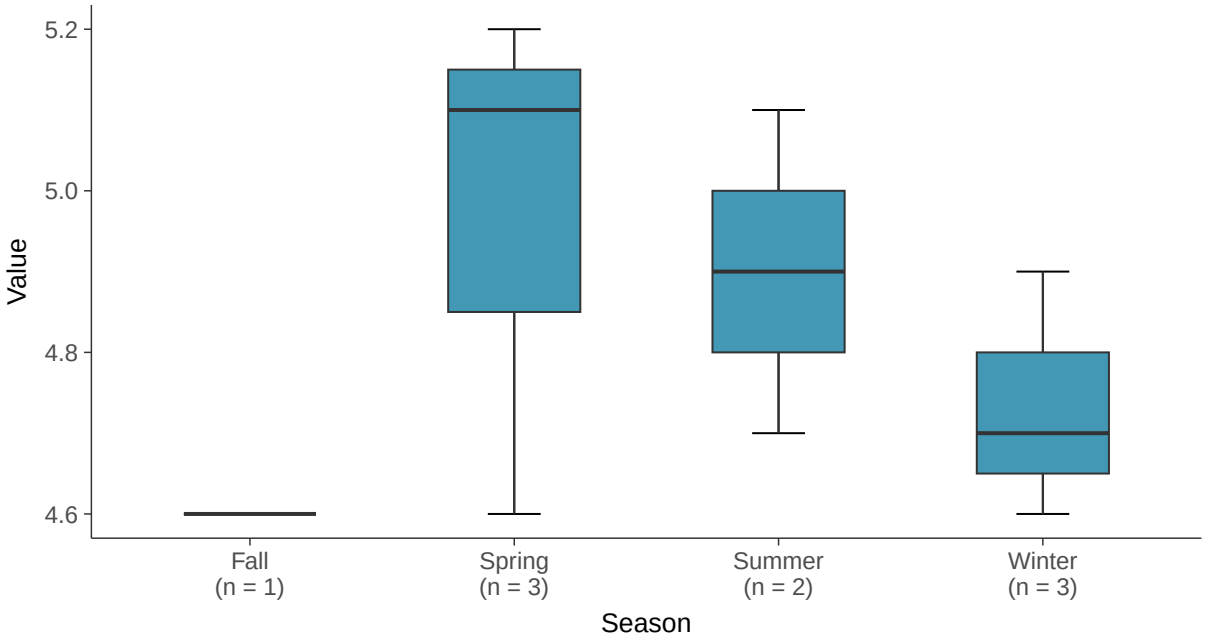
Boxplot

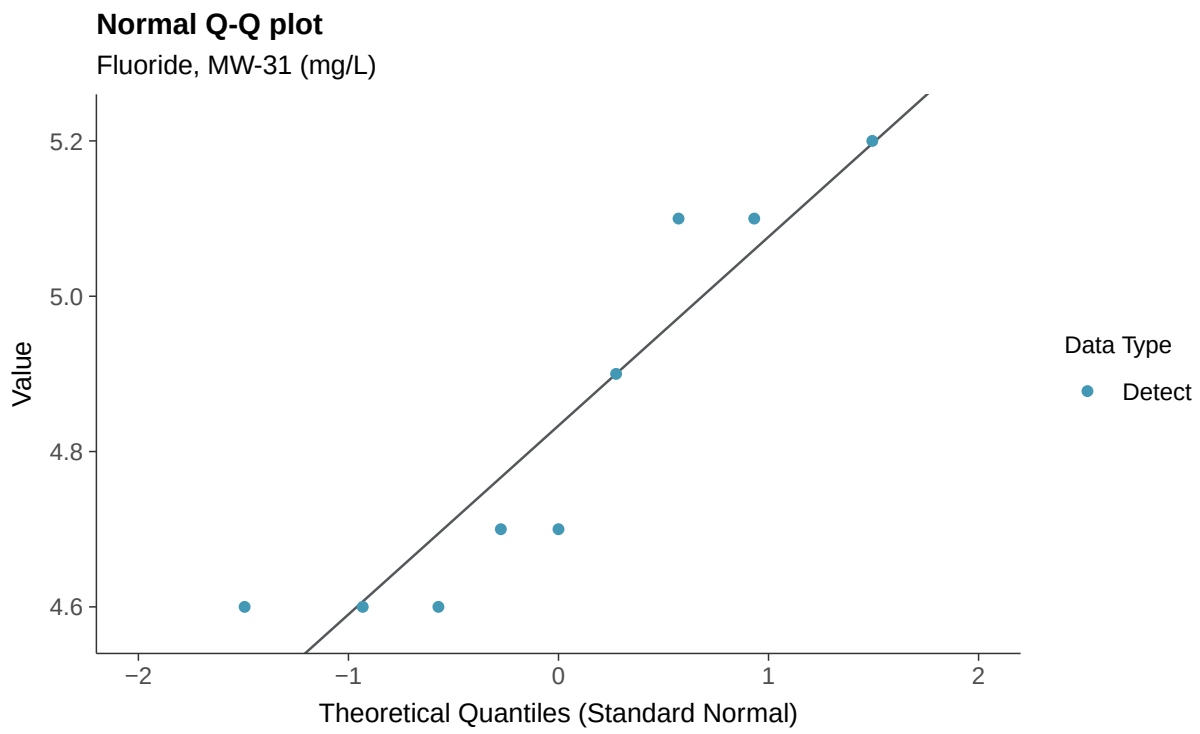
Fluoride, MW-31 (mg/L)

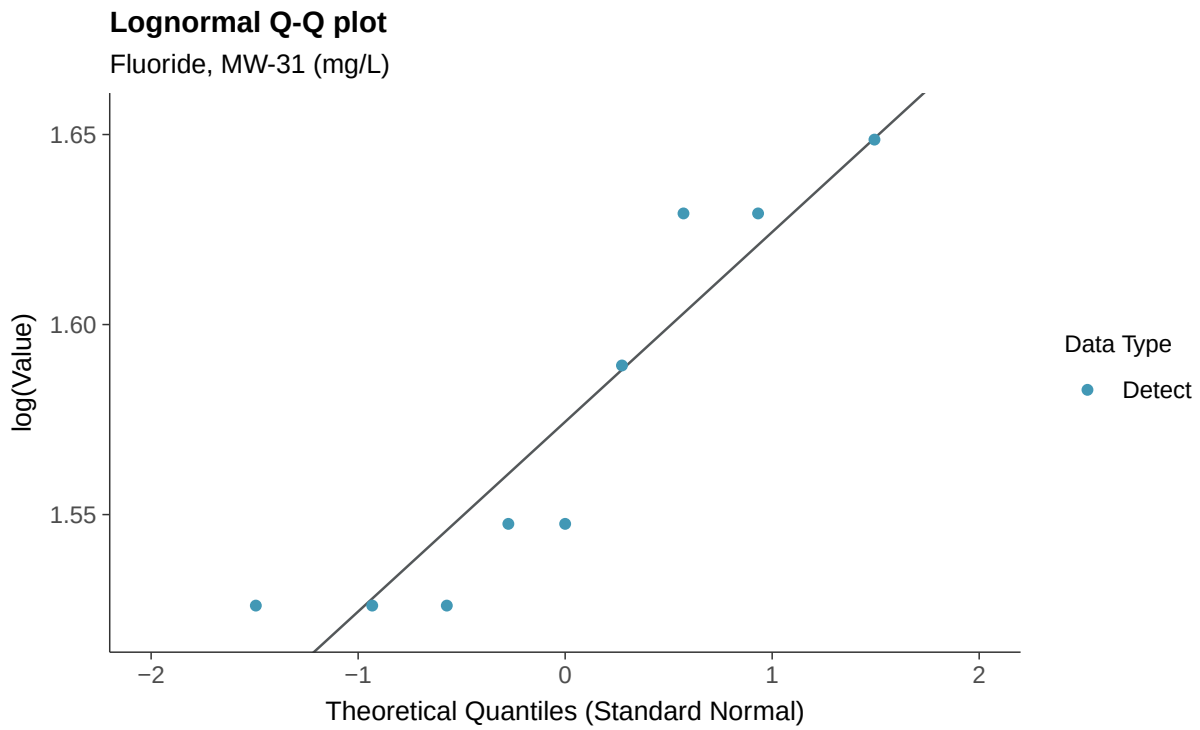


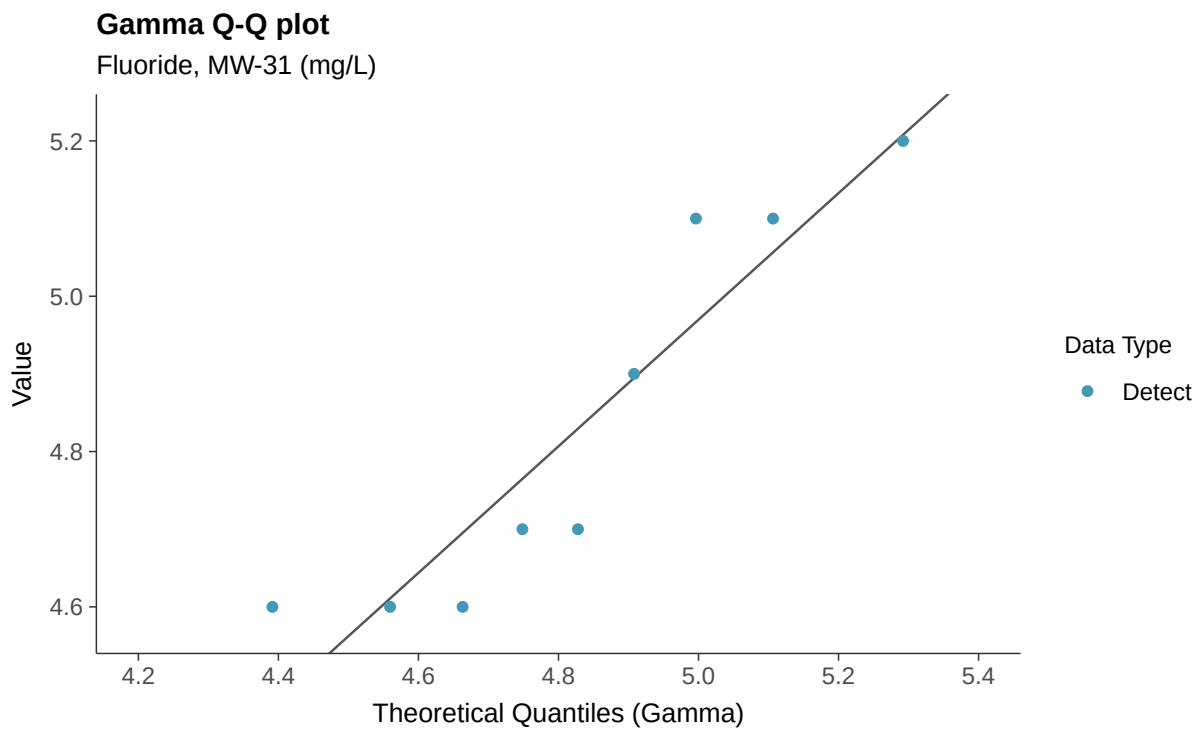
Boxplot by Season

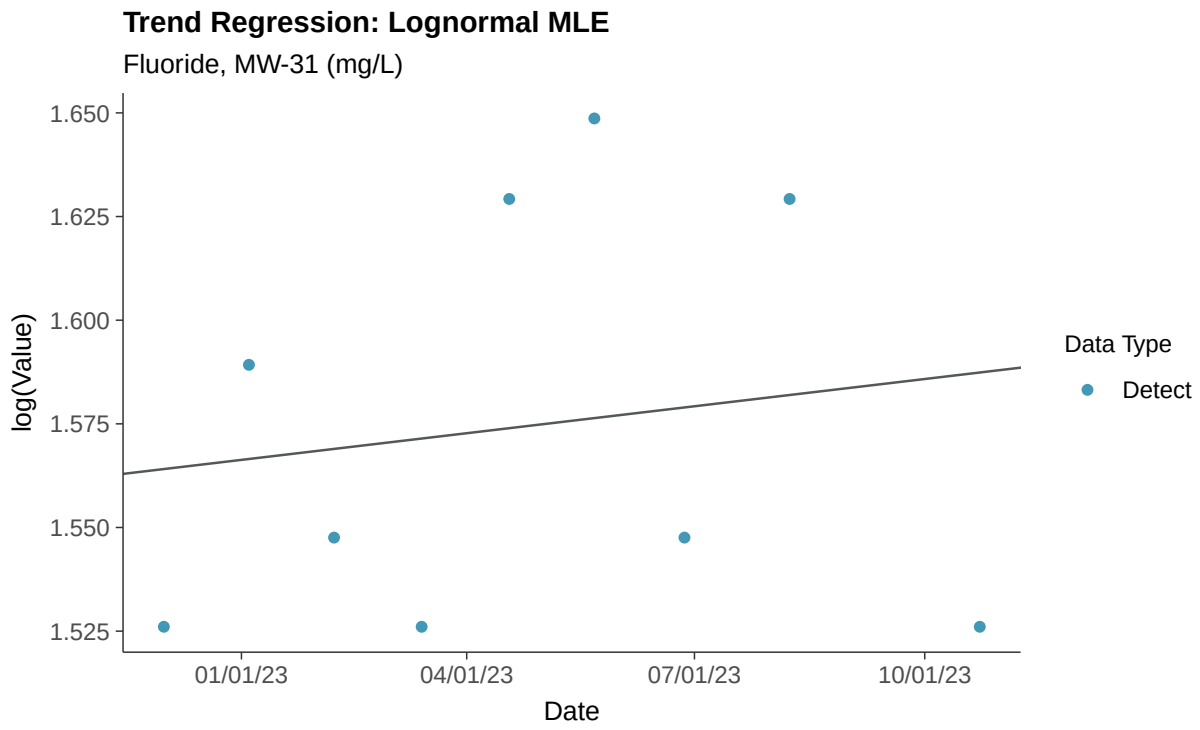
Fluoride, MW-31 (mg/L)

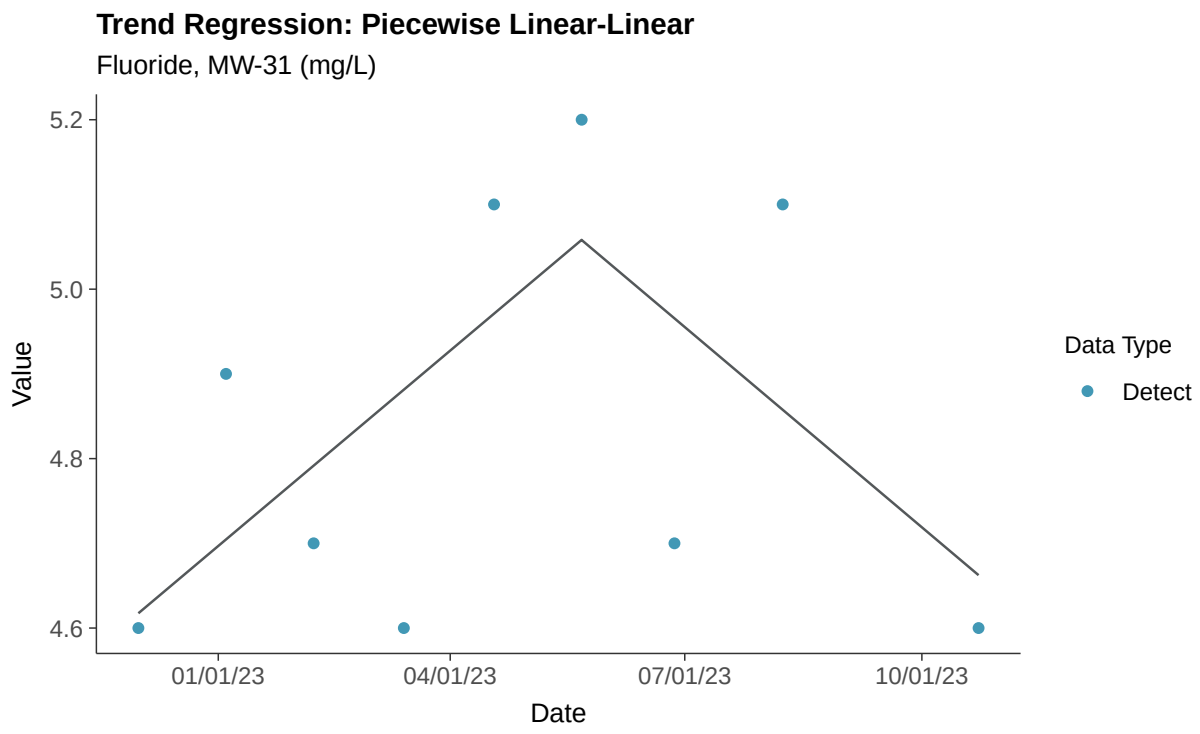



Normal Q-Q plot
Fluoride, MW-31 (mg/L)
Value
5.2
5.0
4.8
4.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride, MW-31 (mg/L)
log(Value)
1.65
1.60
1.55
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

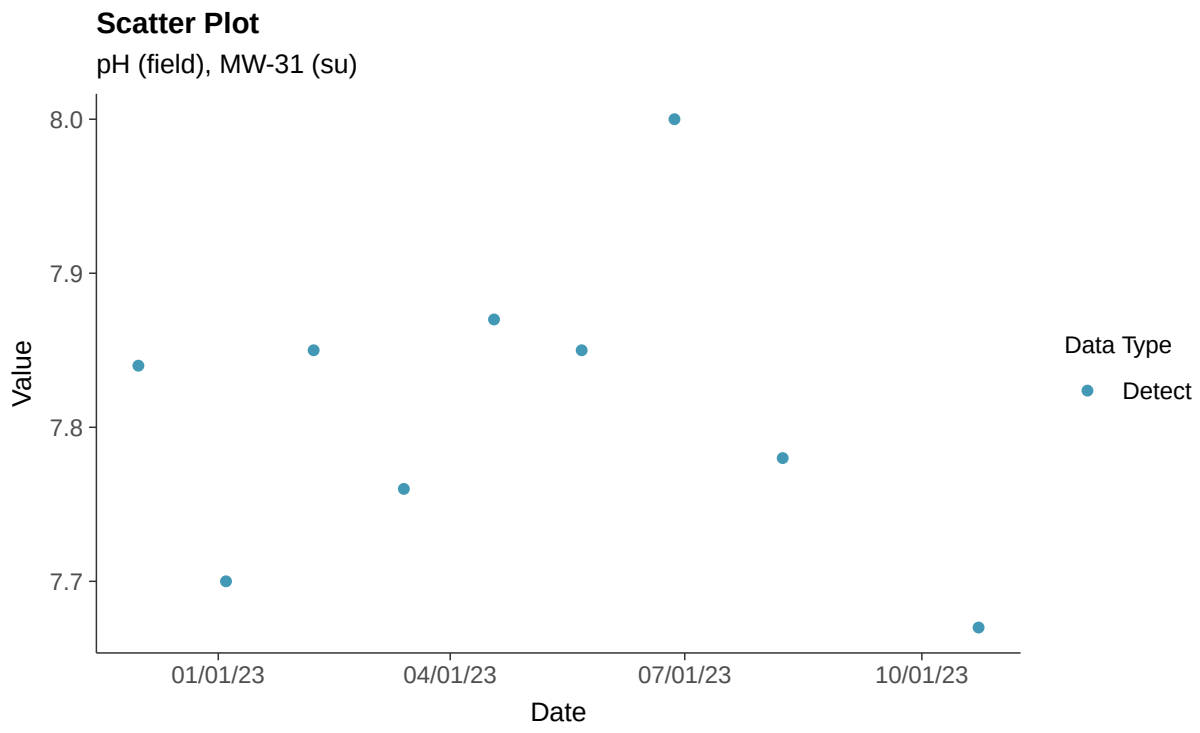

Gamma Q-Q plot
Fluoride, MW-31 (mg/L)
Value
5.2
5.0
4.8
4.6
4.2
4.4
4.6
4.8
5.0
5.2
5.4
Theoretical Quantiles (Gamma)
Data Type
Detect

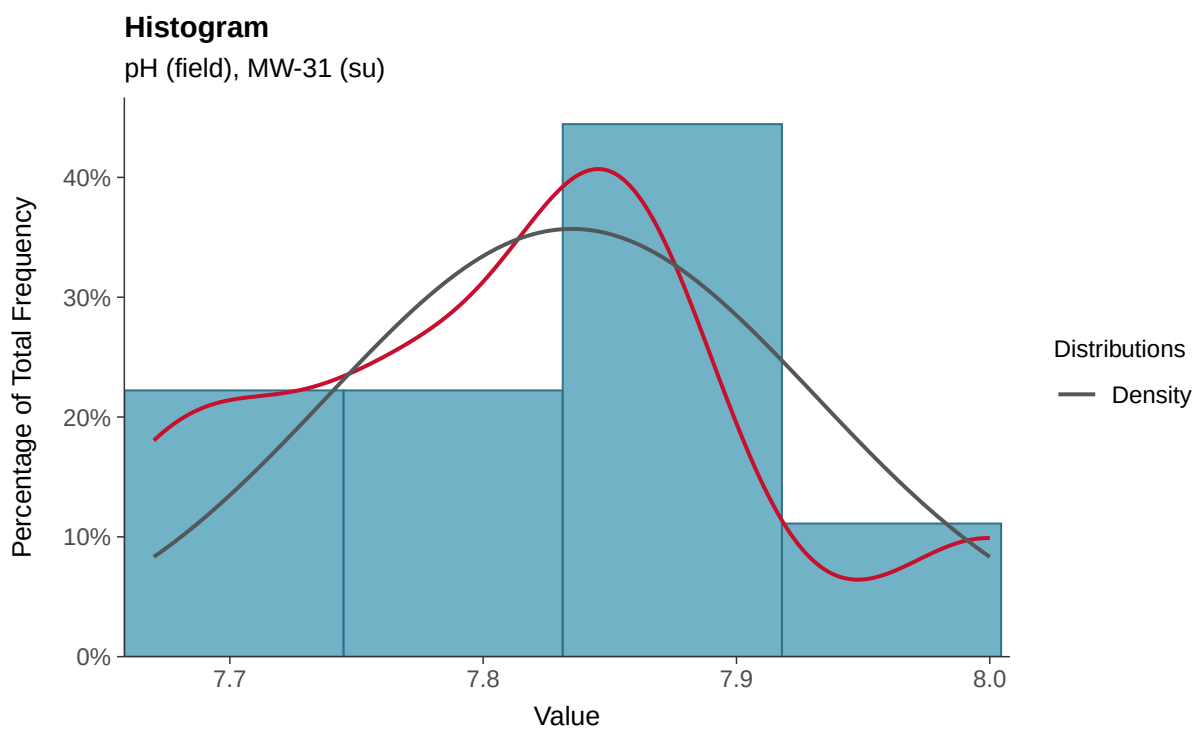

Trend Regression: Lognormal MLE
Fluoride, MW-31 (mg/L)
log(Value)
1.650
1.625
1.600
1.575
1.550
1.525
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Fluoride, MW-31 (mg/L)
5.2
5.0
4.8
4.6
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: pH (field), MW-31

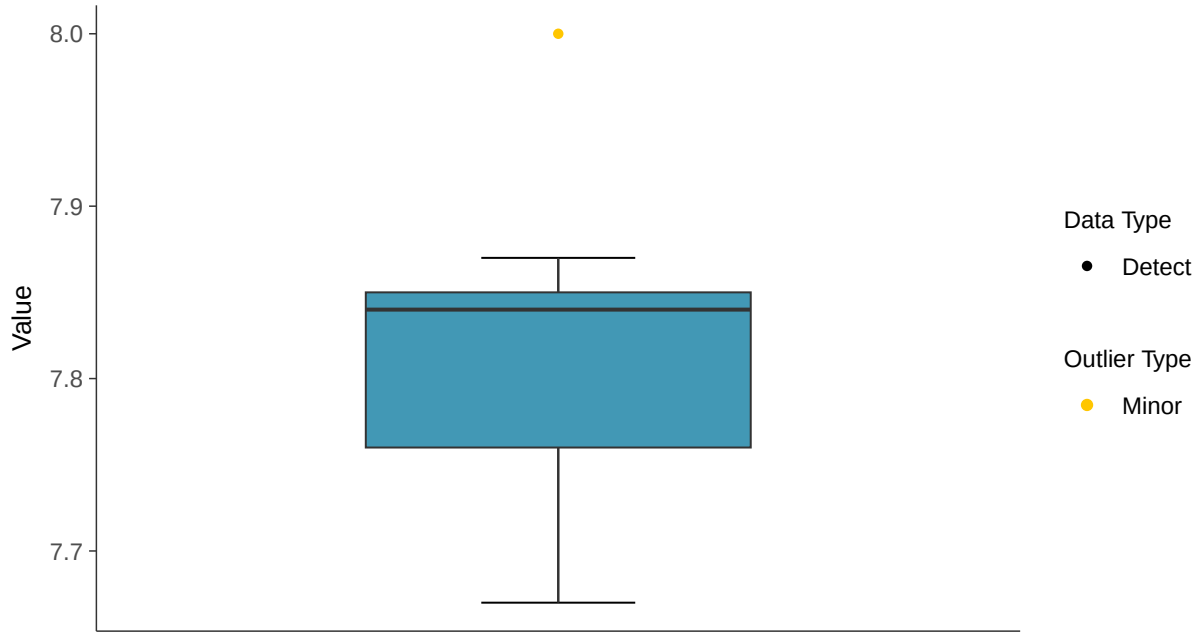
ID: 1_26_4_120





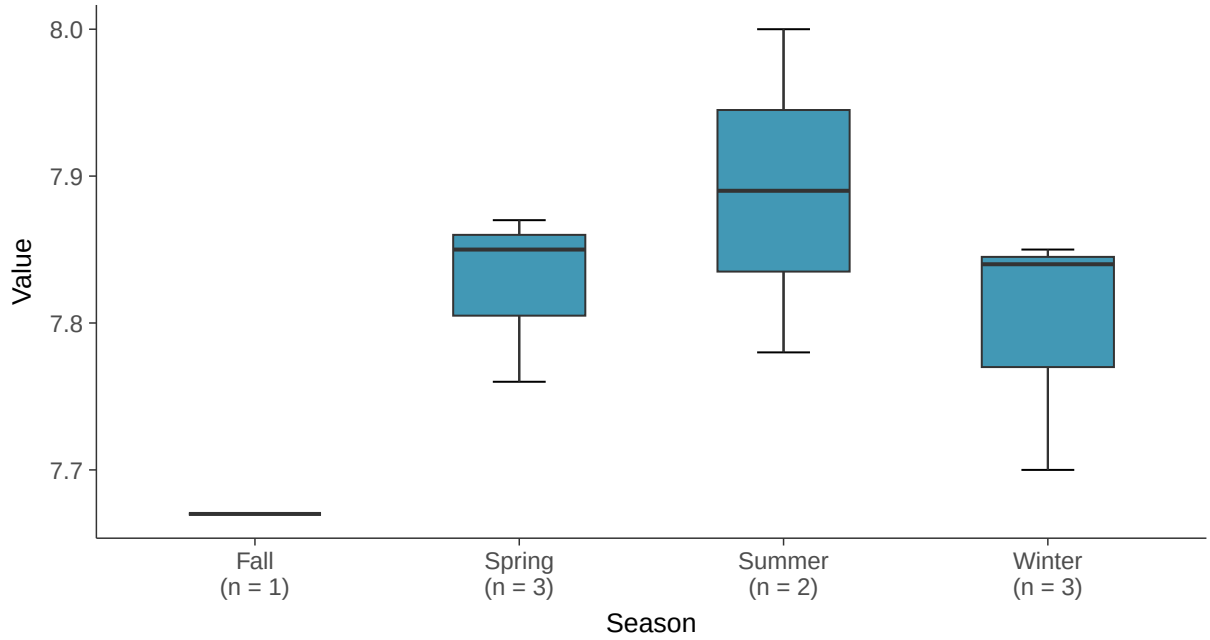
Boxplot

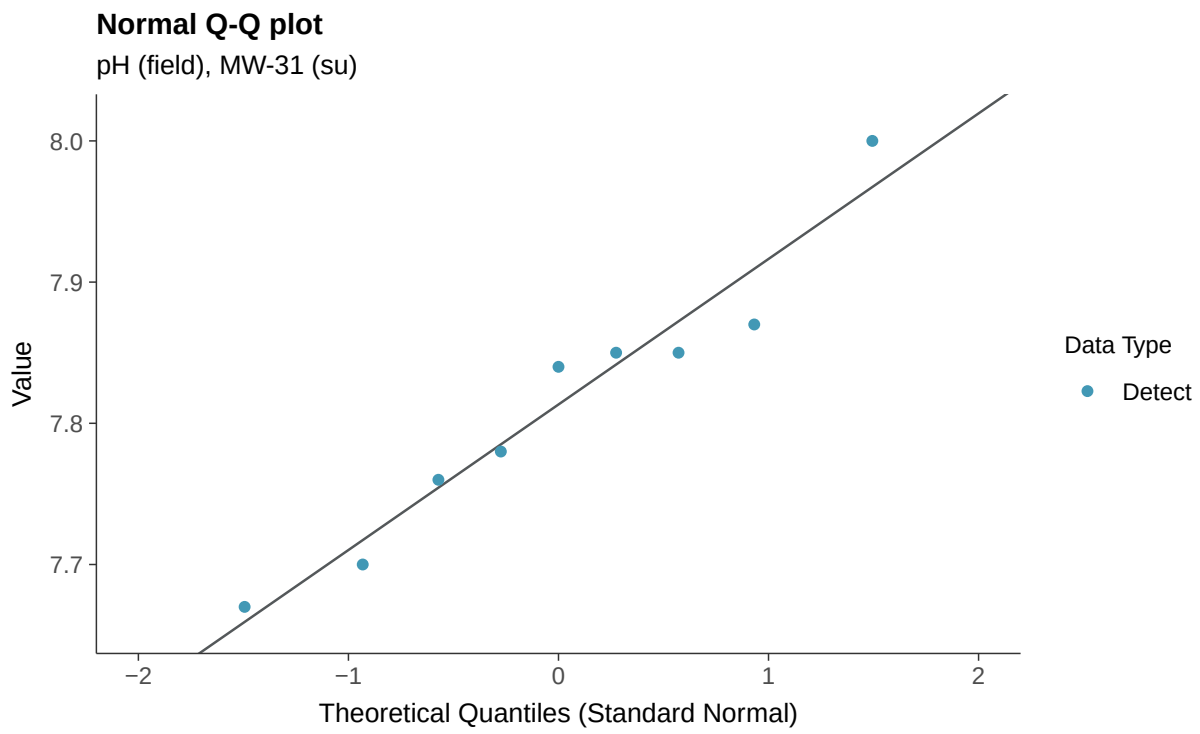
pH (field), MW-31 (su)

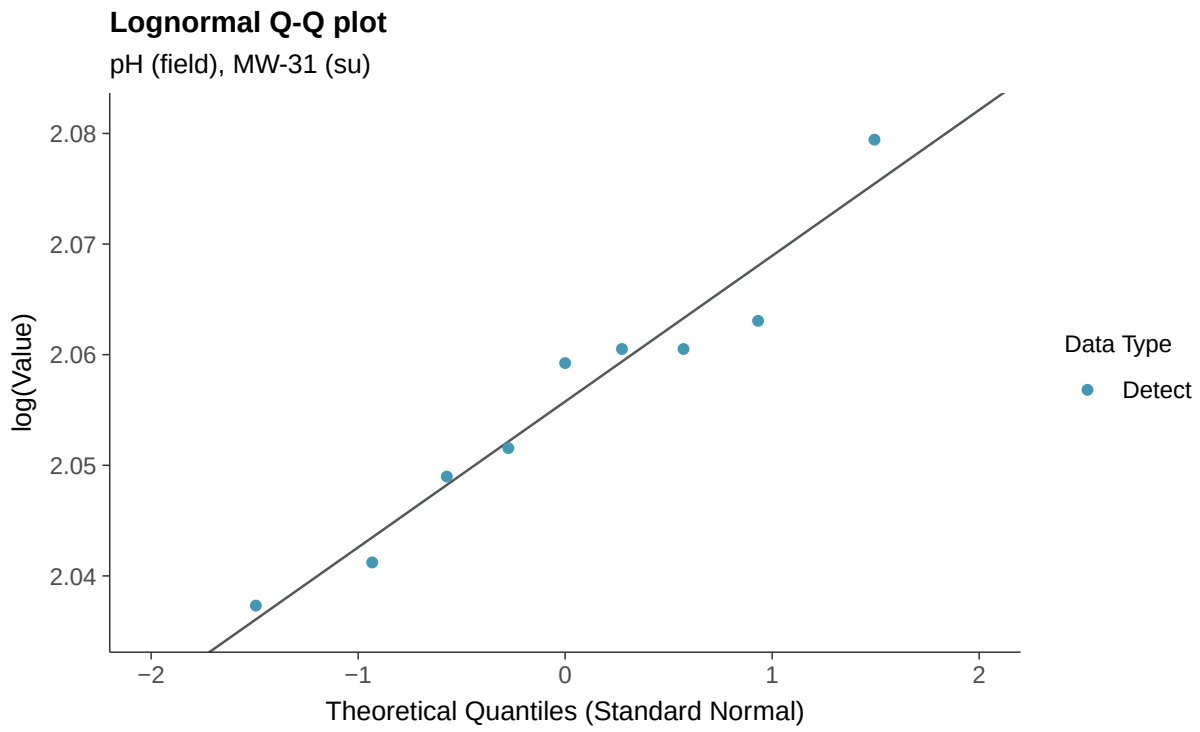


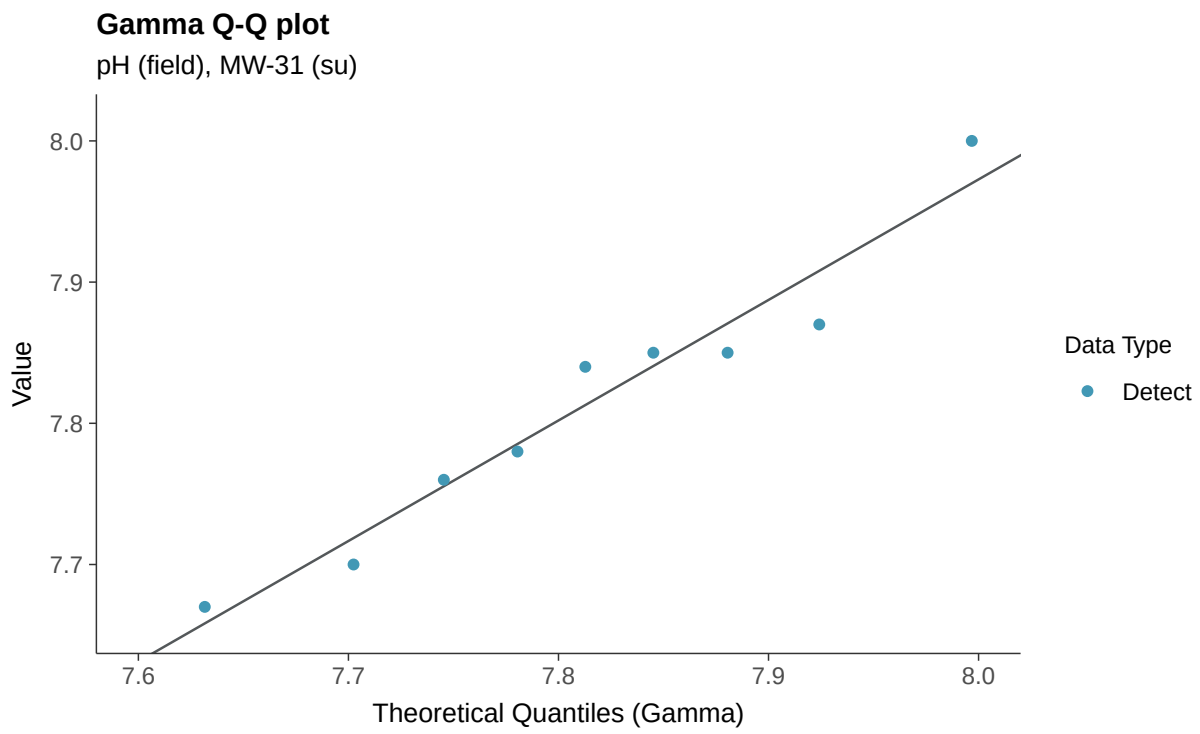
Boxplot by Season

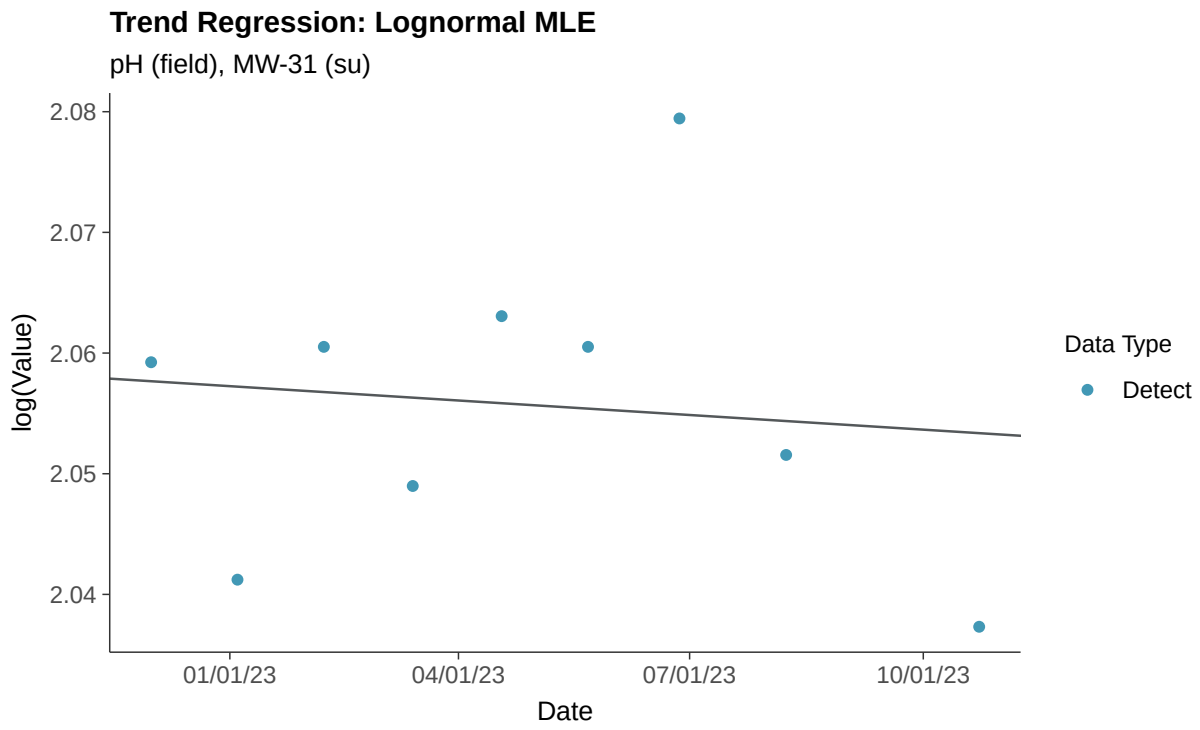
pH (field), MW-31 (su)




Normal Q-Q plot
pH (field), MW-31 (su)
Value
8.0
7.9
7.8
7.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

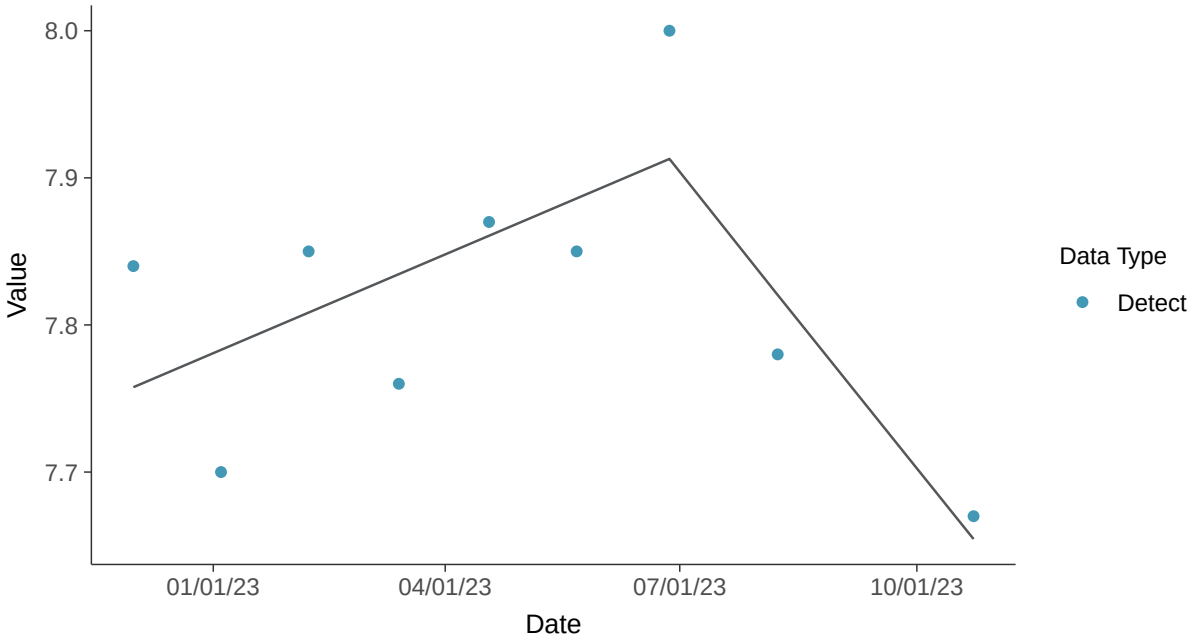

Lognormal Q-Q plot
pH (field), MW-31 (su)
log(Value)
2.08
2.07
2.06
2.05
2.04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
pH (field), MW-31 (su)
Value
8.0
7.9
7.8
7.7
7.6
7.7
7.8
7.9
8.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
pH (field), MW-31 (su)
log(Value)
2.08
2.07
2.06
2.05
2.04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

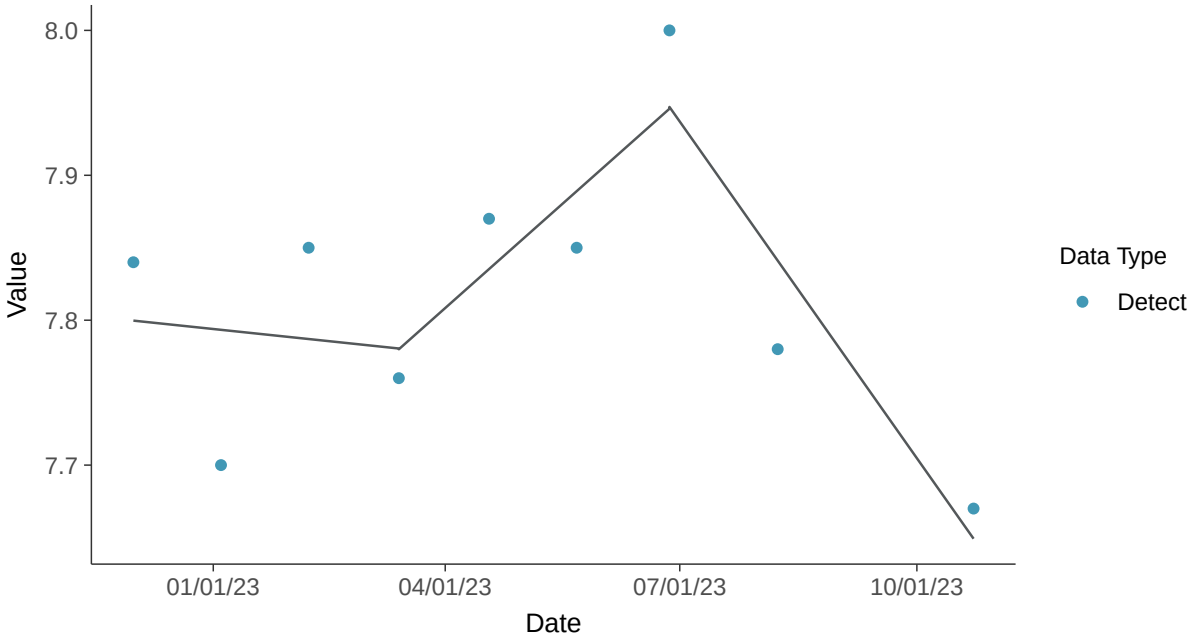
Trend Regression: Piecewise Linear-Linear

pH (field), MW-31 (su)



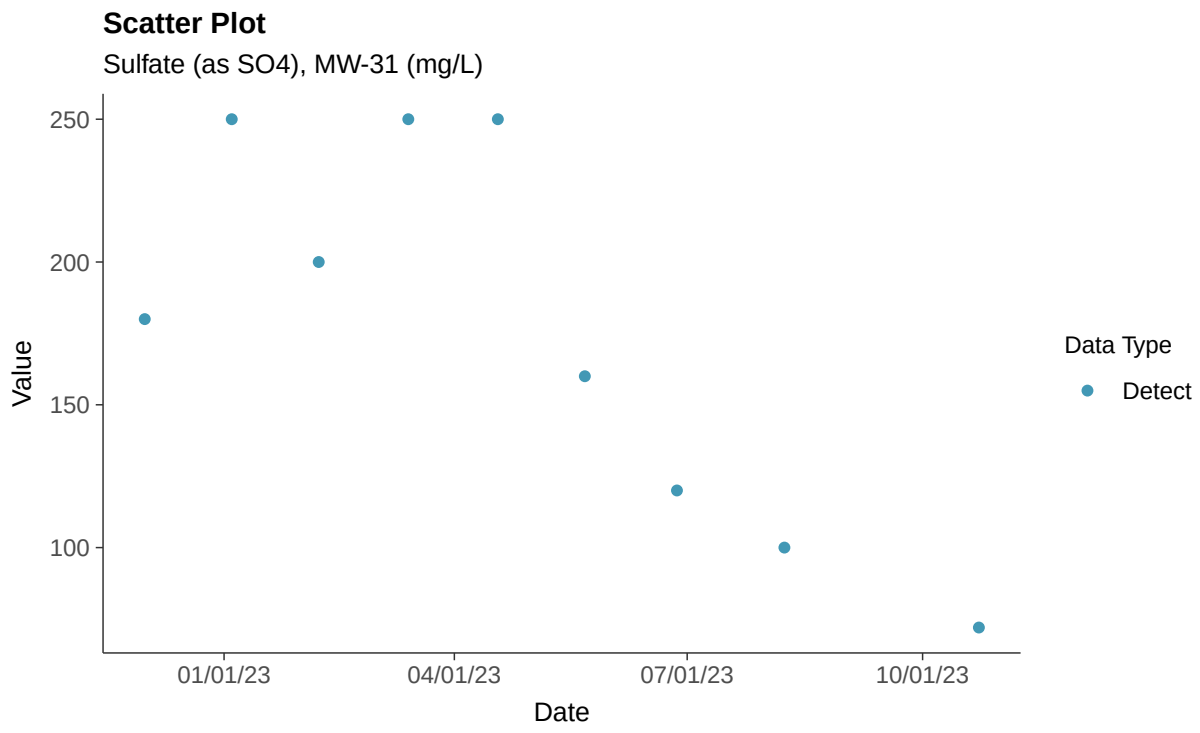
Trend Regression: Piecewise Linear-Linear-Linear

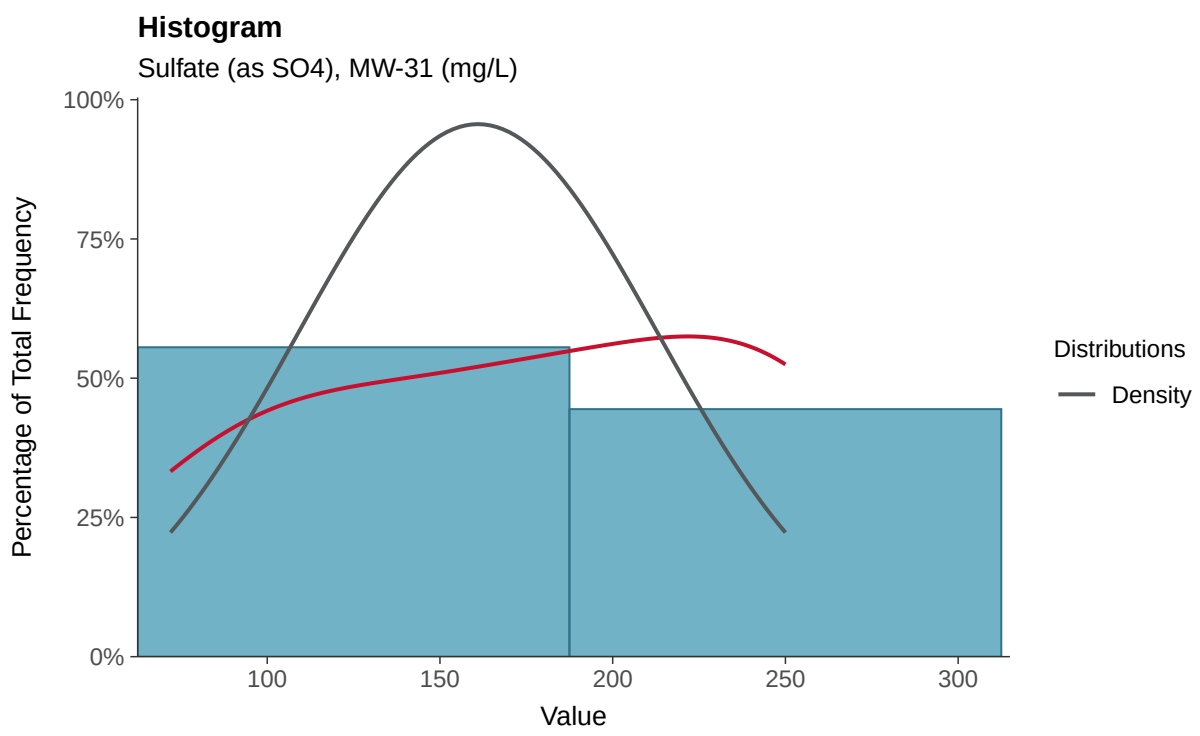
pH (field), MW-31 (su)



Appendix III: Sulfate (as SO4), MW-31

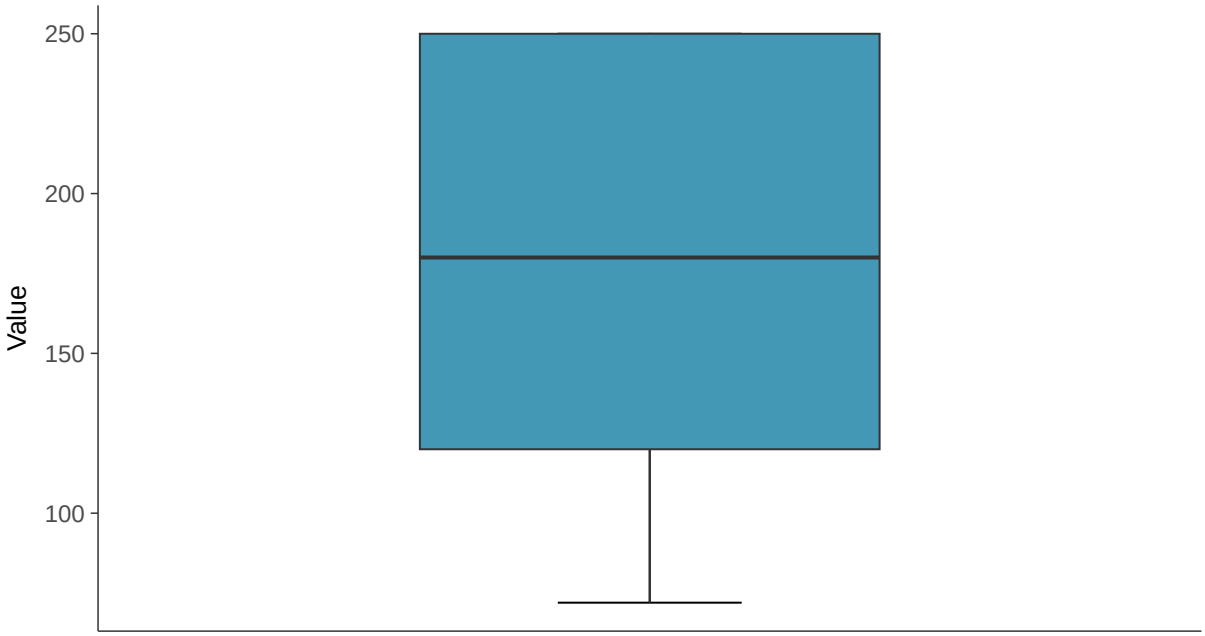
ID: 1_26_4_124





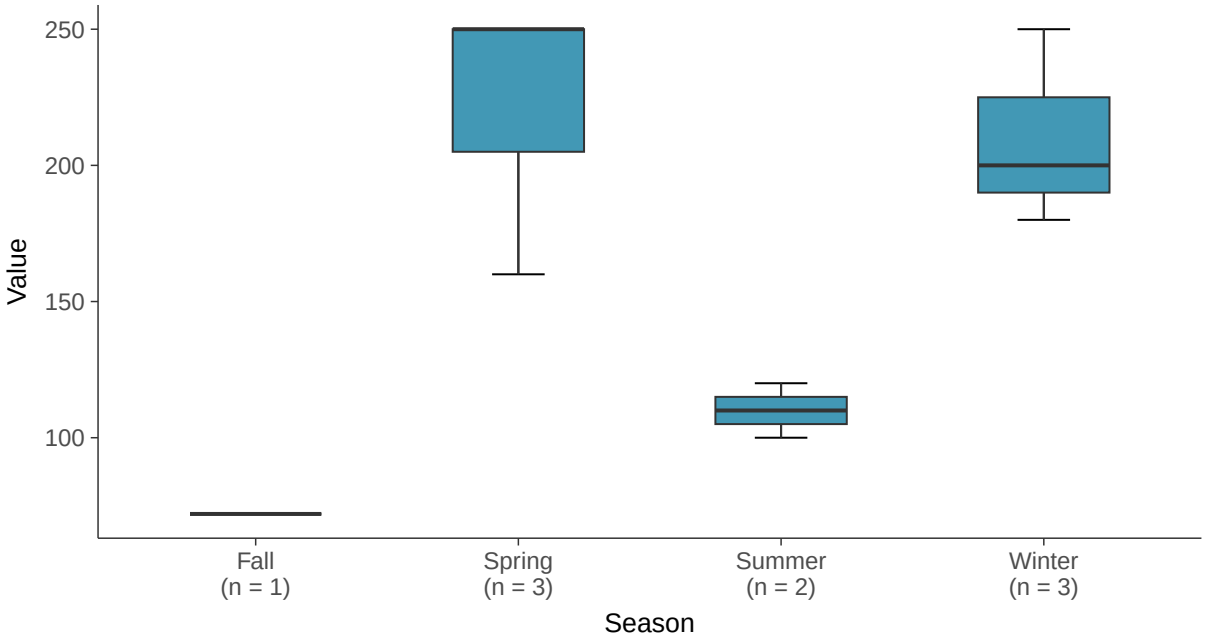
Boxplot

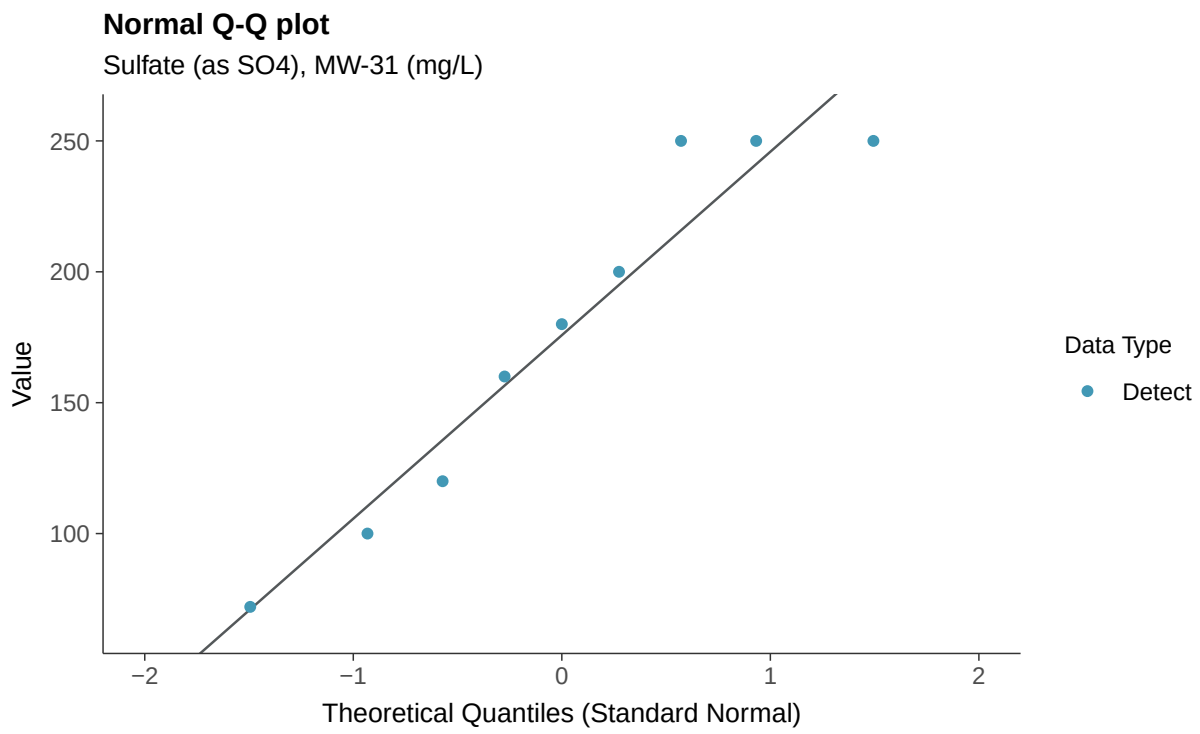
Sulfate (as SO4), MW-31 (mg/L)

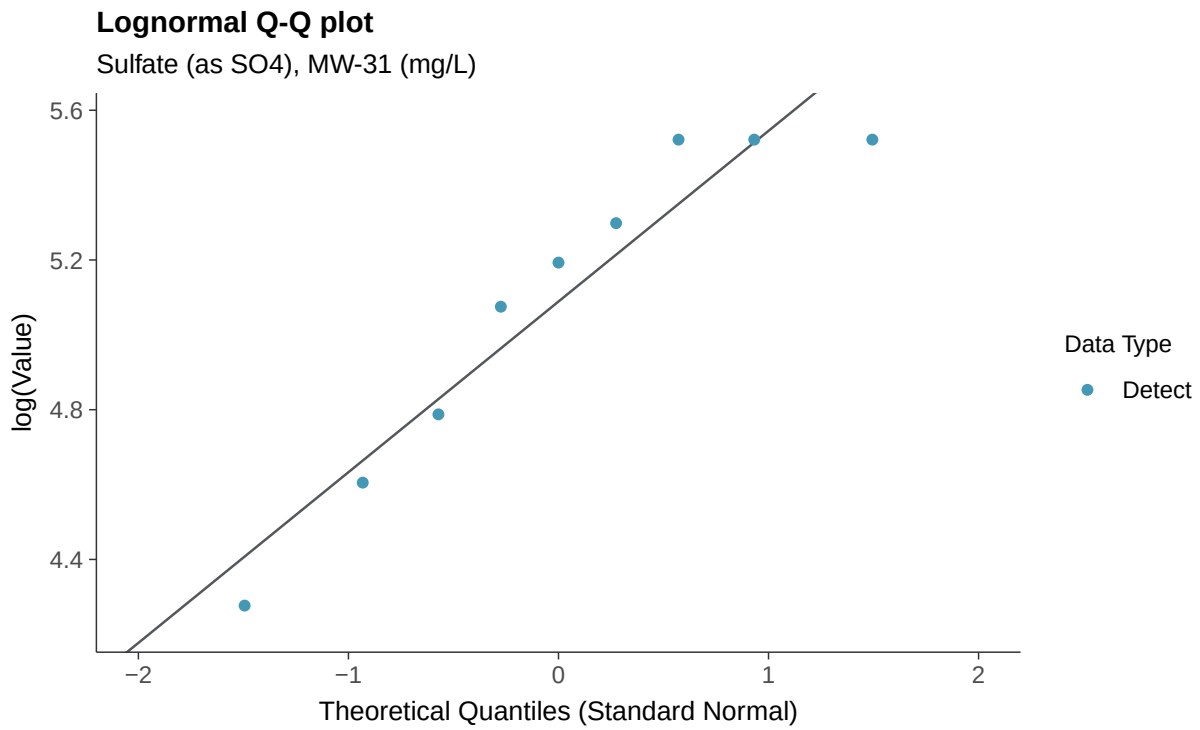


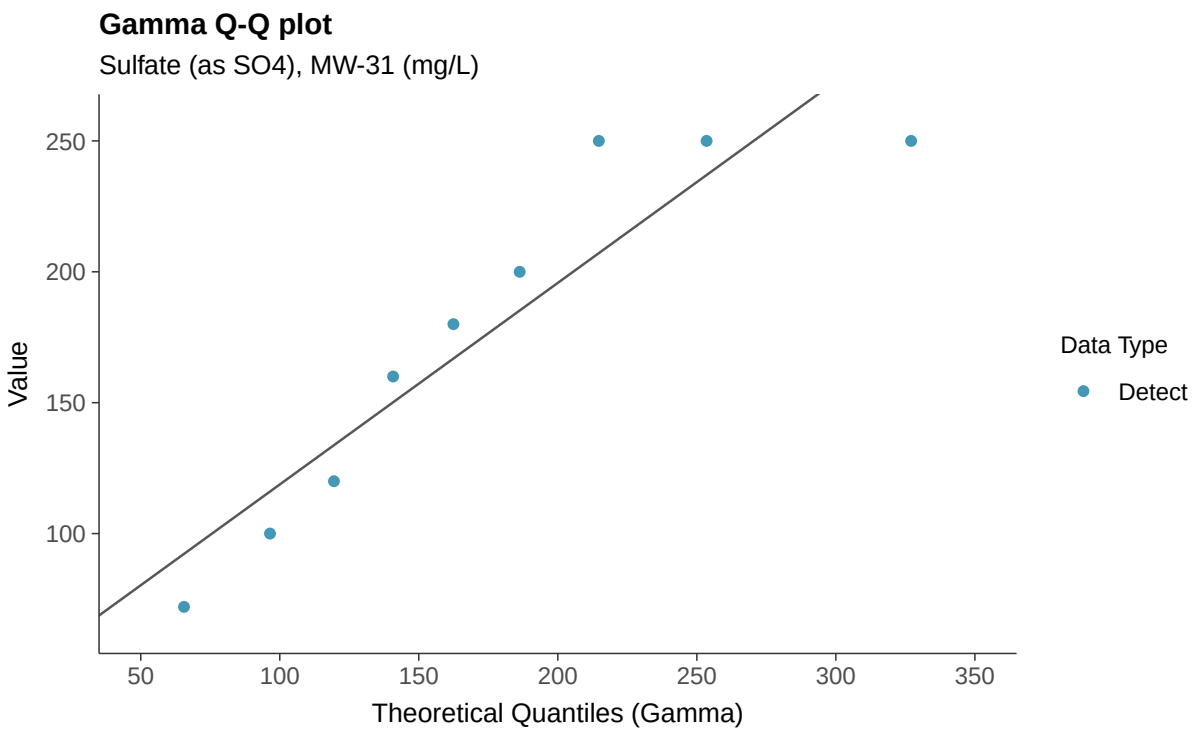
Boxplot by Season

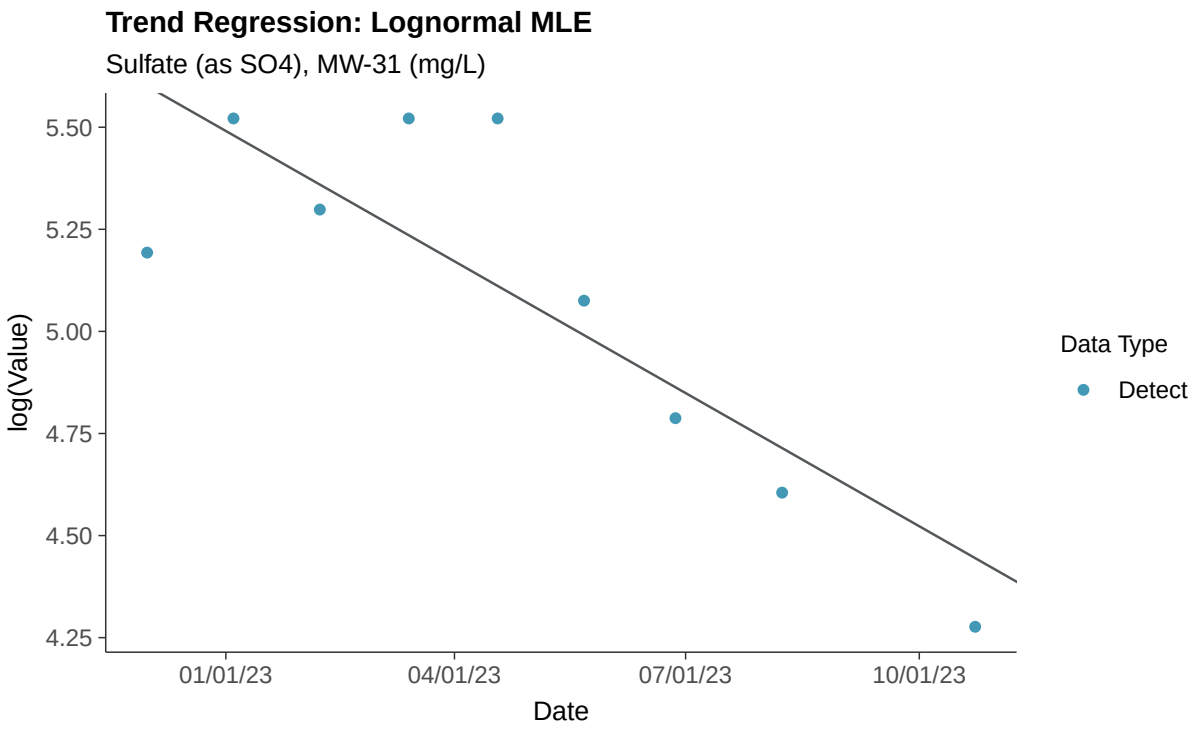
Sulfate (as SO4), MW-31 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-31 (mg/L)
Value
250
200
150
100
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

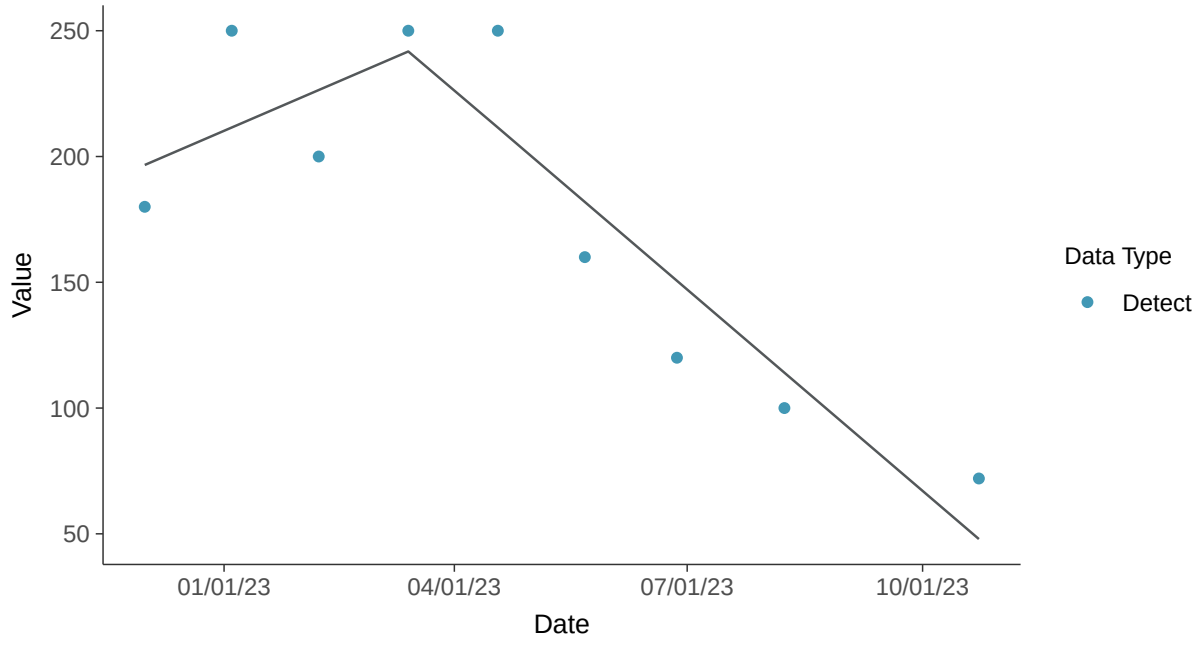

Lognormal Q-Q plot
Sulfate (as SO4), MW-31 (mg/L)
log(Value)
5.6
5.2
4.8
4.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-31 (mg/L)
Value
250
200
150
100
50
100
150
200
250
300
350
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-31 (mg/L)
log(Value)
5.50
5.25
5.00
4.75
4.50
4.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

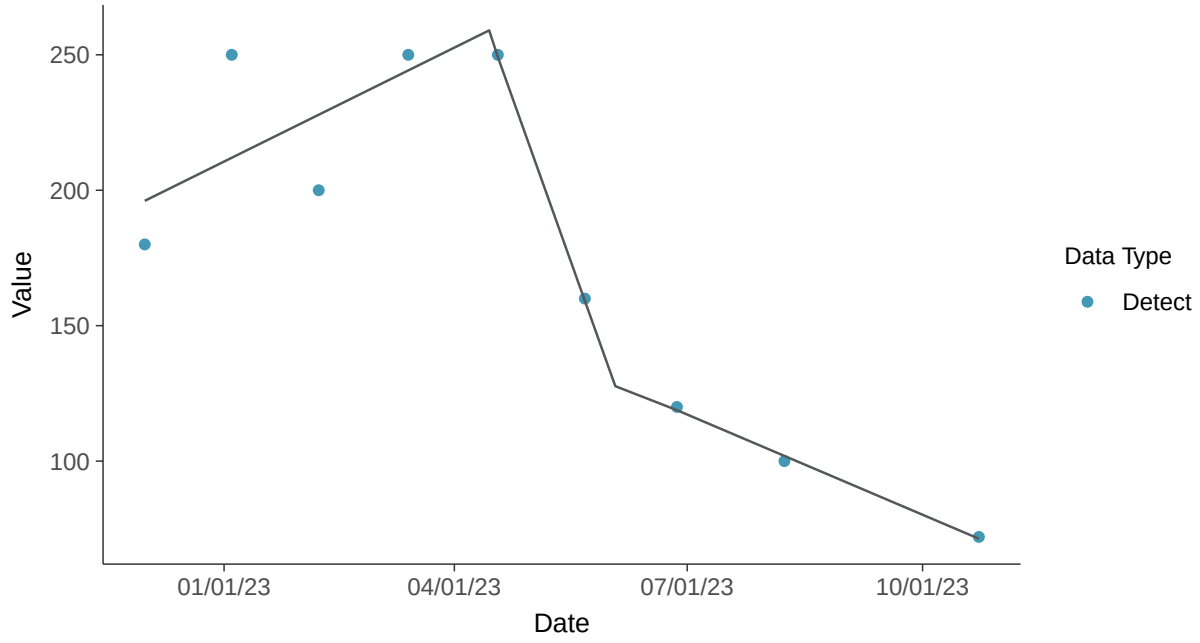
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-31 (mg/L)



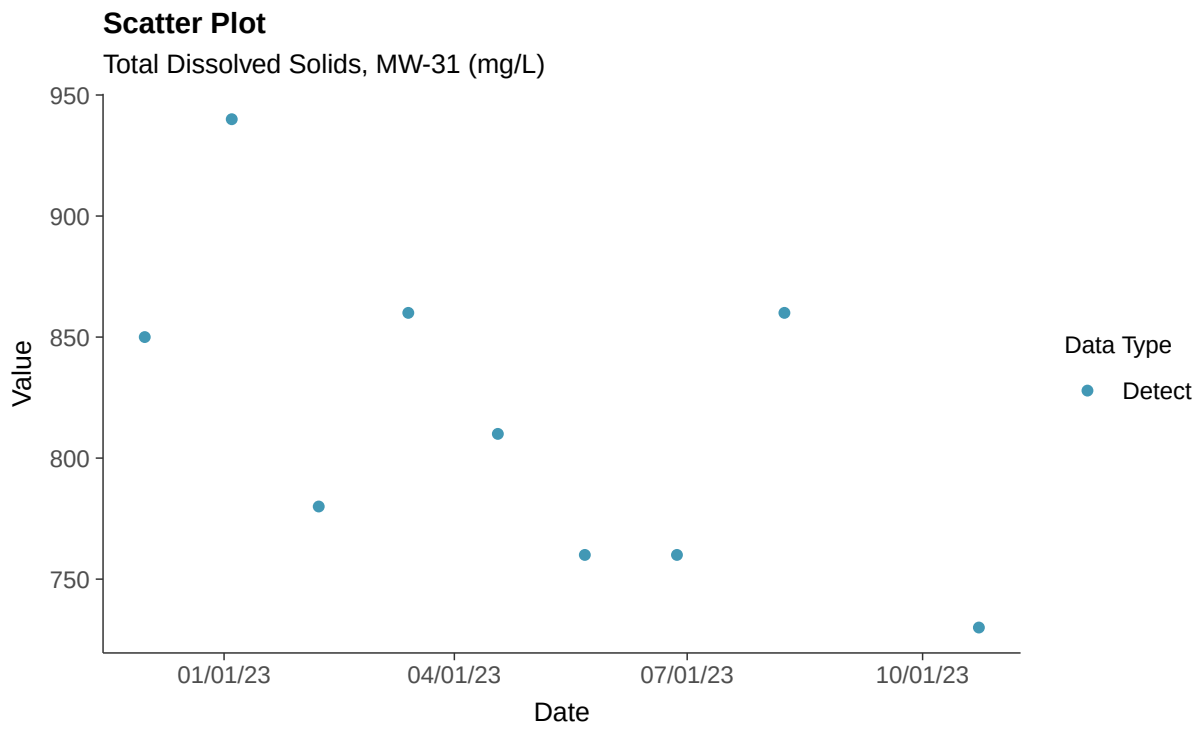
Trend Regression: Piecewise Linear-Linear-Linear

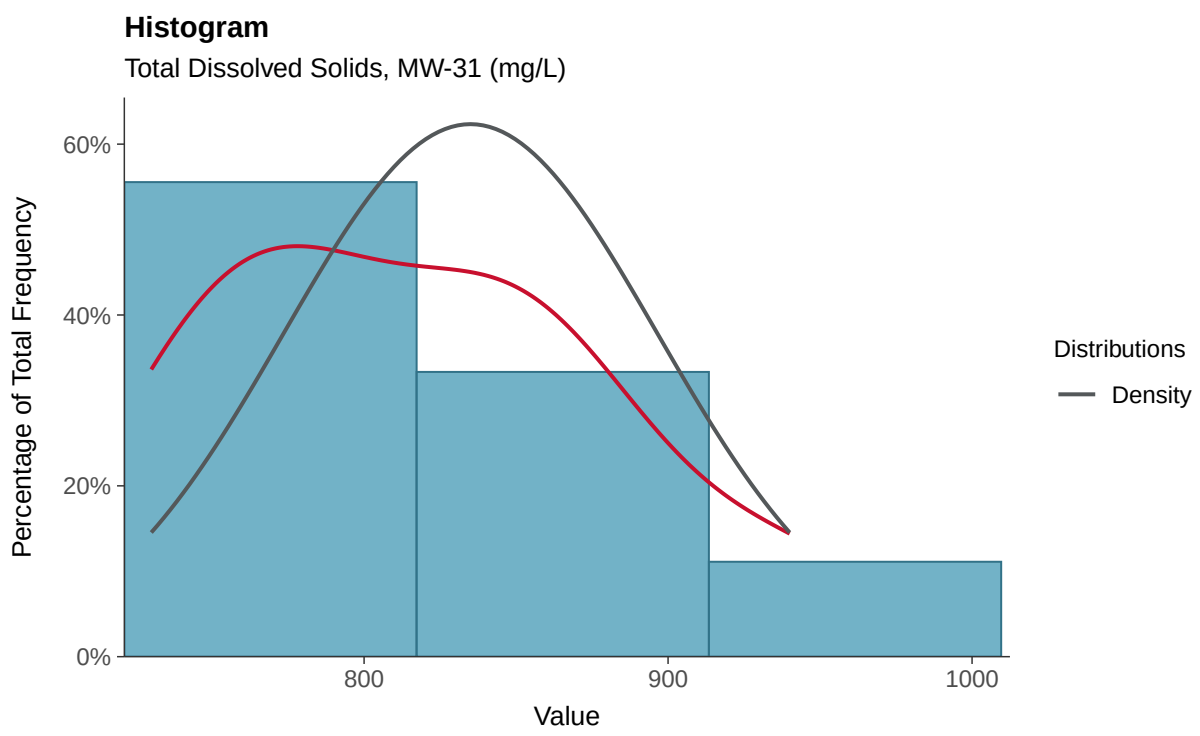
Sulfate (as SO4), MW-31 (mg/L)



Appendix III: Total Dissolved Solids, MW-31

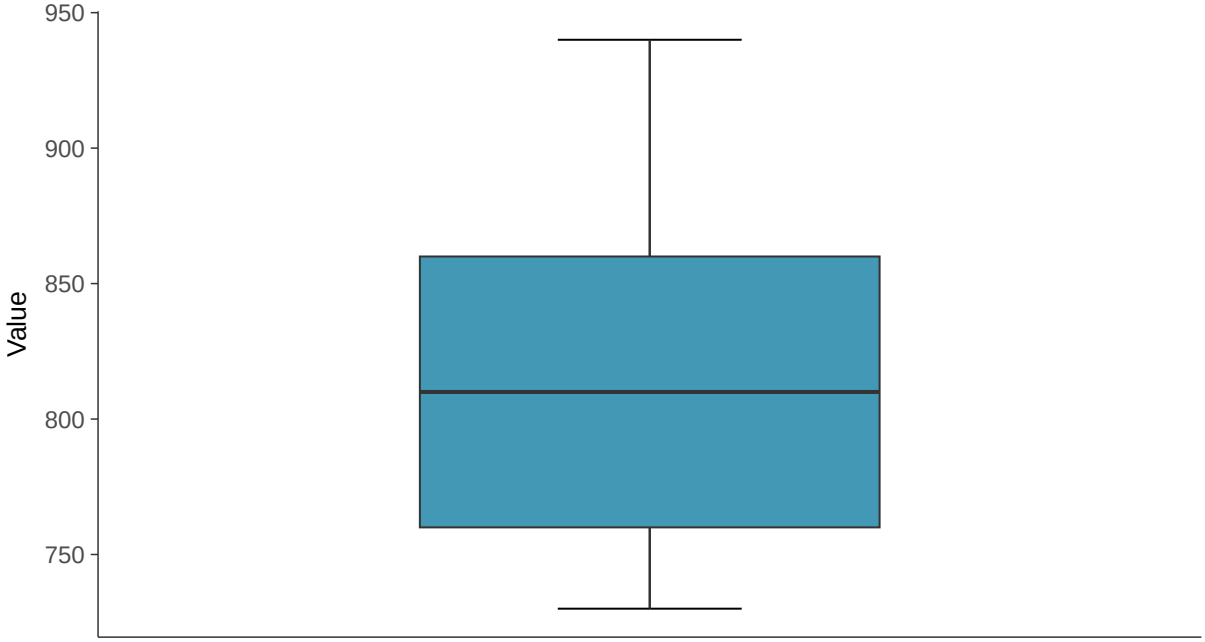
ID: 1_26_4_126





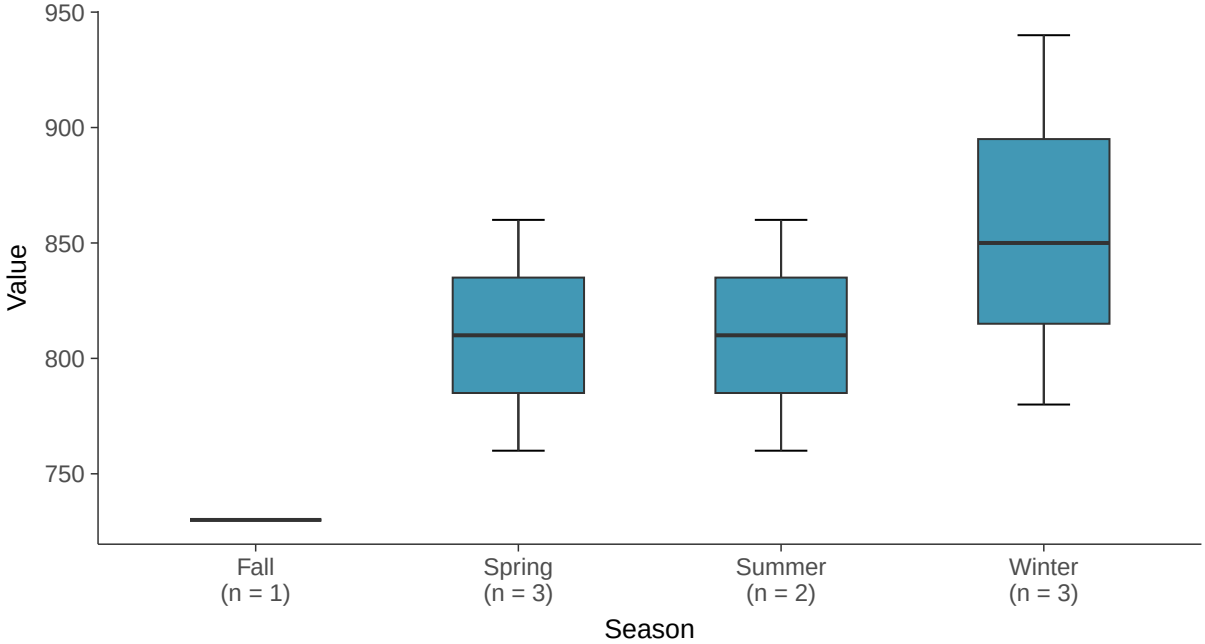
Boxplot

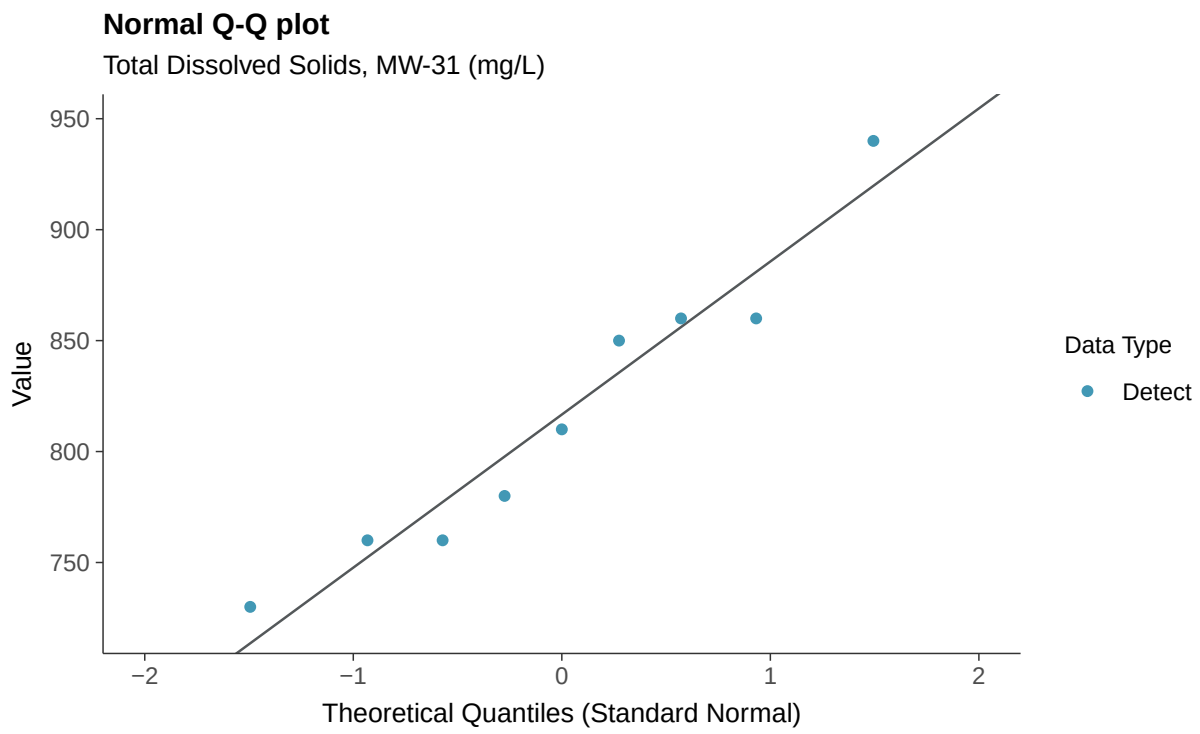
Total Dissolved Solids, MW-31 (mg/L)

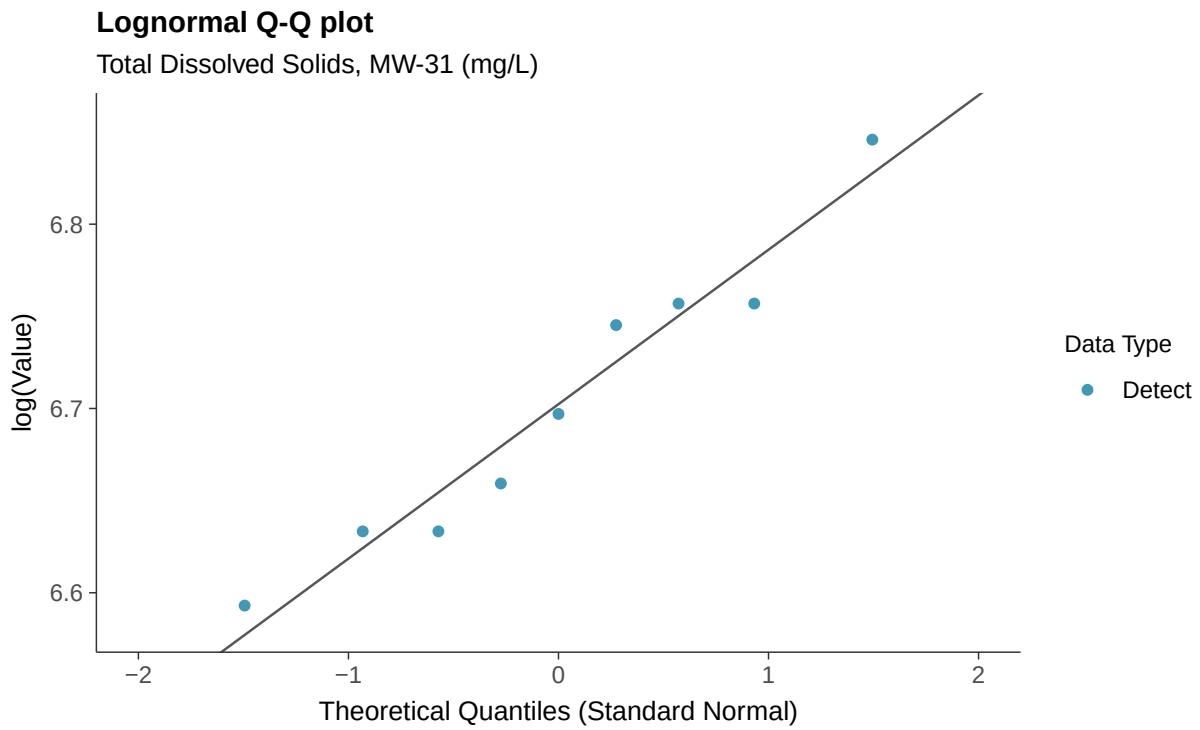


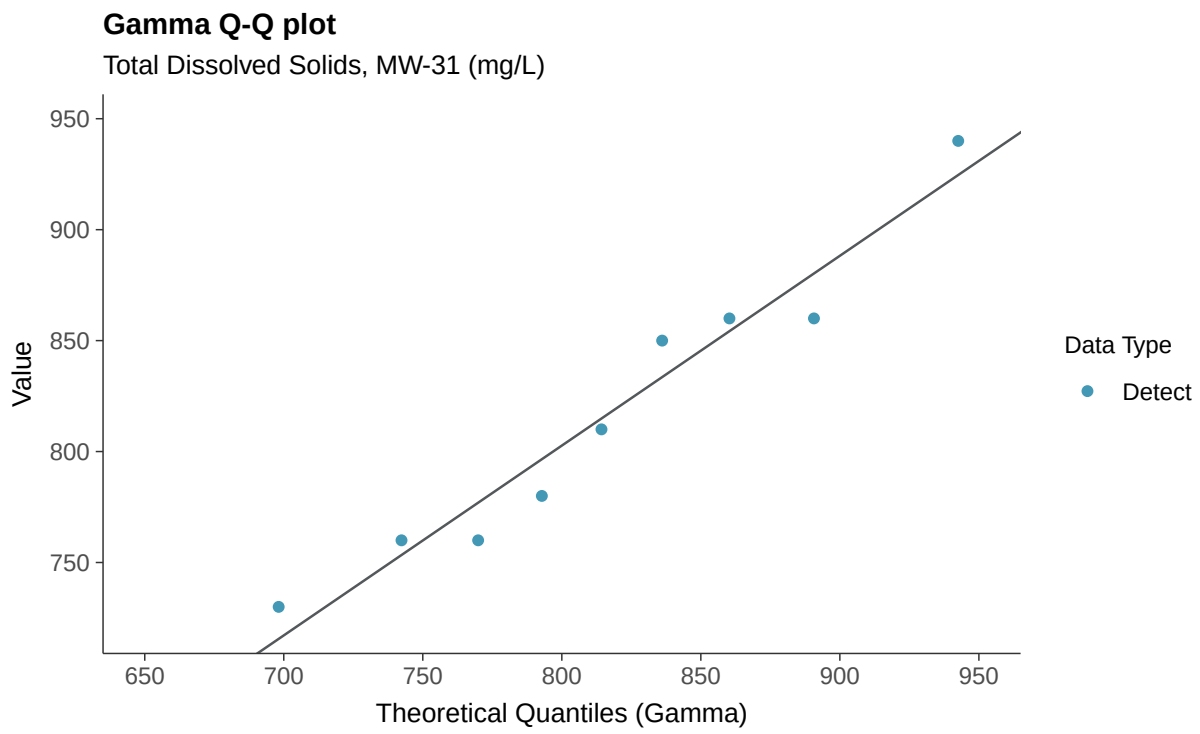
Boxplot by Season

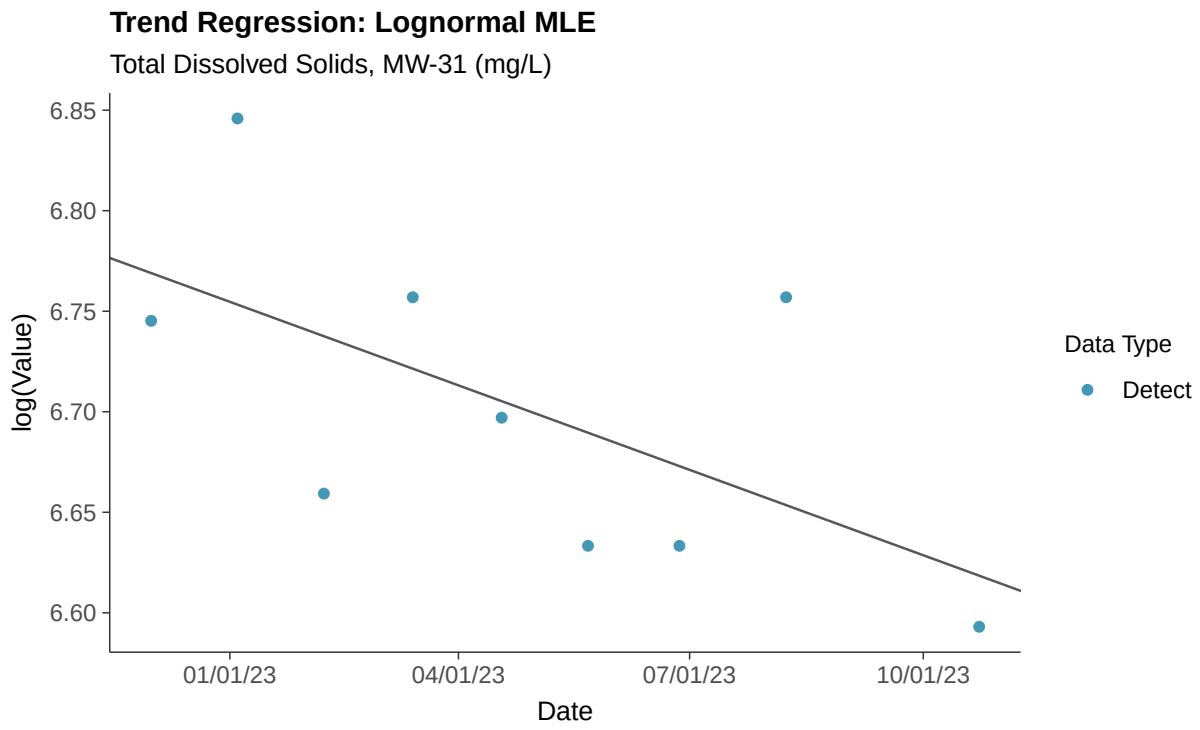
Total Dissolved Solids, MW-31 (mg/L)




Normal Q-Q plot
Total Dissolved Solids, MW-31 (mg/L)
Value
950
900
850
800
750
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

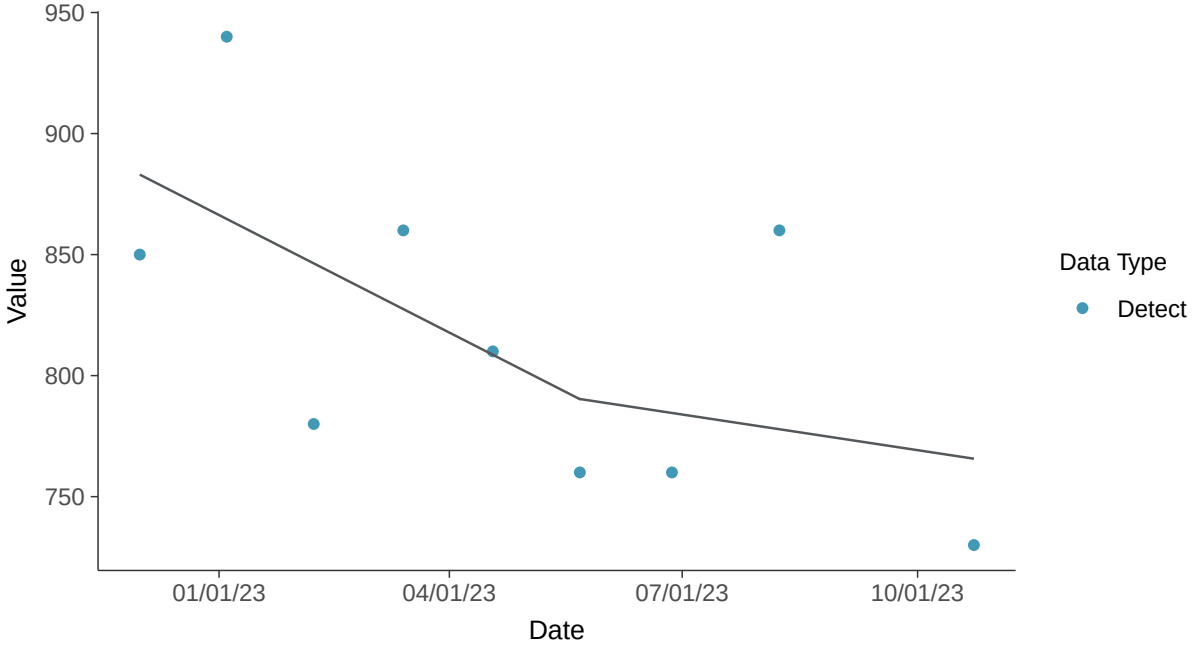

Lognormal Q-Q plot
Total Dissolved Solids, MW-31 (mg/L)
log(Value)
6.8
6.7
6.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Total Dissolved Solids, MW-31 (mg/L)
Value
950
900
850
800
750
650
700
750
800
850
900
950
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-31 (mg/L)
log(Value)
6.85
6.80
6.75
6.70
6.65
6.60
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

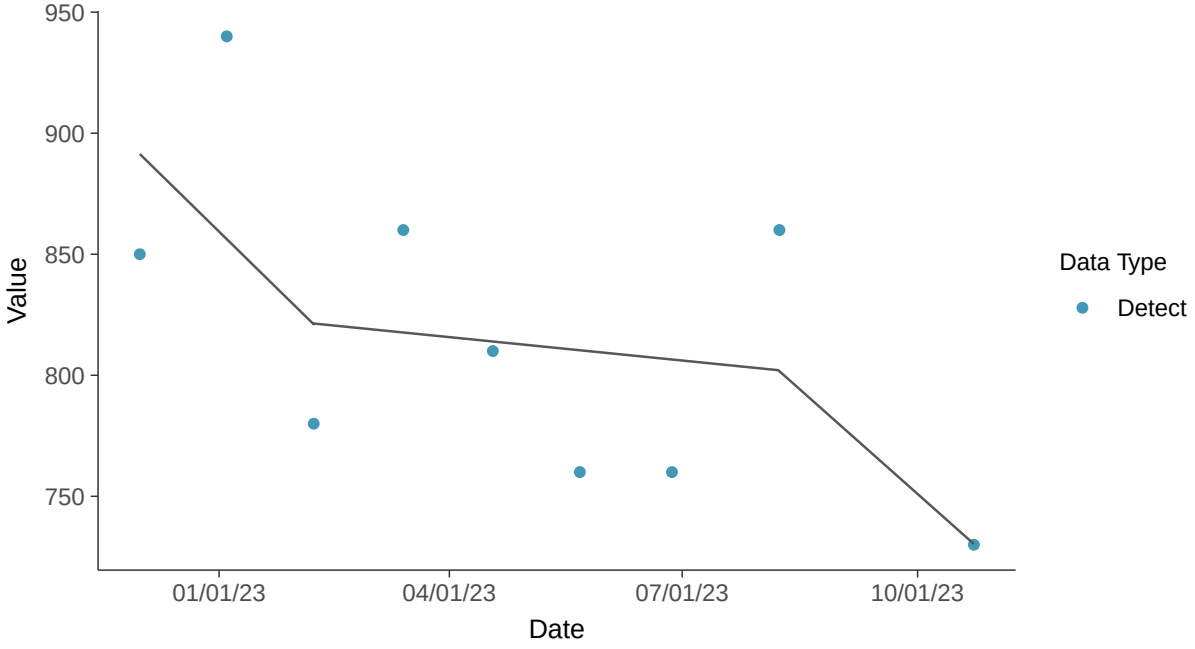
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-31 (mg/L)



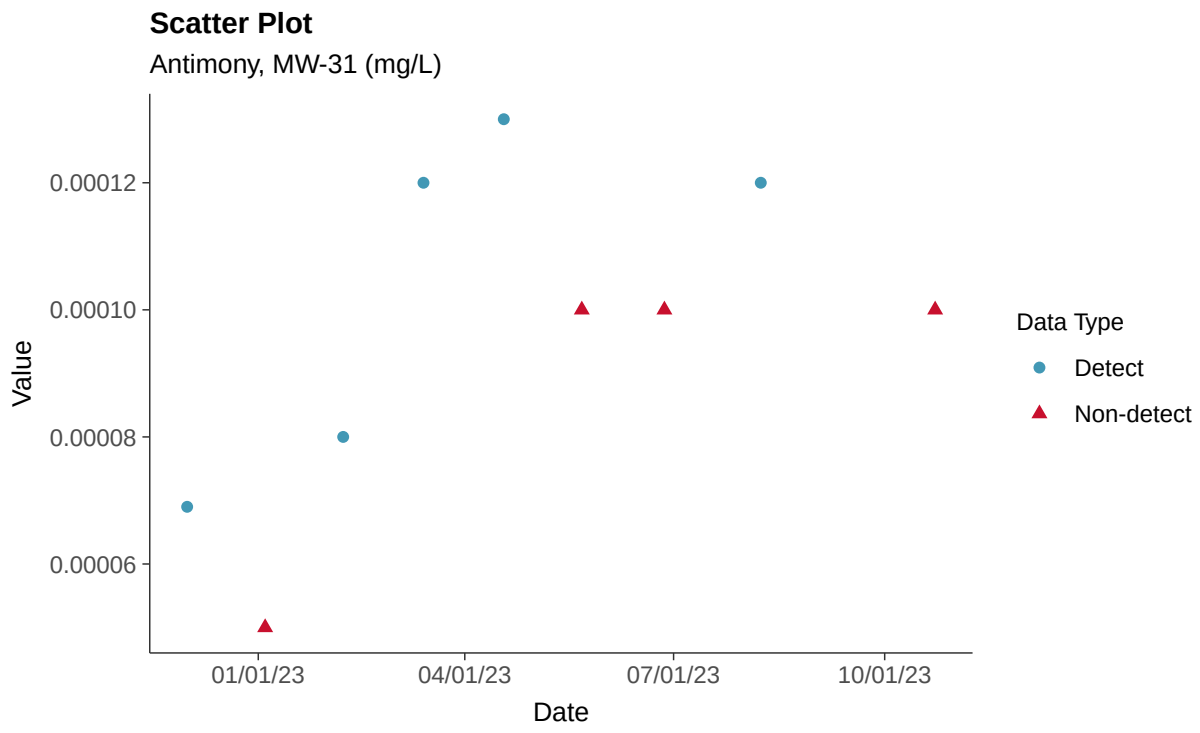
Trend Regression: Piecewise Linear-Linear-Linear

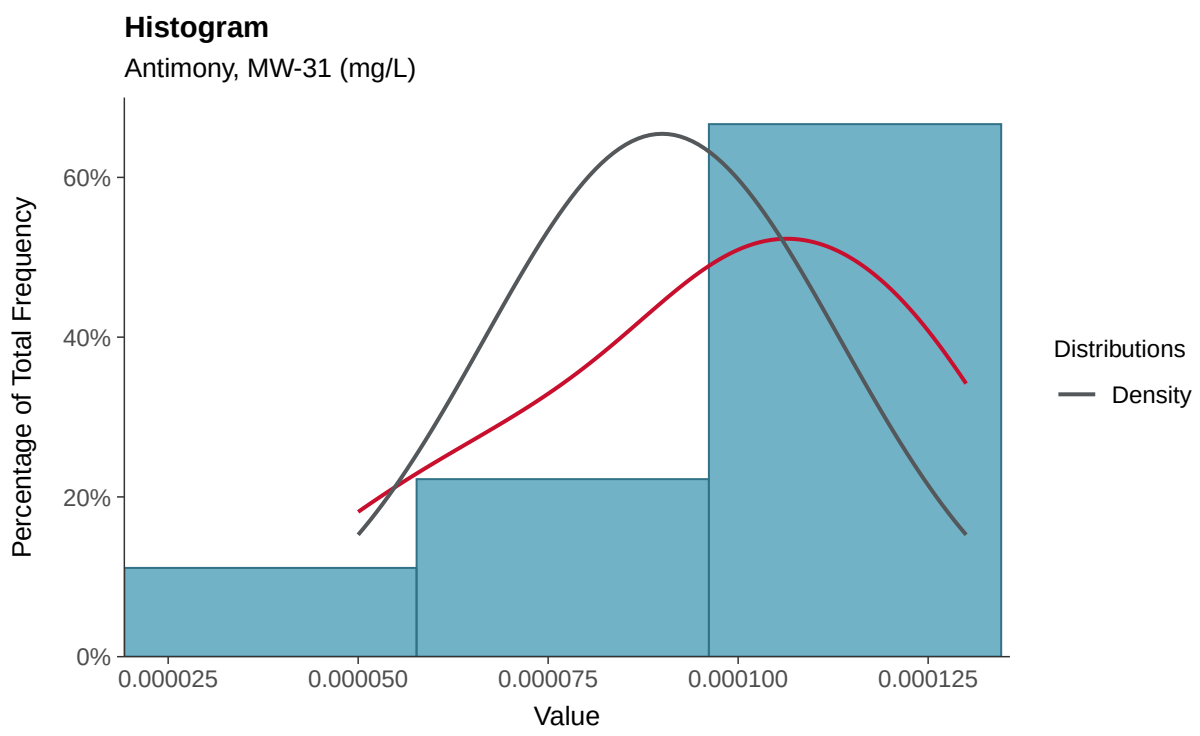
Total Dissolved Solids, MW-31 (mg/L)



Appendix IV: Antimony, MW-31

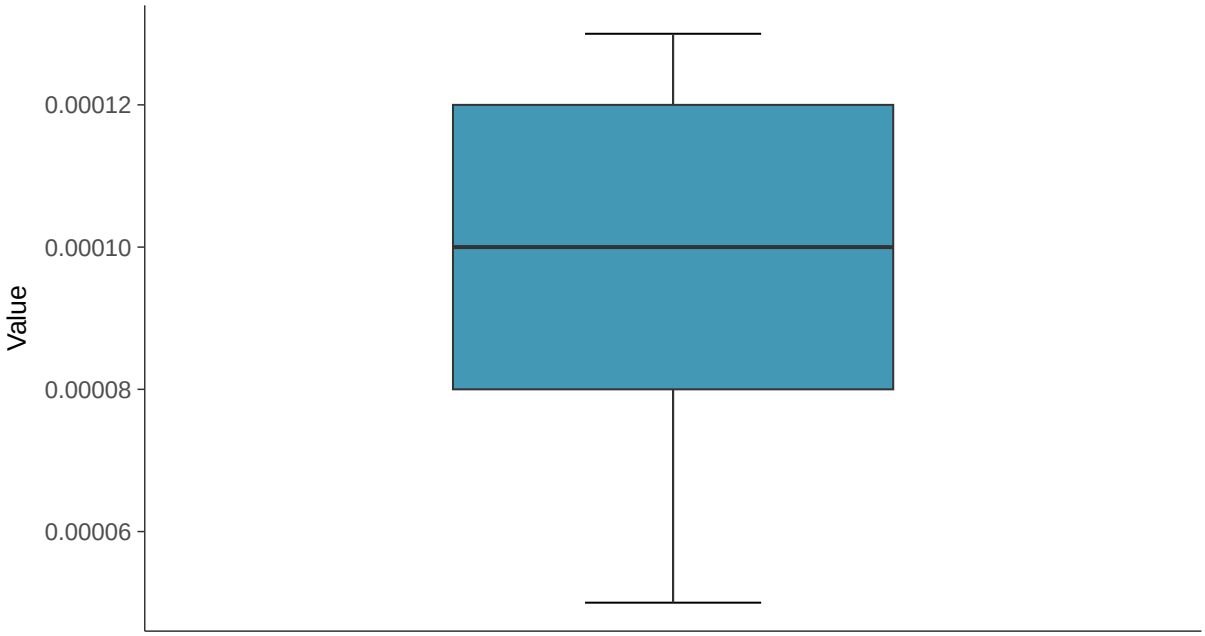
ID: 1_26_5_101





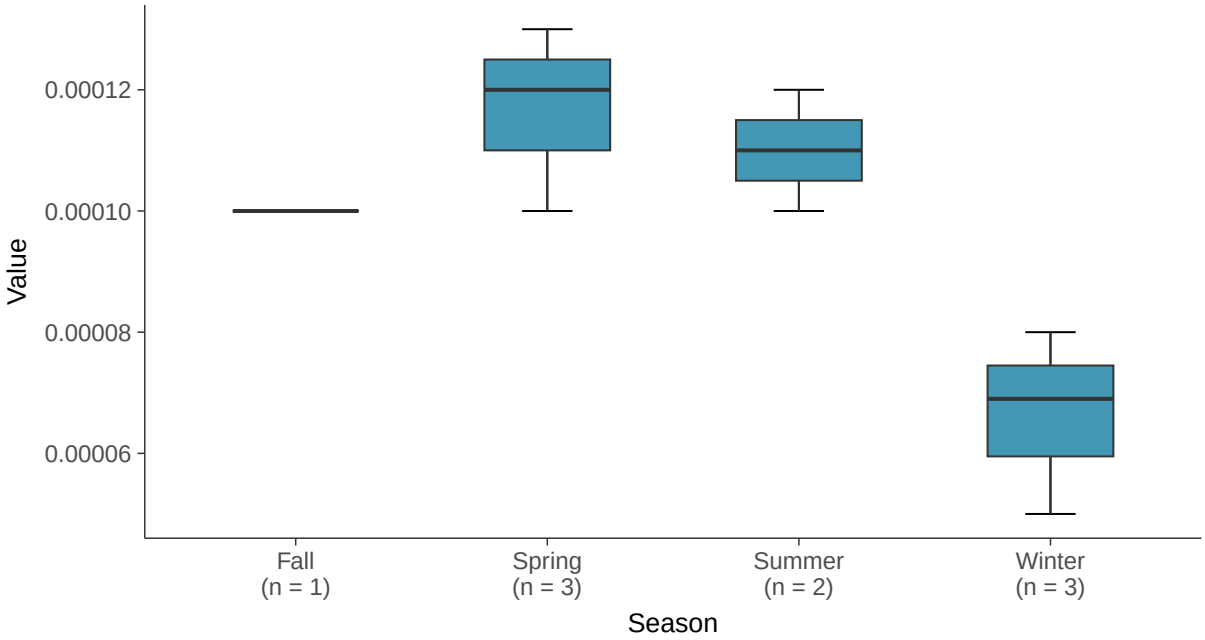
Boxplot

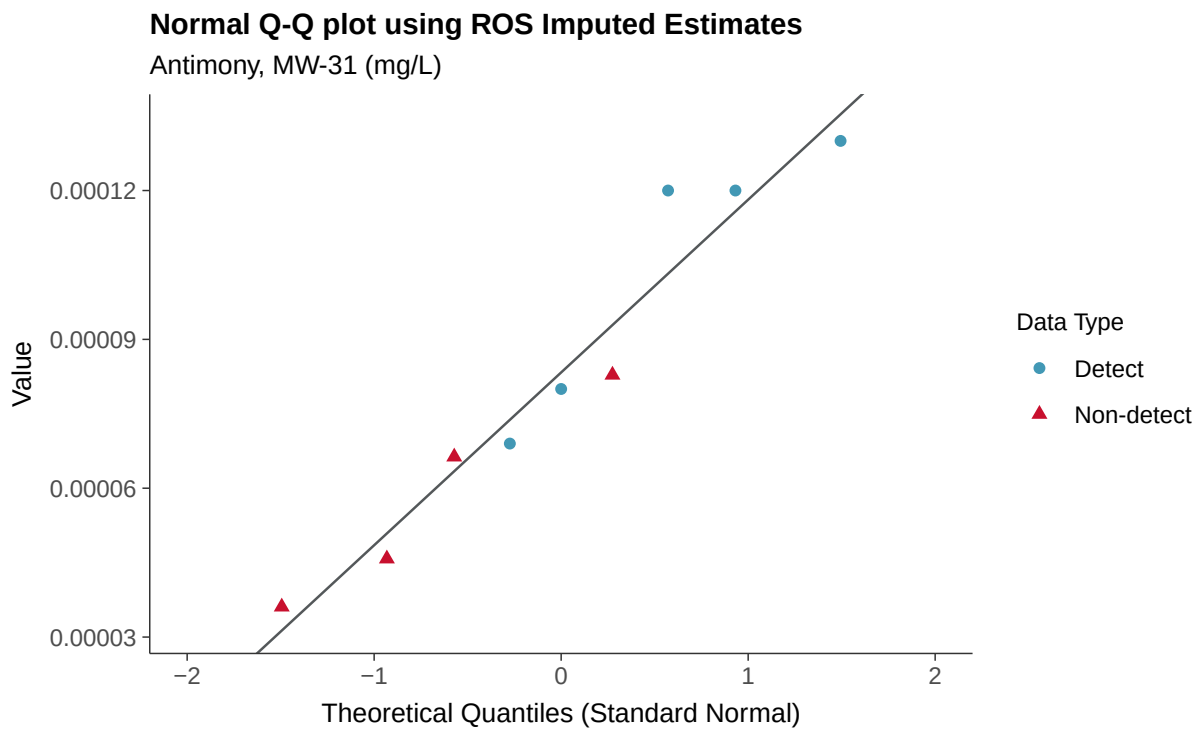
Antimony, MW-31 (mg/L)

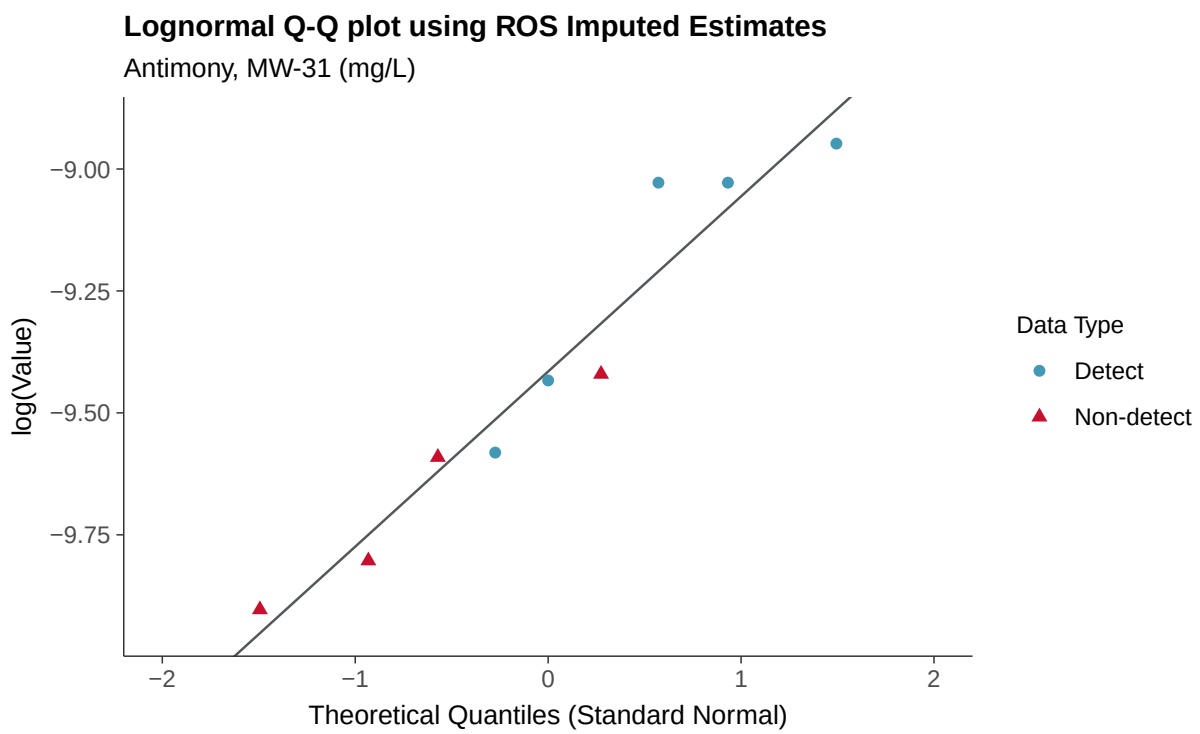


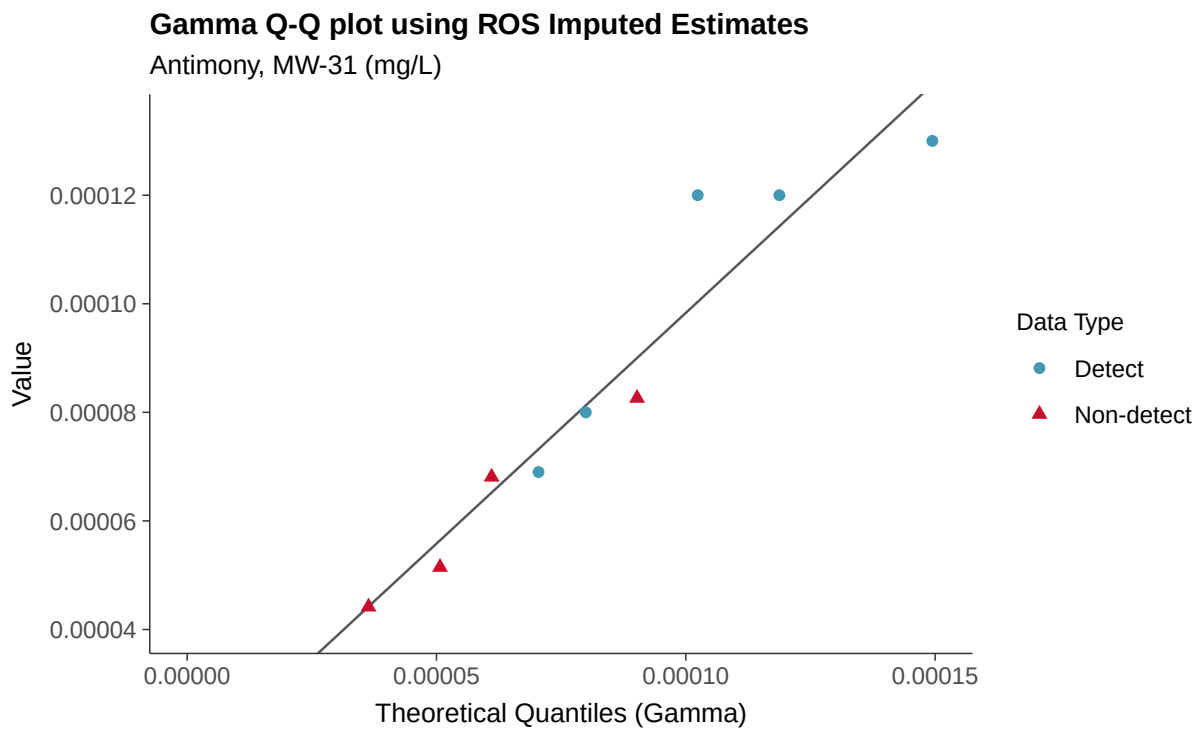
Boxplot by Season

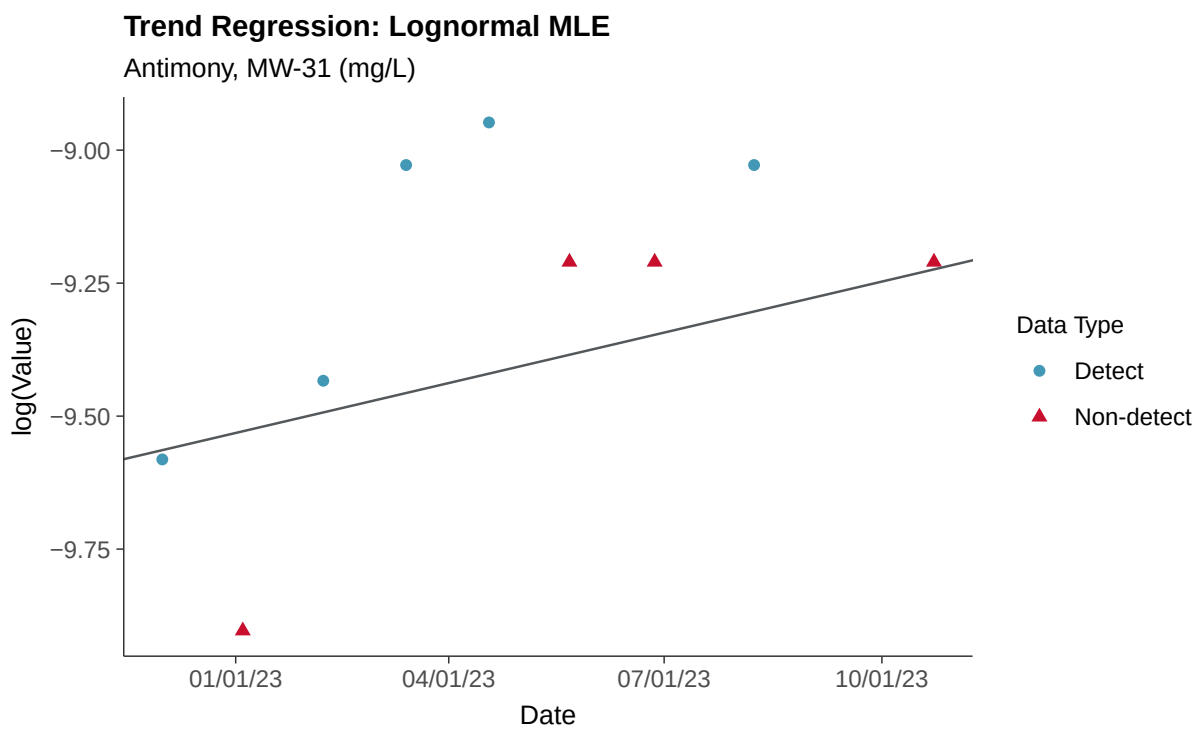
Antimony, MW-31 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-31 (mg/L)
Value
0.00012
0.00009
0.00006
0.00003
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

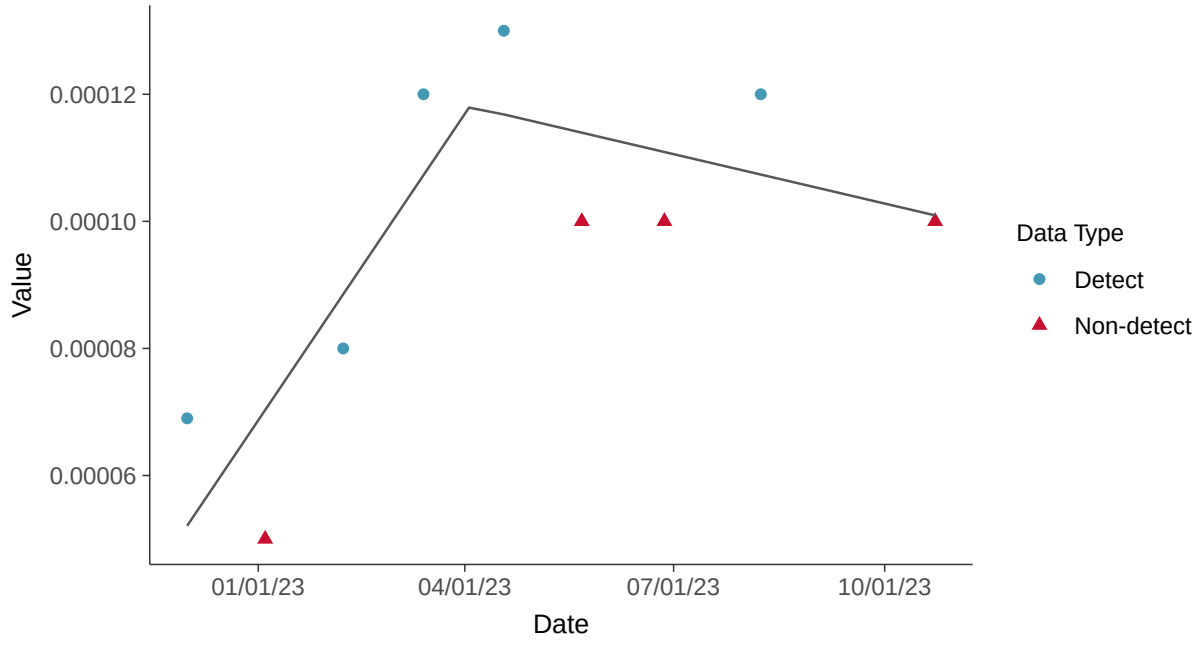

Lognormal Q-Q plot using ROS Imputed Estimates
Antimony, MW-31 (mg/L)
log(Value)
−9.00
−9.25
−9.50
−9.75
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Antimony, MW-31 (mg/L)
Value
0.00012
0.00010
0.00008
0.00006
0.00004
0.00000
0.00005
0.00010
0.00015
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Antimony, MW-31 (mg/L)
log(Value)
−9.00
−9.25
−9.50
−9.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

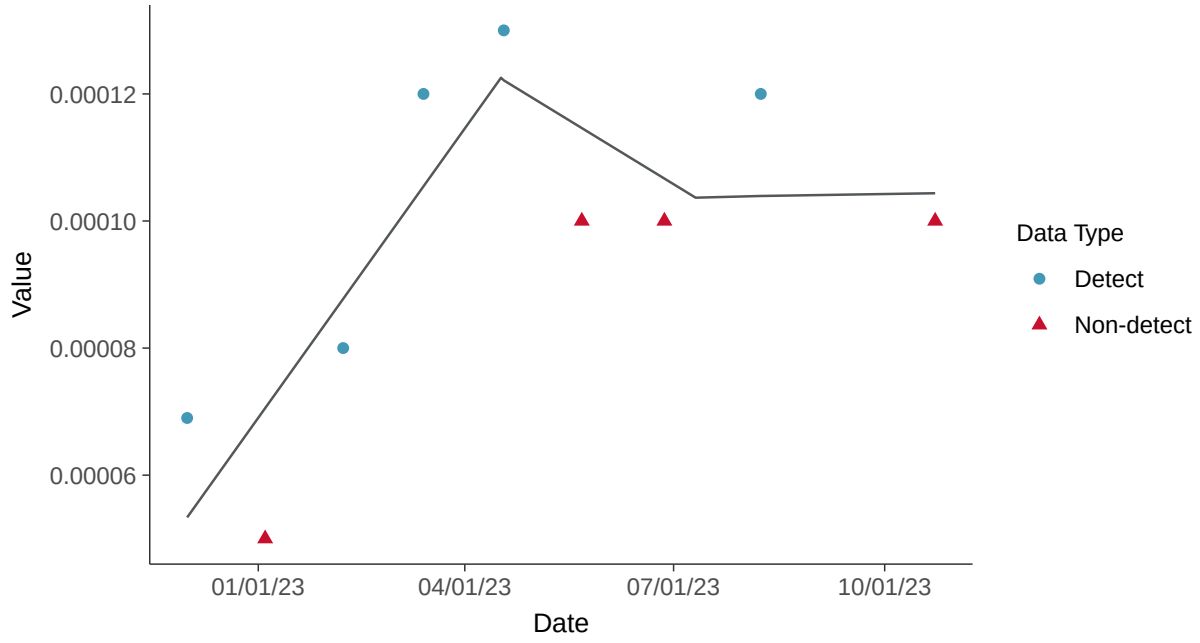
Trend Regression: Piecewise Linear-Linear

Antimony, MW-31 (mg/L)



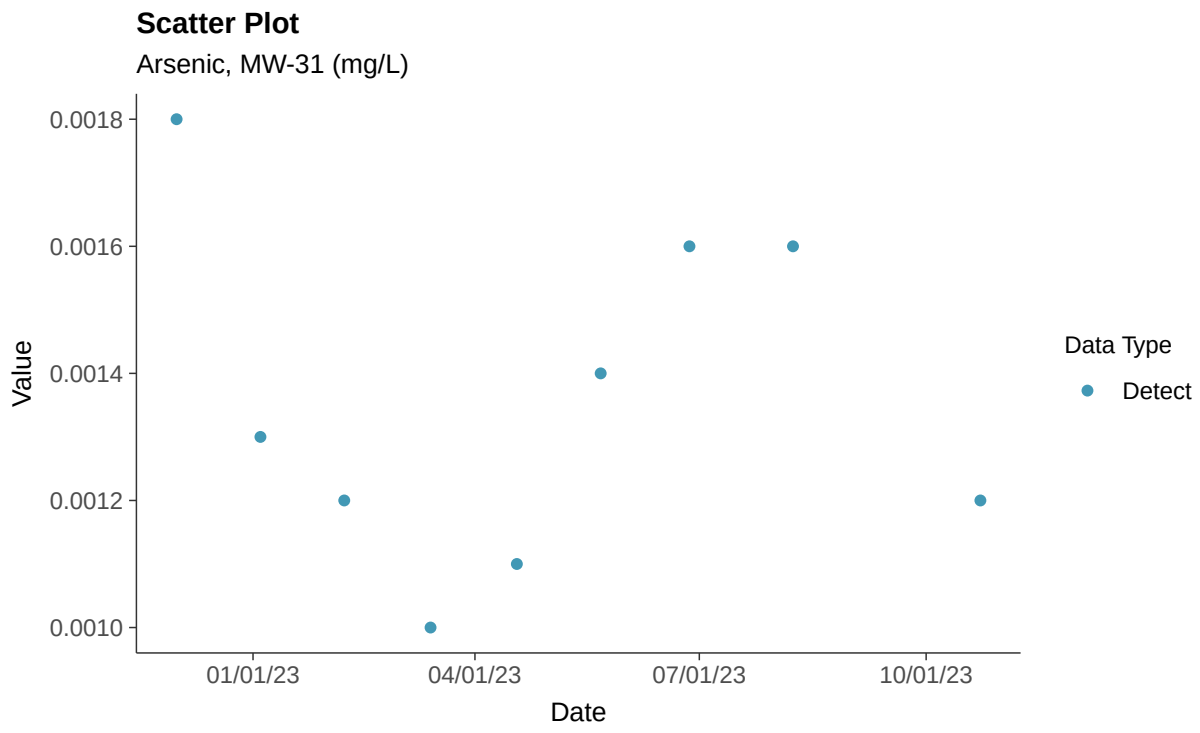
Trend Regression: Piecewise Linear-Linear-Linear

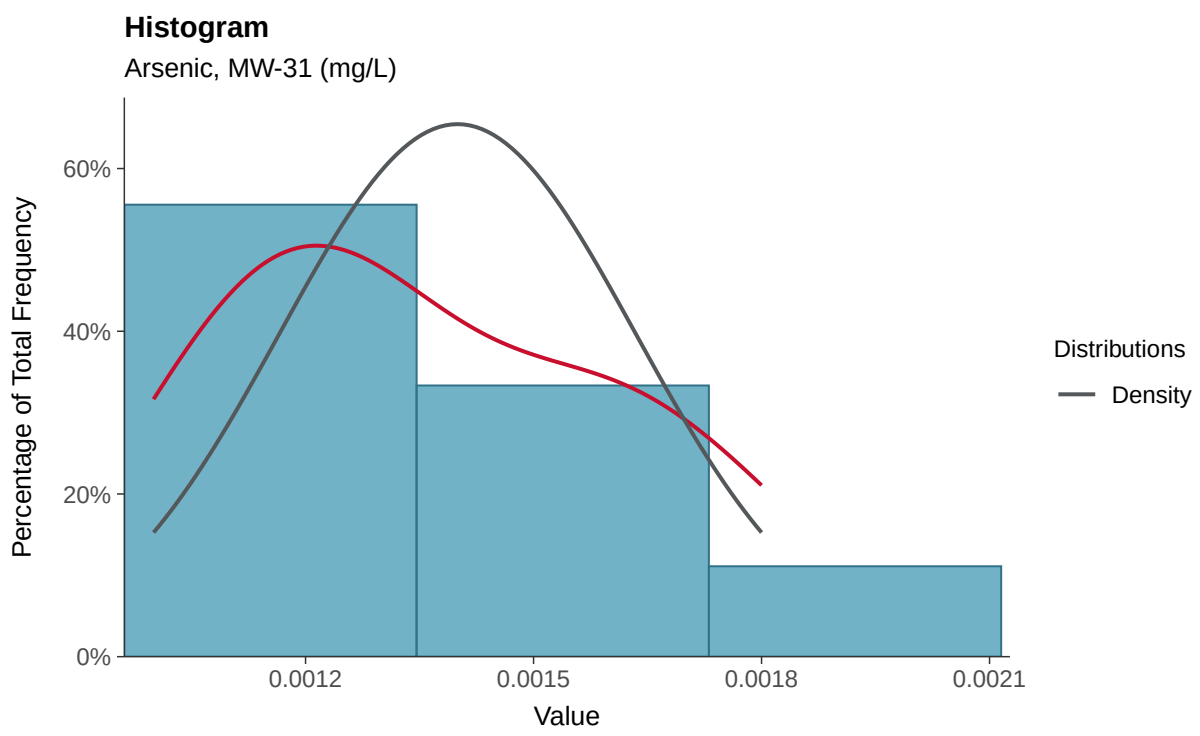
Antimony, MW-31 (mg/L)



Appendix IV: Arsenic, MW-31

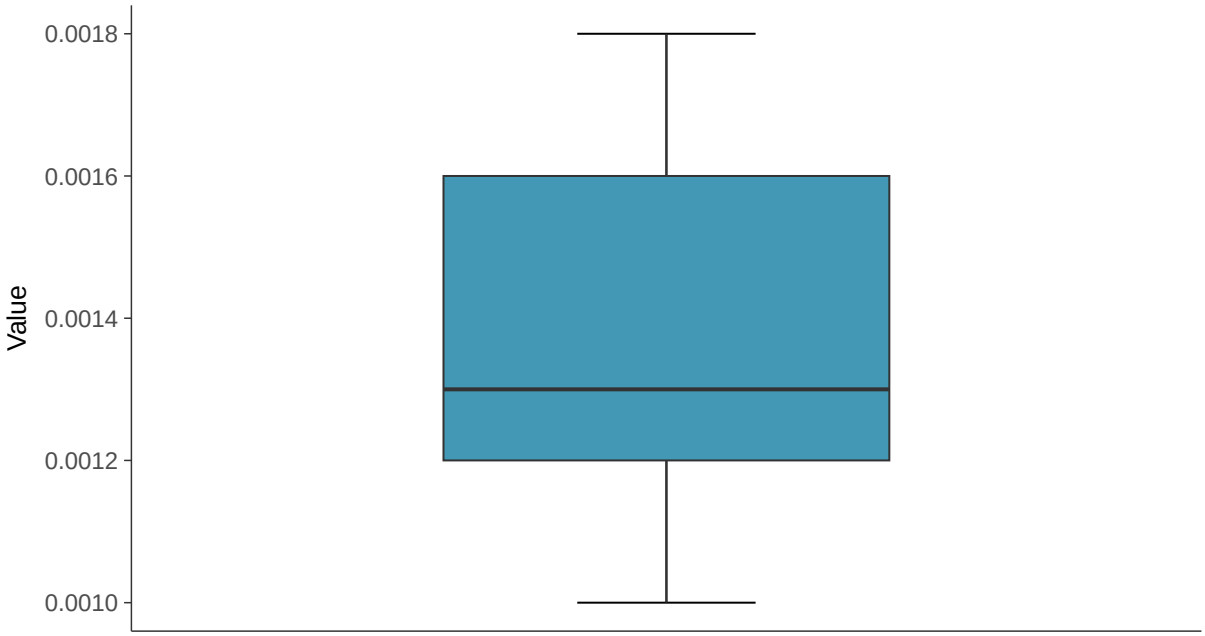
ID: 1_26_5_102





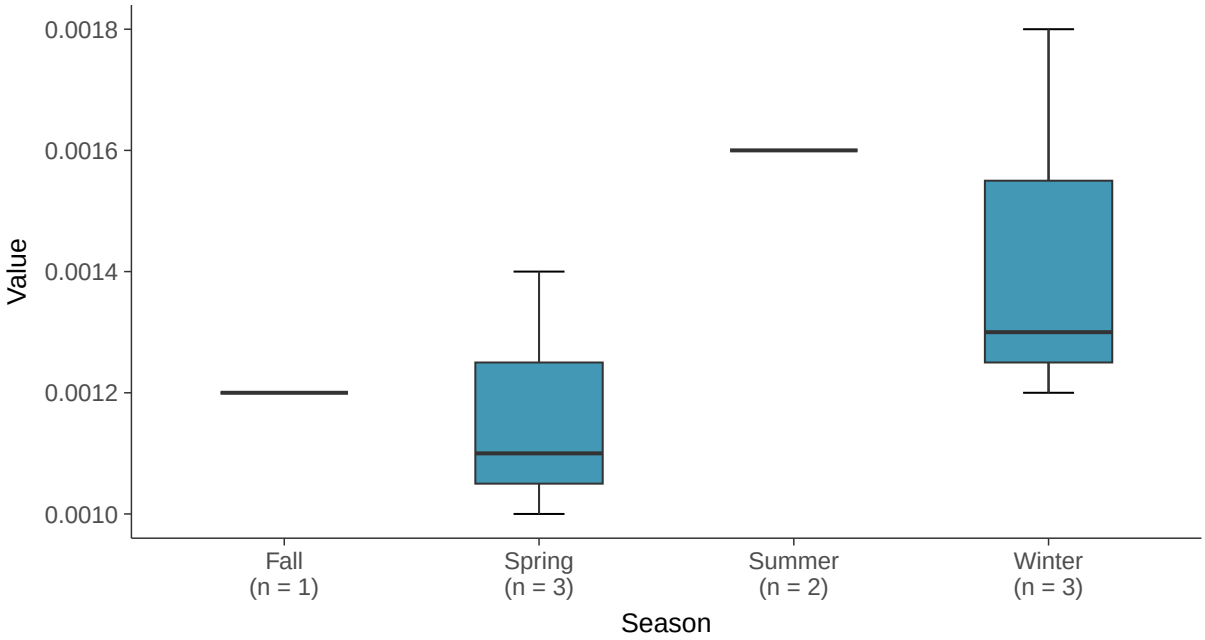
Boxplot

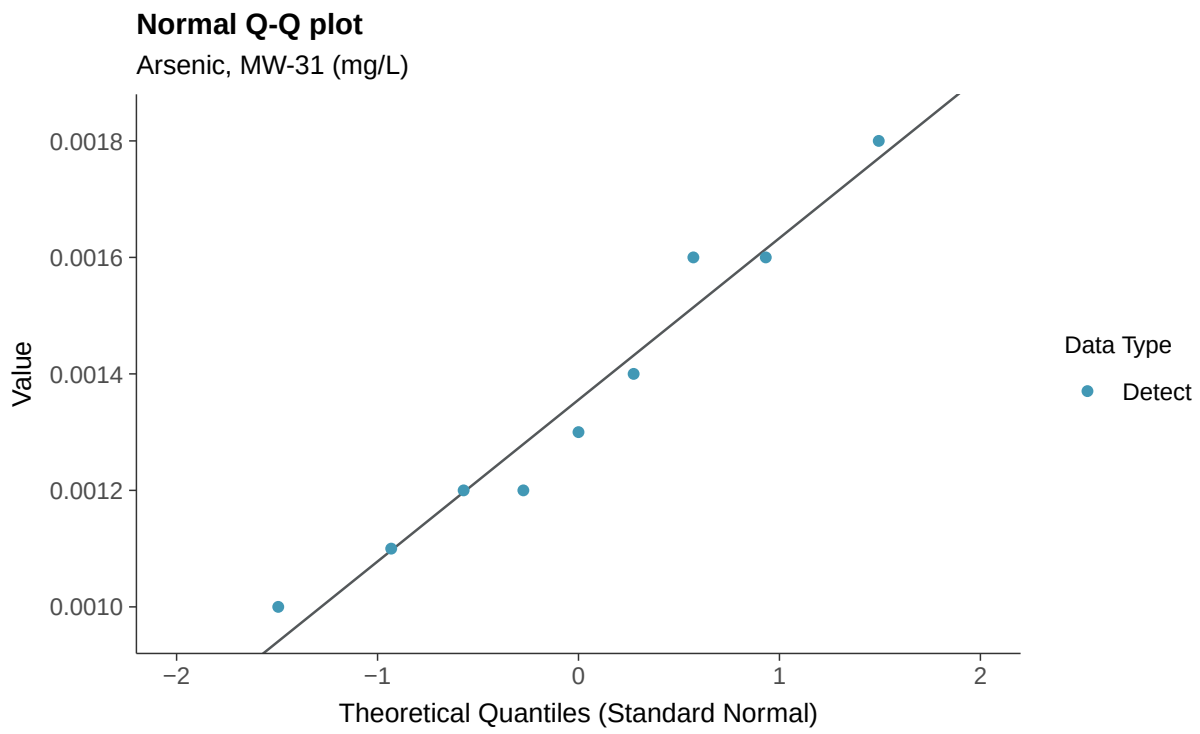
Arsenic, MW-31 (mg/L)

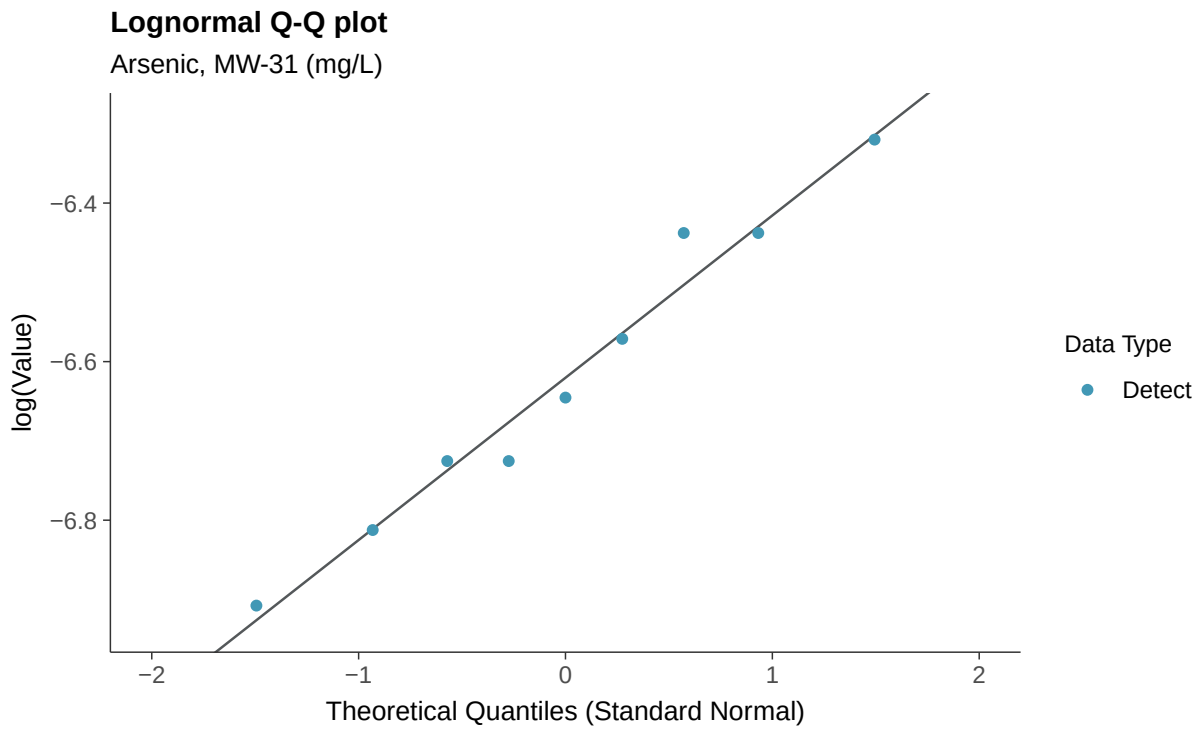


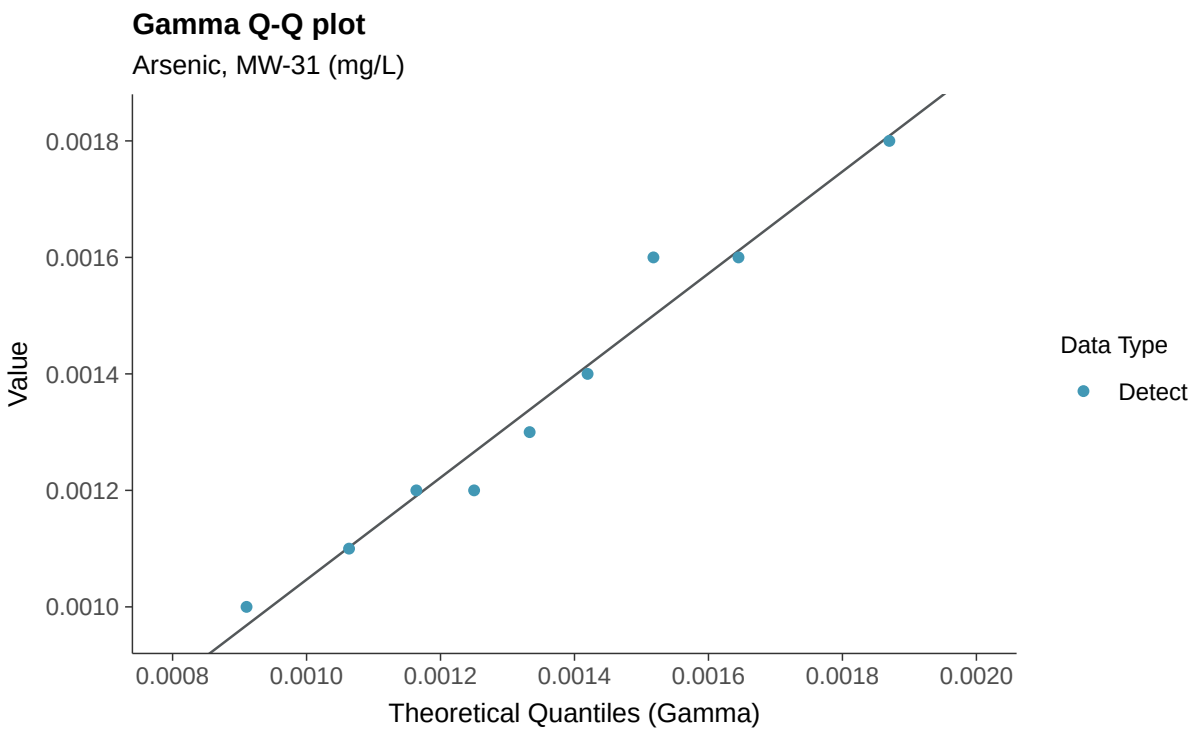
Boxplot by Season

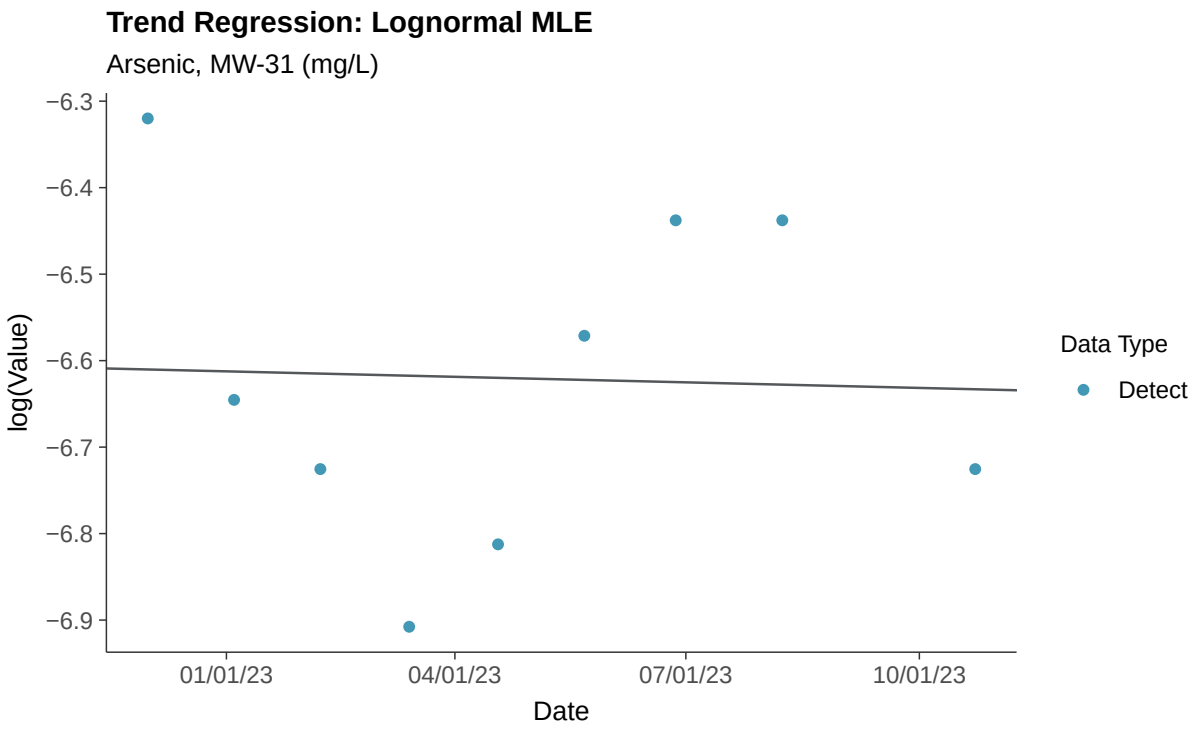
Arsenic, MW-31 (mg/L)

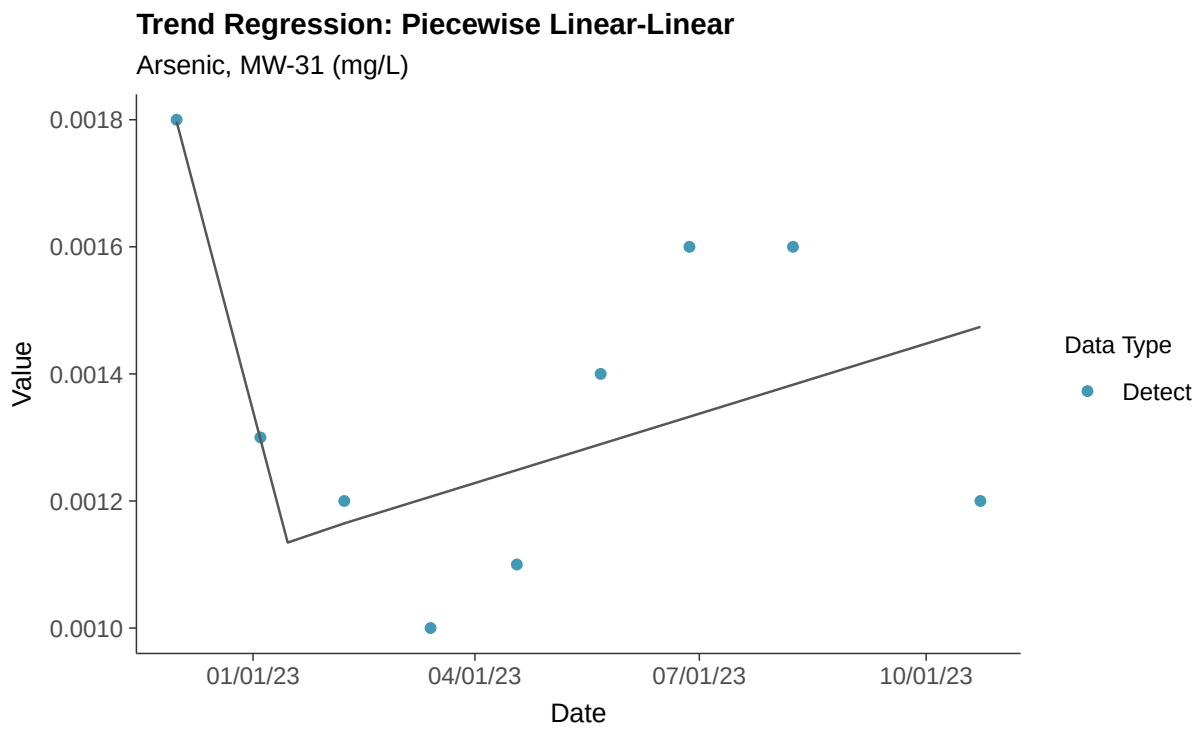


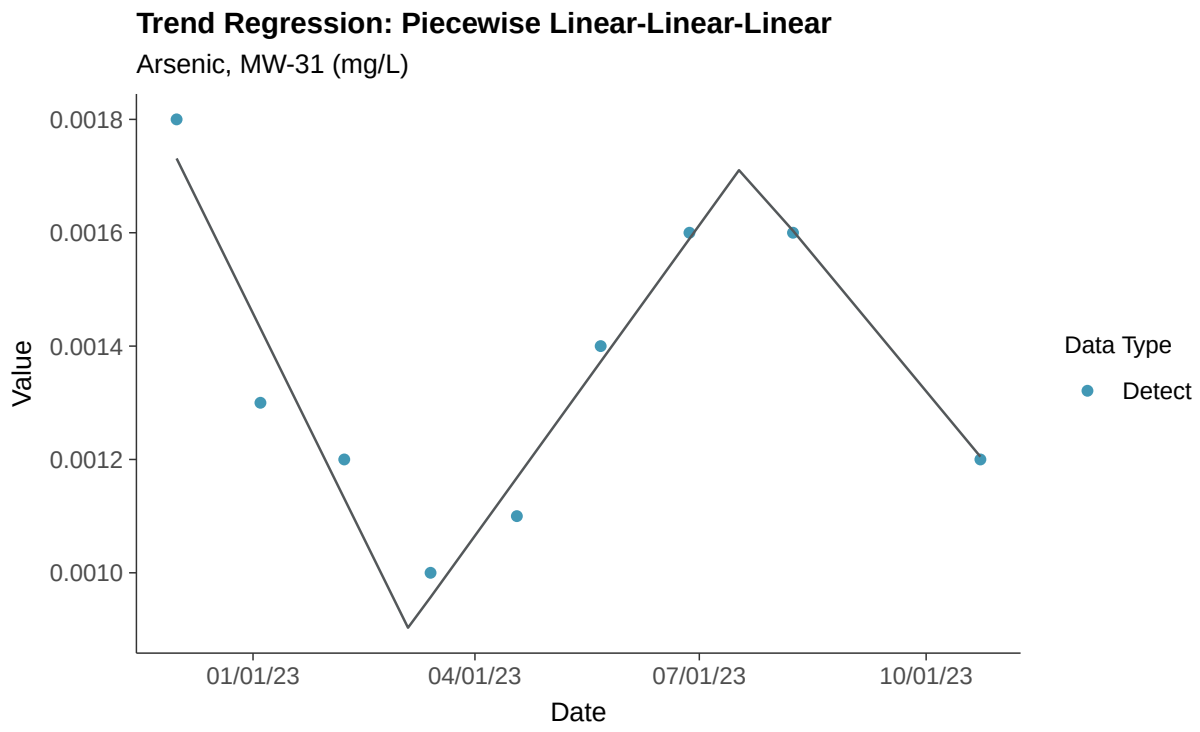

Normal Q-Q plot
Arsenic, MW-31 (mg/L)
Value
0.0018
0.0016
0.0014
0.0012
0.0010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Arsenic, MW-31 (mg/L)
log(Value)
−6.4
−6.6
−6.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-31 (mg/L)
Value
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0010
0.0012
0.0014
0.0016
0.0018
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect

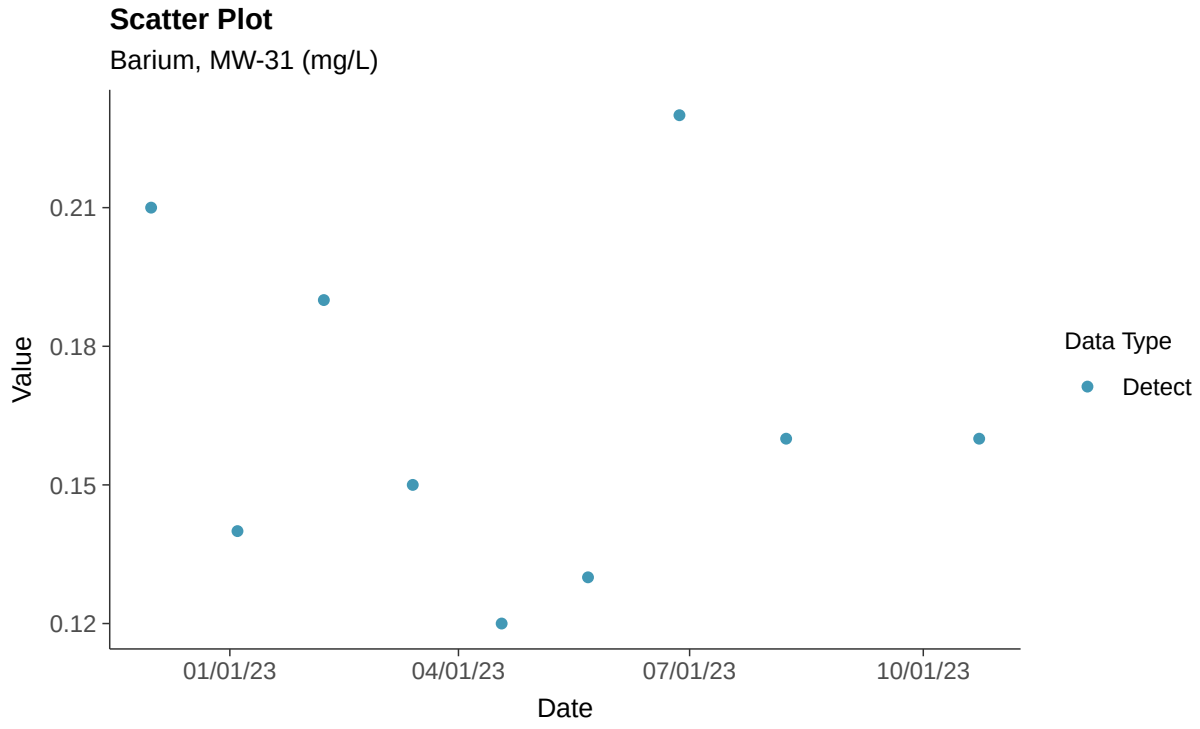

Trend Regression: Lognormal MLE
Arsenic, MW-31 (mg/L)
log(Value)
−6.3
−6.4
−6.5
−6.6
−6.7
−6.8
−6.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

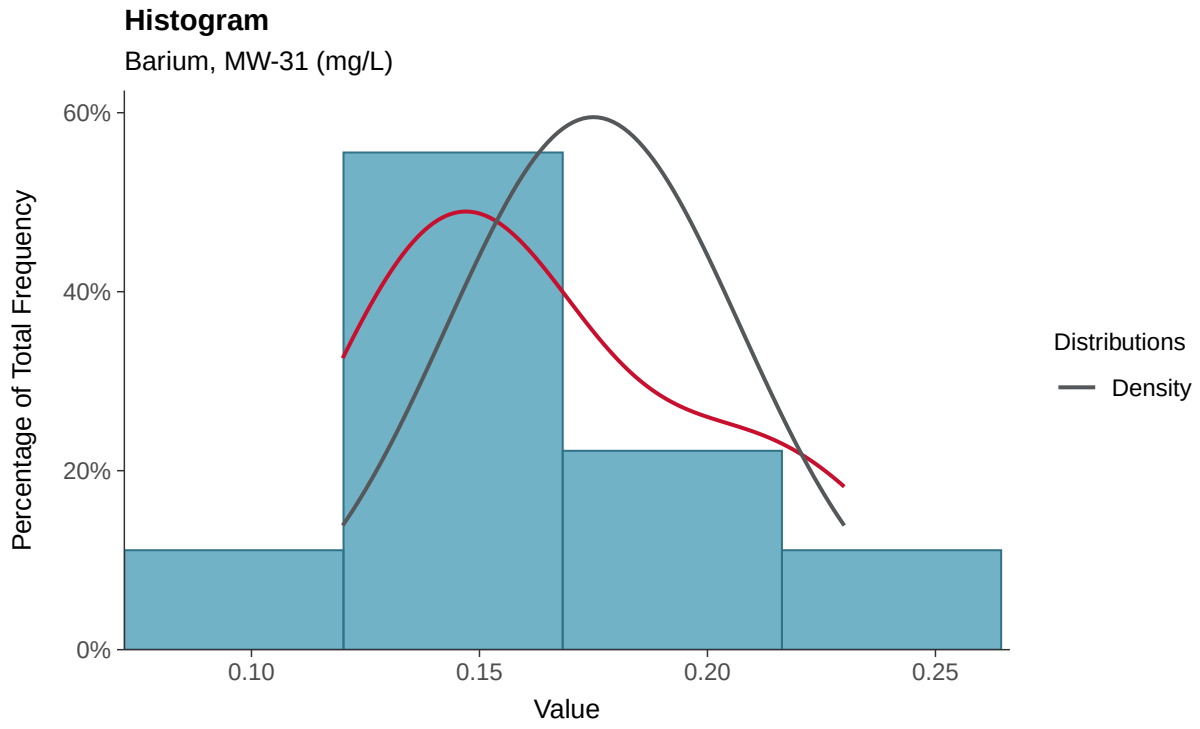

Trend Regression: Piecewise Linear-Linear
Arsenic, MW-31 (mg/L)
0.0018
0.0016
0.0014
0.0012
0.0010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Arsenic, MW-31 (mg/L)
0.0018
0.0016
0.0014
0.0012
0.0010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-31

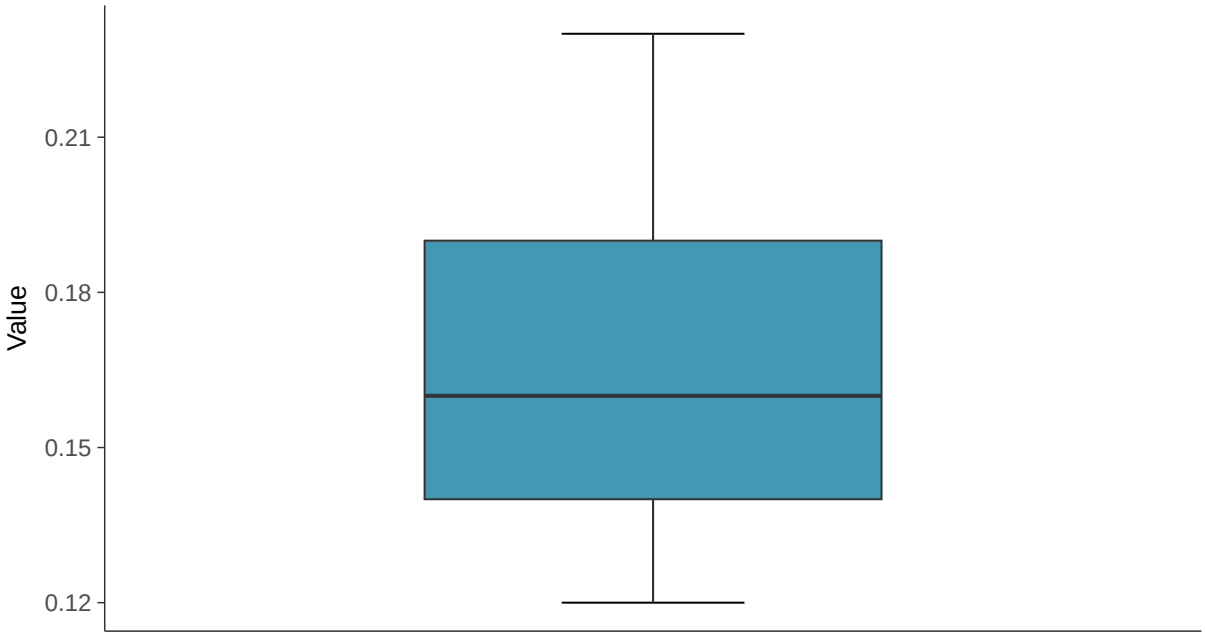
ID: 1_26_5_103





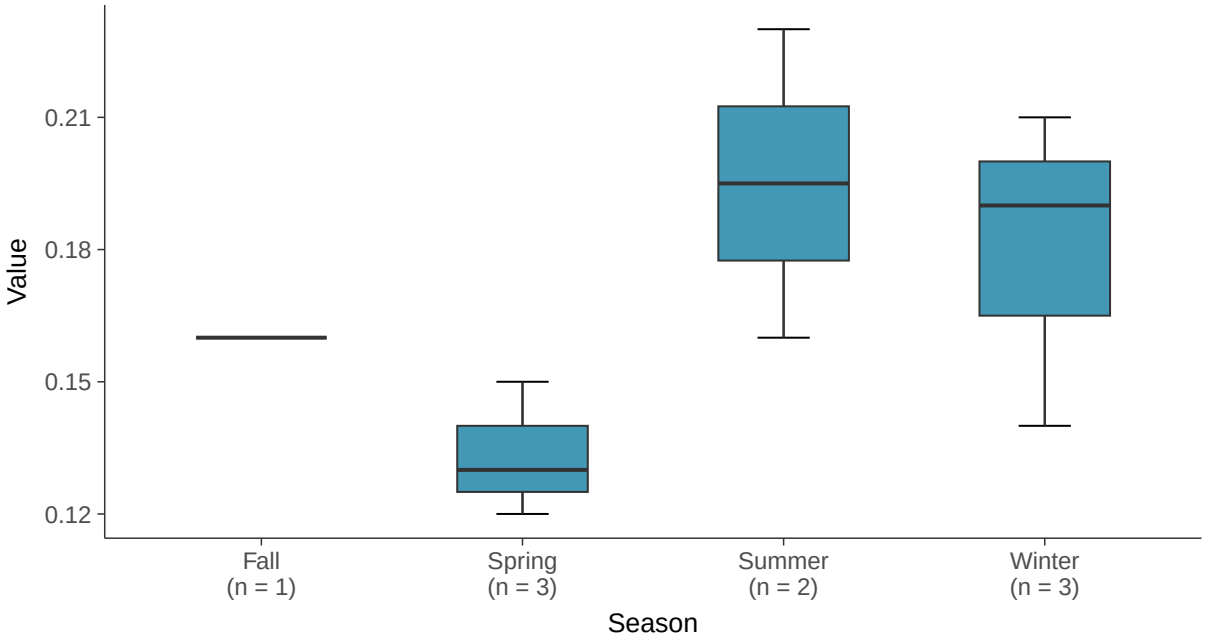
Boxplot

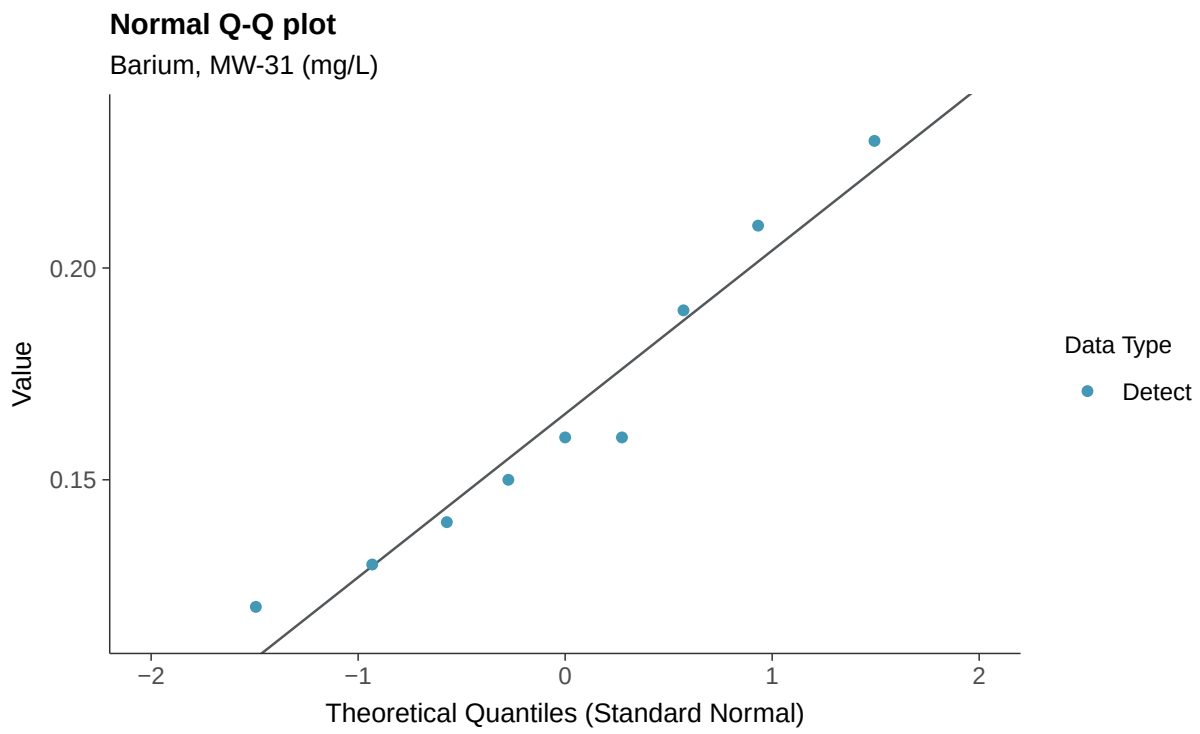
Barium, MW-31 (mg/L)

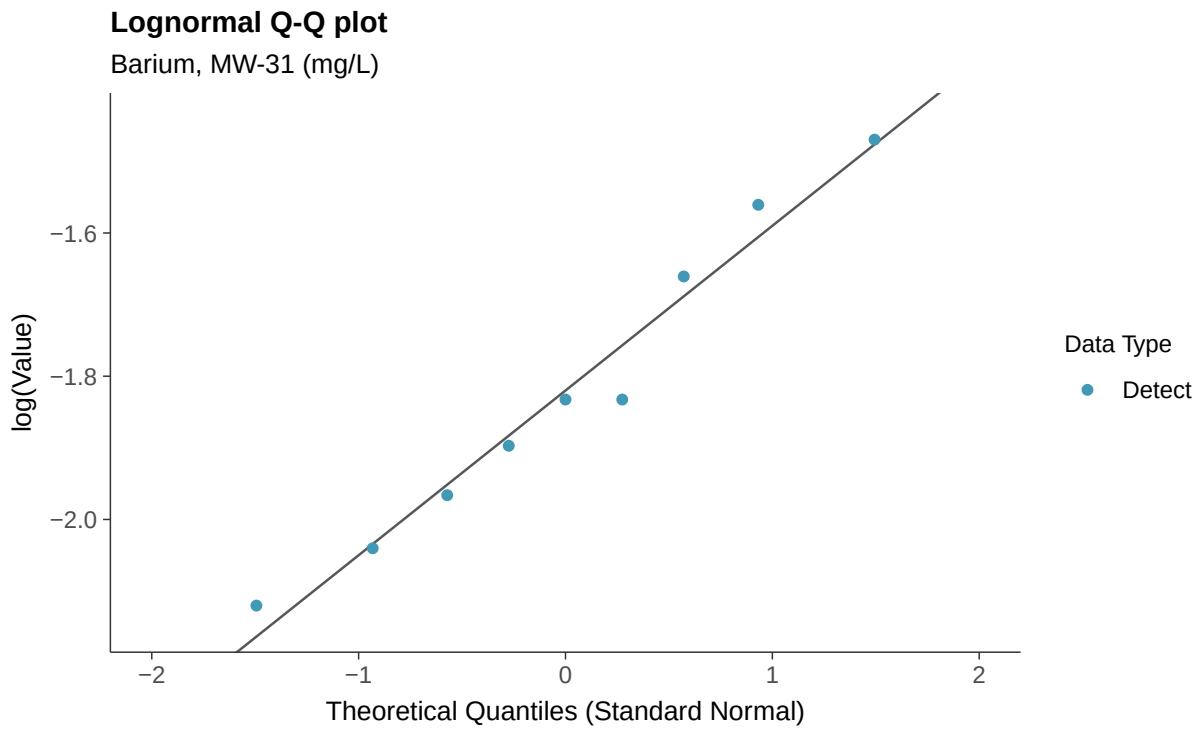


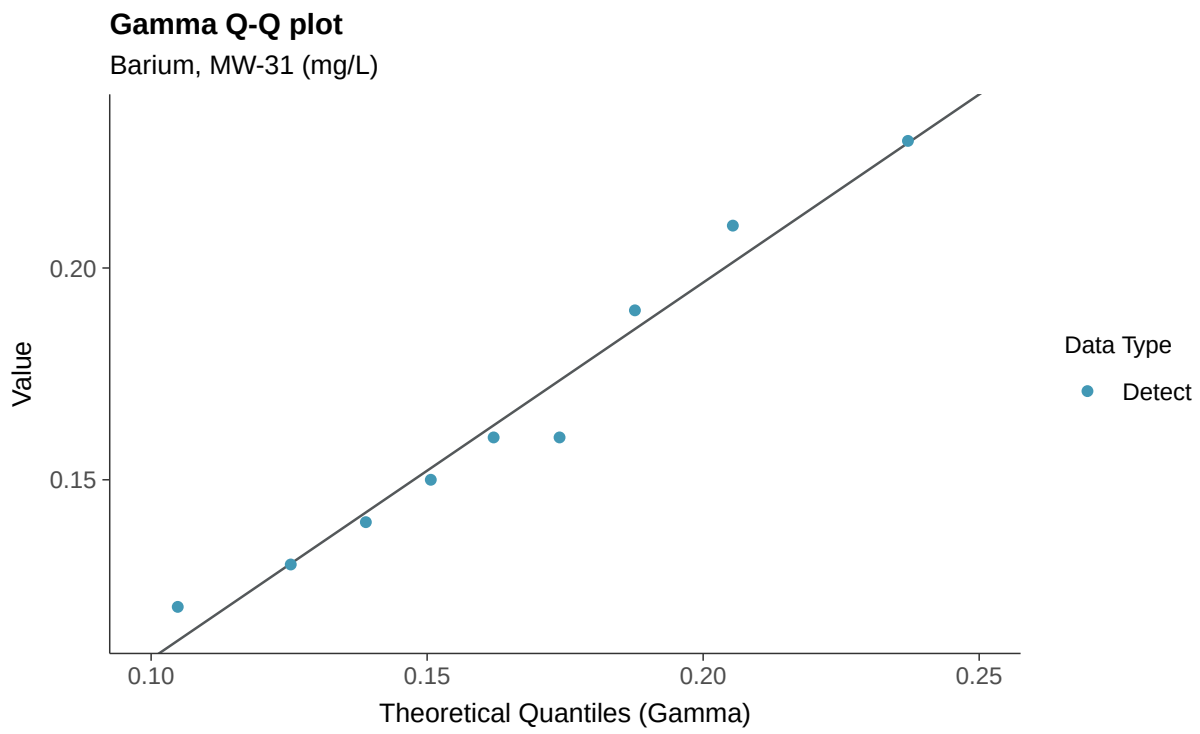
Boxplot by Season

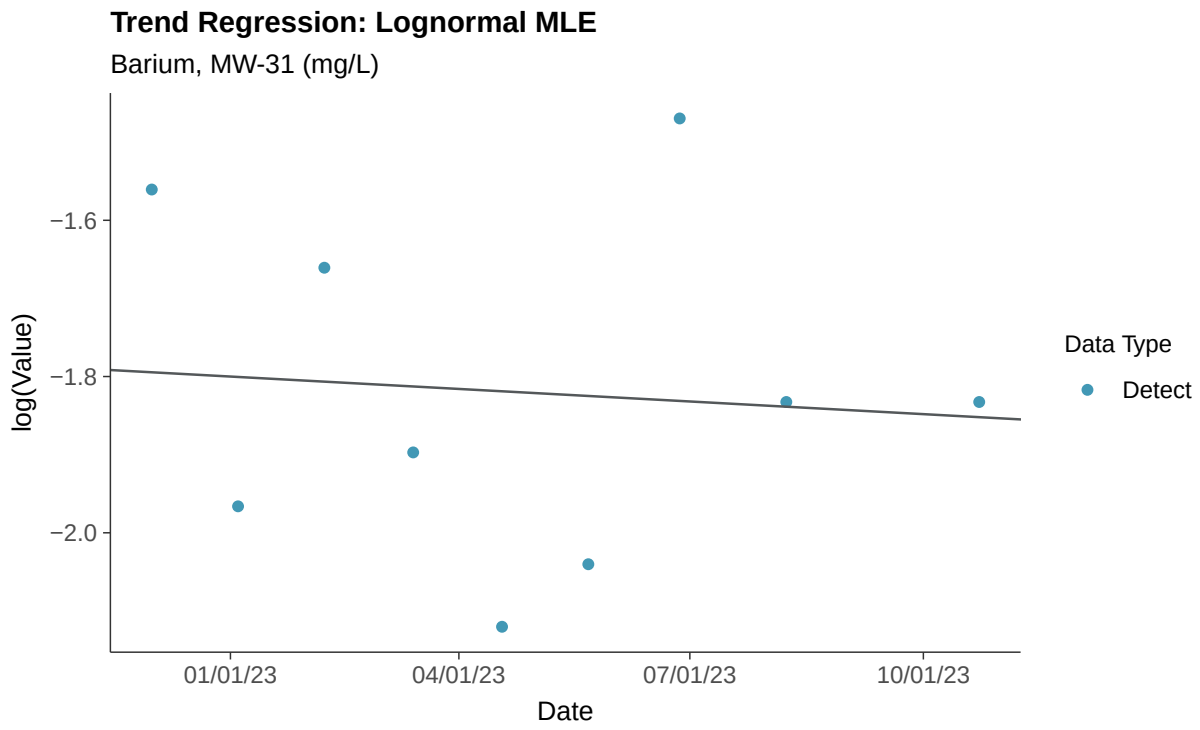
Barium, MW-31 (mg/L)

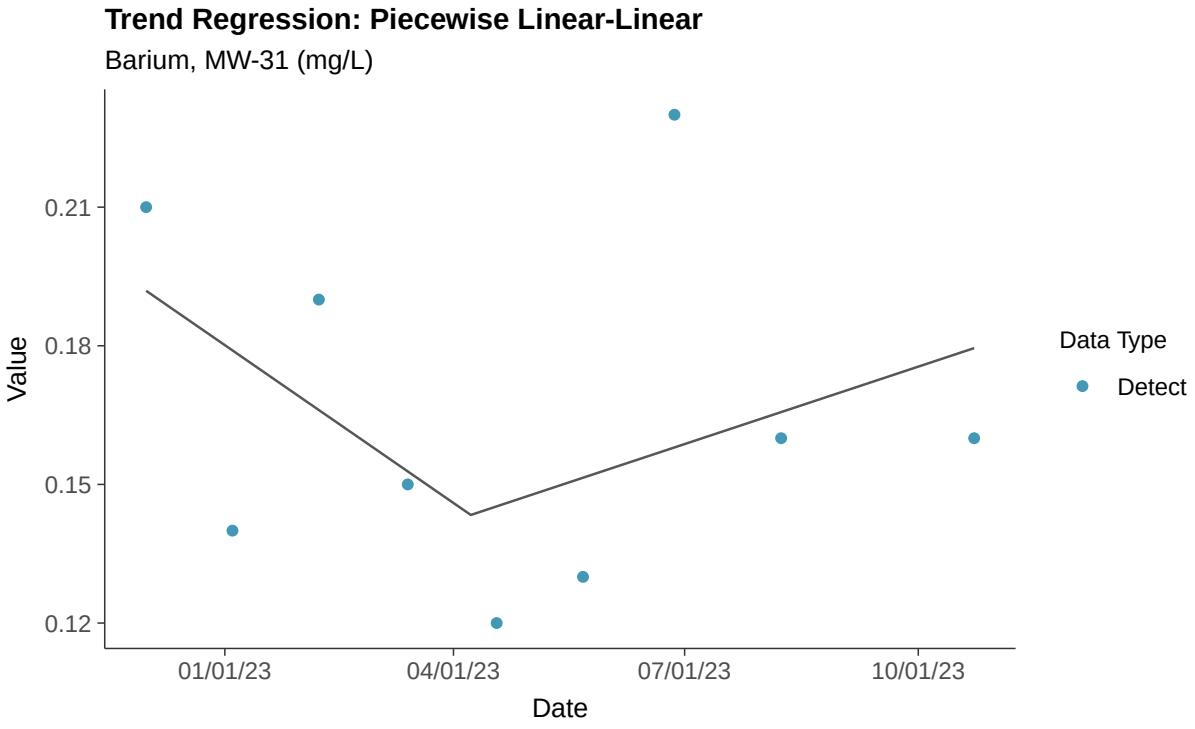



Normal Q-Q plot
Barium, MW-31 (mg/L)
Value
0.20
0.15
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Barium, MW-31 (mg/L)
log(Value)
−1.6
−1.8
−2.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

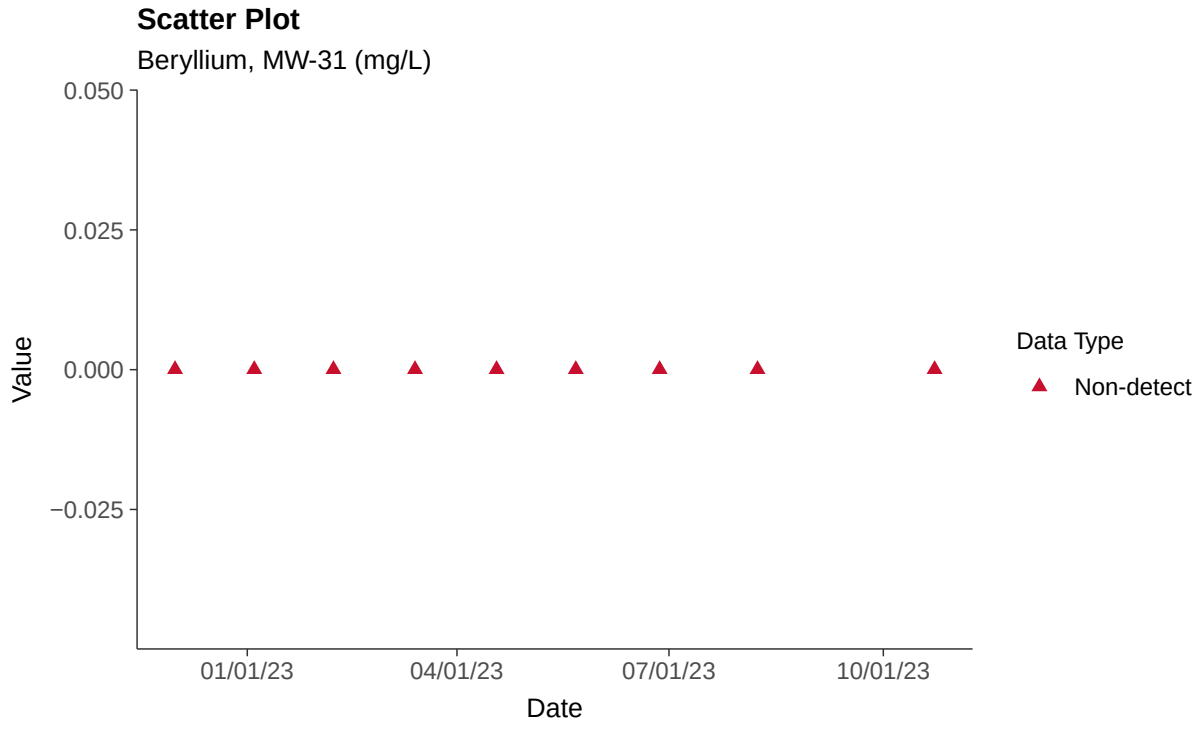

Gamma Q-Q plot
Barium, MW-31 (mg/L)
Value
0.20
0.15
0.10
0.15
0.20
0.25
Theoretical Quantiles (Gamma)
Data Type
Detect

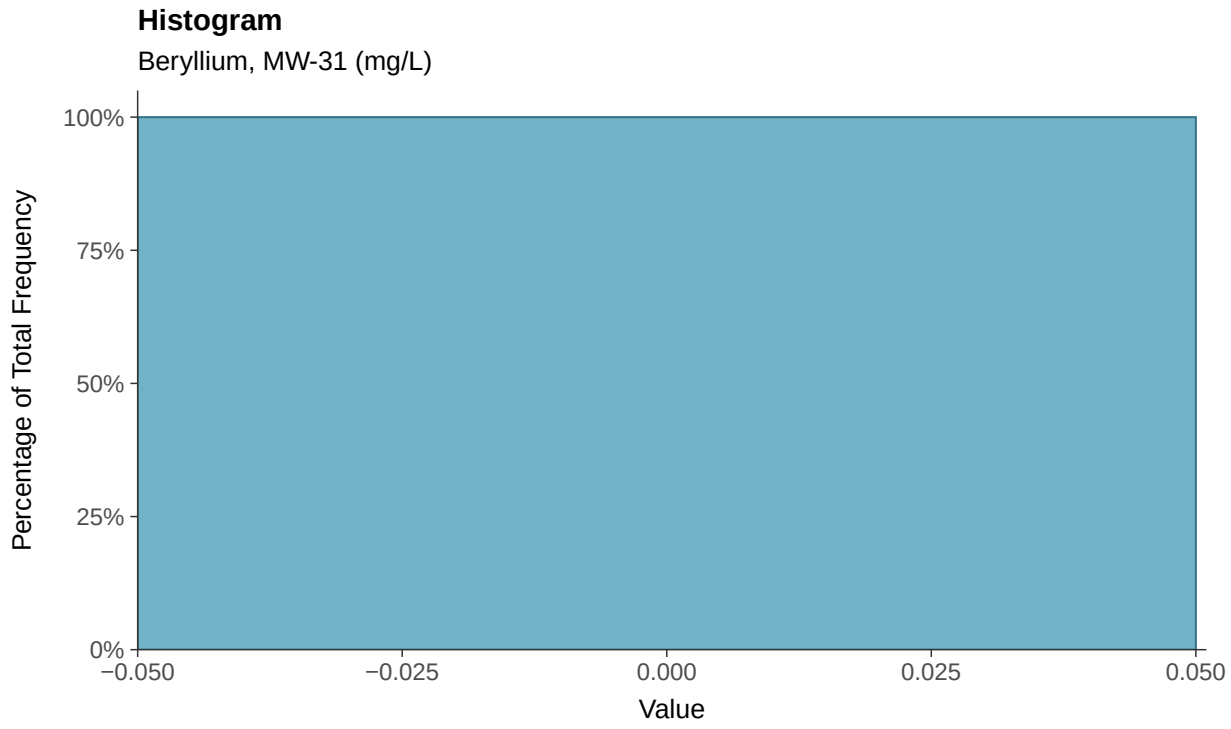

Trend Regression: Lognormal MLE
Barium, MW-31 (mg/L)
log(Value)
−1.6
−1.8
−2.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

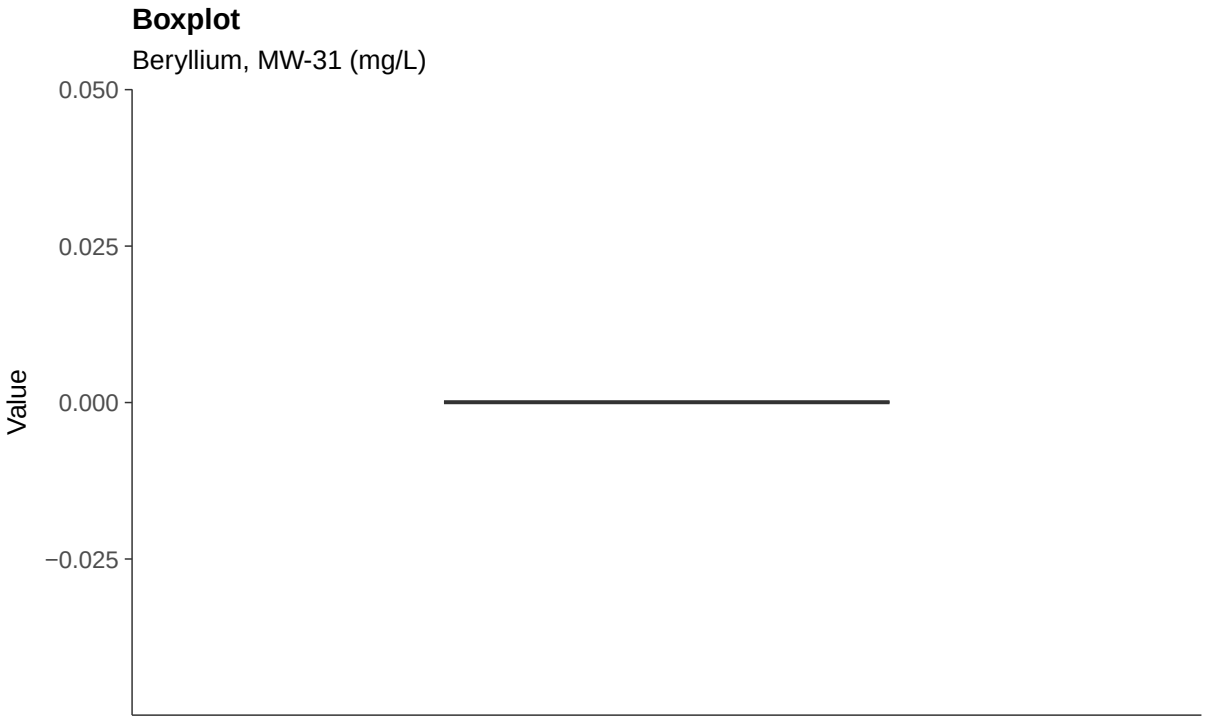

Trend Regression: Piecewise Linear-Linear
Barium, MW-31 (mg/L)
Value
0.21
0.18
0.15
0.12
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

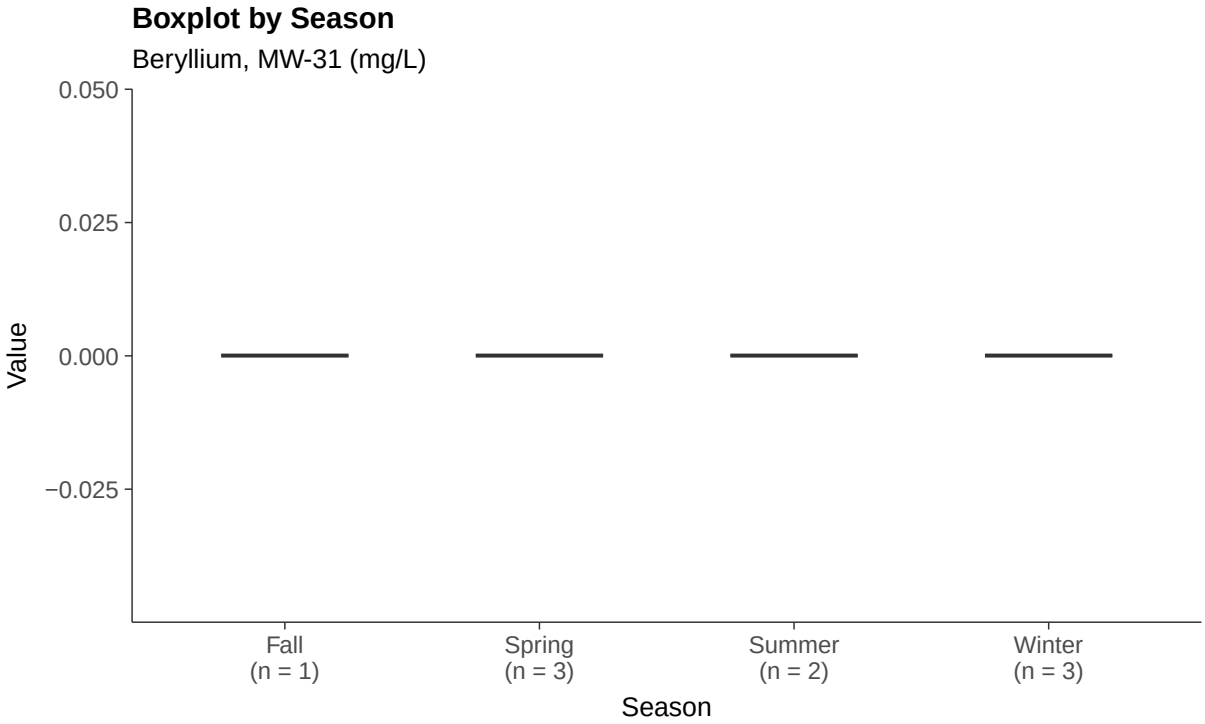
Appendix IV: Beryllium, MW-31

ID: 1_26_5_104



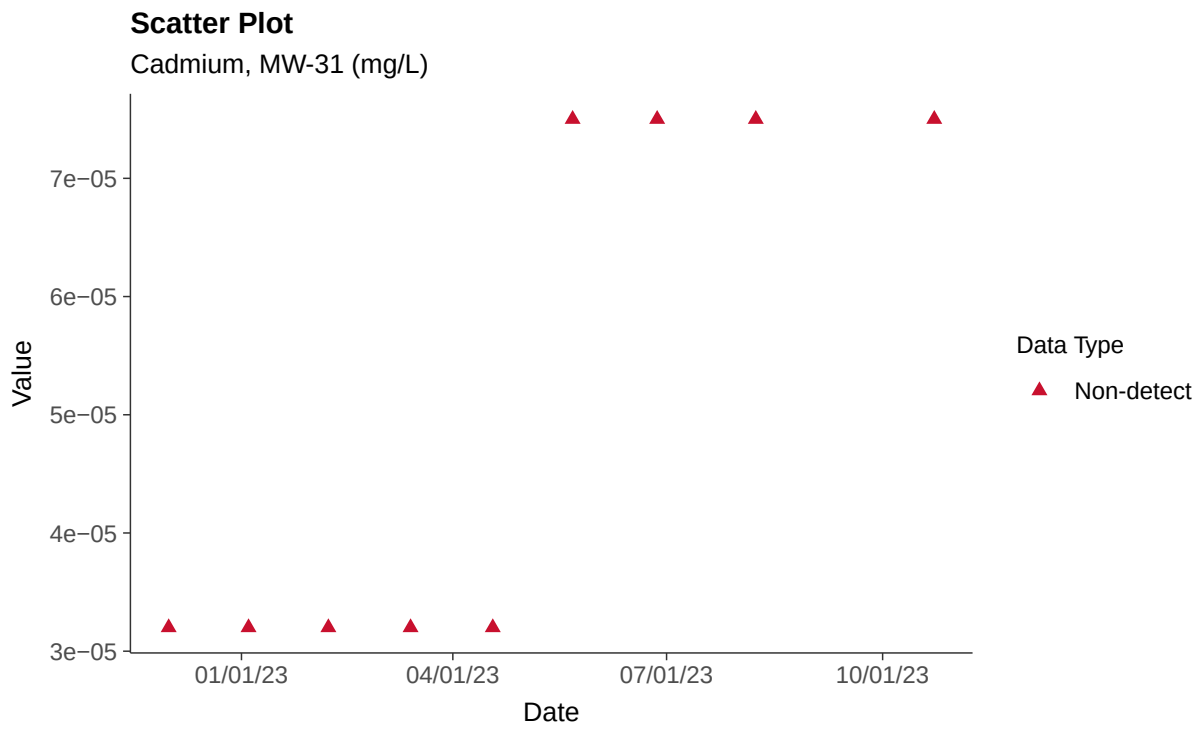


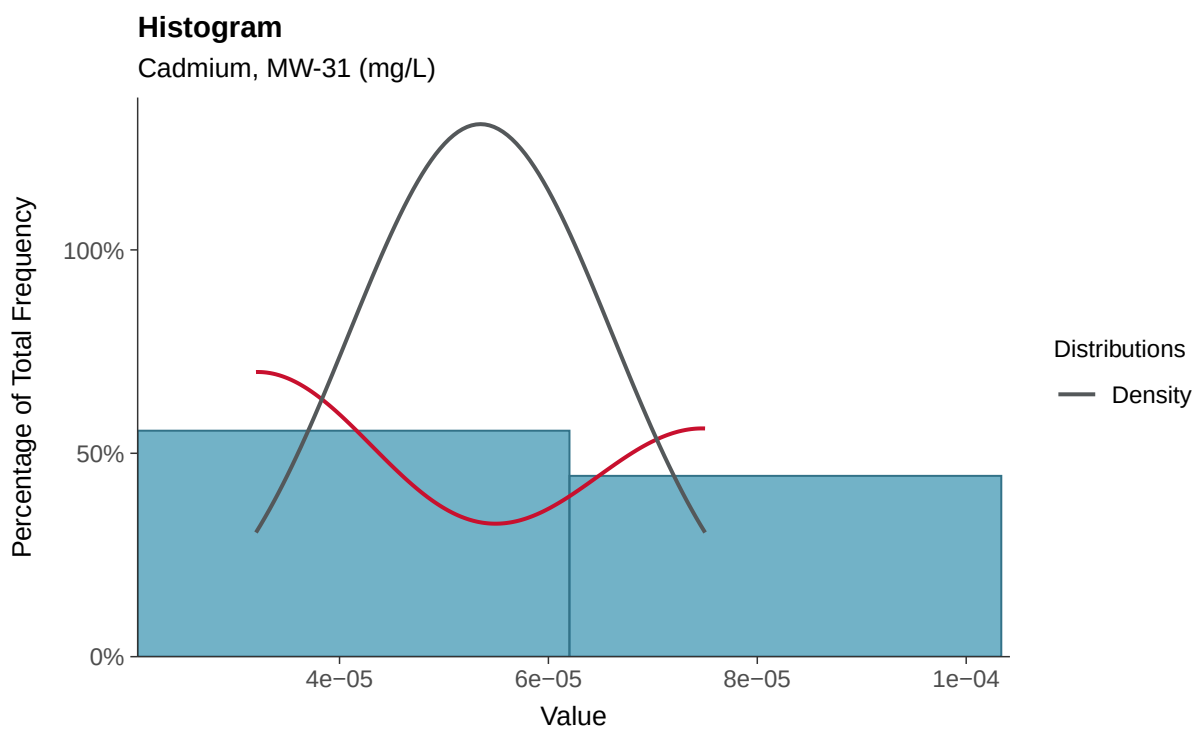

Boxplot
Beryllium, MW-31 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Beryllium, MW-31 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 1)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 3)
Season

Appendix IV: Cadmium, MW-31

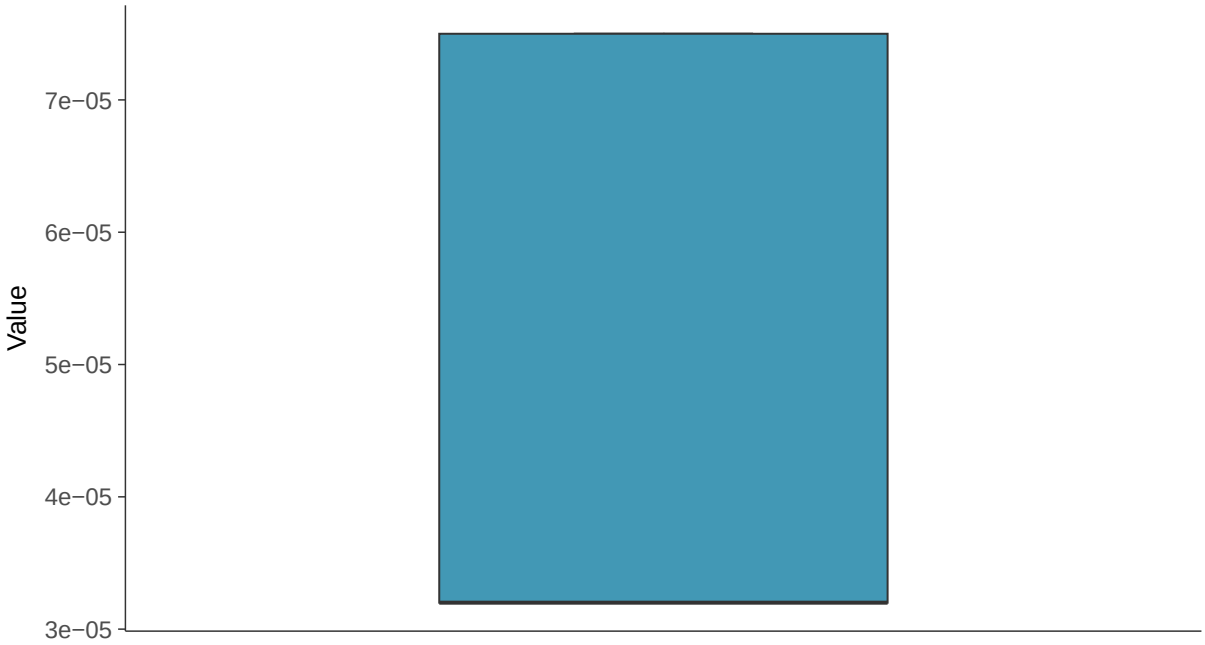
ID: 1_26_5_106





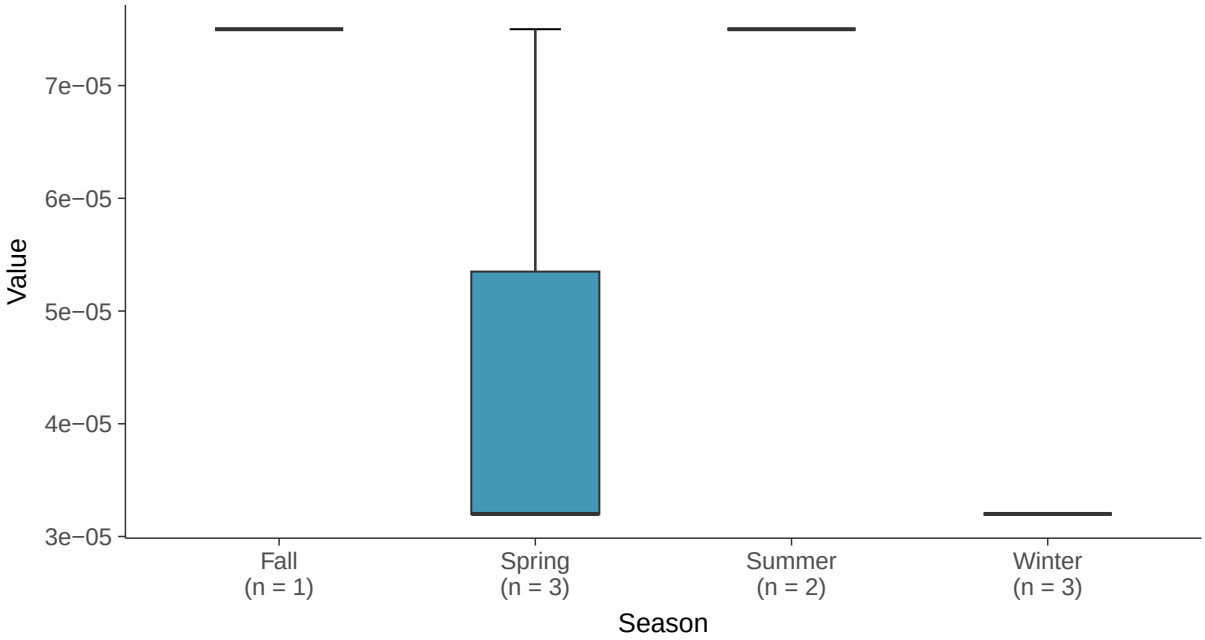
Boxplot

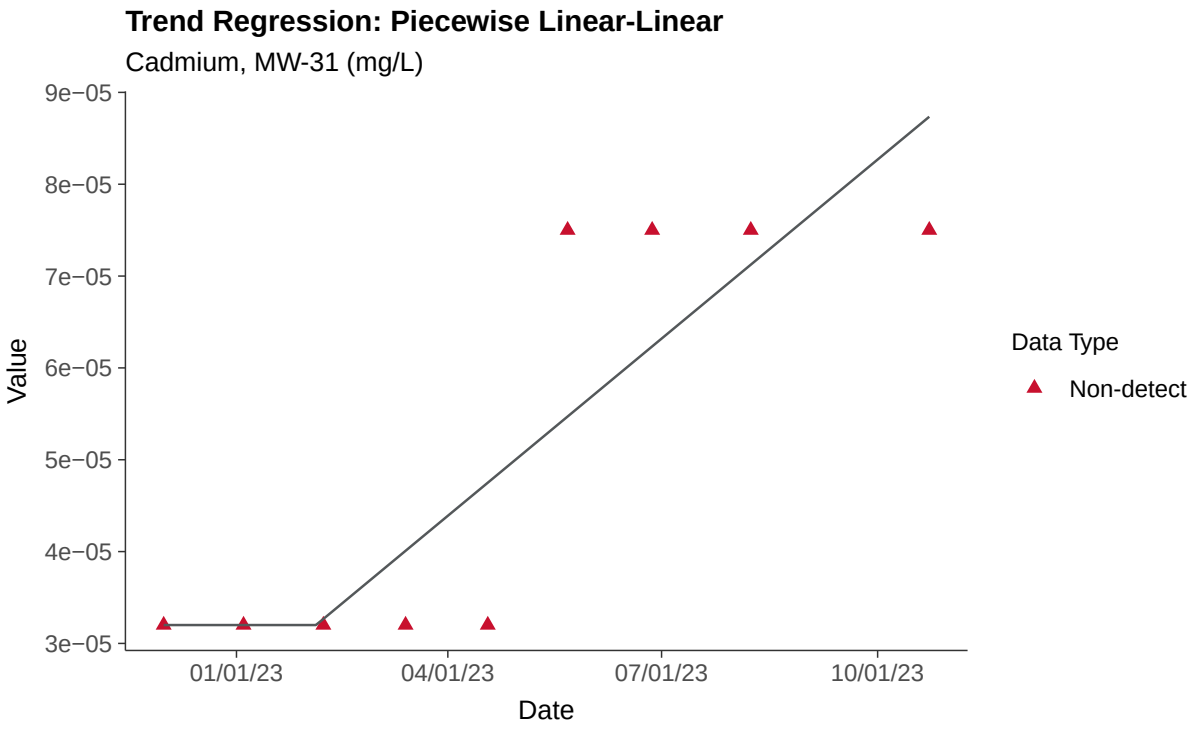
Cadmium, MW-31 (mg/L)

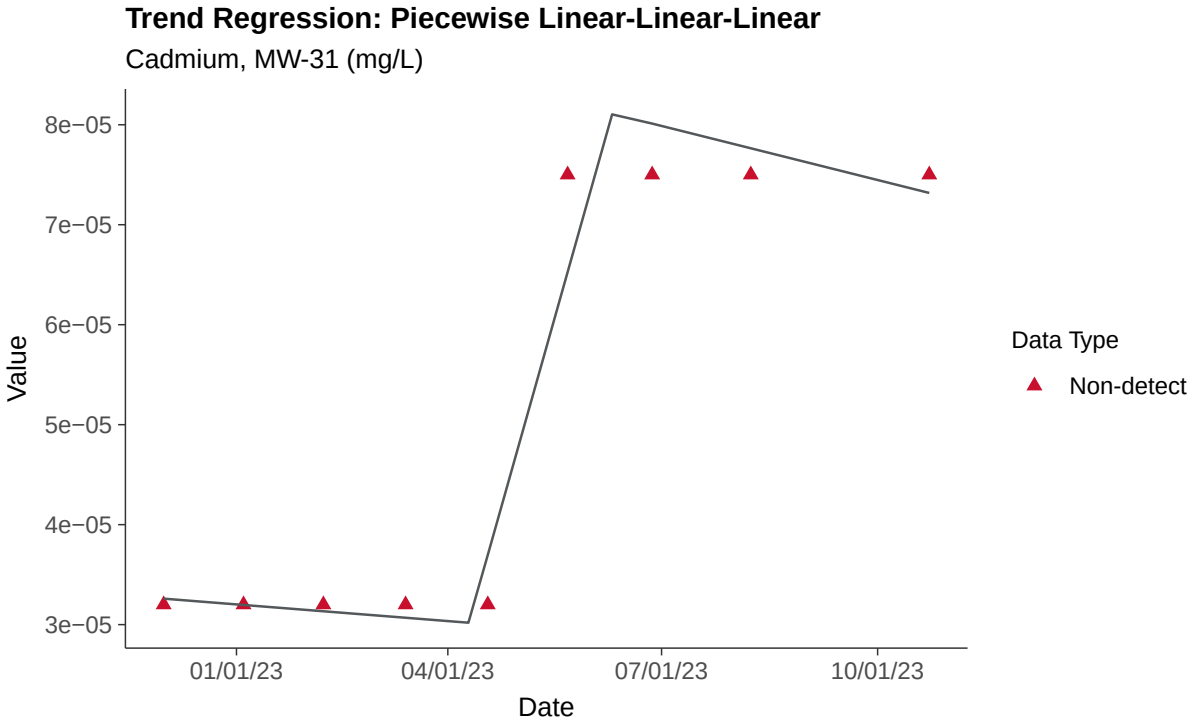


Boxplot by Season

Cadmium, MW-31 (mg/L)

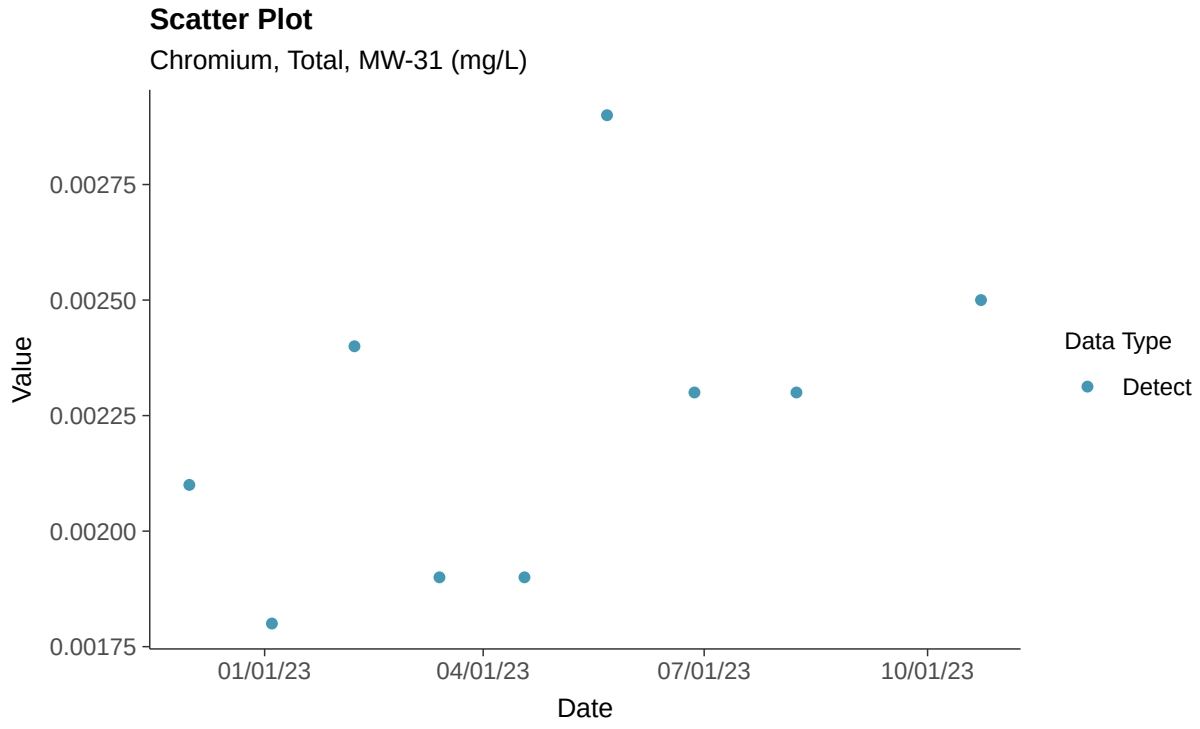


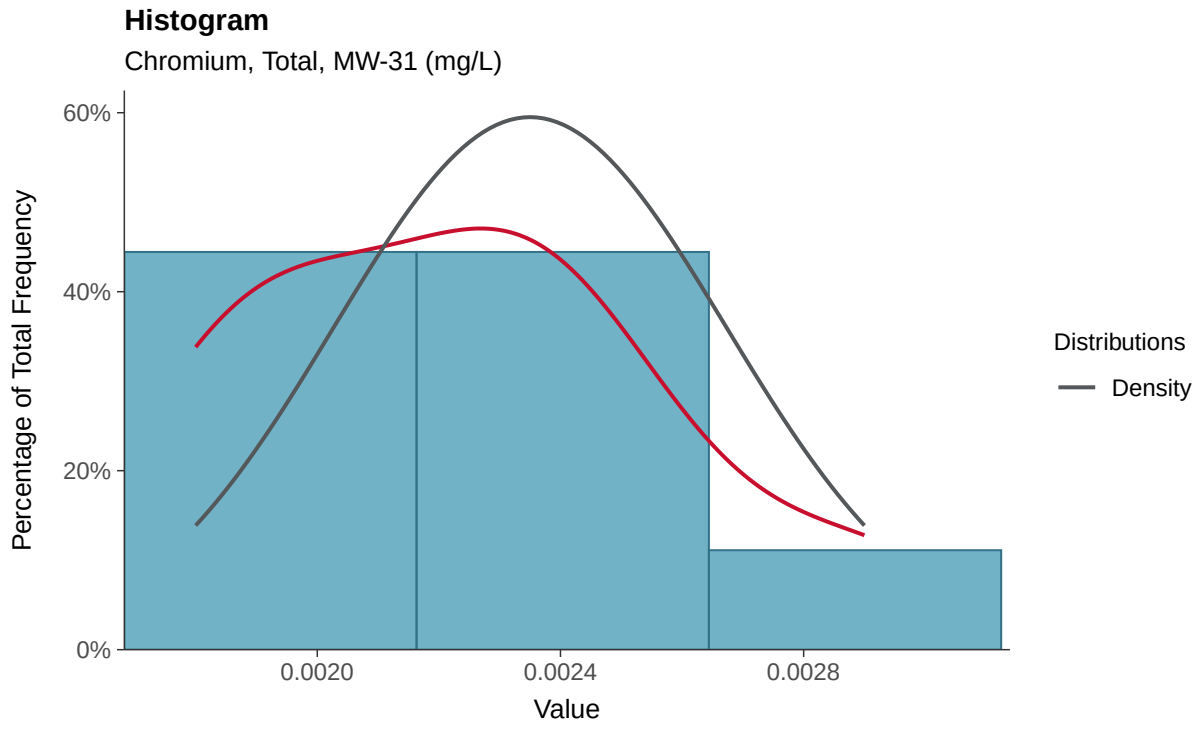

Trend Regression: Piecewise Linear-Linear
Cadmium, MW-31 (mg/L)
9e−05
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Cadmium, MW-31 (mg/L)
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Chromium, Total, MW-31

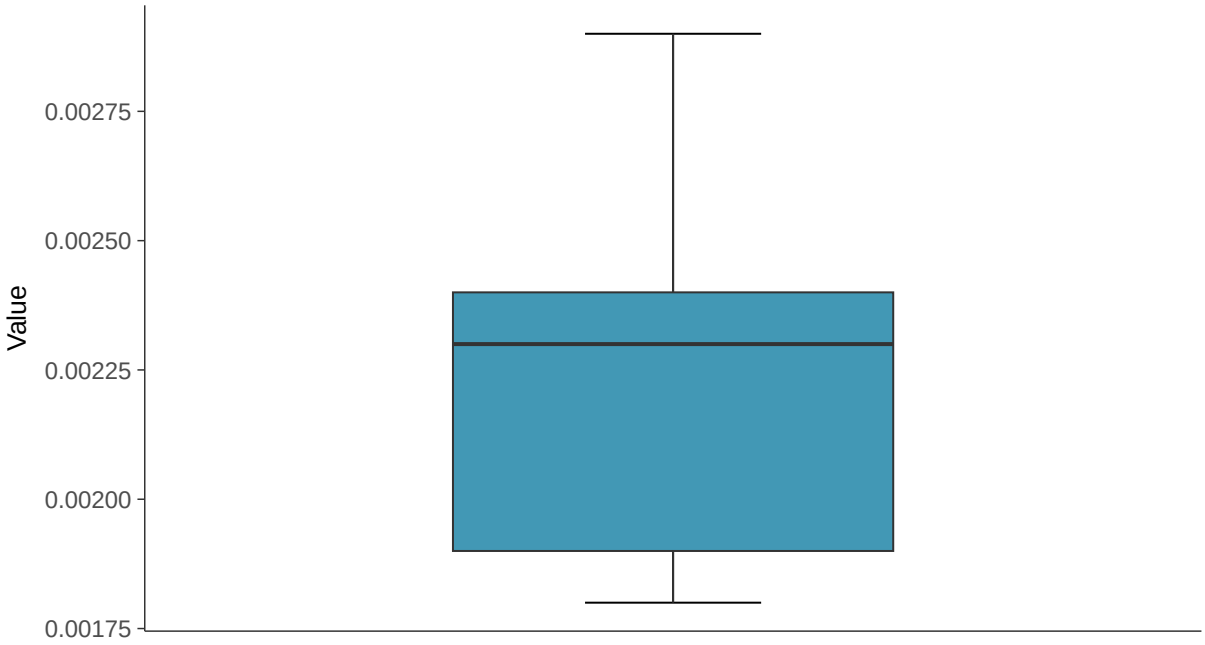
ID: 1_26_5_109





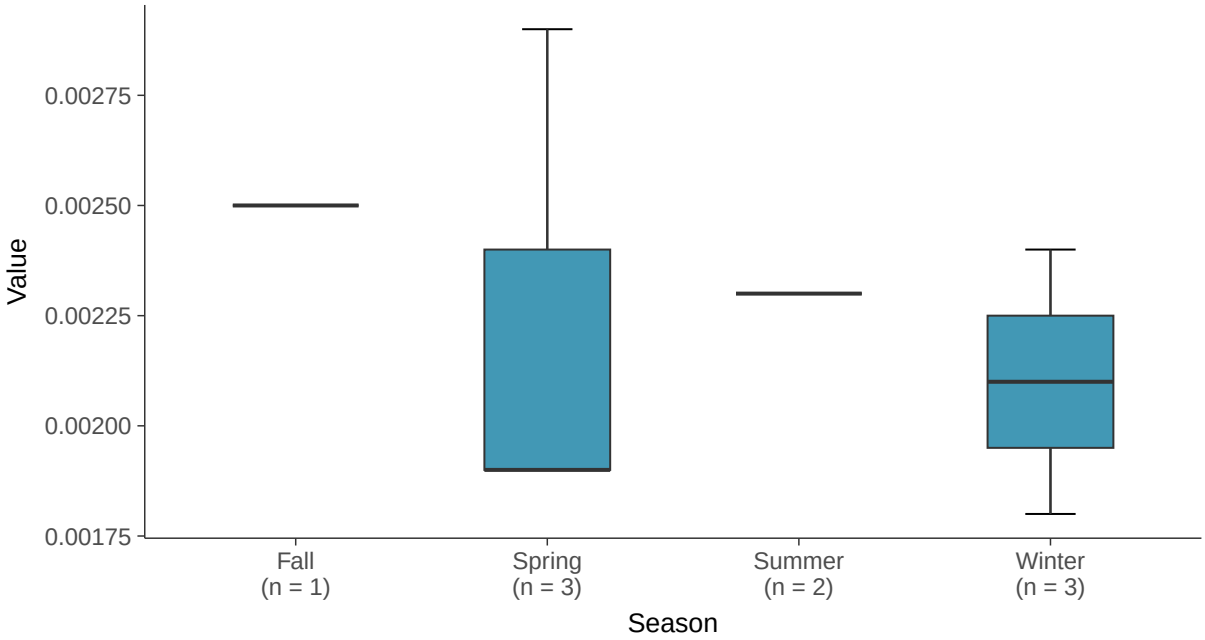
Boxplot

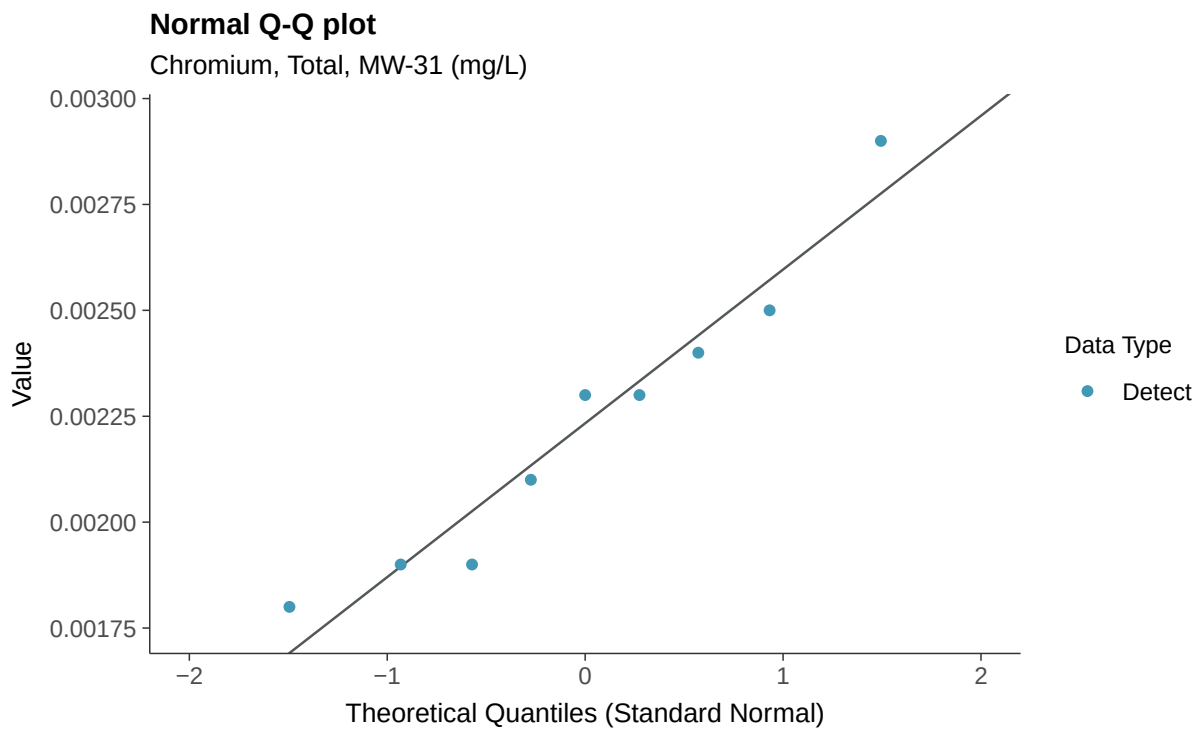
Chromium, Total, MW-31 (mg/L)

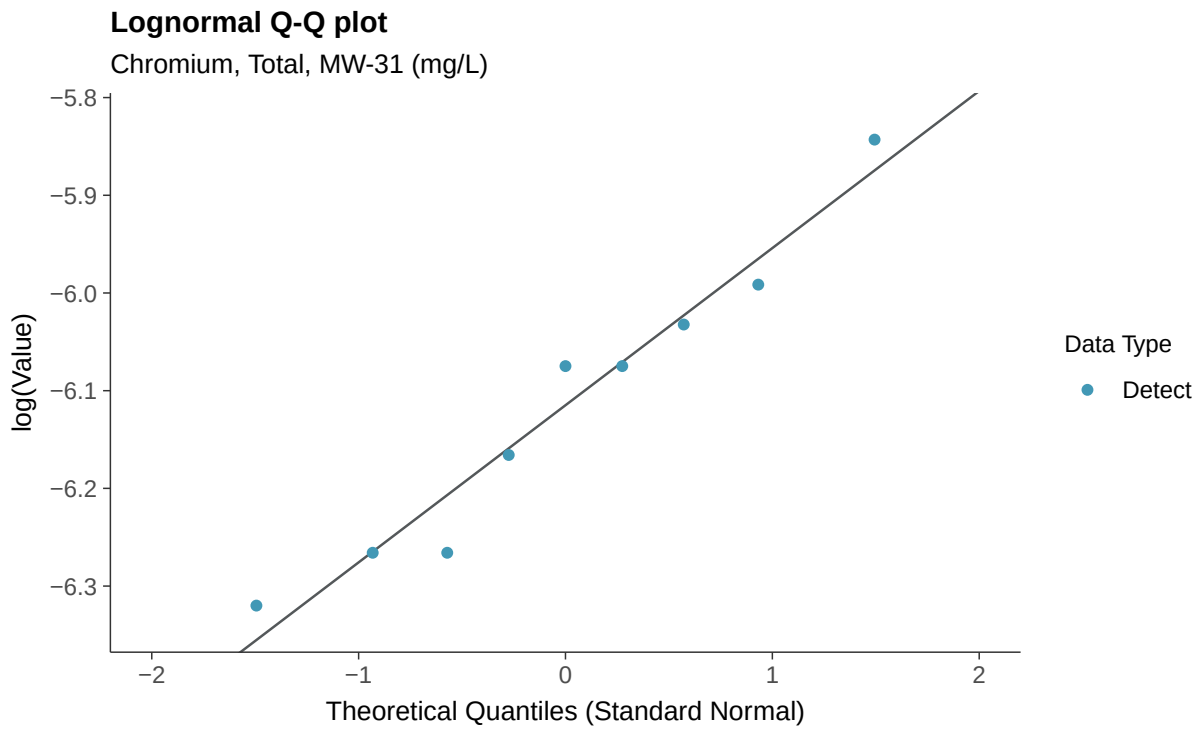


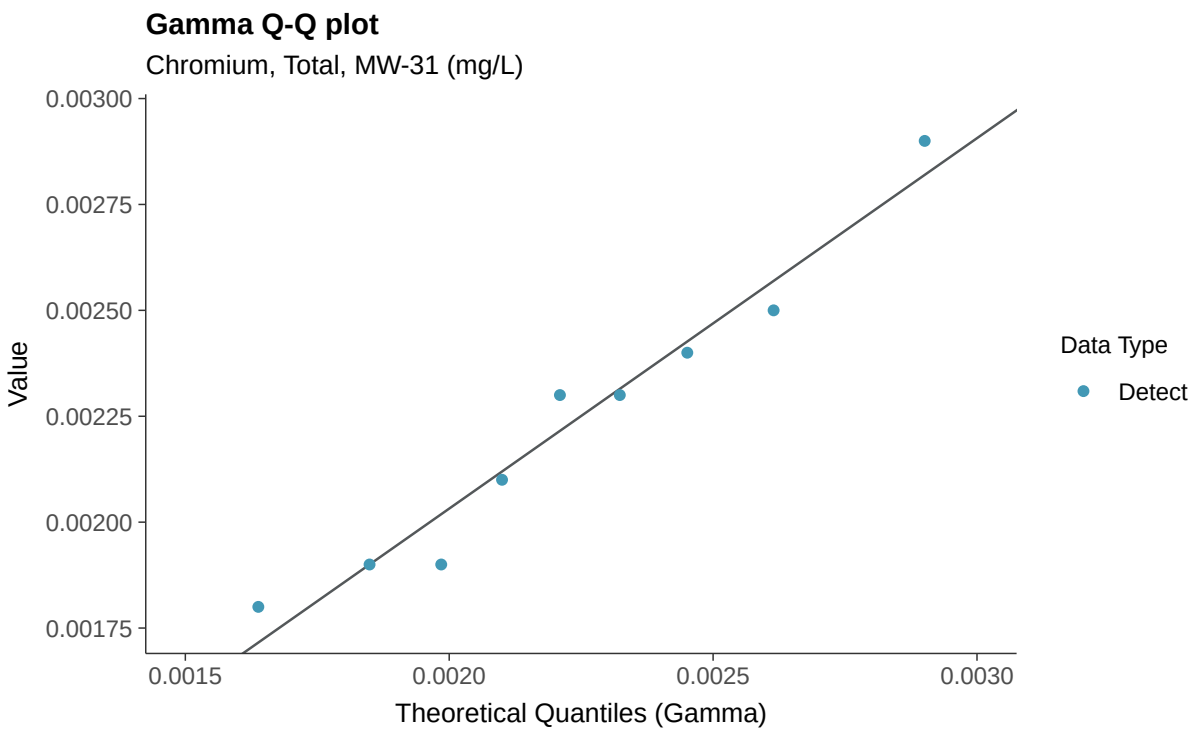
Boxplot by Season

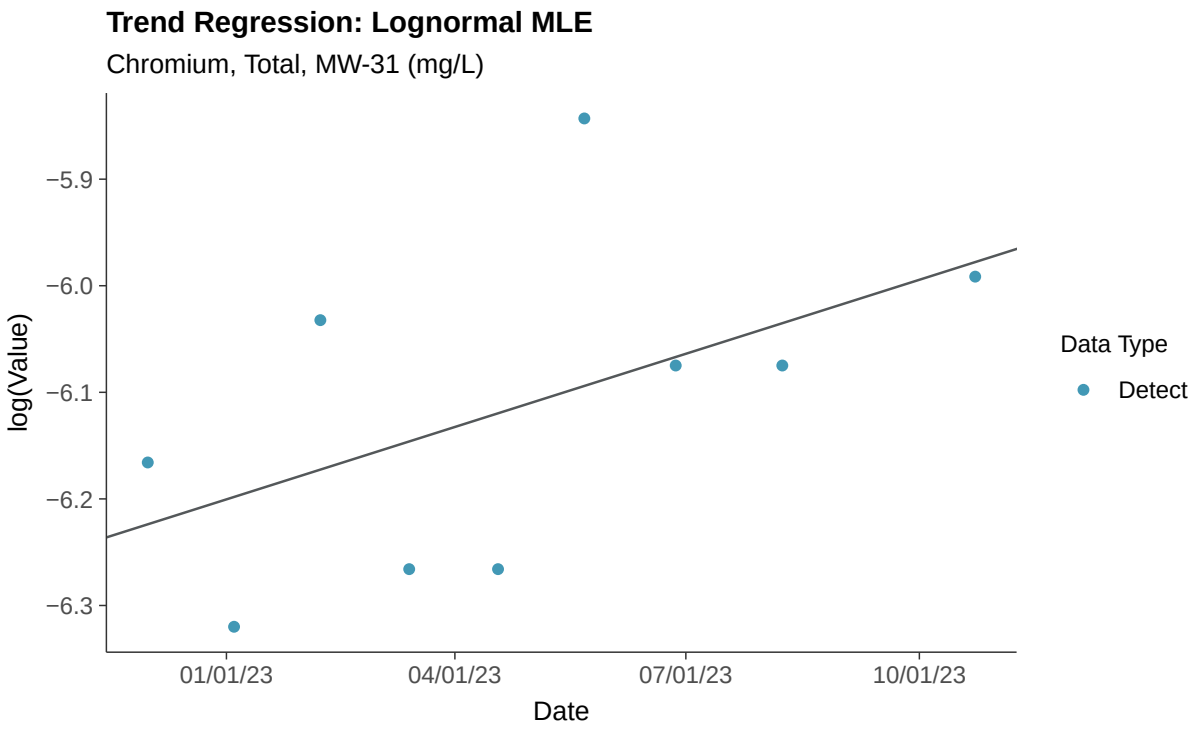
Chromium, Total, MW-31 (mg/L)




Normal Q-Q plot
Chromium, Total, MW-31 (mg/L)
Value
0.00300
0.00275
0.00250
0.00225
0.00200
0.00175
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

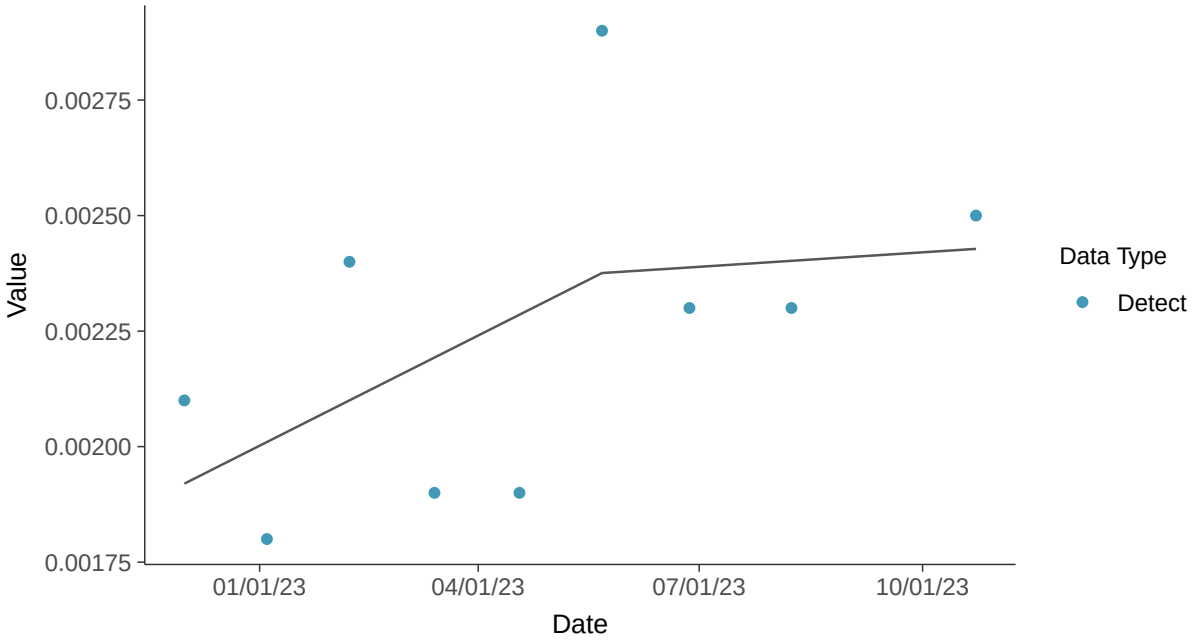

Lognormal Q-Q plot
Chromium, Total, MW-31 (mg/L)
log(Value)
−5.8
−5.9
−6.0
−6.1
−6.2
−6.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chromium, Total, MW-31 (mg/L)
Value
0.00300
0.00275
0.00250
0.00225
0.00200
0.00175
0.0015
0.0020
0.0025
0.0030
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-31 (mg/L)
log(Value)
−5.9
−6.0
−6.1
−6.2
−6.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

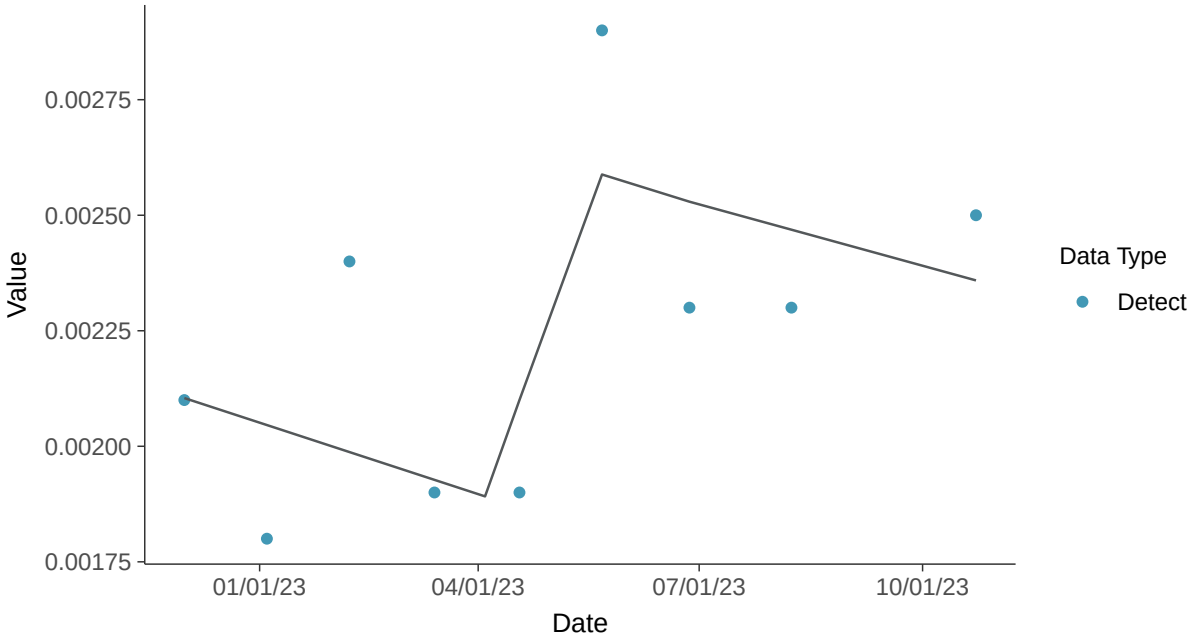
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-31 (mg/L)



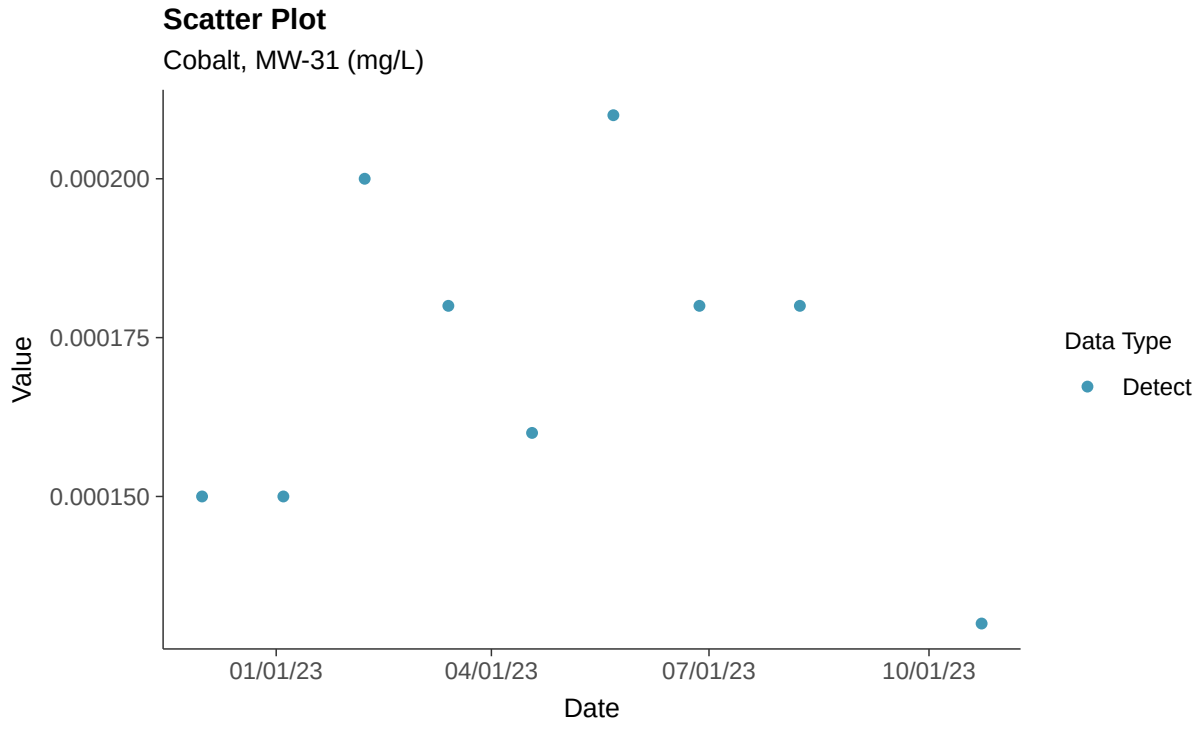
Trend Regression: Piecewise Linear-Linear-Linear

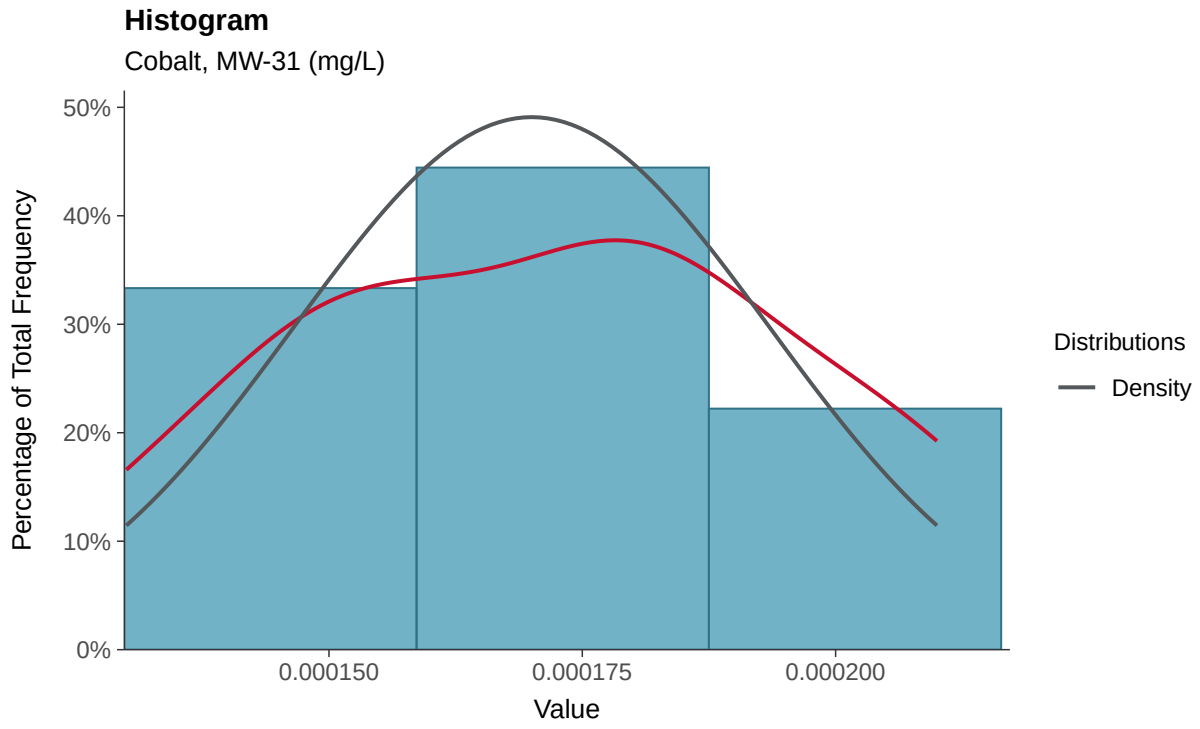
Chromium, Total, MW-31 (mg/L)



Appendix IV: Cobalt, MW-31

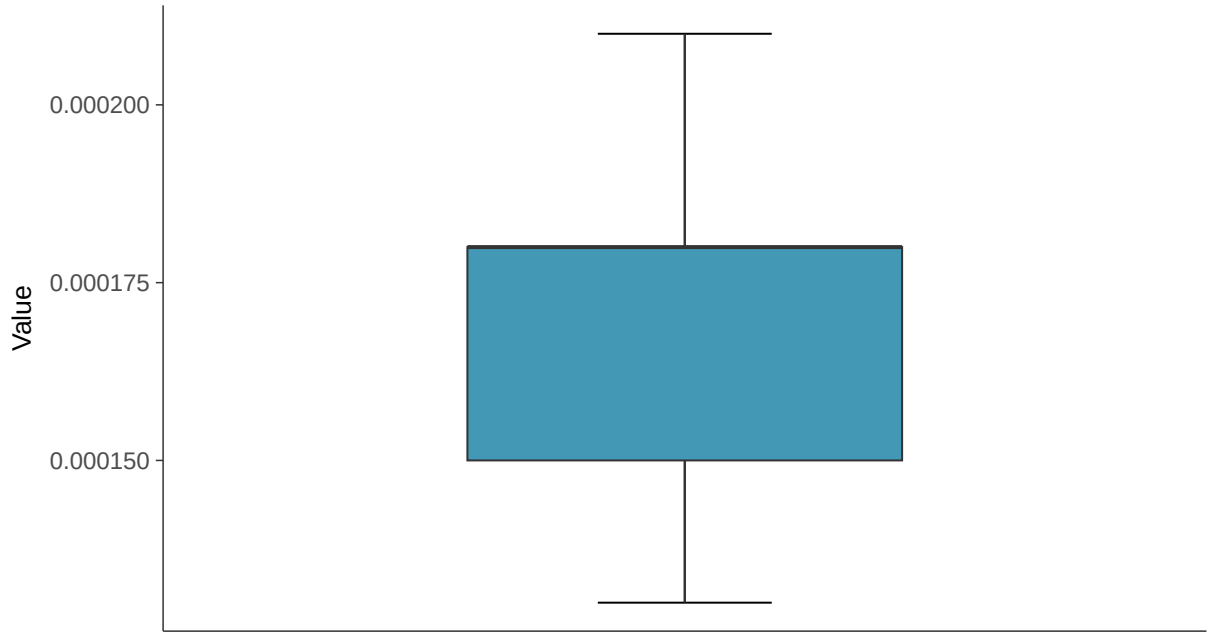
ID: 1_26_5_110





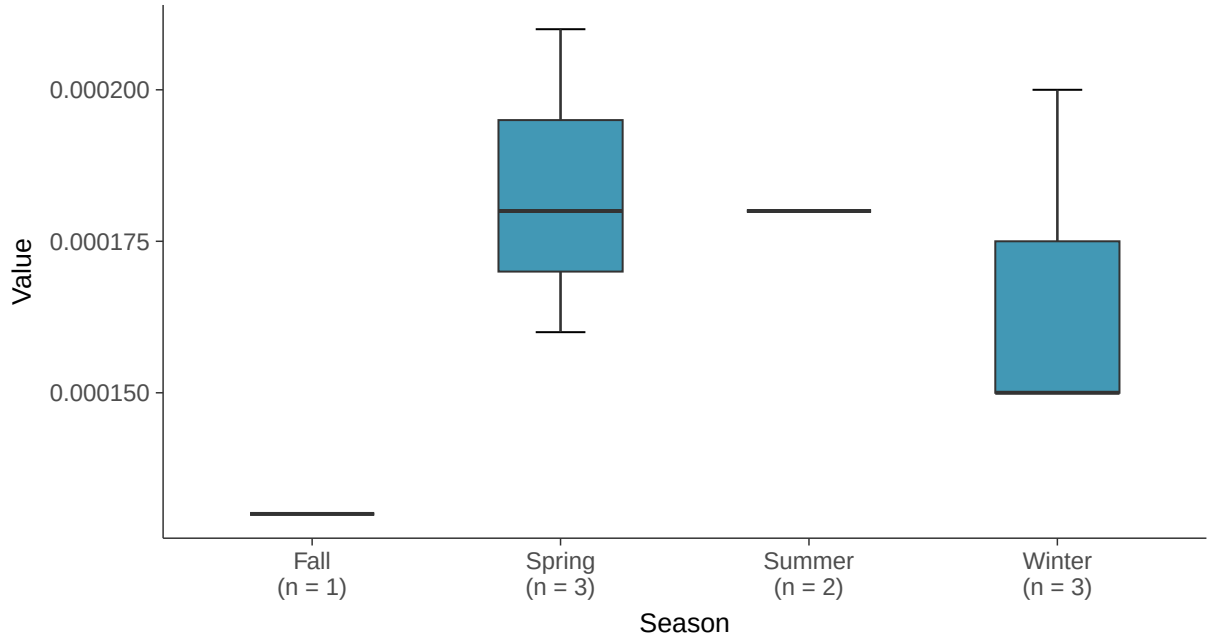
Boxplot

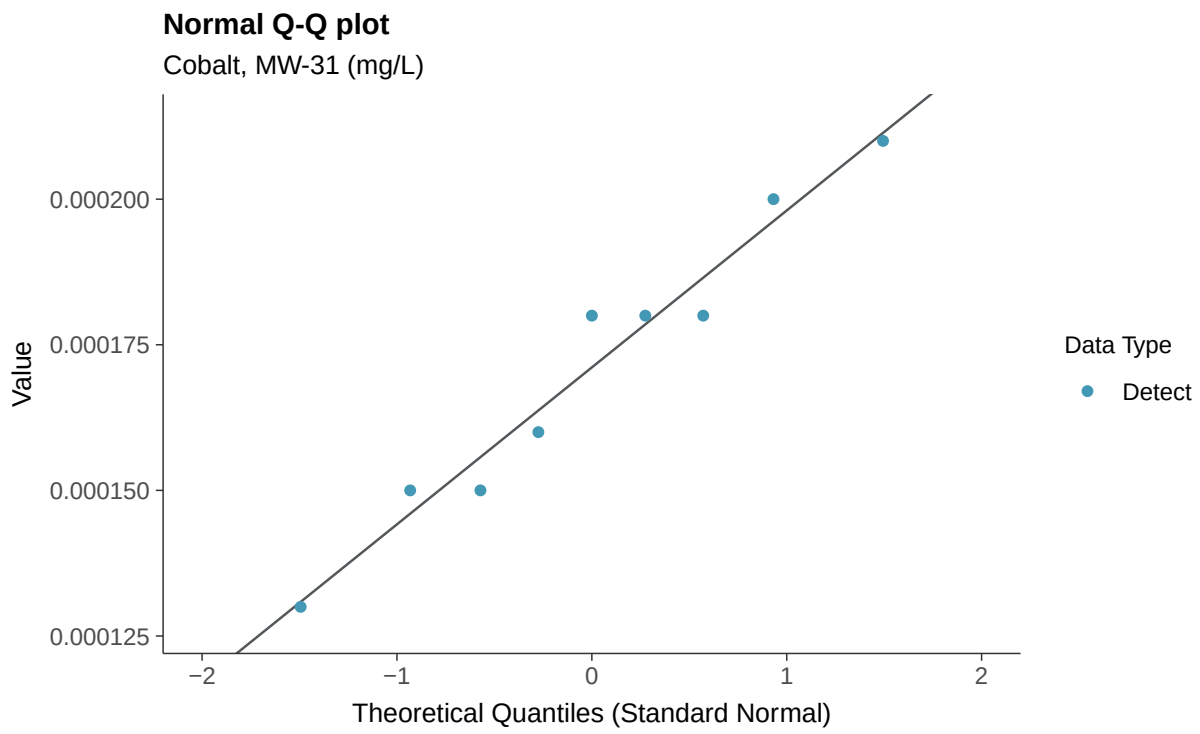
Cobalt, MW-31 (mg/L)

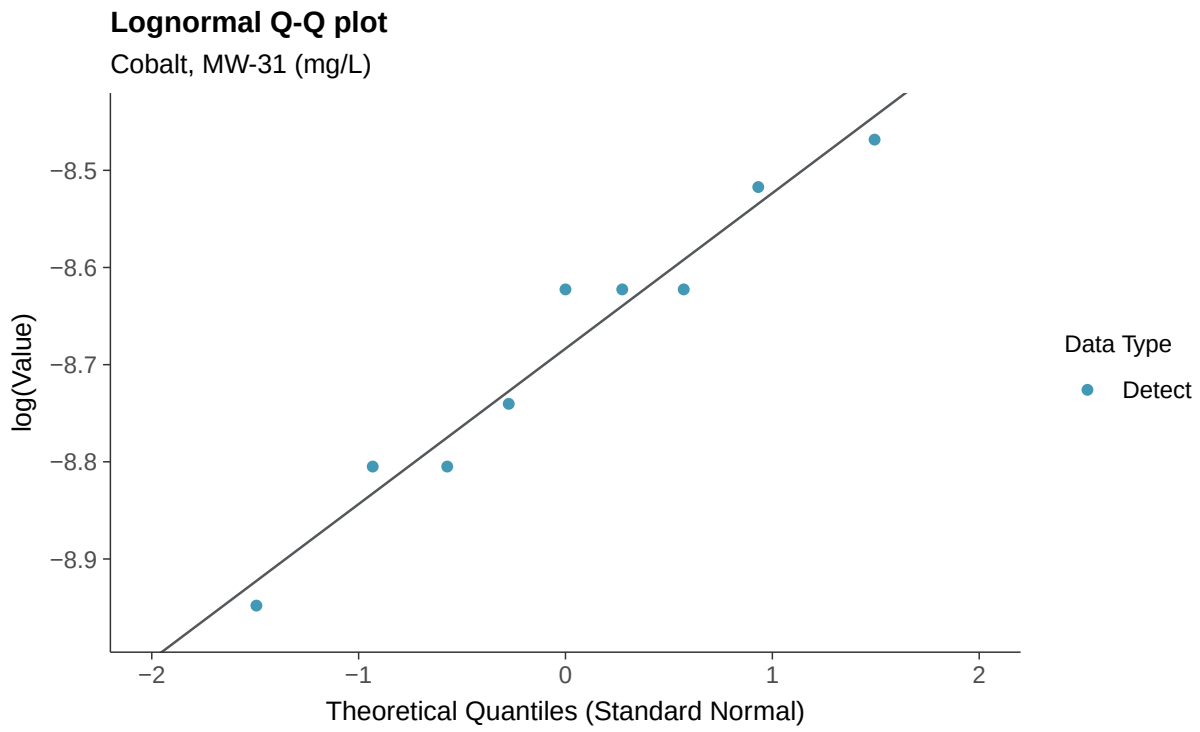


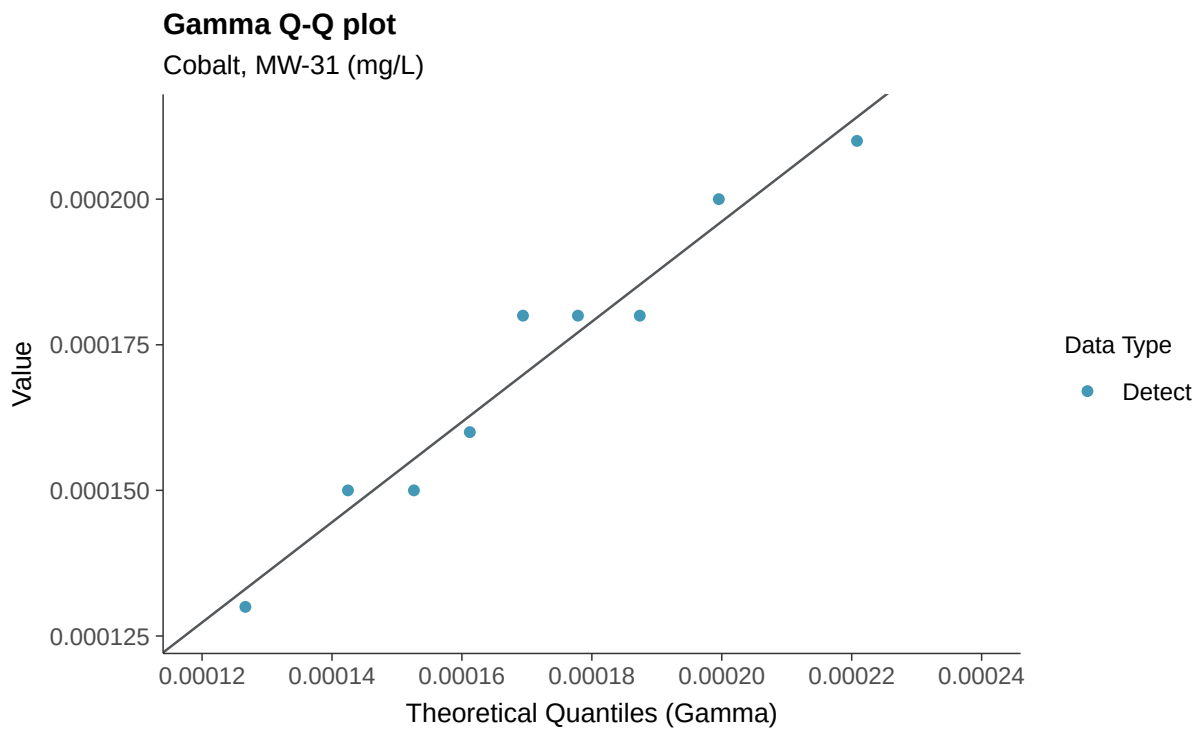
Boxplot by Season

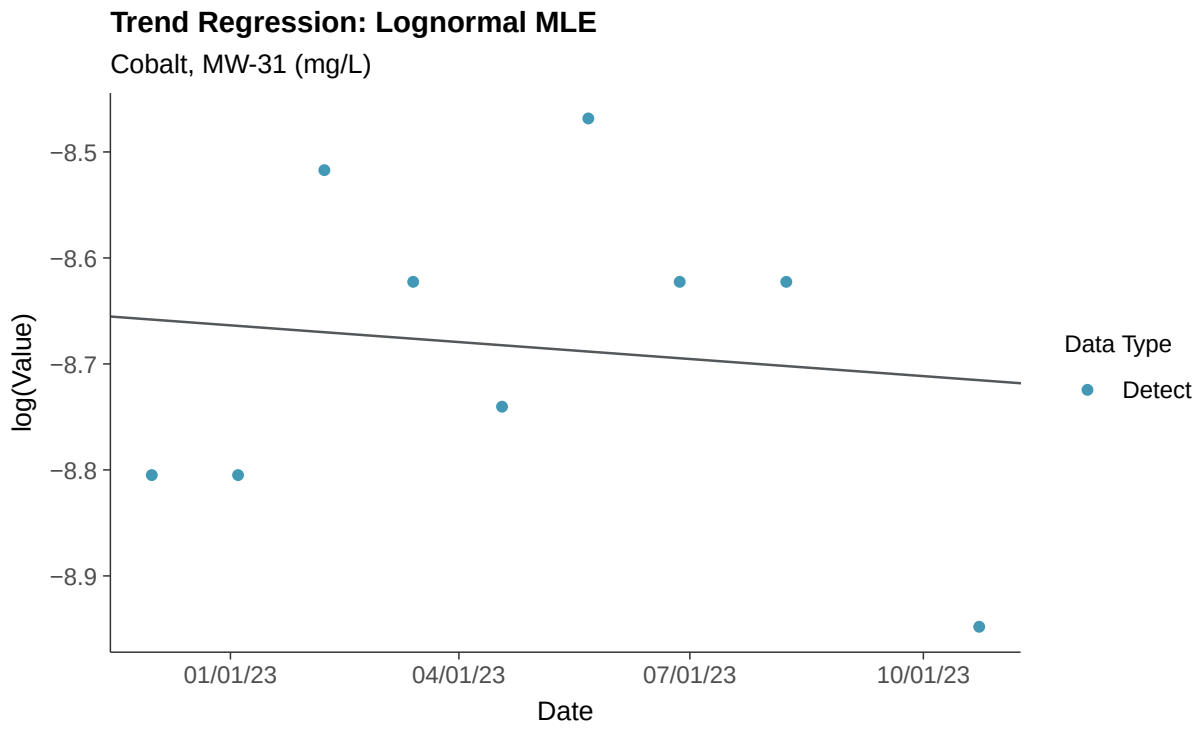
Cobalt, MW-31 (mg/L)




Normal Q-Q plot
Cobalt, MW-31 (mg/L)
Value
0.000200
0.000175
0.000150
0.000125
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

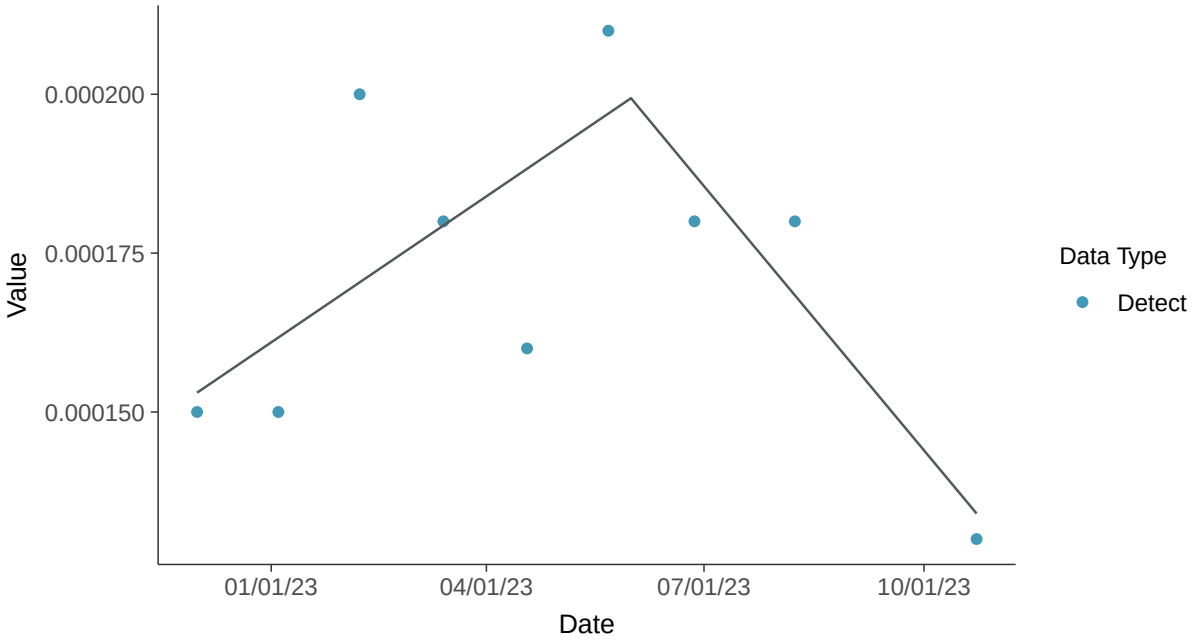

Lognormal Q-Q plot
Cobalt, MW-31 (mg/L)
log(Value)
−8.5
−8.6
−8.7
−8.8
−8.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-31 (mg/L)
Value
0.000200
0.000175
0.000150
0.000125
0.00012
0.00014
0.00016
0.00018
0.00020
0.00022
0.00024
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-31 (mg/L)
log(Value)
−8.5
−8.6
−8.7
−8.8
−8.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

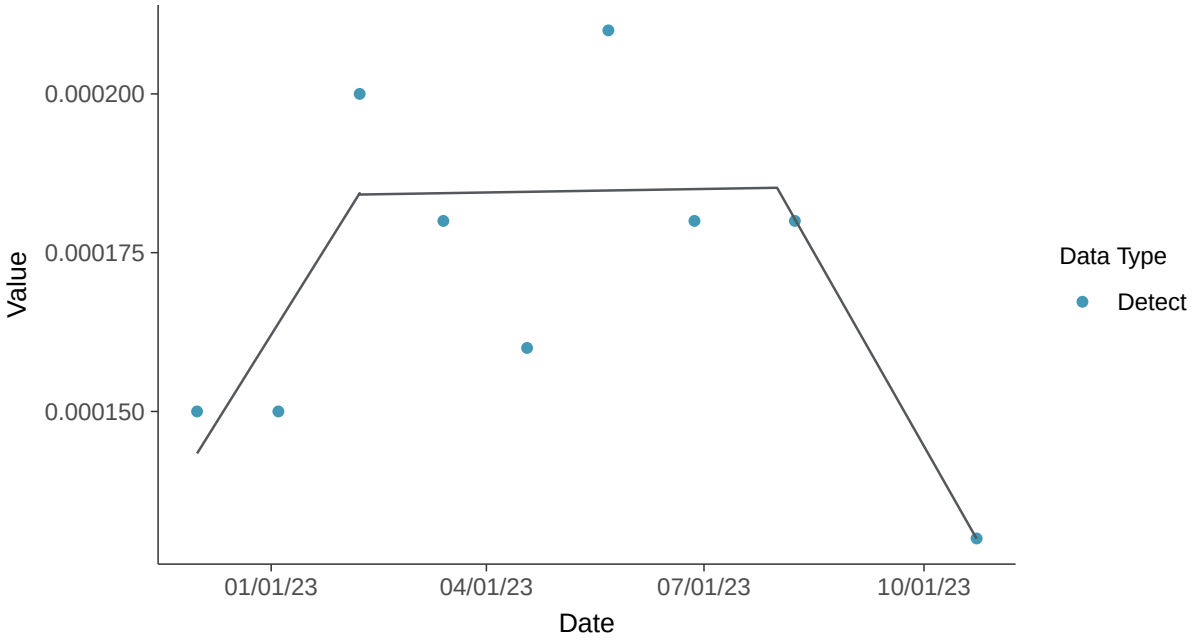
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-31 (mg/L)



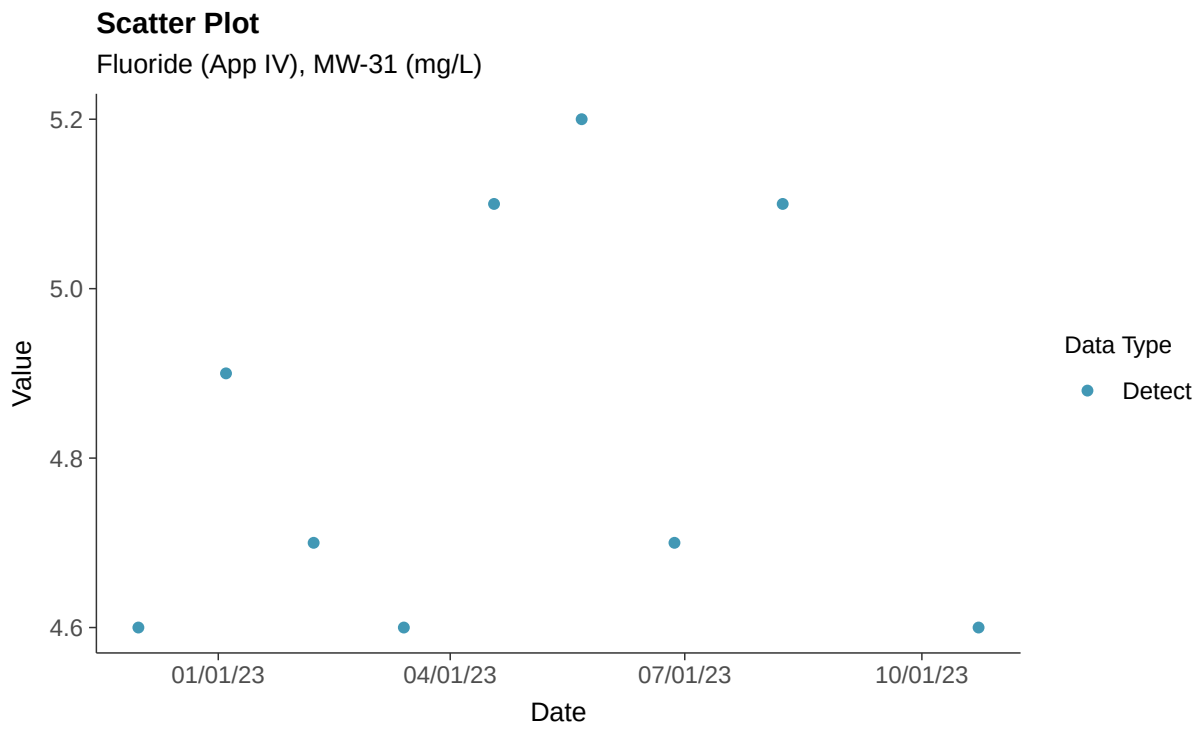
Trend Regression: Piecewise Linear-Linear-Linear

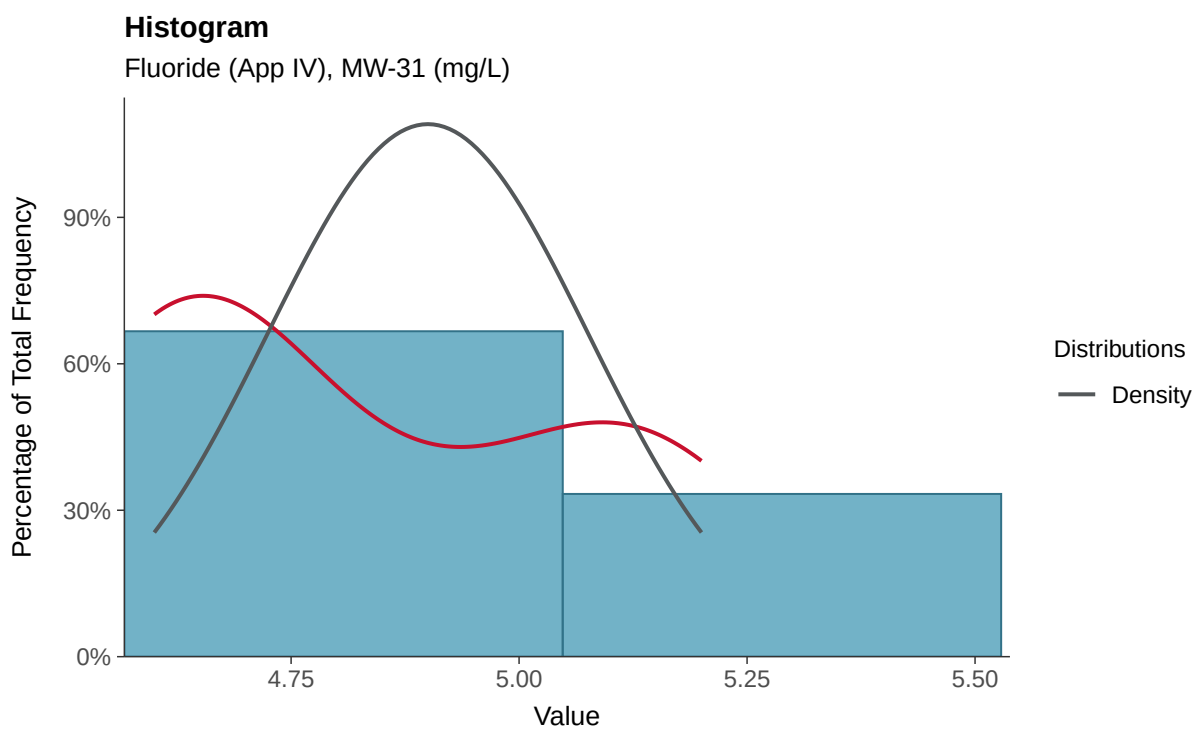
Cobalt, MW-31 (mg/L)



Appendix IV: Fluoride (App IV), MW-31

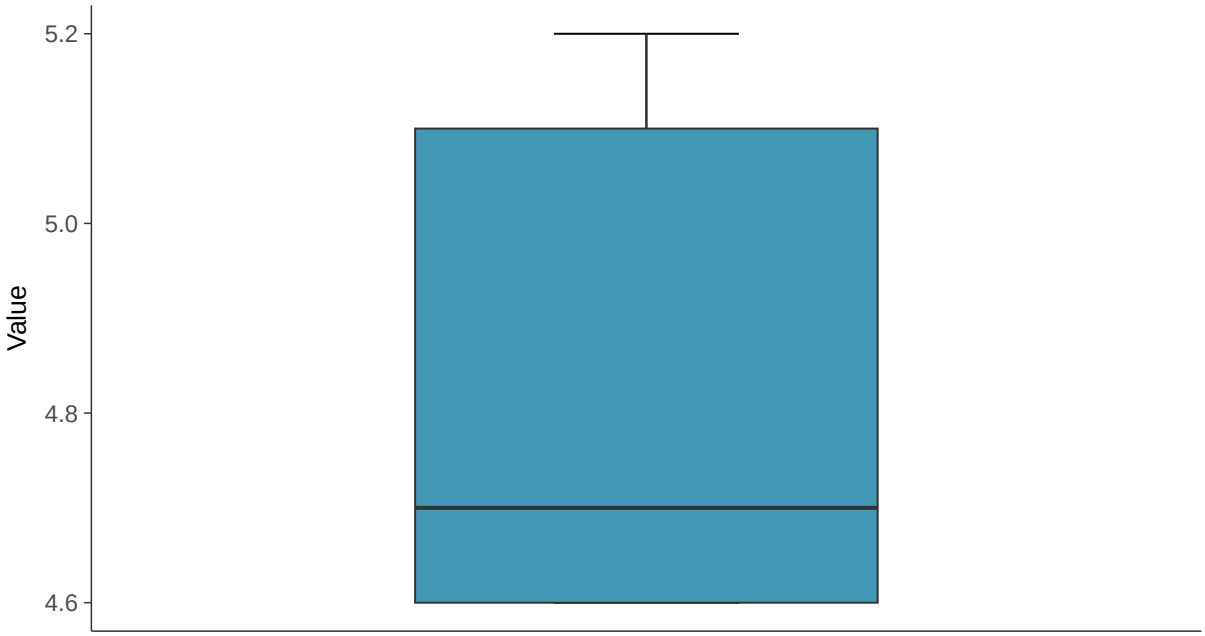
ID: 1_26_5_113





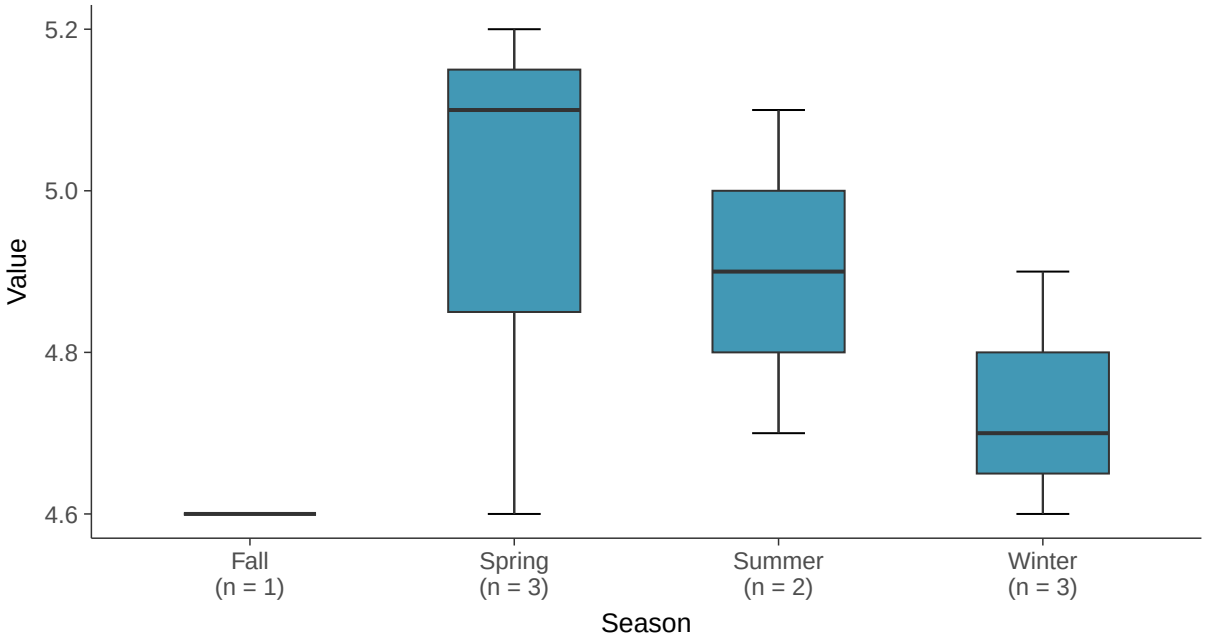
Boxplot

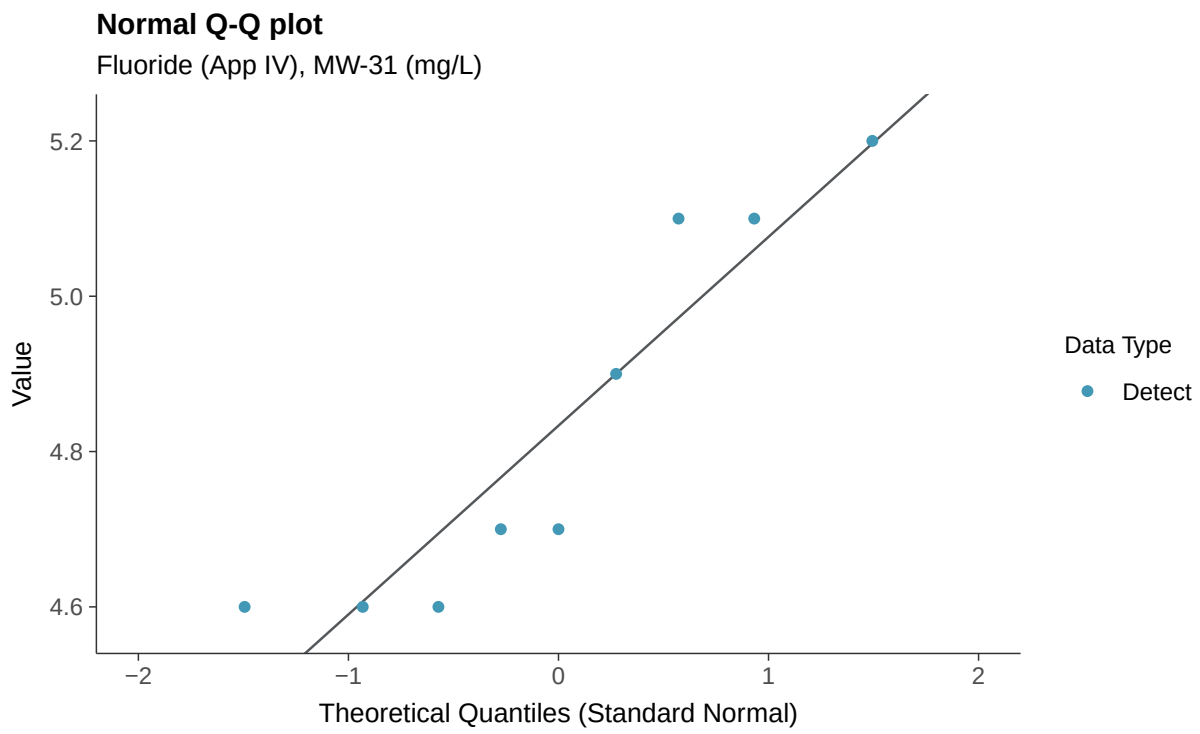
Fluoride (App IV), MW-31 (mg/L)

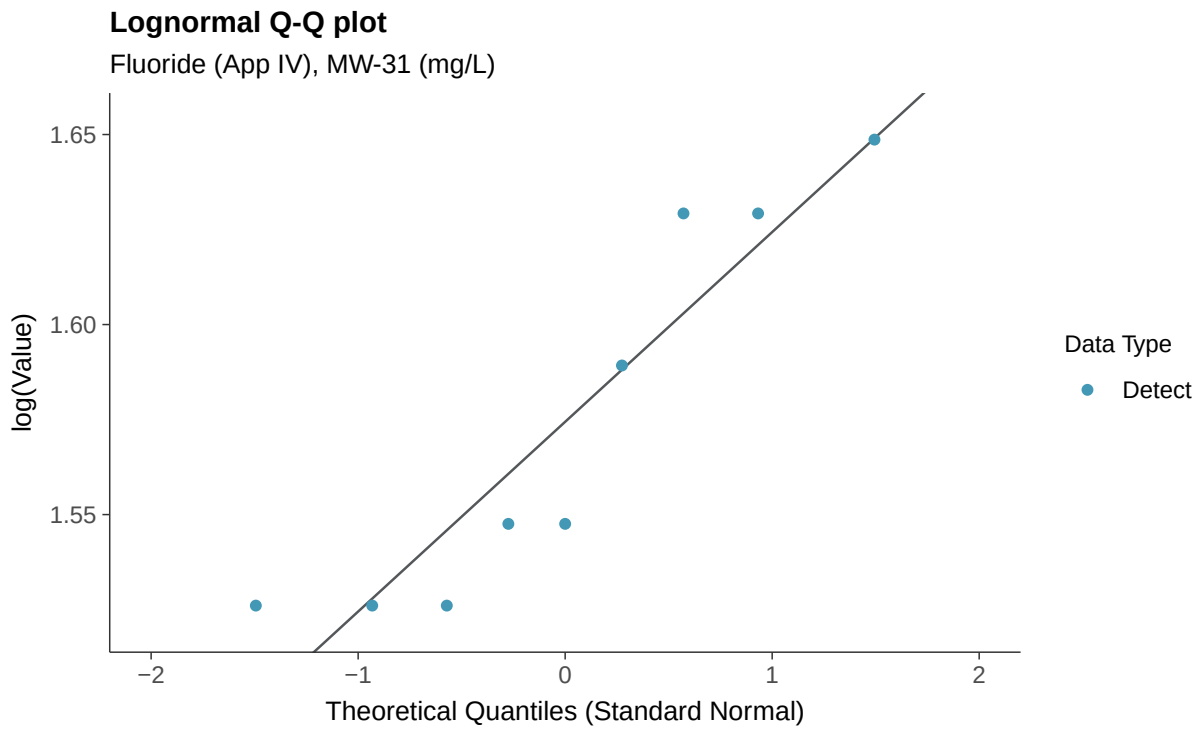


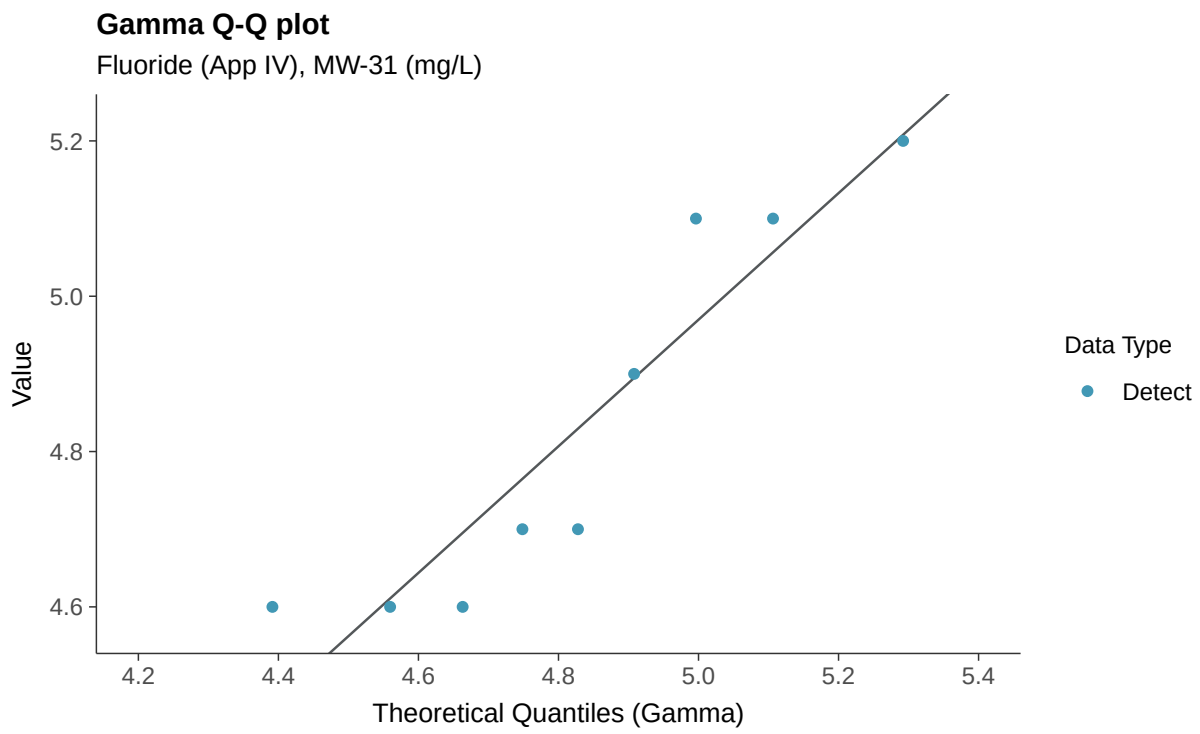
Boxplot by Season

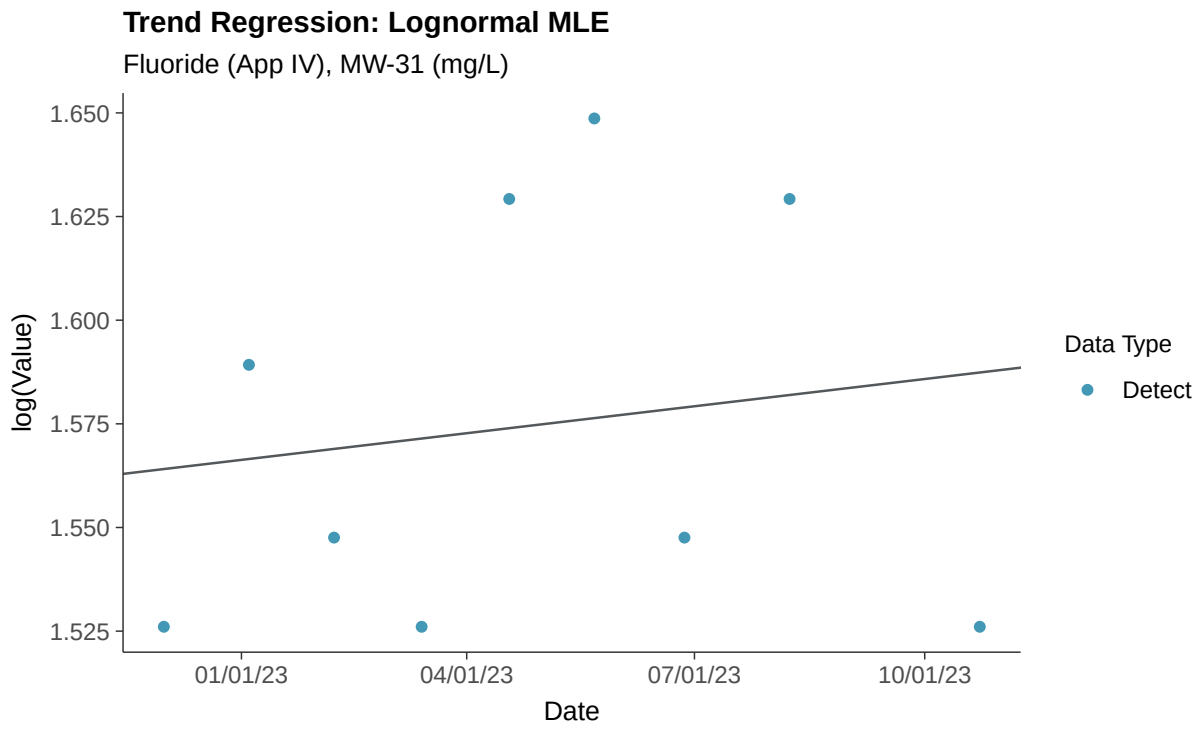
Fluoride (App IV), MW-31 (mg/L)

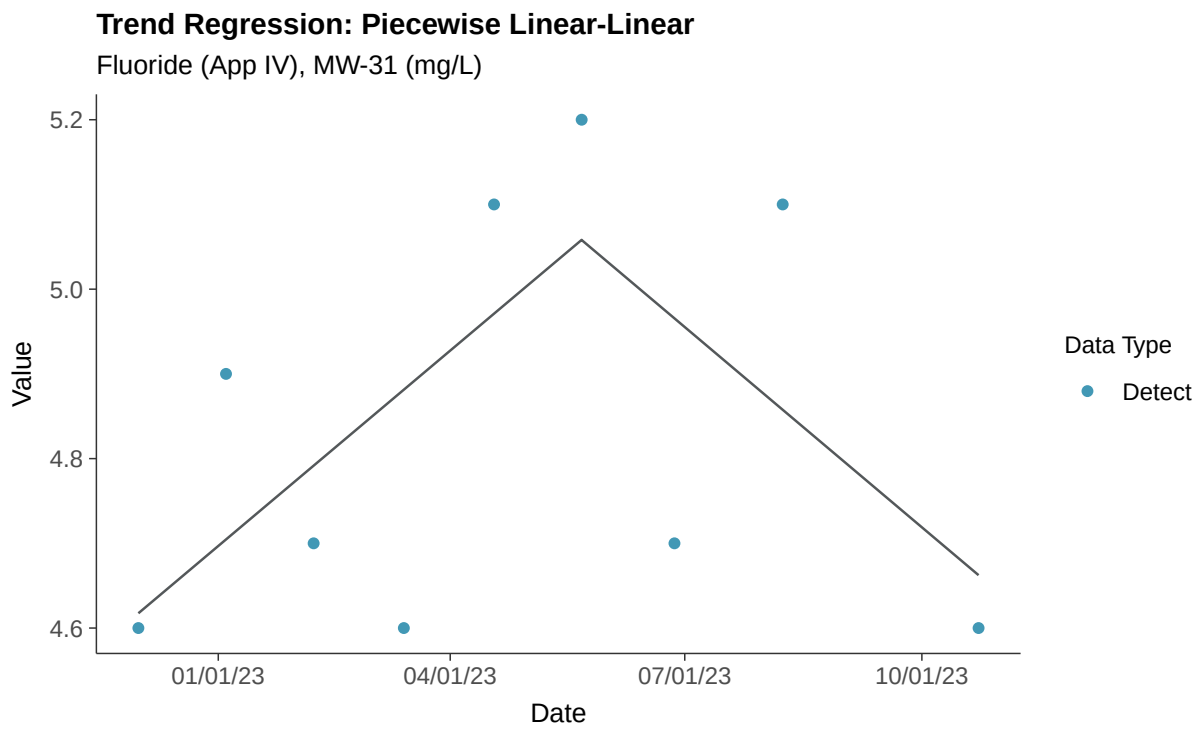



Normal Q-Q plot
Fluoride (App IV), MW-31 (mg/L)
Value
5.2
5.0
4.8
4.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Fluoride (App IV), MW-31 (mg/L)
log(Value)
1.65
1.60
1.55
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

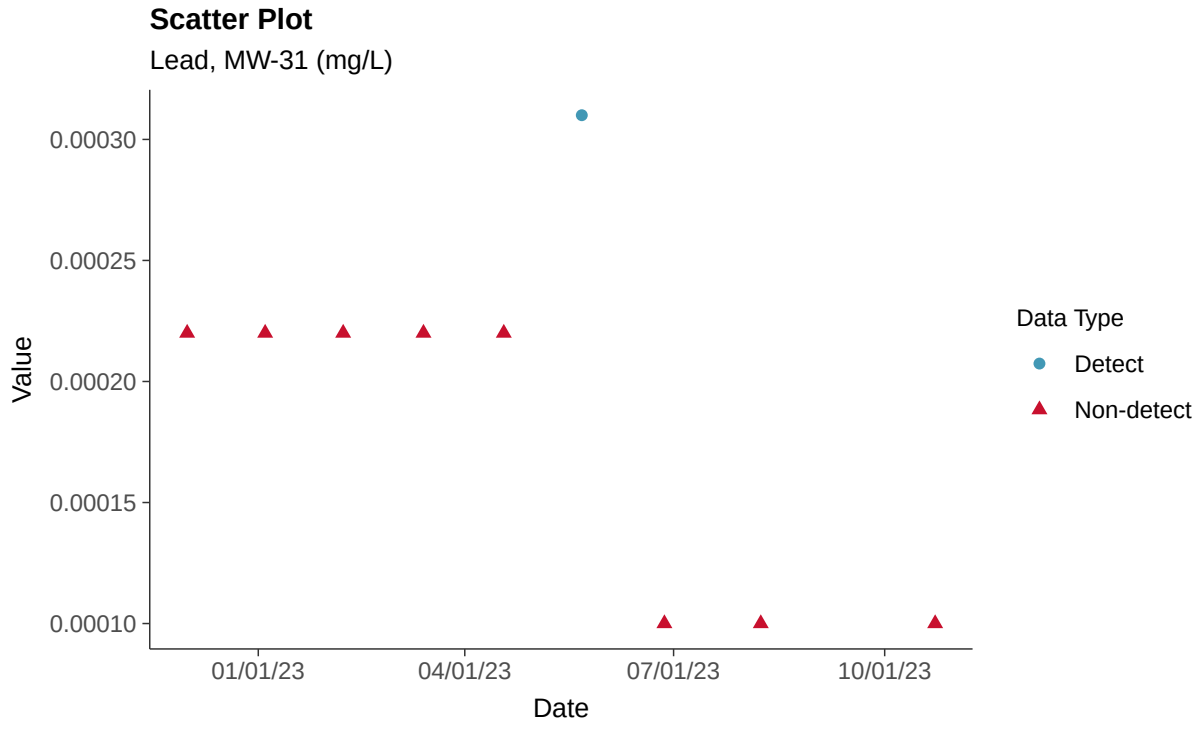

Gamma Q-Q plot
Fluoride (App IV), MW-31 (mg/L)
Value
5.2
5.0
4.8
4.6
4.2
4.4
4.6
4.8
5.0
5.2
5.4
Theoretical Quantiles (Gamma)
Data Type
Detect

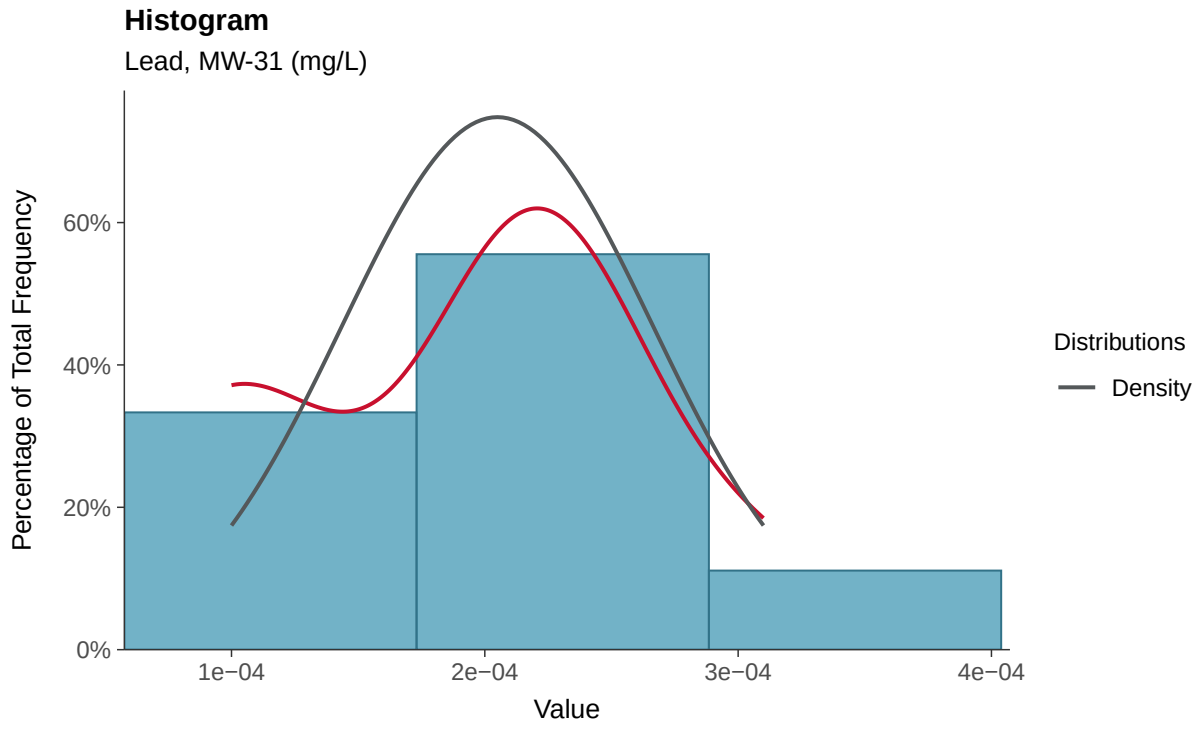

Trend Regression: Lognormal MLE
Fluoride (App IV), MW-31 (mg/L)
log(Value)
1.650
1.625
1.600
1.575
1.550
1.525
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Fluoride (App IV), MW-31 (mg/L)
5.2
5.0
4.8
4.6
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lead, MW-31

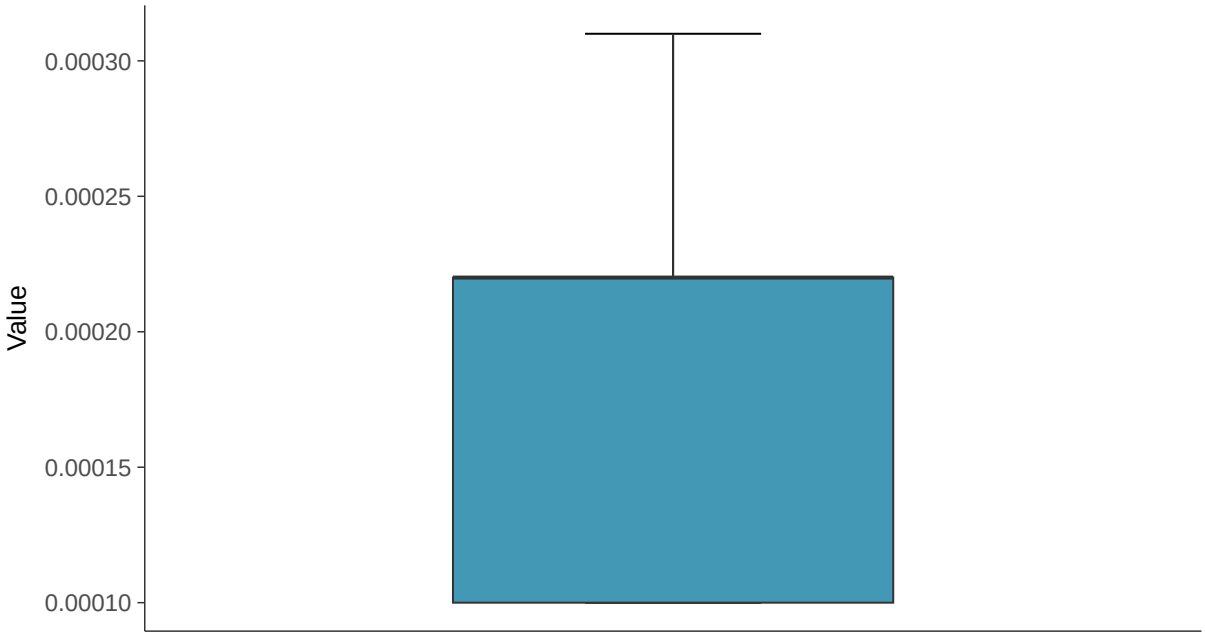
ID: 1_26_5_115





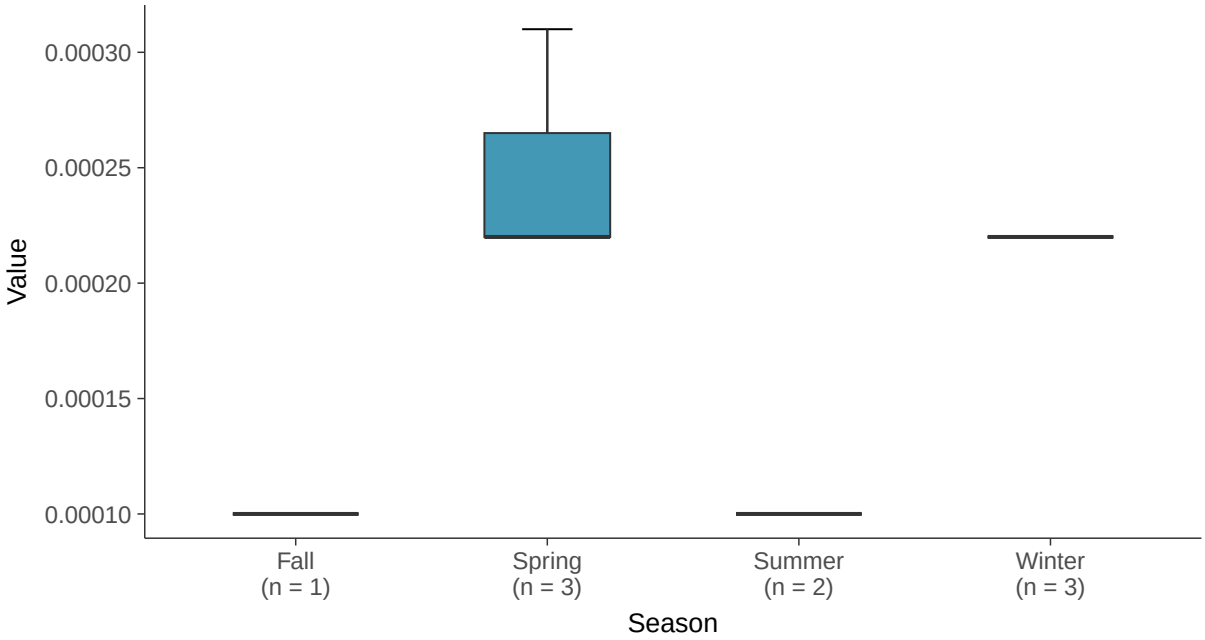
Boxplot

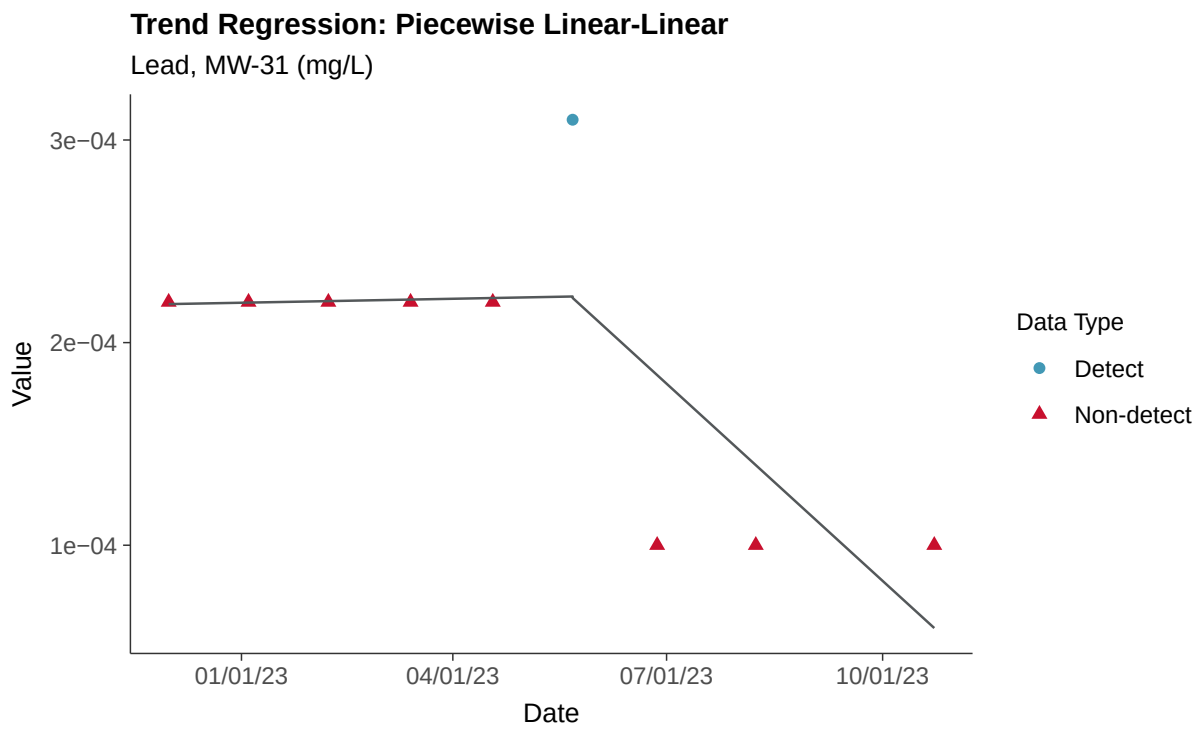
Lead, MW-31 (mg/L)

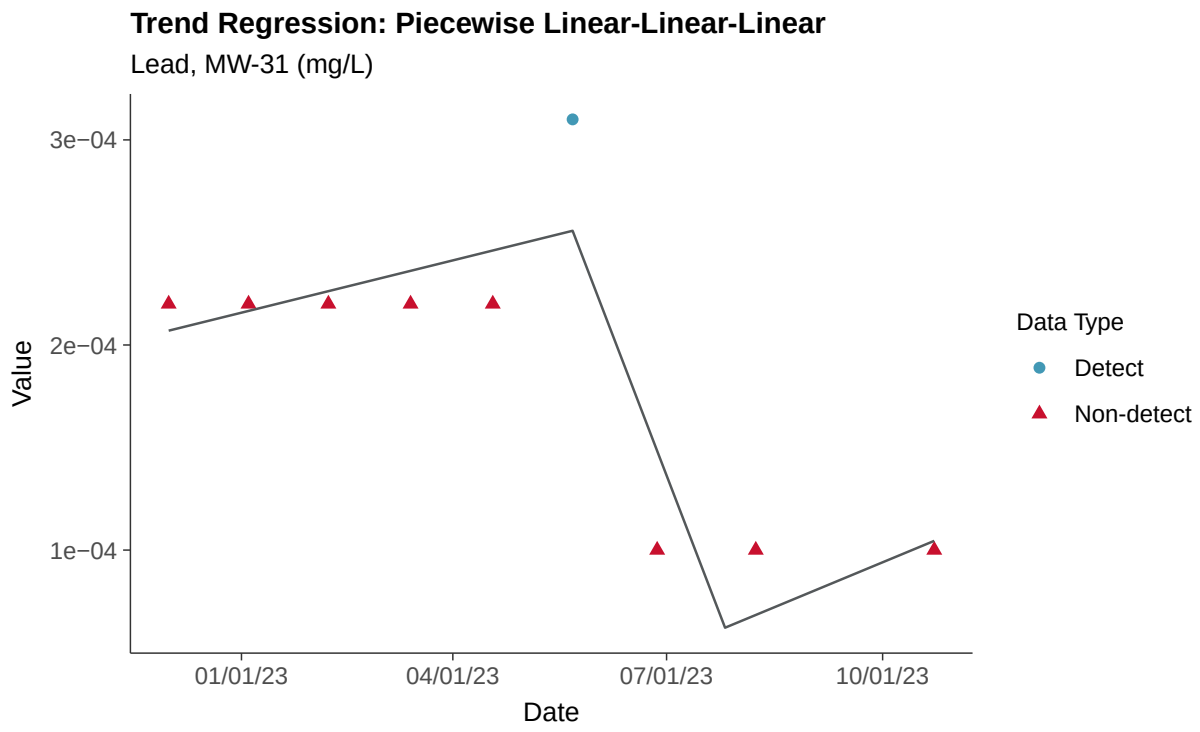


Boxplot by Season

Lead, MW-31 (mg/L)

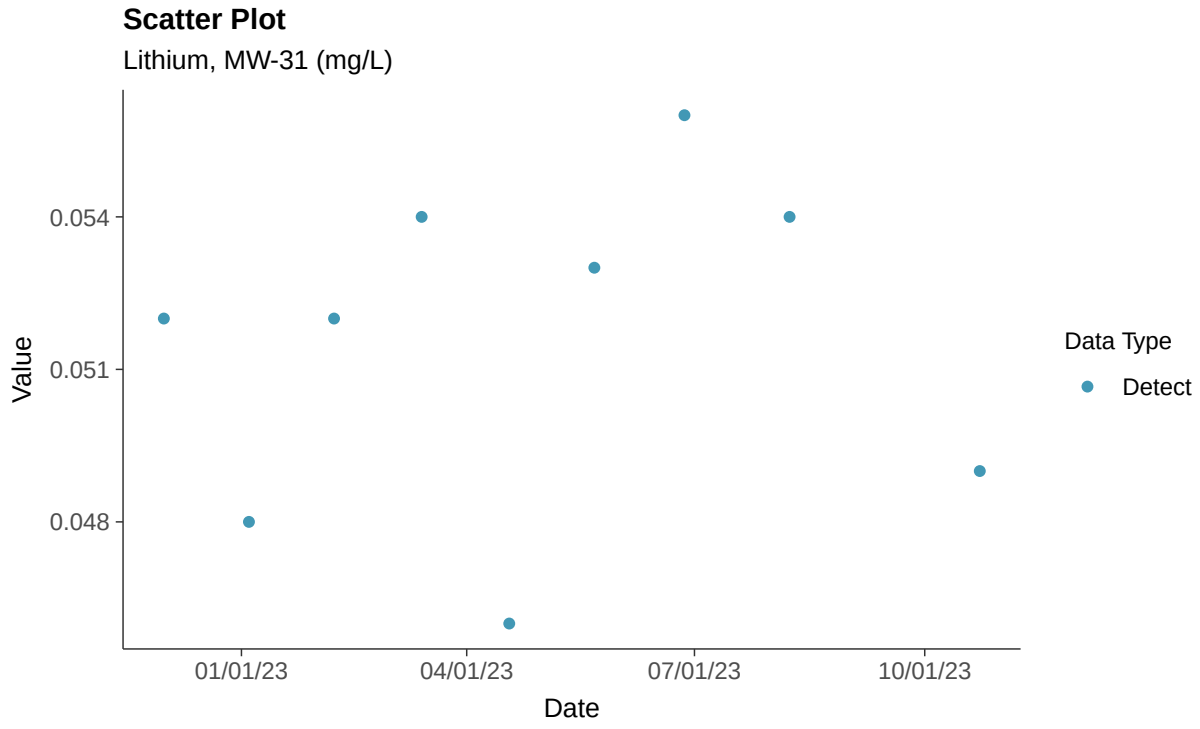


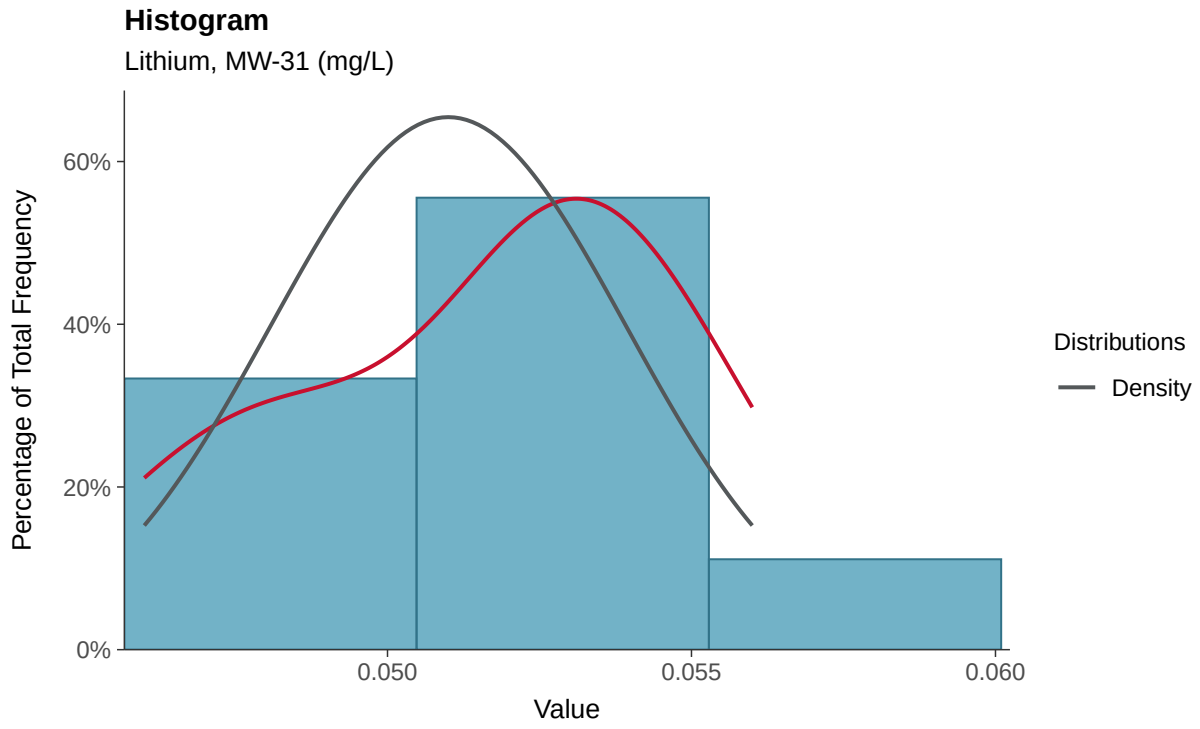

Trend Regression: Piecewise Linear-Linear
Lead, MW-31 (mg/L)
3e−04
2e−04
1e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-31 (mg/L)
3e−04
2e−04
1e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lithium, MW-31

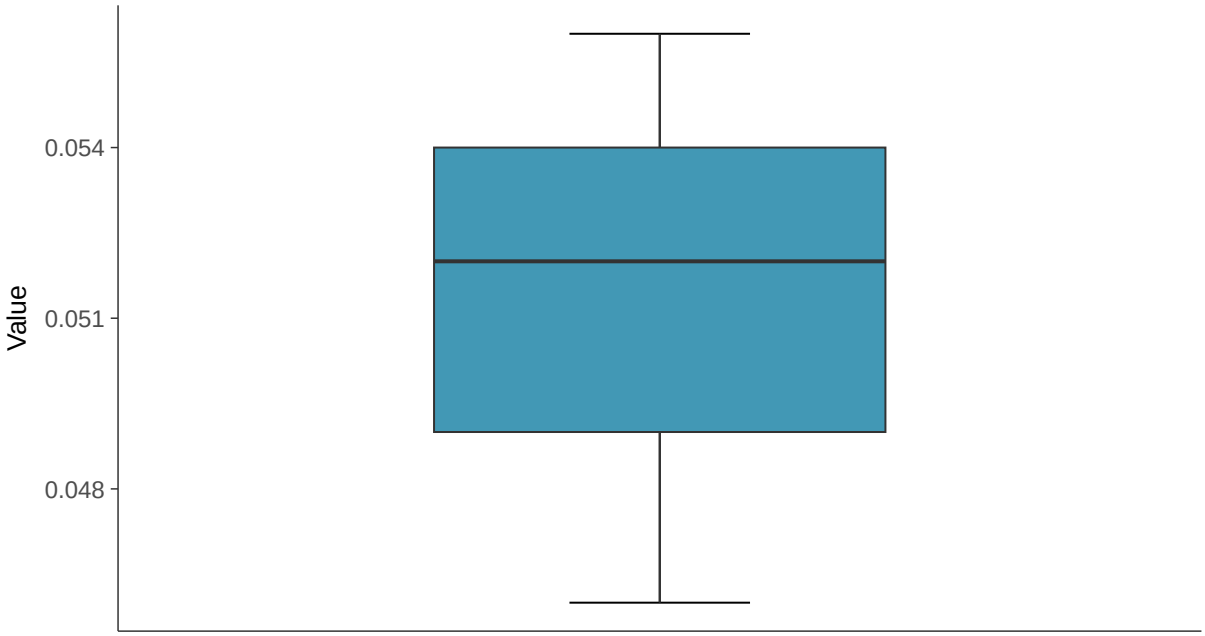
ID: 1_26_5_116





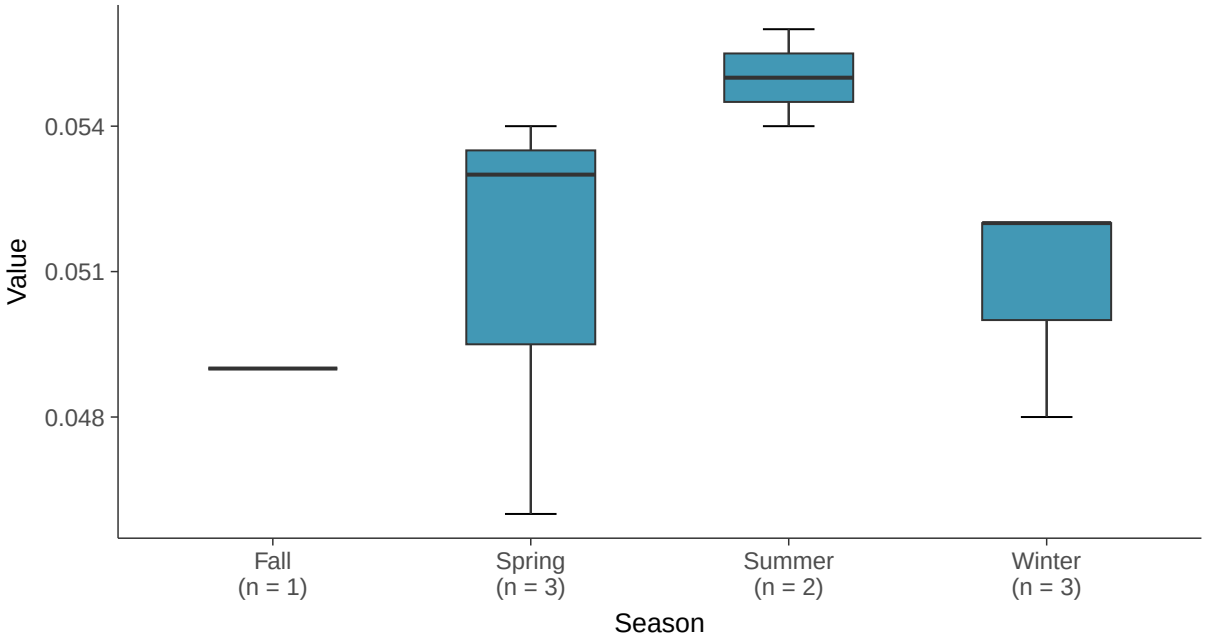
Boxplot

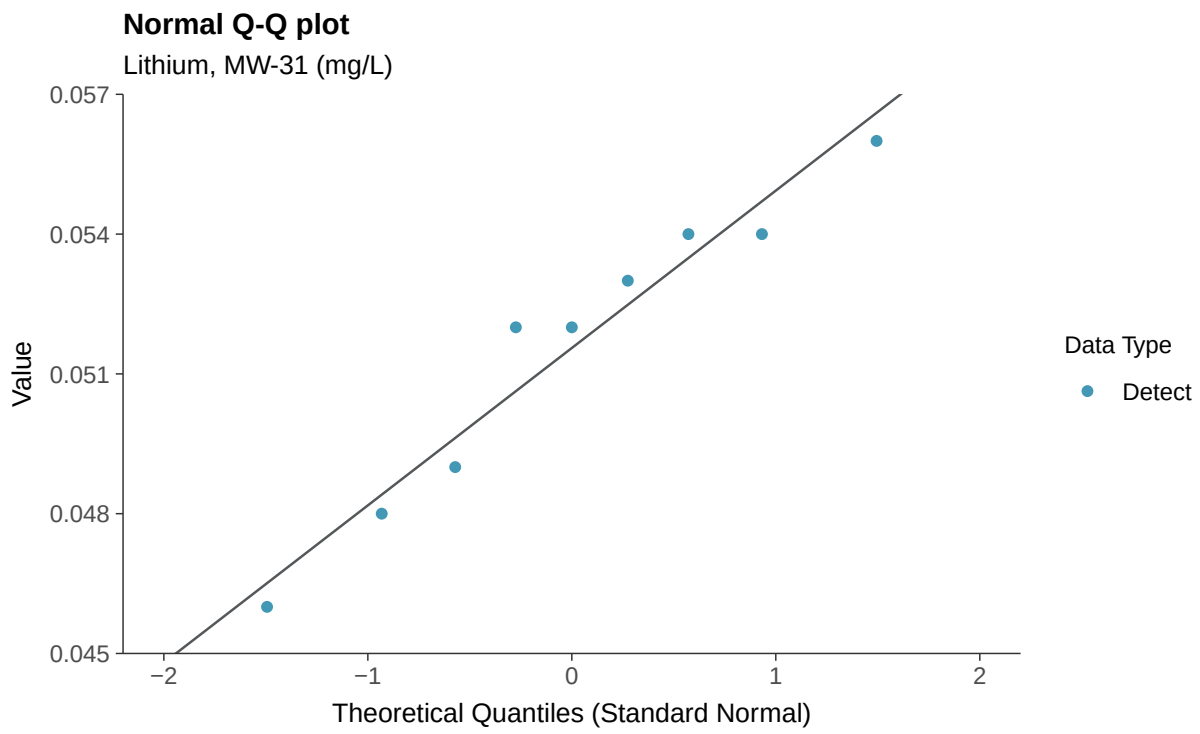
Lithium, MW-31 (mg/L)

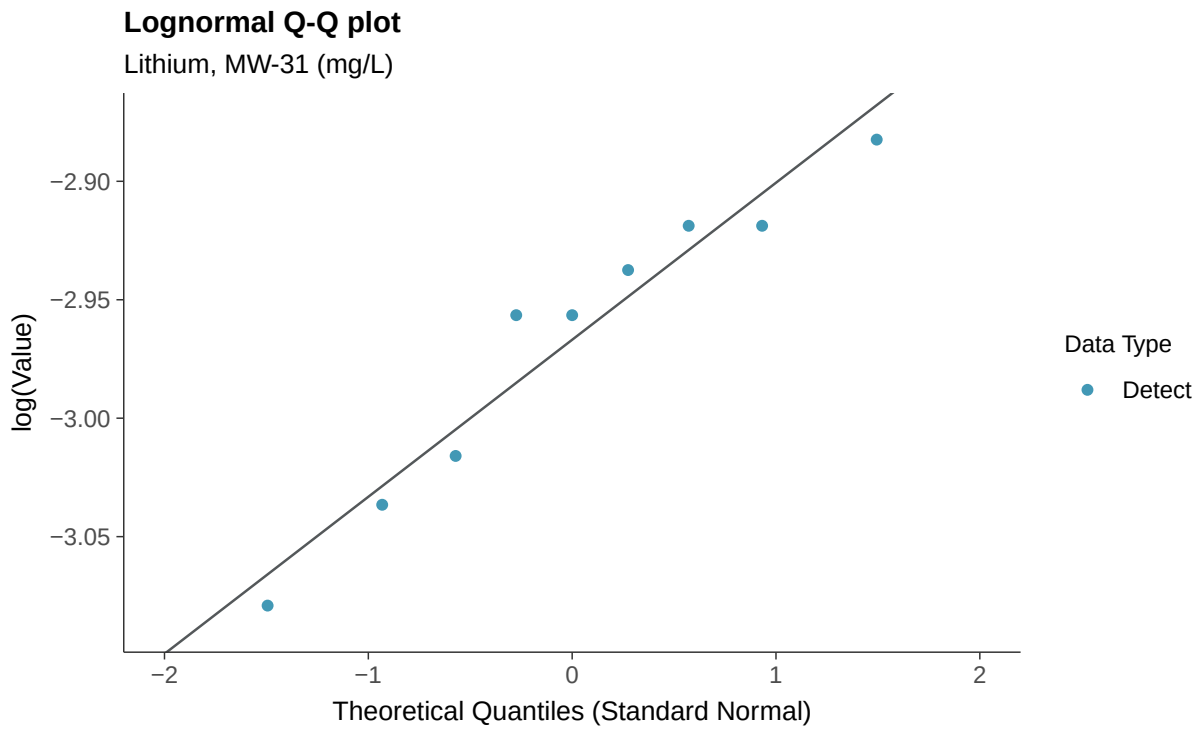


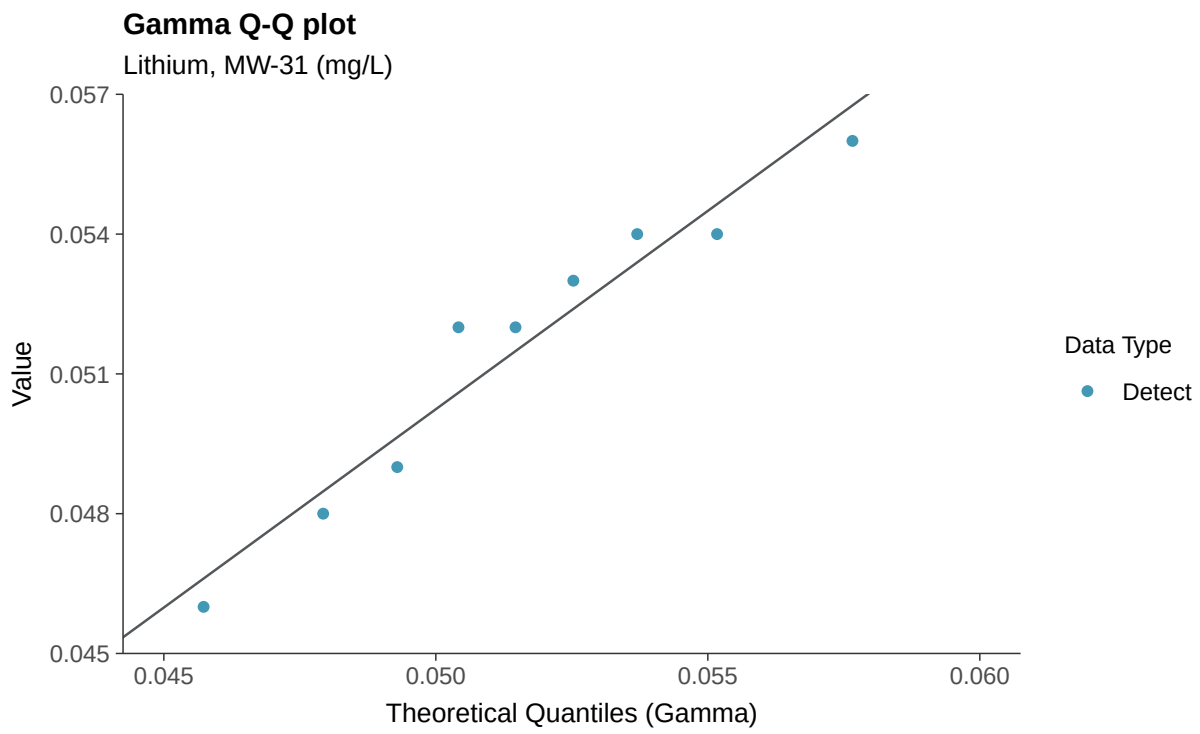
Boxplot by Season

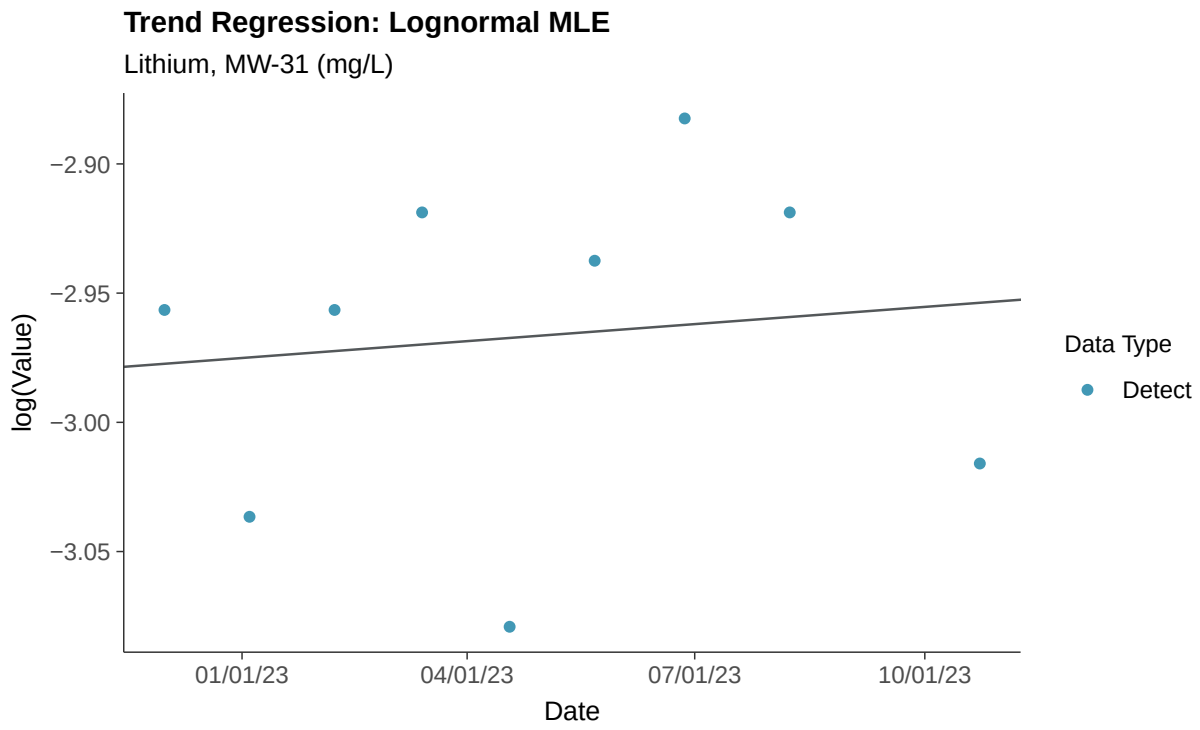
Lithium, MW-31 (mg/L)

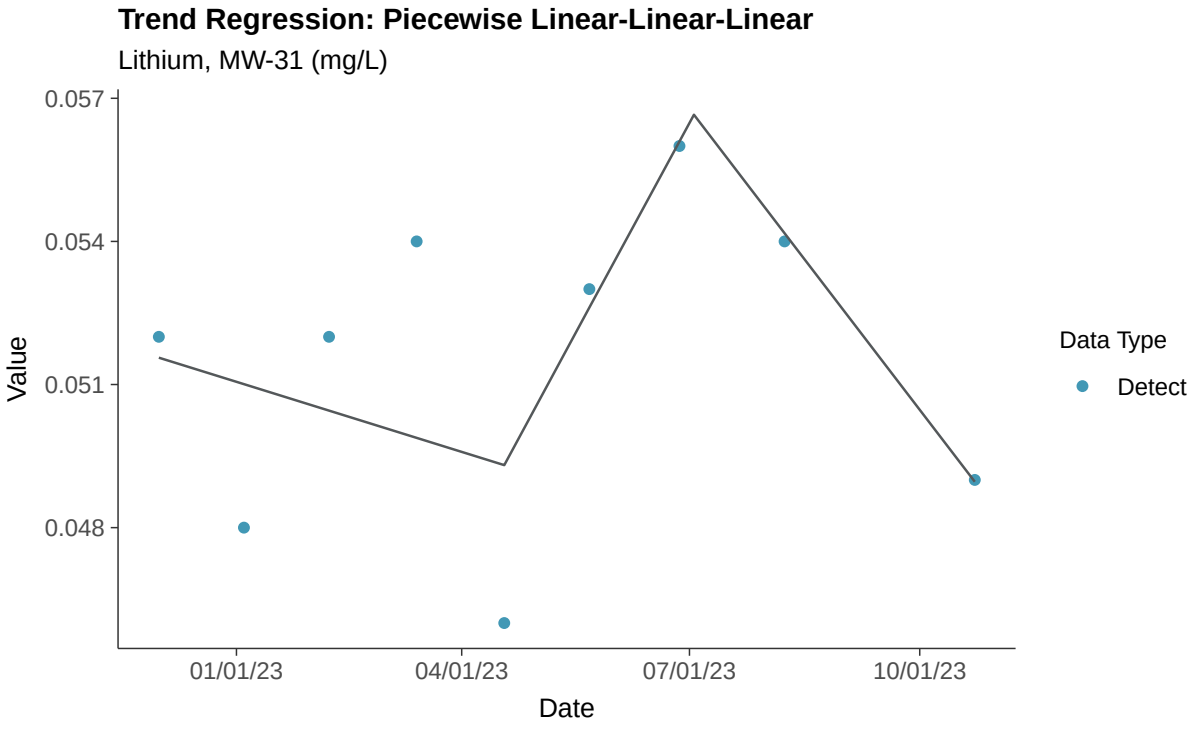



Normal Q-Q plot
Lithium, MW-31 (mg/L)
Value
0.057
0.054
0.051
0.048
0.045
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-31 (mg/L)
log(Value)
−2.90
−2.95
−3.00
−3.05
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

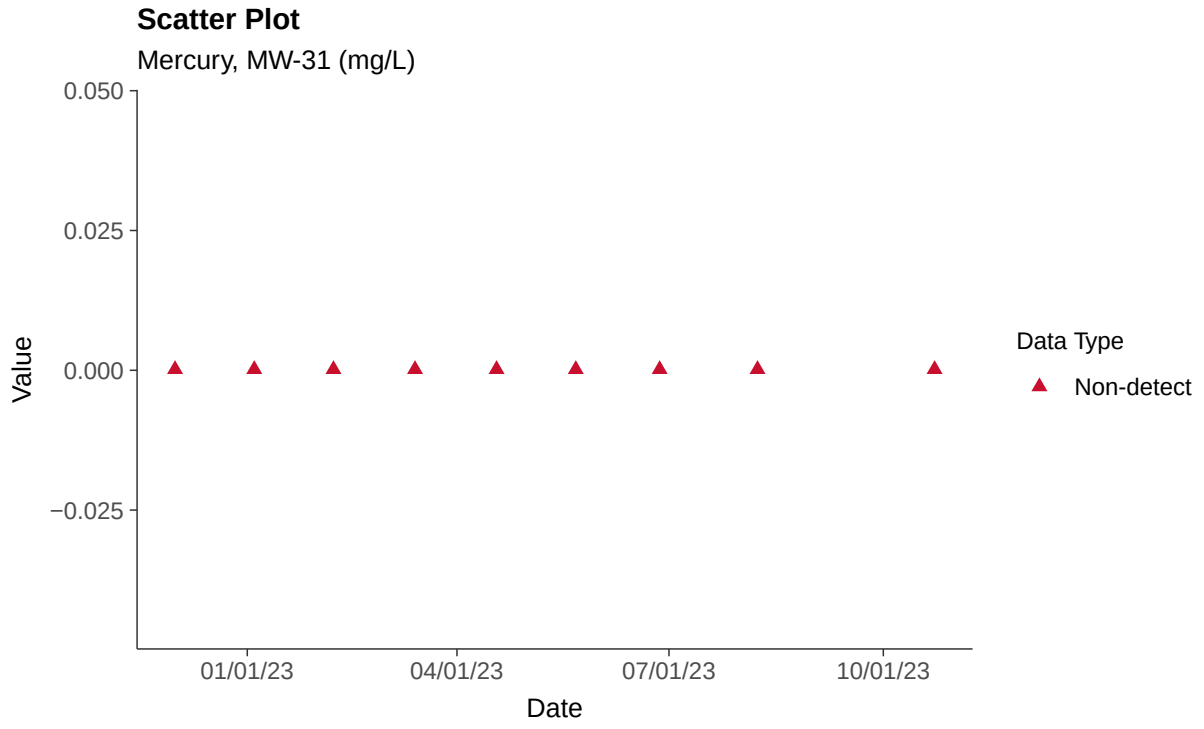

Gamma Q-Q plot
Lithium, MW-31 (mg/L)
0.057
0.054
0.051
0.048
0.045
Value
0.045
0.050
0.055
0.060
Theoretical Quantiles (Gamma)
Data Type
Detect

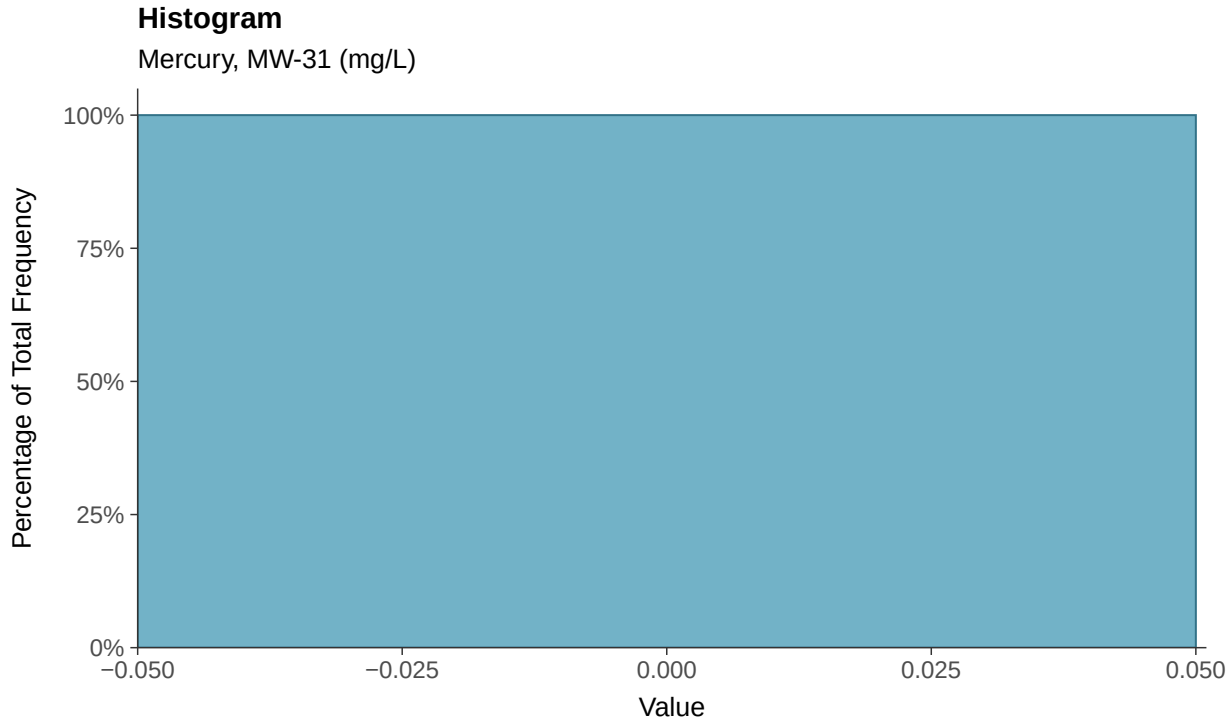

Trend Regression: Lognormal MLE
Lithium, MW-31 (mg/L)
−2.90
−2.95
−3.00
−3.05
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Lithium, MW-31 (mg/L)
0.057
0.054
0.051
0.048
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-31

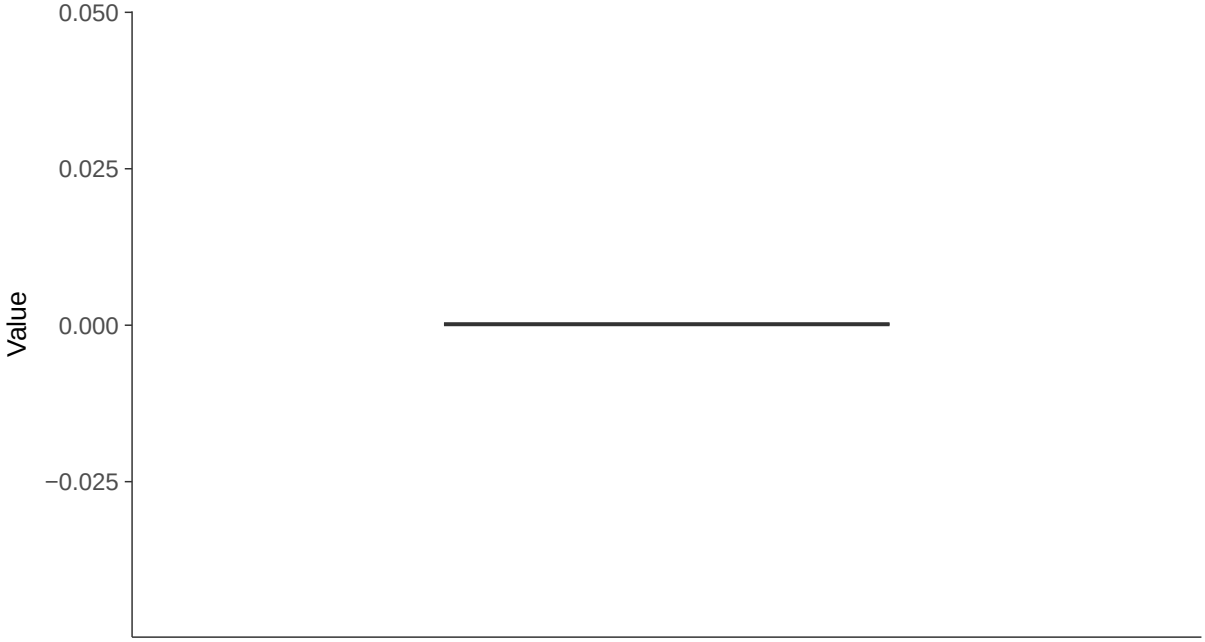
ID: 1_26_5_117





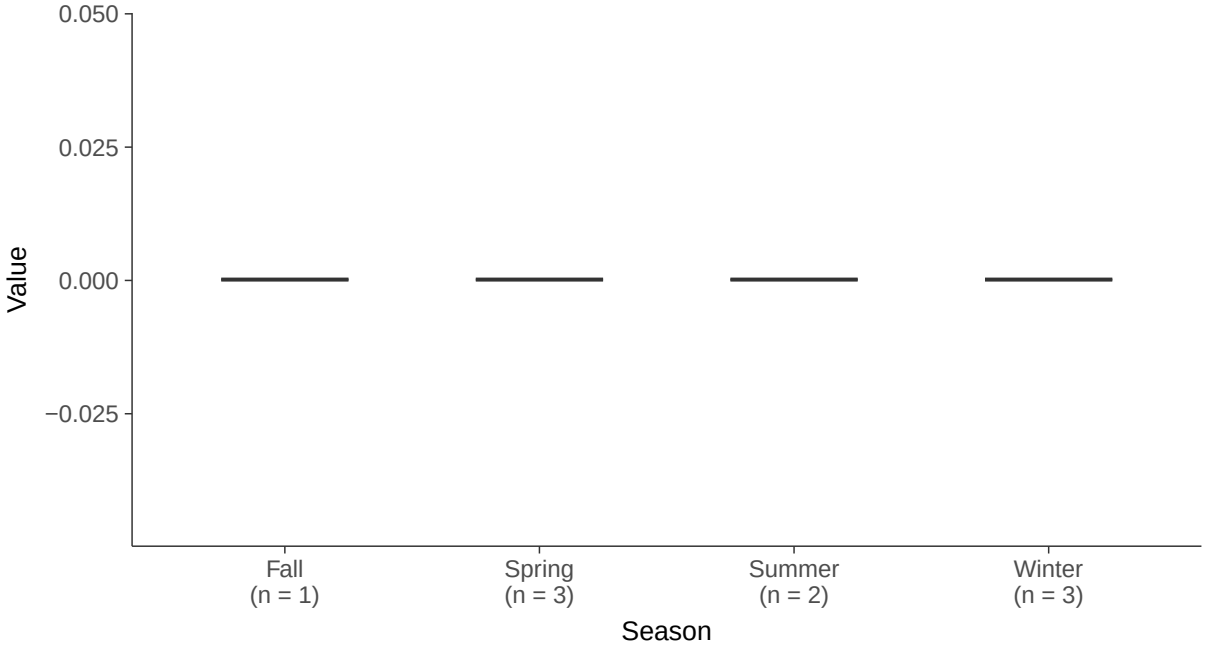
Boxplot

Mercury, MW-31 (mg/L)



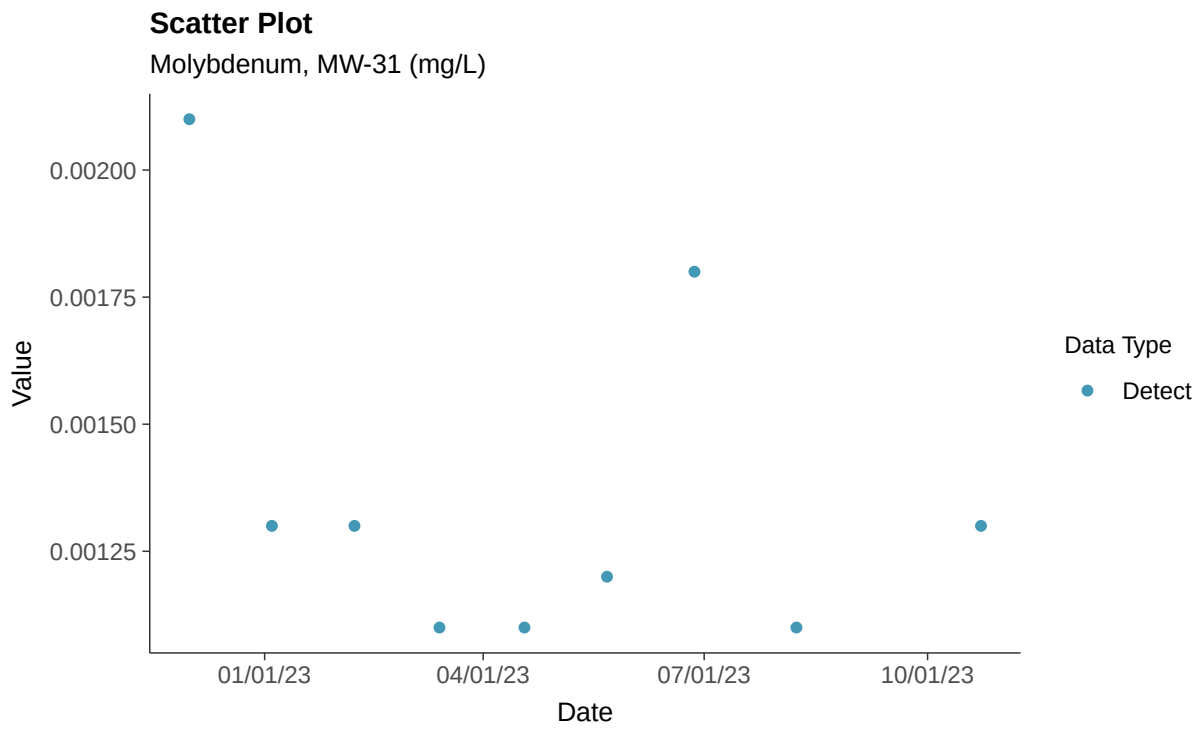
Boxplot by Season

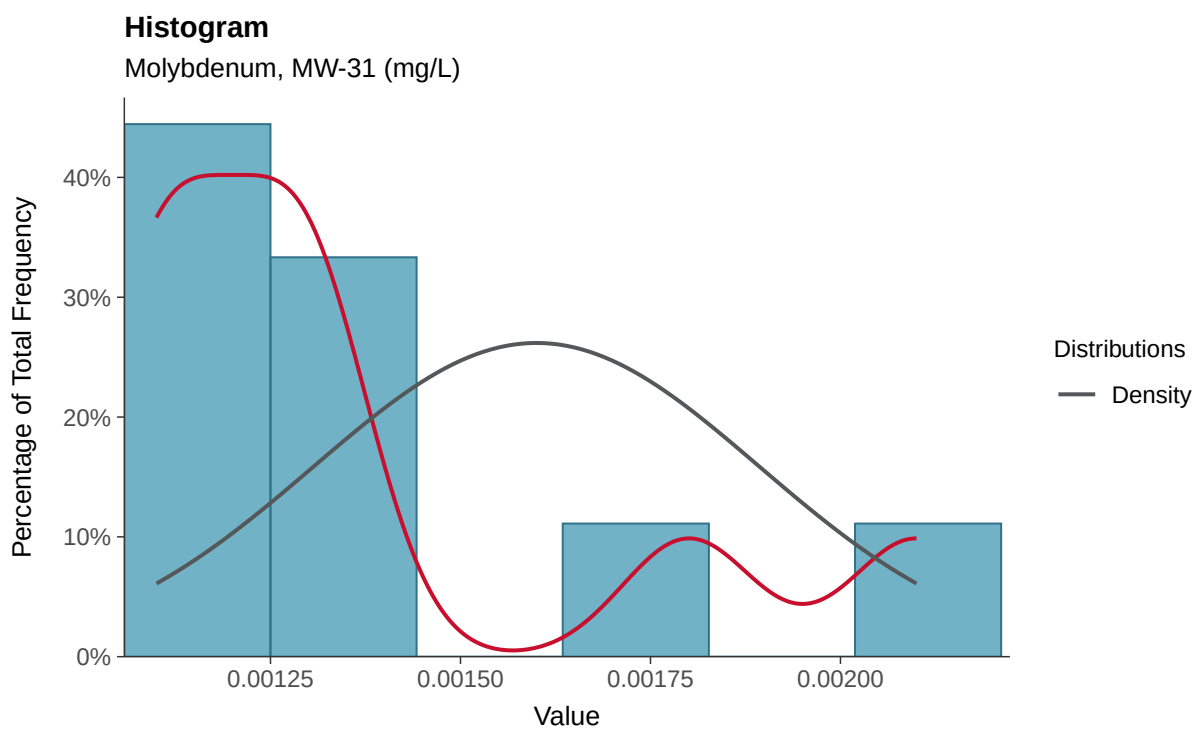
Mercury, MW-31 (mg/L)



Appendix IV: Molybdenum, MW-31

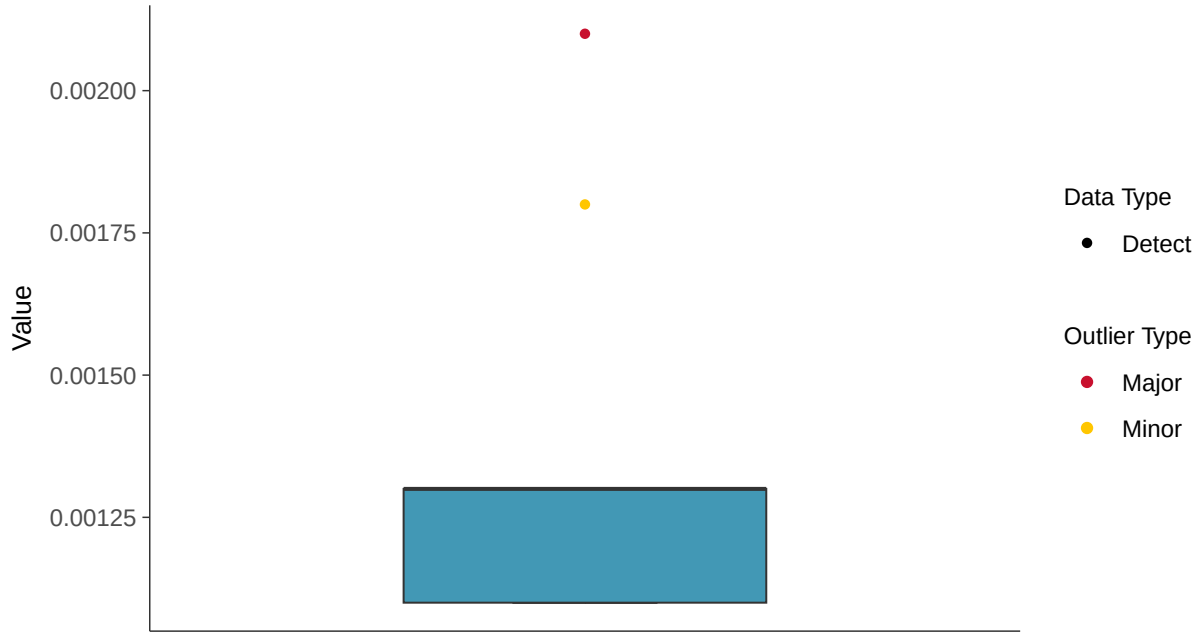
ID: 1_26_5_118





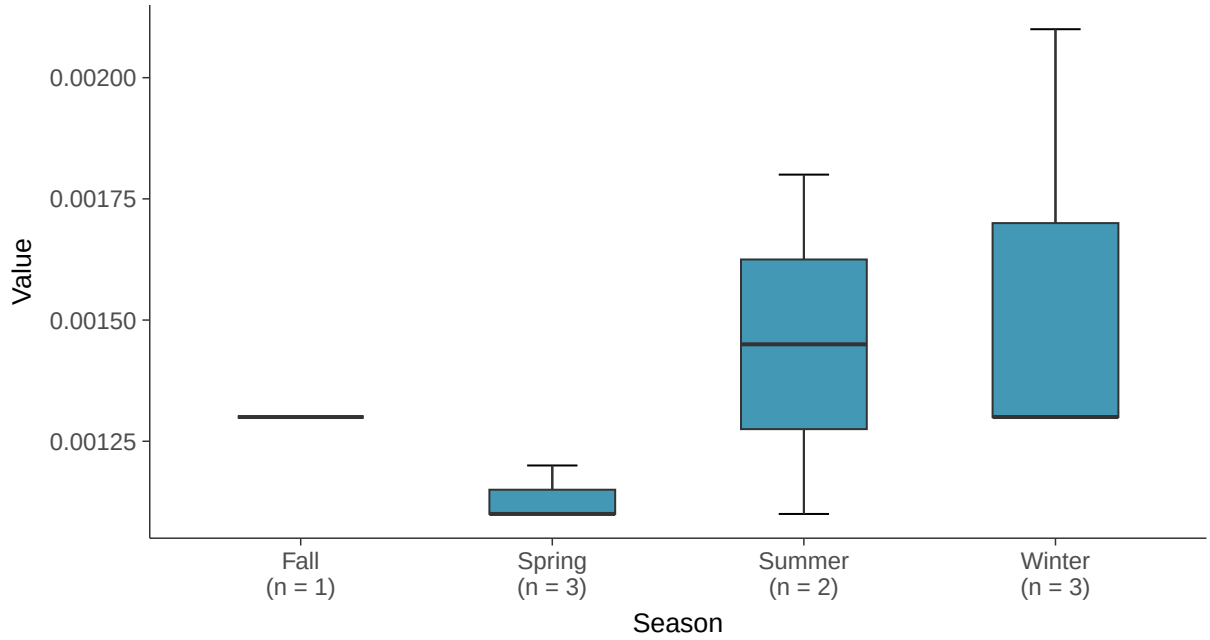
Boxplot

Molybdenum, MW-31 (mg/L)



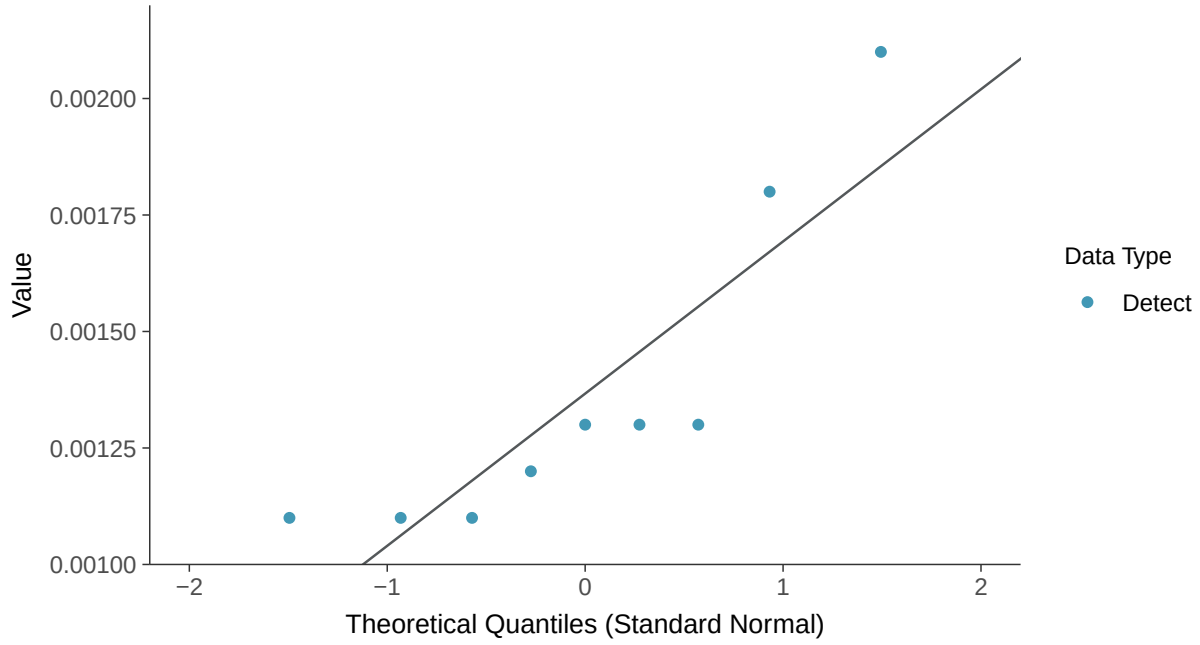
Boxplot by Season

Molybdenum, MW-31 (mg/L)



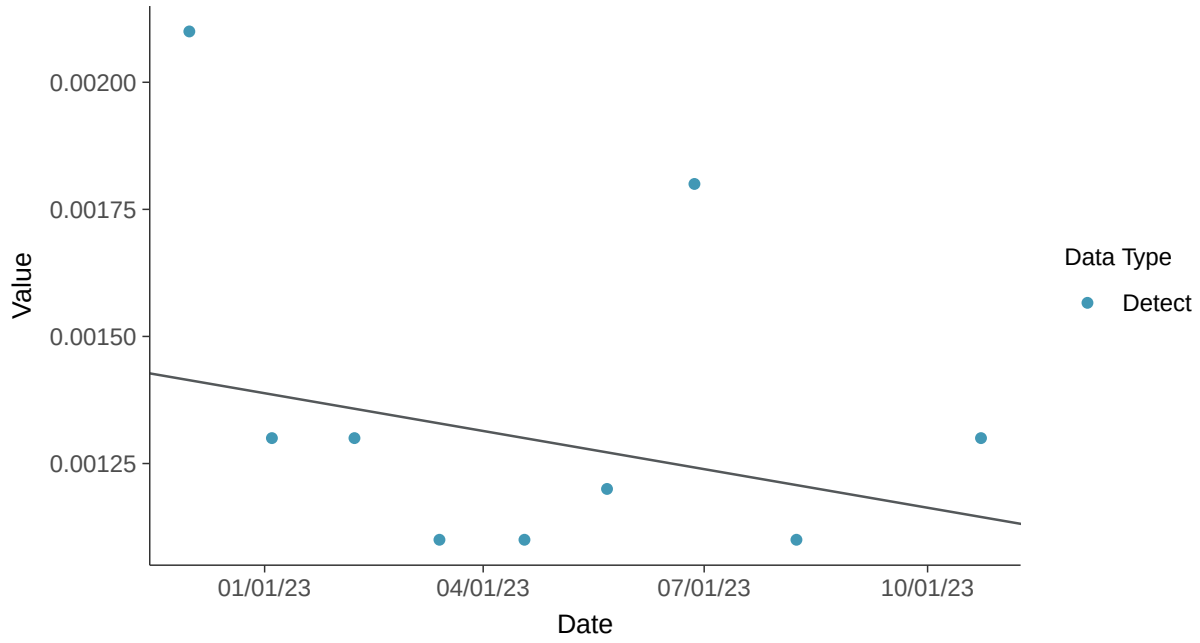
Normal Q-Q plot

Molybdenum, MW-31 (mg/L)



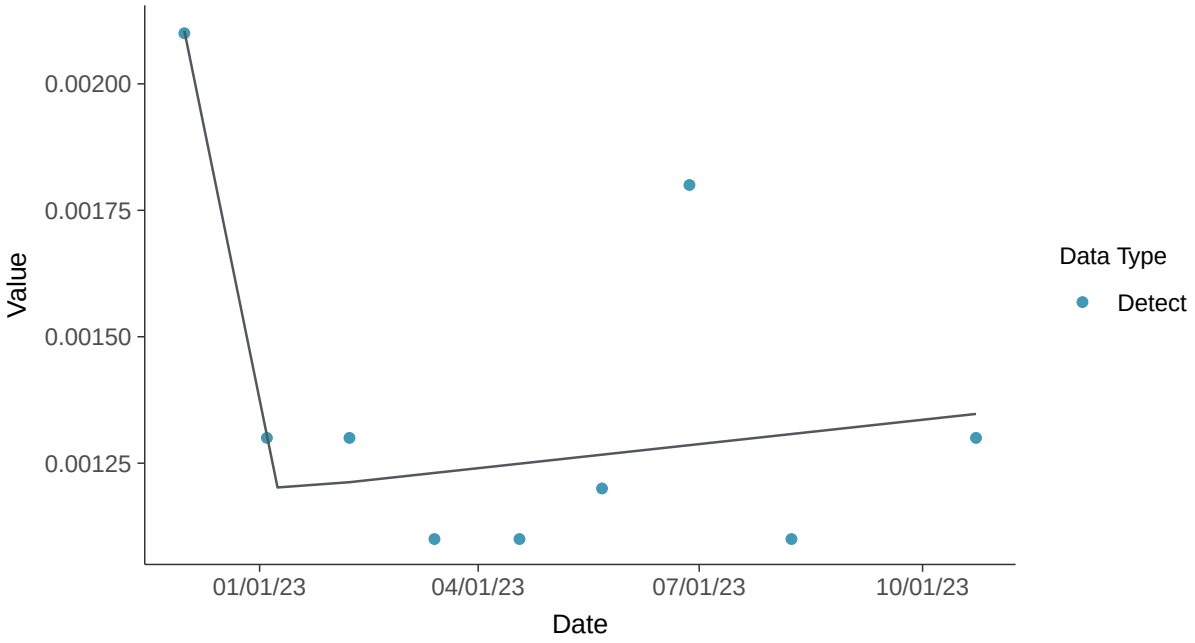
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Molybdenum, MW-31 (mg/L)



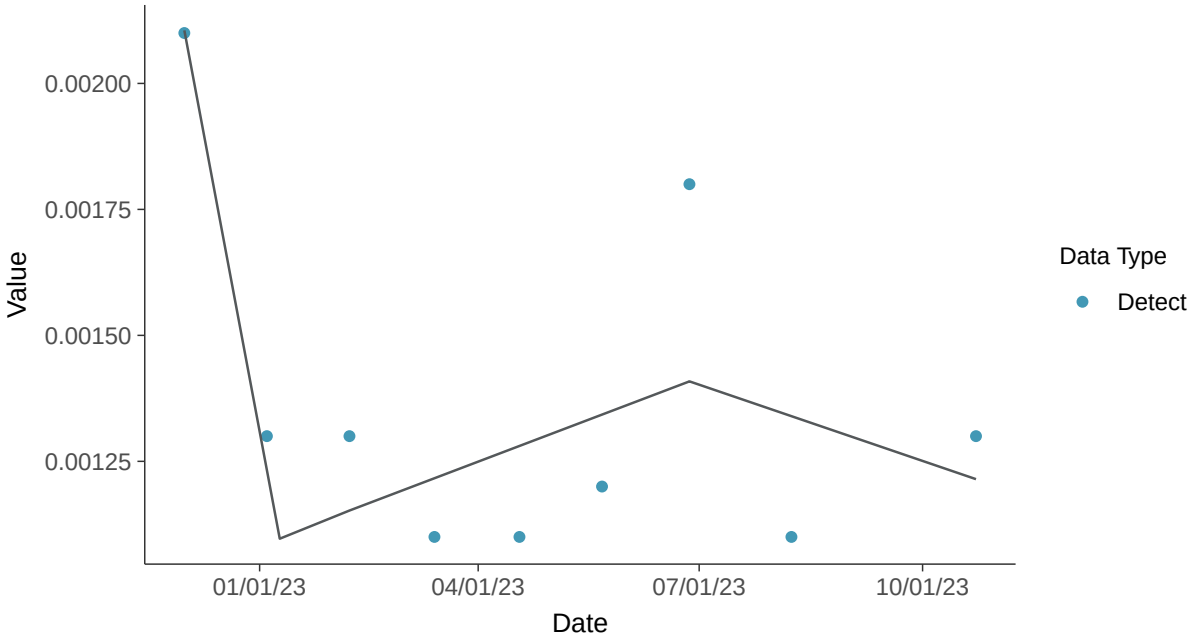
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-31 (mg/L)



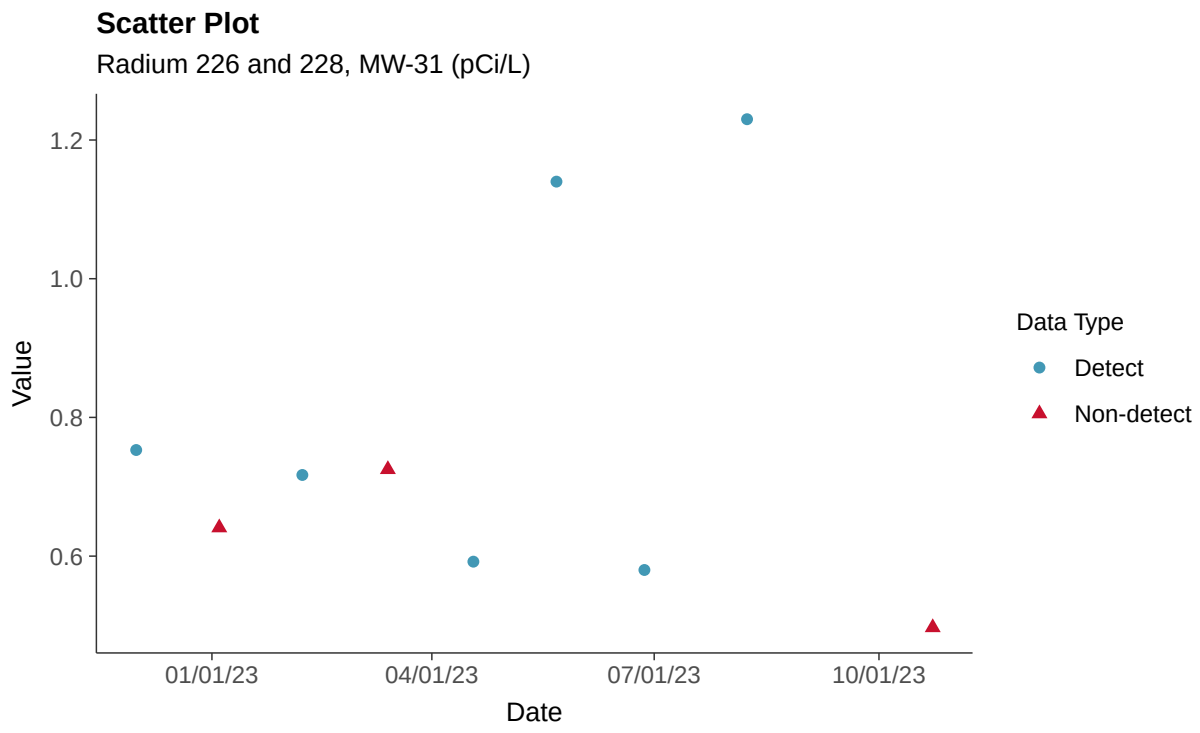
Trend Regression: Piecewise Linear-Linear-Linear

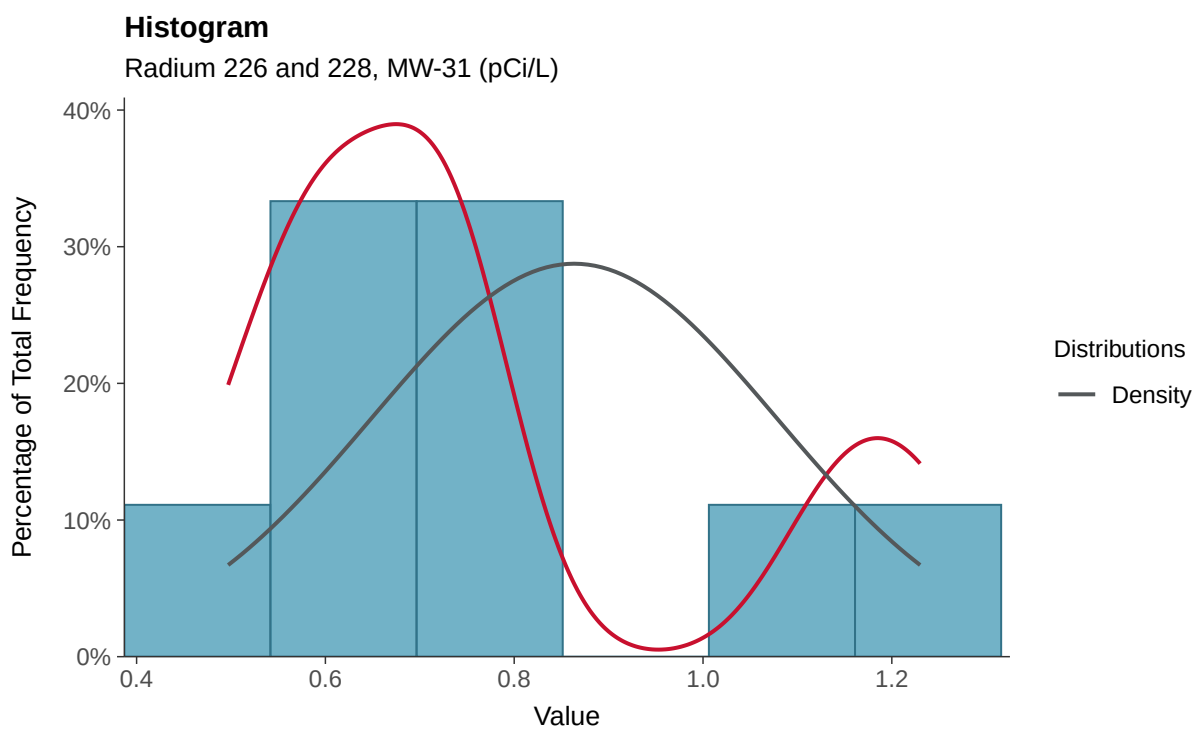
Molybdenum, MW-31 (mg/L)



Appendix IV: Radium 226 and 228, MW-31

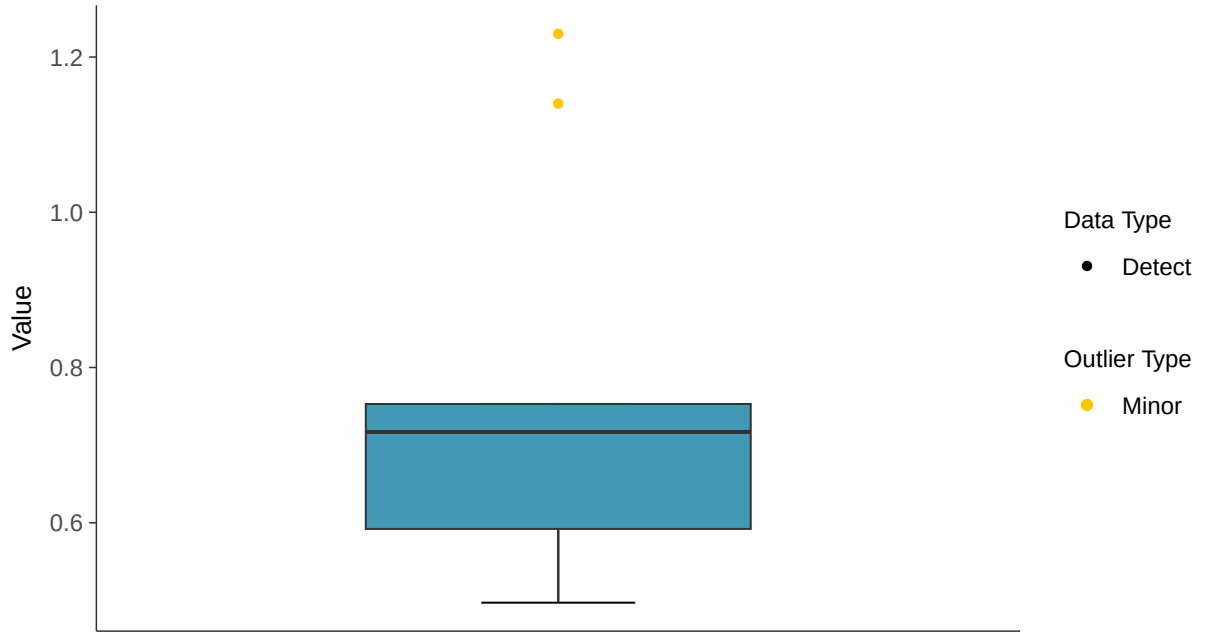
ID: 1_26_5_121





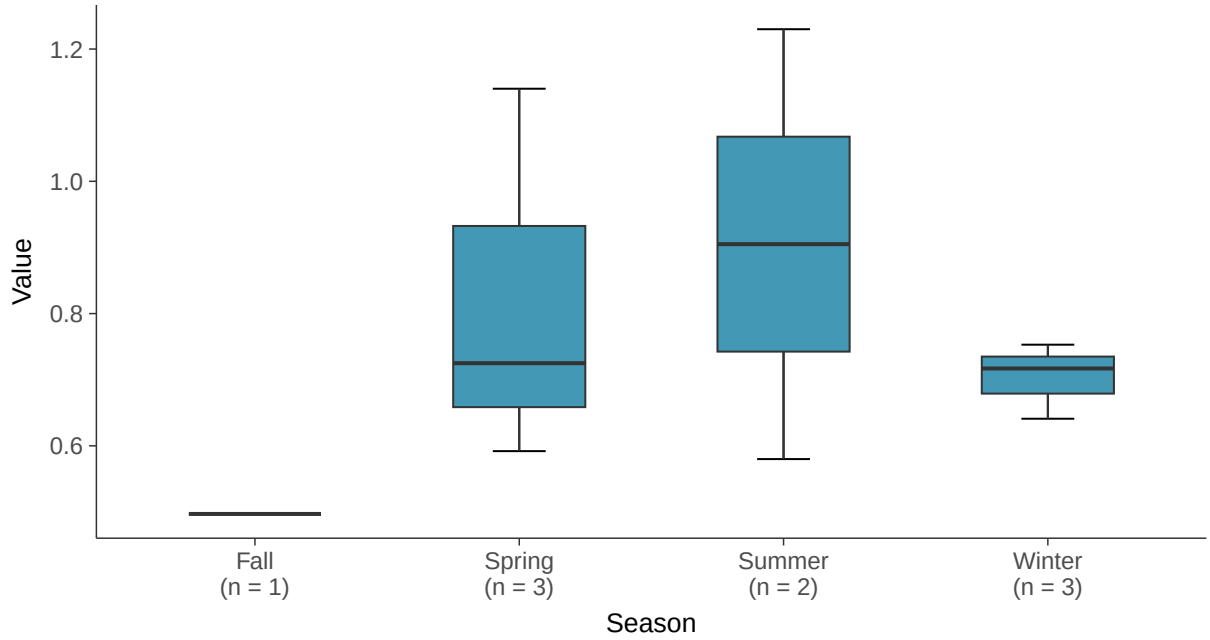
Boxplot

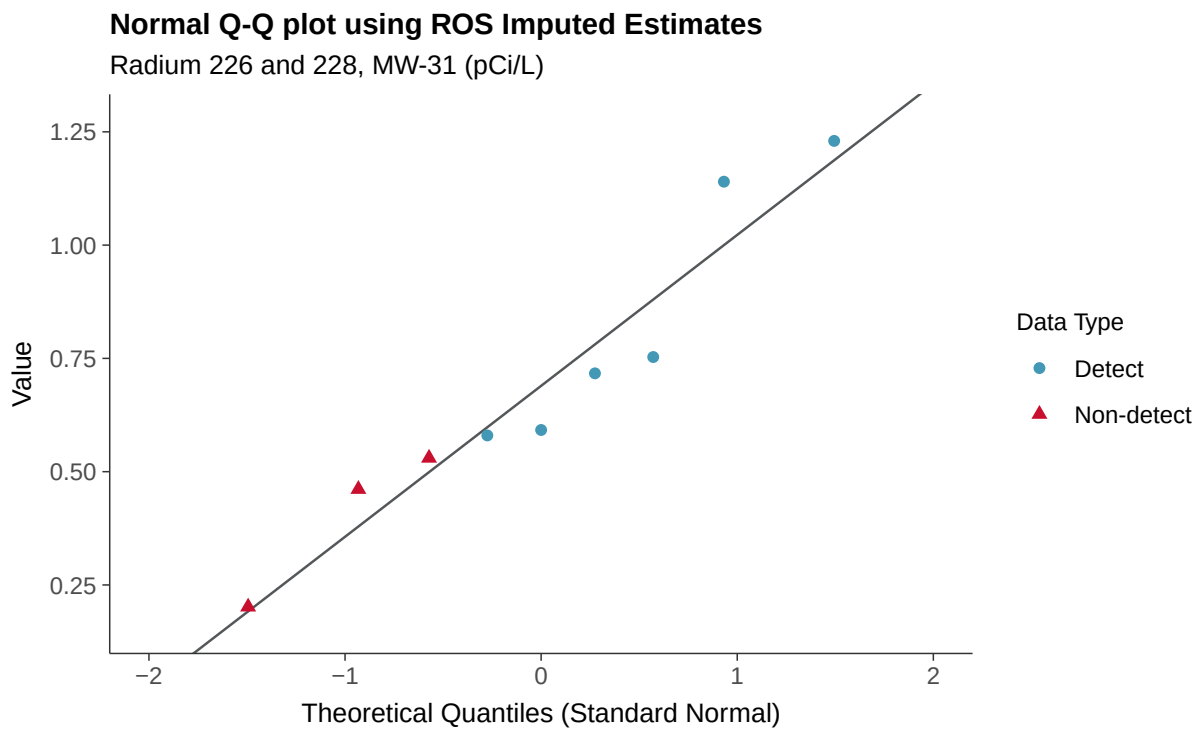
Radium 226 and 228, MW-31 (pCi/L)

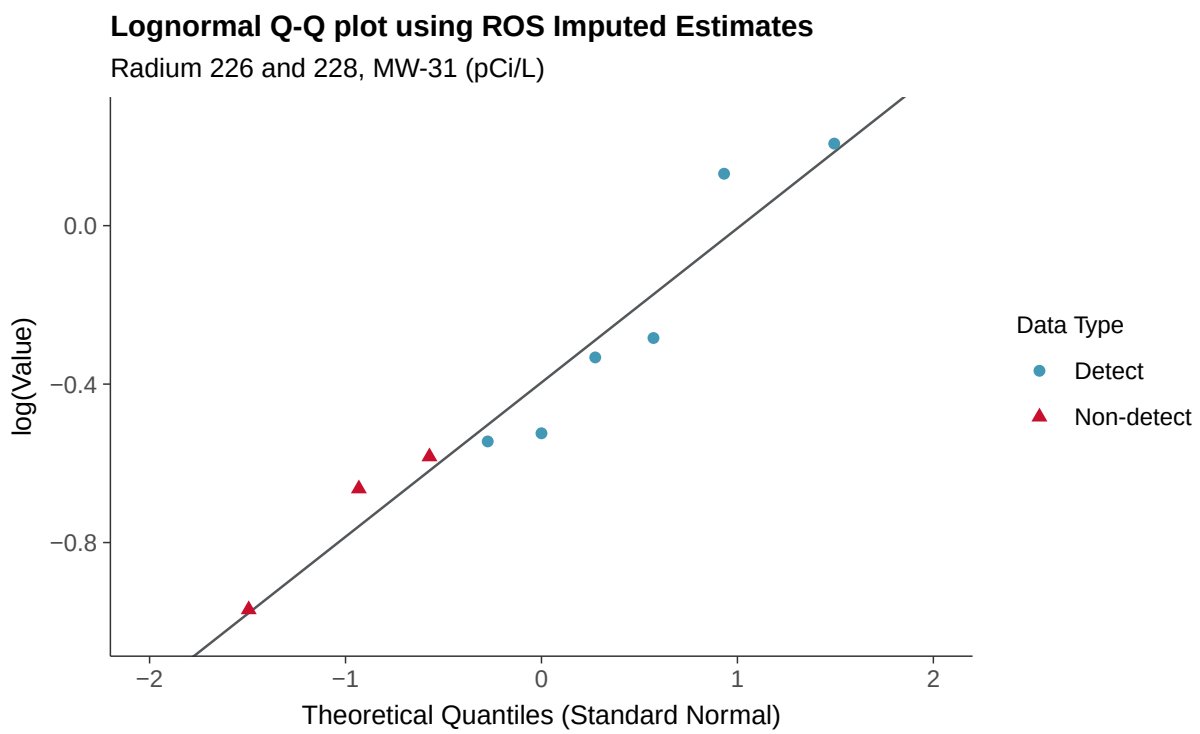


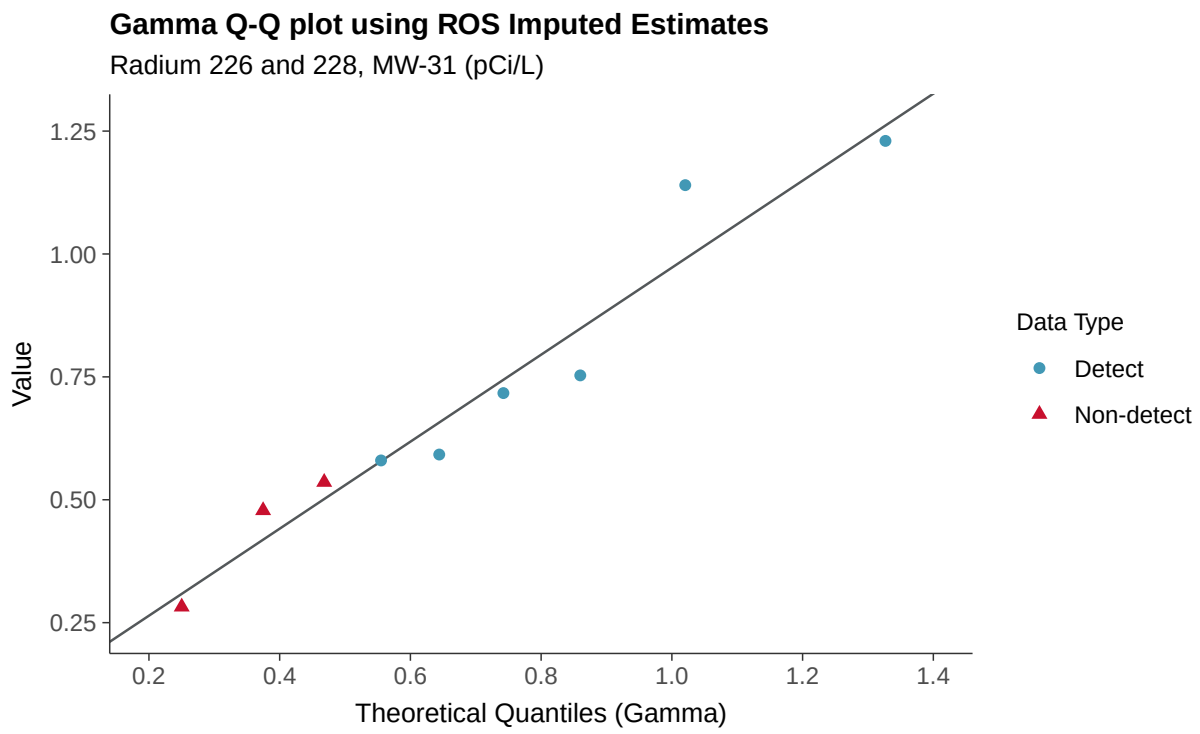
Boxplot by Season

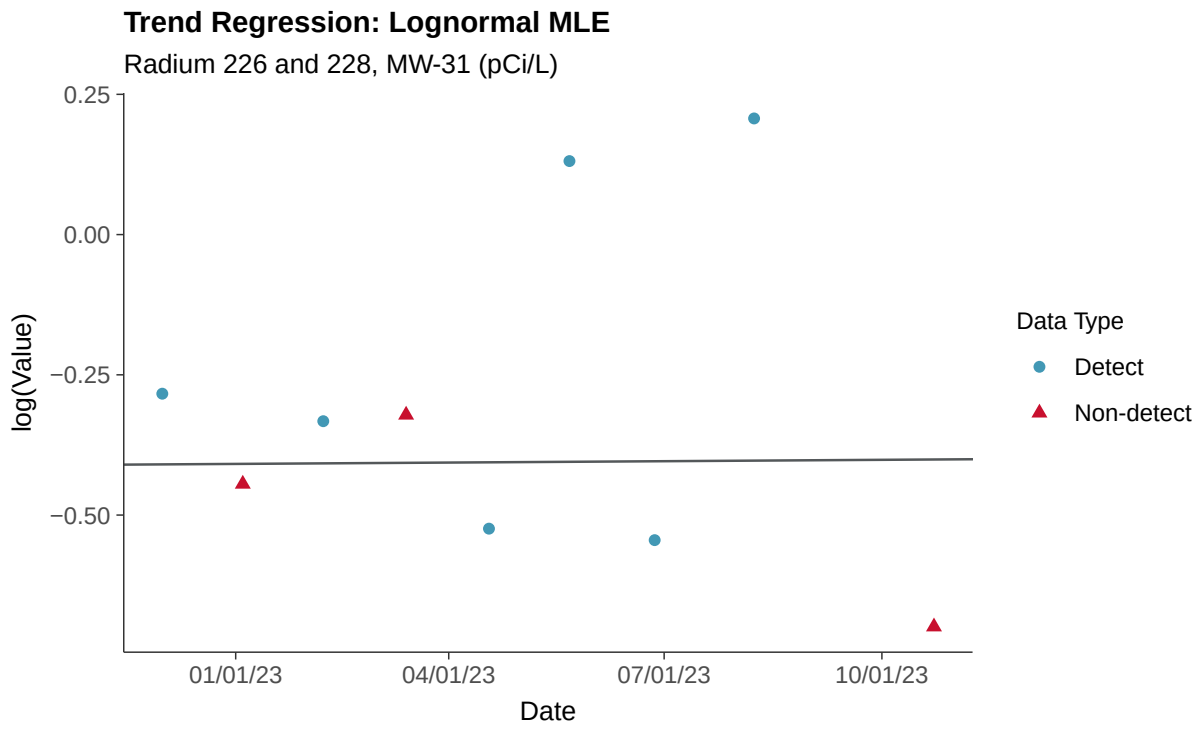
Radium 226 and 228, MW-31 (pCi/L)




Normal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-31 (pCi/L)
Value
1.25
1.00
0.75
0.50
0.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

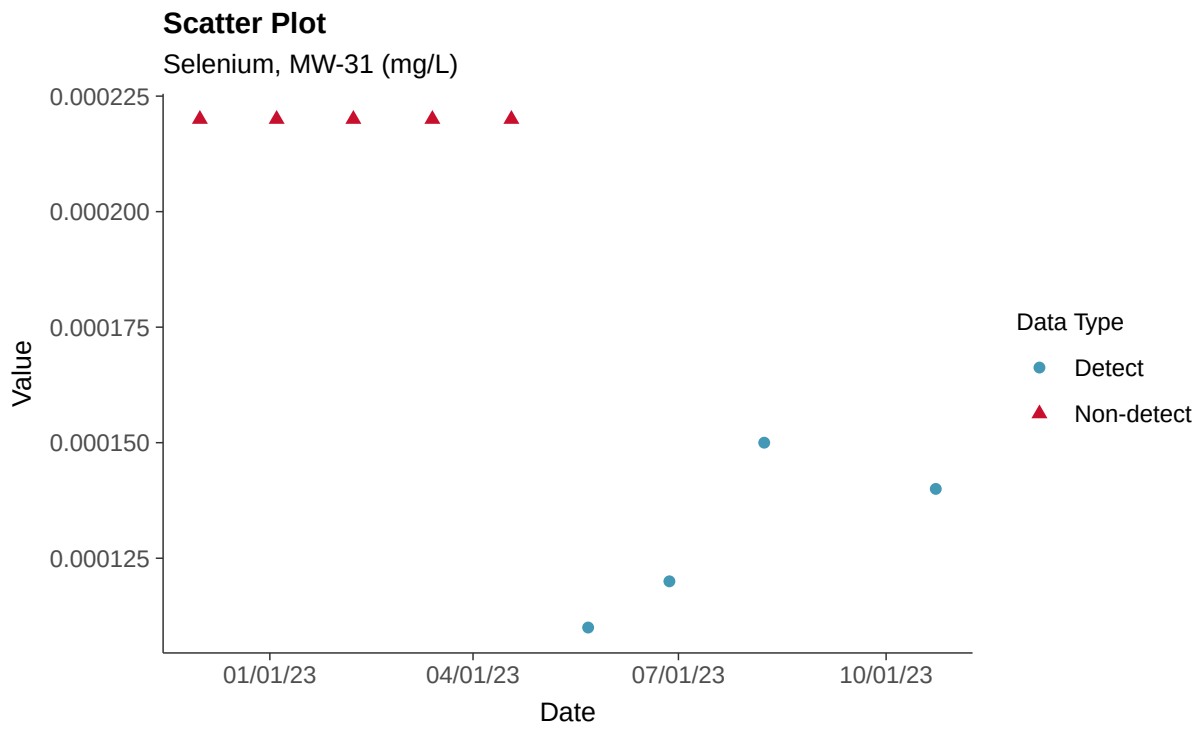

Lognormal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-31 (pCi/L)
log(Value)
0.0
−0.4
−0.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

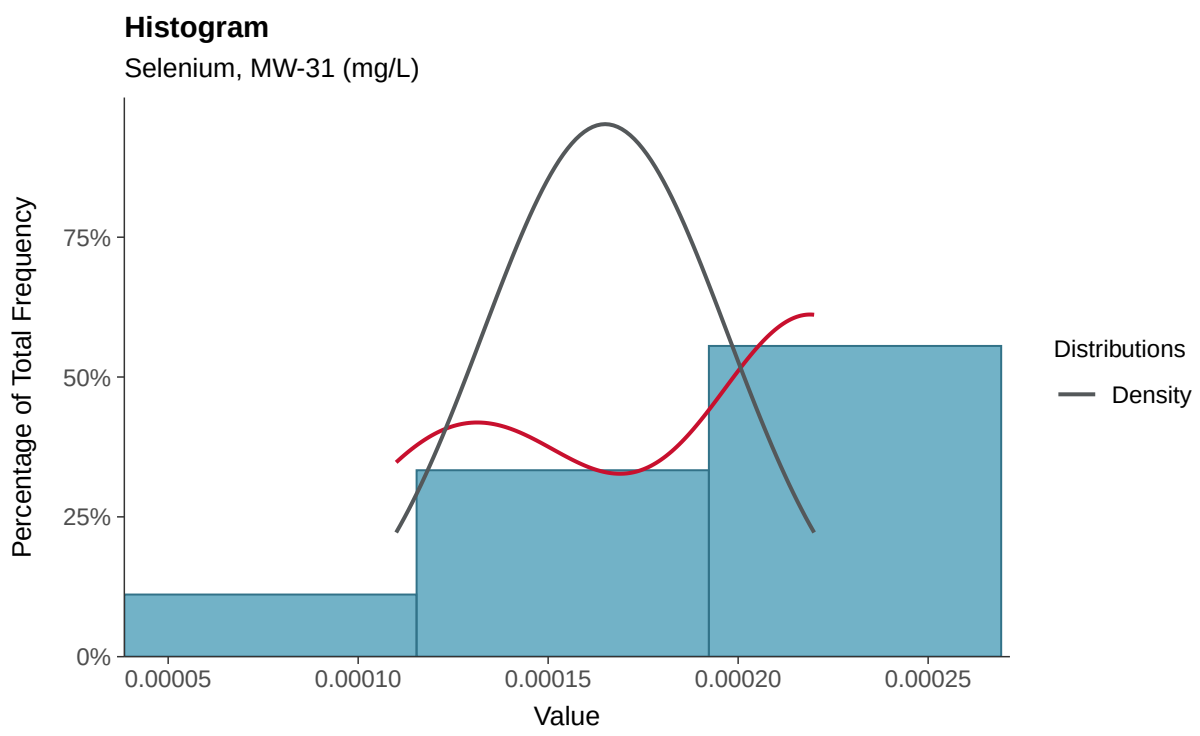

Gamma Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-31 (pCi/L)
Value
1.25
1.00
0.75
0.50
0.25
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

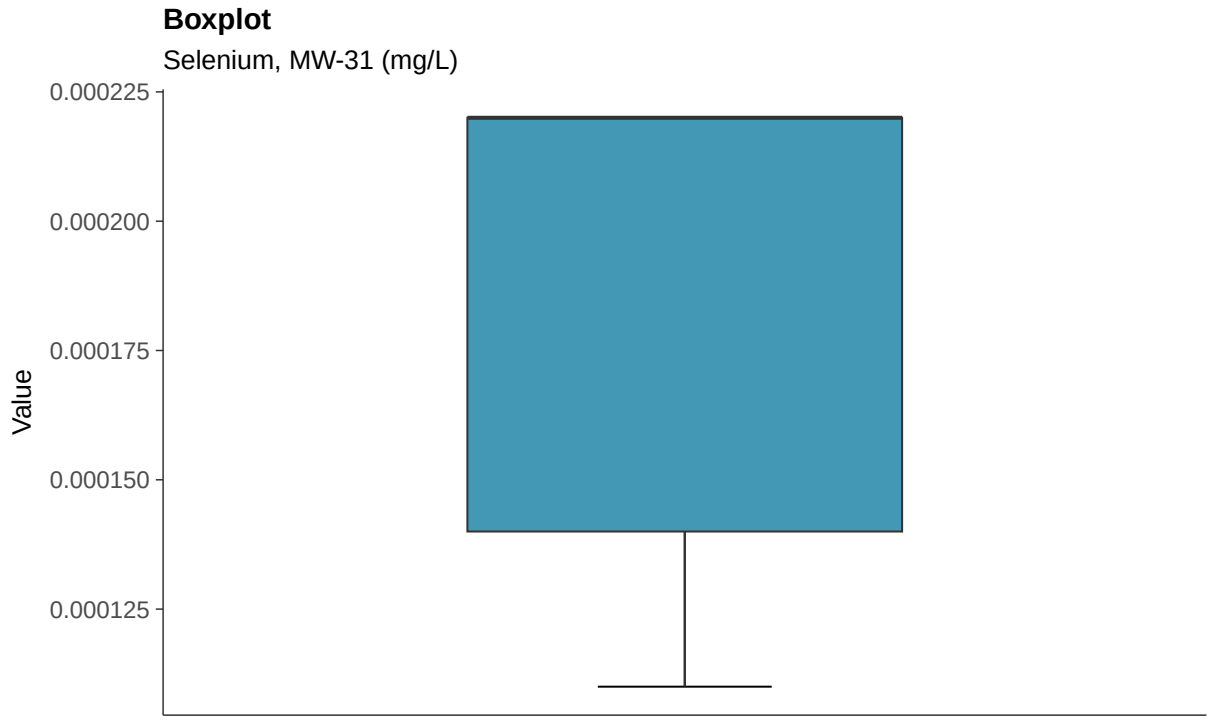

Trend Regression: Lognormal MLE
Radium 226 and 228, MW-31 (pCi/L)
log(Value)
0.25
0.00
−0.25
−0.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

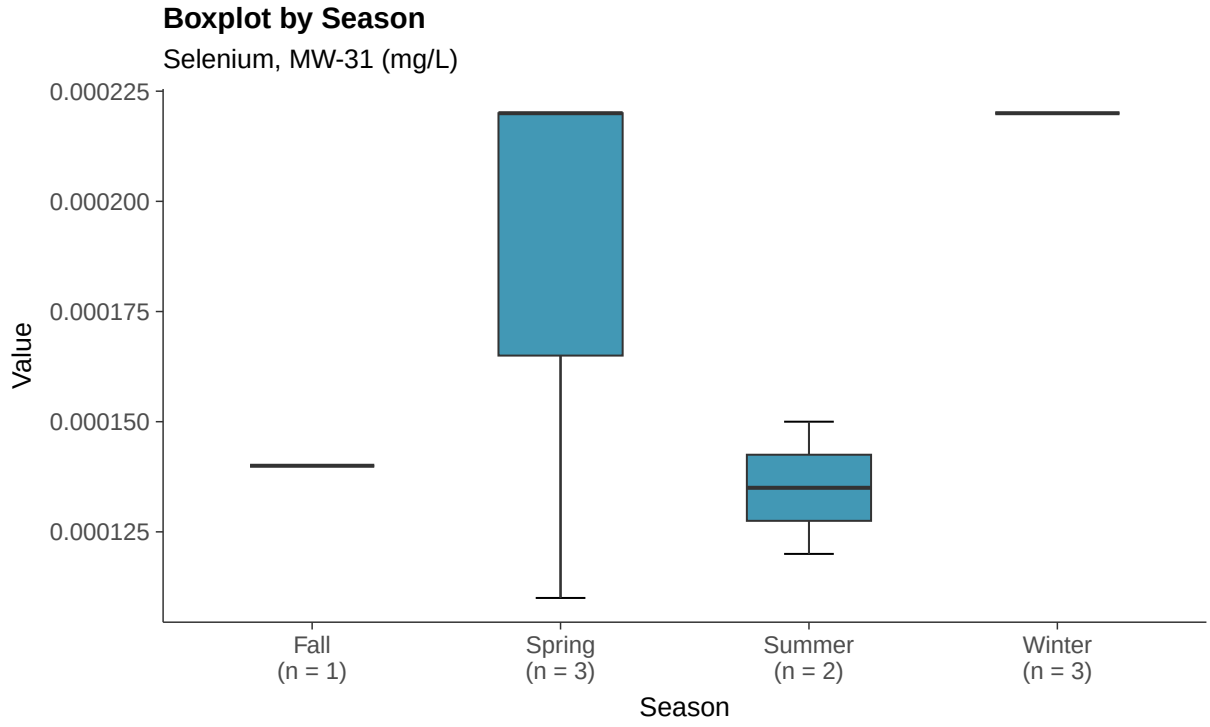
Appendix IV: Selenium, MW-31

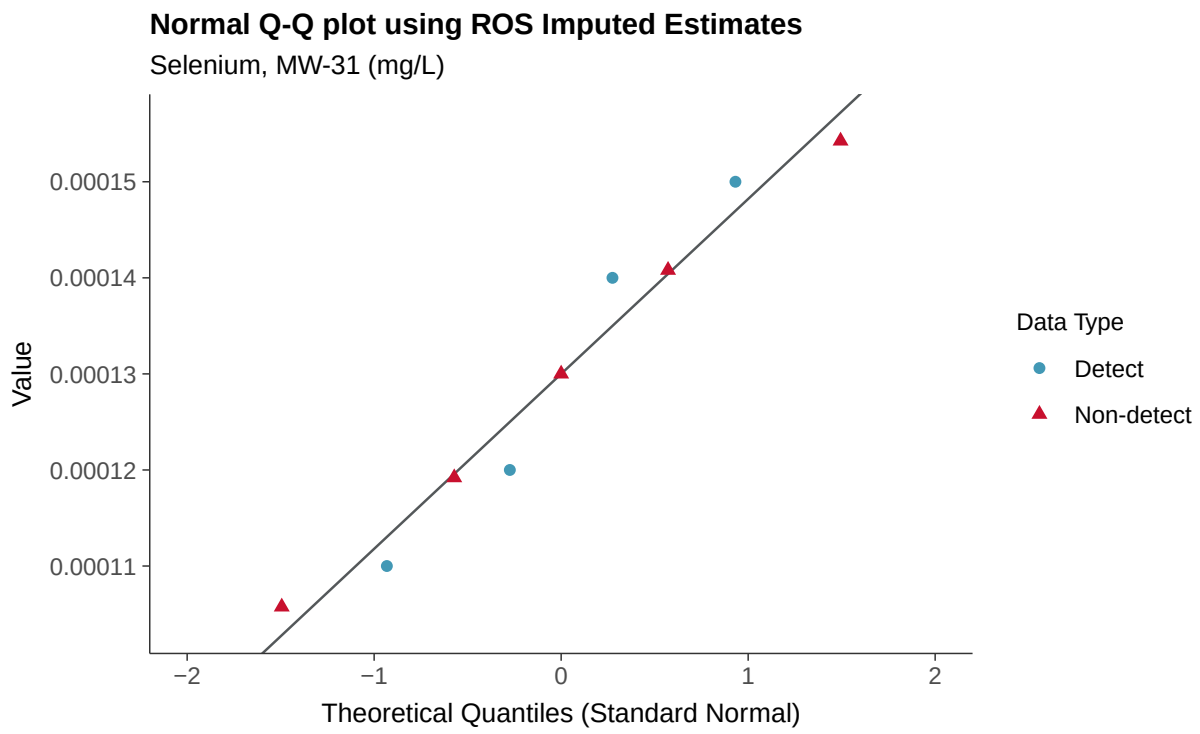
ID: 1_26_5_122

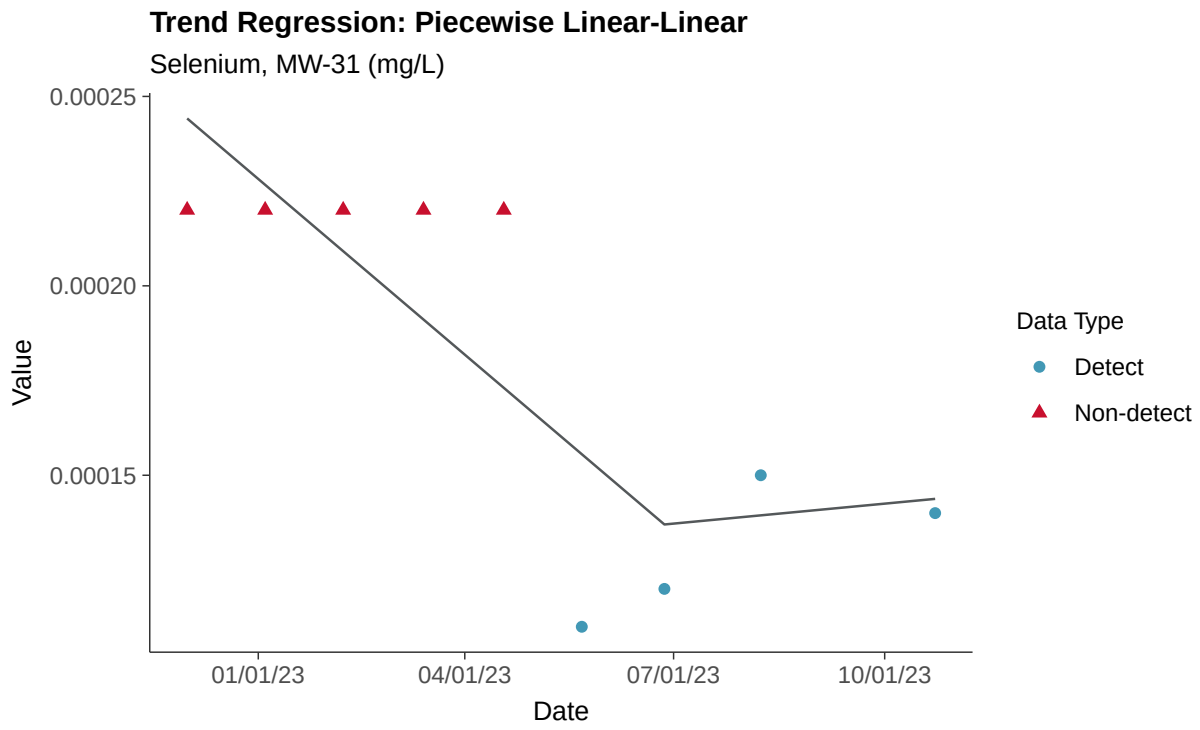


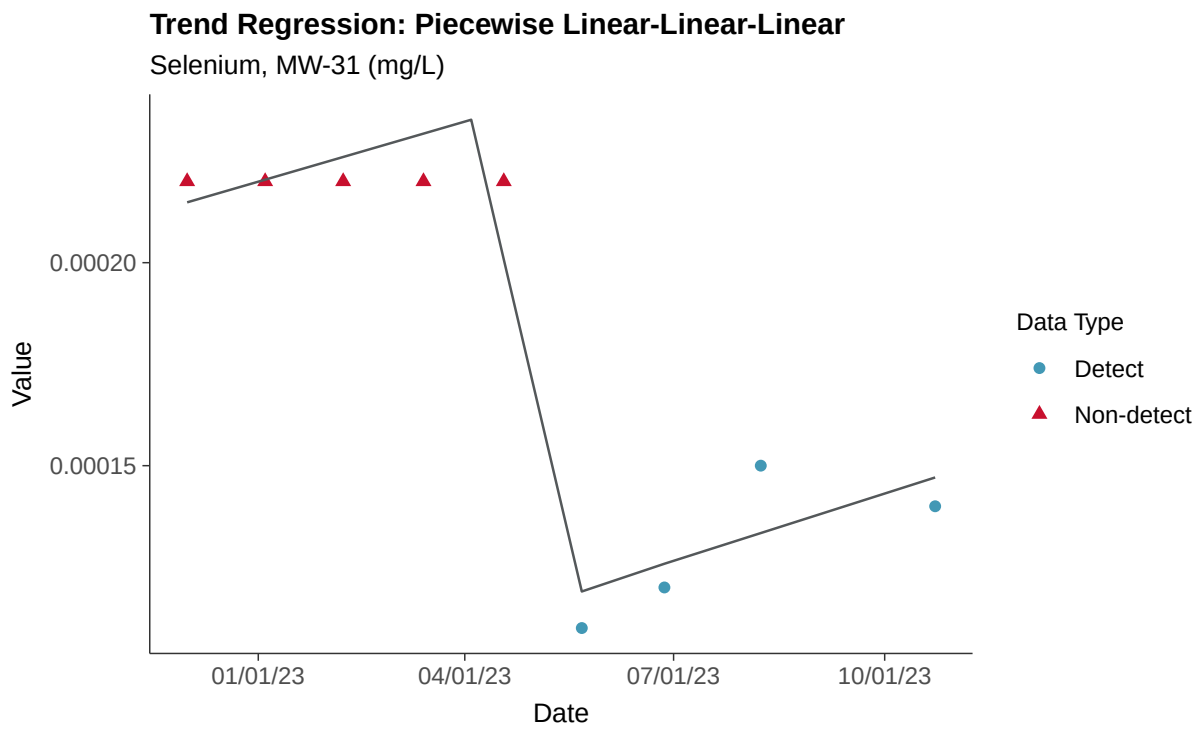



Boxplot
Selenium, MW-31 (mg/L)
0.000225
0.000200
0.000175
0.000150
0.000125
Value


Boxplot by Season
Selenium, MW-31 (mg/L)
0.000225
0.000200
0.000175
0.000150
0.000125
Value
Fall
(n = 1)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 3)
Season

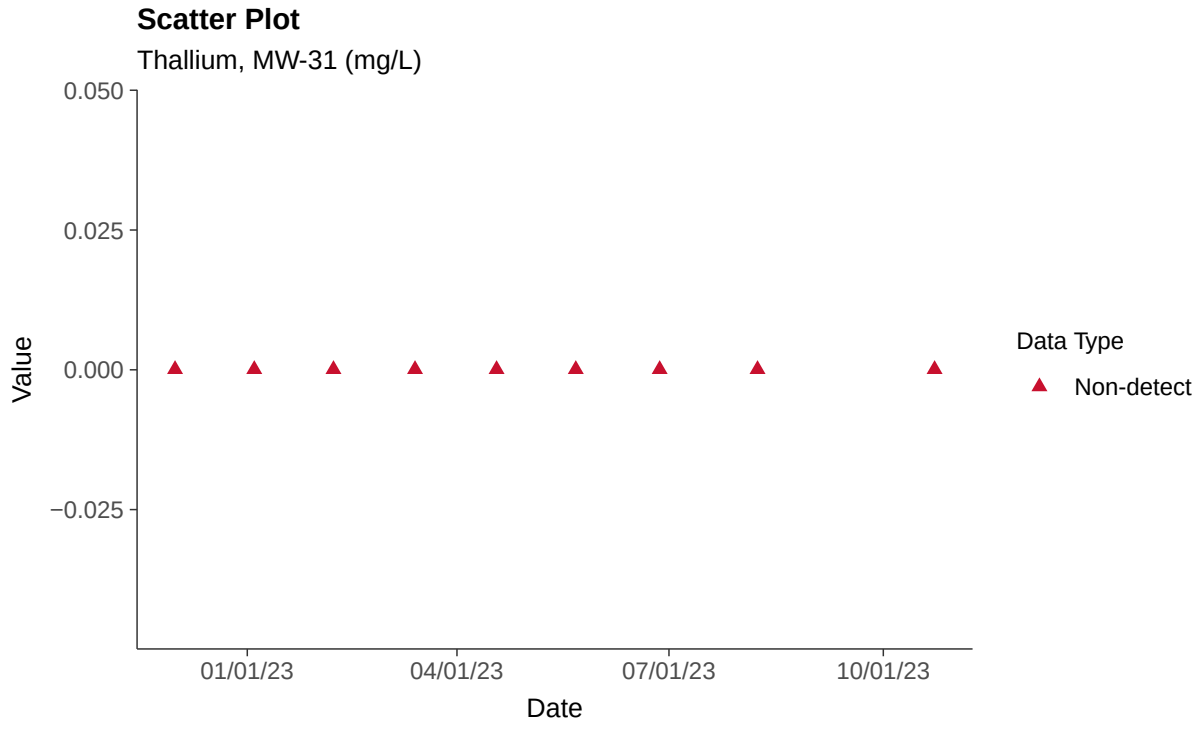

Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-31 (mg/L)
Value
0.00015
0.00014
0.00013
0.00012
0.00011
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

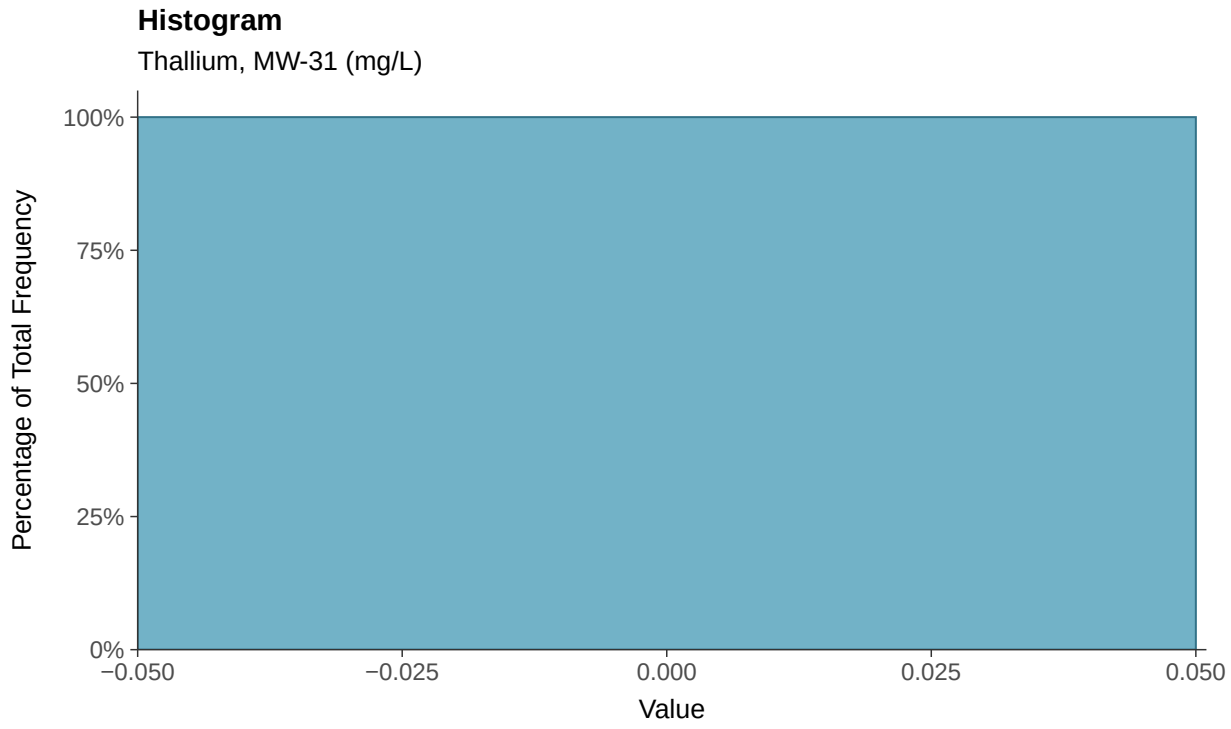

Trend Regression: Piecewise Linear-Linear
Selenium, MW-31 (mg/L)
Value
0.00025
0.00020
0.00015
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

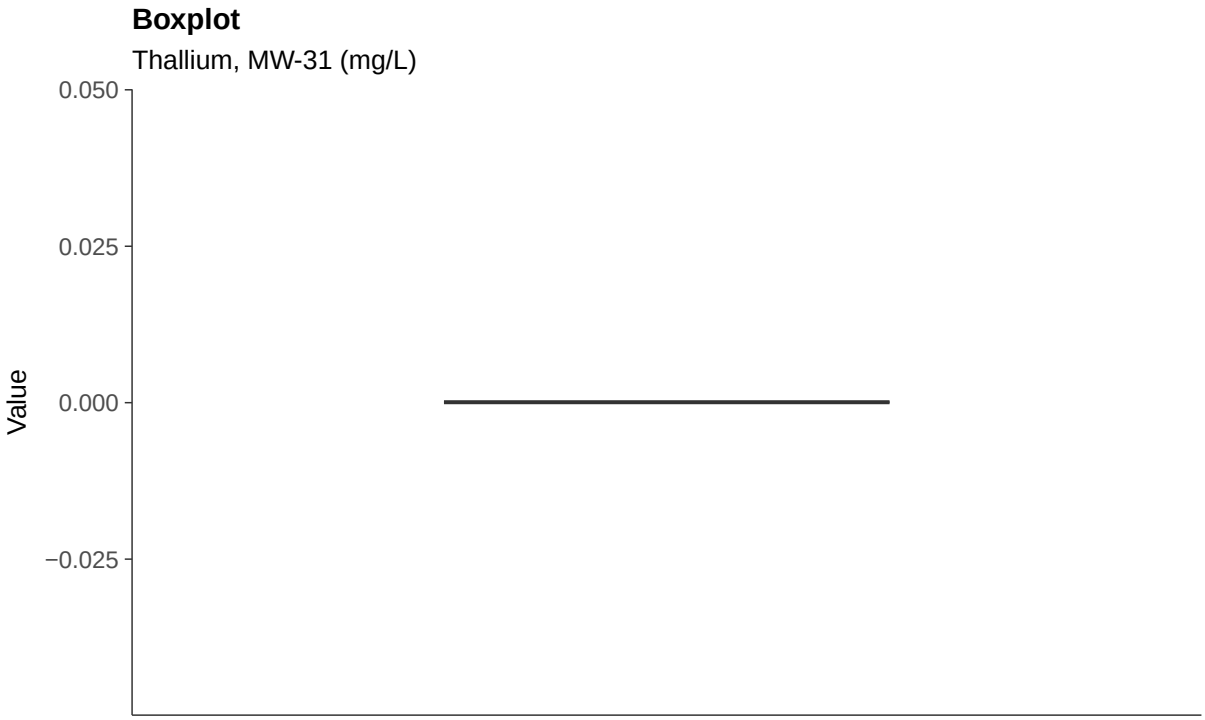

Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-31 (mg/L)
Value
0.00020
0.00015
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

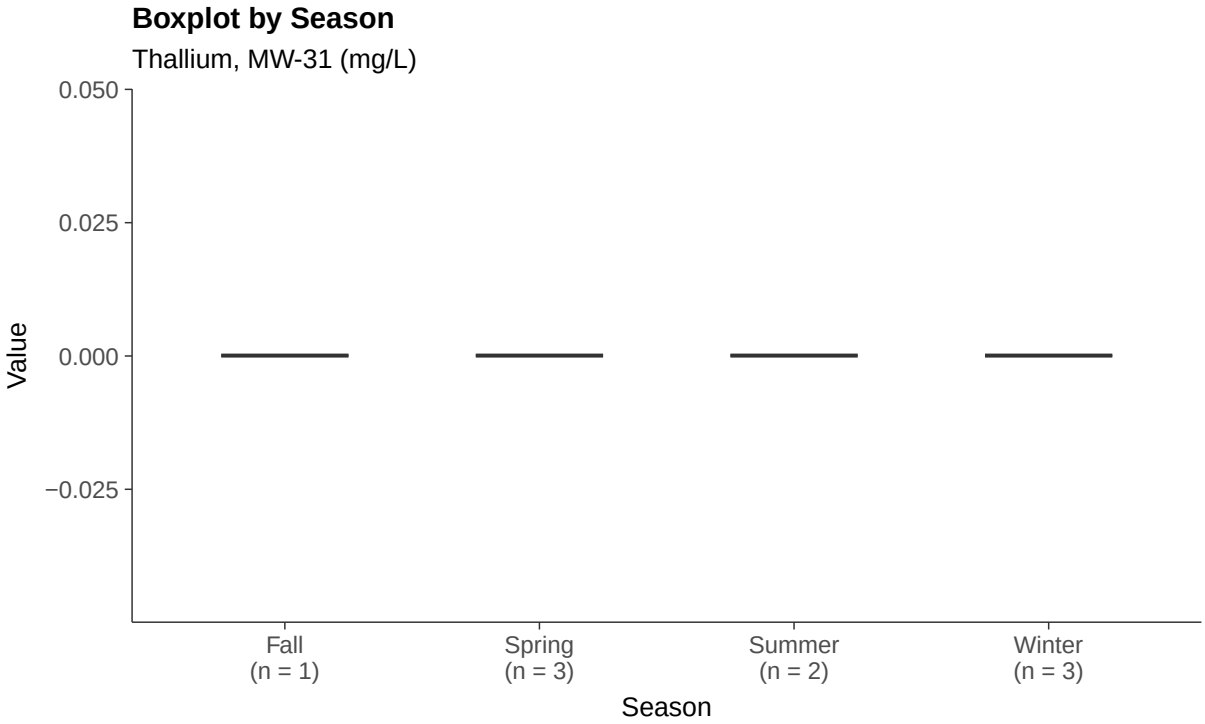
Appendix IV: Thallium, MW-31

ID: 1_26_5_125



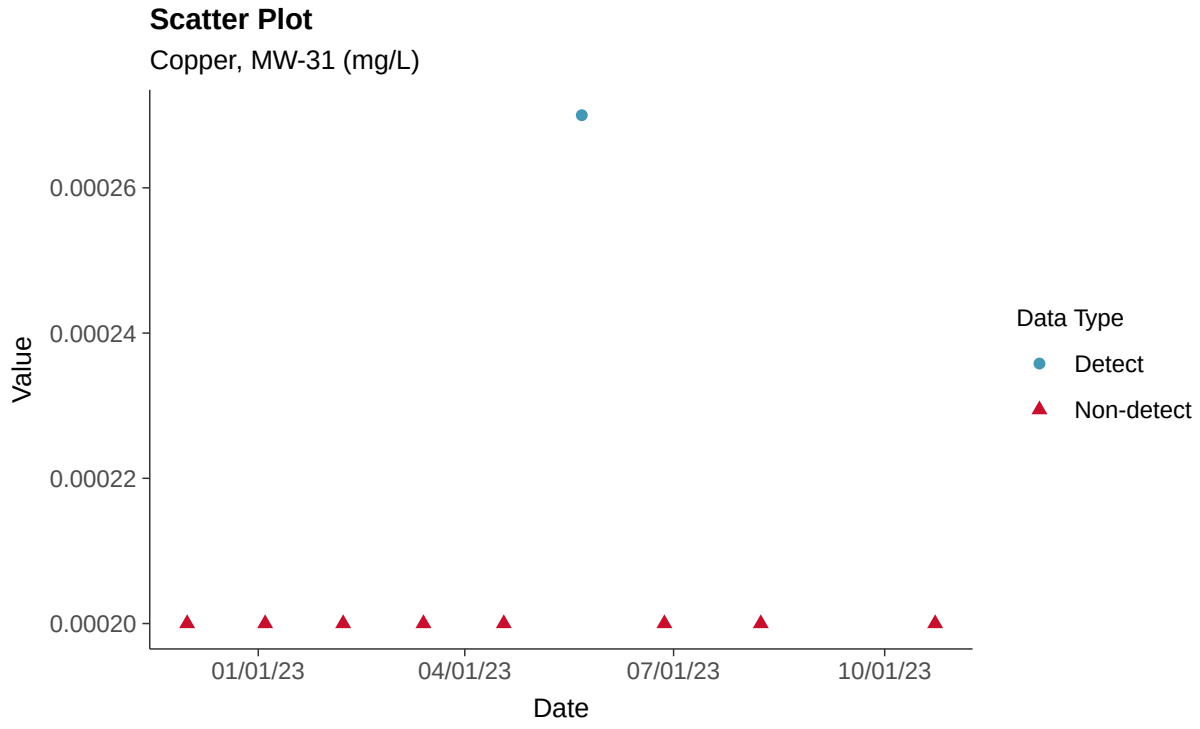


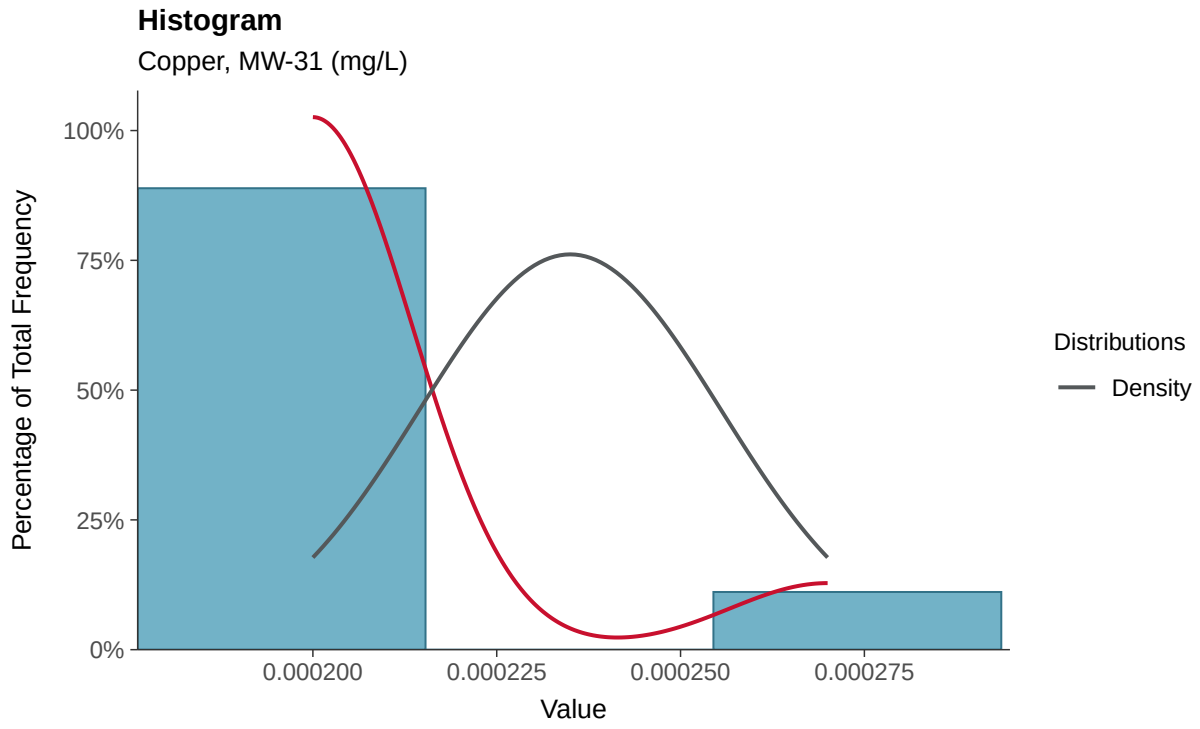

Boxplot
Thallium, MW-31 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Thallium, MW-31 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 1)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 3)
Season

Part 115: Copper, MW-31

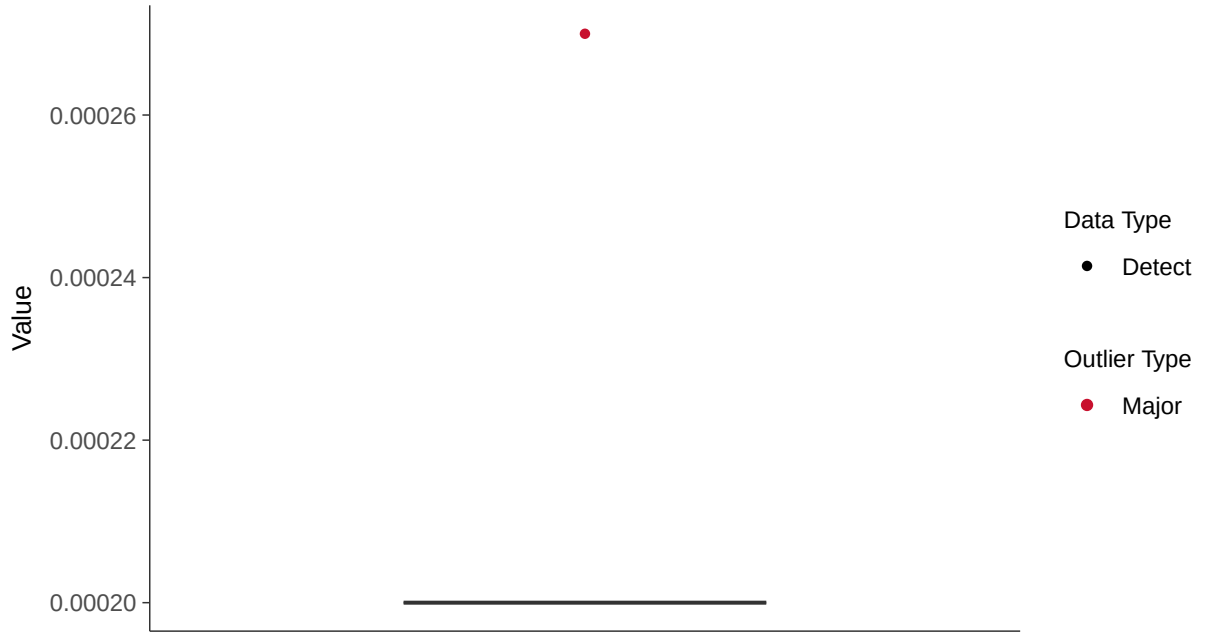
ID: 1_26_6_111





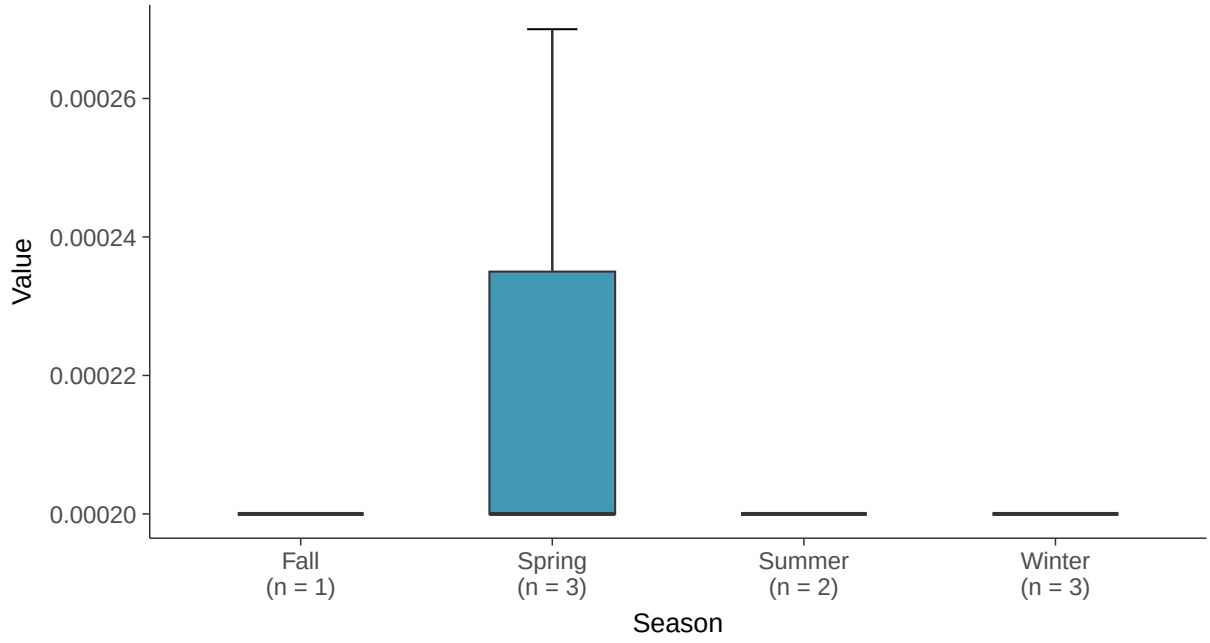
Boxplot

Copper, MW-31 (mg/L)



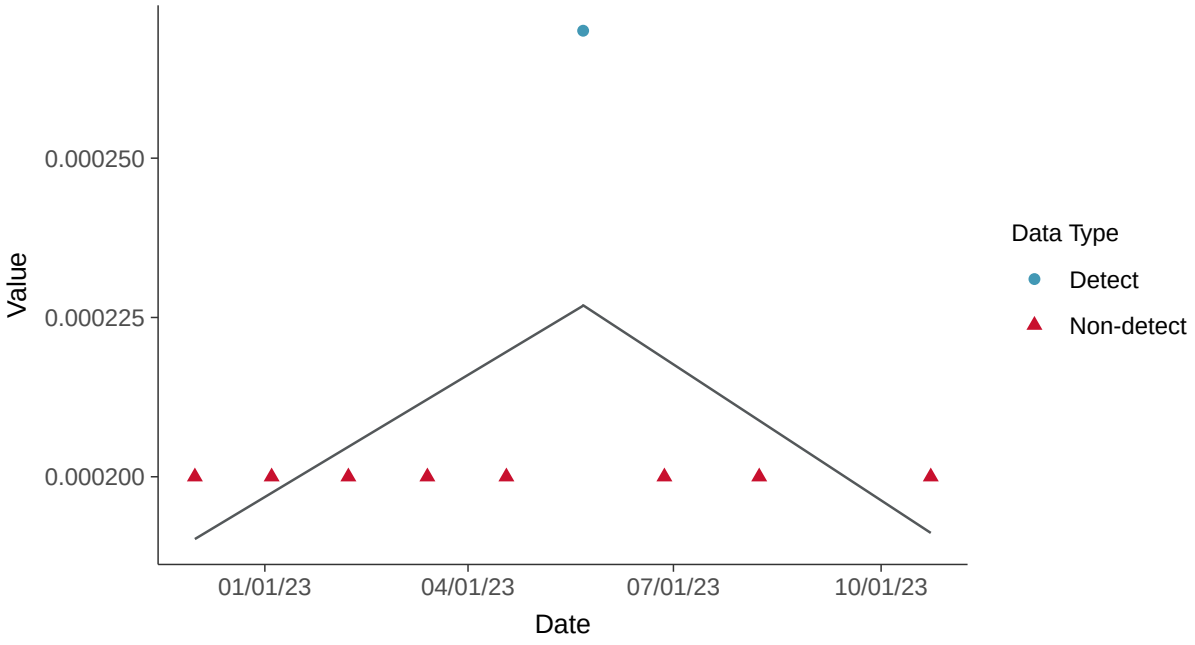
Boxplot by Season

Copper, MW-31 (mg/L)



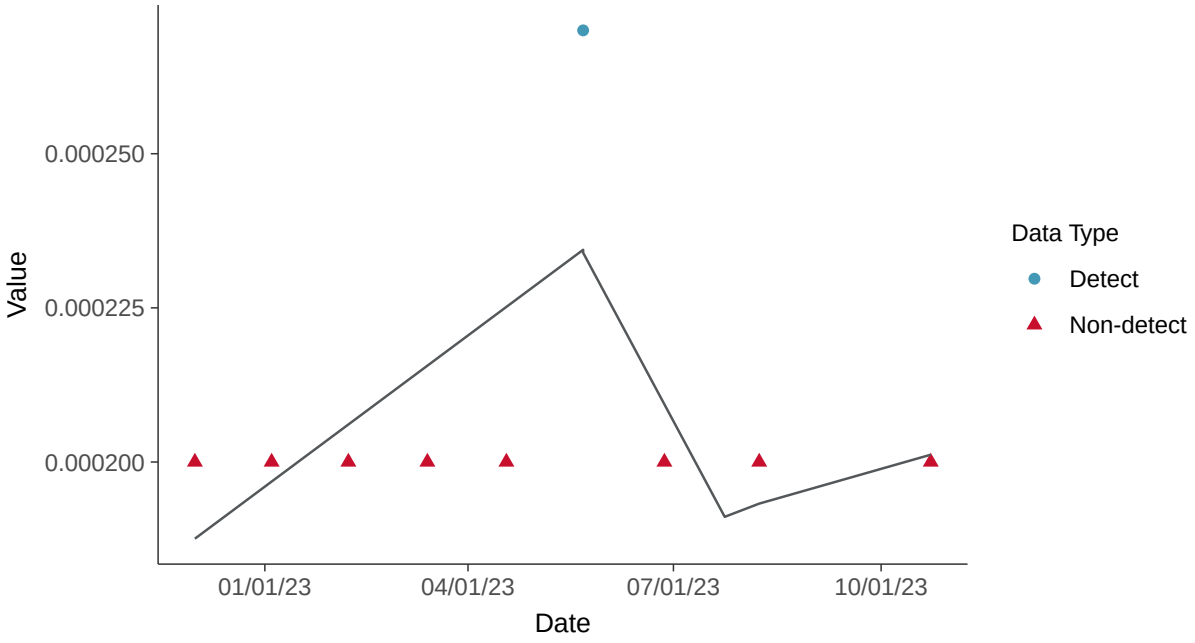
Trend Regression: Piecewise Linear-Linear

Copper, MW-31 (mg/L)



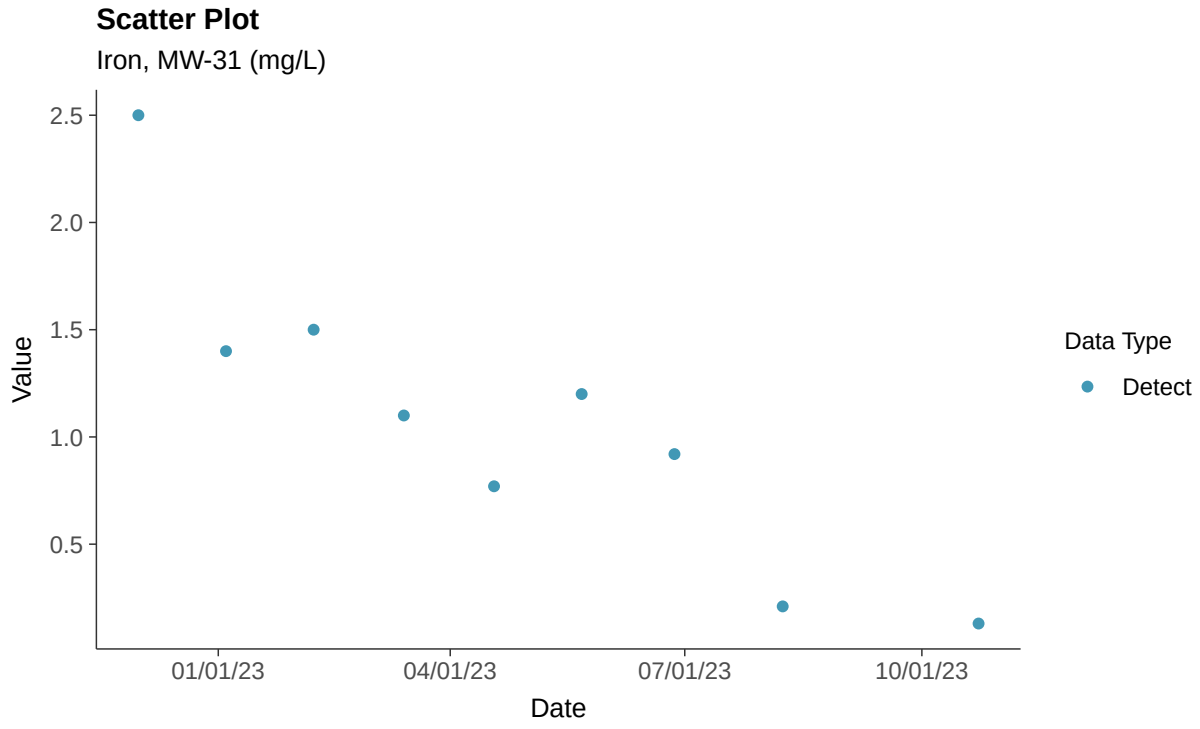
Trend Regression: Piecewise Linear-Linear-Linear

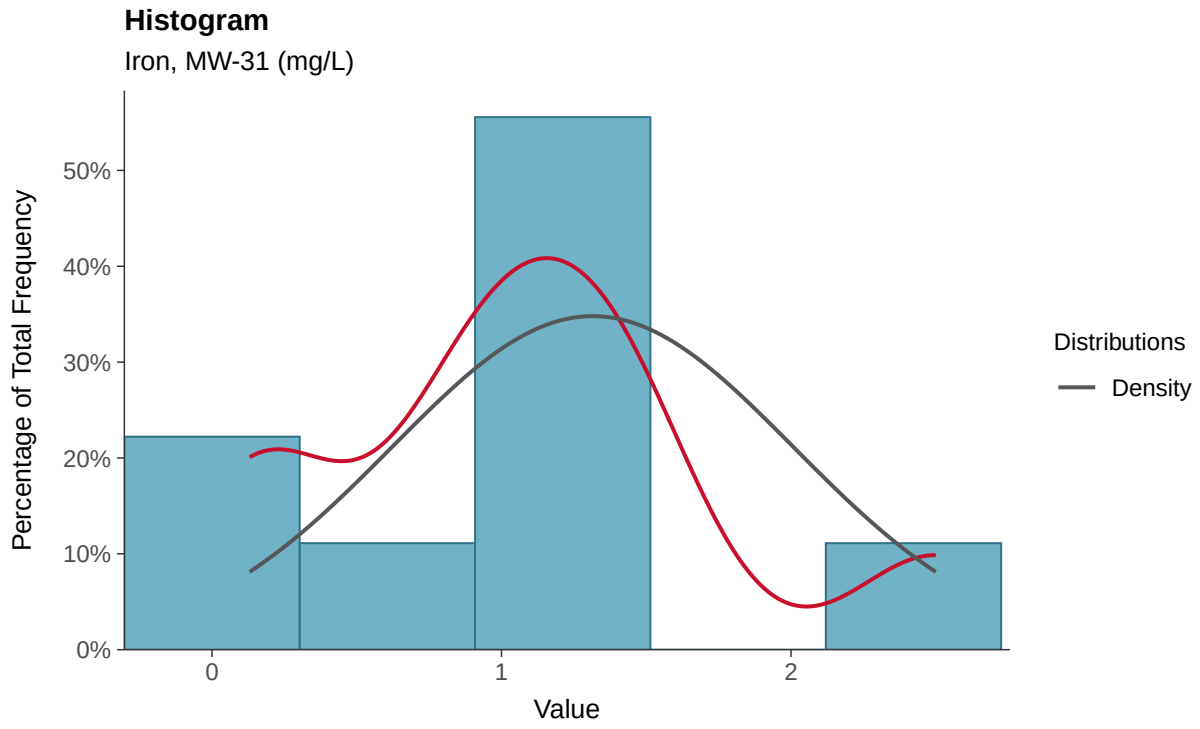
Copper, MW-31 (mg/L)



Part 115: Iron, MW-31

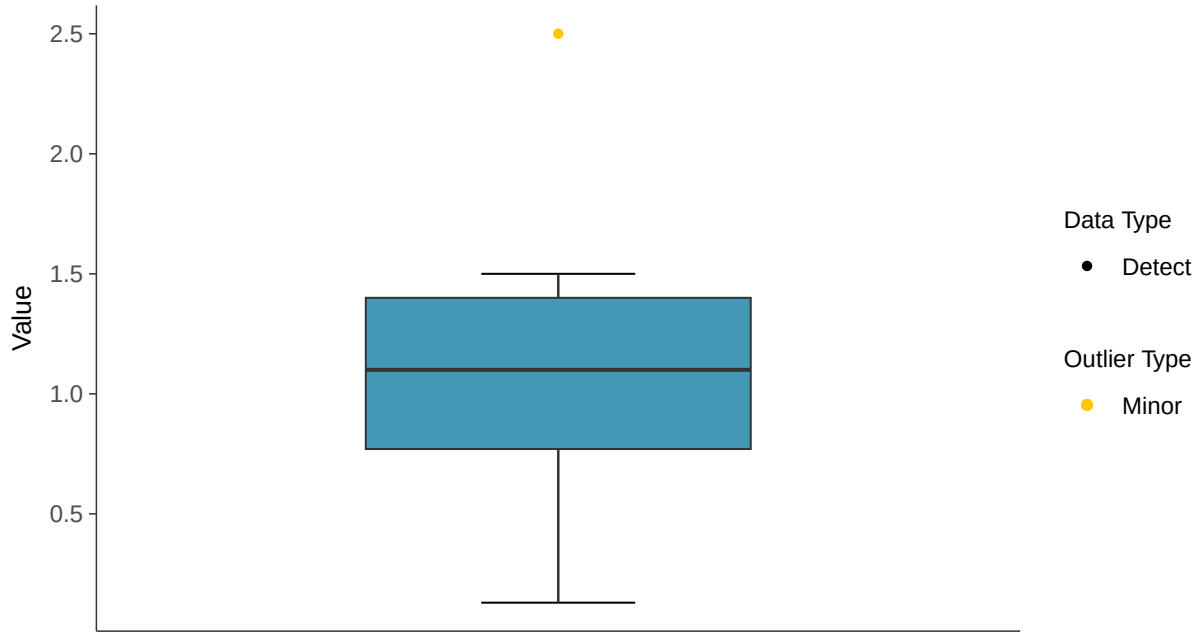
ID: 1_26_6_114





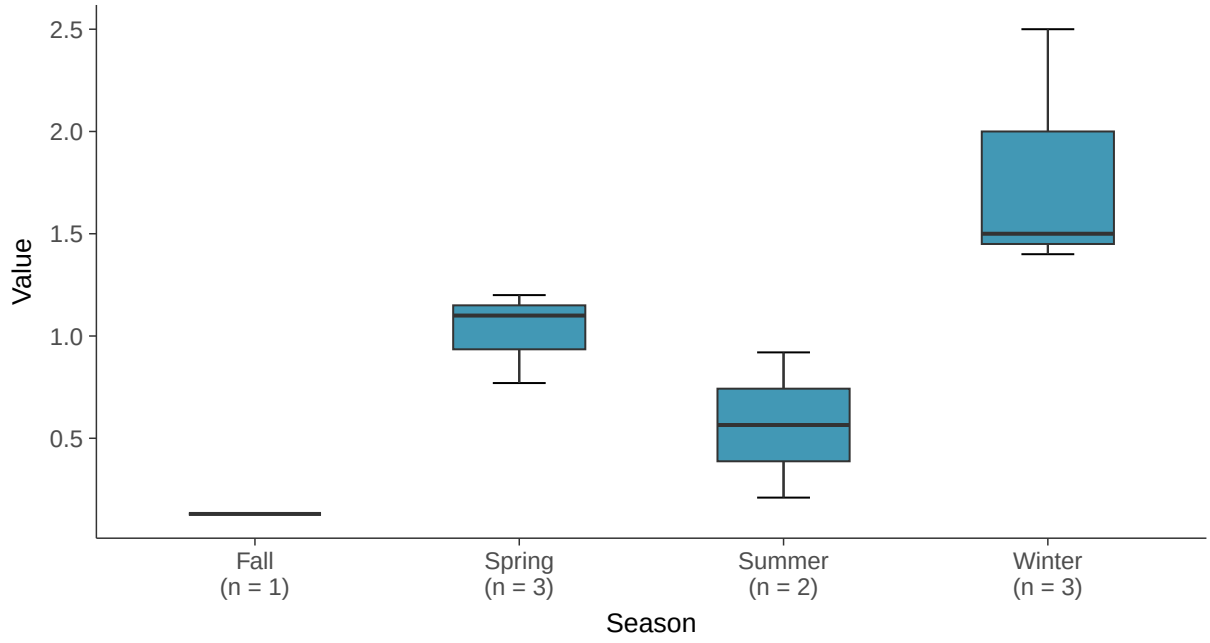
Boxplot

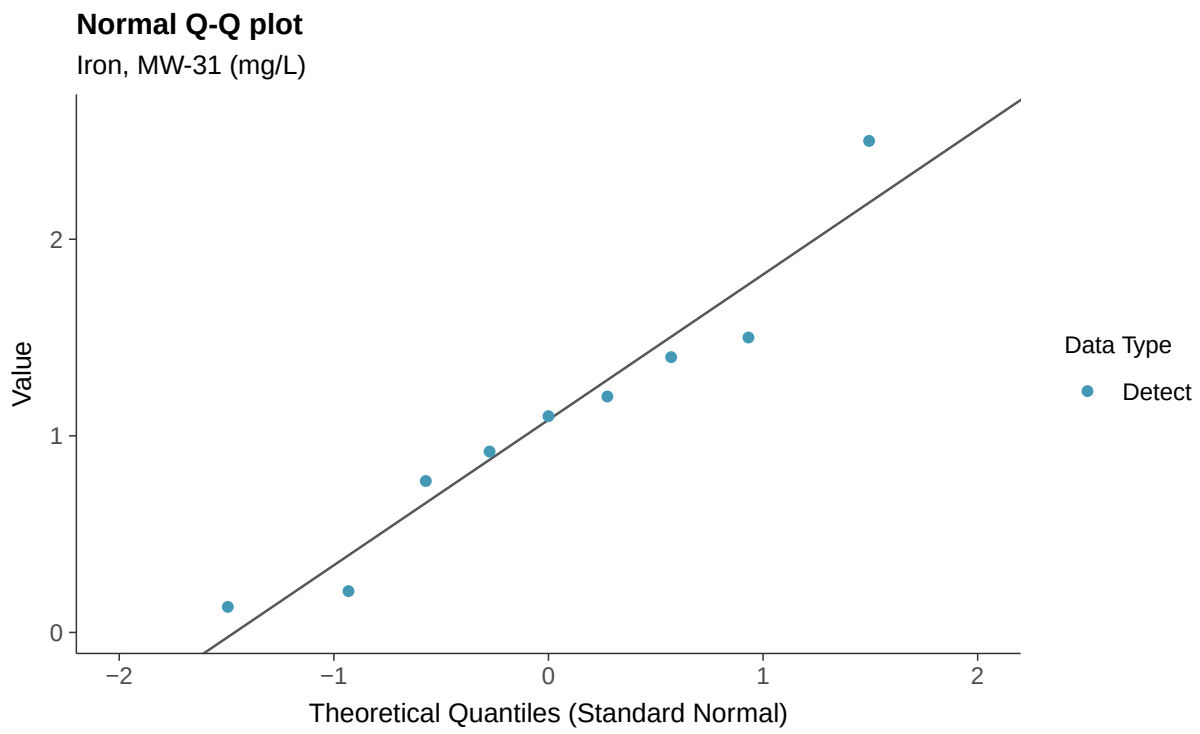
Iron, MW-31 (mg/L)

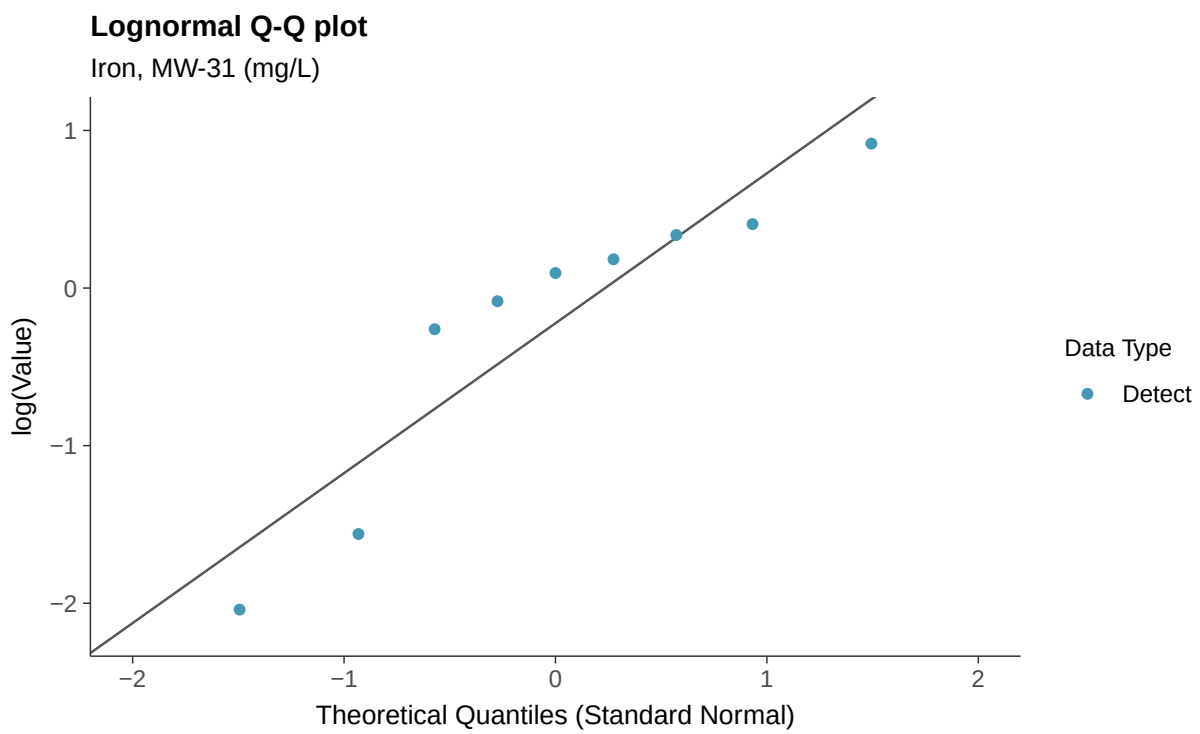


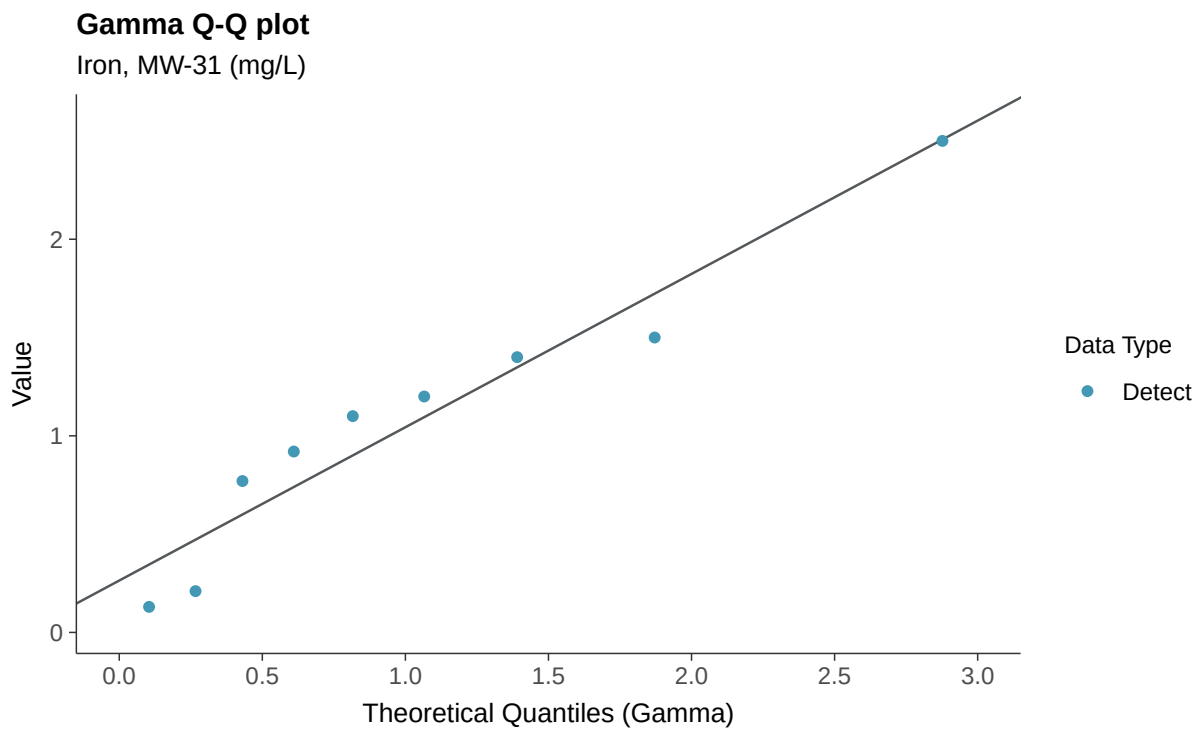
Boxplot by Season

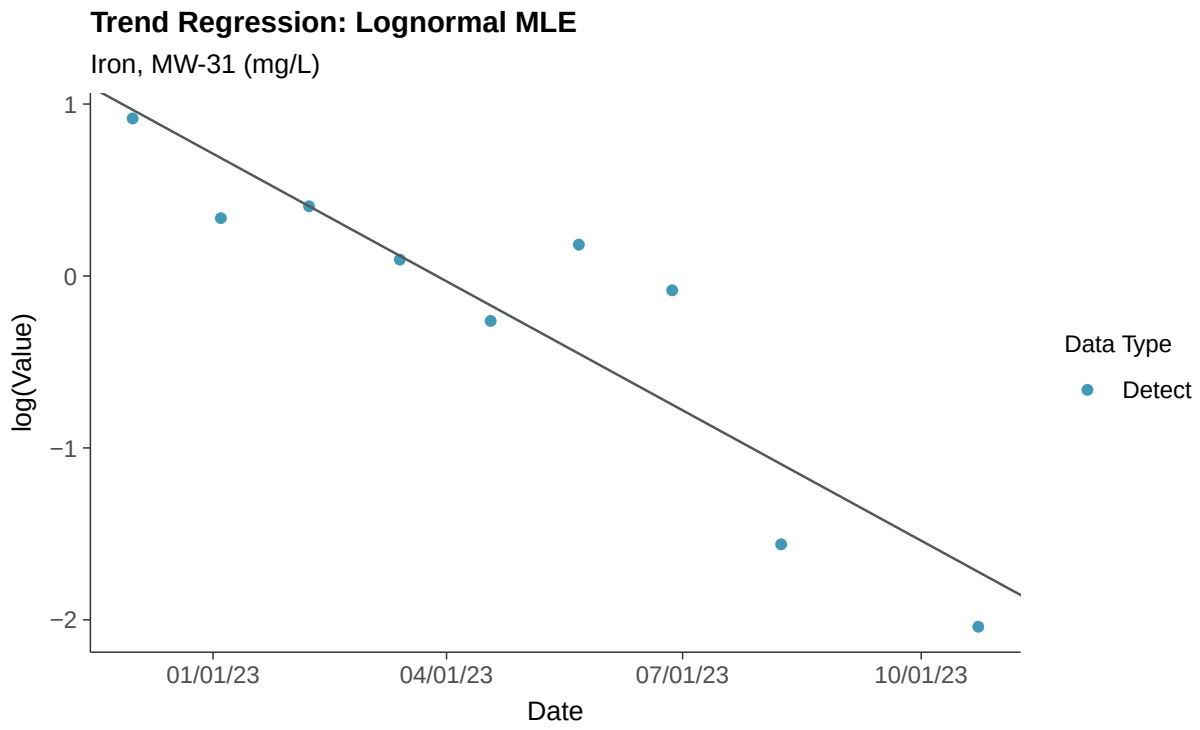
Iron, MW-31 (mg/L)




Normal Q-Q plot
Iron, MW-31 (mg/L)
Value
0
1
2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

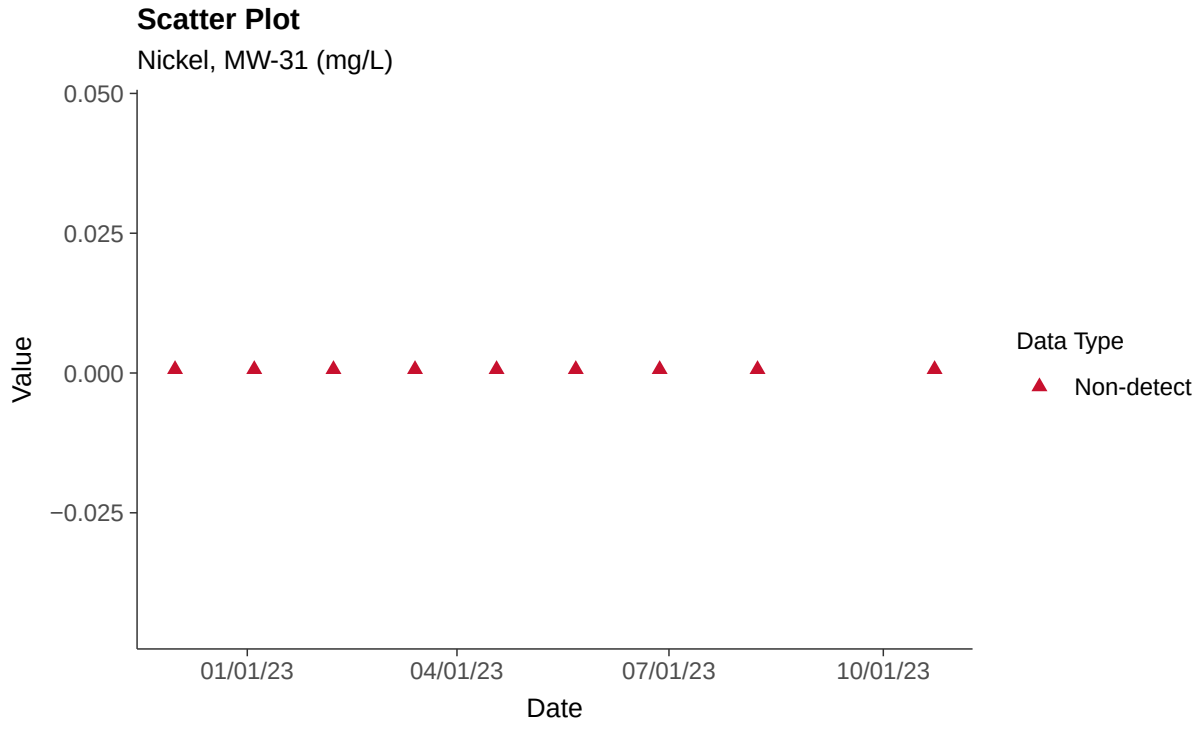

Lognormal Q-Q plot
Iron, MW-31 (mg/L)
log(Value)
1
0
−1
−2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

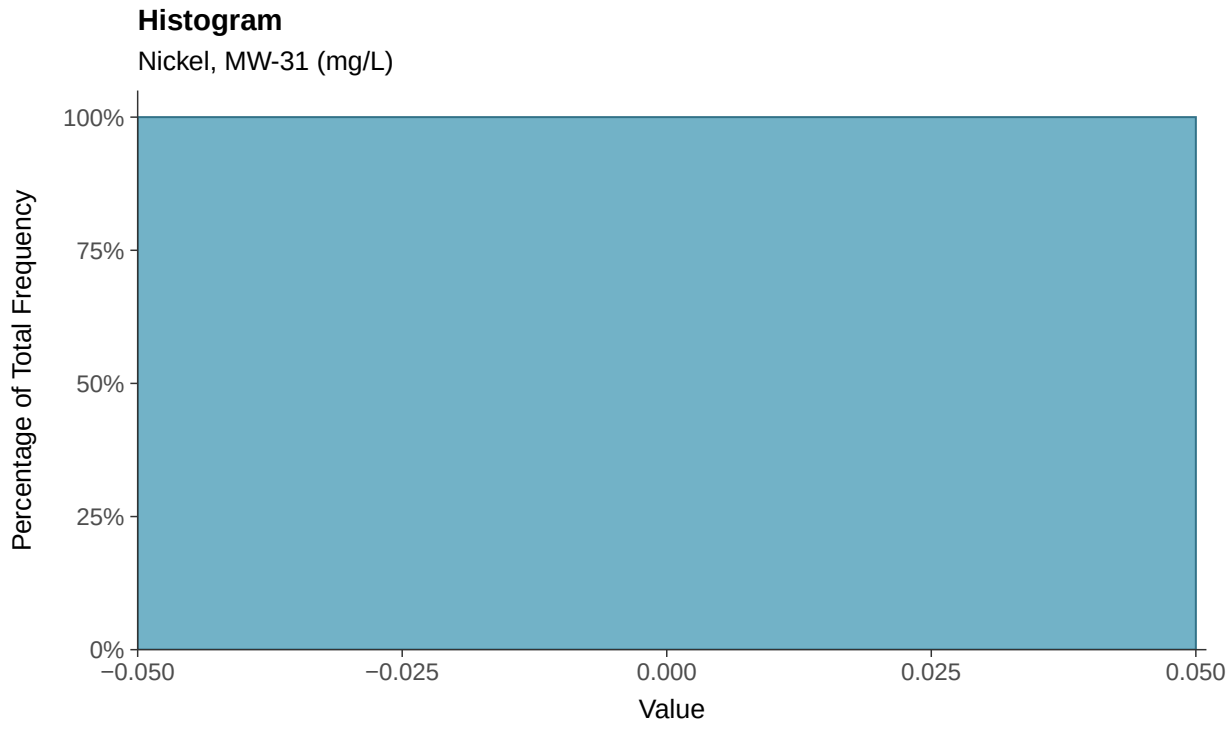

Gamma Q-Q plot
Iron, MW-31 (mg/L)
Value
0
1
2
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Iron, MW-31 (mg/L)
log(Value)
1
0
−1
−2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-31

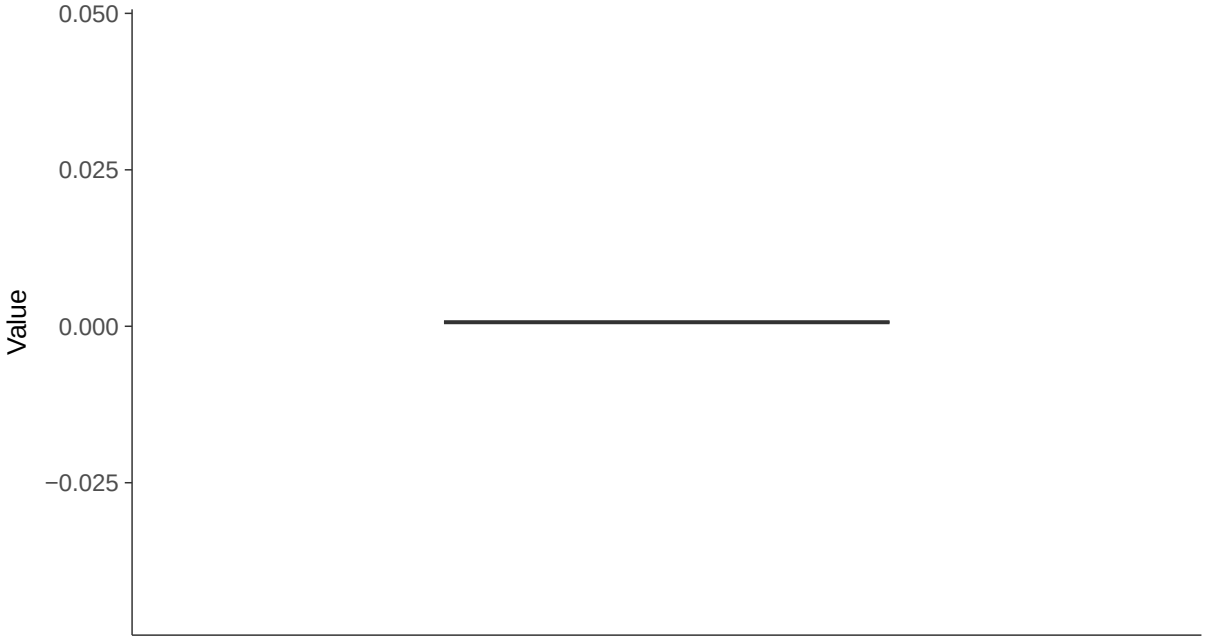
ID: 1_26_6_119





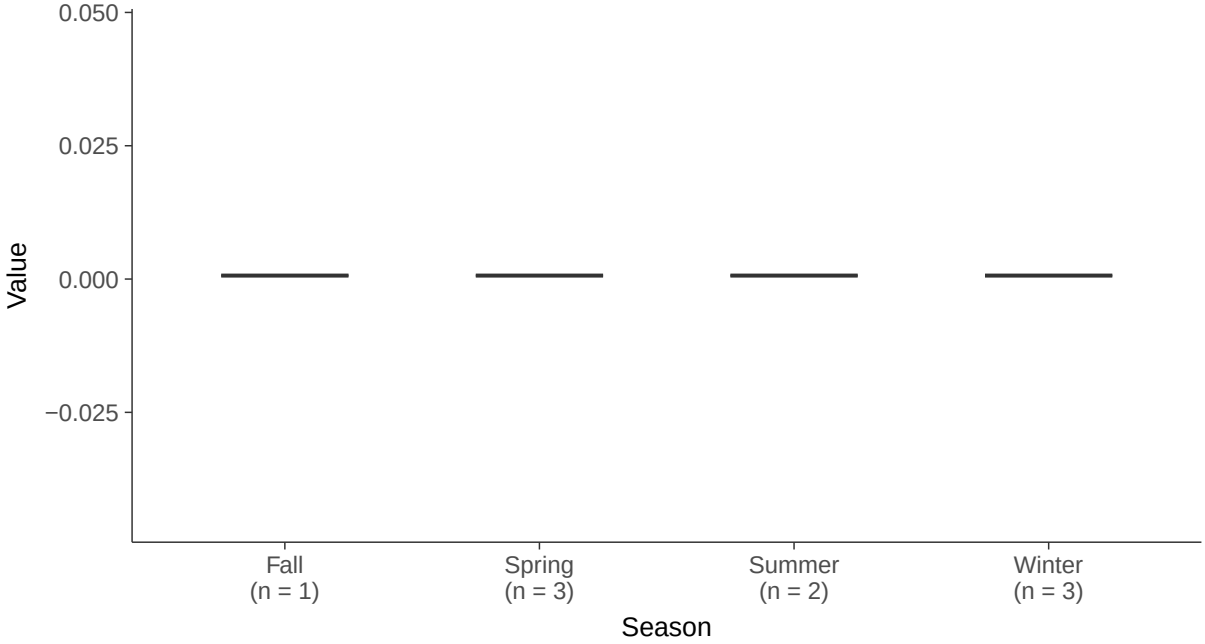
Boxplot

Nickel, MW-31 (mg/L)



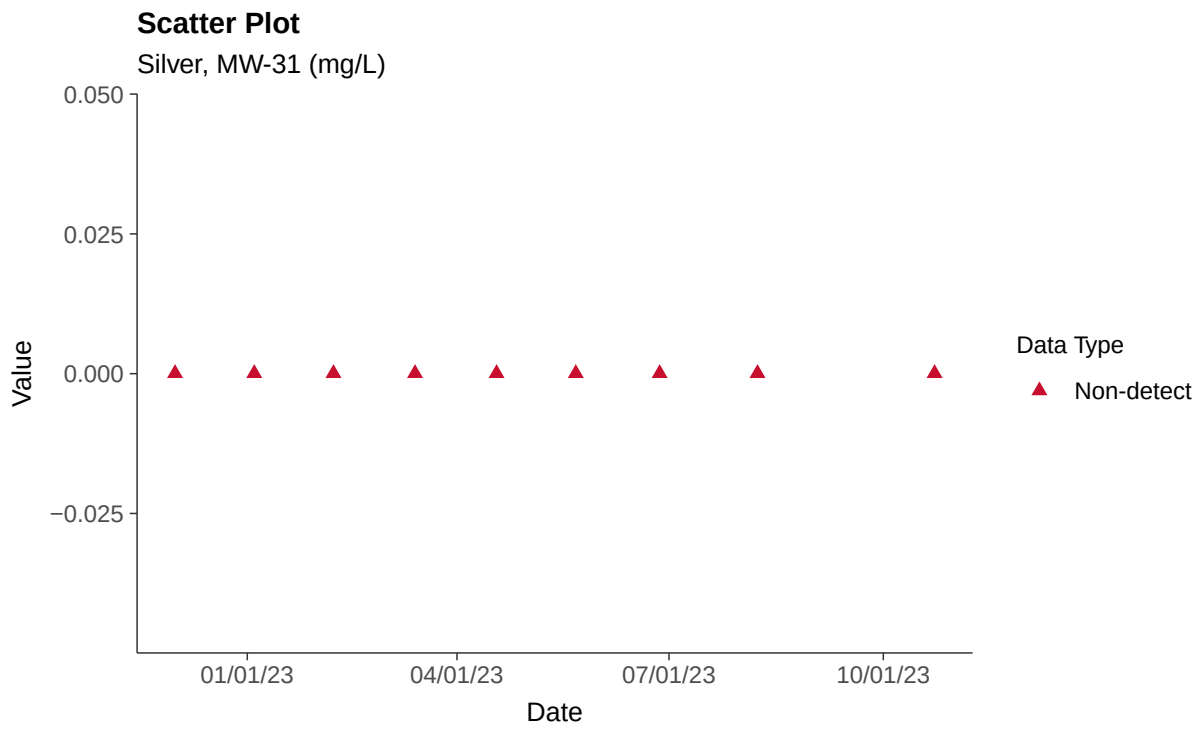
Boxplot by Season

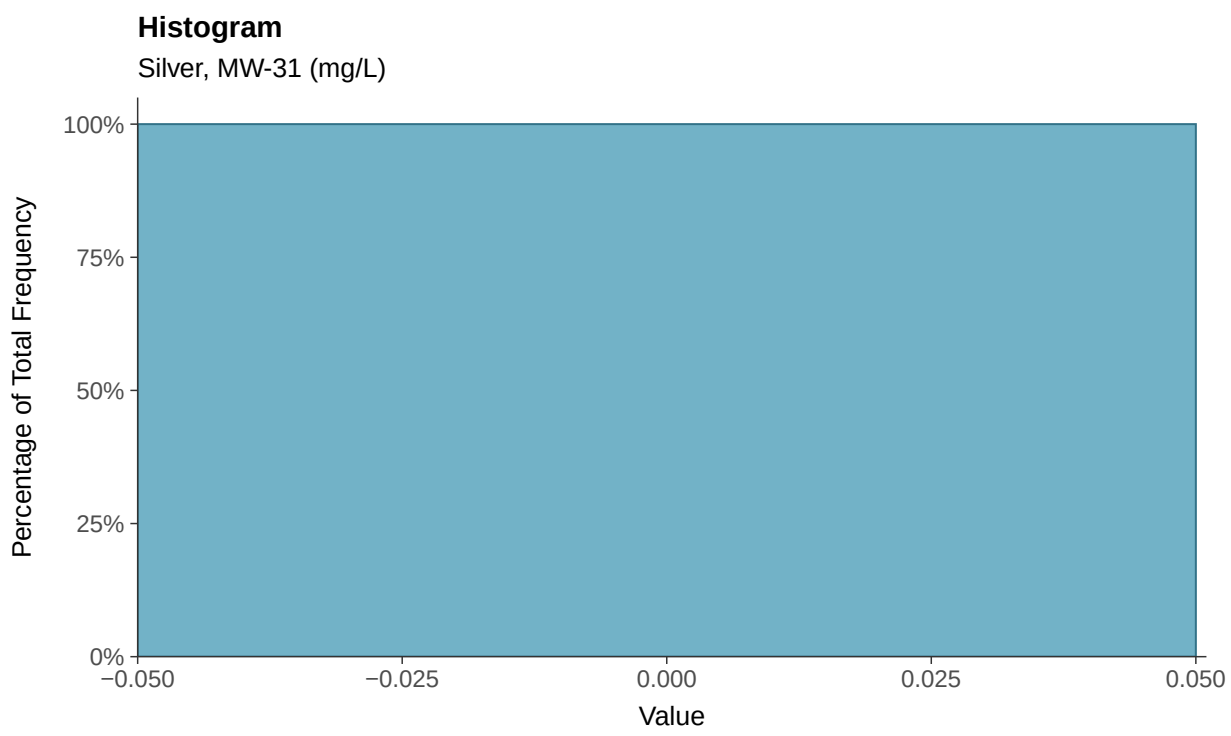
Nickel, MW-31 (mg/L)



Part 115: Silver, MW-31

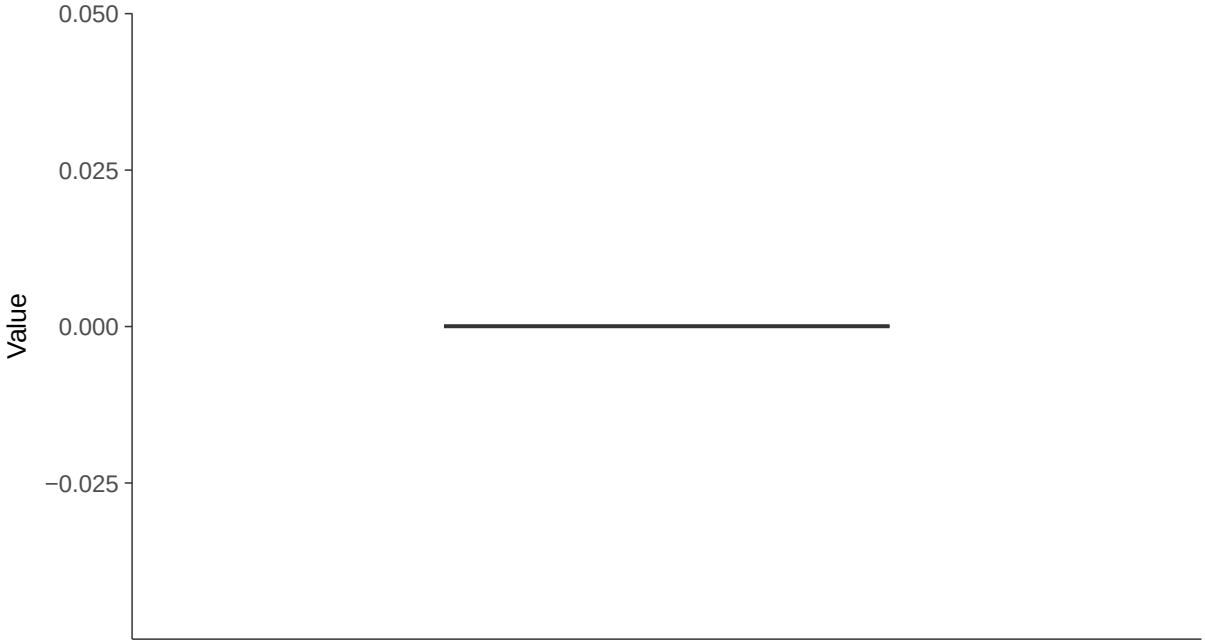
ID: 1_26_6_123





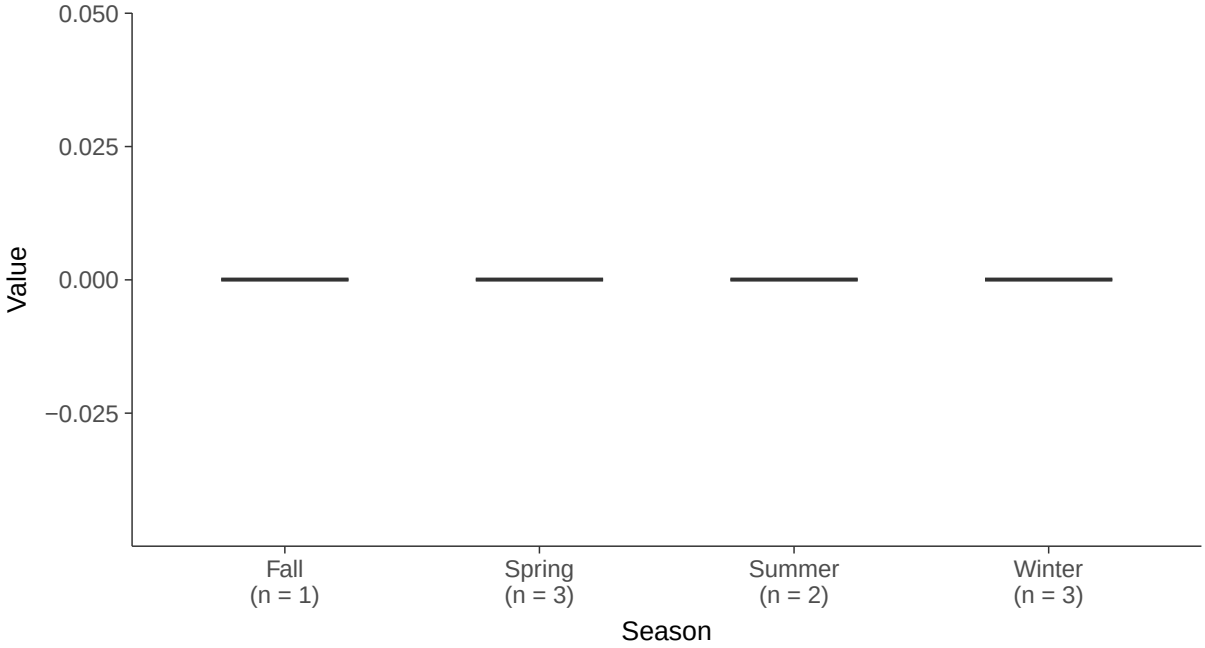
Boxplot

Silver, MW-31 (mg/L)



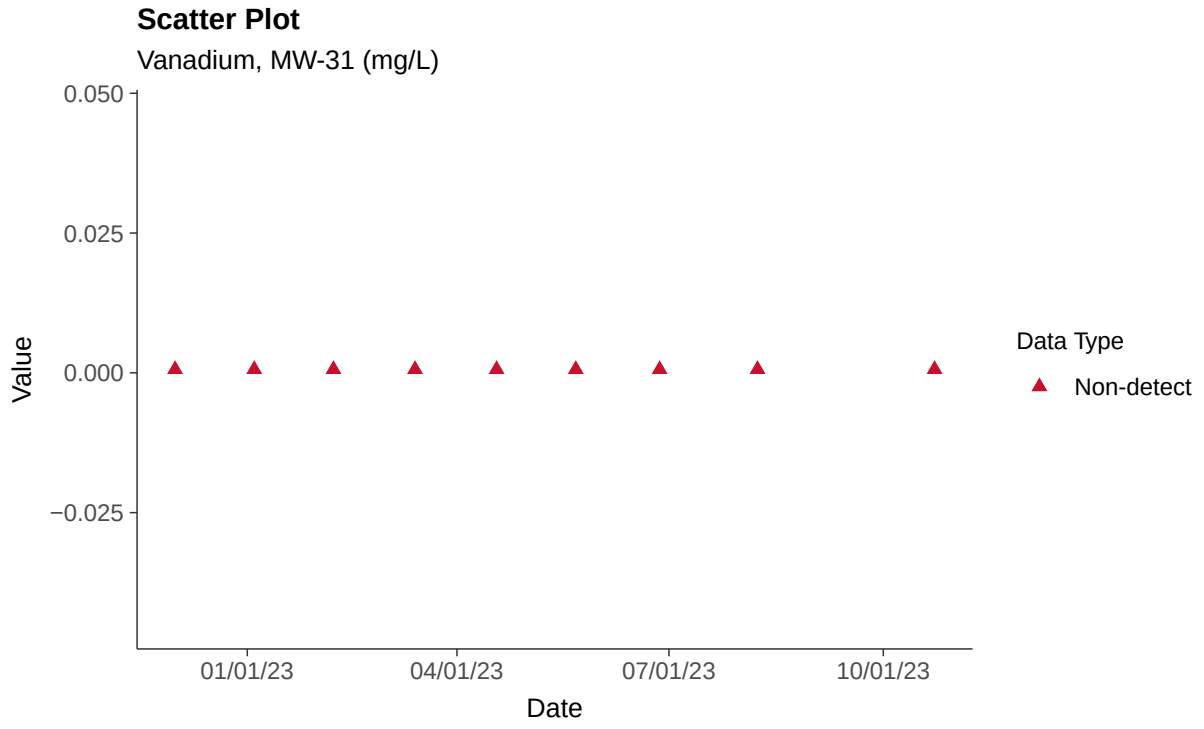
Boxplot by Season

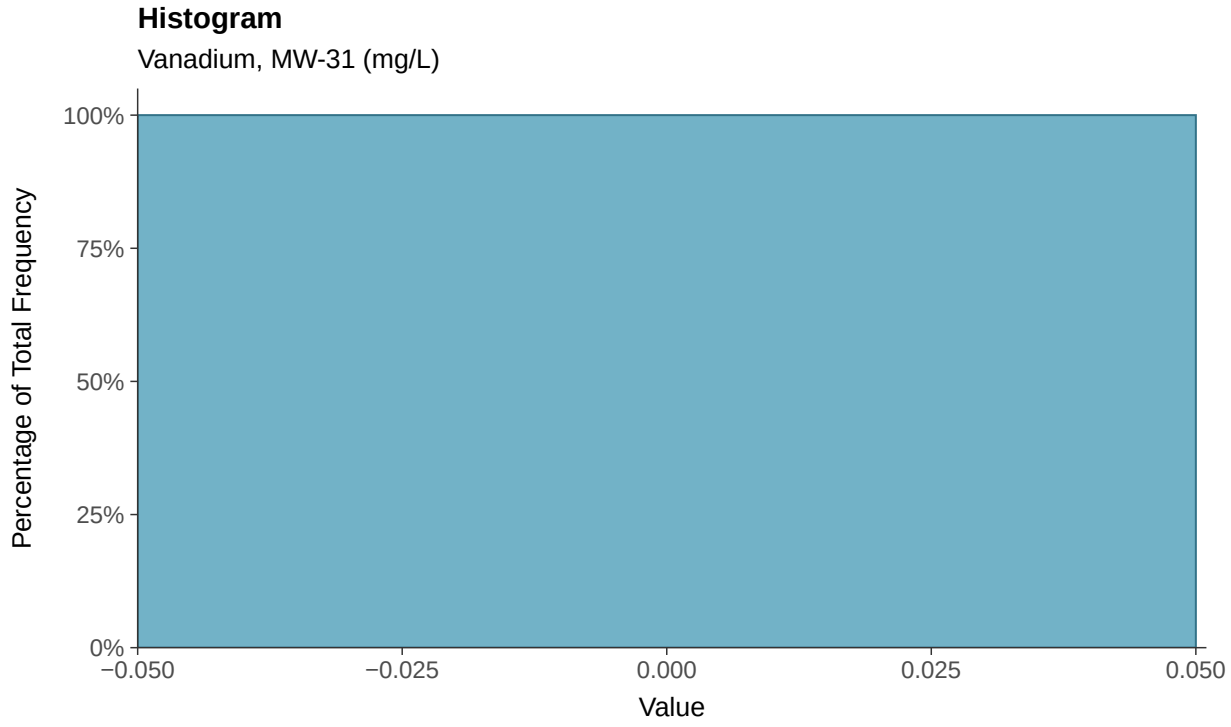
Silver, MW-31 (mg/L)



Part 115: Vanadium, MW-31

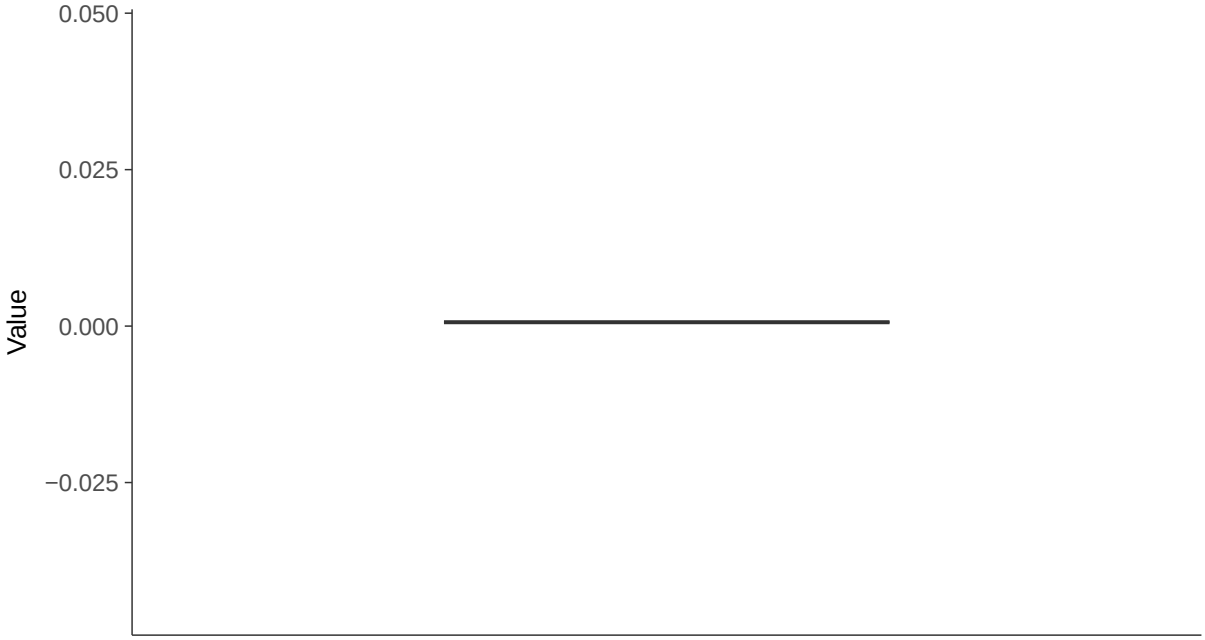
ID: 1_26_6_129





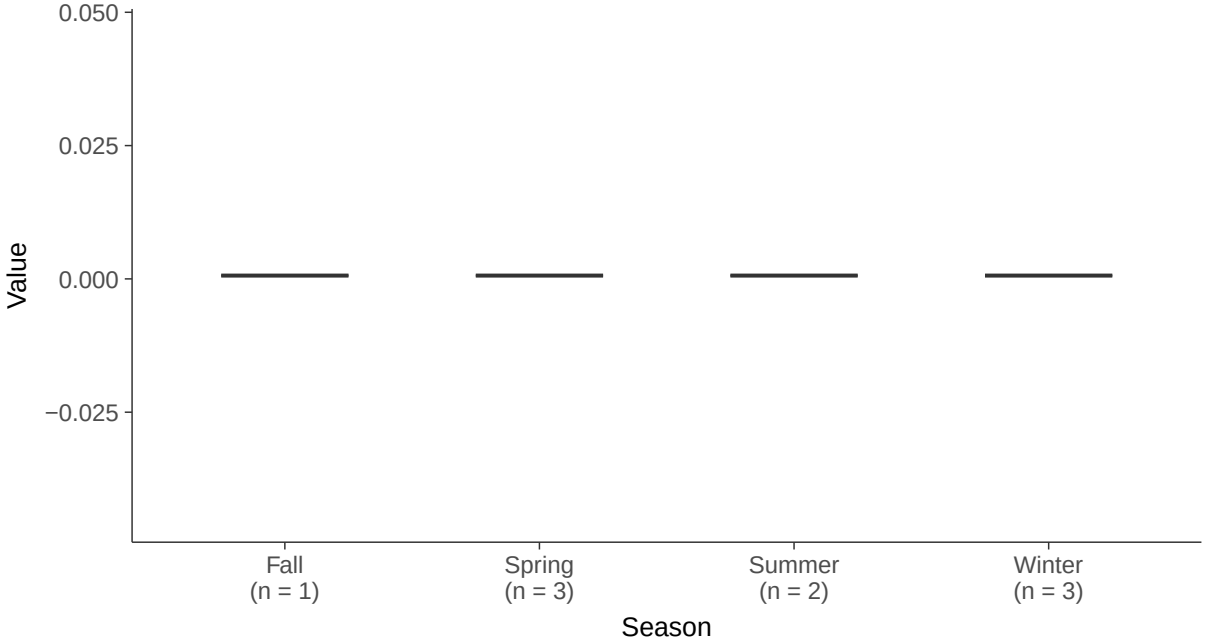
Boxplot

Vanadium, MW-31 (mg/L)



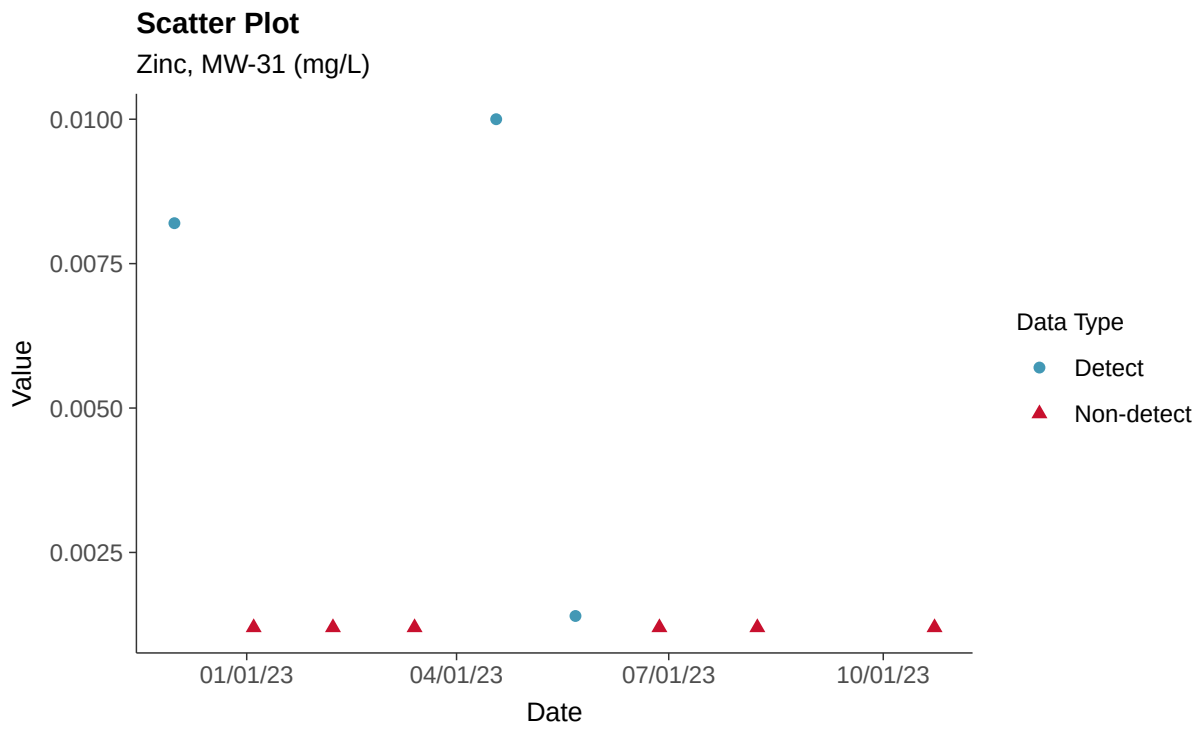
Boxplot by Season

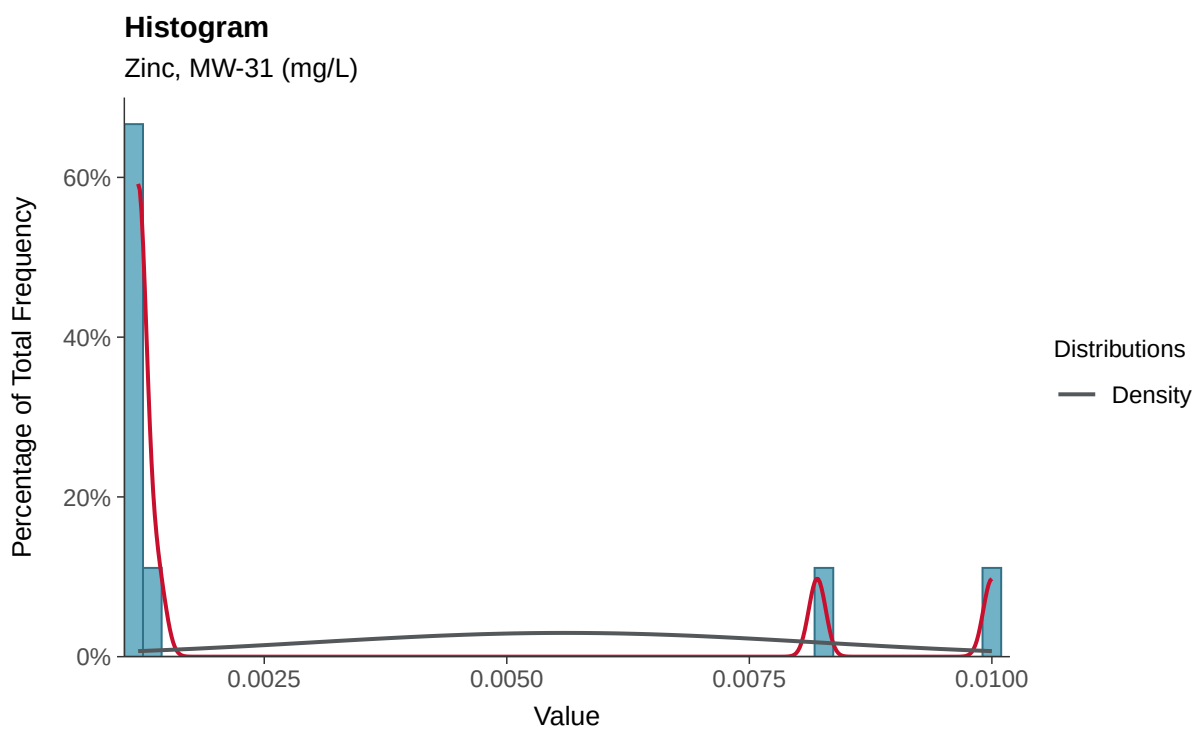
Vanadium, MW-31 (mg/L)



Part 115: Zinc, MW-31

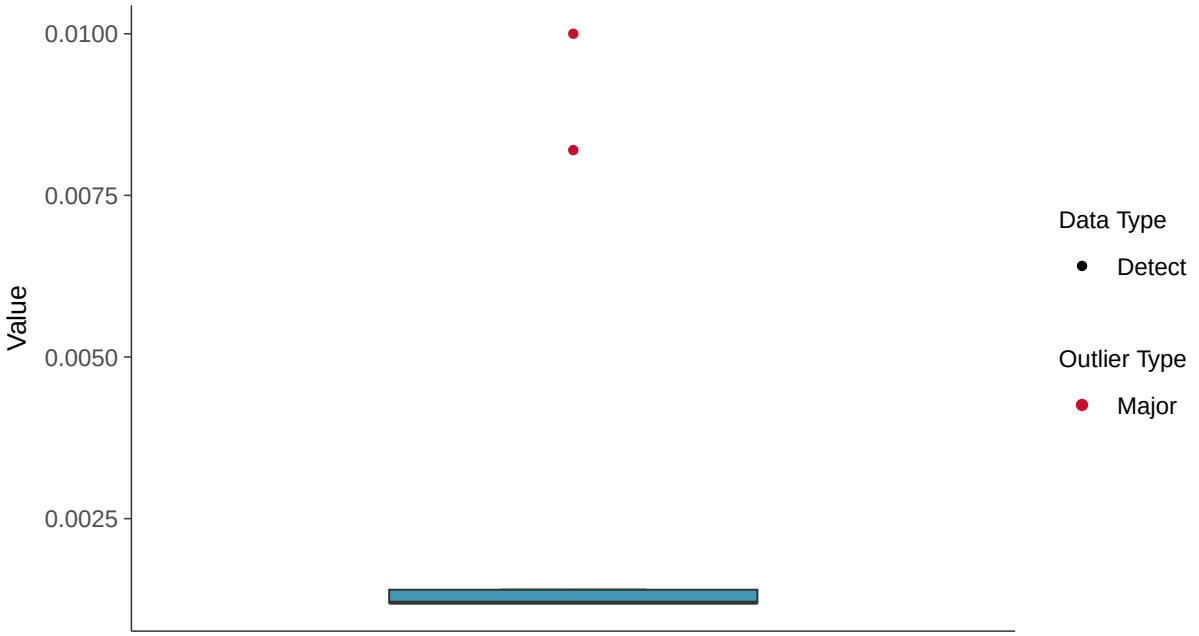
ID: 1_26_6_130





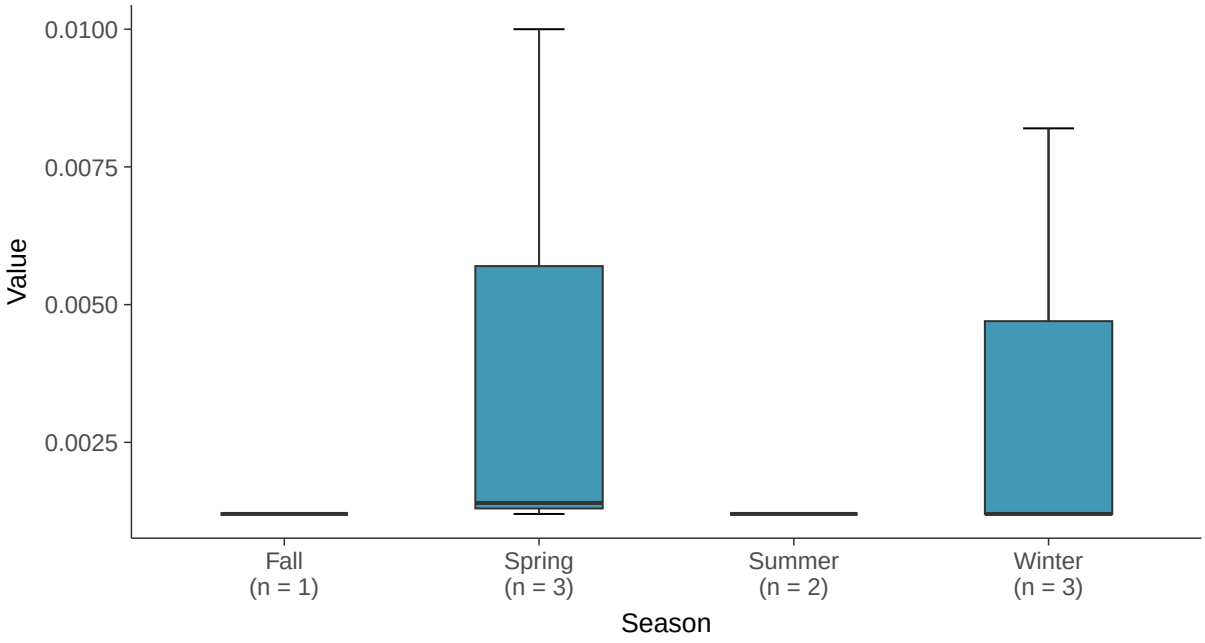
Boxplot

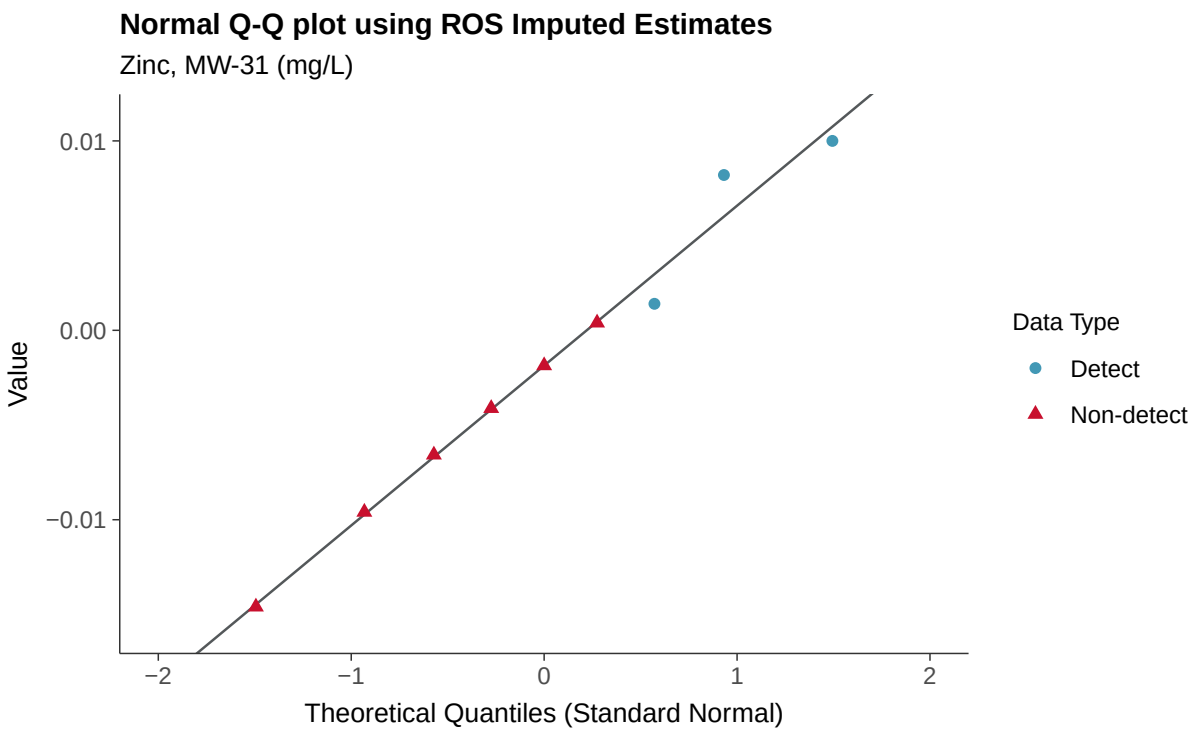
Zinc, MW-31 (mg/L)



Boxplot by Season

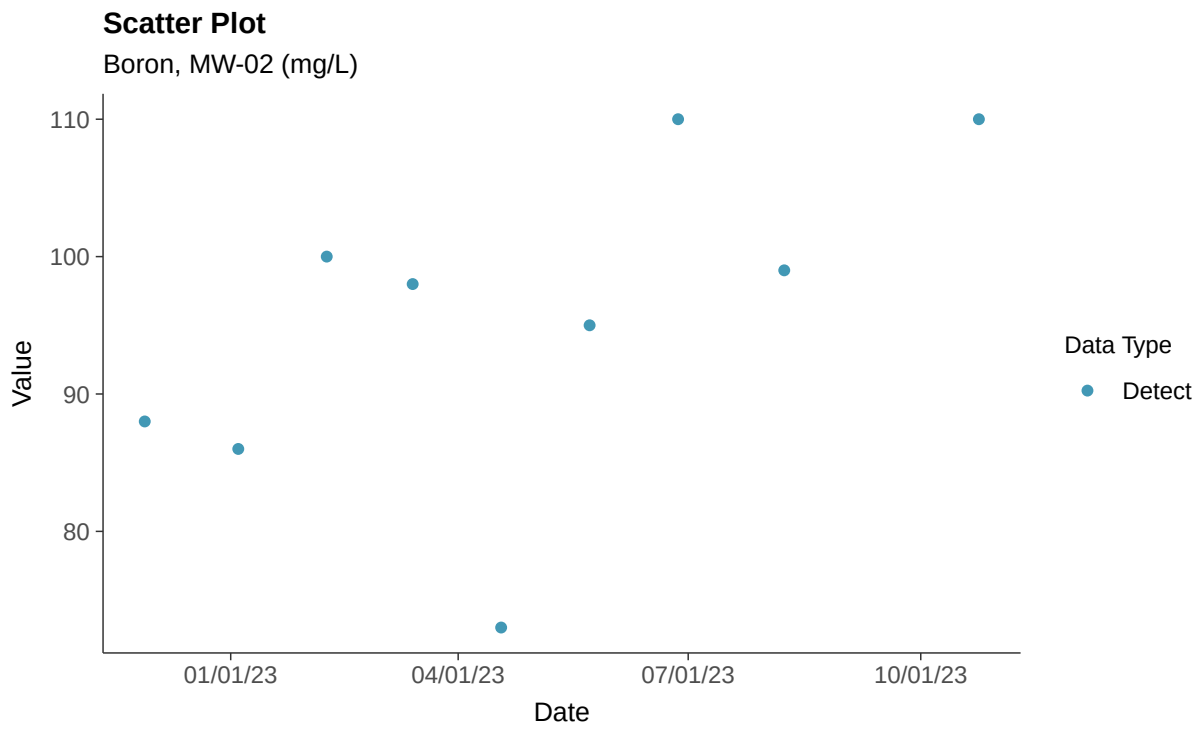
Zinc, MW-31 (mg/L)

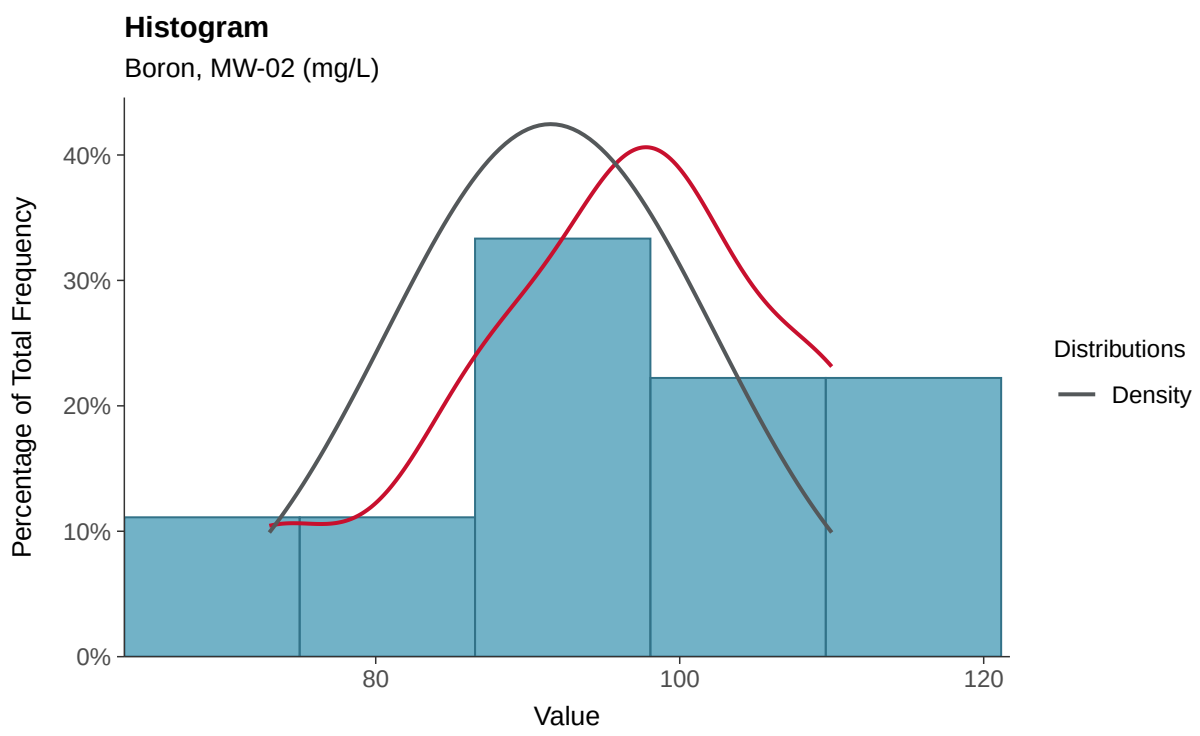



Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-31 (mg/L)
Value
0.01
0.00
−0.01
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

Appendix III: Boron, MW-02

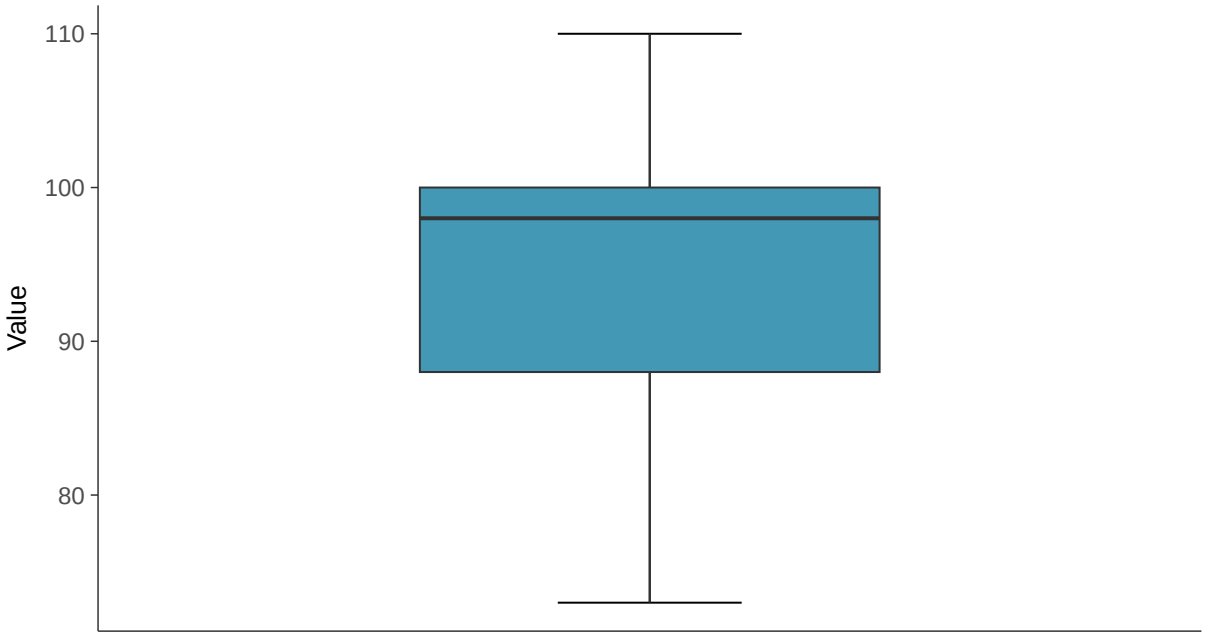
ID: 2_12_4_105





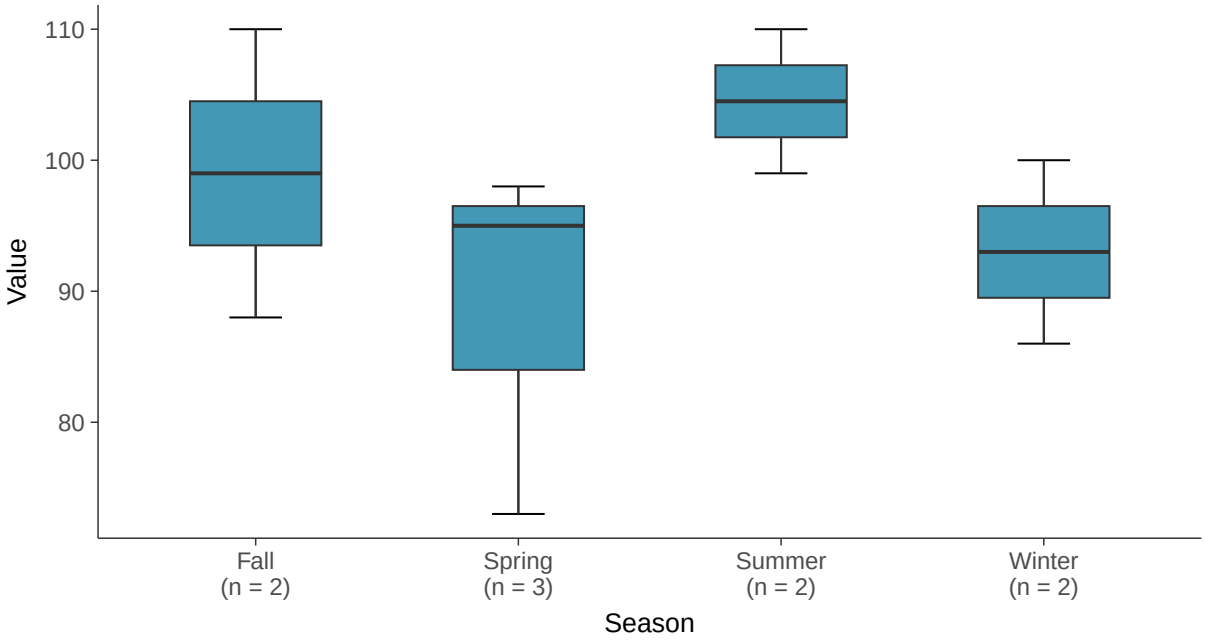
Boxplot

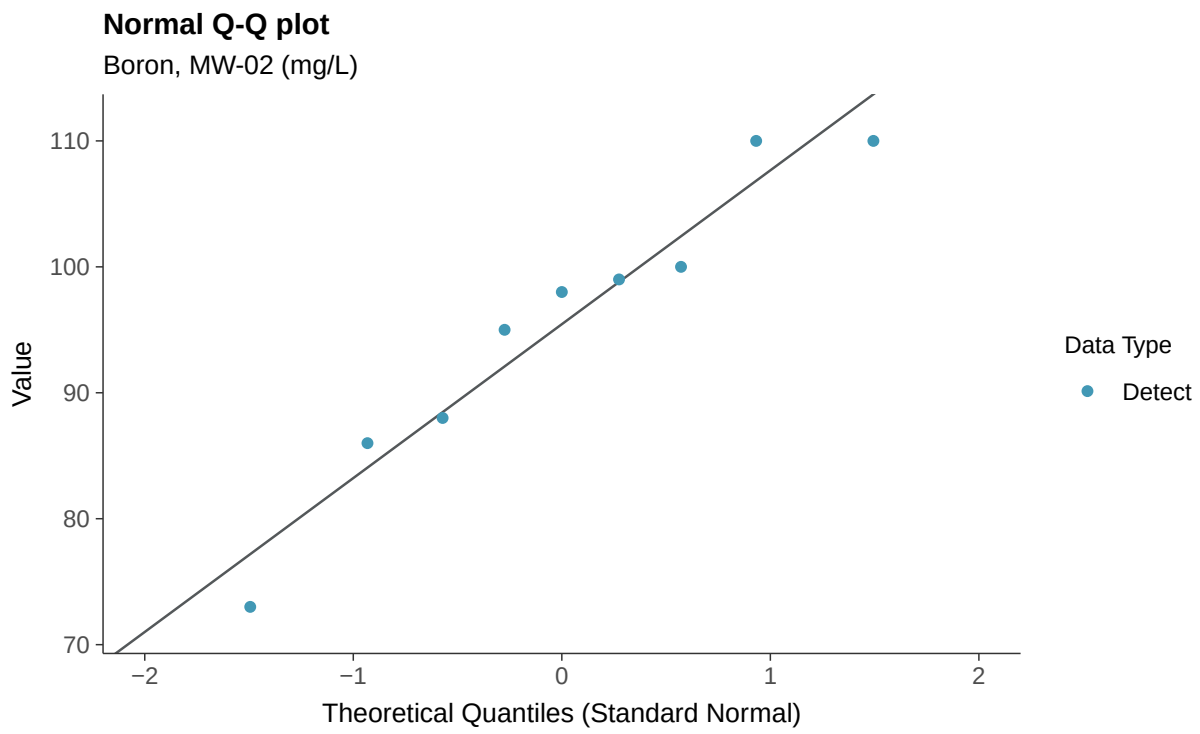
Boron, MW-02 (mg/L)

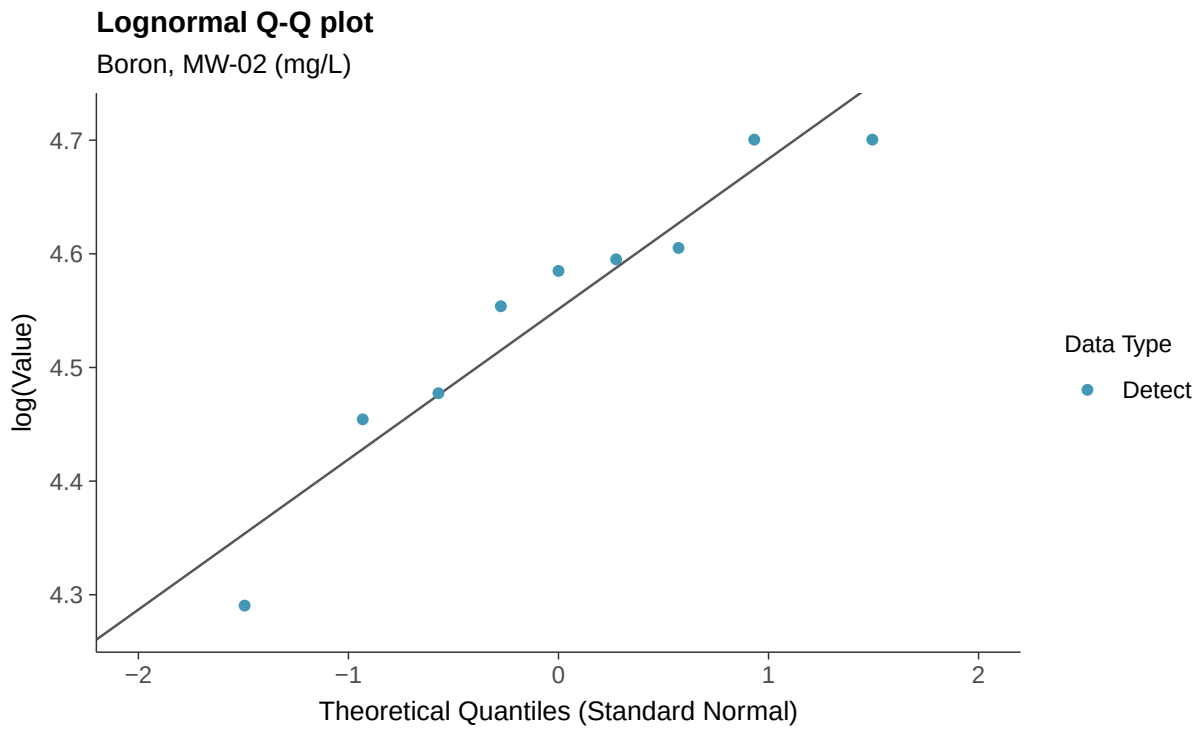


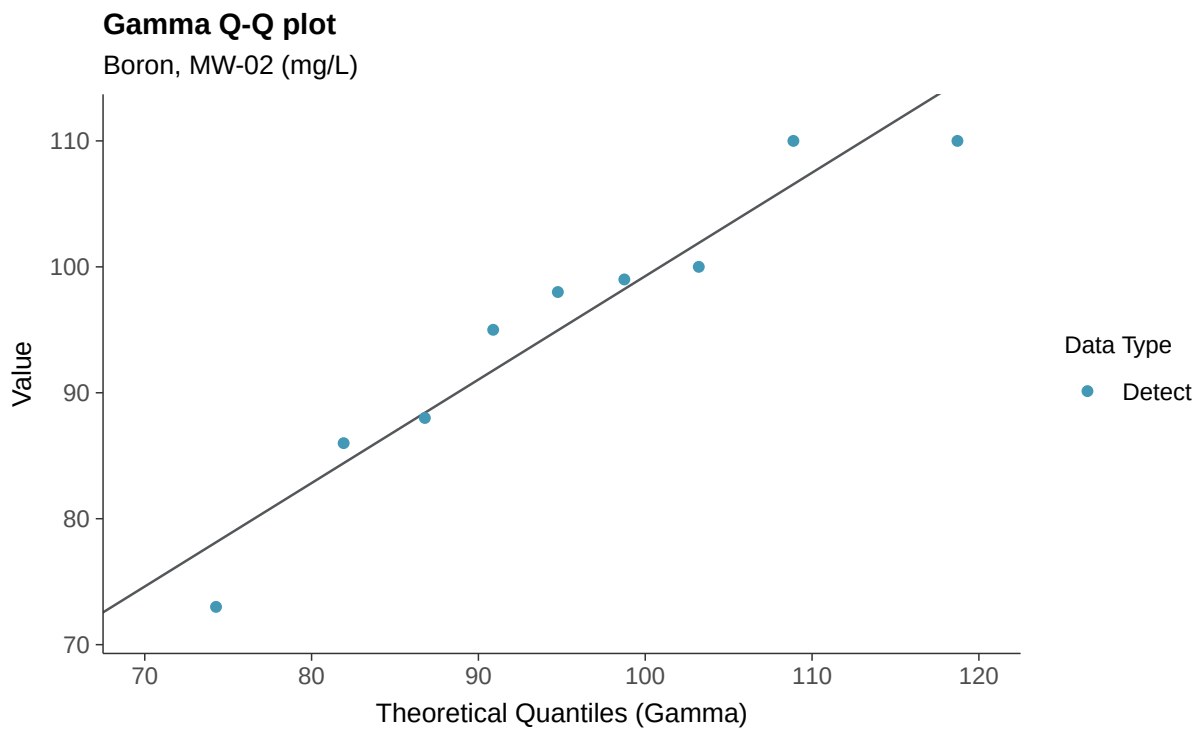
Boxplot by Season

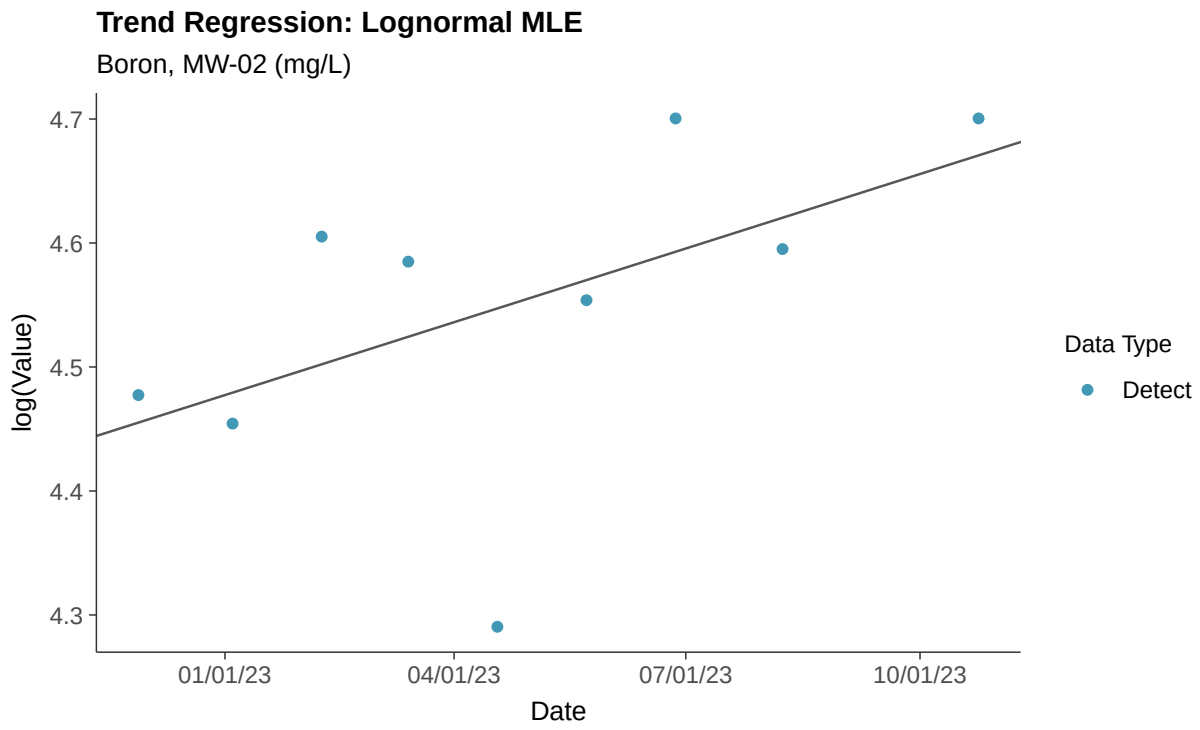
Boron, MW-02 (mg/L)

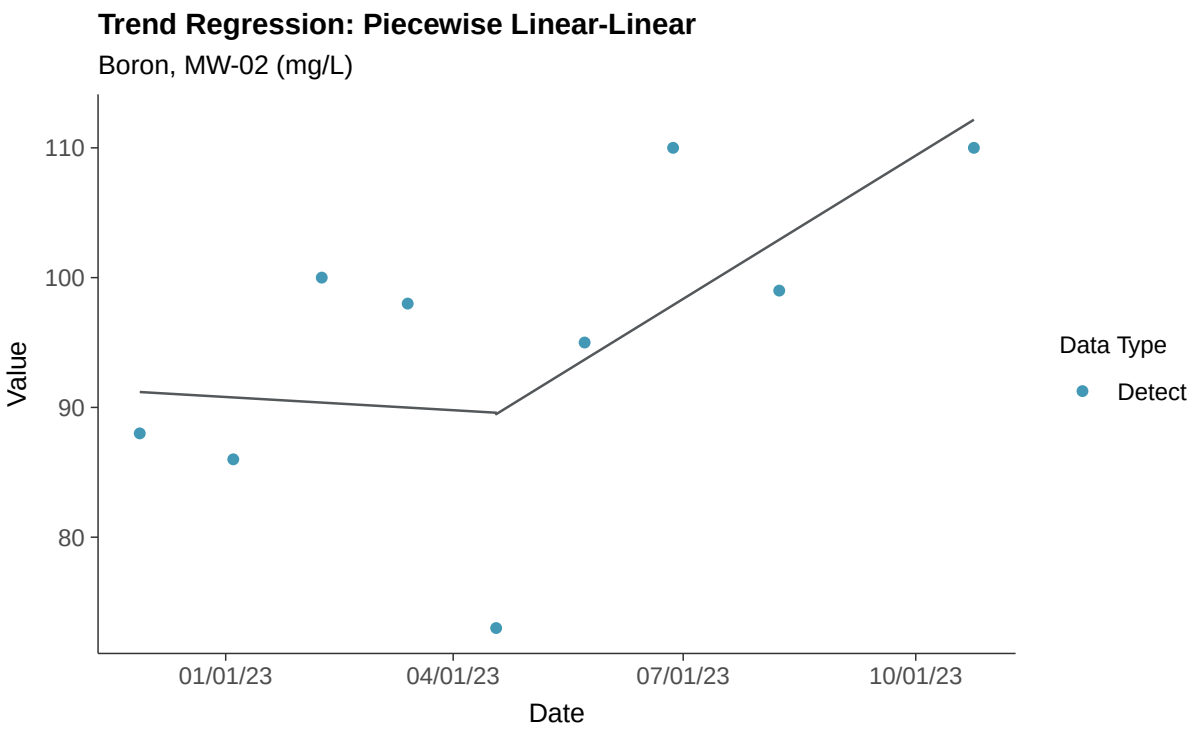



Normal Q-Q plot
Boron, MW-02 (mg/L)
Value
110
100
90
80
70
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-02 (mg/L)
log(Value)
4.7
4.6
4.5
4.4
4.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

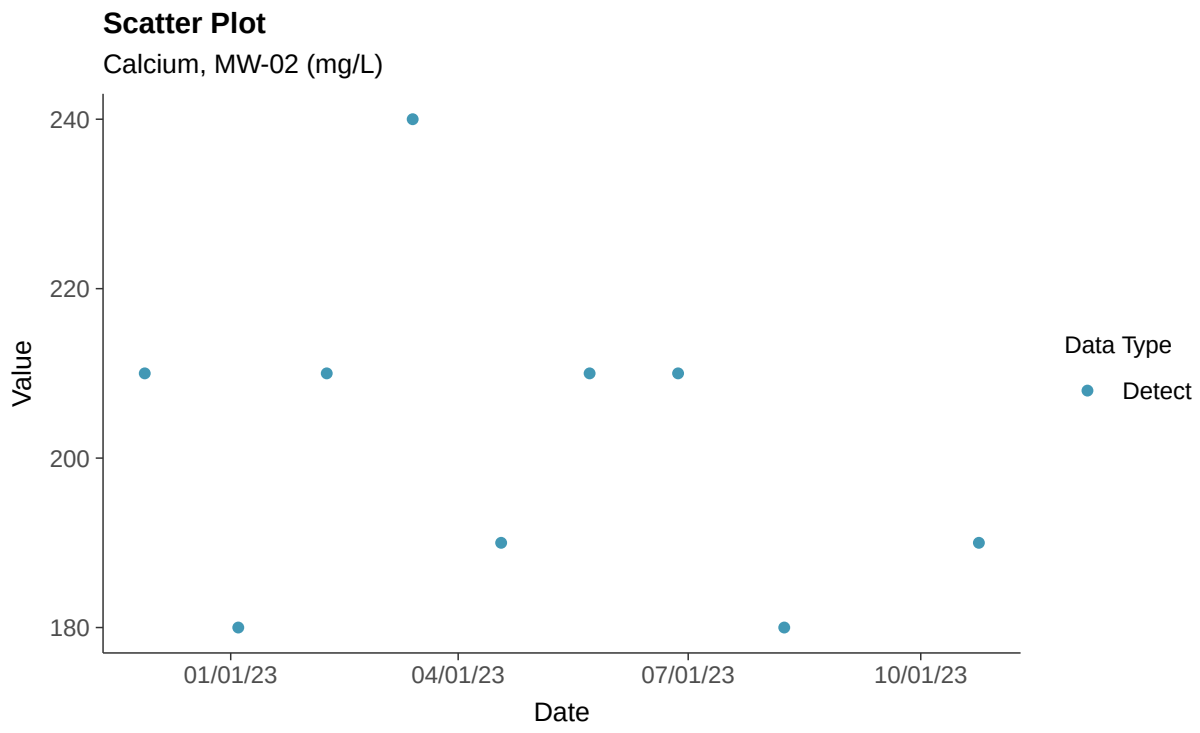

Gamma Q-Q plot
Boron, MW-02 (mg/L)
Value
110
100
90
80
70
70
80
90
100
110
120
Theoretical Quantiles (Gamma)
Data Type
Detect

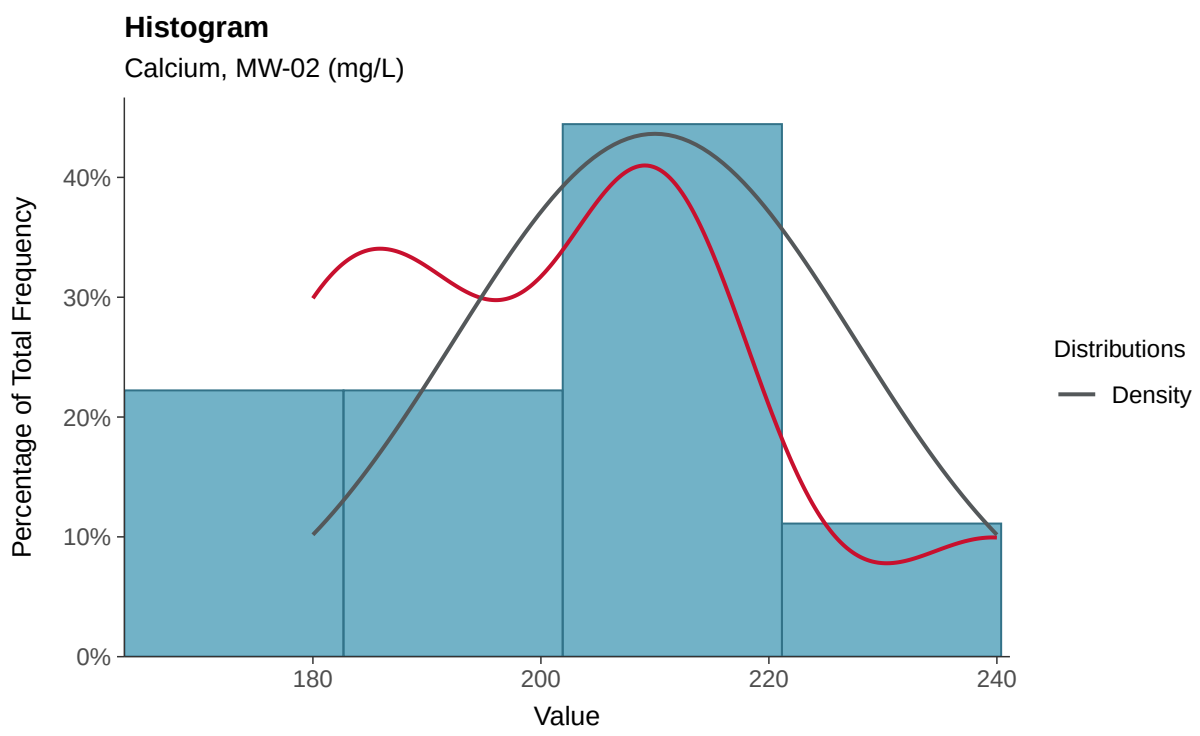

Trend Regression: Lognormal MLE
Boron, MW-02 (mg/L)
log(Value)
4.7
4.6
4.5
4.4
4.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Boron, MW-02 (mg/L)
110
100
90
80
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-02

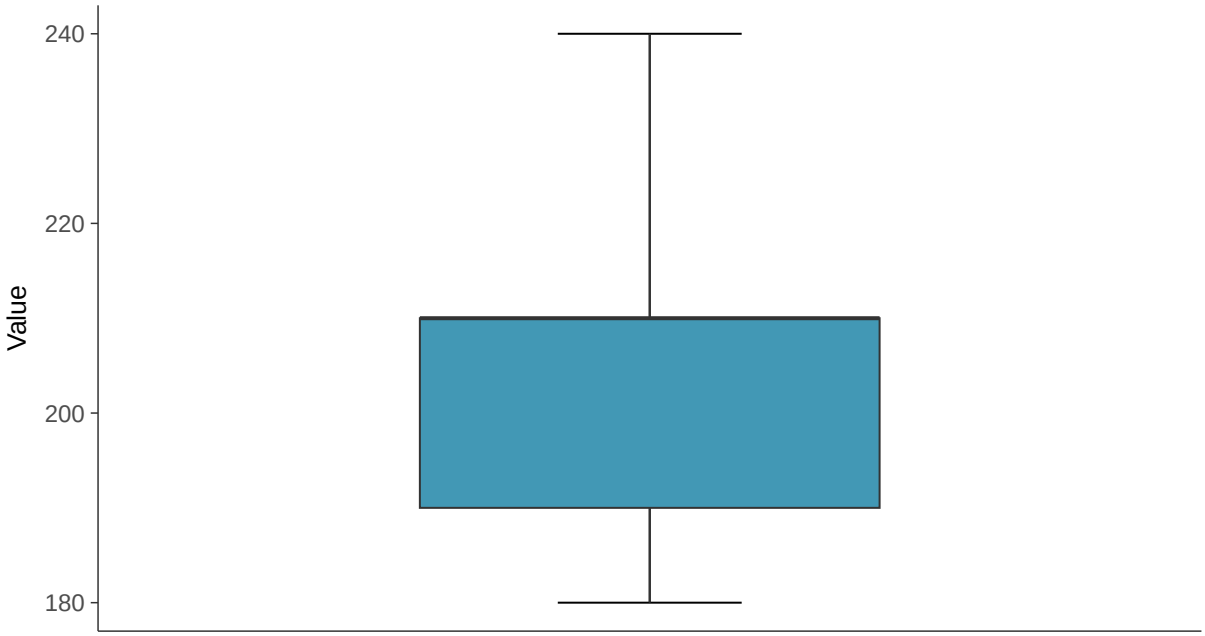
ID: 2_12_4_107





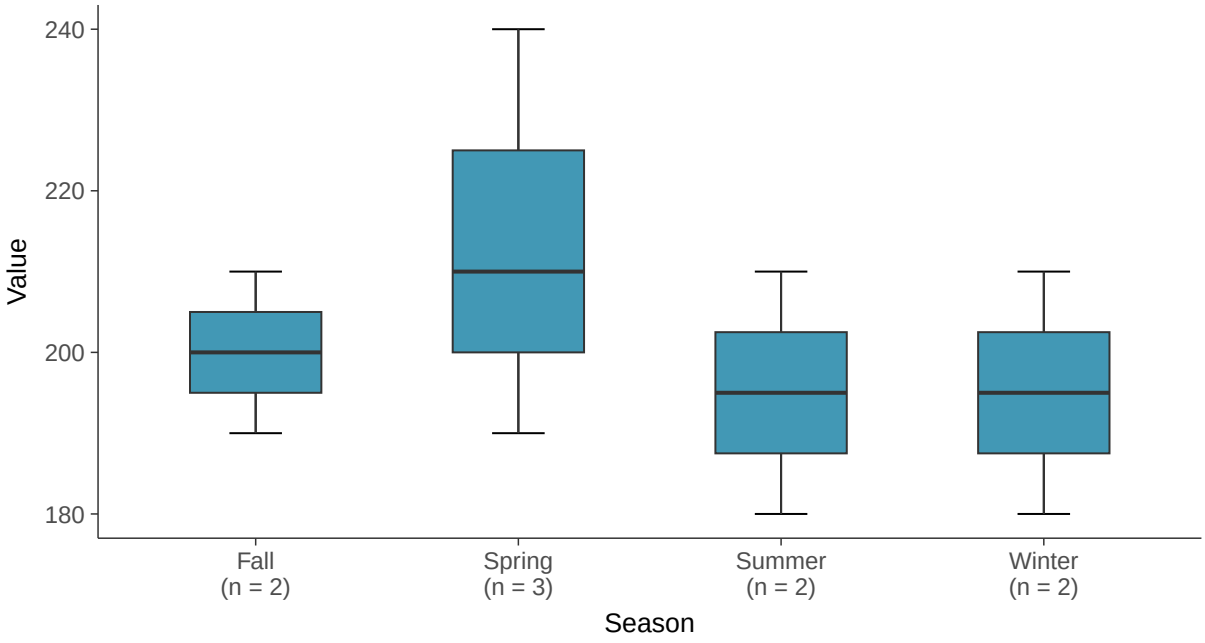
Boxplot

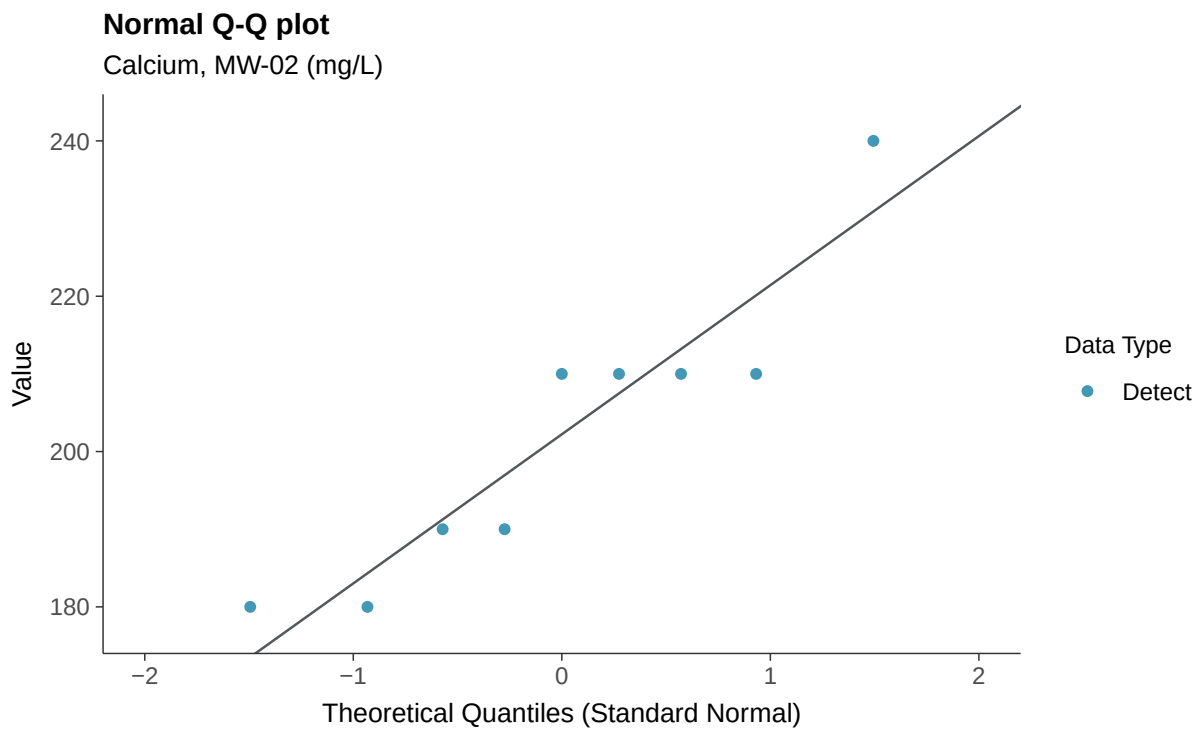
Calcium, MW-02 (mg/L)

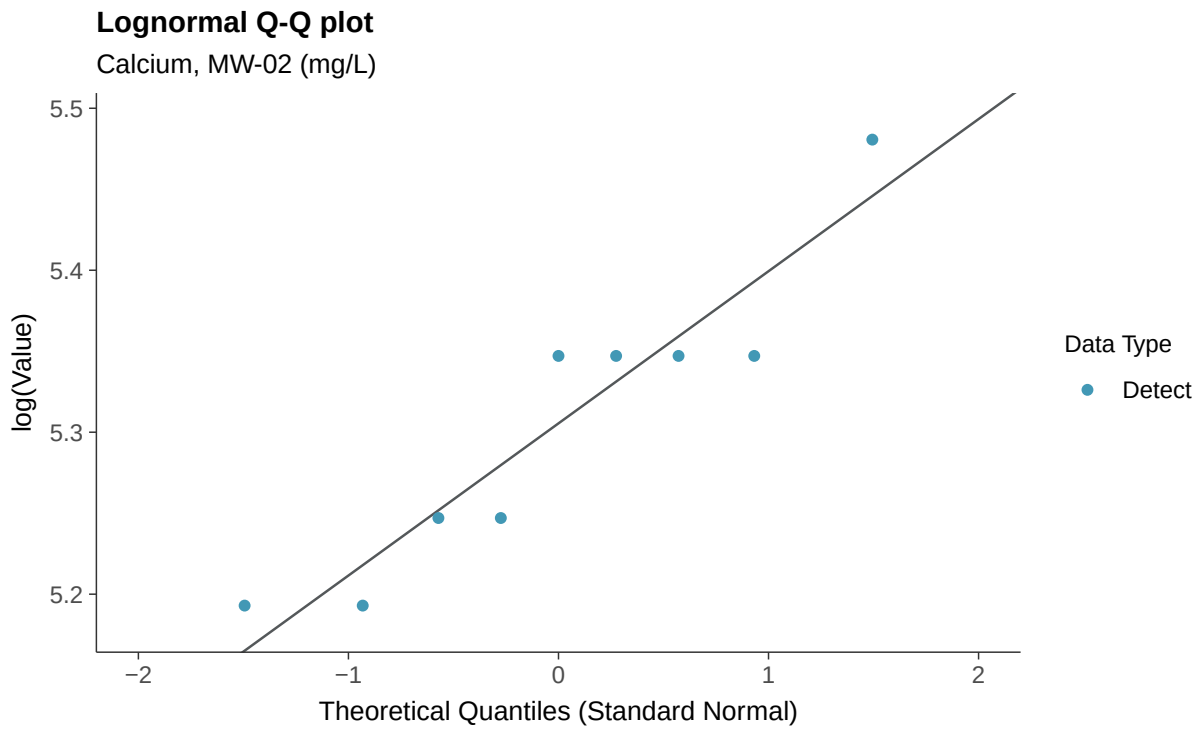


Boxplot by Season

Calcium, MW-02 (mg/L)

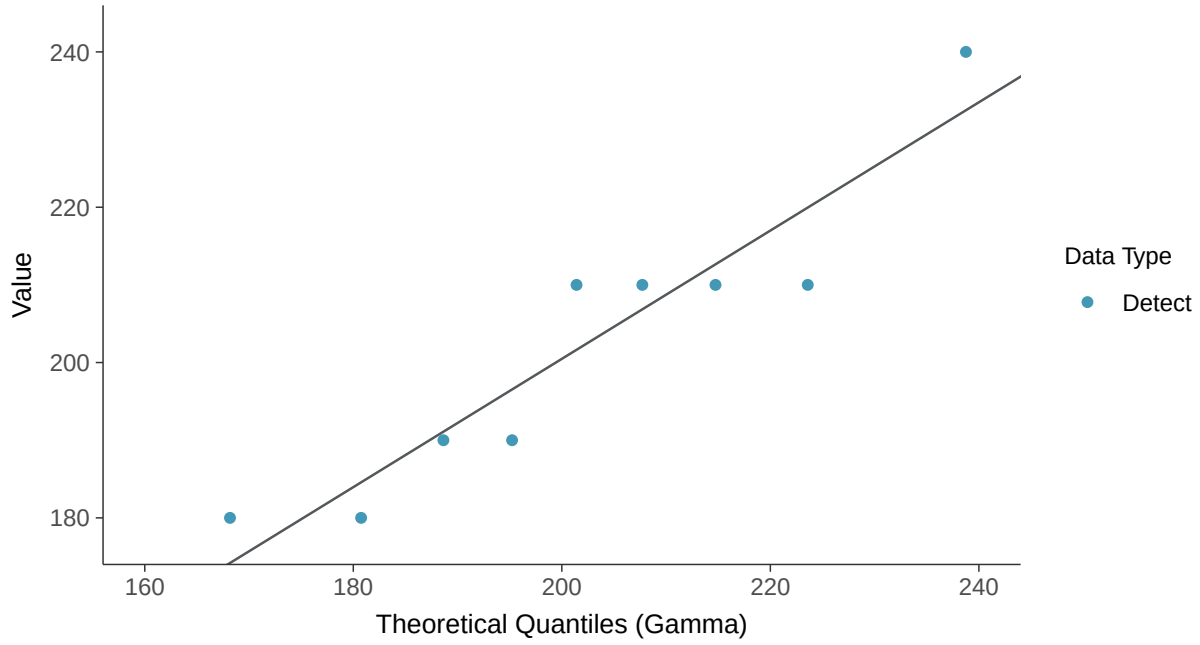



Normal Q-Q plot
Calcium, MW-02 (mg/L)
Value
240
220
200
180
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Calcium, MW-02 (mg/L)
log(Value)
5.5
5.4
5.3
5.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

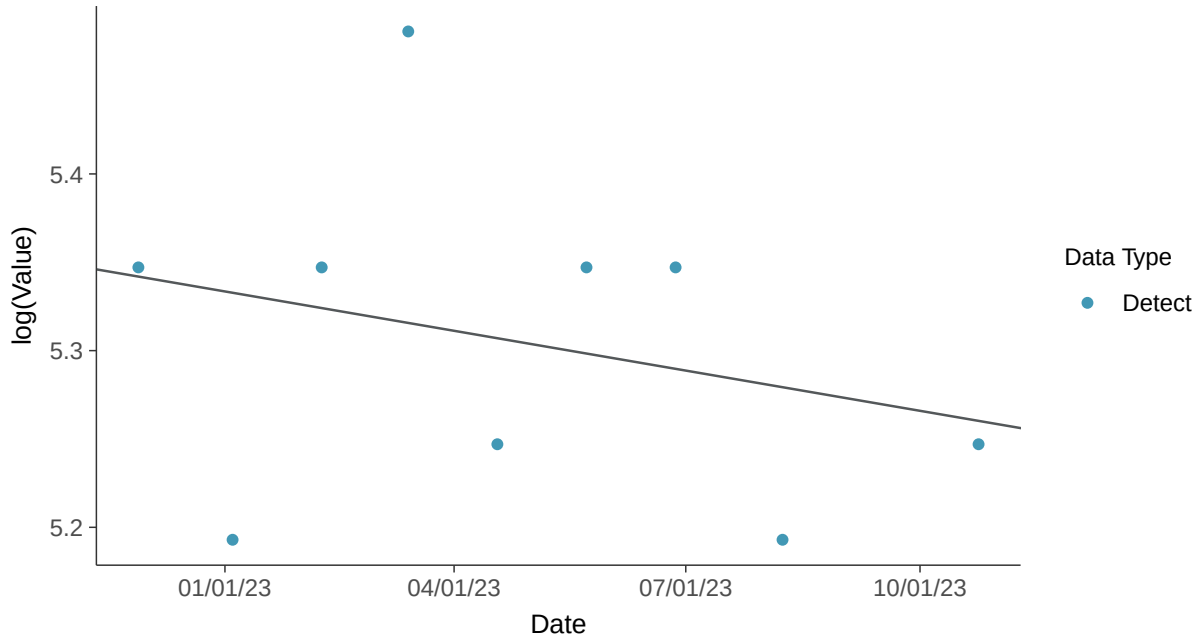
Gamma Q-Q plot

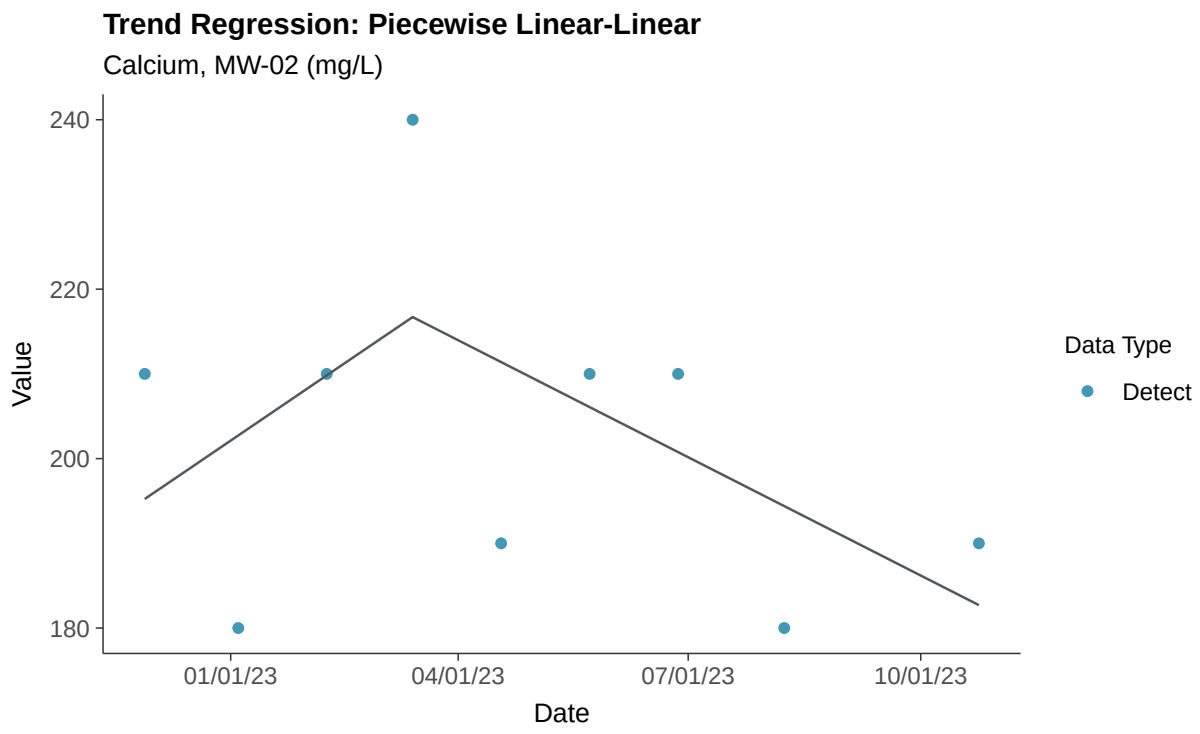
Calcium, MW-02 (mg/L)



Trend Regression: Lognormal MLE

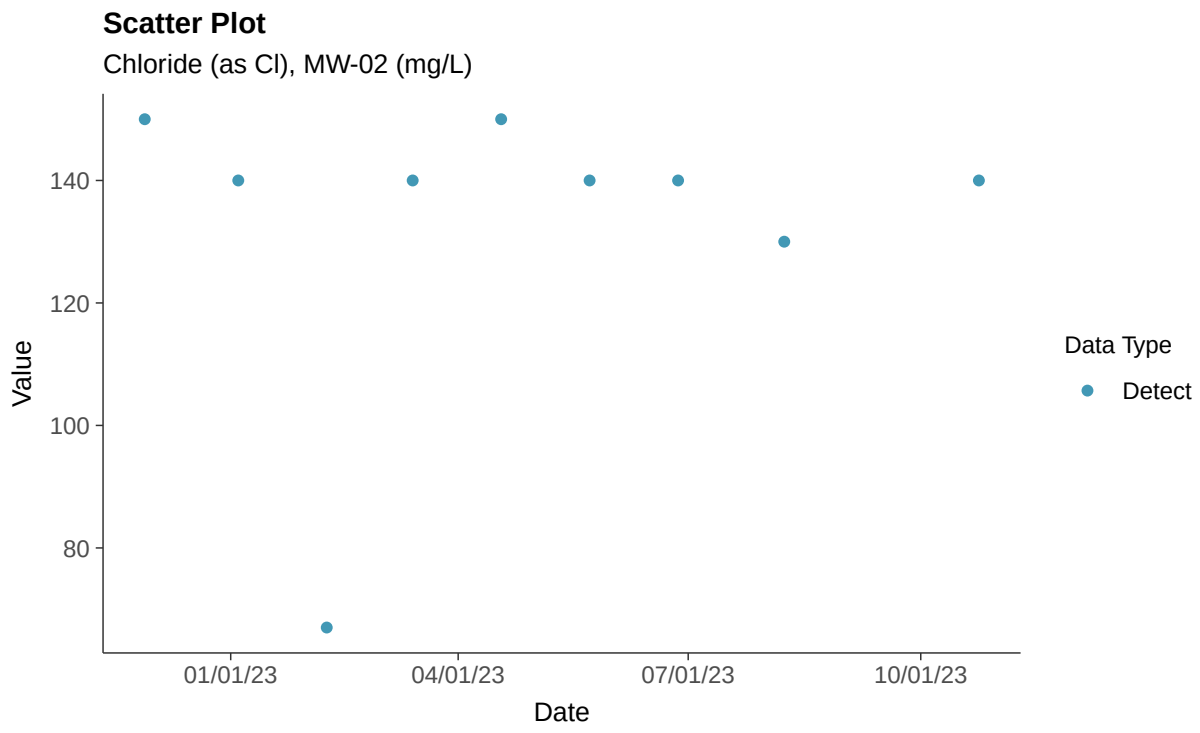
Calcium, MW-02 (mg/L)

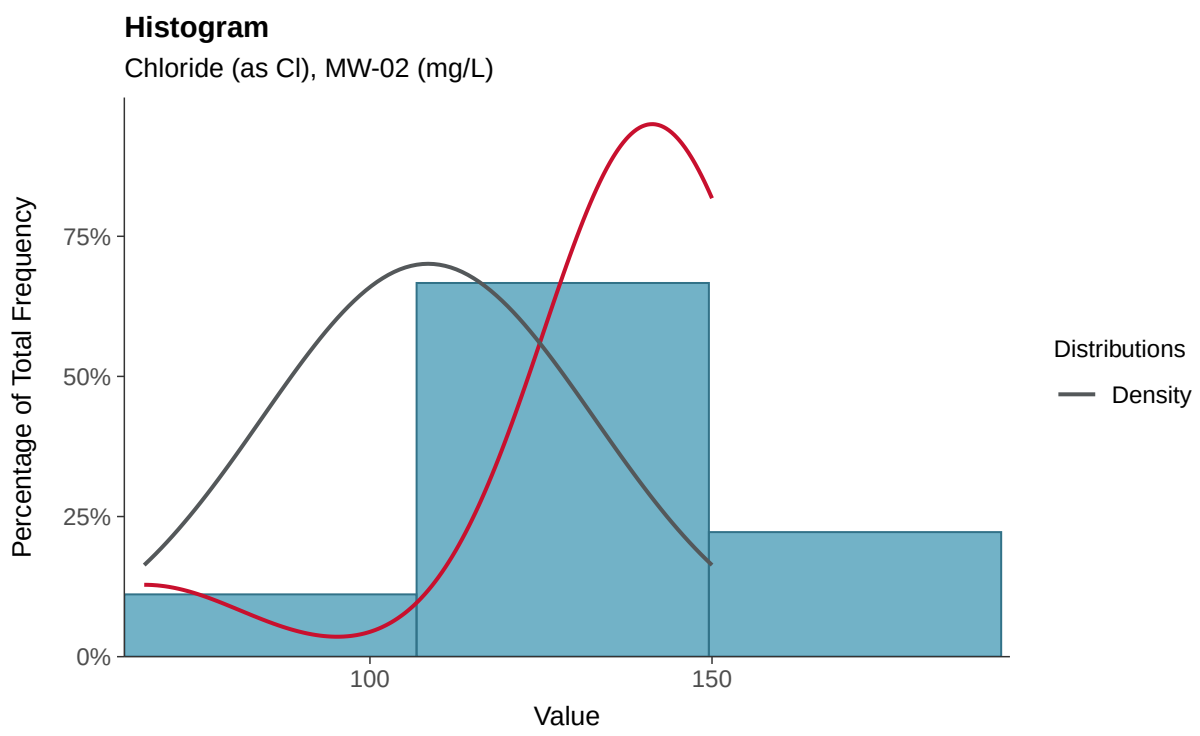



Trend Regression: Piecewise Linear-Linear
Calcium, MW-02 (mg/L)
240
220
200
180
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-02

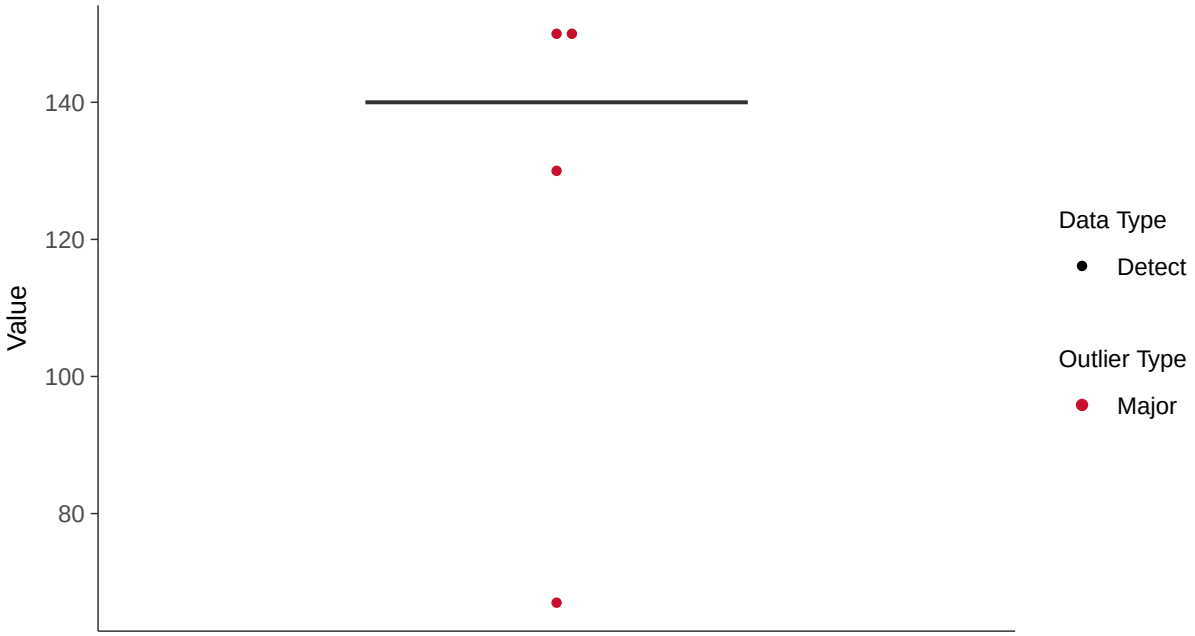
ID: 2_12_4_108





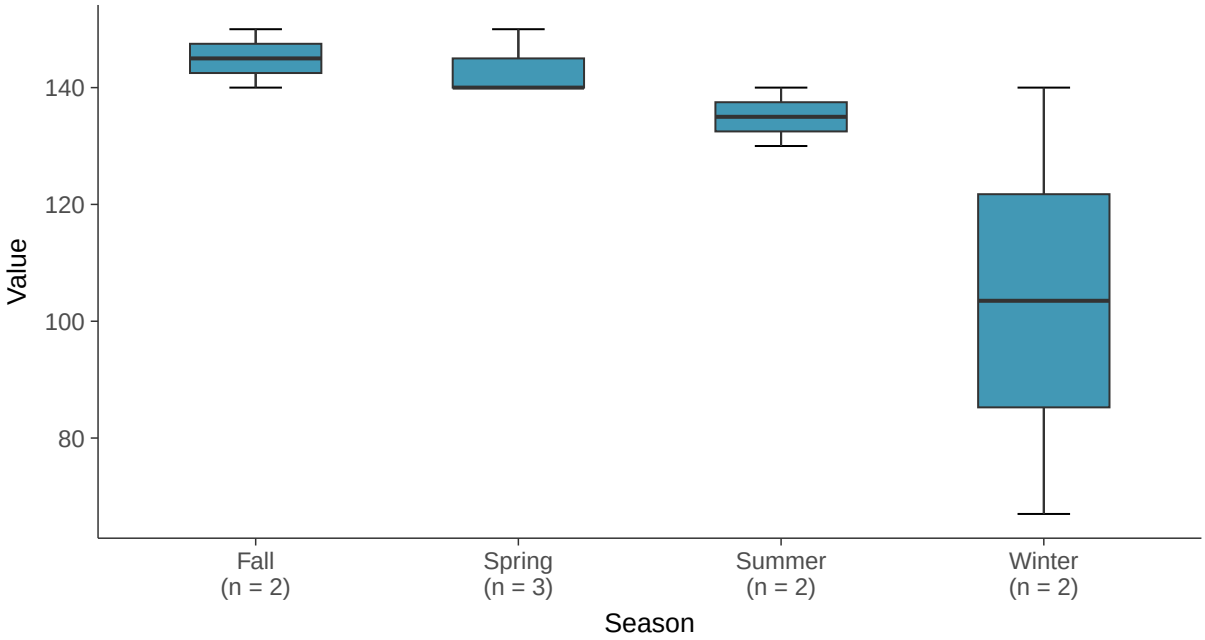
Boxplot

Chloride (as Cl), MW-02 (mg/L)



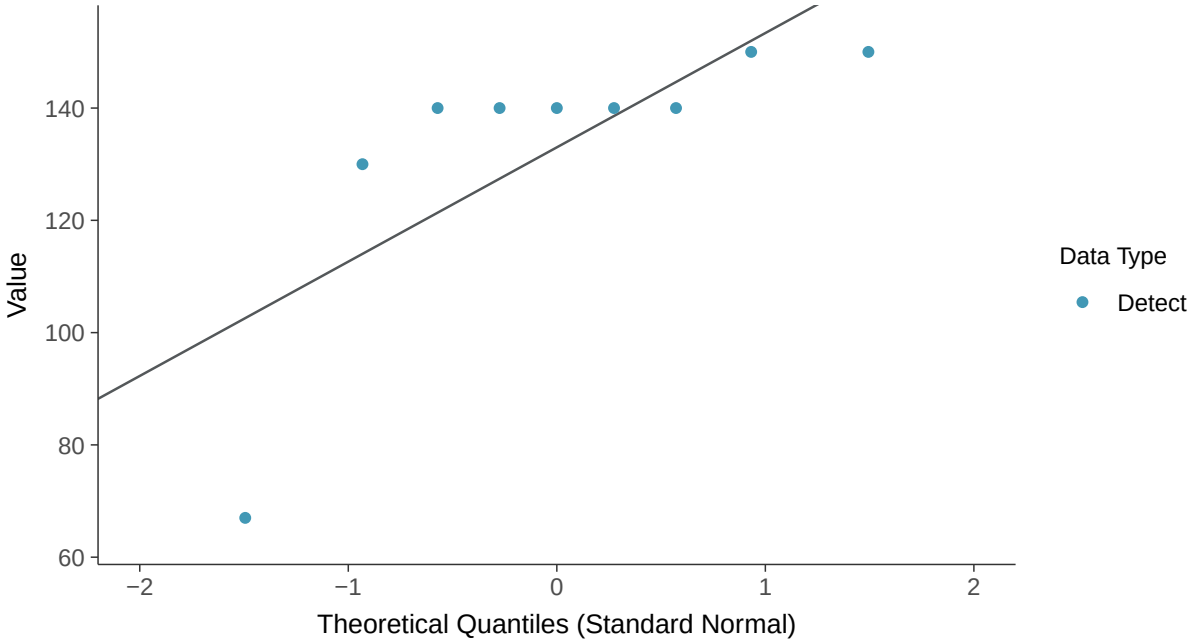
Boxplot by Season

Chloride (as Cl), MW-02 (mg/L)



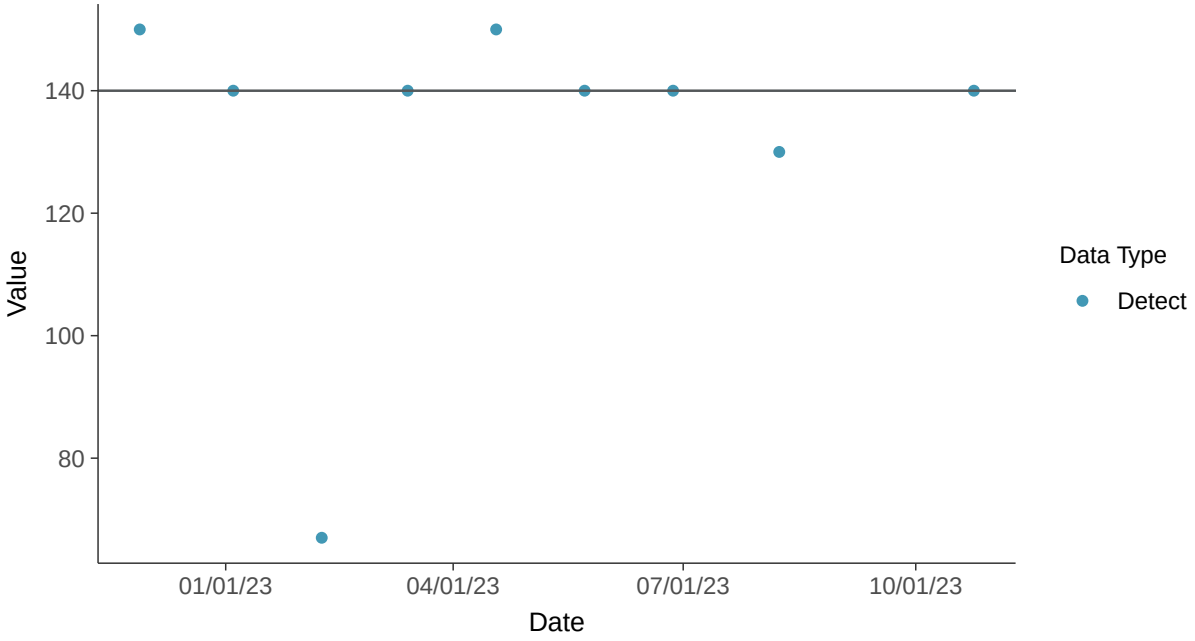
Normal Q-Q plot

Chloride (as Cl), MW-02 (mg/L)



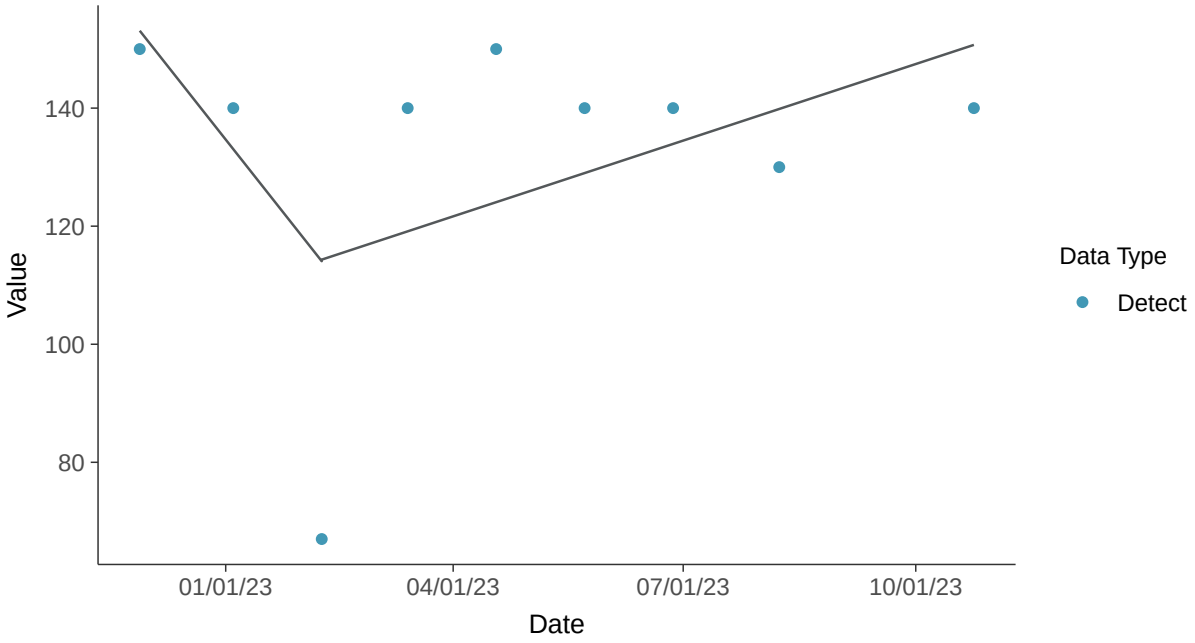
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Chloride (as Cl), MW-02 (mg/L)



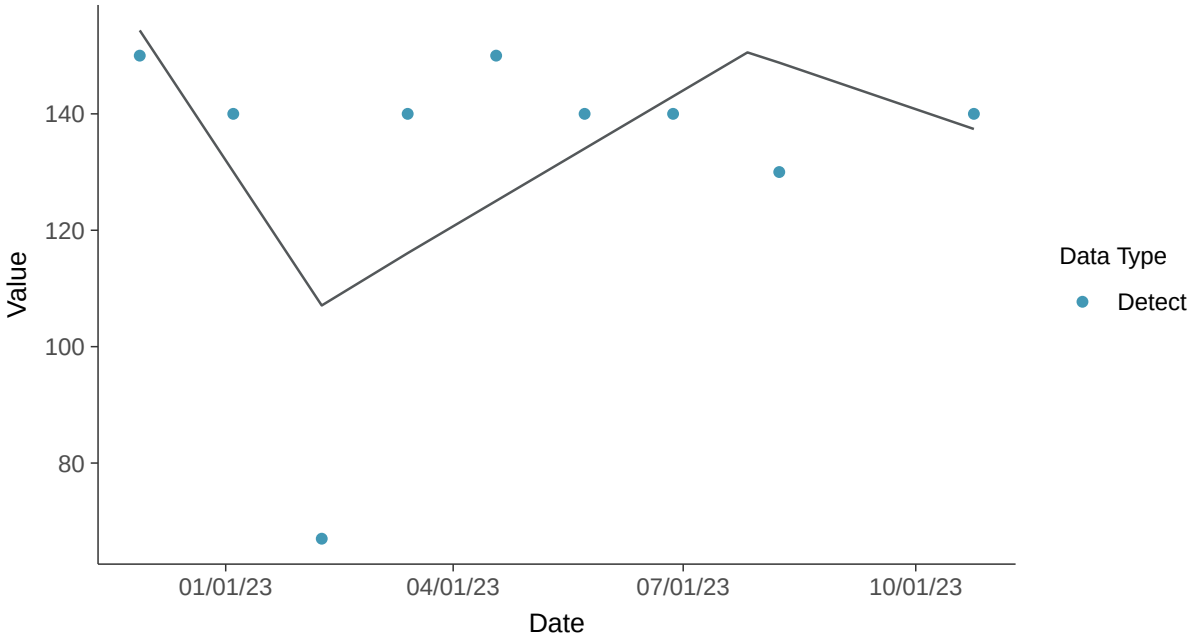
Trend Regression: Piecewise Linear-Linear

Chloride (as Cl), MW-02 (mg/L)



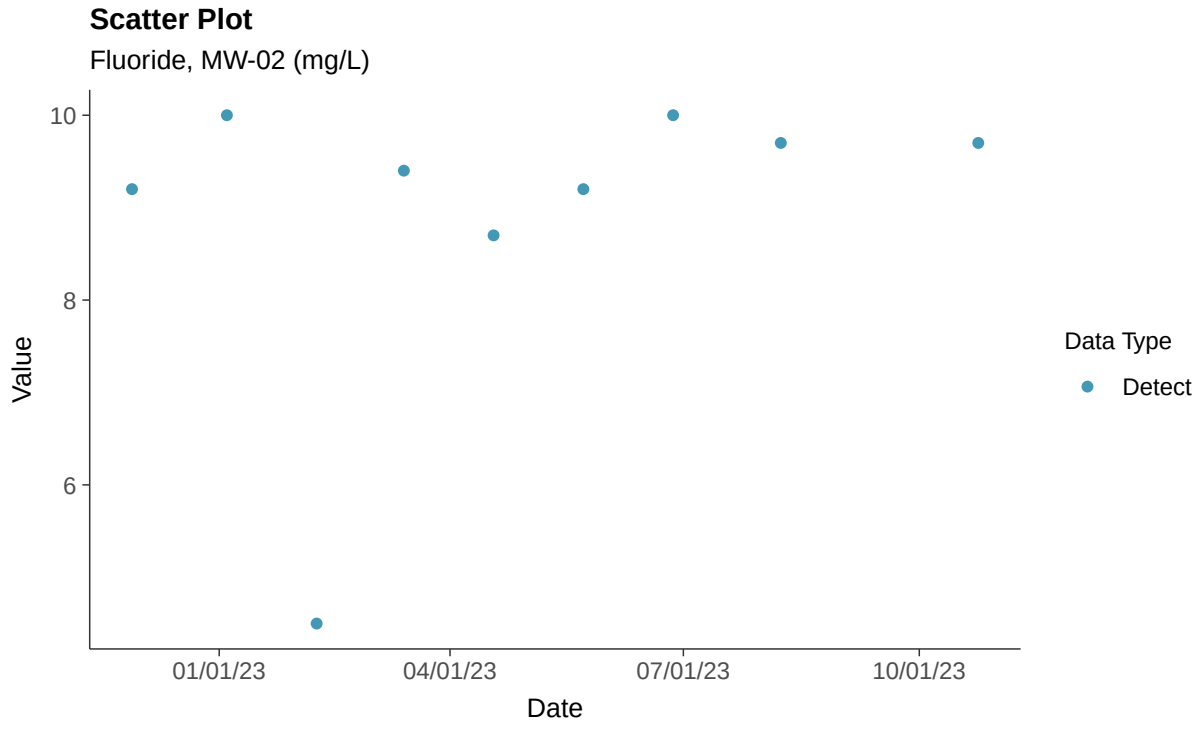
Trend Regression: Piecewise Linear-Linear-Linear

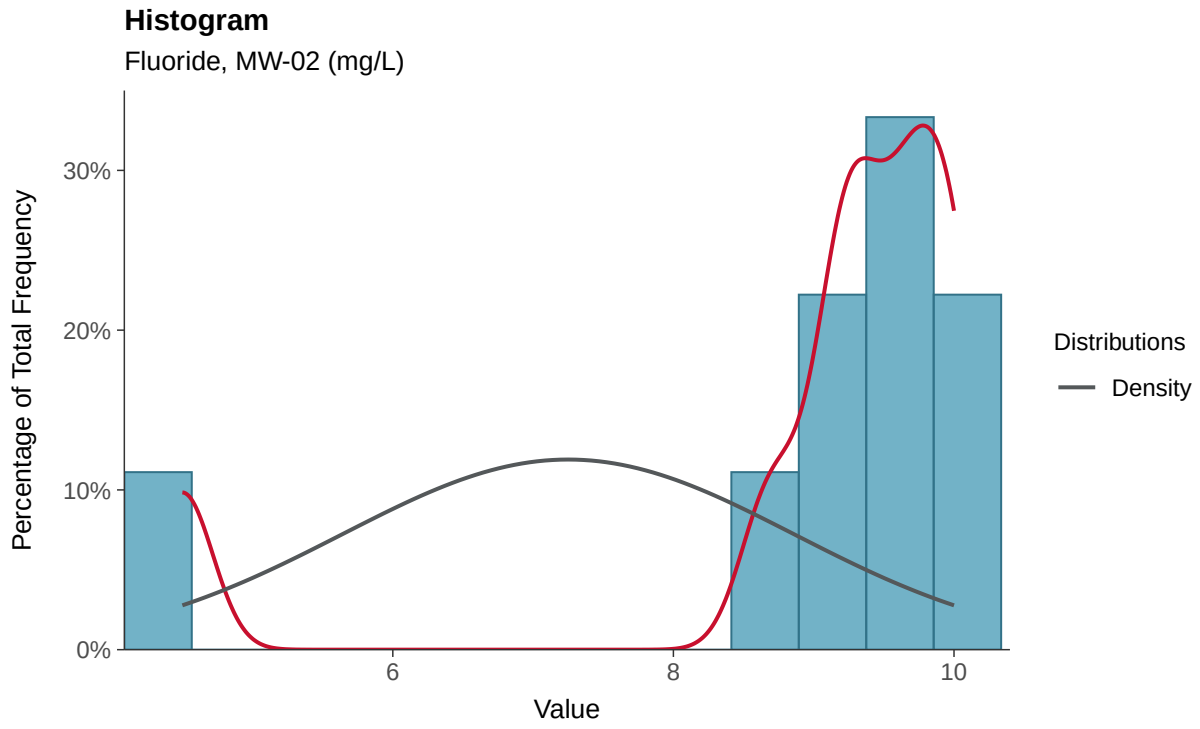
Chloride (as Cl), MW-02 (mg/L)



Appendix III: Fluoride, MW-02

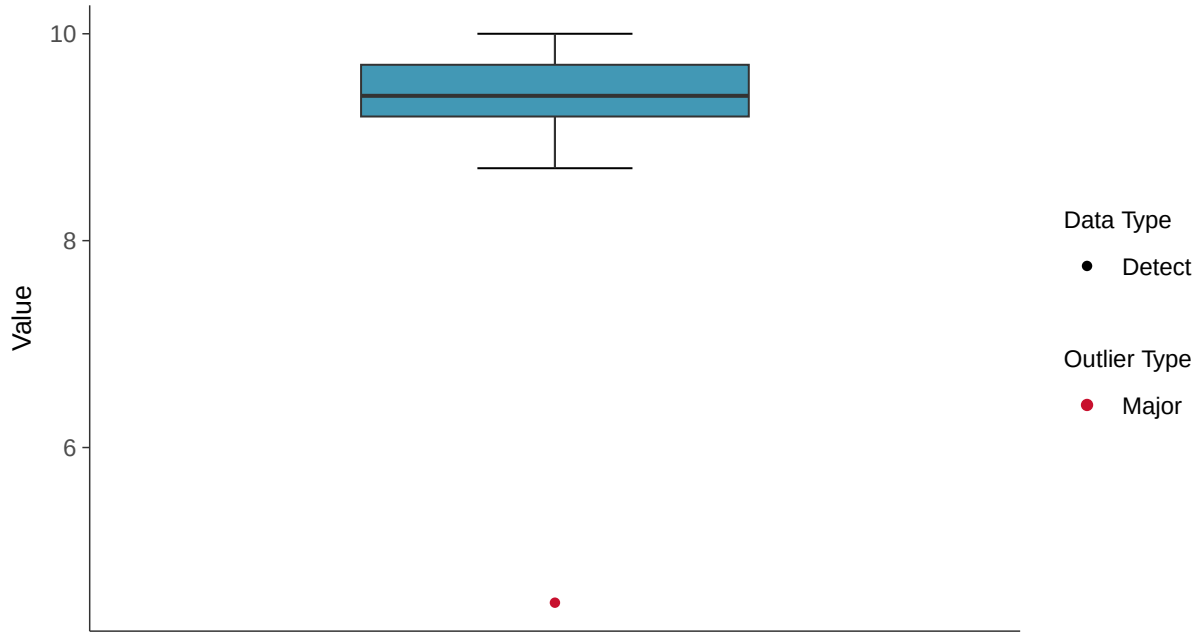
ID: 2_12_4_112





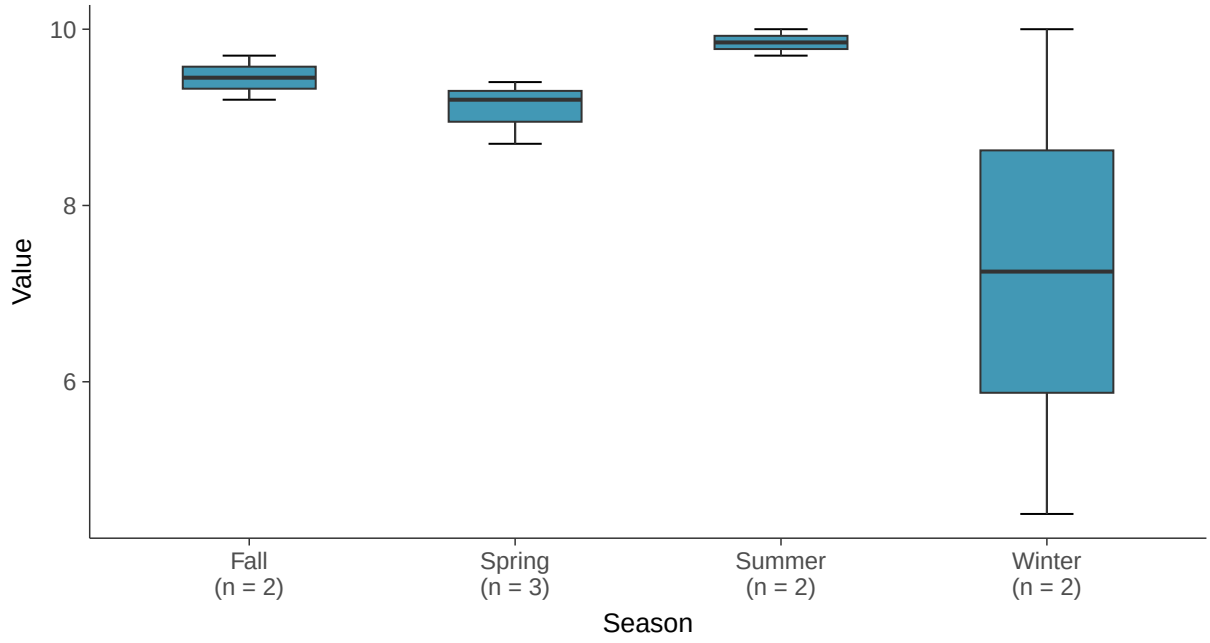
Boxplot

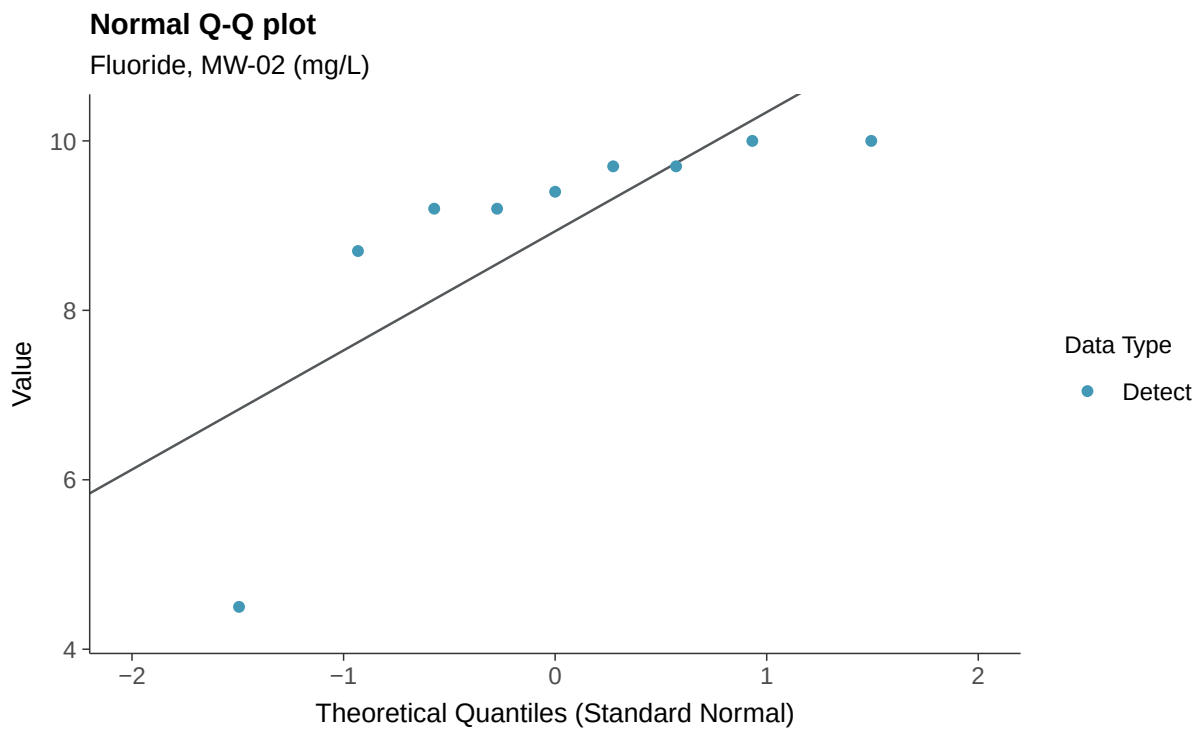
Fluoride, MW-02 (mg/L)

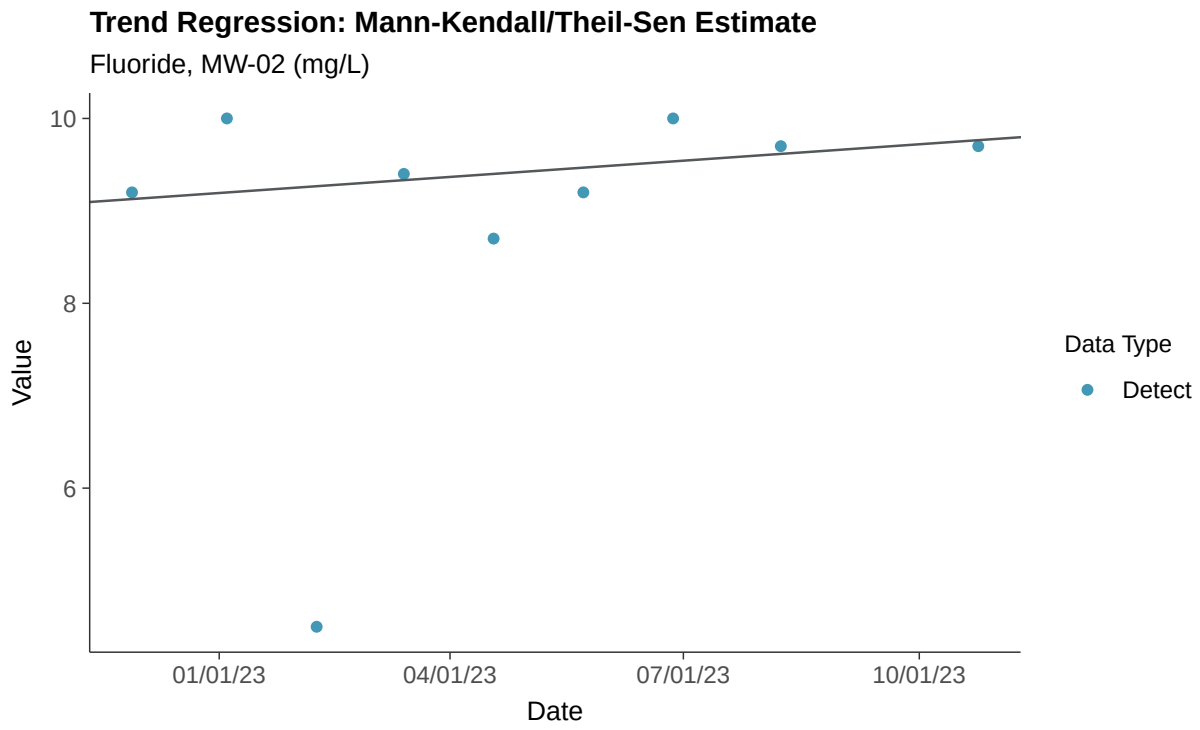


Boxplot by Season

Fluoride, MW-02 (mg/L)

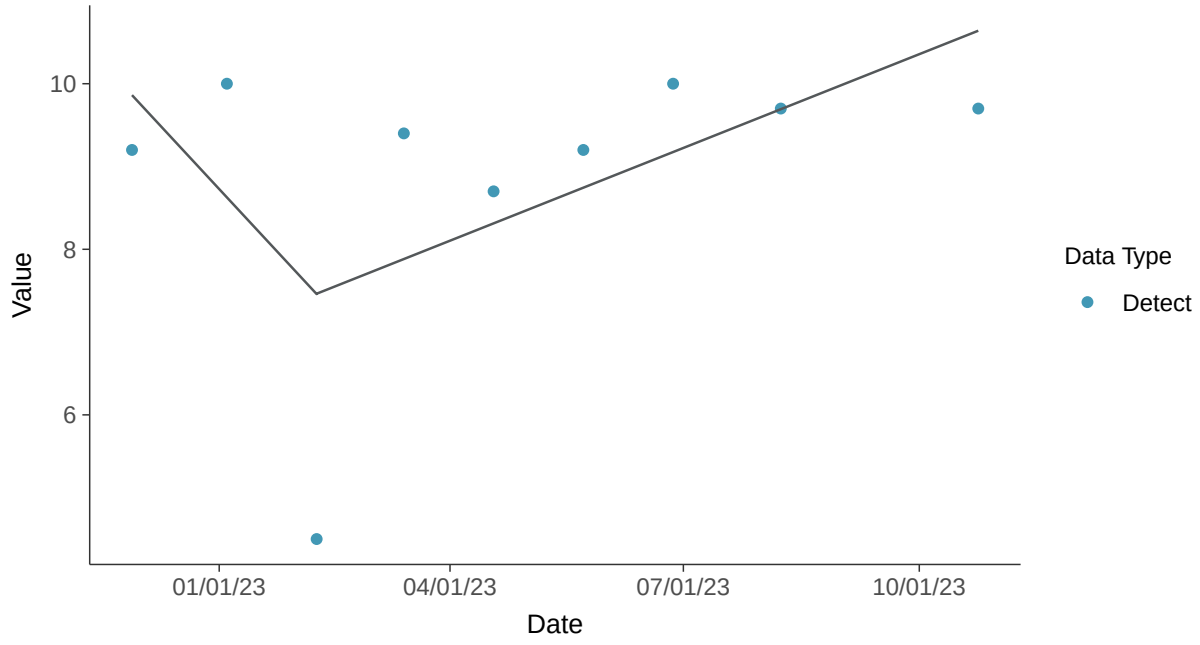



Normal Q-Q plot
Fluoride, MW-02 (mg/L)
Value
10
8
6
4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Fluoride, MW-02 (mg/L)
Value
10
8
6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

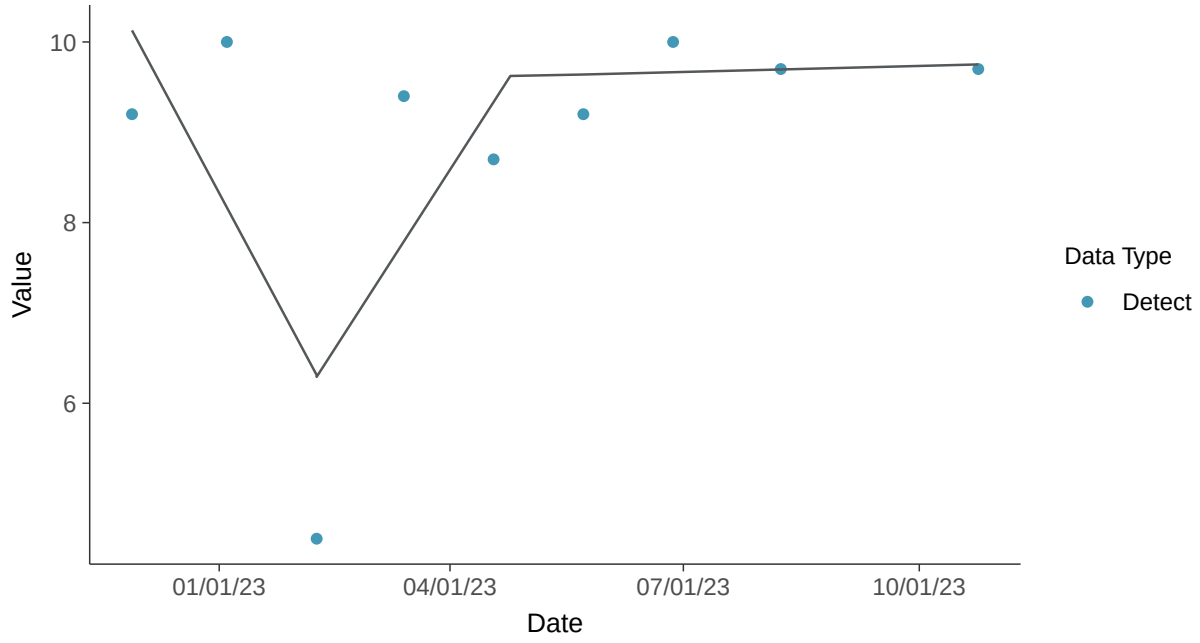
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-02 (mg/L)



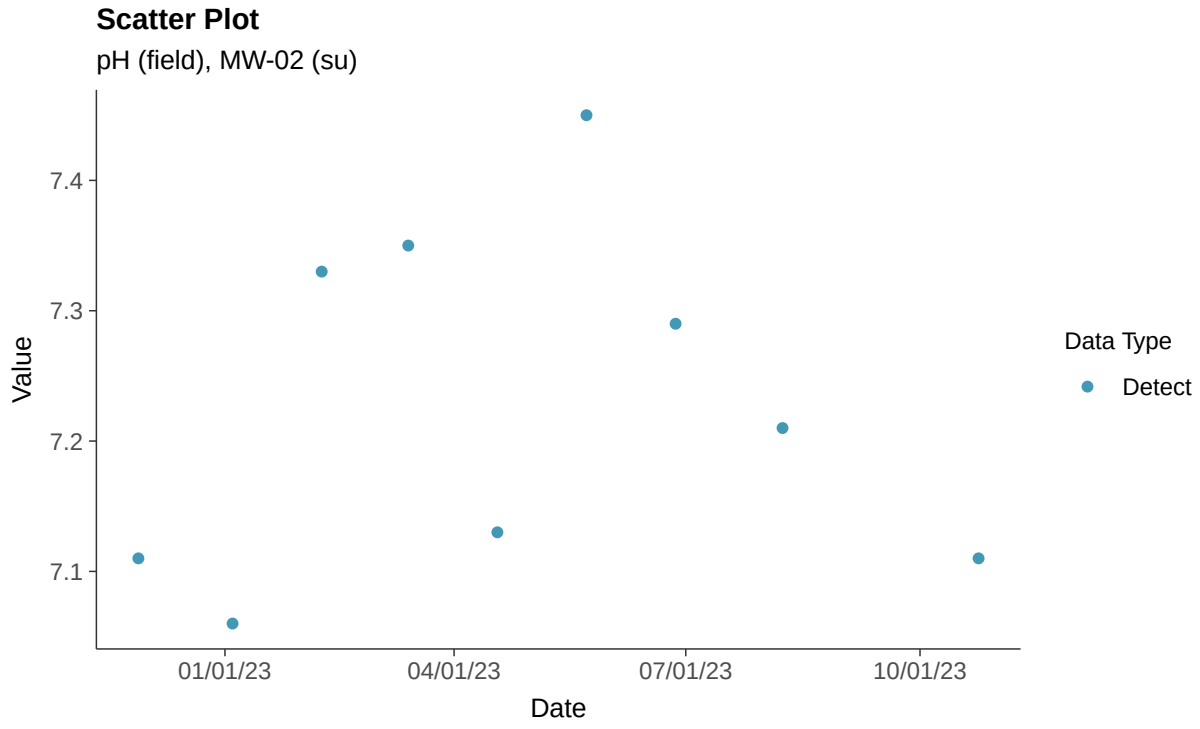
Trend Regression: Piecewise Linear-Linear-Linear

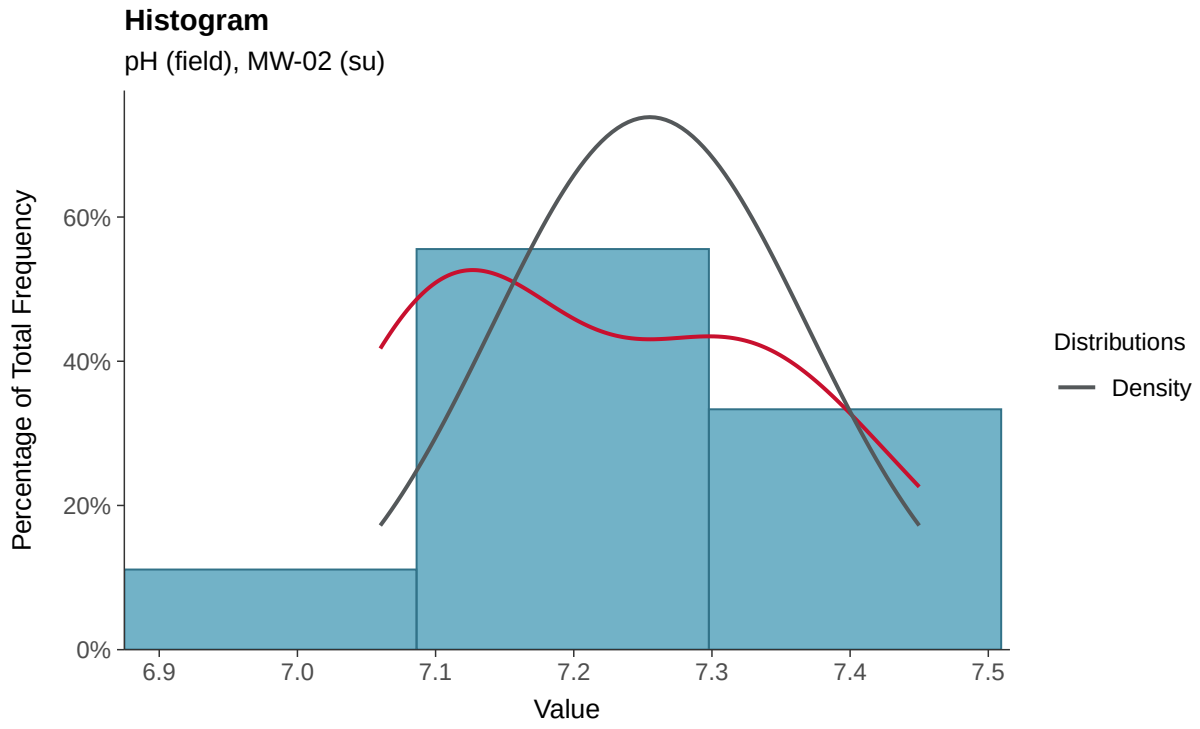
Fluoride, MW-02 (mg/L)



Appendix III: pH (field), MW-02

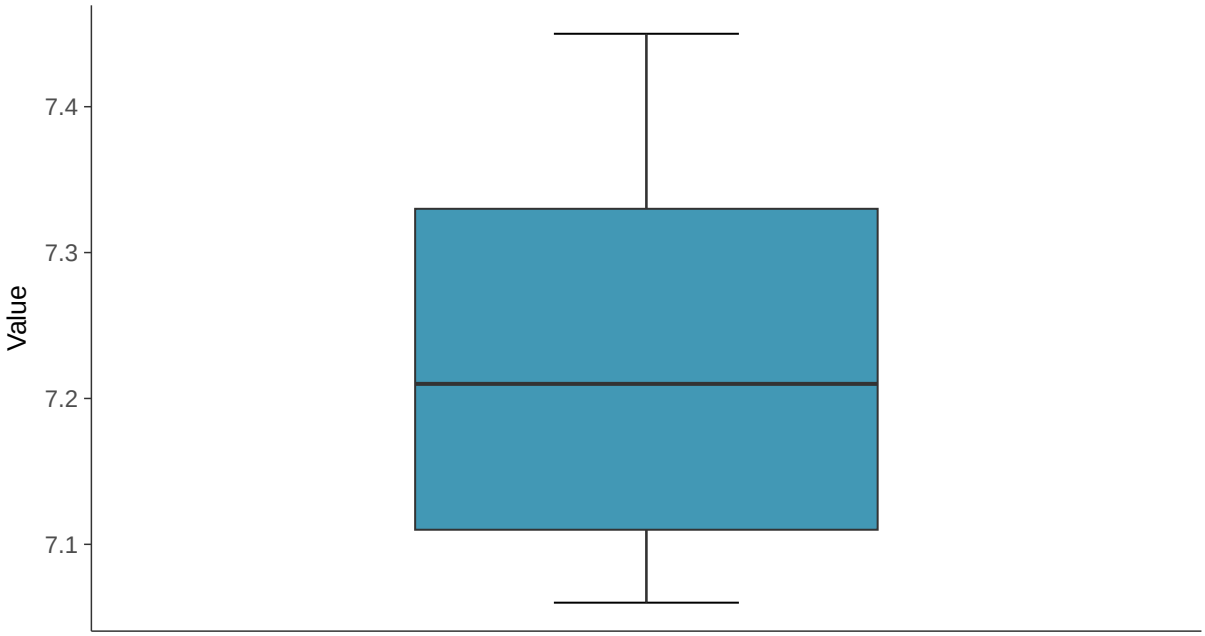
ID: 2_12_4_120





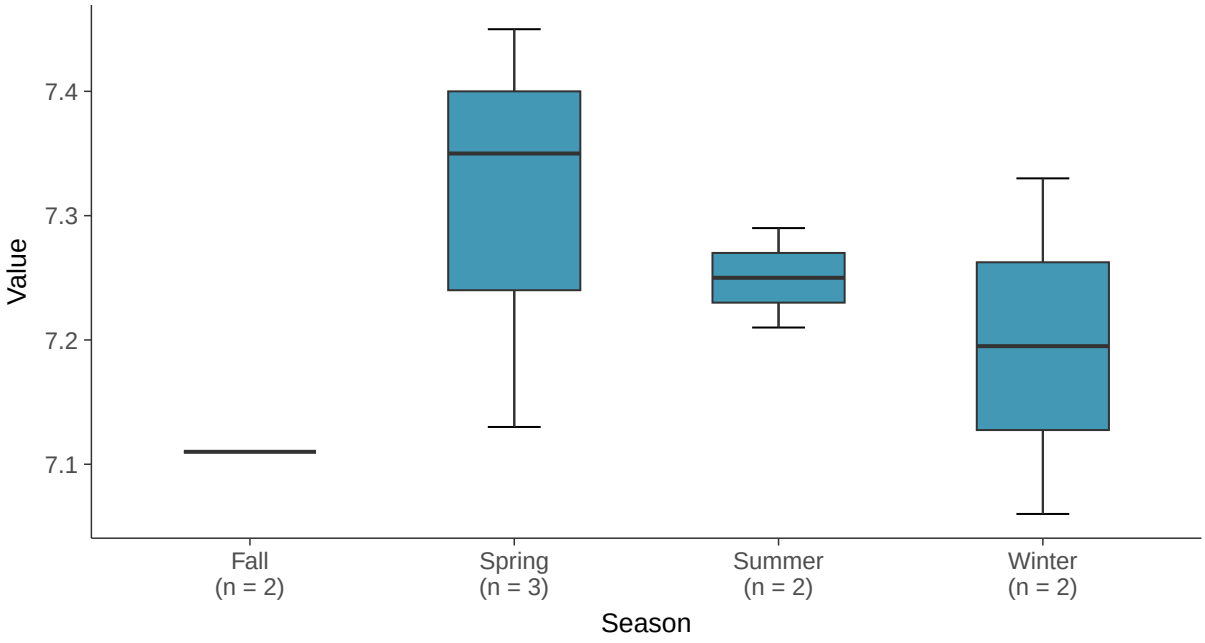
Boxplot

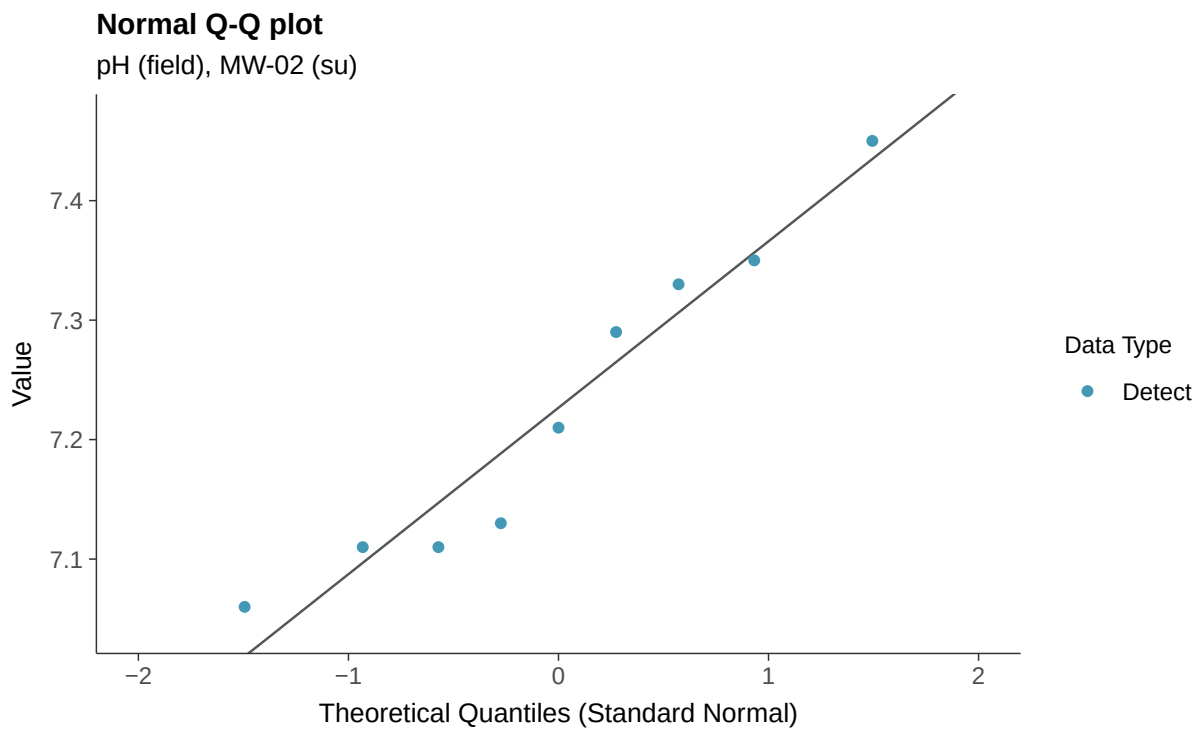
pH (field), MW-02 (su)

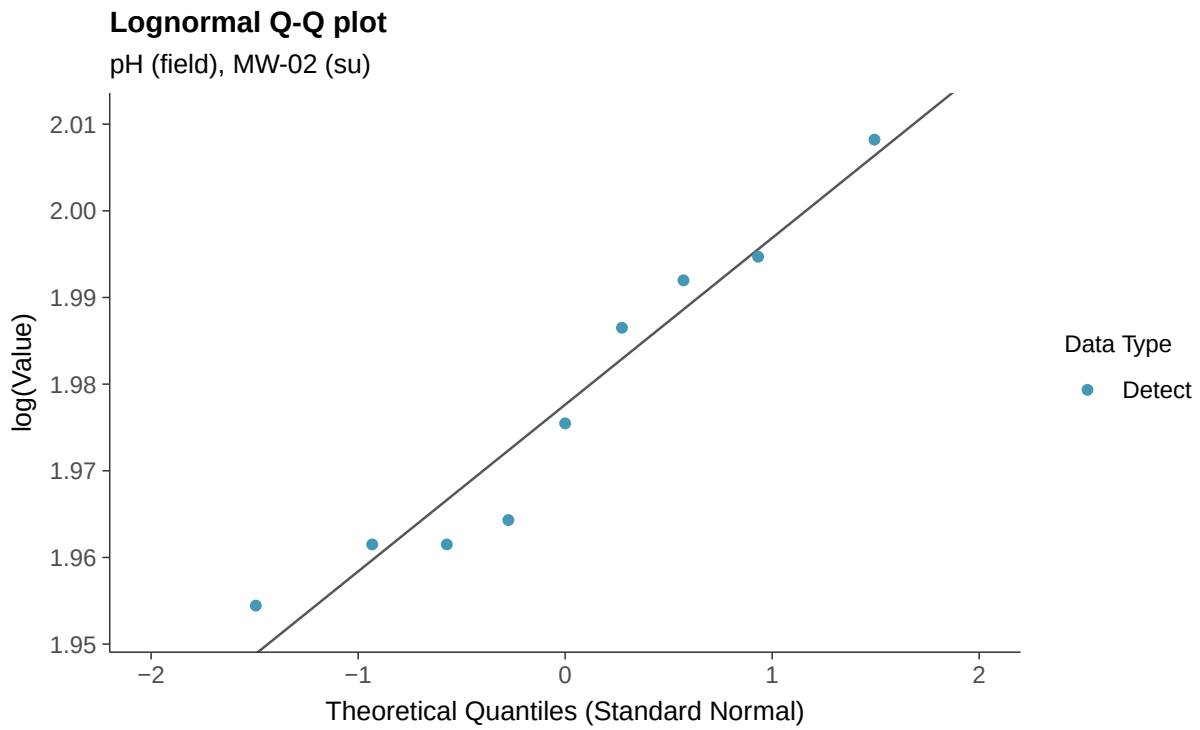


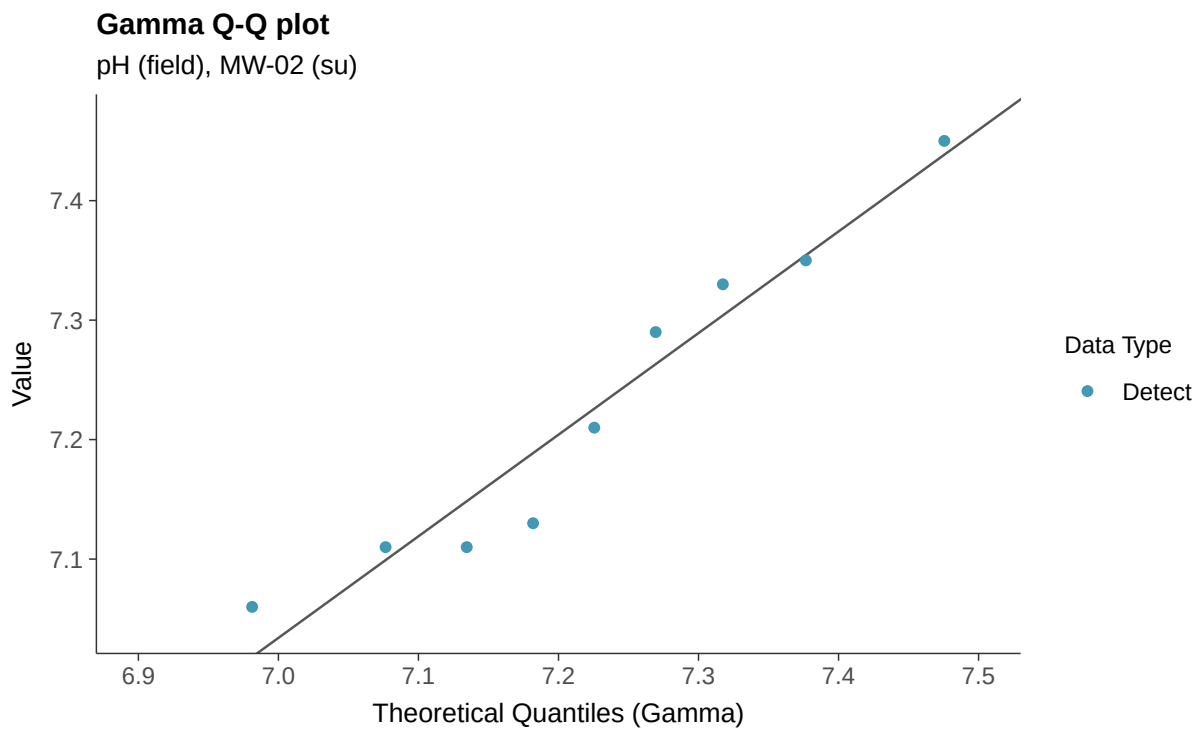
Boxplot by Season

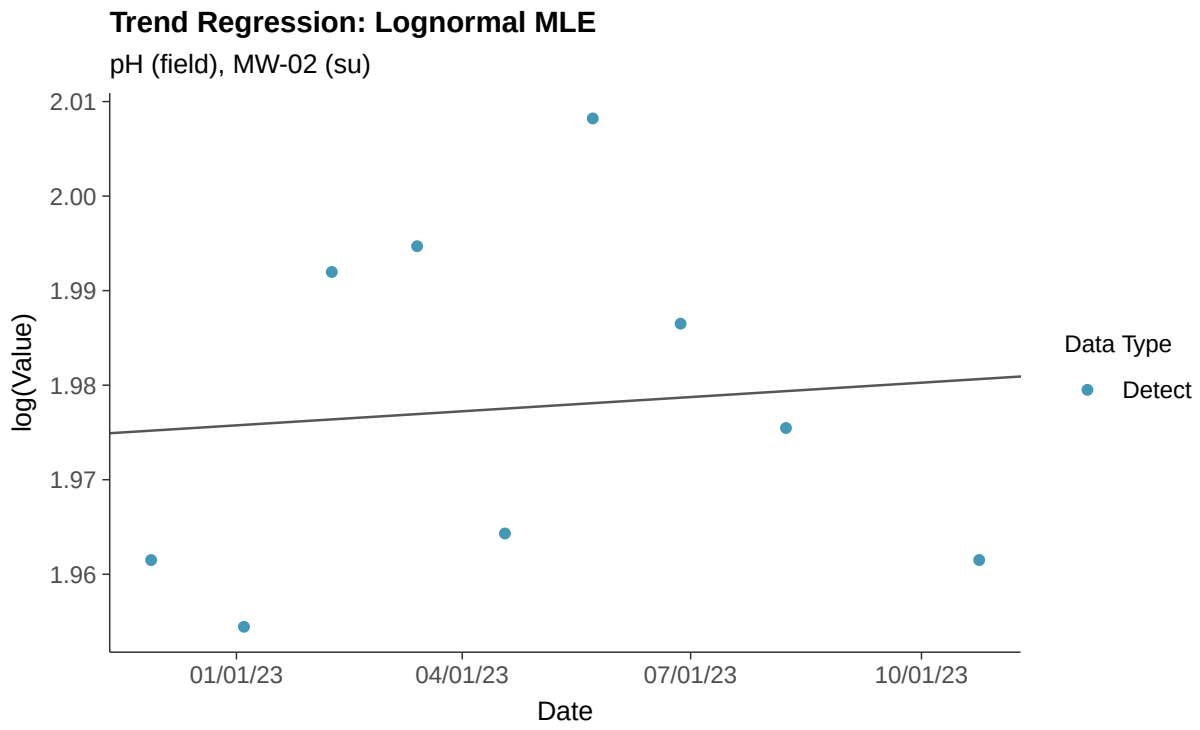
pH (field), MW-02 (su)




Normal Q-Q plot
pH (field), MW-02 (su)
Value
7.4
7.3
7.2
7.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

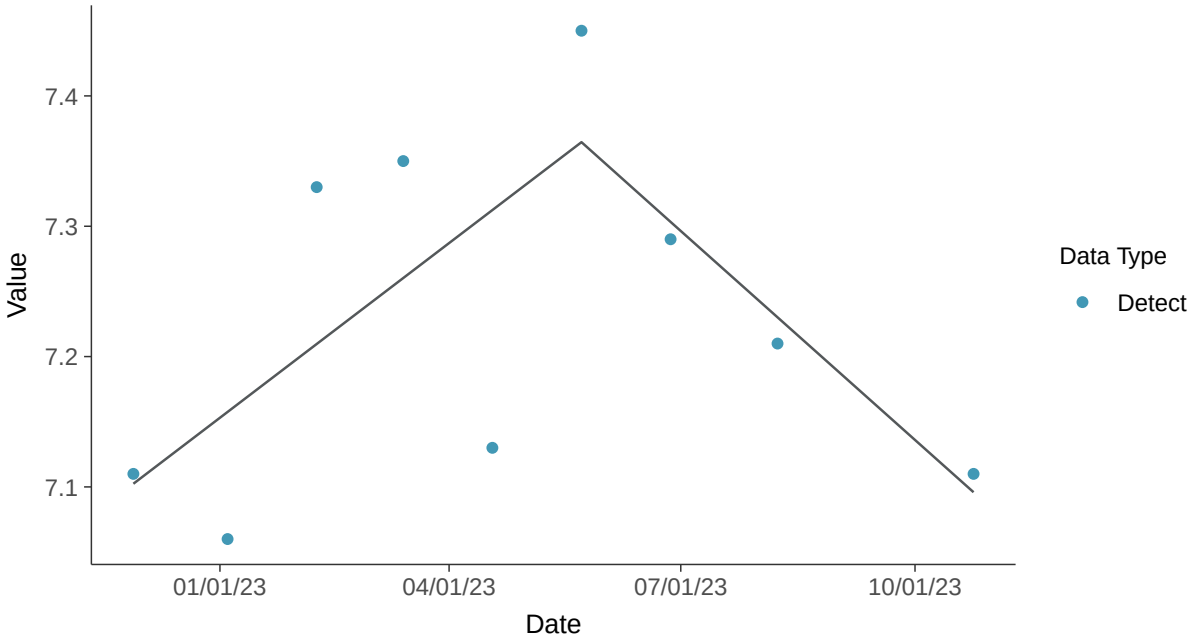

Lognormal Q-Q plot
pH (field), MW-02 (su)
log(Value)
2.01
2.00
1.99
1.98
1.97
1.96
1.95
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
pH (field), MW-02 (su)
Value
7.4
7.3
7.2
7.1
6.9
7.0
7.1
7.2
7.3
7.4
7.5
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
pH (field), MW-02 (su)
log(Value)
2.01
2.00
1.99
1.98
1.97
1.96
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

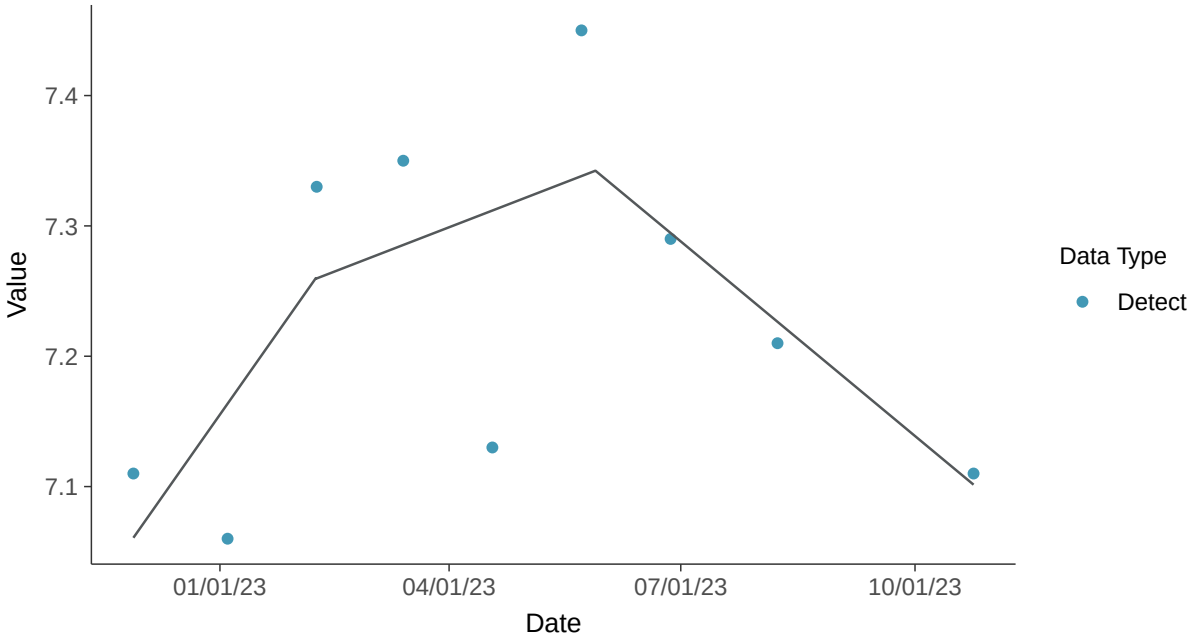
Trend Regression: Piecewise Linear-Linear

pH (field), MW-02 (su)



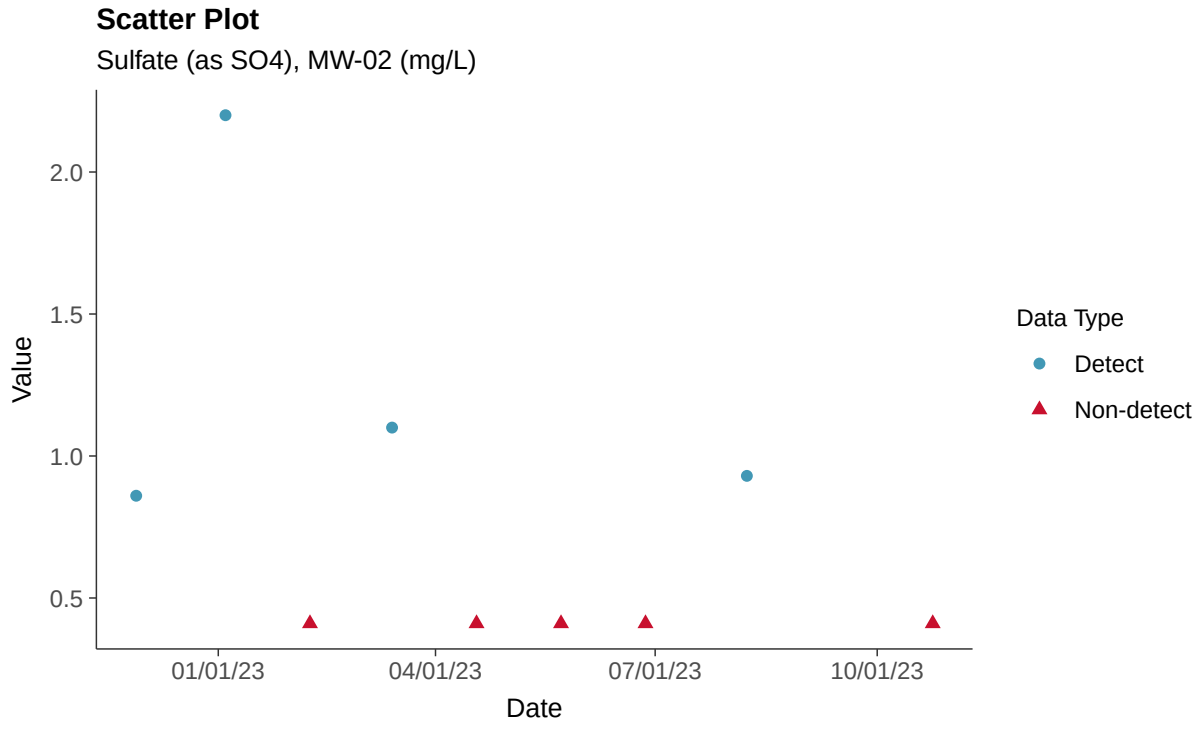
Trend Regression: Piecewise Linear-Linear-Linear

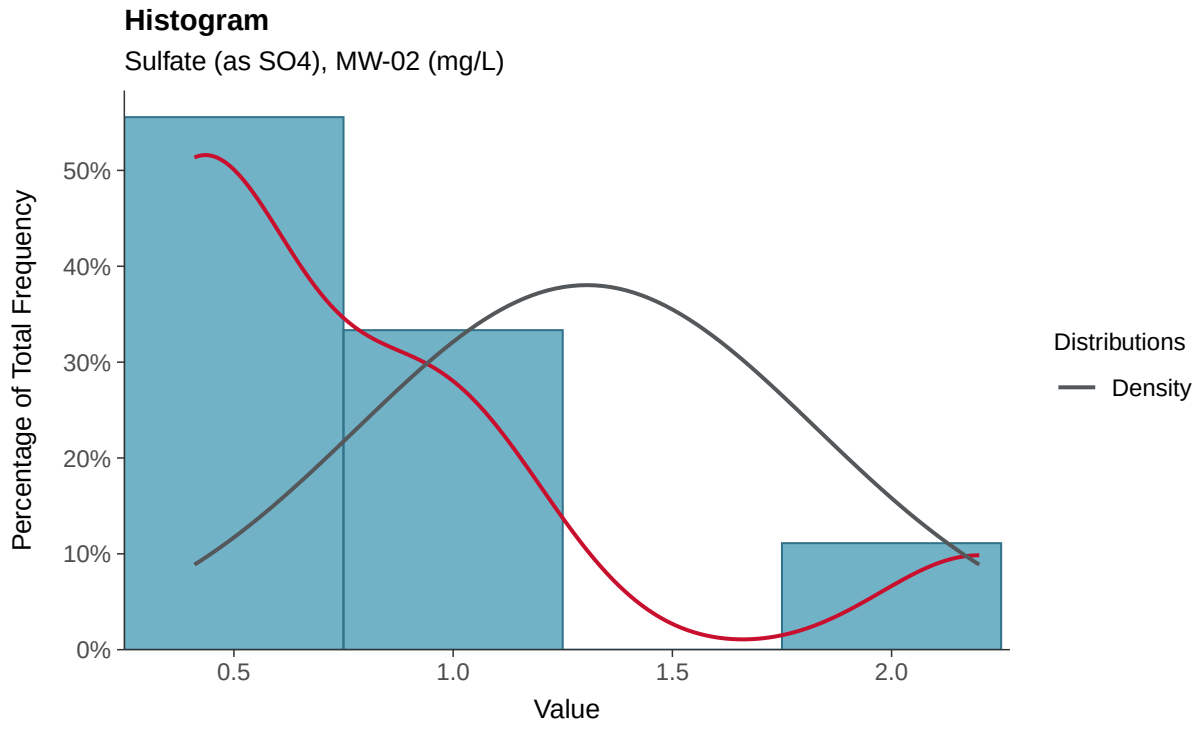
pH (field), MW-02 (su)



Appendix III: Sulfate (as SO4), MW-02

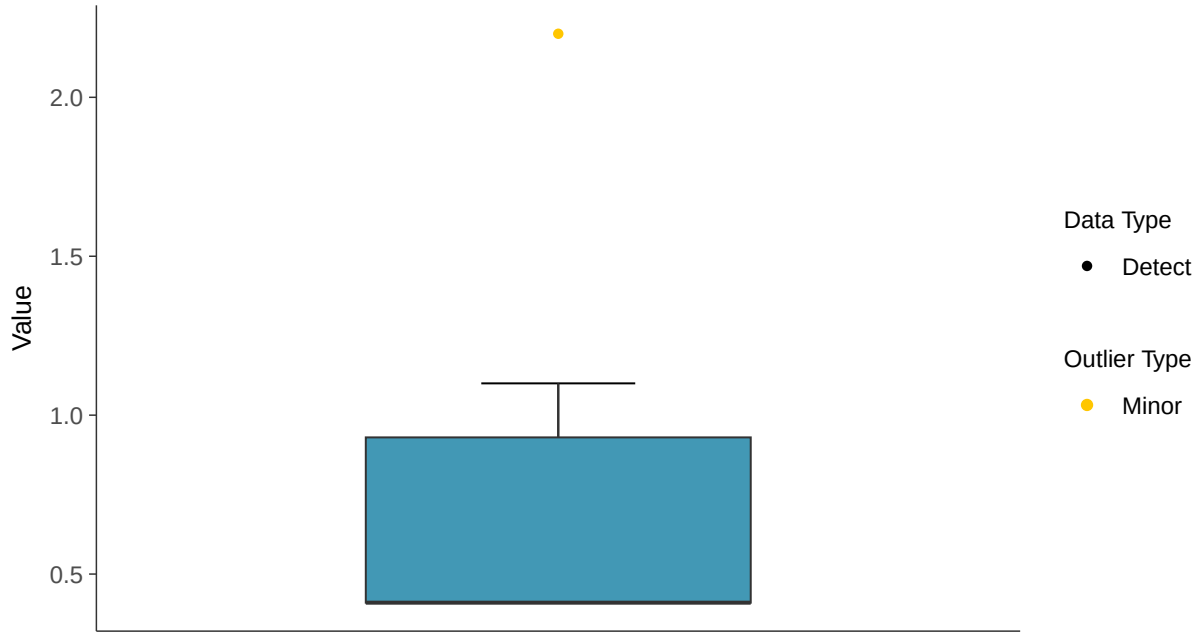
ID: 2_12_4_124





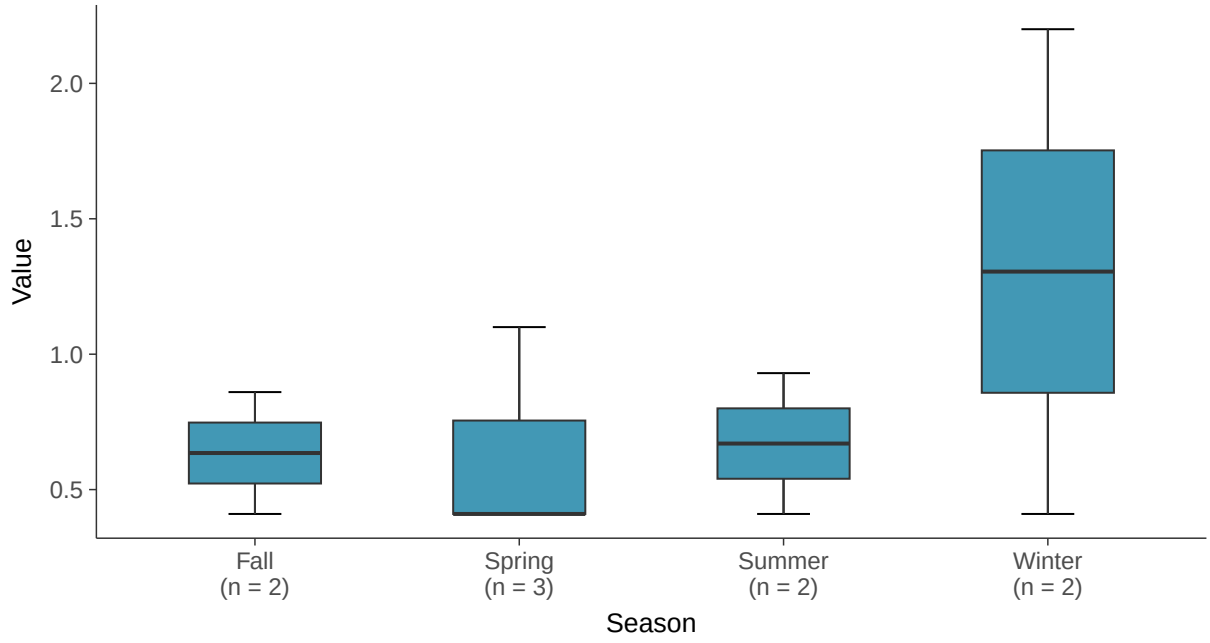
Boxplot

Sulfate (as SO4), MW-02 (mg/L)



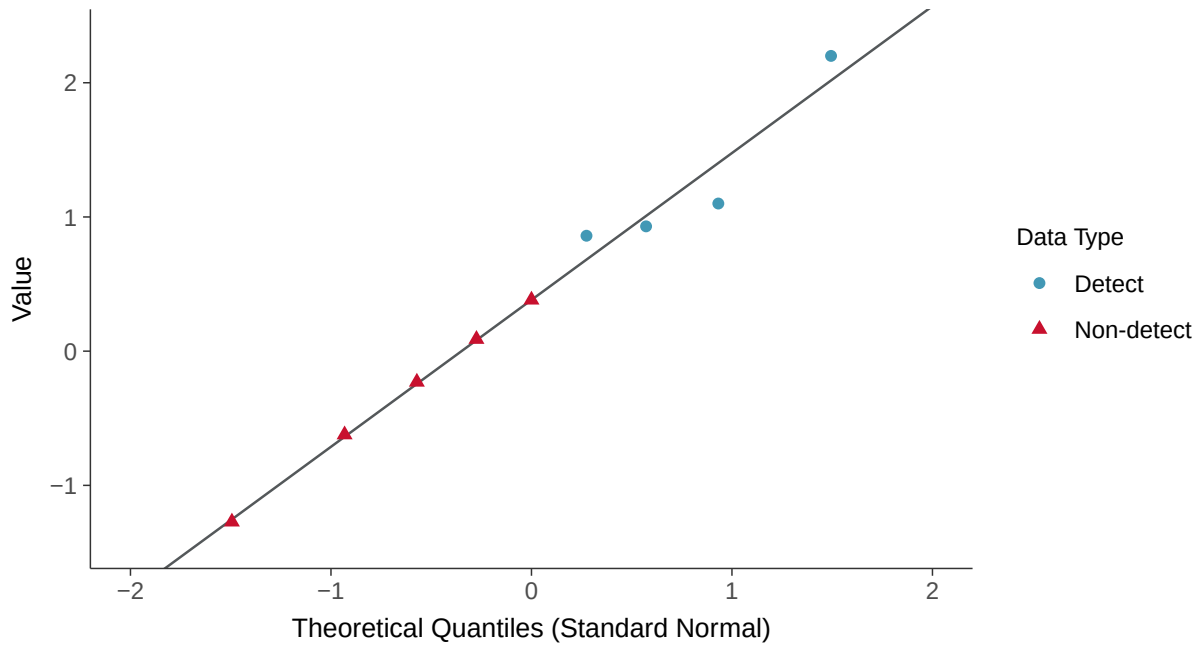
Boxplot by Season

Sulfate (as SO4), MW-02 (mg/L)



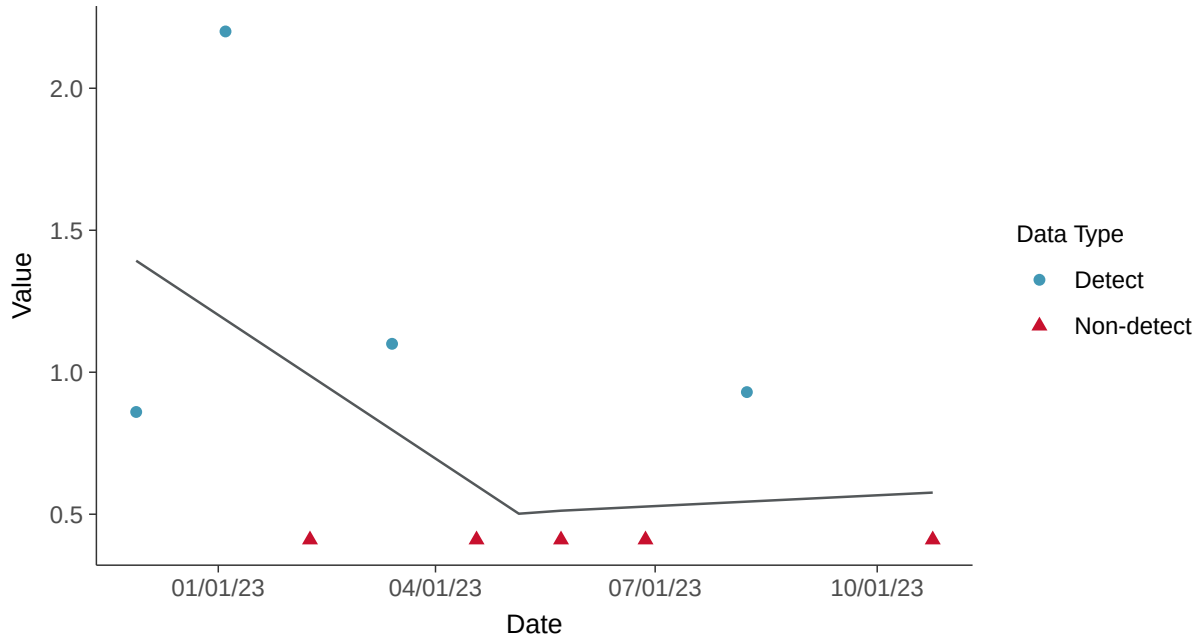
Normal Q-Q plot using ROS Imputed Estimates

Sulfate (as SO4), MW-02 (mg/L)



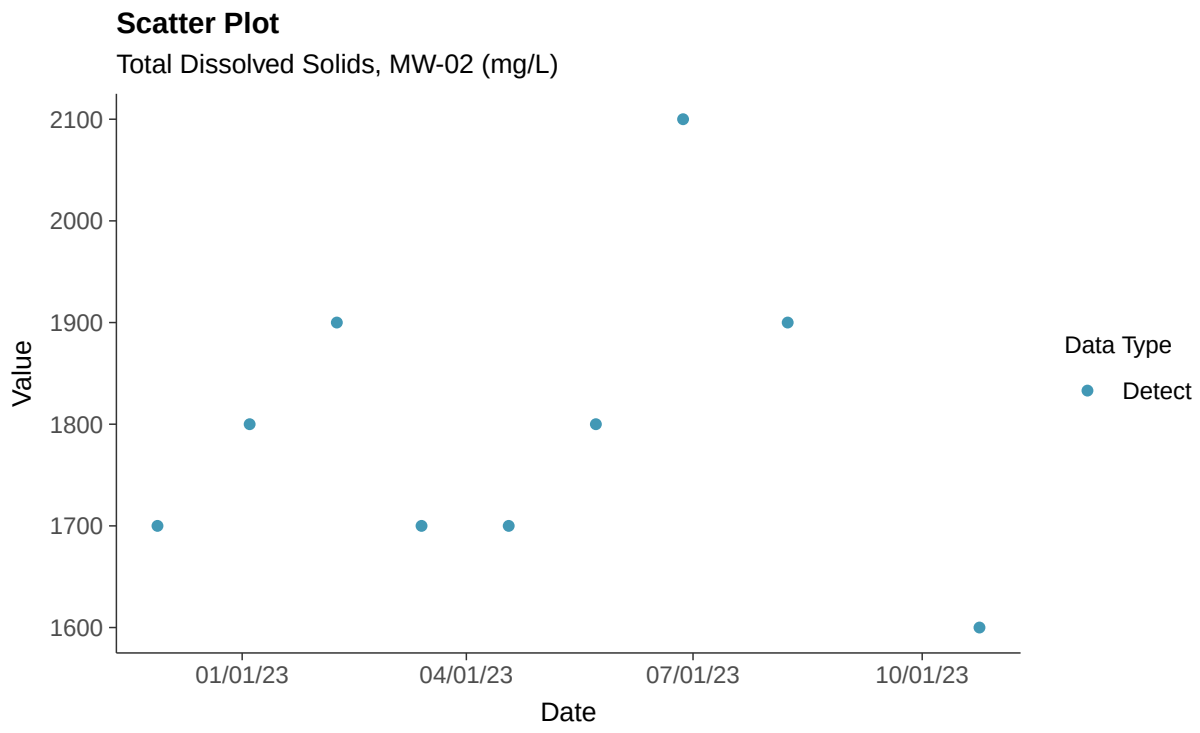
Trend Regression: Piecewise Linear-Linear

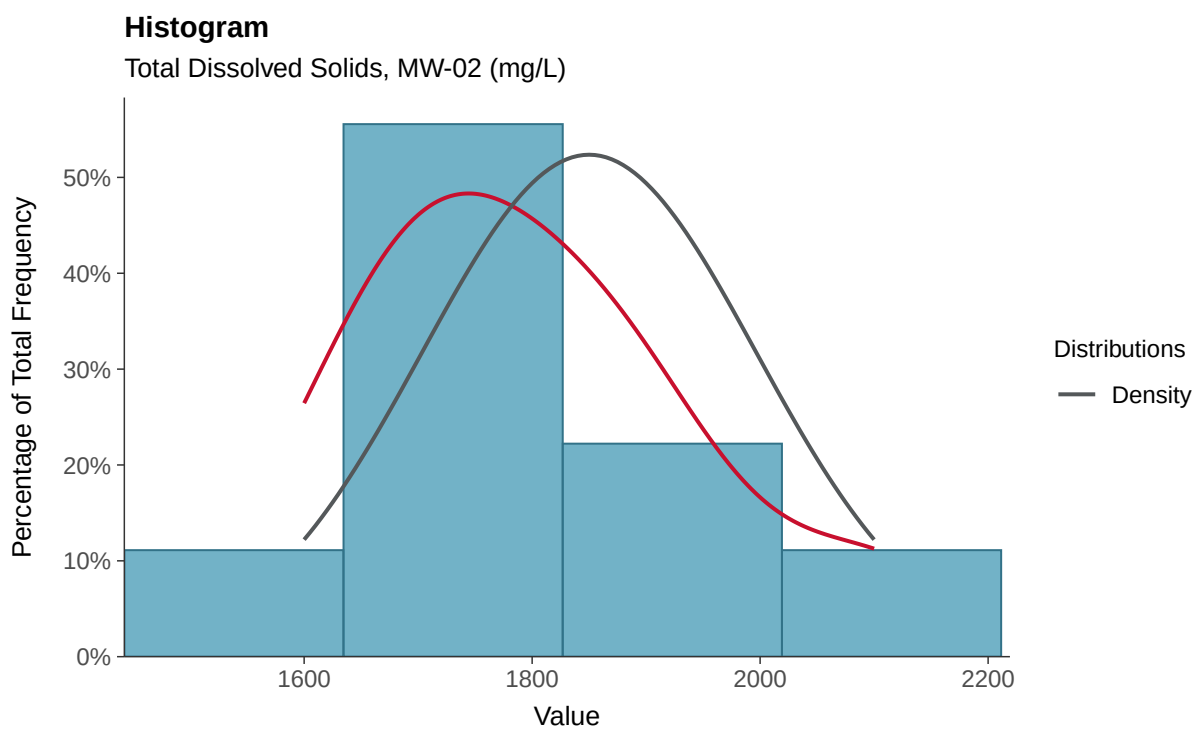
Sulfate (as SO4), MW-02 (mg/L)



Appendix III: Total Dissolved Solids, MW-02

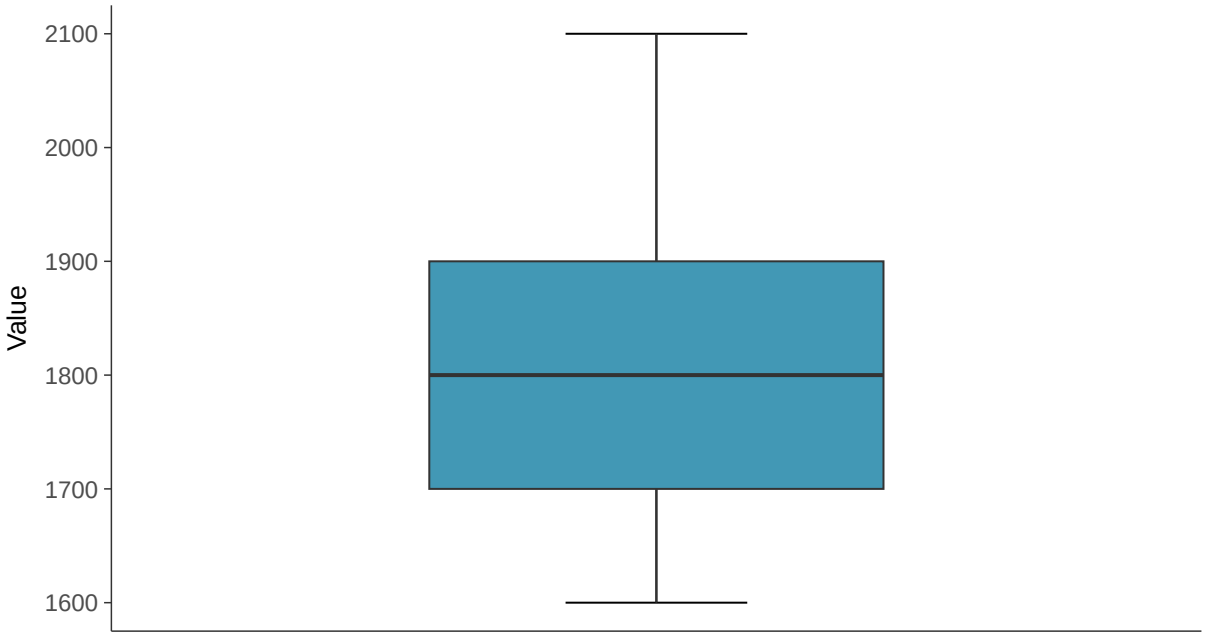
ID: 2_12_4_126





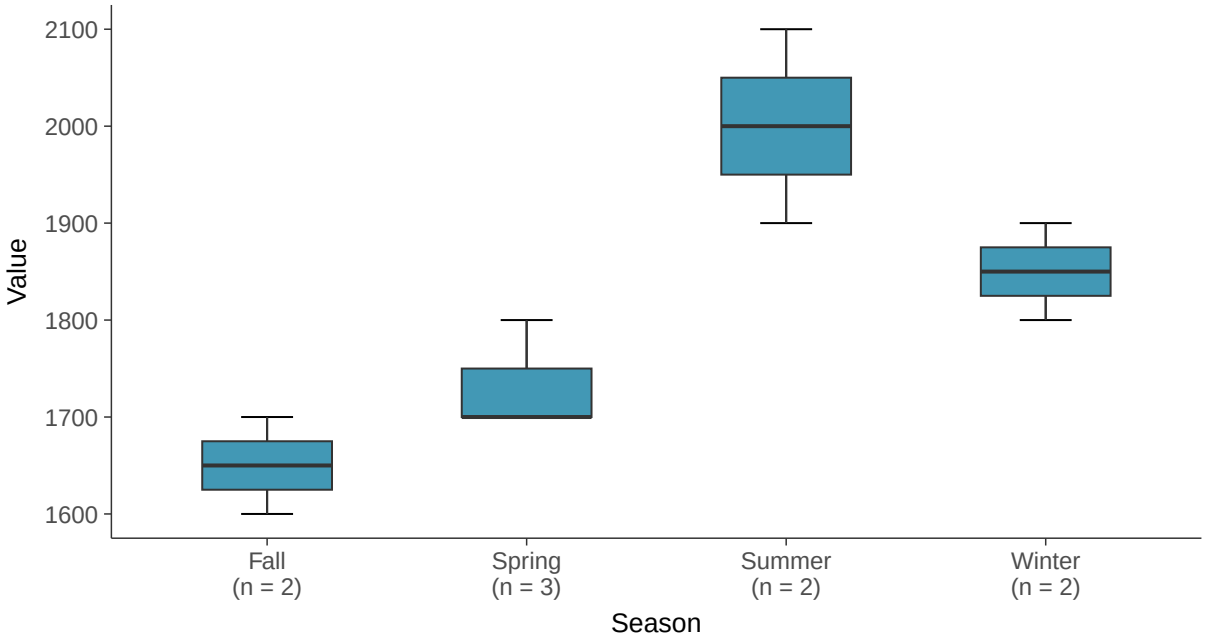
Boxplot

Total Dissolved Solids, MW-02 (mg/L)



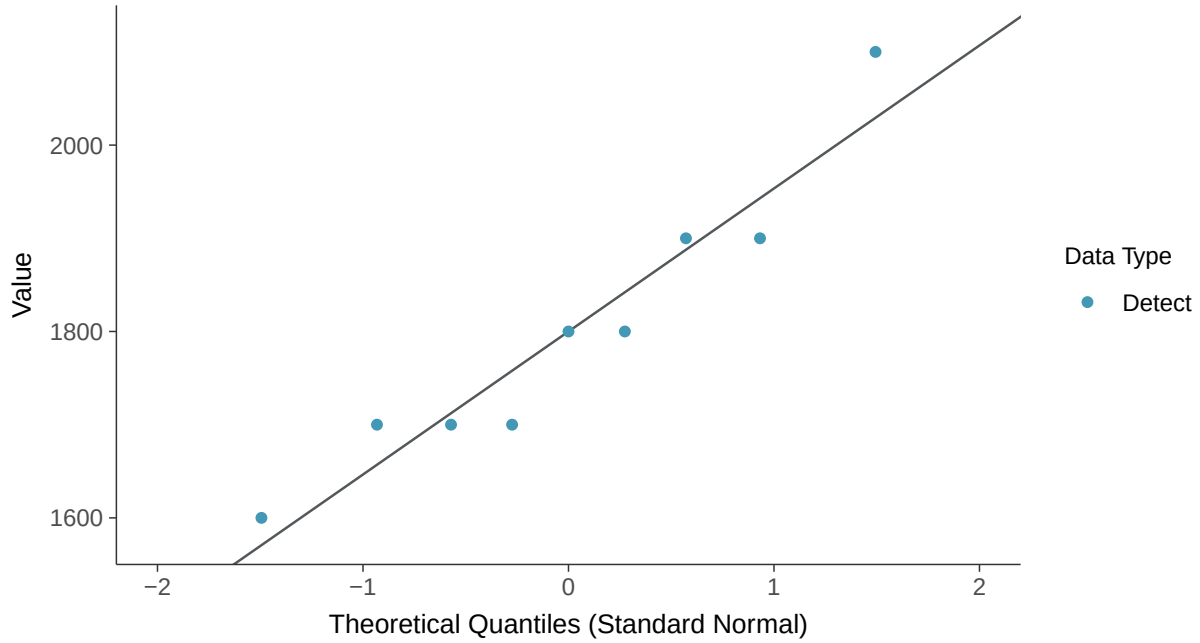
Boxplot by Season

Total Dissolved Solids, MW-02 (mg/L)



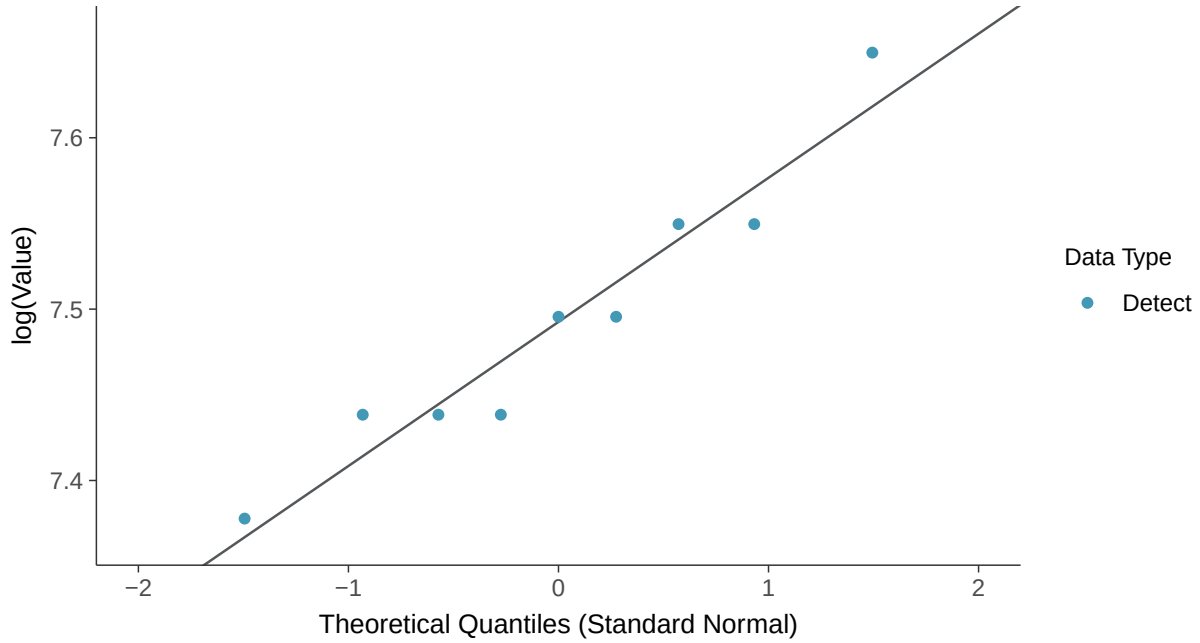
Normal Q-Q plot

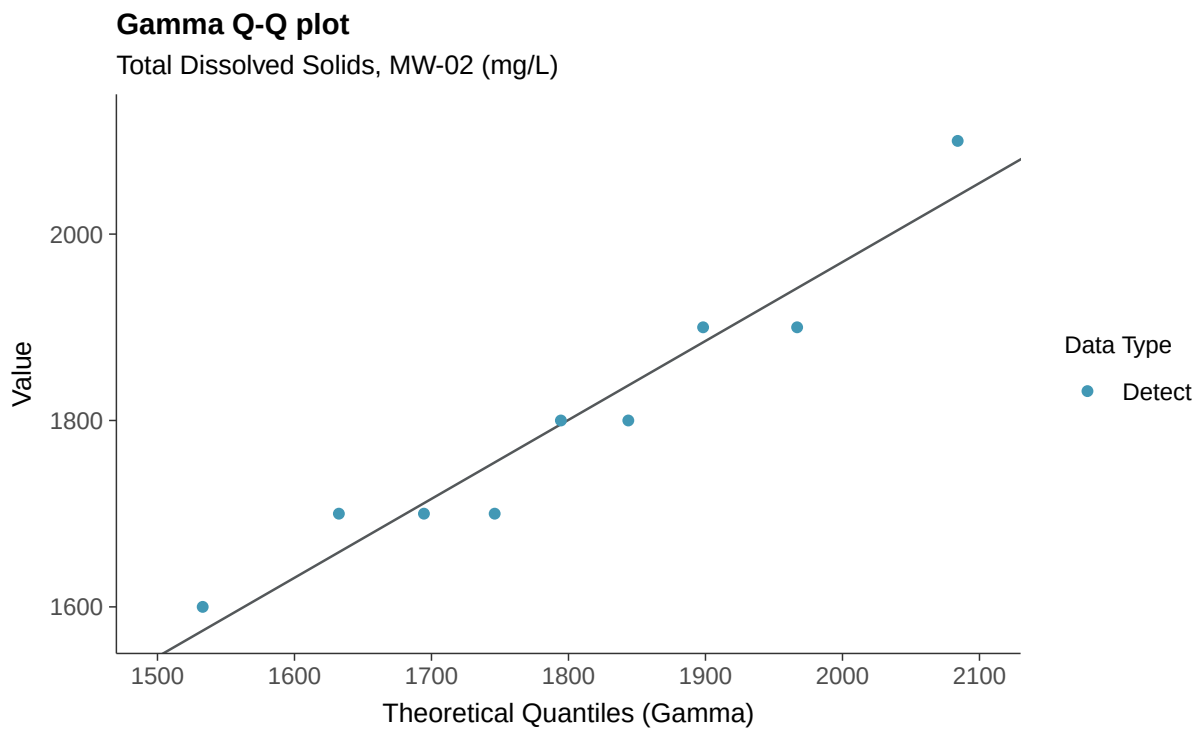
Total Dissolved Solids, MW-02 (mg/L)

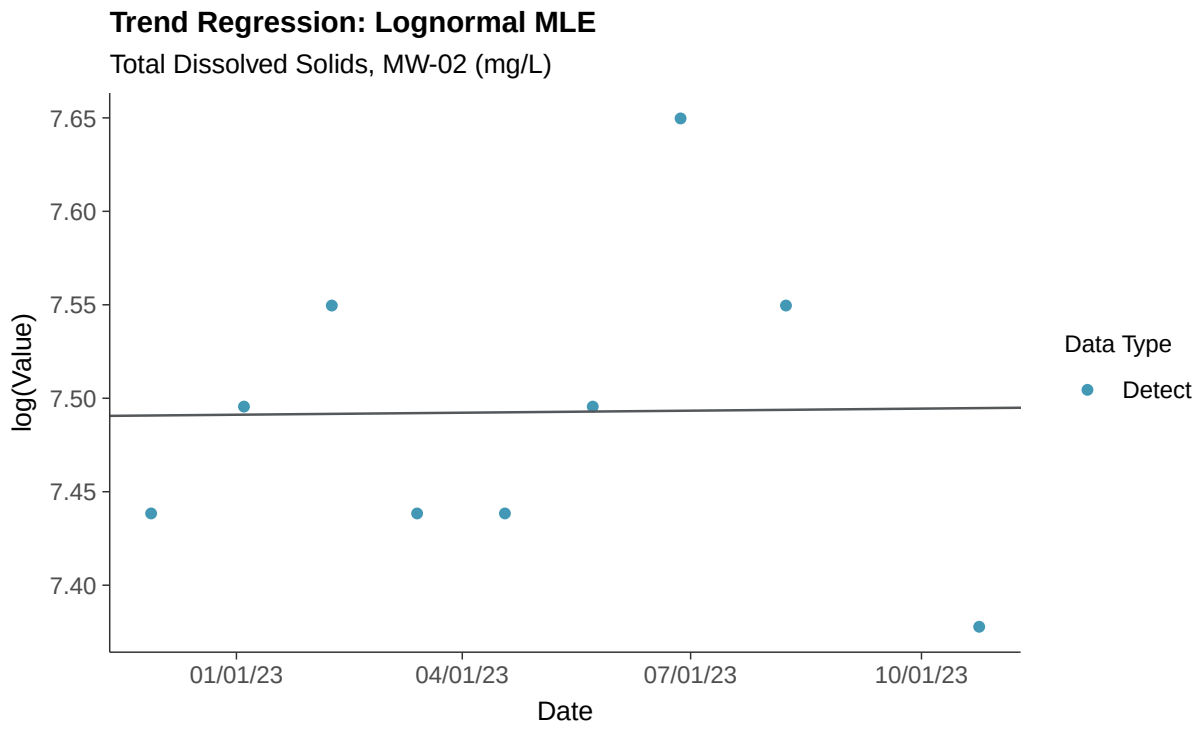


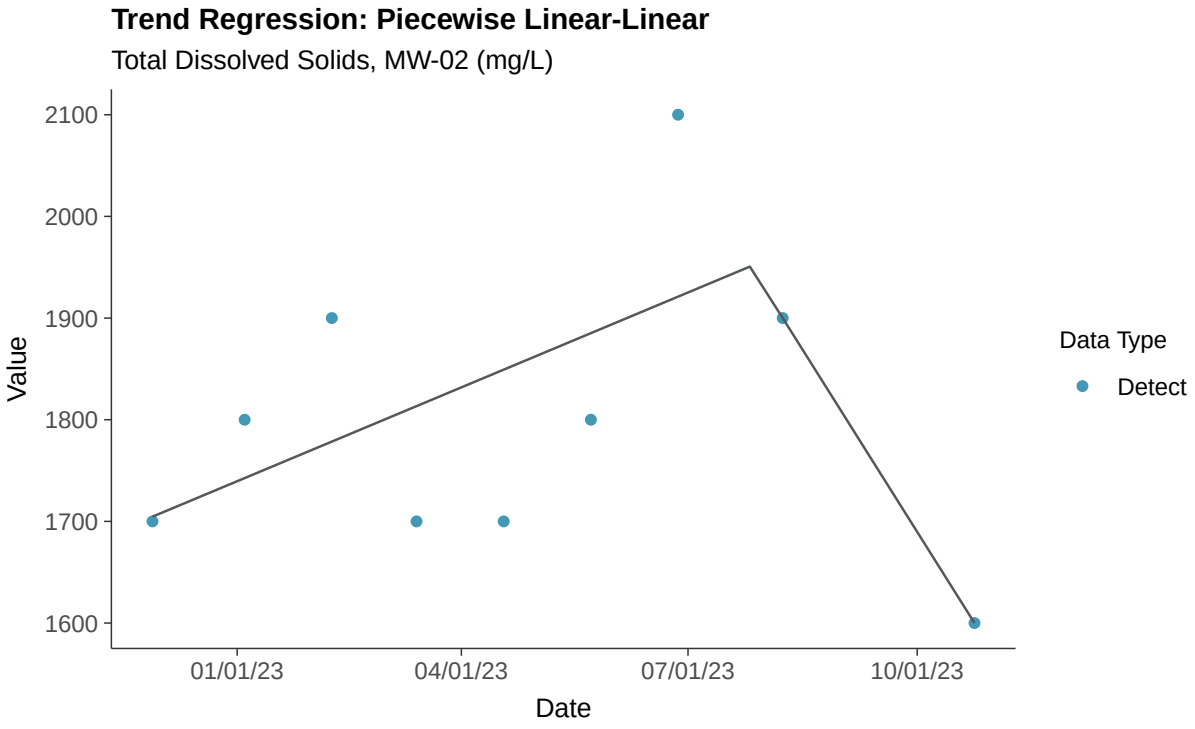
Lognormal Q-Q plot

Total Dissolved Solids, MW-02 (mg/L)



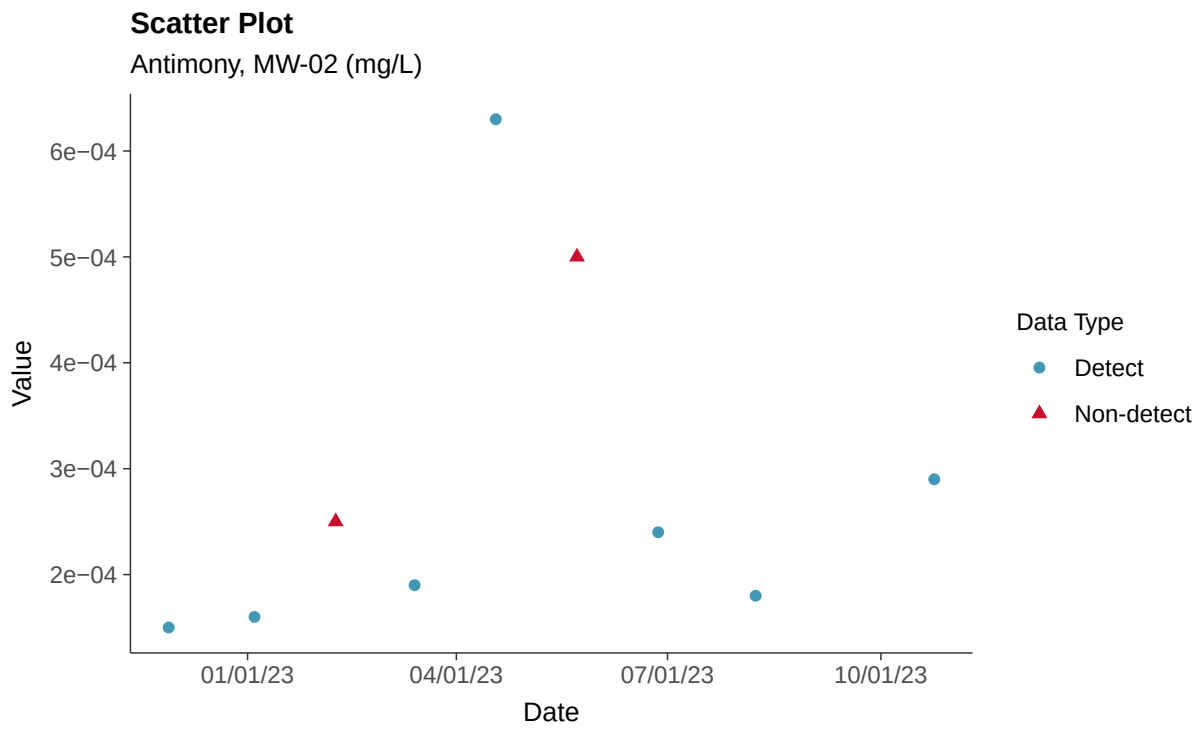

Gamma Q-Q plot
Total Dissolved Solids, MW-02 (mg/L)
Value
2000
1800
1600
1500
1600
1700
1800
1900
2000
2100
Theoretical Quantiles (Gamma)
Data Type
Detect

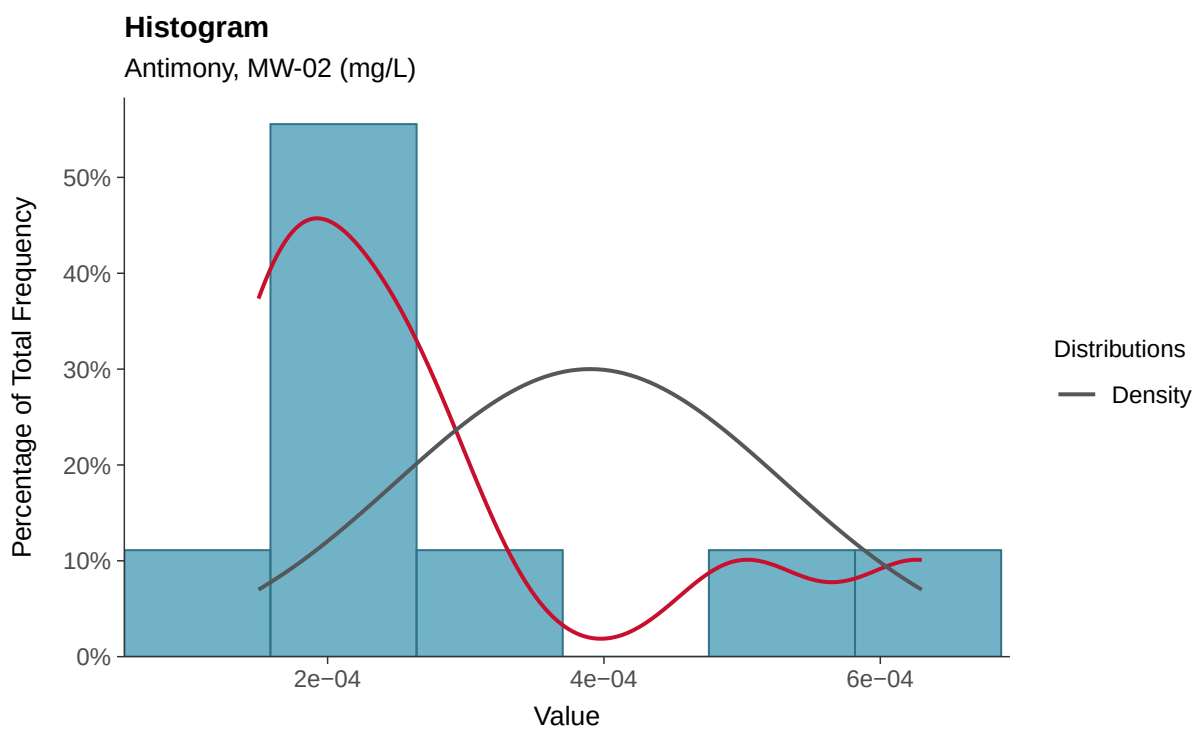

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-02 (mg/L)
log(Value)
7.65
7.60
7.55
7.50
7.45
7.40
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-02 (mg/L)
Value
2100
2000
1900
1800
1700
1600
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-02

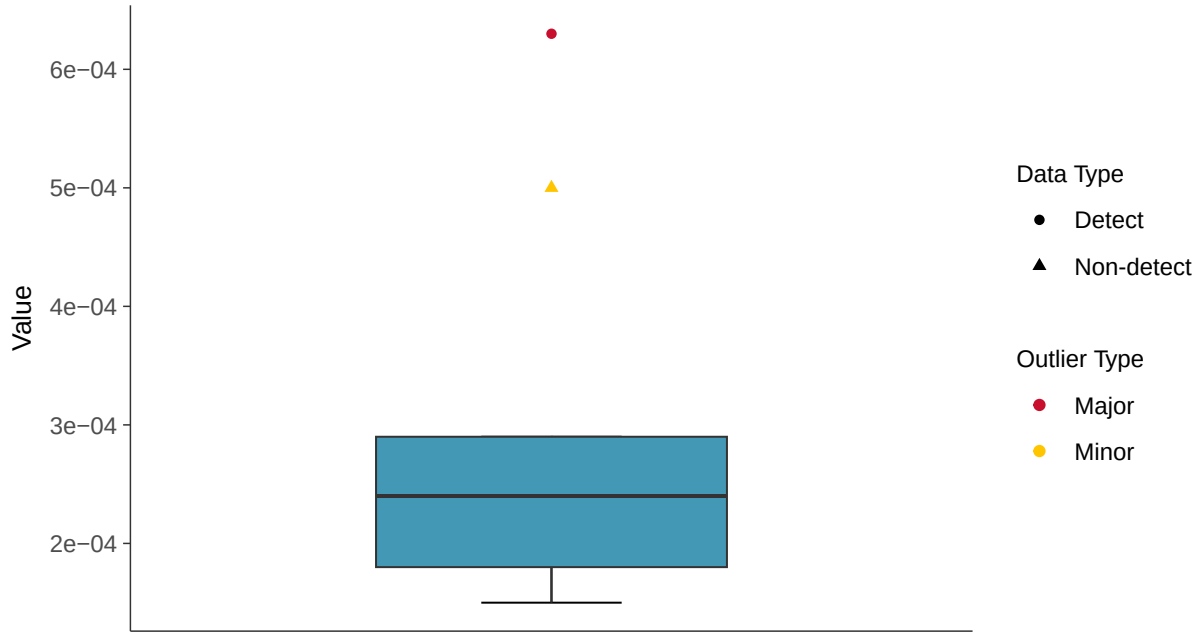
ID: 2_12_5_101





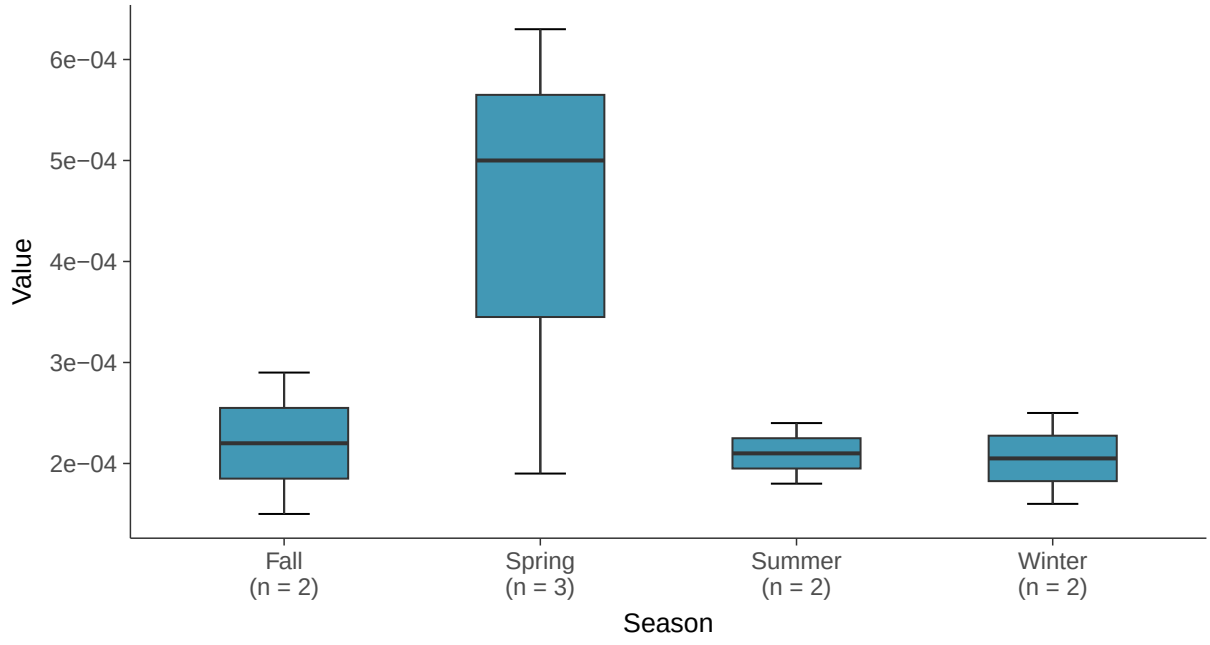
Boxplot

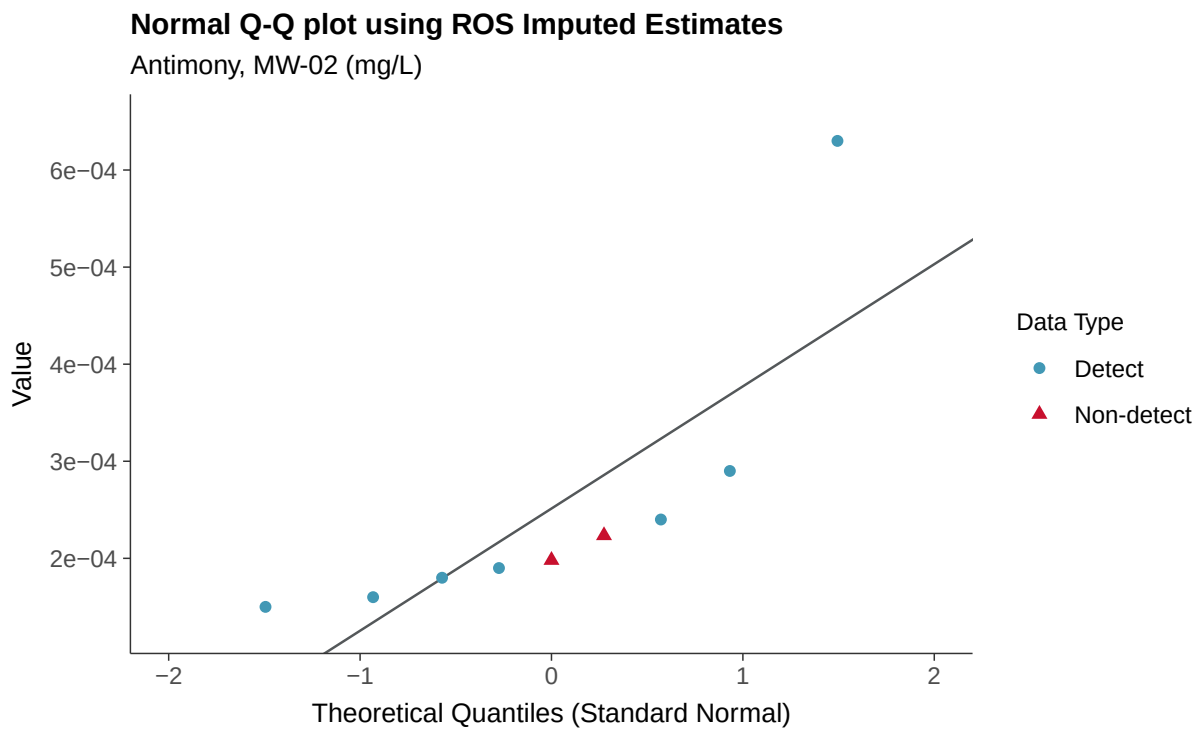
Antimony, MW-02 (mg/L)

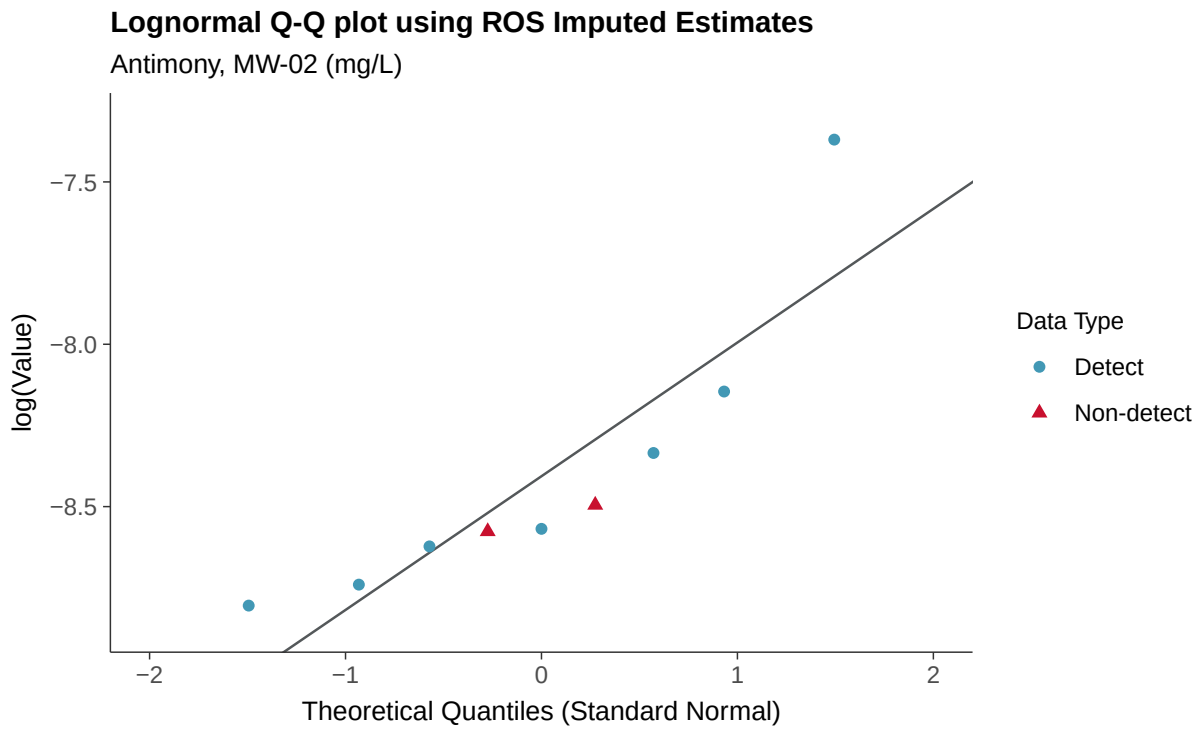


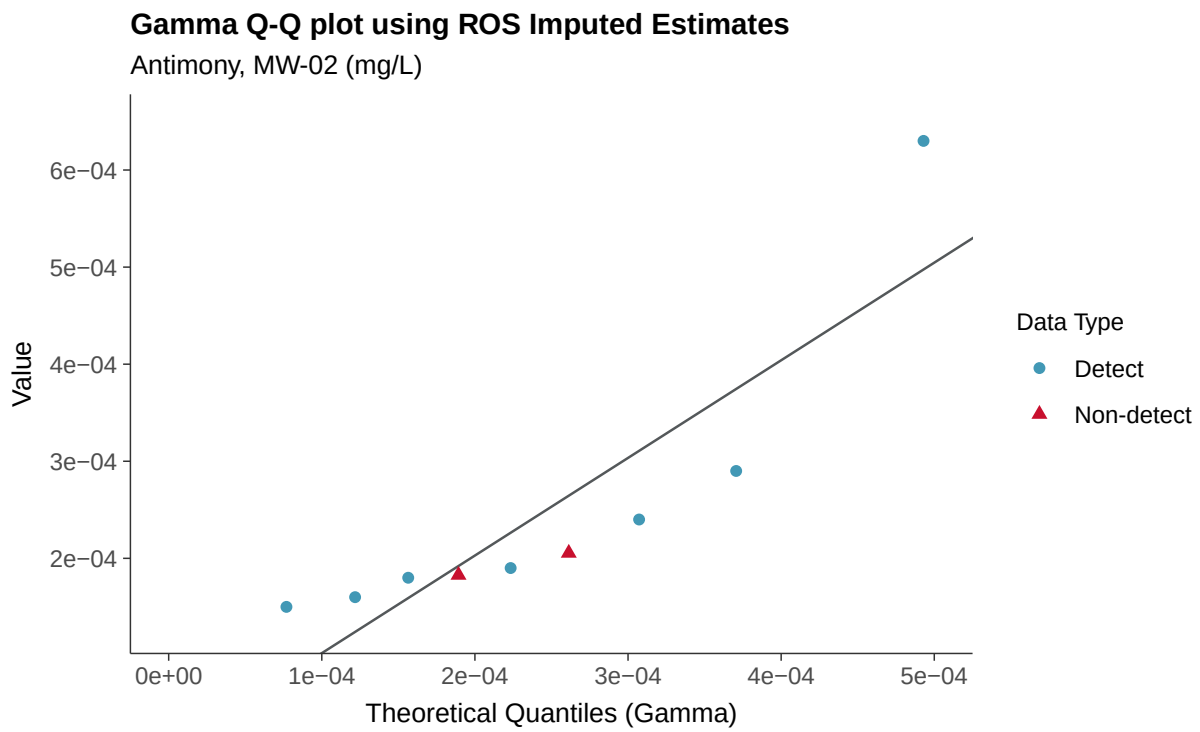
Boxplot by Season

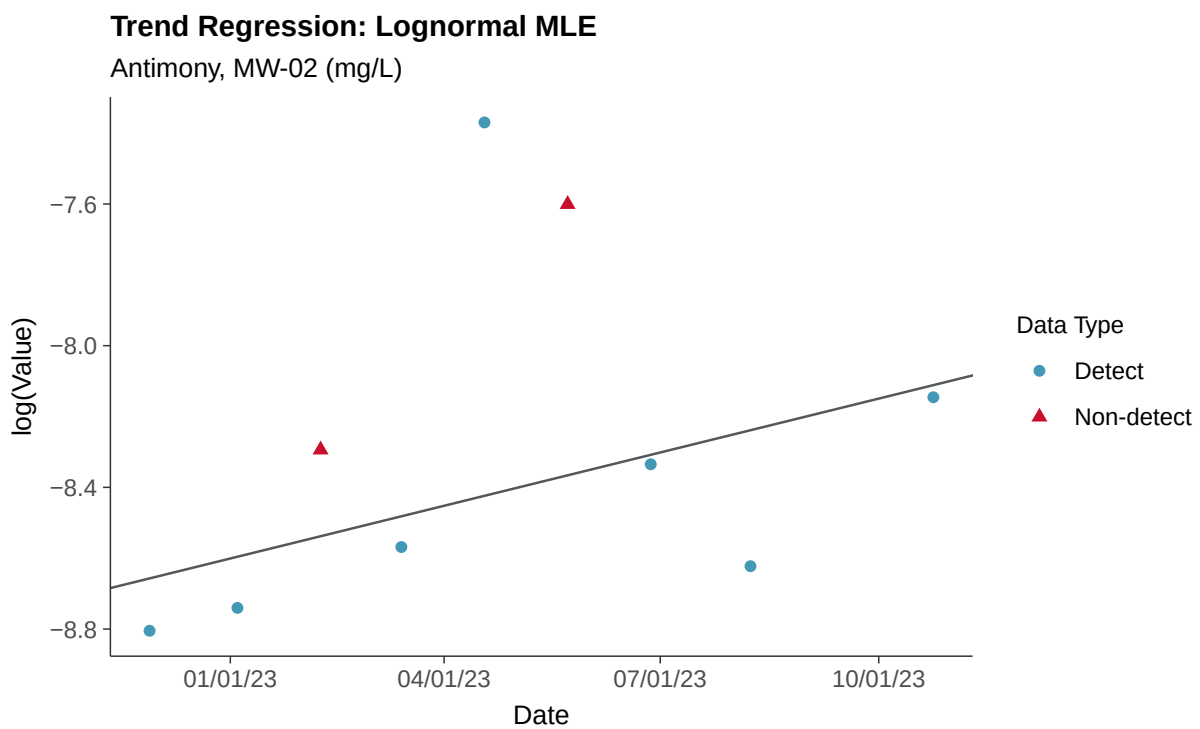
Antimony, MW-02 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-02 (mg/L)
Value
6e−04
5e−04
4e−04
3e−04
2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

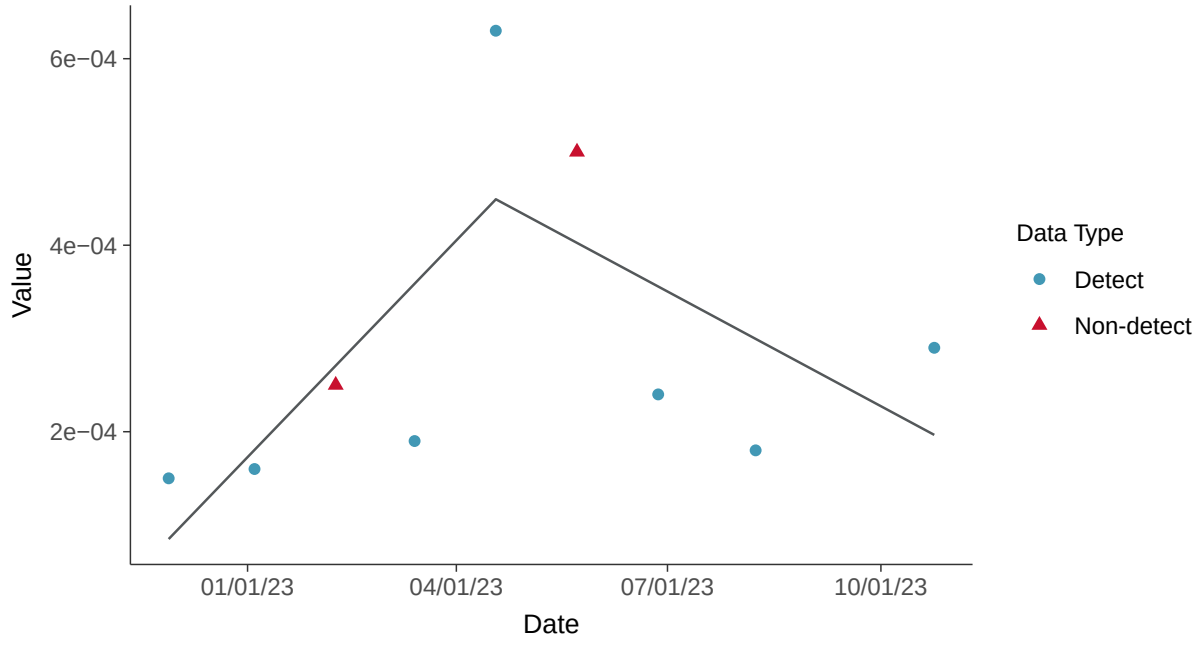

Lognormal Q-Q plot using ROS Imputed Estimates
Antimony, MW-02 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Antimony, MW-02 (mg/L)
Value
6e−04
5e−04
4e−04
3e−04
2e−04
0e+00
1e−04
2e−04
3e−04
4e−04
5e−04
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Antimony, MW-02 (mg/L)
log(Value)
−7.6
−8.0
−8.4
−8.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

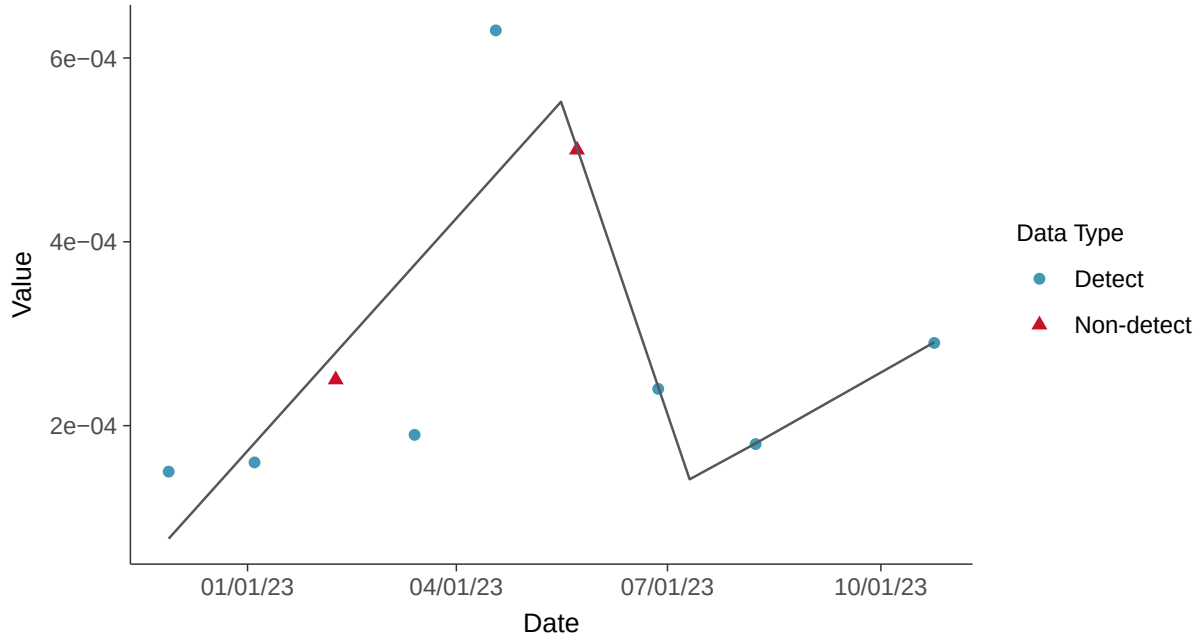
Trend Regression: Piecewise Linear-Linear

Antimony, MW-02 (mg/L)



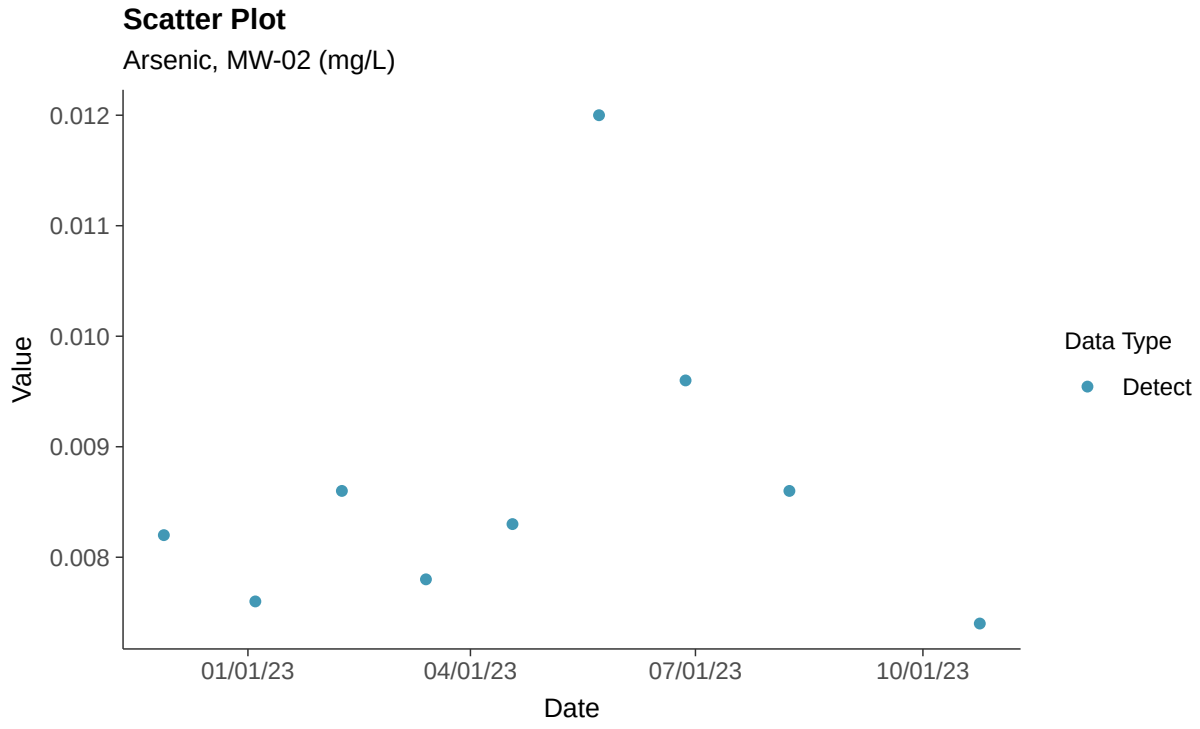
Trend Regression: Piecewise Linear-Linear-Linear

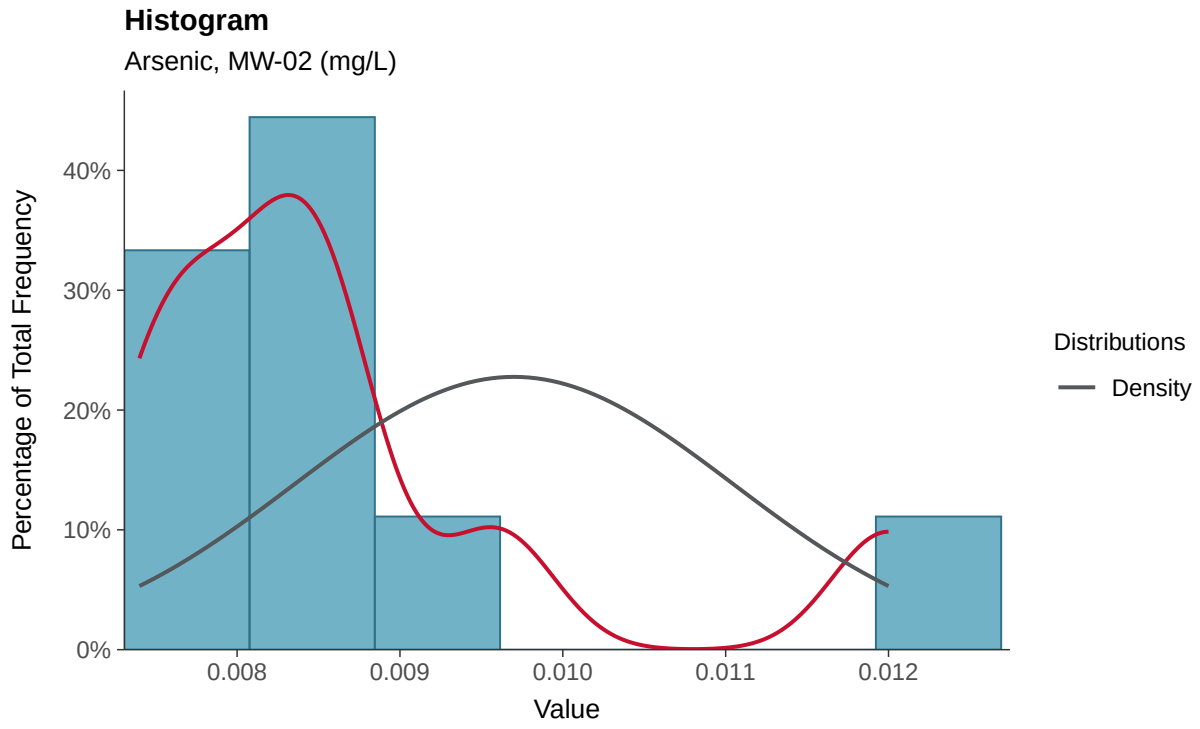
Antimony, MW-02 (mg/L)



Appendix IV: Arsenic, MW-02

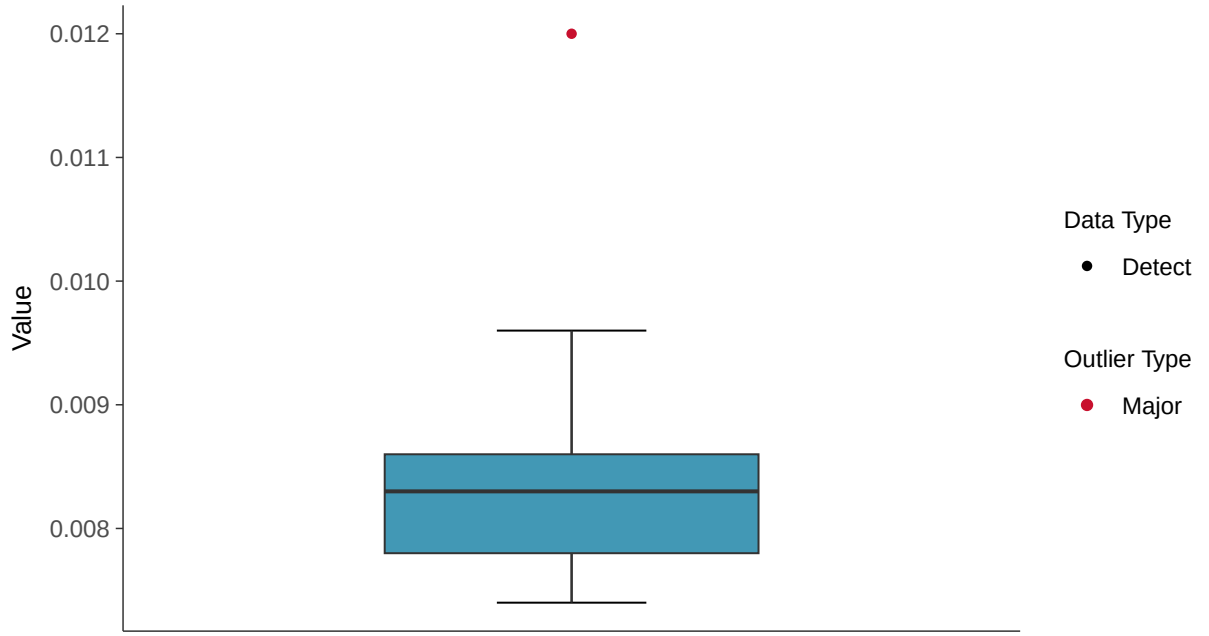
ID: 2_12_5_102





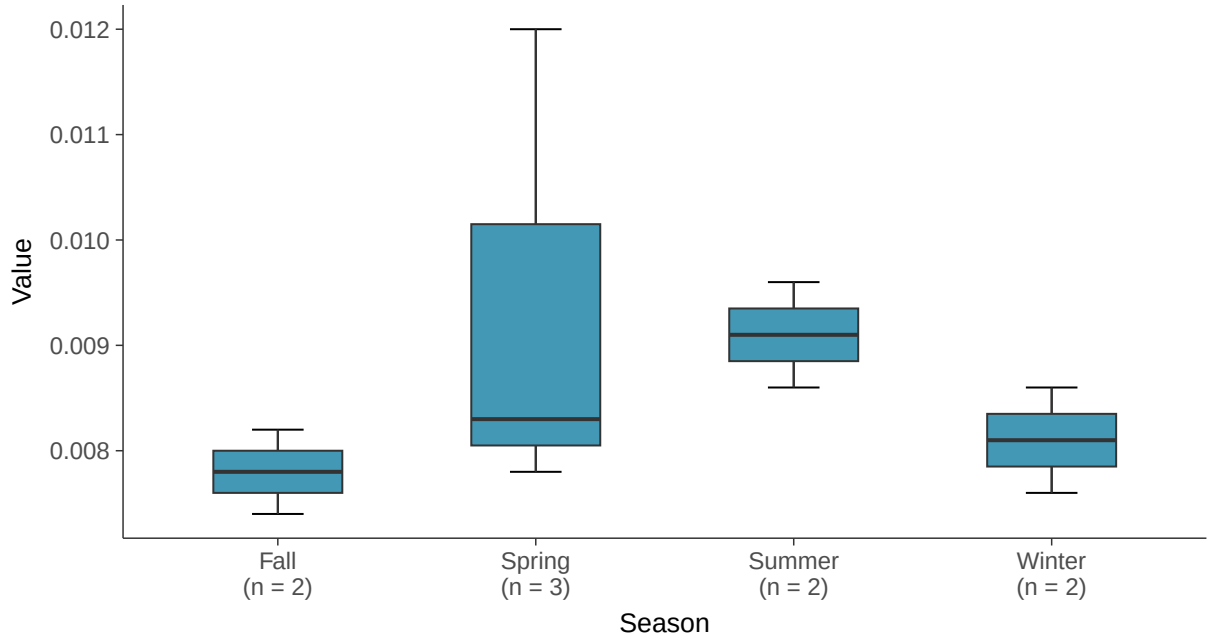
Boxplot

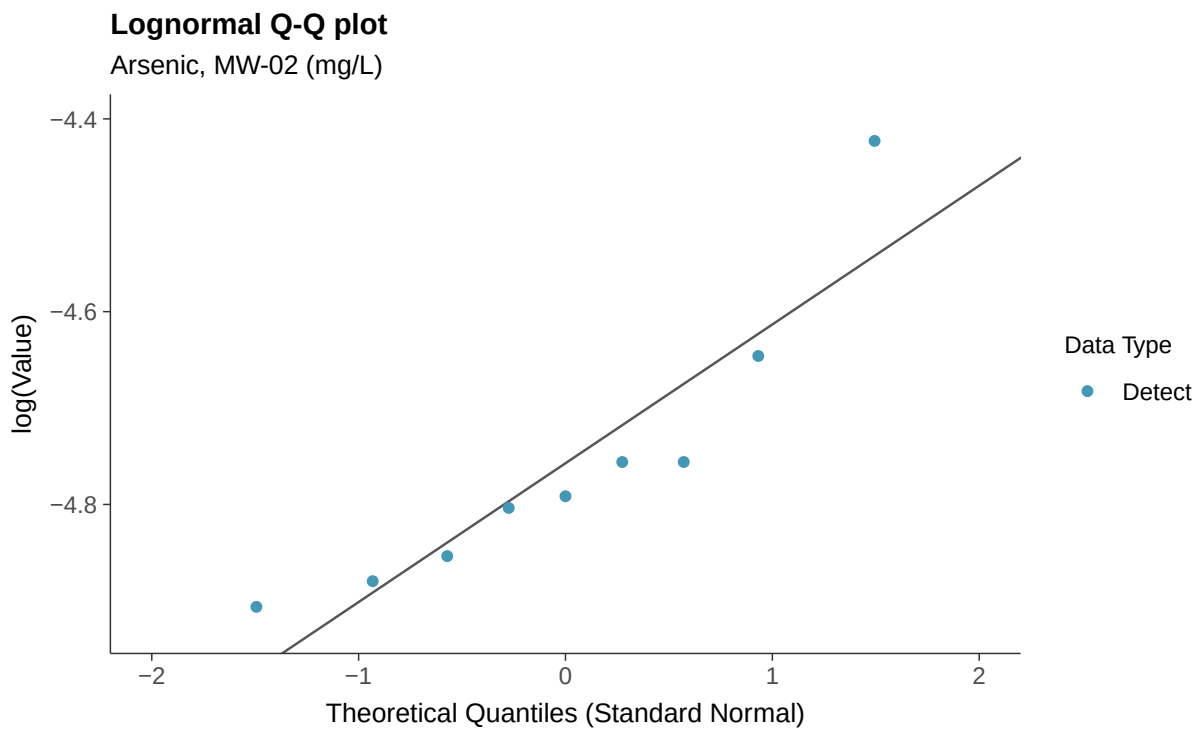
Arsenic, MW-02 (mg/L)

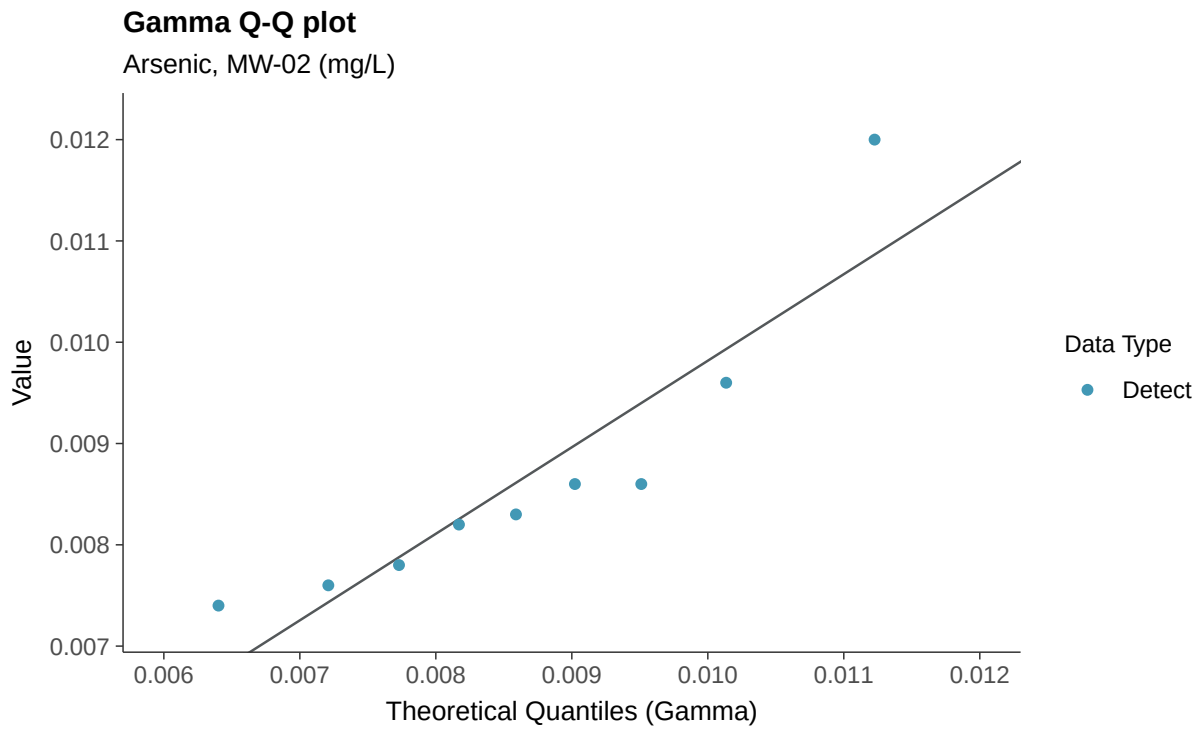


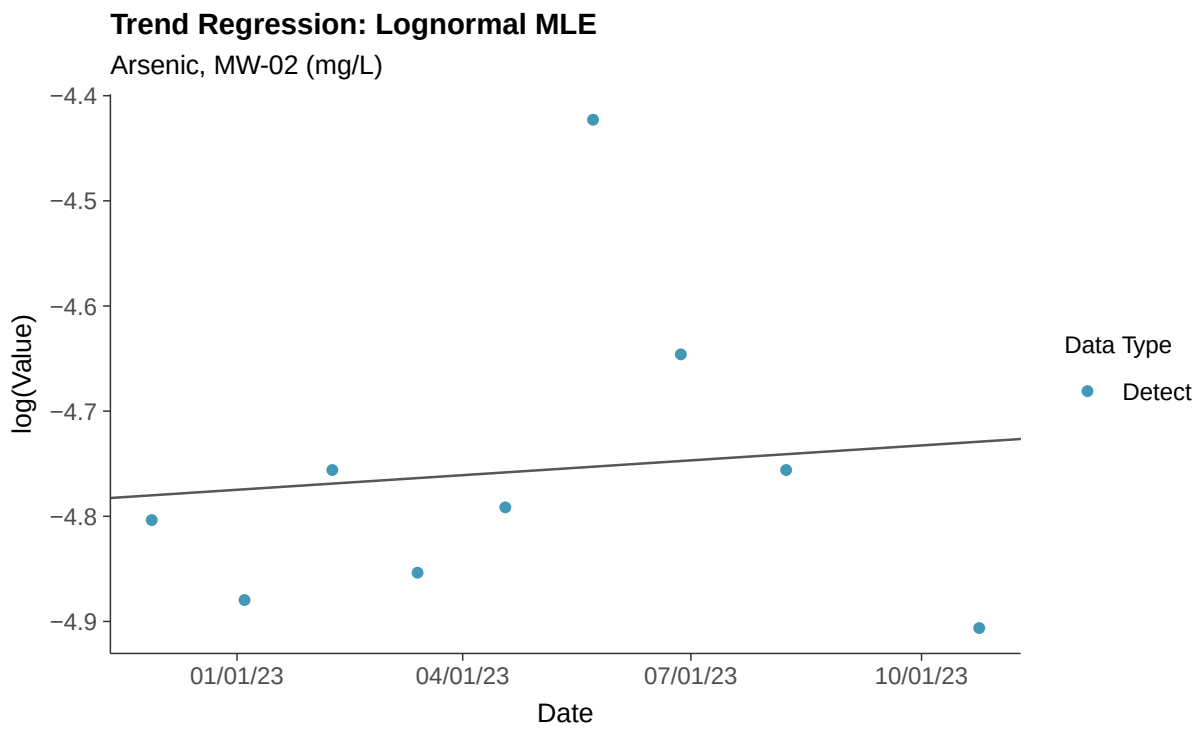
Boxplot by Season

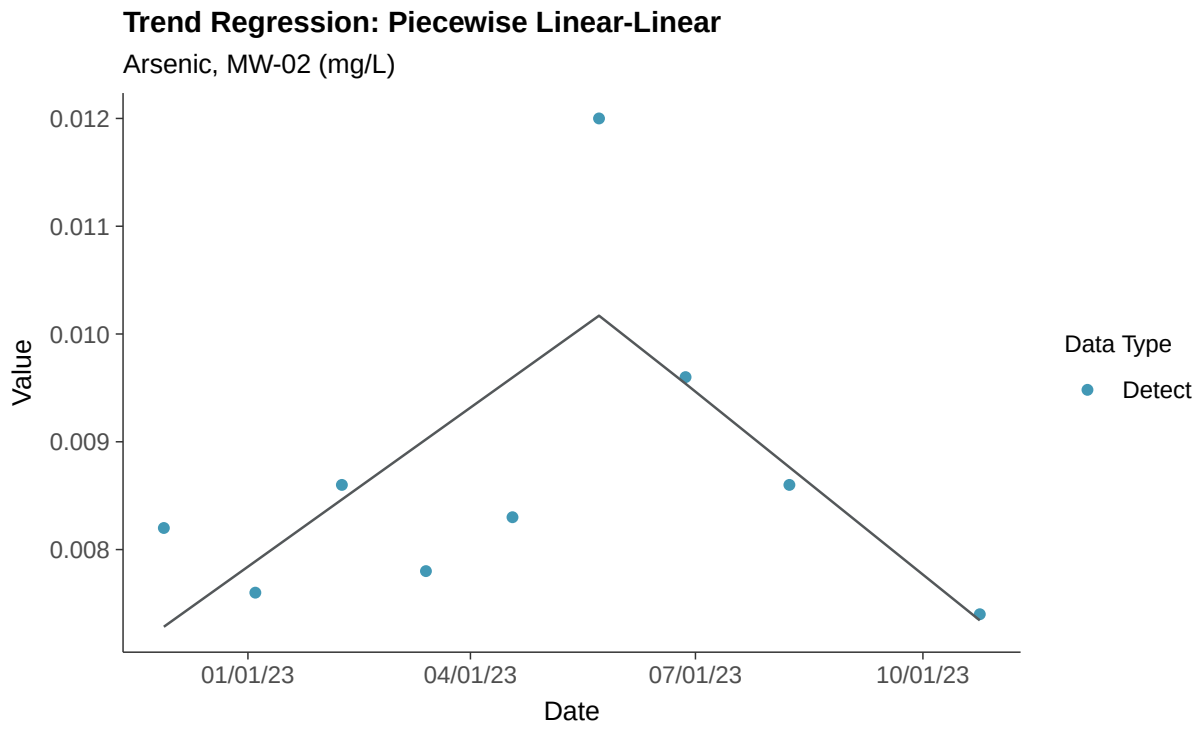
Arsenic, MW-02 (mg/L)




Lognormal Q-Q plot
Arsenic, MW-02 (mg/L)
log(Value)
−4.4
−4.6
−4.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

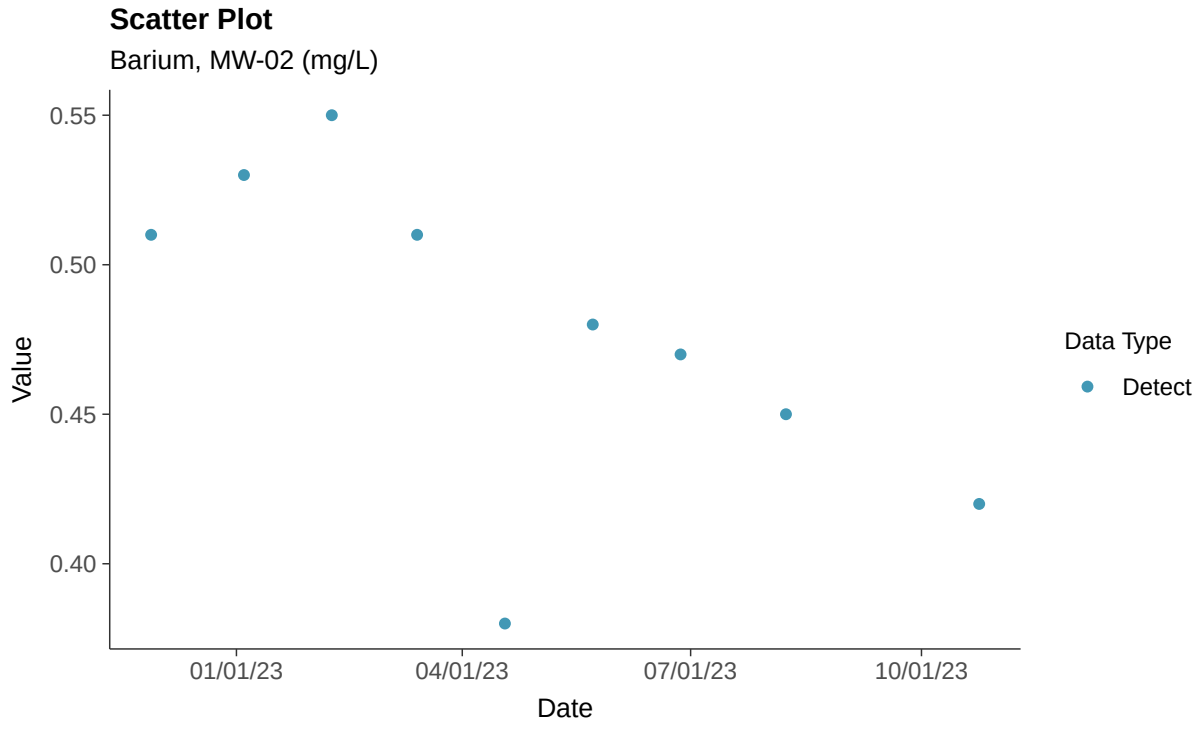

Gamma Q-Q plot
Arsenic, MW-02 (mg/L)
Value
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.007
0.008
0.009
0.010
0.011
0.012
Theoretical Quantiles (Gamma)
Data Type
Detect

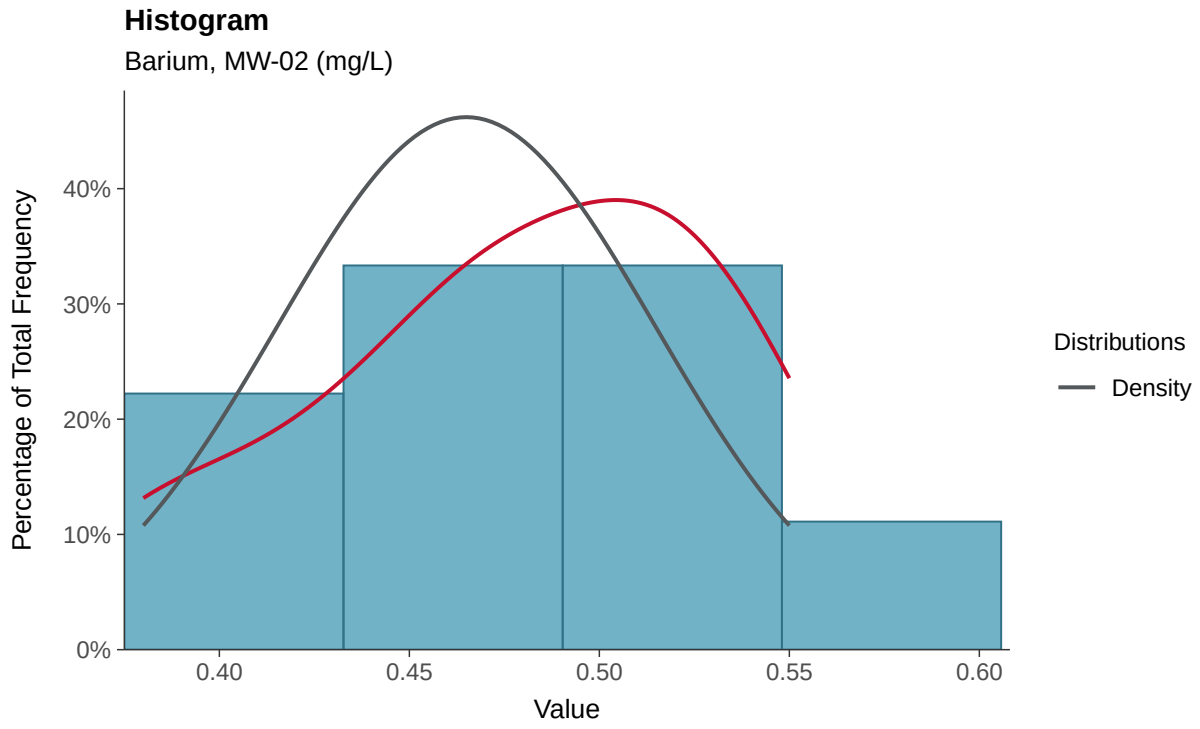

Trend Regression: Lognormal MLE
Arsenic, MW-02 (mg/L)
−4.4
−4.5
−4.6
−4.7
−4.8
−4.9
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Arsenic, MW-02 (mg/L)
0.012
0.011
0.010
0.009
0.008
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-02

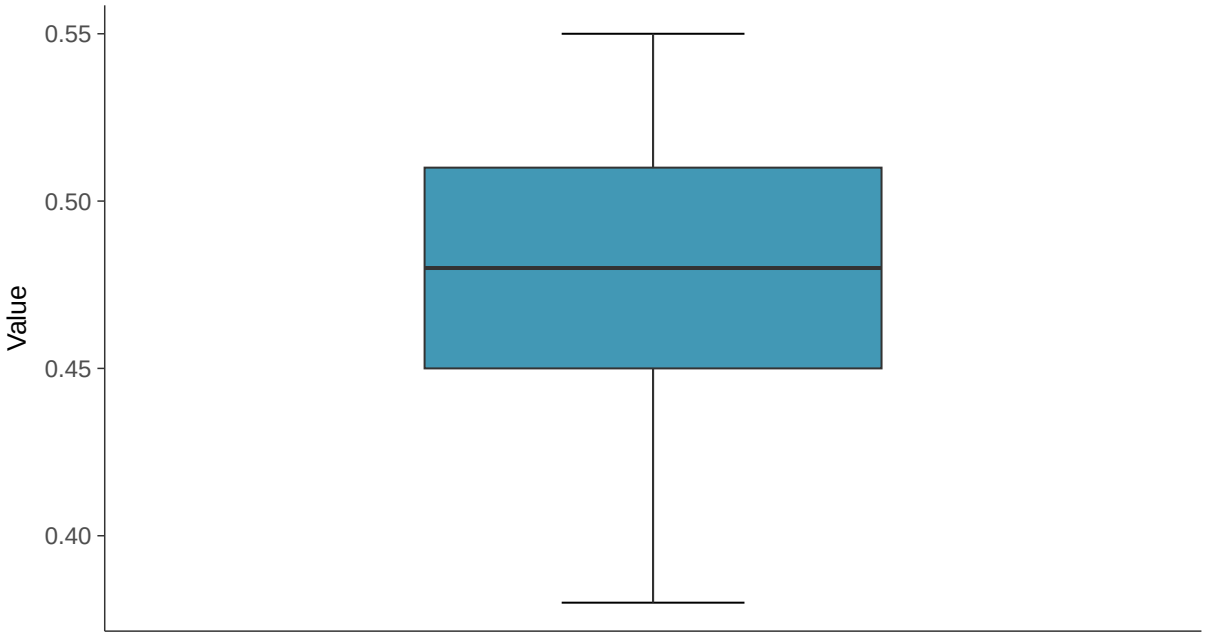
ID: 2_12_5_103





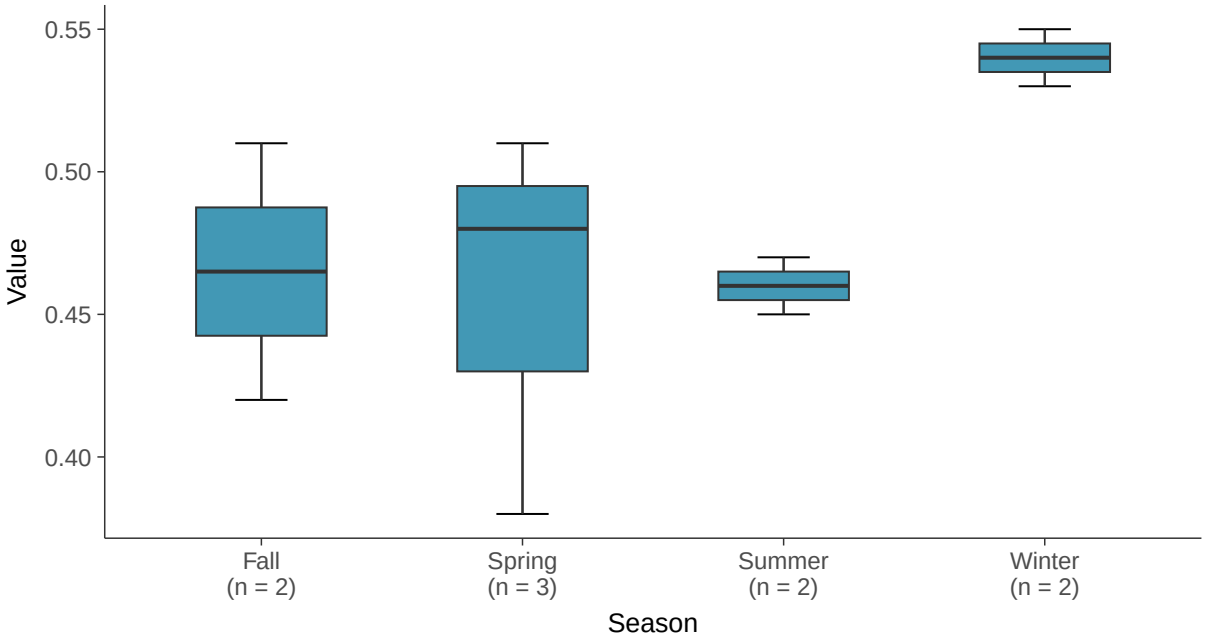
Boxplot

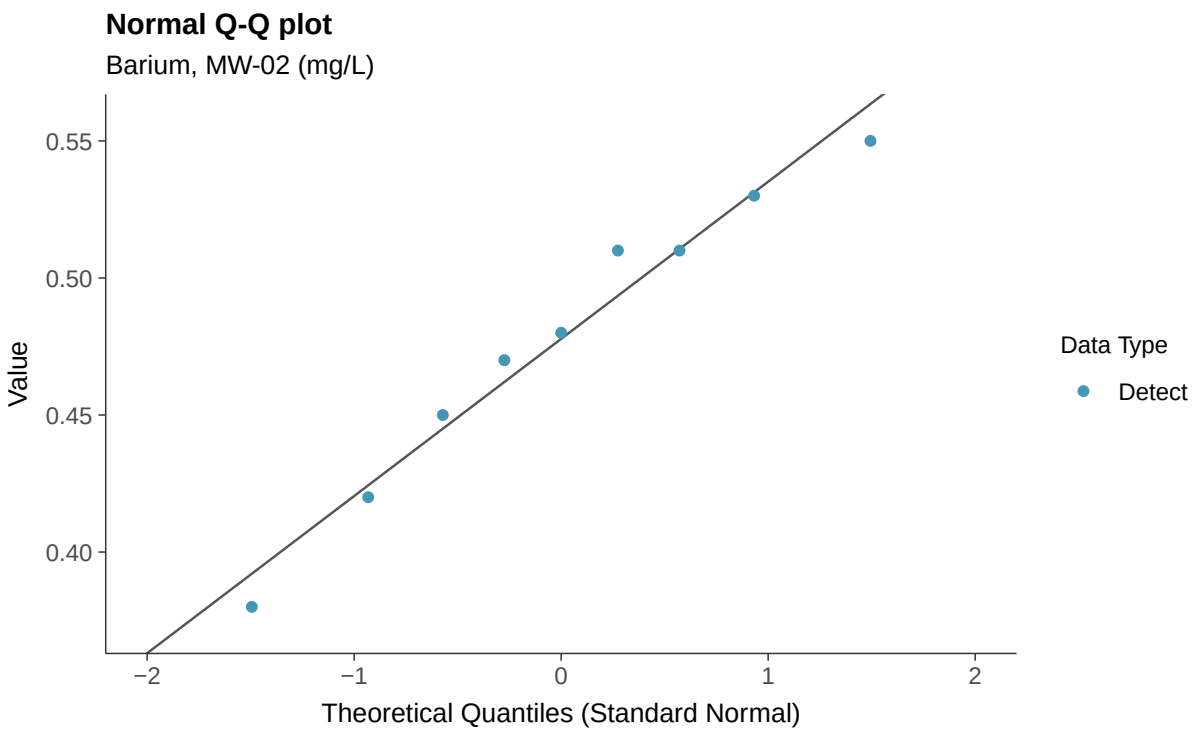
Barium, MW-02 (mg/L)

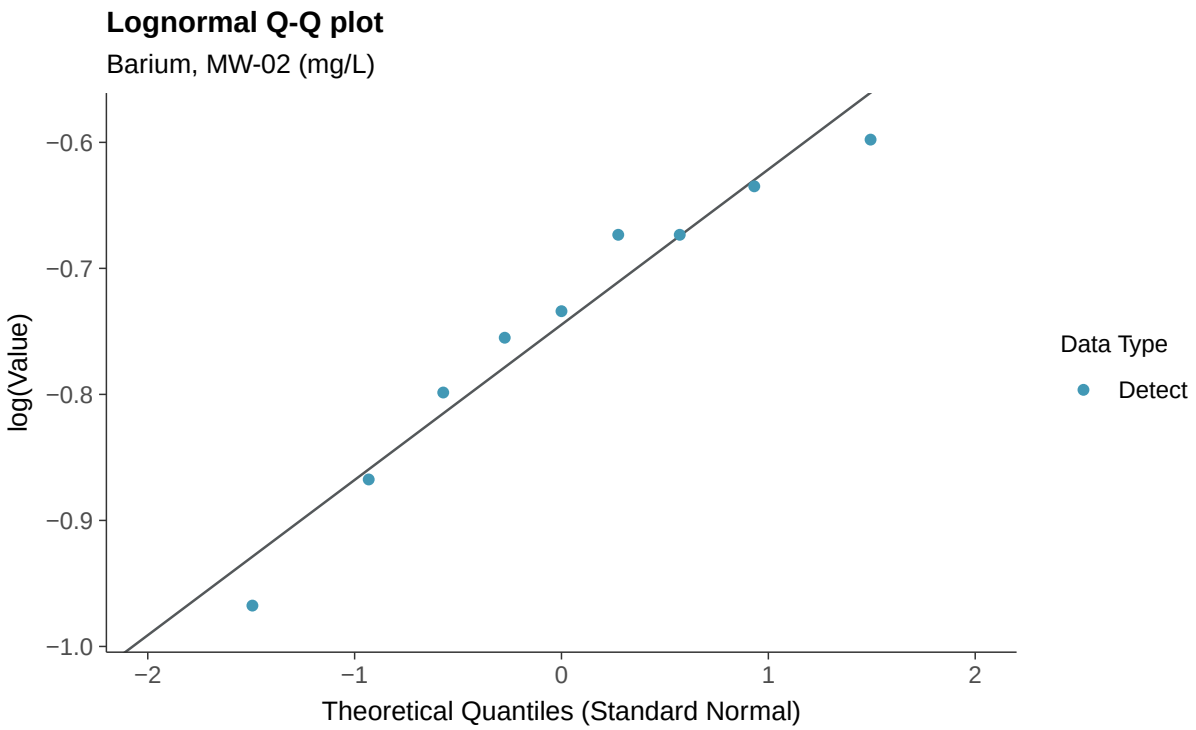


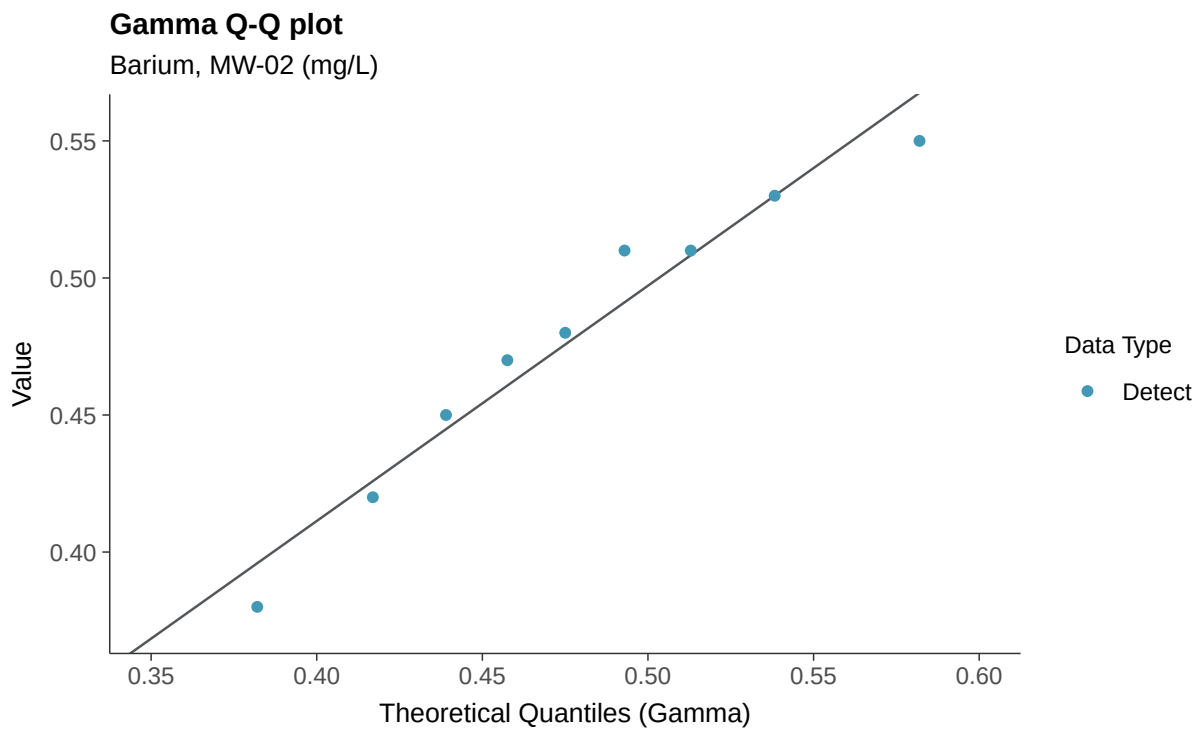
Boxplot by Season

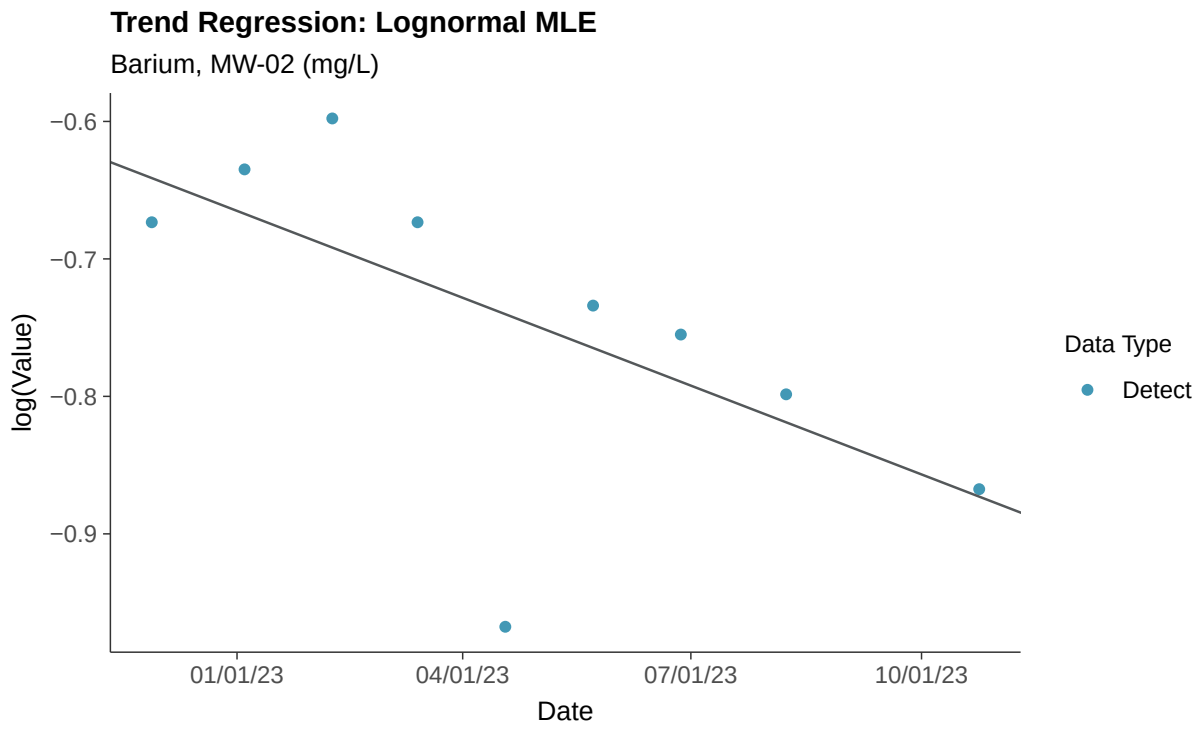
Barium, MW-02 (mg/L)

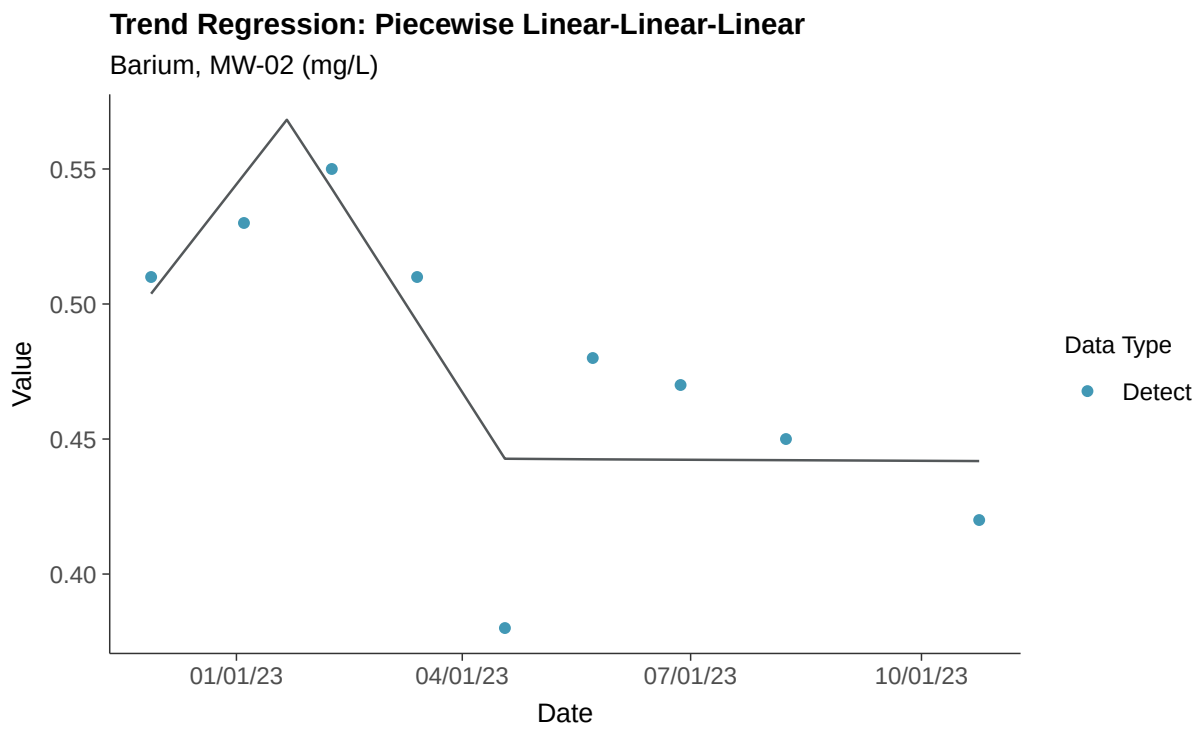



Normal Q-Q plot
Barium, MW-02 (mg/L)
Value
0.55
0.50
0.45
0.40
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Barium, MW-02 (mg/L)
log(Value)
−0.6
−0.7
−0.8
−0.9
−1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

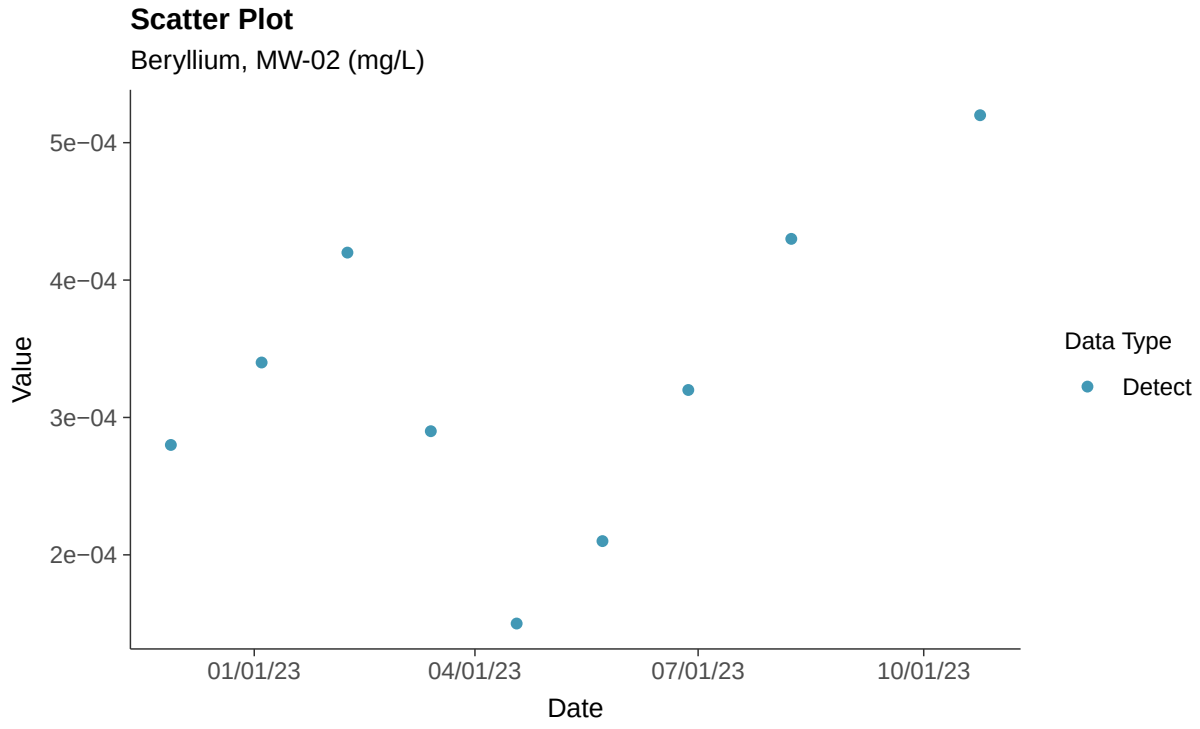

Gamma Q-Q plot
Barium, MW-02 (mg/L)
Value
0.55
0.50
0.45
0.40
0.35
0.40
0.45
0.50
0.55
0.60
Theoretical Quantiles (Gamma)
Data Type
Detect

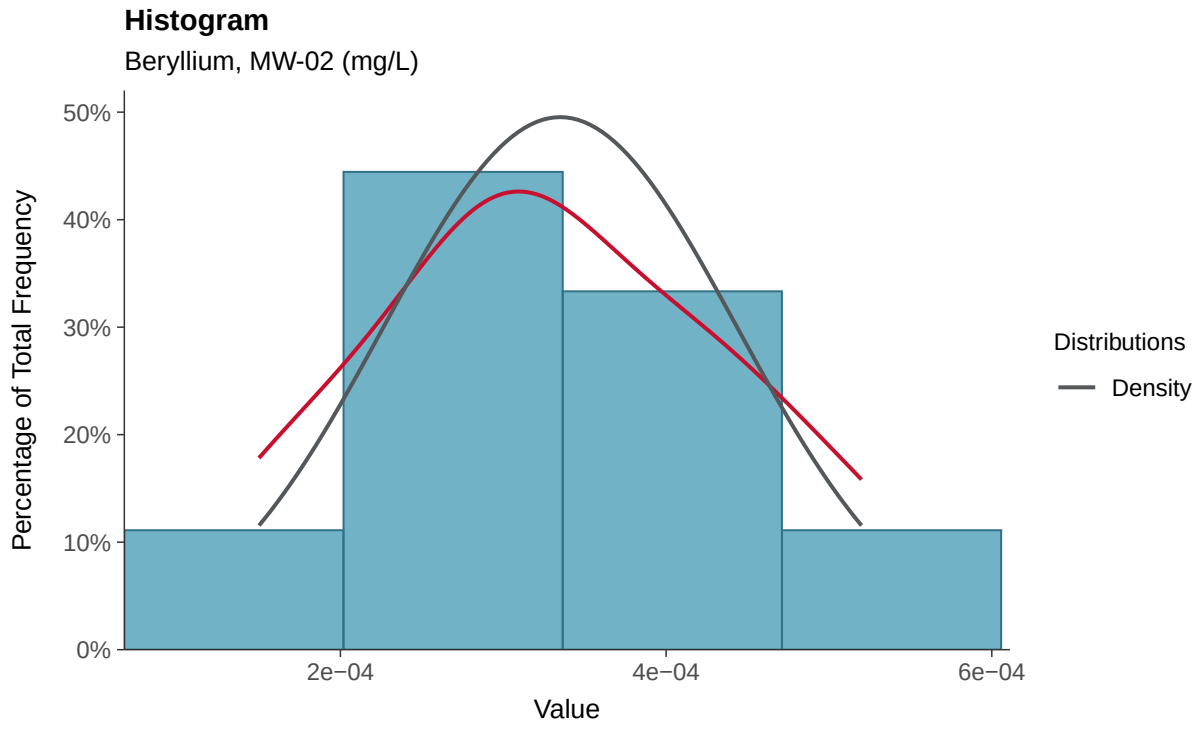

Trend Regression: Lognormal MLE
Barium, MW-02 (mg/L)
log(Value)
−0.6
−0.7
−0.8
−0.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Barium, MW-02 (mg/L)
0.55
0.50
0.45
0.40
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-02

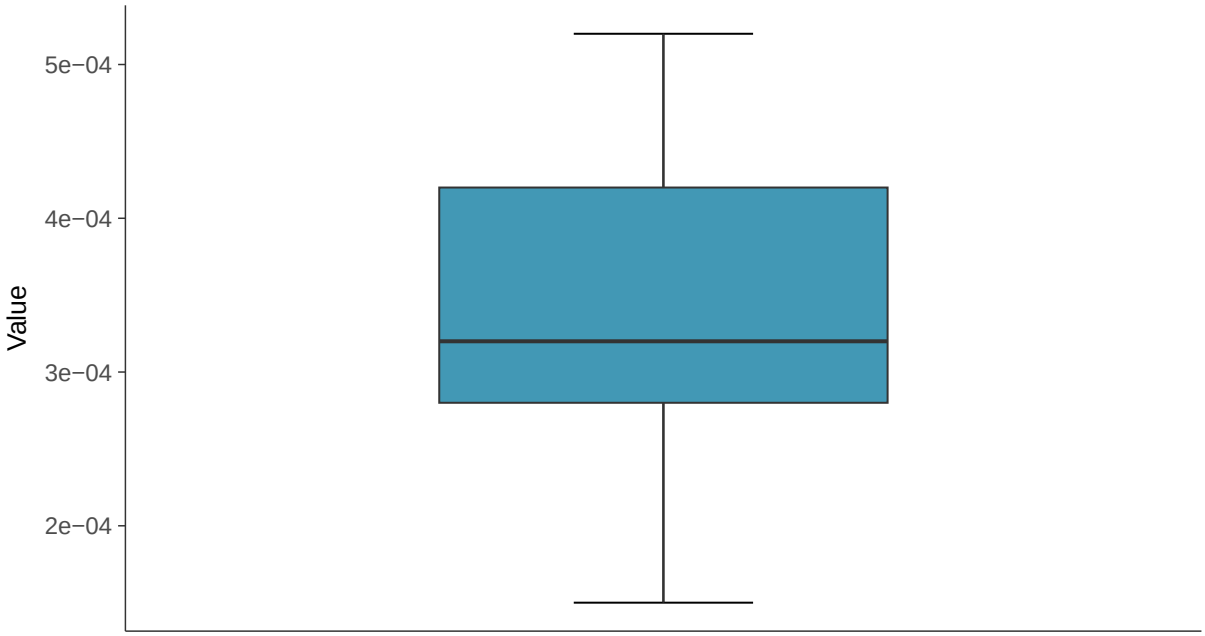
ID: 2_12_5_104





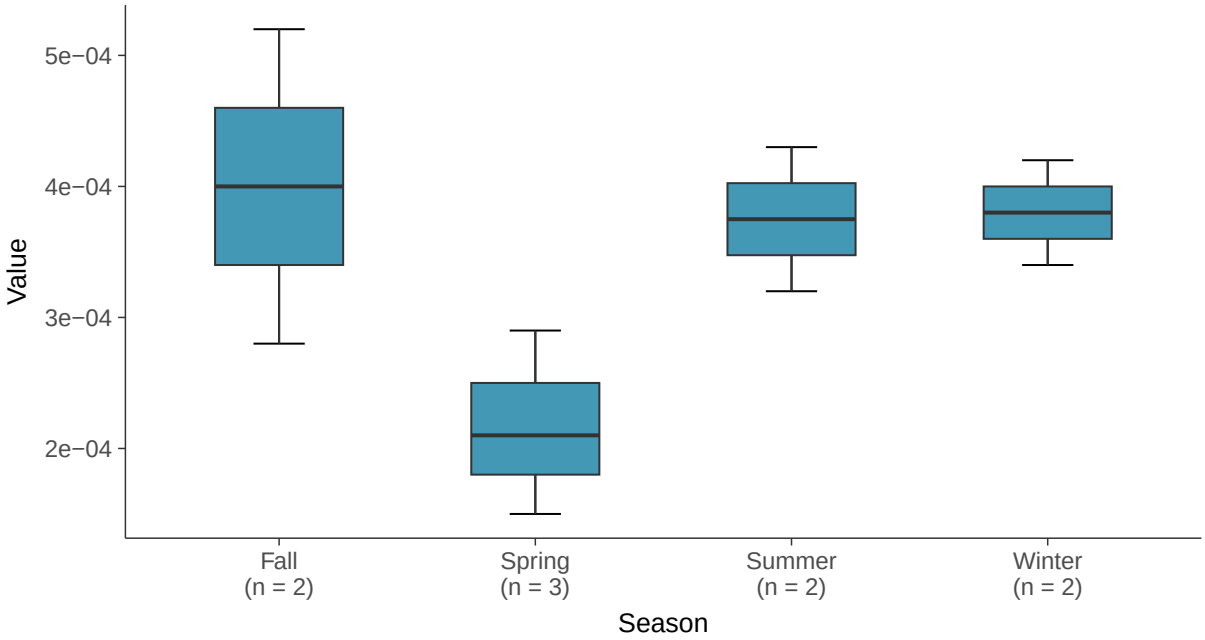
Boxplot

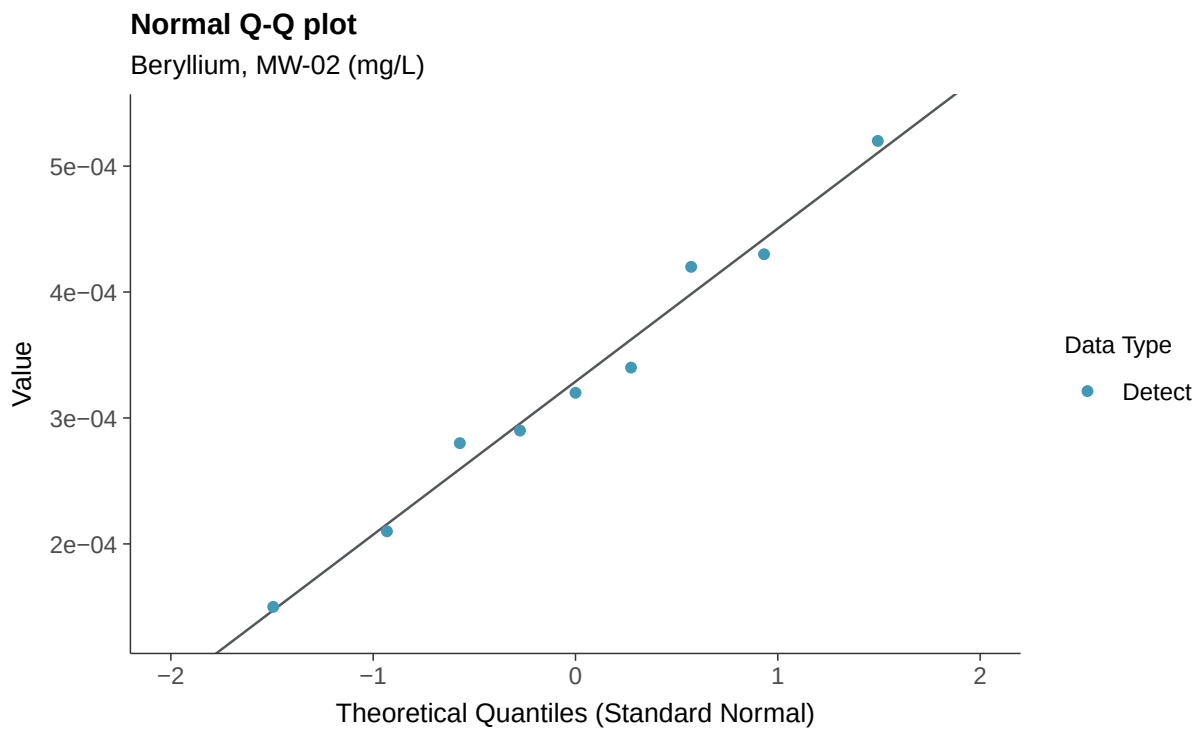
Beryllium, MW-02 (mg/L)

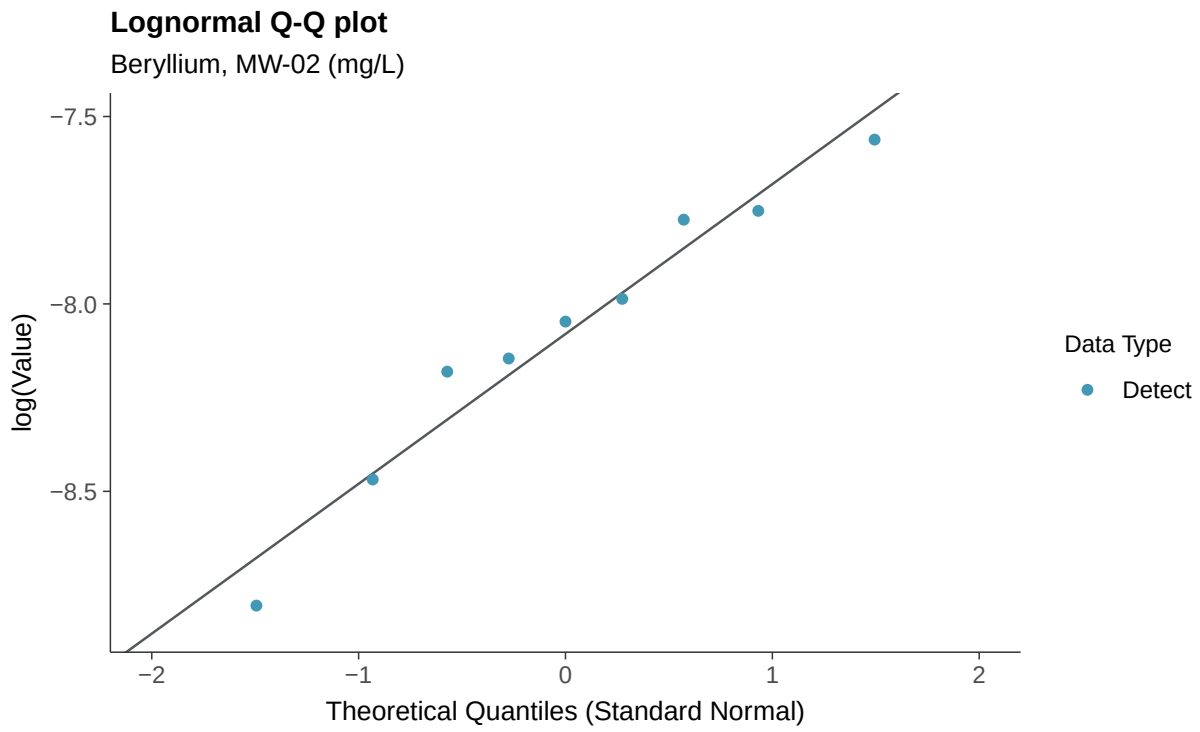


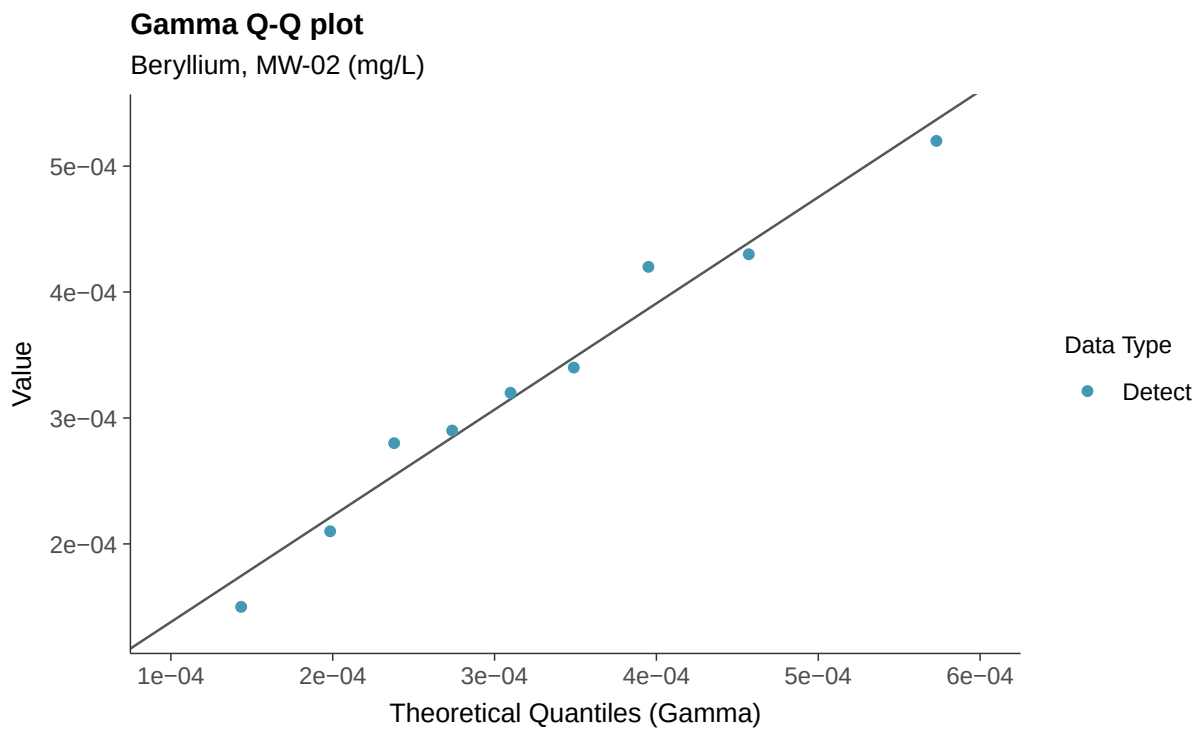
Boxplot by Season

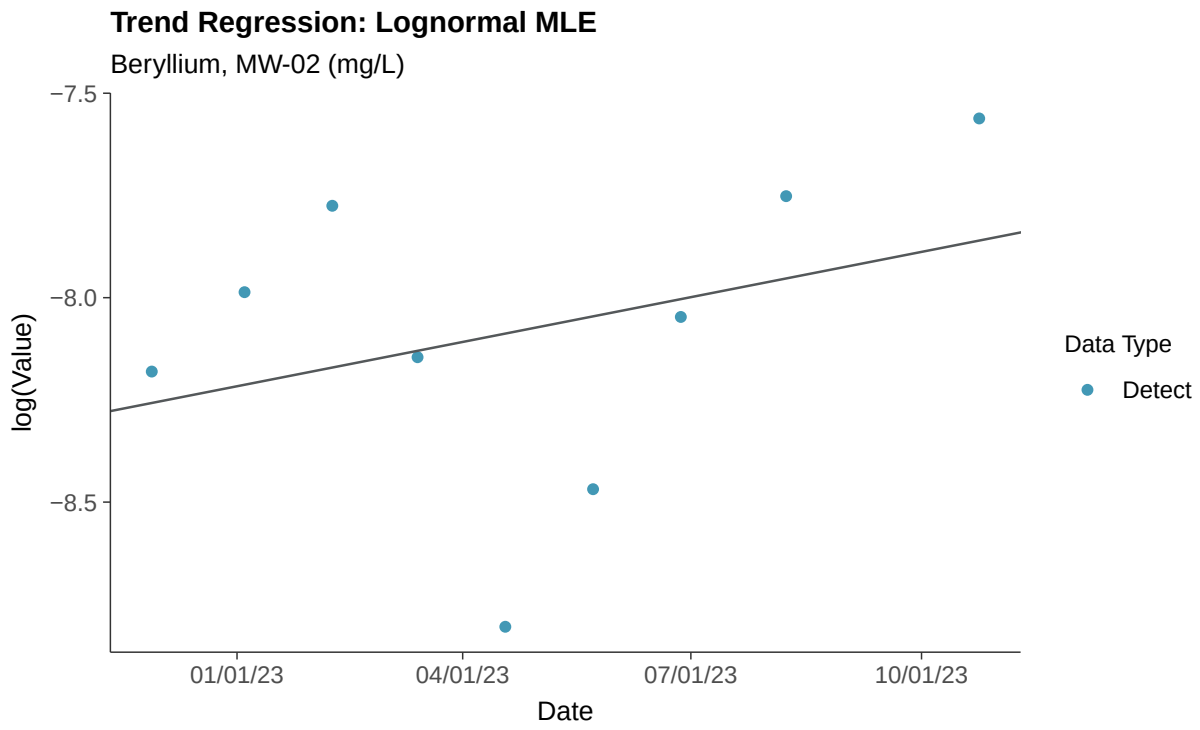
Beryllium, MW-02 (mg/L)




Normal Q-Q plot
Beryllium, MW-02 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

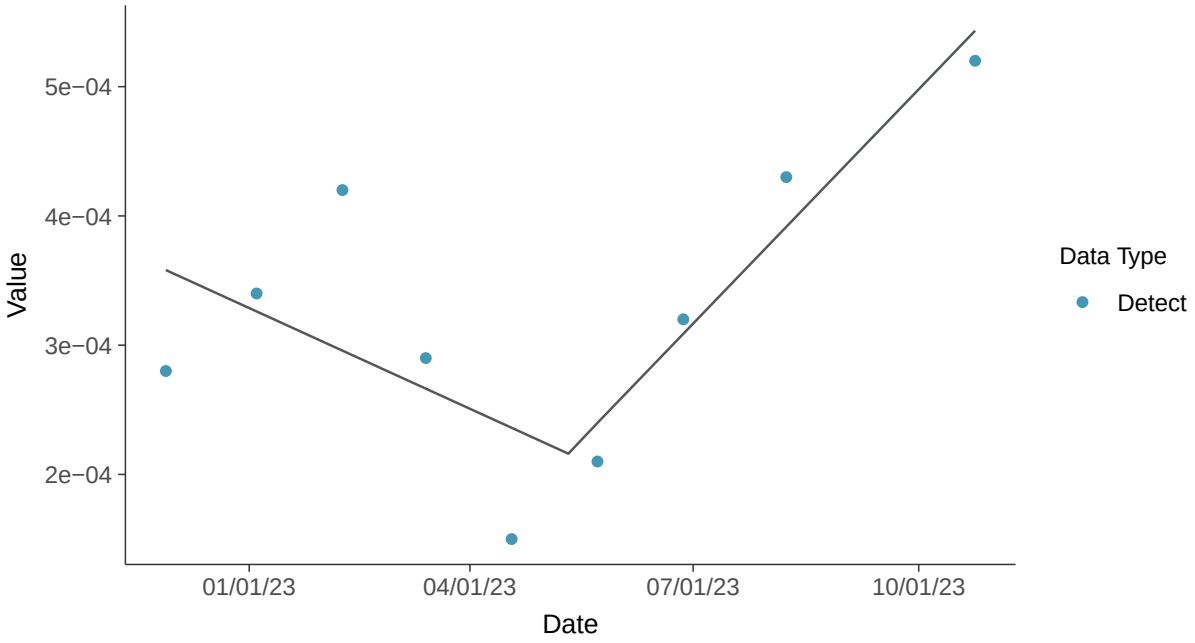

Lognormal Q-Q plot
Beryllium, MW-02 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Beryllium, MW-02 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
2e−04
3e−04
4e−04
5e−04
6e−04
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Beryllium, MW-02 (mg/L)
log(Value)
−7.5
−8.0
−8.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

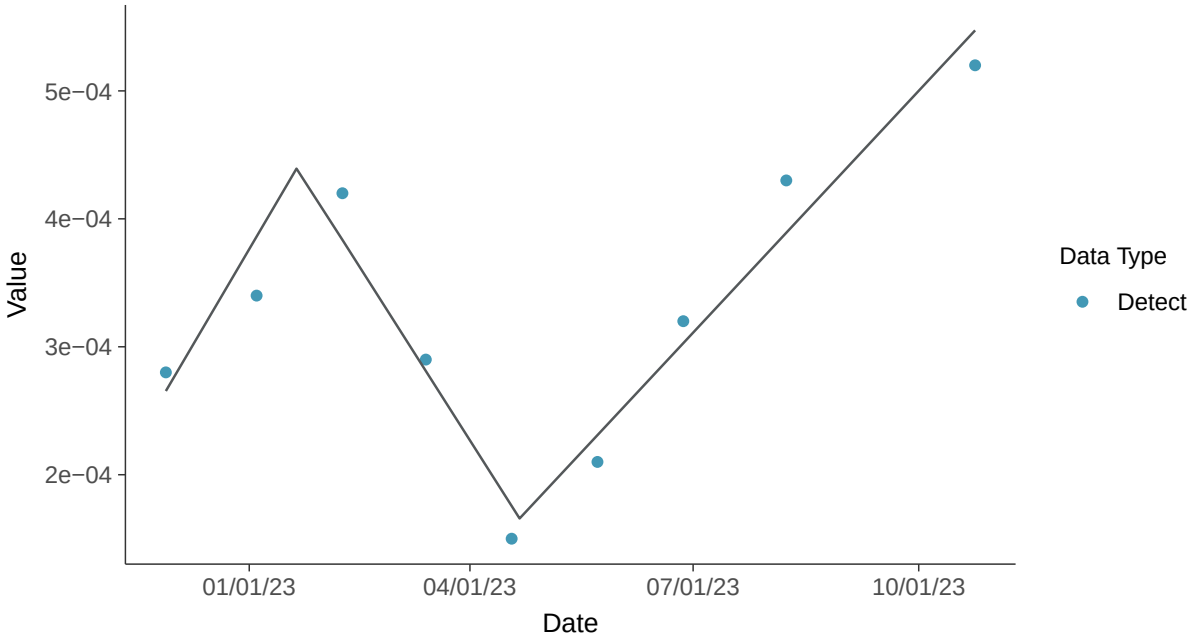
Trend Regression: Piecewise Linear-Linear

Beryllium, MW-02 (mg/L)



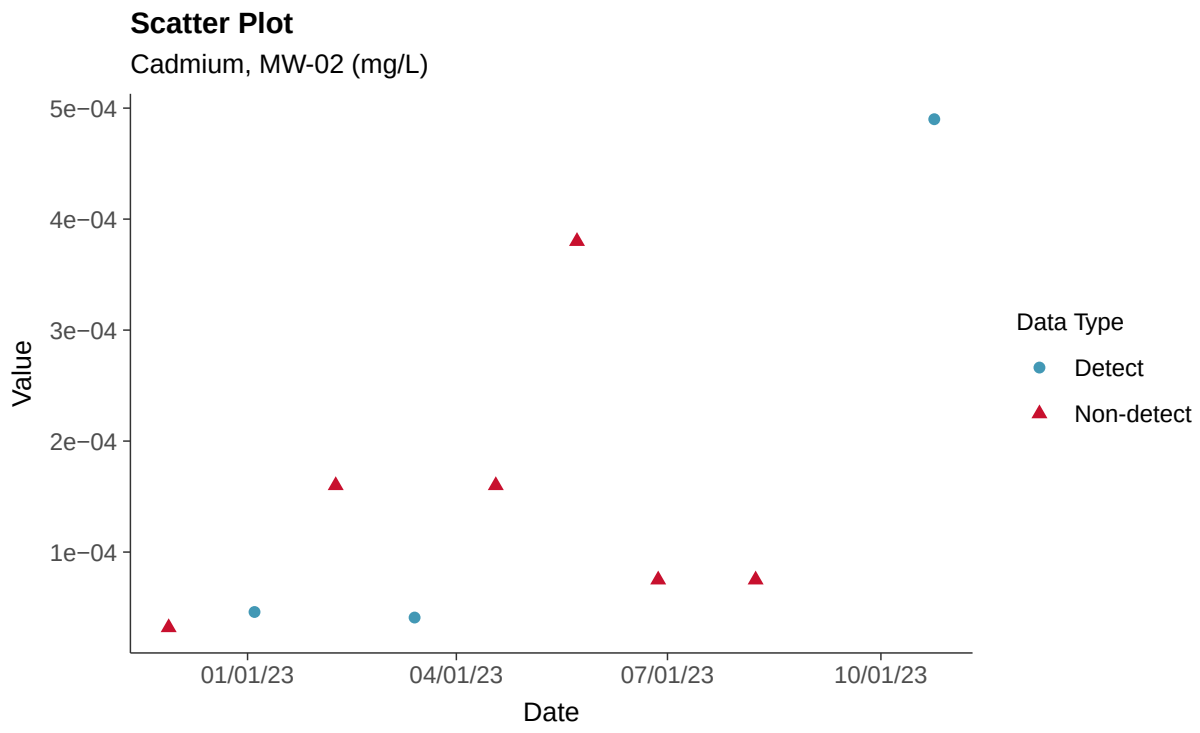
Trend Regression: Piecewise Linear-Linear-Linear

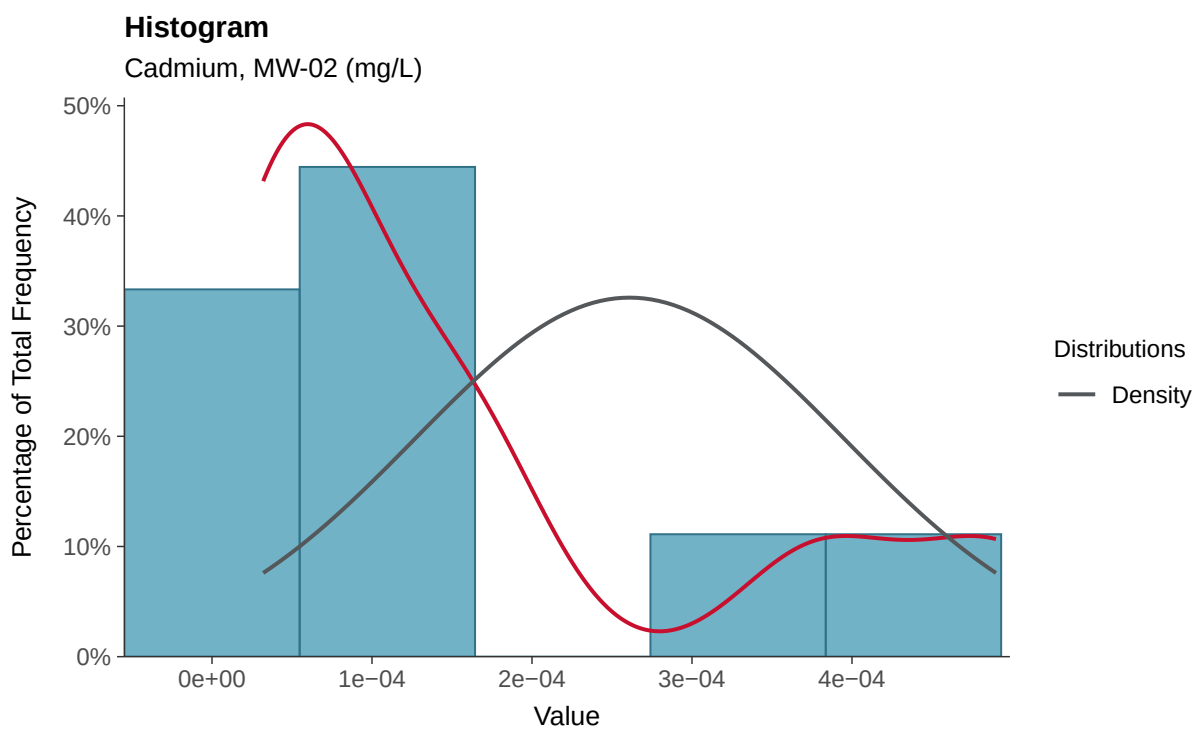
Beryllium, MW-02 (mg/L)



Appendix IV: Cadmium, MW-02

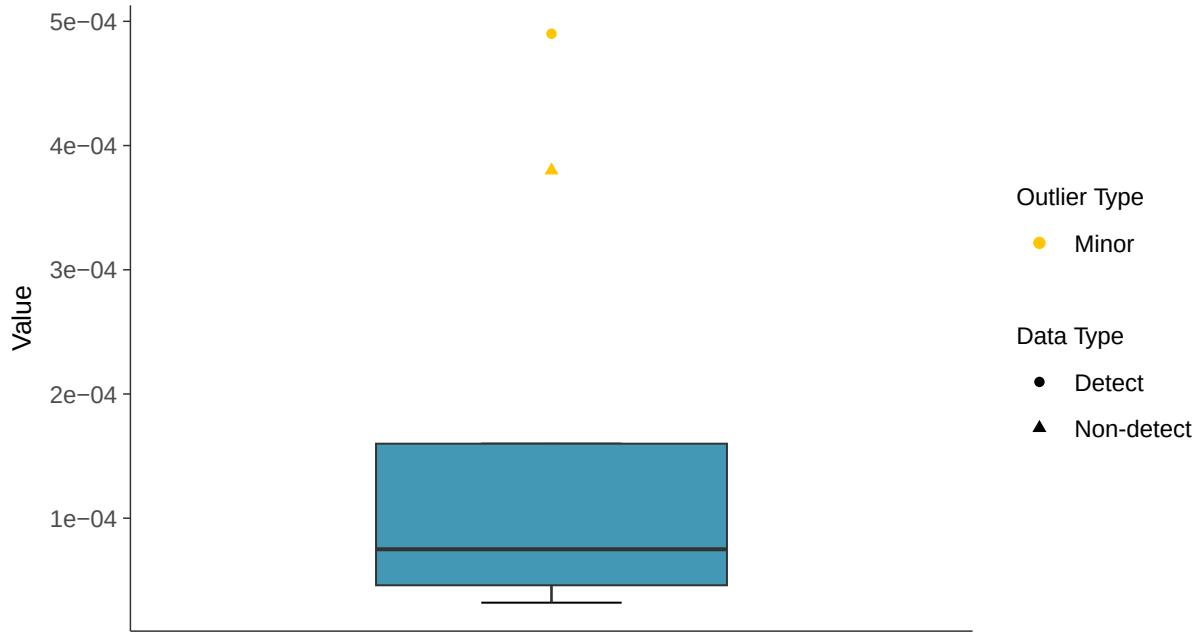
ID: 2_12_5_106





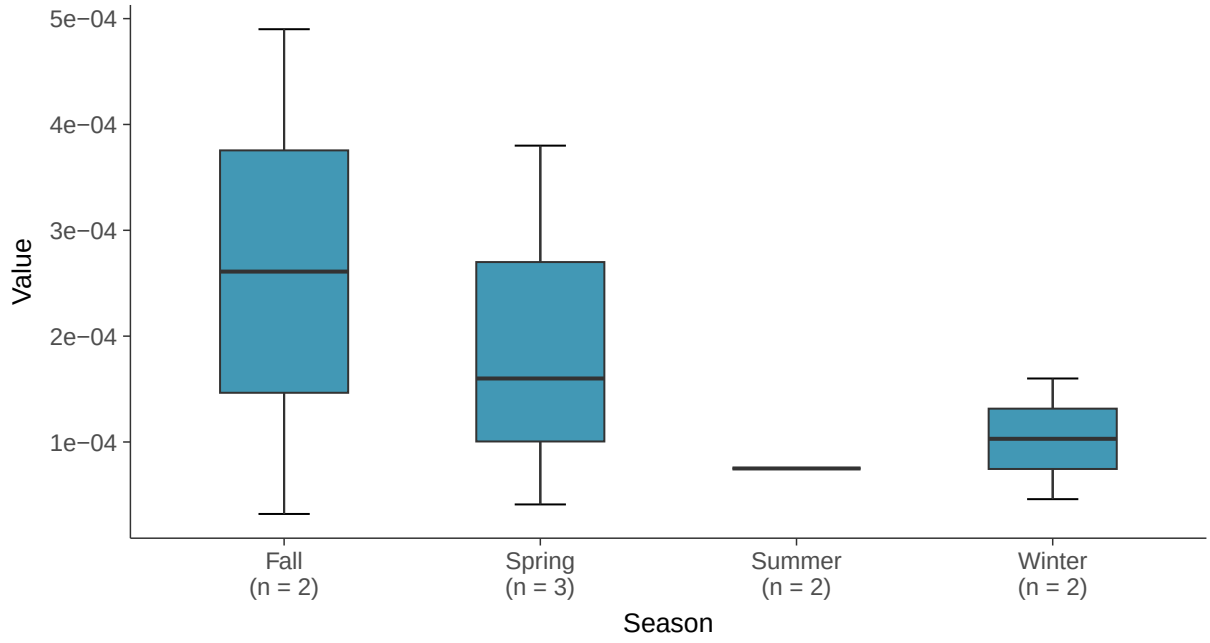
Boxplot

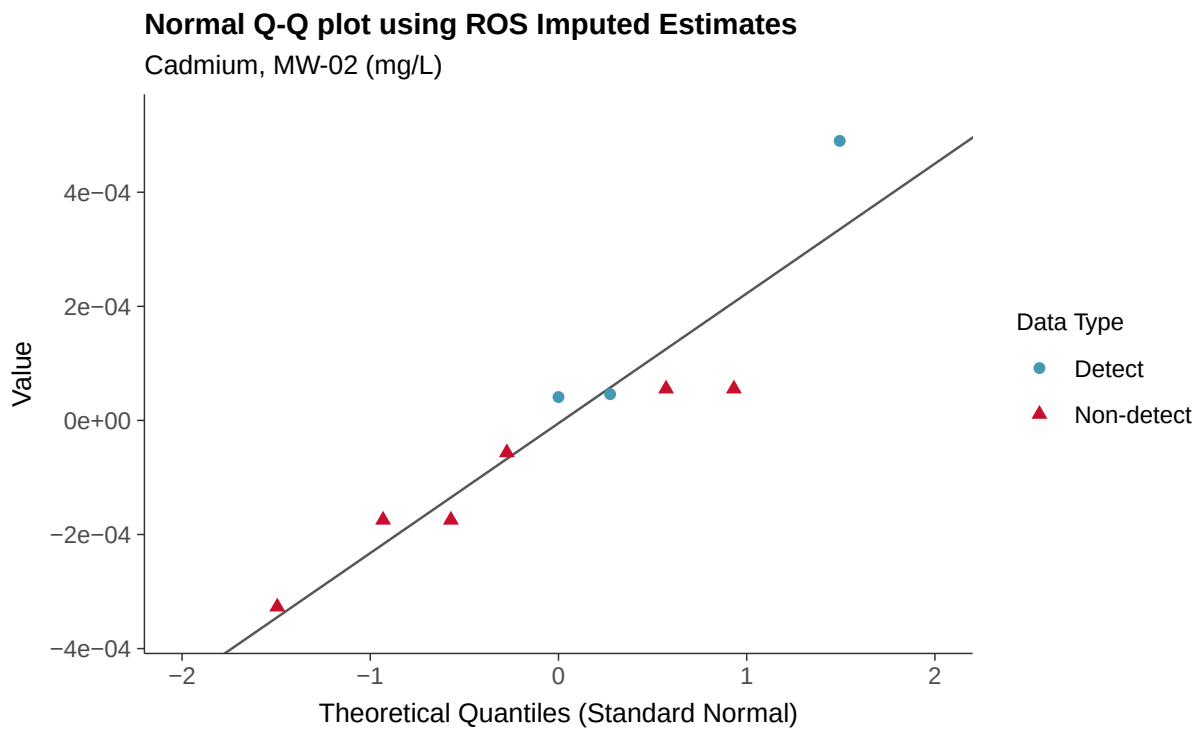
Cadmium, MW-02 (mg/L)

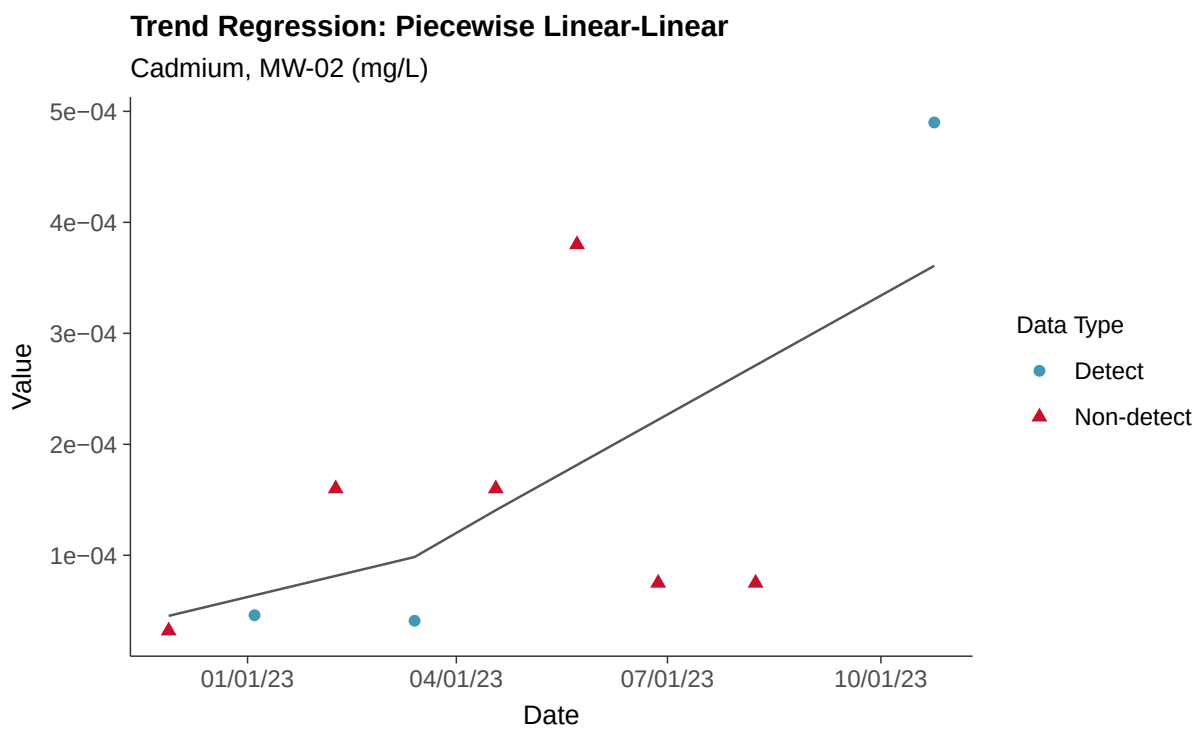


Boxplot by Season

Cadmium, MW-02 (mg/L)

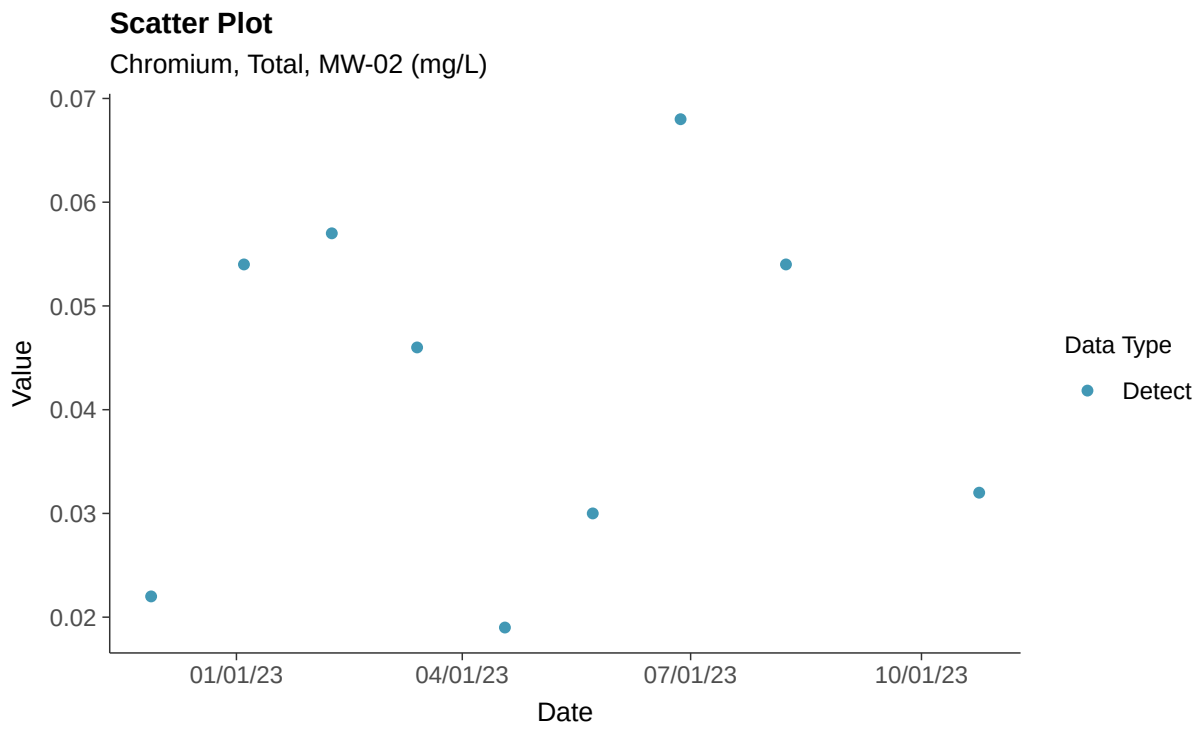


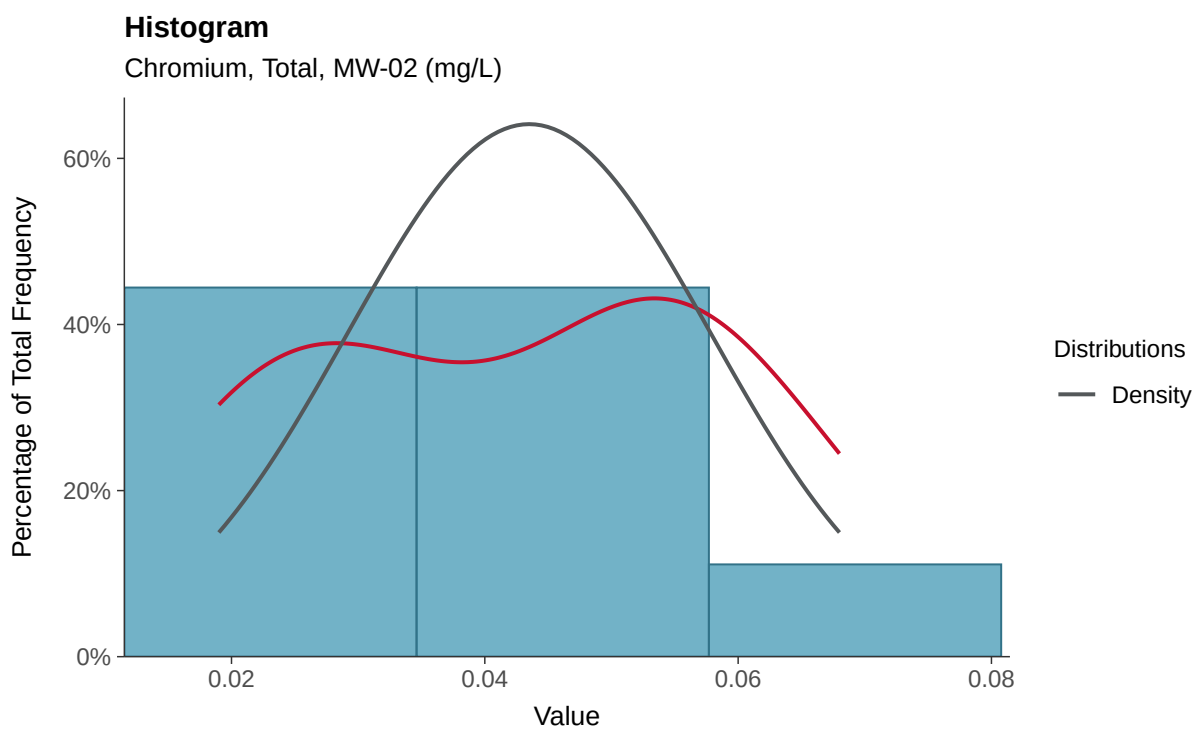

Normal Q-Q plot using ROS Imputed Estimates
Cadmium, MW-02 (mg/L)
Value
4e−04
2e−04
0e+00
−2e−04
−4e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Cadmium, MW-02 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Chromium, Total, MW-02

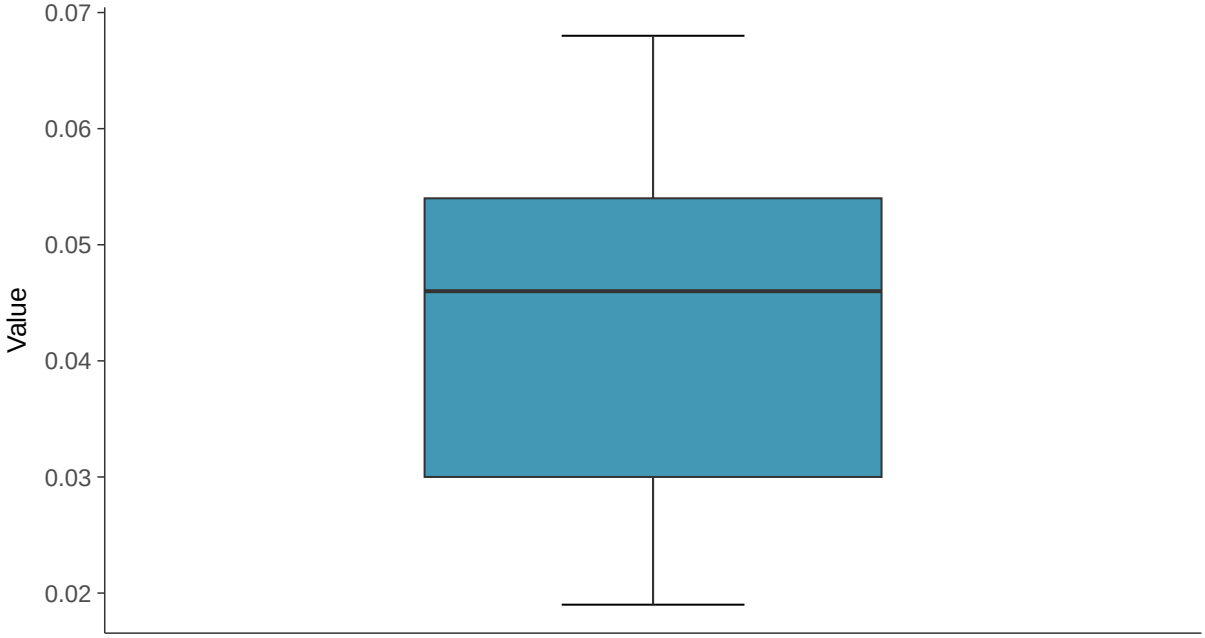
ID: 2_12_5_109





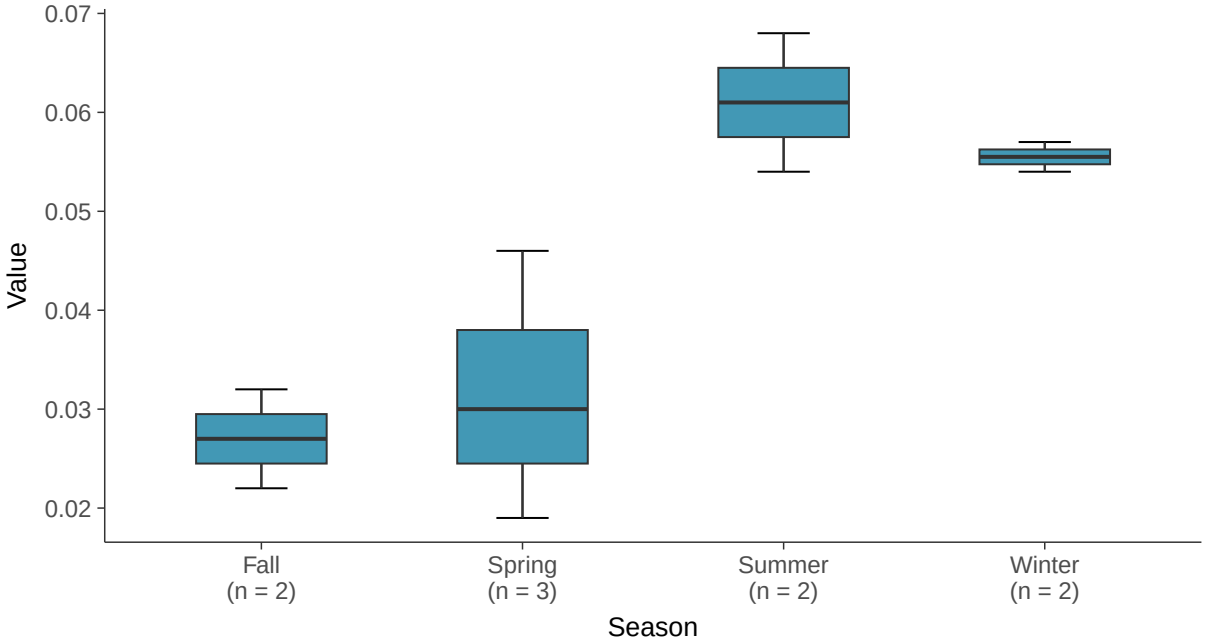
Boxplot

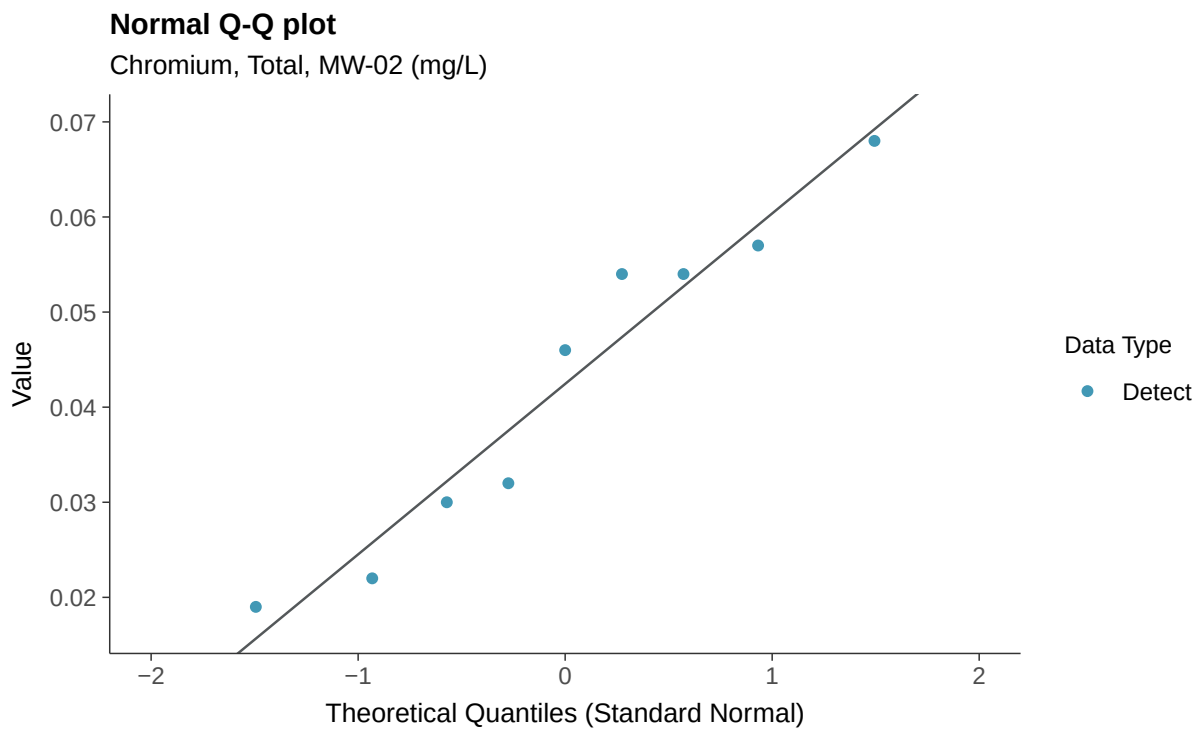
Chromium, Total, MW-02 (mg/L)

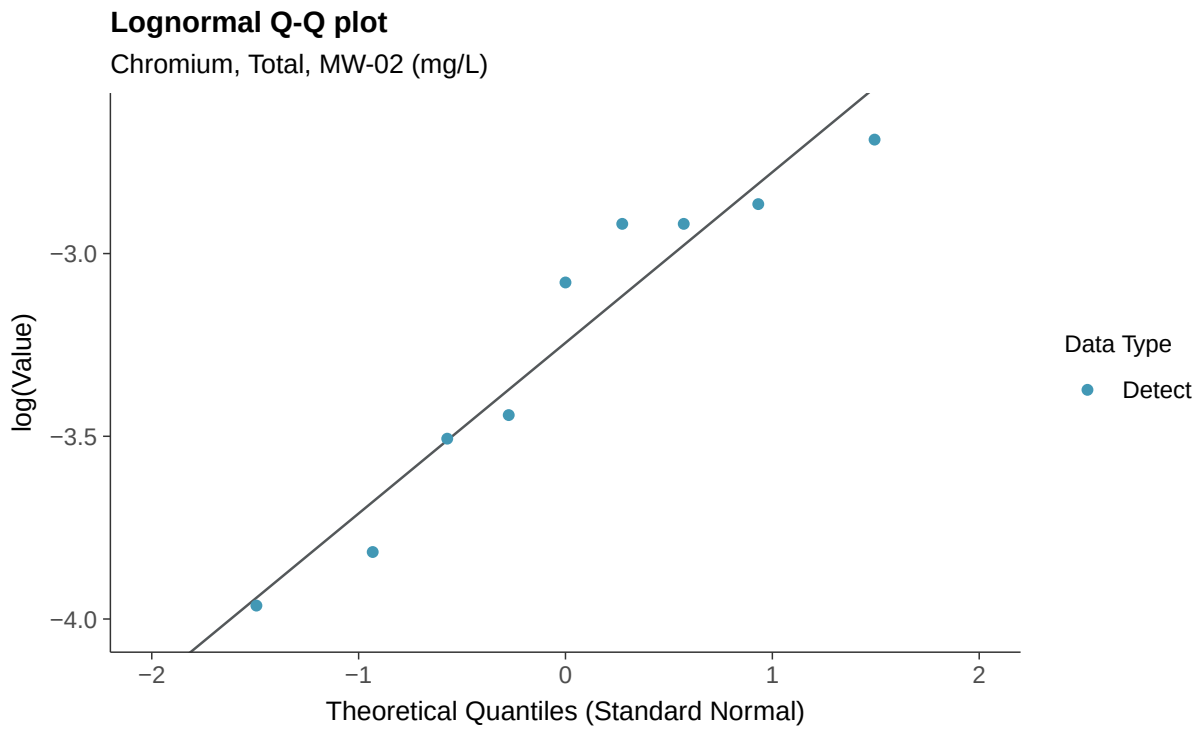


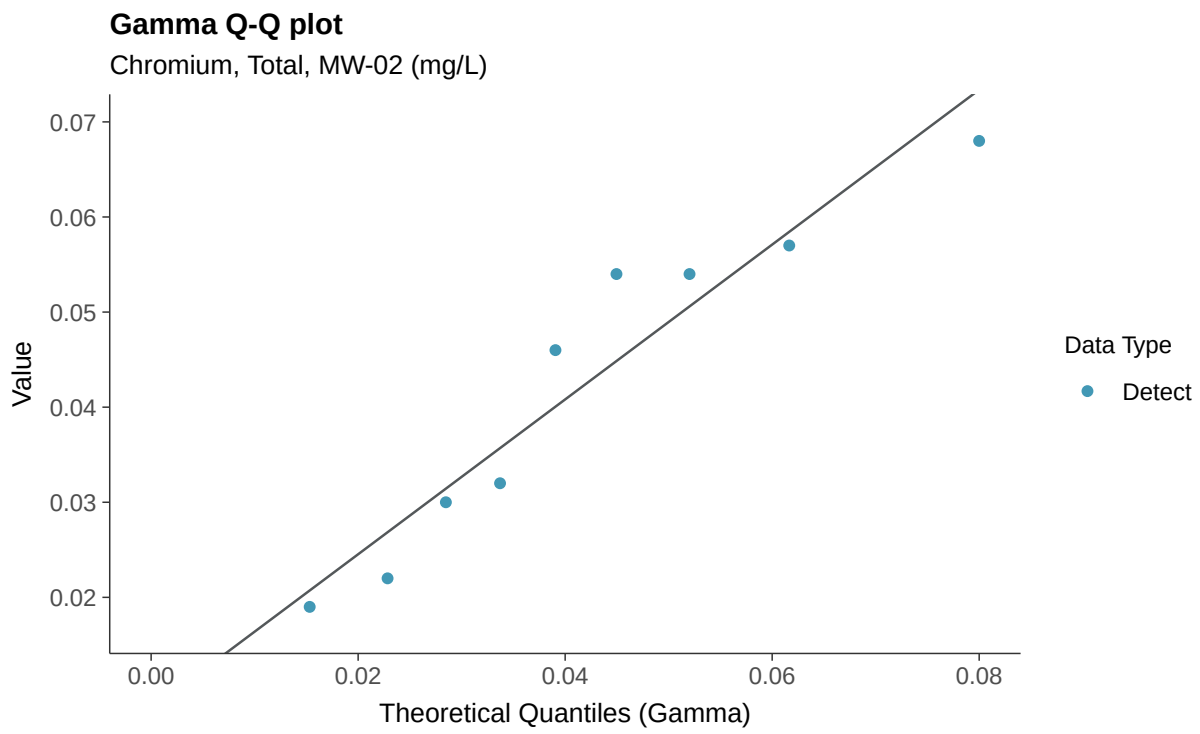
Boxplot by Season

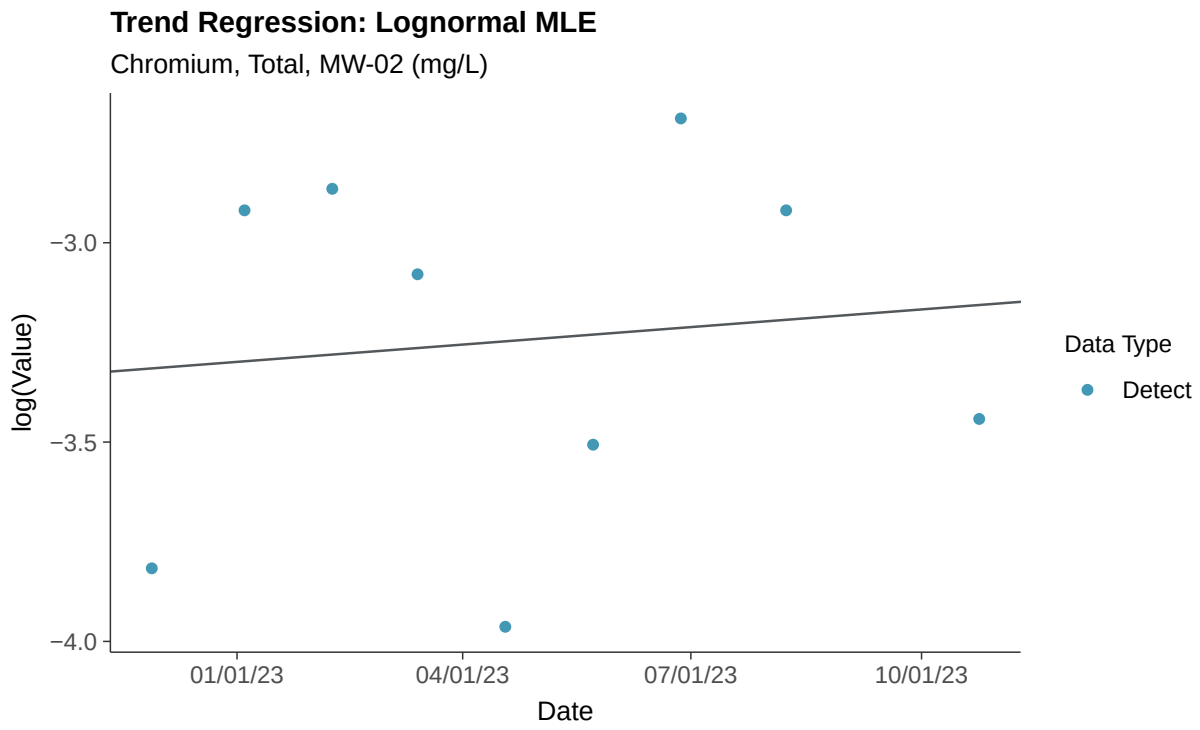
Chromium, Total, MW-02 (mg/L)




Normal Q-Q plot
Chromium, Total, MW-02 (mg/L)
Value
0.07
0.06
0.05
0.04
0.03
0.02
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

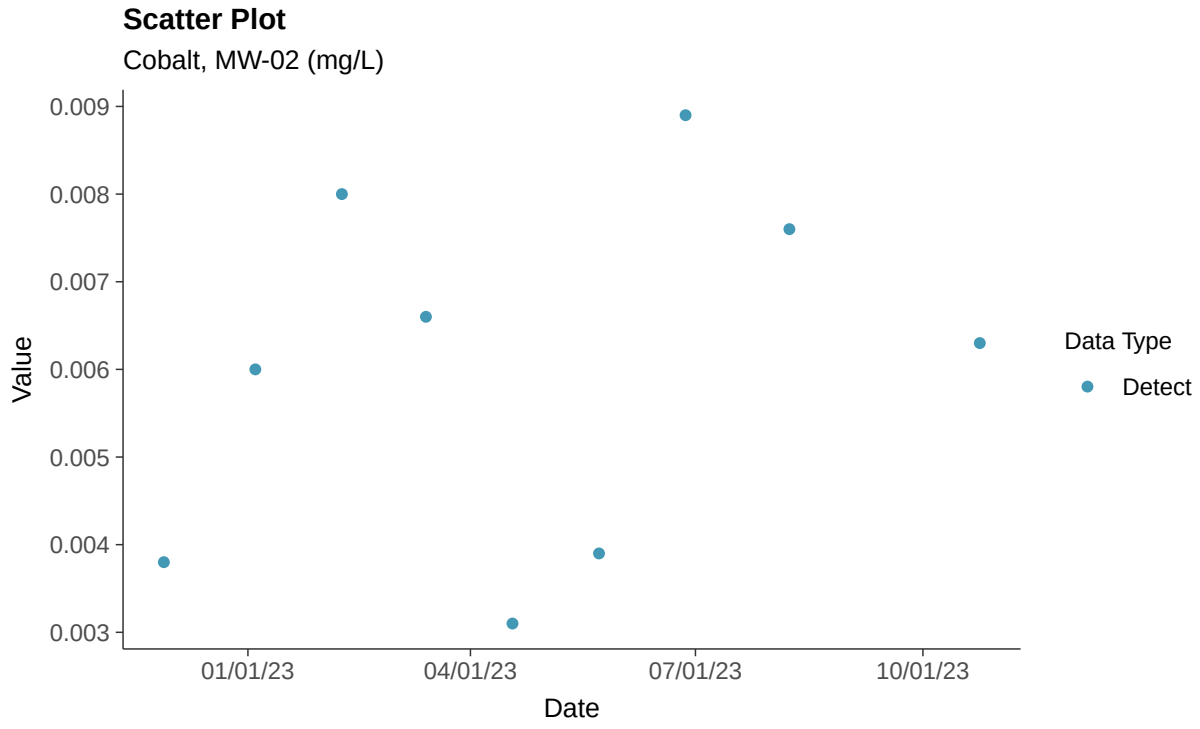

Lognormal Q-Q plot
Chromium, Total, MW-02 (mg/L)
log(Value)
−3.0
−3.5
−4.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

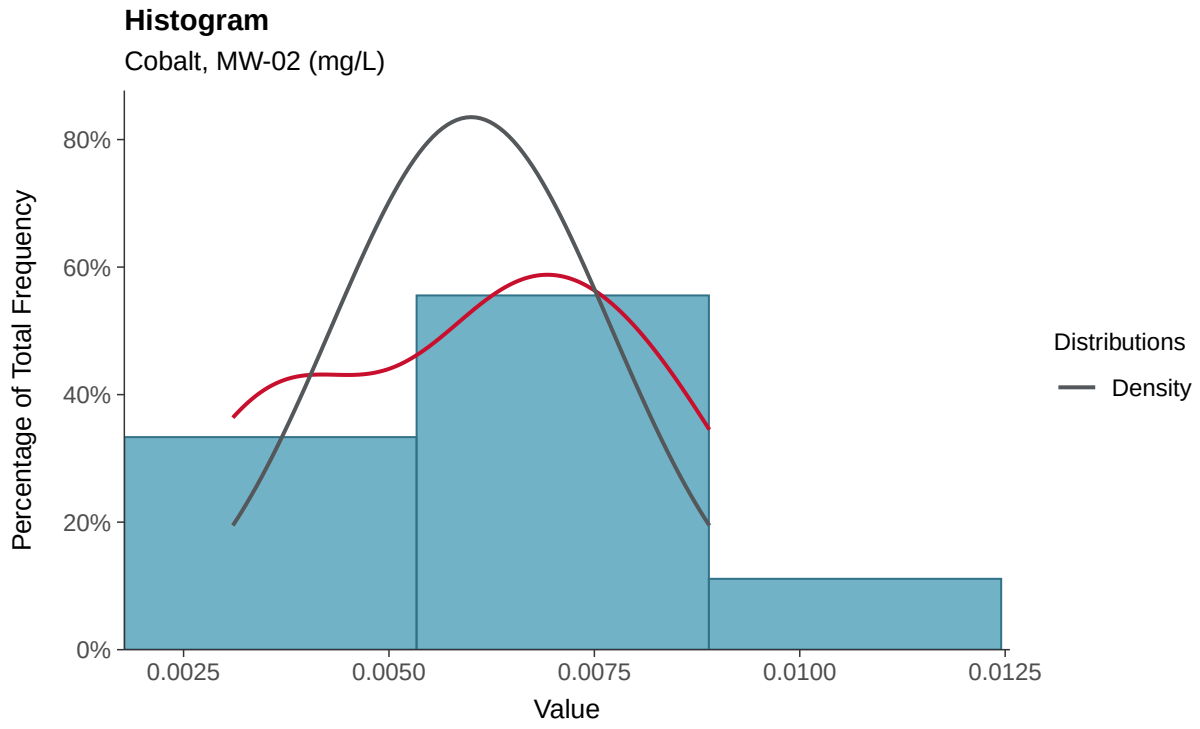

Gamma Q-Q plot
Chromium, Total, MW-02 (mg/L)
Value
0.07
0.06
0.05
0.04
0.03
0.02
0.00
0.02
0.04
0.06
0.08
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-02 (mg/L)
log(Value)
−3.0
−3.5
−4.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Cobalt, MW-02

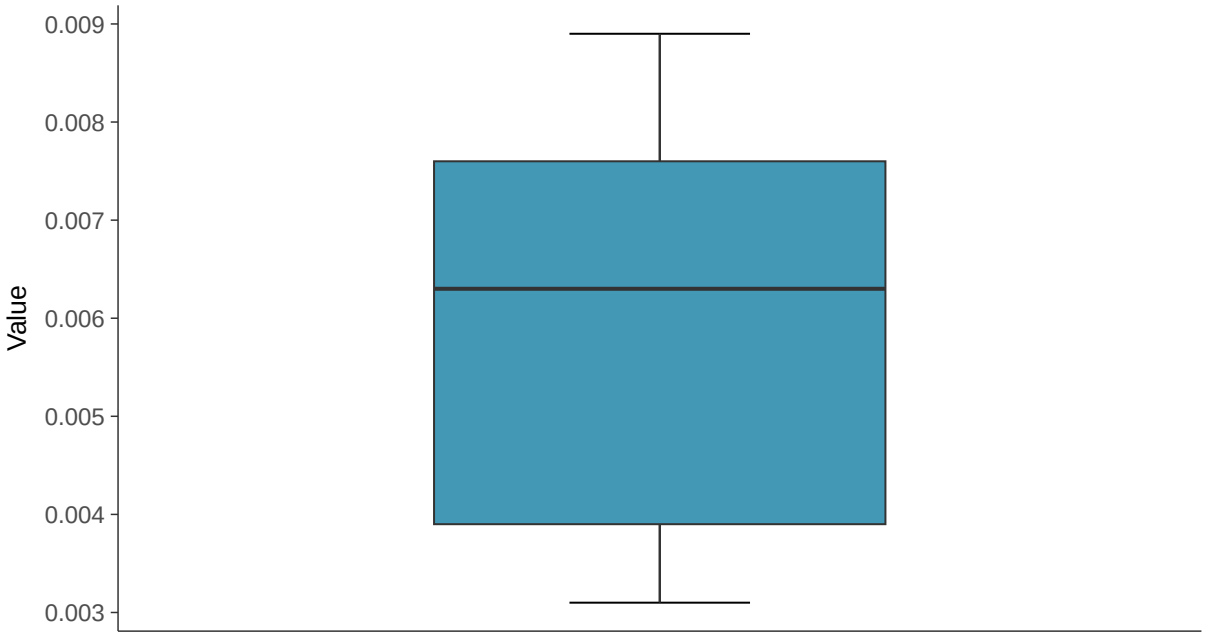
ID: 2_12_5_110





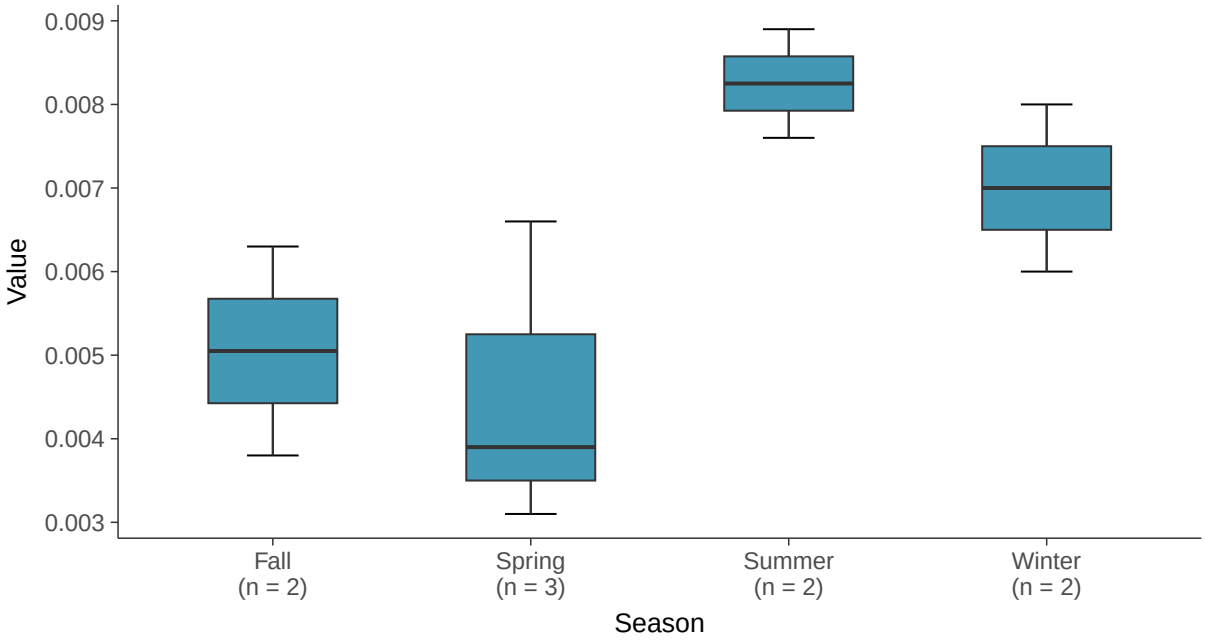
Boxplot

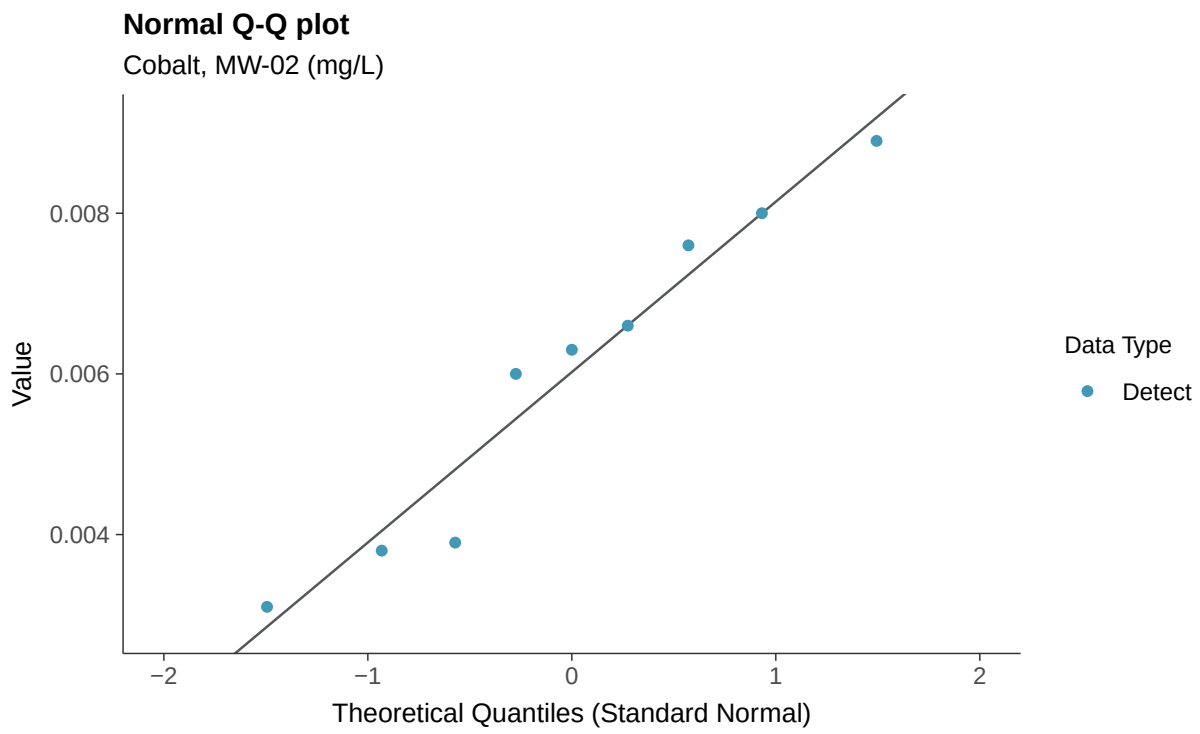
Cobalt, MW-02 (mg/L)

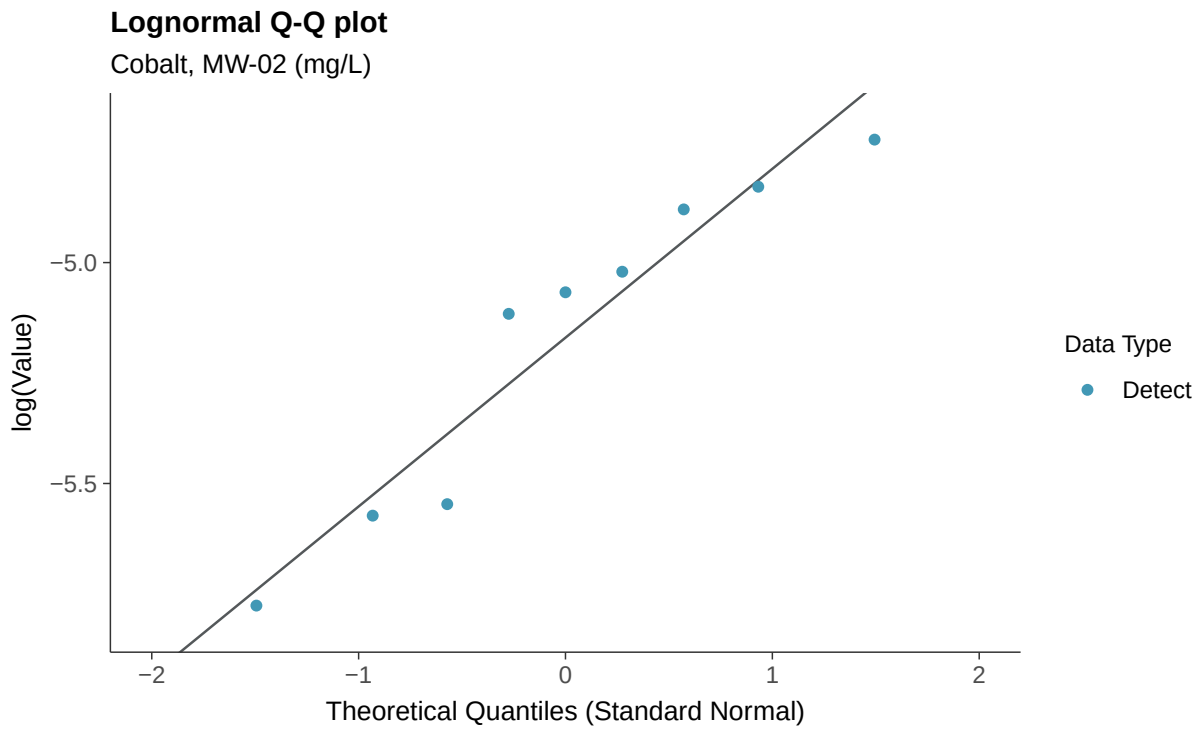


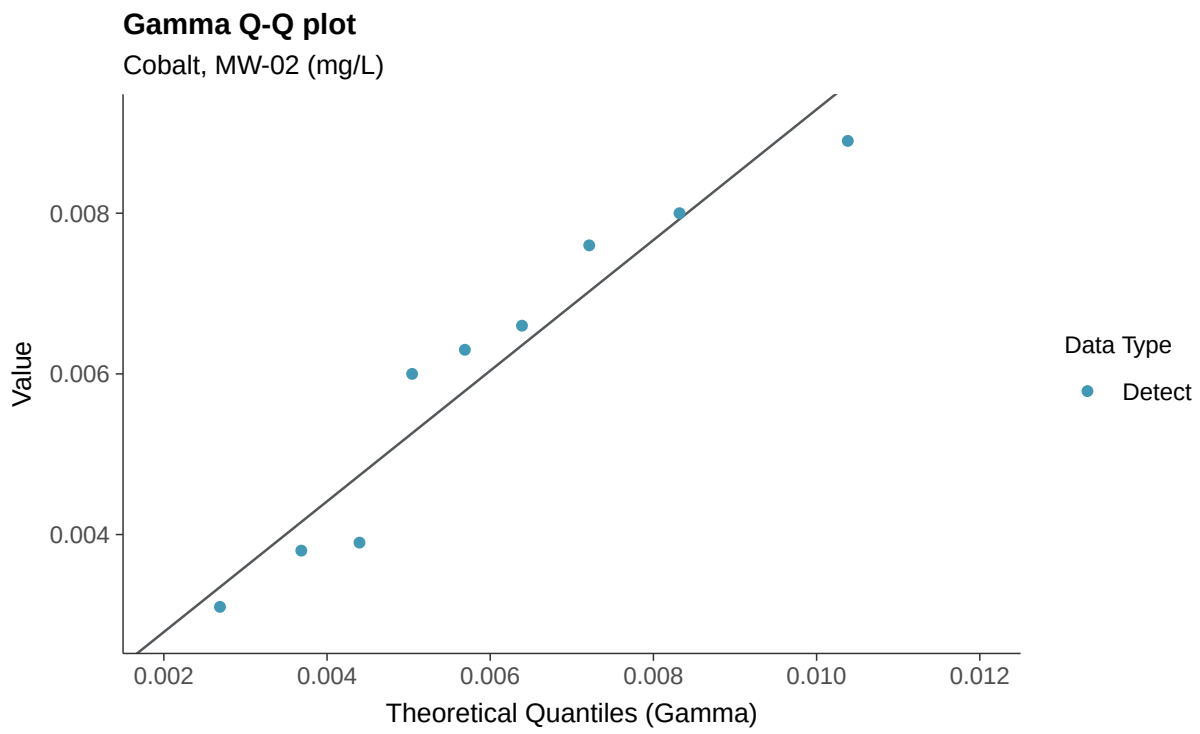
Boxplot by Season

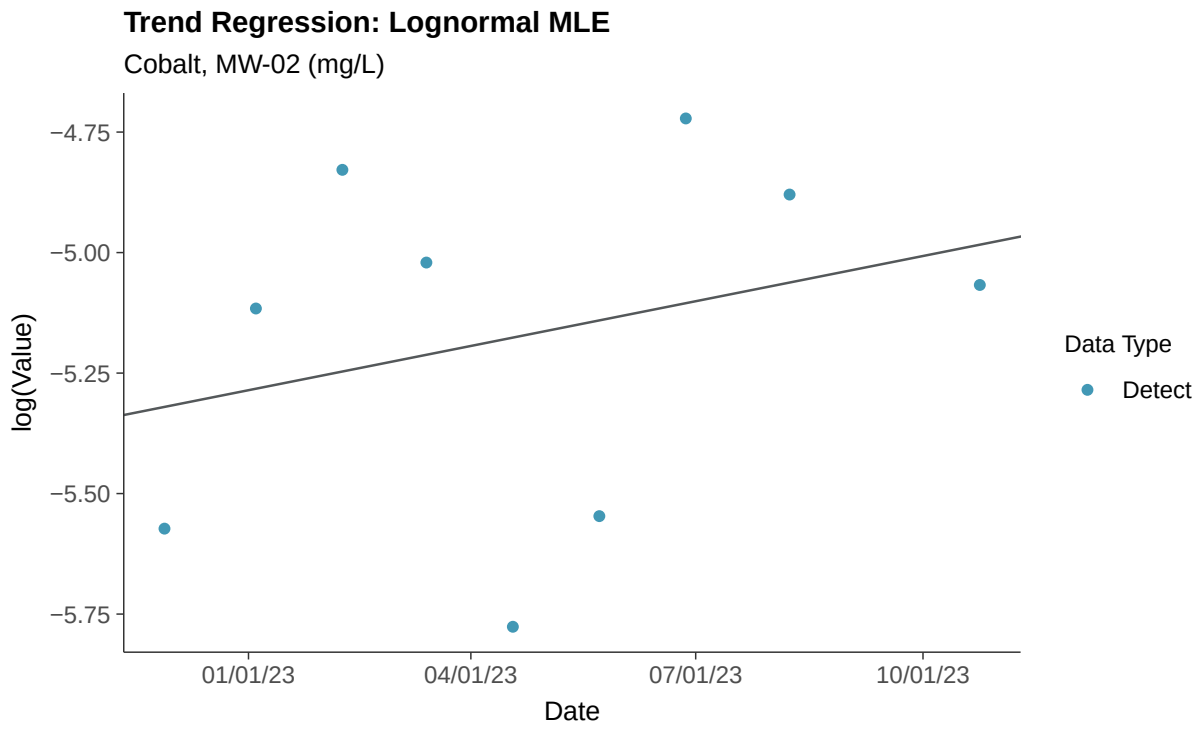
Cobalt, MW-02 (mg/L)

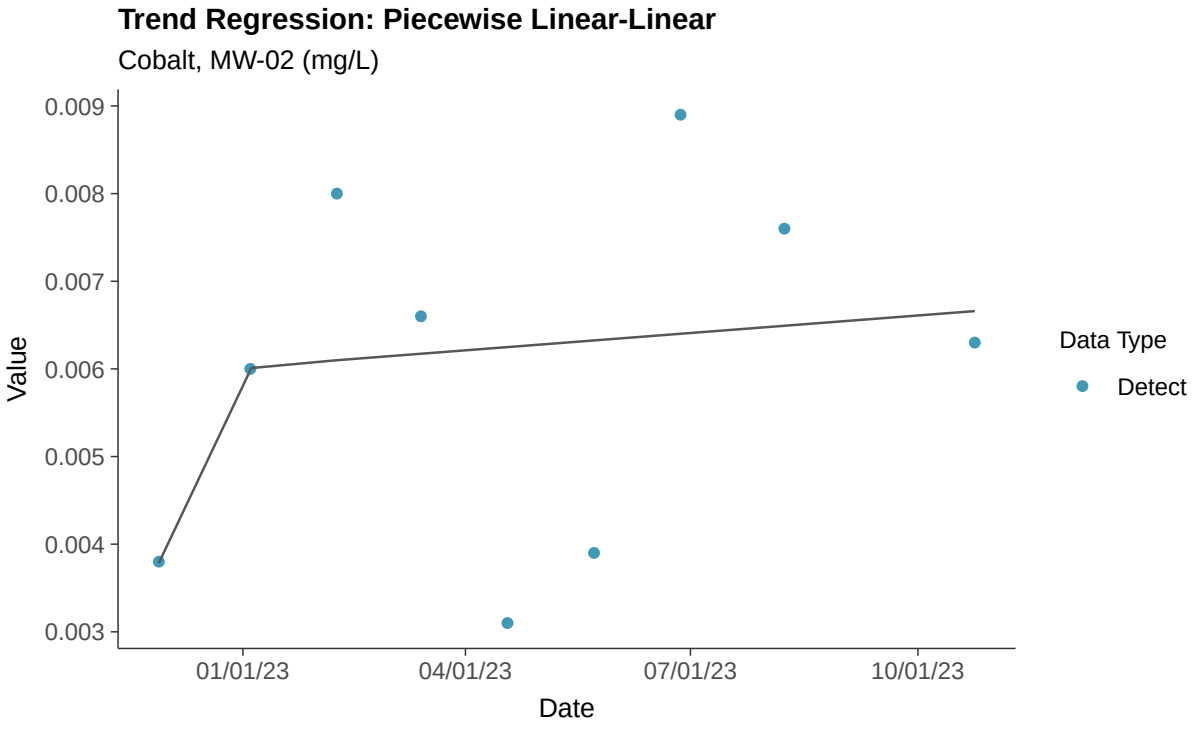



Normal Q-Q plot
Cobalt, MW-02 (mg/L)
Value
0.008
0.006
0.004
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Cobalt, MW-02 (mg/L)
log(Value)
−5.0
−5.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

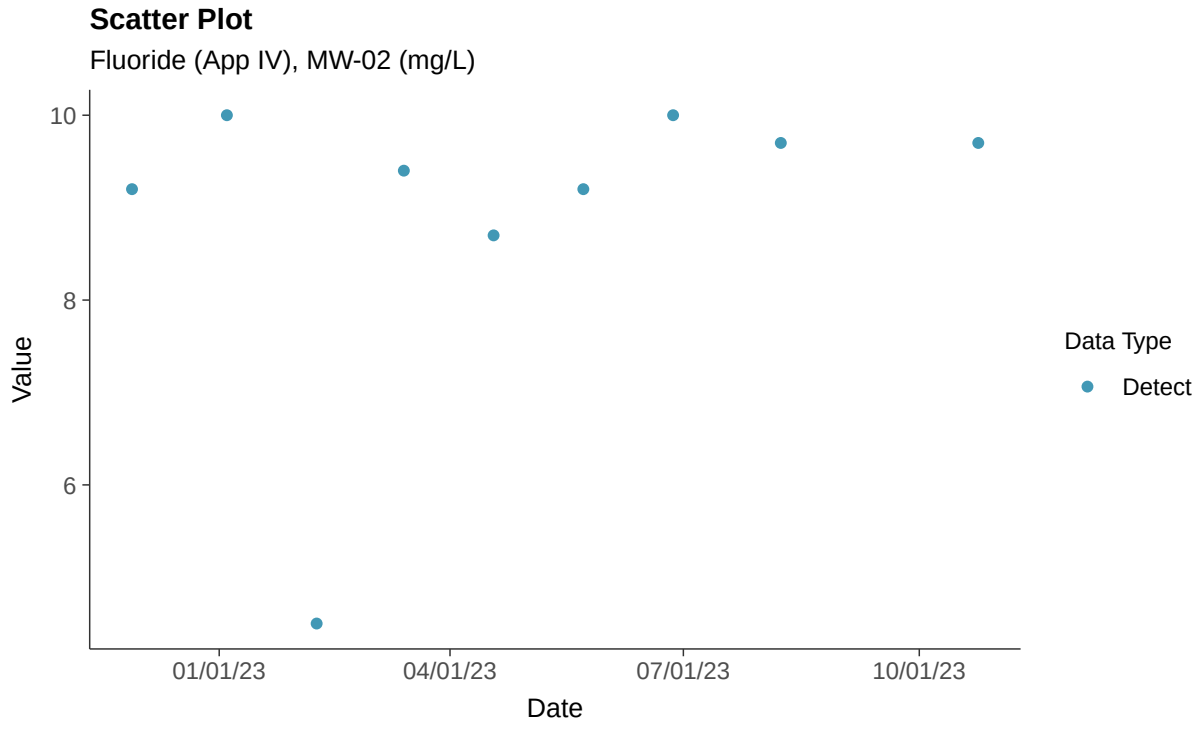

Gamma Q-Q plot
Cobalt, MW-02 (mg/L)
Value
0.008
0.006
0.004
0.002
0.004
0.006
0.008
0.010
0.012
Theoretical Quantiles (Gamma)
Data Type
Detect

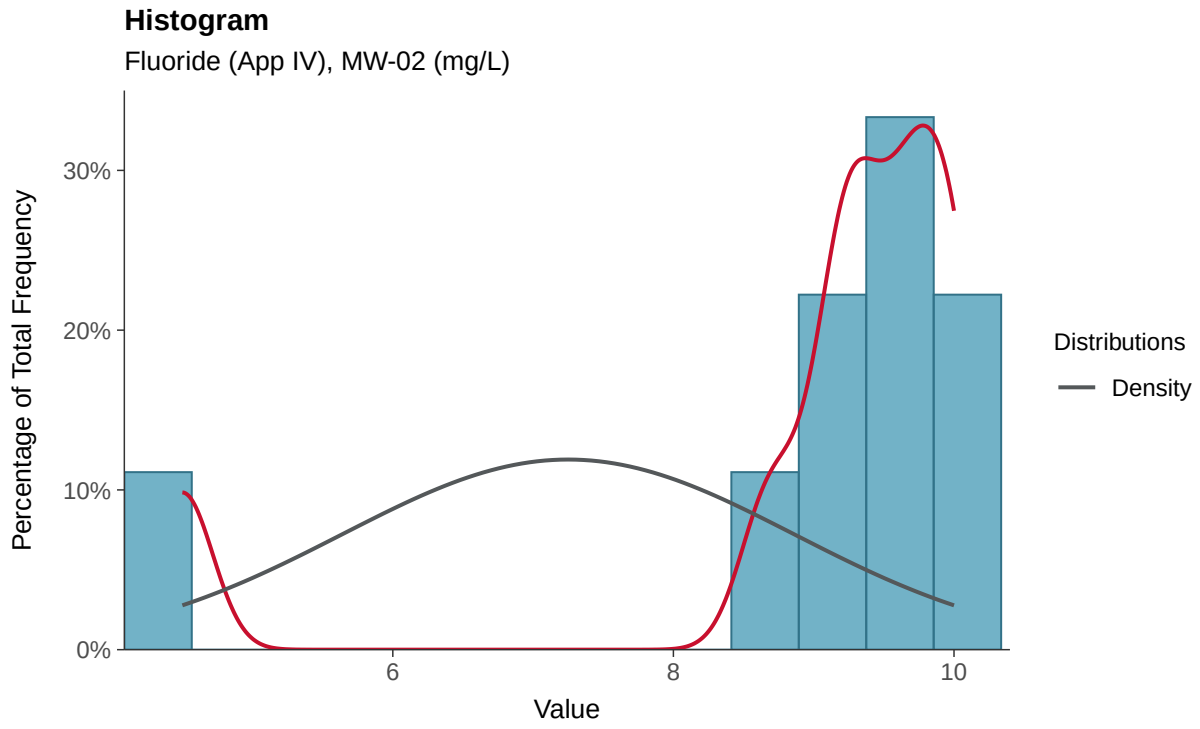

Trend Regression: Lognormal MLE
Cobalt, MW-02 (mg/L)
log(Value)
−4.75
−5.00
−5.25
−5.50
−5.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Cobalt, MW-02 (mg/L)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-02

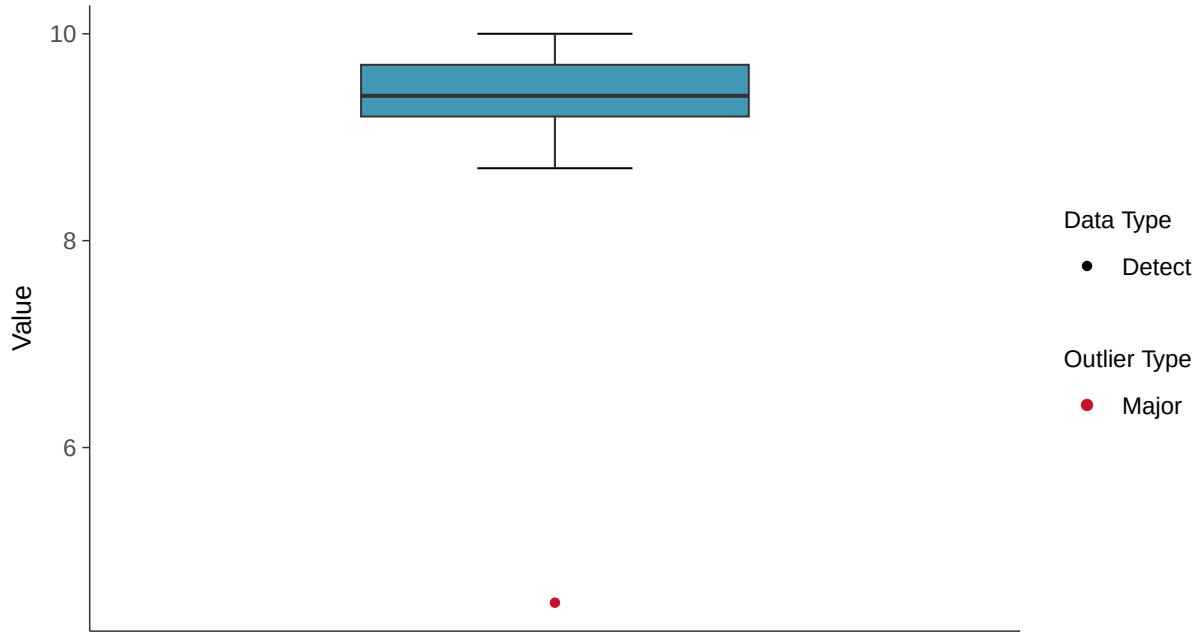
ID: 2_12_5_113





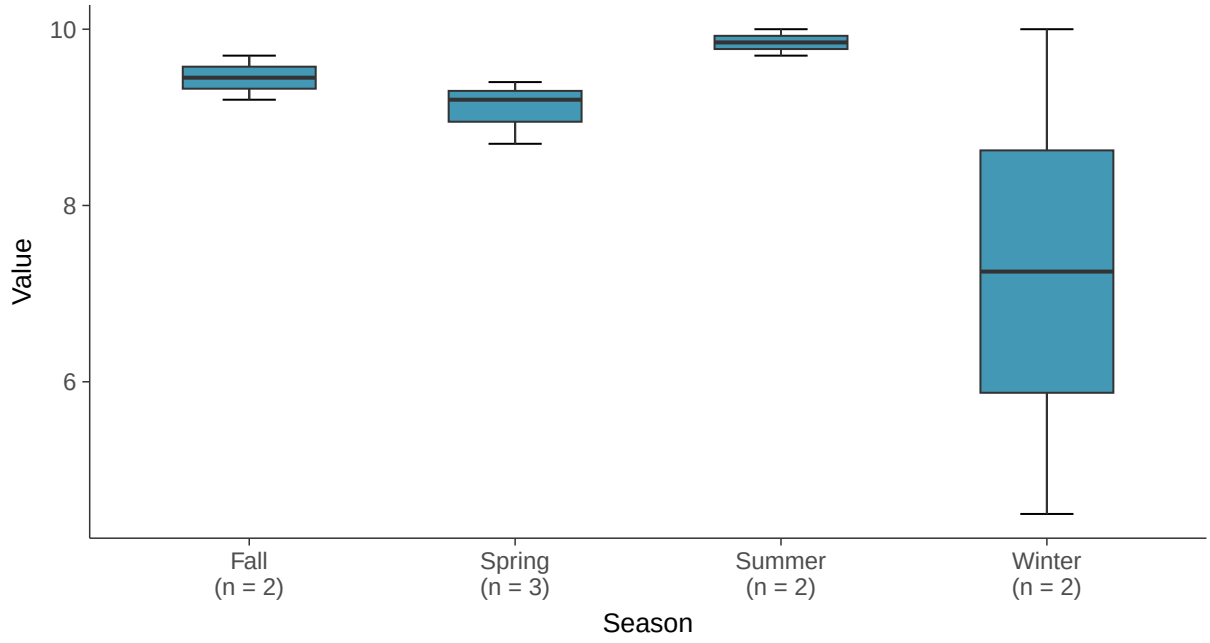
Boxplot

Fluoride (App IV), MW-02 (mg/L)



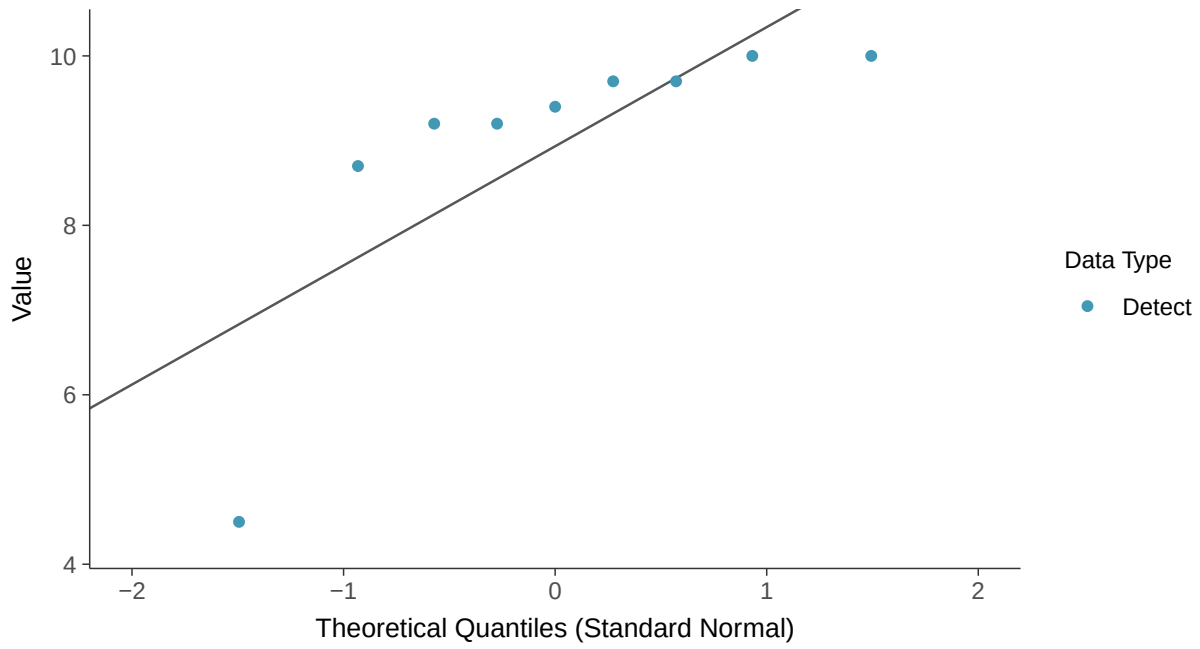
Boxplot by Season

Fluoride (App IV), MW-02 (mg/L)



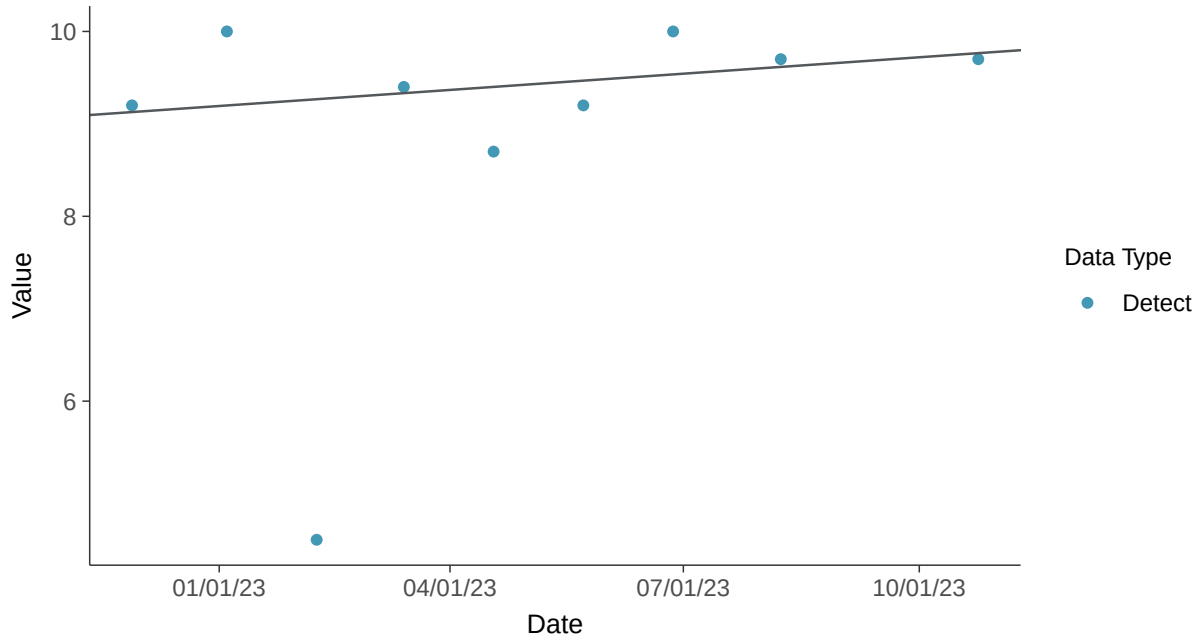
Normal Q-Q plot

Fluoride (App IV), MW-02 (mg/L)



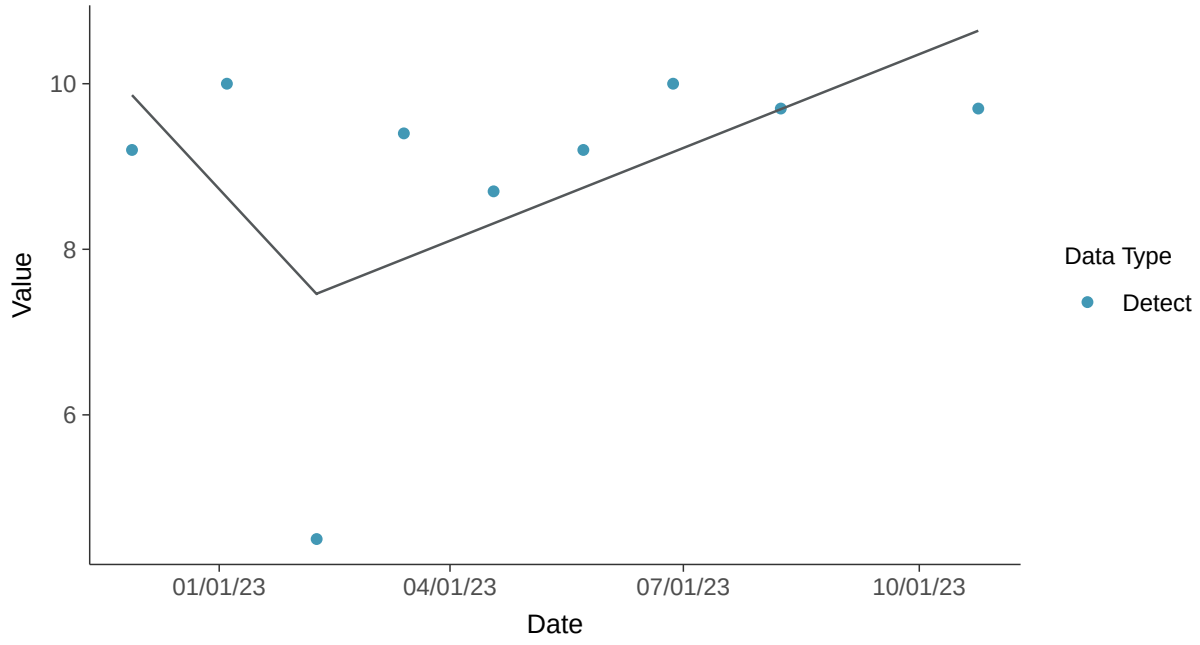
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Fluoride (App IV), MW-02 (mg/L)



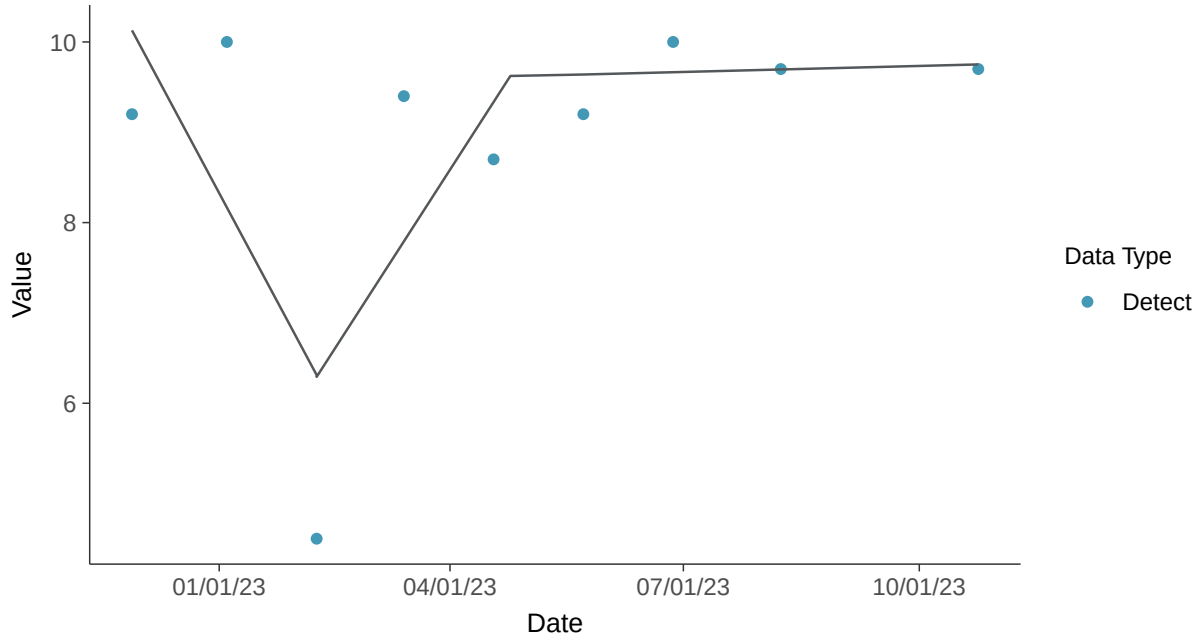
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-02 (mg/L)



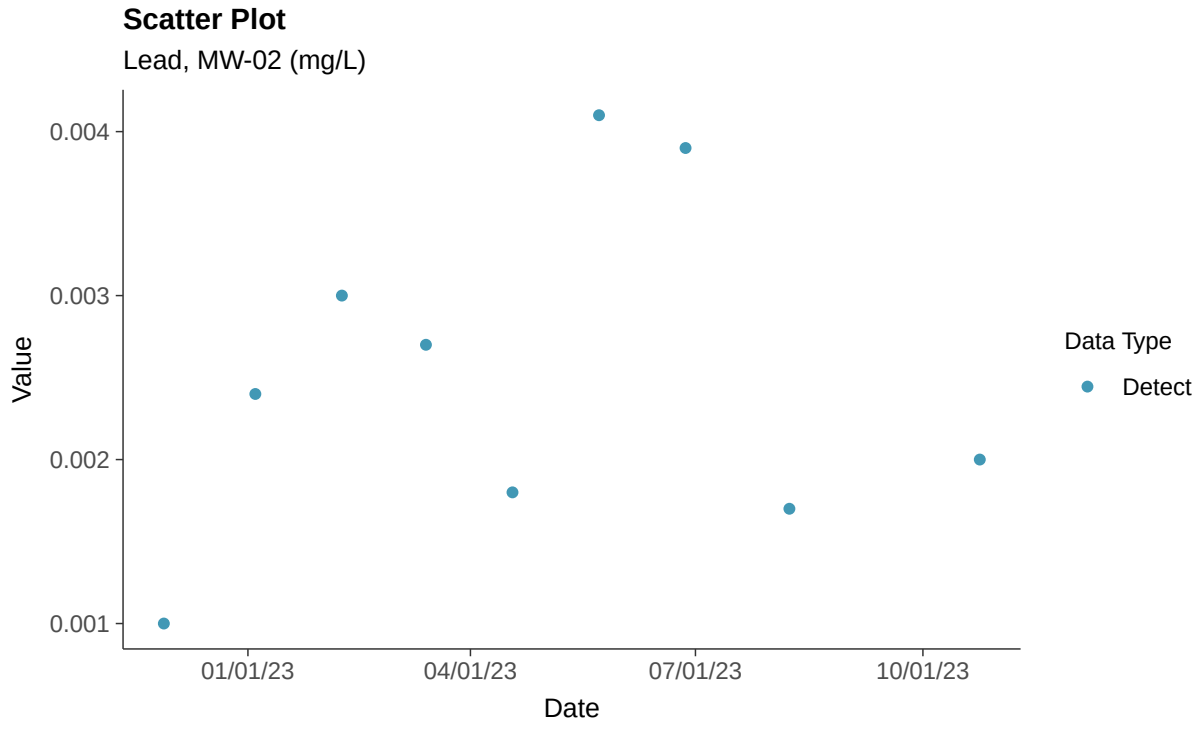
Trend Regression: Piecewise Linear-Linear-Linear

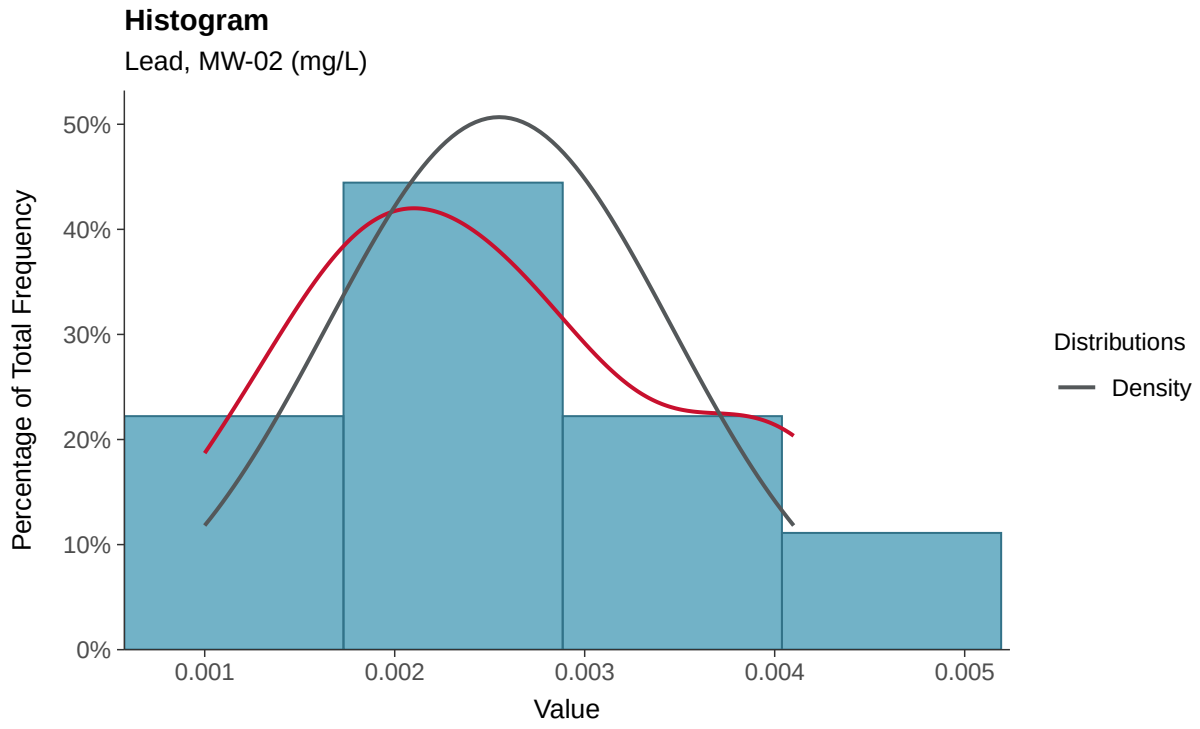
Fluoride (App IV), MW-02 (mg/L)



Appendix IV: Lead, MW-02

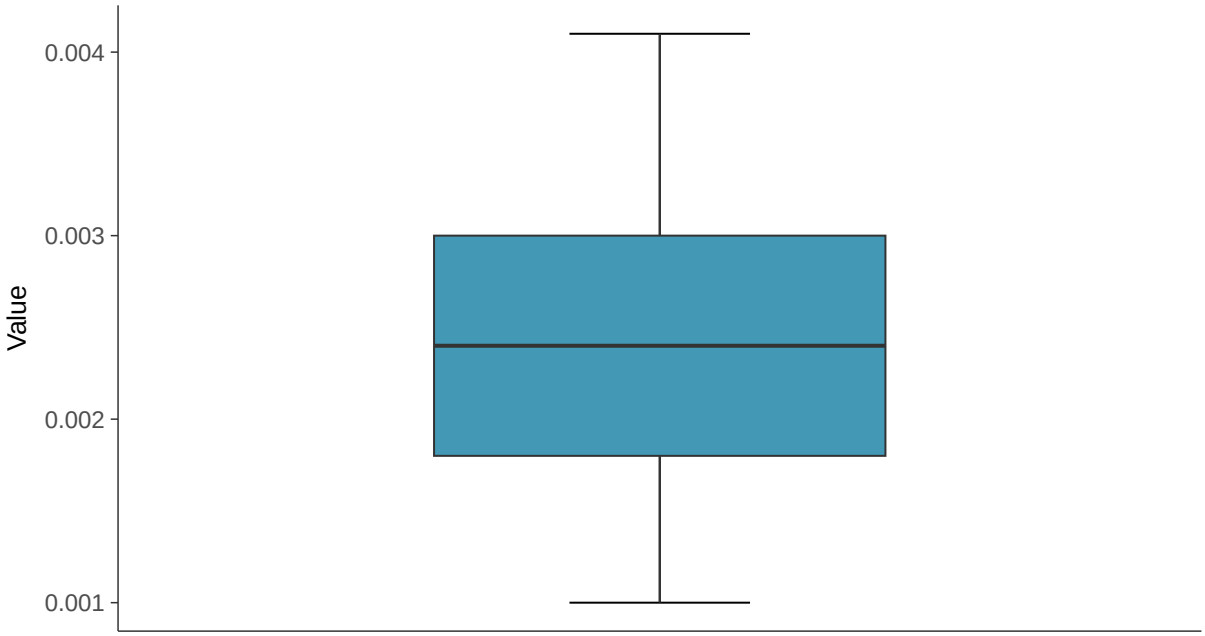
ID: 2_12_5_115





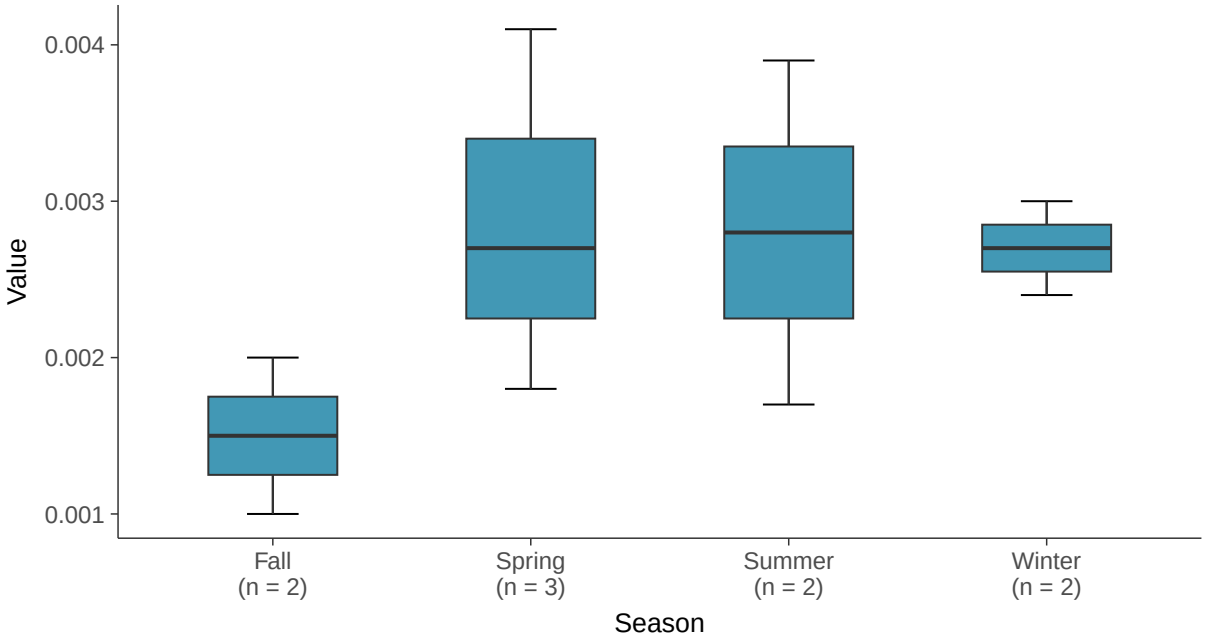
Boxplot

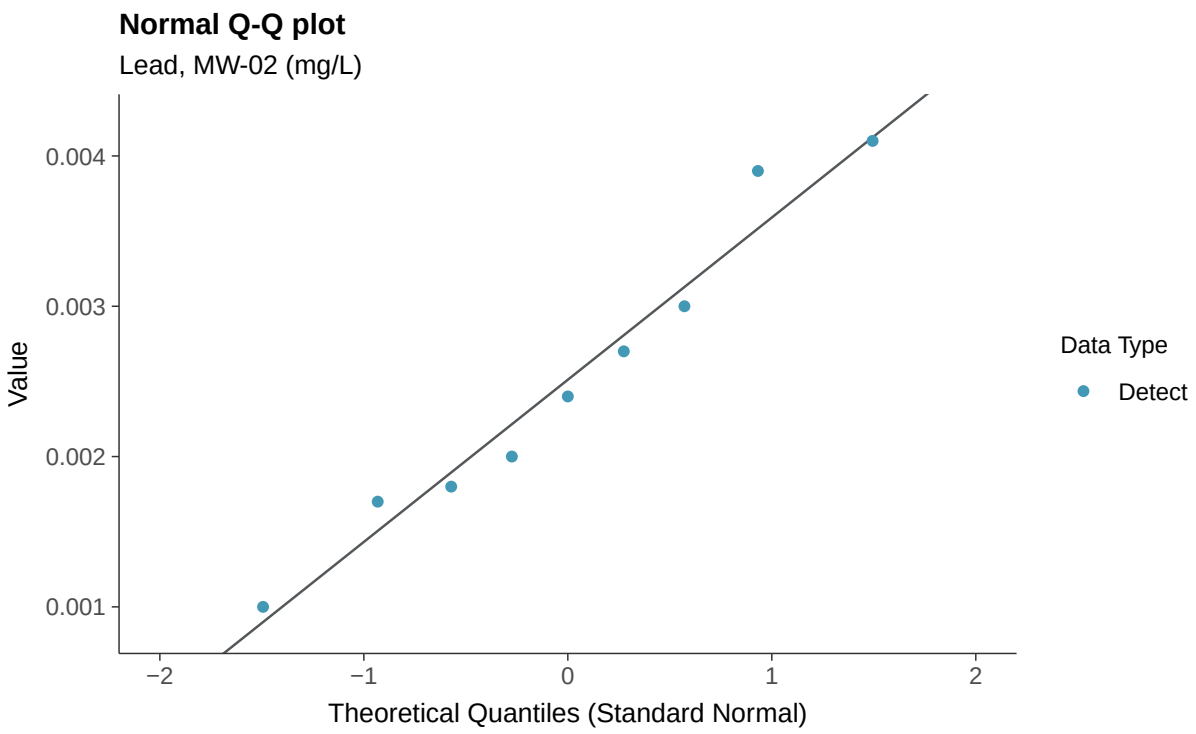
Lead, MW-02 (mg/L)

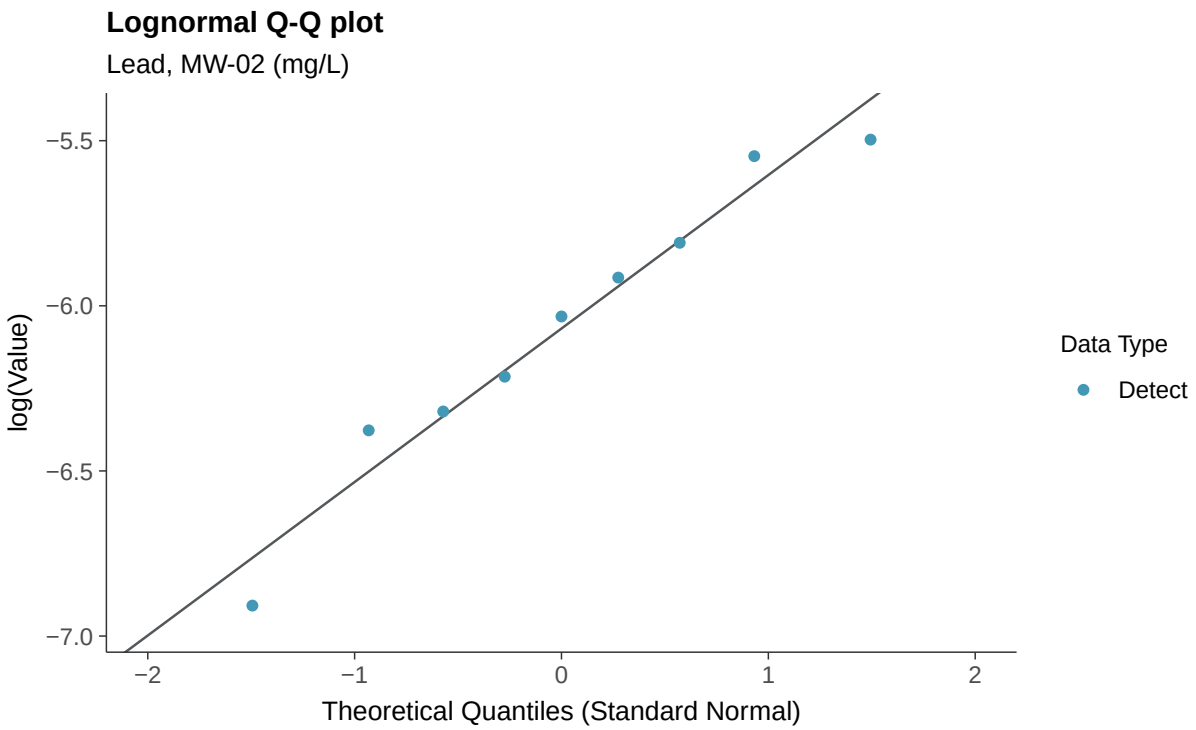


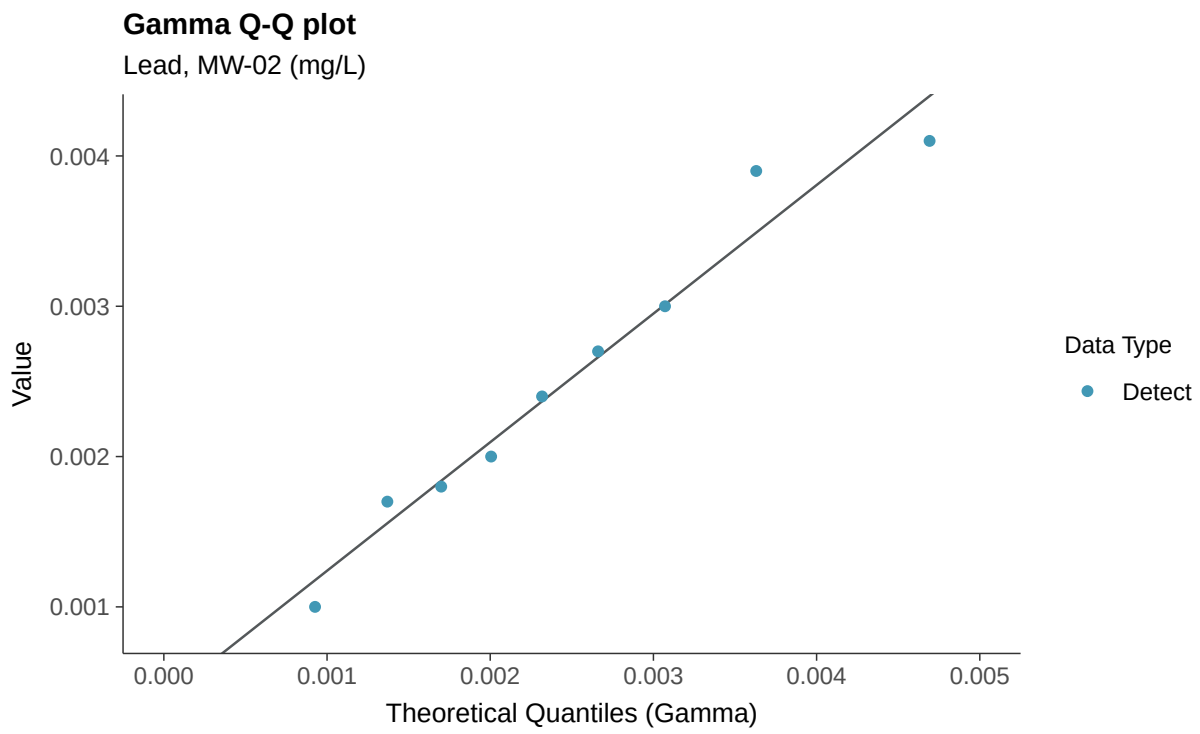
Boxplot by Season

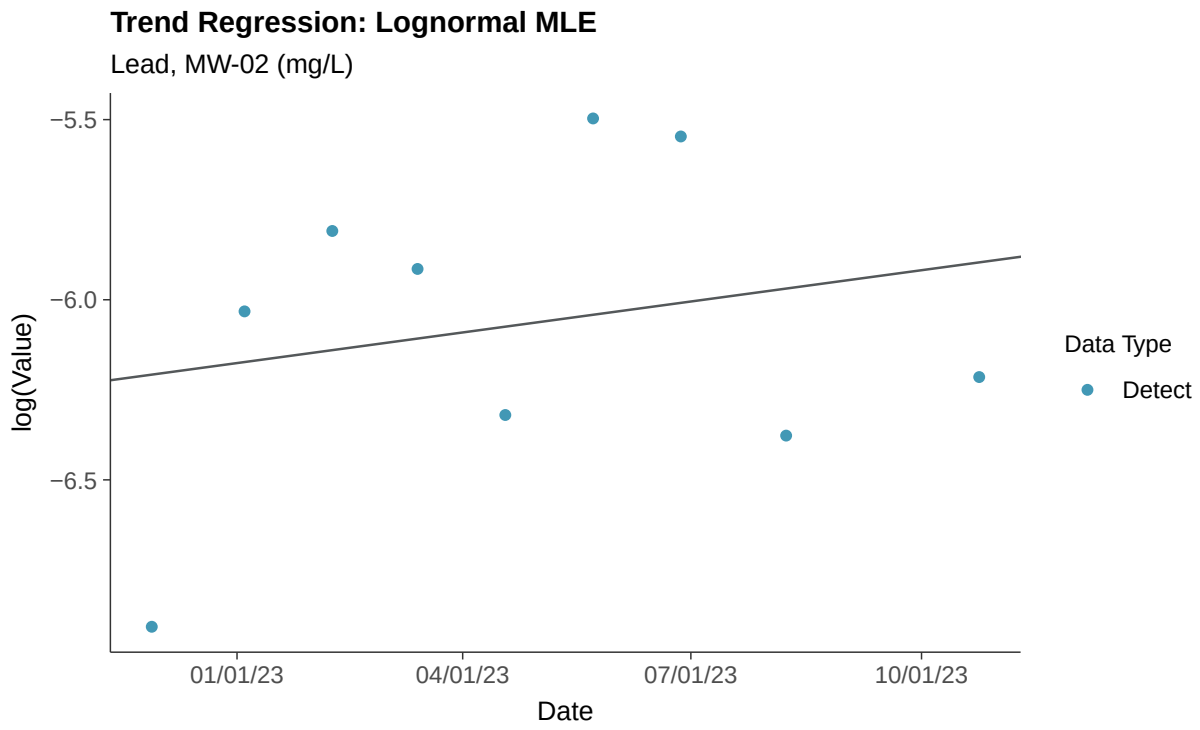
Lead, MW-02 (mg/L)

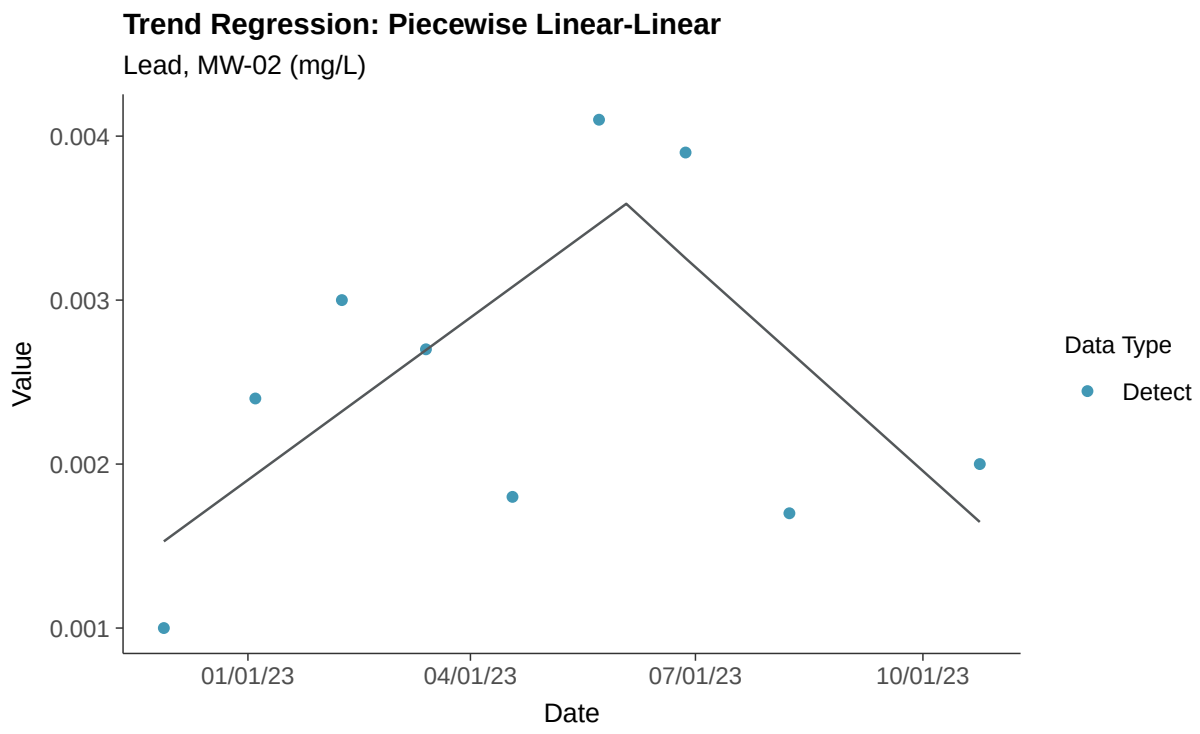



Normal Q-Q plot
Lead, MW-02 (mg/L)
Value
0.004
0.003
0.002
0.001
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lead, MW-02 (mg/L)
log(Value)
−5.5
−6.0
−6.5
−7.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

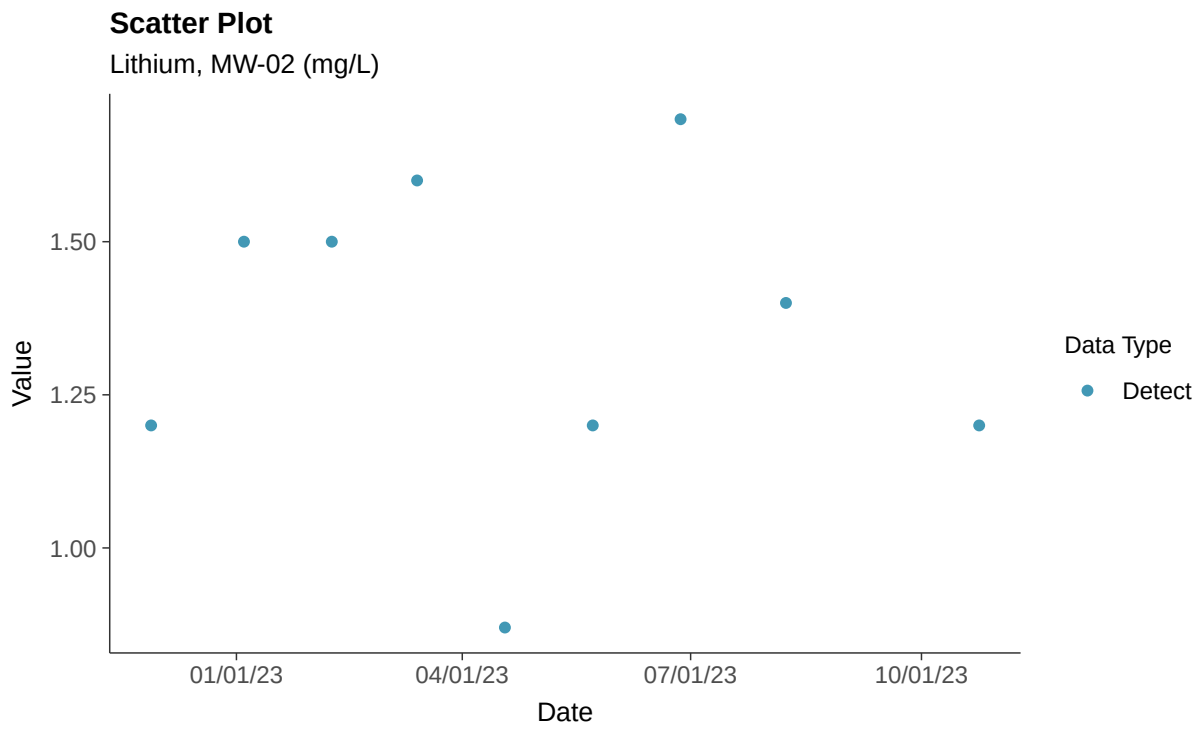

Gamma Q-Q plot
Lead, MW-02 (mg/L)
Value
0.004
0.003
0.002
0.001
0.000
0.001
0.002
0.003
0.004
0.005
Theoretical Quantiles (Gamma)
Data Type
Detect

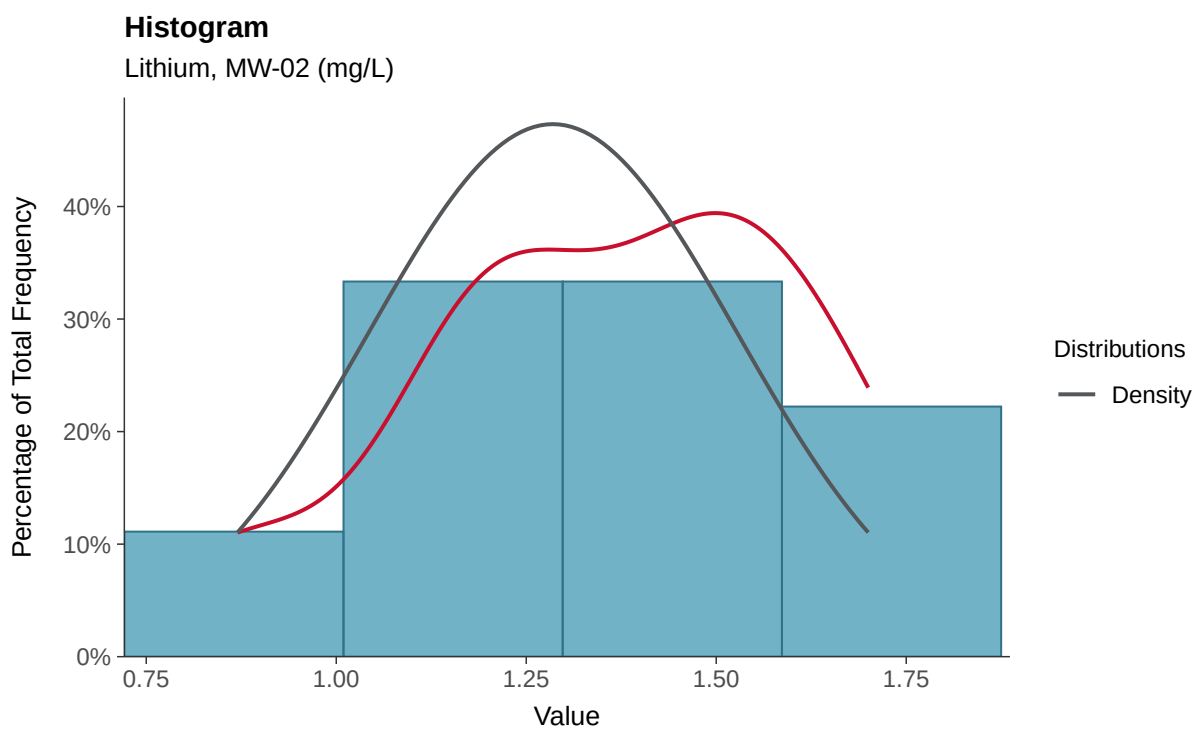

Trend Regression: Lognormal MLE
Lead, MW-02 (mg/L)
log(Value)
−5.5
−6.0
−6.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Lead, MW-02 (mg/L)
0.004
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lithium, MW-02

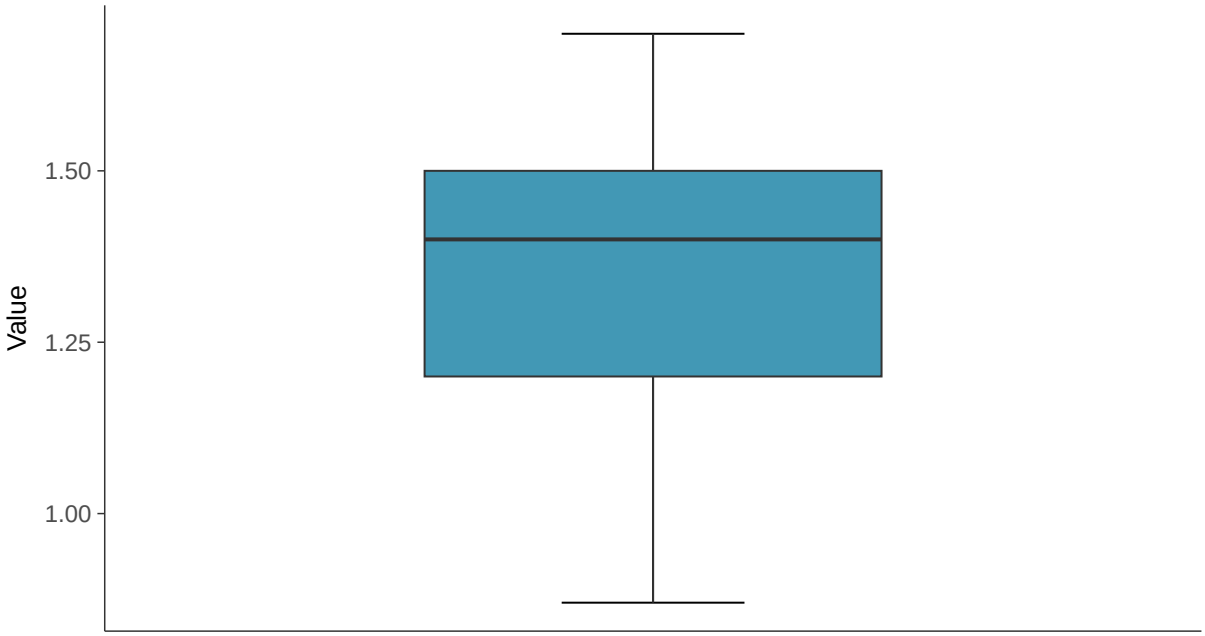
ID: 2_12_5_116





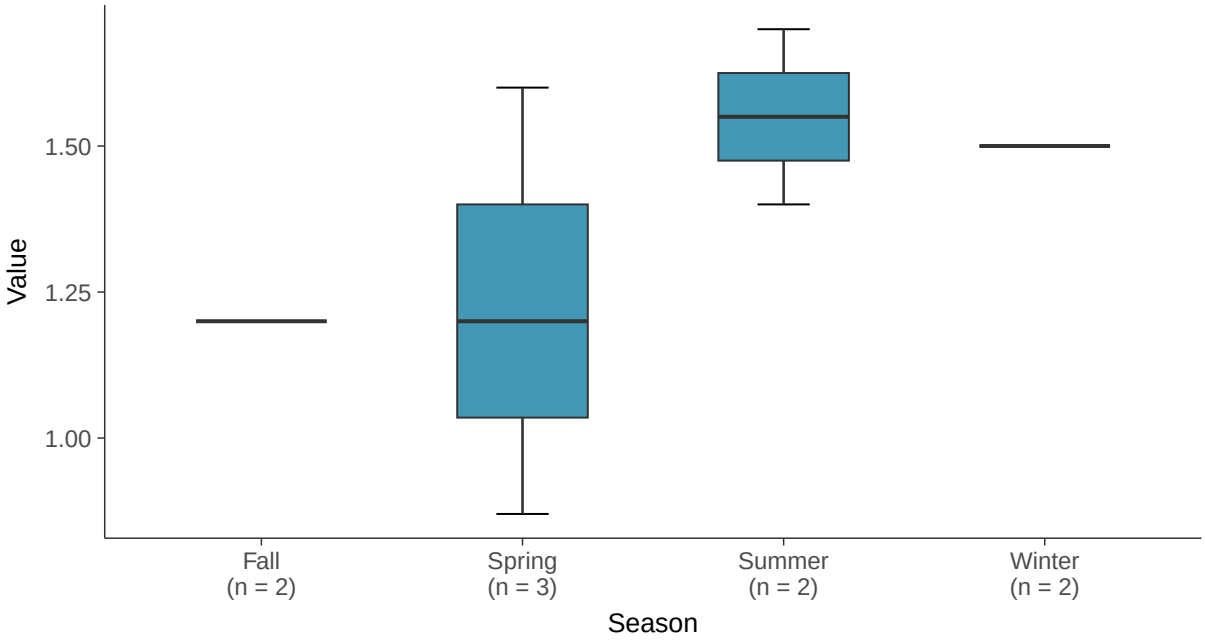
Boxplot

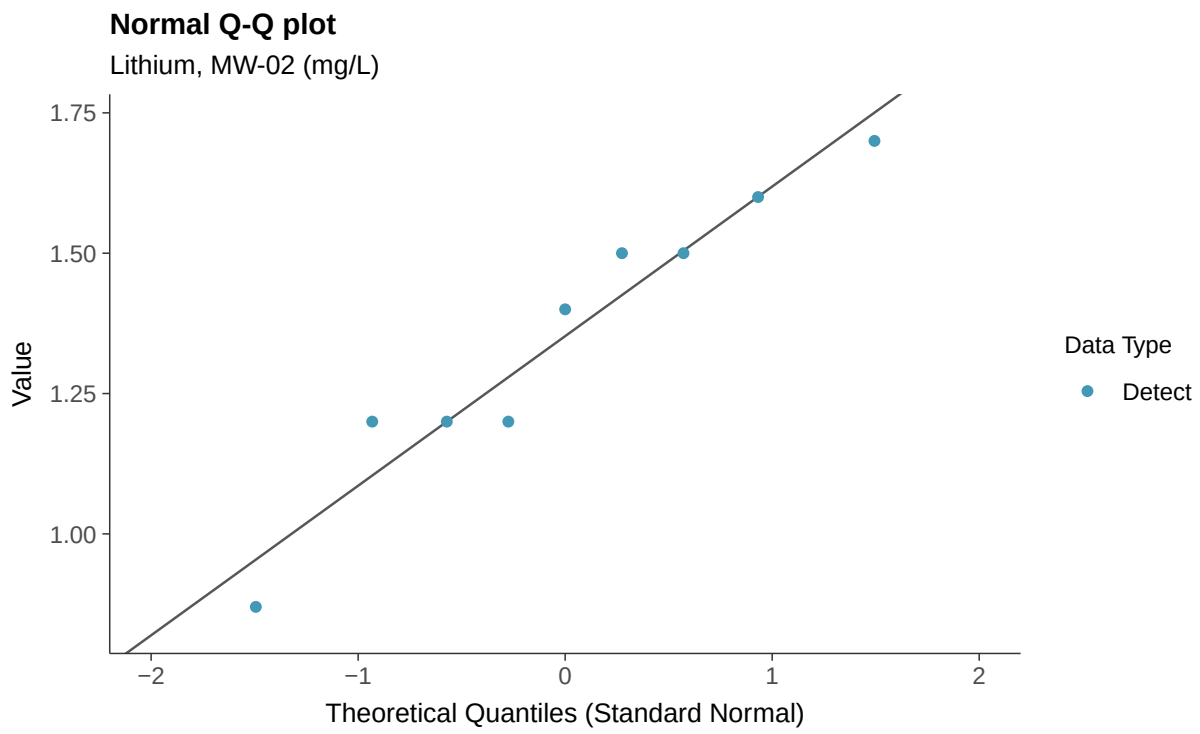
Lithium, MW-02 (mg/L)

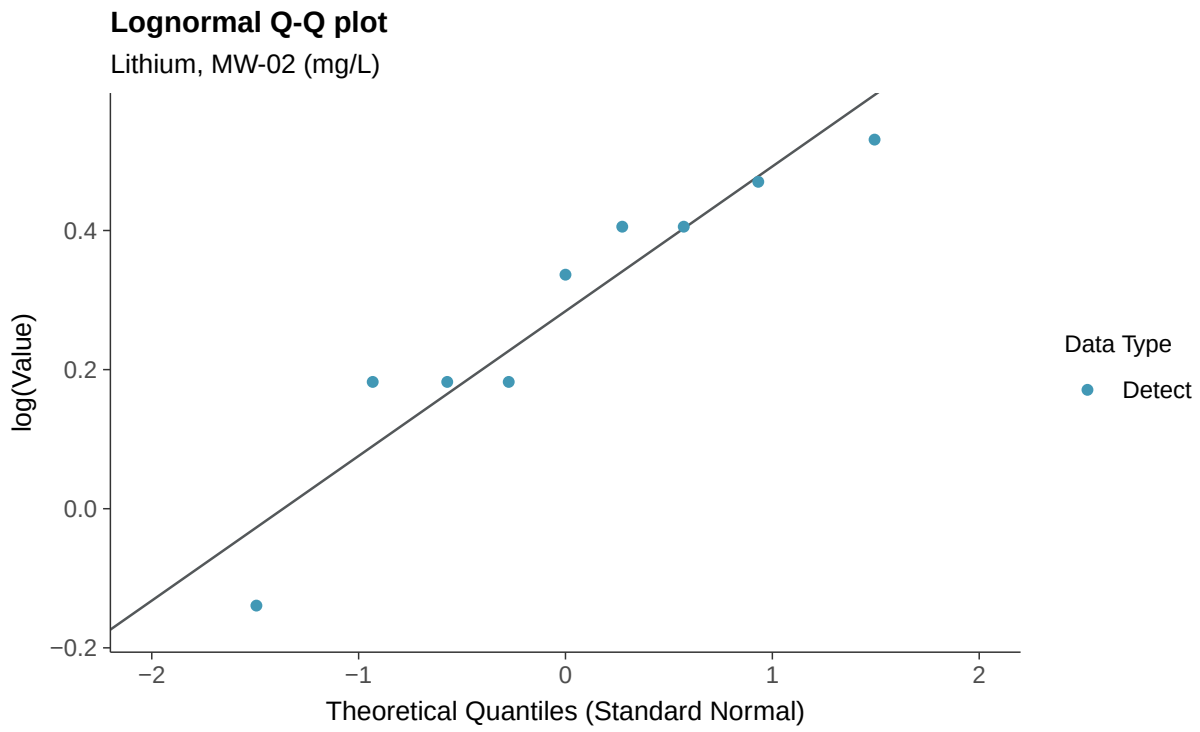


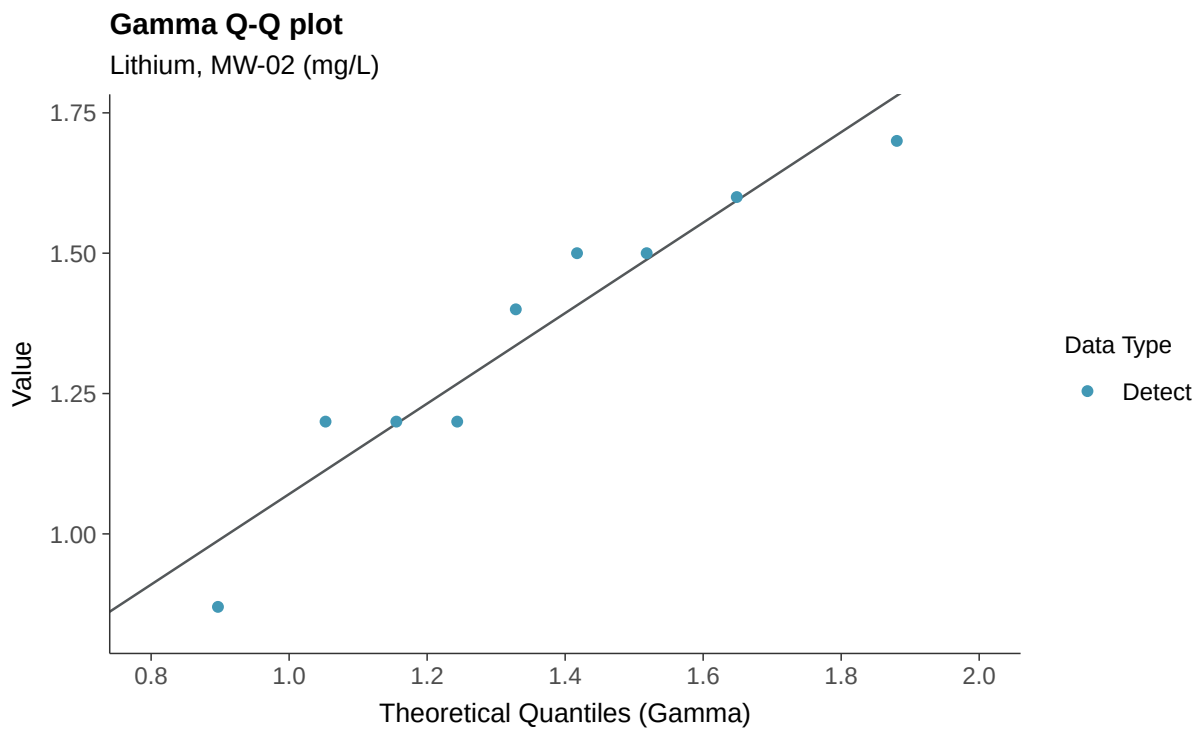
Boxplot by Season

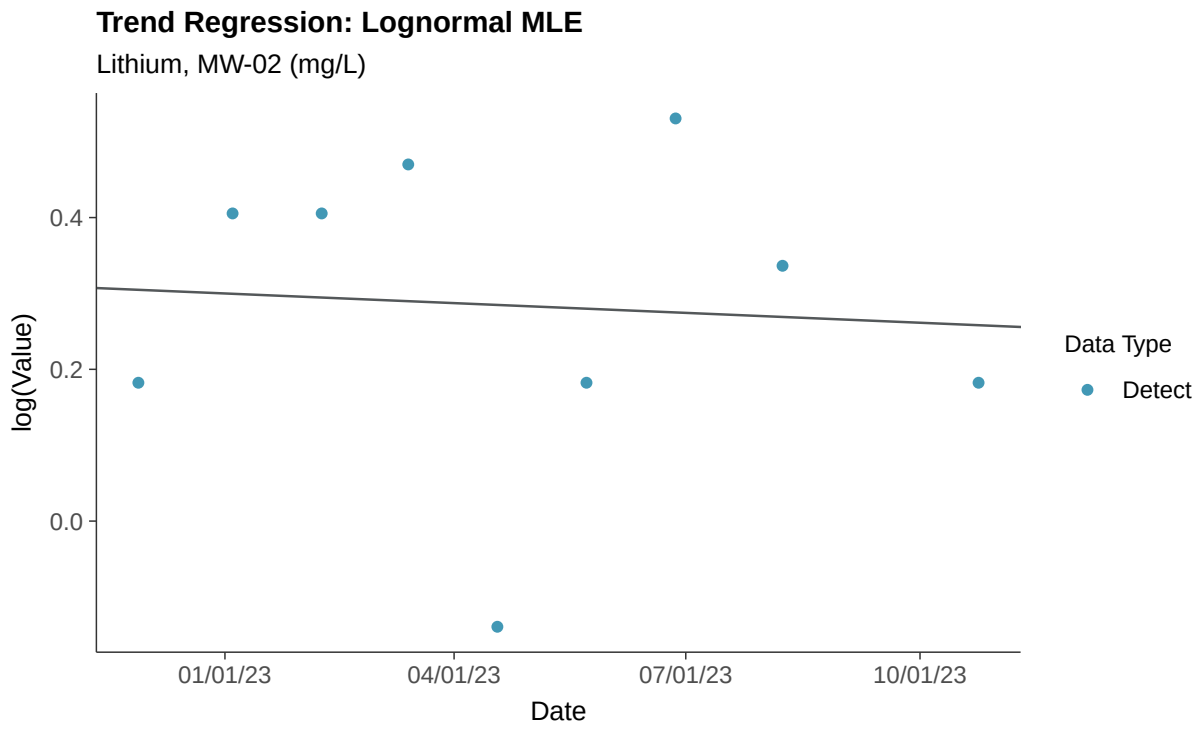
Lithium, MW-02 (mg/L)




Normal Q-Q plot
Lithium, MW-02 (mg/L)
Value
1.75
1.50
1.25
1.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

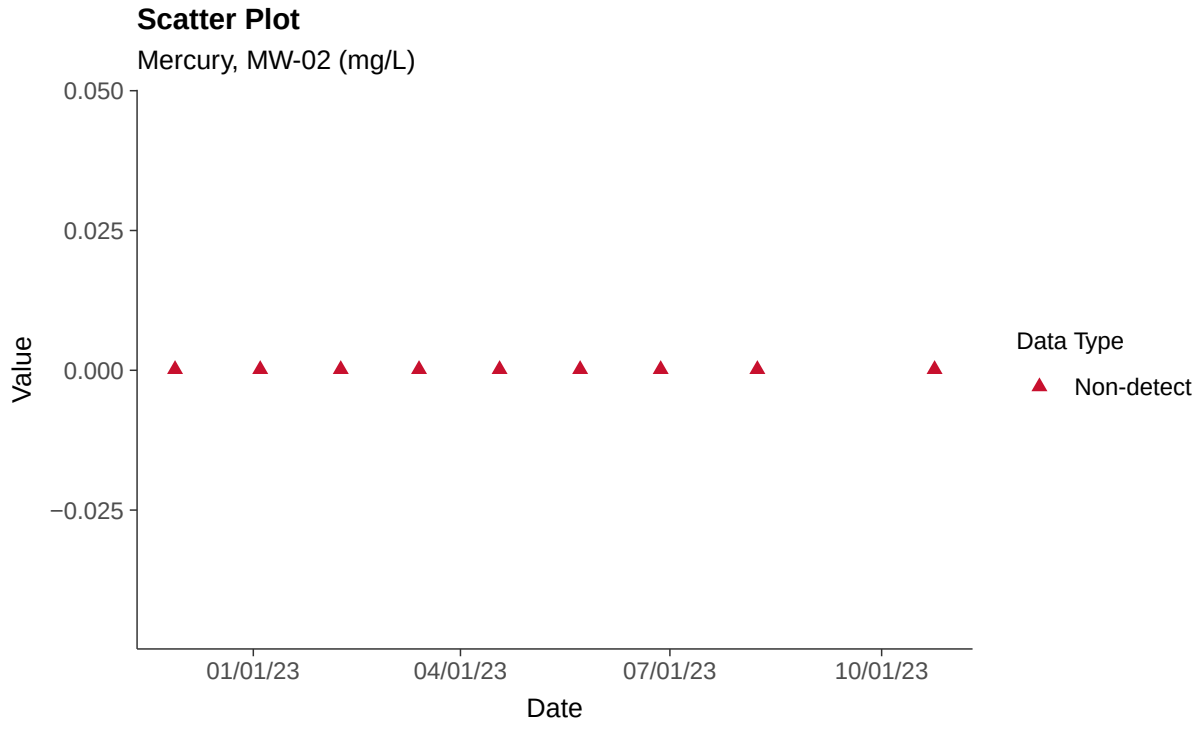

Lognormal Q-Q plot
Lithium, MW-02 (mg/L)
log(Value)
0.4
0.2
0.0
−0.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

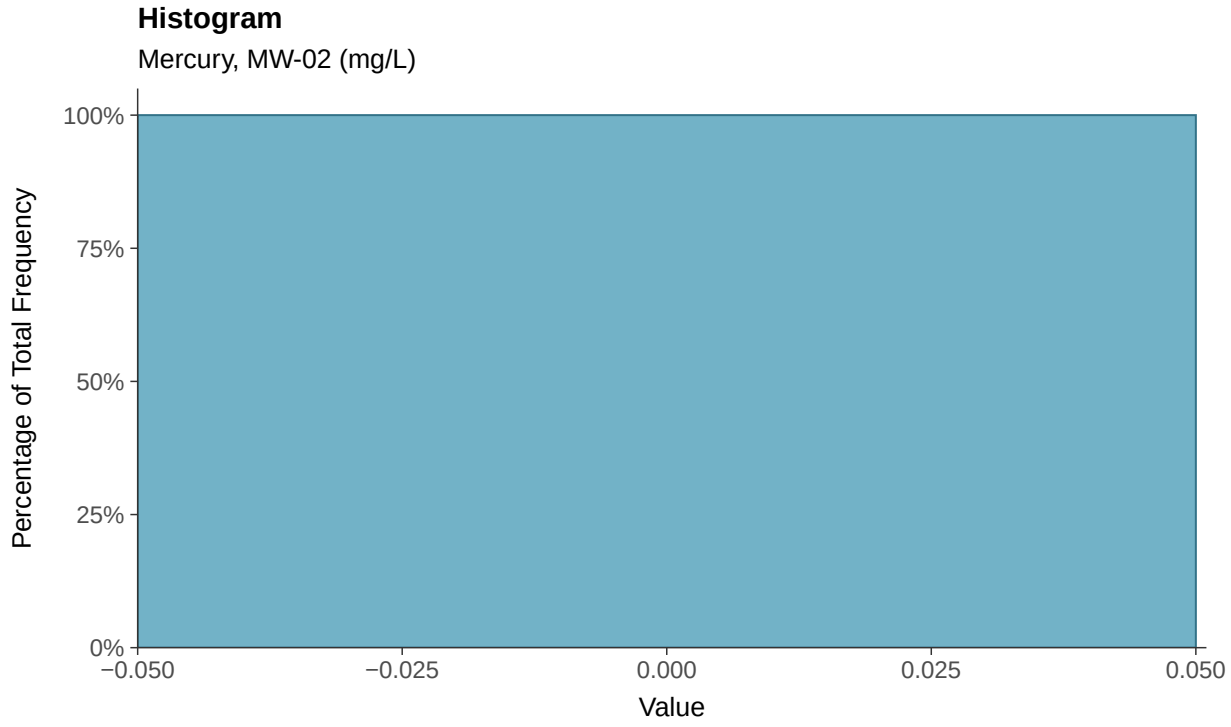

Gamma Q-Q plot
Lithium, MW-02 (mg/L)
Value
1.75
1.50
1.25
1.00
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Lithium, MW-02 (mg/L)
log(Value)
0.4
0.2
0.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-02

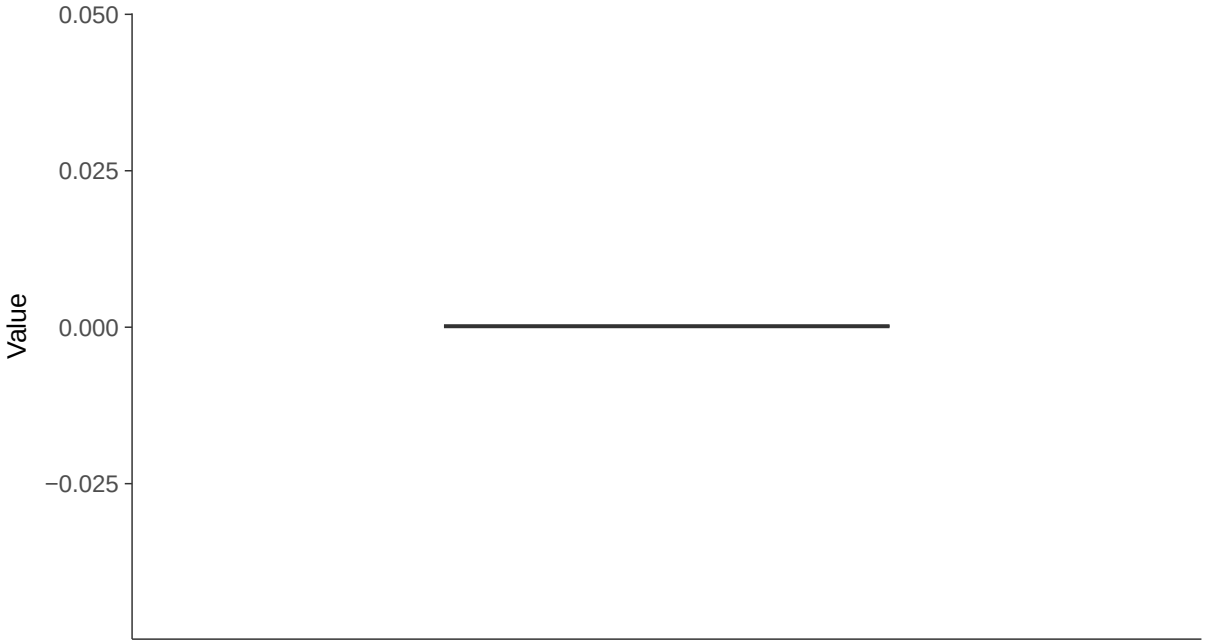
ID: 2_12_5_117





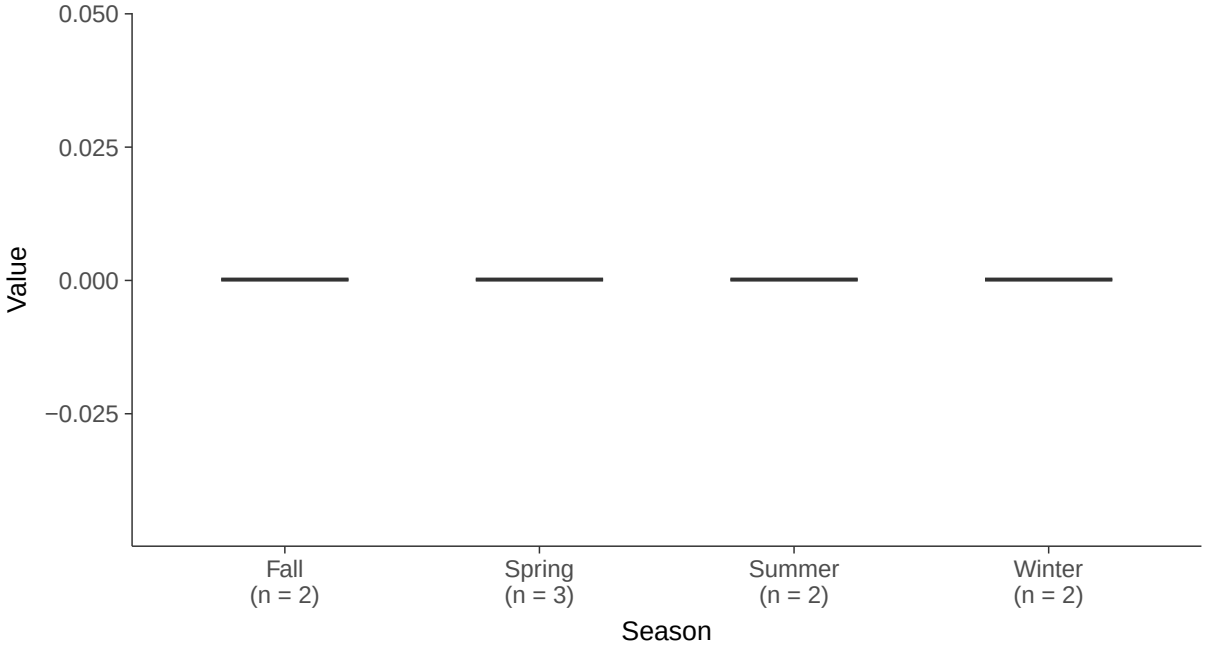
Boxplot

Mercury, MW-02 (mg/L)



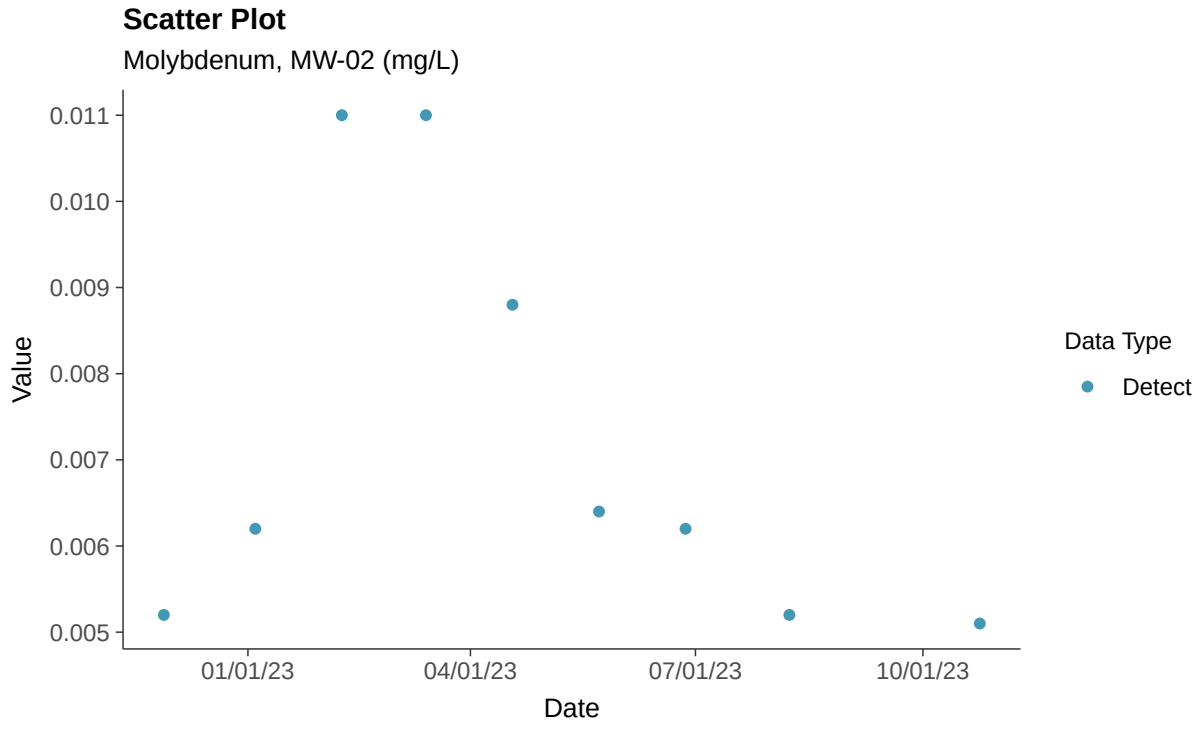
Boxplot by Season

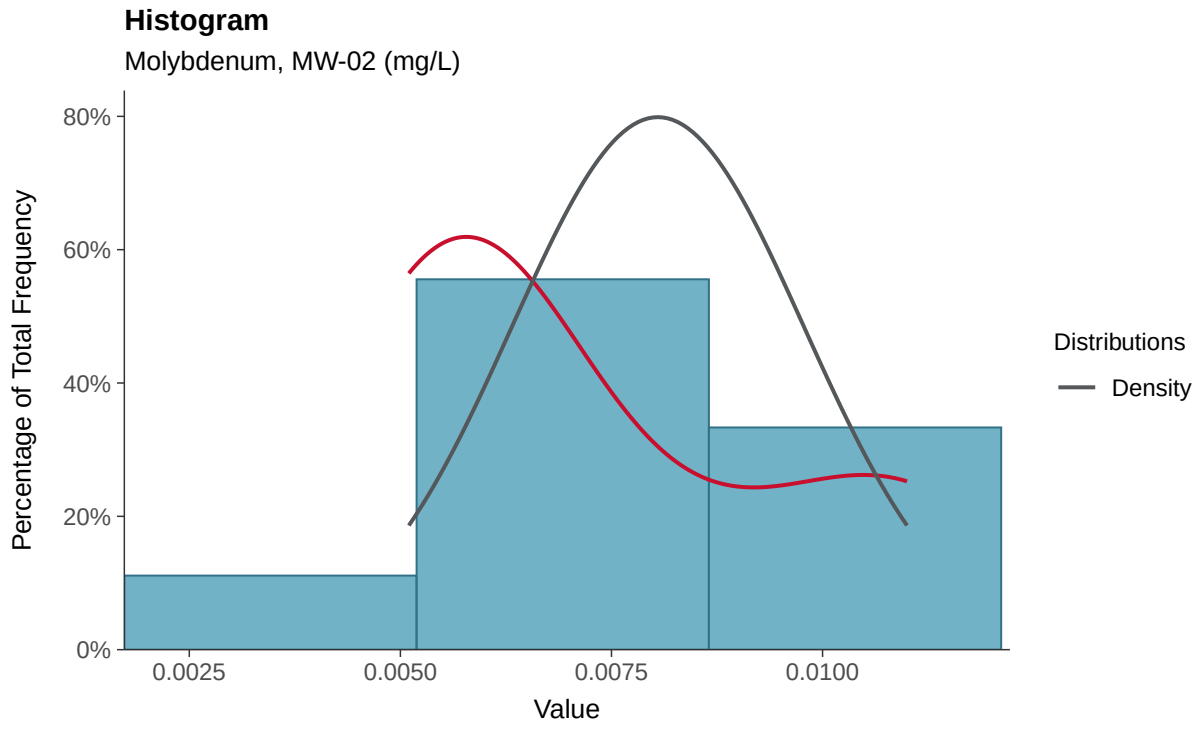
Mercury, MW-02 (mg/L)



Appendix IV: Molybdenum, MW-02

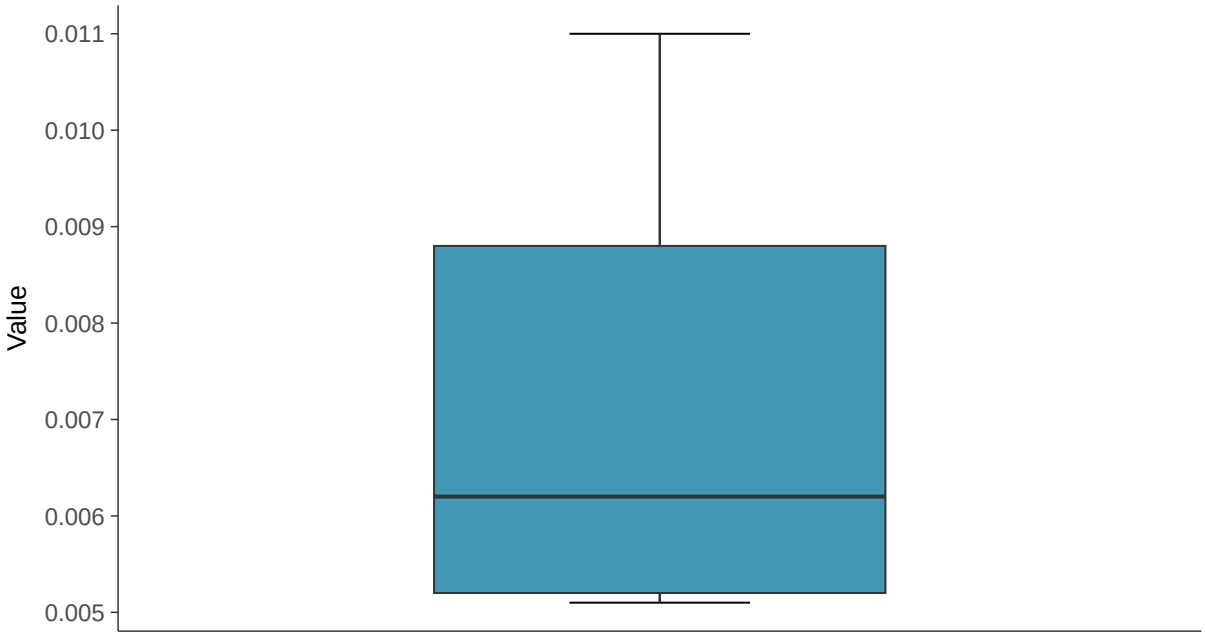
ID: 2_12_5_118





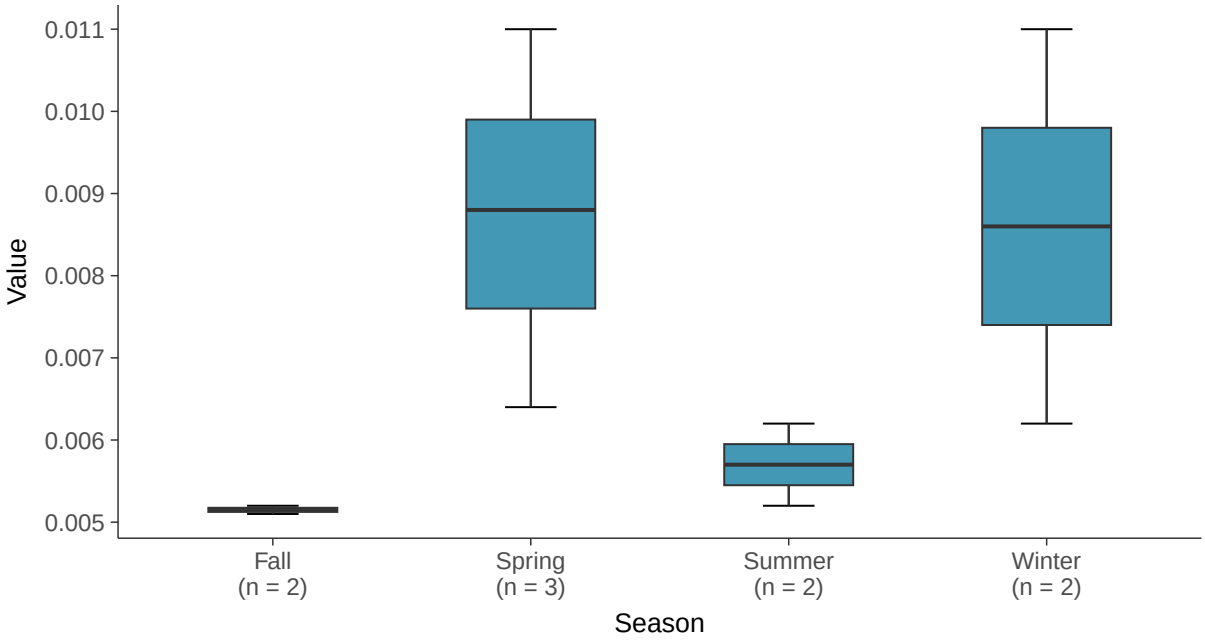
Boxplot

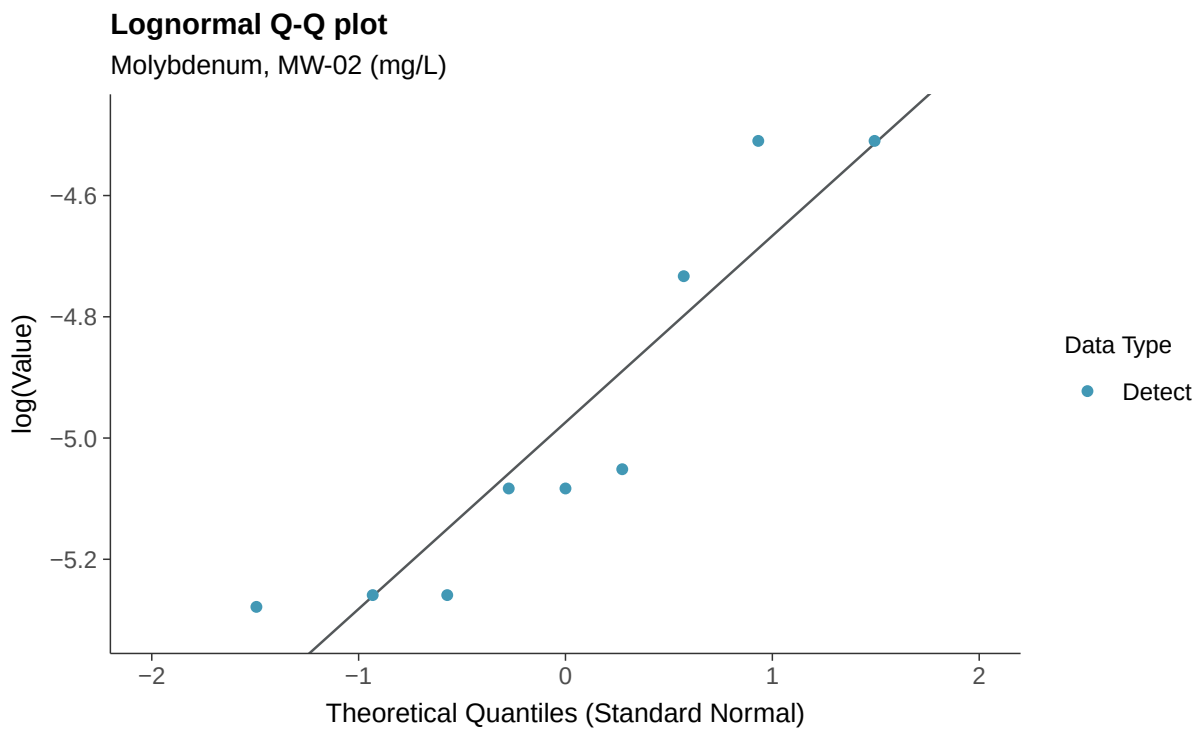
Molybdenum, MW-02 (mg/L)

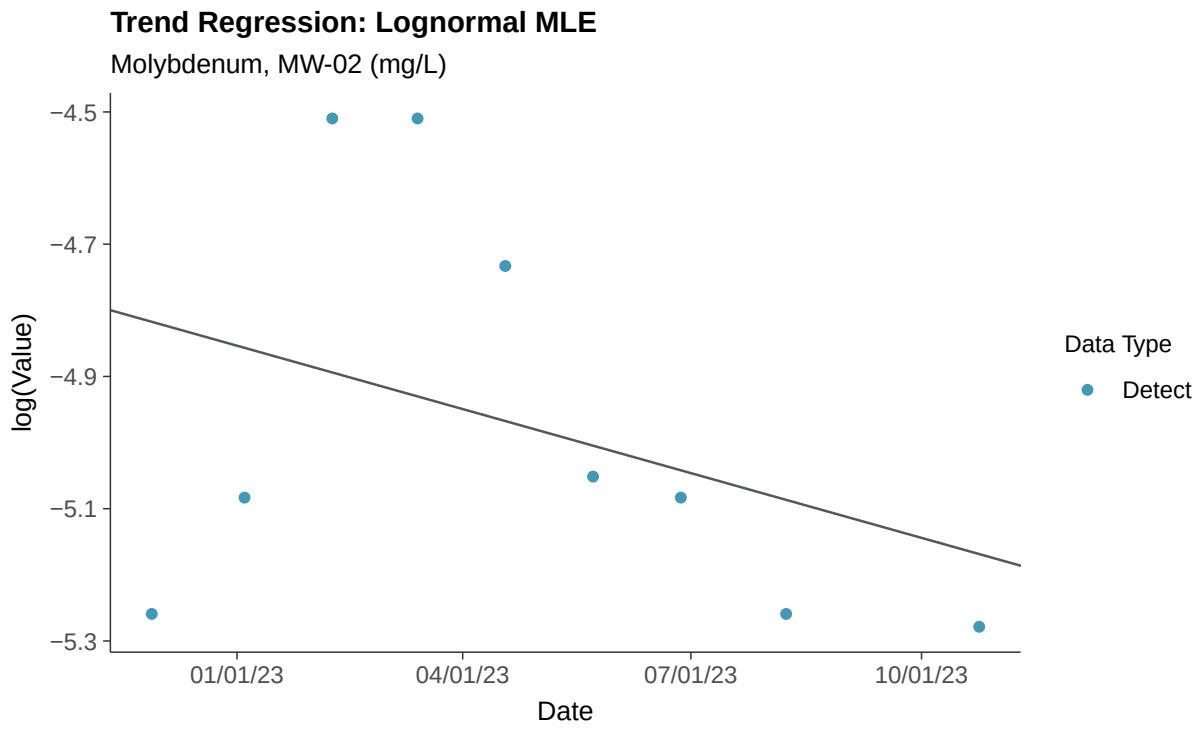


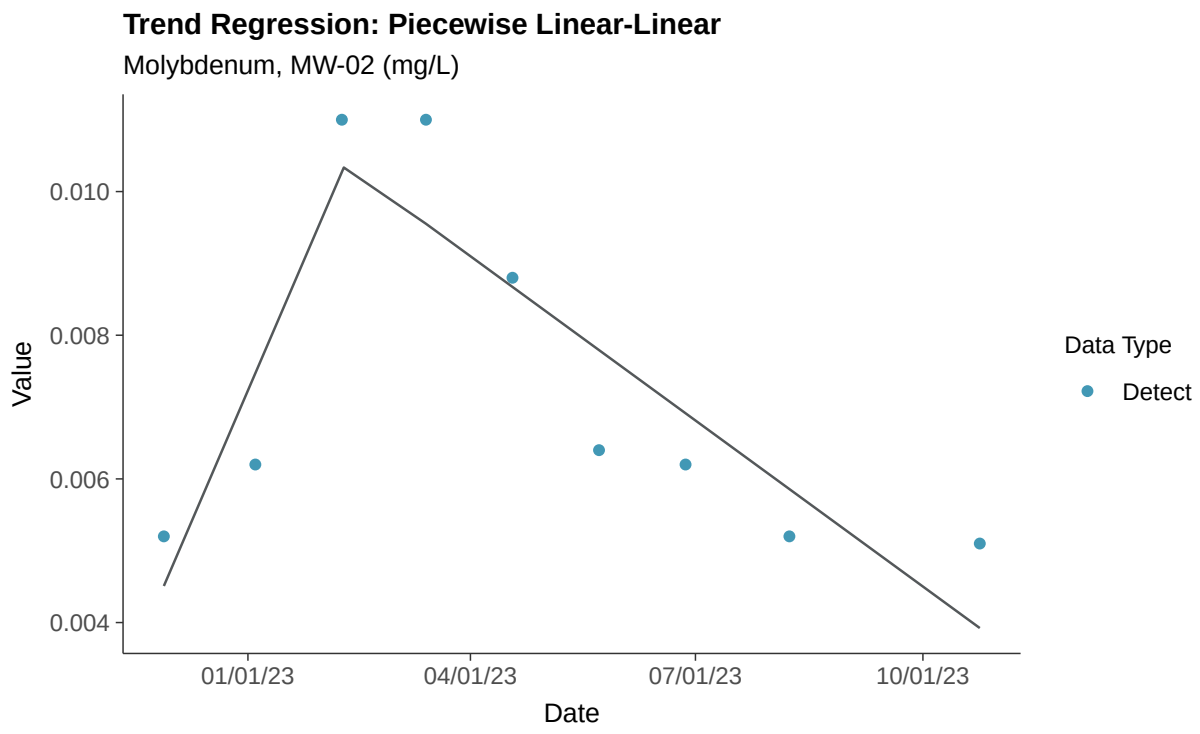
Boxplot by Season

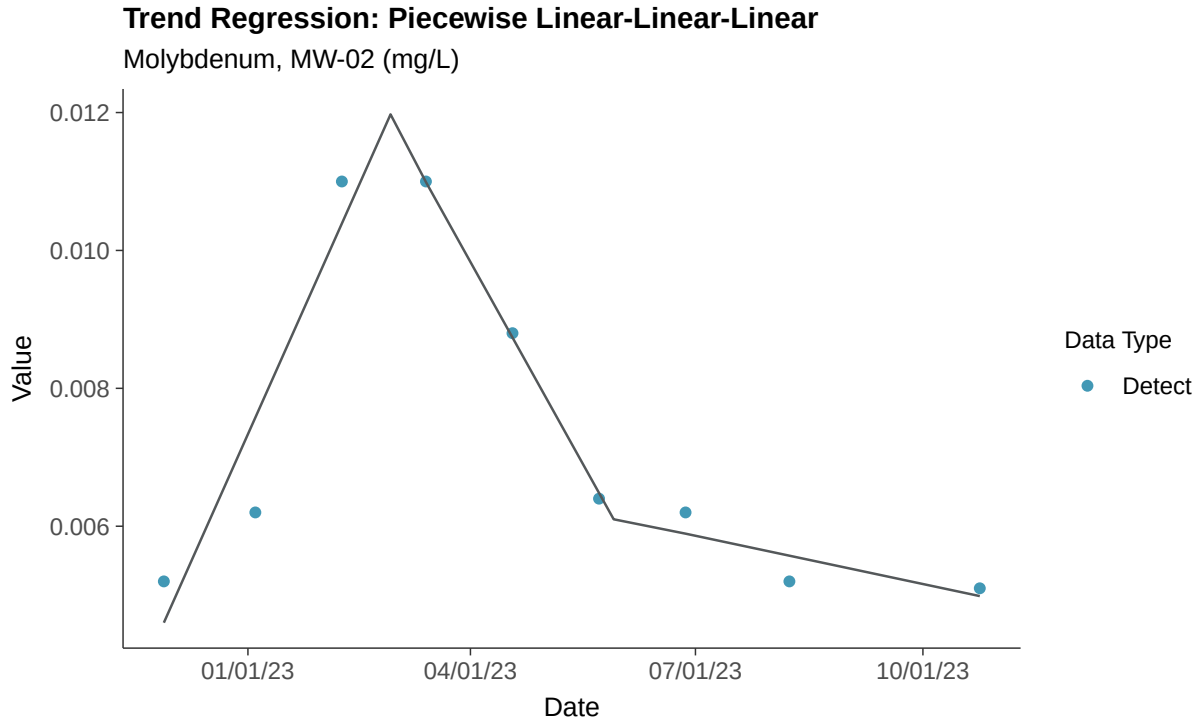
Molybdenum, MW-02 (mg/L)




Lognormal Q-Q plot
Molybdenum, MW-02 (mg/L)
log(Value)
−4.6
−4.8
−5.0
−5.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

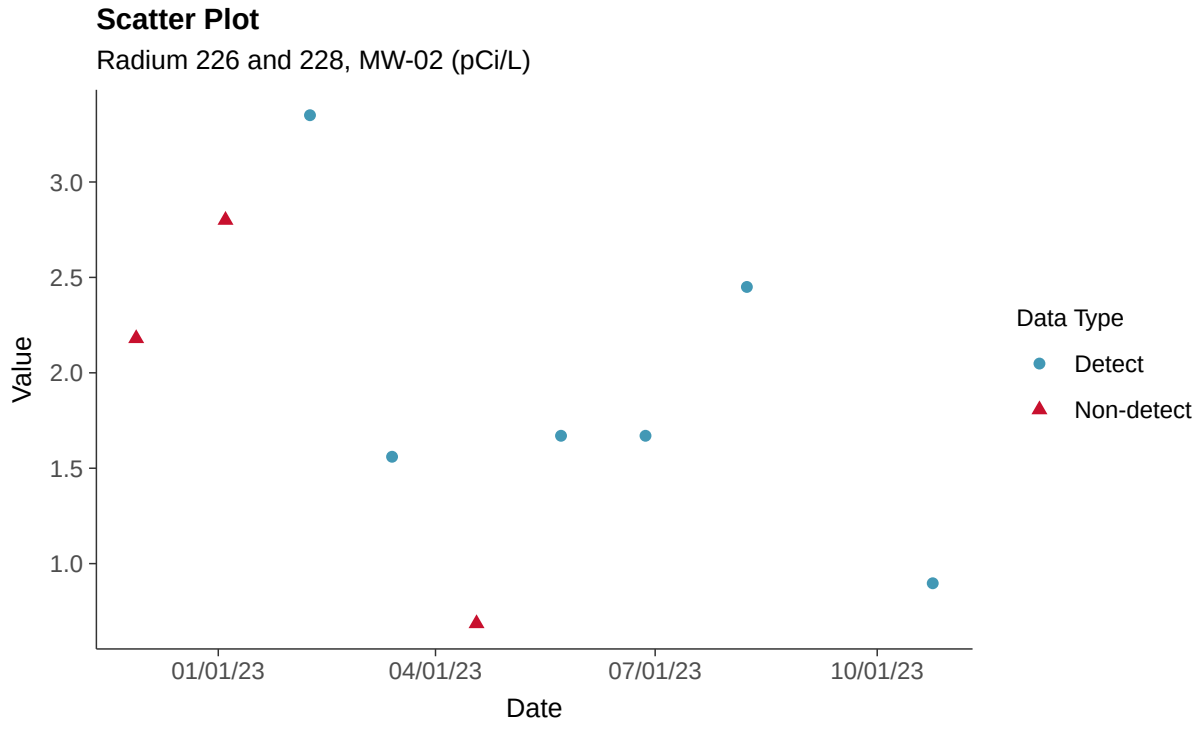

Trend Regression: Lognormal MLE
Molybdenum, MW-02 (mg/L)
log(Value)
−4.5
−4.7
−4.9
−5.1
−5.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

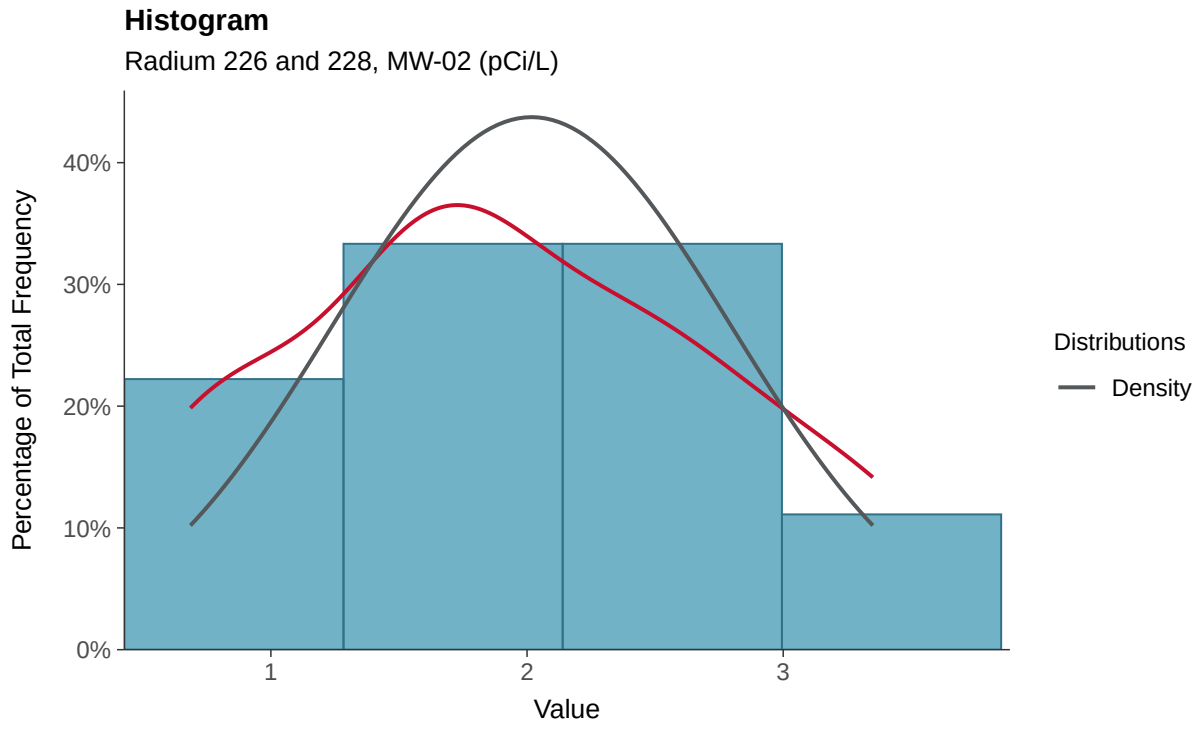

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-02 (mg/L)
Value
0.010
0.008
0.006
0.004
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-02 (mg/L)
Value
0.012
0.010
0.008
0.006
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Radium 226 and 228, MW-02

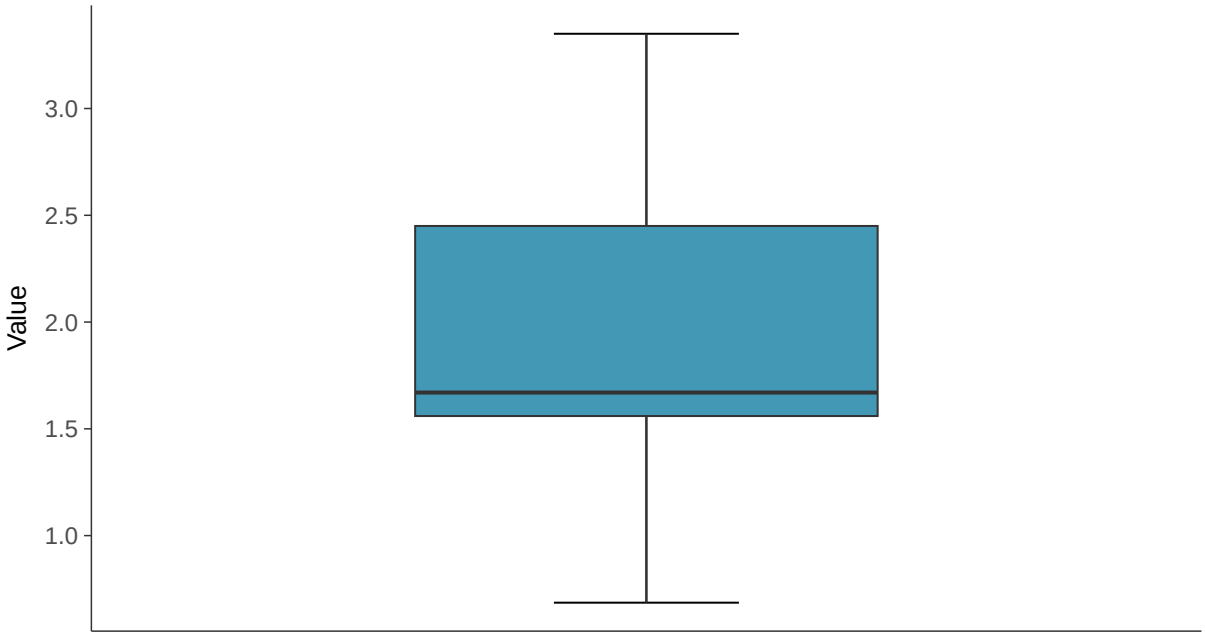
ID: 2_12_5_121





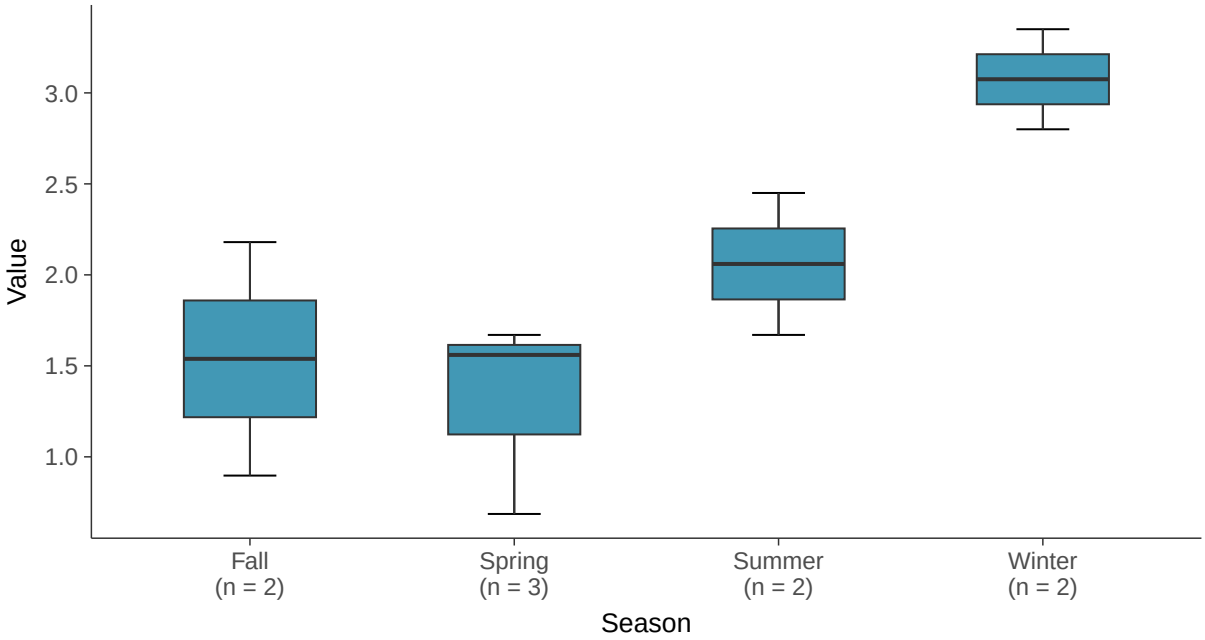
Boxplot

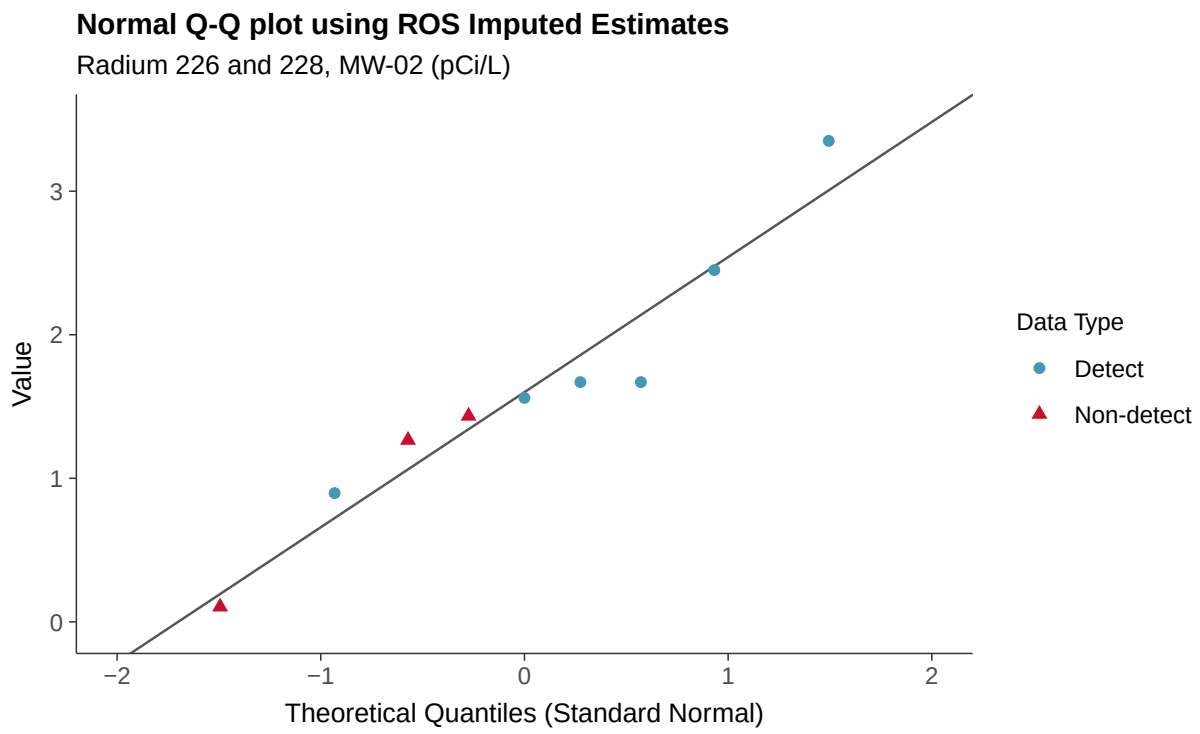
Radium 226 and 228, MW-02 (pCi/L)

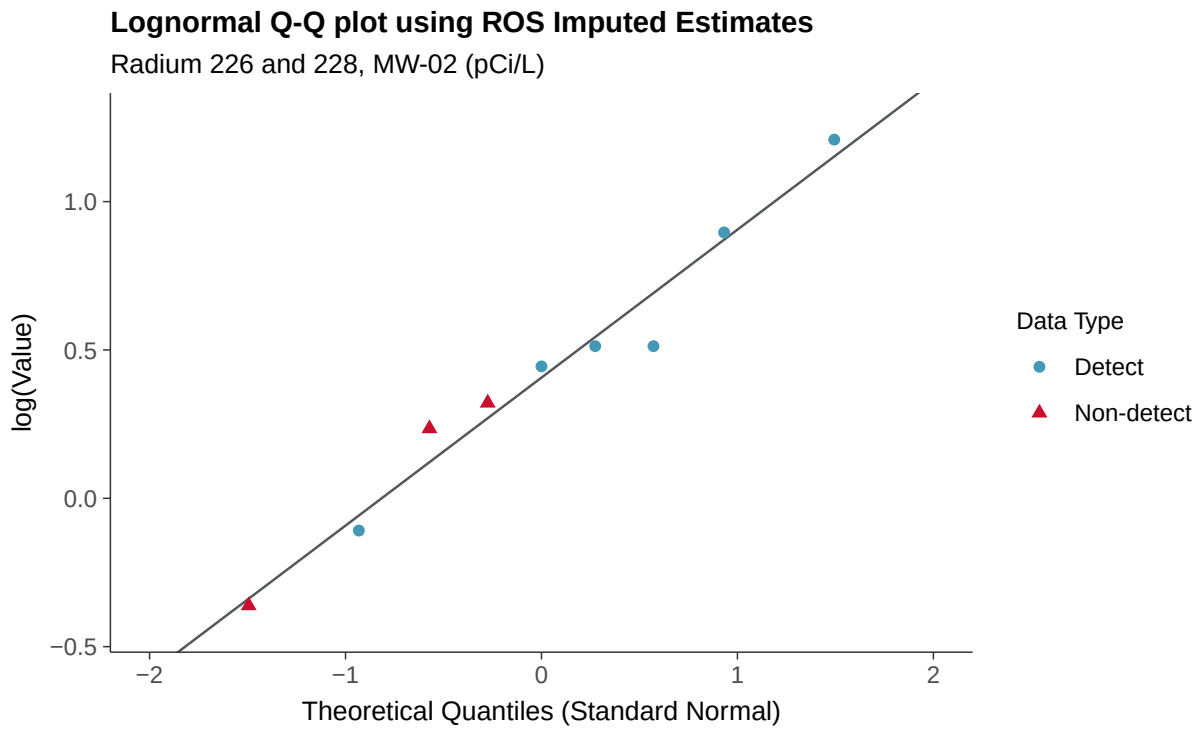


Boxplot by Season

Radium 226 and 228, MW-02 (pCi/L)

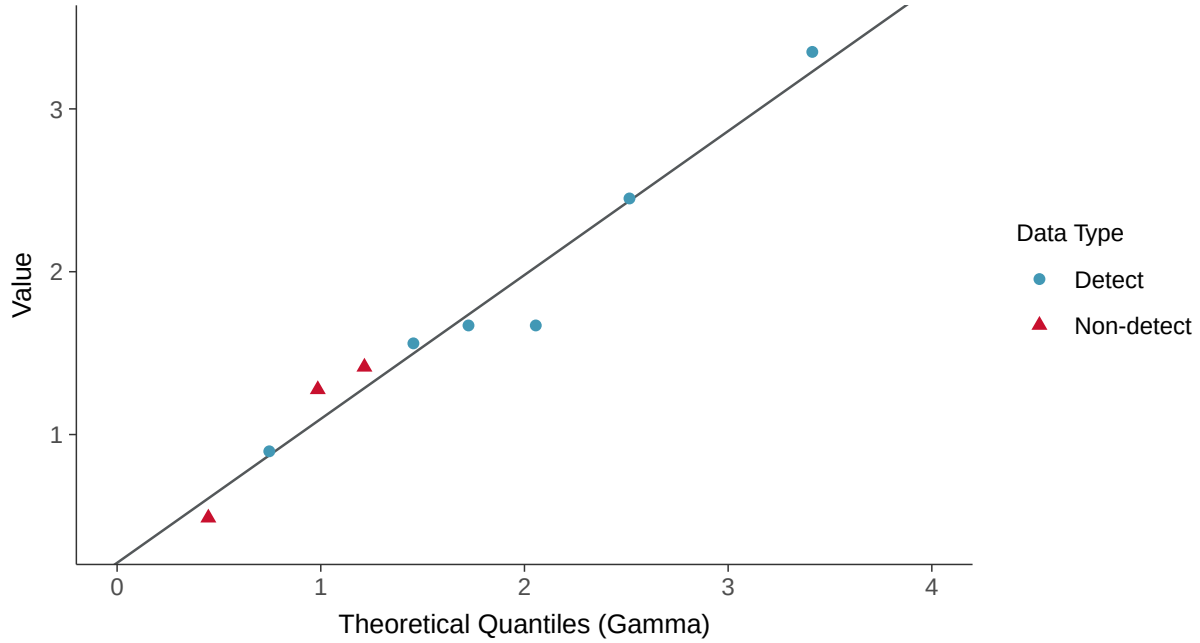



Normal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-02 (pCi/L)
Value
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-02 (pCi/L)
log(Value)
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

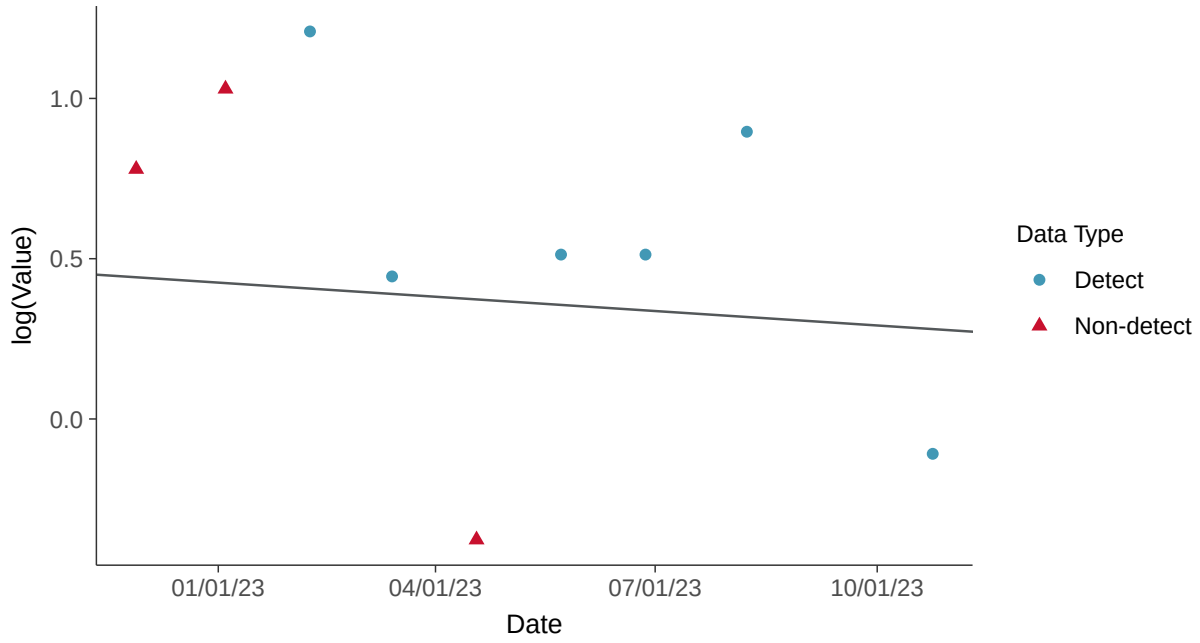
Gamma Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-02 (pCi/L)



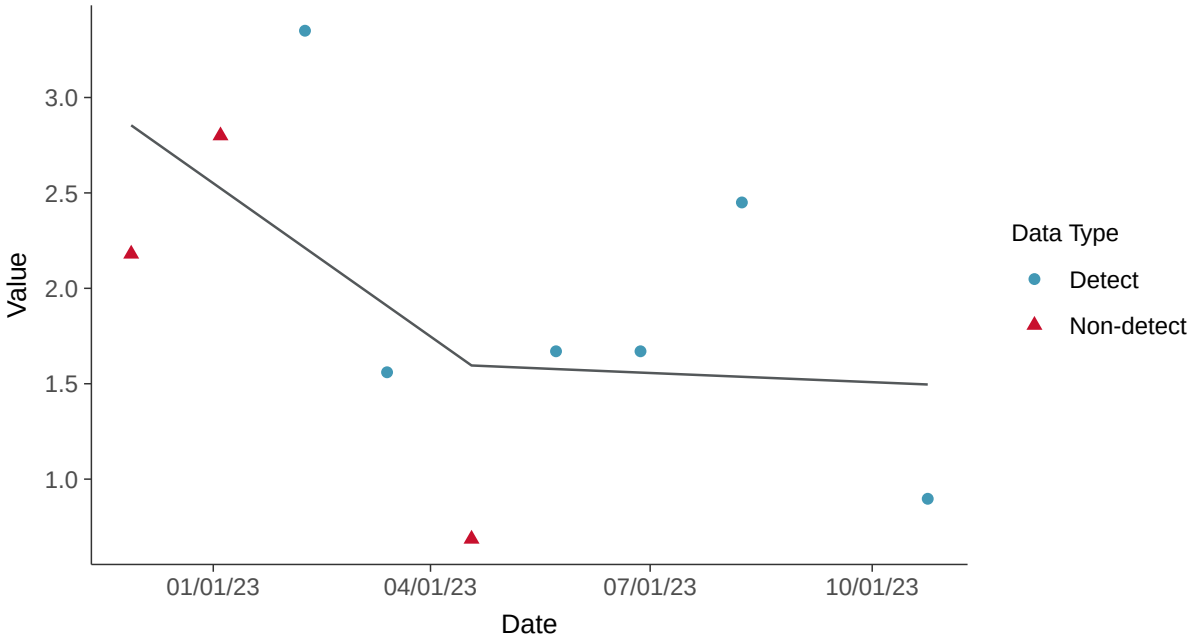
Trend Regression: Lognormal MLE

Radium 226 and 228, MW-02 (pCi/L)



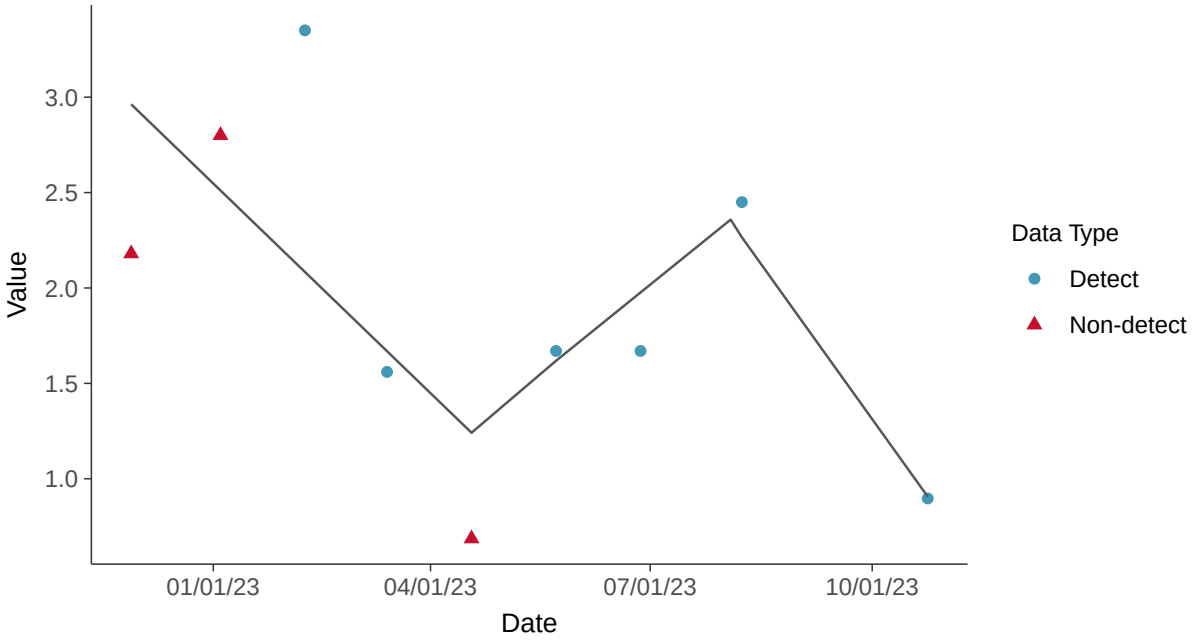
Trend Regression: Piecewise Linear-Linear

Radium 226 and 228, MW-02 (pCi/L)



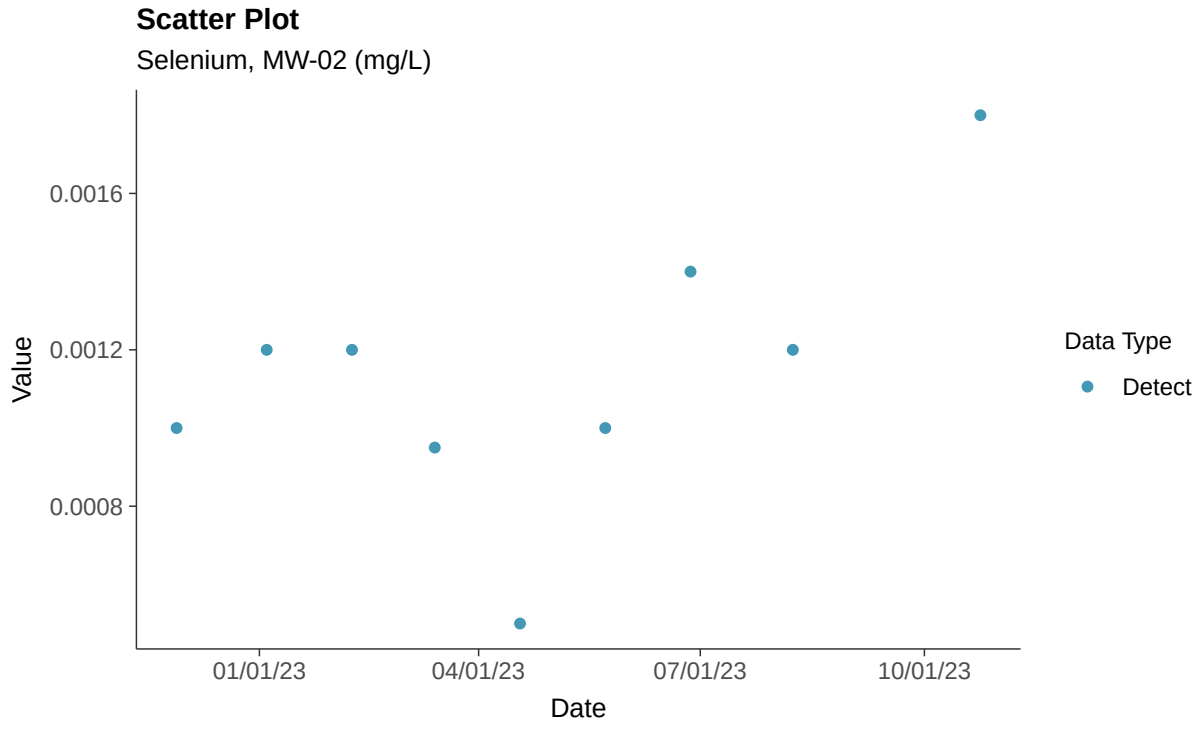
Trend Regression: Piecewise Linear-Linear-Linear

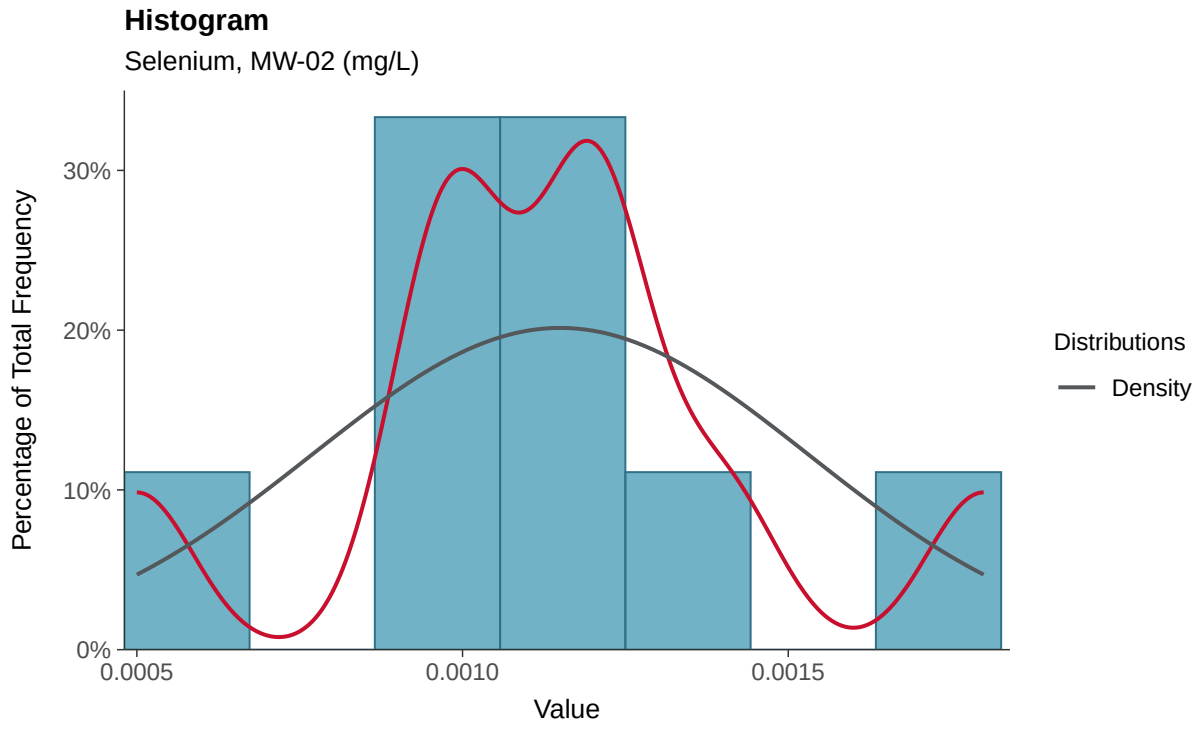
Radium 226 and 228, MW-02 (pCi/L)



Appendix IV: Selenium, MW-02

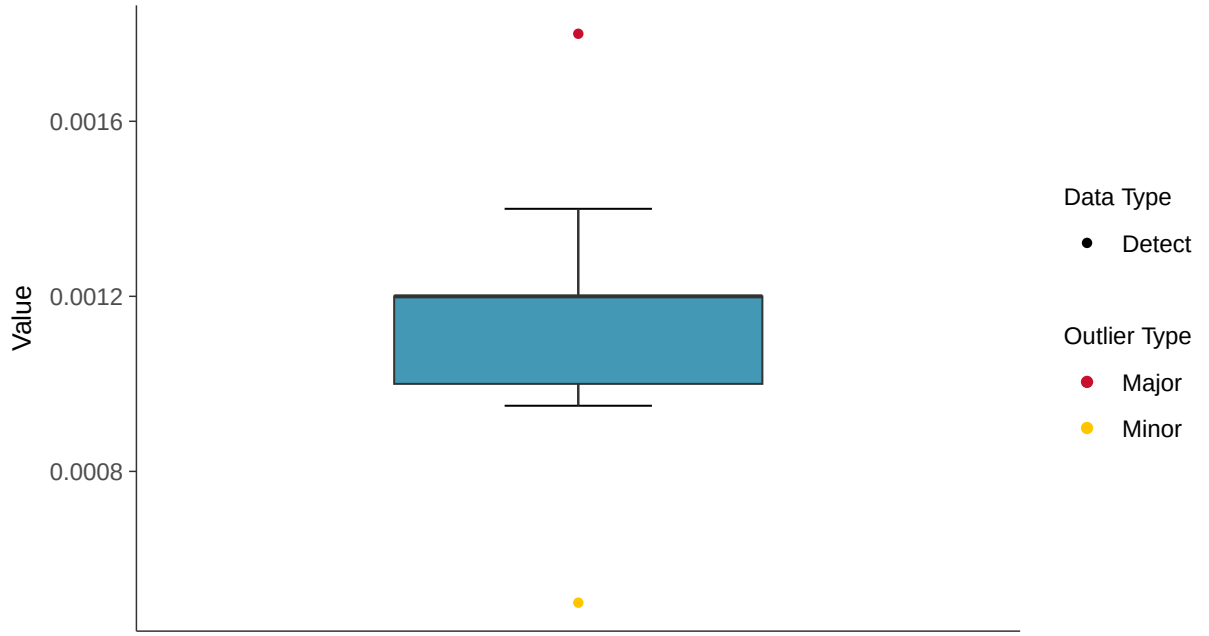
ID: 2_12_5_122





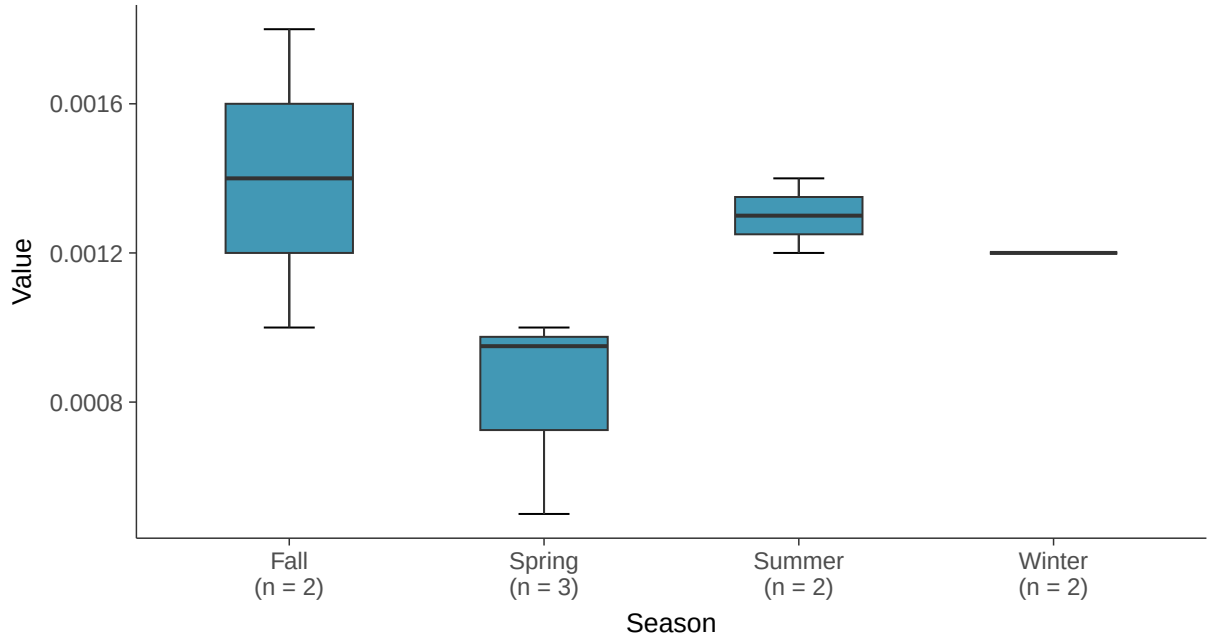
Boxplot

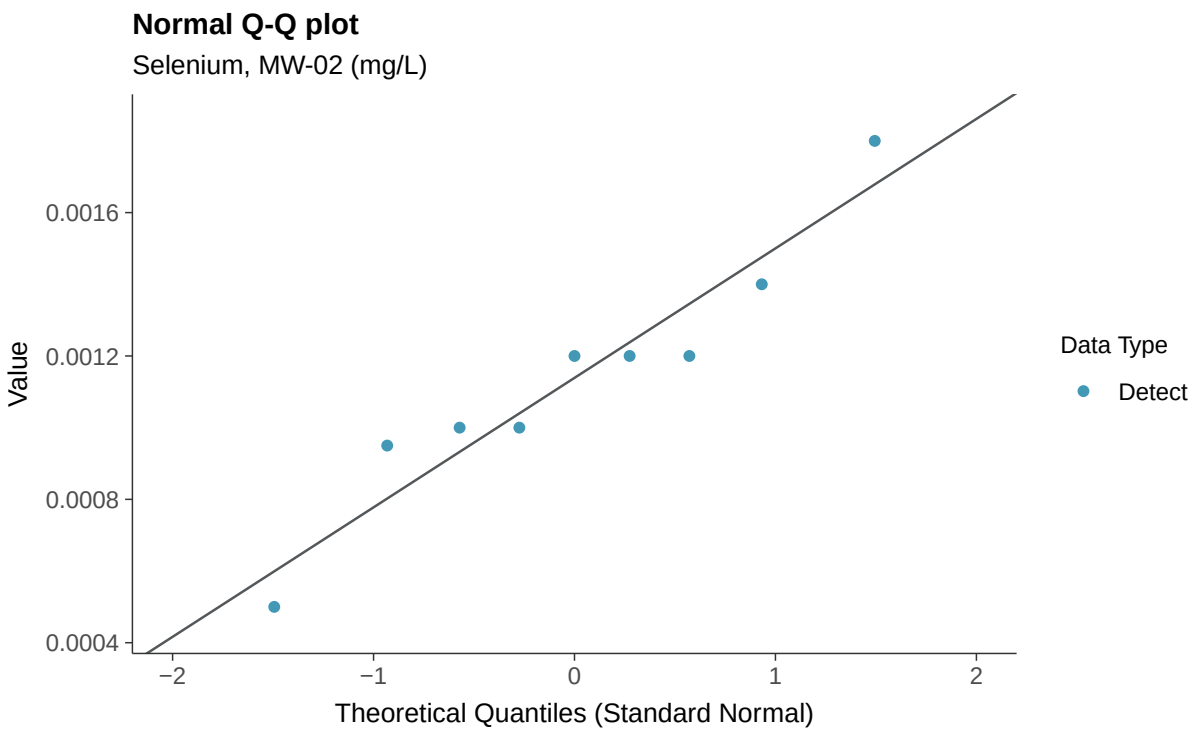
Selenium, MW-02 (mg/L)

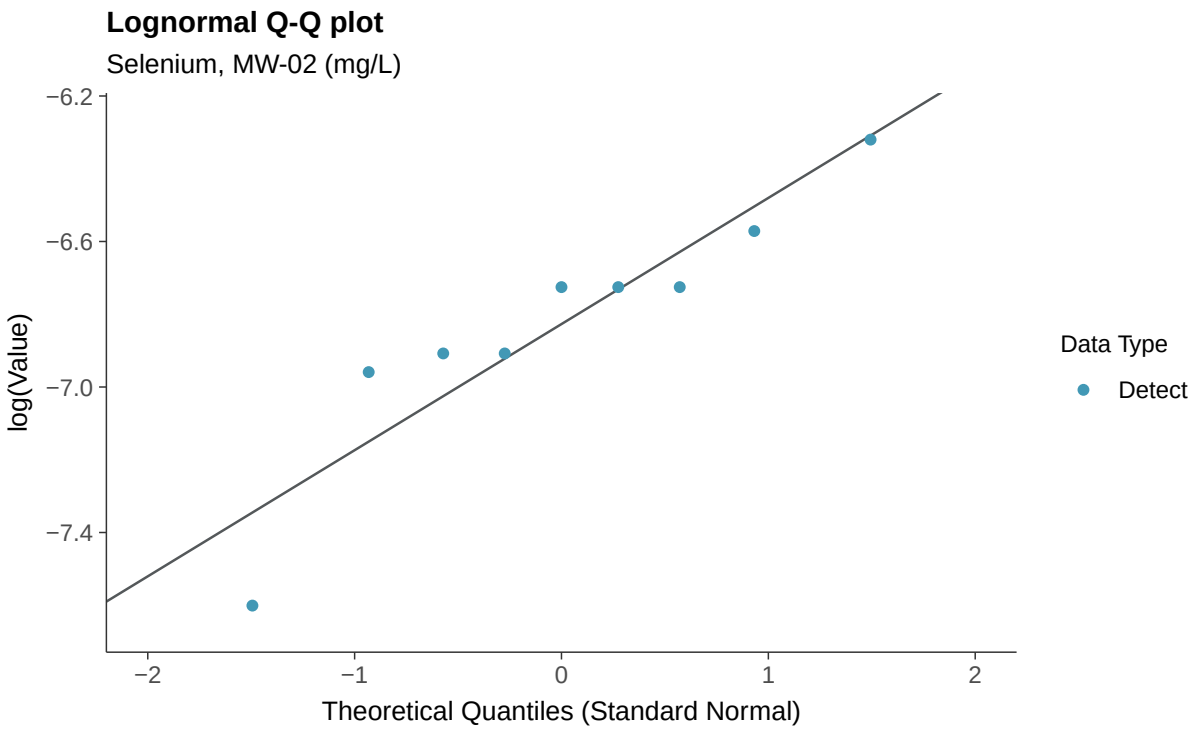


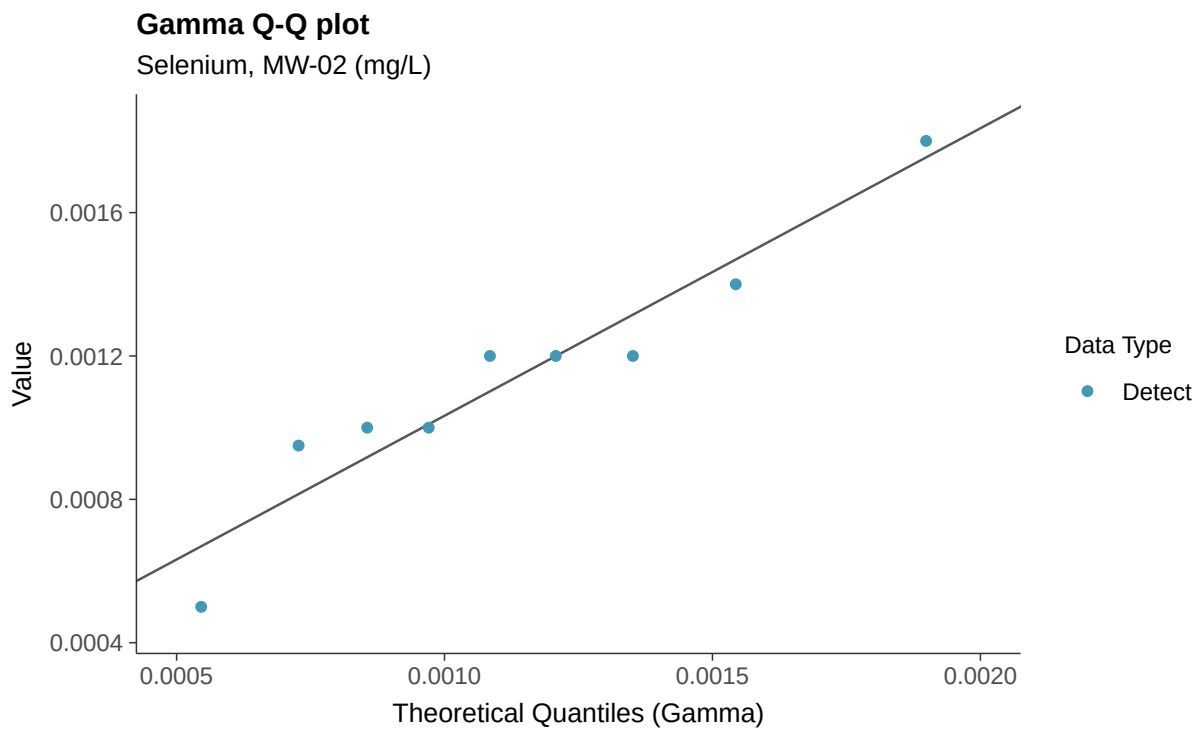
Boxplot by Season

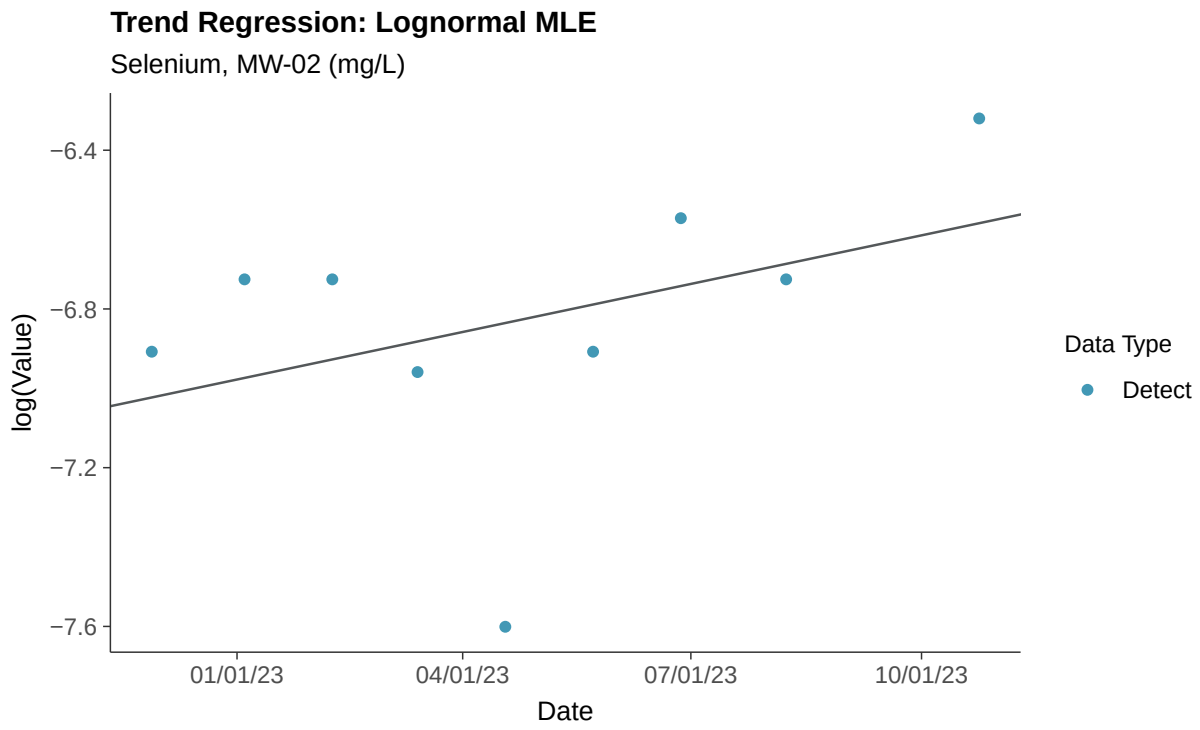
Selenium, MW-02 (mg/L)

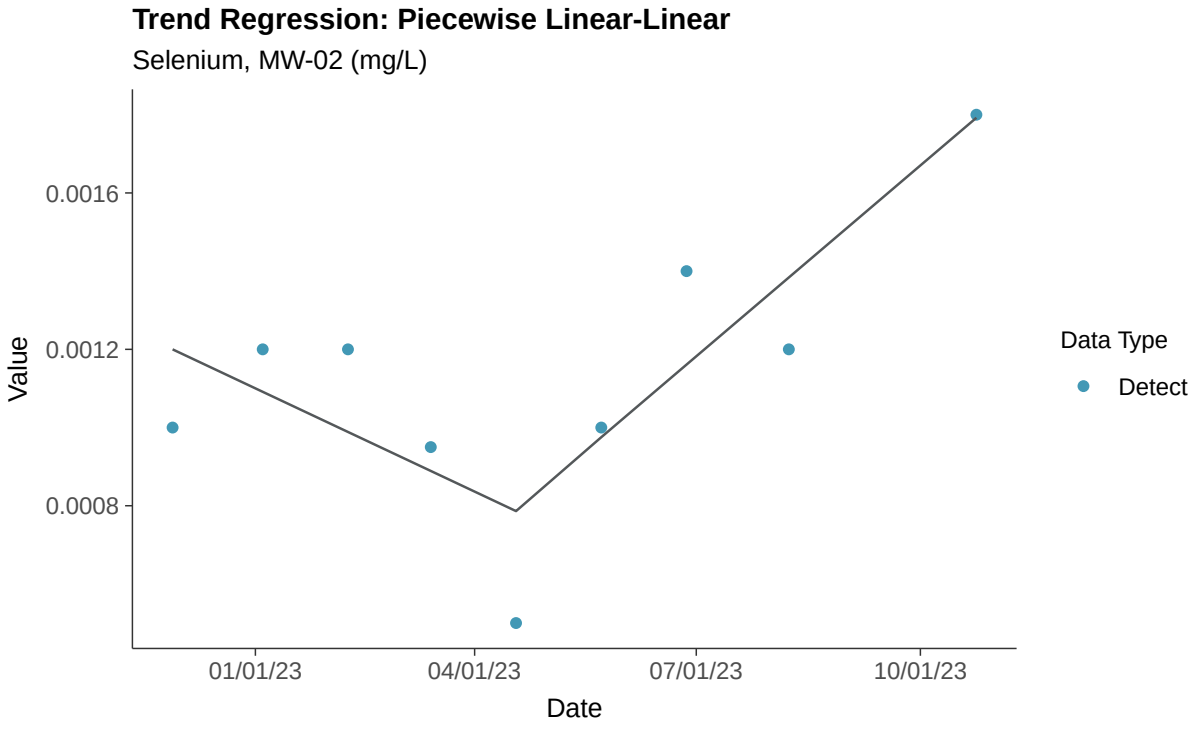



Normal Q-Q plot
Selenium, MW-02 (mg/L)
Value
0.0016
0.0012
0.0008
0.0004
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Selenium, MW-02 (mg/L)
log(Value)
−6.2
−6.6
−7.0
−7.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

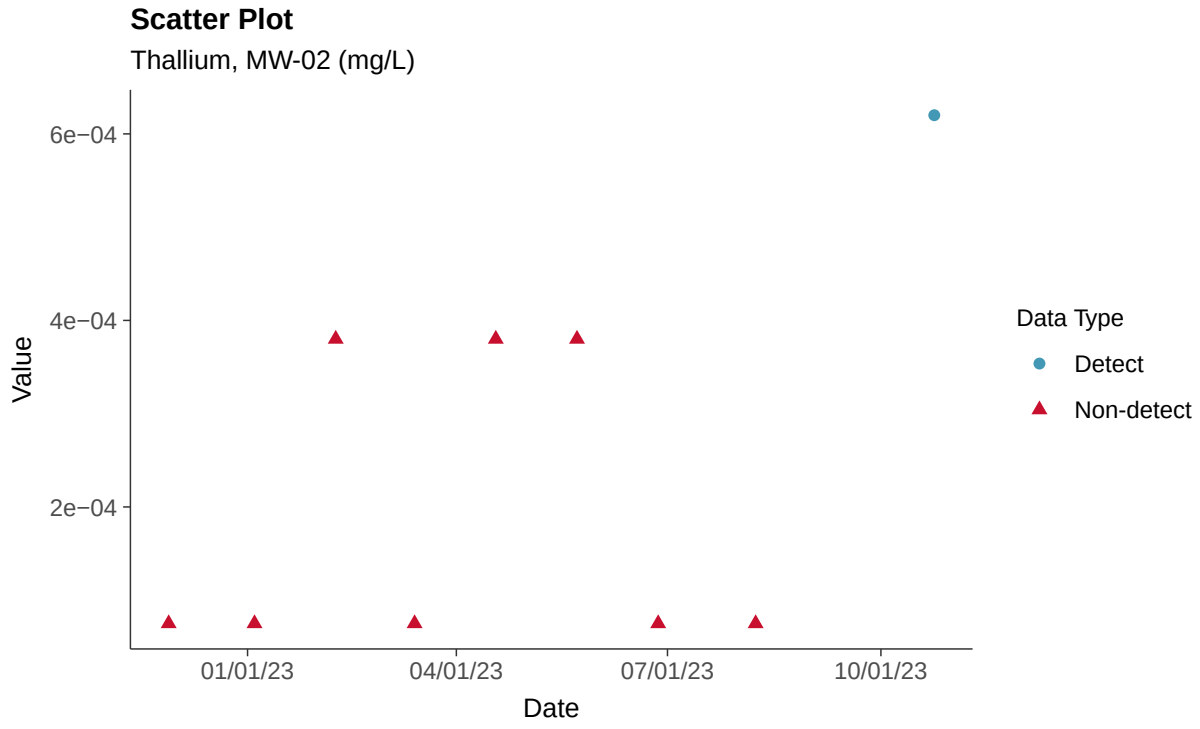

Gamma Q-Q plot
Selenium, MW-02 (mg/L)
Value
0.0016
0.0012
0.0008
0.0004
0.0005
0.0010
0.0015
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect

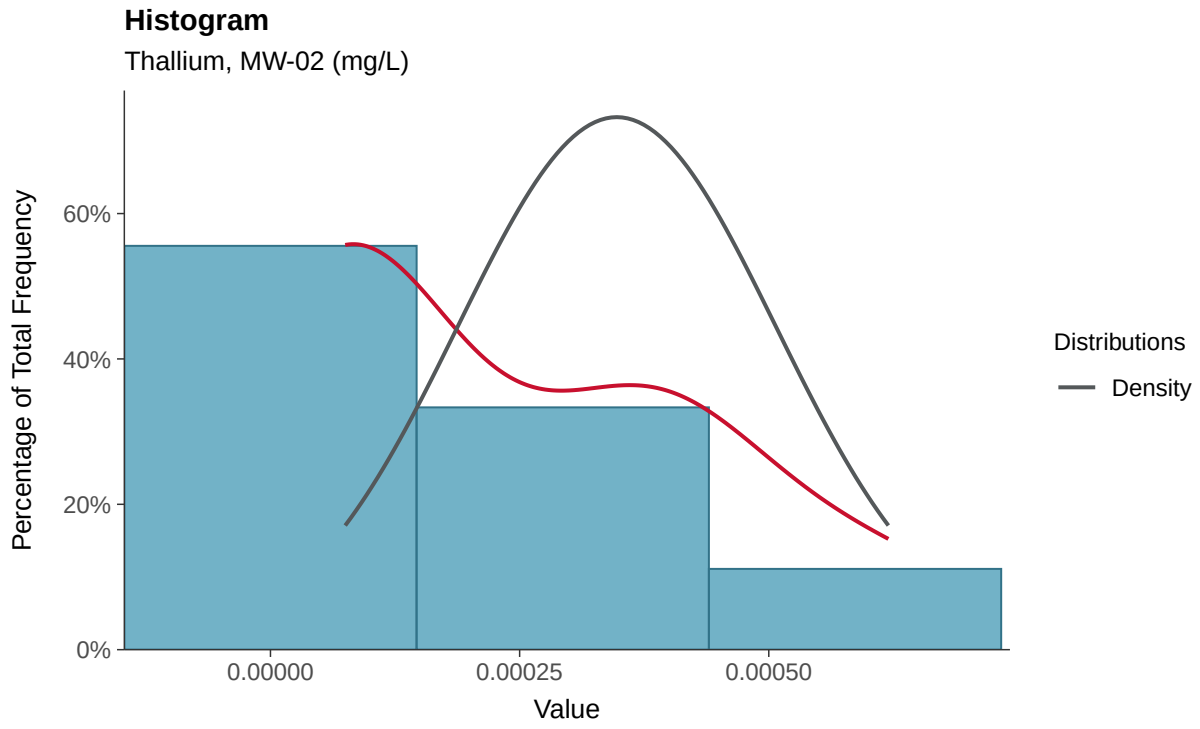

Trend Regression: Lognormal MLE
Selenium, MW-02 (mg/L)
log(Value)
−6.4
−6.8
−7.2
−7.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Selenium, MW-02 (mg/L)
0.0016
0.0012
0.0008
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Thallium, MW-02

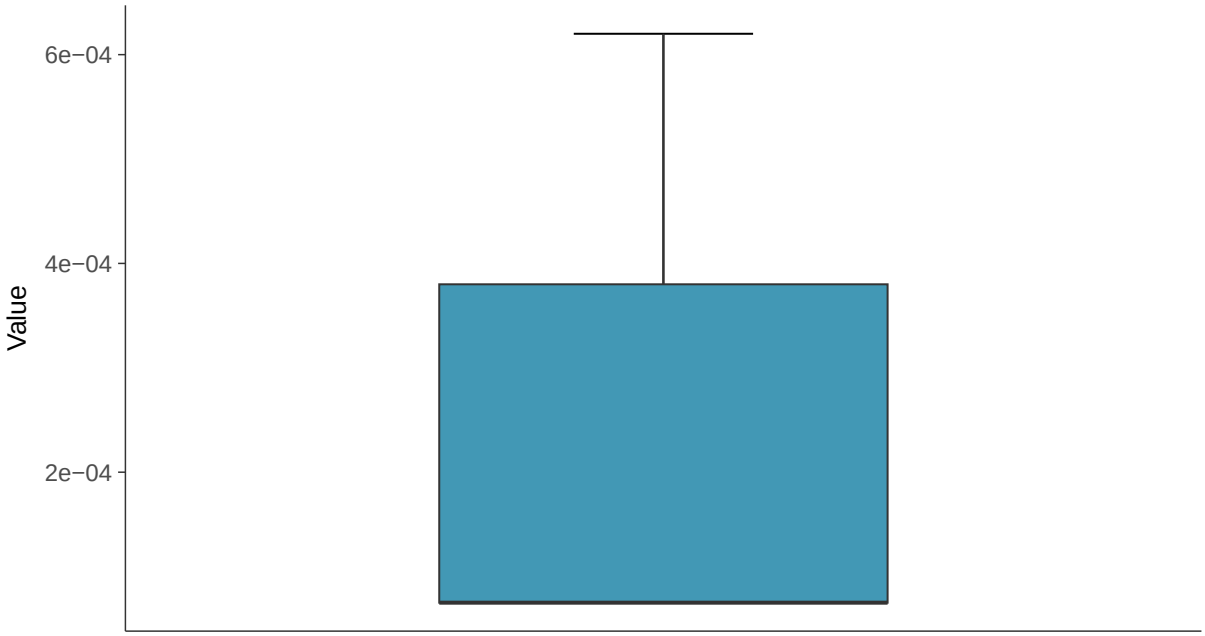
ID: 2_12_5_125





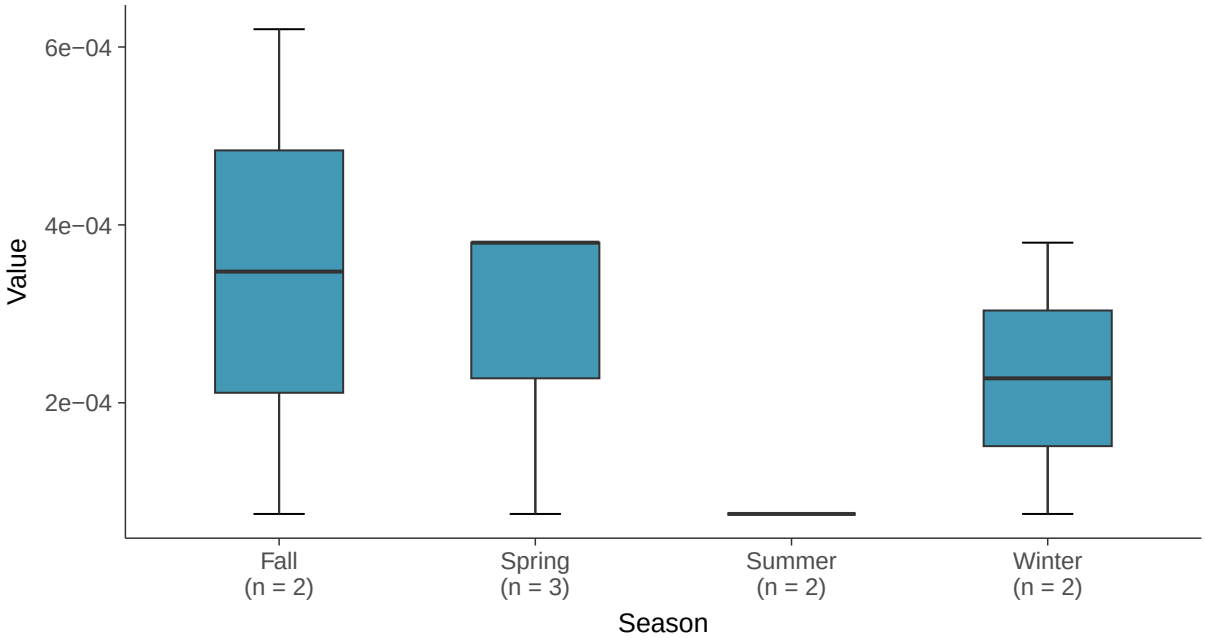
Boxplot

Thallium, MW-02 (mg/L)



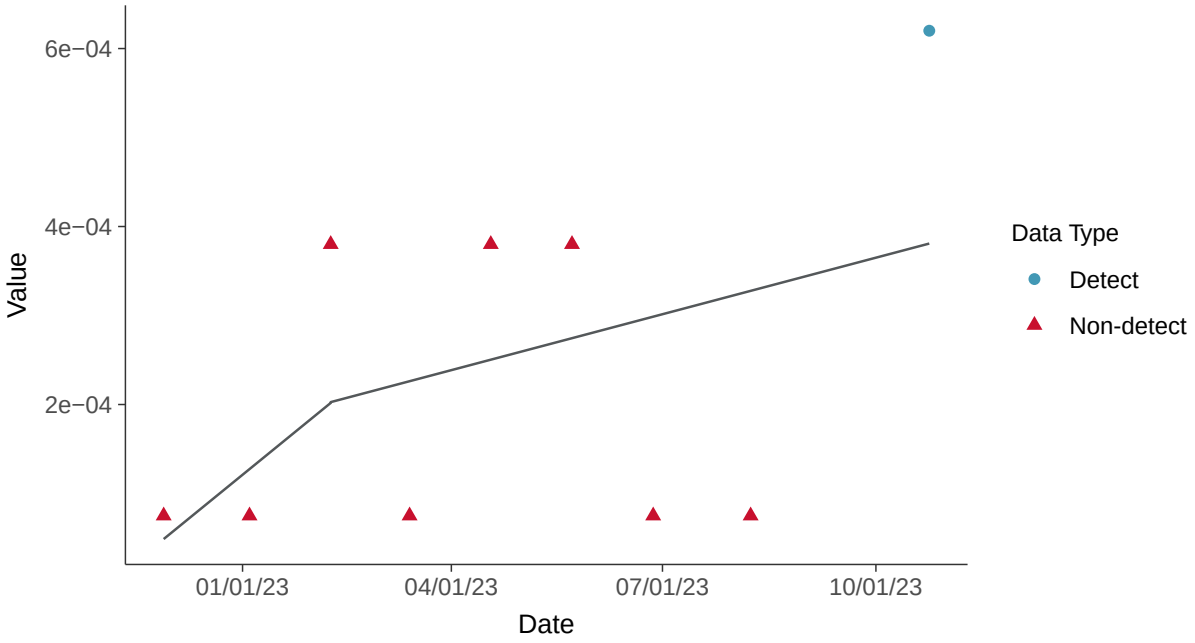
Boxplot by Season

Thallium, MW-02 (mg/L)



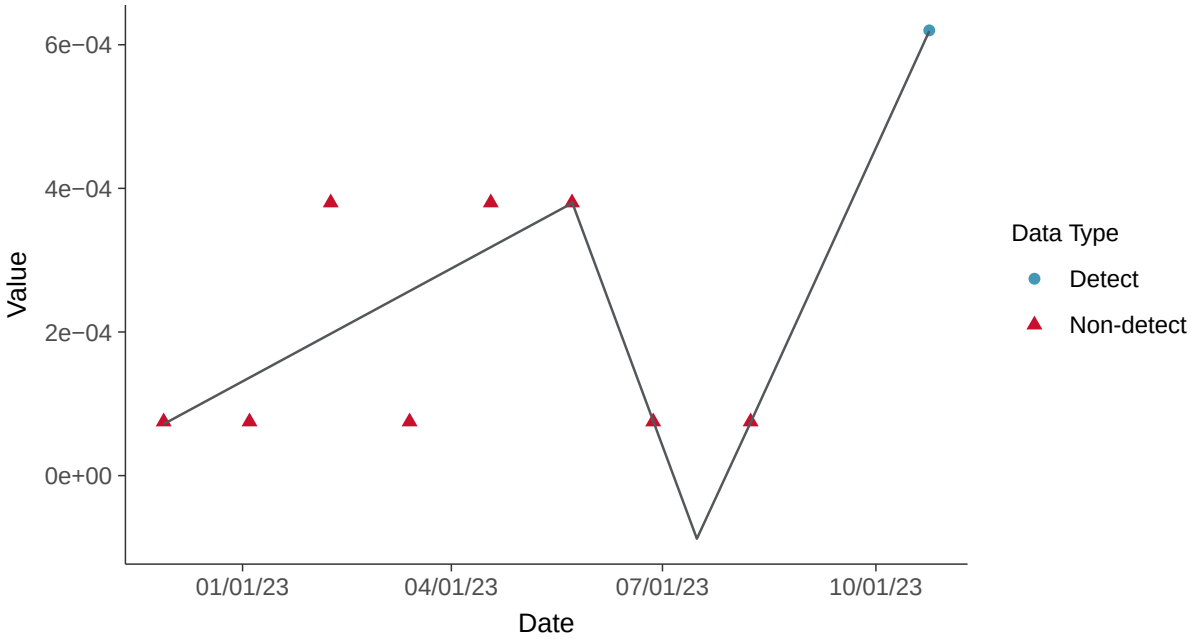
Trend Regression: Piecewise Linear-Linear

Thallium, MW-02 (mg/L)



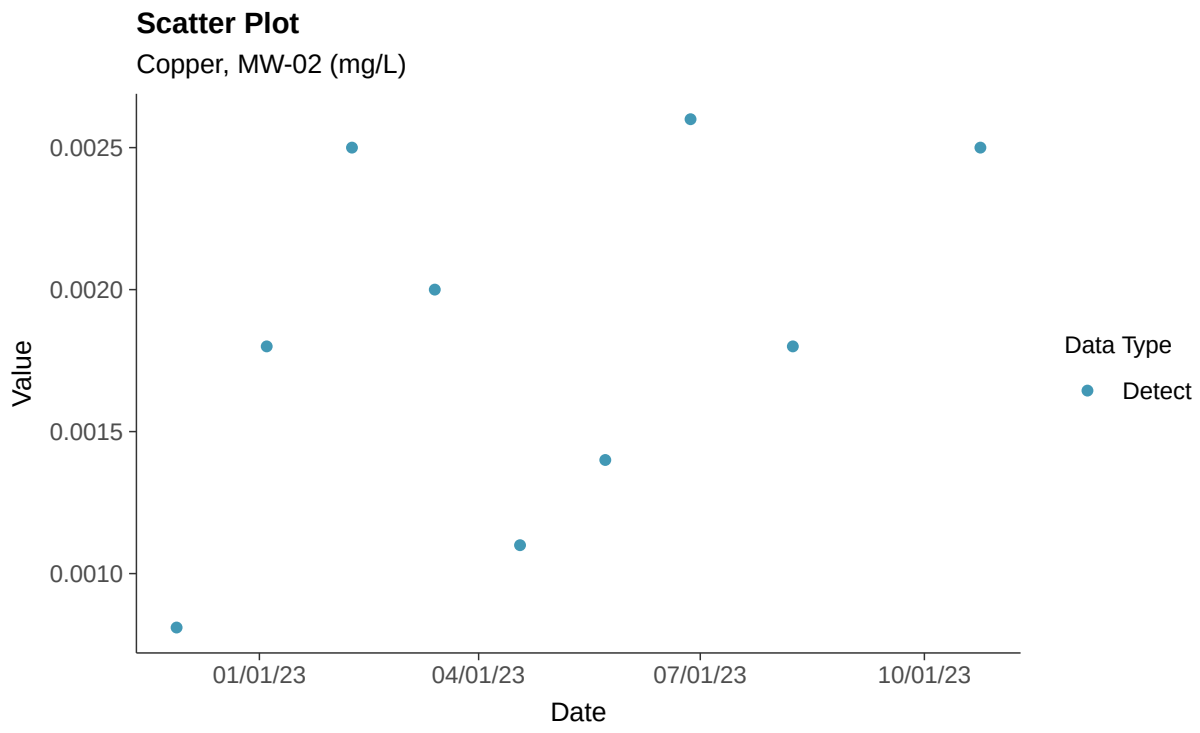
Trend Regression: Piecewise Linear-Linear-Linear

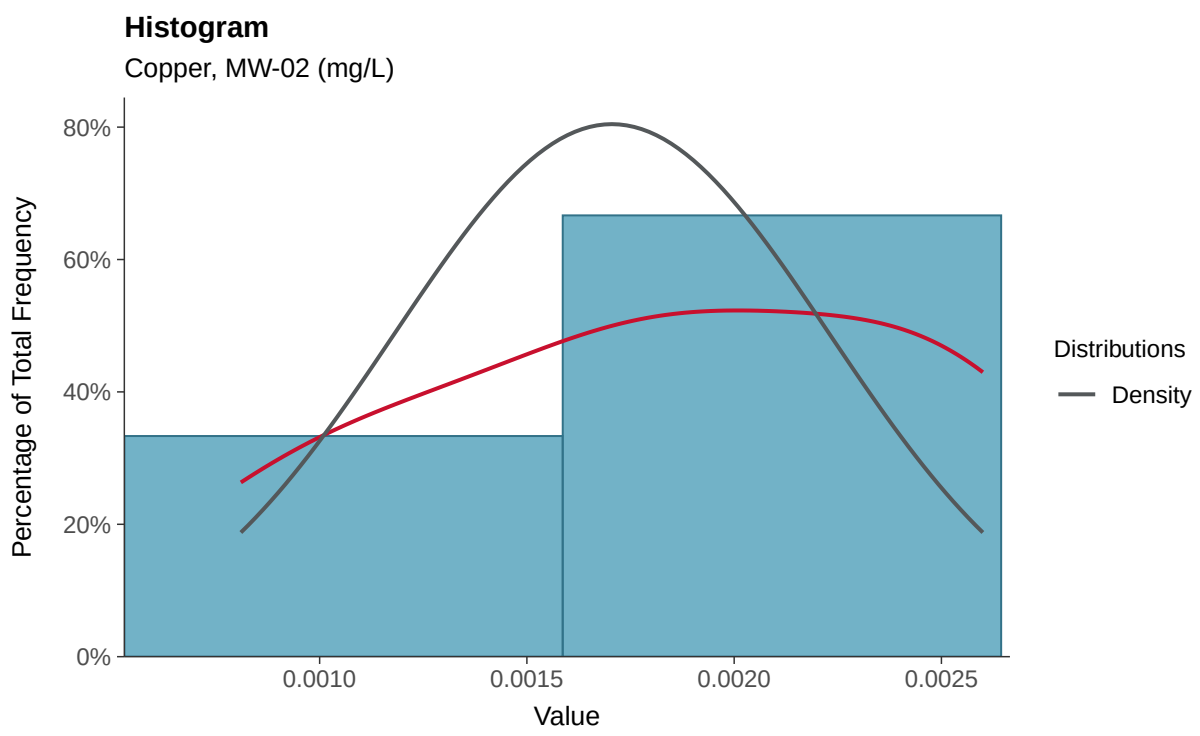
Thallium, MW-02 (mg/L)



Part 115: Copper, MW-02

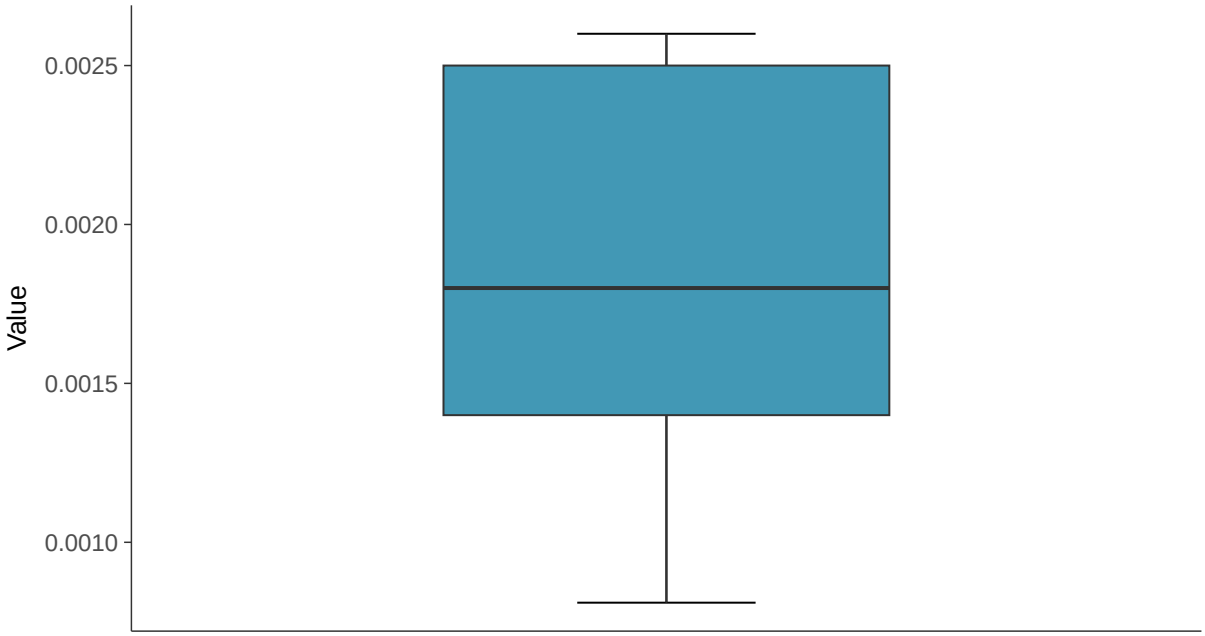
ID: 2_12_6_111





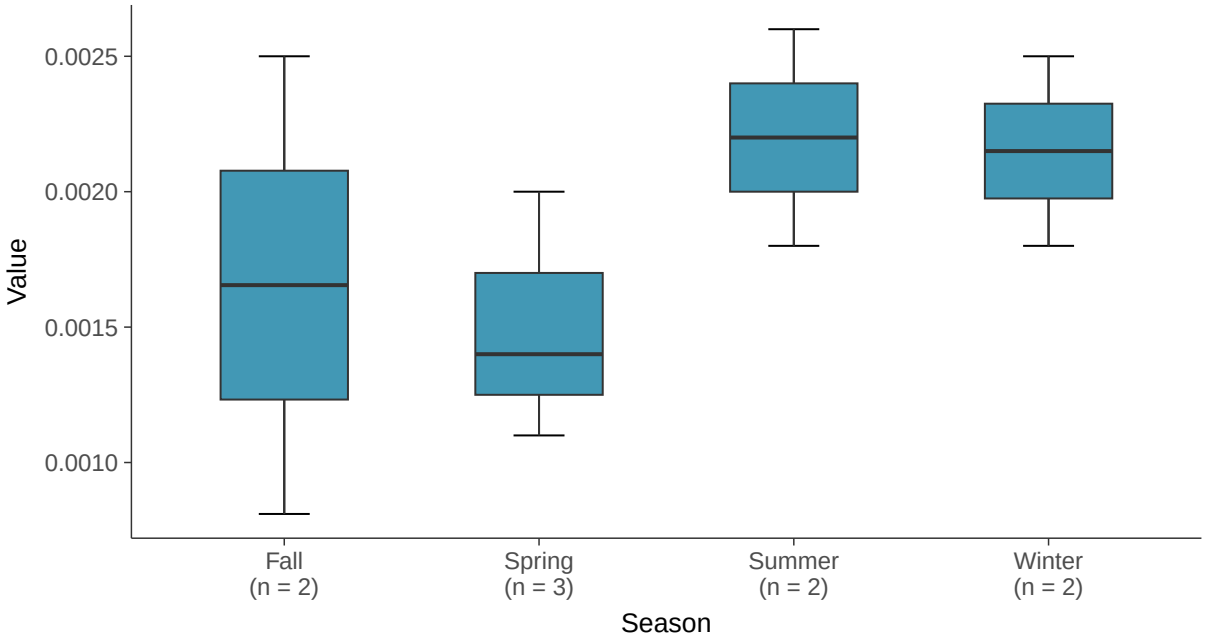
Boxplot

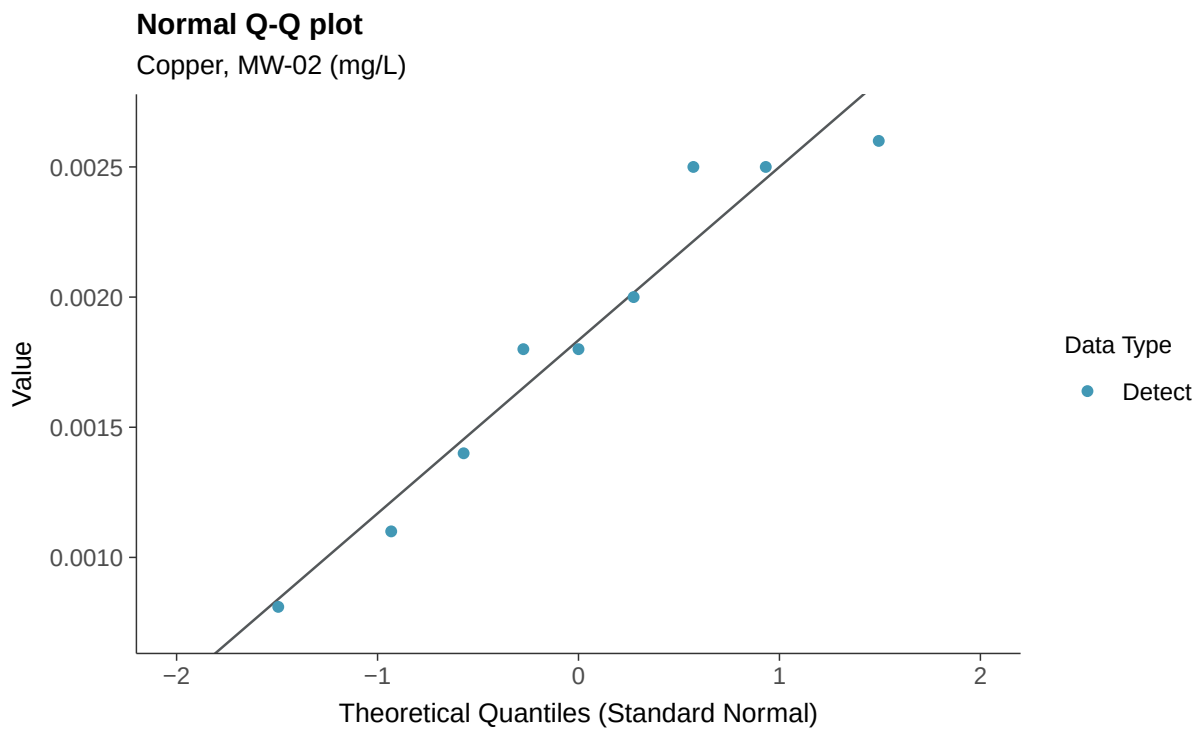
Copper, MW-02 (mg/L)

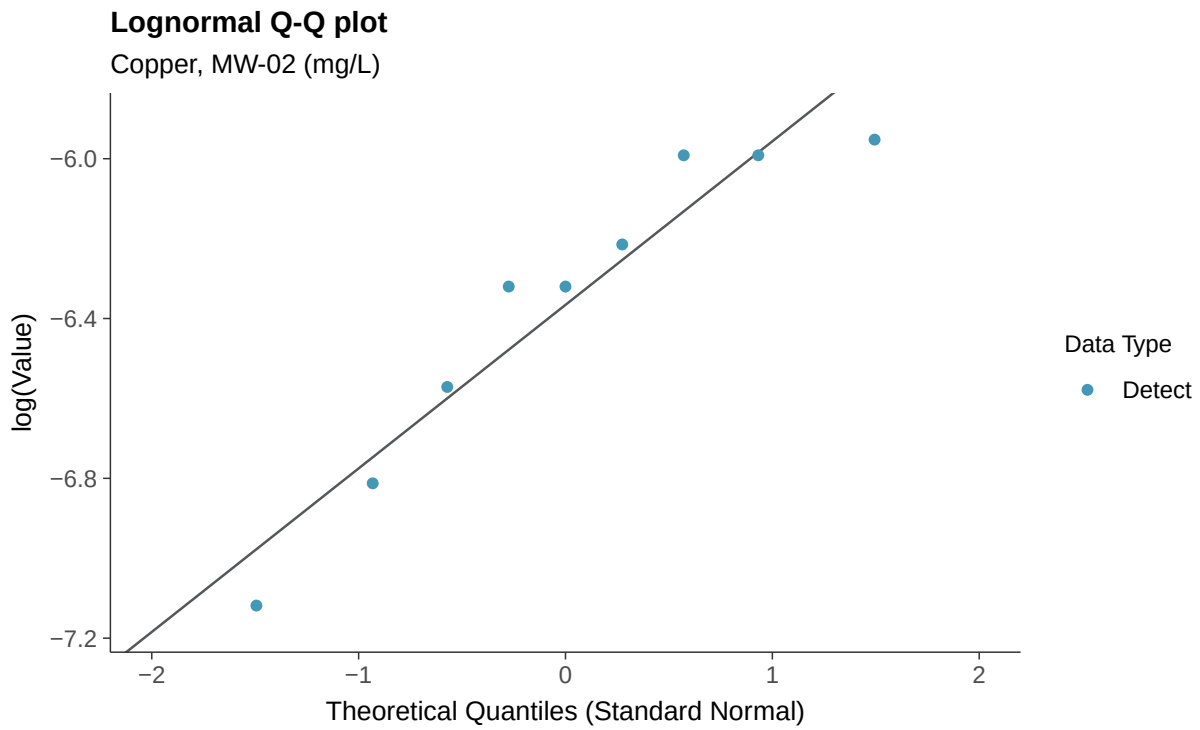


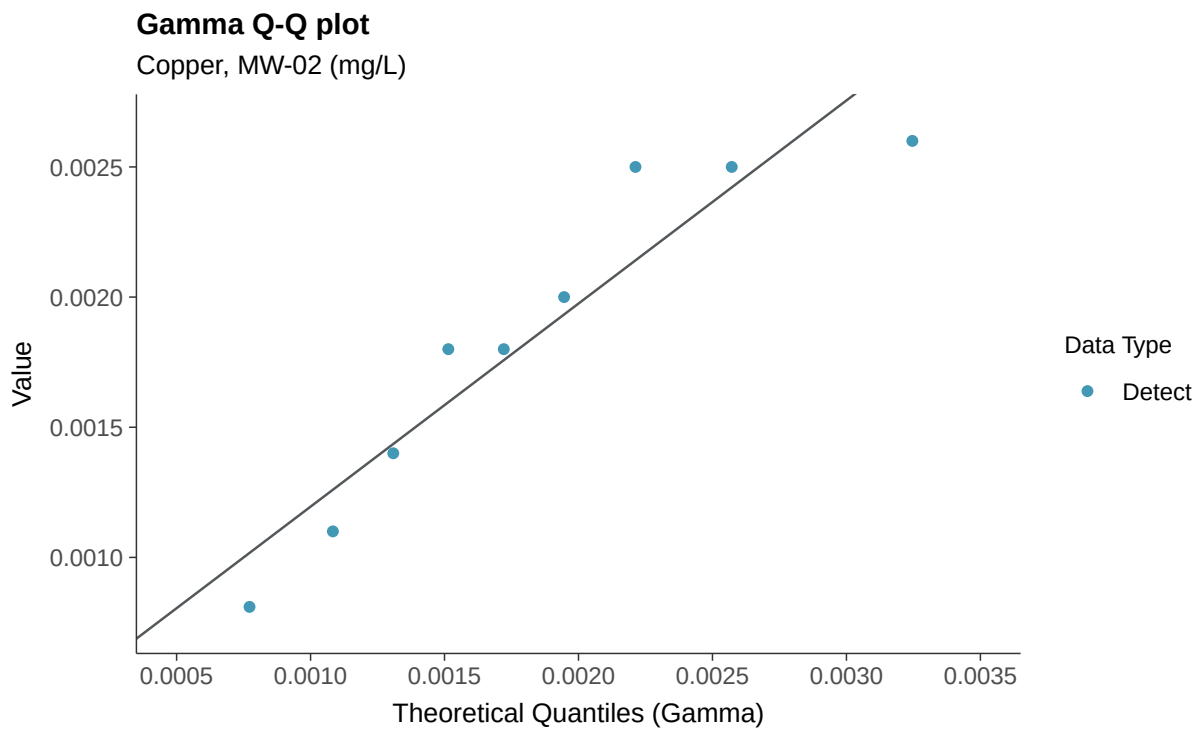
Boxplot by Season

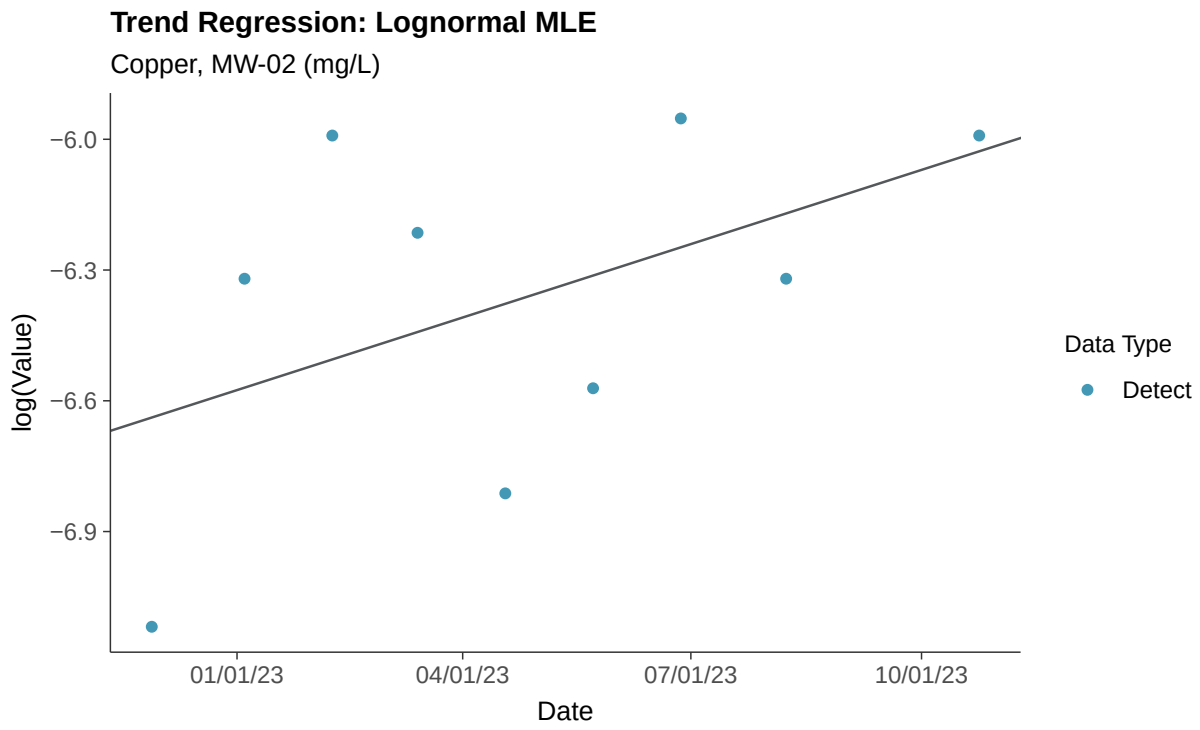
Copper, MW-02 (mg/L)

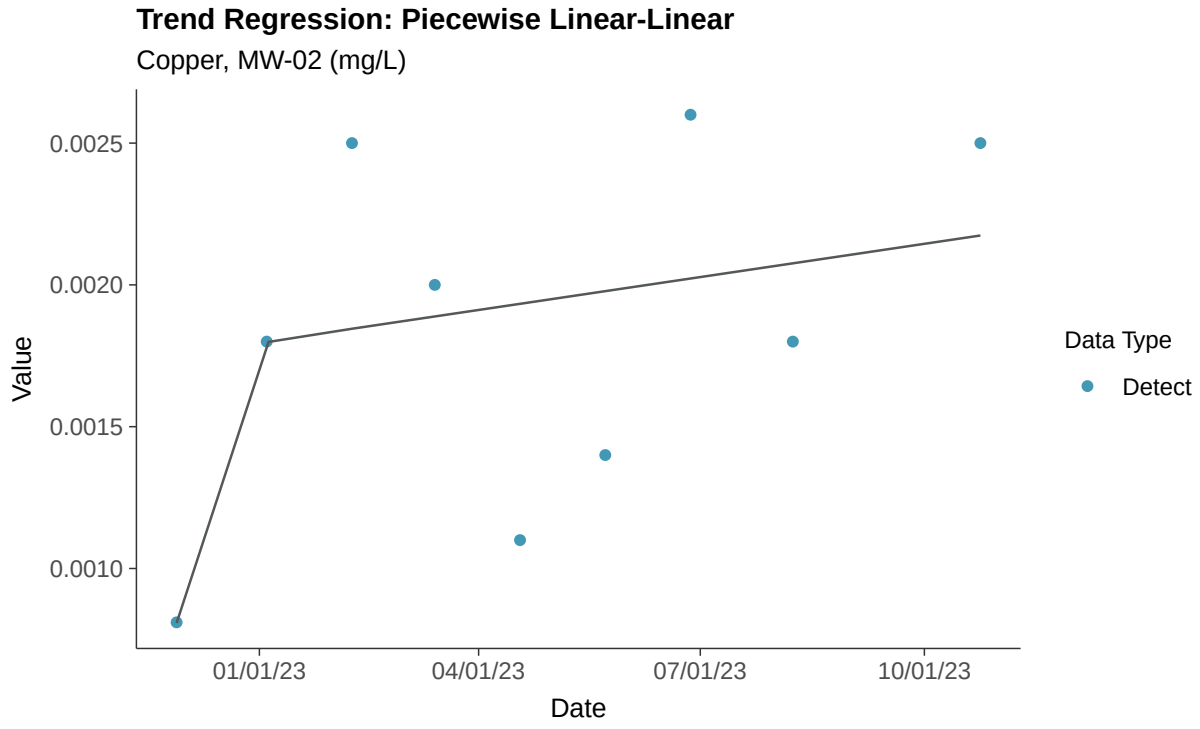



Normal Q-Q plot
Copper, MW-02 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Copper, MW-02 (mg/L)
log(Value)
−6.0
−6.4
−6.8
−7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

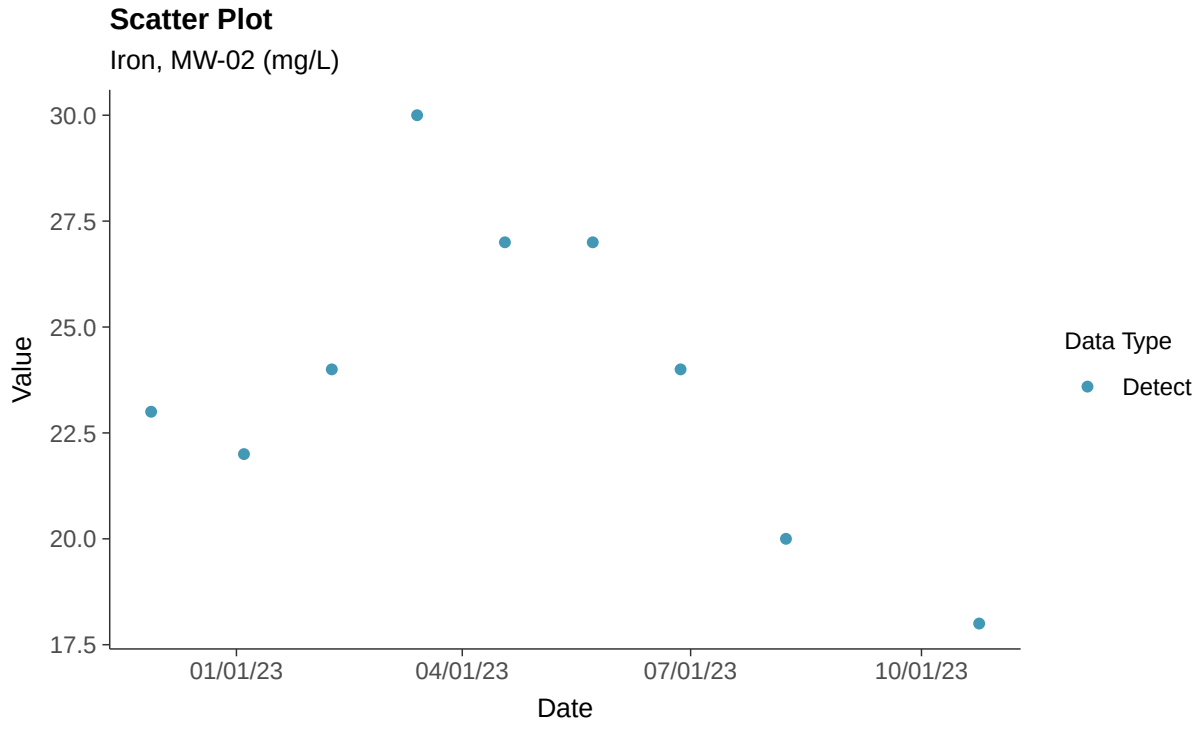

Gamma Q-Q plot
Copper, MW-02 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
Theoretical Quantiles (Gamma)
Data Type
Detect

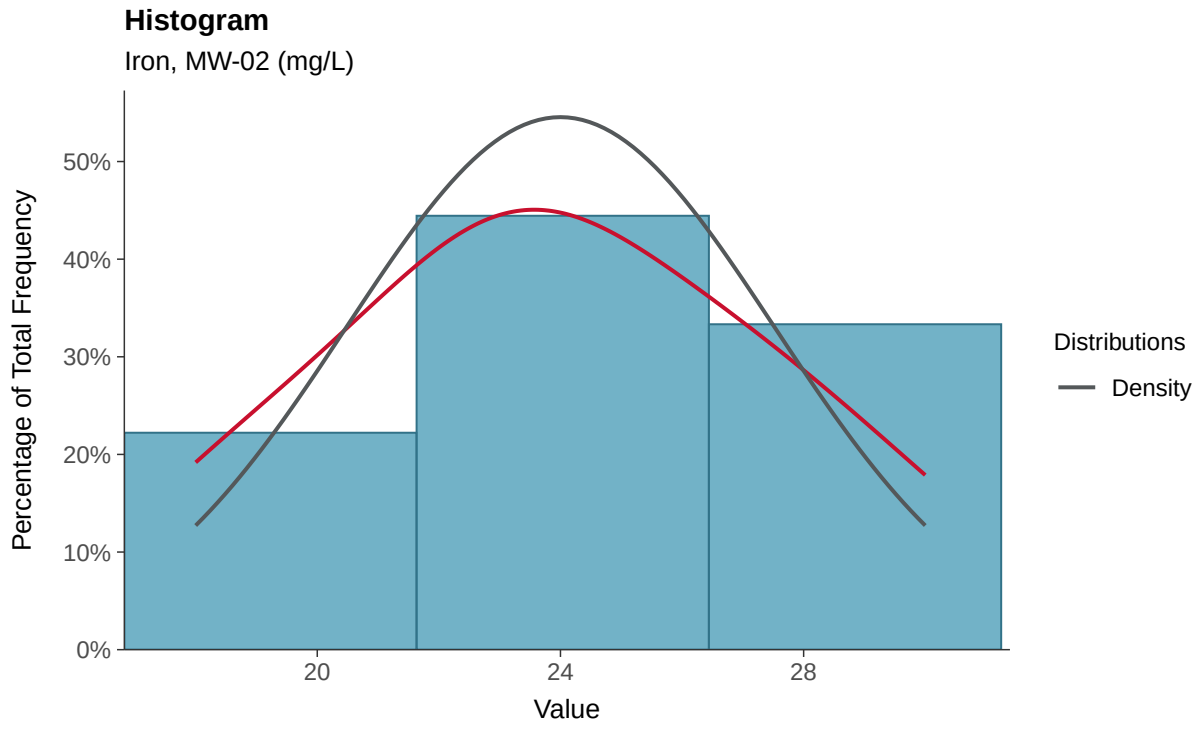

Trend Regression: Lognormal MLE
Copper, MW-02 (mg/L)
log(Value)
−6.0
−6.3
−6.6
−6.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Copper, MW-02 (mg/L)
0.0025
0.0020
0.0015
0.0010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Iron, MW-02

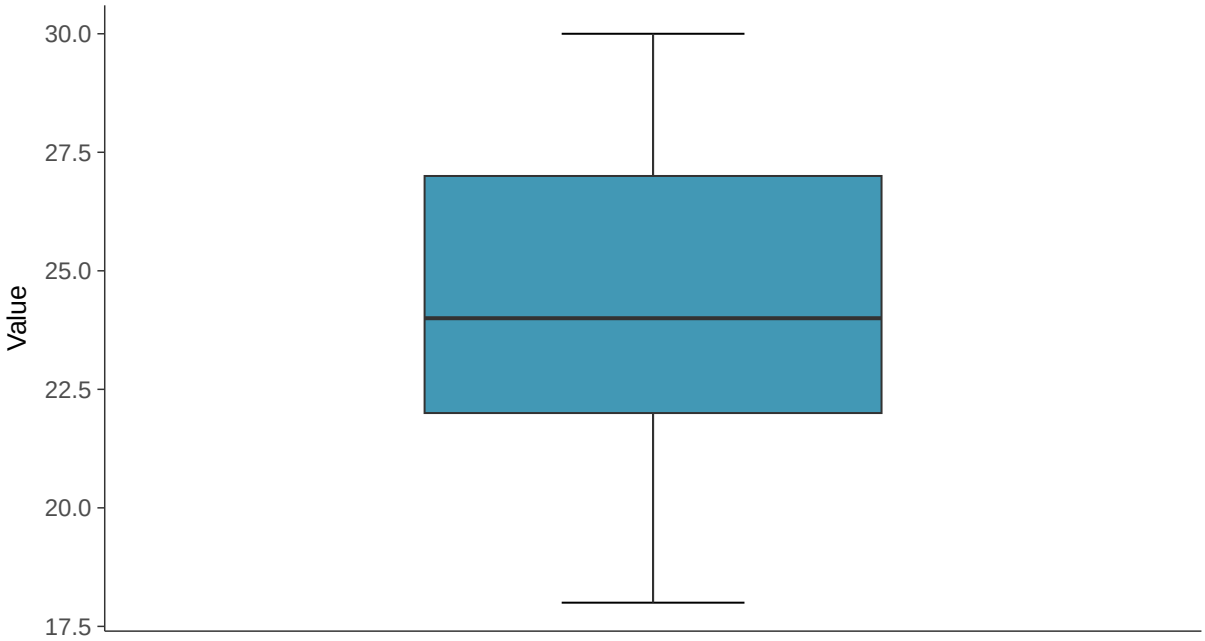
ID: 2_12_6_114





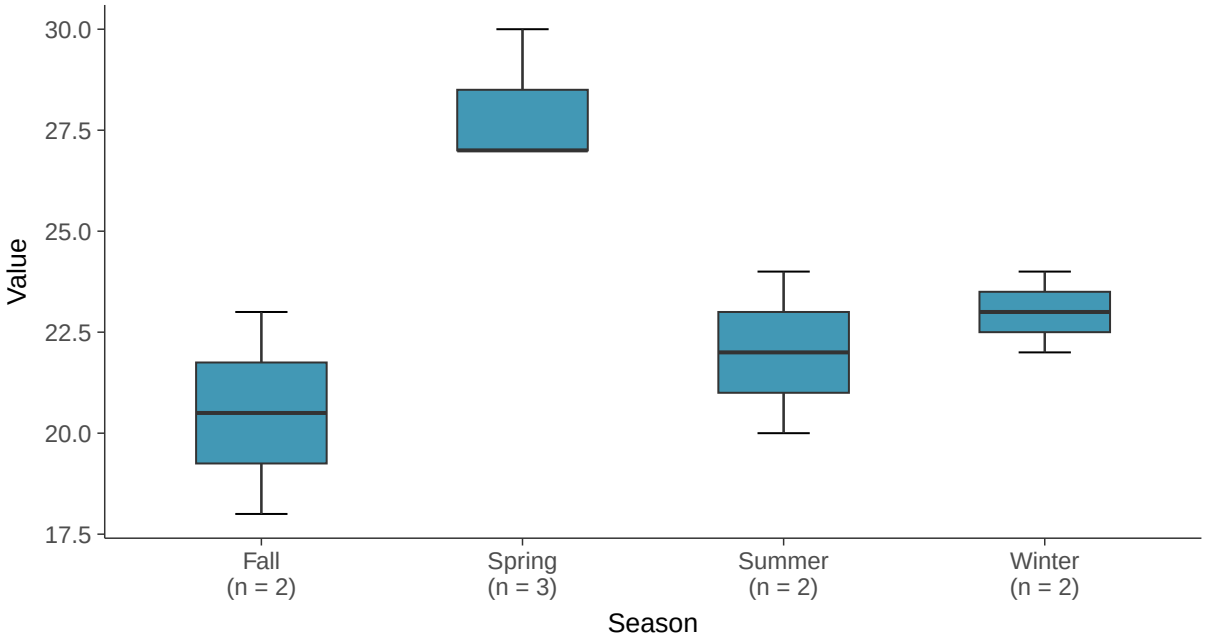
Boxplot

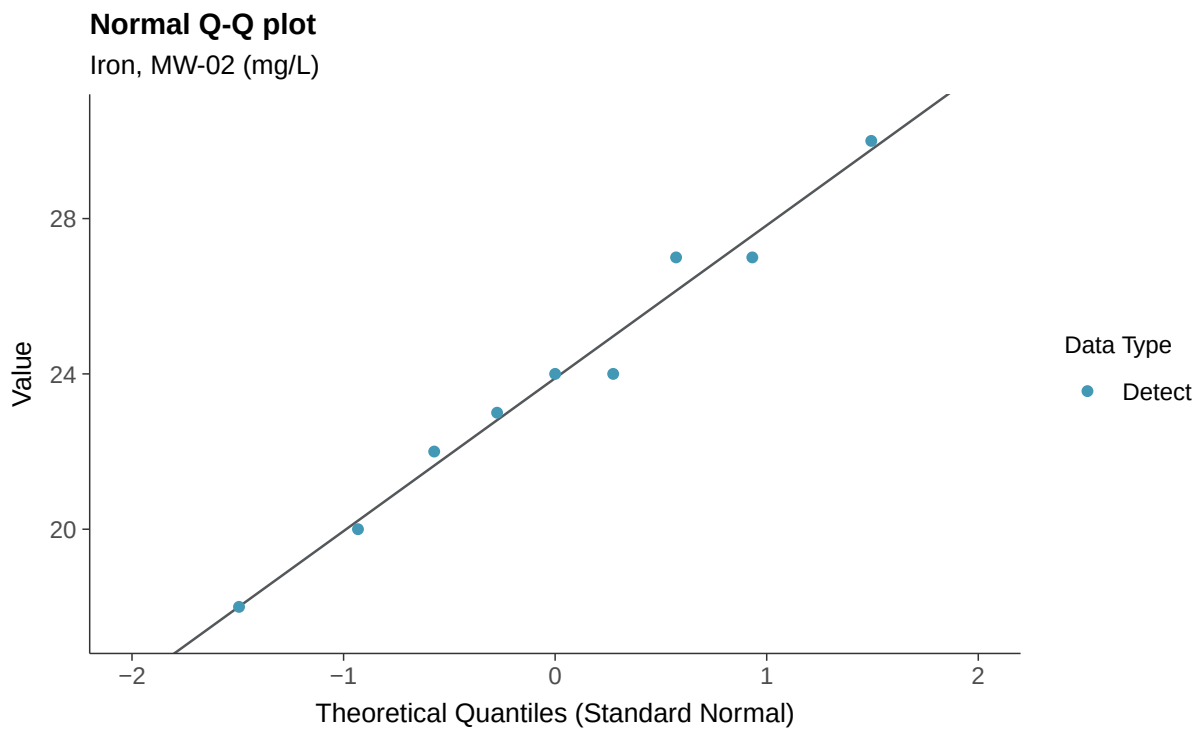
Iron, MW-02 (mg/L)

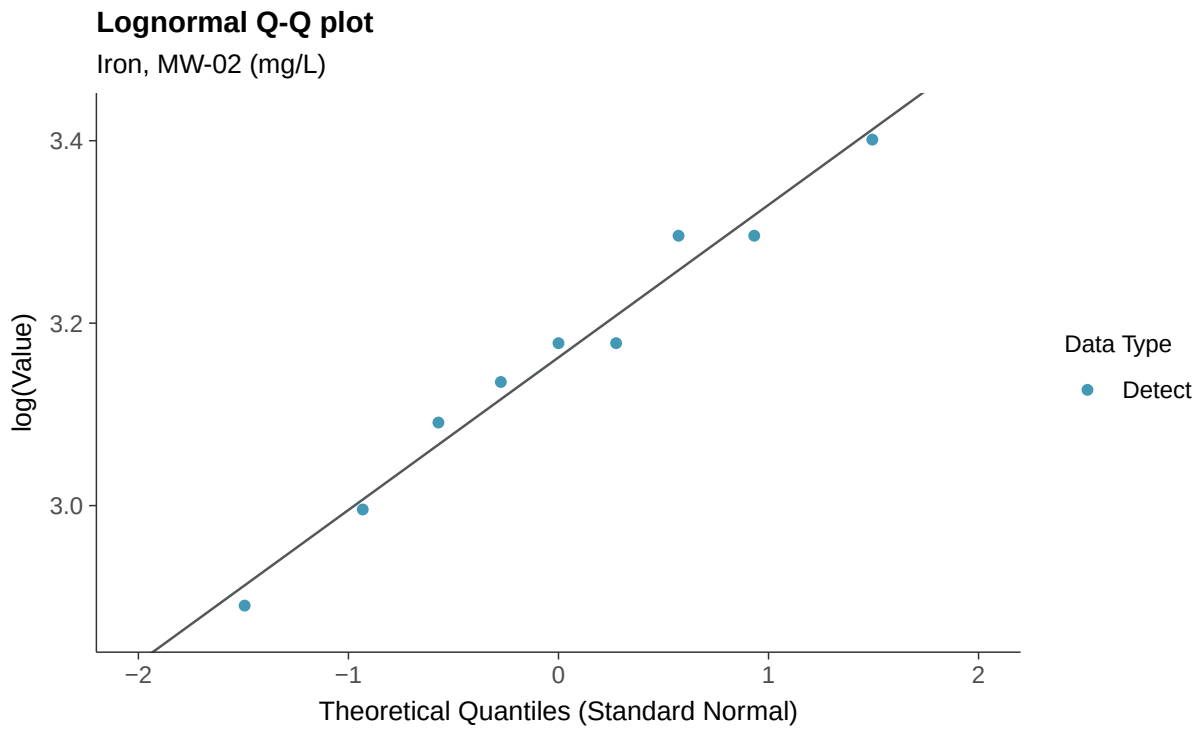


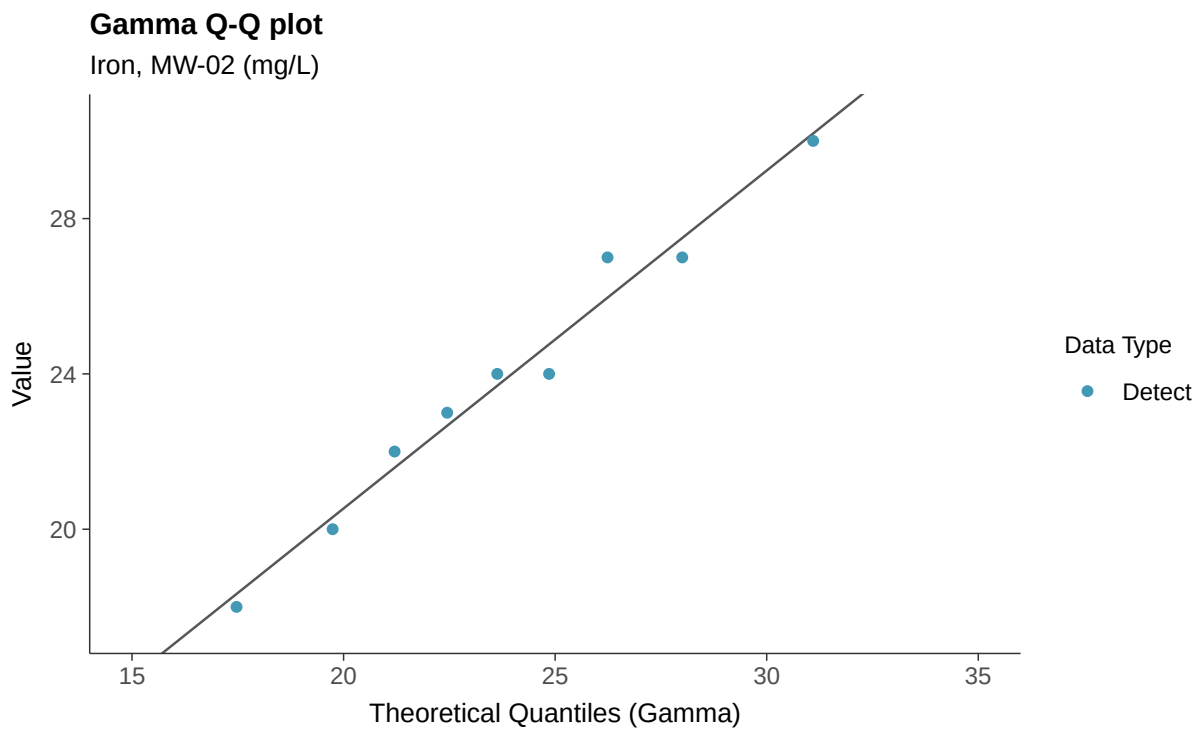
Boxplot by Season

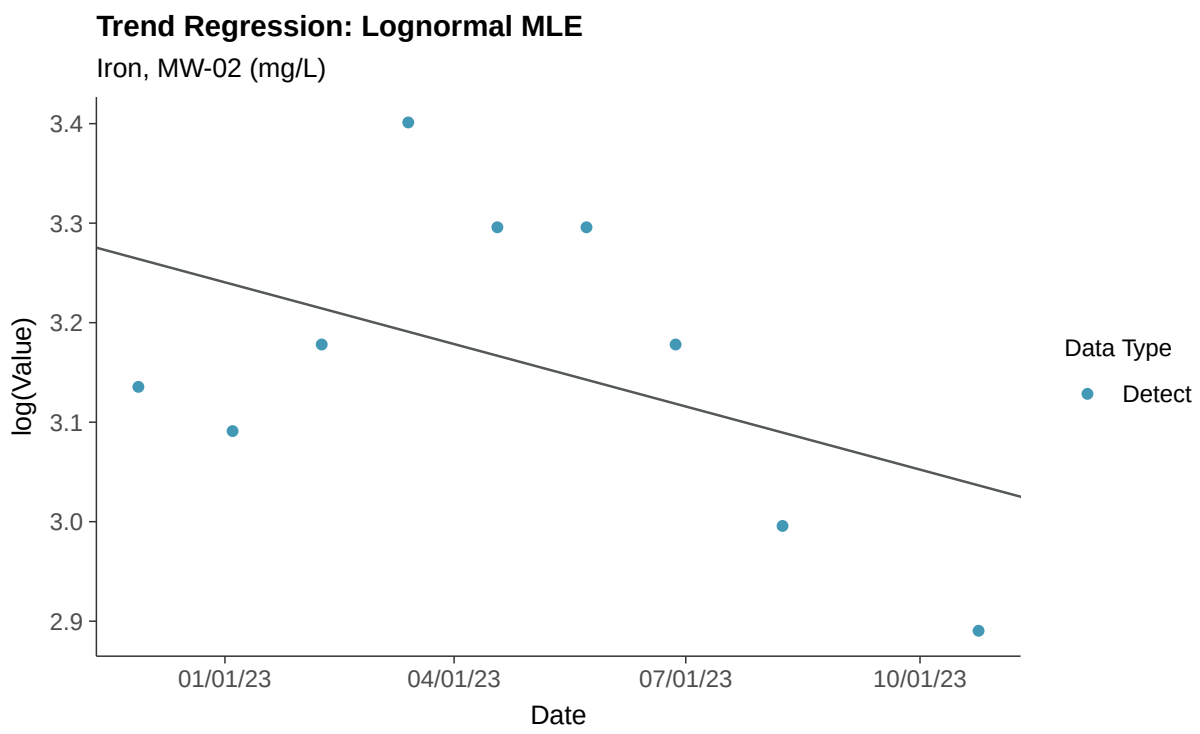
Iron, MW-02 (mg/L)

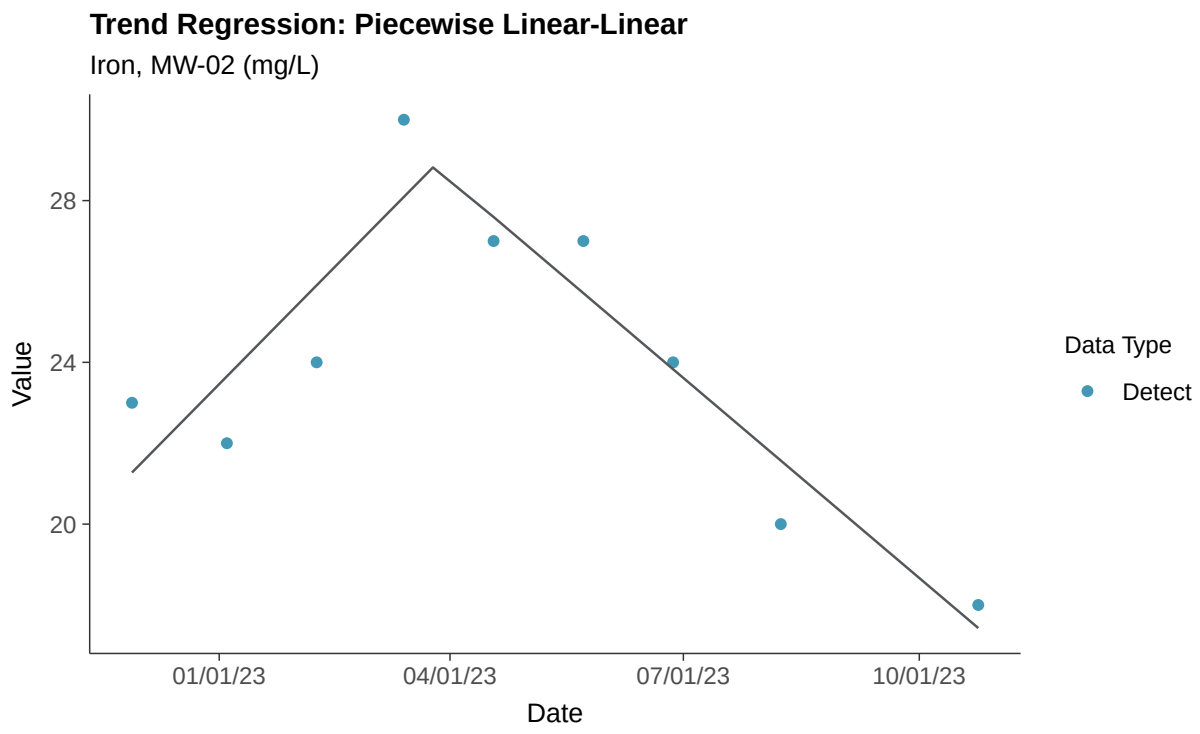



Normal Q-Q plot
Iron, MW-02 (mg/L)
Value
28
24
20
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-02 (mg/L)
log(Value)
3.4
3.2
3.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

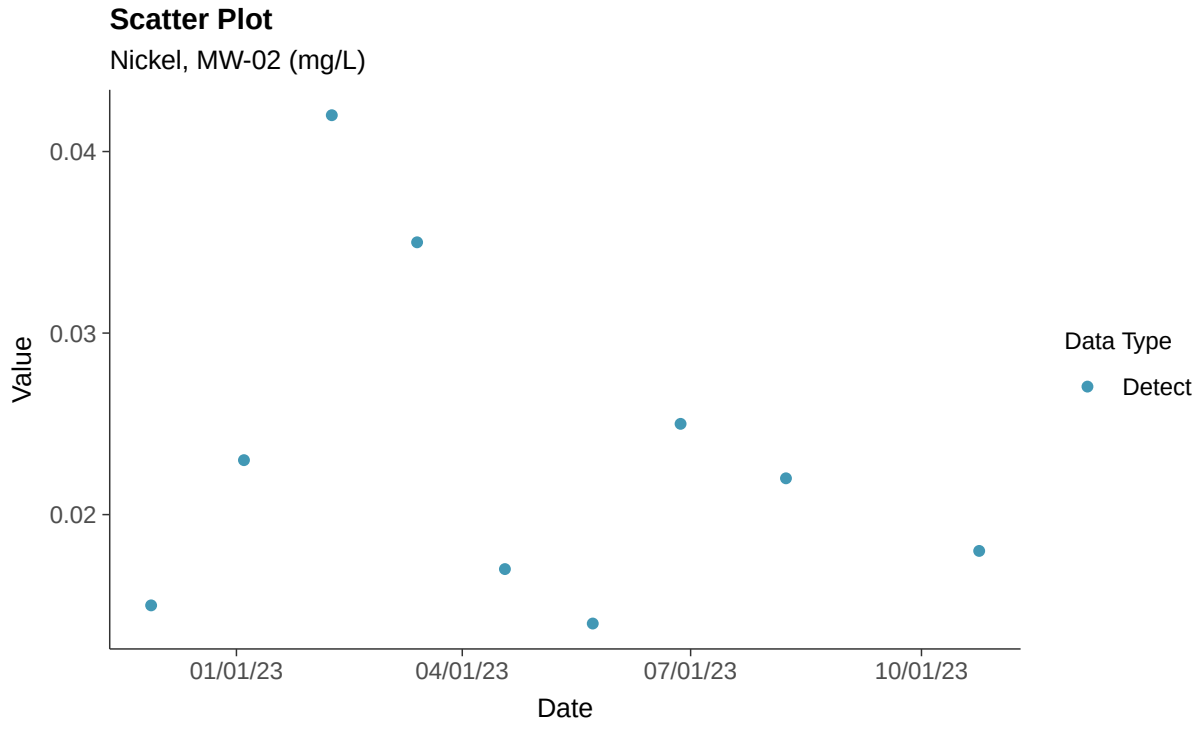

Gamma Q-Q plot
Iron, MW-02 (mg/L)
Value
28
24
20
15
20
25
30
35
Theoretical Quantiles (Gamma)
Data Type
Detect

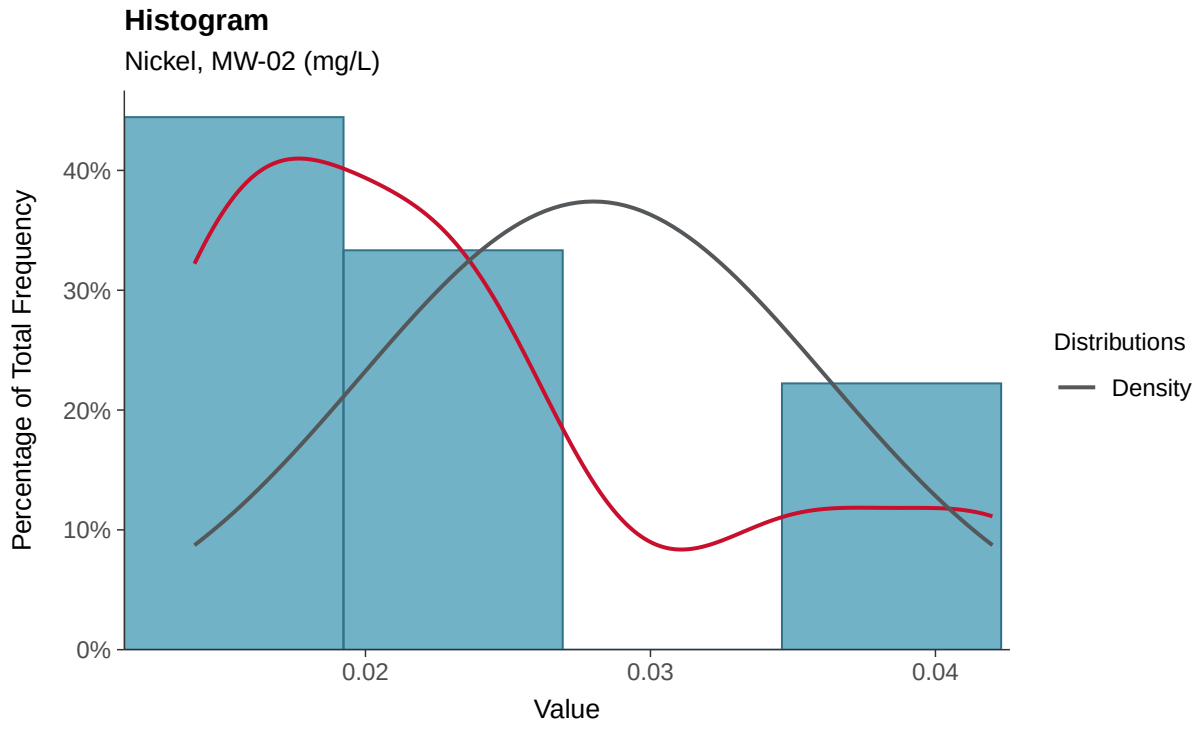

Trend Regression: Lognormal MLE
Iron, MW-02 (mg/L)
log(Value)
3.4
3.3
3.2
3.1
3.0
2.9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-02 (mg/L)
Value
28
24
20
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-02

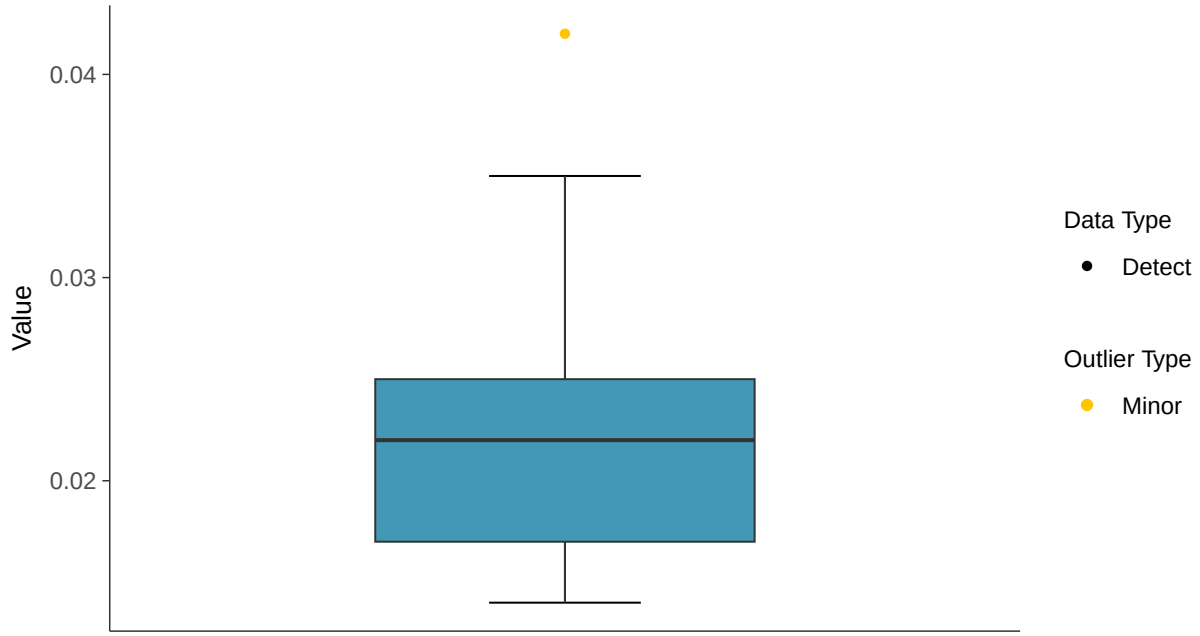
ID: 2_12_6_119





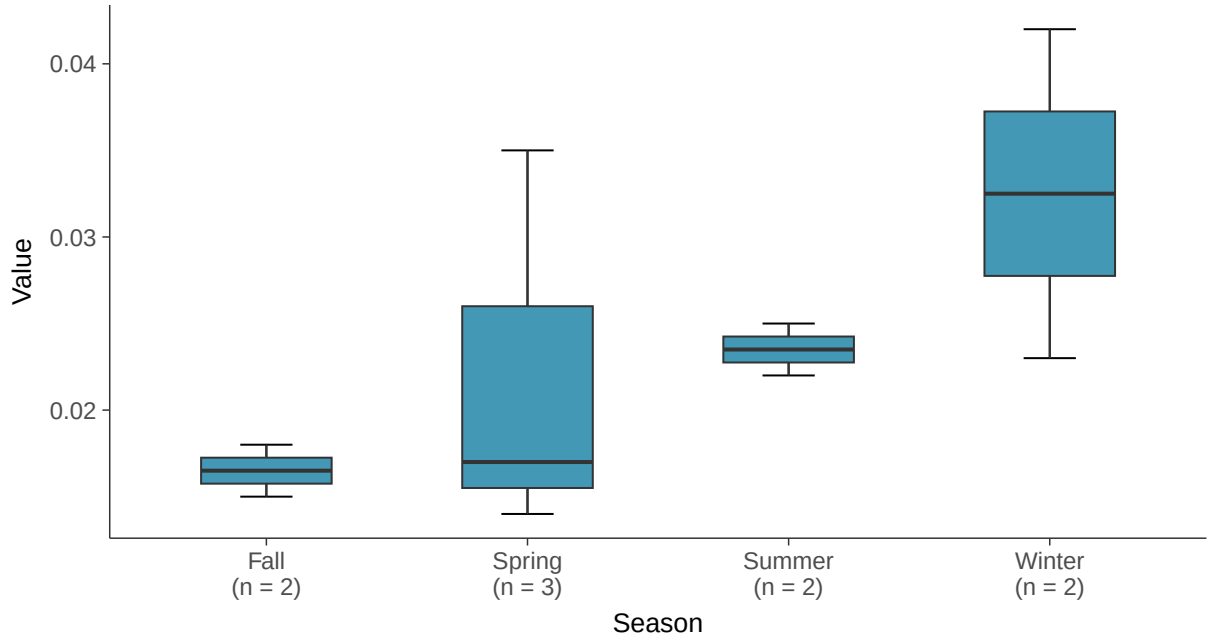
Boxplot

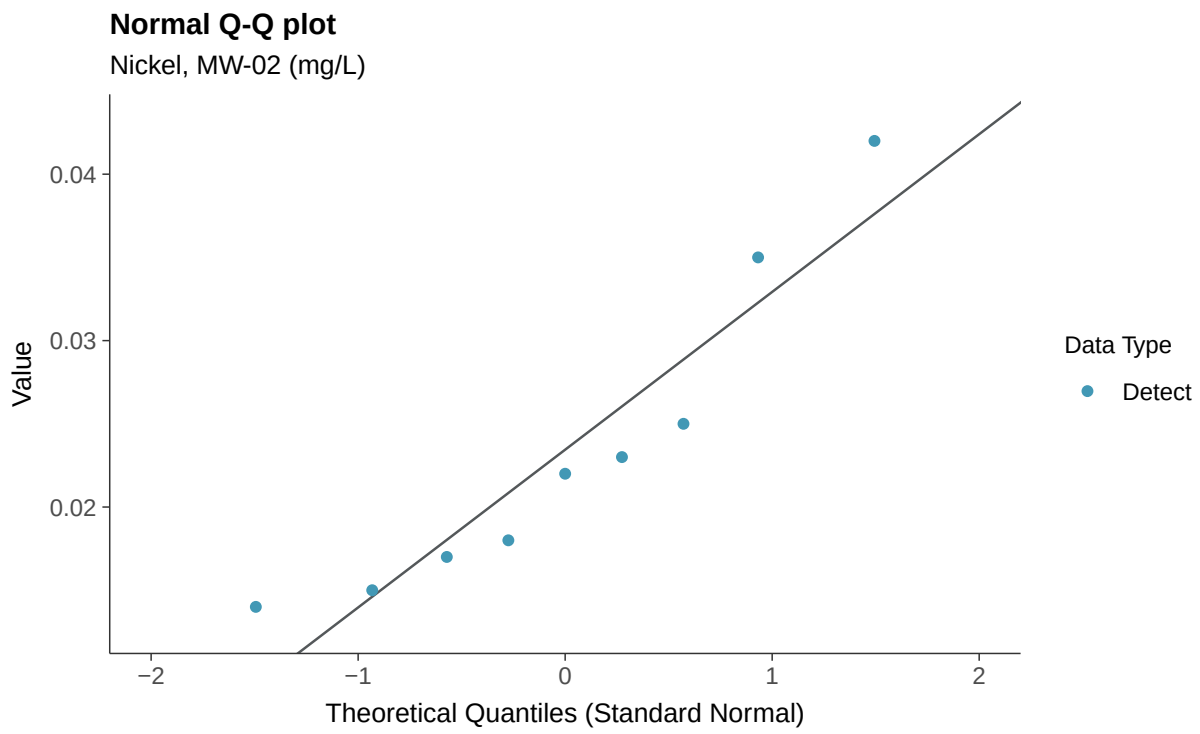
Nickel, MW-02 (mg/L)

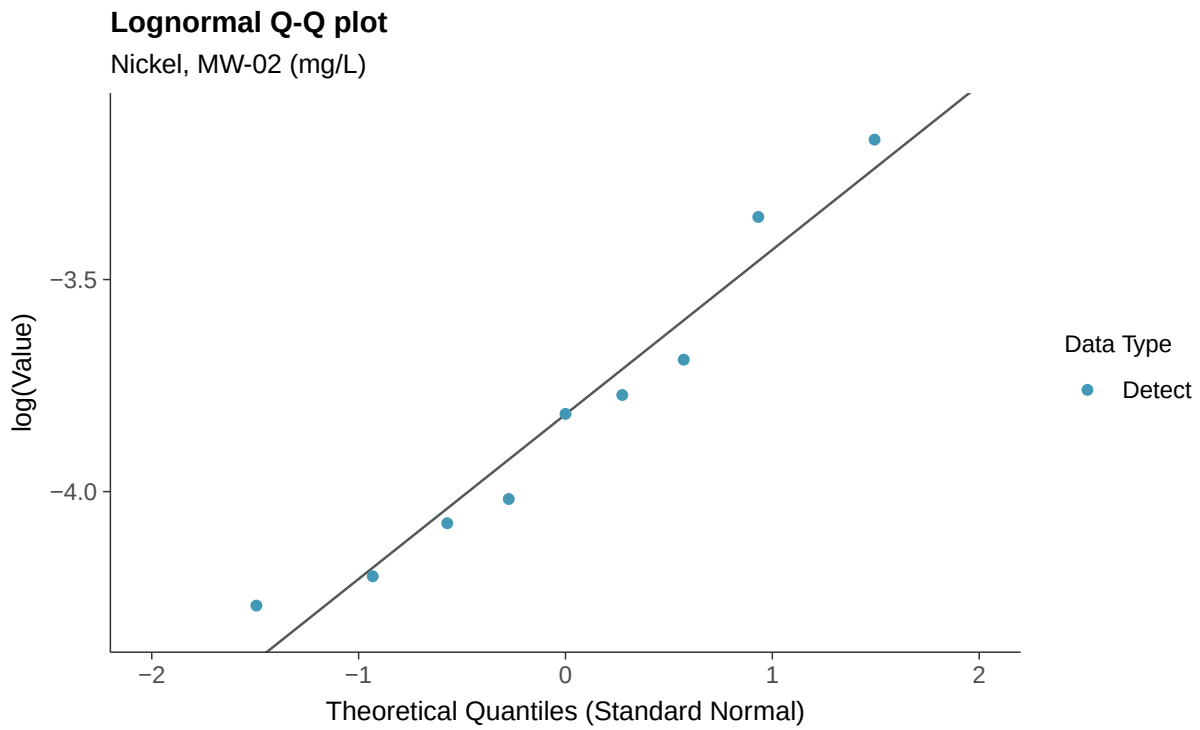


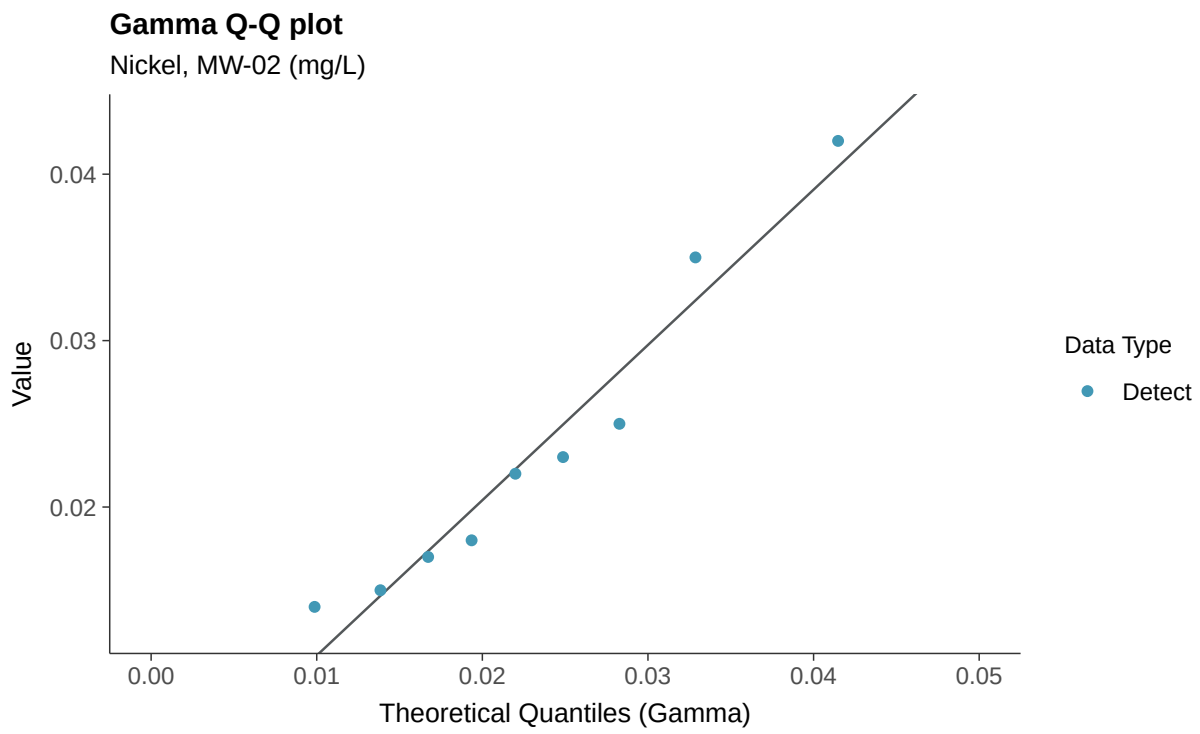
Boxplot by Season

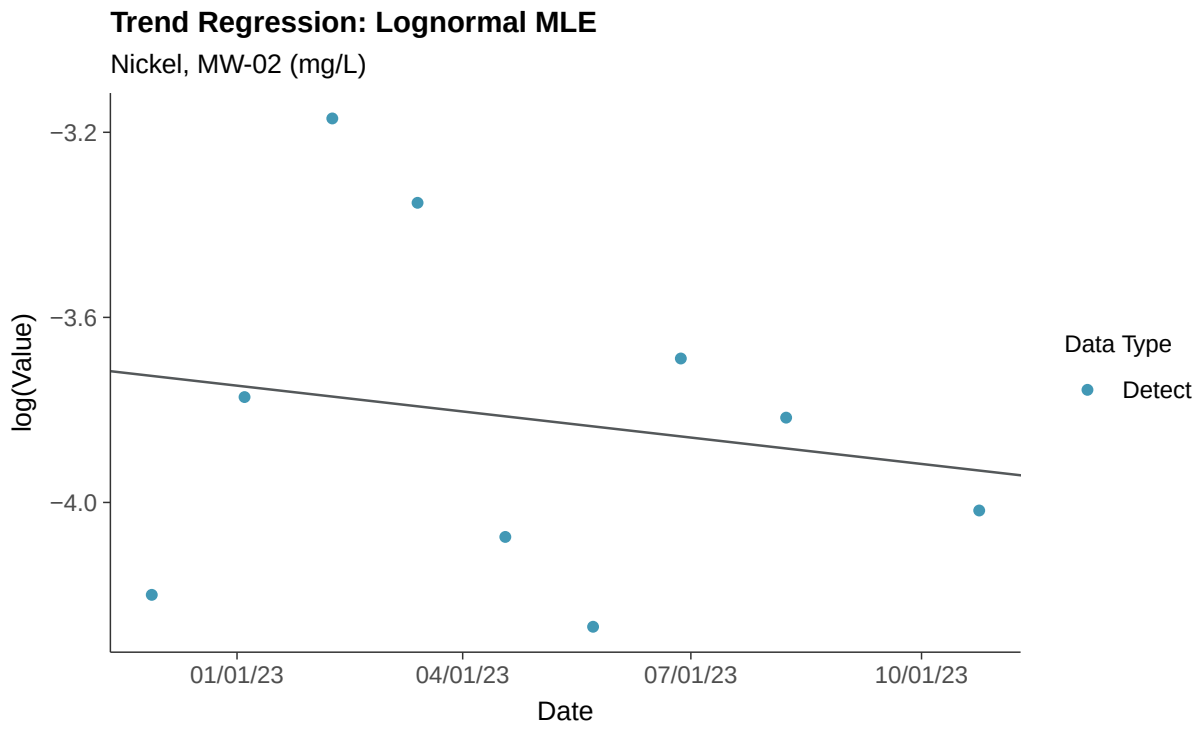
Nickel, MW-02 (mg/L)

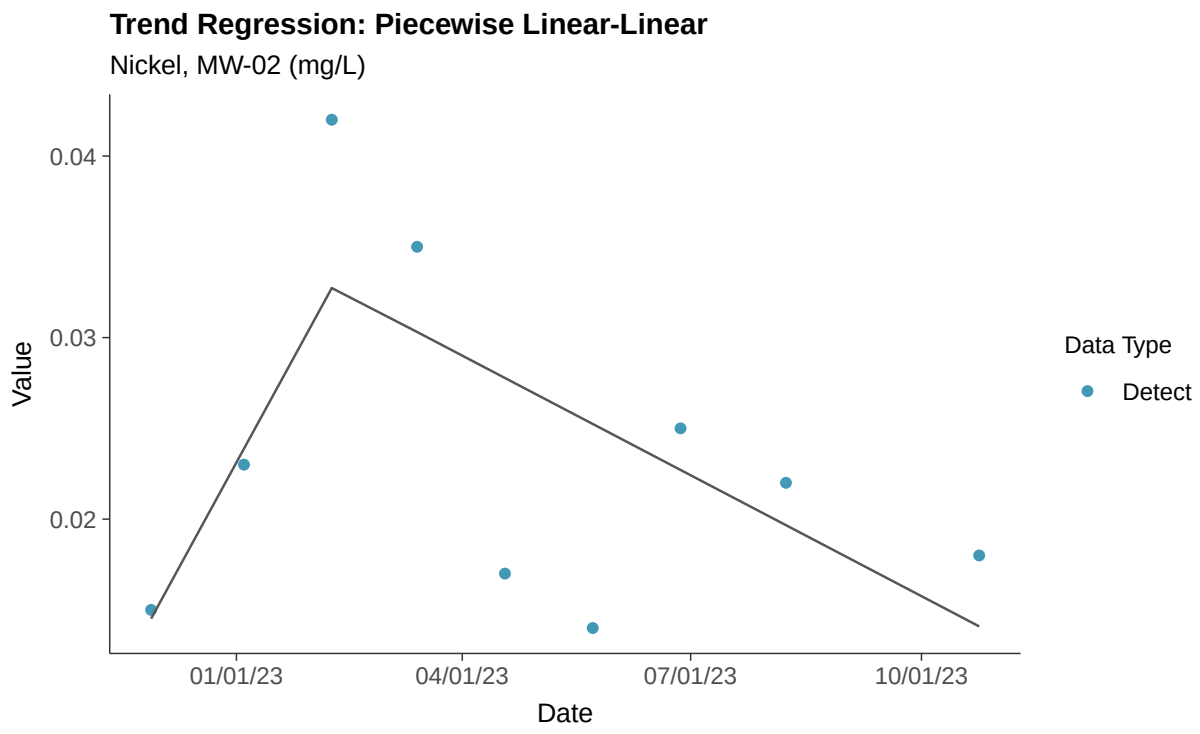



Normal Q-Q plot
Nickel, MW-02 (mg/L)
Value
0.04
0.03
0.02
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Nickel, MW-02 (mg/L)
log(Value)
−3.5
−4.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

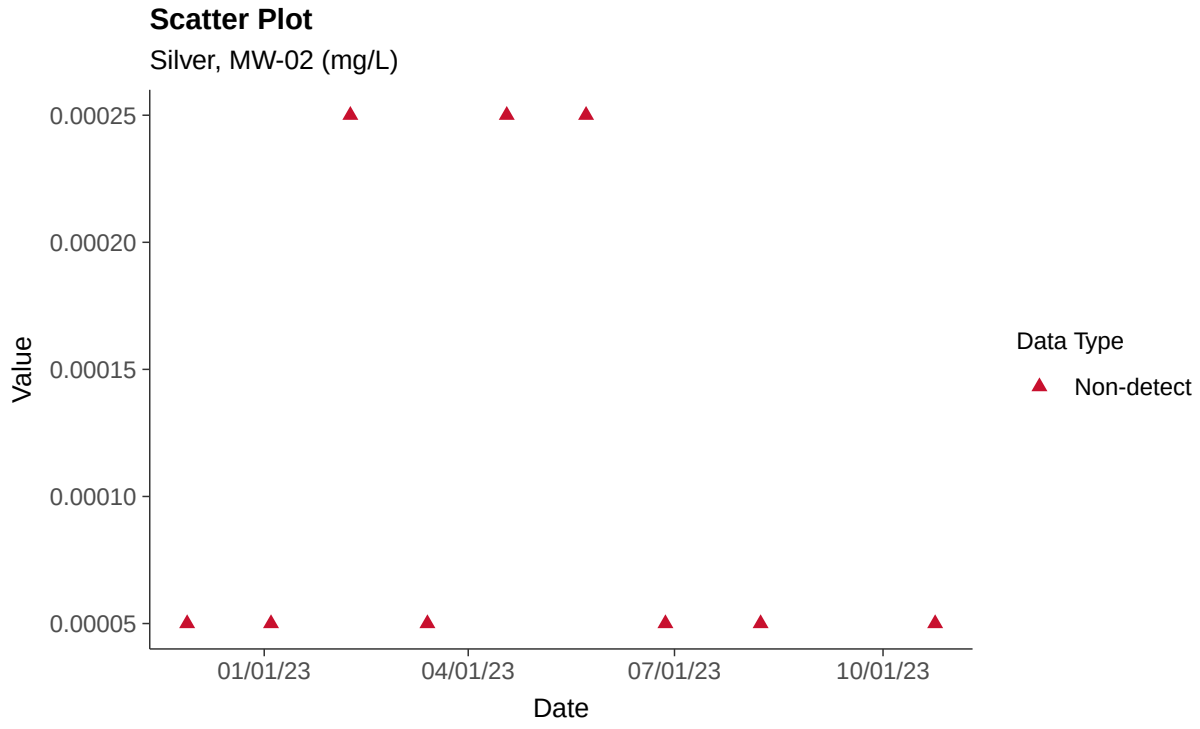

Gamma Q-Q plot
Nickel, MW-02 (mg/L)
Value
0.04
0.03
0.02
0.00
0.01
0.02
0.03
0.04
0.05
Theoretical Quantiles (Gamma)
Data Type
Detect

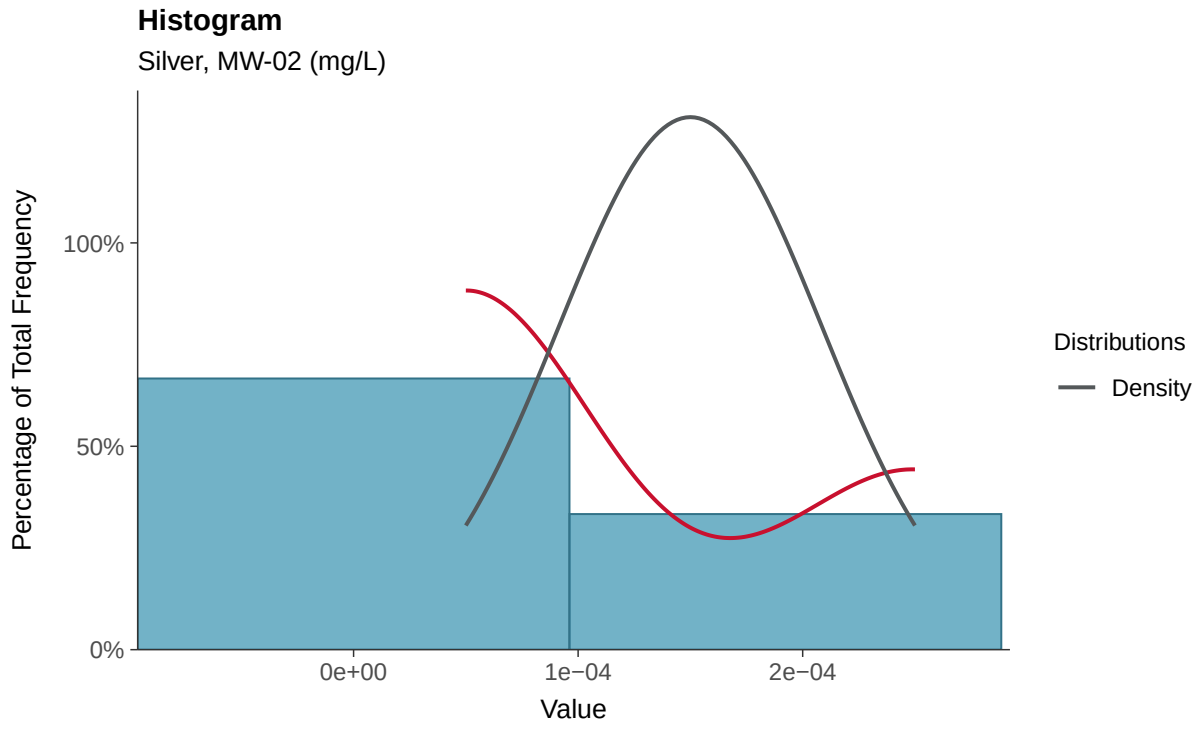

Trend Regression: Lognormal MLE
Nickel, MW-02 (mg/L)
log(Value)
−3.2
−3.6
−4.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Nickel, MW-02 (mg/L)
0.04
0.03
0.02
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-02

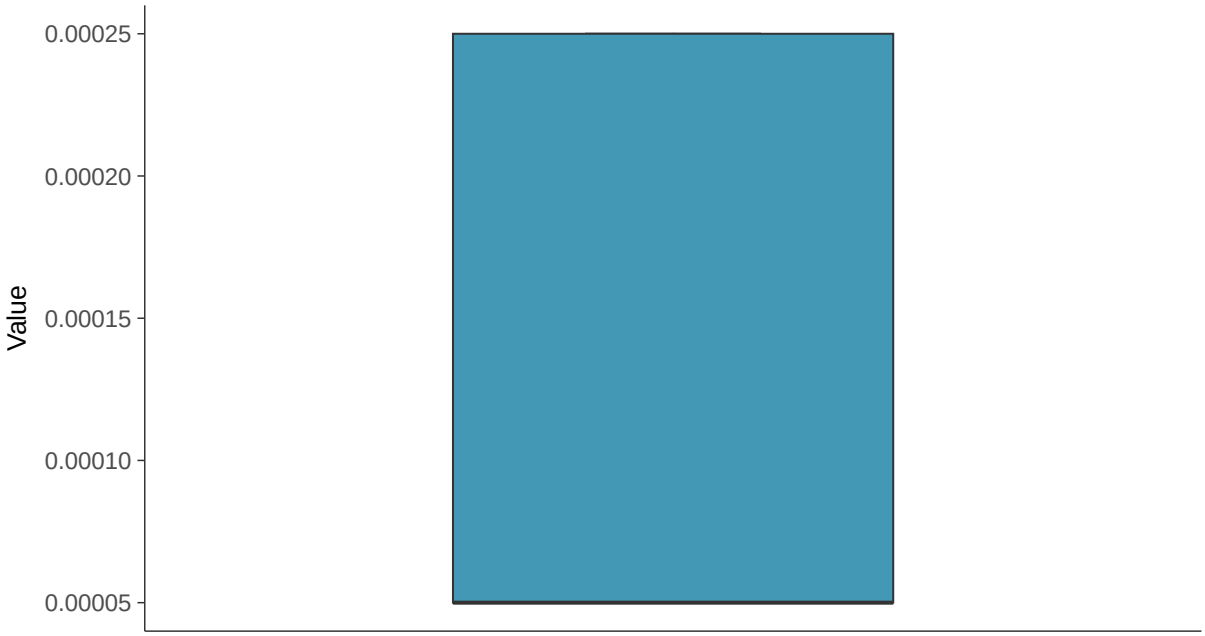
ID: 2_12_6_123





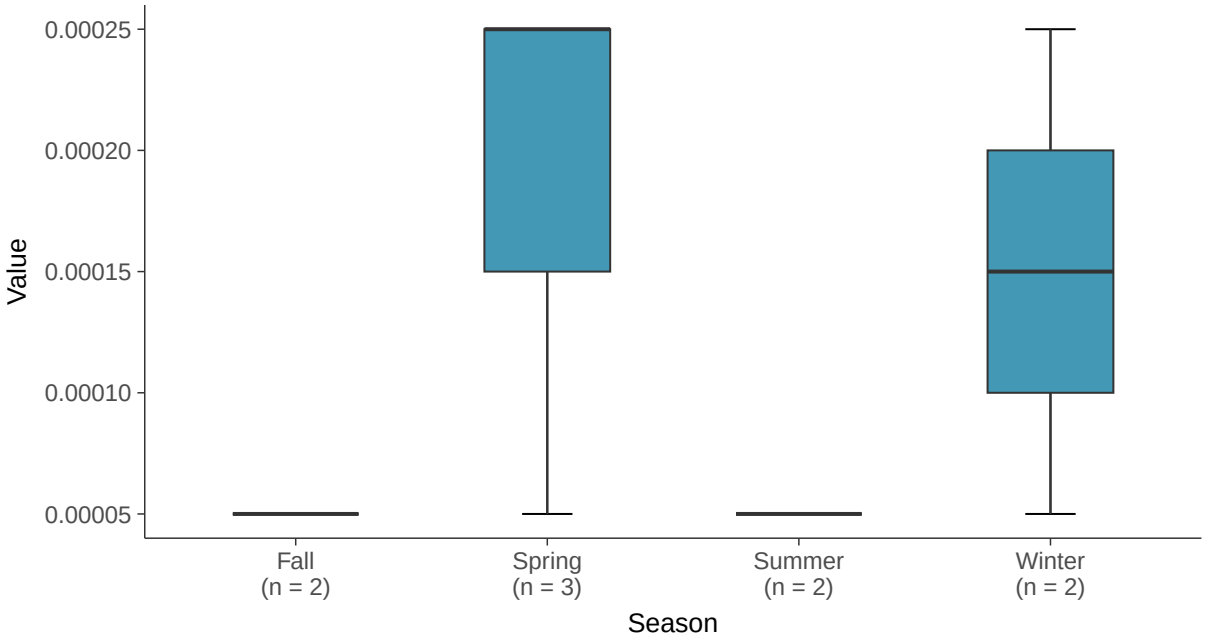
Boxplot

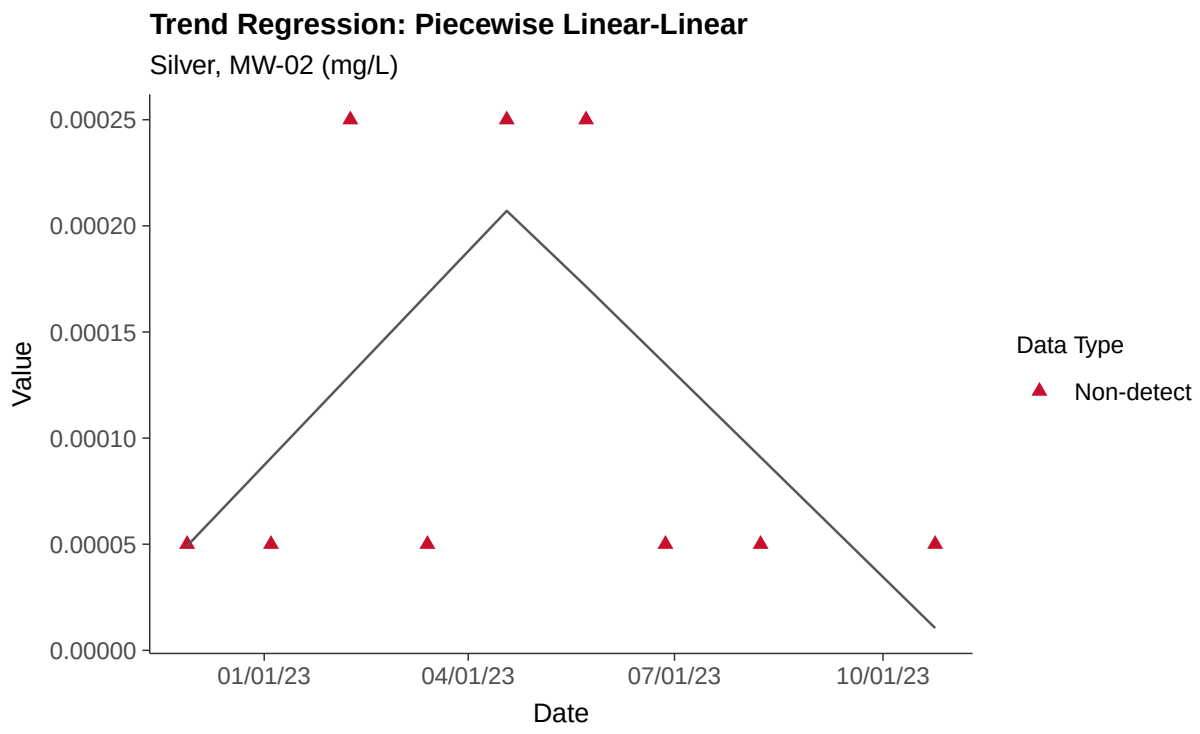
Silver, MW-02 (mg/L)

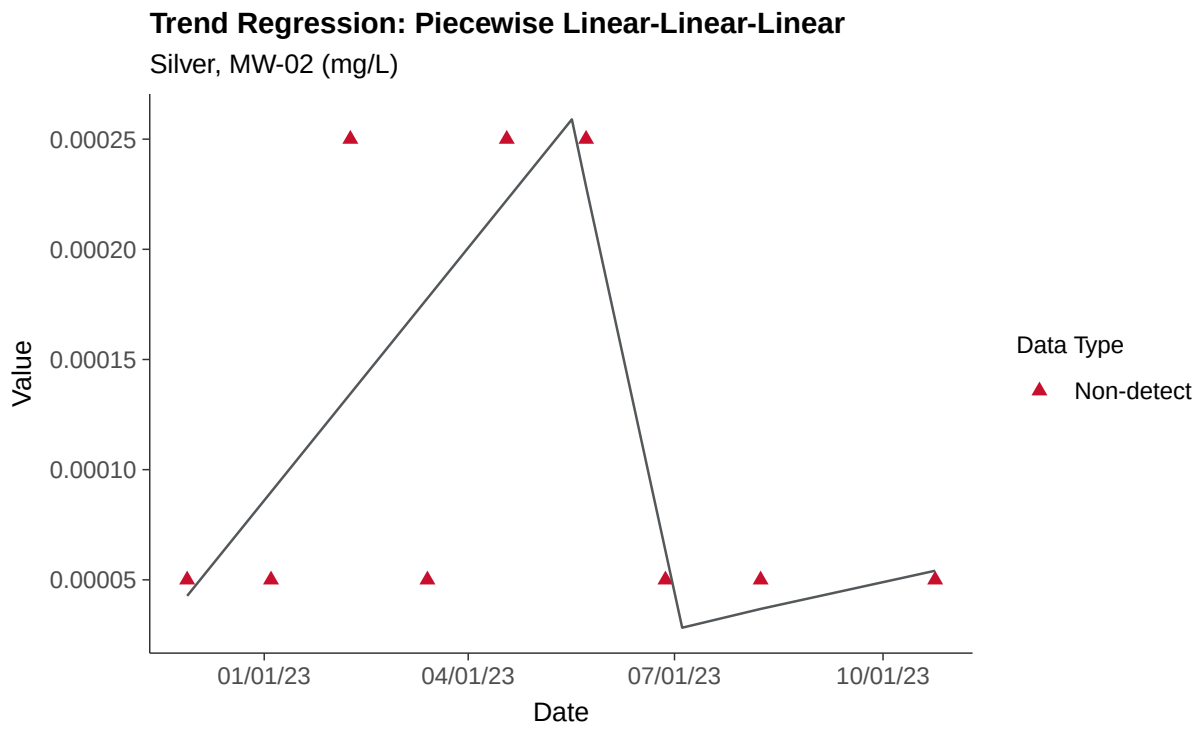


Boxplot by Season

Silver, MW-02 (mg/L)

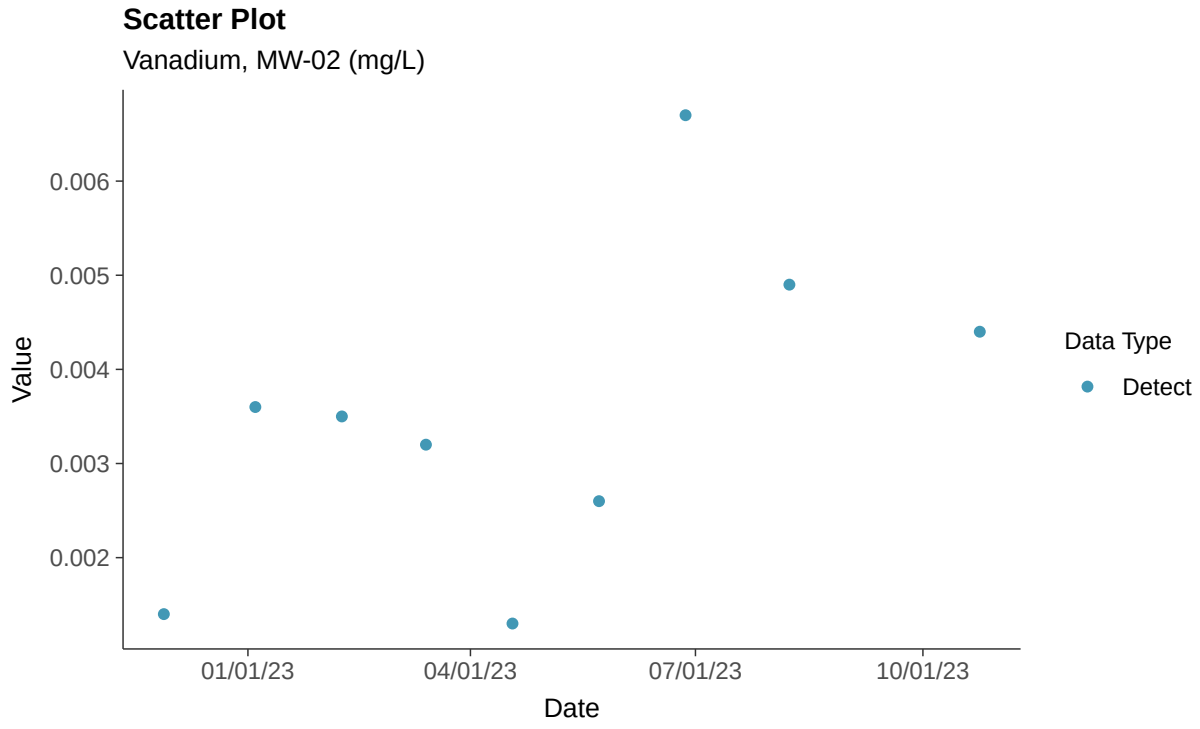


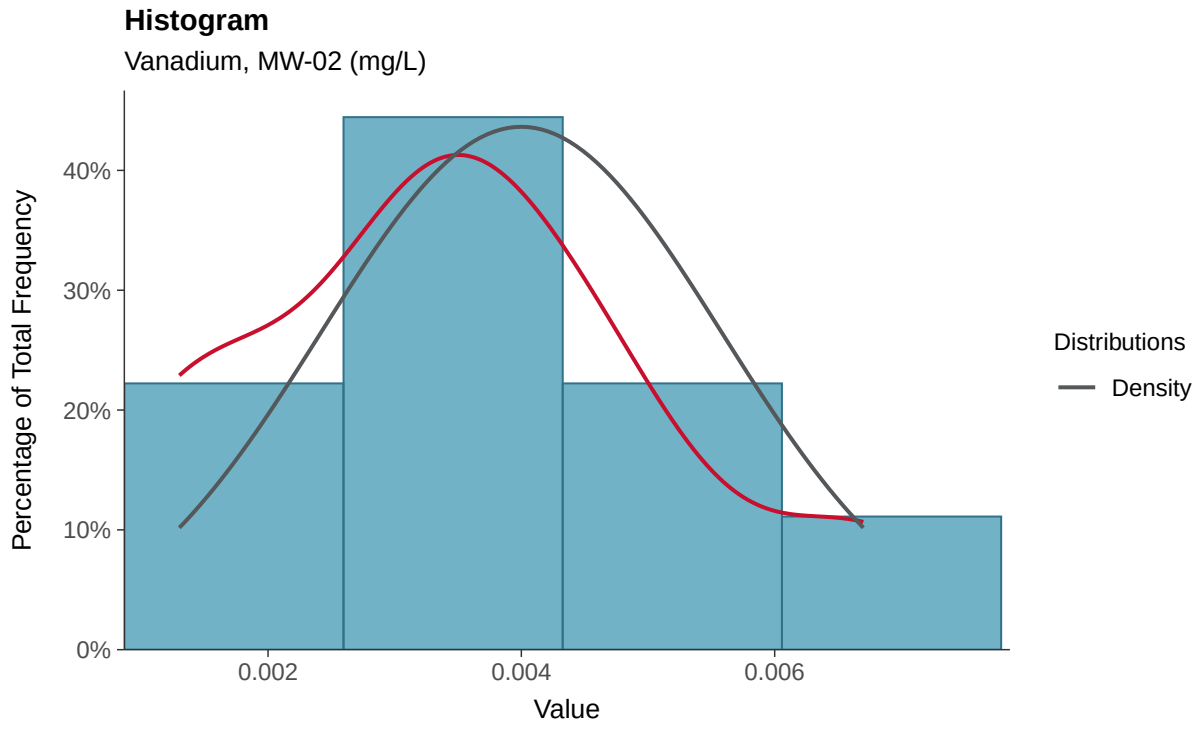

Trend Regression: Piecewise Linear-Linear
Silver, MW-02 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-02 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-02

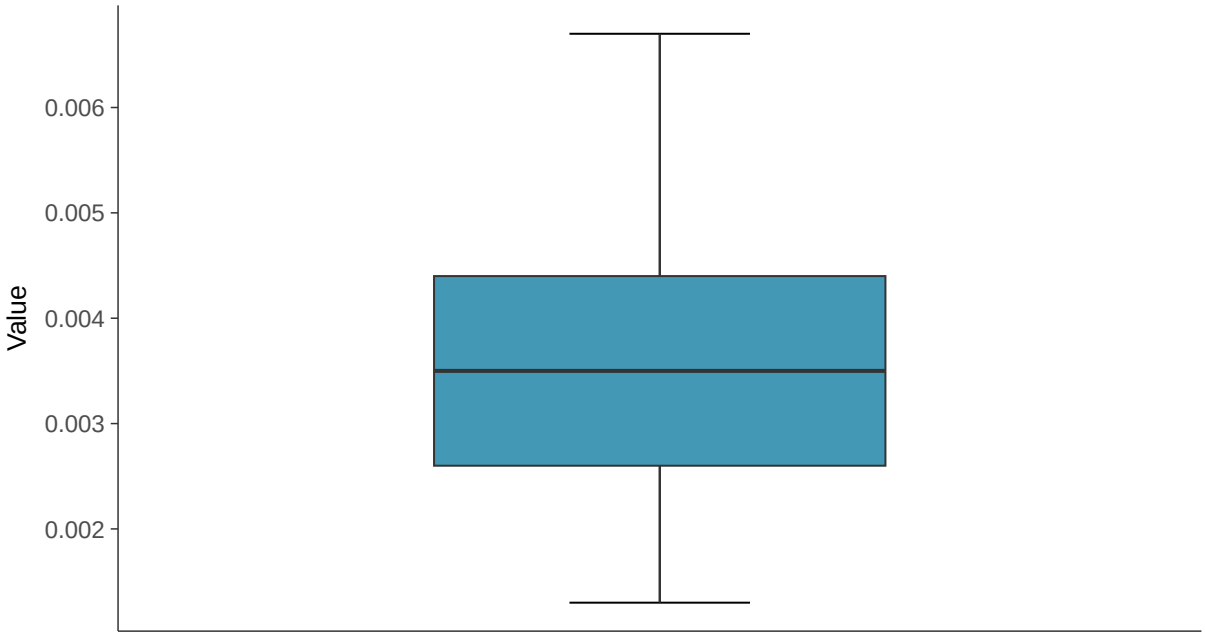
ID: 2_12_6_129





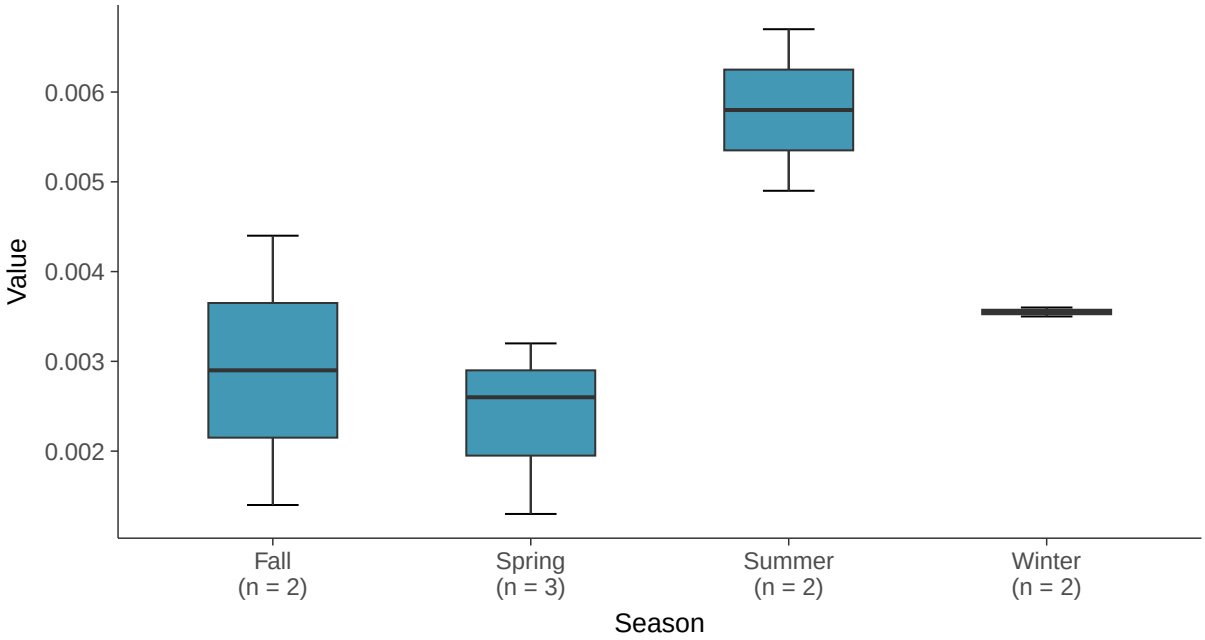
Boxplot

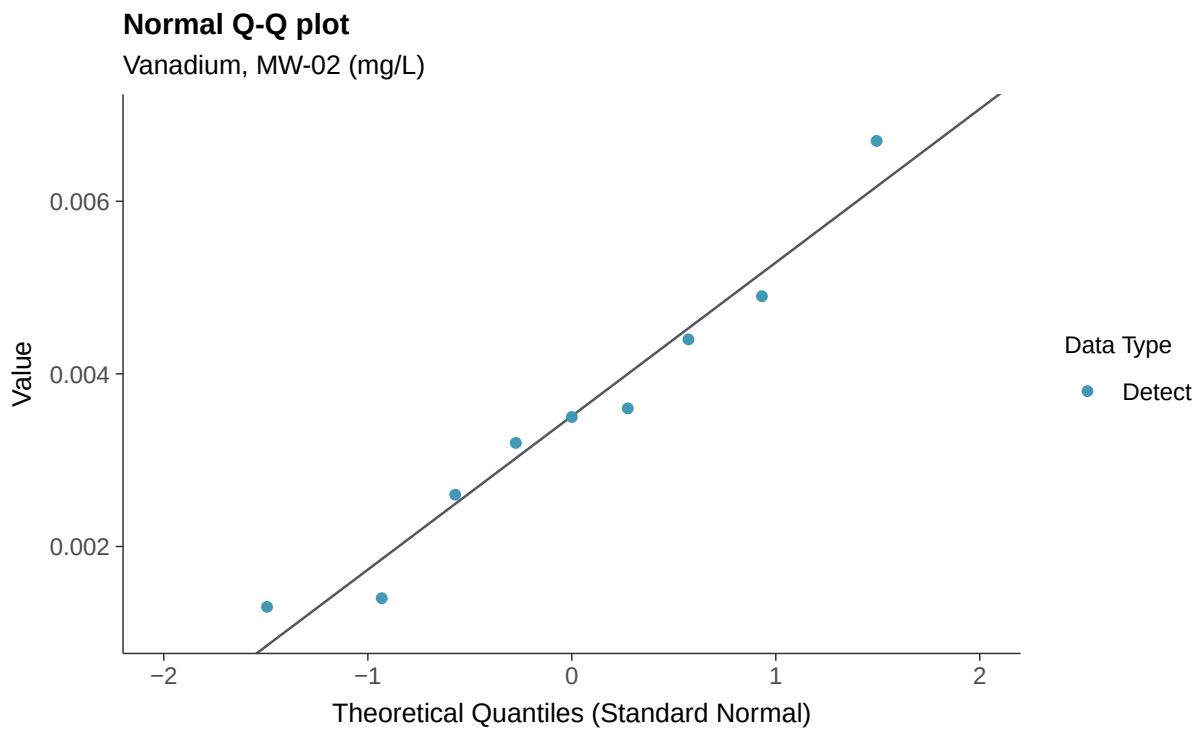
Vanadium, MW-02 (mg/L)

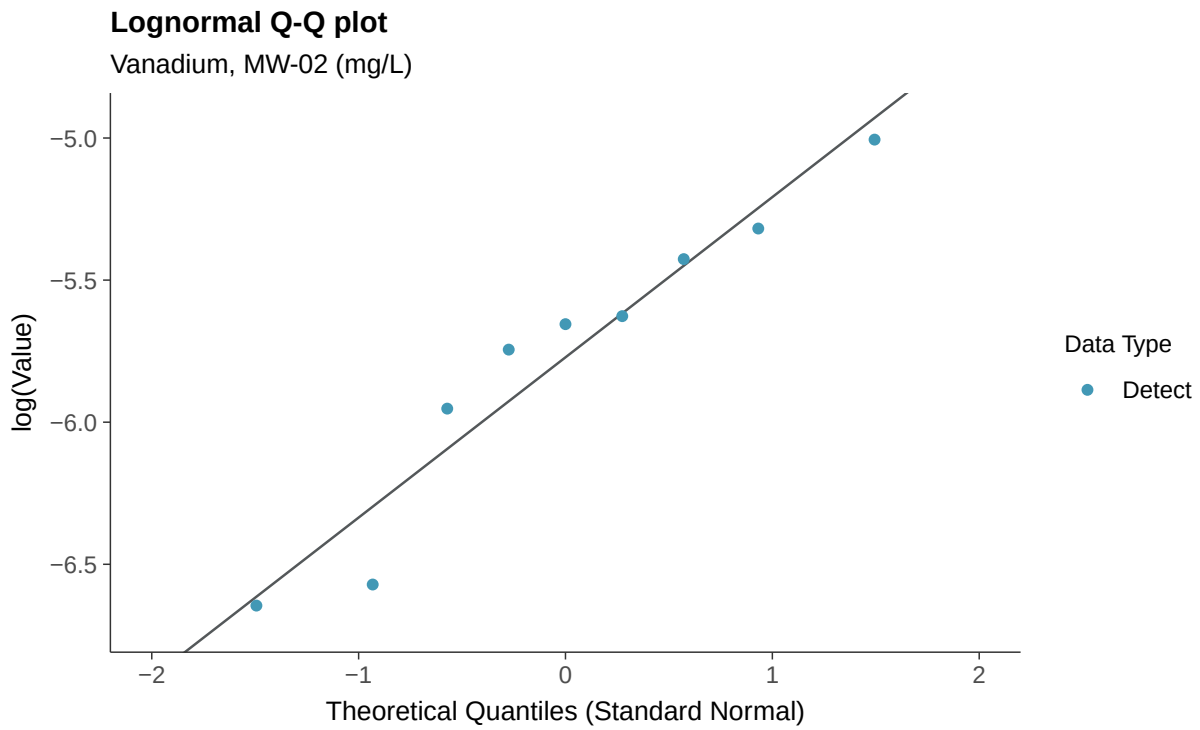


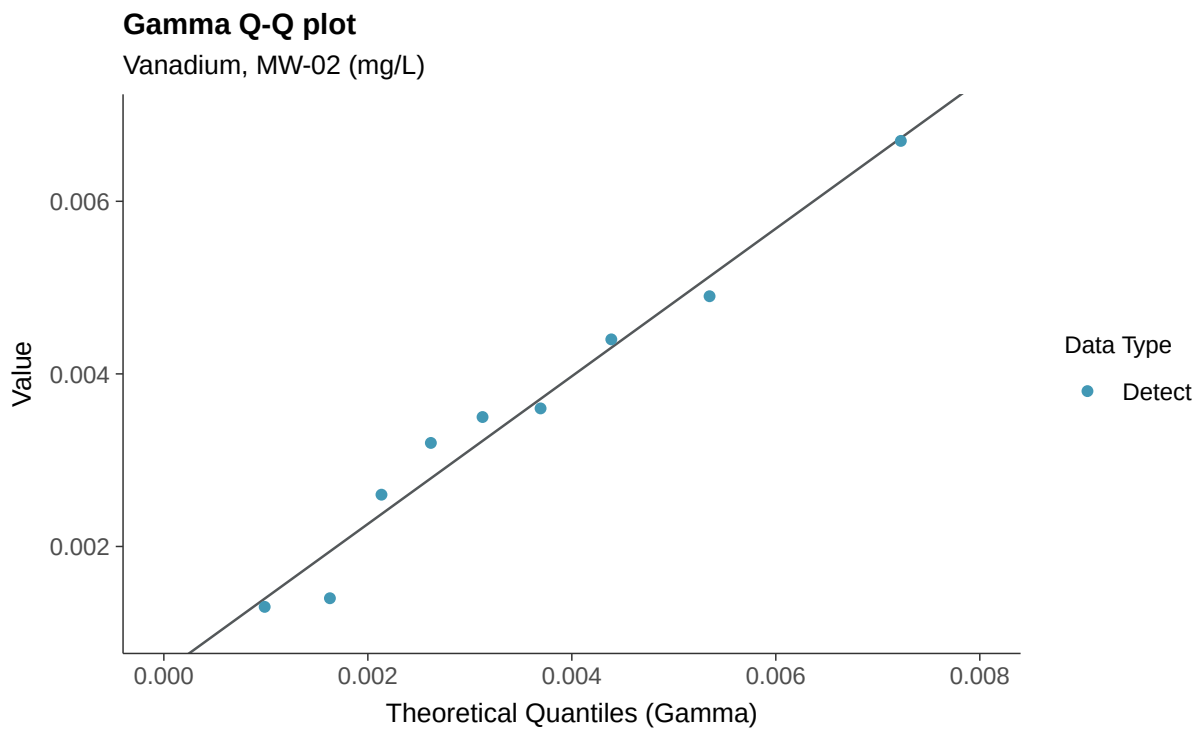
Boxplot by Season

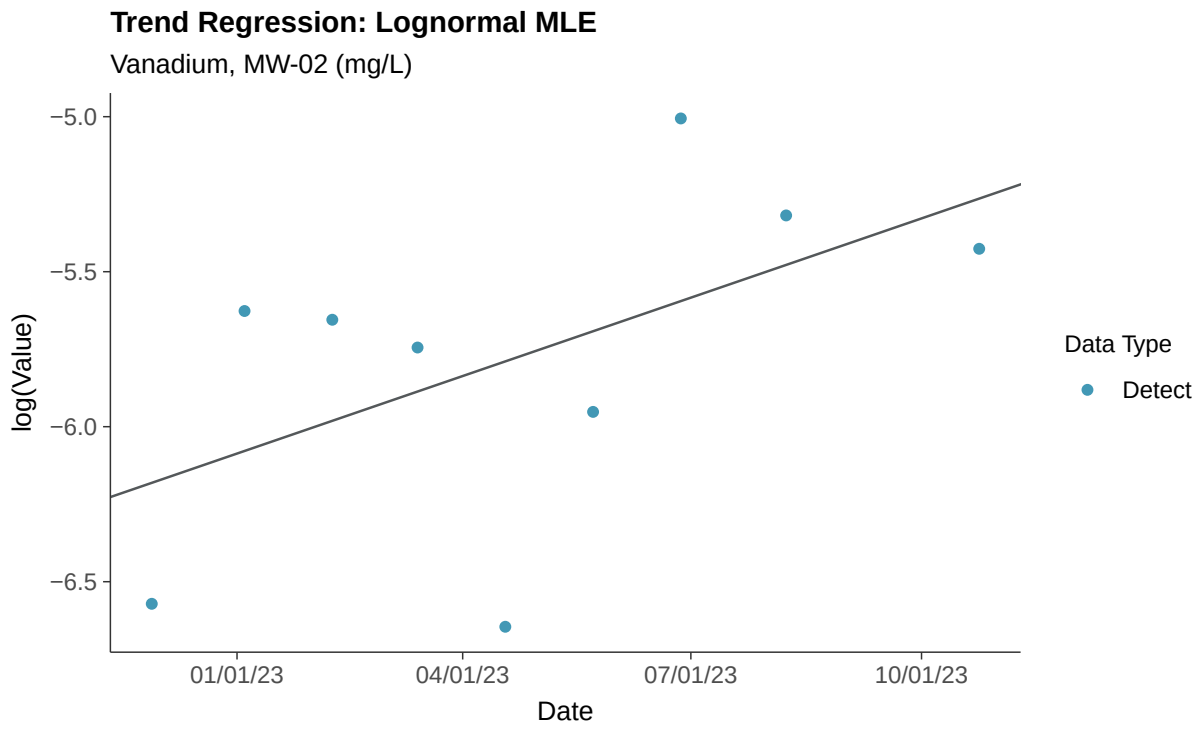
Vanadium, MW-02 (mg/L)

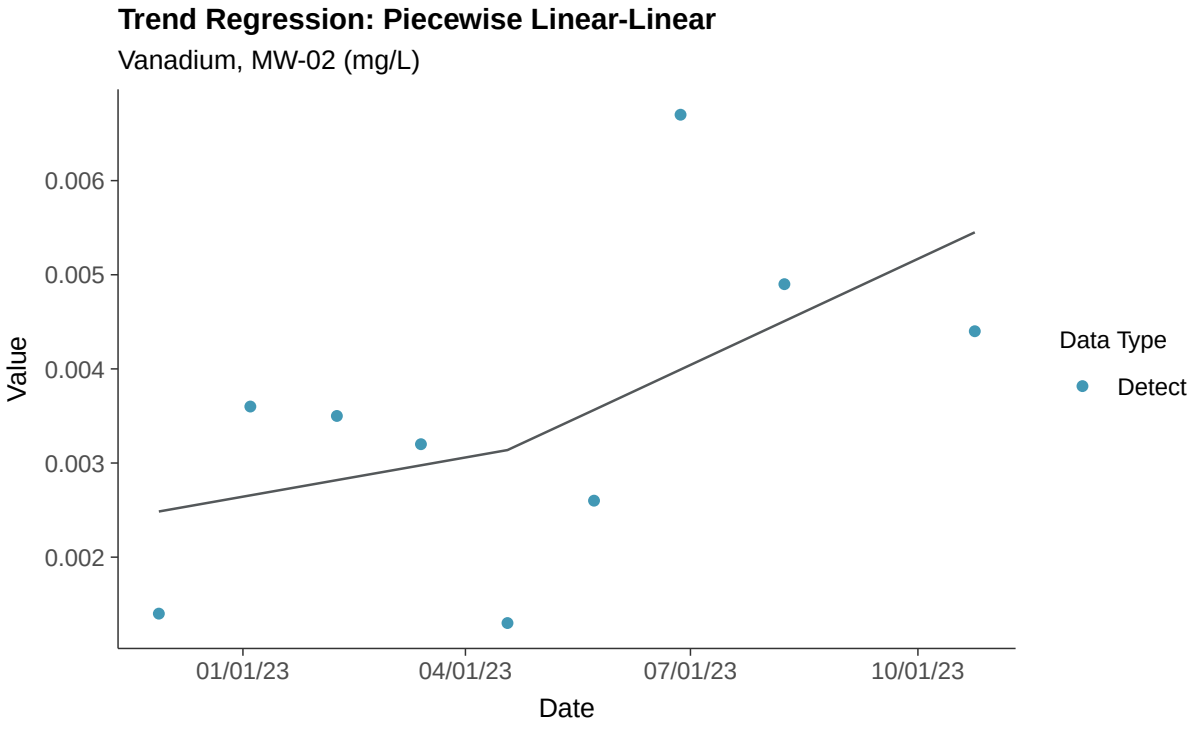



Normal Q-Q plot
Vanadium, MW-02 (mg/L)
Value
0.006
0.004
0.002
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Vanadium, MW-02 (mg/L)
log(Value)
−5.0
−5.5
−6.0
−6.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

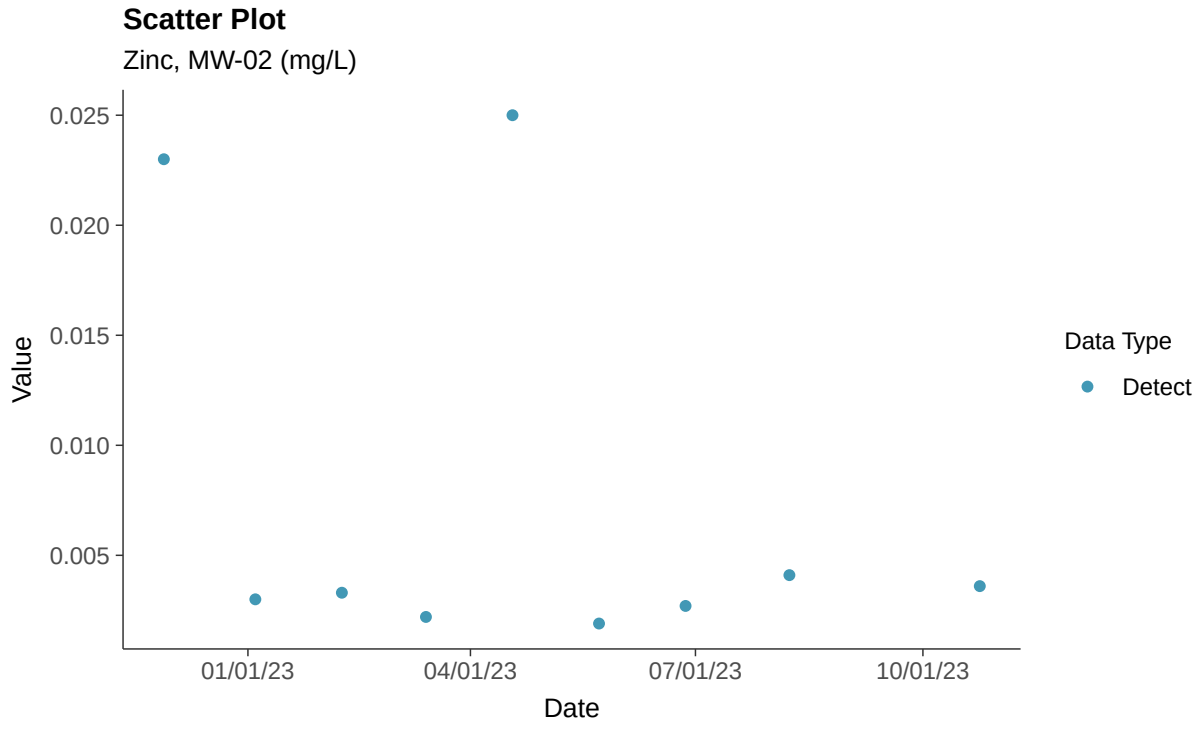

Gamma Q-Q plot
Vanadium, MW-02 (mg/L)
Value
0.006
0.004
0.002
0.000
0.002
0.004
0.006
0.008
Theoretical Quantiles (Gamma)
Data Type
Detect

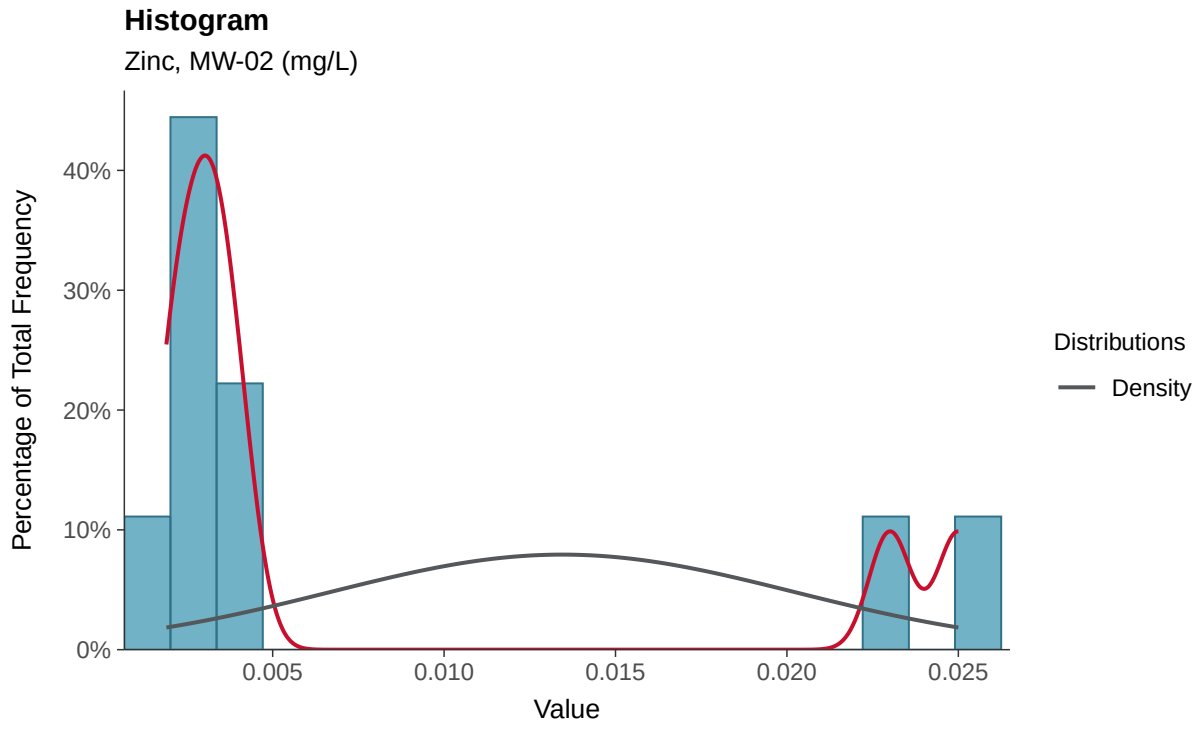

Trend Regression: Lognormal MLE
Vanadium, MW-02 (mg/L)
log(Value)
−5.0
−5.5
−6.0
−6.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Vanadium, MW-02 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Zinc, MW-02

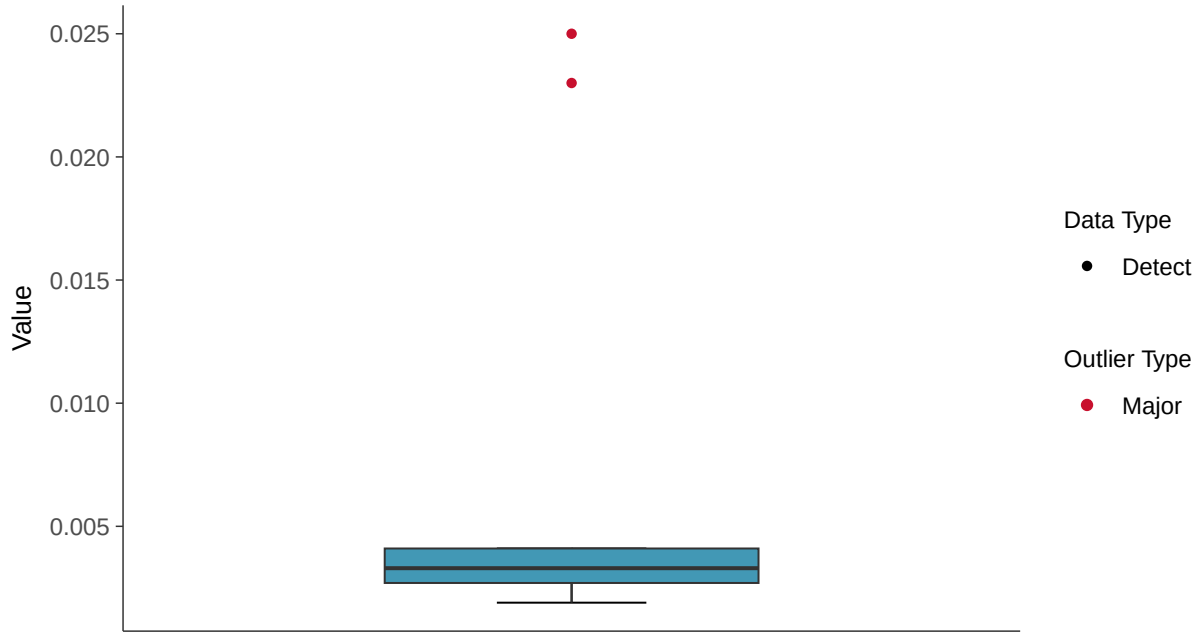
ID: 2_12_6_130





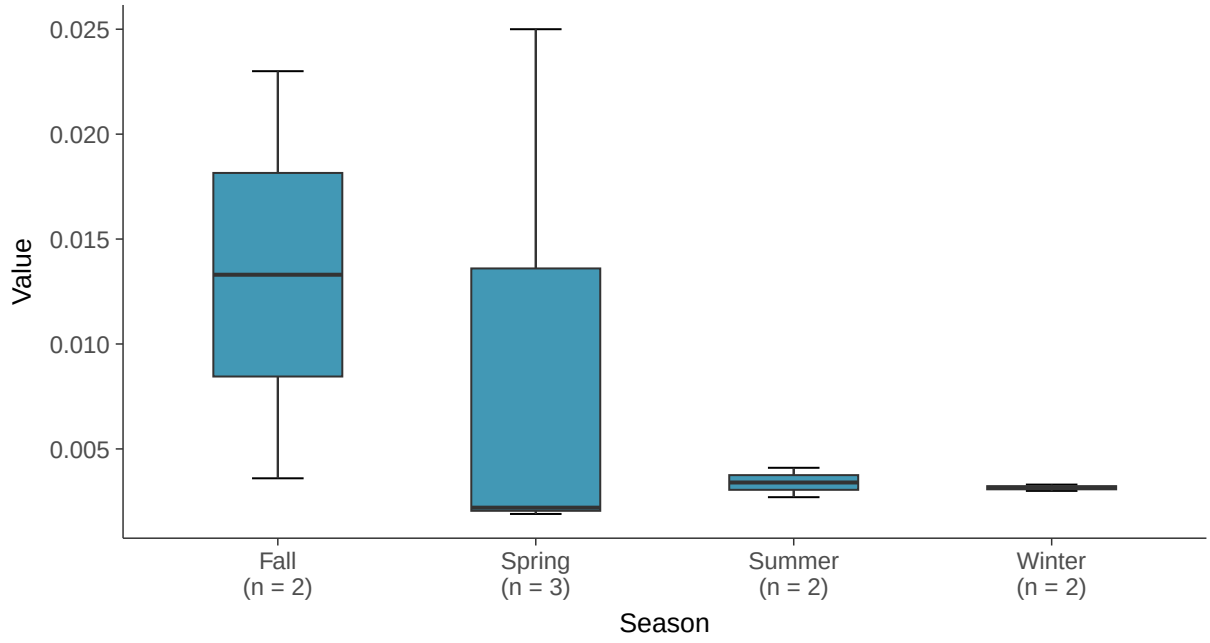
Boxplot

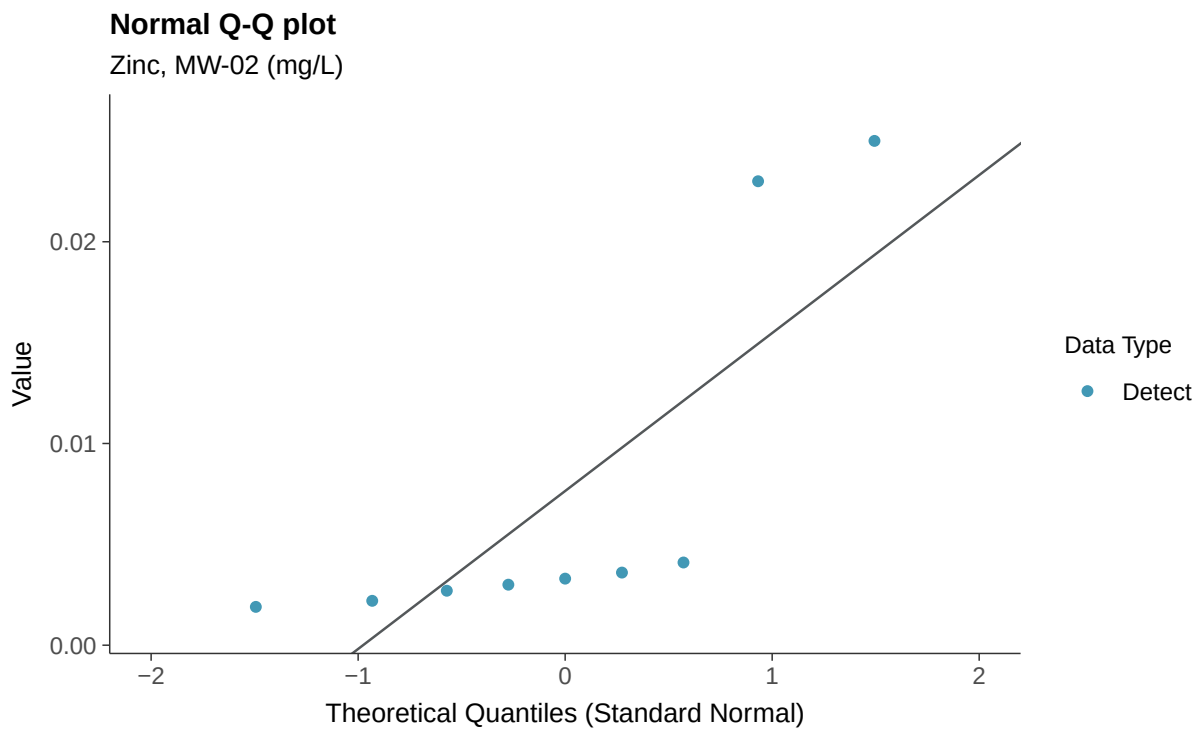
Zinc, MW-02 (mg/L)

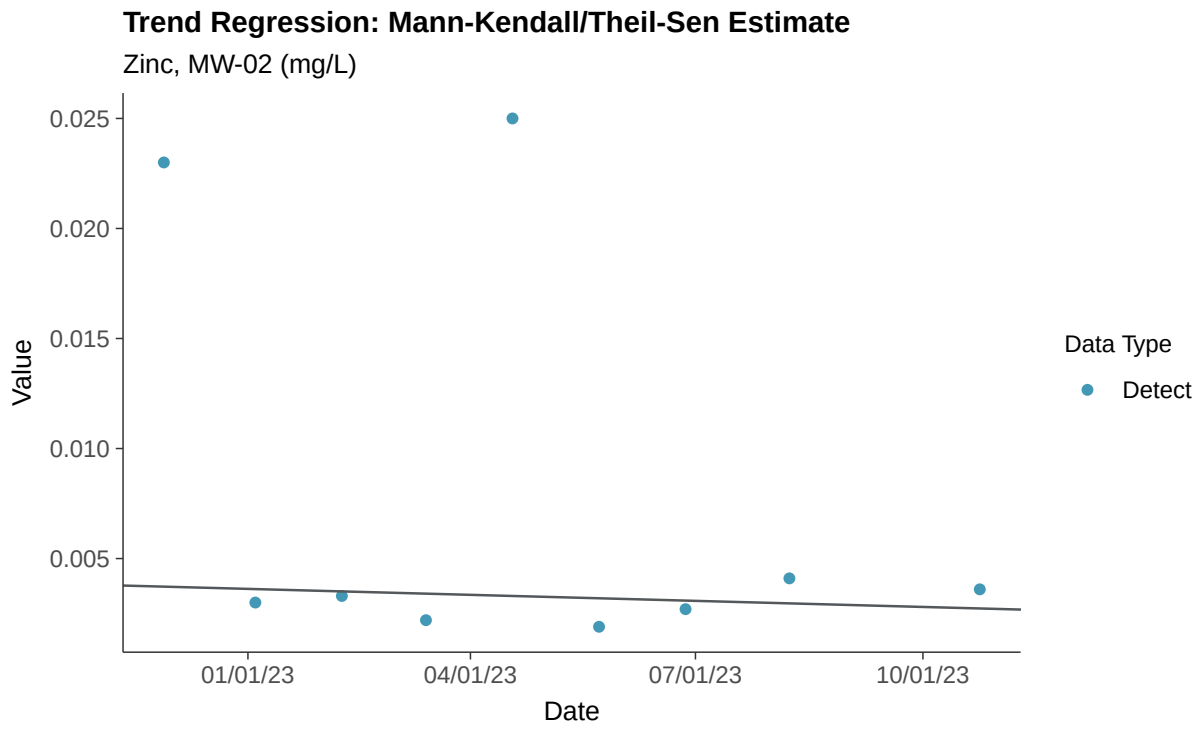


Boxplot by Season

Zinc, MW-02 (mg/L)

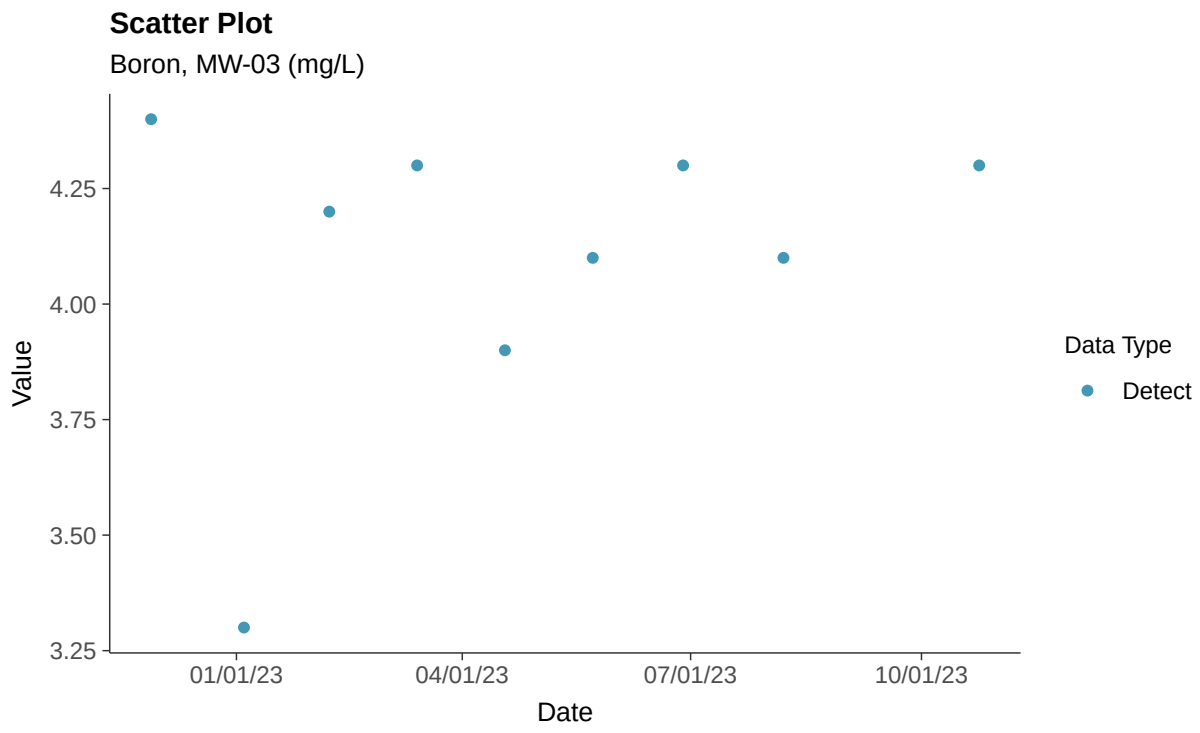


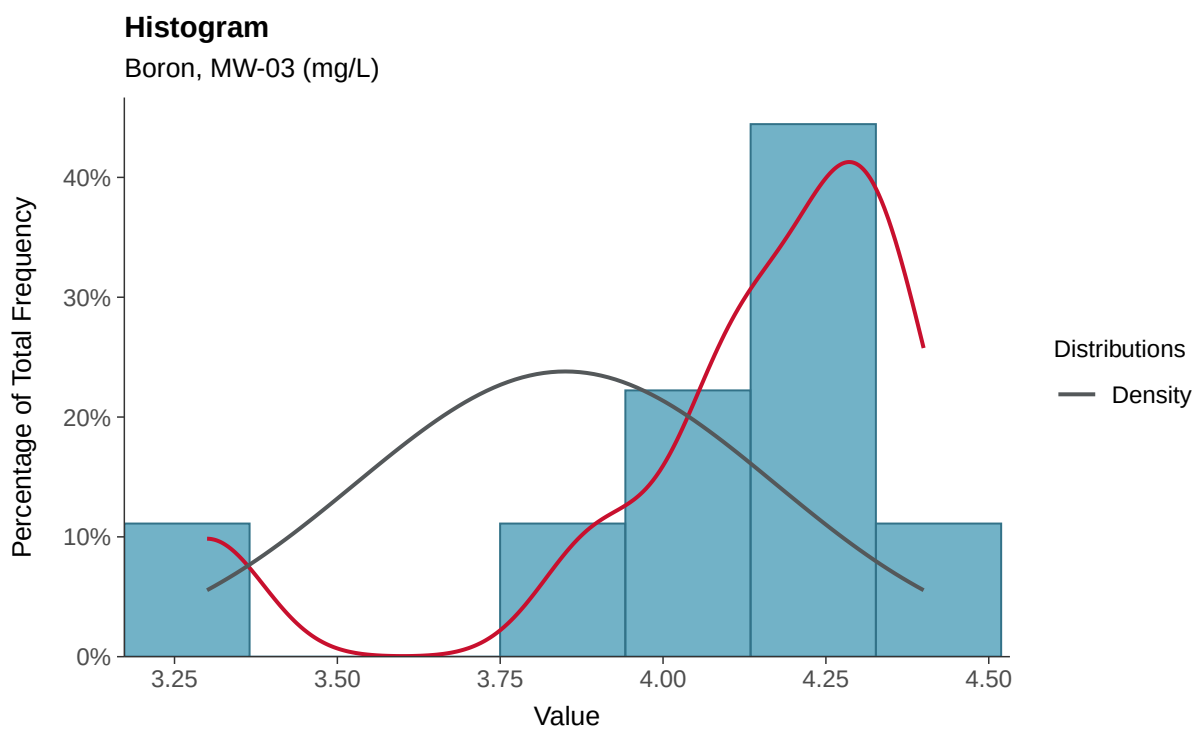

Normal Q-Q plot
Zinc, MW-02 (mg/L)
Value
0.02
0.01
0.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Zinc, MW-02 (mg/L)
Value
0.025
0.020
0.015
0.010
0.005
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Boron, MW-03

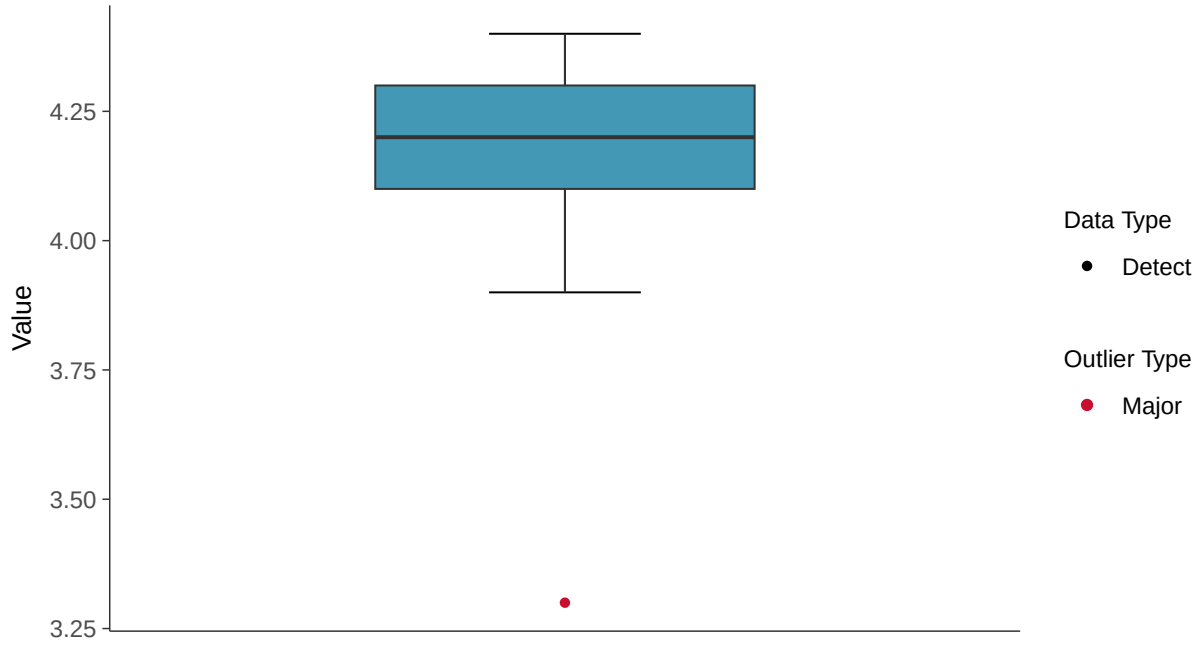
ID: 2_13_4_105





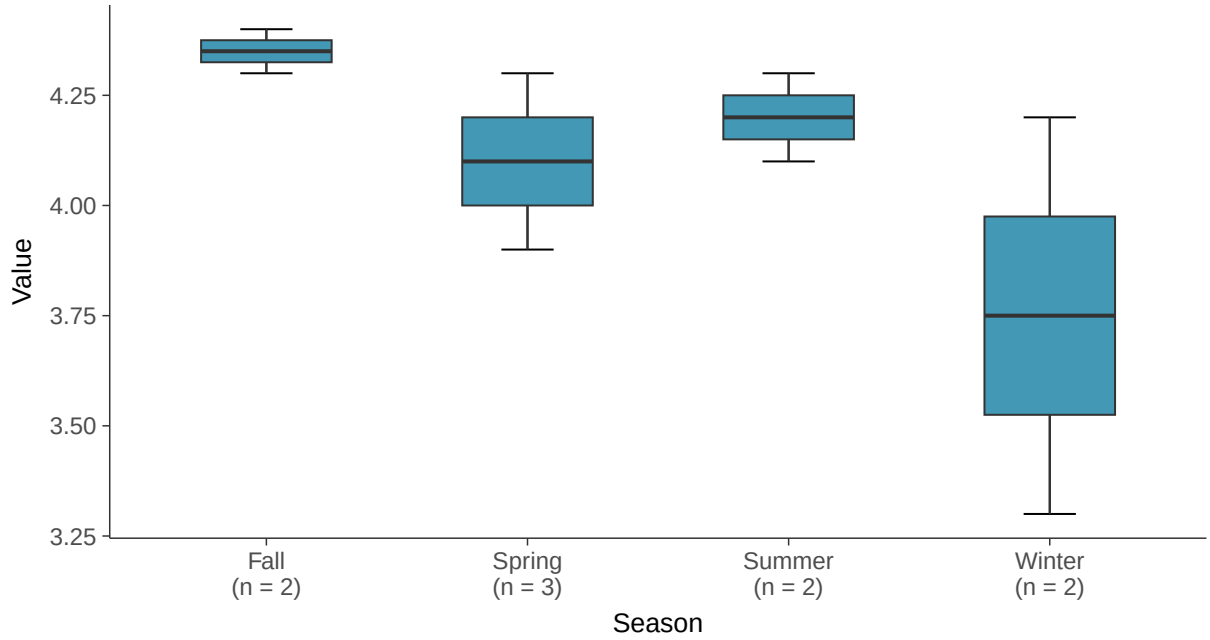
Boxplot

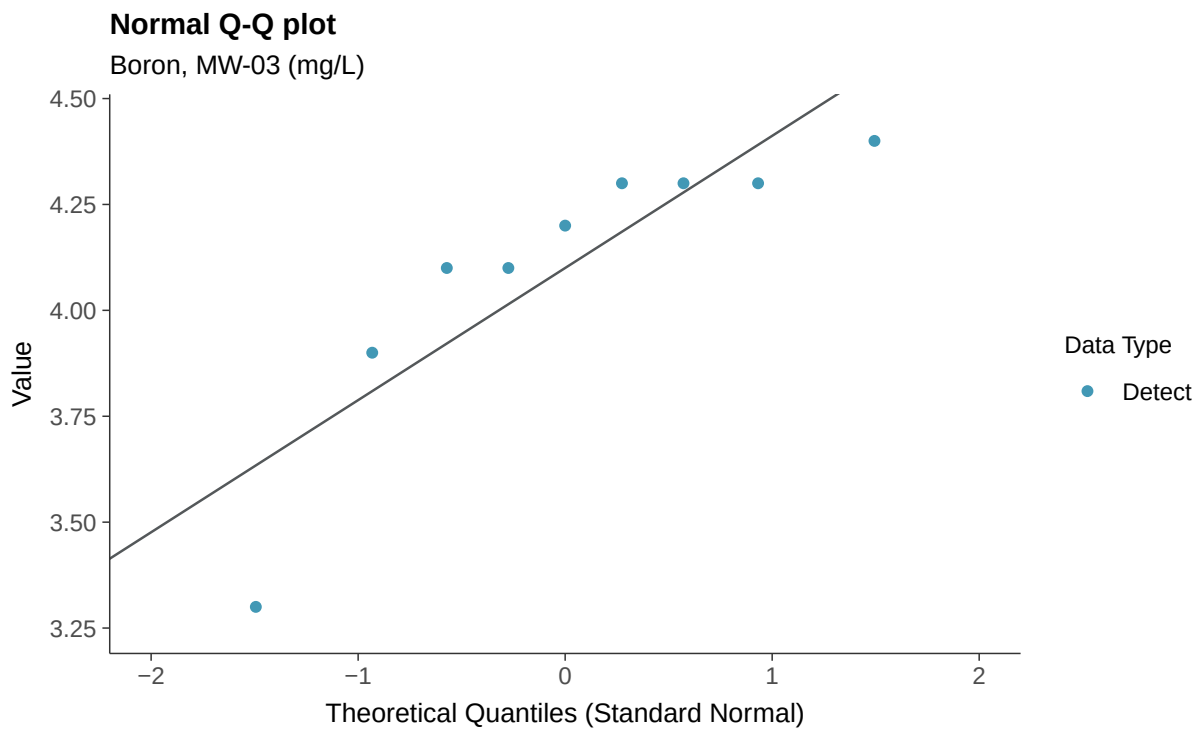
Boron, MW-03 (mg/L)

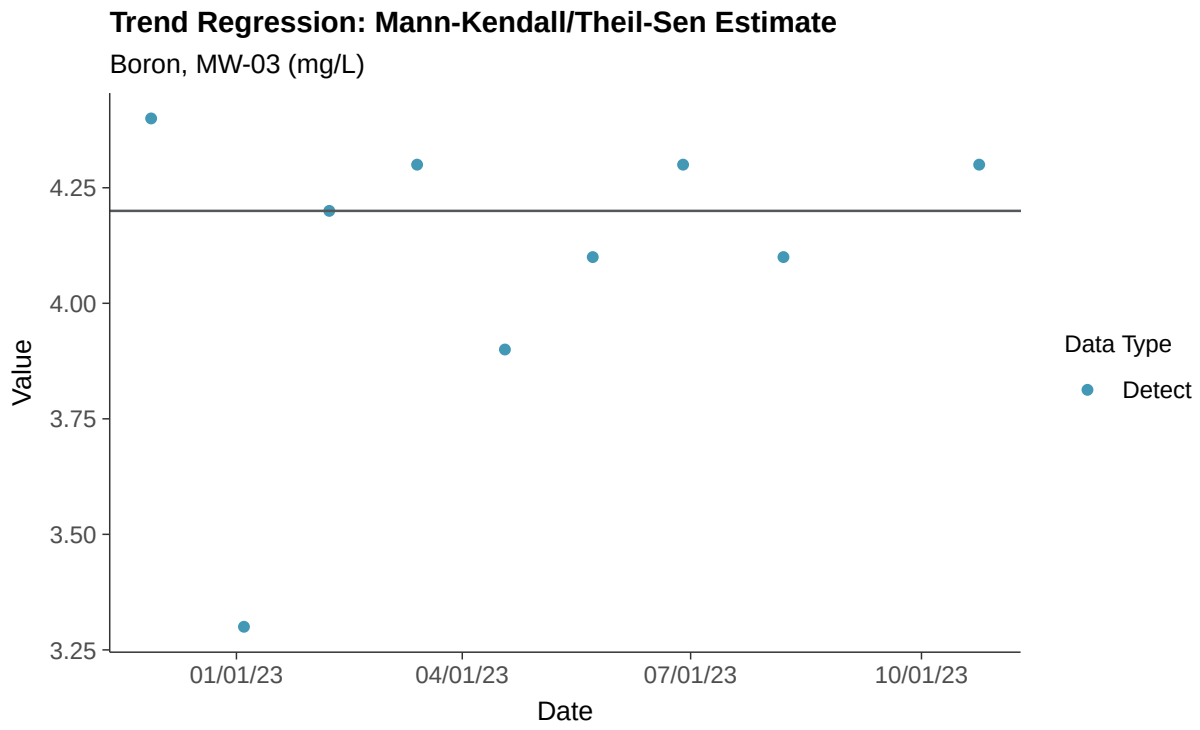


Boxplot by Season

Boron, MW-03 (mg/L)

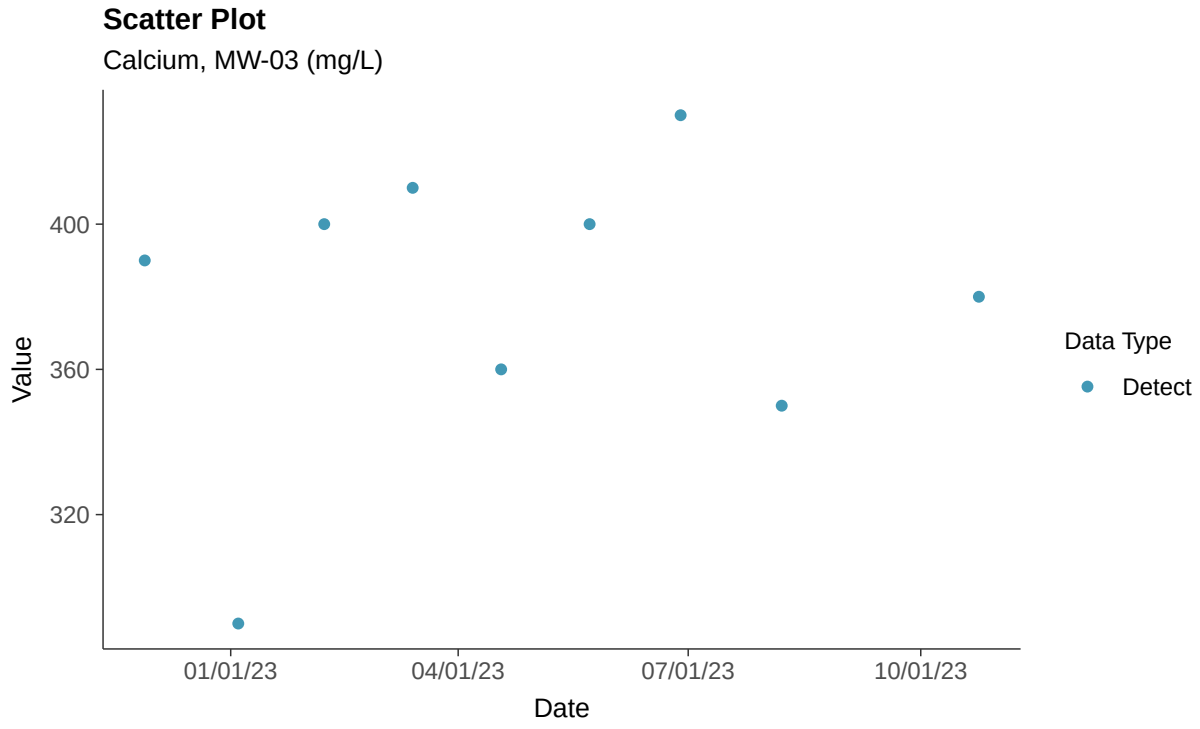


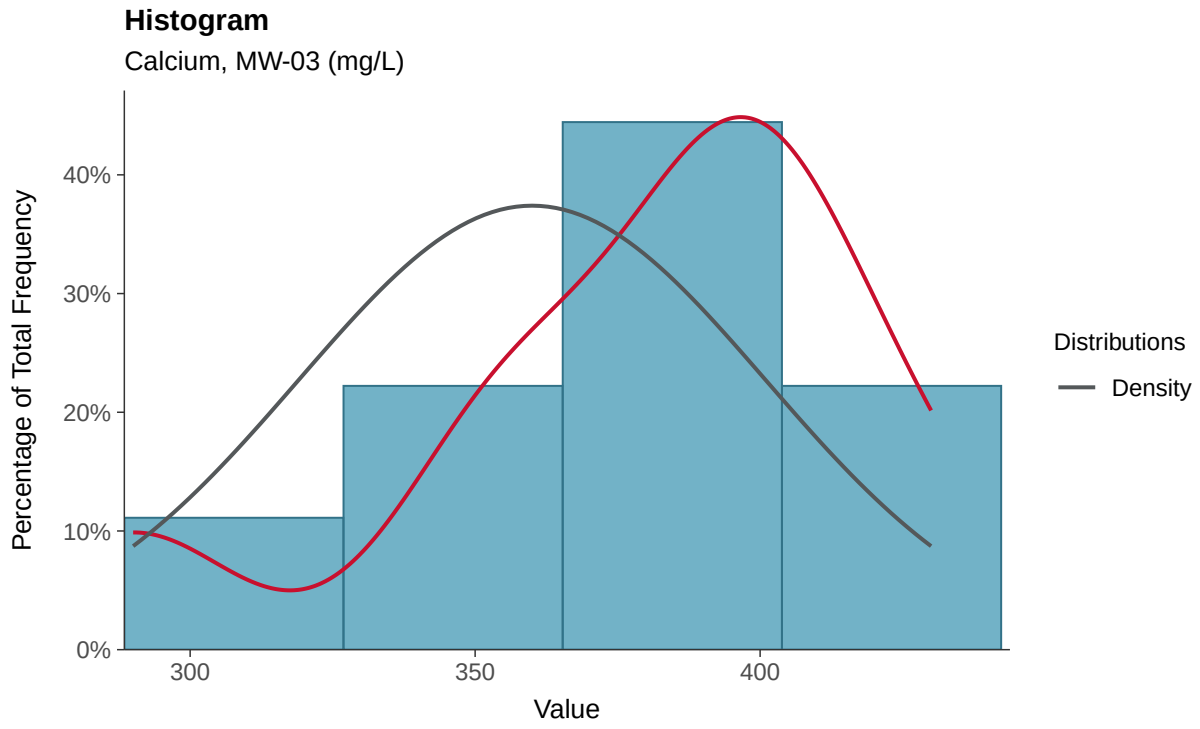

Normal Q-Q plot
Boron, MW-03 (mg/L)
Value
4.50
4.25
4.00
3.75
3.50
3.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Boron, MW-03 (mg/L)
Value
4.25
4.00
3.75
3.50
3.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-03

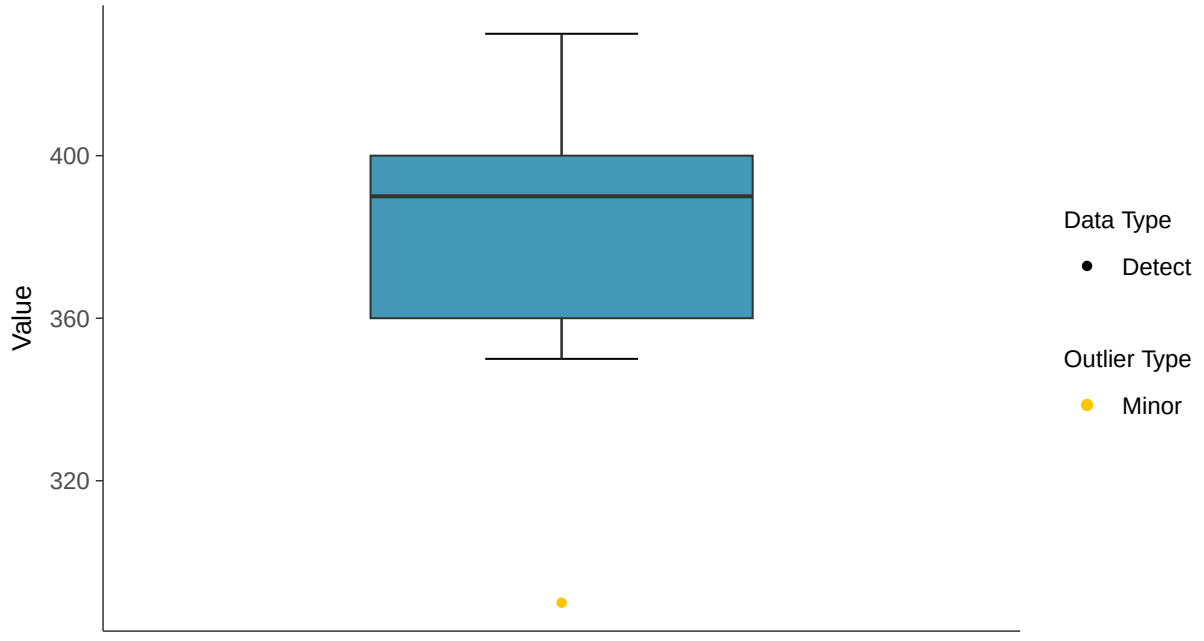
ID: 2_13_4_107





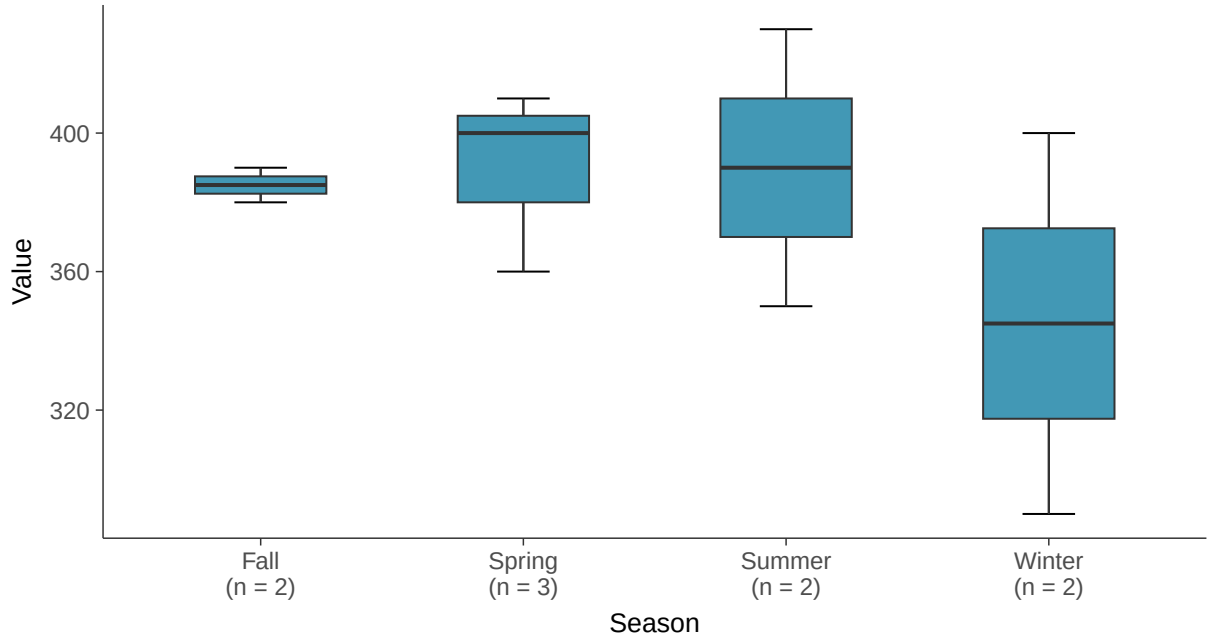
Boxplot

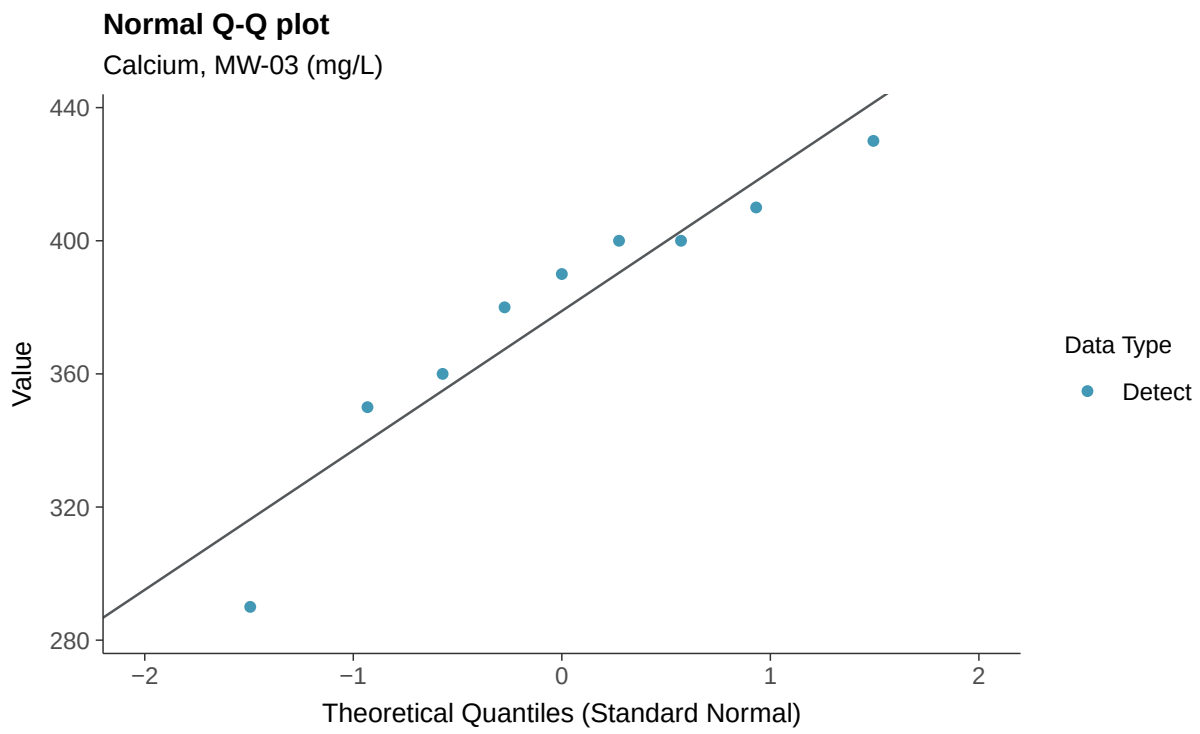
Calcium, MW-03 (mg/L)

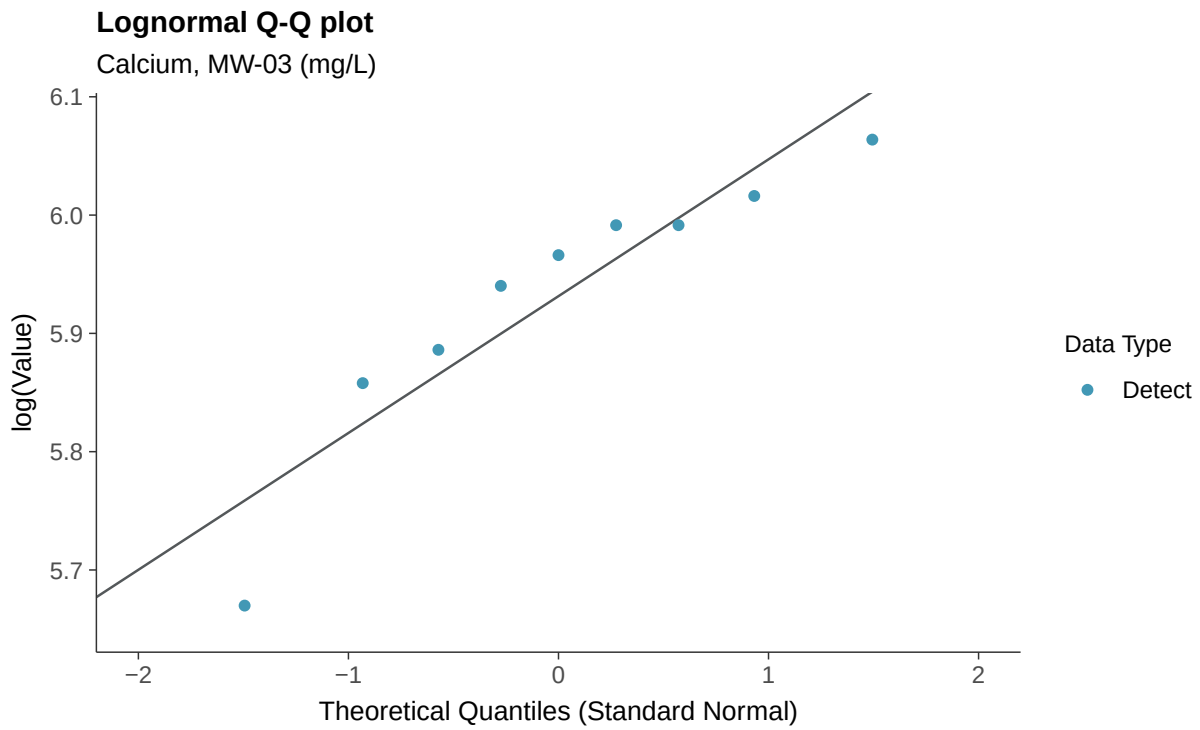


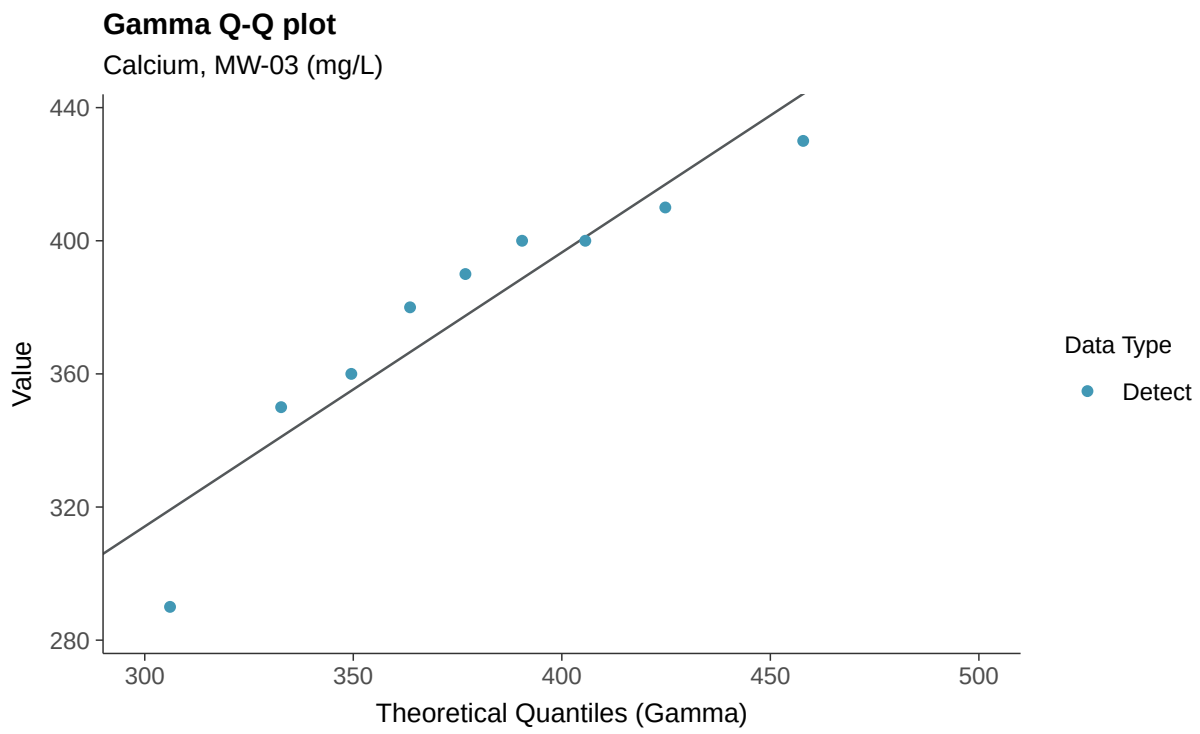
Boxplot by Season

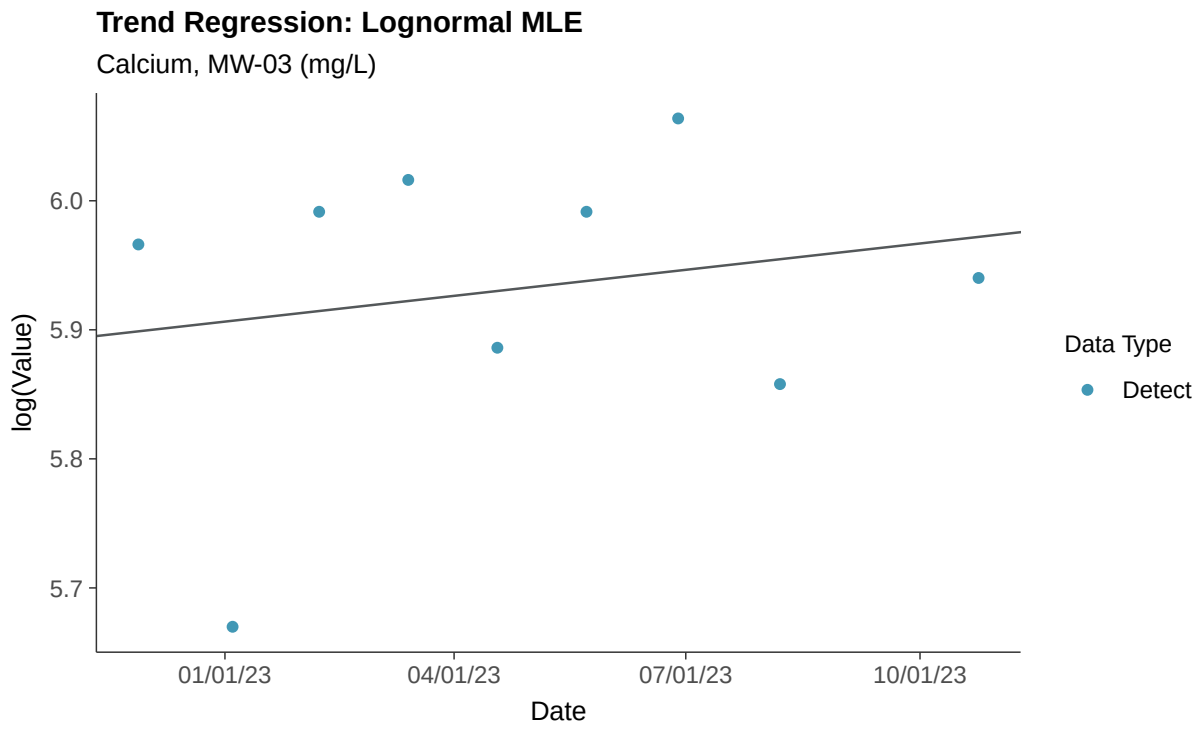
Calcium, MW-03 (mg/L)

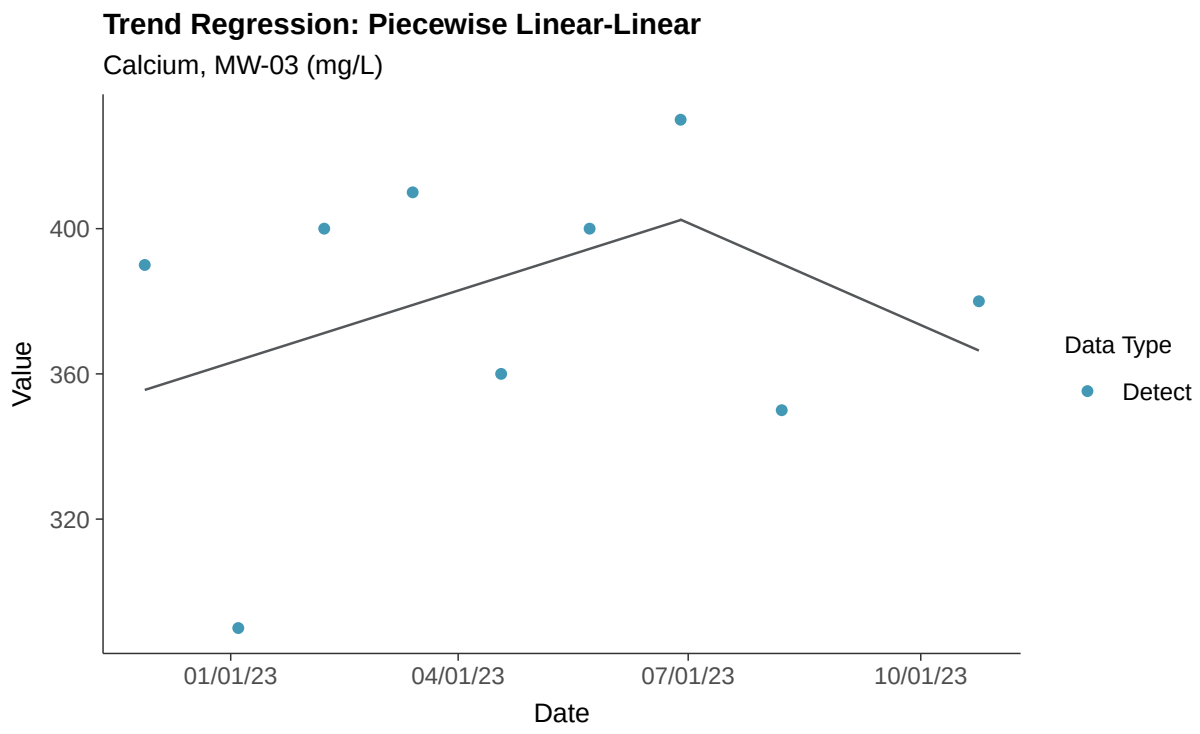



Normal Q-Q plot
Calcium, MW-03 (mg/L)
Value
440
400
360
320
280
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Calcium, MW-03 (mg/L)
log(Value)
6.1
6.0
5.9
5.8
5.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

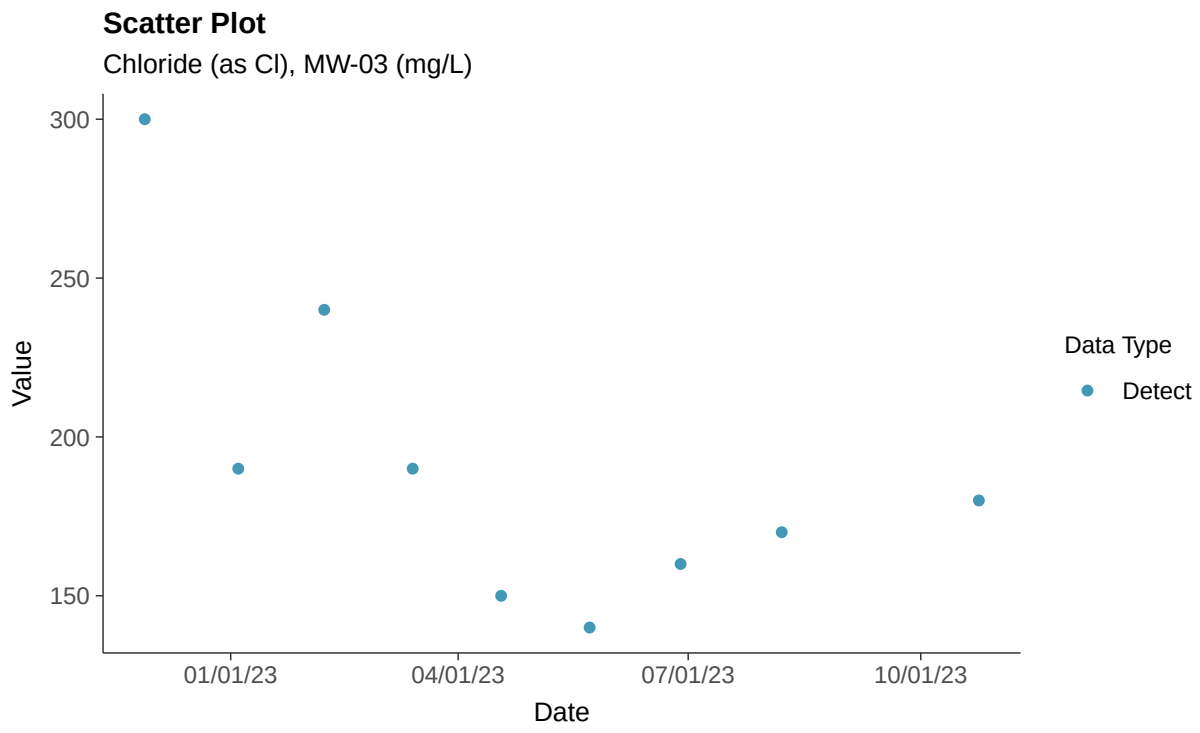

Gamma Q-Q plot
Calcium, MW-03 (mg/L)
Value
440
400
360
320
280
300
350
400
450
500
Theoretical Quantiles (Gamma)
Data Type
Detect

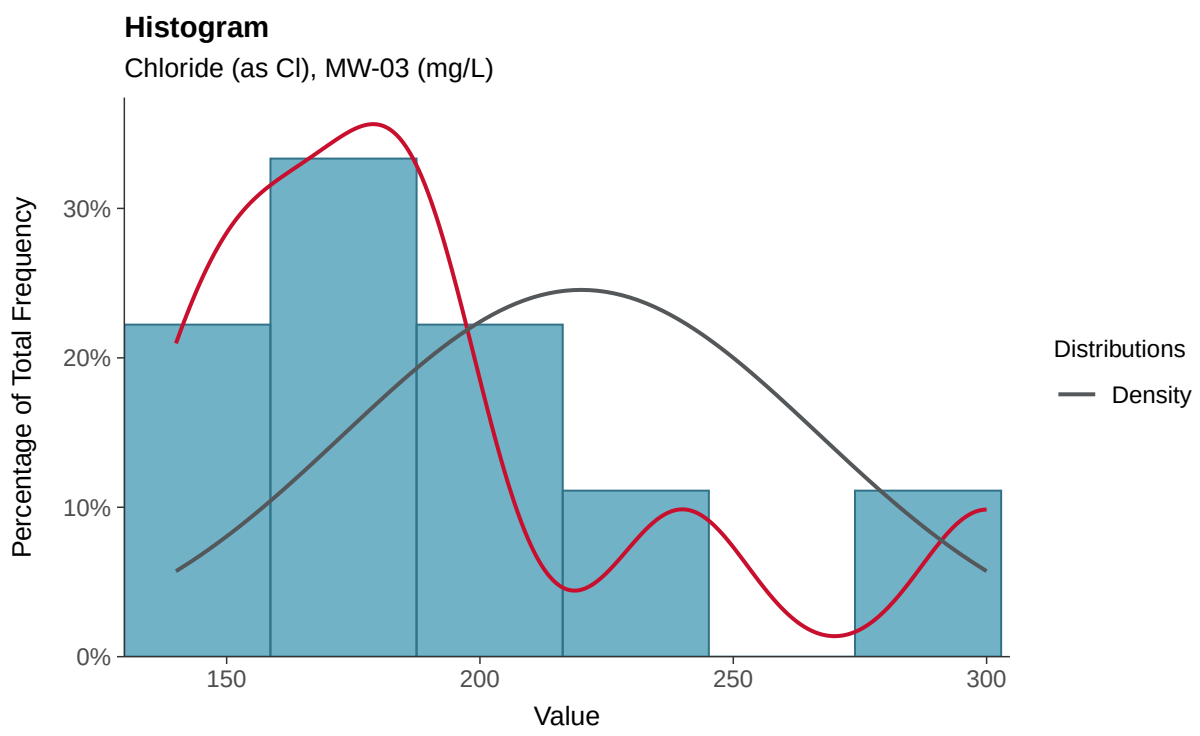

Trend Regression: Lognormal MLE
Calcium, MW-03 (mg/L)
log(Value)
6.0
5.9
5.8
5.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Calcium, MW-03 (mg/L)
Value
400
360
320
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-03

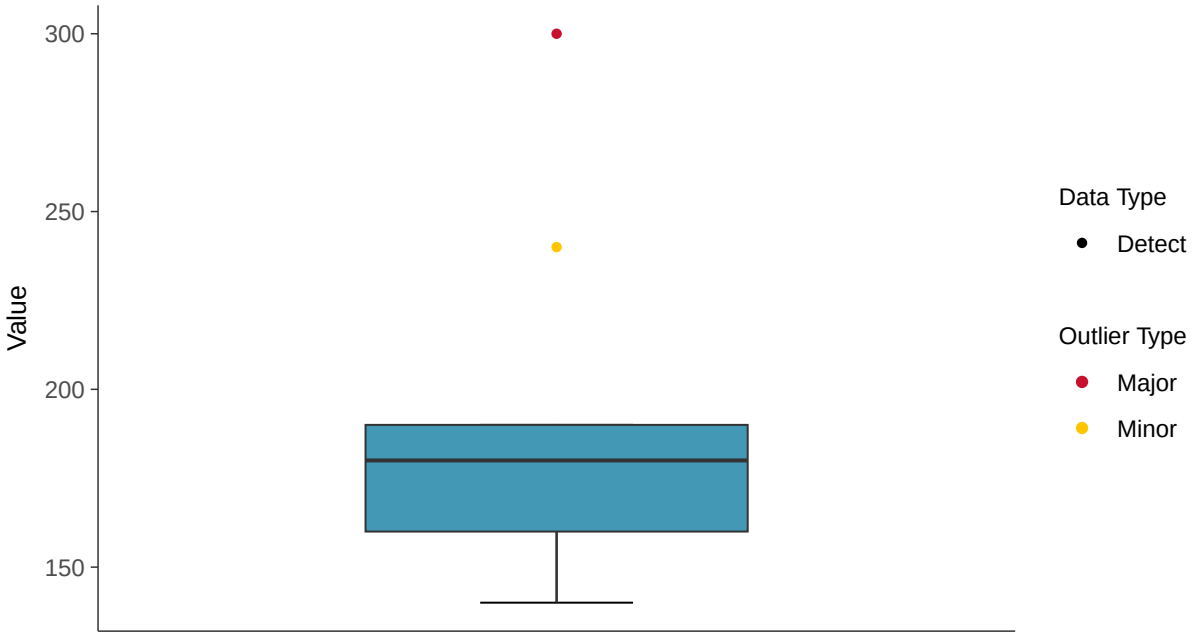
ID: 2_13_4_108





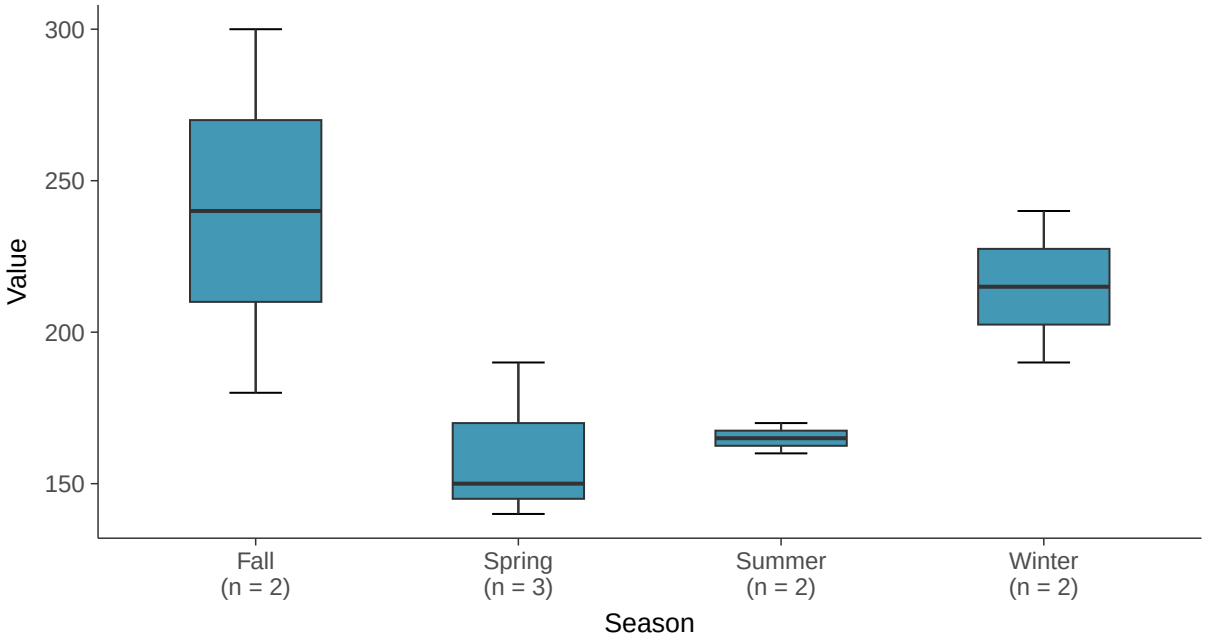
Boxplot

Chloride (as Cl), MW-03 (mg/L)



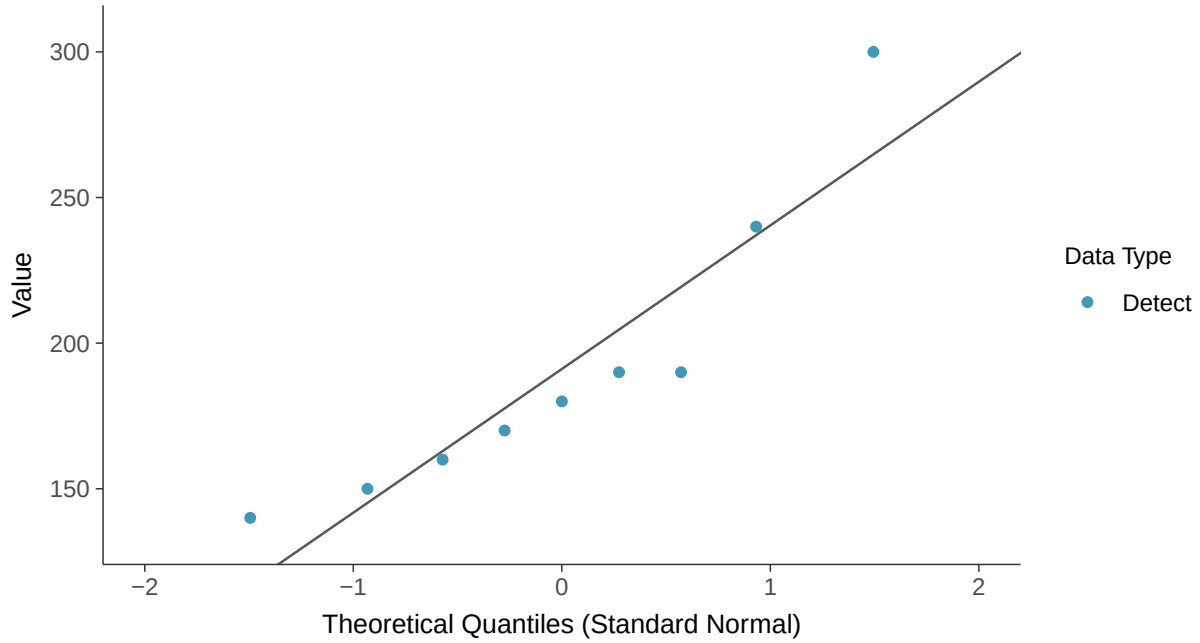
Boxplot by Season

Chloride (as Cl), MW-03 (mg/L)



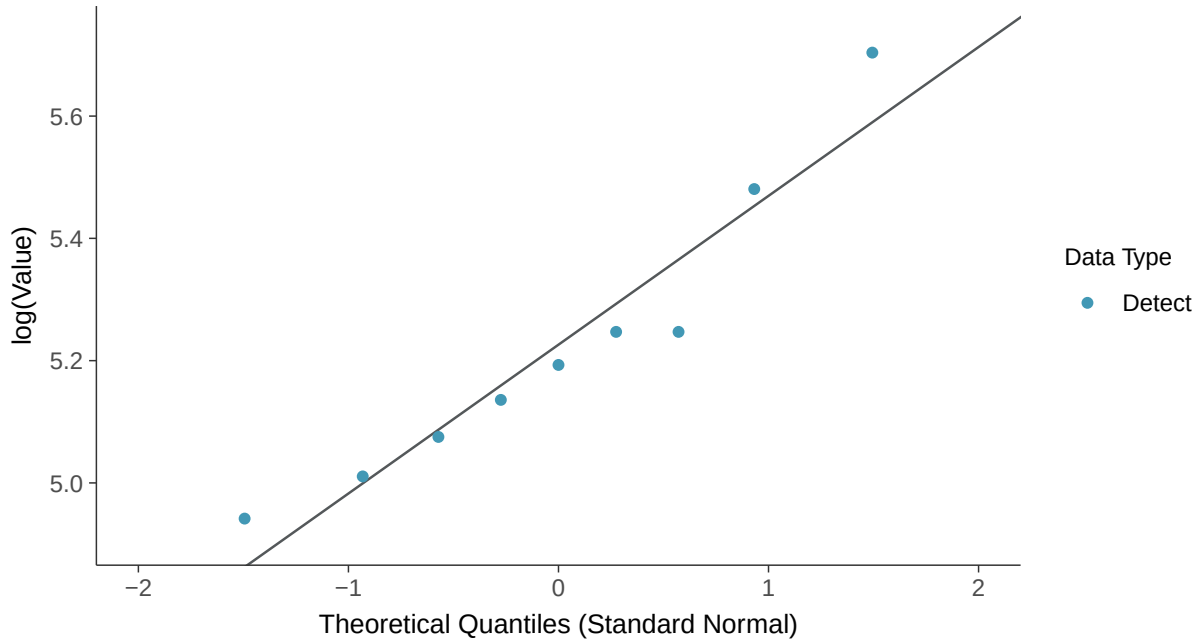
Normal Q-Q plot

Chloride (as Cl), MW-03 (mg/L)



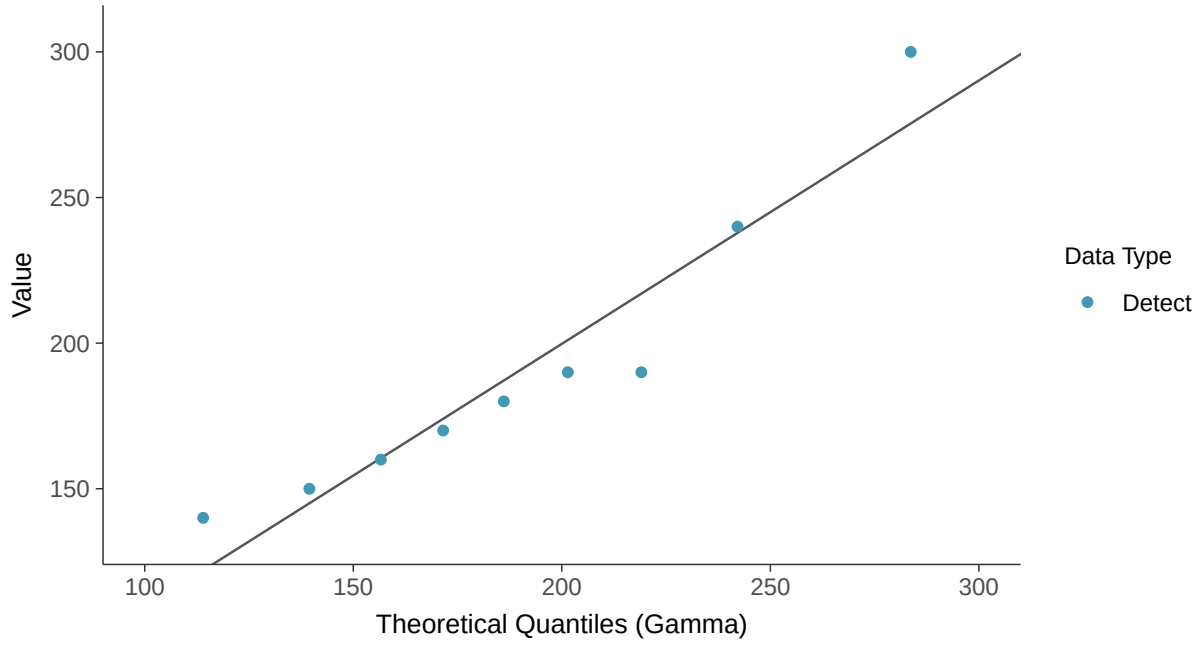
Lognormal Q-Q plot

Chloride (as Cl), MW-03 (mg/L)



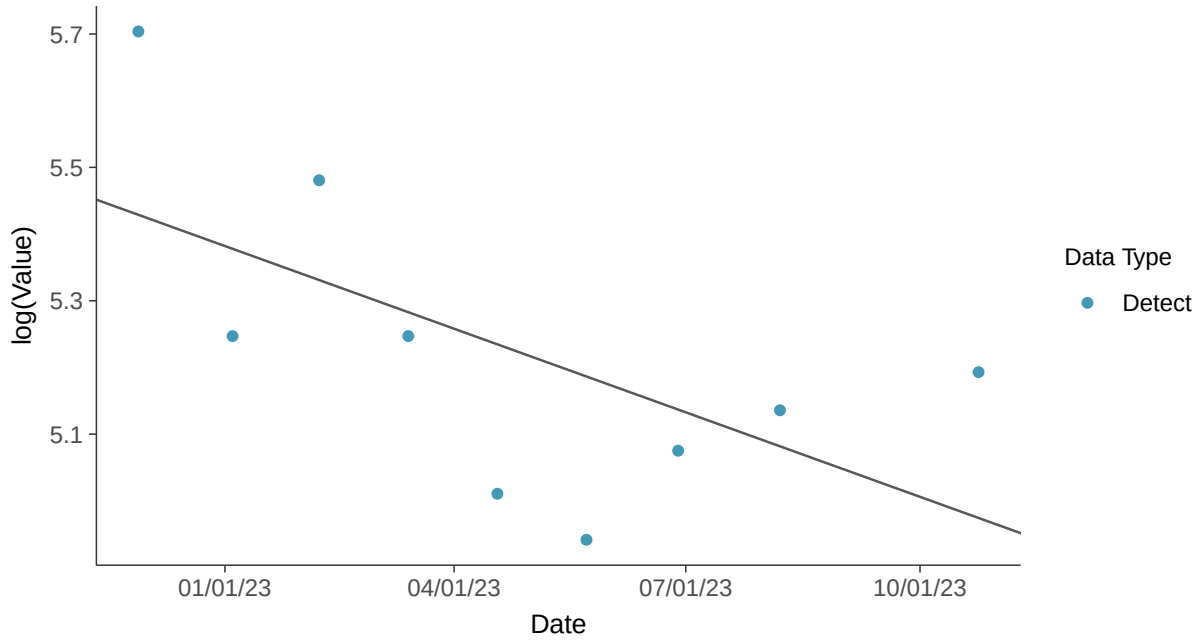
Gamma Q-Q plot

Chloride (as Cl), MW-03 (mg/L)



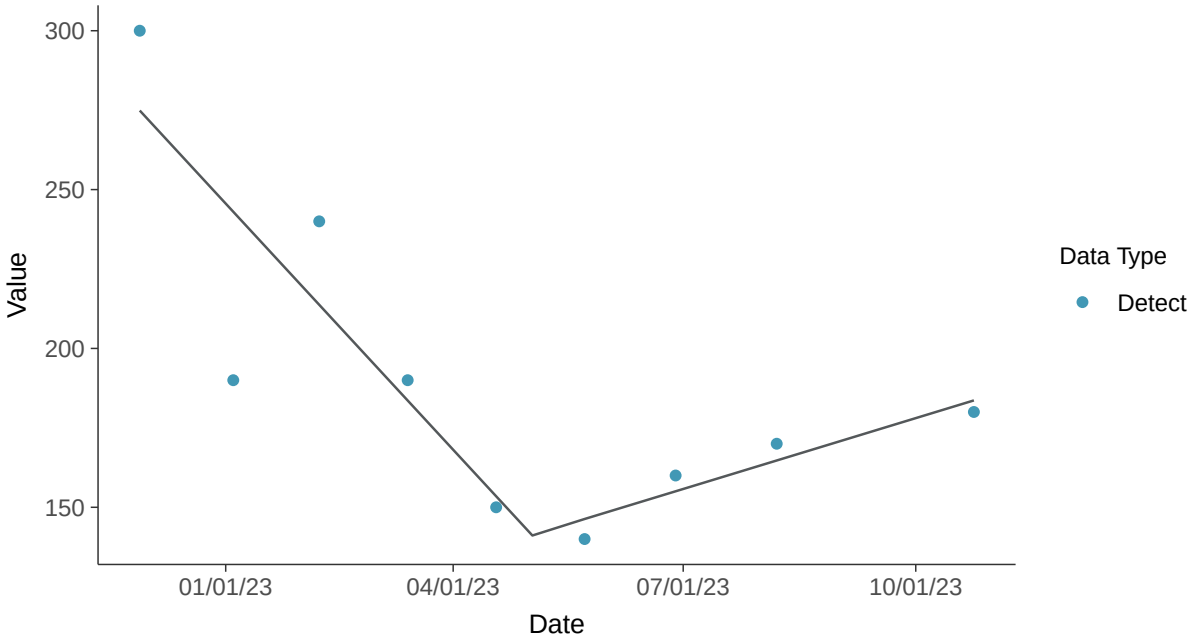
Trend Regression: Lognormal MLE

Chloride (as Cl), MW-03 (mg/L)



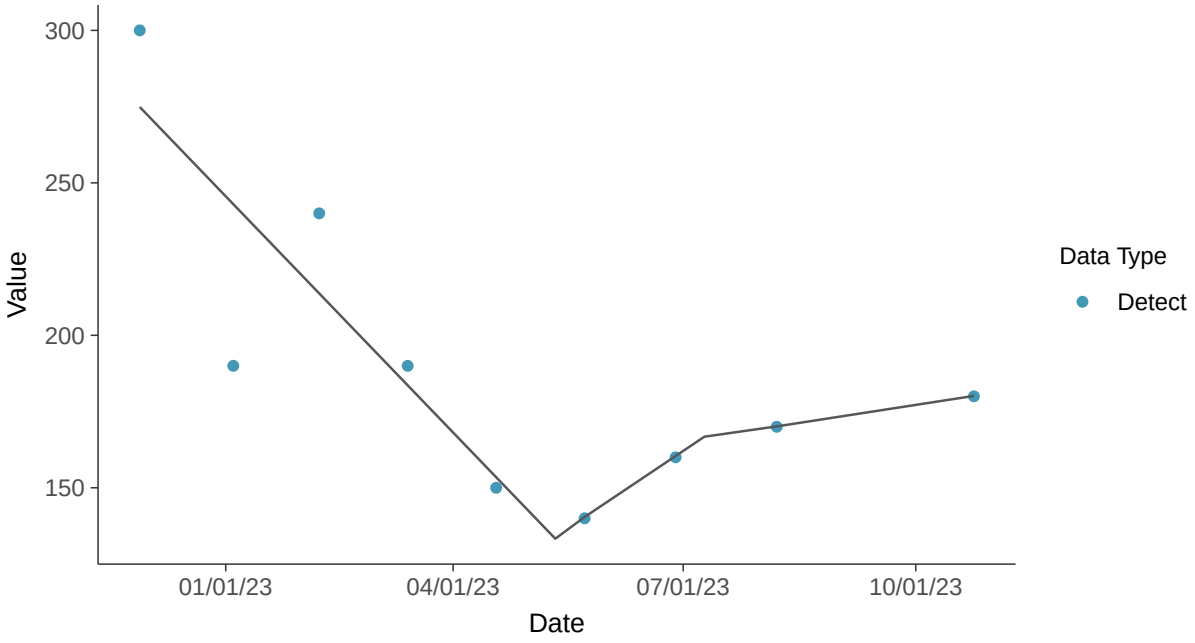
Trend Regression: Piecewise Linear-Linear

Chloride (as Cl), MW-03 (mg/L)



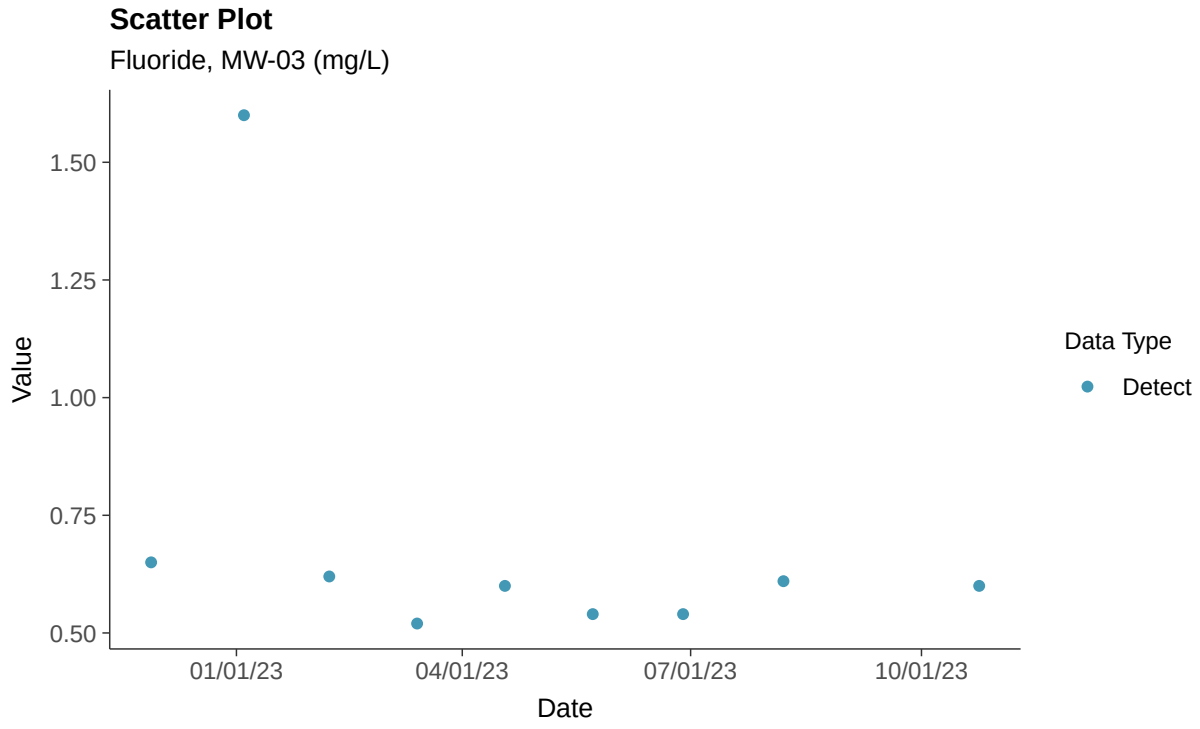
Trend Regression: Piecewise Linear-Linear-Linear

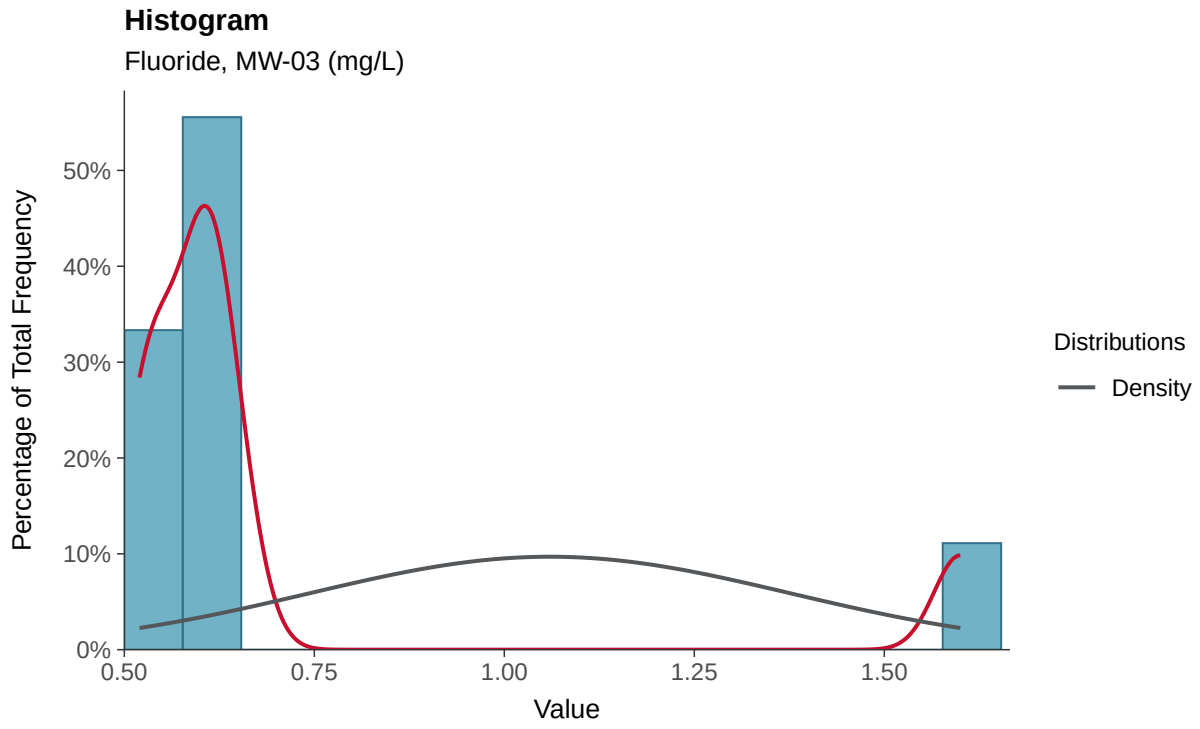
Chloride (as Cl), MW-03 (mg/L)



Appendix III: Fluoride, MW-03

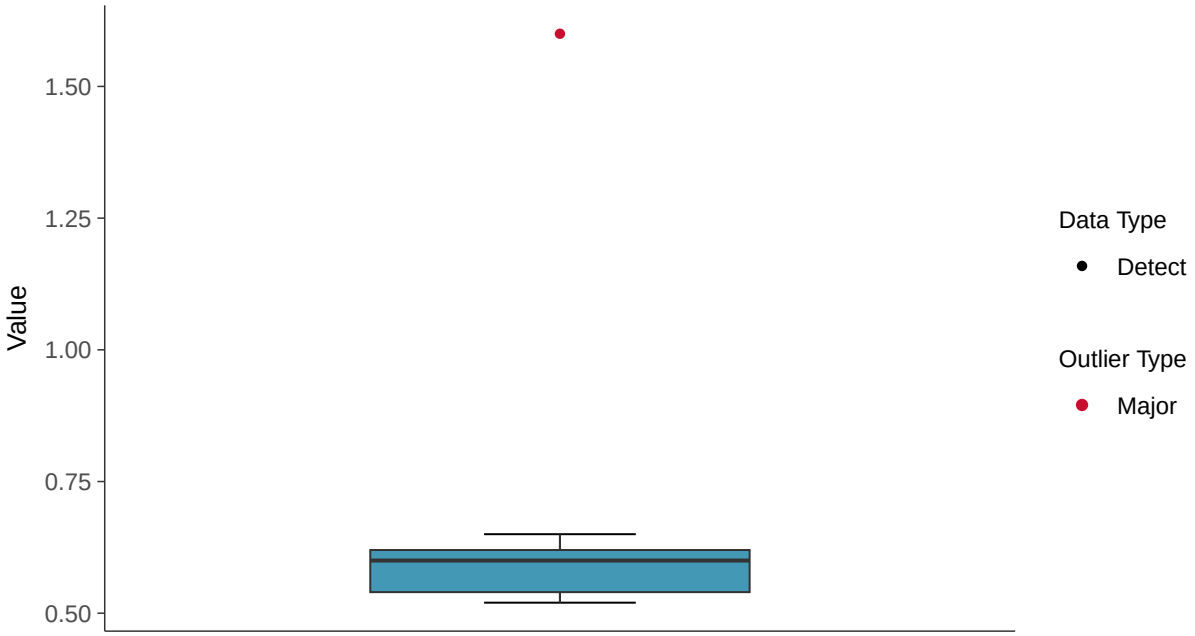
ID: 2_13_4_112





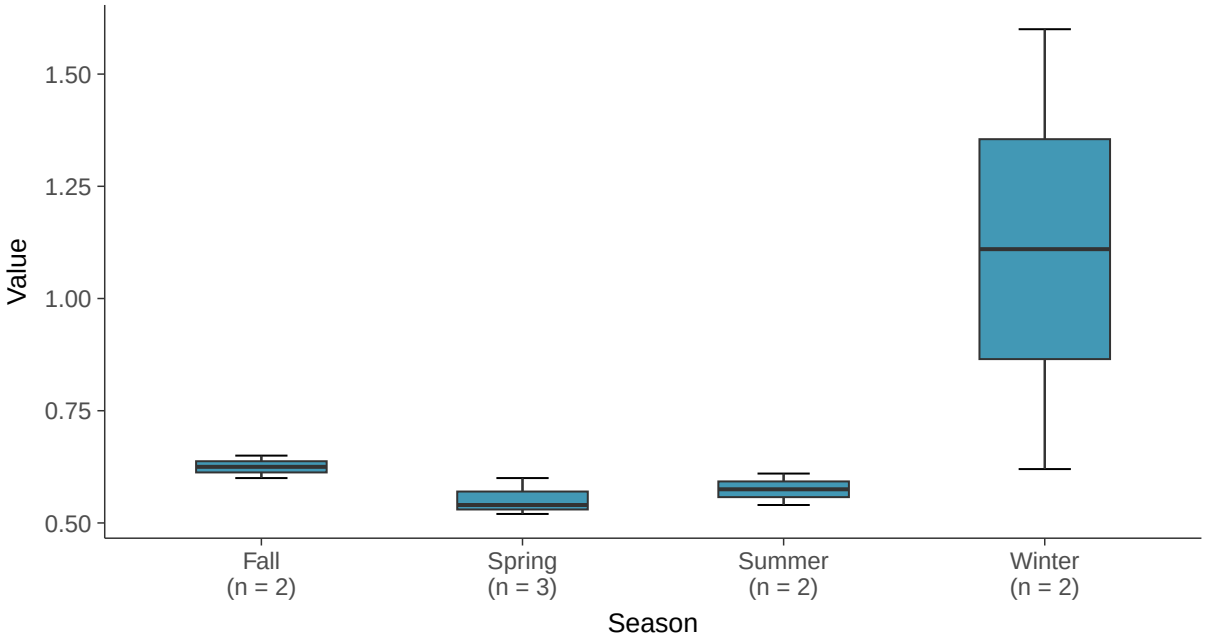
Boxplot

Fluoride, MW-03 (mg/L)



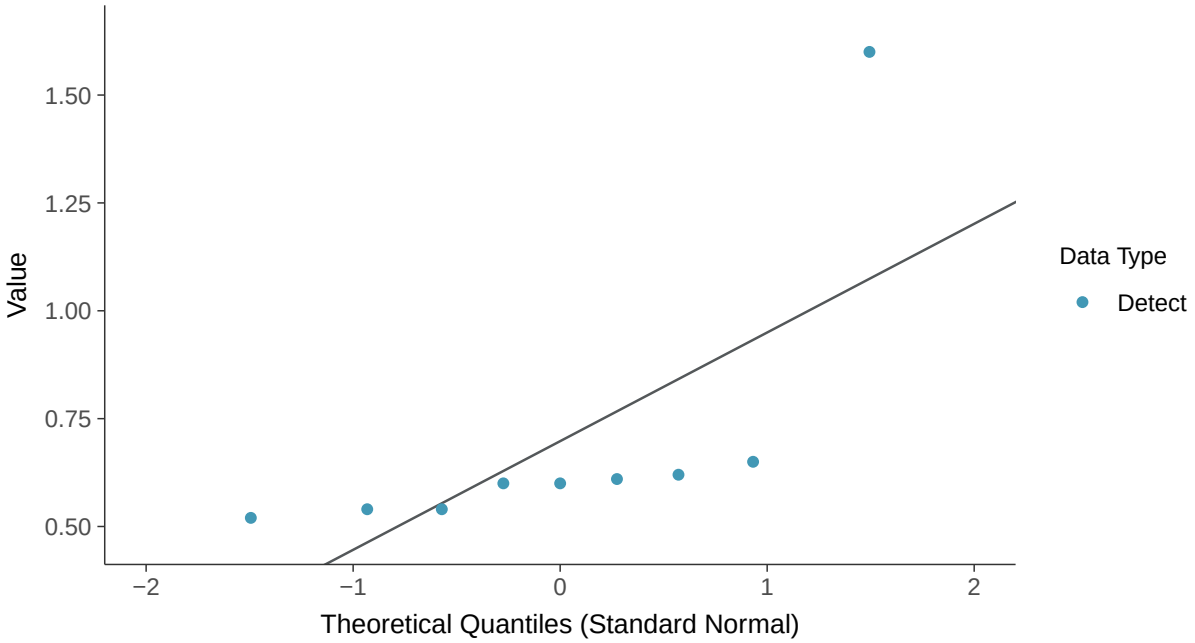
Boxplot by Season

Fluoride, MW-03 (mg/L)



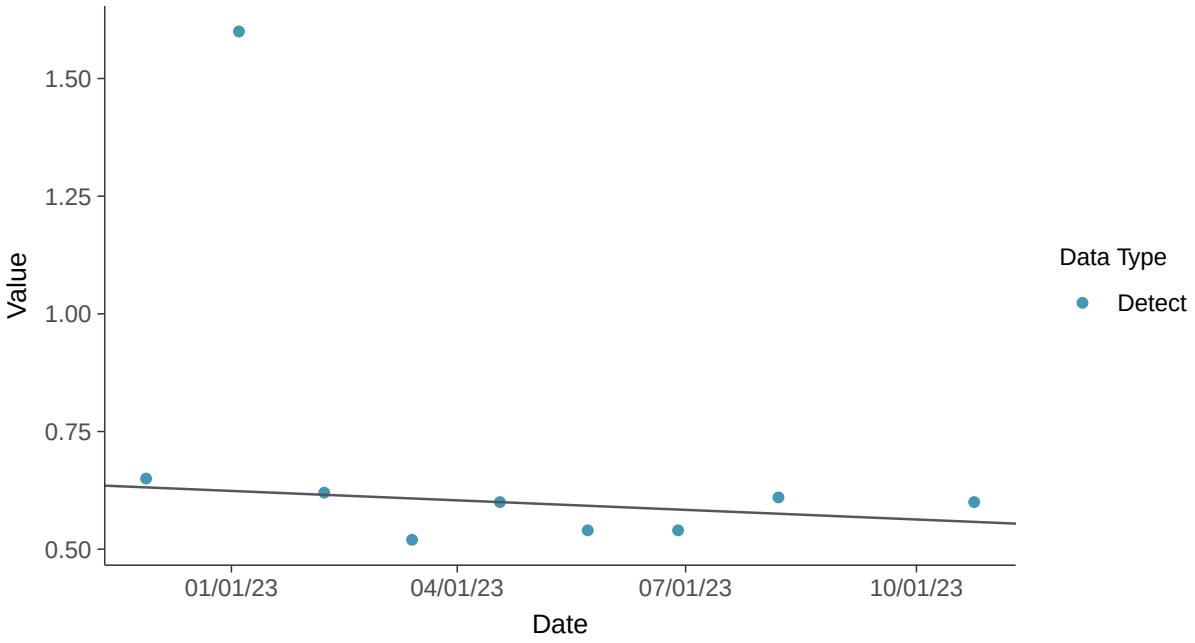
Normal Q-Q plot

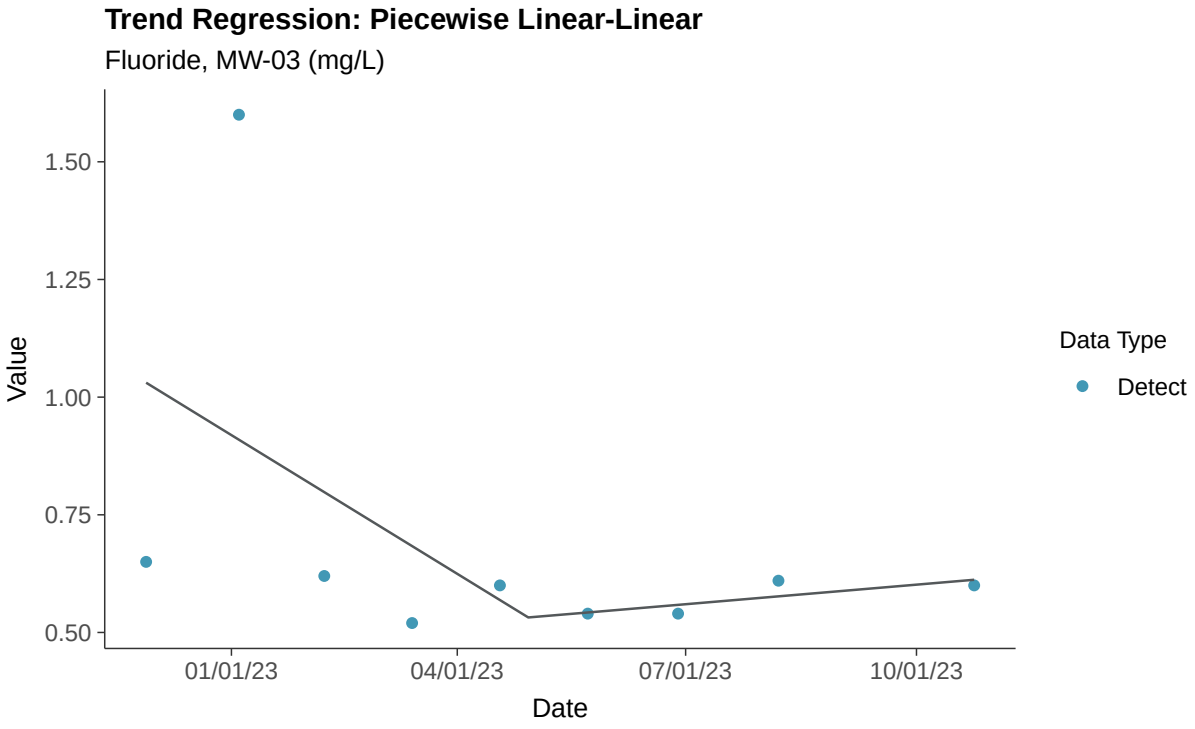
Fluoride, MW-03 (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

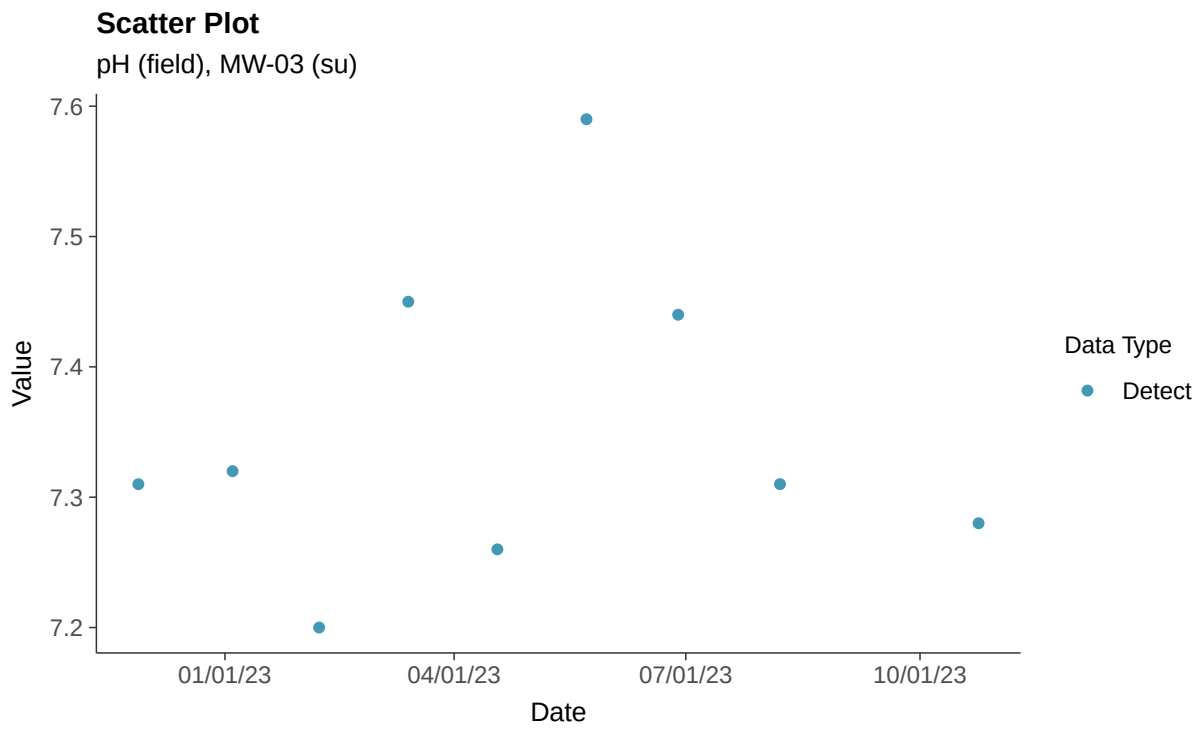
Fluoride, MW-03 (mg/L)

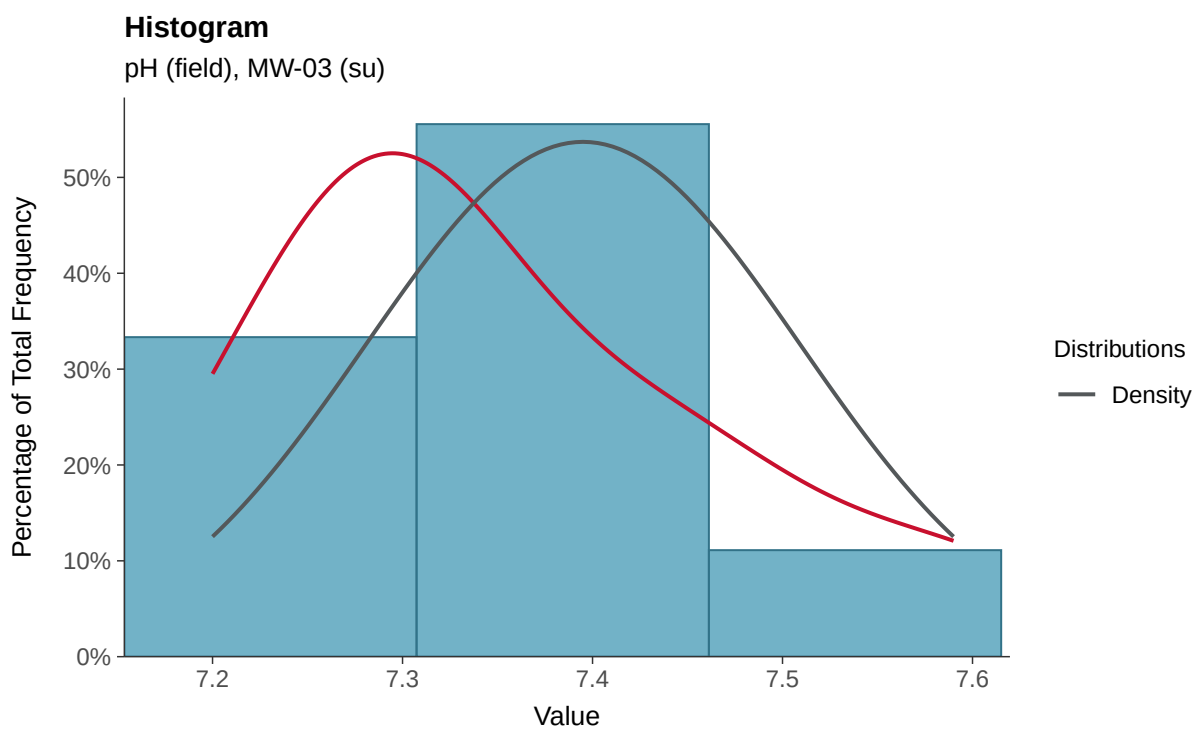



Trend Regression: Piecewise Linear-Linear
Fluoride, MW-03 (mg/L)
Value
1.50
1.25
1.00
0.75
0.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: pH (field), MW-03

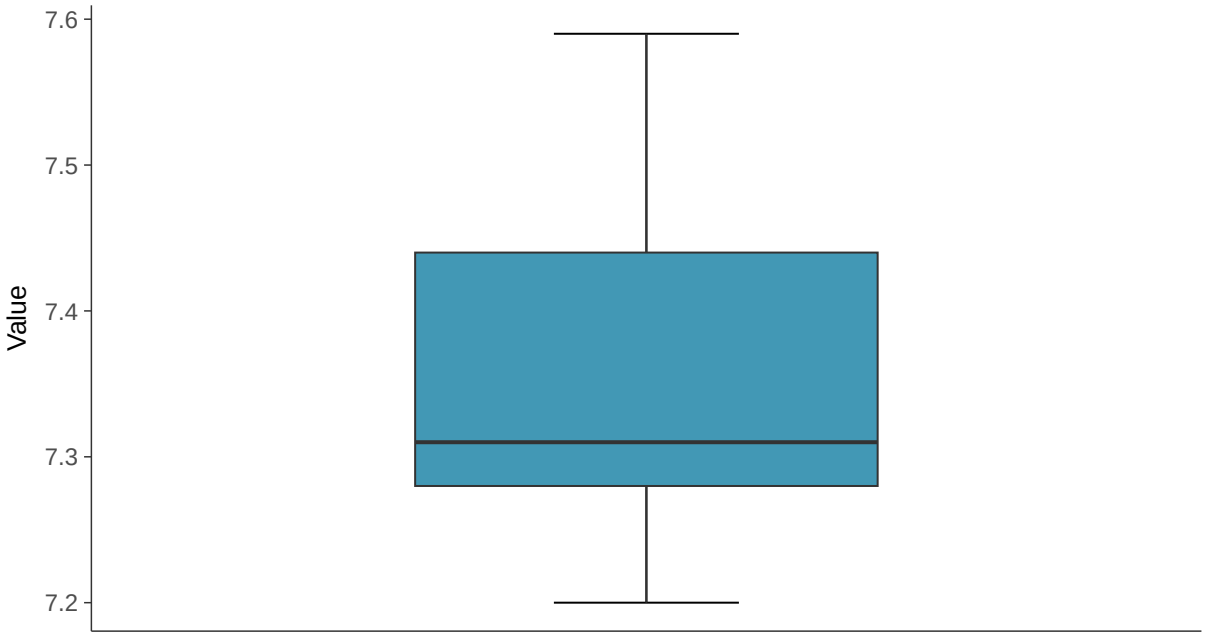
ID: 2_13_4_120





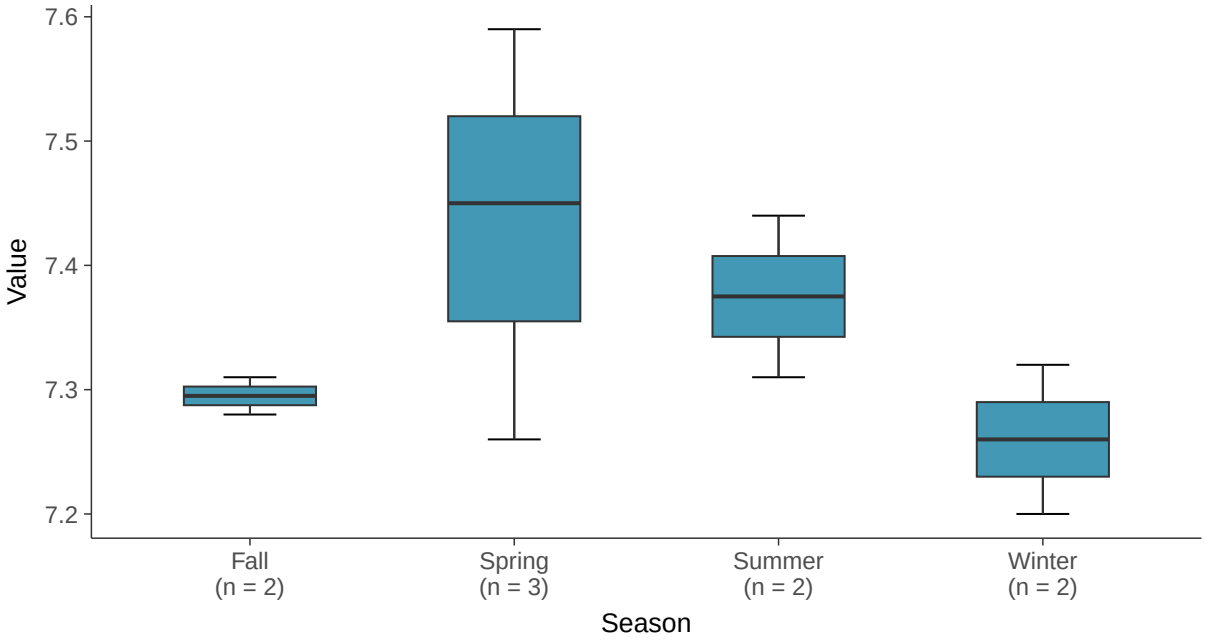
Boxplot

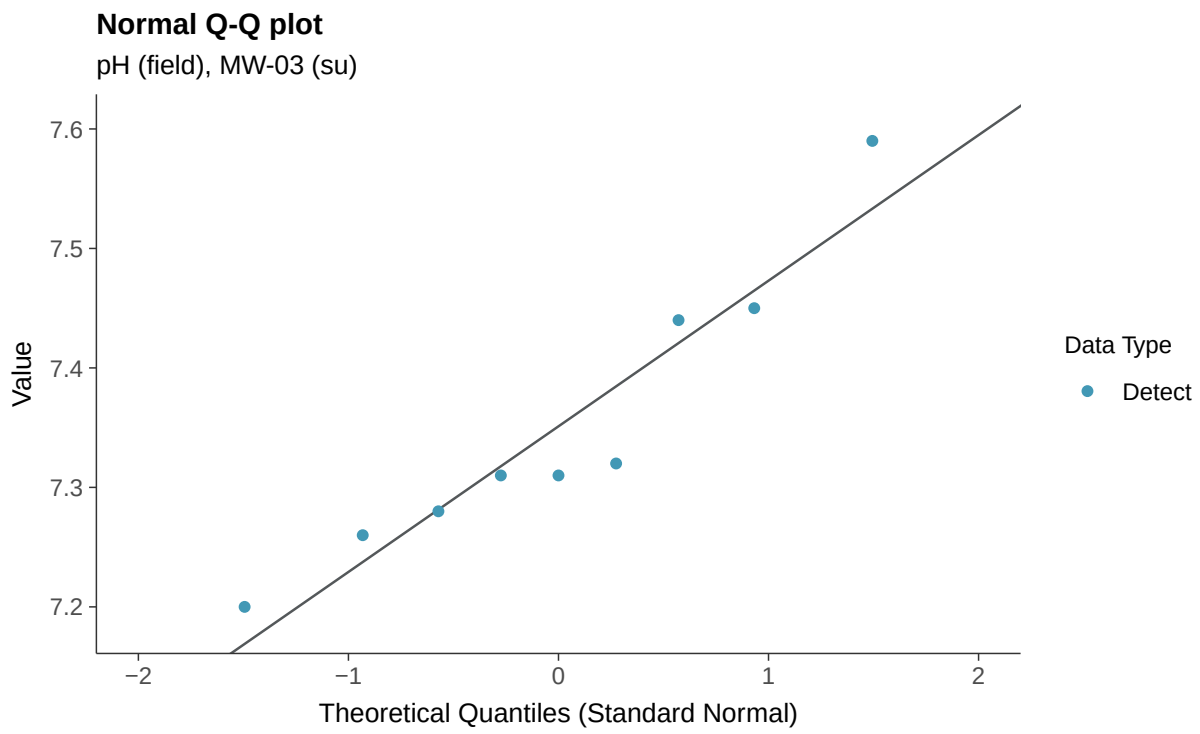
pH (field), MW-03 (su)

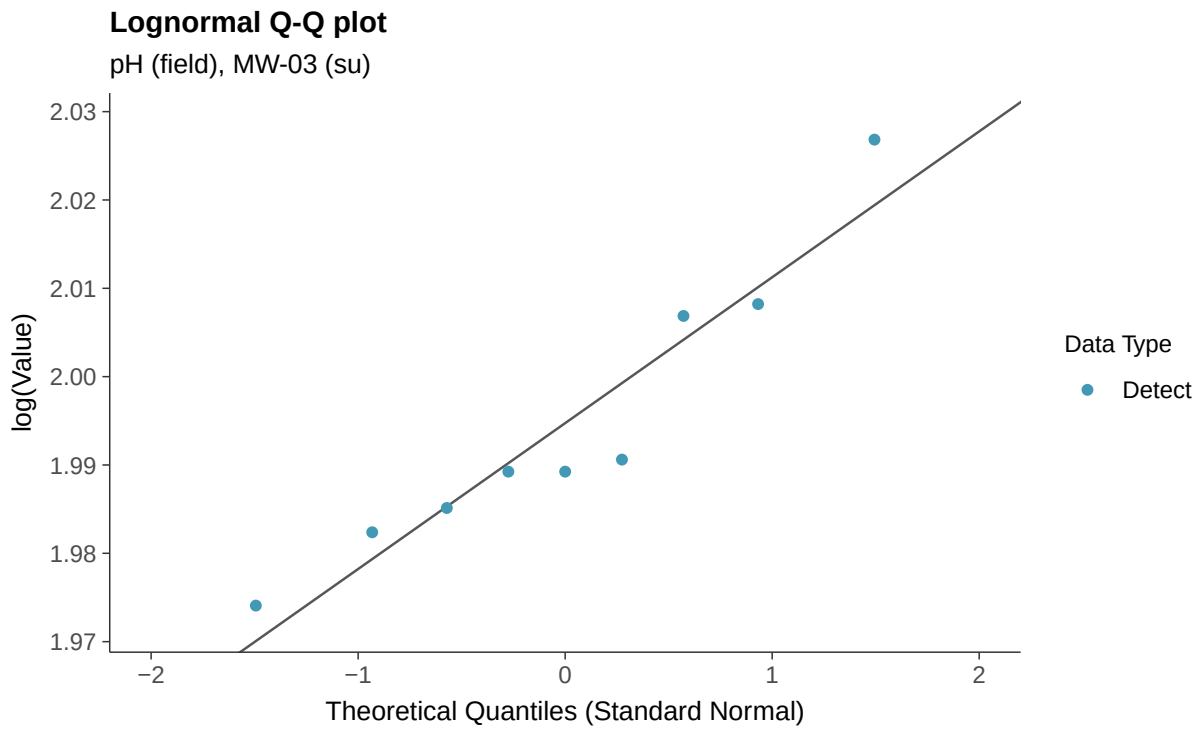


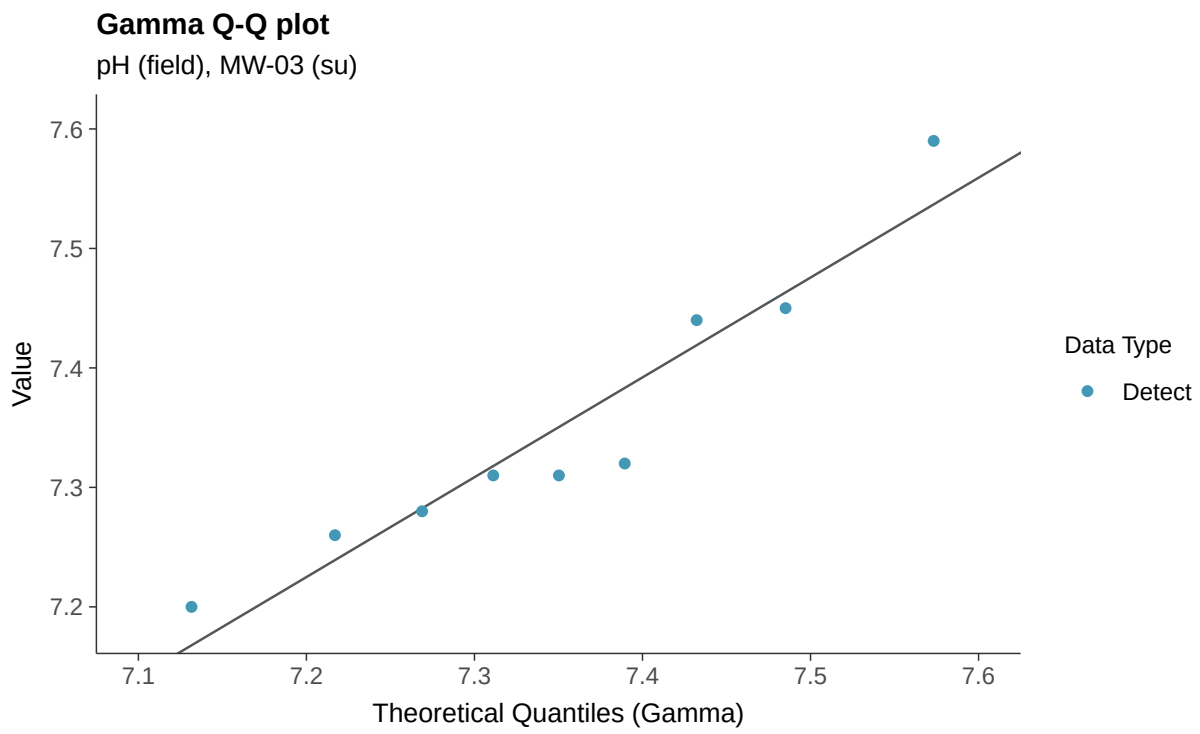
Boxplot by Season

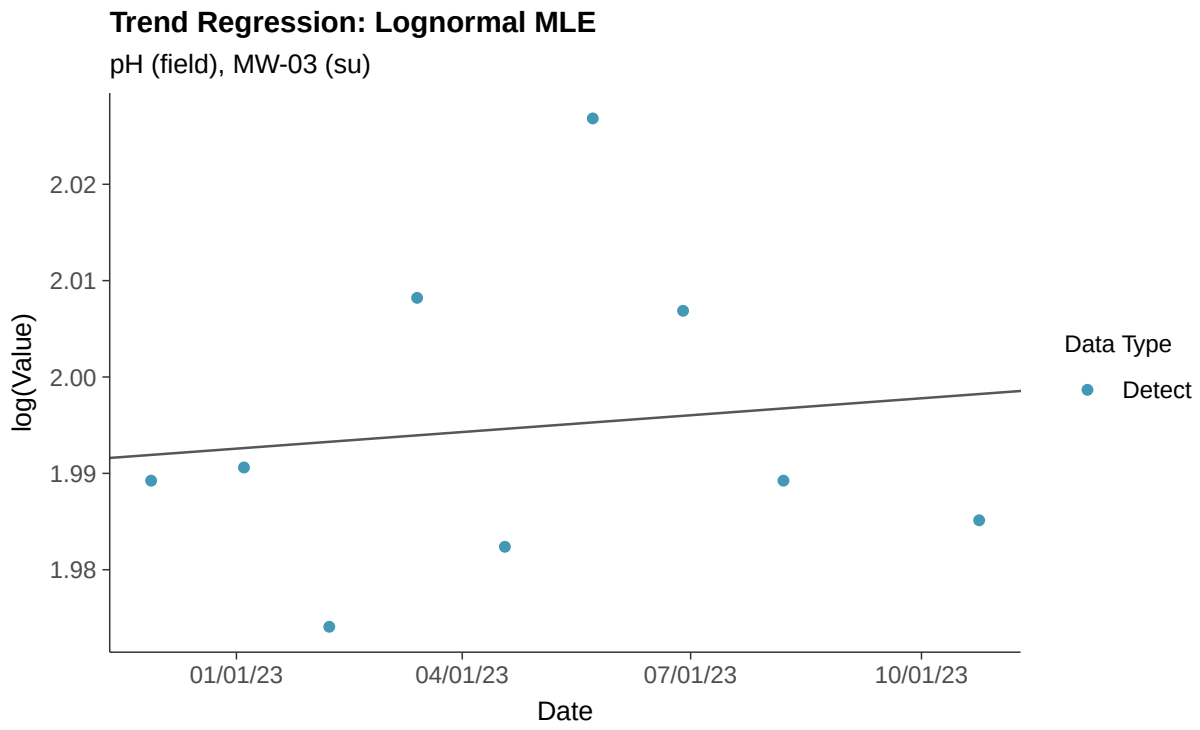
pH (field), MW-03 (su)

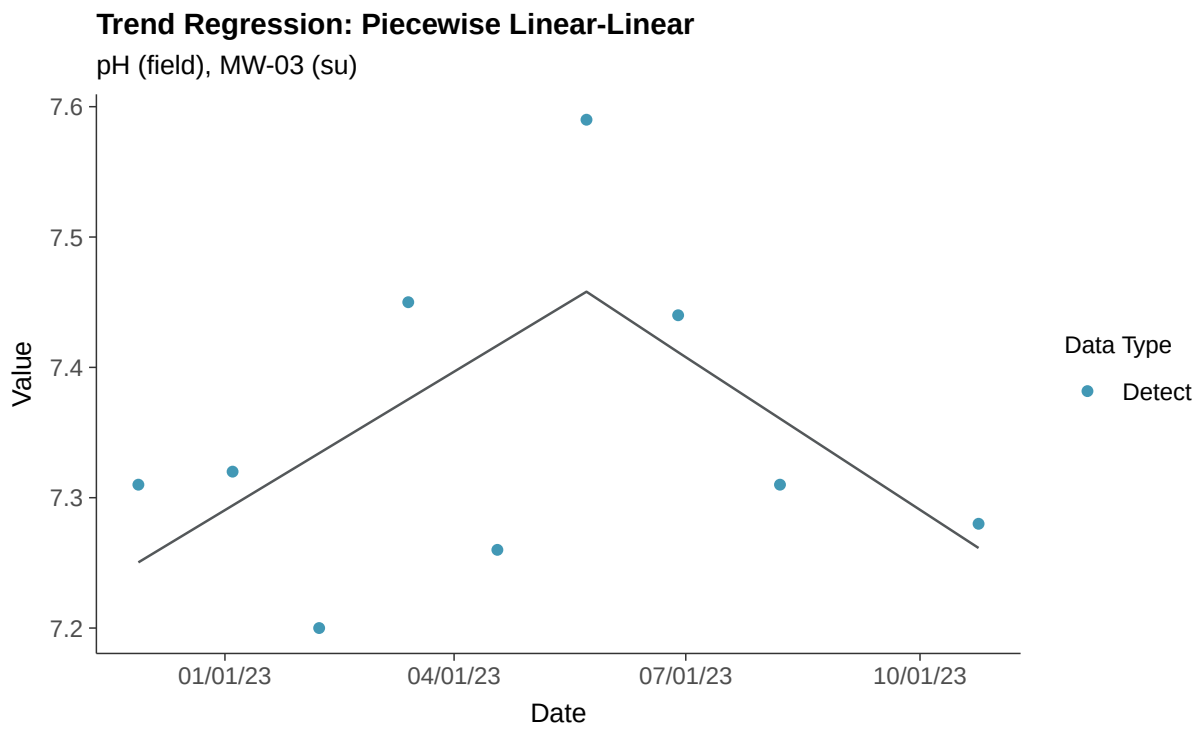



Normal Q-Q plot
pH (field), MW-03 (su)
Value
7.6
7.5
7.4
7.3
7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
pH (field), MW-03 (su)
log(Value)
2.03
2.02
2.01
2.00
1.99
1.98
1.97
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

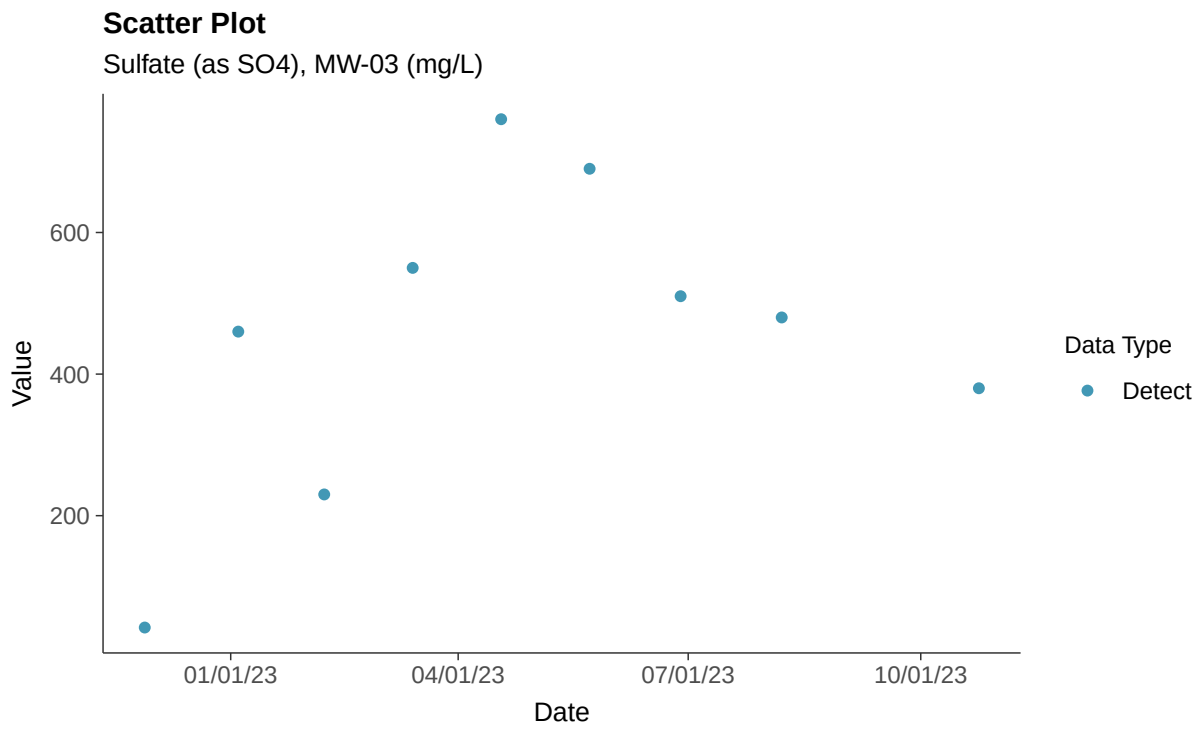

Gamma Q-Q plot
pH (field), MW-03 (su)
Value
7.6
7.5
7.4
7.3
7.2
7.1
7.2
7.3
7.4
7.5
7.6
Theoretical Quantiles (Gamma)
Data Type
Detect

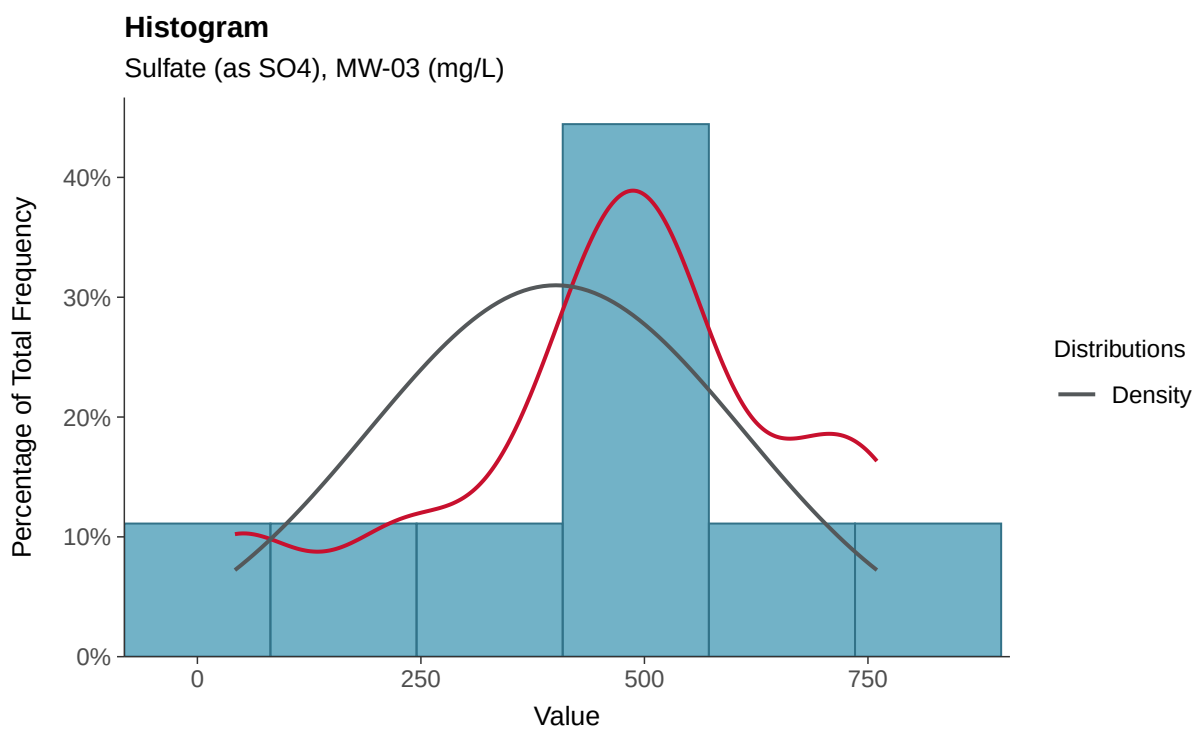

Trend Regression: Lognormal MLE
pH (field), MW-03 (su)
log(Value)
2.02
2.01
2.00
1.99
1.98
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-03 (su)
7.6
7.5
7.4
7.3
7.2
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-03

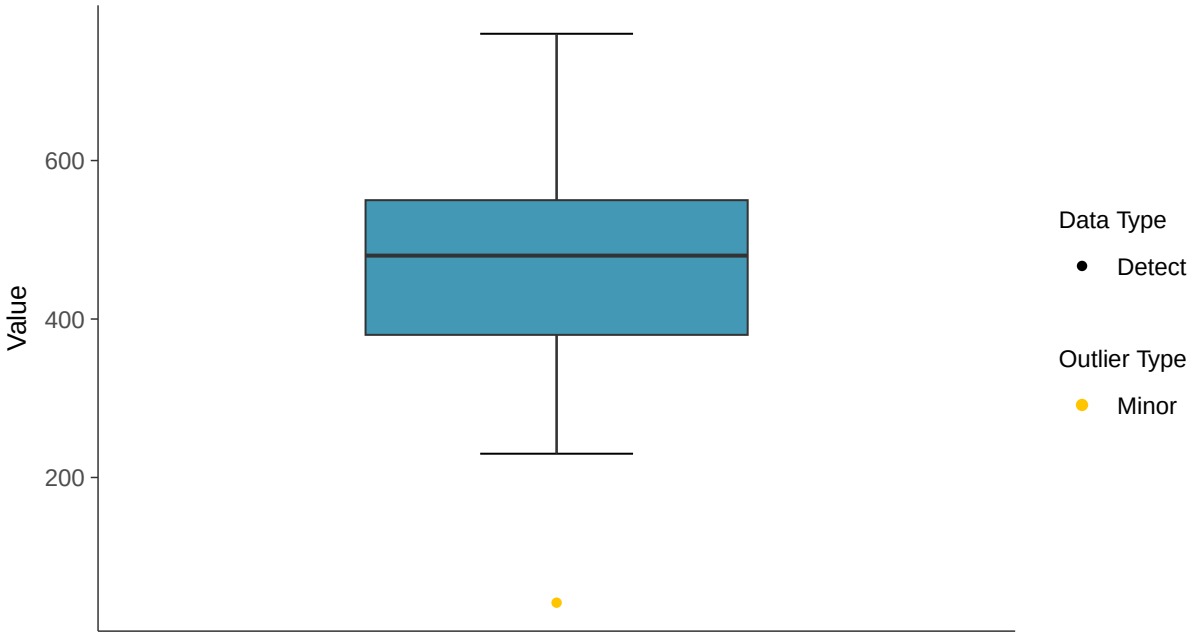
ID: 2_13_4_124





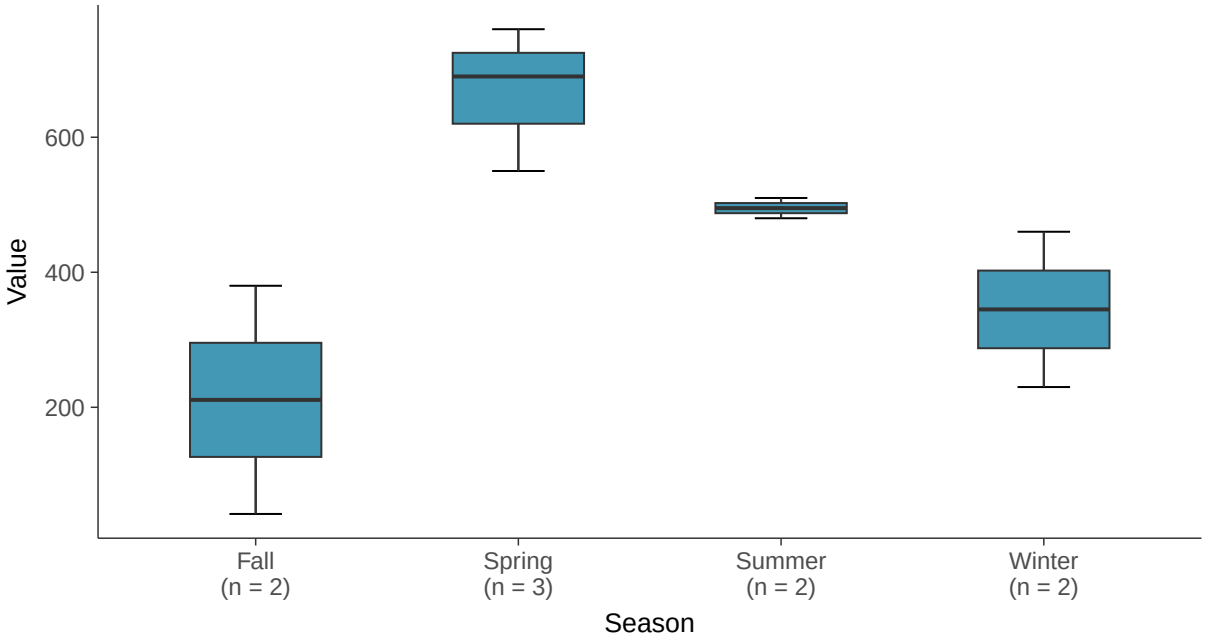
Boxplot

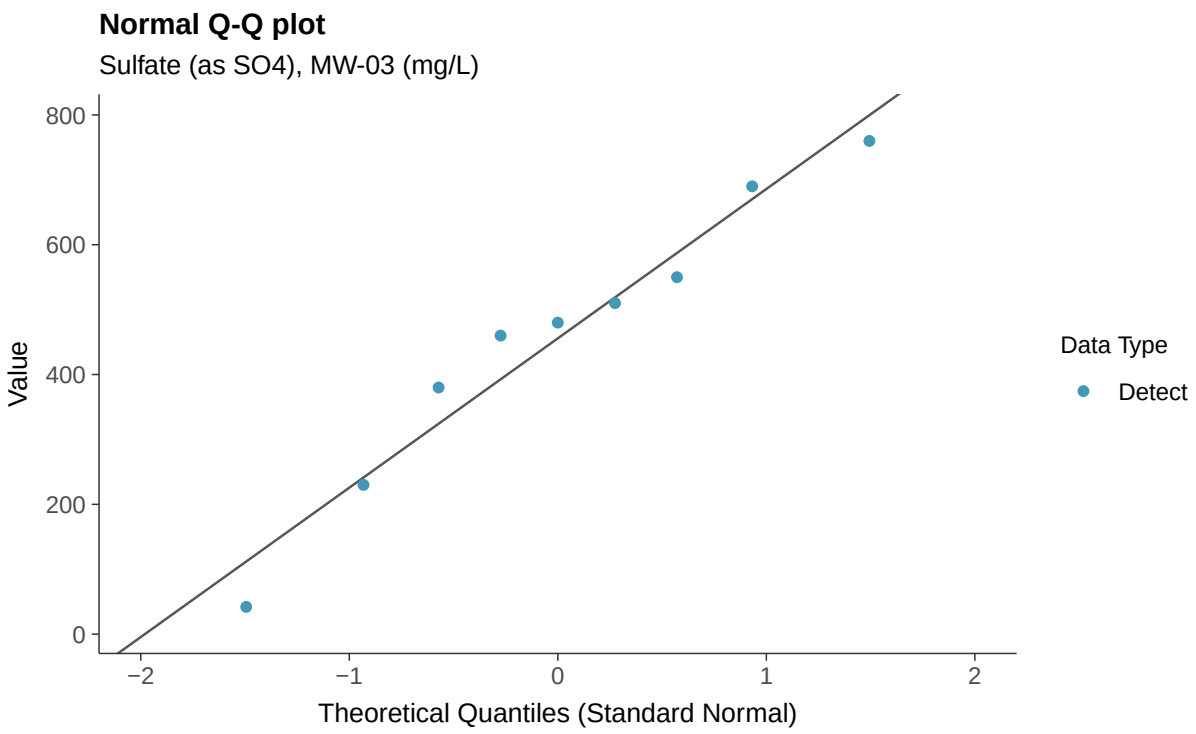
Sulfate (as SO4), MW-03 (mg/L)

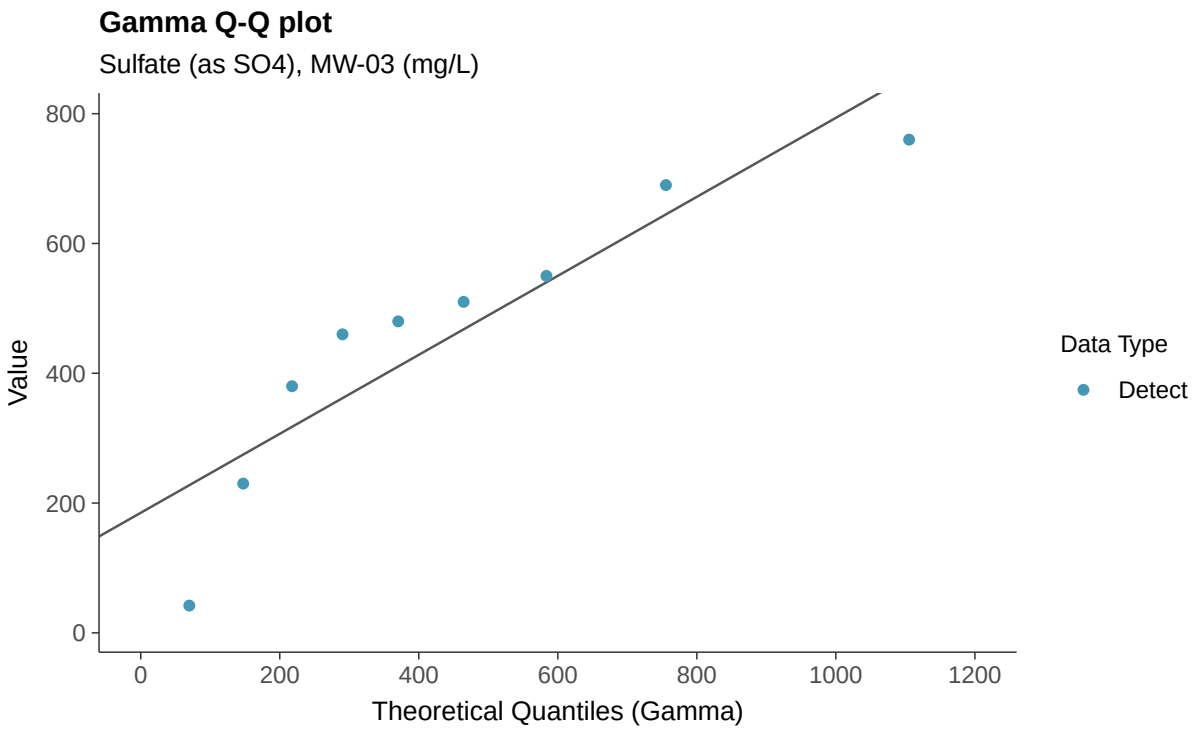


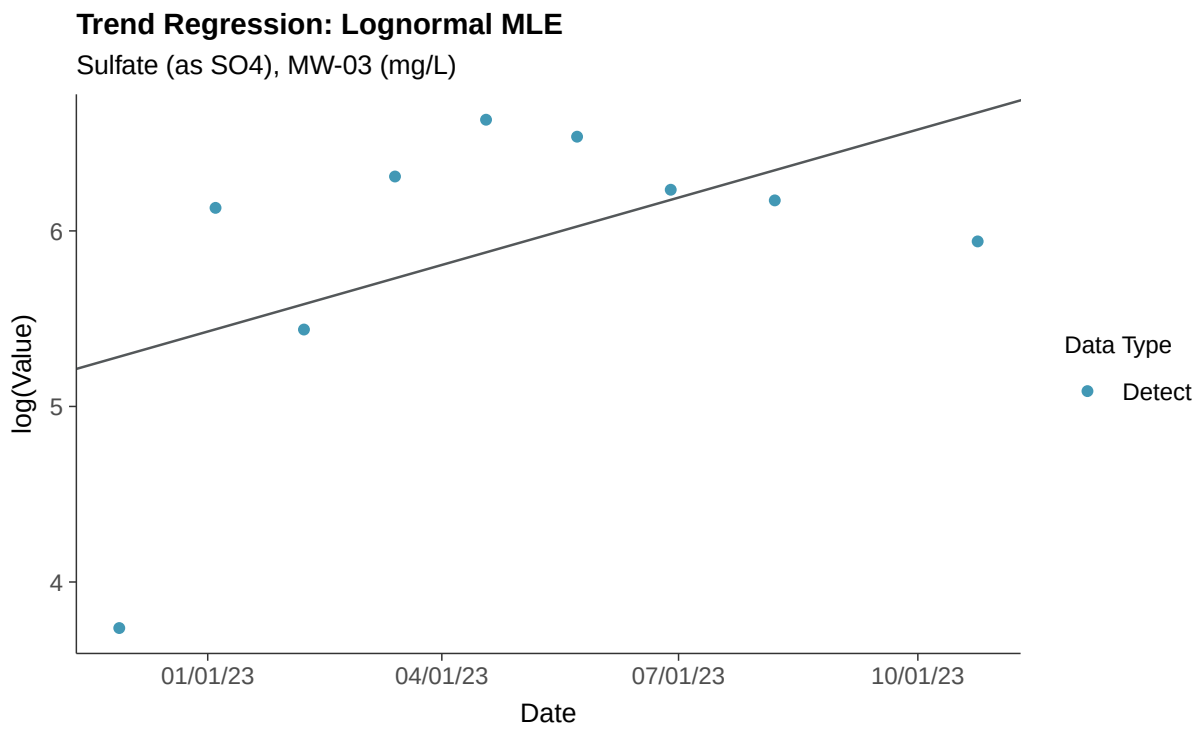
Boxplot by Season

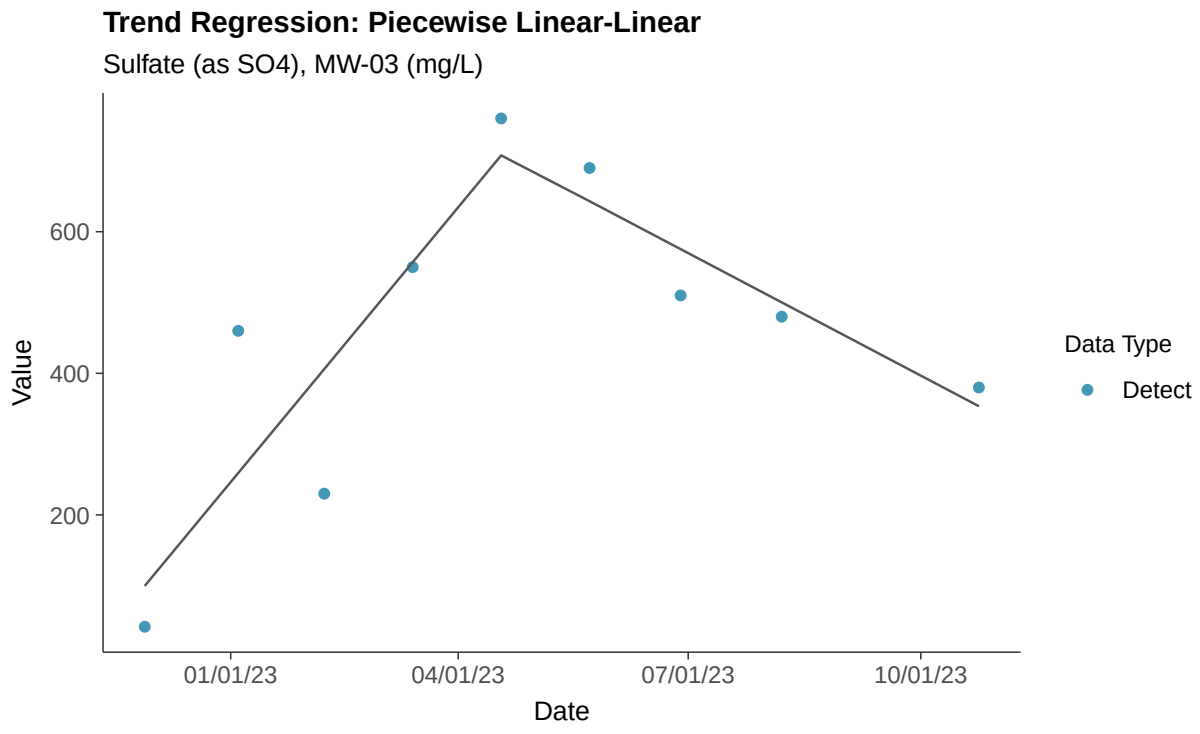
Sulfate (as SO4), MW-03 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-03 (mg/L)
Value
800
600
400
200
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

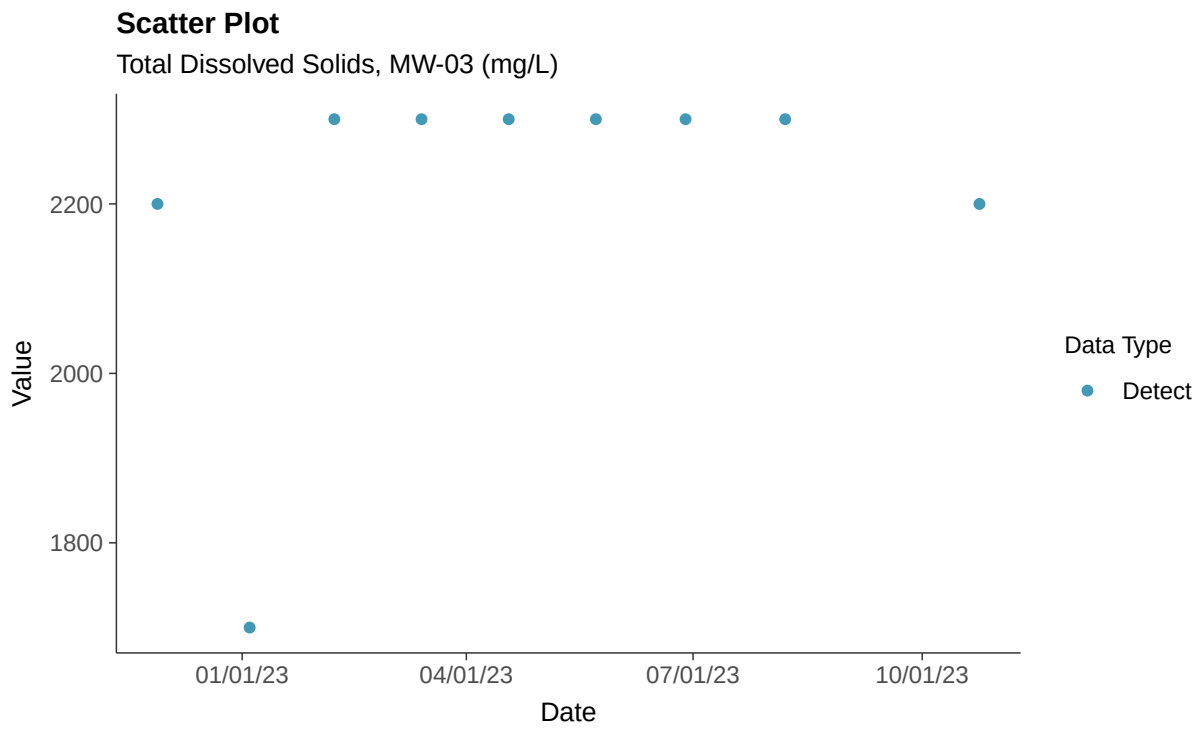

Gamma Q-Q plot
Sulfate (as SO4), MW-03 (mg/L)
Value
800
600
400
200
0
0
200
400
600
800
1000
1200
Theoretical Quantiles (Gamma)
Data Type
Detect

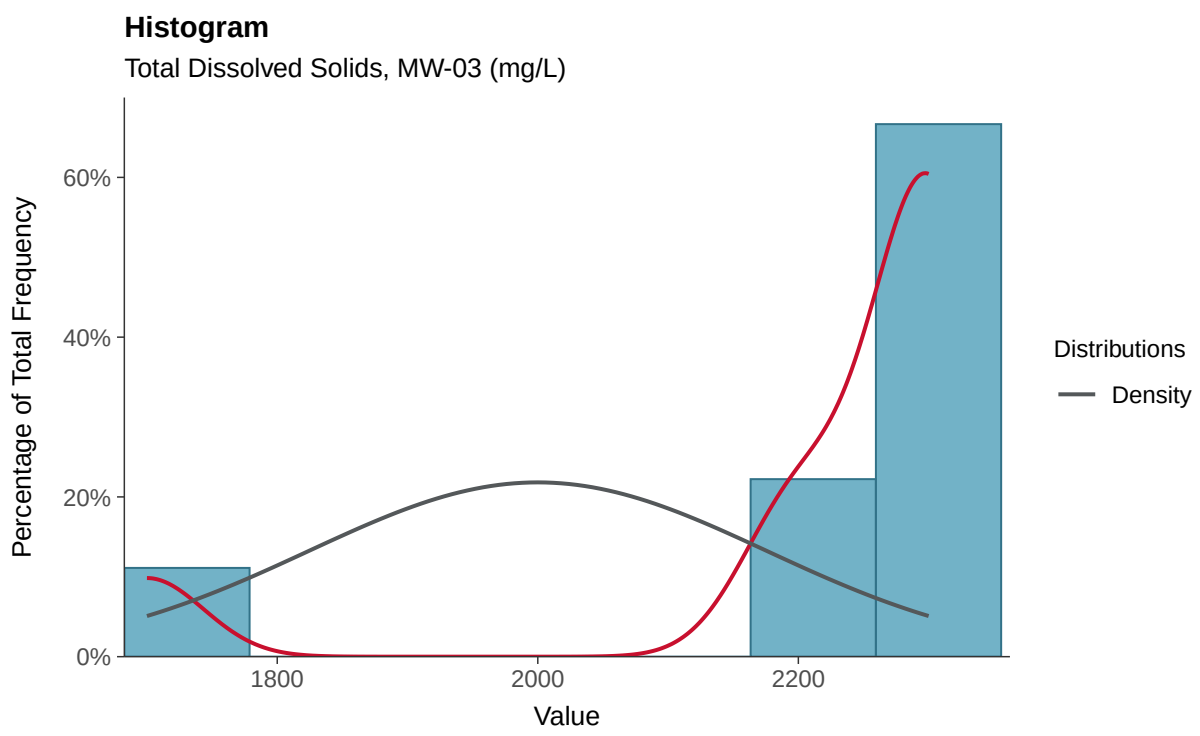

Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-03 (mg/L)
log(Value)
6
5
4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Sulfate (as SO4), MW-03 (mg/L)
Value
600
400
200
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Total Dissolved Solids, MW-03

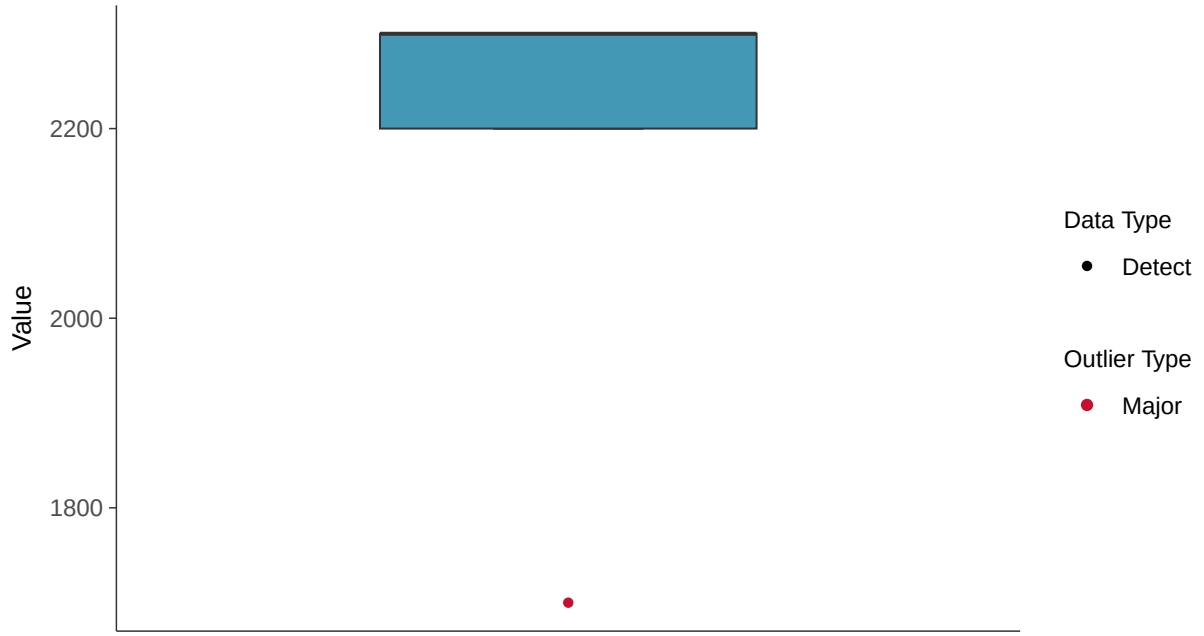
ID: 2_13_4_126





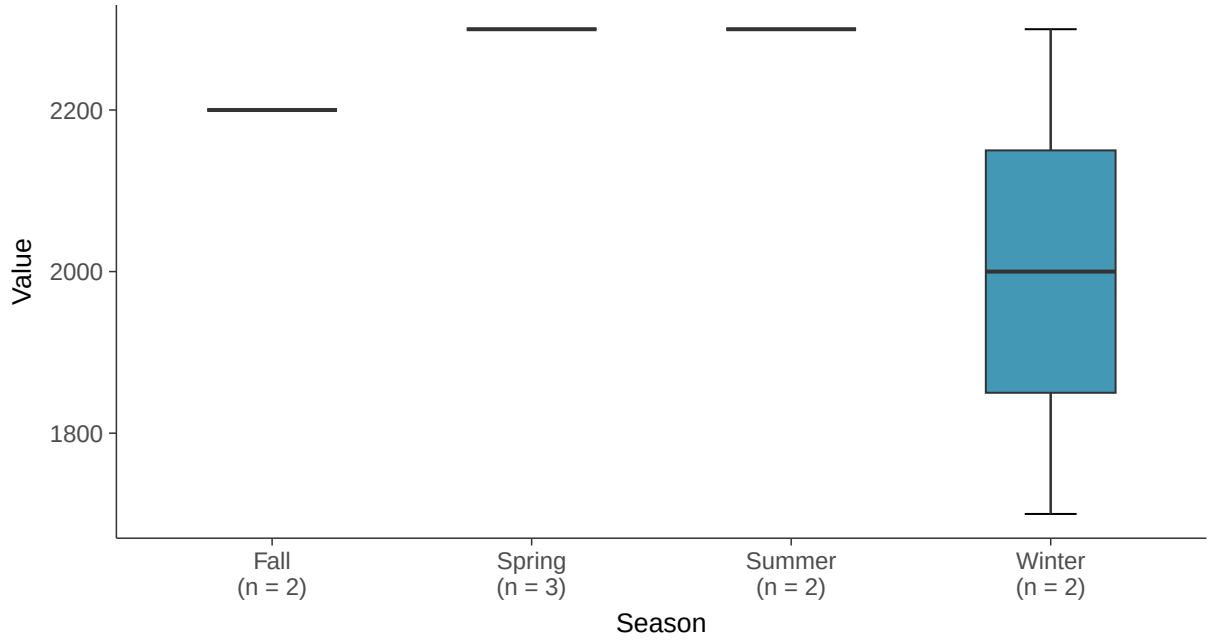
Boxplot

Total Dissolved Solids, MW-03 (mg/L)



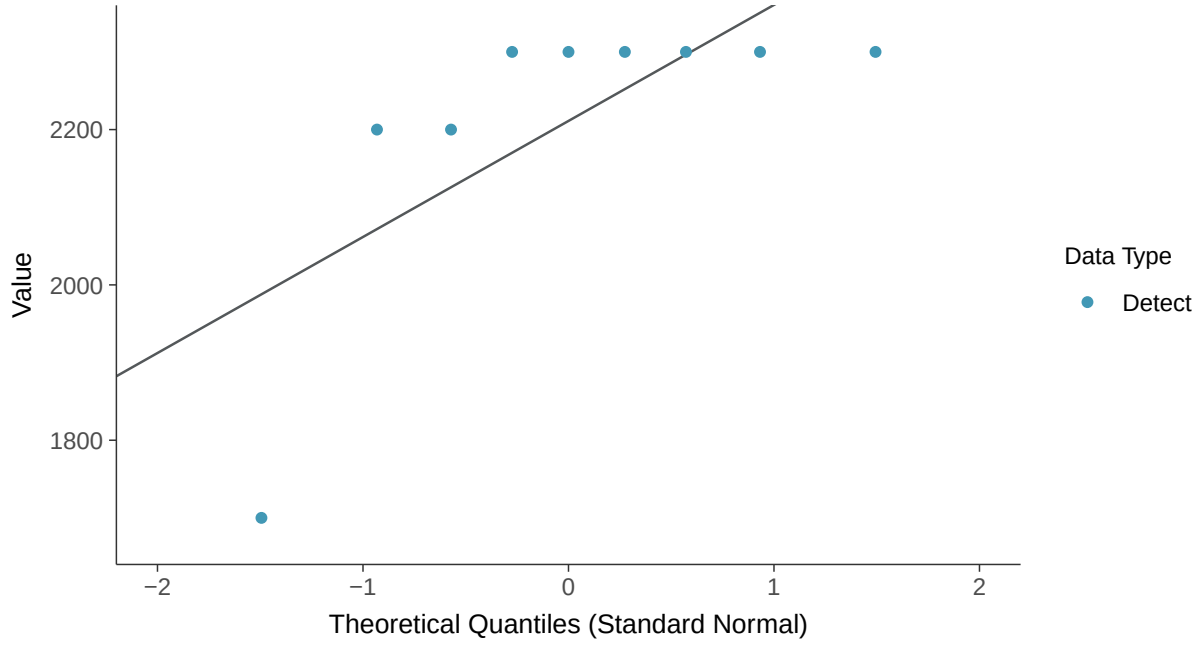
Boxplot by Season

Total Dissolved Solids, MW-03 (mg/L)



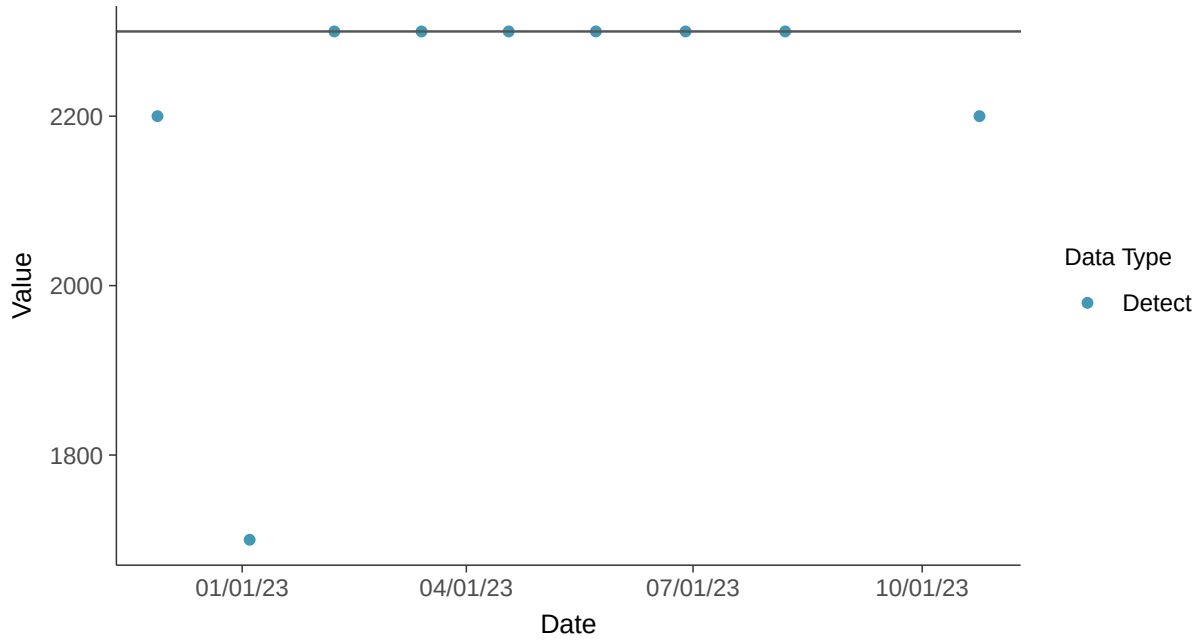
Normal Q-Q plot

Total Dissolved Solids, MW-03 (mg/L)



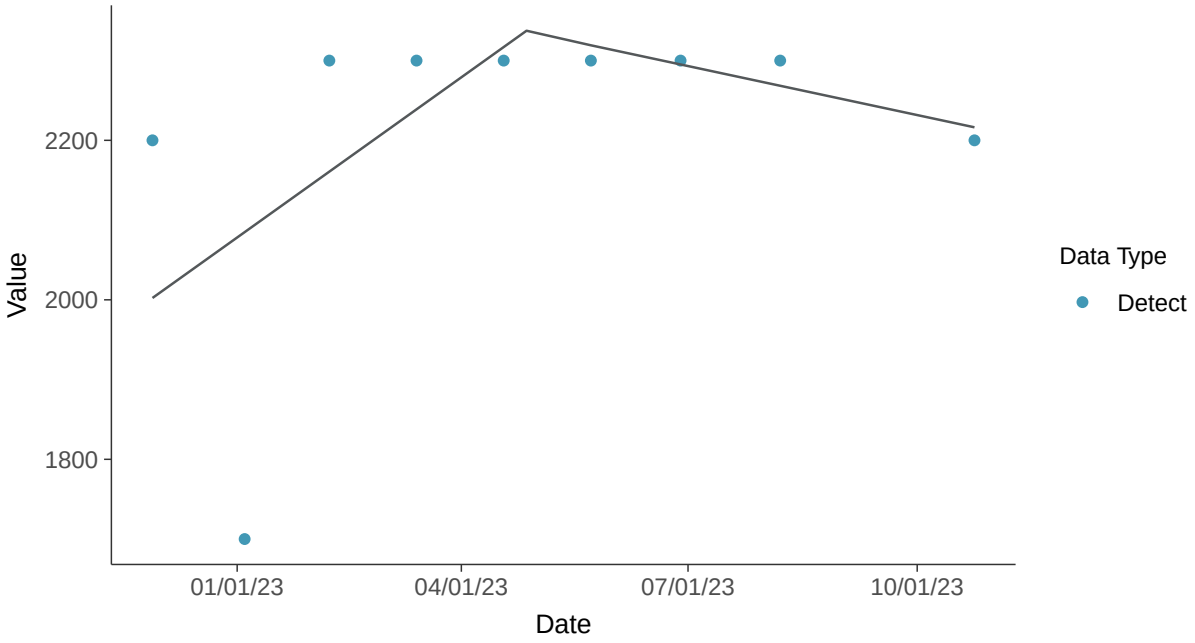
Trend Regression: Mann-Kendall/Theil-Sen Estimate

Total Dissolved Solids, MW-03 (mg/L)



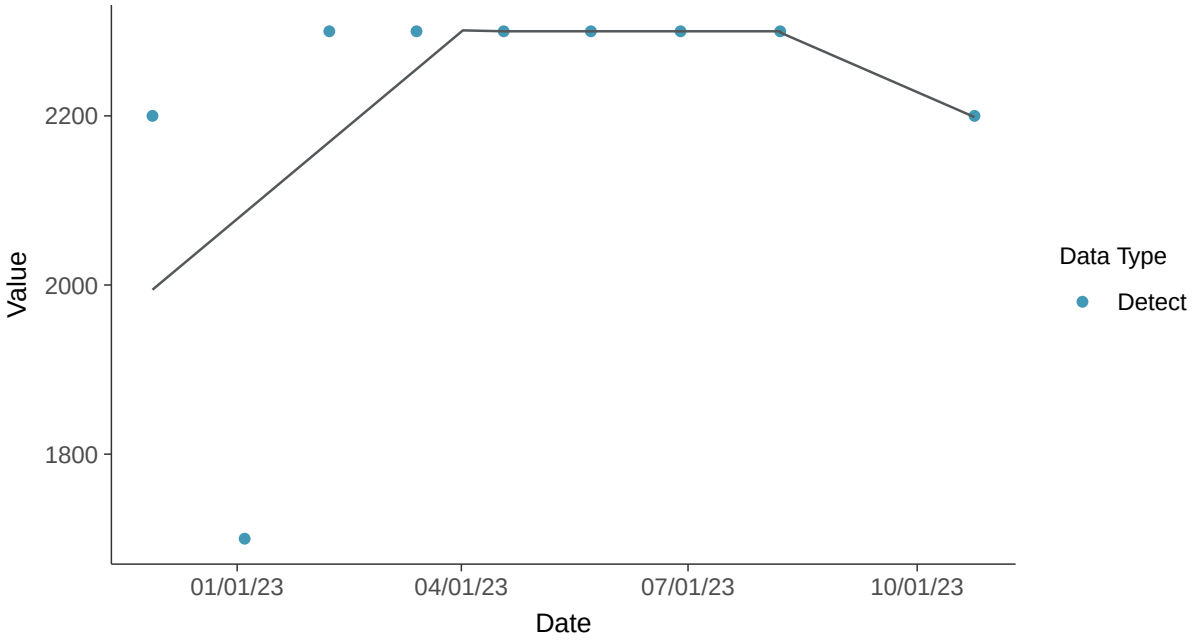
Trend Regression: Piecewise Linear-Linear

Total Dissolved Solids, MW-03 (mg/L)



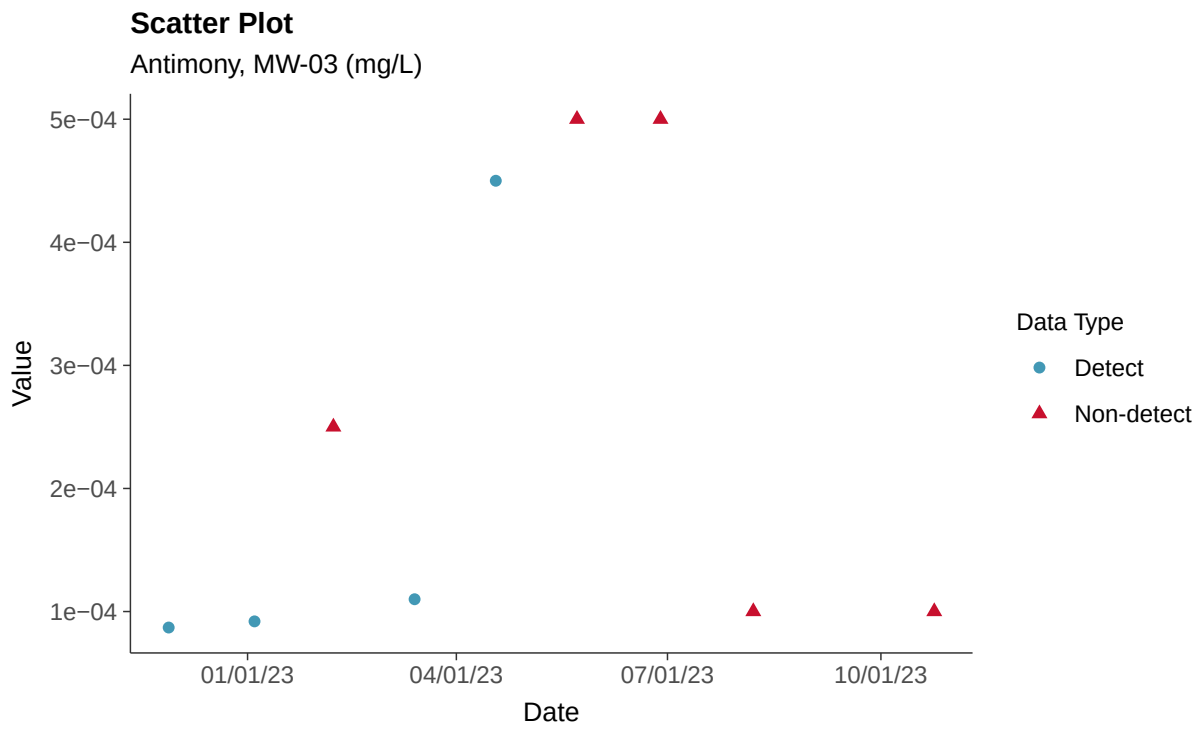
Trend Regression: Piecewise Linear-Linear-Linear

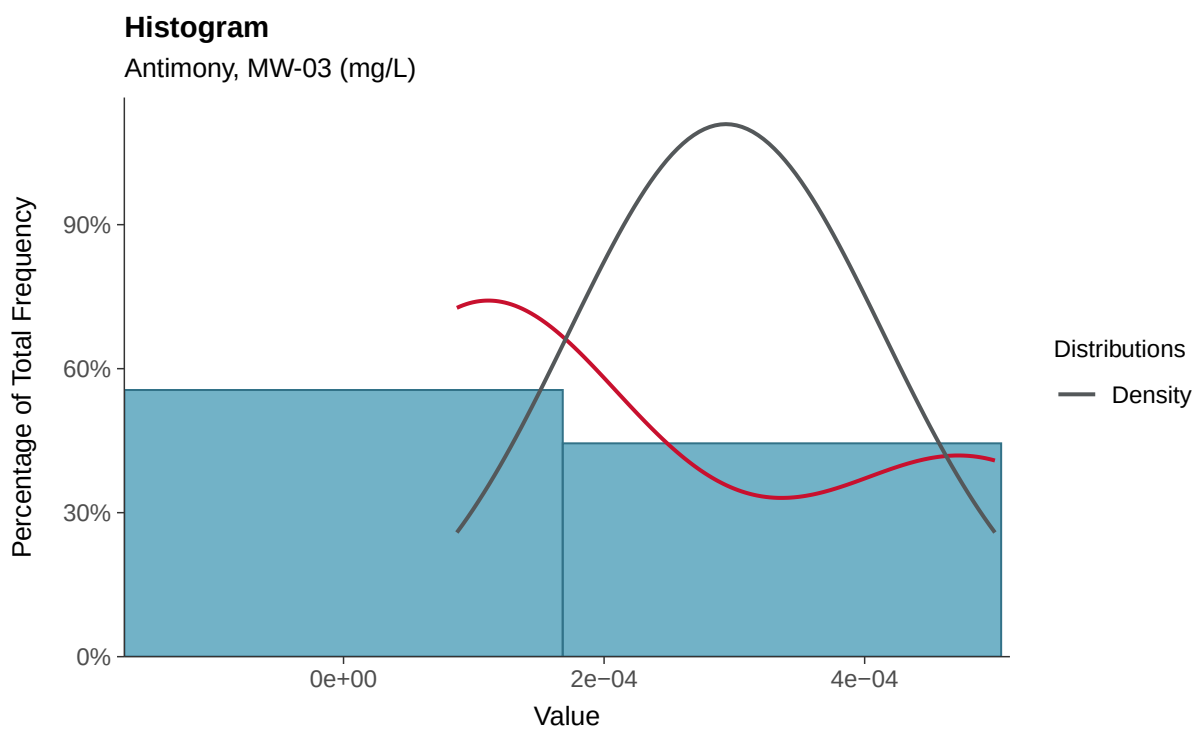
Total Dissolved Solids, MW-03 (mg/L)



Appendix IV: Antimony, MW-03

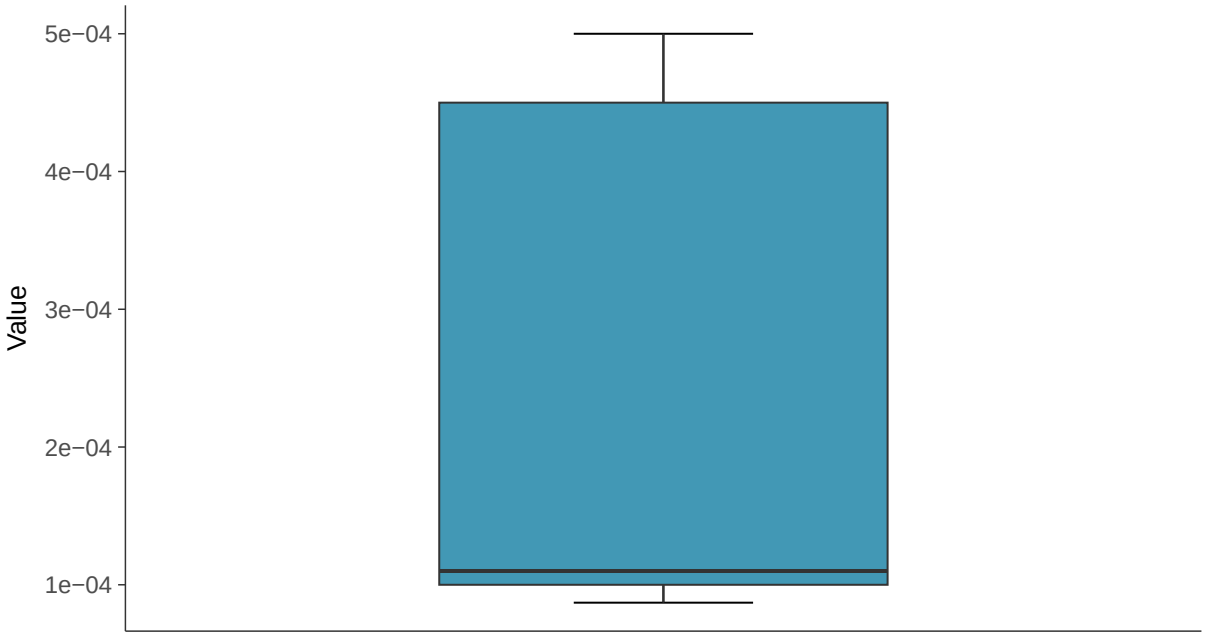
ID: 2_13_5_101





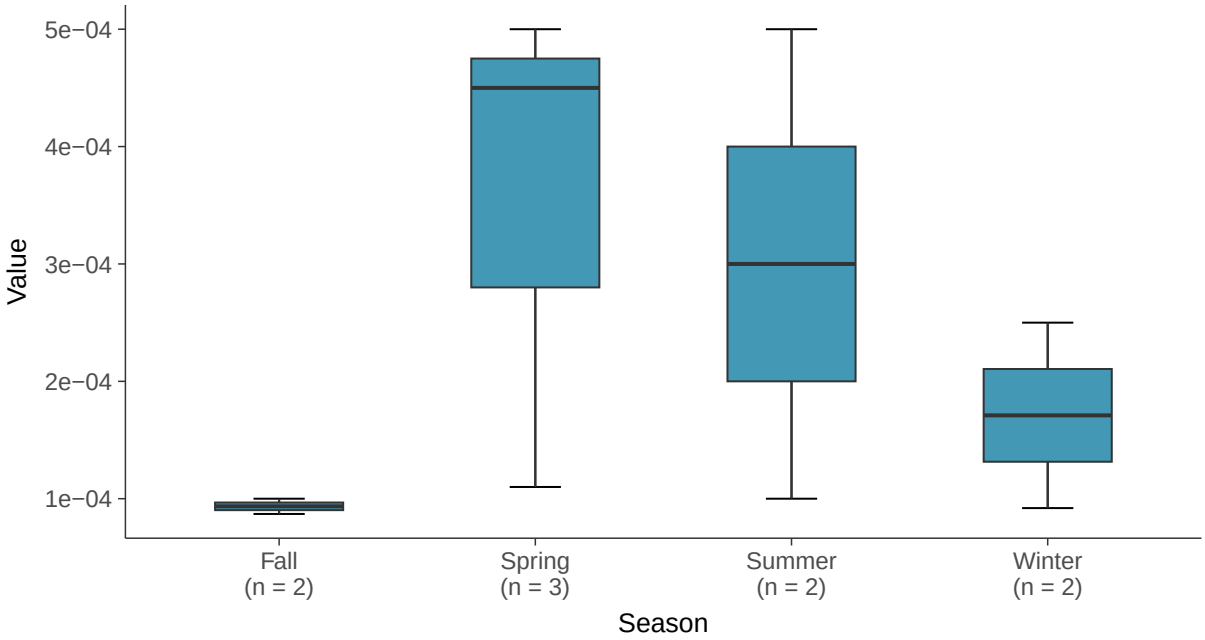
Boxplot

Antimony, MW-03 (mg/L)



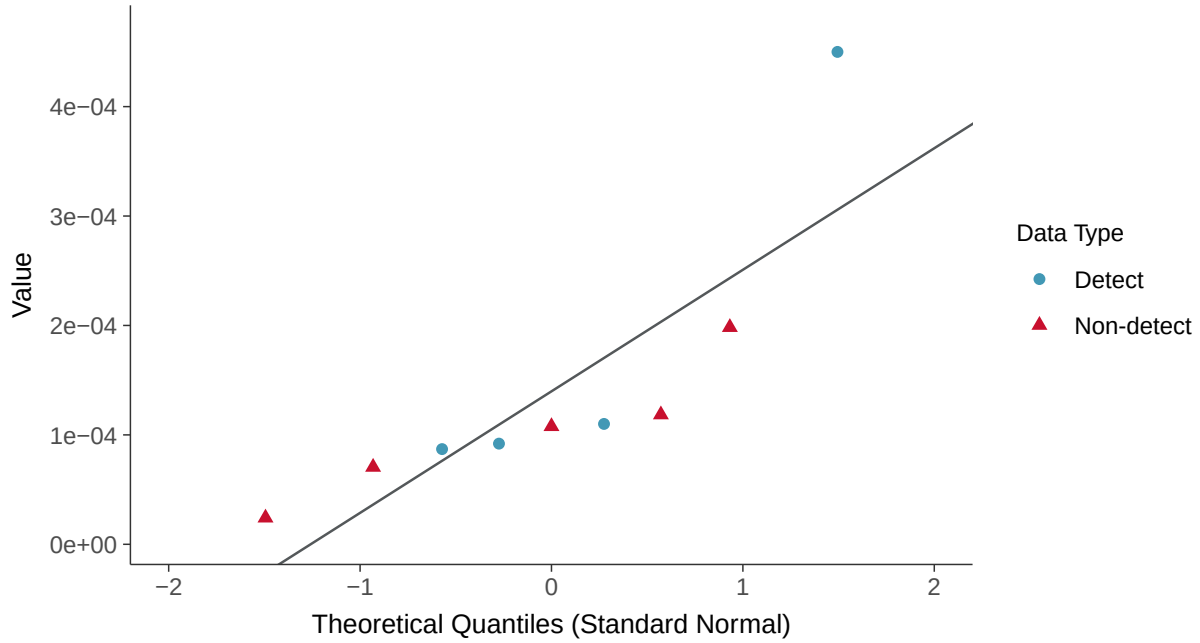
Boxplot by Season

Antimony, MW-03 (mg/L)



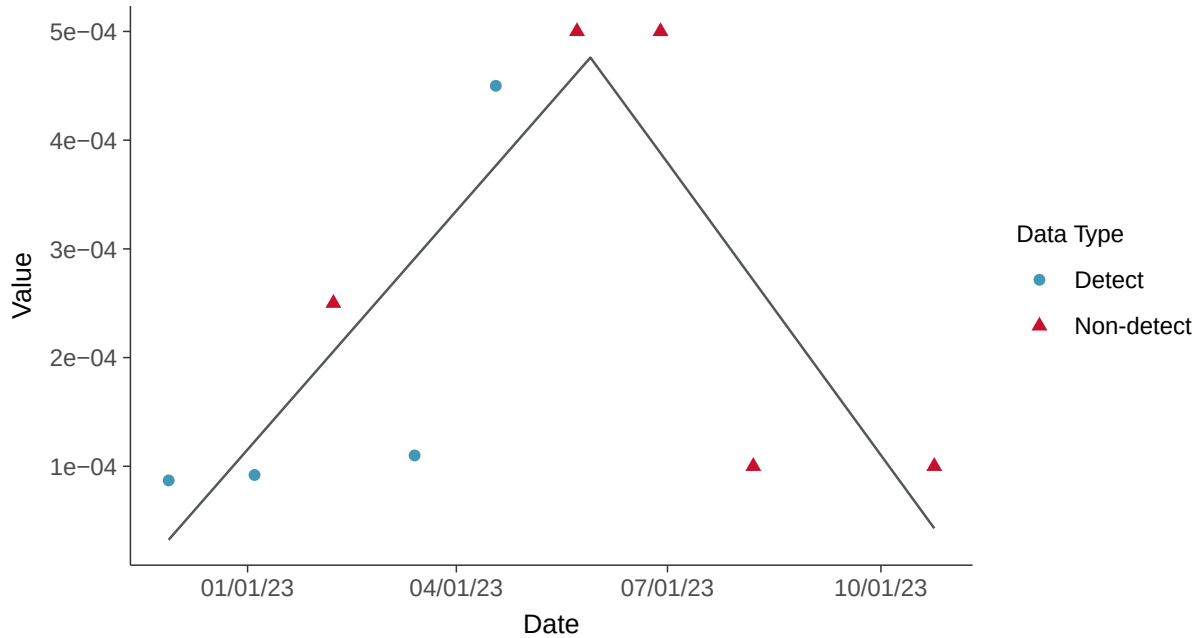
Normal Q-Q plot using ROS Imputed Estimates

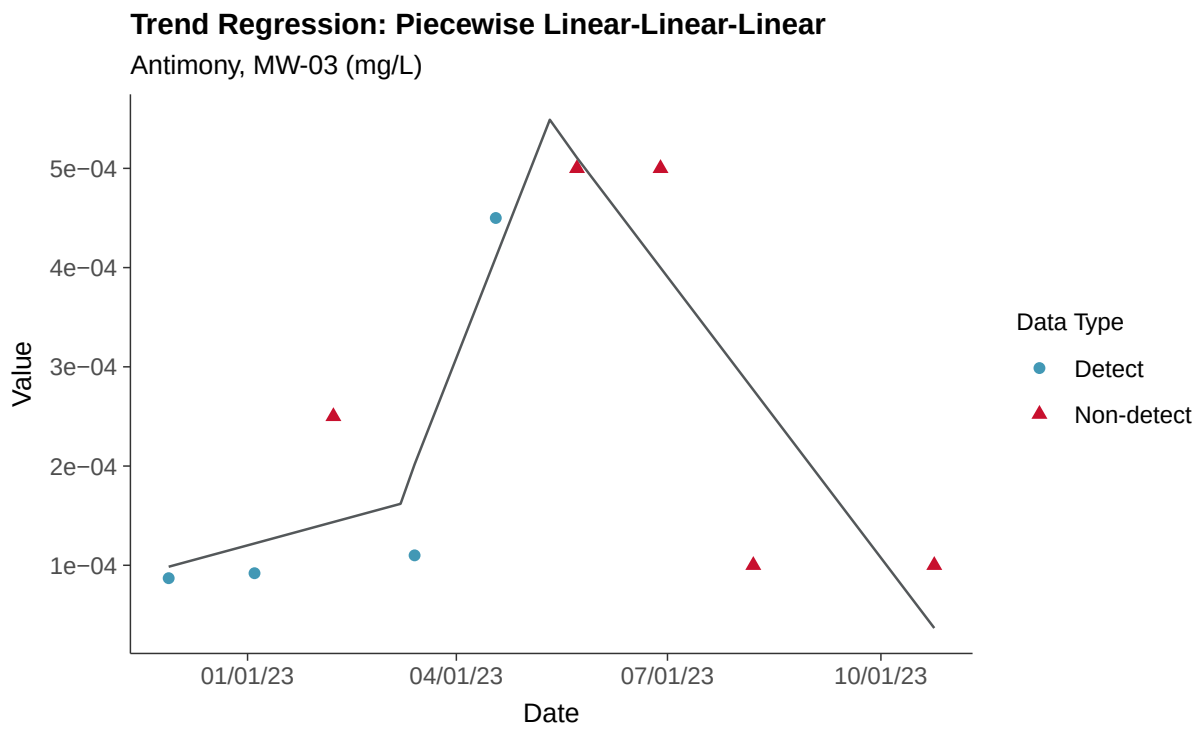
Antimony, MW-03 (mg/L)



Trend Regression: Piecewise Linear-Linear

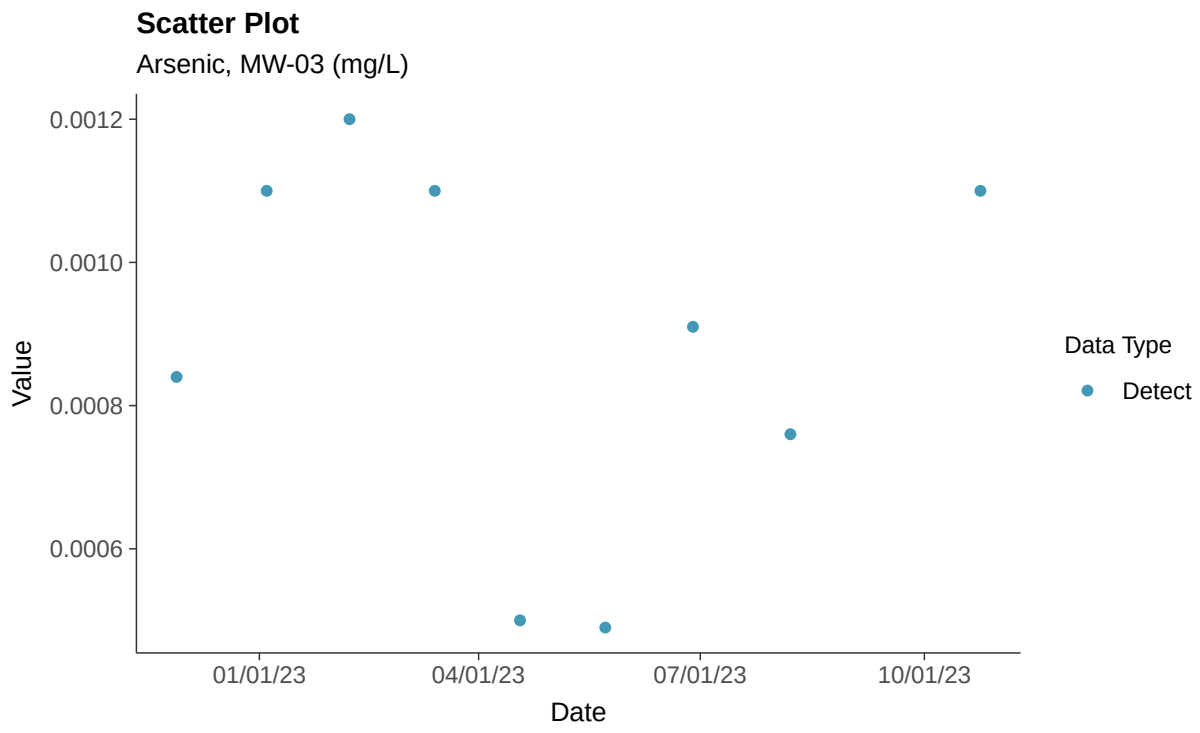
Antimony, MW-03 (mg/L)

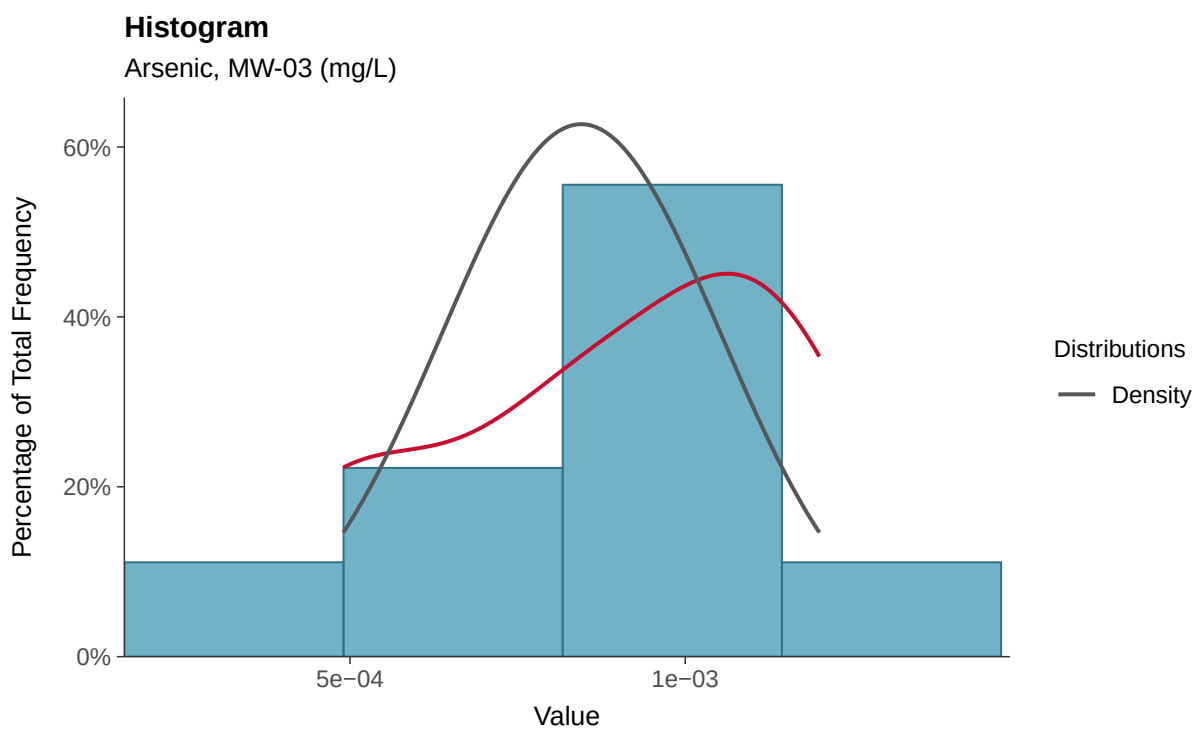



Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-03 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-03

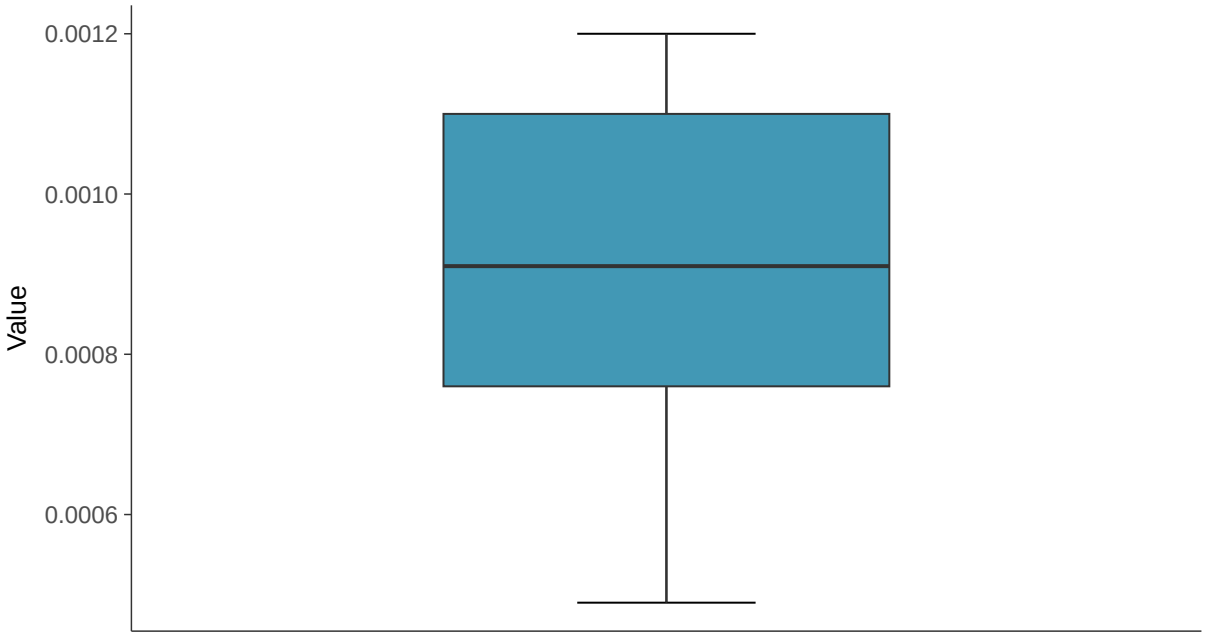
ID: 2_13_5_102





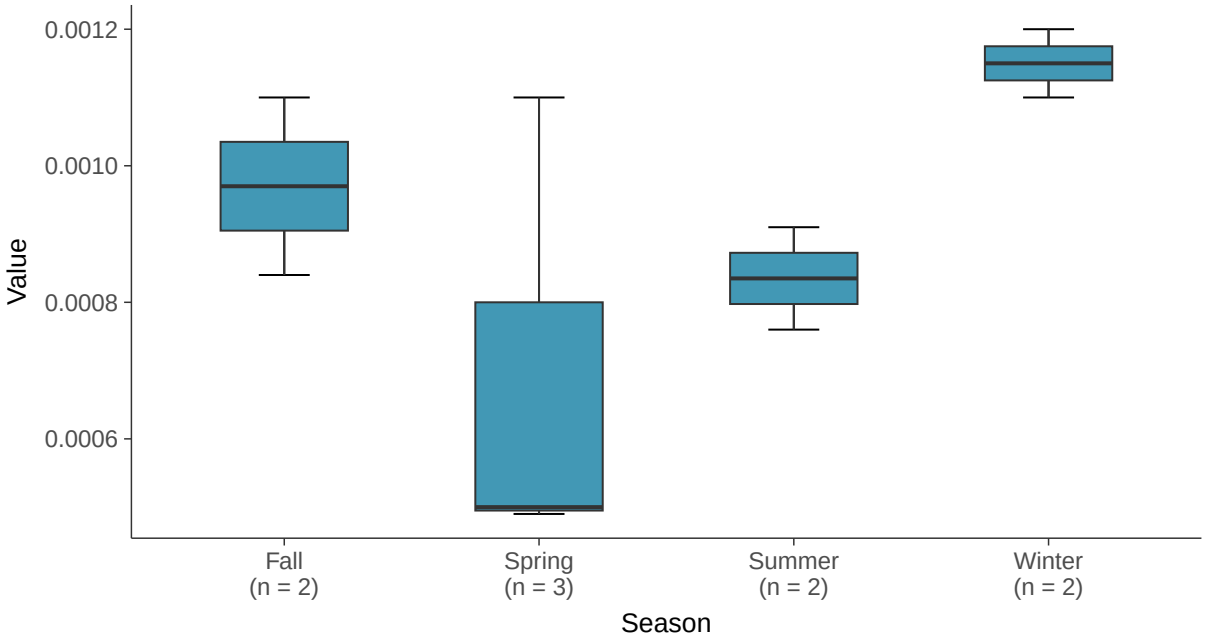
Boxplot

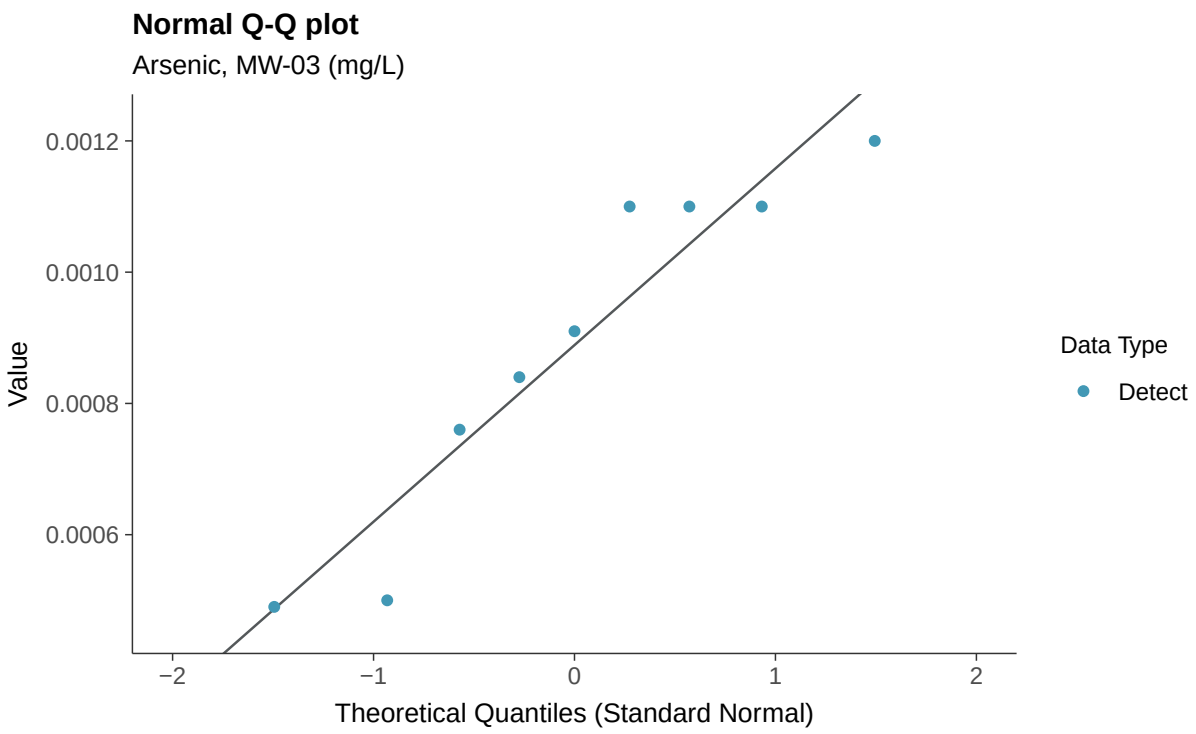
Arsenic, MW-03 (mg/L)

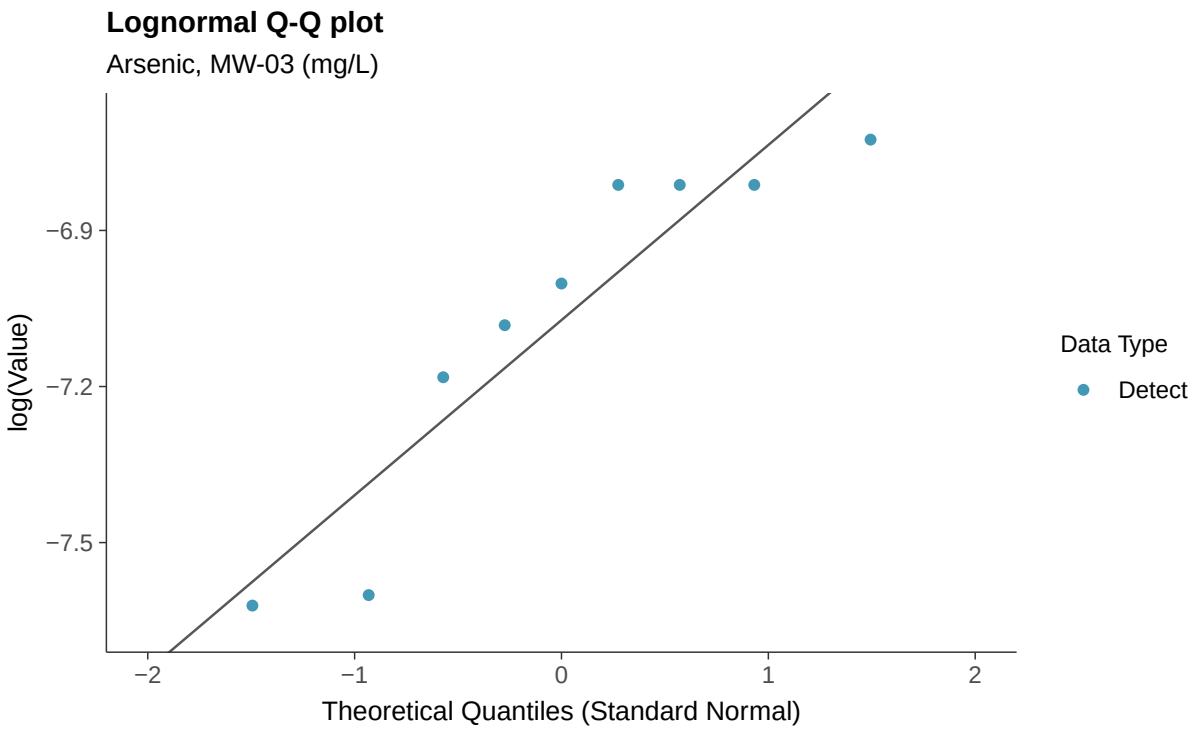


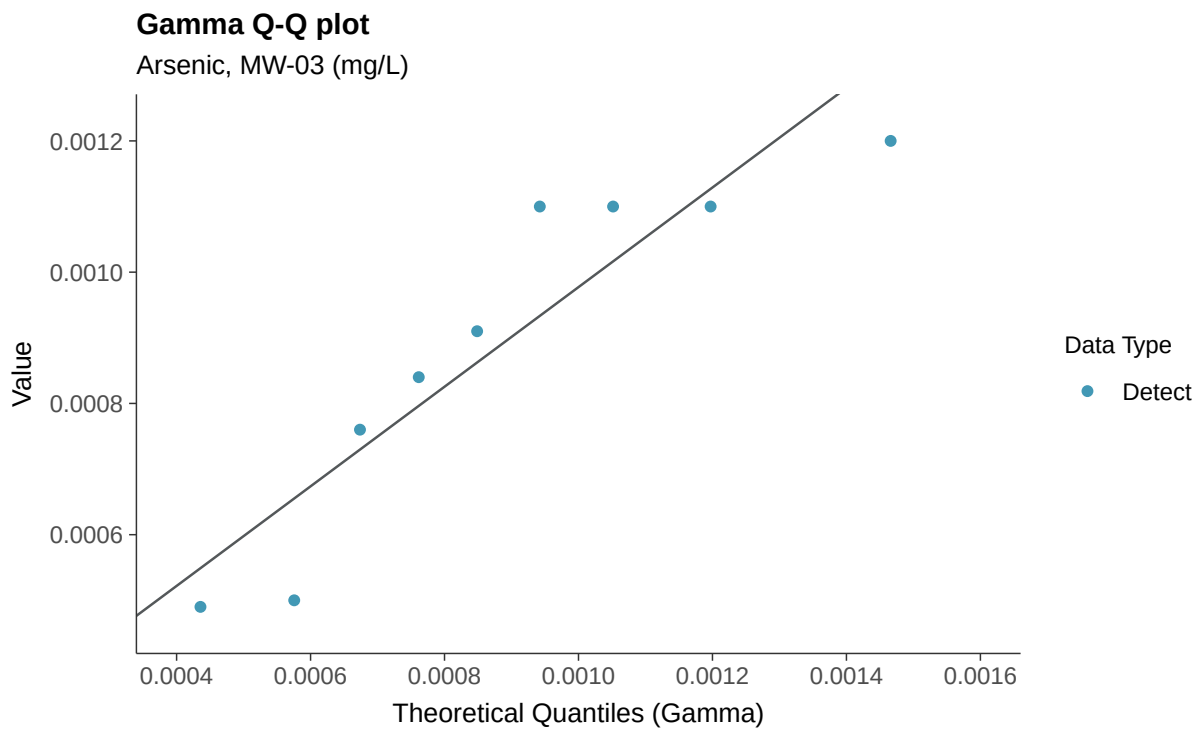
Boxplot by Season

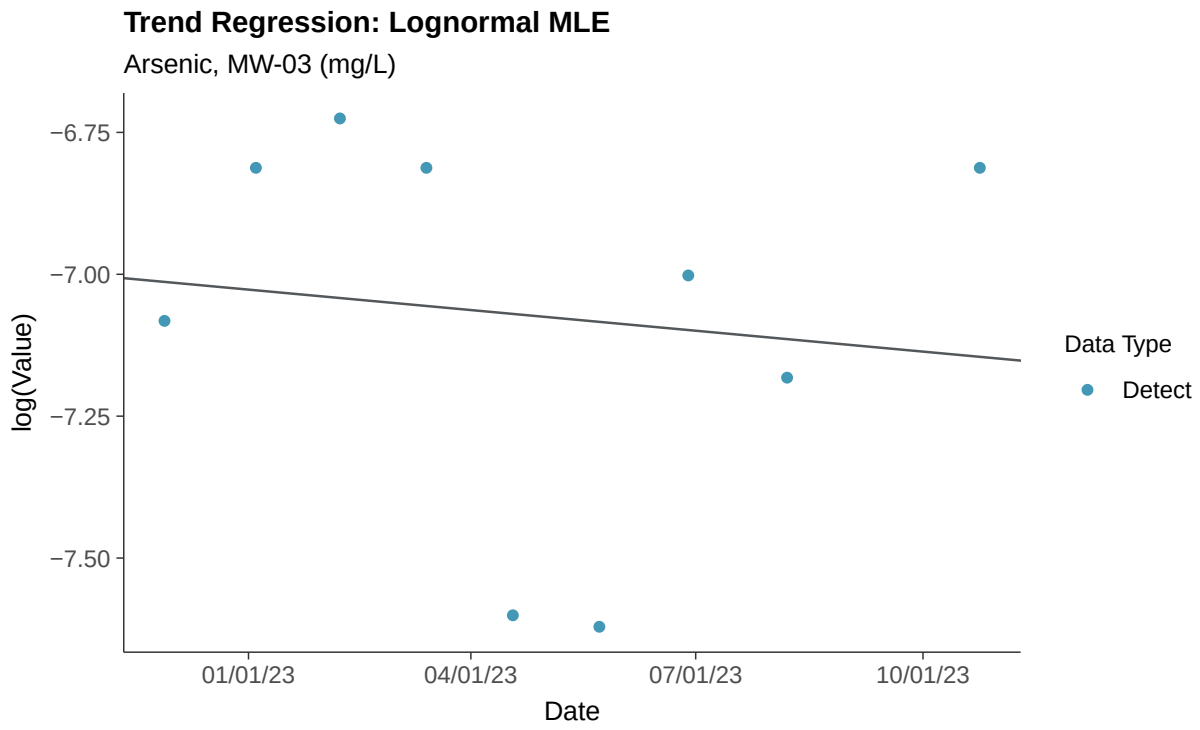
Arsenic, MW-03 (mg/L)




Normal Q-Q plot
Arsenic, MW-03 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

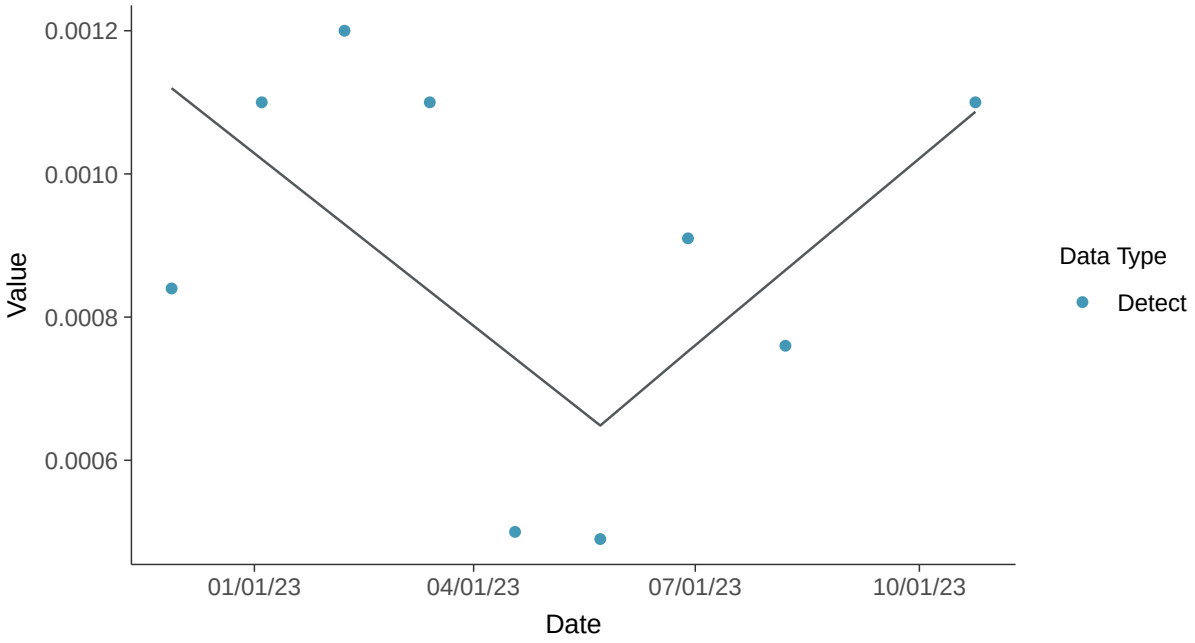

Lognormal Q-Q plot
Arsenic, MW-03 (mg/L)
log(Value)
−6.9
−7.2
−7.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-03 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
0.0004
0.0006
0.0008
0.0010
0.0012
0.0014
0.0016
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Arsenic, MW-03 (mg/L)
log(Value)
−6.75
−7.00
−7.25
−7.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

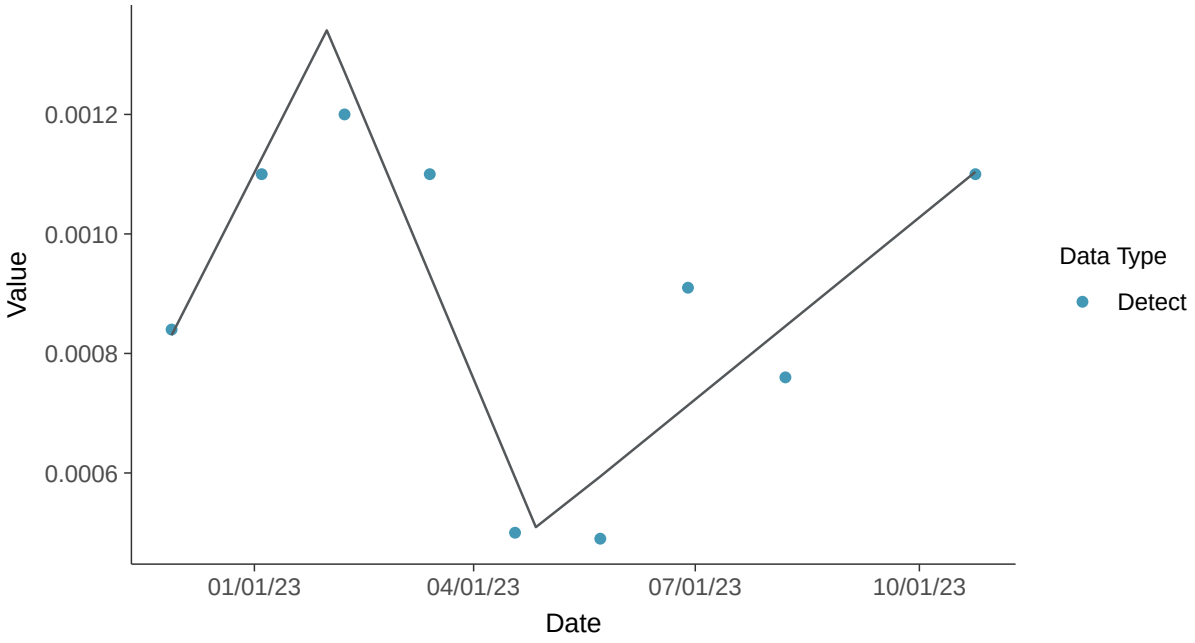
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-03 (mg/L)



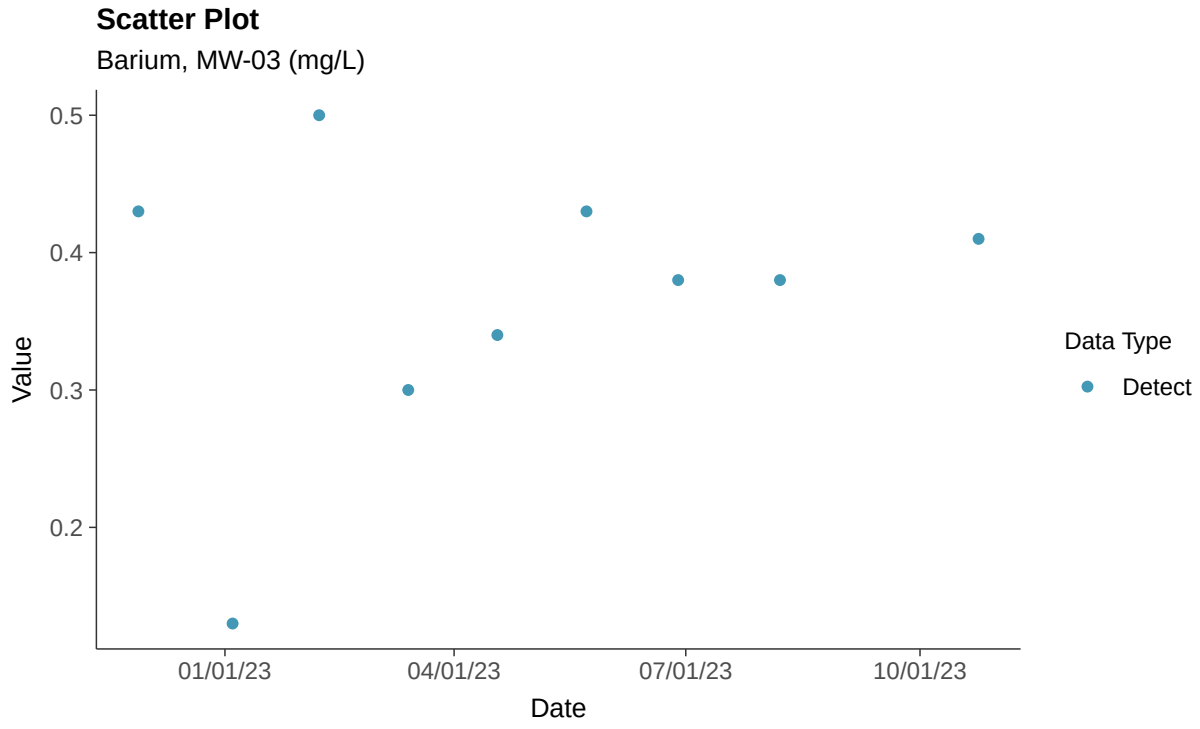
Trend Regression: Piecewise Linear-Linear-Linear

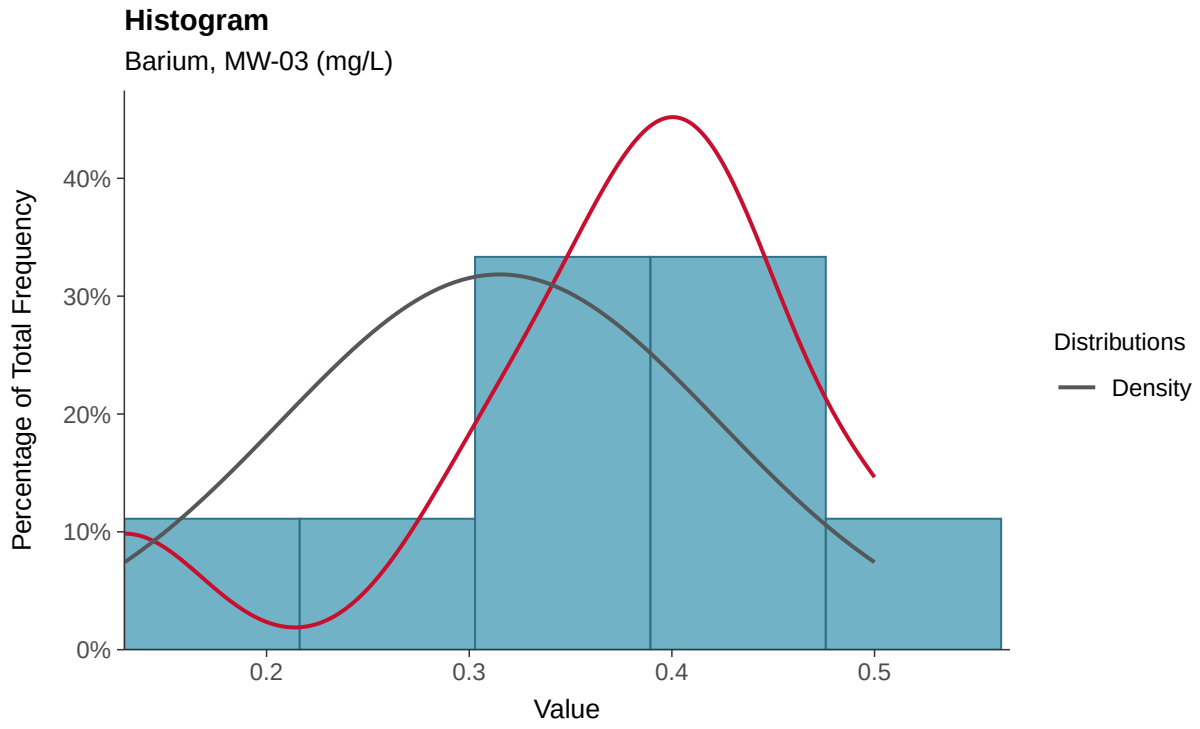
Arsenic, MW-03 (mg/L)



Appendix IV: Barium, MW-03

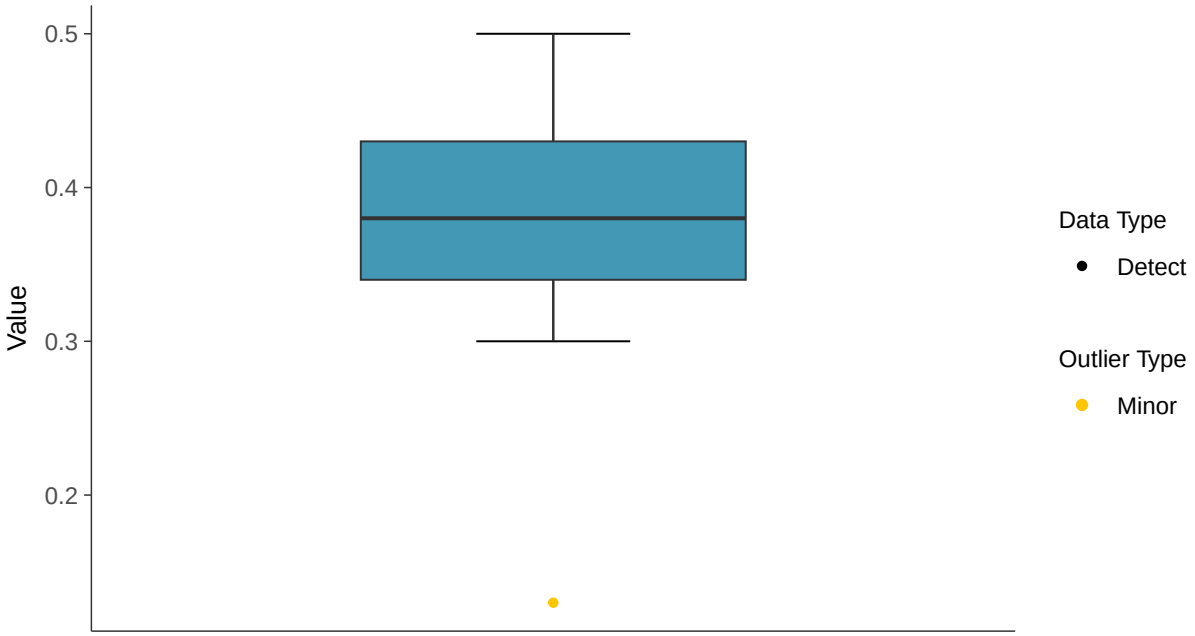
ID: 2_13_5_103





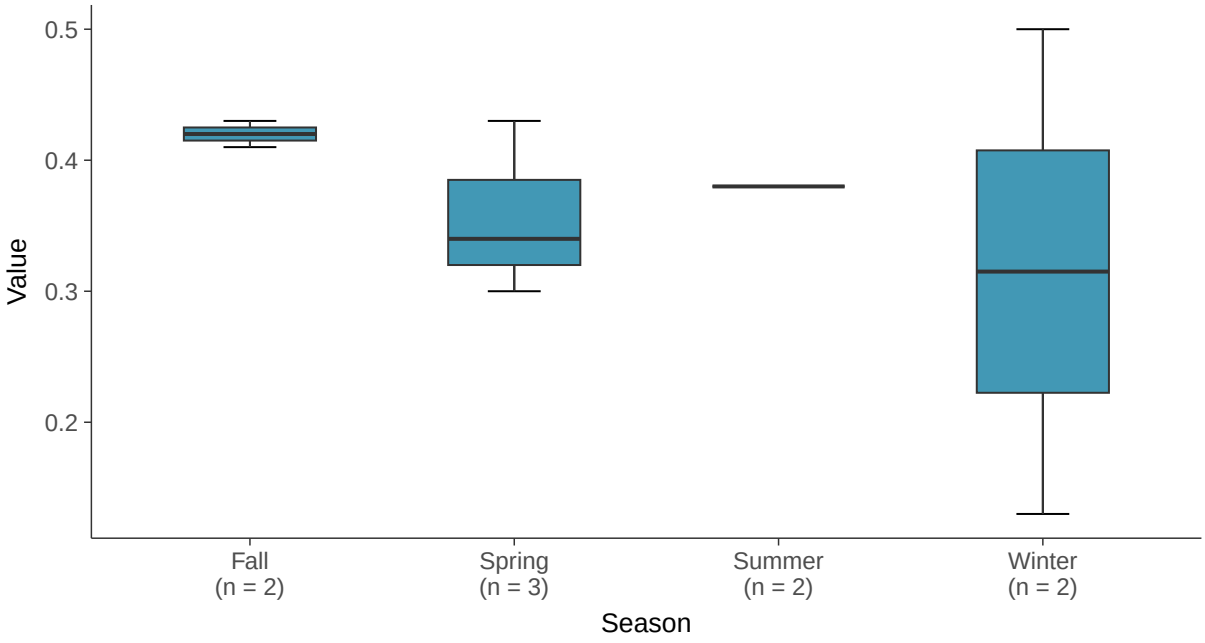
Boxplot

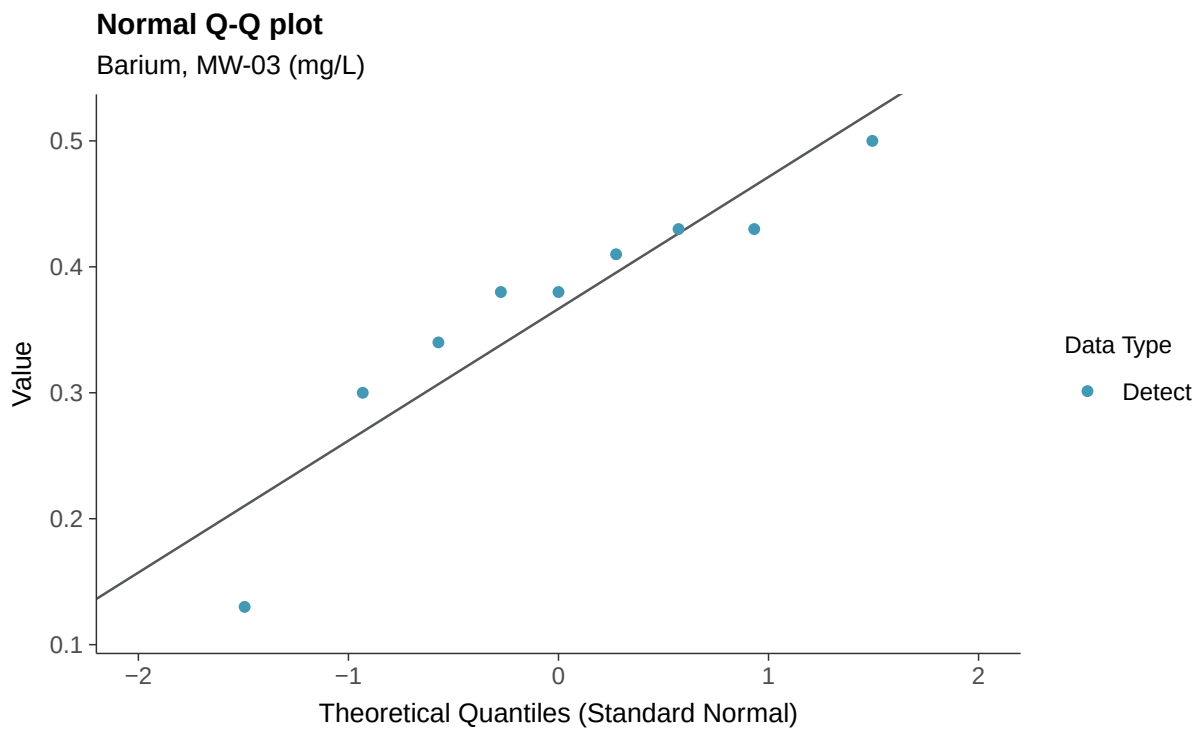
Barium, MW-03 (mg/L)

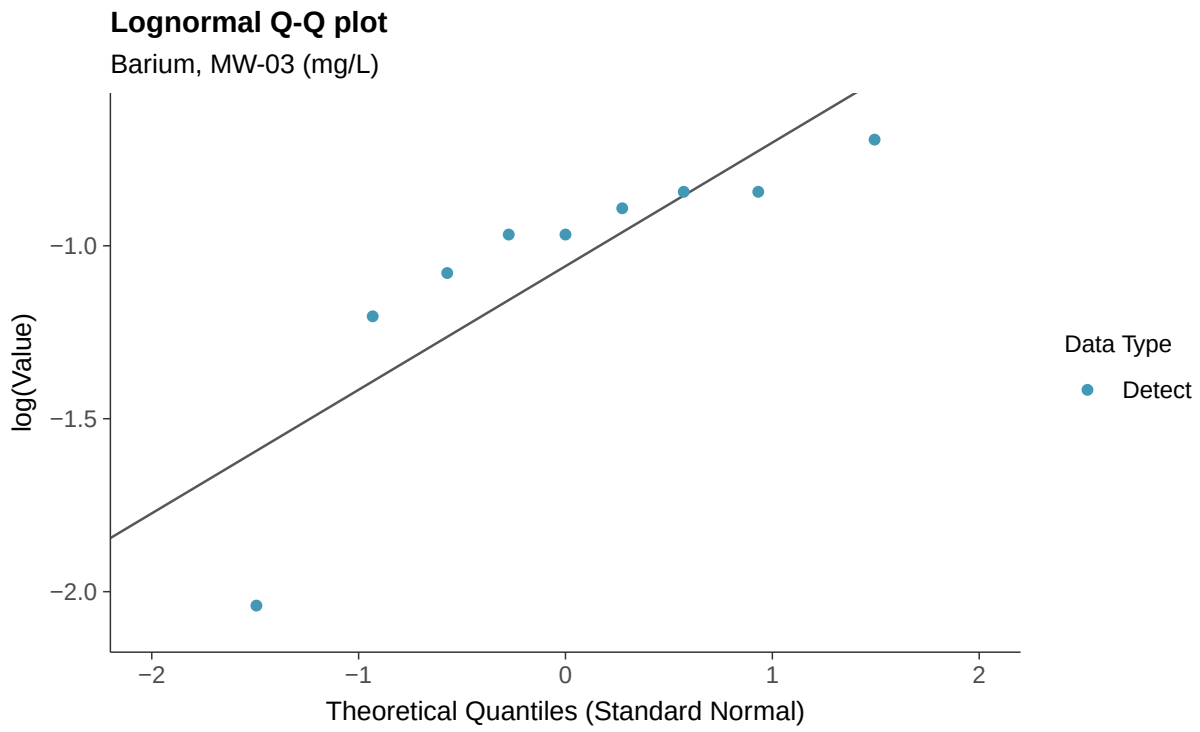


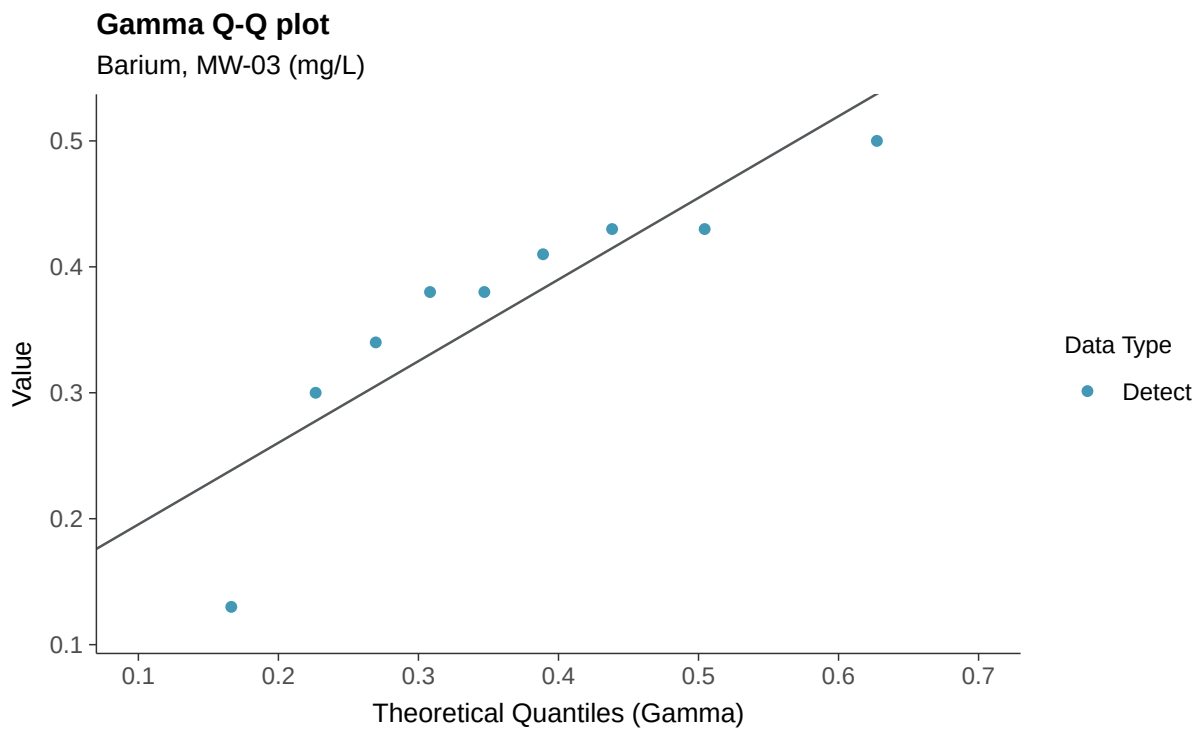
Boxplot by Season

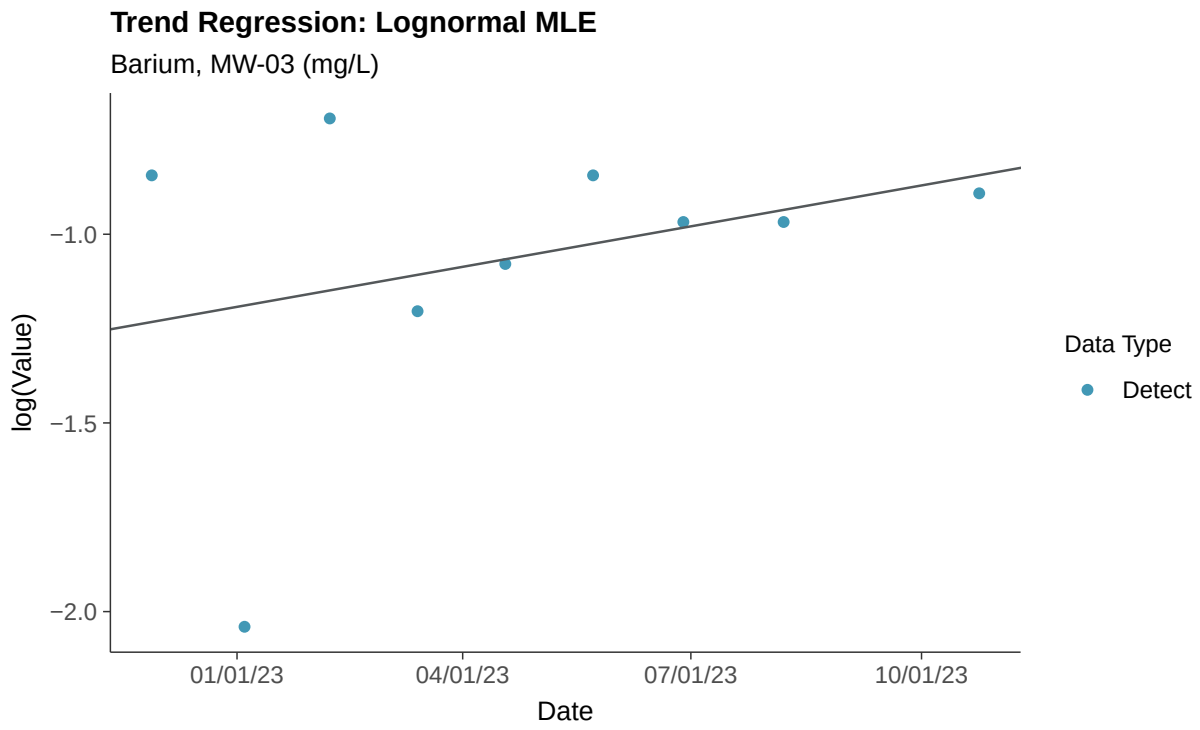
Barium, MW-03 (mg/L)




Normal Q-Q plot
Barium, MW-03 (mg/L)
Value
0.5
0.4
0.3
0.2
0.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

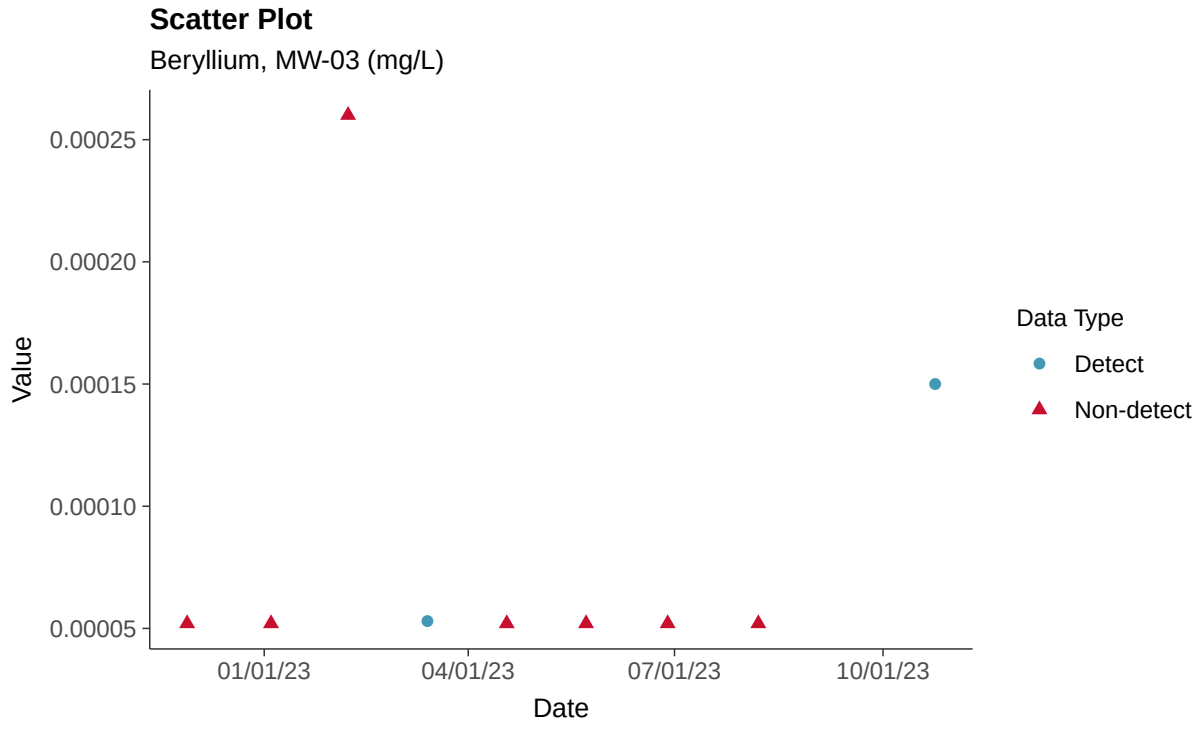

Lognormal Q-Q plot
Barium, MW-03 (mg/L)
log(Value)
−1.0
−1.5
−2.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

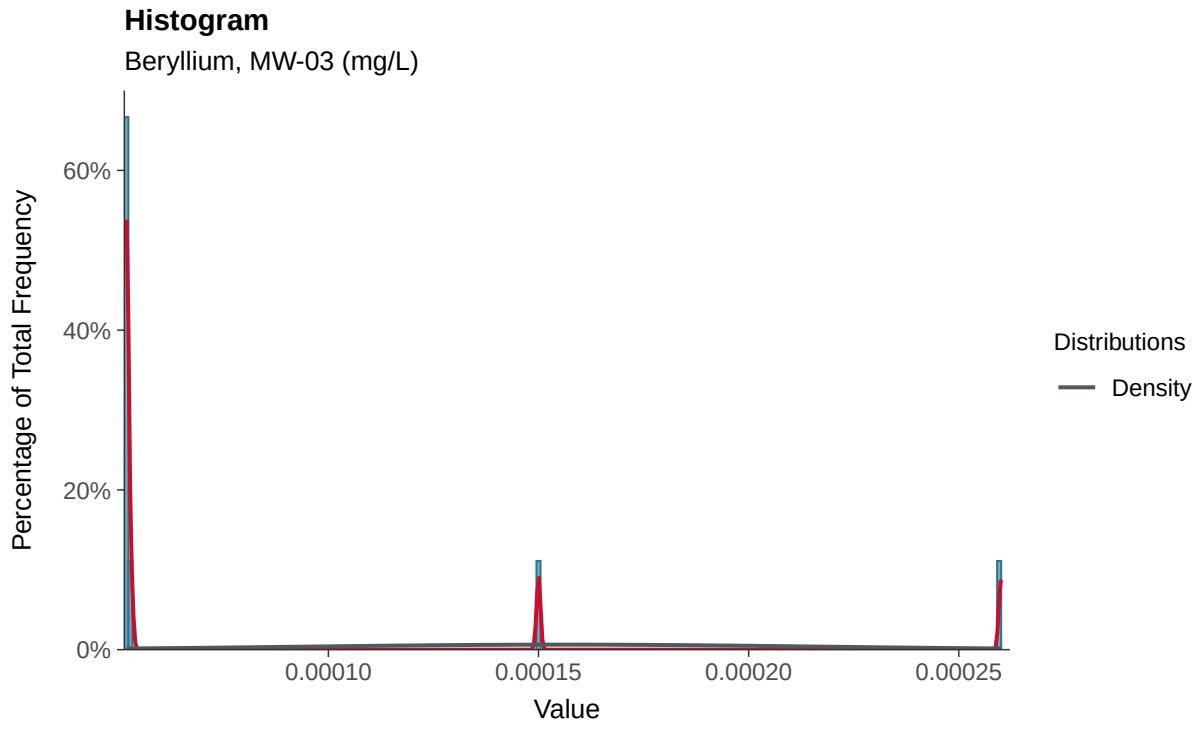

Gamma Q-Q plot
Barium, MW-03 (mg/L)
Value
0.5
0.4
0.3
0.2
0.1
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Barium, MW-03 (mg/L)
log(Value)
−1.0
−1.5
−2.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-03

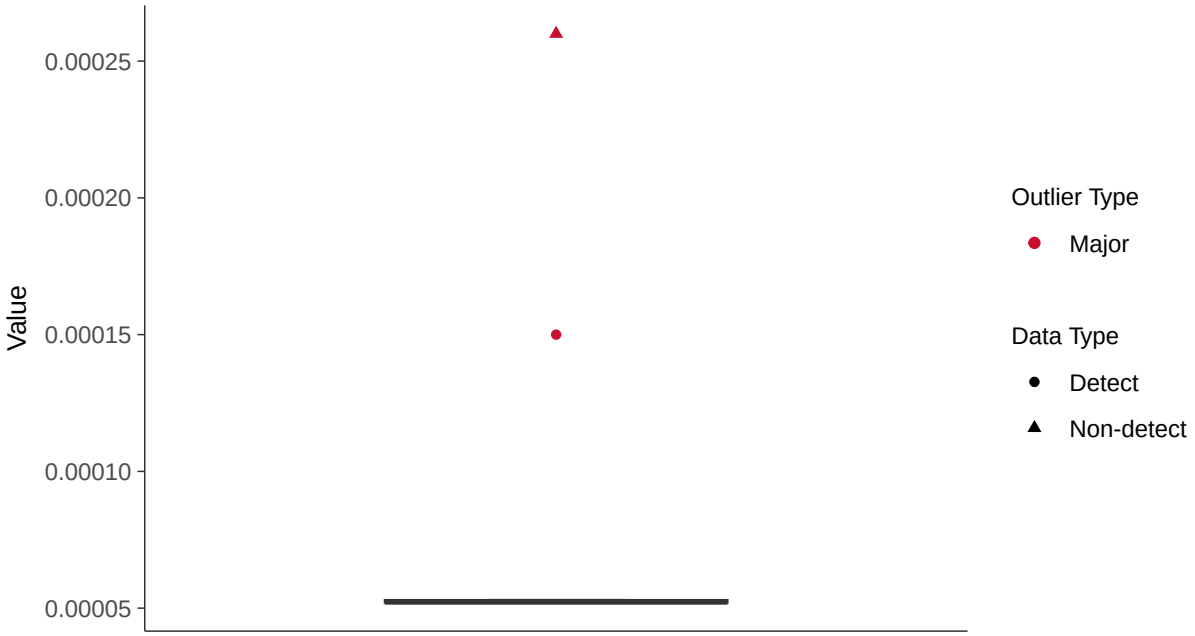
ID: 2_13_5_104





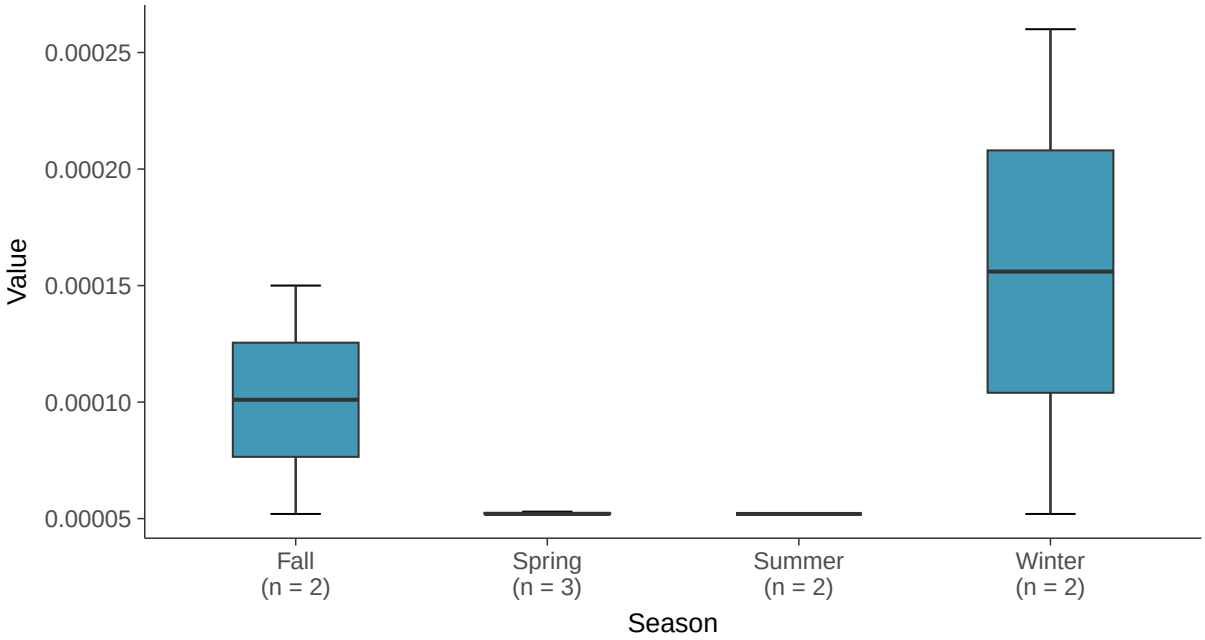
Boxplot

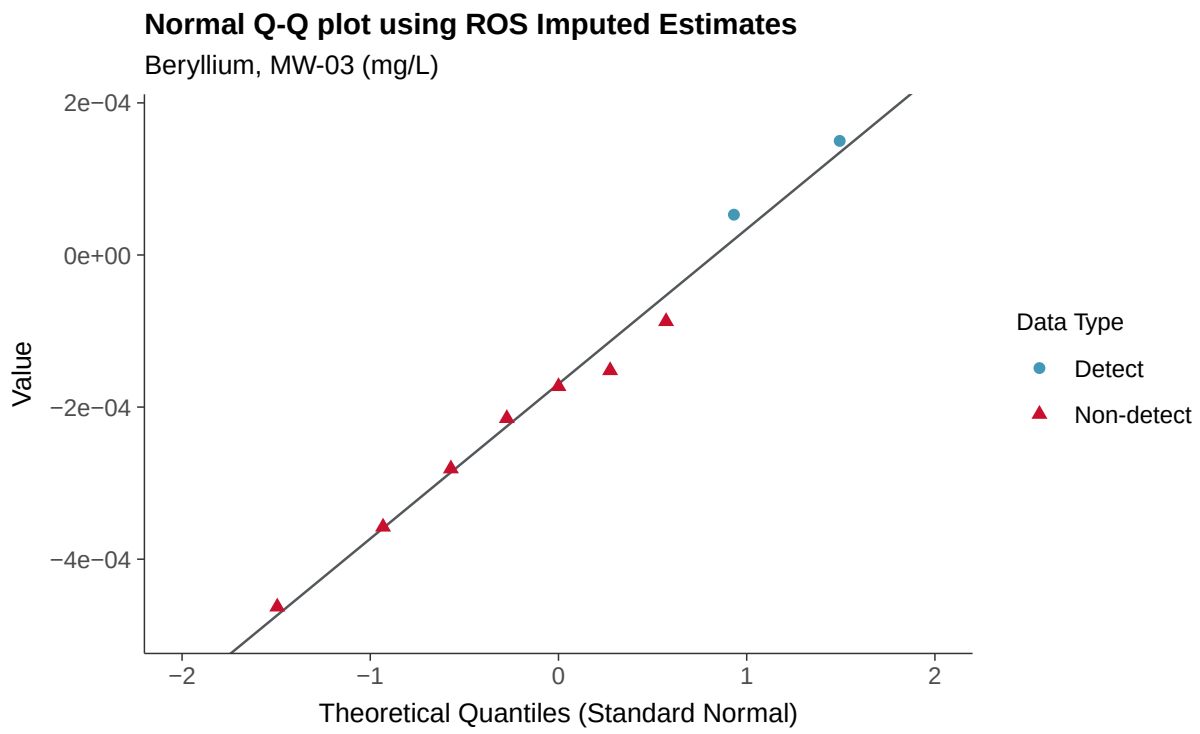
Beryllium, MW-03 (mg/L)

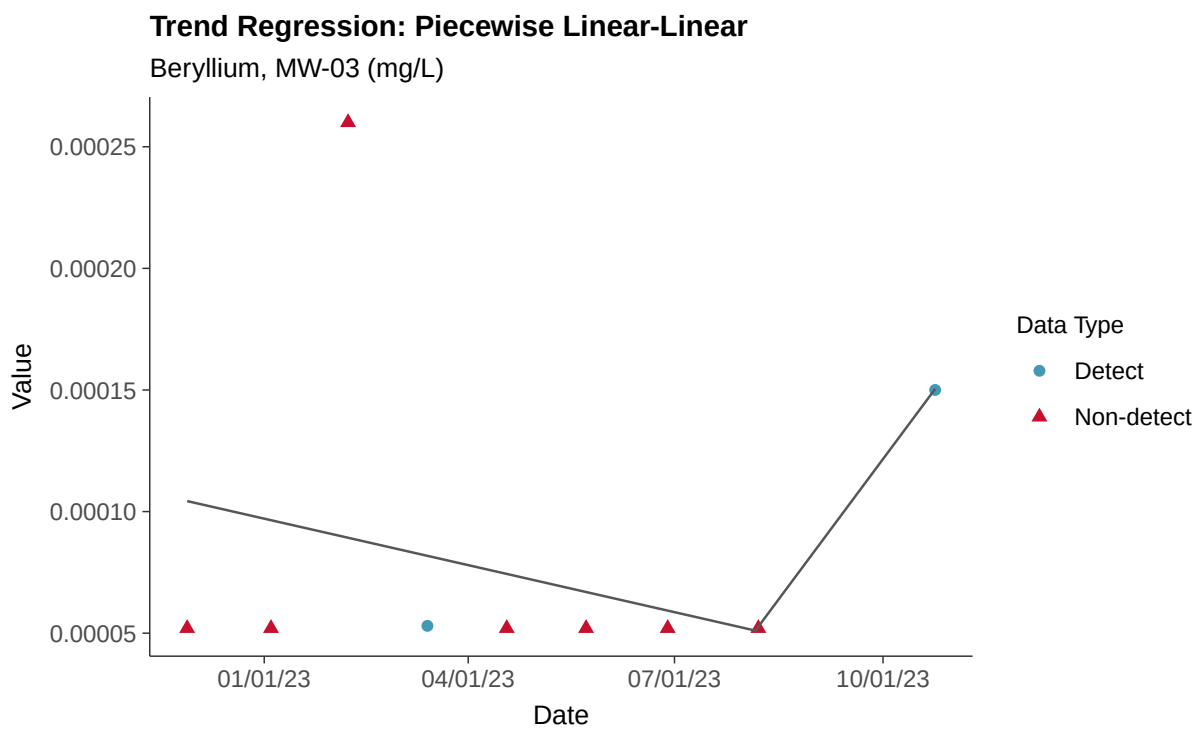


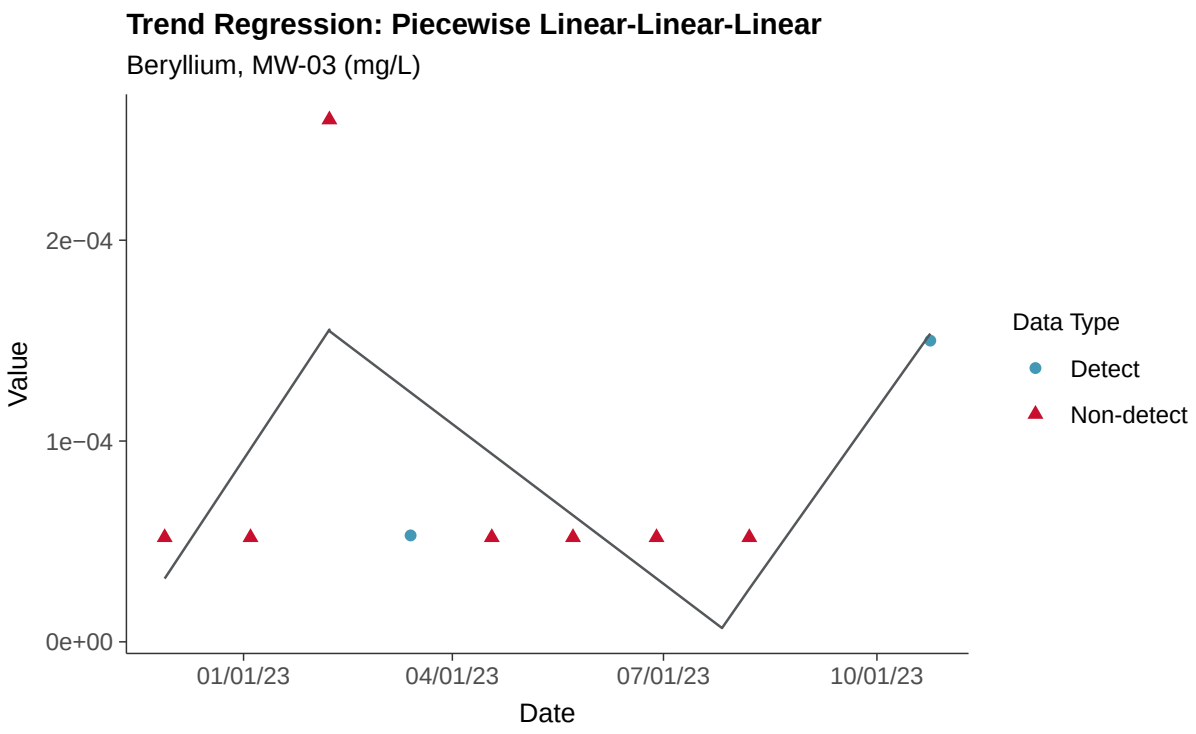
Boxplot by Season

Beryllium, MW-03 (mg/L)



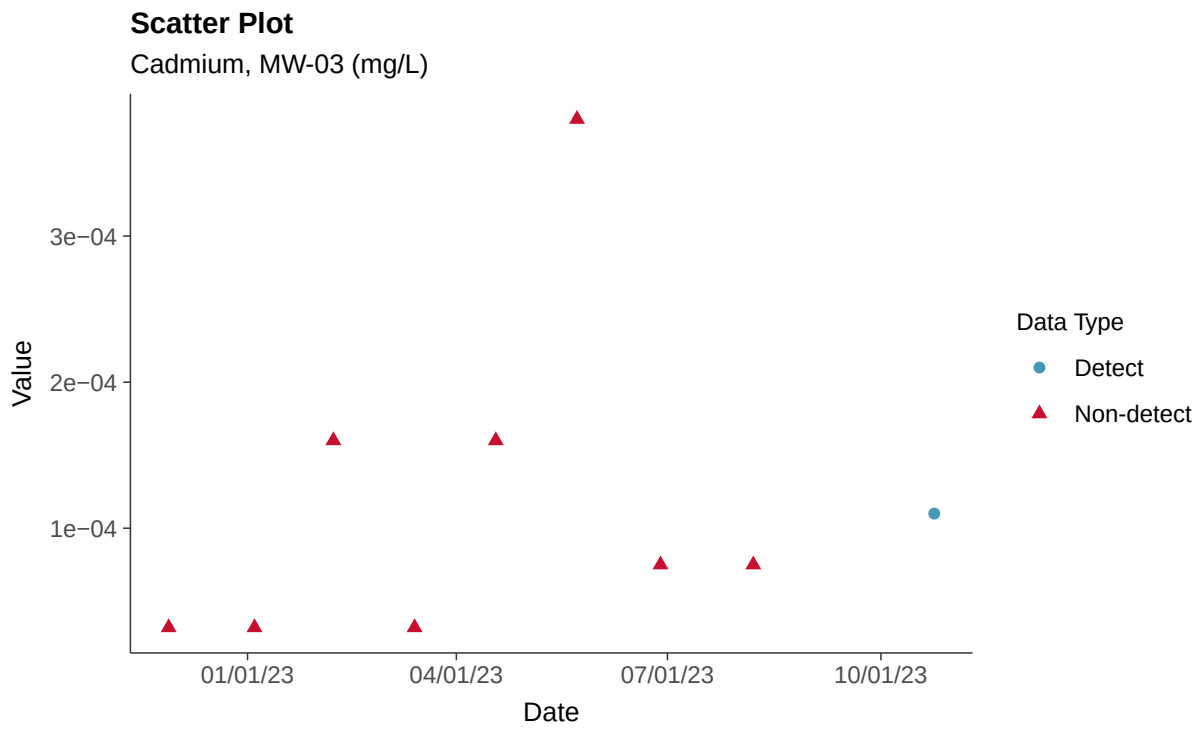

Normal Q-Q plot using ROS Imputed Estimates
Beryllium, MW-03 (mg/L)
2e−04
0e+00
−2e−04
−4e−04
Value
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

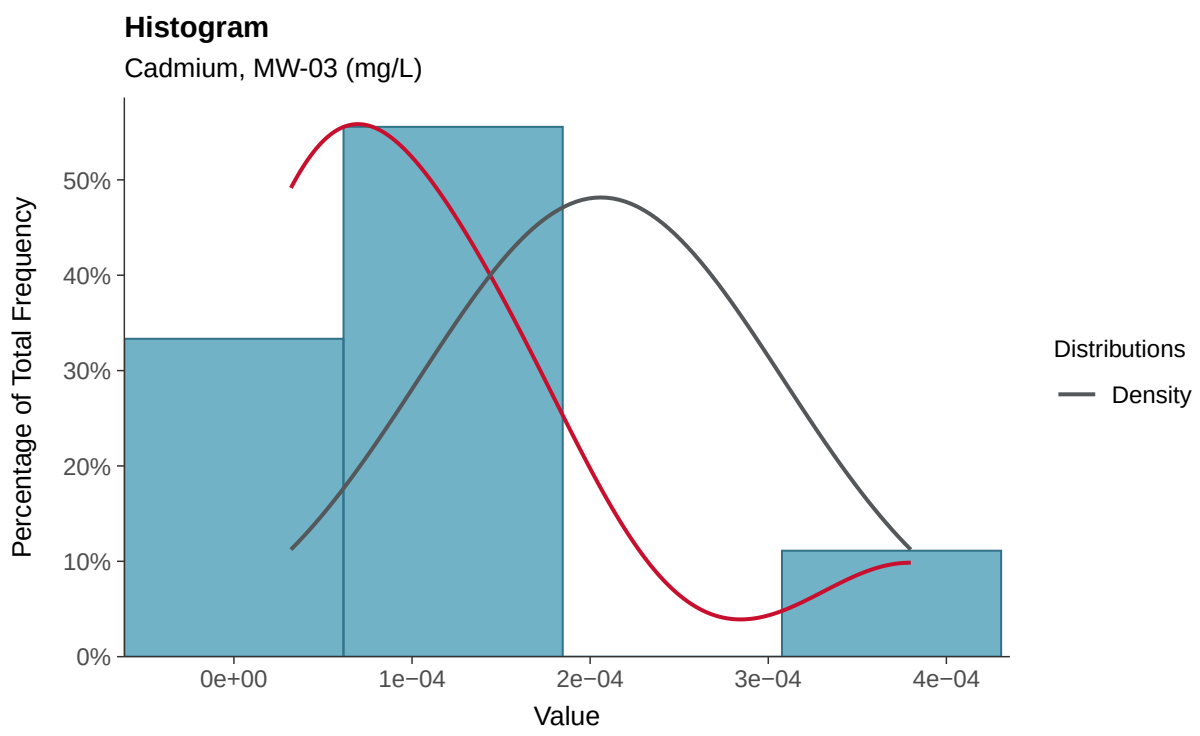

Trend Regression: Piecewise Linear-Linear
Beryllium, MW-03 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Beryllium, MW-03 (mg/L)
Value
2e−04
1e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Cadmium, MW-03

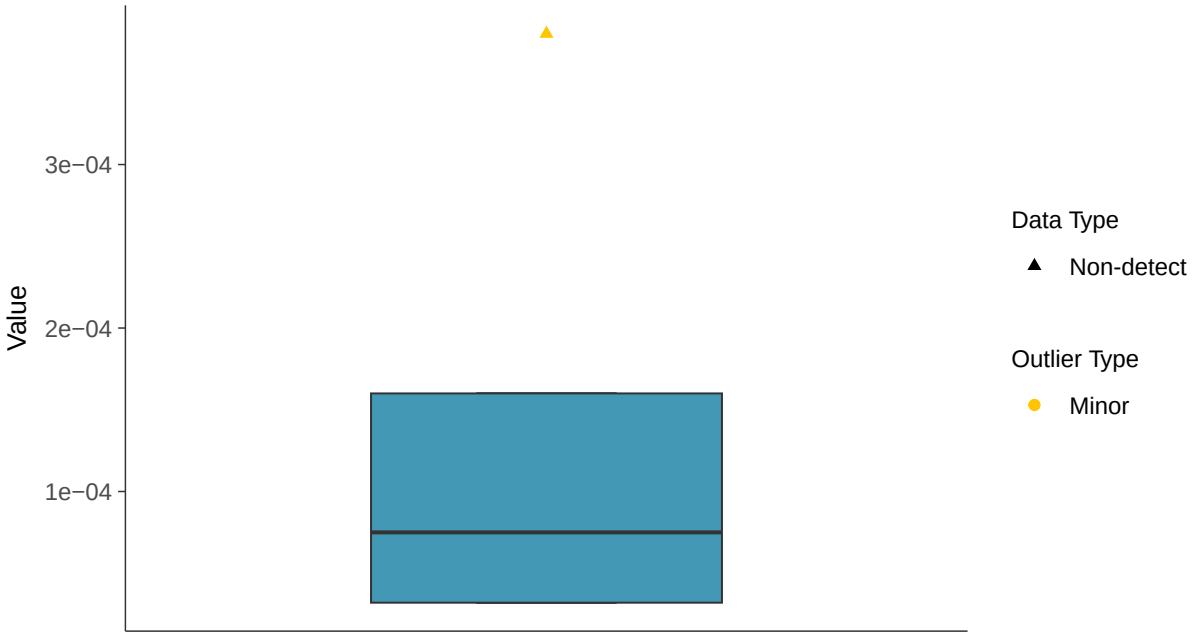
ID: 2_13_5_106





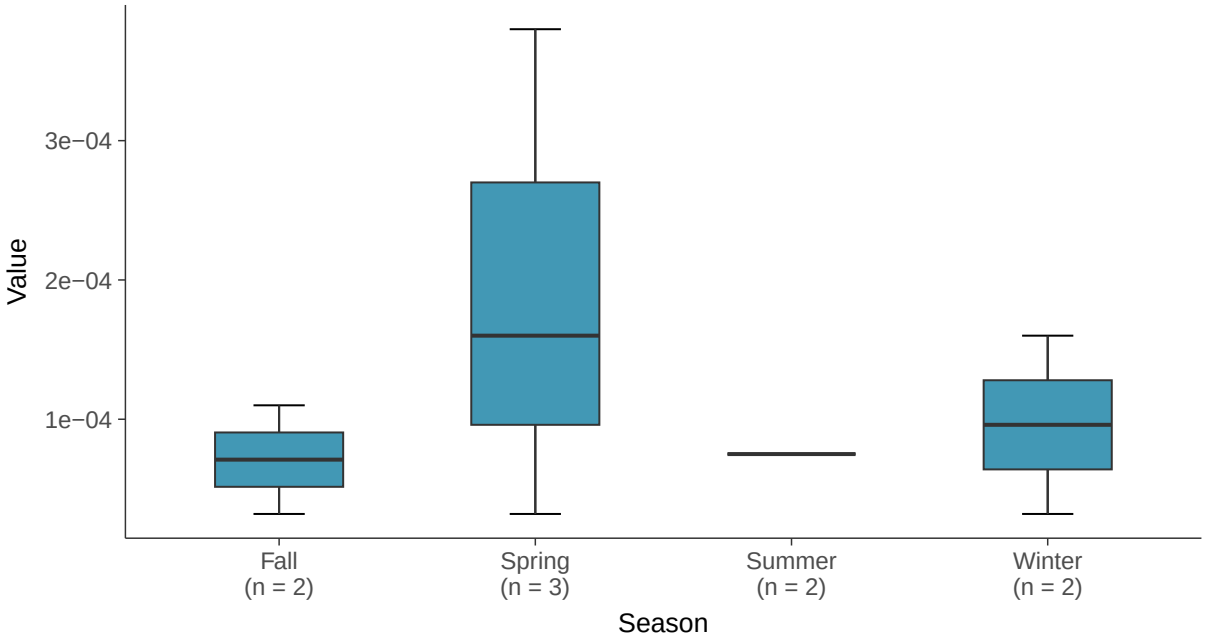
Boxplot

Cadmium, MW-03 (mg/L)



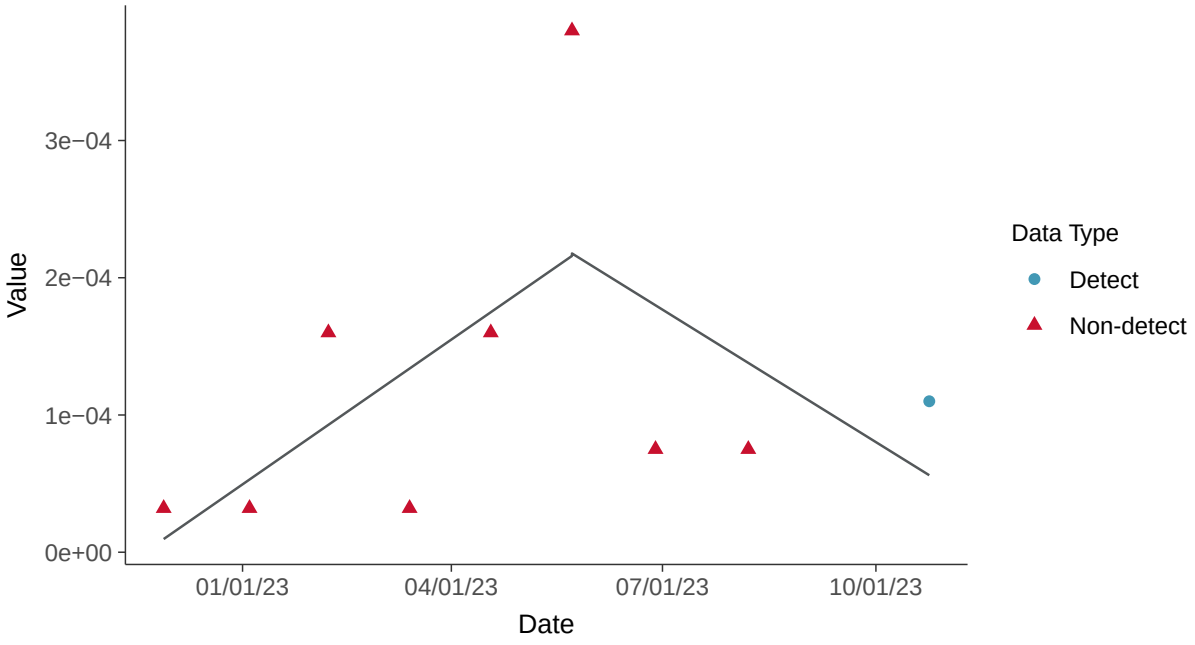
Boxplot by Season

Cadmium, MW-03 (mg/L)



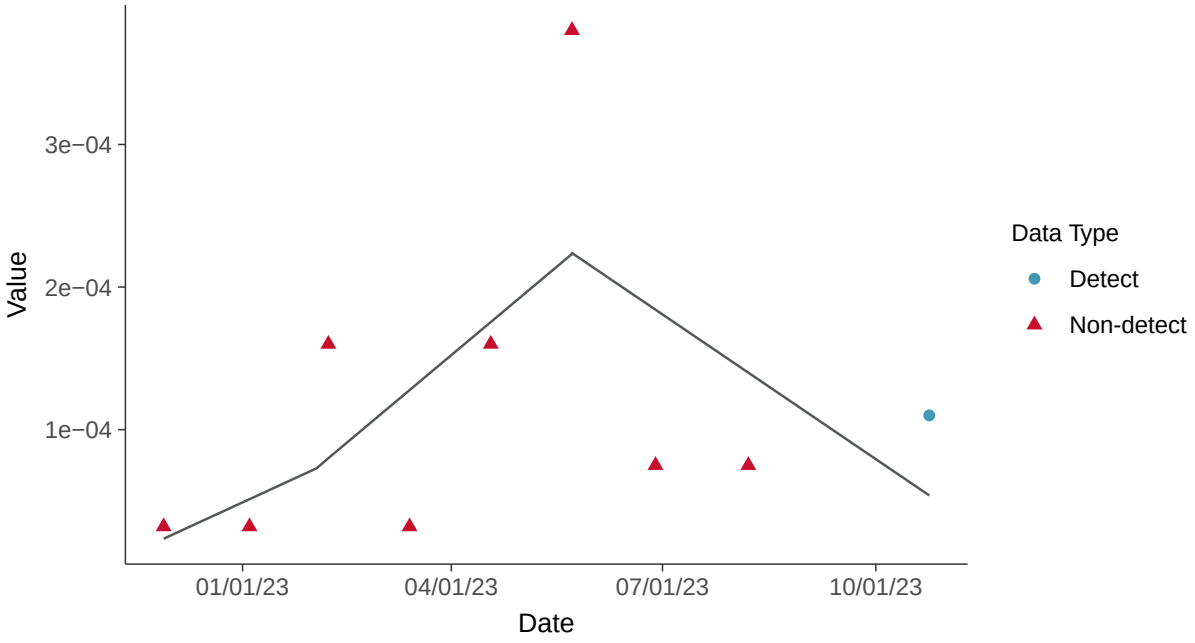
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-03 (mg/L)



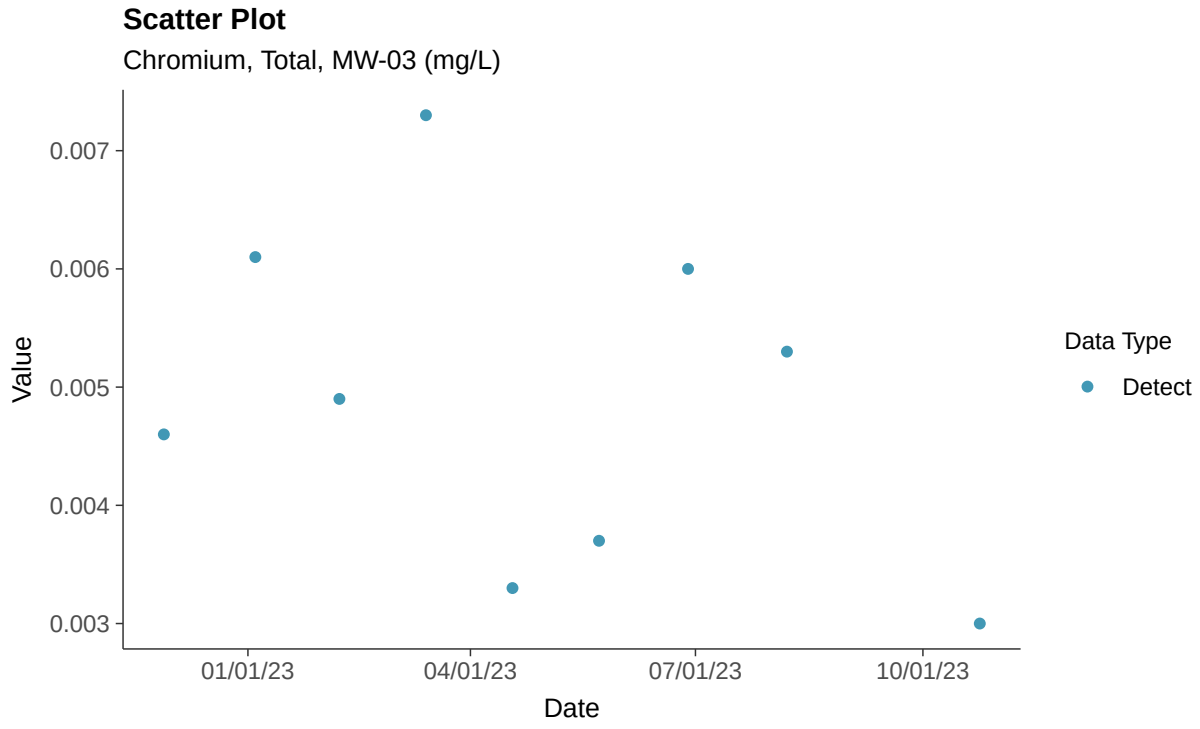
Trend Regression: Piecewise Linear-Linear-Linear

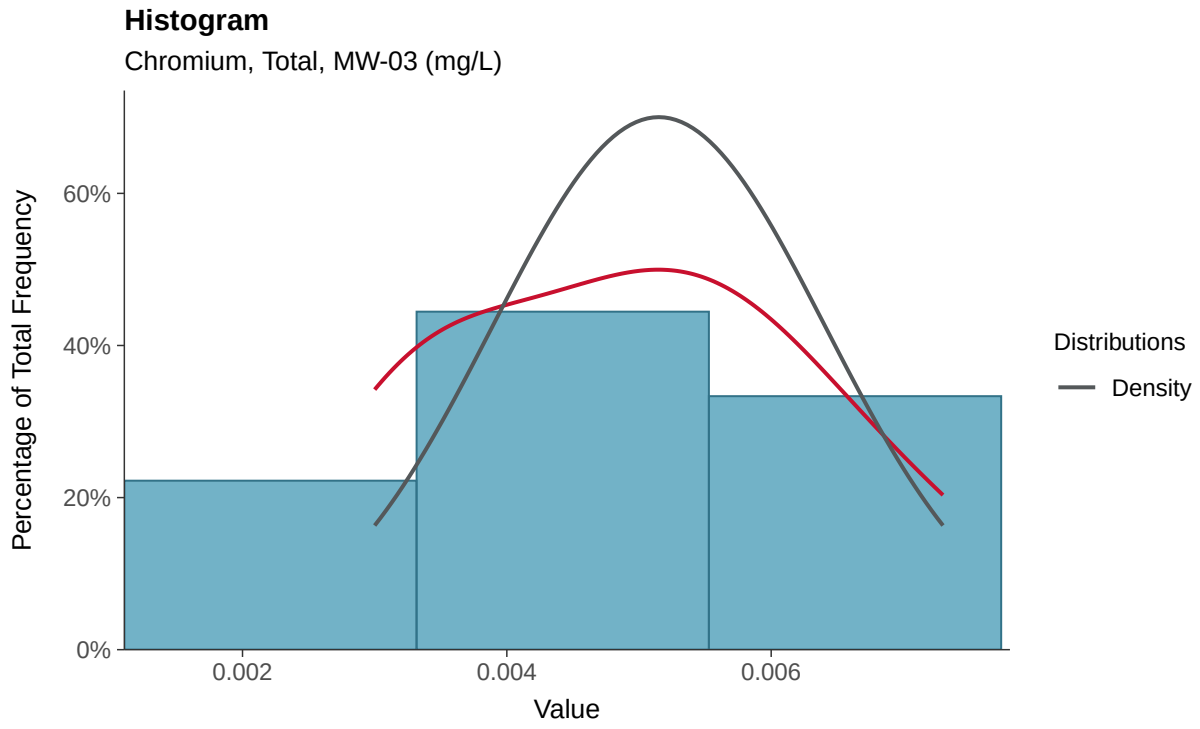
Cadmium, MW-03 (mg/L)



Appendix IV: Chromium, Total, MW-03

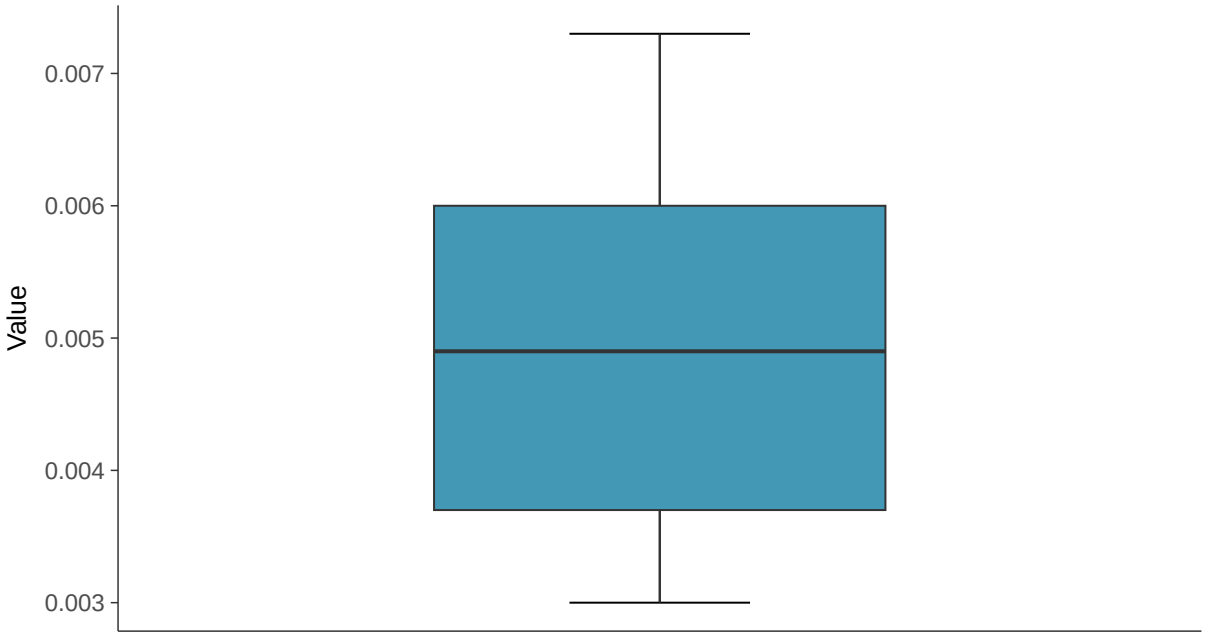
ID: 2_13_5_109





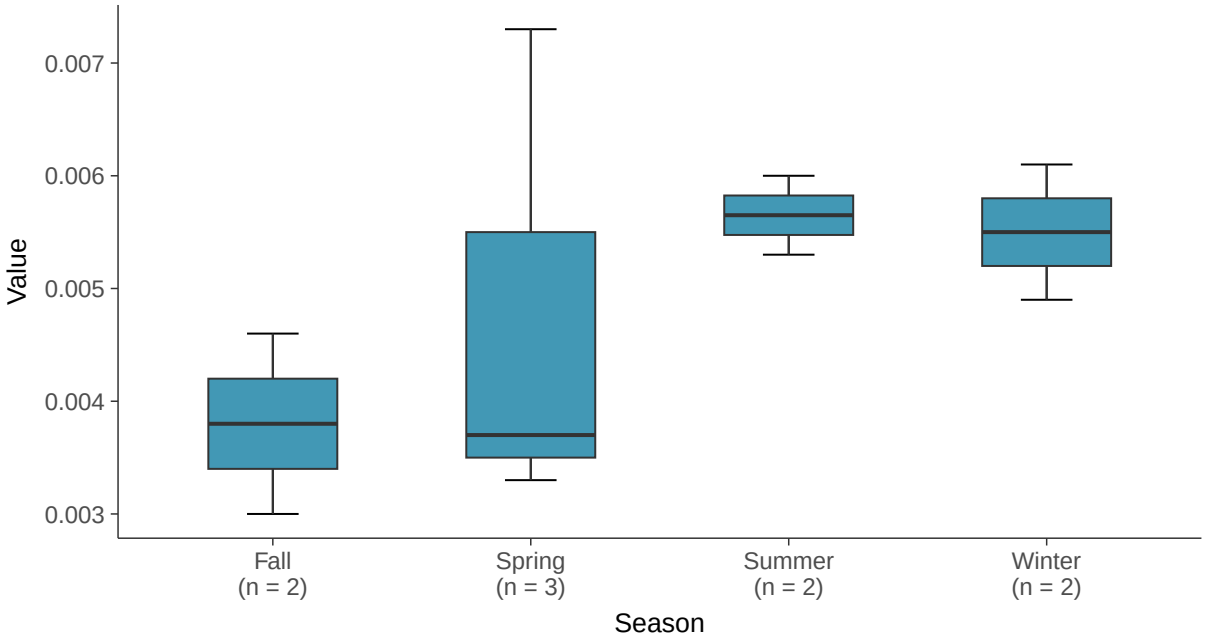
Boxplot

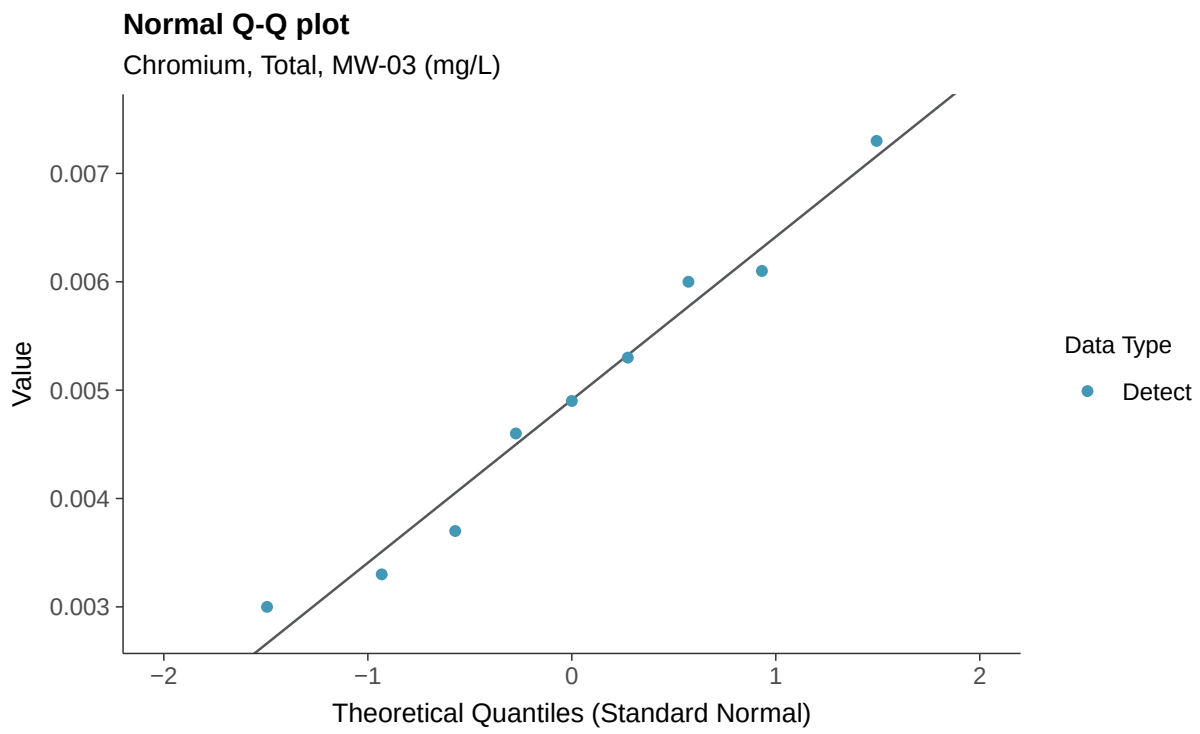
Chromium, Total, MW-03 (mg/L)

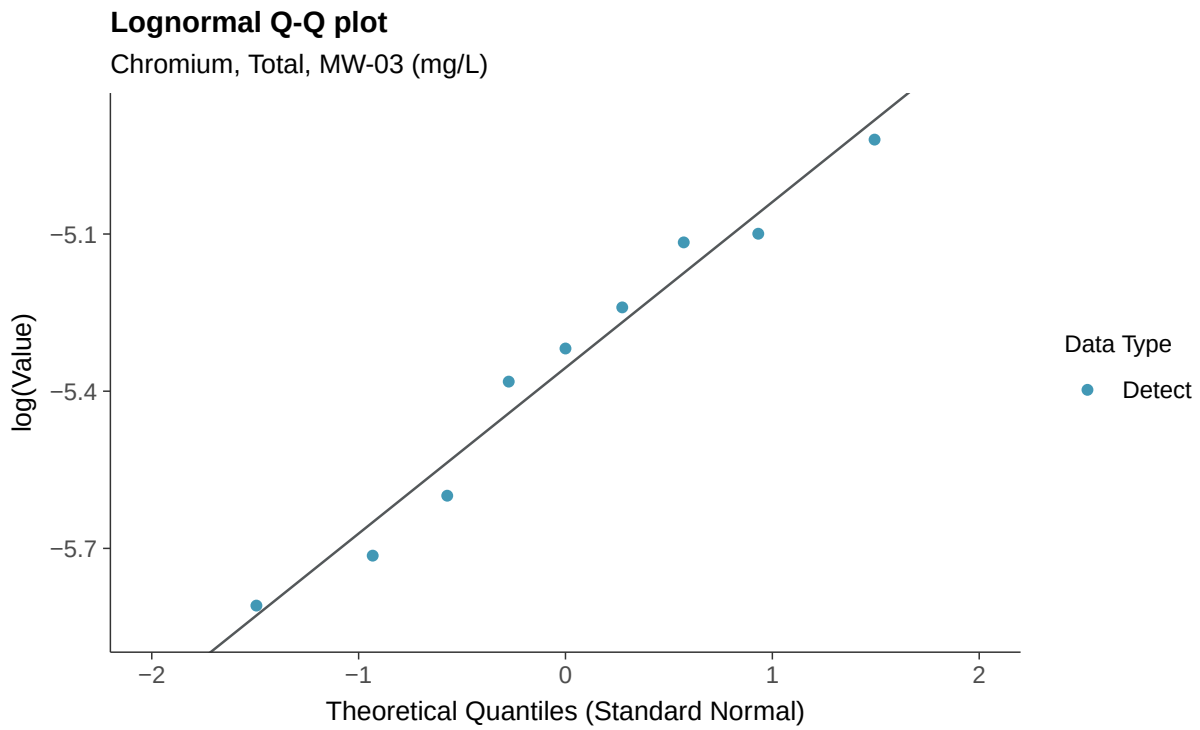


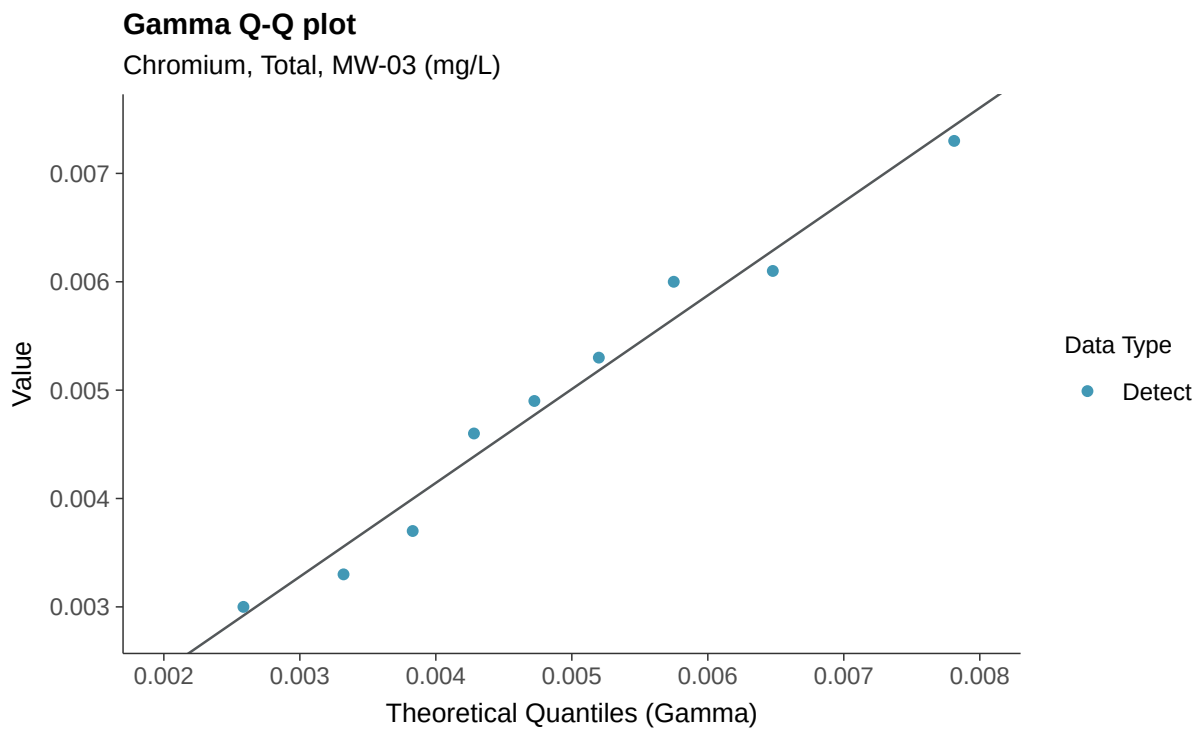
Boxplot by Season

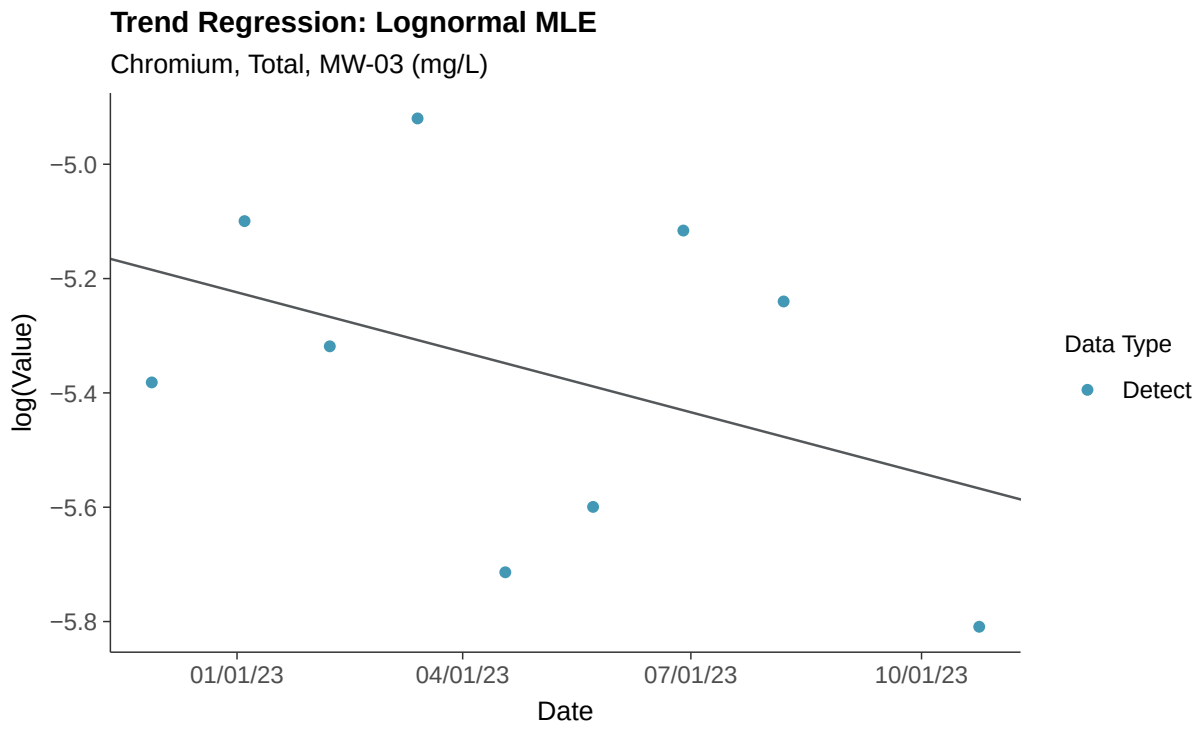
Chromium, Total, MW-03 (mg/L)

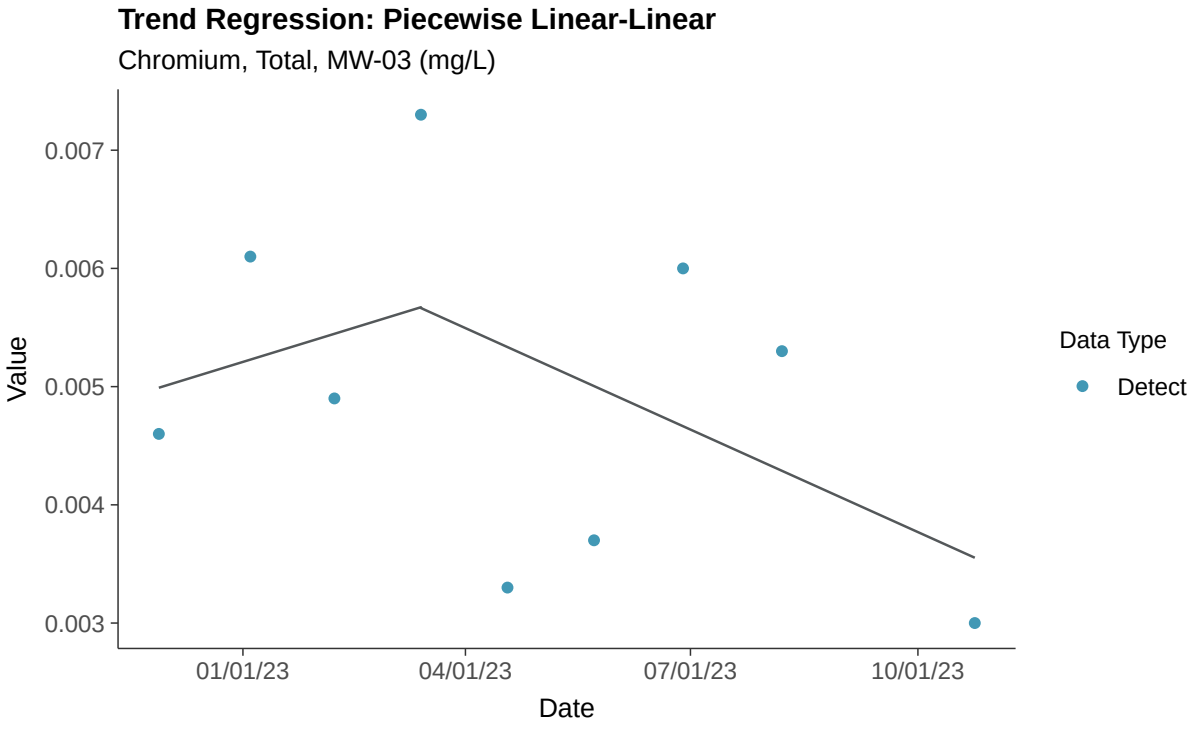



Normal Q-Q plot
Chromium, Total, MW-03 (mg/L)
Value
0.007
0.006
0.005
0.004
0.003
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chromium, Total, MW-03 (mg/L)
log(Value)
−5.1
−5.4
−5.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

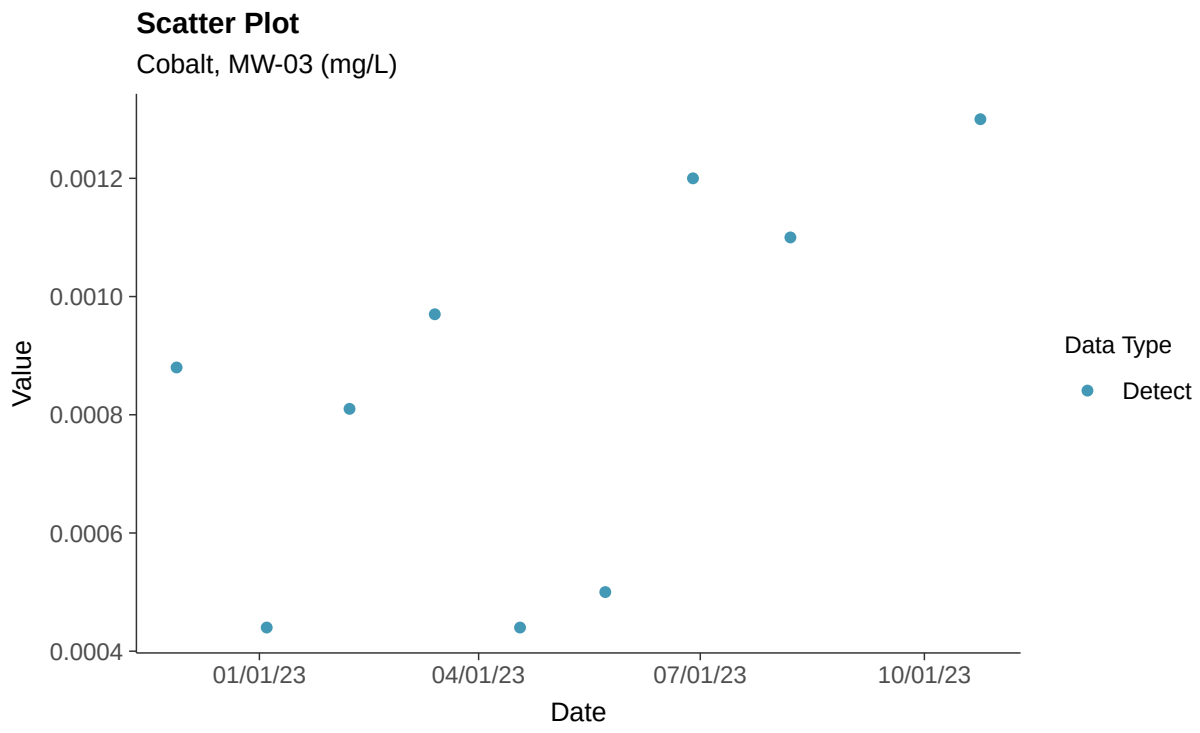

Gamma Q-Q plot
Chromium, Total, MW-03 (mg/L)
Value
0.007
0.006
0.005
0.004
0.003
0.002
0.003
0.004
0.005
0.006
0.007
0.008
Theoretical Quantiles (Gamma)
Data Type
Detect

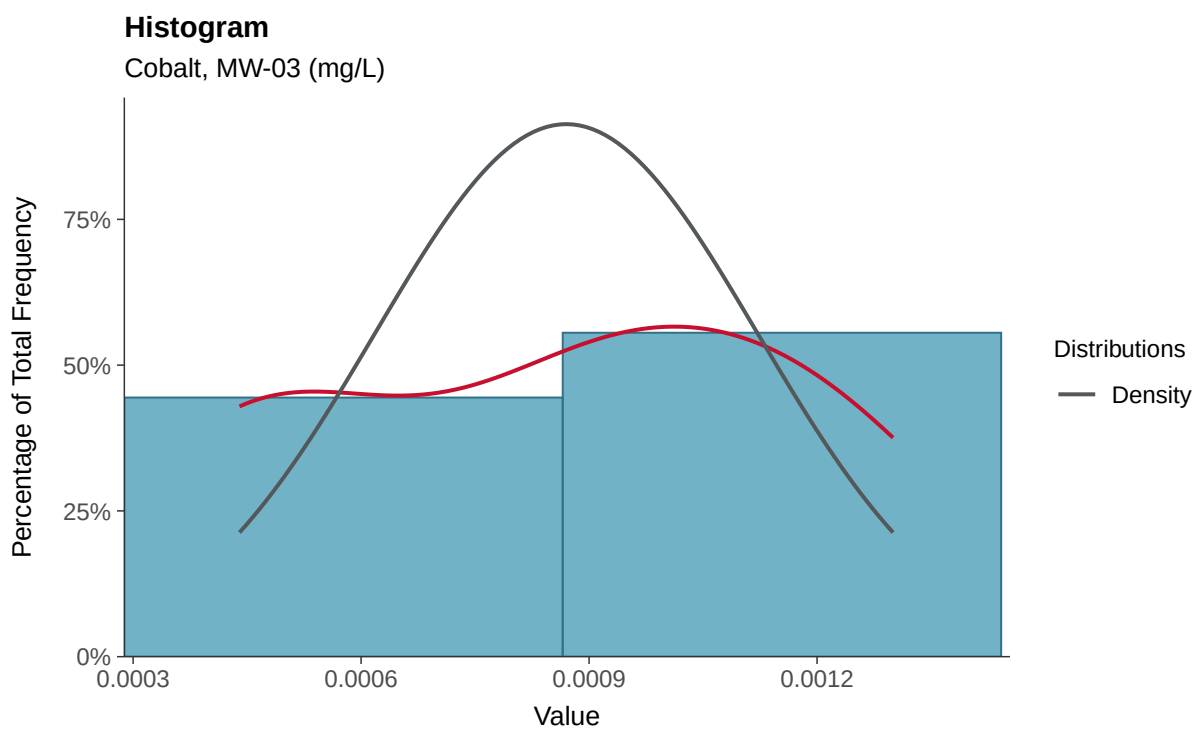

Trend Regression: Lognormal MLE
Chromium, Total, MW-03 (mg/L)
log(Value)
−5.0
−5.2
−5.4
−5.6
−5.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chromium, Total, MW-03 (mg/L)
0.007
0.006
0.005
0.004
0.003
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Cobalt, MW-03

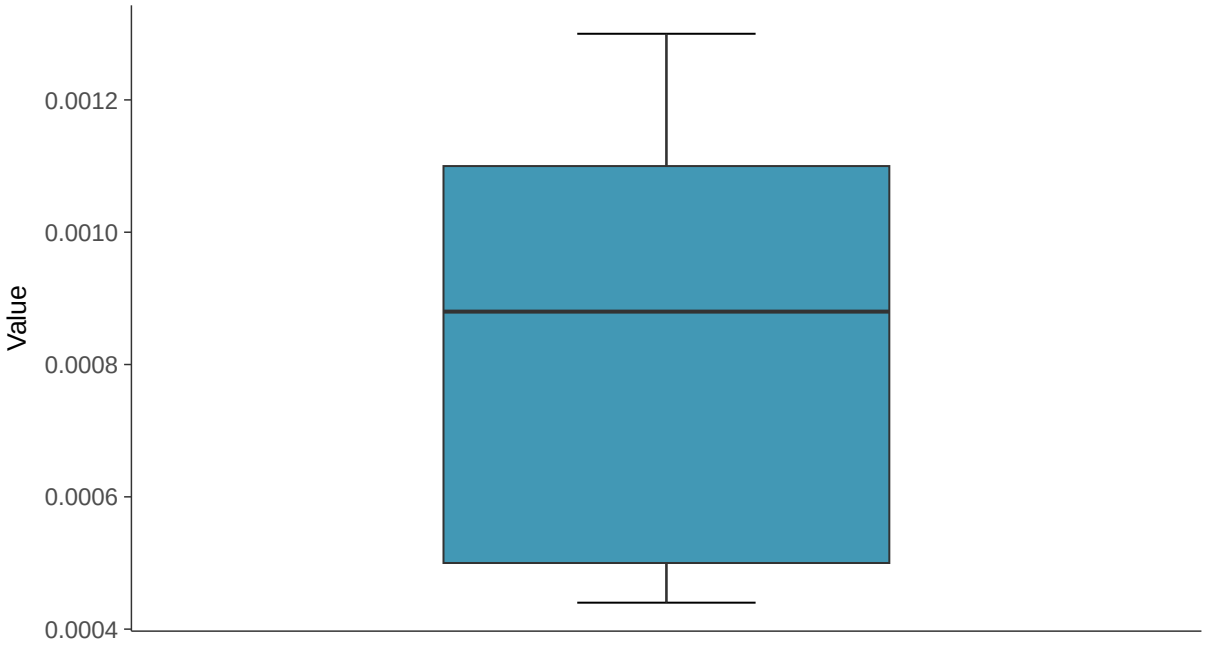
ID: 2_13_5_110





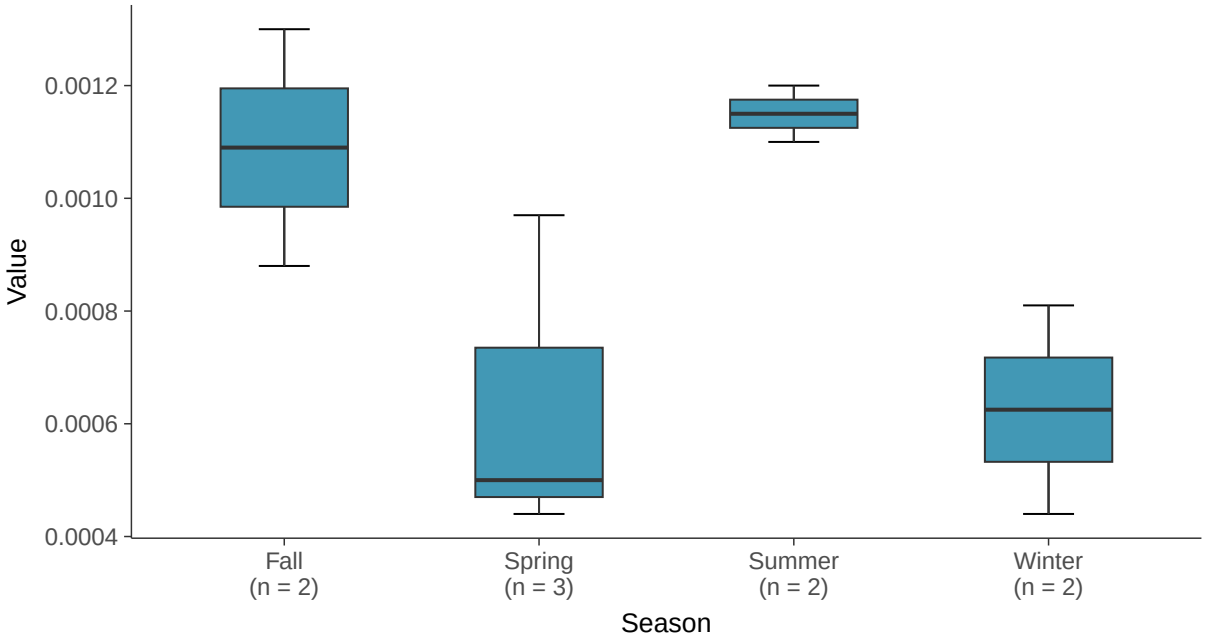
Boxplot

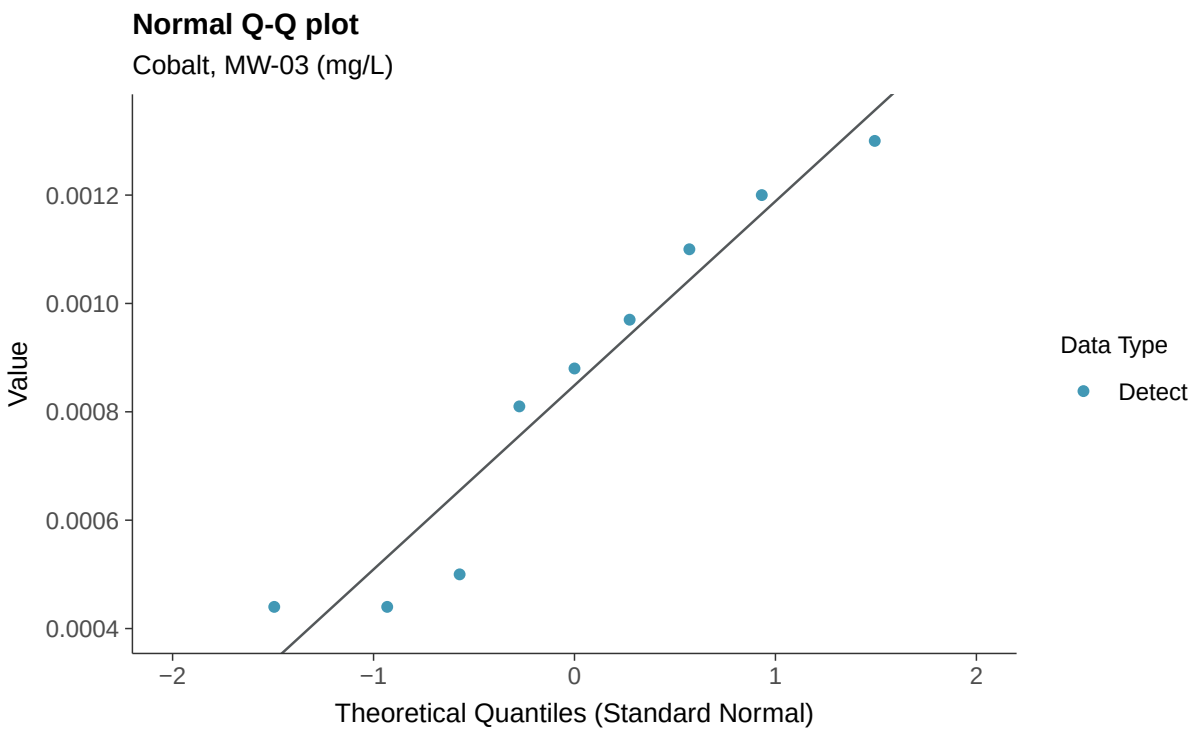
Cobalt, MW-03 (mg/L)

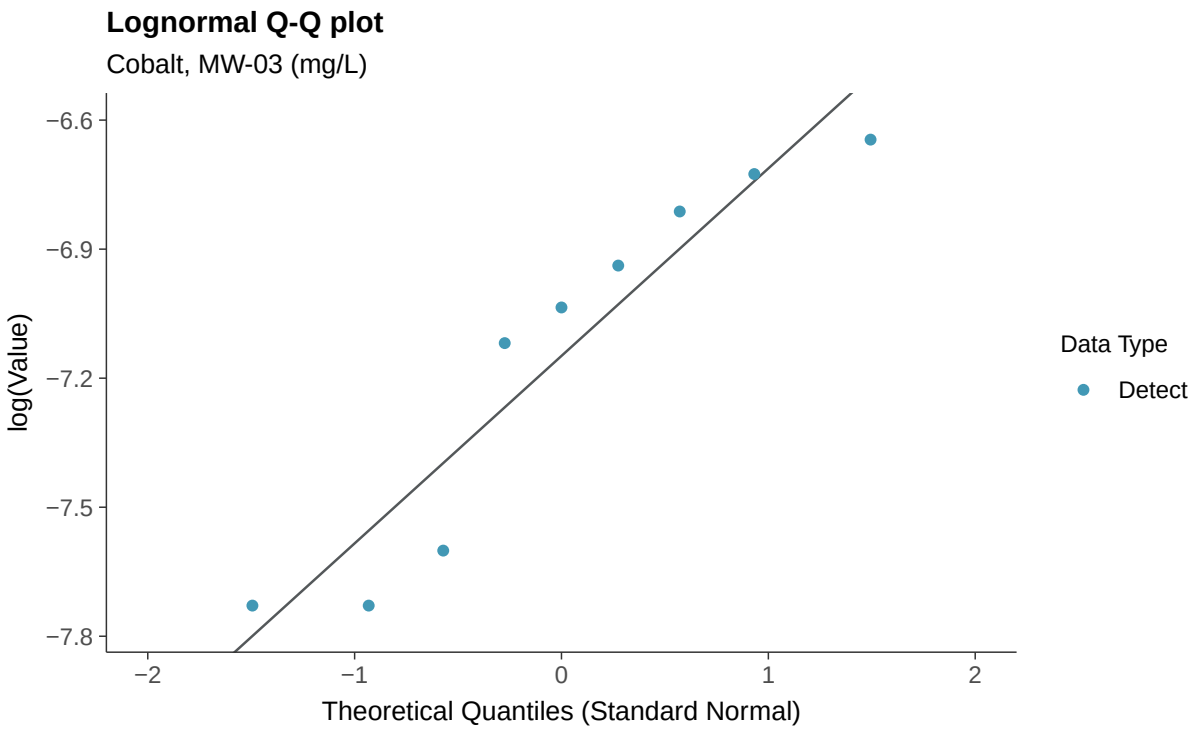


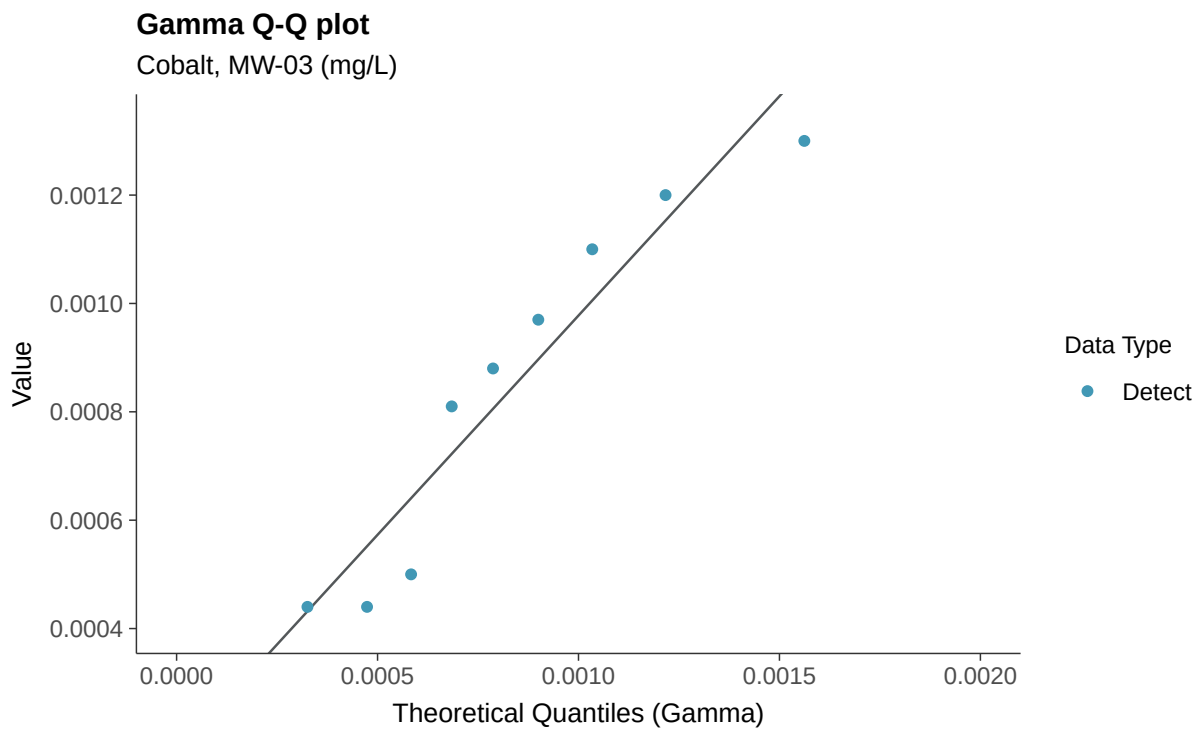
Boxplot by Season

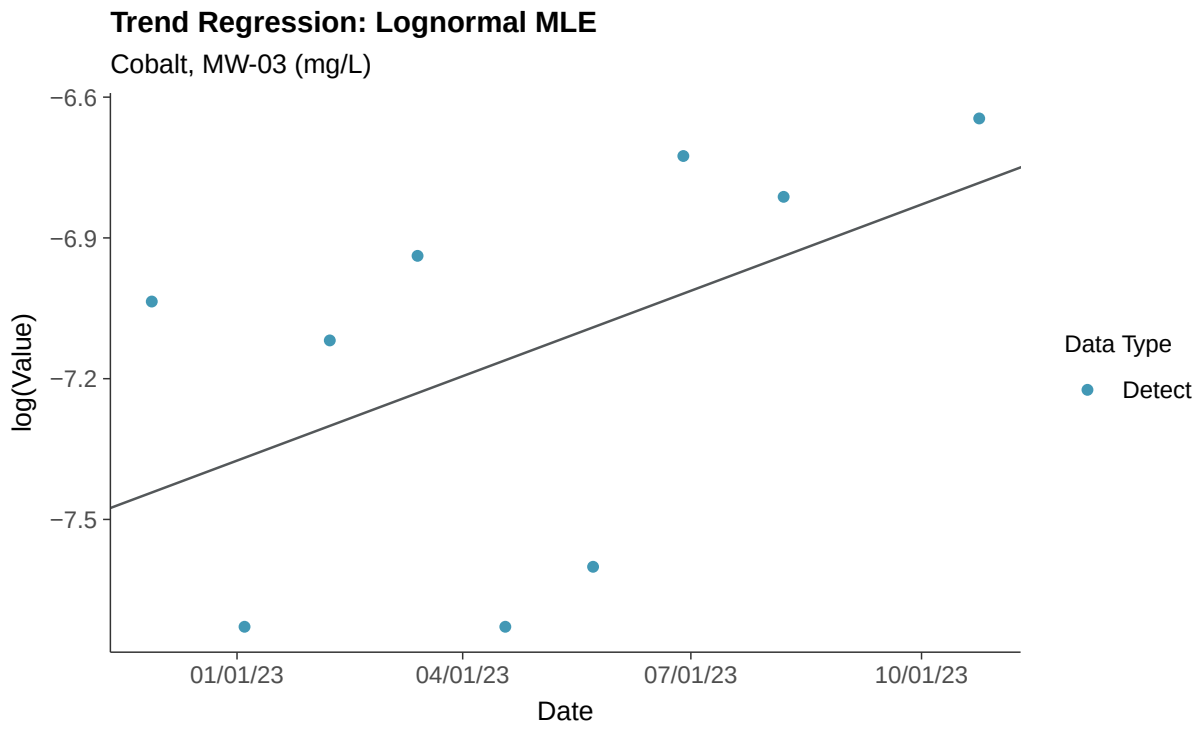
Cobalt, MW-03 (mg/L)

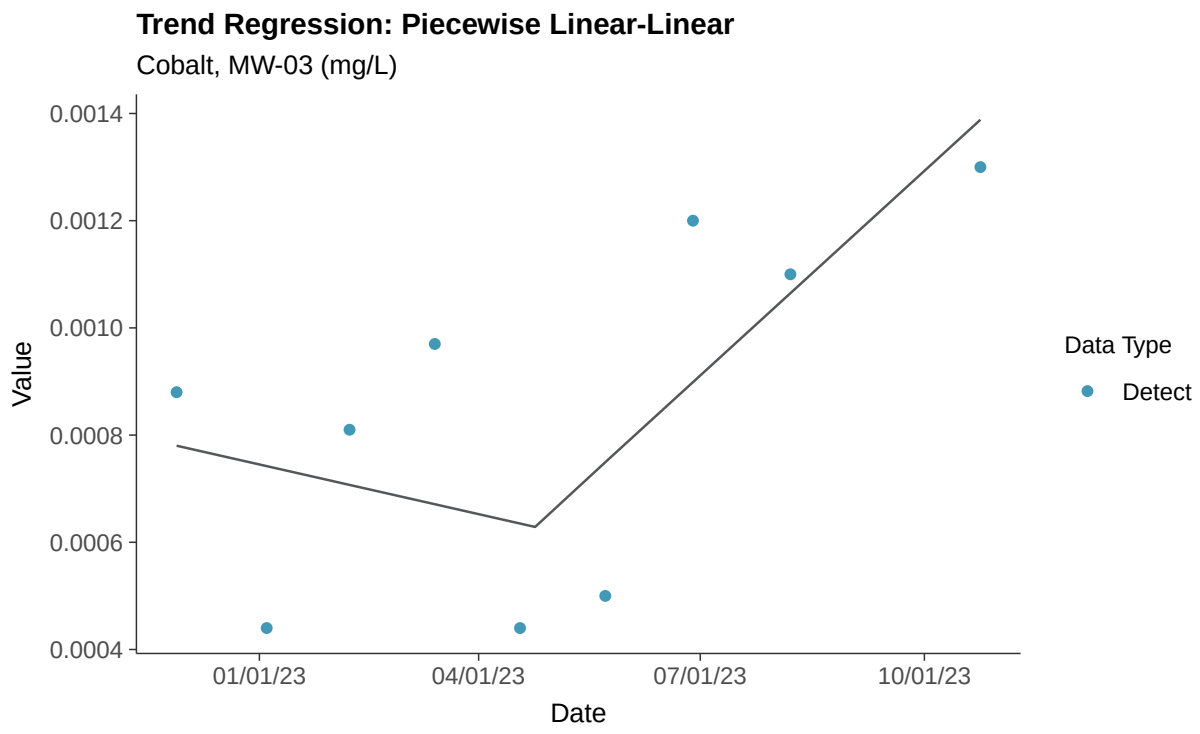


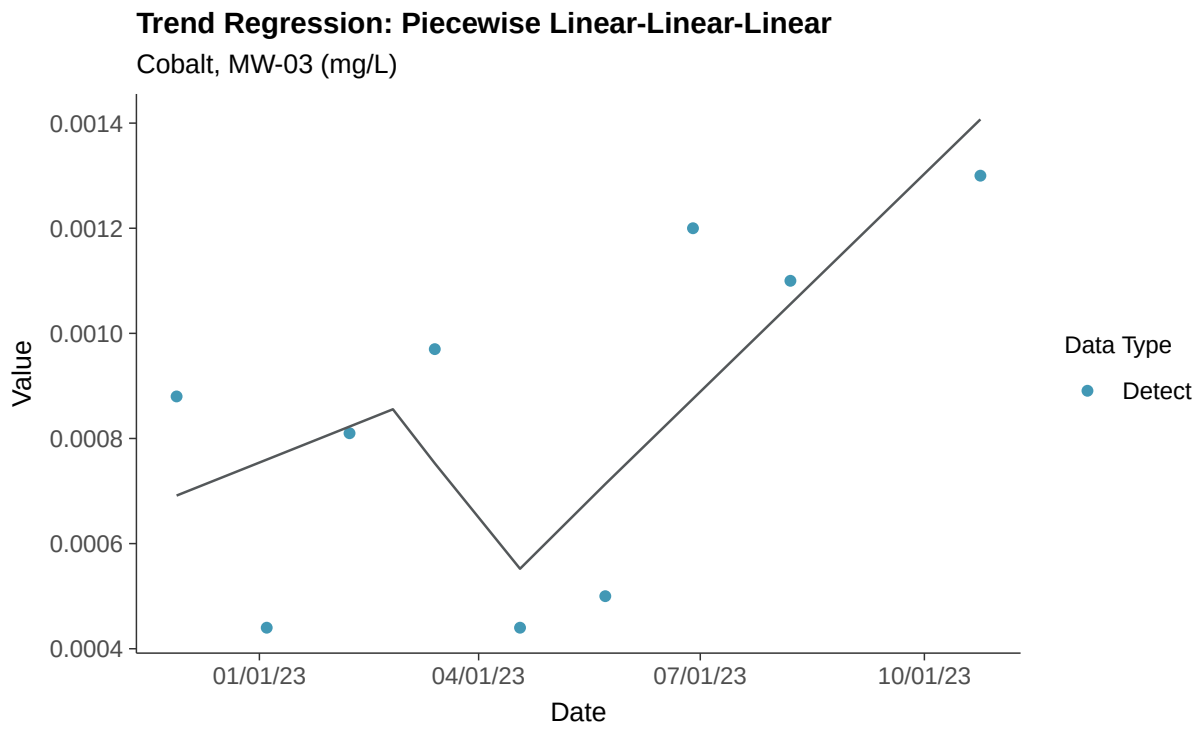

Normal Q-Q plot
Cobalt, MW-03 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
0.0004
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Cobalt, MW-03 (mg/L)
log(Value)
−6.6
−6.9
−7.2
−7.5
−7.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-03 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
0.0004
0.0000
0.0005
0.0010
0.0015
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect

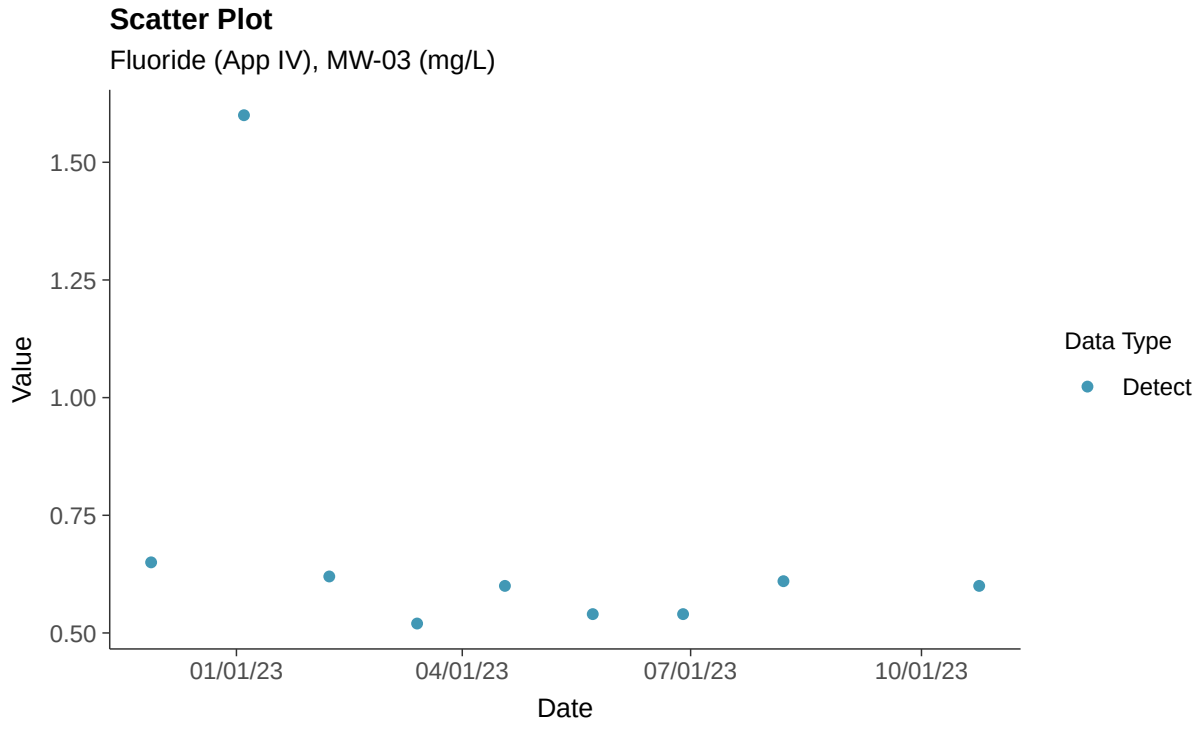

Trend Regression: Lognormal MLE
Cobalt, MW-03 (mg/L)
log(Value)
−6.6
−6.9
−7.2
−7.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

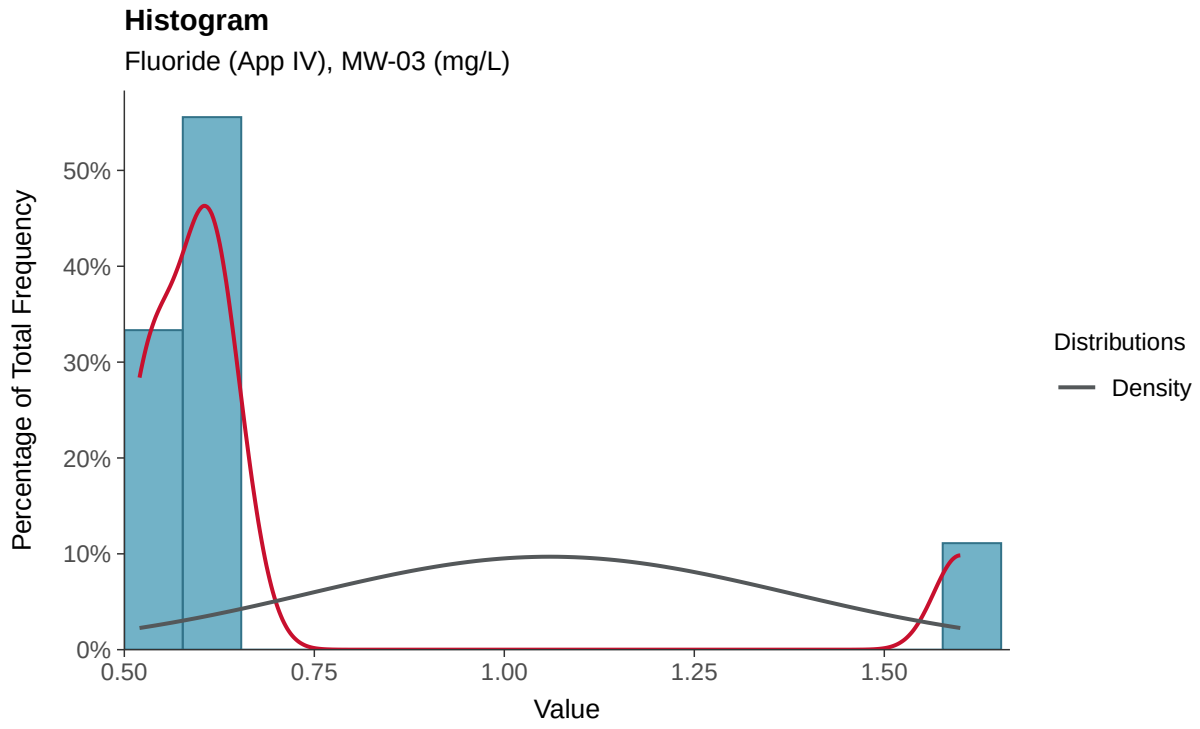

Trend Regression: Piecewise Linear-Linear
Cobalt, MW-03 (mg/L)
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Cobalt, MW-03 (mg/L)
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-03

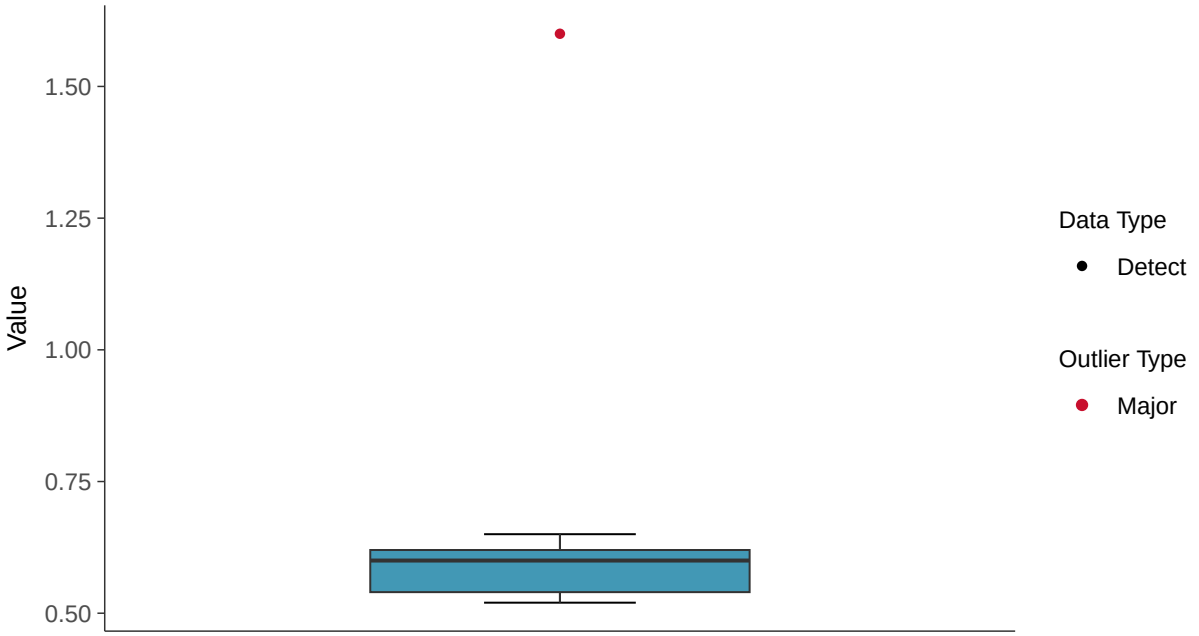
ID: 2_13_5_113





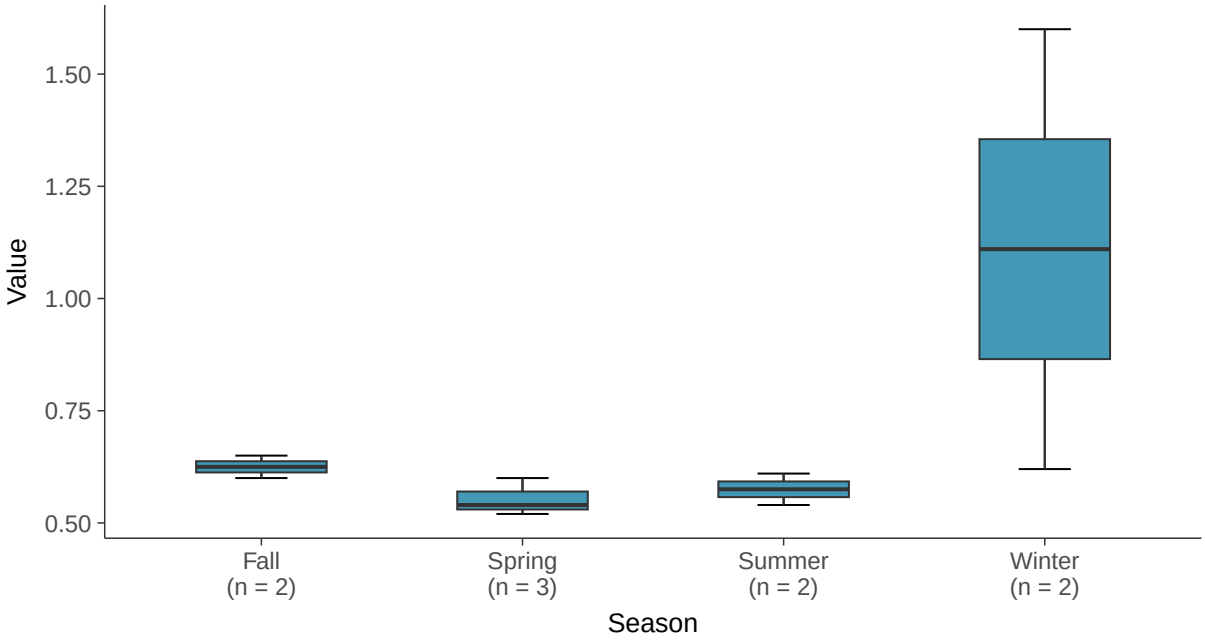
Boxplot

Fluoride (App IV), MW-03 (mg/L)



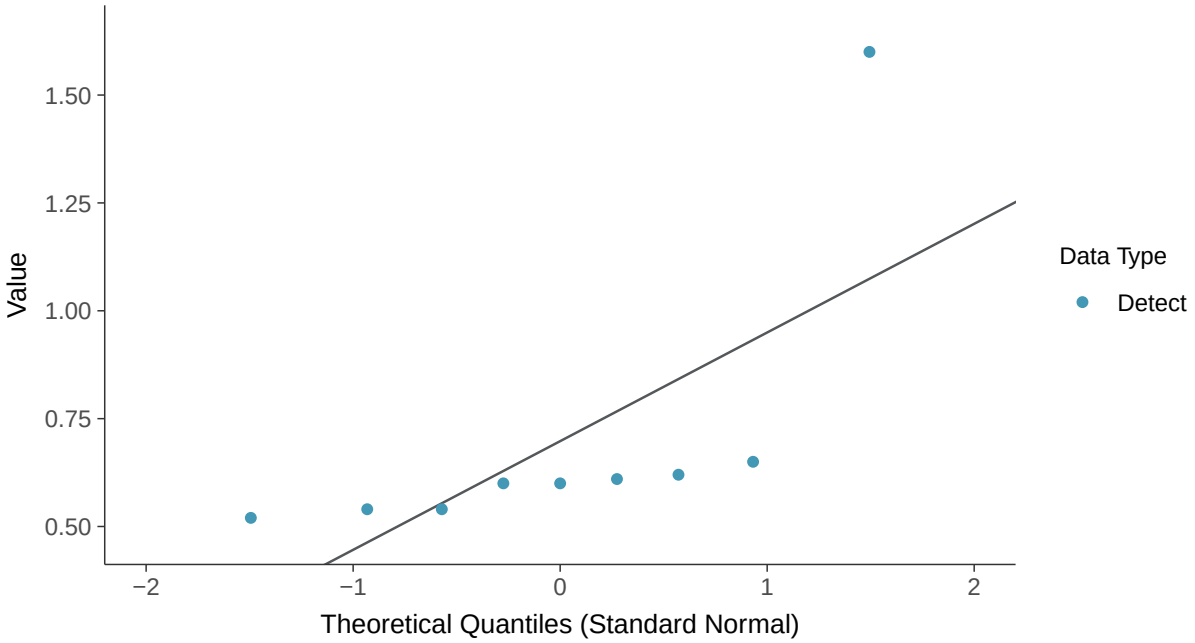
Boxplot by Season

Fluoride (App IV), MW-03 (mg/L)



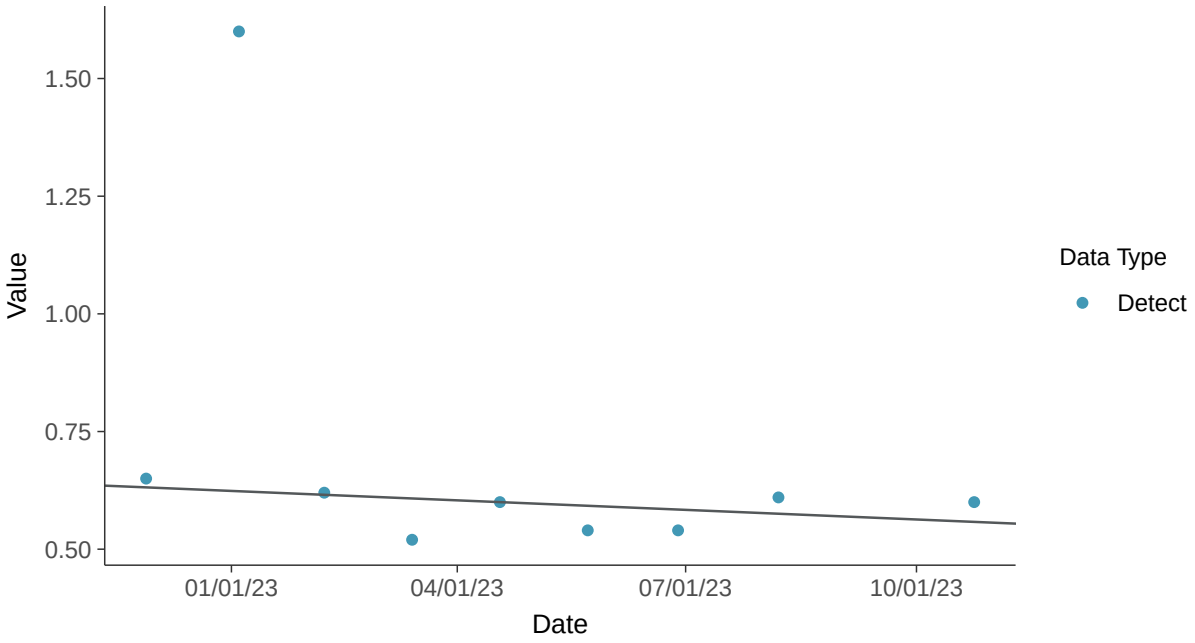
Normal Q-Q plot

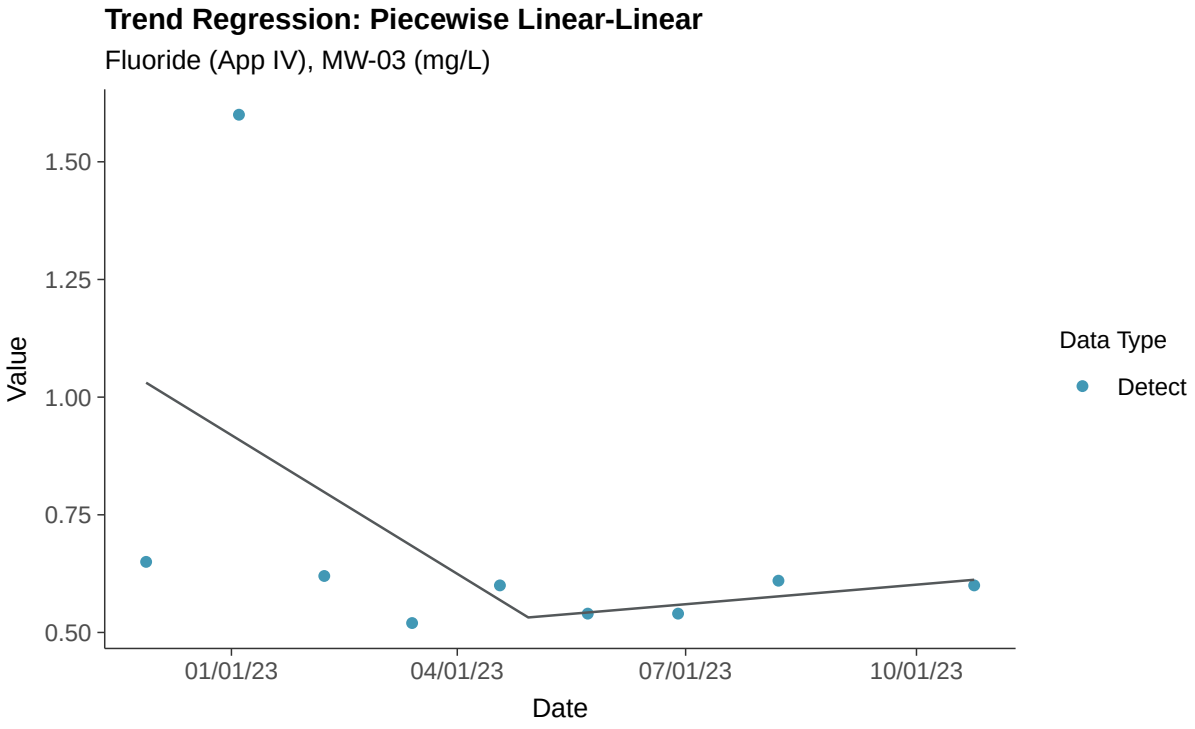
Fluoride (App IV), MW-03 (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

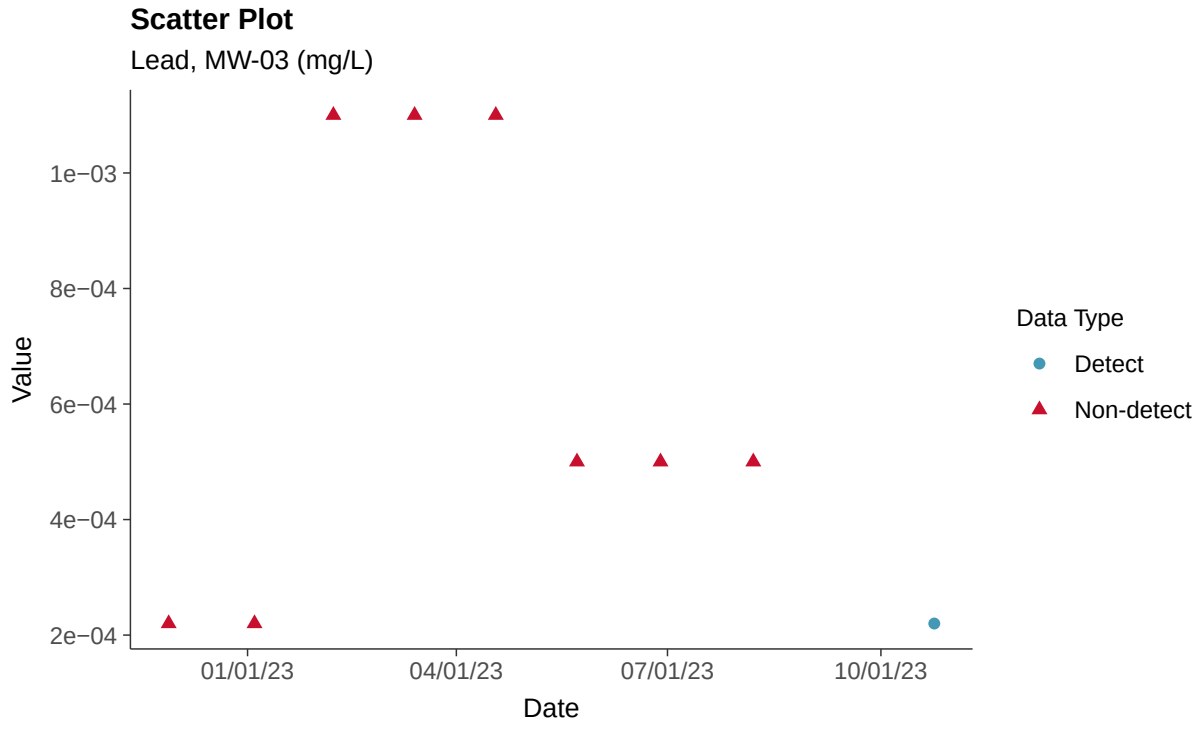
Fluoride (App IV), MW-03 (mg/L)

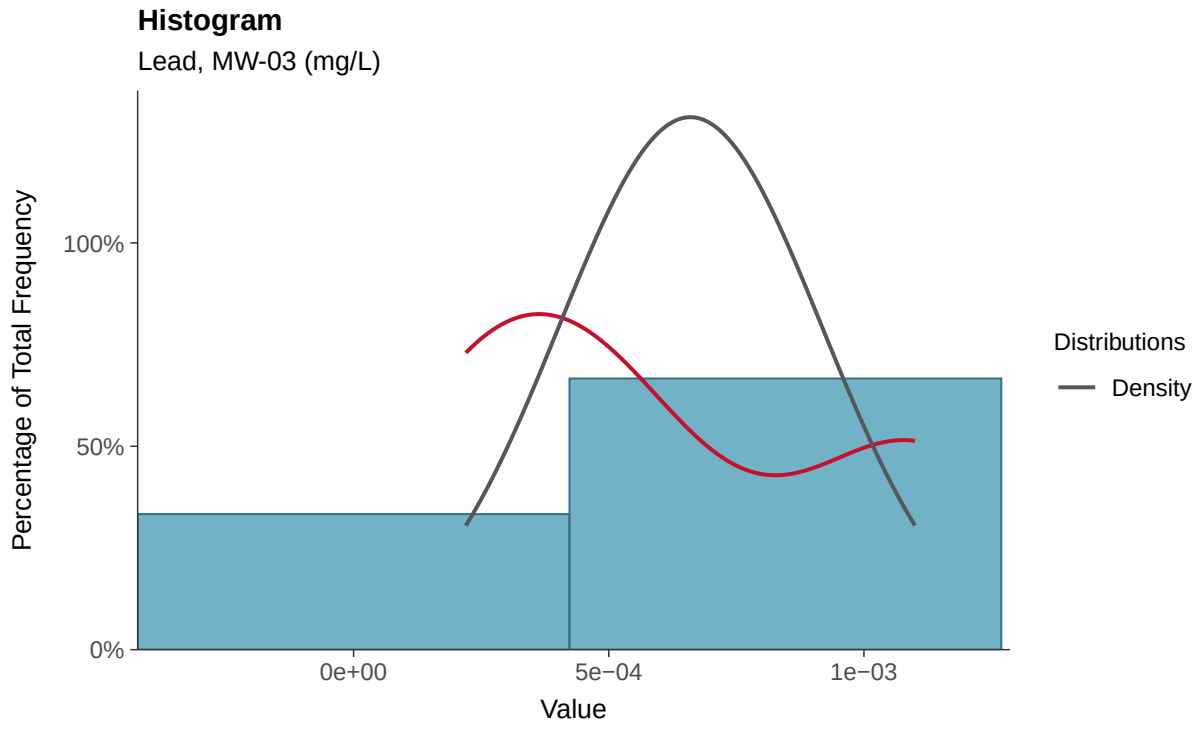



Trend Regression: Piecewise Linear-Linear
Fluoride (App IV), MW-03 (mg/L)
Value
1.50
1.25
1.00
0.75
0.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Lead, MW-03

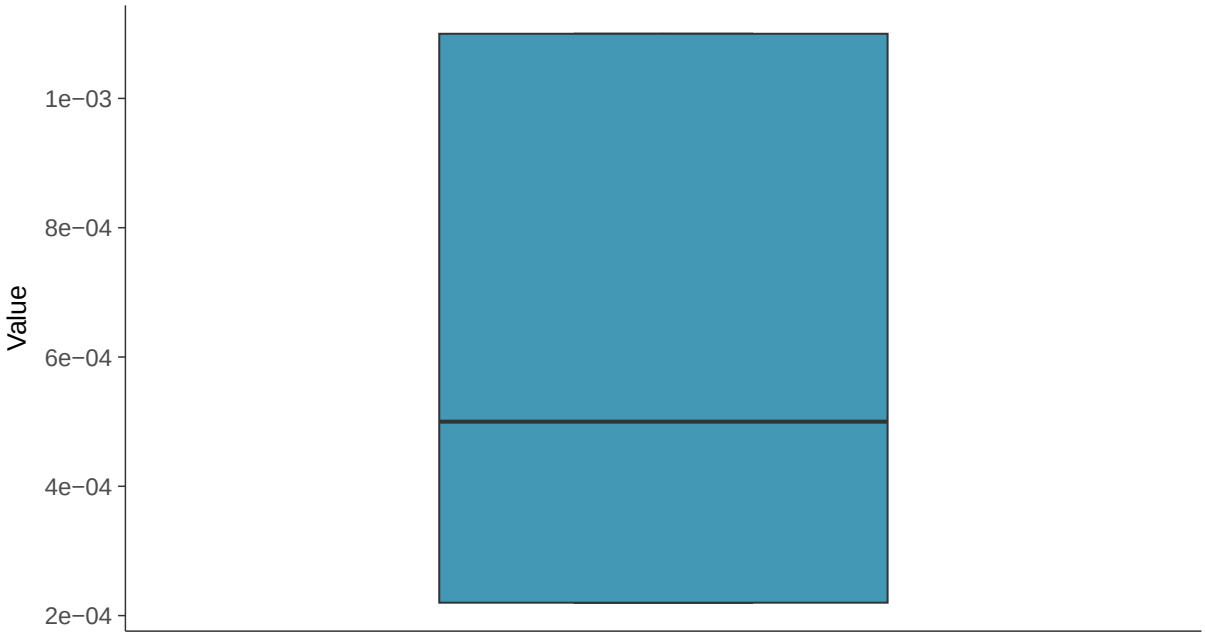
ID: 2_13_5_115





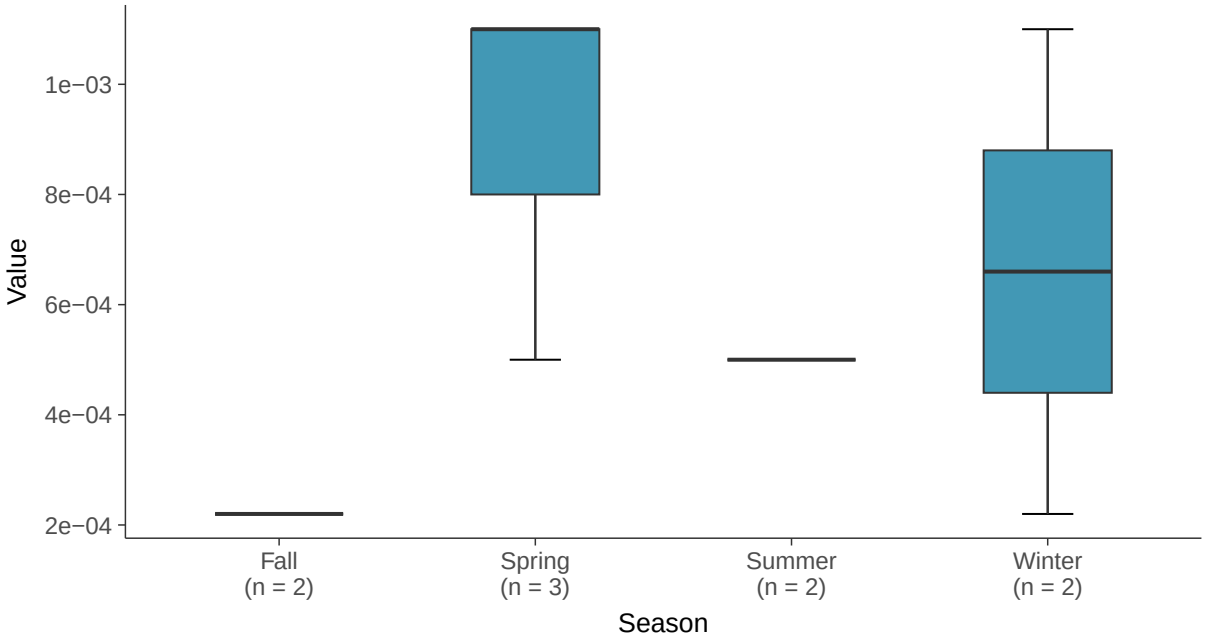
Boxplot

Lead, MW-03 (mg/L)



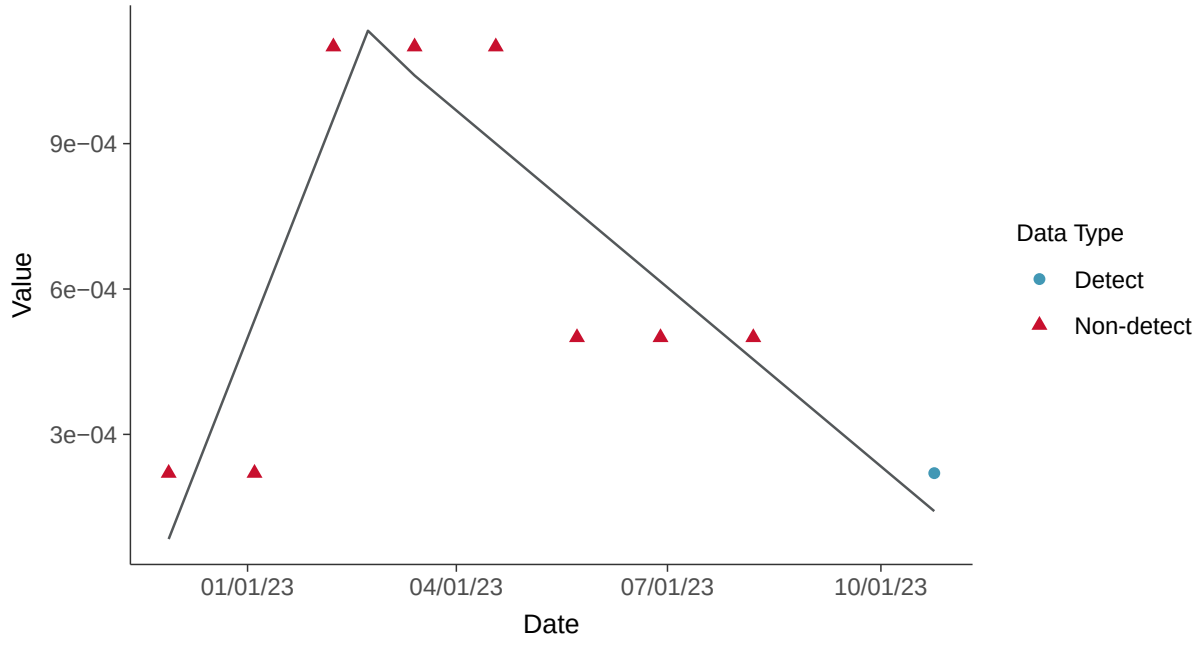
Boxplot by Season

Lead, MW-03 (mg/L)



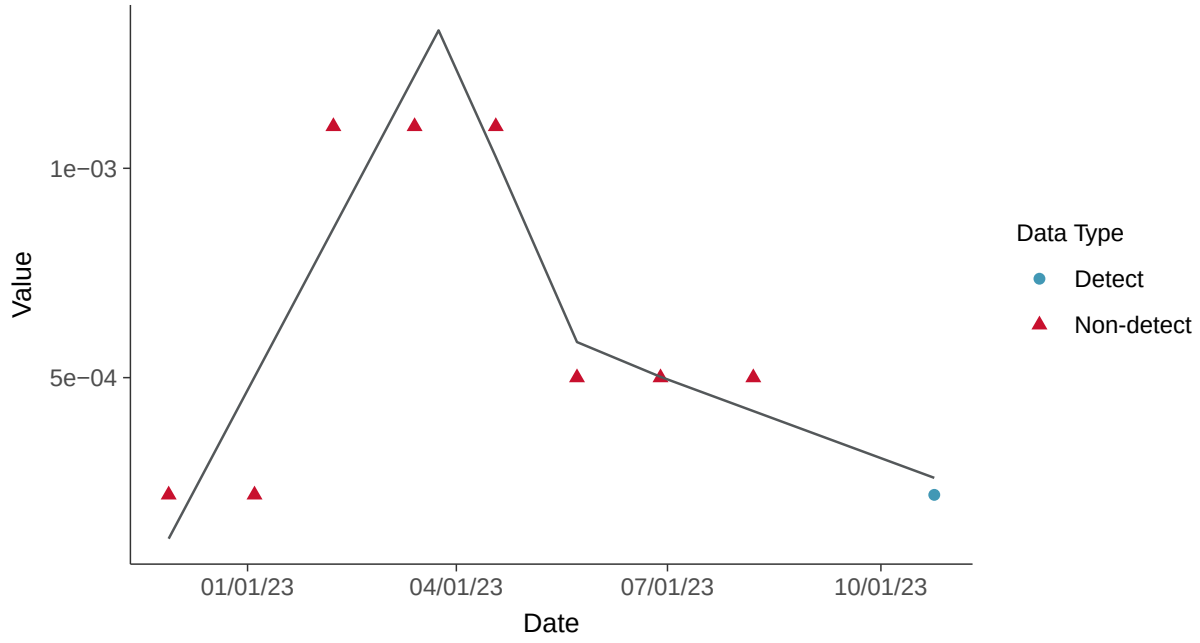
Trend Regression: Piecewise Linear-Linear

Lead, MW-03 (mg/L)



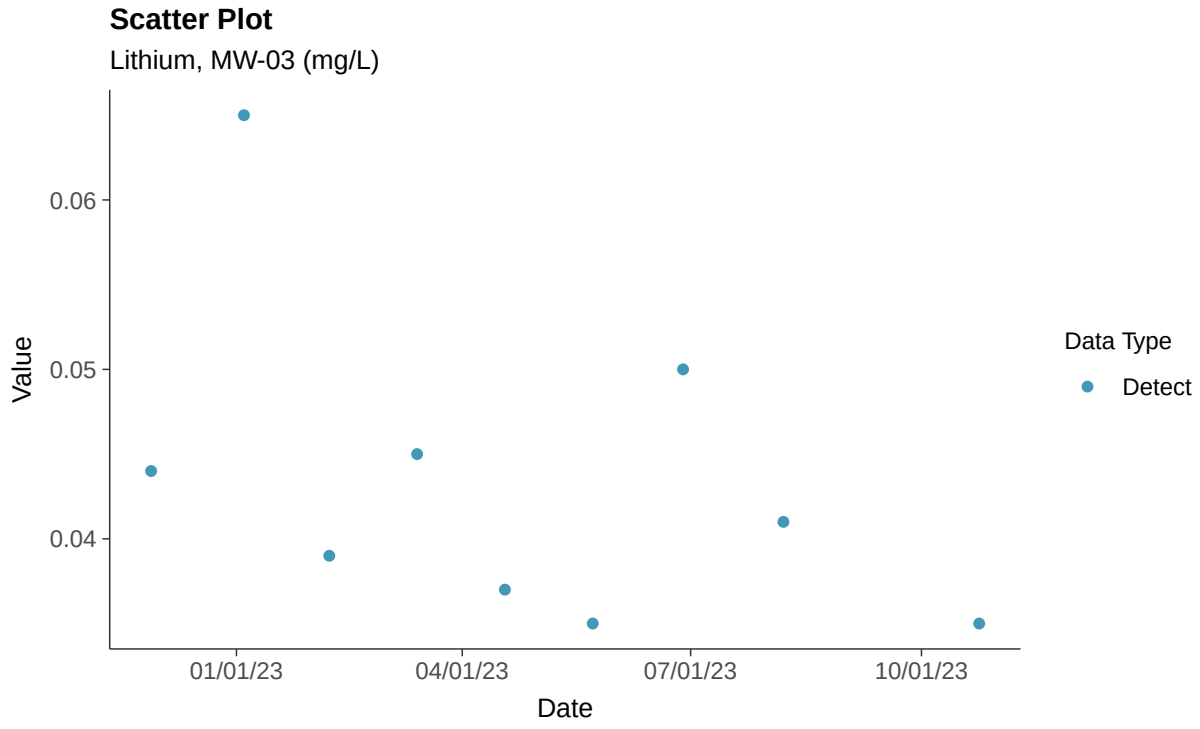
Trend Regression: Piecewise Linear-Linear-Linear

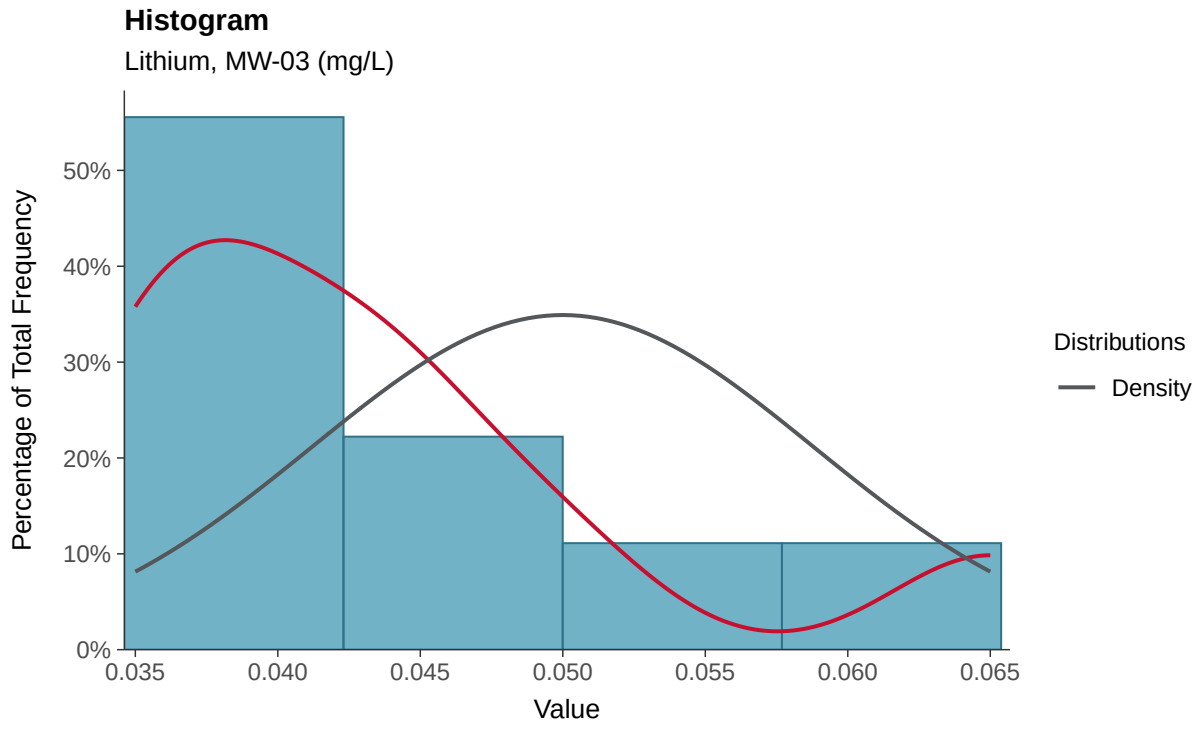
Lead, MW-03 (mg/L)



Appendix IV: Lithium, MW-03

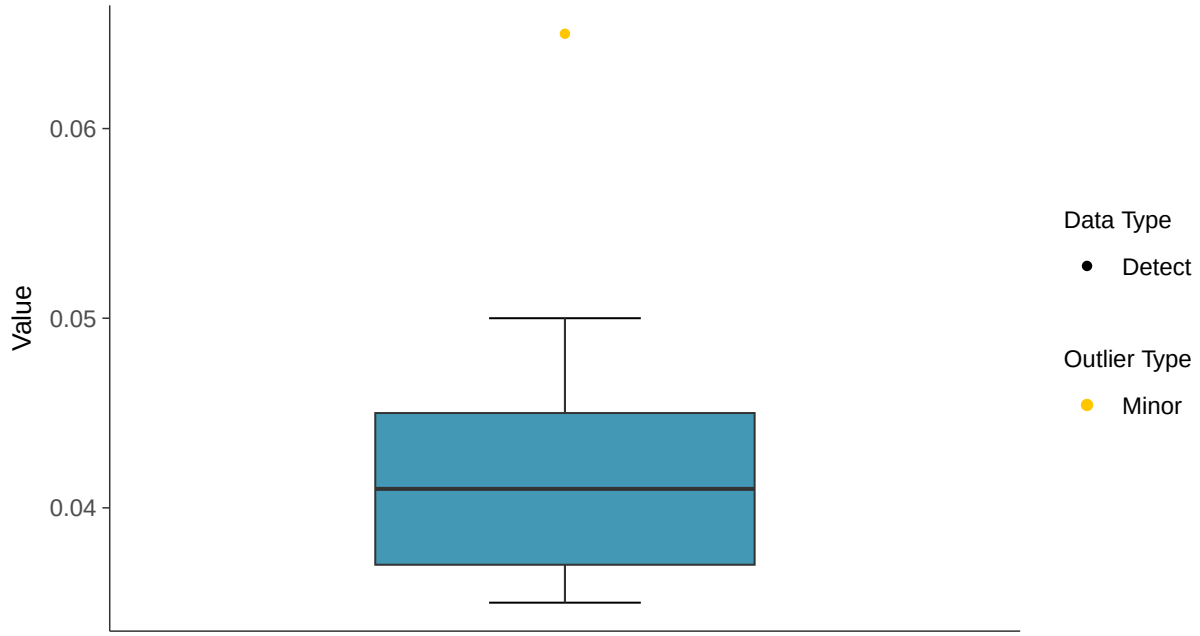
ID: 2_13_5_116





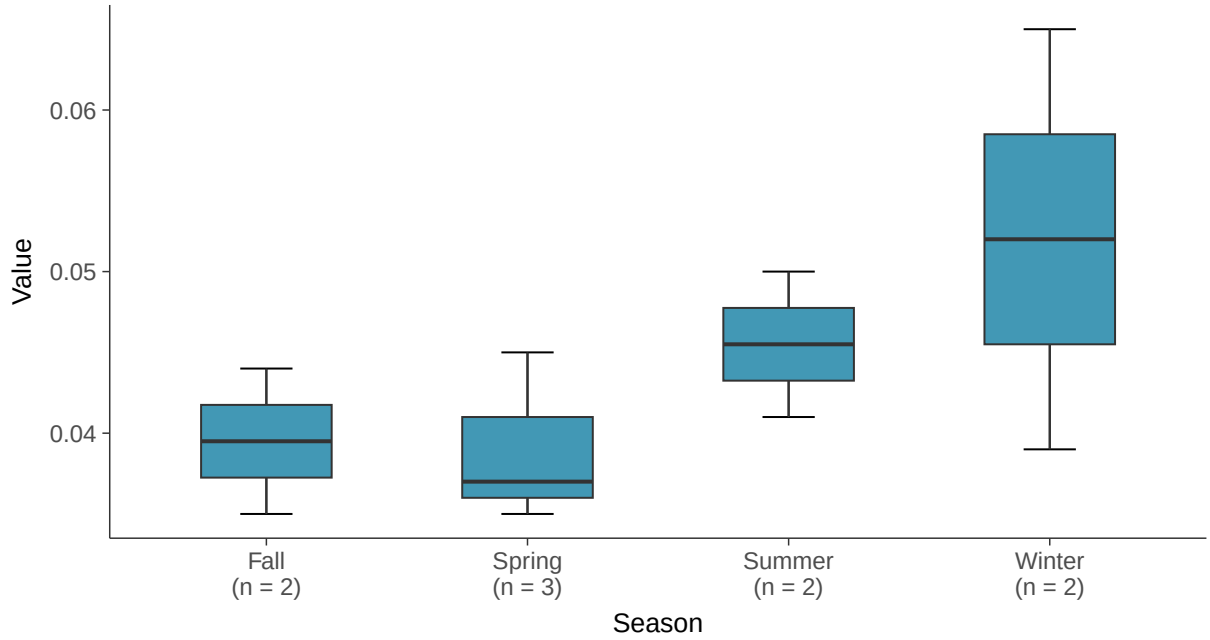
Boxplot

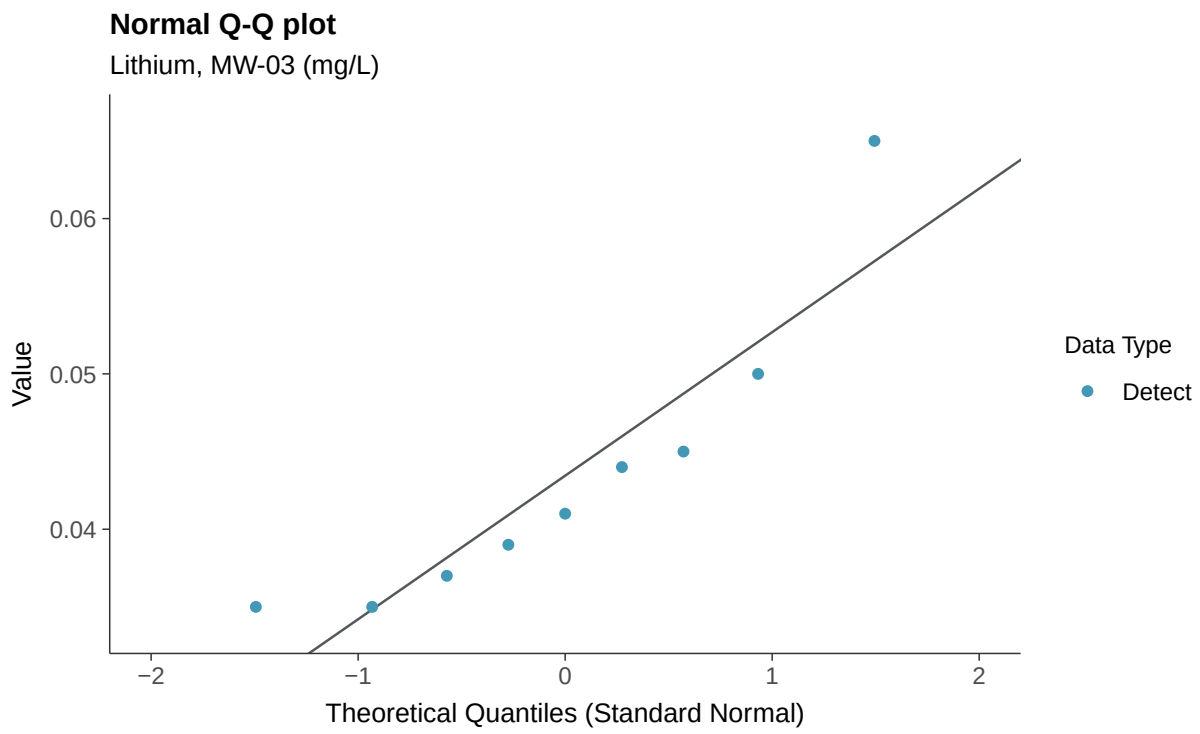
Lithium, MW-03 (mg/L)

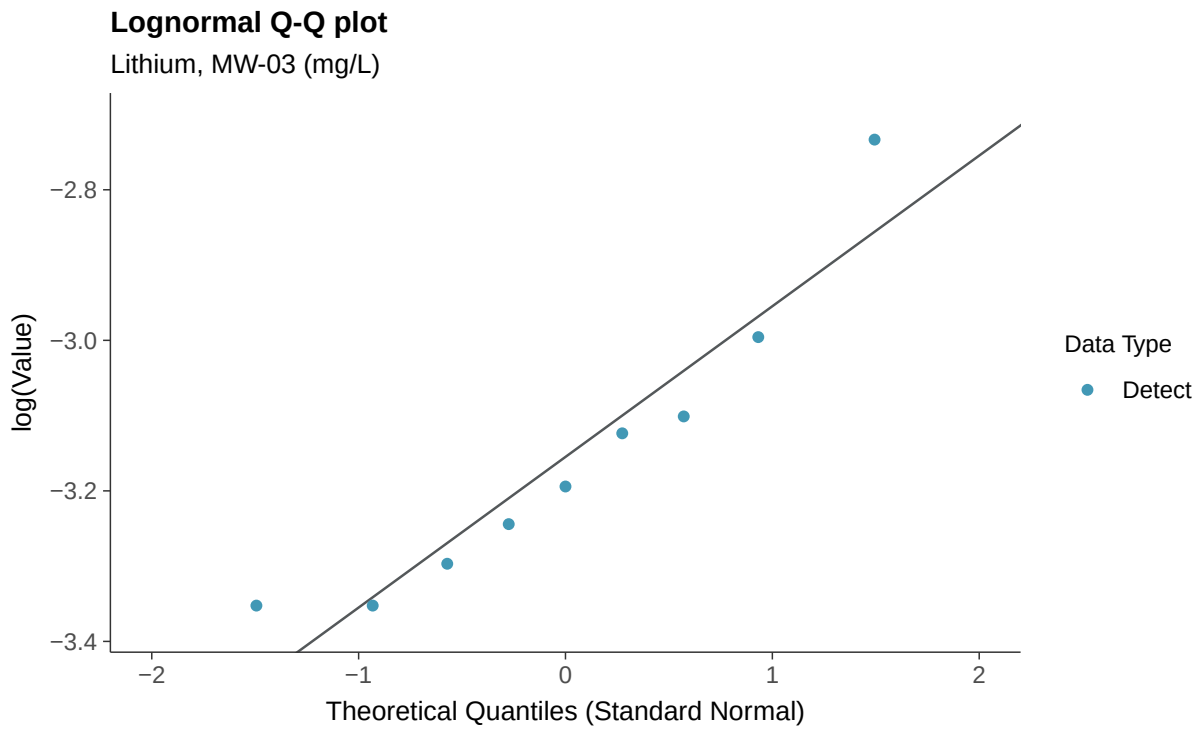


Boxplot by Season

Lithium, MW-03 (mg/L)

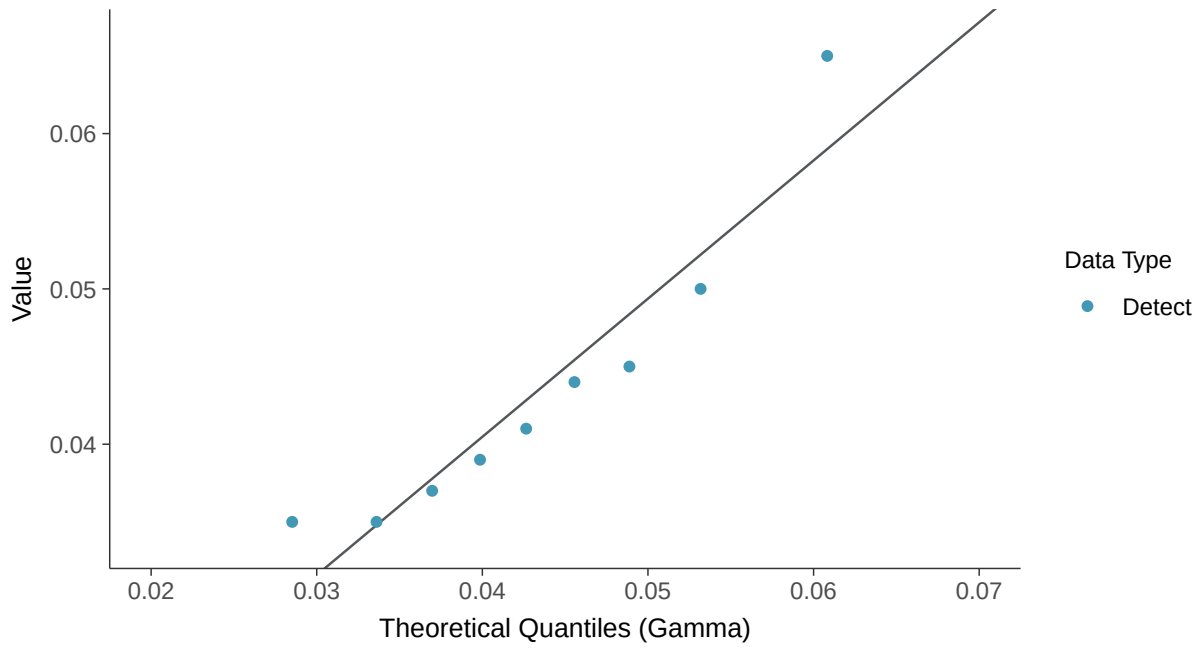



Normal Q-Q plot
Lithium, MW-03 (mg/L)
Value
0.06
0.05
0.04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-03 (mg/L)
log(Value)
−2.8
−3.0
−3.2
−3.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

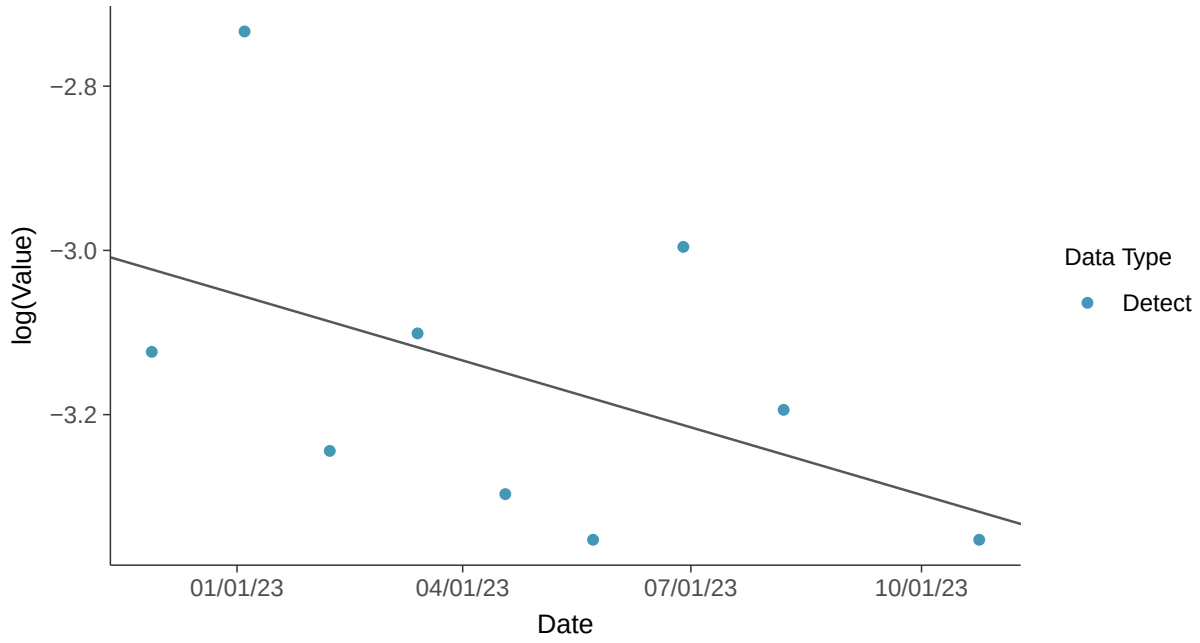
Gamma Q-Q plot

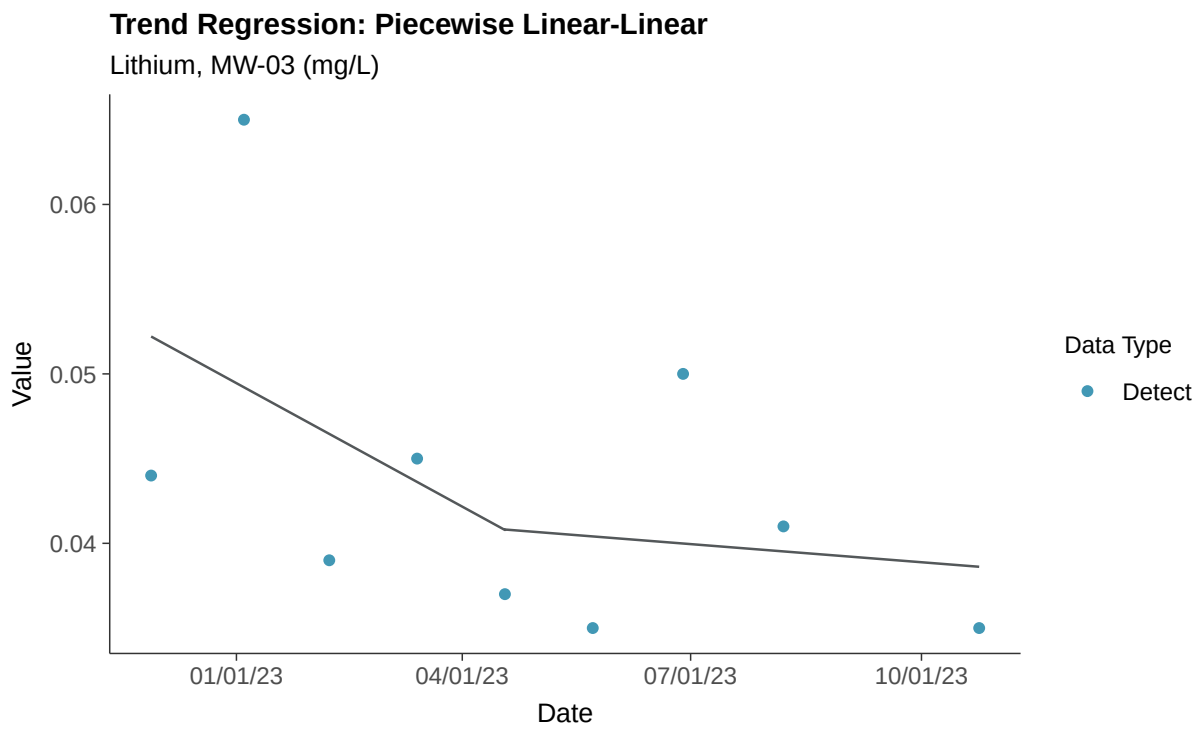
Lithium, MW-03 (mg/L)



Trend Regression: Lognormal MLE

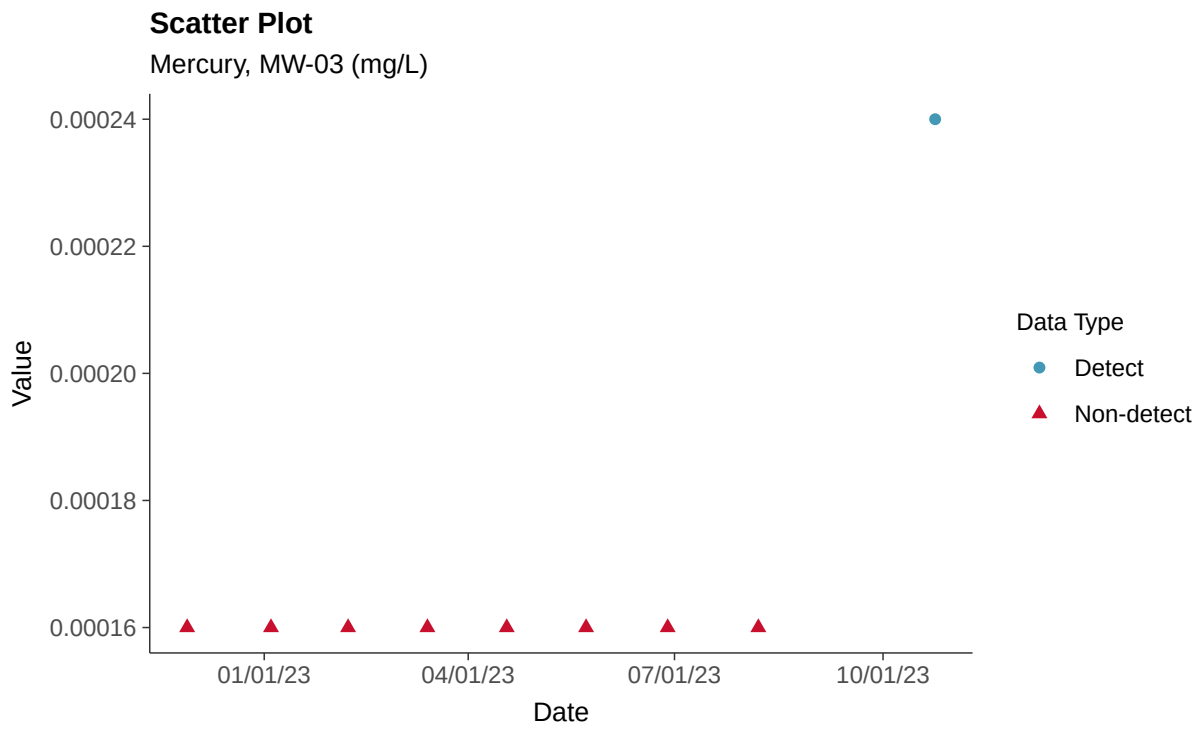
Lithium, MW-03 (mg/L)

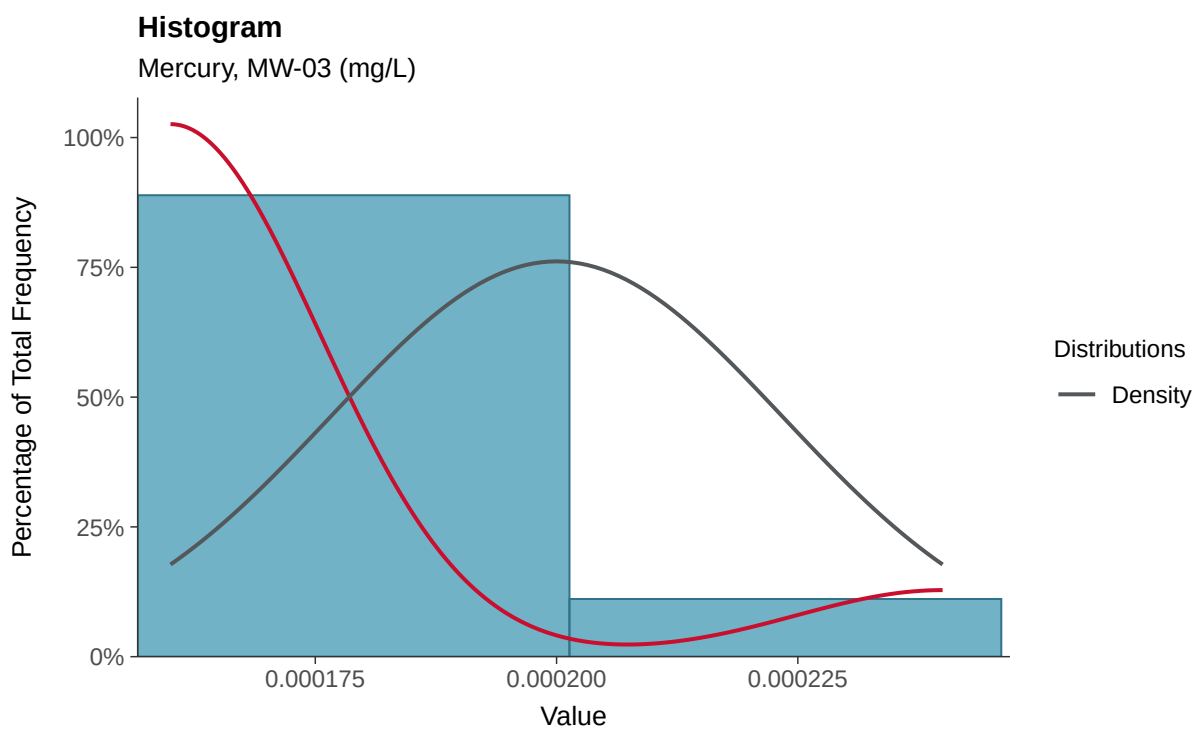


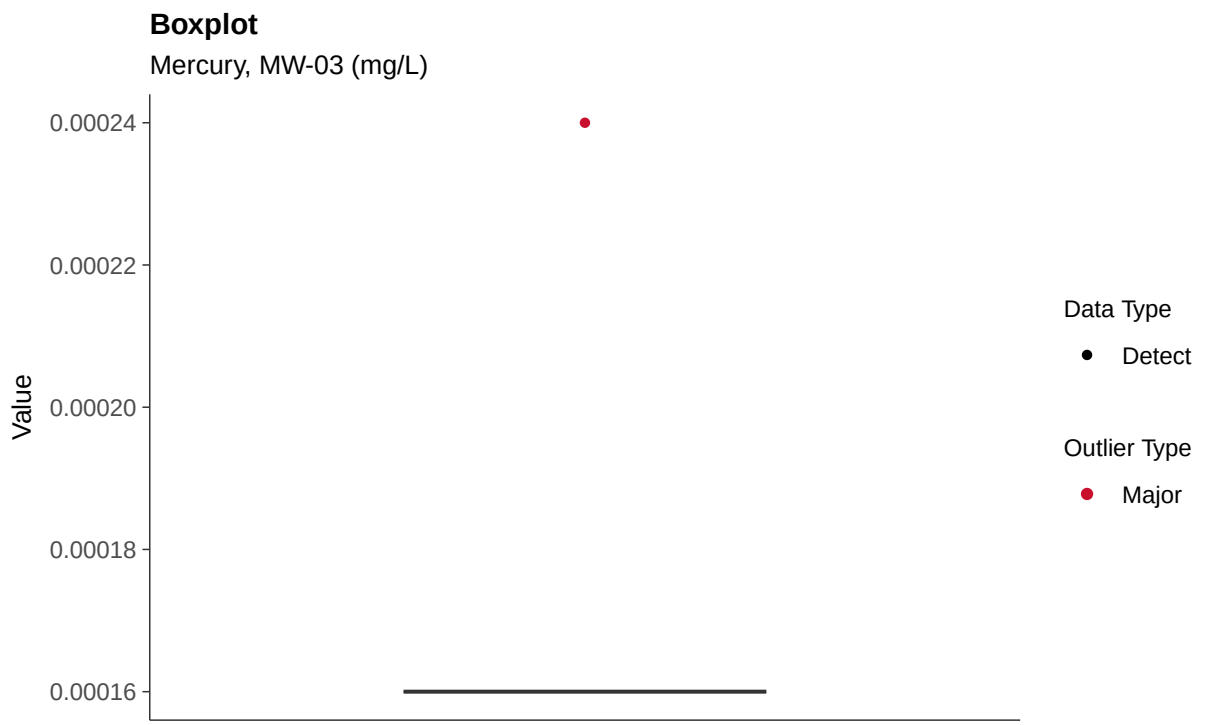

Trend Regression: Piecewise Linear-Linear
Lithium, MW-03 (mg/L)
Value
0.06
0.05
0.04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

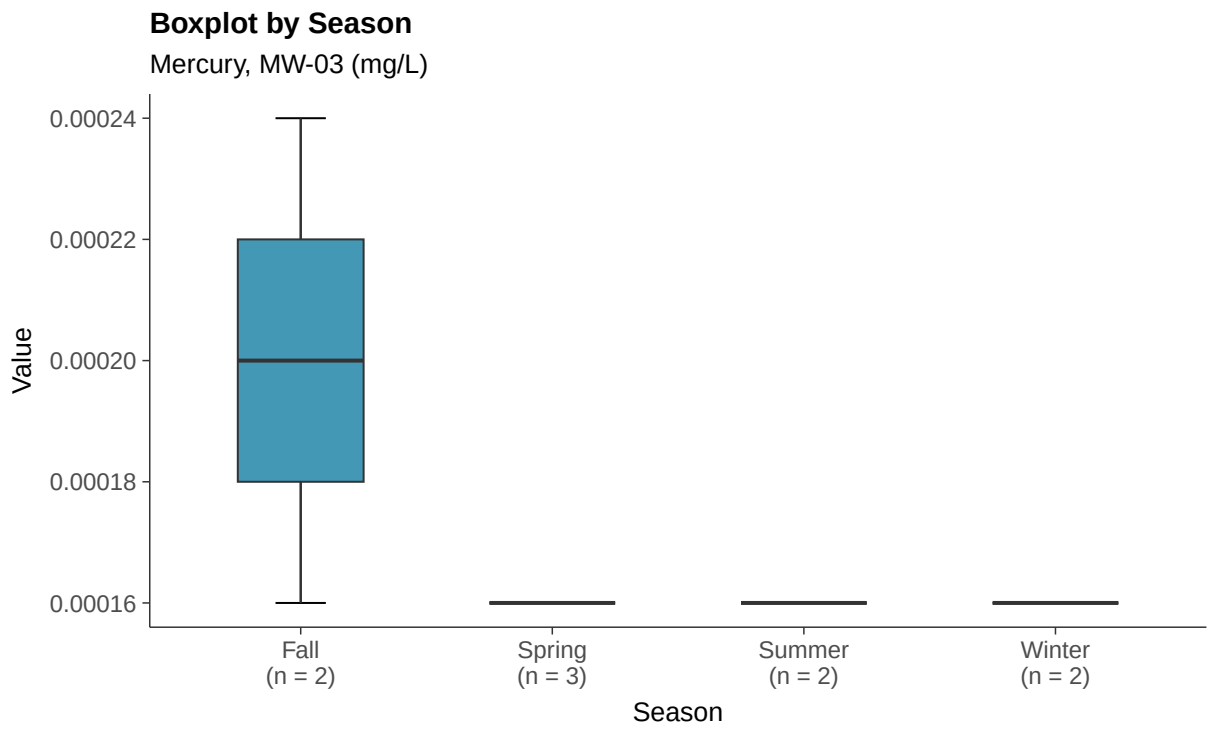
Appendix IV: Mercury, MW-03

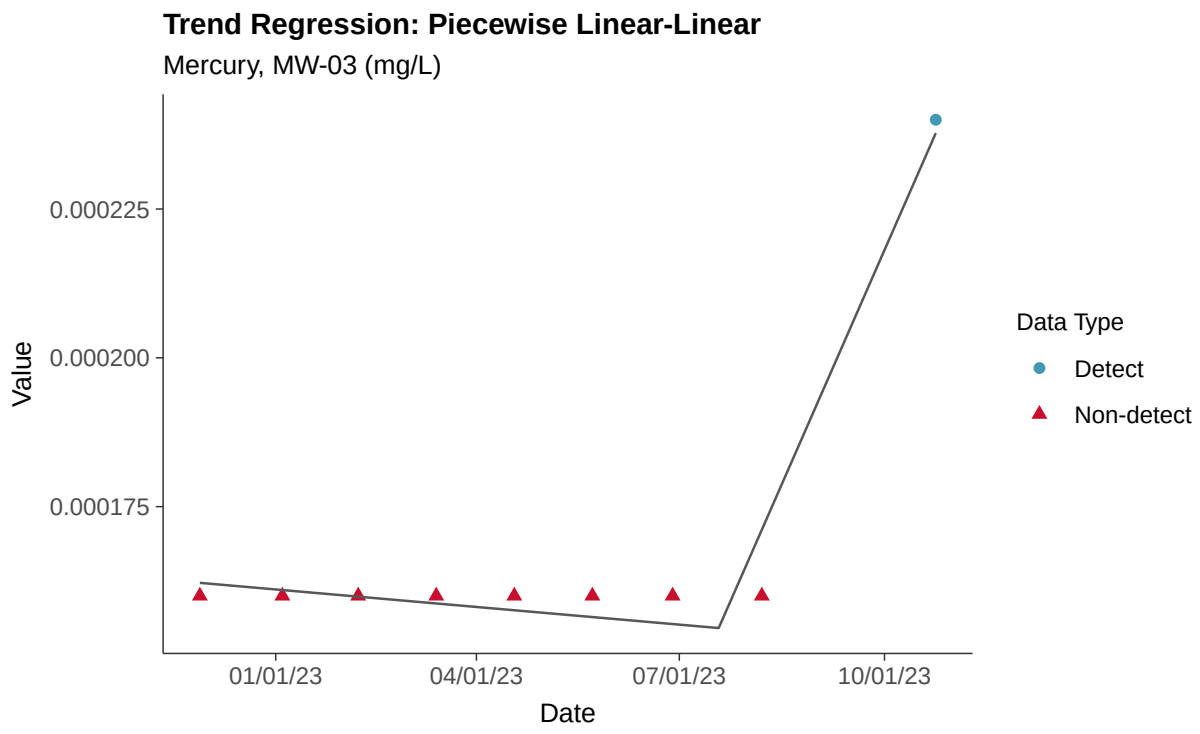
ID: 2_13_5_117





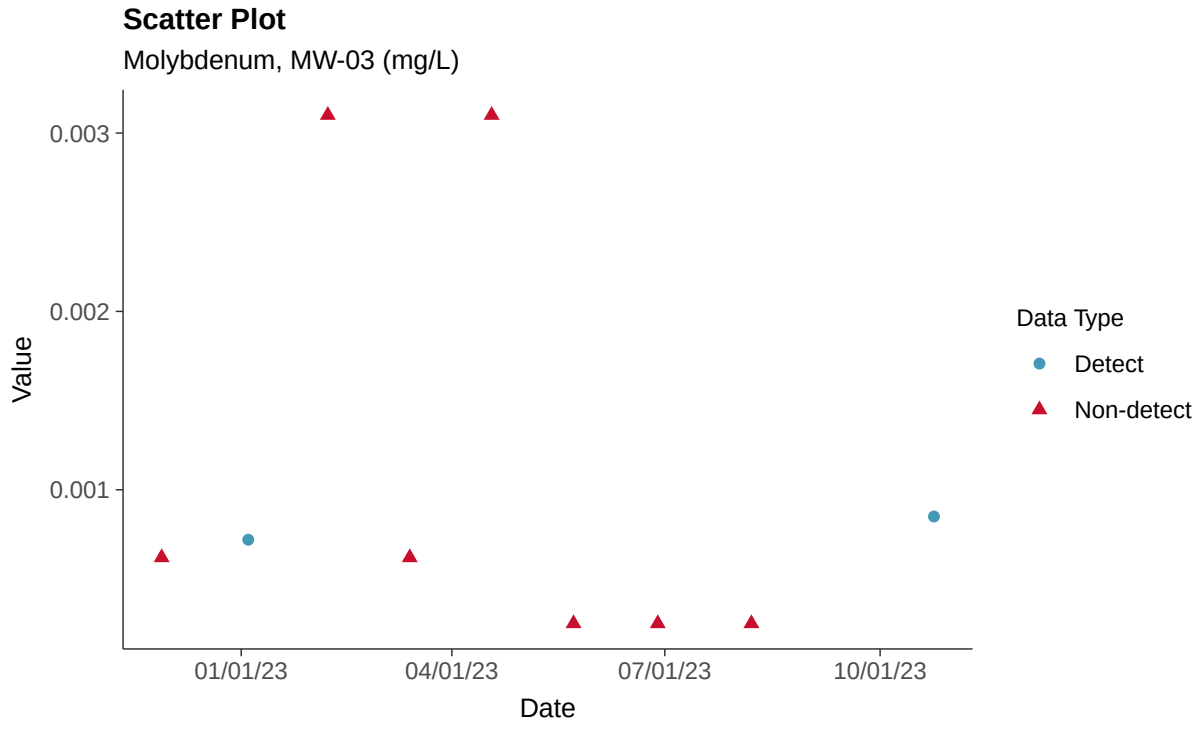

Boxplot
Mercury, MW-03 (mg/L)
Value
0.00024
0.00022
0.00020
0.00018
0.00016
Data Type
Detect
Outlier Type
Major

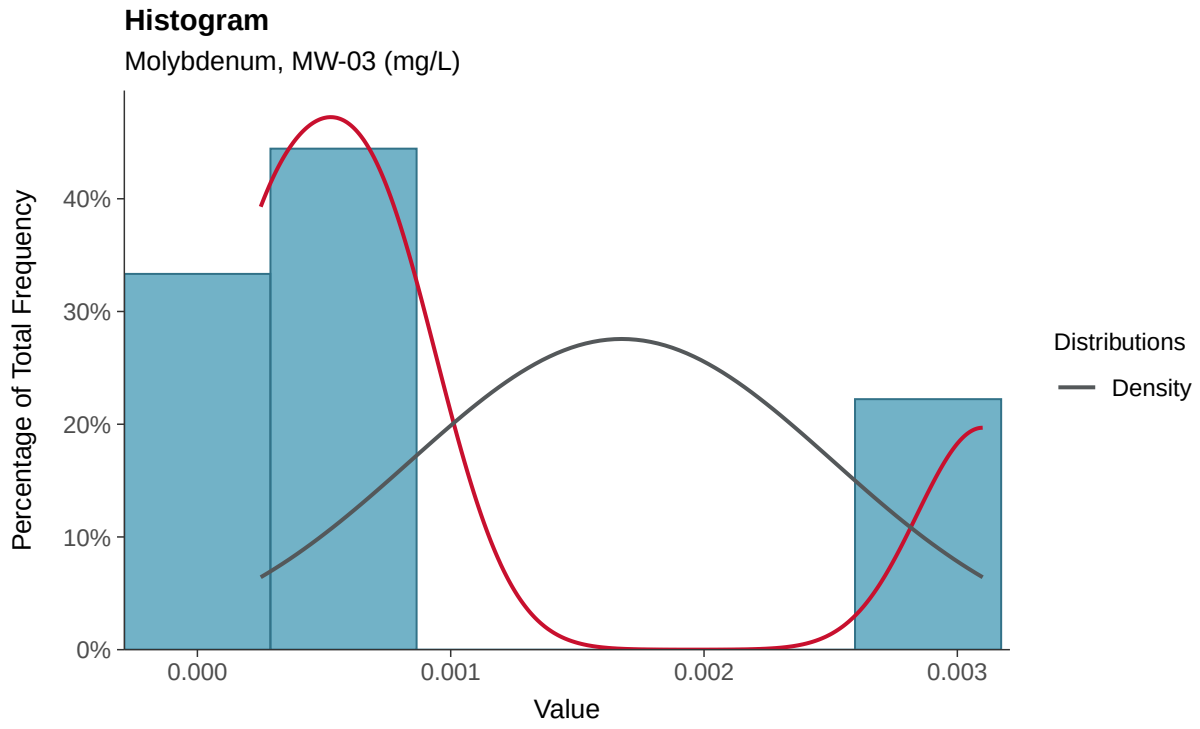

Boxplot by Season
Mercury, MW-03 (mg/L)
Value
0.00024
0.00022
0.00020
0.00018
0.00016
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Trend Regression: Piecewise Linear-Linear
Mercury, MW-03 (mg/L)
Value
0.000225
0.000200
0.000175
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Molybdenum, MW-03

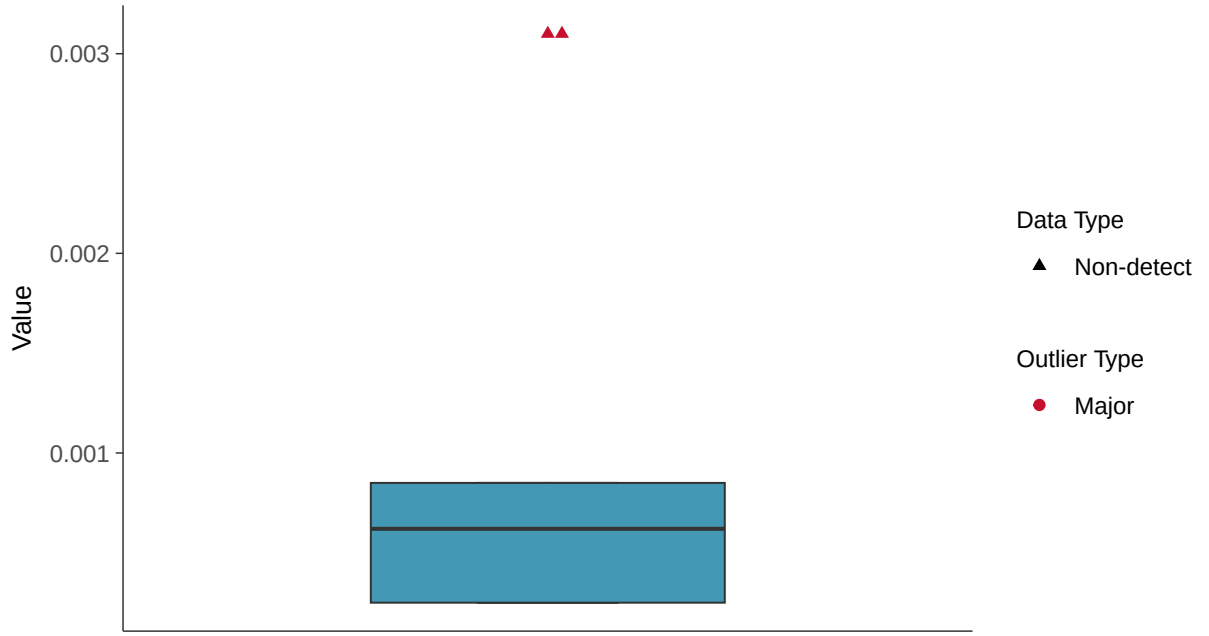
ID: 2_13_5_118





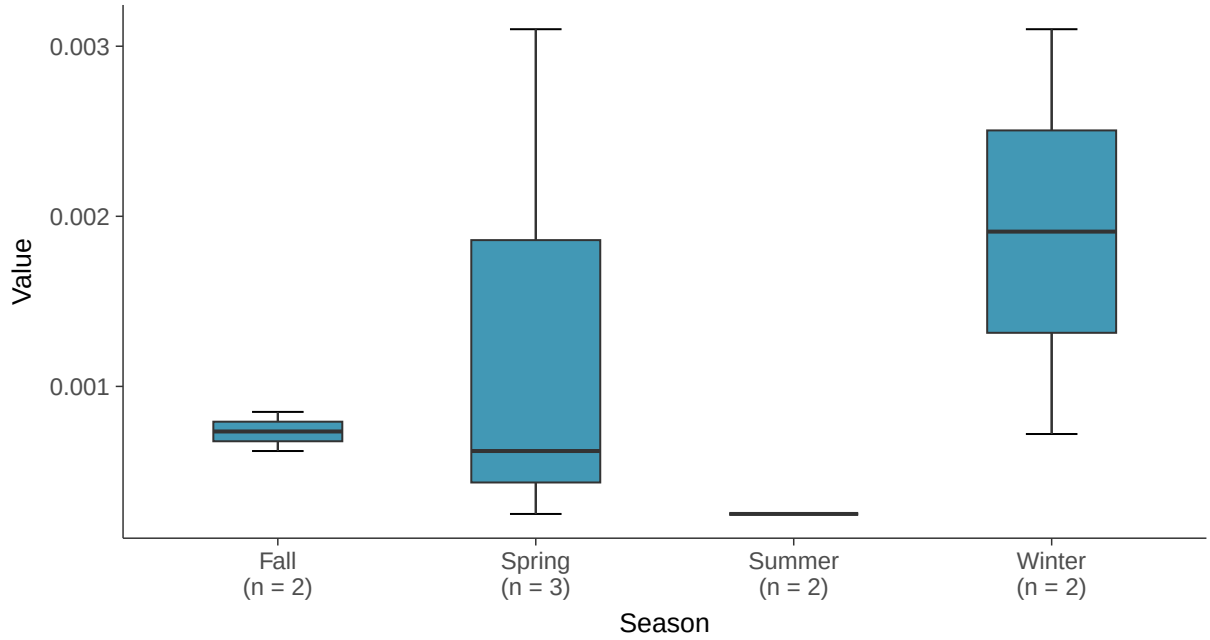
Boxplot

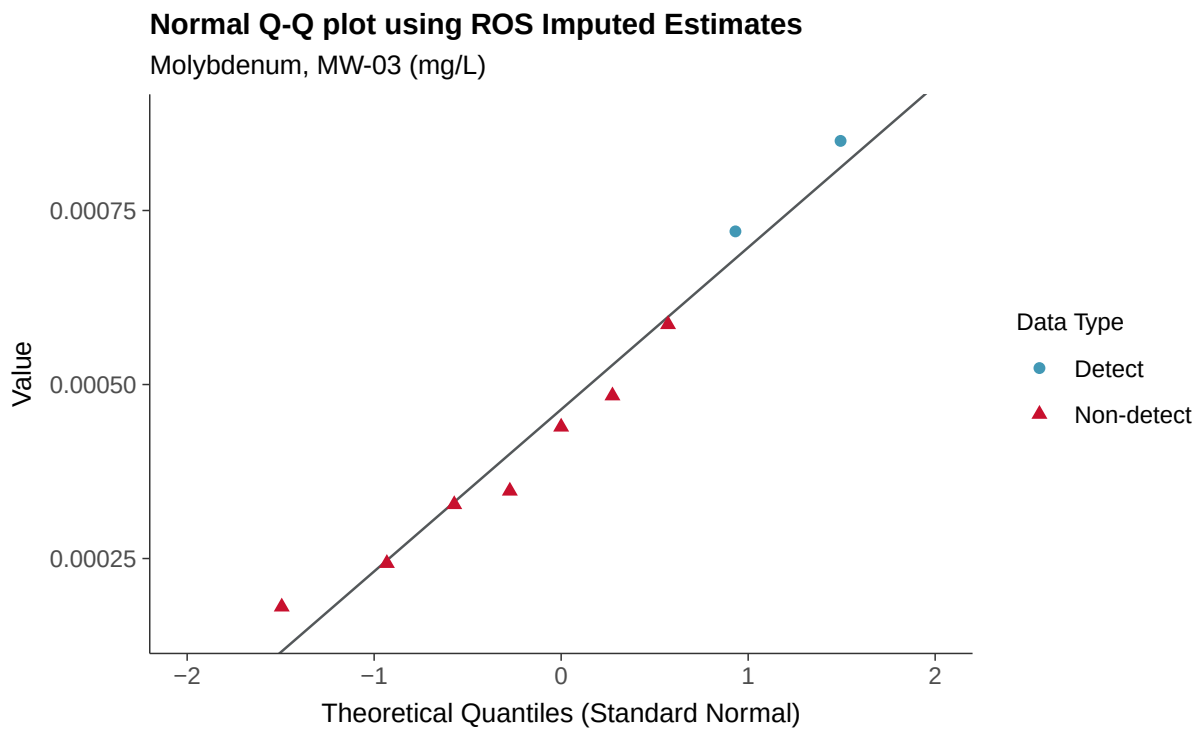
Molybdenum, MW-03 (mg/L)

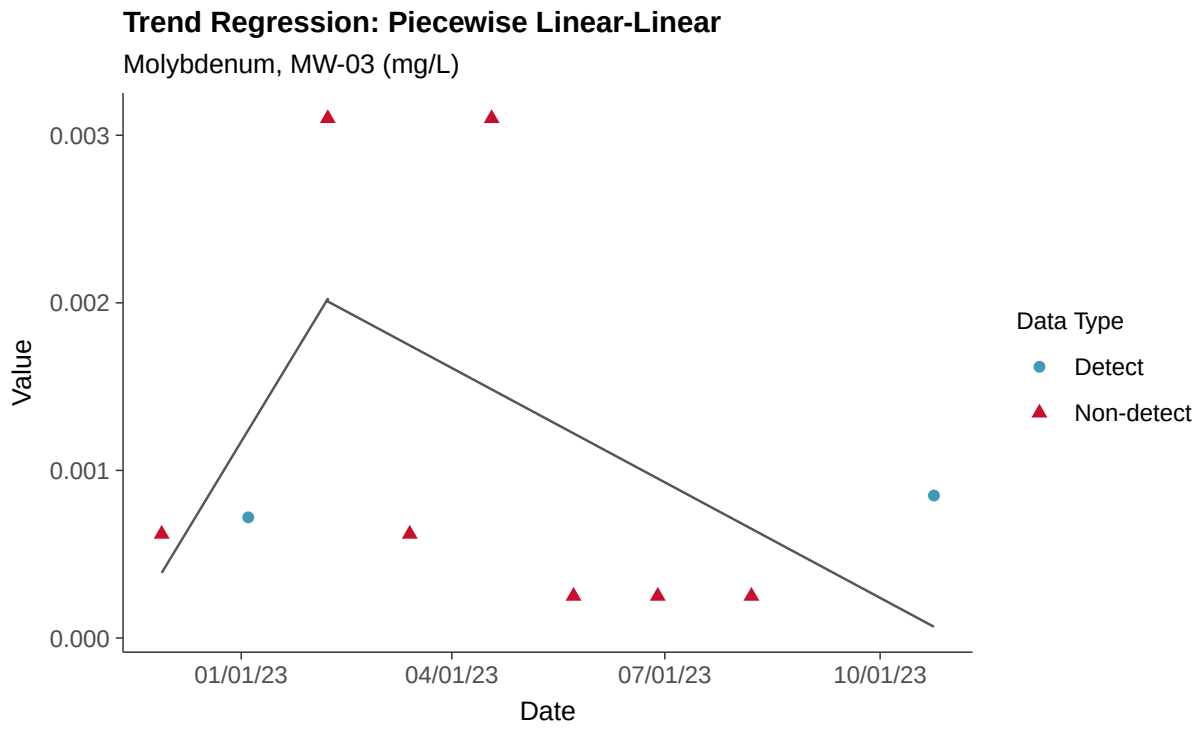


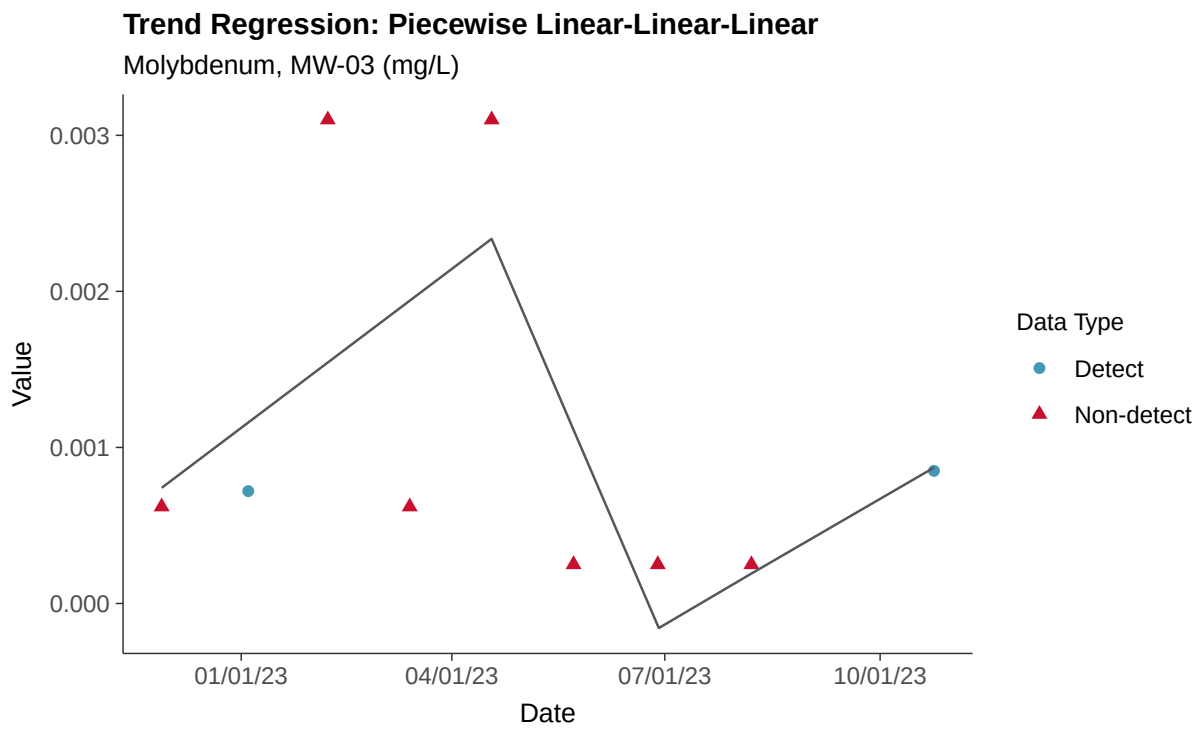
Boxplot by Season

Molybdenum, MW-03 (mg/L)



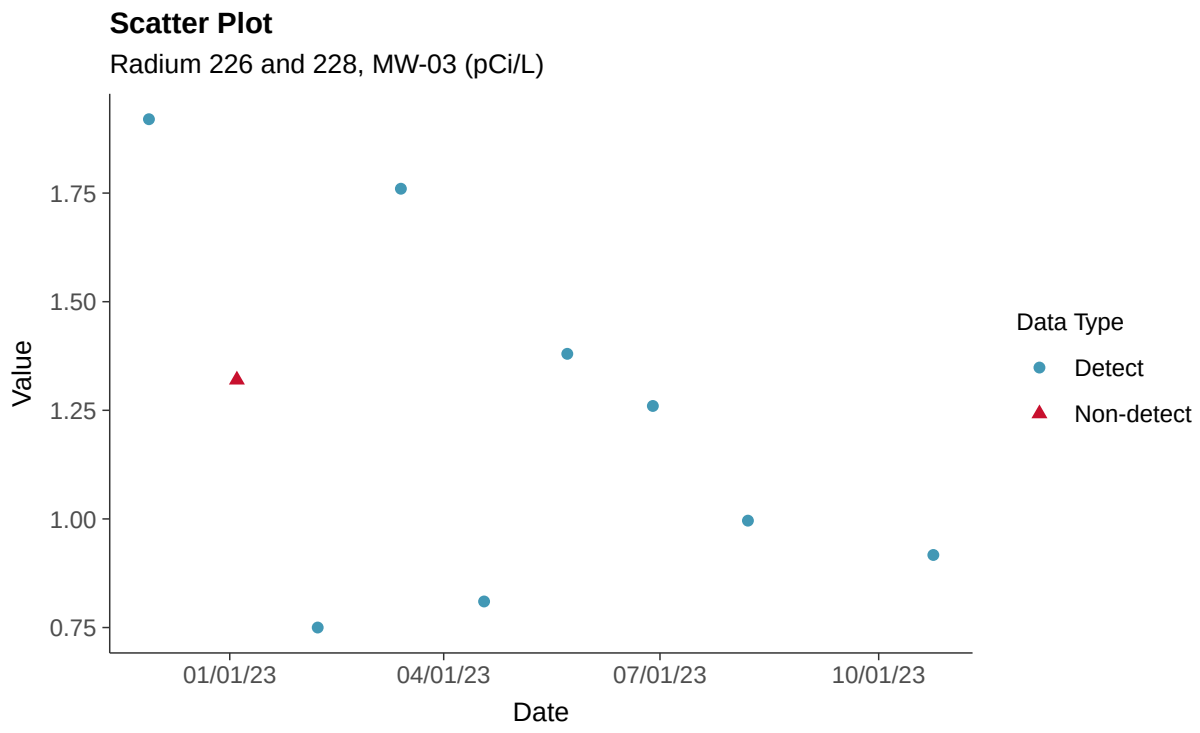

Normal Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-03 (mg/L)
Value
0.00075
0.00050
0.00025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

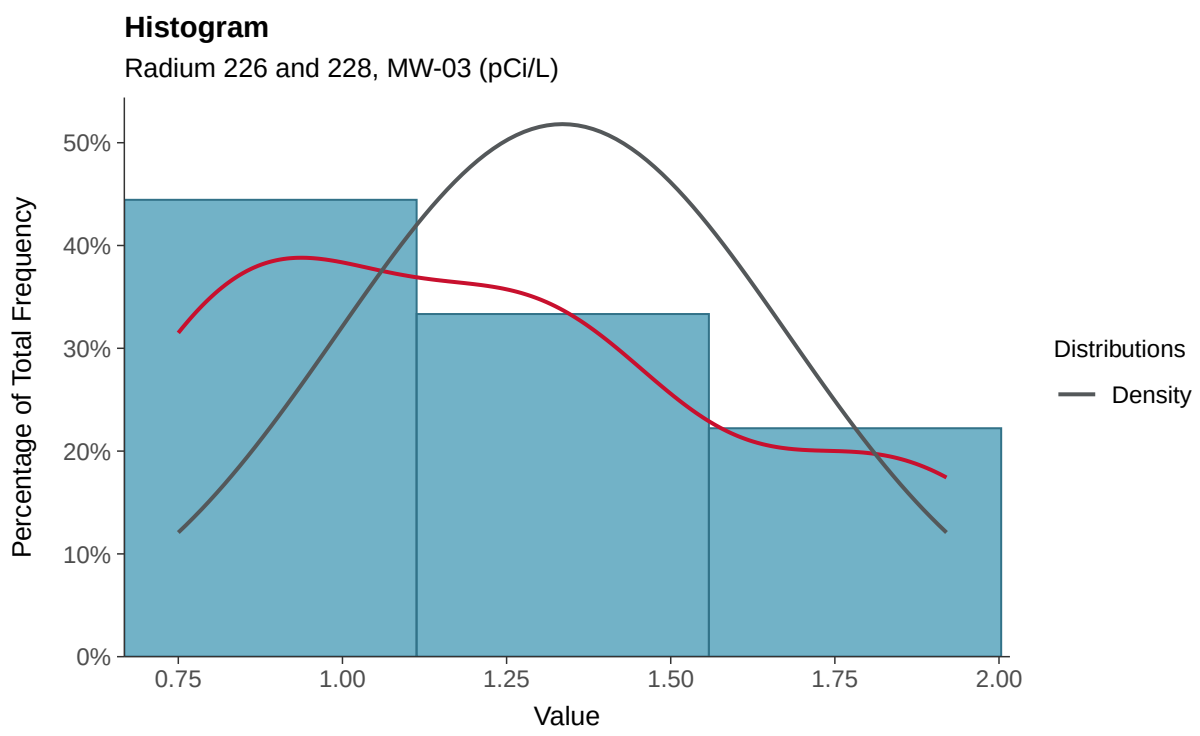

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-03 (mg/L)
Value
0.003
0.002
0.001
0.000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-03 (mg/L)
0.003
0.002
0.001
0.000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Radium 226 and 228, MW-03

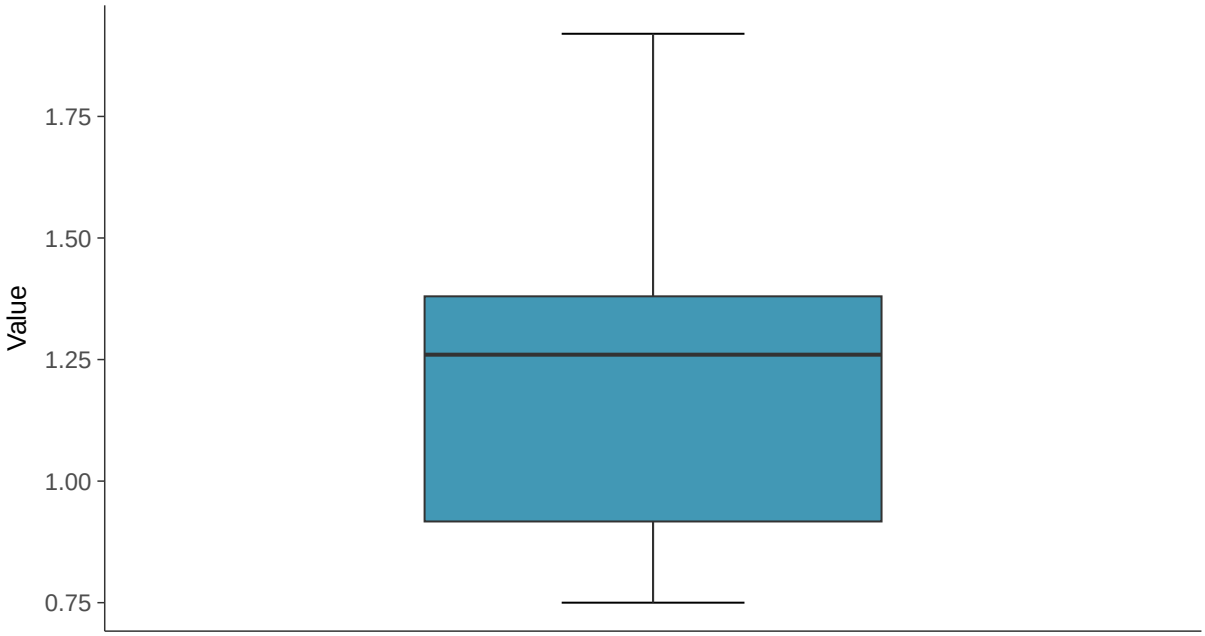
ID: 2_13_5_121





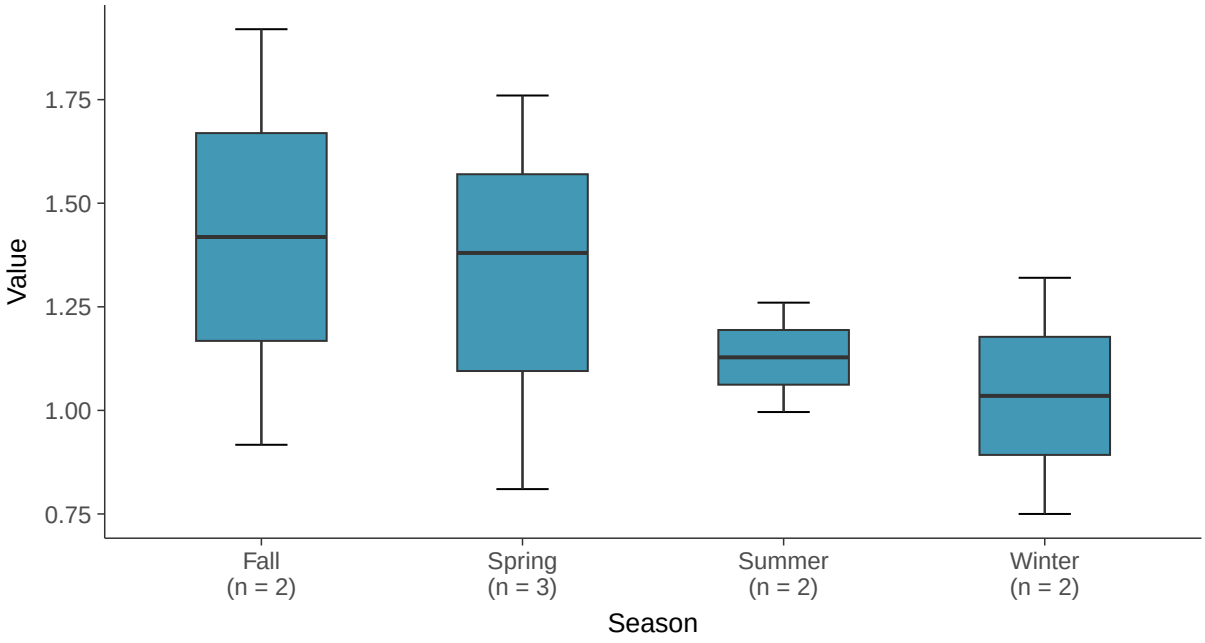
Boxplot

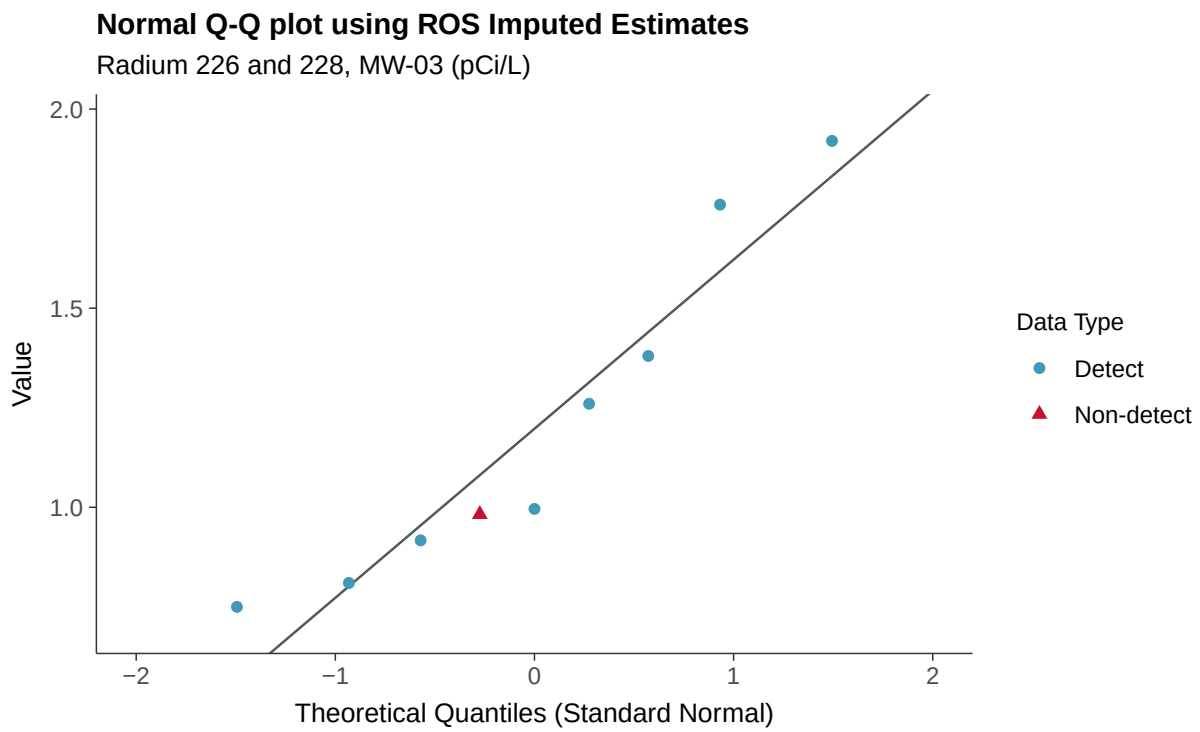
Radium 226 and 228, MW-03 (pCi/L)

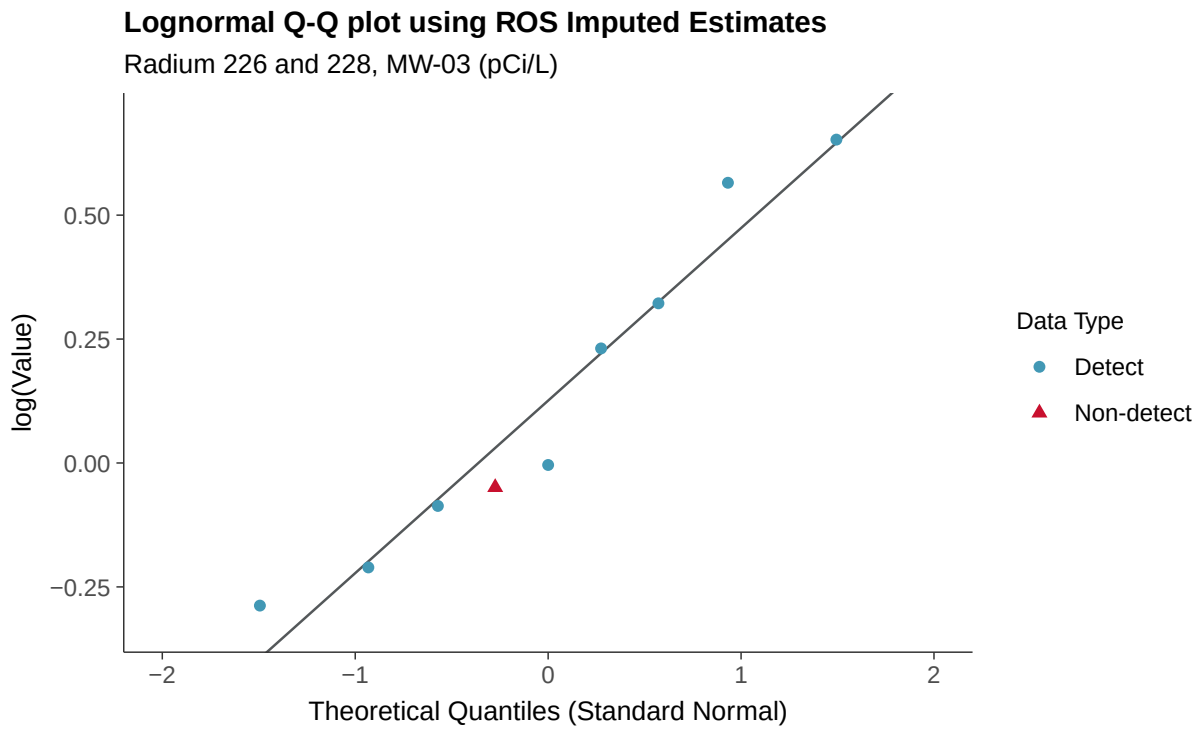


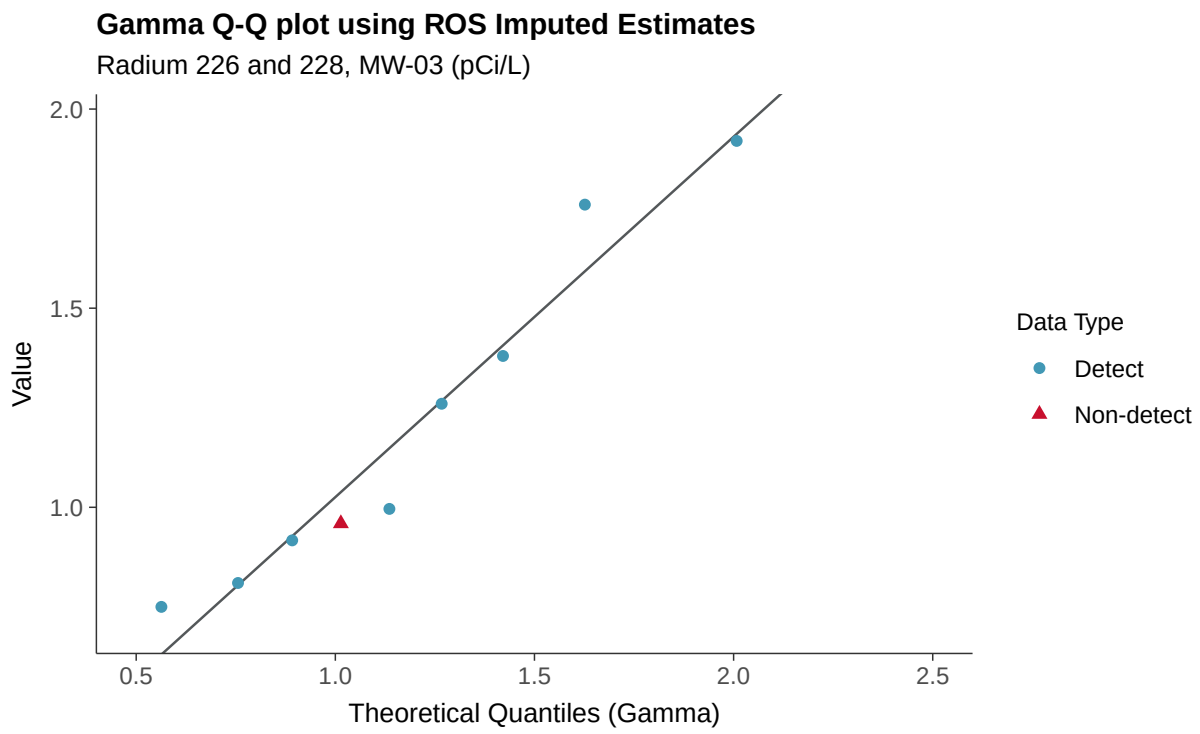
Boxplot by Season

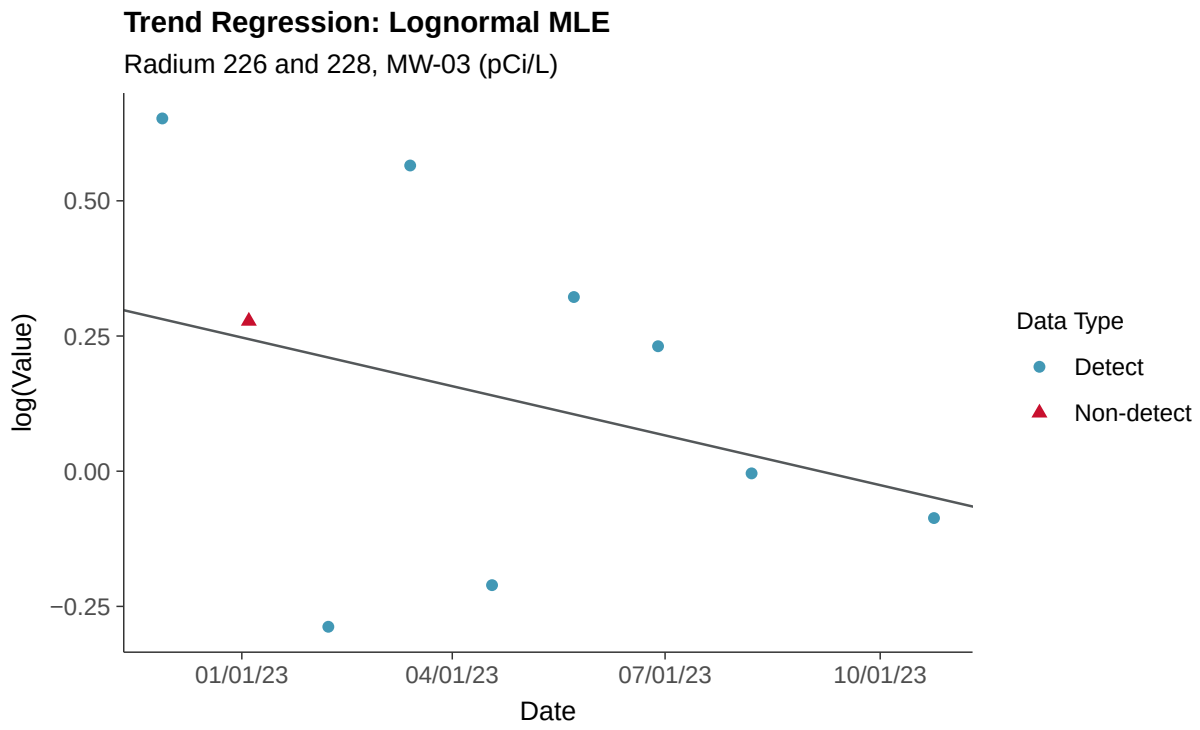
Radium 226 and 228, MW-03 (pCi/L)

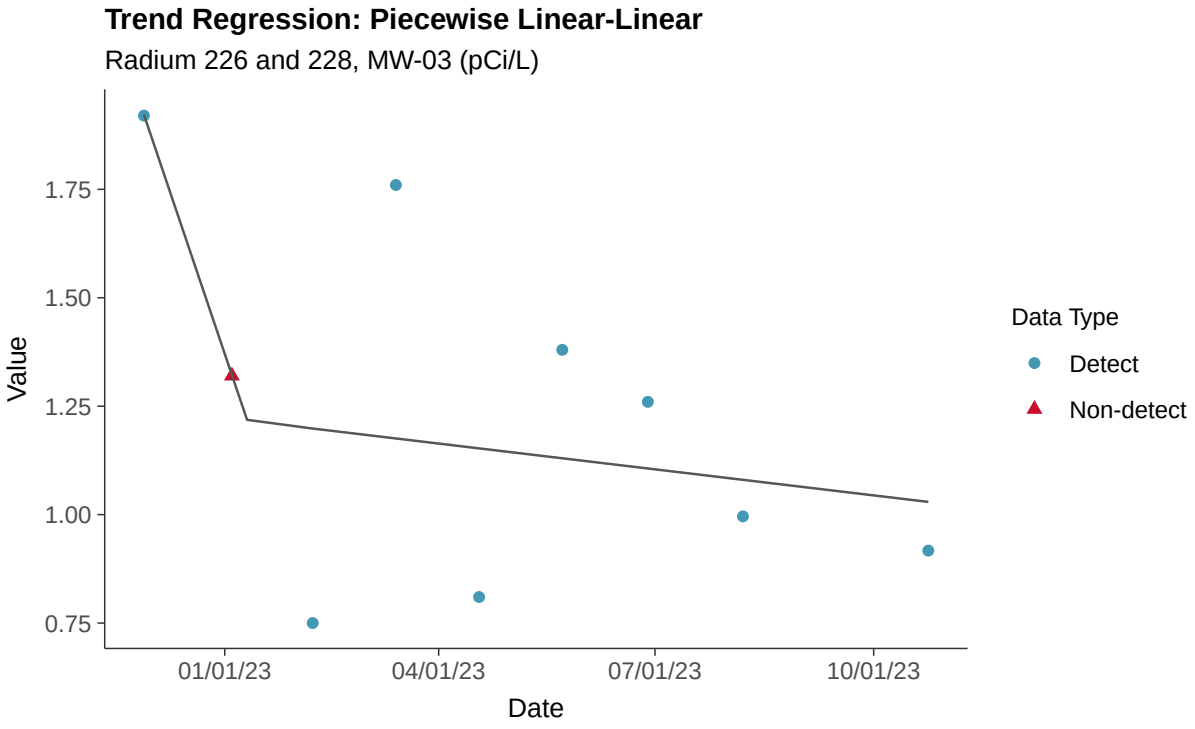



Normal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-03 (pCi/L)
Value
2.0
1.5
1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-03 (pCi/L)
log(Value)
0.50
0.25
0.00
−0.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

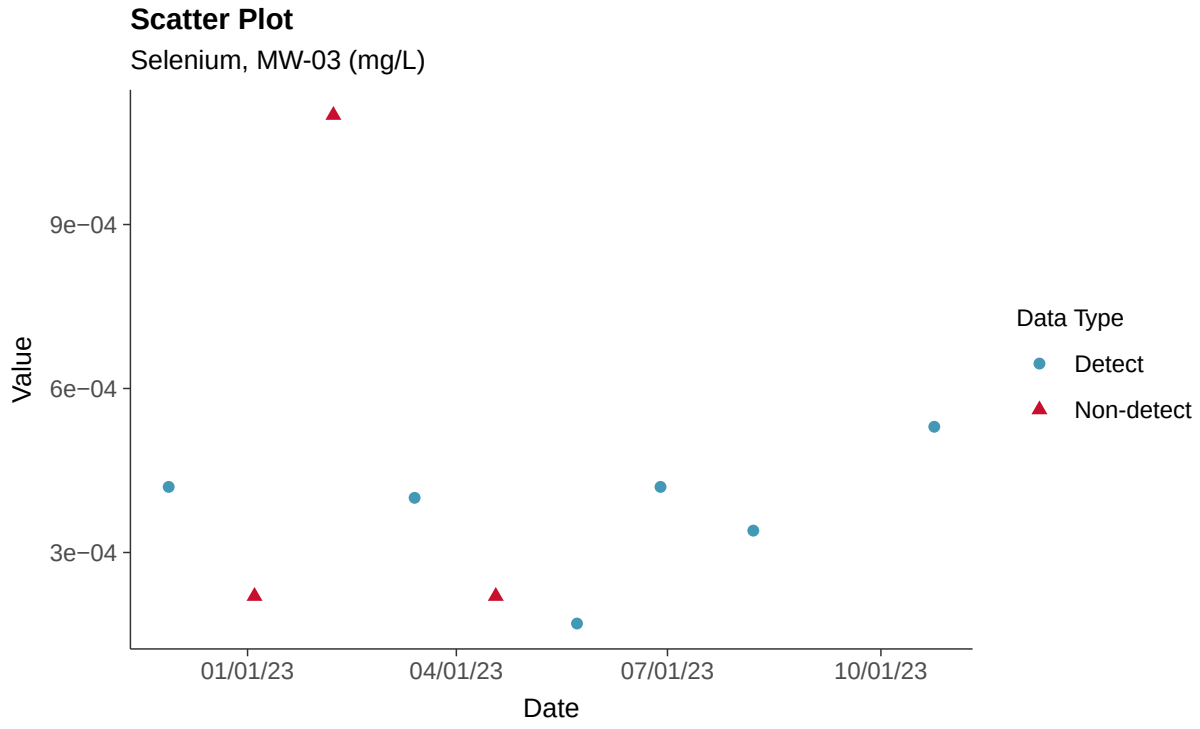

Gamma Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-03 (pCi/L)
Value
2.0
1.5
1.0
0.5
1.0
1.5
2.0
2.5
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

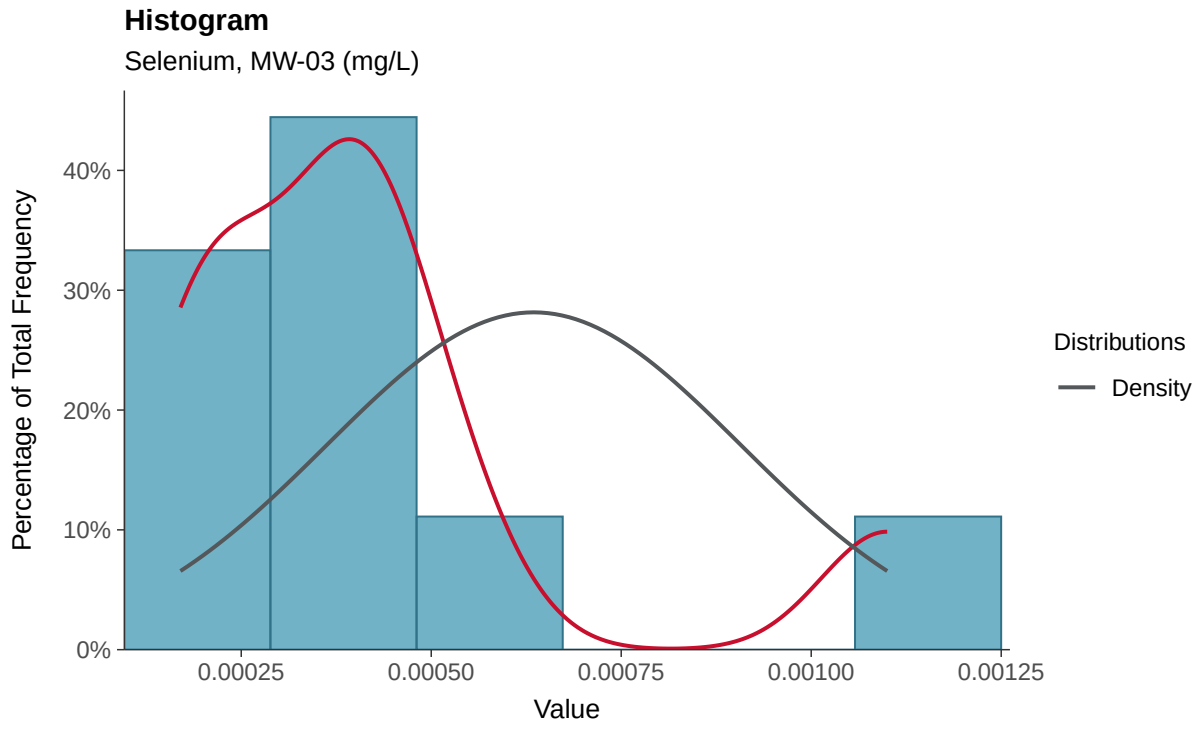

Trend Regression: Lognormal MLE
Radium 226 and 228, MW-03 (pCi/L)
log(Value)
0.50
0.25
0.00
−0.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Radium 226 and 228, MW-03 (pCi/L)
Value
1.75
1.50
1.25
1.00
0.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Selenium, MW-03

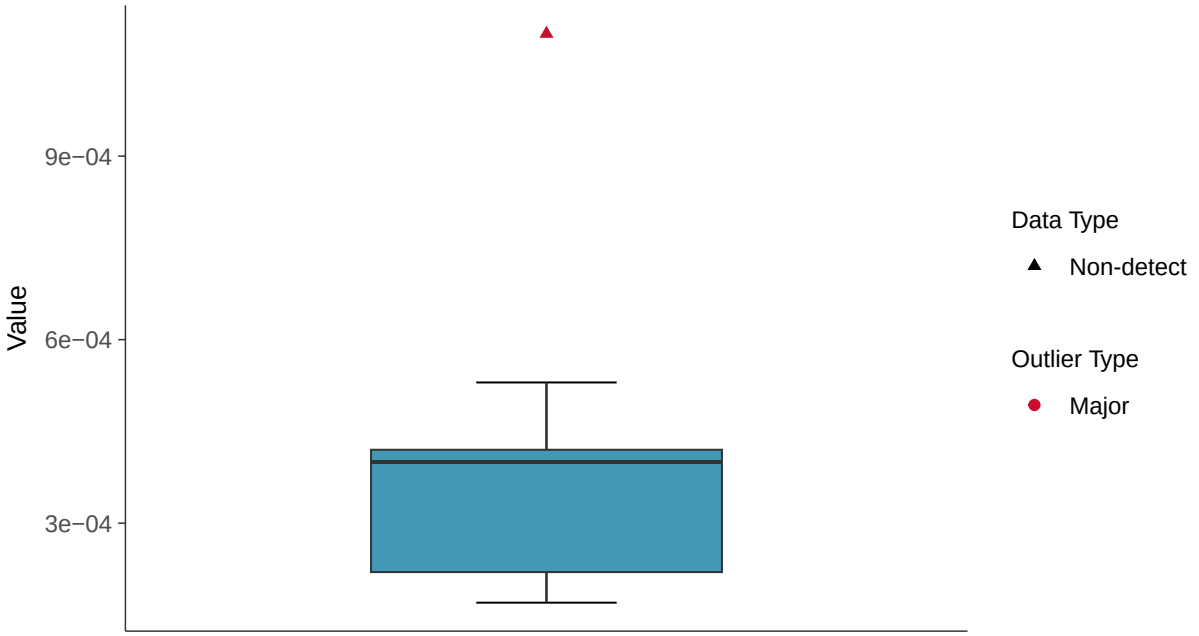
ID: 2_13_5_122





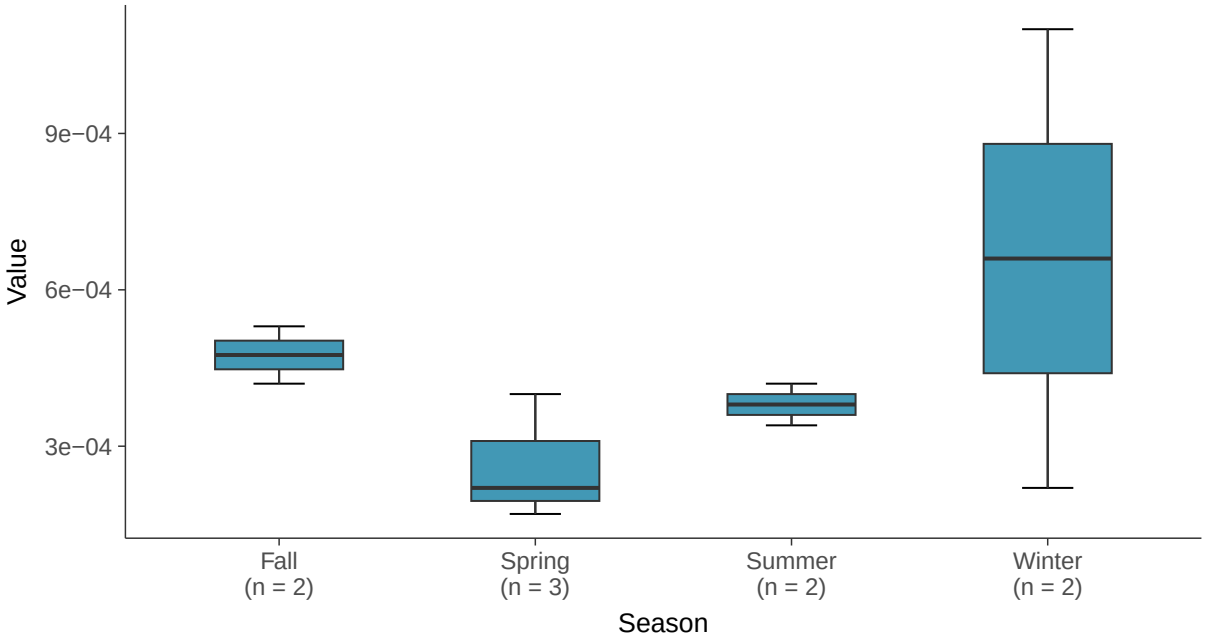
Boxplot

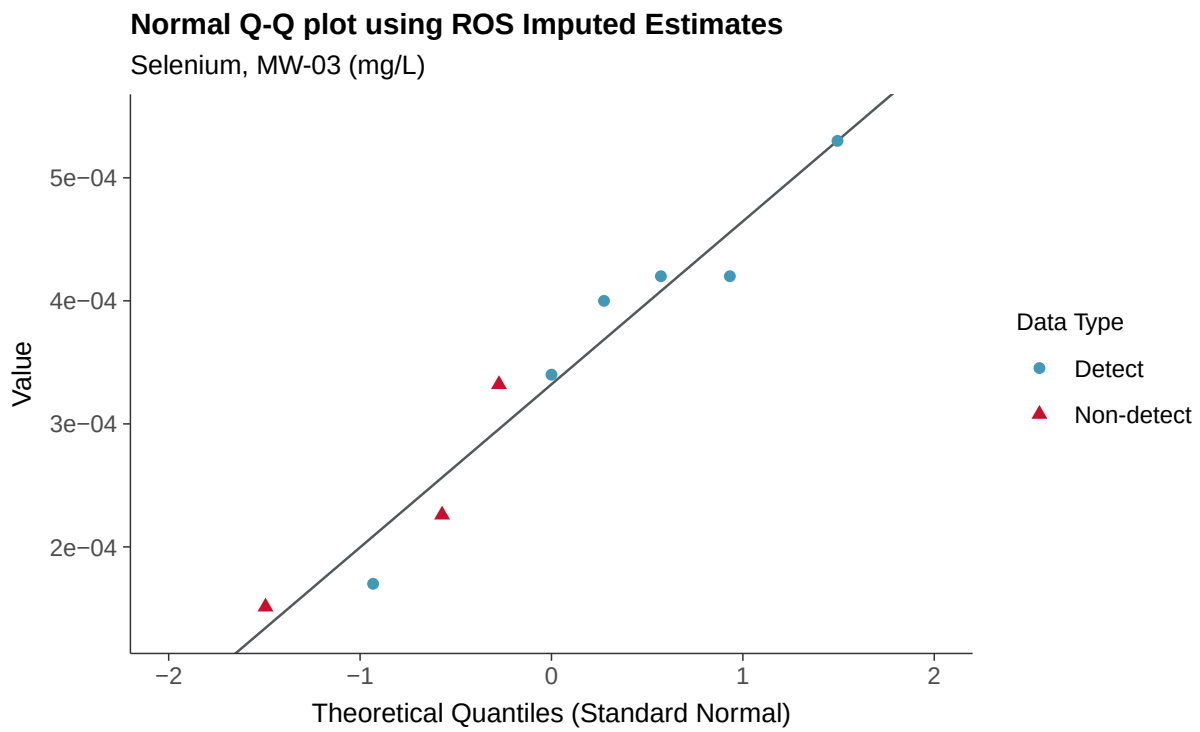
Selenium, MW-03 (mg/L)

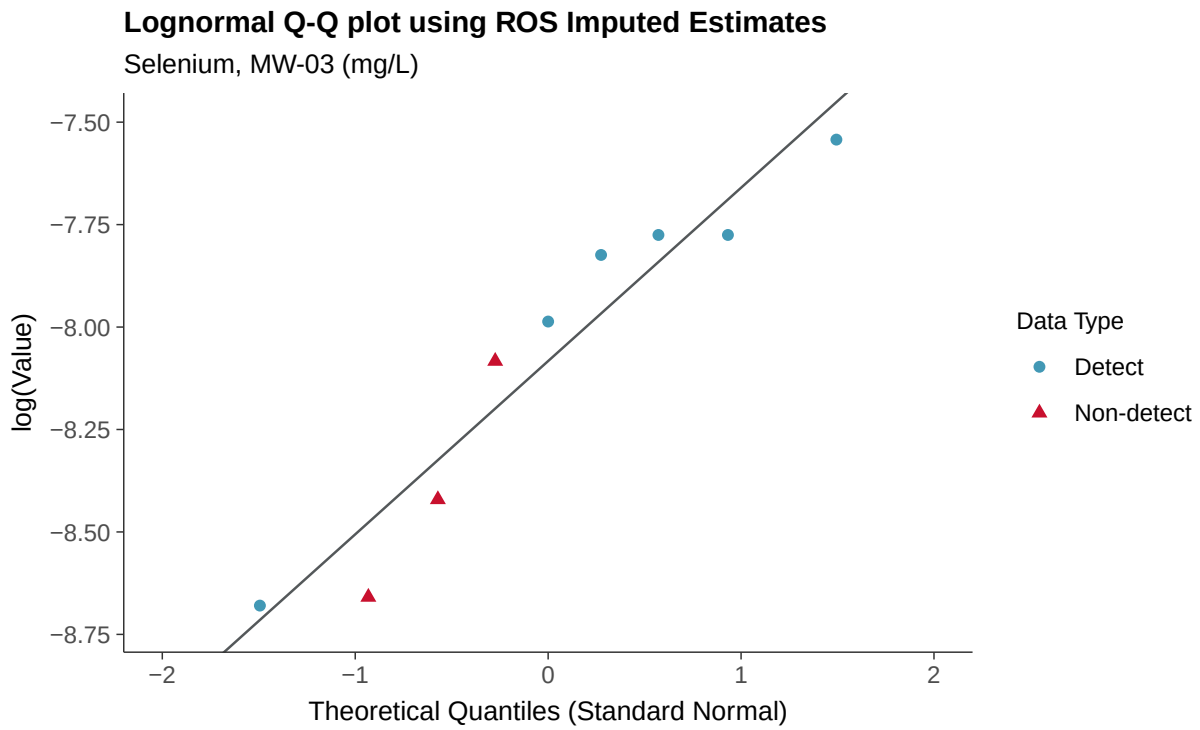


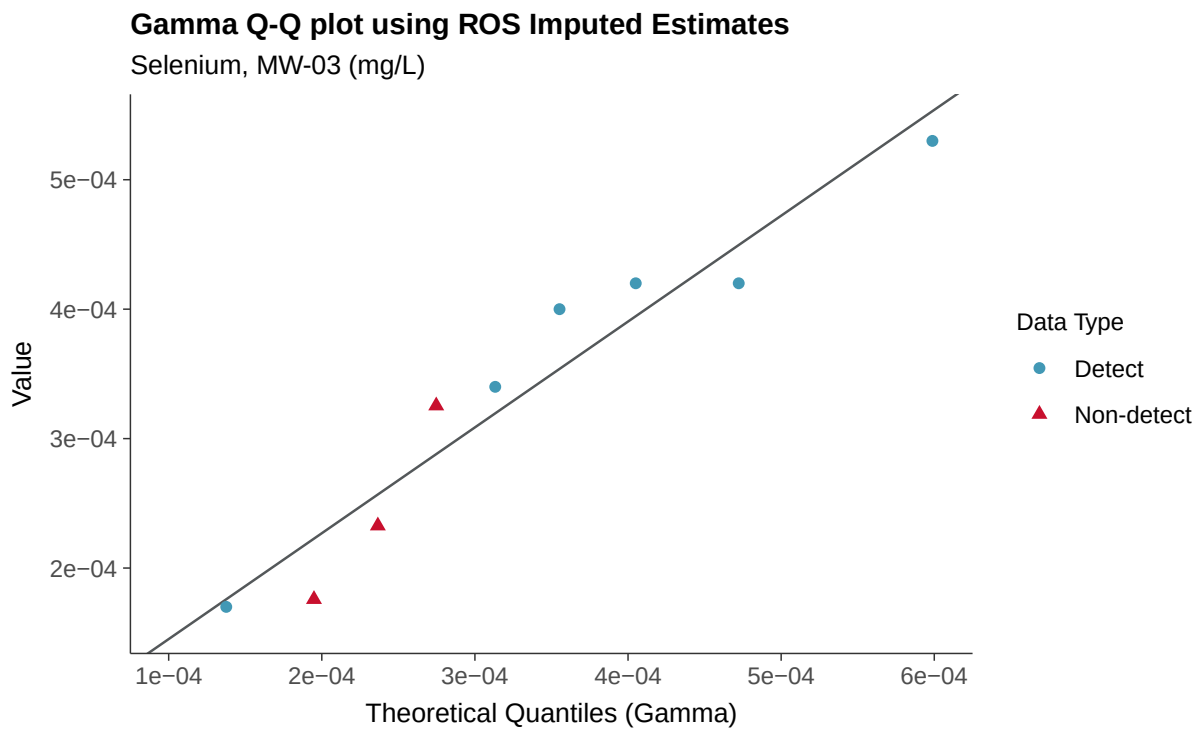
Boxplot by Season

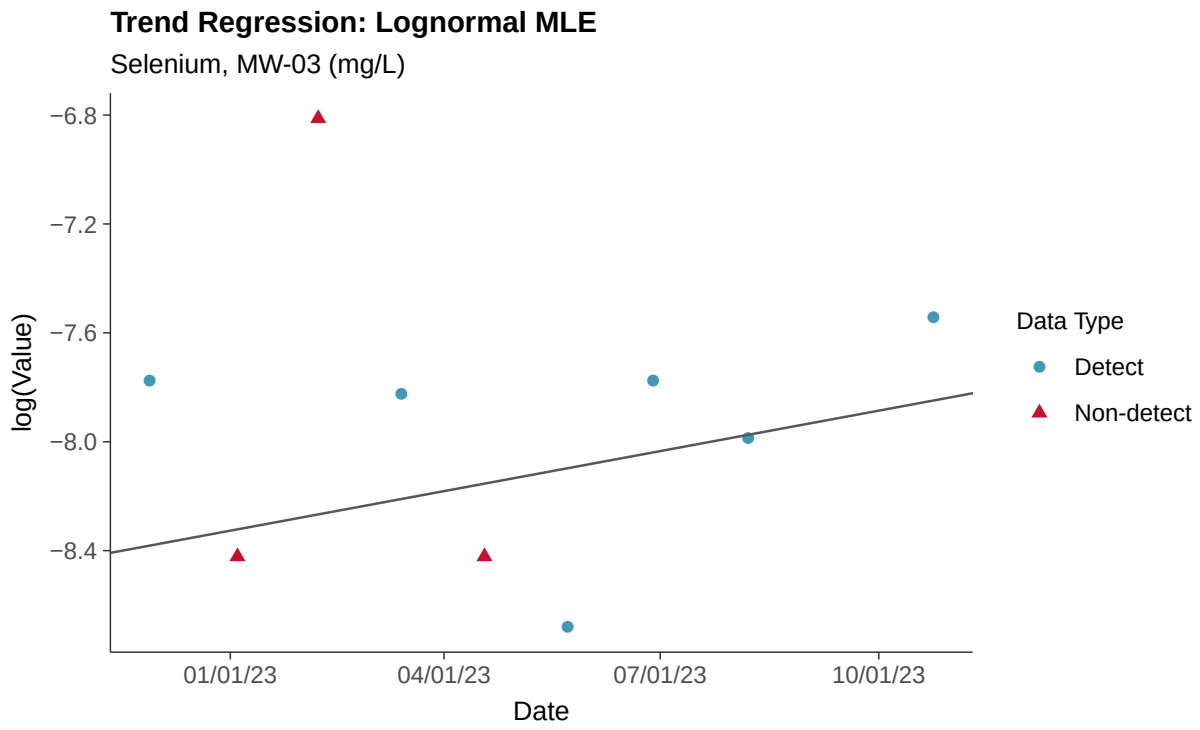
Selenium, MW-03 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-03 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

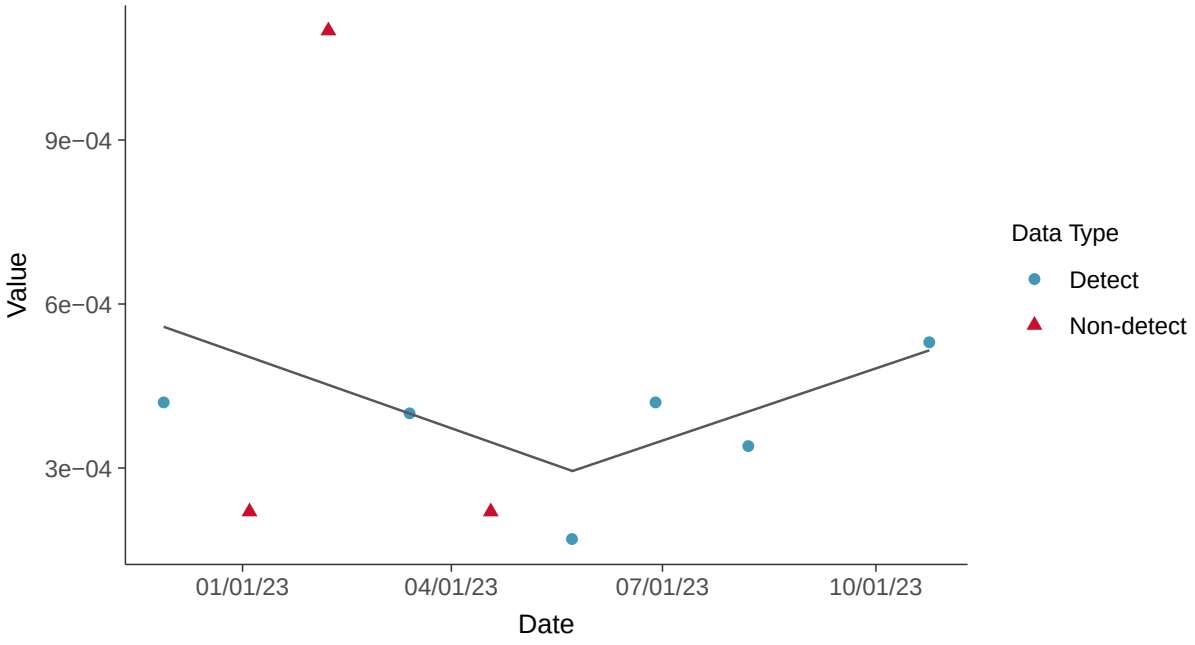

Lognormal Q-Q plot using ROS Imputed Estimates
Selenium, MW-03 (mg/L)
log(Value)
−7.50
−7.75
−8.00
−8.25
−8.50
−8.75
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Selenium, MW-03 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
2e−04
3e−04
4e−04
5e−04
6e−04
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Selenium, MW-03 (mg/L)
log(Value)
−6.8
−7.2
−7.6
−8.0
−8.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

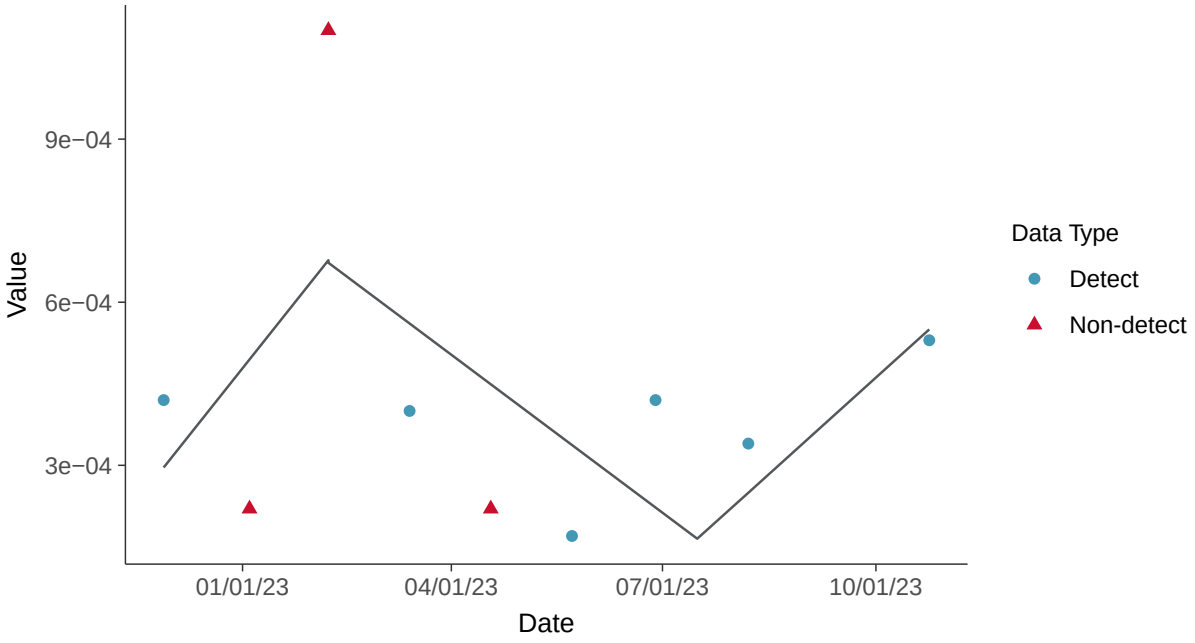
Trend Regression: Piecewise Linear-Linear

Selenium, MW-03 (mg/L)



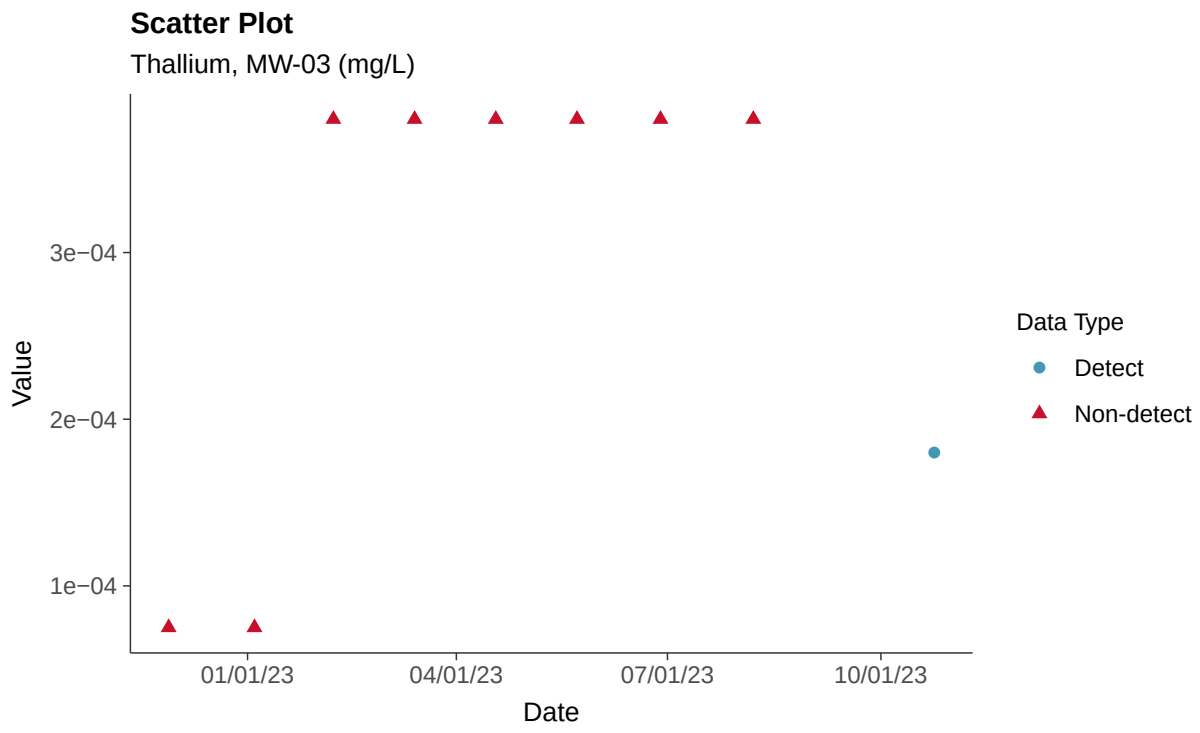
Trend Regression: Piecewise Linear-Linear-Linear

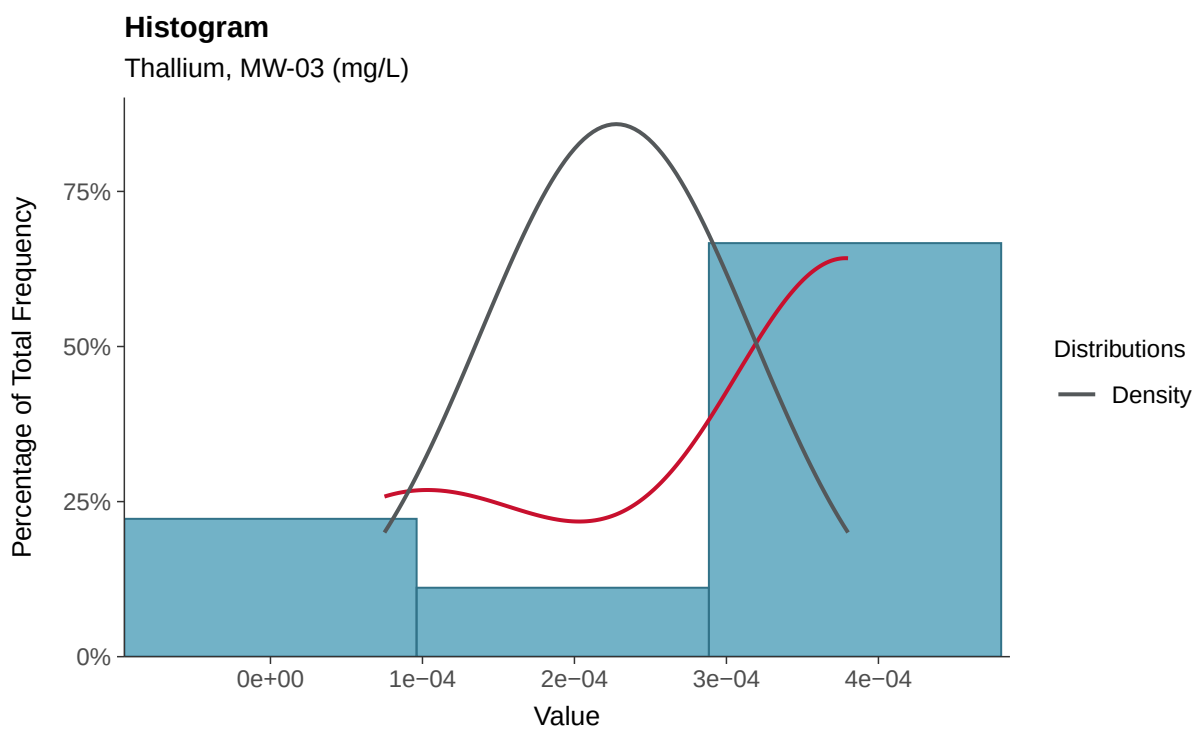
Selenium, MW-03 (mg/L)



Appendix IV: Thallium, MW-03

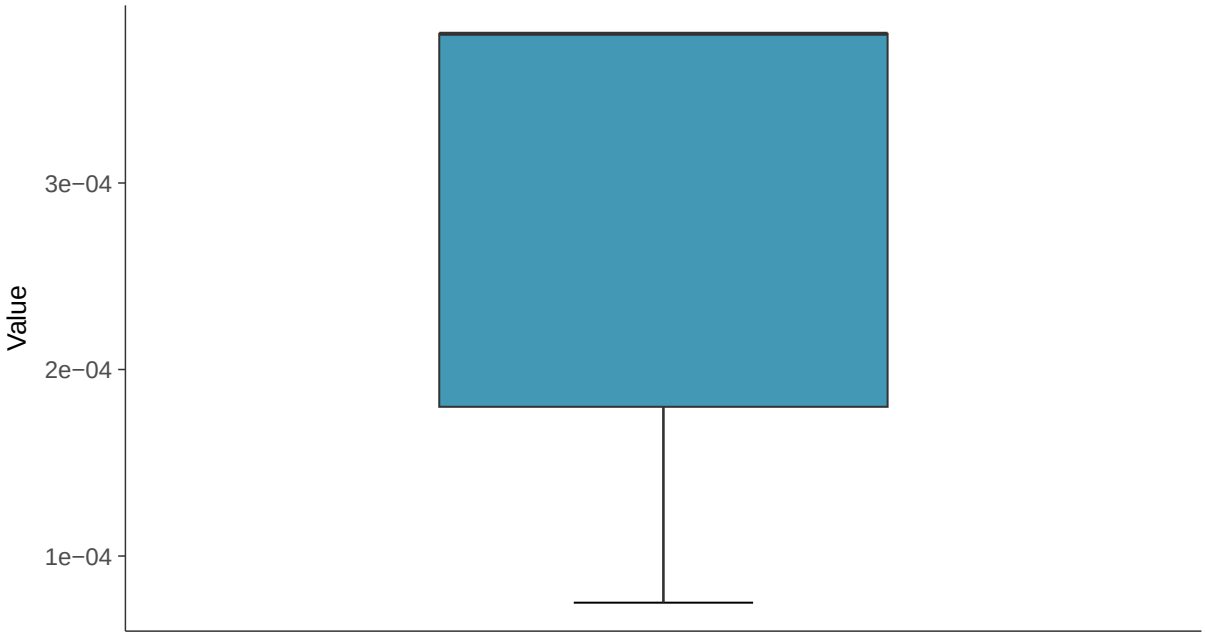
ID: 2_13_5_125





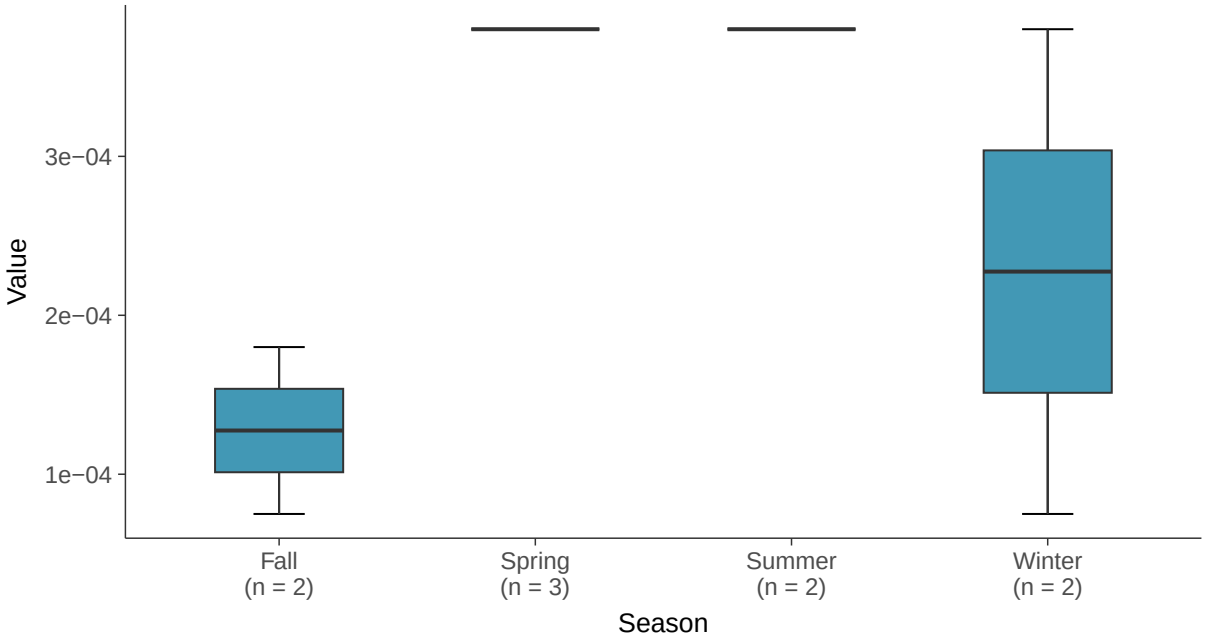
Boxplot

Thallium, MW-03 (mg/L)



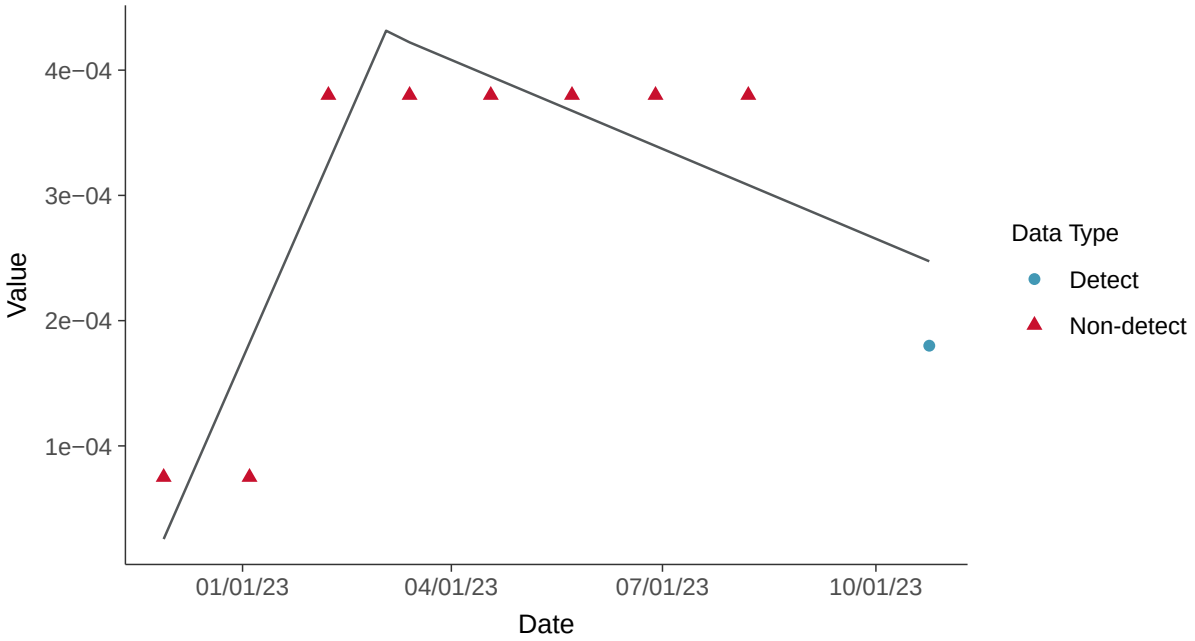
Boxplot by Season

Thallium, MW-03 (mg/L)



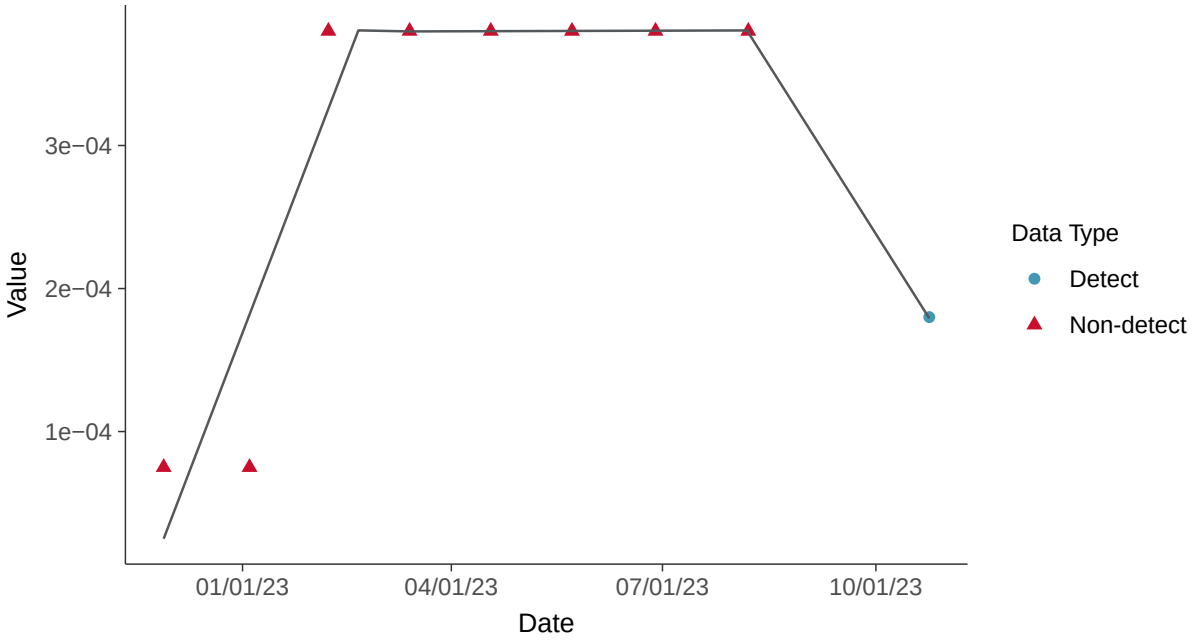
Trend Regression: Piecewise Linear-Linear

Thallium, MW-03 (mg/L)



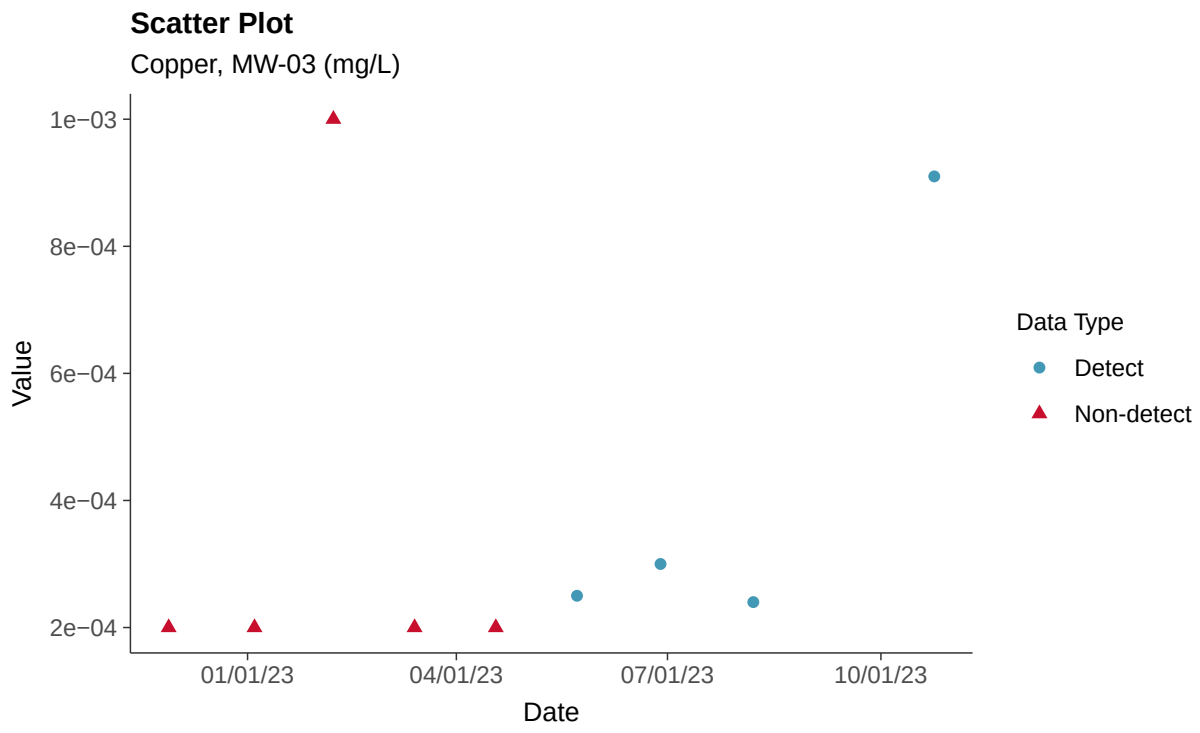
Trend Regression: Piecewise Linear-Linear-Linear

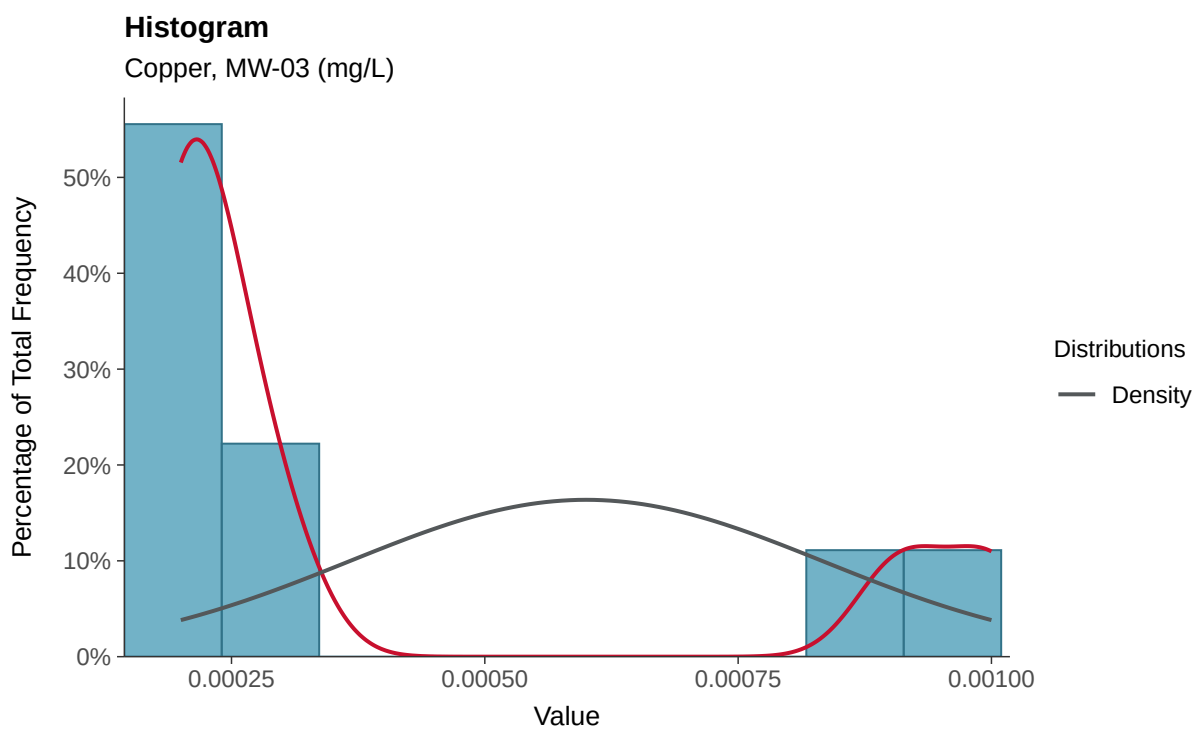
Thallium, MW-03 (mg/L)



Part 115: Copper, MW-03

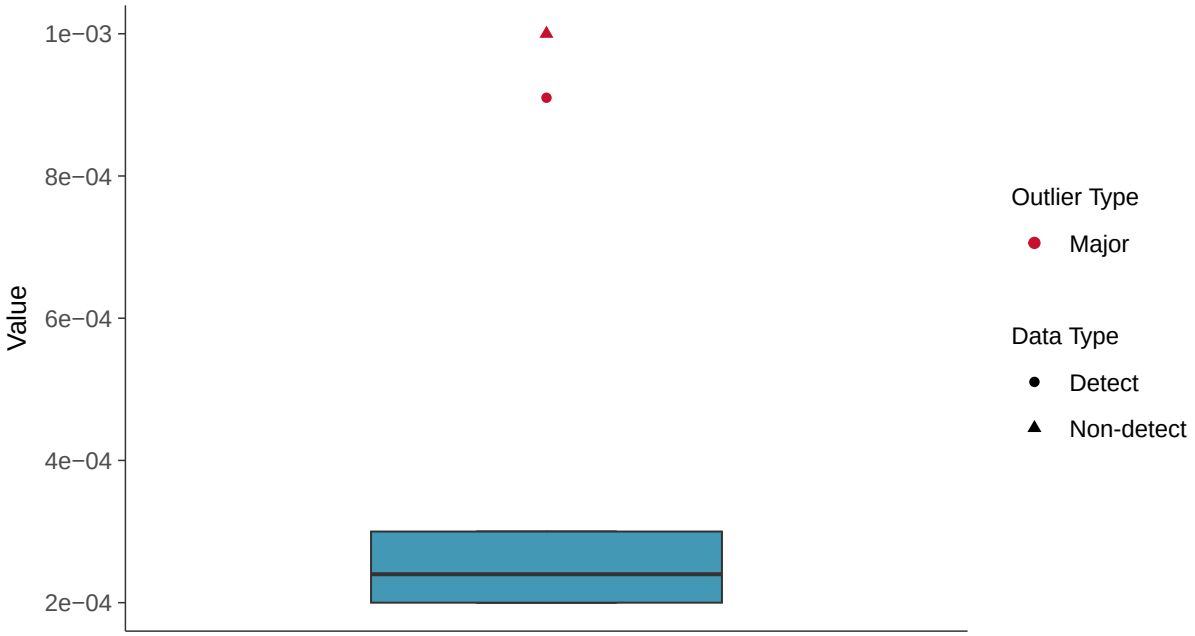
ID: 2_13_6_111





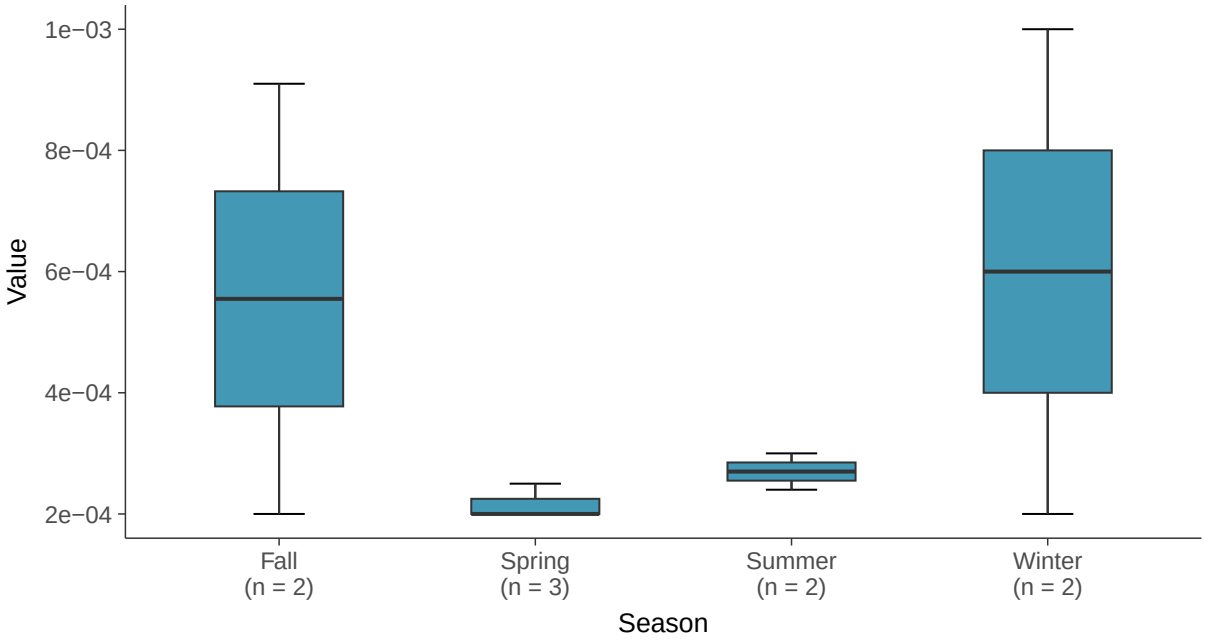
Boxplot

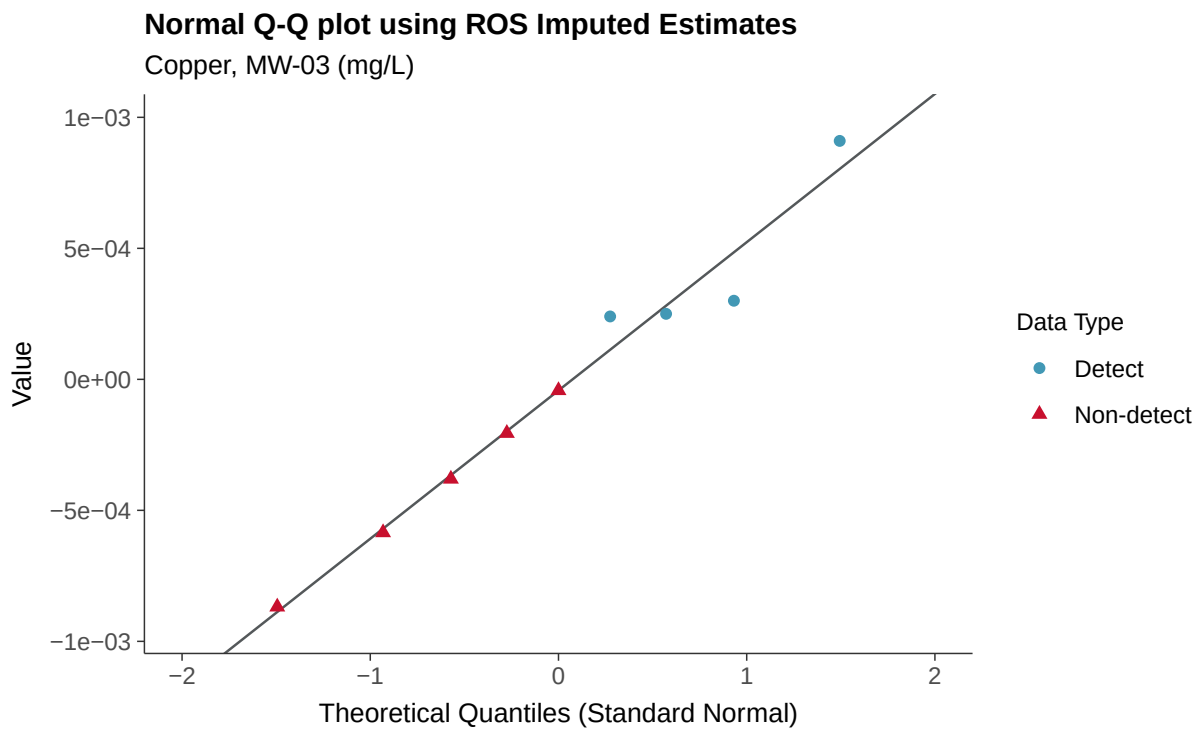
Copper, MW-03 (mg/L)

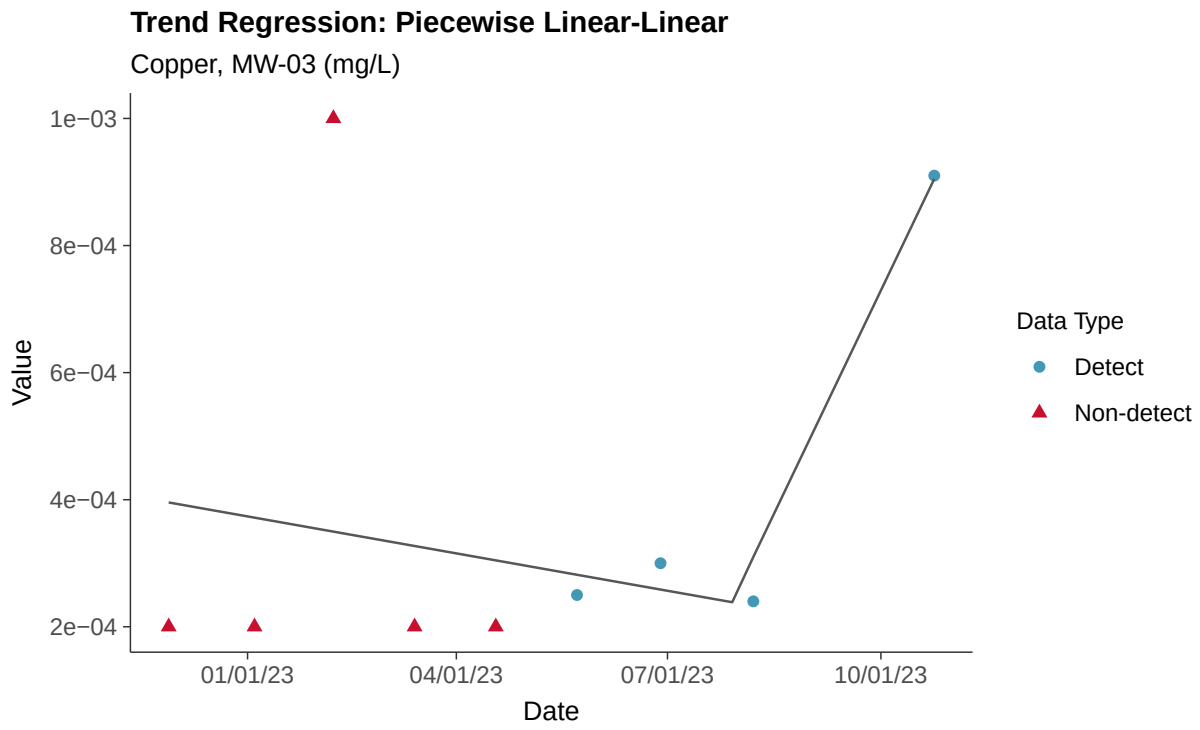


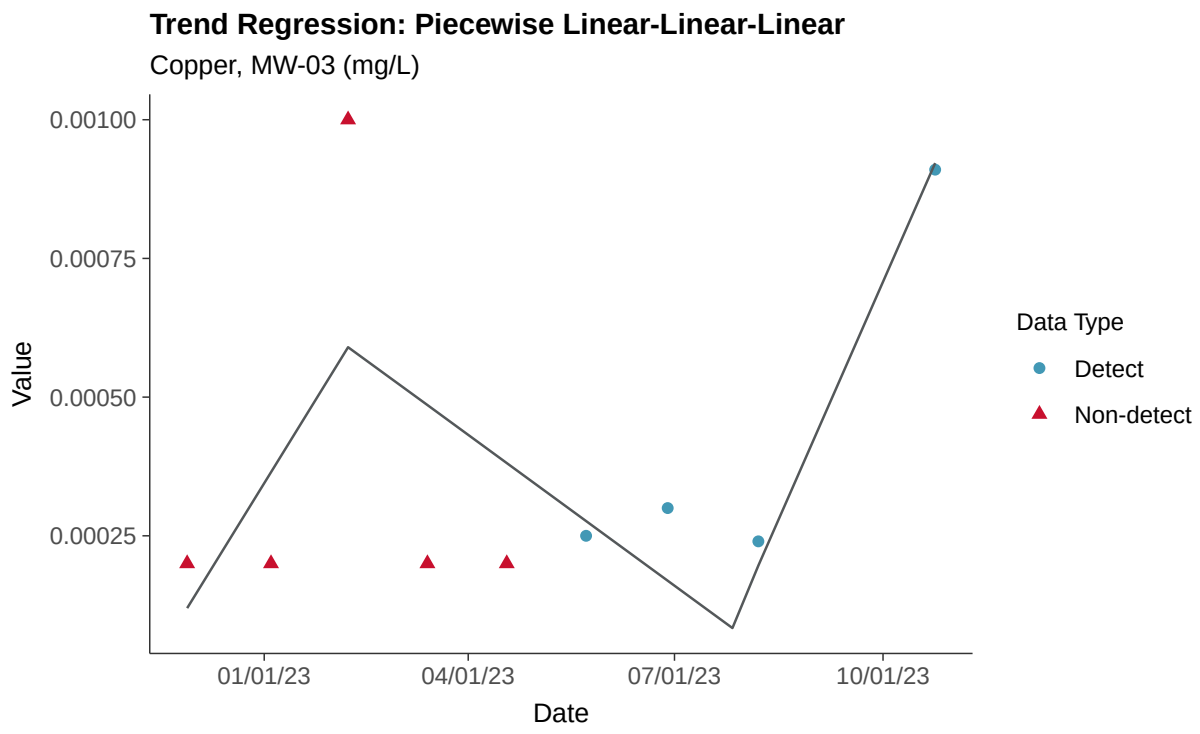
Boxplot by Season

Copper, MW-03 (mg/L)



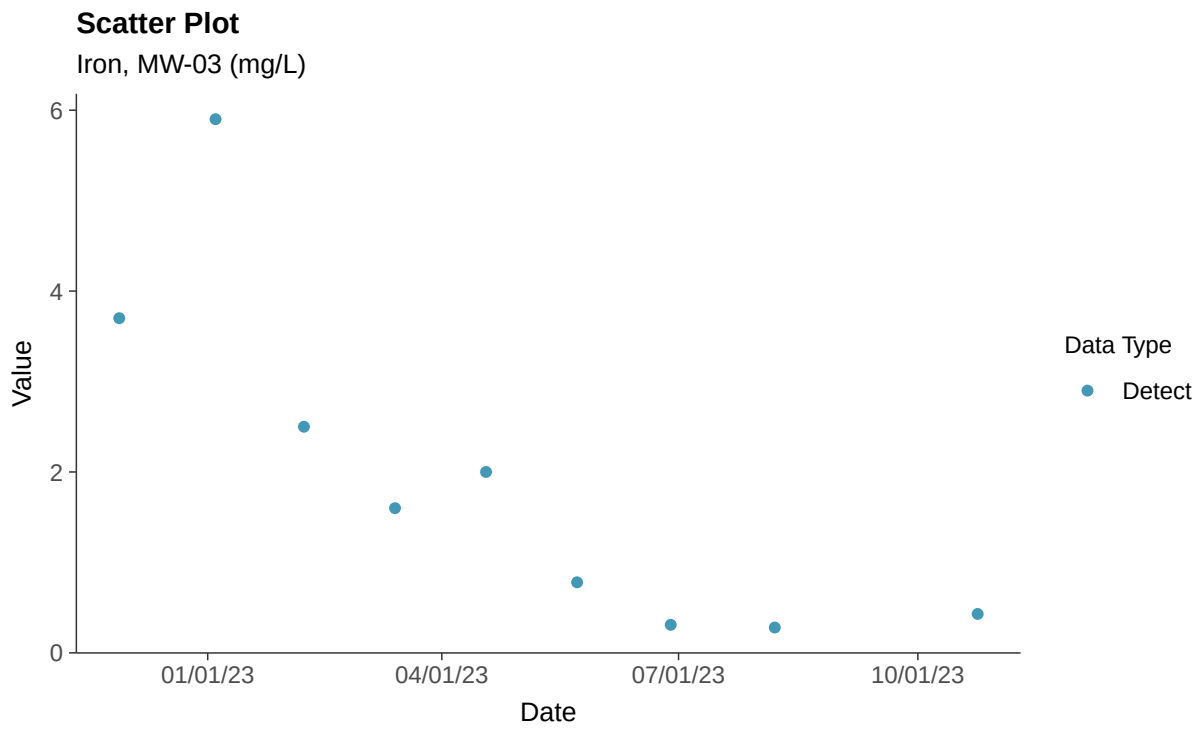

Normal Q-Q plot using ROS Imputed Estimates
Copper, MW-03 (mg/L)
Value
1e−03
5e−04
0e+00
−5e−04
−1e−03
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

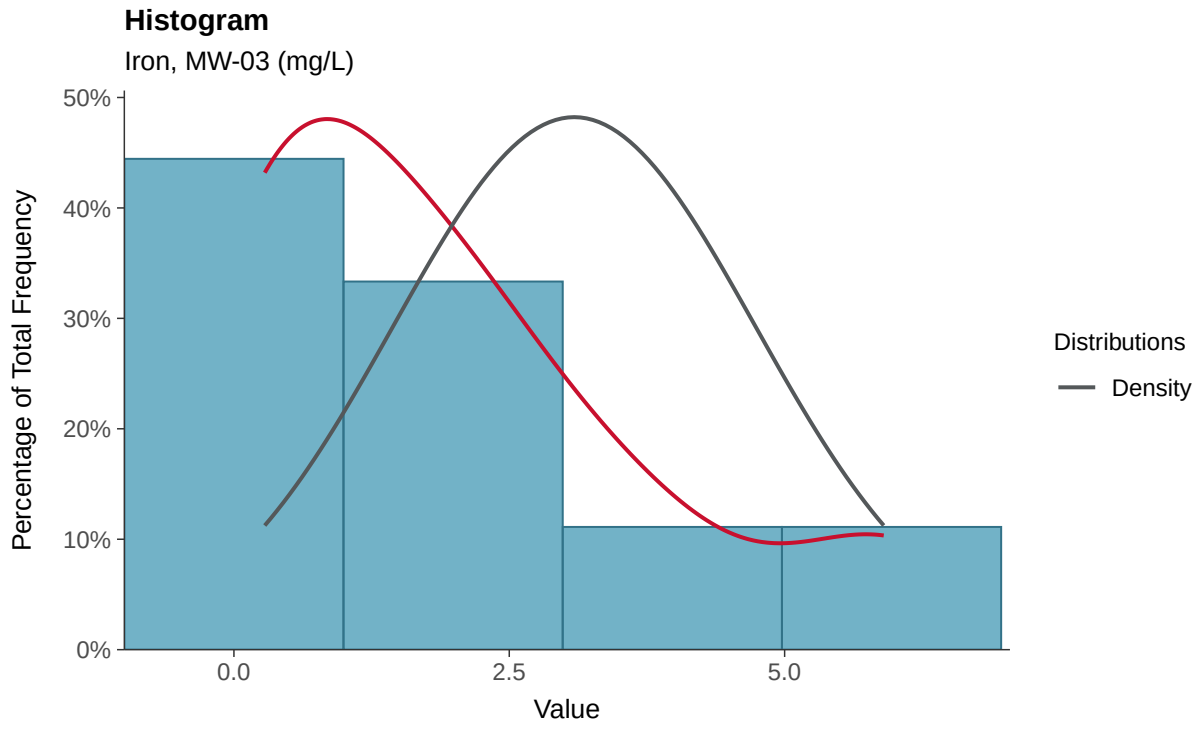

Trend Regression: Piecewise Linear-Linear
Copper, MW-03 (mg/L)
Value
1e−03
8e−04
6e−04
4e−04
2e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Copper, MW-03 (mg/L)
0.00100
0.00075
0.00050
0.00025
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-03

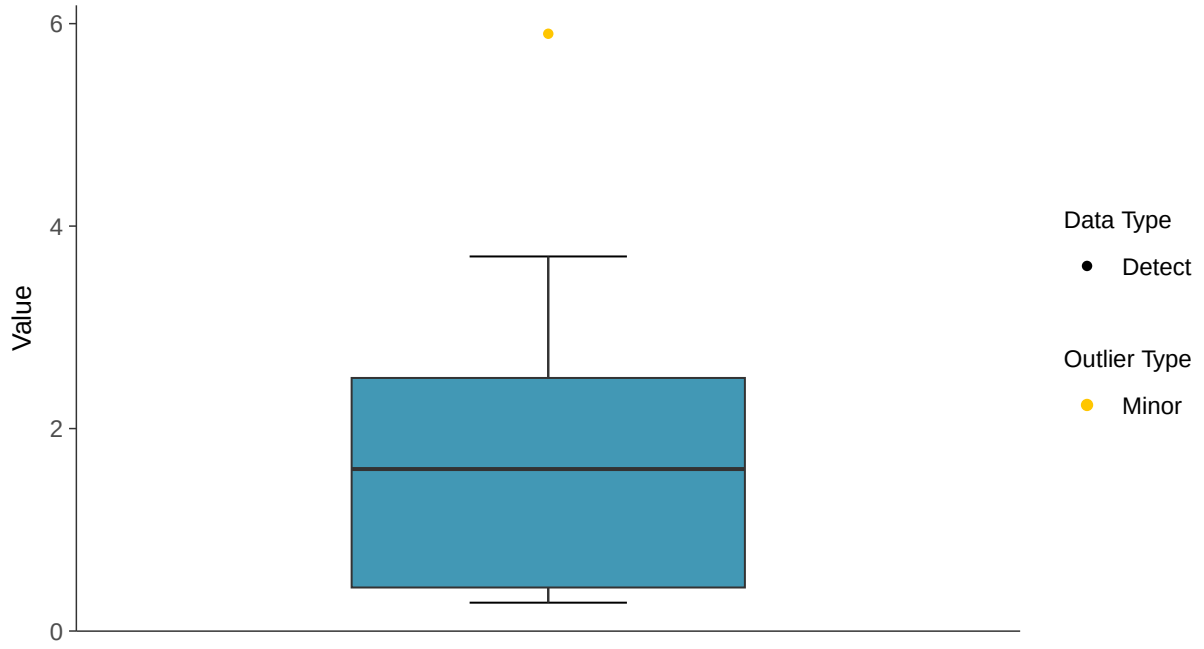
ID: 2_13_6_114





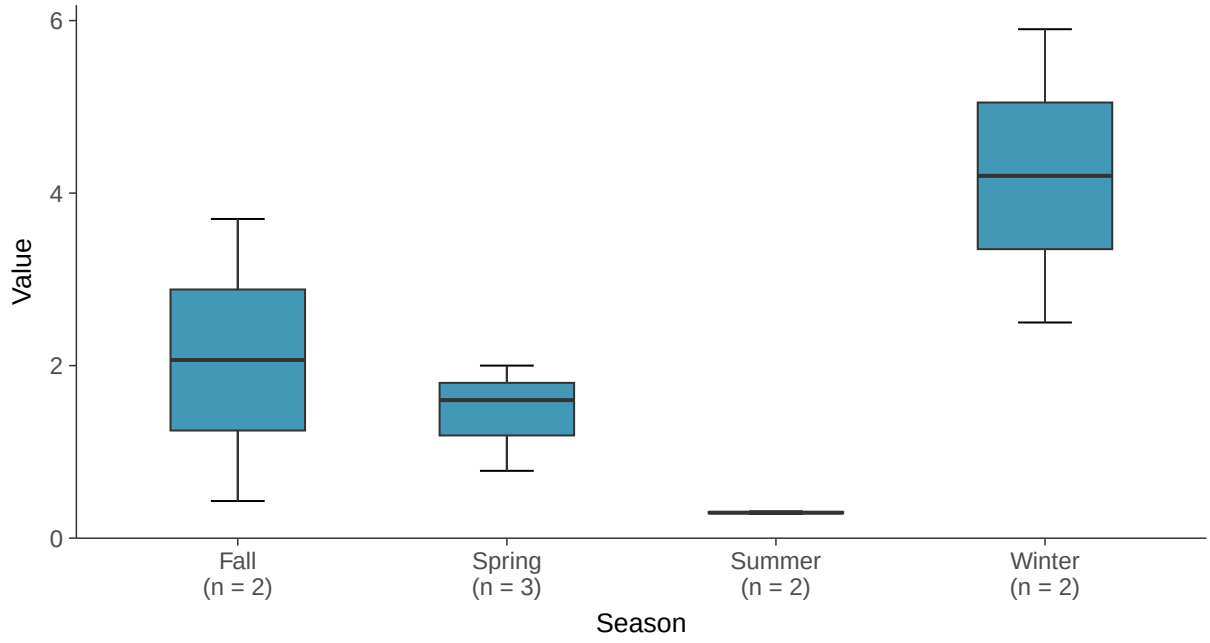
Boxplot

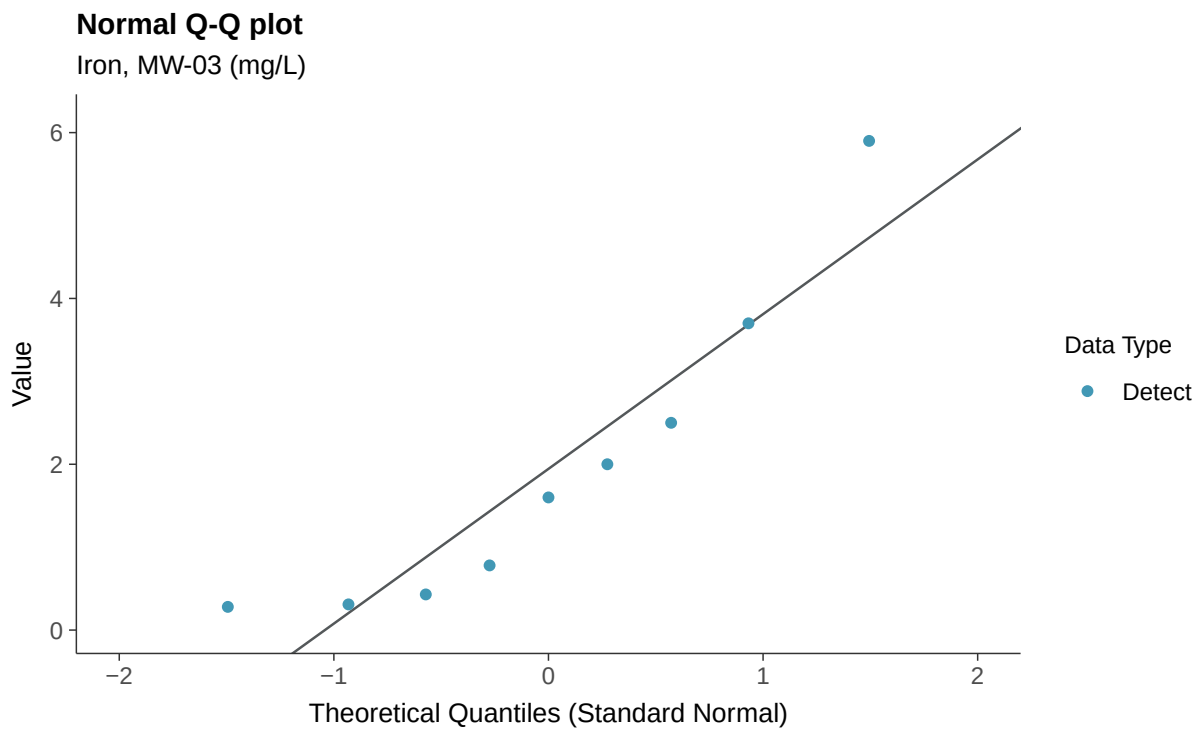
Iron, MW-03 (mg/L)

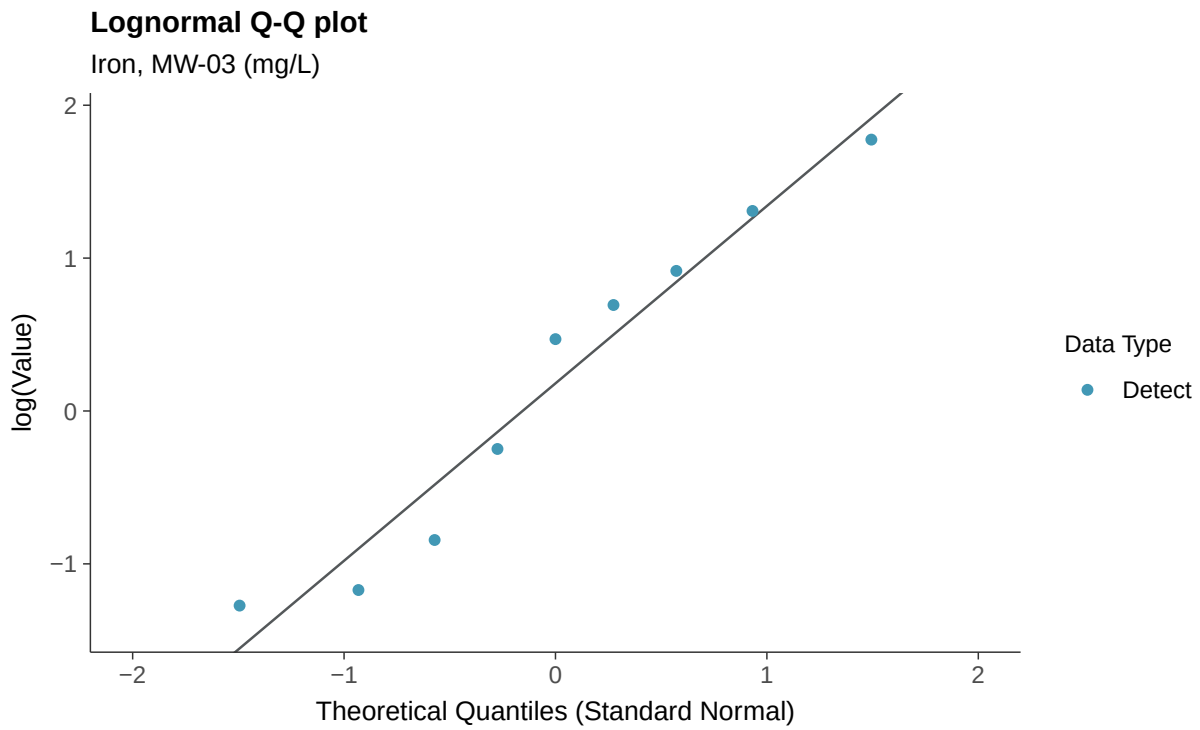


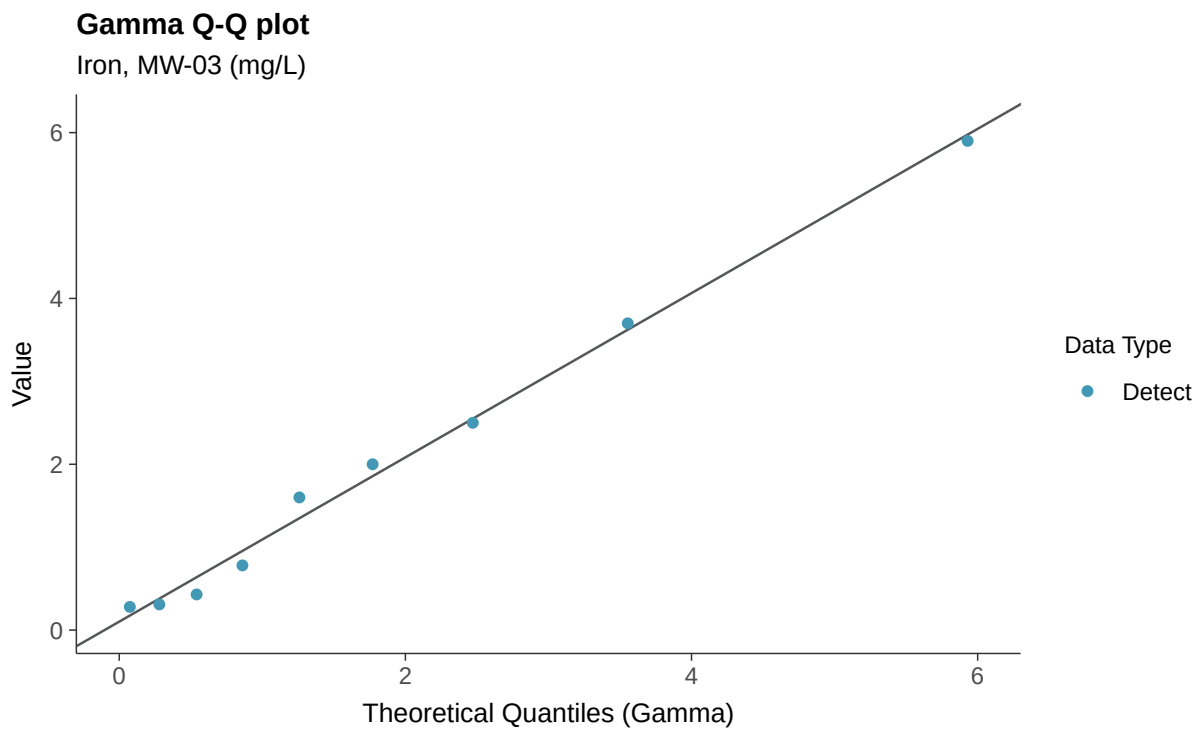
Boxplot by Season

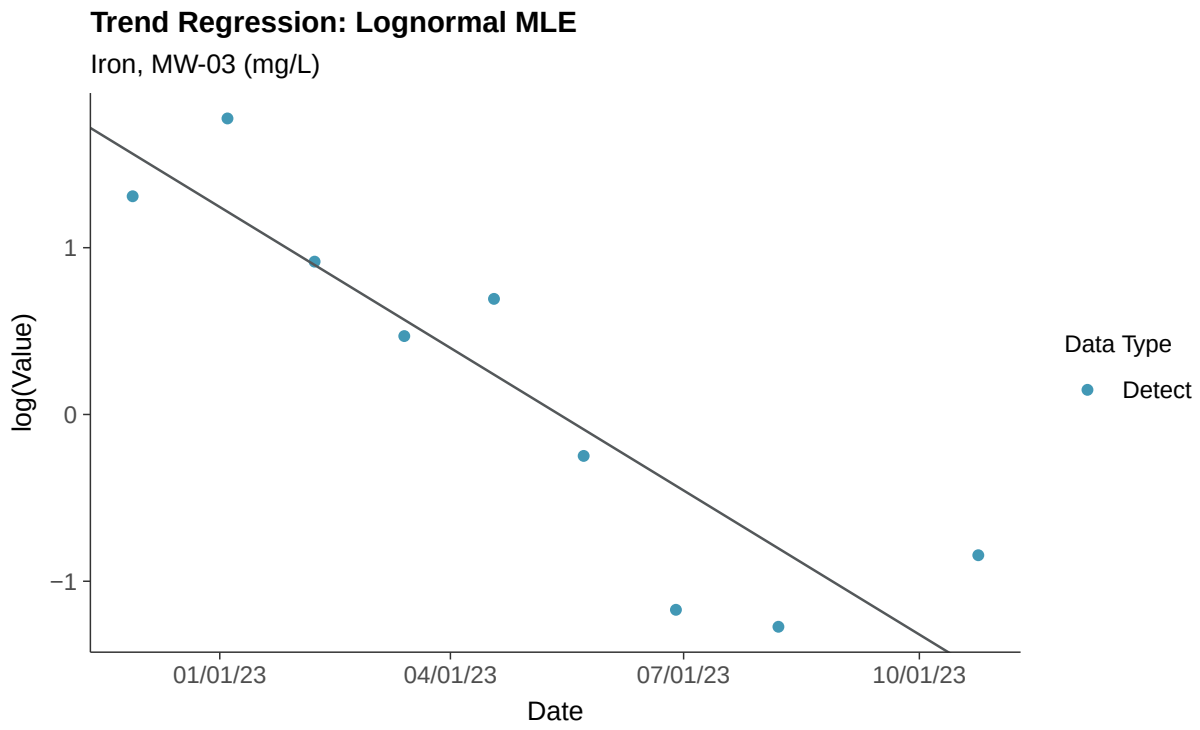
Iron, MW-03 (mg/L)

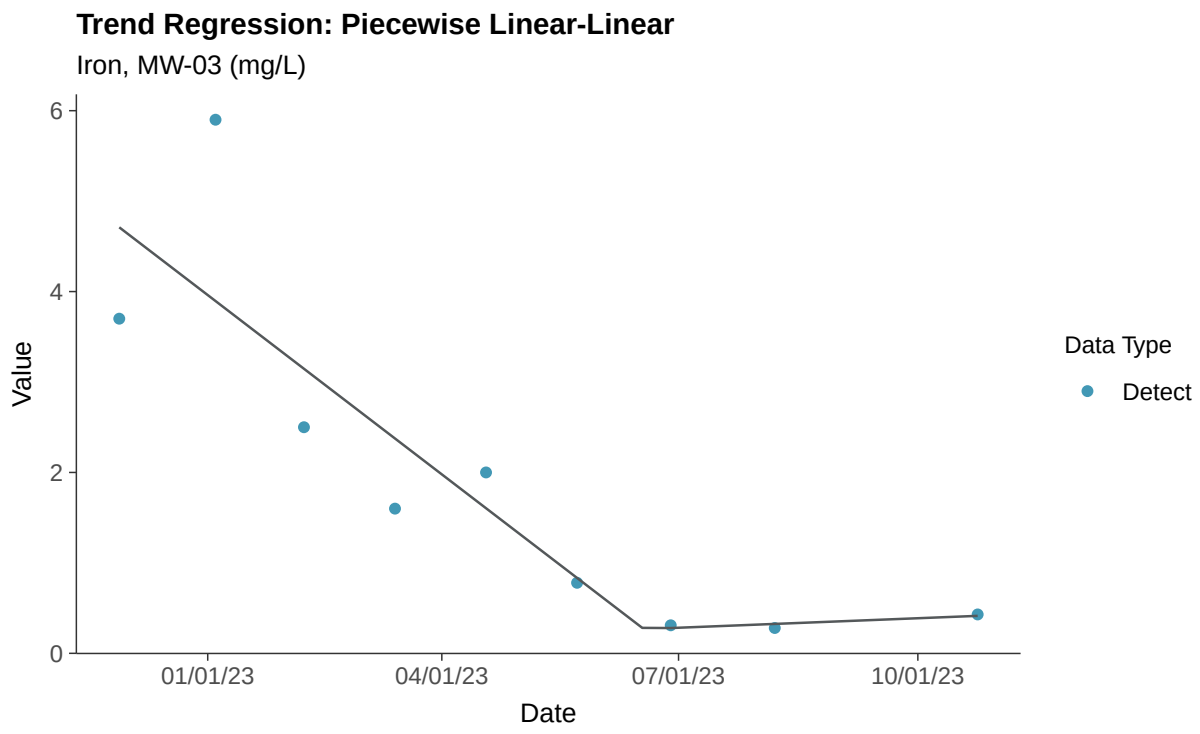



Normal Q-Q plot
Iron, MW-03 (mg/L)
Value
6
4
2
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-03 (mg/L)
log(Value)
2
1
0
−1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

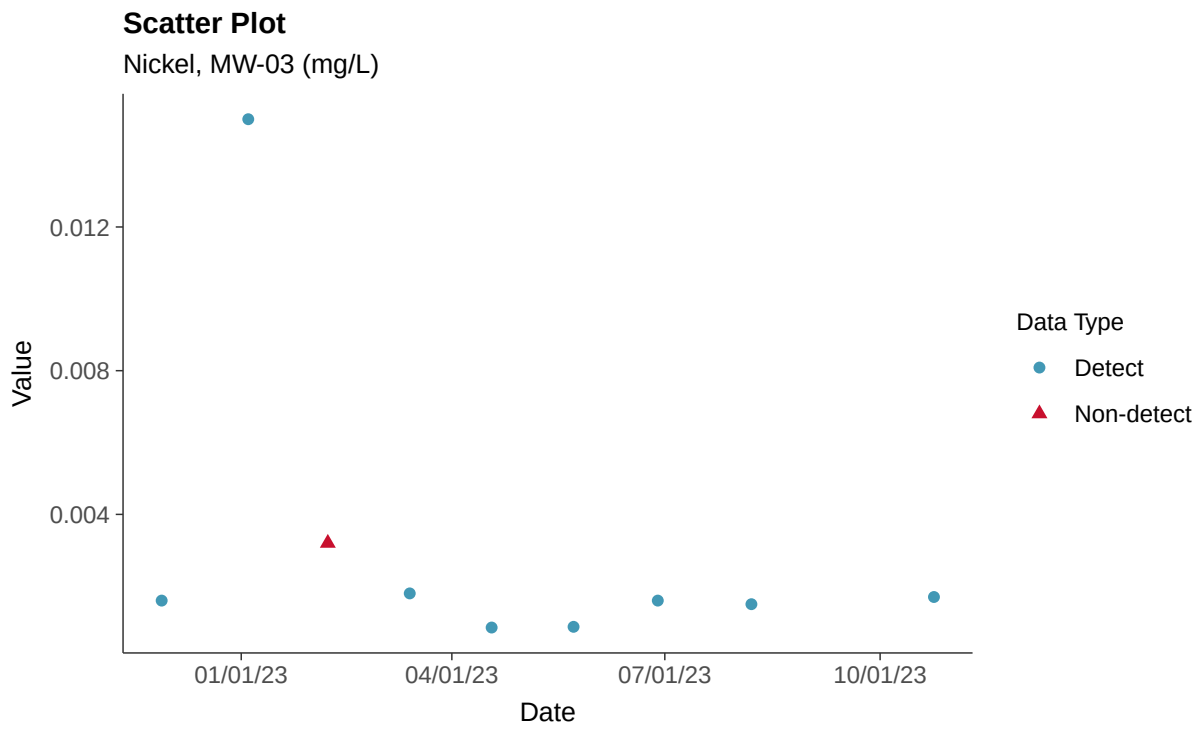

Gamma Q-Q plot
Iron, MW-03 (mg/L)
Value
Theoretical Quantiles (Gamma)
0
2
4
6
Data Type
Detect

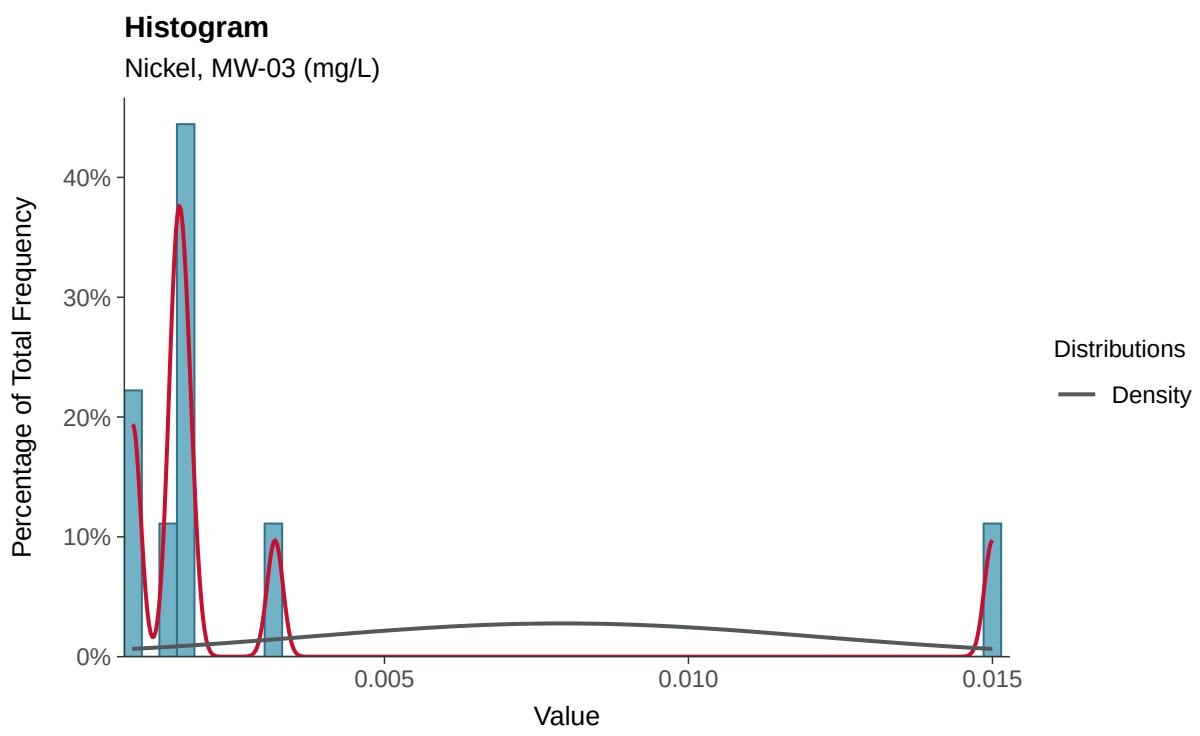

Trend Regression: Lognormal MLE
Iron, MW-03 (mg/L)
log(Value)
Date
01/01/23
04/01/23
07/01/23
10/01/23
1
0
−1
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-03 (mg/L)
Value
6
4
2
0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-03

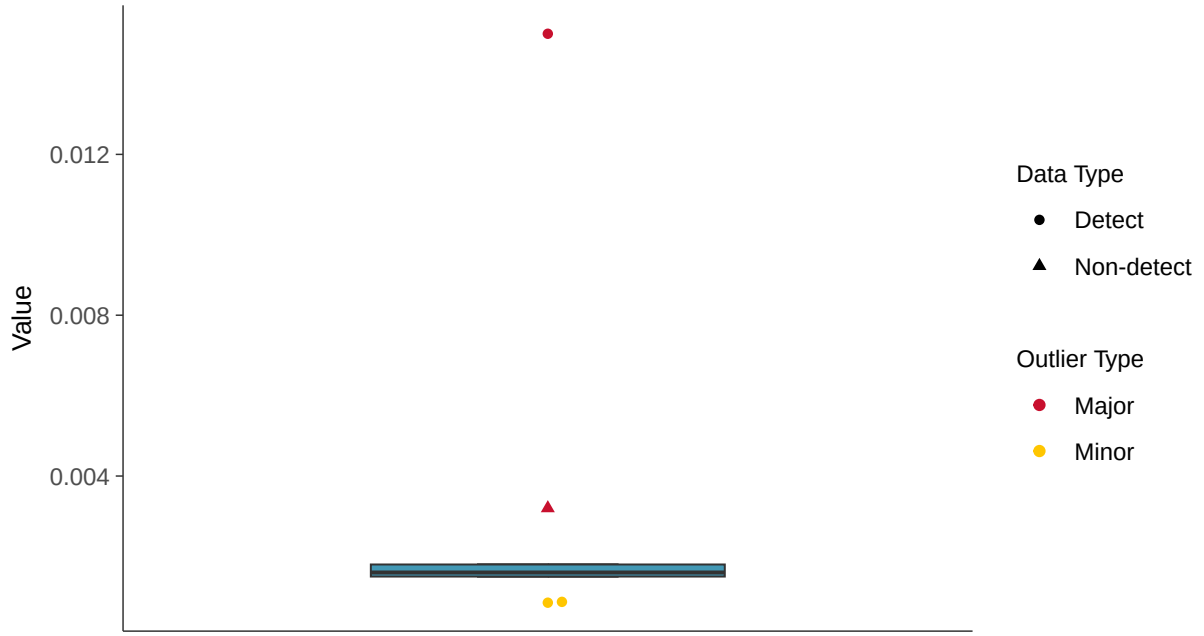
ID: 2_13_6_119





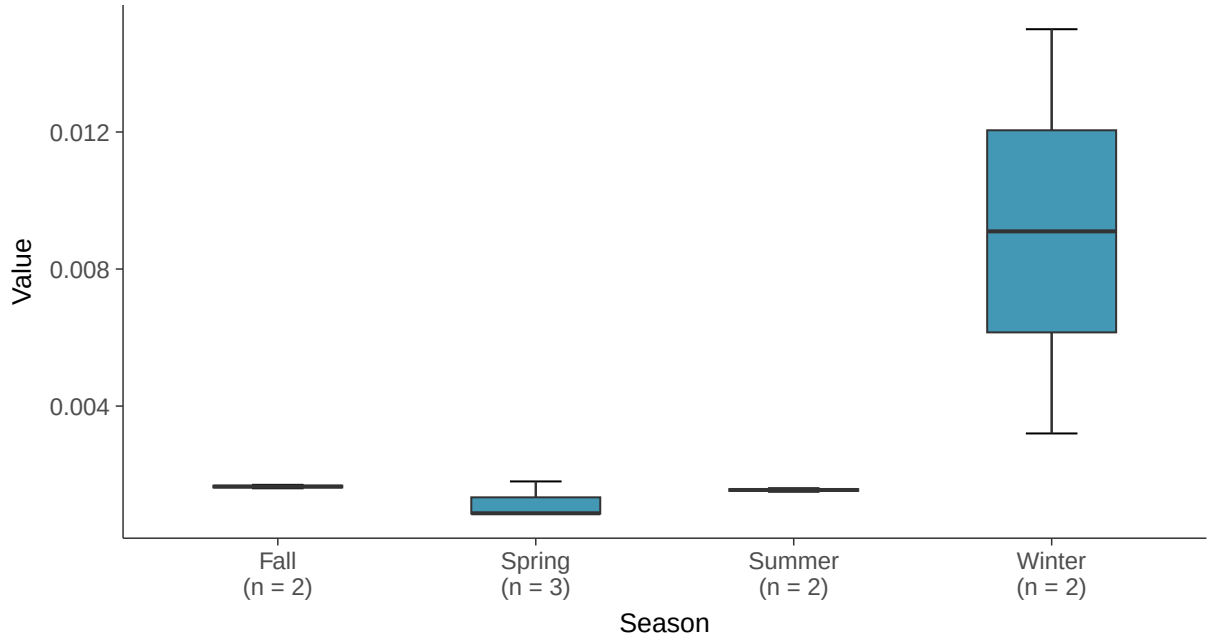
Boxplot

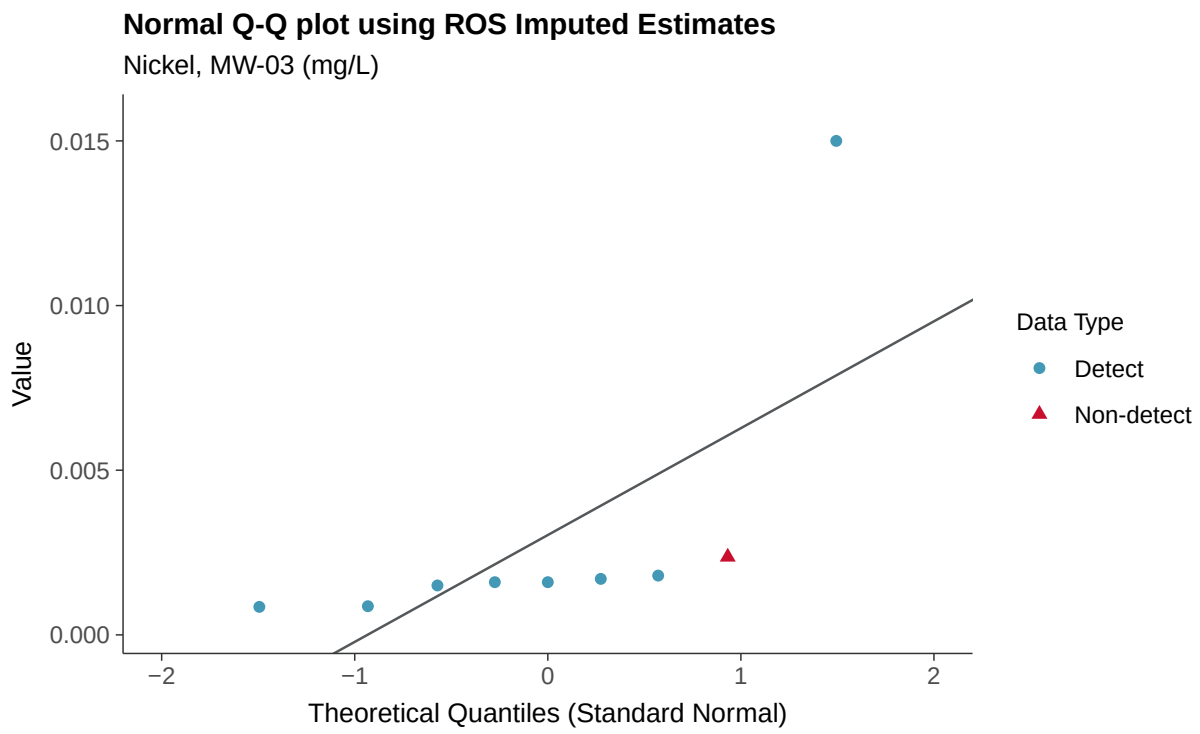
Nickel, MW-03 (mg/L)

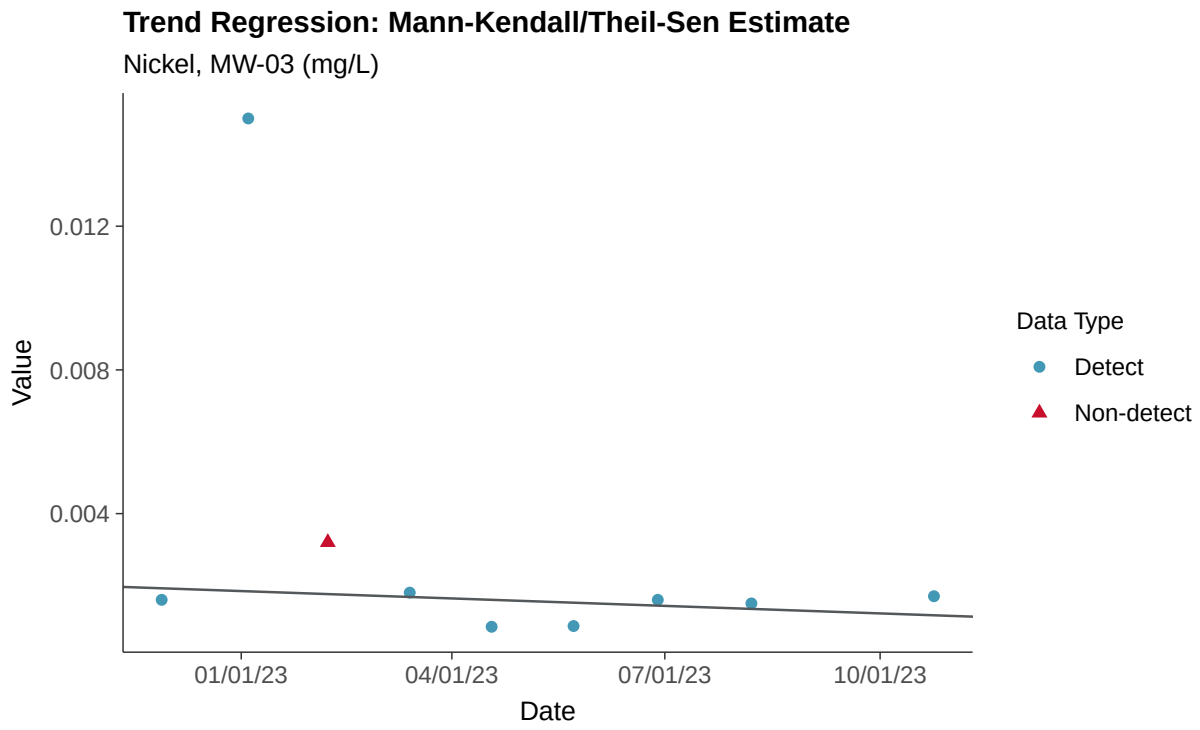


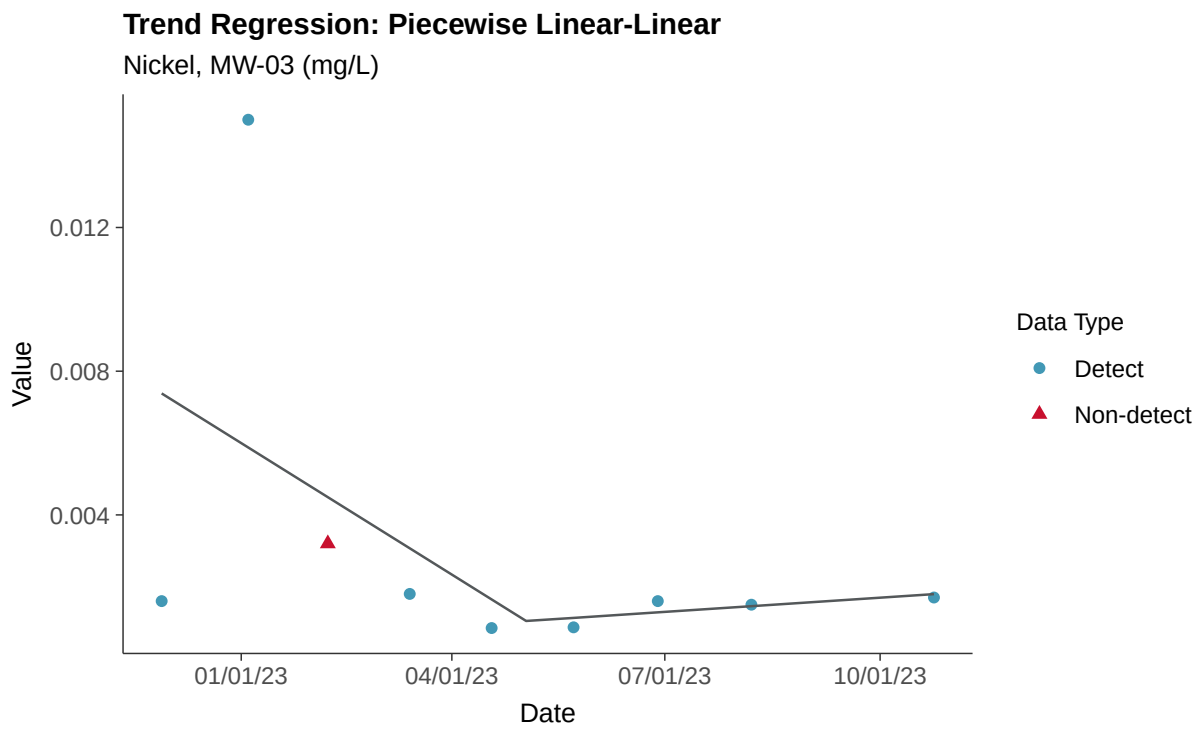
Boxplot by Season

Nickel, MW-03 (mg/L)



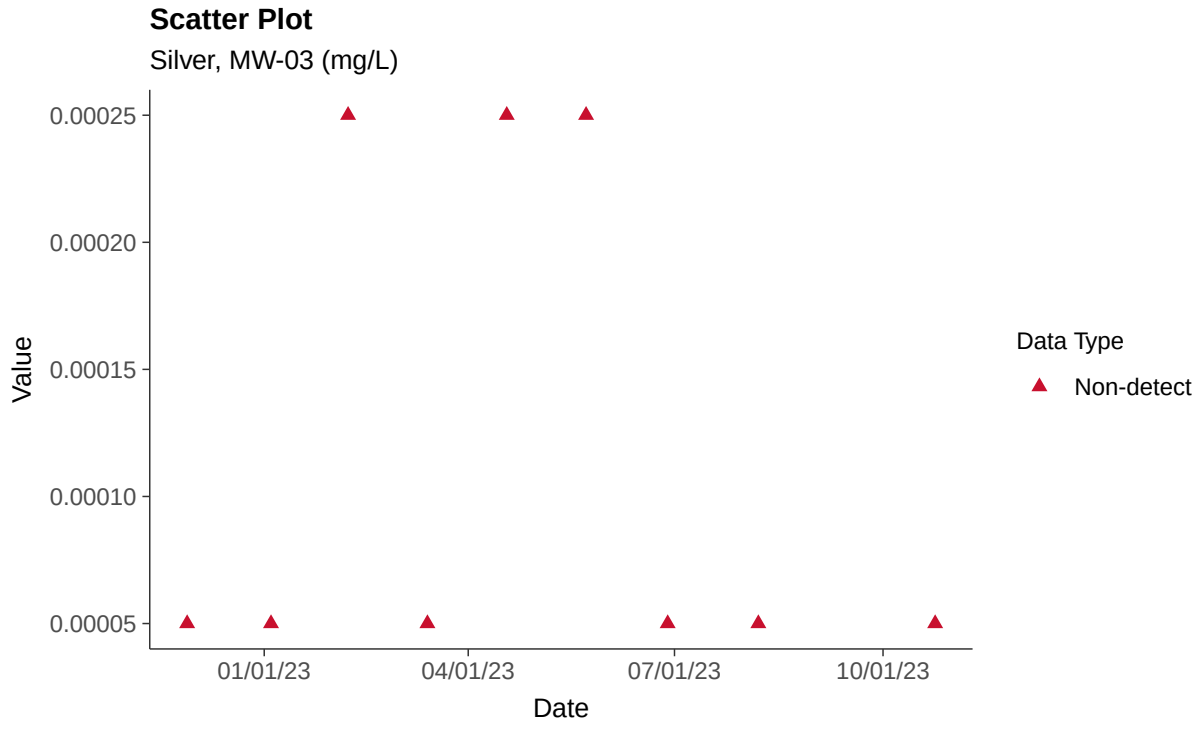

Normal Q-Q plot using ROS Imputed Estimates
Nickel, MW-03 (mg/L)
Value
0.015
0.010
0.005
0.000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

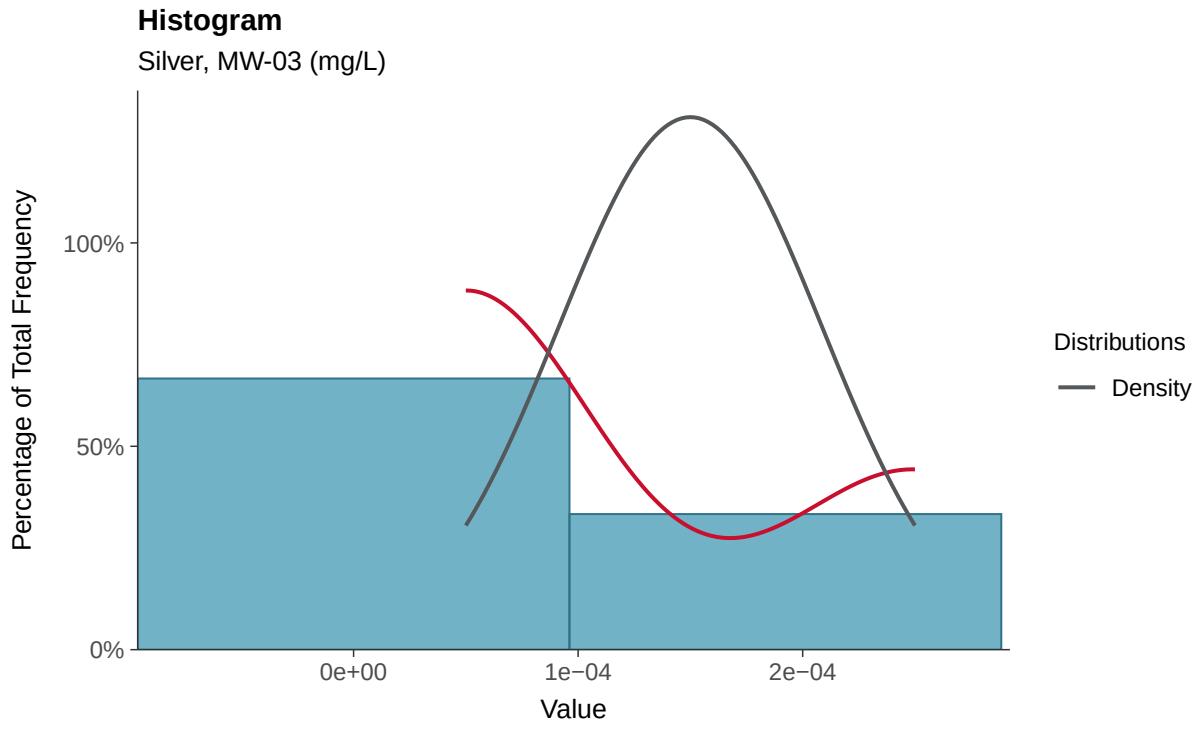

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Nickel, MW-03 (mg/L)
Value
0.012
0.008
0.004
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Nickel, MW-03 (mg/L)
Value
0.012
0.008
0.004
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Silver, MW-03

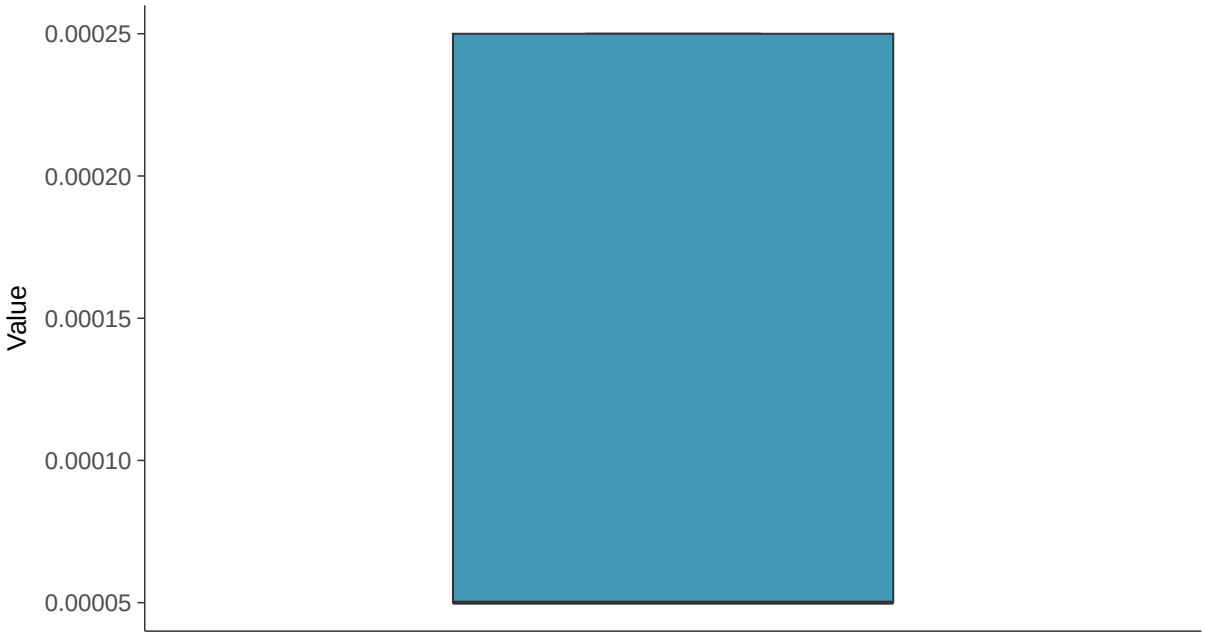
ID: 2_13_6_123





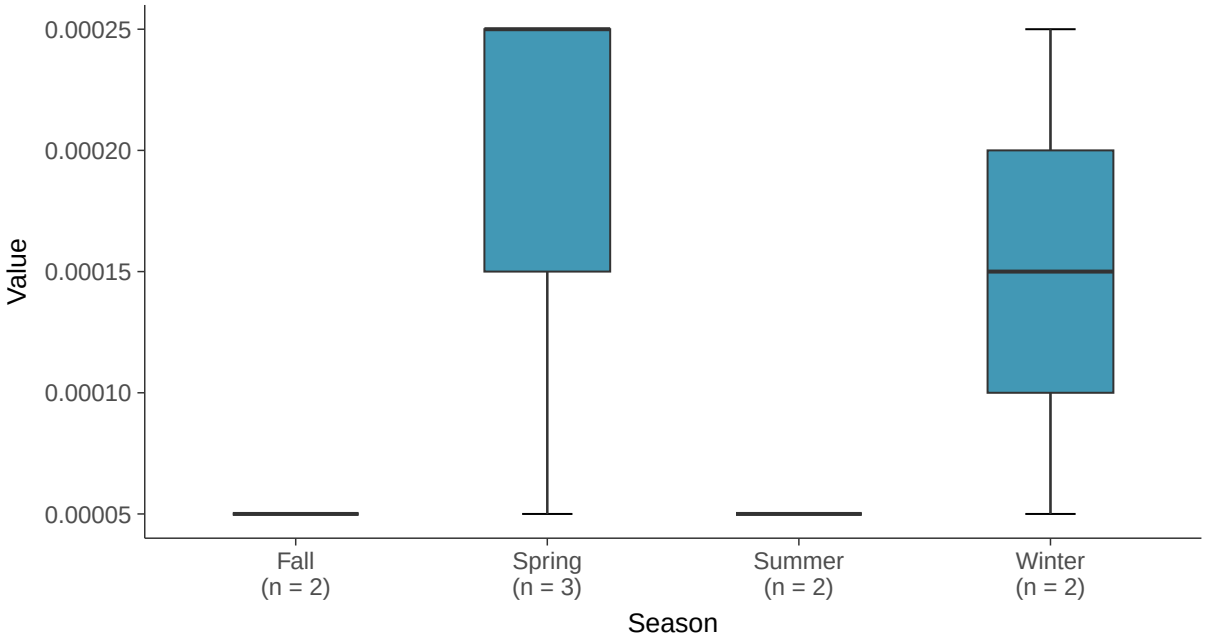
Boxplot

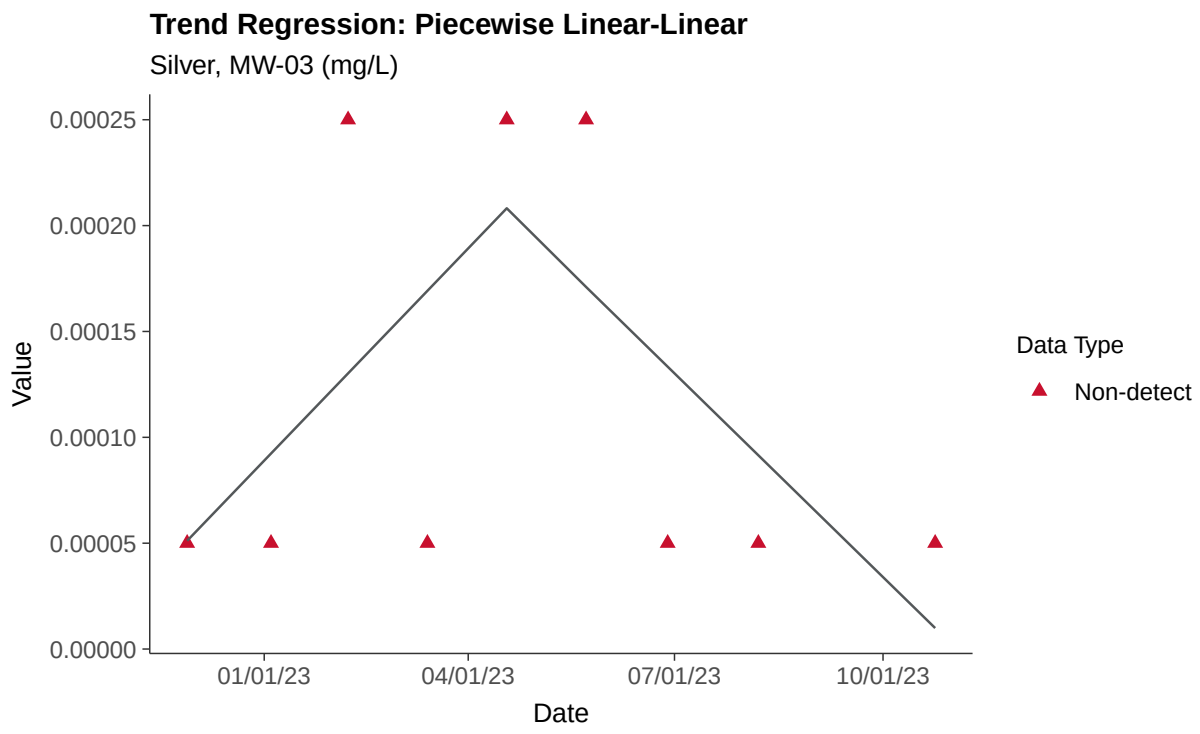
Silver, MW-03 (mg/L)

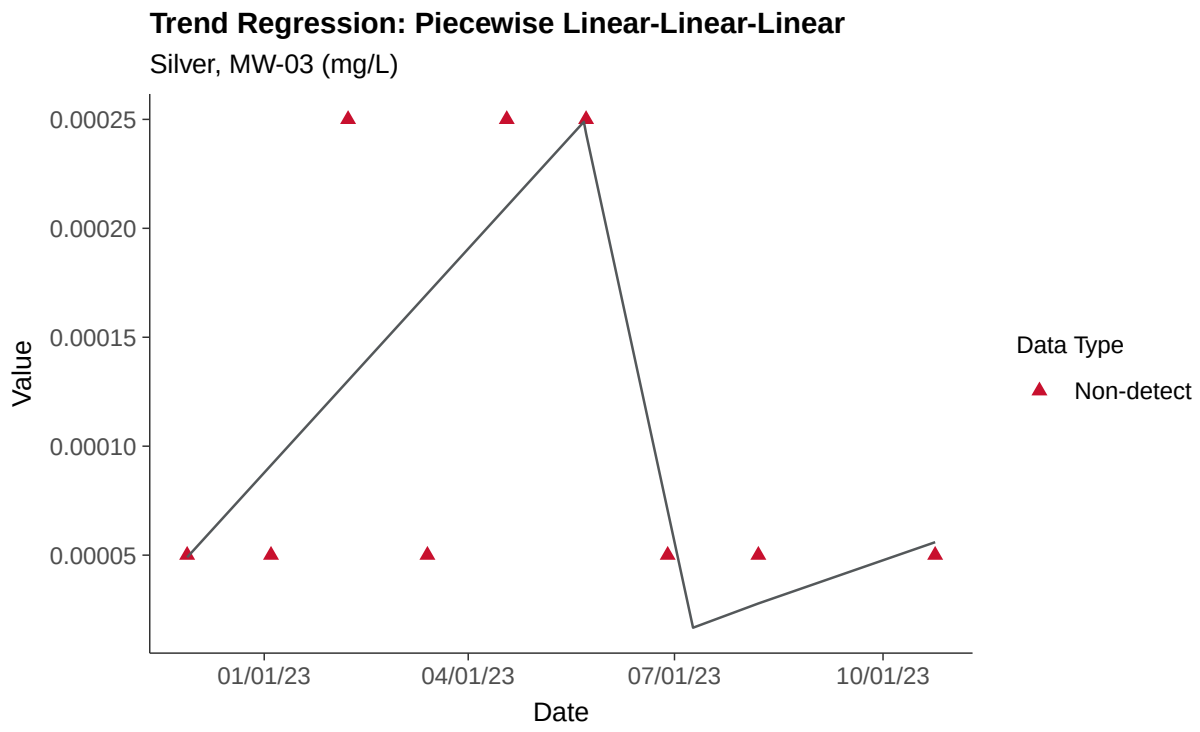


Boxplot by Season

Silver, MW-03 (mg/L)

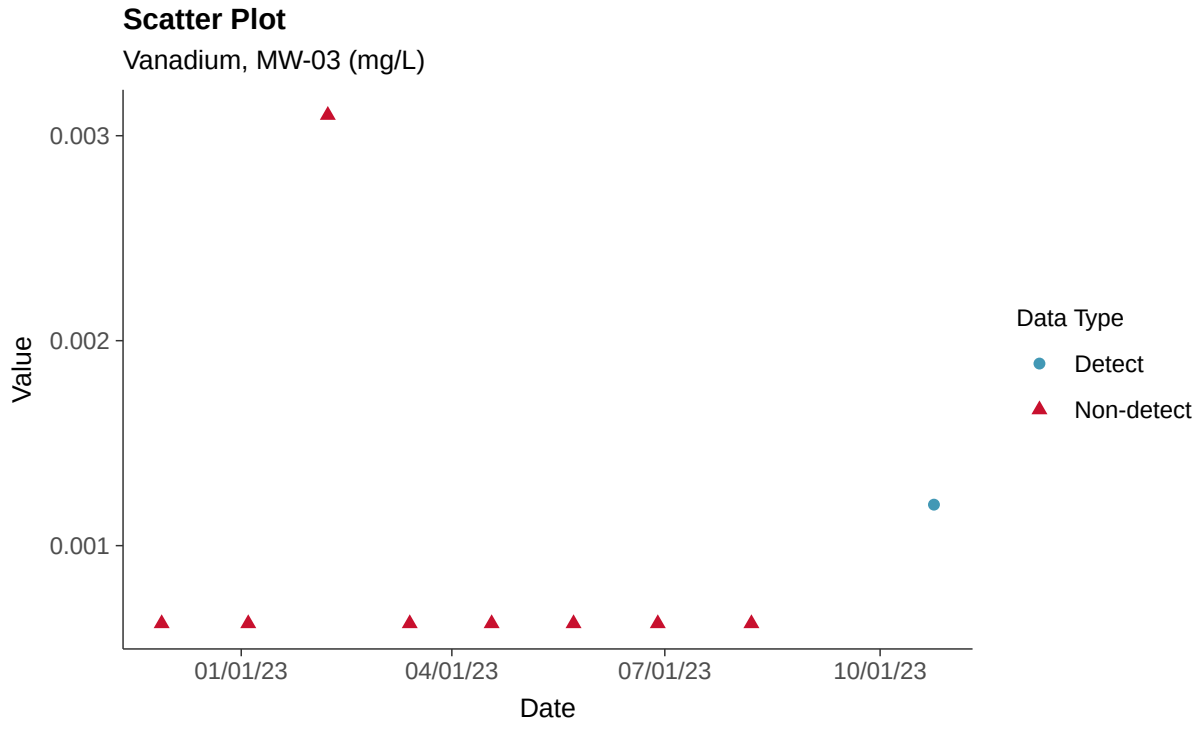


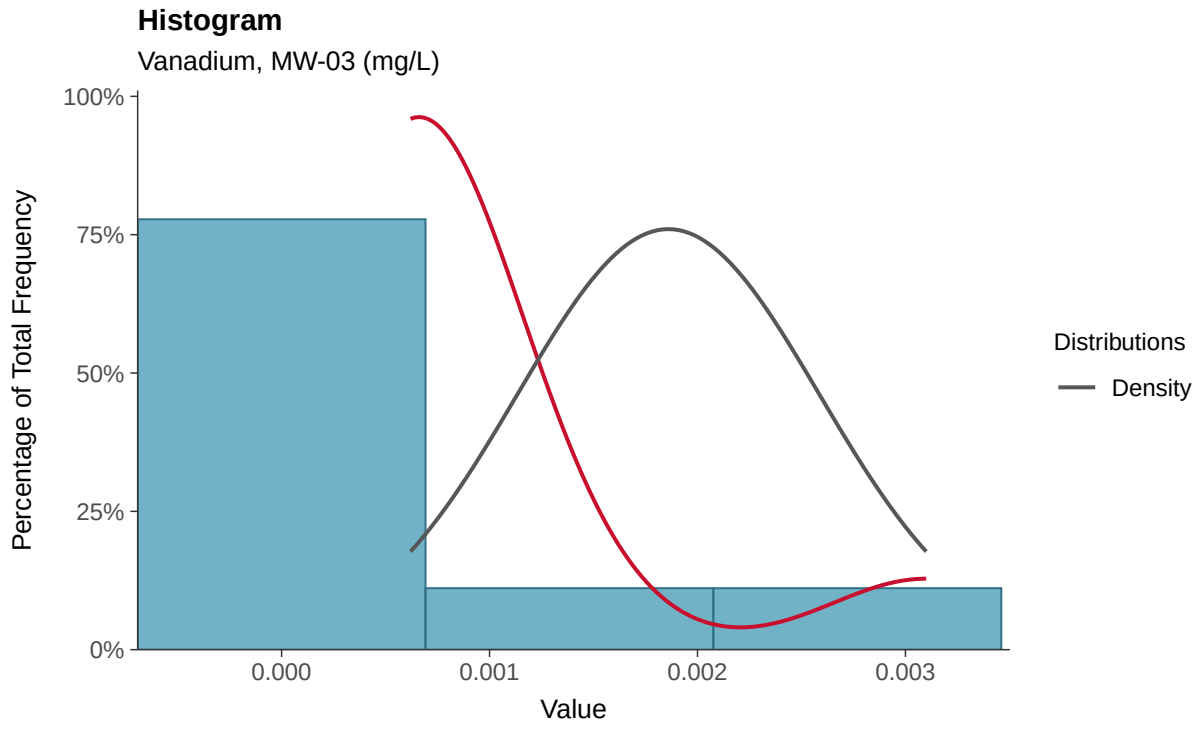

Trend Regression: Piecewise Linear-Linear
Silver, MW-03 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-03 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-03

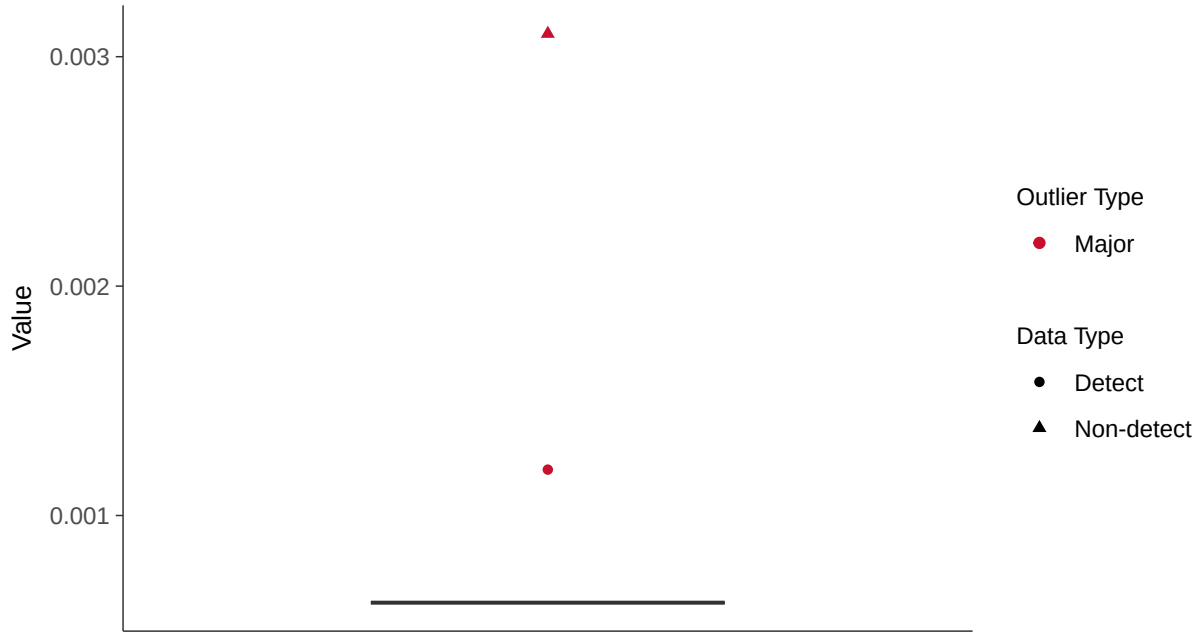
ID: 2_13_6_129





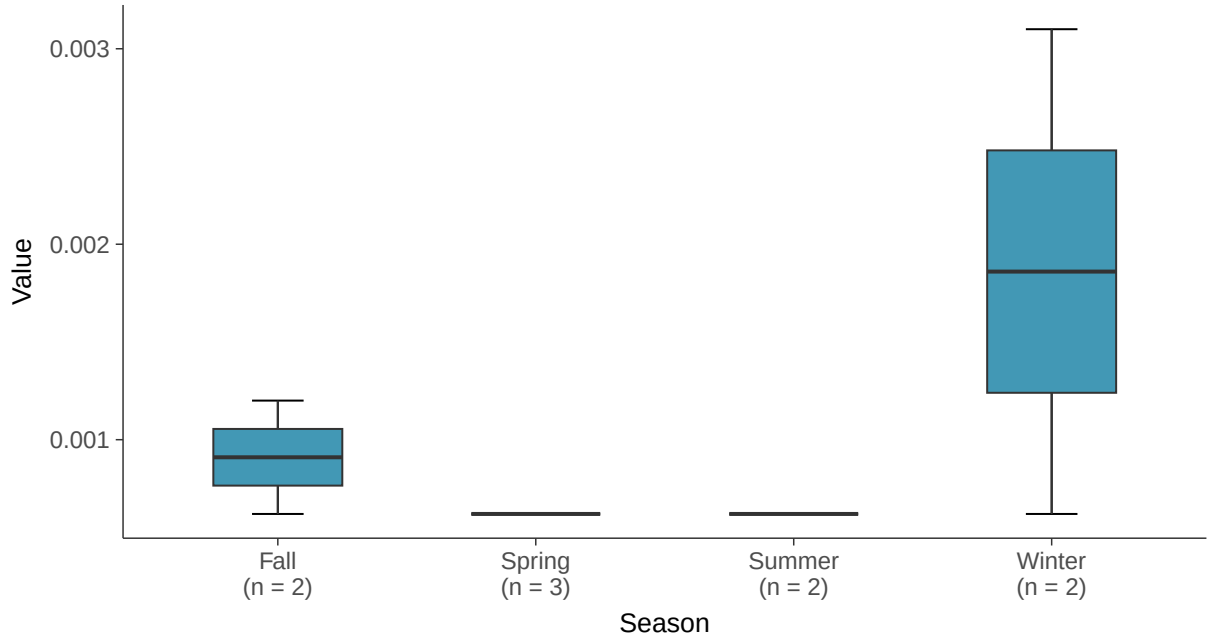
Boxplot

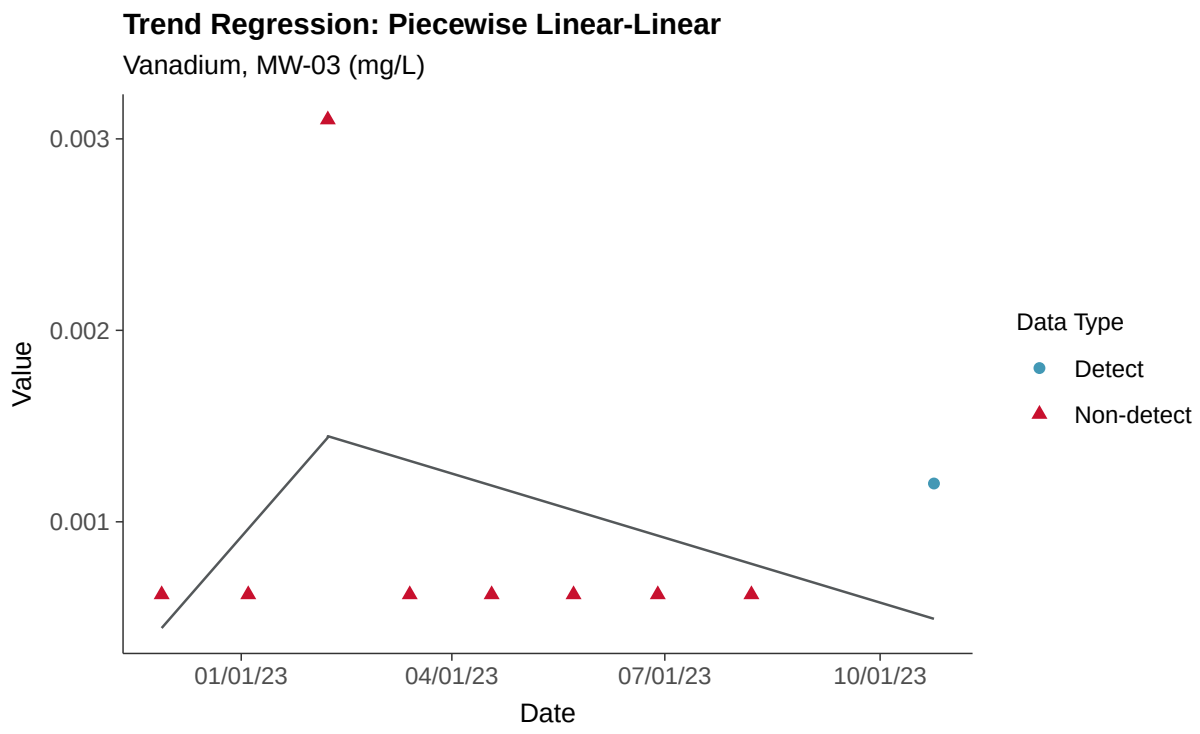
Vanadium, MW-03 (mg/L)

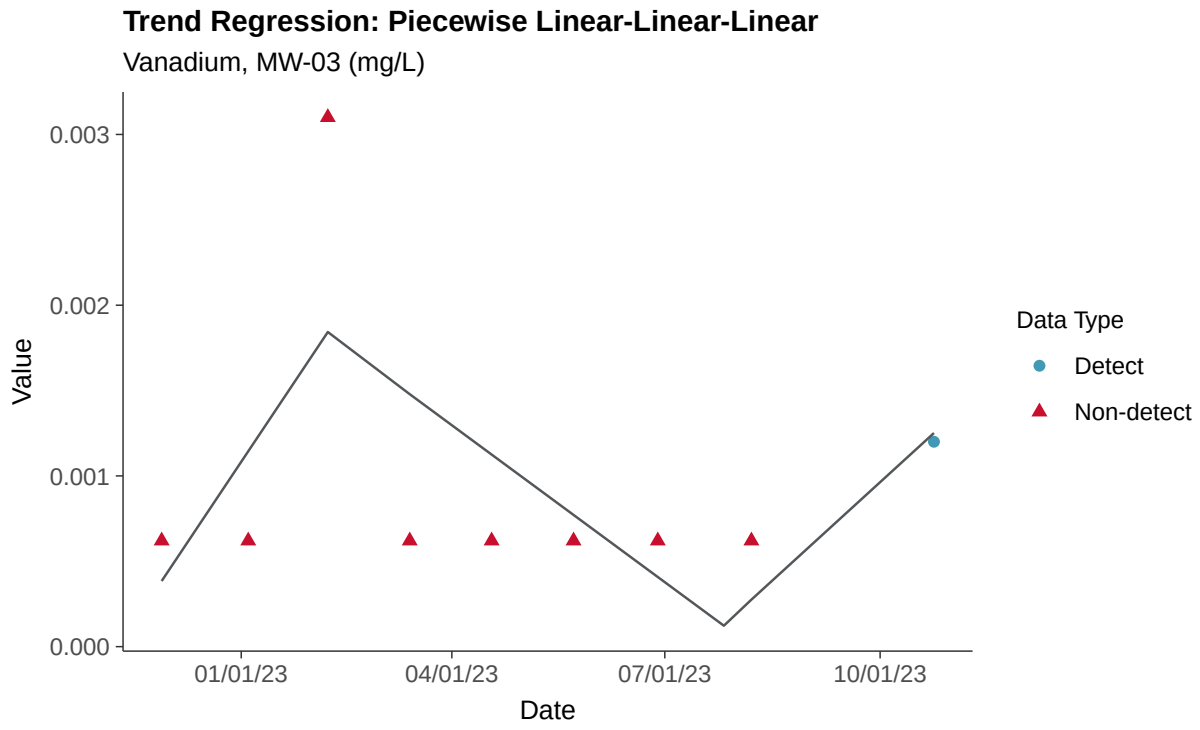


Boxplot by Season

Vanadium, MW-03 (mg/L)

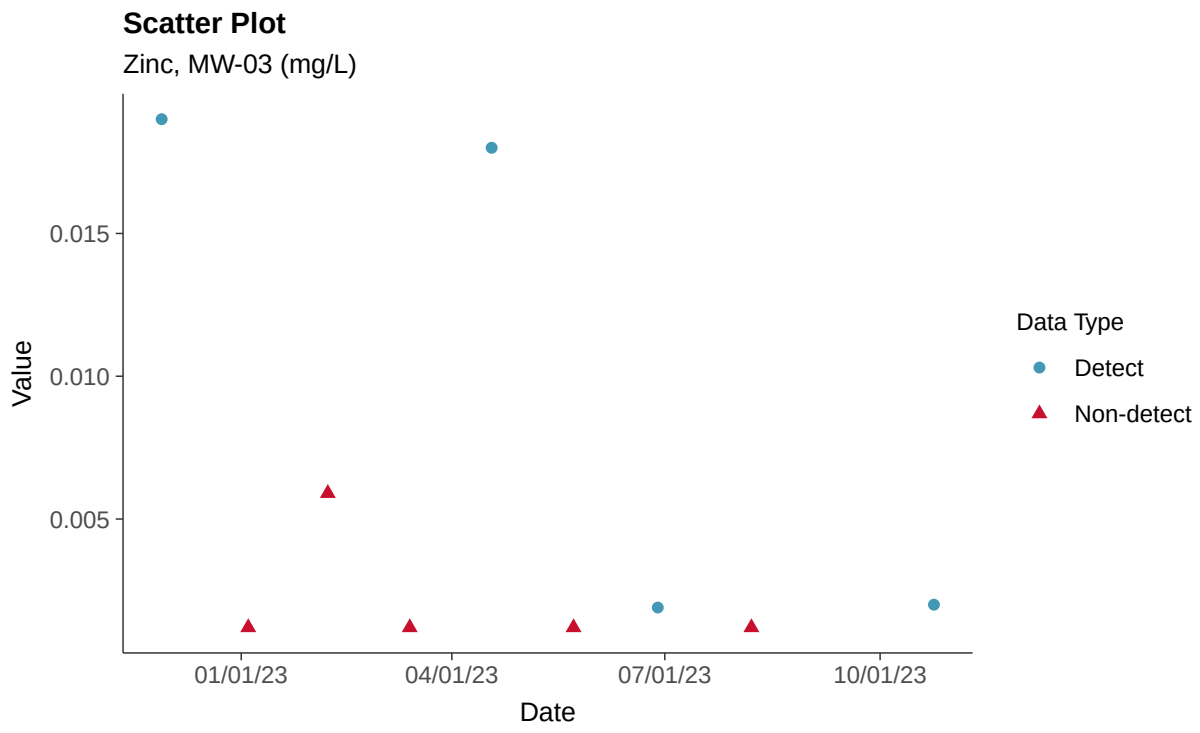


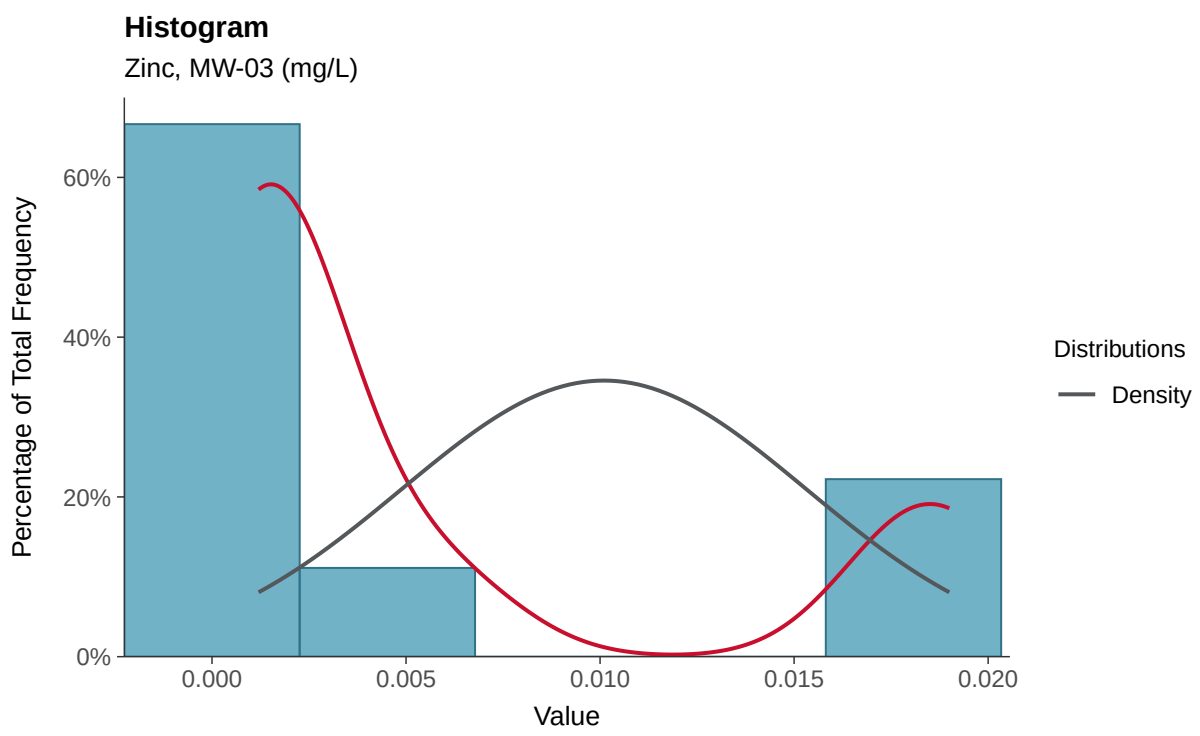

Trend Regression: Piecewise Linear-Linear
Vanadium, MW-03 (mg/L)
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Vanadium, MW-03 (mg/L)
0.003
0.002
0.001
0.000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Zinc, MW-03

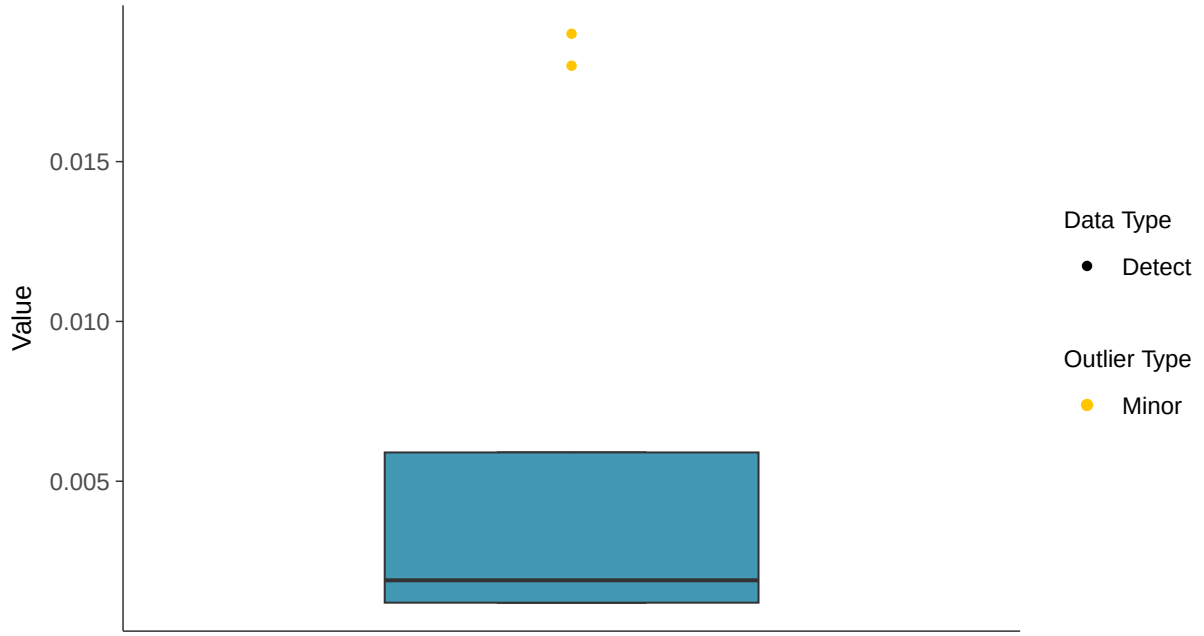
ID: 2_13_6_130





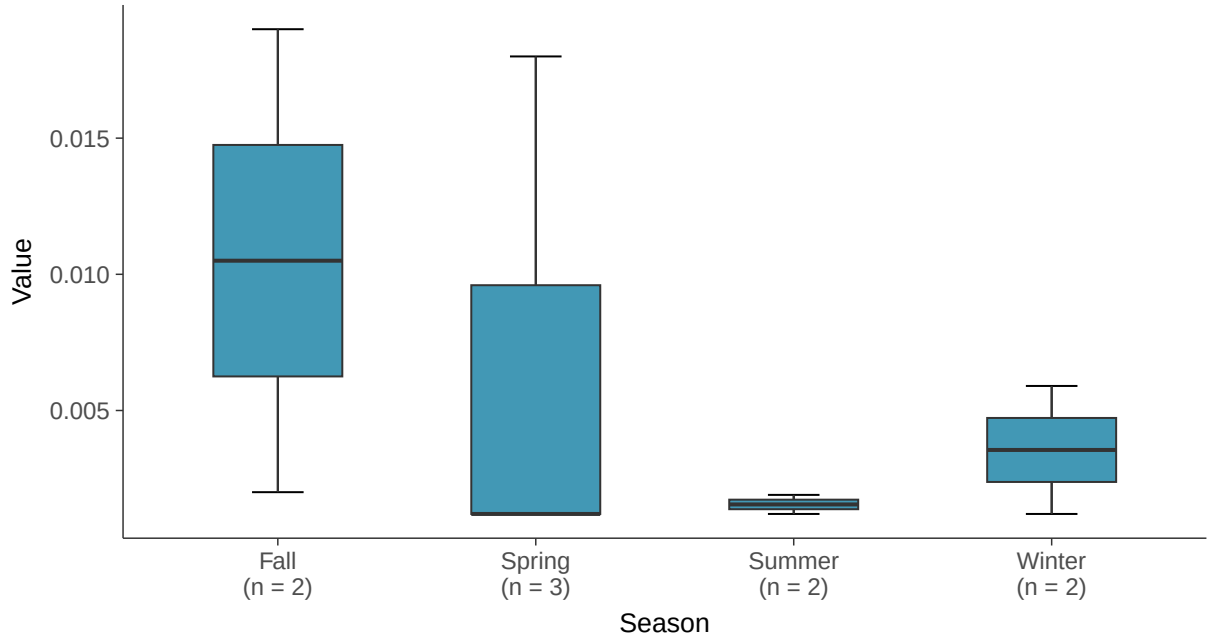
Boxplot

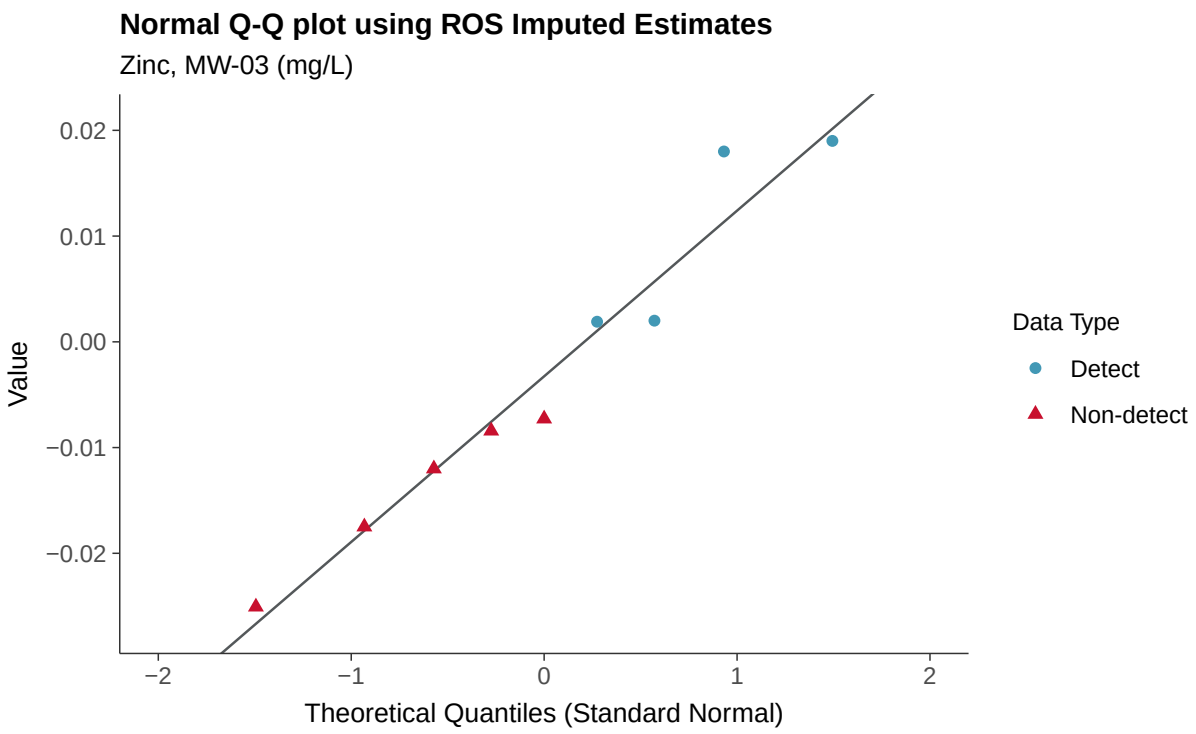
Zinc, MW-03 (mg/L)



Boxplot by Season

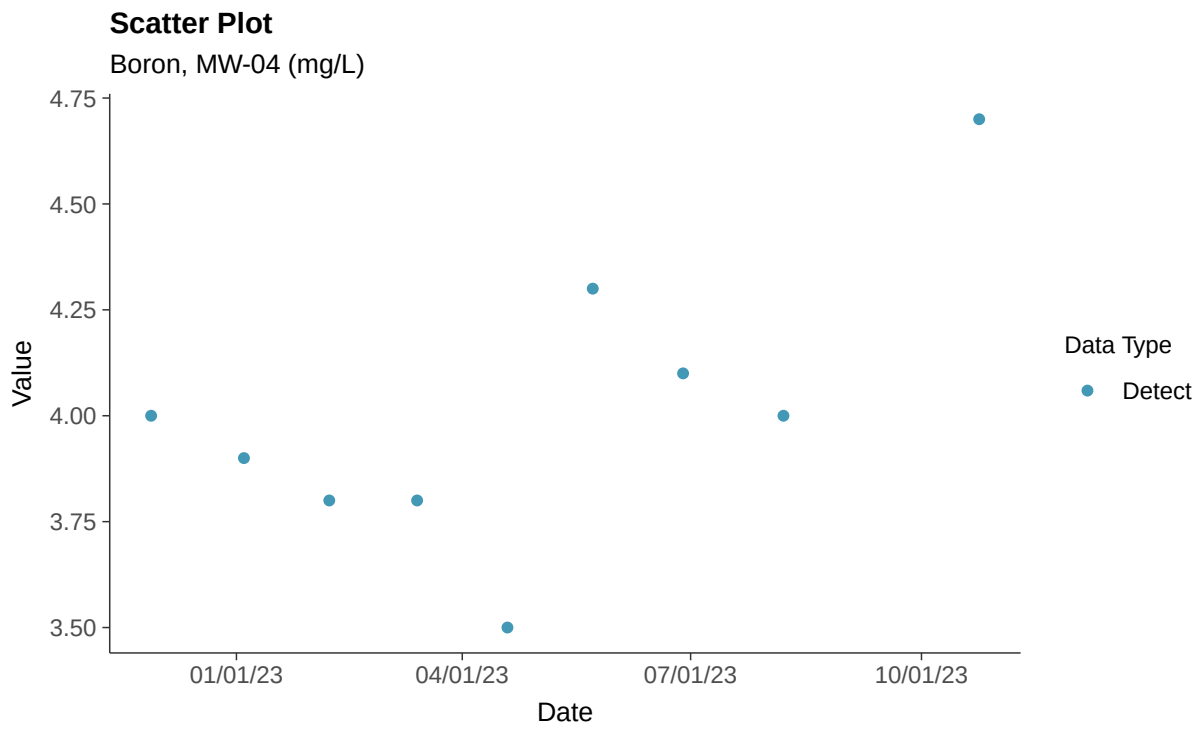
Zinc, MW-03 (mg/L)

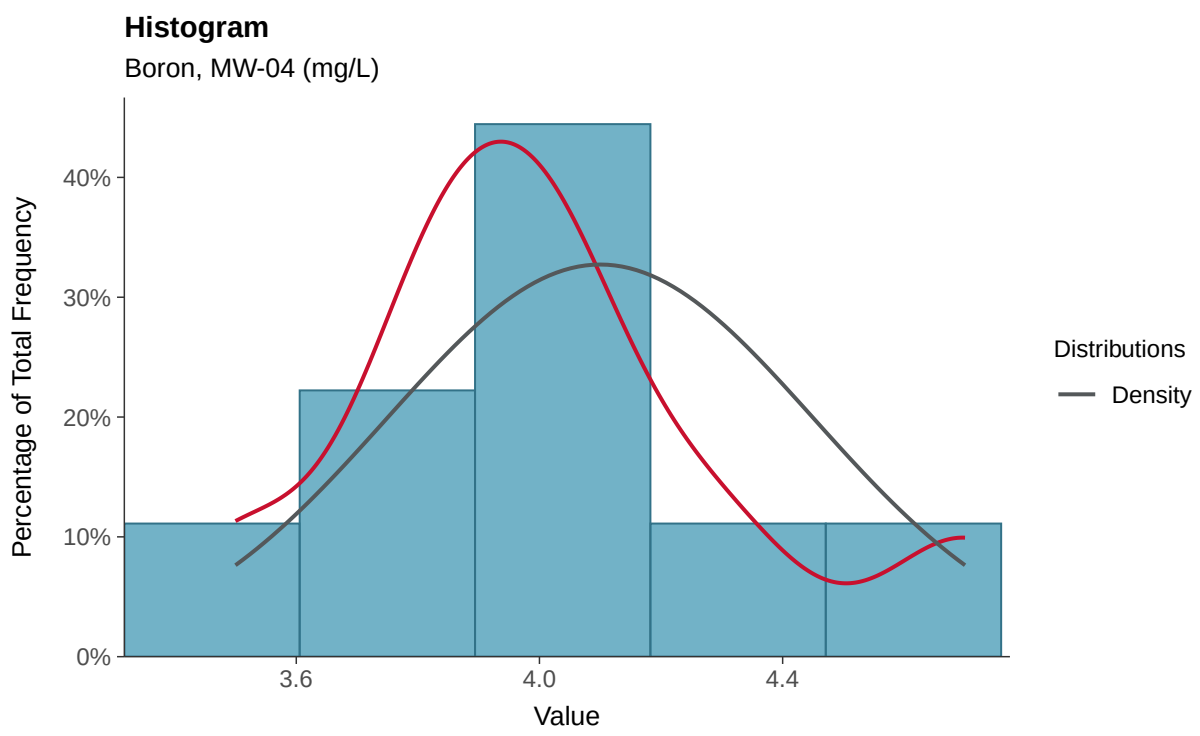


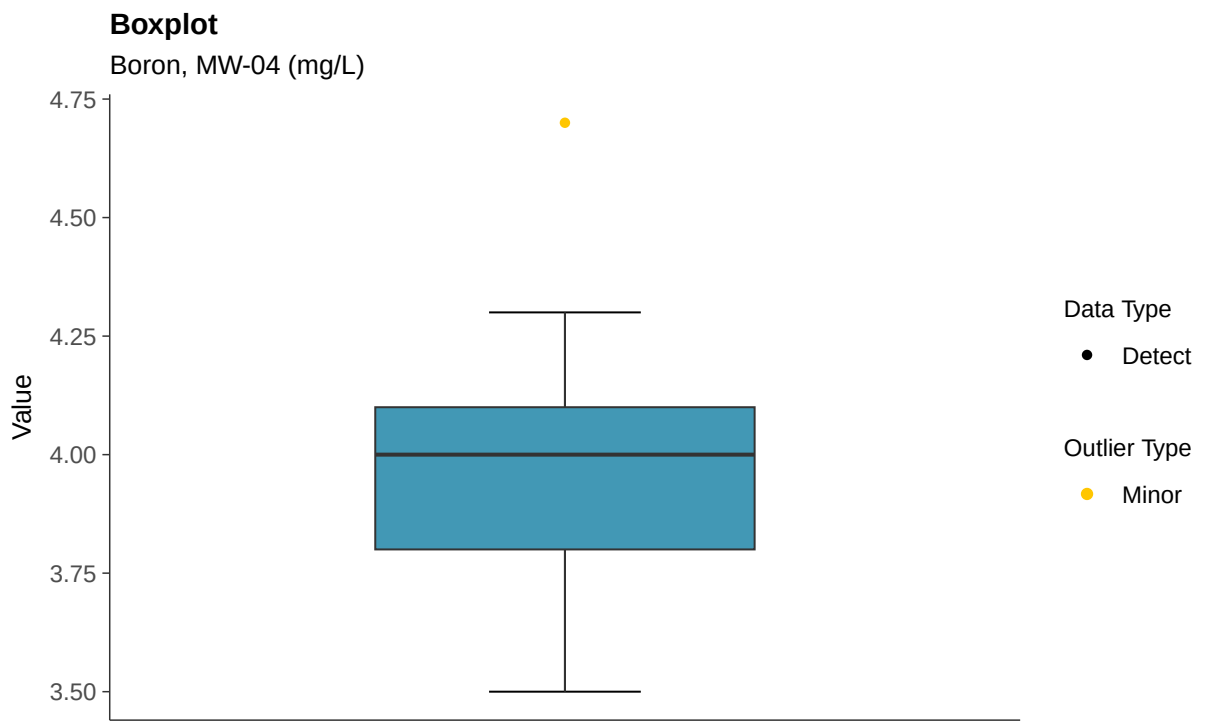

Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-03 (mg/L)
Value
0.02
0.01
0.00
−0.01
−0.02
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

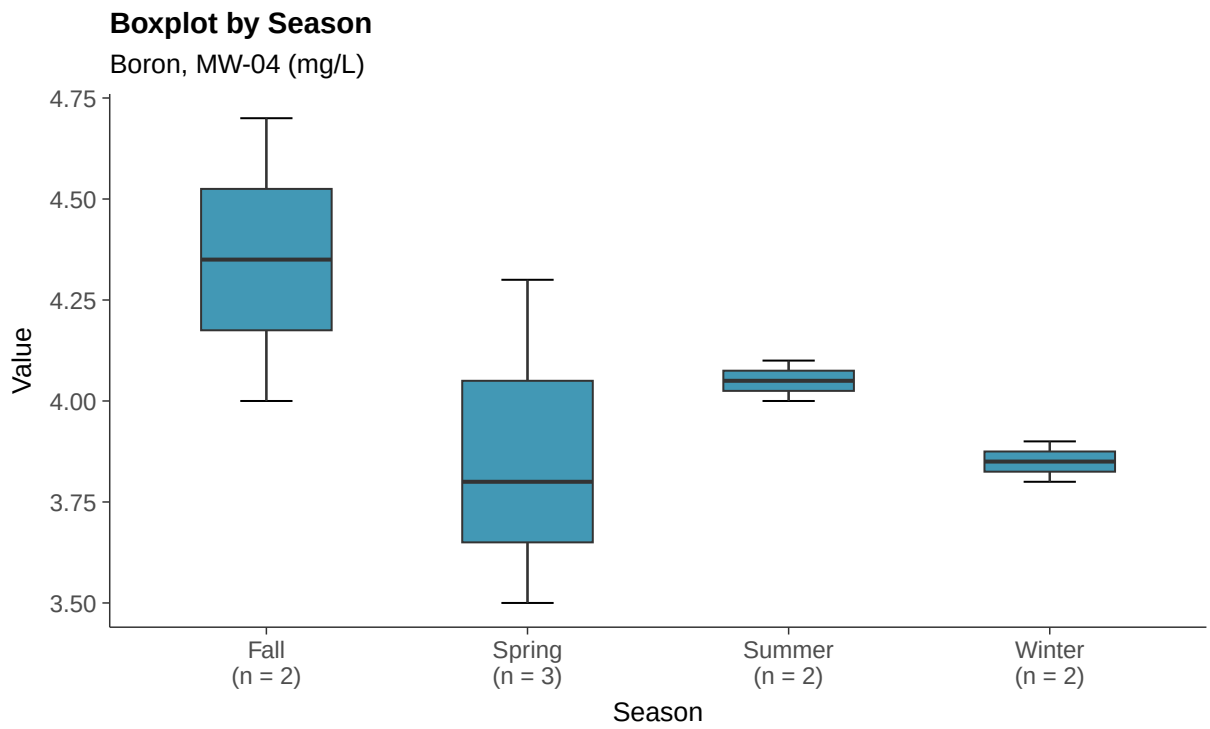
Appendix III: Boron, MW-04

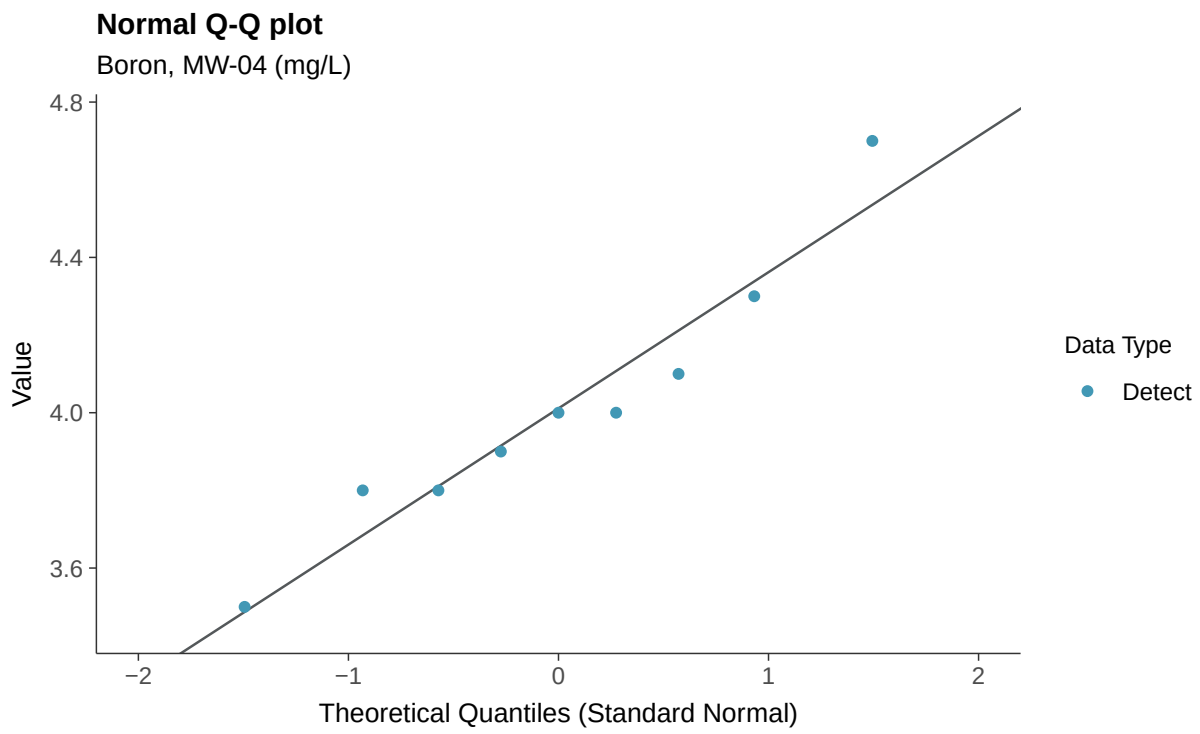
ID: 2_14_4_105

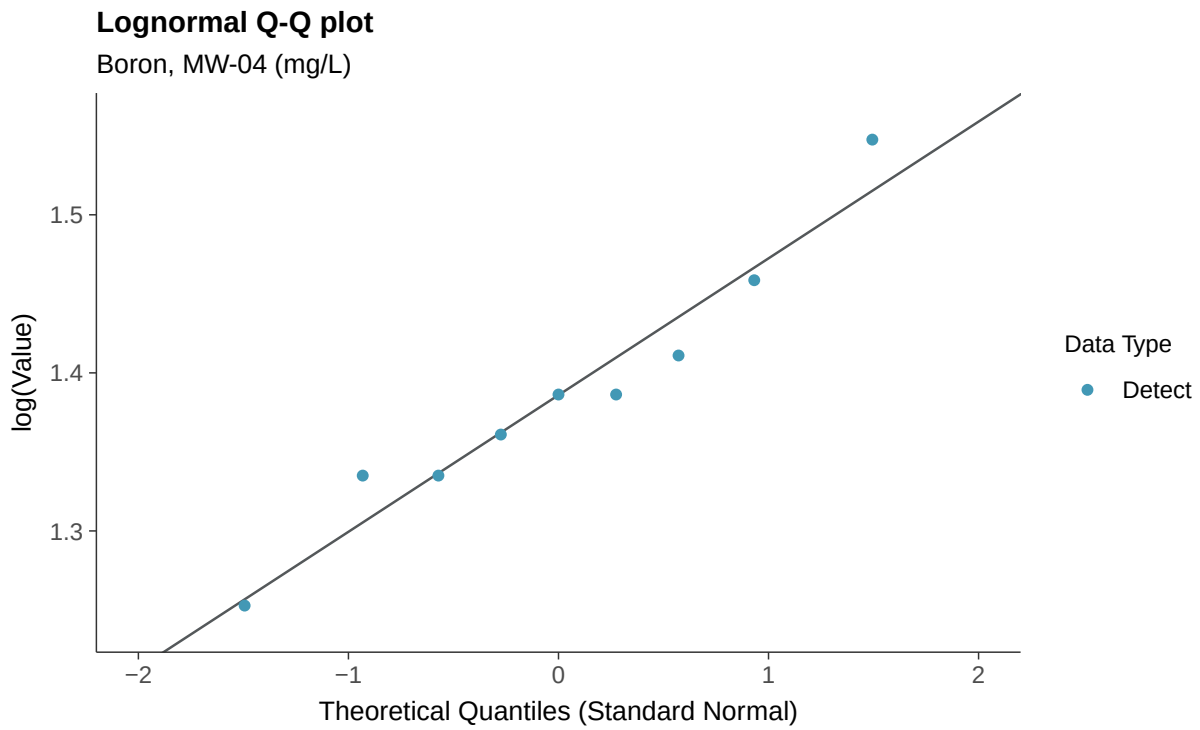





Boxplot
Boron, MW-04 (mg/L)
Value
4.75
4.50
4.25
4.00
3.75
3.50
Data Type
Detect
Outlier Type
Minor

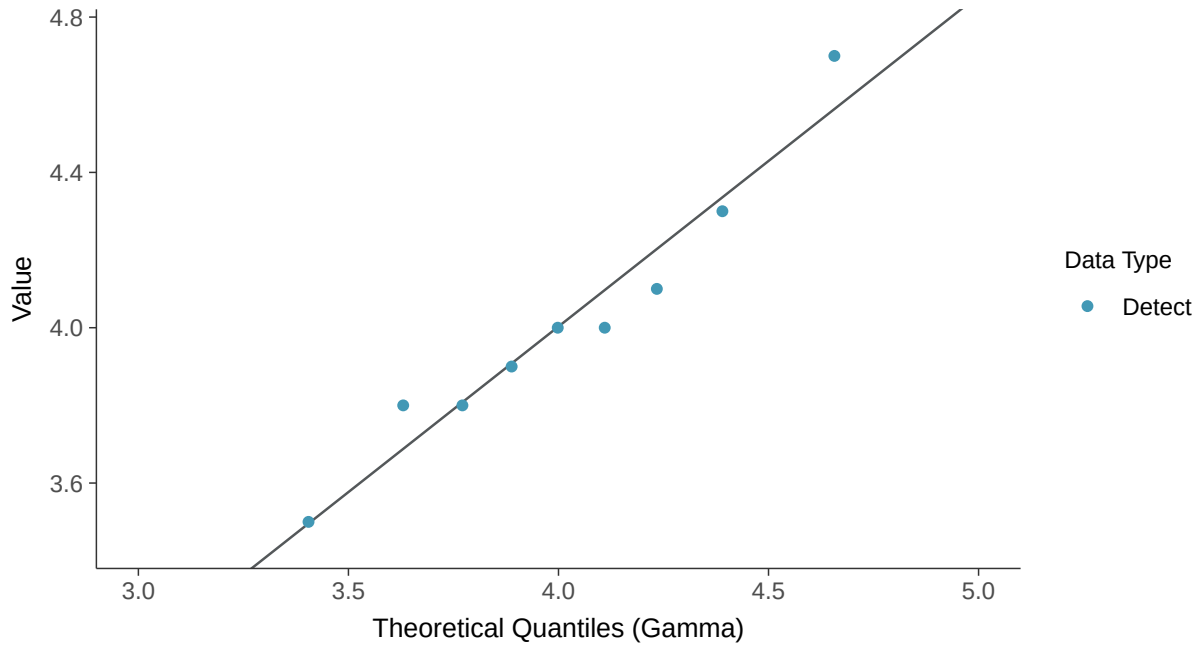

Boxplot by Season
Boron, MW-04 (mg/L)
Value
4.75
4.50
4.25
4.00
3.75
3.50
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Normal Q-Q plot
Boron, MW-04 (mg/L)
Value
4.8
4.4
4.0
3.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-04 (mg/L)
log(Value)
1.5
1.4
1.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

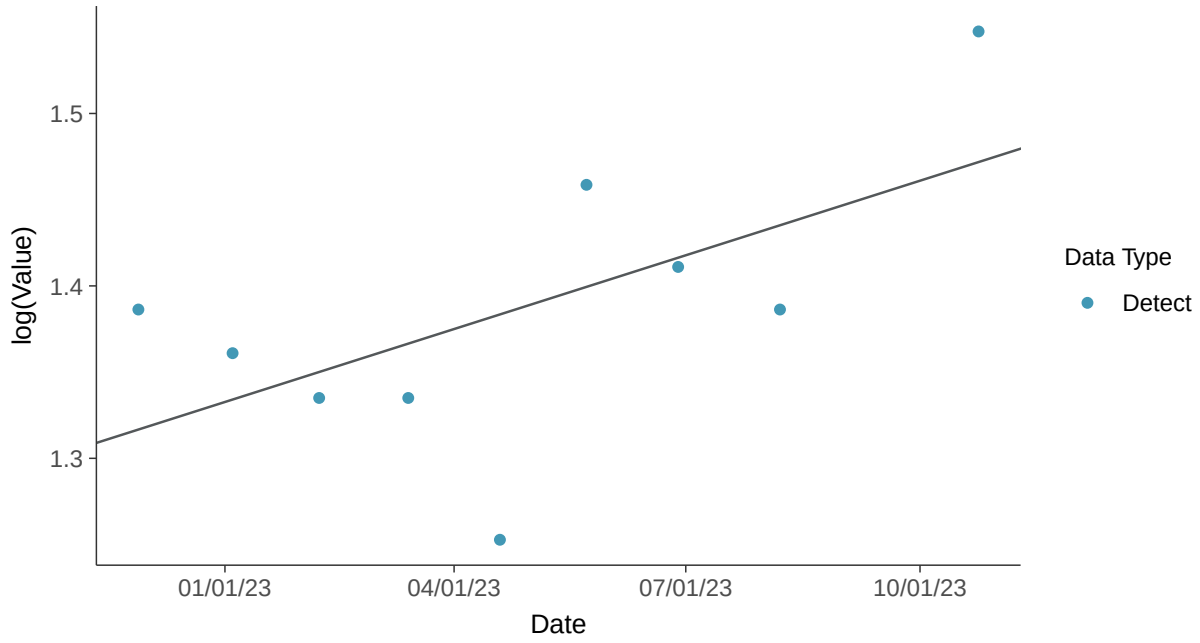
Gamma Q-Q plot

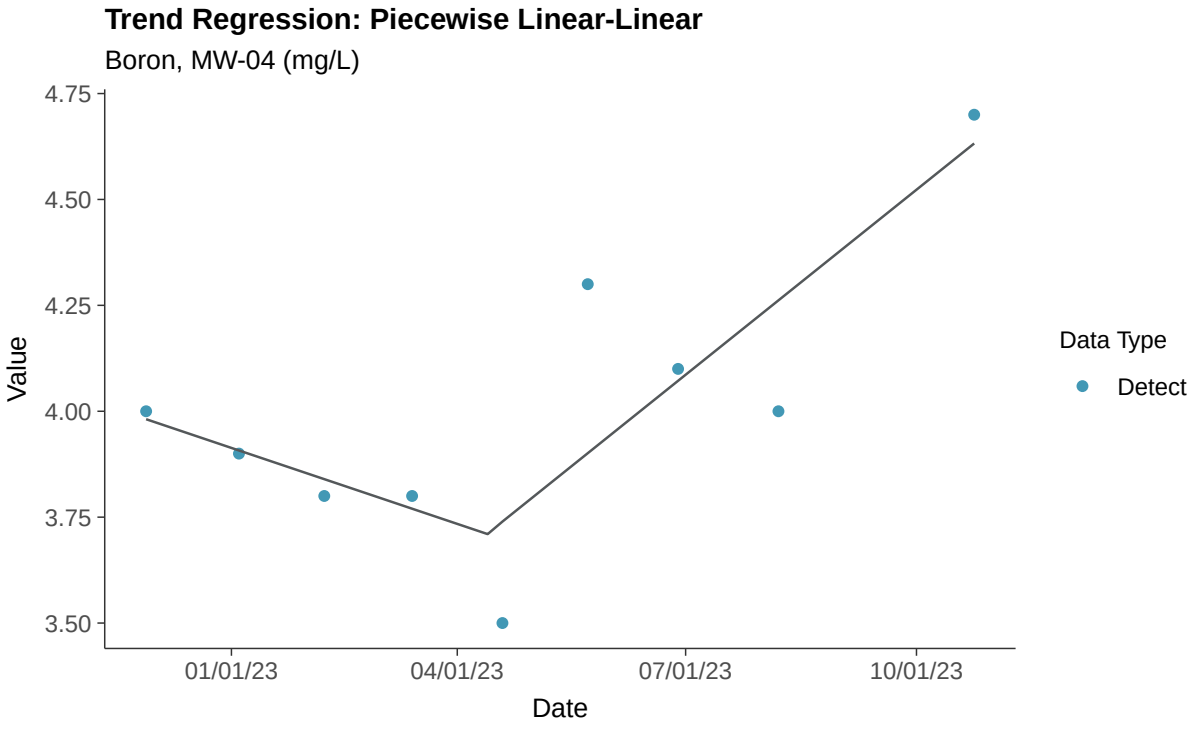
Boron, MW-04 (mg/L)



Trend Regression: Lognormal MLE

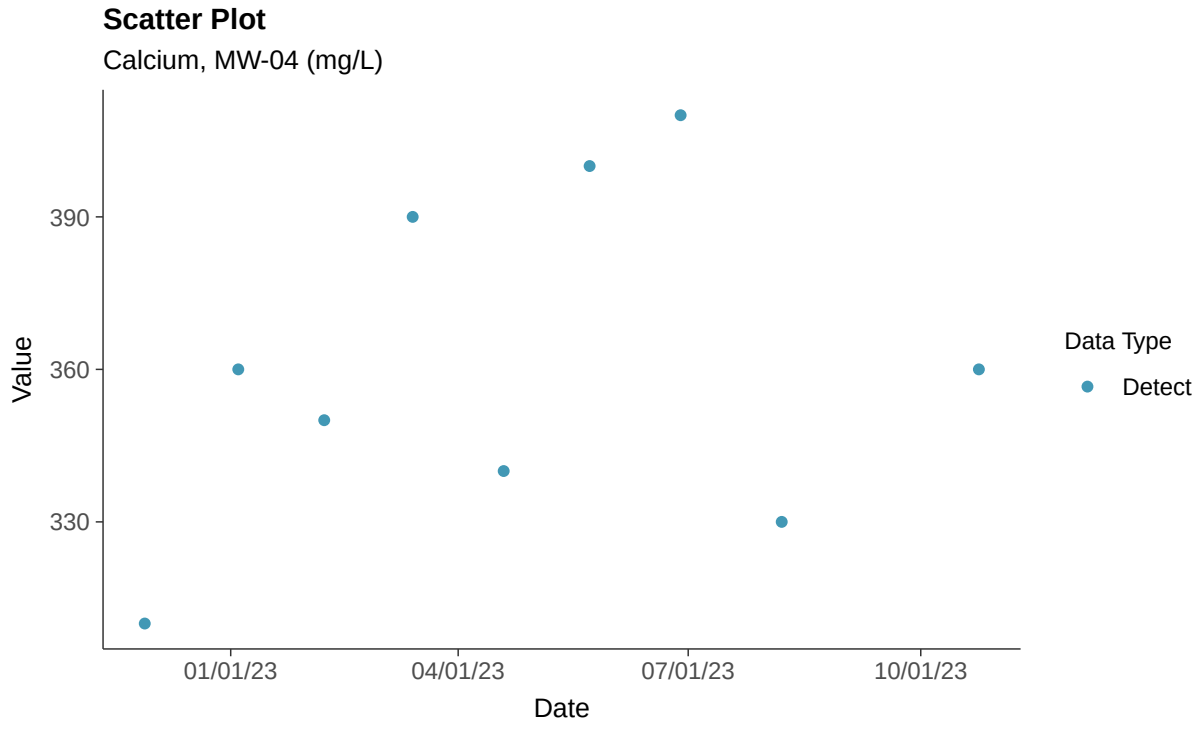
Boron, MW-04 (mg/L)

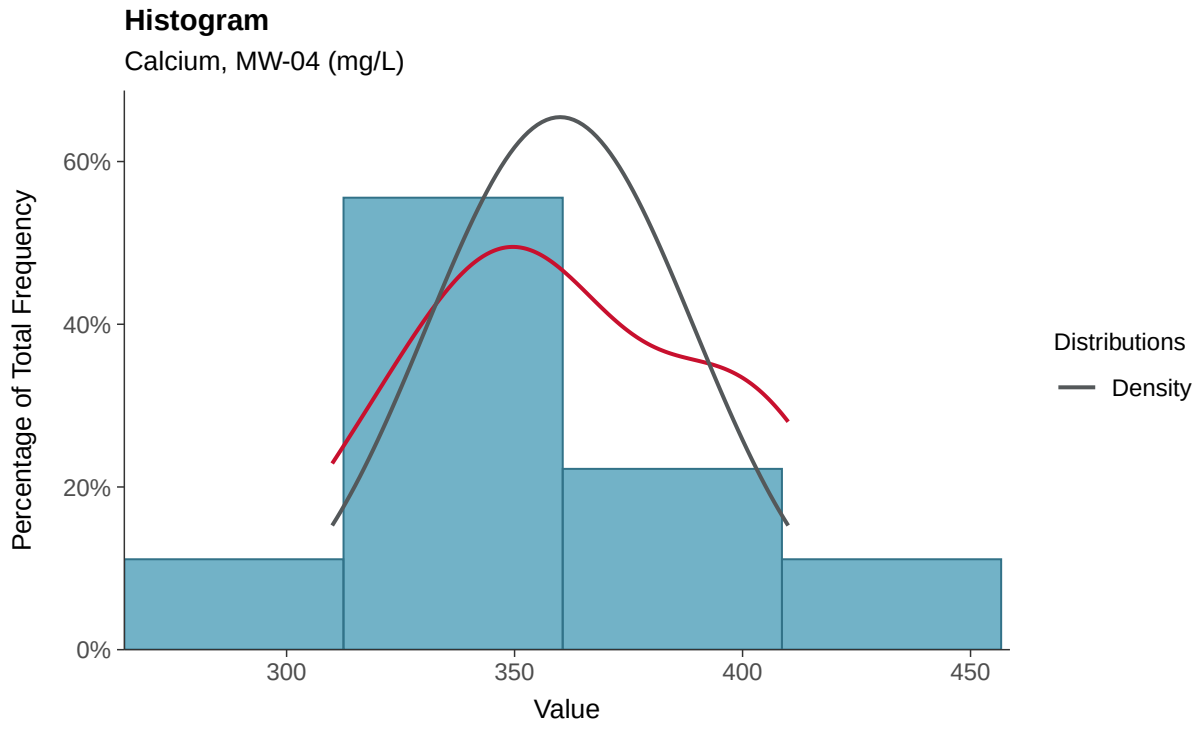



Trend Regression: Piecewise Linear-Linear
Boron, MW-04 (mg/L)
4.75
4.50
4.25
4.00
3.75
3.50
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-04

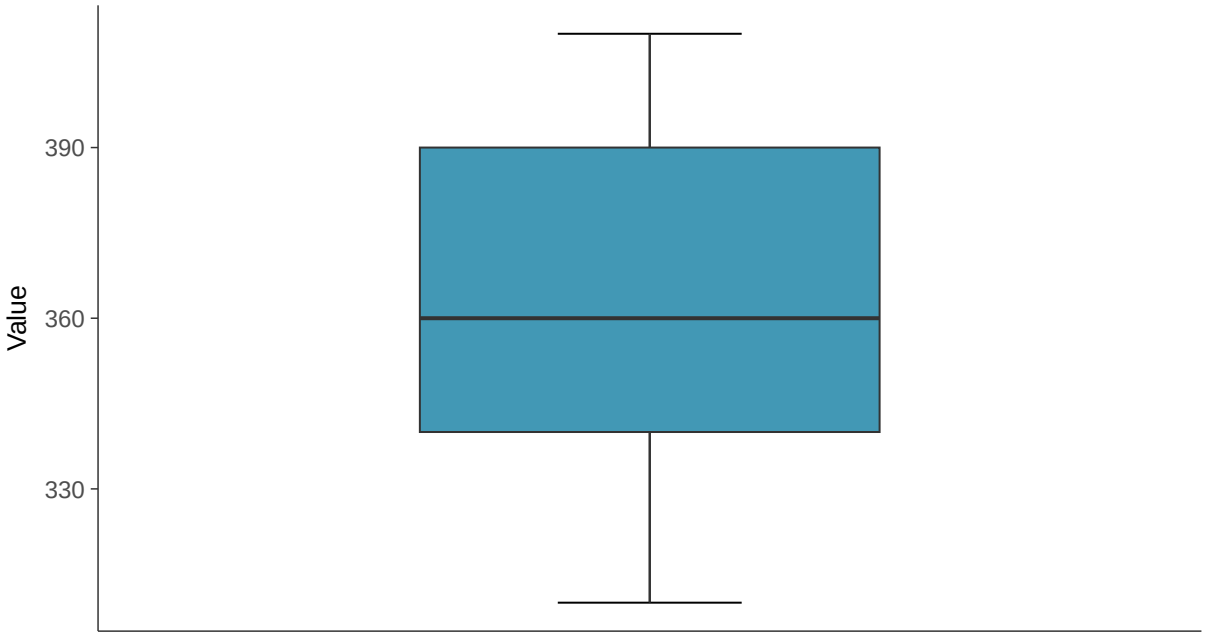
ID: 2_14_4_107





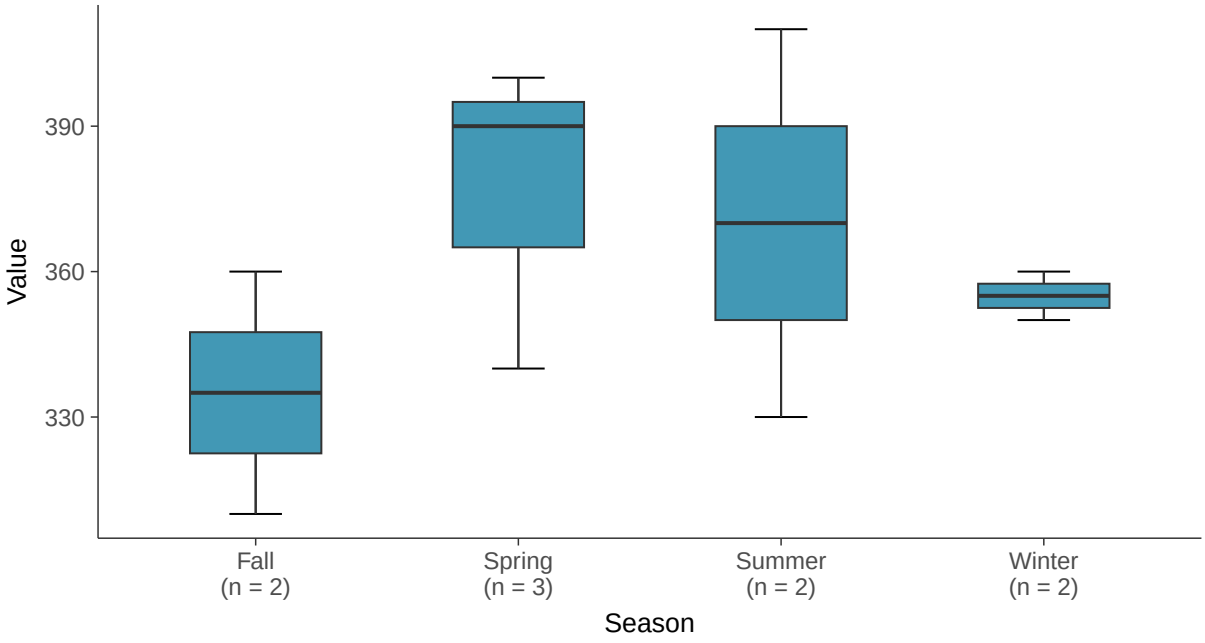
Boxplot

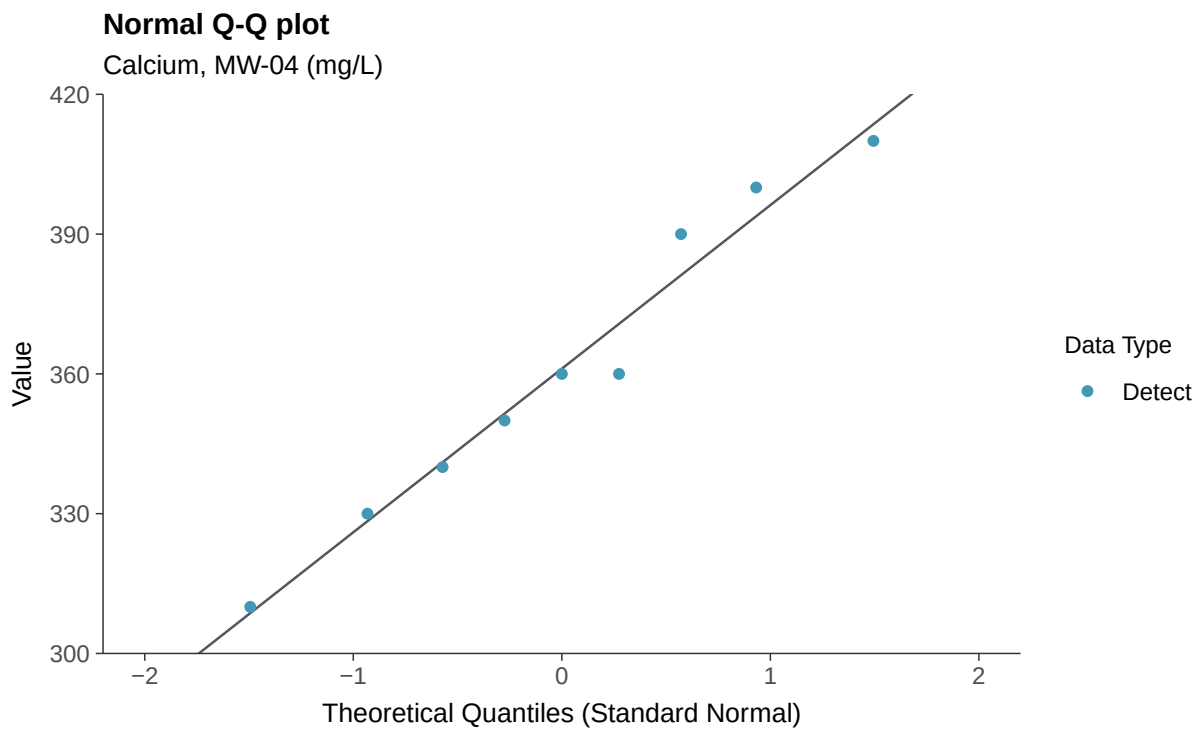
Calcium, MW-04 (mg/L)

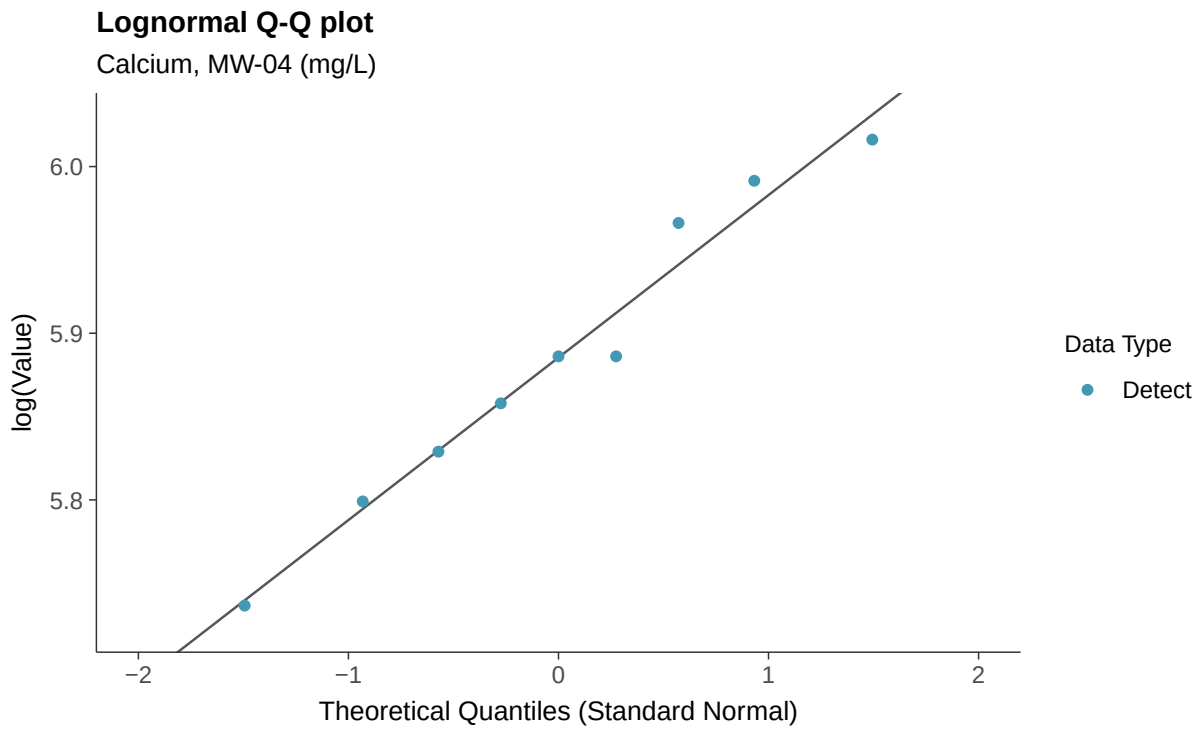


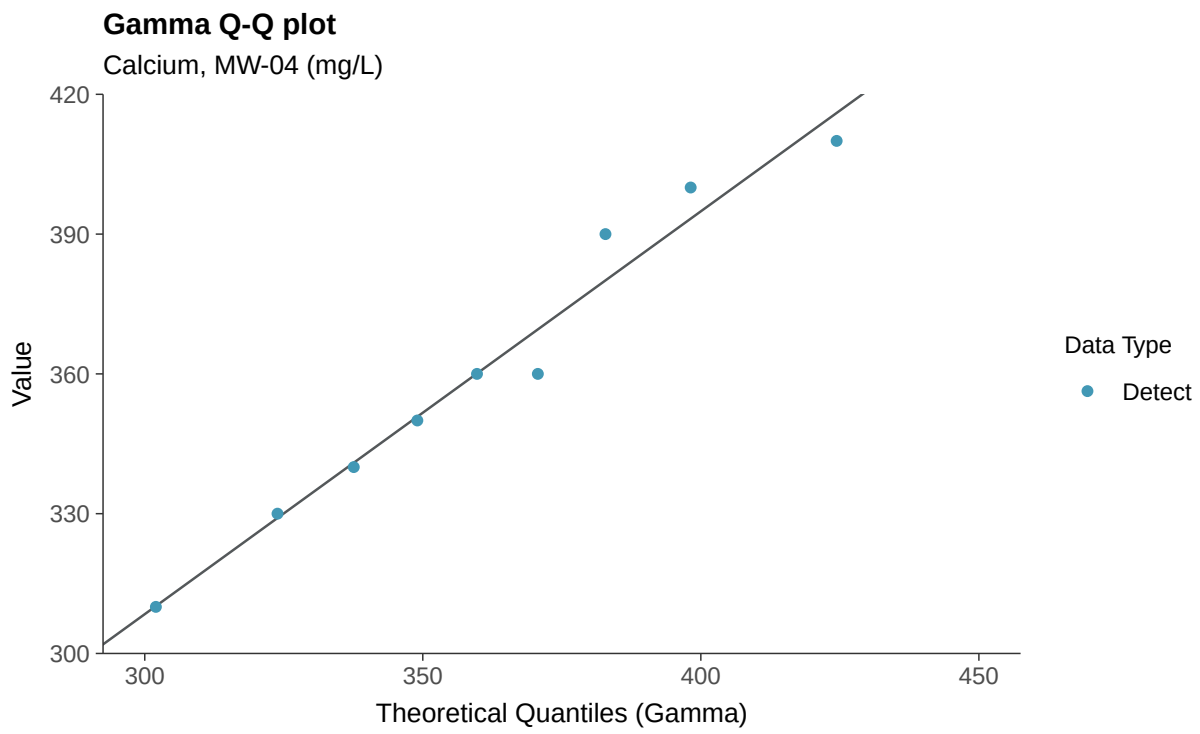
Boxplot by Season

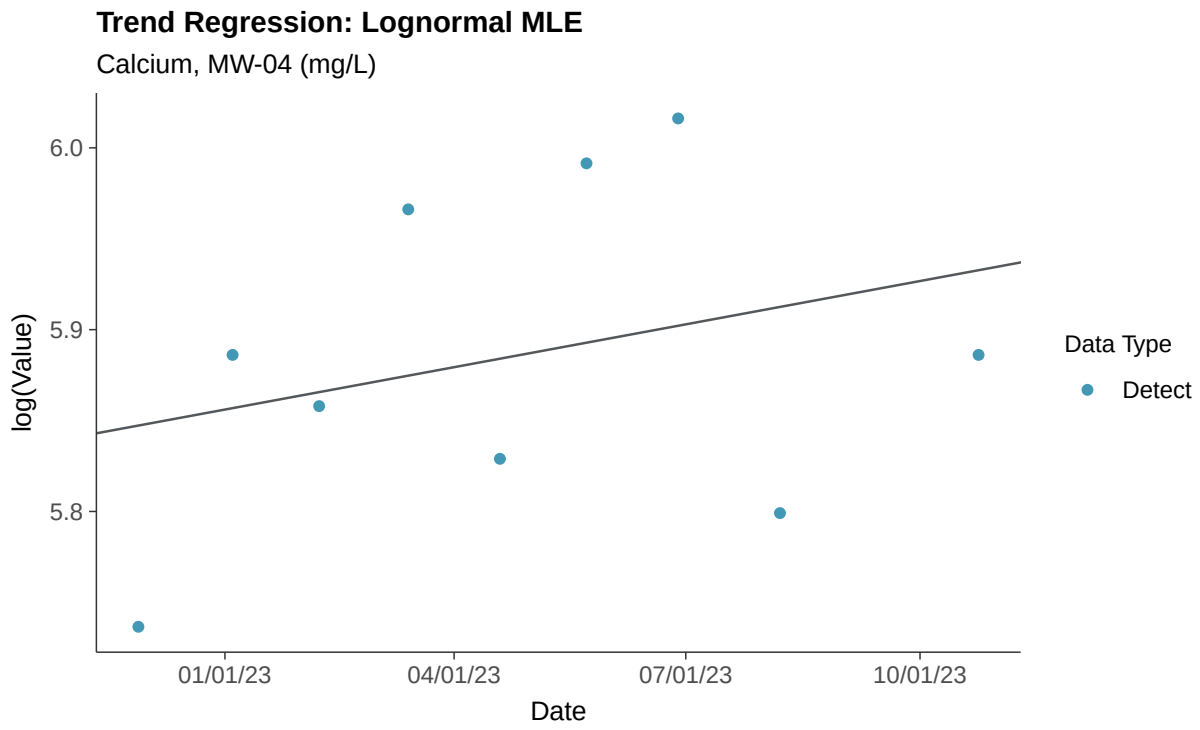
Calcium, MW-04 (mg/L)

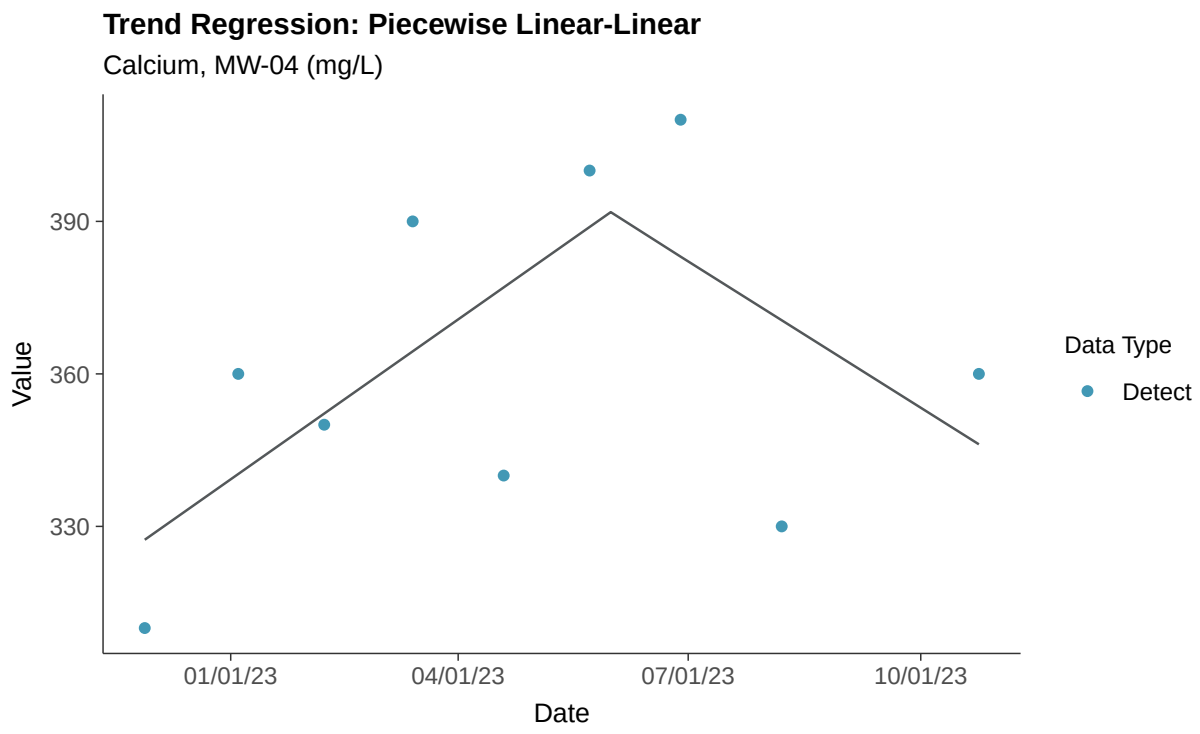



Normal Q-Q plot
Calcium, MW-04 (mg/L)
Value
420
390
360
330
300
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Calcium, MW-04 (mg/L)
log(Value)
6.0
5.9
5.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

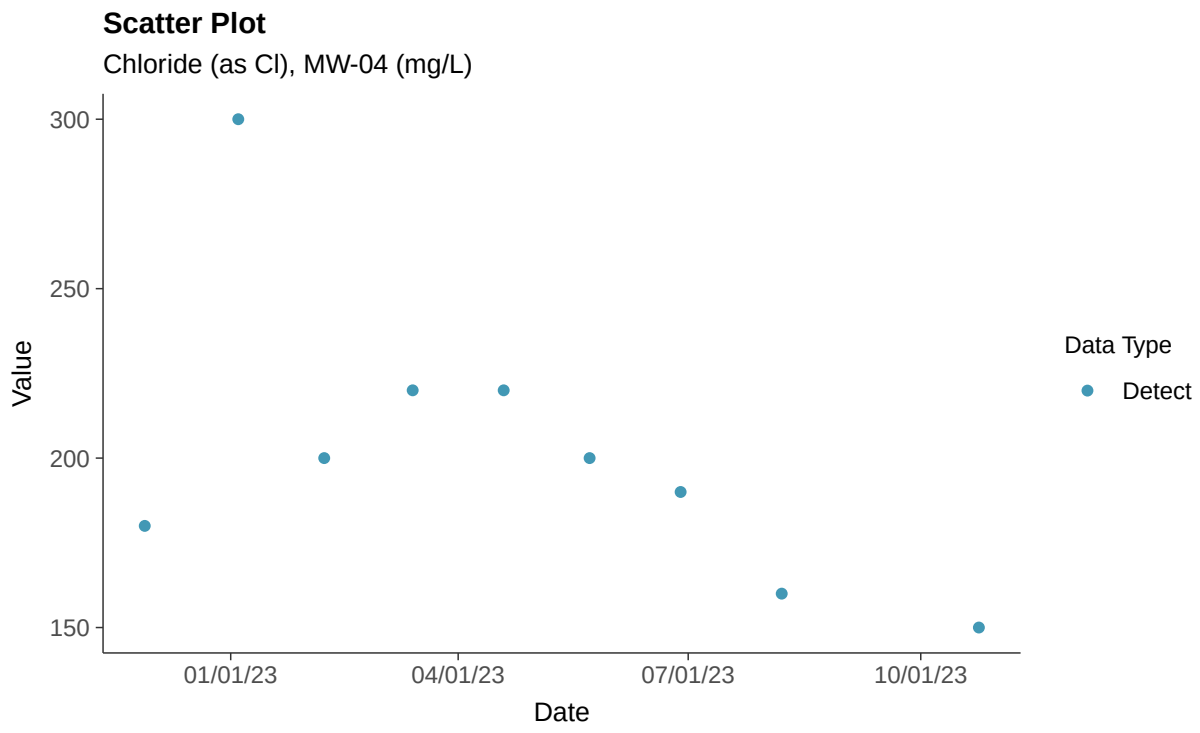

Gamma Q-Q plot
Calcium, MW-04 (mg/L)
Value
420
390
360
330
300
300
350
400
450
Theoretical Quantiles (Gamma)
Data Type
Detect

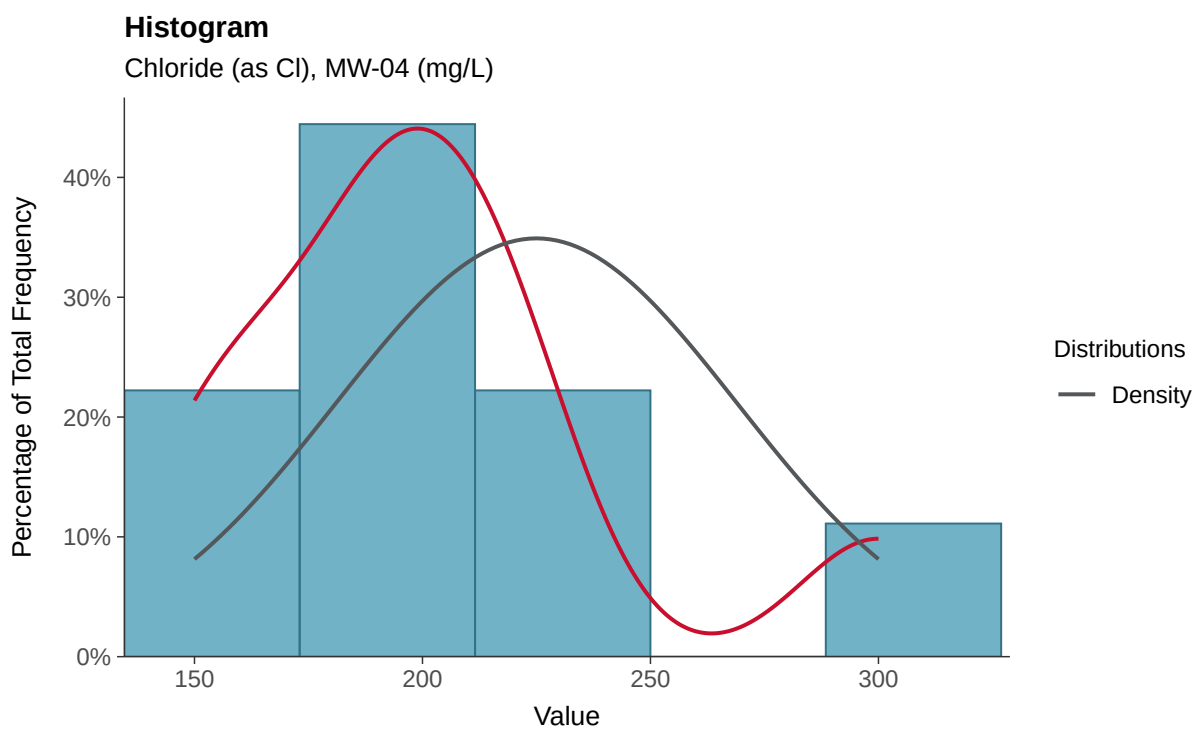

Trend Regression: Lognormal MLE
Calcium, MW-04 (mg/L)
log(Value)
6.0
5.9
5.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Calcium, MW-04 (mg/L)
Value
390
360
330
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-04

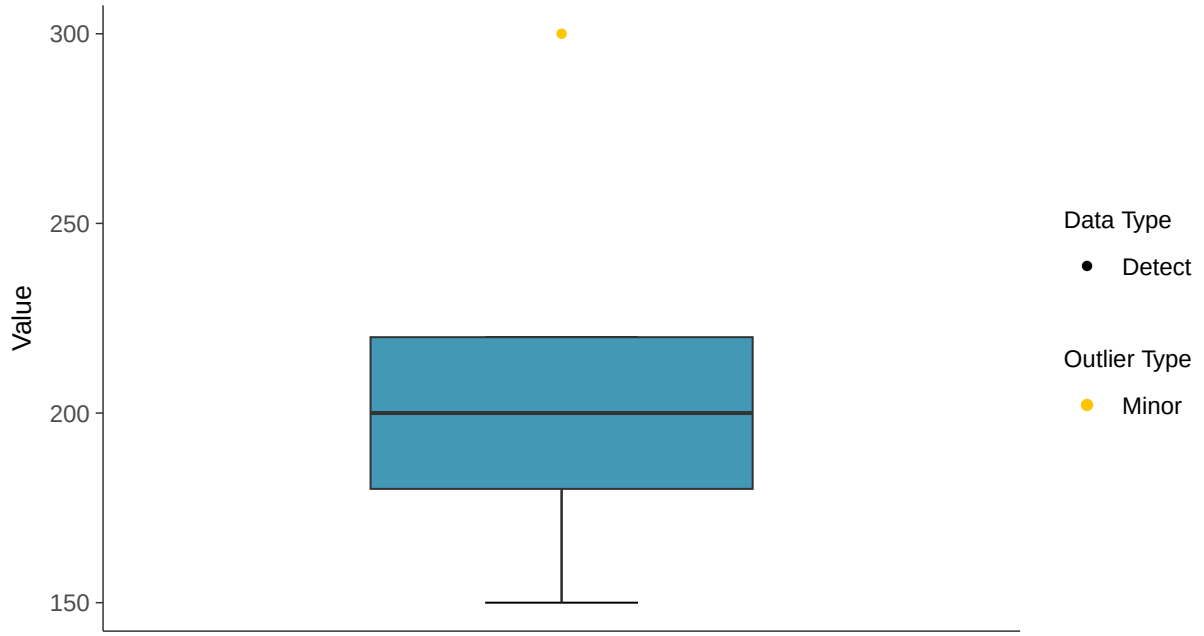
ID: 2_14_4_108





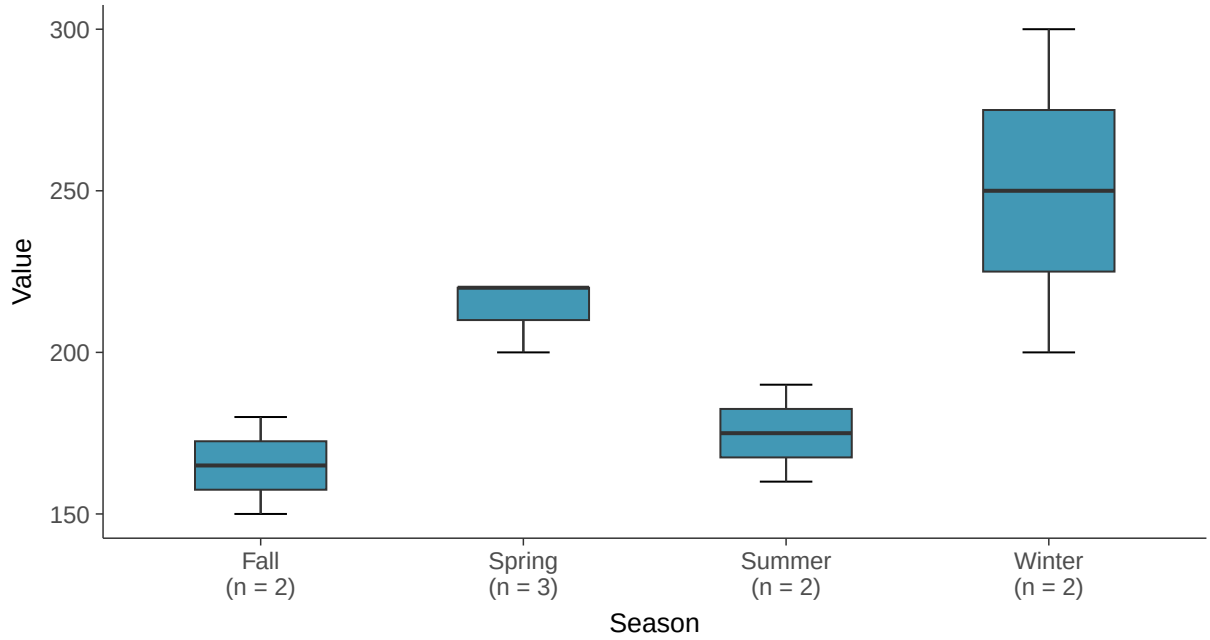
Boxplot

Chloride (as Cl), MW-04 (mg/L)



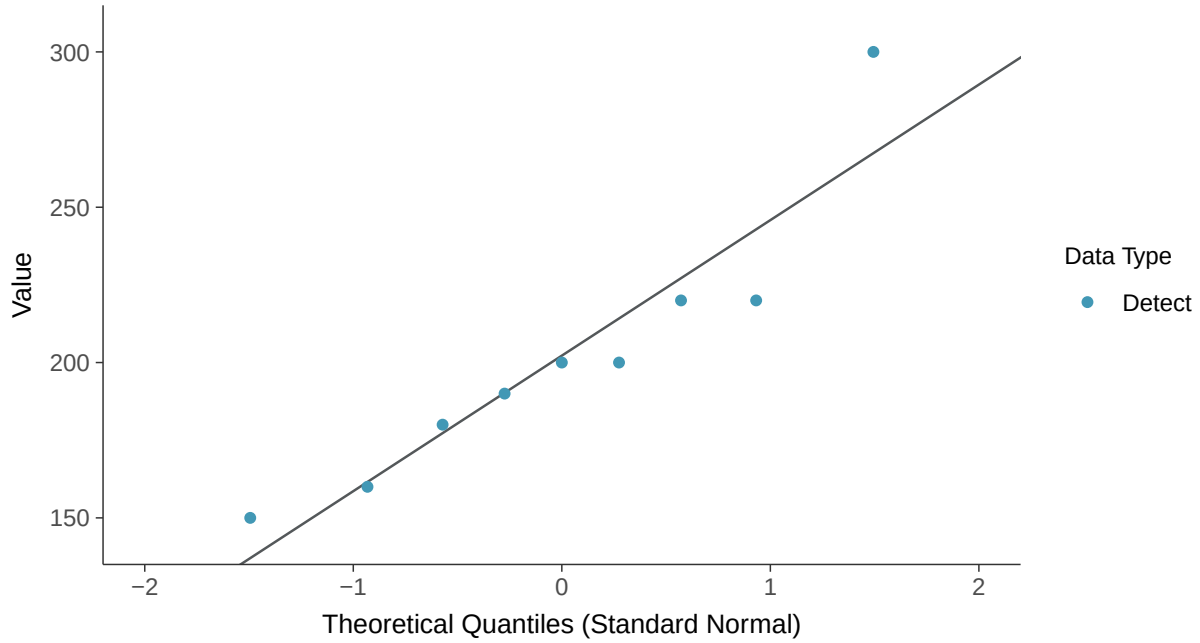
Boxplot by Season

Chloride (as Cl), MW-04 (mg/L)



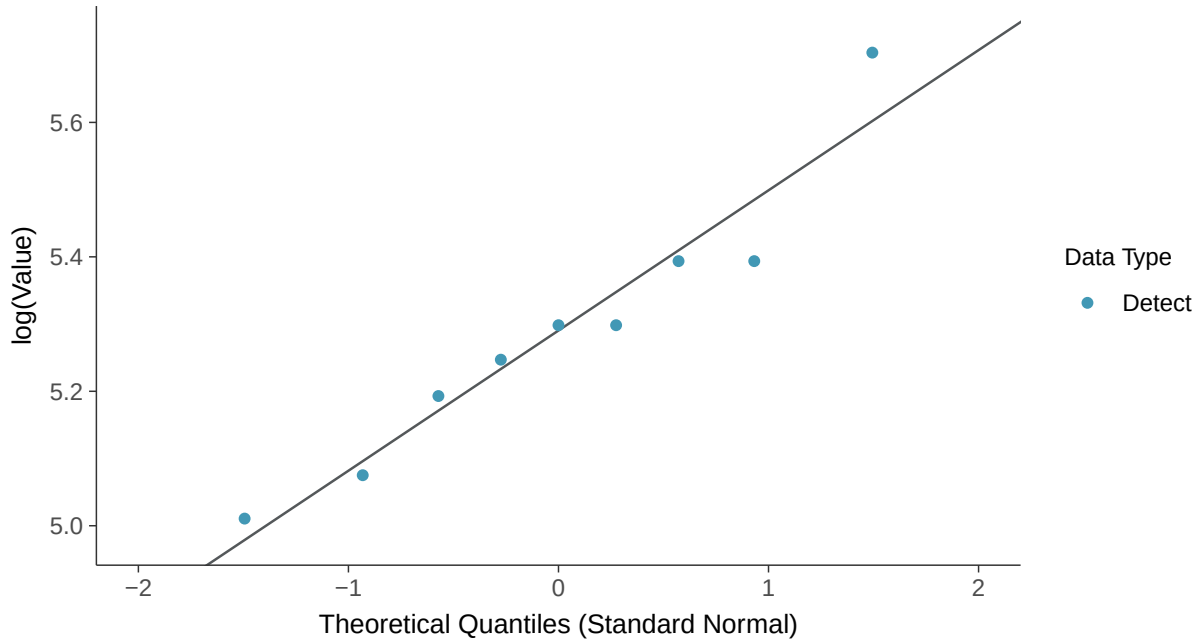
Normal Q-Q plot

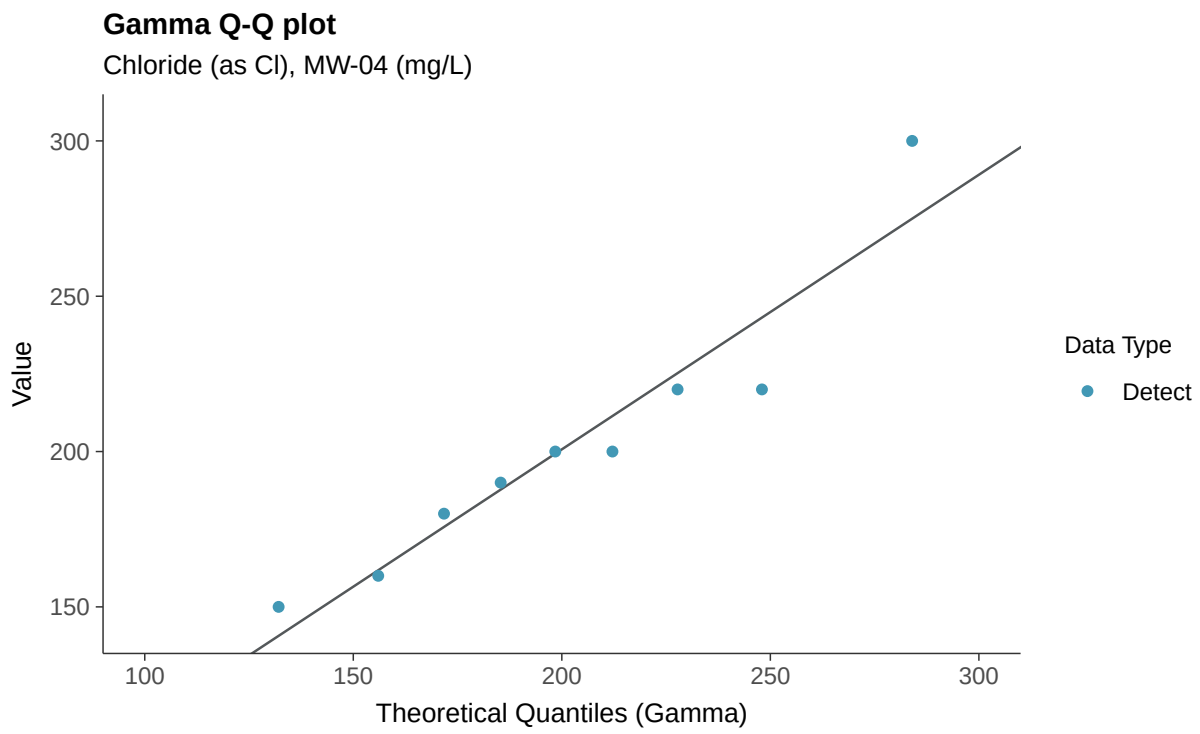
Chloride (as Cl), MW-04 (mg/L)

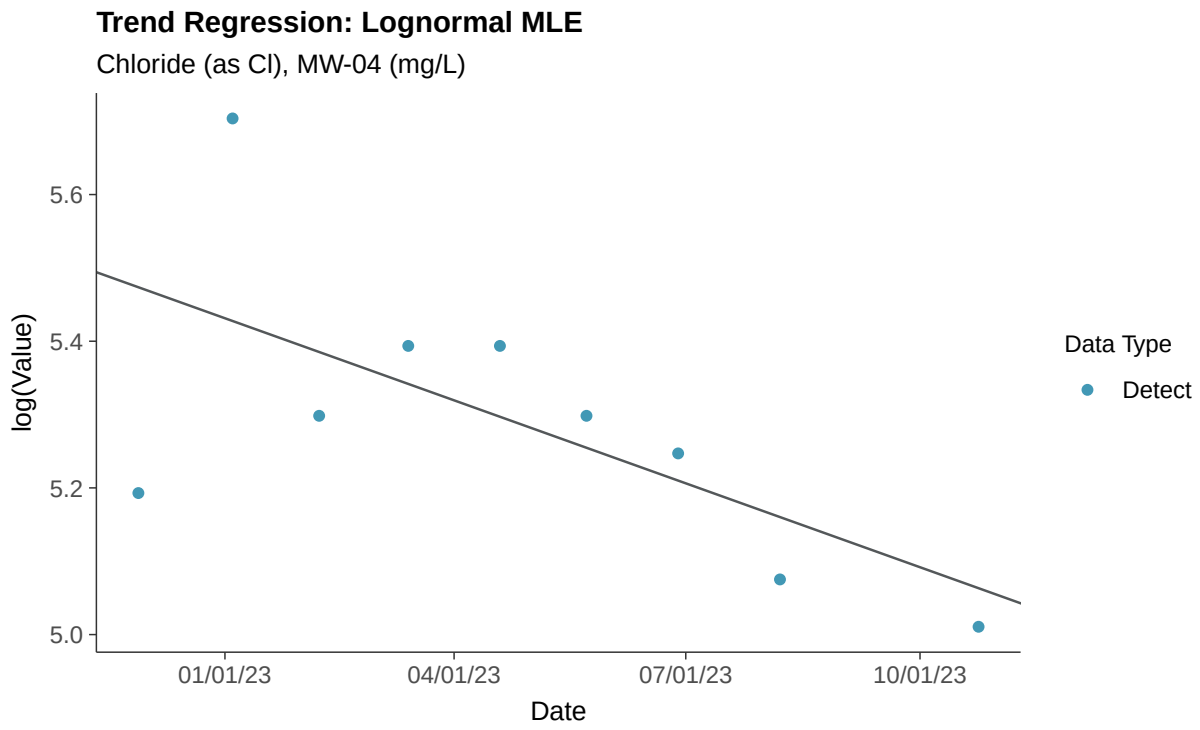


Lognormal Q-Q plot

Chloride (as Cl), MW-04 (mg/L)

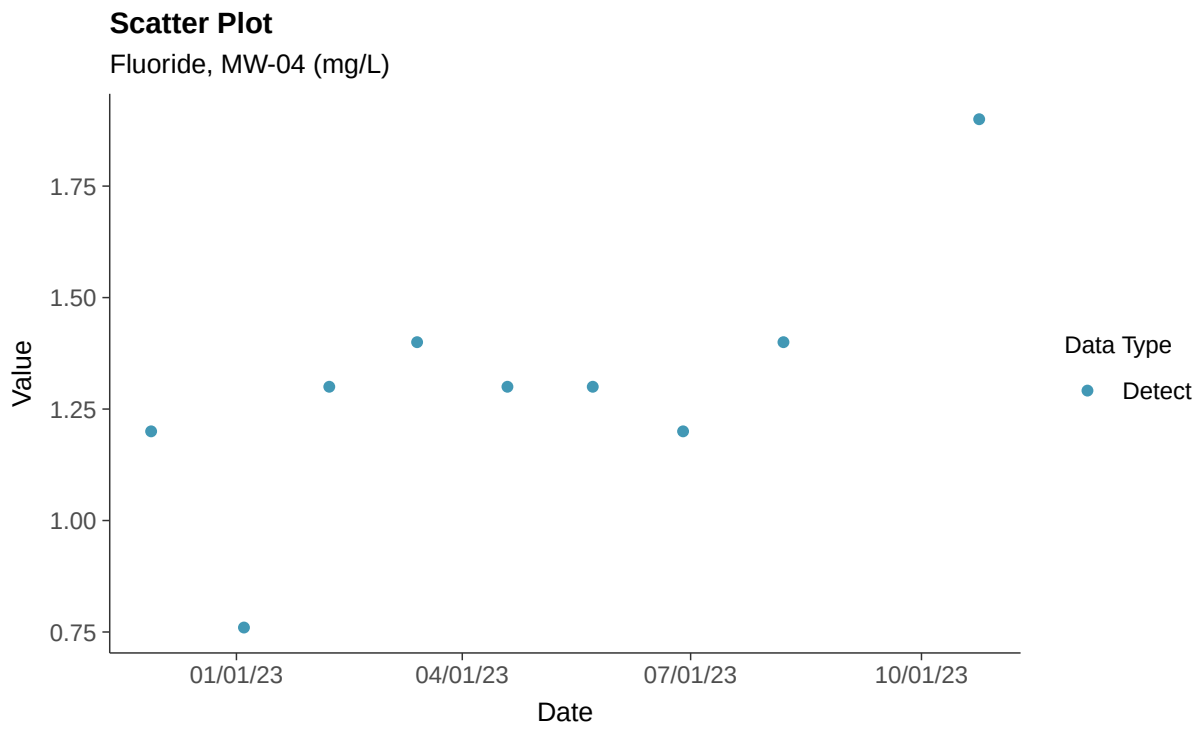


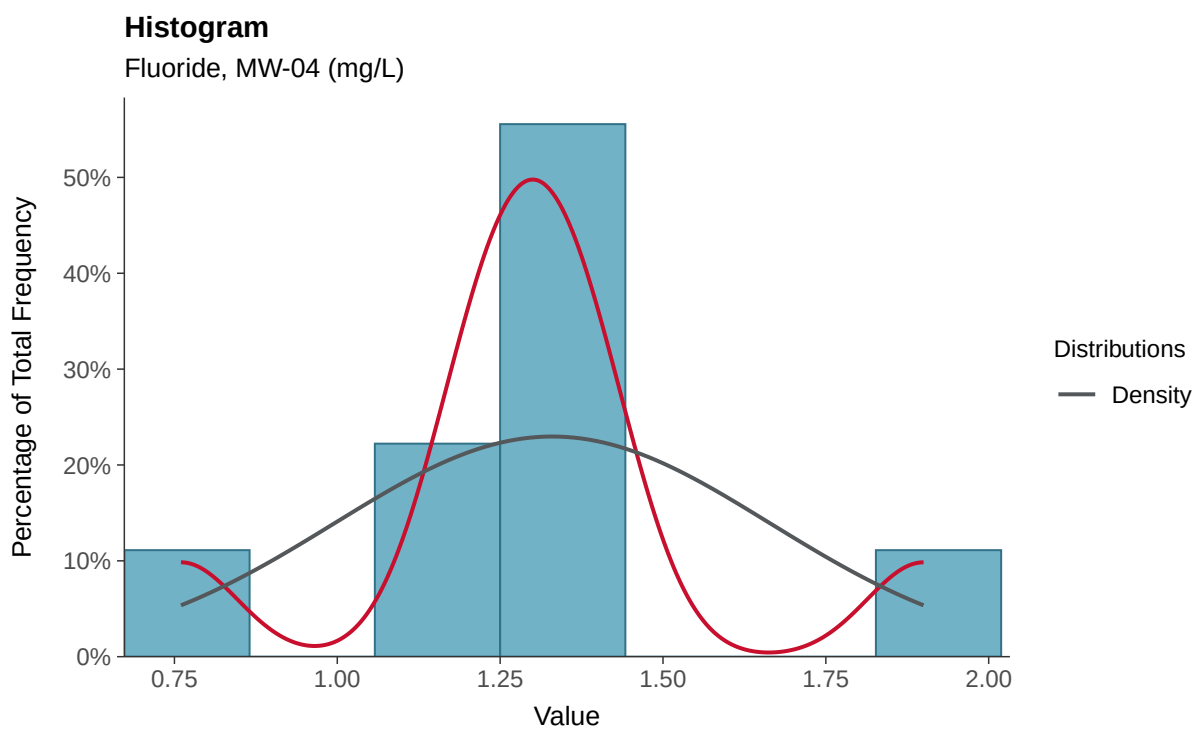

Gamma Q-Q plot
Chloride (as Cl), MW-04 (mg/L)
Value
300
250
200
150
100
150
200
250
300
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chloride (as Cl), MW-04 (mg/L)
log(Value)
5.6
5.4
5.2
5.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-04

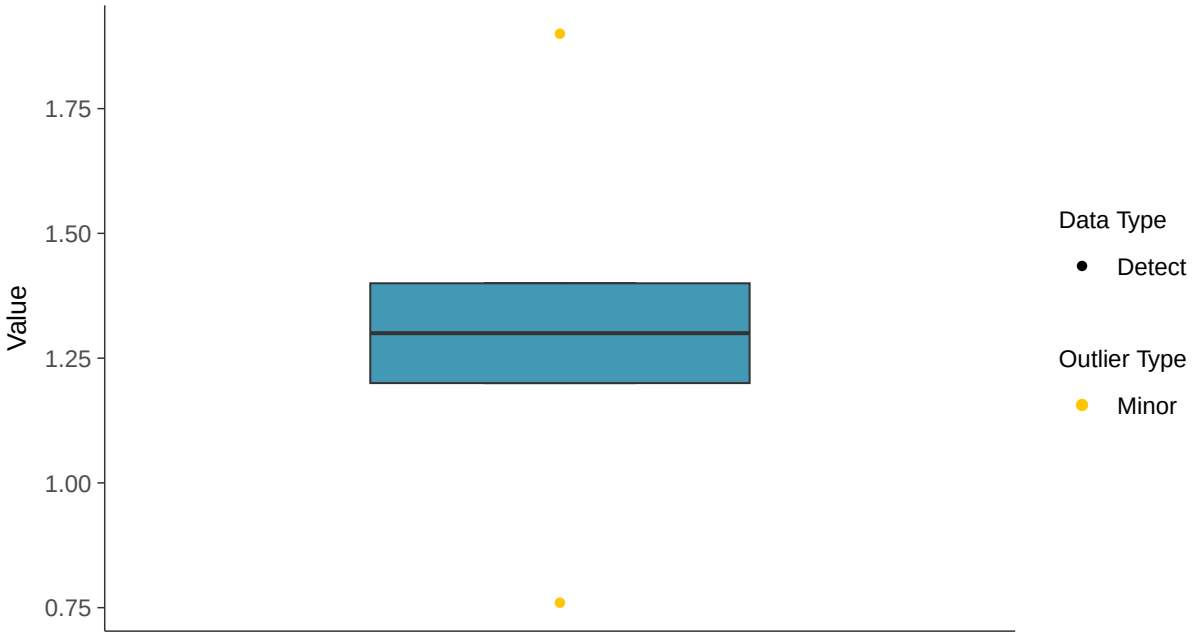
ID: 2_14_4_112





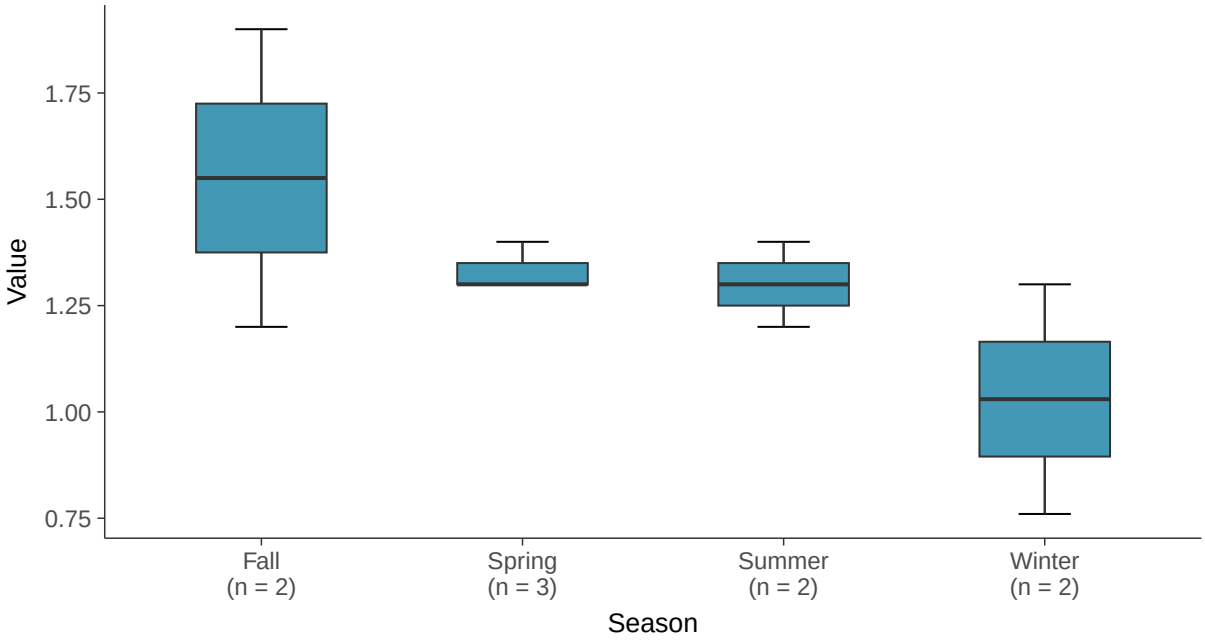
Boxplot

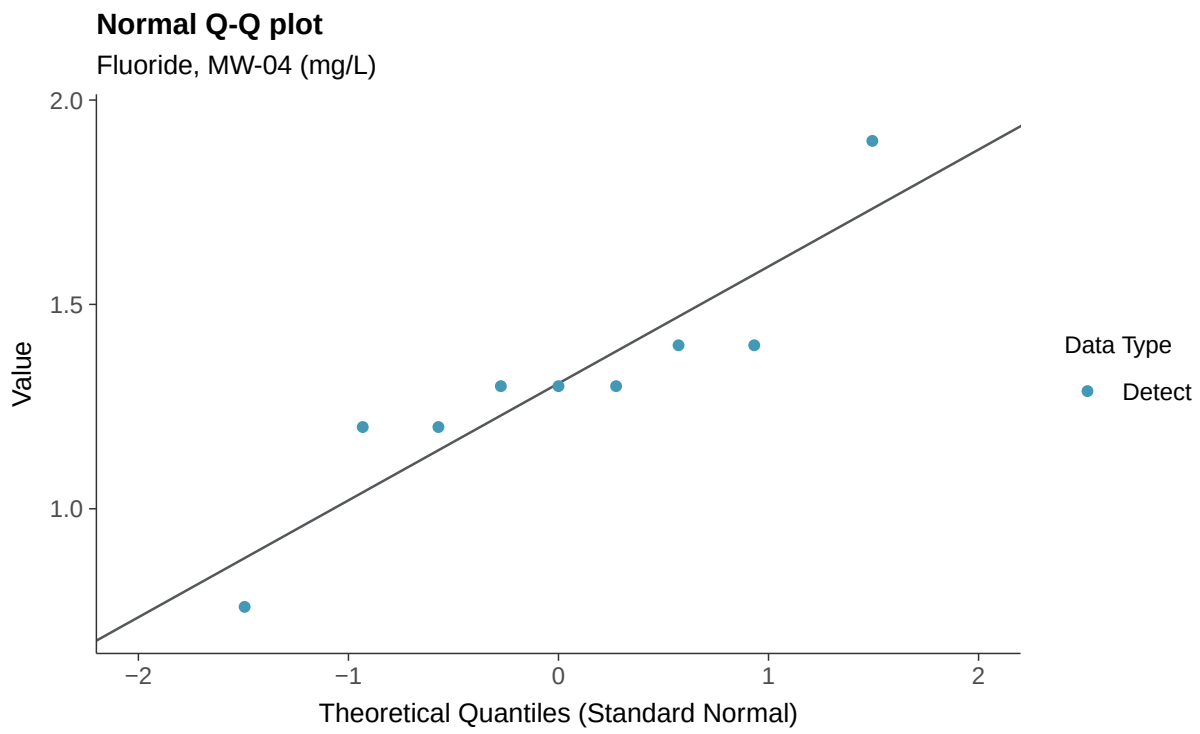
Fluoride, MW-04 (mg/L)

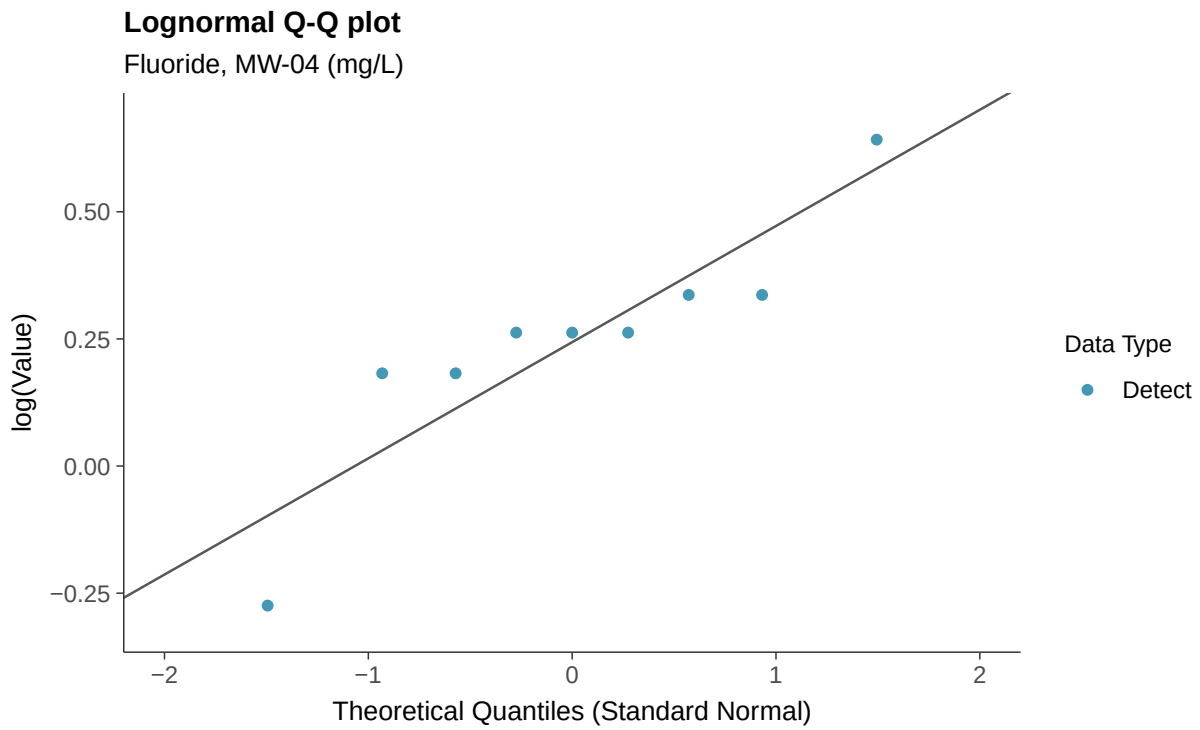


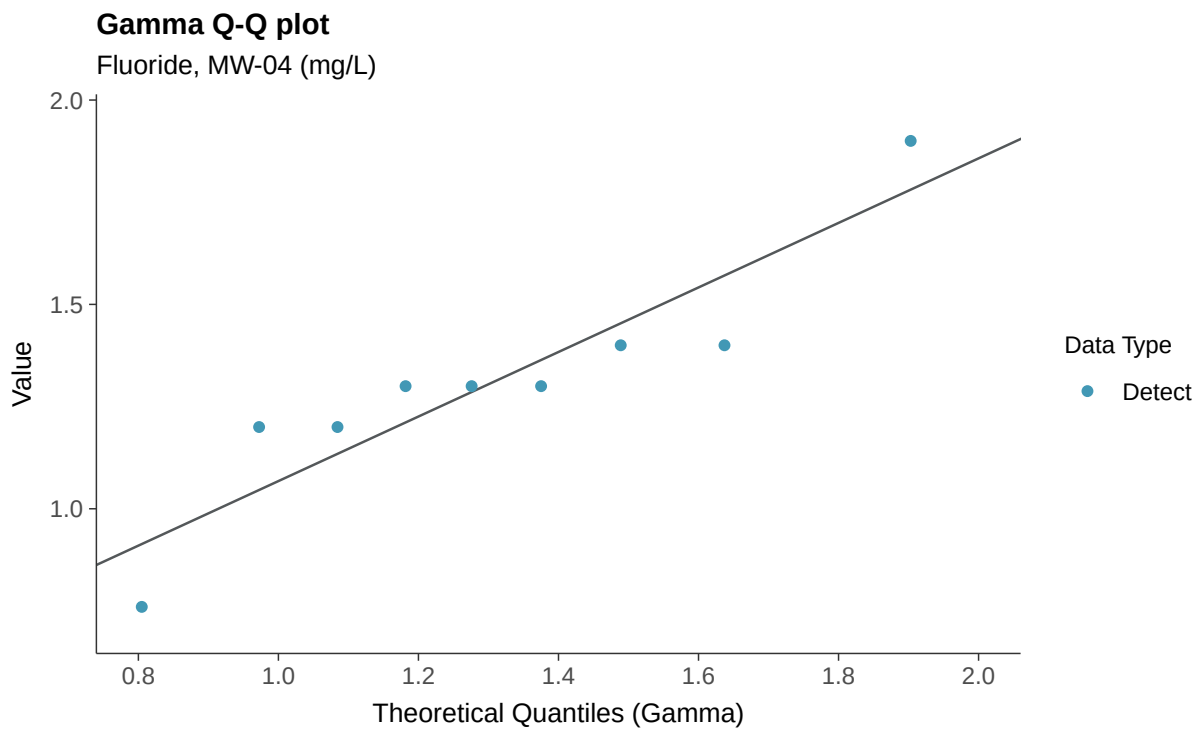
Boxplot by Season

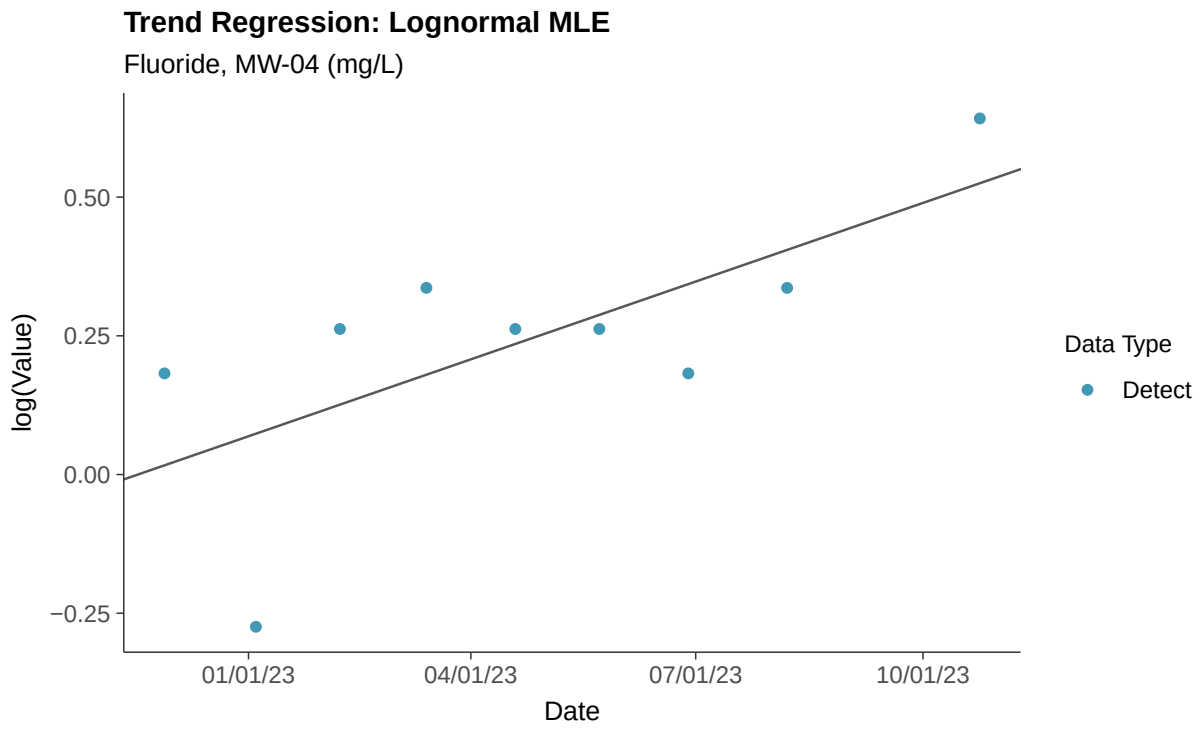
Fluoride, MW-04 (mg/L)




Normal Q-Q plot
Fluoride, MW-04 (mg/L)
Value
2.0
1.5
1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

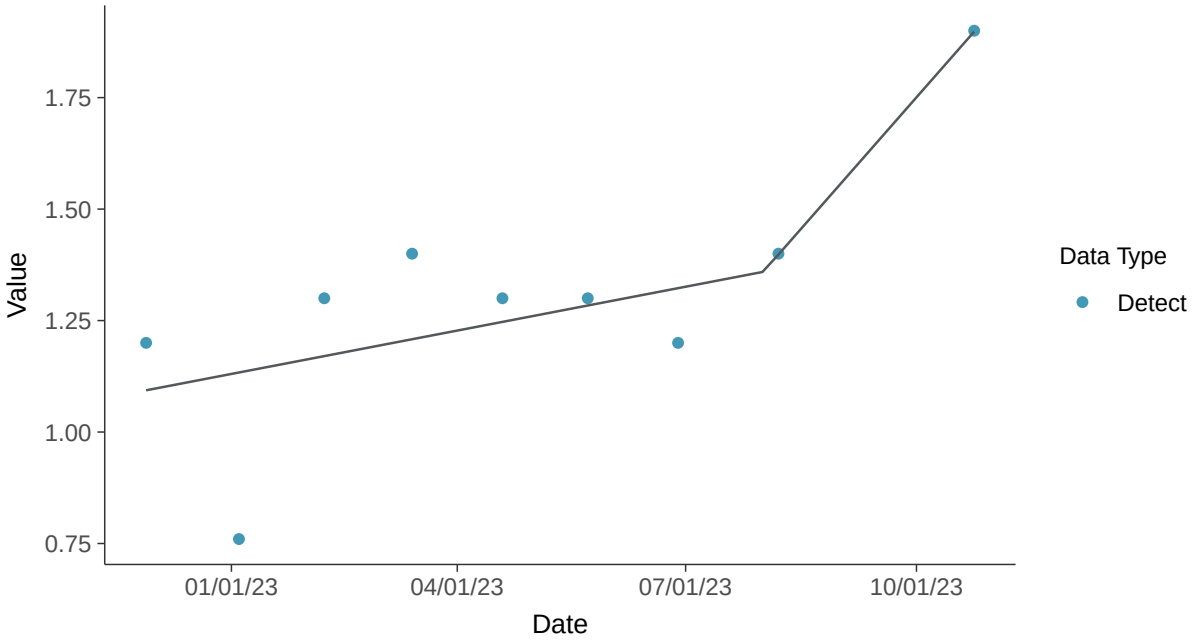

Lognormal Q-Q plot
Fluoride, MW-04 (mg/L)
log(Value)
0.50
0.25
0.00
−0.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride, MW-04 (mg/L)
Value
2.0
1.5
1.0
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride, MW-04 (mg/L)
log(Value)
0.50
0.25
0.00
−0.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

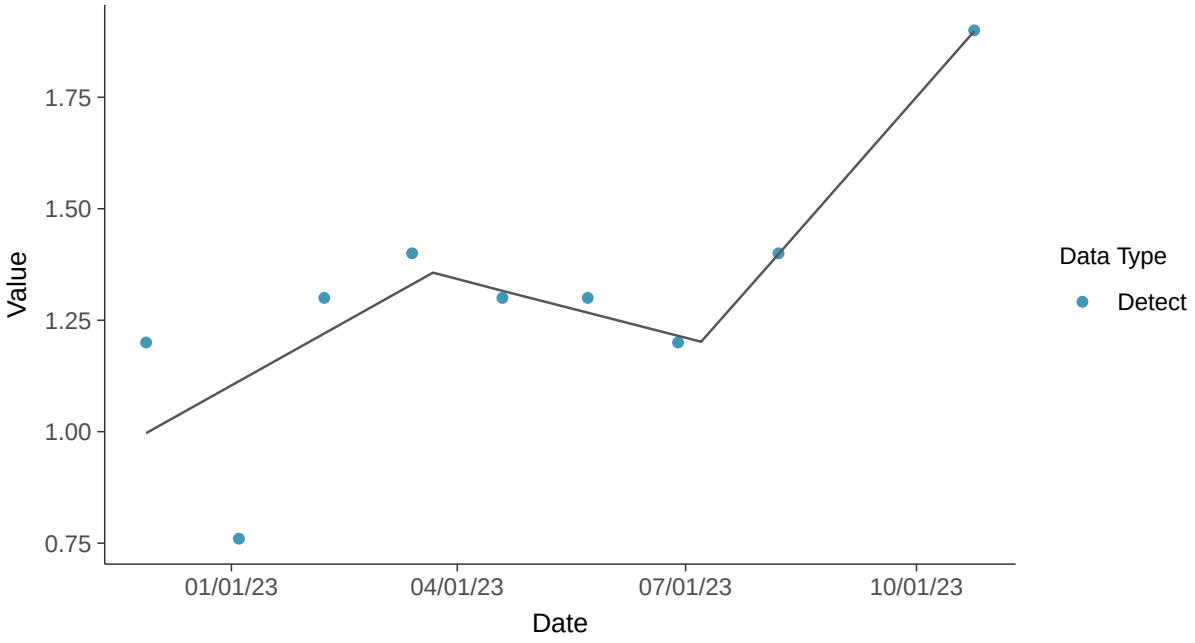
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-04 (mg/L)



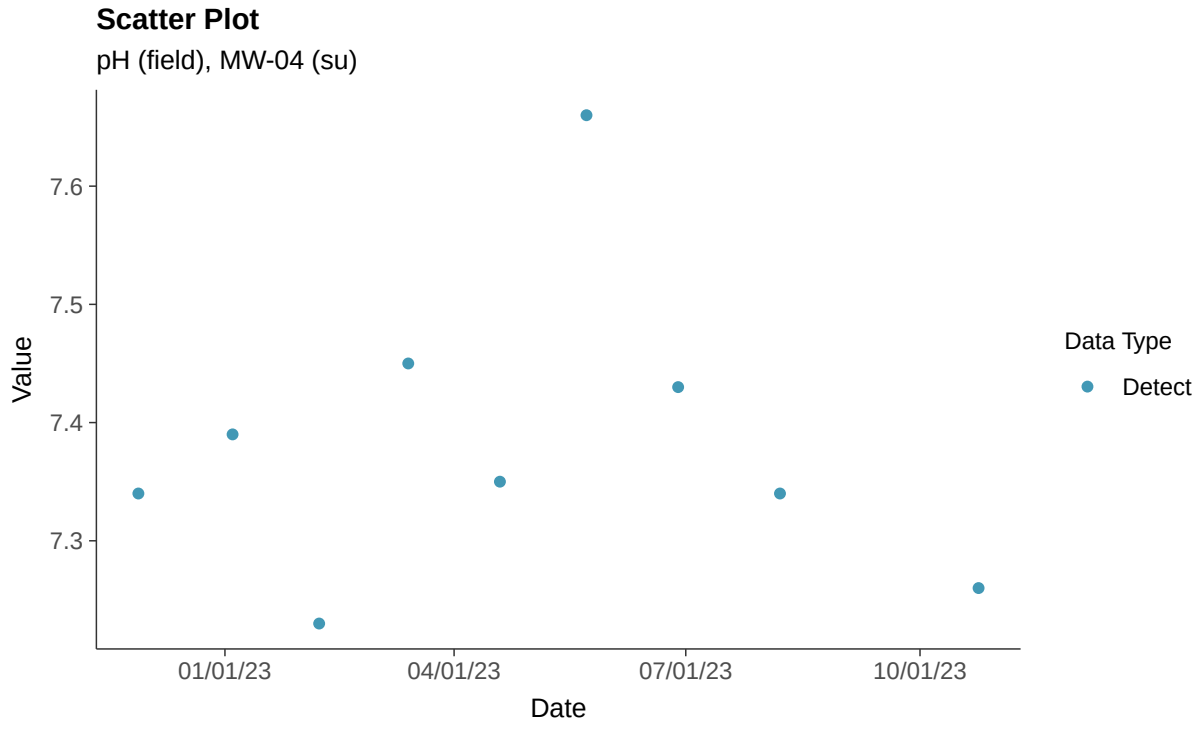
Trend Regression: Piecewise Linear-Linear-Linear

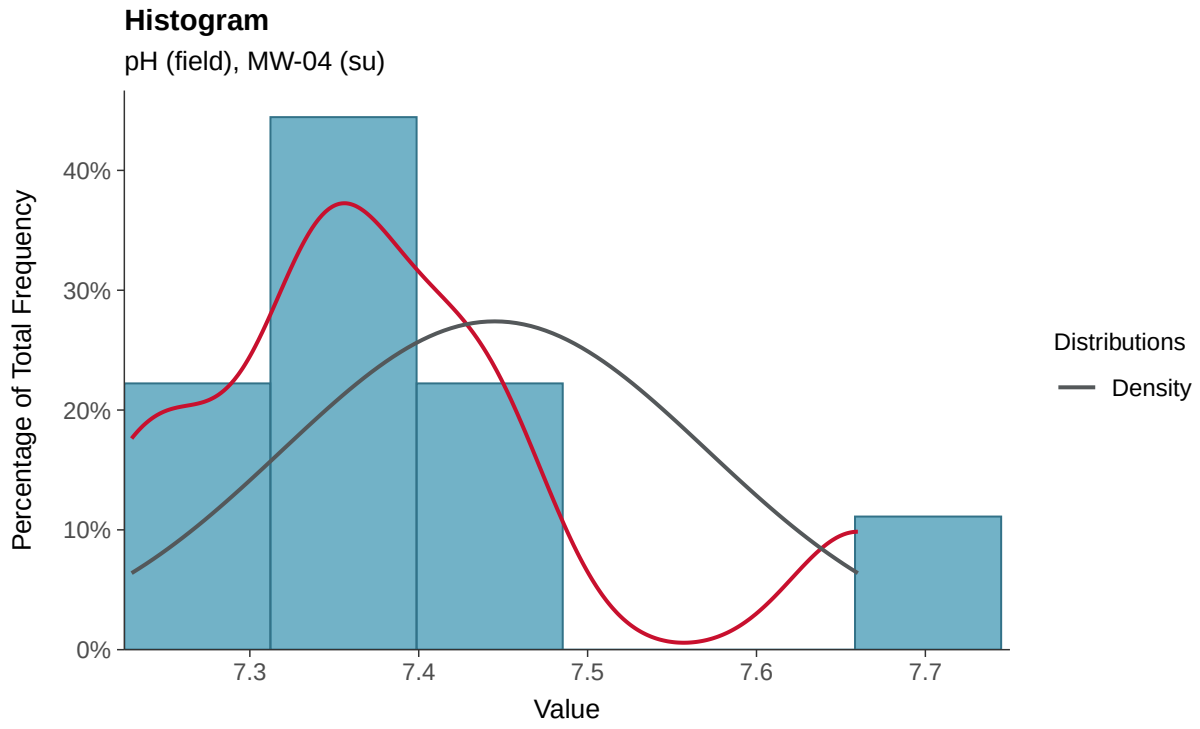
Fluoride, MW-04 (mg/L)



Appendix III: pH (field), MW-04

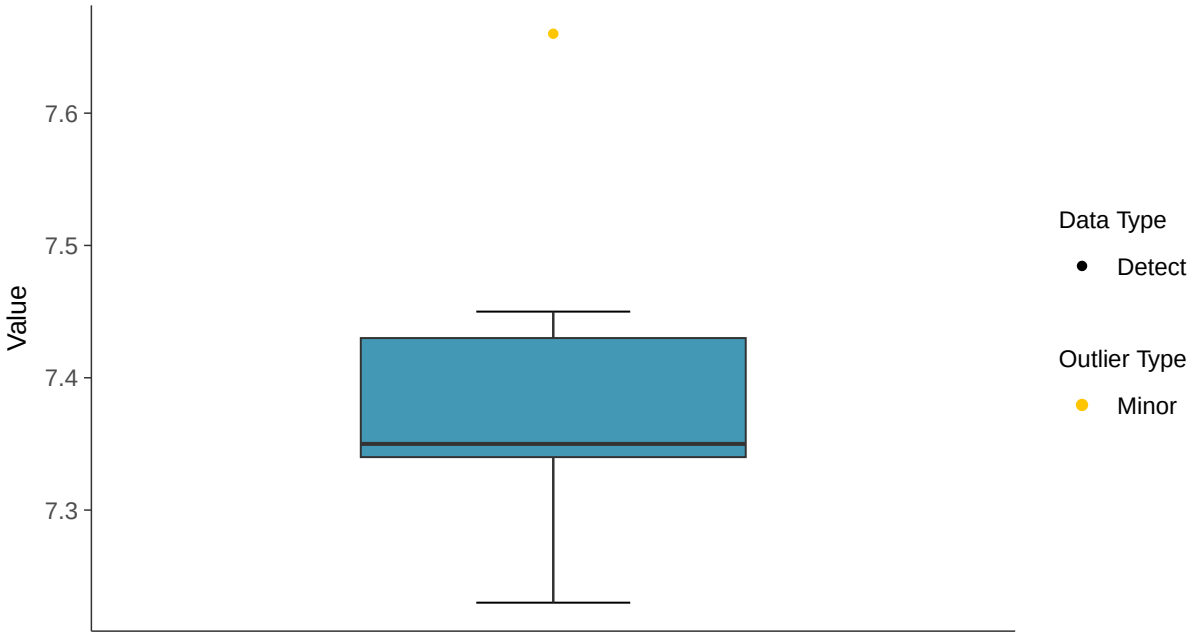
ID: 2_14_4_120





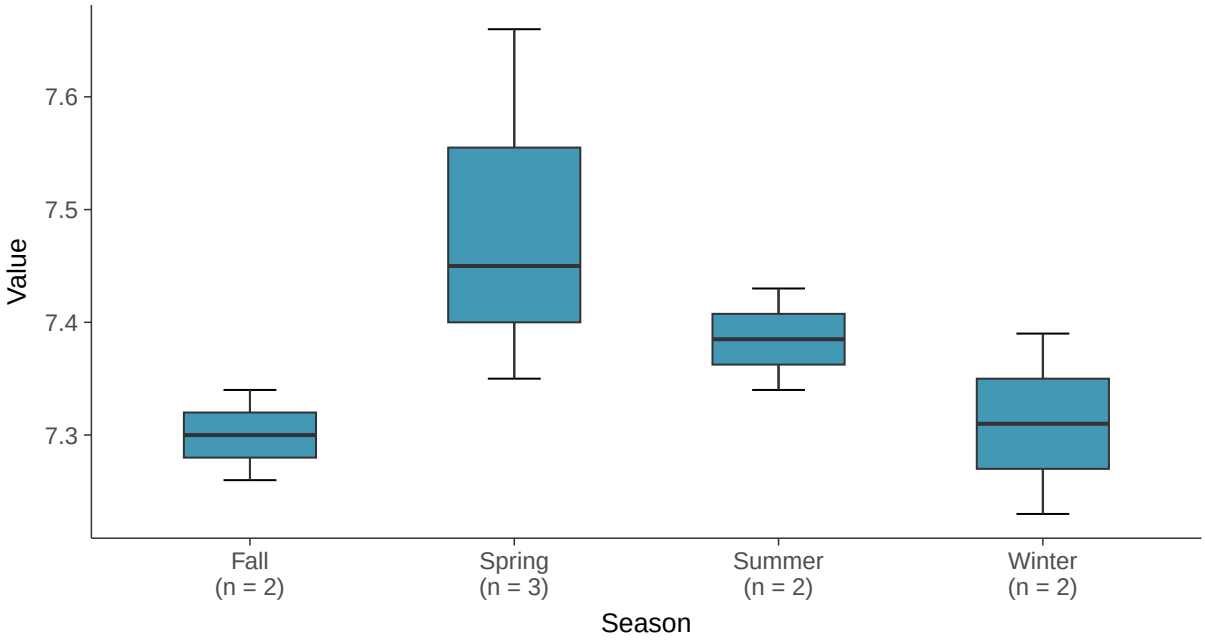
Boxplot

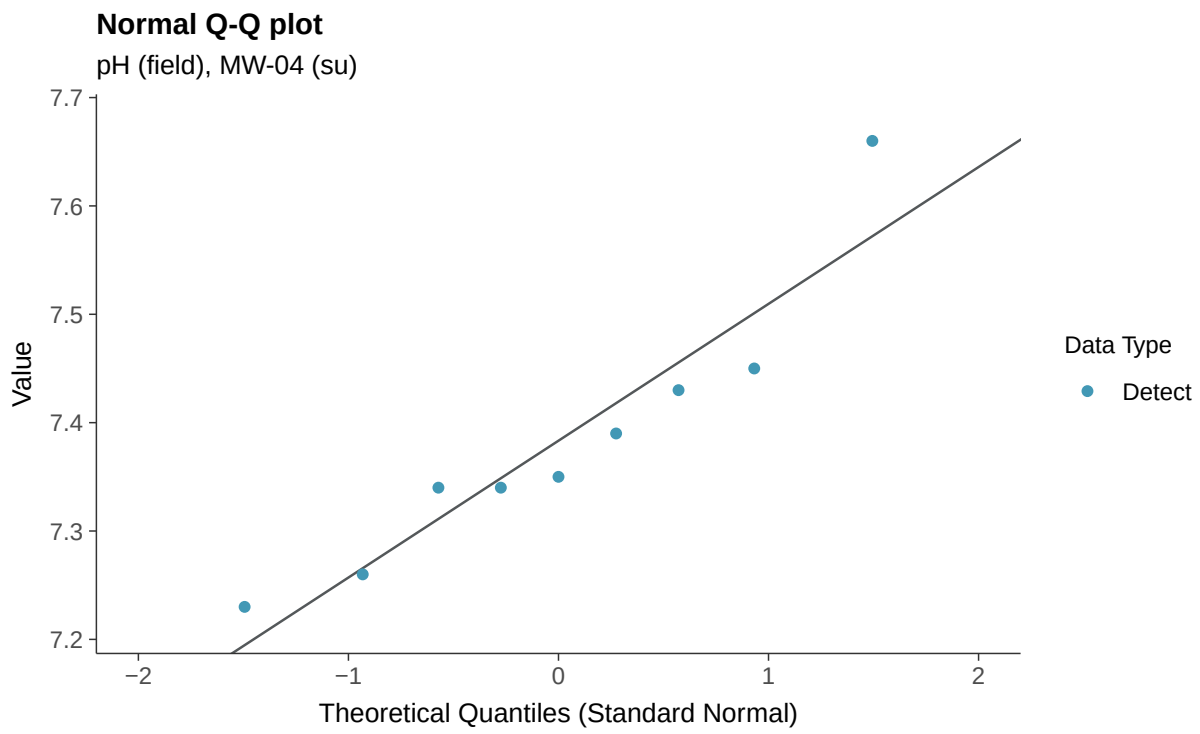
pH (field), MW-04 (su)

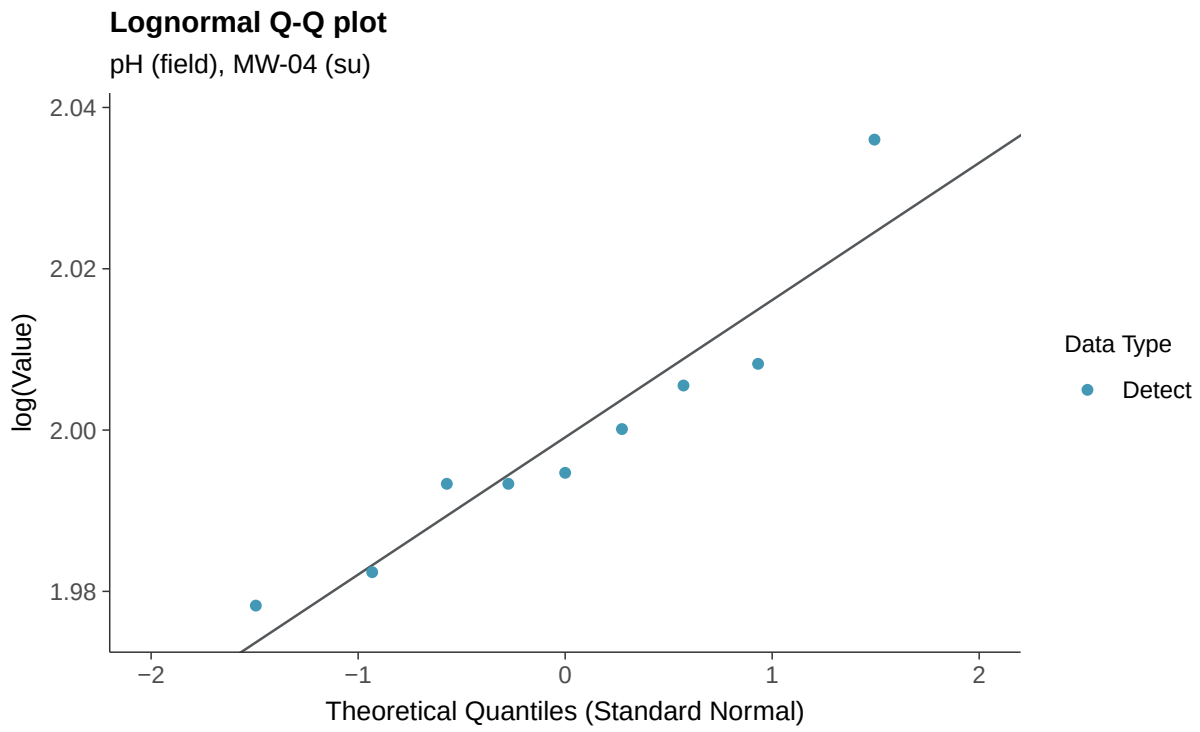


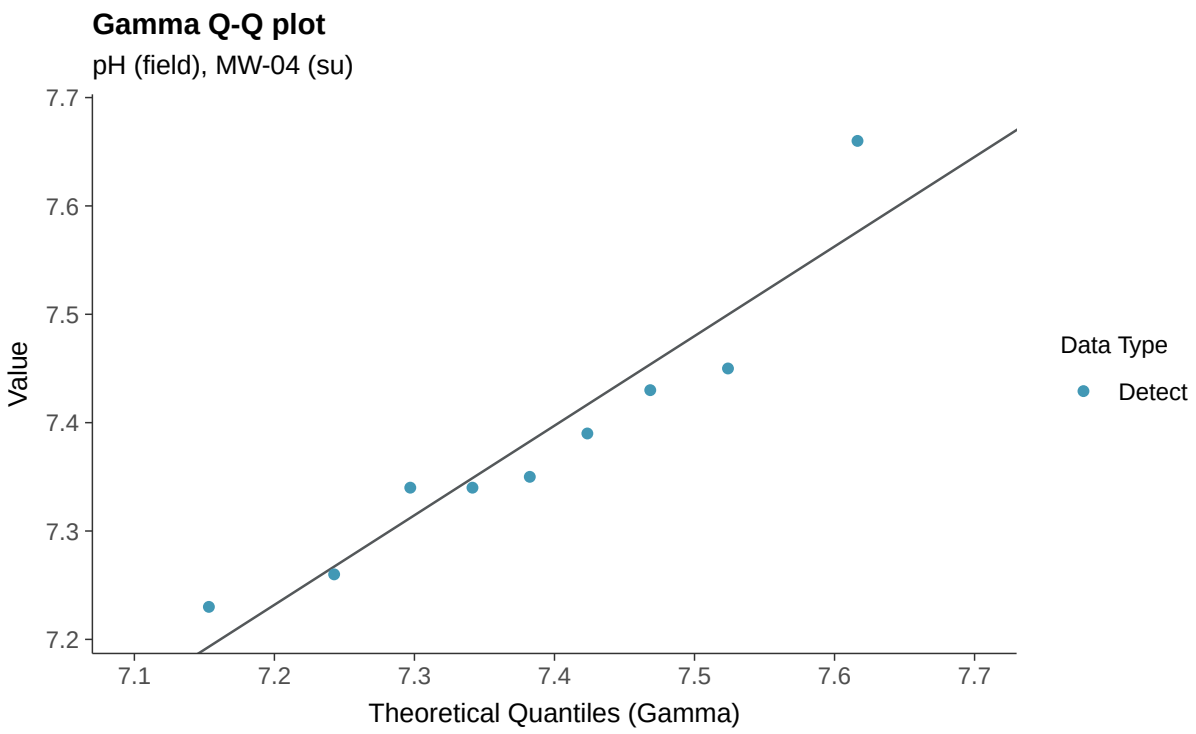
Boxplot by Season

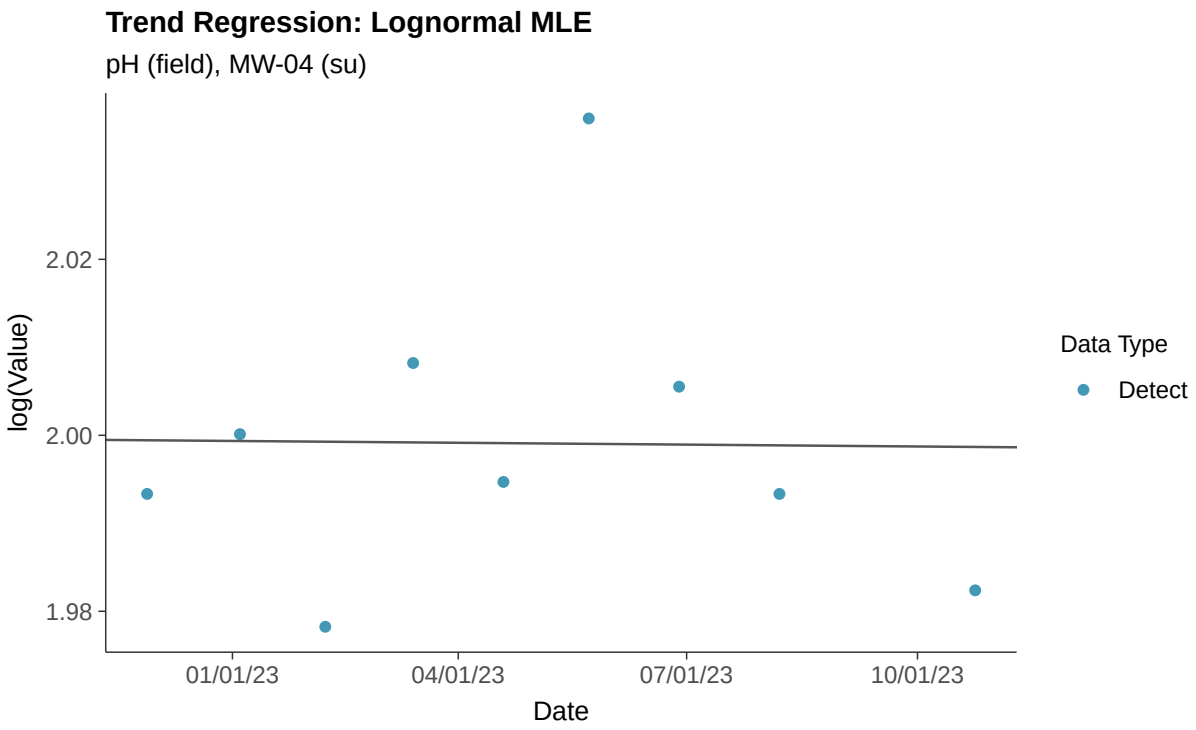
pH (field), MW-04 (su)

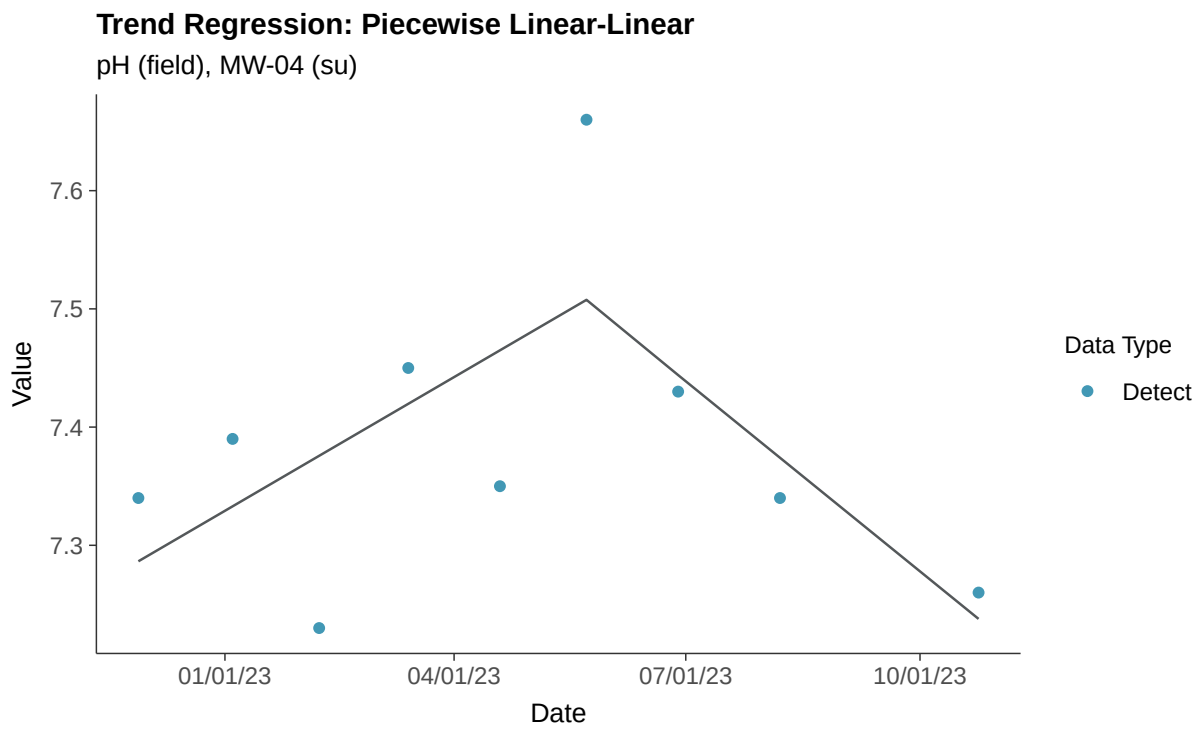



Normal Q-Q plot
pH (field), MW-04 (su)
Value
7.7
7.6
7.5
7.4
7.3
7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
pH (field), MW-04 (su)
log(Value)
2.04
2.02
2.00
1.98
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

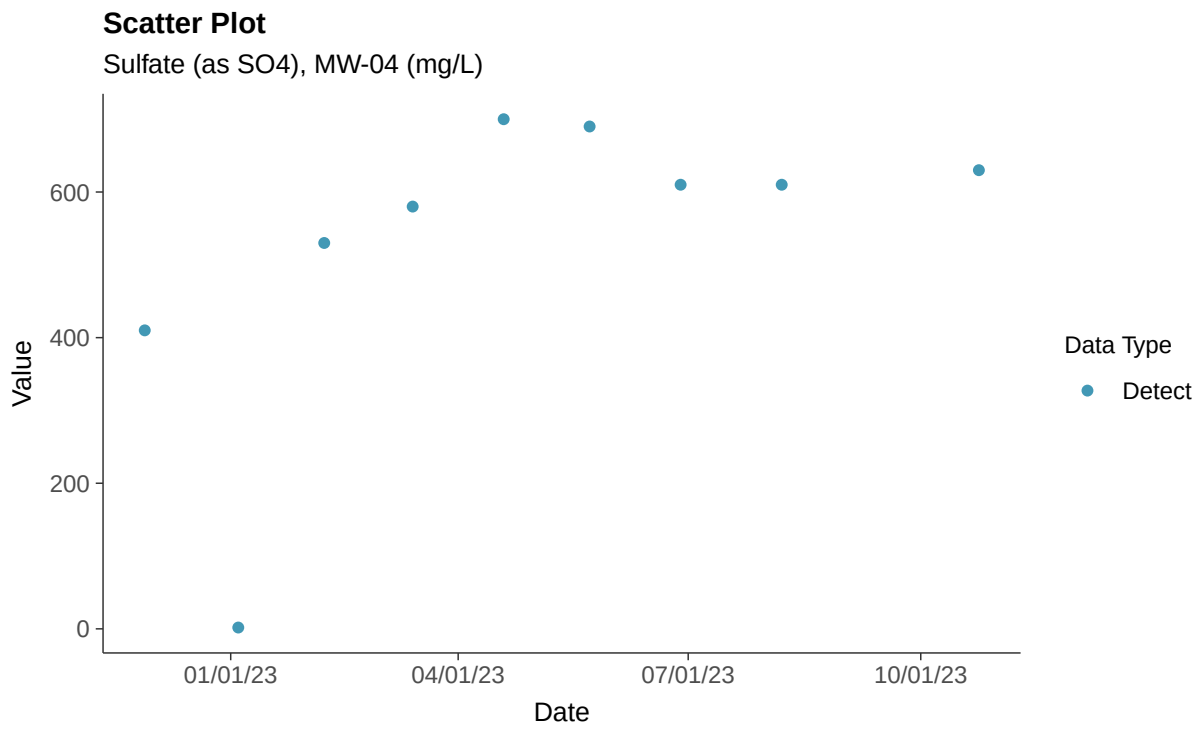

Gamma Q-Q plot
pH (field), MW-04 (su)
Value
7.7
7.6
7.5
7.4
7.3
7.2
7.1
7.2
7.3
7.4
7.5
7.6
7.7
Theoretical Quantiles (Gamma)
Data Type
Detect

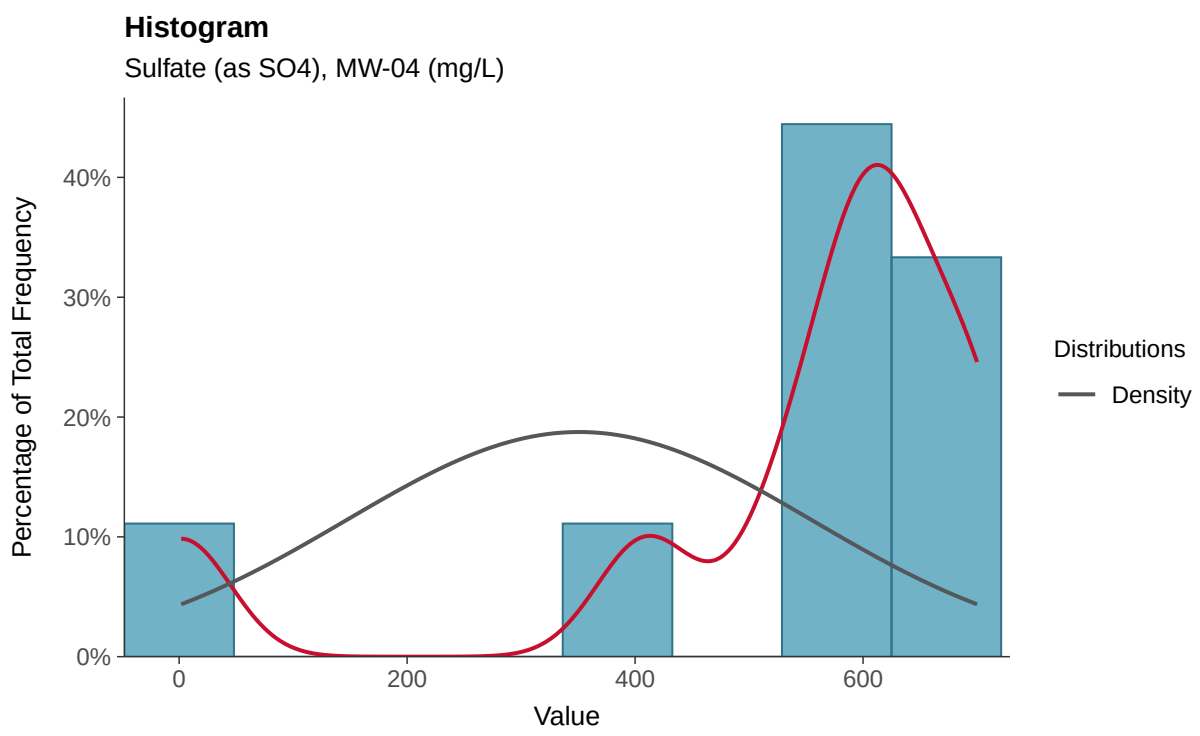

Trend Regression: Lognormal MLE
pH (field), MW-04 (su)
log(Value)
2.02
2.00
1.98
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-04 (su)
Value
7.6
7.5
7.4
7.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-04

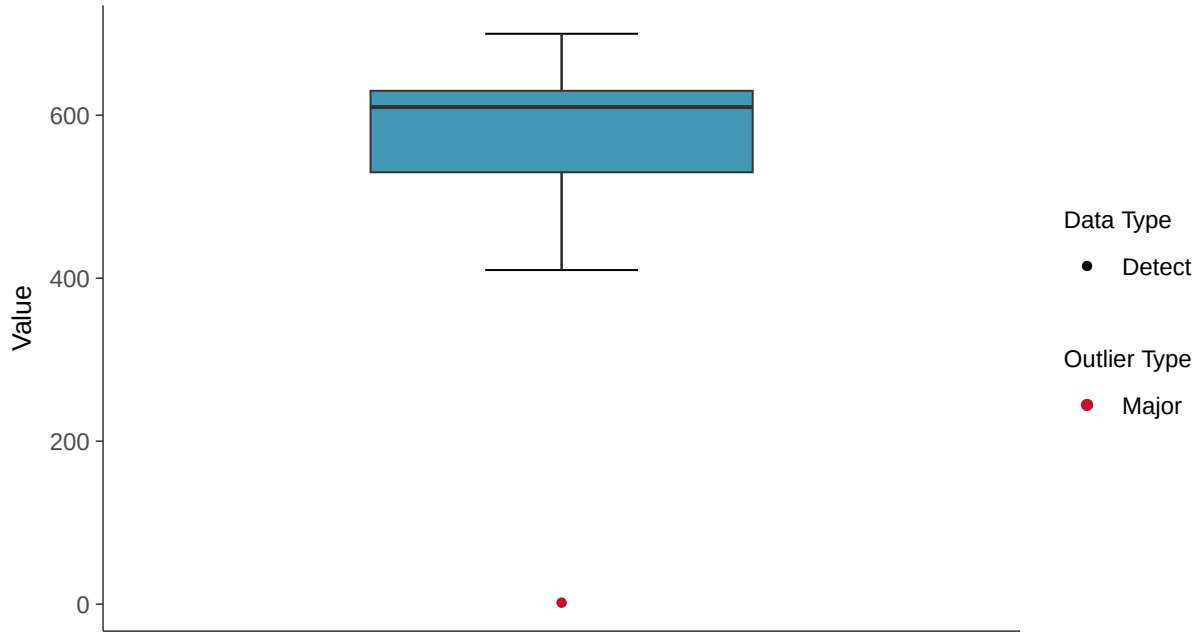
ID: 2_14_4_124





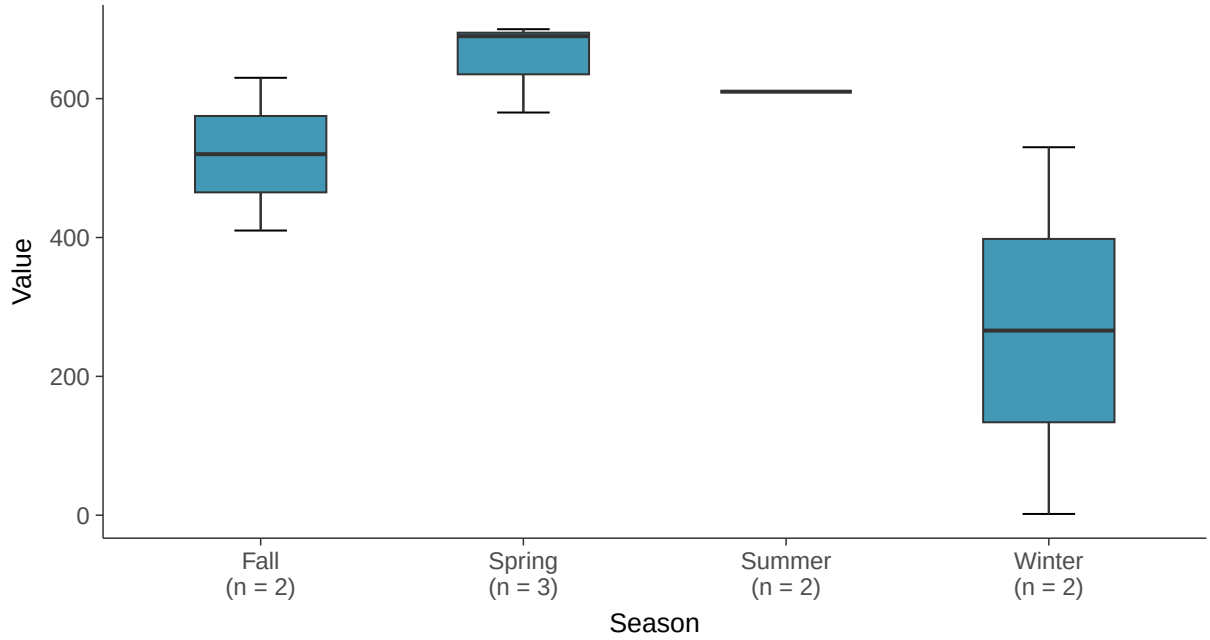
Boxplot

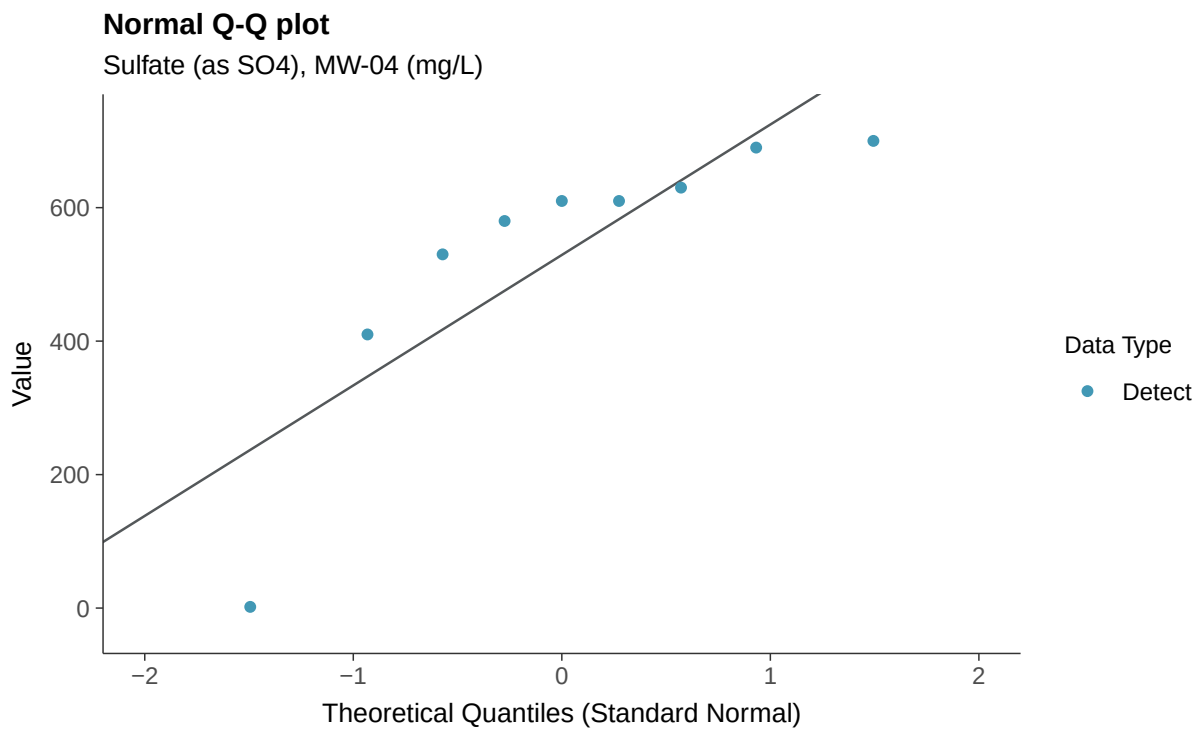
Sulfate (as SO4), MW-04 (mg/L)

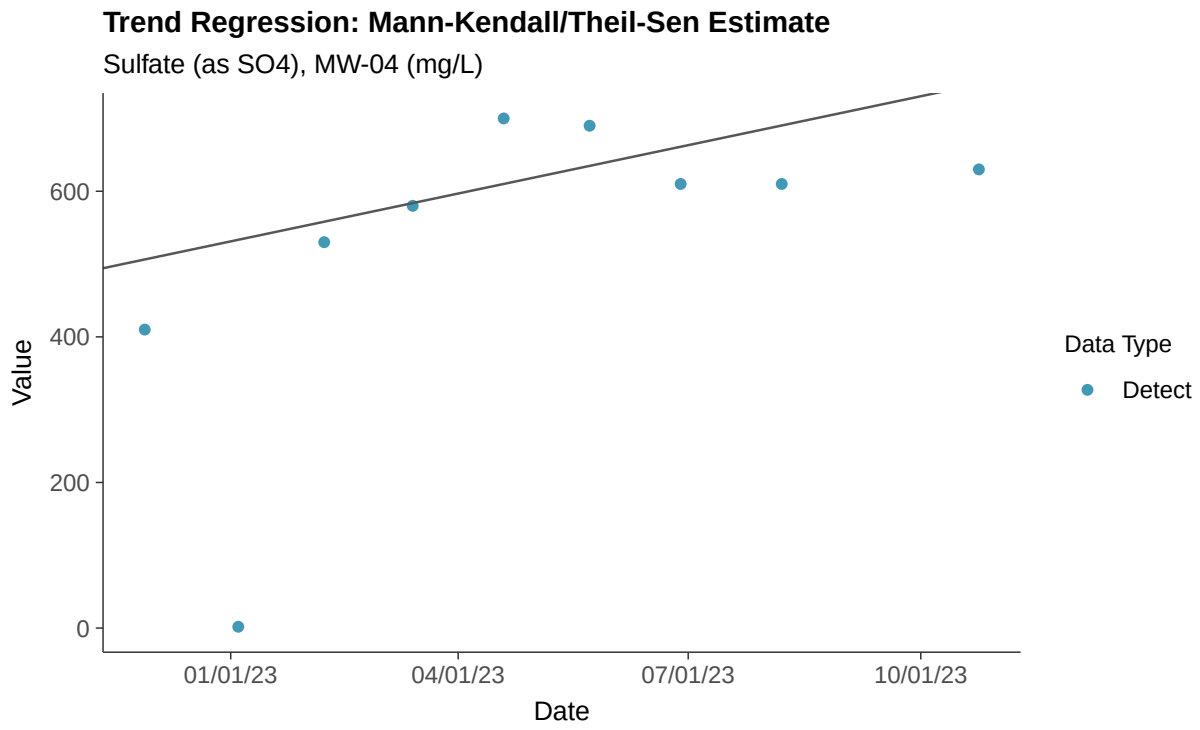


Boxplot by Season

Sulfate (as SO4), MW-04 (mg/L)

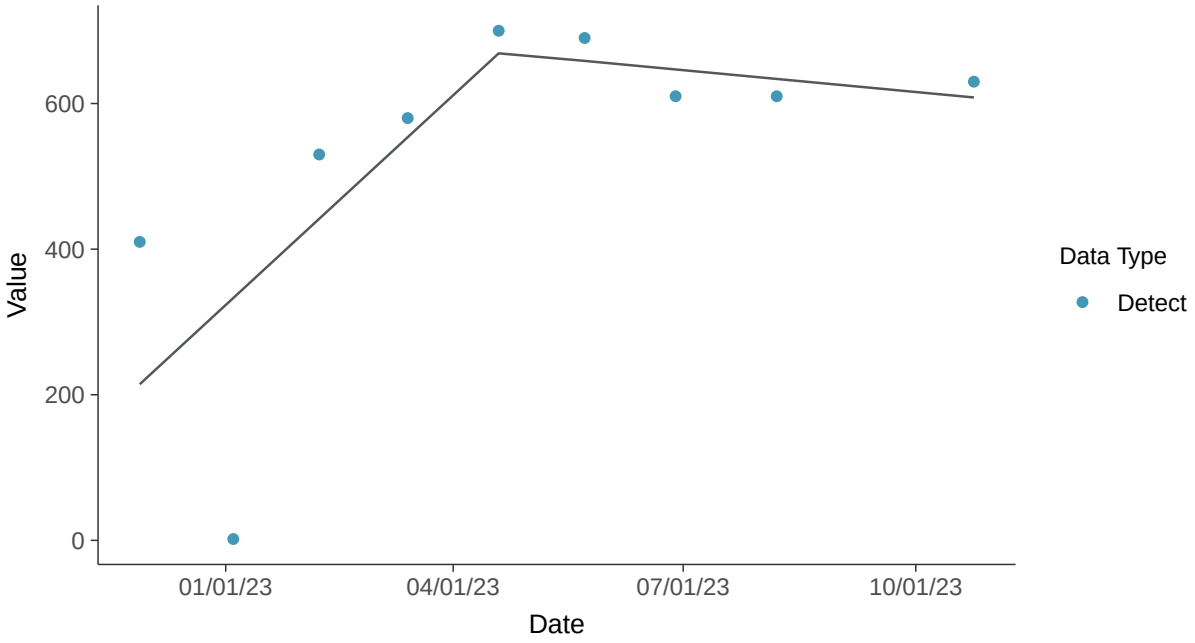



Normal Q-Q plot
Sulfate (as SO4), MW-04 (mg/L)
Value
600
400
200
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Sulfate (as SO4), MW-04 (mg/L)
Value
600
400
200
0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

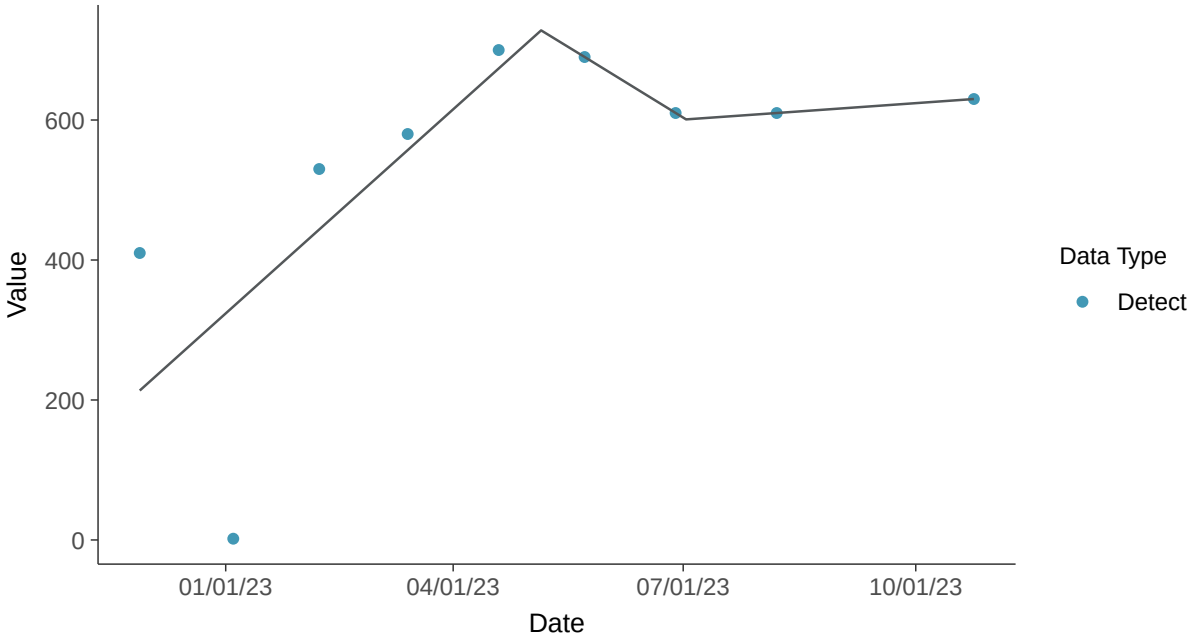
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-04 (mg/L)



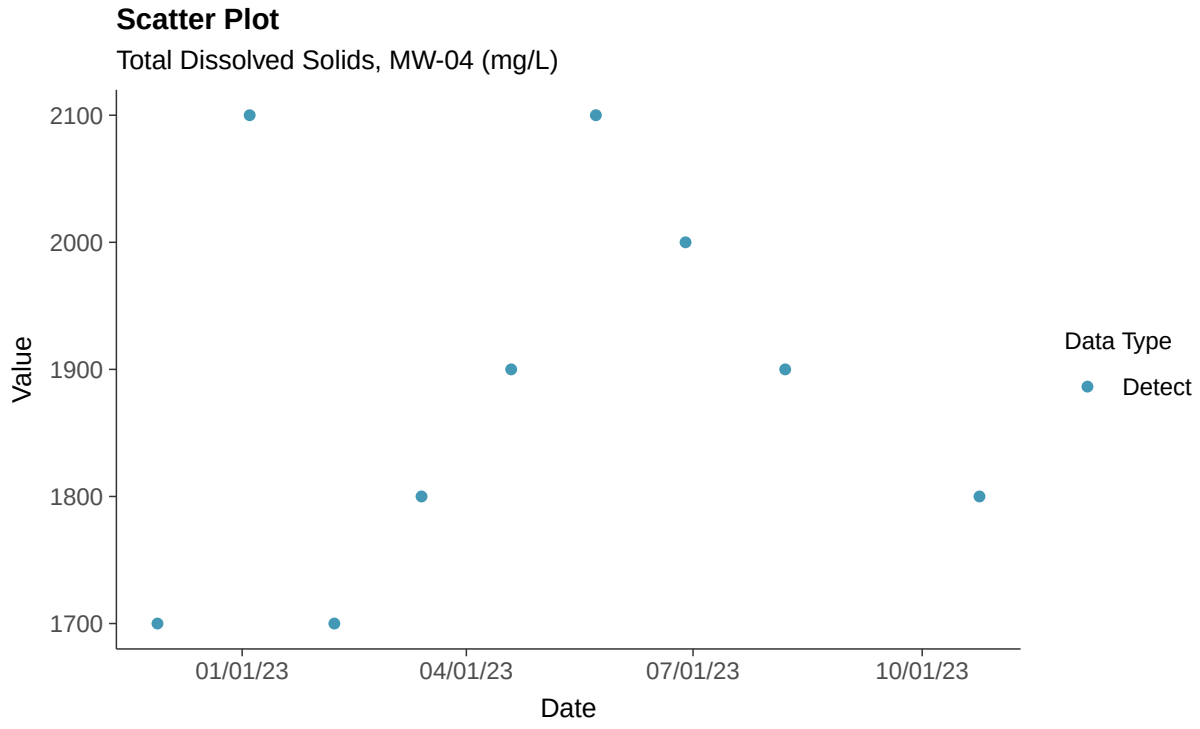
Trend Regression: Piecewise Linear-Linear-Linear

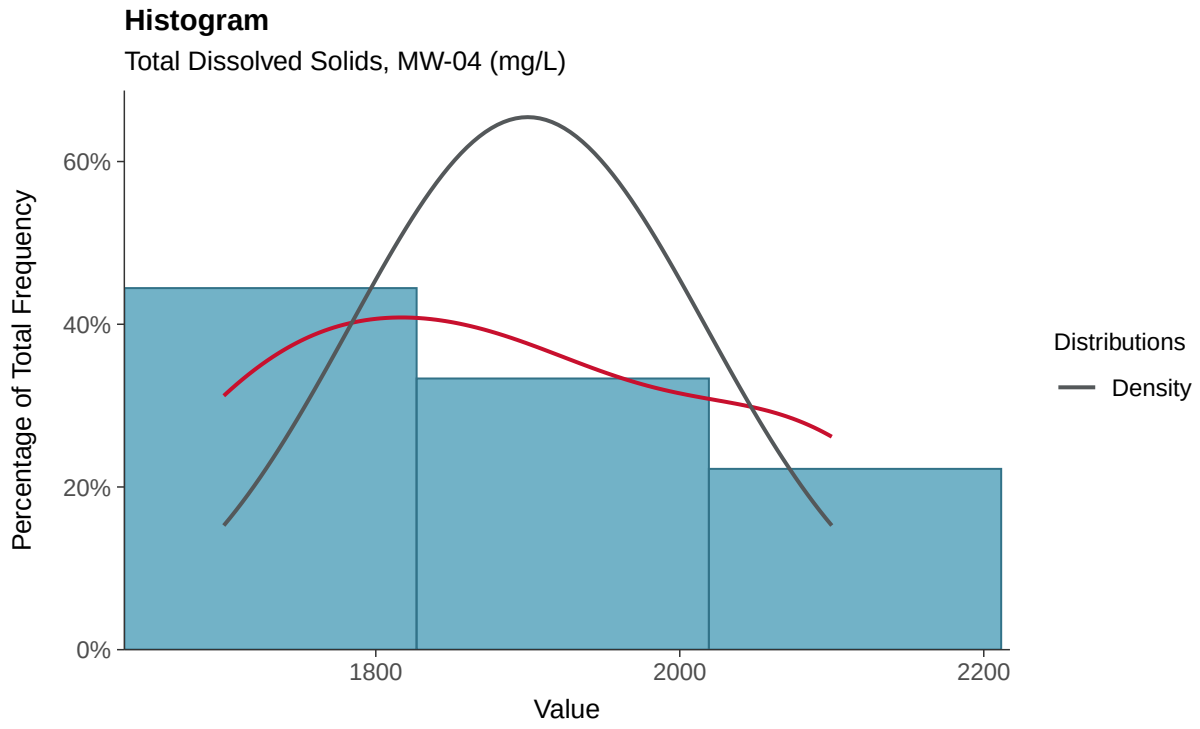
Sulfate (as SO4), MW-04 (mg/L)



Appendix III: Total Dissolved Solids, MW-04

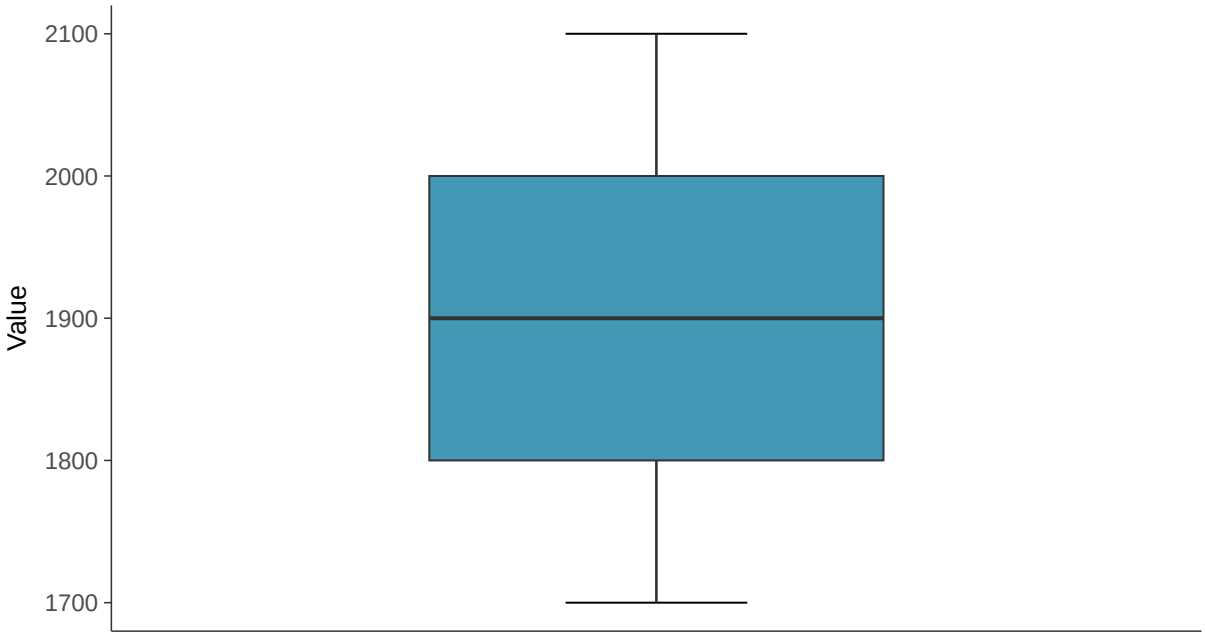
ID: 2_14_4_126





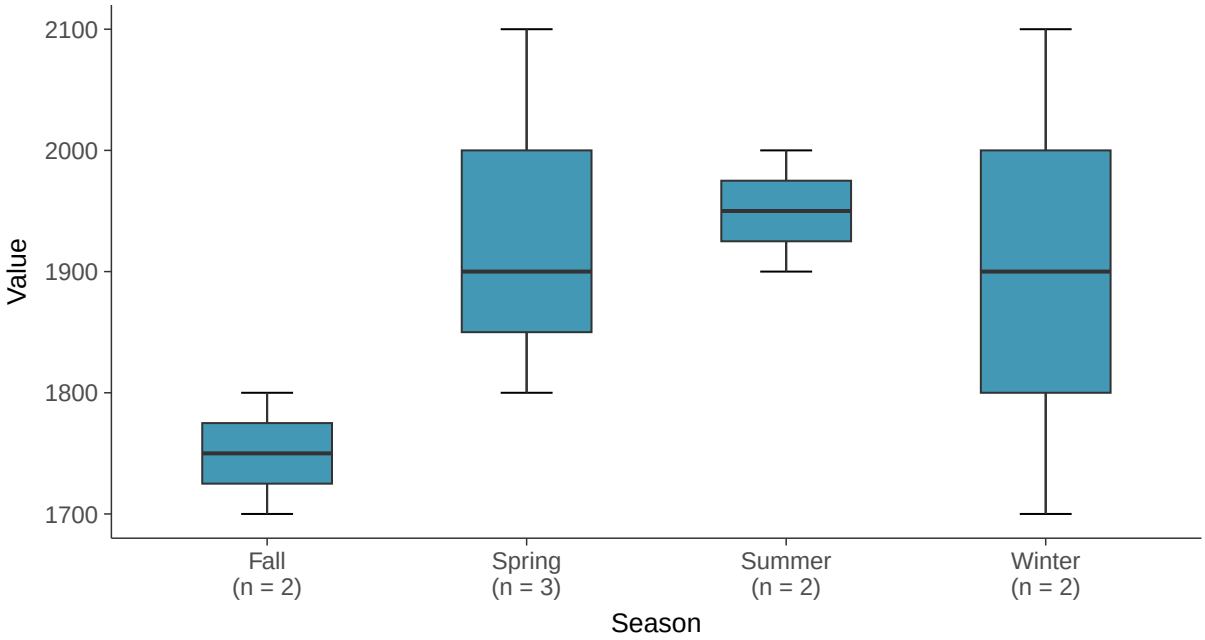
Boxplot

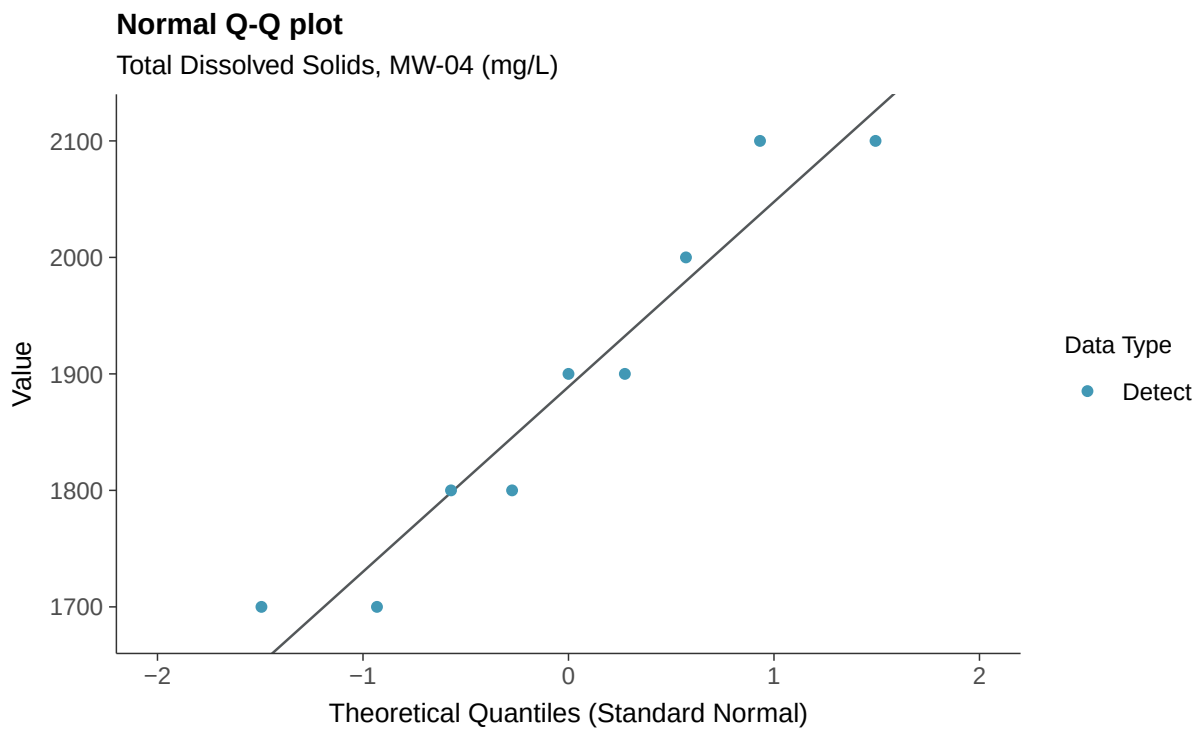
Total Dissolved Solids, MW-04 (mg/L)

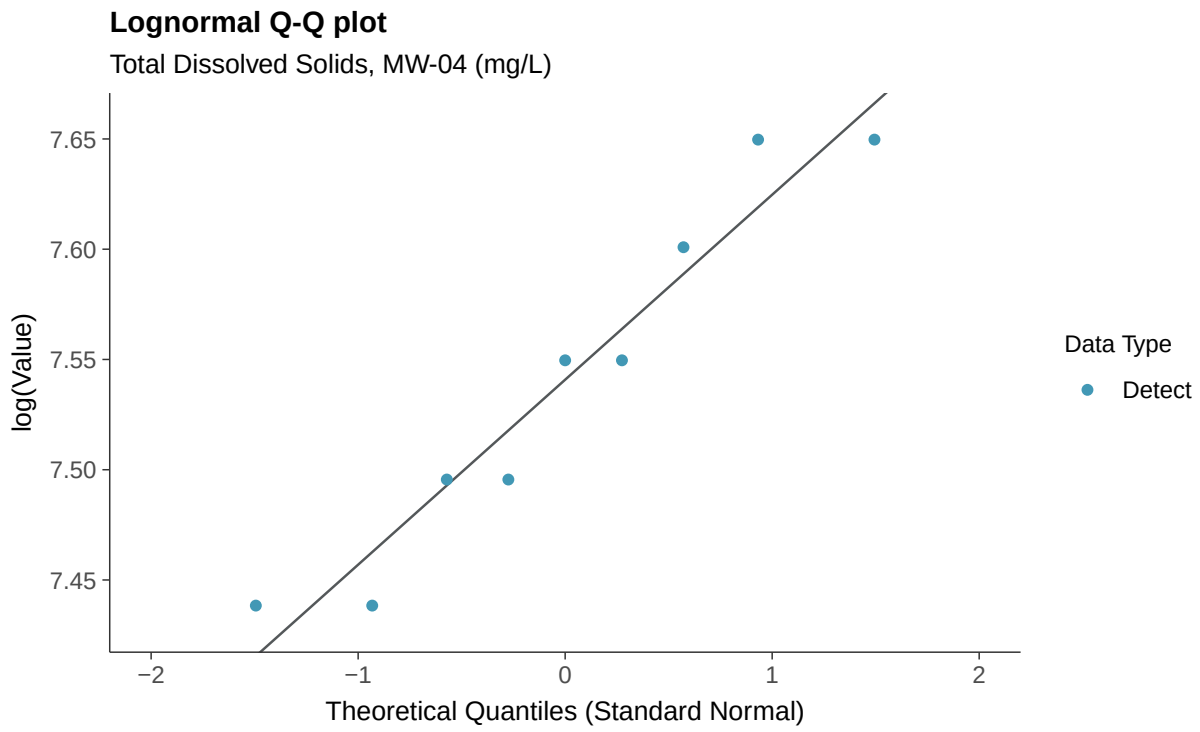


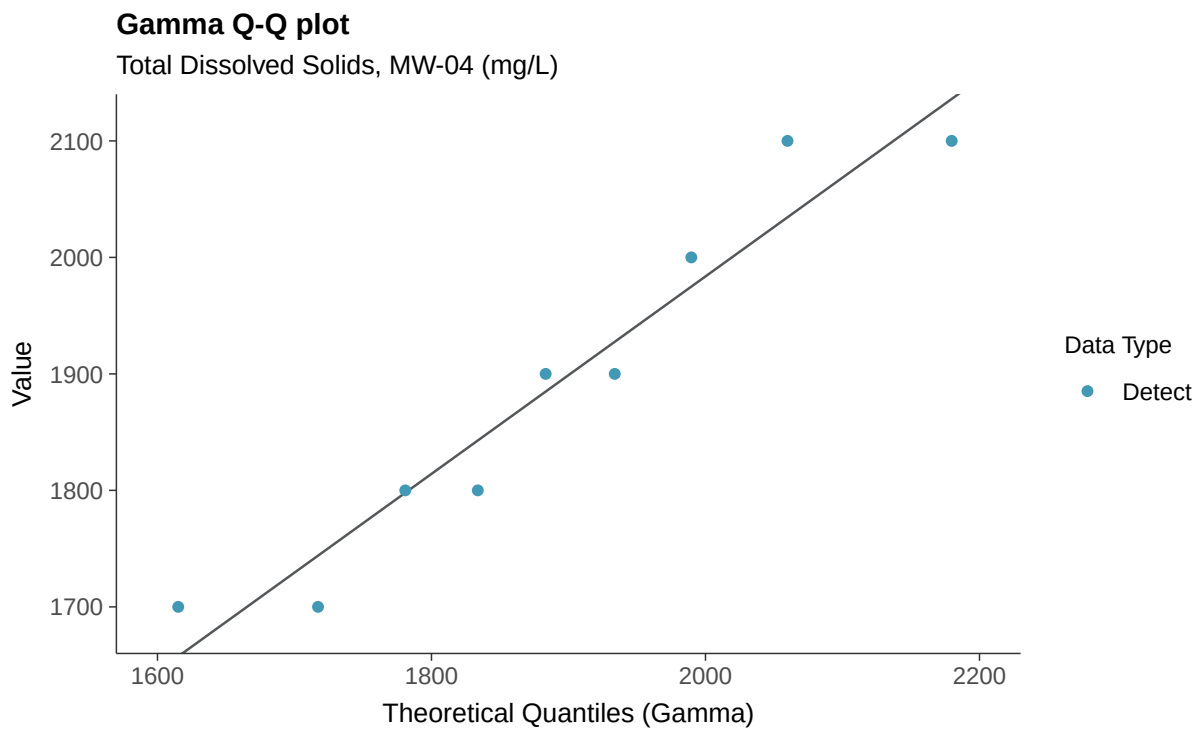
Boxplot by Season

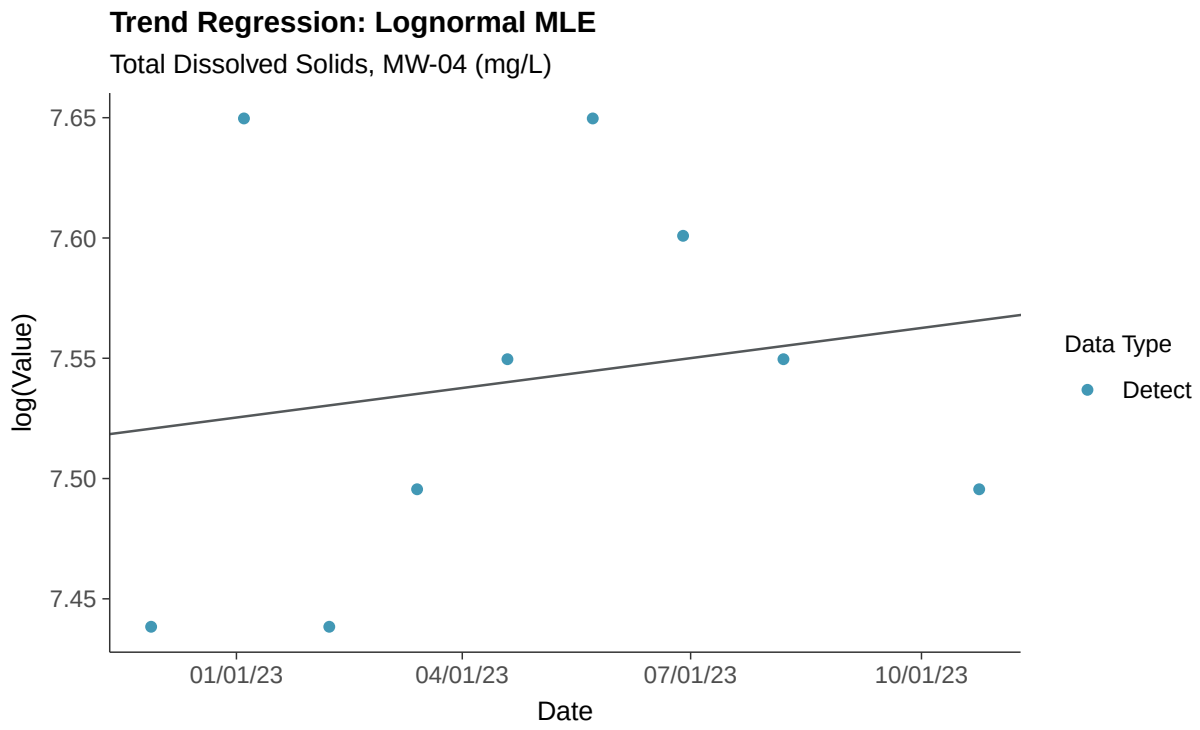
Total Dissolved Solids, MW-04 (mg/L)

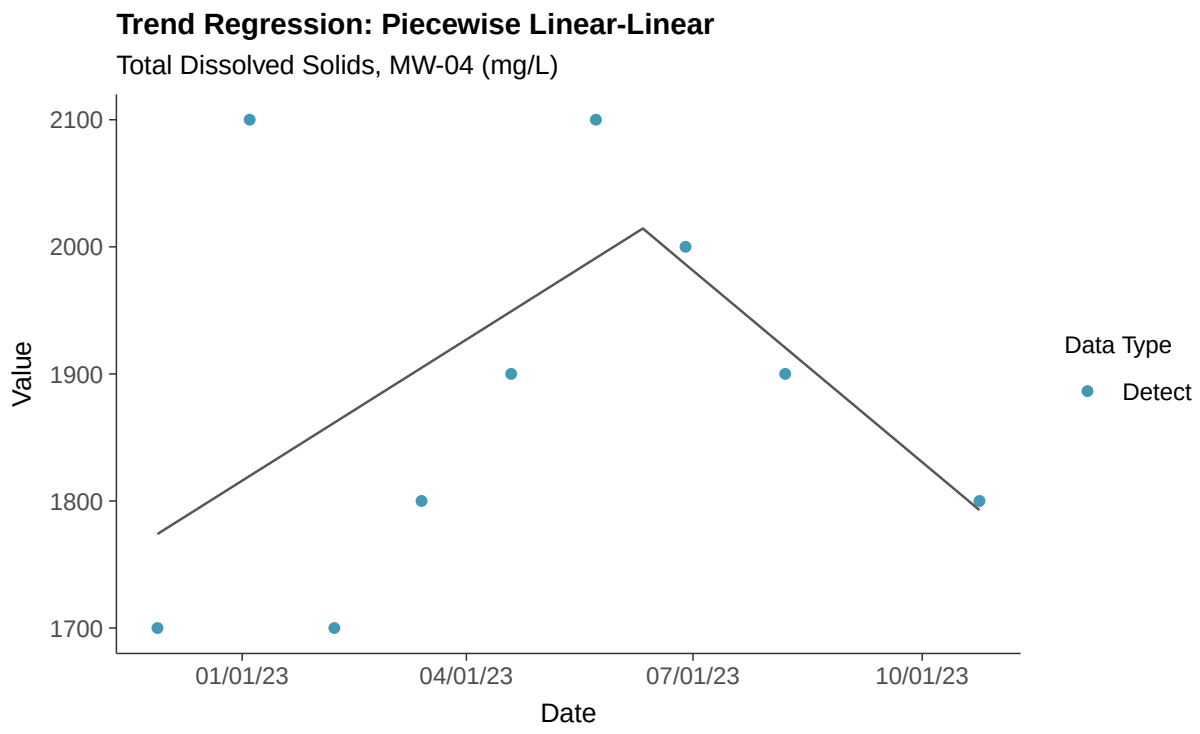



Normal Q-Q plot
Total Dissolved Solids, MW-04 (mg/L)
Value
2100
2000
1900
1800
1700
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Total Dissolved Solids, MW-04 (mg/L)
log(Value)
7.65
7.60
7.55
7.50
7.45
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

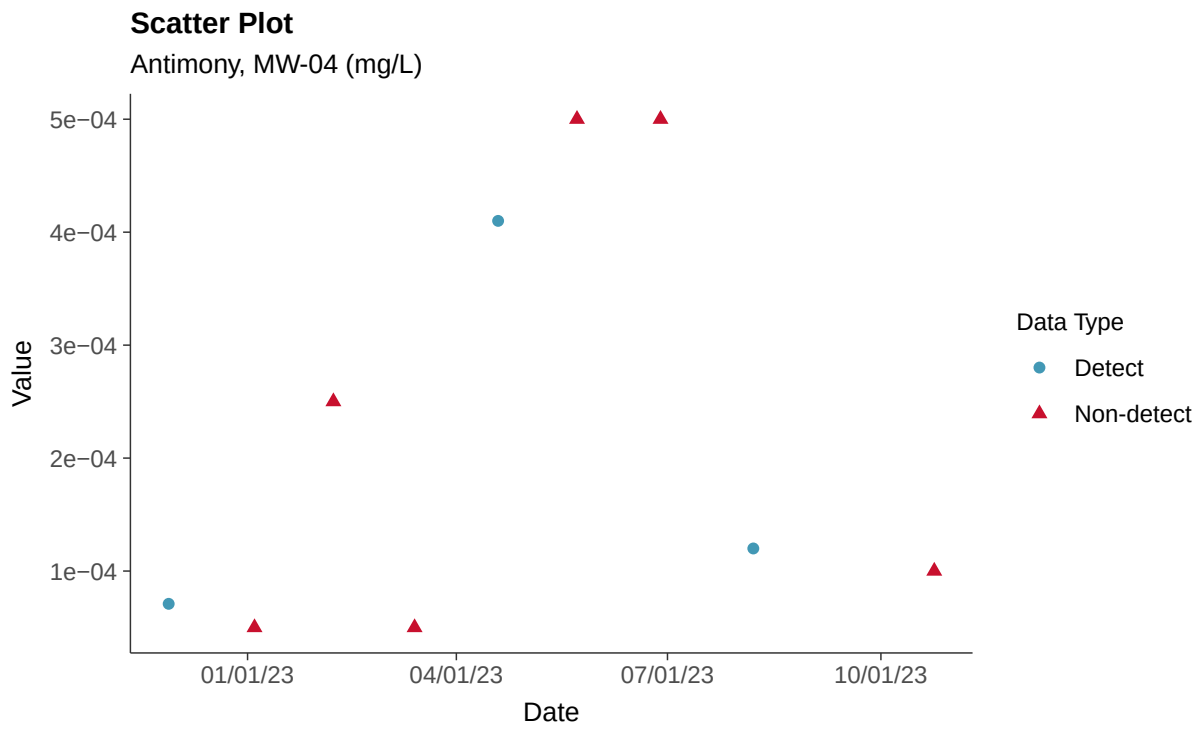

Gamma Q-Q plot
Total Dissolved Solids, MW-04 (mg/L)
Value
2100
2000
1900
1800
1700
1600
1800
2000
2200
Theoretical Quantiles (Gamma)
Data Type
Detect

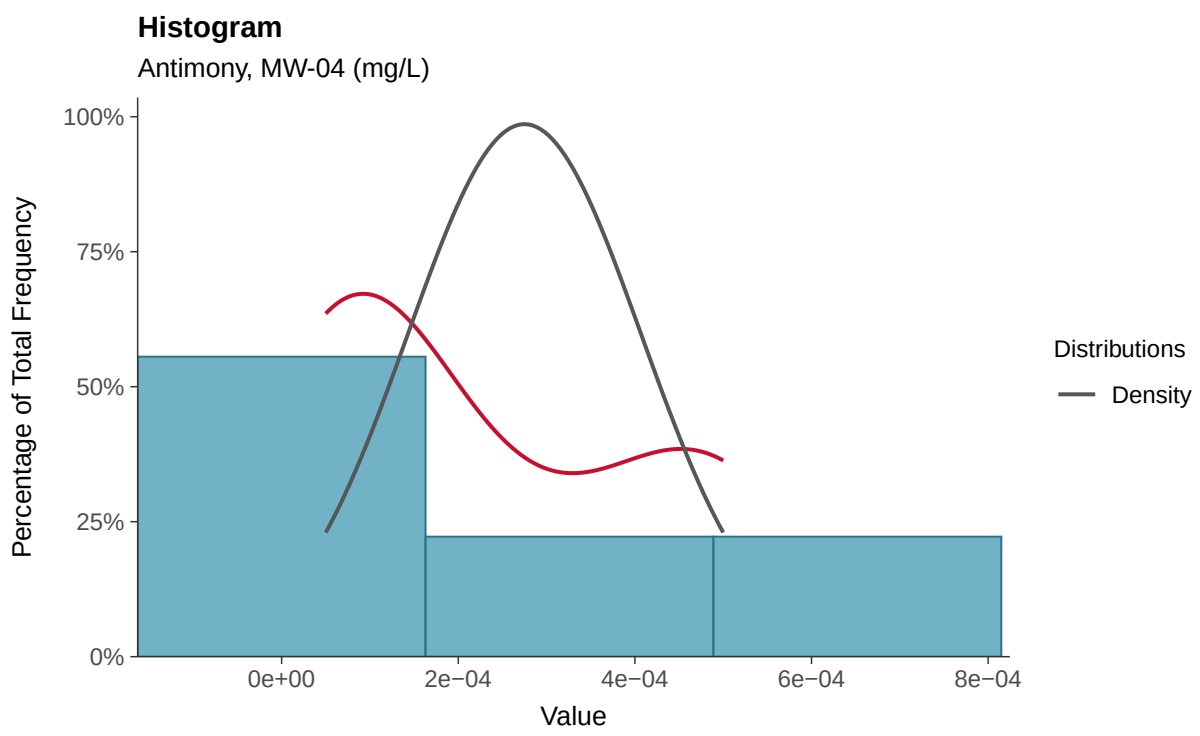

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-04 (mg/L)
log(Value)
7.65
7.60
7.55
7.50
7.45
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-04 (mg/L)
2100
2000
1900
1800
1700
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-04

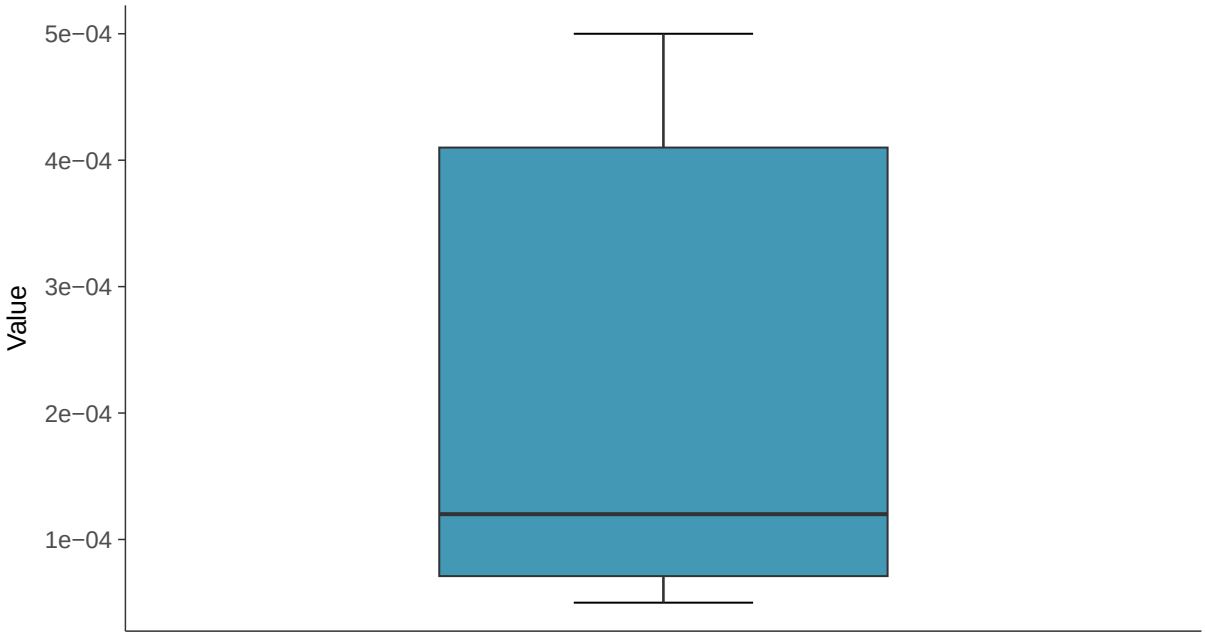
ID: 2_14_5_101





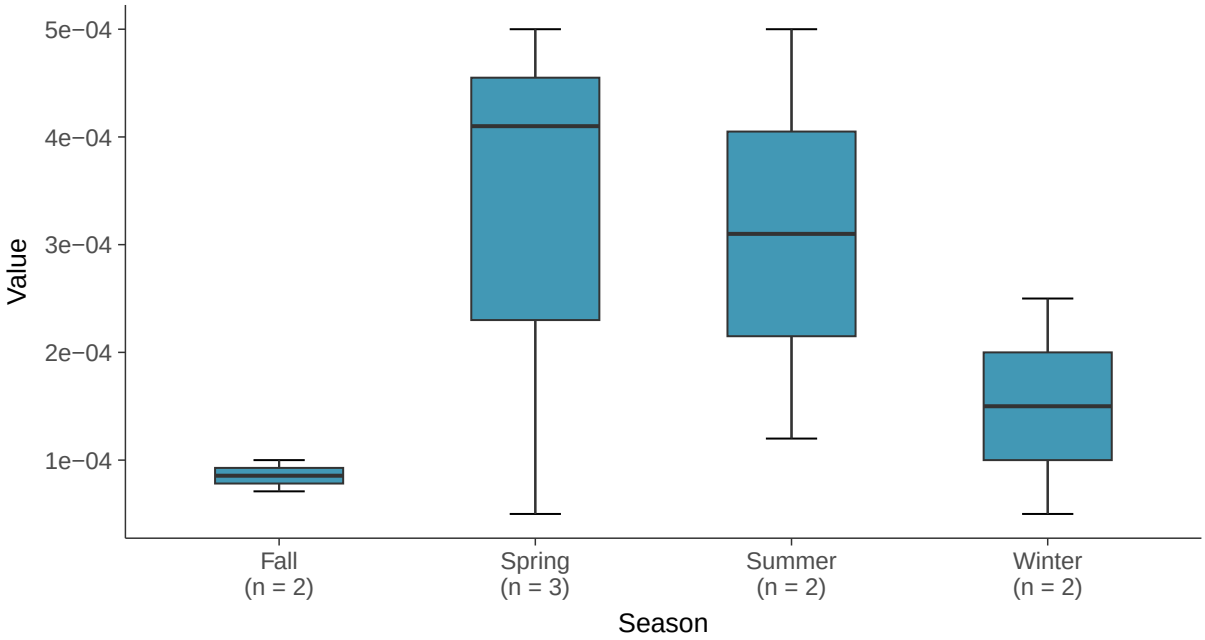
Boxplot

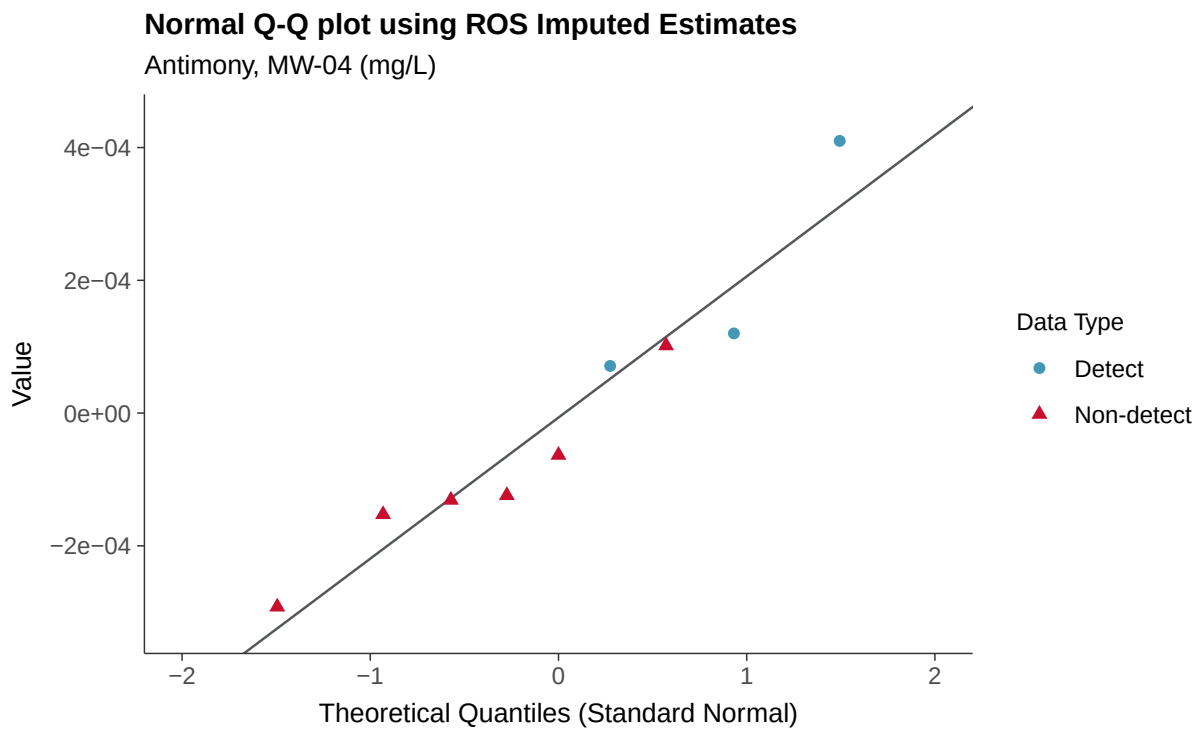
Antimony, MW-04 (mg/L)

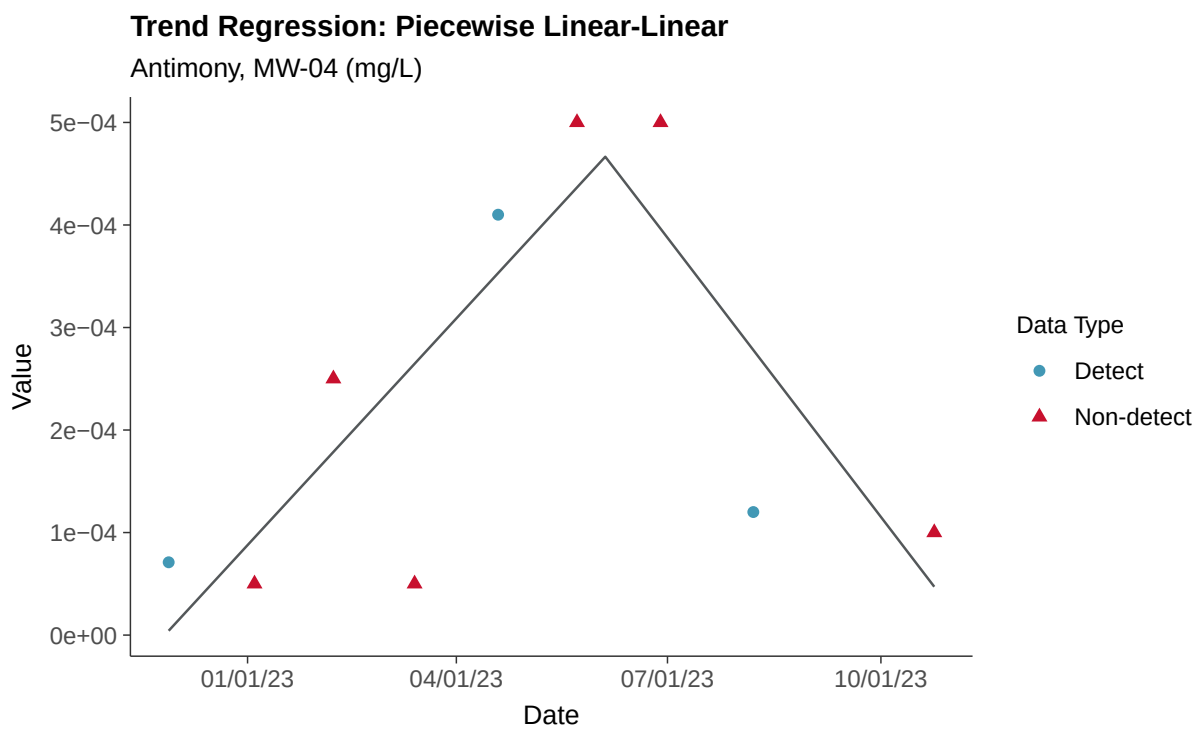


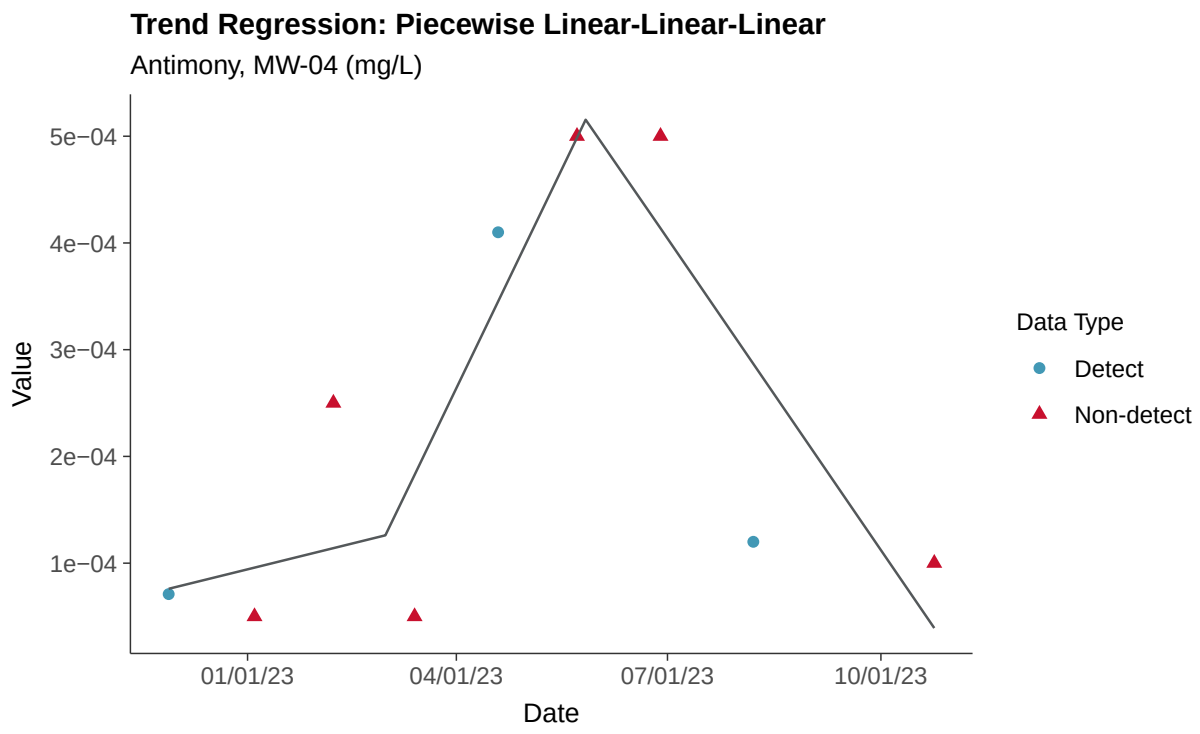
Boxplot by Season

Antimony, MW-04 (mg/L)



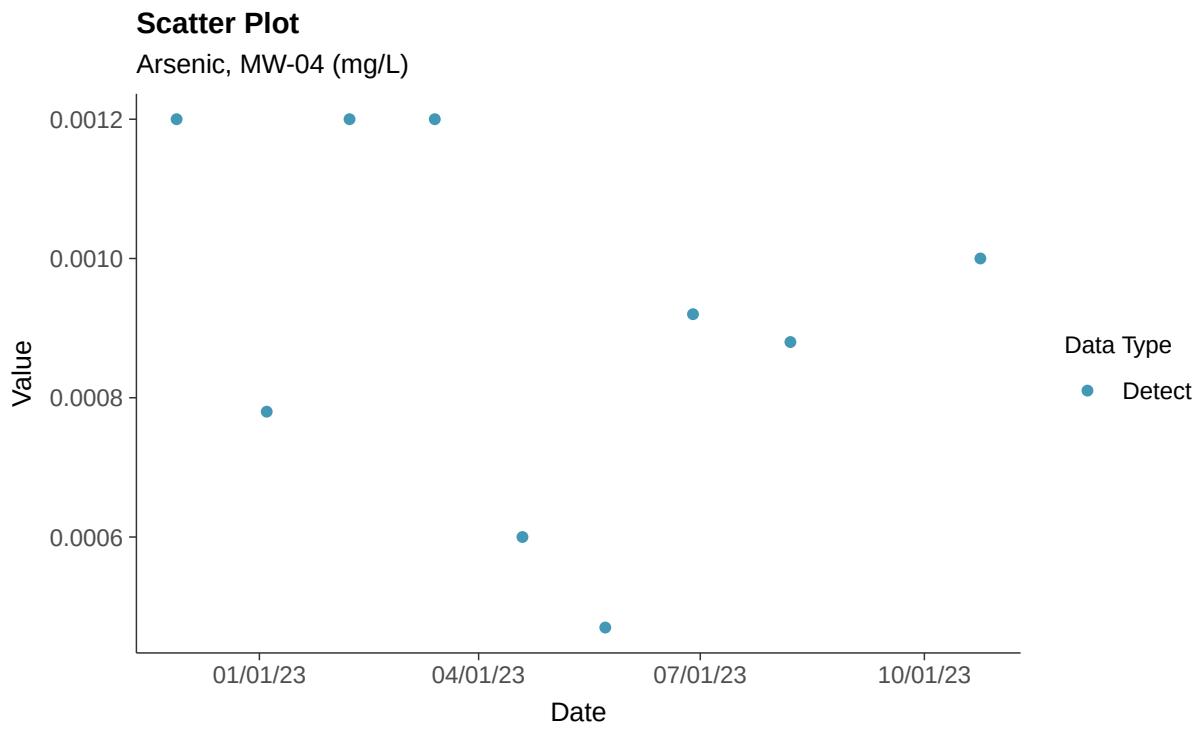

Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-04 (mg/L)
Value
4e−04
2e−04
0e+00
−2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

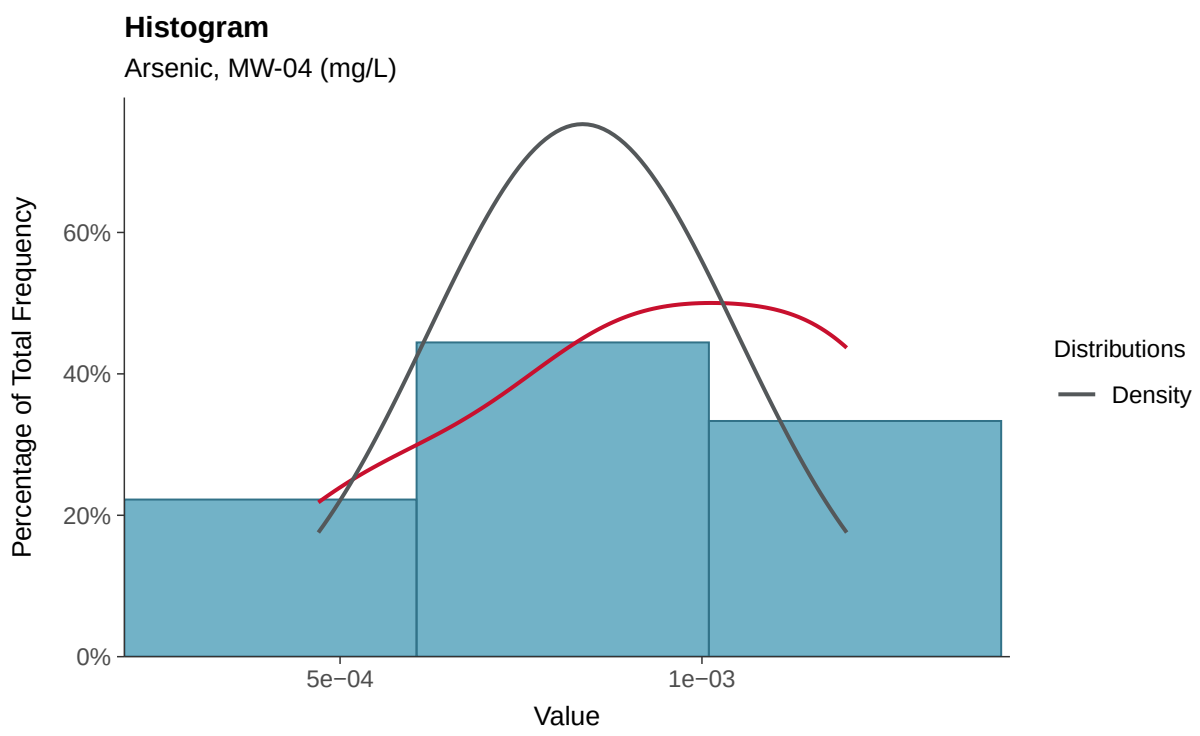

Trend Regression: Piecewise Linear-Linear
Antimony, MW-04 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-04 (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-04

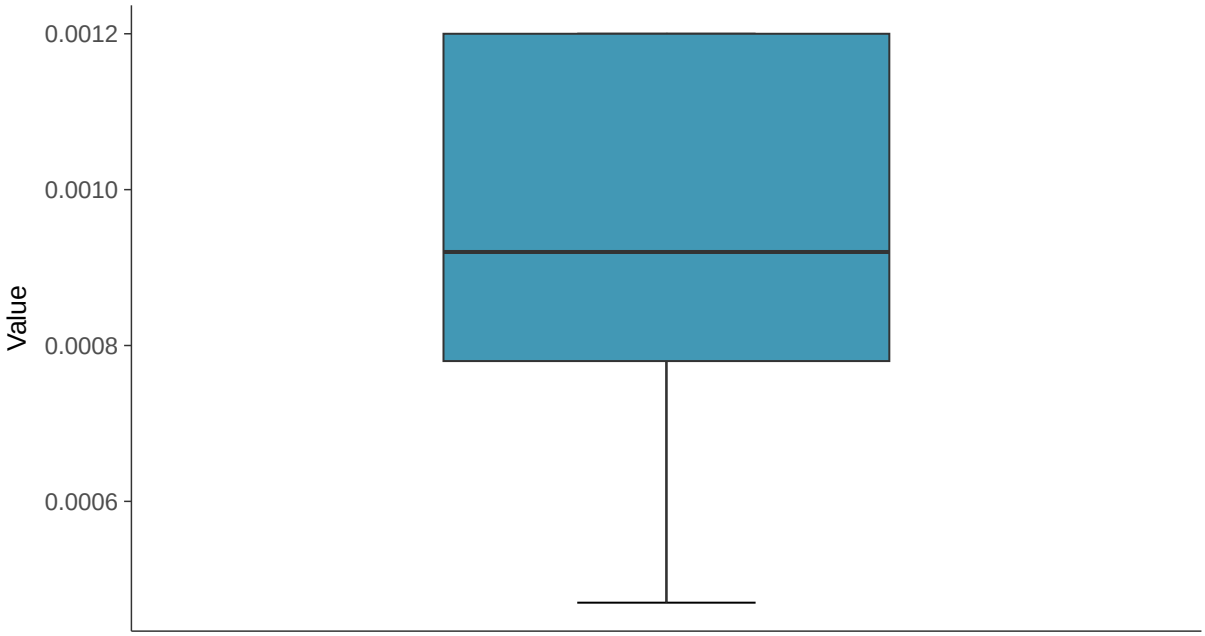
ID: 2_14_5_102





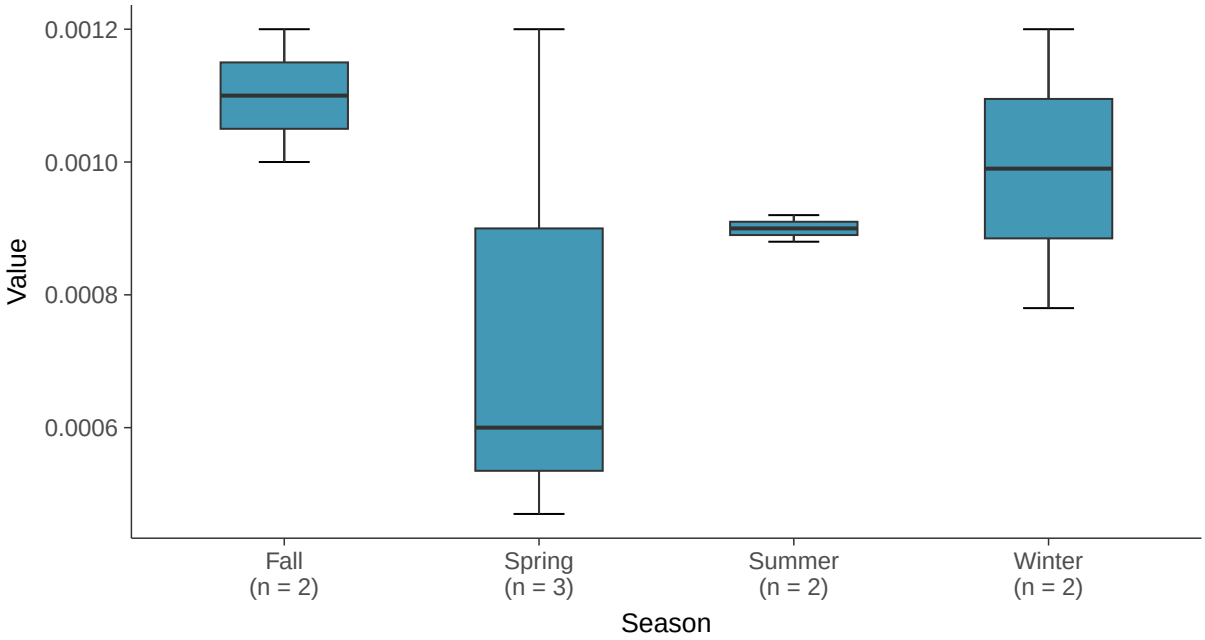
Boxplot

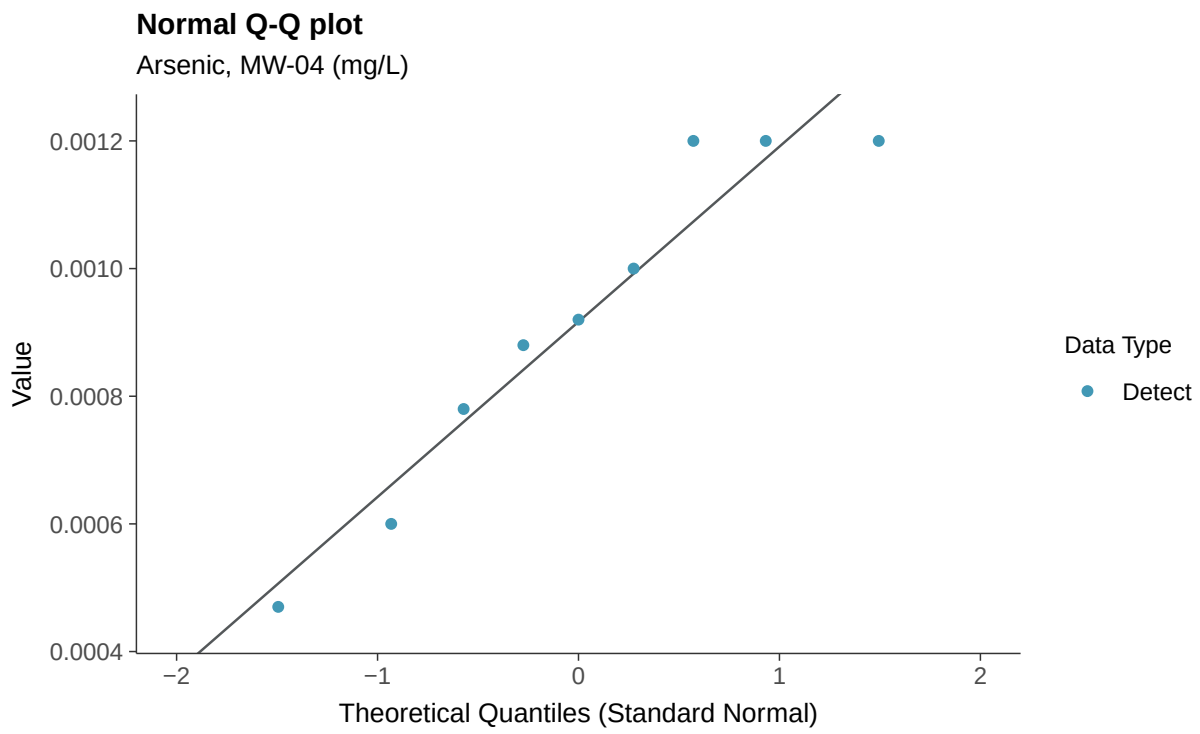
Arsenic, MW-04 (mg/L)

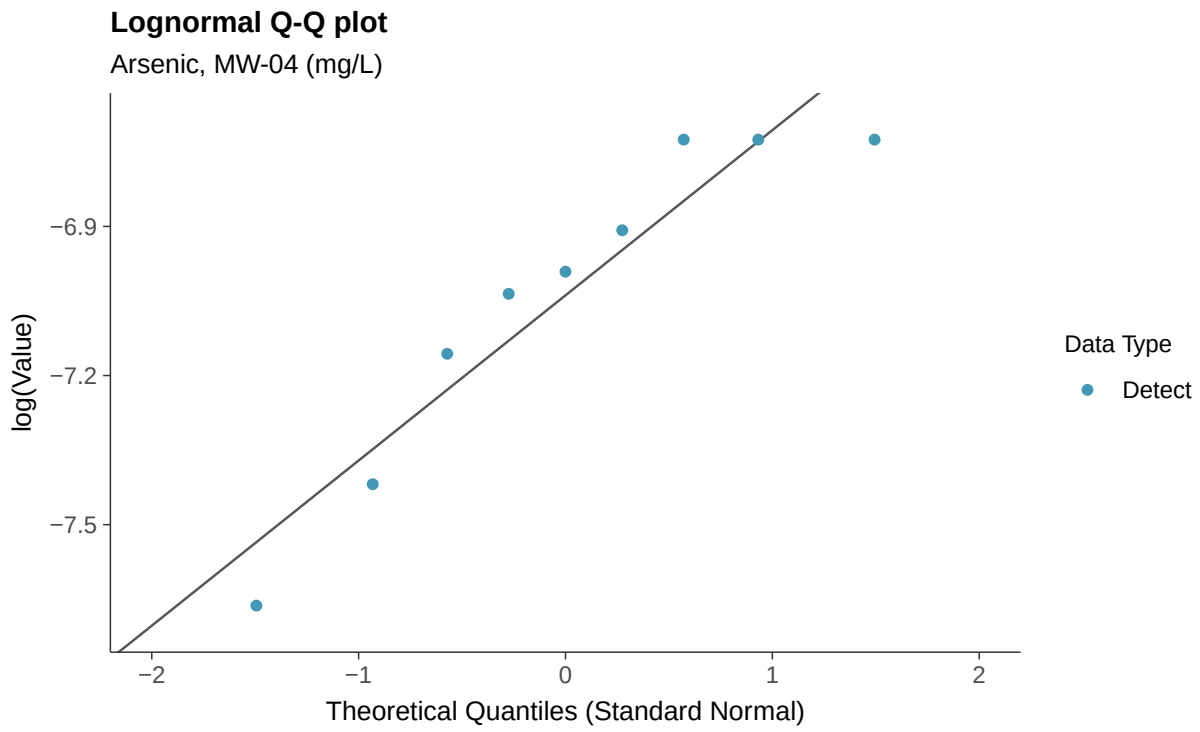


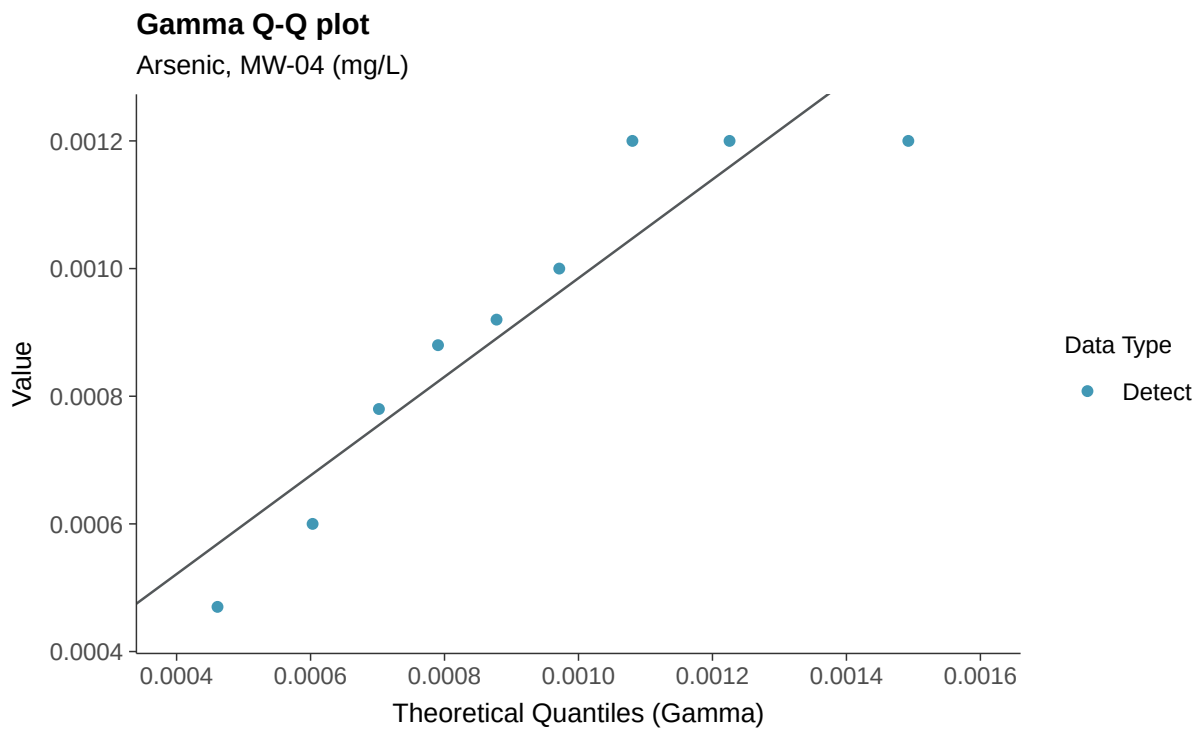
Boxplot by Season

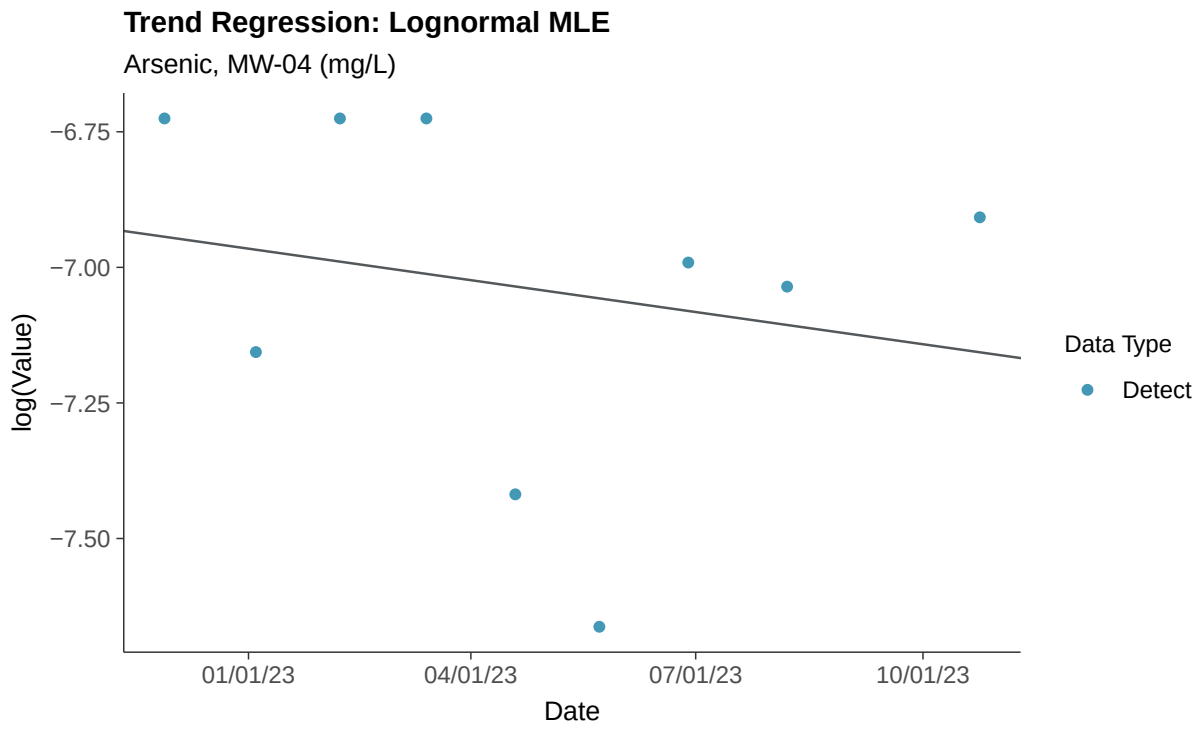
Arsenic, MW-04 (mg/L)

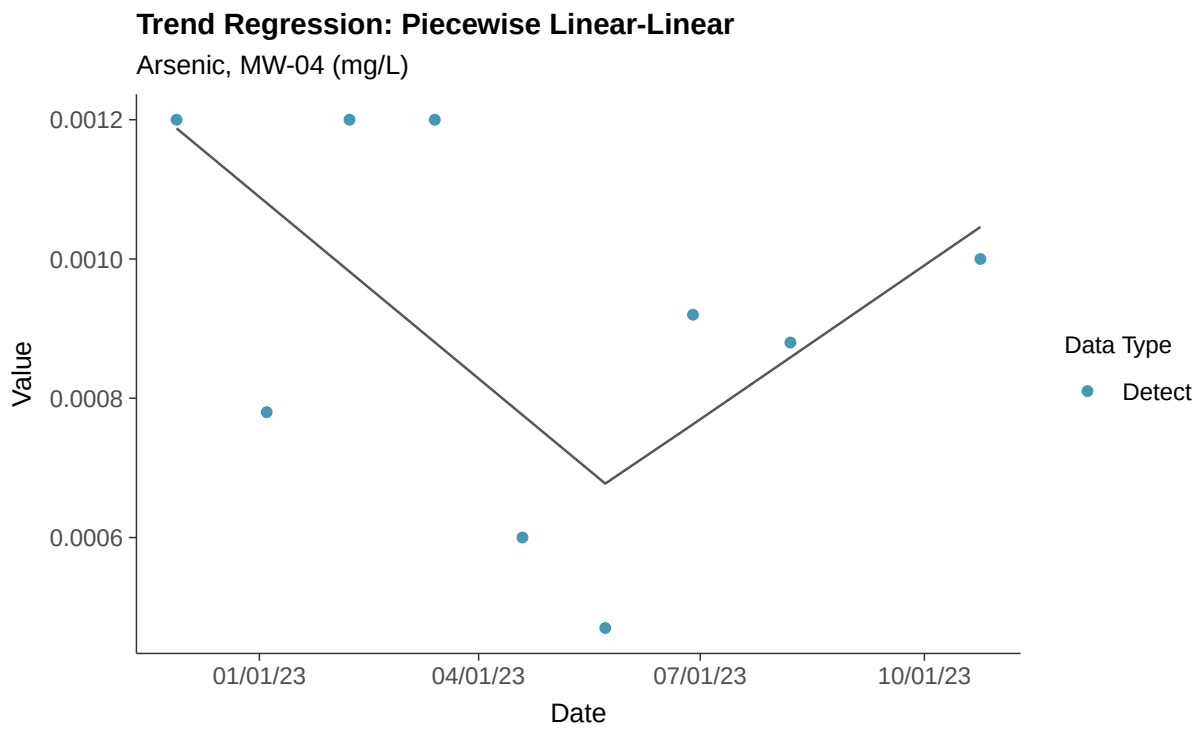


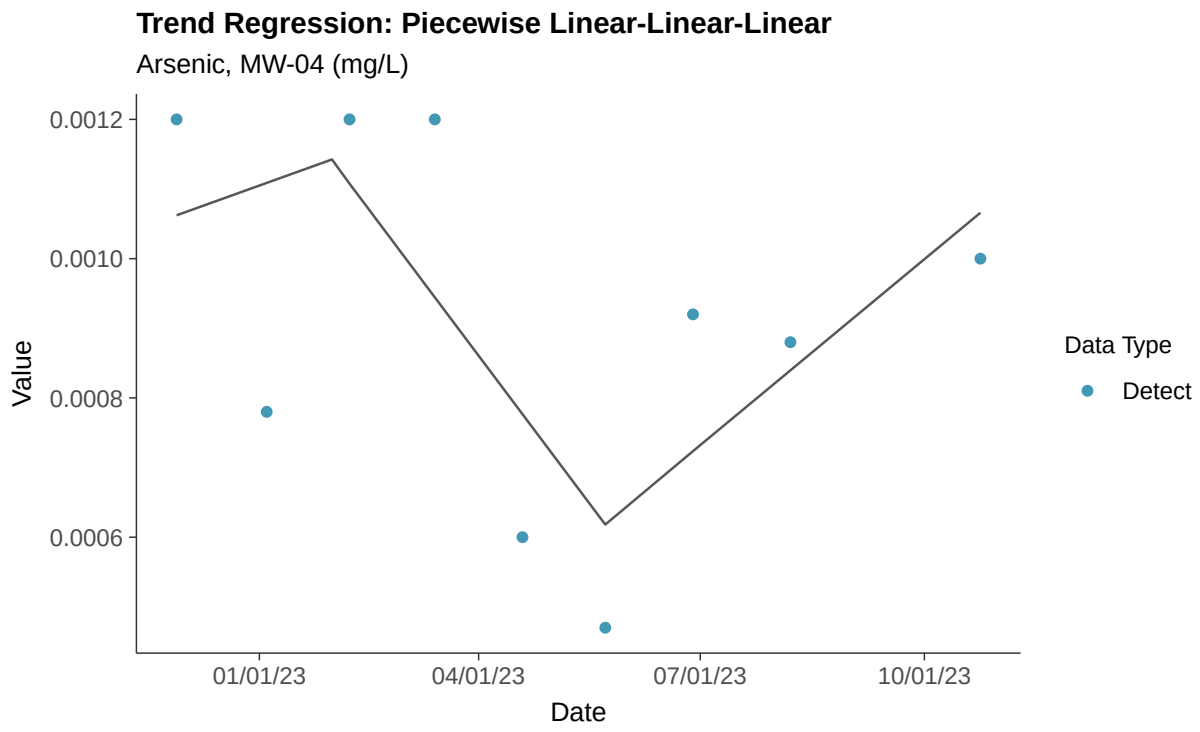

Normal Q-Q plot
Arsenic, MW-04 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
0.0004
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Arsenic, MW-04 (mg/L)
log(Value)
−6.9
−7.2
−7.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-04 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
0.0004
0.0004
0.0006
0.0008
0.0010
0.0012
0.0014
0.0016
Theoretical Quantiles (Gamma)
Data Type
Detect

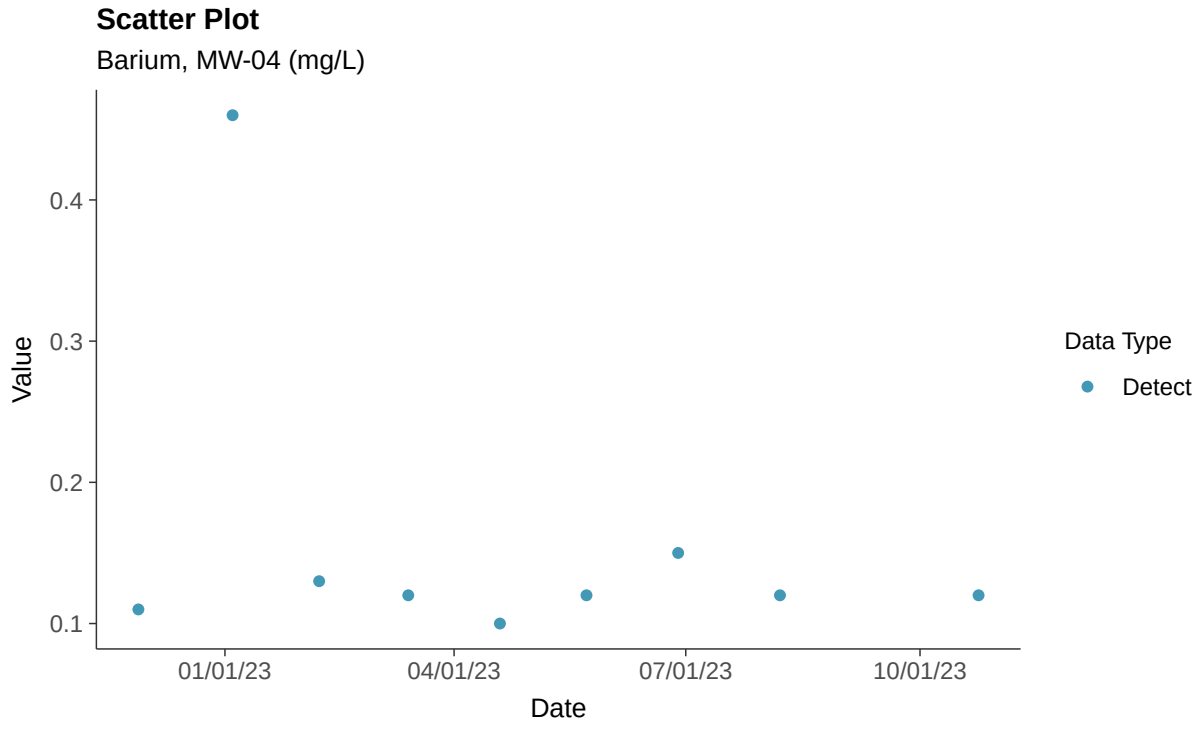

Trend Regression: Lognormal MLE
Arsenic, MW-04 (mg/L)
log(Value)
−6.75
−7.00
−7.25
−7.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

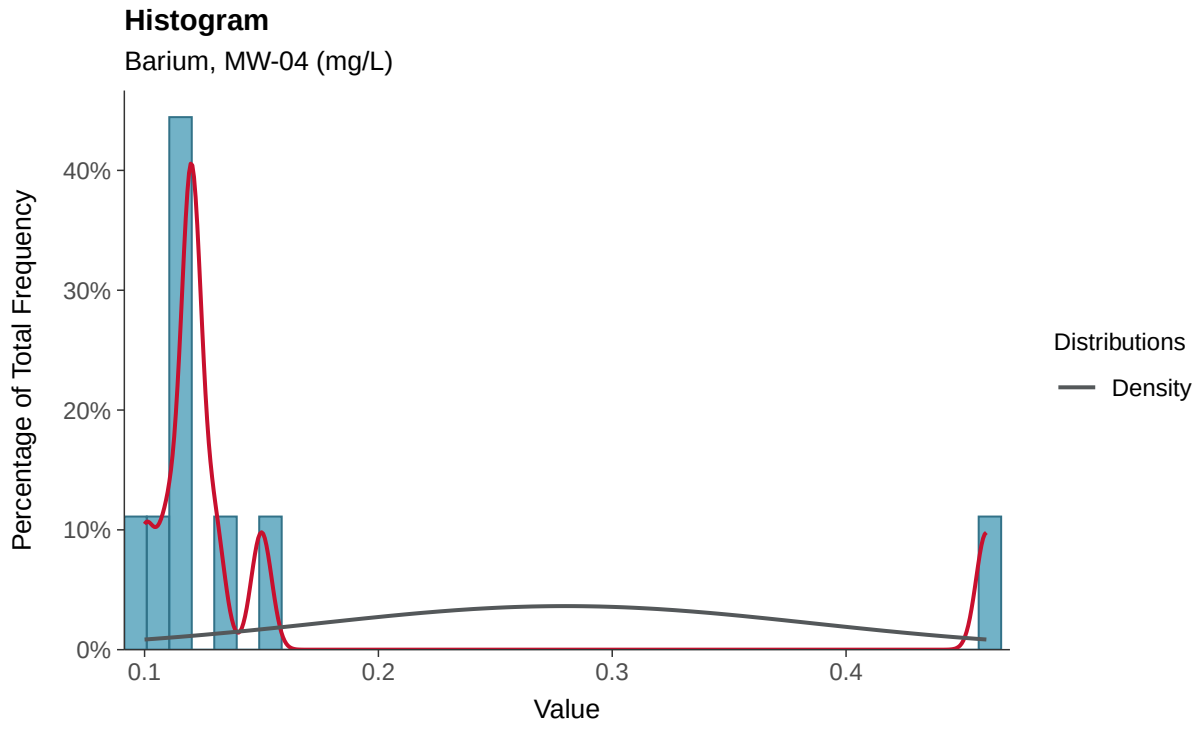

Trend Regression: Piecewise Linear-Linear
Arsenic, MW-04 (mg/L)
0.0012
0.0010
0.0008
0.0006
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Arsenic, MW-04 (mg/L)
0.0012
0.0010
0.0008
0.0006
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-04

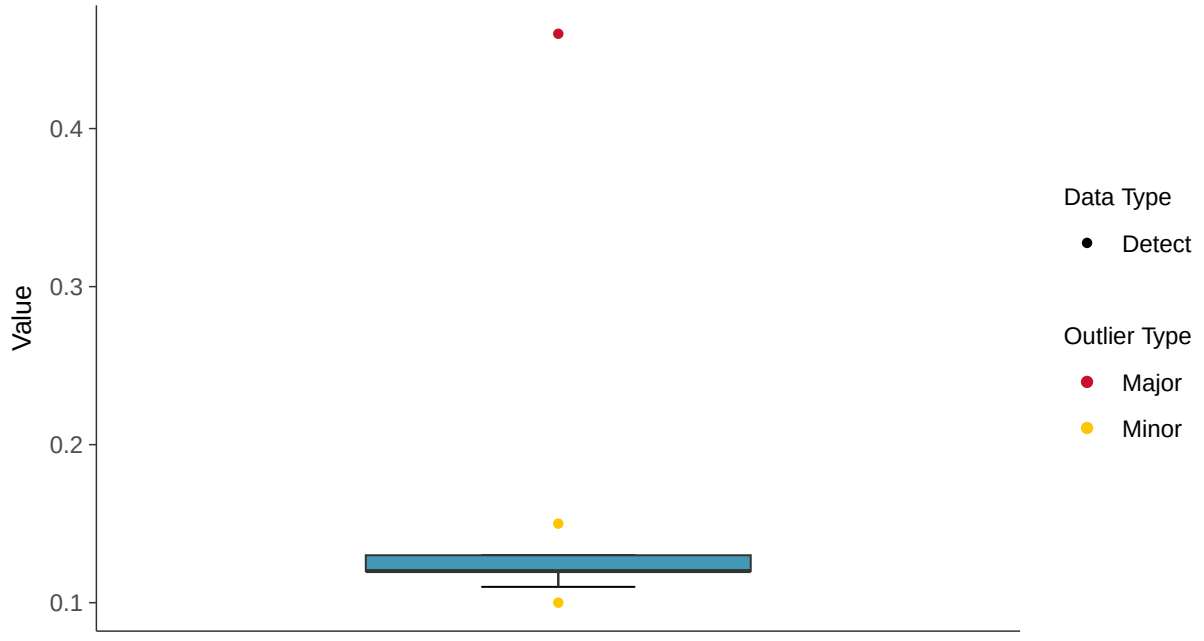
ID: 2_14_5_103





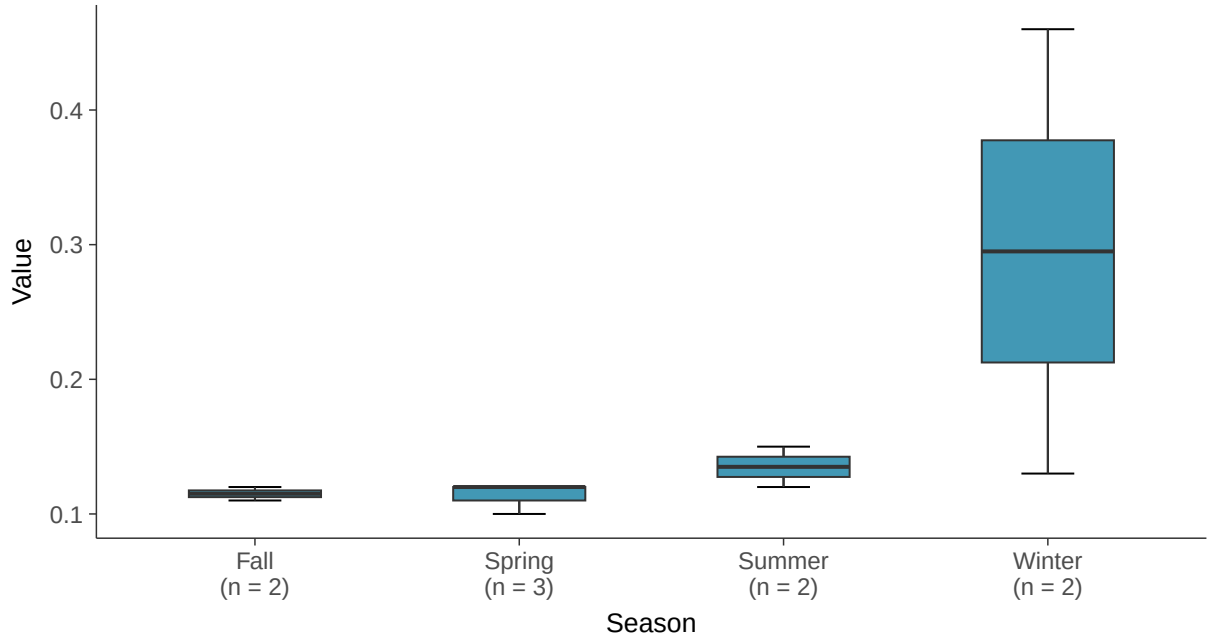
Boxplot

Barium, MW-04 (mg/L)



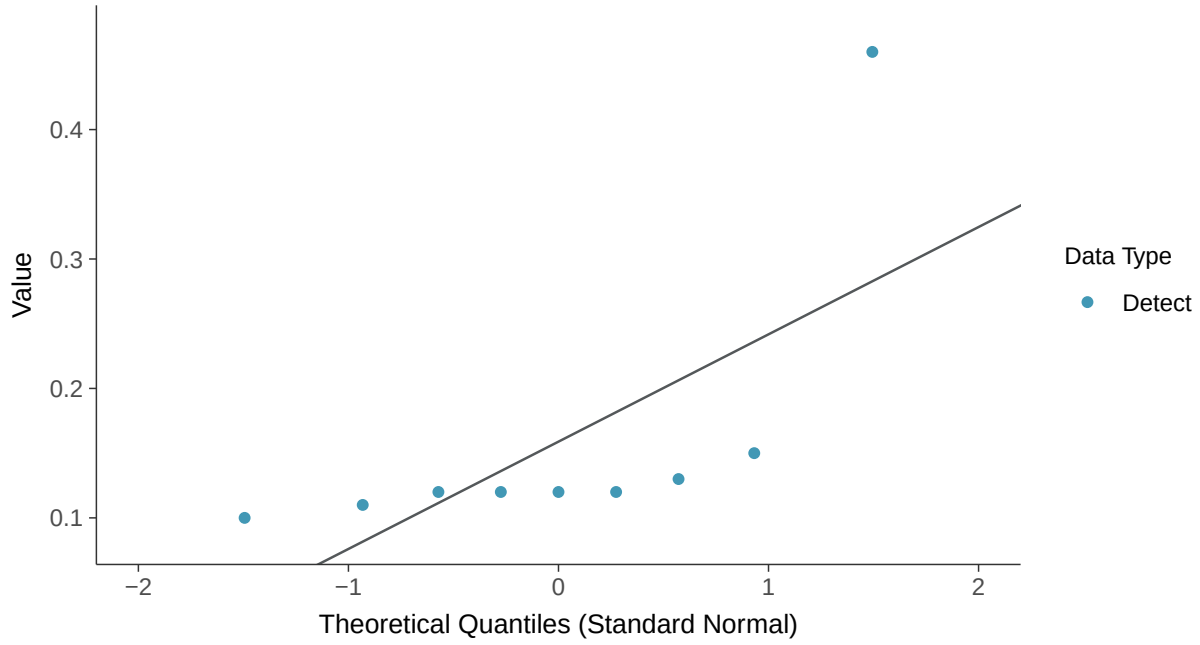
Boxplot by Season

Barium, MW-04 (mg/L)



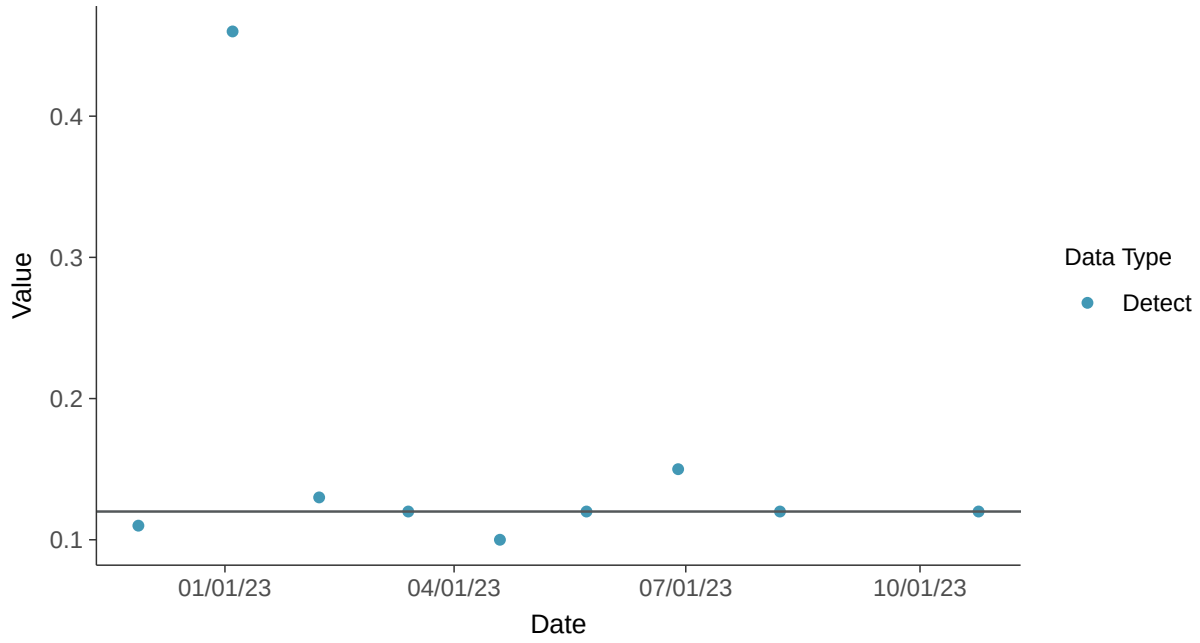
Normal Q-Q plot

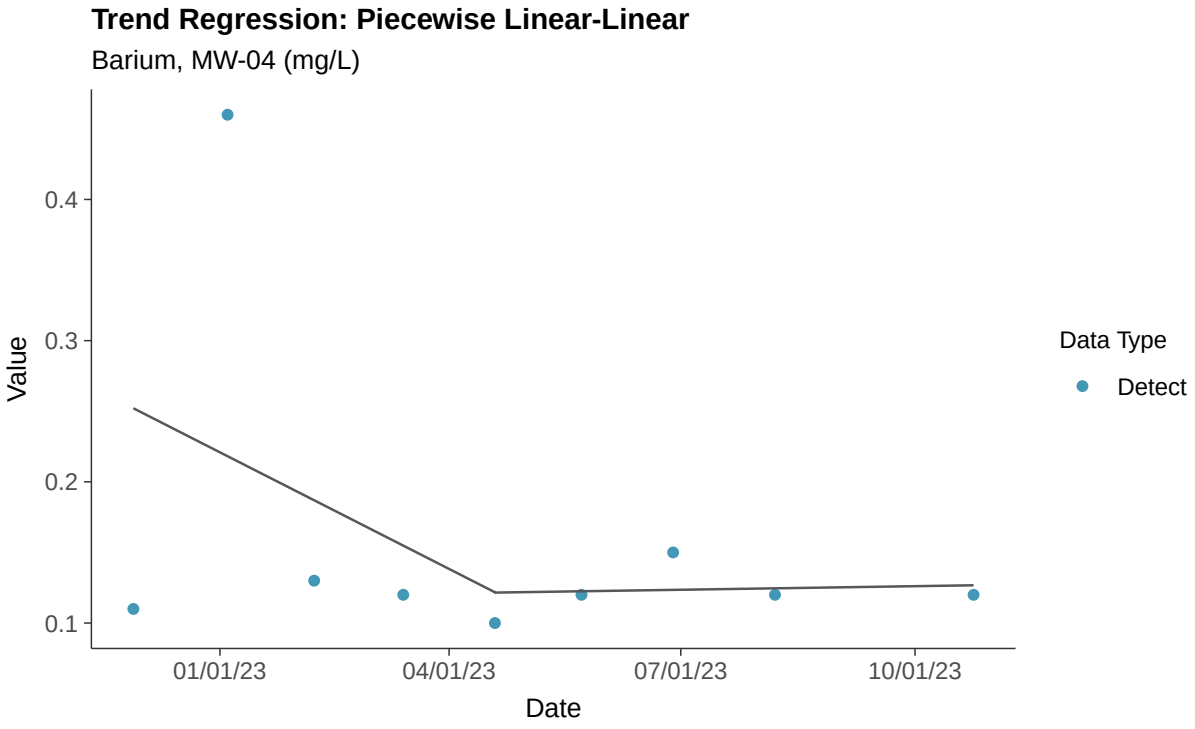
Barium, MW-04 (mg/L)



Trend Regression: Mann-Kendall/Theil-Sen Estimate

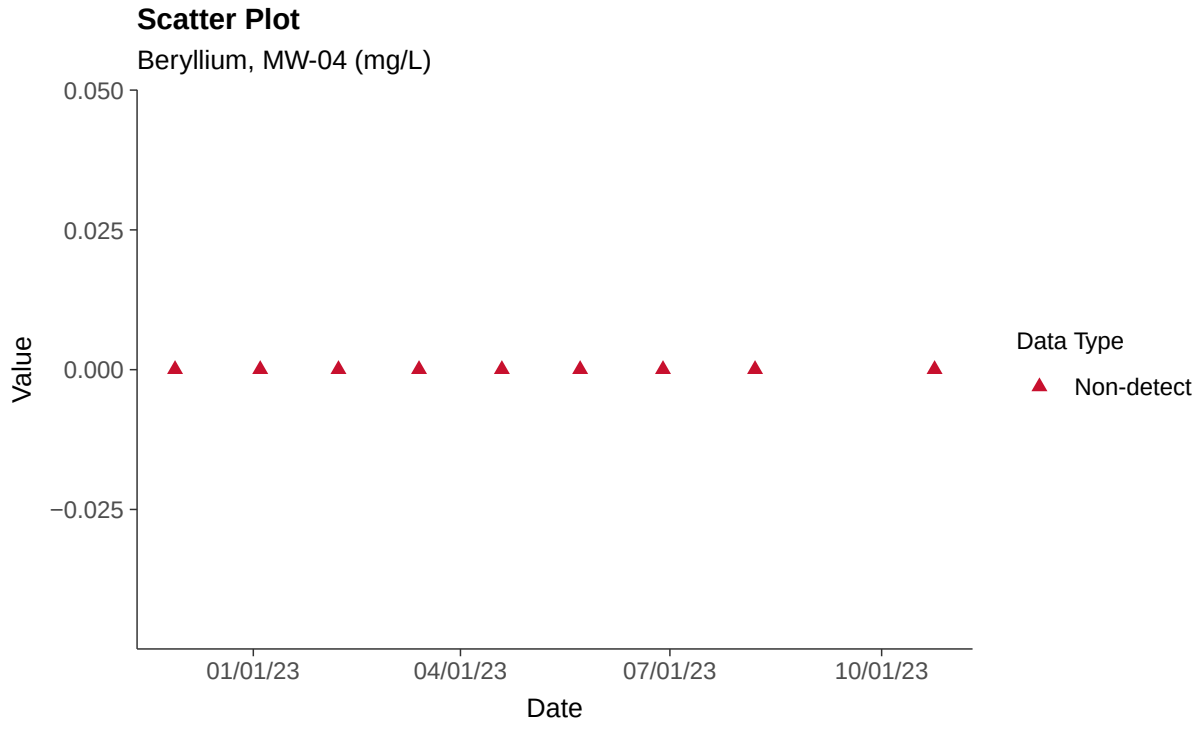
Barium, MW-04 (mg/L)

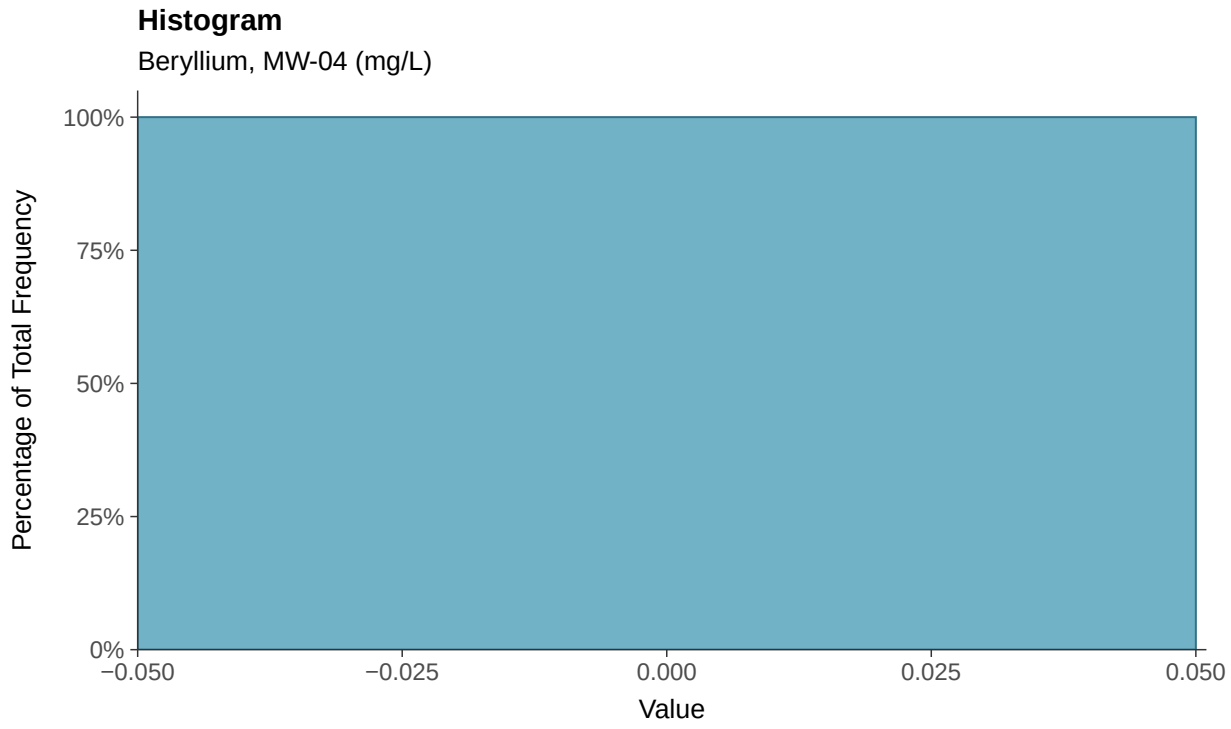



Trend Regression: Piecewise Linear-Linear
Barium, MW-04 (mg/L)
Value
0.4
0.3
0.2
0.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-04

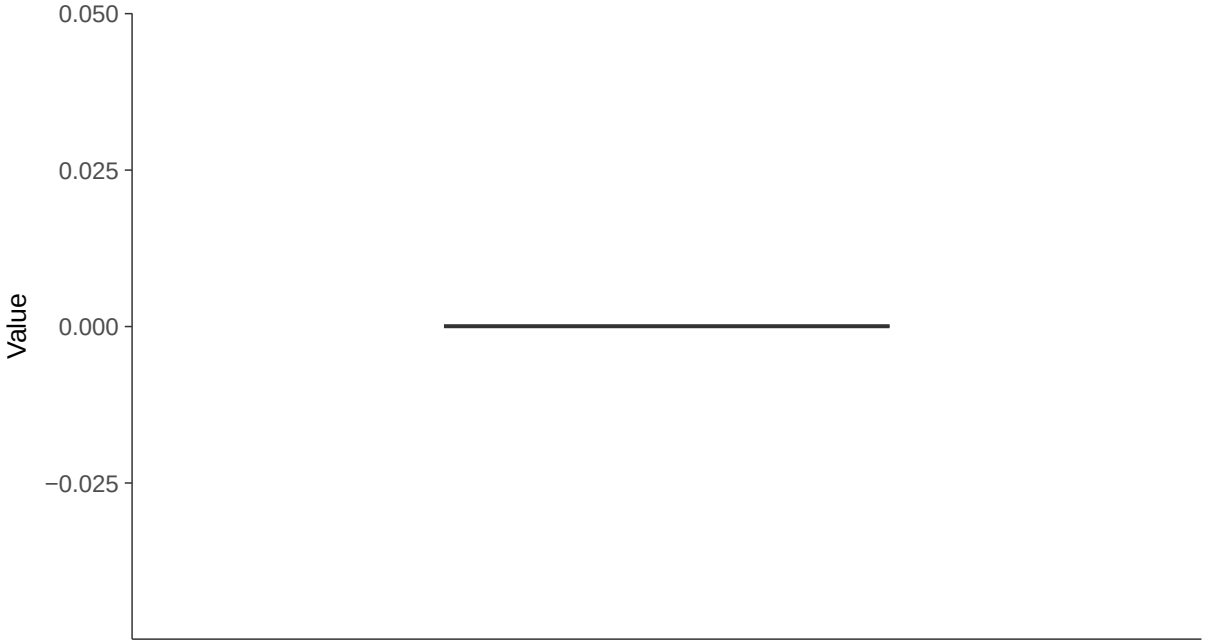
ID: 2_14_5_104





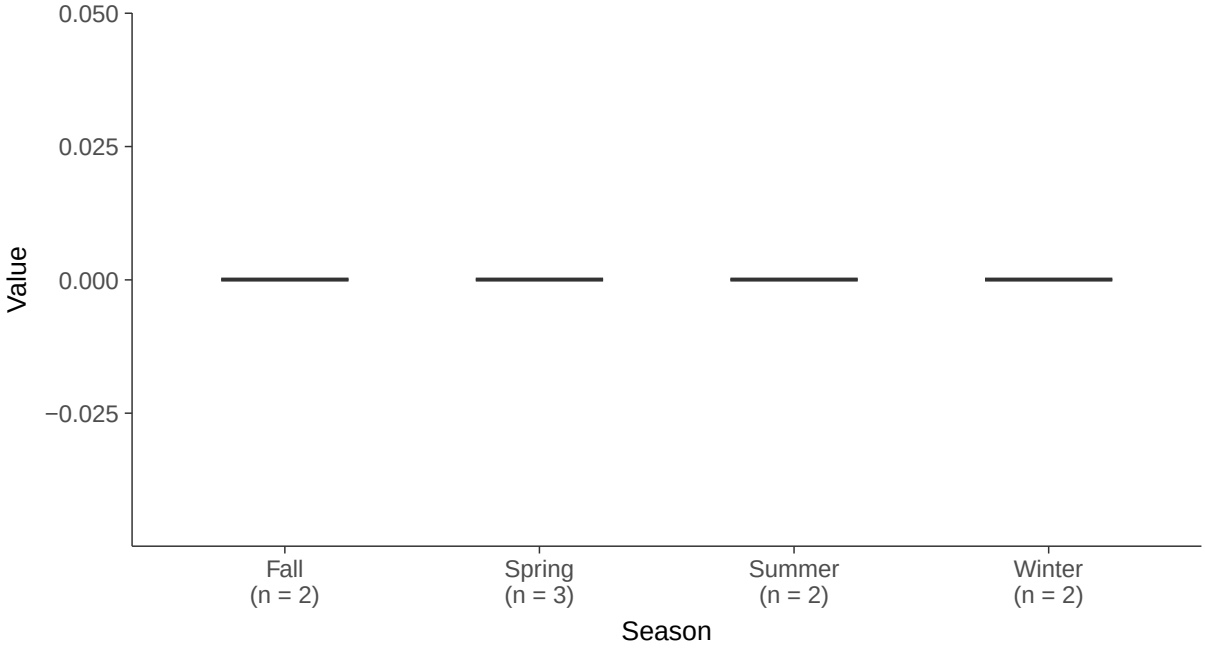
Boxplot

Beryllium, MW-04 (mg/L)



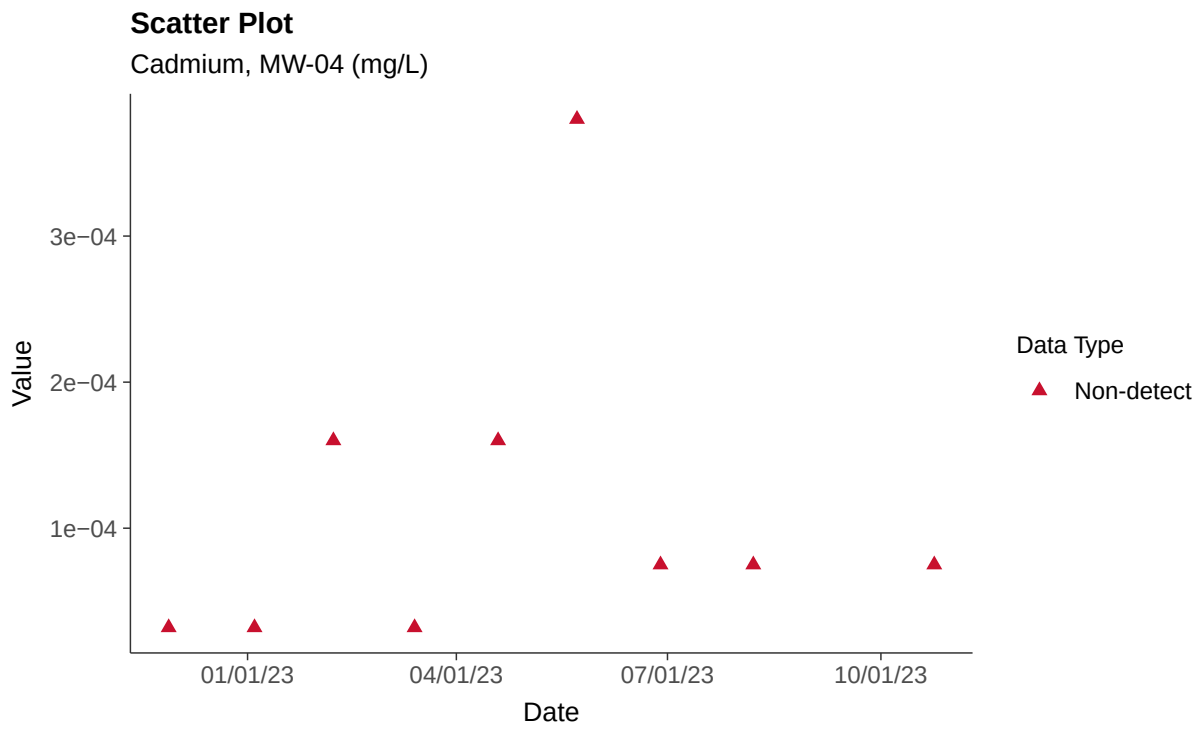
Boxplot by Season

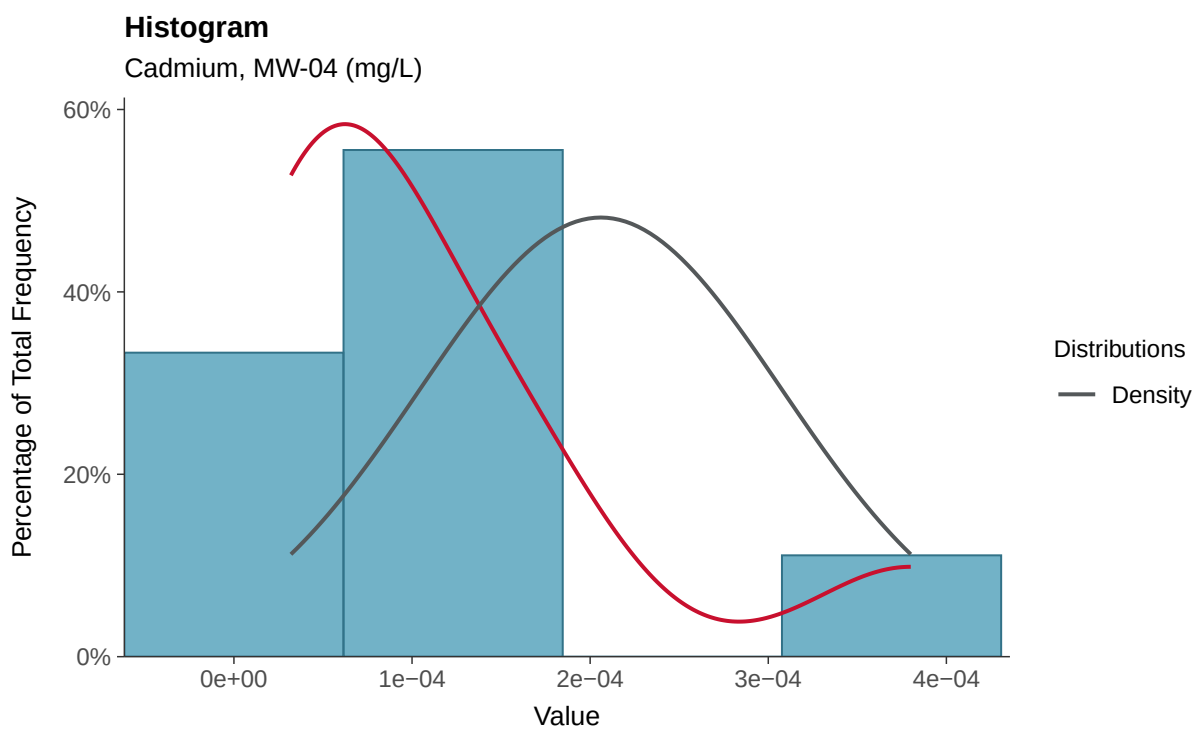
Beryllium, MW-04 (mg/L)



Appendix IV: Cadmium, MW-04

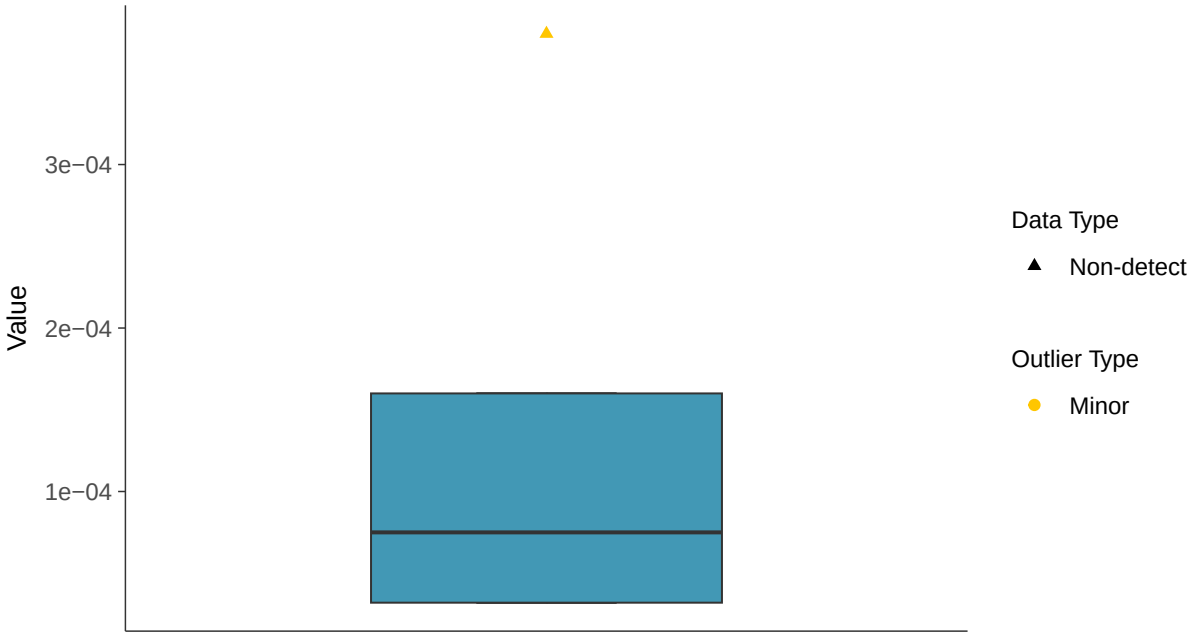
ID: 2_14_5_106





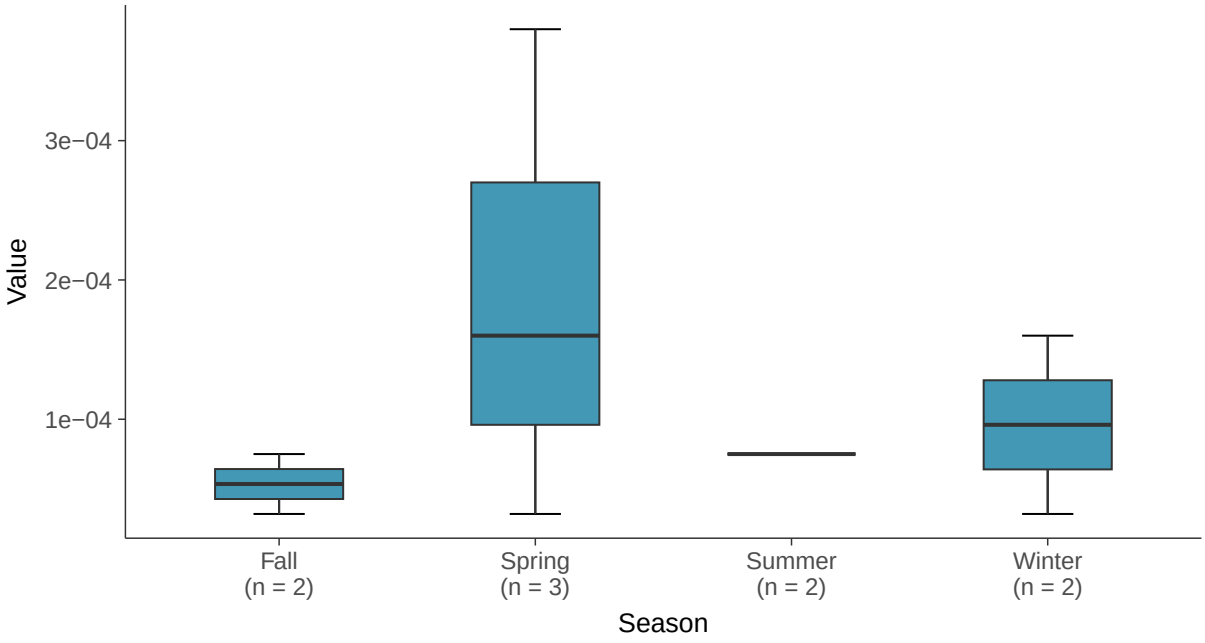
Boxplot

Cadmium, MW-04 (mg/L)



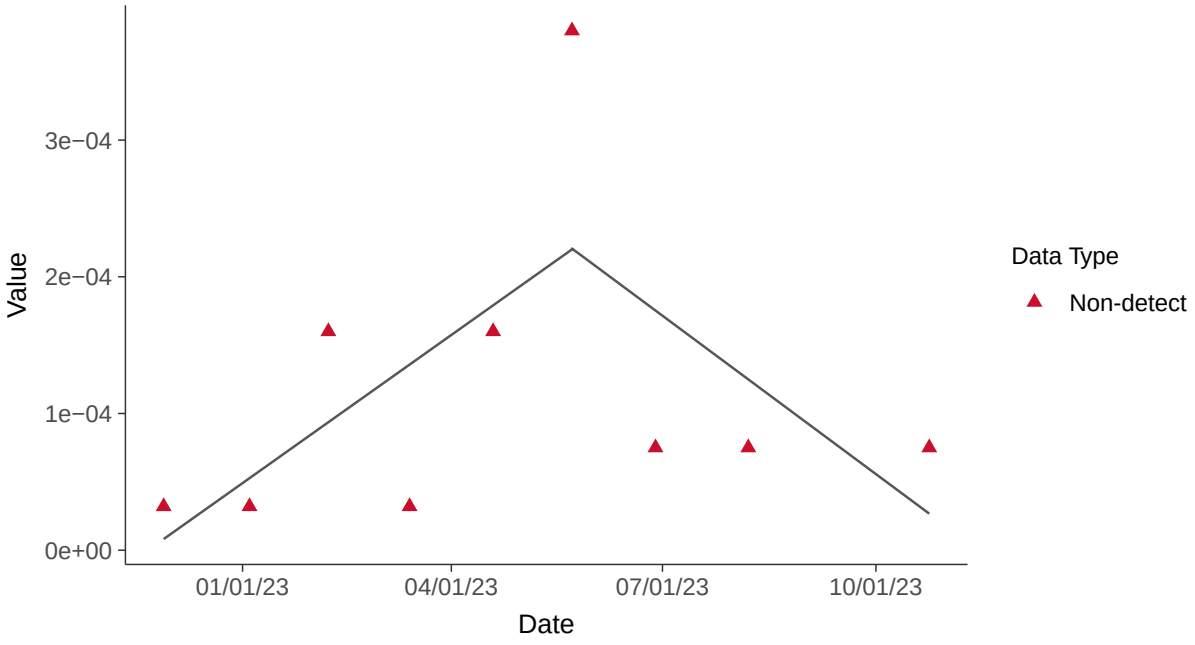
Boxplot by Season

Cadmium, MW-04 (mg/L)



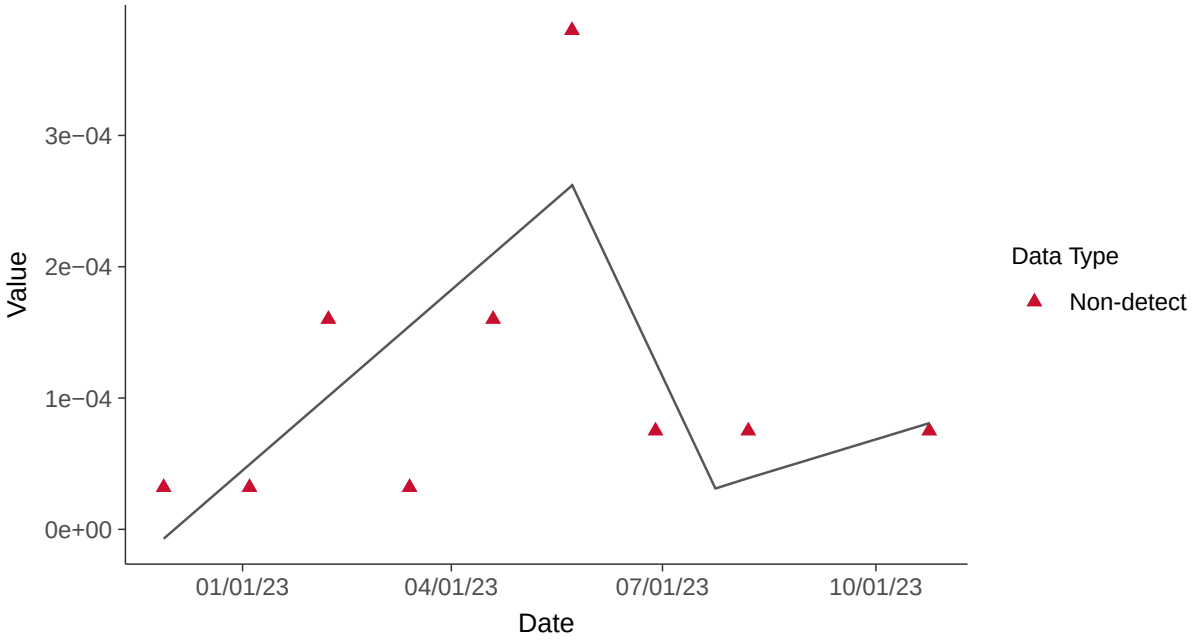
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-04 (mg/L)



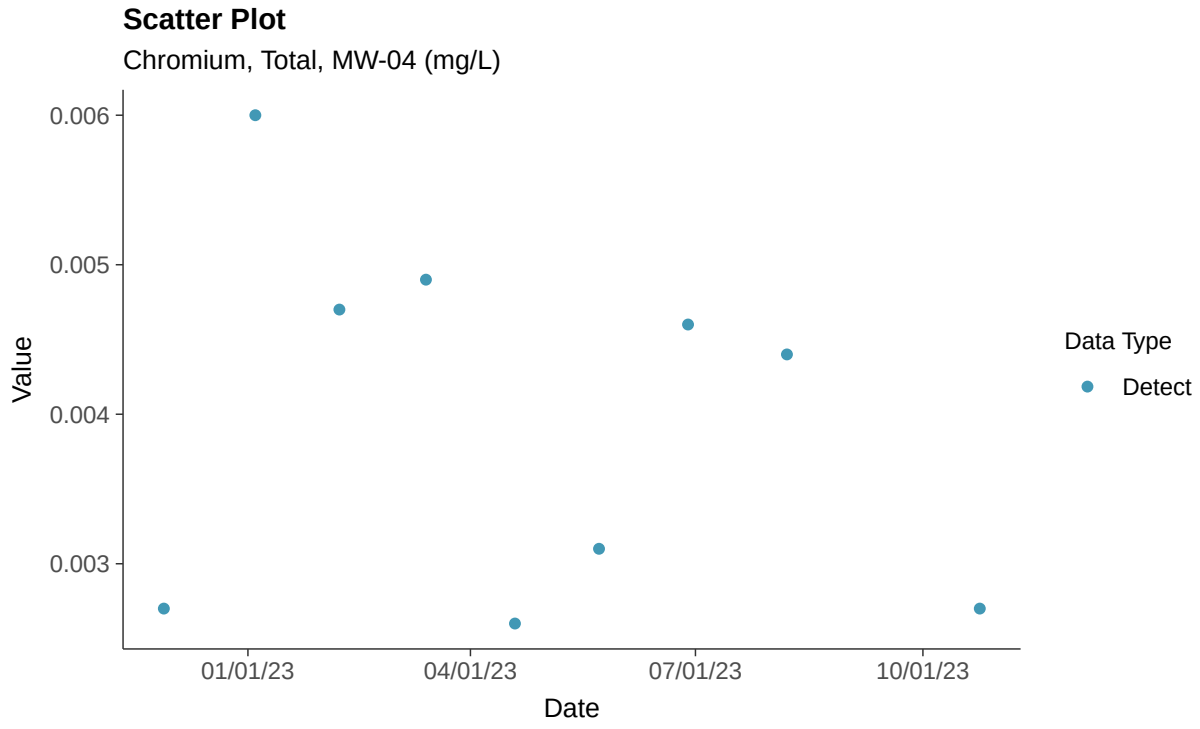
Trend Regression: Piecewise Linear-Linear-Linear

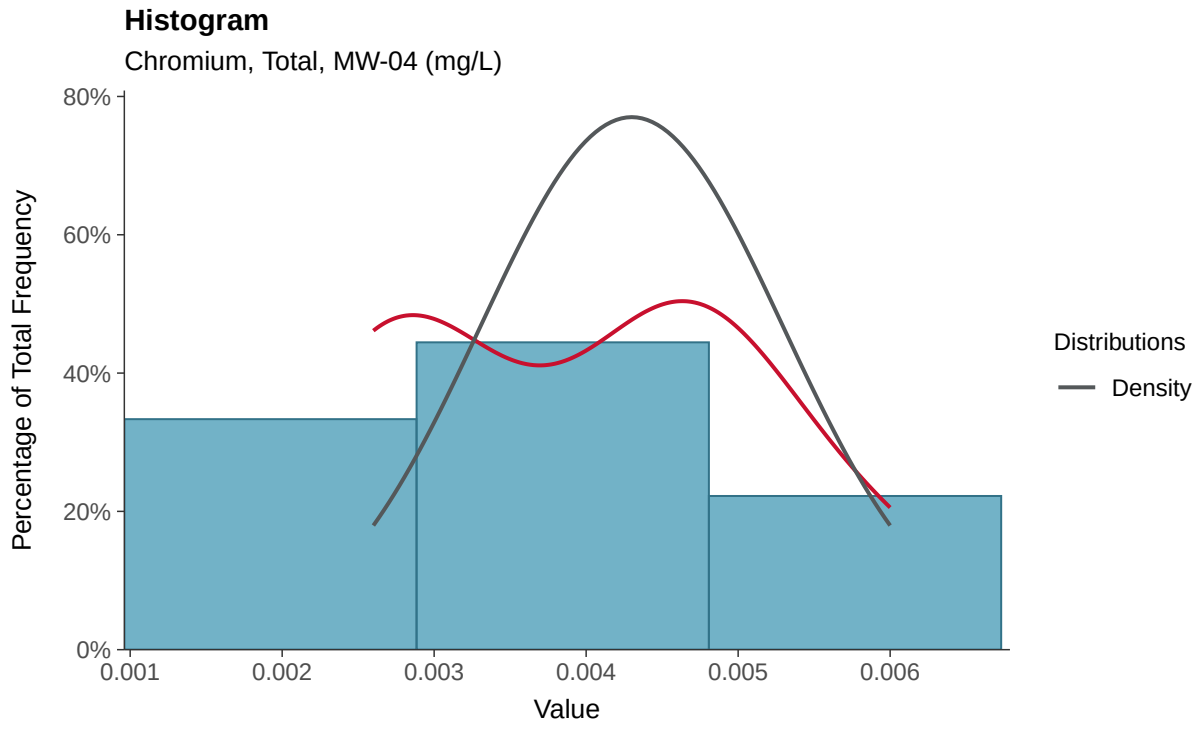
Cadmium, MW-04 (mg/L)



Appendix IV: Chromium, Total, MW-04

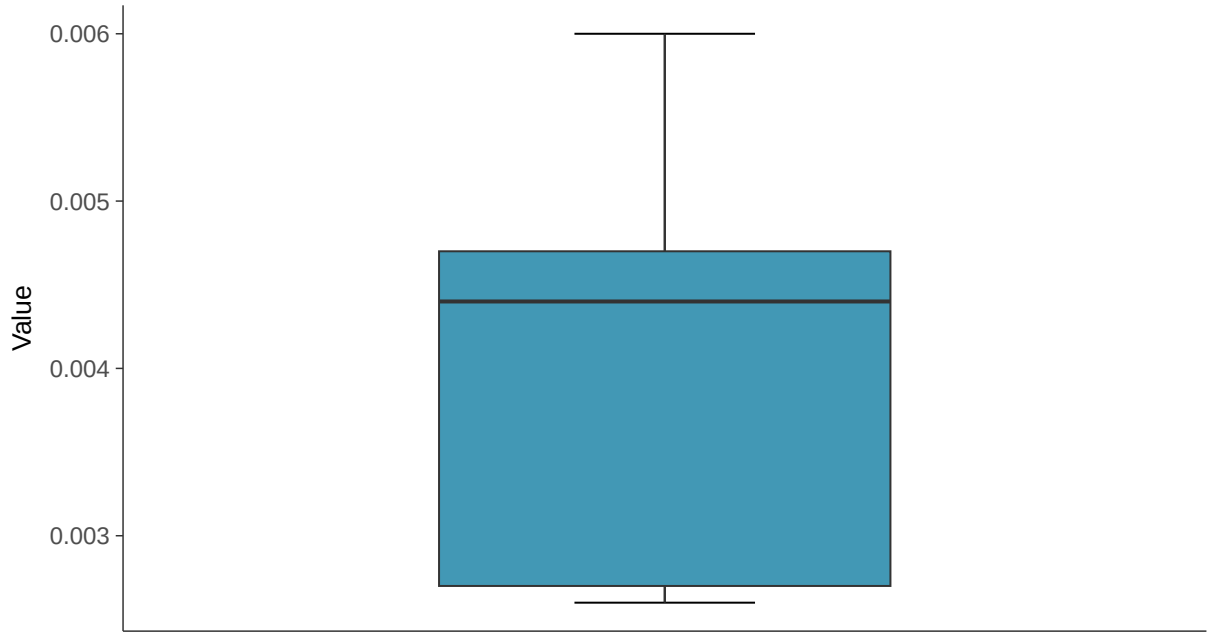
ID: 2_14_5_109





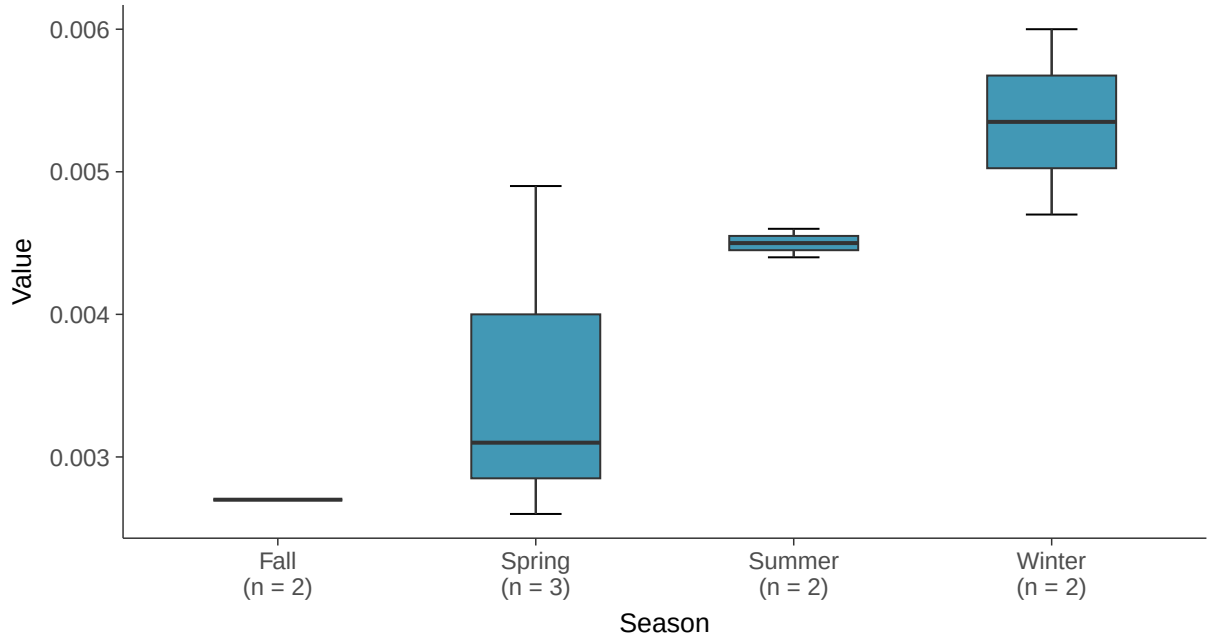
Boxplot

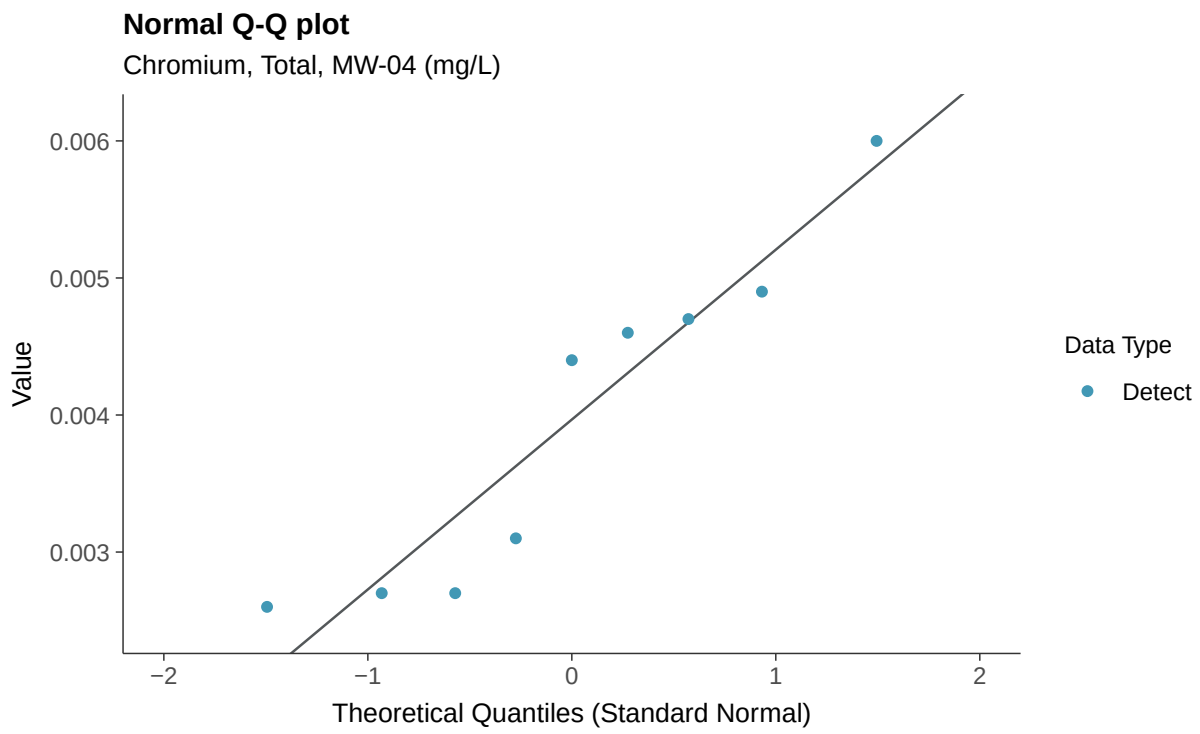
Chromium, Total, MW-04 (mg/L)

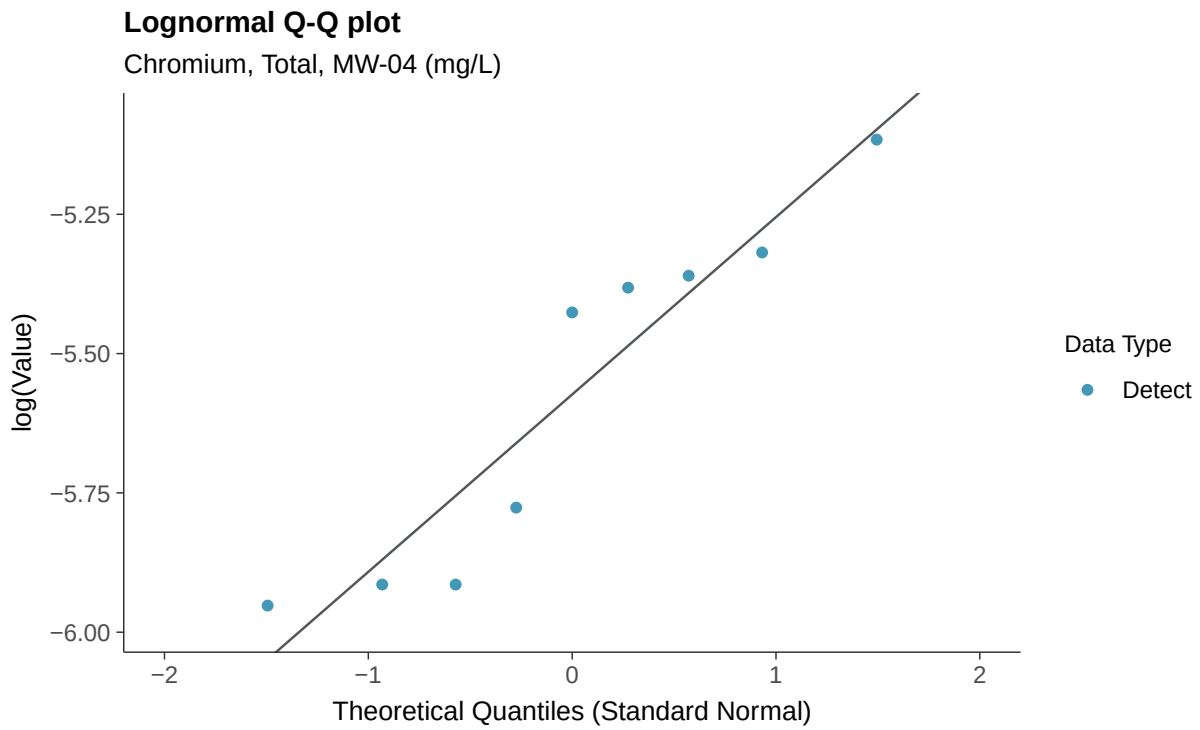


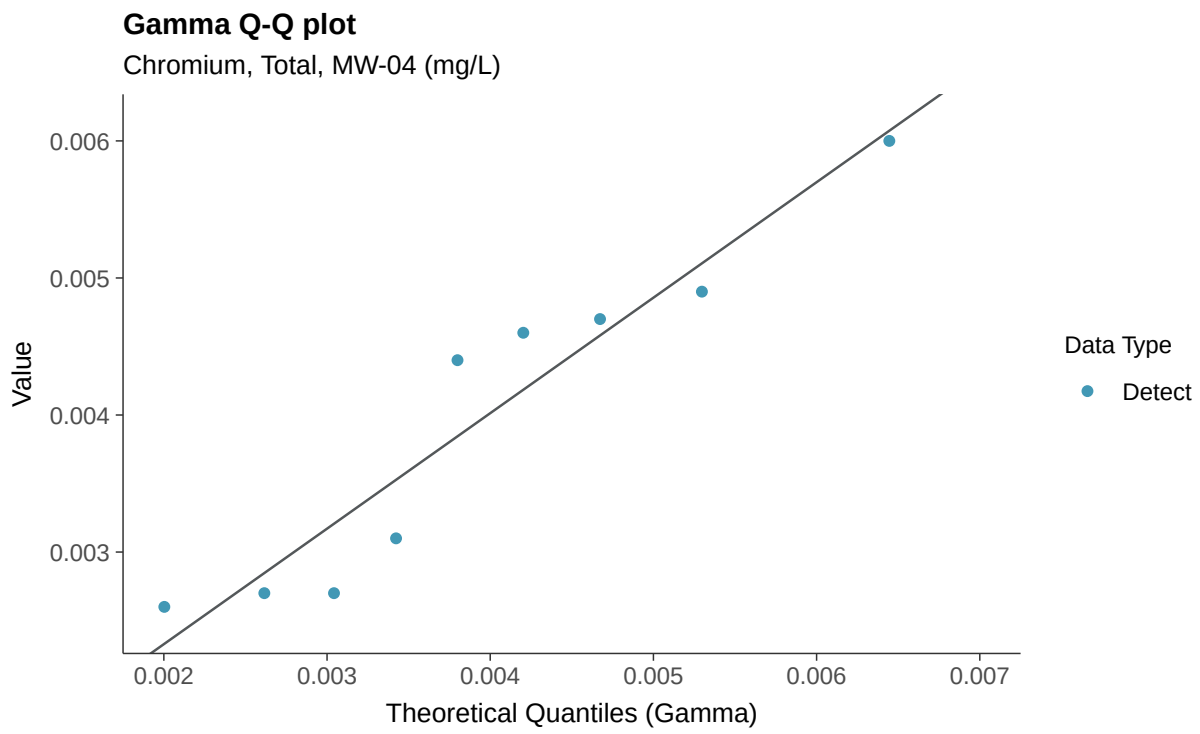
Boxplot by Season

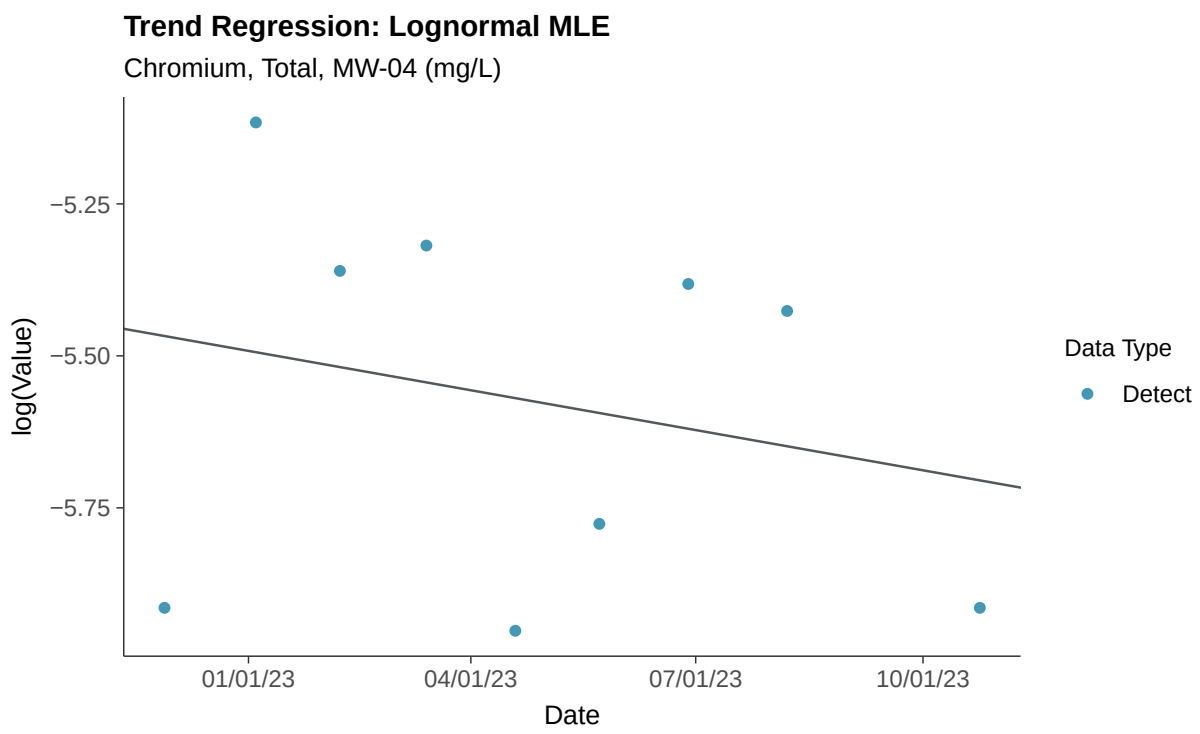
Chromium, Total, MW-04 (mg/L)




Normal Q-Q plot
Chromium, Total, MW-04 (mg/L)
Value
0.006
0.005
0.004
0.003
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

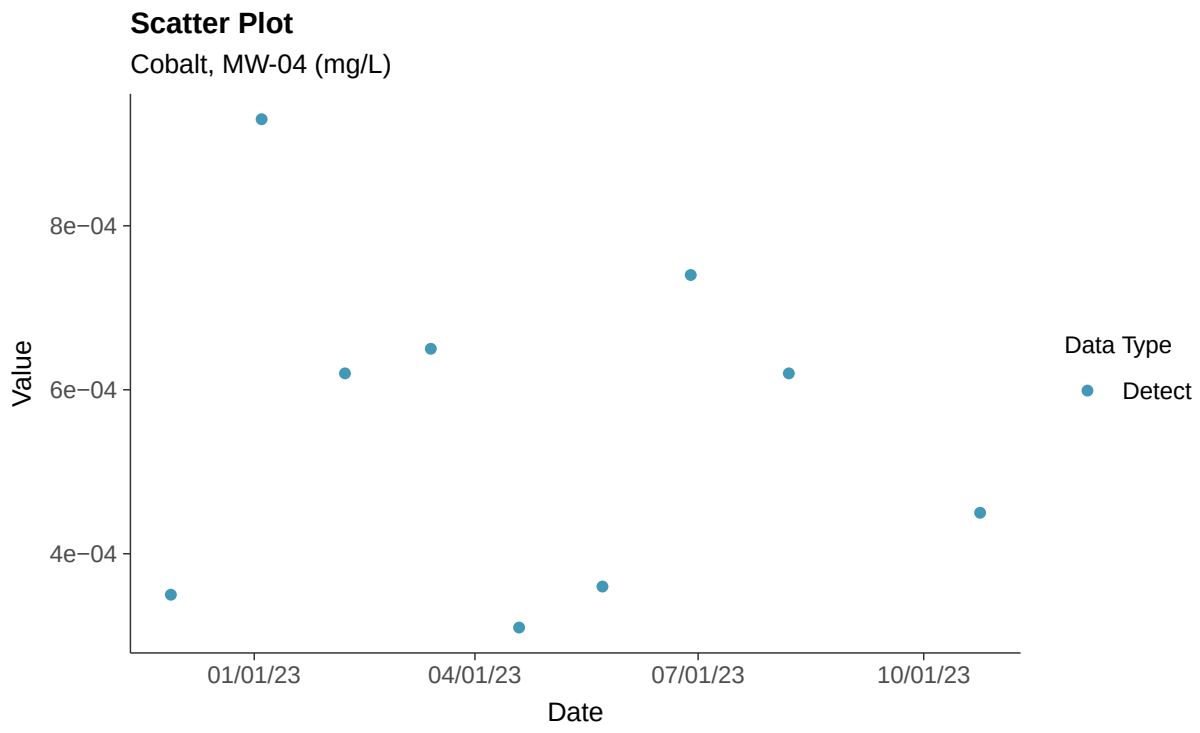

Lognormal Q-Q plot
Chromium, Total, MW-04 (mg/L)
log(Value)
−5.25
−5.50
−5.75
−6.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

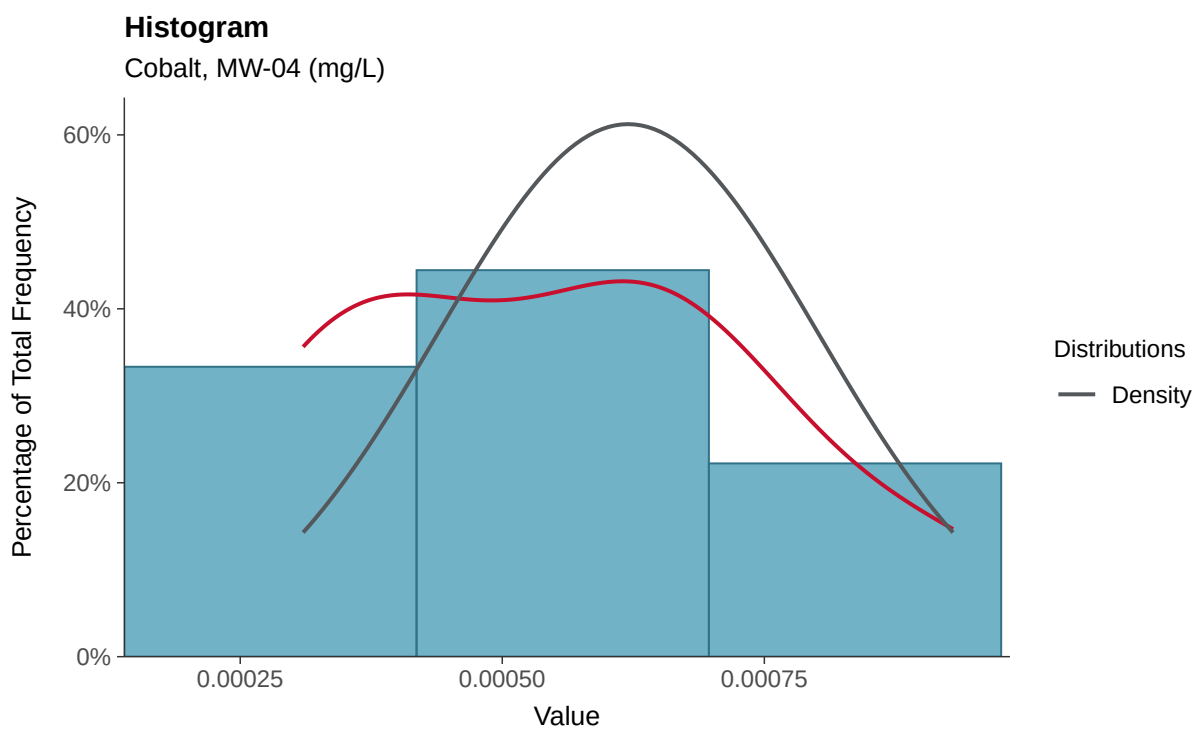

Gamma Q-Q plot
Chromium, Total, MW-04 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
0.003
0.004
0.005
0.006
0.007
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-04 (mg/L)
log(Value)
−5.25
−5.50
−5.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Cobalt, MW-04

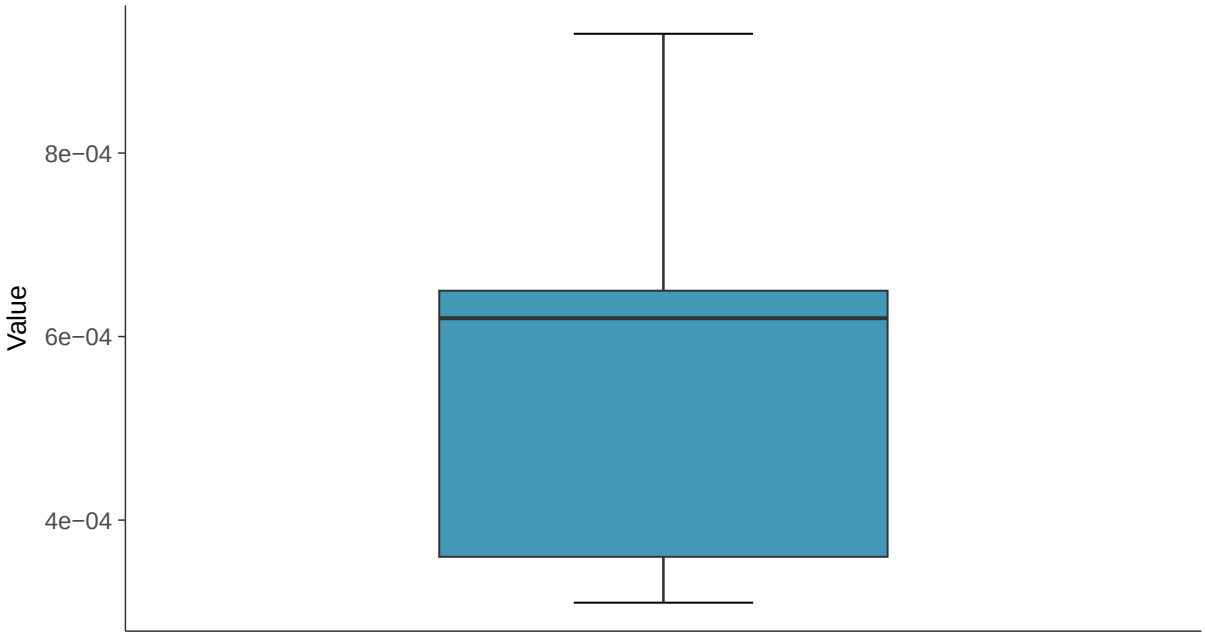
ID: 2_14_5_110





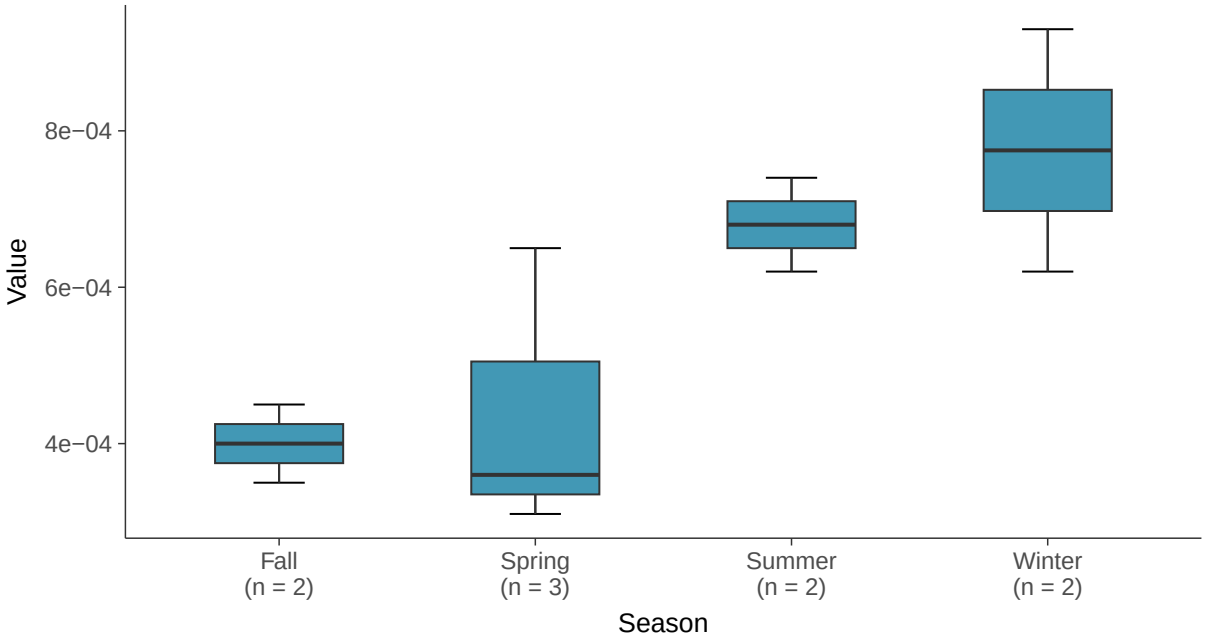
Boxplot

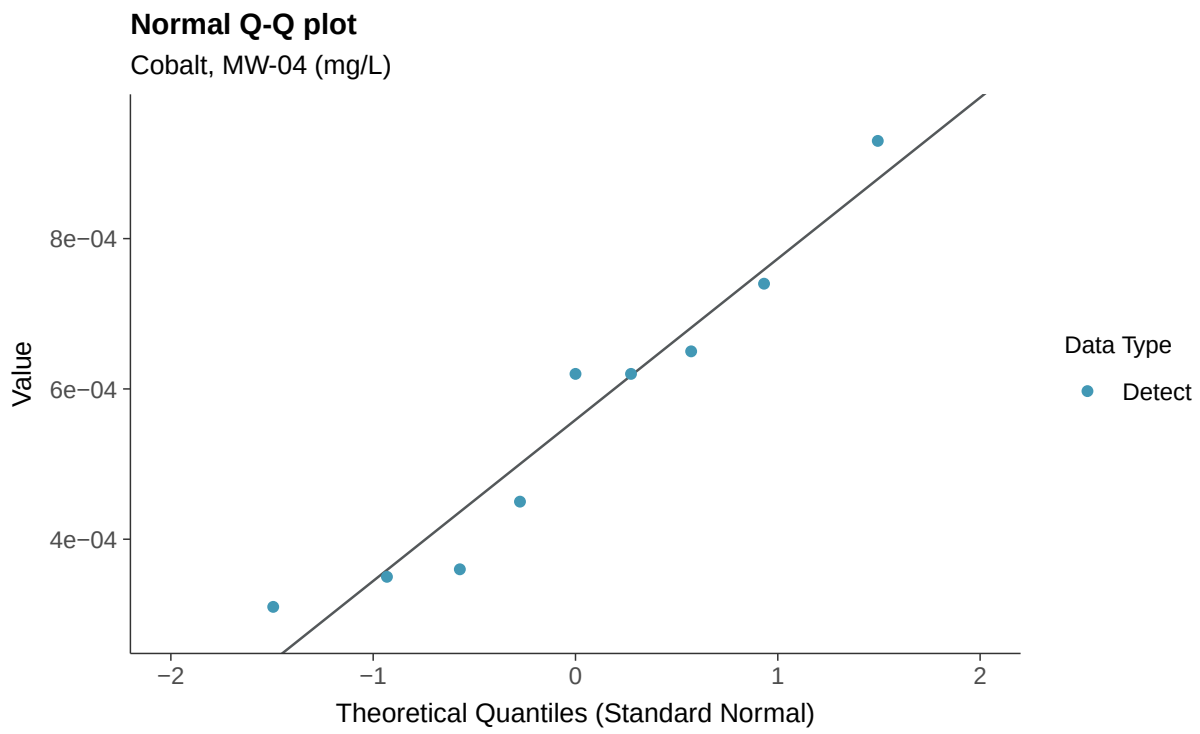
Cobalt, MW-04 (mg/L)

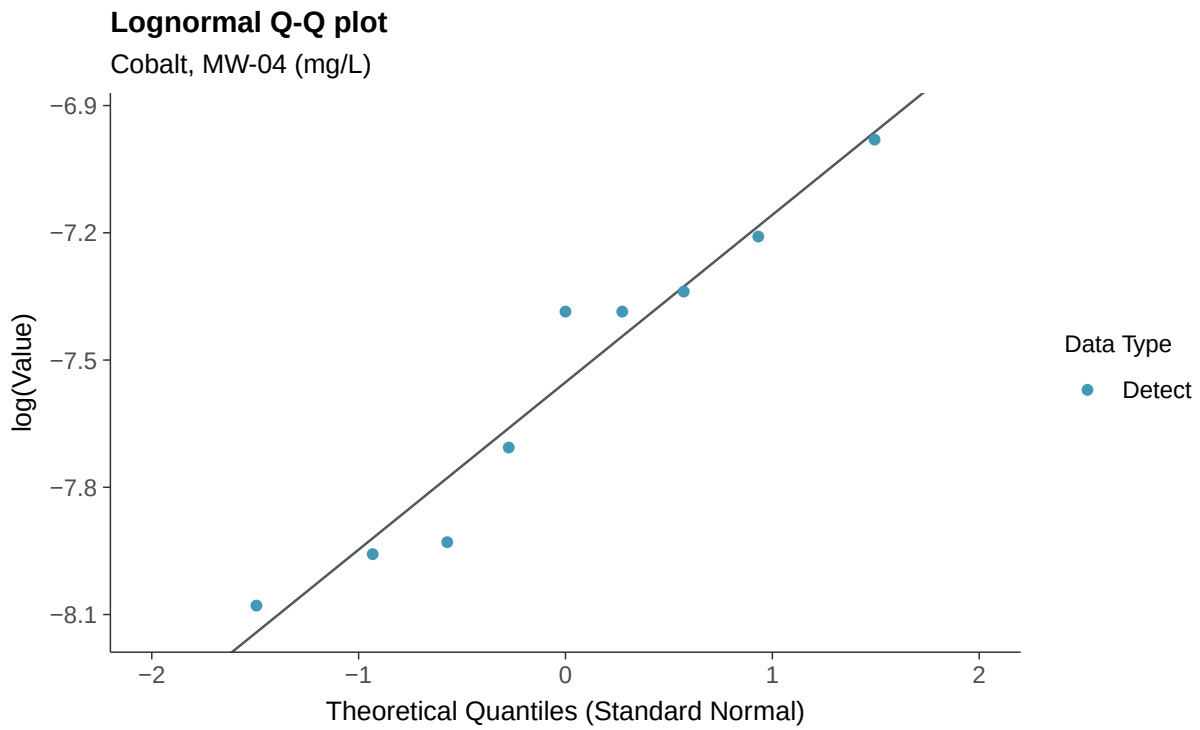


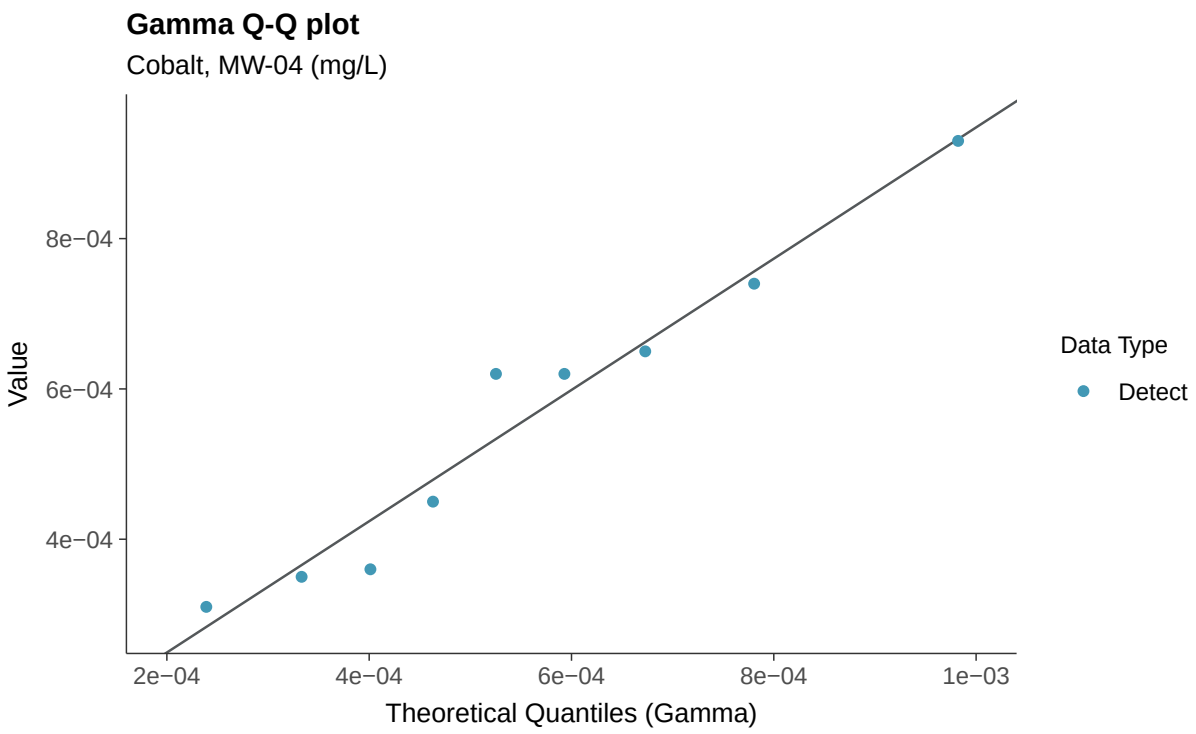
Boxplot by Season

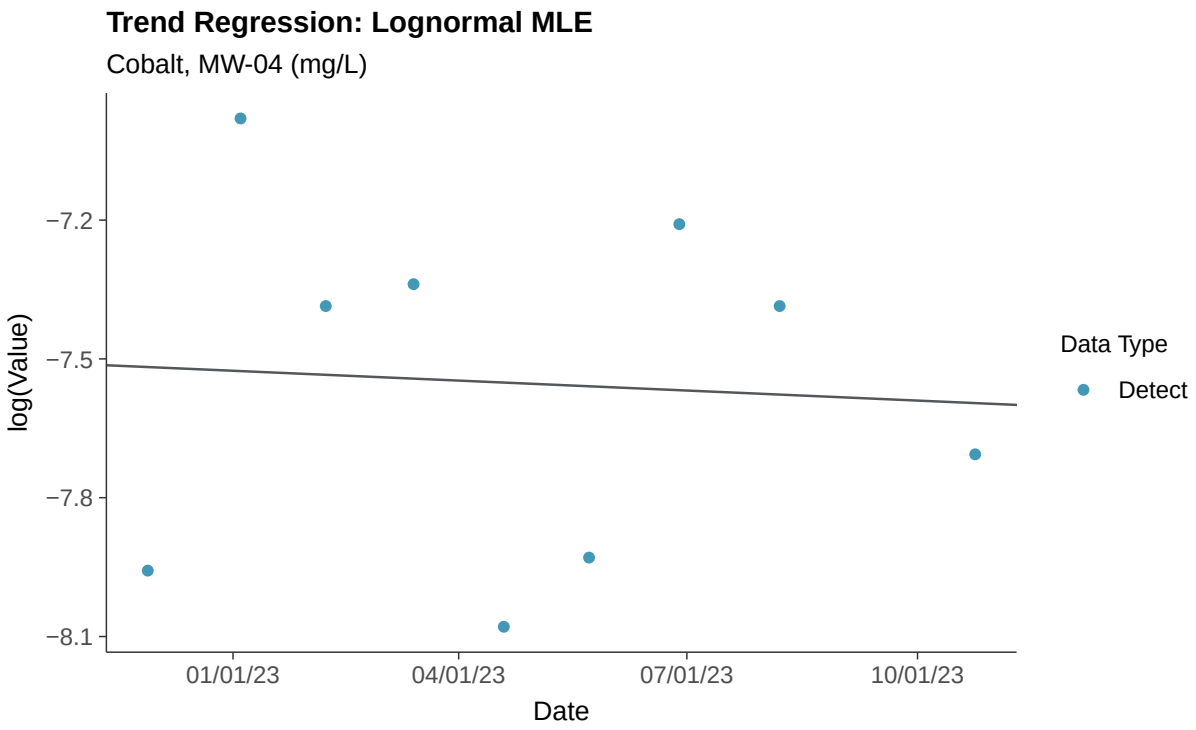
Cobalt, MW-04 (mg/L)




Normal Q-Q plot
Cobalt, MW-04 (mg/L)
Value
8e−04
6e−04
4e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

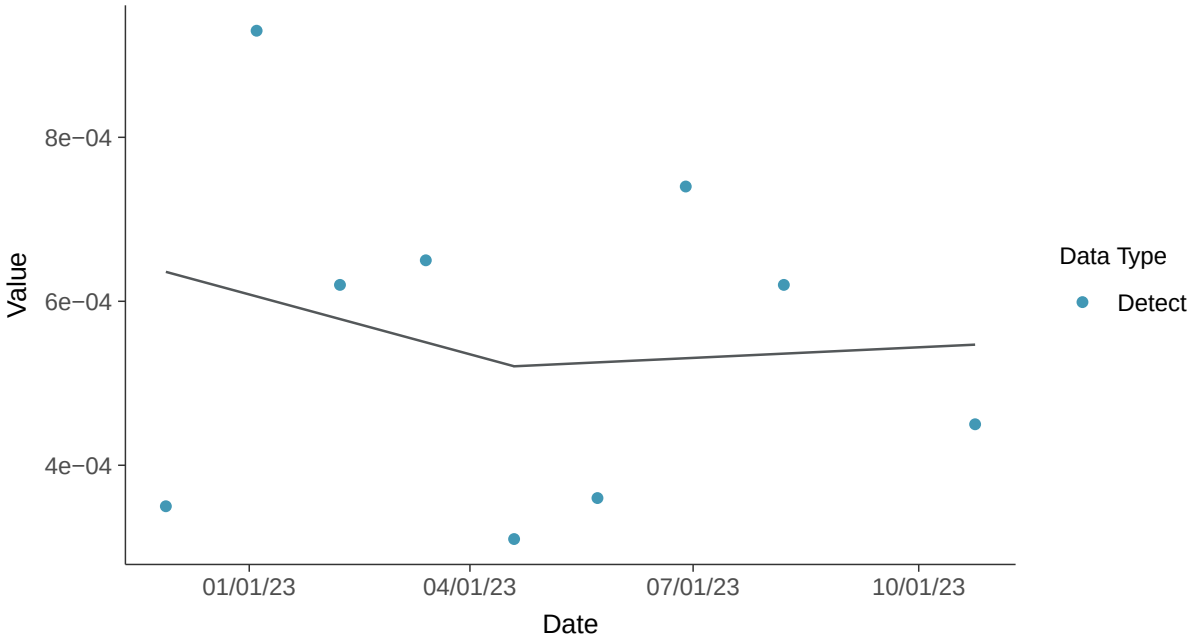

Lognormal Q-Q plot
Cobalt, MW-04 (mg/L)
log(Value)
−6.9
−7.2
−7.5
−7.8
−8.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-04 (mg/L)
Value
8e−04
6e−04
4e−04
2e−04
4e−04
6e−04
8e−04
1e−03
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-04 (mg/L)
log(Value)
−7.2
−7.5
−7.8
−8.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

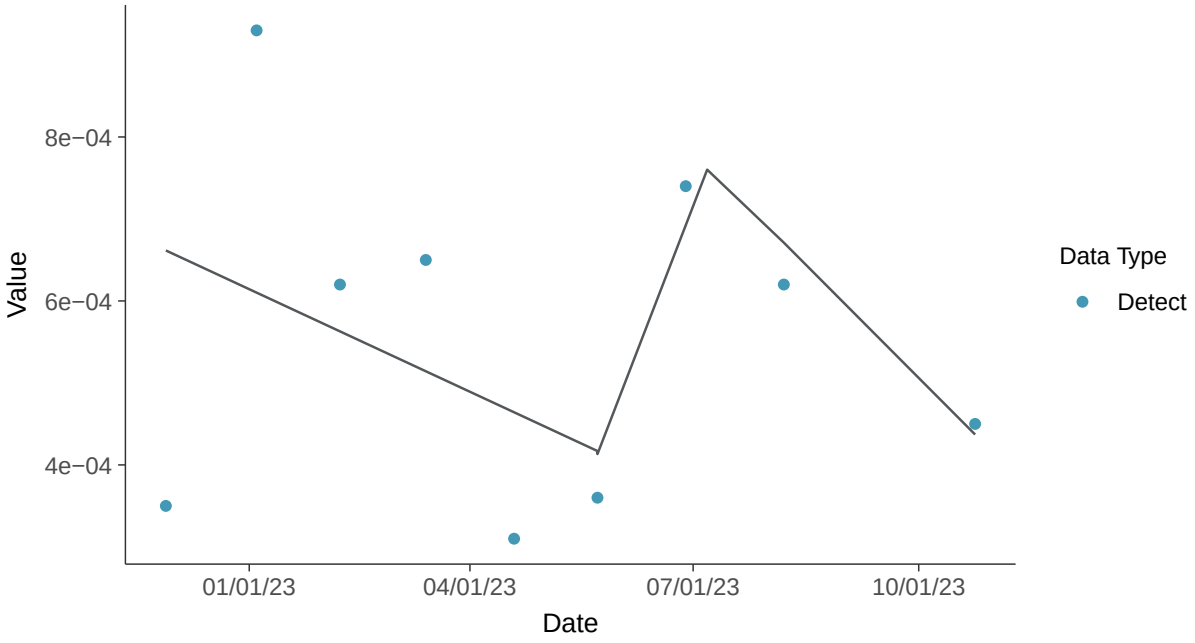
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-04 (mg/L)



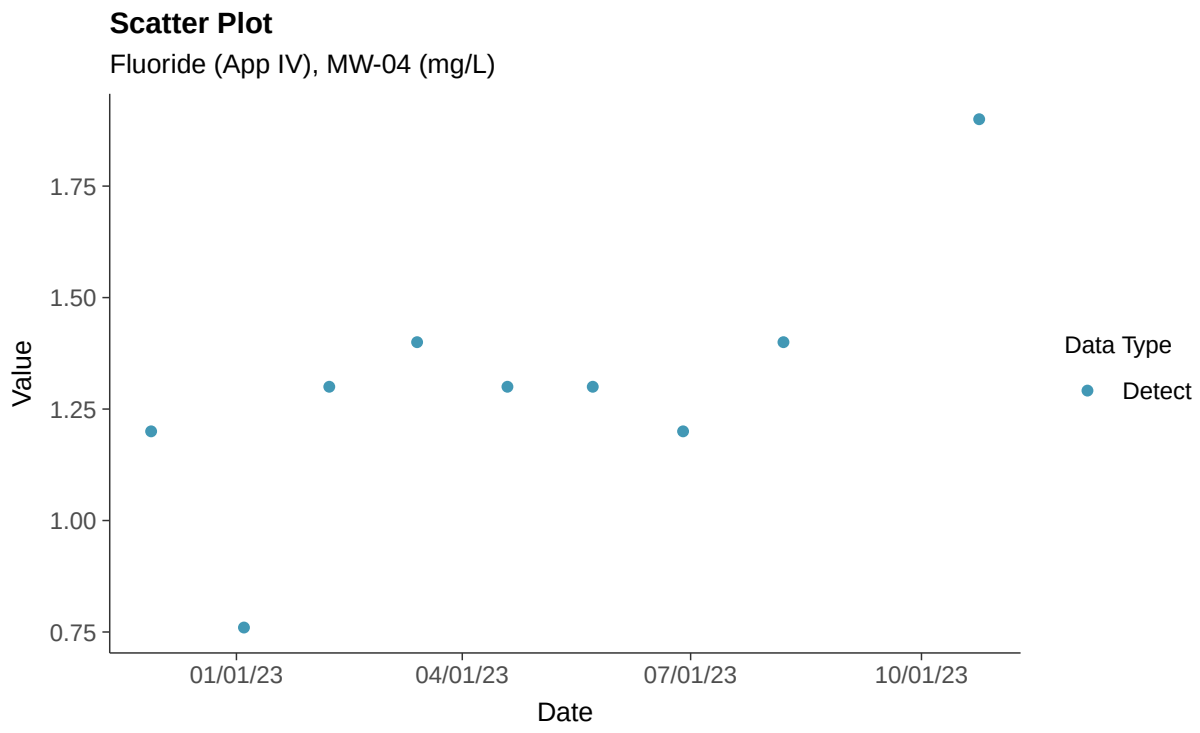
Trend Regression: Piecewise Linear-Linear-Linear

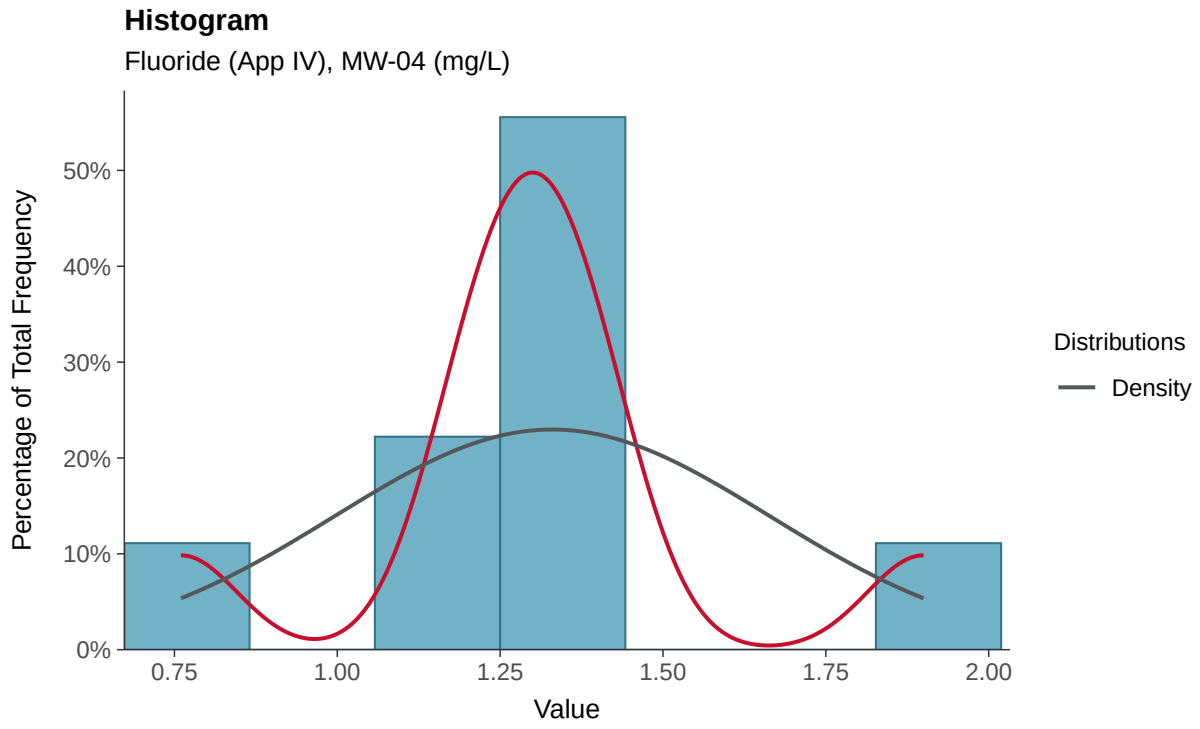
Cobalt, MW-04 (mg/L)



Appendix IV: Fluoride (App IV), MW-04

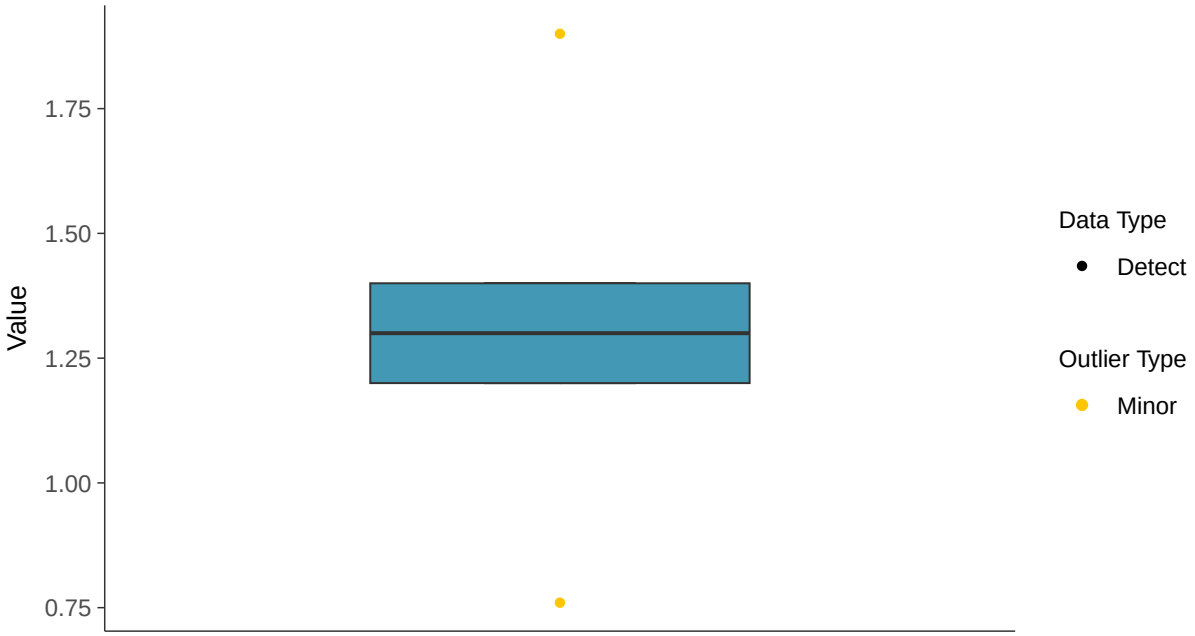
ID: 2_14_5_113





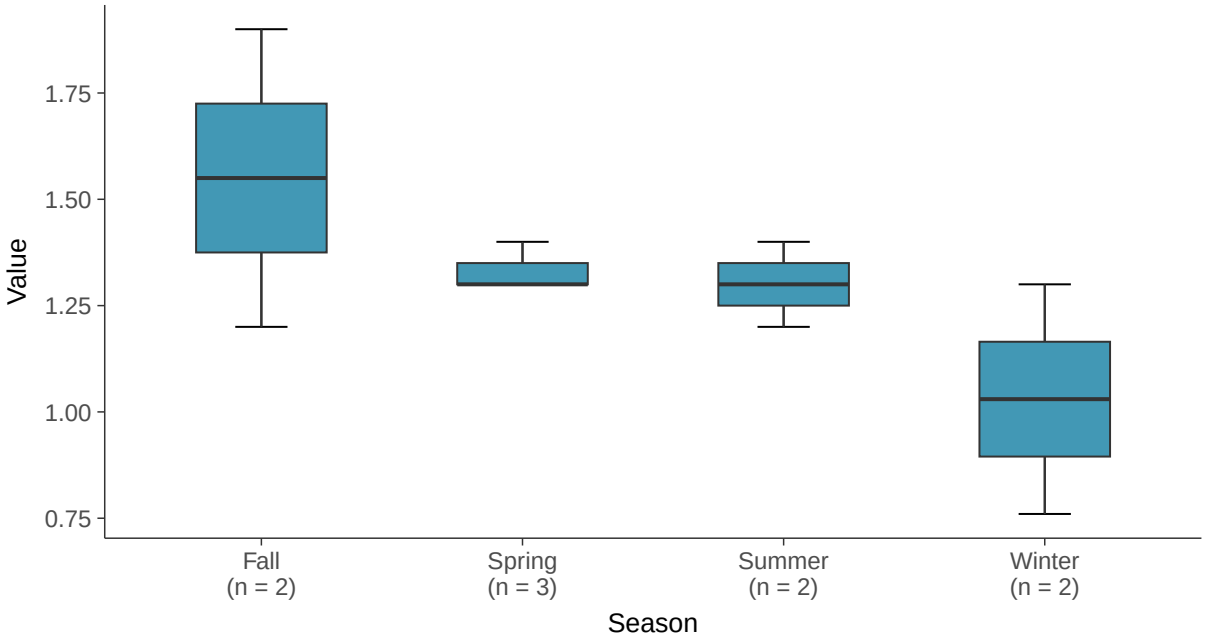
Boxplot

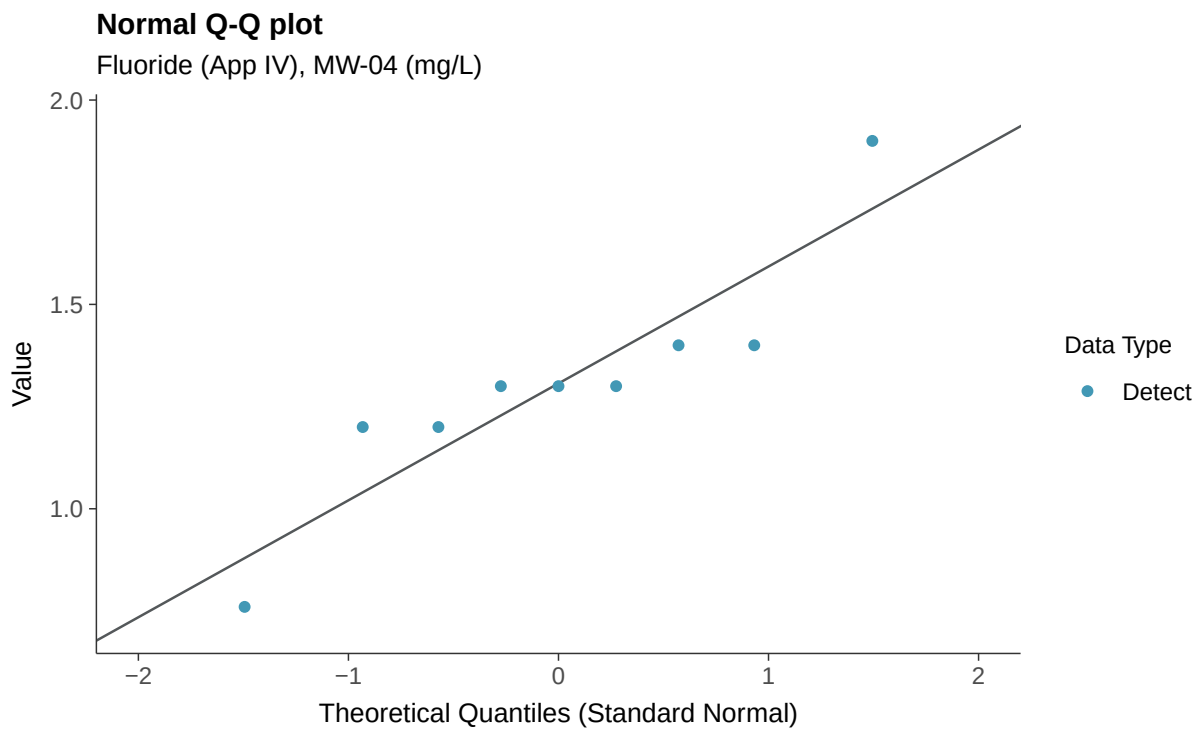
Fluoride (App IV), MW-04 (mg/L)

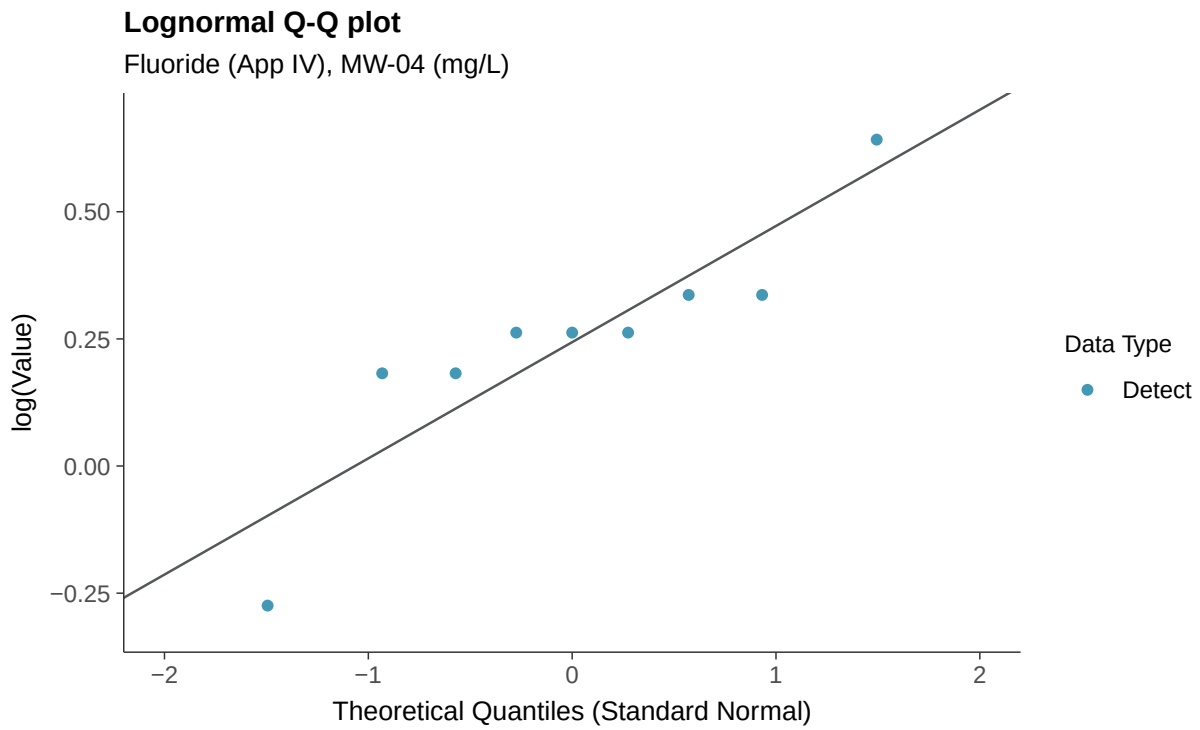


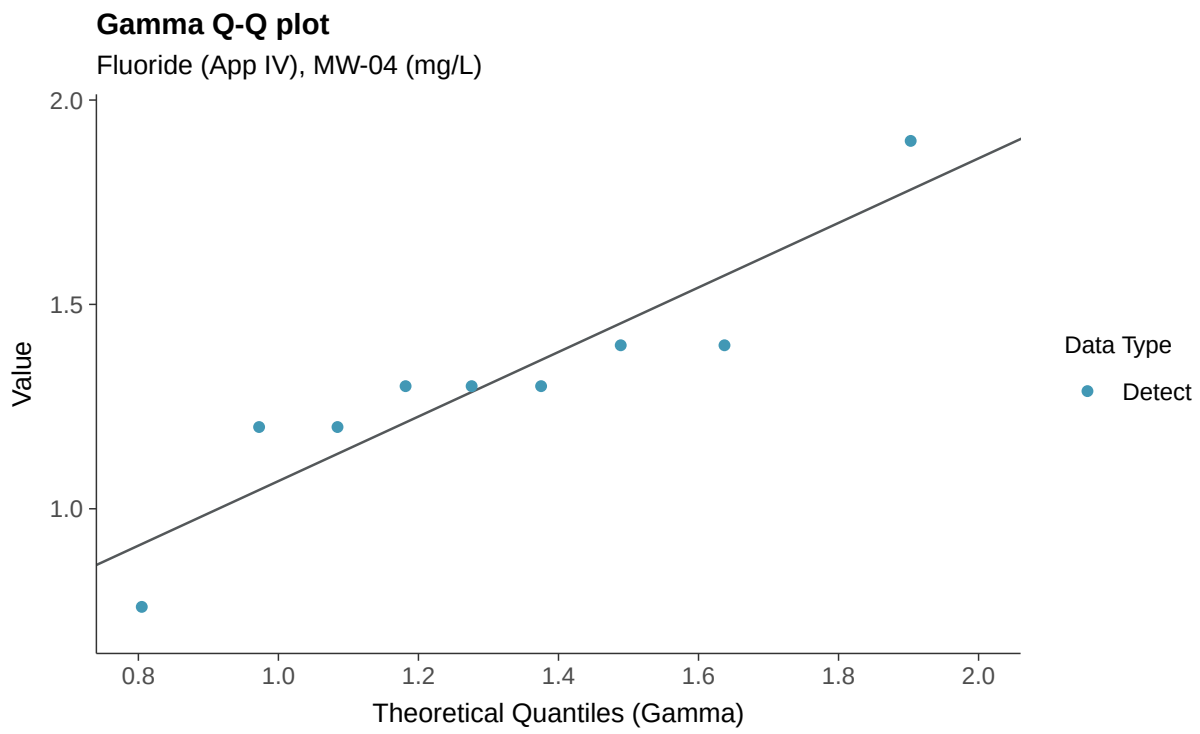
Boxplot by Season

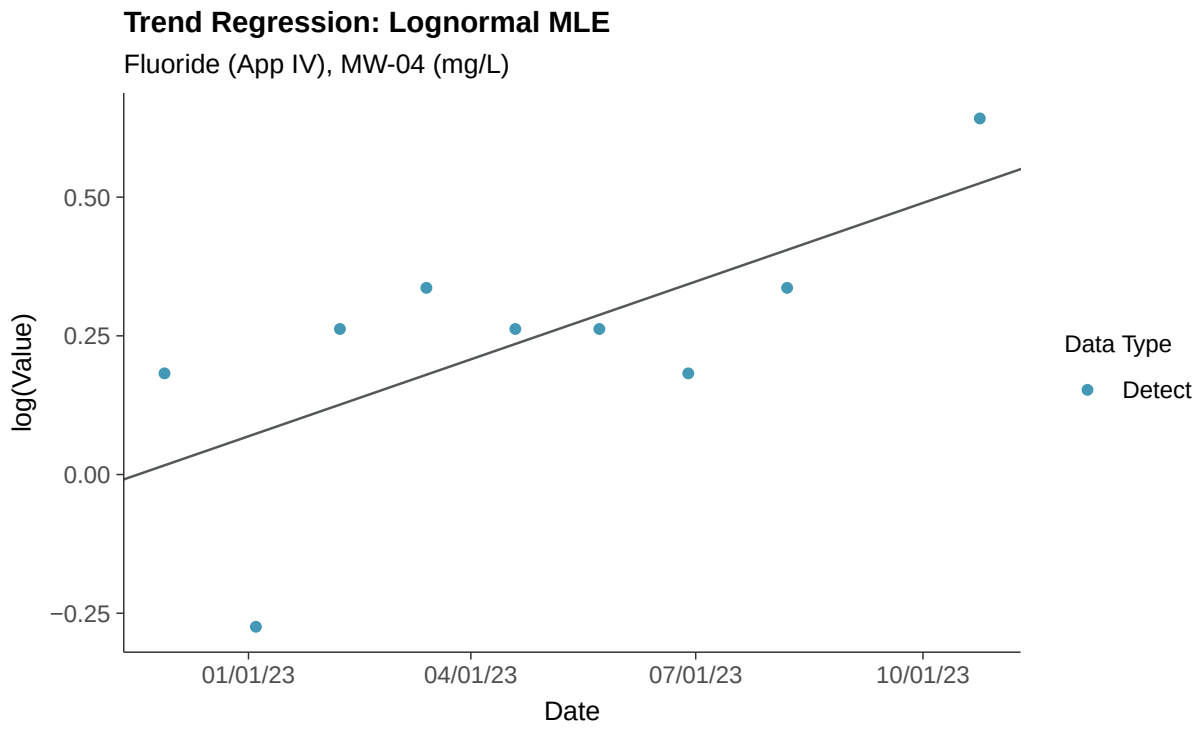
Fluoride (App IV), MW-04 (mg/L)




Normal Q-Q plot
Fluoride (App IV), MW-04 (mg/L)
Value
2.0
1.5
1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

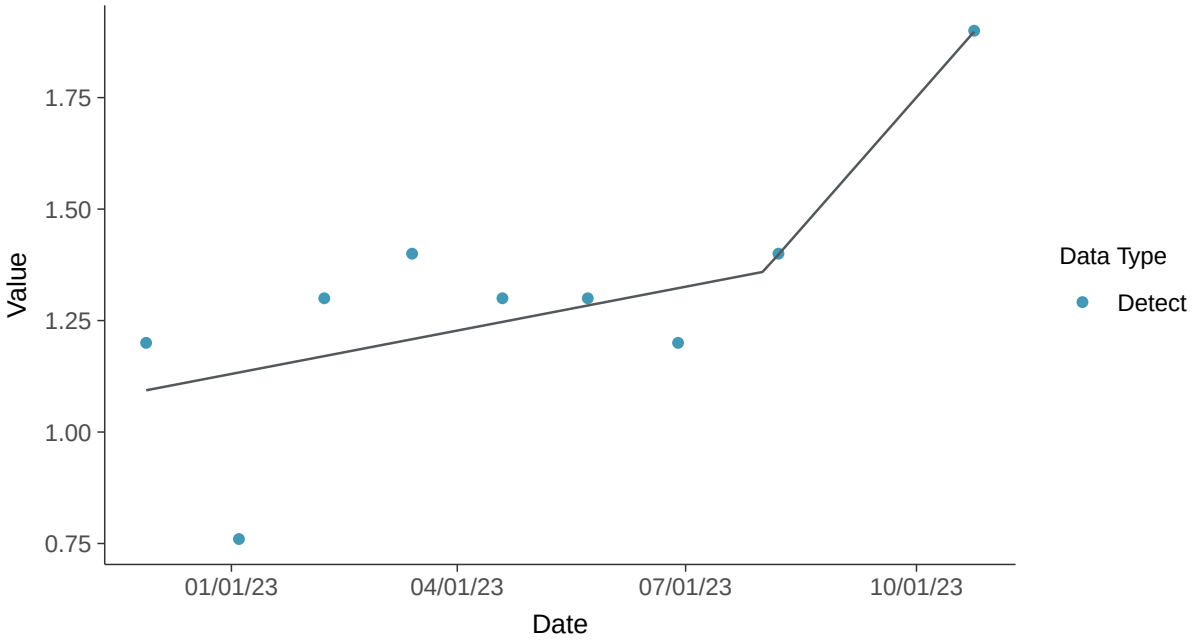

Lognormal Q-Q plot
Fluoride (App IV), MW-04 (mg/L)
log(Value)
0.50
0.25
0.00
−0.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride (App IV), MW-04 (mg/L)
Value
2.0
1.5
1.0
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-04 (mg/L)
log(Value)
0.50
0.25
0.00
−0.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

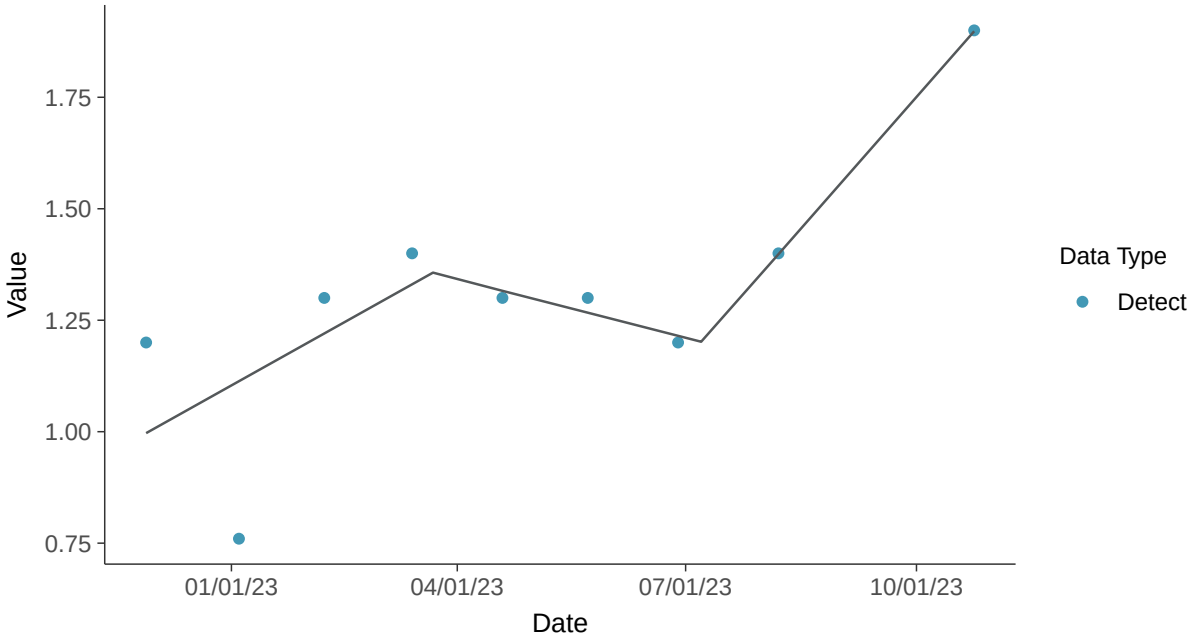
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-04 (mg/L)



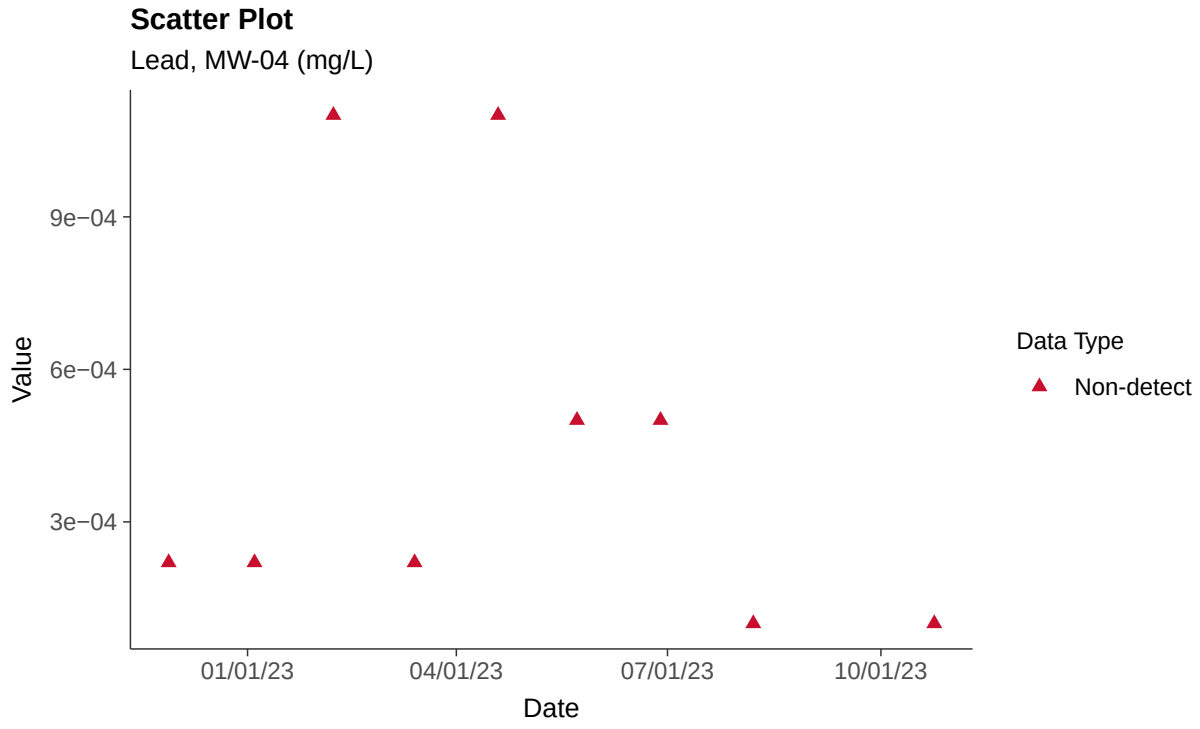
Trend Regression: Piecewise Linear-Linear-Linear

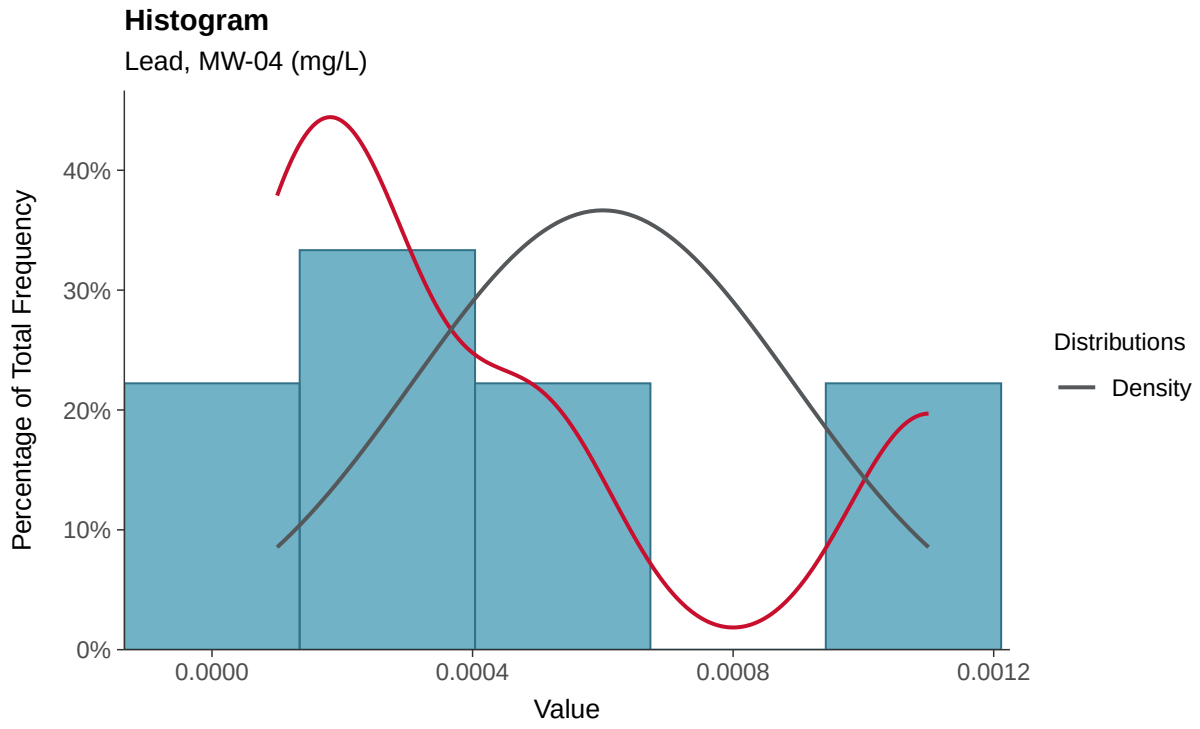
Fluoride (App IV), MW-04 (mg/L)



Appendix IV: Lead, MW-04

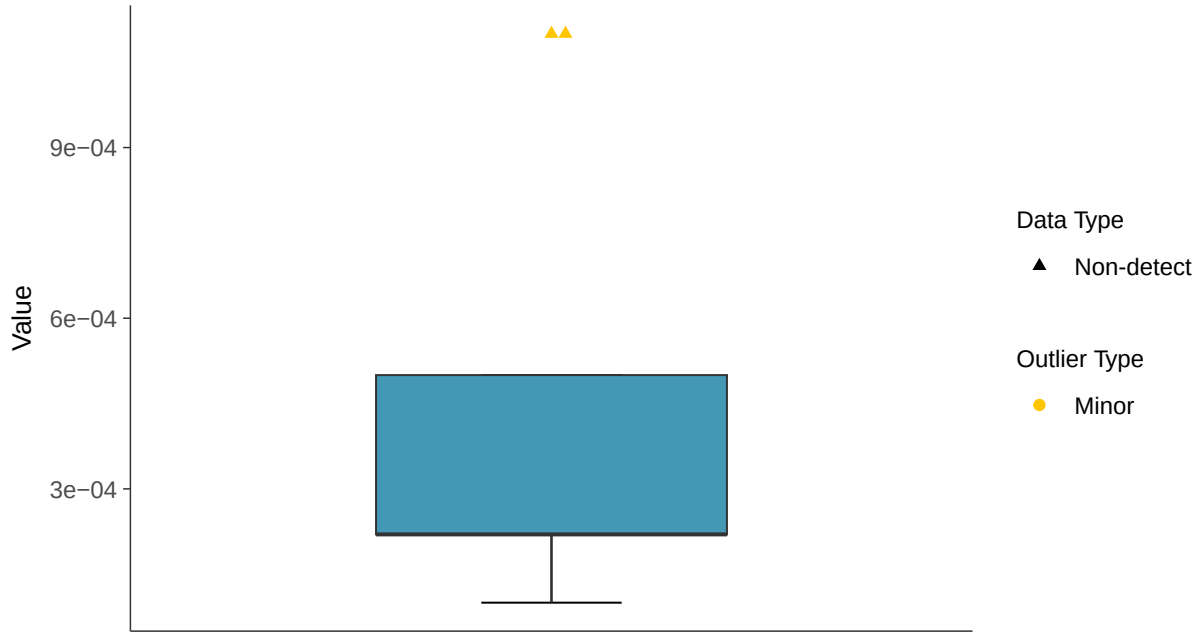
ID: 2_14_5_115





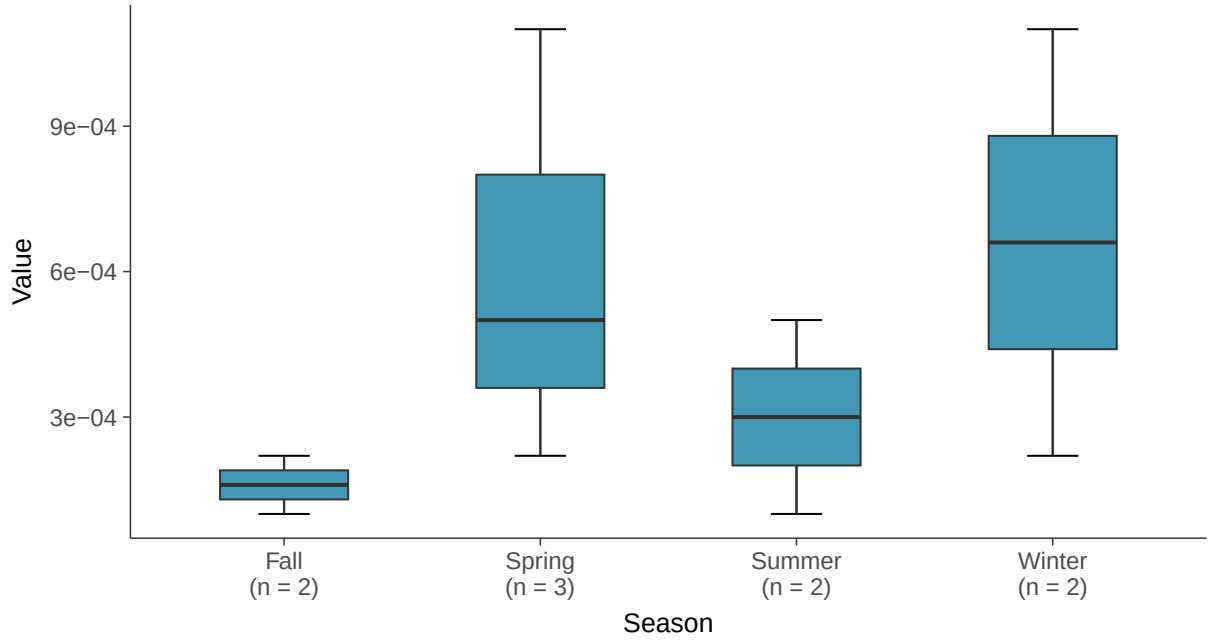
Boxplot

Lead, MW-04 (mg/L)



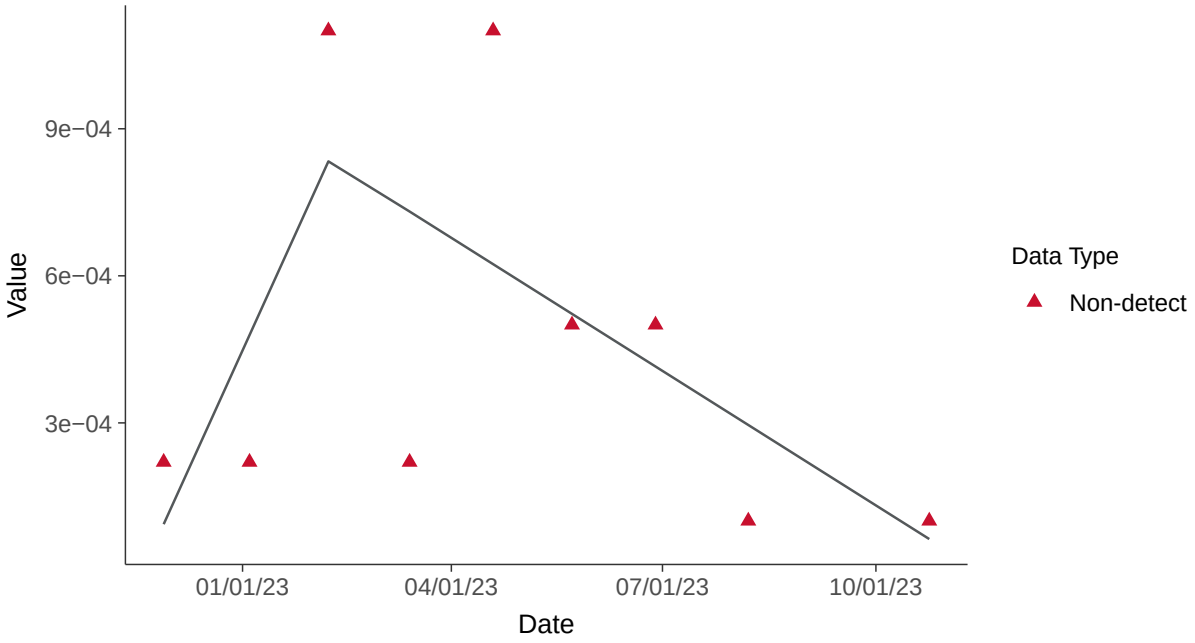
Boxplot by Season

Lead, MW-04 (mg/L)



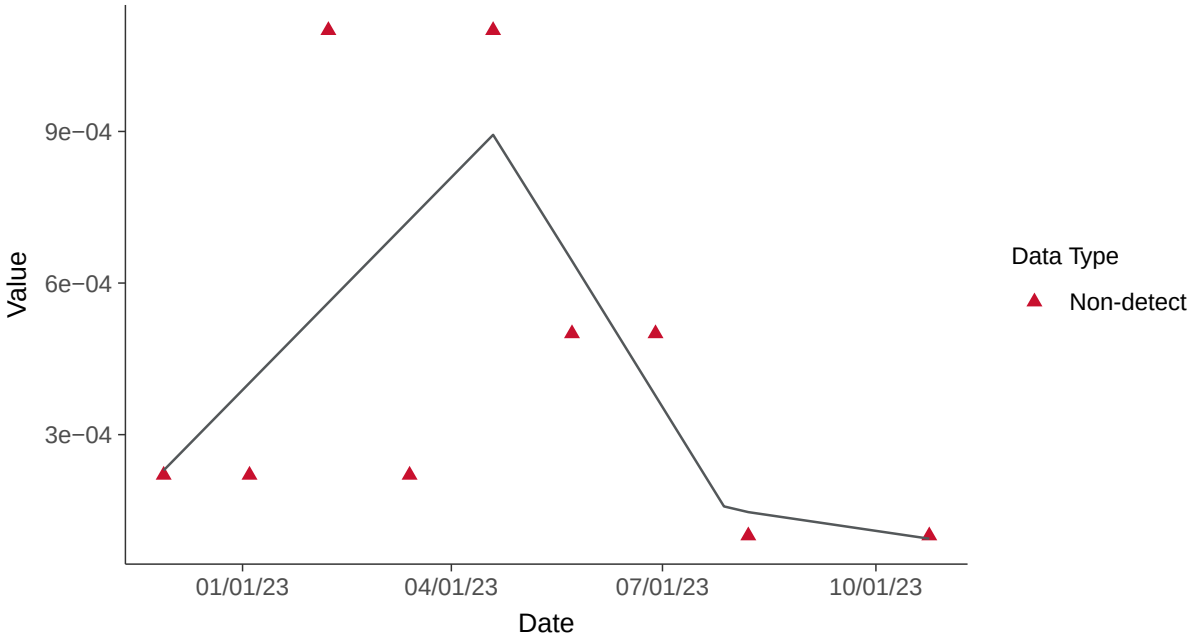
Trend Regression: Piecewise Linear-Linear

Lead, MW-04 (mg/L)



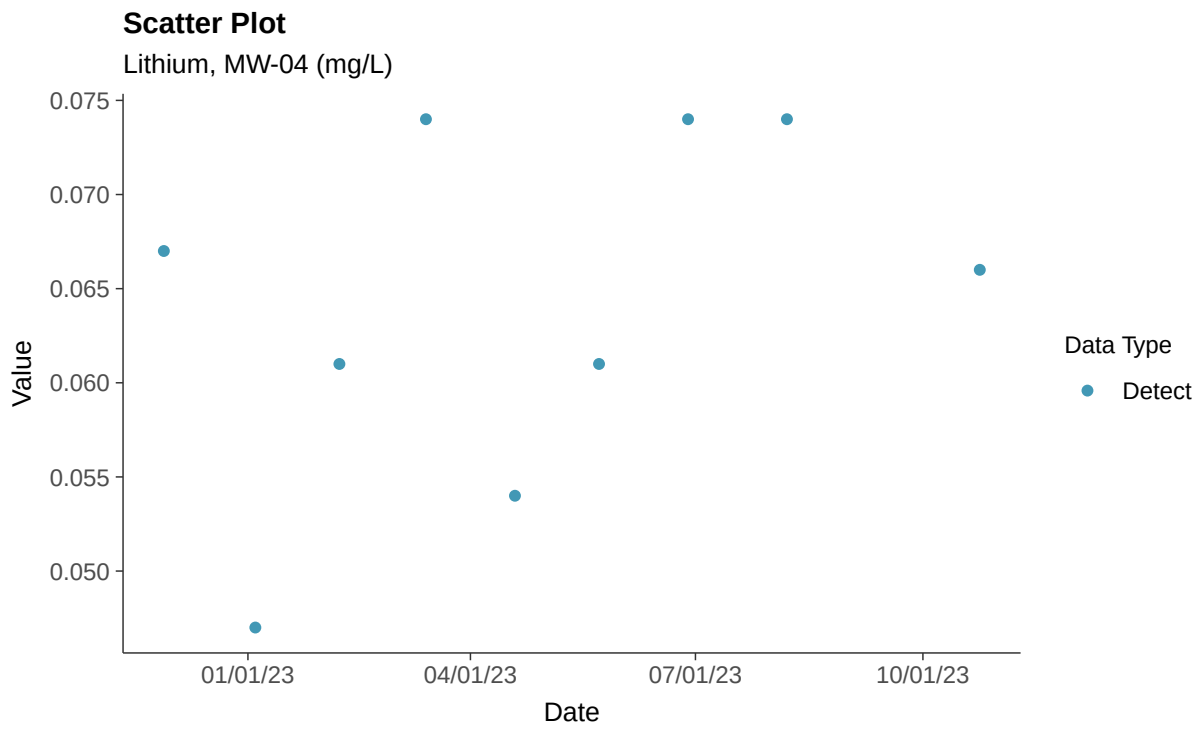
Trend Regression: Piecewise Linear-Linear-Linear

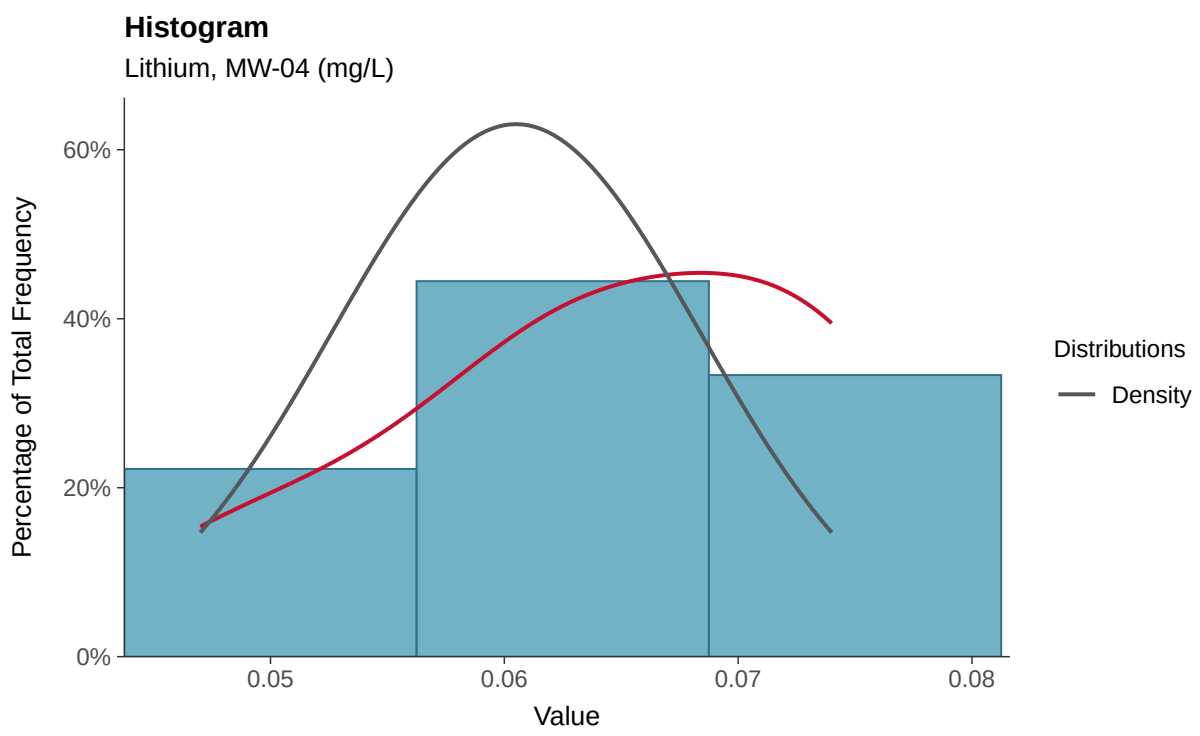
Lead, MW-04 (mg/L)



Appendix IV: Lithium, MW-04

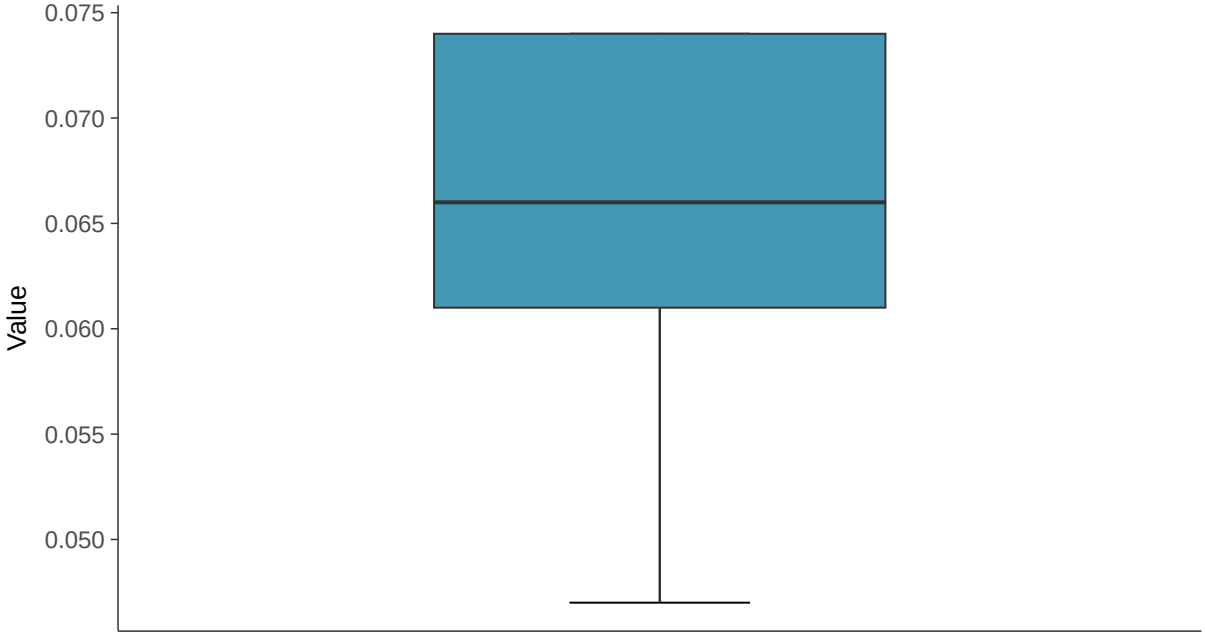
ID: 2_14_5_116





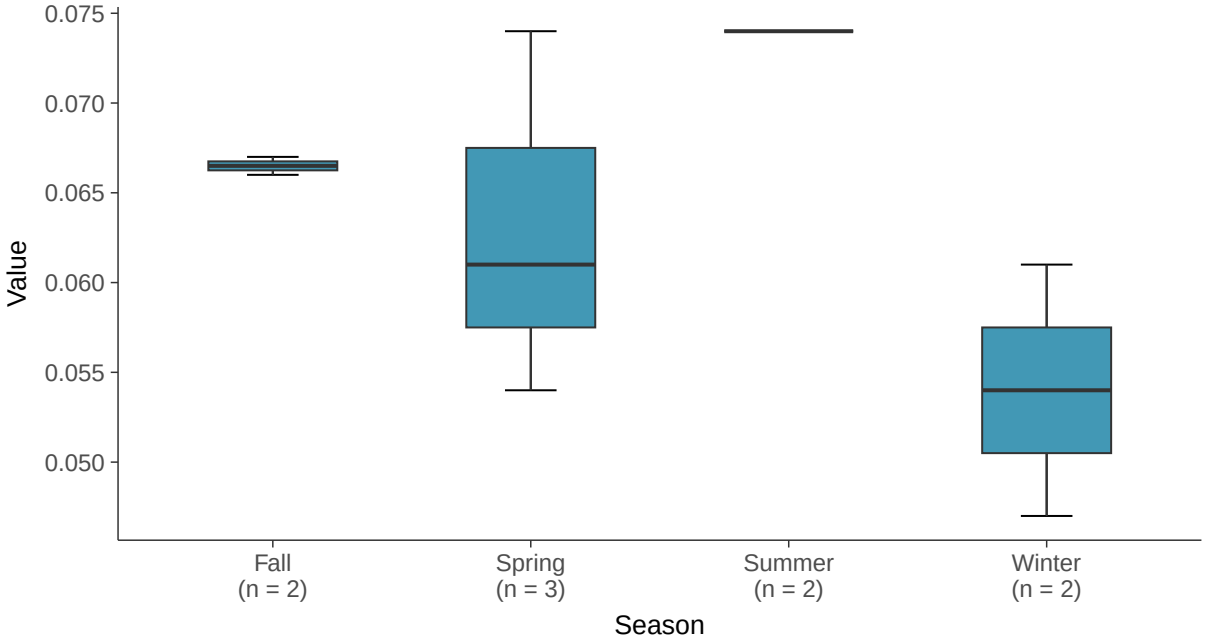
Boxplot

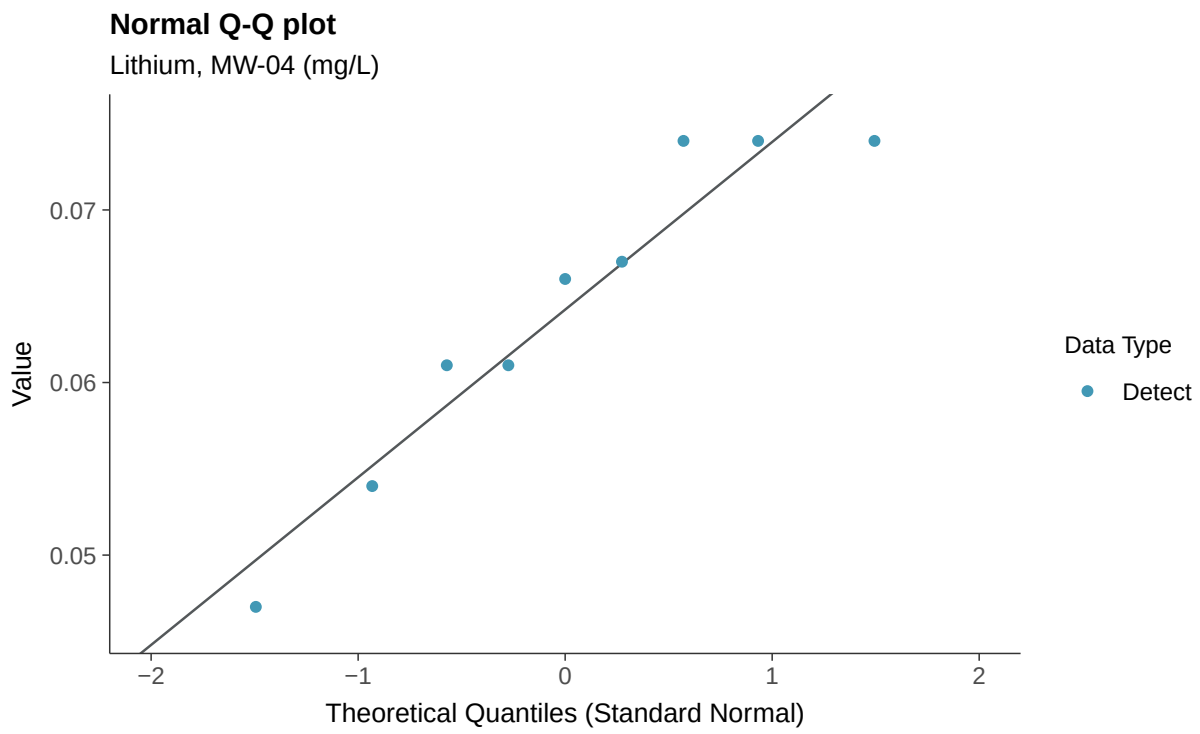
Lithium, MW-04 (mg/L)

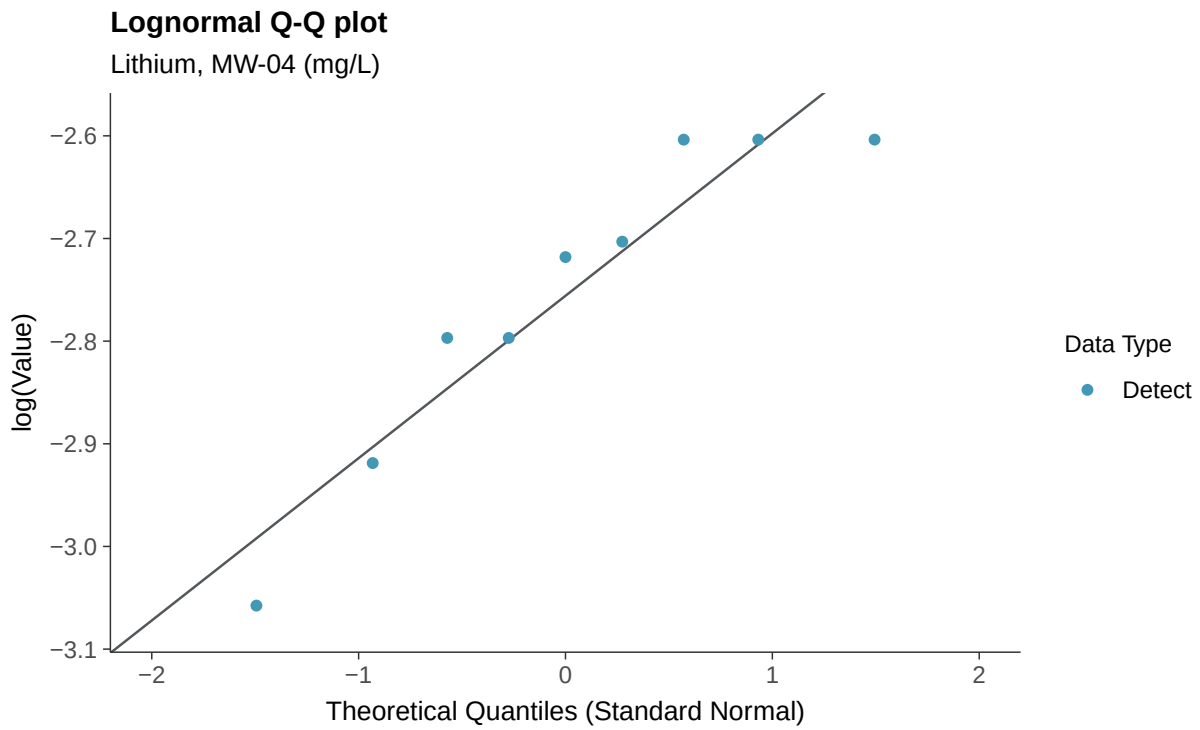


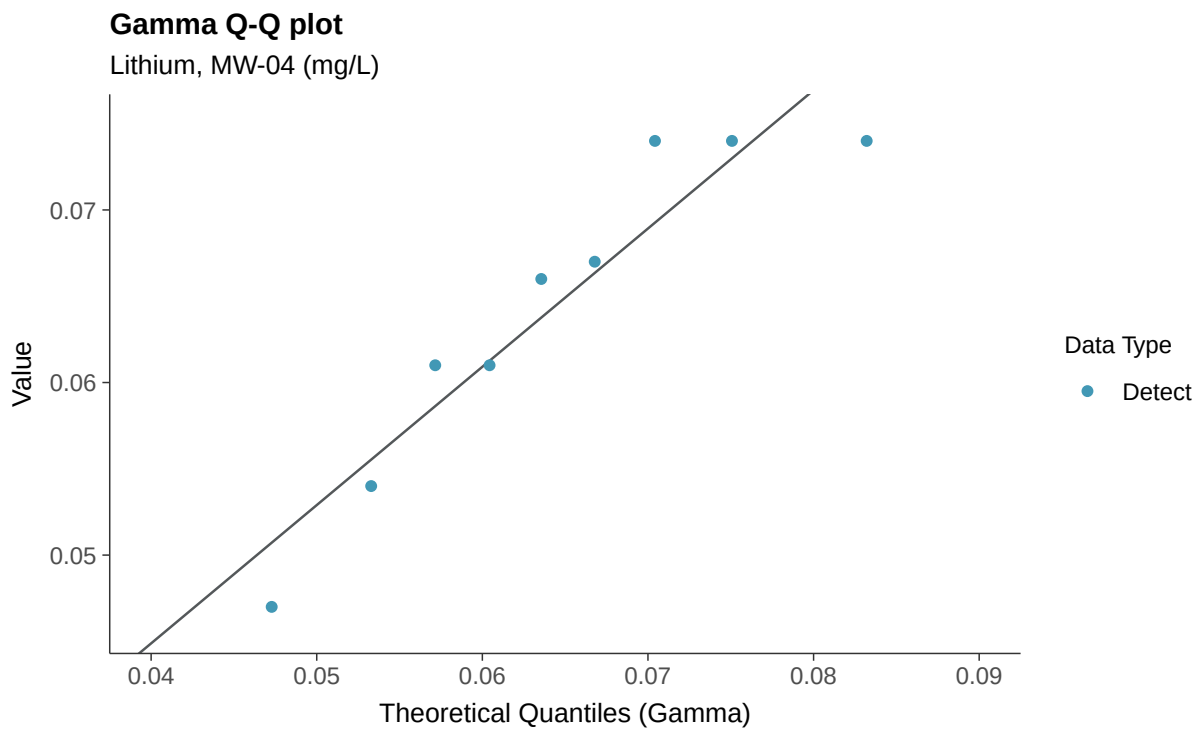
Boxplot by Season

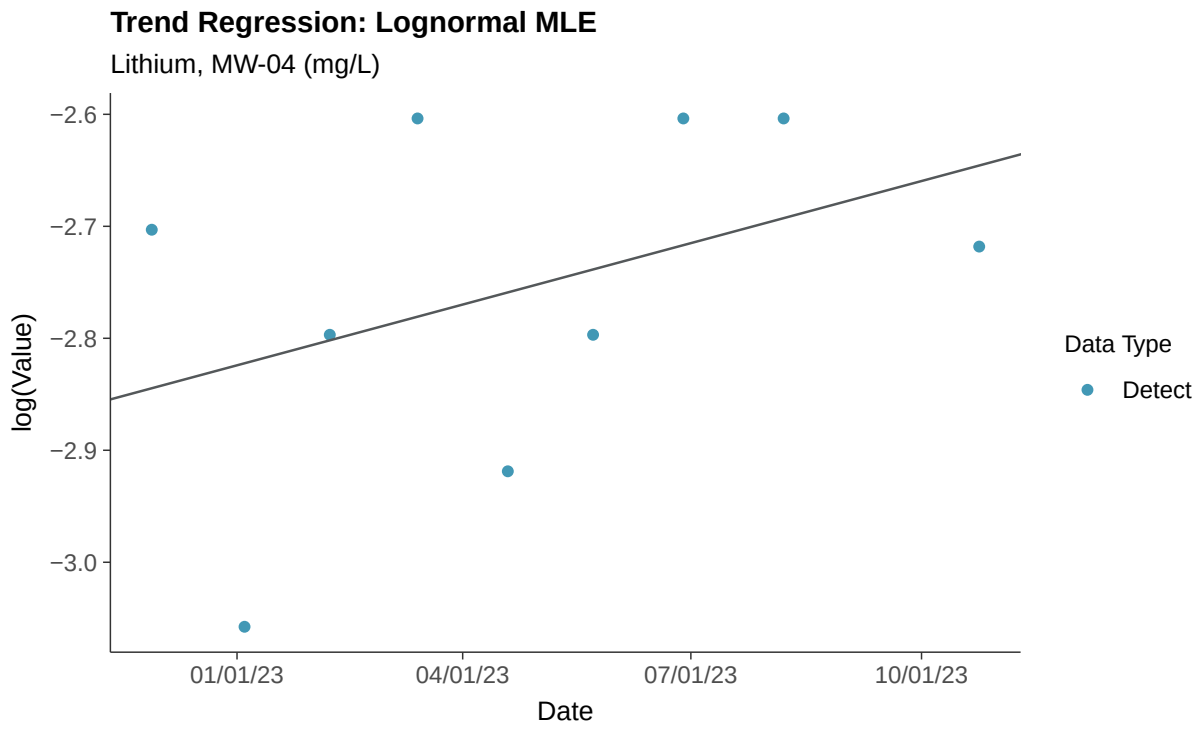
Lithium, MW-04 (mg/L)




Normal Q-Q plot
Lithium, MW-04 (mg/L)
Value
0.07
0.06
0.05
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

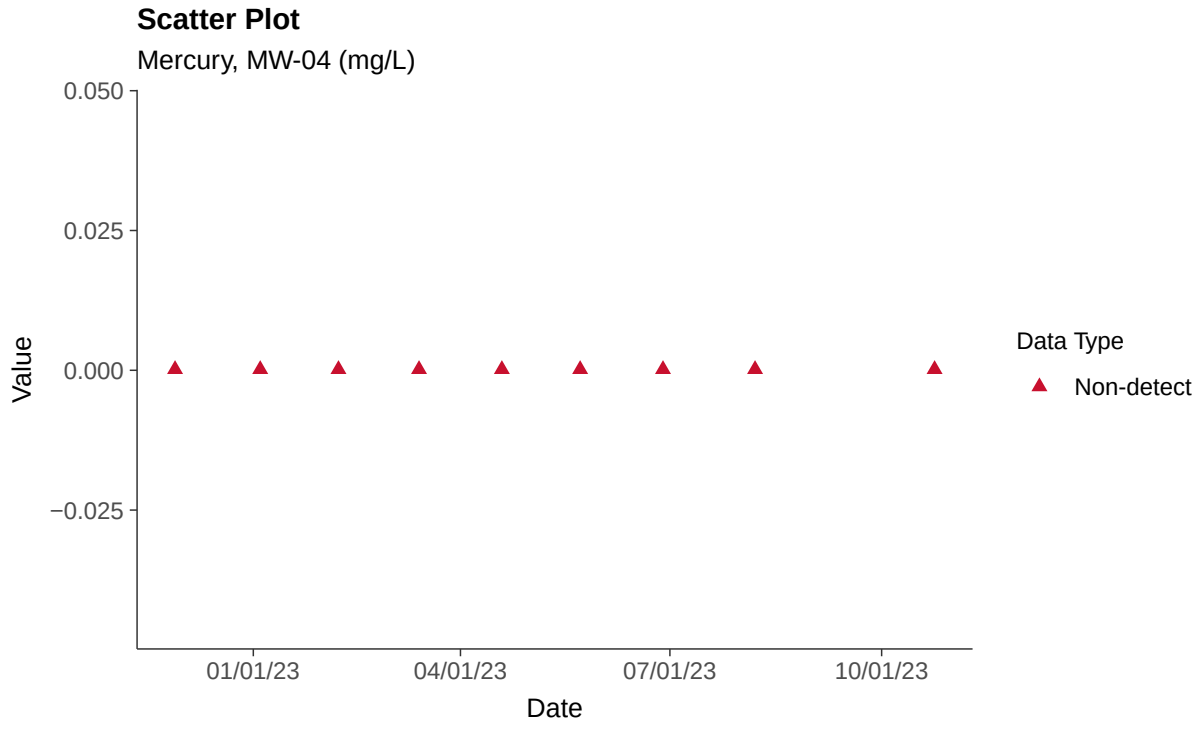

Lognormal Q-Q plot
Lithium, MW-04 (mg/L)
log(Value)
−2.6
−2.7
−2.8
−2.9
−3.0
−3.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

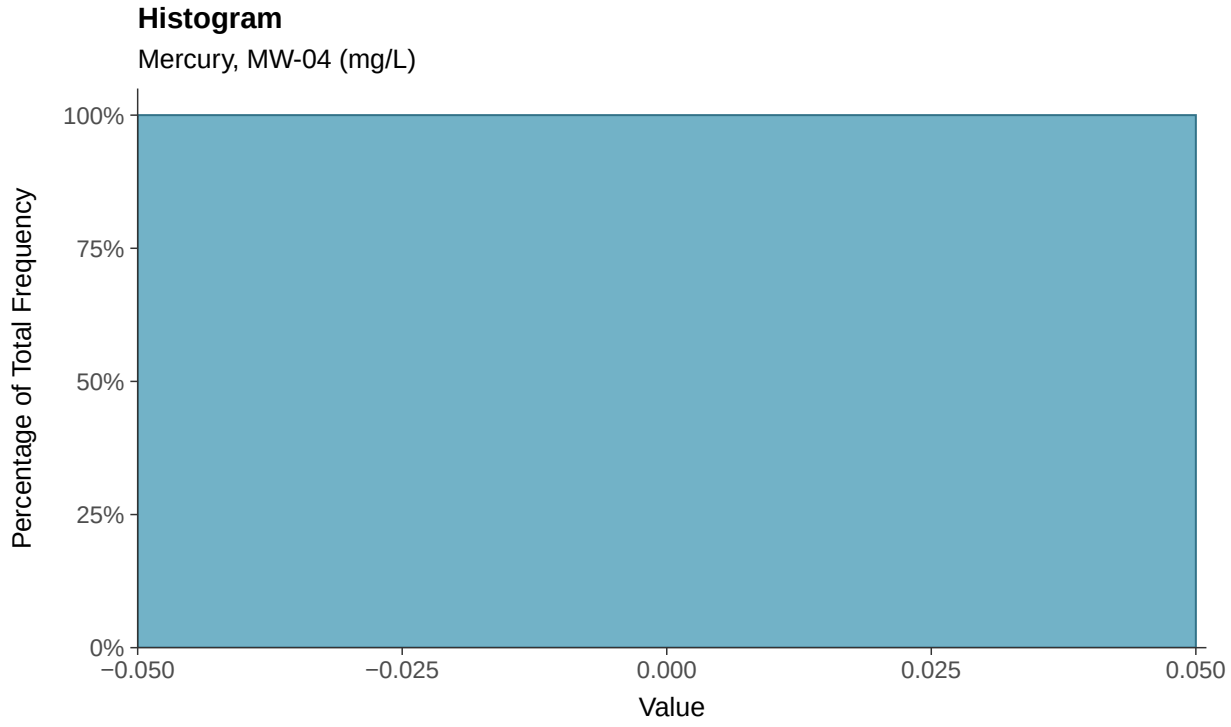

Gamma Q-Q plot
Lithium, MW-04 (mg/L)
Value
0.07
0.06
0.05
0.04
0.05
0.06
0.07
0.08
0.09
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Lithium, MW-04 (mg/L)
log(Value)
−2.6
−2.7
−2.8
−2.9
−3.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-04

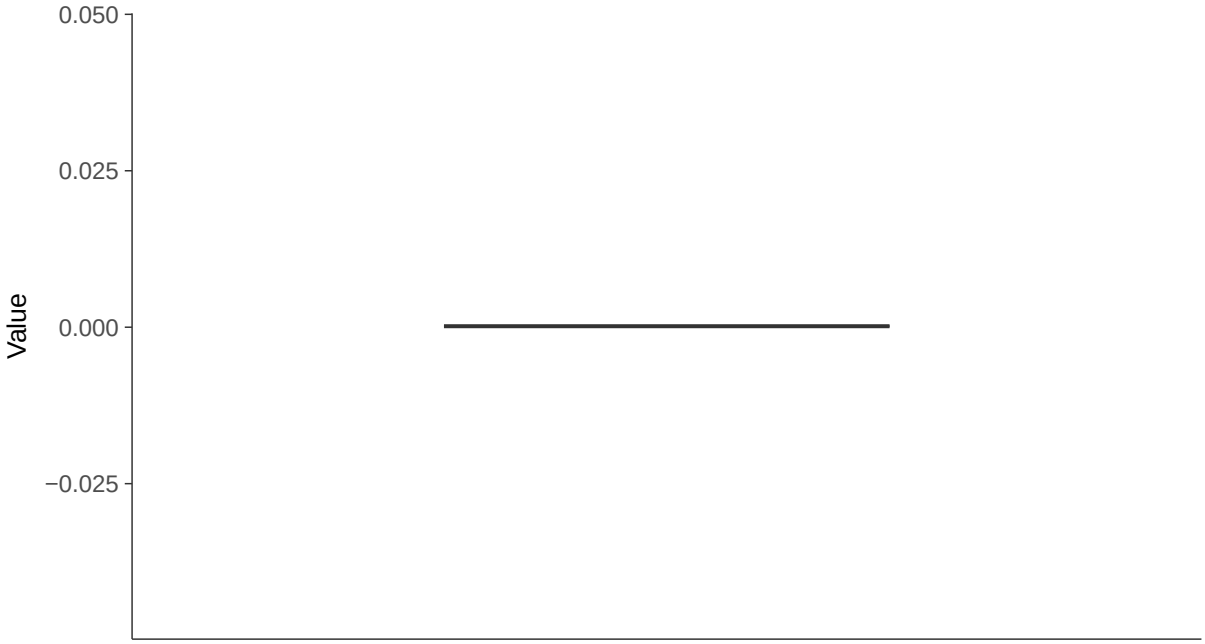
ID: 2_14_5_117





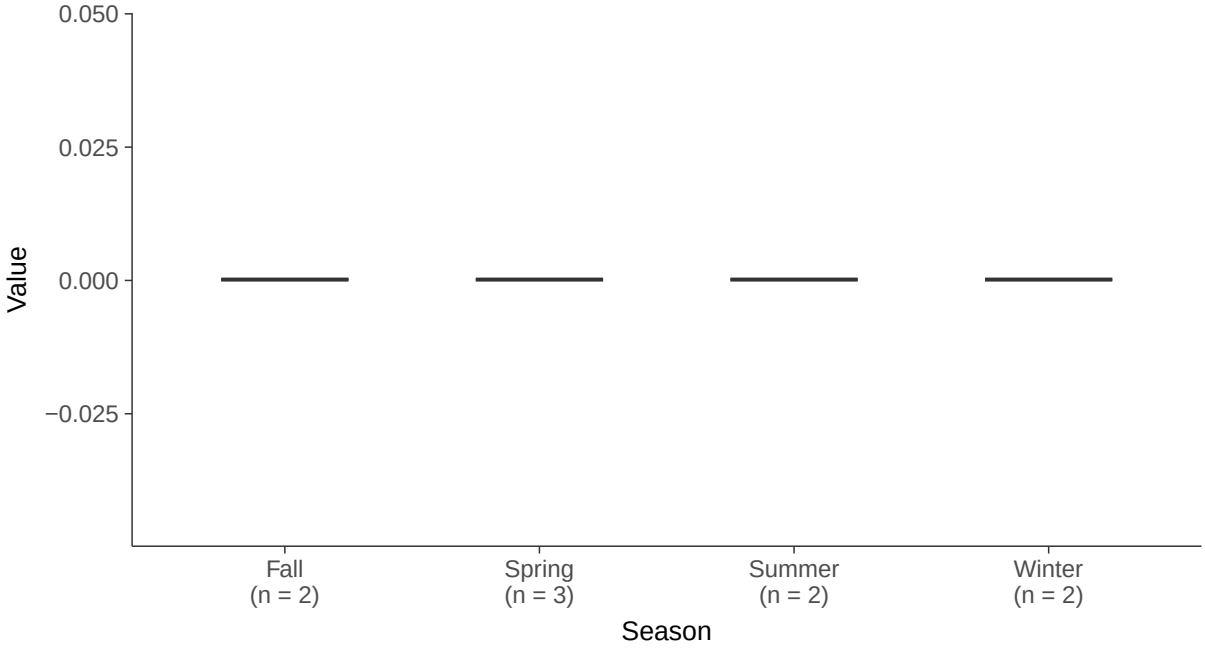
Boxplot

Mercury, MW-04 (mg/L)



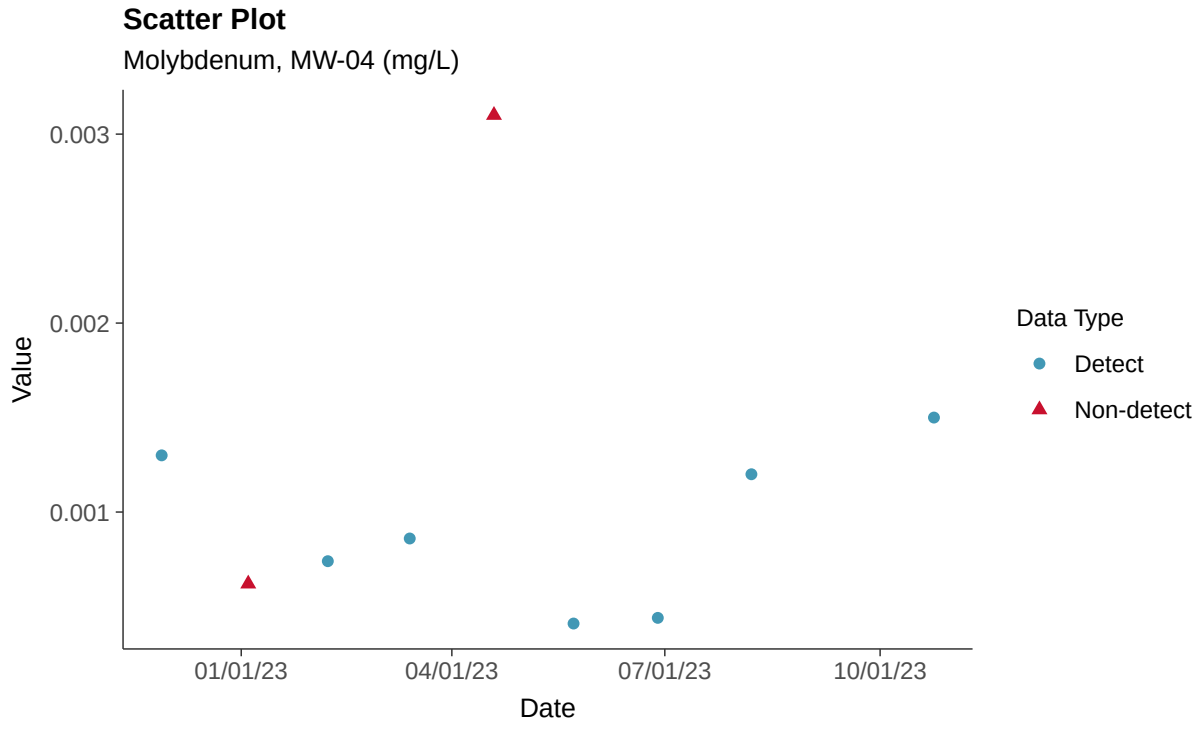
Boxplot by Season

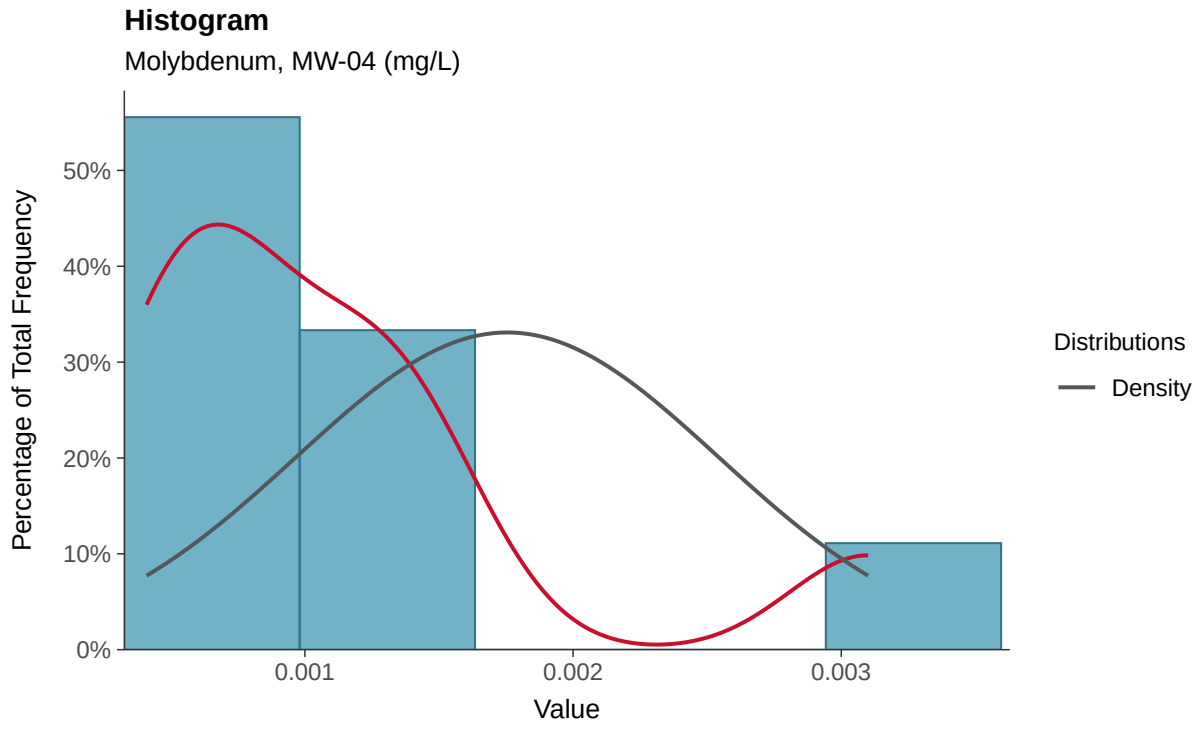
Mercury, MW-04 (mg/L)

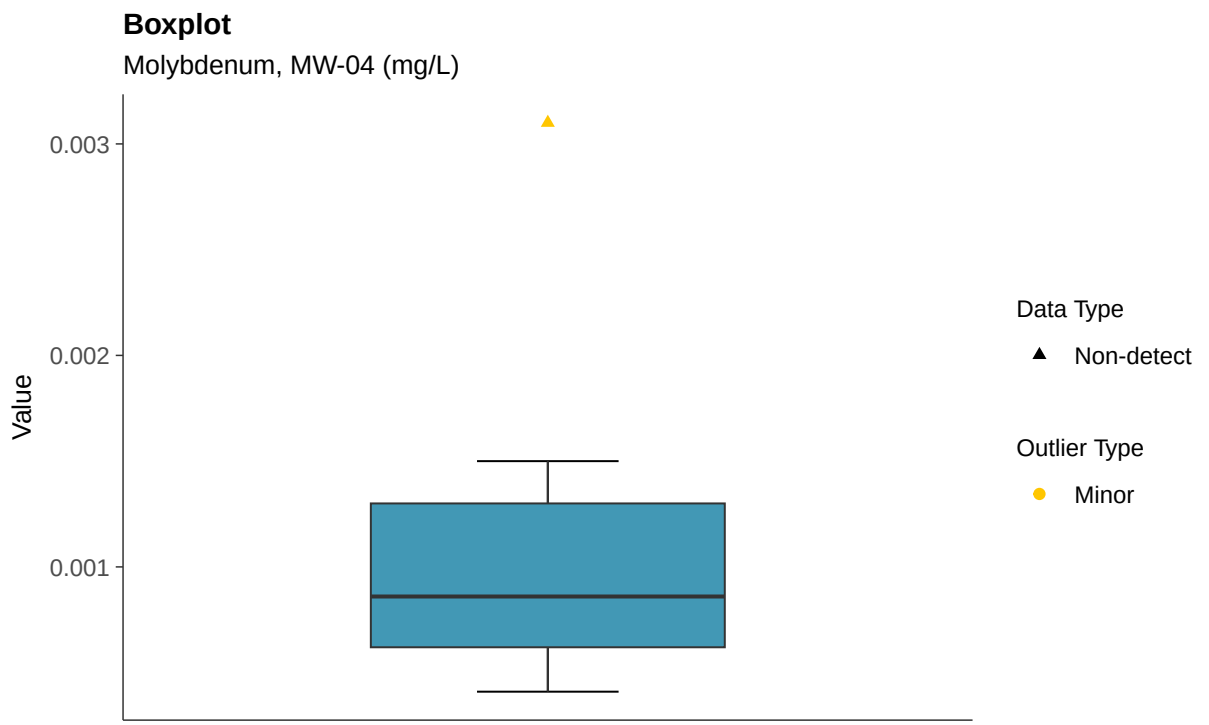


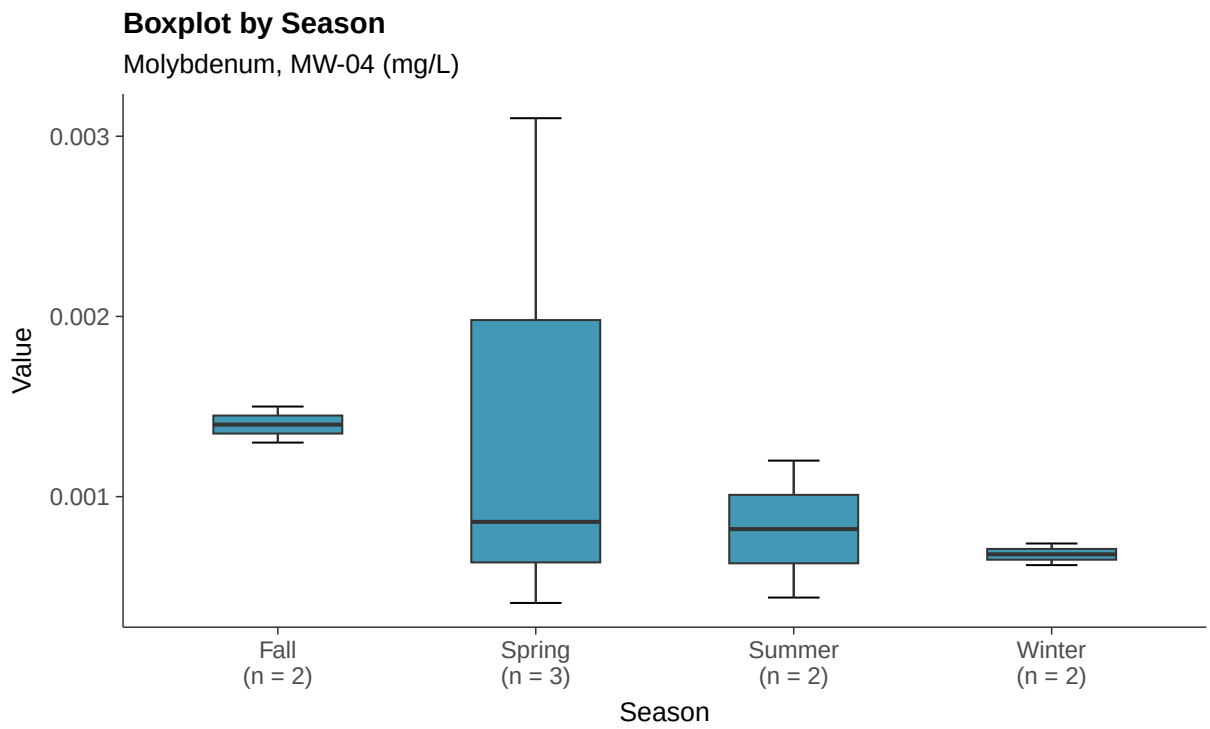
Appendix IV: Molybdenum, MW-04

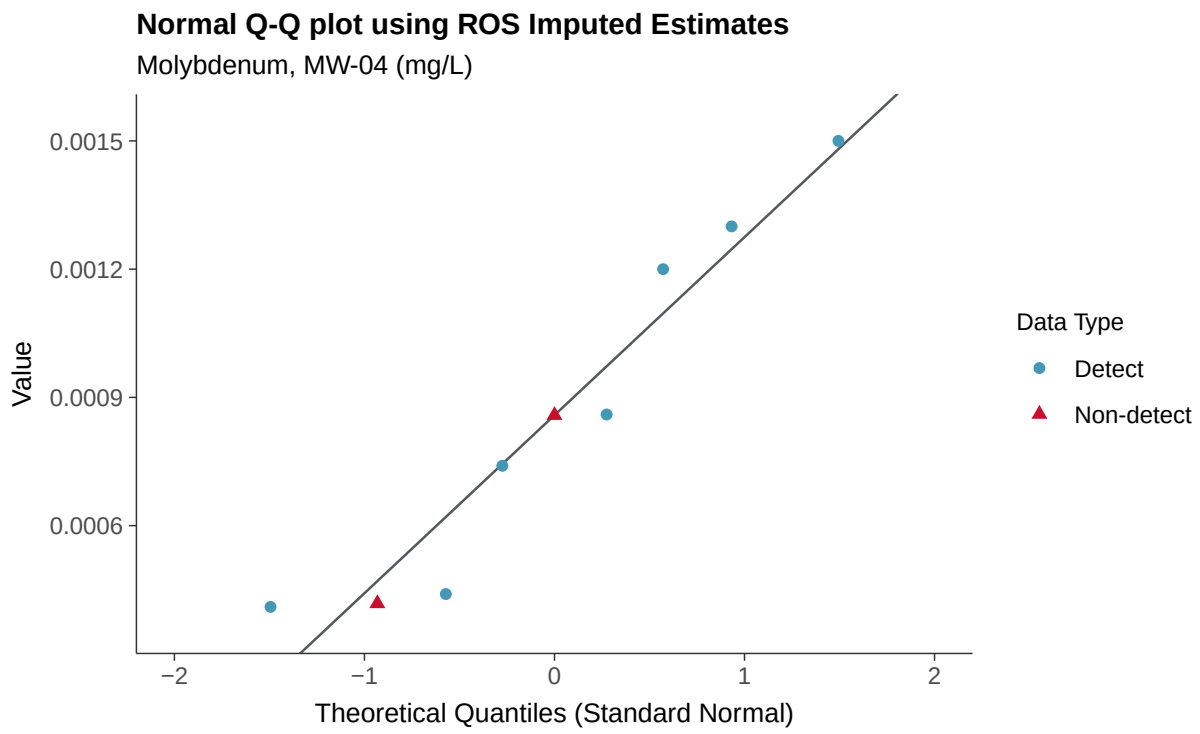
ID: 2_14_5_118

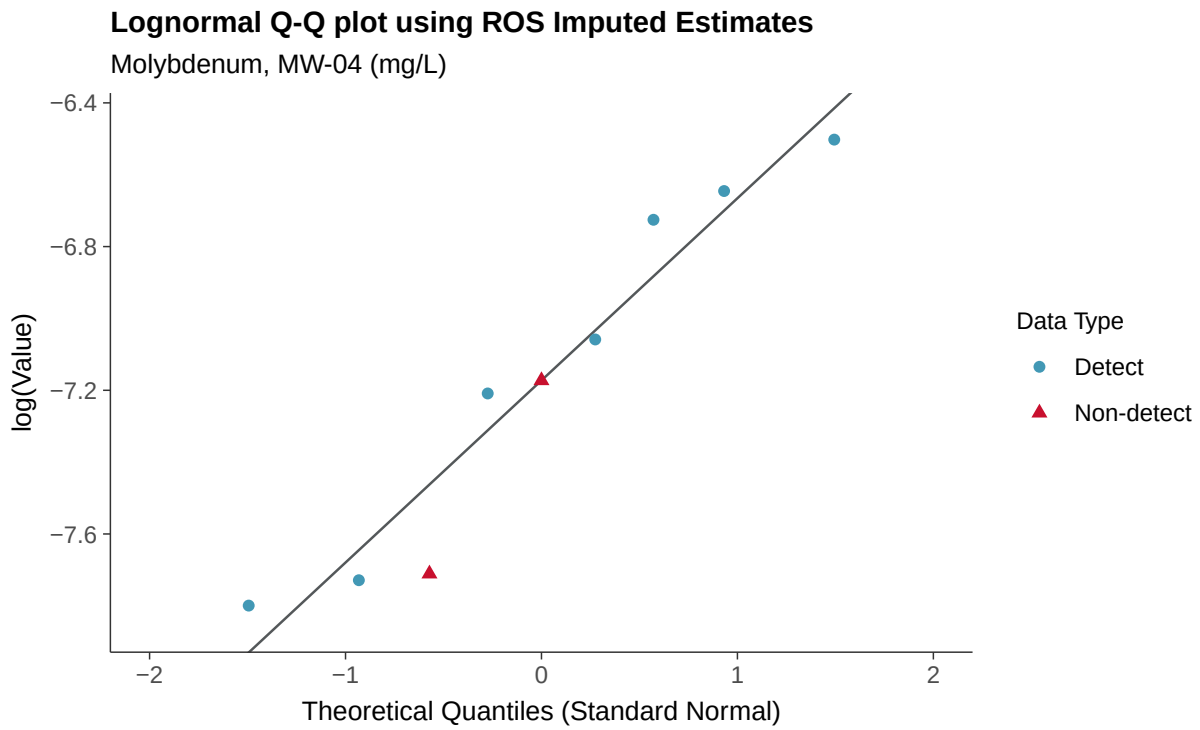


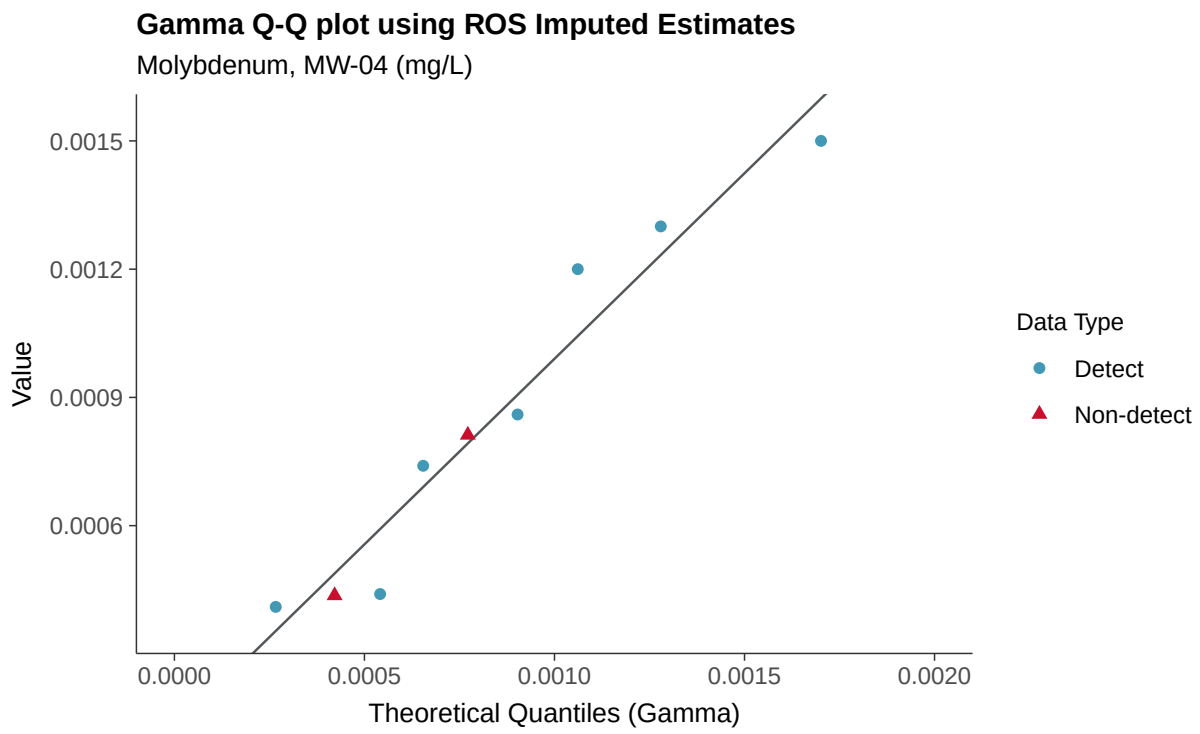


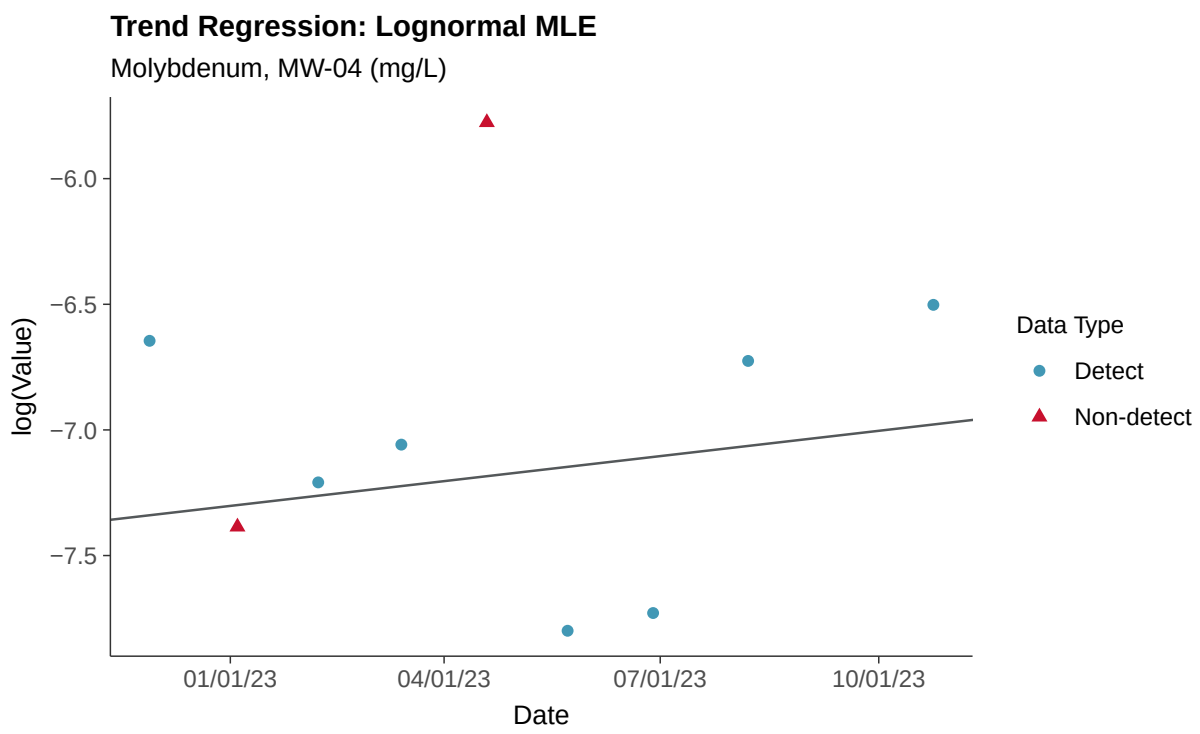

Boxplot
Molybdenum, MW-04 (mg/L)
Value
0.003
0.002
0.001
Data Type
Non-detect
Outlier Type
Minor

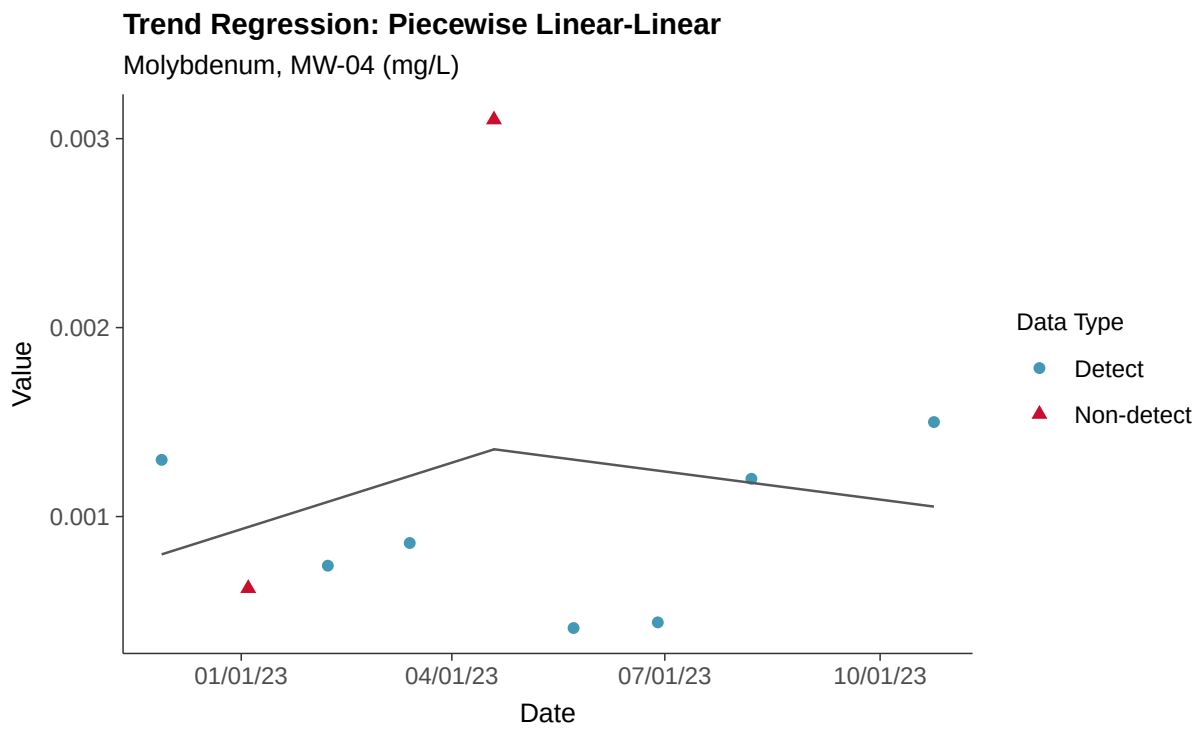

Boxplot by Season
Molybdenum, MW-04 (mg/L)
Value
0.003
0.002
0.001
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

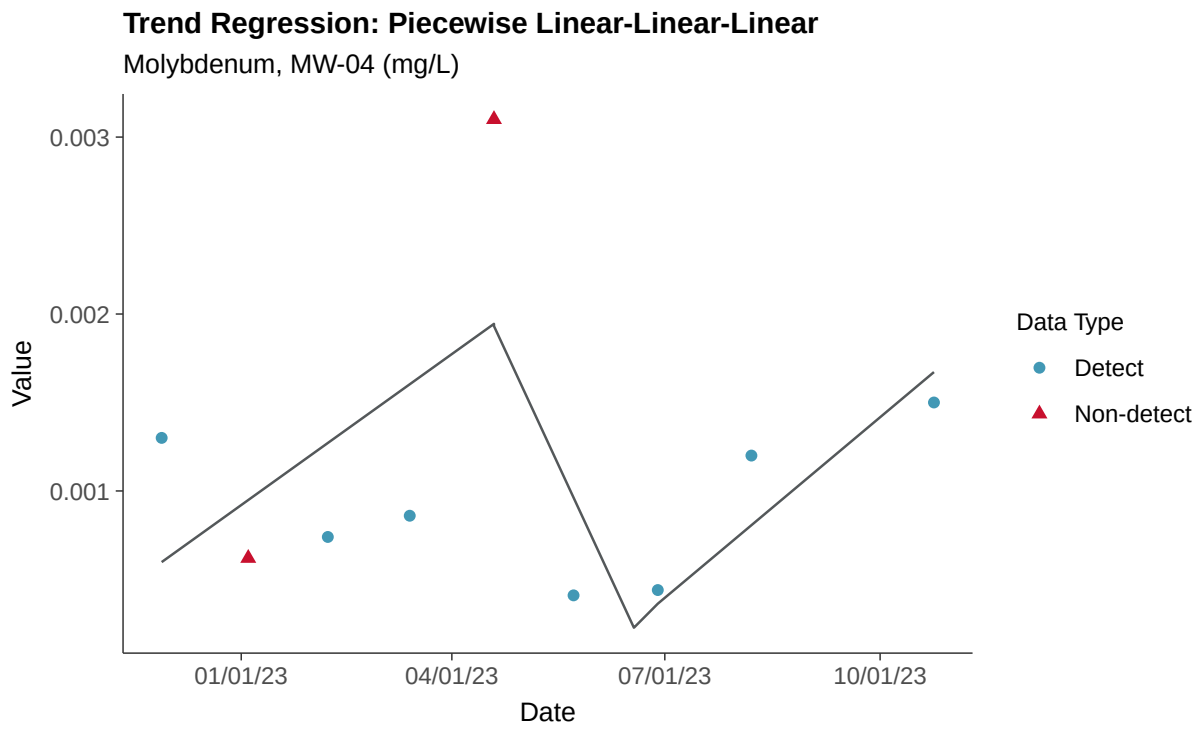

Normal Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-04 (mg/L)
Value
0.0015
0.0012
0.0009
0.0006
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-04 (mg/L)
log(Value)
−6.4
−6.8
−7.2
−7.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-04 (mg/L)
Value
0.0015
0.0012
0.0009
0.0006
0.0000
0.0005
0.0010
0.0015
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

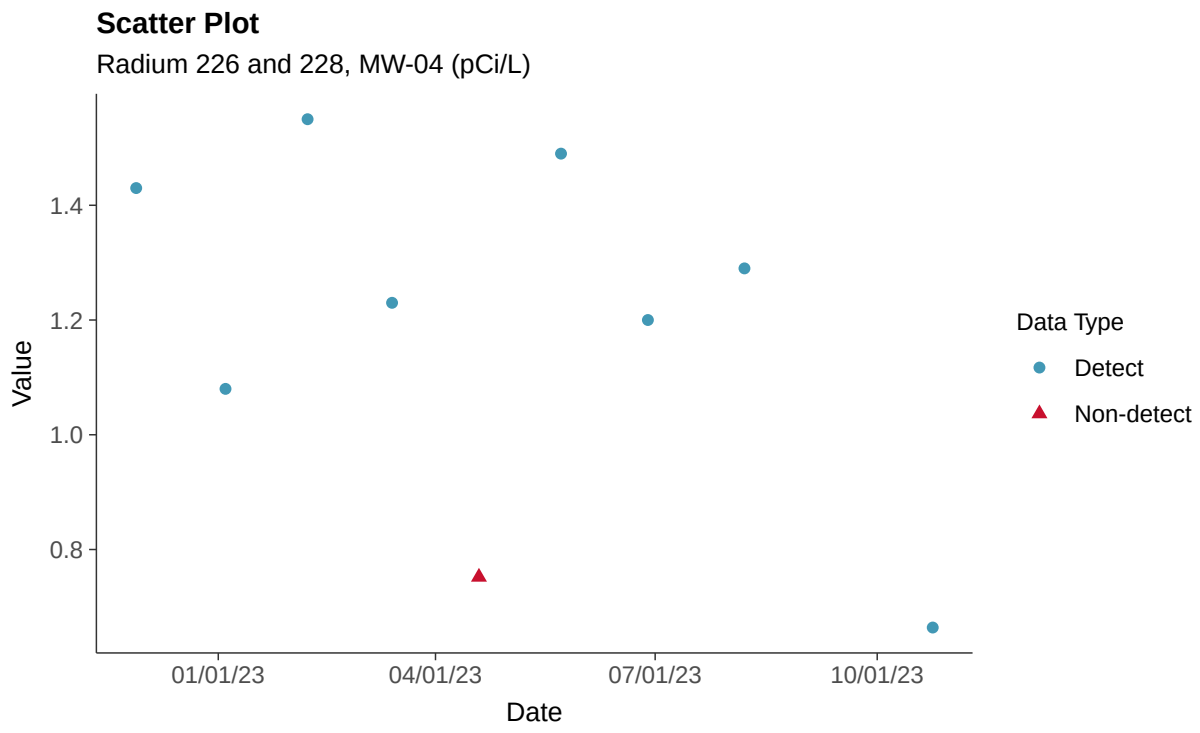

Trend Regression: Lognormal MLE
Molybdenum, MW-04 (mg/L)
log(Value)
−6.0
−6.5
−7.0
−7.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

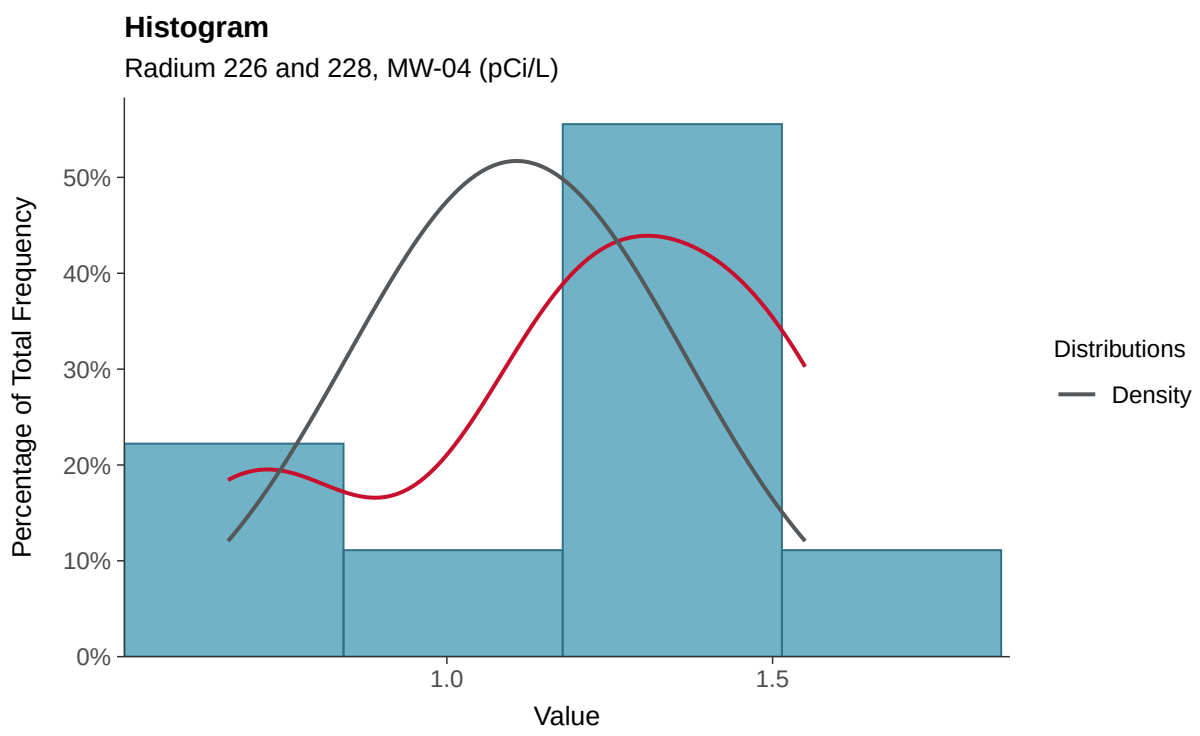

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-04 (mg/L)
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-04 (mg/L)
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Radium 226 and 228, MW-04

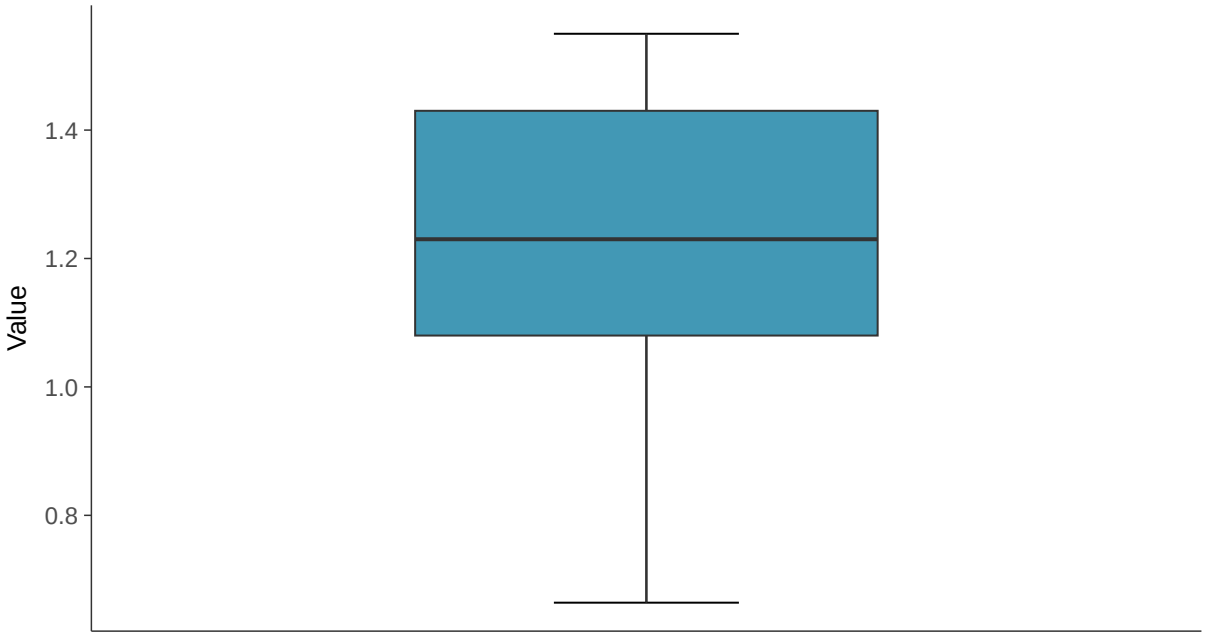
ID: 2_14_5_121





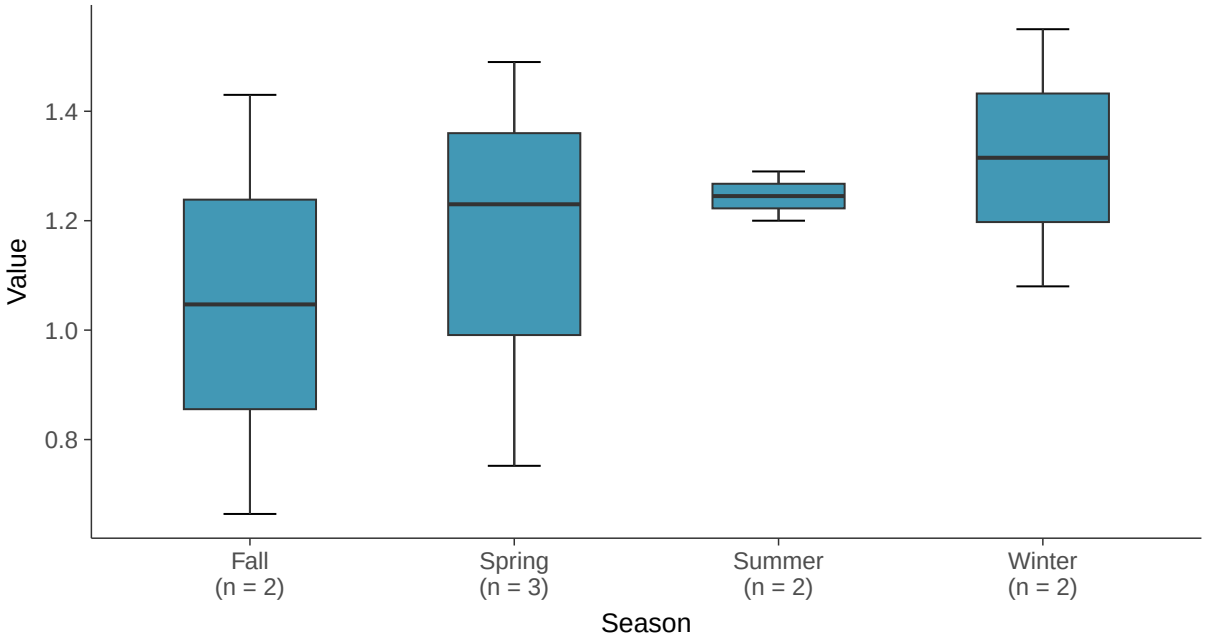
Boxplot

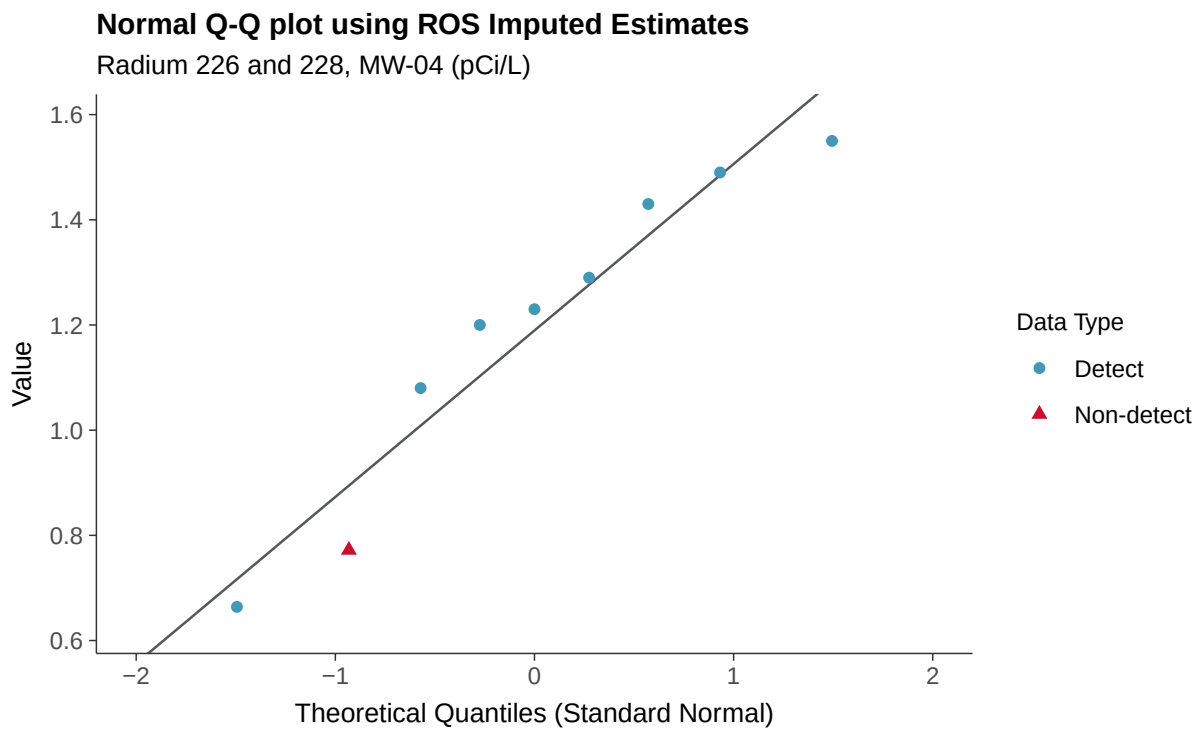
Radium 226 and 228, MW-04 (pCi/L)

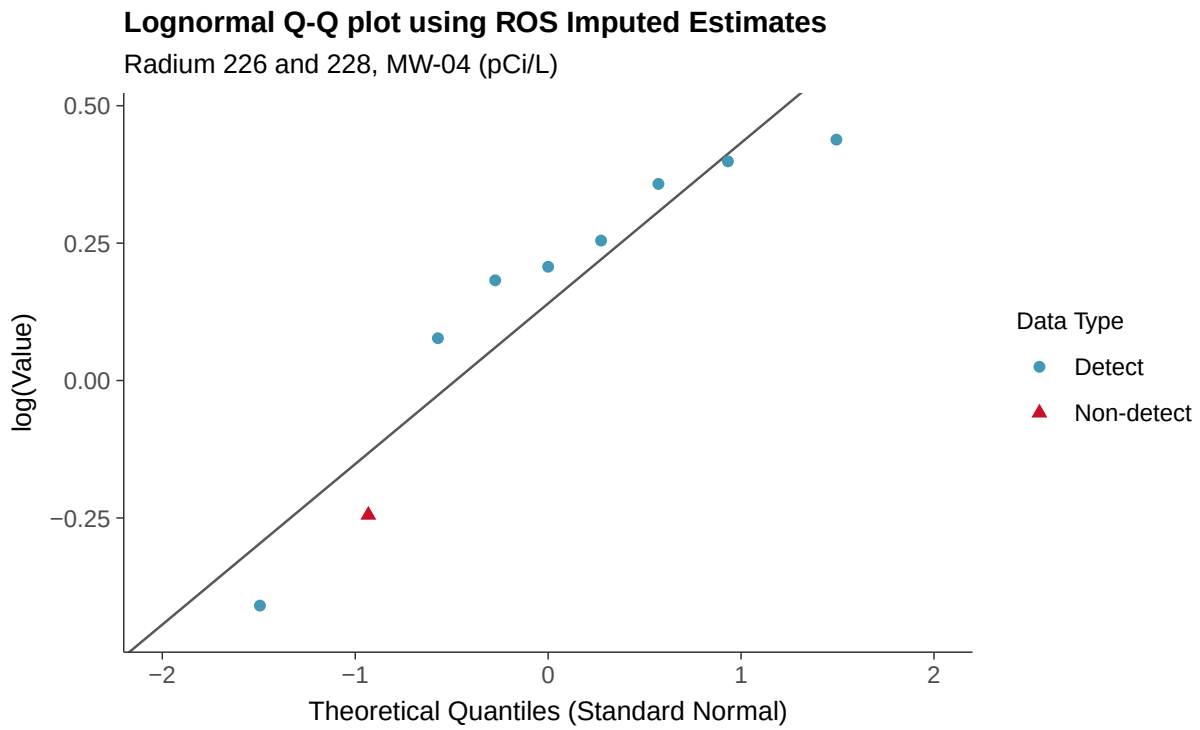


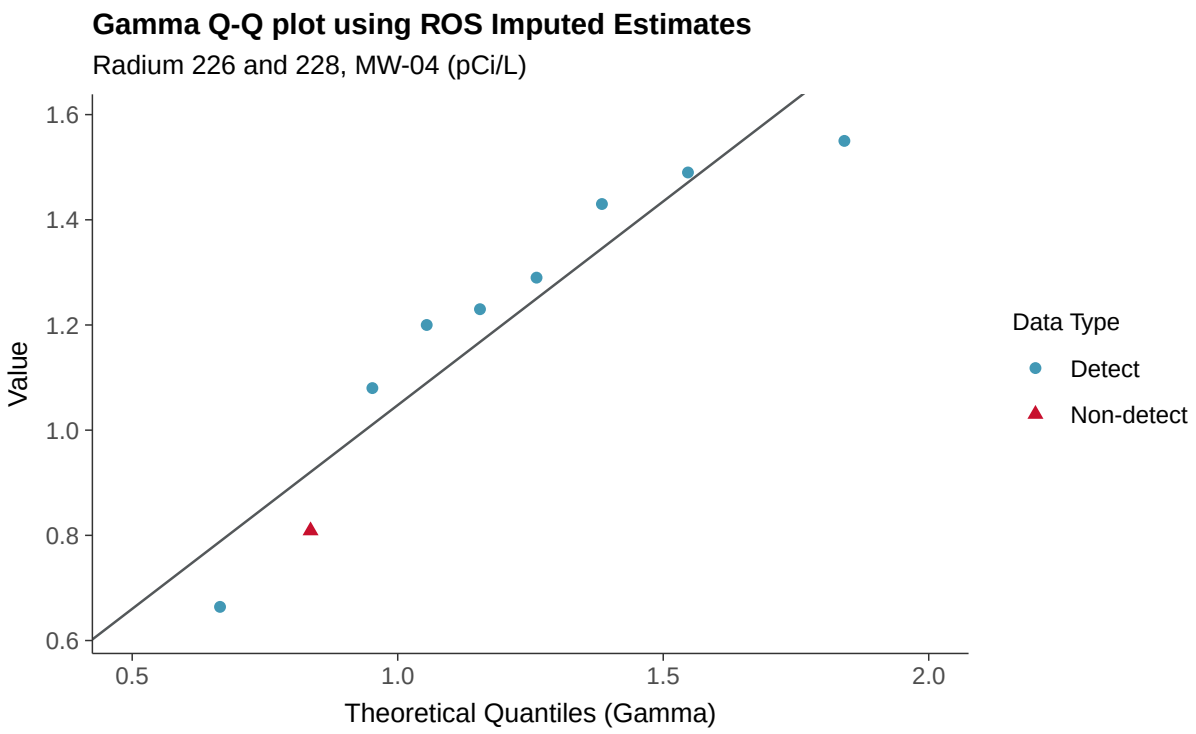
Boxplot by Season

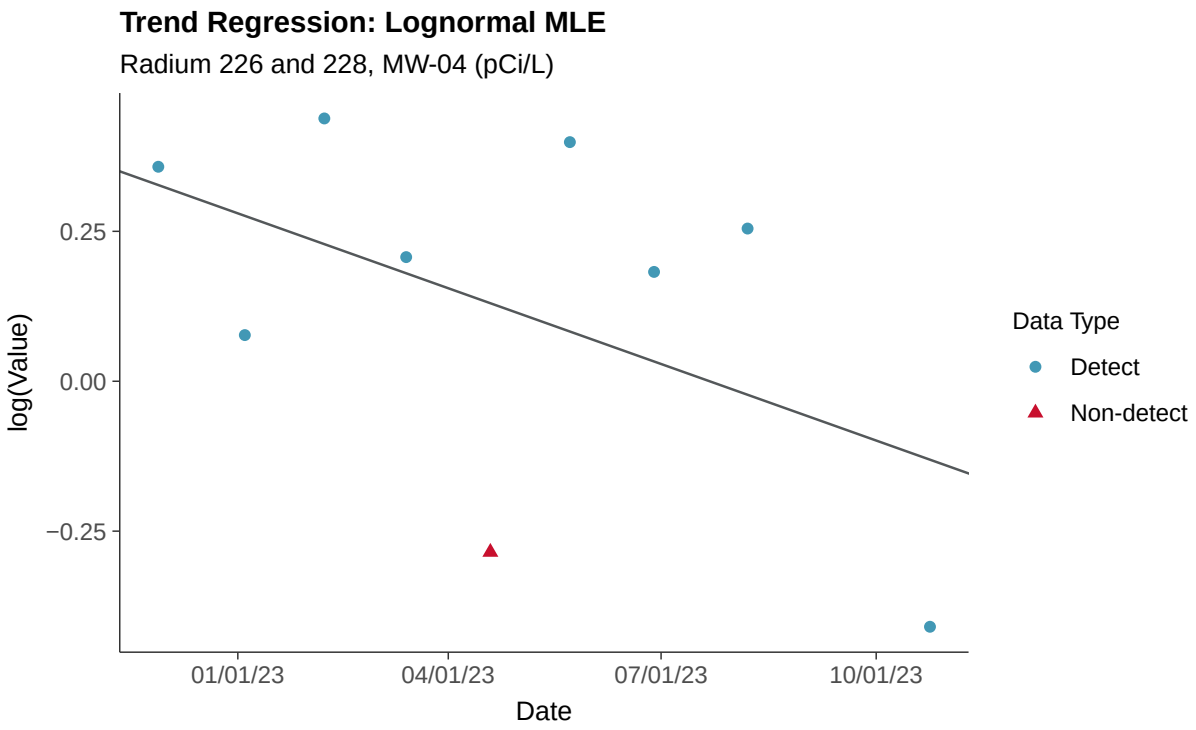
Radium 226 and 228, MW-04 (pCi/L)




Normal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-04 (pCi/L)
Value
1.6
1.4
1.2
1.0
0.8
0.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

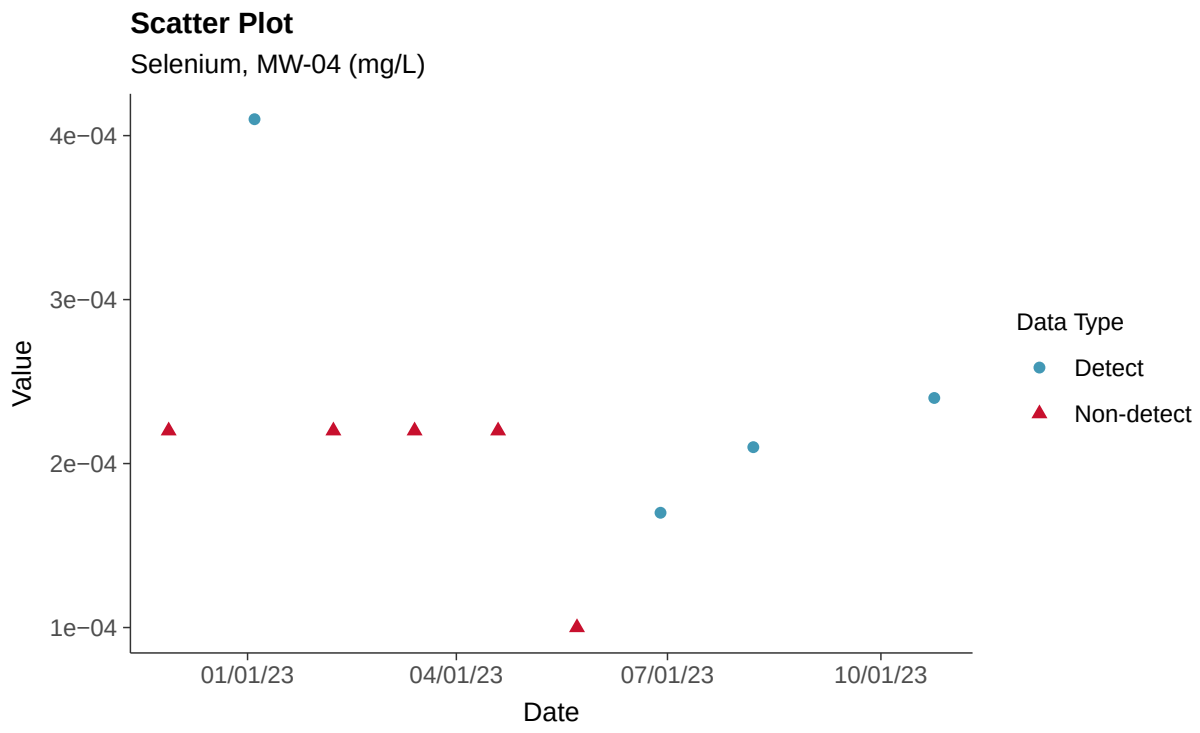

Lognormal Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-04 (pCi/L)
log(Value)
0.50
0.25
0.00
−0.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

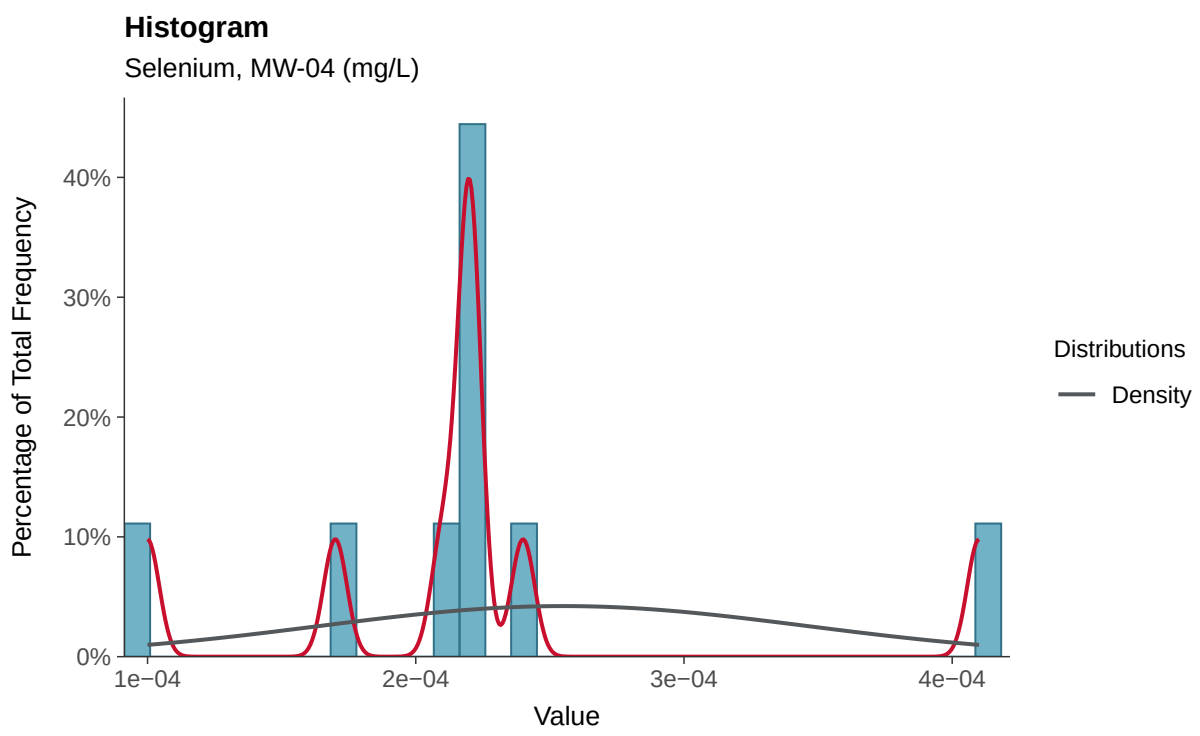

Gamma Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-04 (pCi/L)
Value
1.6
1.4
1.2
1.0
0.8
0.6
0.5
1.0
1.5
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Radium 226 and 228, MW-04 (pCi/L)
log(Value)
0.25
0.00
−0.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Selenium, MW-04

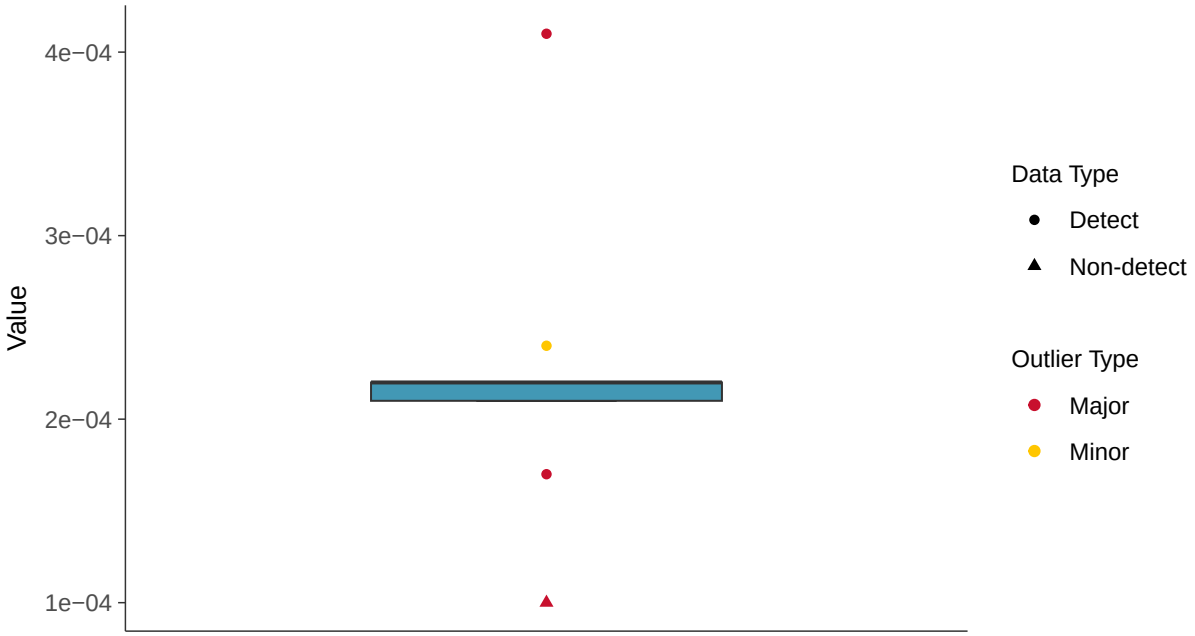
ID: 2_14_5_122





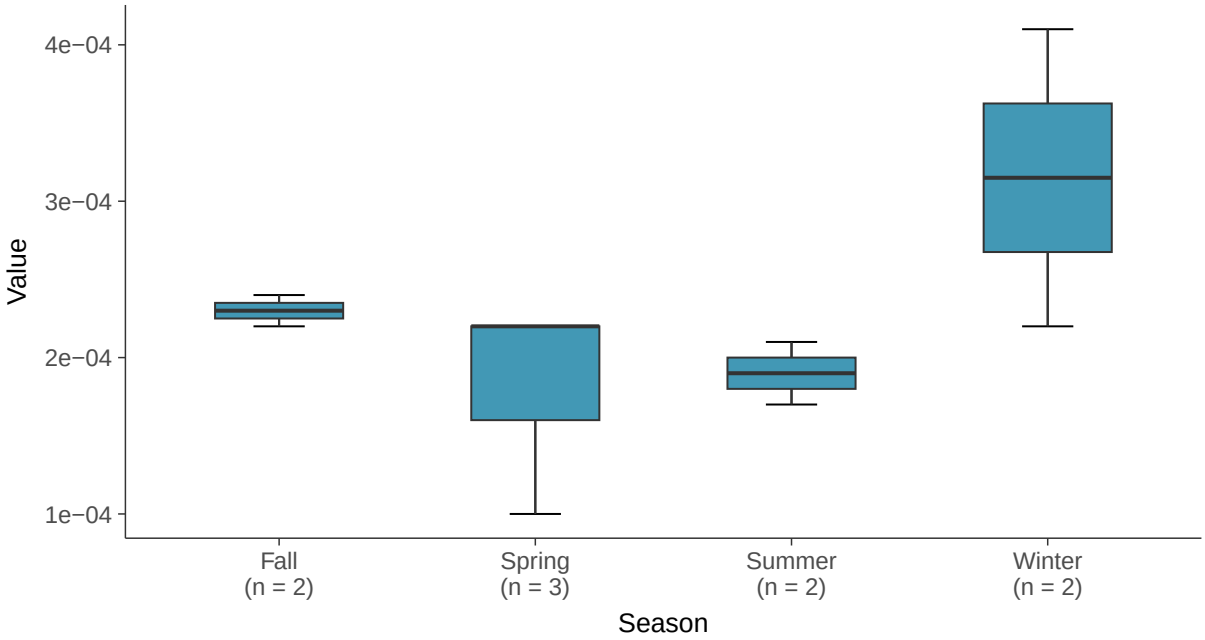
Boxplot

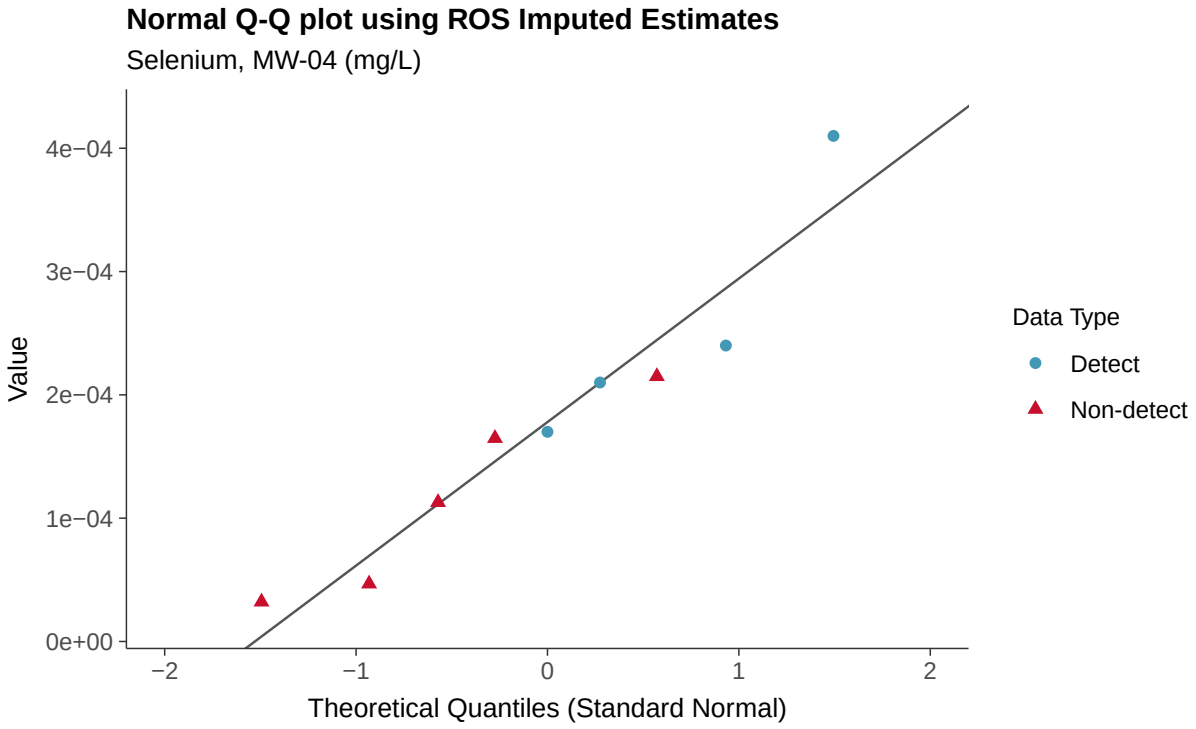
Selenium, MW-04 (mg/L)

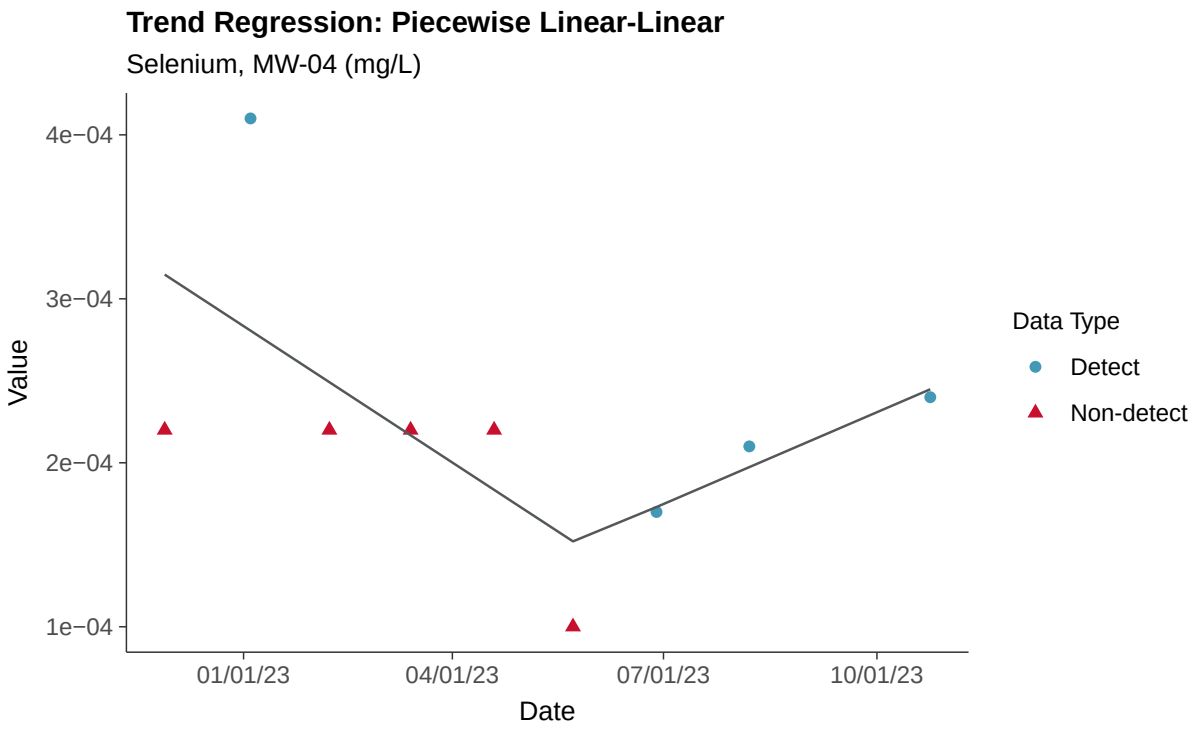


Boxplot by Season

Selenium, MW-04 (mg/L)

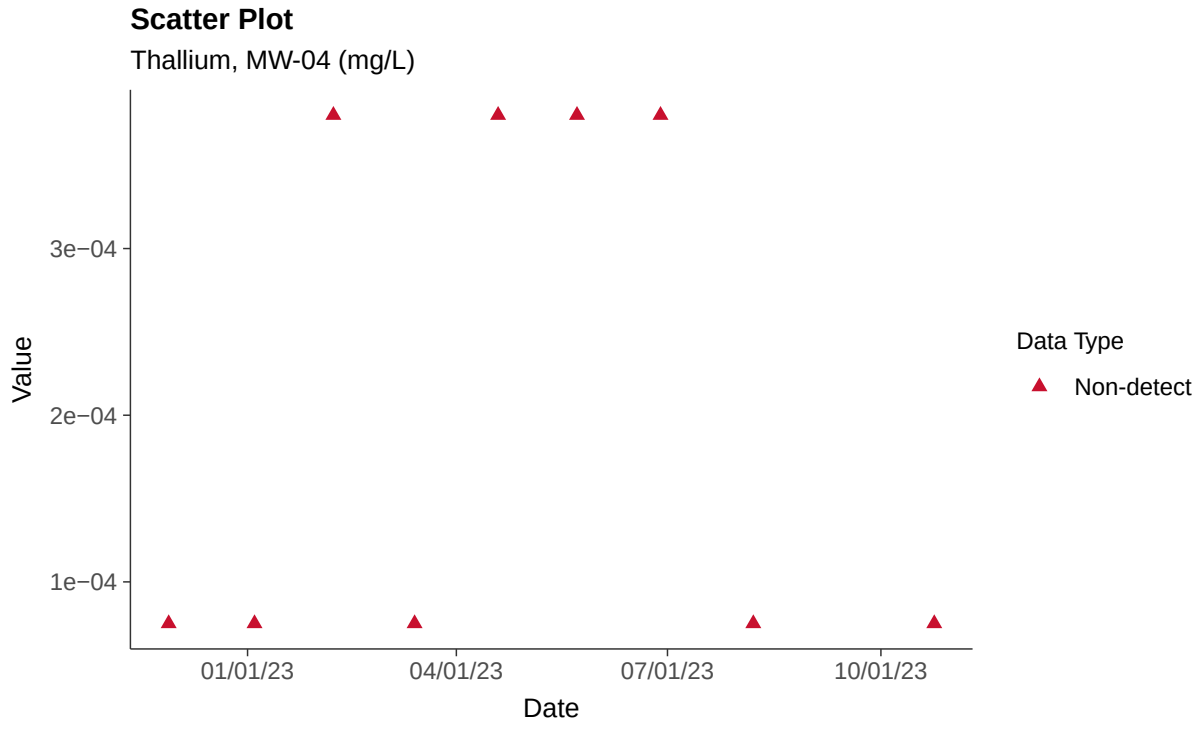


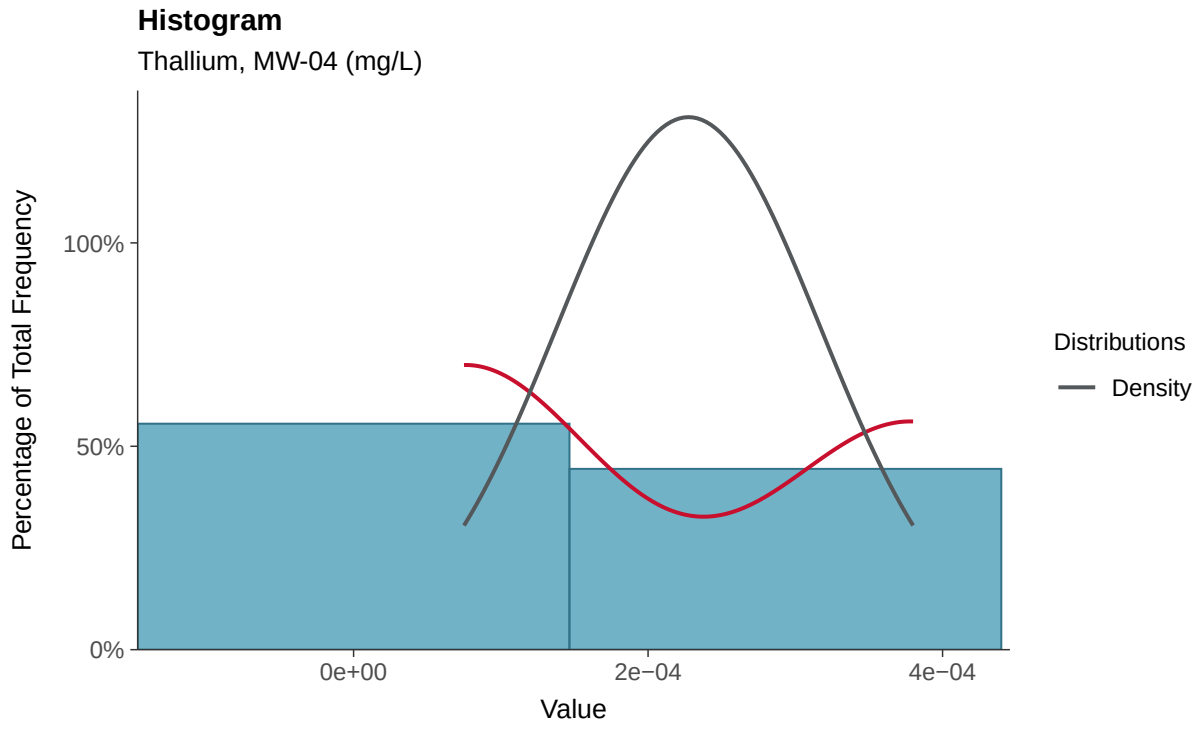

Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-04 (mg/L)
Value
4e−04
3e−04
2e−04
1e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Selenium, MW-04 (mg/L)
Value
4e−04
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-04

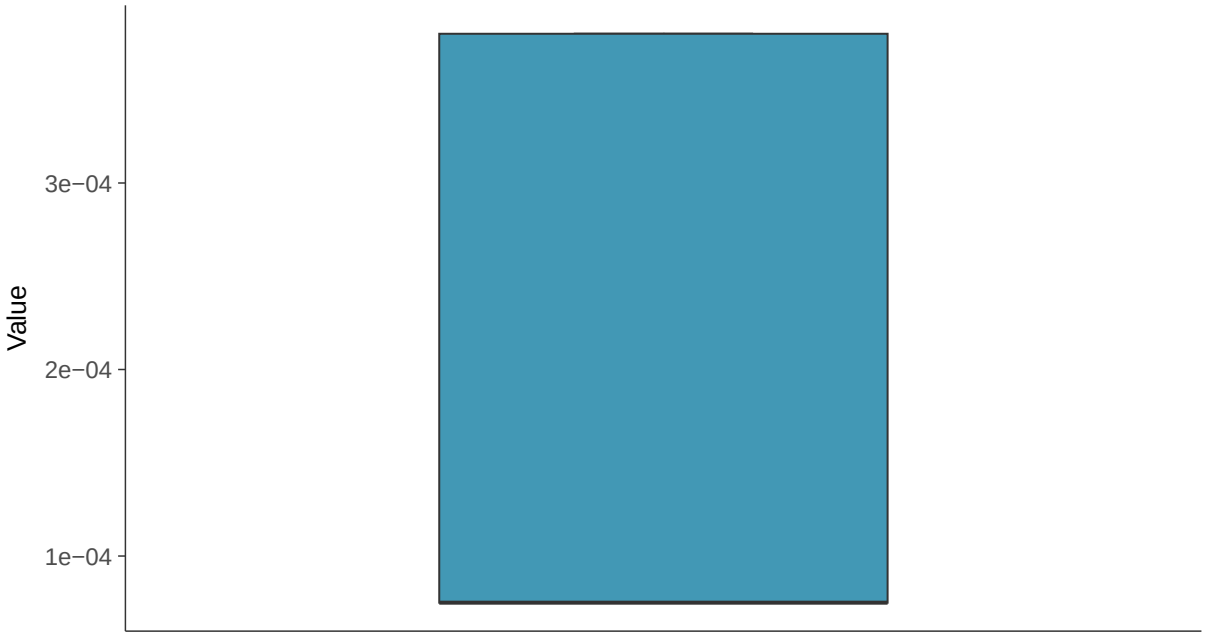
ID: 2_14_5_125





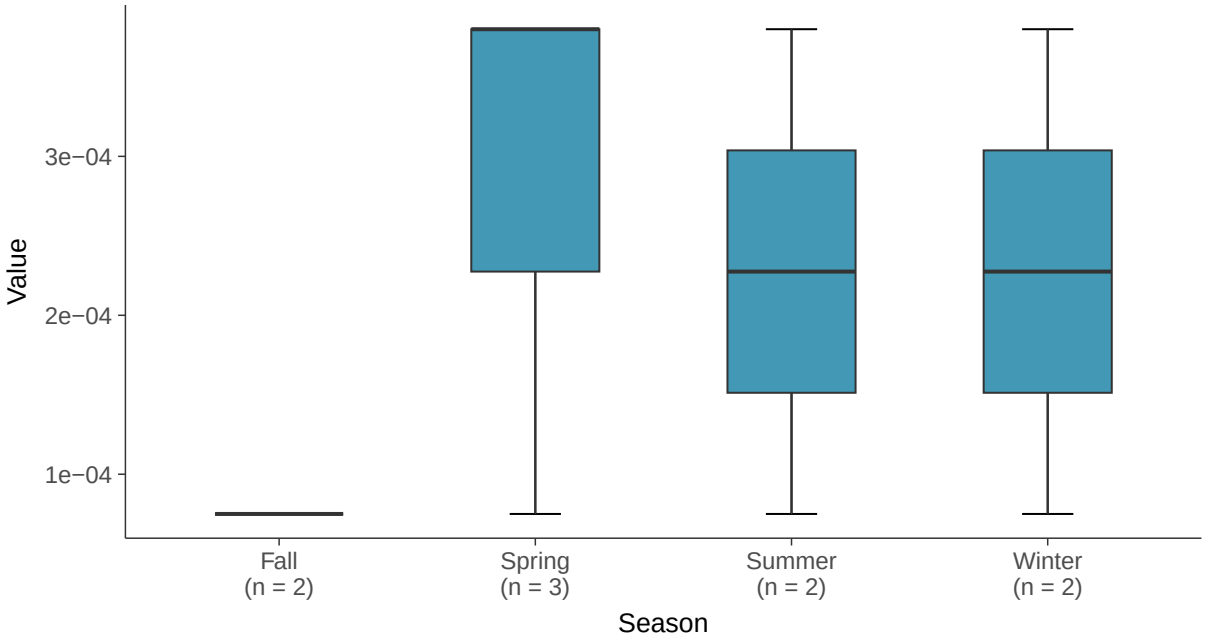
Boxplot

Thallium, MW-04 (mg/L)



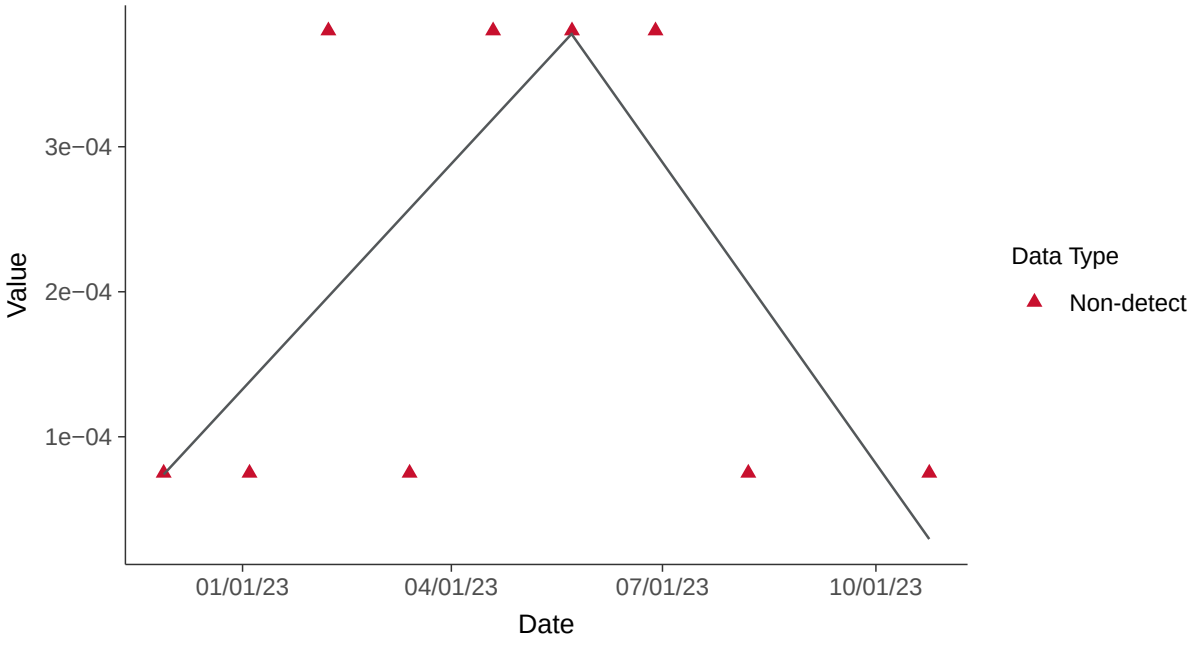
Boxplot by Season

Thallium, MW-04 (mg/L)



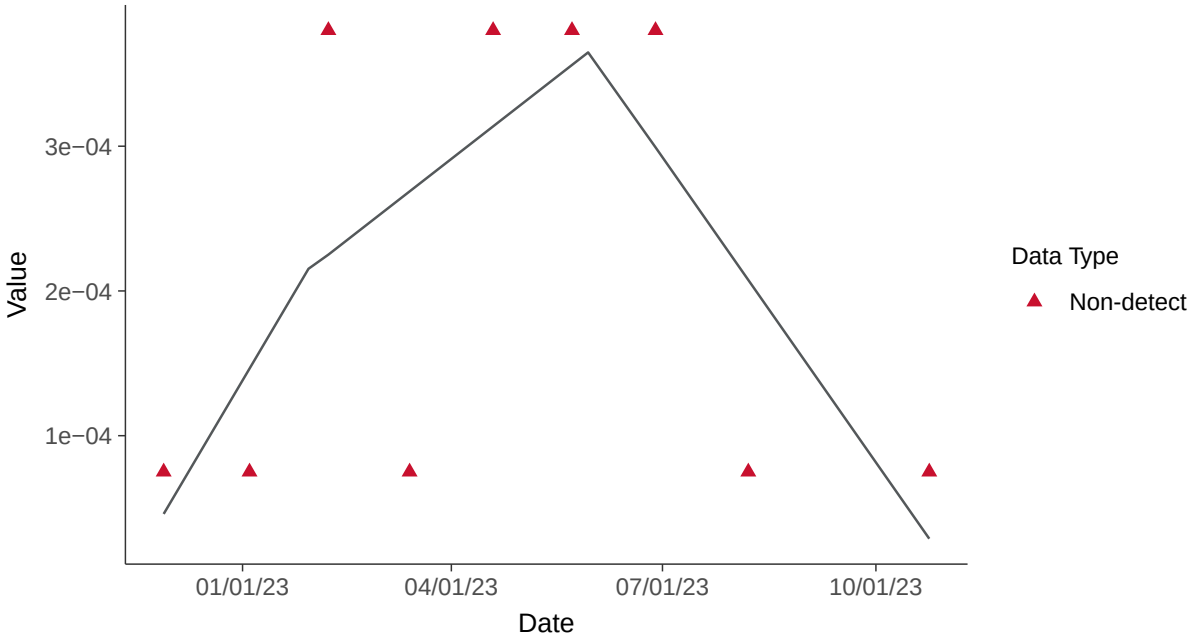
Trend Regression: Piecewise Linear-Linear

Thallium, MW-04 (mg/L)



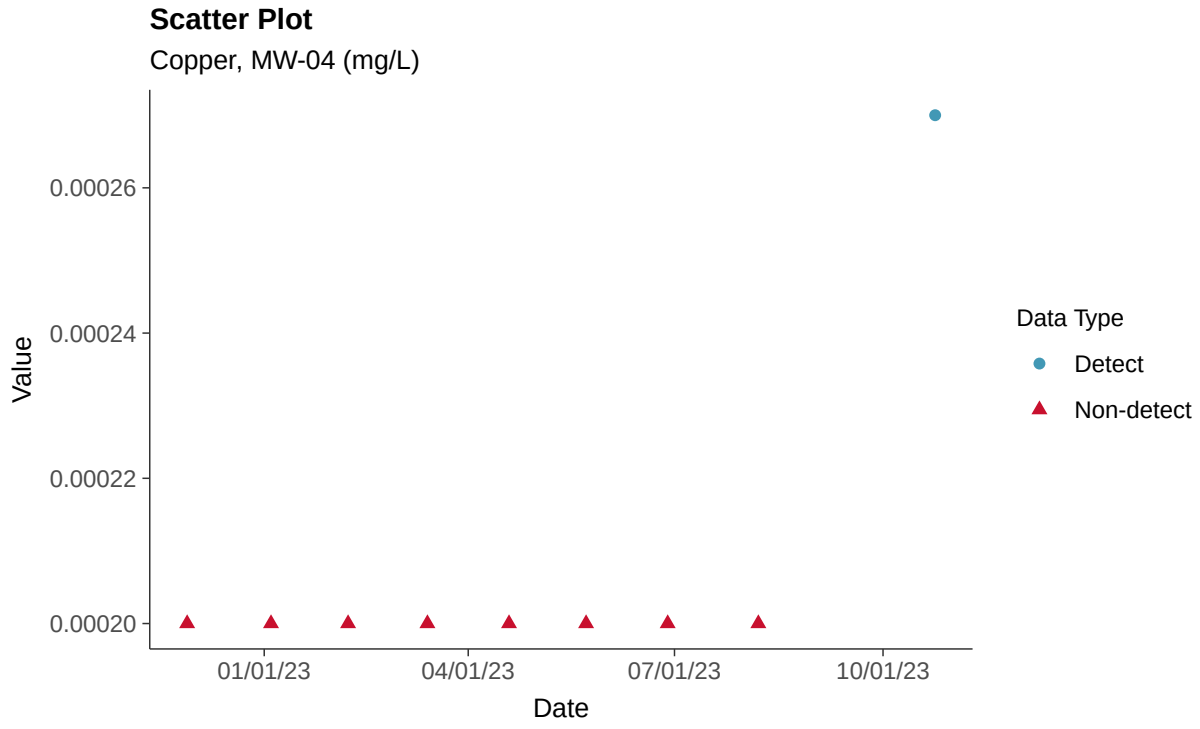
Trend Regression: Piecewise Linear-Linear-Linear

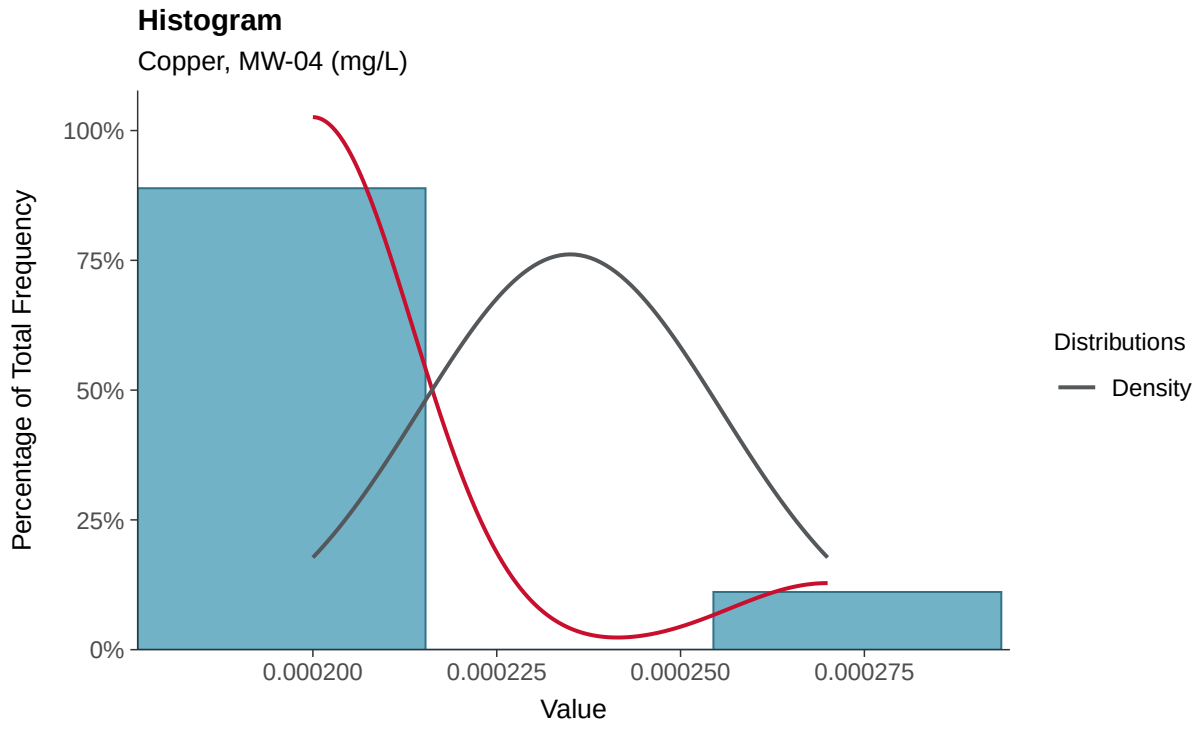
Thallium, MW-04 (mg/L)



Part 115: Copper, MW-04

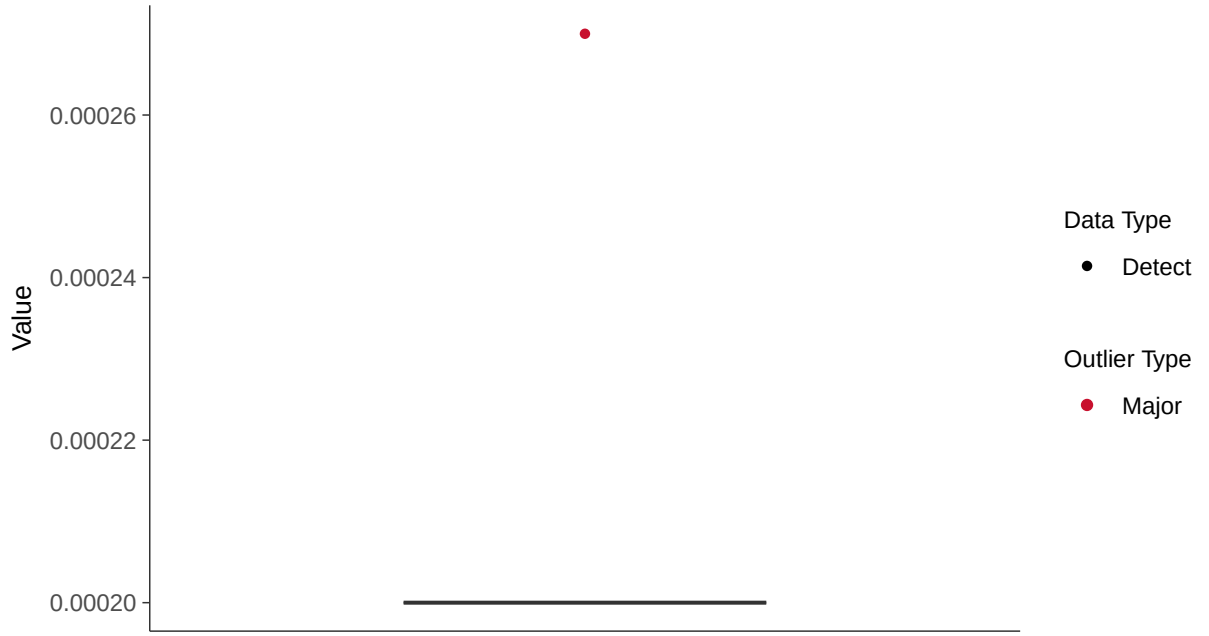
ID: 2_14_6_111





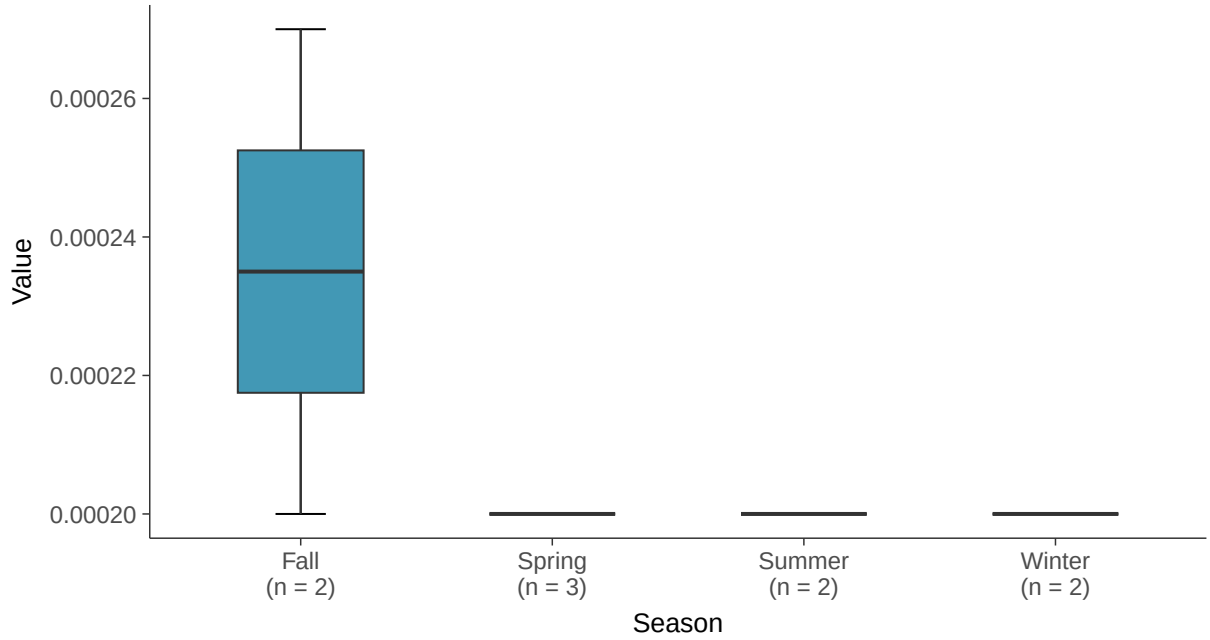
Boxplot

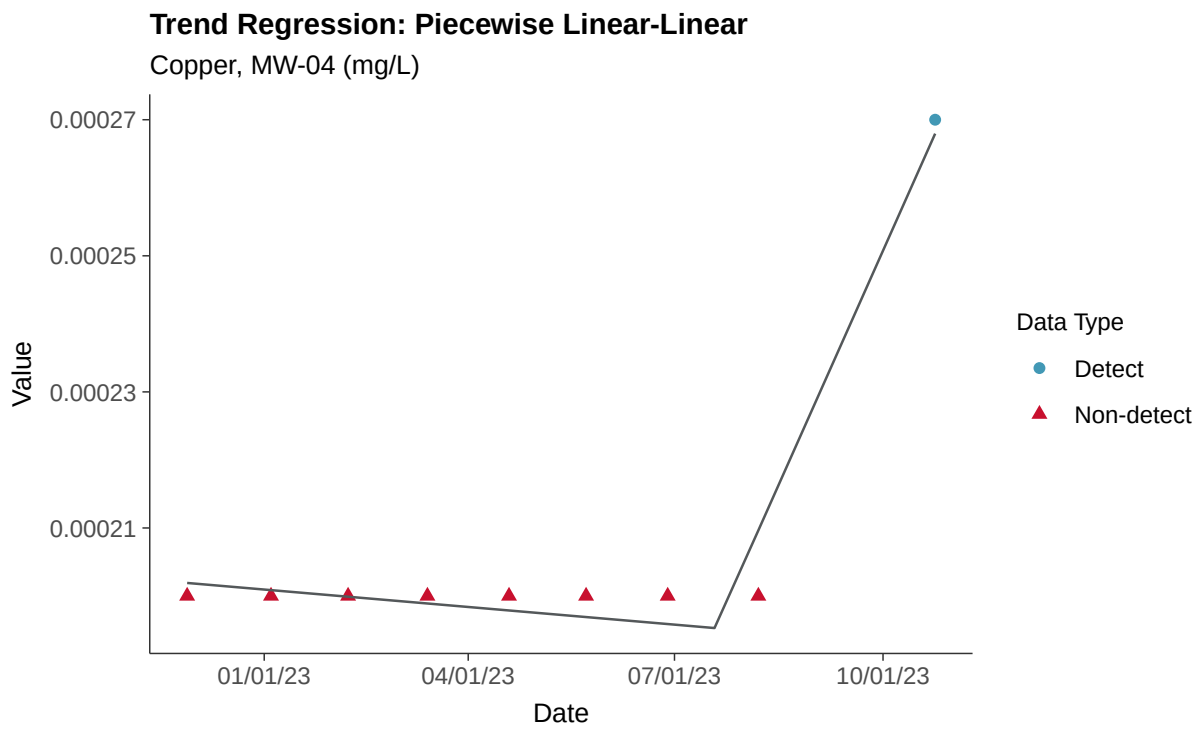
Copper, MW-04 (mg/L)



Boxplot by Season

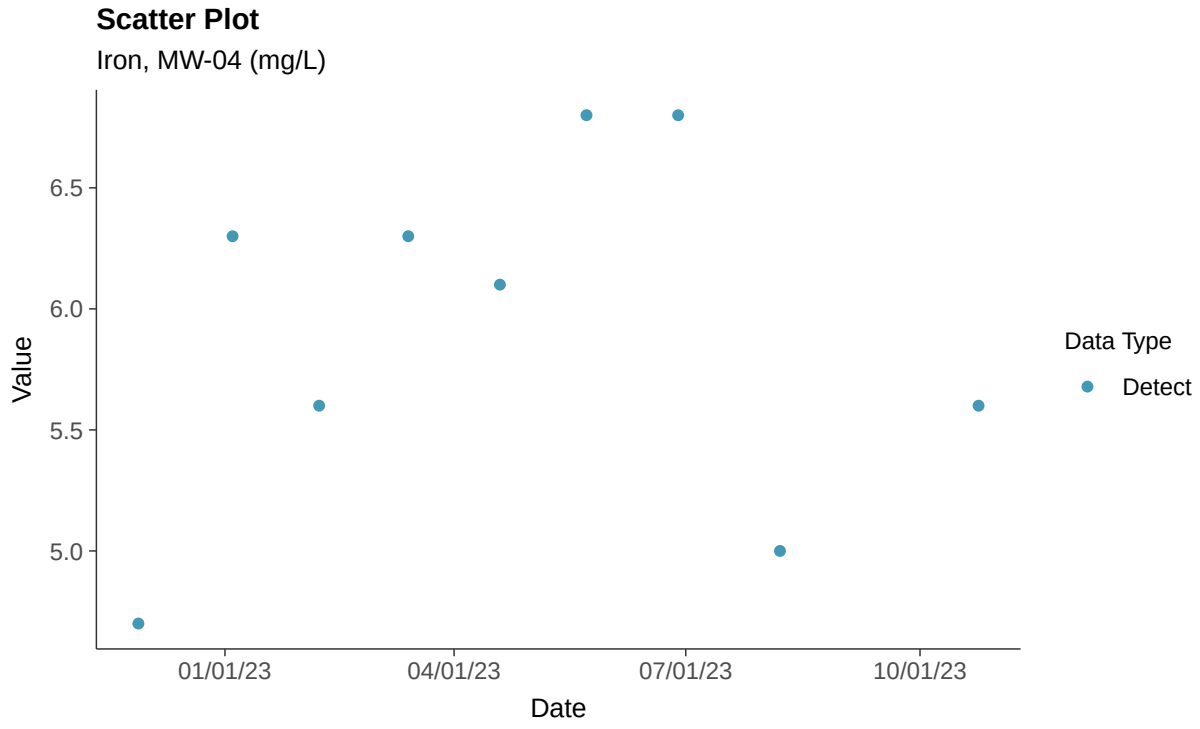
Copper, MW-04 (mg/L)

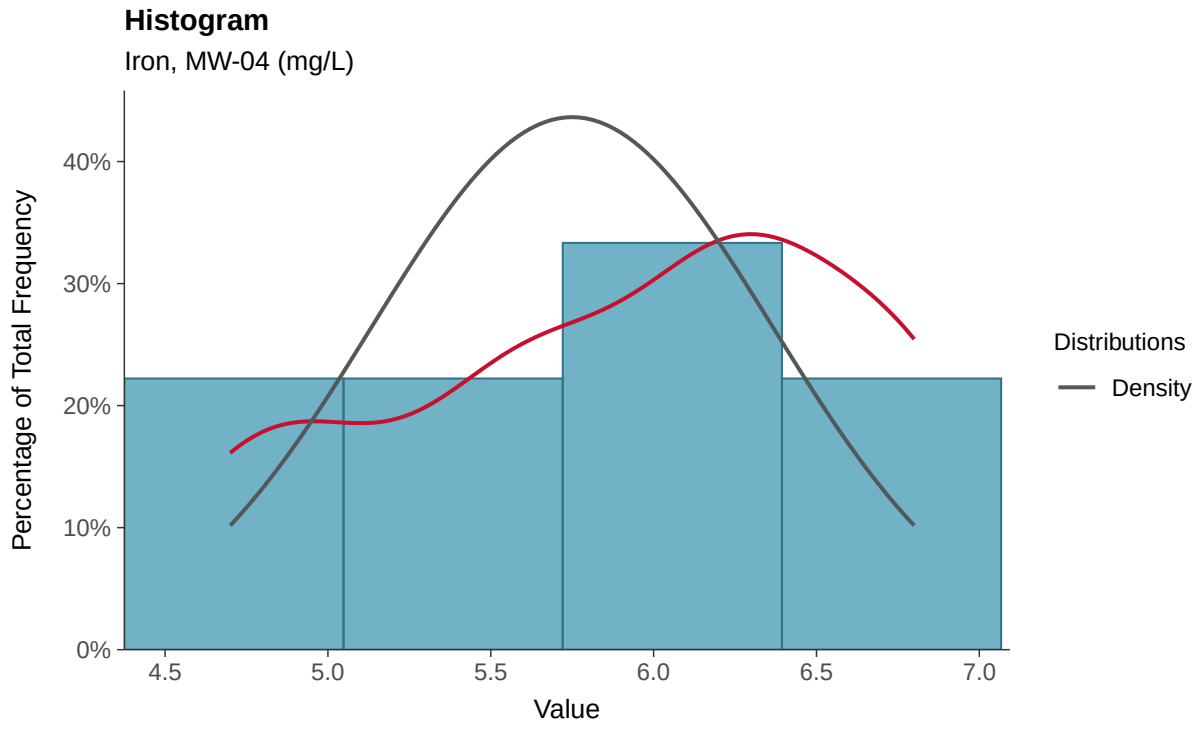



Trend Regression: Piecewise Linear-Linear
Copper, MW-04 (mg/L)
0.00027
0.00025
0.00023
0.00021
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-04

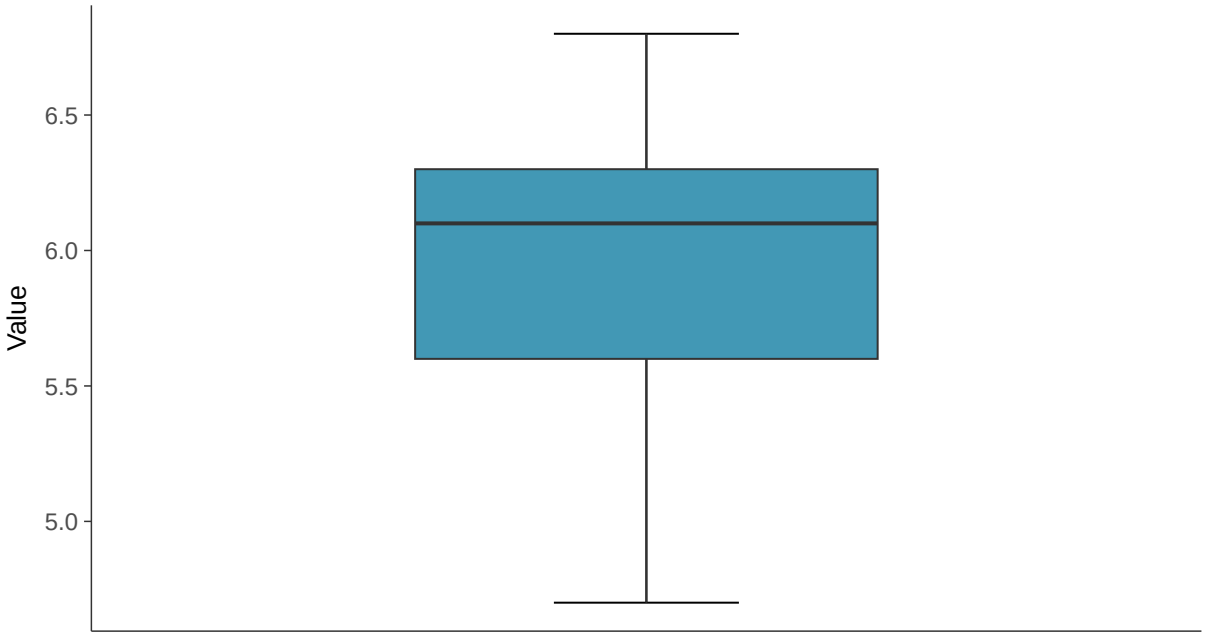
ID: 2_14_6_114





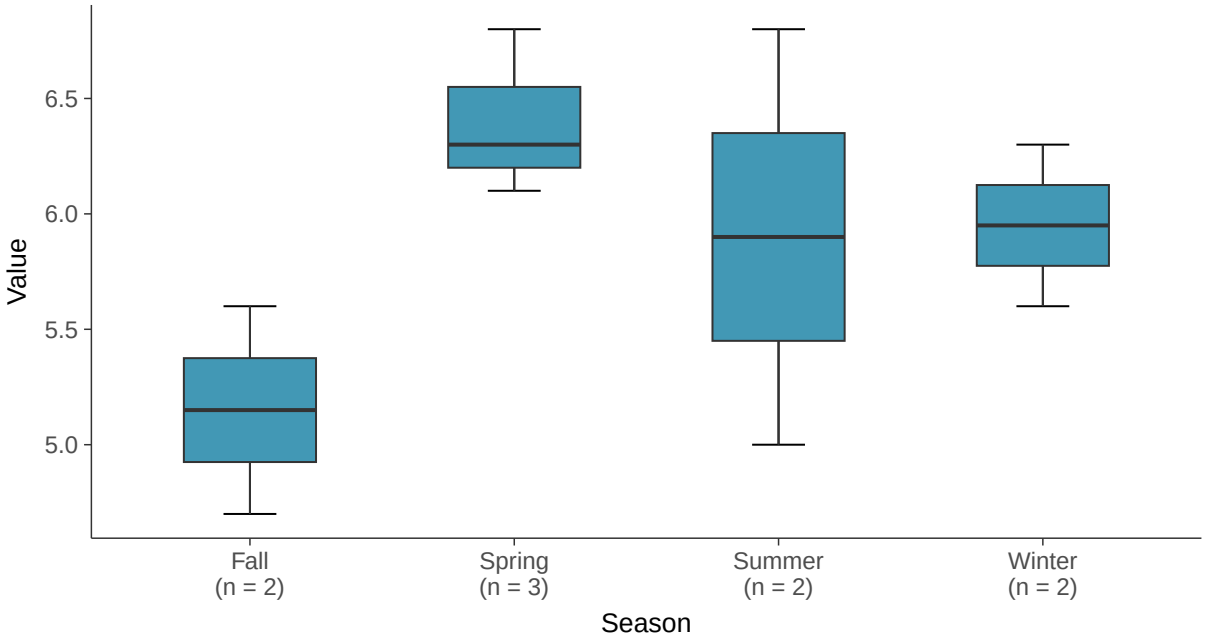
Boxplot

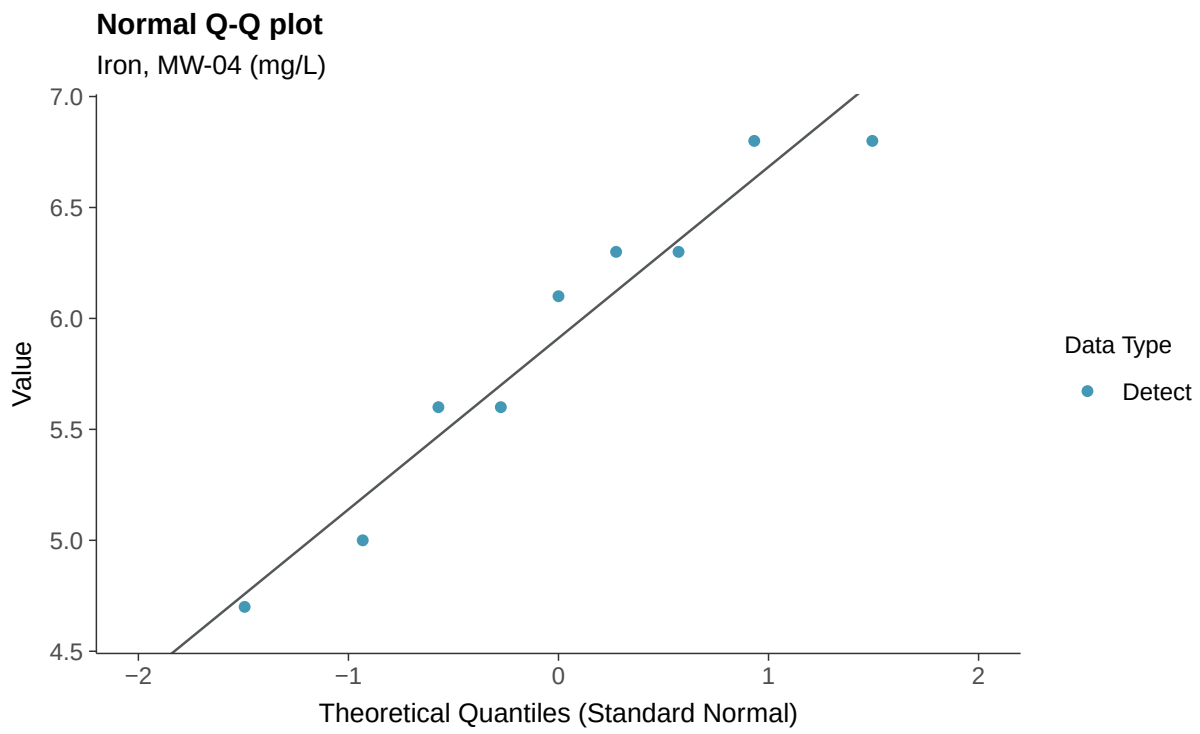
Iron, MW-04 (mg/L)

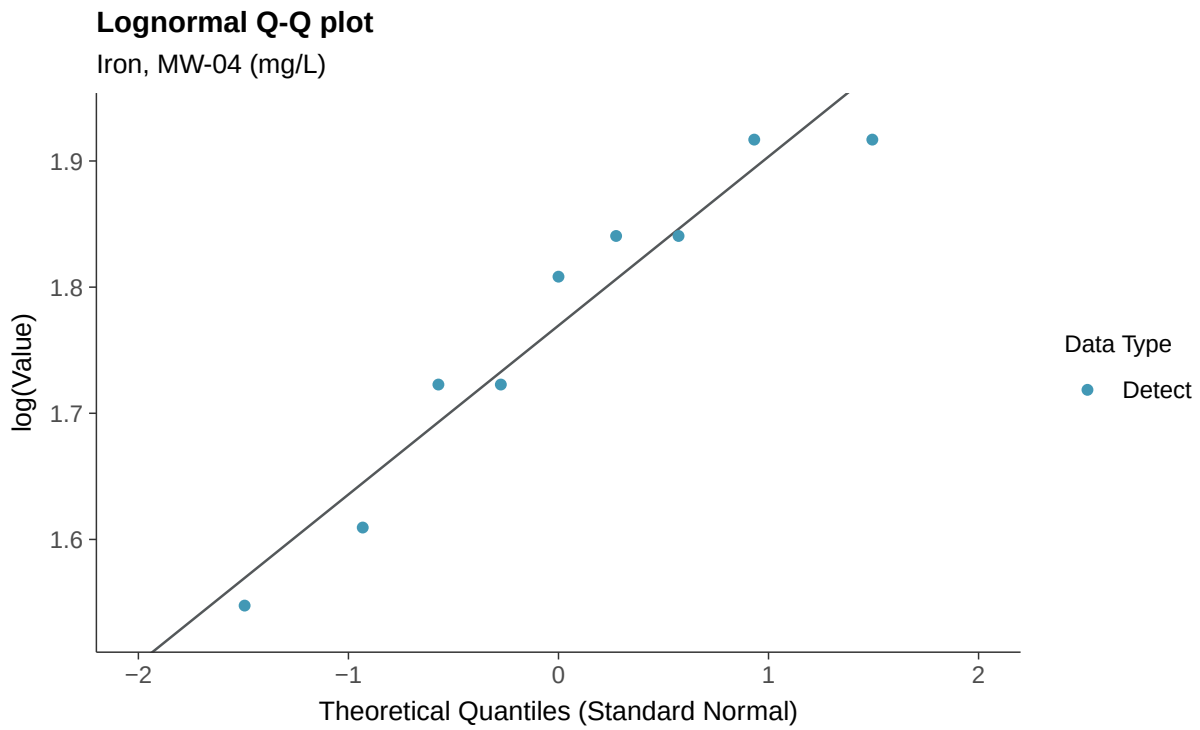


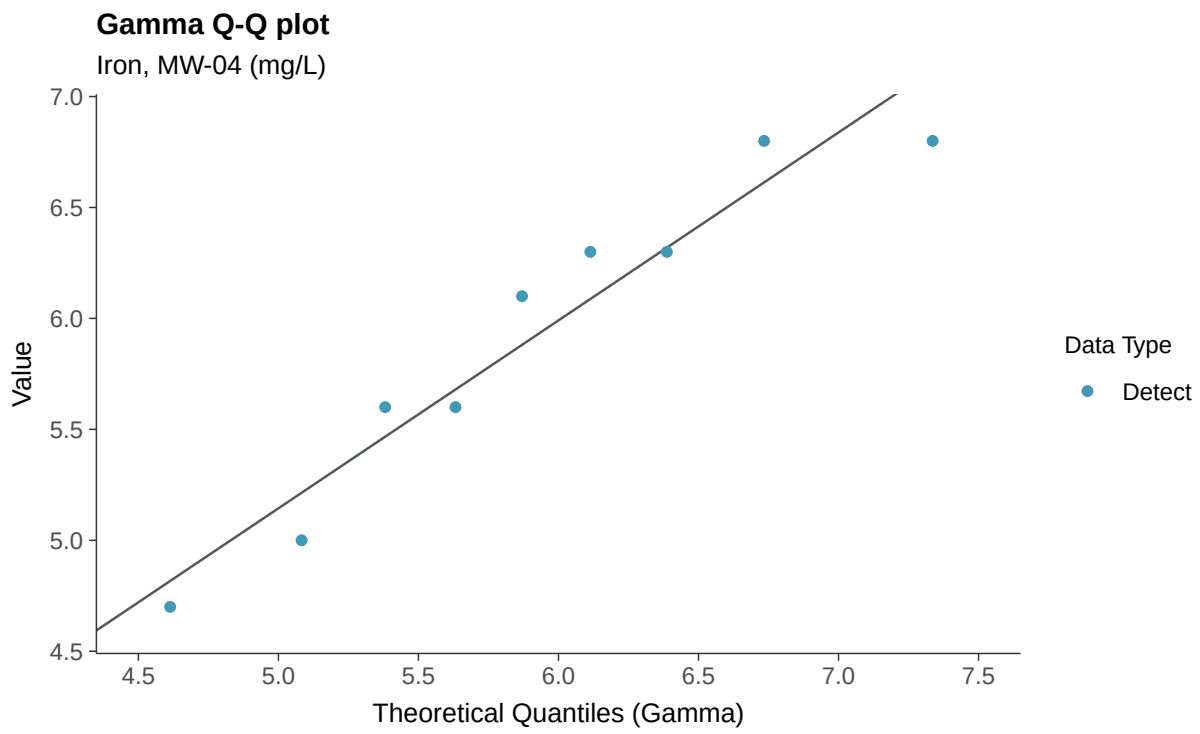
Boxplot by Season

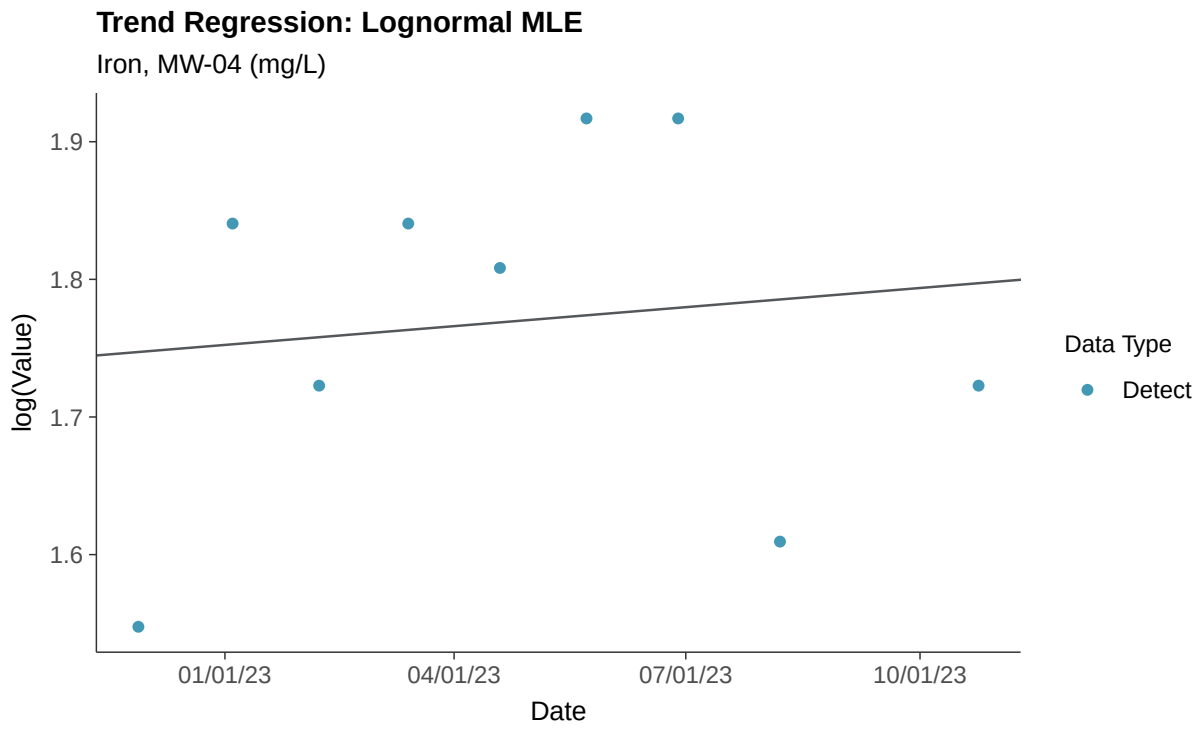
Iron, MW-04 (mg/L)

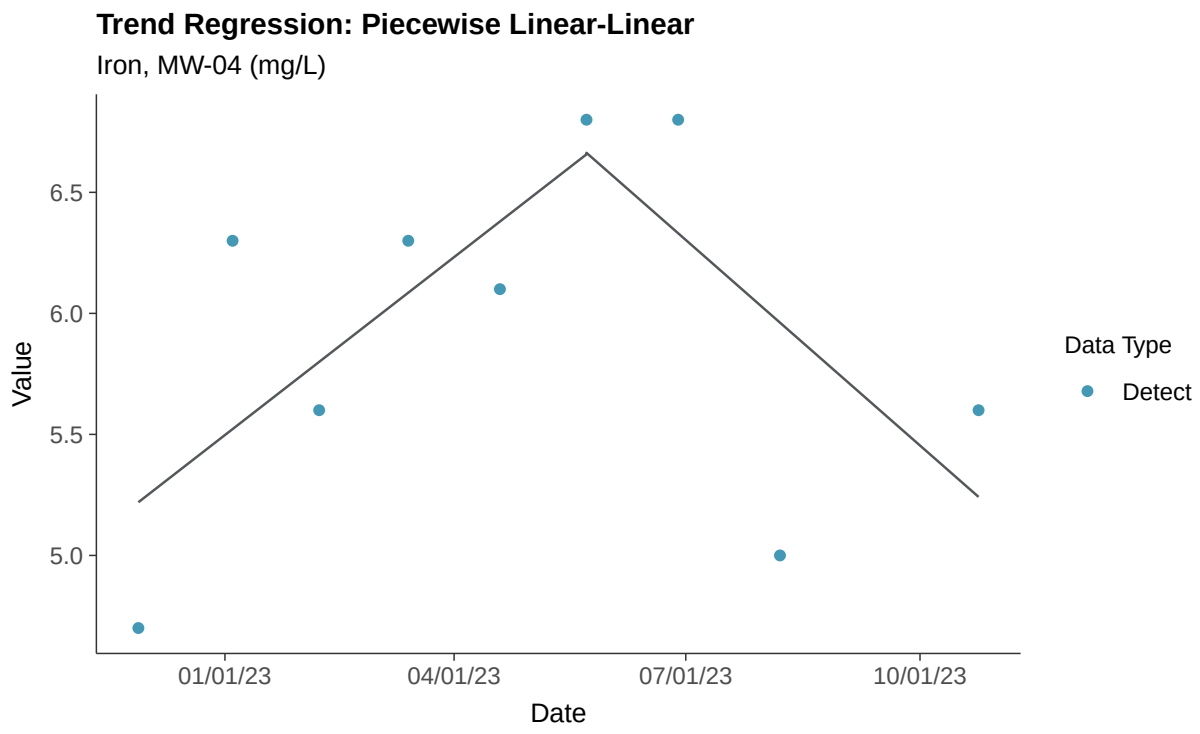



Normal Q-Q plot
Iron, MW-04 (mg/L)
Value
7.0
6.5
6.0
5.5
5.0
4.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-04 (mg/L)
log(Value)
1.9
1.8
1.7
1.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

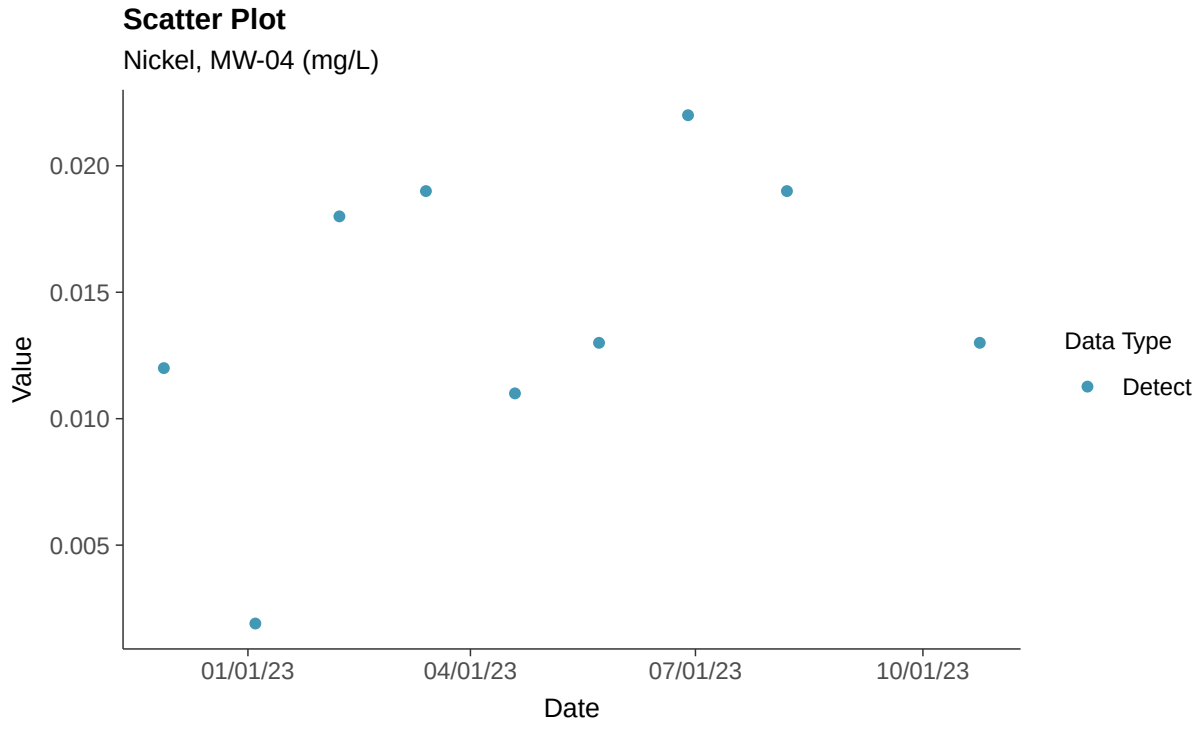

Gamma Q-Q plot
Iron, MW-04 (mg/L)
Value
7.0
6.5
6.0
5.5
5.0
4.5
4.5
5.0
5.5
6.0
6.5
7.0
7.5
Theoretical Quantiles (Gamma)
Data Type
Detect

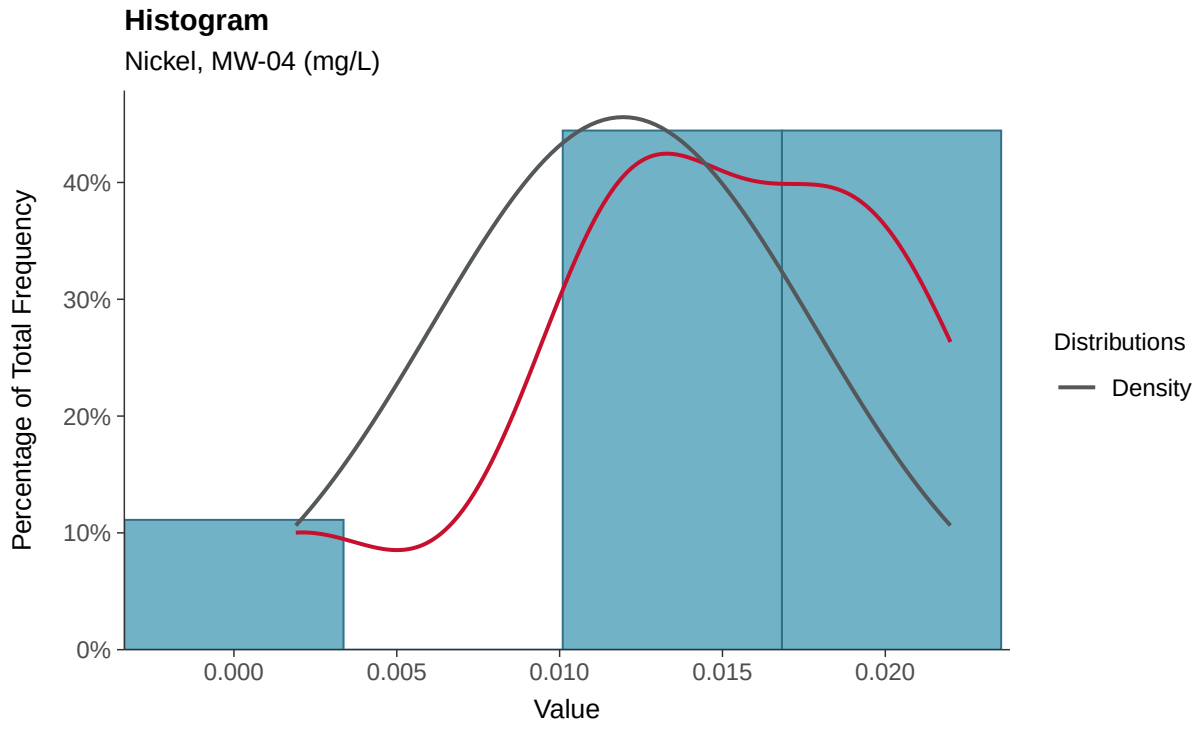

Trend Regression: Lognormal MLE
Iron, MW-04 (mg/L)
log(Value)
1.9
1.8
1.7
1.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-04 (mg/L)
Value
6.5
6.0
5.5
5.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-04

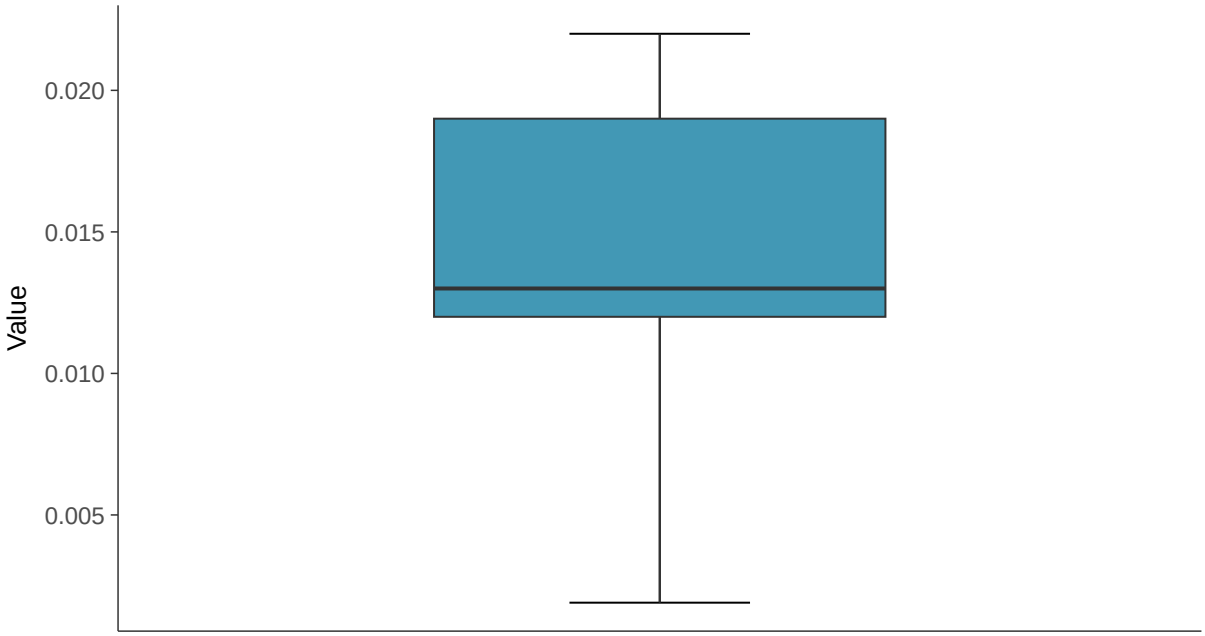
ID: 2_14_6_119





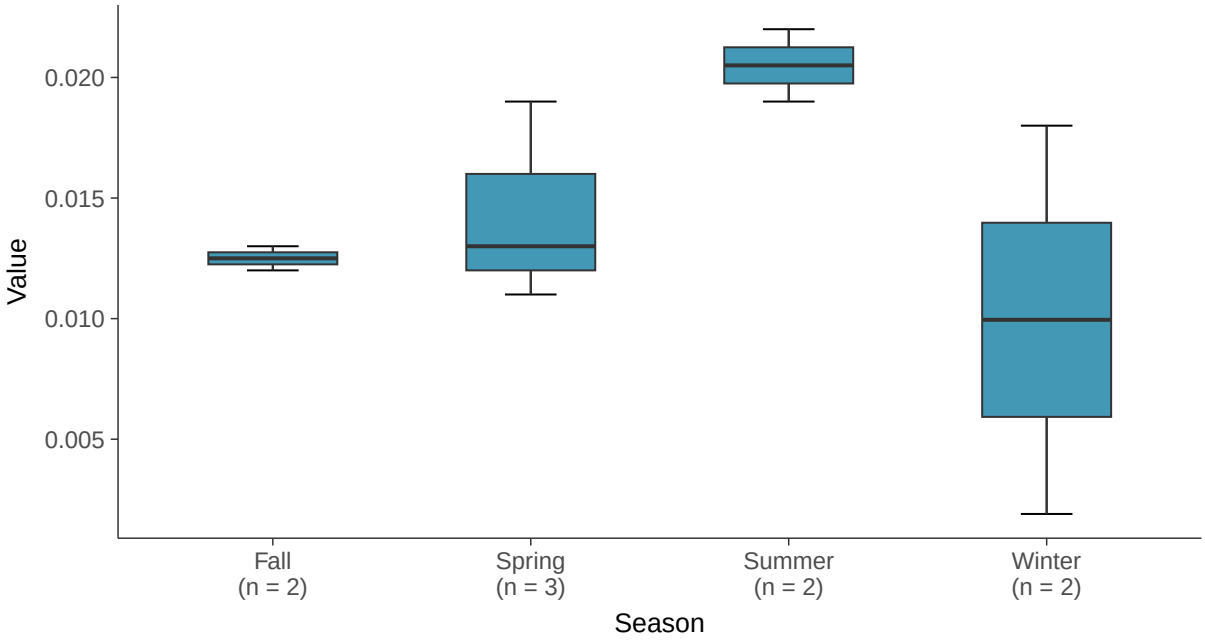
Boxplot

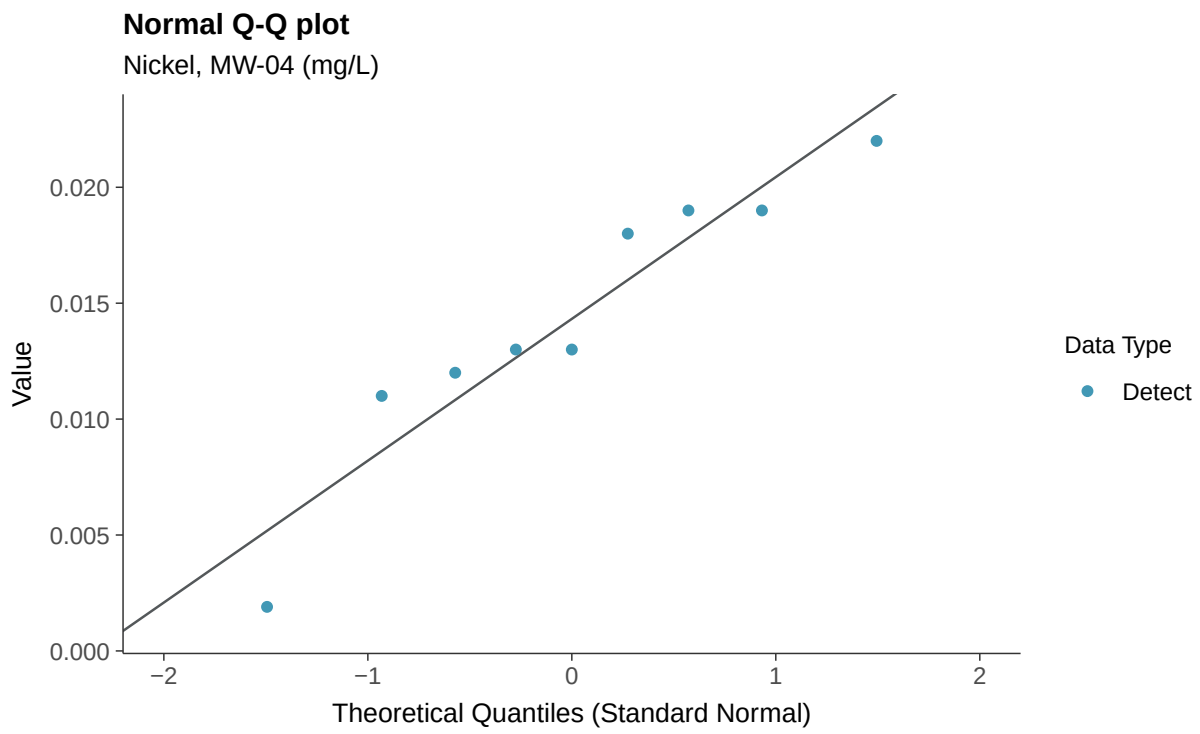
Nickel, MW-04 (mg/L)

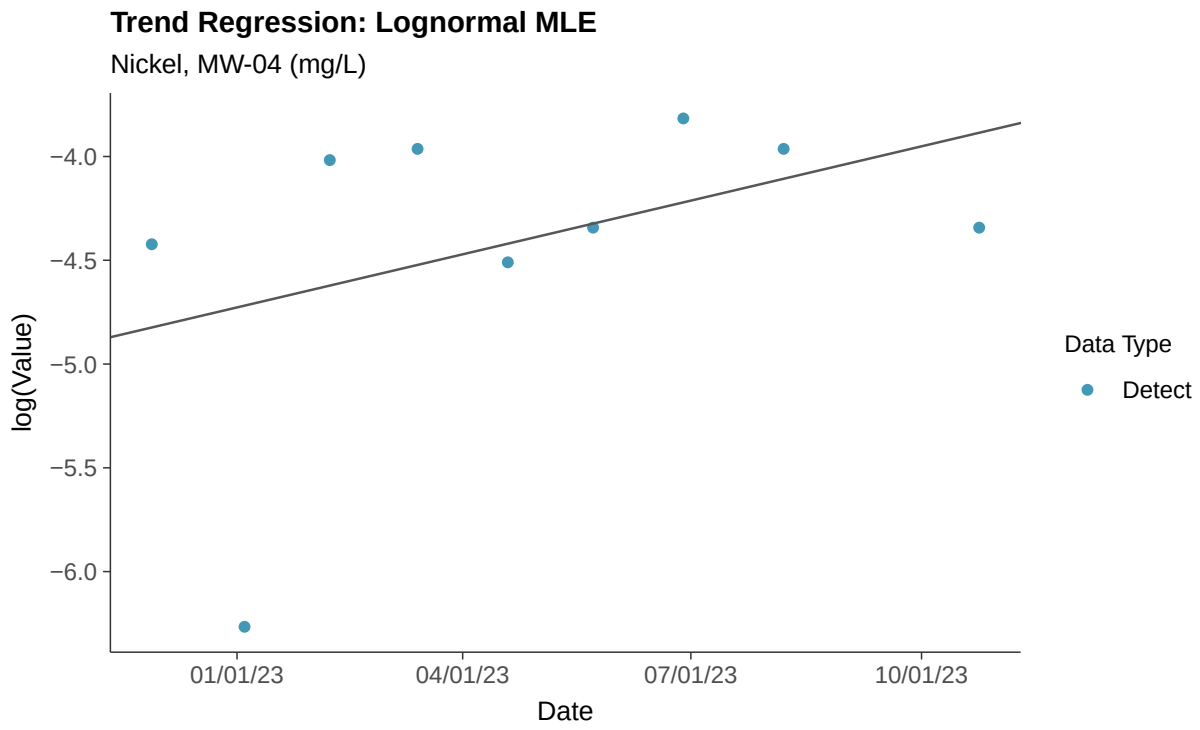


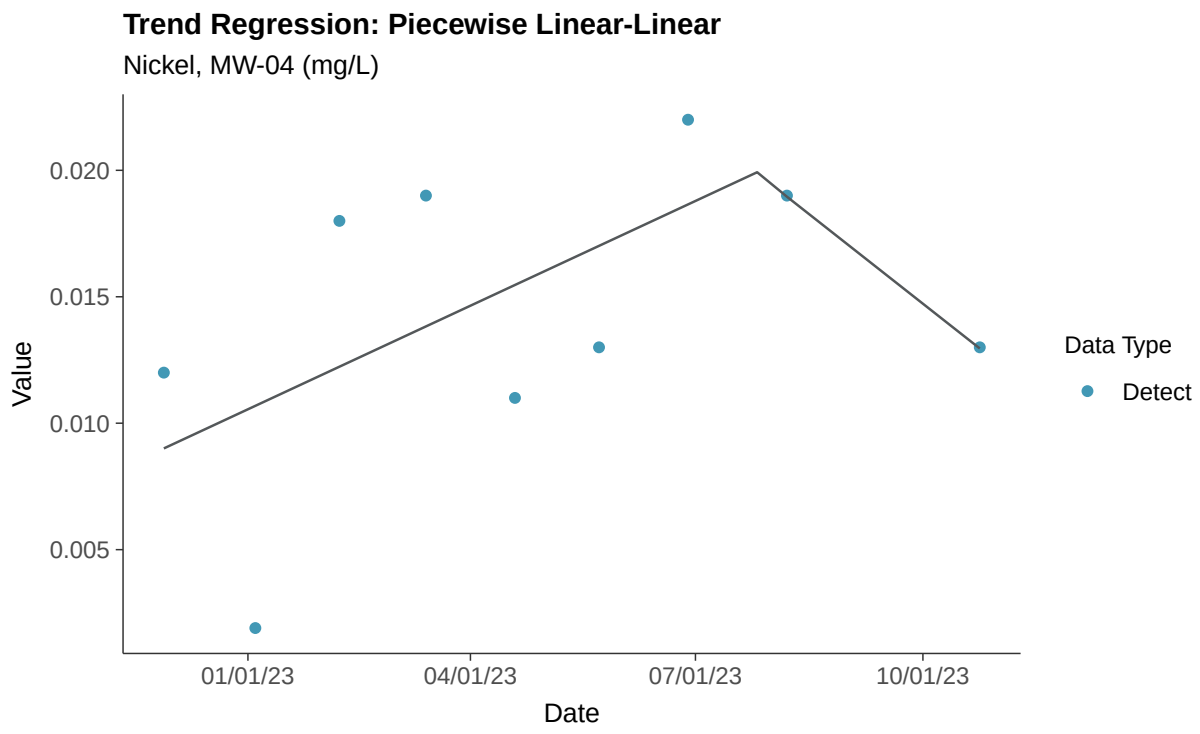
Boxplot by Season

Nickel, MW-04 (mg/L)



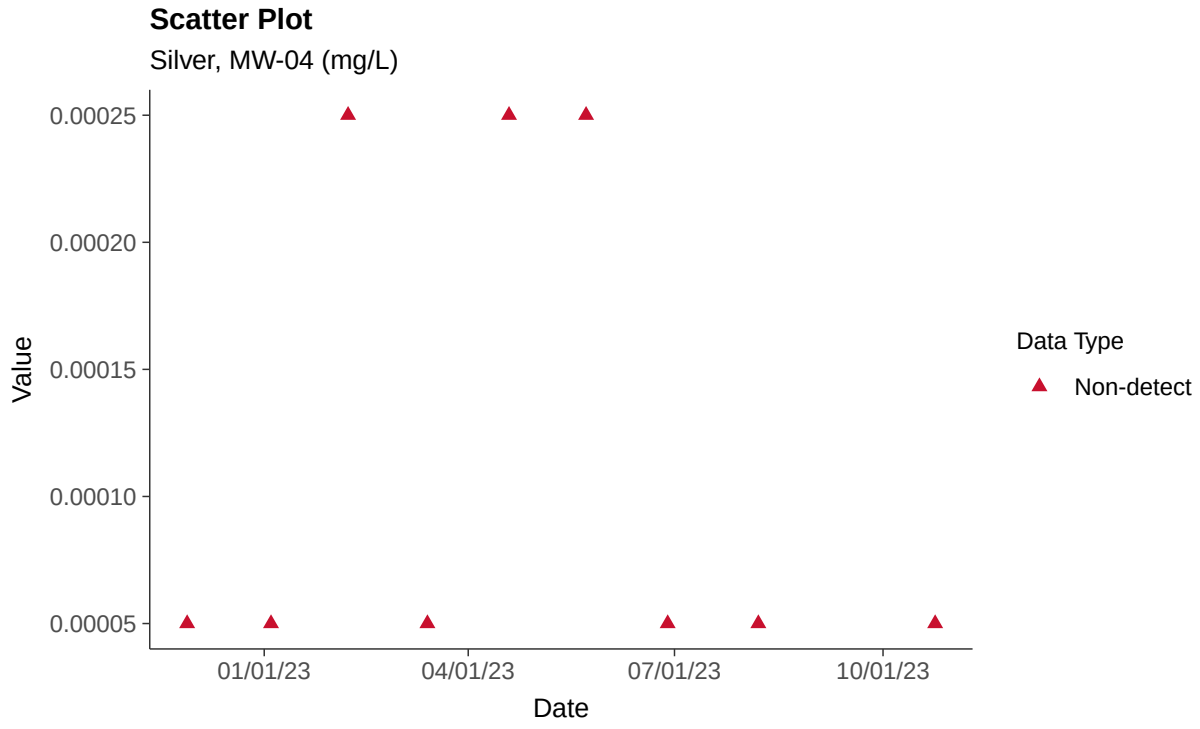

Normal Q-Q plot
Nickel, MW-04 (mg/L)
Value
0.020
0.015
0.010
0.005
0.000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

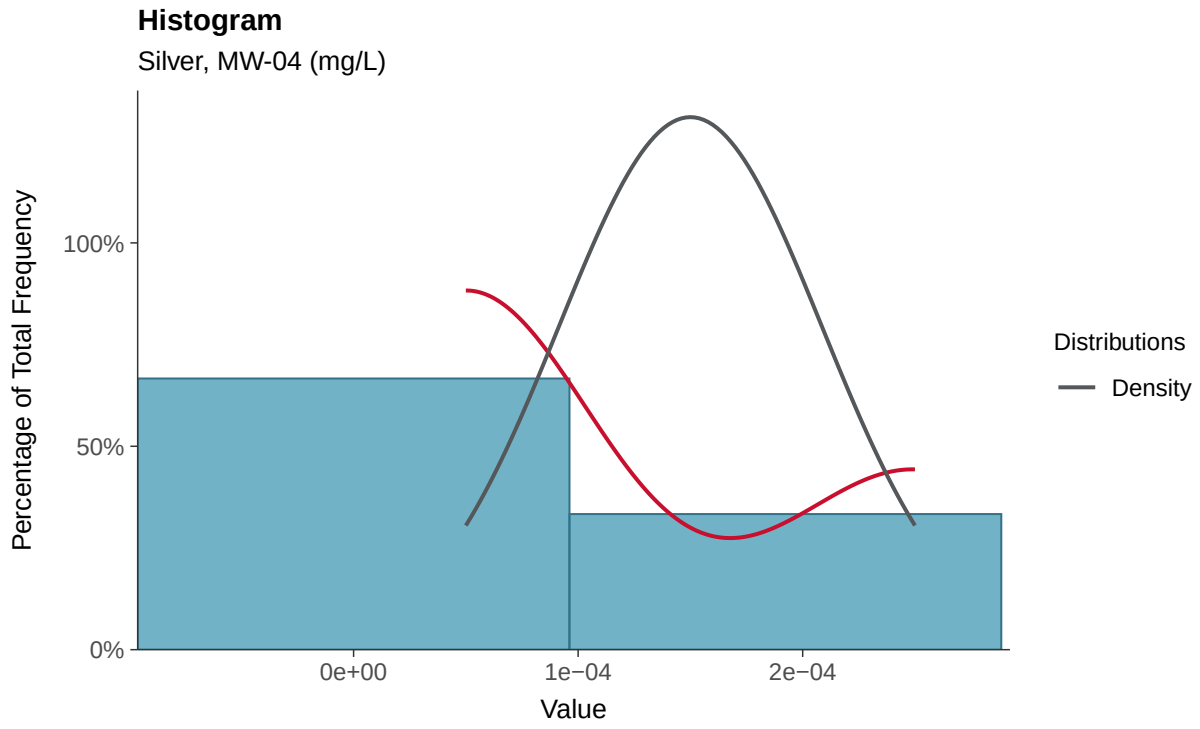

Trend Regression: Lognormal MLE
Nickel, MW-04 (mg/L)
log(Value)
−4.0
−4.5
−5.0
−5.5
−6.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Nickel, MW-04 (mg/L)
0.020
0.015
0.010
0.005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-04

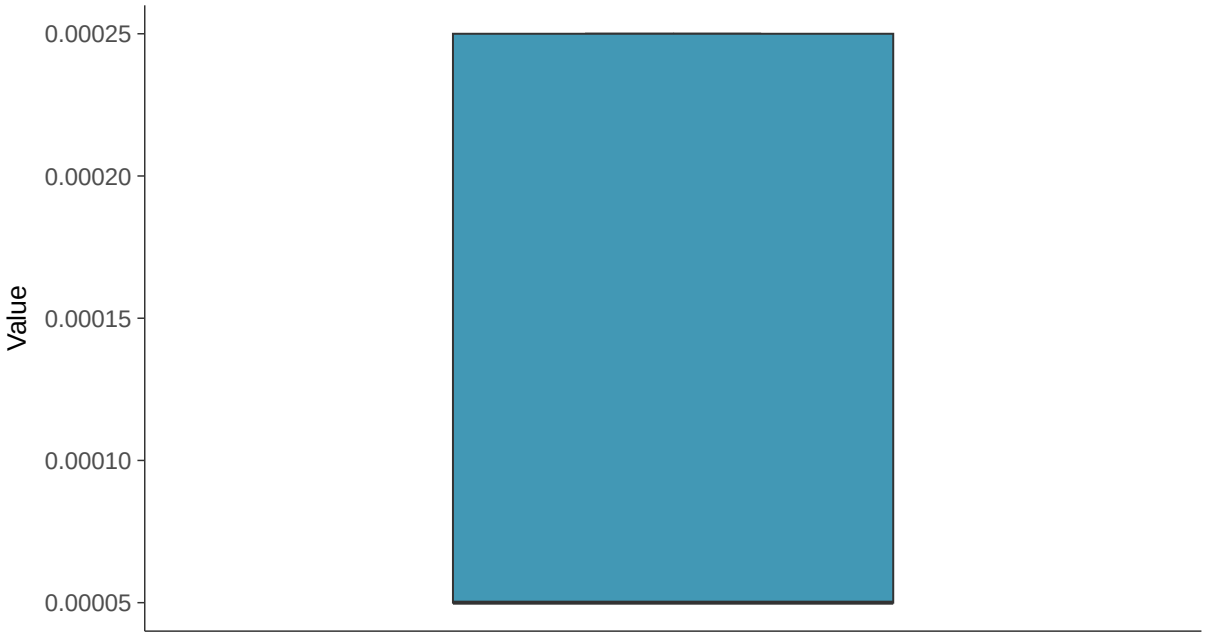
ID: 2_14_6_123





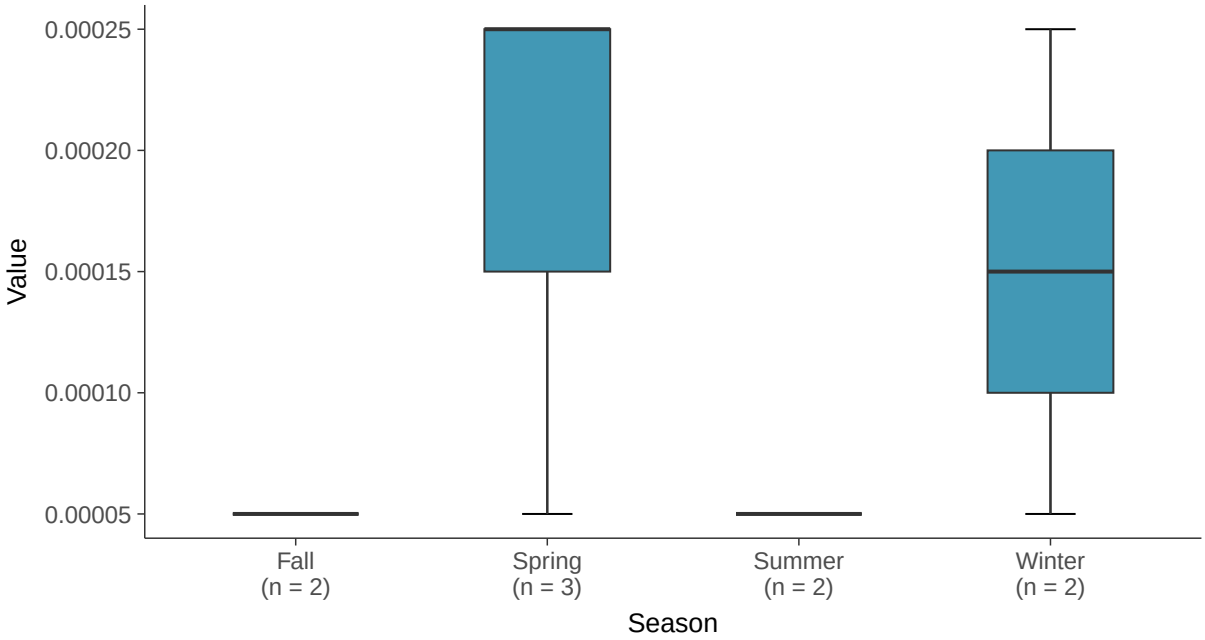
Boxplot

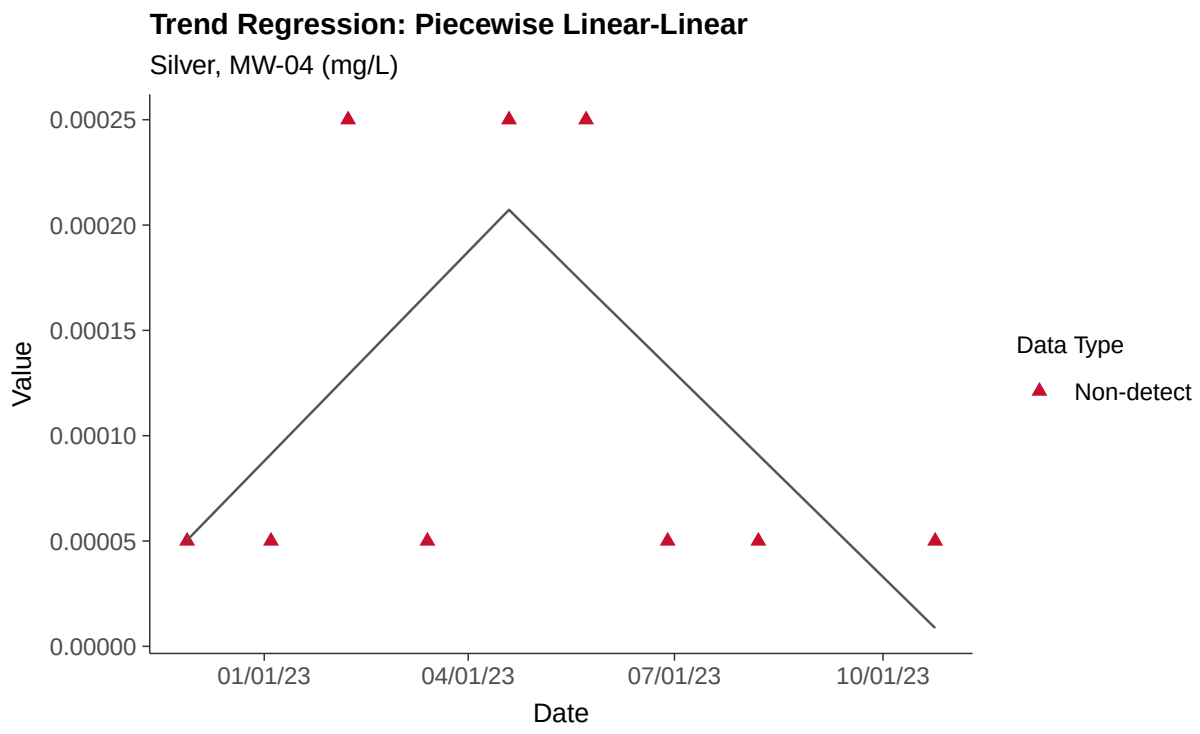
Silver, MW-04 (mg/L)

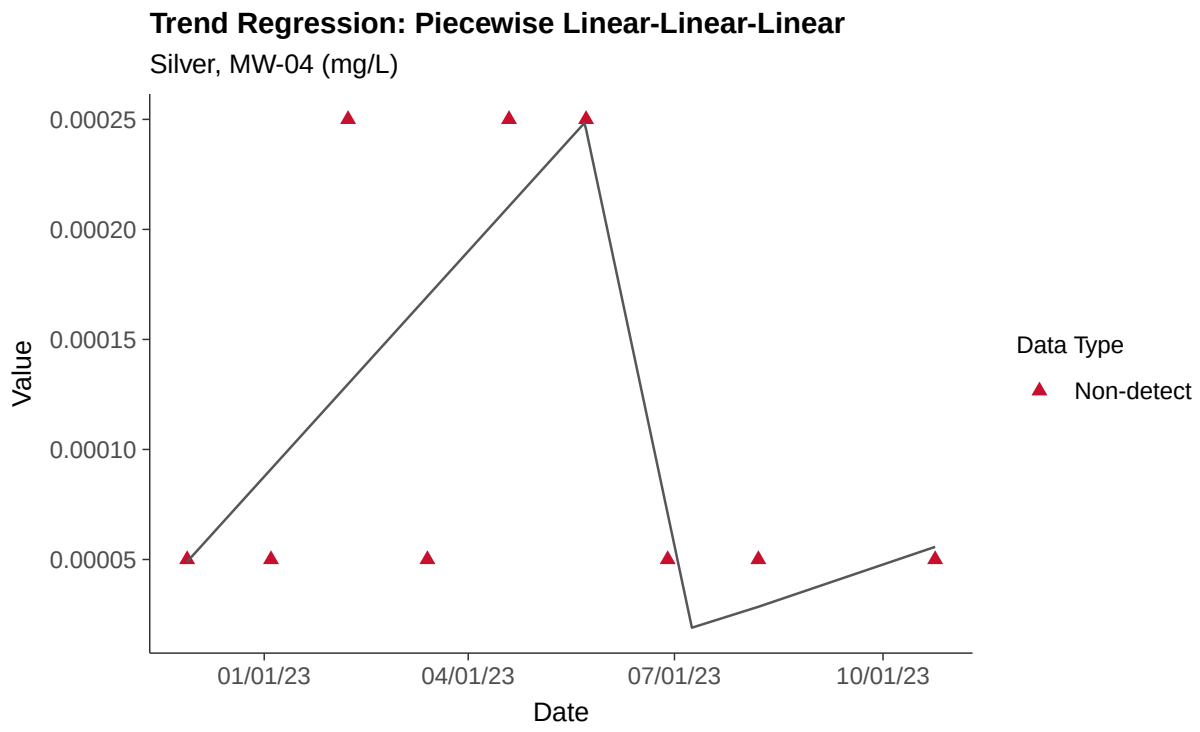


Boxplot by Season

Silver, MW-04 (mg/L)

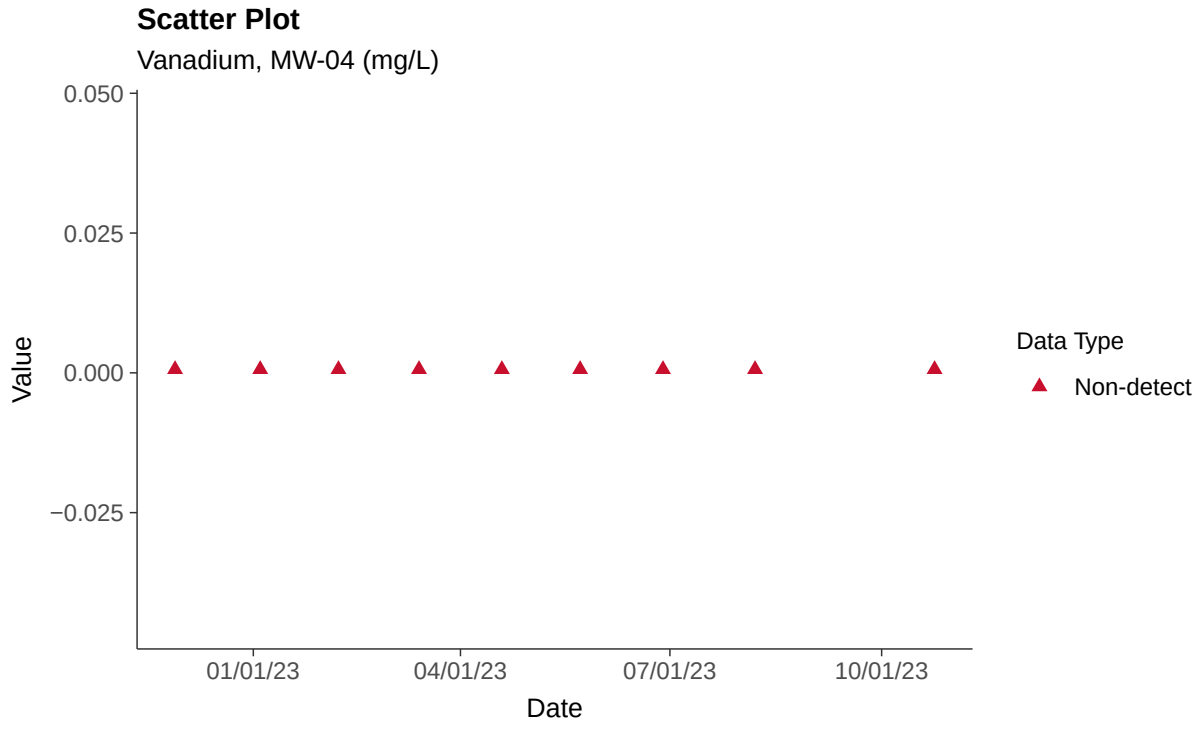


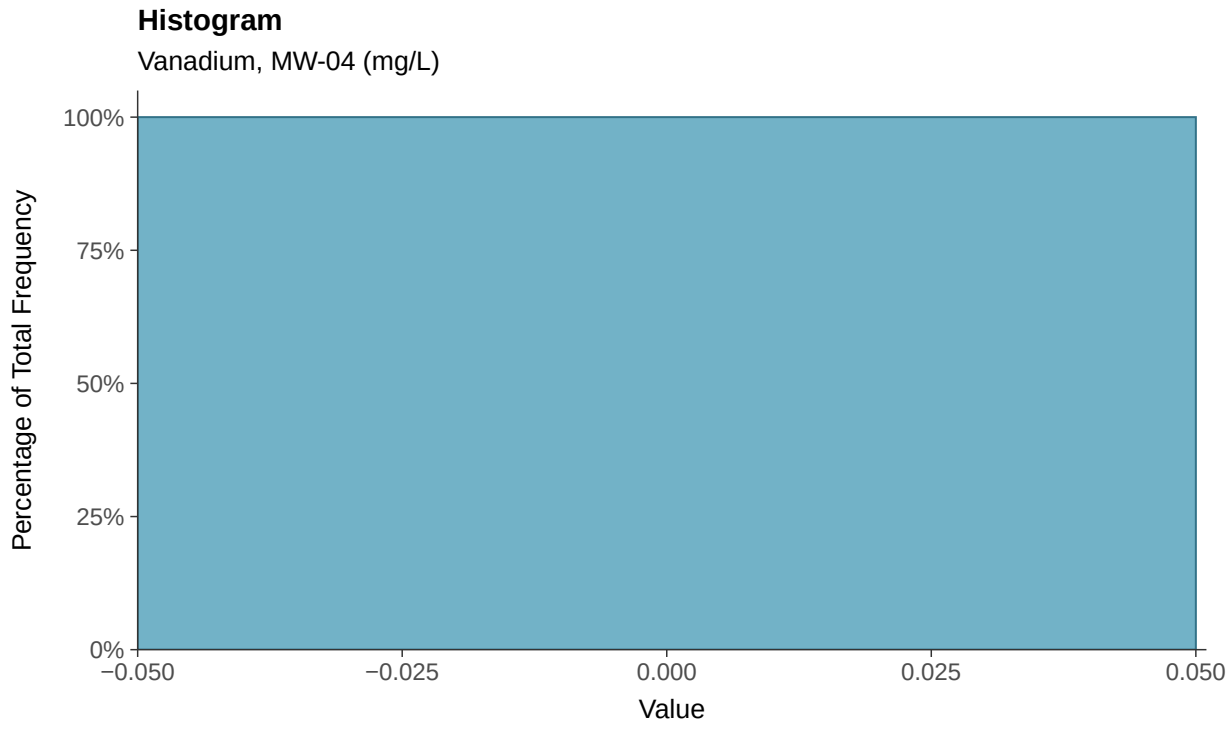

Trend Regression: Piecewise Linear-Linear
Silver, MW-04 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-04 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Part 115: Vanadium, MW-04

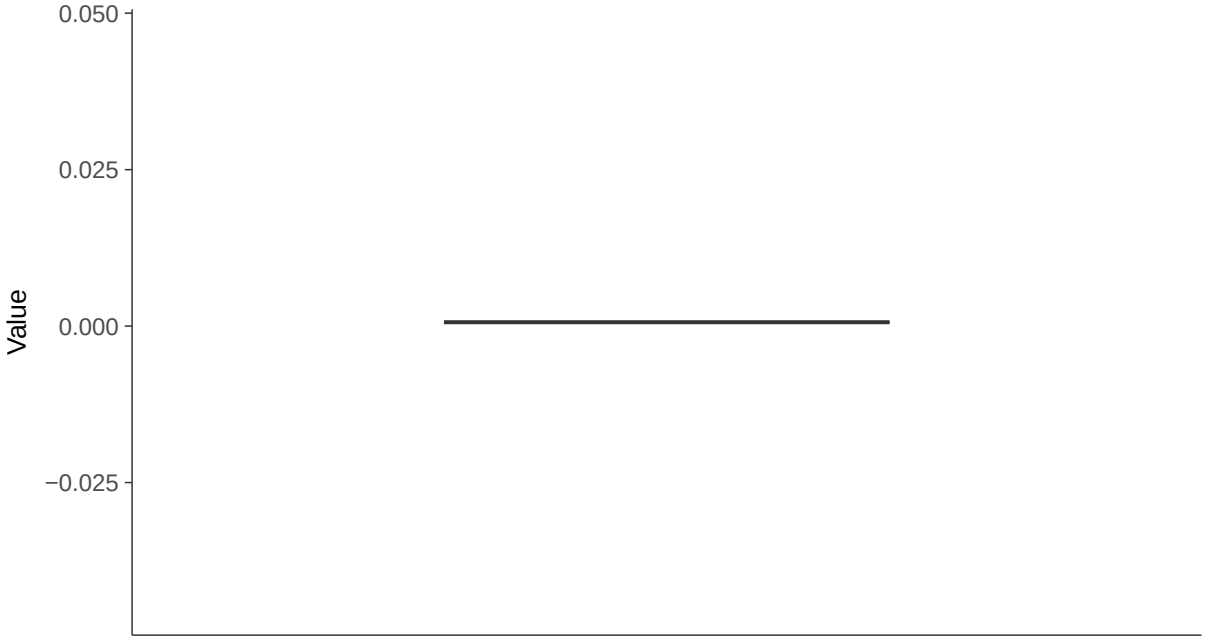
ID: 2_14_6_129





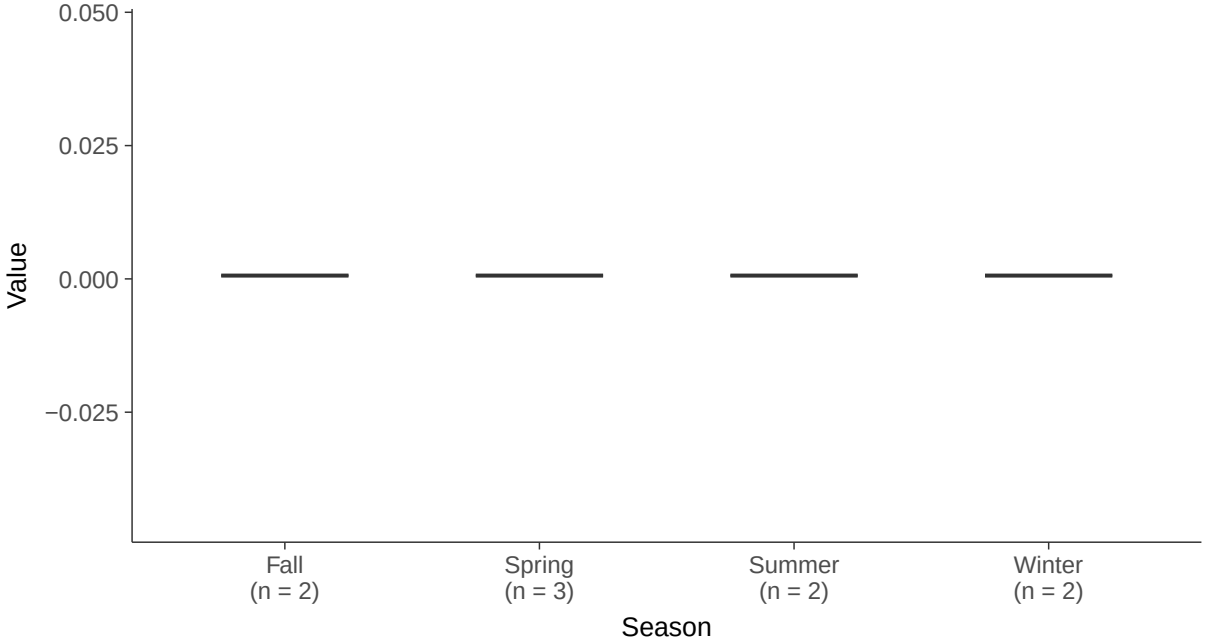
Boxplot

Vanadium, MW-04 (mg/L)



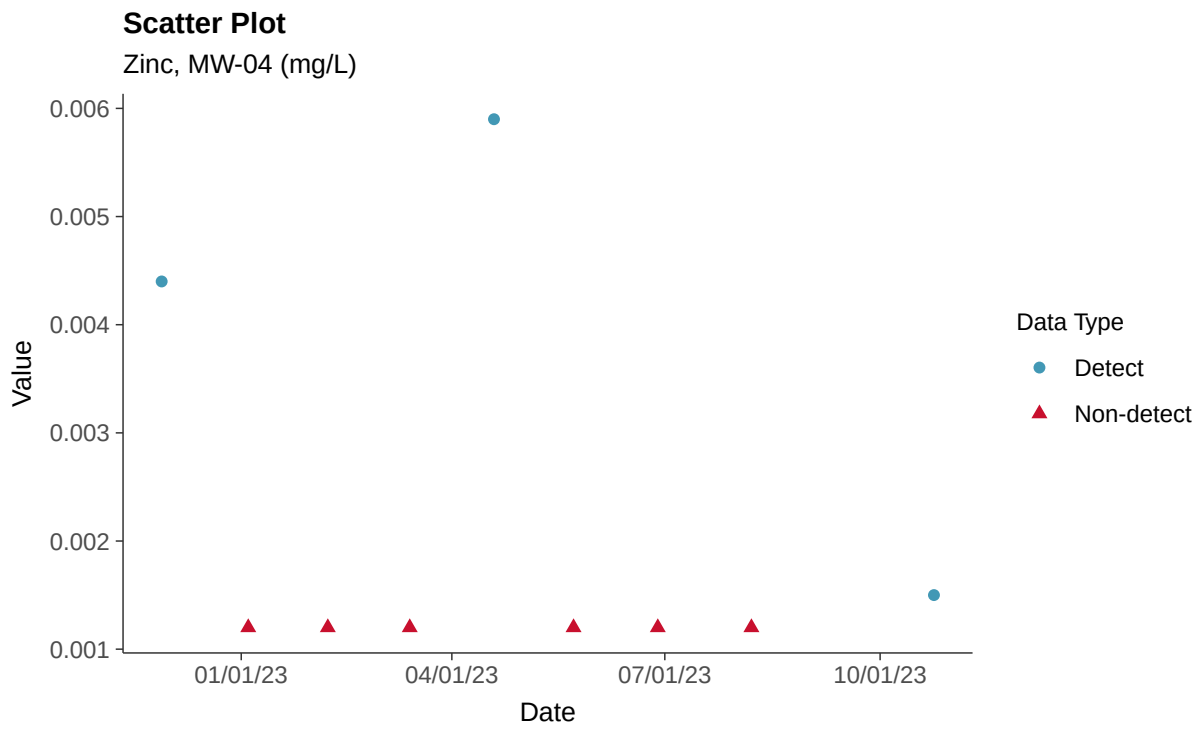
Boxplot by Season

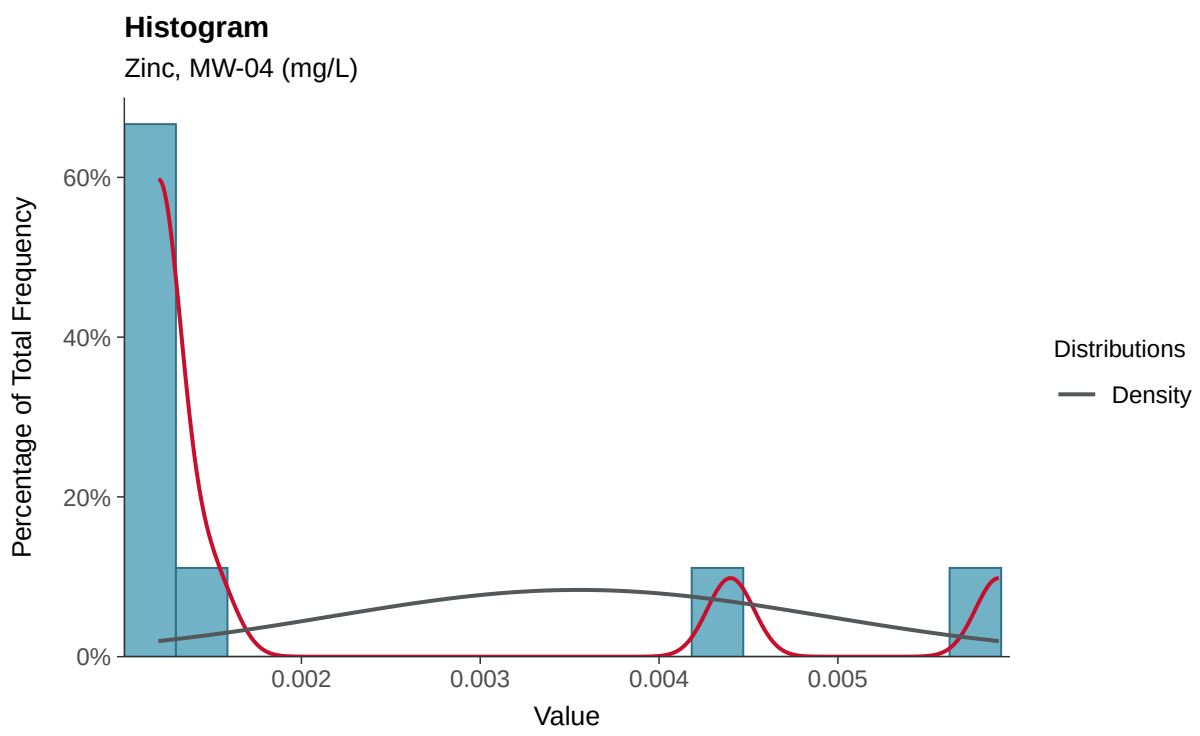
Vanadium, MW-04 (mg/L)



Part 115: Zinc, MW-04

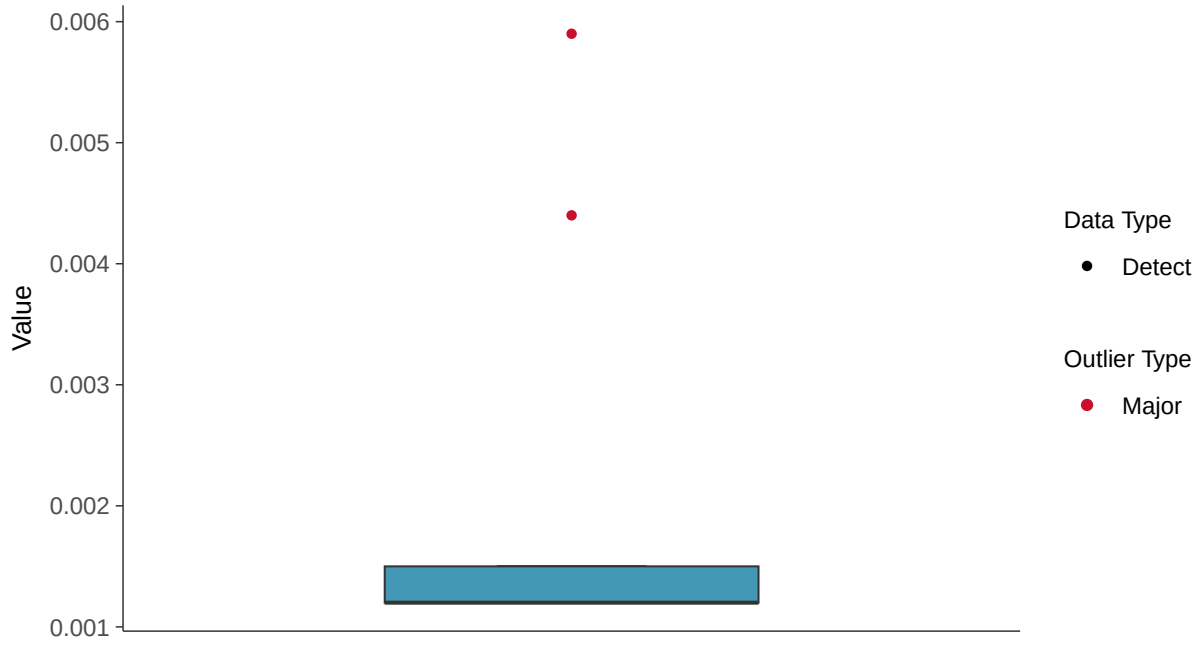
ID: 2_14_6_130





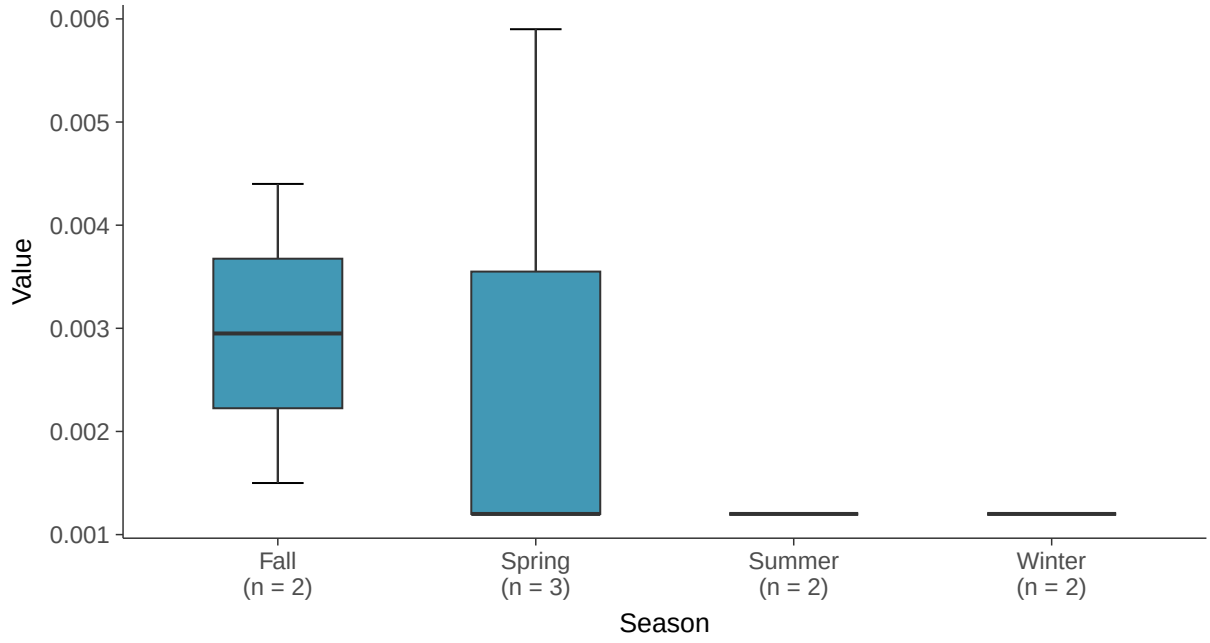
Boxplot

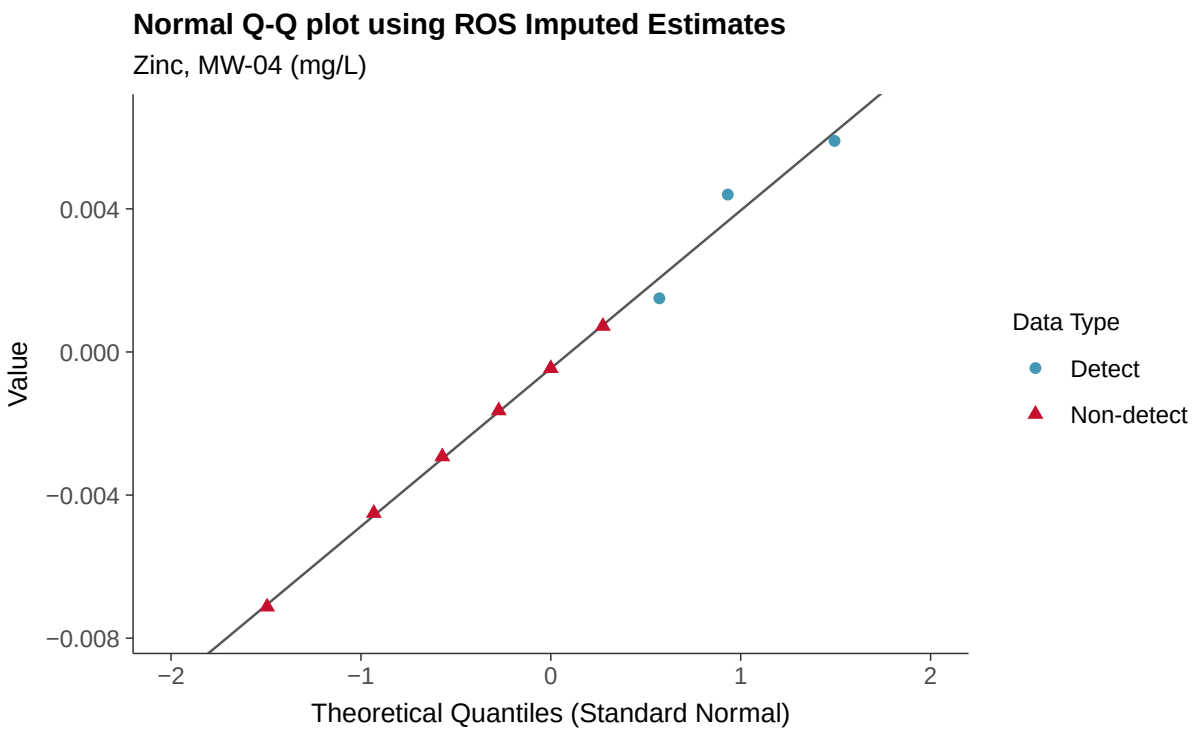
Zinc, MW-04 (mg/L)



Boxplot by Season

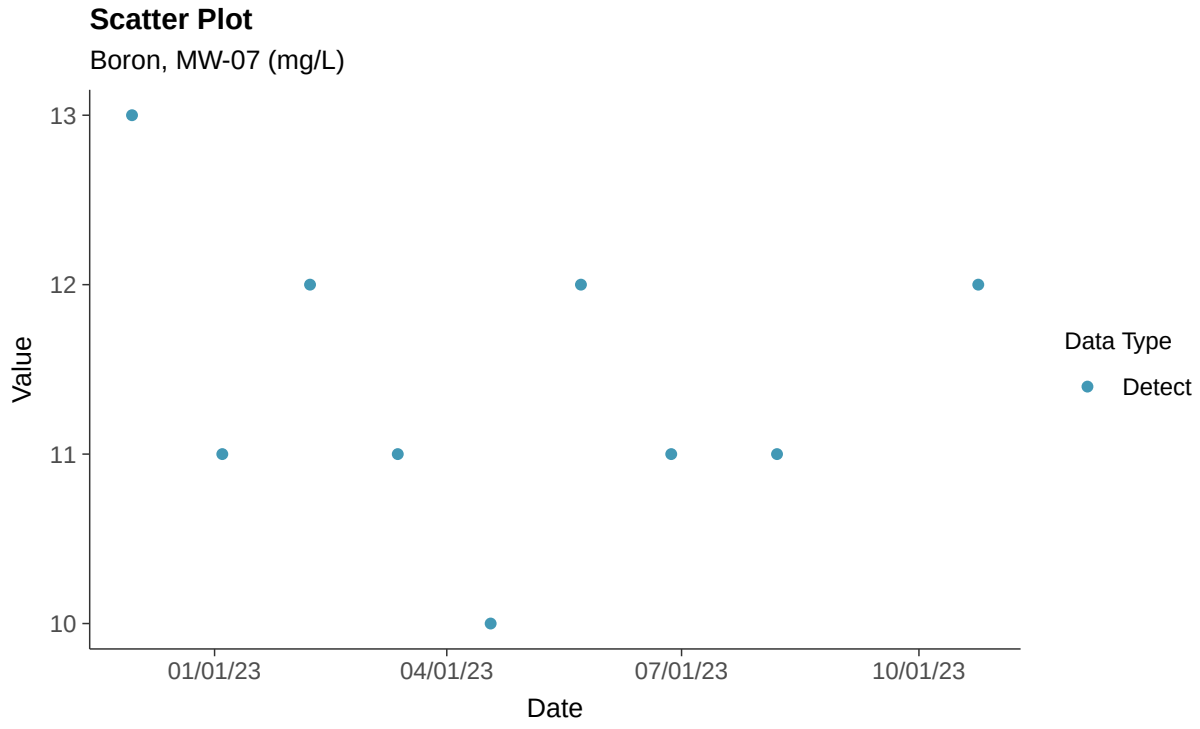
Zinc, MW-04 (mg/L)

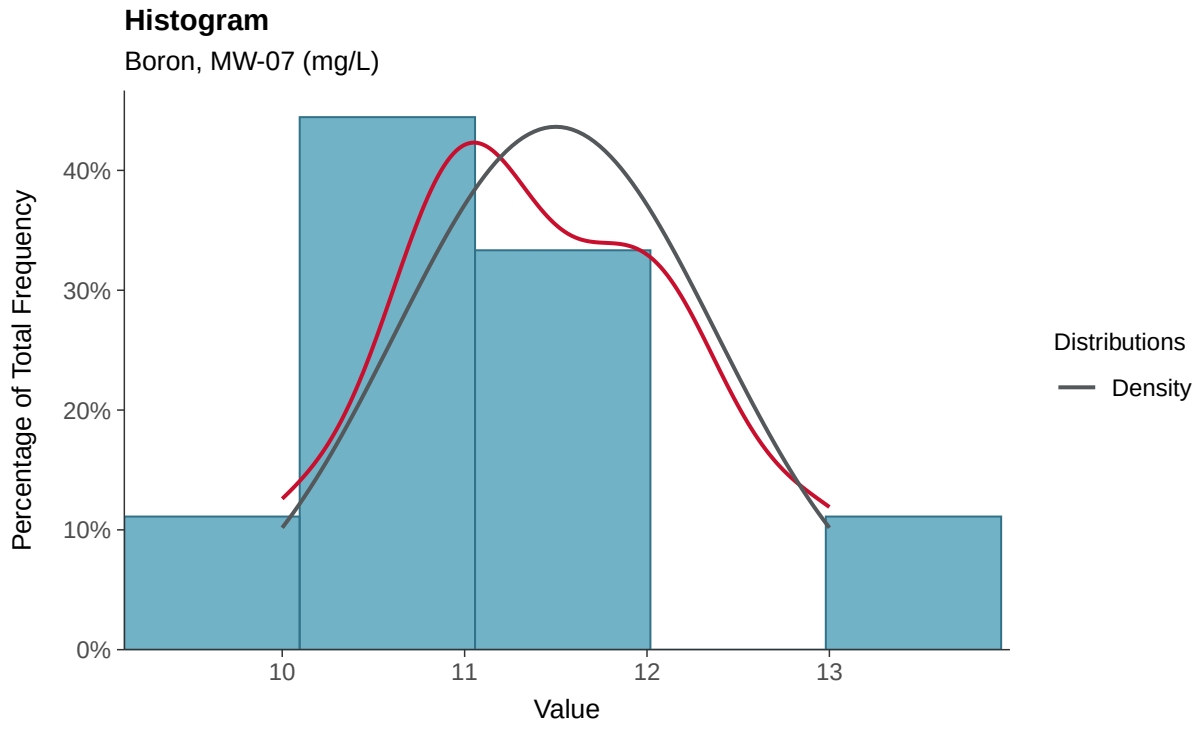



Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-04 (mg/L)
Value
0.004
0.000
−0.004
−0.008
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

Appendix III: Boron, MW-07

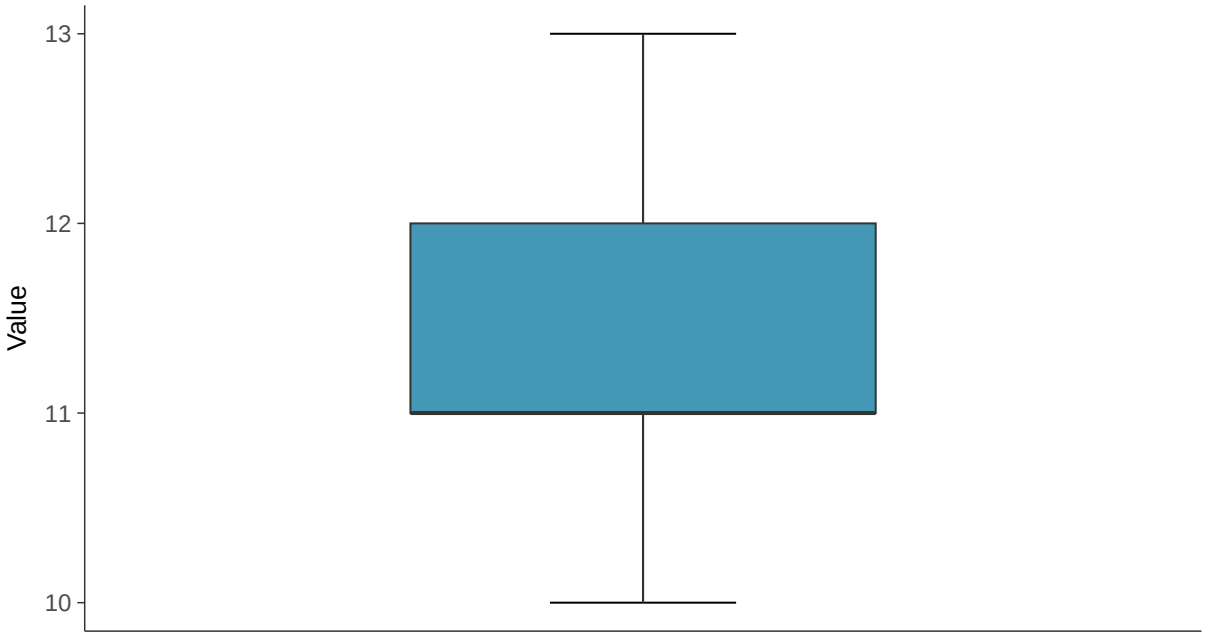
ID: 2_16_4_105





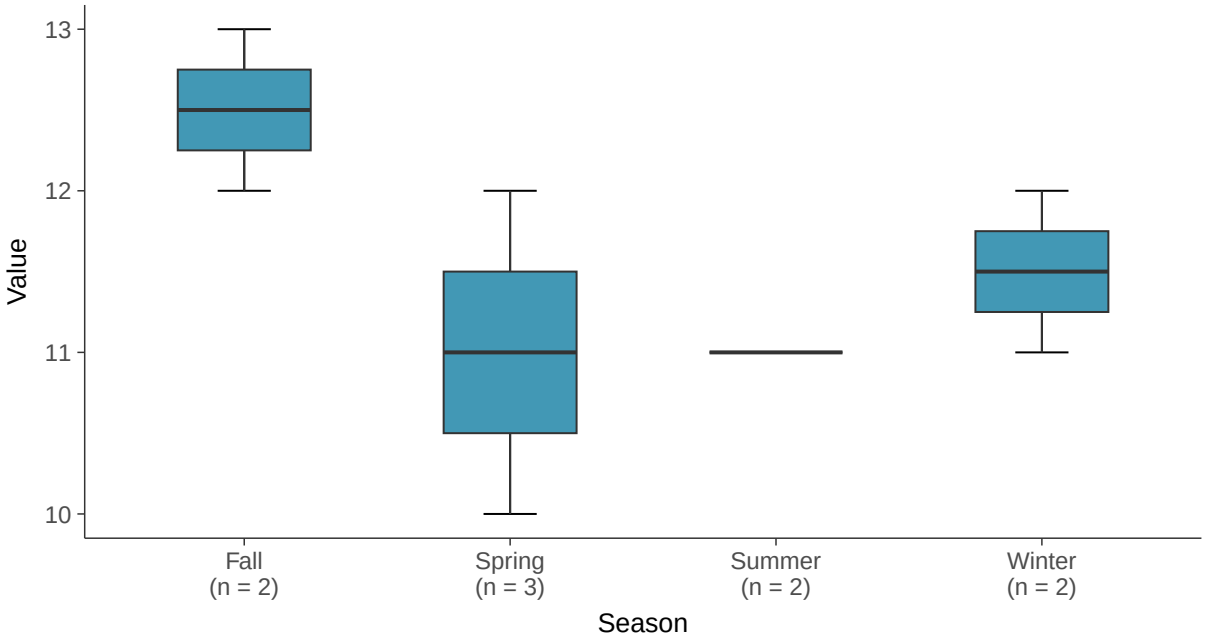
Boxplot

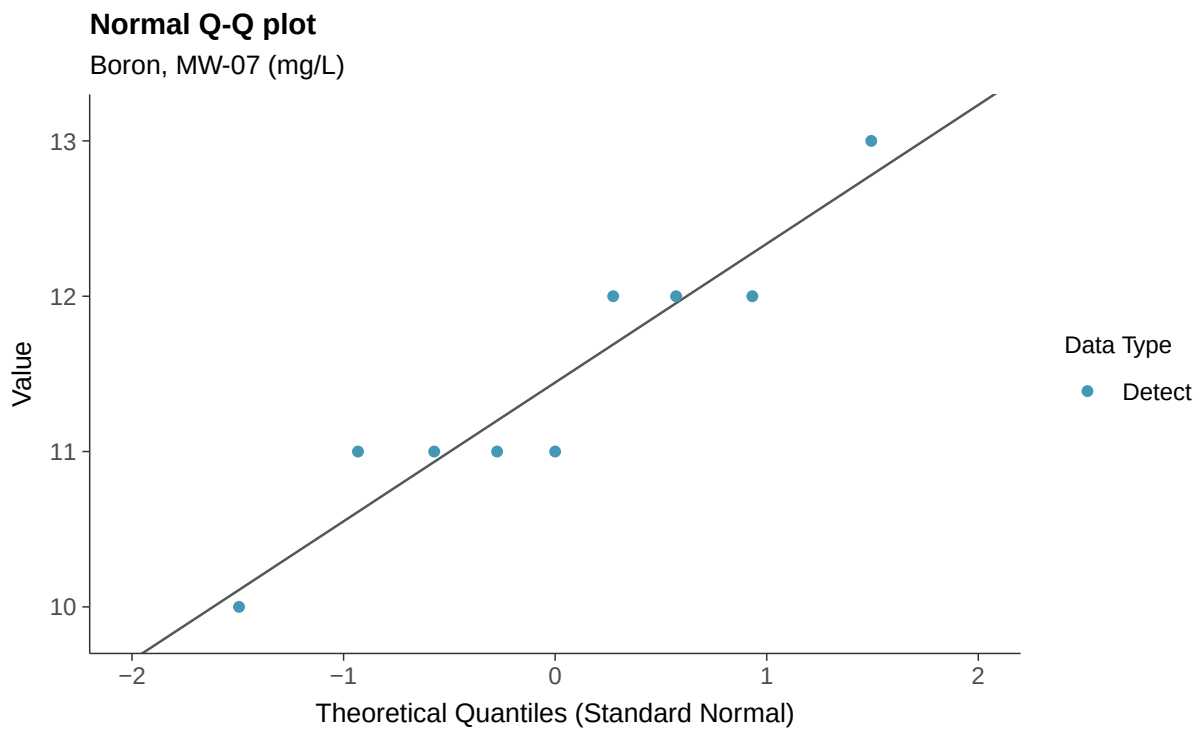
Boron, MW-07 (mg/L)

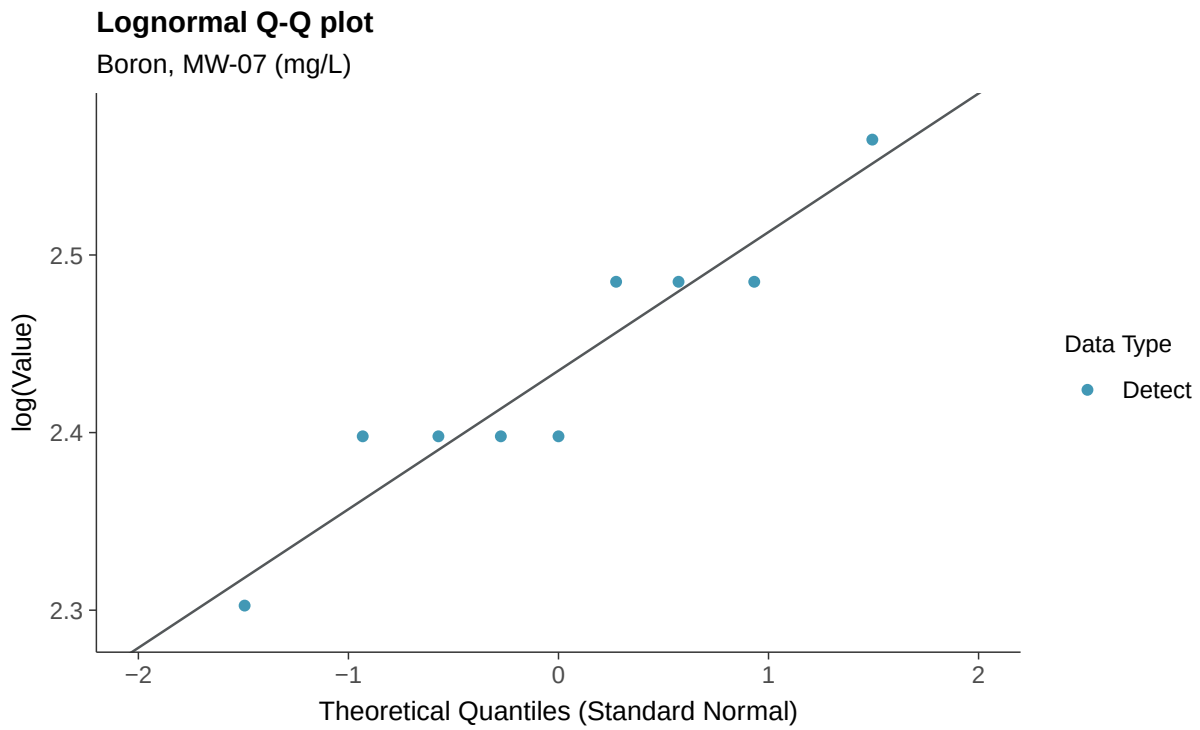


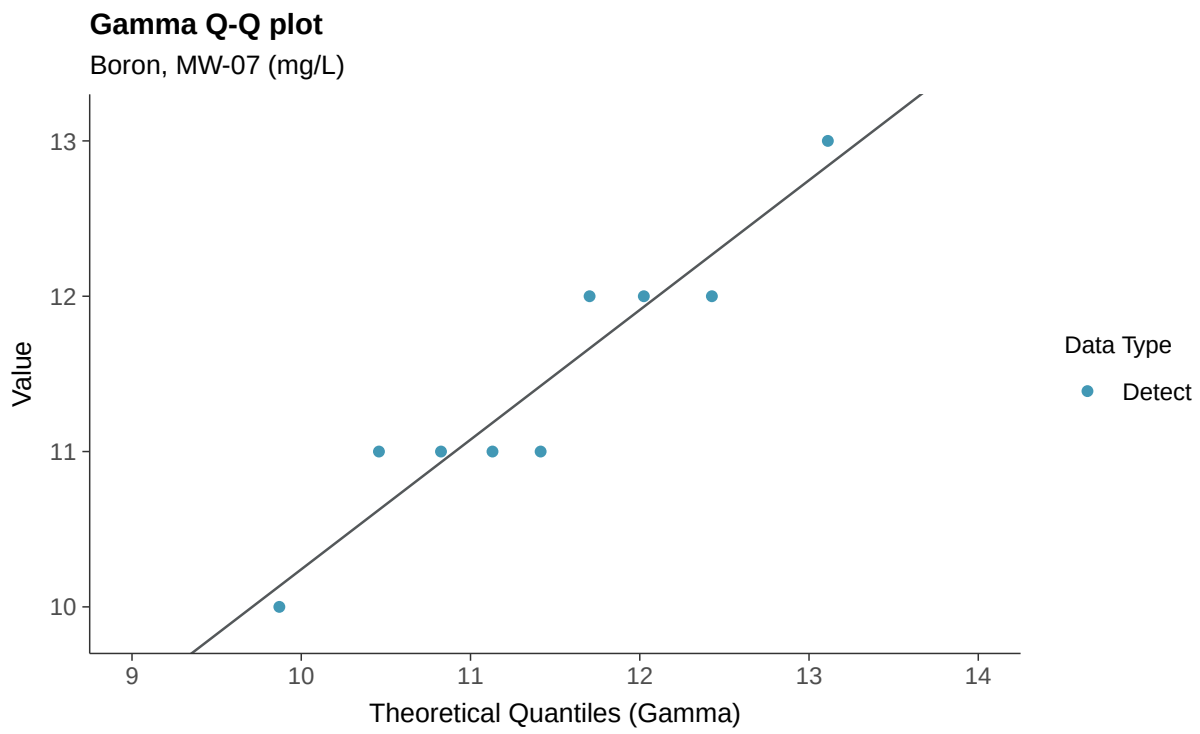
Boxplot by Season

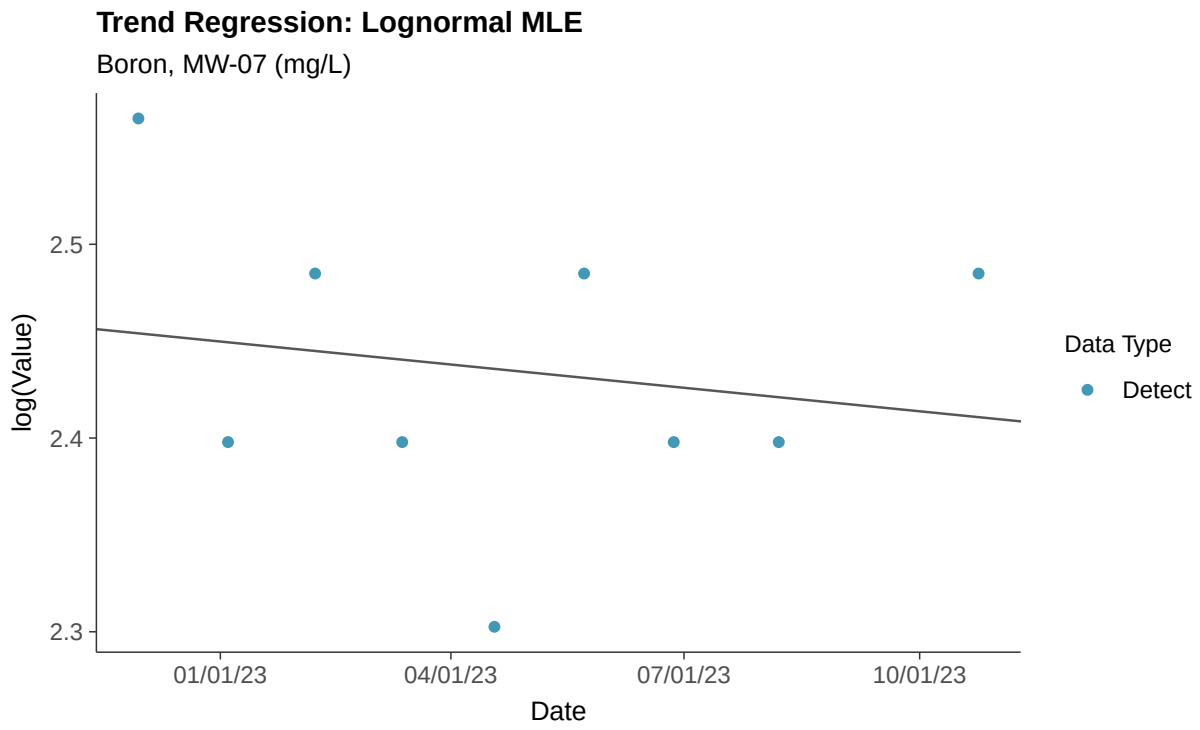
Boron, MW-07 (mg/L)

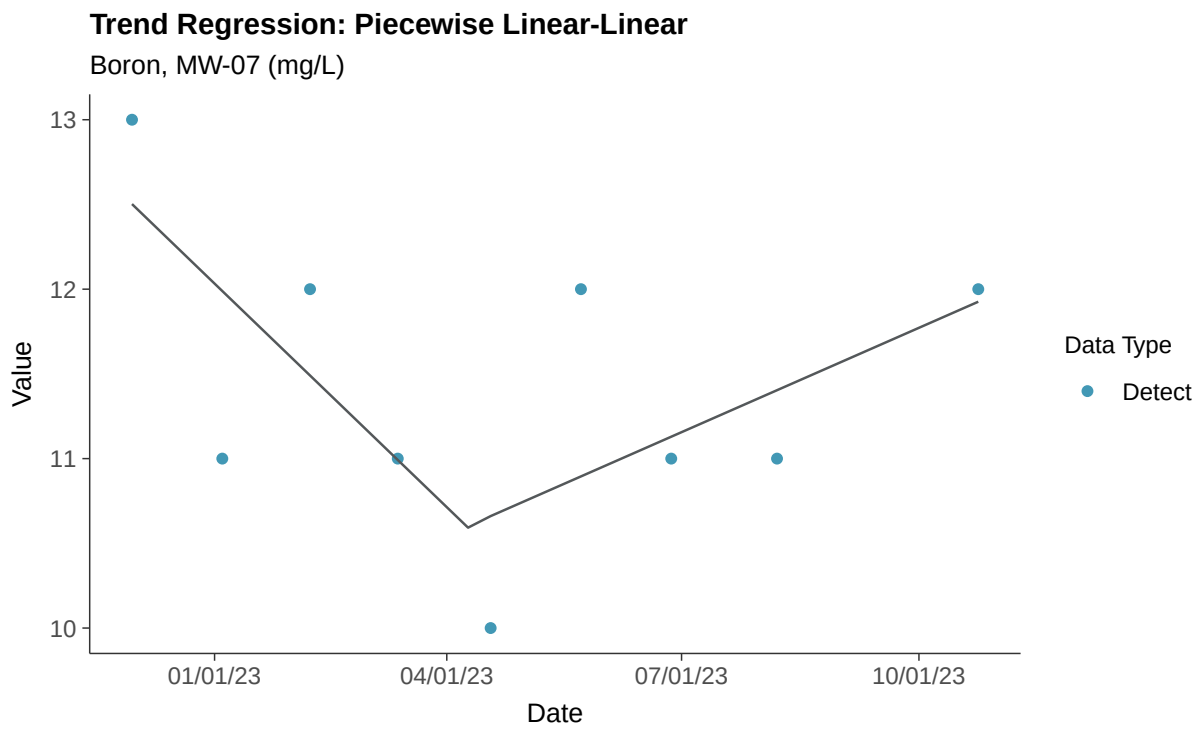



Normal Q-Q plot
Boron, MW-07 (mg/L)
Value
13
12
11
10
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-07 (mg/L)
log(Value)
2.5
2.4
2.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

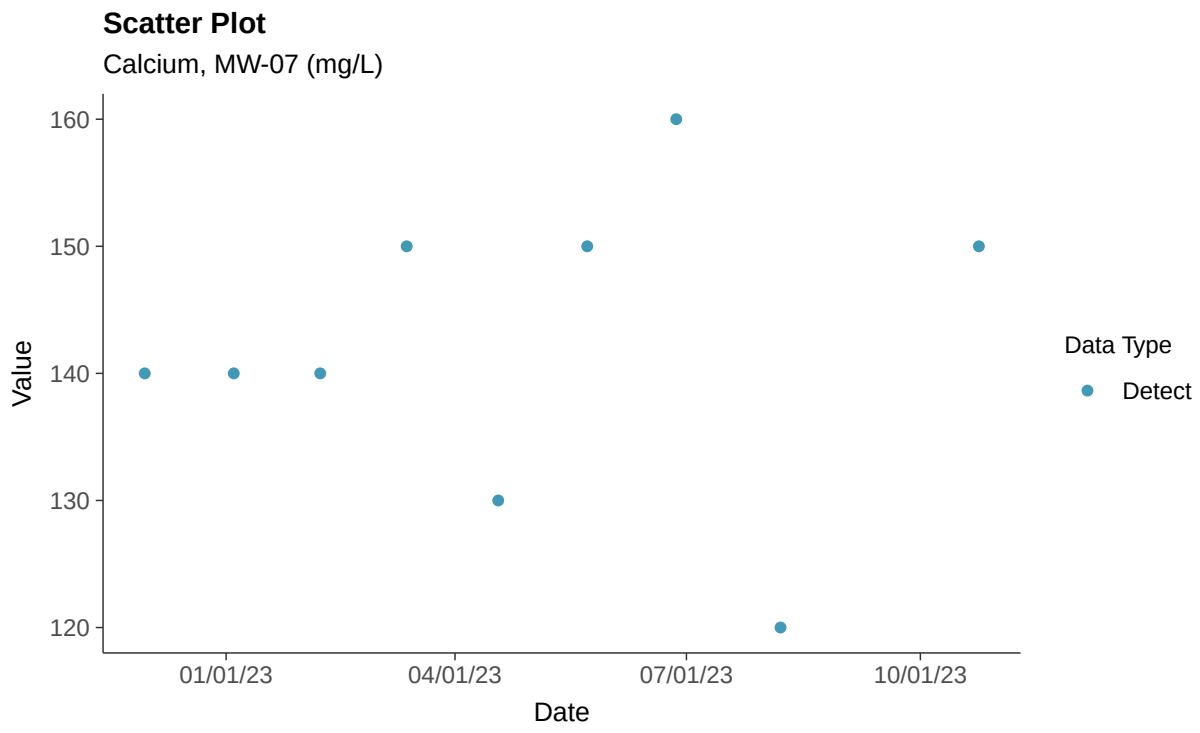

Gamma Q-Q plot
Boron, MW-07 (mg/L)
Value
13
12
11
10
9
10
11
12
13
14
Theoretical Quantiles (Gamma)
Data Type
Detect

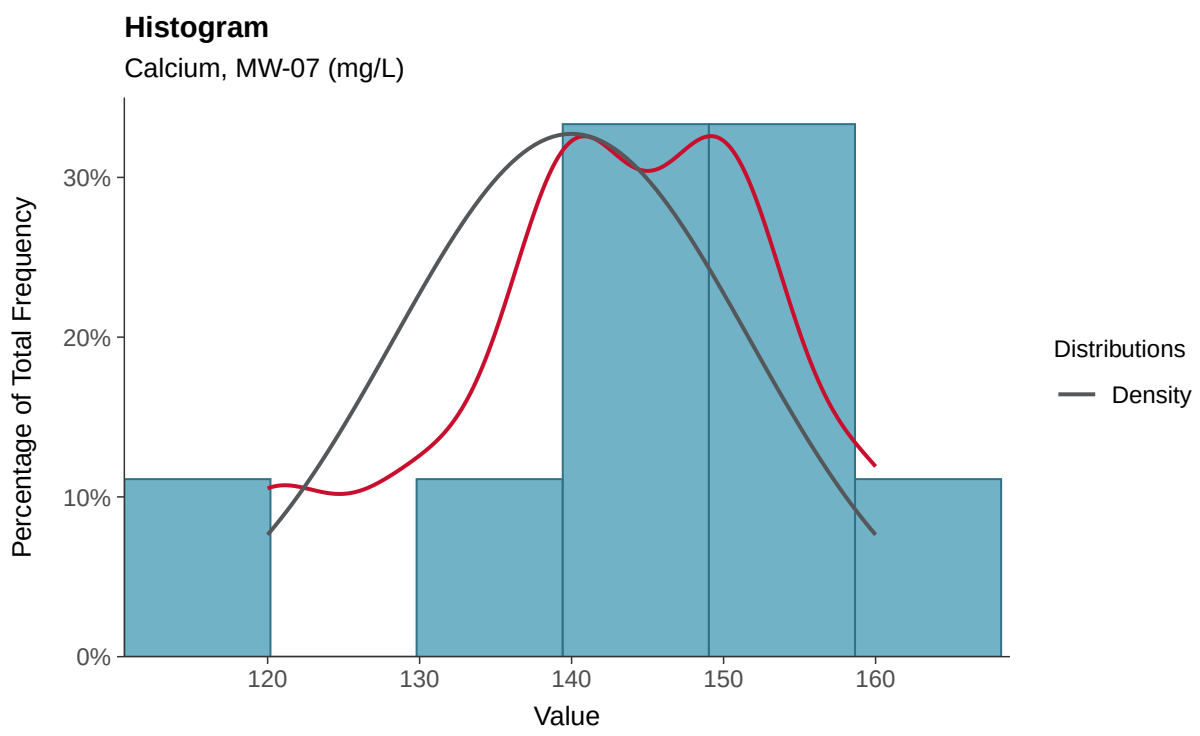

Trend Regression: Lognormal MLE
Boron, MW-07 (mg/L)
log(Value)
2.5
2.4
2.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Boron, MW-07 (mg/L)
13
12
11
10
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-07

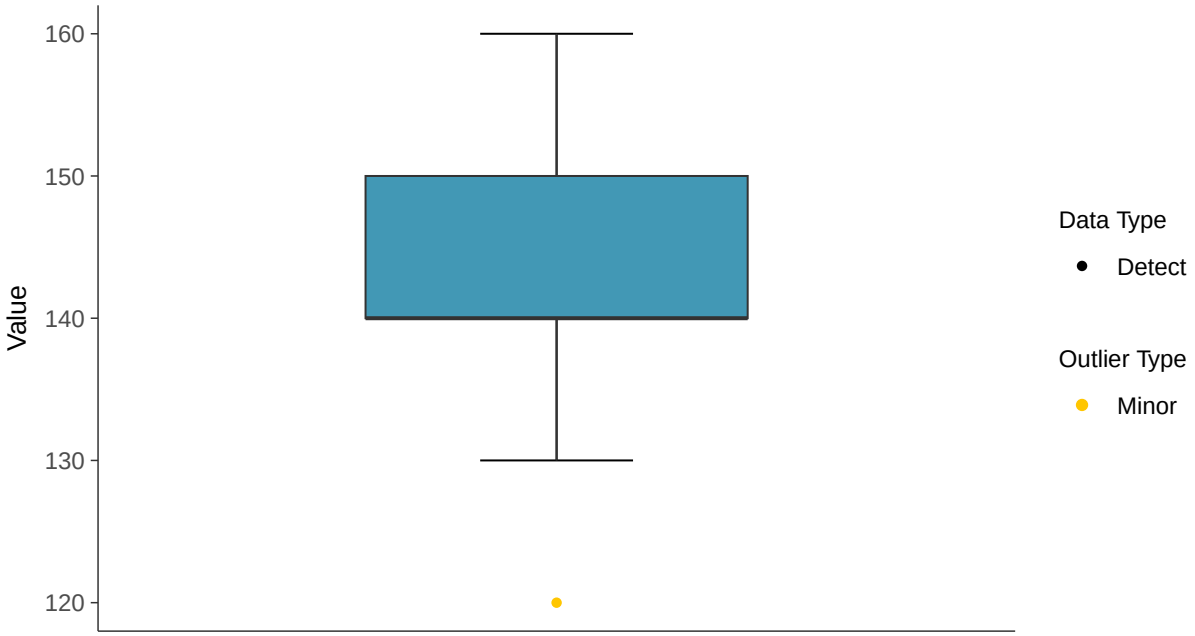
ID: 2_16_4_107





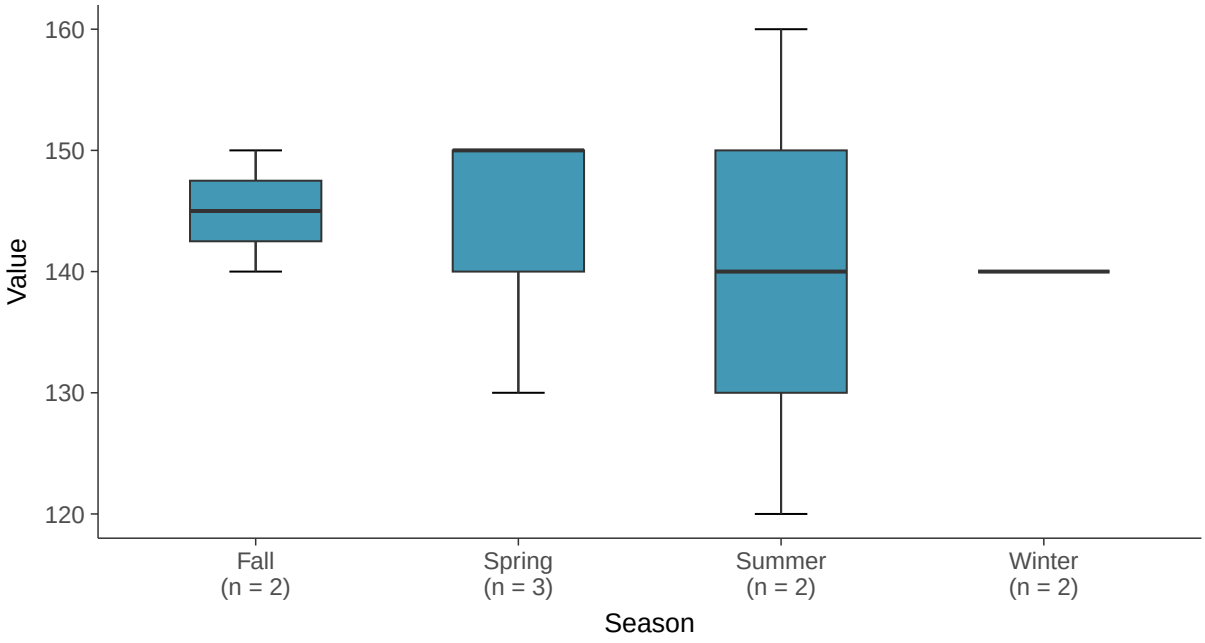
Boxplot

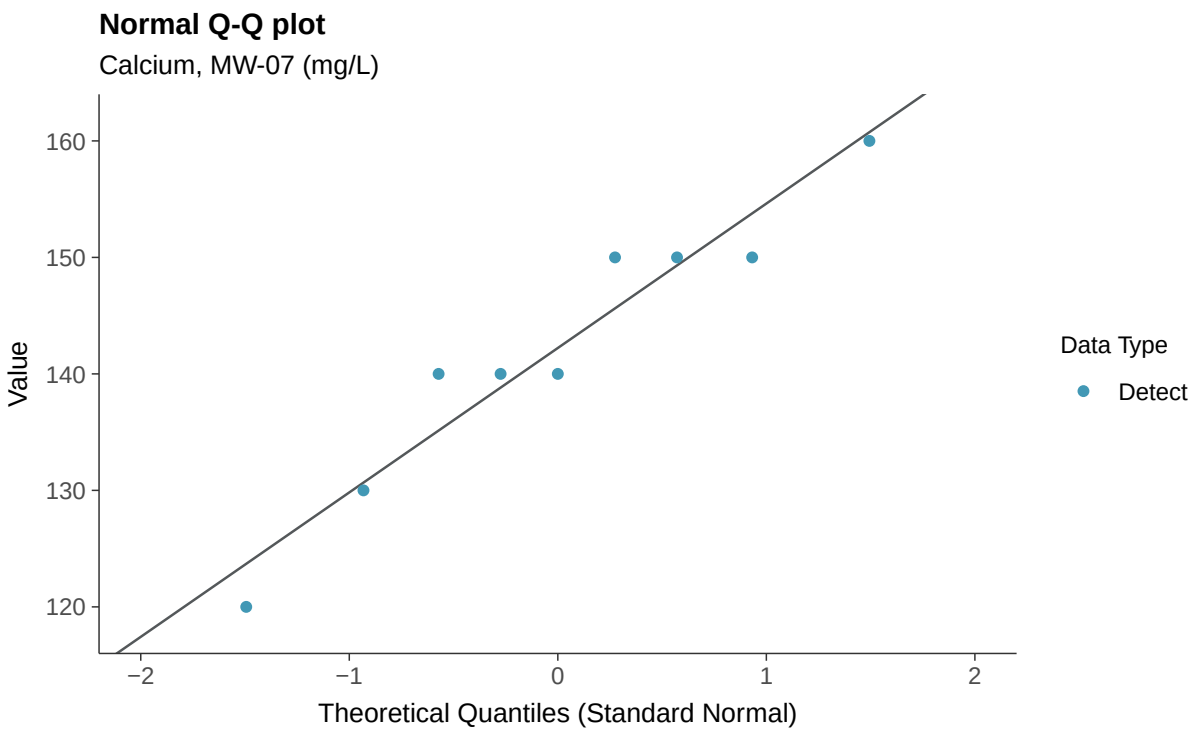
Calcium, MW-07 (mg/L)

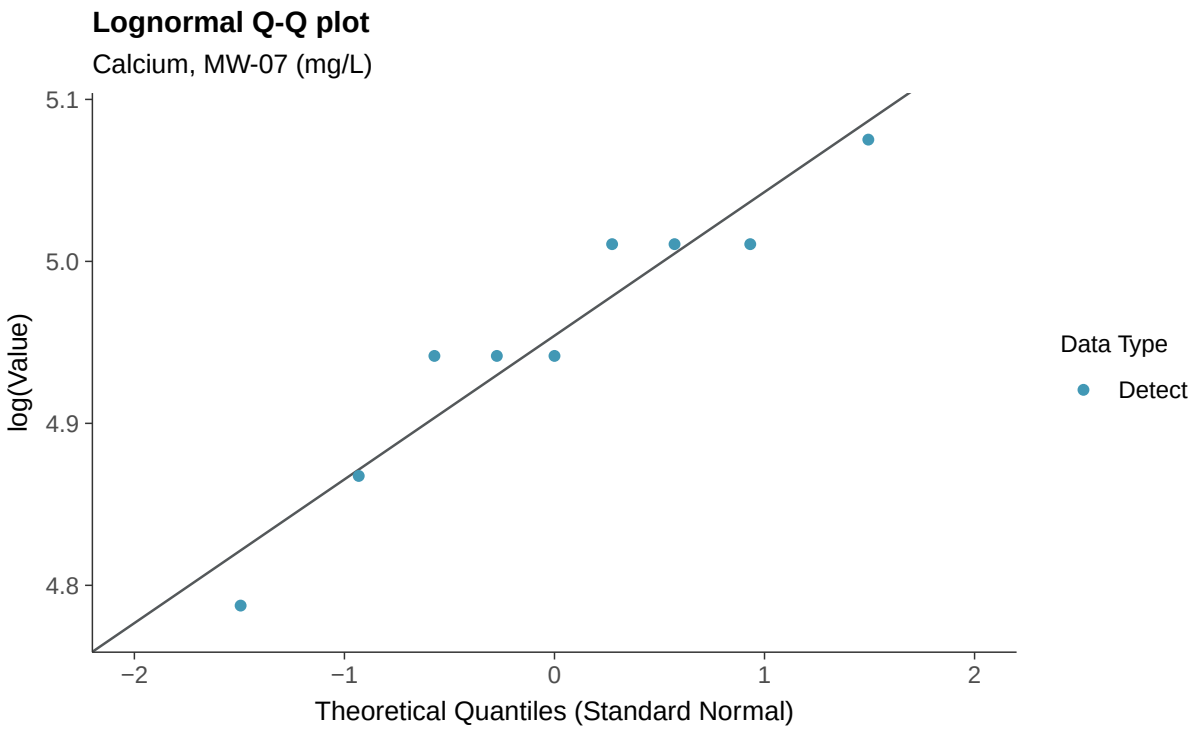


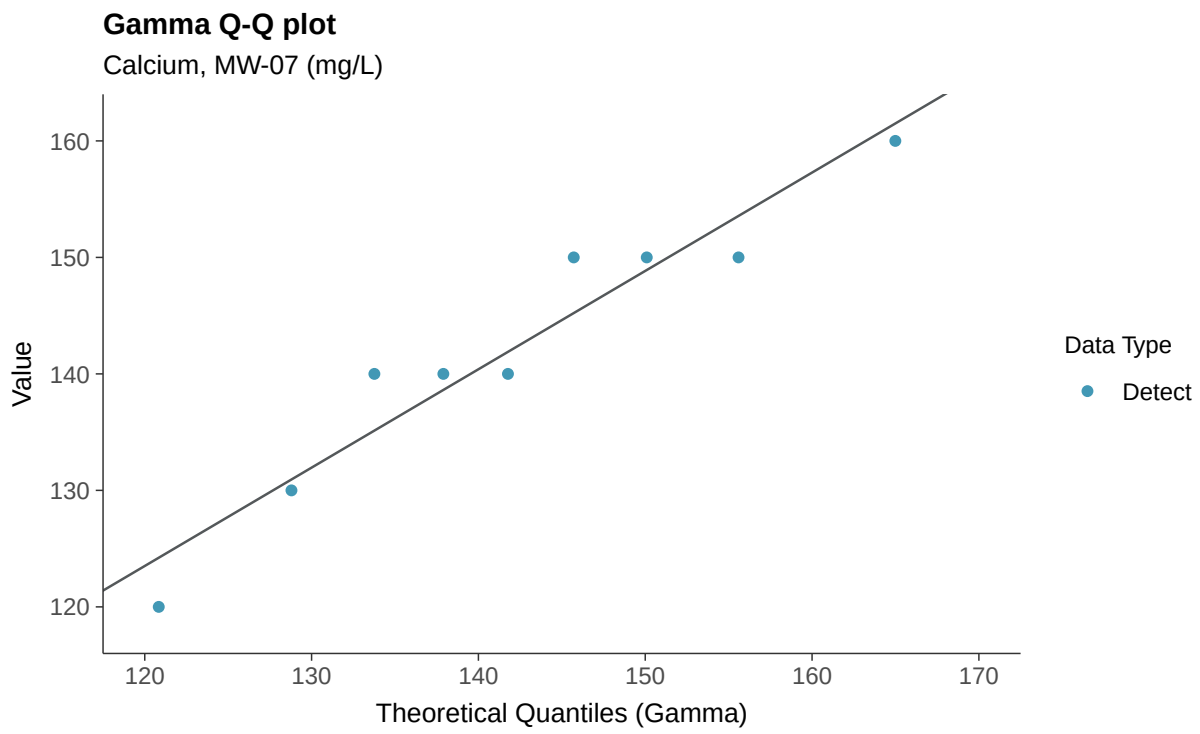
Boxplot by Season

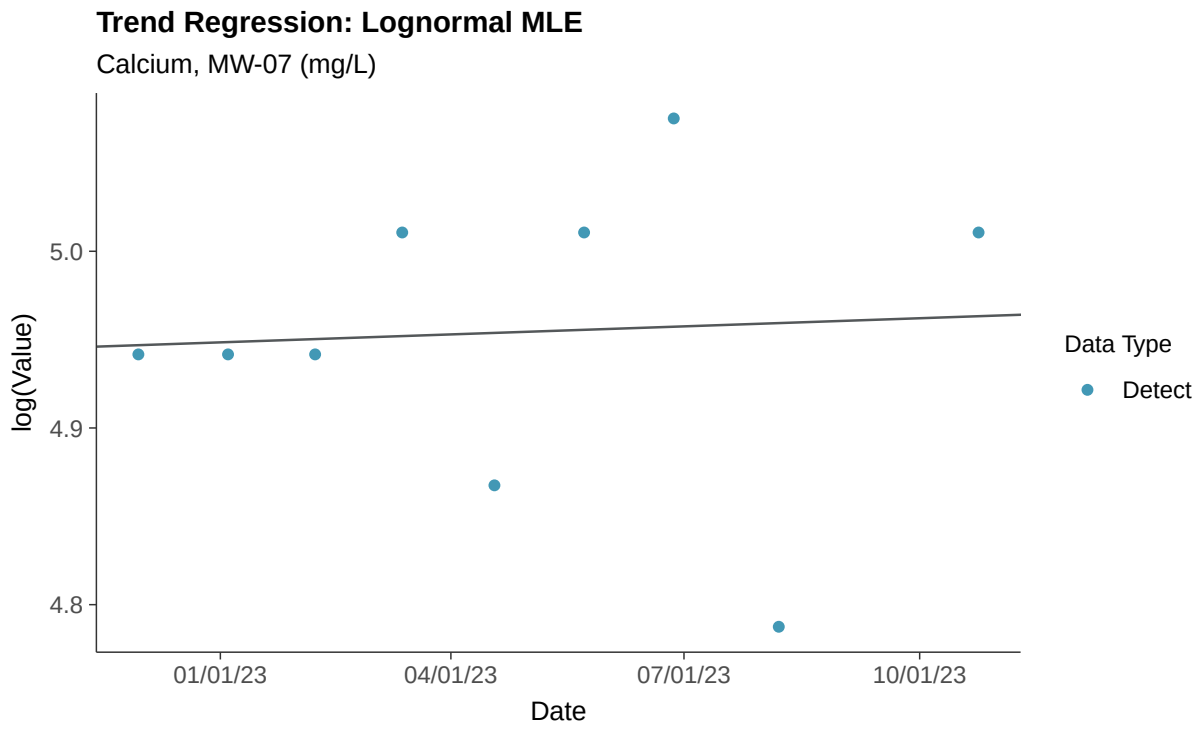
Calcium, MW-07 (mg/L)

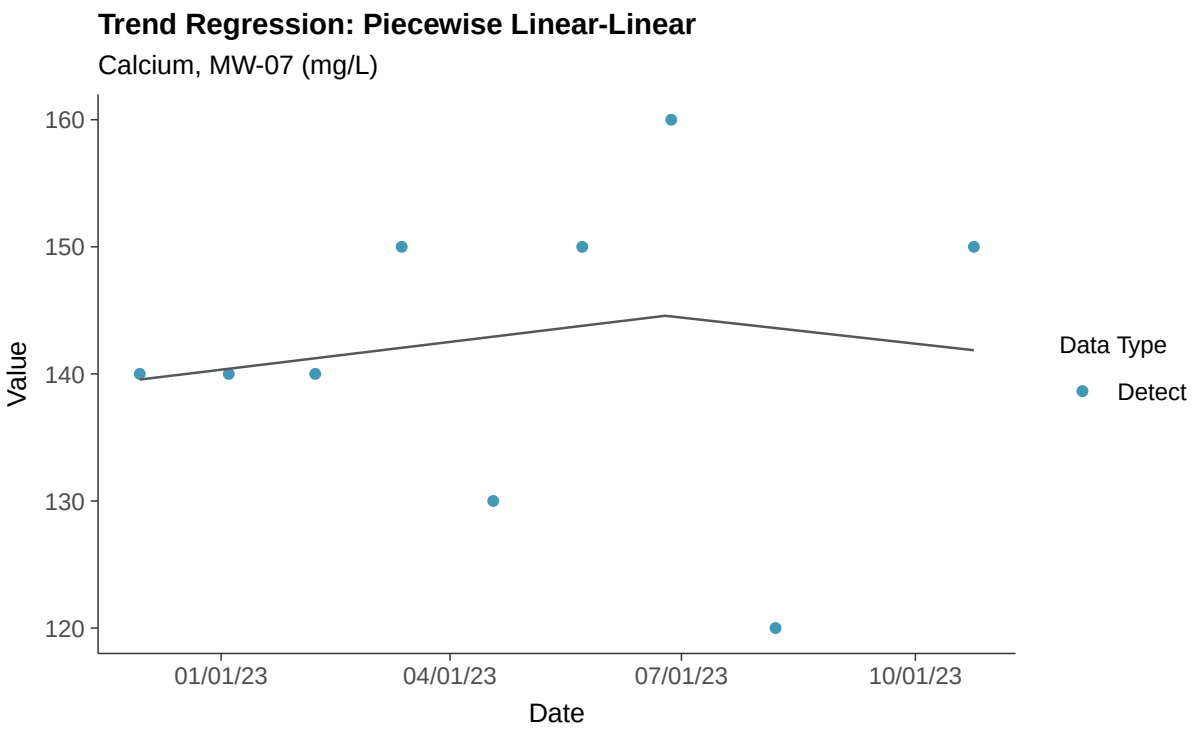



Normal Q-Q plot
Calcium, MW-07 (mg/L)
Value
160
150
140
130
120
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Calcium, MW-07 (mg/L)
log(Value)
5.1
5.0
4.9
4.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

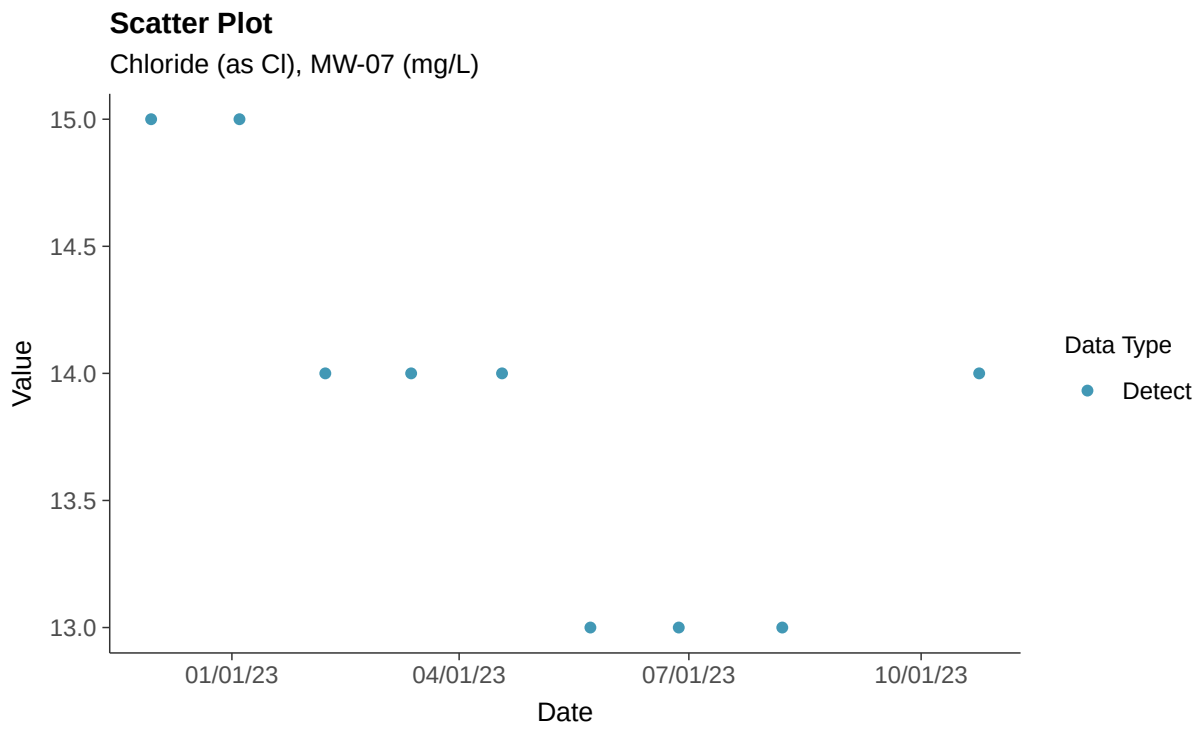

Gamma Q-Q plot
Calcium, MW-07 (mg/L)
Value
160
150
140
130
120
120
130
140
150
160
170
Theoretical Quantiles (Gamma)
Data Type
Detect

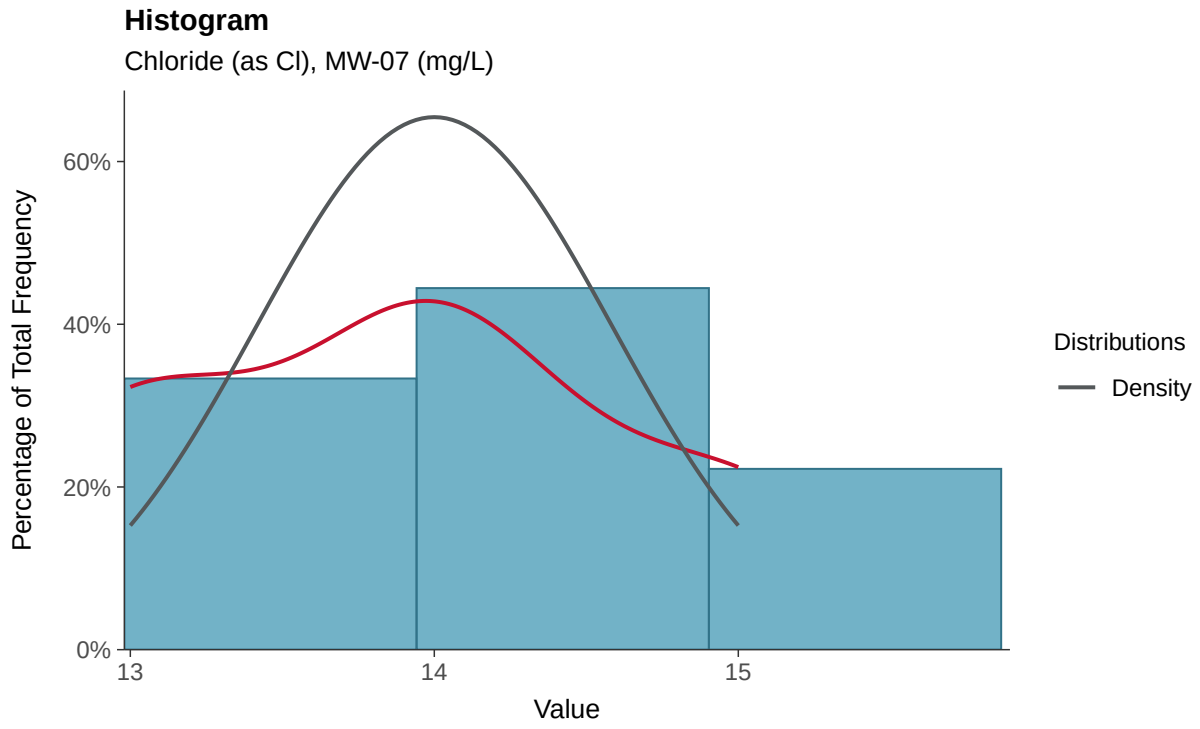

Trend Regression: Lognormal MLE
Calcium, MW-07 (mg/L)
log(Value)
5.0
4.9
4.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Calcium, MW-07 (mg/L)
160
150
140
130
120
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-07

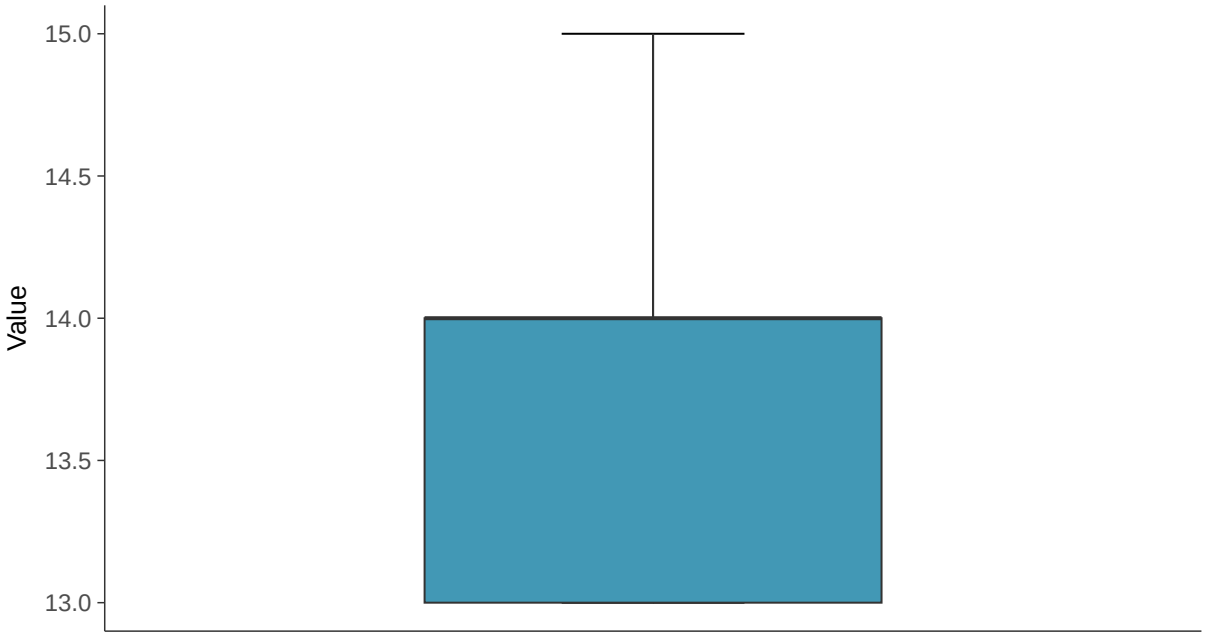
ID: 2_16_4_108





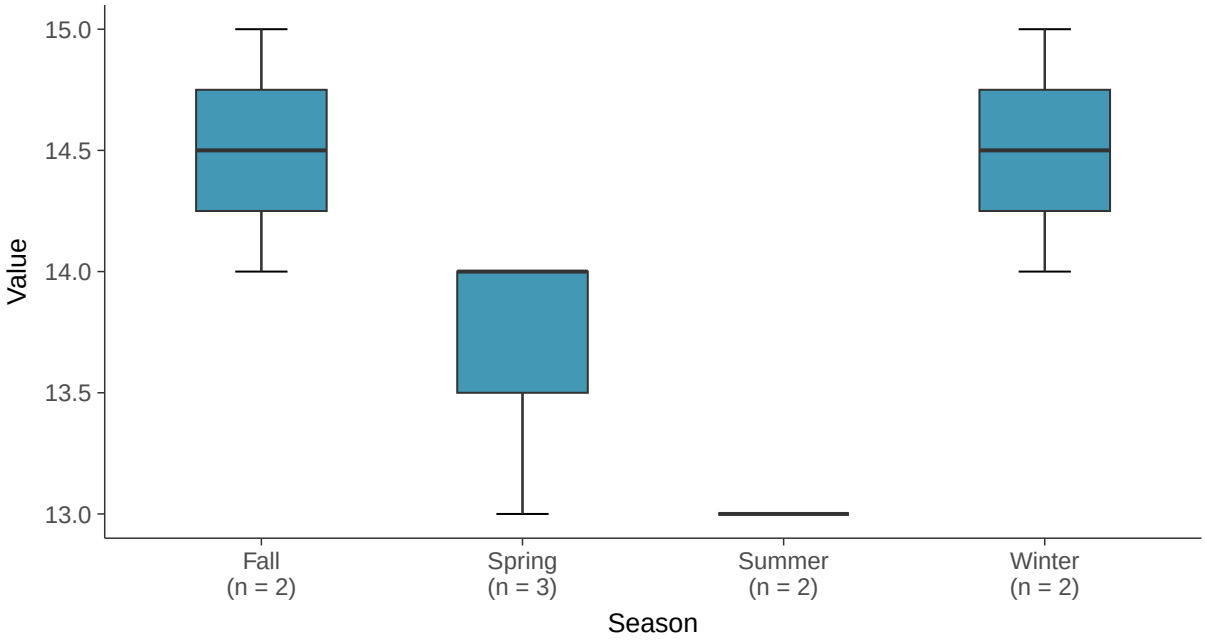
Boxplot

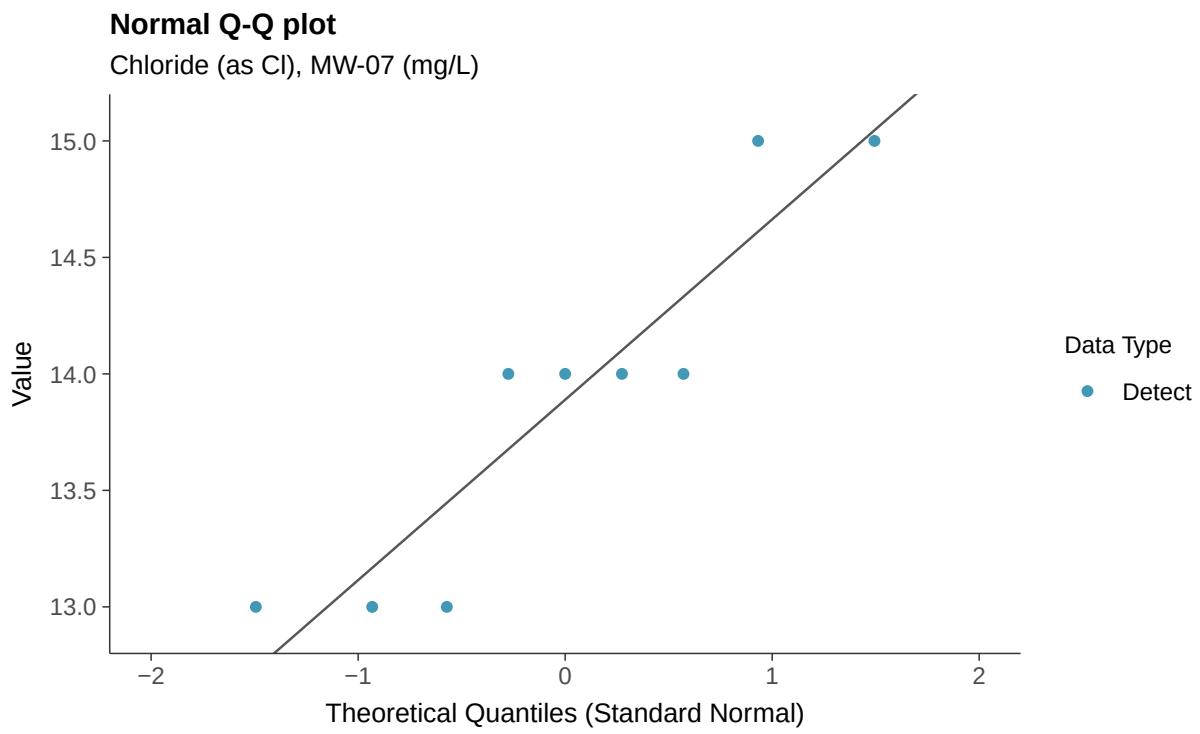
Chloride (as Cl), MW-07 (mg/L)

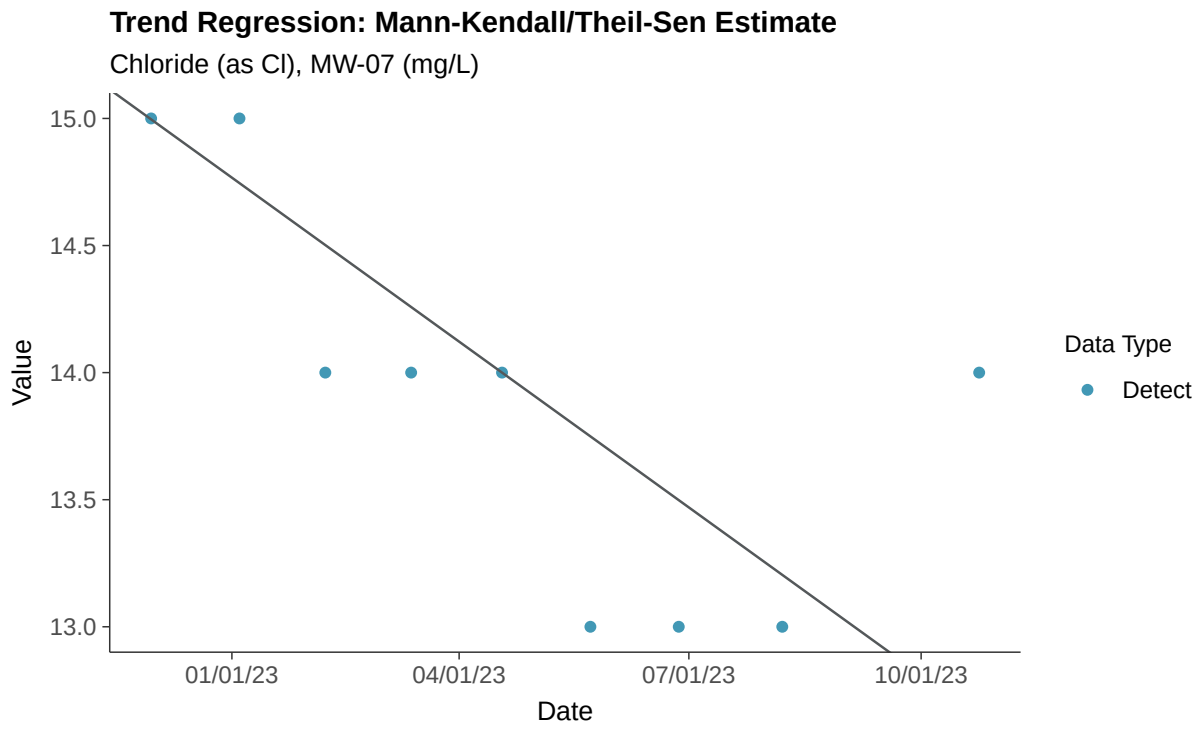


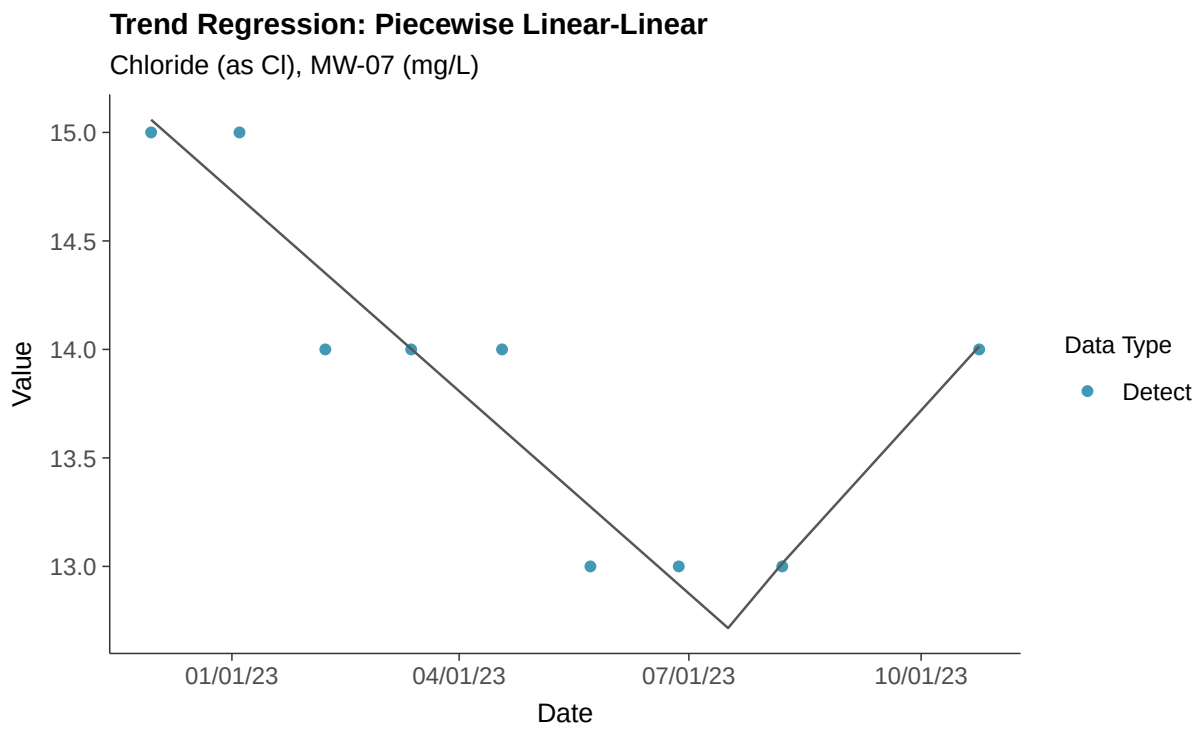
Boxplot by Season

Chloride (as Cl), MW-07 (mg/L)



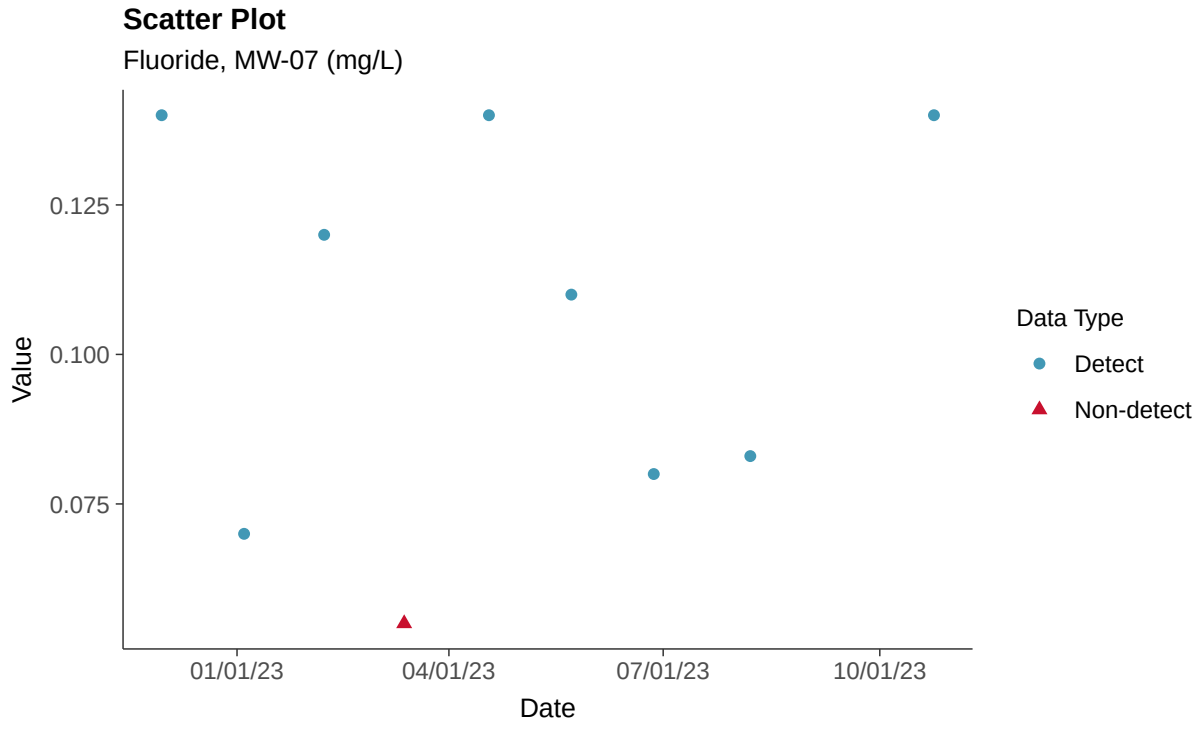

Normal Q-Q plot
Chloride (as Cl), MW-07 (mg/L)
Value
15.0
14.5
14.0
13.5
13.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

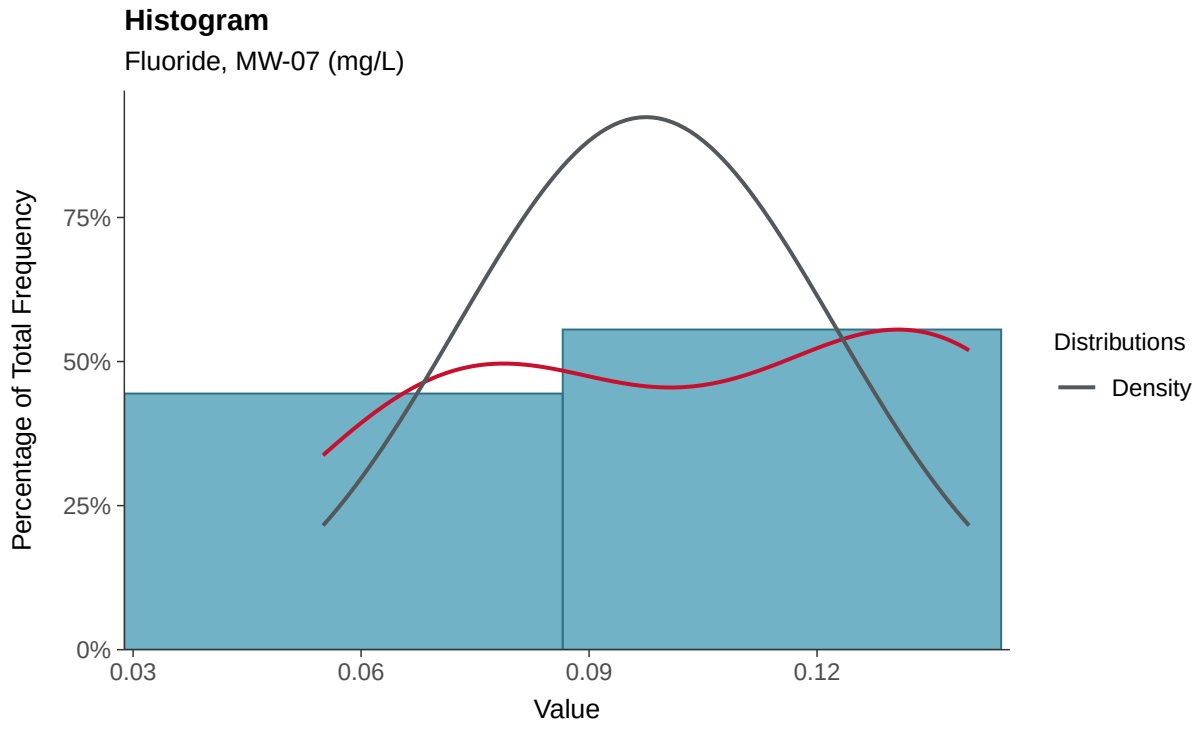

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Chloride (as Cl), MW-07 (mg/L)
Value
15.0
14.5
14.0
13.5
13.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-07 (mg/L)
15.0
14.5
14.0
13.5
13.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-07

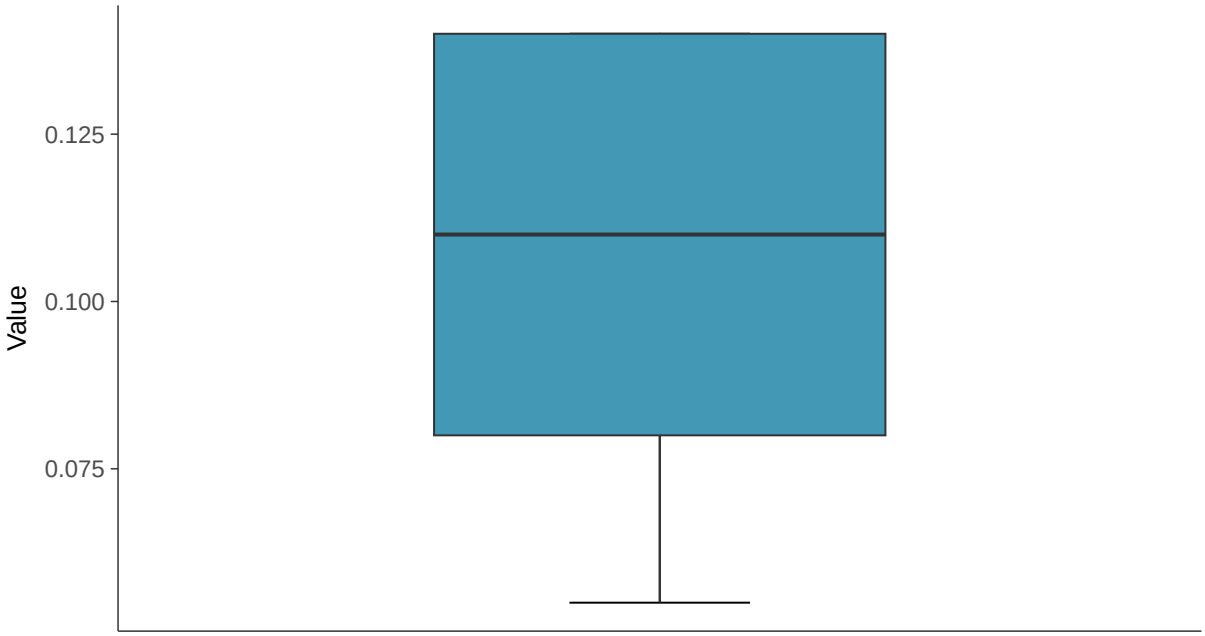
ID: 2_16_4_112





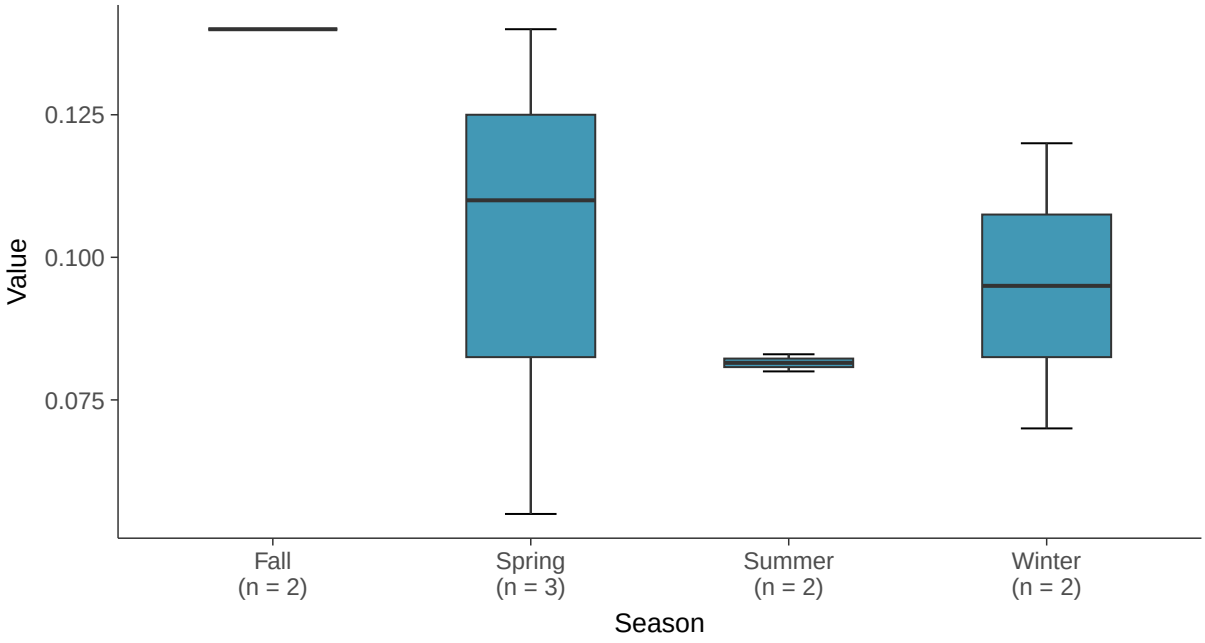
Boxplot

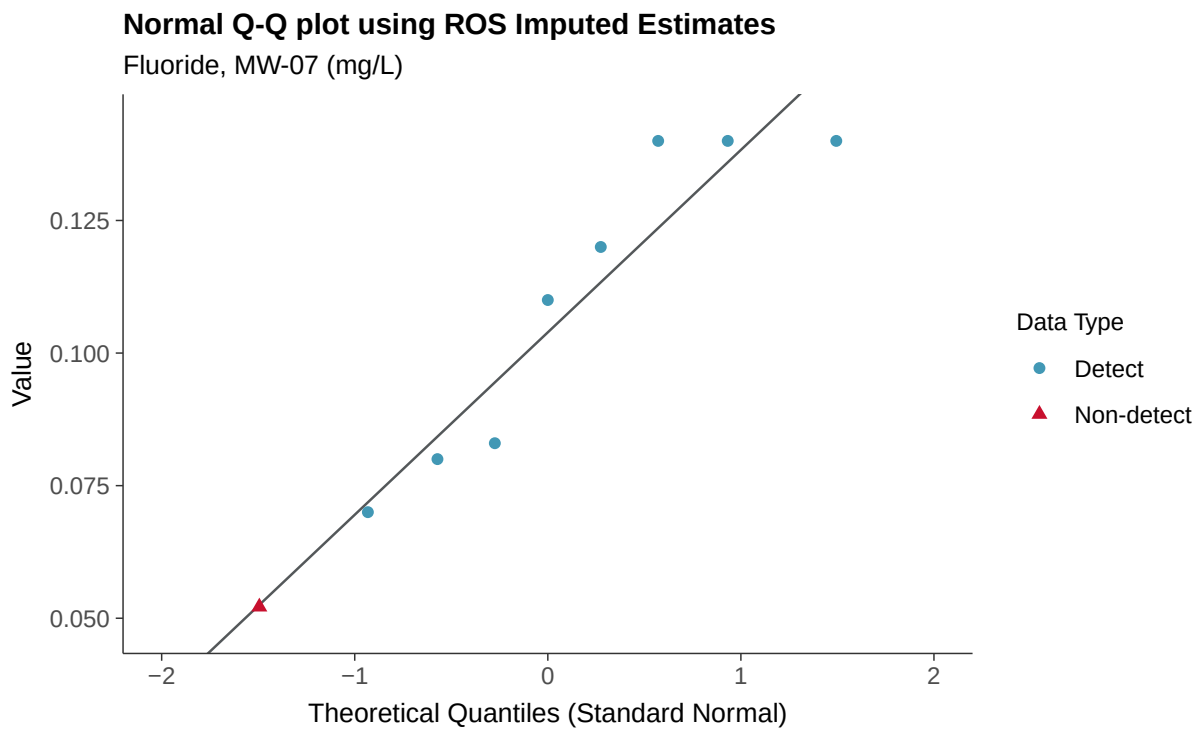
Fluoride, MW-07 (mg/L)

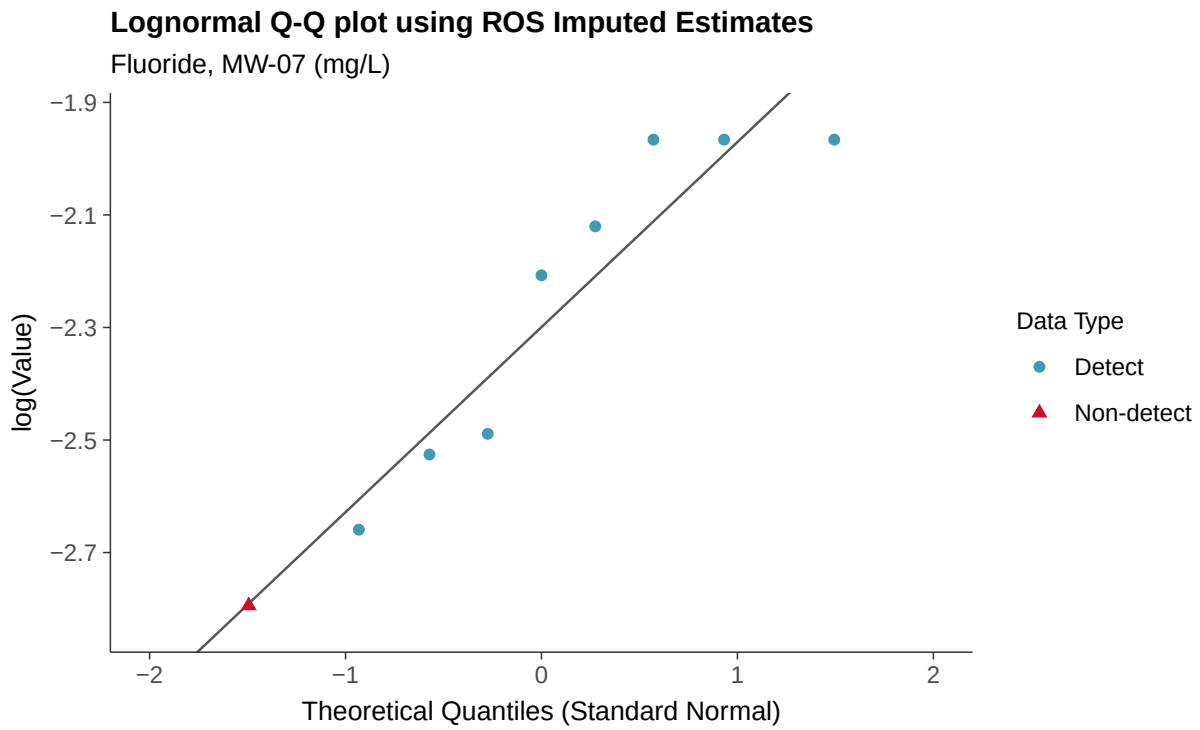


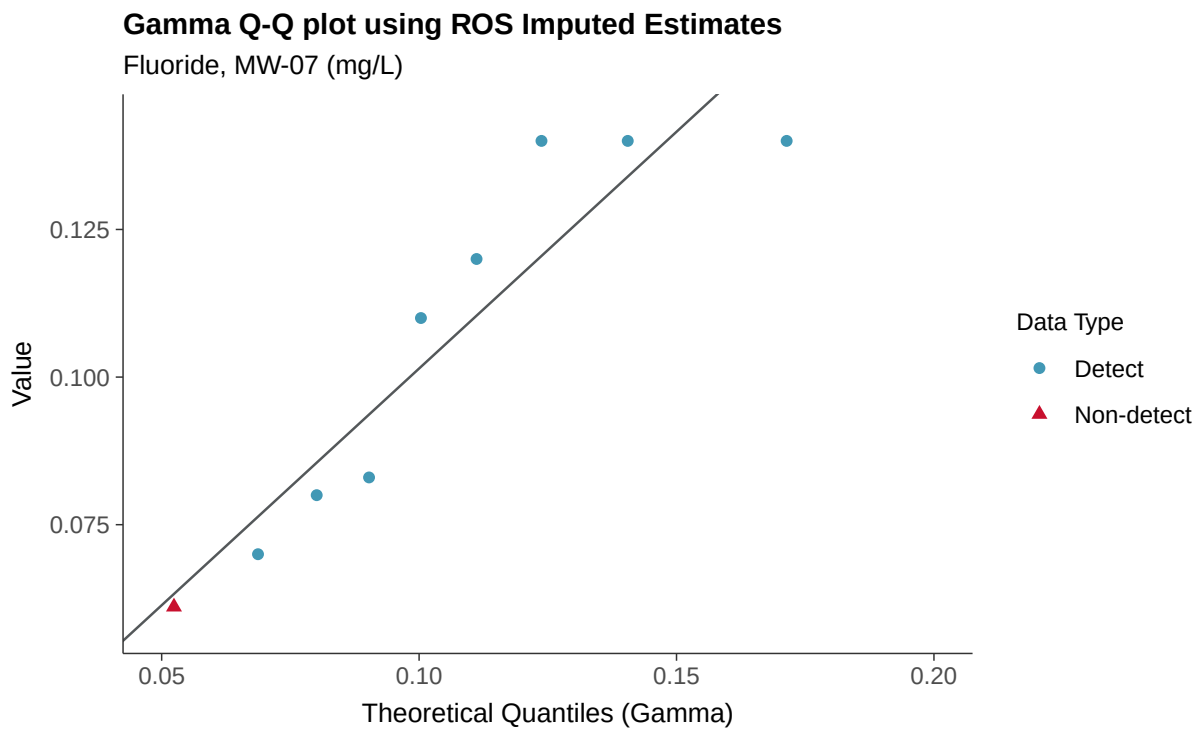
Boxplot by Season

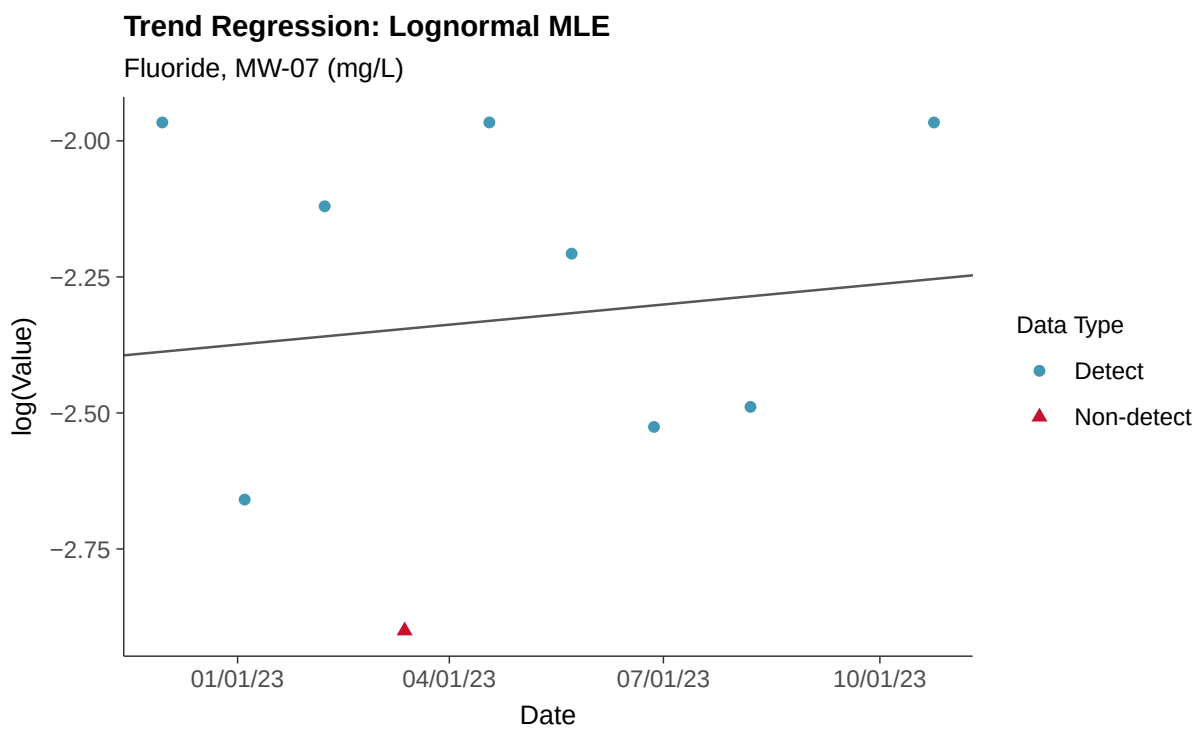
Fluoride, MW-07 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Fluoride, MW-07 (mg/L)
Value
0.125
0.100
0.075
0.050
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

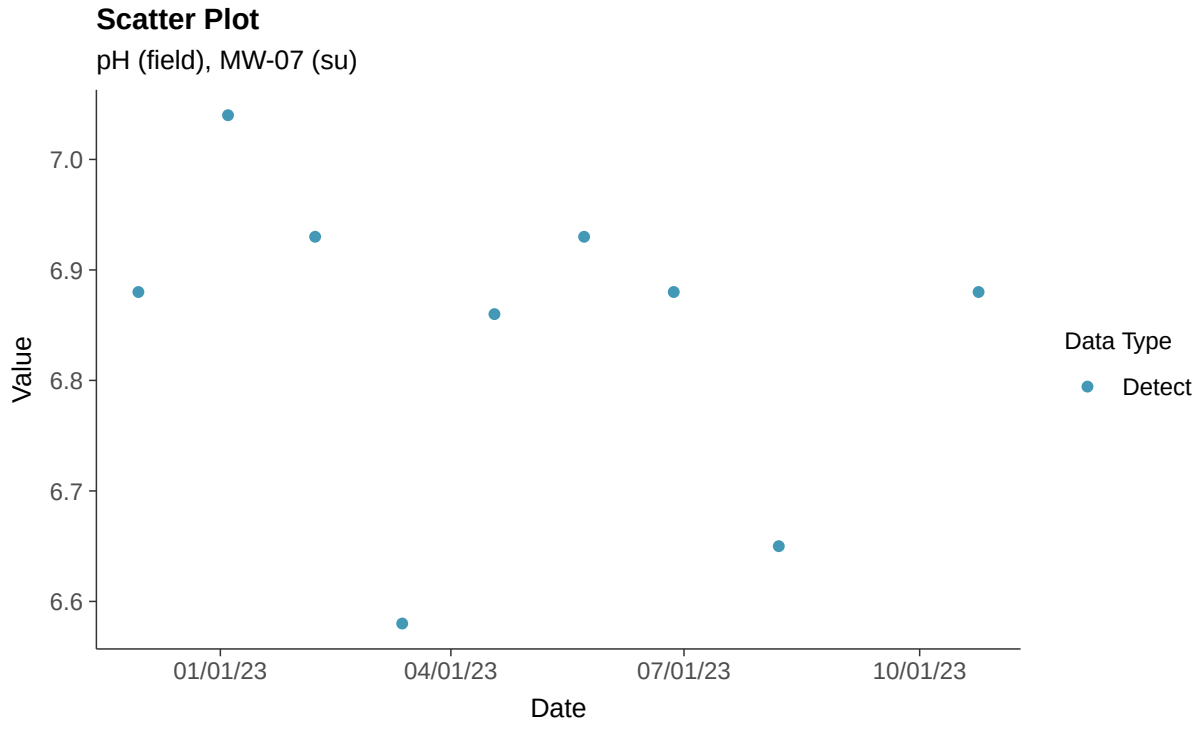

Lognormal Q-Q plot using ROS Imputed Estimates
Fluoride, MW-07 (mg/L)
log(Value)
−1.9
−2.1
−2.3
−2.5
−2.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

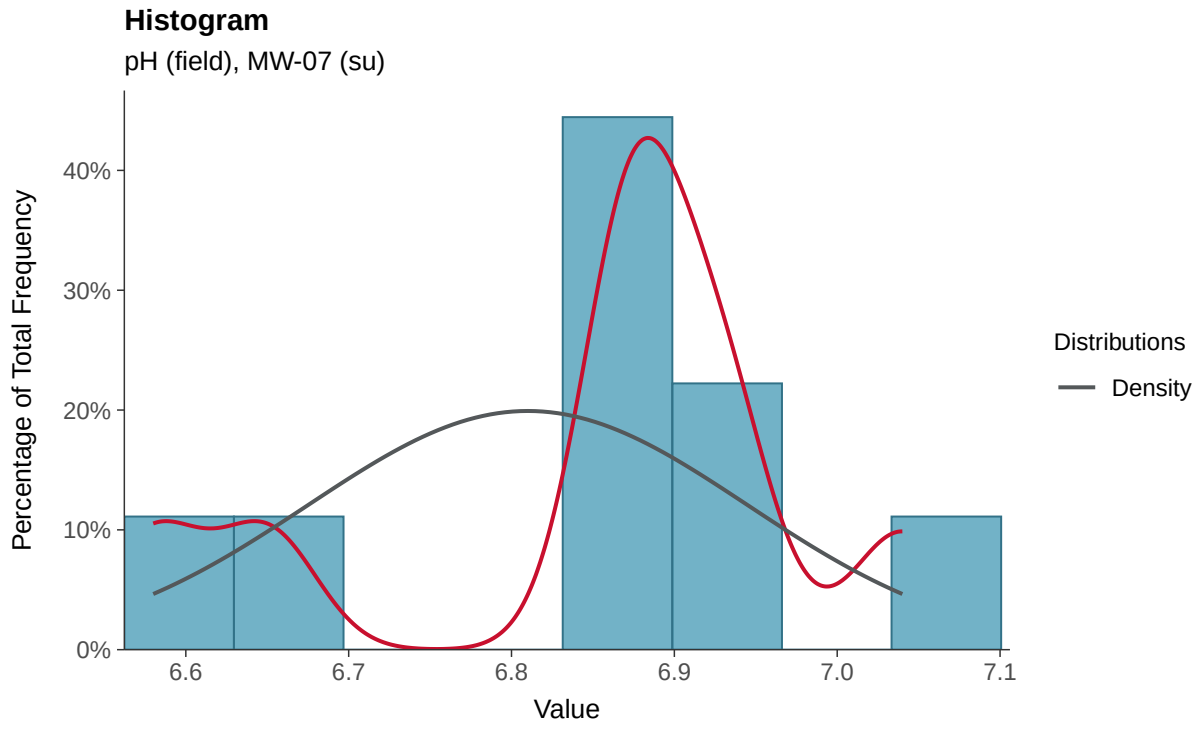

Gamma Q-Q plot using ROS Imputed Estimates
Fluoride, MW-07 (mg/L)
Value
0.125
0.100
0.075
0.05
0.10
0.15
0.20
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Fluoride, MW-07 (mg/L)
log(Value)
−2.00
−2.25
−2.50
−2.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: pH (field), MW-07

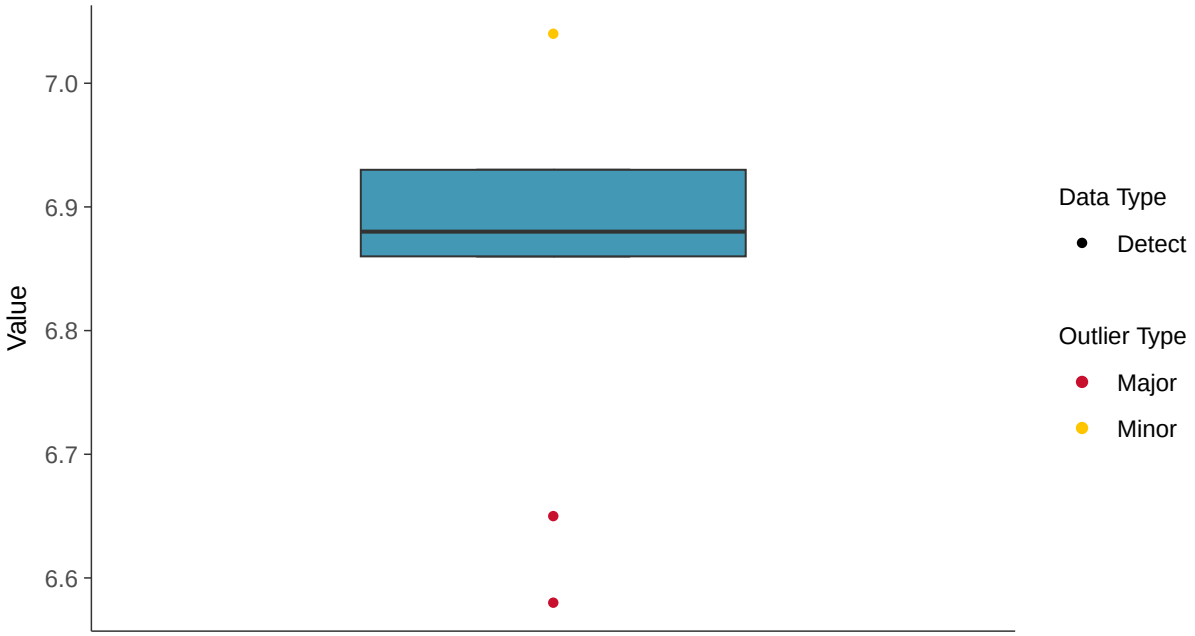
ID: 2_16_4_120





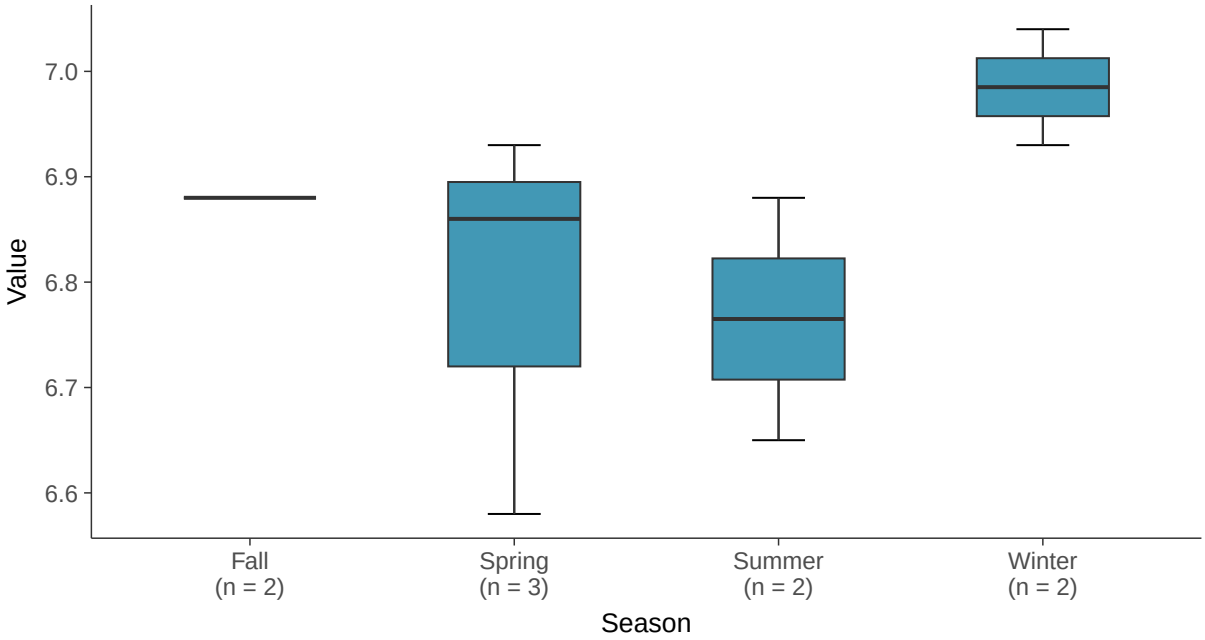
Boxplot

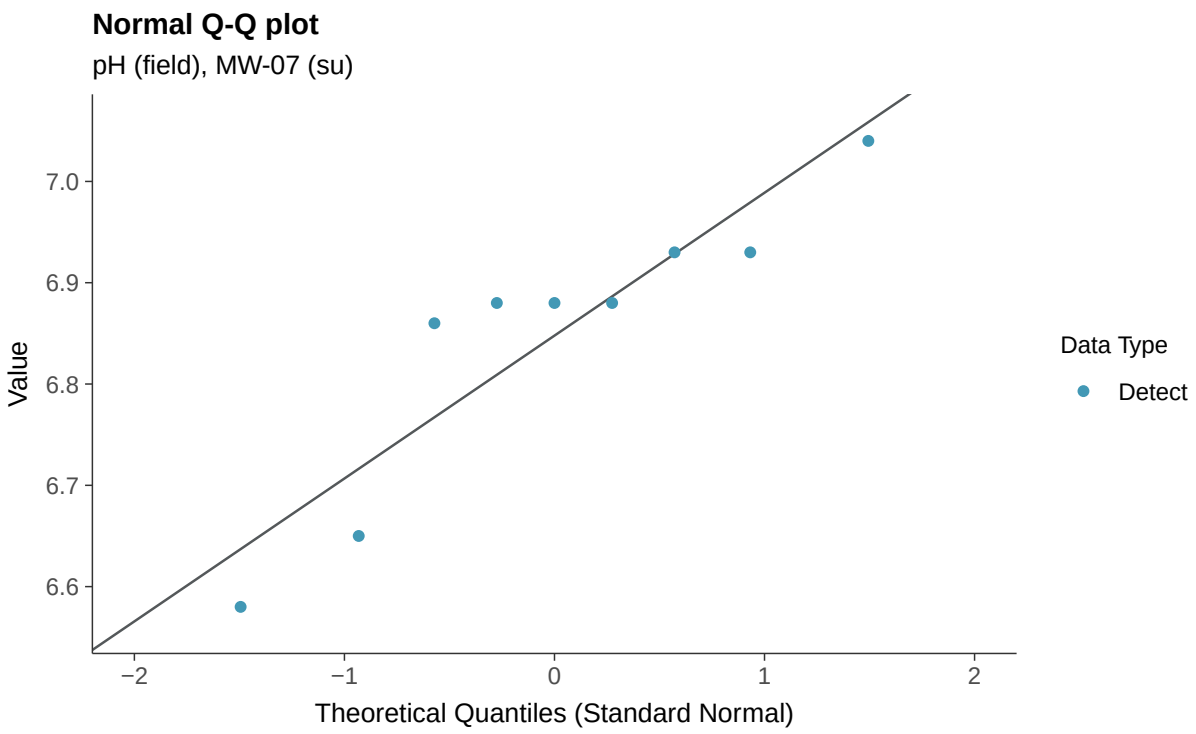
pH (field), MW-07 (su)

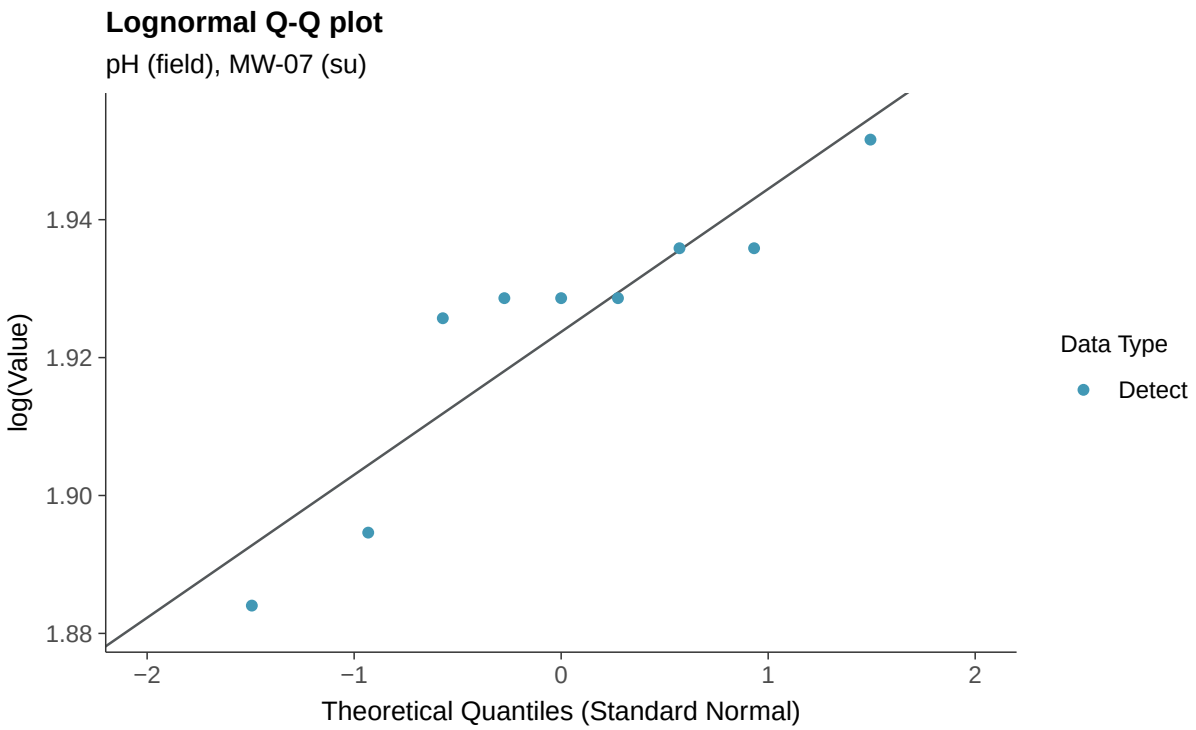


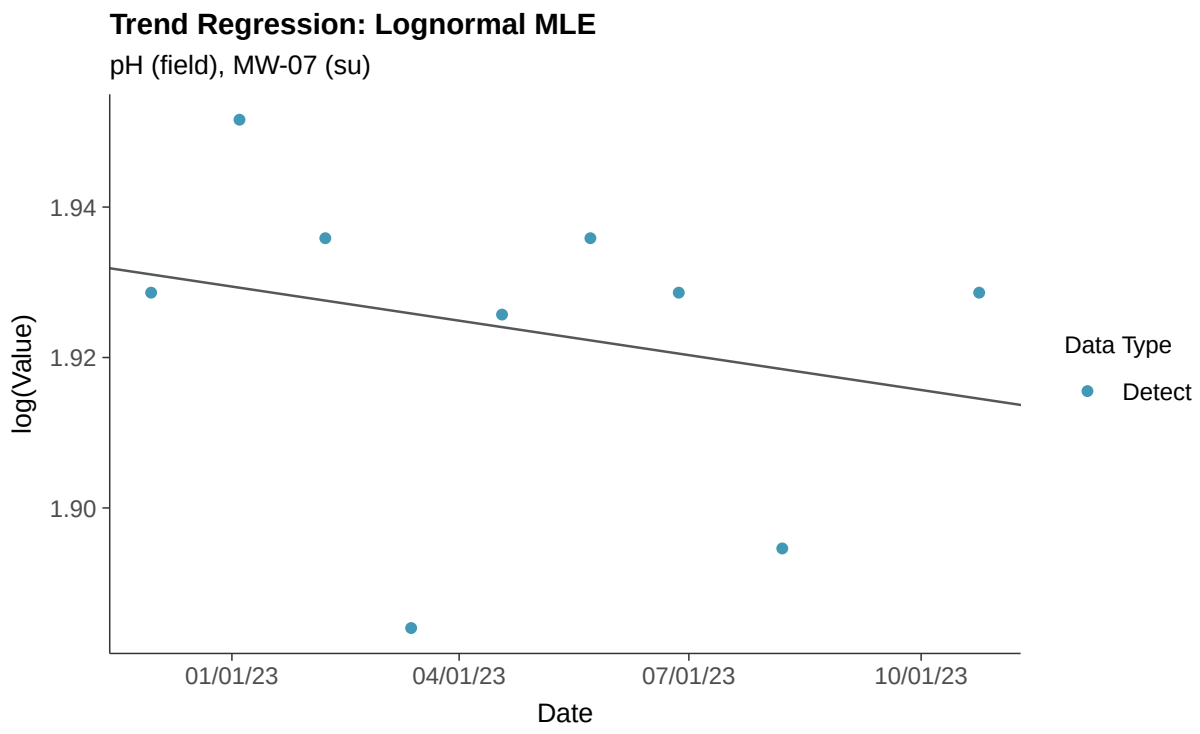
Boxplot by Season

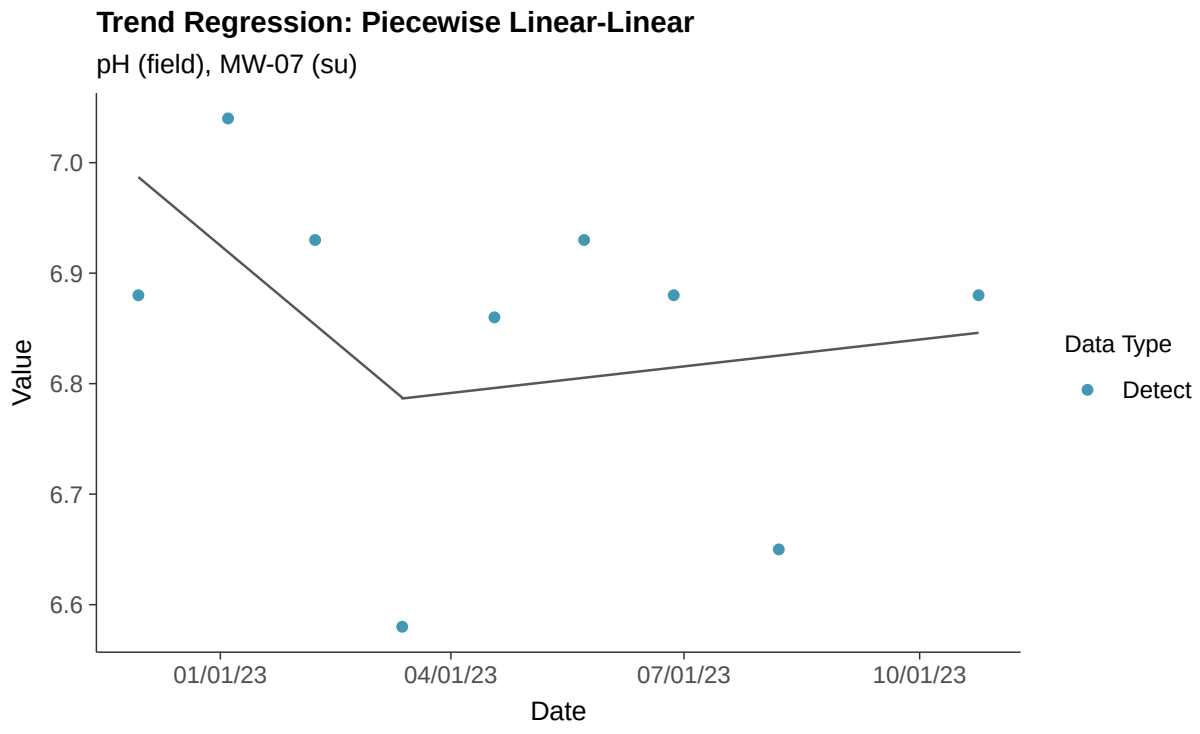
pH (field), MW-07 (su)




Normal Q-Q plot
pH (field), MW-07 (su)
Value
7.0
6.9
6.8
6.7
6.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

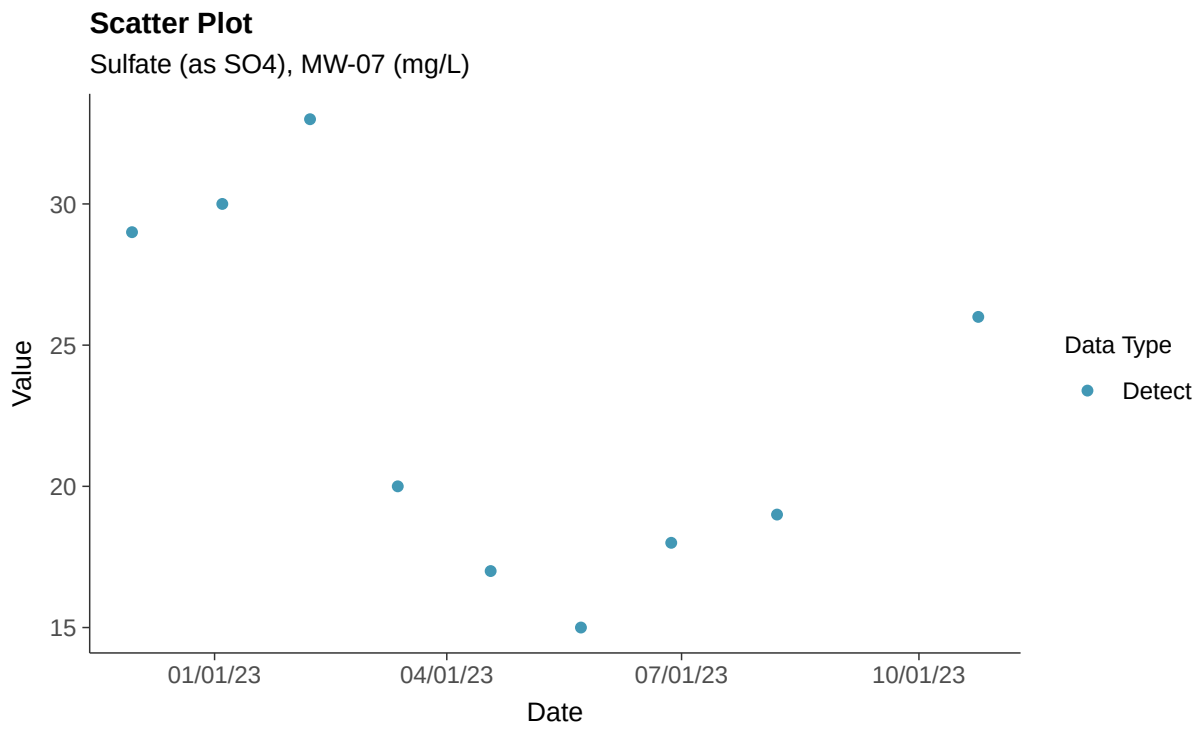

Lognormal Q-Q plot
pH (field), MW-07 (su)
log(Value)
1.94
1.92
1.90
1.88
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

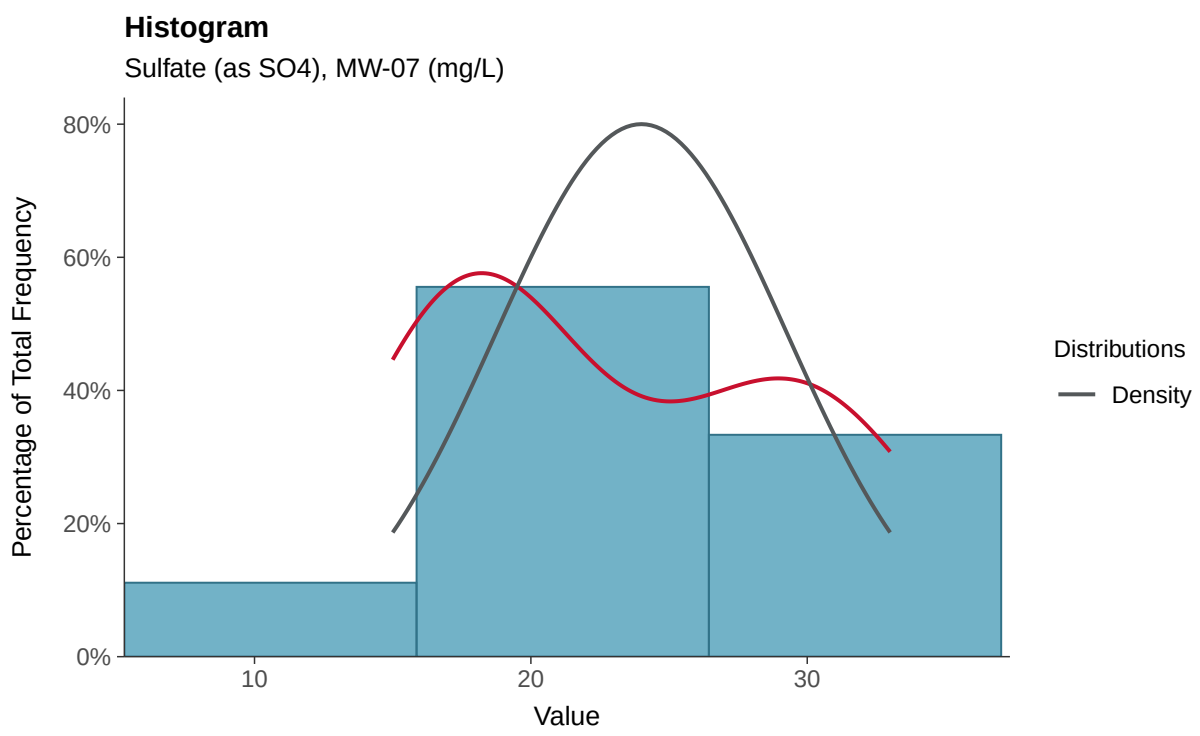

Trend Regression: Lognormal MLE
pH (field), MW-07 (su)
log(Value)
1.94
1.92
1.90
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-07 (su)
Value
7.0
6.9
6.8
6.7
6.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-07

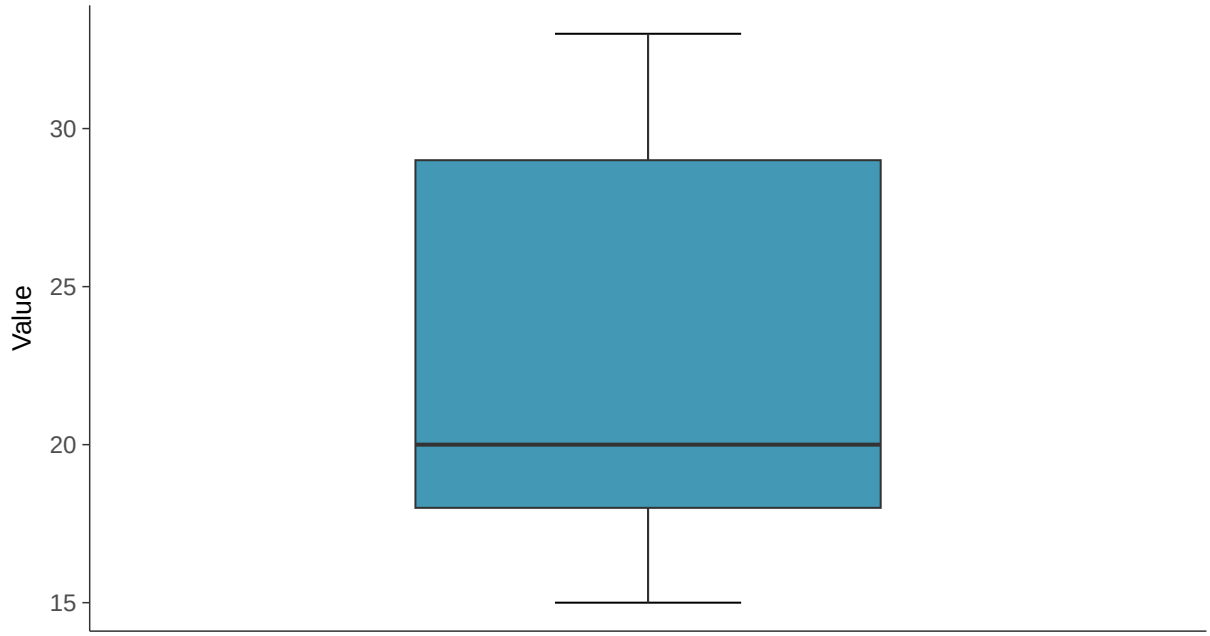
ID: 2_16_4_124





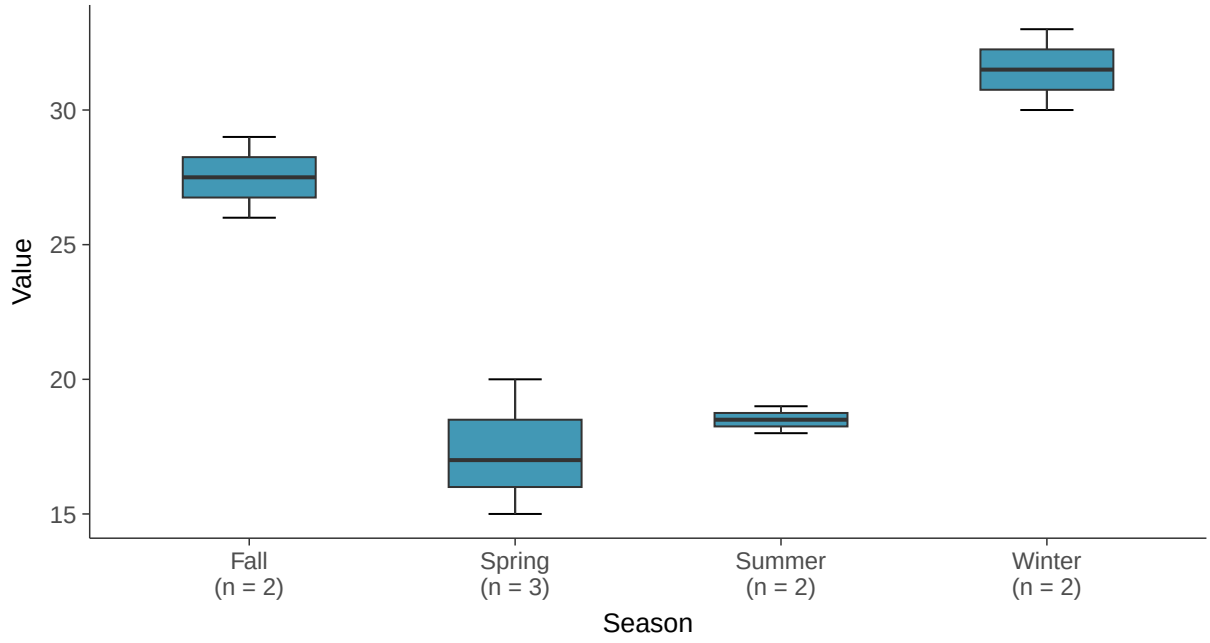
Boxplot

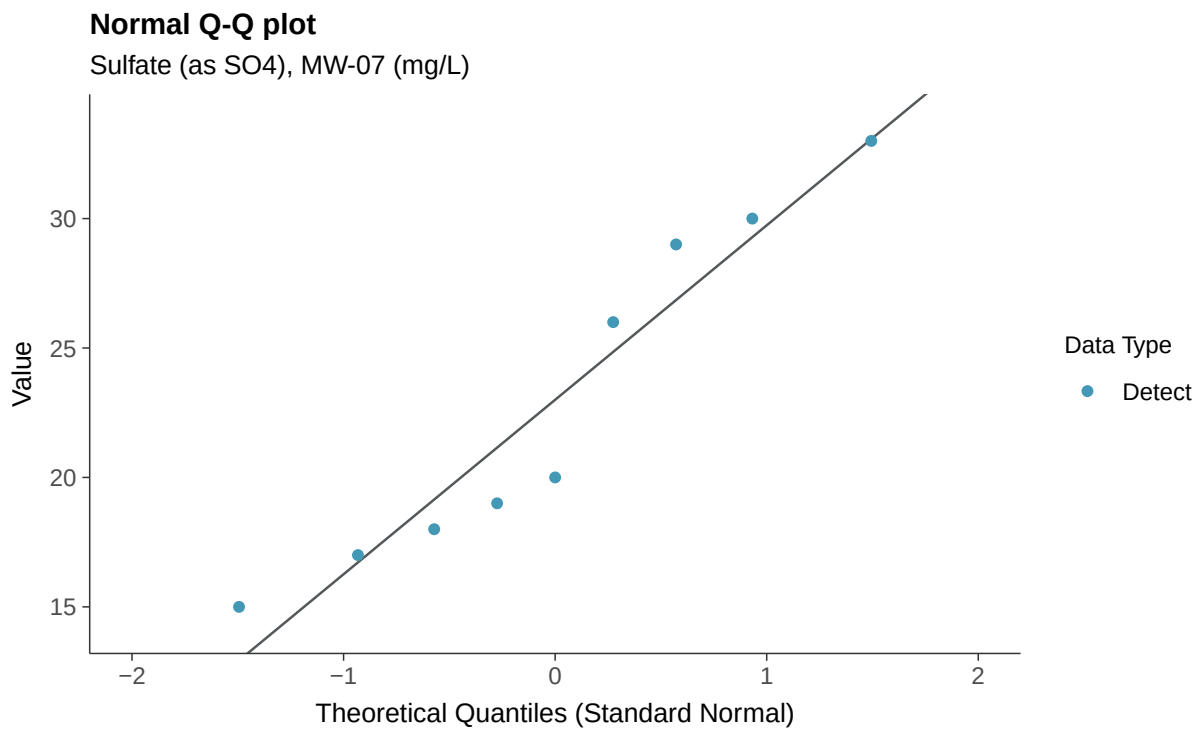
Sulfate (as SO4), MW-07 (mg/L)

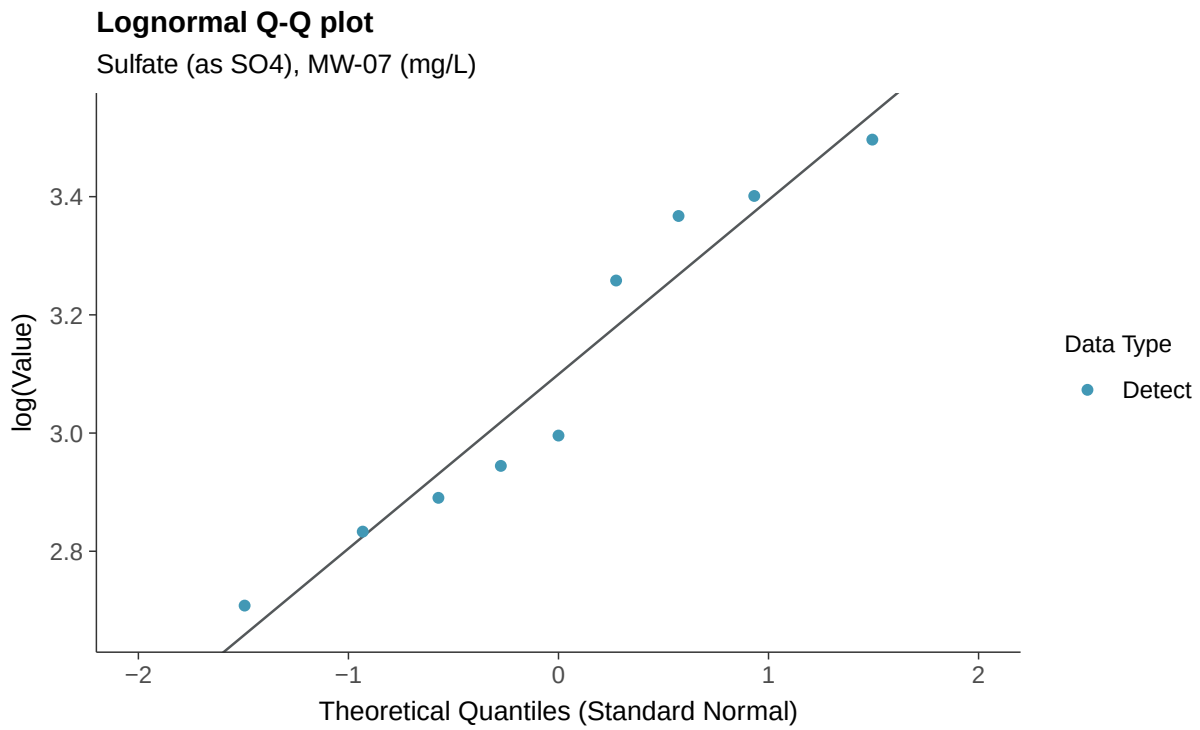


Boxplot by Season

Sulfate (as SO4), MW-07 (mg/L)

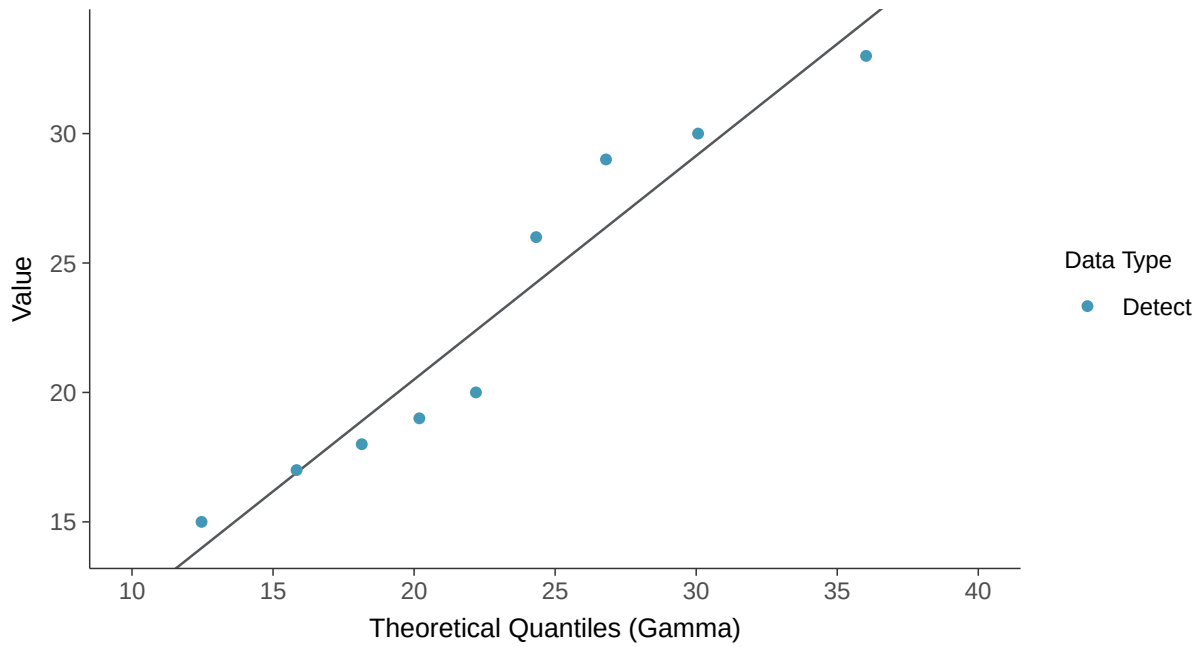



Normal Q-Q plot
Sulfate (as SO4), MW-07 (mg/L)
Value
30
25
20
15
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Sulfate (as SO4), MW-07 (mg/L)
log(Value)
3.4
3.2
3.0
2.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

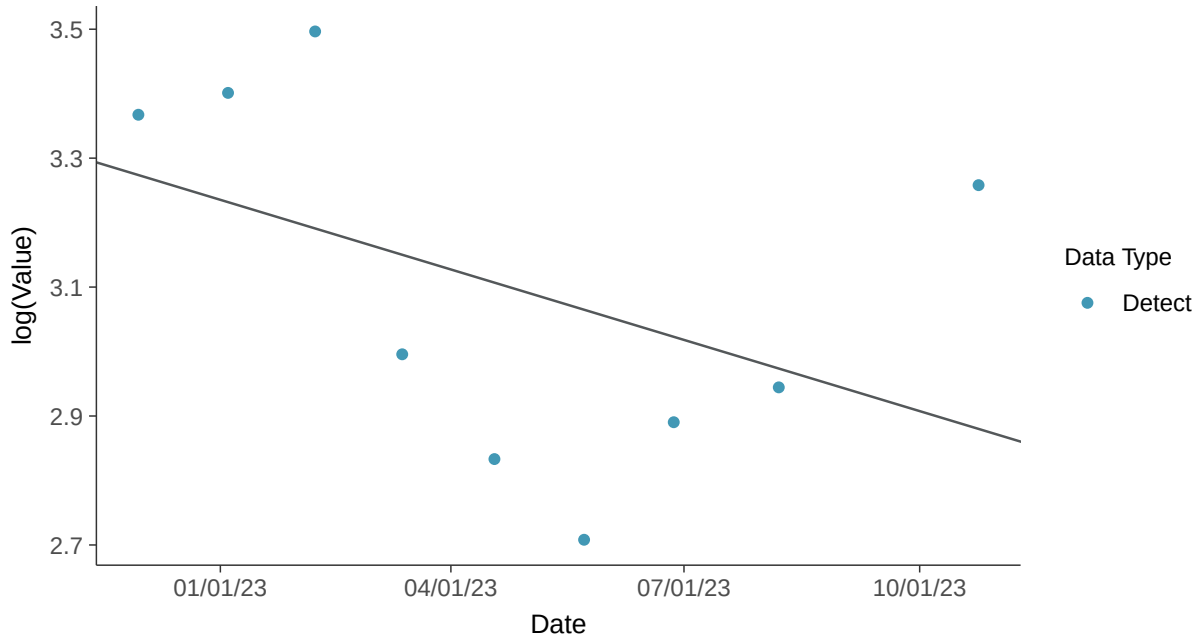
Gamma Q-Q plot

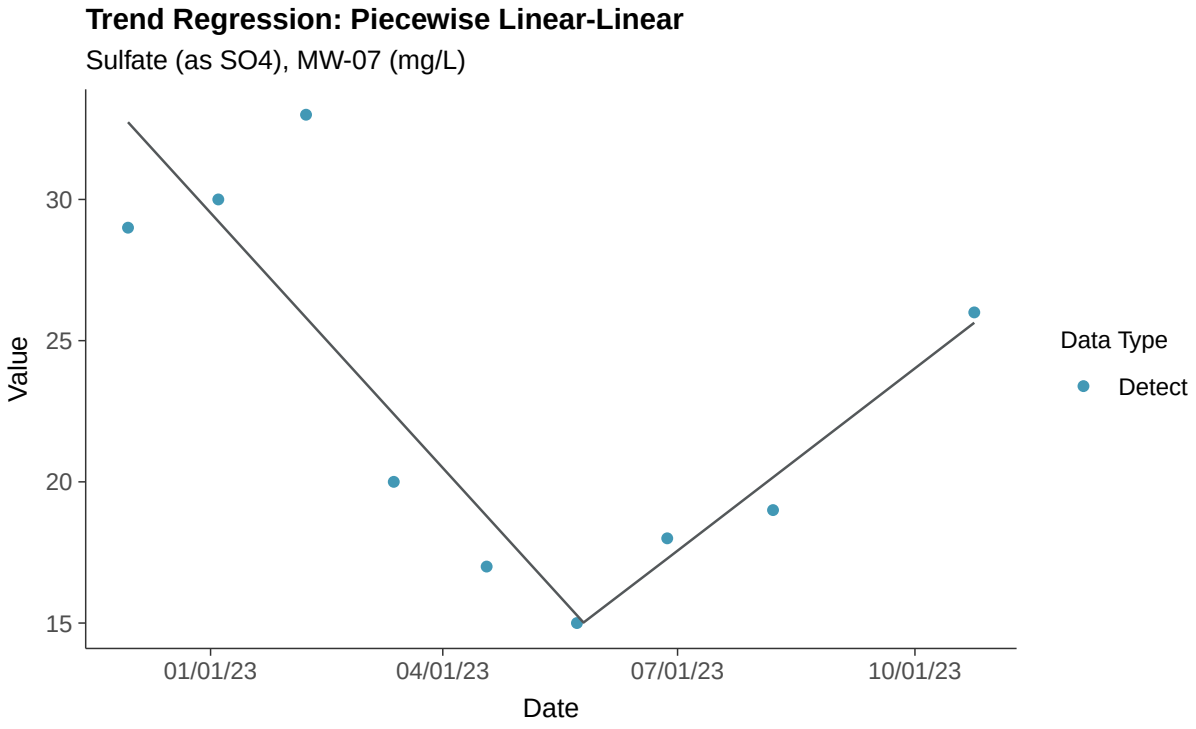
Sulfate (as SO4), MW-07 (mg/L)



Trend Regression: Lognormal MLE

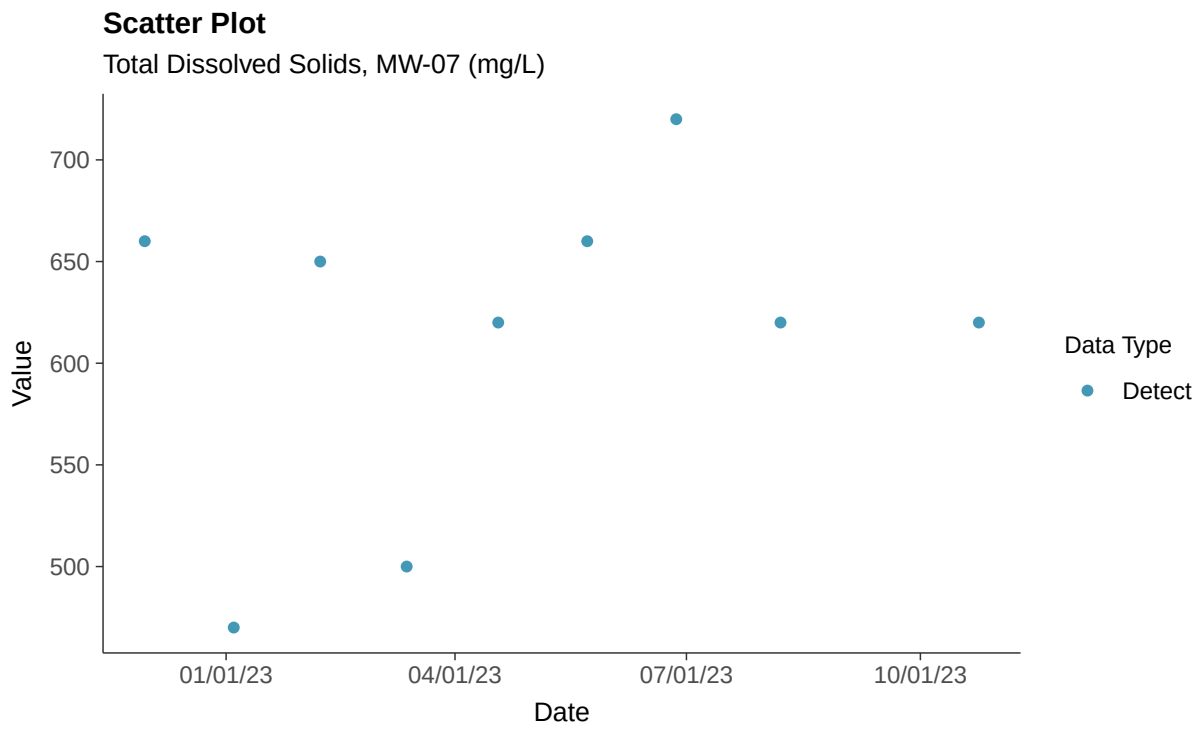
Sulfate (as SO4), MW-07 (mg/L)

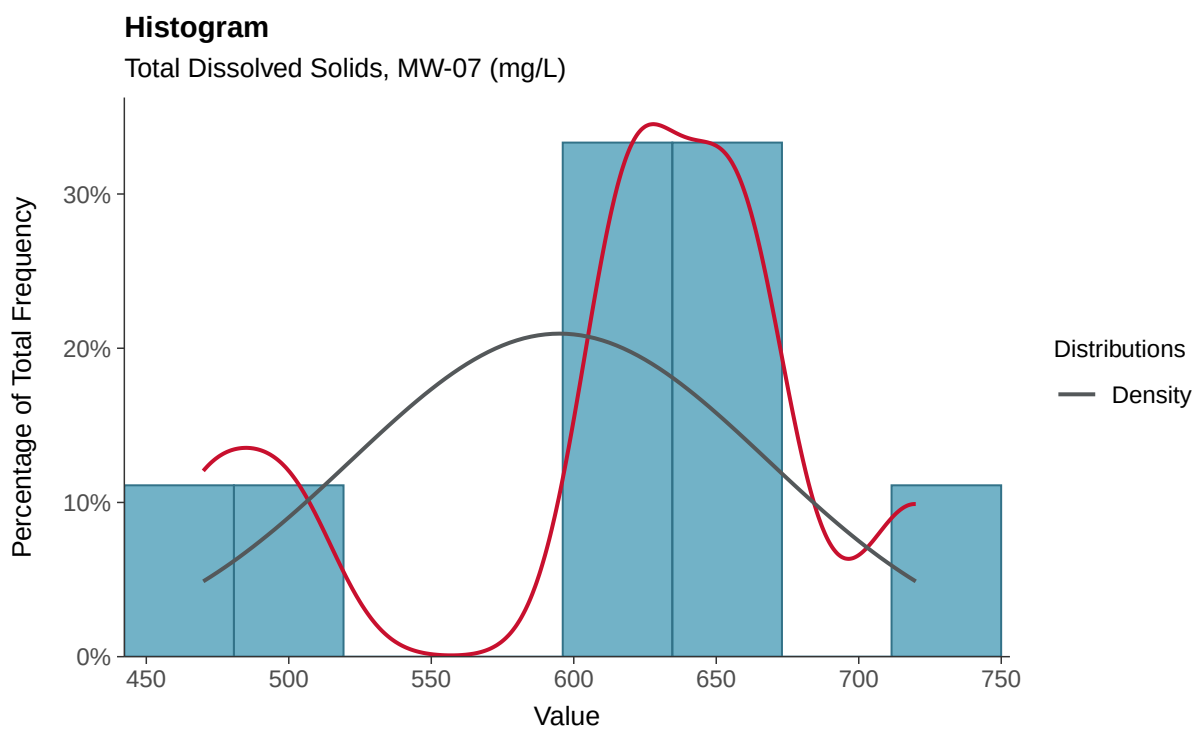



Trend Regression: Piecewise Linear-Linear
Sulfate (as SO4), MW-07 (mg/L)
Value
30
25
20
15
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Total Dissolved Solids, MW-07

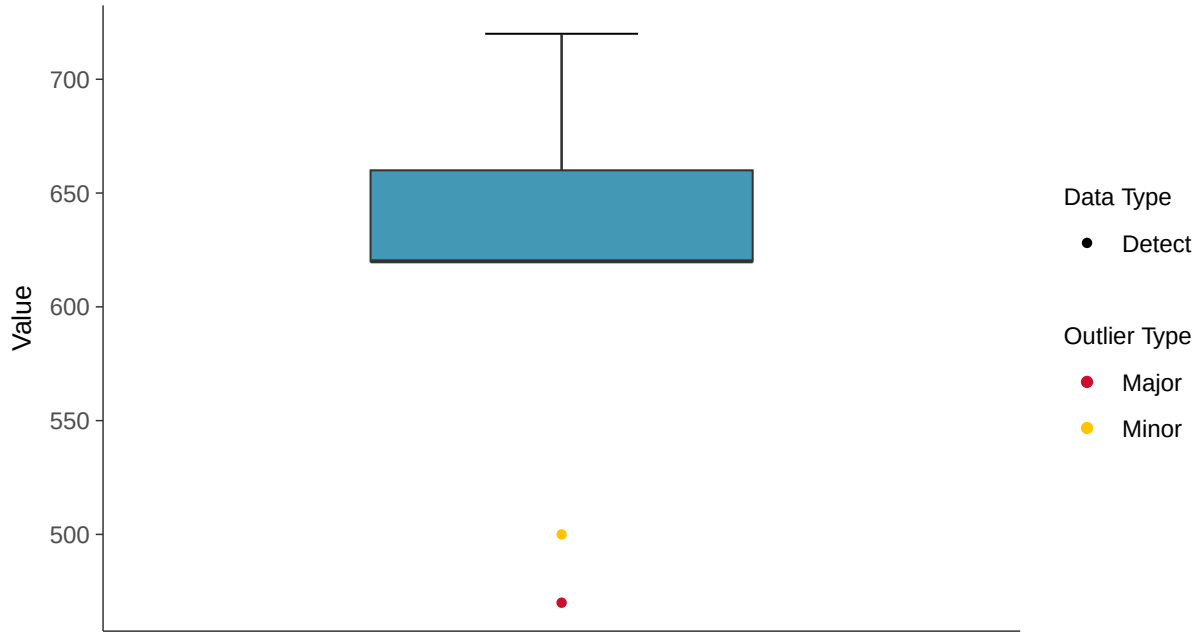
ID: 2_16_4_126





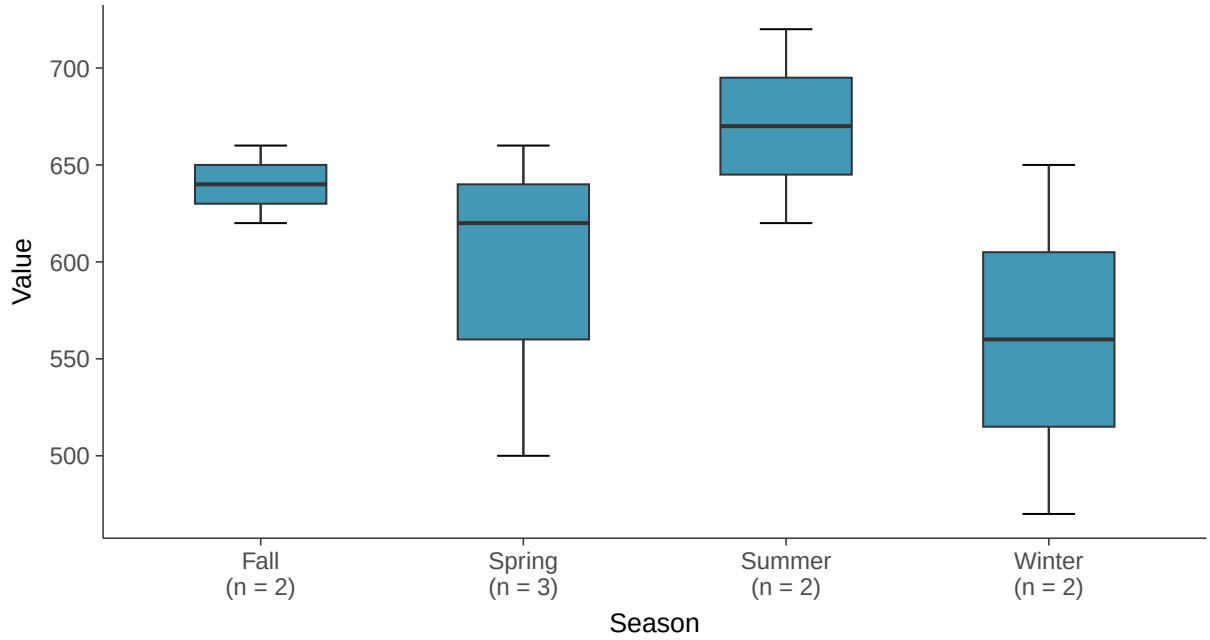
Boxplot

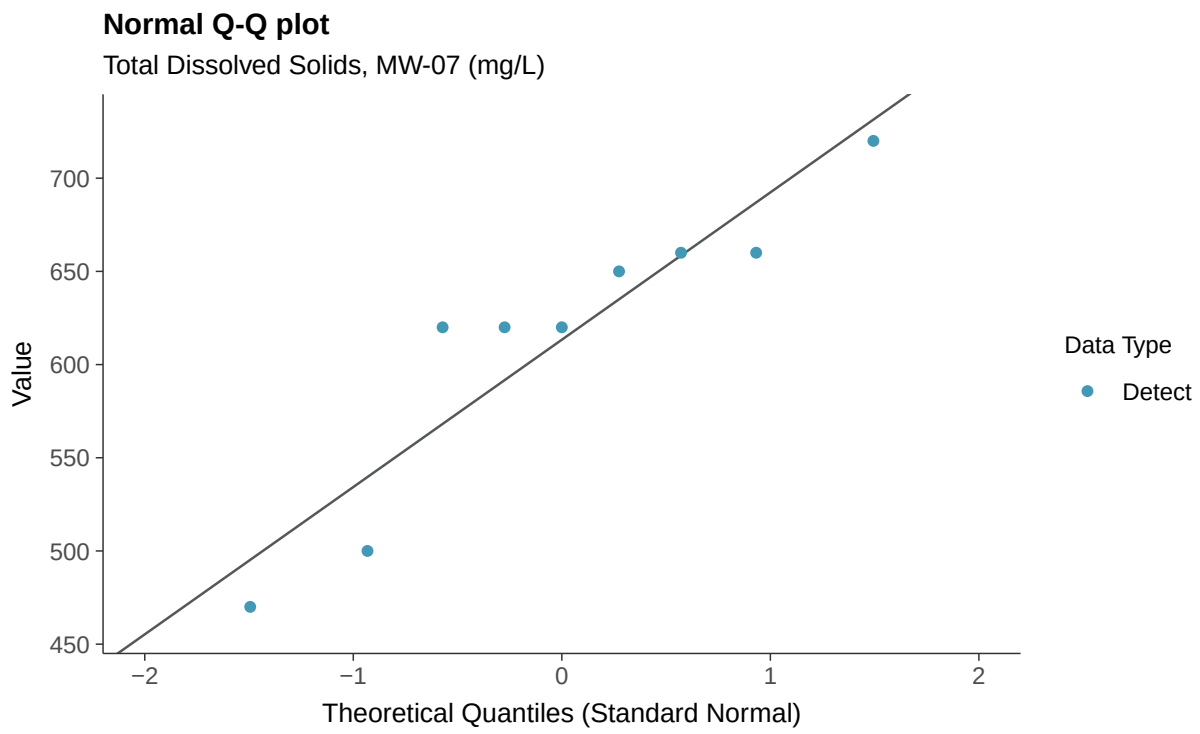
Total Dissolved Solids, MW-07 (mg/L)

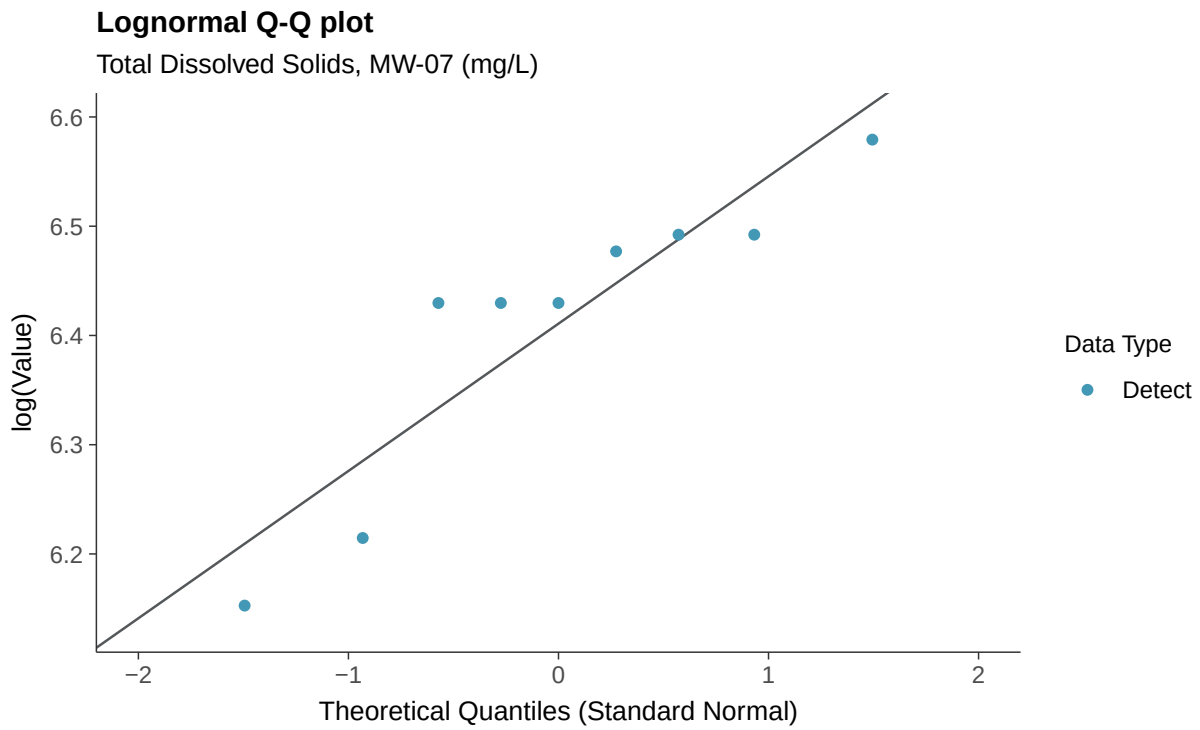


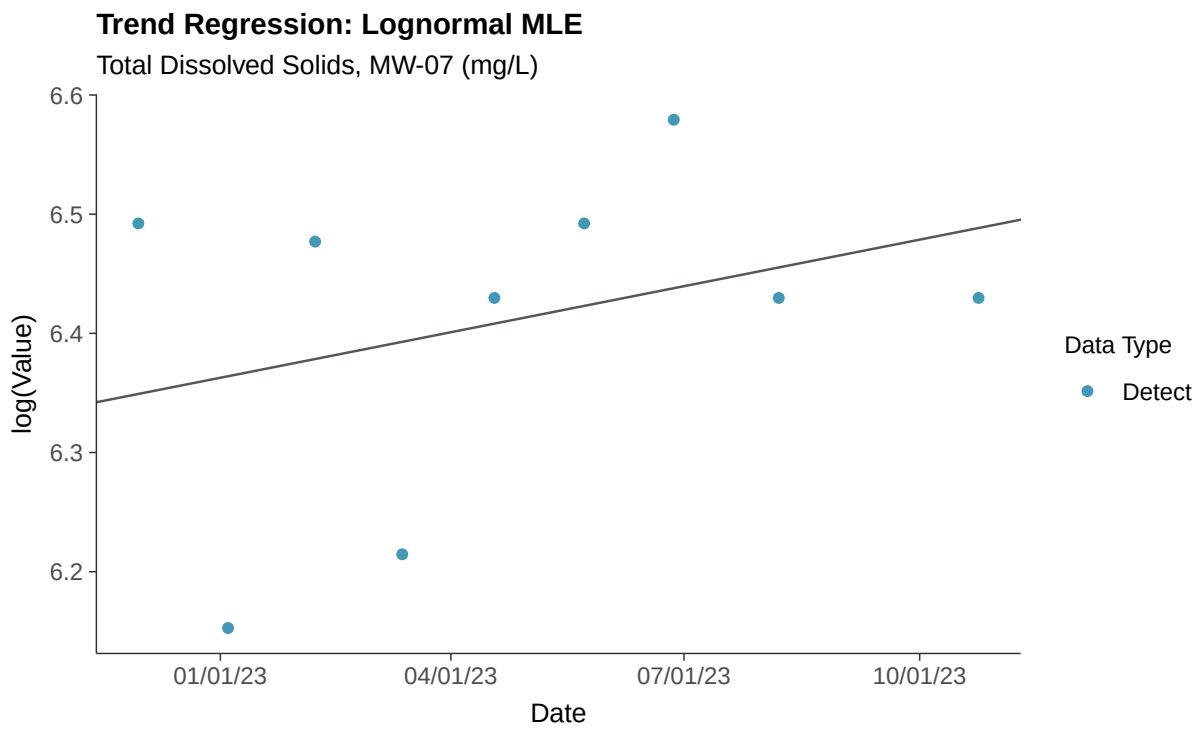
Boxplot by Season

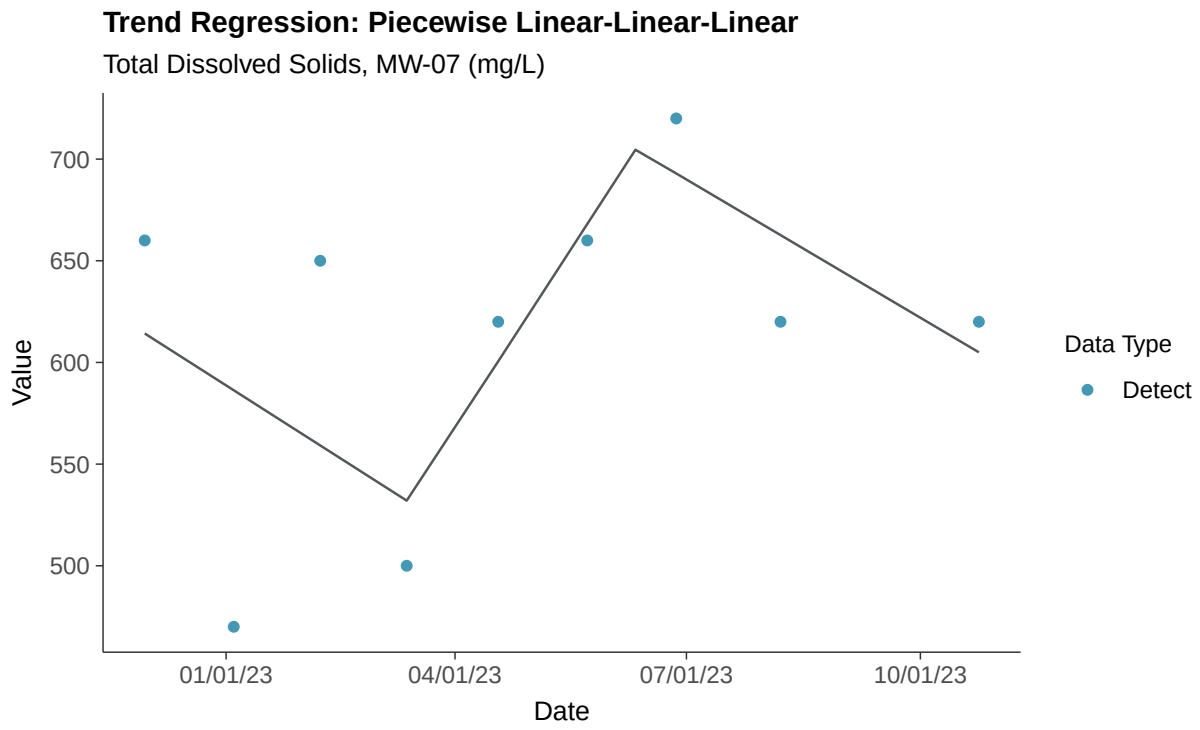
Total Dissolved Solids, MW-07 (mg/L)




Normal Q-Q plot
Total Dissolved Solids, MW-07 (mg/L)
Value
700
650
600
550
500
450
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

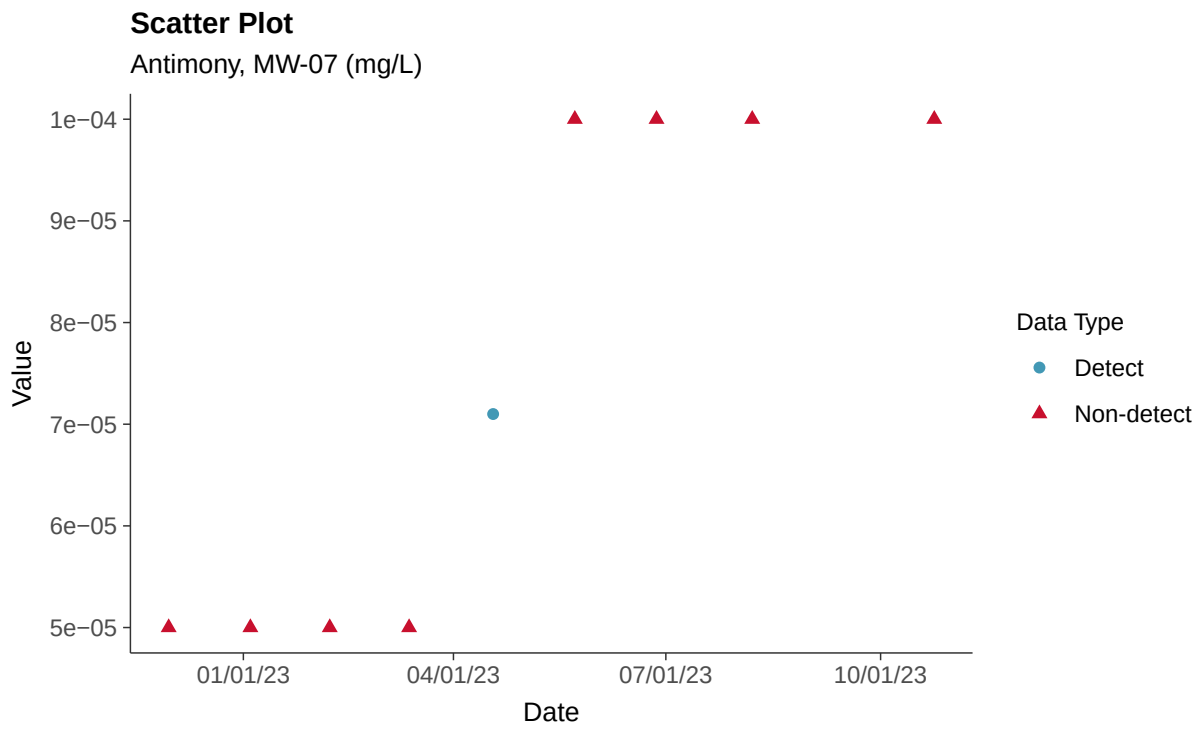

Lognormal Q-Q plot
Total Dissolved Solids, MW-07 (mg/L)
log(Value)
6.6
6.5
6.4
6.3
6.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

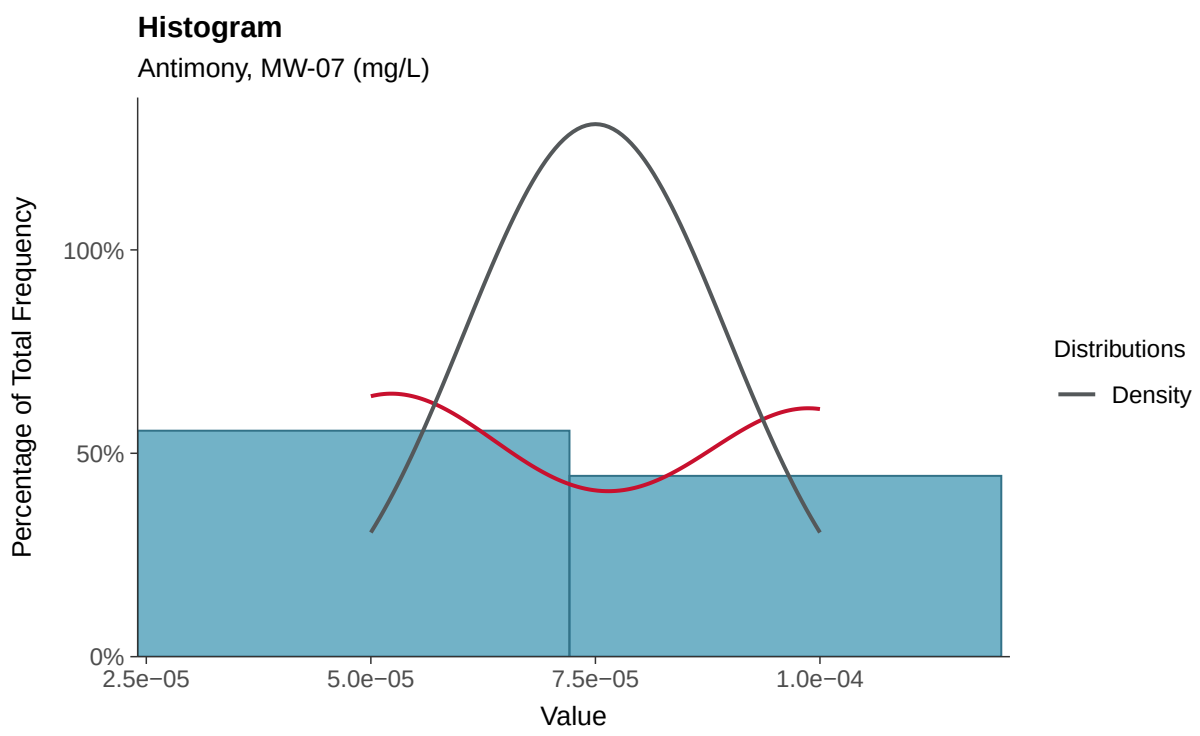

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-07 (mg/L)
6.6
6.5
6.4
6.3
6.2
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Total Dissolved Solids, MW-07 (mg/L)
700
650
600
550
500
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-07

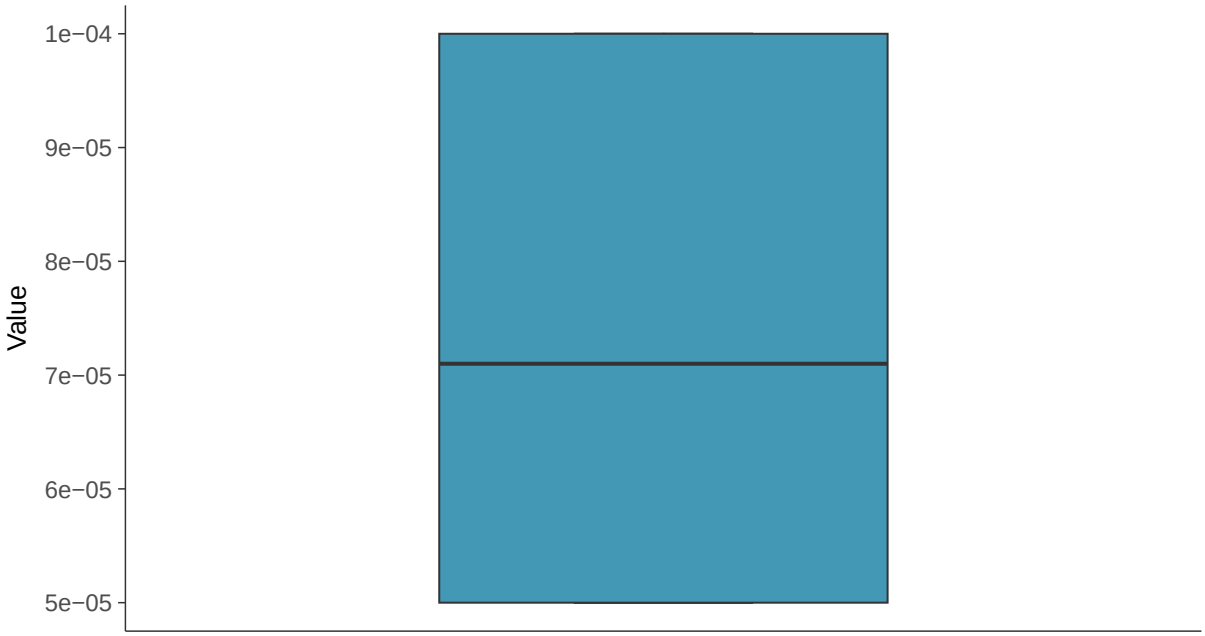
ID: 2_16_5_101





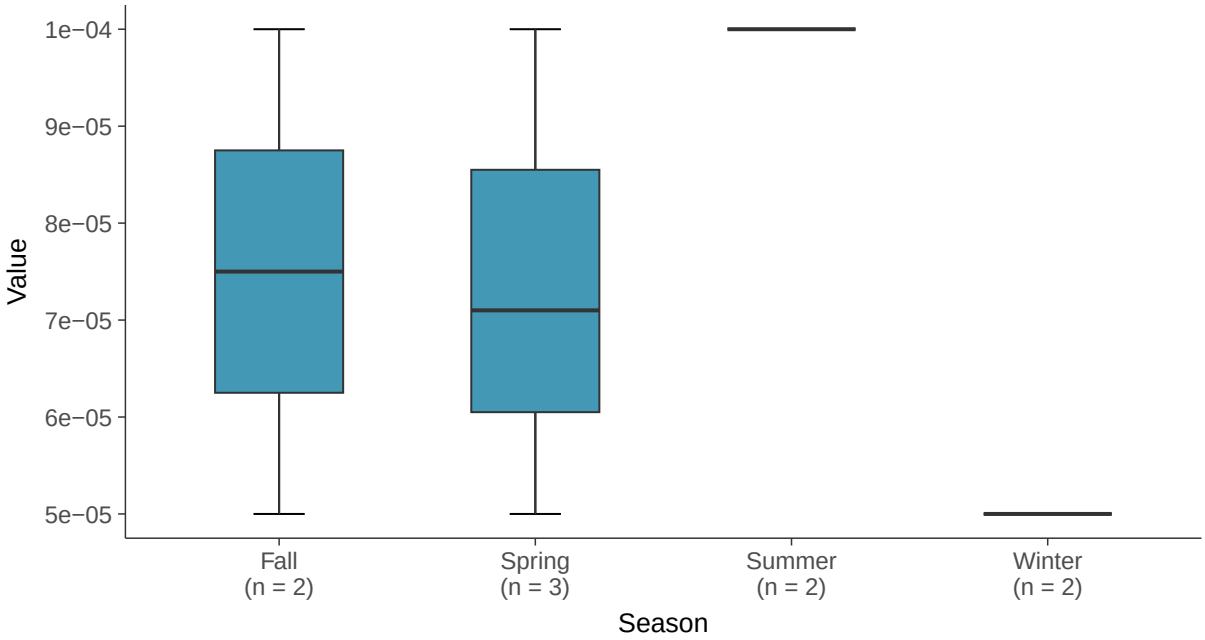
Boxplot

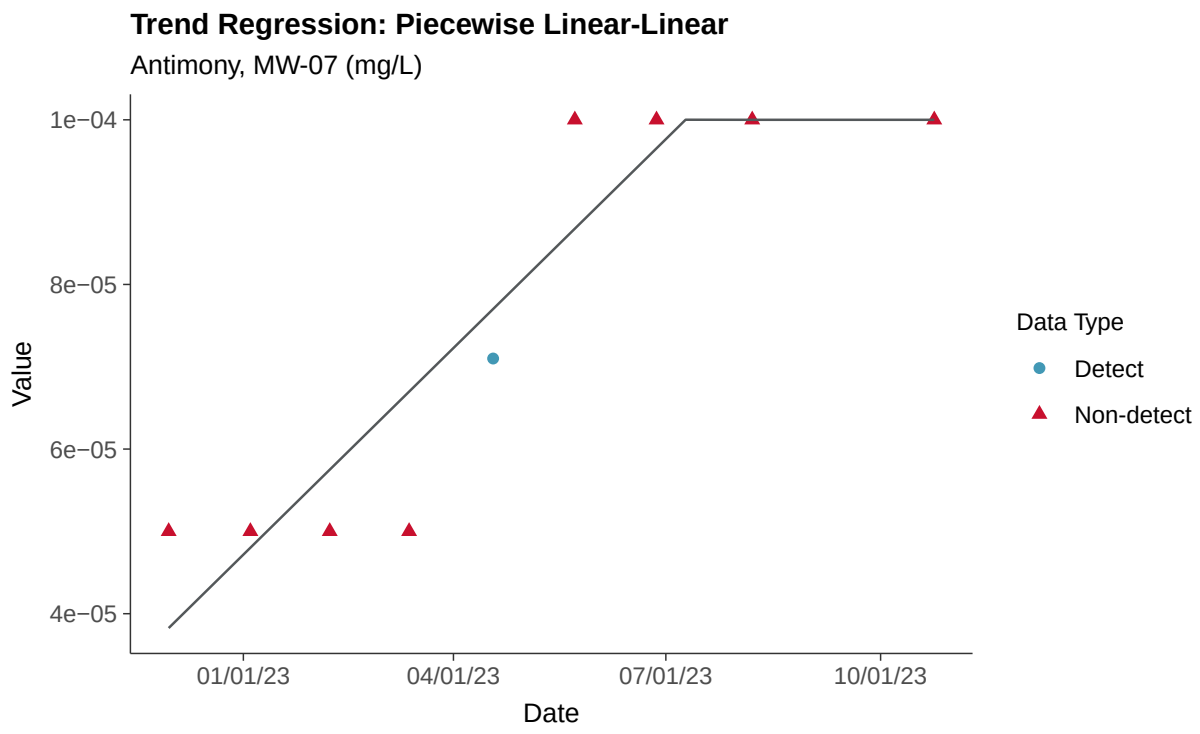
Antimony, MW-07 (mg/L)

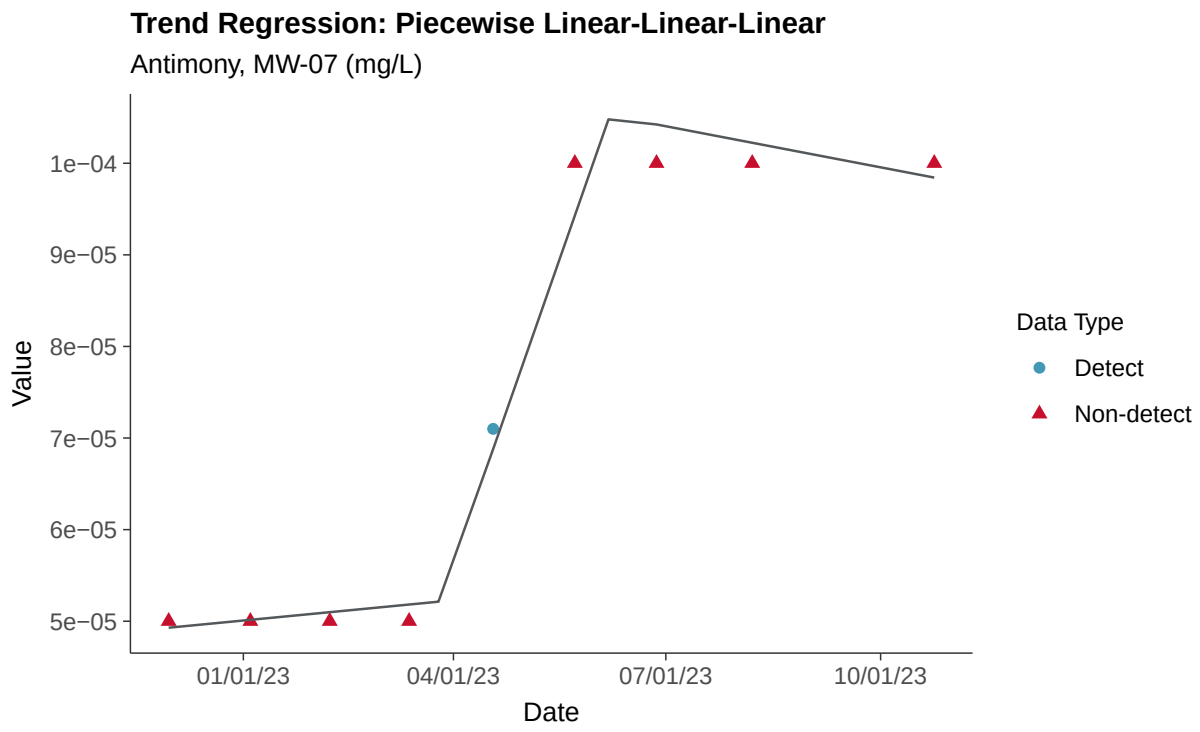


Boxplot by Season

Antimony, MW-07 (mg/L)

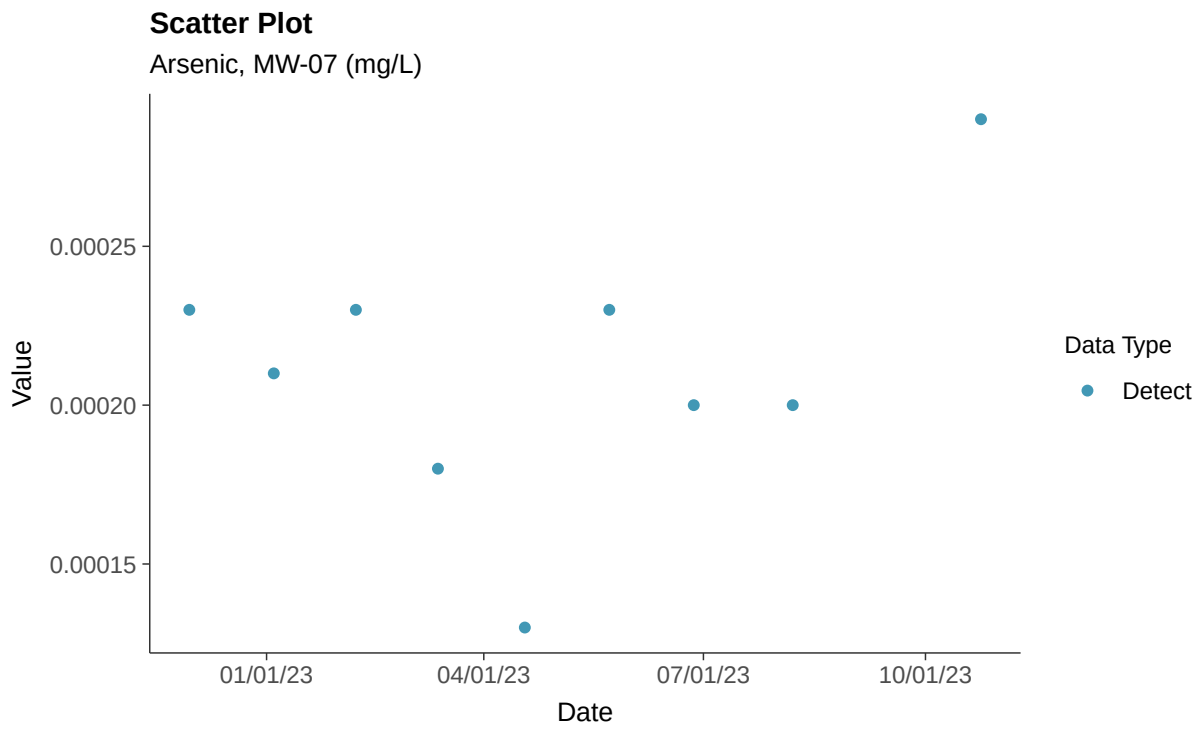


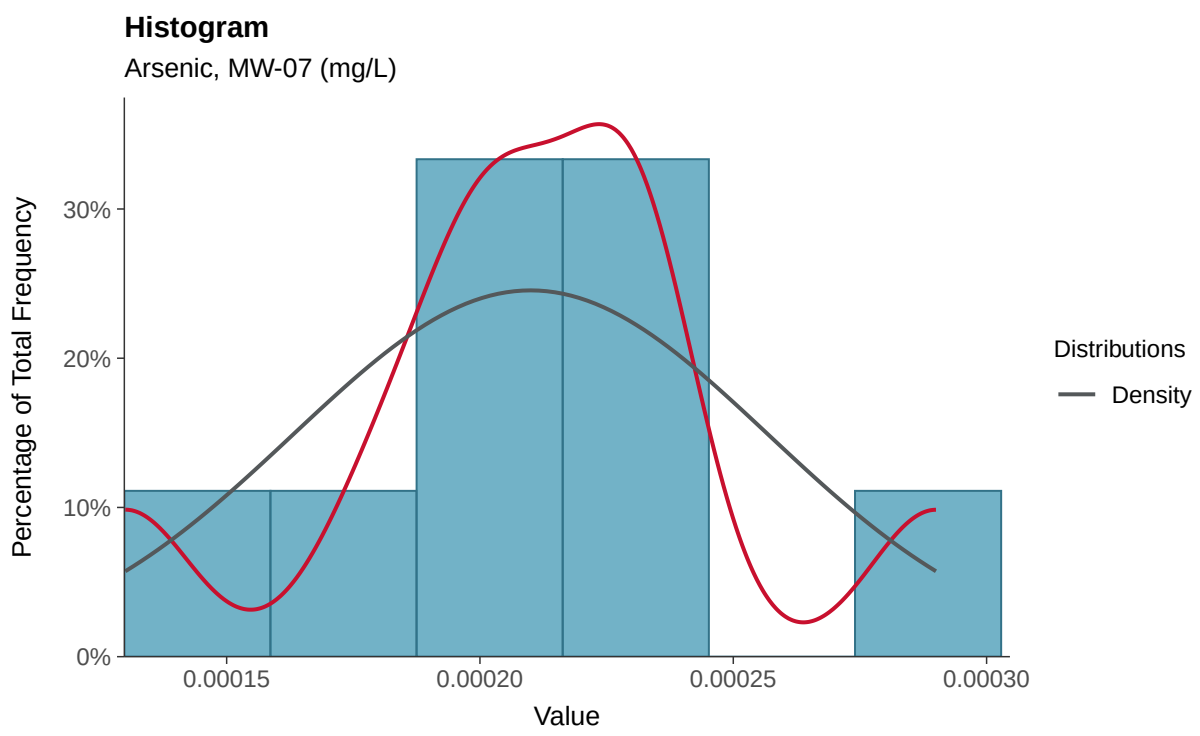

Trend Regression: Piecewise Linear-Linear
Antimony, MW-07 (mg/L)
1e−04
8e−05
6e−05
4e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-07 (mg/L)
1e−04
9e−05
8e−05
7e−05
6e−05
5e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-07

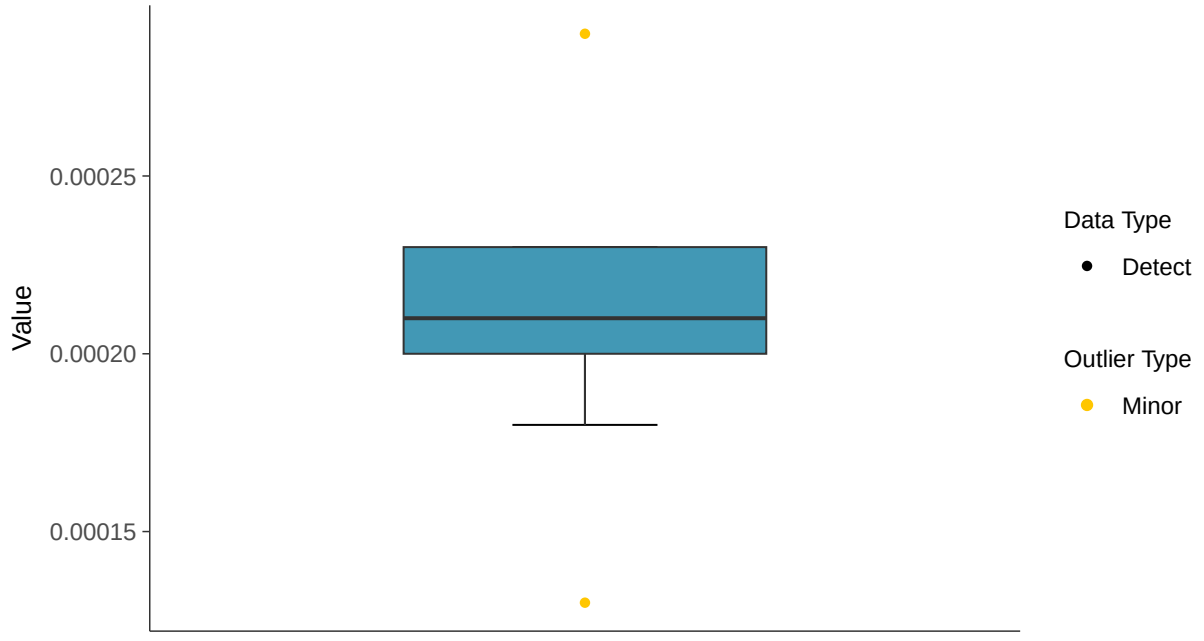
ID: 2_16_5_102





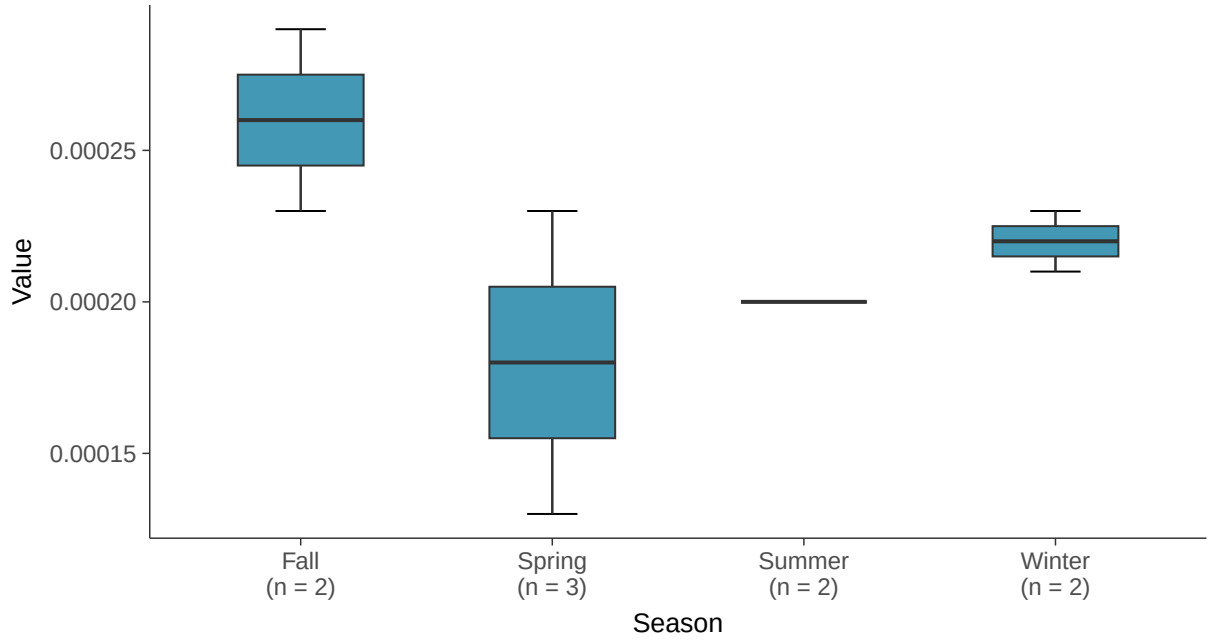
Boxplot

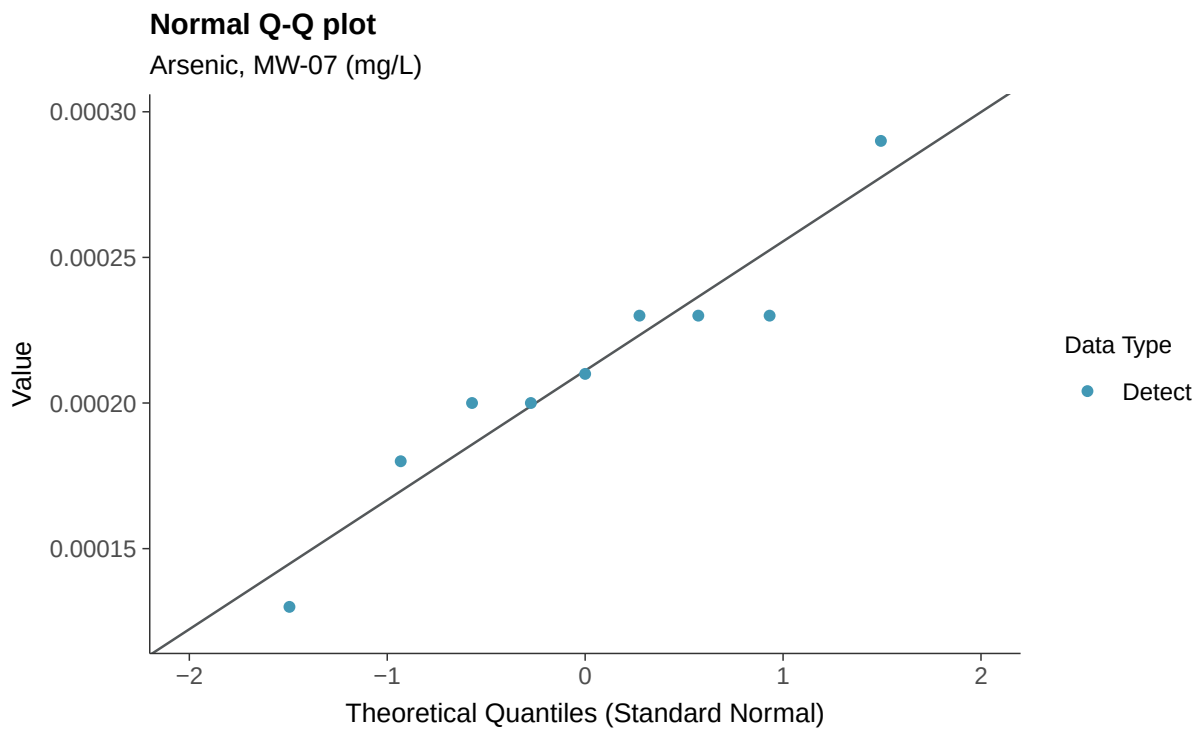
Arsenic, MW-07 (mg/L)

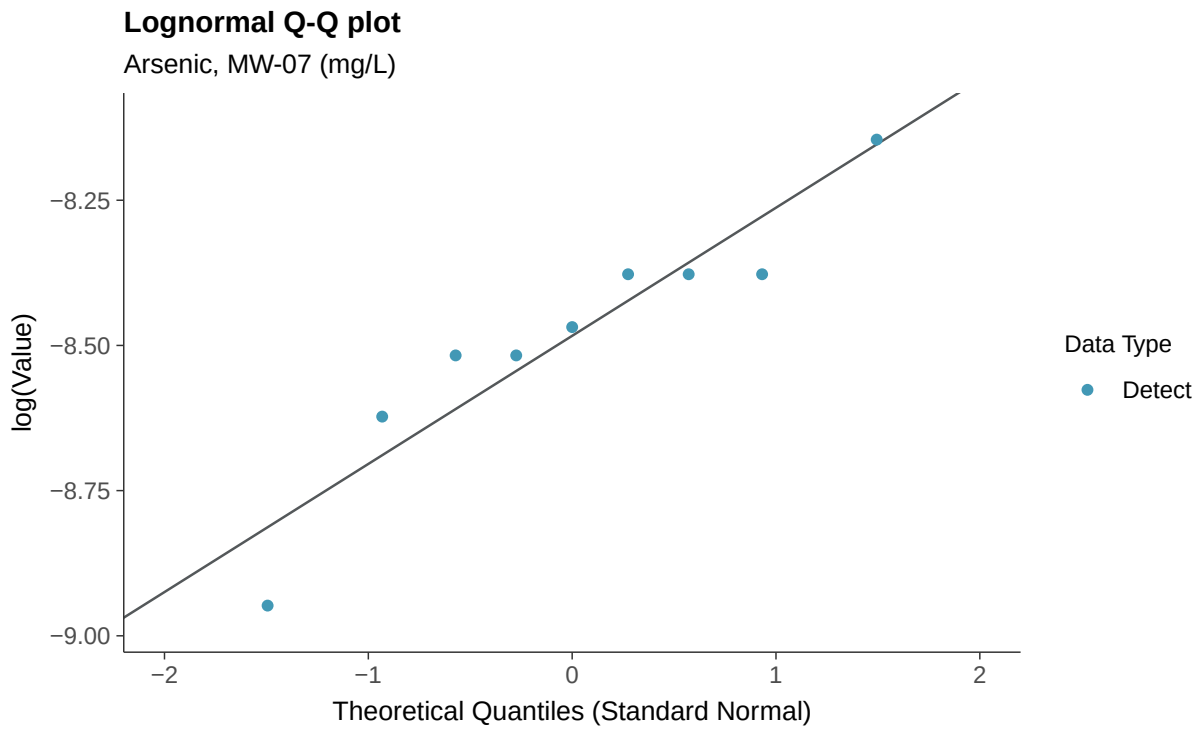


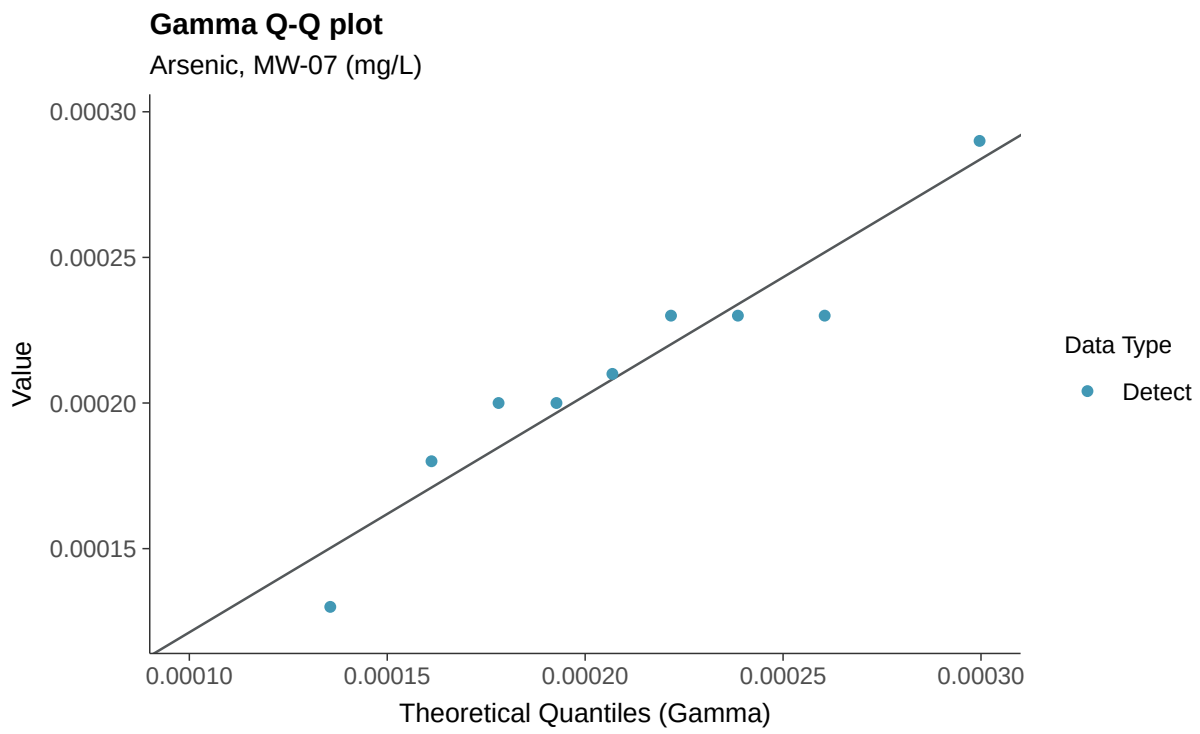
Boxplot by Season

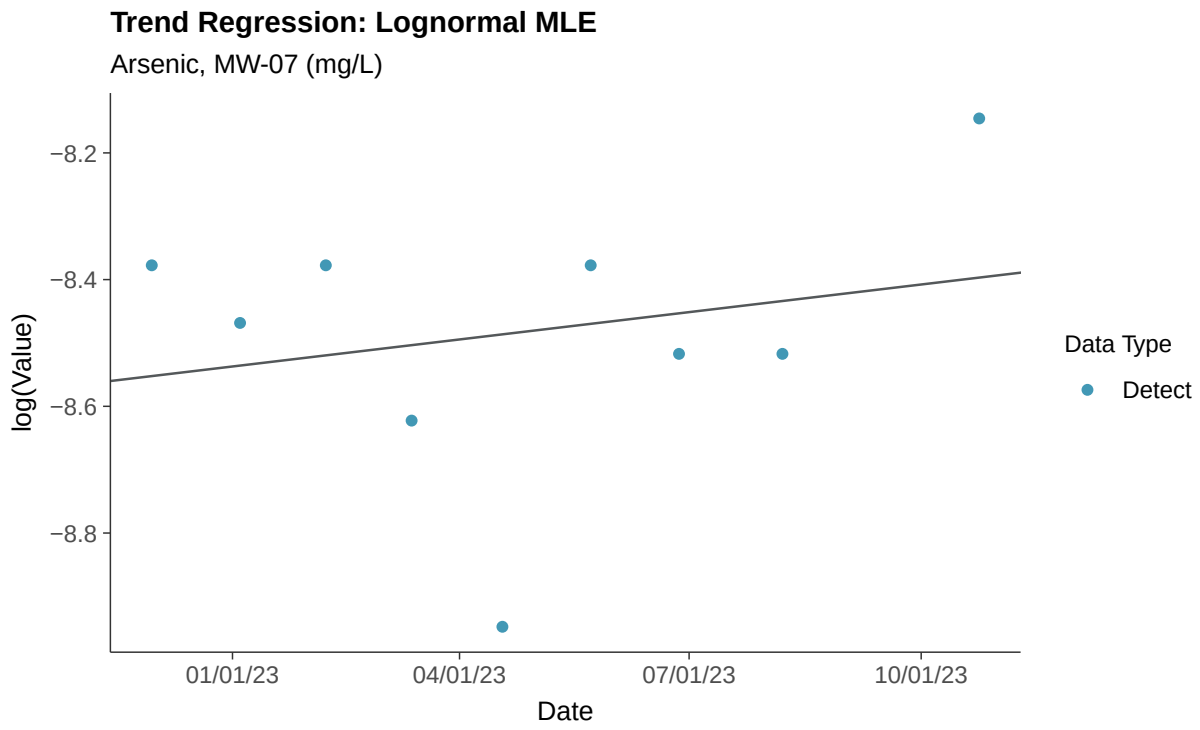
Arsenic, MW-07 (mg/L)




Normal Q-Q plot
Arsenic, MW-07 (mg/L)
Value
0.00030
0.00025
0.00020
0.00015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

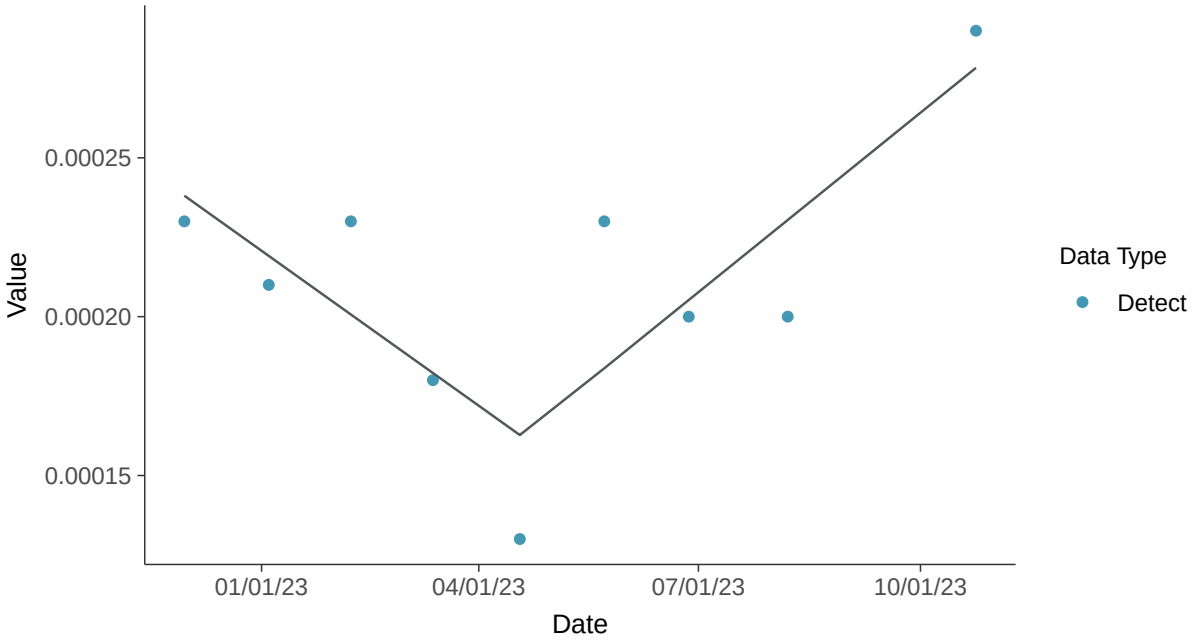

Lognormal Q-Q plot
Arsenic, MW-07 (mg/L)
log(Value)
−8.25
−8.50
−8.75
−9.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-07 (mg/L)
0.00030
0.00025
0.00020
0.00015
Value
0.00010
0.00015
0.00020
0.00025
0.00030
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Arsenic, MW-07 (mg/L)
−8.2
−8.4
−8.6
−8.8
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

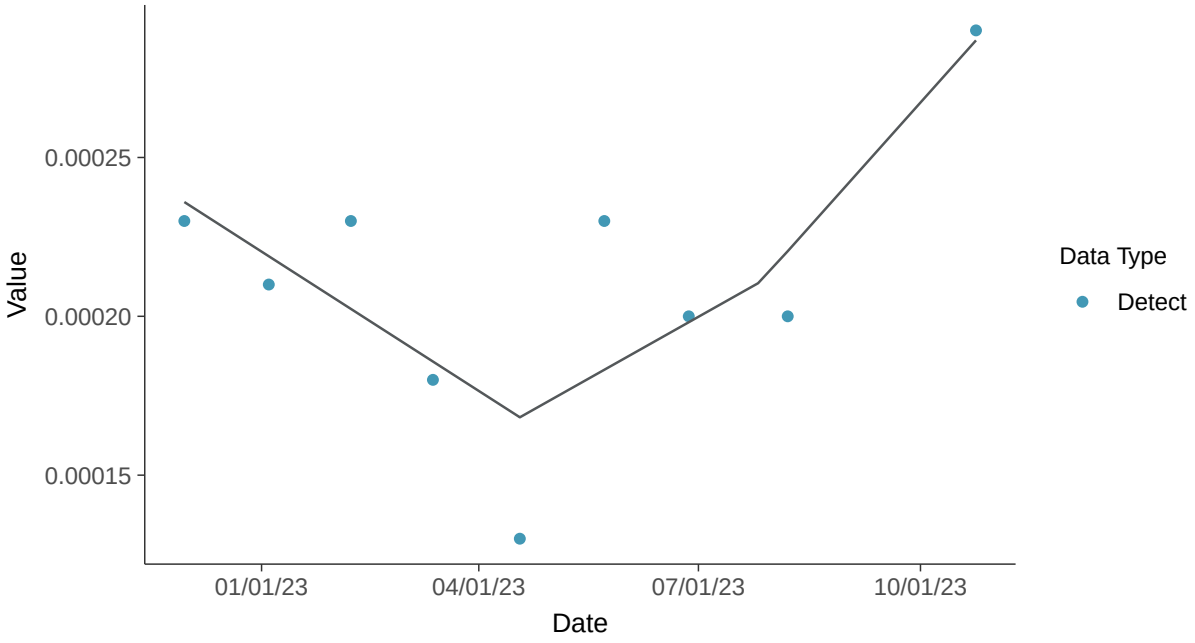
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-07 (mg/L)



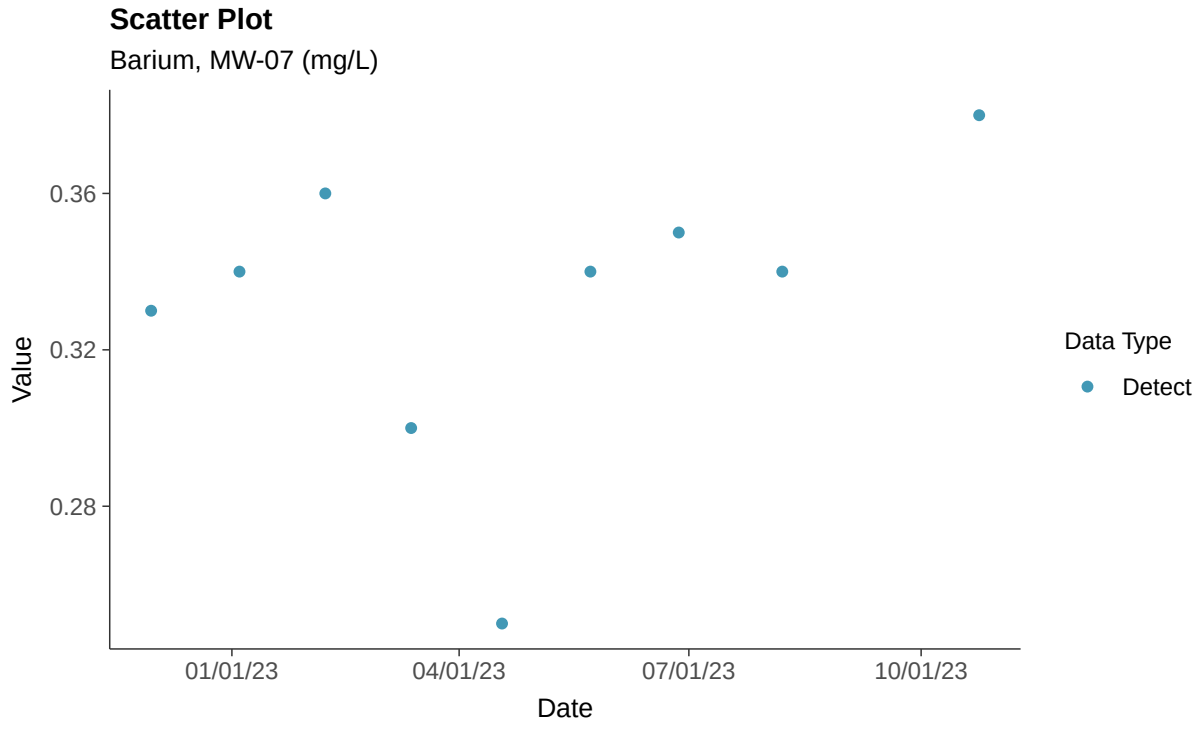
Trend Regression: Piecewise Linear-Linear-Linear

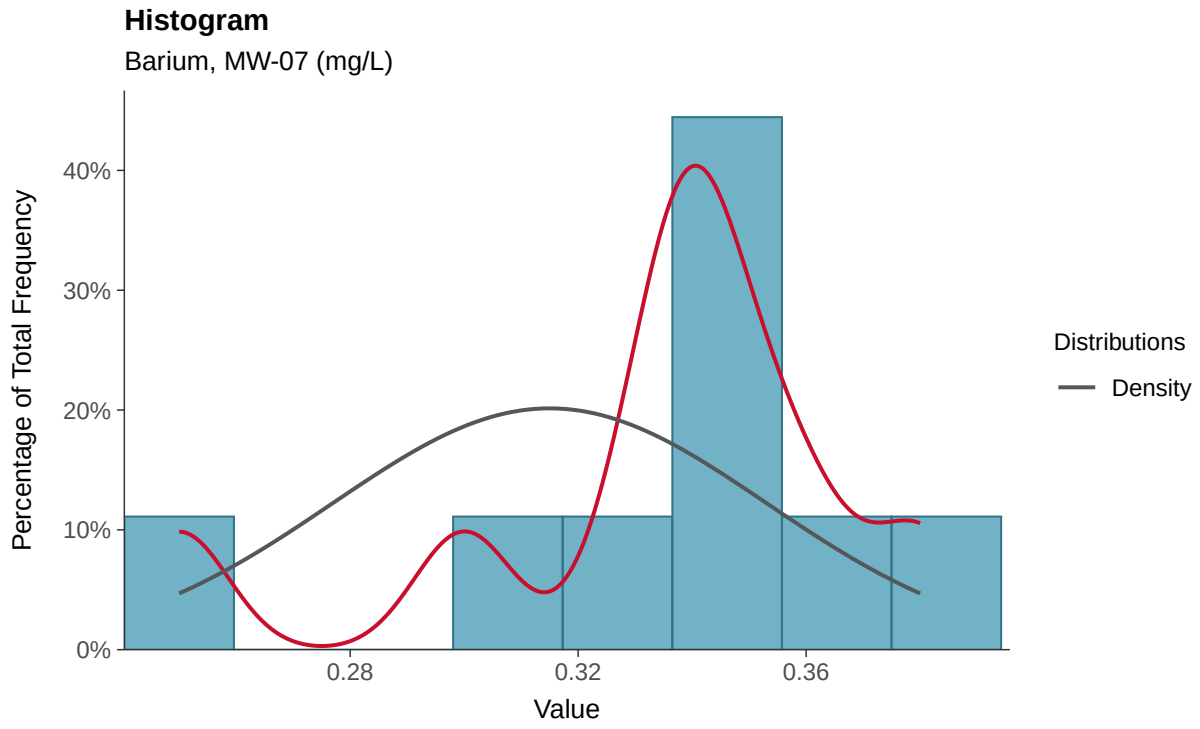
Arsenic, MW-07 (mg/L)



Appendix IV: Barium, MW-07

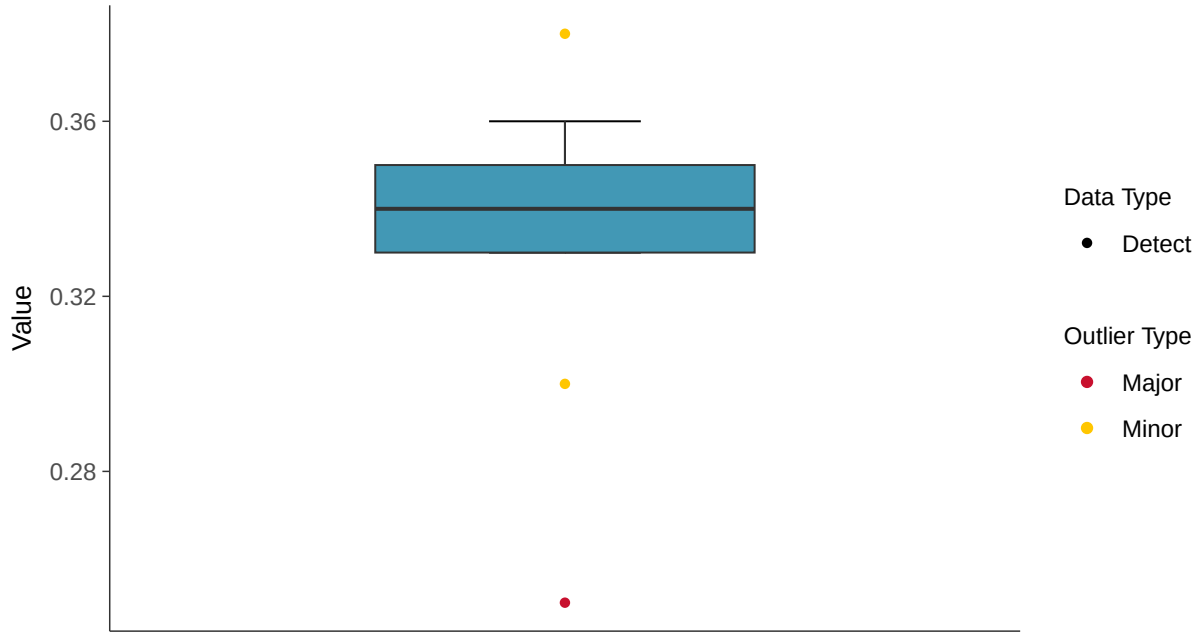
ID: 2_16_5_103





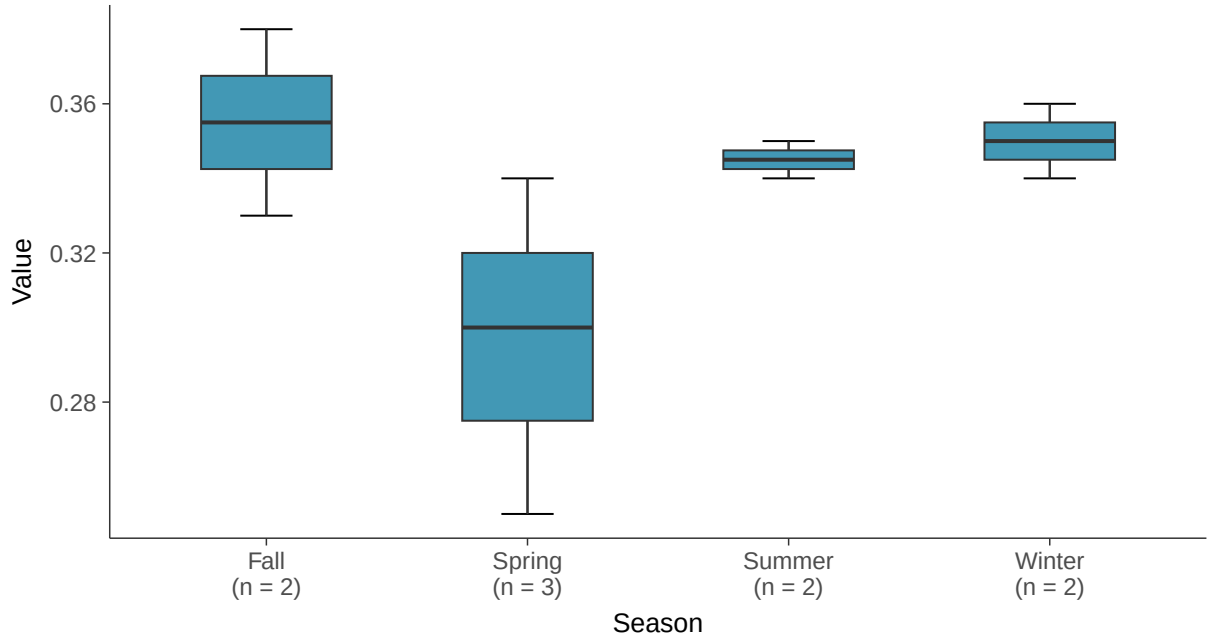
Boxplot

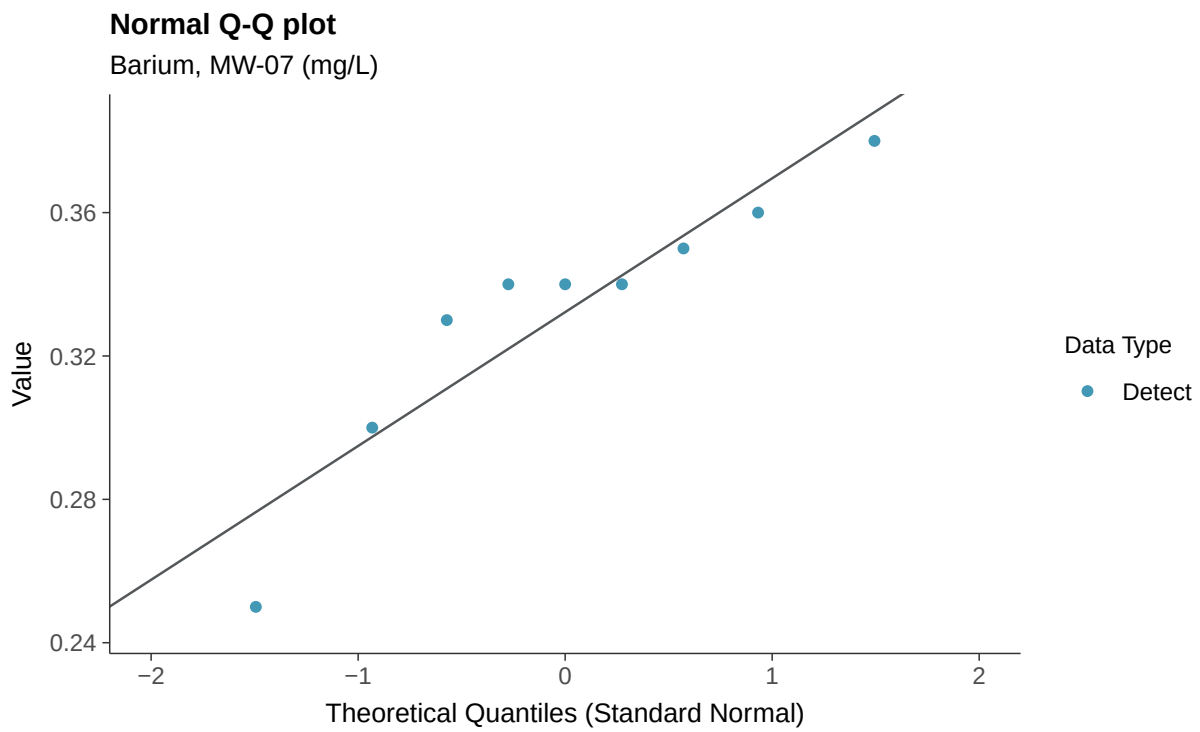
Barium, MW-07 (mg/L)

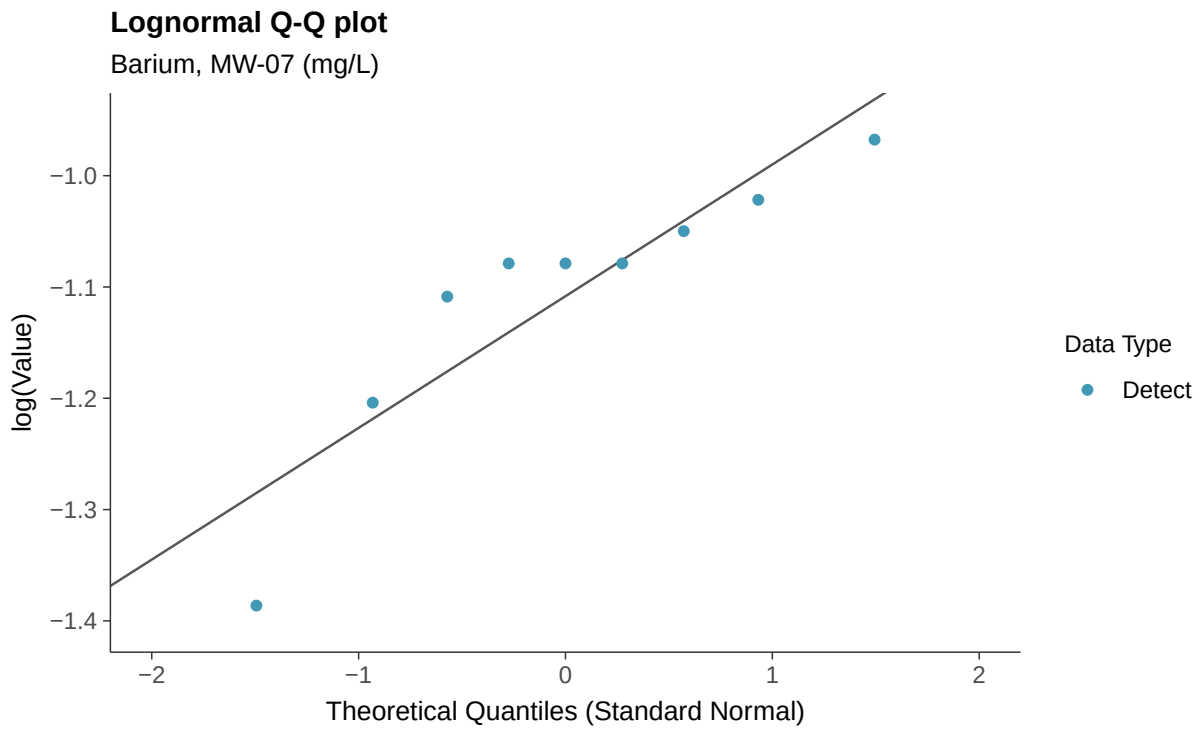


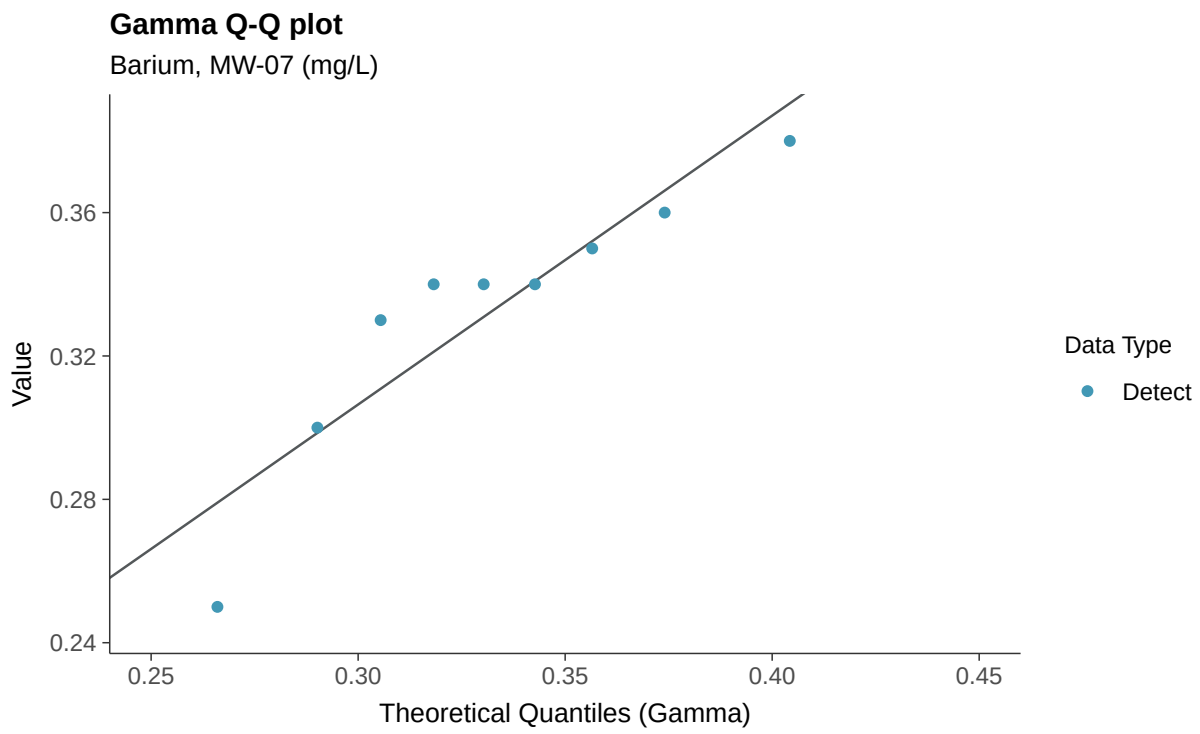
Boxplot by Season

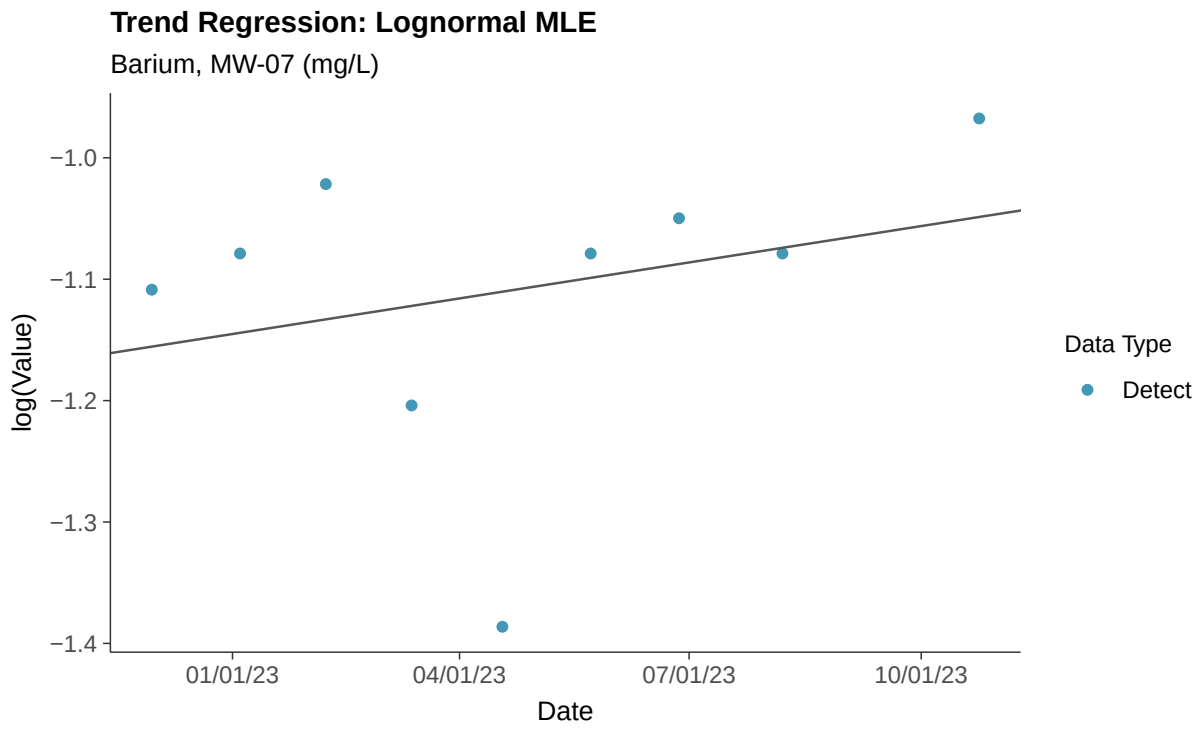
Barium, MW-07 (mg/L)

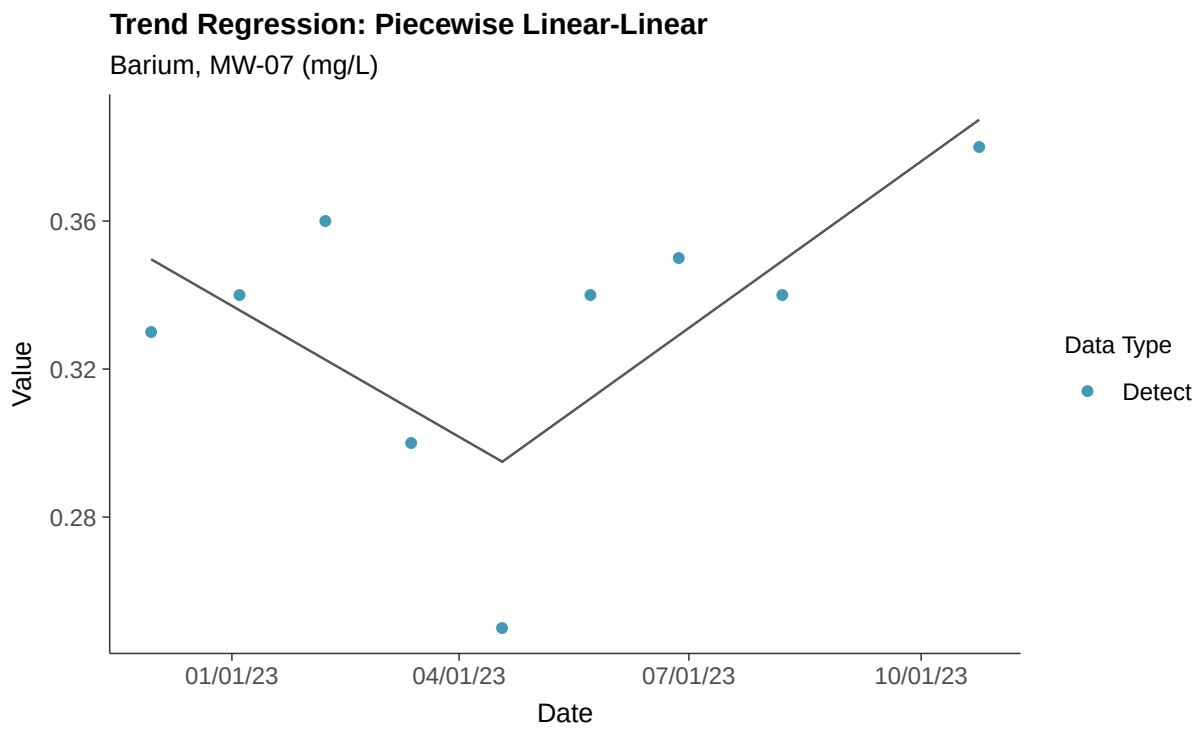



Normal Q-Q plot
Barium, MW-07 (mg/L)
Value
0.36
0.32
0.28
0.24
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Barium, MW-07 (mg/L)
log(Value)
−1.0
−1.1
−1.2
−1.3
−1.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

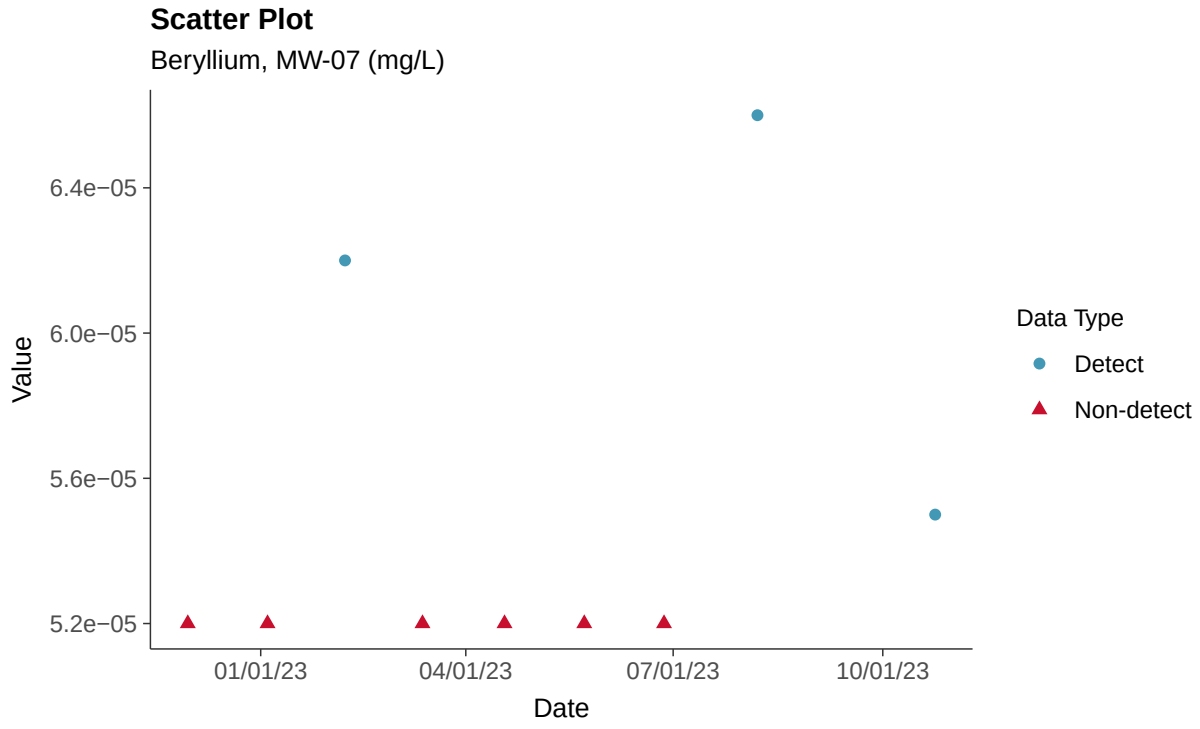

Gamma Q-Q plot
Barium, MW-07 (mg/L)
Value
0.36
0.32
0.28
0.24
0.25
0.30
0.35
0.40
0.45
Theoretical Quantiles (Gamma)
Data Type
Detect

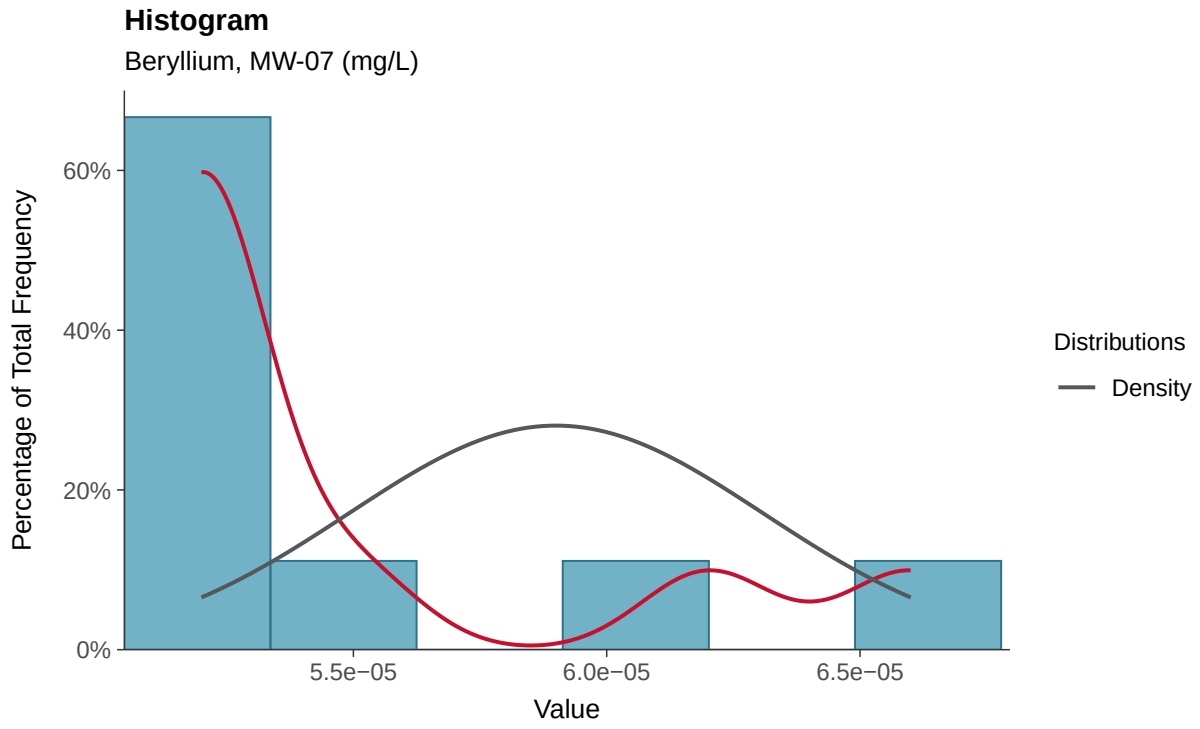

Trend Regression: Lognormal MLE
Barium, MW-07 (mg/L)
log(Value)
−1.0
−1.1
−1.2
−1.3
−1.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Barium, MW-07 (mg/L)
Value
0.36
0.32
0.28
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-07

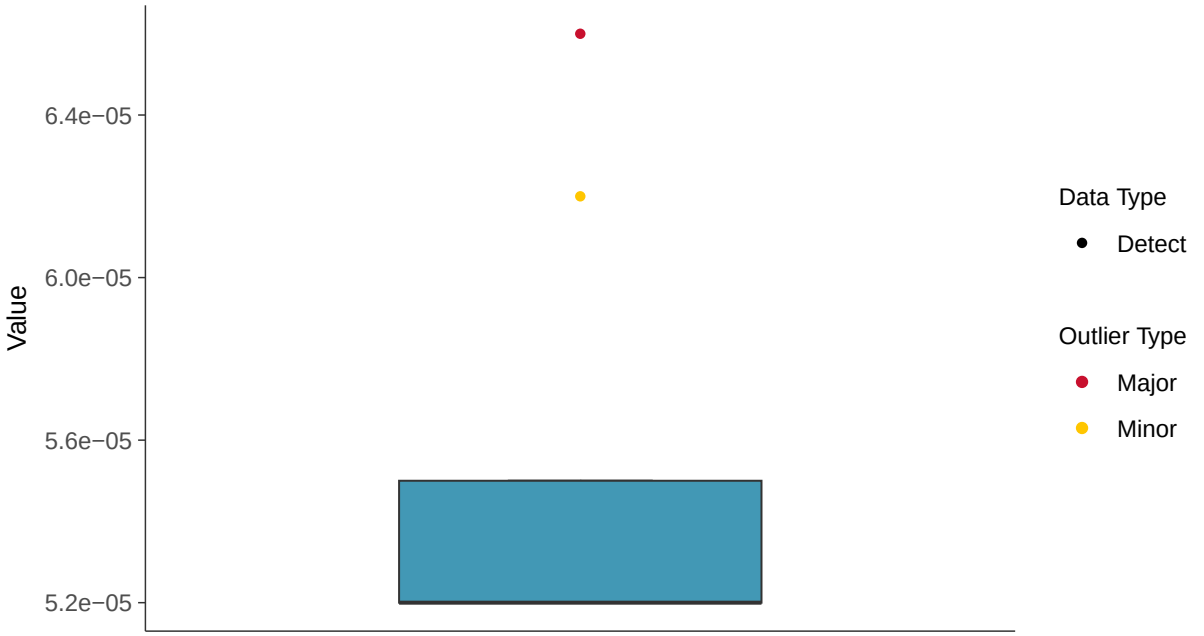
ID: 2_16_5_104





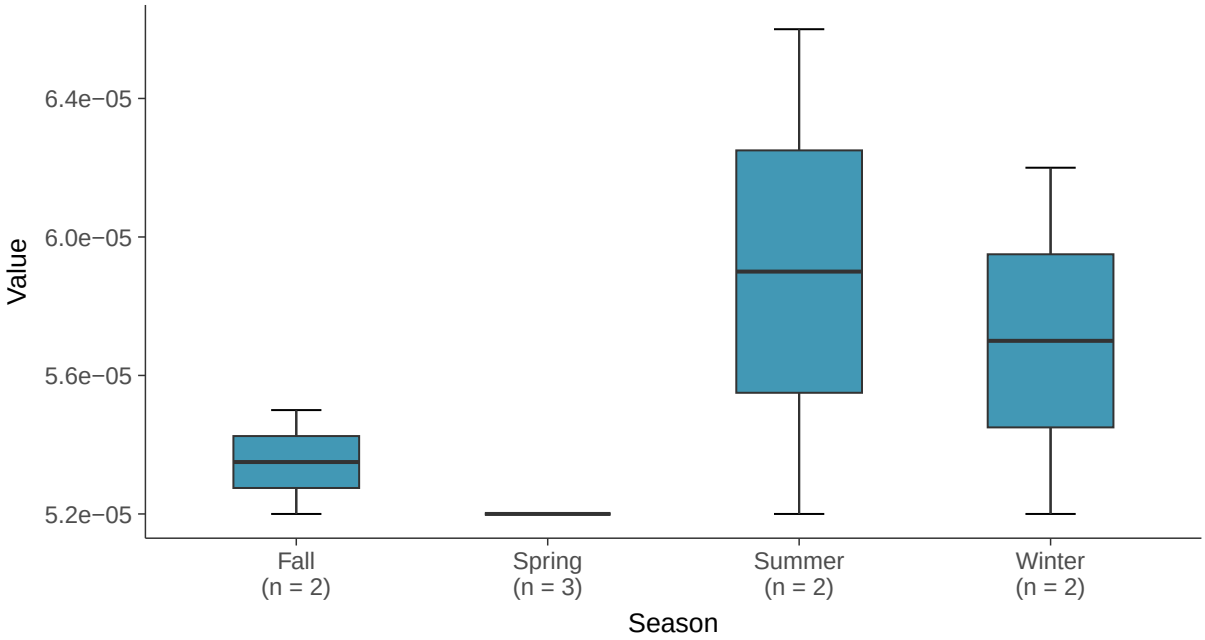
Boxplot

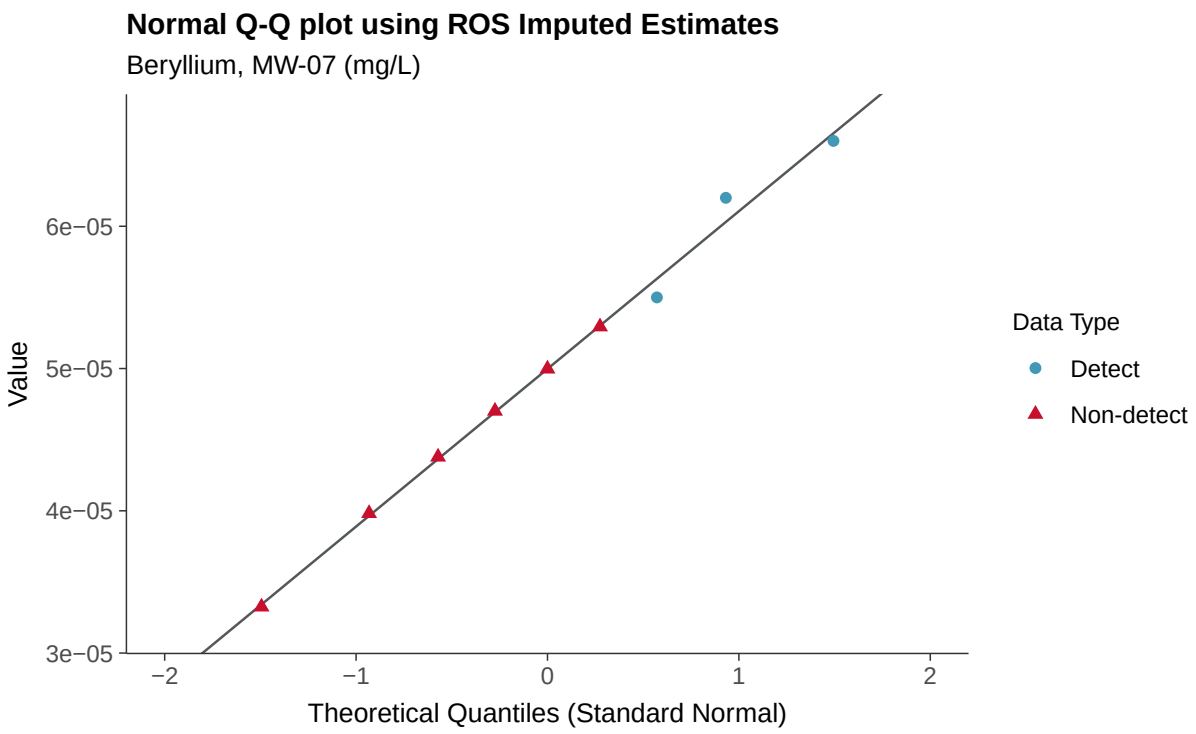
Beryllium, MW-07 (mg/L)

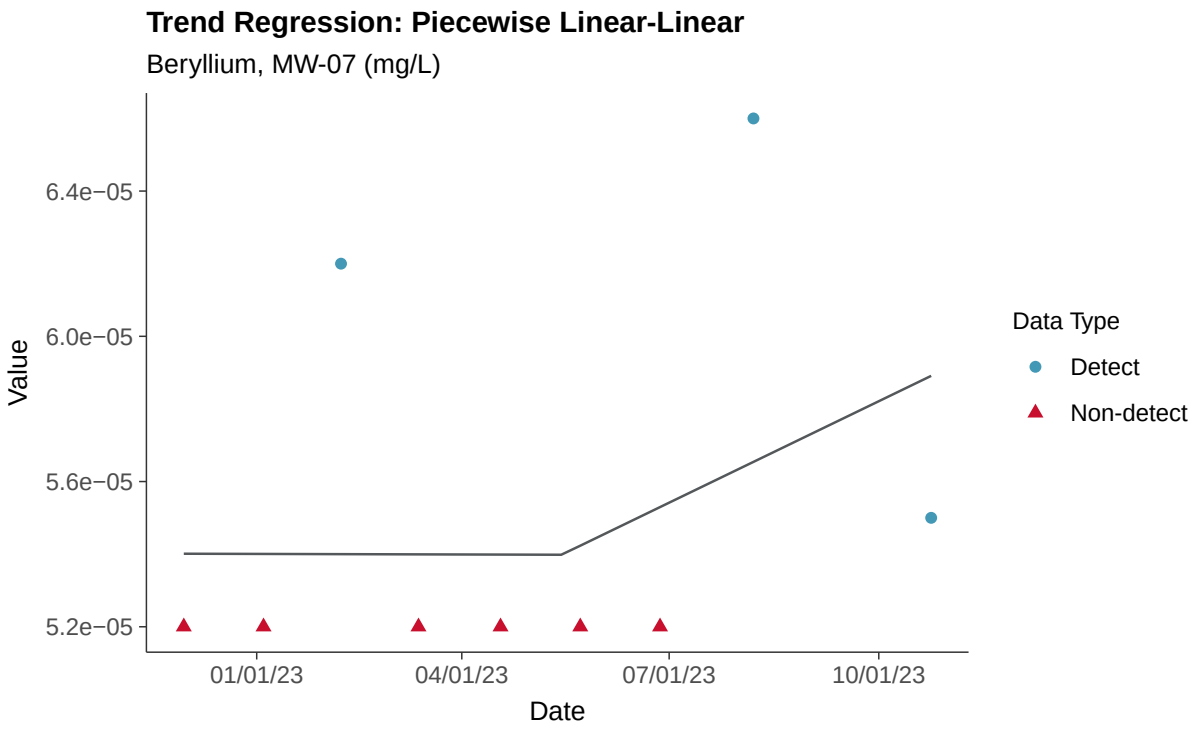


Boxplot by Season

Beryllium, MW-07 (mg/L)

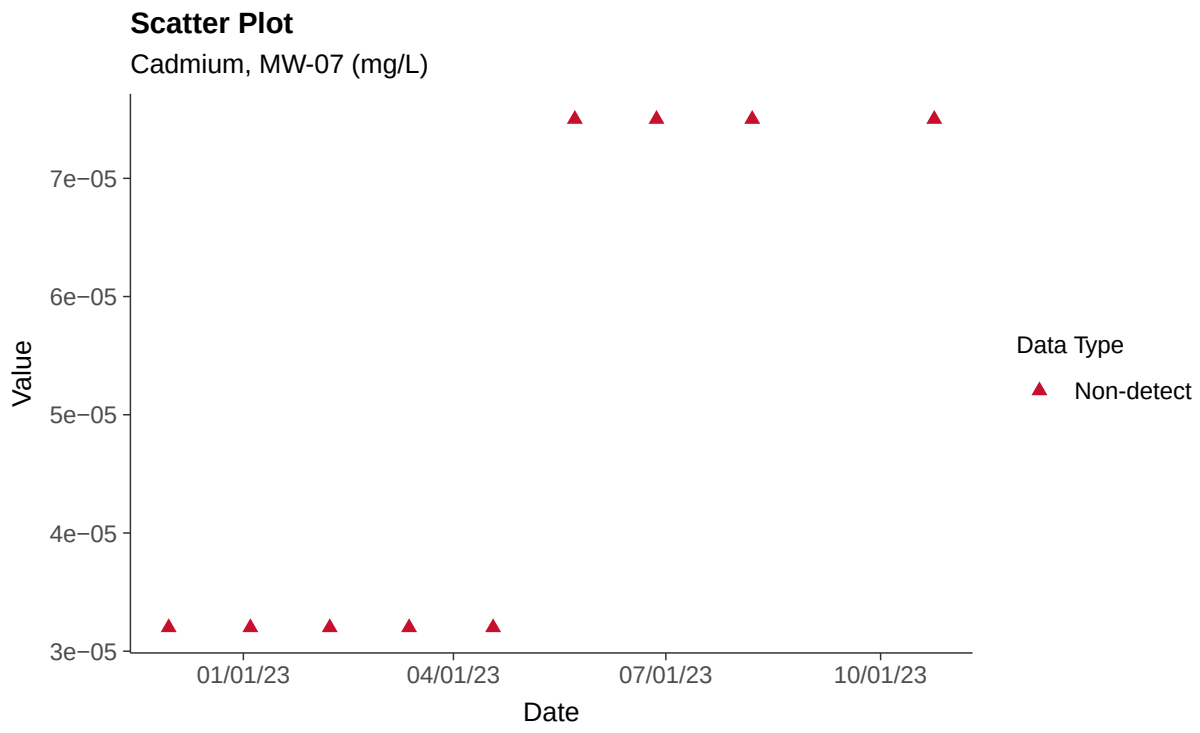


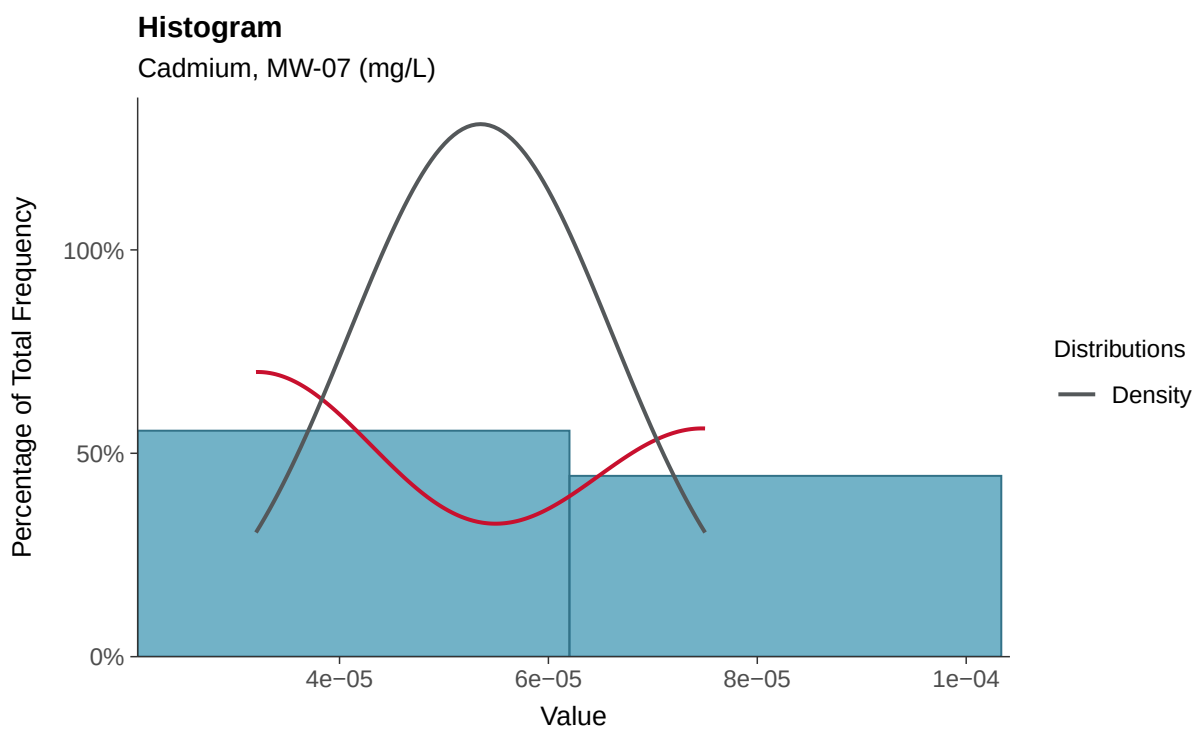

Normal Q-Q plot using ROS Imputed Estimates
Beryllium, MW-07 (mg/L)
Value
6e−05
5e−05
4e−05
3e−05
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Beryllium, MW-07 (mg/L)
Value
6.4e−05
6.0e−05
5.6e−05
5.2e−05
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Cadmium, MW-07

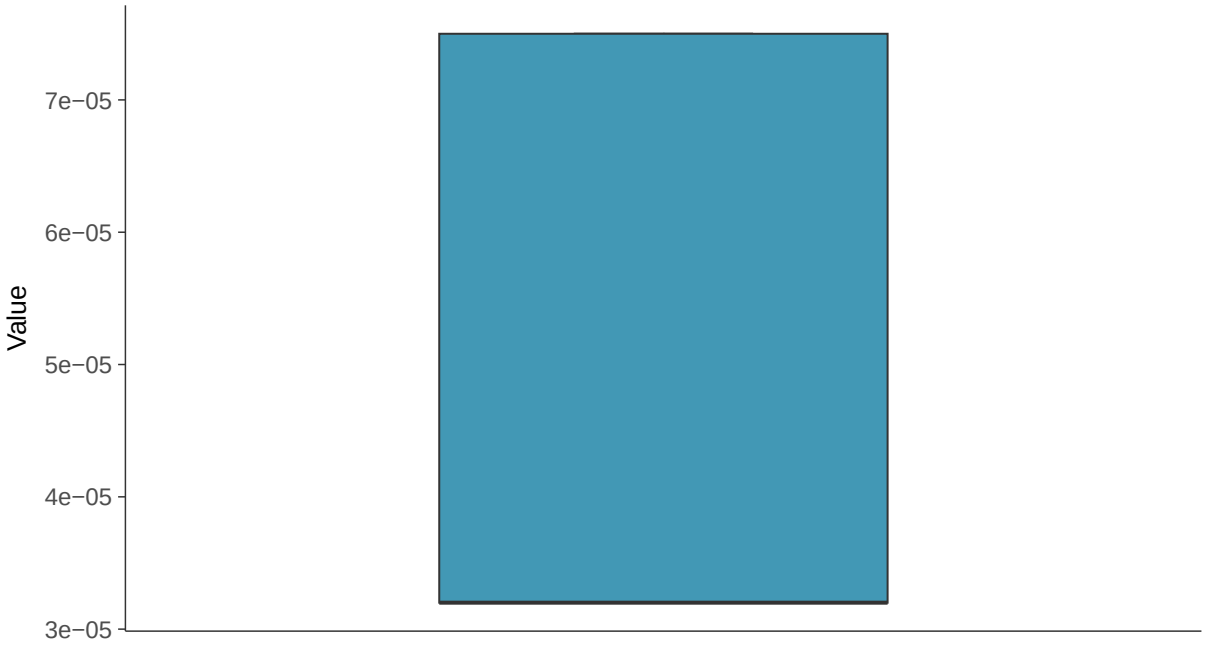
ID: 2_16_5_106





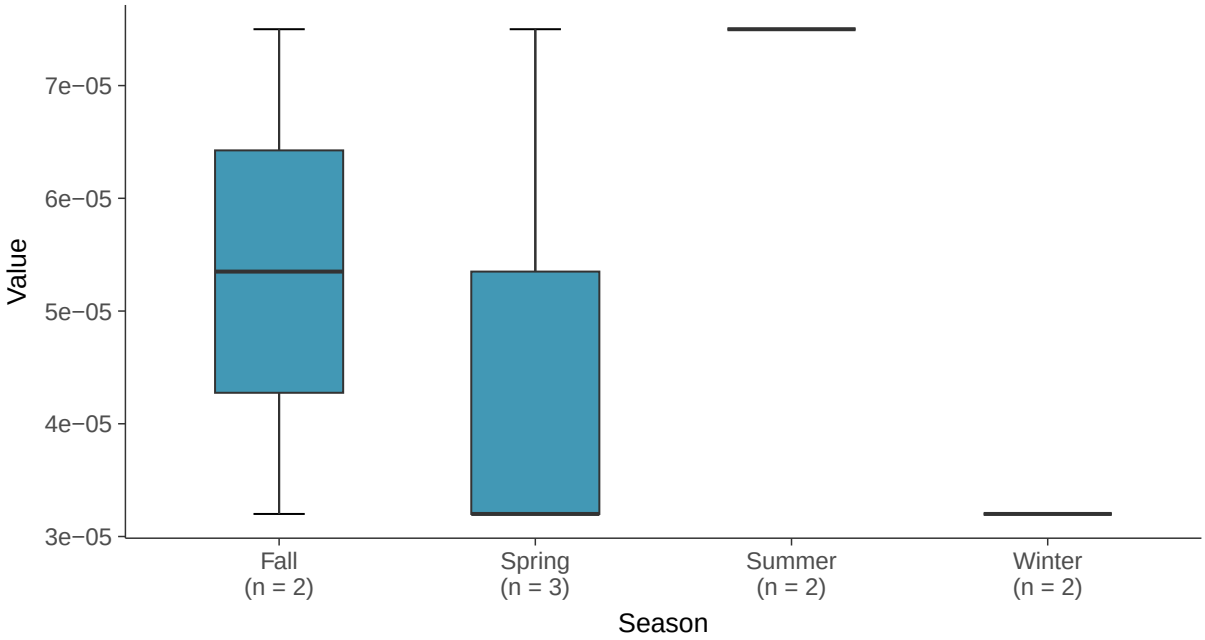
Boxplot

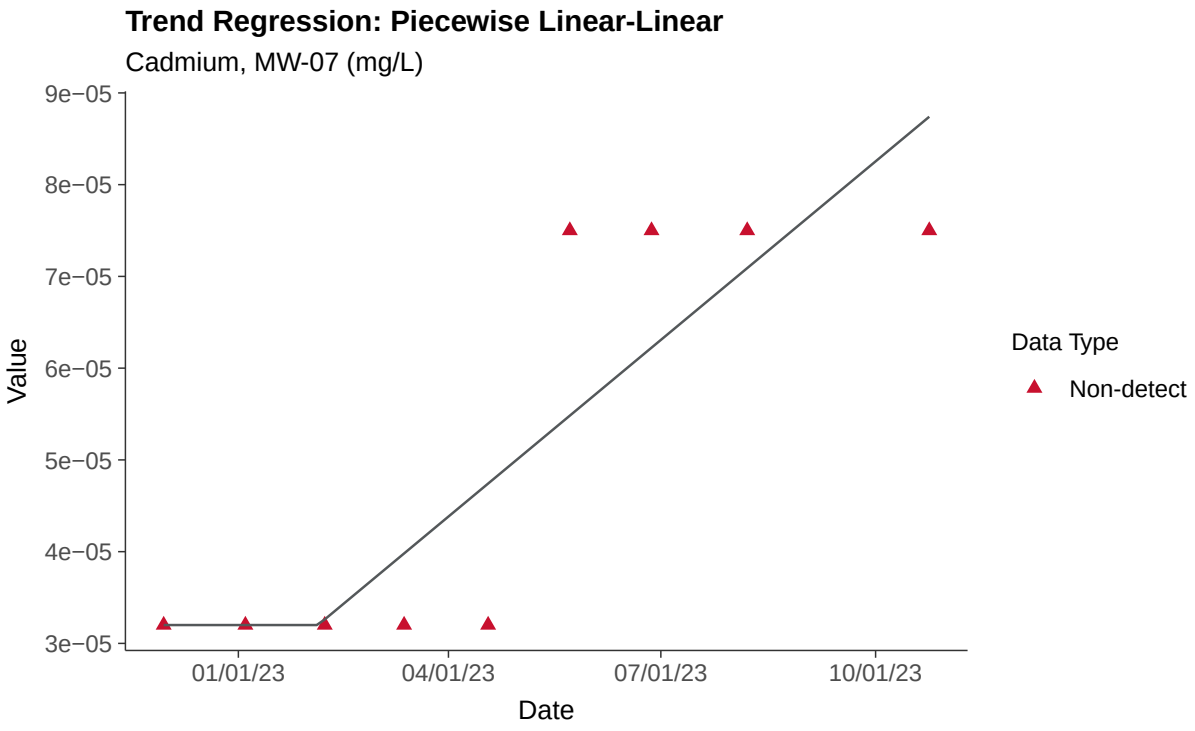
Cadmium, MW-07 (mg/L)

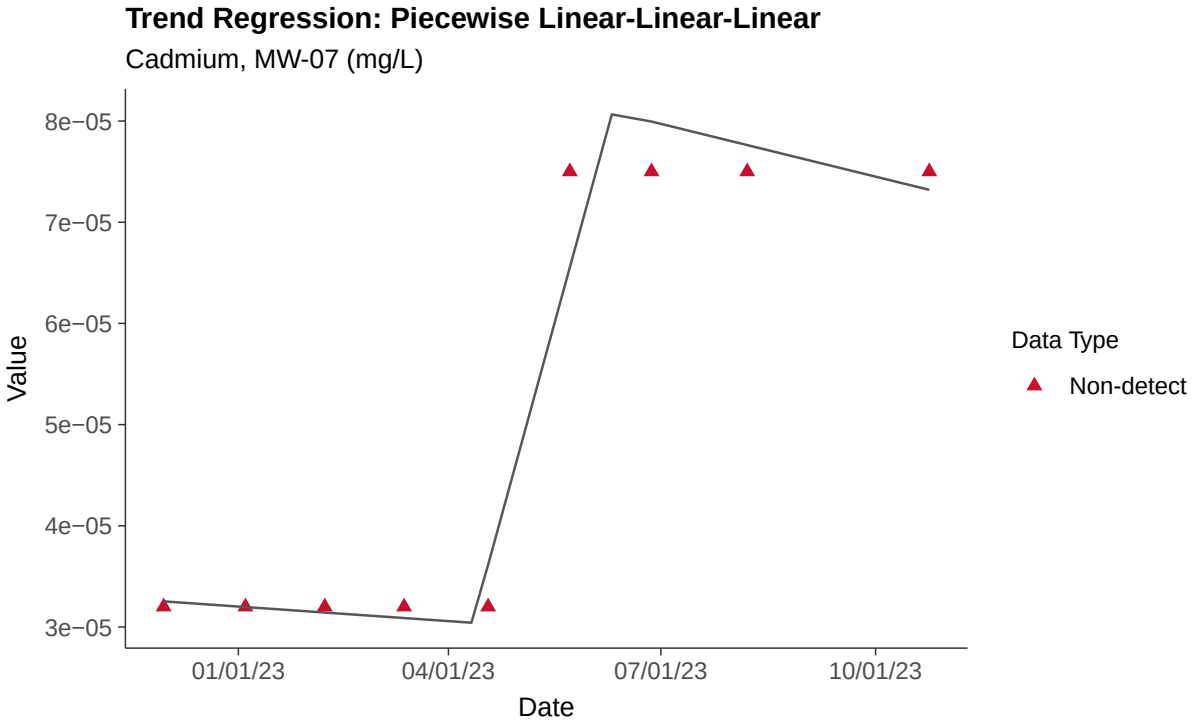


Boxplot by Season

Cadmium, MW-07 (mg/L)

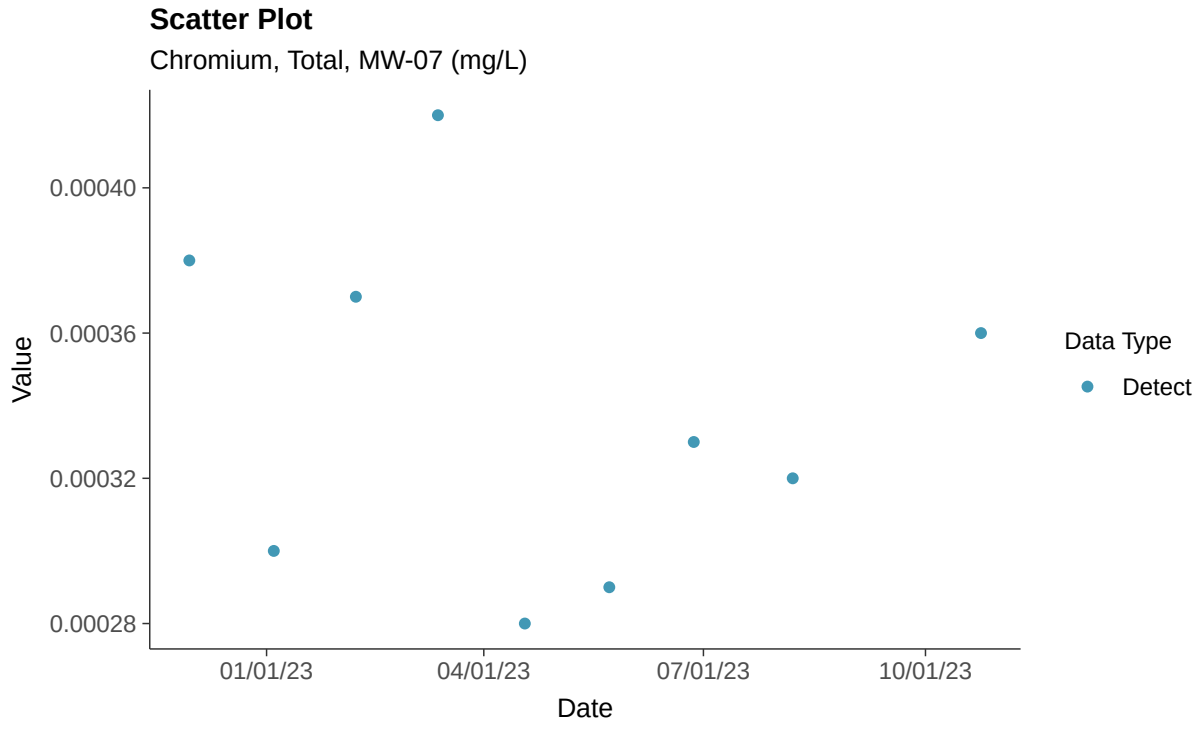


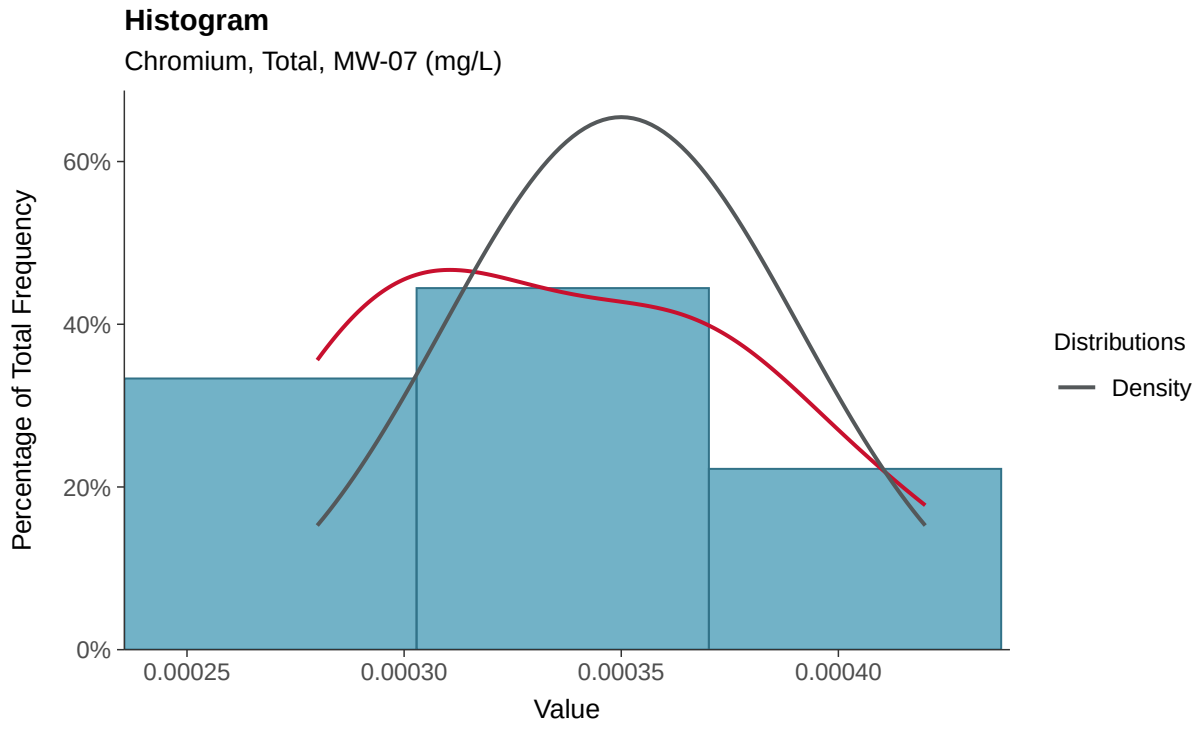

Trend Regression: Piecewise Linear-Linear
Cadmium, MW-07 (mg/L)
9e−05
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Cadmium, MW-07 (mg/L)
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Chromium, Total, MW-07

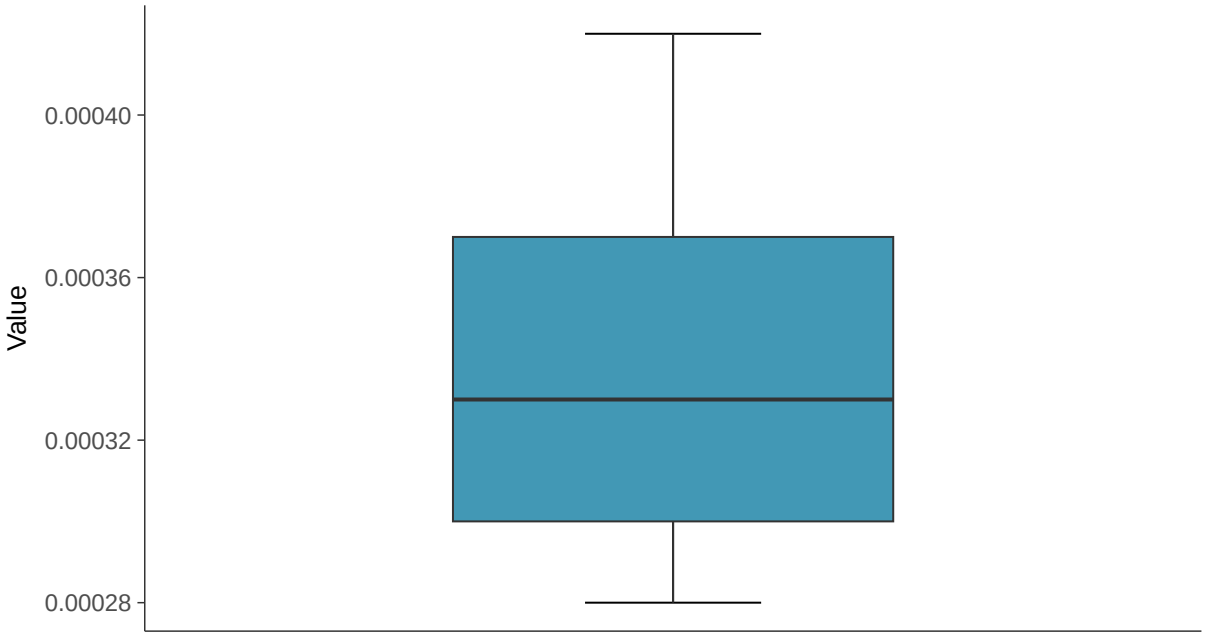
ID: 2_16_5_109





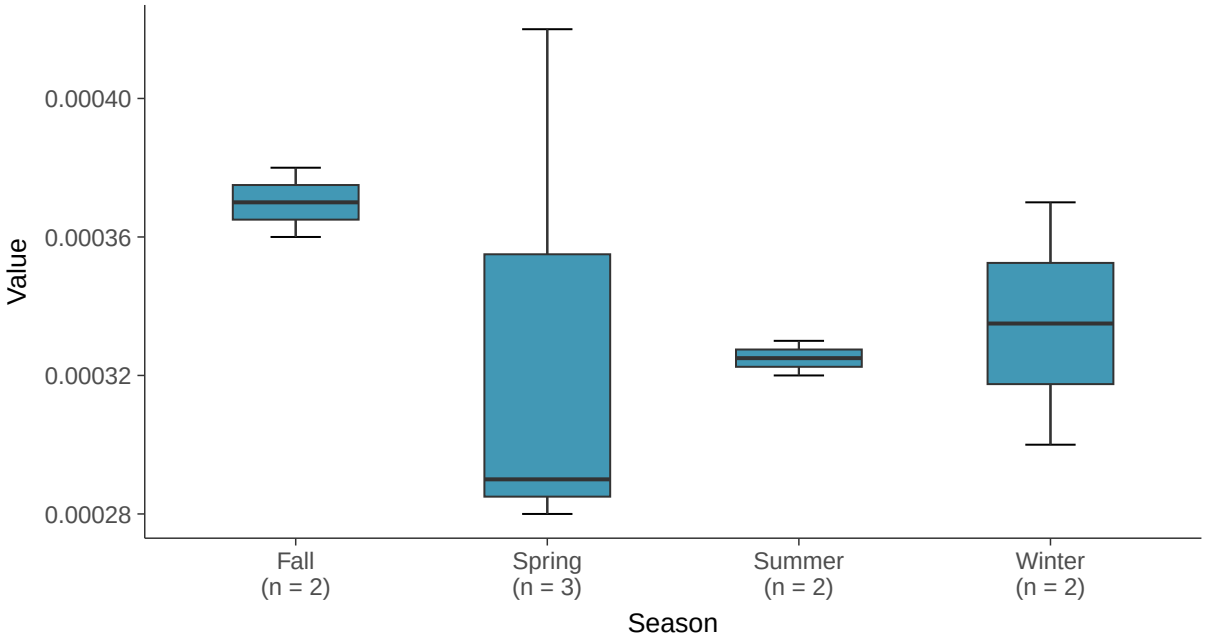
Boxplot

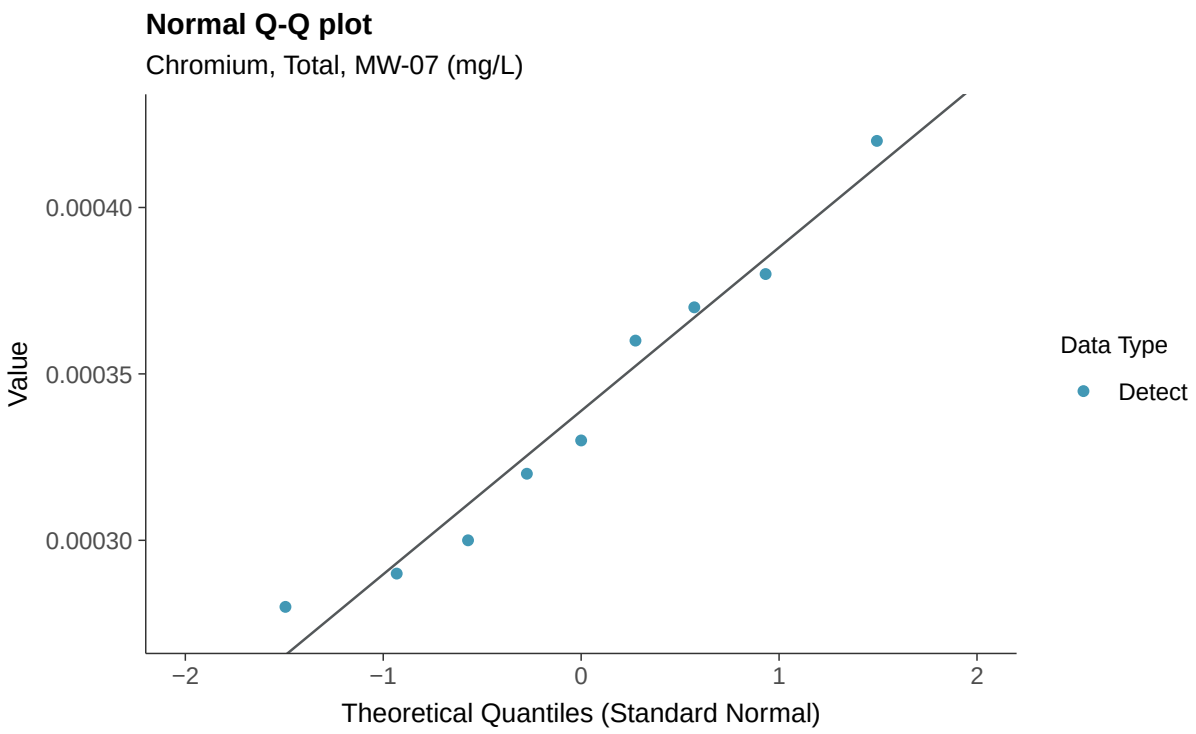
Chromium, Total, MW-07 (mg/L)

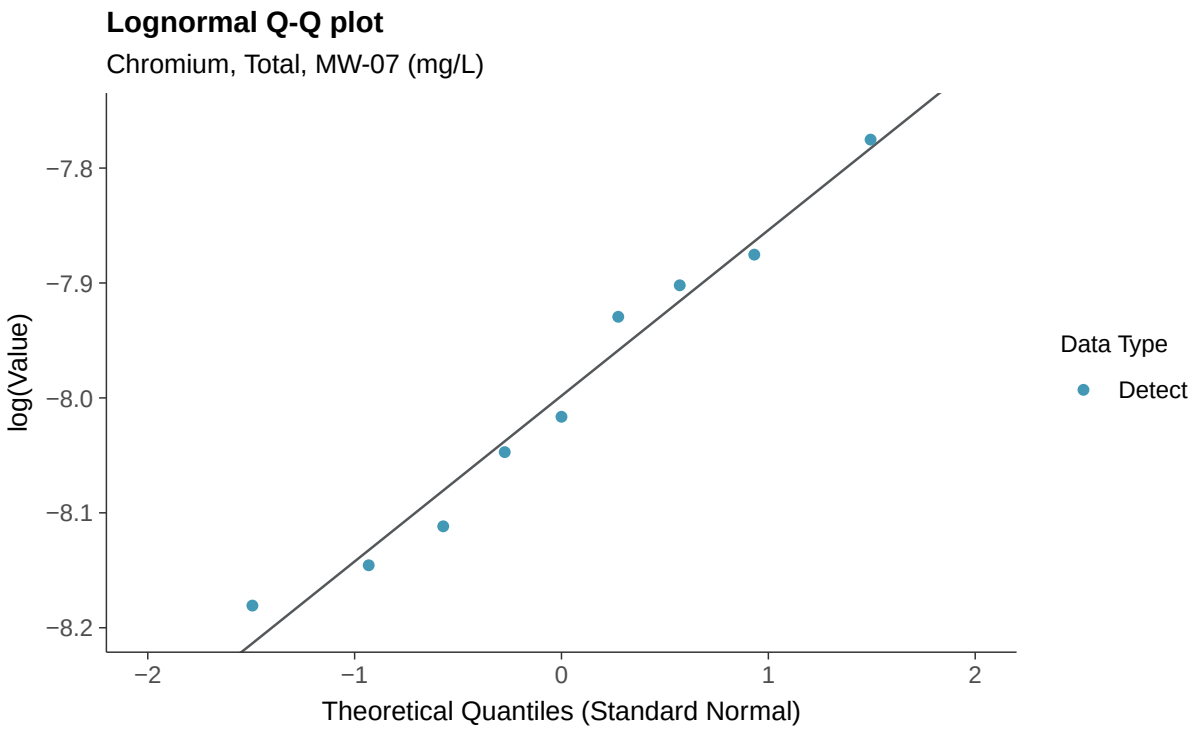


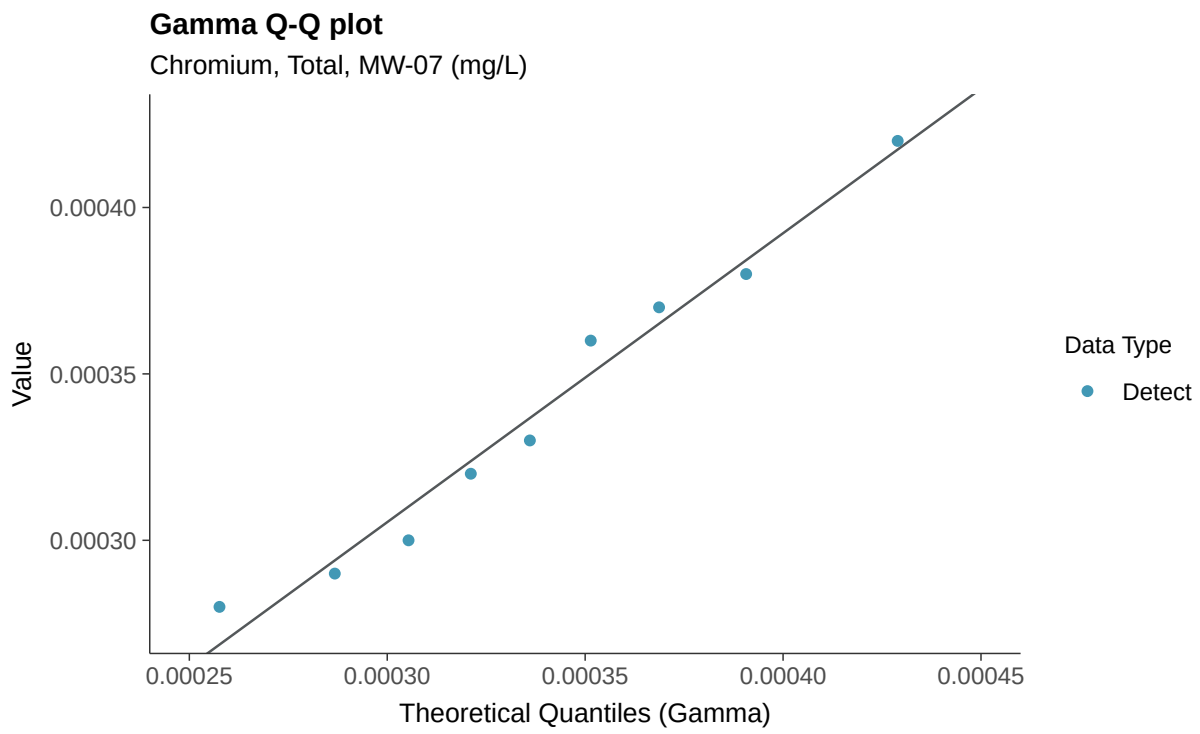
Boxplot by Season

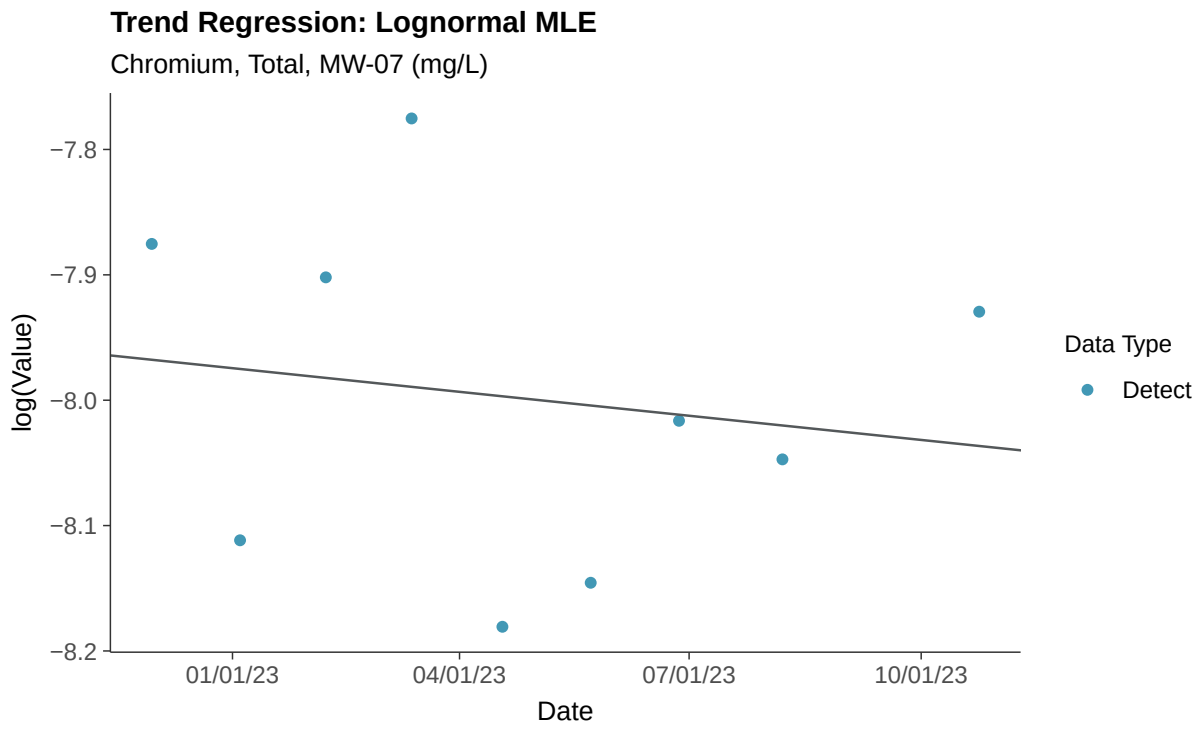
Chromium, Total, MW-07 (mg/L)




Normal Q-Q plot
Chromium, Total, MW-07 (mg/L)
Value
0.00040
0.00035
0.00030
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

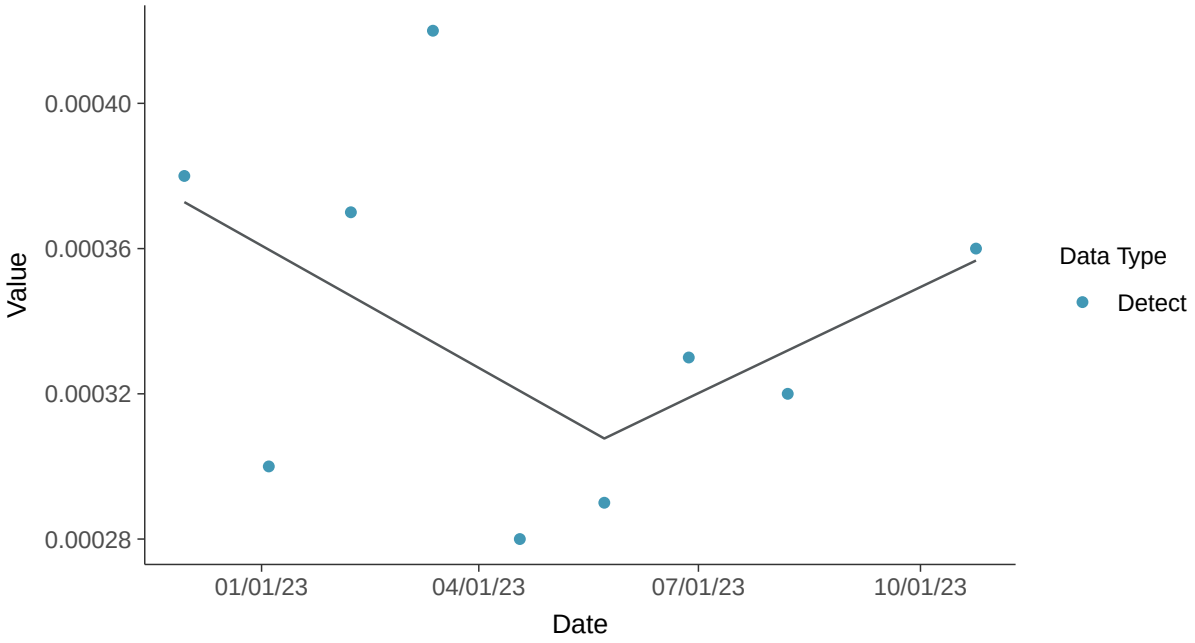

Lognormal Q-Q plot
Chromium, Total, MW-07 (mg/L)
log(Value)
−7.8
−7.9
−8.0
−8.1
−8.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chromium, Total, MW-07 (mg/L)
Value
0.00040
0.00035
0.00030
0.00025
0.00030
0.00035
0.00040
0.00045
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-07 (mg/L)
log(Value)
−7.8
−7.9
−8.0
−8.1
−8.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

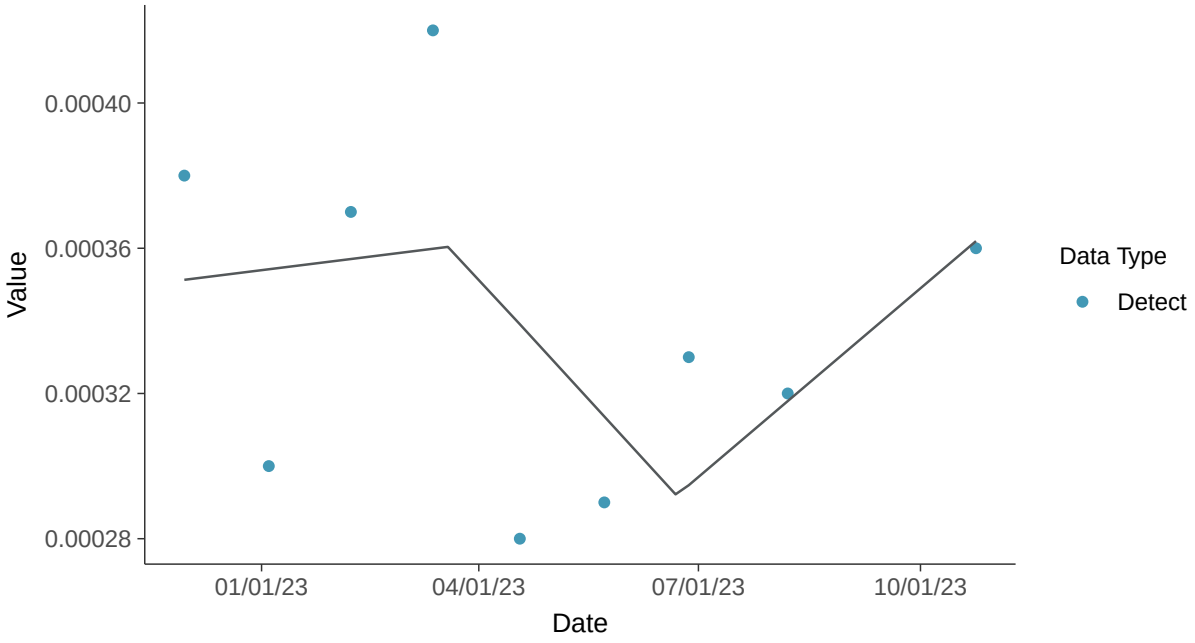
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-07 (mg/L)



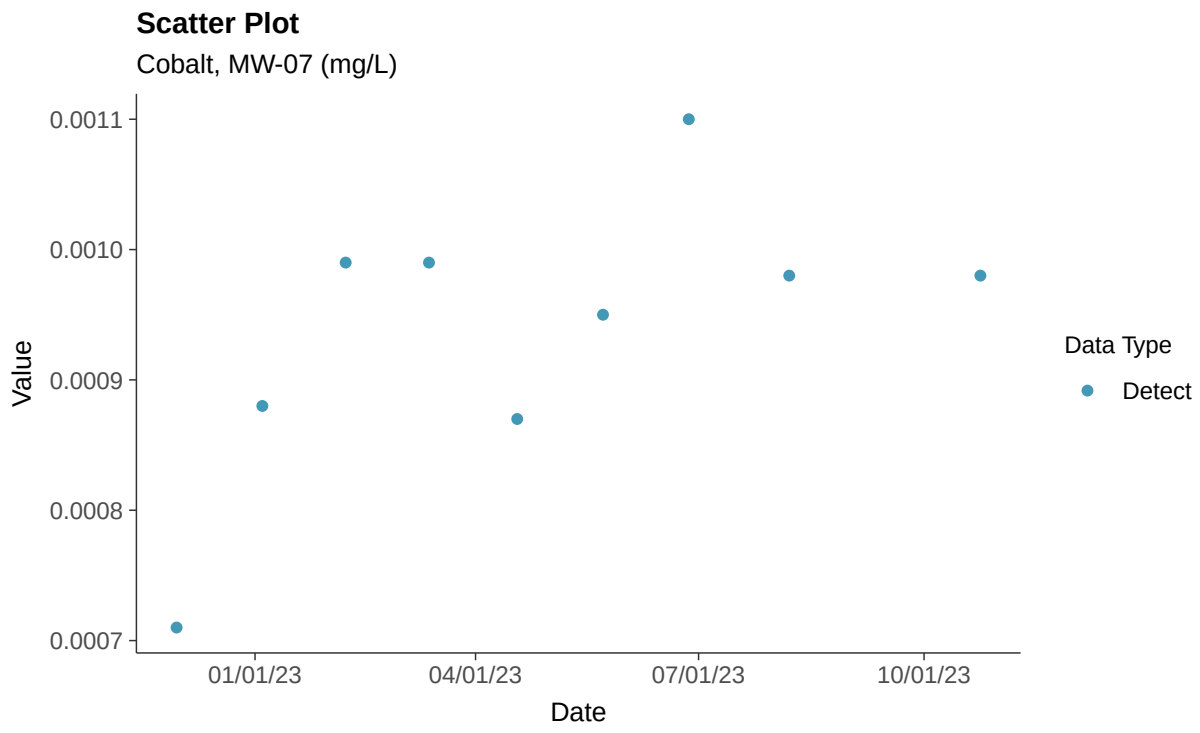
Trend Regression: Piecewise Linear-Linear-Linear

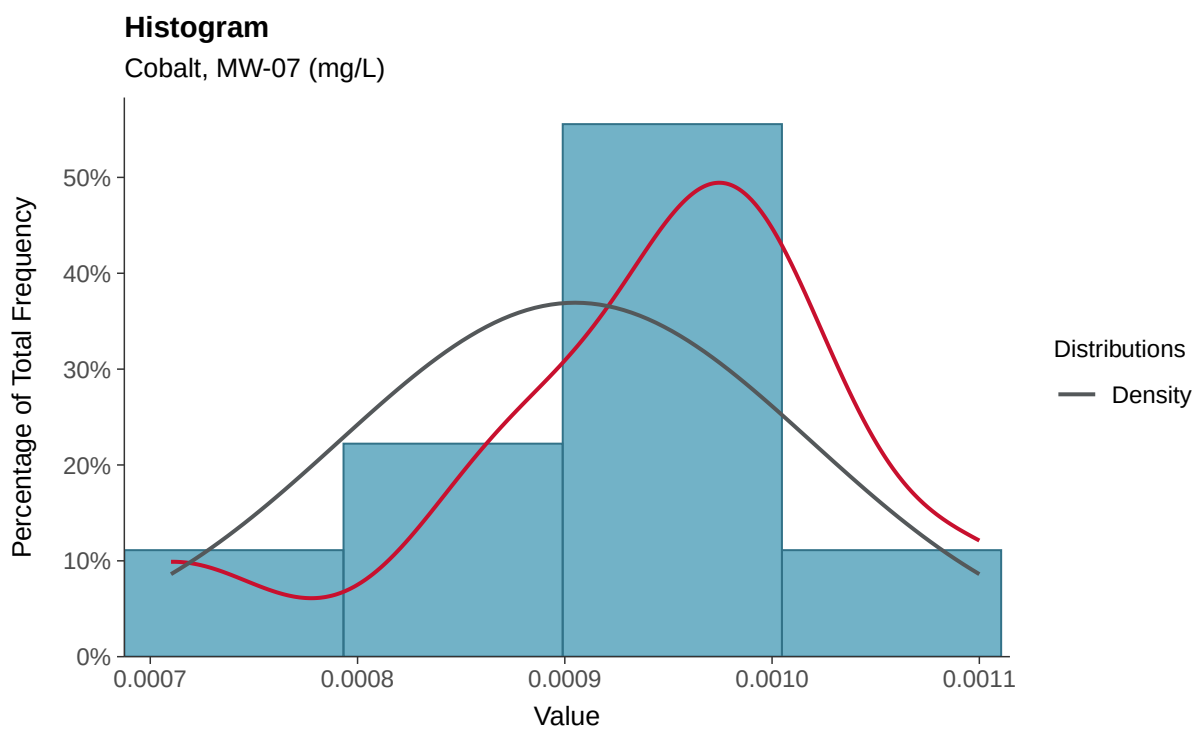
Chromium, Total, MW-07 (mg/L)



Appendix IV: Cobalt, MW-07

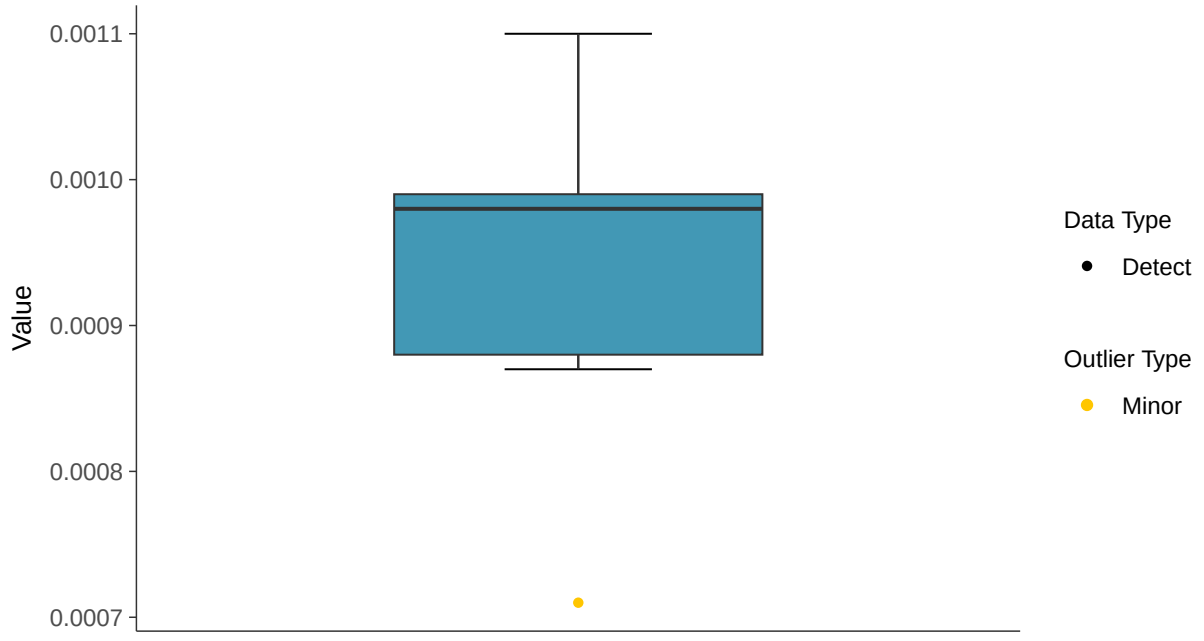
ID: 2_16_5_110





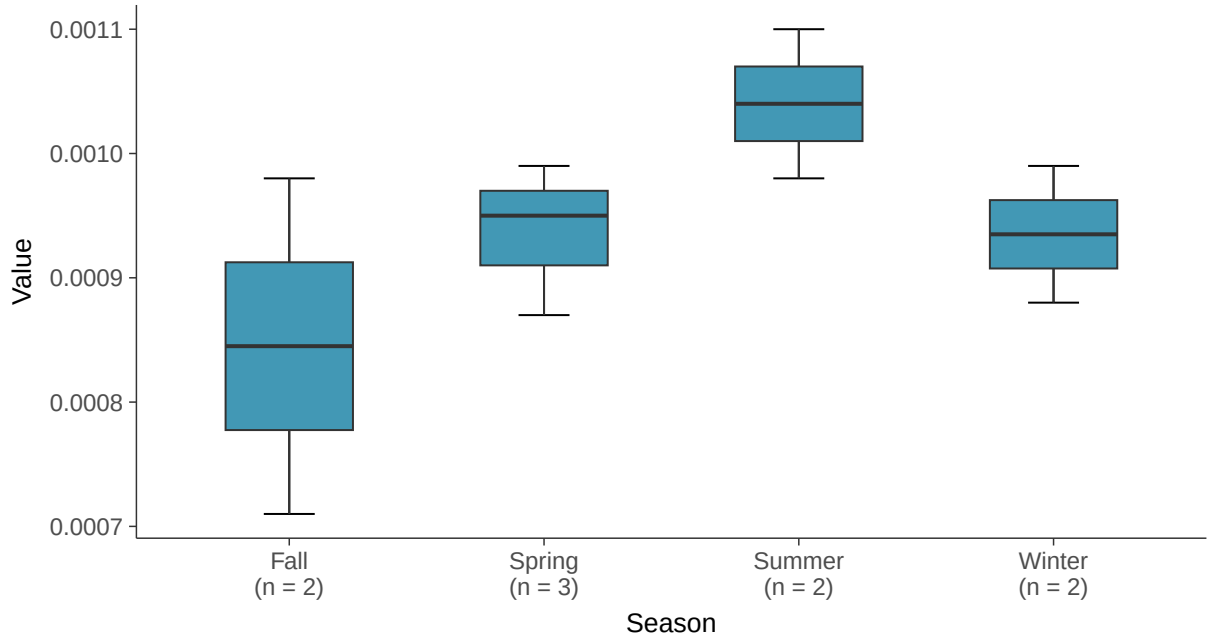
Boxplot

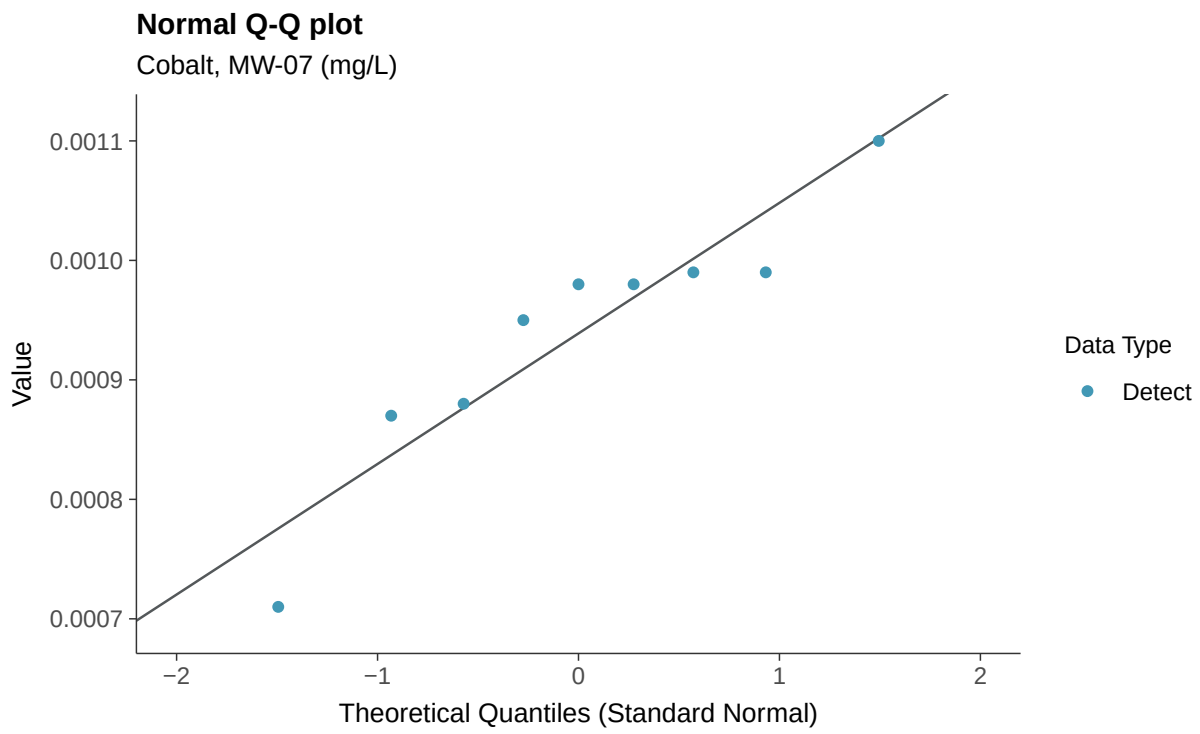
Cobalt, MW-07 (mg/L)

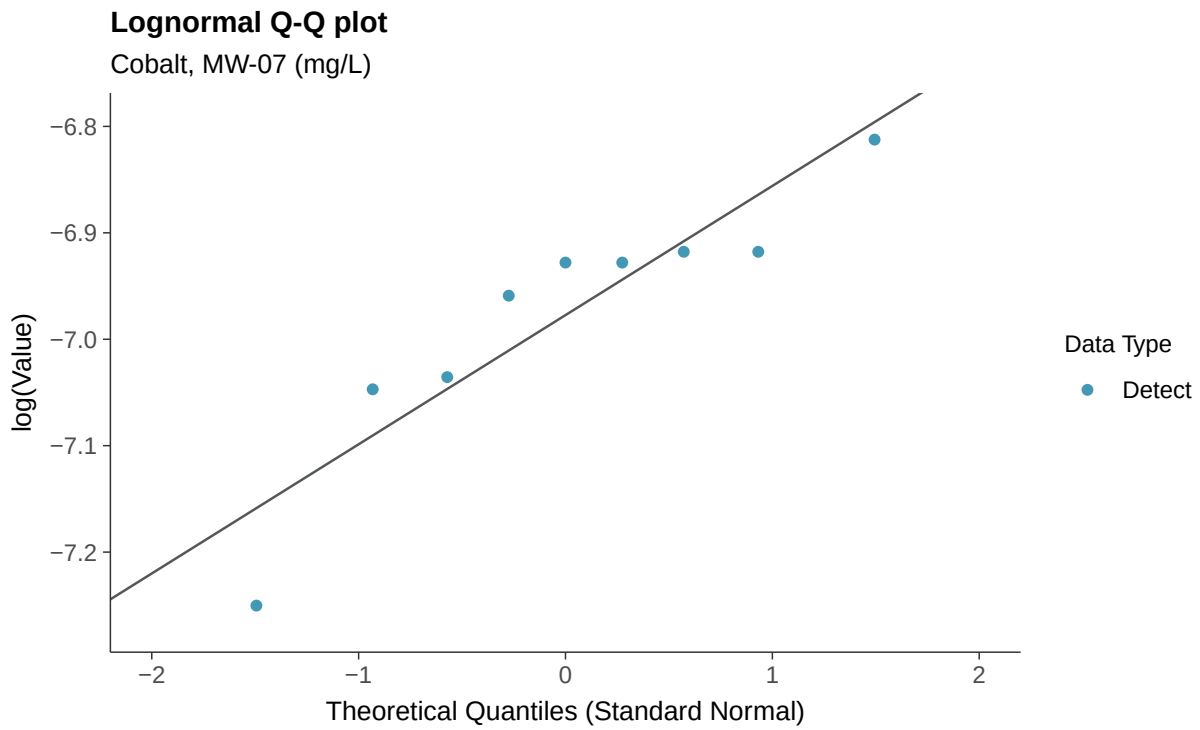


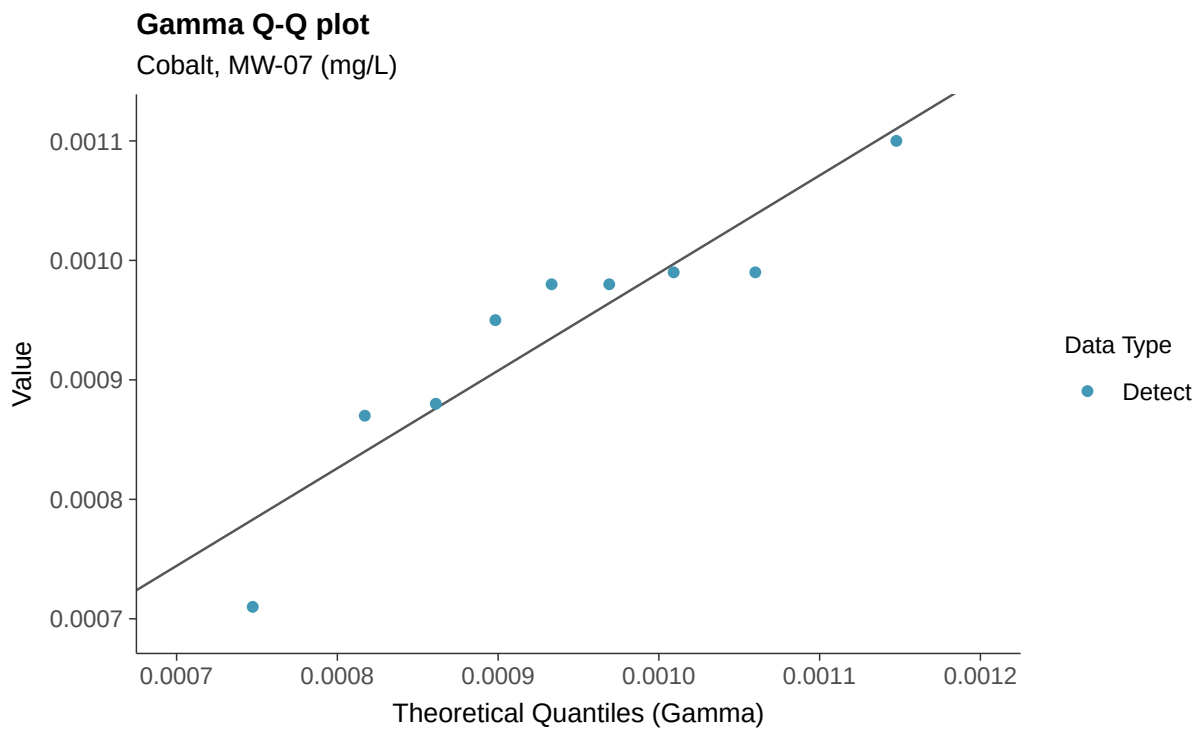
Boxplot by Season

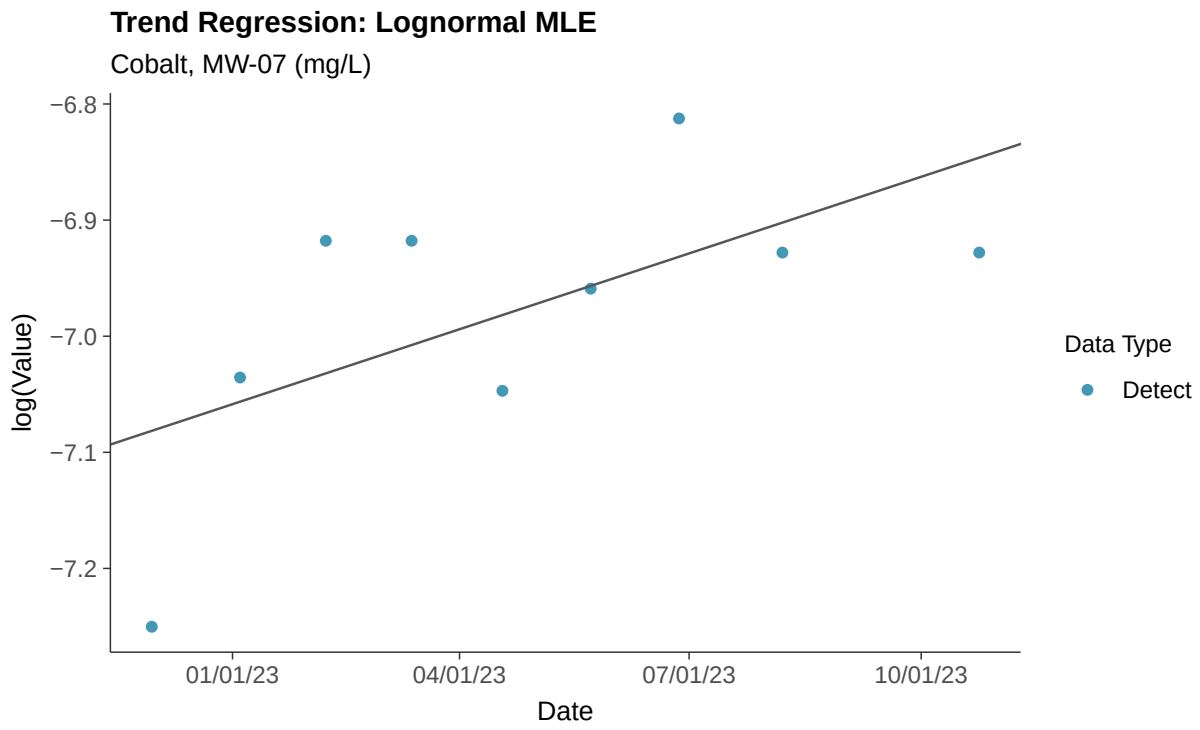
Cobalt, MW-07 (mg/L)

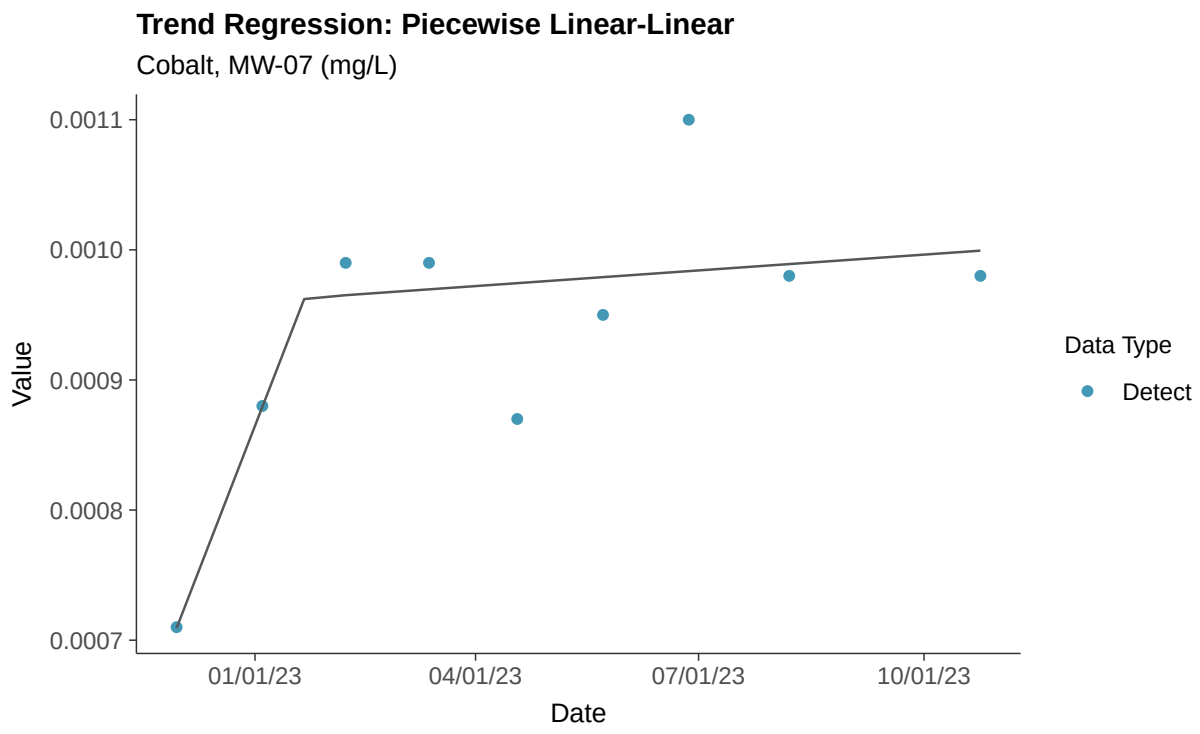


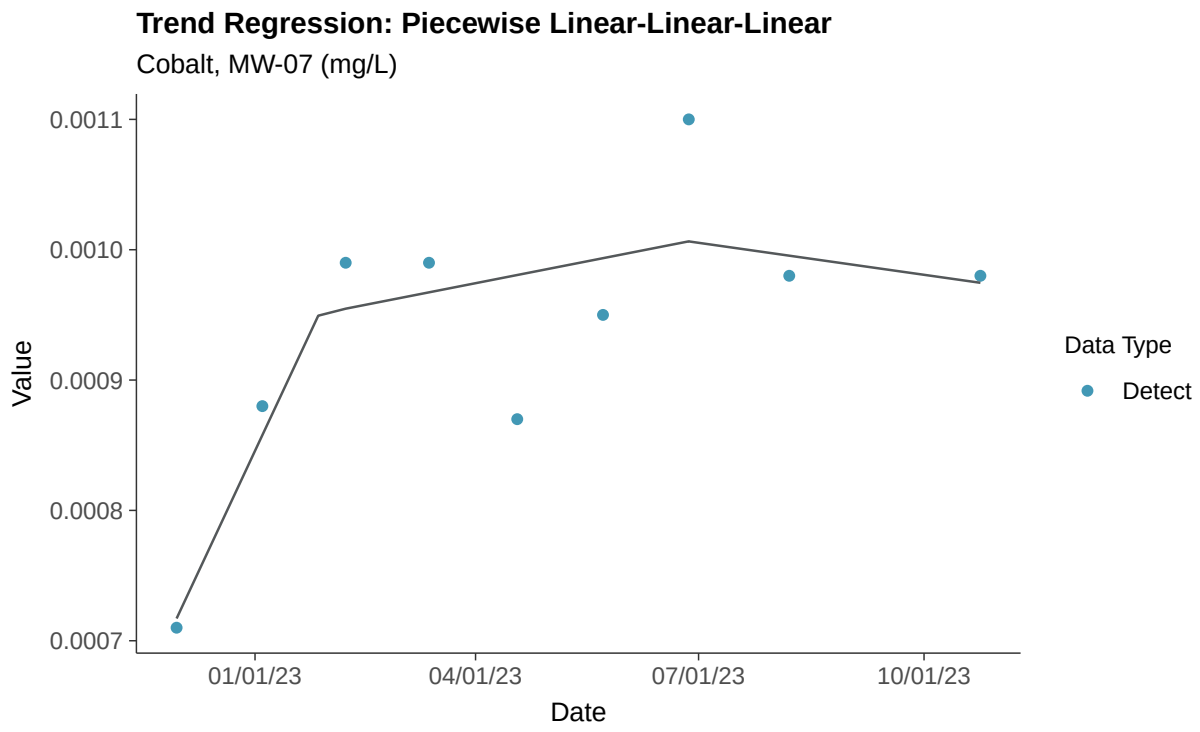

Normal Q-Q plot
Cobalt, MW-07 (mg/L)
Value
0.0011
0.0010
0.0009
0.0008
0.0007
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Cobalt, MW-07 (mg/L)
log(Value)
−6.8
−6.9
−7.0
−7.1
−7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-07 (mg/L)
Value
0.0011
0.0010
0.0009
0.0008
0.0007
0.0007
0.0008
0.0009
0.0010
0.0011
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect

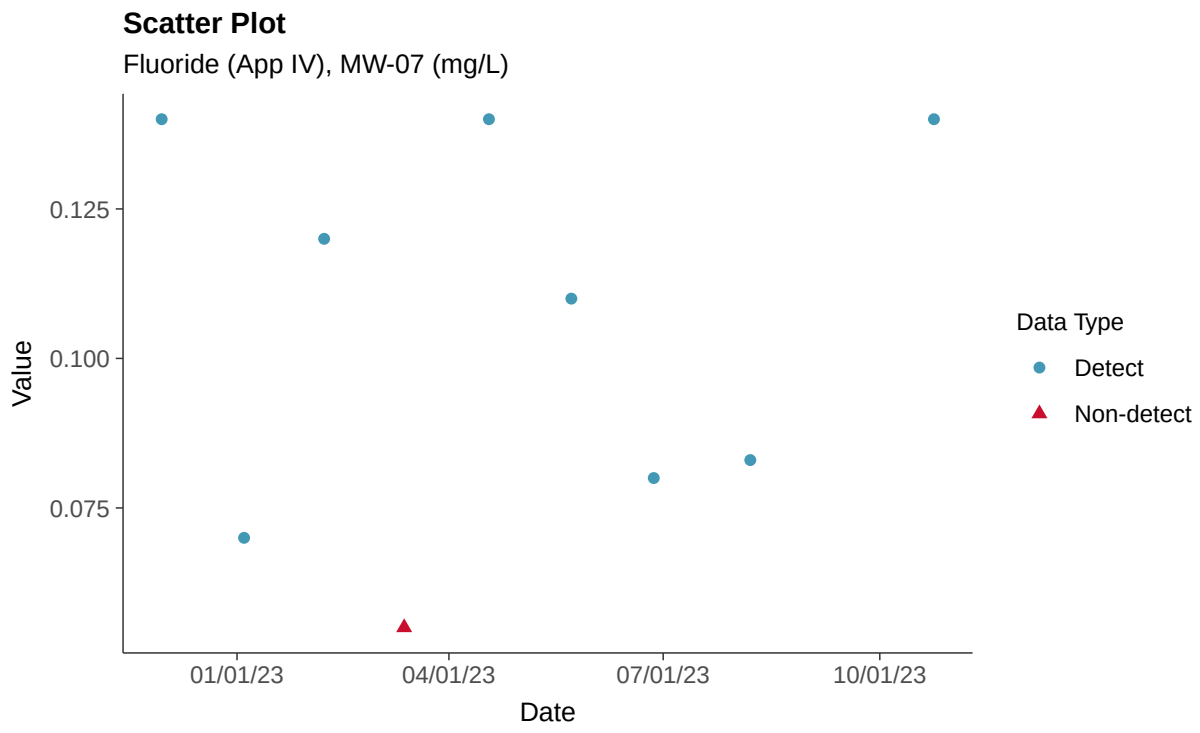

Trend Regression: Lognormal MLE
Cobalt, MW-07 (mg/L)
log(Value)
−6.8
−6.9
−7.0
−7.1
−7.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

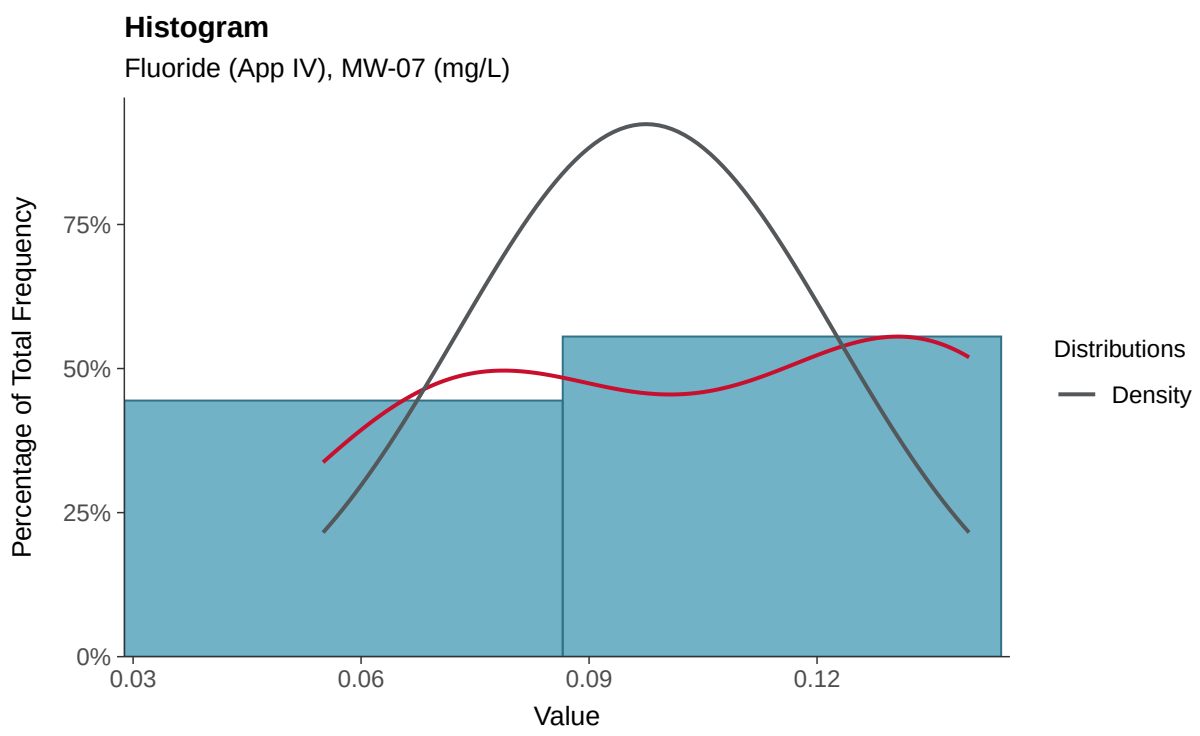

Trend Regression: Piecewise Linear-Linear
Cobalt, MW-07 (mg/L)
0.0011
0.0010
0.0009
0.0008
0.0007
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Cobalt, MW-07 (mg/L)
0.0011
0.0010
0.0009
0.0008
0.0007
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-07

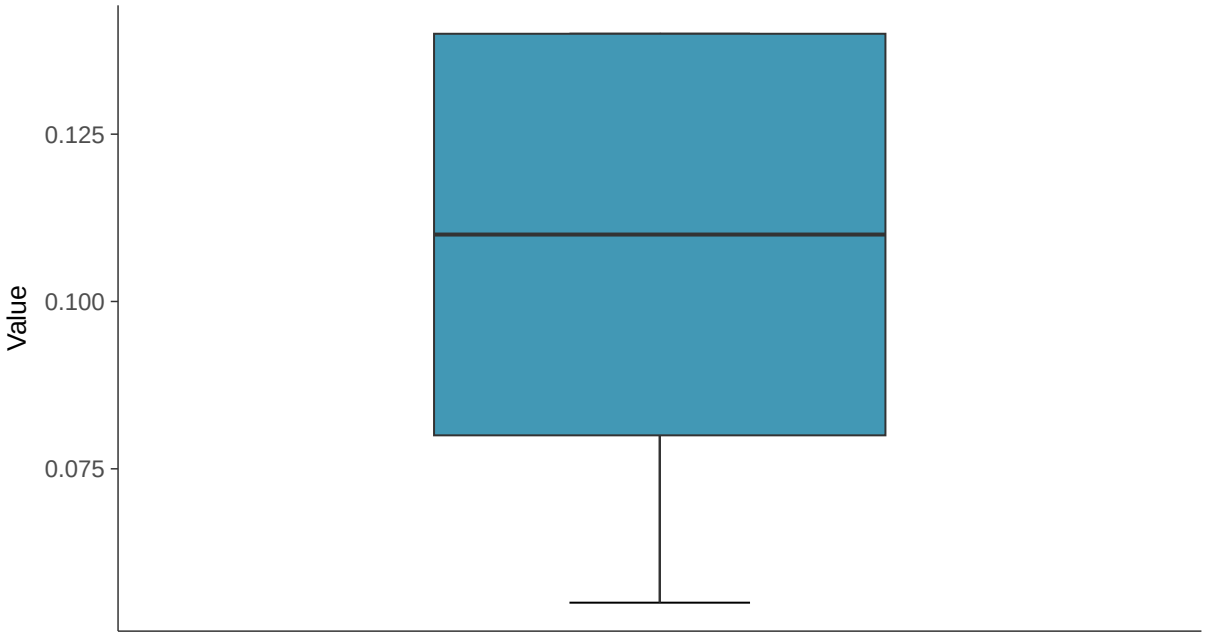
ID: 2_16_5_113





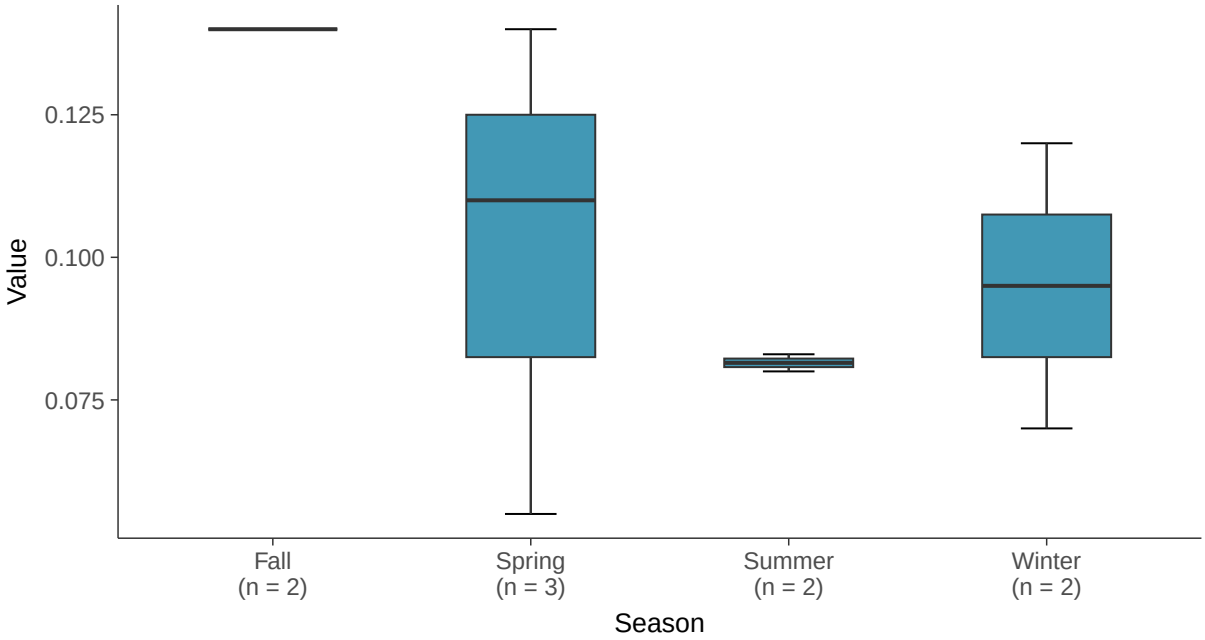
Boxplot

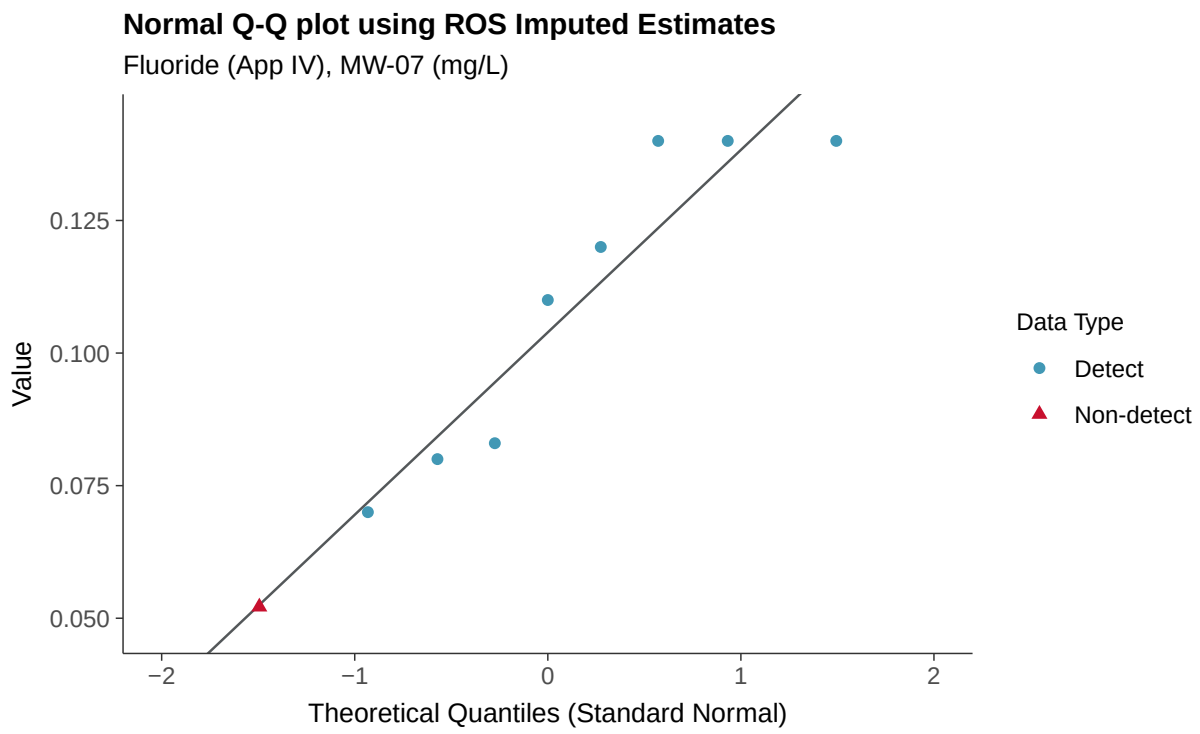
Fluoride (App IV), MW-07 (mg/L)

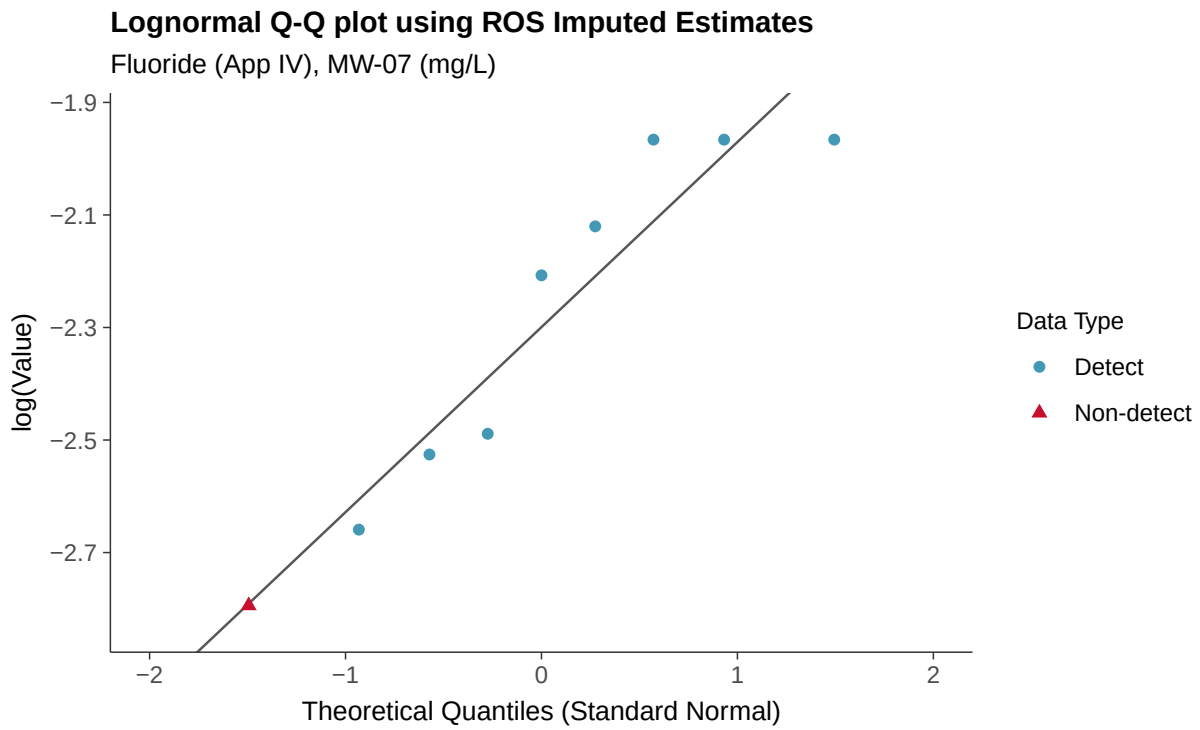


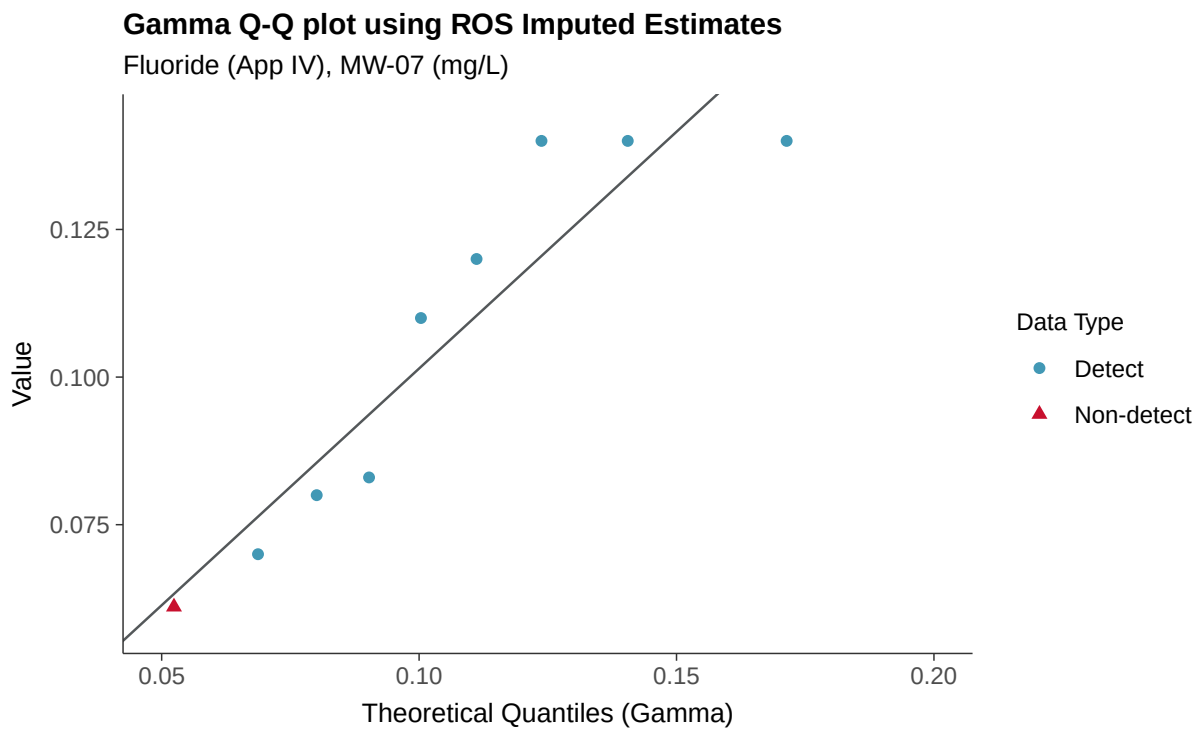
Boxplot by Season

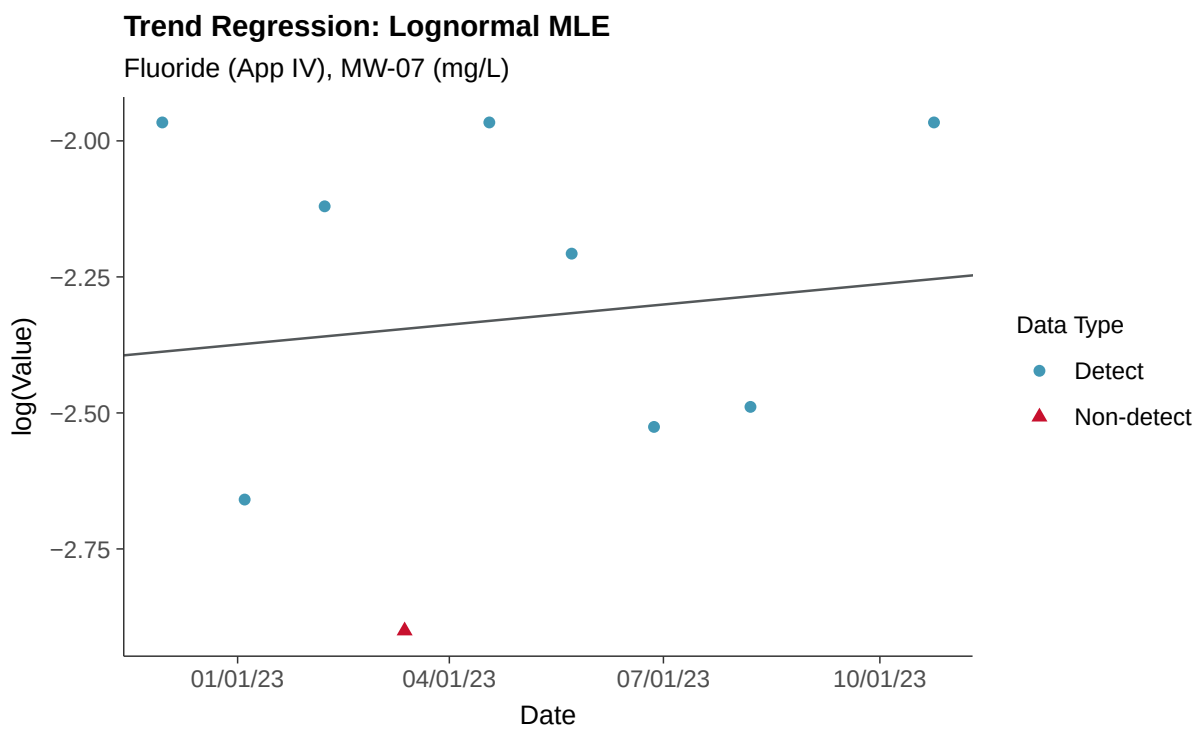
Fluoride (App IV), MW-07 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Fluoride (App IV), MW-07 (mg/L)
Value
0.125
0.100
0.075
0.050
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

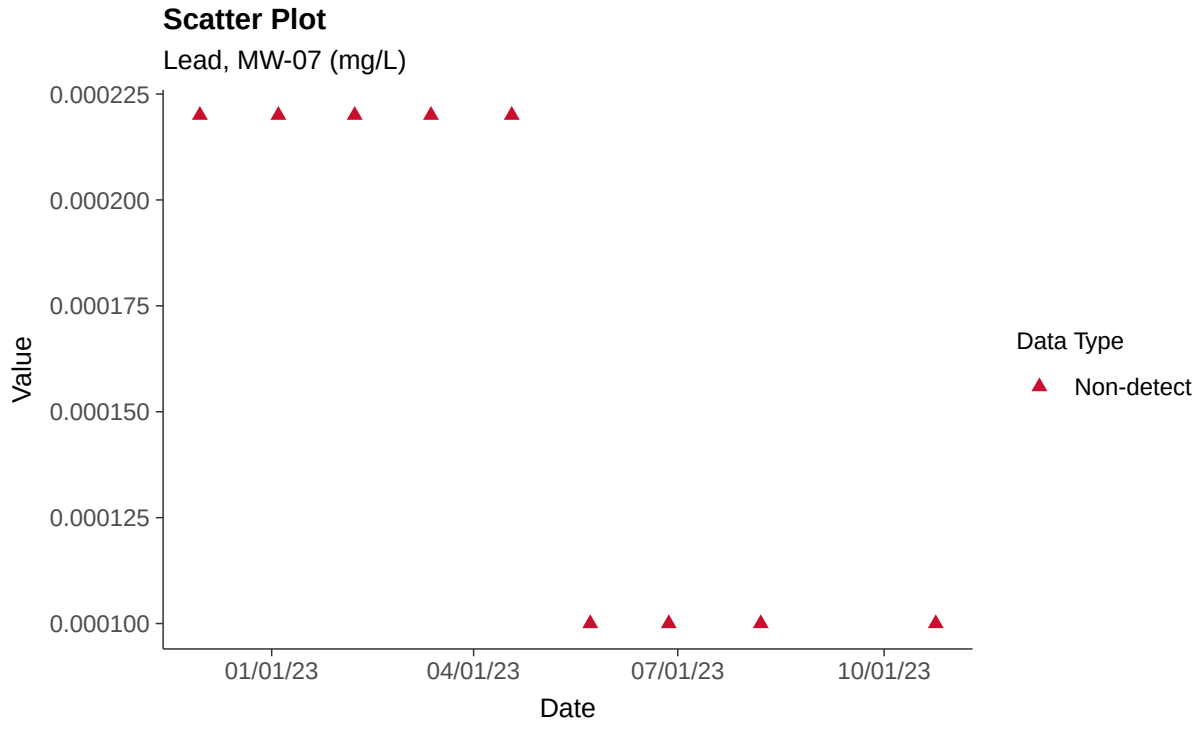

Lognormal Q-Q plot using ROS Imputed Estimates
Fluoride (App IV), MW-07 (mg/L)
log(Value)
−1.9
−2.1
−2.3
−2.5
−2.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

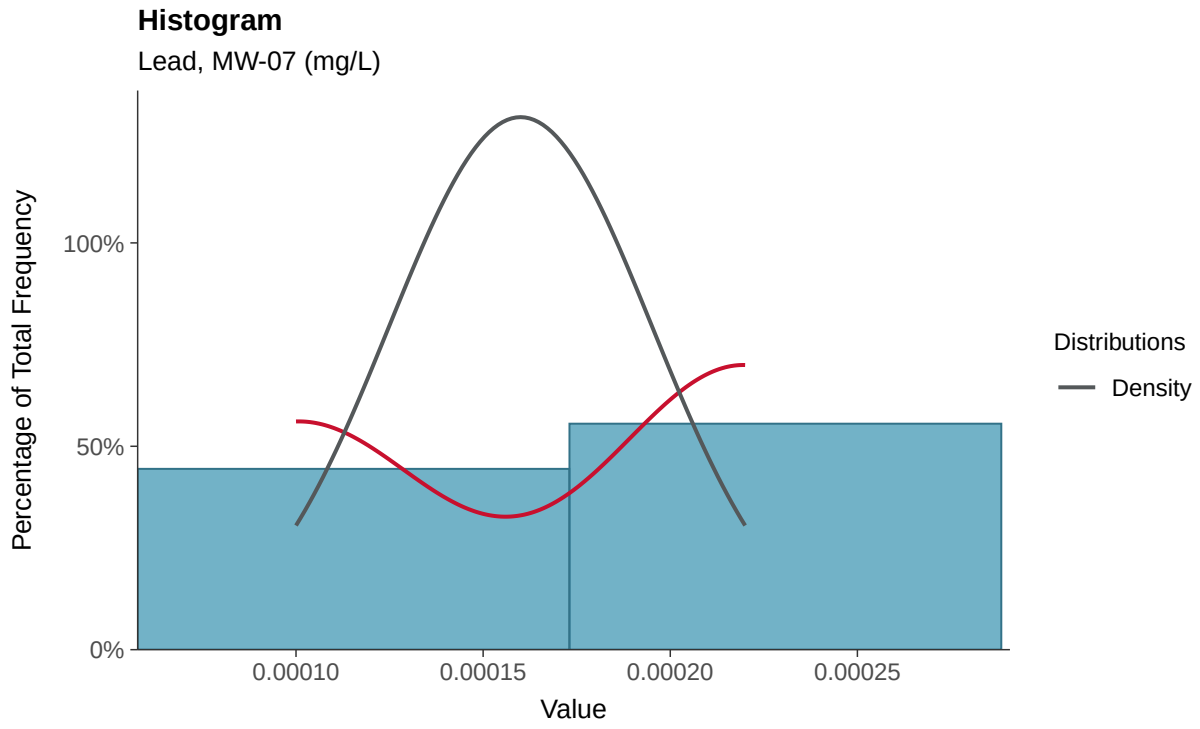

Gamma Q-Q plot using ROS Imputed Estimates
Fluoride (App IV), MW-07 (mg/L)
Value
0.125
0.100
0.075
0.05
0.10
0.15
0.20
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-07 (mg/L)
log(Value)
−2.00
−2.25
−2.50
−2.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lead, MW-07

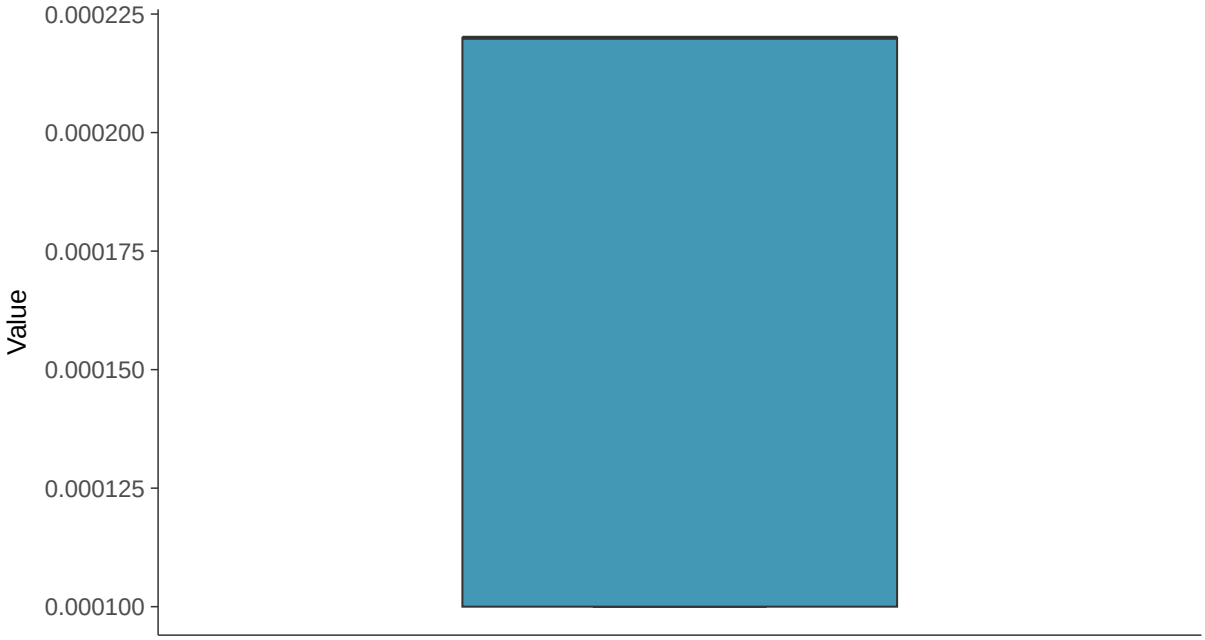
ID: 2_16_5_115





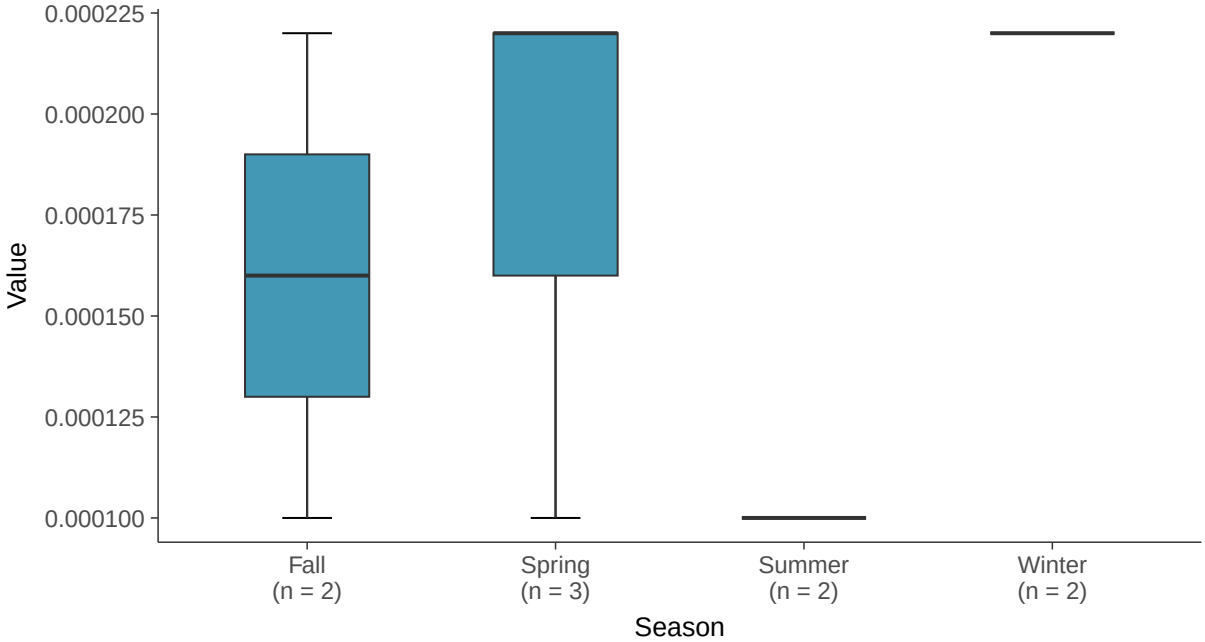
Boxplot

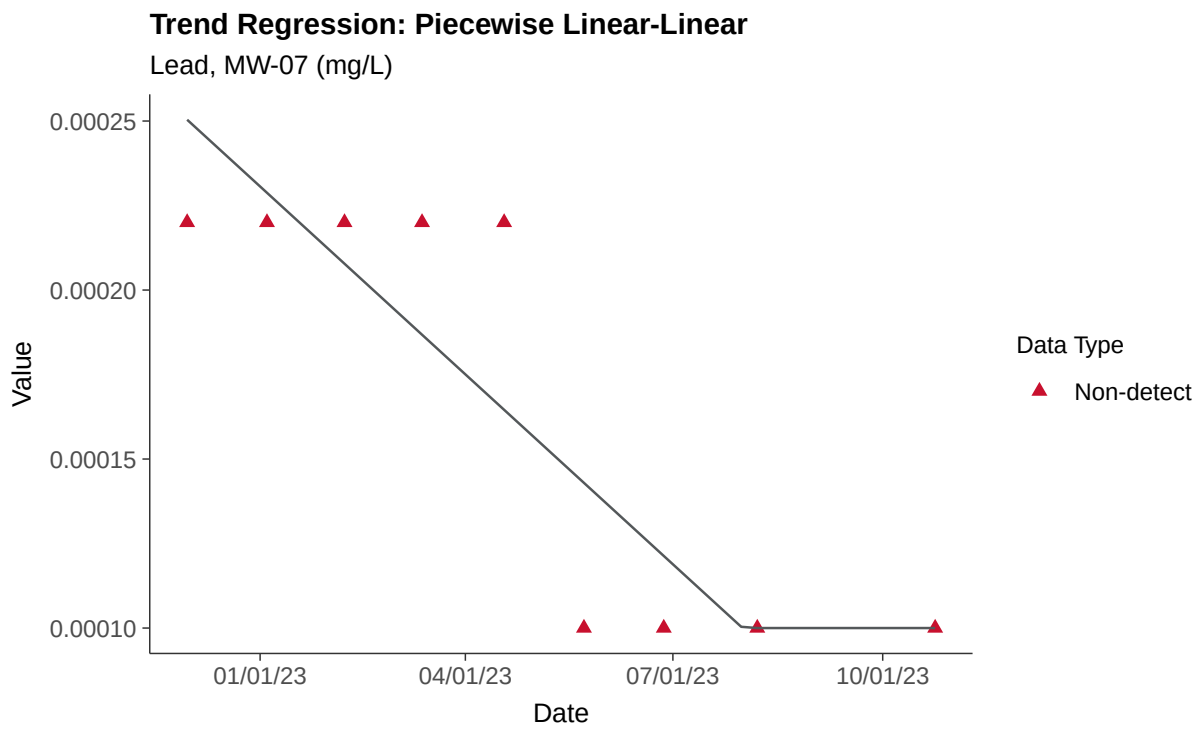
Lead, MW-07 (mg/L)

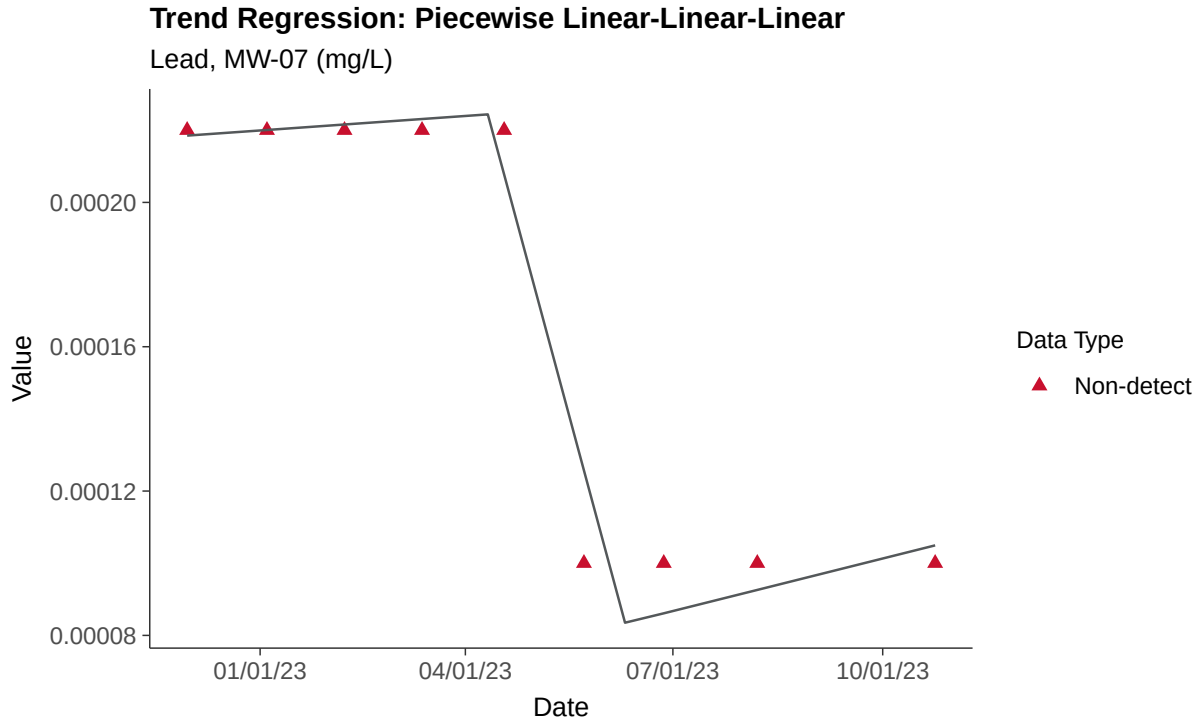


Boxplot by Season

Lead, MW-07 (mg/L)

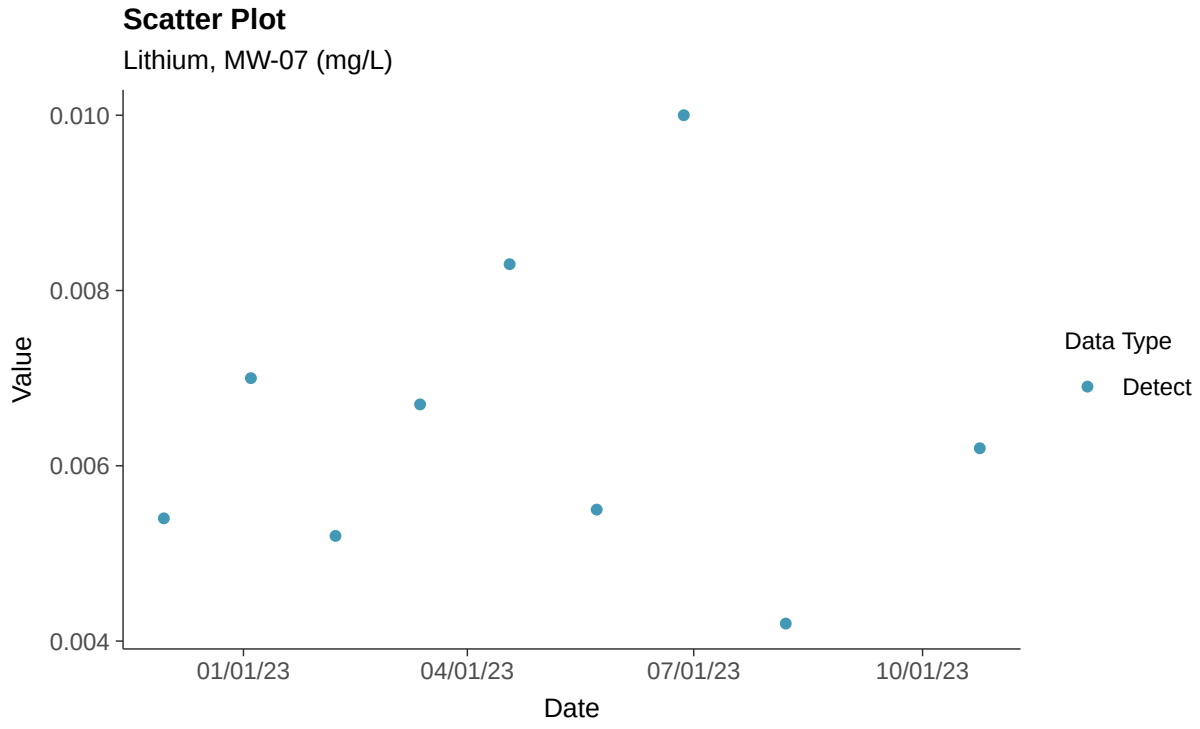


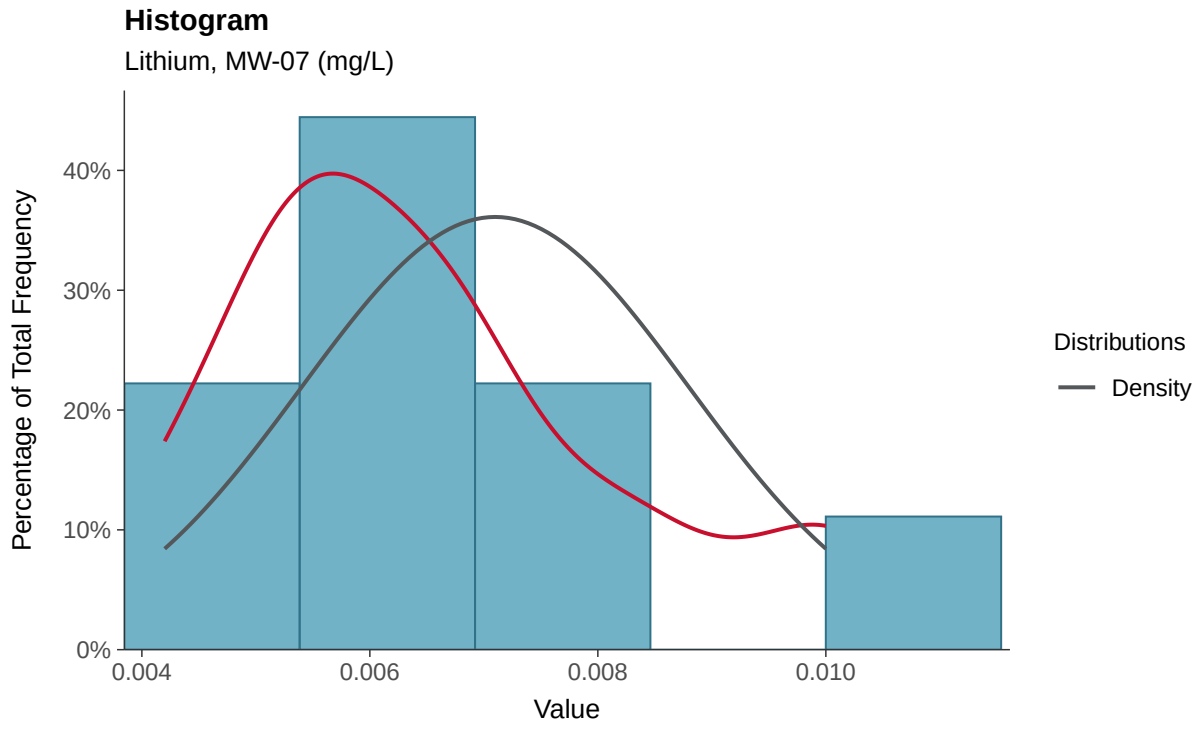

Trend Regression: Piecewise Linear-Linear
Lead, MW-07 (mg/L)
0.00025
0.00020
0.00015
0.00010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-07 (mg/L)
0.00020
0.00016
0.00012
0.00008
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Lithium, MW-07

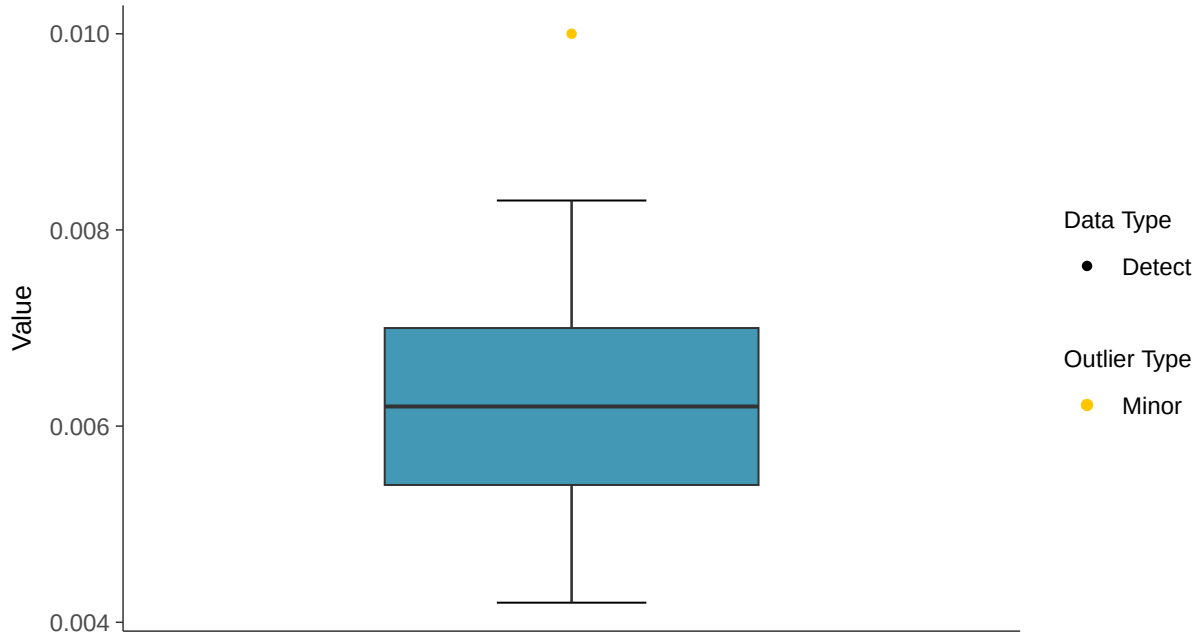
ID: 2_16_5_116





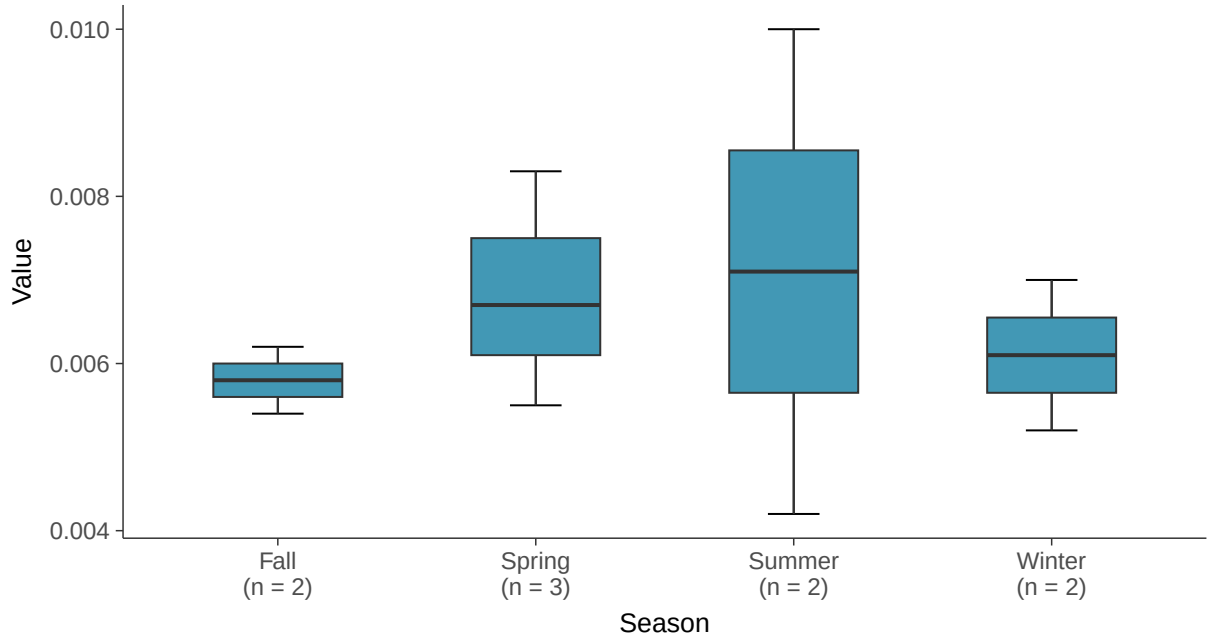
Boxplot

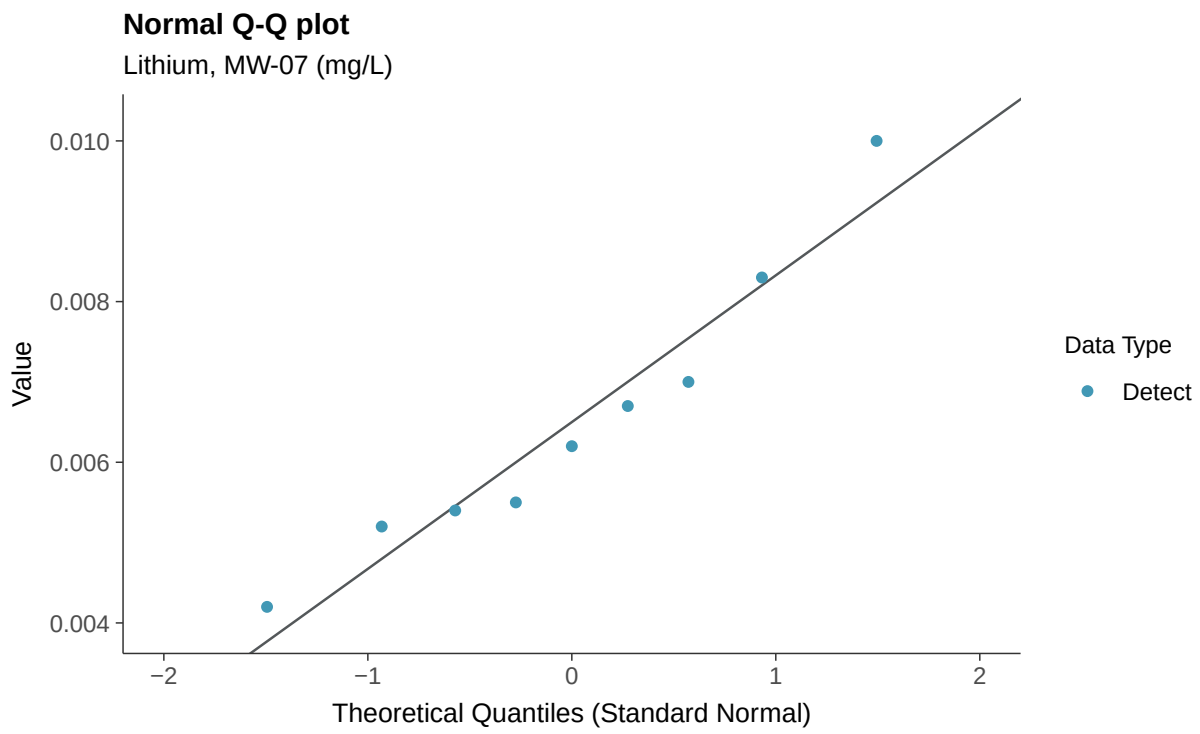
Lithium, MW-07 (mg/L)

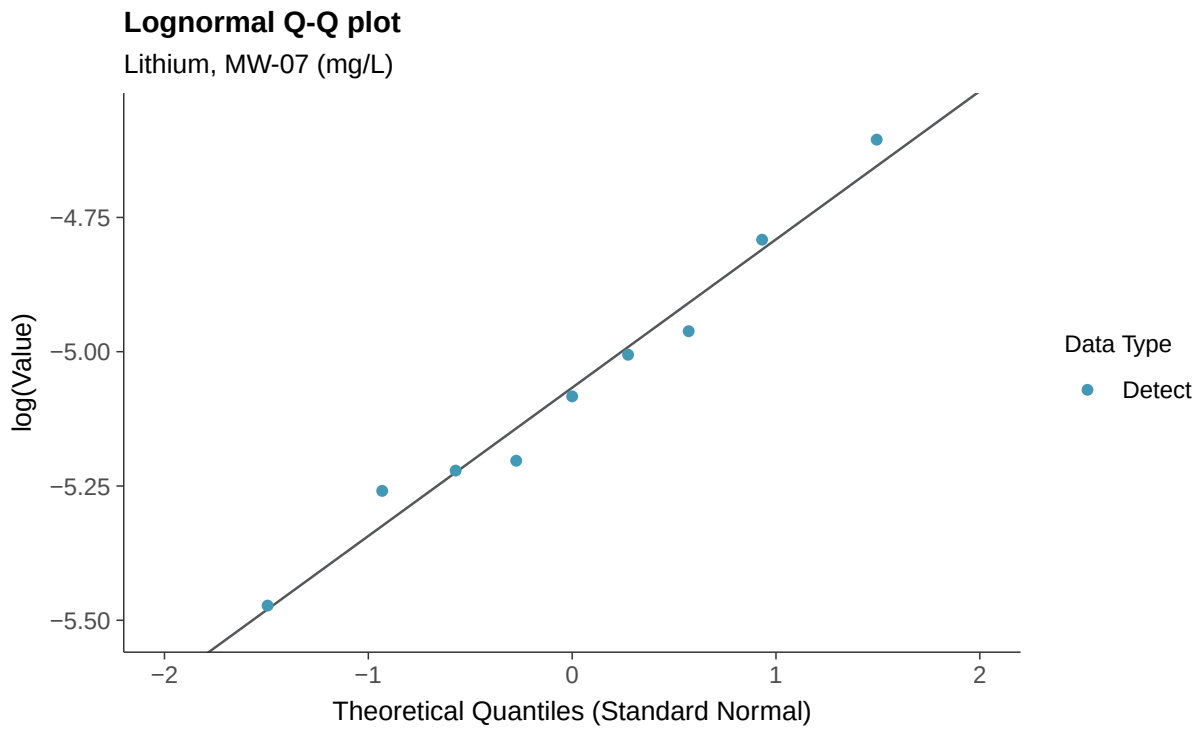


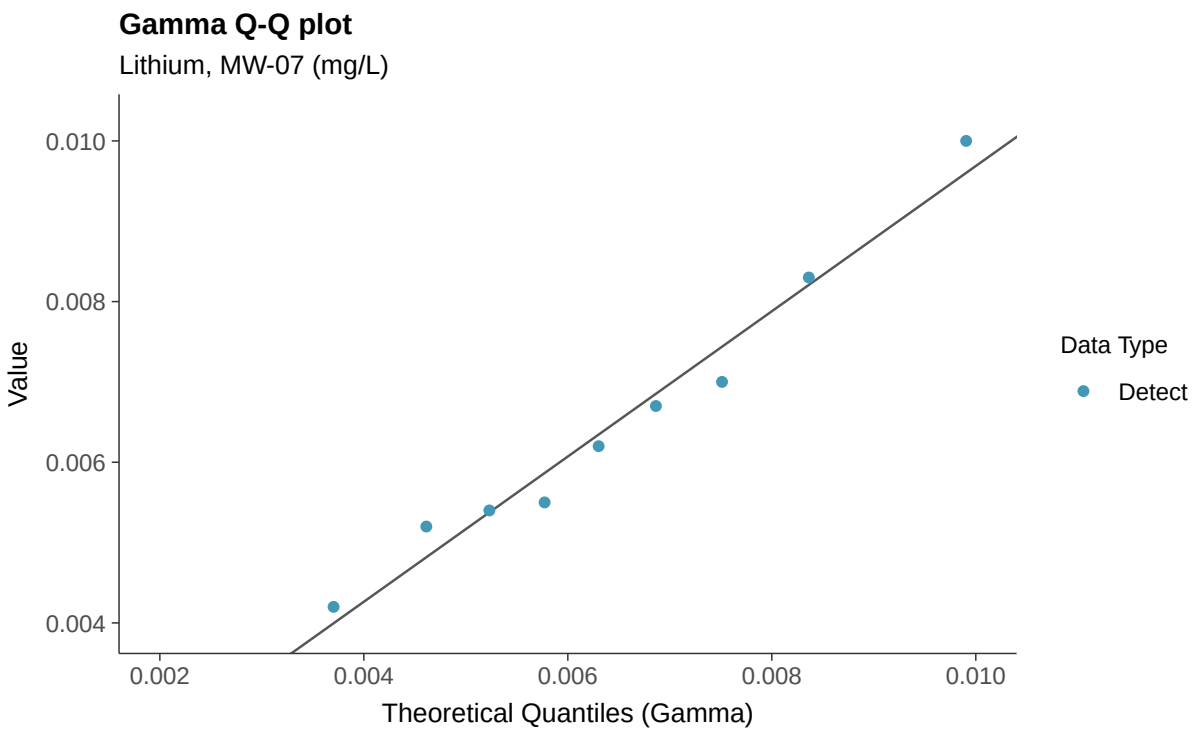
Boxplot by Season

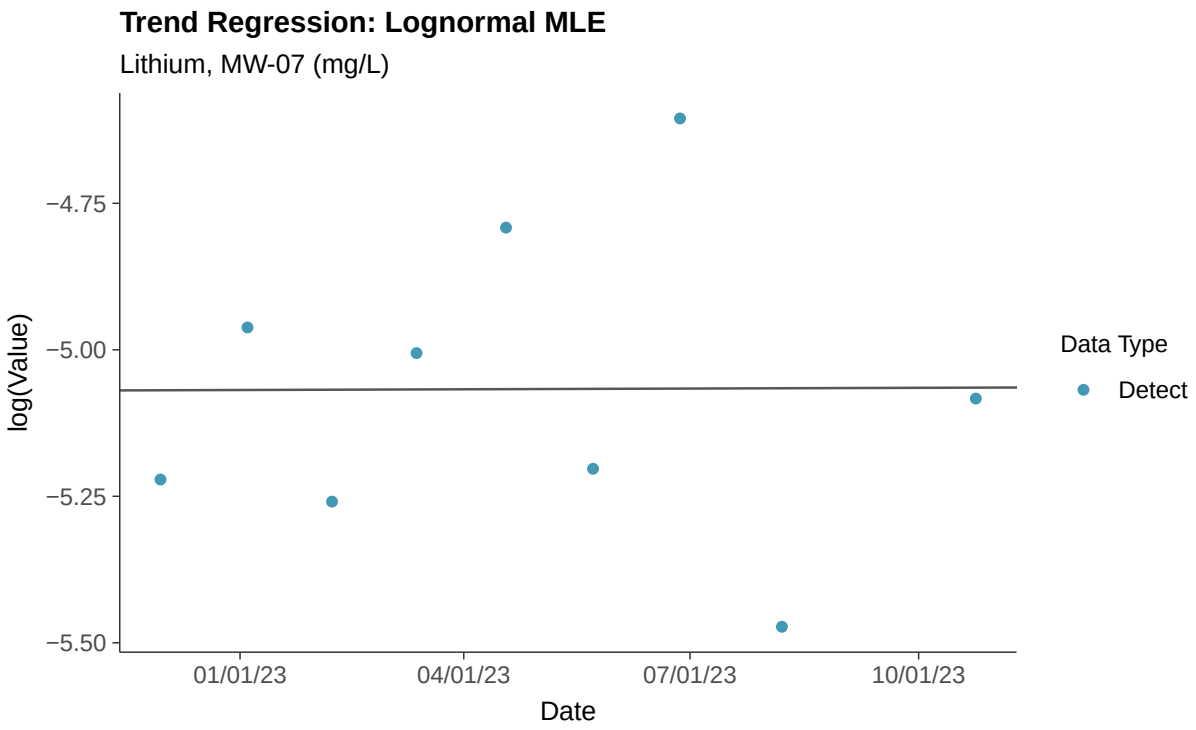
Lithium, MW-07 (mg/L)

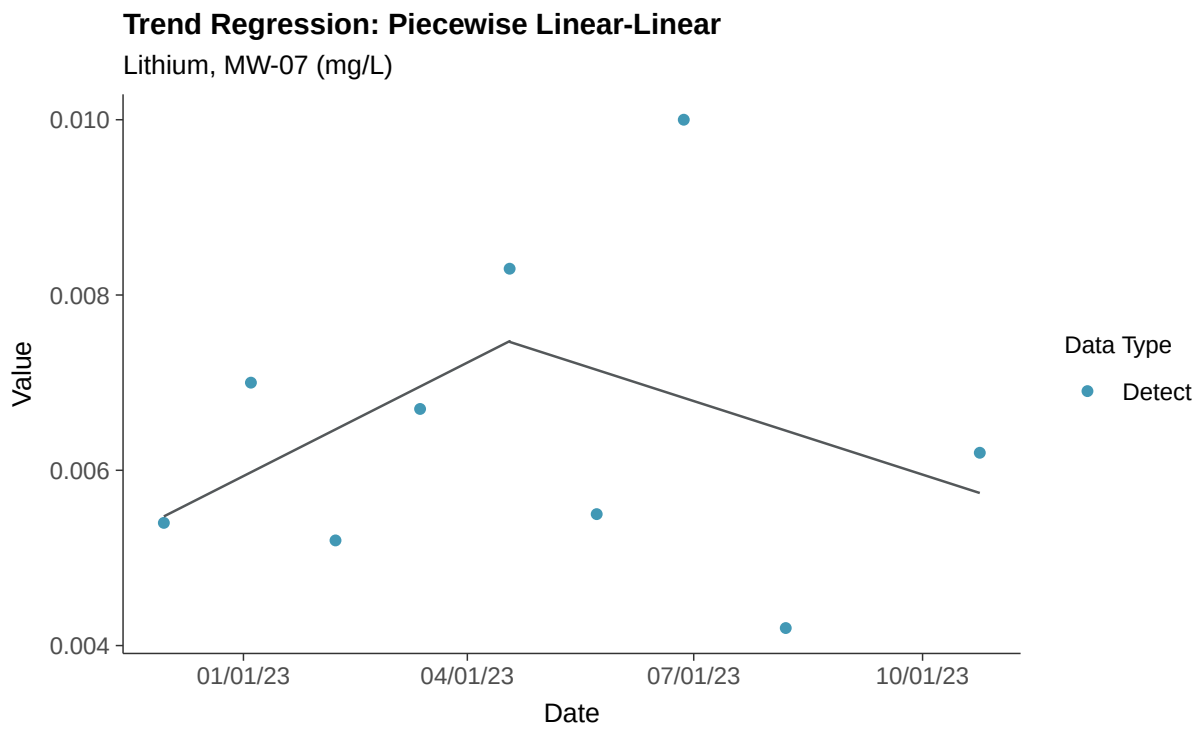



Normal Q-Q plot
Lithium, MW-07 (mg/L)
Value
0.010
0.008
0.006
0.004
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-07 (mg/L)
log(Value)
−4.75
−5.00
−5.25
−5.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

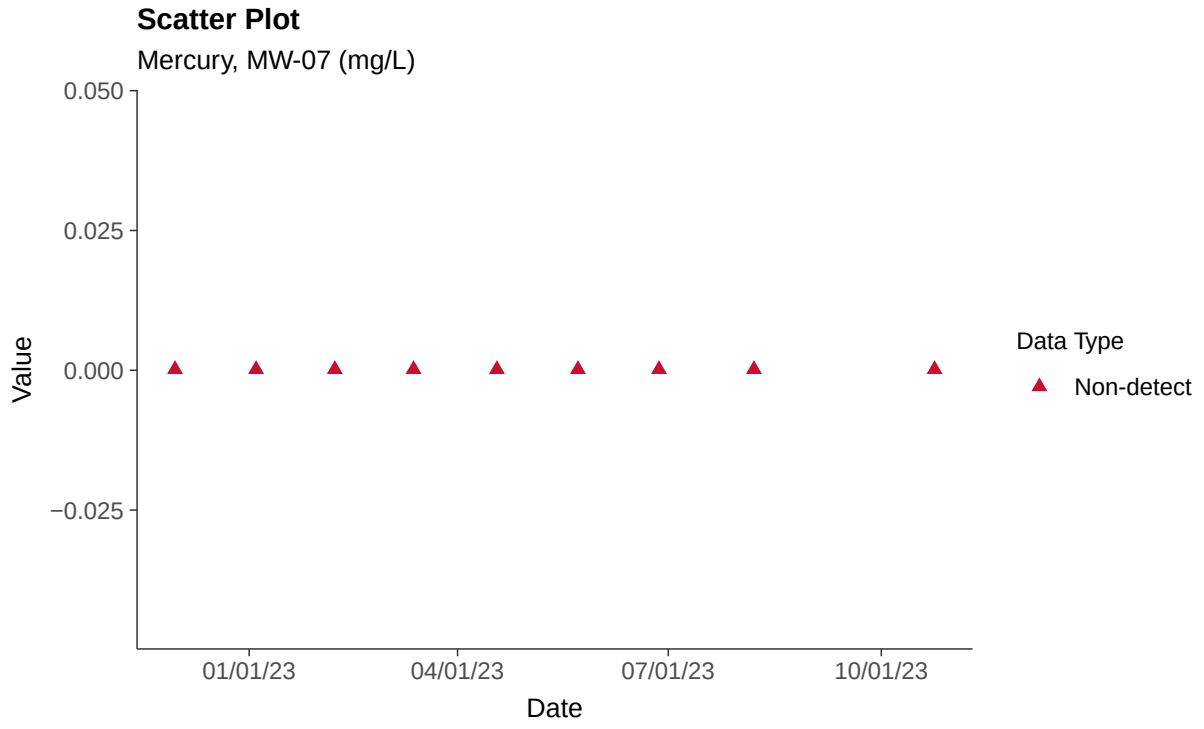

Gamma Q-Q plot
Lithium, MW-07 (mg/L)
Value
0.010
0.008
0.006
0.004
0.002
0.004
0.006
0.008
0.010
Theoretical Quantiles (Gamma)
Data Type
Detect

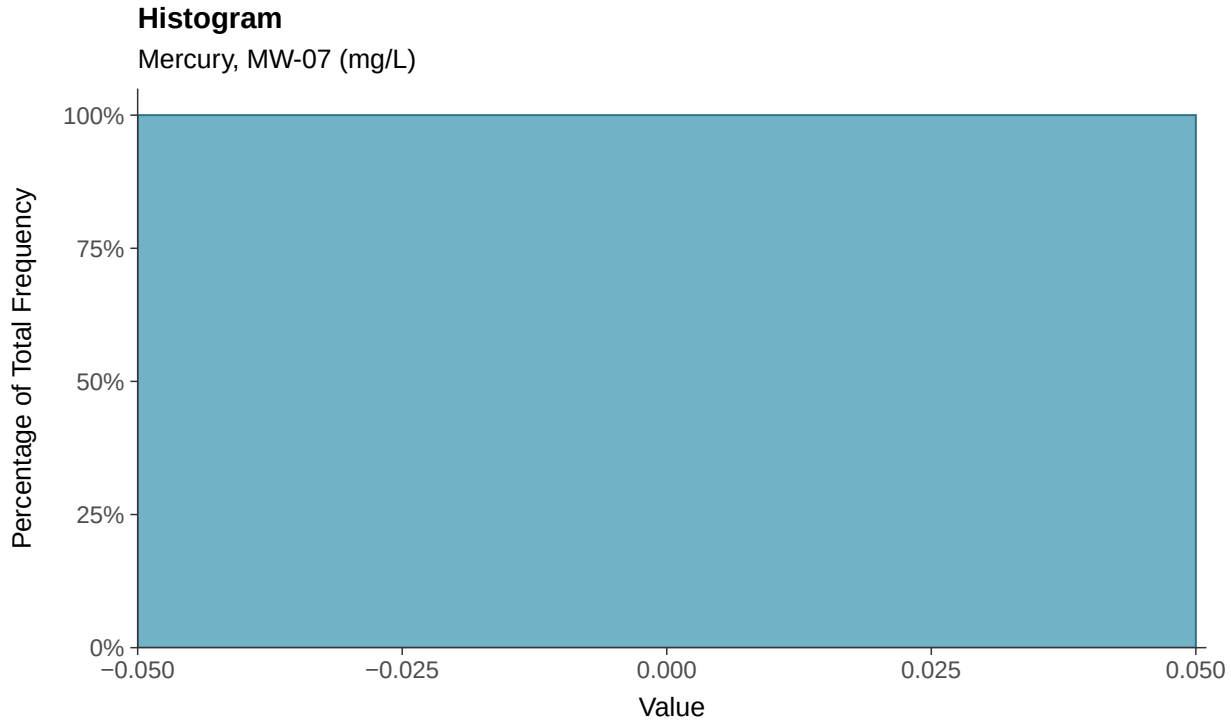

Trend Regression: Lognormal MLE
Lithium, MW-07 (mg/L)
log(Value)
−4.75
−5.00
−5.25
−5.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Lithium, MW-07 (mg/L)
0.010
0.008
0.006
0.004
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-07

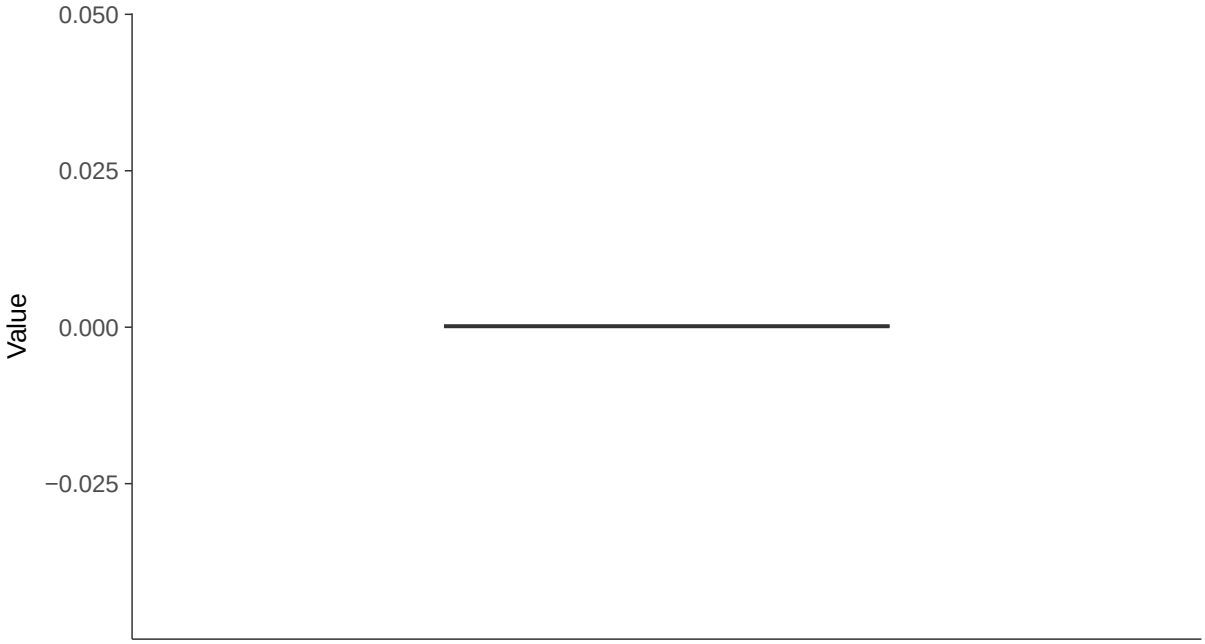
ID: 2_16_5_117





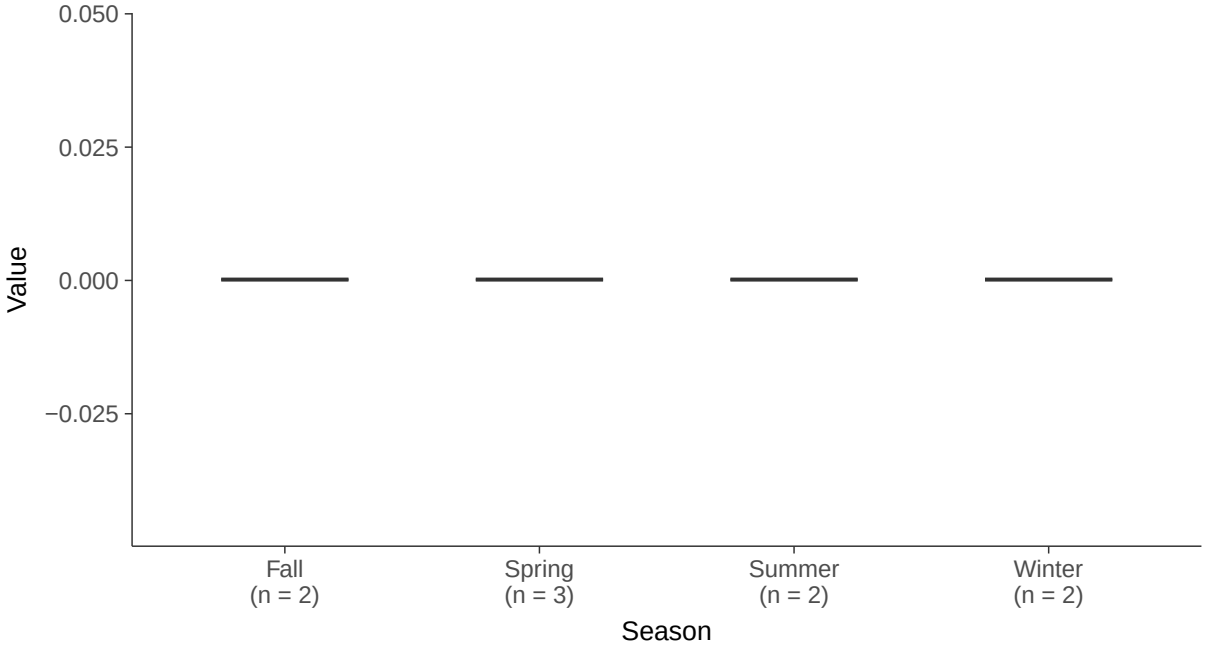
Boxplot

Mercury, MW-07 (mg/L)



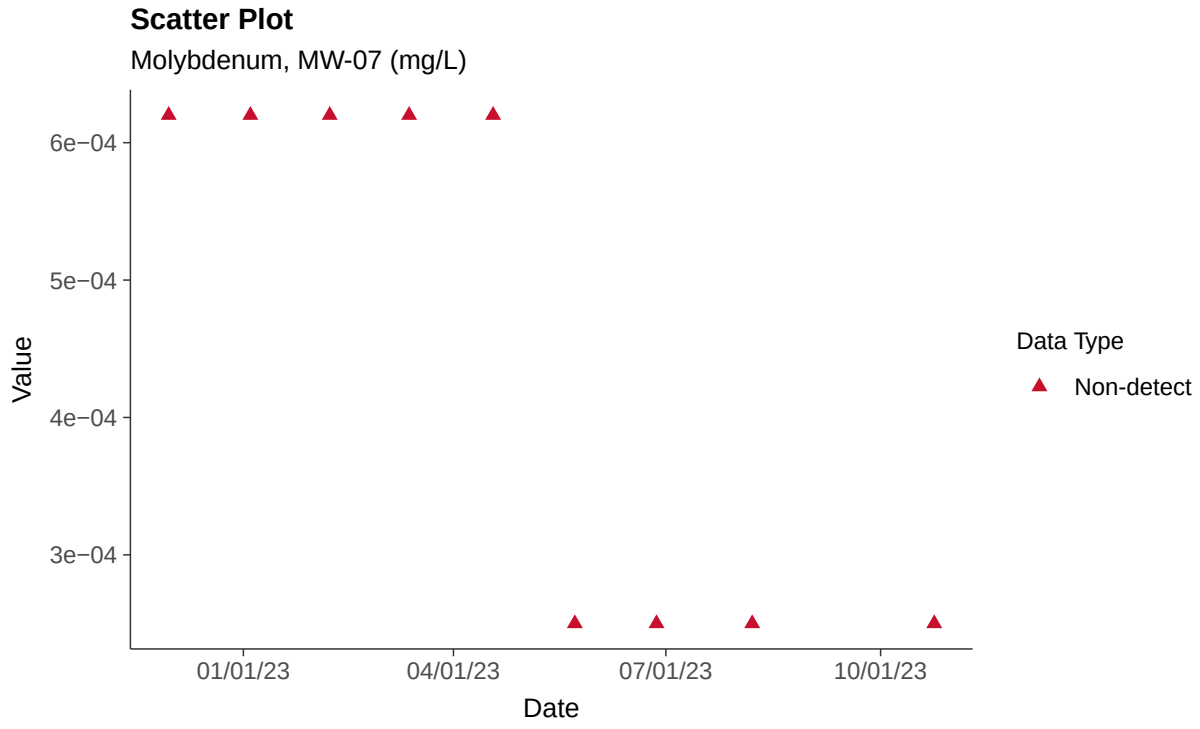
Boxplot by Season

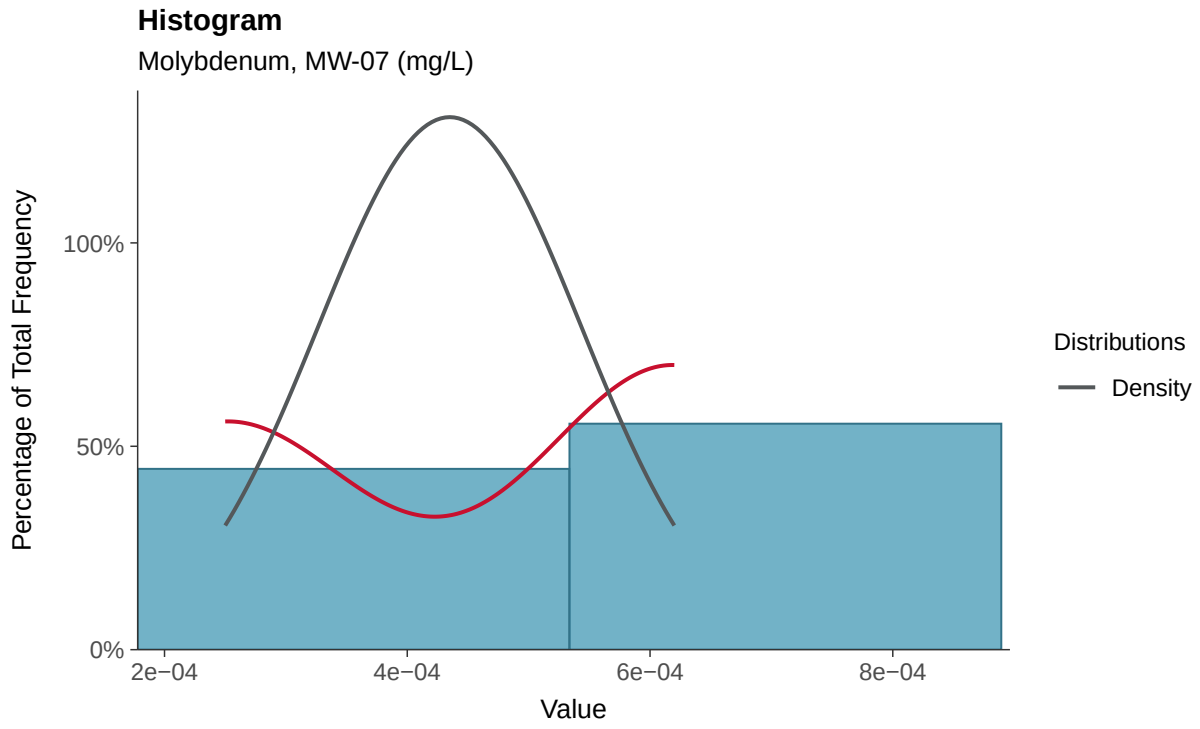
Mercury, MW-07 (mg/L)



Appendix IV: Molybdenum, MW-07

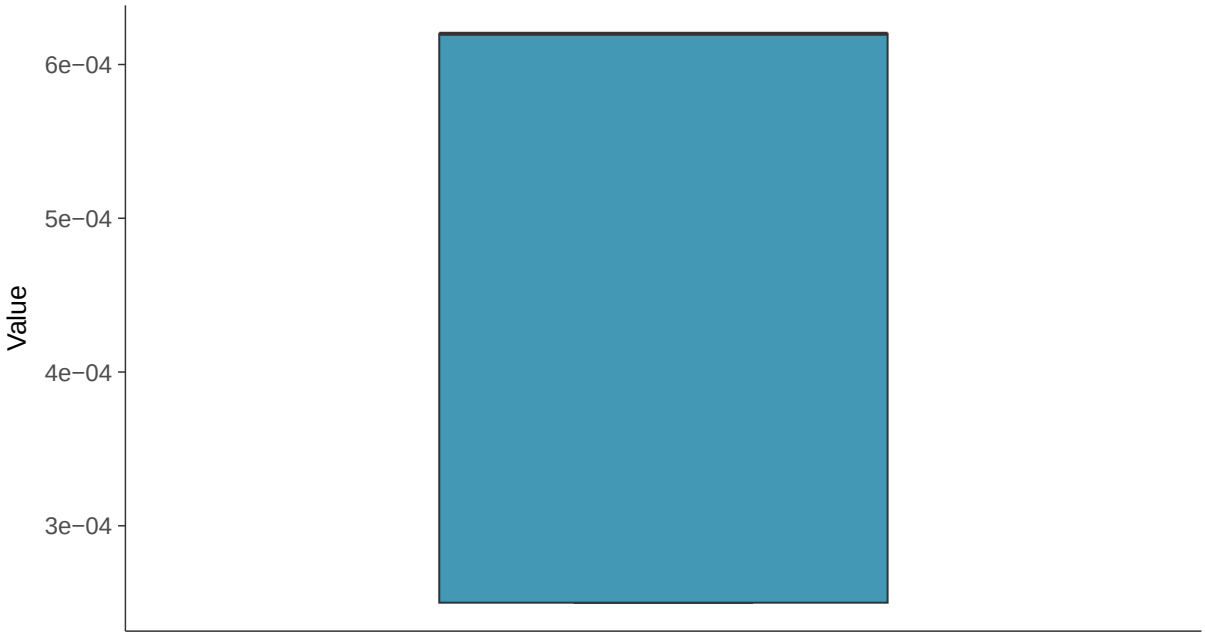
ID: 2_16_5_118





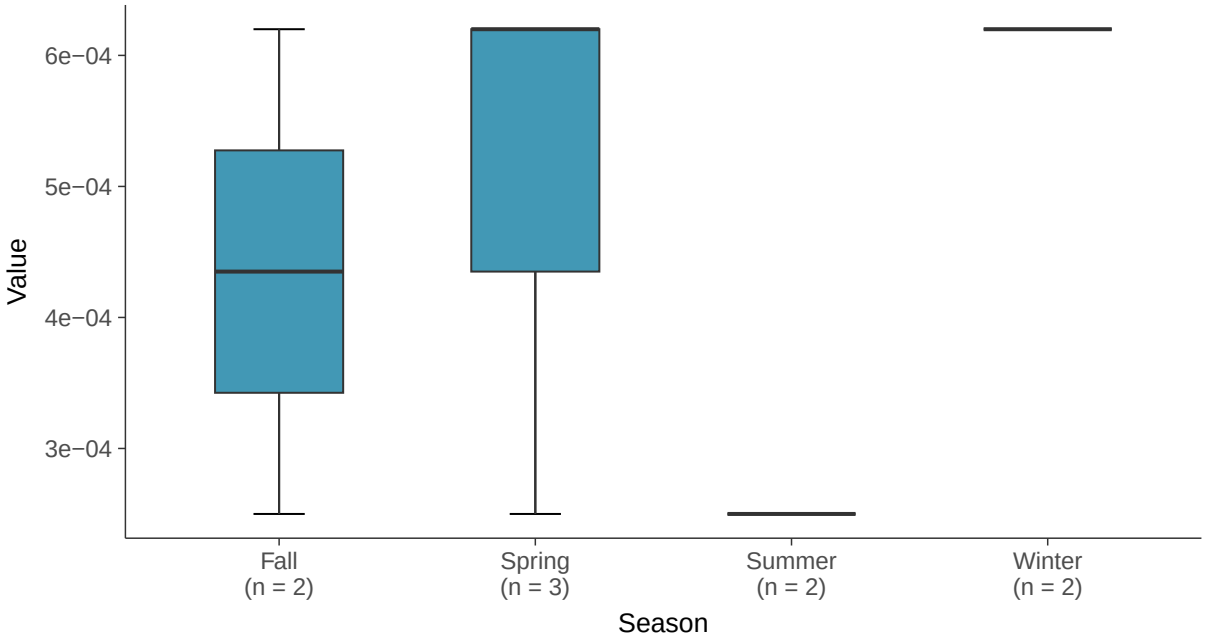
Boxplot

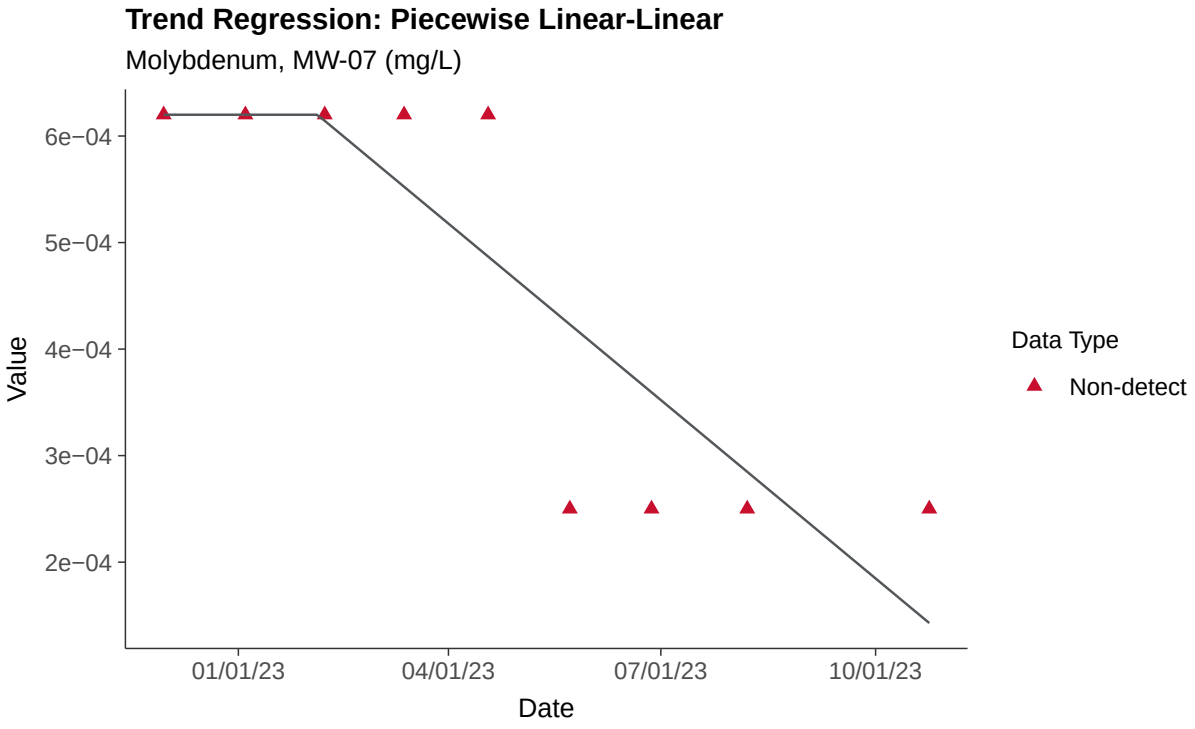
Molybdenum, MW-07 (mg/L)

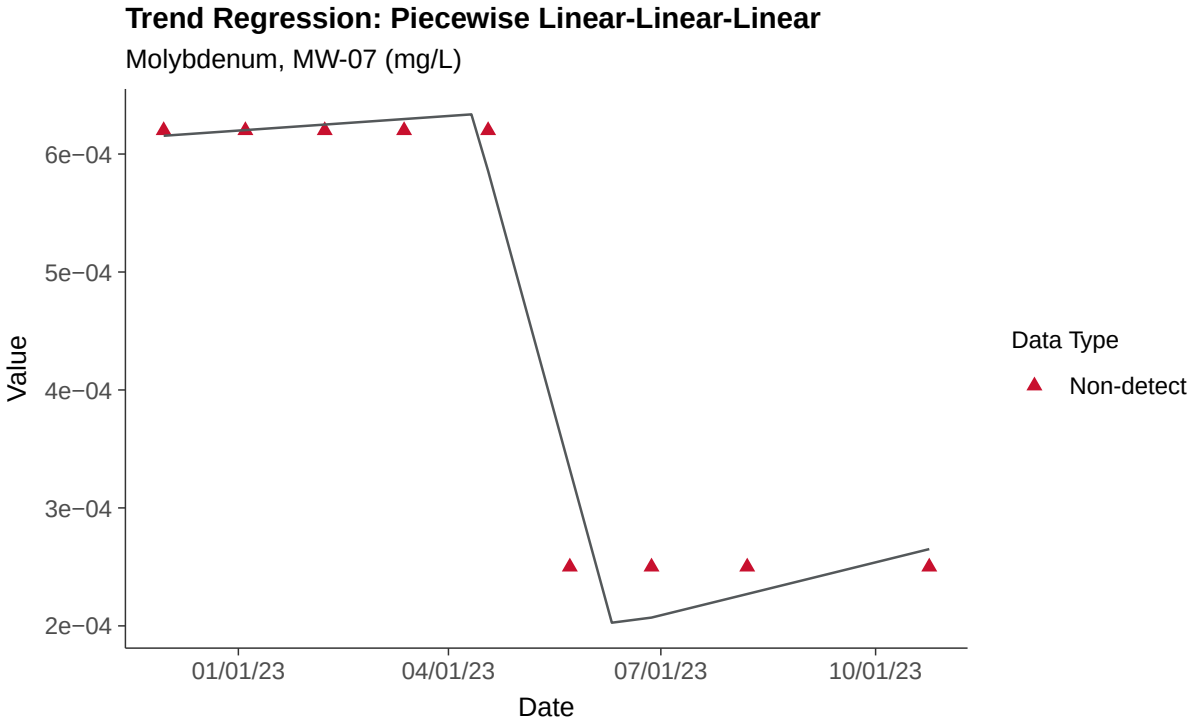


Boxplot by Season

Molybdenum, MW-07 (mg/L)

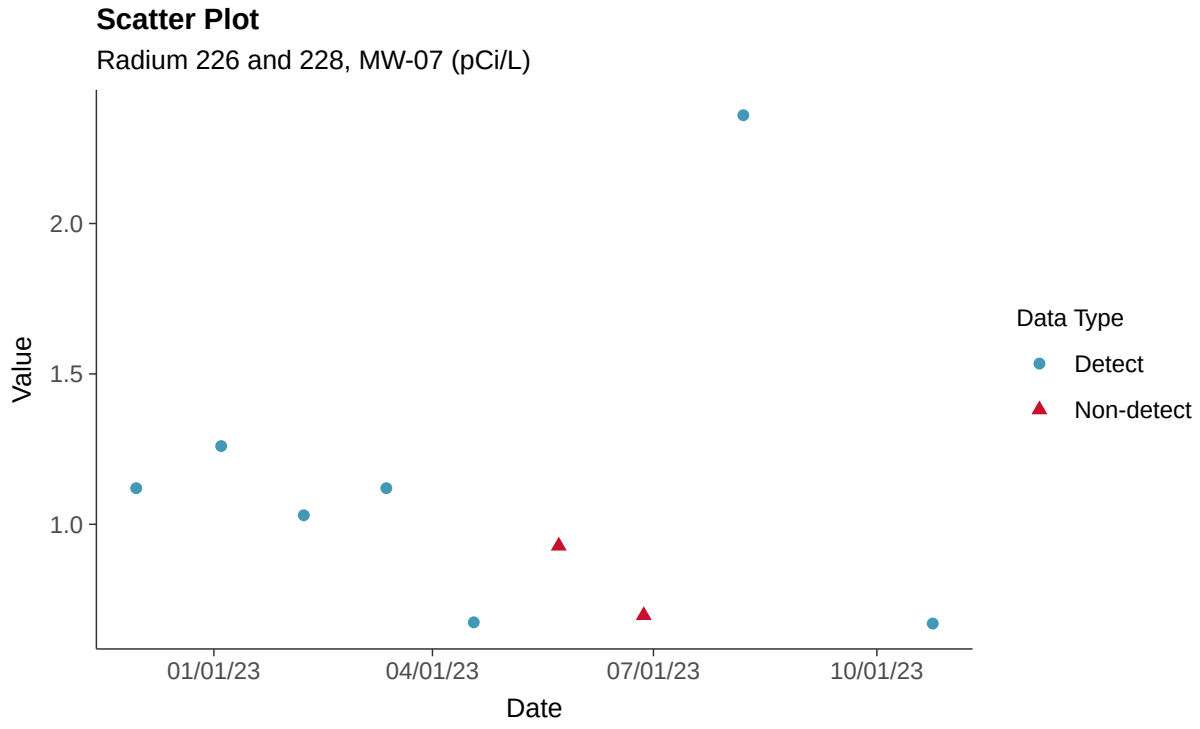


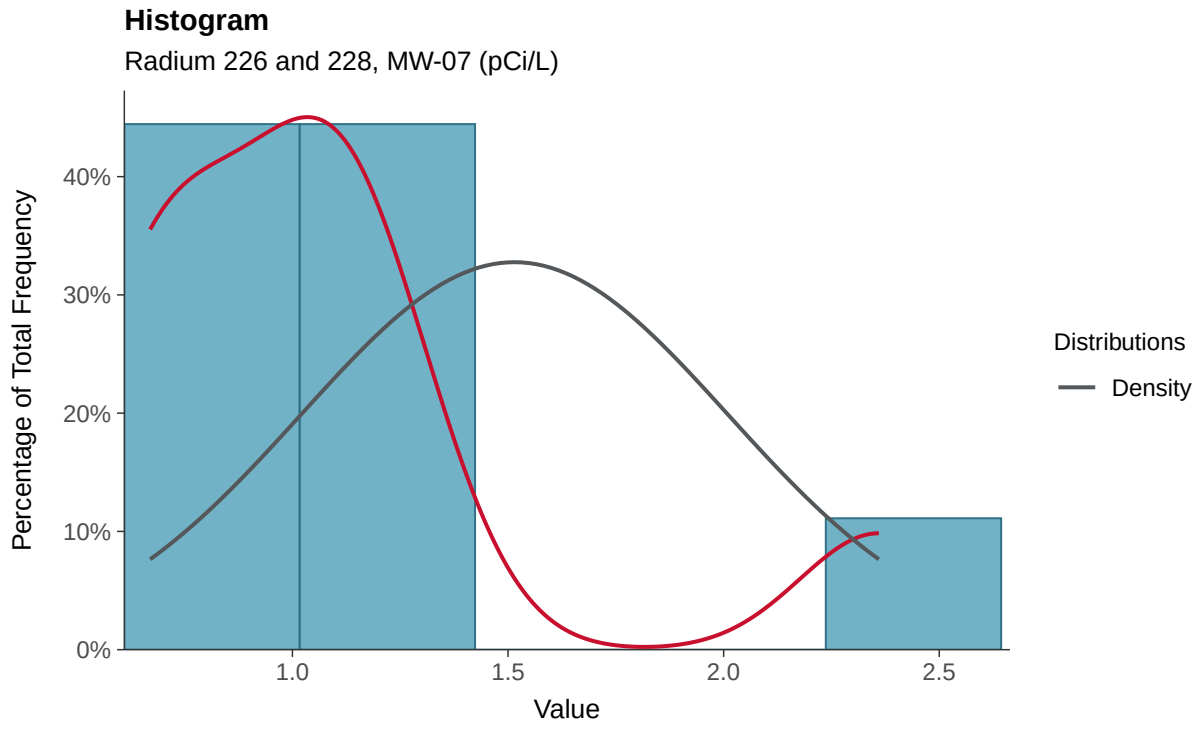

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-07 (mg/L)
6e−04
5e−04
4e−04
3e−04
2e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-07 (mg/L)
6e−04
5e−04
4e−04
3e−04
2e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Radium 226 and 228, MW-07

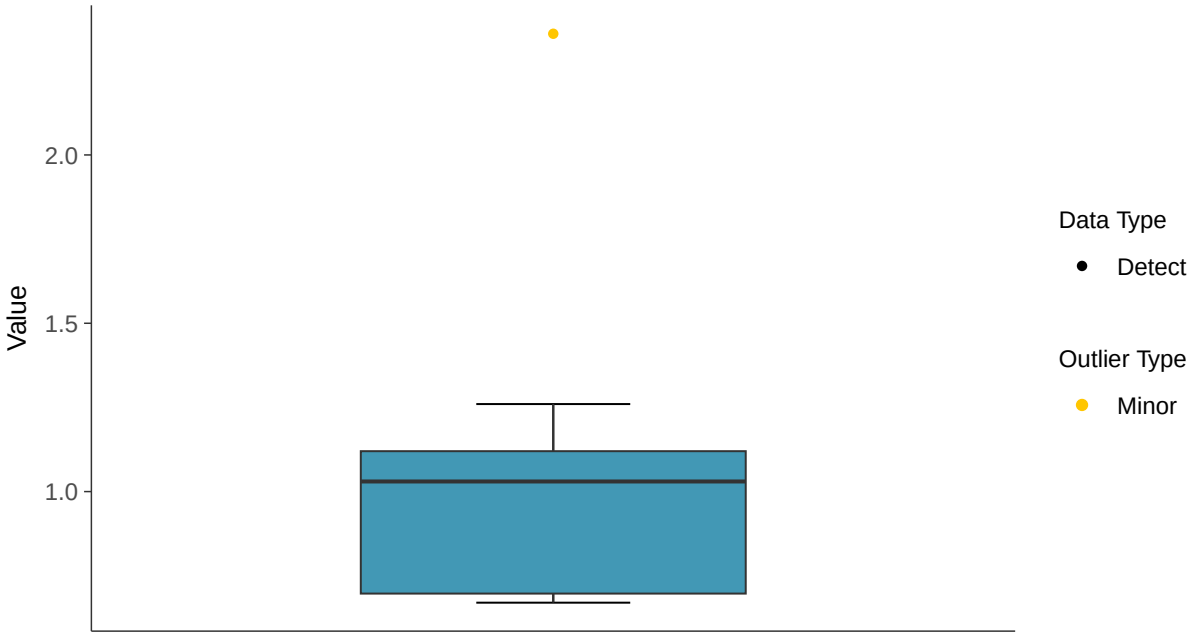
ID: 2_16_5_121





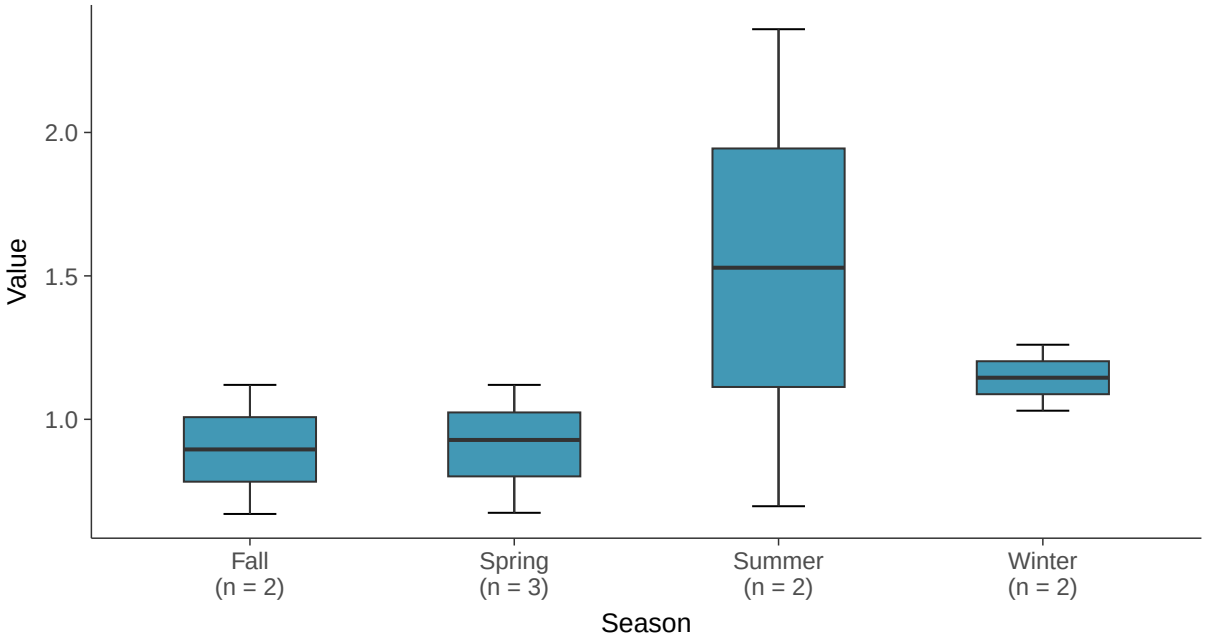
Boxplot

Radium 226 and 228, MW-07 (pCi/L)



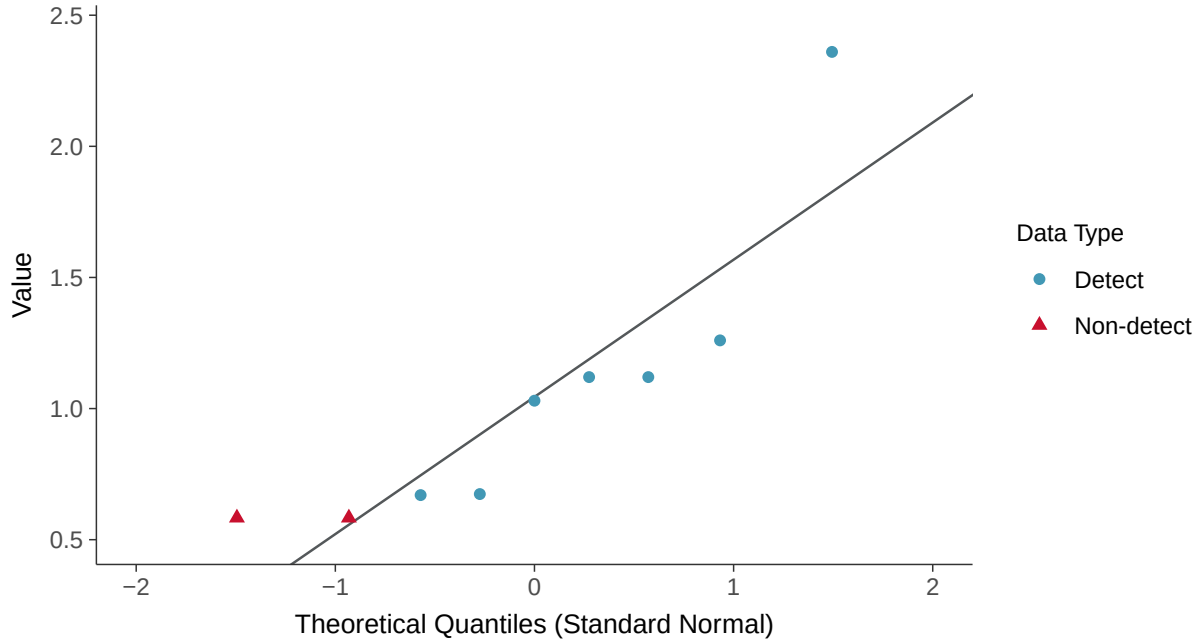
Boxplot by Season

Radium 226 and 228, MW-07 (pCi/L)



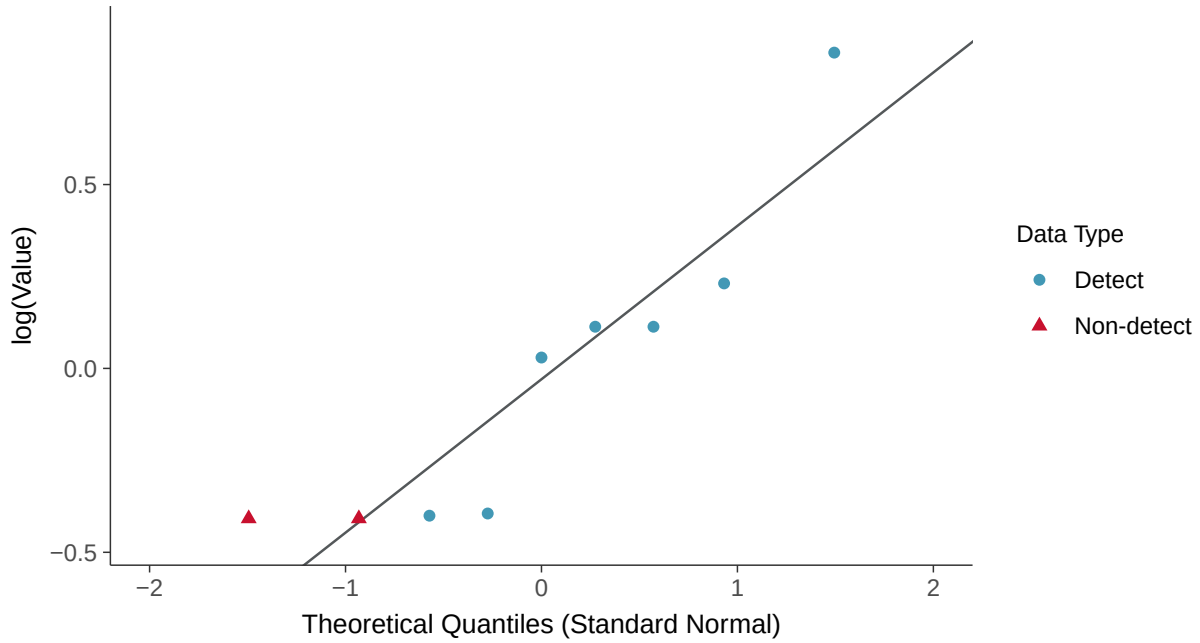
Normal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-07 (pCi/L)



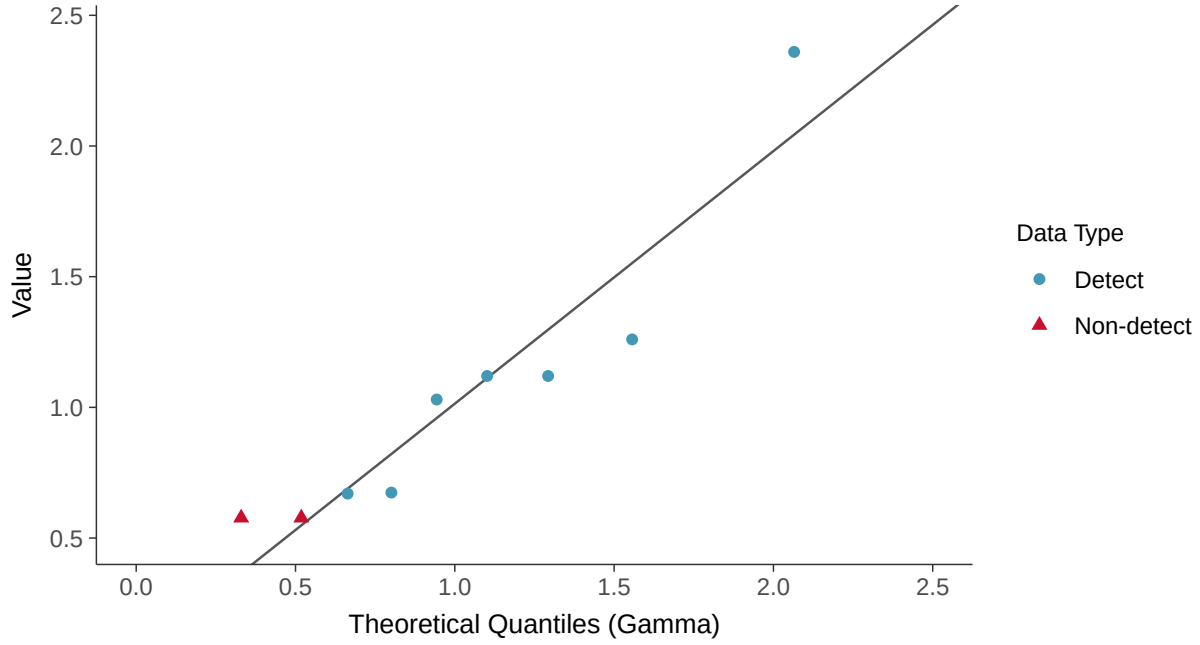
Lognormal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-07 (pCi/L)



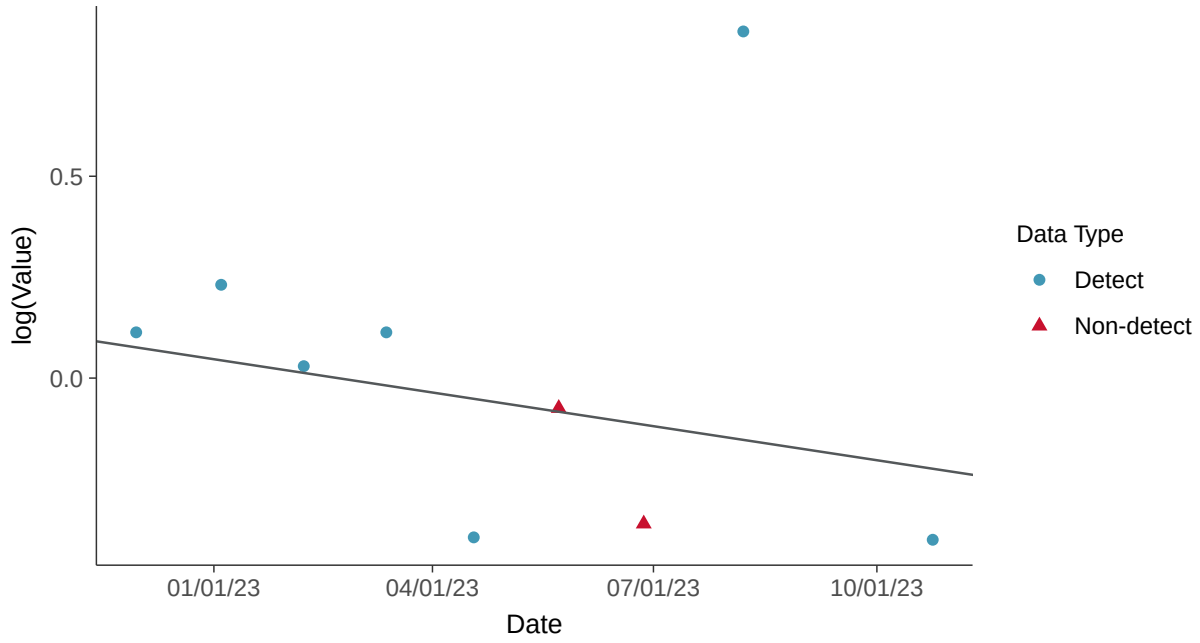
Gamma Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-07 (pCi/L)



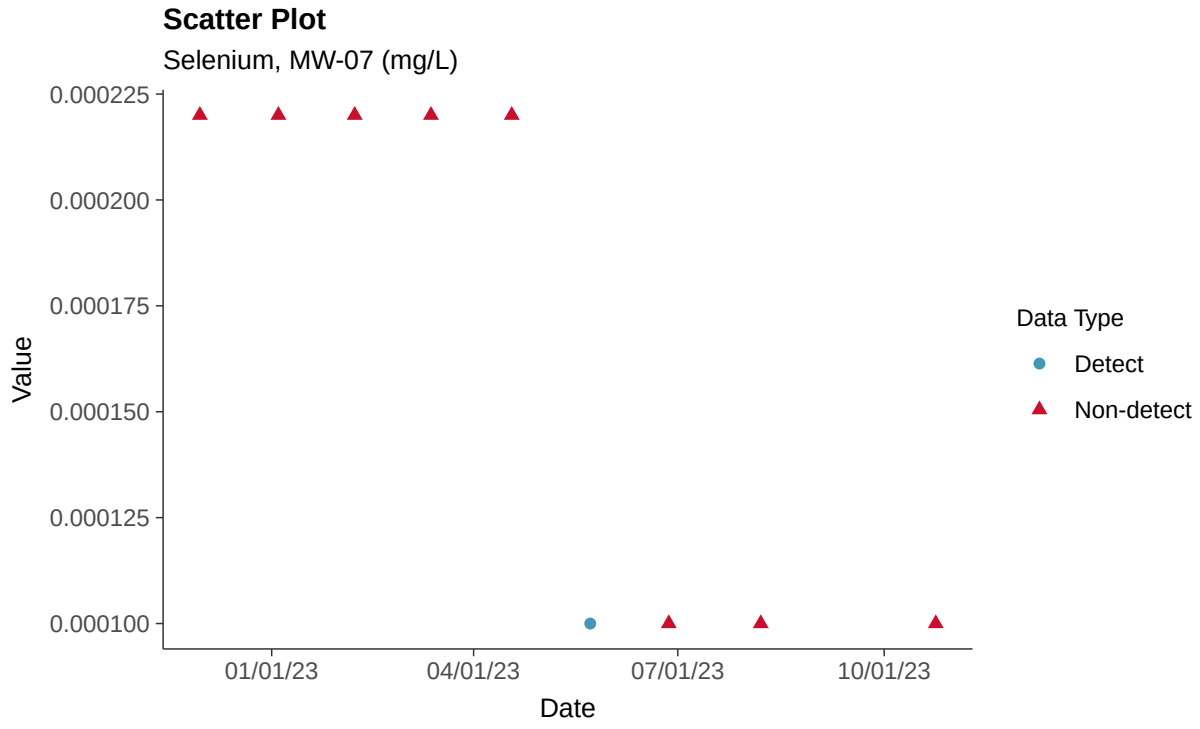
Trend Regression: Lognormal MLE

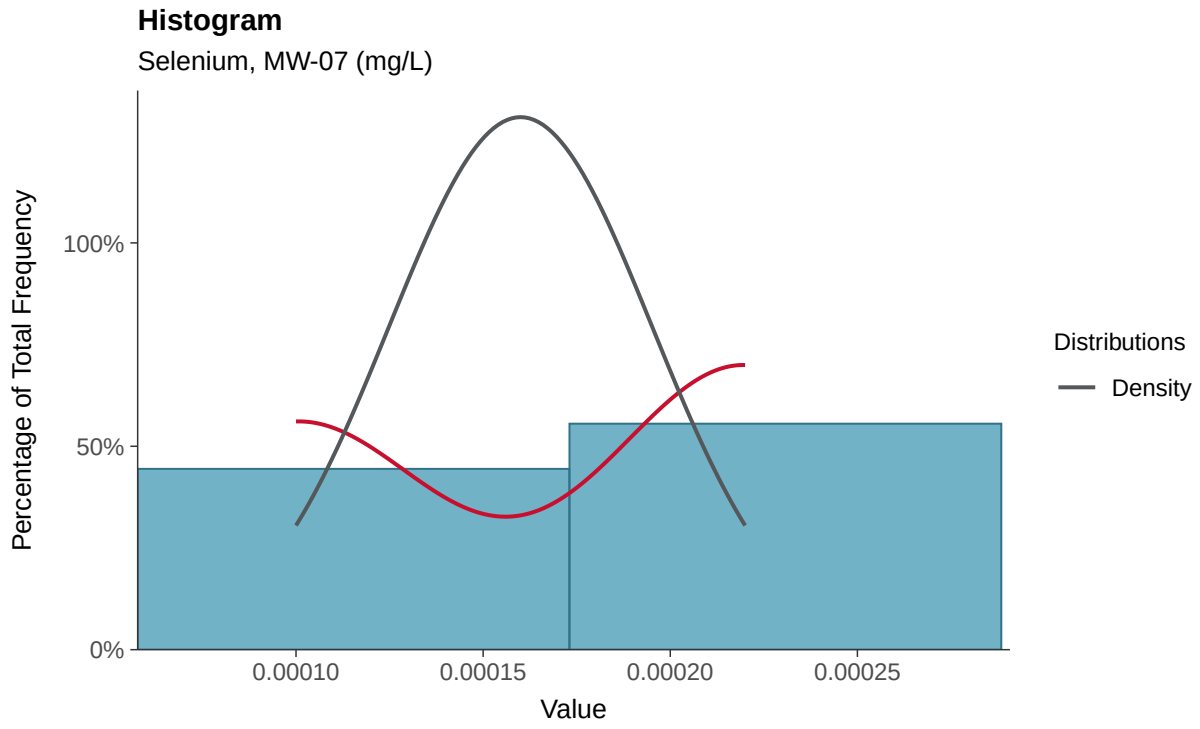
Radium 226 and 228, MW-07 (pCi/L)

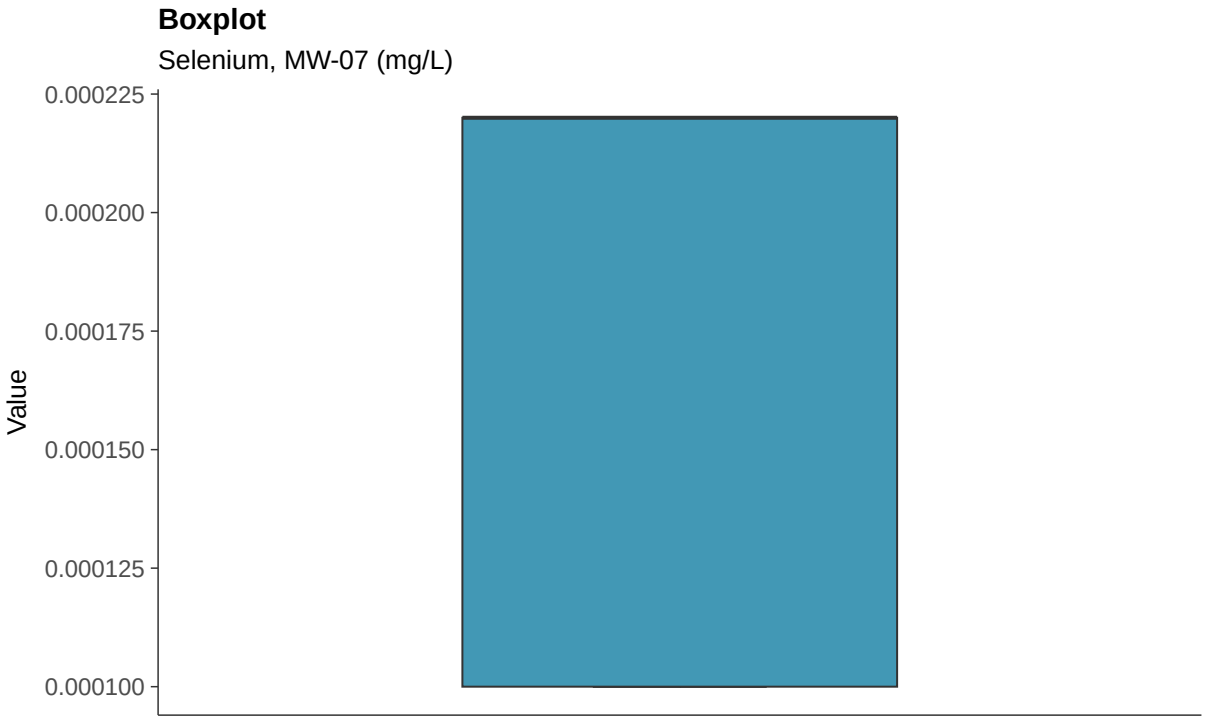


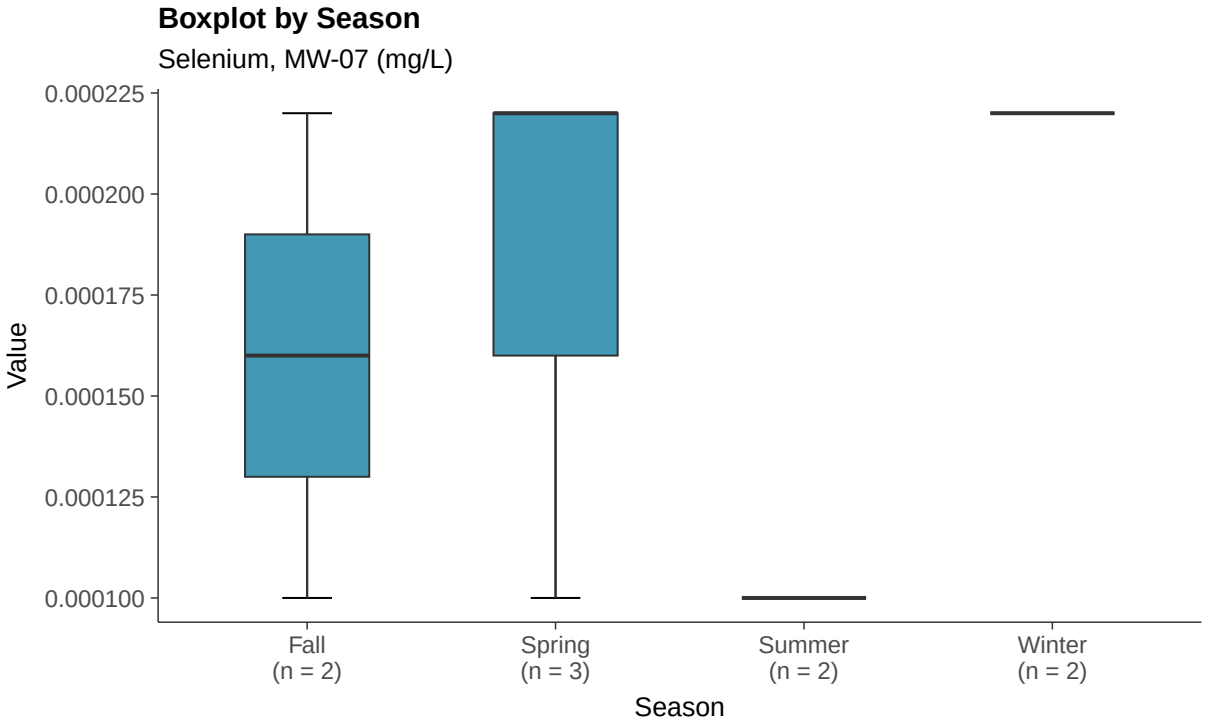
Appendix IV: Selenium, MW-07

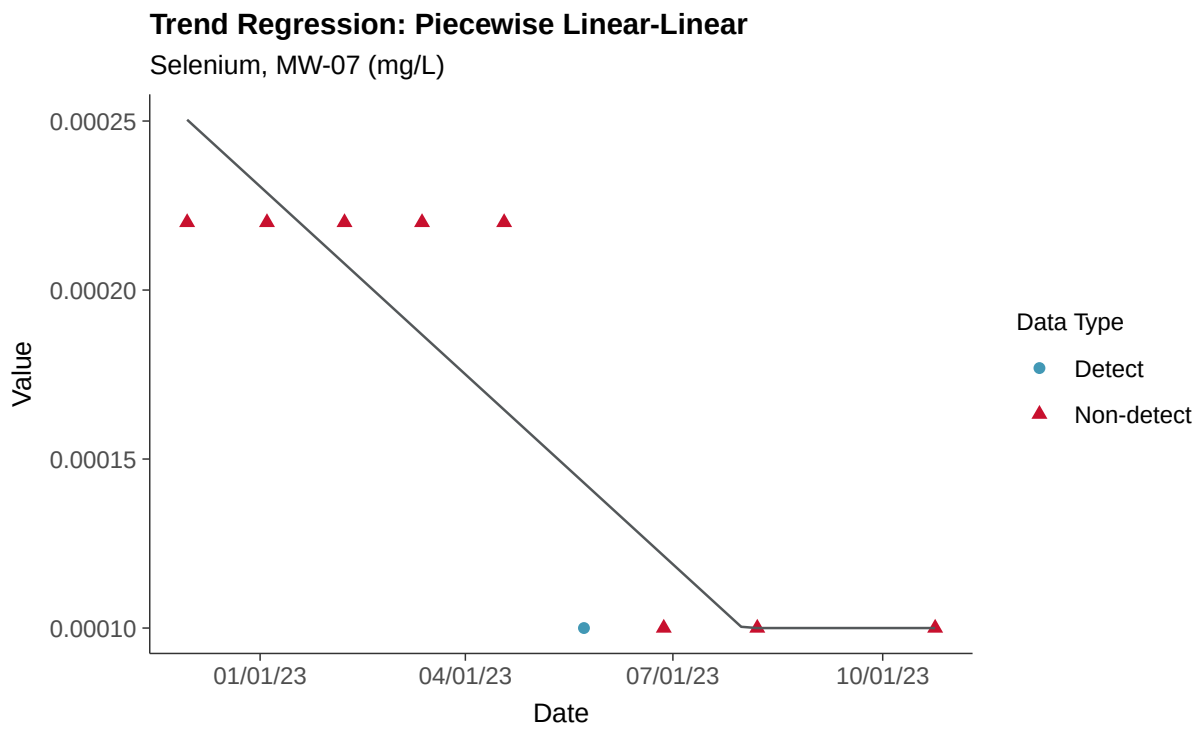
ID: 2_16_5_122

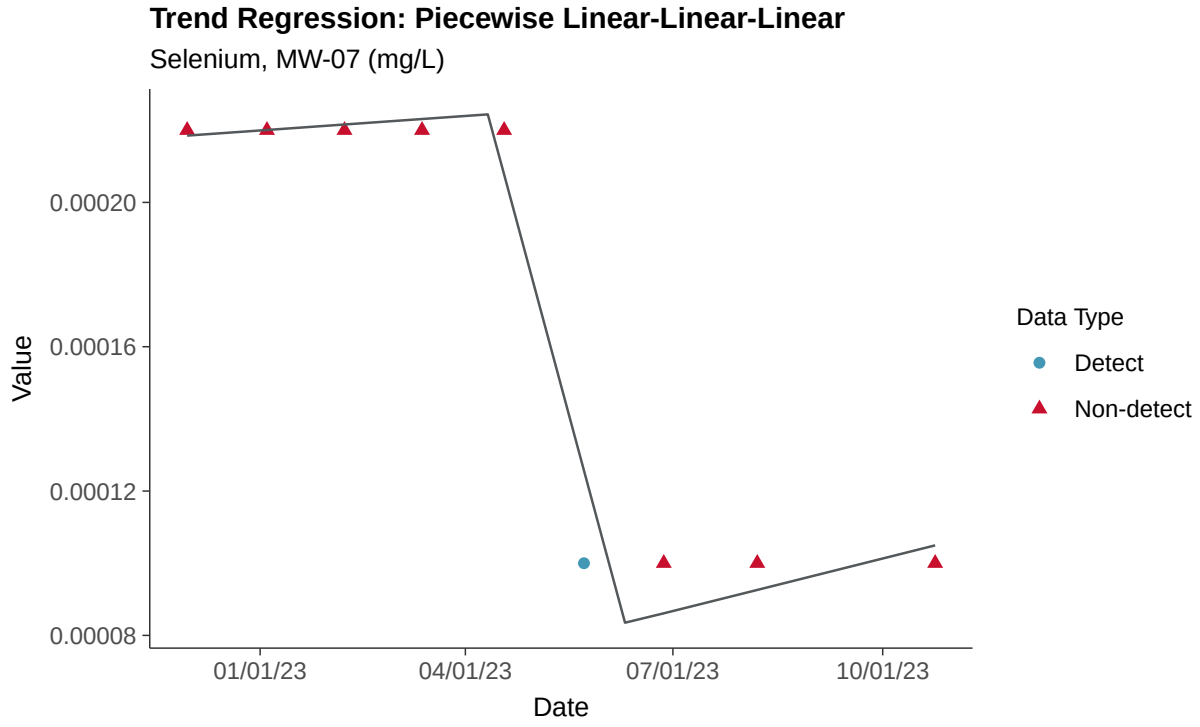





Boxplot
Selenium, MW-07 (mg/L)
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100
Value

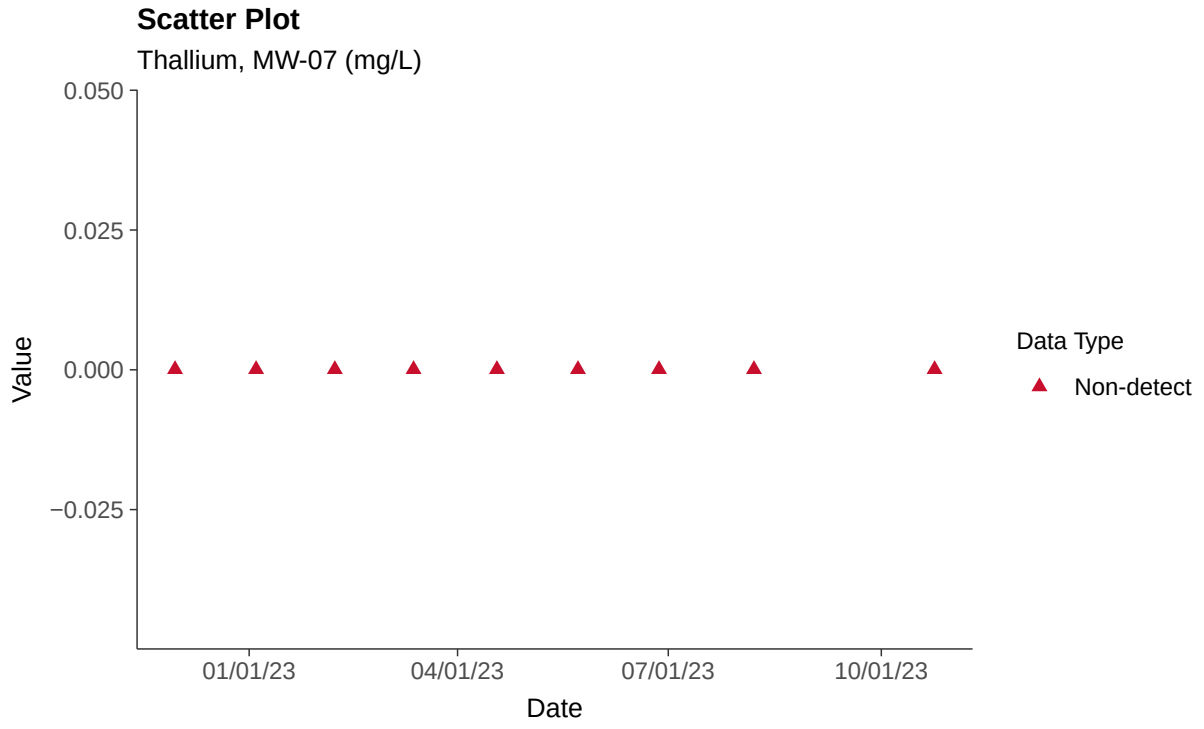

Boxplot by Season
Selenium, MW-07 (mg/L)
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

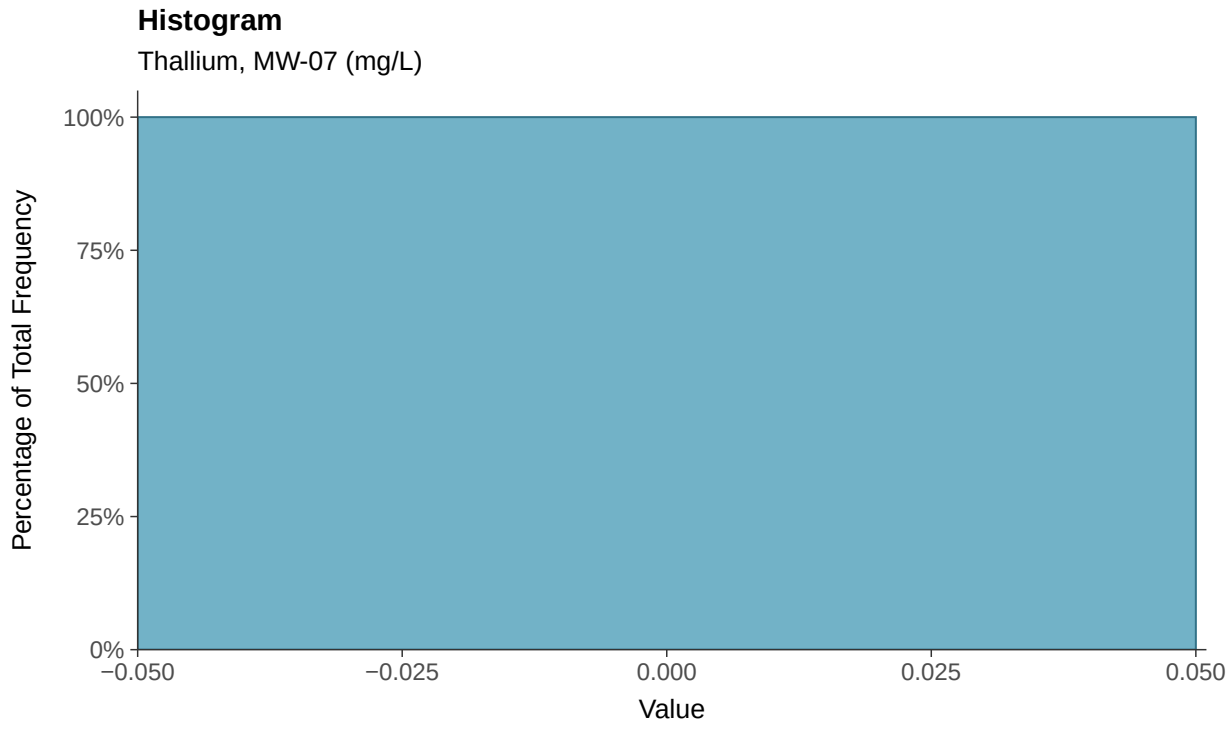

Trend Regression: Piecewise Linear-Linear
Selenium, MW-07 (mg/L)
0.00025
0.00020
0.00015
0.00010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-07 (mg/L)
0.00020
0.00016
0.00012
0.00008
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-07

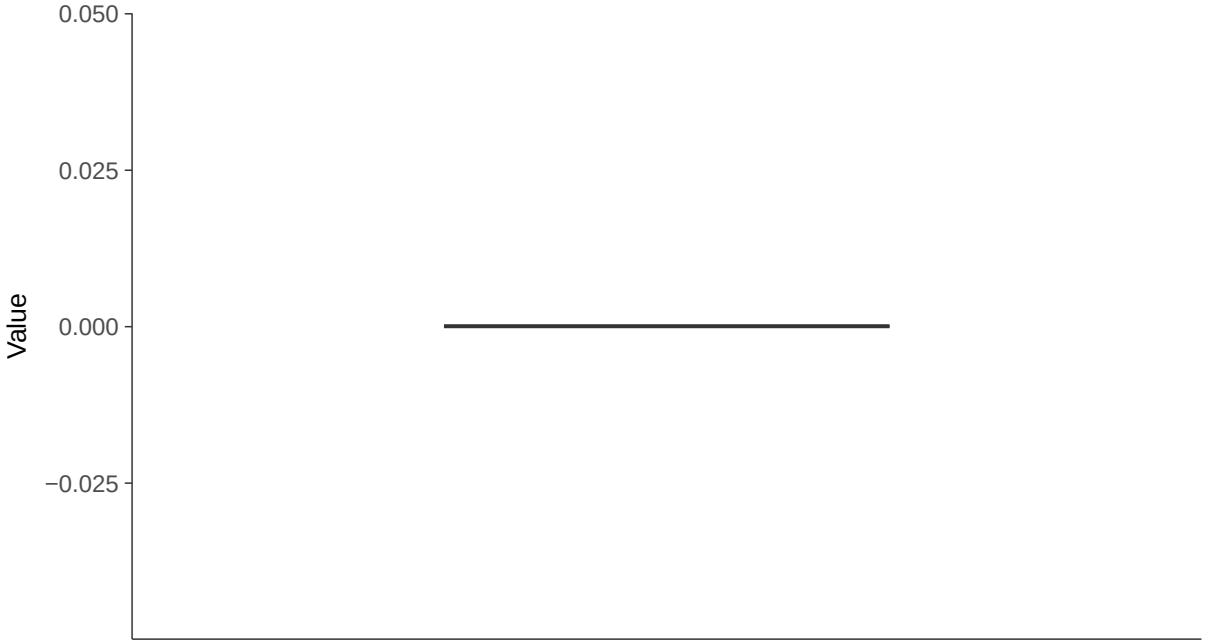
ID: 2_16_5_125





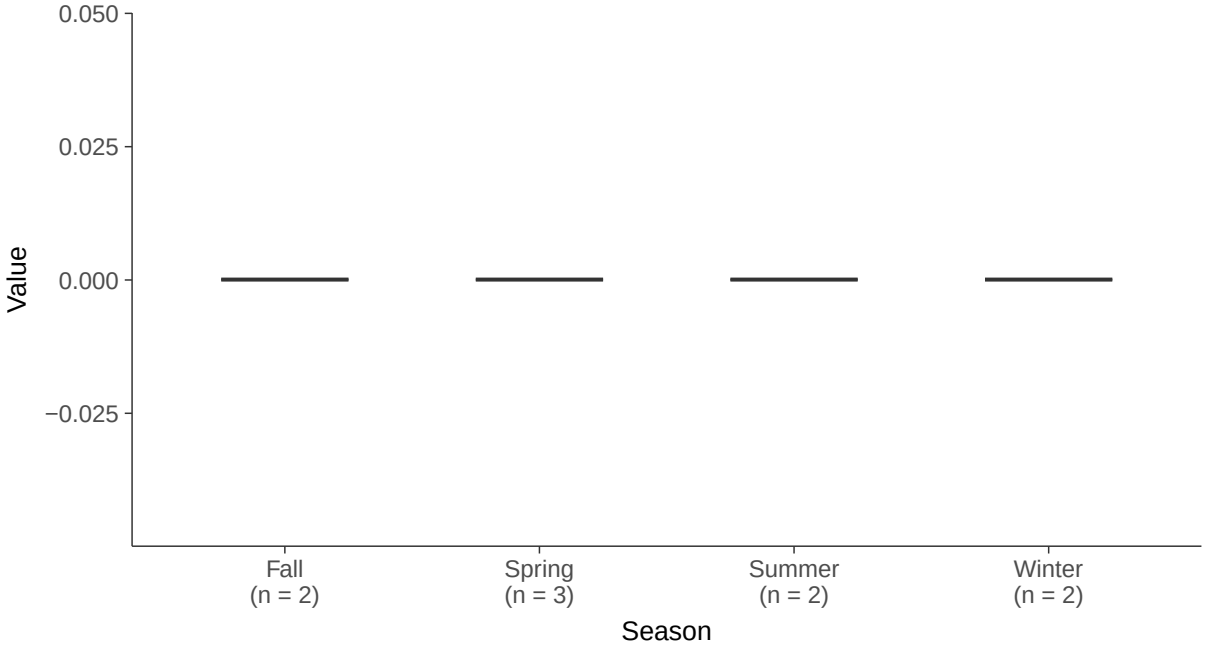
Boxplot

Thallium, MW-07 (mg/L)



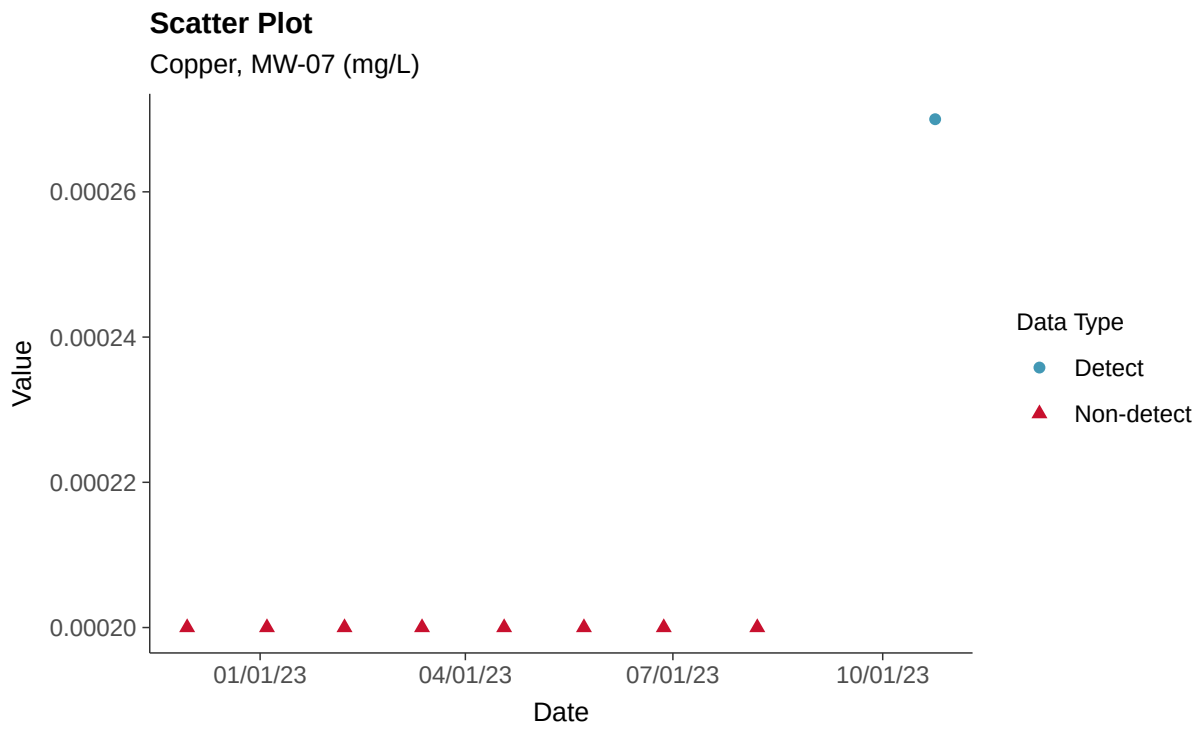
Boxplot by Season

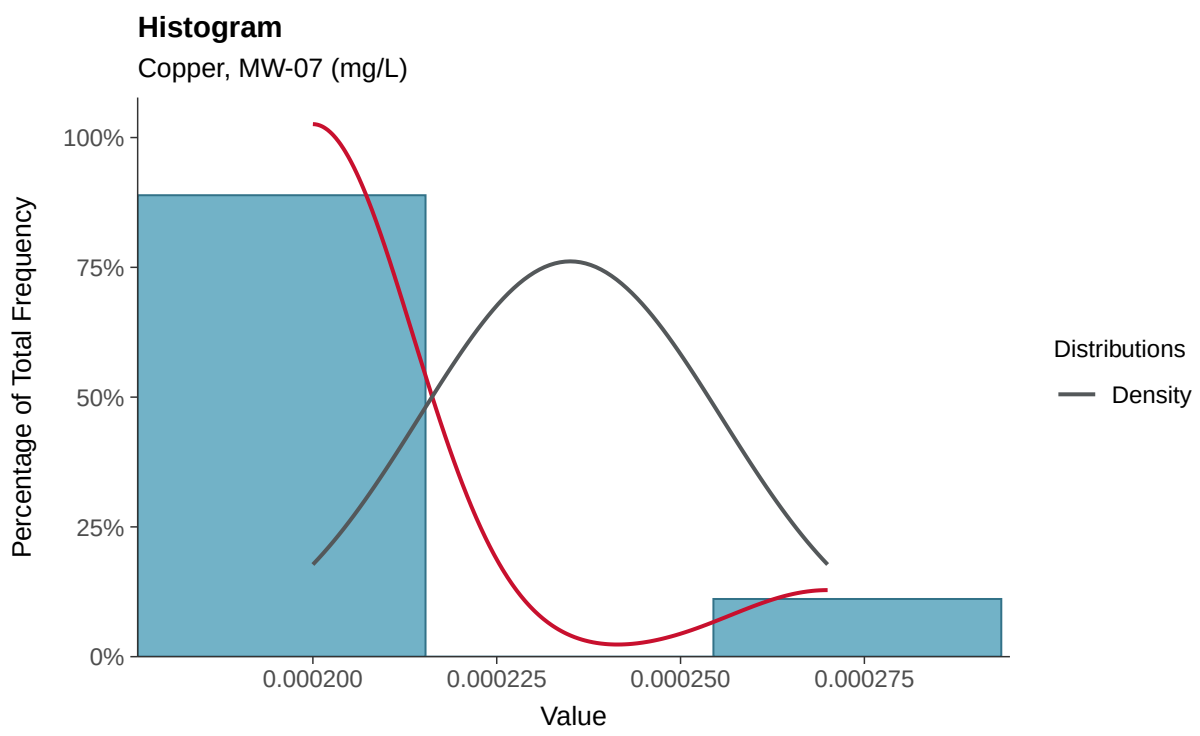
Thallium, MW-07 (mg/L)



Part 115: Copper, MW-07

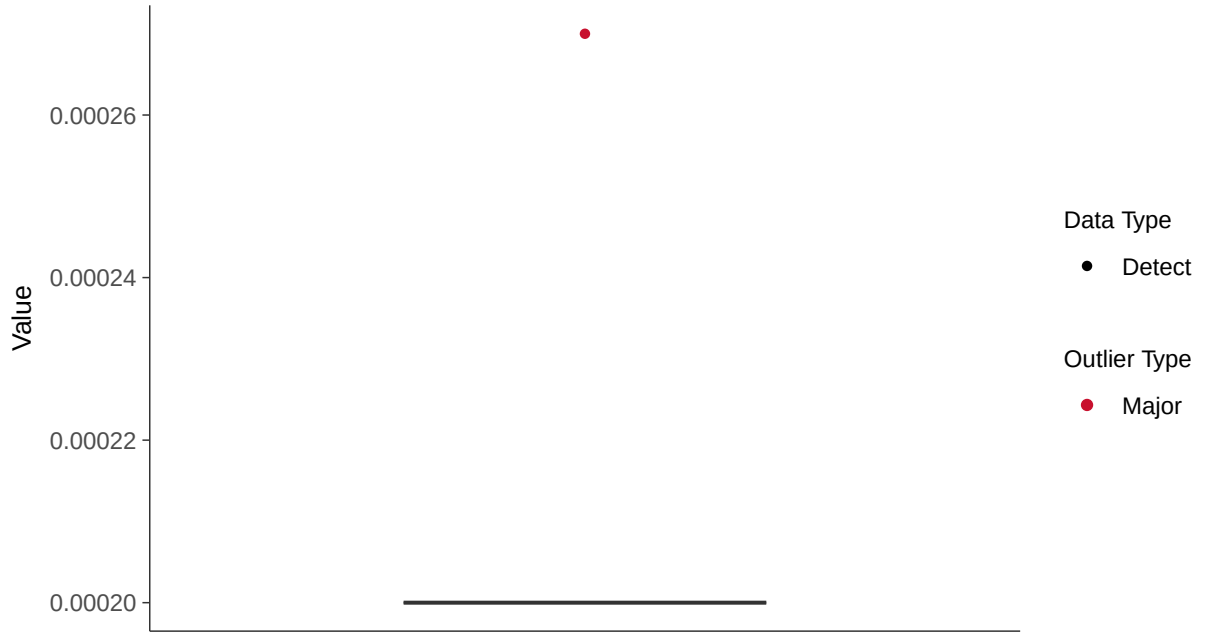
ID: 2_16_6_111





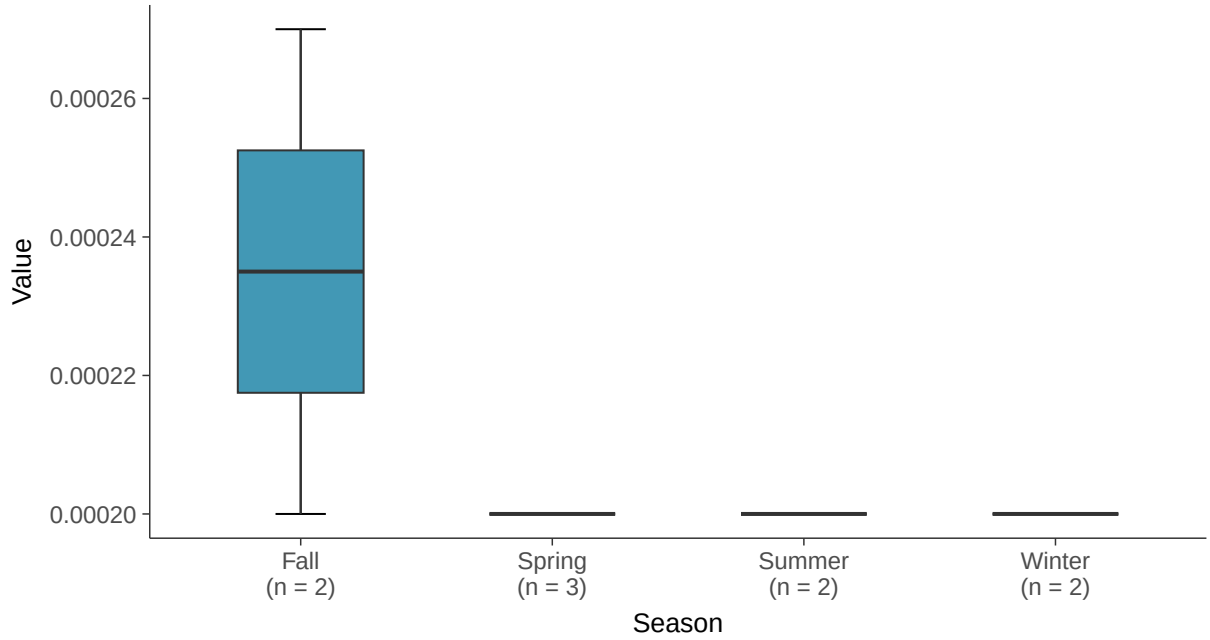
Boxplot

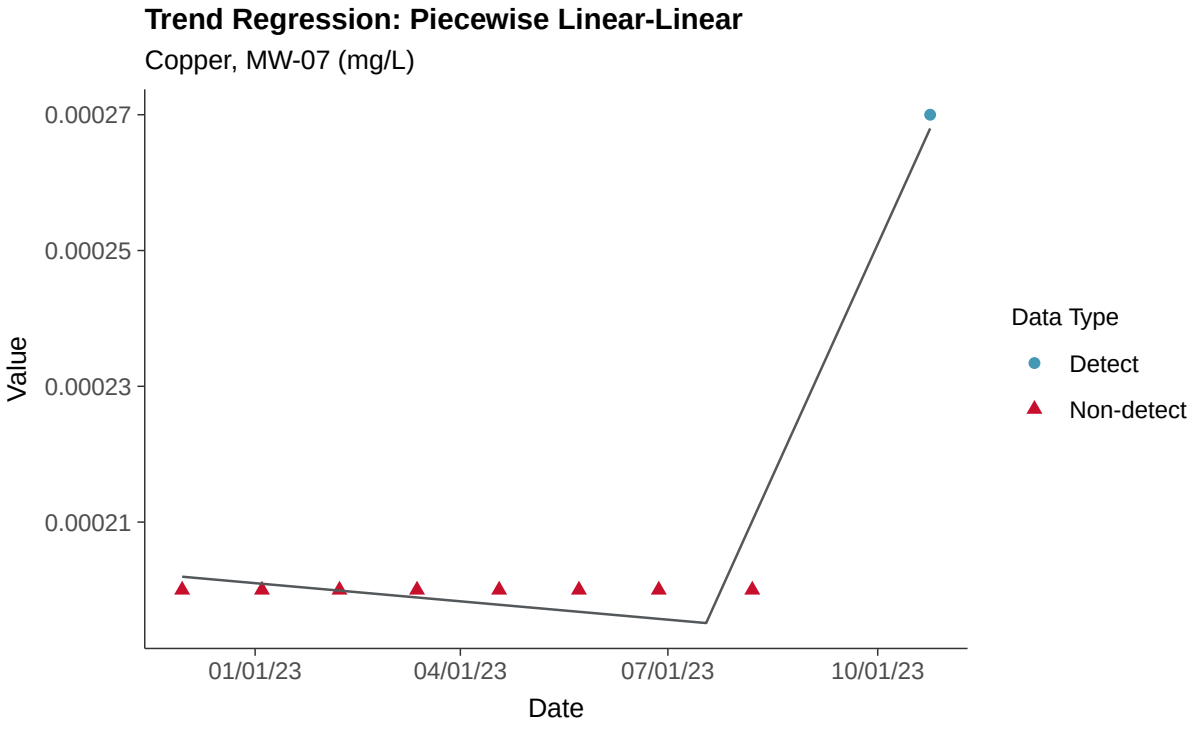
Copper, MW-07 (mg/L)



Boxplot by Season

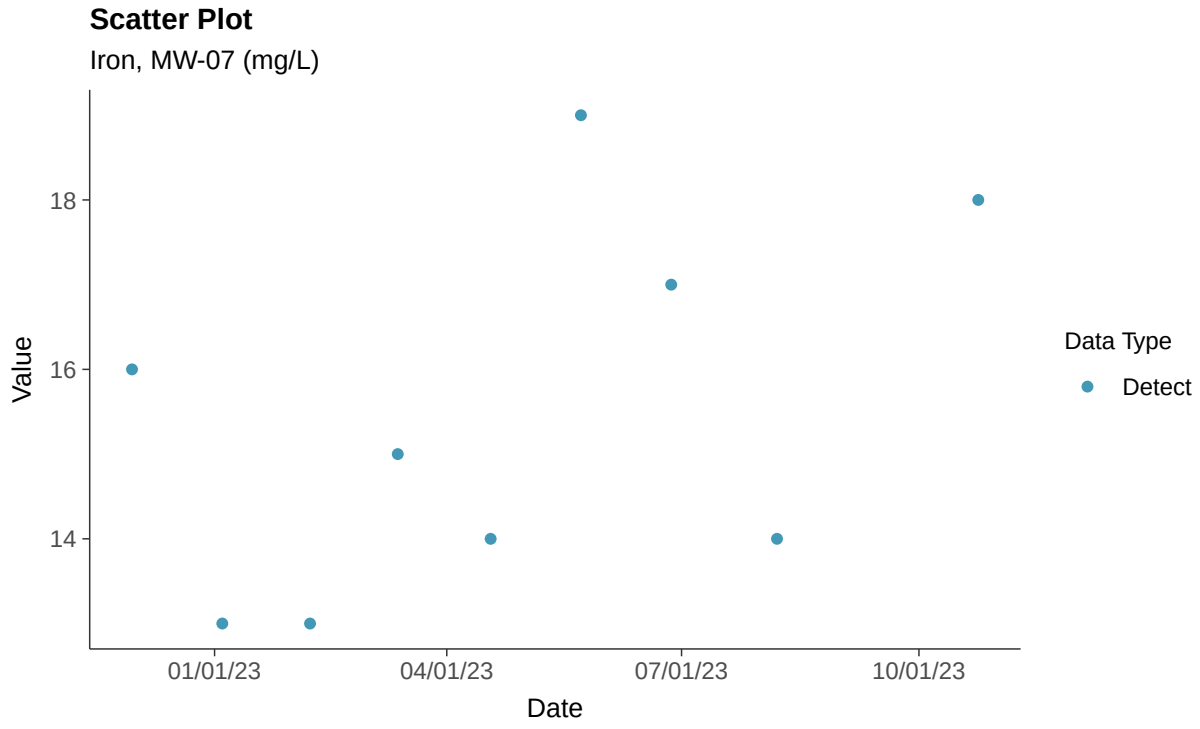
Copper, MW-07 (mg/L)

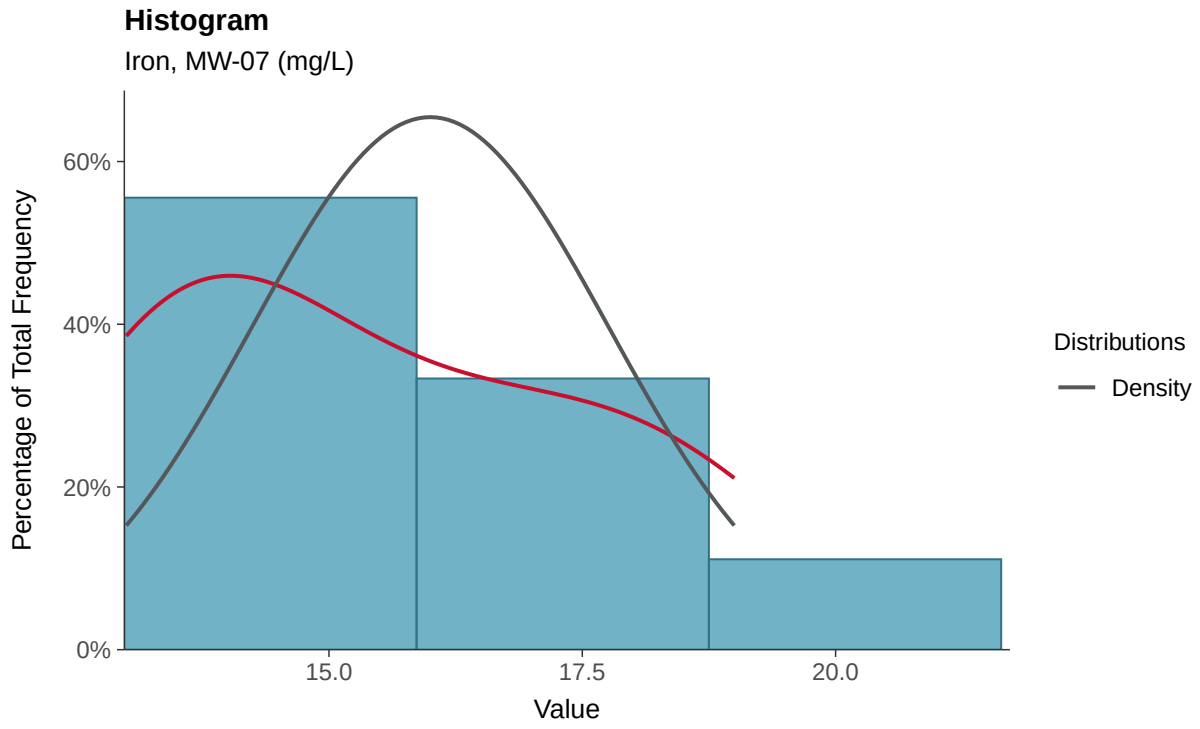



Trend Regression: Piecewise Linear-Linear
Copper, MW-07 (mg/L)
0.00027
0.00025
0.00023
0.00021
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-07

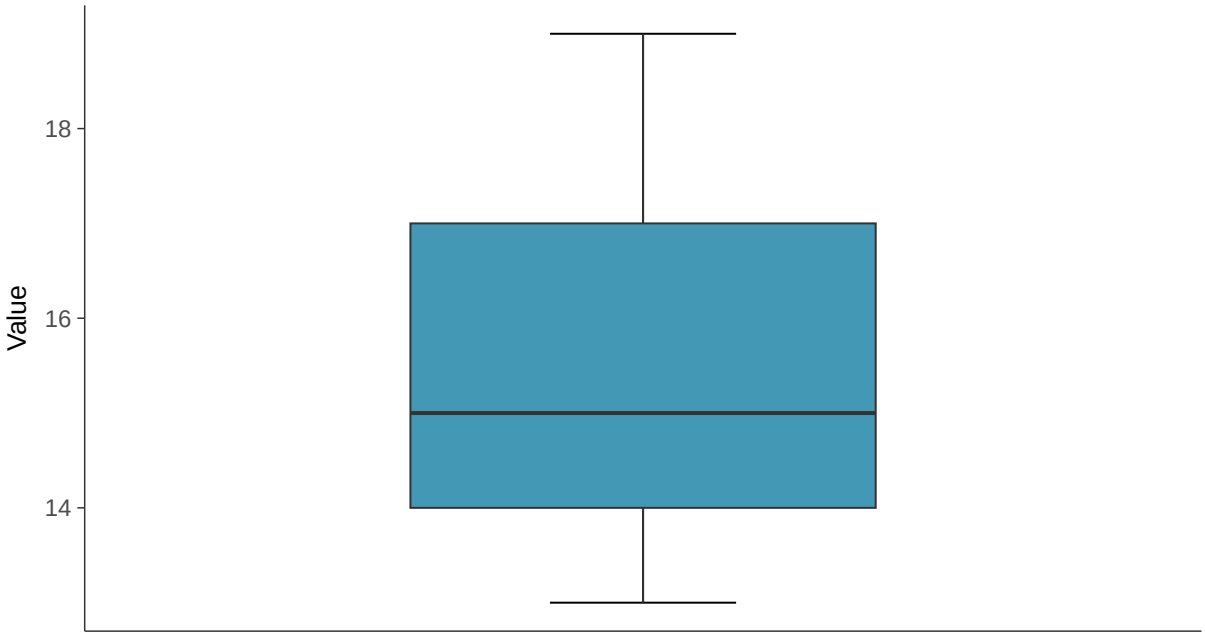
ID: 2_16_6_114





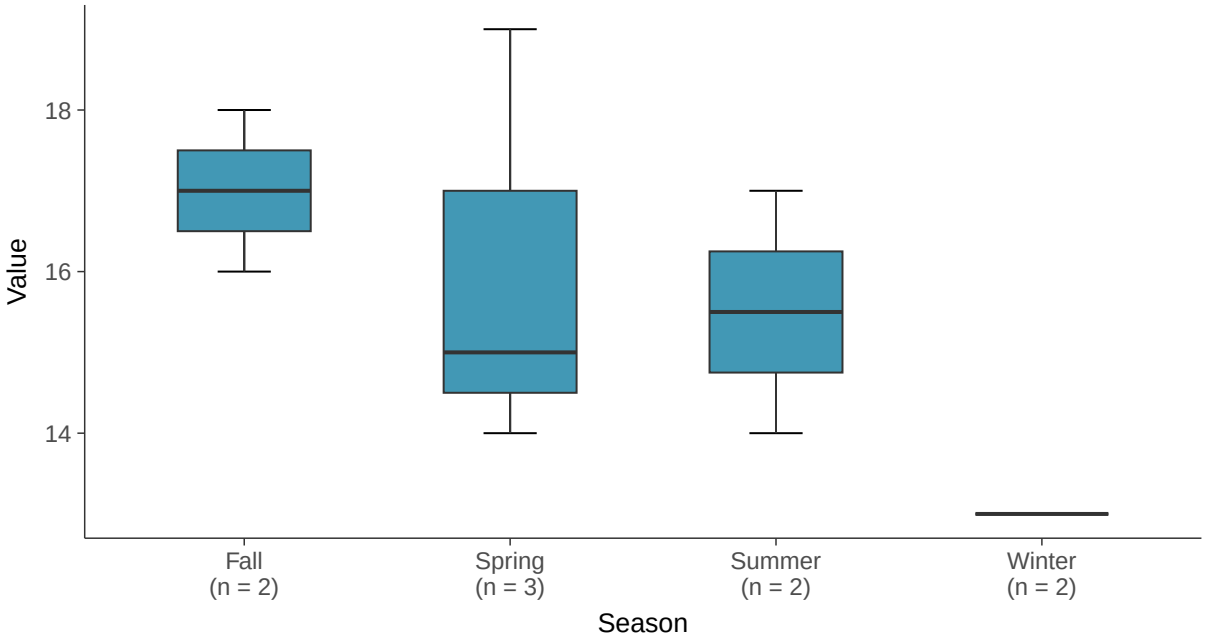
Boxplot

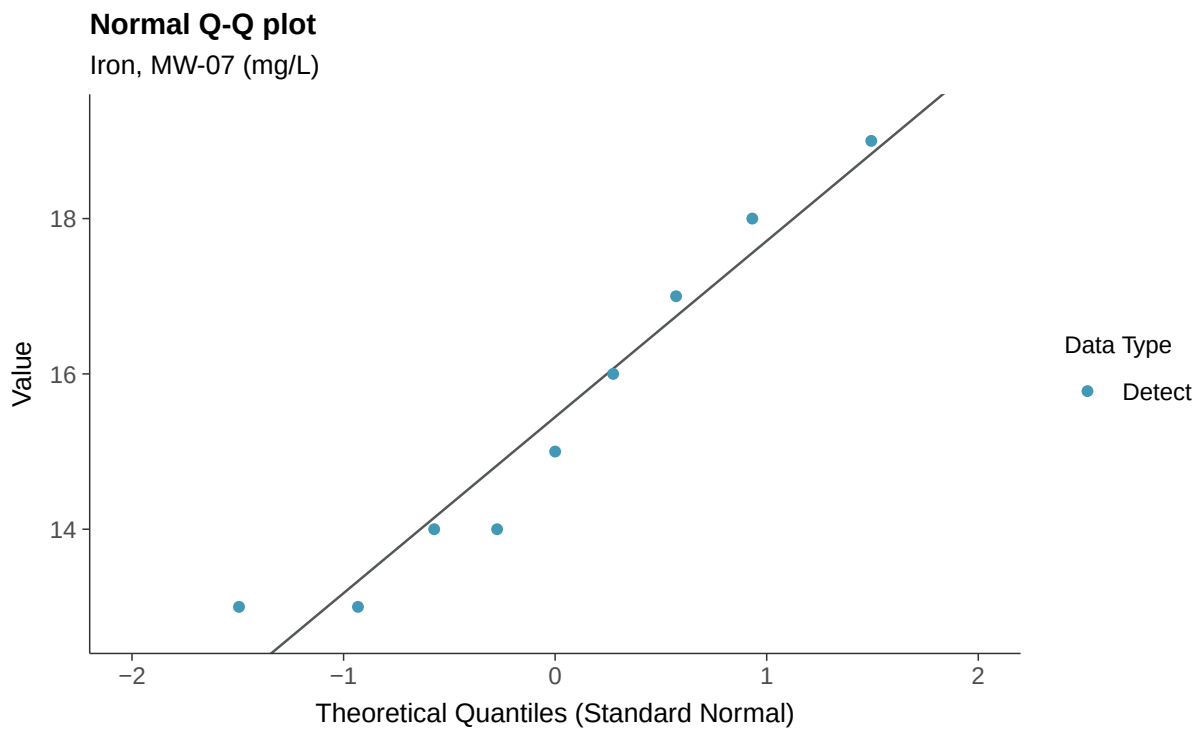
Iron, MW-07 (mg/L)

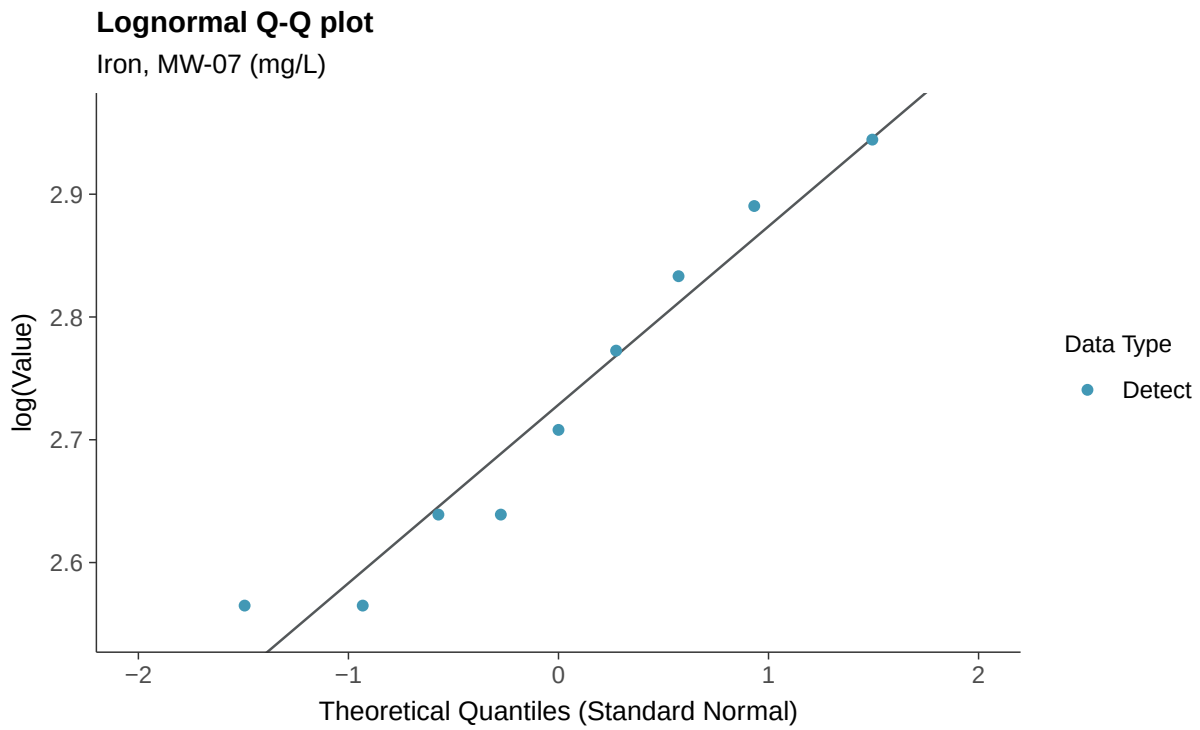


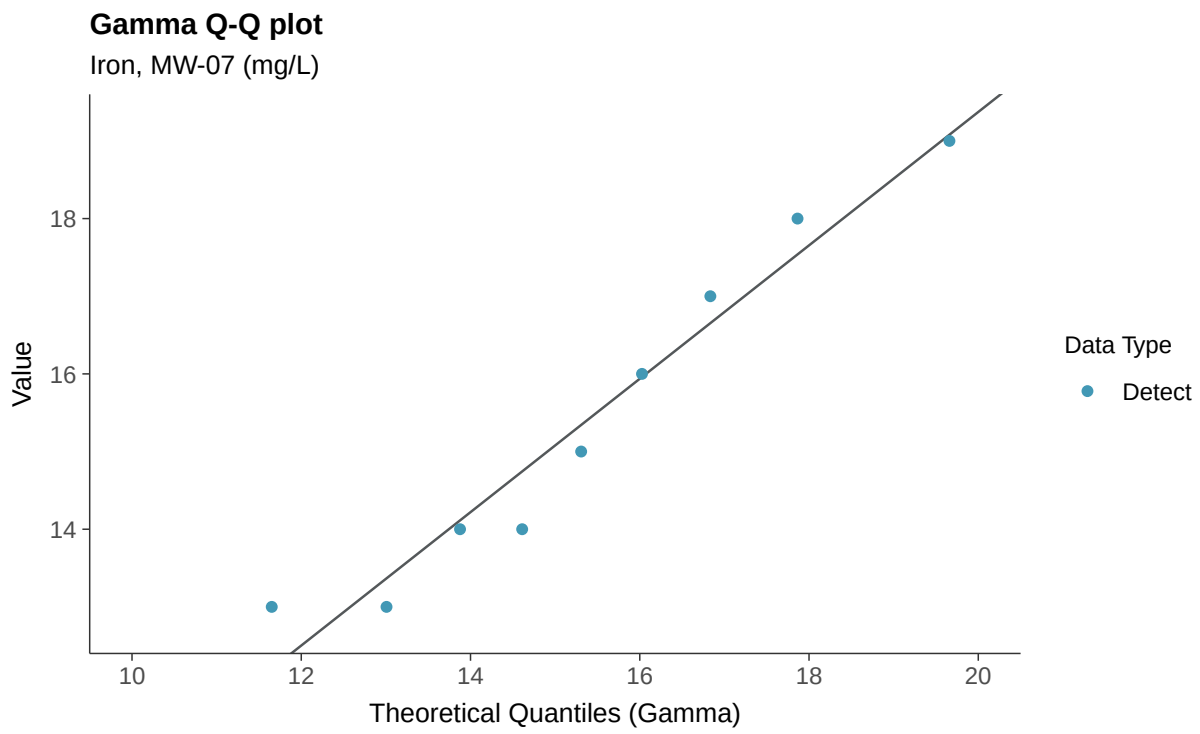
Boxplot by Season

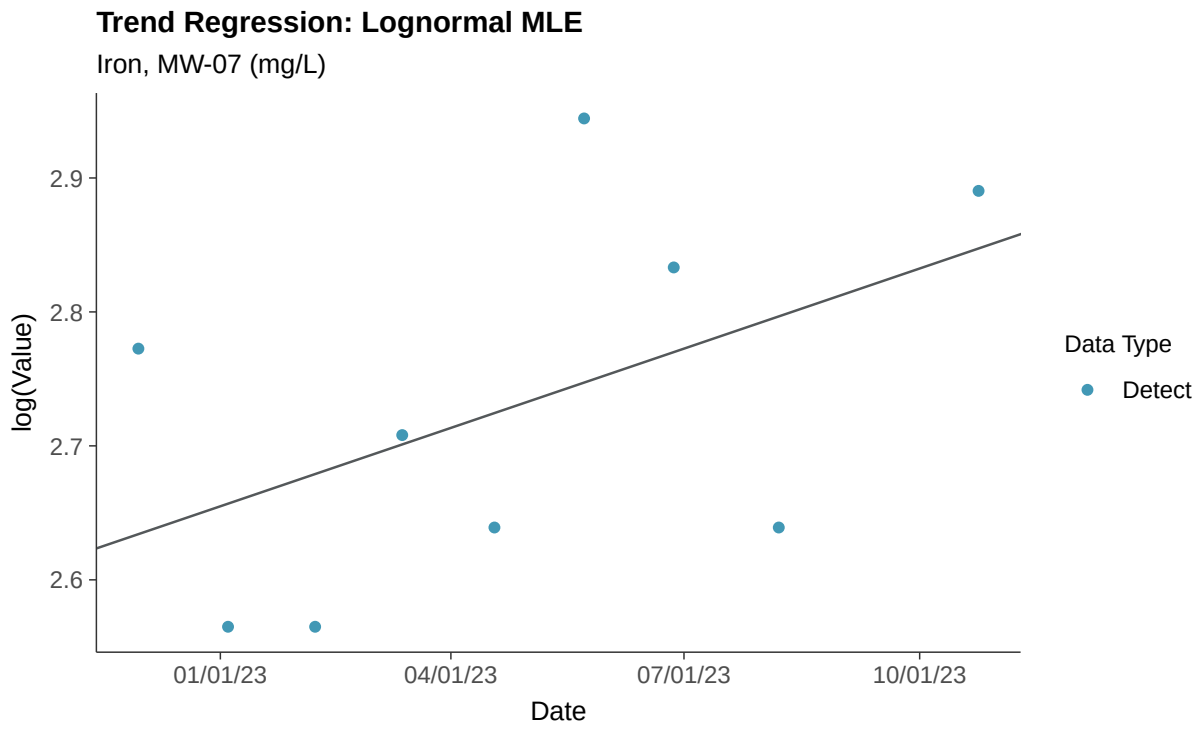
Iron, MW-07 (mg/L)




Normal Q-Q plot
Iron, MW-07 (mg/L)
Value
18
16
14
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

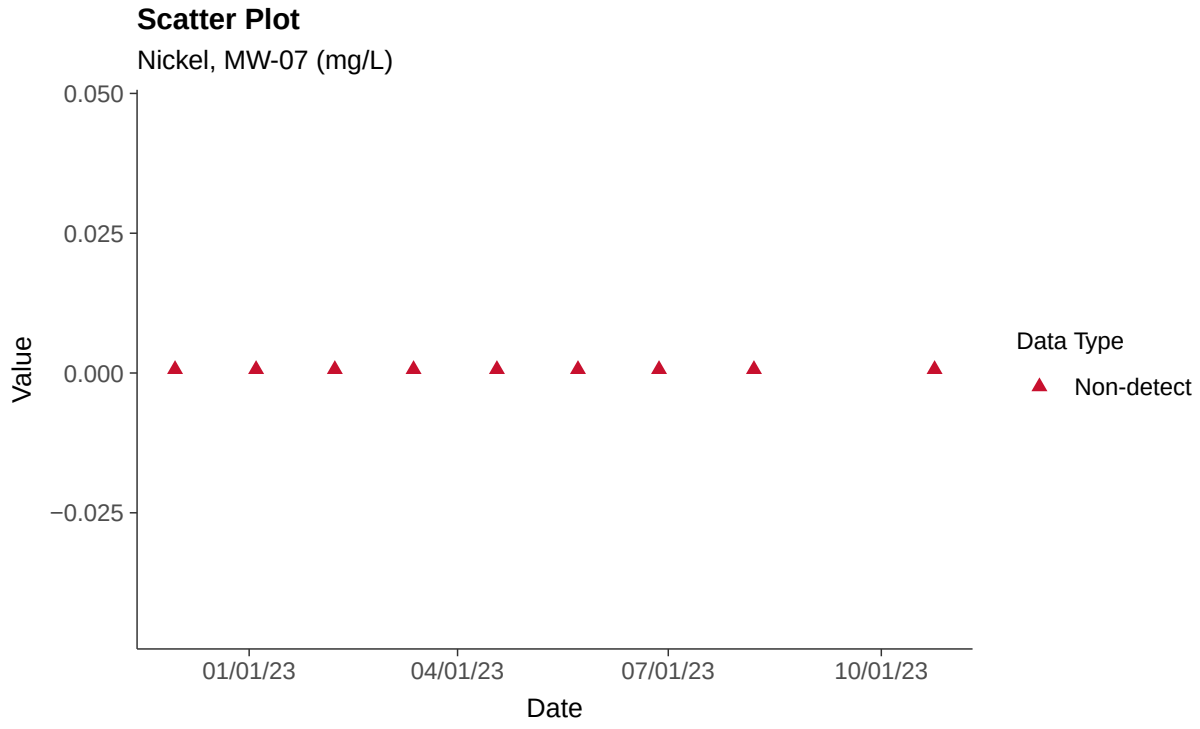

Lognormal Q-Q plot
Iron, MW-07 (mg/L)
log(Value)
2.9
2.8
2.7
2.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

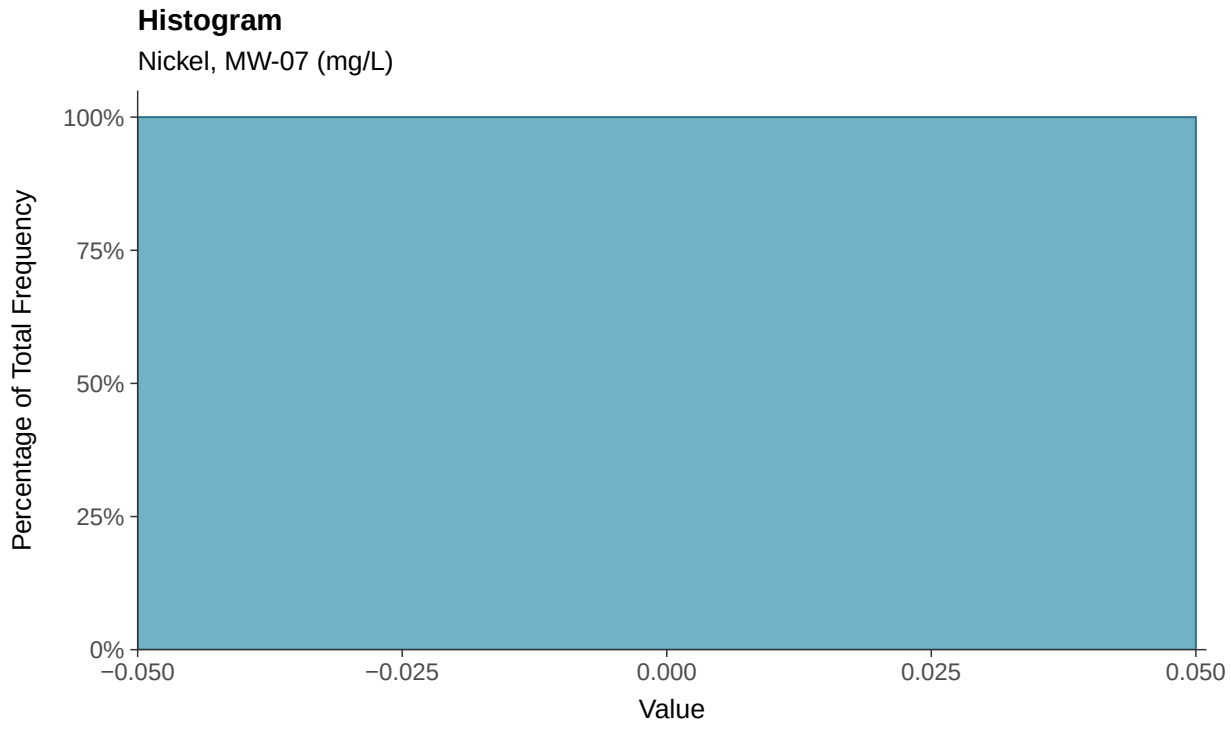

Gamma Q-Q plot
Iron, MW-07 (mg/L)
Value
18
16
14
10
12
14
16
18
20
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Iron, MW-07 (mg/L)
log(Value)
2.9
2.8
2.7
2.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-07

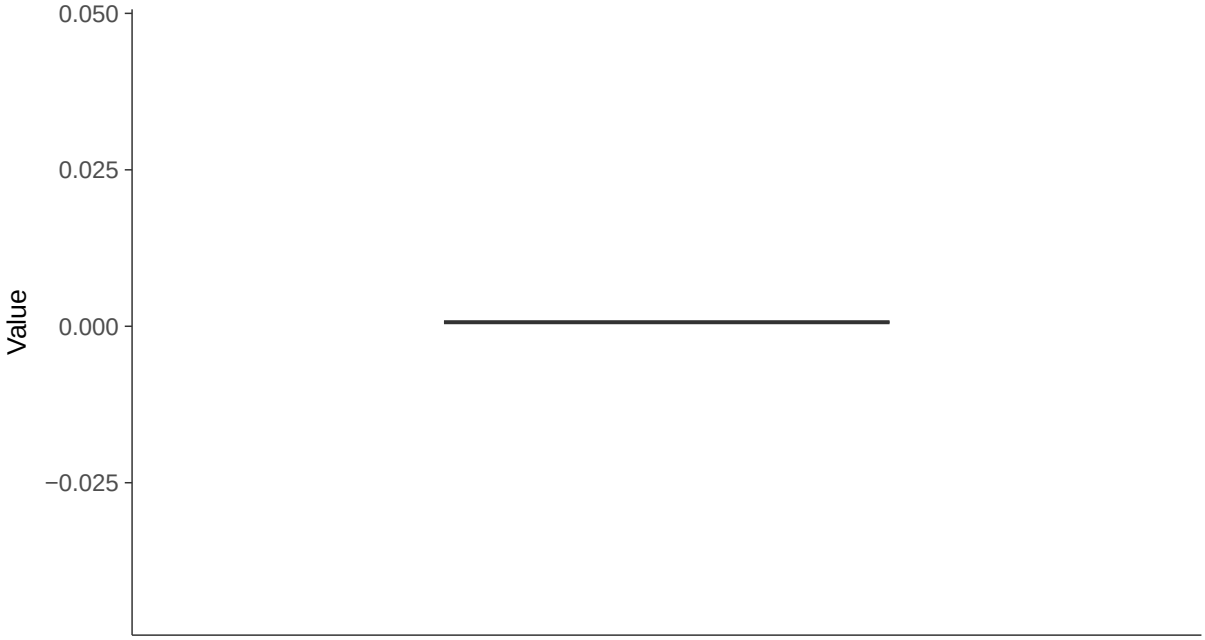
ID: 2_16_6_119





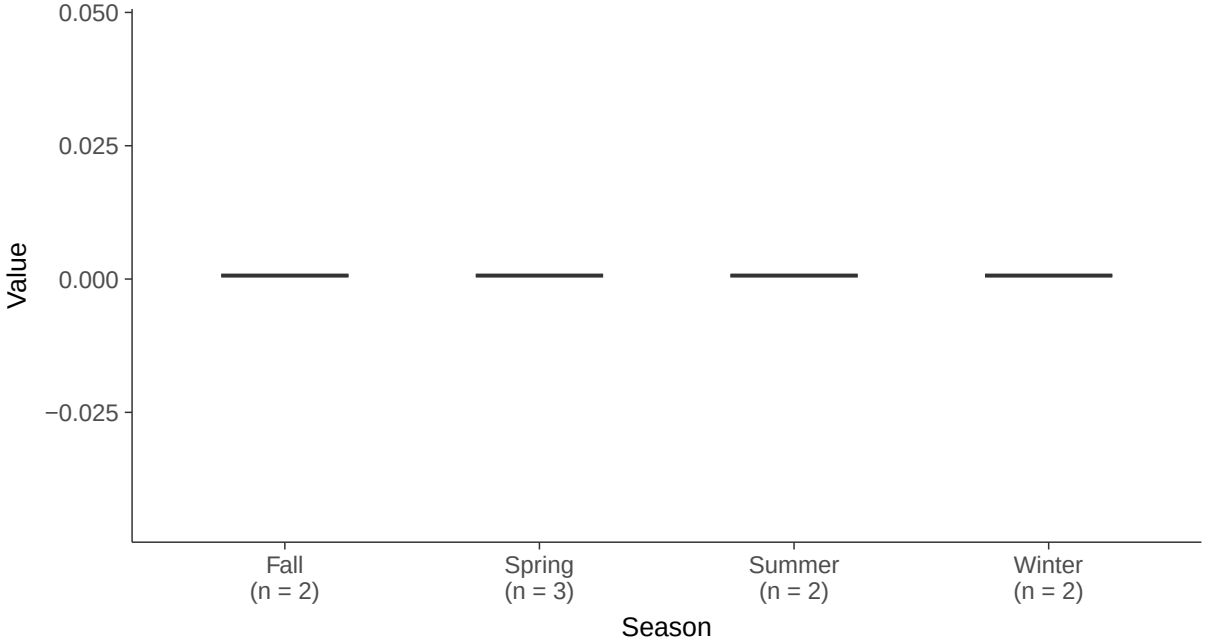
Boxplot

Nickel, MW-07 (mg/L)



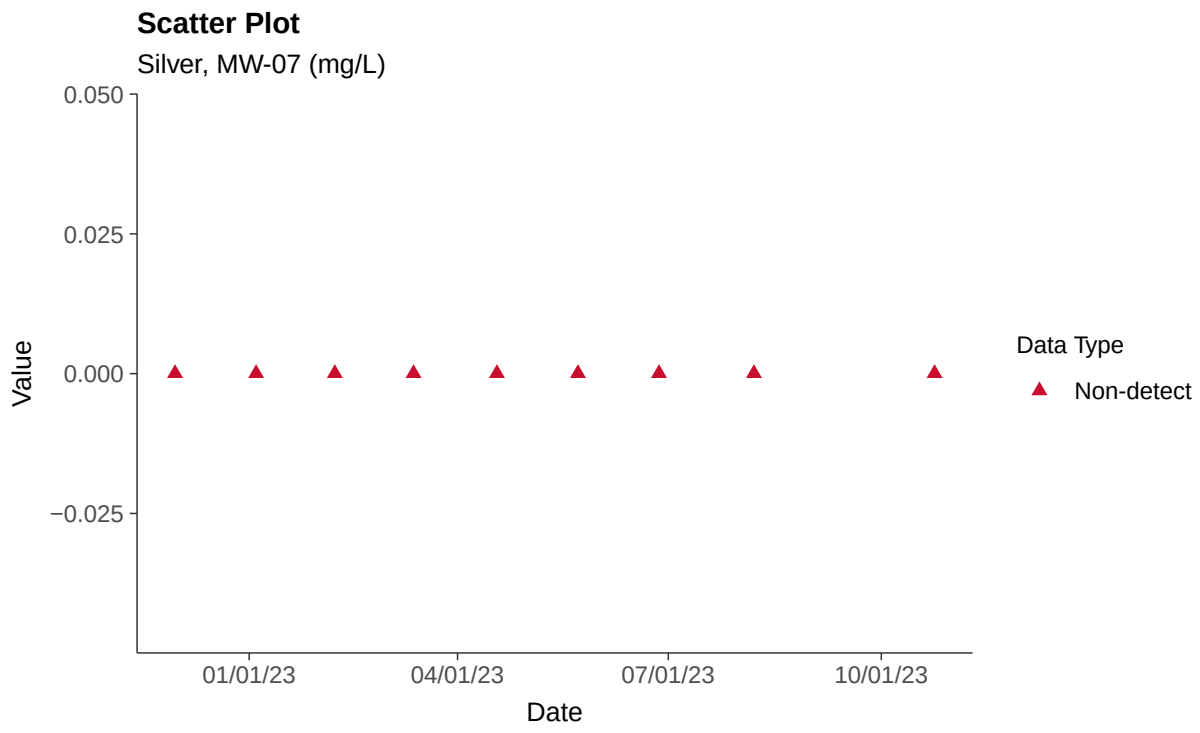
Boxplot by Season

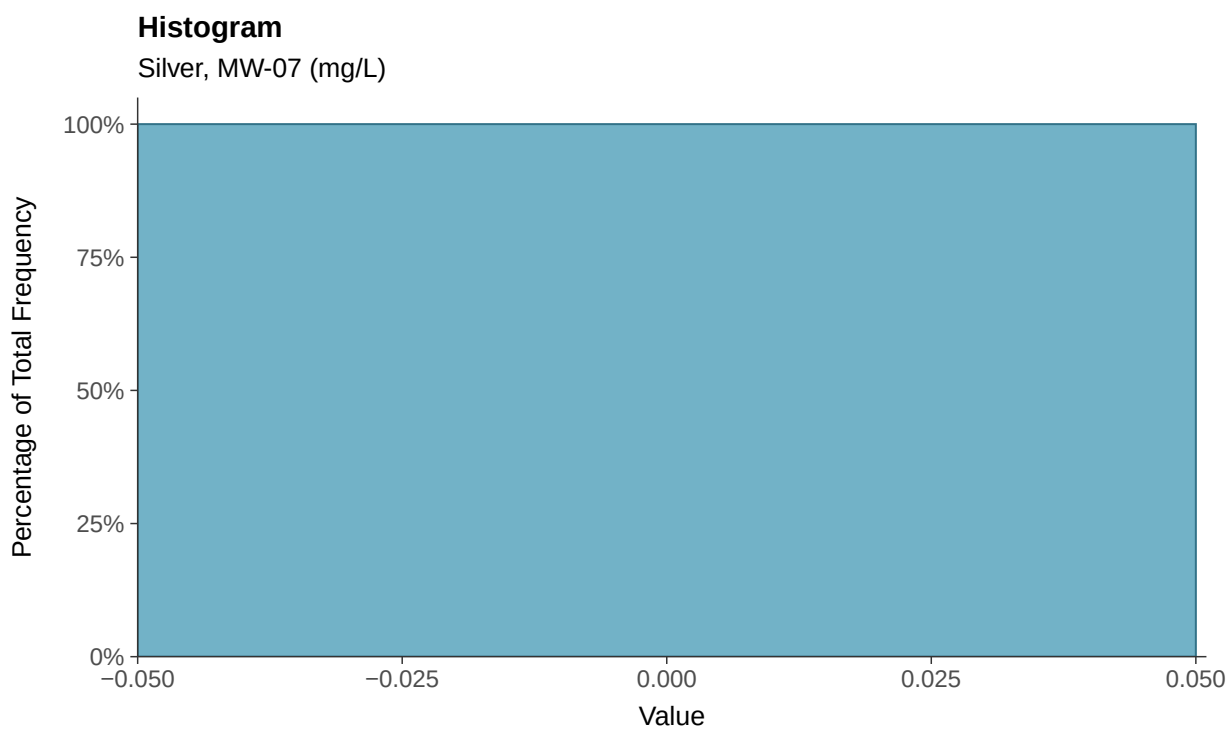
Nickel, MW-07 (mg/L)



Part 115: Silver, MW-07

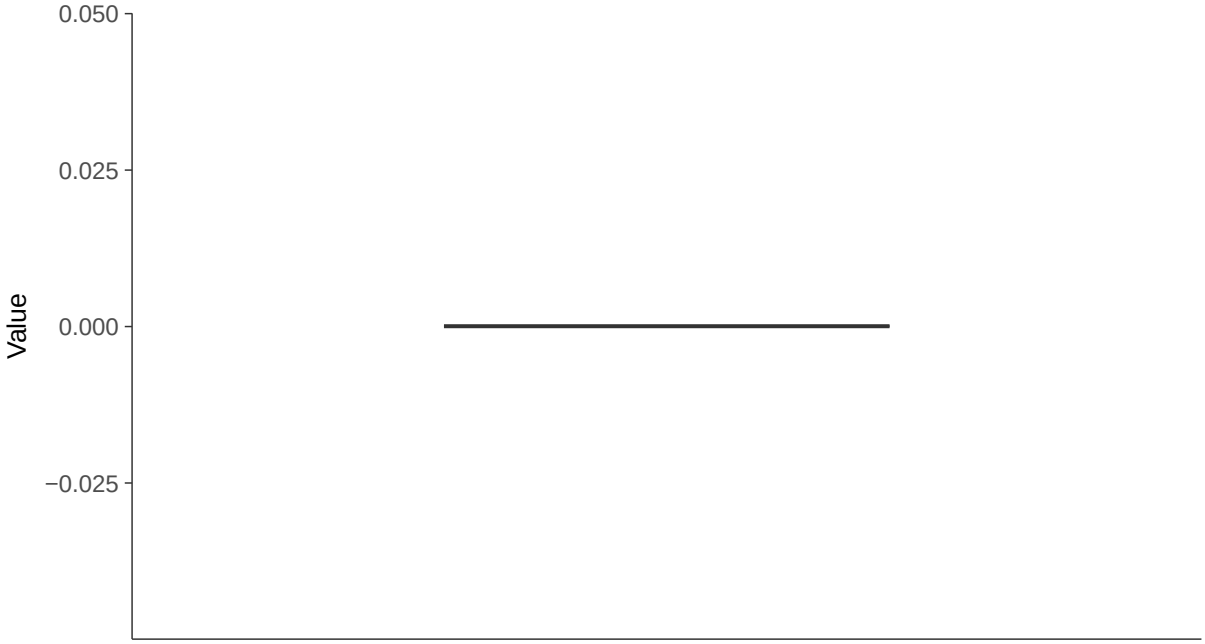
ID: 2_16_6_123





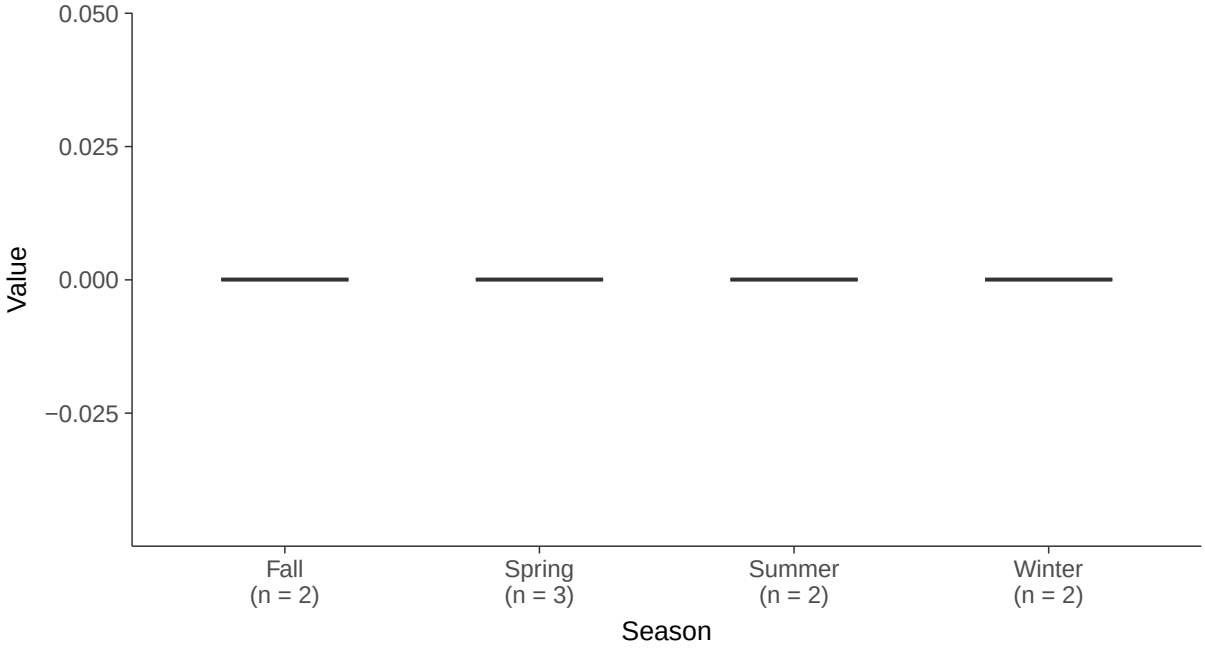
Boxplot

Silver, MW-07 (mg/L)



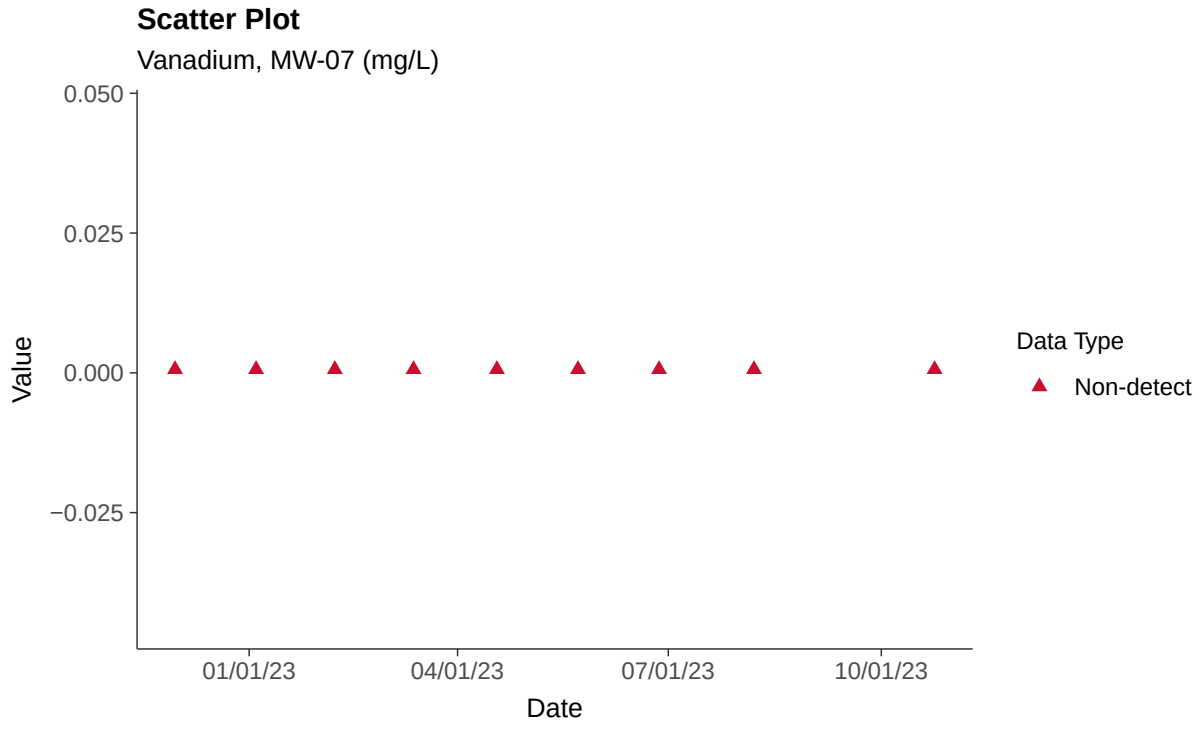
Boxplot by Season

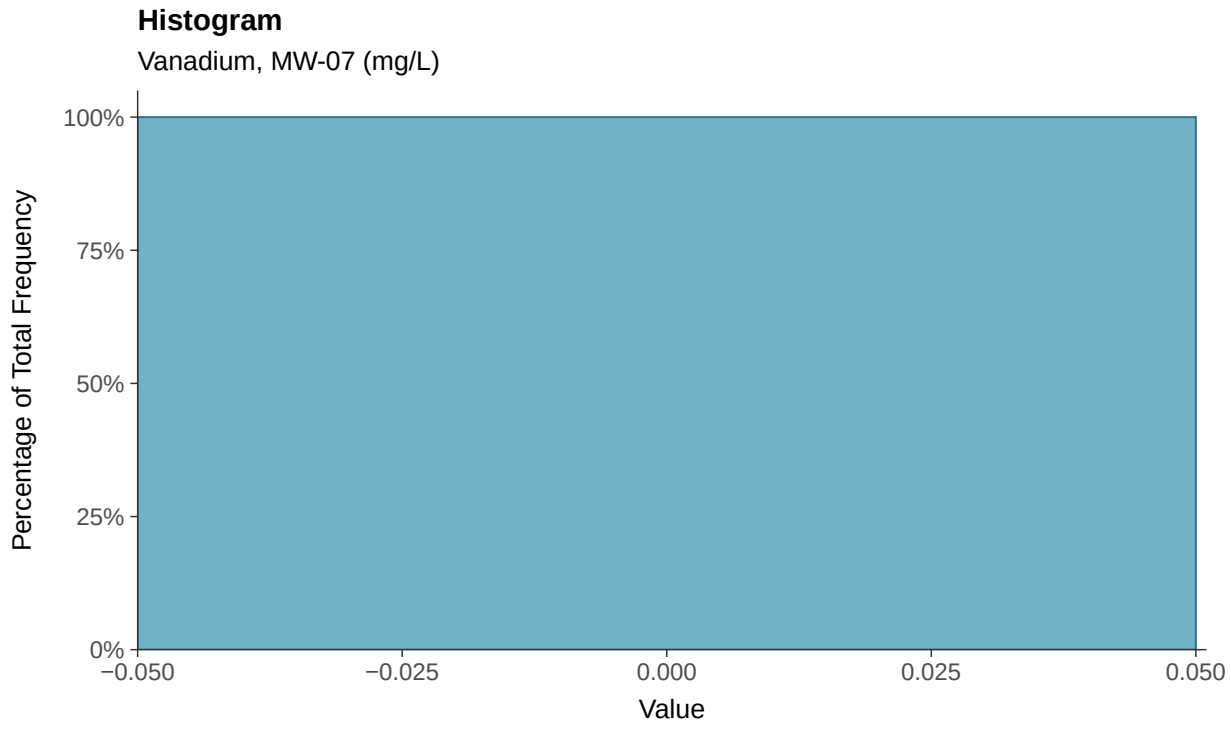
Silver, MW-07 (mg/L)



Part 115: Vanadium, MW-07

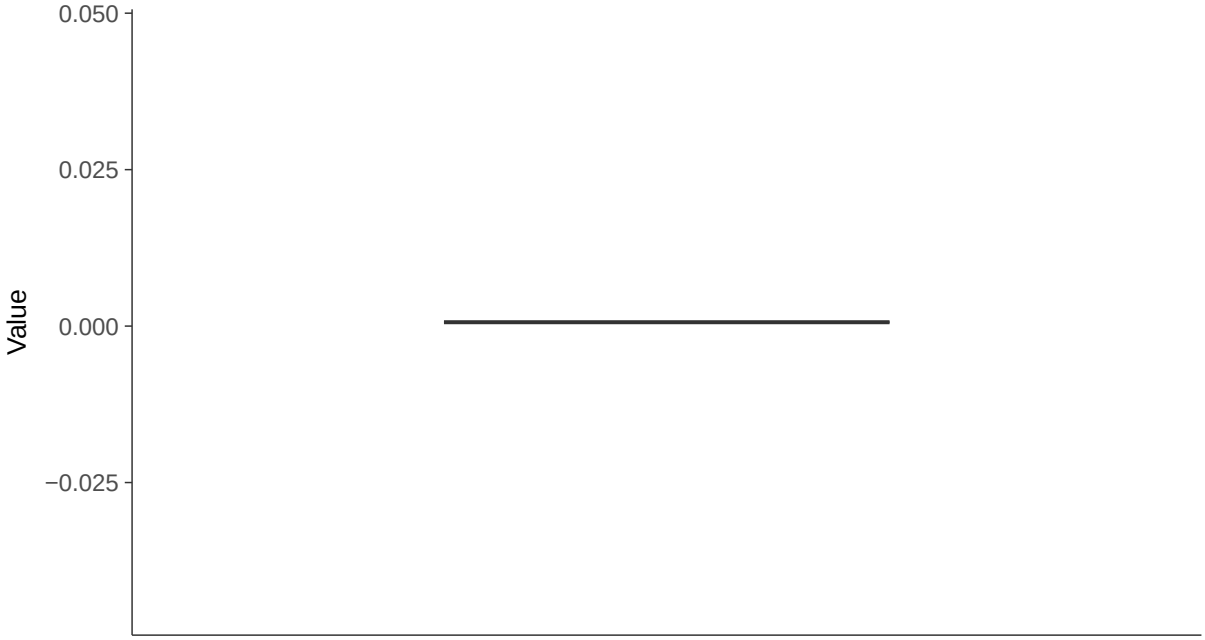
ID: 2_16_6_129





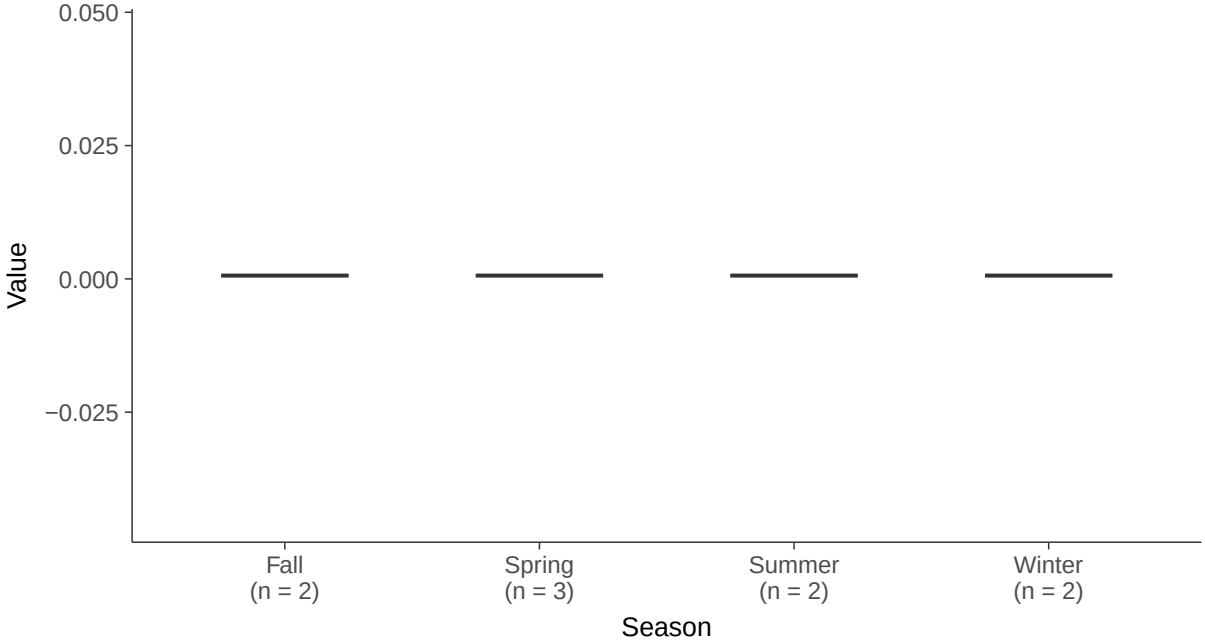
Boxplot

Vanadium, MW-07 (mg/L)



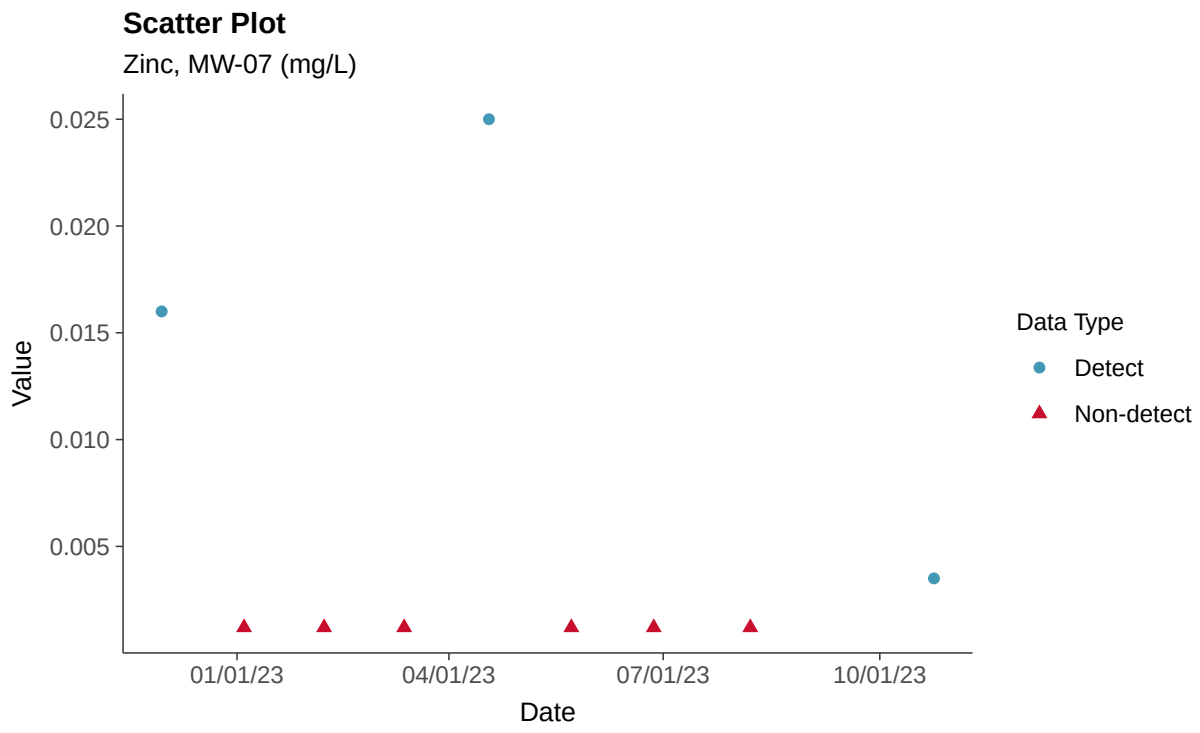
Boxplot by Season

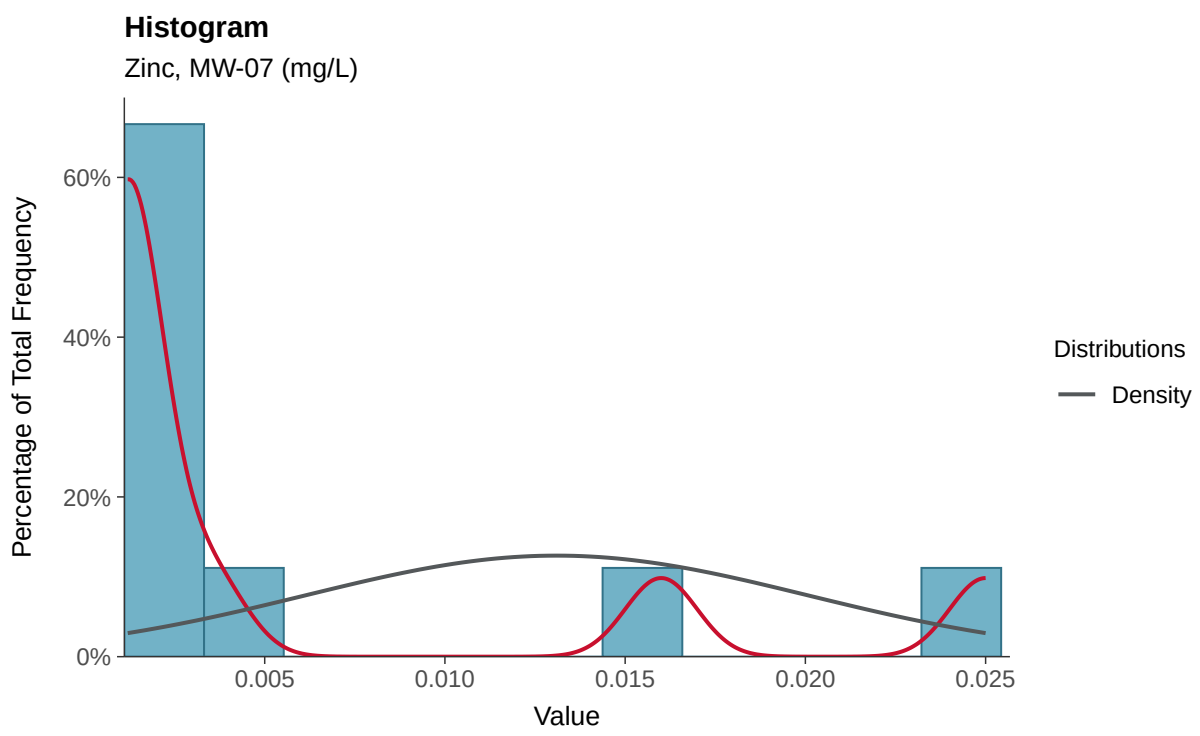
Vanadium, MW-07 (mg/L)



Part 115: Zinc, MW-07

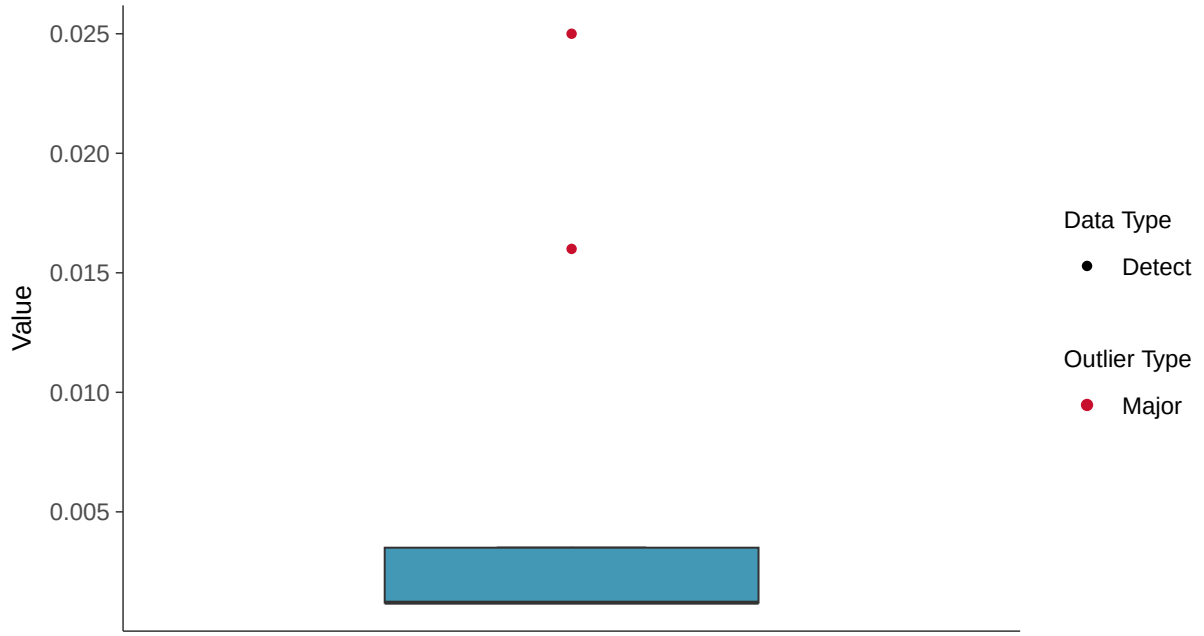
ID: 2_16_6_130





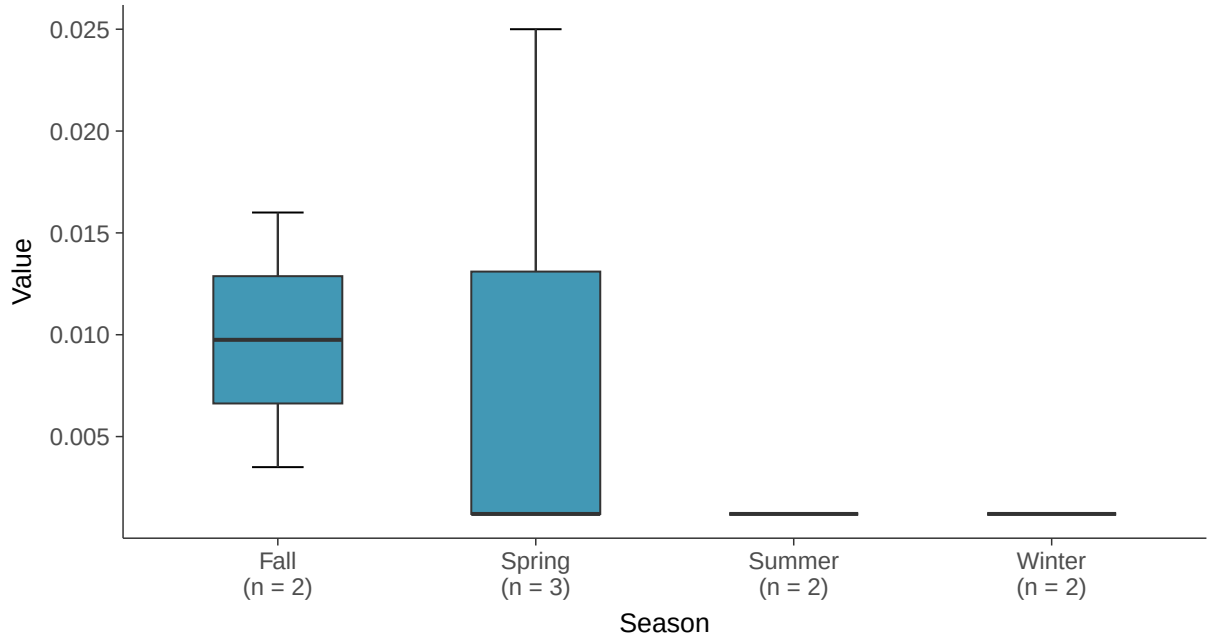
Boxplot

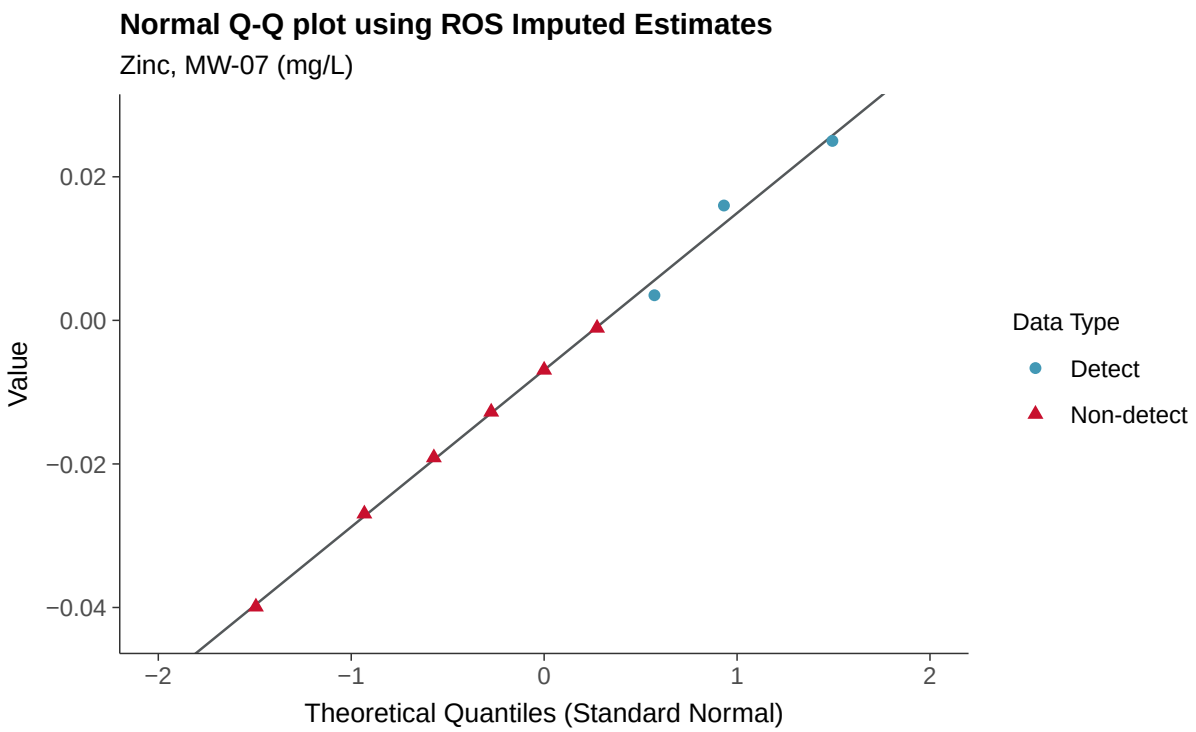
Zinc, MW-07 (mg/L)



Boxplot by Season

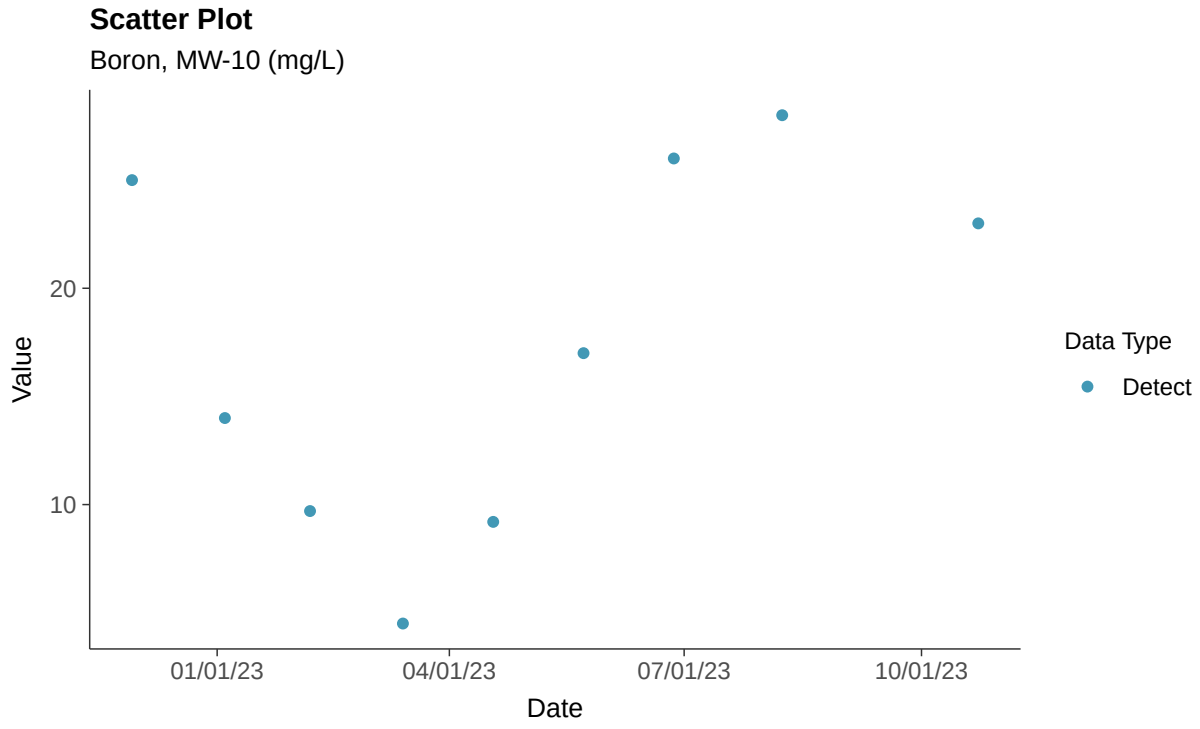
Zinc, MW-07 (mg/L)

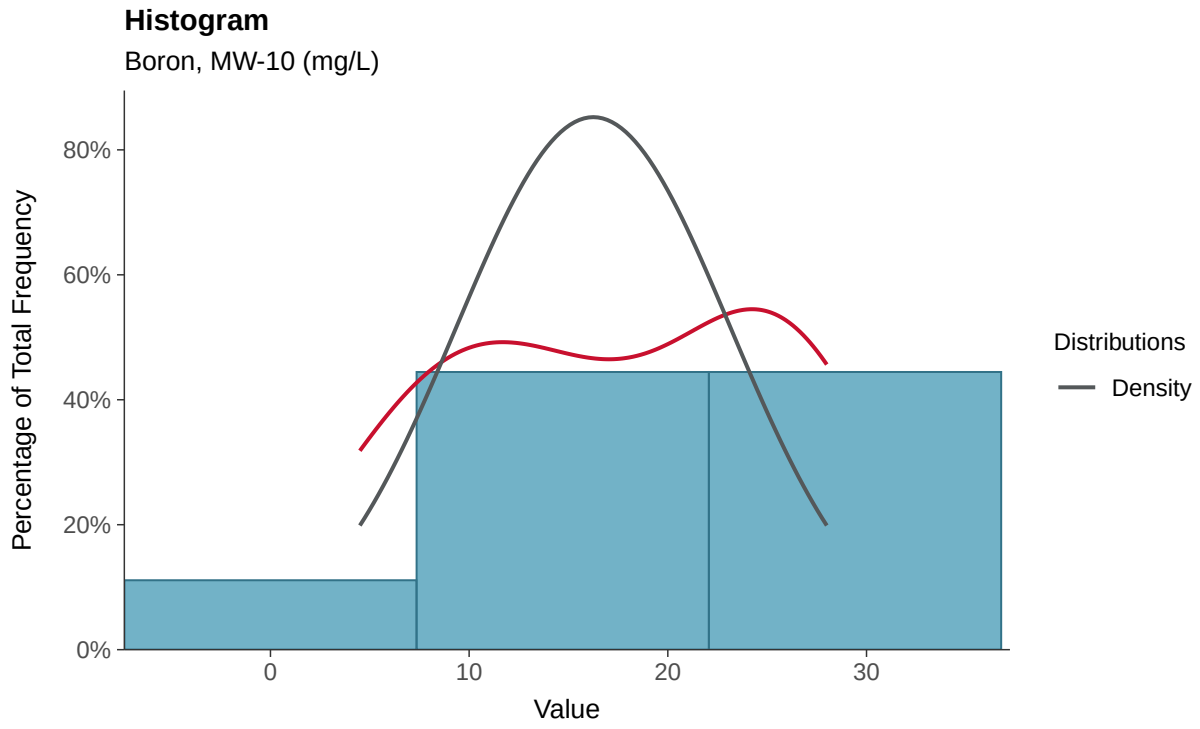



Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-07 (mg/L)
Value
0.02
0.00
−0.02
−0.04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

Appendix III: Boron, MW-10

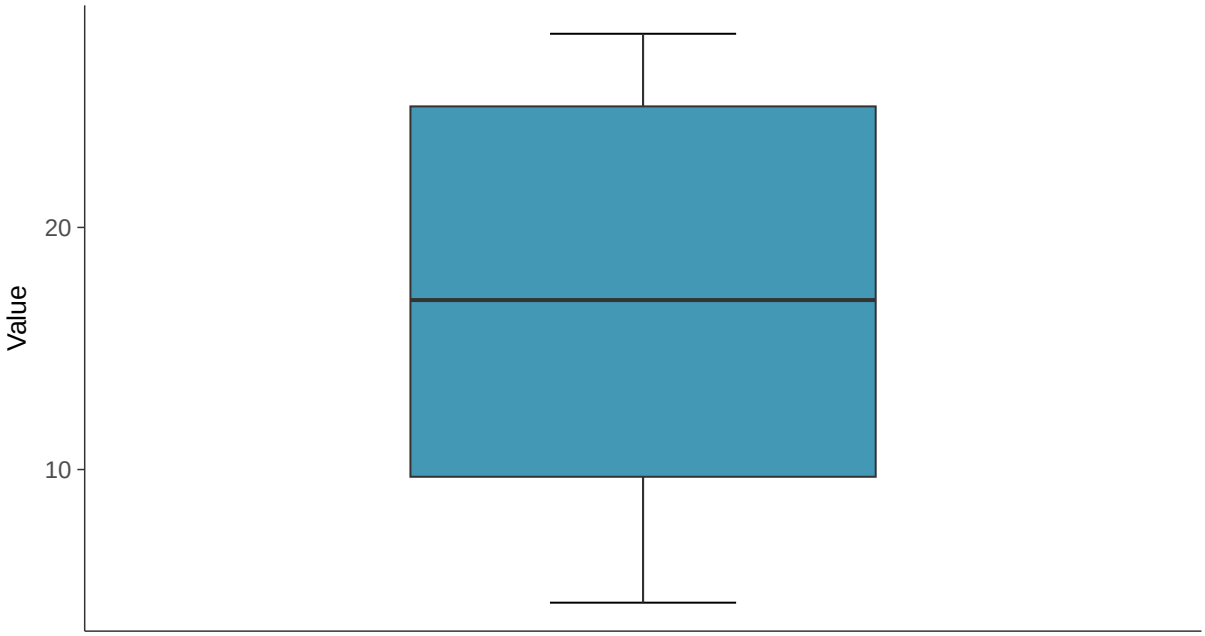
ID: 2_19_4_105





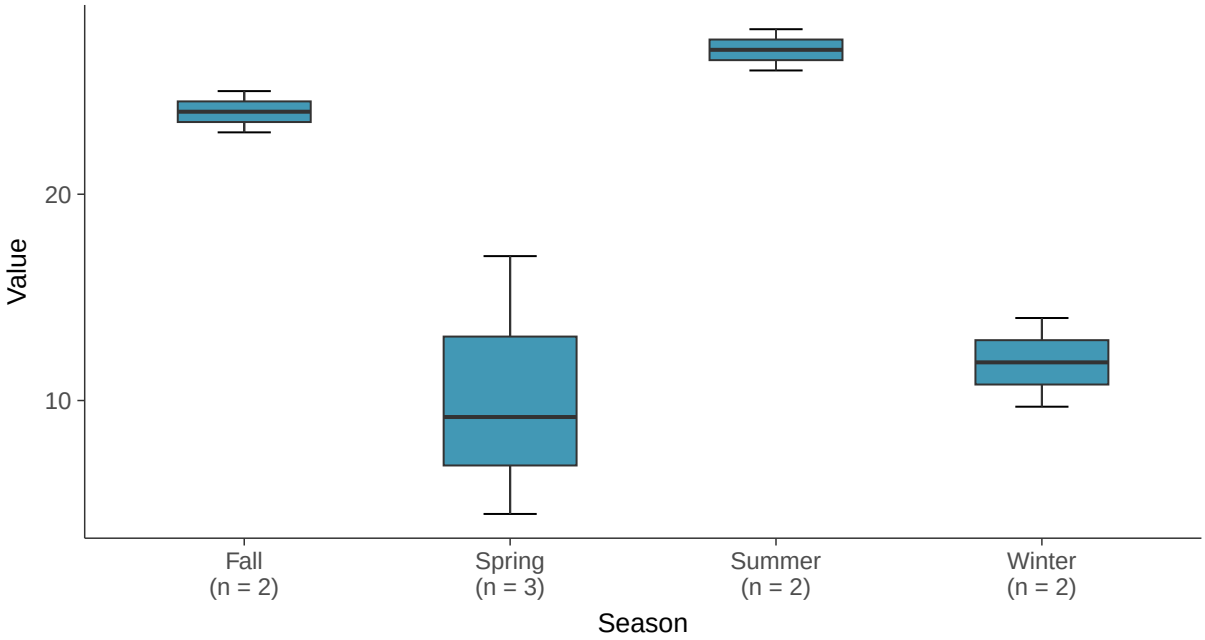
Boxplot

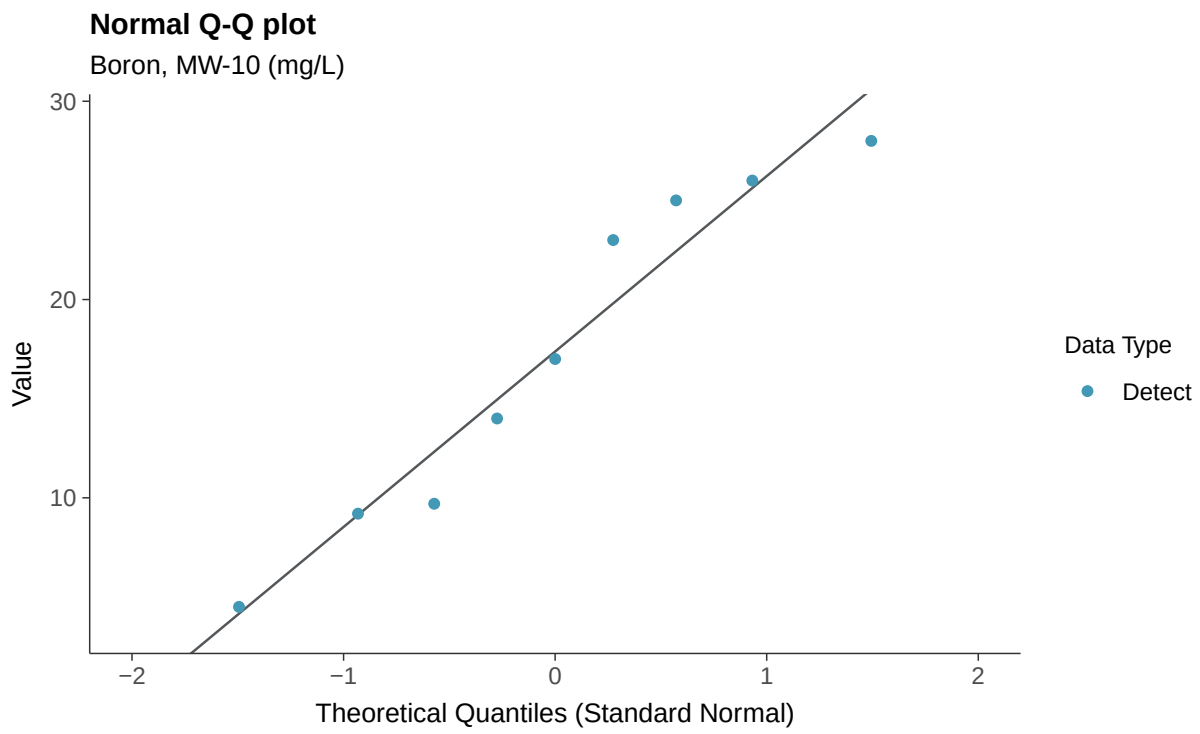
Boron, MW-10 (mg/L)

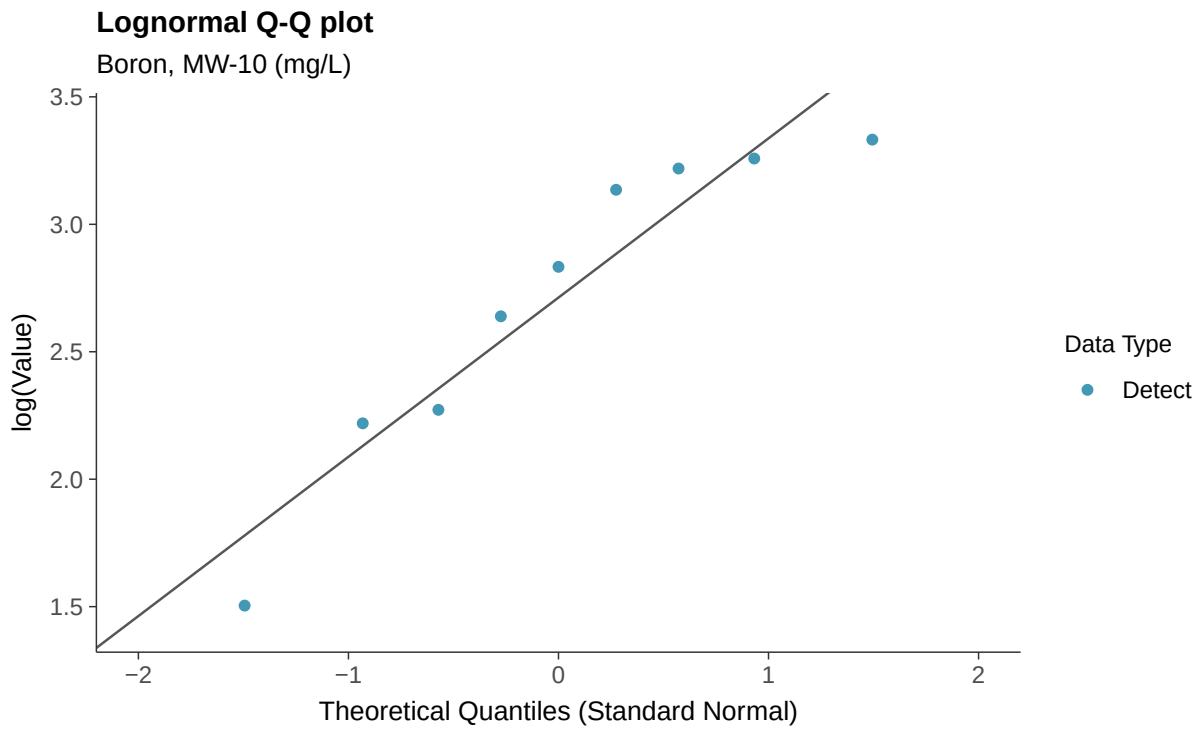


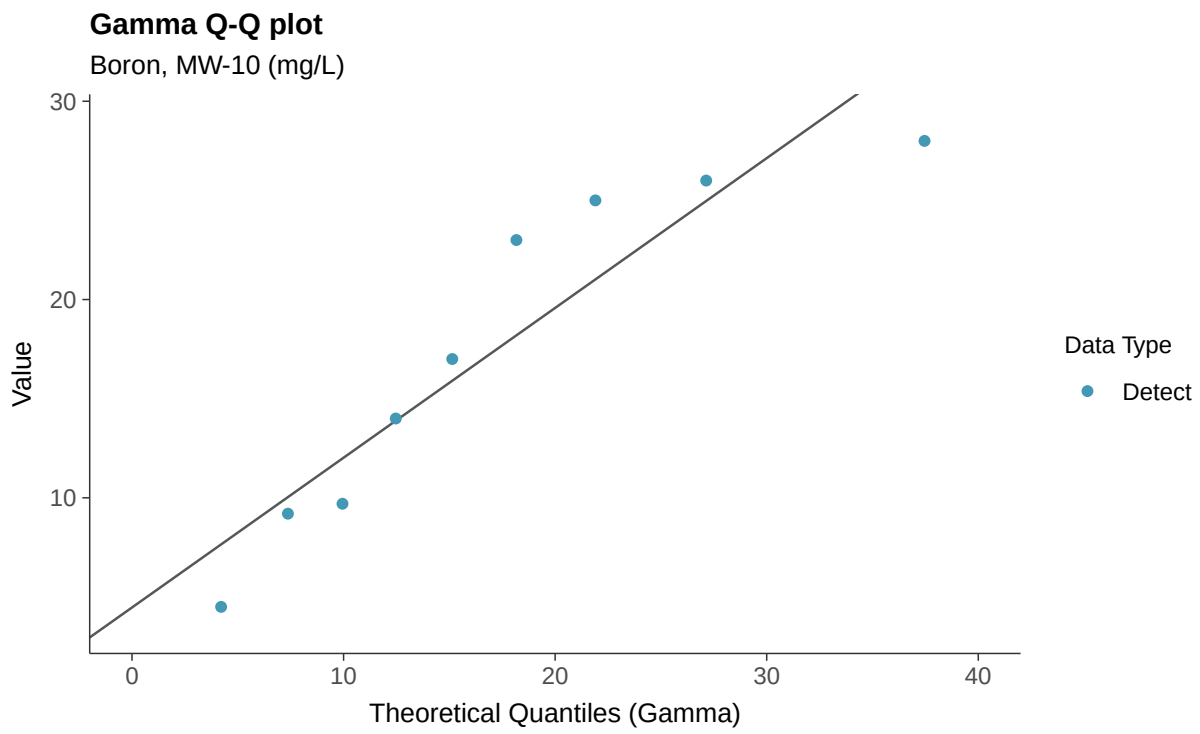
Boxplot by Season

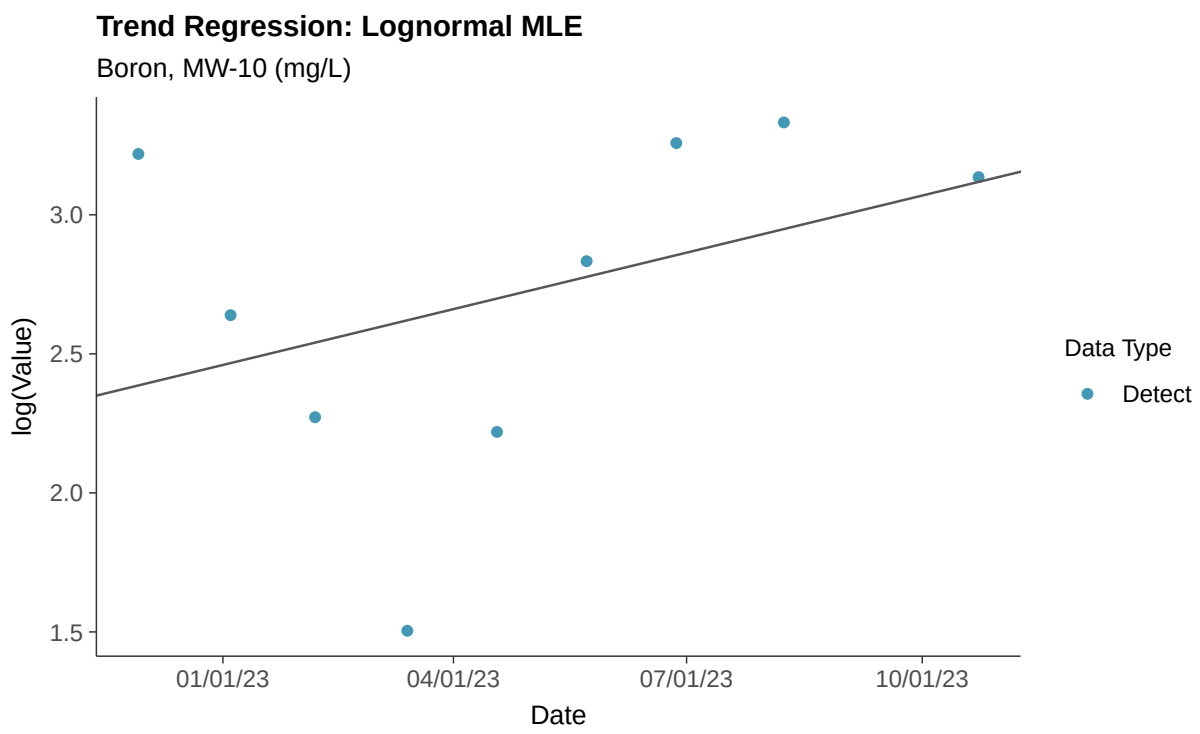
Boron, MW-10 (mg/L)




Normal Q-Q plot
Boron, MW-10 (mg/L)
Value
30
20
10
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

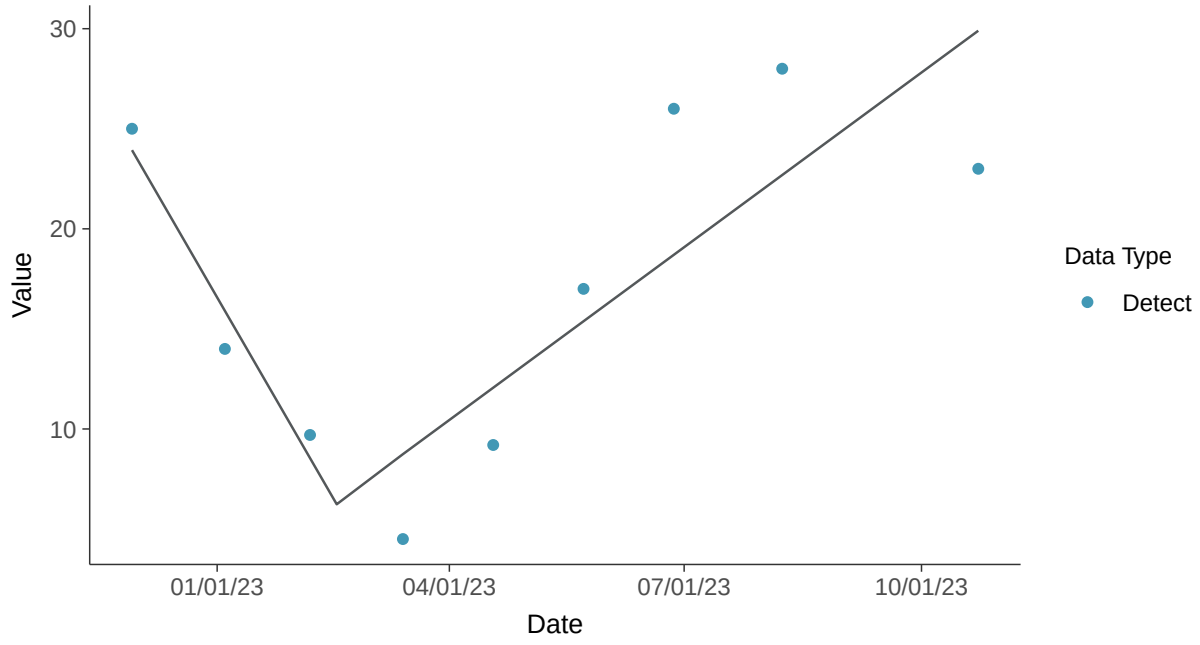

Lognormal Q-Q plot
Boron, MW-10 (mg/L)
log(Value)
3.5
3.0
2.5
2.0
1.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Boron, MW-10 (mg/L)
Value
30
20
10
0
10
20
30
40
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Boron, MW-10 (mg/L)
log(Value)
3.0
2.5
2.0
1.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

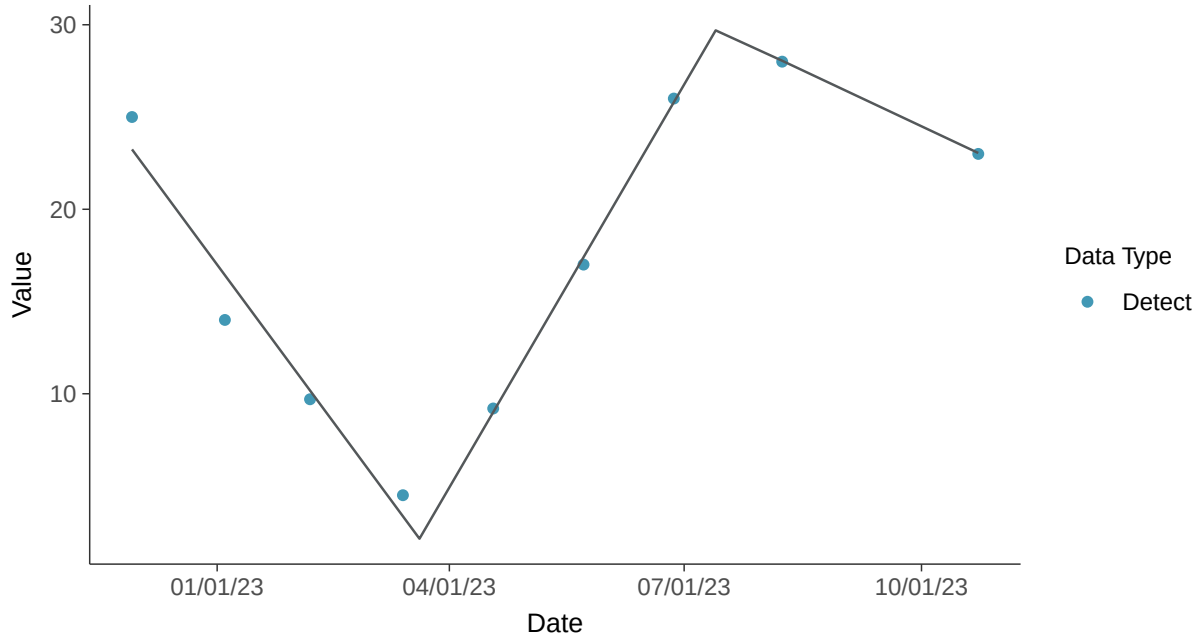
Trend Regression: Piecewise Linear-Linear

Boron, MW-10 (mg/L)



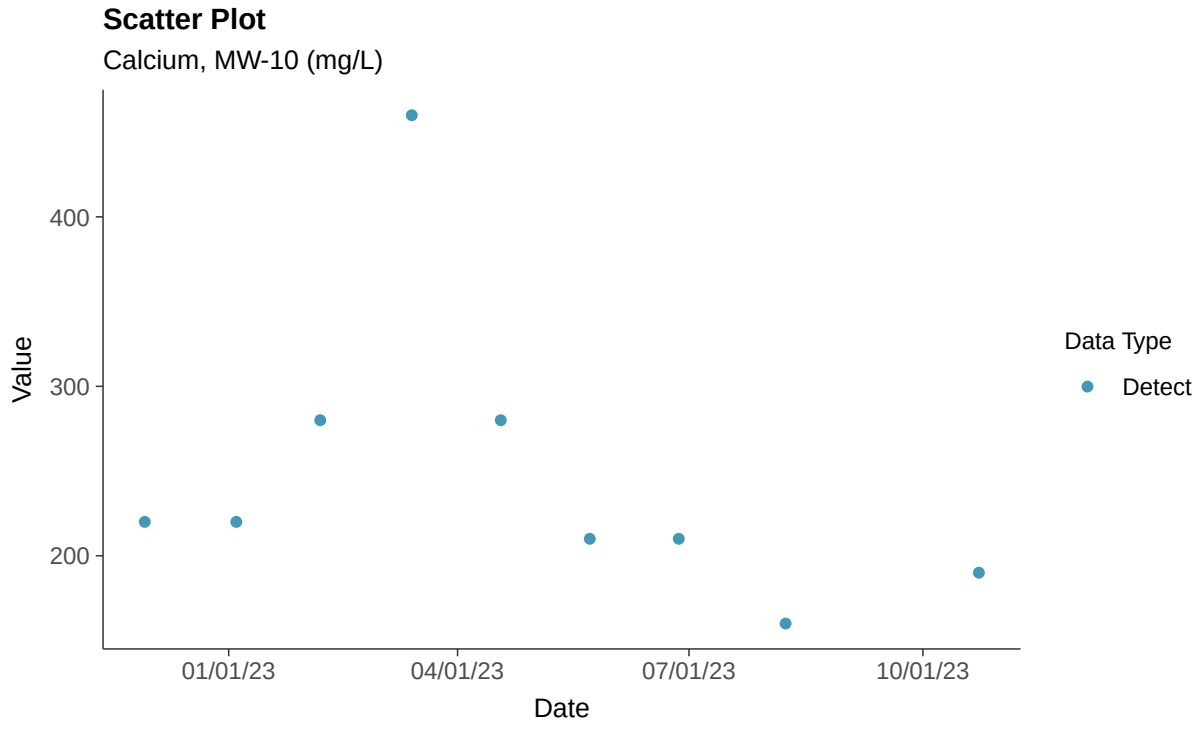
Trend Regression: Piecewise Linear-Linear-Linear

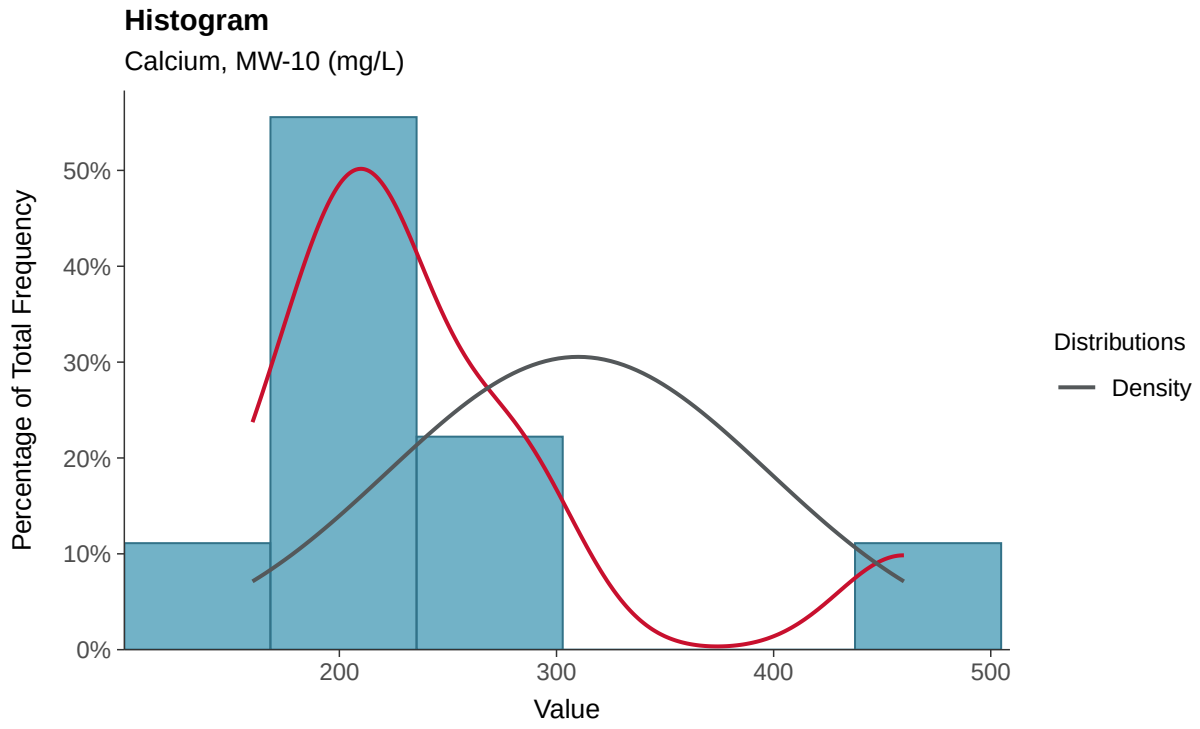
Boron, MW-10 (mg/L)



Appendix III: Calcium, MW-10

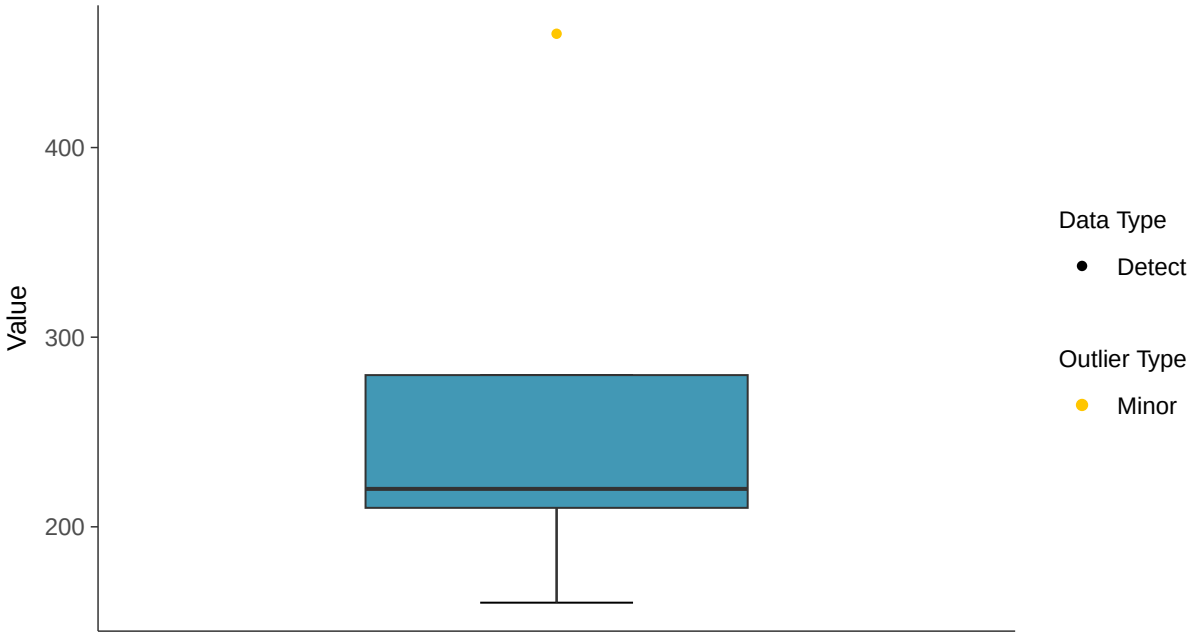
ID: 2_19_4_107





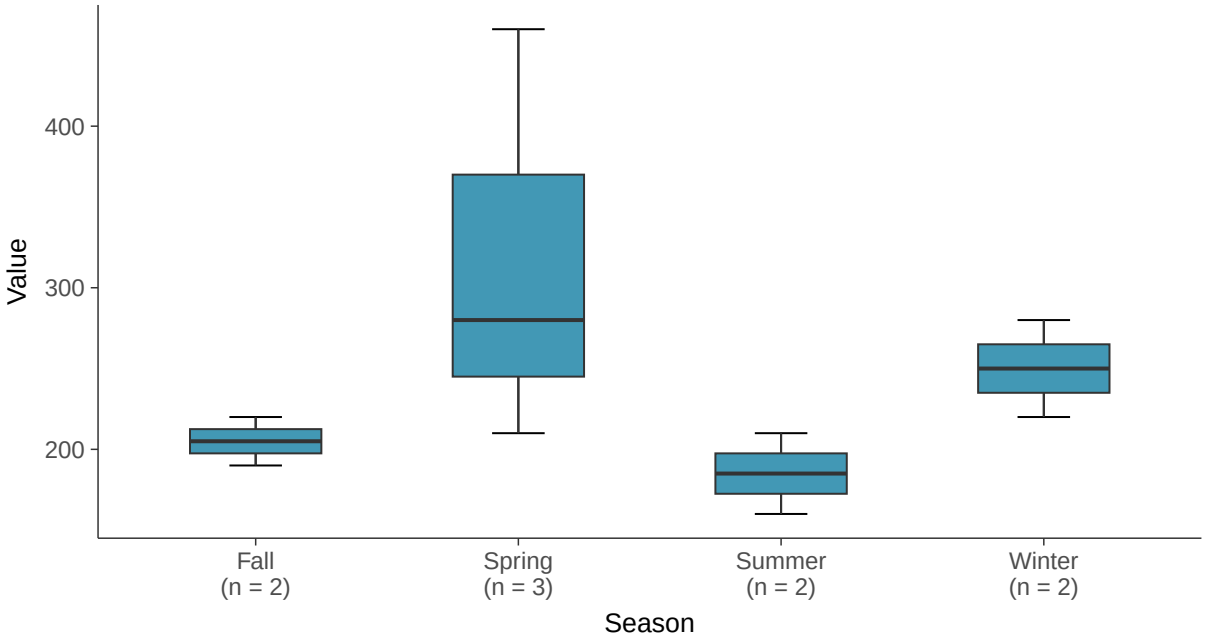
Boxplot

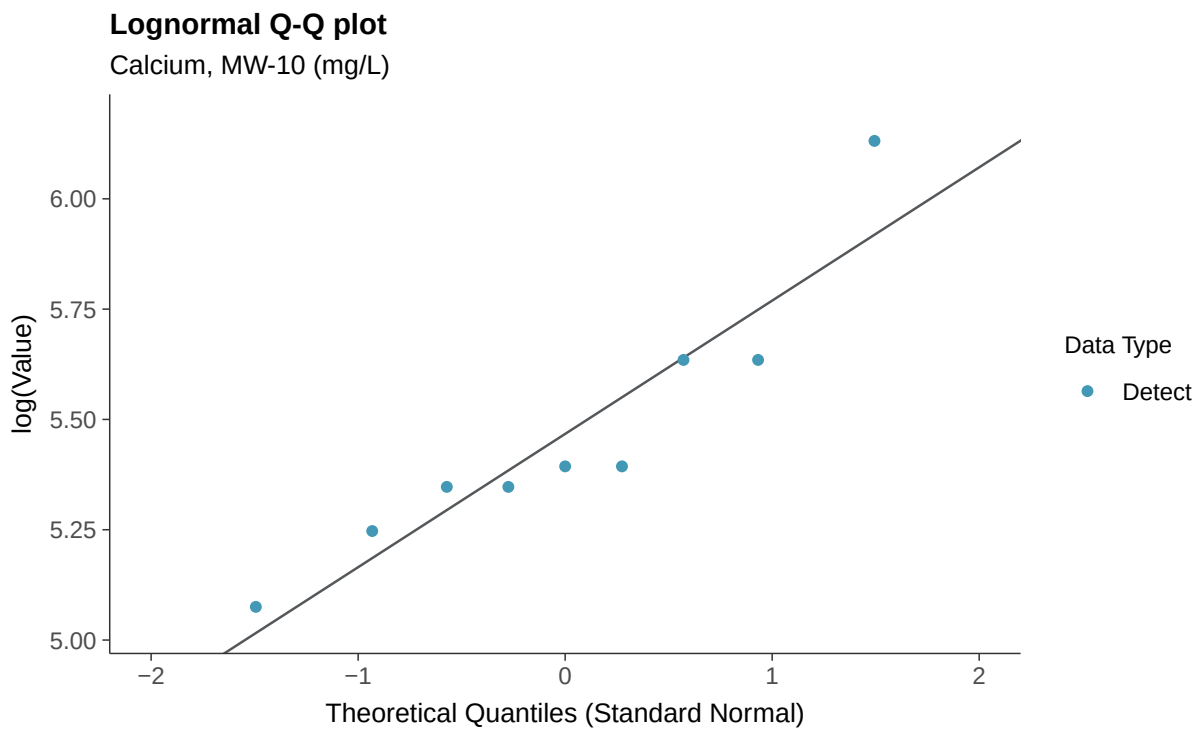
Calcium, MW-10 (mg/L)

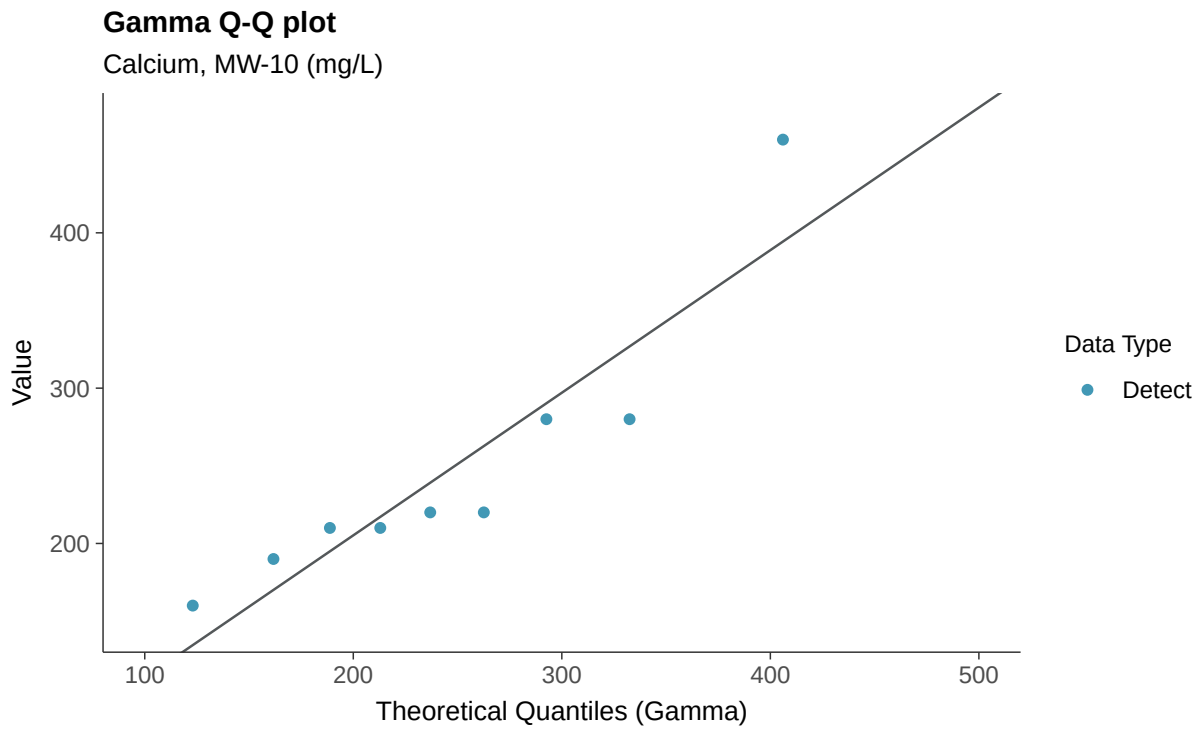


Boxplot by Season

Calcium, MW-10 (mg/L)

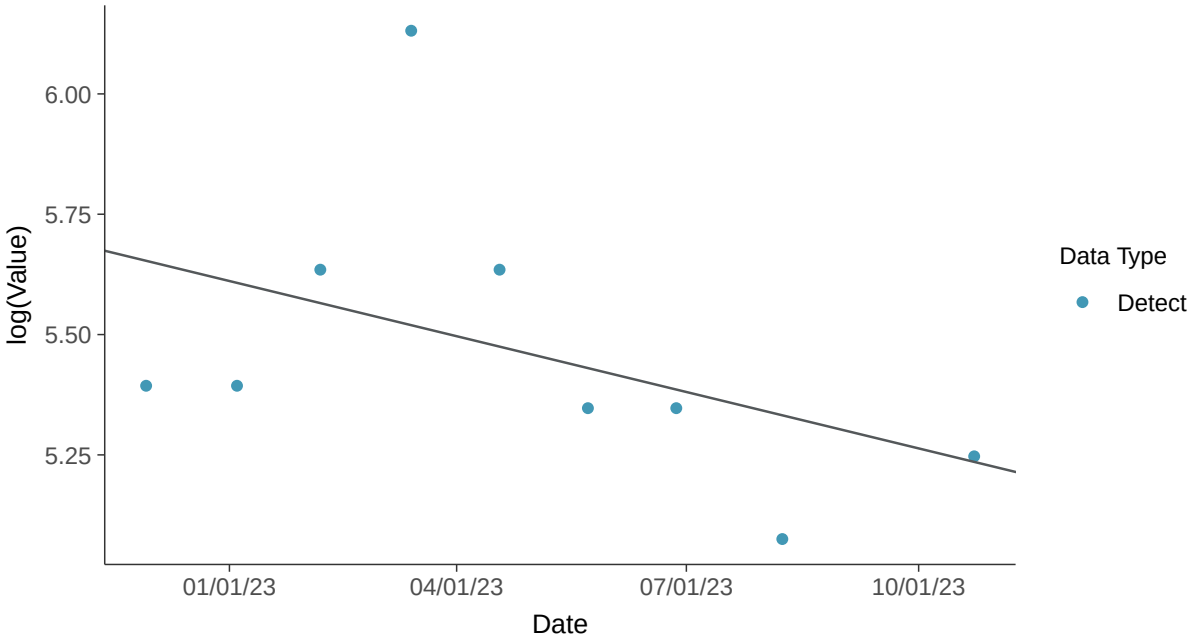



Lognormal Q-Q plot
Calcium, MW-10 (mg/L)
log(Value)
6.00
5.75
5.50
5.25
5.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-10 (mg/L)
Value
400
300
200
100
200
300
400
500
Theoretical Quantiles (Gamma)
Data Type
Detect

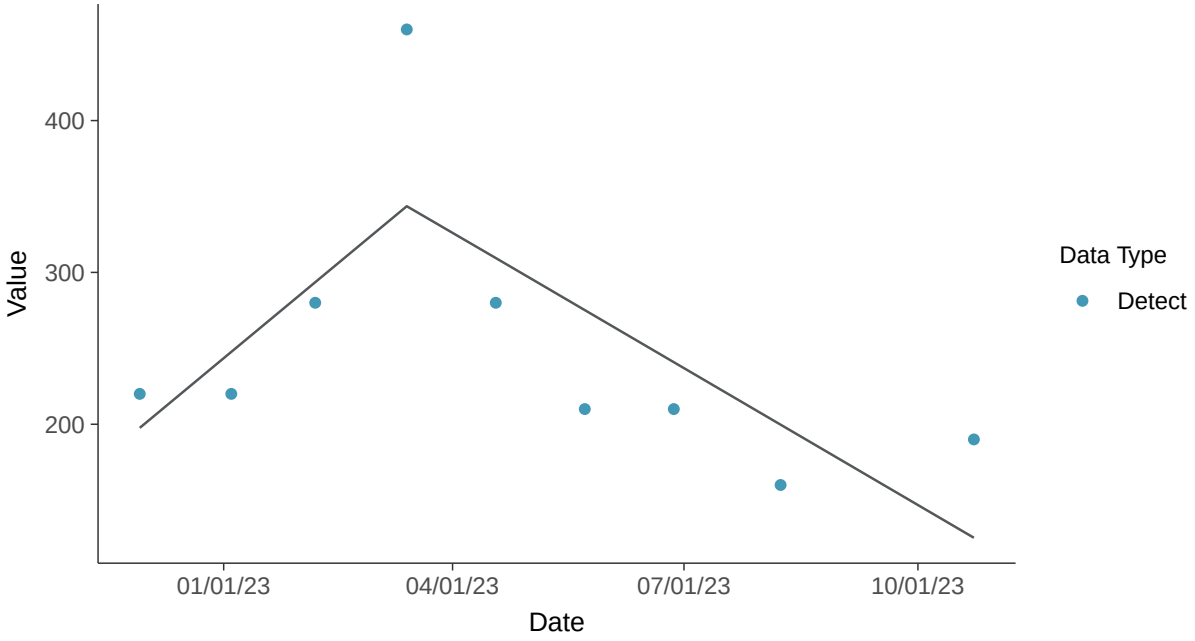
Trend Regression: Lognormal MLE

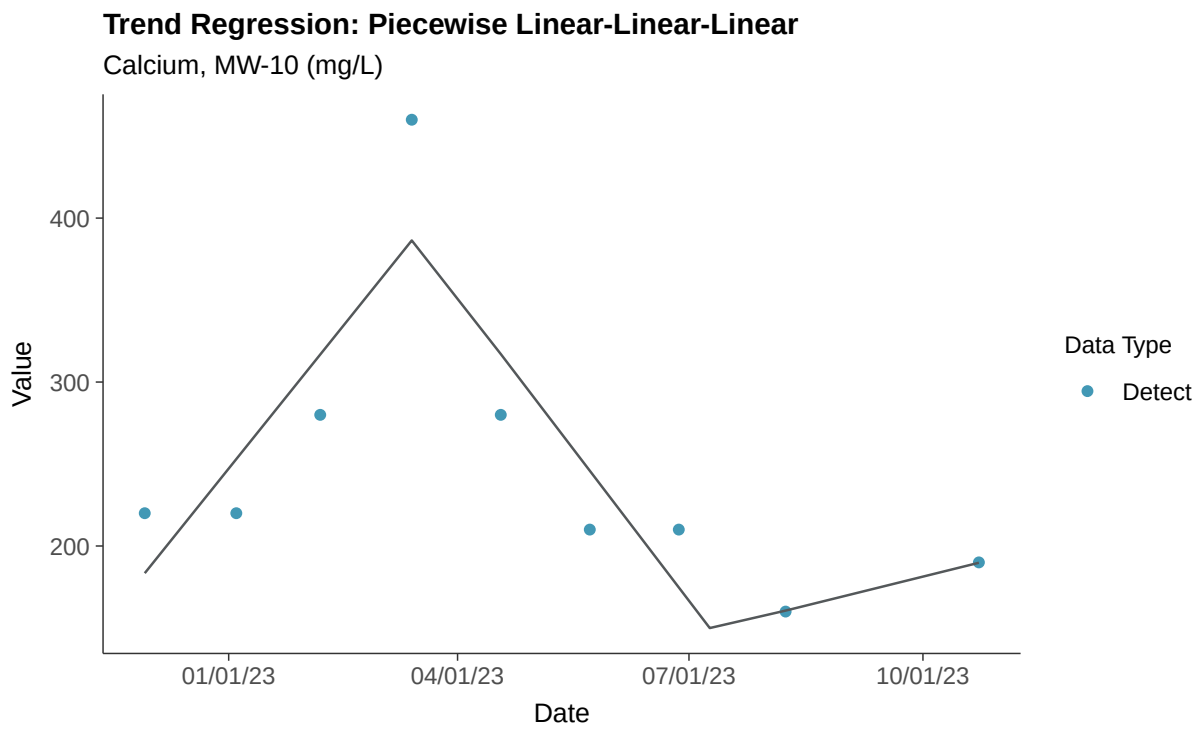
Calcium, MW-10 (mg/L)



Trend Regression: Piecewise Linear-Linear

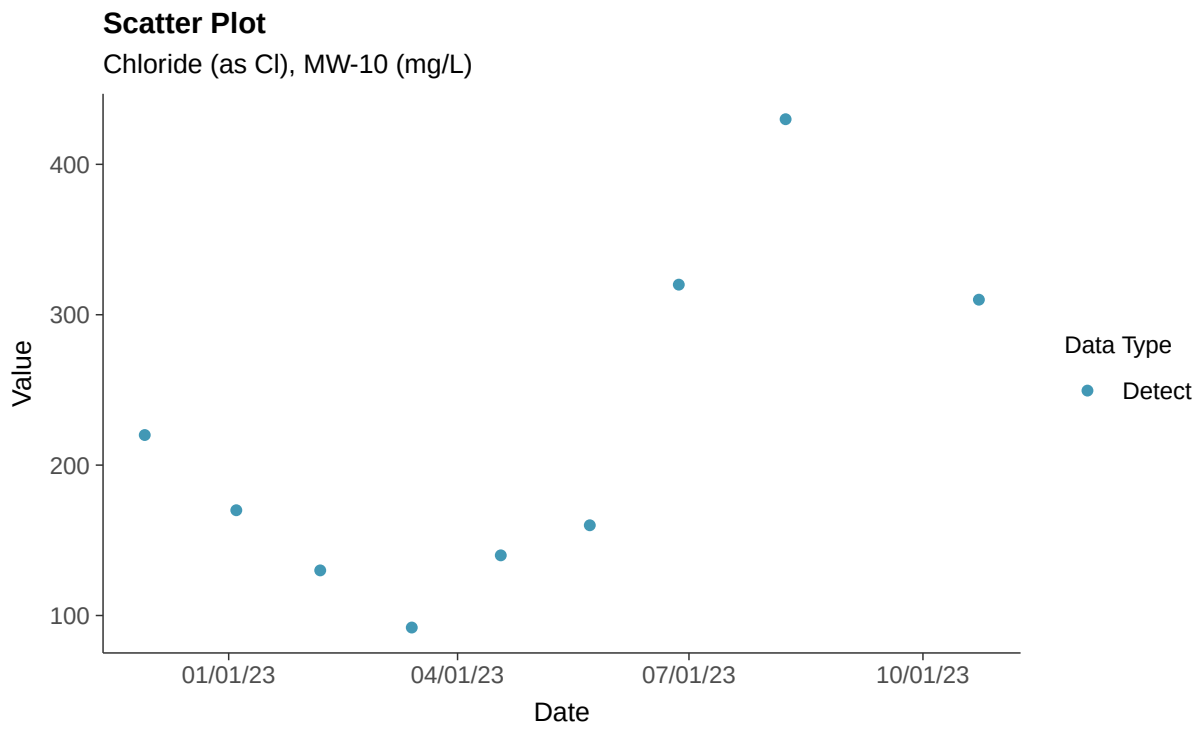
Calcium, MW-10 (mg/L)

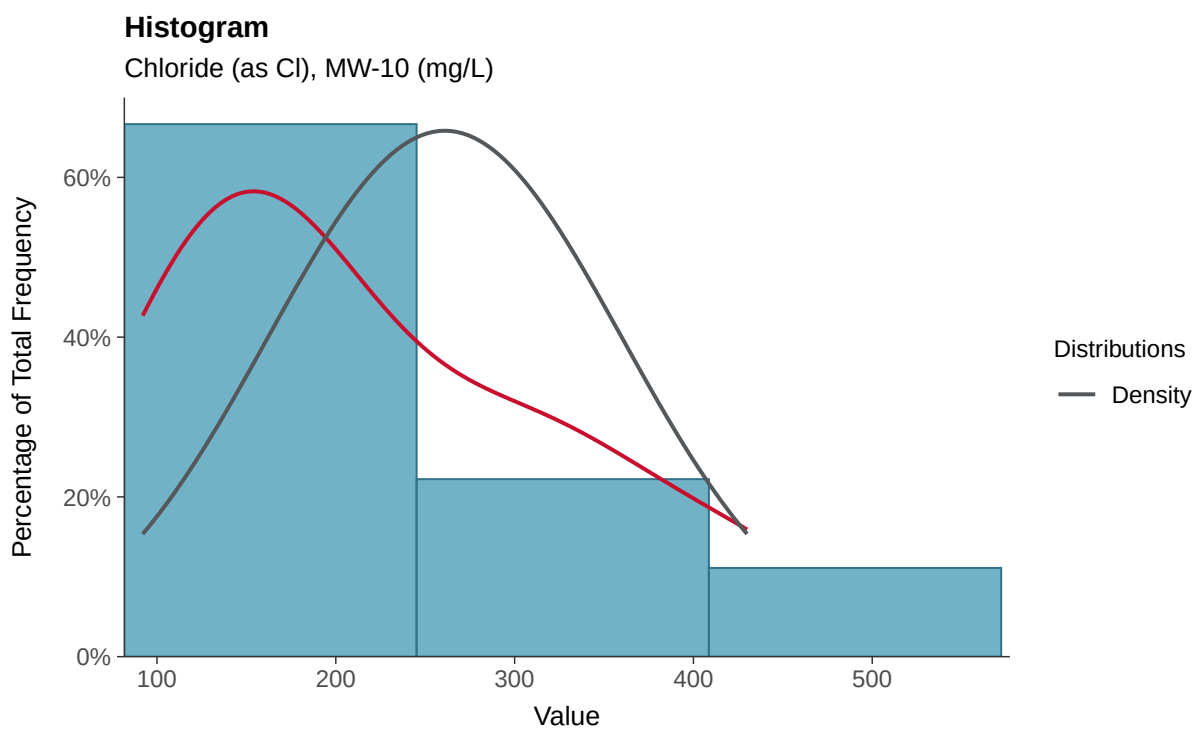



Trend Regression: Piecewise Linear-Linear-Linear
Calcium, MW-10 (mg/L)
Value
400
300
200
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Chloride (as Cl), MW-10

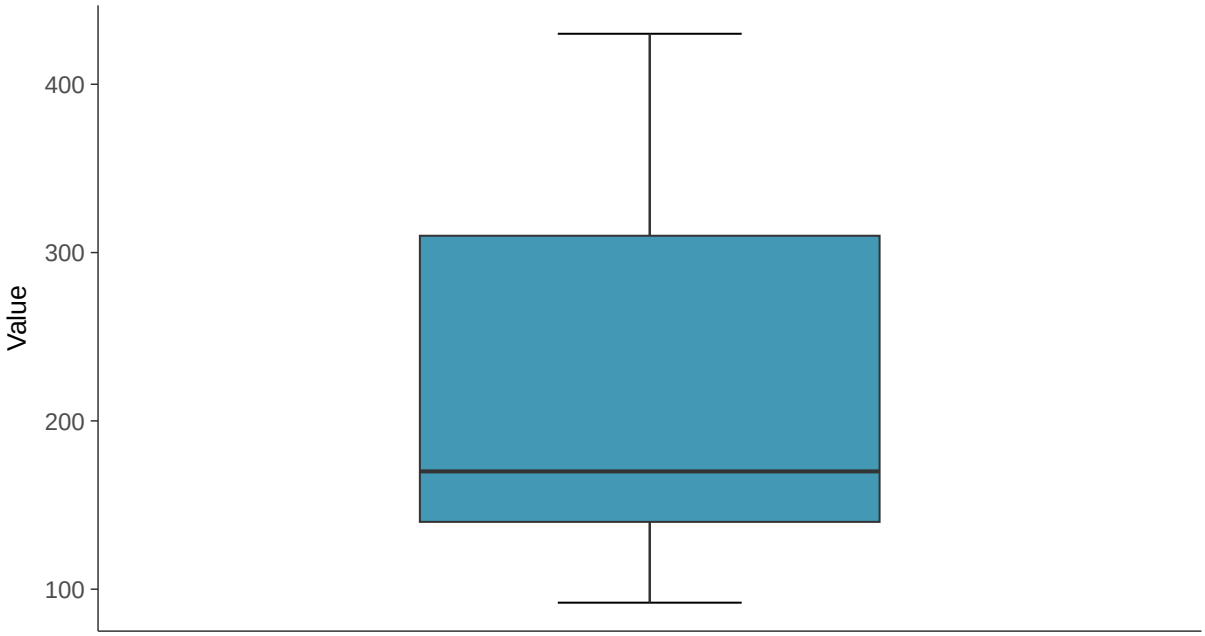
ID: 2_19_4_108





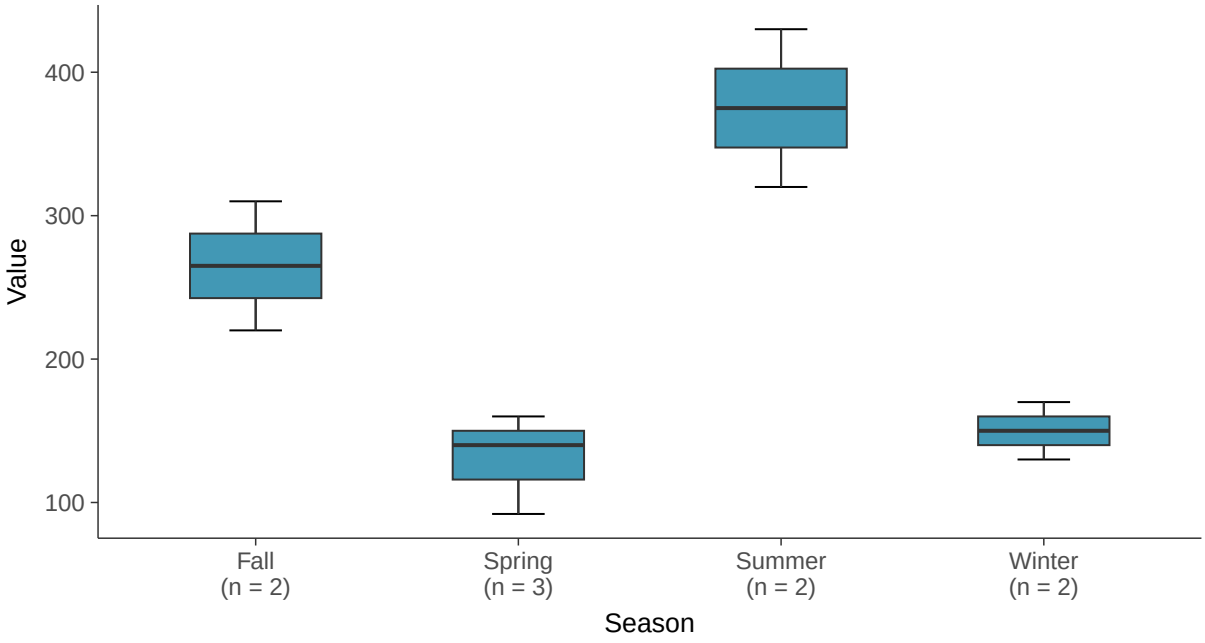
Boxplot

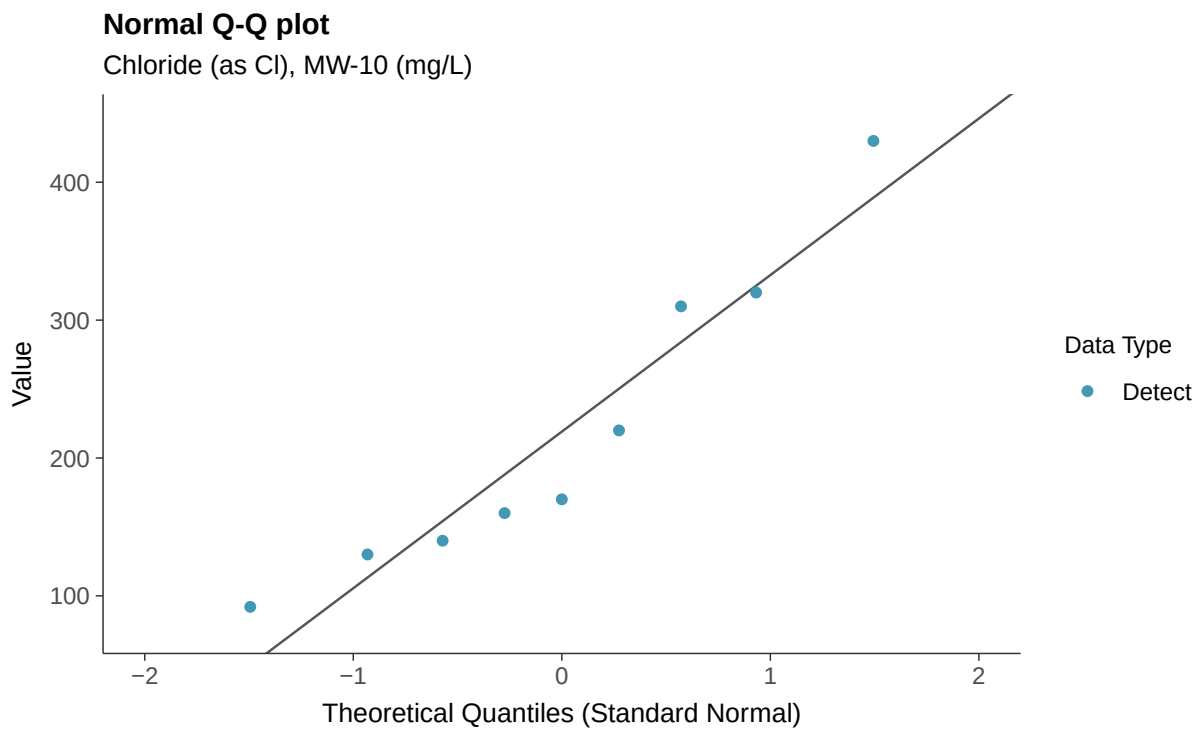
Chloride (as Cl), MW-10 (mg/L)

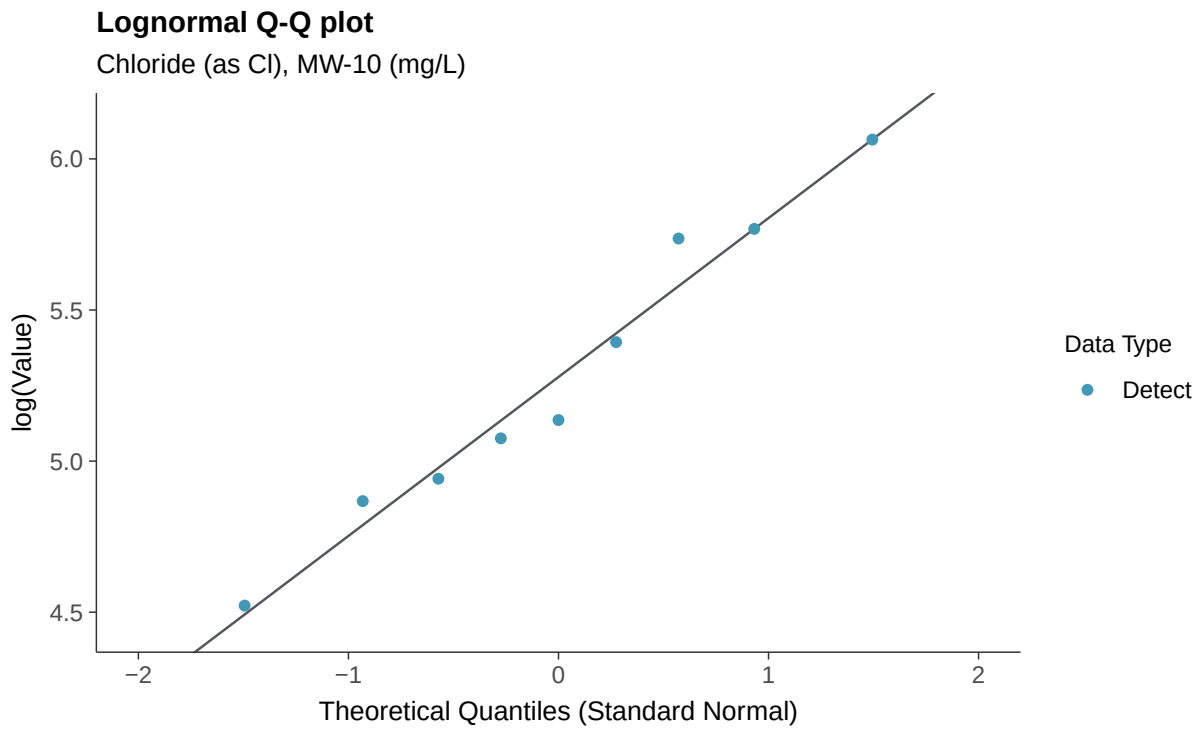


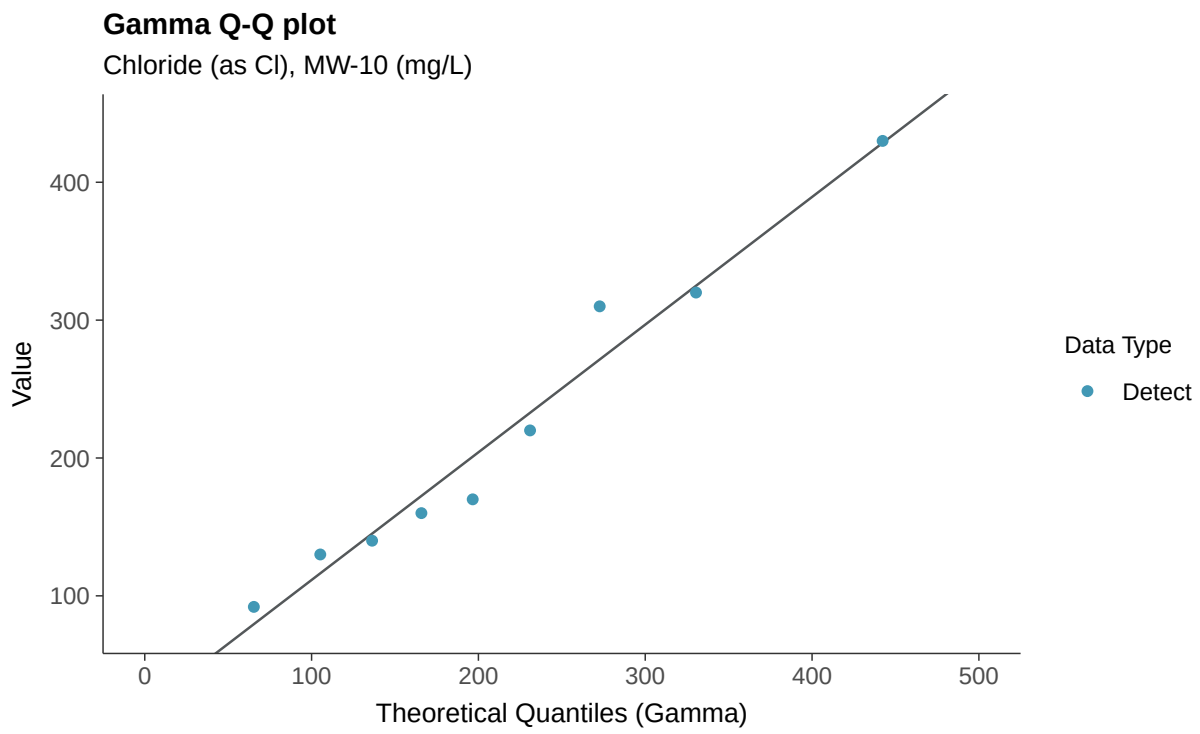
Boxplot by Season

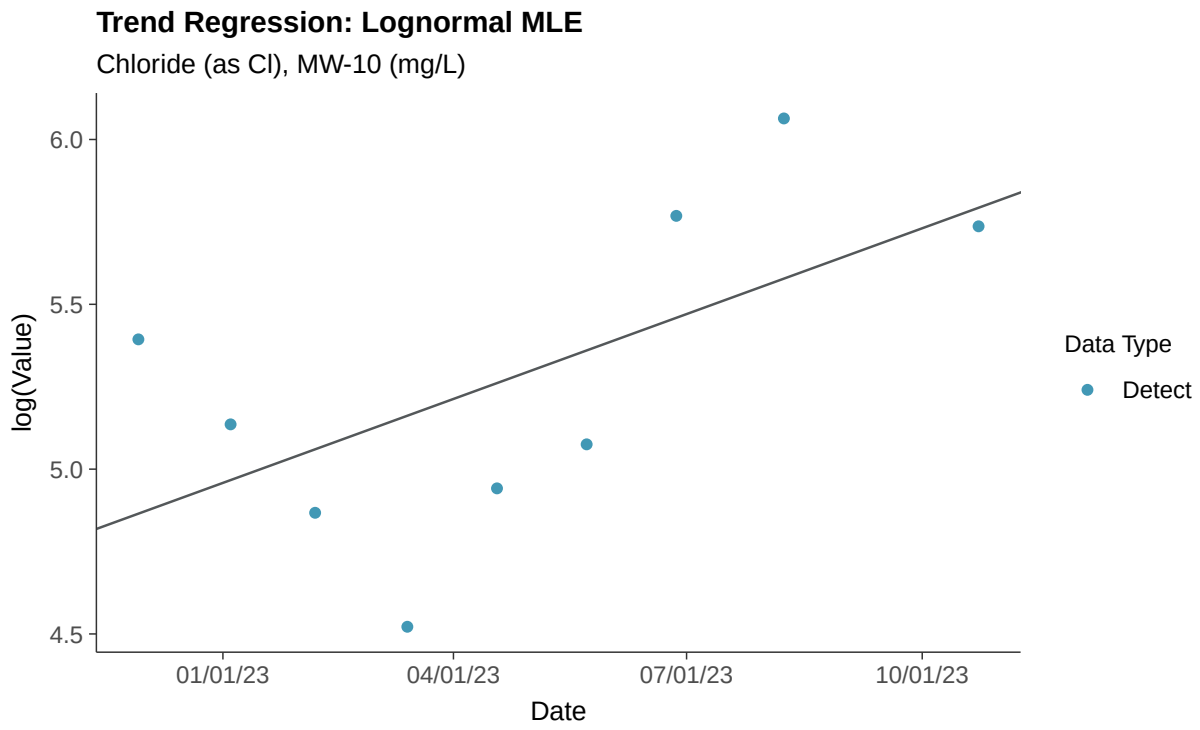
Chloride (as Cl), MW-10 (mg/L)

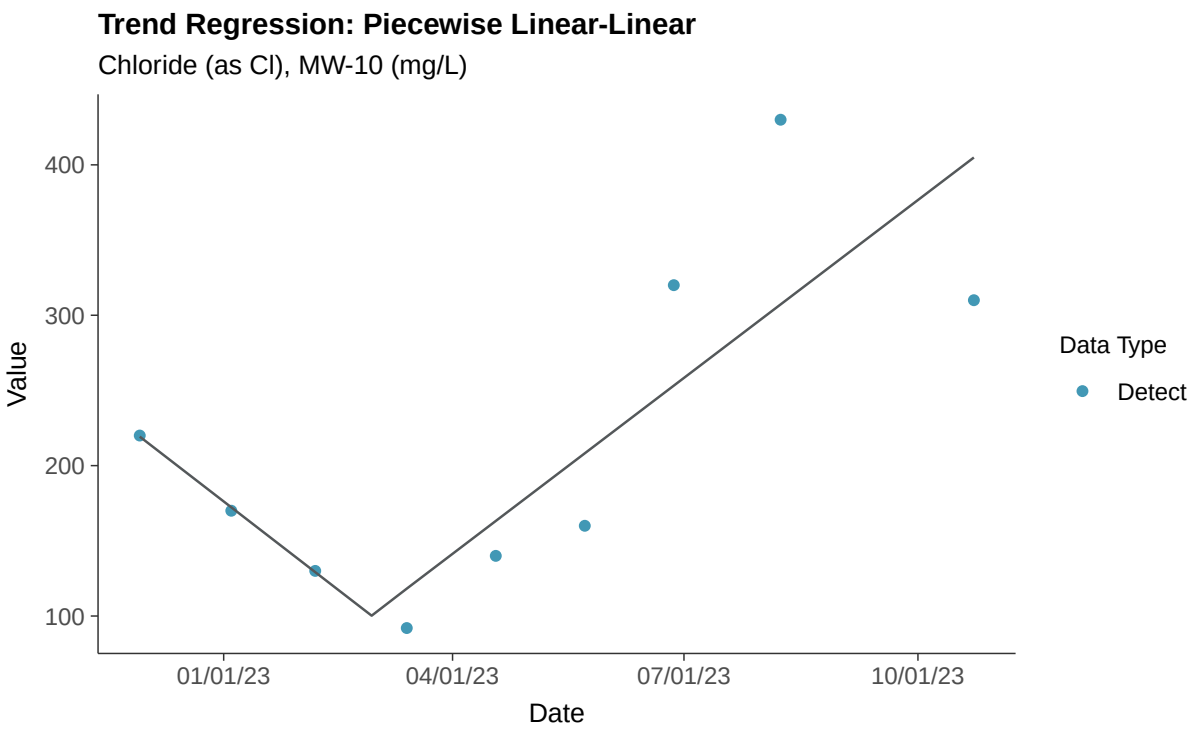



Normal Q-Q plot
Chloride (as Cl), MW-10 (mg/L)
Value
400
300
200
100
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chloride (as Cl), MW-10 (mg/L)
log(Value)
6.0
5.5
5.0
4.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

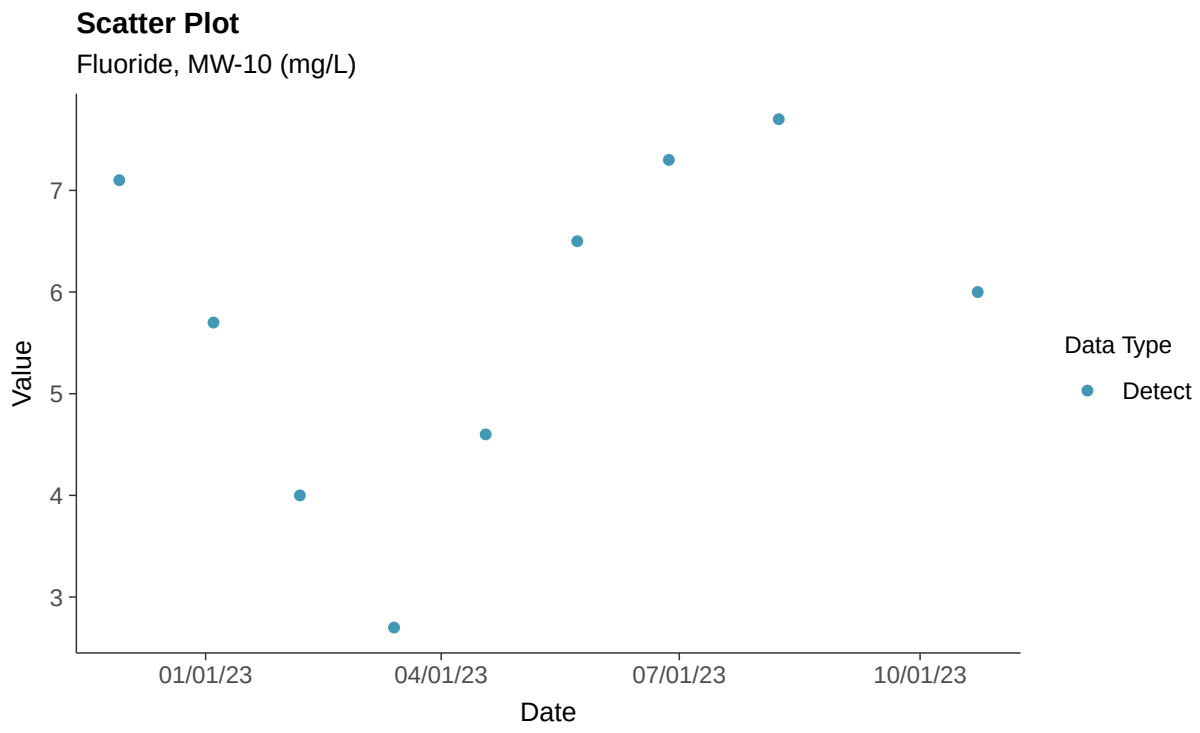

Gamma Q-Q plot
Chloride (as Cl), MW-10 (mg/L)
Value
400
300
200
100
0
100
200
300
400
500
Theoretical Quantiles (Gamma)
Data Type
Detect

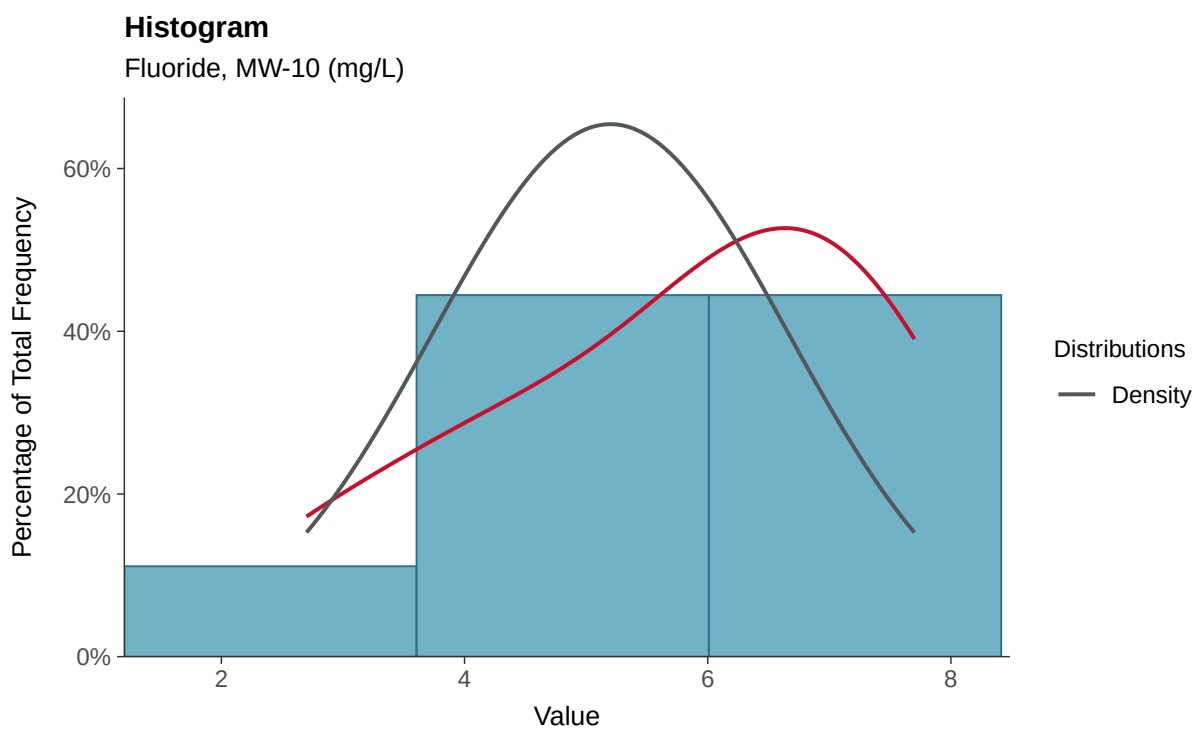

Trend Regression: Lognormal MLE
Chloride (as Cl), MW-10 (mg/L)
log(Value)
6.0
5.5
5.0
4.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-10 (mg/L)
Value
400
300
200
100
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-10

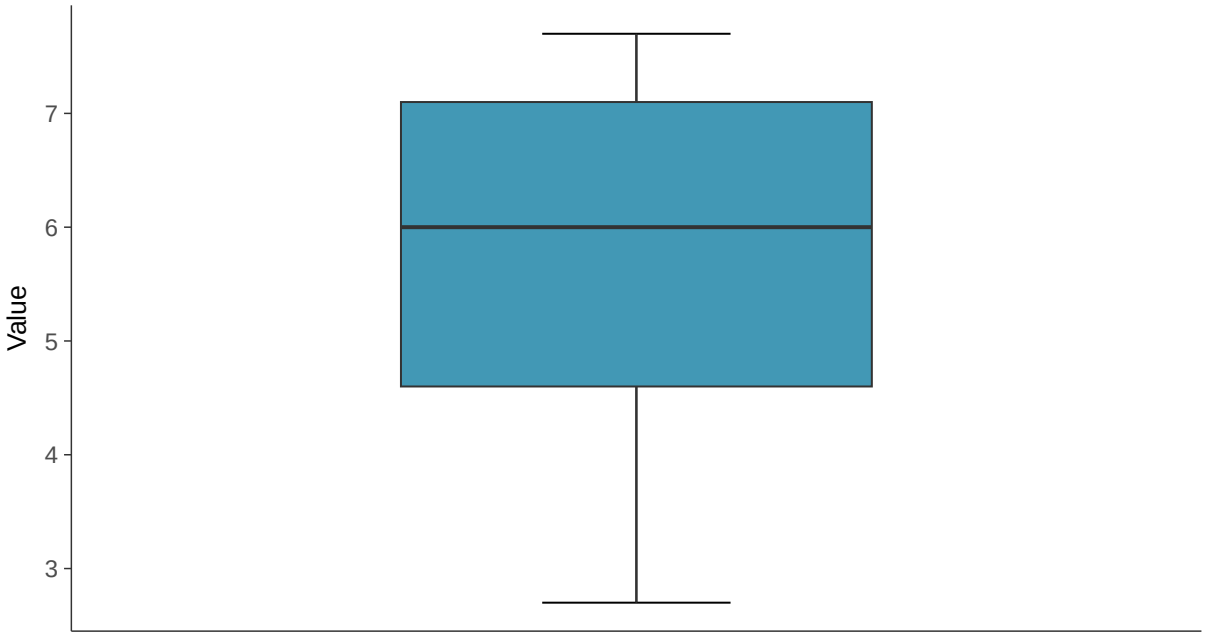
ID: 2_19_4_112





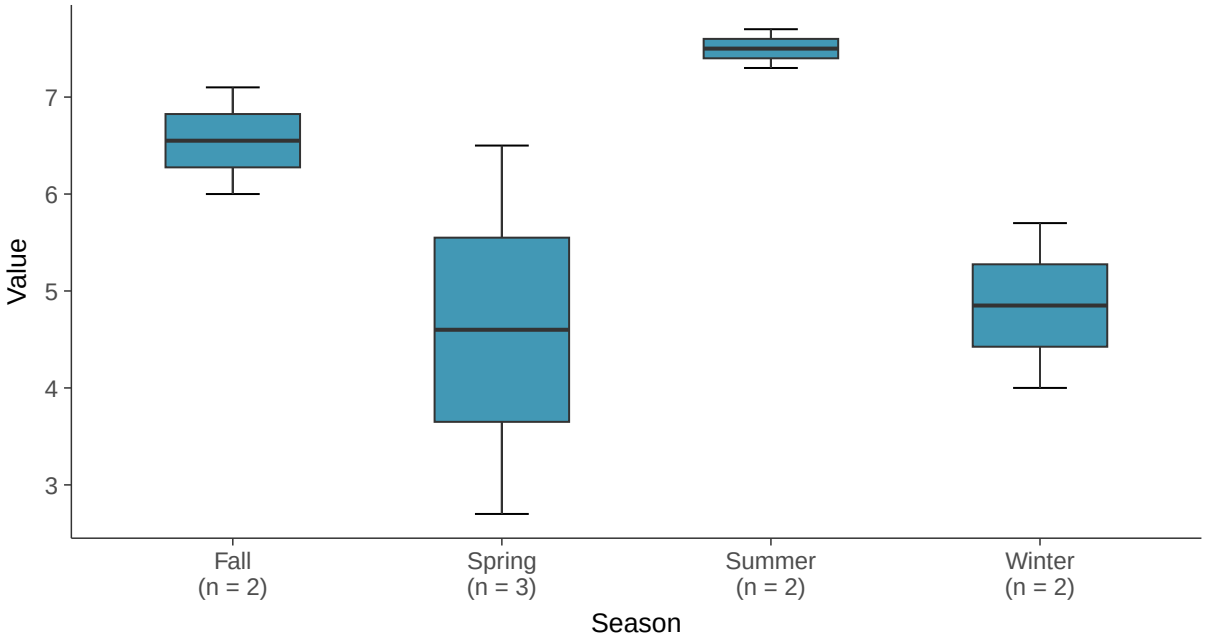
Boxplot

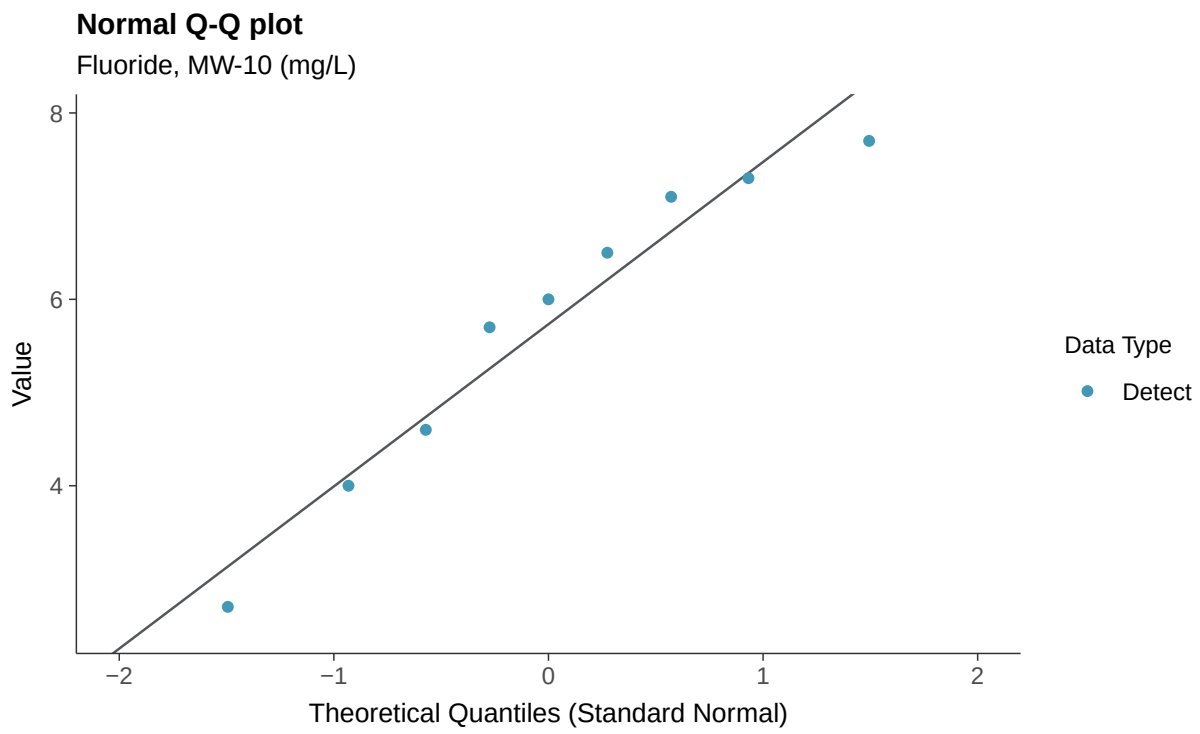
Fluoride, MW-10 (mg/L)

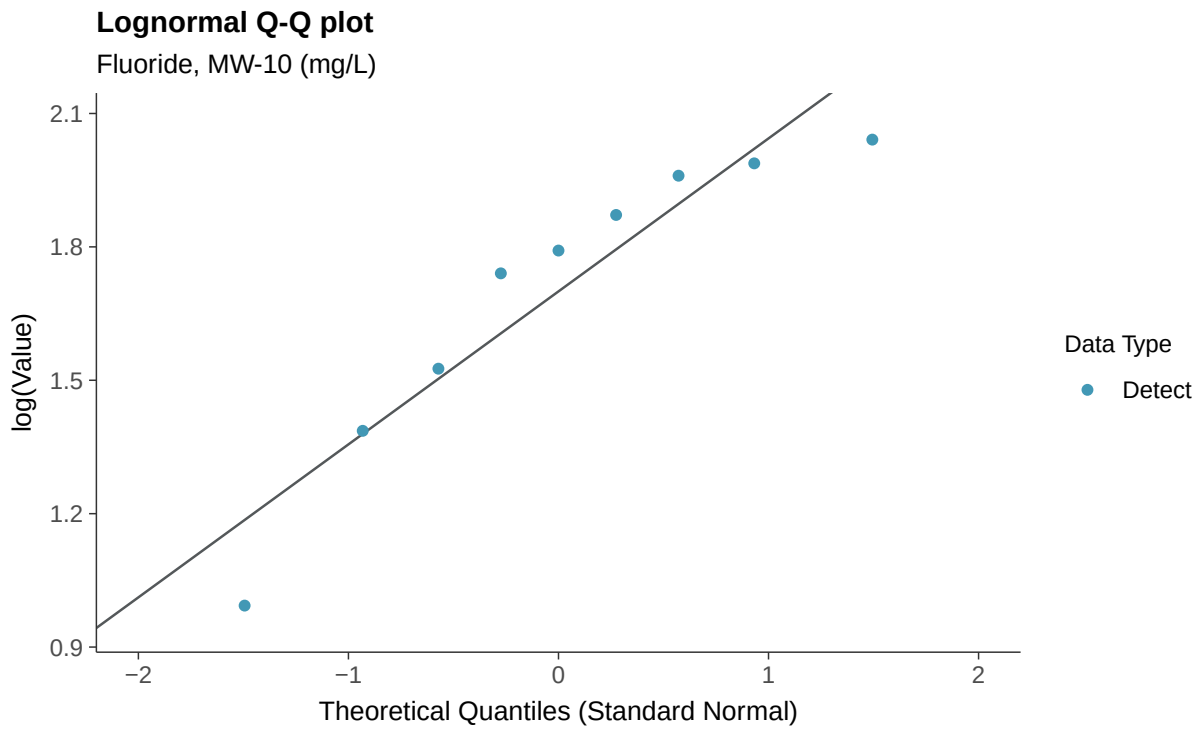


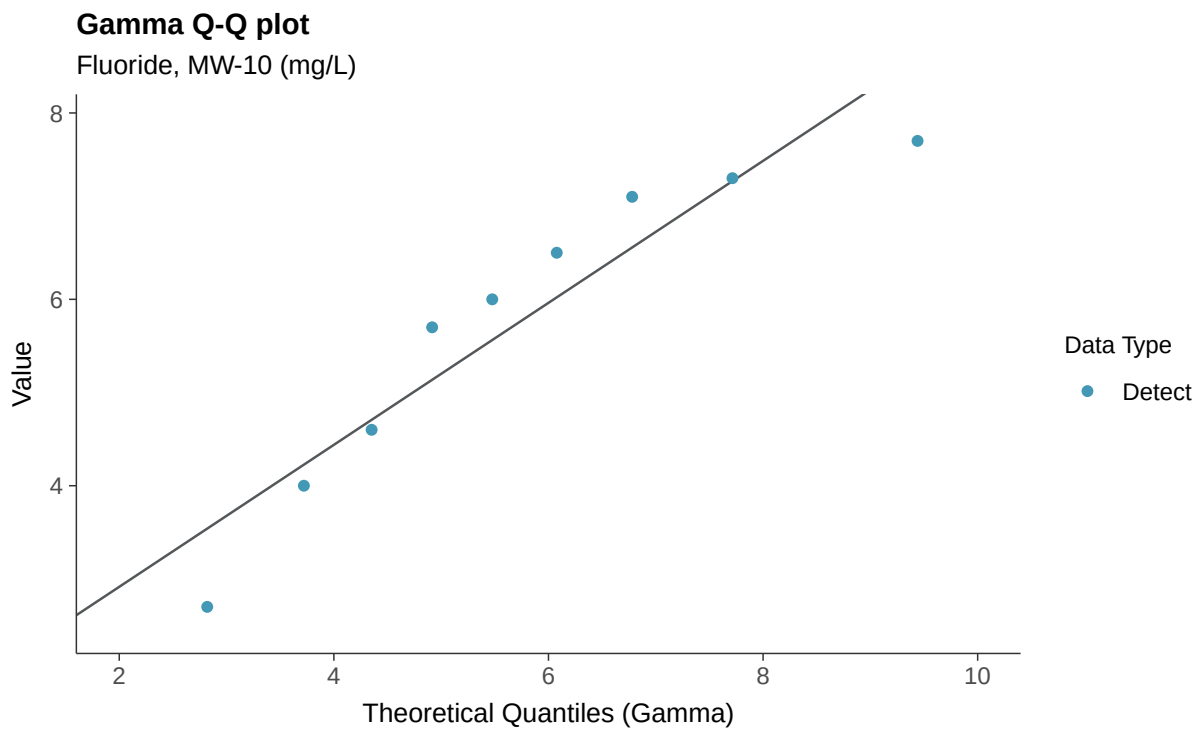
Boxplot by Season

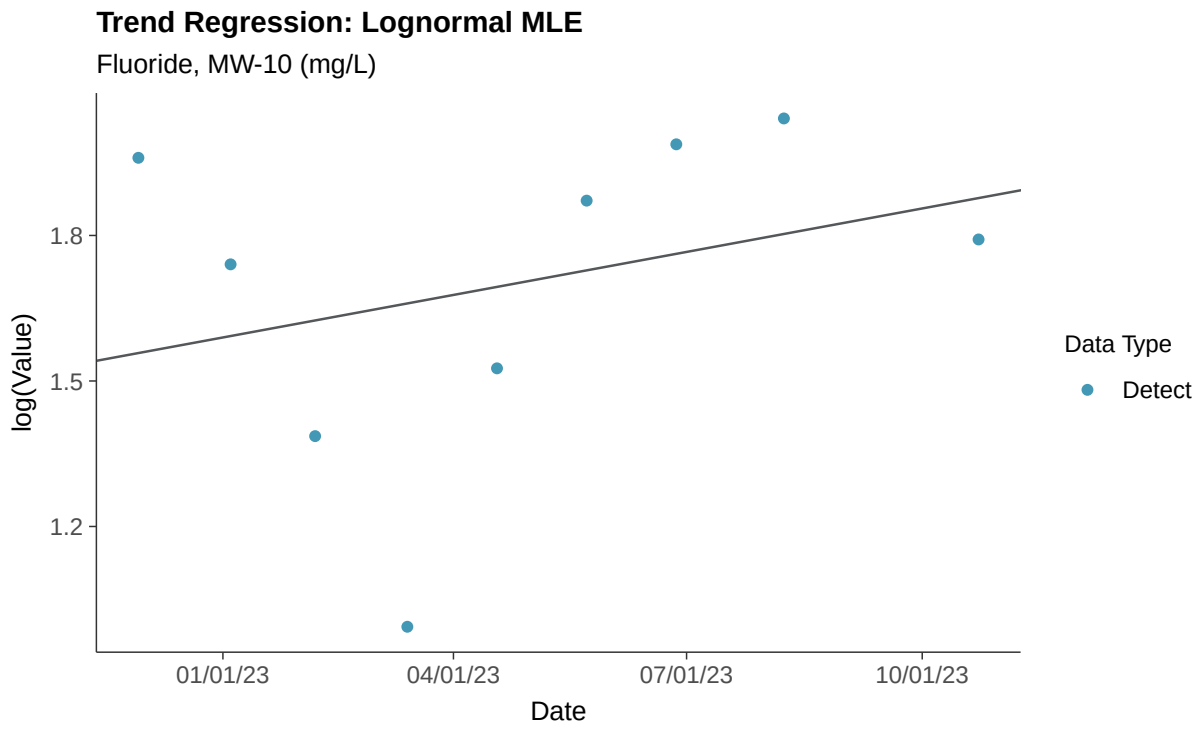
Fluoride, MW-10 (mg/L)




Normal Q-Q plot
Fluoride, MW-10 (mg/L)
Value
8
6
4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

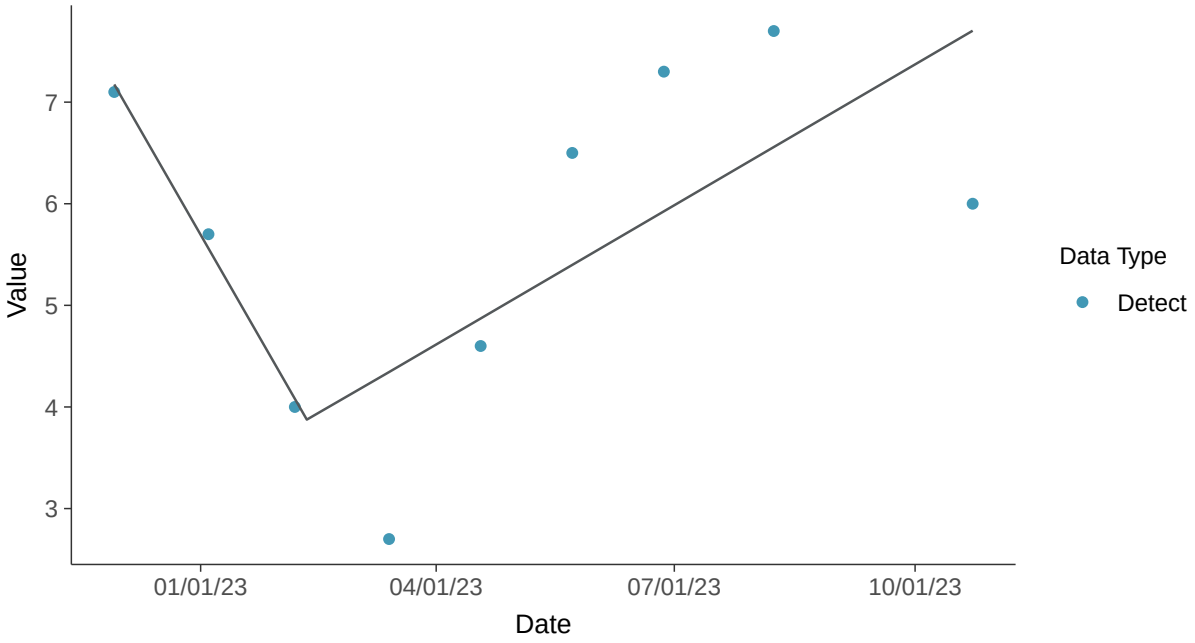

Lognormal Q-Q plot
Fluoride, MW-10 (mg/L)
log(Value)
2.1
1.8
1.5
1.2
0.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride, MW-10 (mg/L)
Value
8
6
4
2
4
6
8
10
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride, MW-10 (mg/L)
log(Value)
1.8
1.5
1.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

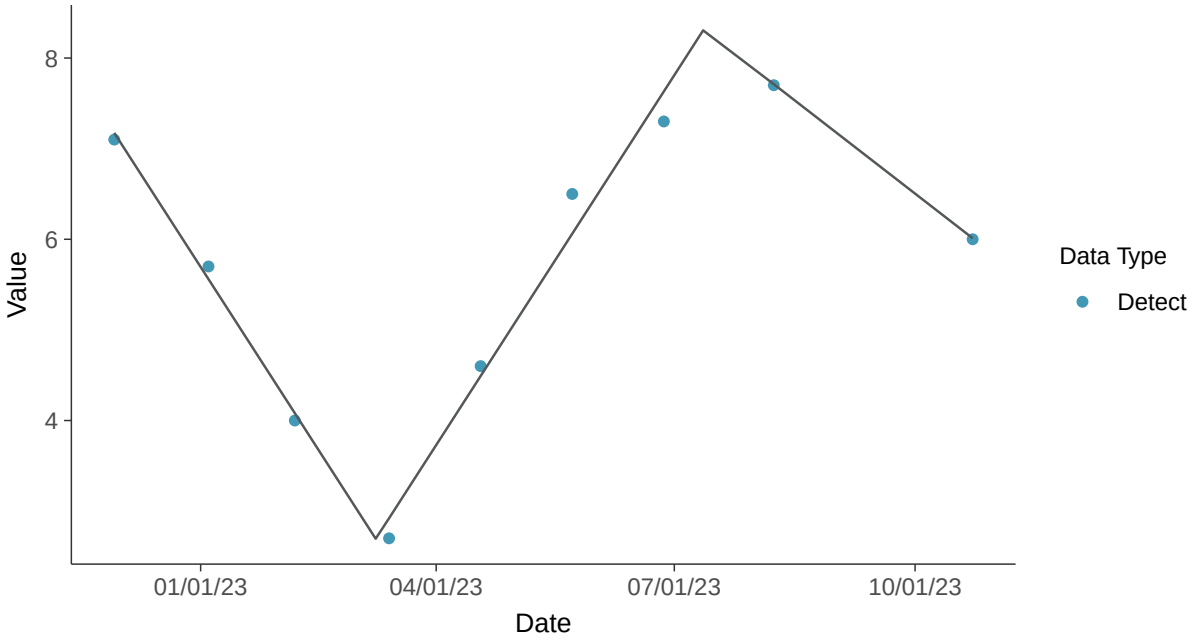
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-10 (mg/L)



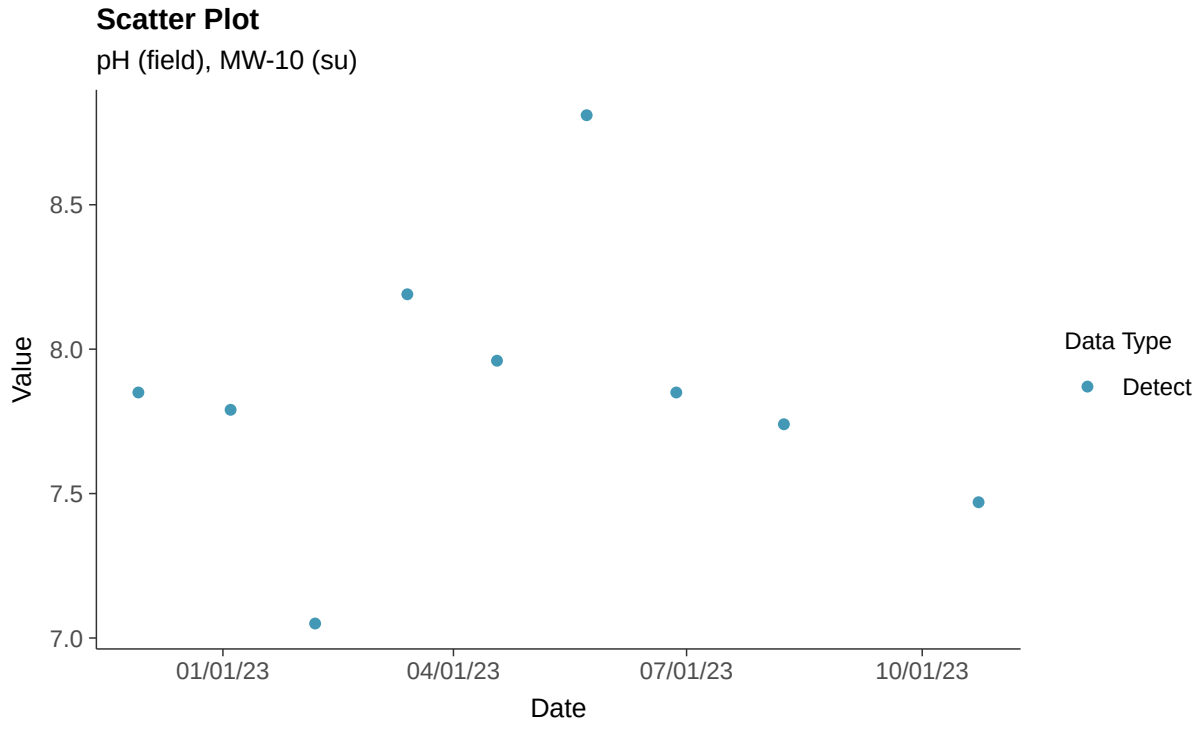
Trend Regression: Piecewise Linear-Linear-Linear

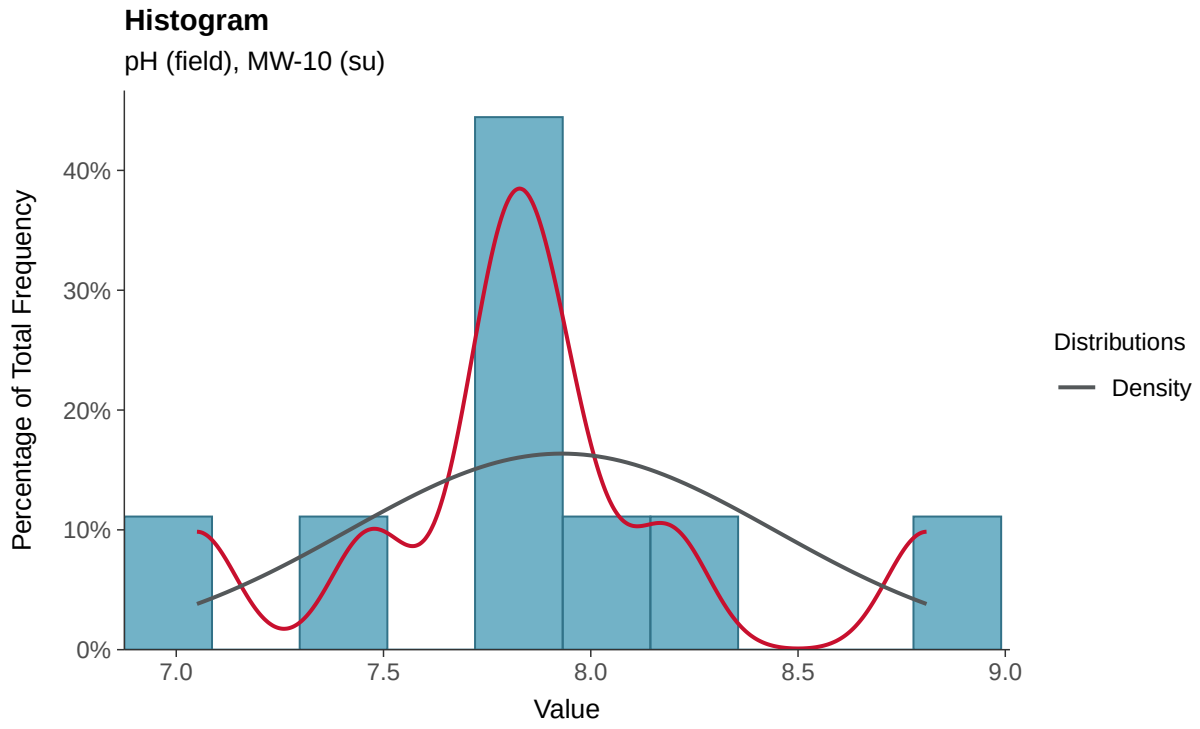
Fluoride, MW-10 (mg/L)

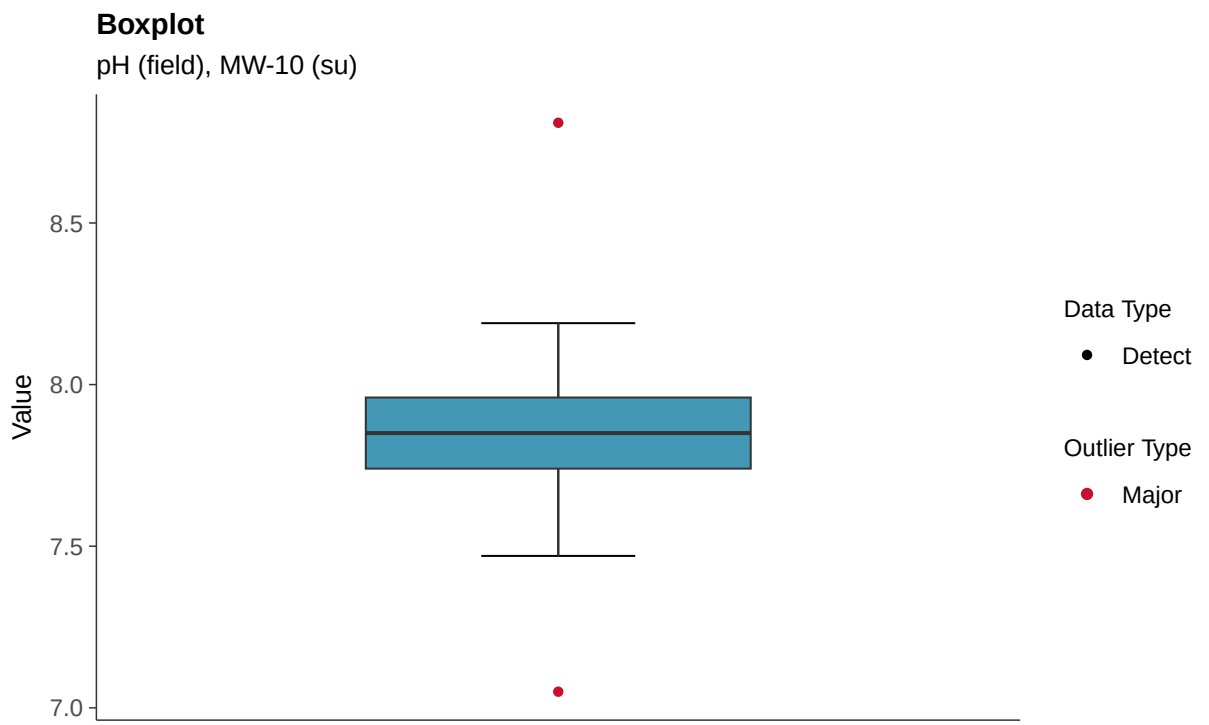


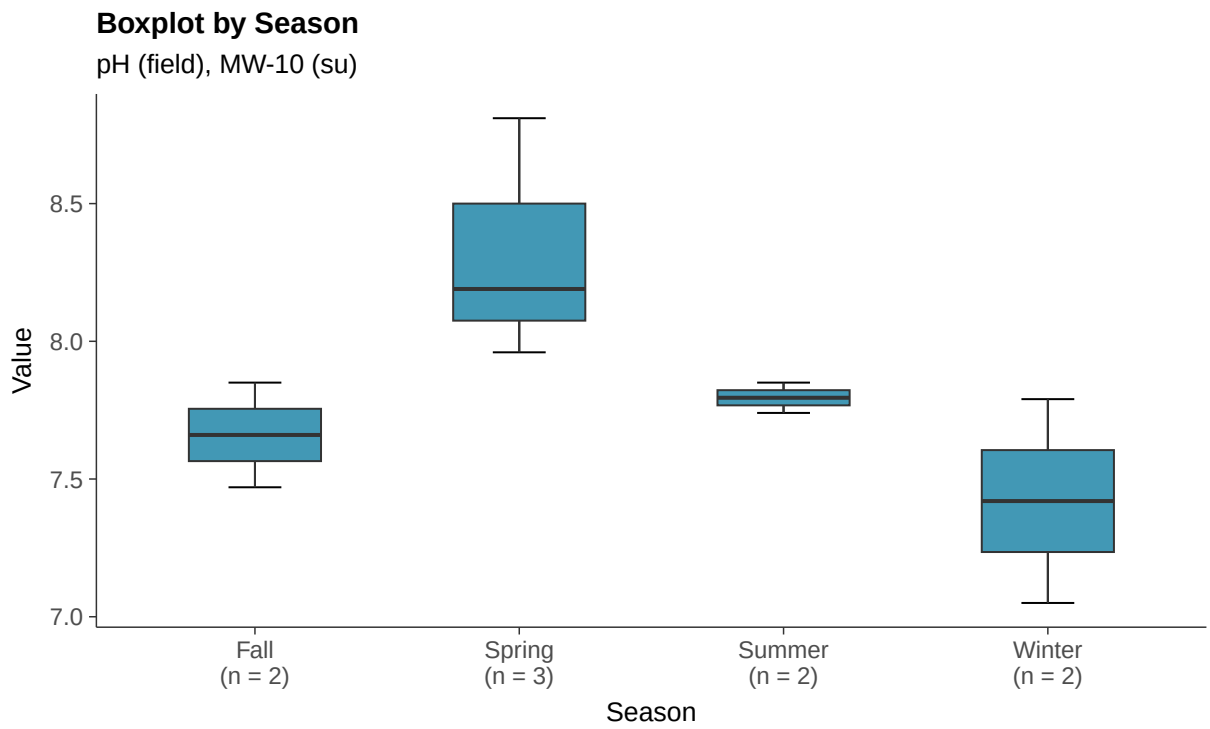
Appendix III: pH (field), MW-10

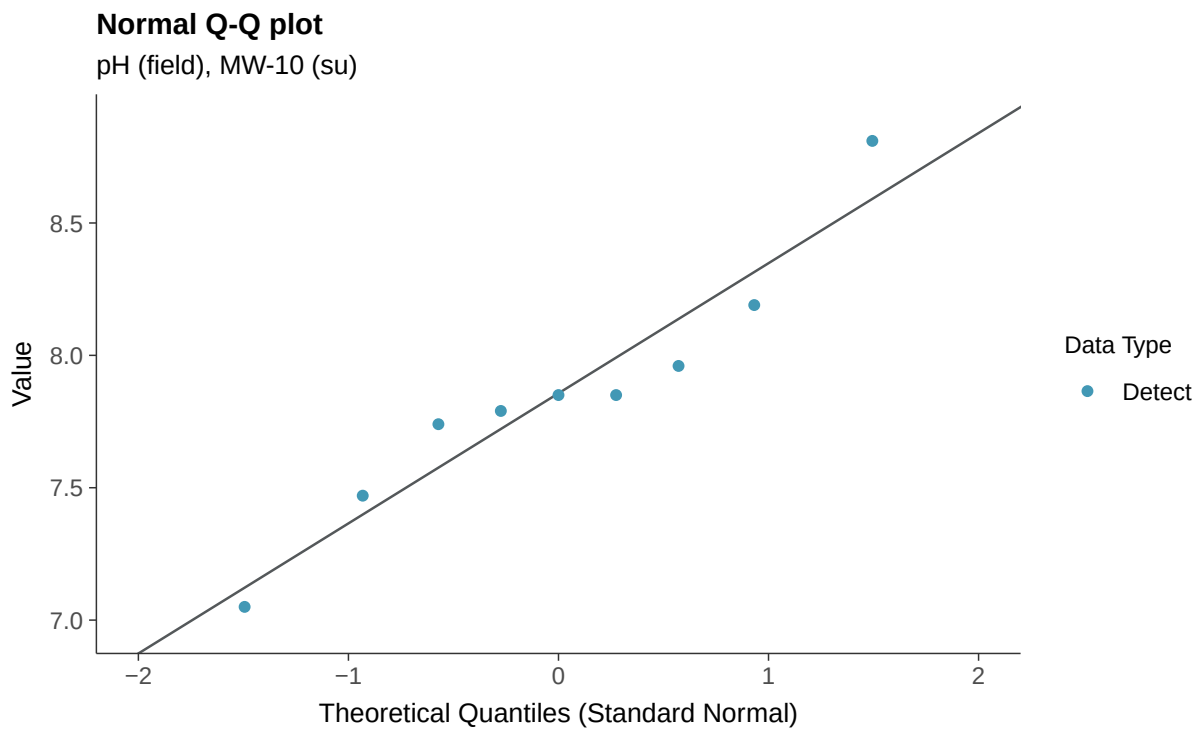
ID: 2_19_4_120

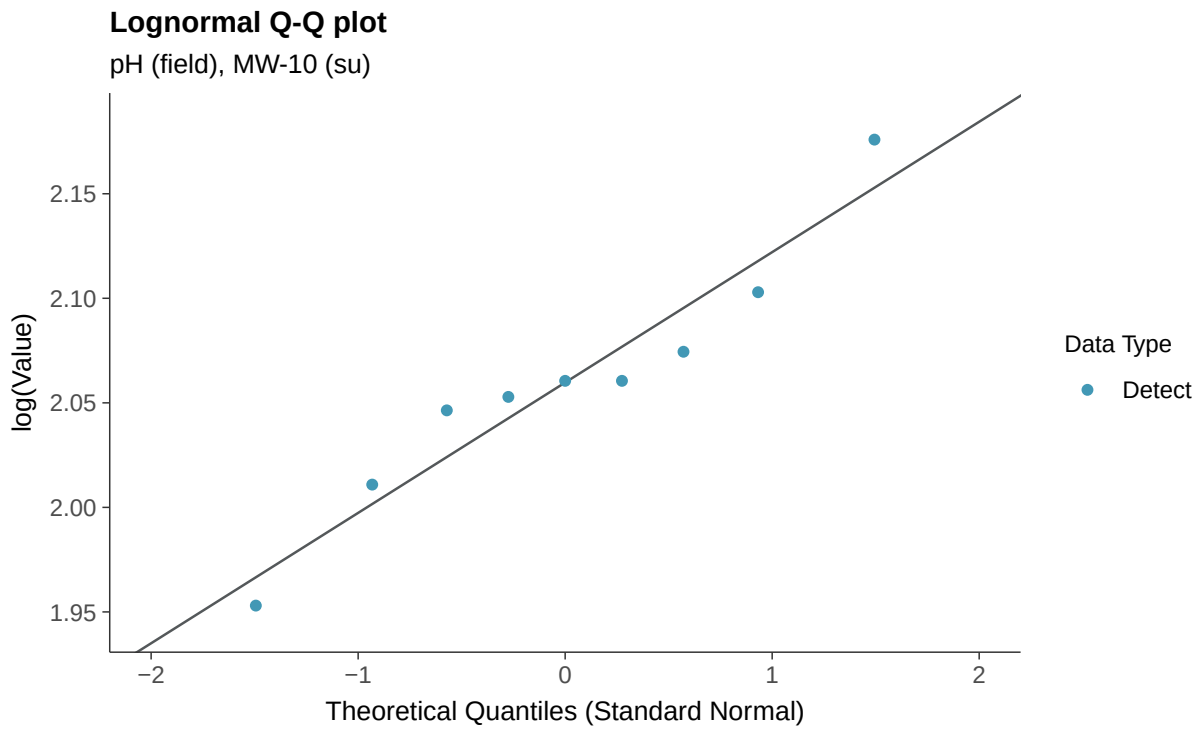


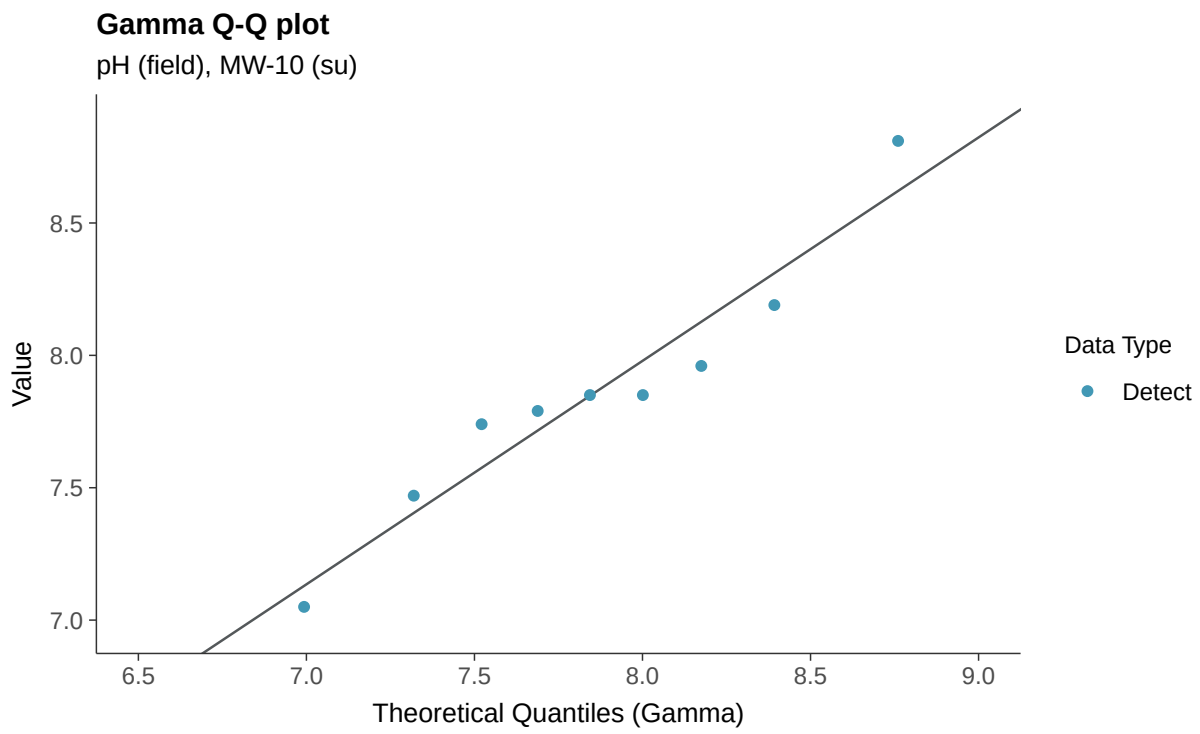


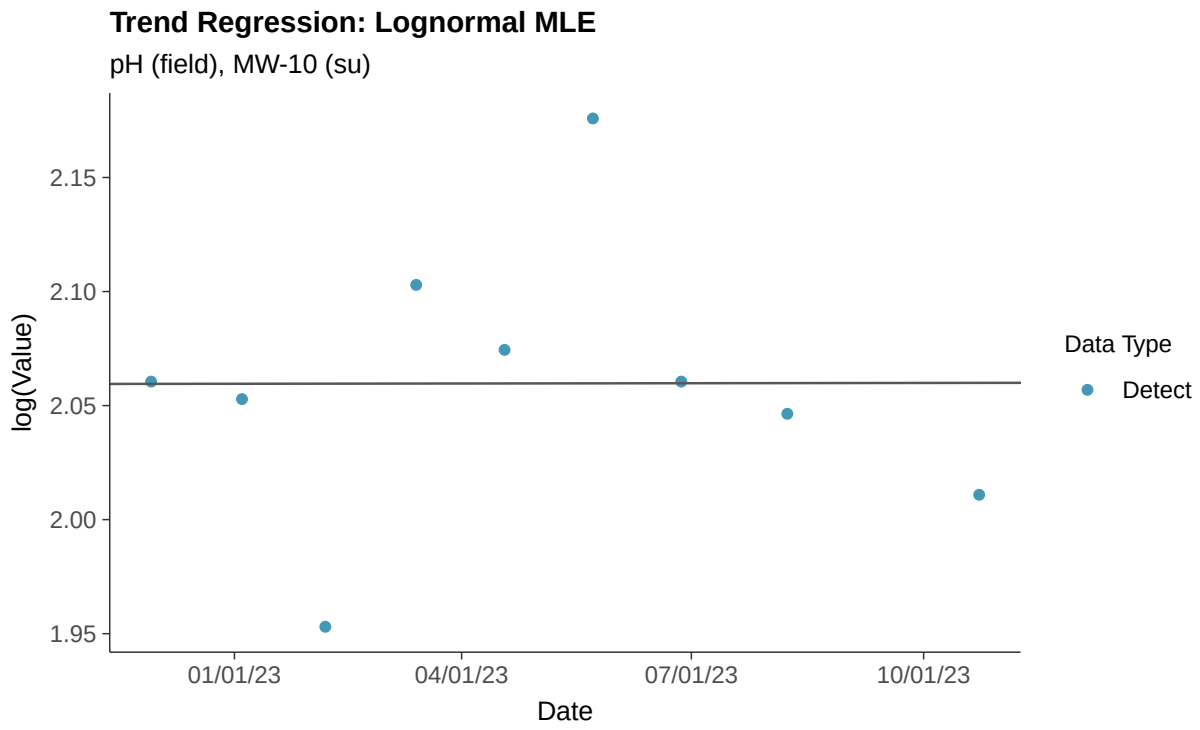

Boxplot
pH (field), MW-10 (su)
Value
8.5
8.0
7.5
7.0
Data Type
Detect
Outlier Type
Major


Boxplot by Season
pH (field), MW-10 (su)
Value
8.5
8.0
7.5
7.0
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Normal Q-Q plot
pH (field), MW-10 (su)
Value
8.5
8.0
7.5
7.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

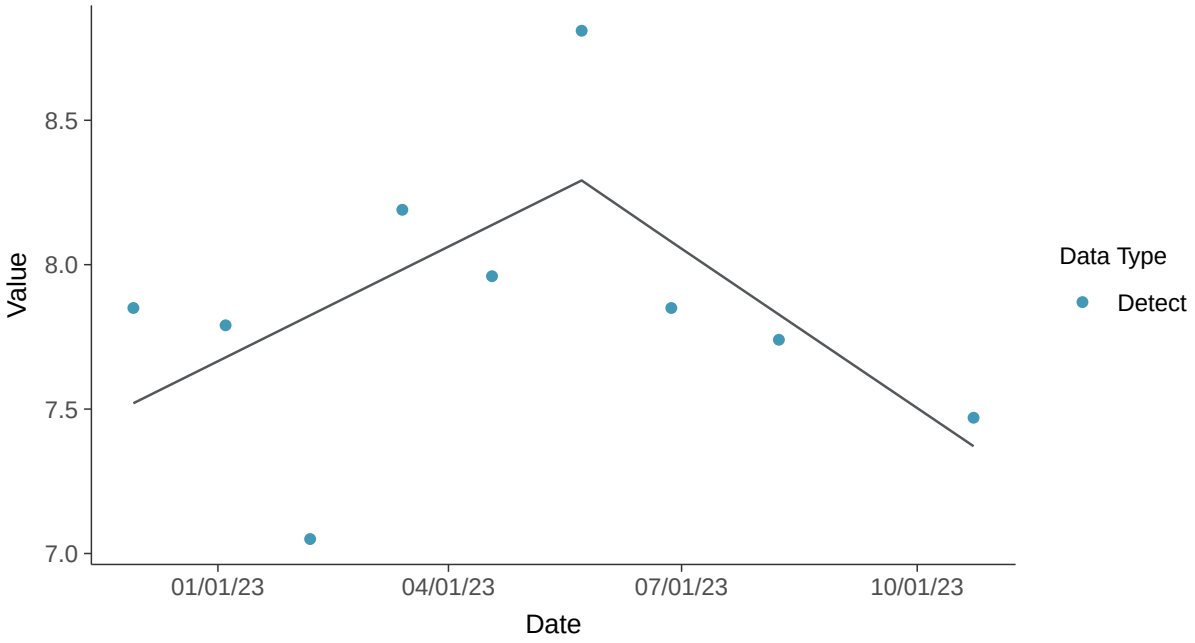

Lognormal Q-Q plot
pH (field), MW-10 (su)
log(Value)
2.15
2.10
2.05
2.00
1.95
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
pH (field), MW-10 (su)
Value
8.5
8.0
7.5
7.0
6.5
7.0
7.5
8.0
8.5
9.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
pH (field), MW-10 (su)
log(Value)
2.15
2.10
2.05
2.00
1.95
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

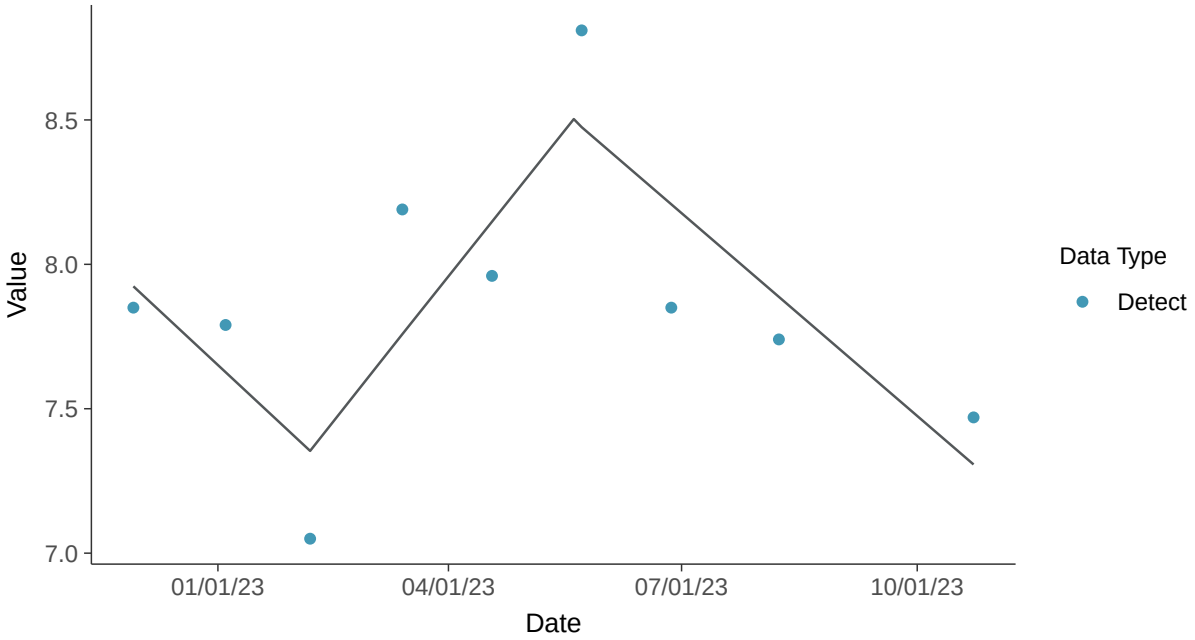
Trend Regression: Piecewise Linear-Linear

pH (field), MW-10 (su)



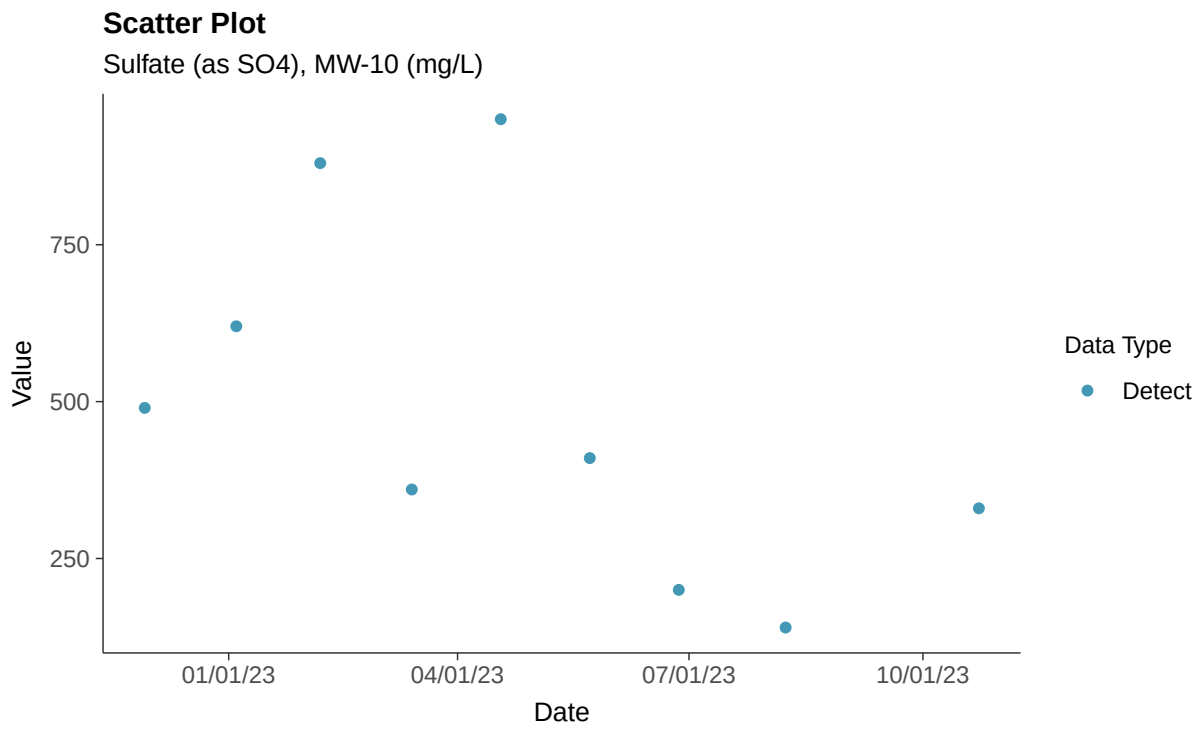
Trend Regression: Piecewise Linear-Linear-Linear

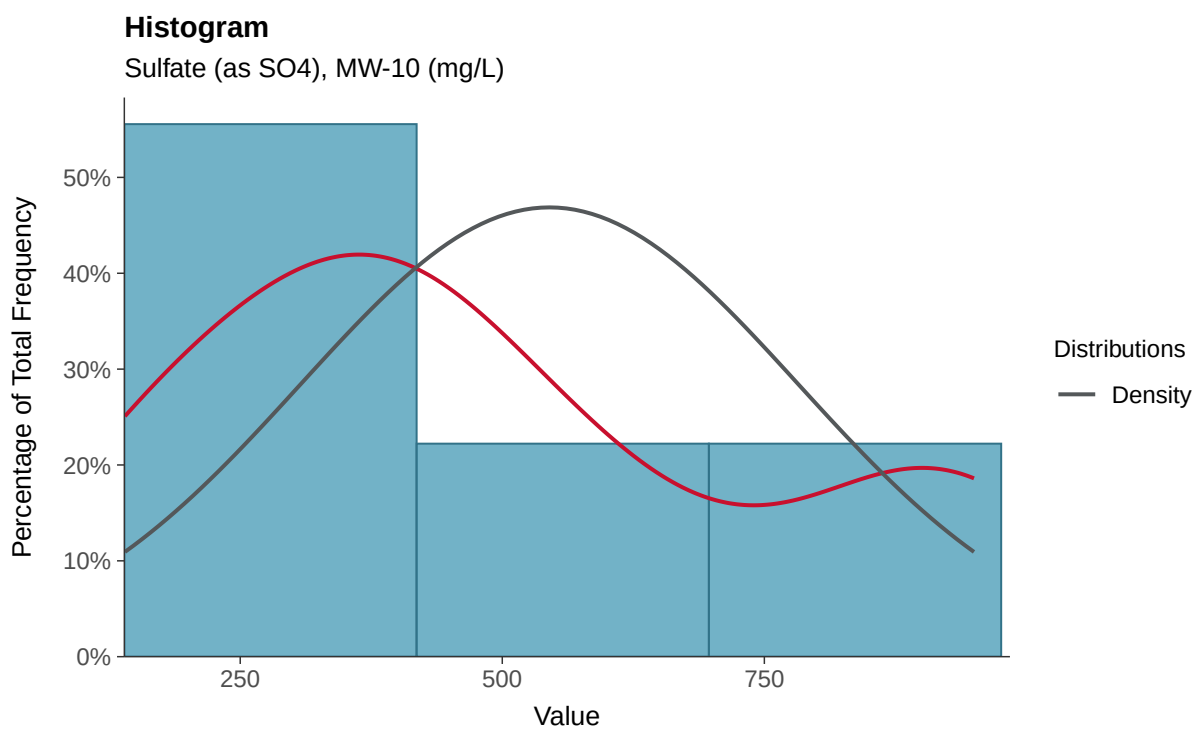
pH (field), MW-10 (su)



Appendix III: Sulfate (as SO4), MW-10

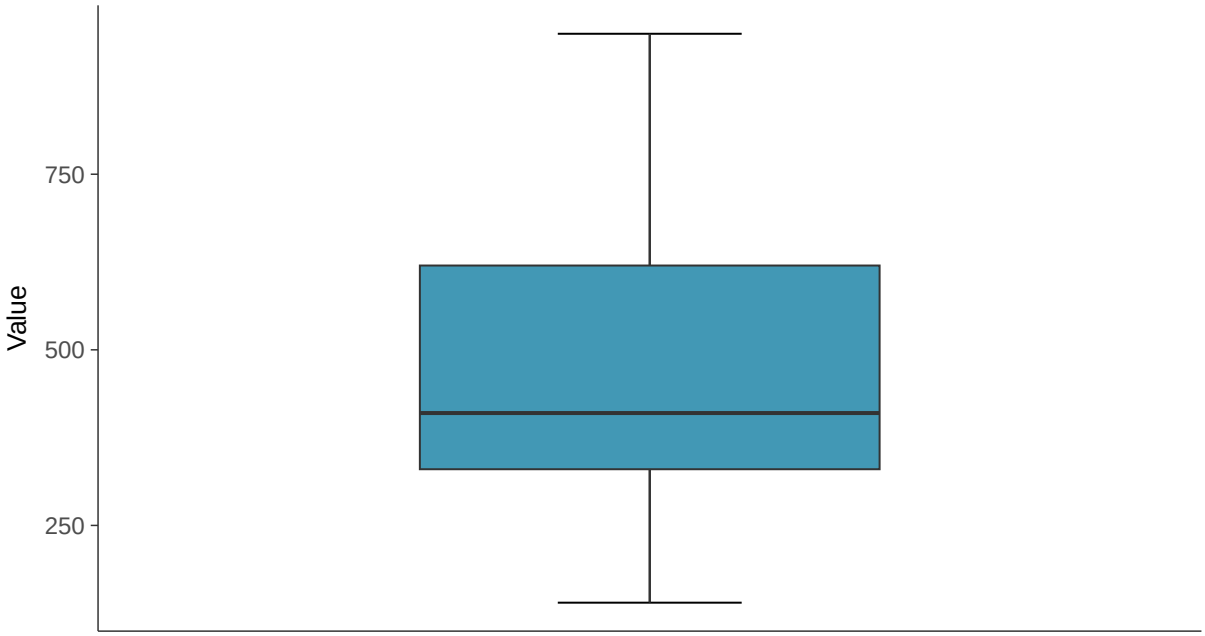
ID: 2_19_4_124





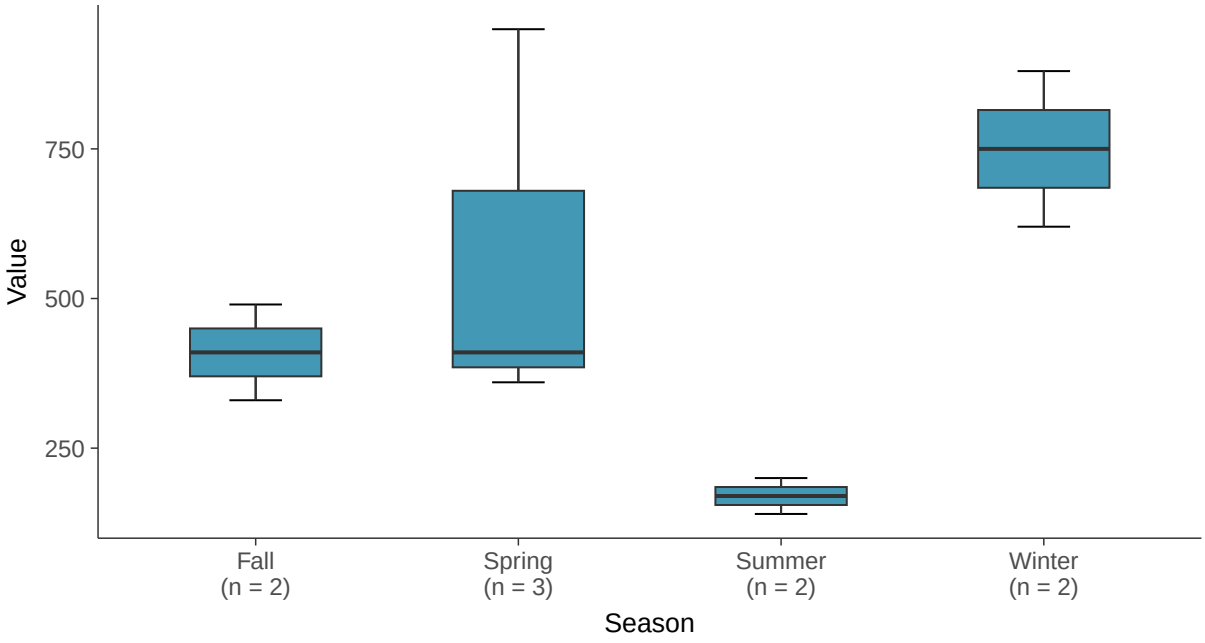
Boxplot

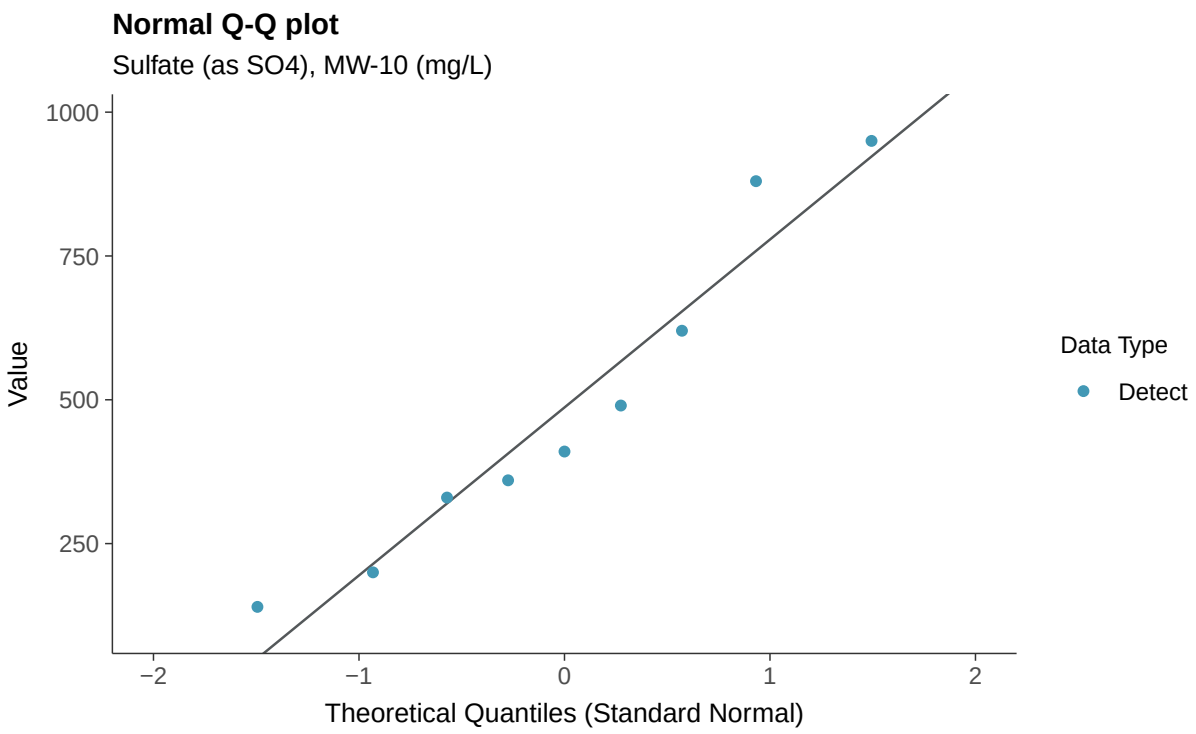
Sulfate (as SO4), MW-10 (mg/L)

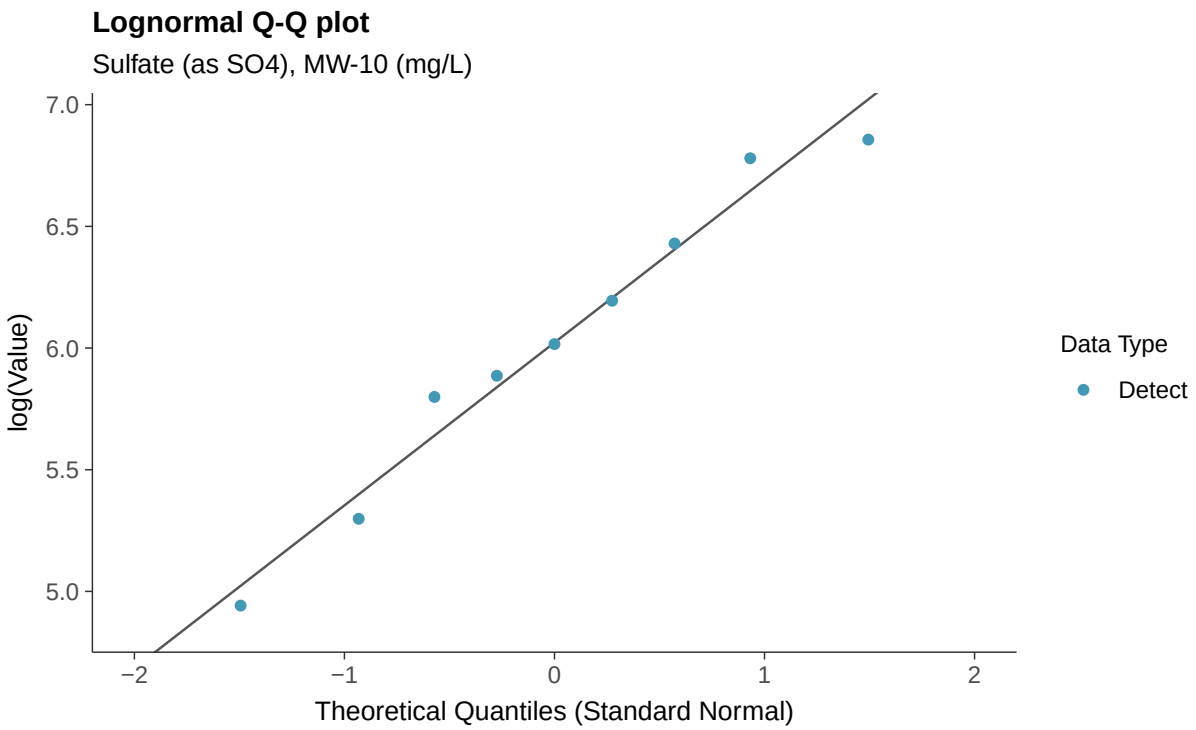


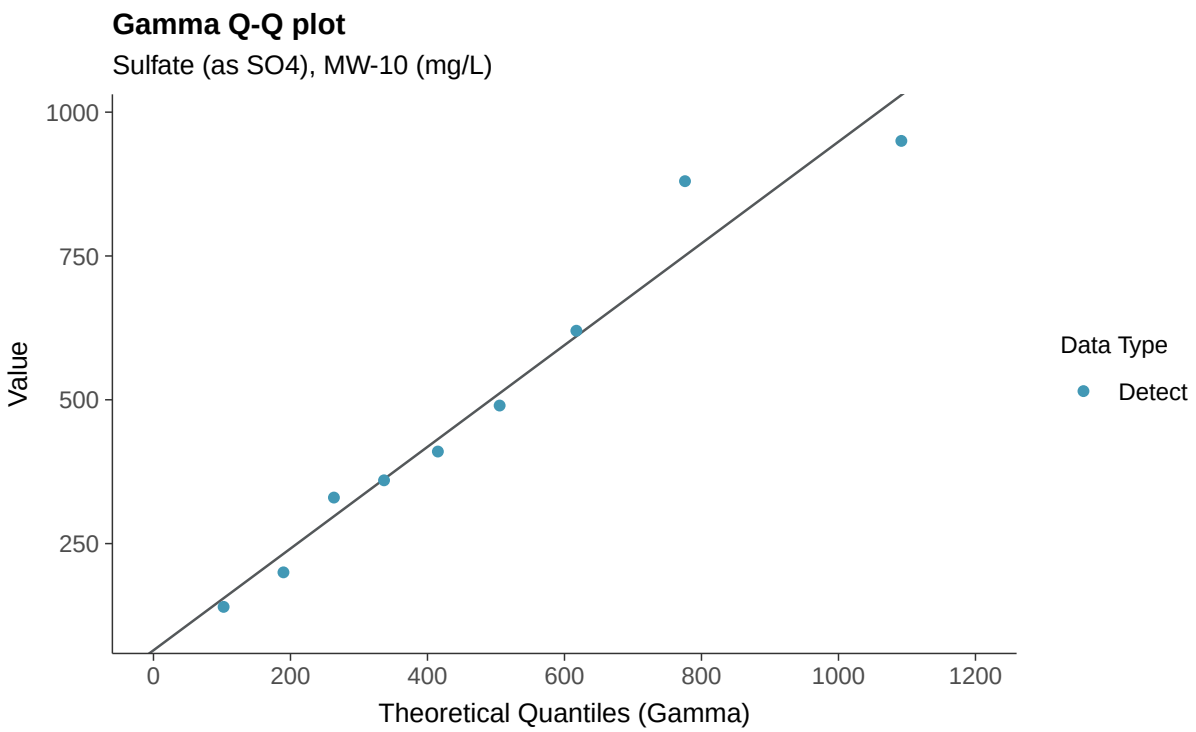
Boxplot by Season

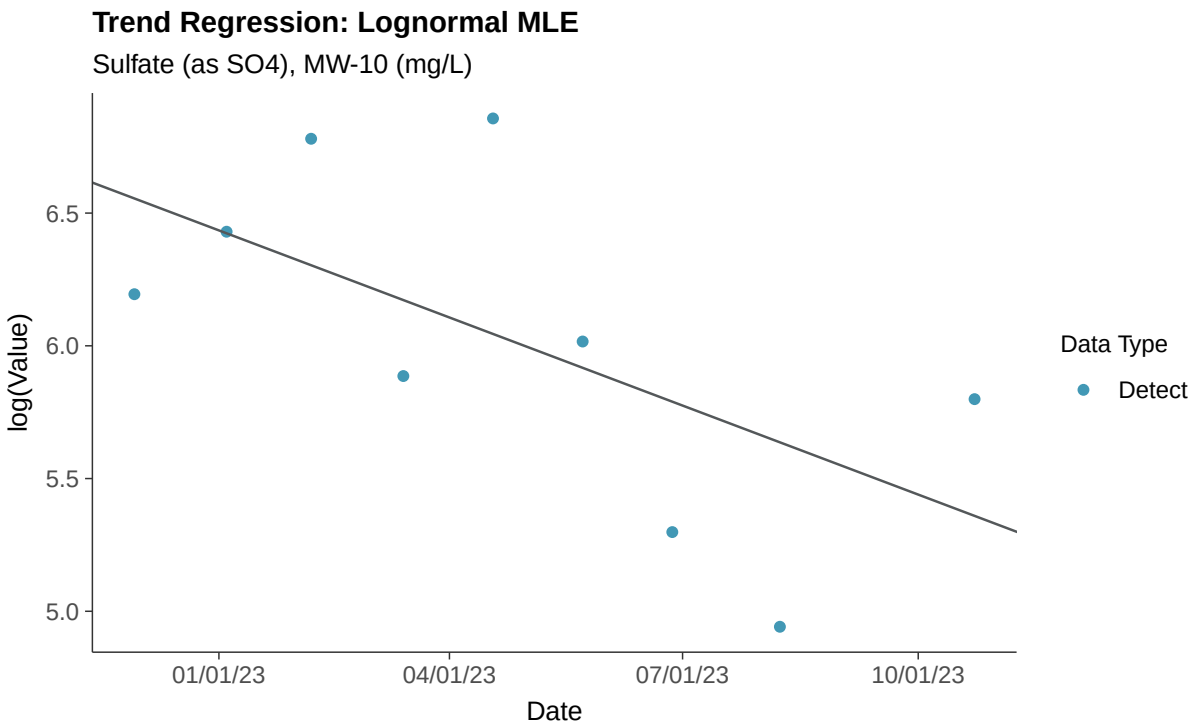
Sulfate (as SO4), MW-10 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-10 (mg/L)
Value
1000
750
500
250
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

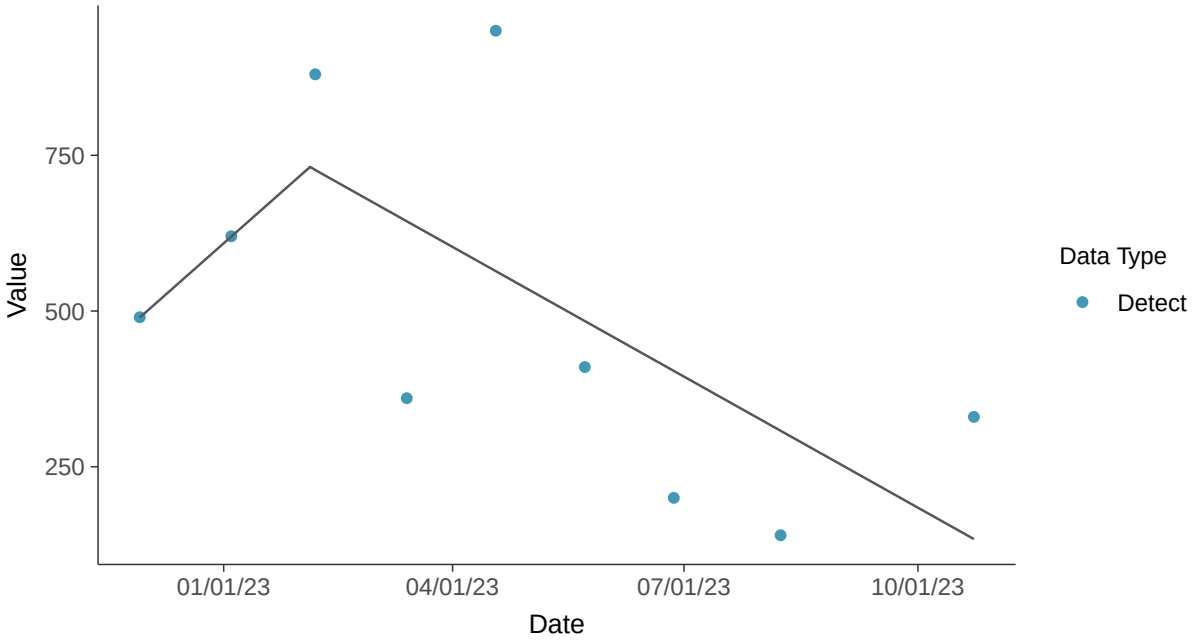

Lognormal Q-Q plot
Sulfate (as SO4), MW-10 (mg/L)
log(Value)
7.0
6.5
6.0
5.5
5.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-10 (mg/L)
Value
1000
750
500
250
0
200
400
600
800
1000
1200
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-10 (mg/L)
log(Value)
6.5
6.0
5.5
5.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

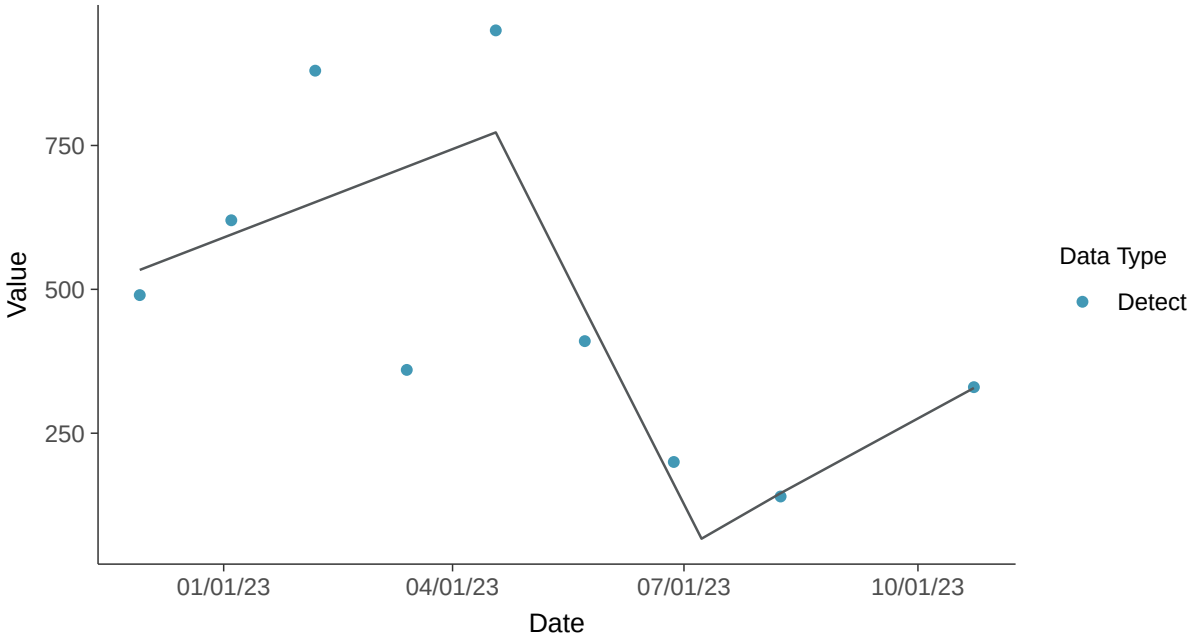
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-10 (mg/L)



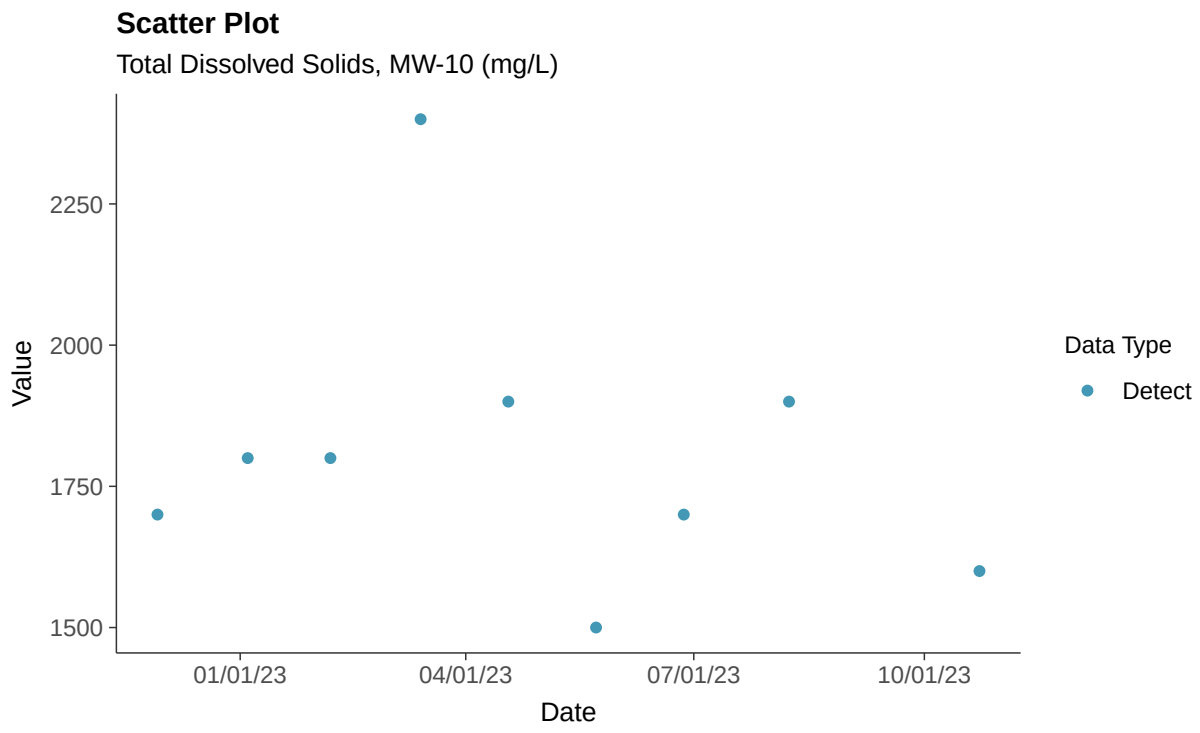
Trend Regression: Piecewise Linear-Linear-Linear

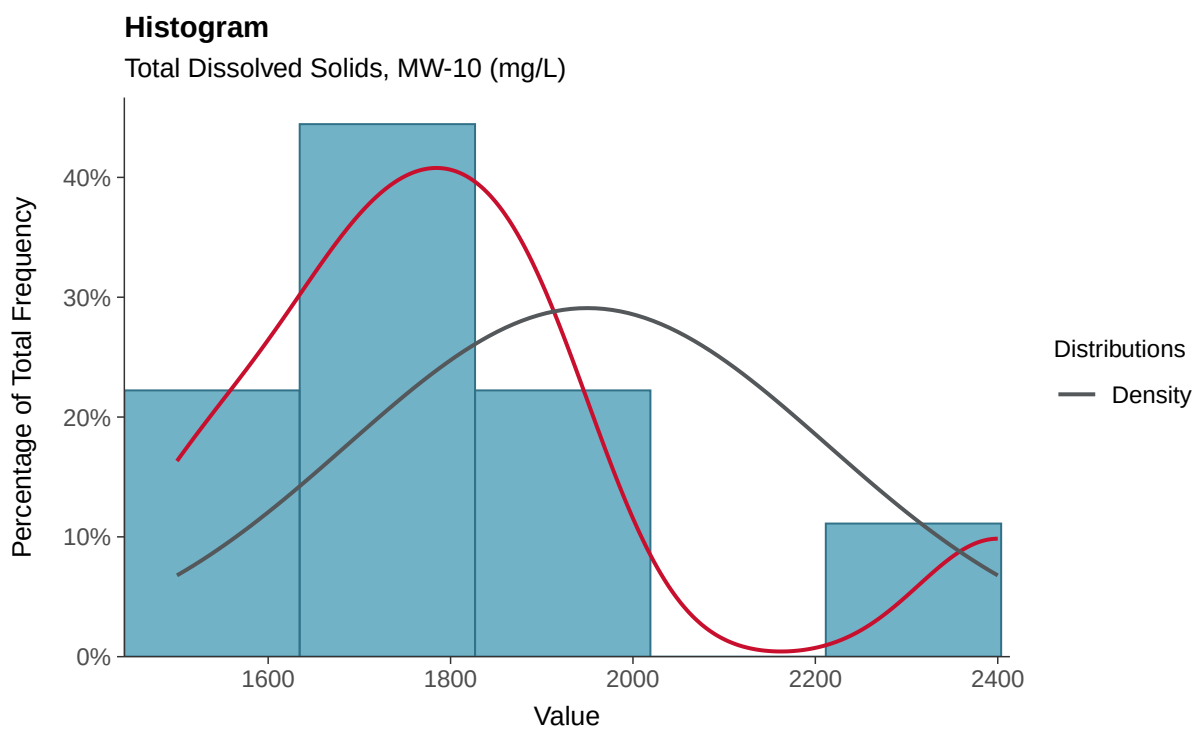
Sulfate (as SO4), MW-10 (mg/L)



Appendix III: Total Dissolved Solids, MW-10

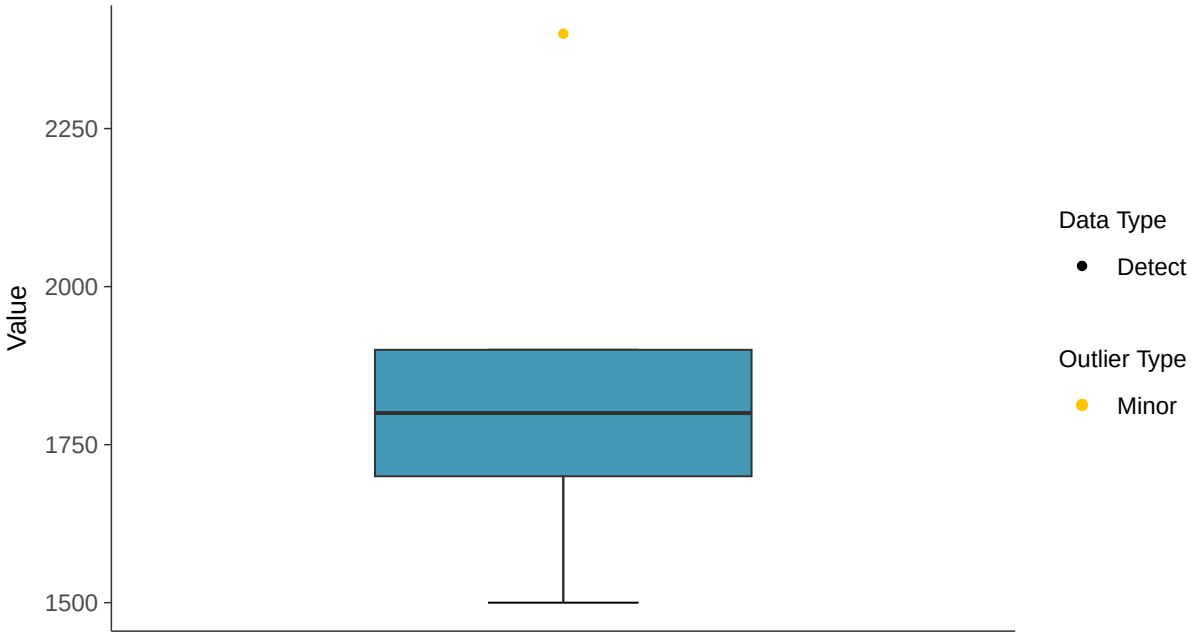
ID: 2_19_4_126





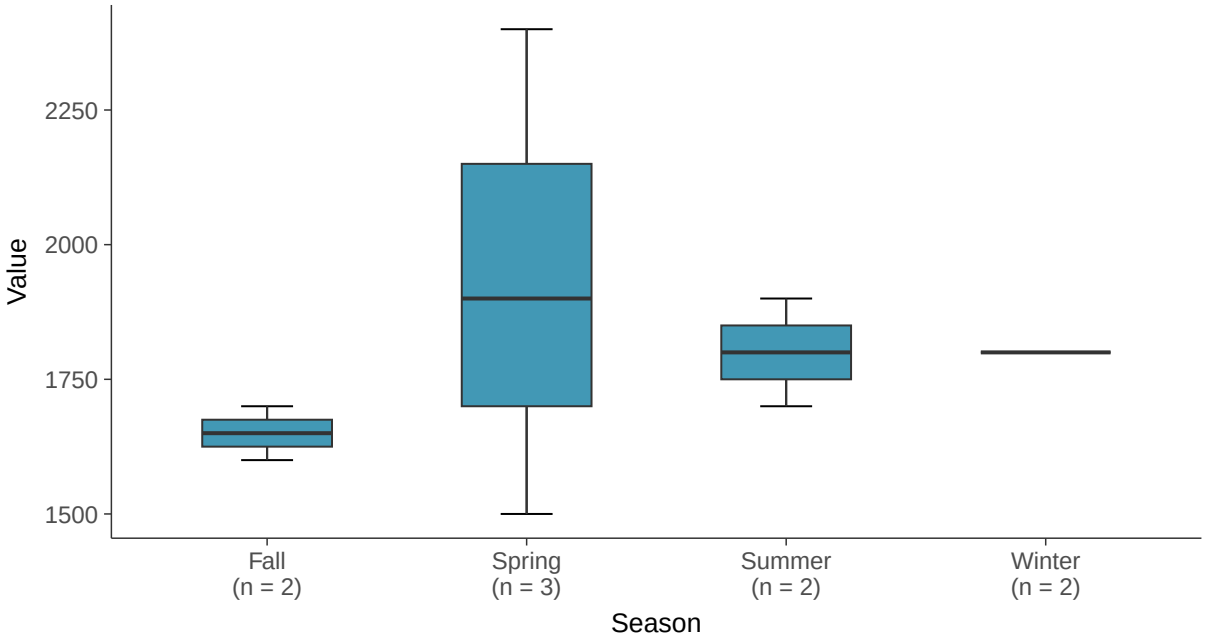
Boxplot

Total Dissolved Solids, MW-10 (mg/L)



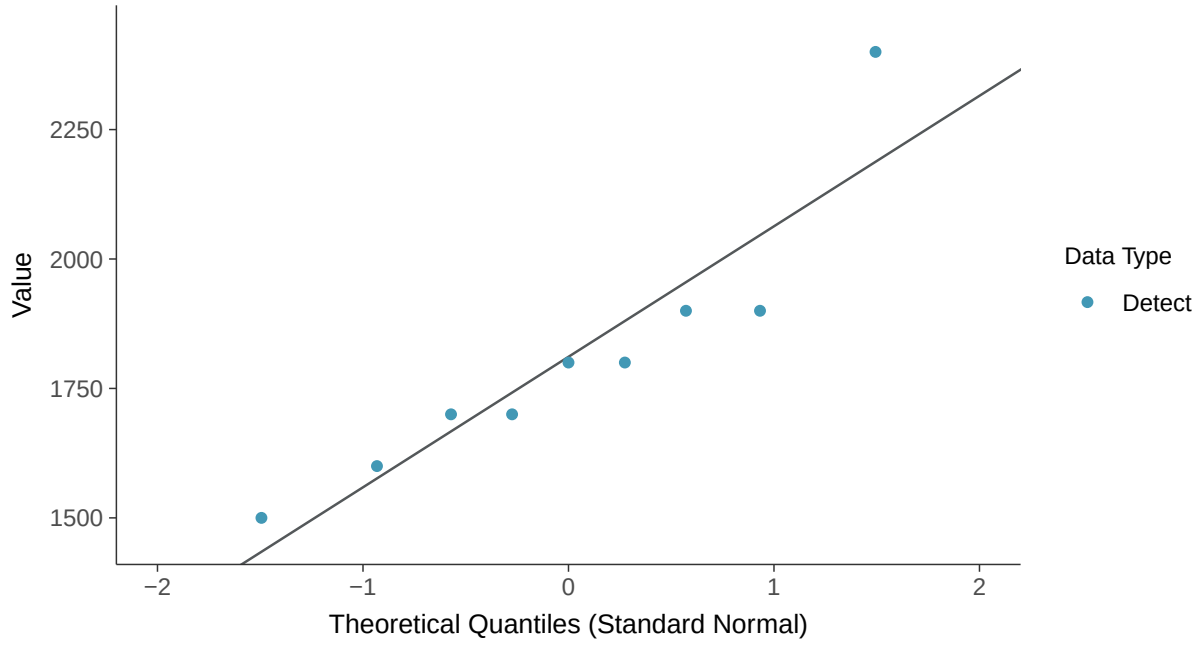
Boxplot by Season

Total Dissolved Solids, MW-10 (mg/L)



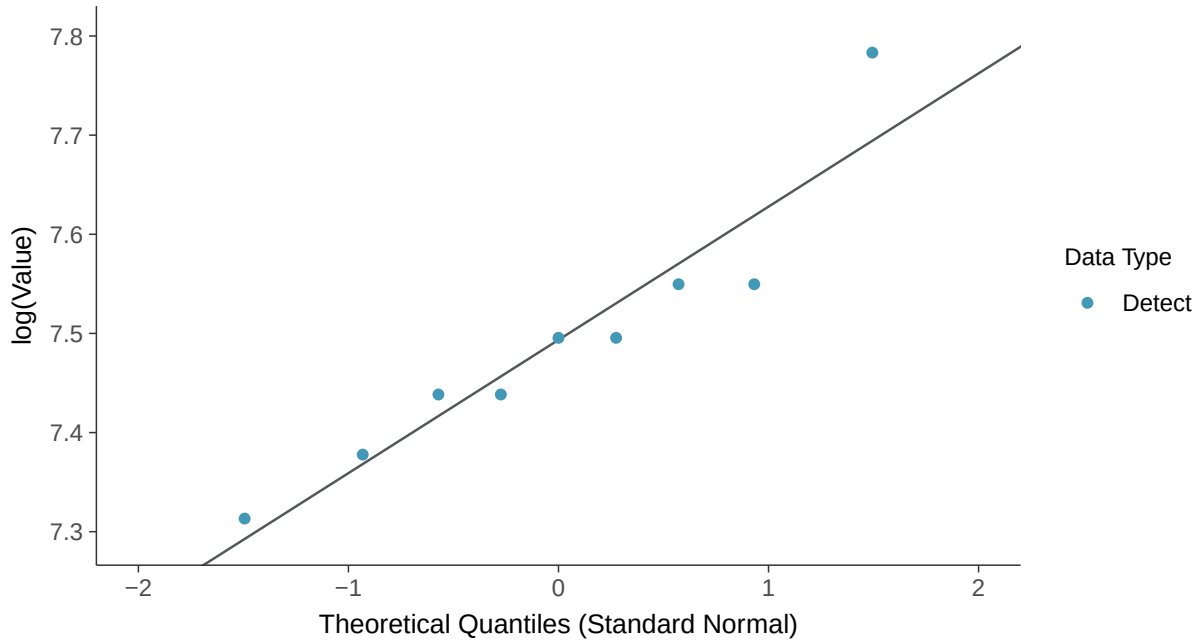
Normal Q-Q plot

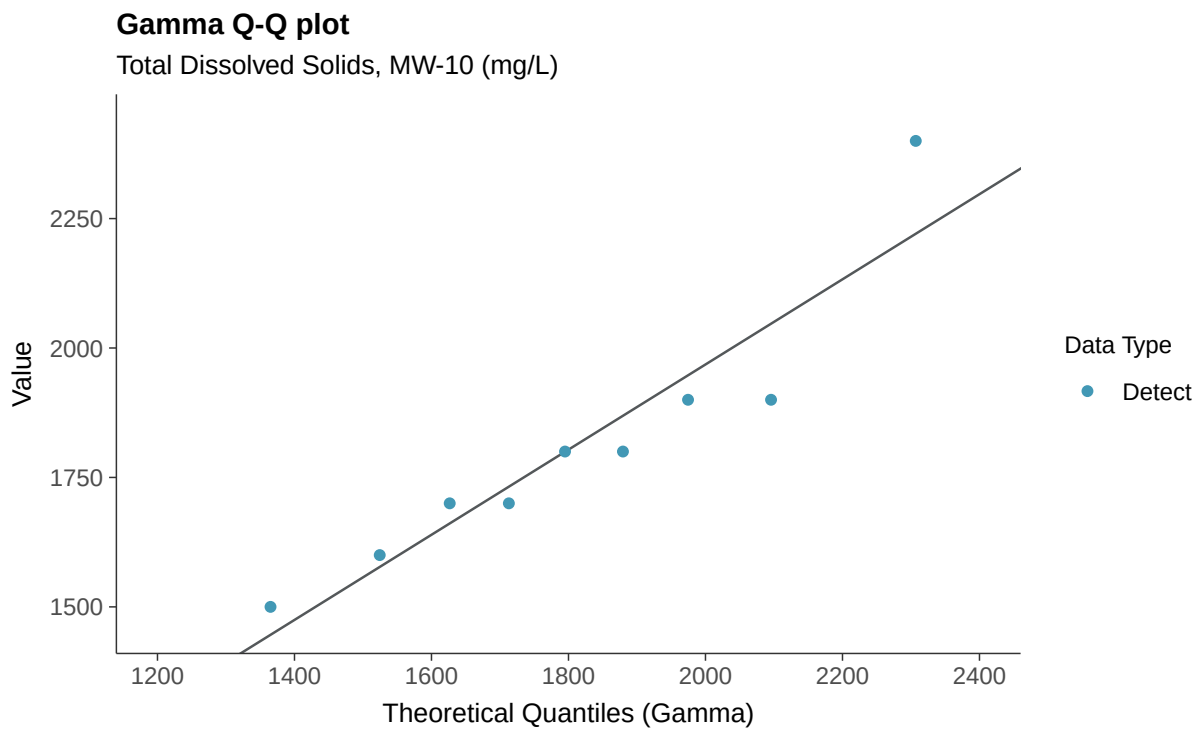
Total Dissolved Solids, MW-10 (mg/L)

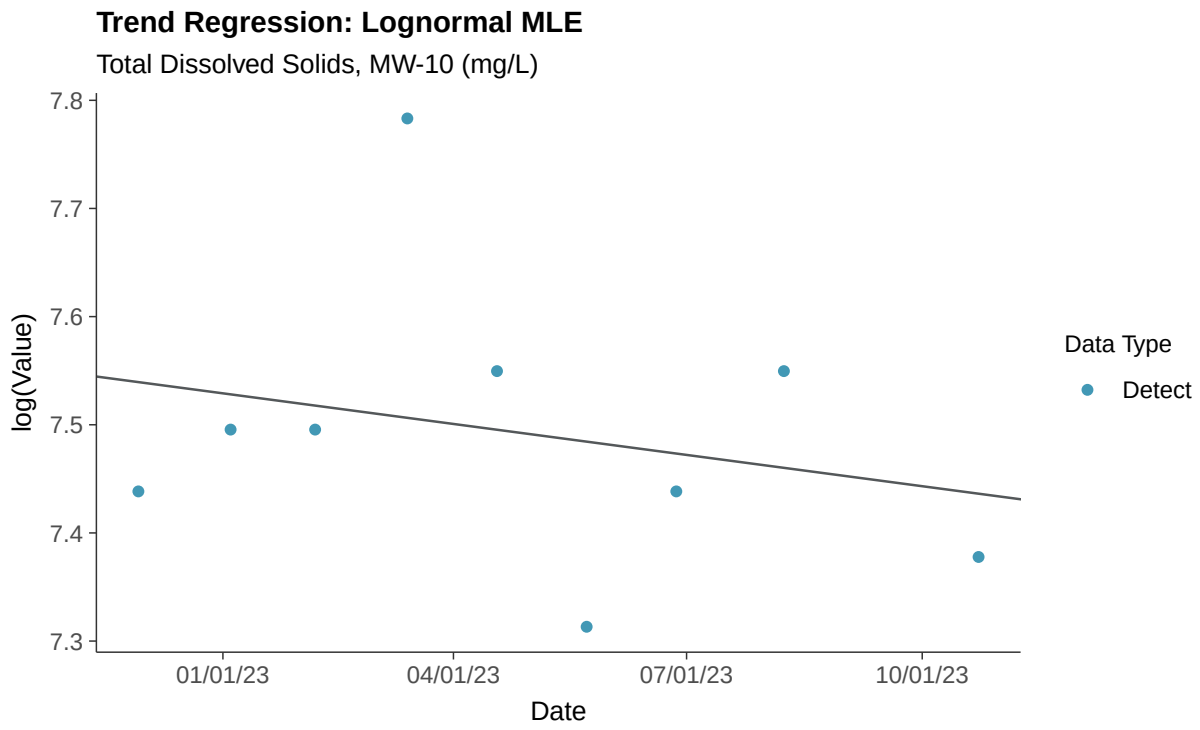


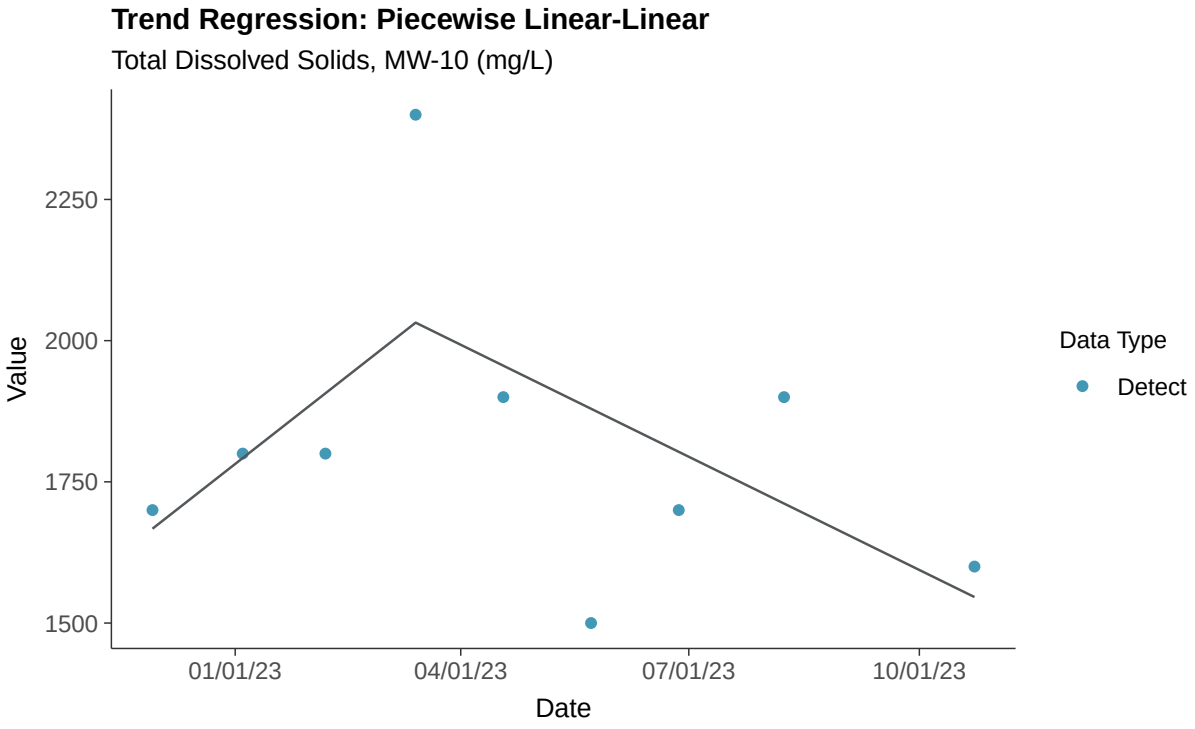
Lognormal Q-Q plot

Total Dissolved Solids, MW-10 (mg/L)



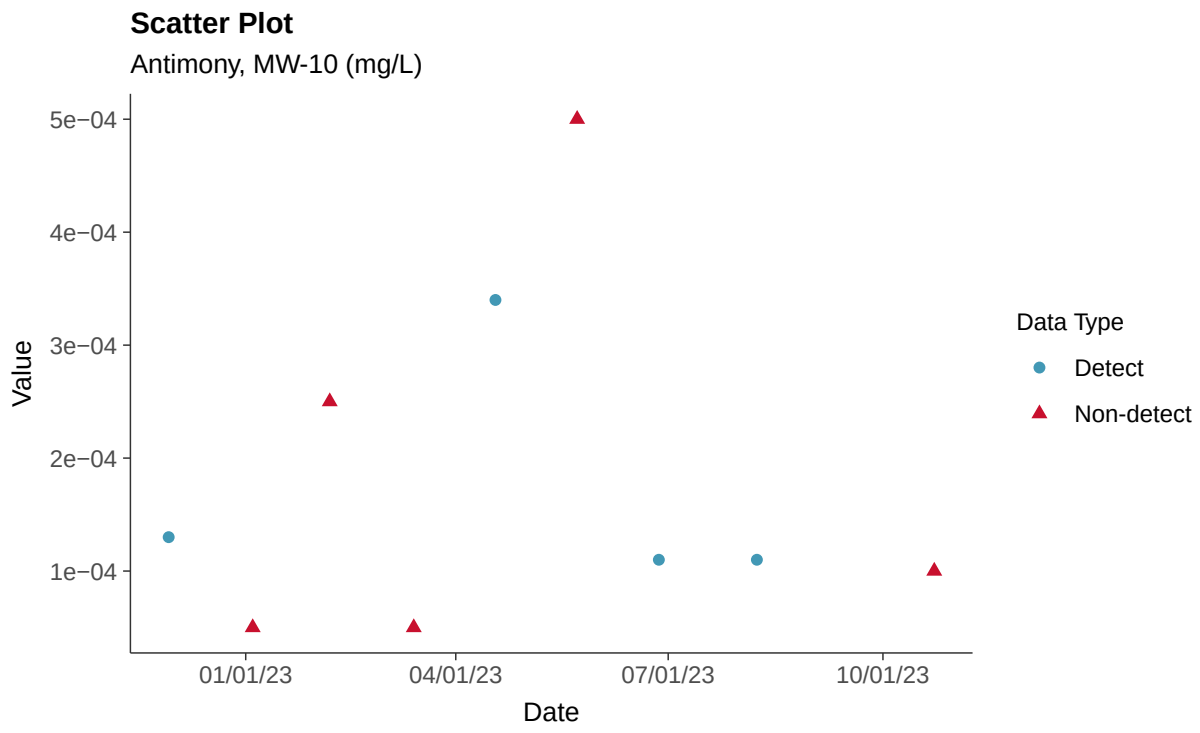

Gamma Q-Q plot
Total Dissolved Solids, MW-10 (mg/L)
Value
2250
2000
1750
1500
1200
1400
1600
1800
2000
2200
2400
Theoretical Quantiles (Gamma)
Data Type
Detect

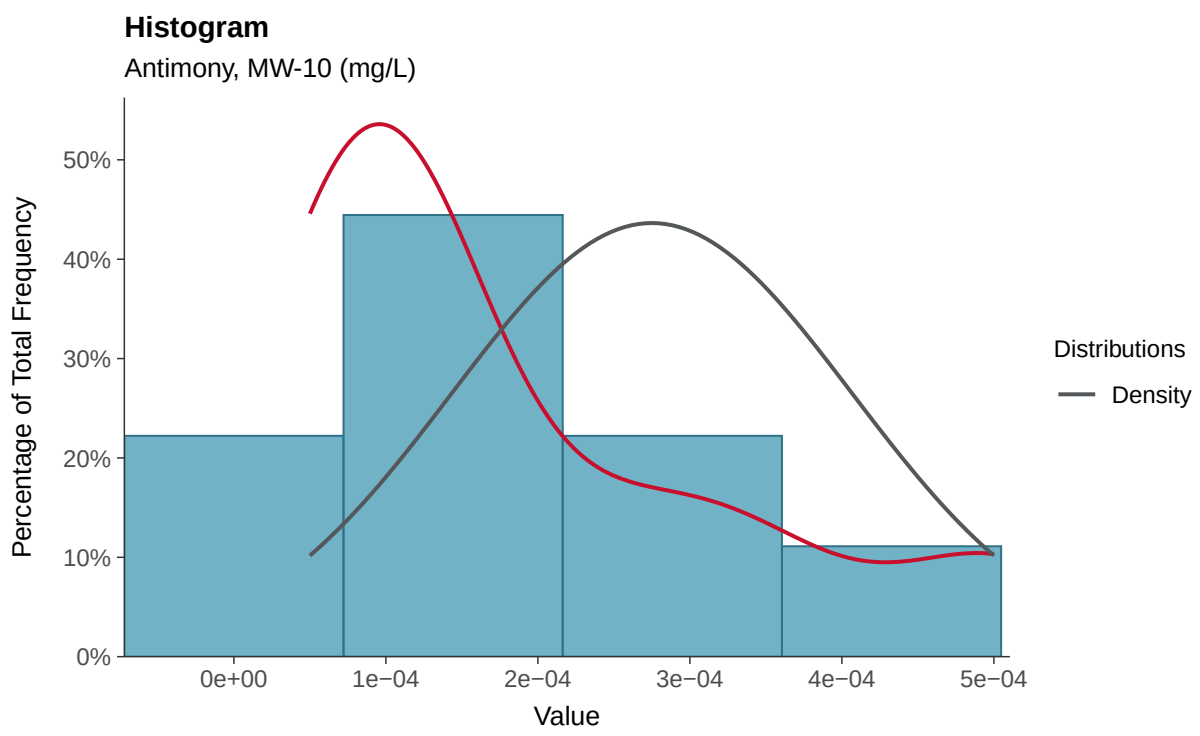

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-10 (mg/L)
log(Value)
7.8
7.7
7.6
7.5
7.4
7.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-10 (mg/L)
Value
2250
2000
1750
1500
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-10

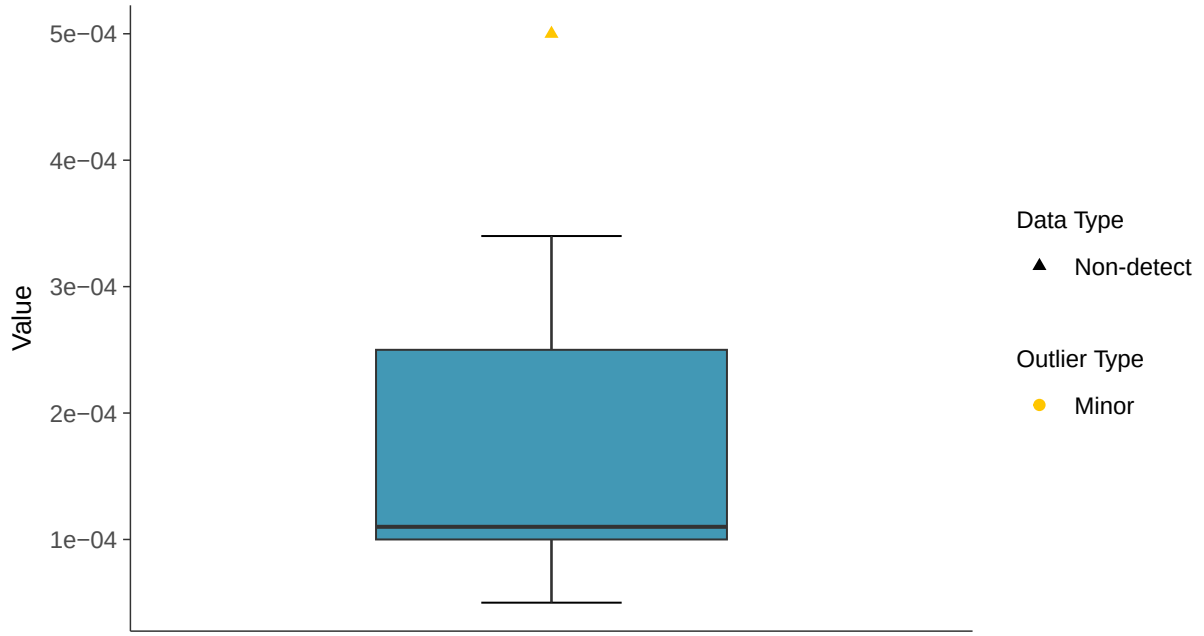
ID: 2_19_5_101





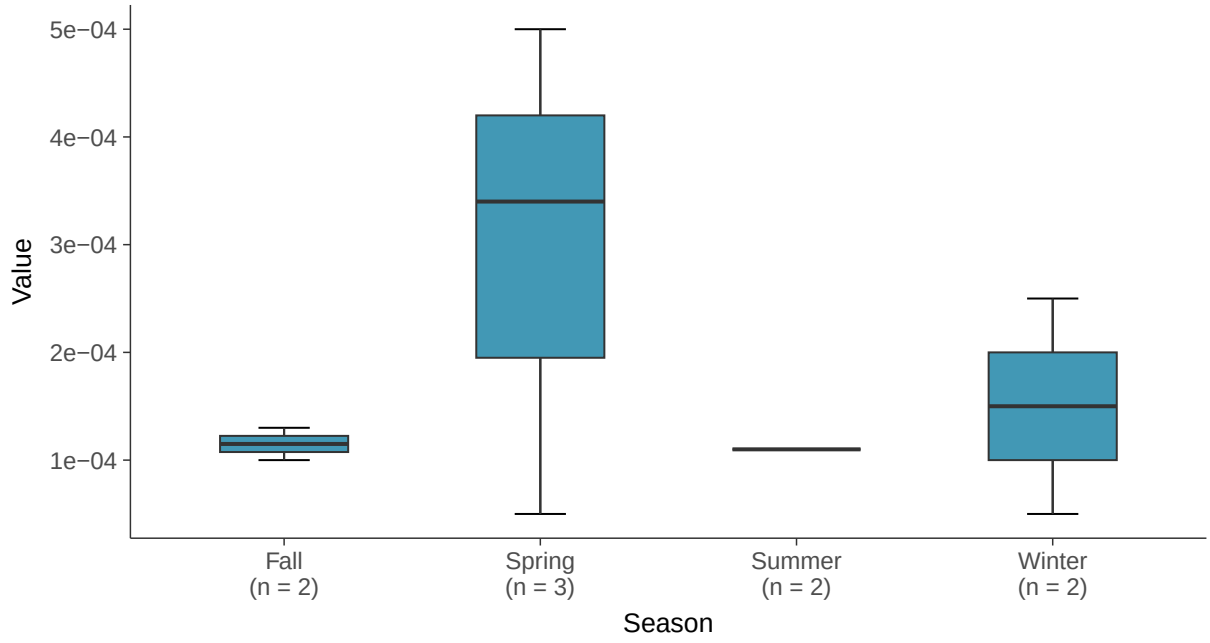
Boxplot

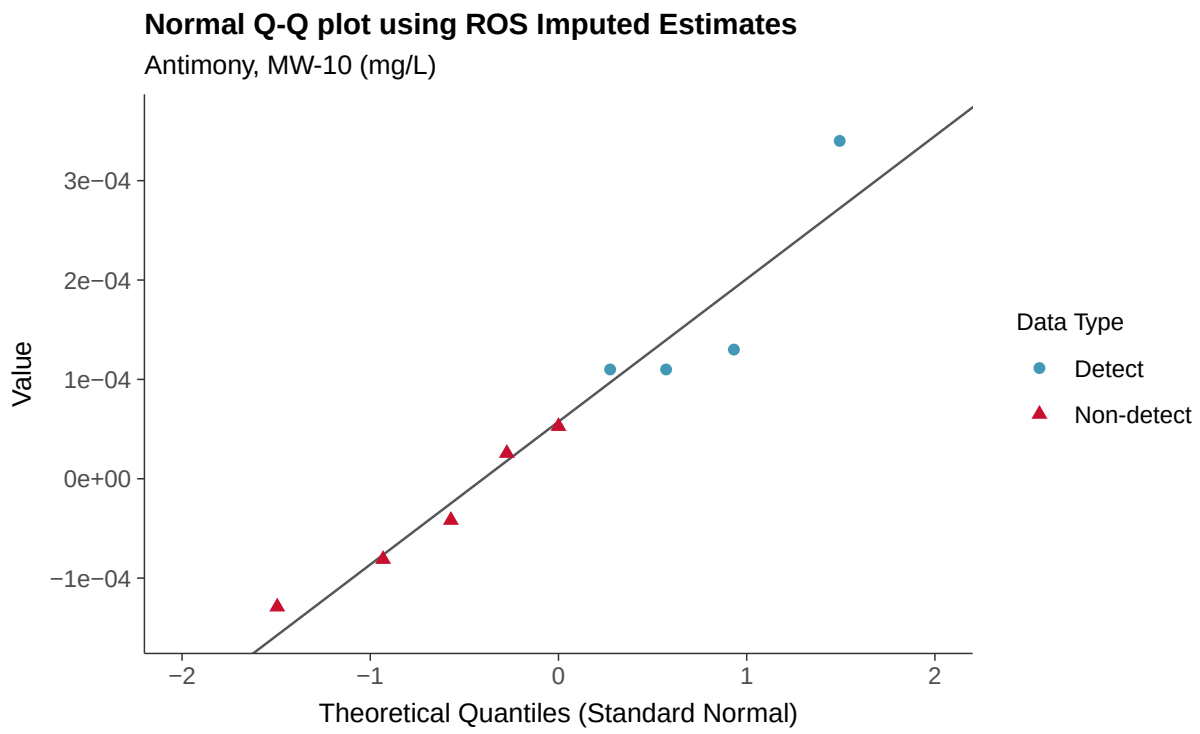
Antimony, MW-10 (mg/L)

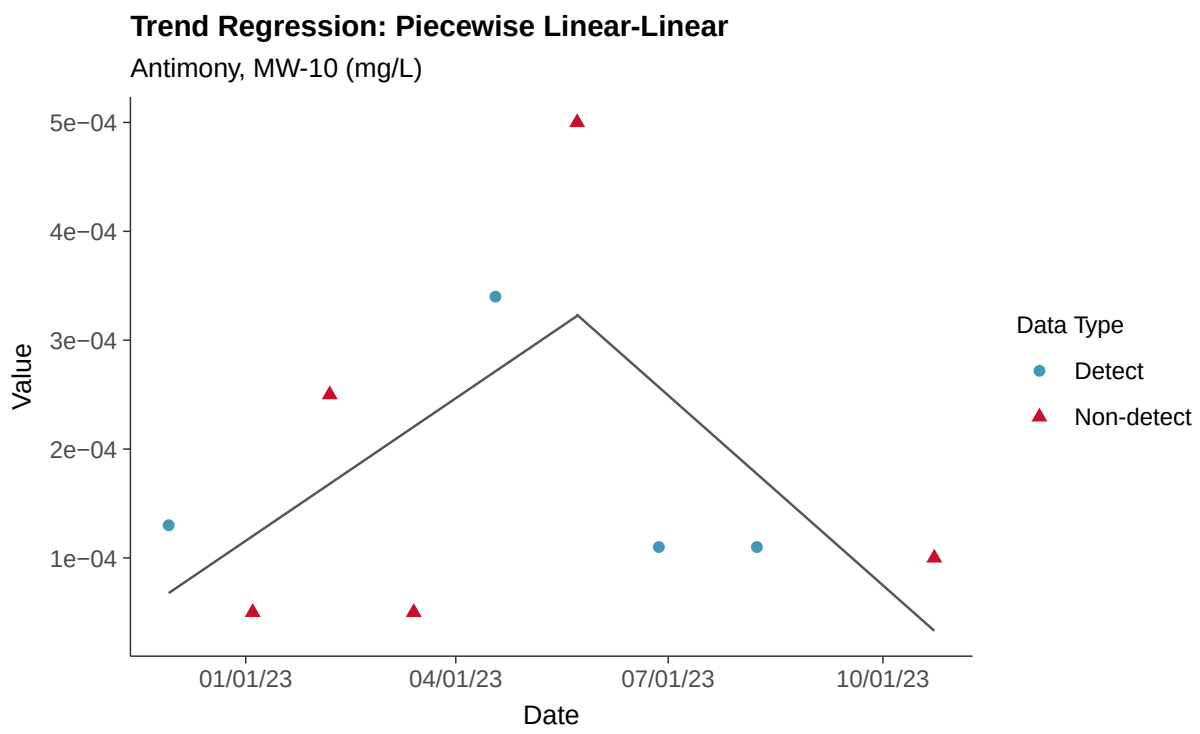


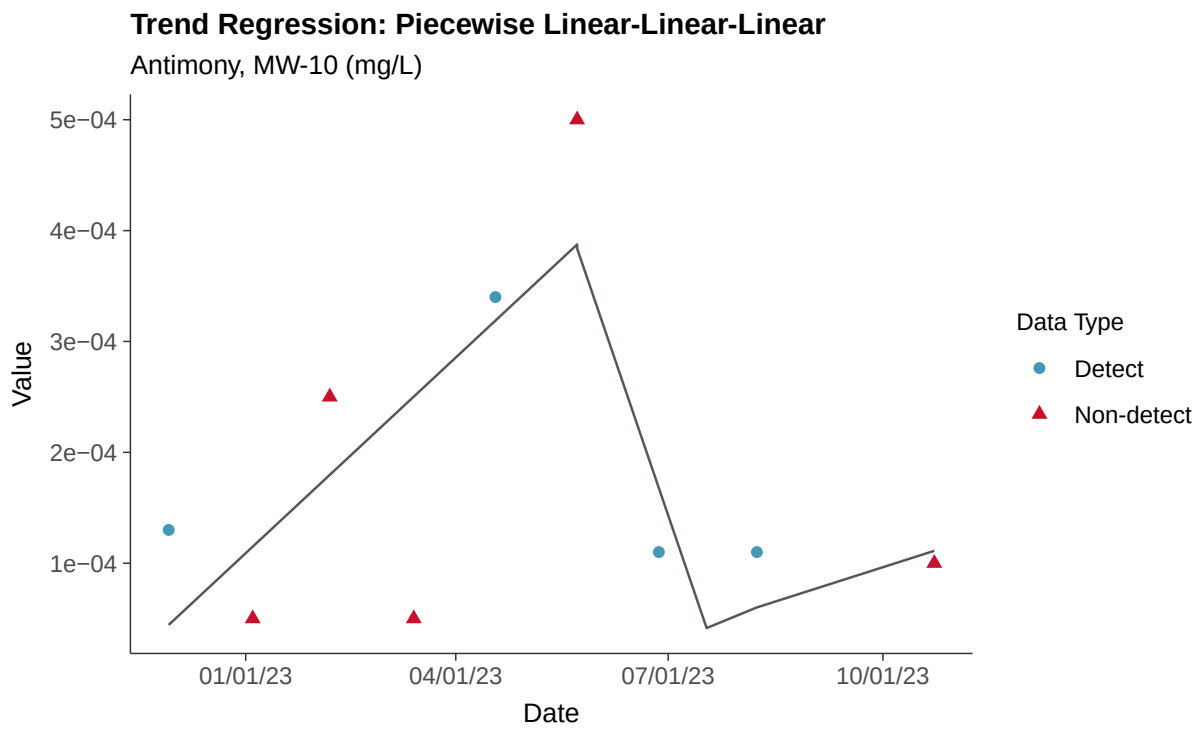
Boxplot by Season

Antimony, MW-10 (mg/L)



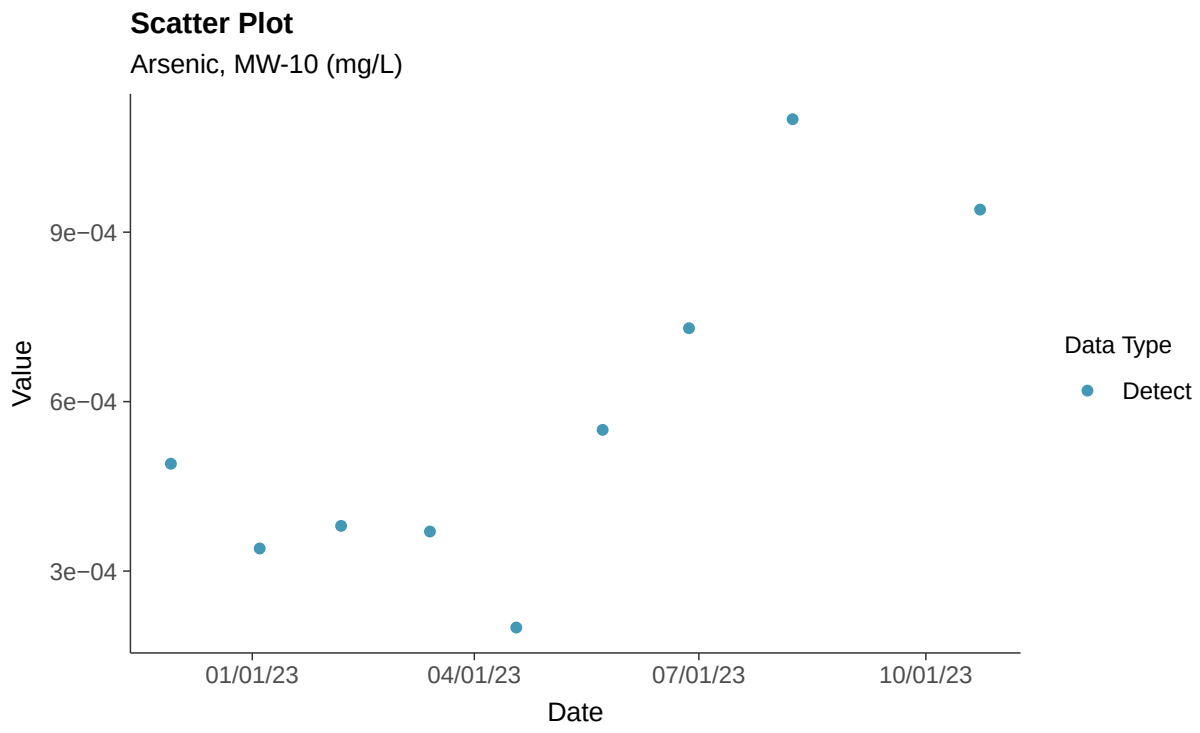

Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-10 (mg/L)
Value
3e−04
2e−04
1e−04
0e+00
−1e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

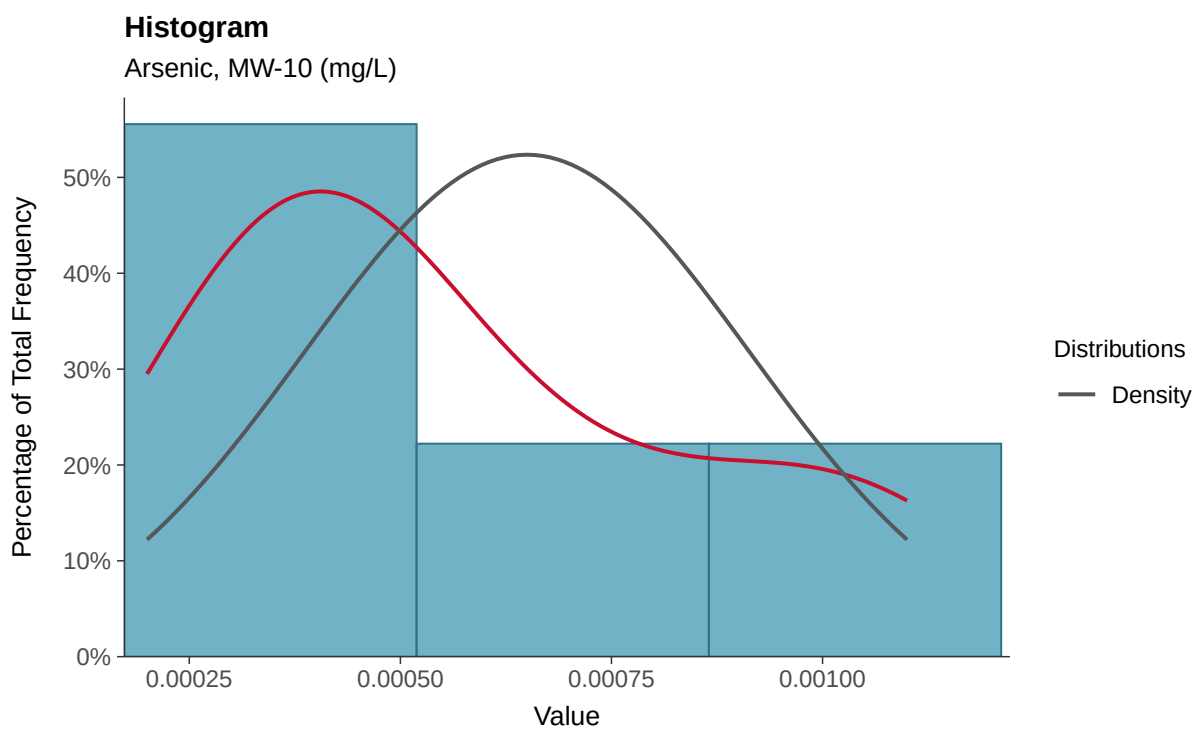

Trend Regression: Piecewise Linear-Linear
Antimony, MW-10 (mg/L)
Value
5e−04
4e−04
3e−04
2e−04
1e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-10 (mg/L)
5e−04
4e−04
3e−04
2e−04
1e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-10

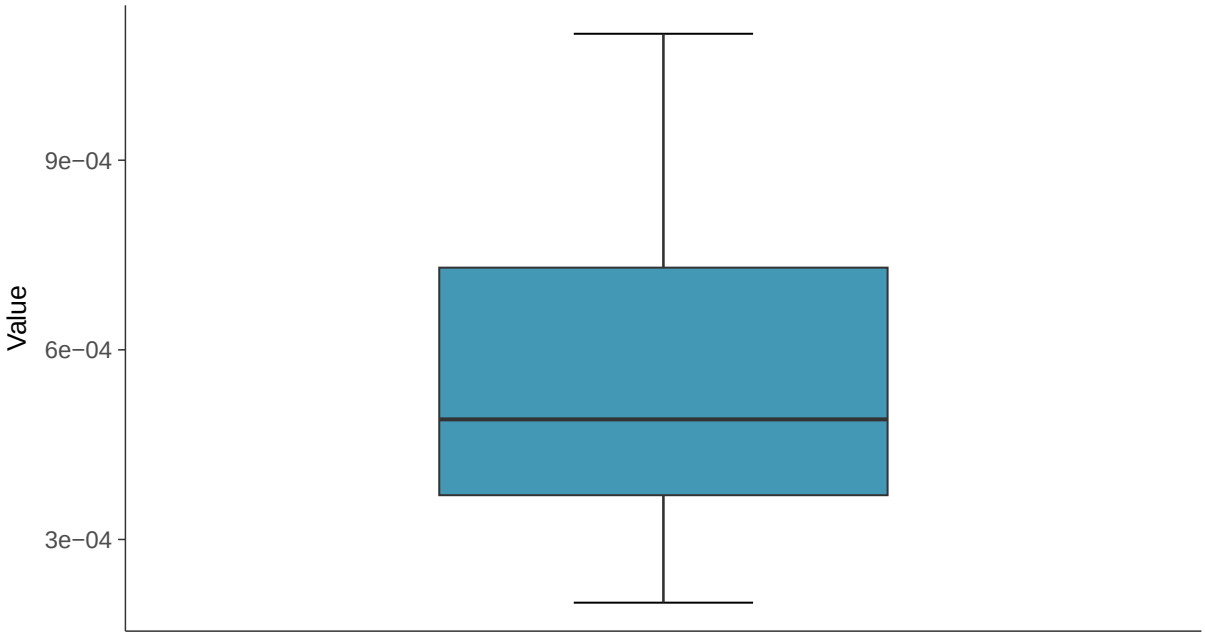
ID: 2_19_5_102





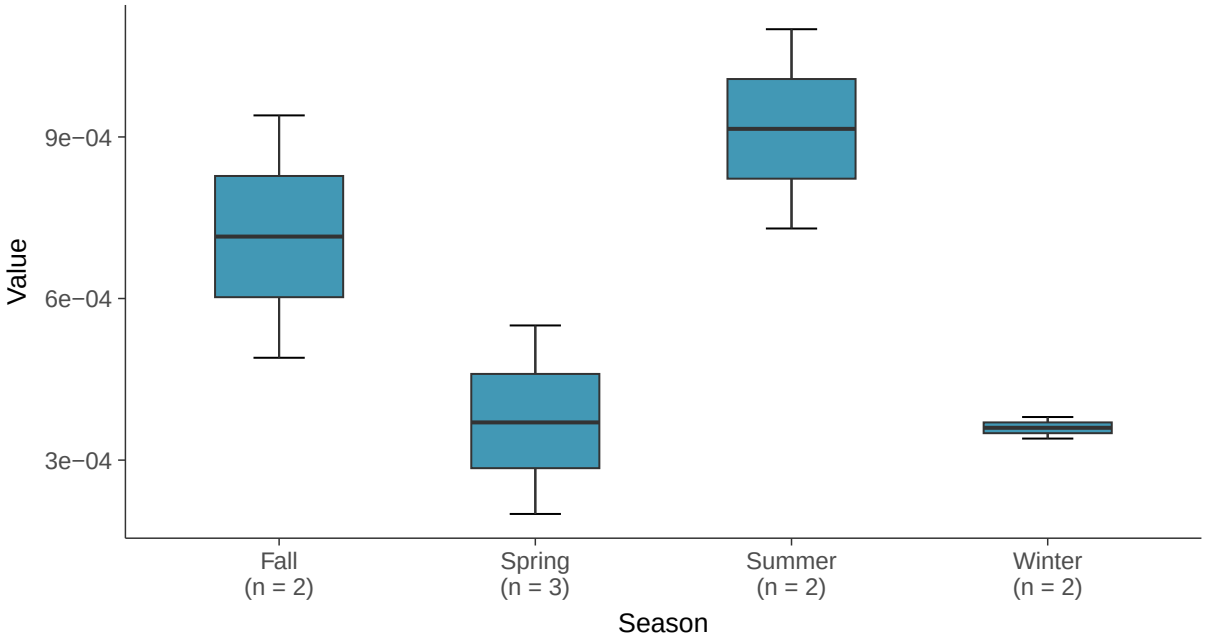
Boxplot

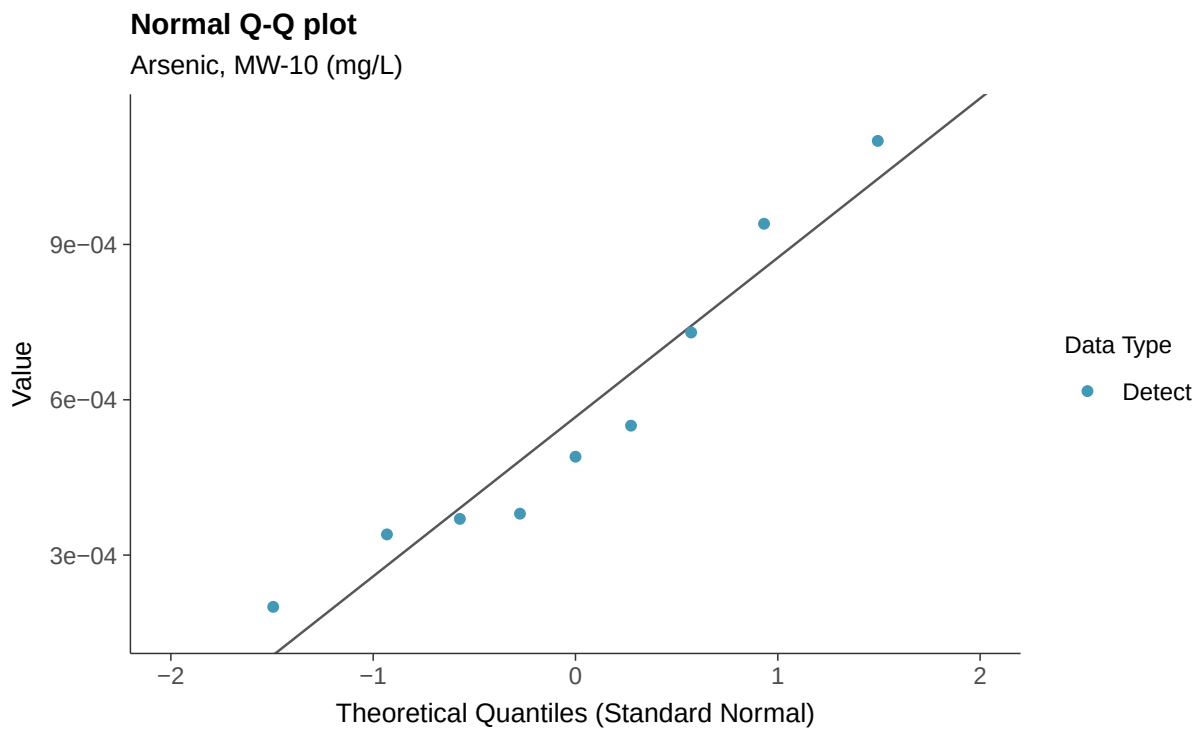
Arsenic, MW-10 (mg/L)

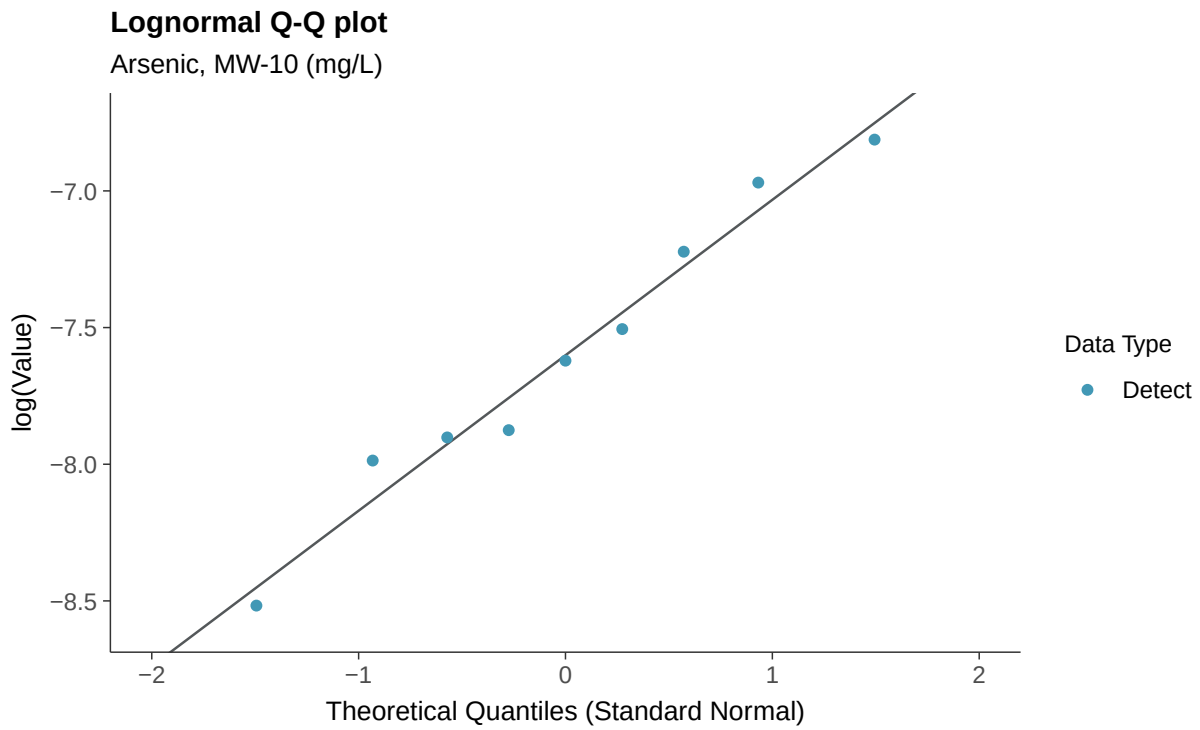


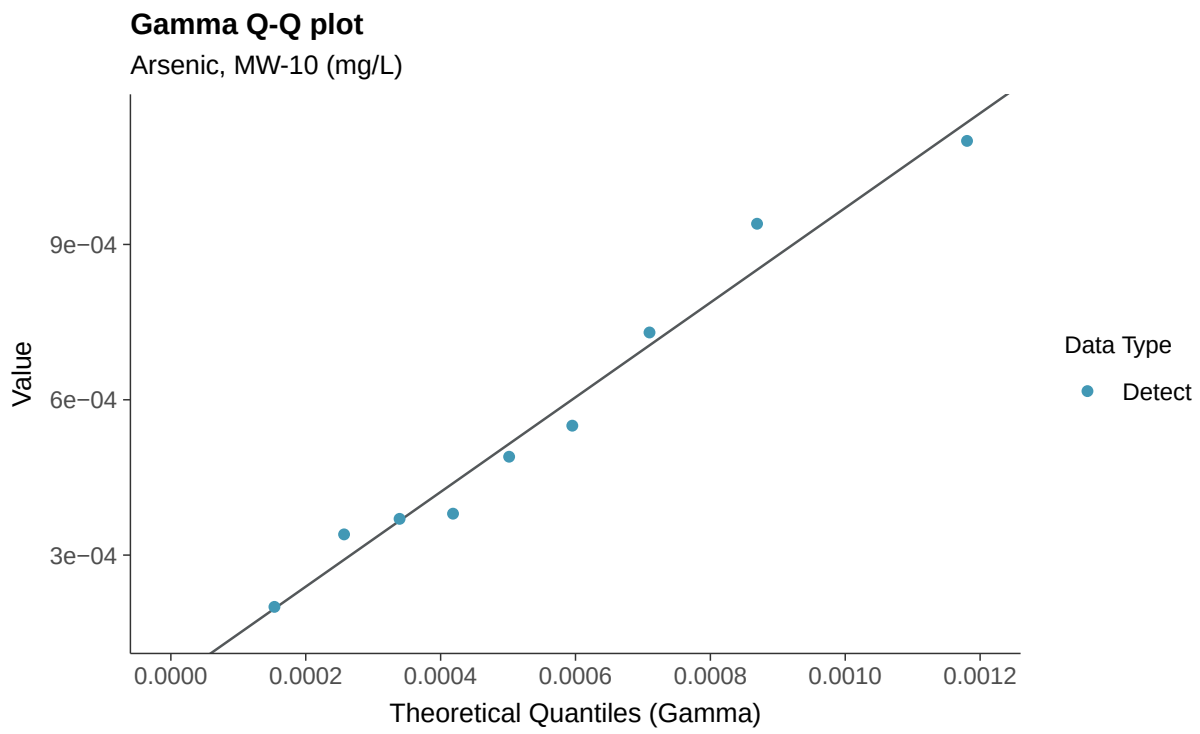
Boxplot by Season

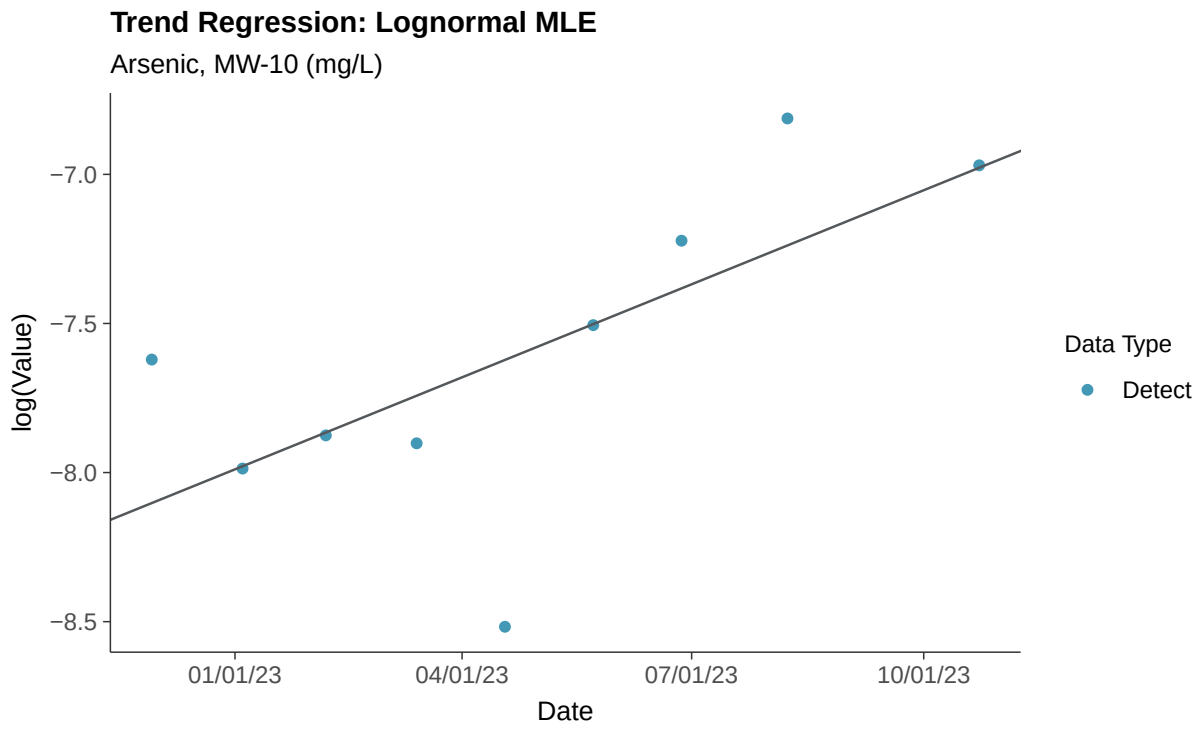
Arsenic, MW-10 (mg/L)




Normal Q-Q plot
Arsenic, MW-10 (mg/L)
Value
9e−04
6e−04
3e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

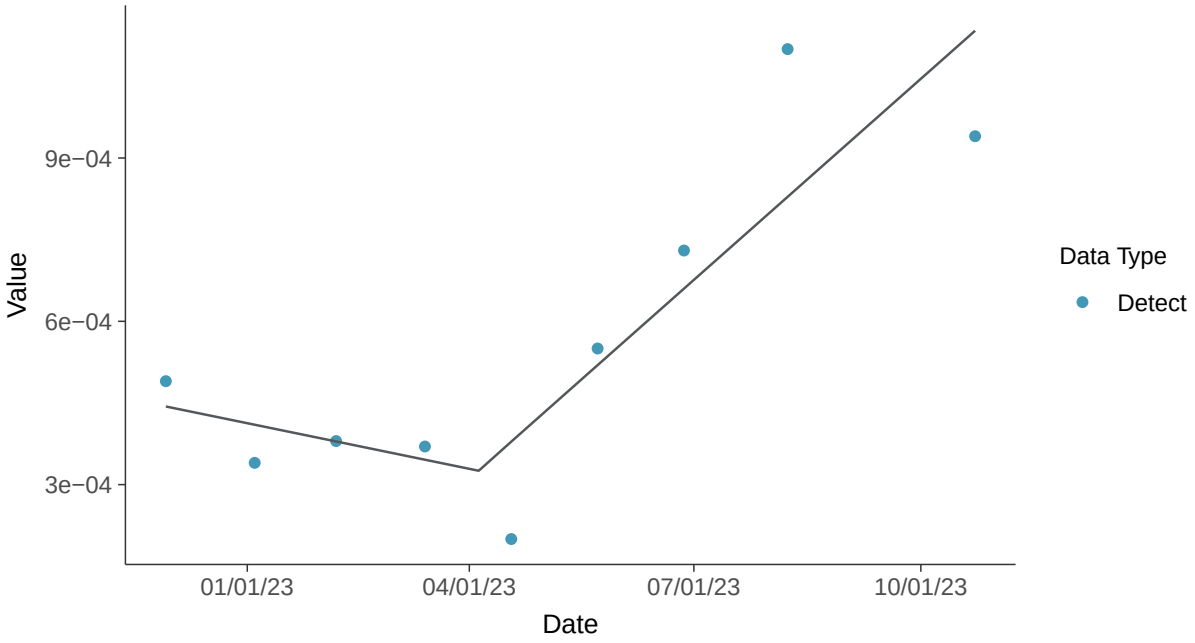

Lognormal Q-Q plot
Arsenic, MW-10 (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-10 (mg/L)
Value
9e−04
6e−04
3e−04
0.0000
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Arsenic, MW-10 (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

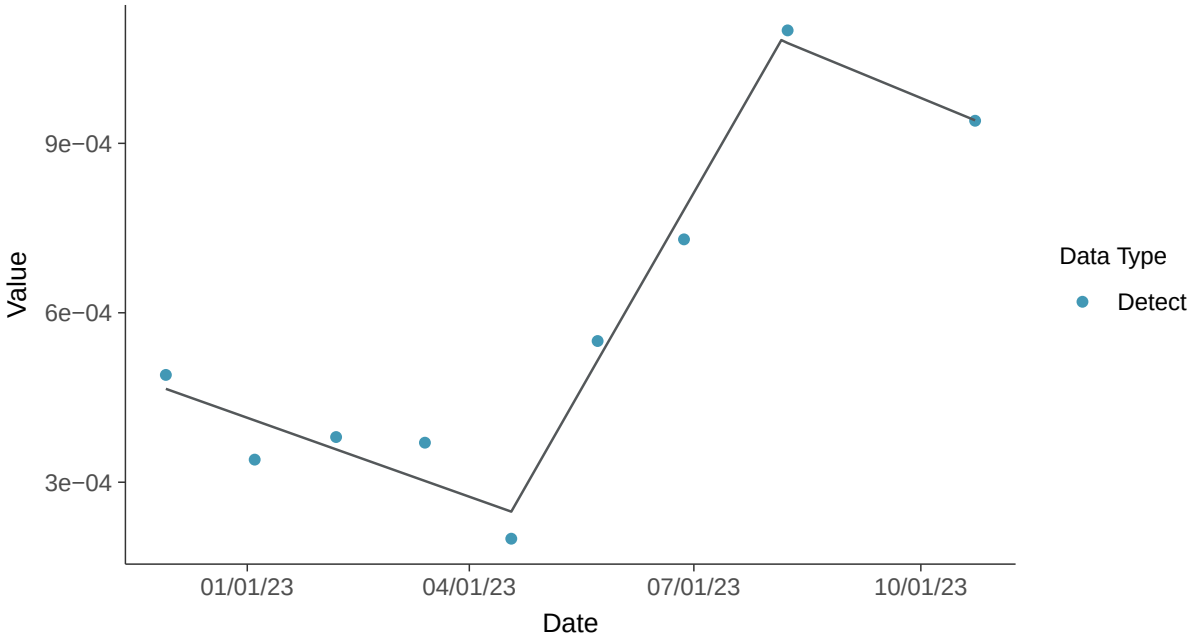
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-10 (mg/L)



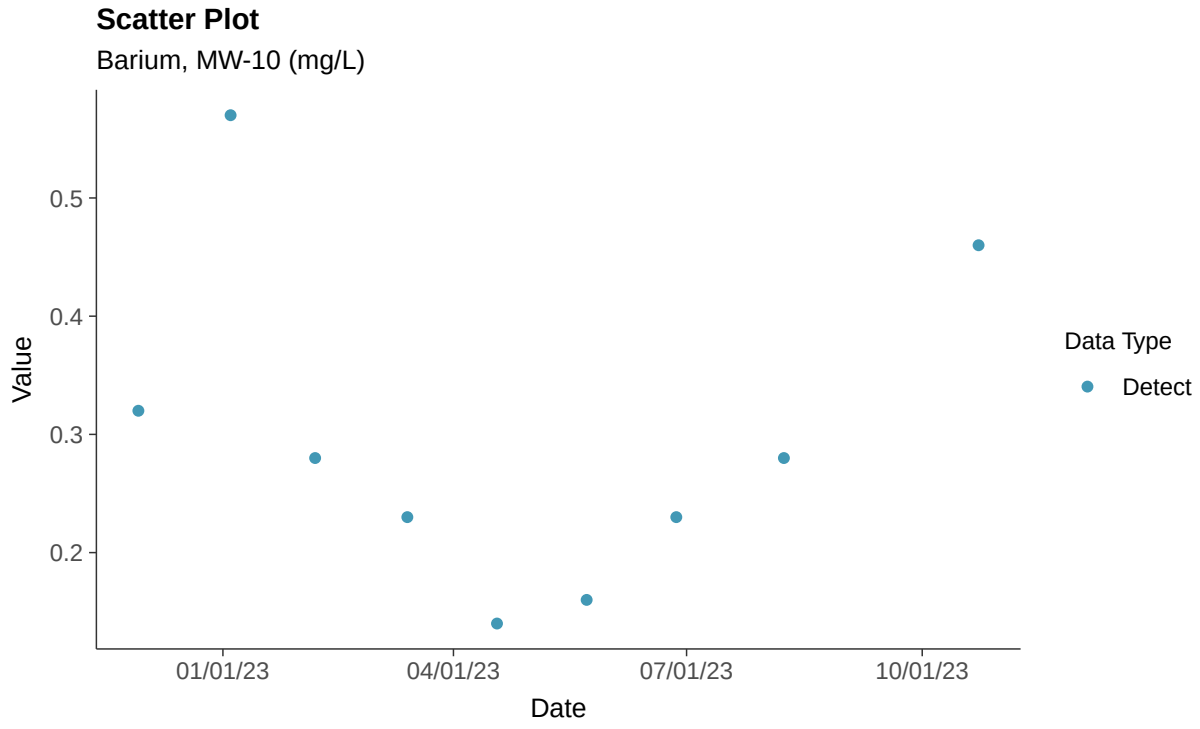
Trend Regression: Piecewise Linear-Linear-Linear

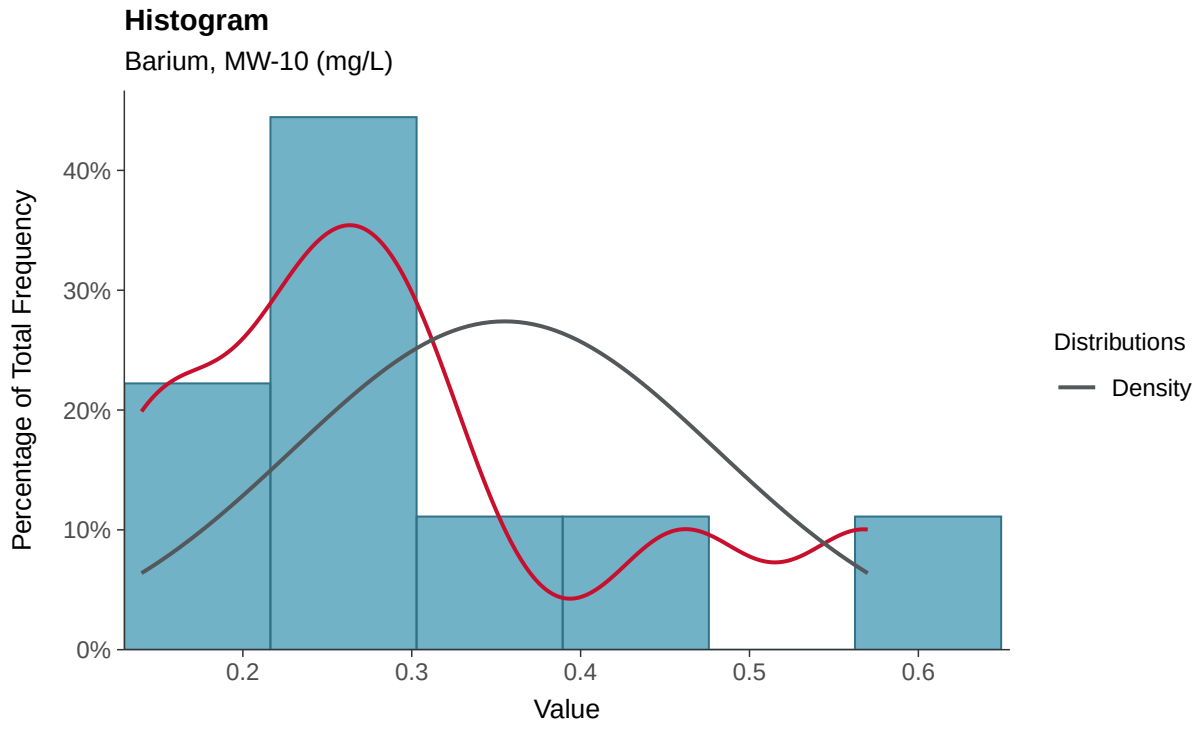
Arsenic, MW-10 (mg/L)



Appendix IV: Barium, MW-10

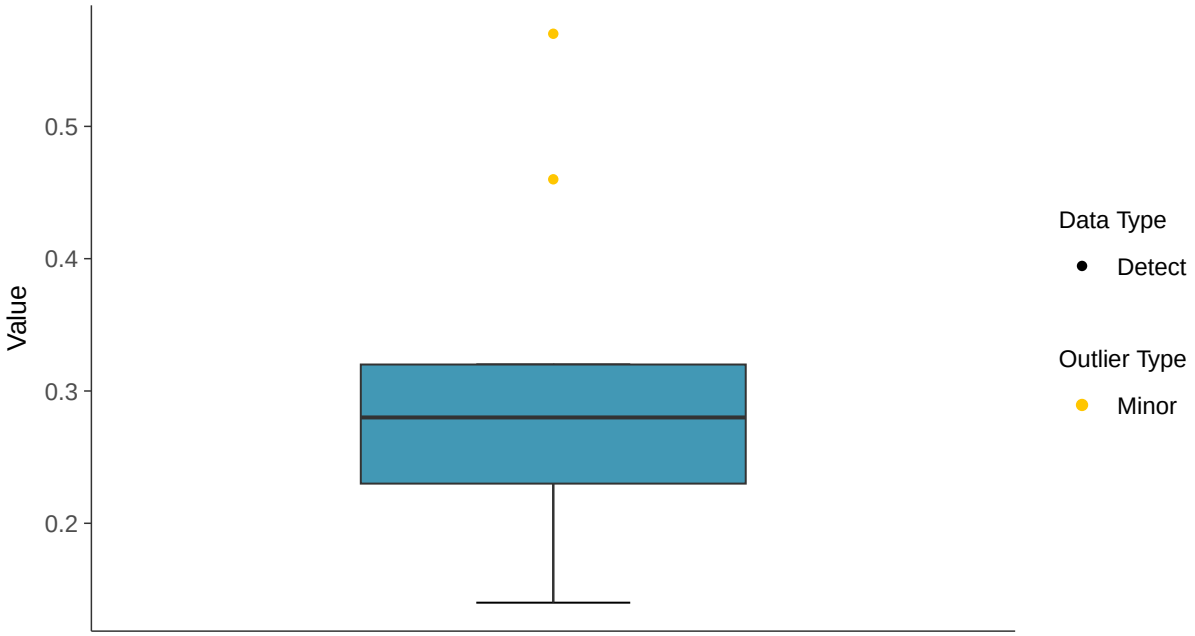
ID: 2_19_5_103





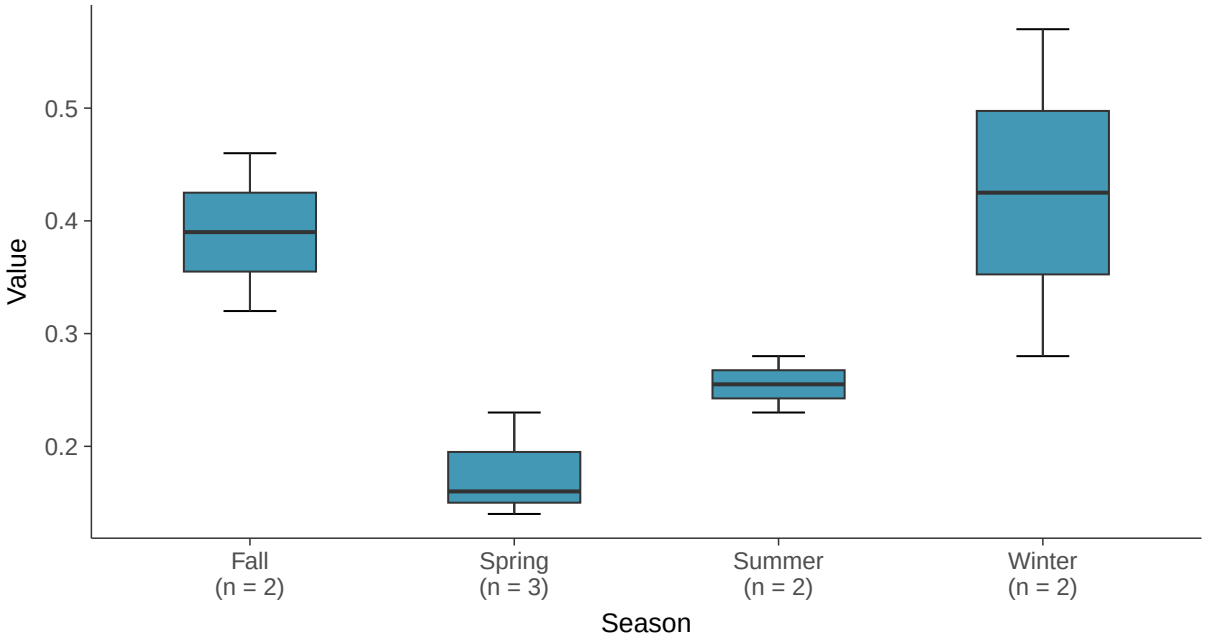
Boxplot

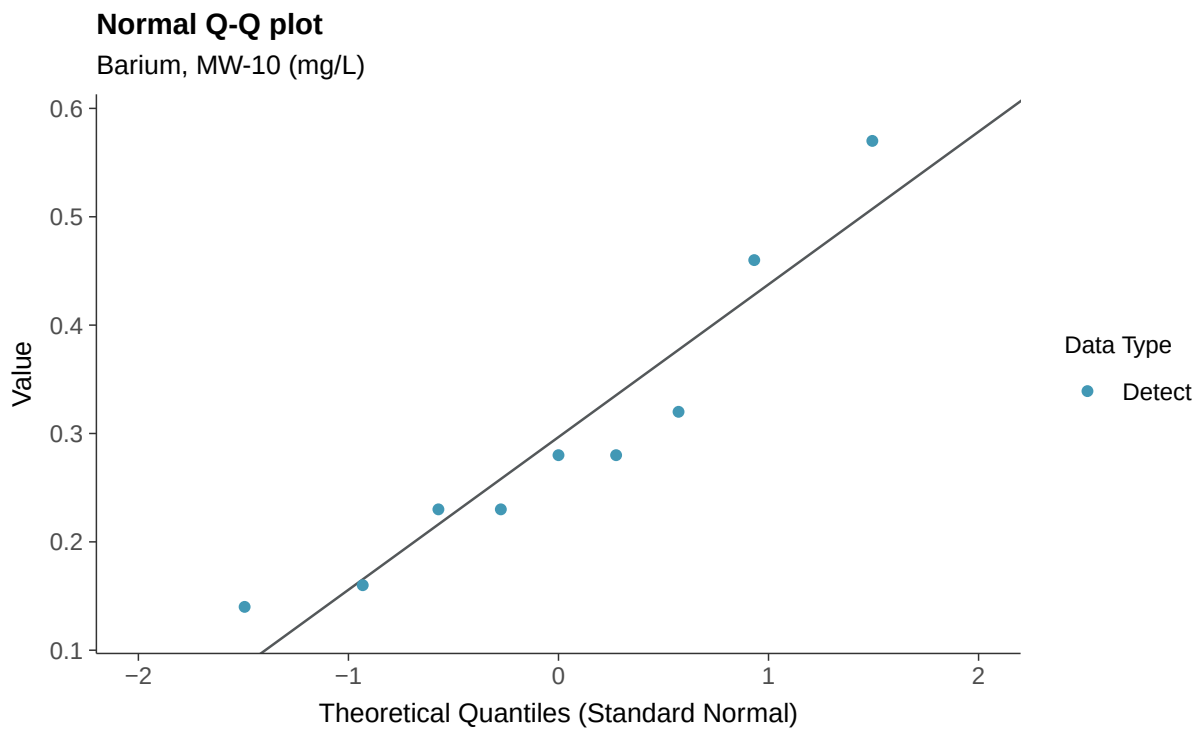
Barium, MW-10 (mg/L)

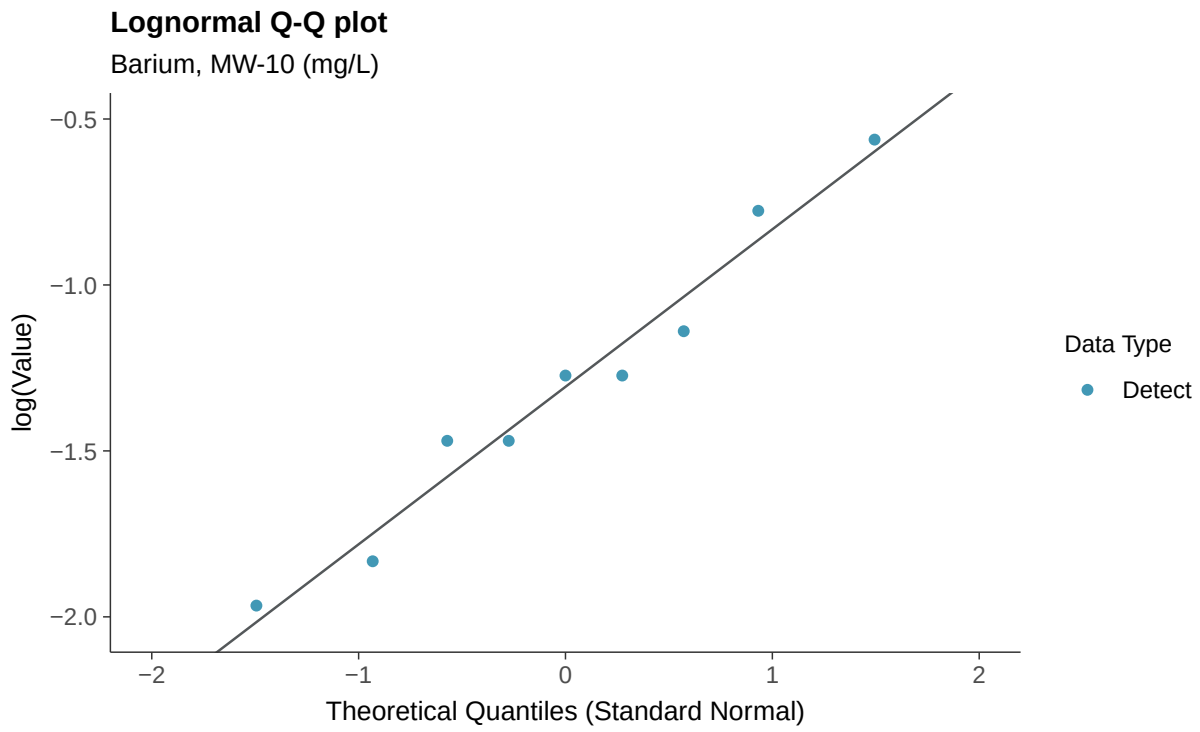


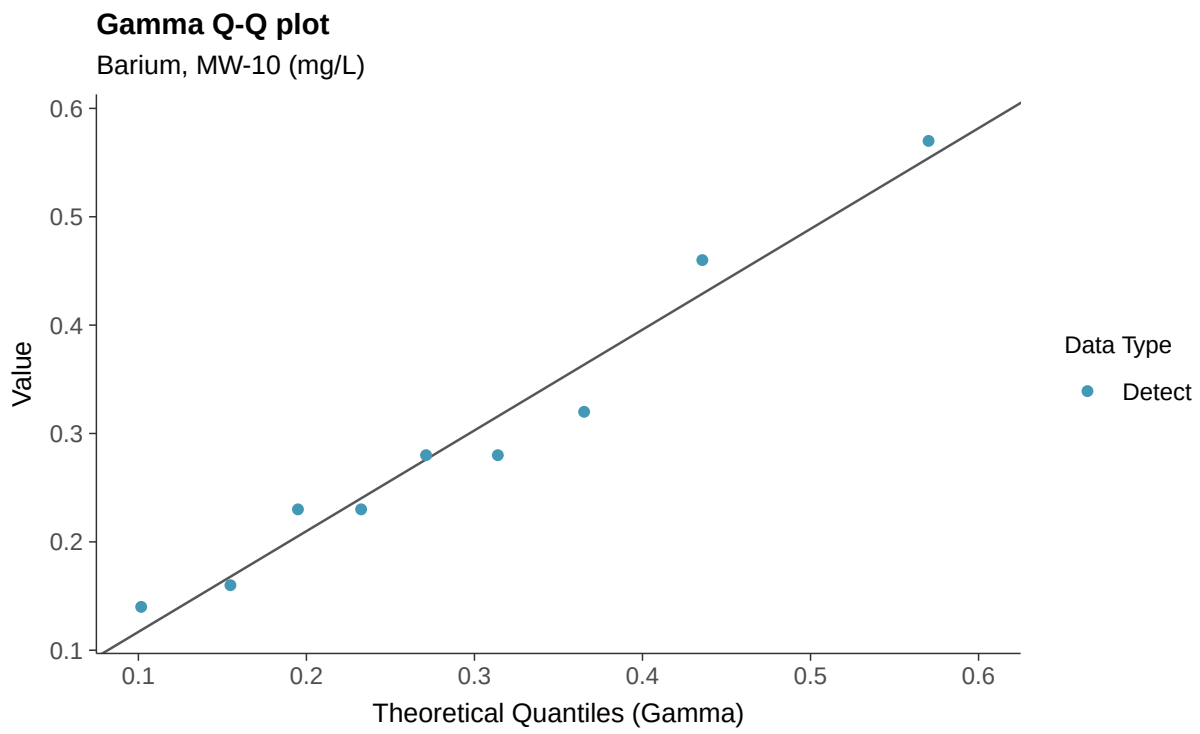
Boxplot by Season

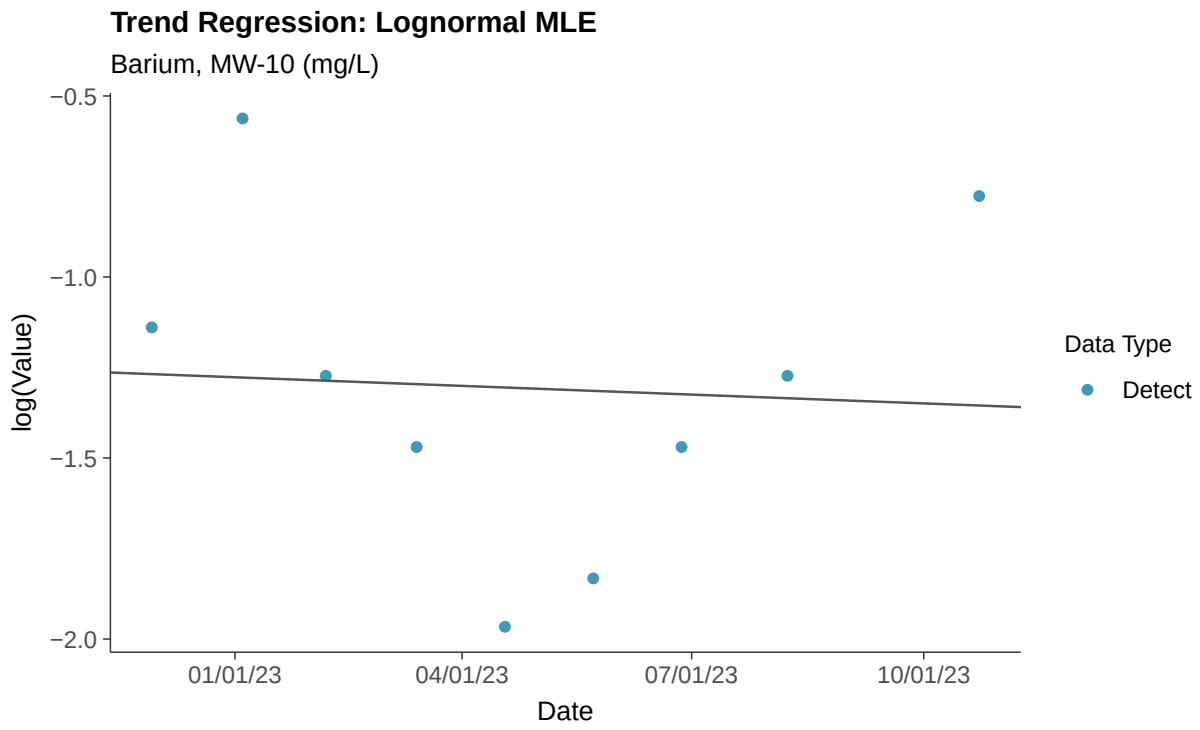
Barium, MW-10 (mg/L)

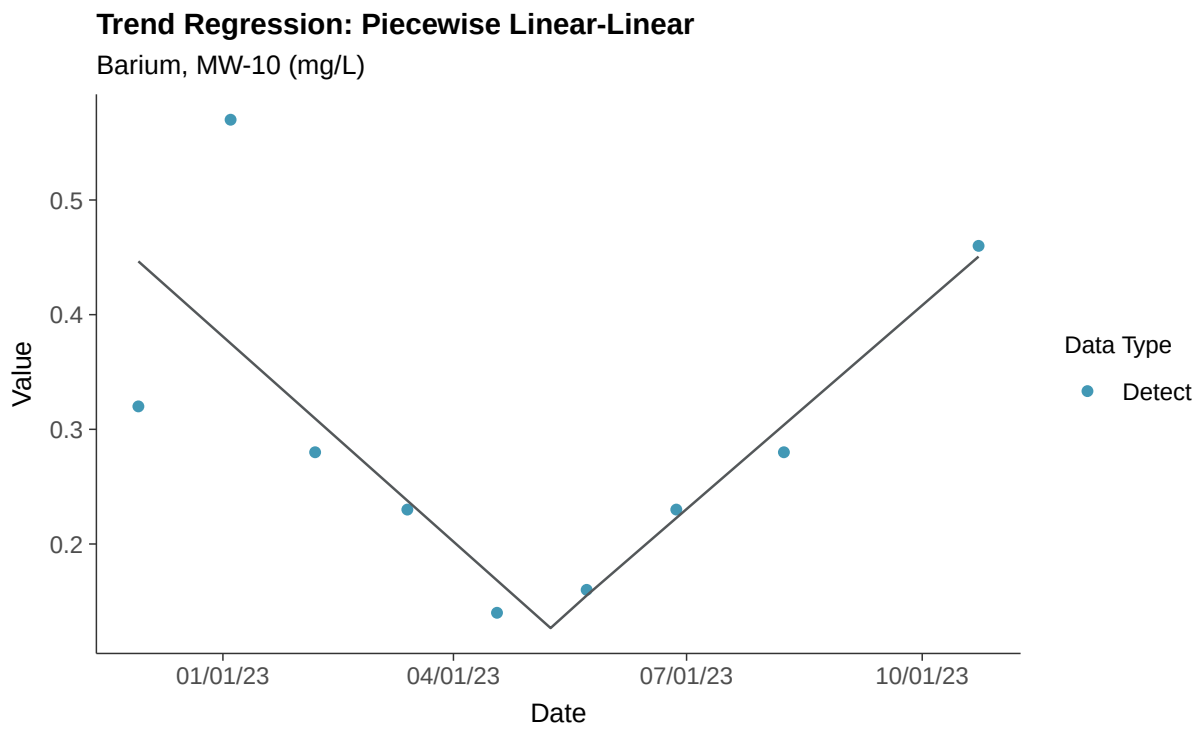



Normal Q-Q plot
Barium, MW-10 (mg/L)
Value
0.6
0.5
0.4
0.3
0.2
0.1
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Barium, MW-10 (mg/L)
log(Value)
−0.5
−1.0
−1.5
−2.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

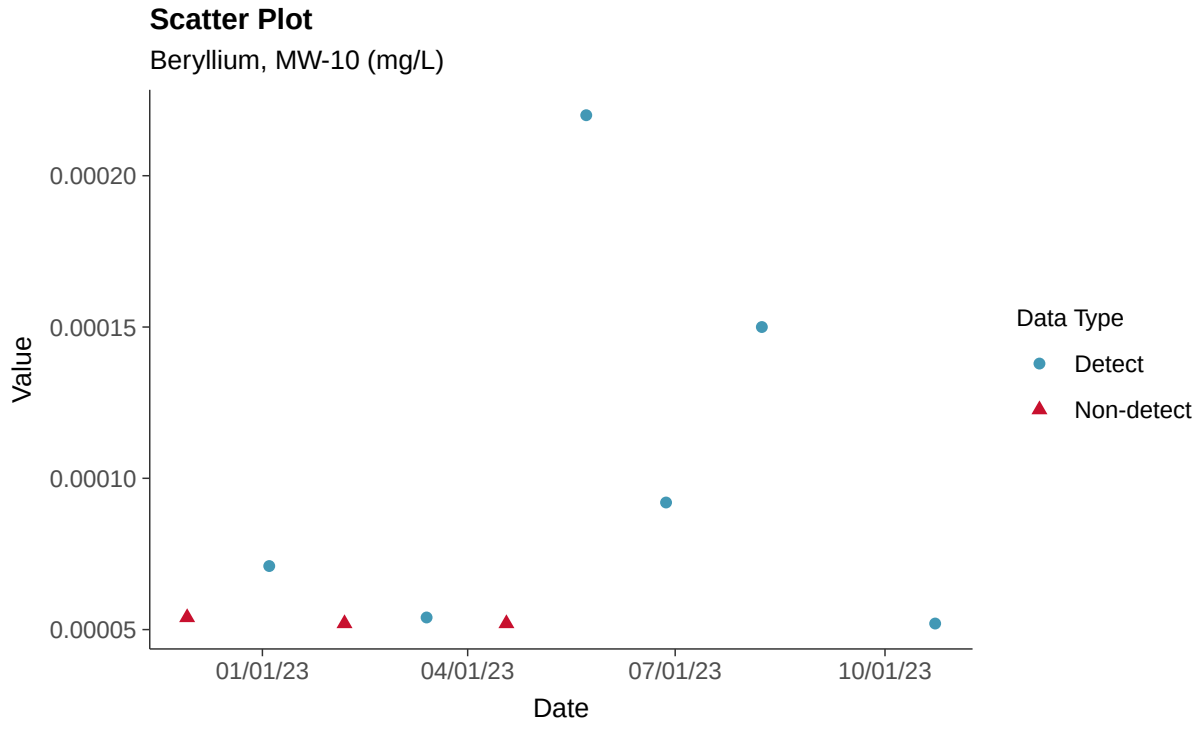

Gamma Q-Q plot
Barium, MW-10 (mg/L)
Value
0.6
0.5
0.4
0.3
0.2
0.1
0.1
0.2
0.3
0.4
0.5
0.6
Theoretical Quantiles (Gamma)
Data Type
Detect

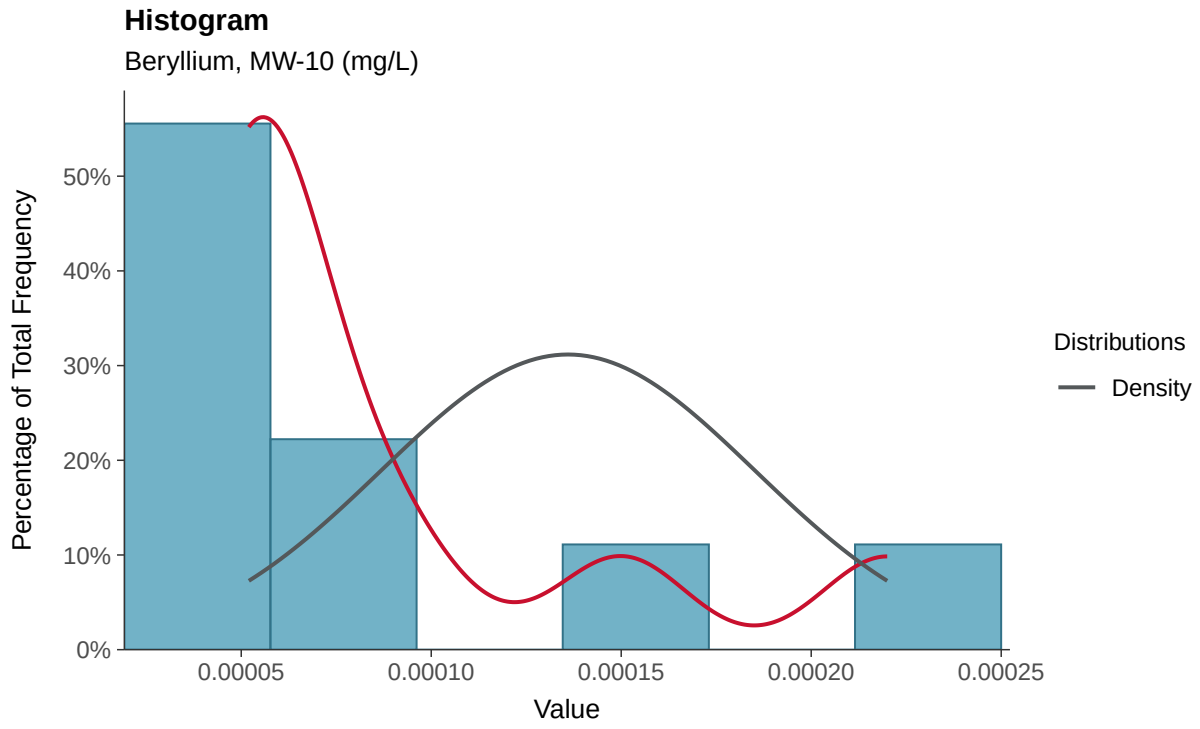

Trend Regression: Lognormal MLE
Barium, MW-10 (mg/L)
log(Value)
−0.5
−1.0
−1.5
−2.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Barium, MW-10 (mg/L)
Value
0.5
0.4
0.3
0.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-10

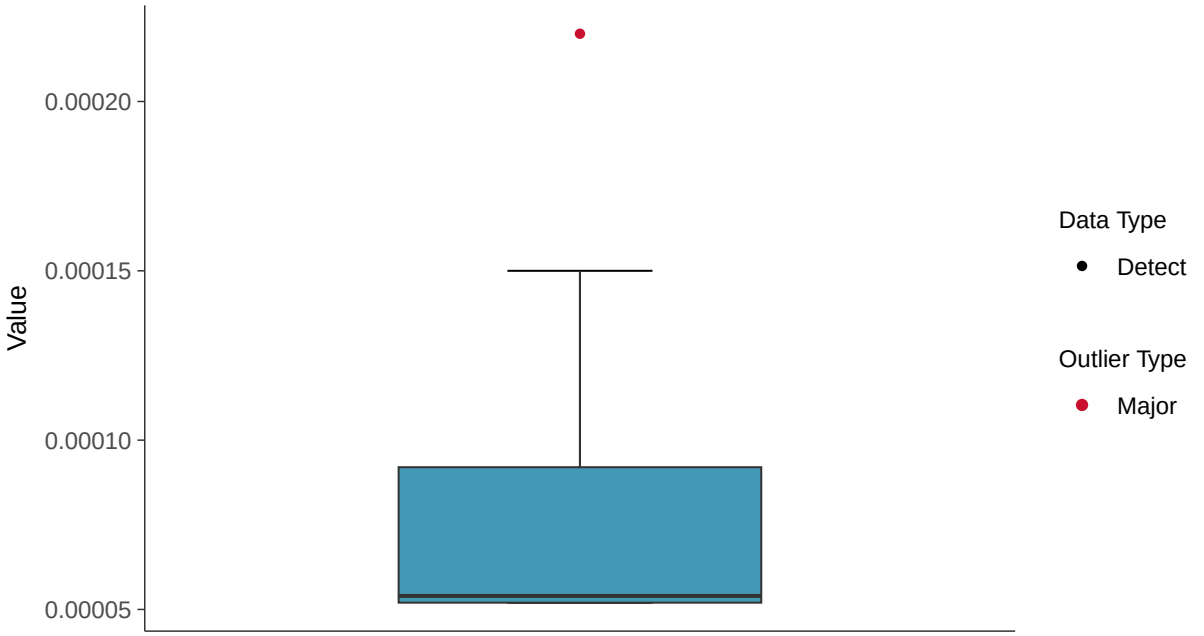
ID: 2_19_5_104





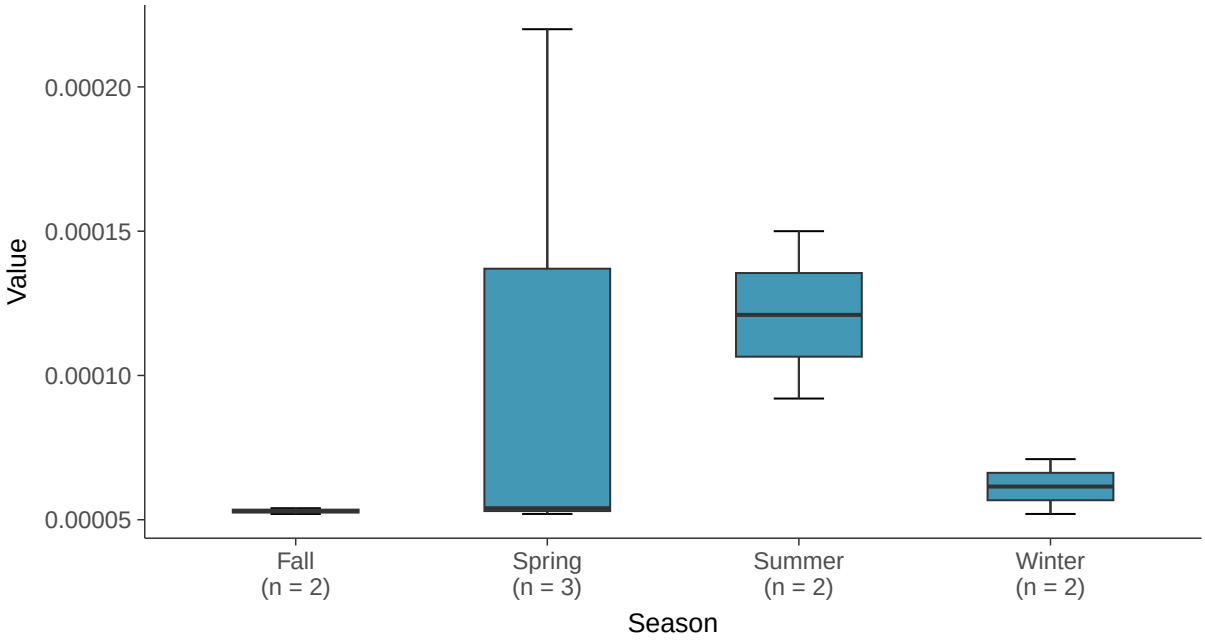
Boxplot

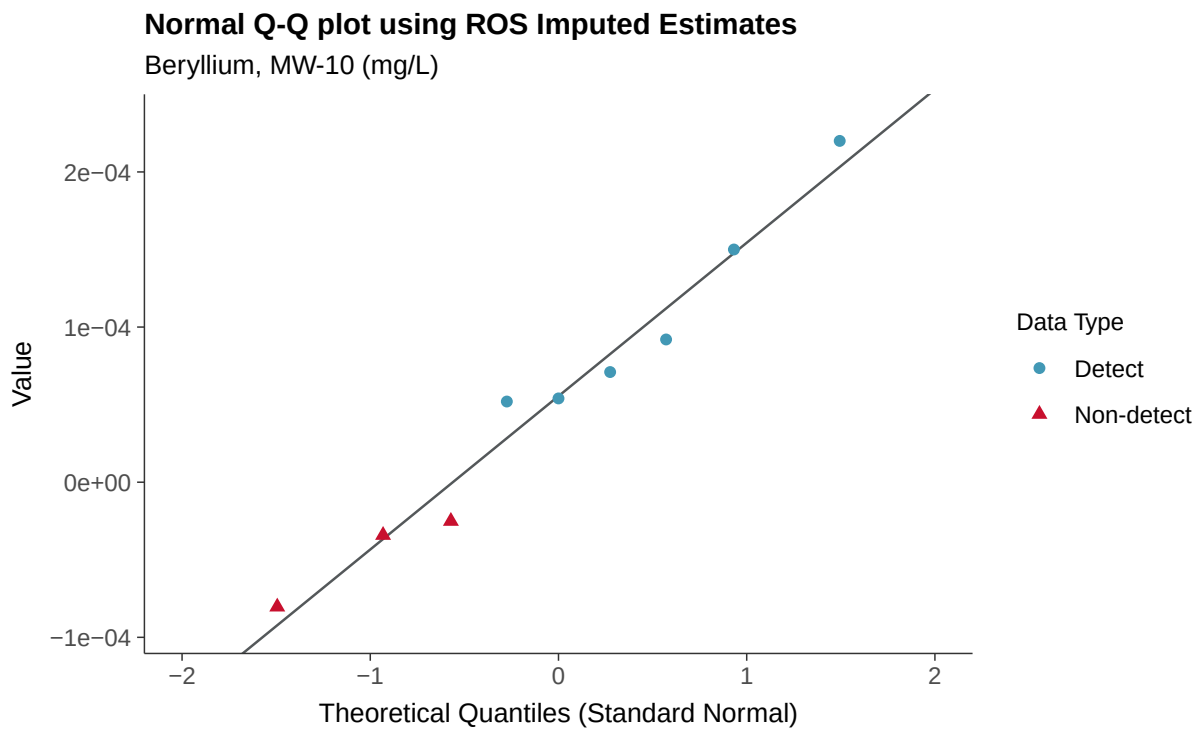
Beryllium, MW-10 (mg/L)

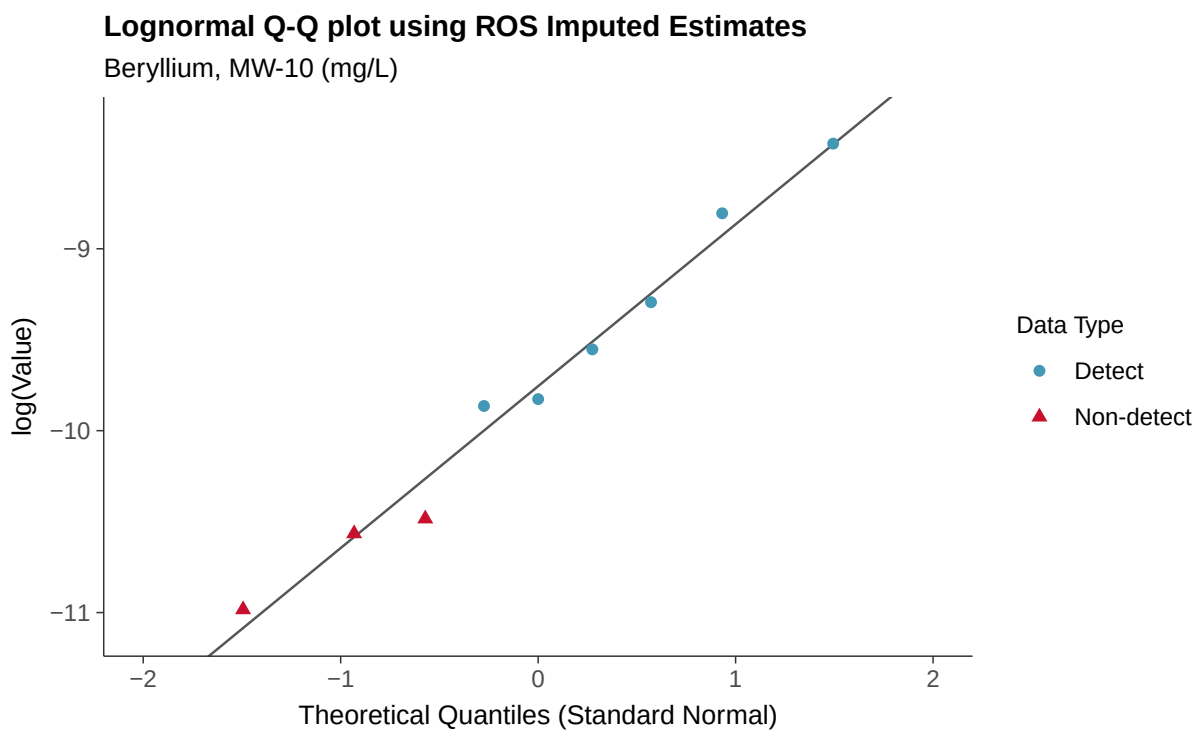


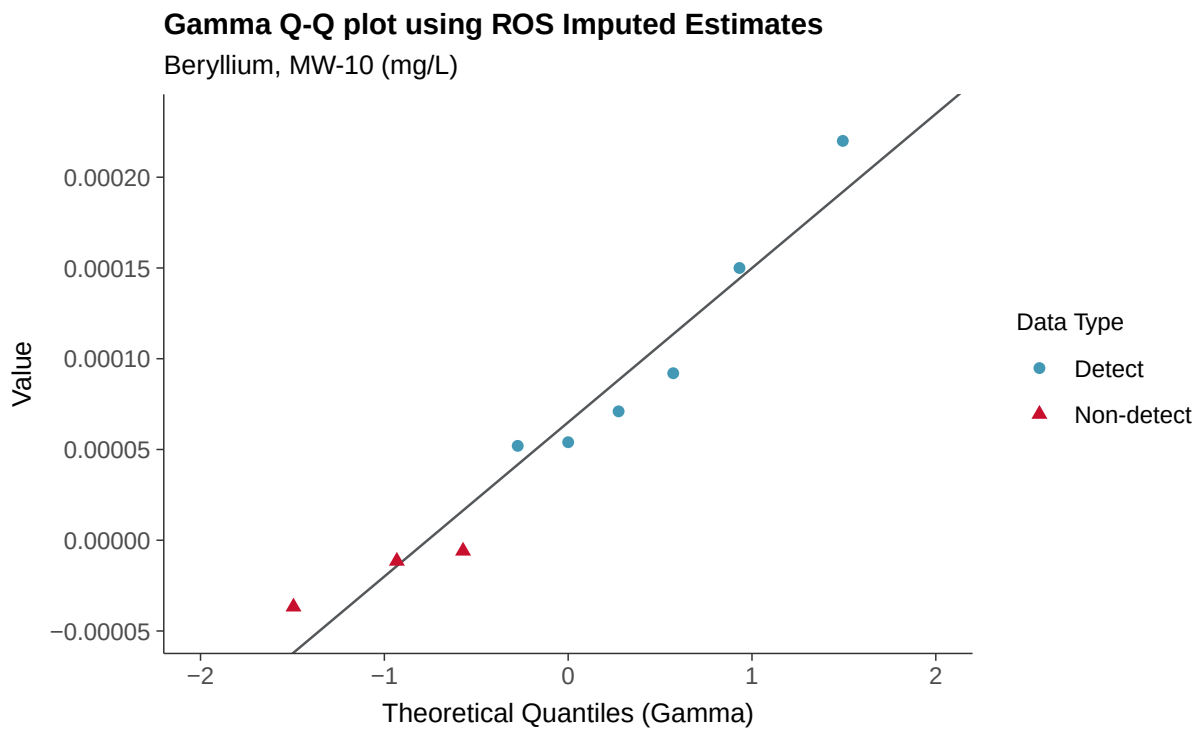
Boxplot by Season

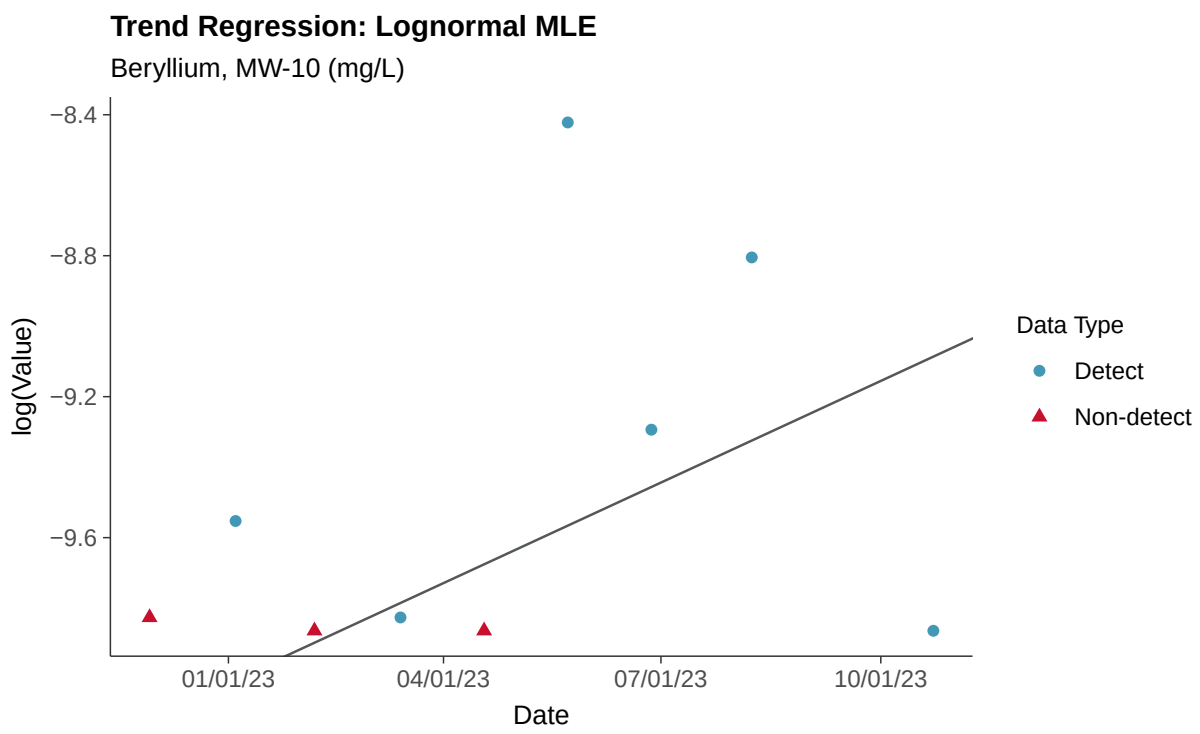
Beryllium, MW-10 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Beryllium, MW-10 (mg/L)
Value
2e−04
1e−04
0e+00
−1e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

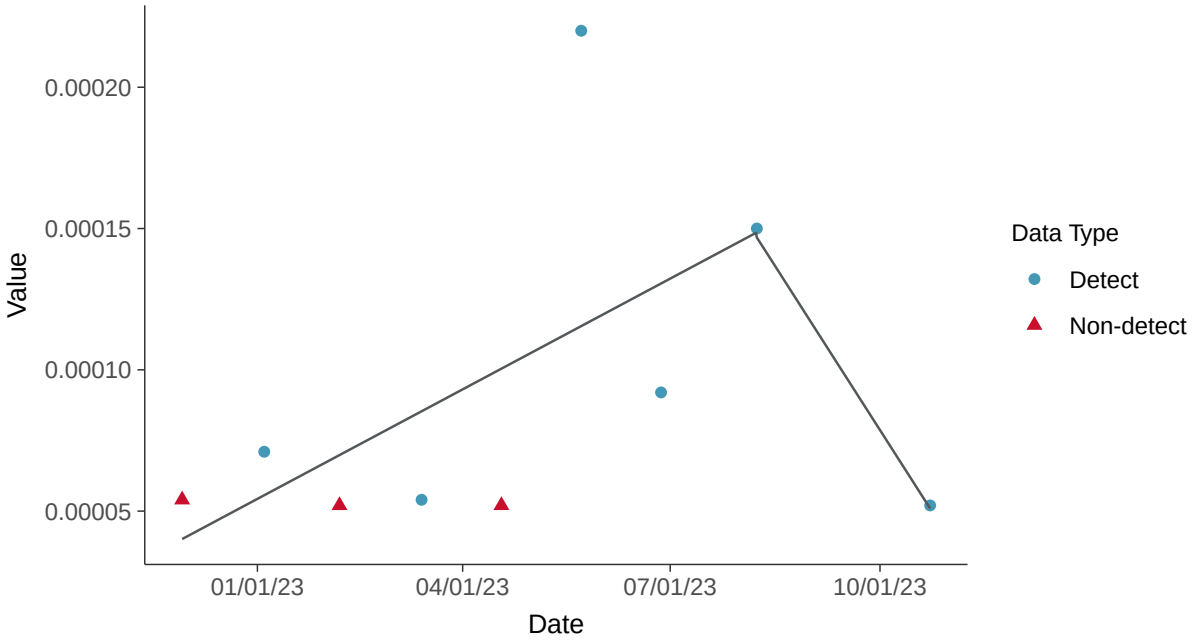

Lognormal Q-Q plot using ROS Imputed Estimates
Beryllium, MW-10 (mg/L)
log(Value)
−9
−10
−11
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Beryllium, MW-10 (mg/L)
Value
0.00020
0.00015
0.00010
0.00005
0.00000
−0.00005
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Beryllium, MW-10 (mg/L)
log(Value)
−8.4
−8.8
−9.2
−9.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

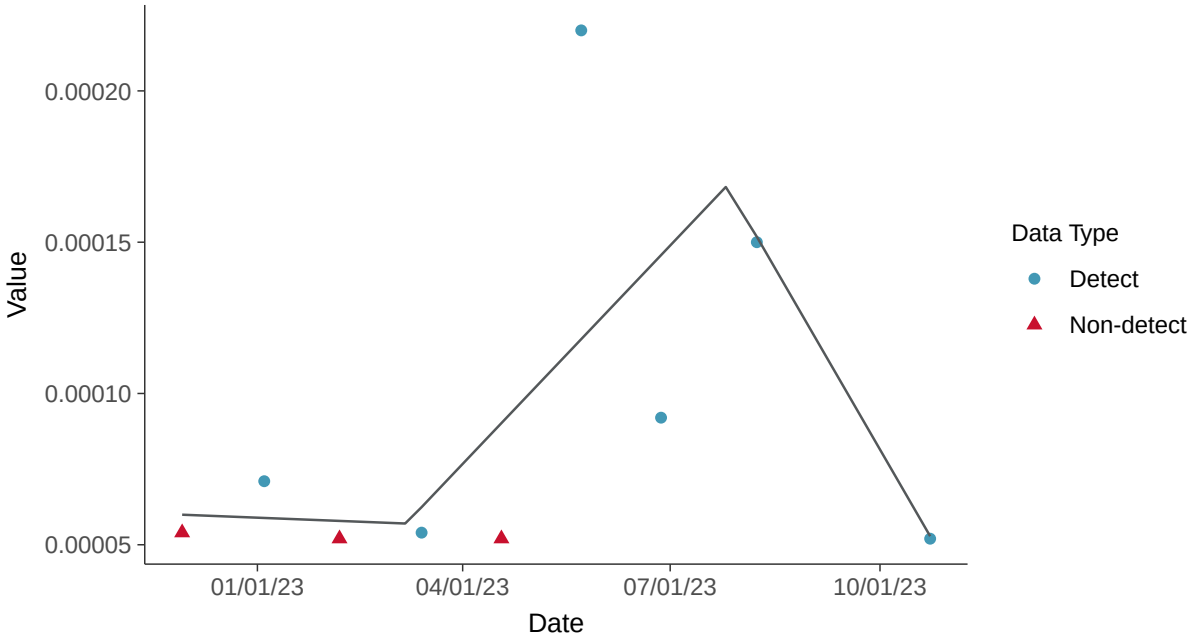
Trend Regression: Piecewise Linear-Linear

Beryllium, MW-10 (mg/L)



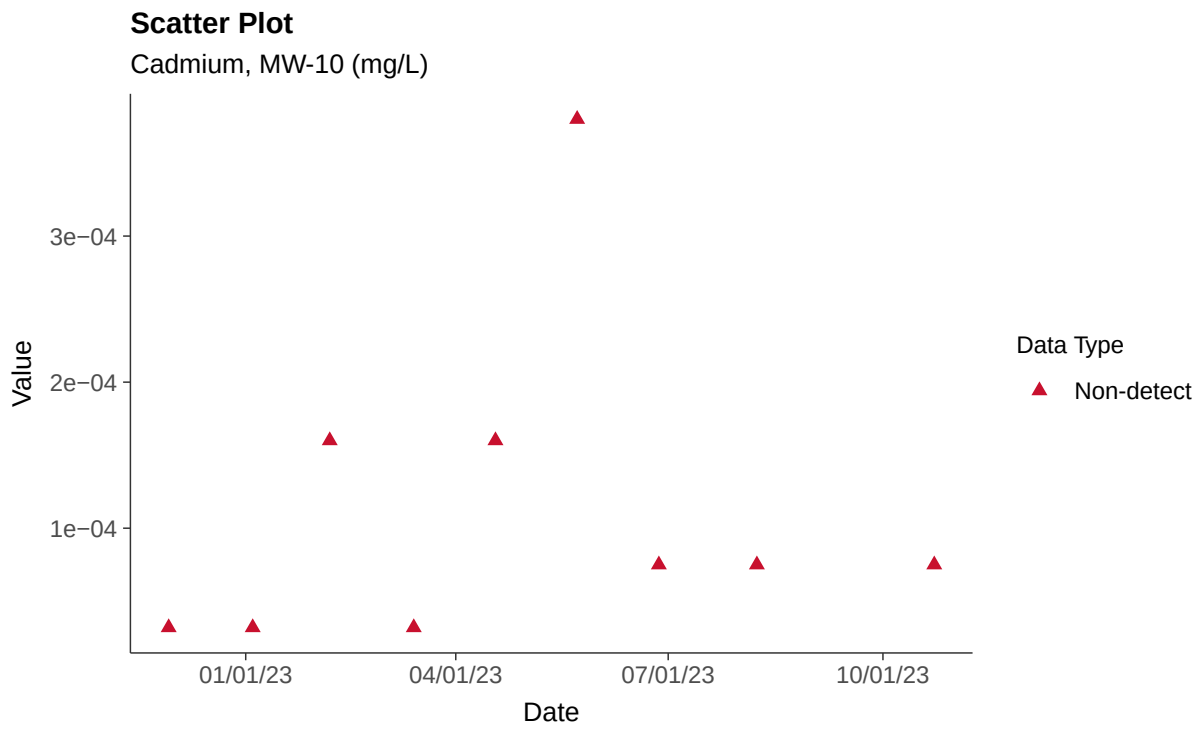
Trend Regression: Piecewise Linear-Linear-Linear

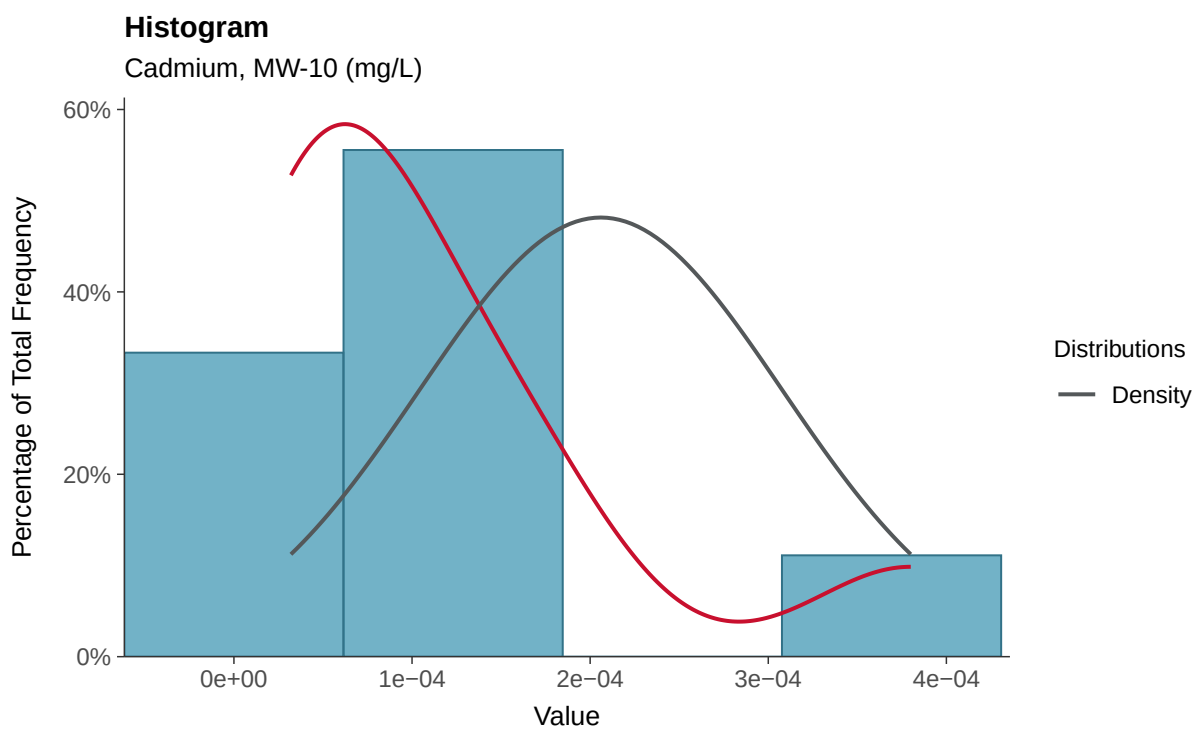
Beryllium, MW-10 (mg/L)



Appendix IV: Cadmium, MW-10

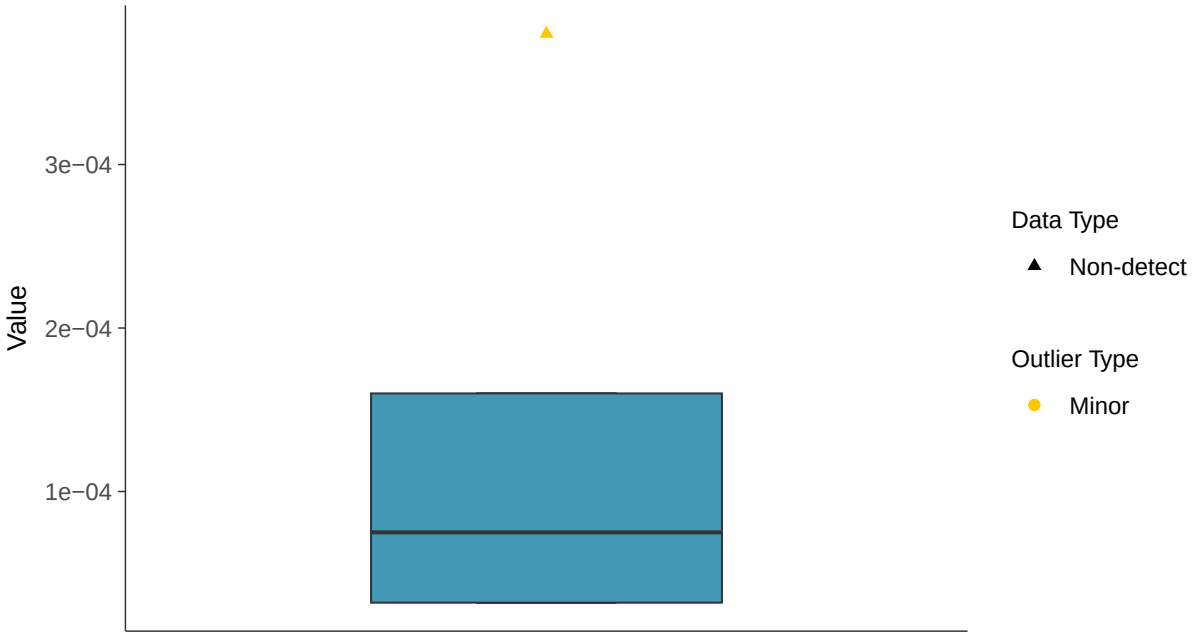
ID: 2_19_5_106





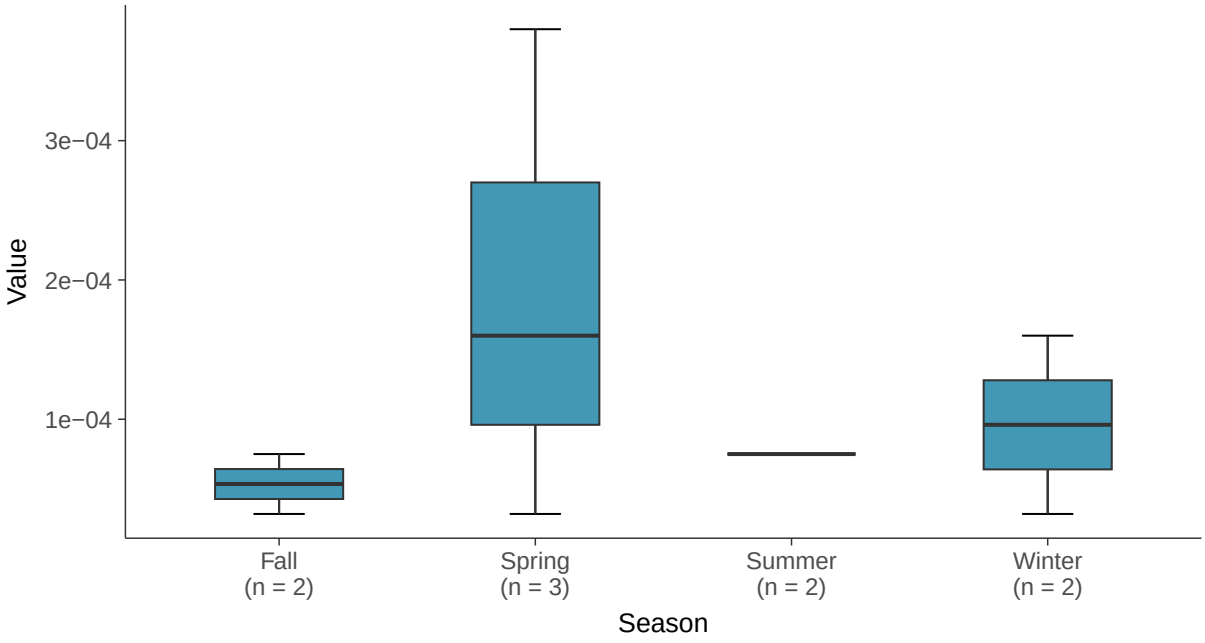
Boxplot

Cadmium, MW-10 (mg/L)



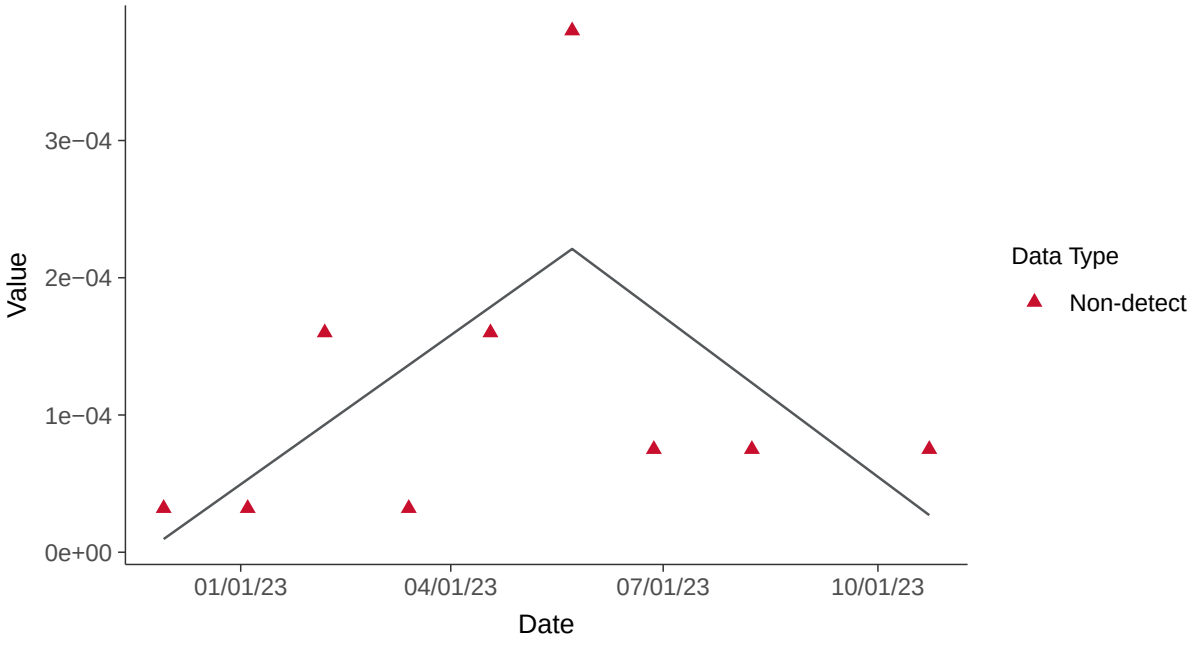
Boxplot by Season

Cadmium, MW-10 (mg/L)



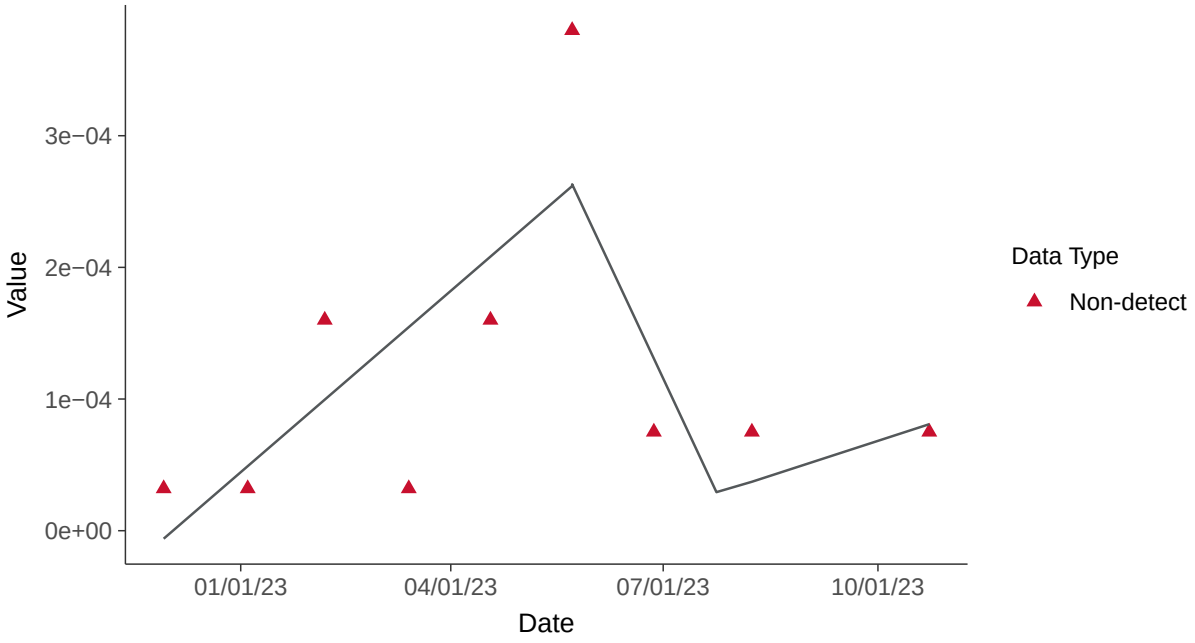
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-10 (mg/L)



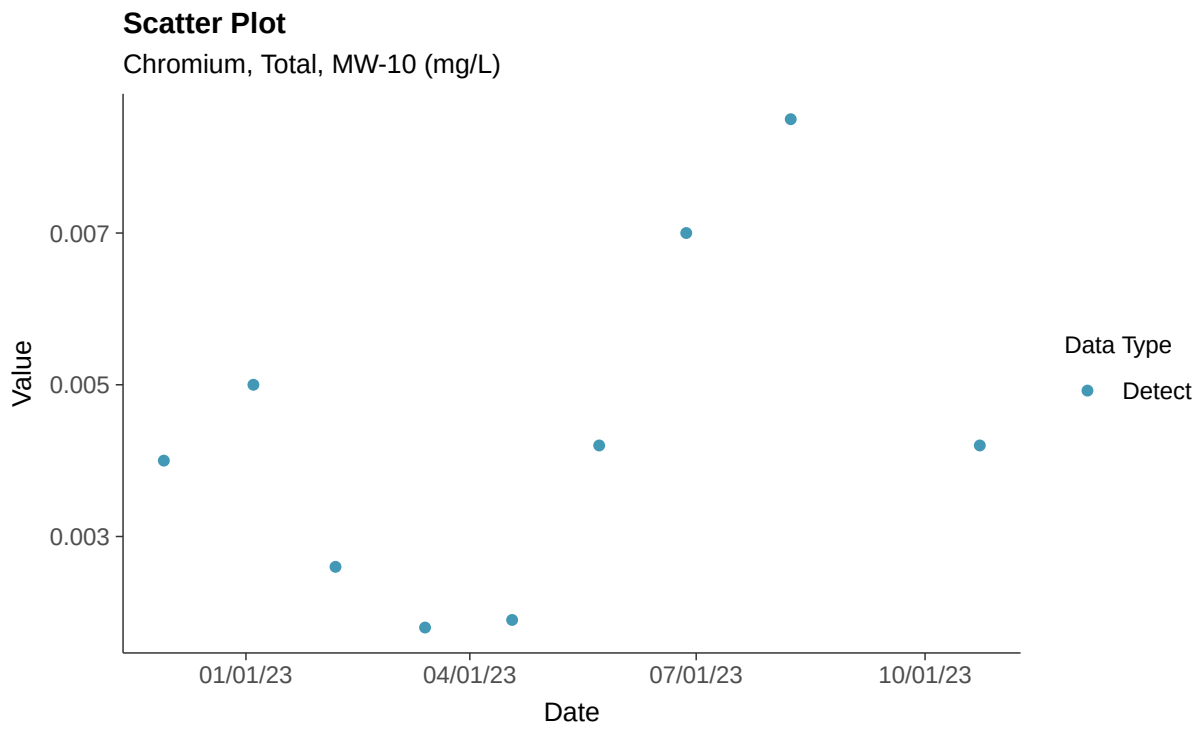
Trend Regression: Piecewise Linear-Linear-Linear

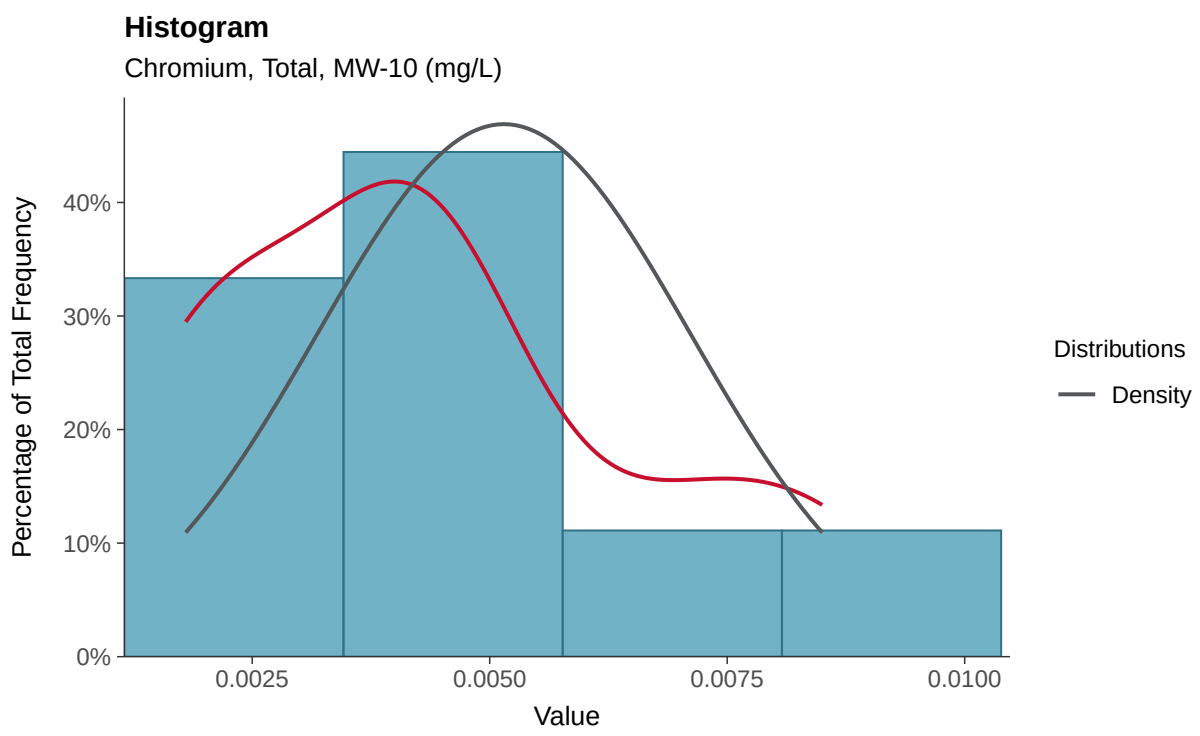
Cadmium, MW-10 (mg/L)



Appendix IV: Chromium, Total, MW-10

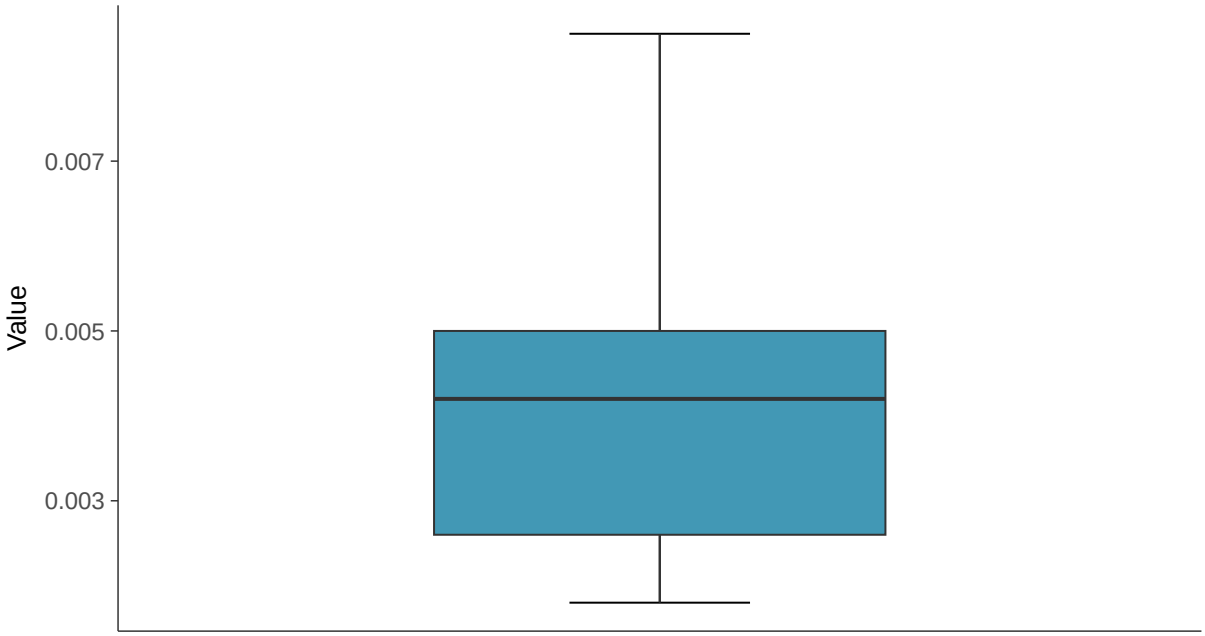
ID: 2_19_5_109





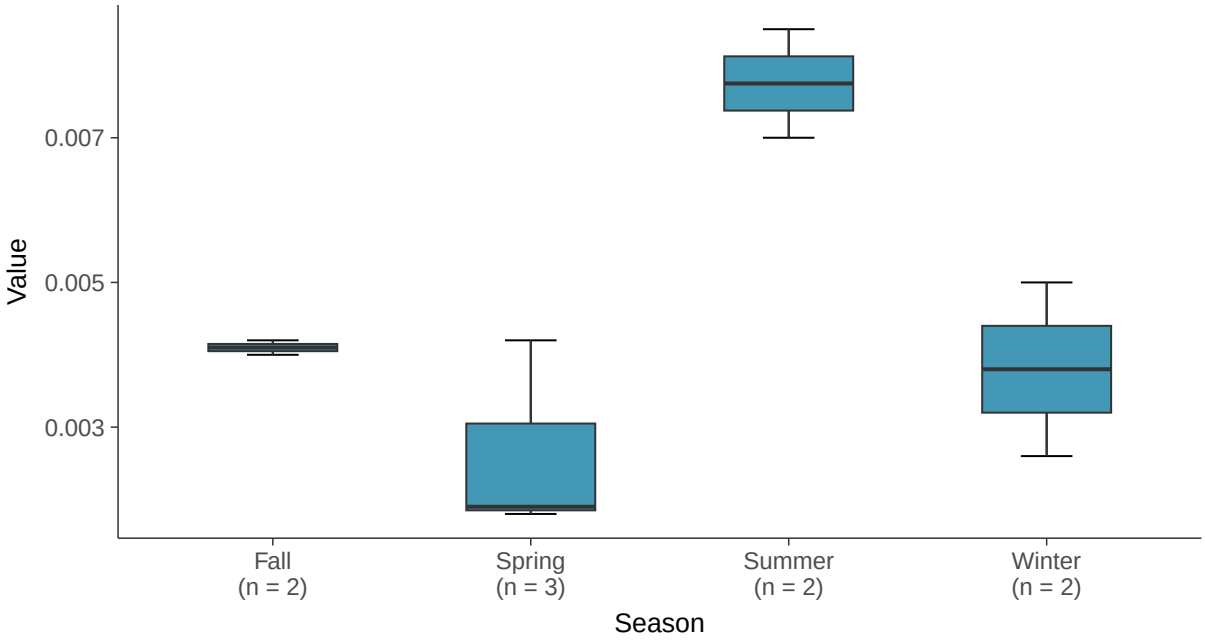
Boxplot

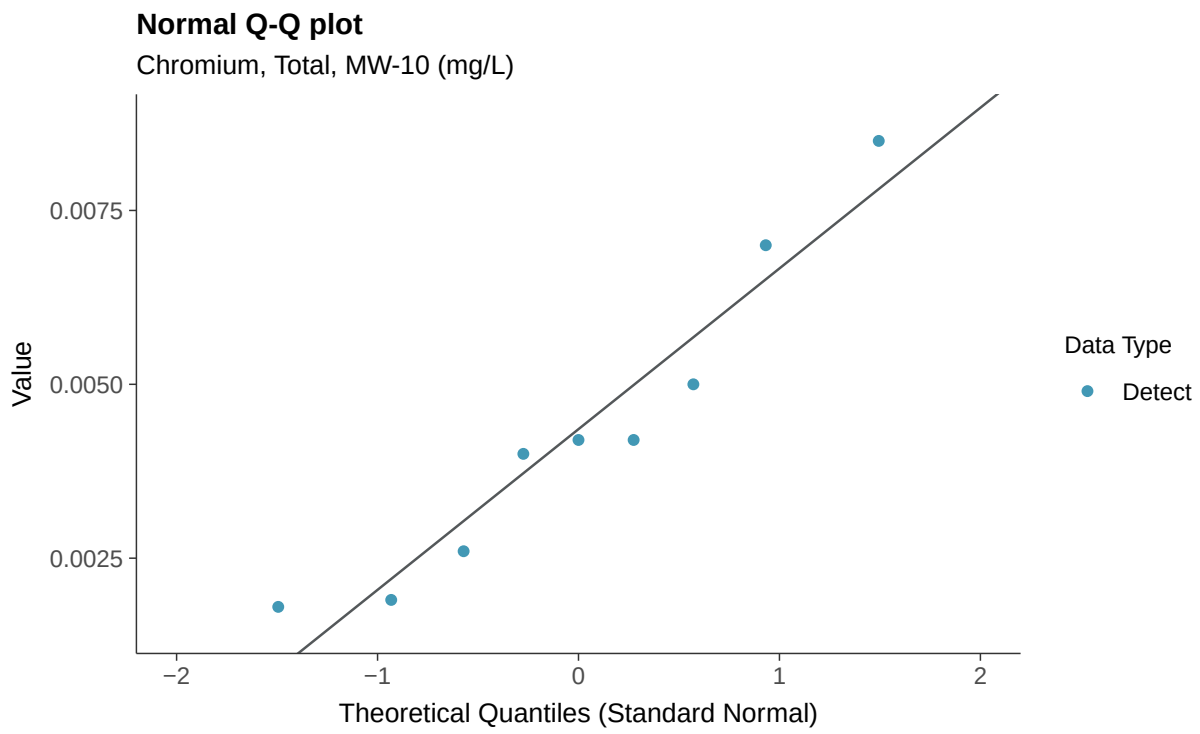
Chromium, Total, MW-10 (mg/L)

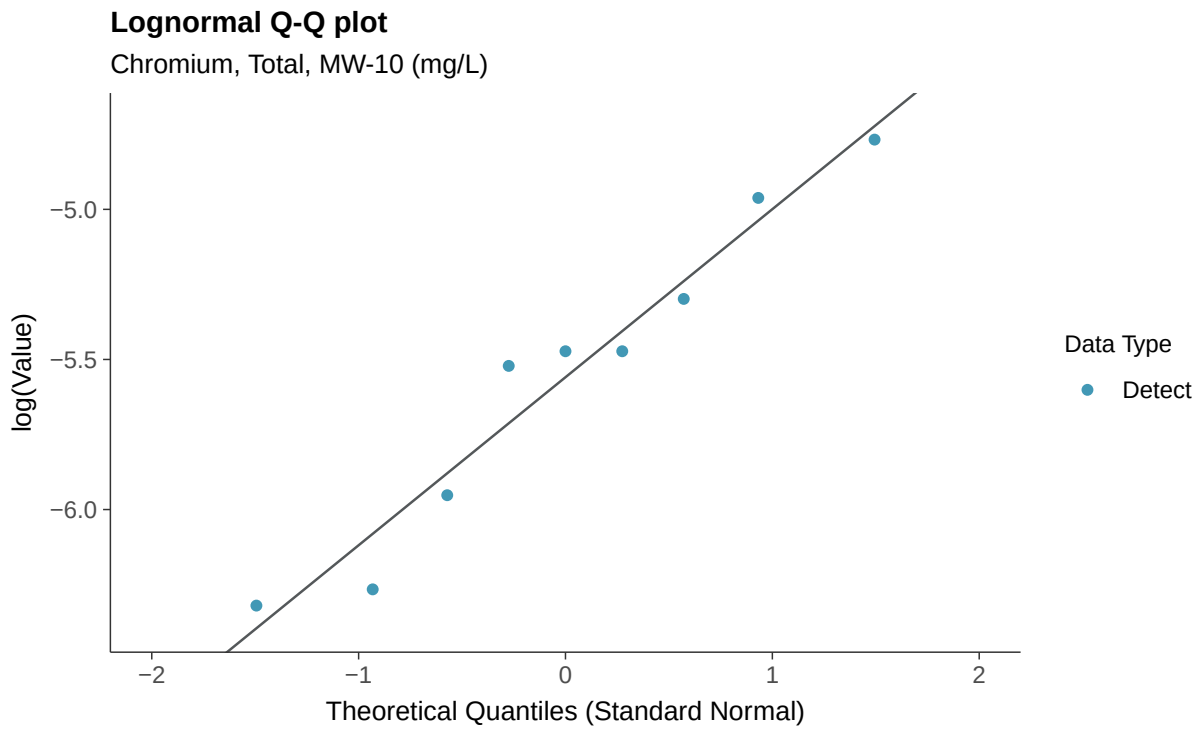


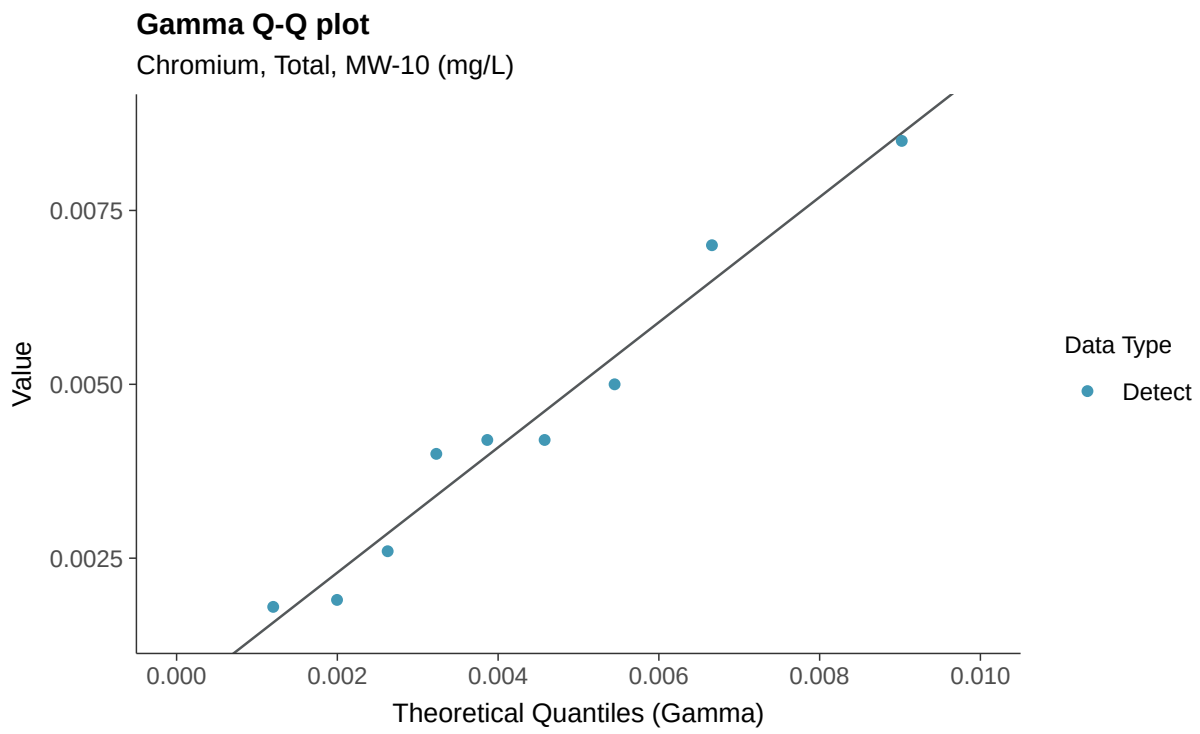
Boxplot by Season

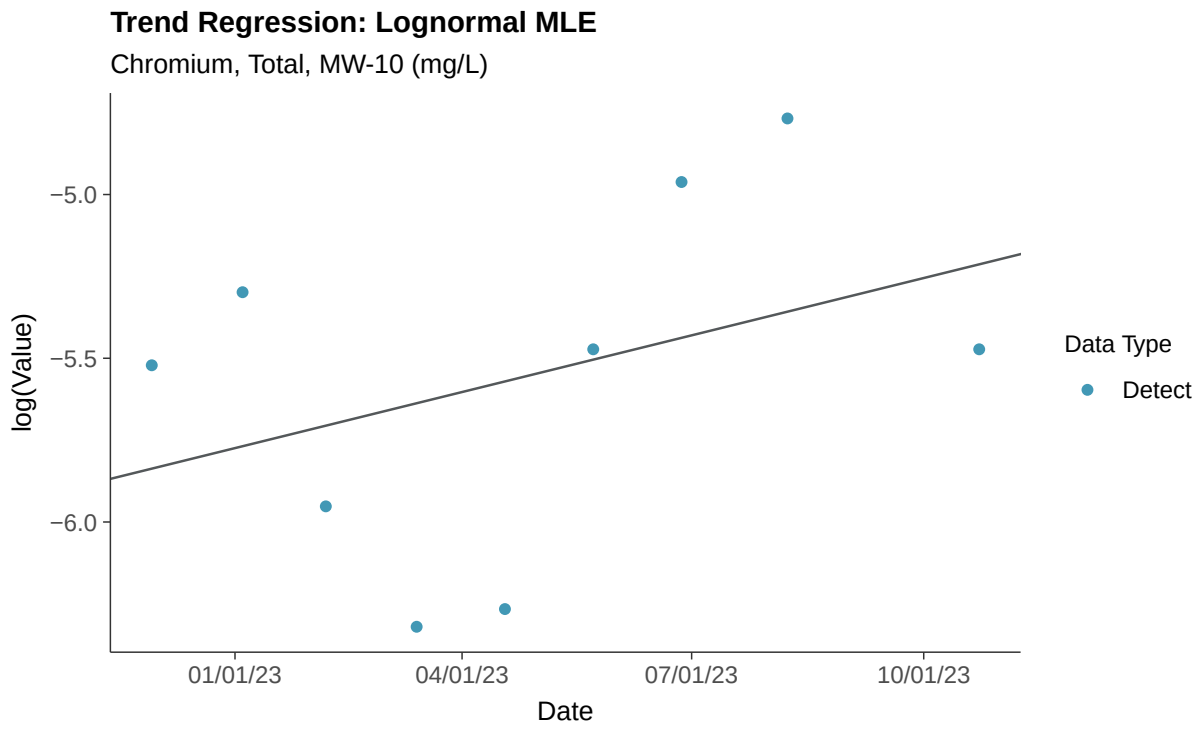
Chromium, Total, MW-10 (mg/L)




Normal Q-Q plot
Chromium, Total, MW-10 (mg/L)
Value
0.0075
0.0050
0.0025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

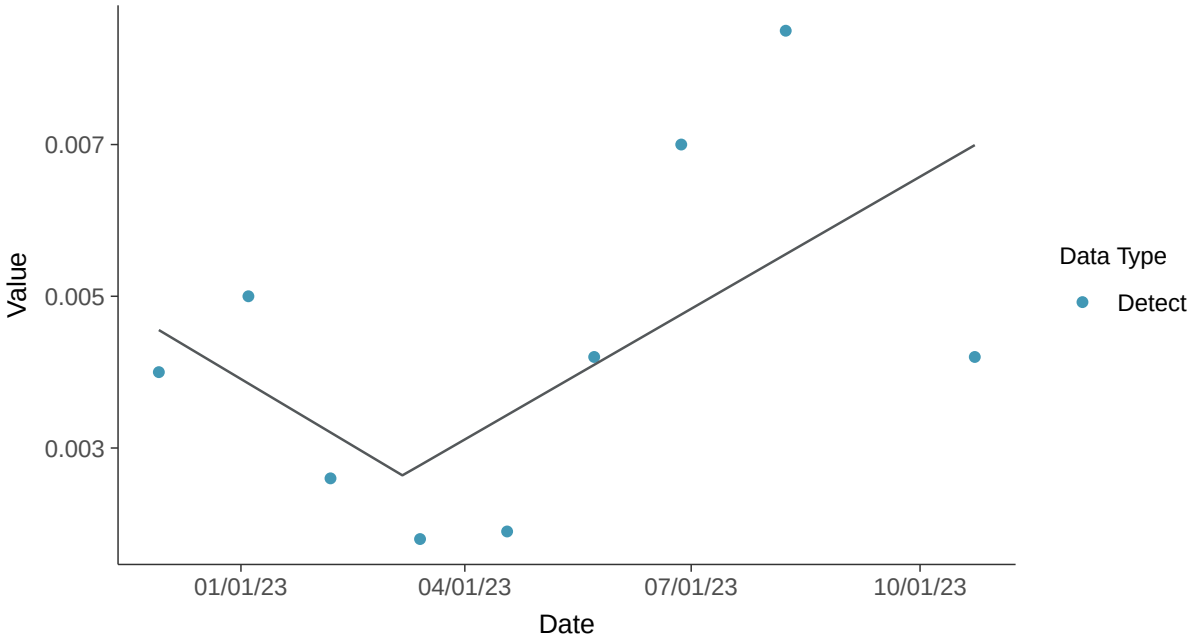

Lognormal Q-Q plot
Chromium, Total, MW-10 (mg/L)
log(Value)
−5.0
−5.5
−6.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chromium, Total, MW-10 (mg/L)
Value
0.0075
0.0050
0.0025
0.000
0.002
0.004
0.006
0.008
0.010
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-10 (mg/L)
log(Value)
−5.0
−5.5
−6.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

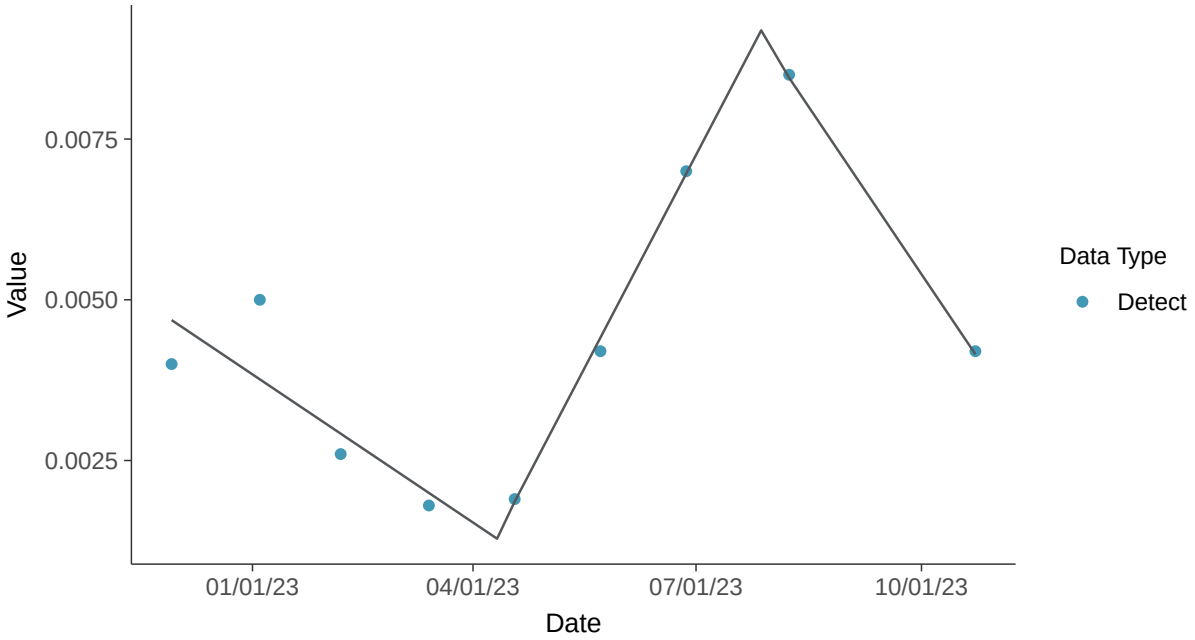
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-10 (mg/L)



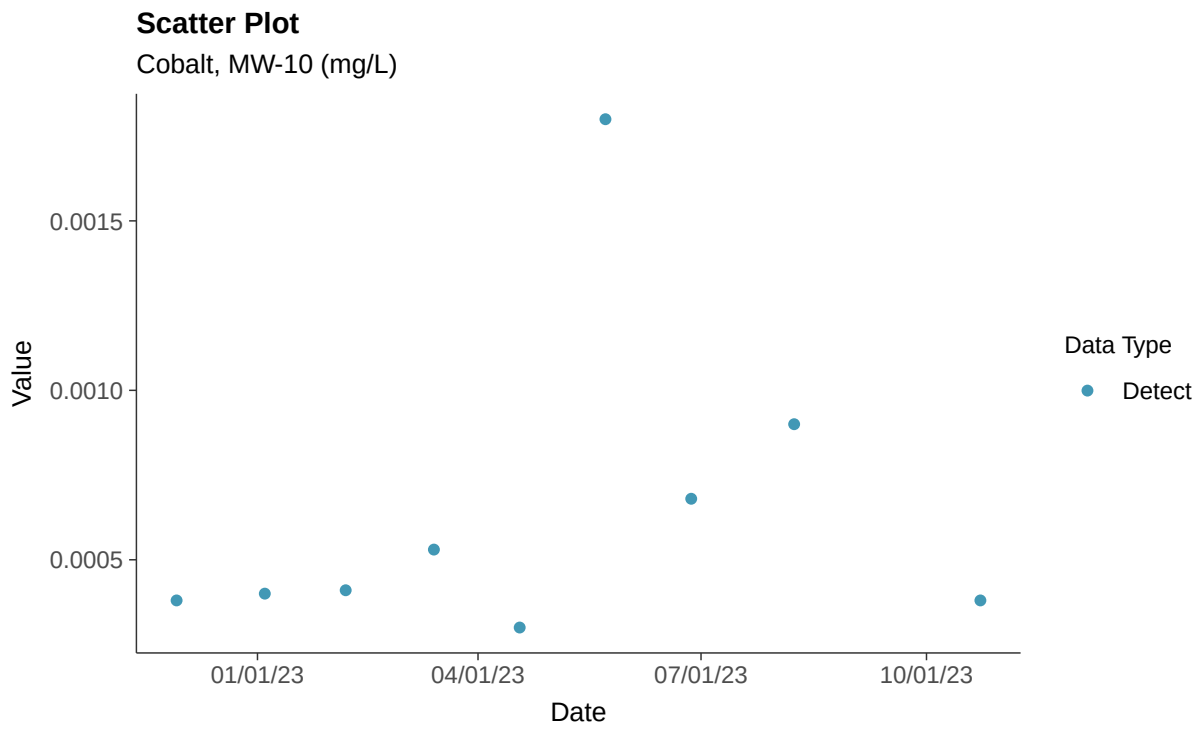
Trend Regression: Piecewise Linear-Linear-Linear

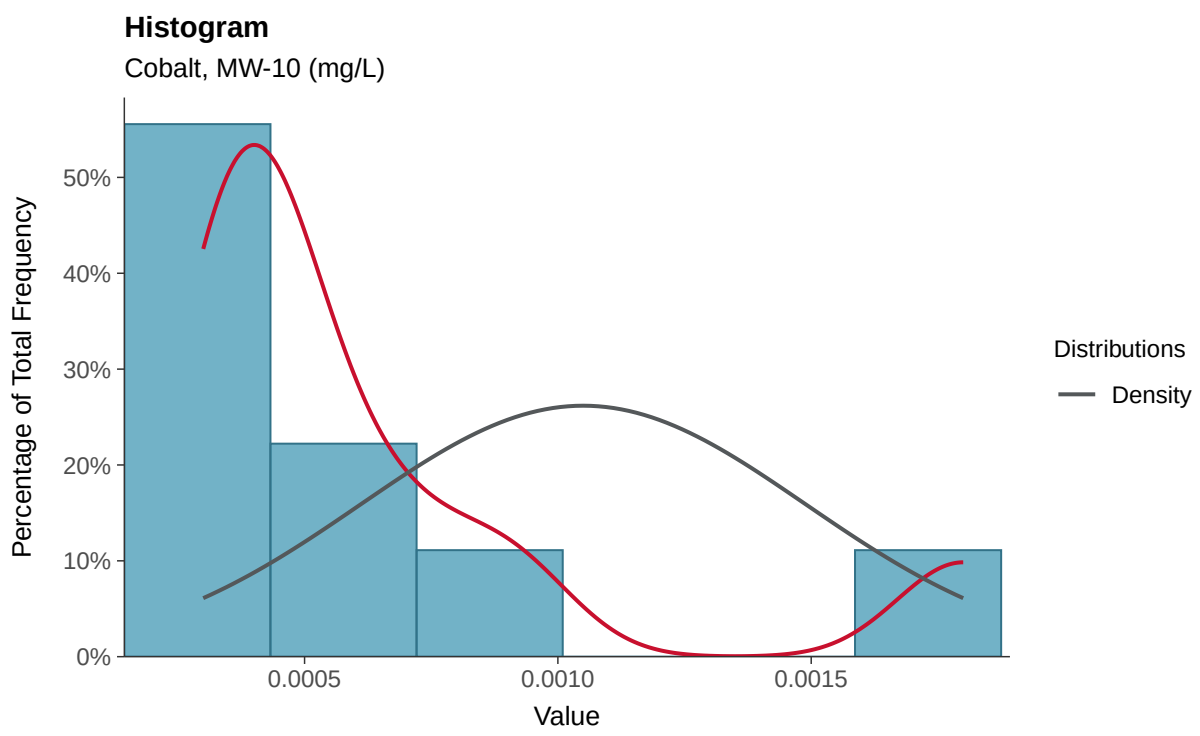
Chromium, Total, MW-10 (mg/L)



Appendix IV: Cobalt, MW-10

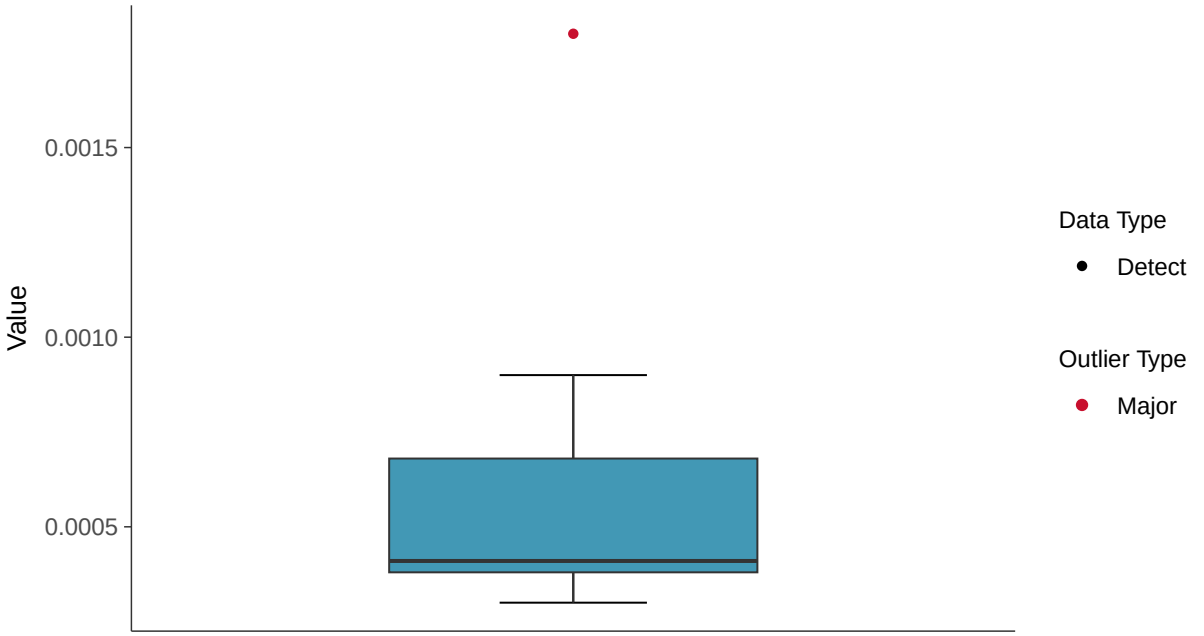
ID: 2_19_5_110





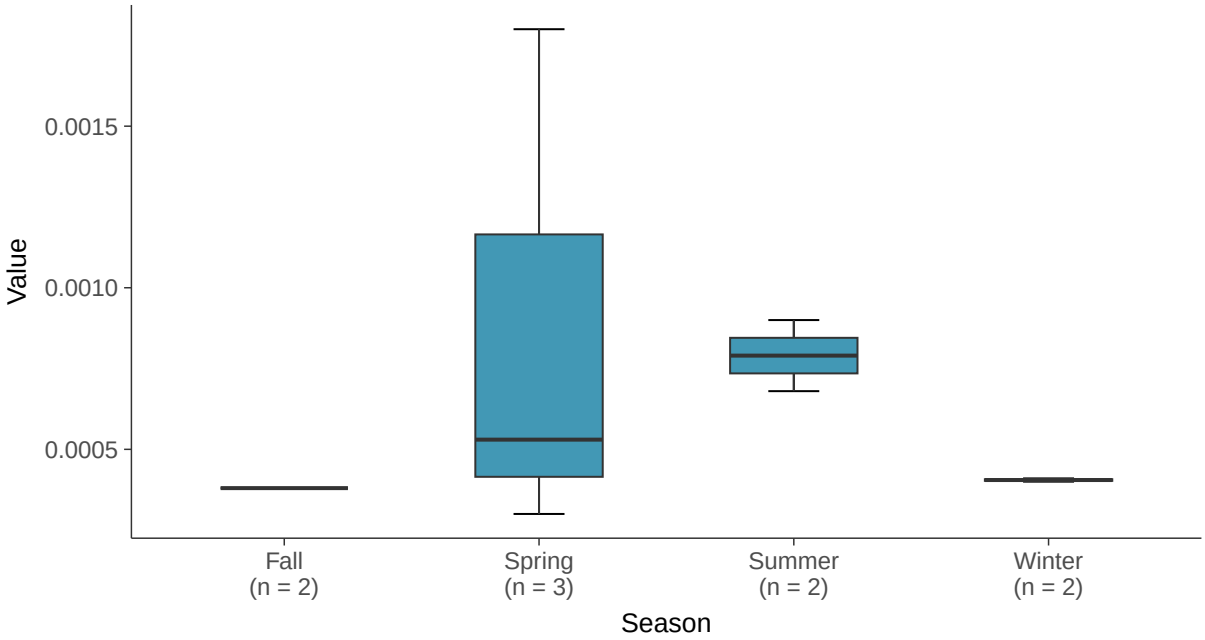
Boxplot

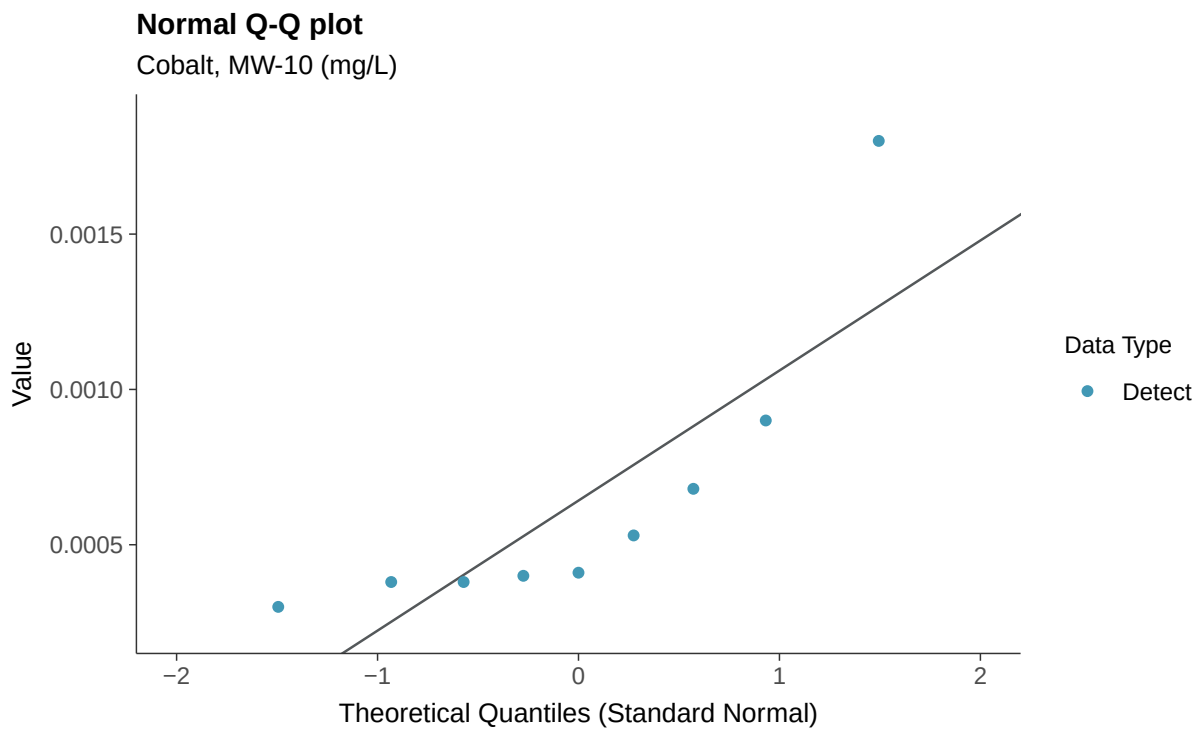
Cobalt, MW-10 (mg/L)

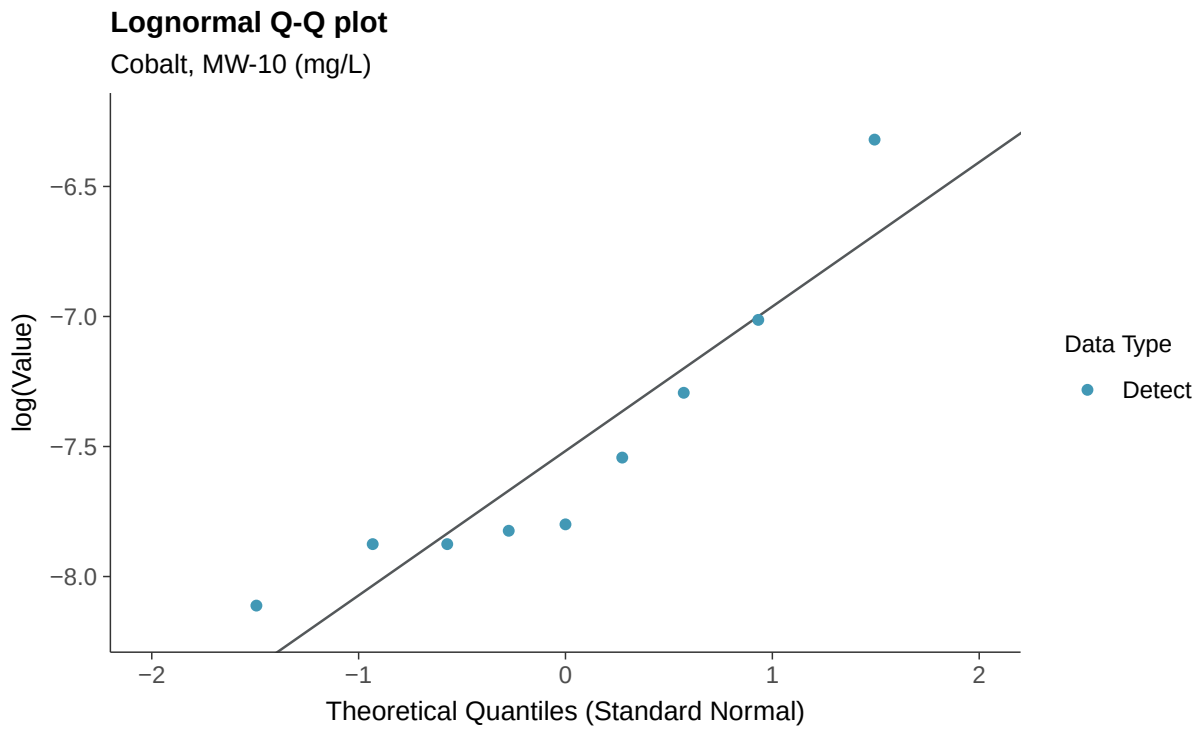


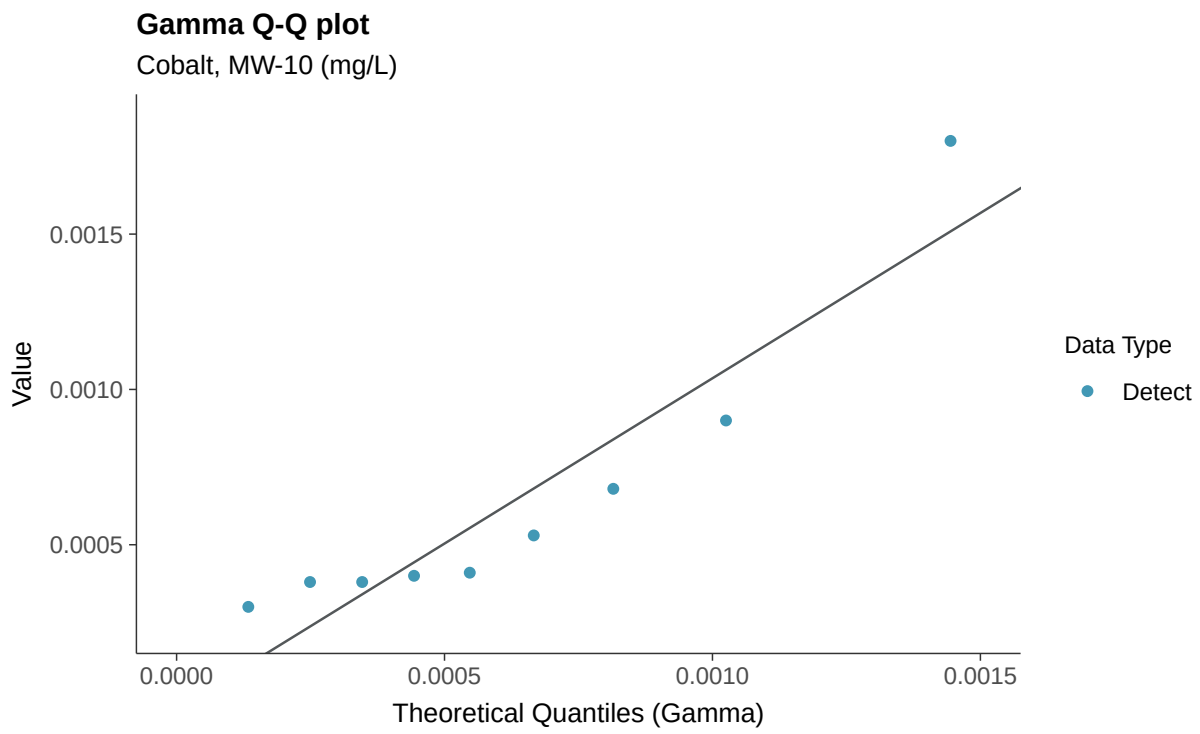
Boxplot by Season

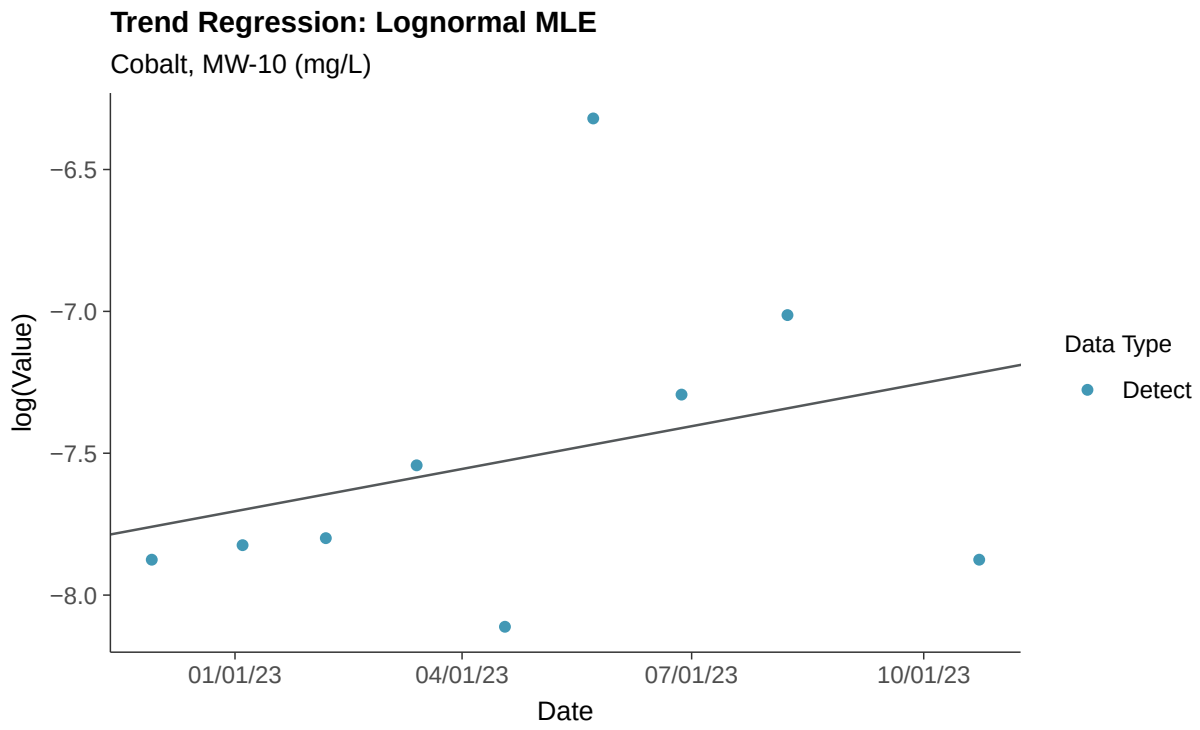
Cobalt, MW-10 (mg/L)




Normal Q-Q plot
Cobalt, MW-10 (mg/L)
Value
0.0015
0.0010
0.0005
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

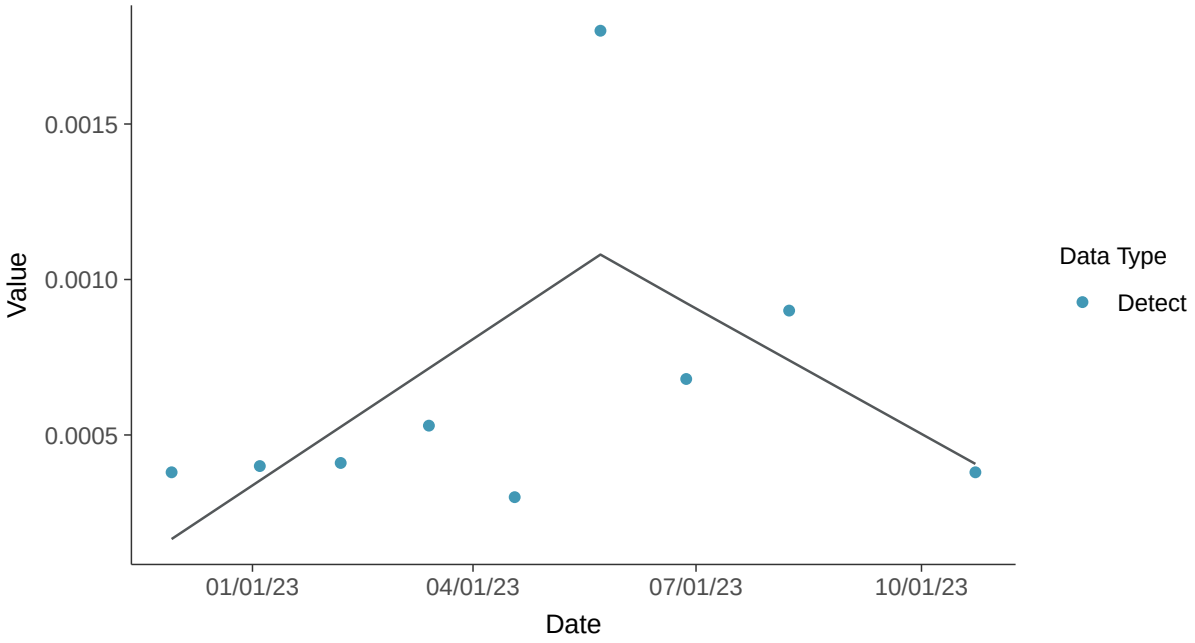

Lognormal Q-Q plot
Cobalt, MW-10 (mg/L)
log(Value)
−6.5
−7.0
−7.5
−8.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cobalt, MW-10 (mg/L)
Value
0.0015
0.0010
0.0005
0.0000
0.0005
0.0010
0.0015
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-10 (mg/L)
log(Value)
−6.5
−7.0
−7.5
−8.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

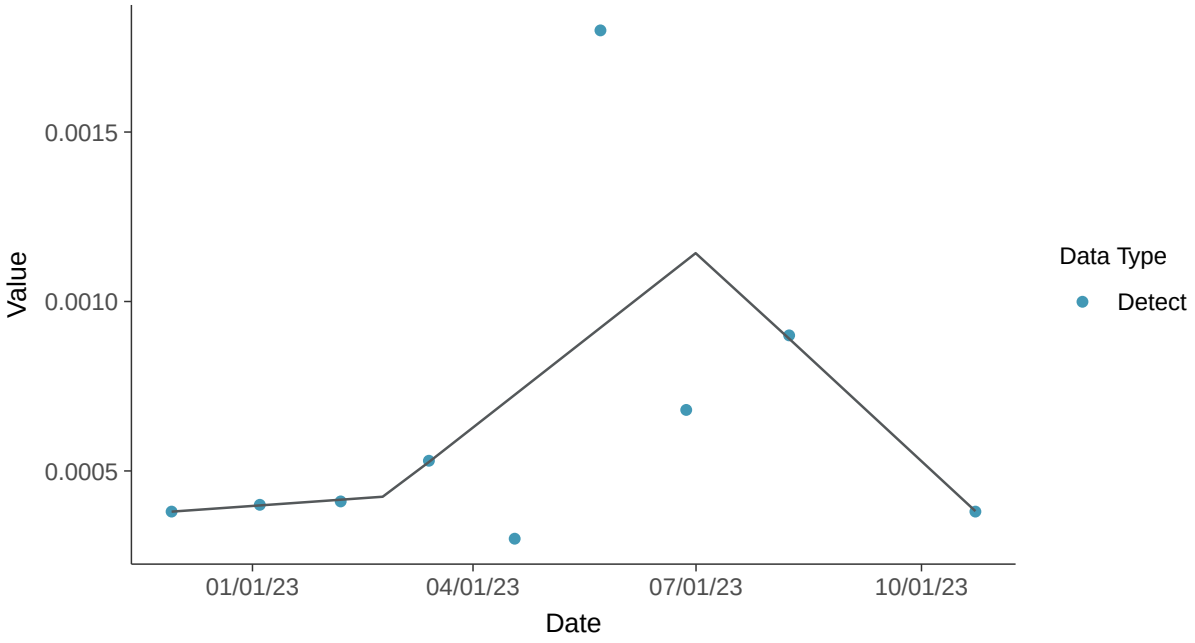
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-10 (mg/L)



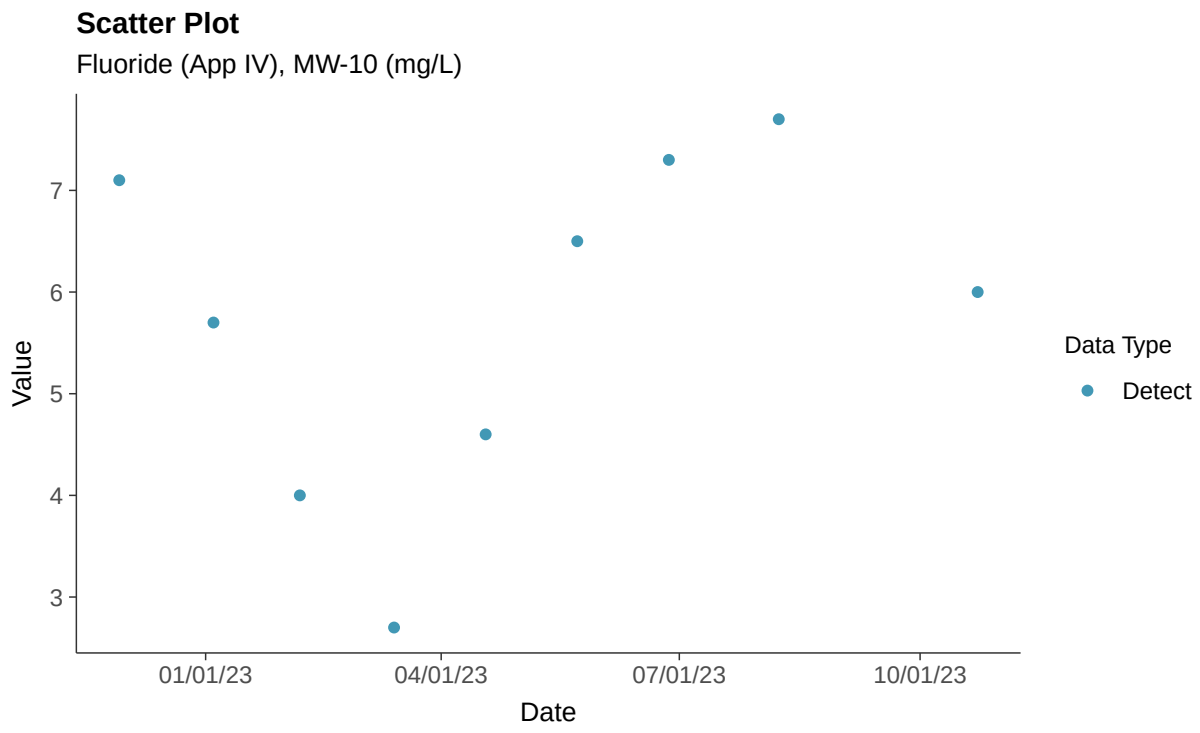
Trend Regression: Piecewise Linear-Linear-Linear

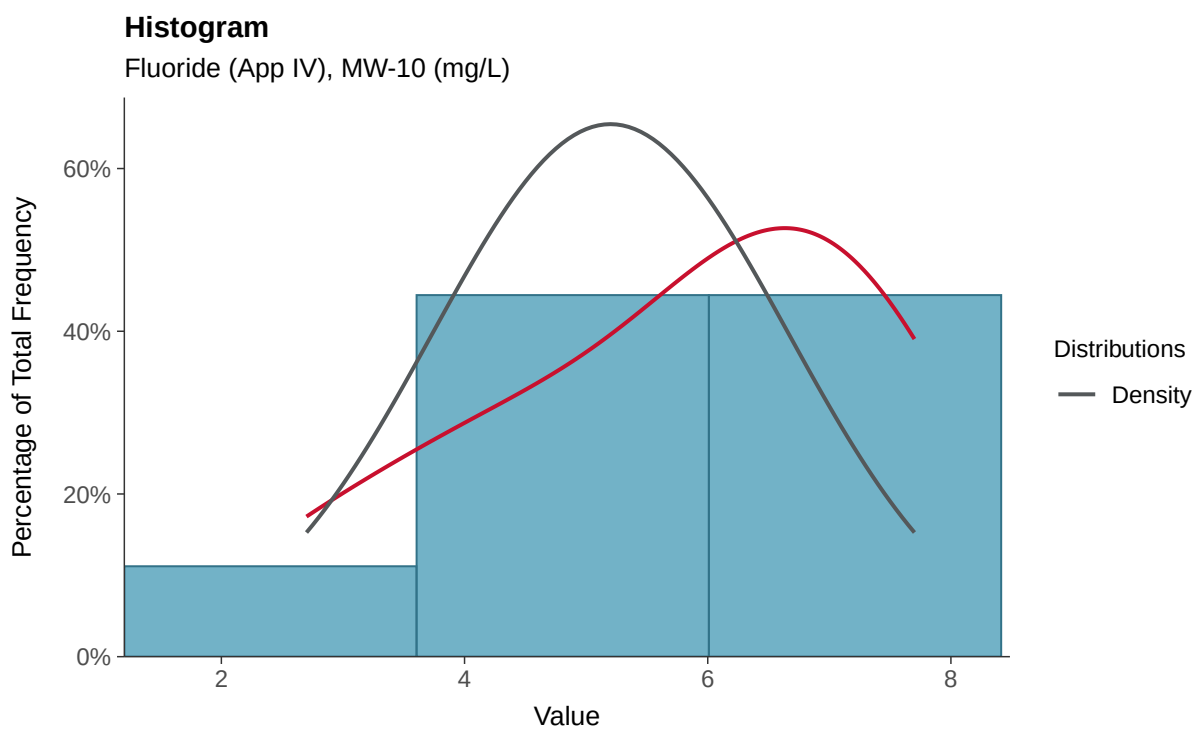
Cobalt, MW-10 (mg/L)



Appendix IV: Fluoride (App IV), MW-10

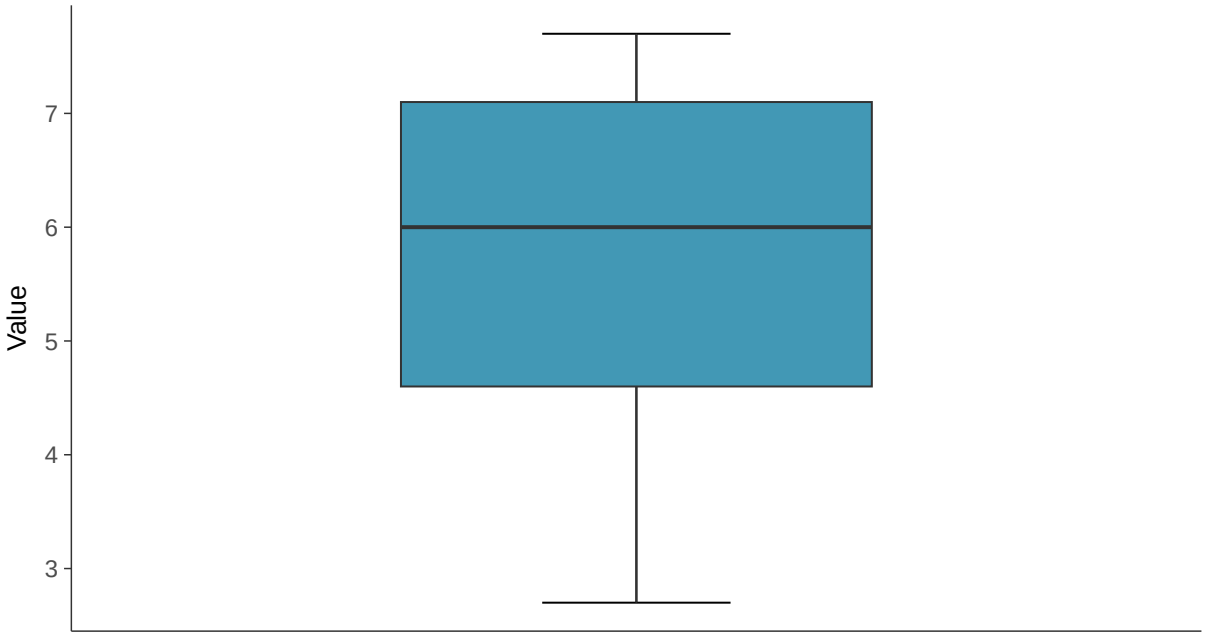
ID: 2_19_5_113





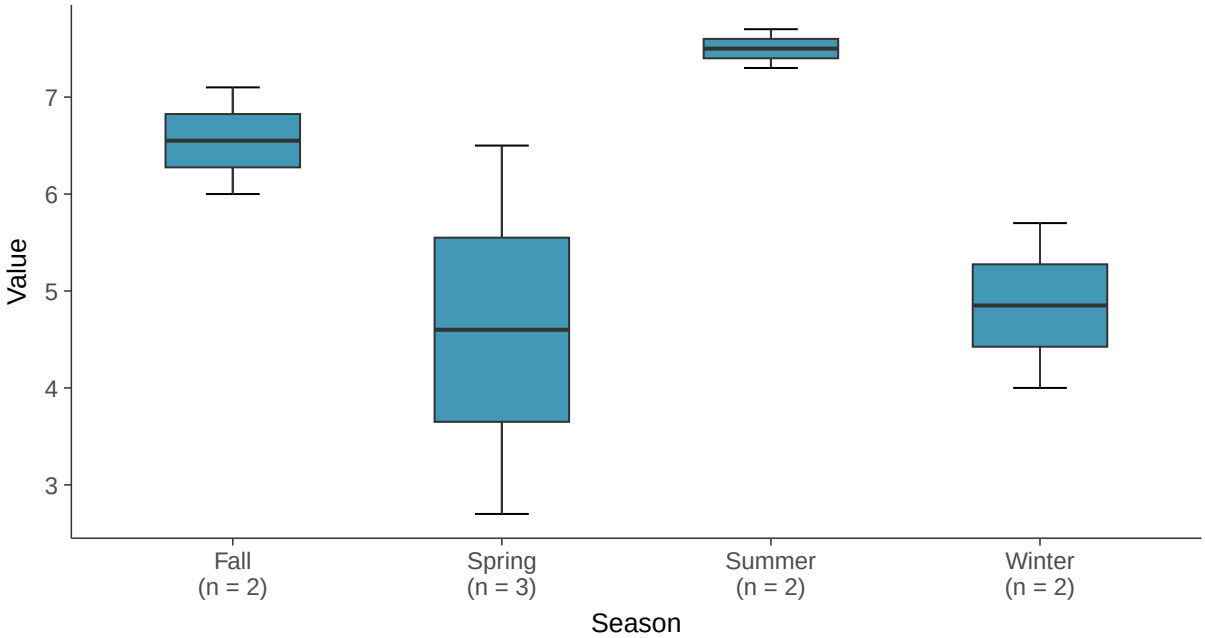
Boxplot

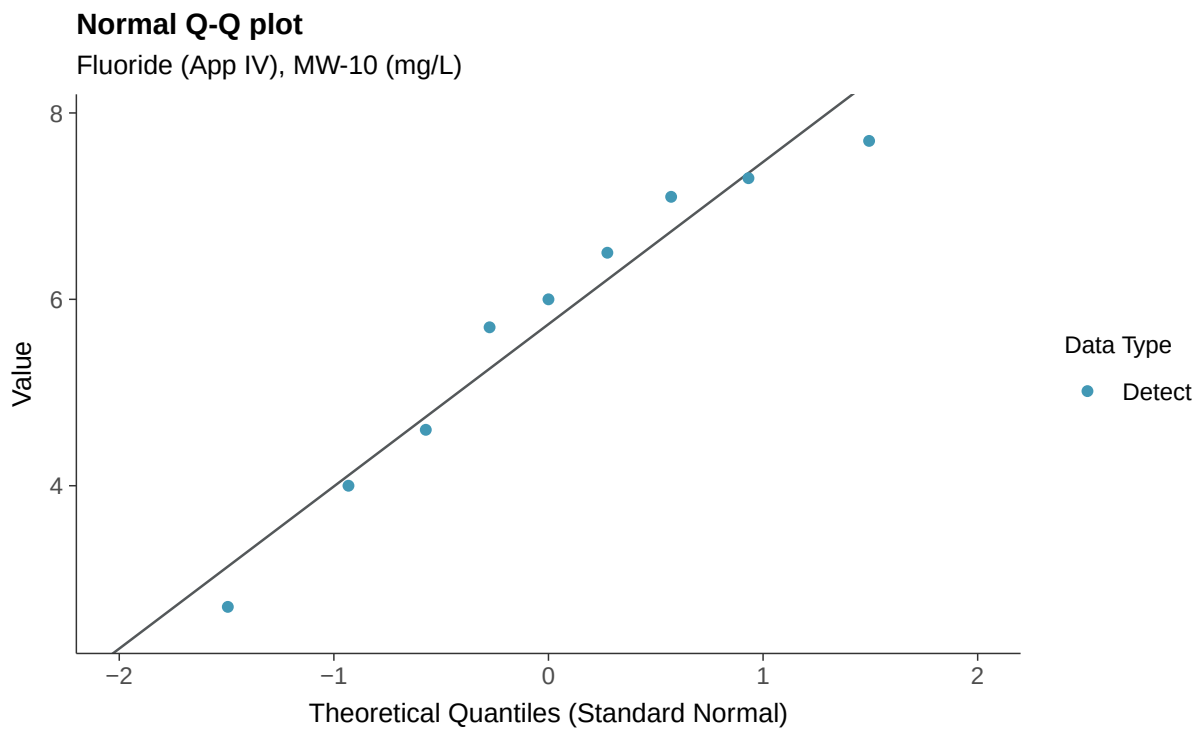
Fluoride (App IV), MW-10 (mg/L)

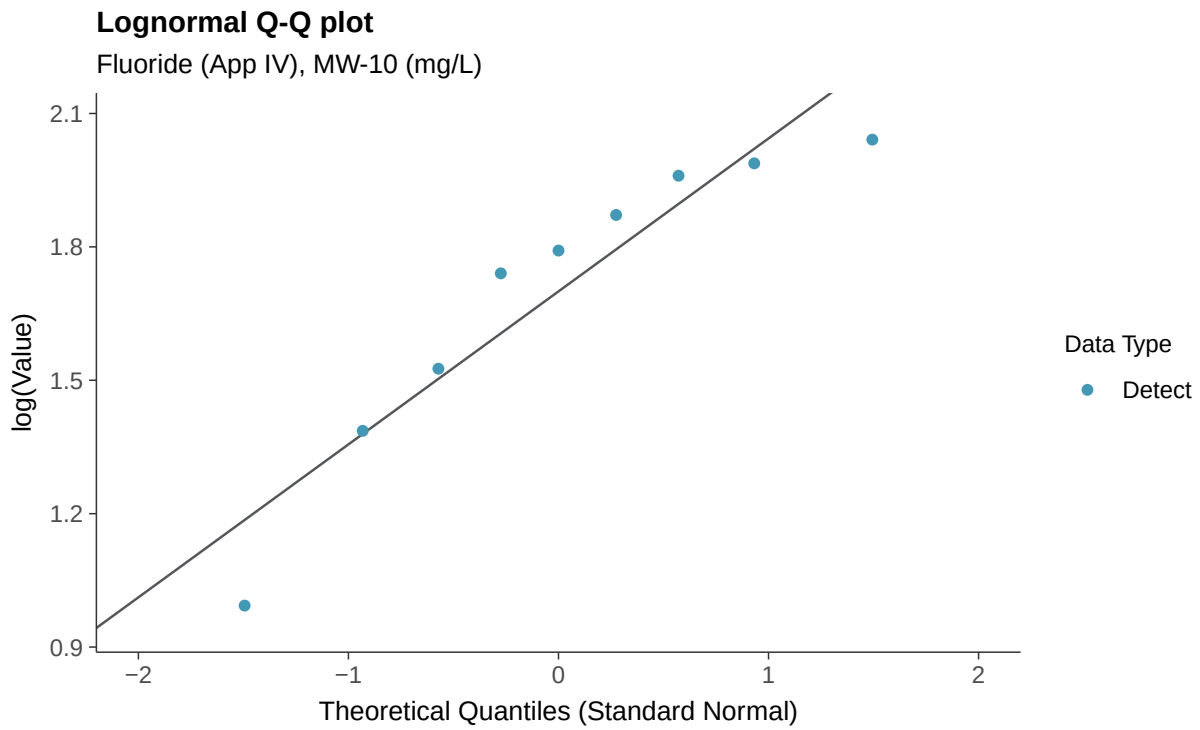


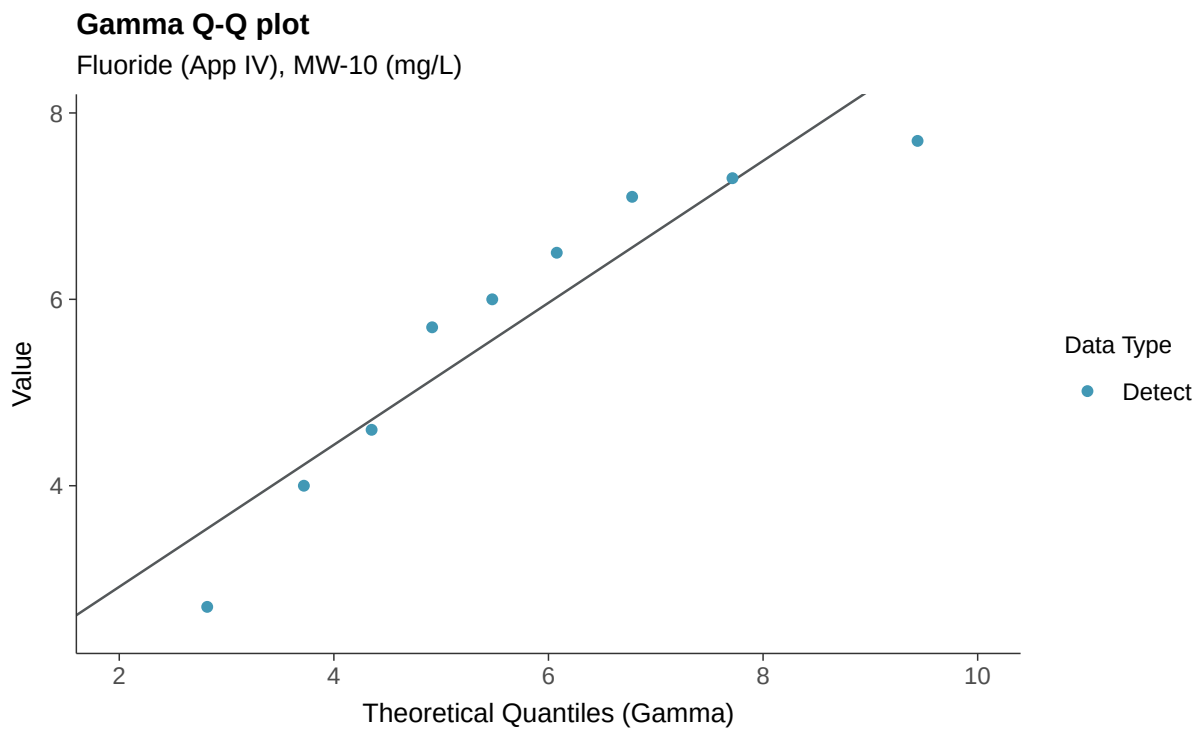
Boxplot by Season

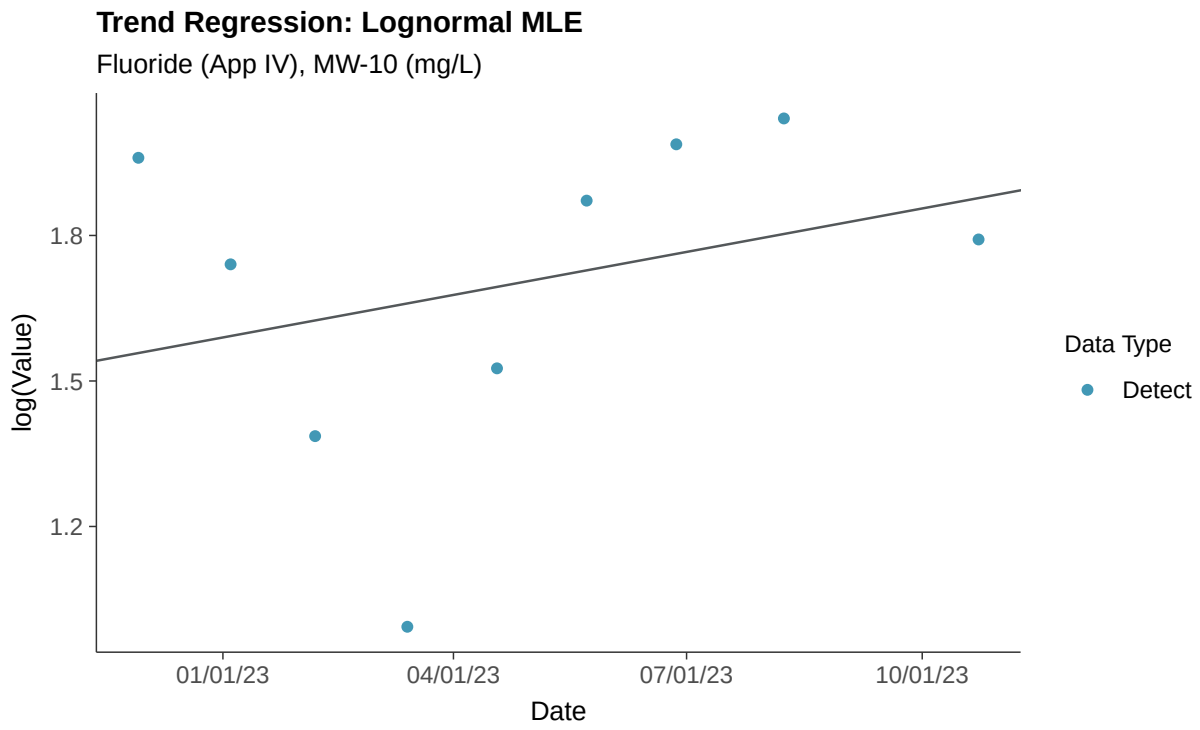
Fluoride (App IV), MW-10 (mg/L)




Normal Q-Q plot
Fluoride (App IV), MW-10 (mg/L)
Value
8
6
4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

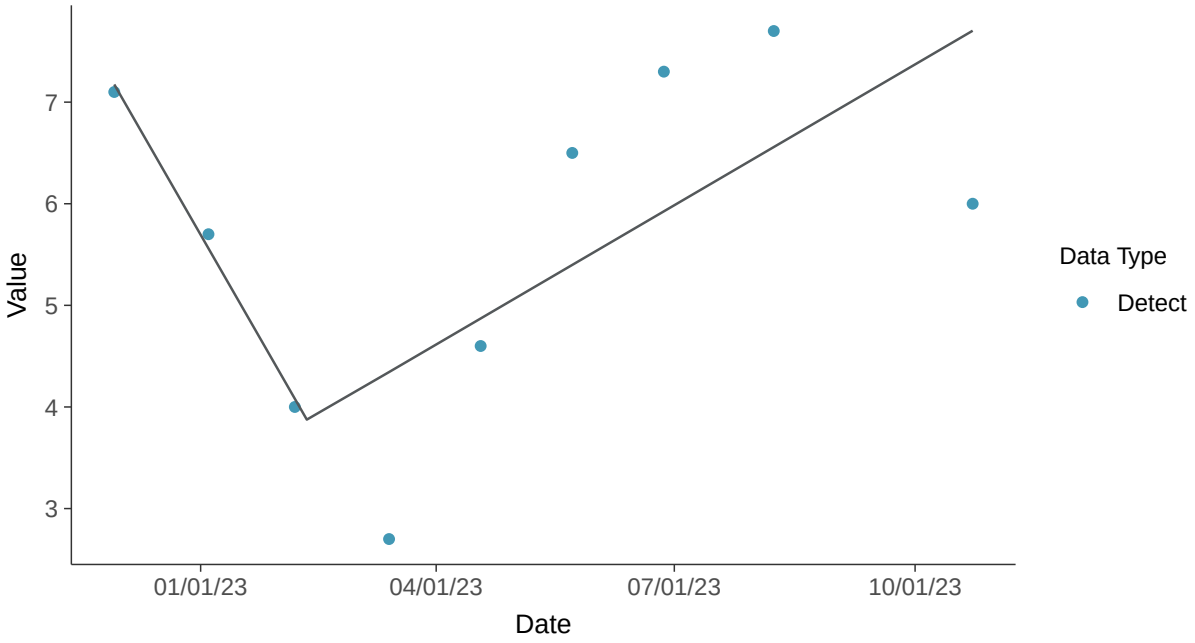

Lognormal Q-Q plot
Fluoride (App IV), MW-10 (mg/L)
log(Value)
2.1
1.8
1.5
1.2
0.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride (App IV), MW-10 (mg/L)
Value
8
6
4
2
4
6
8
10
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-10 (mg/L)
log(Value)
1.8
1.5
1.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

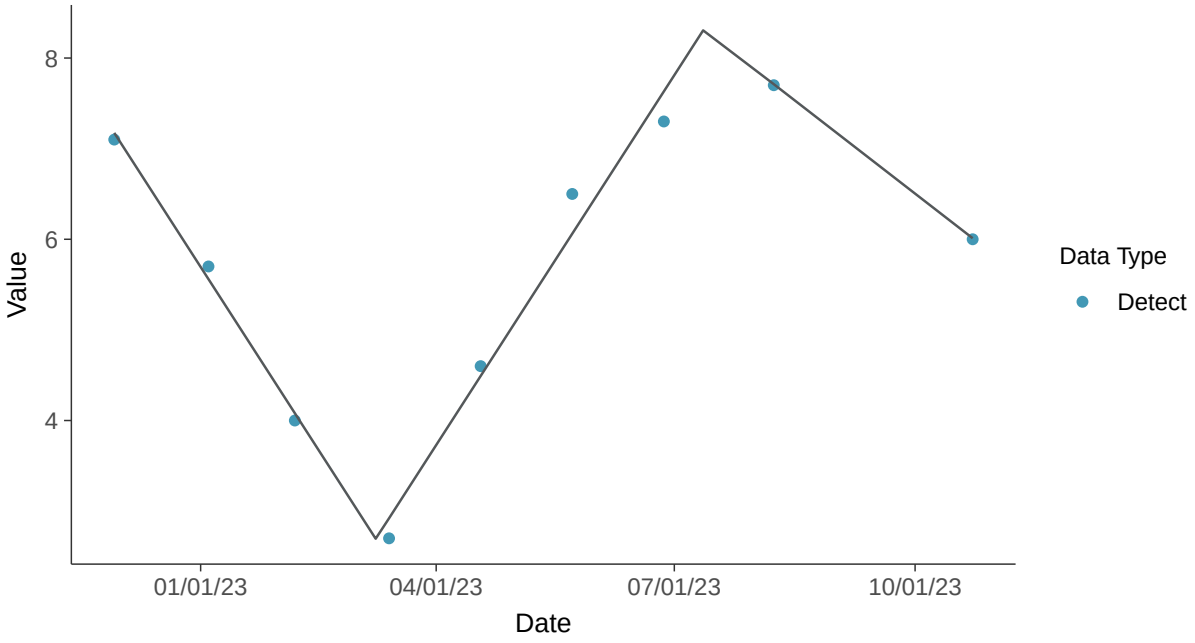
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-10 (mg/L)



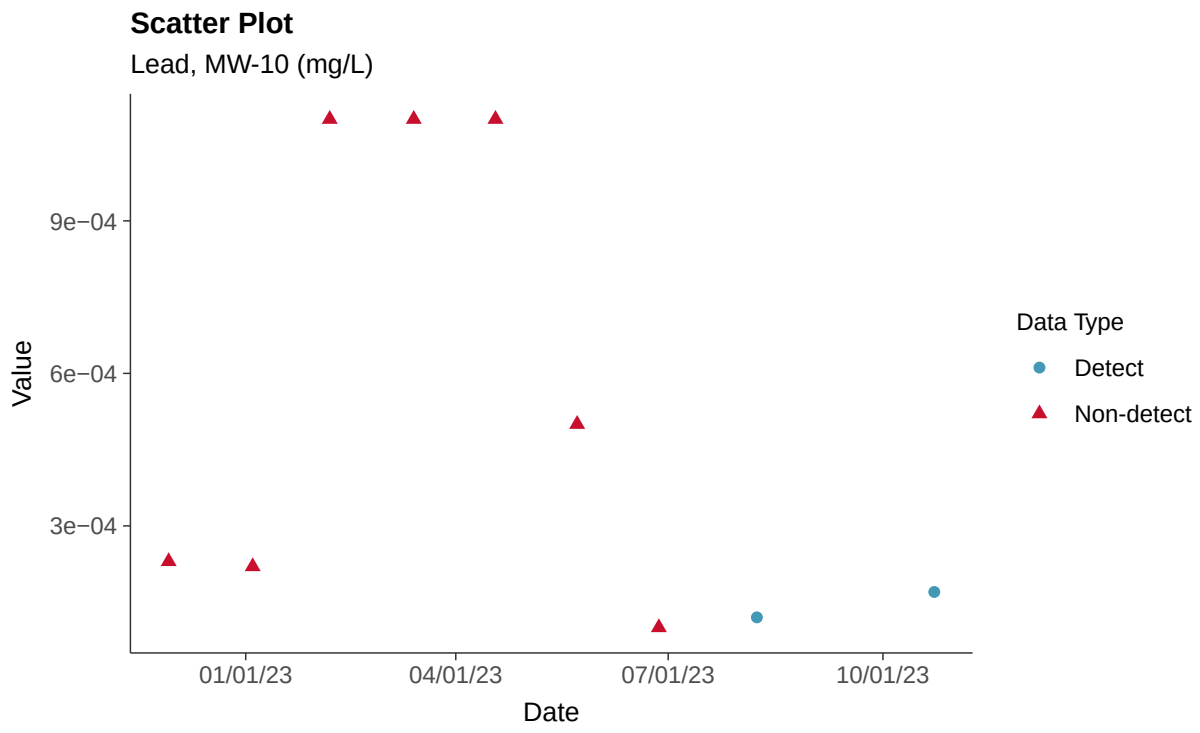
Trend Regression: Piecewise Linear-Linear-Linear

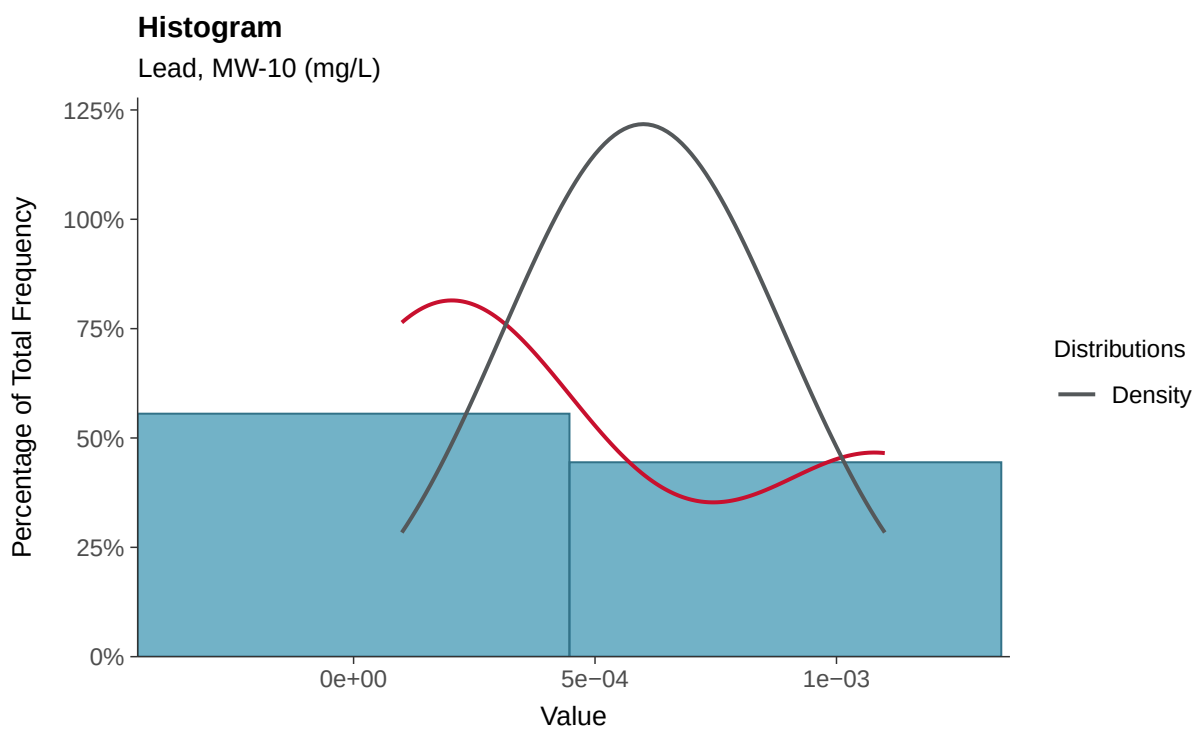
Fluoride (App IV), MW-10 (mg/L)



Appendix IV: Lead, MW-10

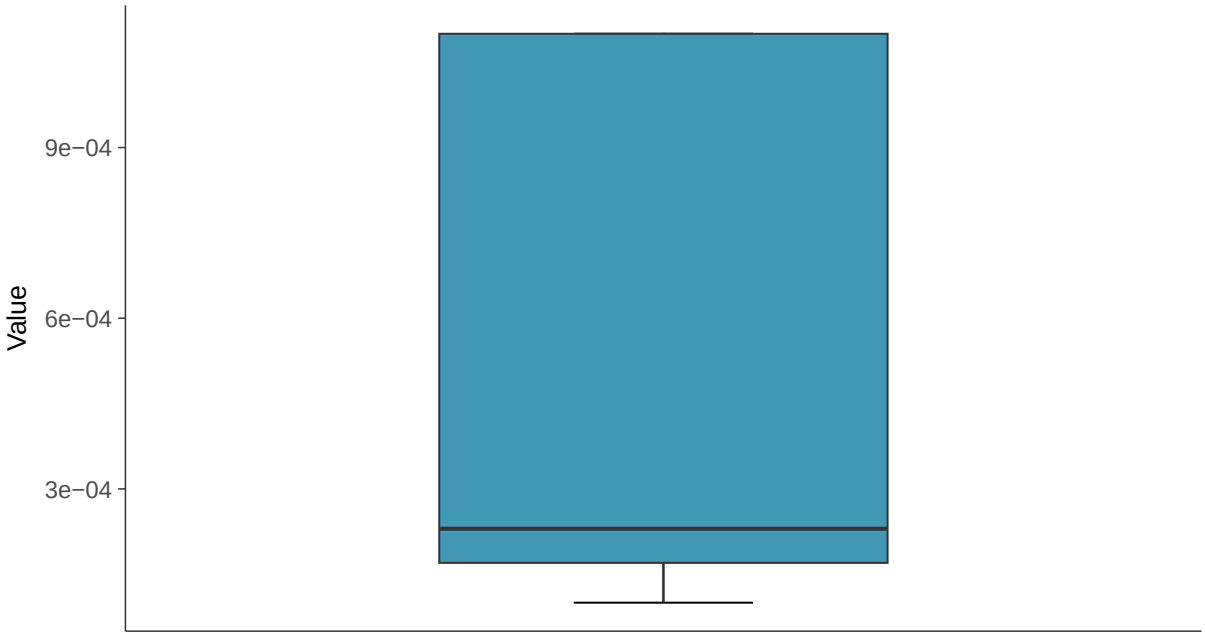
ID: 2_19_5_115





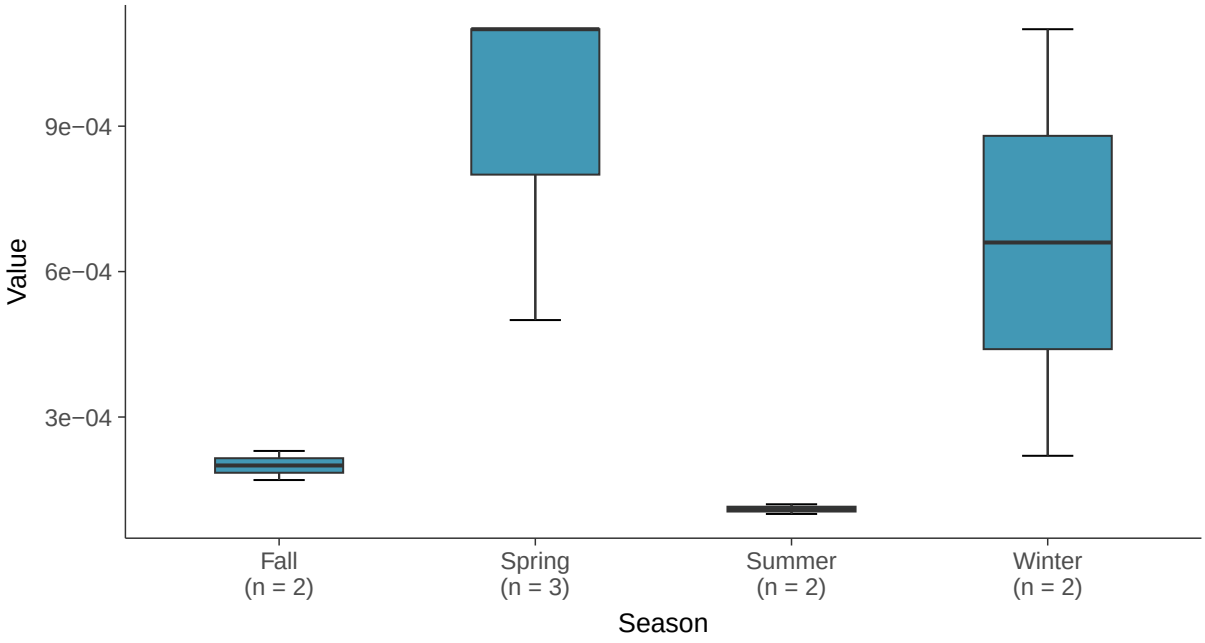
Boxplot

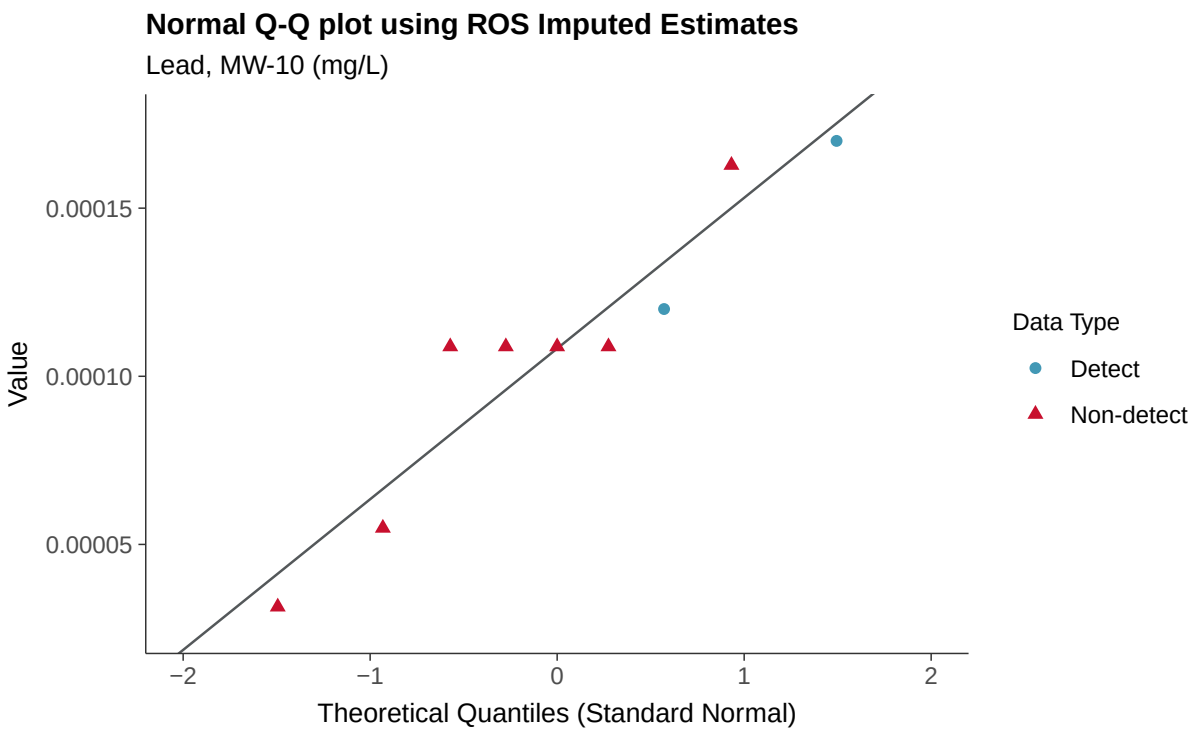
Lead, MW-10 (mg/L)

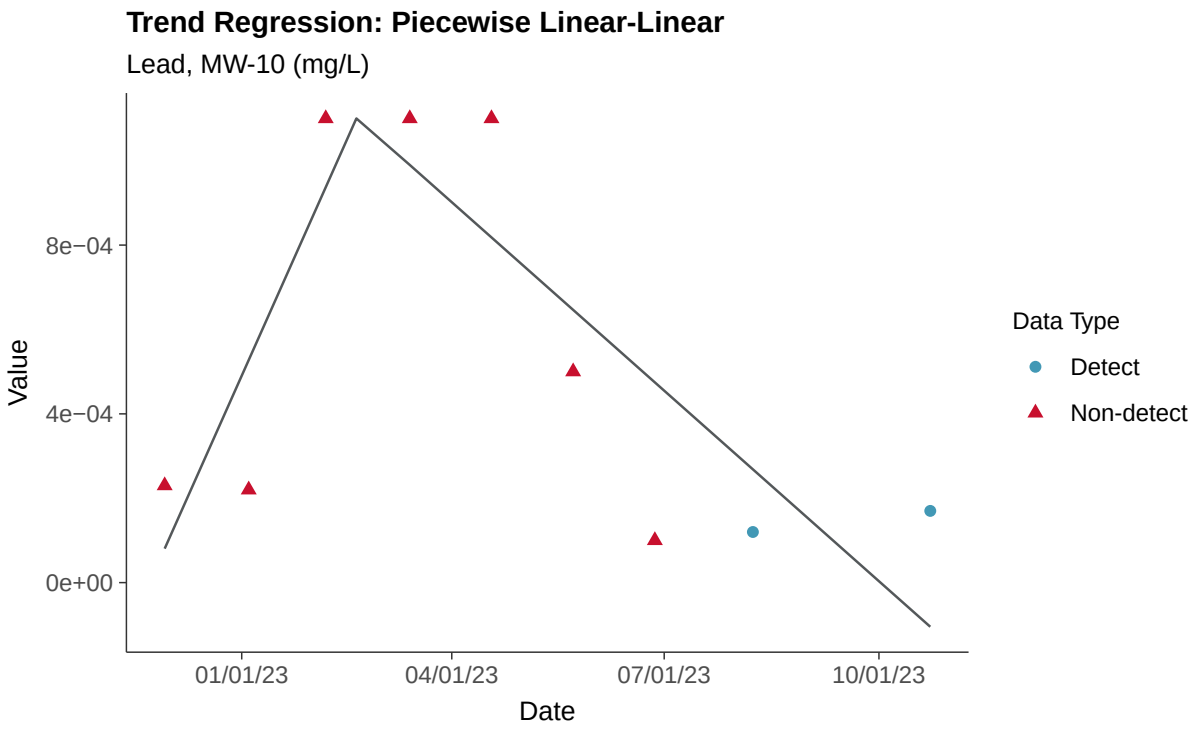


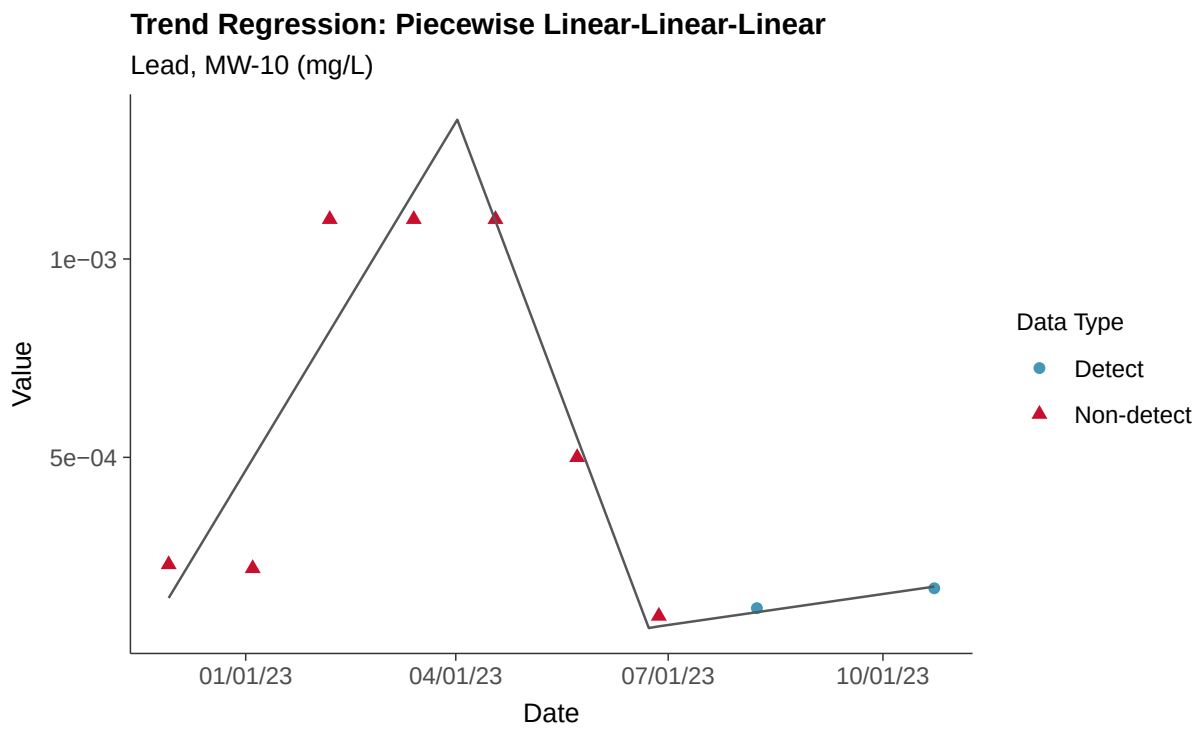
Boxplot by Season

Lead, MW-10 (mg/L)



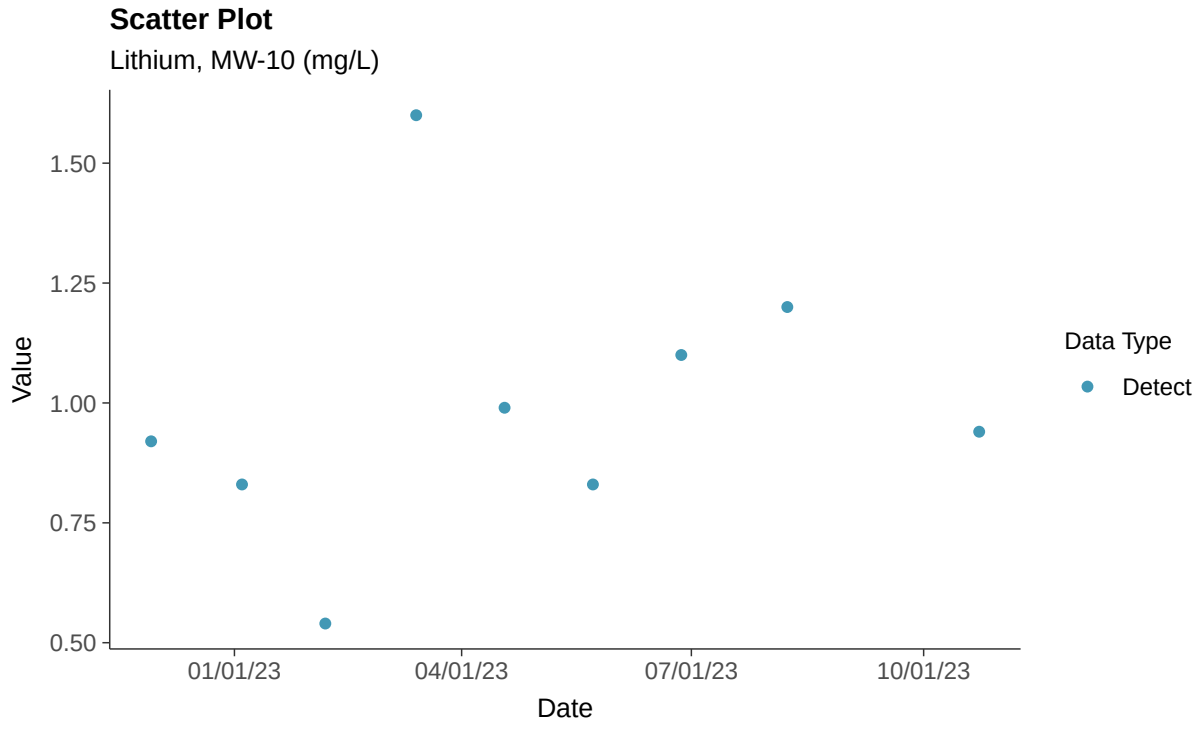

Normal Q-Q plot using ROS Imputed Estimates
Lead, MW-10 (mg/L)
Value
0.00015
0.00010
0.00005
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

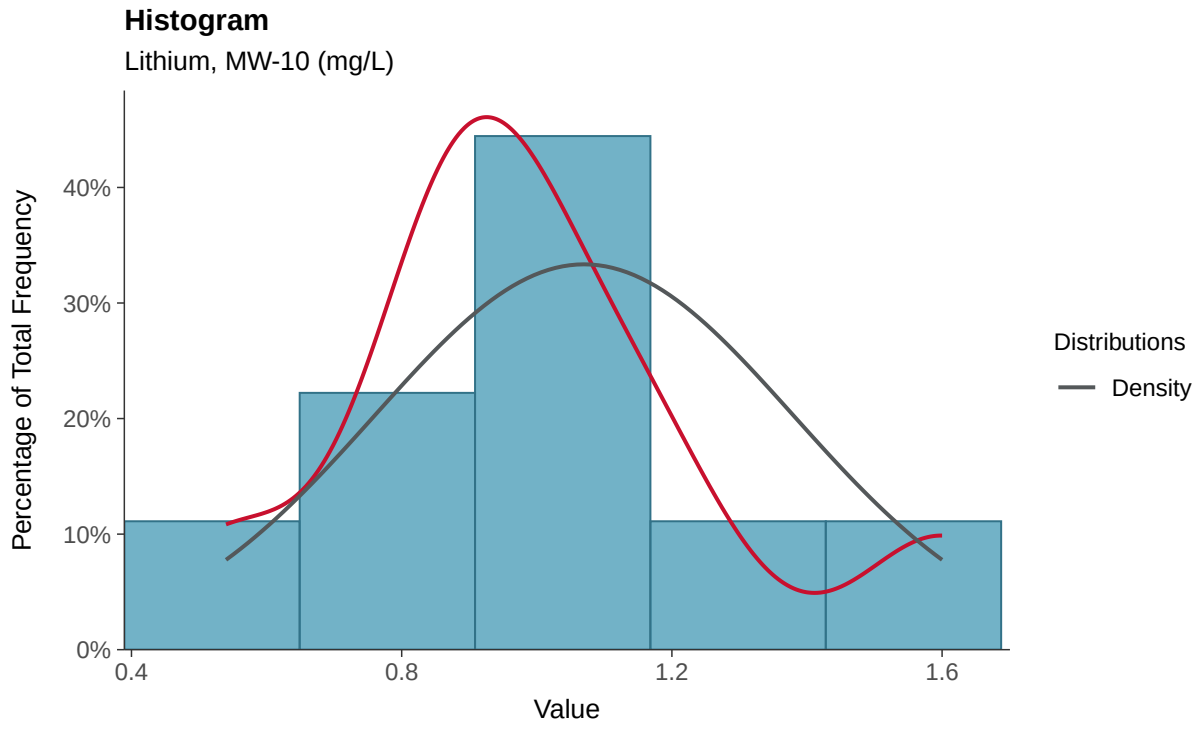

Trend Regression: Piecewise Linear-Linear
Lead, MW-10 (mg/L)
Value
8e−04
4e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-10 (mg/L)
Value
1e−03
5e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lithium, MW-10

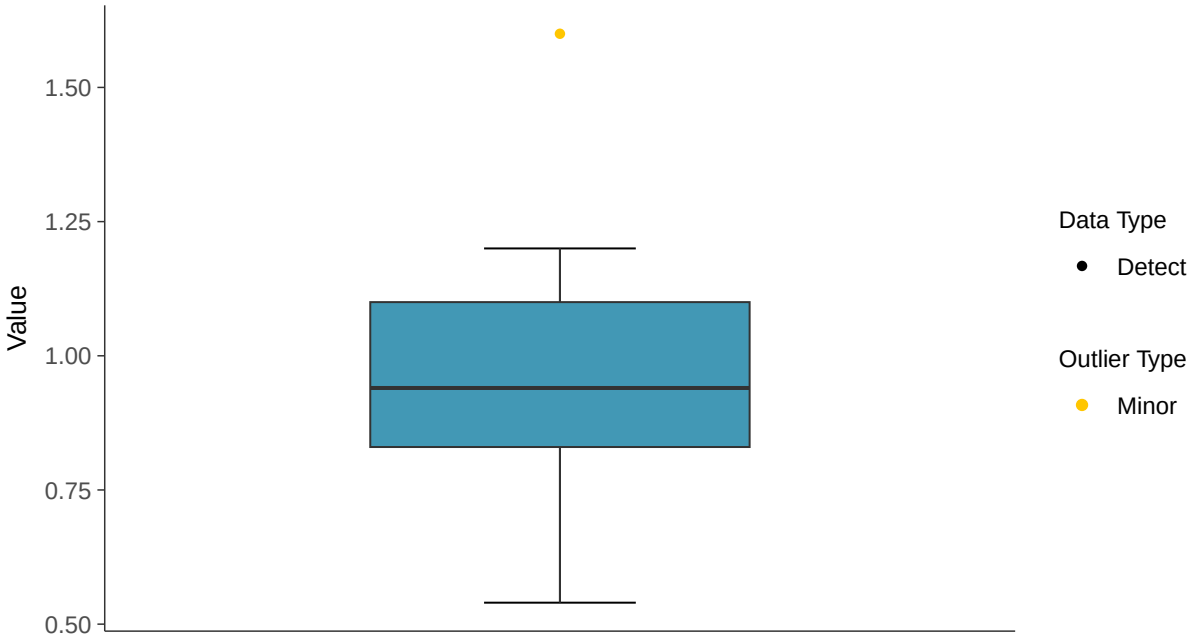
ID: 2_19_5_116





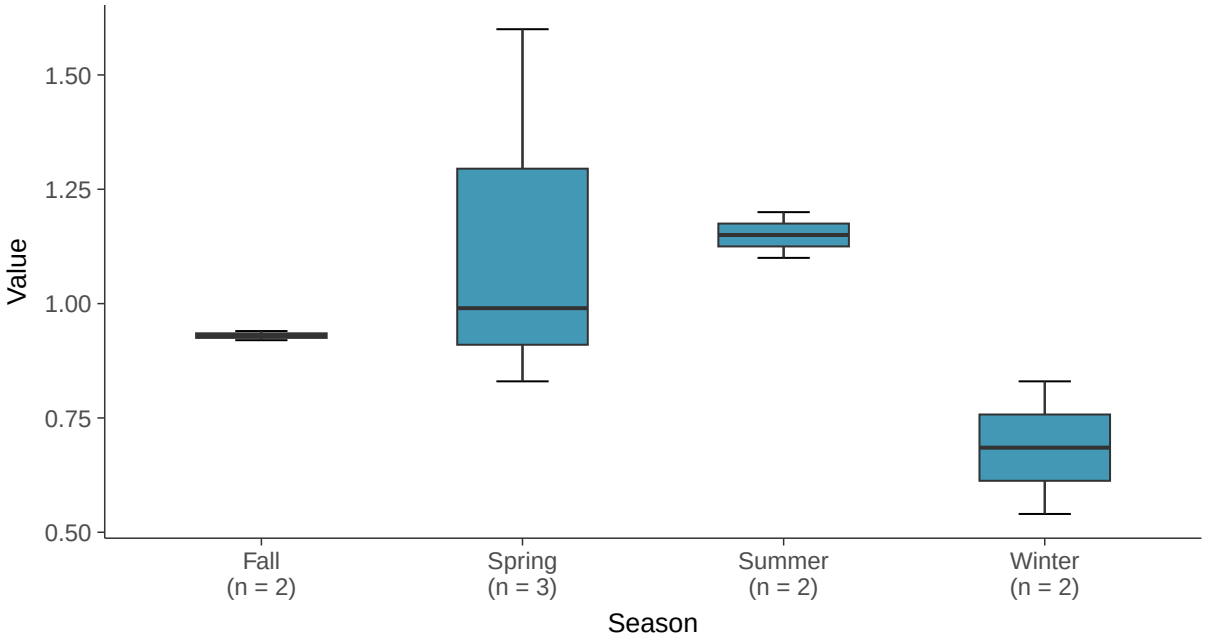
Boxplot

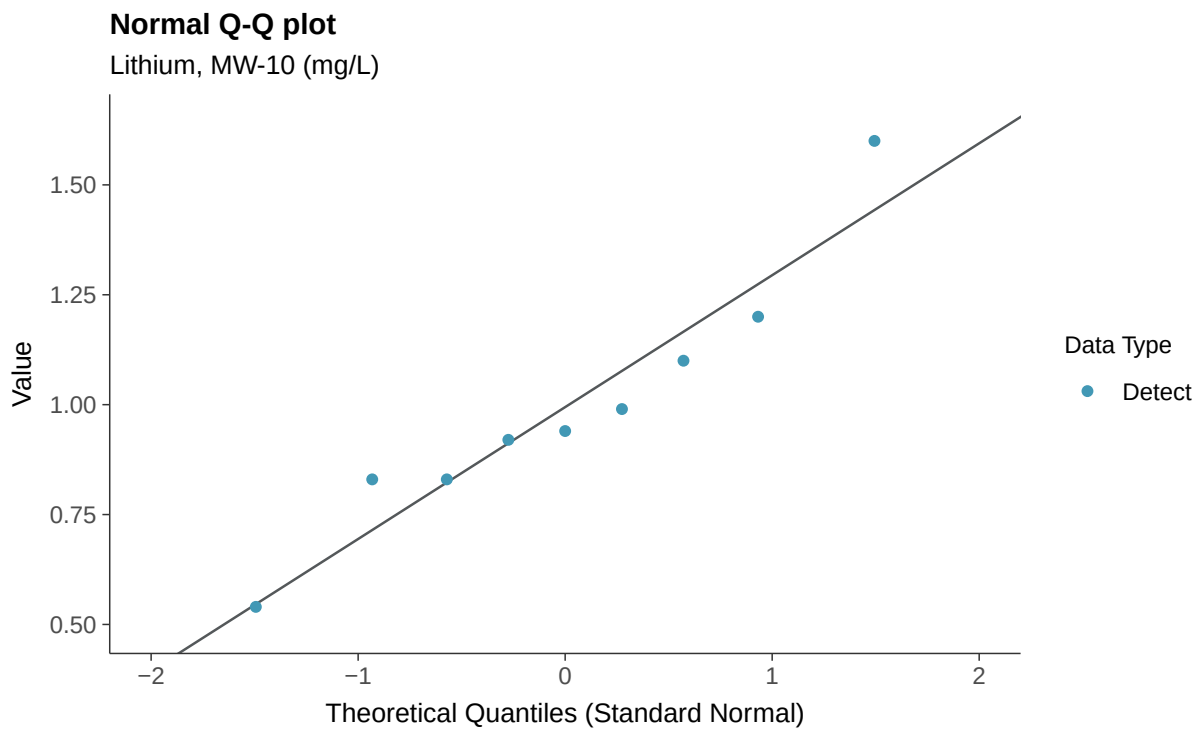
Lithium, MW-10 (mg/L)

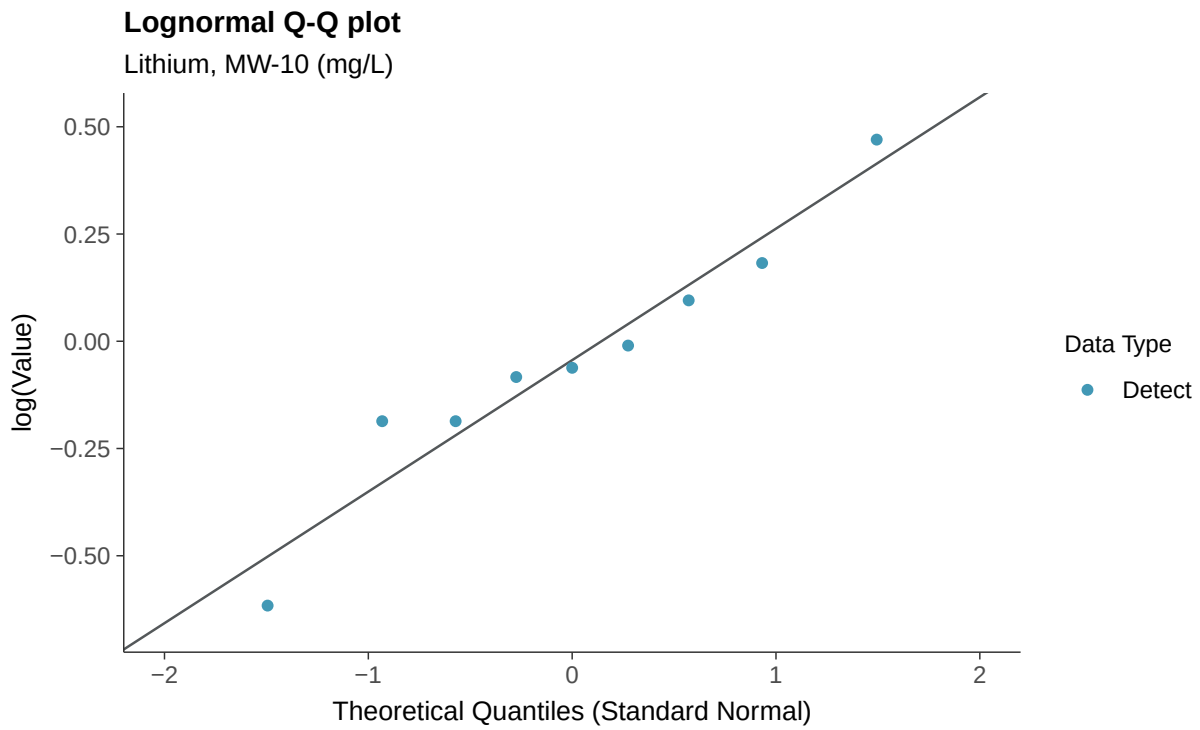


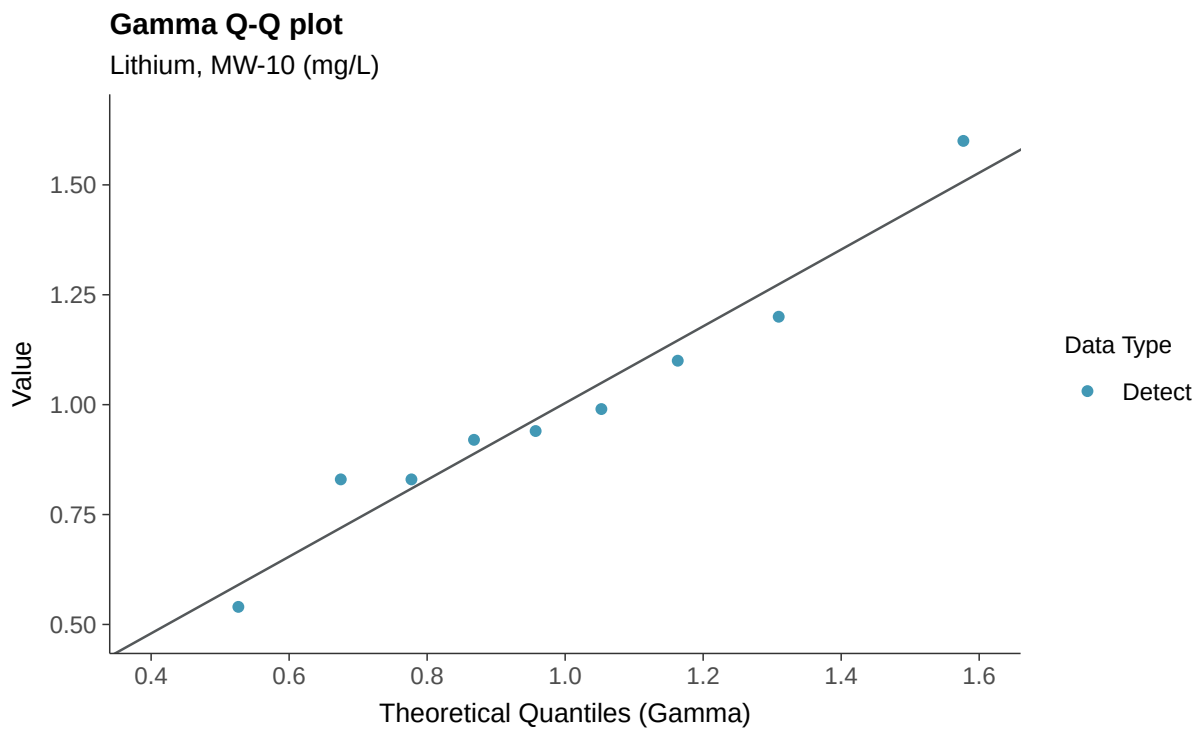
Boxplot by Season

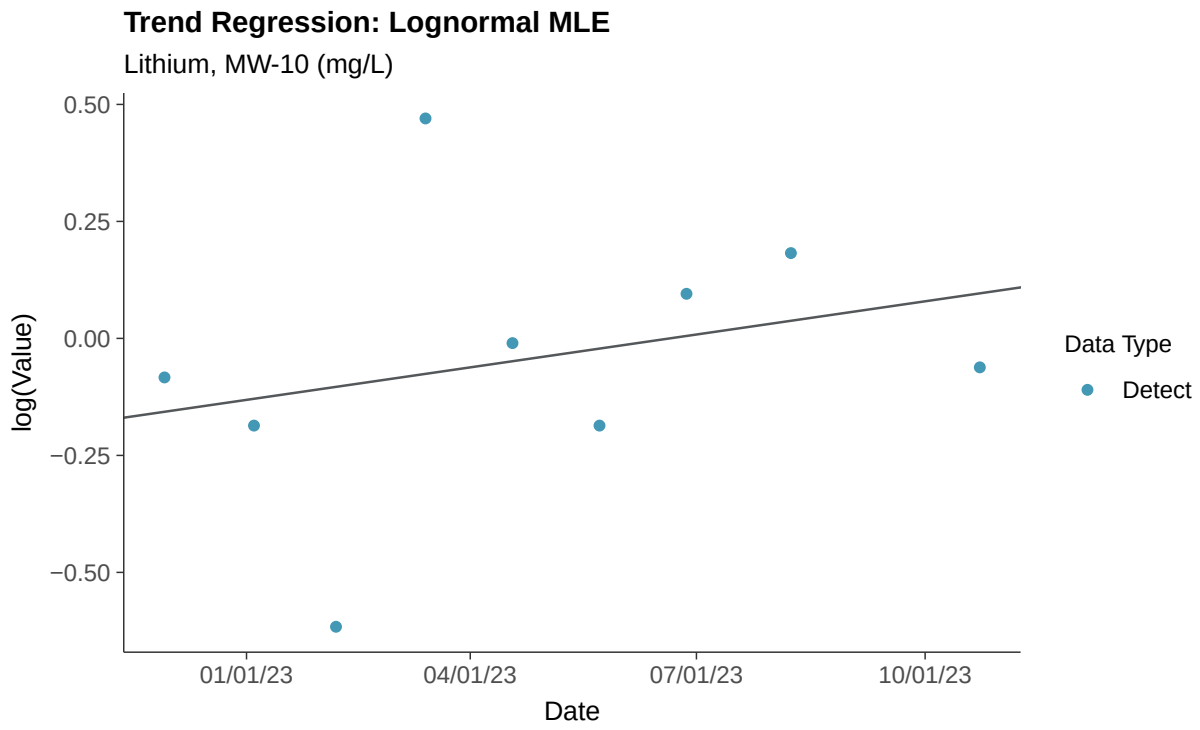
Lithium, MW-10 (mg/L)

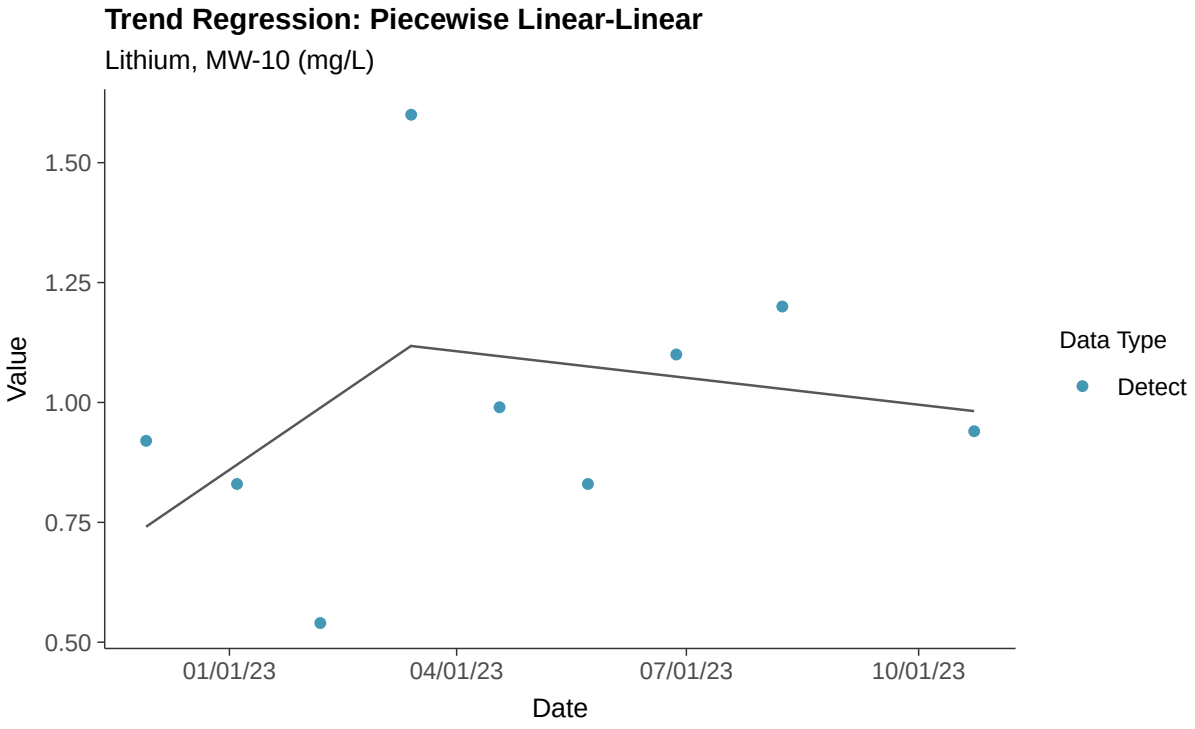



Normal Q-Q plot
Lithium, MW-10 (mg/L)
Value
1.50
1.25
1.00
0.75
0.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-10 (mg/L)
log(Value)
0.50
0.25
0.00
−0.25
−0.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

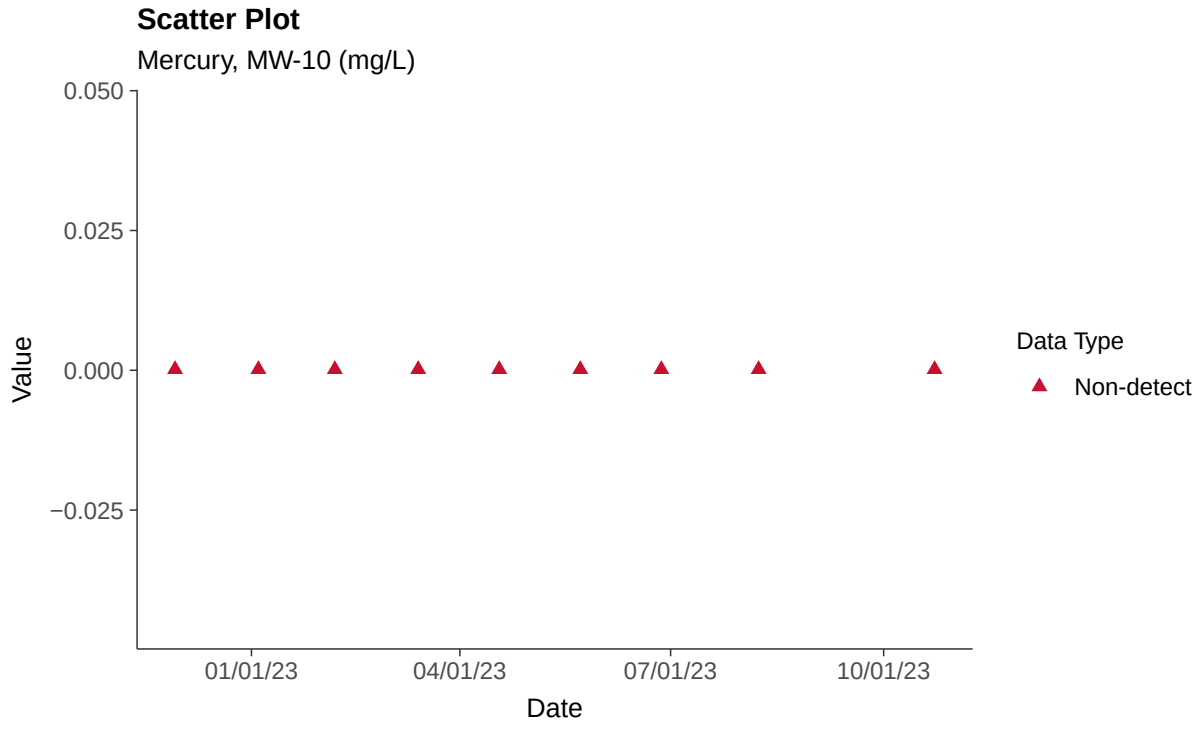

Gamma Q-Q plot
Lithium, MW-10 (mg/L)
Value
1.50
1.25
1.00
0.75
0.50
0.4
0.6
0.8
1.0
1.2
1.4
1.6
Theoretical Quantiles (Gamma)
Data Type
Detect

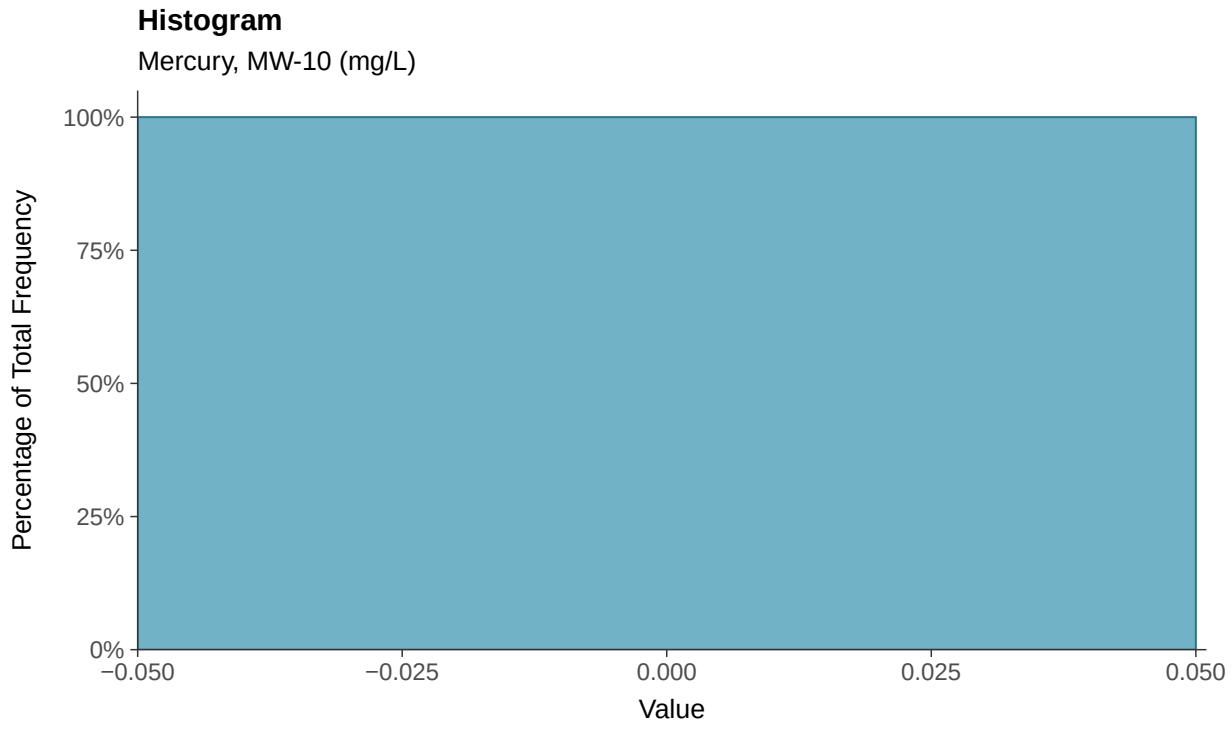

Trend Regression: Lognormal MLE
Lithium, MW-10 (mg/L)
log(Value)
0.50
0.25
0.00
−0.25
−0.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Lithium, MW-10 (mg/L)
Value
1.50
1.25
1.00
0.75
0.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-10

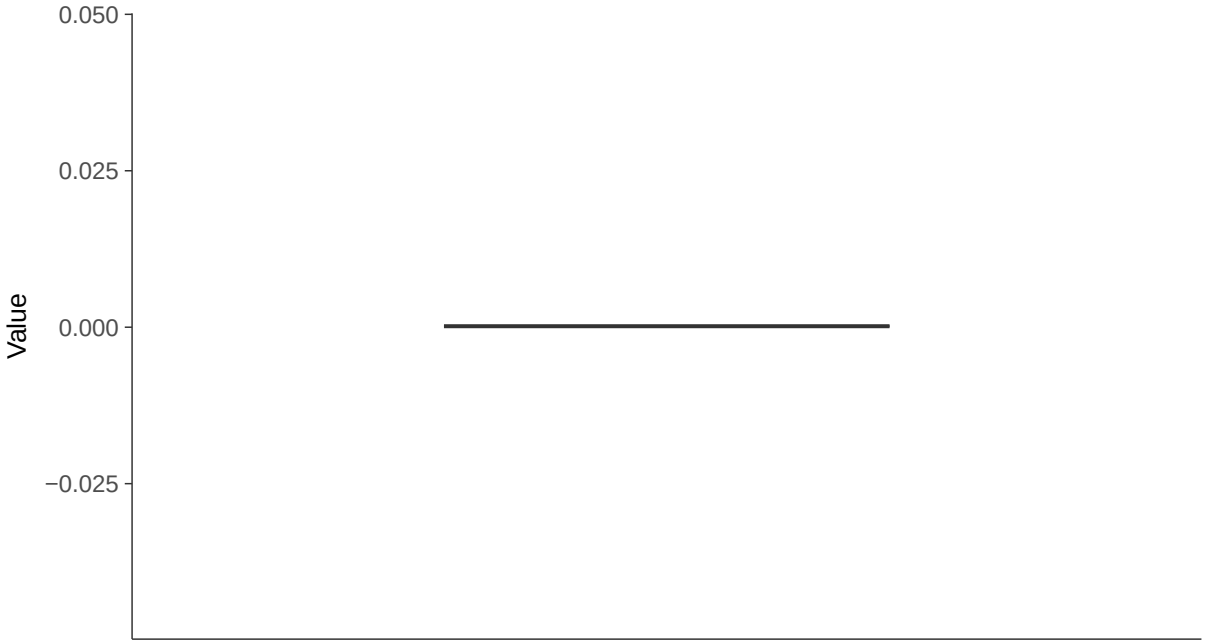
ID: 2_19_5_117





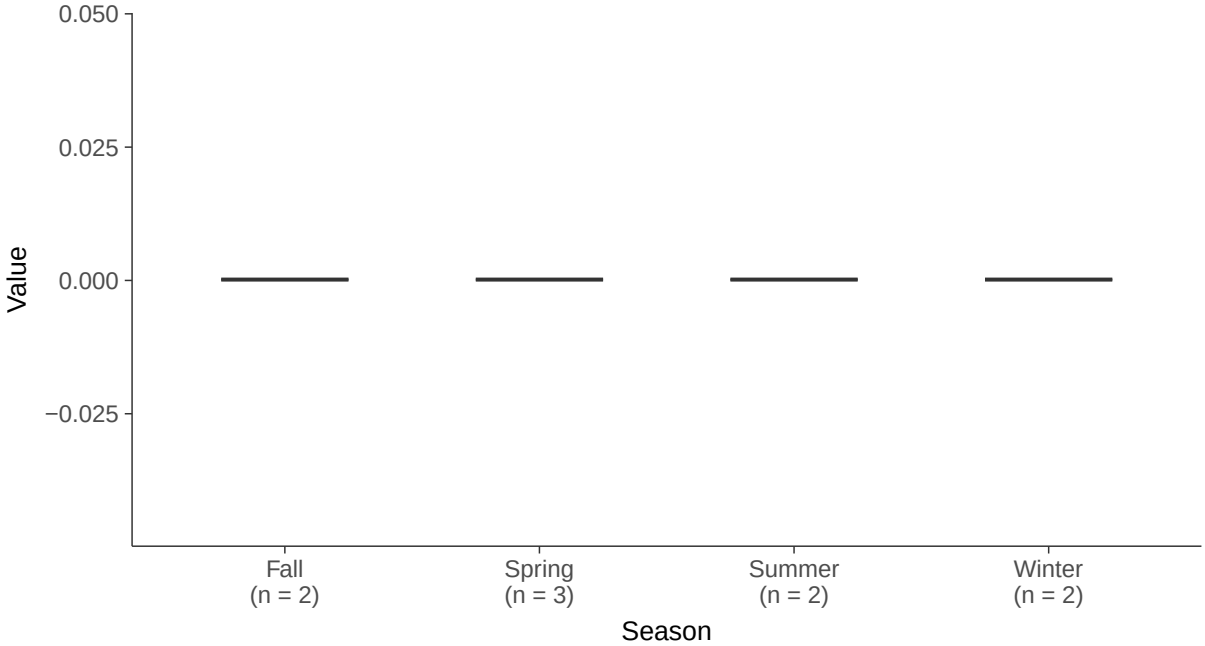
Boxplot

Mercury, MW-10 (mg/L)



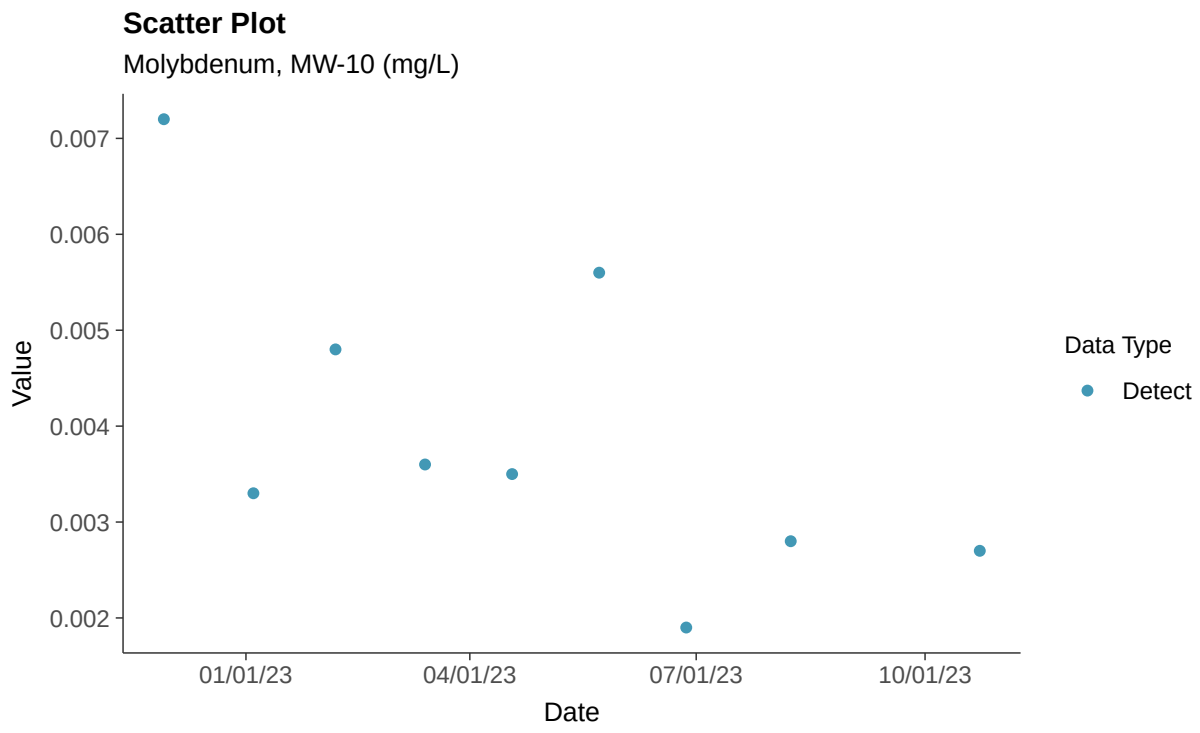
Boxplot by Season

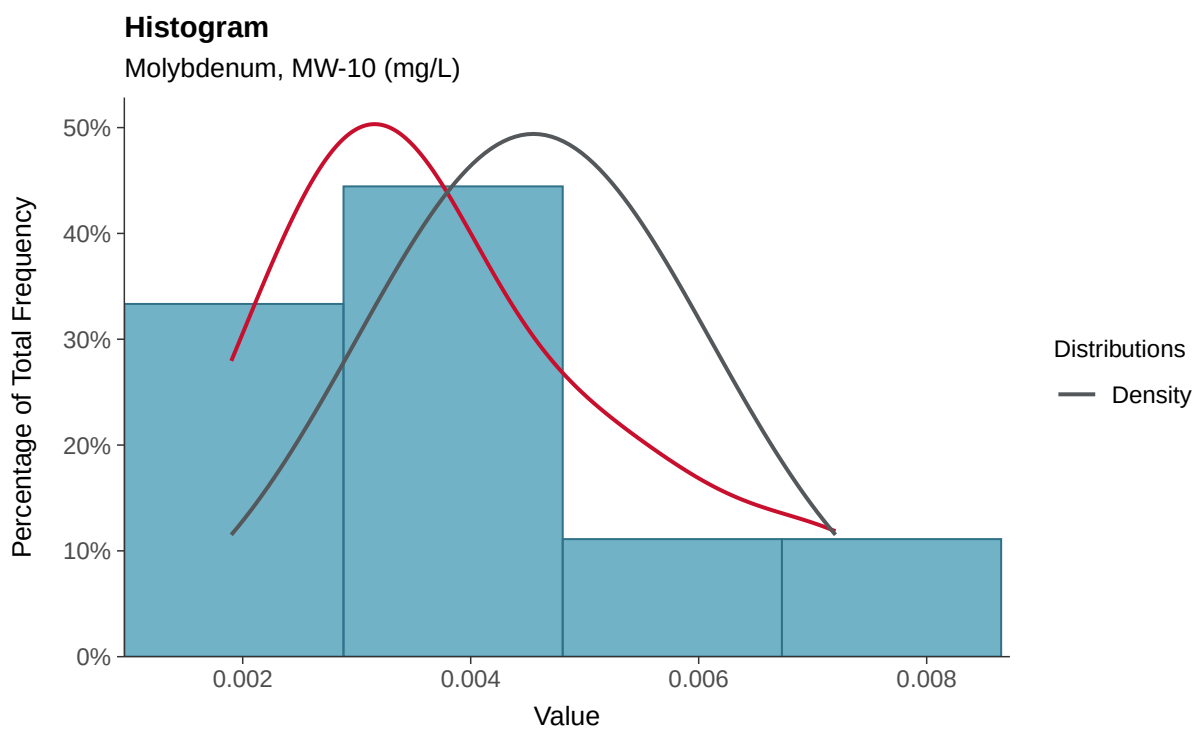
Mercury, MW-10 (mg/L)



Appendix IV: Molybdenum, MW-10

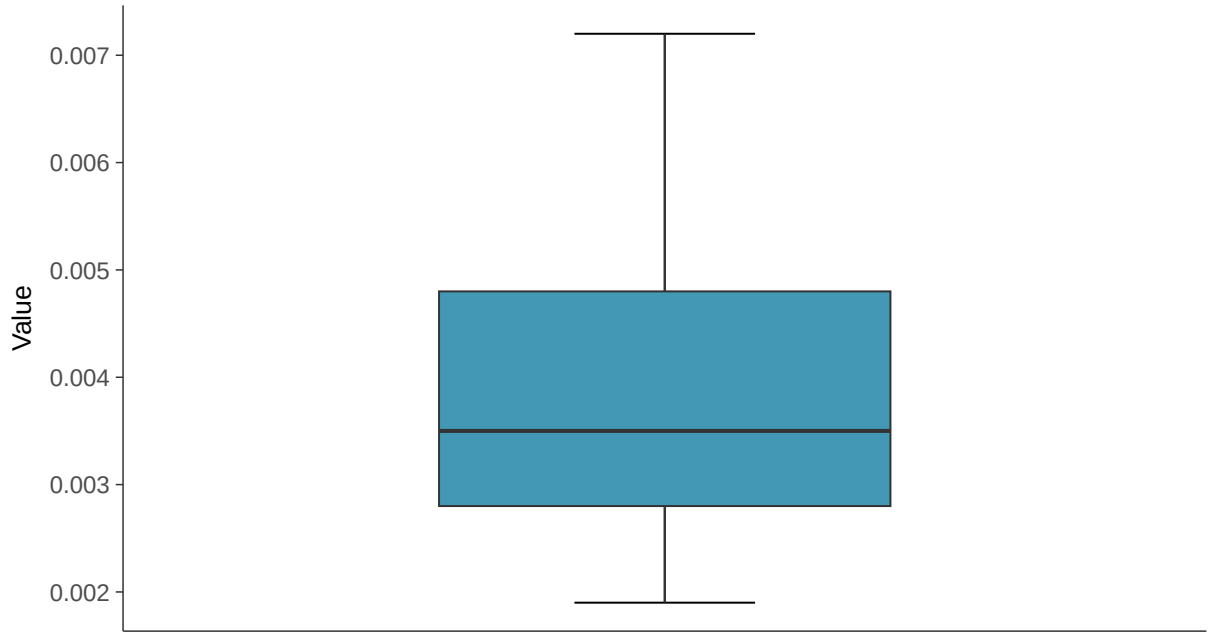
ID: 2_19_5_118





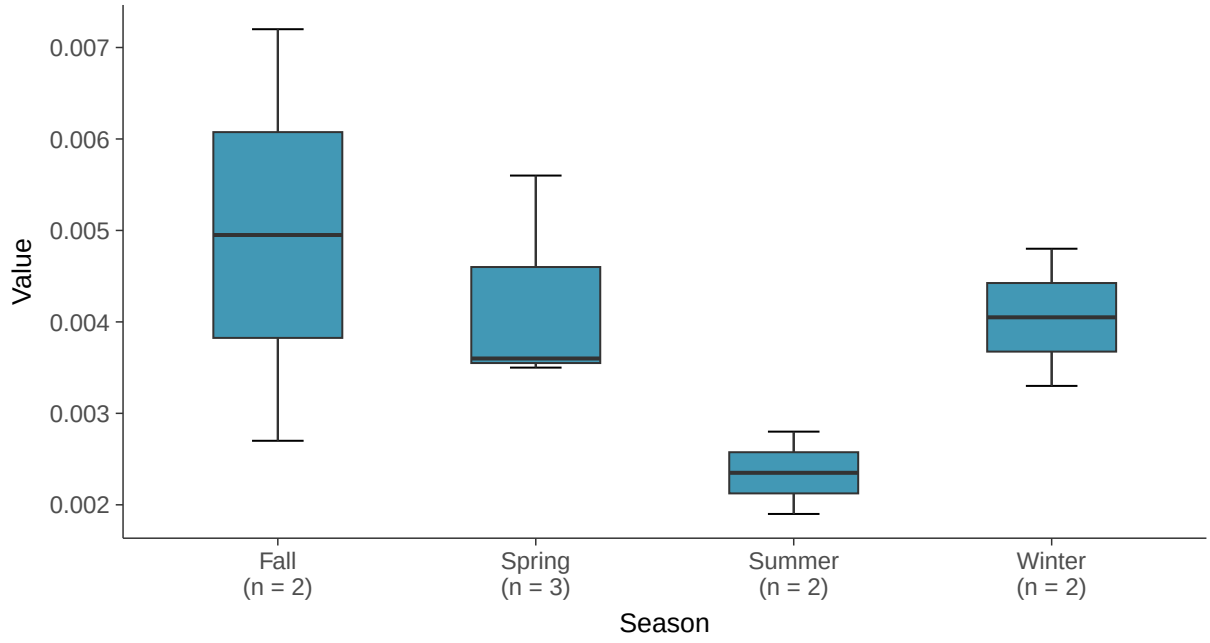
Boxplot

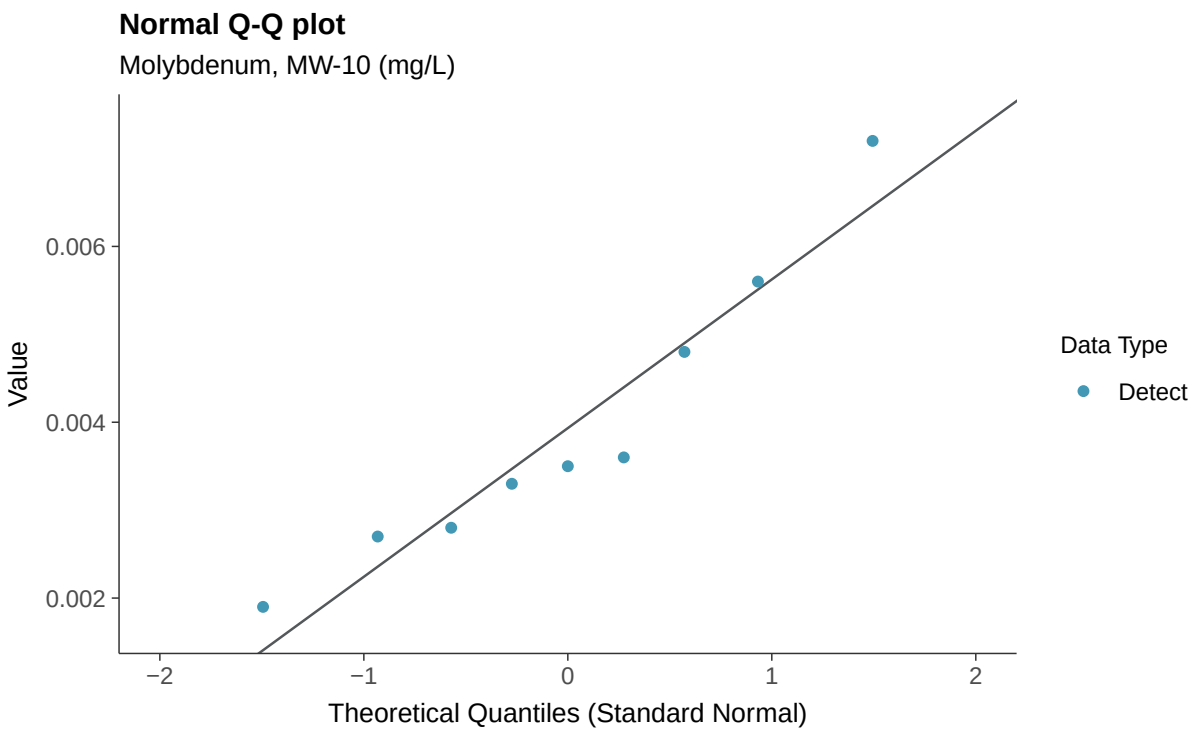
Molybdenum, MW-10 (mg/L)

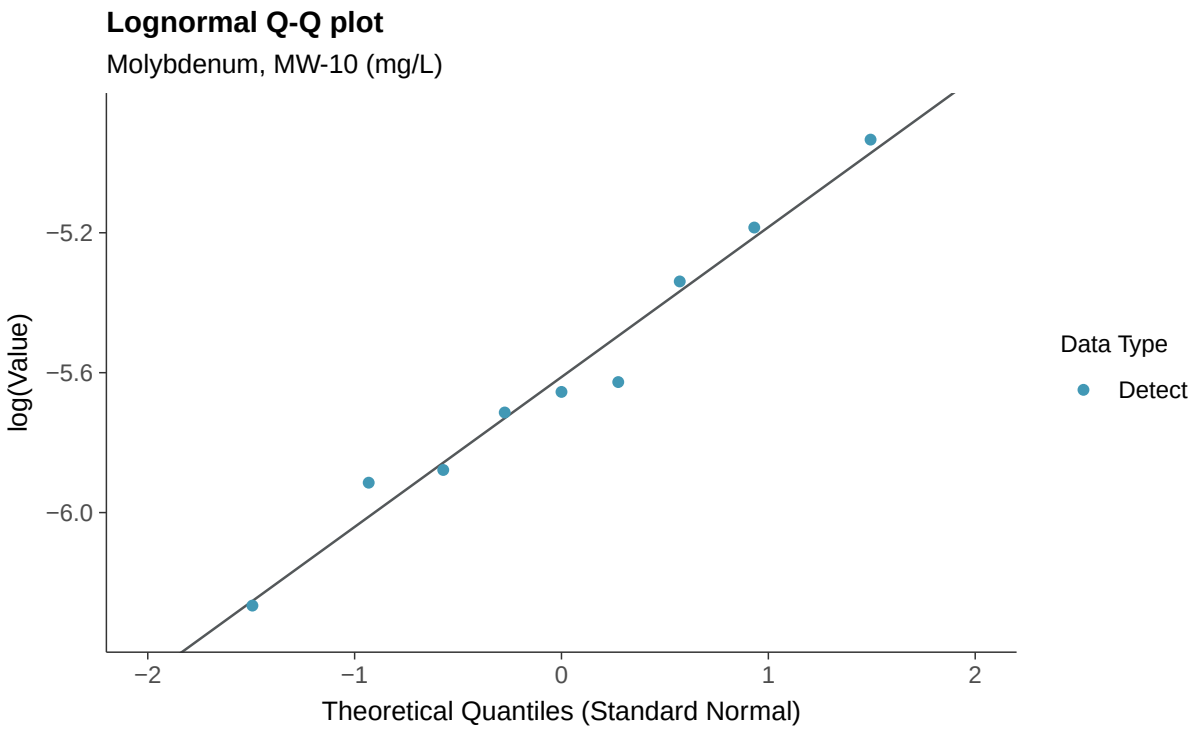


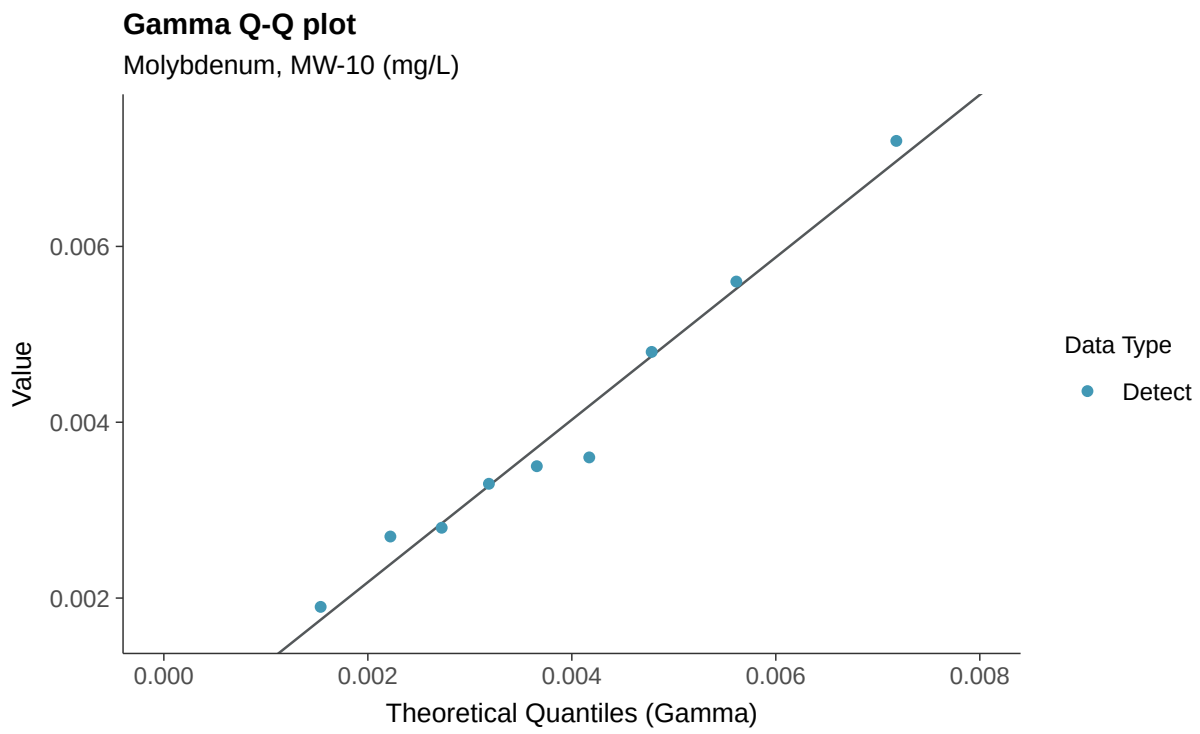
Boxplot by Season

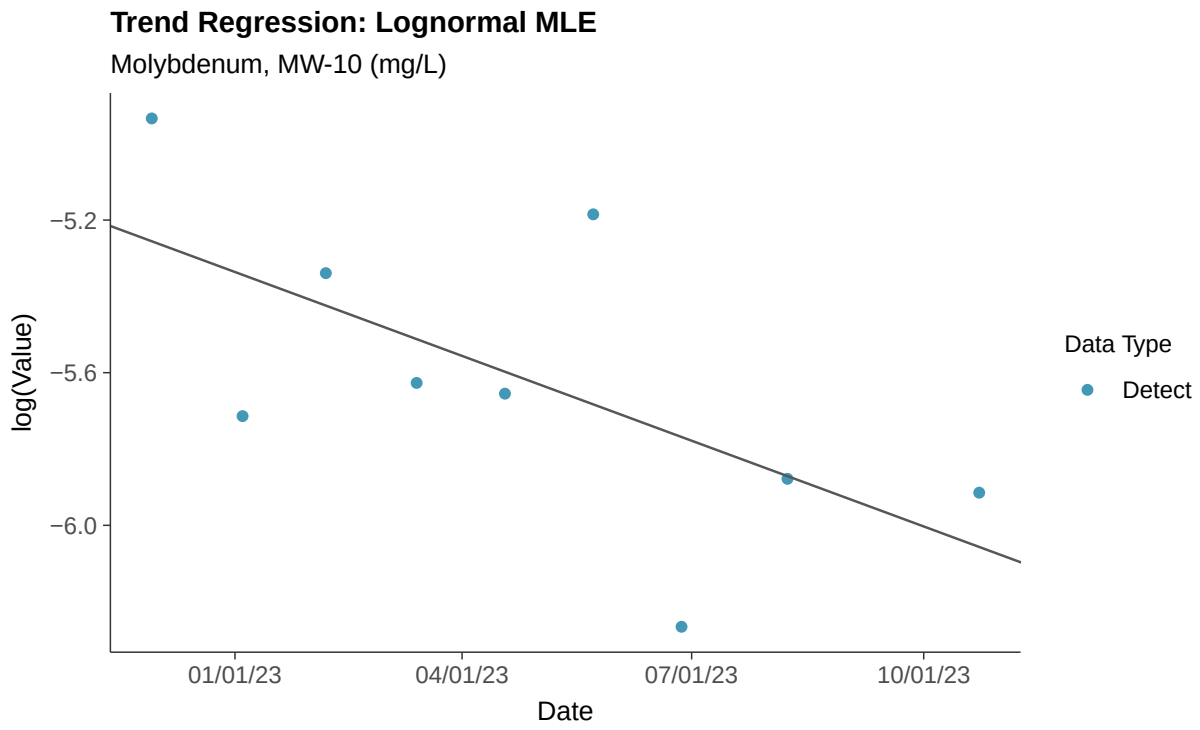
Molybdenum, MW-10 (mg/L)




Normal Q-Q plot
Molybdenum, MW-10 (mg/L)
Value
0.006
0.004
0.002
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

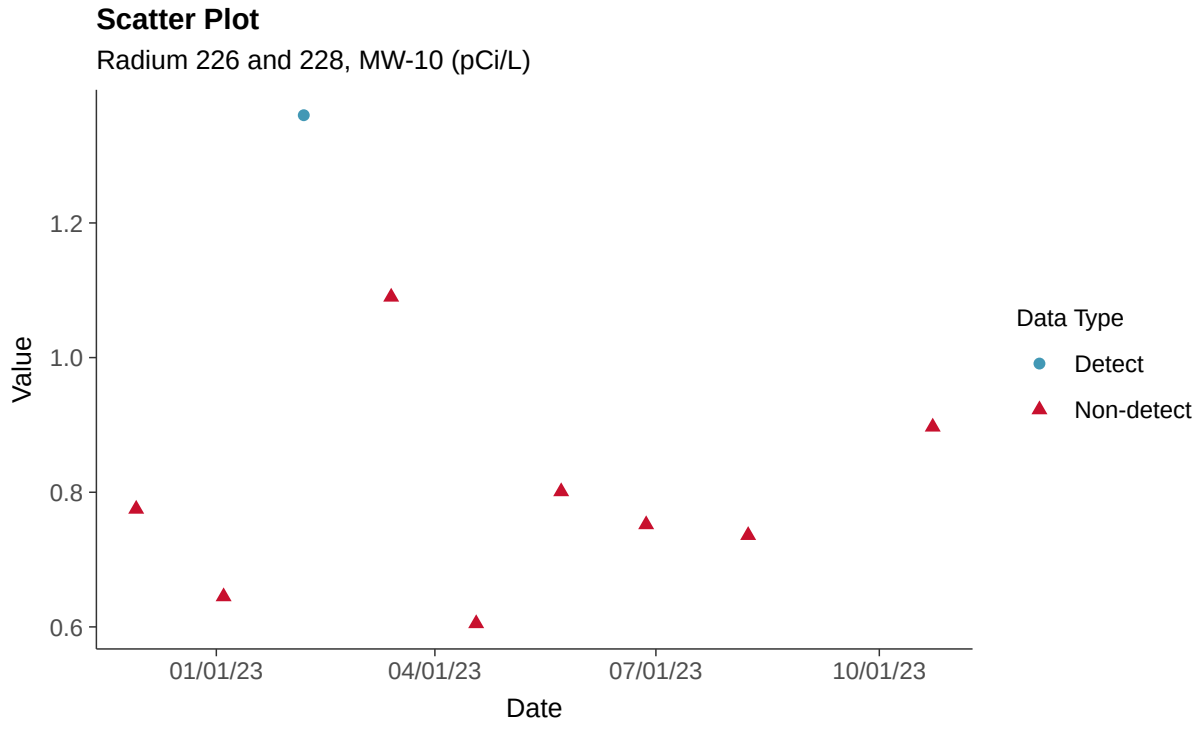

Lognormal Q-Q plot
Molybdenum, MW-10 (mg/L)
log(Value)
−5.2
−5.6
−6.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

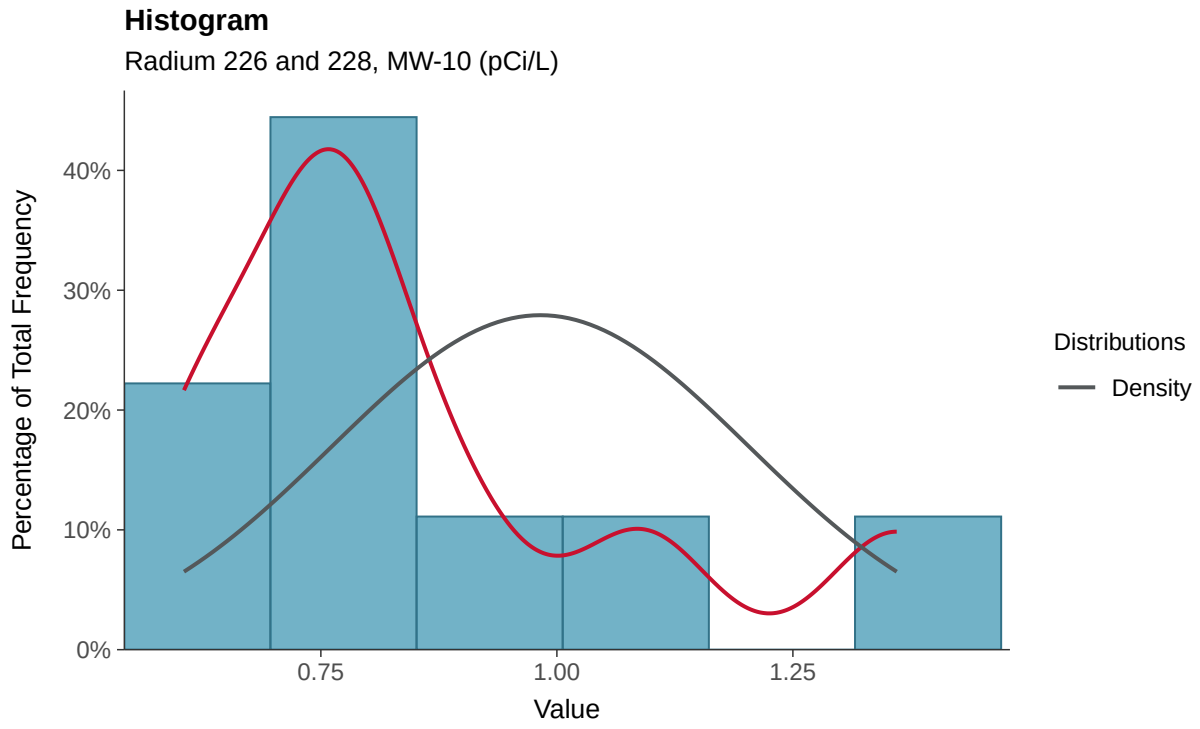

Gamma Q-Q plot
Molybdenum, MW-10 (mg/L)
Value
0.006
0.004
0.002
0.000
0.002
0.004
0.006
0.008
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Molybdenum, MW-10 (mg/L)
log(Value)
−5.2
−5.6
−6.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Radium 226 and 228, MW-10

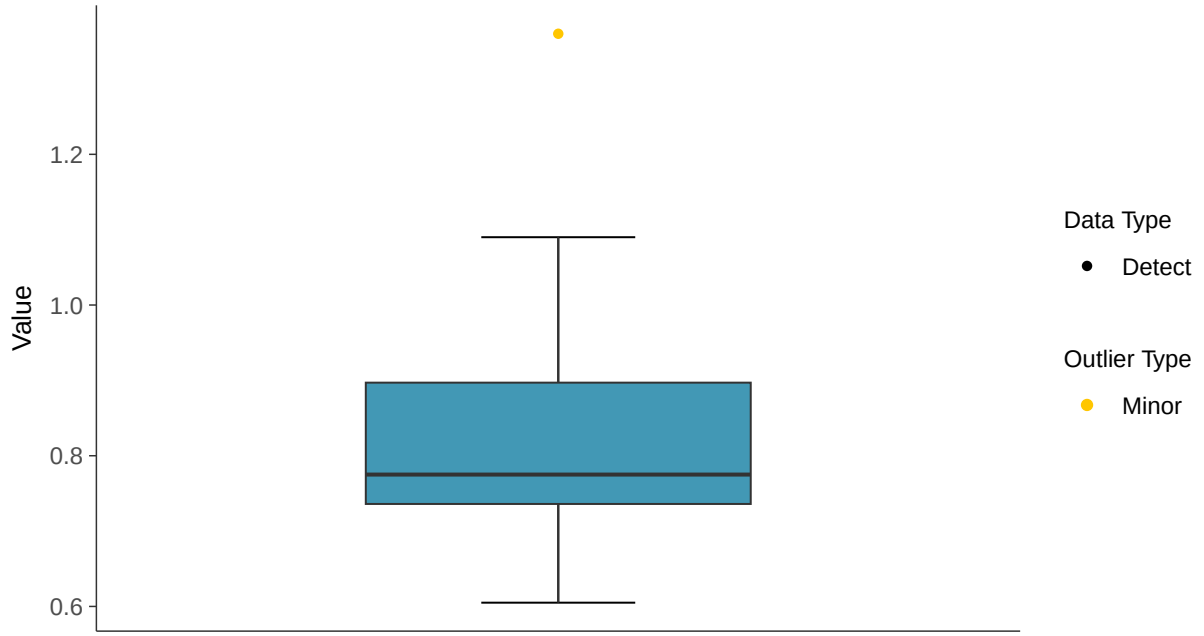
ID: 2_19_5_121





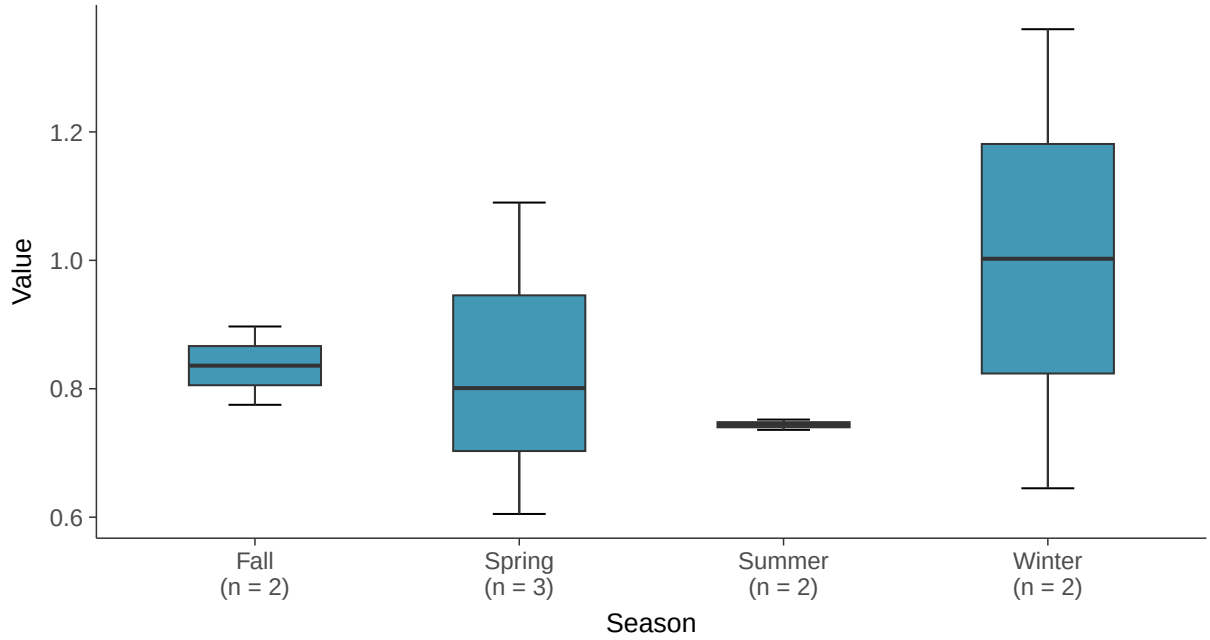
Boxplot

Radium 226 and 228, MW-10 (pCi/L)



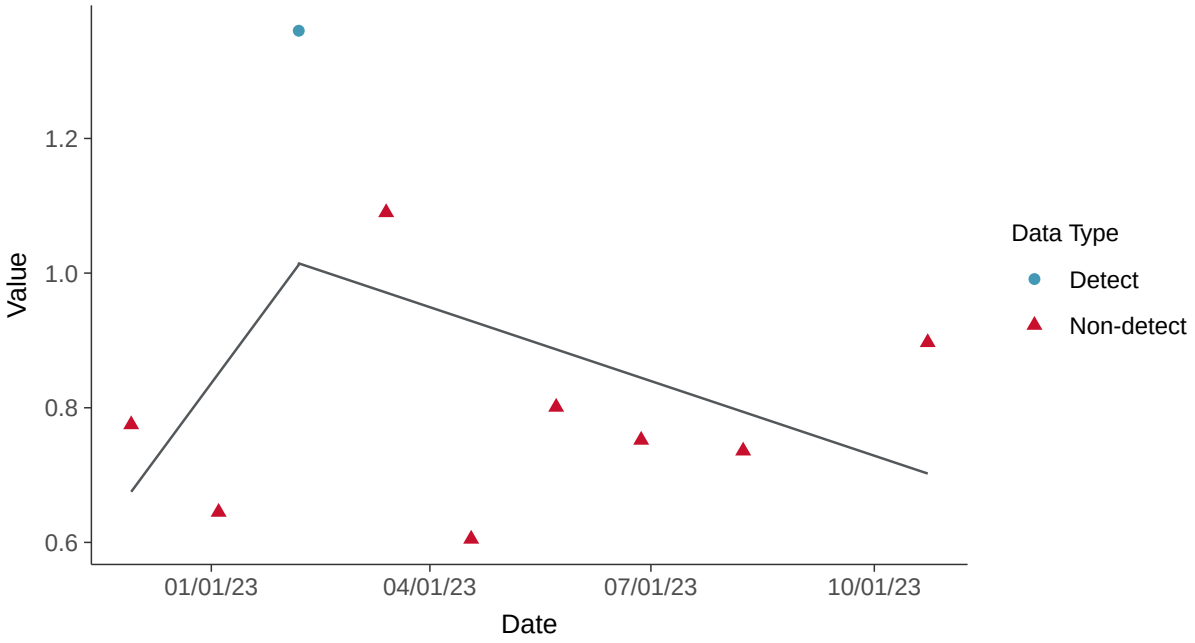
Boxplot by Season

Radium 226 and 228, MW-10 (pCi/L)



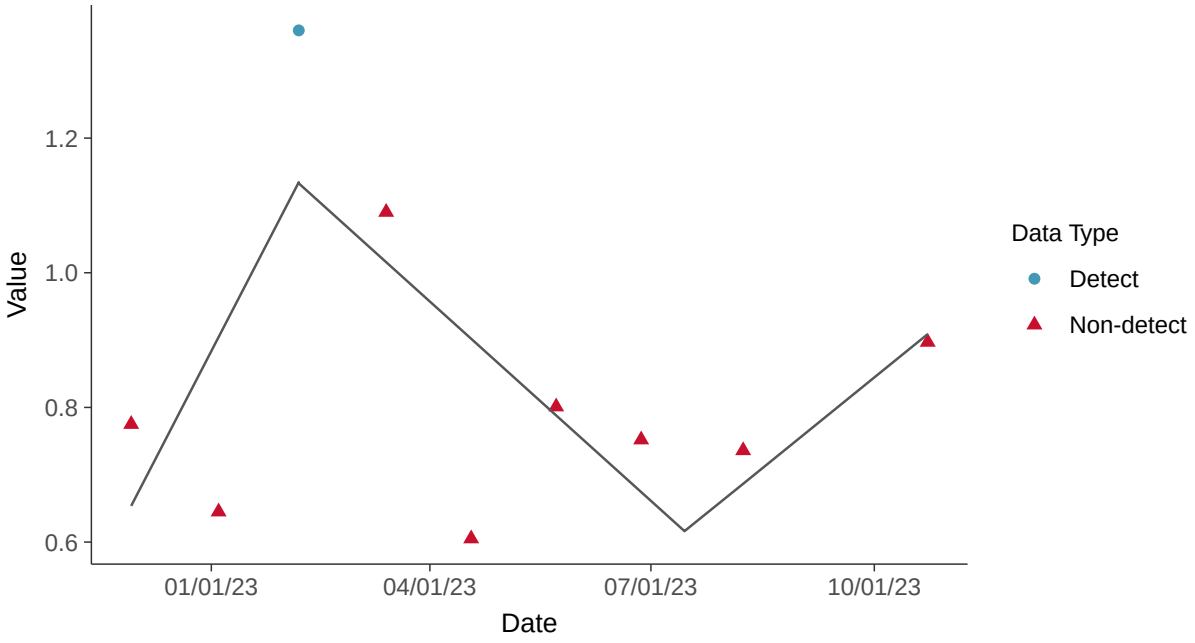
Trend Regression: Piecewise Linear-Linear

Radium 226 and 228, MW-10 (pCi/L)



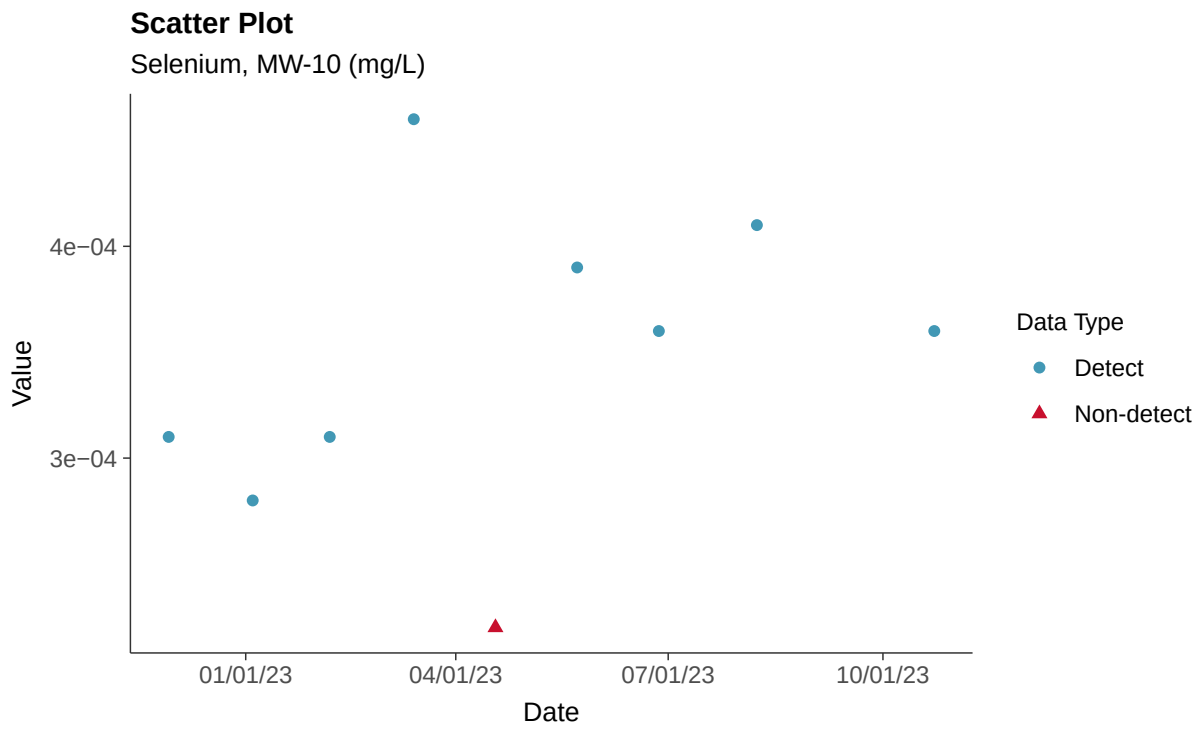
Trend Regression: Piecewise Linear-Linear-Linear

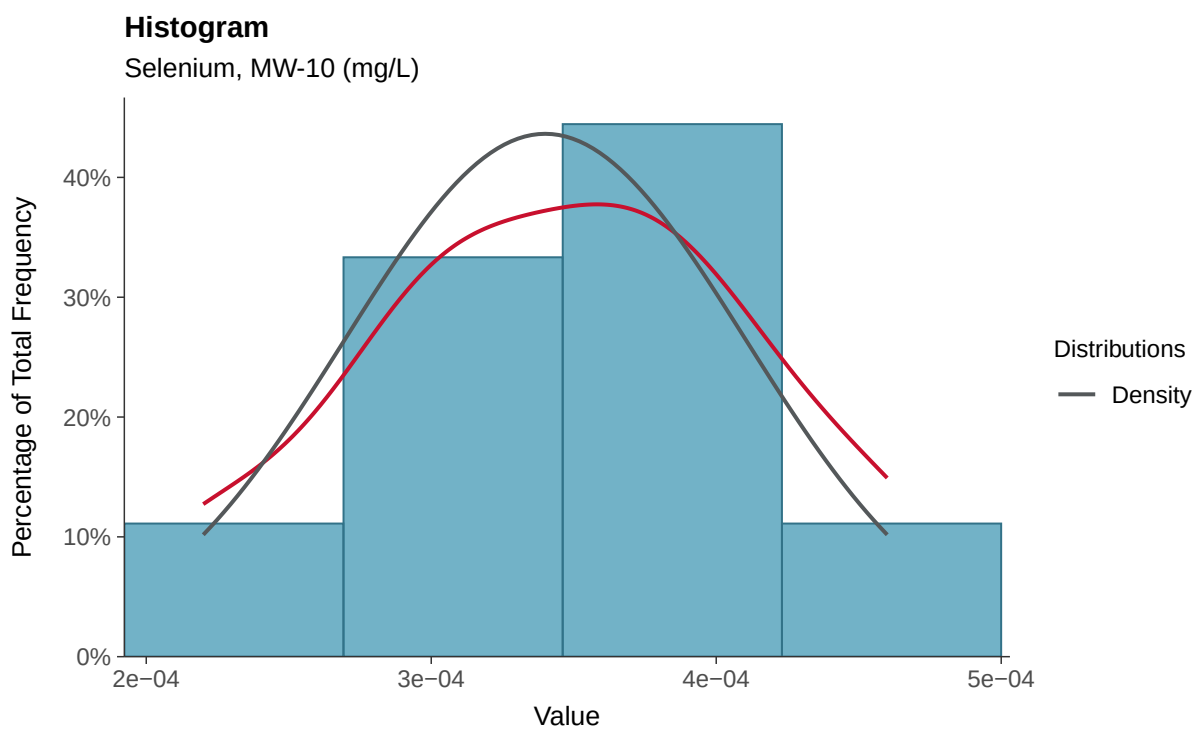
Radium 226 and 228, MW-10 (pCi/L)



Appendix IV: Selenium, MW-10

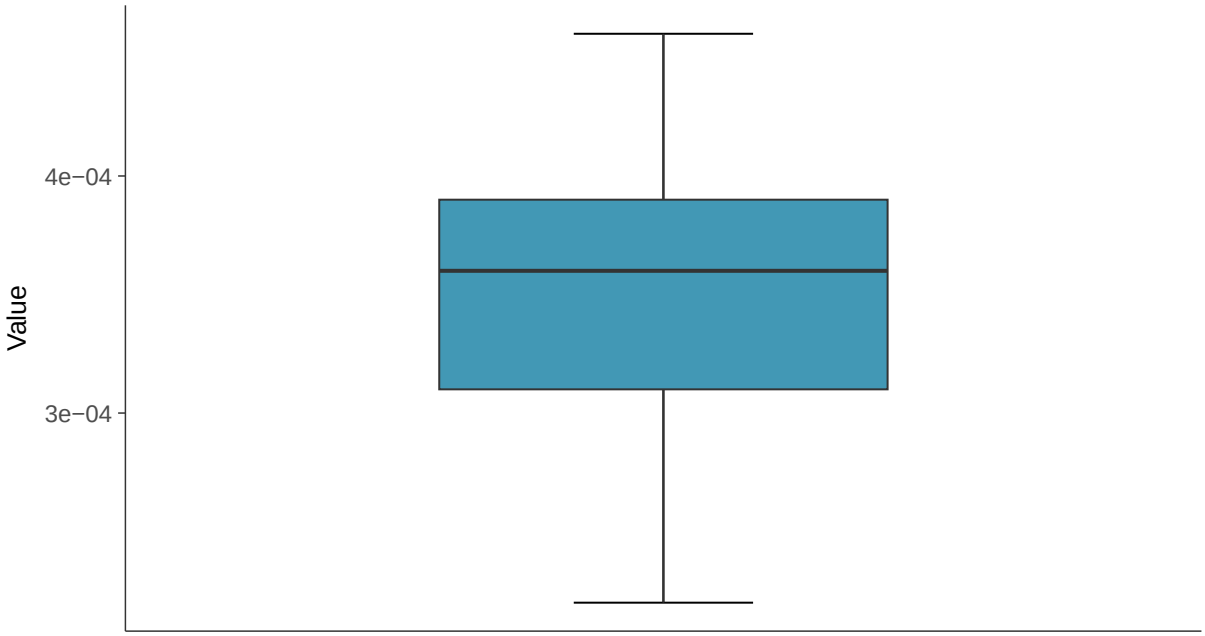
ID: 2_19_5_122





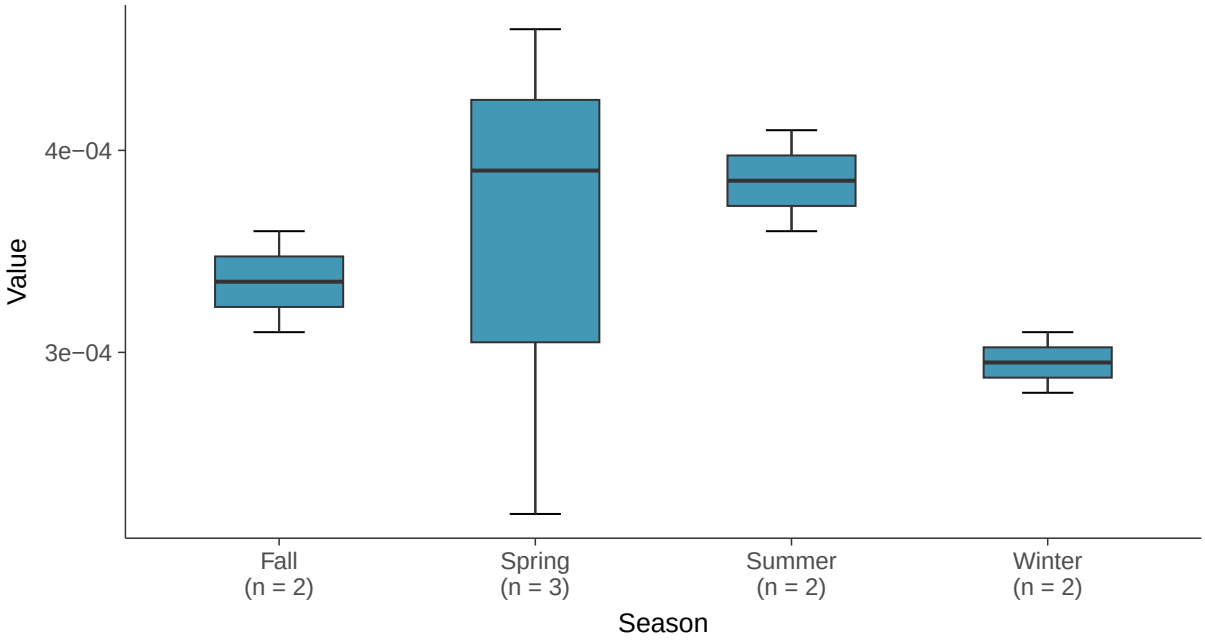
Boxplot

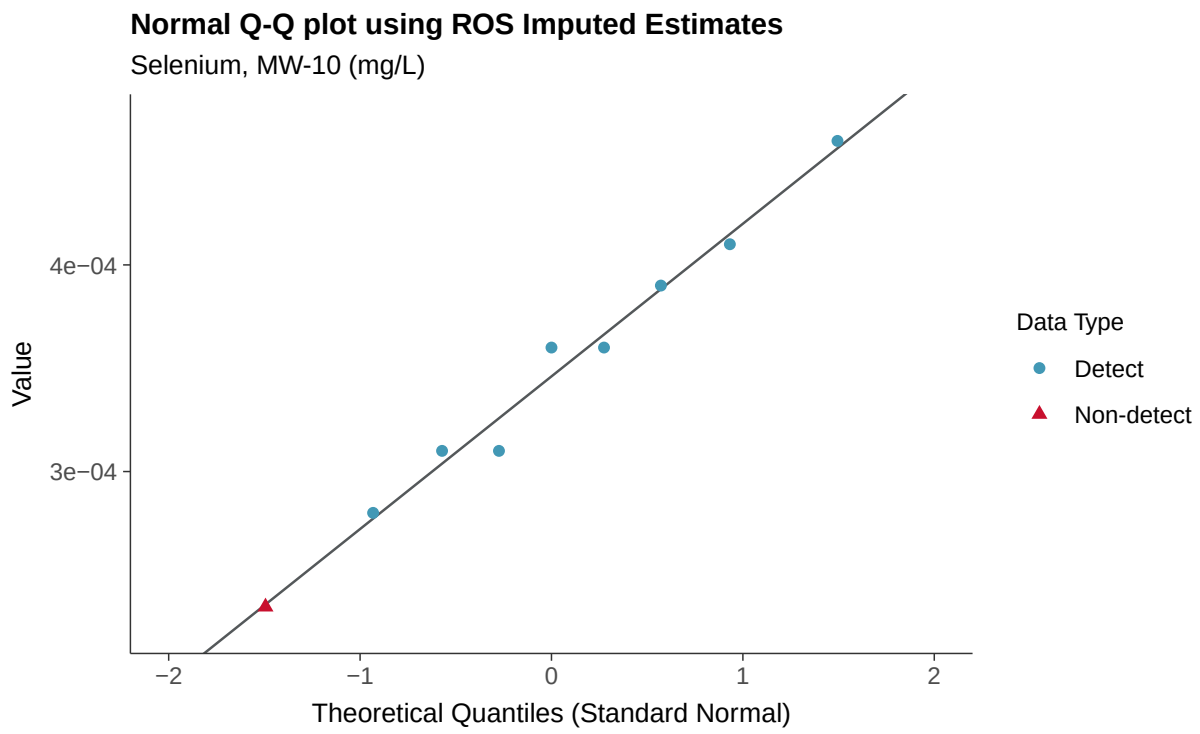
Selenium, MW-10 (mg/L)

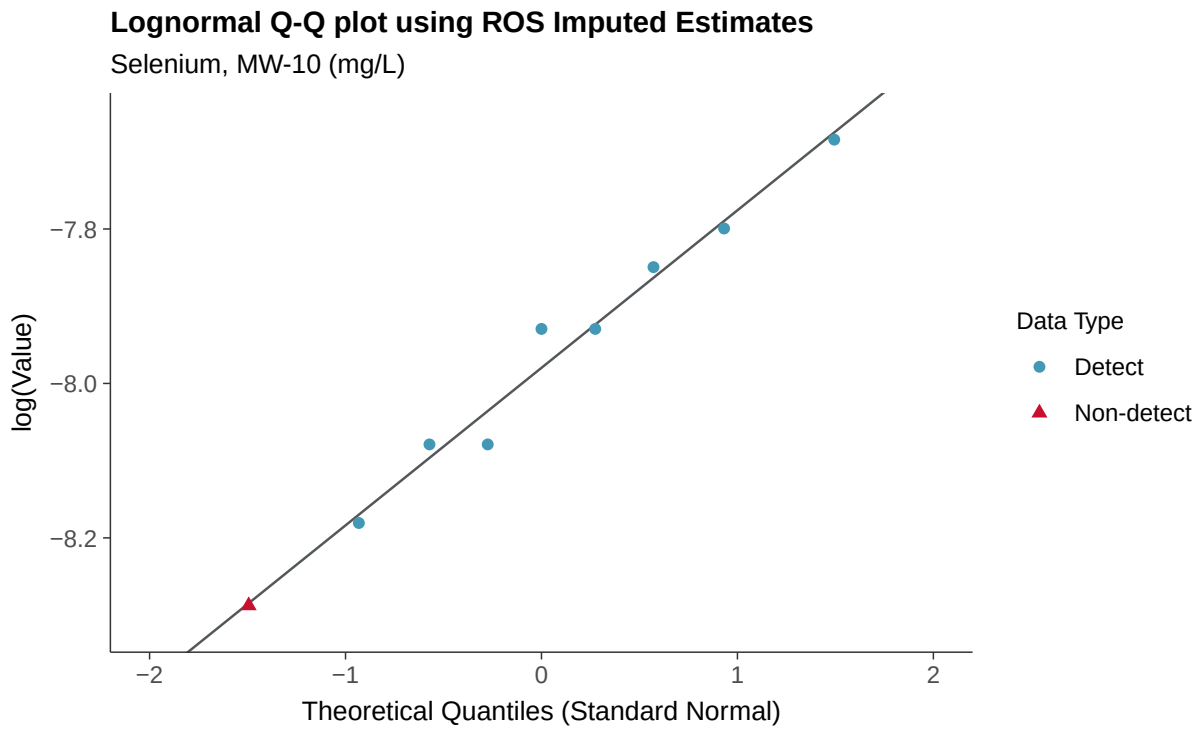


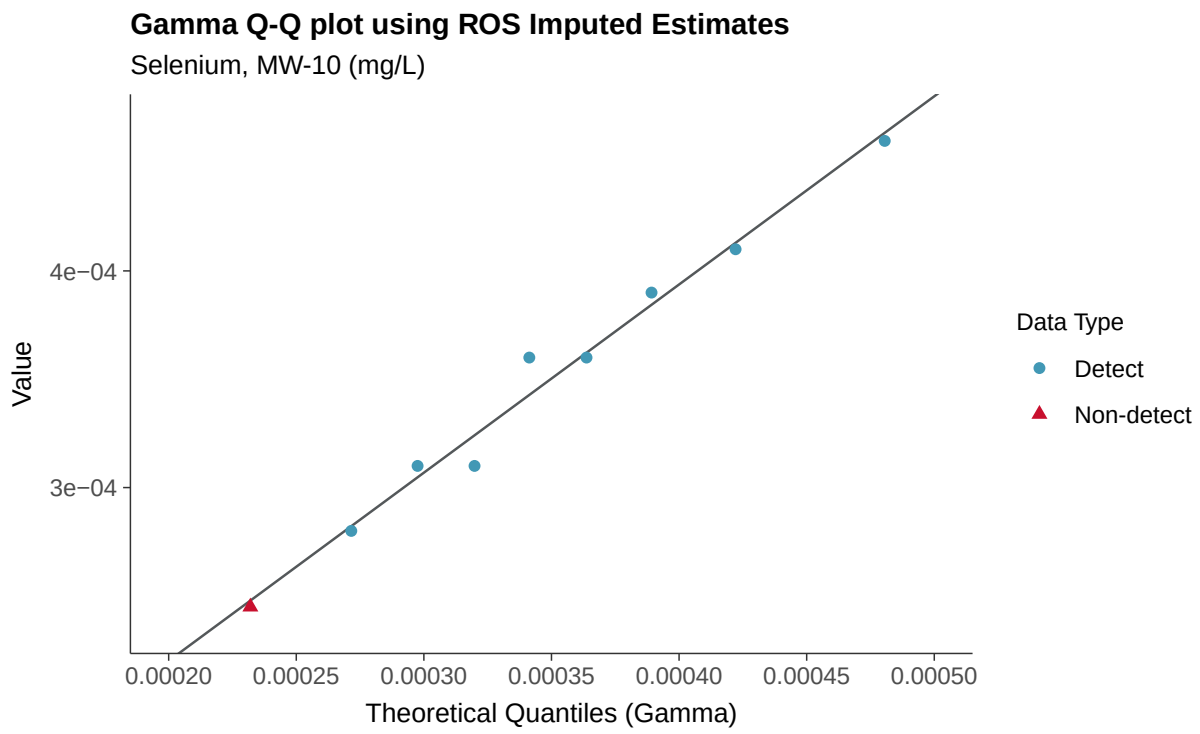
Boxplot by Season

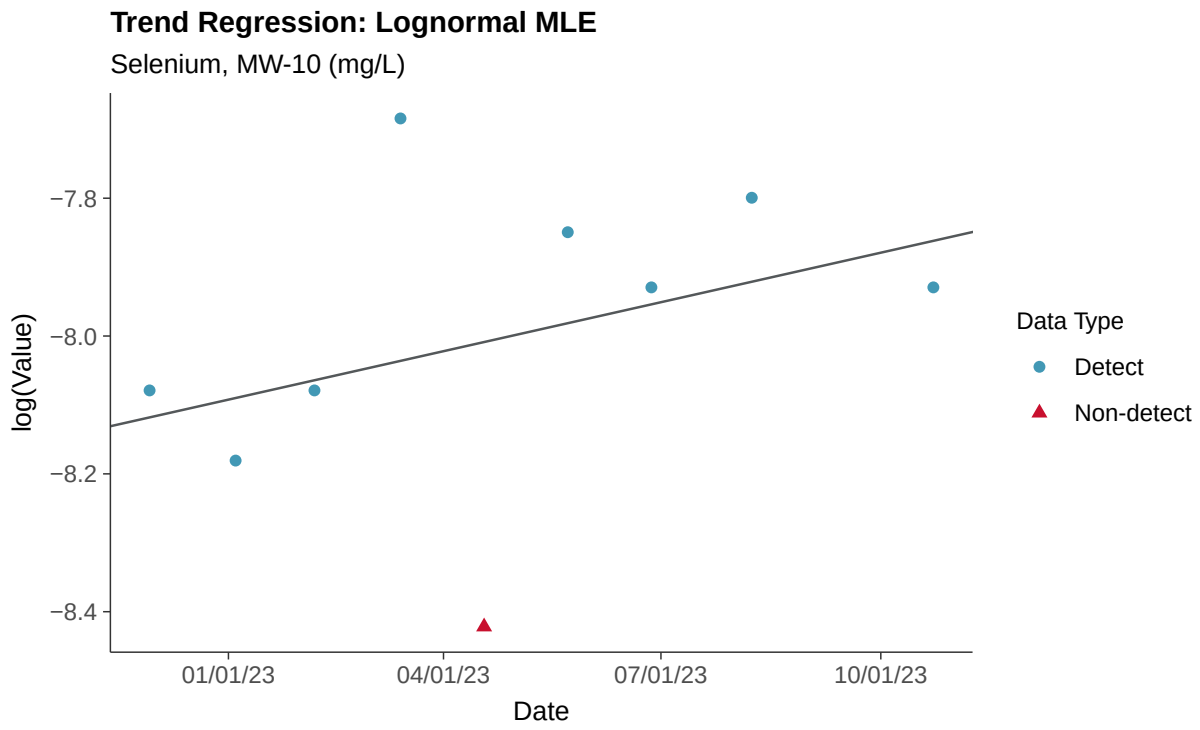
Selenium, MW-10 (mg/L)

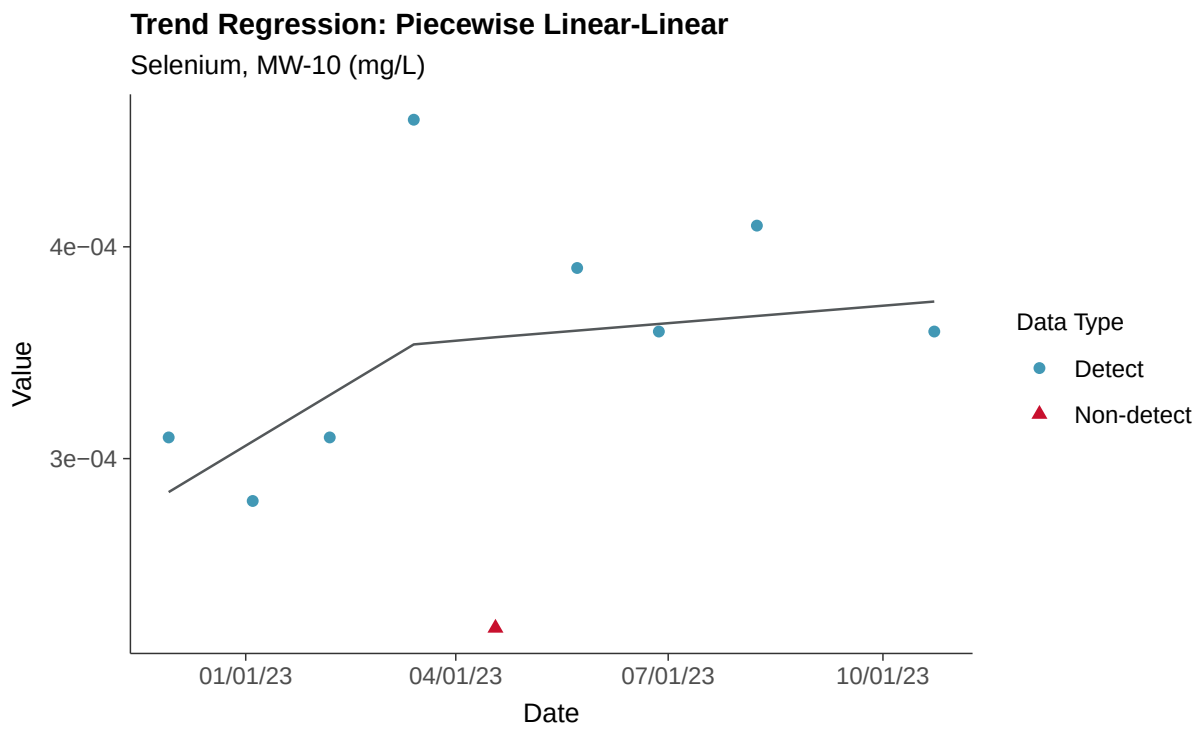



Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-10 (mg/L)
Value
4e−04
3e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Selenium, MW-10 (mg/L)
log(Value)
−7.8
−8.0
−8.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

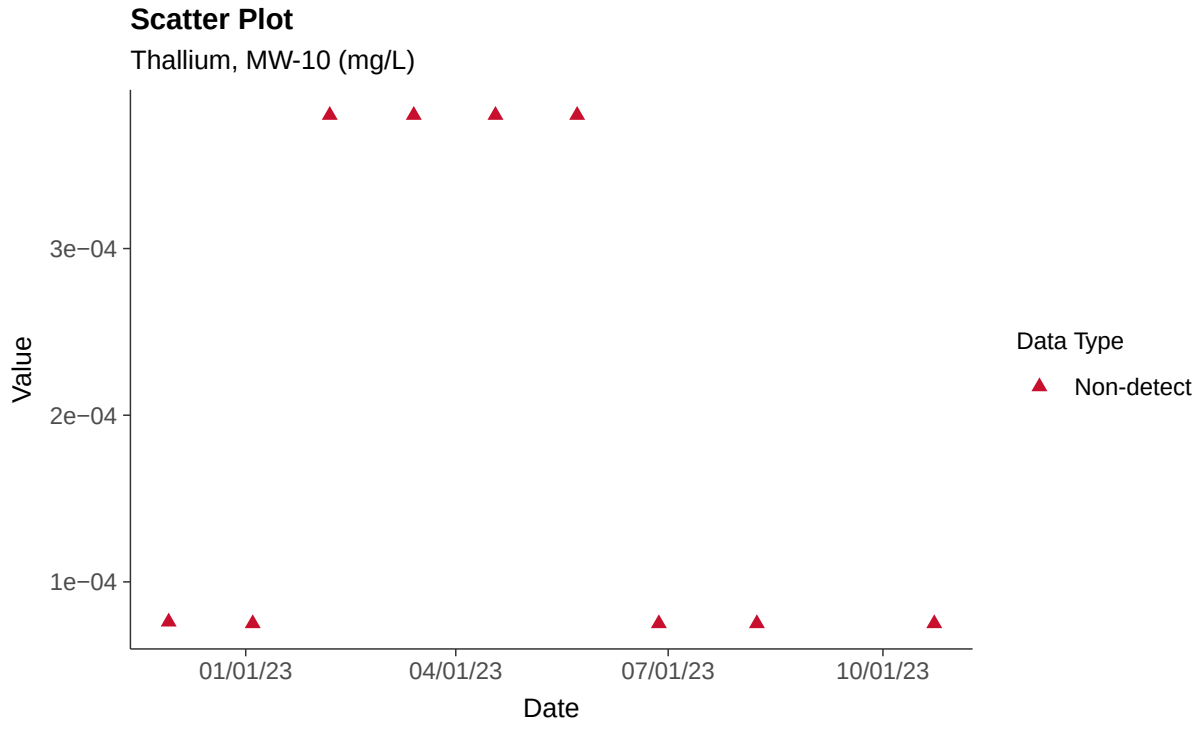

Gamma Q-Q plot using ROS Imputed Estimates
Selenium, MW-10 (mg/L)
Value
4e−04
3e−04
0.00020
0.00025
0.00030
0.00035
0.00040
0.00045
0.00050
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

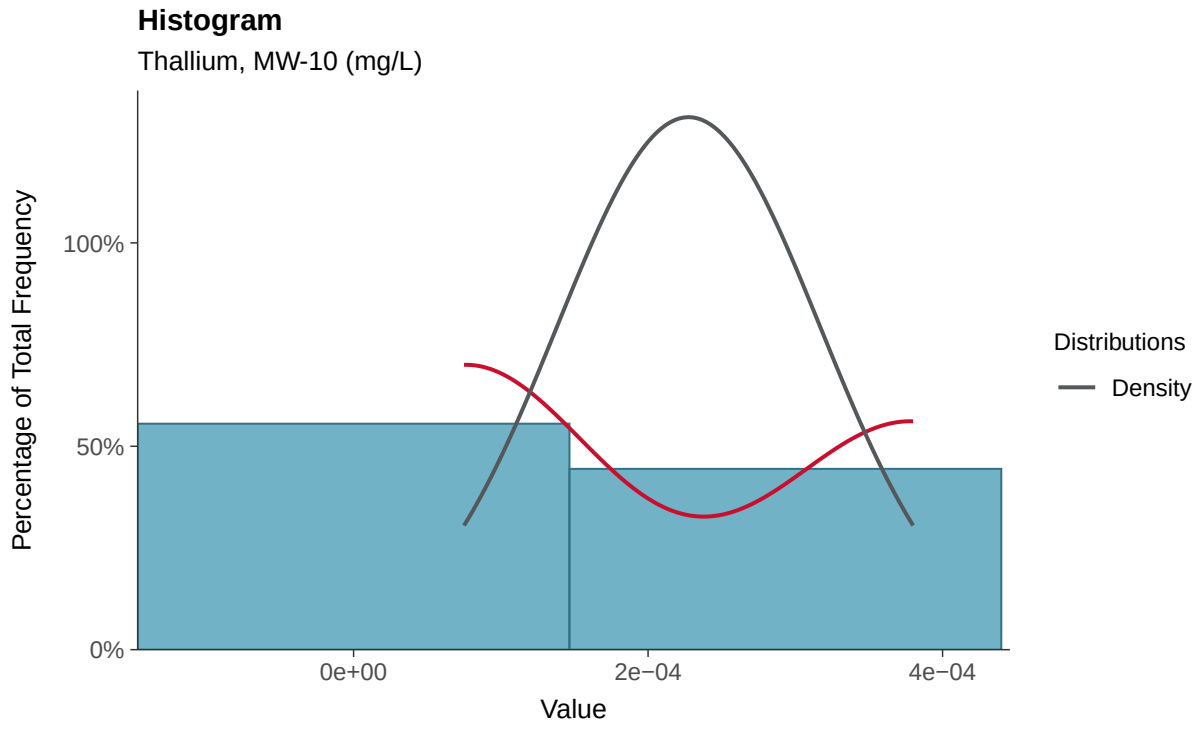

Trend Regression: Lognormal MLE
Selenium, MW-10 (mg/L)
log(Value)
−7.8
−8.0
−8.2
−8.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Selenium, MW-10 (mg/L)
Value
4e−04
3e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-10

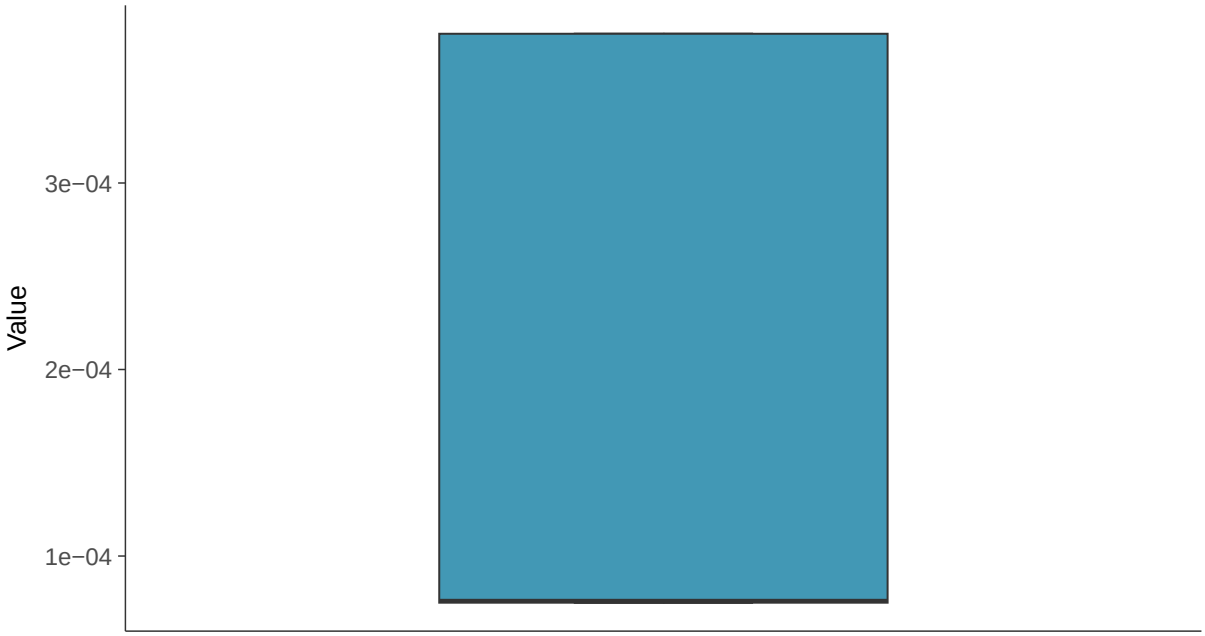
ID: 2_19_5_125





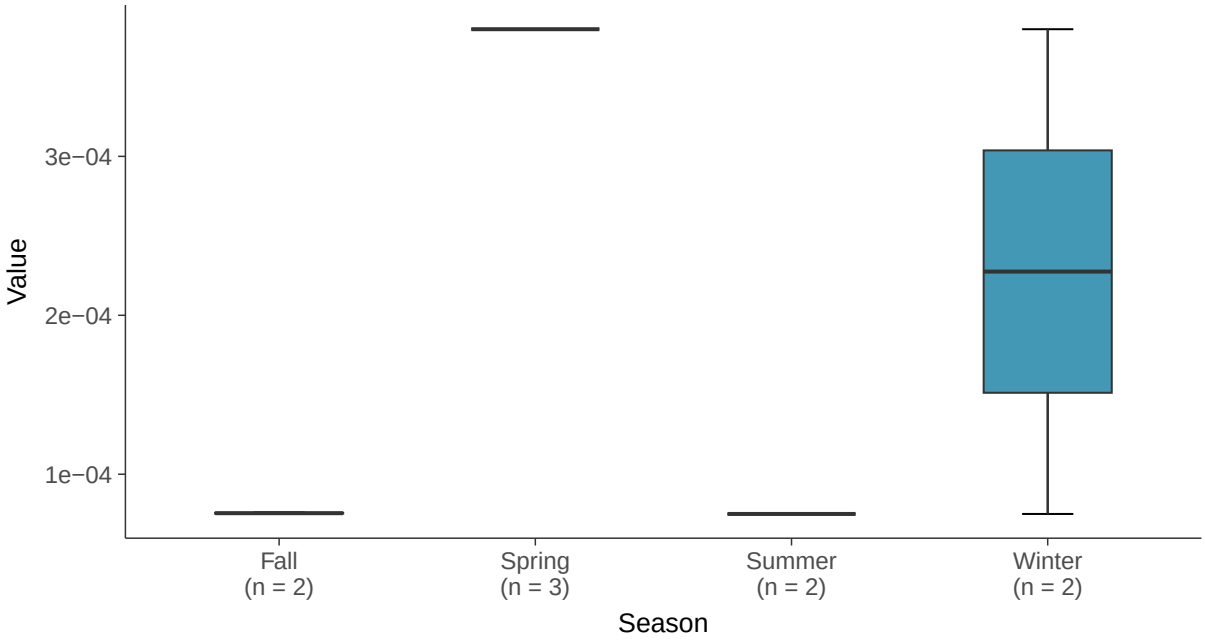
Boxplot

Thallium, MW-10 (mg/L)



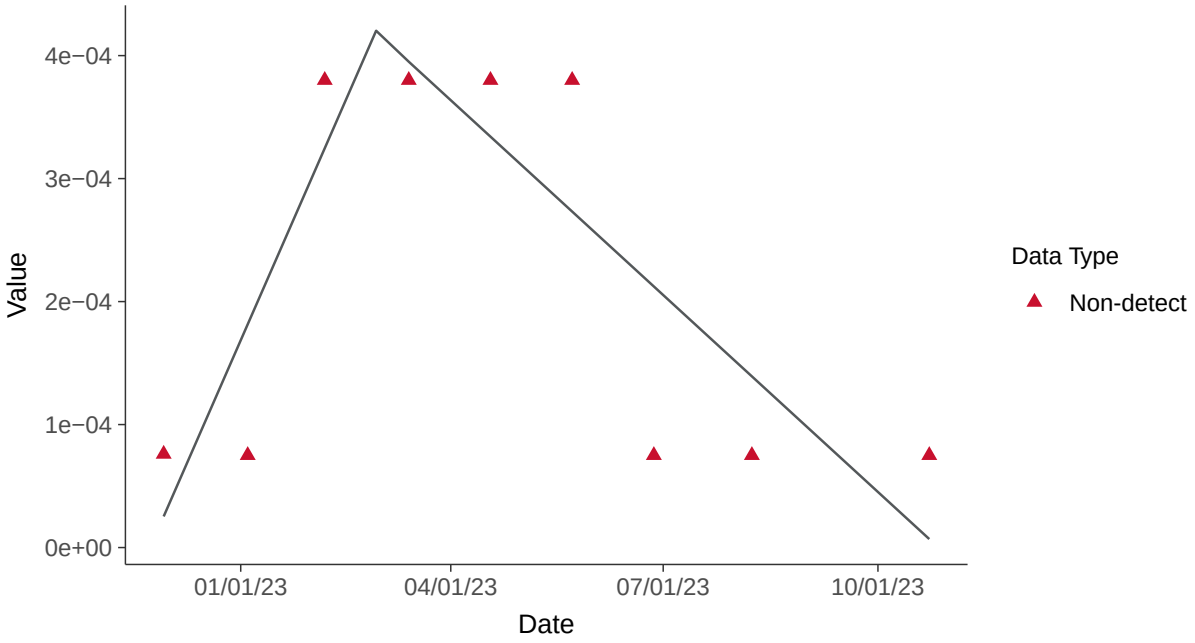
Boxplot by Season

Thallium, MW-10 (mg/L)



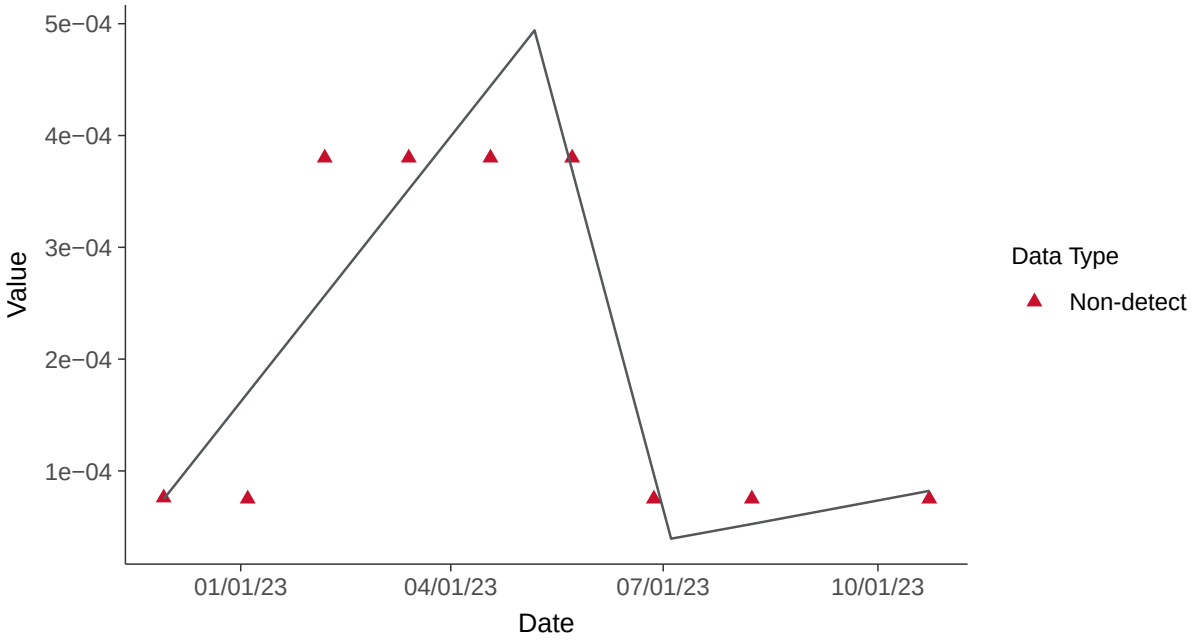
Trend Regression: Piecewise Linear-Linear

Thallium, MW-10 (mg/L)



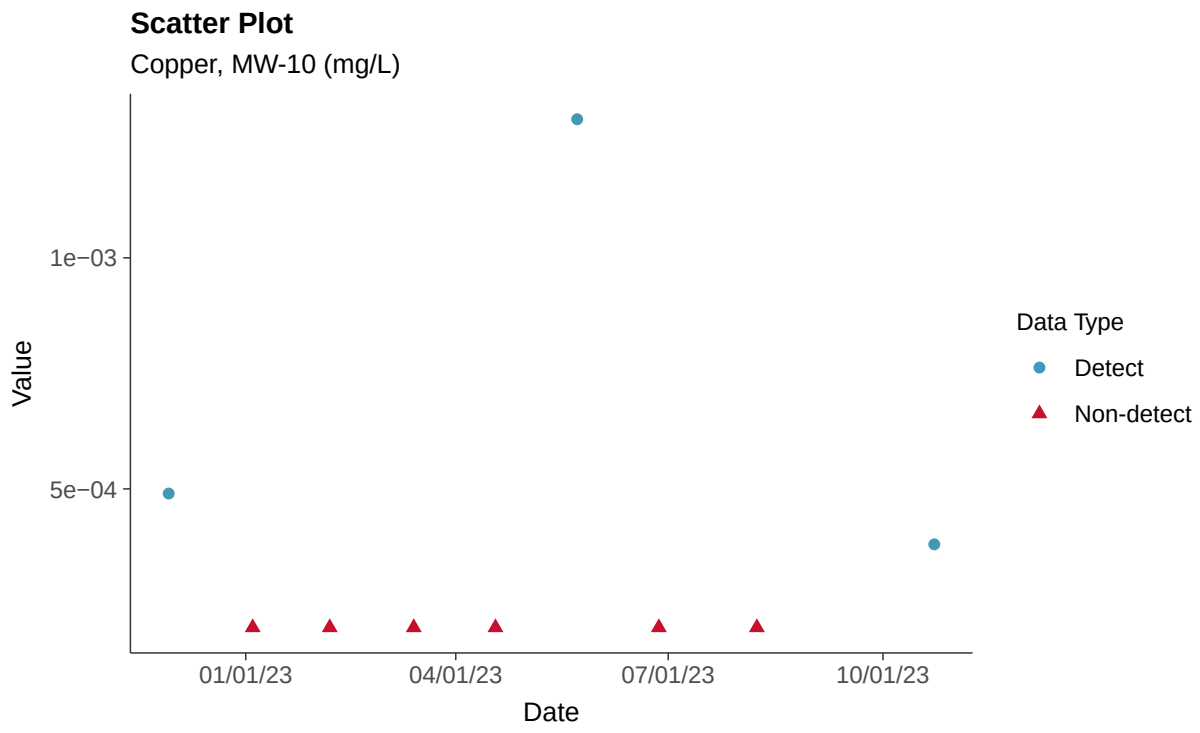
Trend Regression: Piecewise Linear-Linear-Linear

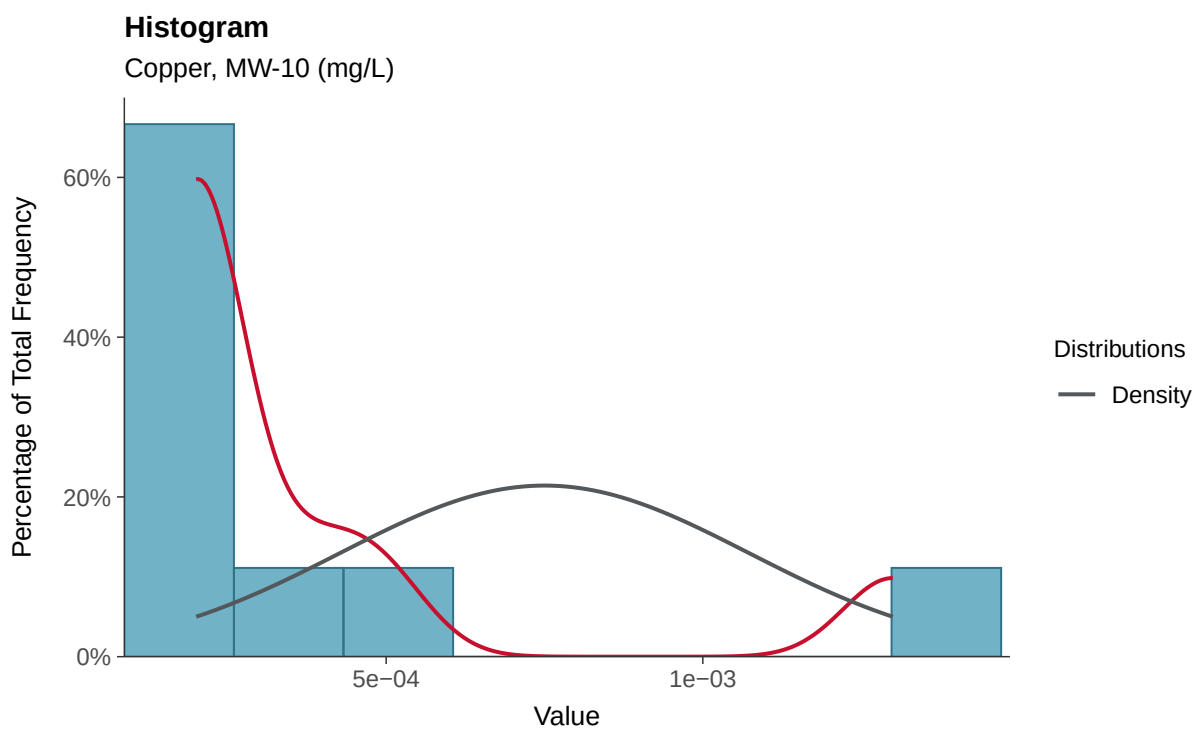
Thallium, MW-10 (mg/L)



Part 115: Copper, MW-10

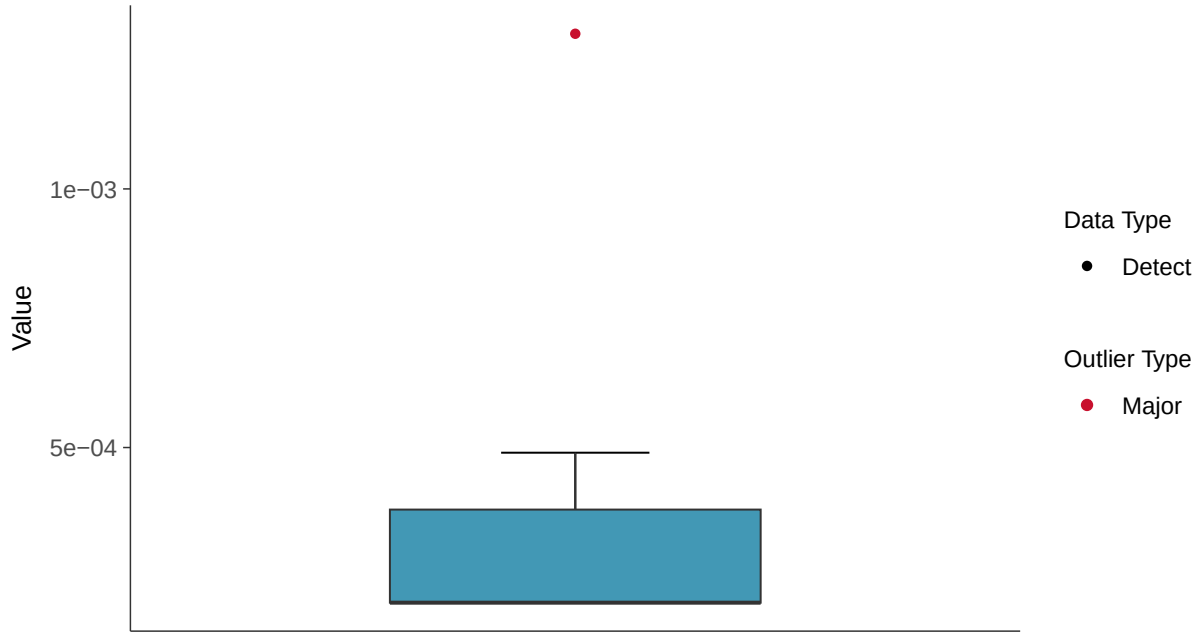
ID: 2_19_6_111





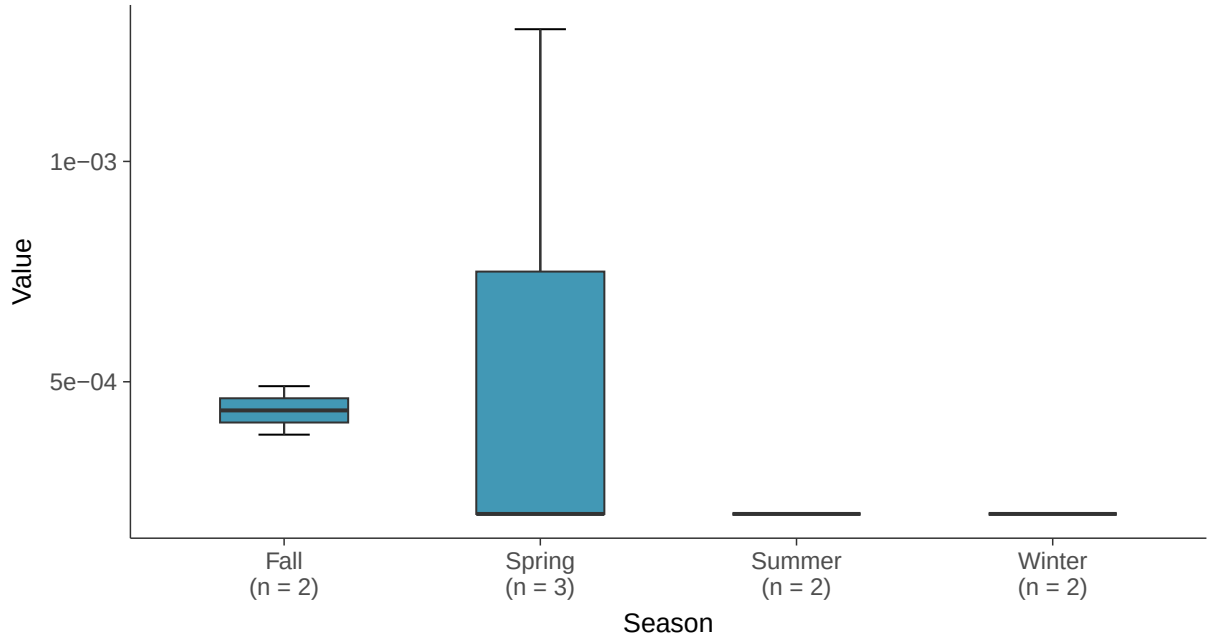
Boxplot

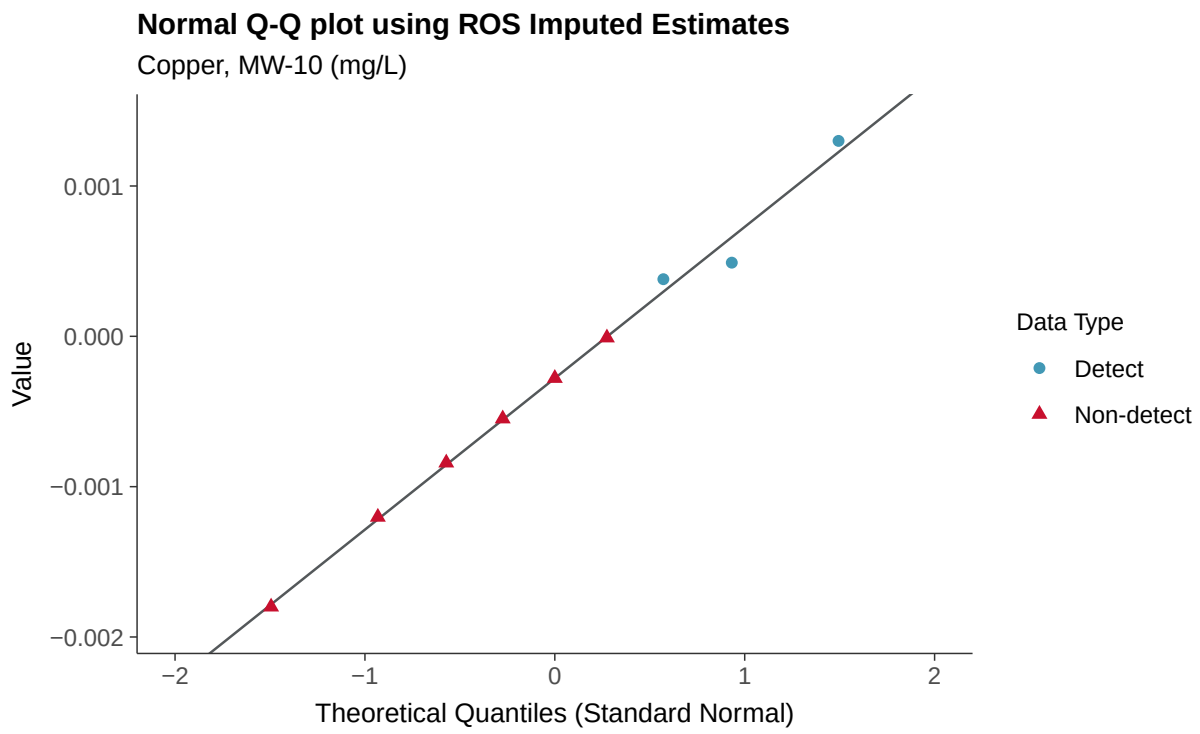
Copper, MW-10 (mg/L)

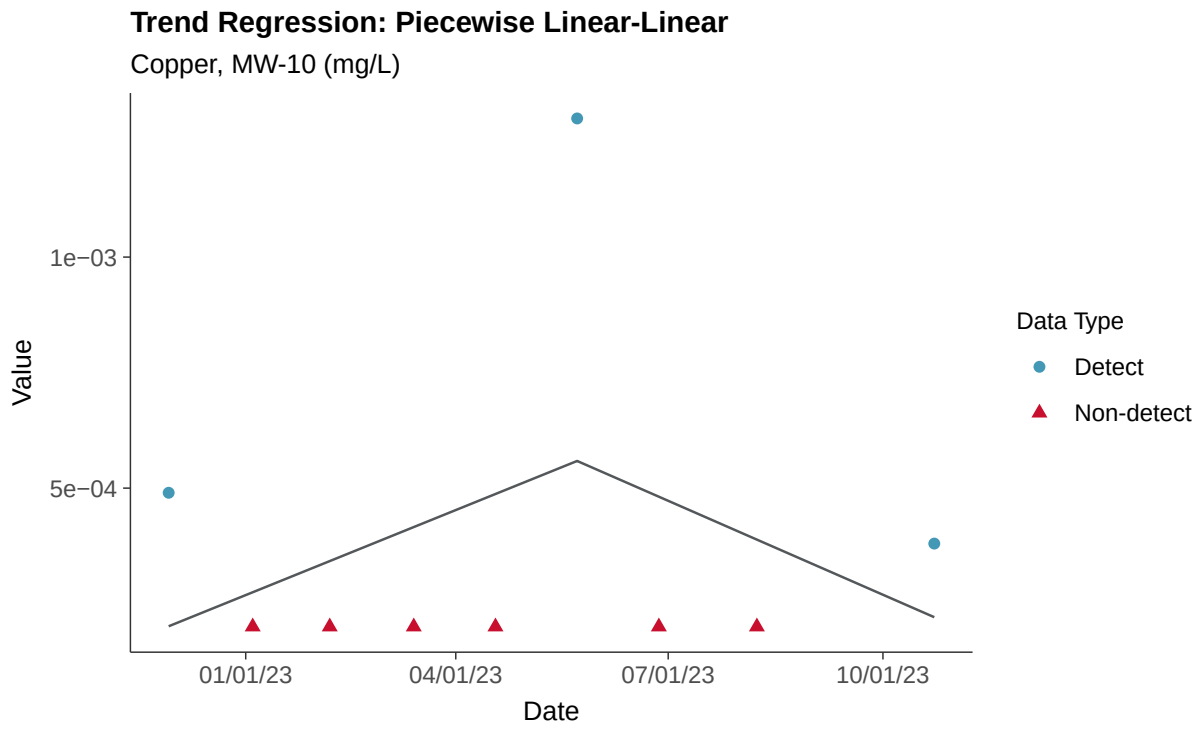


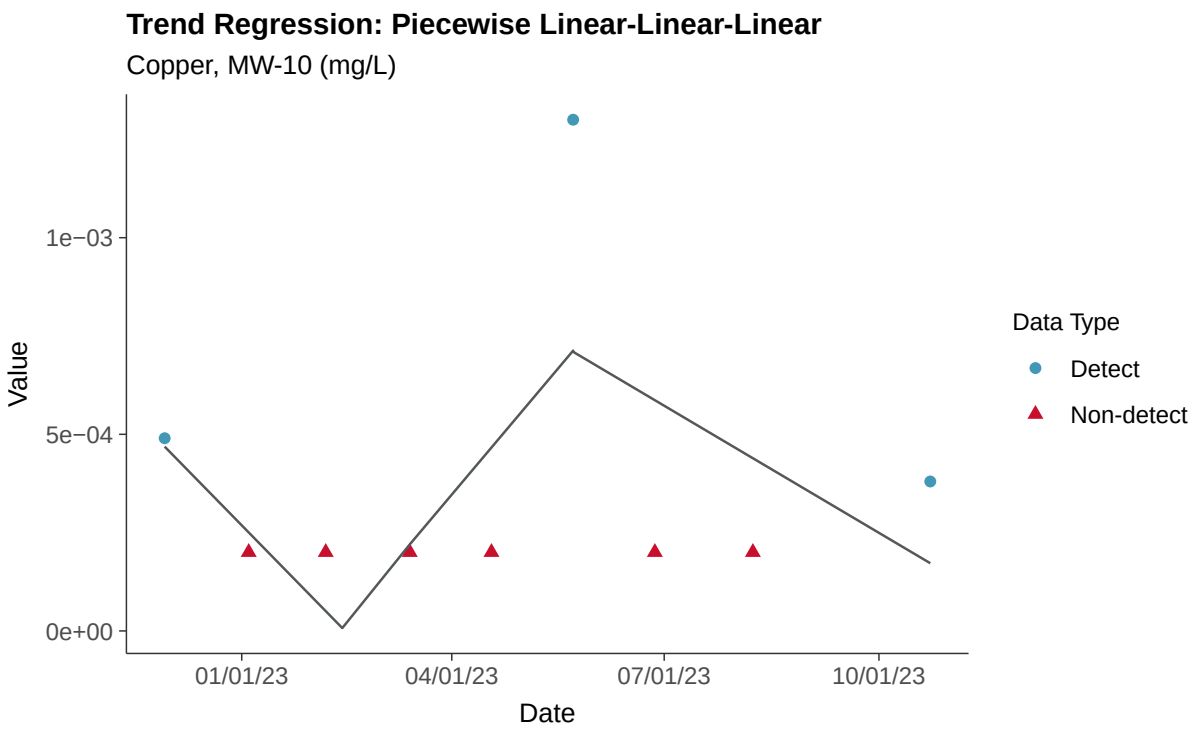
Boxplot by Season

Copper, MW-10 (mg/L)



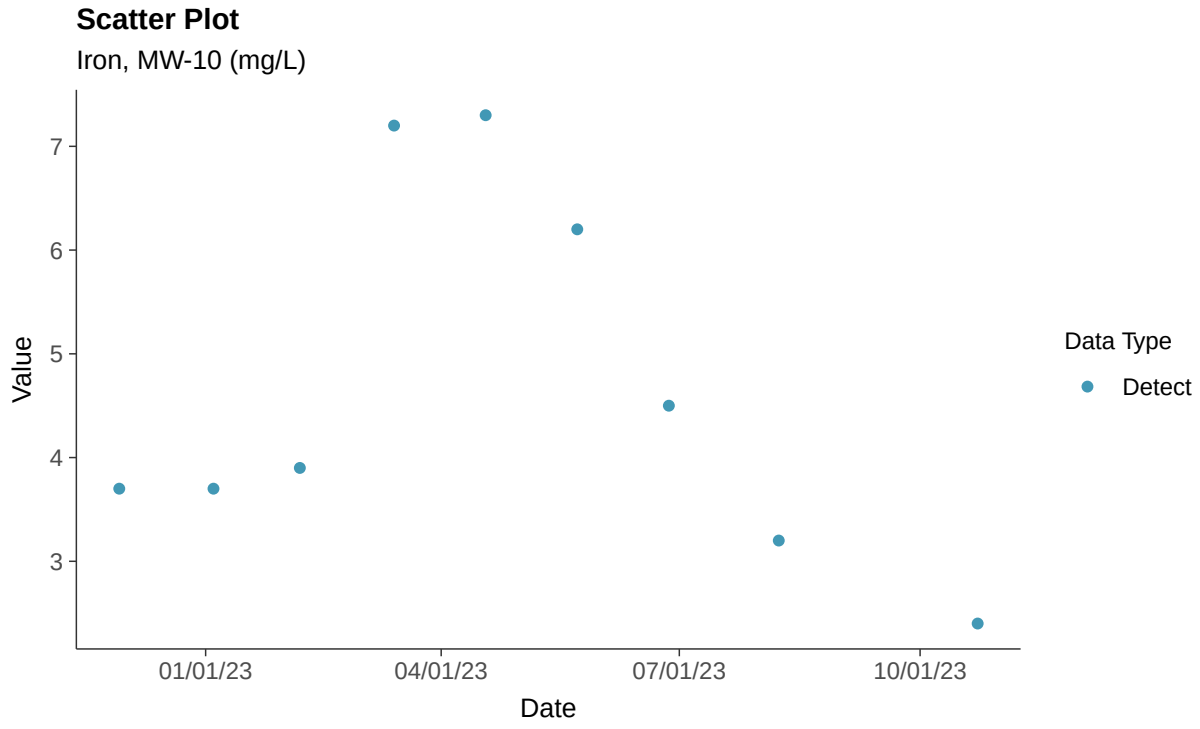

Normal Q-Q plot using ROS Imputed Estimates
Copper, MW-10 (mg/L)
Value
0.001
0.000
−0.001
−0.002
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

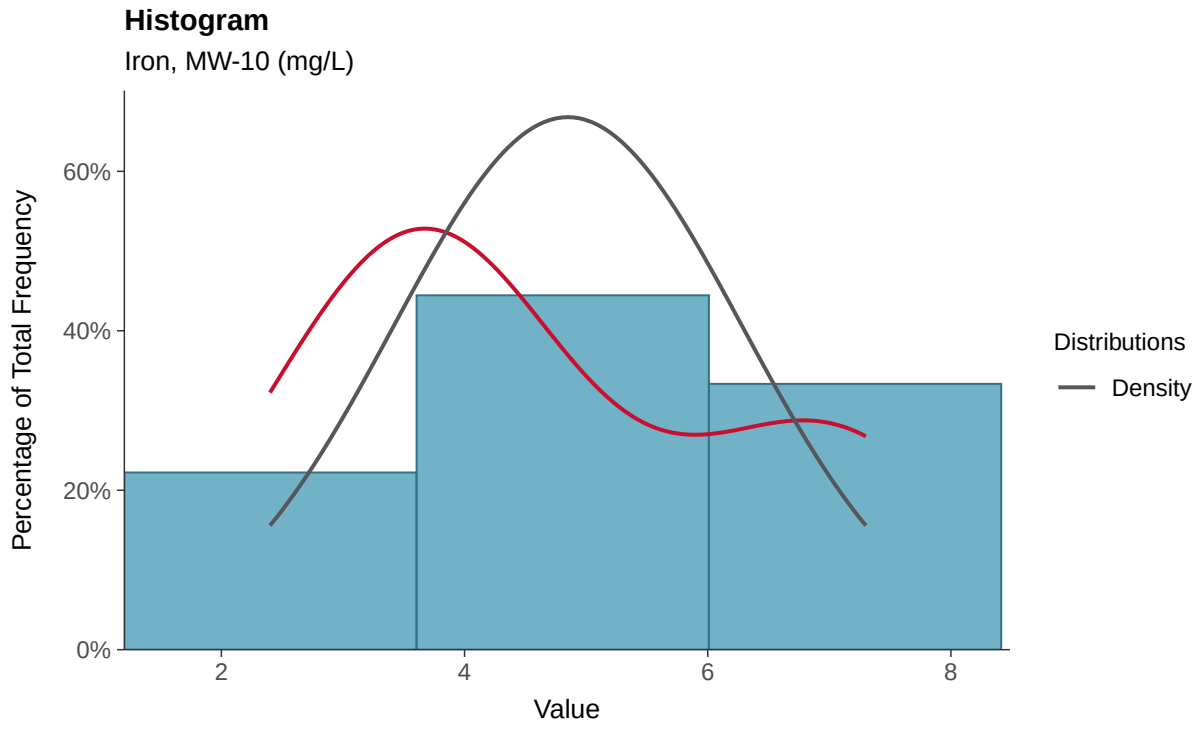

Trend Regression: Piecewise Linear-Linear
Copper, MW-10 (mg/L)
Value
1e−03
5e−04
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Copper, MW-10 (mg/L)
Value
1e−03
5e−04
0e+00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-10

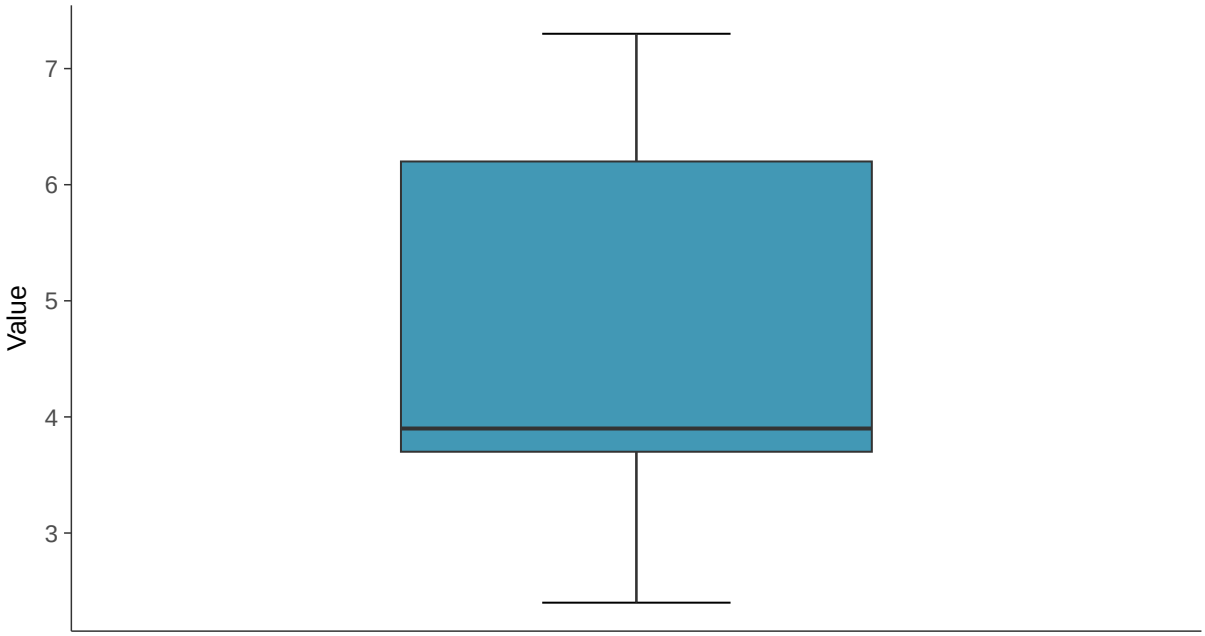
ID: 2_19_6_114





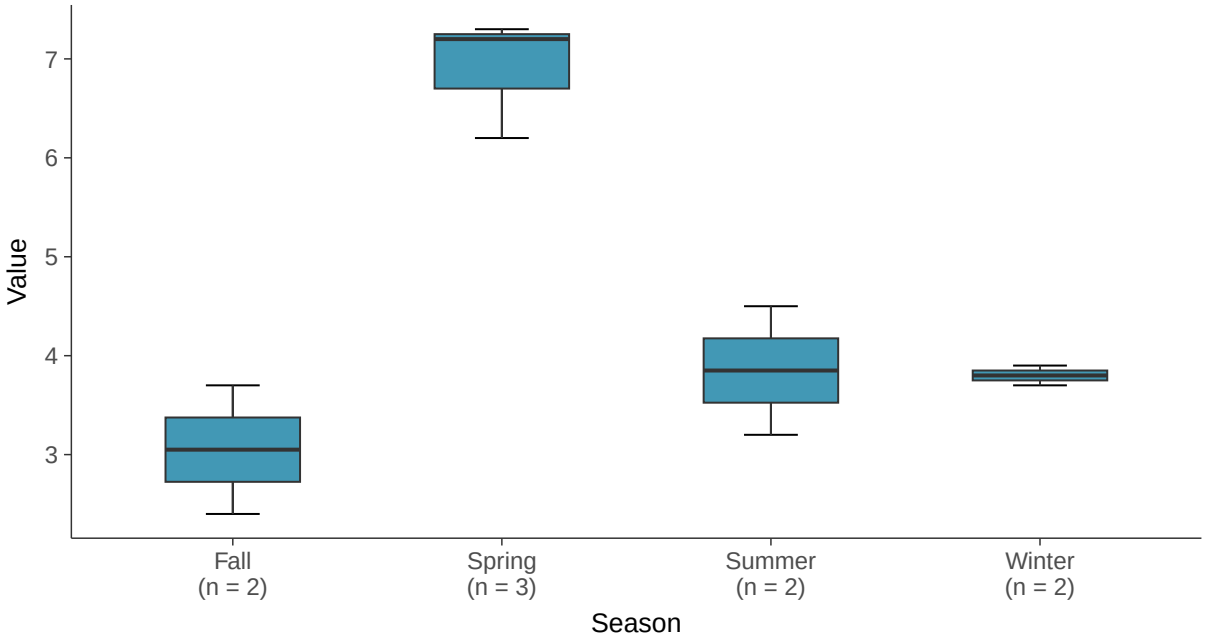
Boxplot

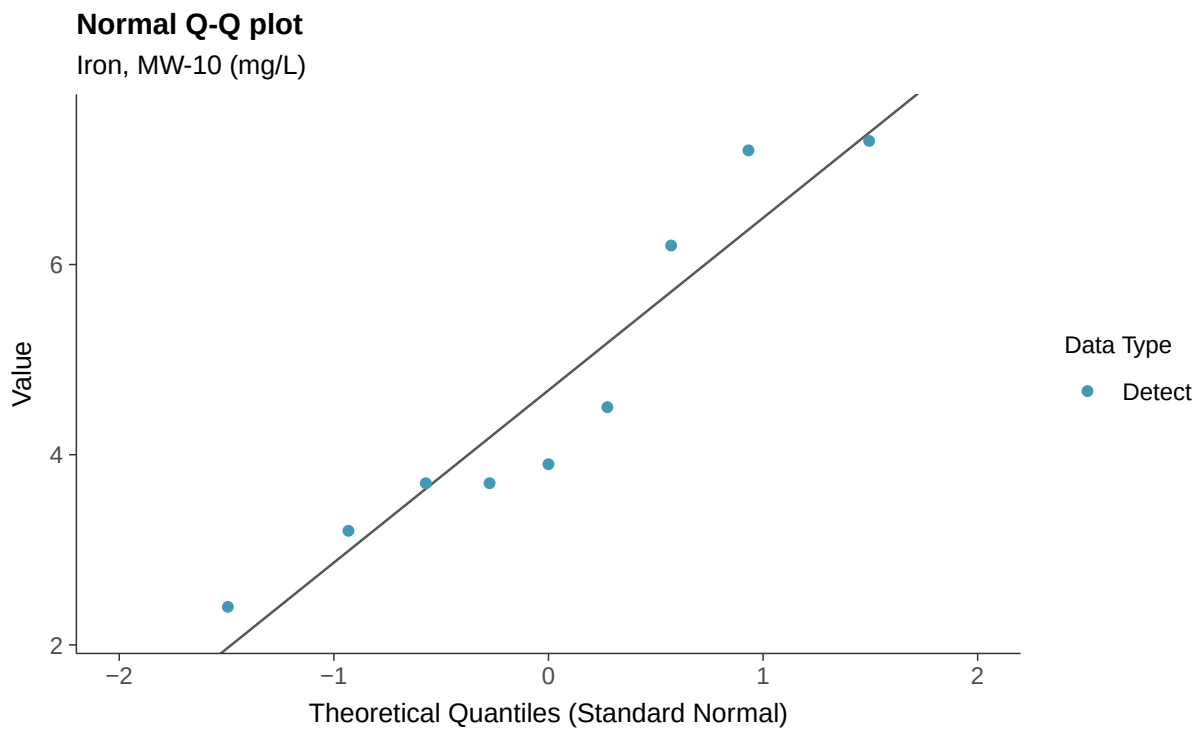
Iron, MW-10 (mg/L)

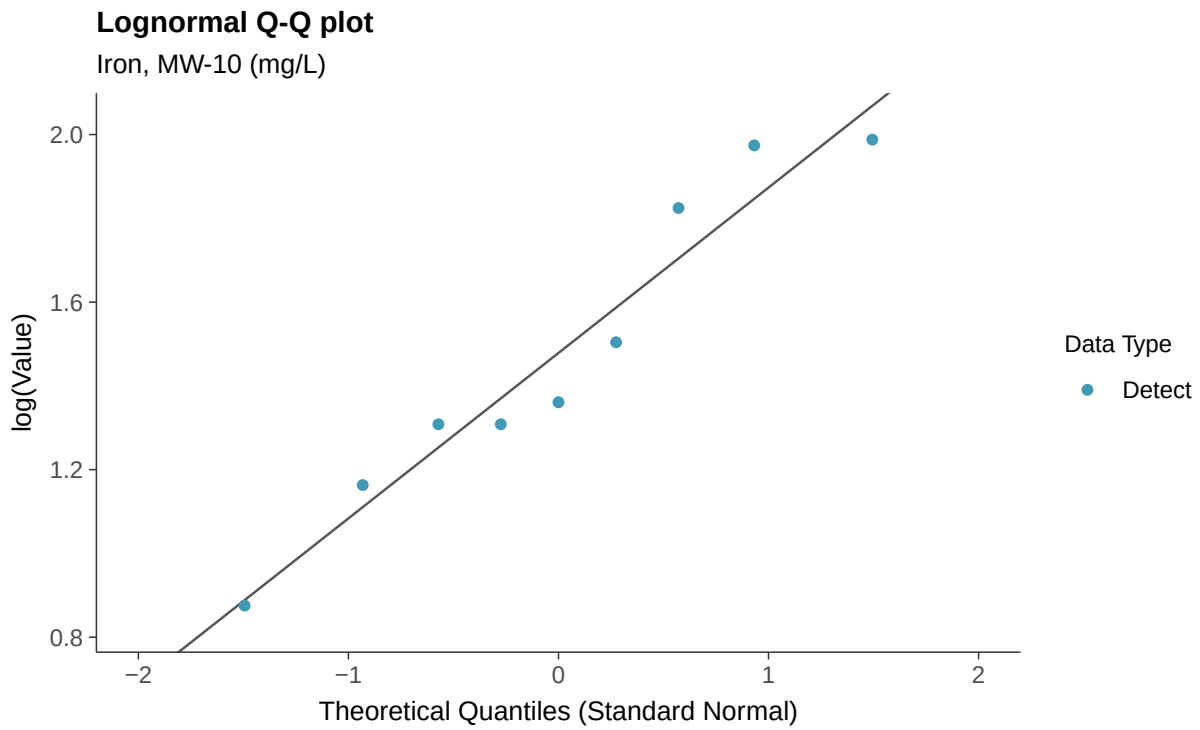


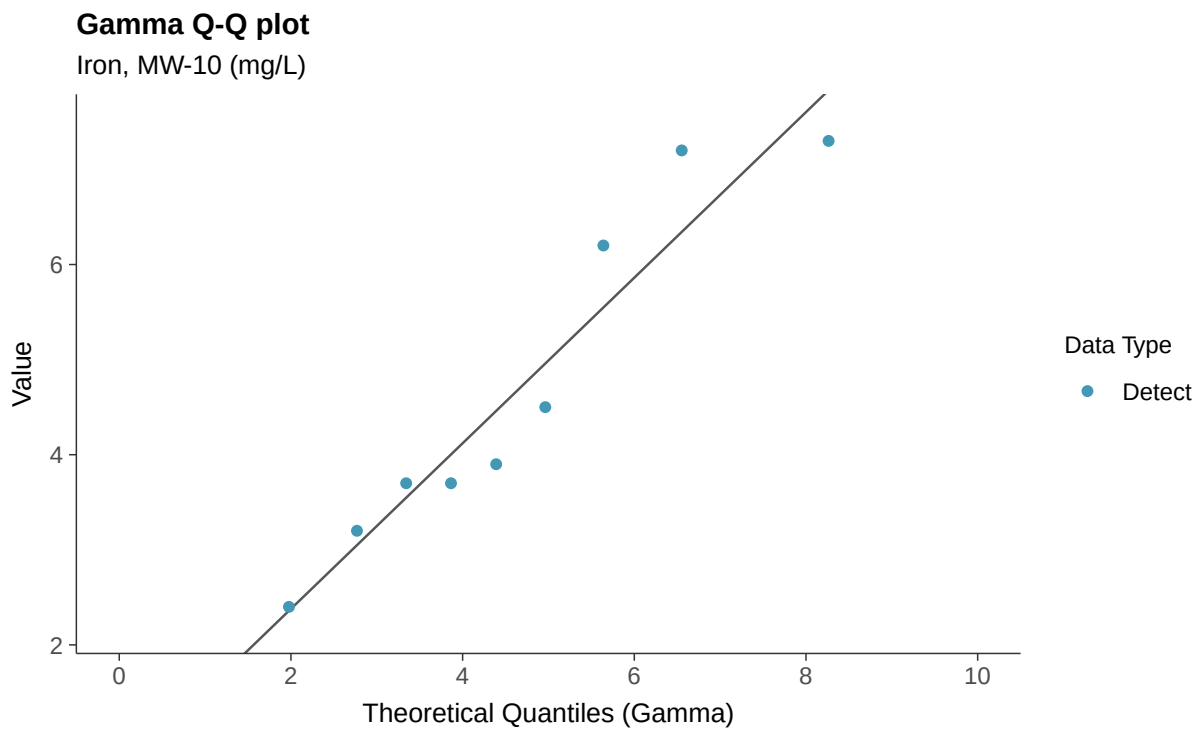
Boxplot by Season

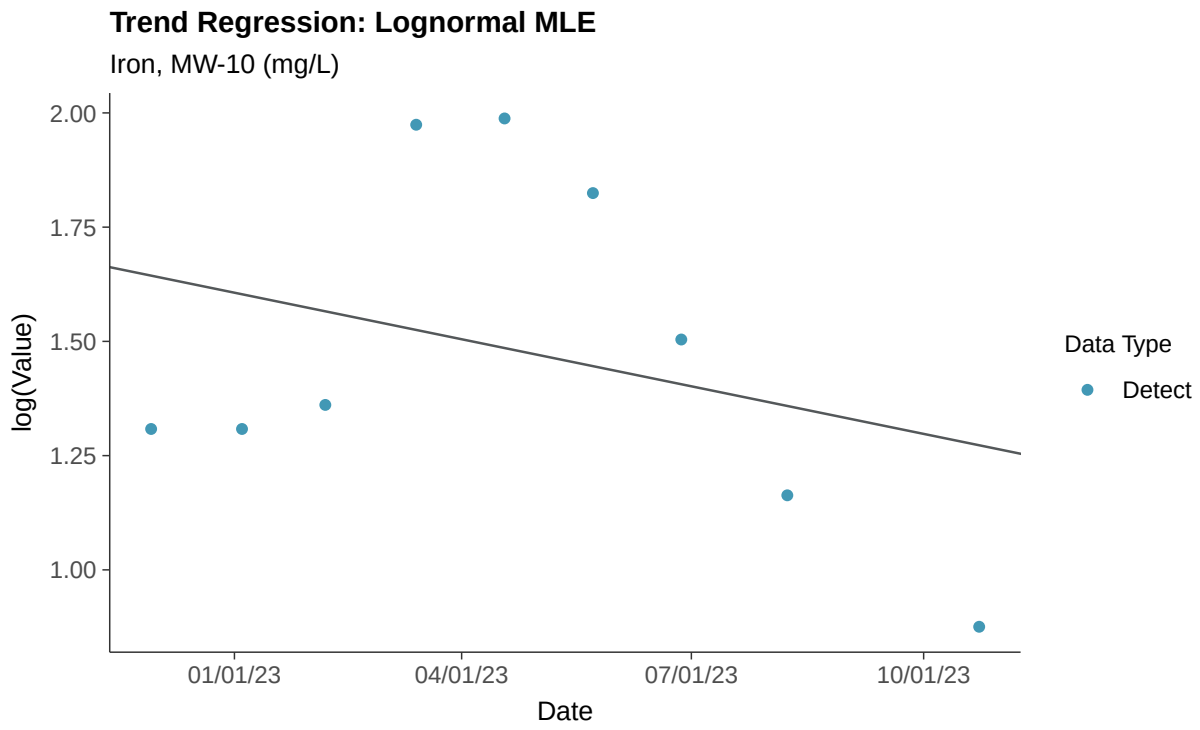
Iron, MW-10 (mg/L)




Normal Q-Q plot
Iron, MW-10 (mg/L)
Value
6
4
2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

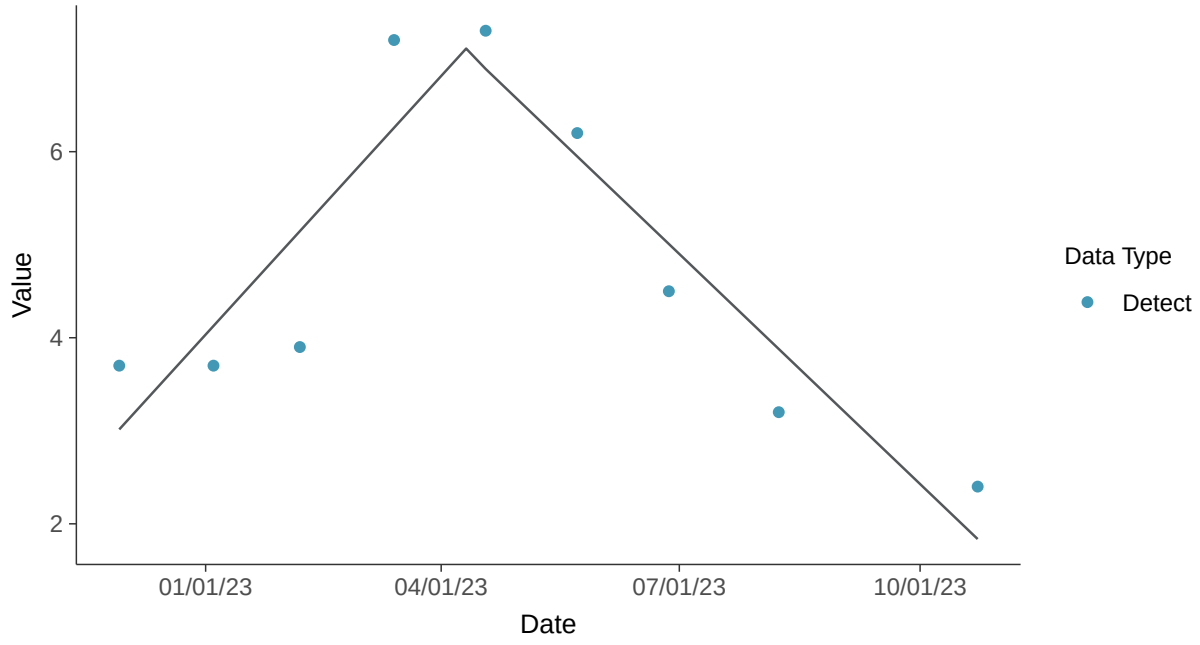

Lognormal Q-Q plot
Iron, MW-10 (mg/L)
log(Value)
2.0
1.6
1.2
0.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Iron, MW-10 (mg/L)
Value
2
4
6
0
2
4
6
8
10
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Iron, MW-10 (mg/L)
log(Value)
2.00
1.75
1.50
1.25
1.00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

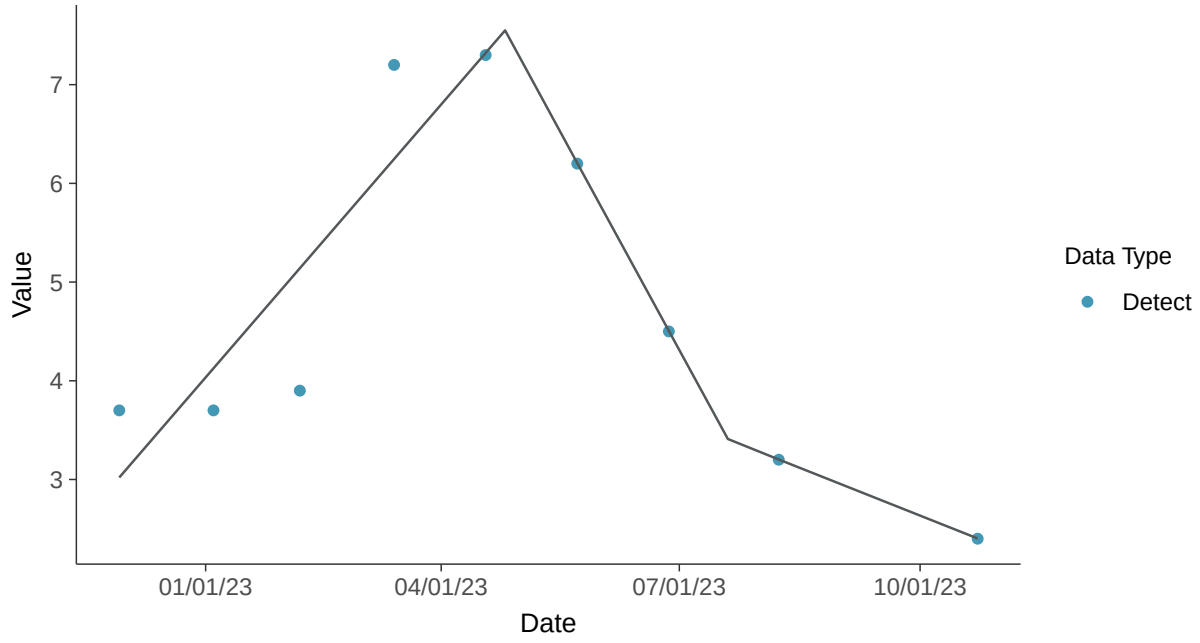
Trend Regression: Piecewise Linear-Linear

Iron, MW-10 (mg/L)



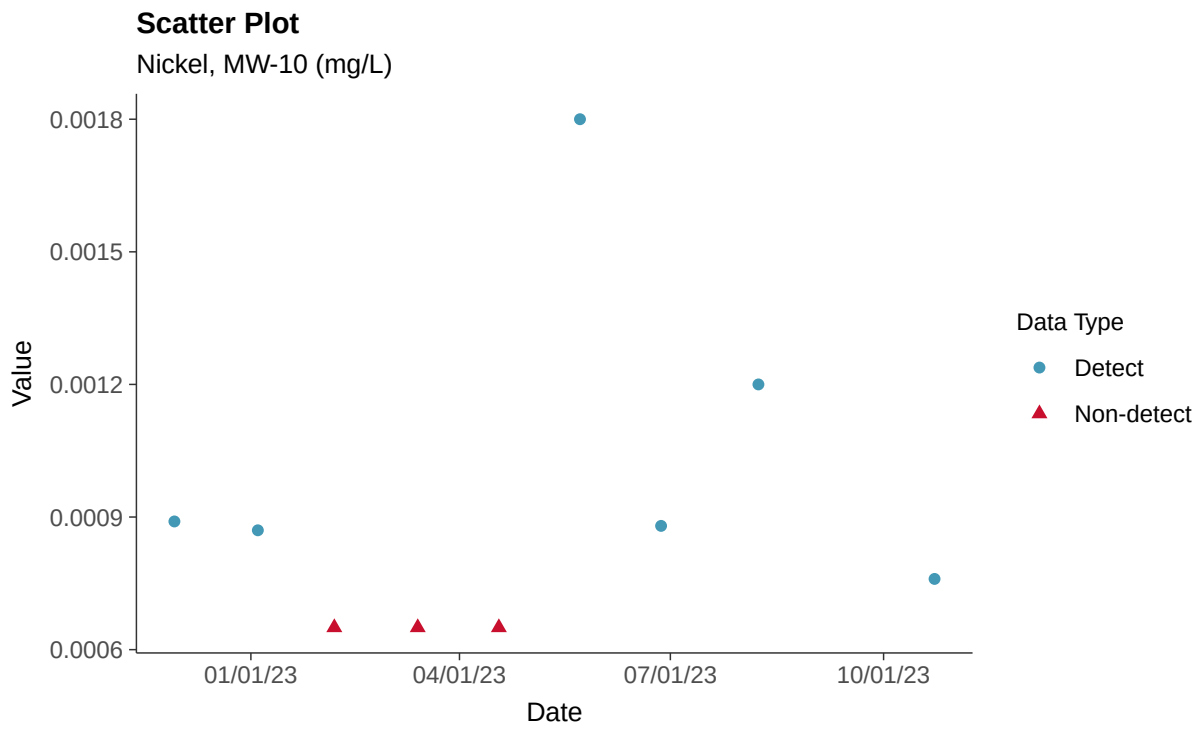
Trend Regression: Piecewise Linear-Linear-Linear

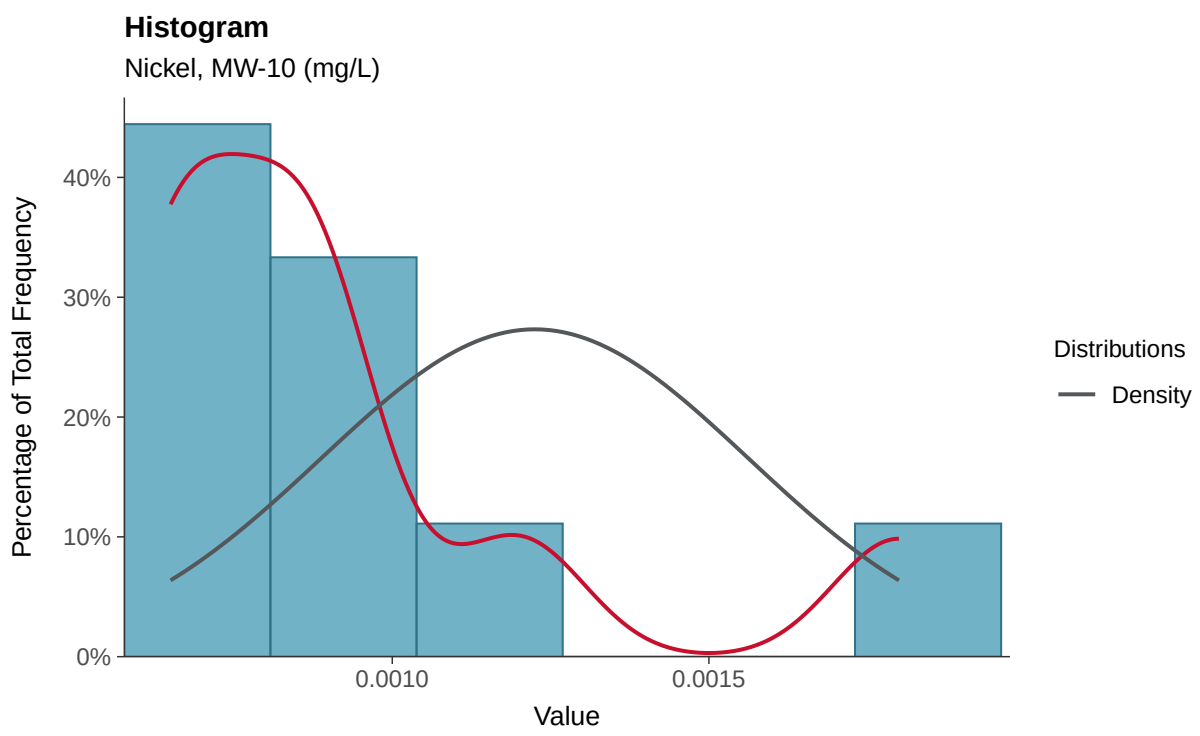
Iron, MW-10 (mg/L)

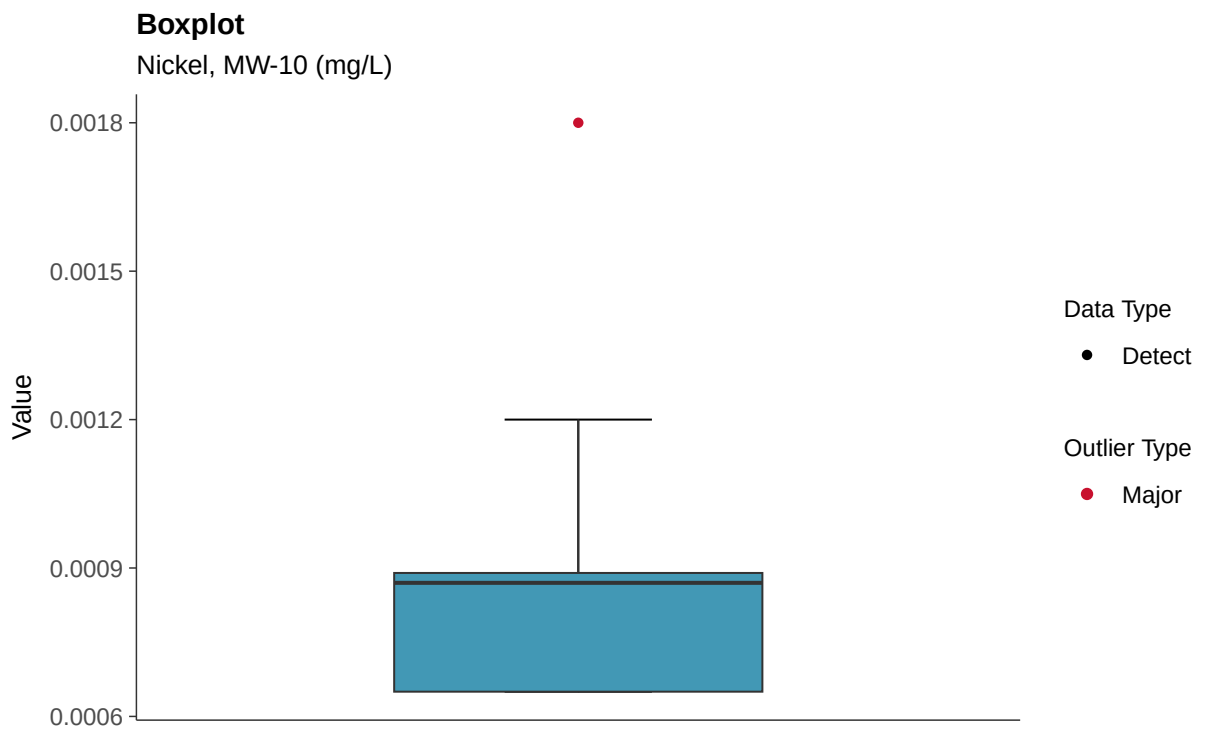


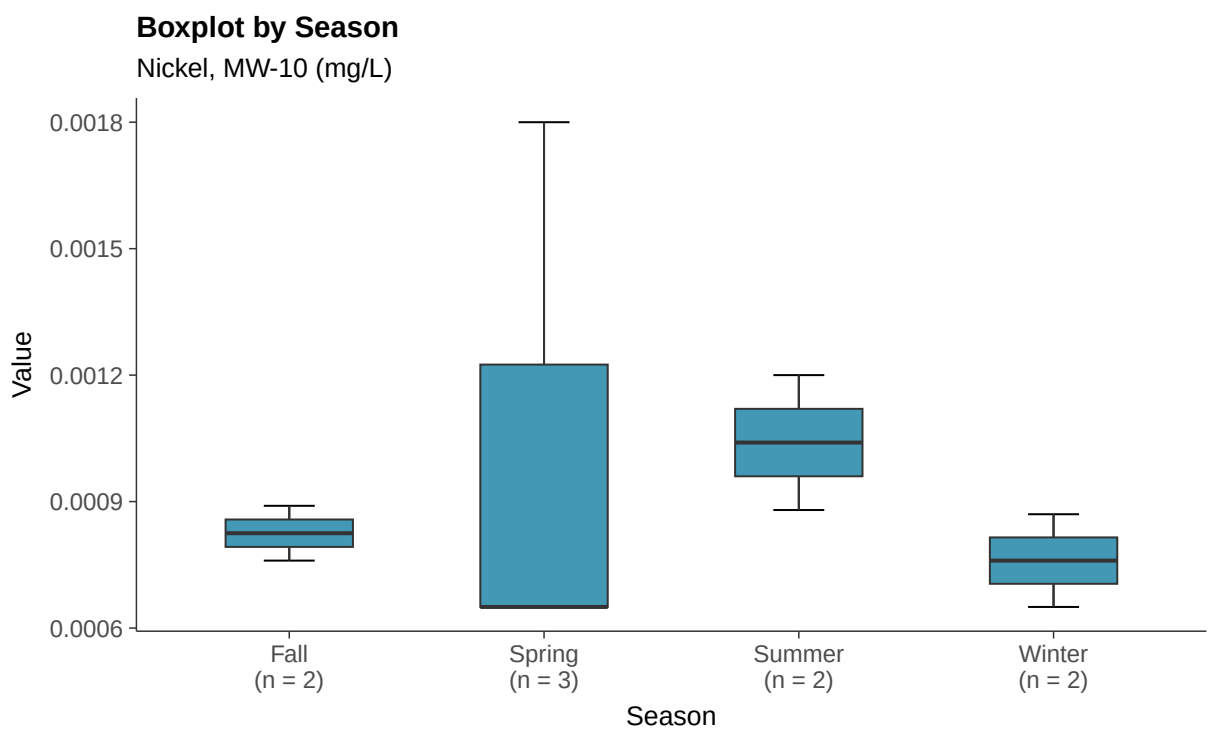
Part 115: Nickel, MW-10

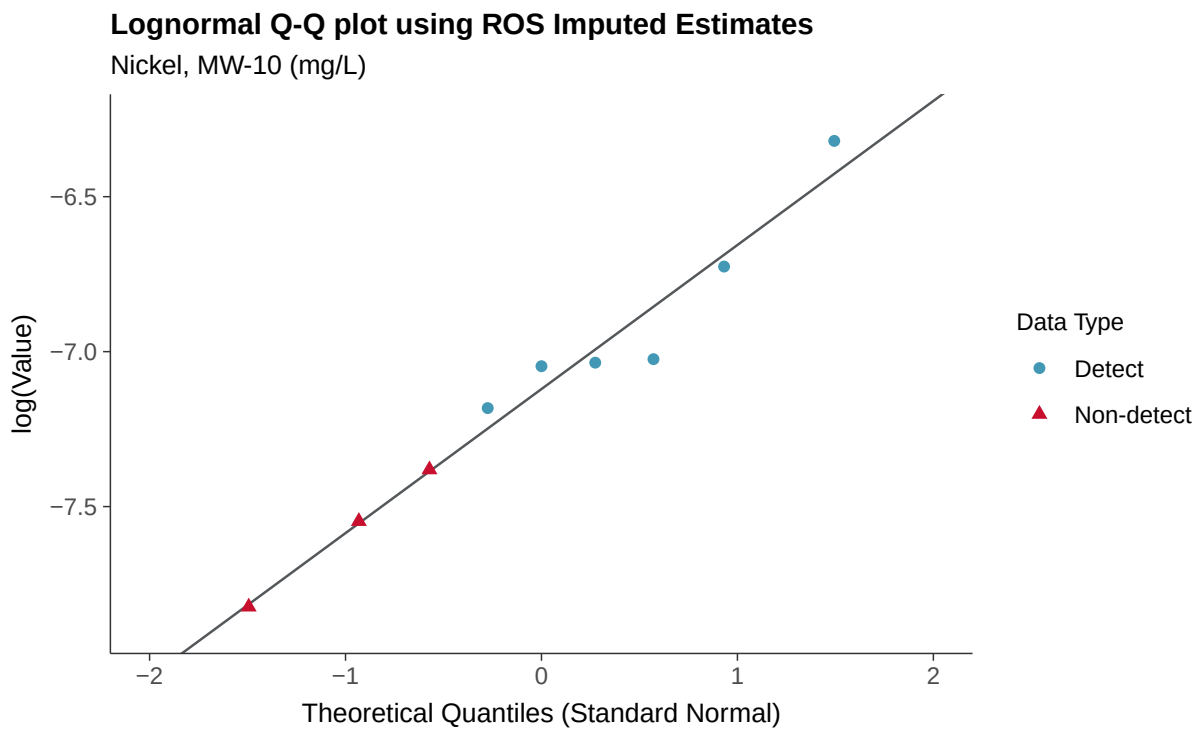
ID: 2_19_6_119

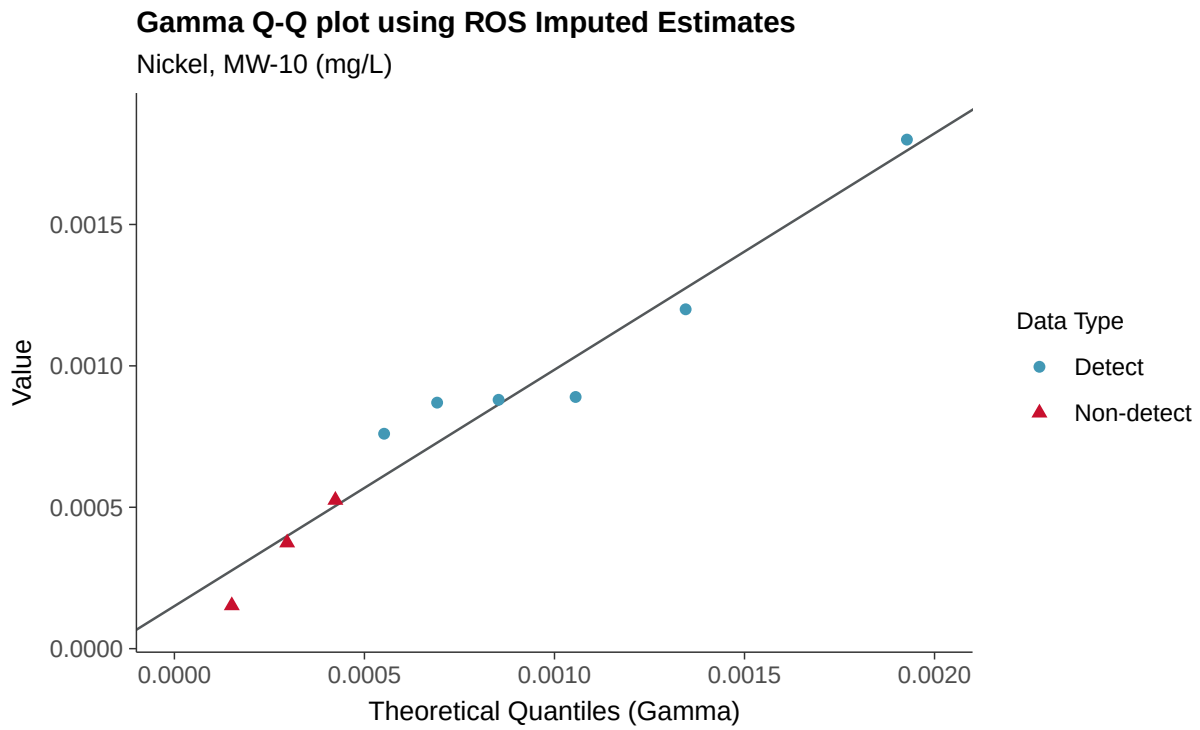


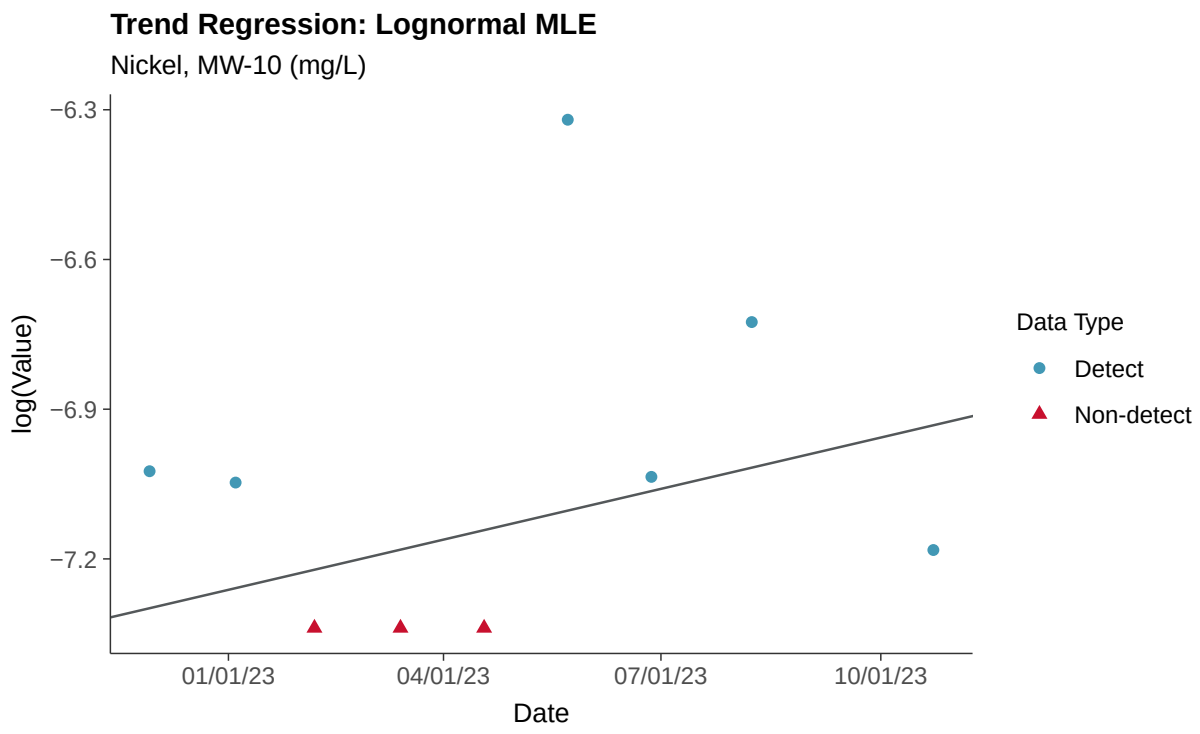


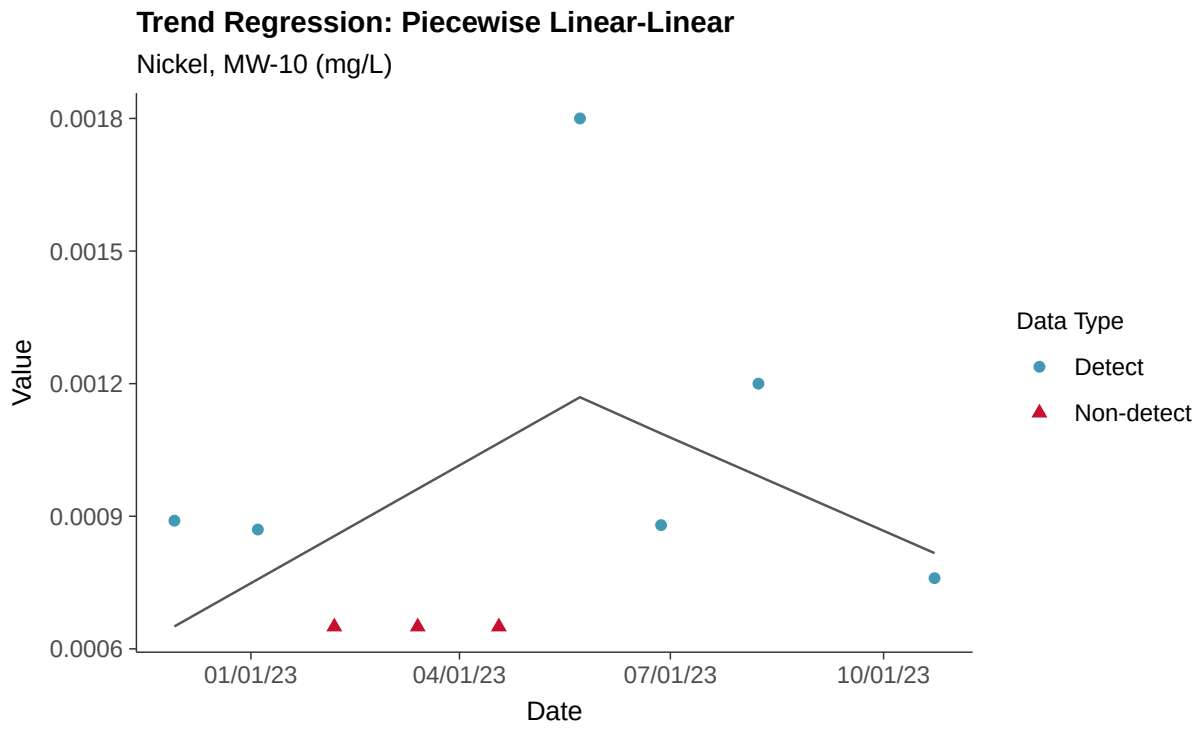

Boxplot
Nickel, MW-10 (mg/L)
Value
0.0018
0.0015
0.0012
0.0009
0.0006
Data Type
Detect
Outlier Type
Major

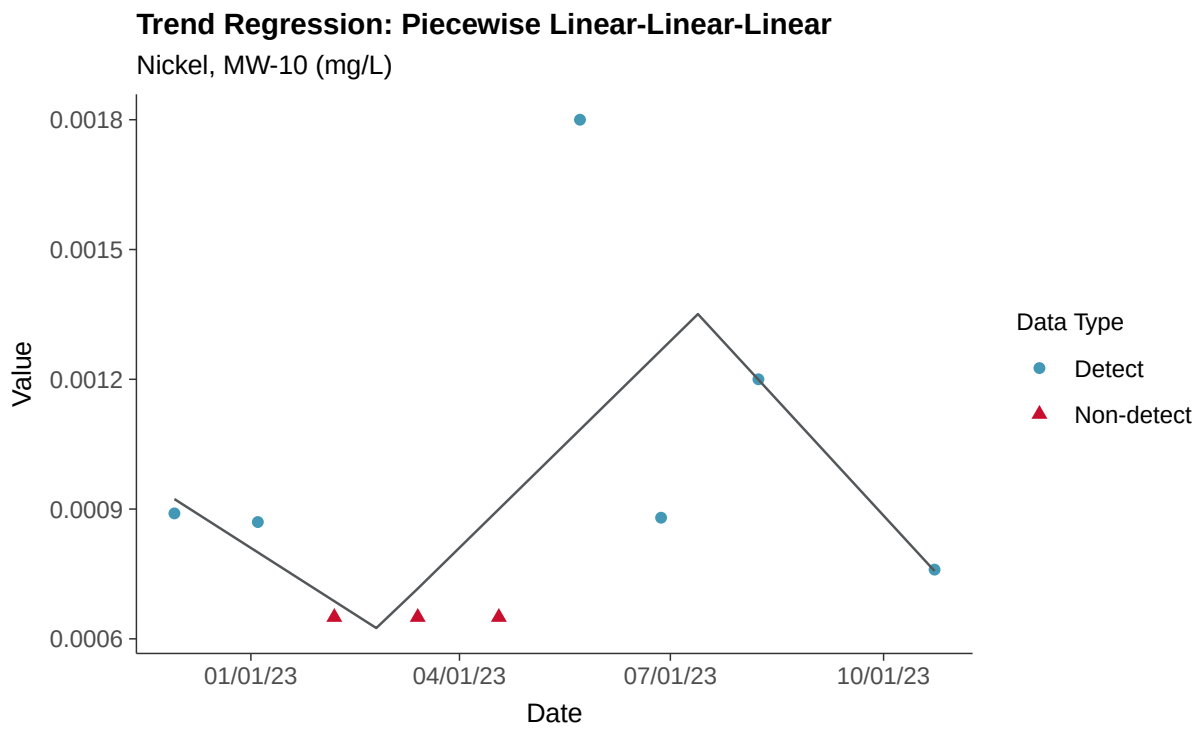

Boxplot by Season
Nickel, MW-10 (mg/L)
Value
0.0018
0.0015
0.0012
0.0009
0.0006
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Lognormal Q-Q plot using ROS Imputed Estimates
Nickel, MW-10 (mg/L)
log(Value)
−6.5
−7.0
−7.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Nickel, MW-10 (mg/L)
Value
0.0015
0.0010
0.0005
0.0000
0.0000
0.0005
0.0010
0.0015
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

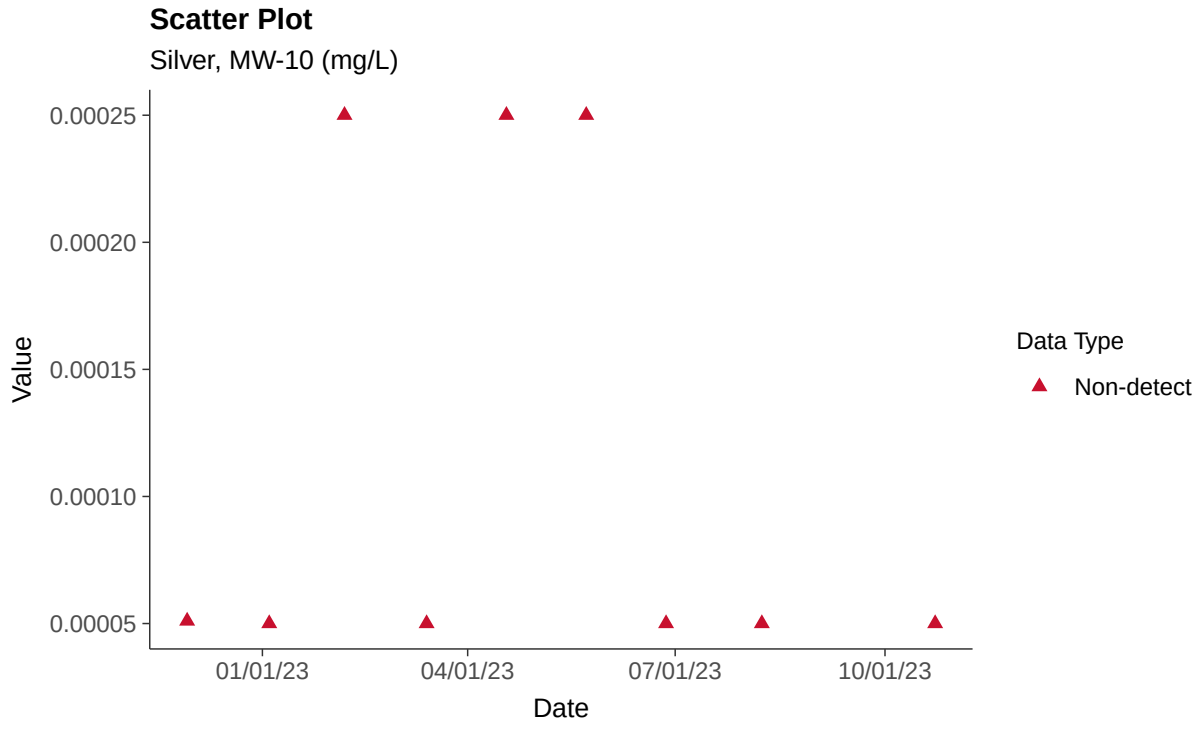

Trend Regression: Lognormal MLE
Nickel, MW-10 (mg/L)
log(Value)
−6.3
−6.6
−6.9
−7.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

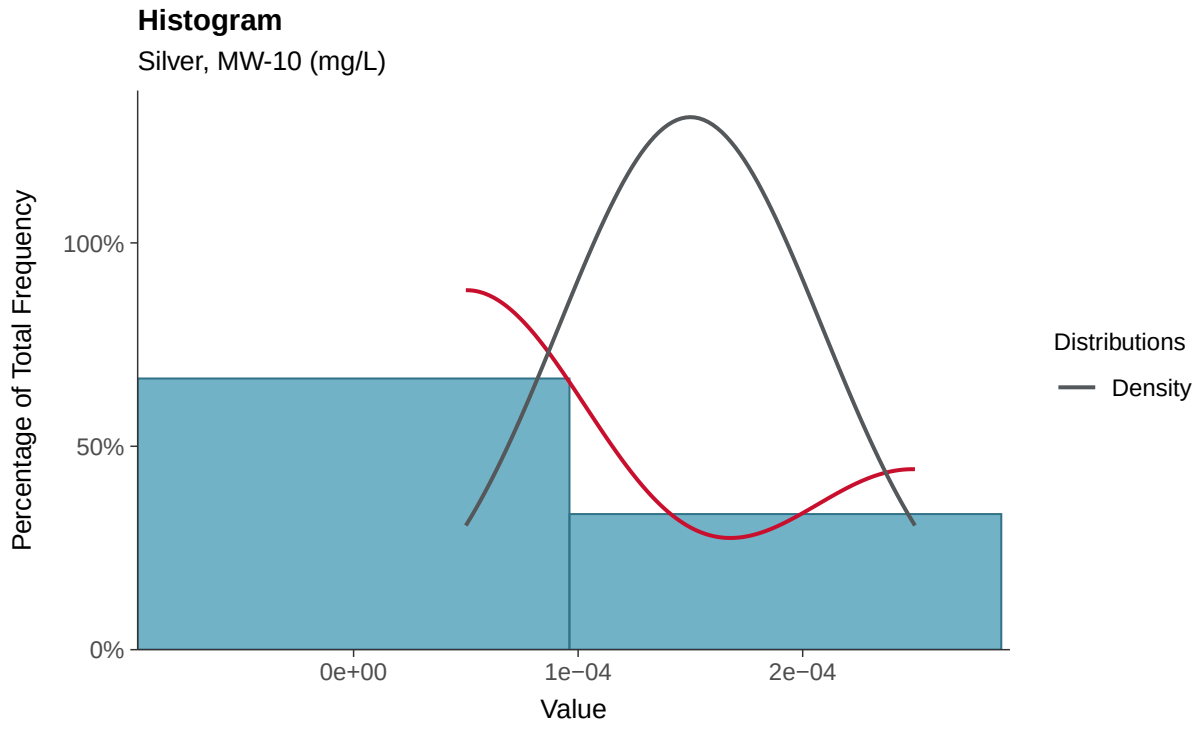

Trend Regression: Piecewise Linear-Linear
Nickel, MW-10 (mg/L)
Value
0.0018
0.0015
0.0012
0.0009
0.0006
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-10 (mg/L)
0.0018
0.0015
0.0012
0.0009
0.0006
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Silver, MW-10

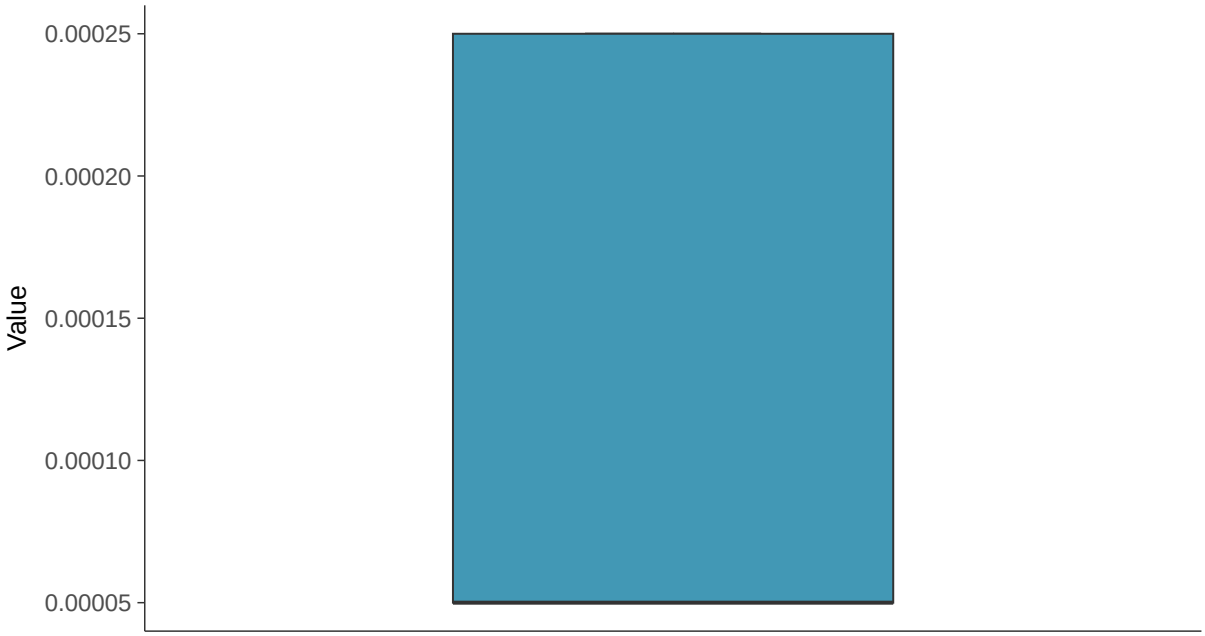
ID: 2_19_6_123





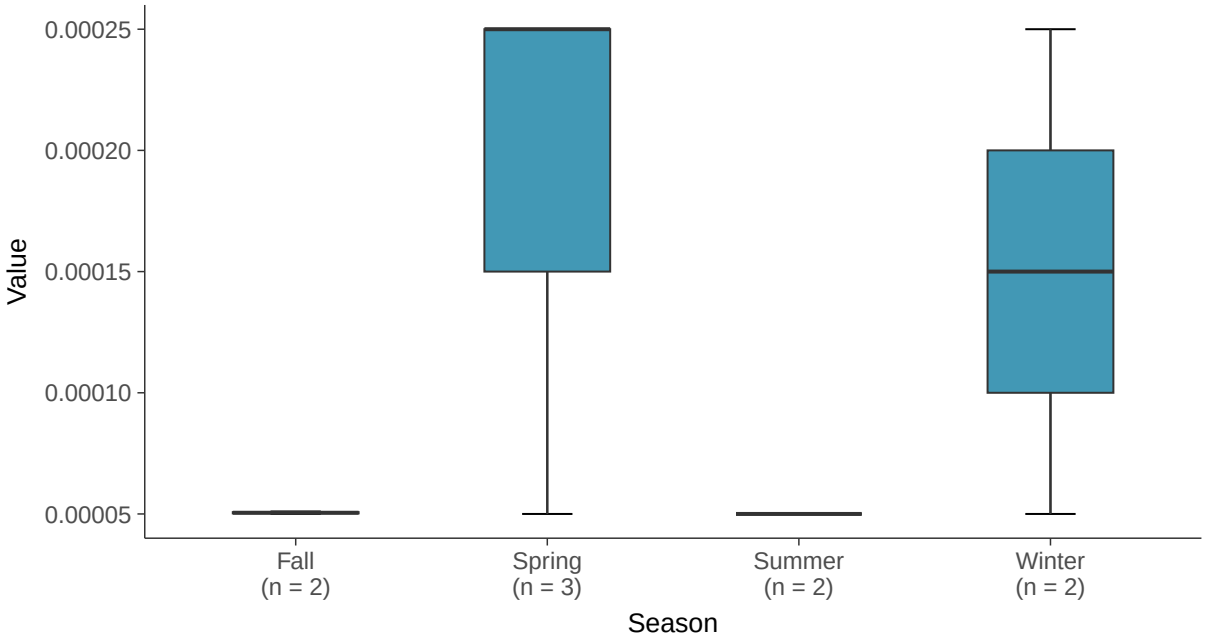
Boxplot

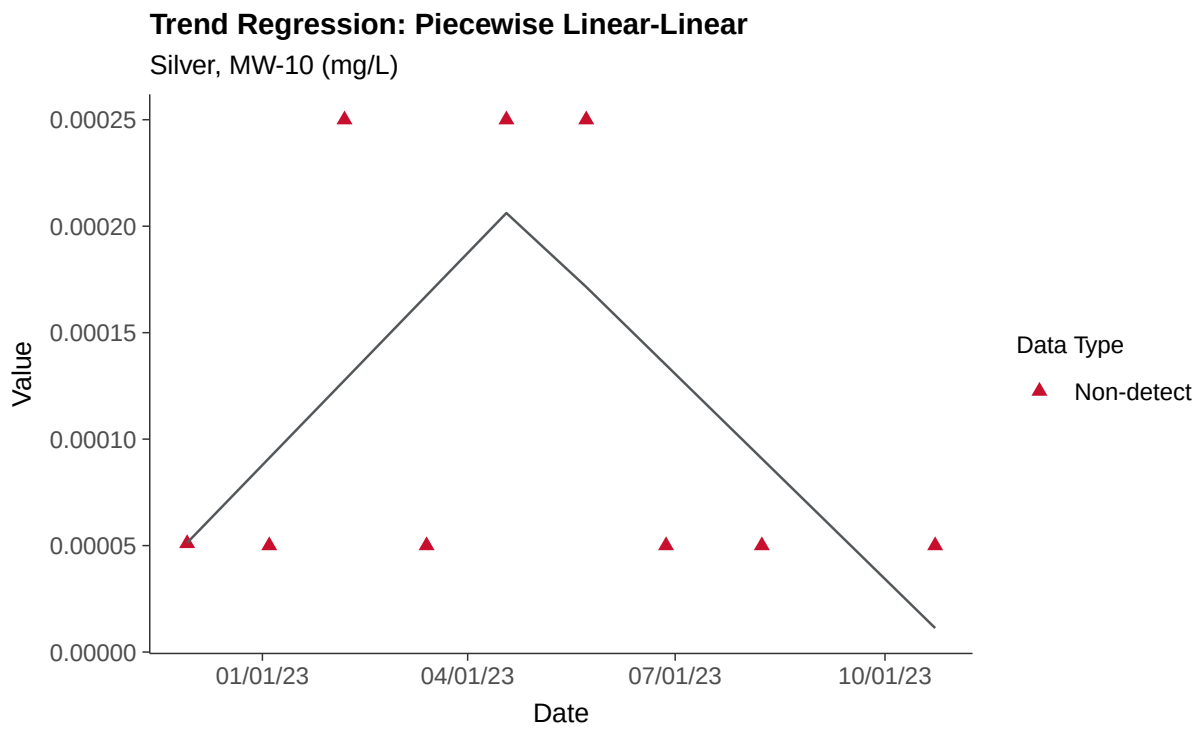
Silver, MW-10 (mg/L)

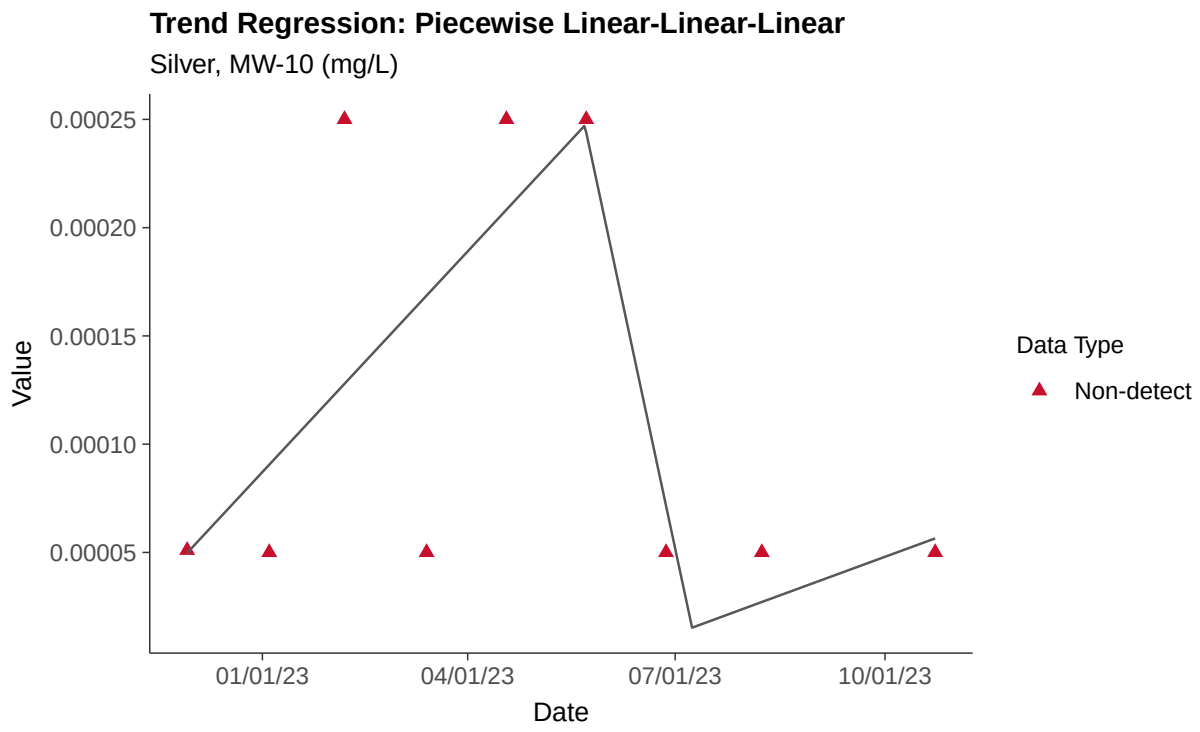


Boxplot by Season

Silver, MW-10 (mg/L)

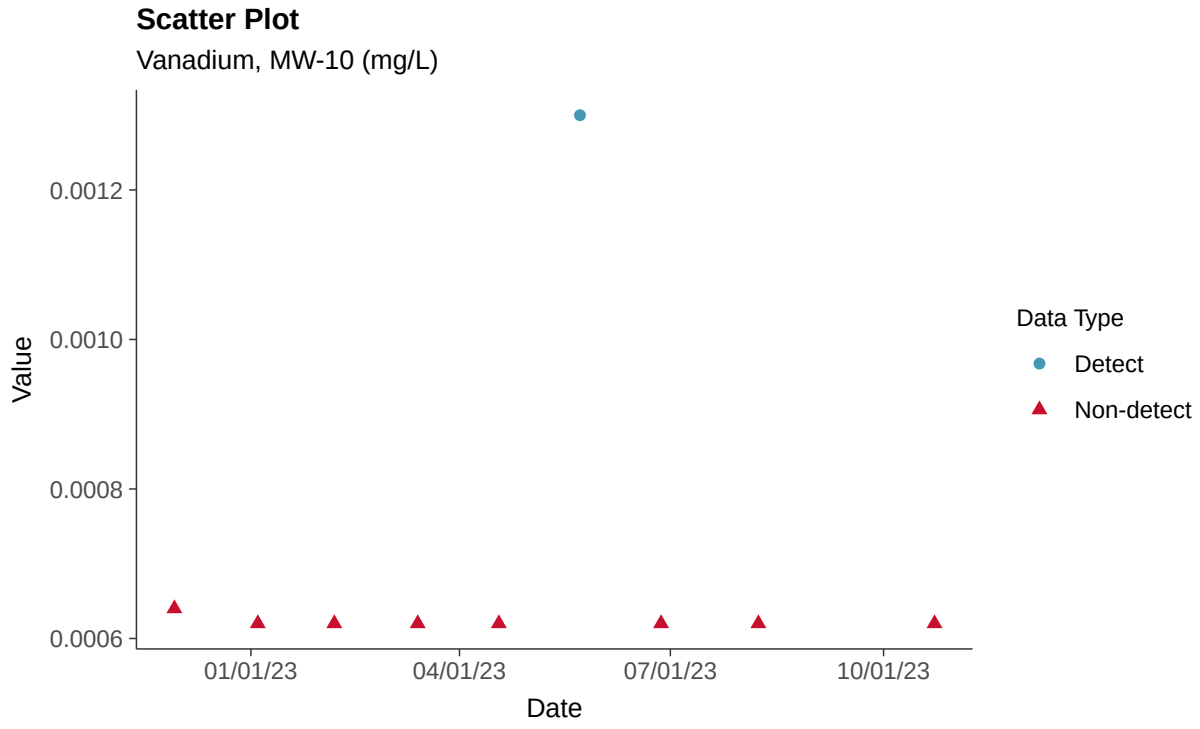


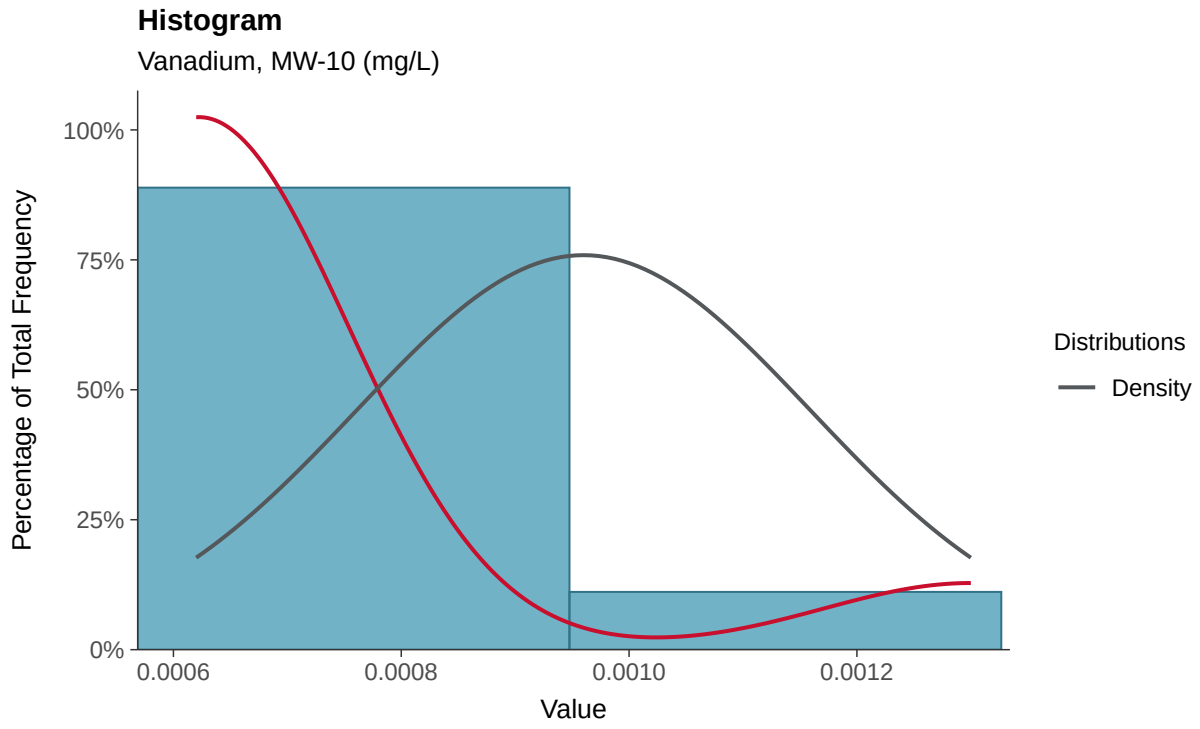

Trend Regression: Piecewise Linear-Linear
Silver, MW-10 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

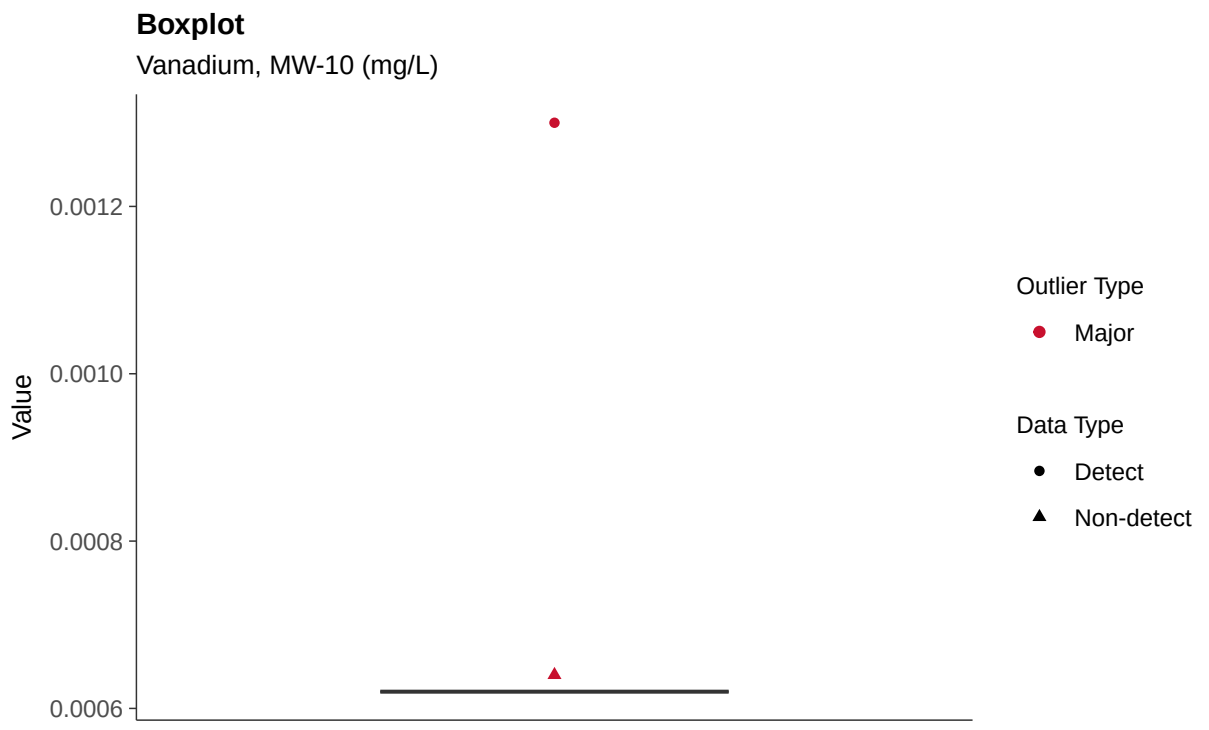

Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-10 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

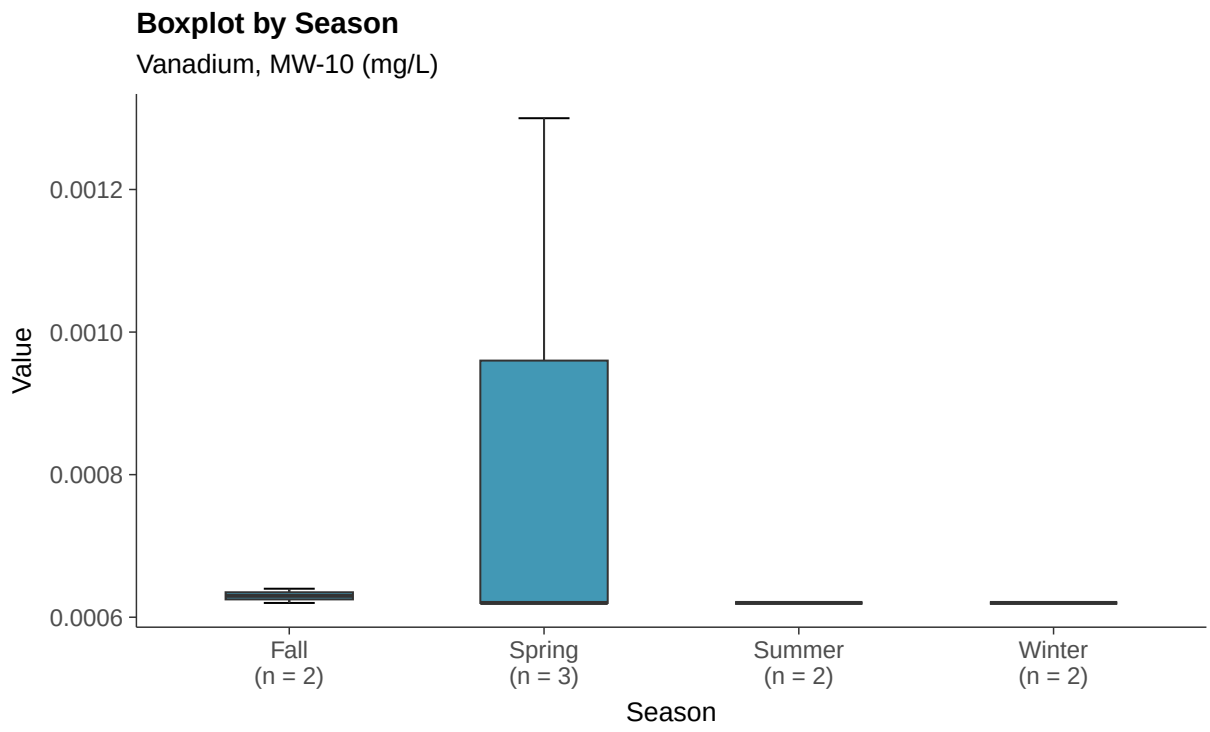
Part 115: Vanadium, MW-10

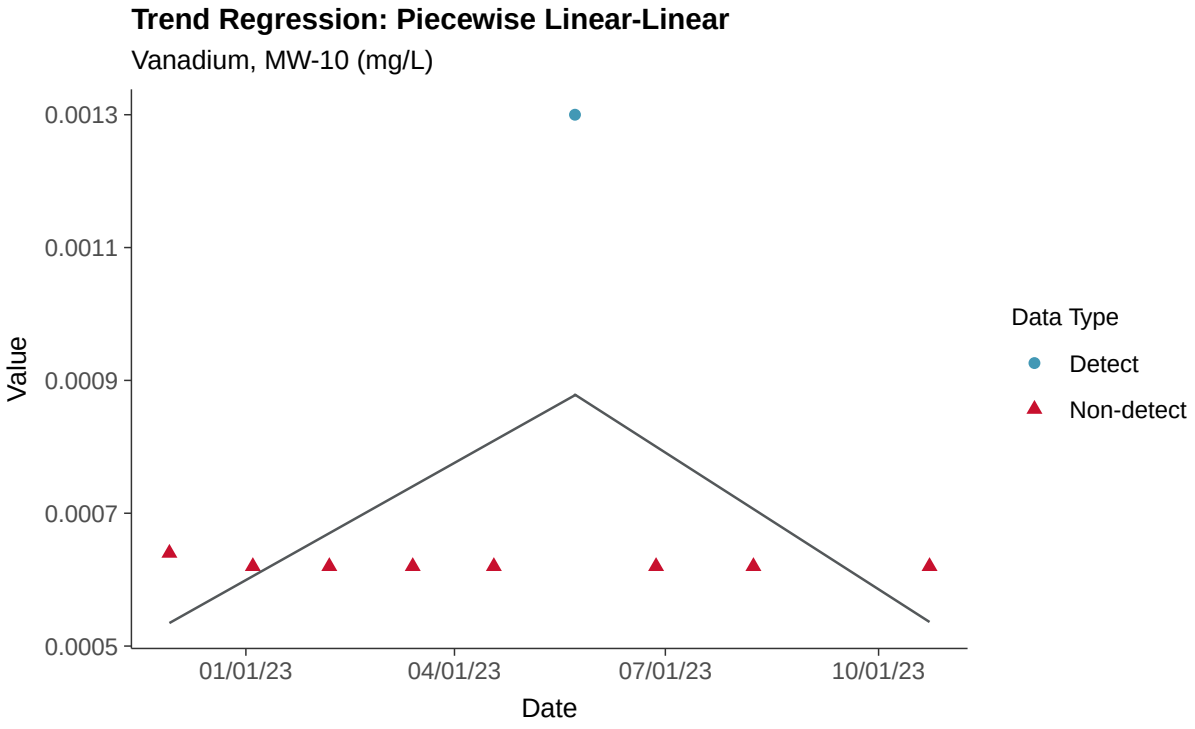
ID: 2_19_6_129

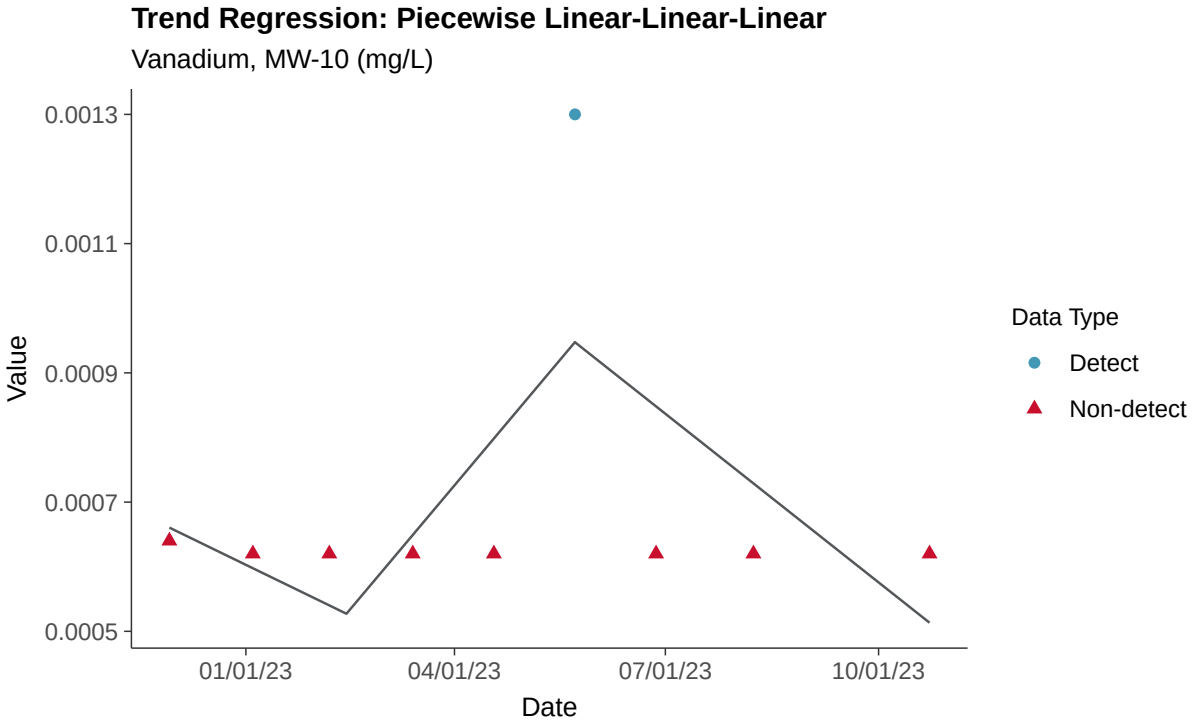





Boxplot
Vanadium, MW-10 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
Outlier Type
Major
Data Type
Detect
Non-detect

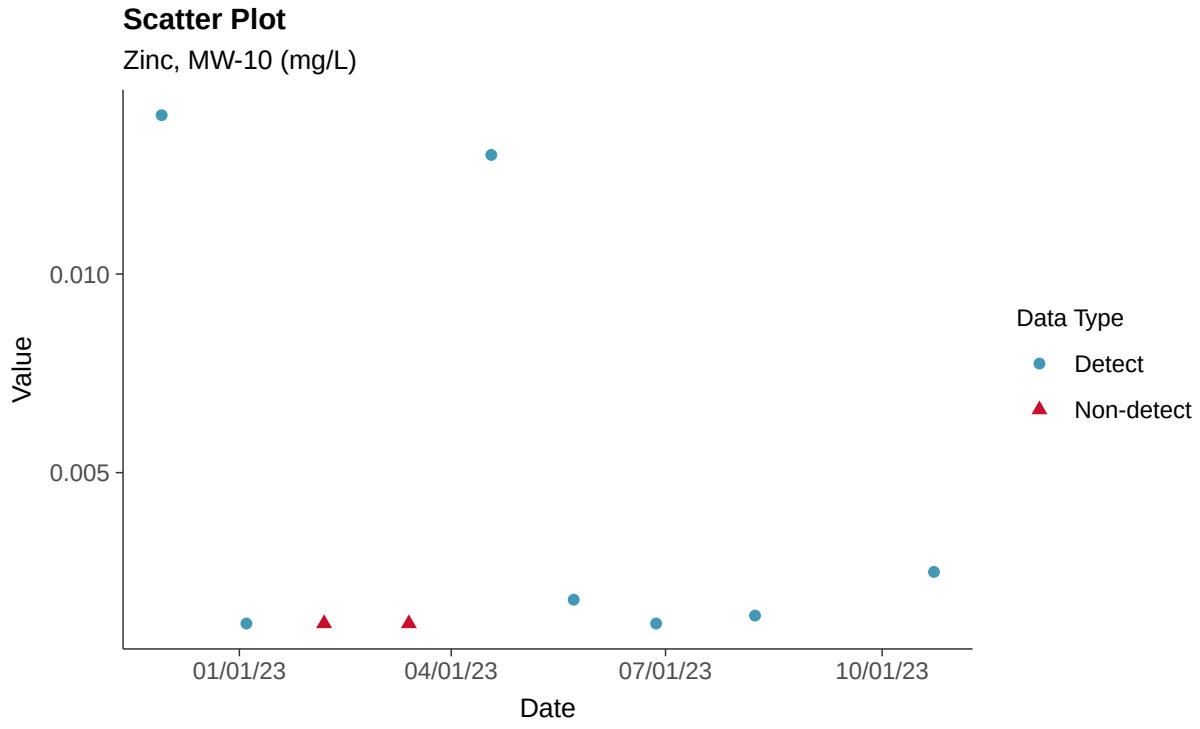

Boxplot by Season
Vanadium, MW-10 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

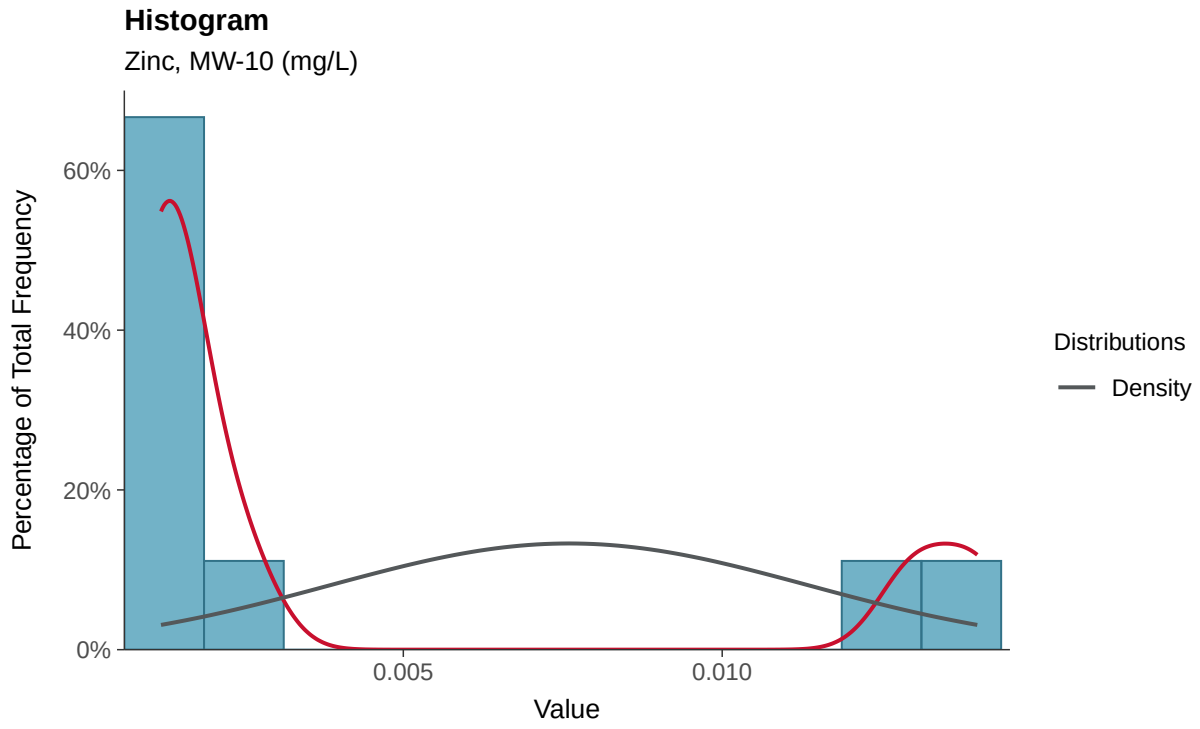

Trend Regression: Piecewise Linear-Linear
Vanadium, MW-10 (mg/L)
0.0013
0.0011
0.0009
0.0007
0.0005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Vanadium, MW-10 (mg/L)
0.0013
0.0011
0.0009
0.0007
0.0005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Zinc, MW-10

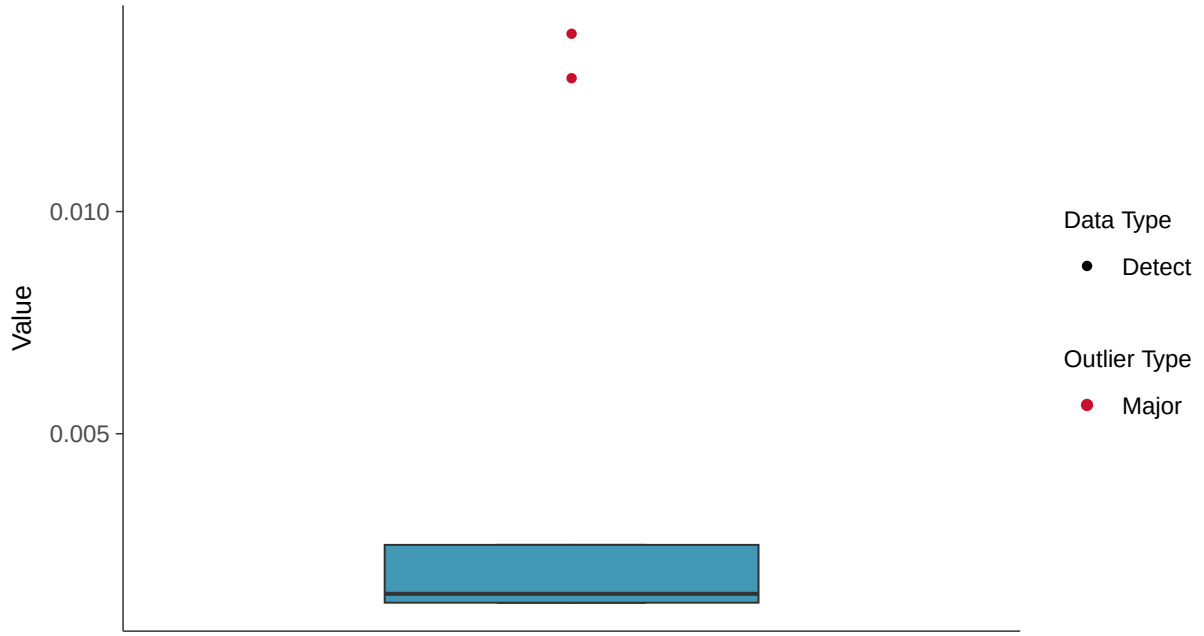
ID: 2_19_6_130





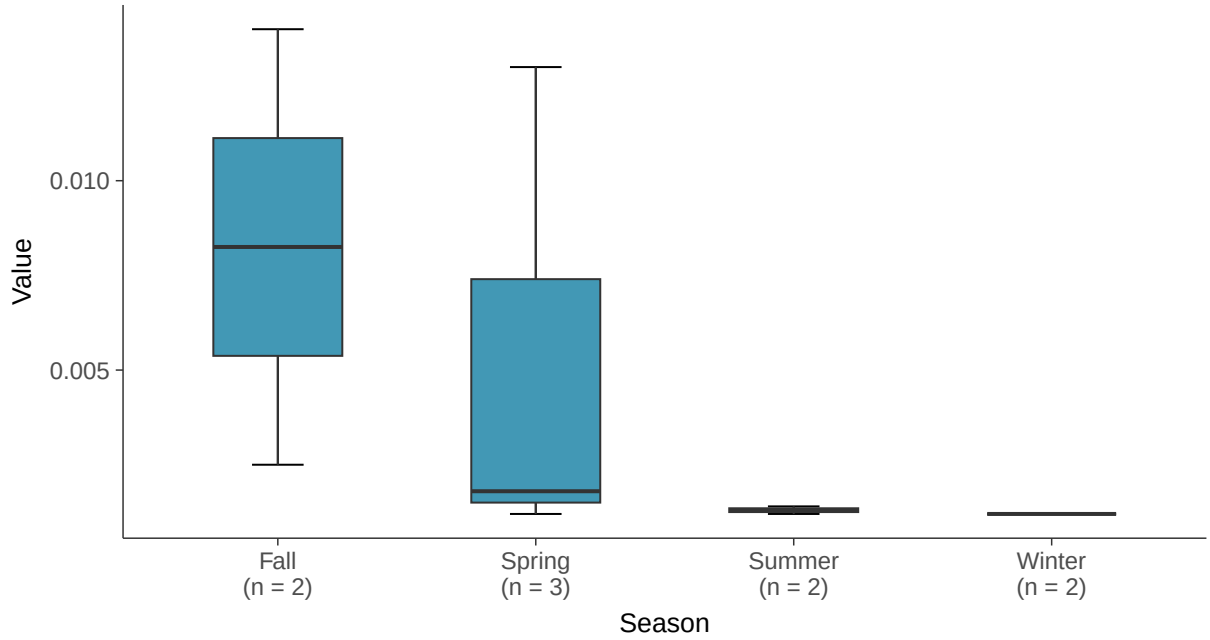
Boxplot

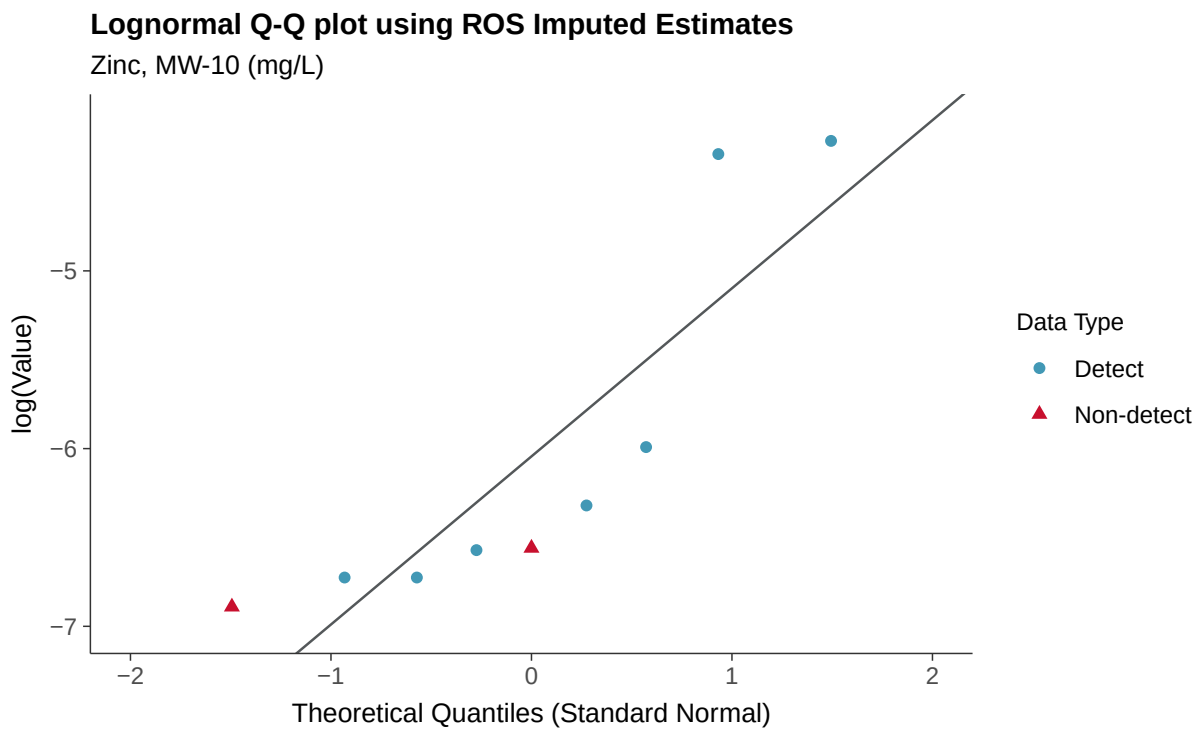
Zinc, MW-10 (mg/L)

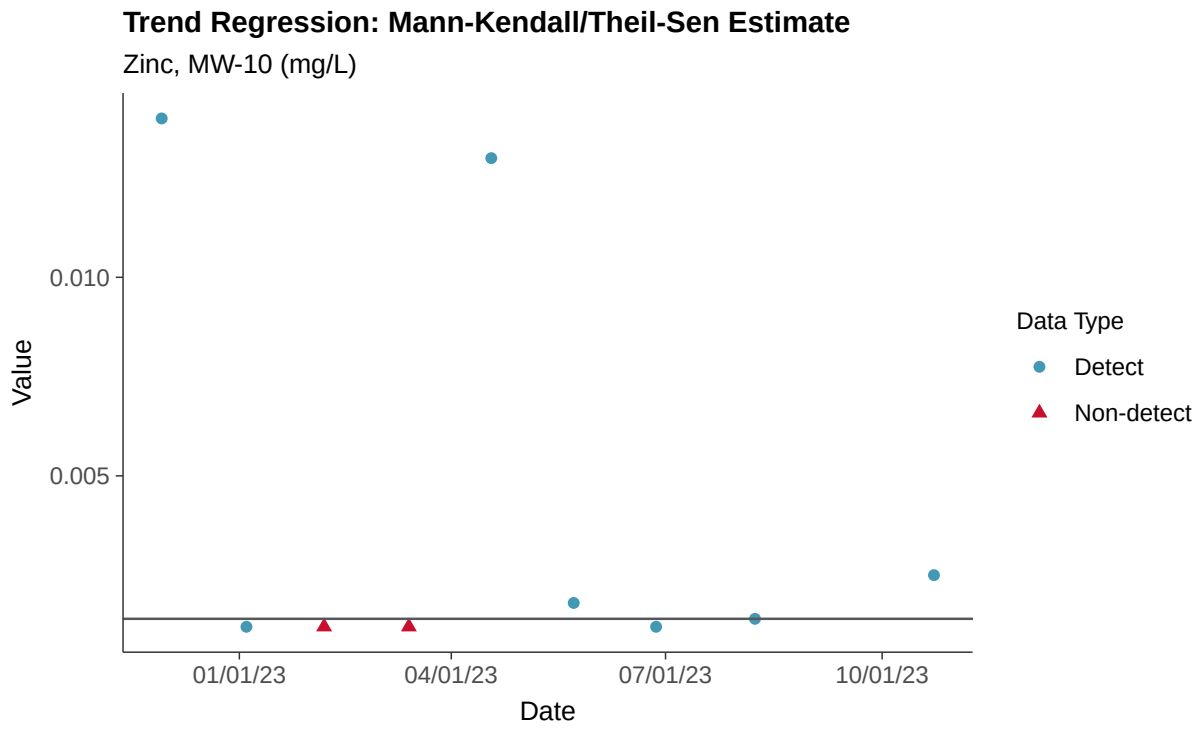


Boxplot by Season

Zinc, MW-10 (mg/L)

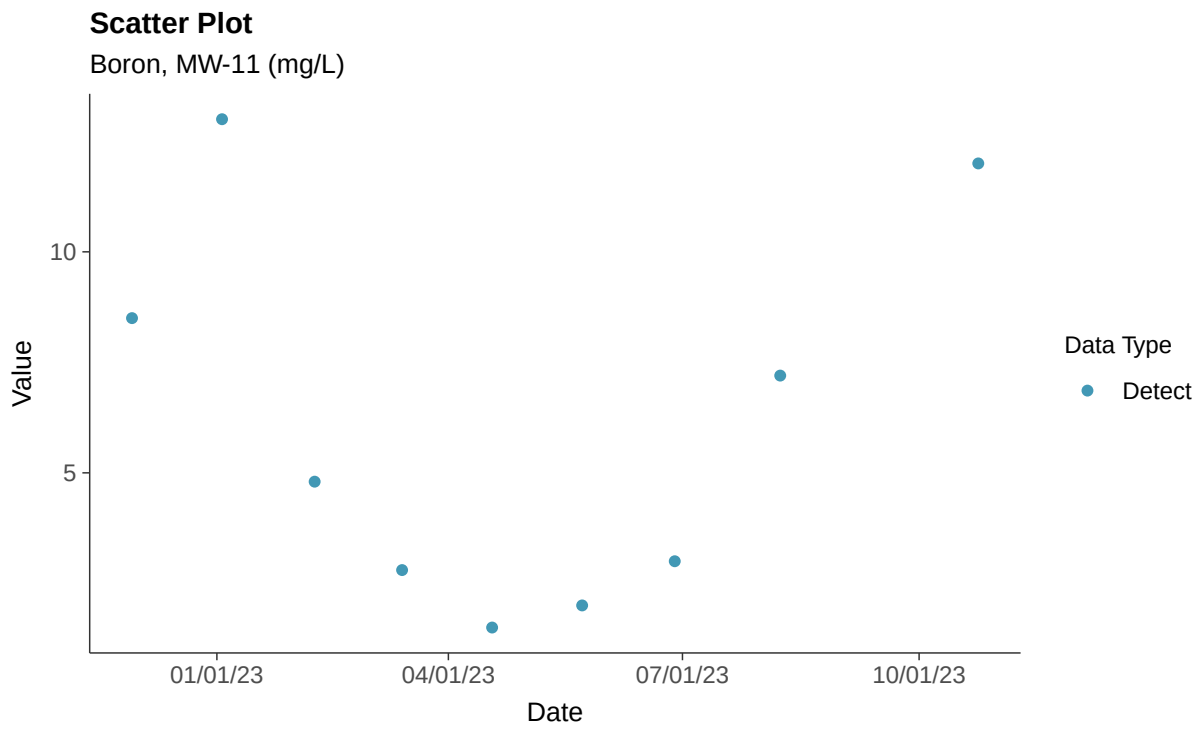


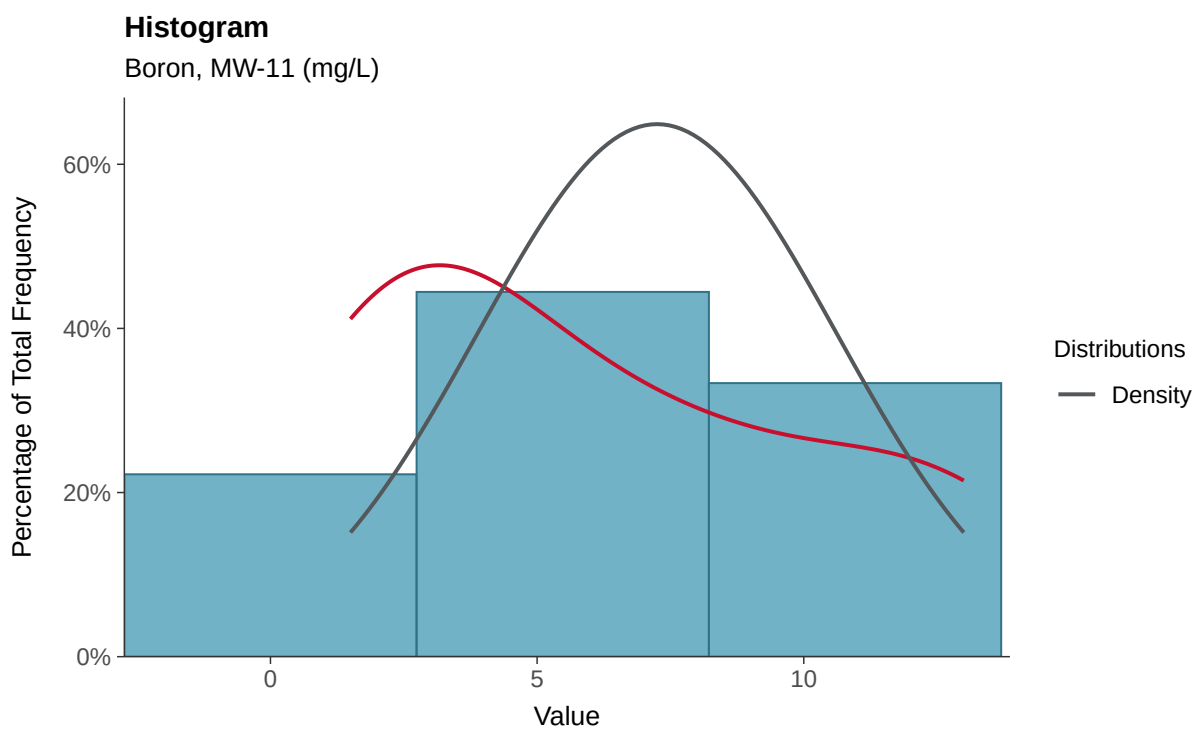

Lognormal Q-Q plot using ROS Imputed Estimates
Zinc, MW-10 (mg/L)
log(Value)
−5
−6
−7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Zinc, MW-10 (mg/L)
Value
0.010
0.005
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Boron, MW-11

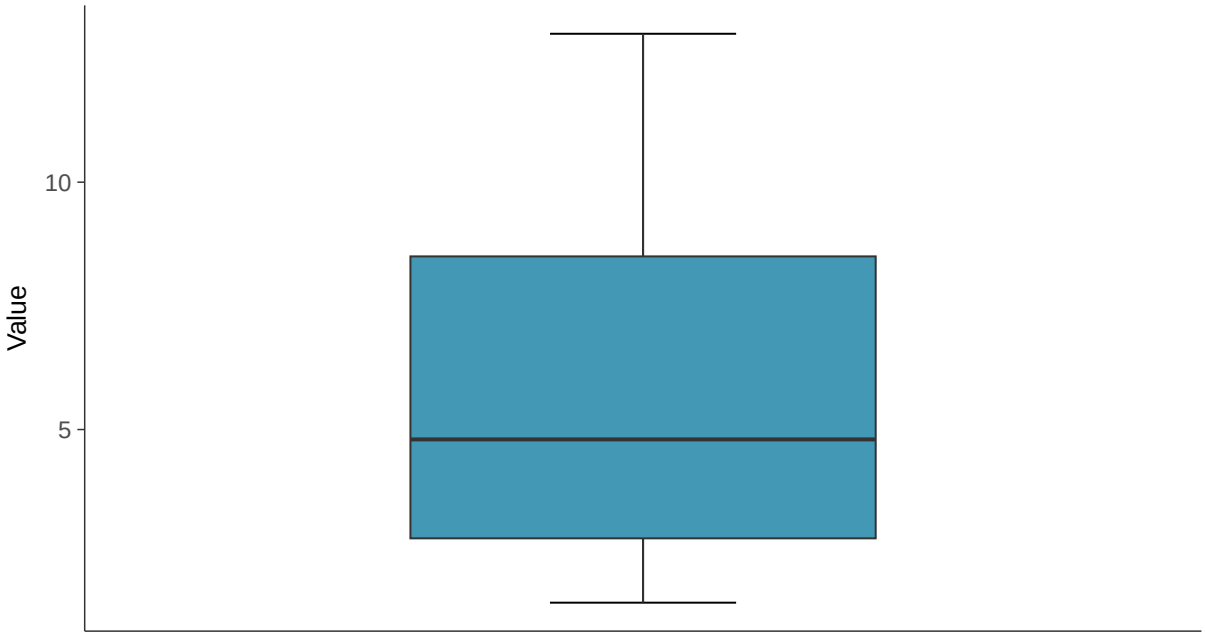
ID: 2_20_4_105





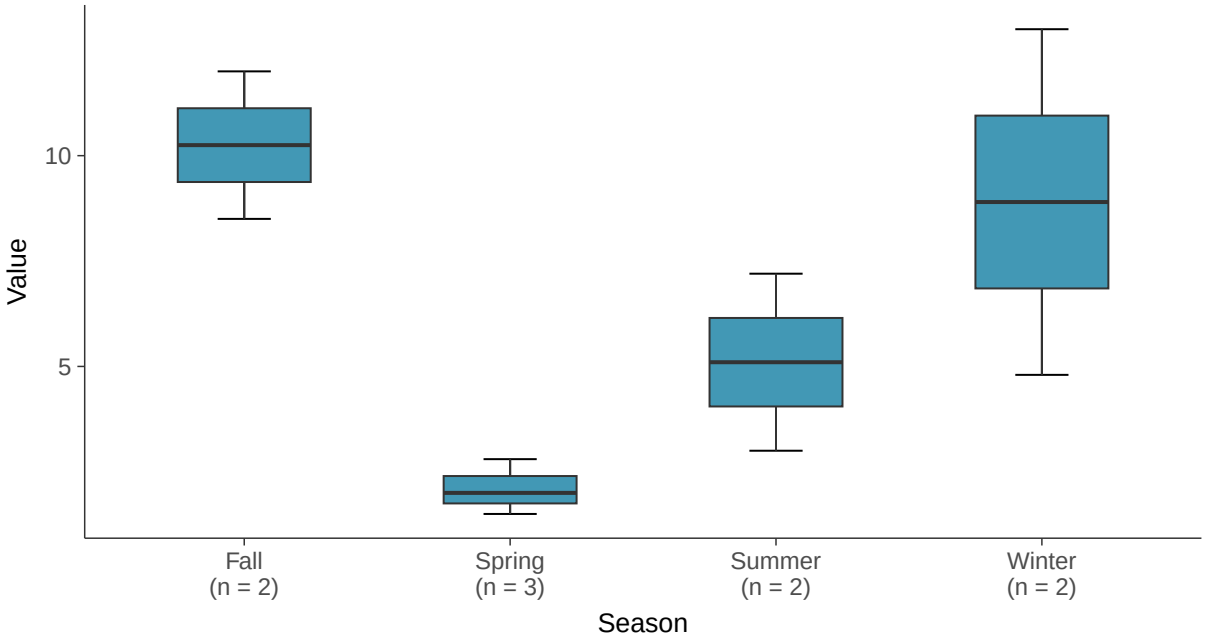
Boxplot

Boron, MW-11 (mg/L)



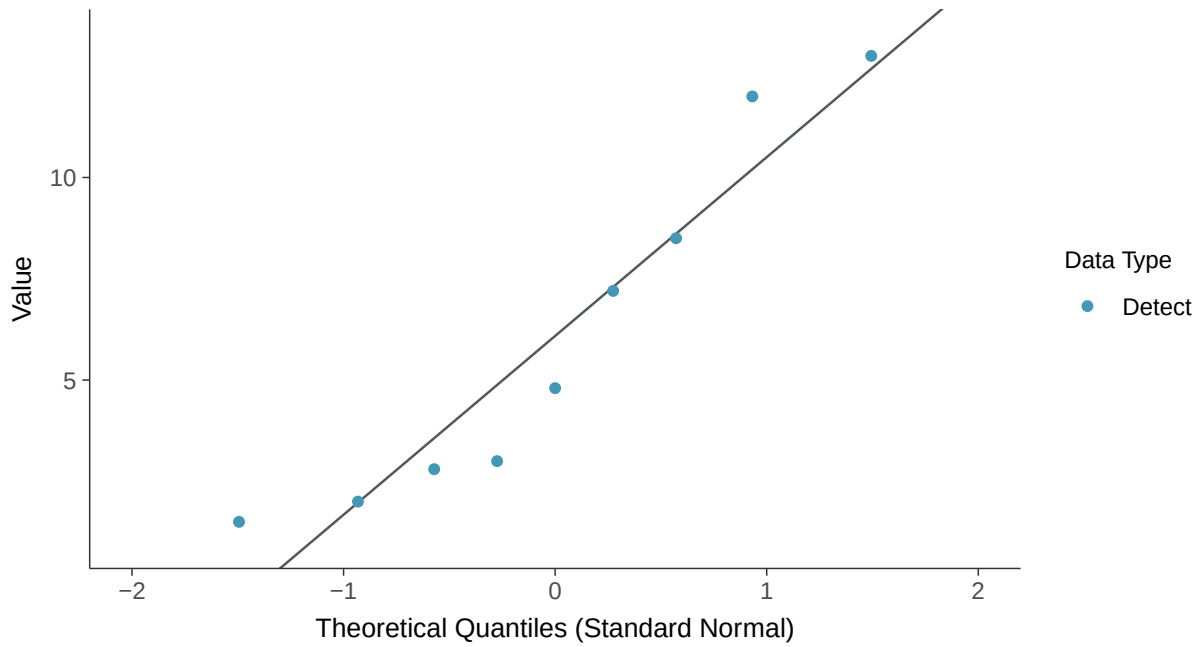
Boxplot by Season

Boron, MW-11 (mg/L)



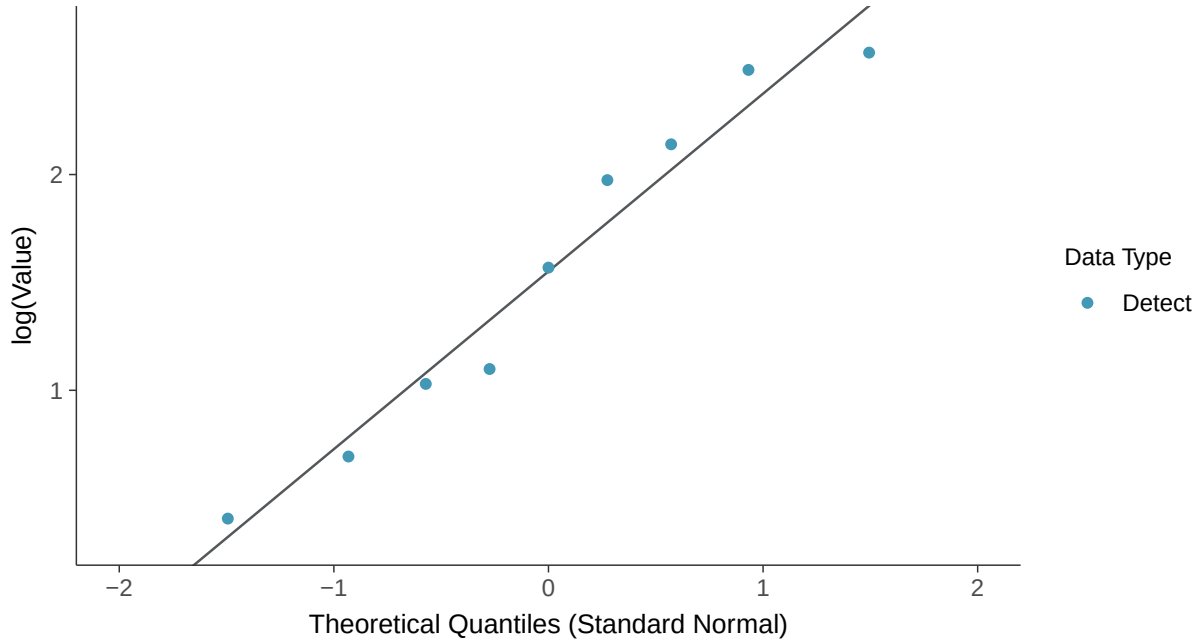
Normal Q-Q plot

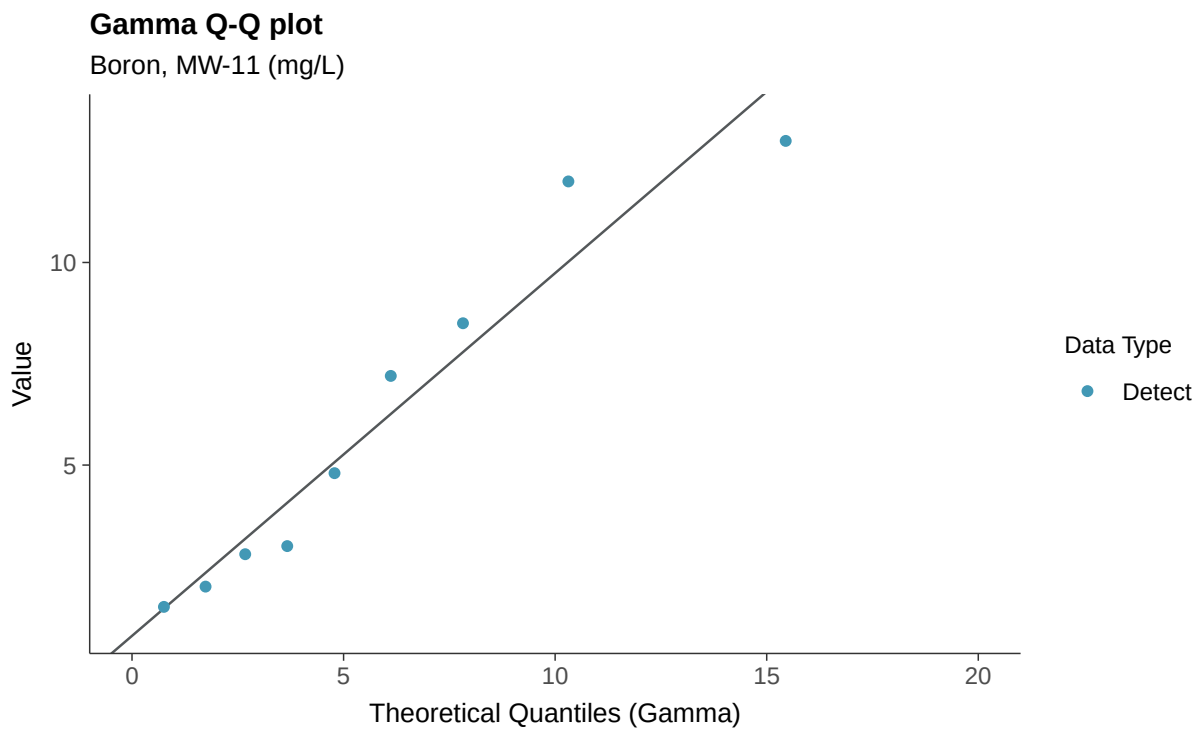
Boron, MW-11 (mg/L)

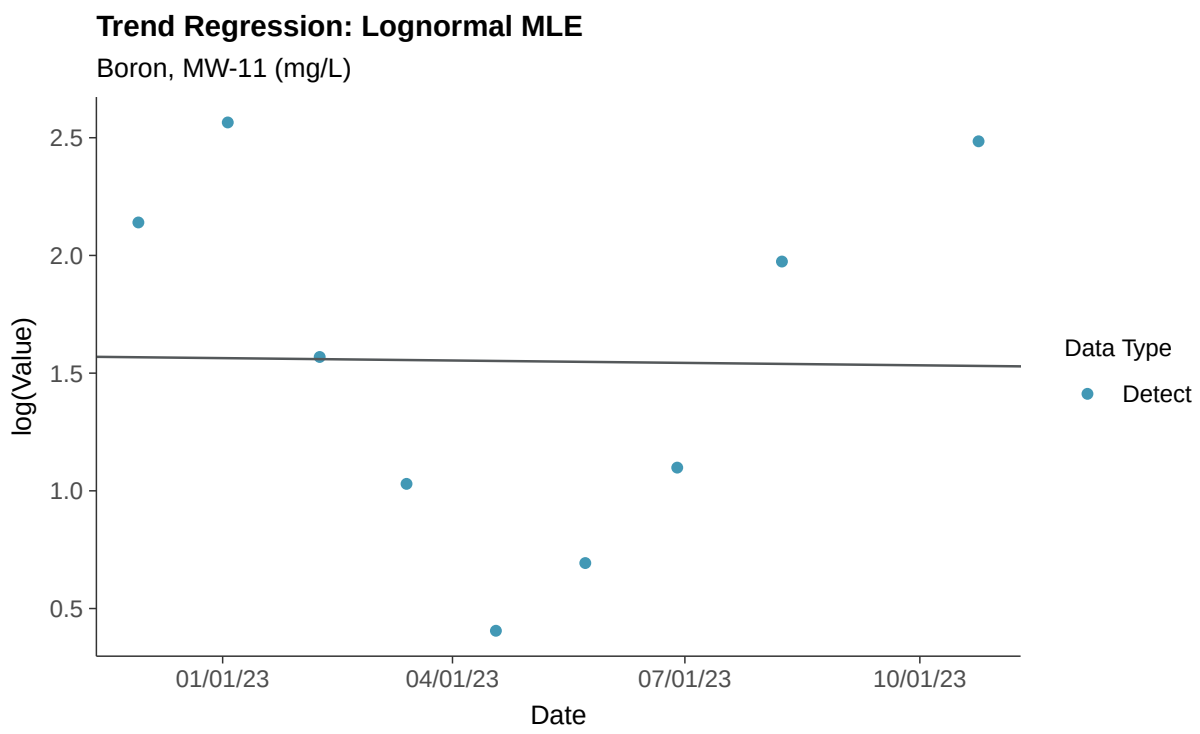


Lognormal Q-Q plot

Boron, MW-11 (mg/L)

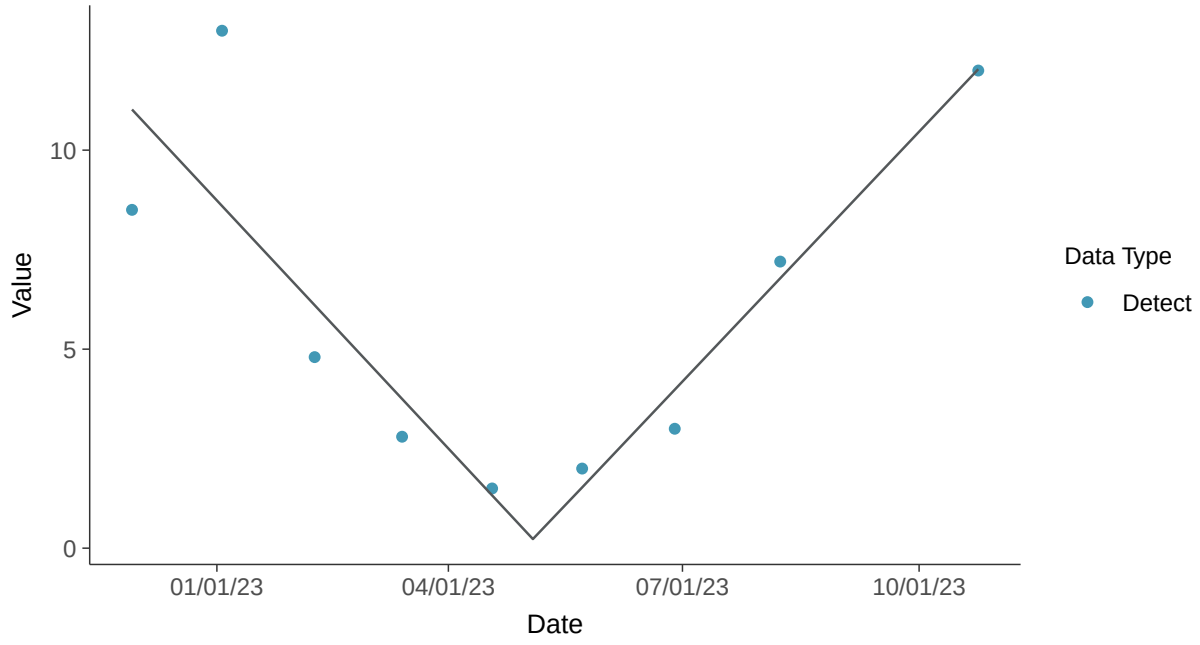



Gamma Q-Q plot
Boron, MW-11 (mg/L)
Value
10
5
0
5
10
15
20
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Boron, MW-11 (mg/L)
log(Value)
2.5
2.0
1.5
1.0
0.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

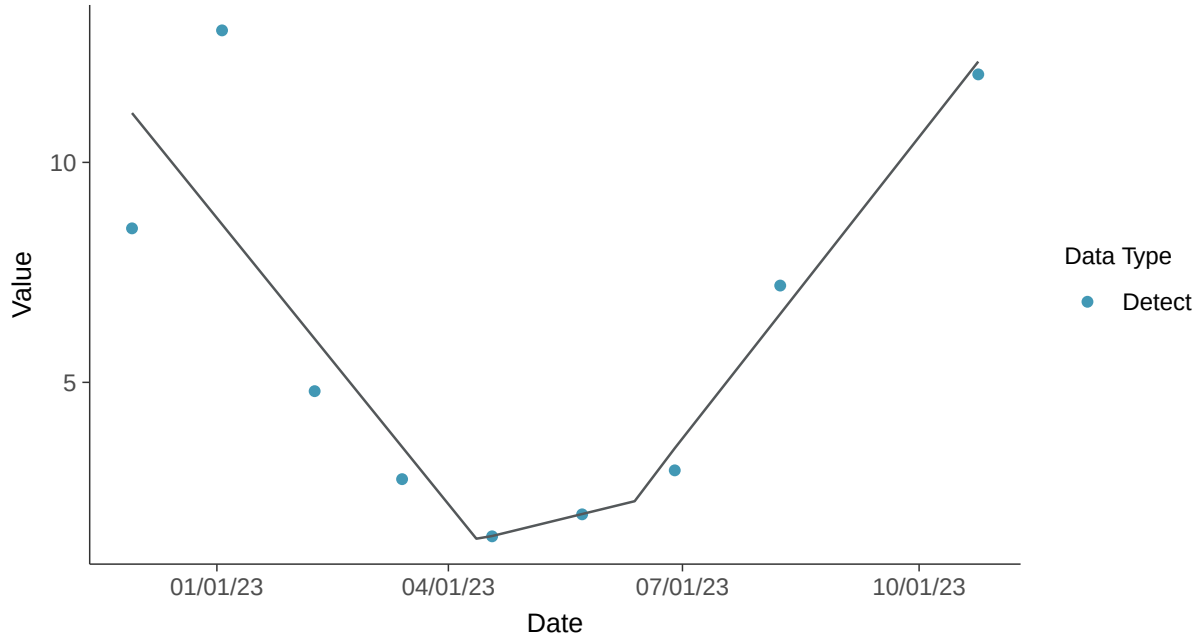
Trend Regression: Piecewise Linear-Linear

Boron, MW-11 (mg/L)



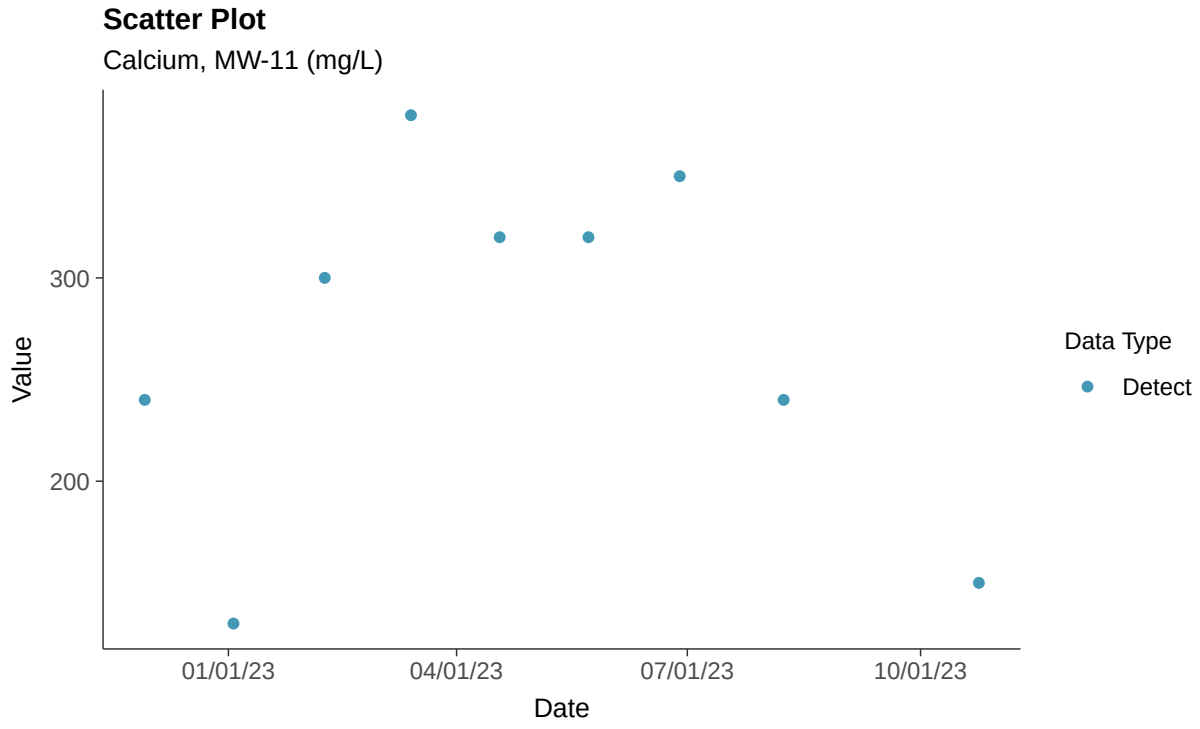
Trend Regression: Piecewise Linear-Linear-Linear

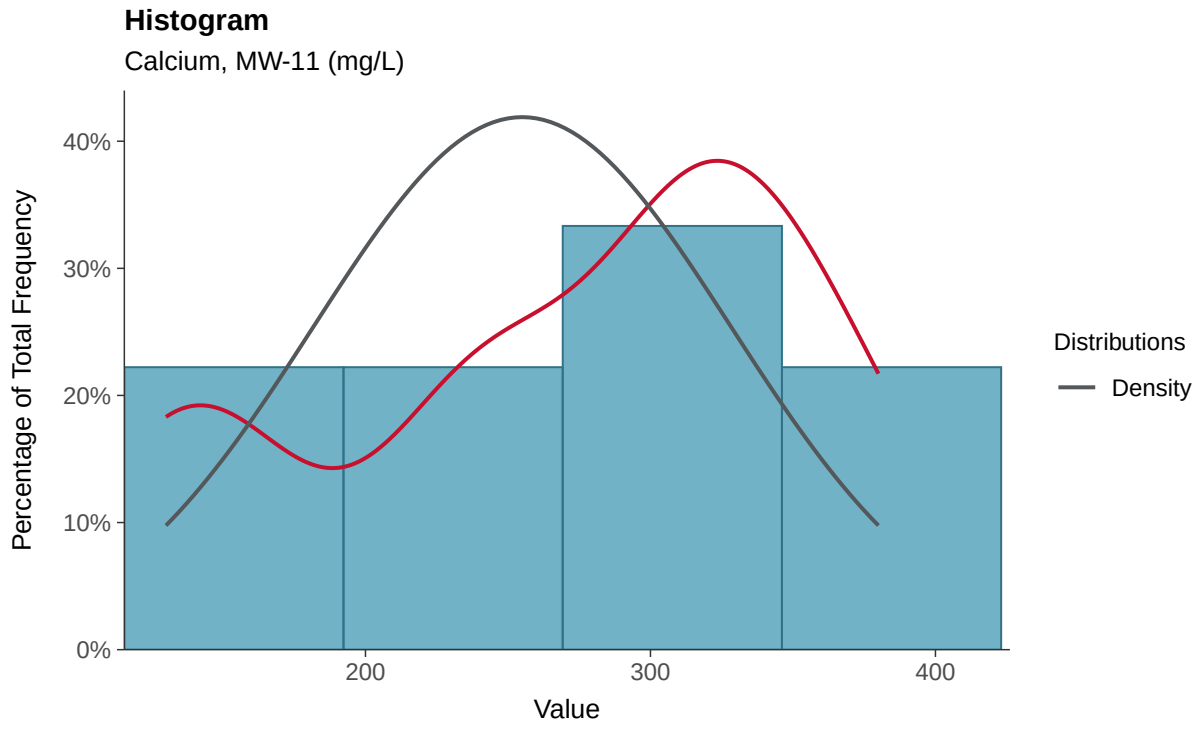
Boron, MW-11 (mg/L)



Appendix III: Calcium, MW-11

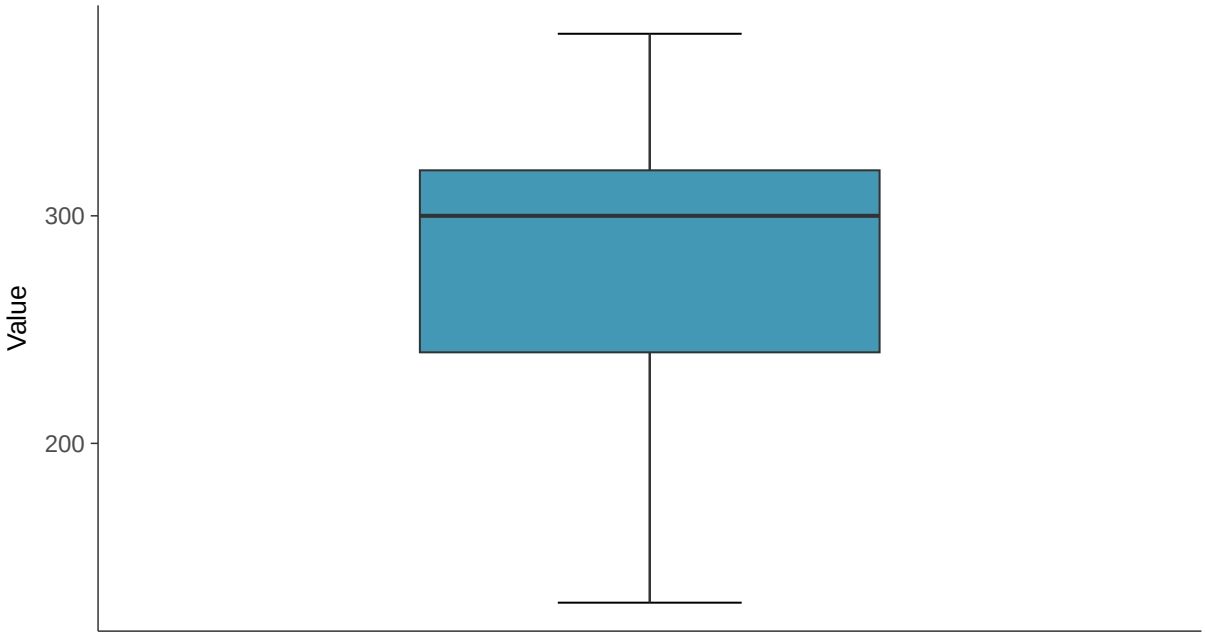
ID: 2_20_4_107





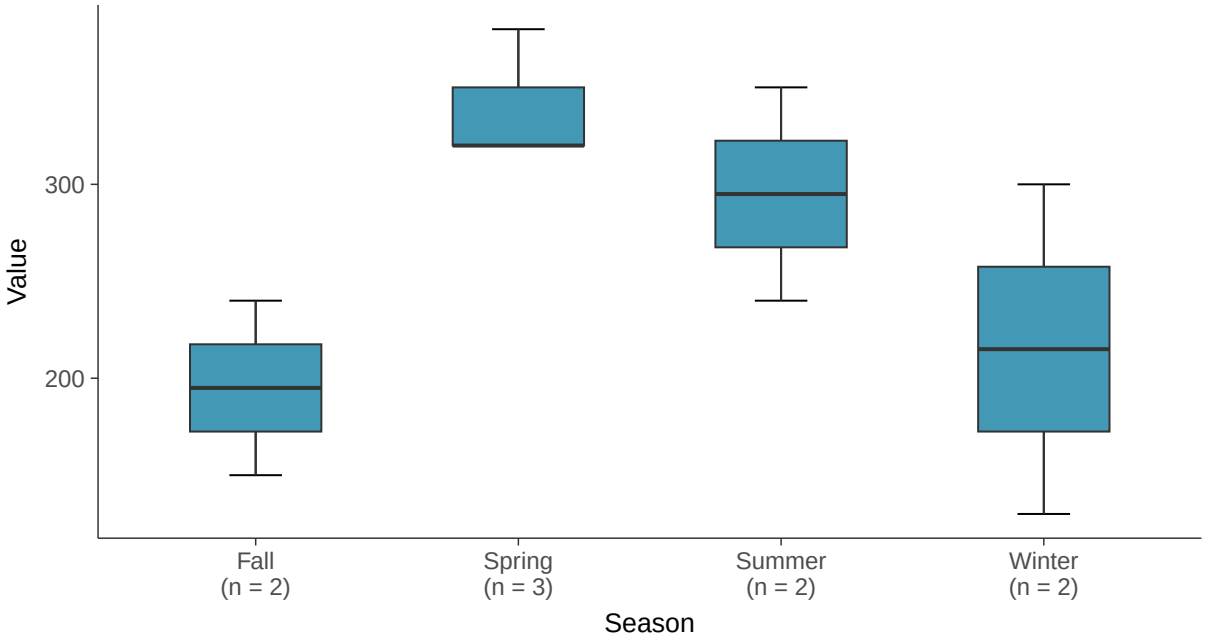
Boxplot

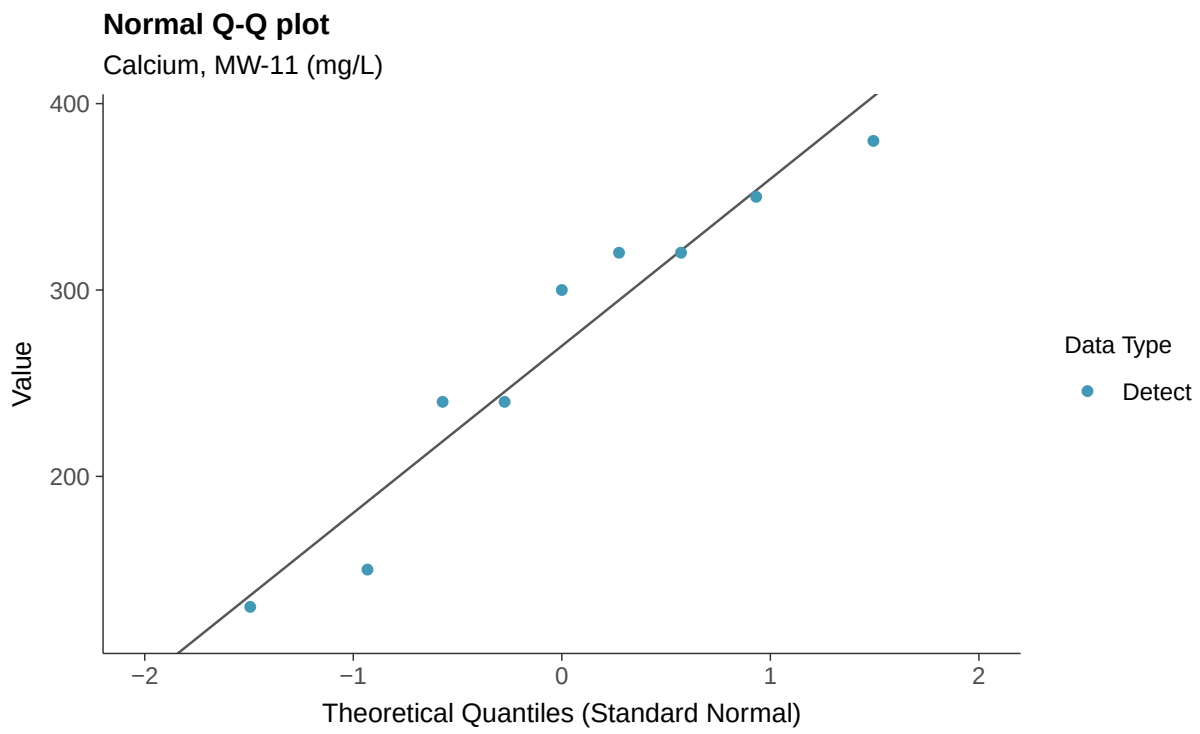
Calcium, MW-11 (mg/L)

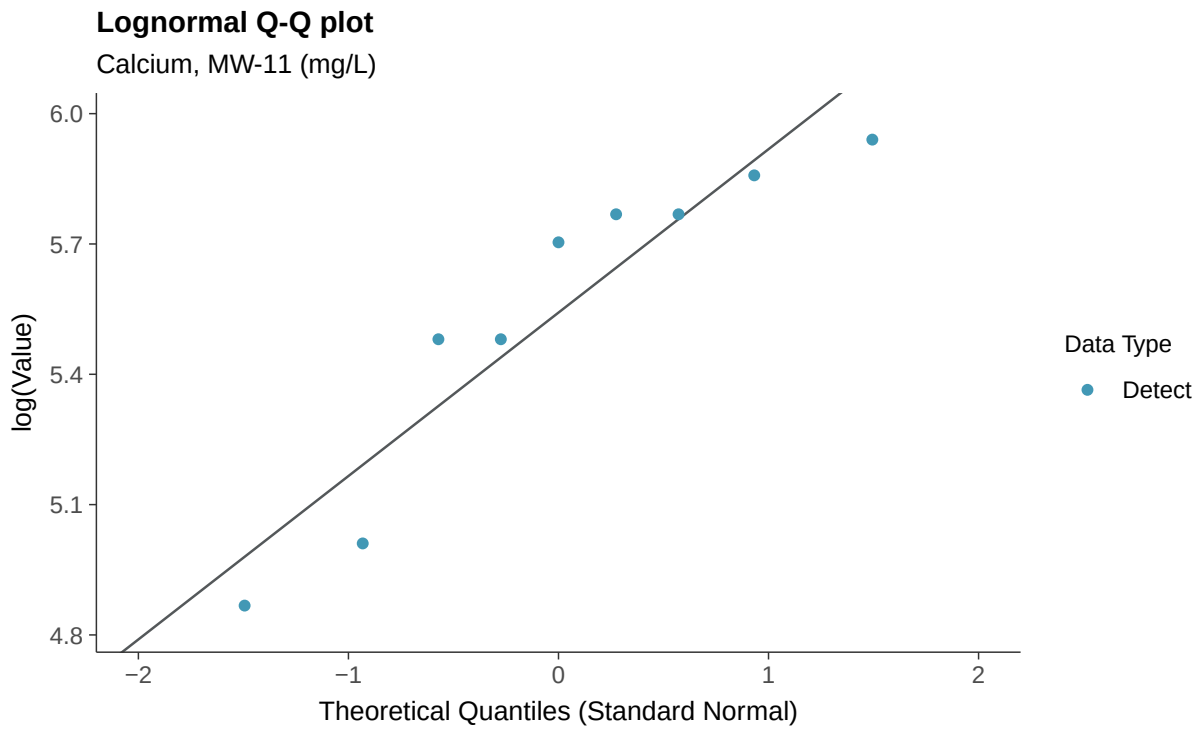


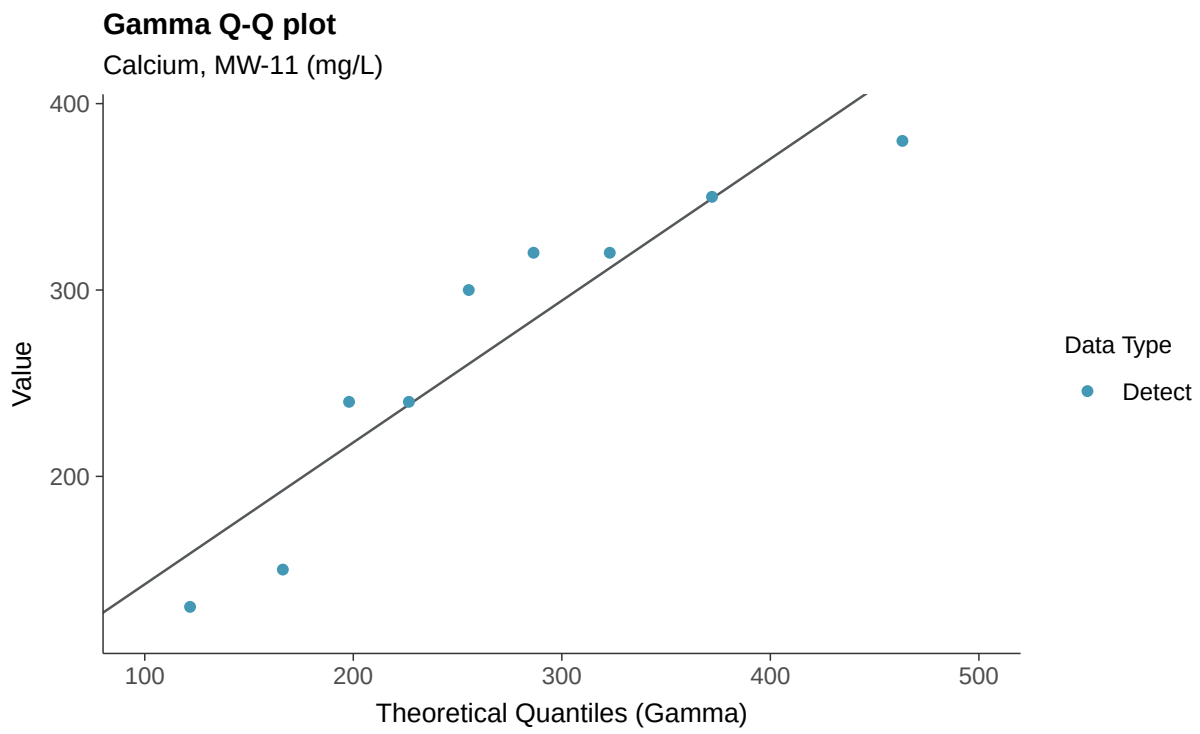
Boxplot by Season

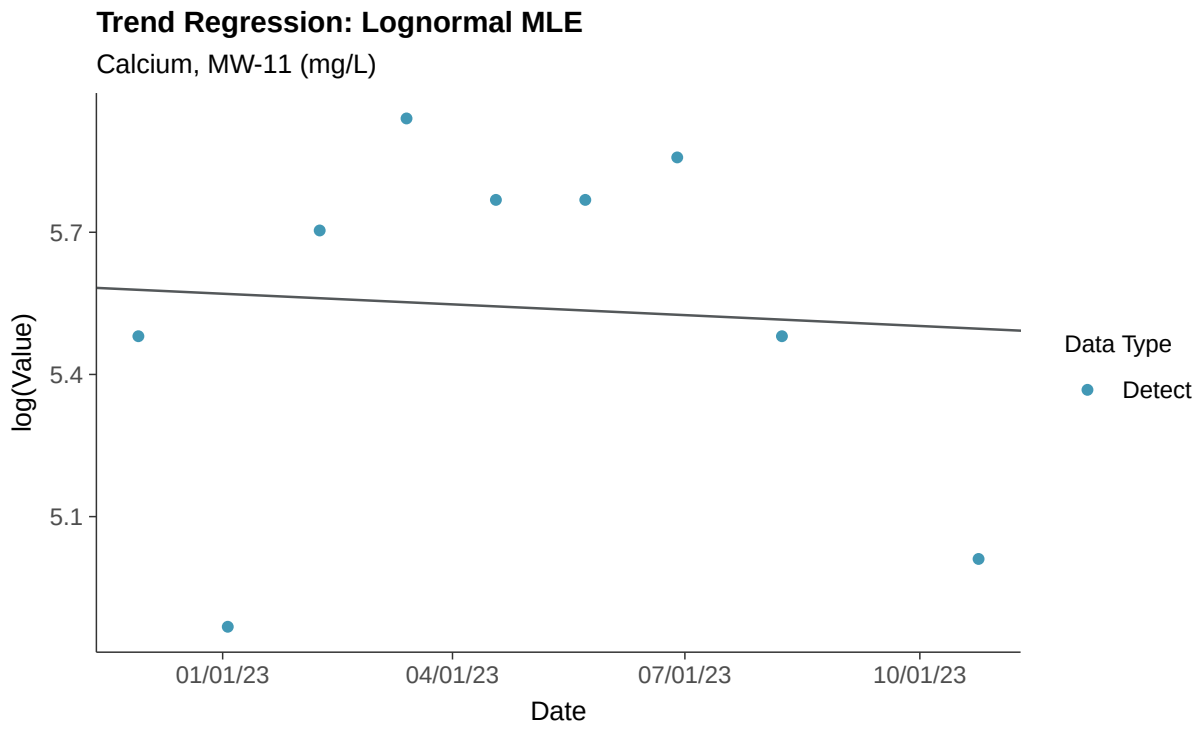
Calcium, MW-11 (mg/L)




Normal Q-Q plot
Calcium, MW-11 (mg/L)
Value
400
300
200
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

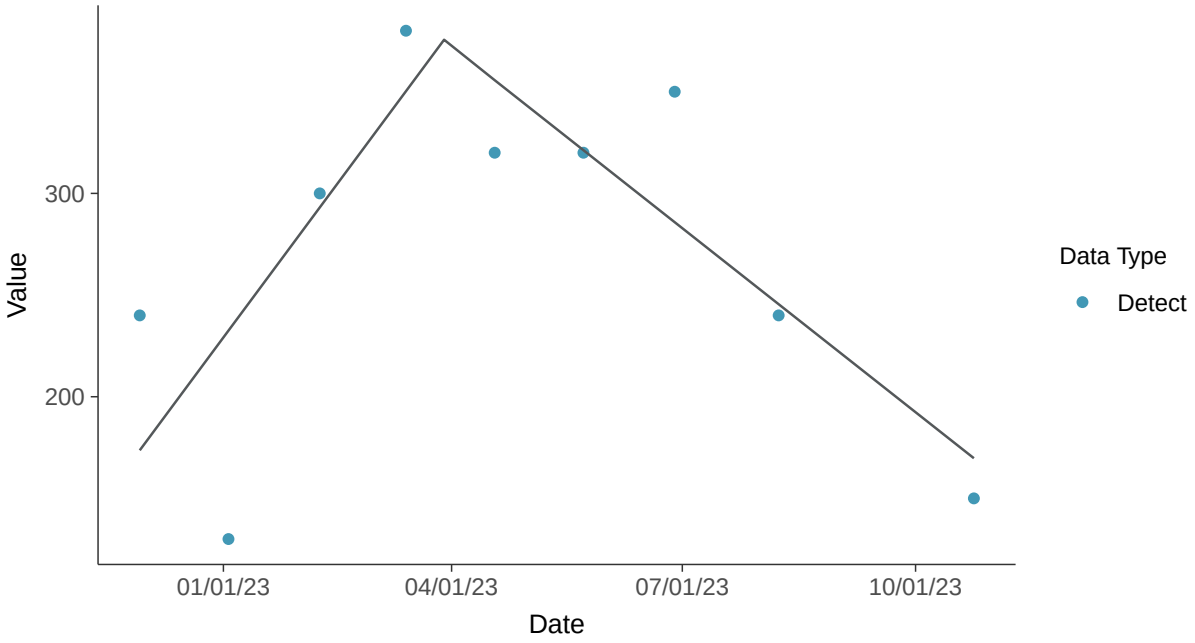

Lognormal Q-Q plot
Calcium, MW-11 (mg/L)
log(Value)
6.0
5.7
5.4
5.1
4.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-11 (mg/L)
400
300
200
Value
100
200
300
400
500
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-11 (mg/L)
5.7
5.4
5.1
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

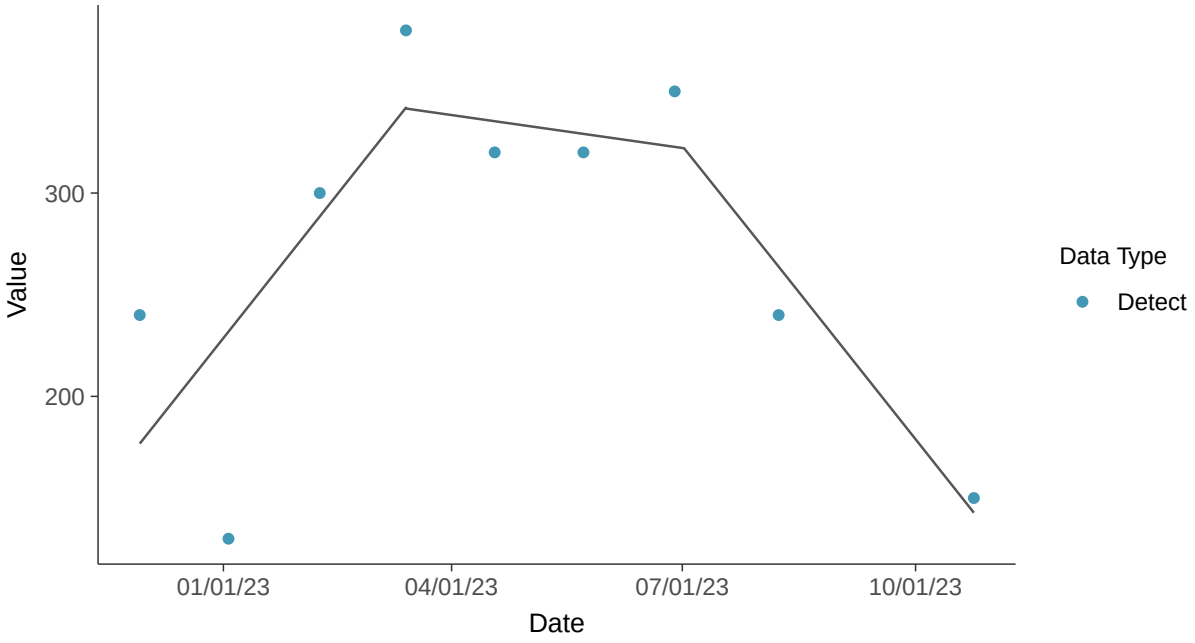
Trend Regression: Piecewise Linear-Linear

Calcium, MW-11 (mg/L)



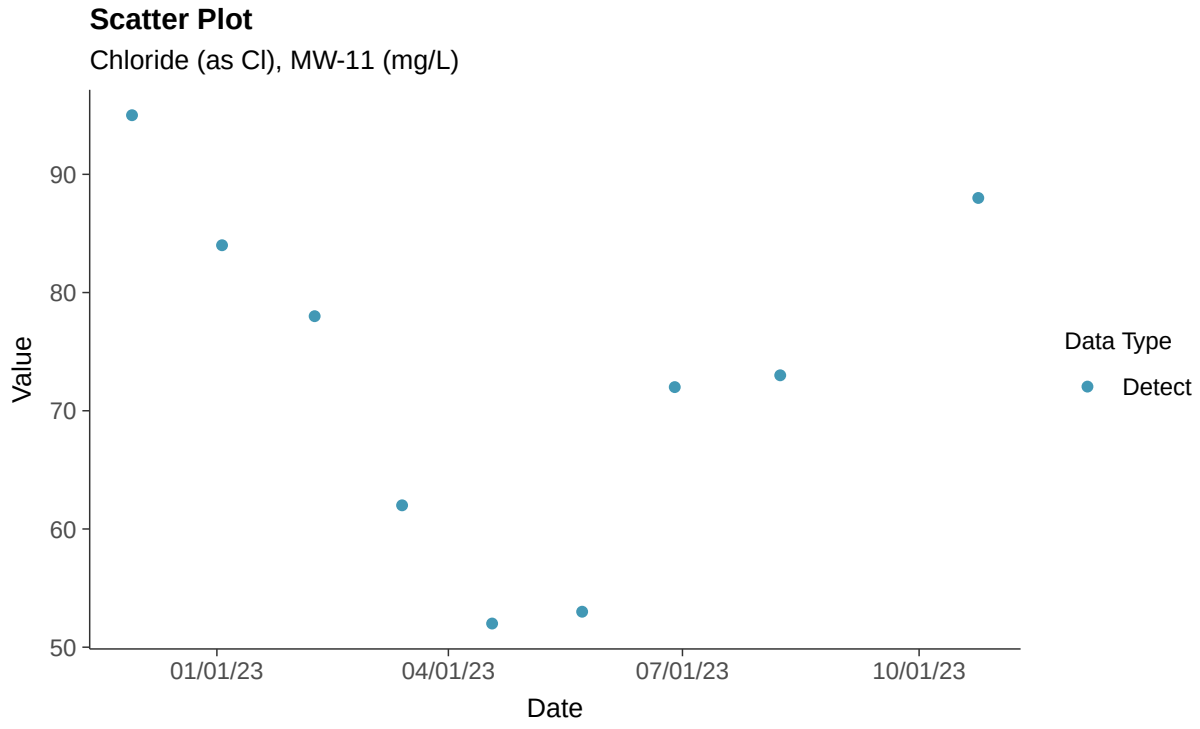
Trend Regression: Piecewise Linear-Linear-Linear

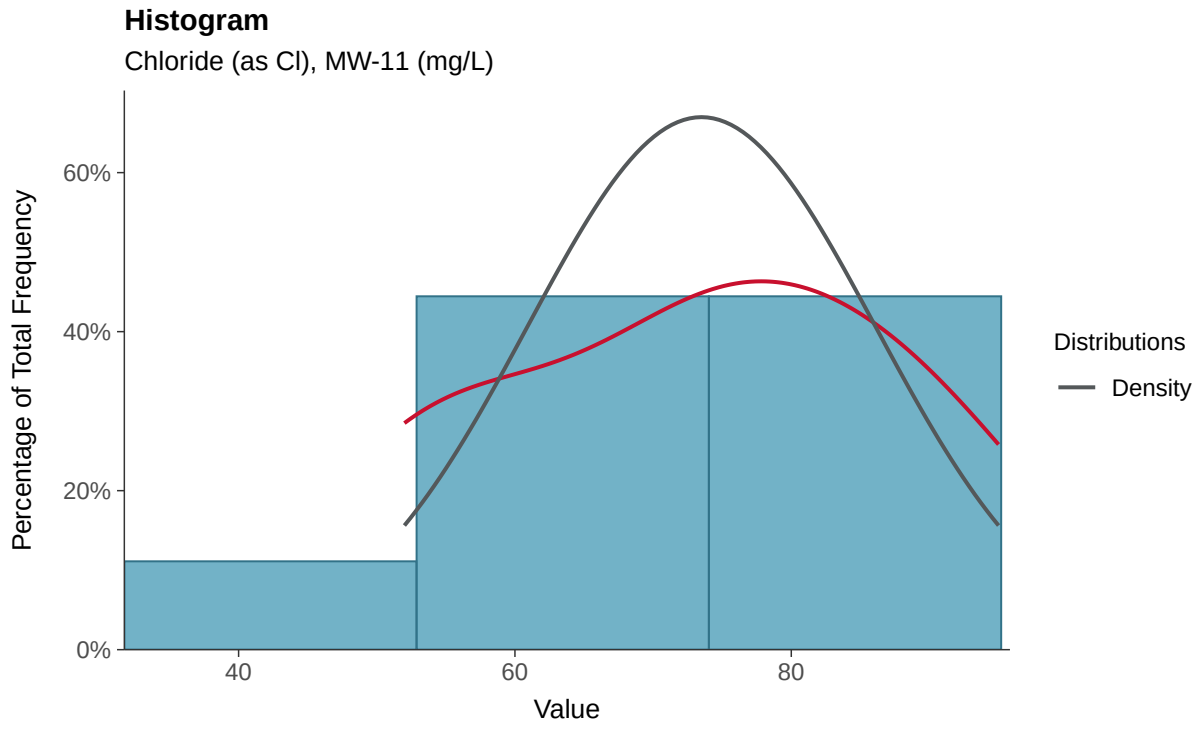
Calcium, MW-11 (mg/L)



Appendix III: Chloride (as Cl), MW-11

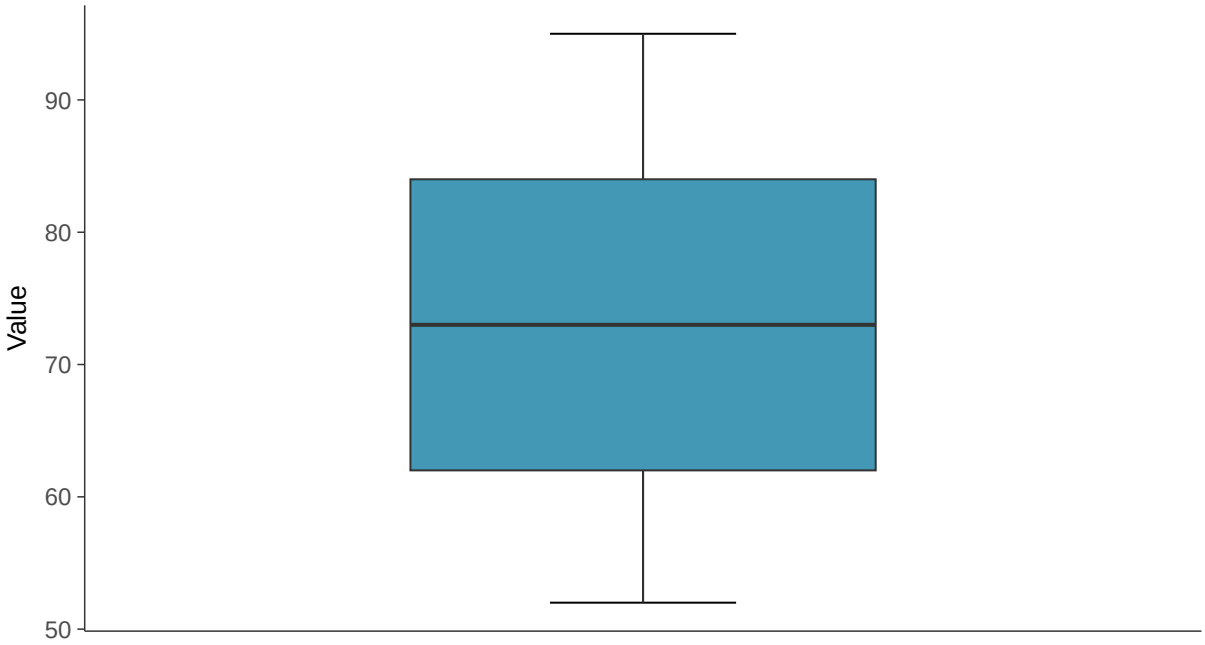
ID: 2_20_4_108





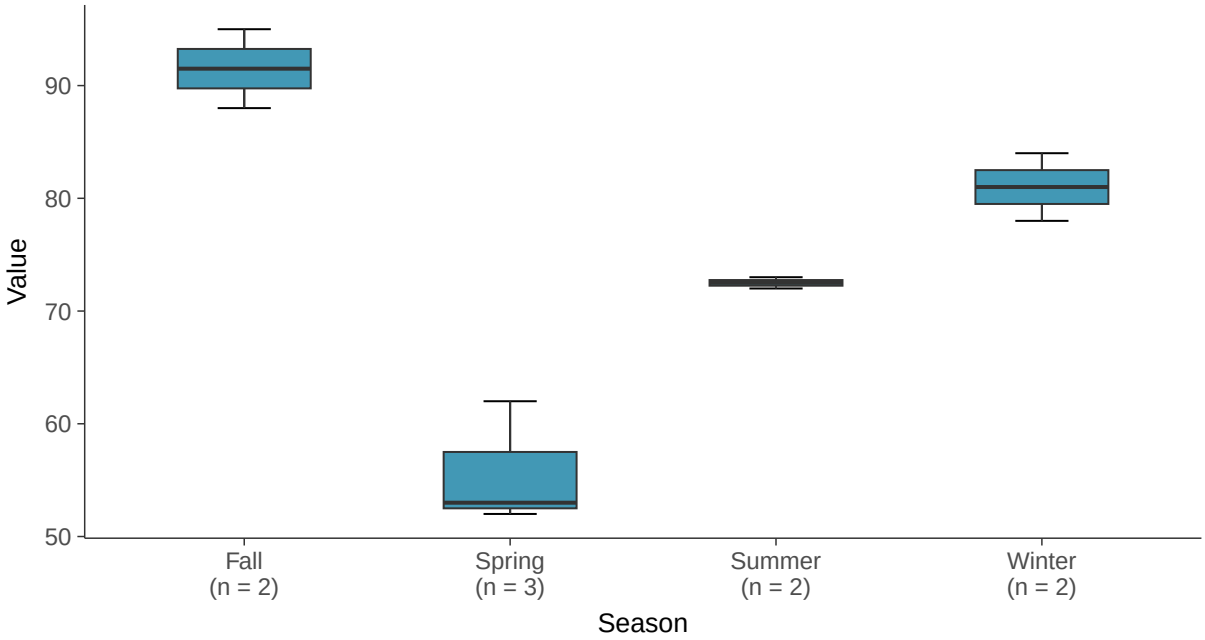
Boxplot

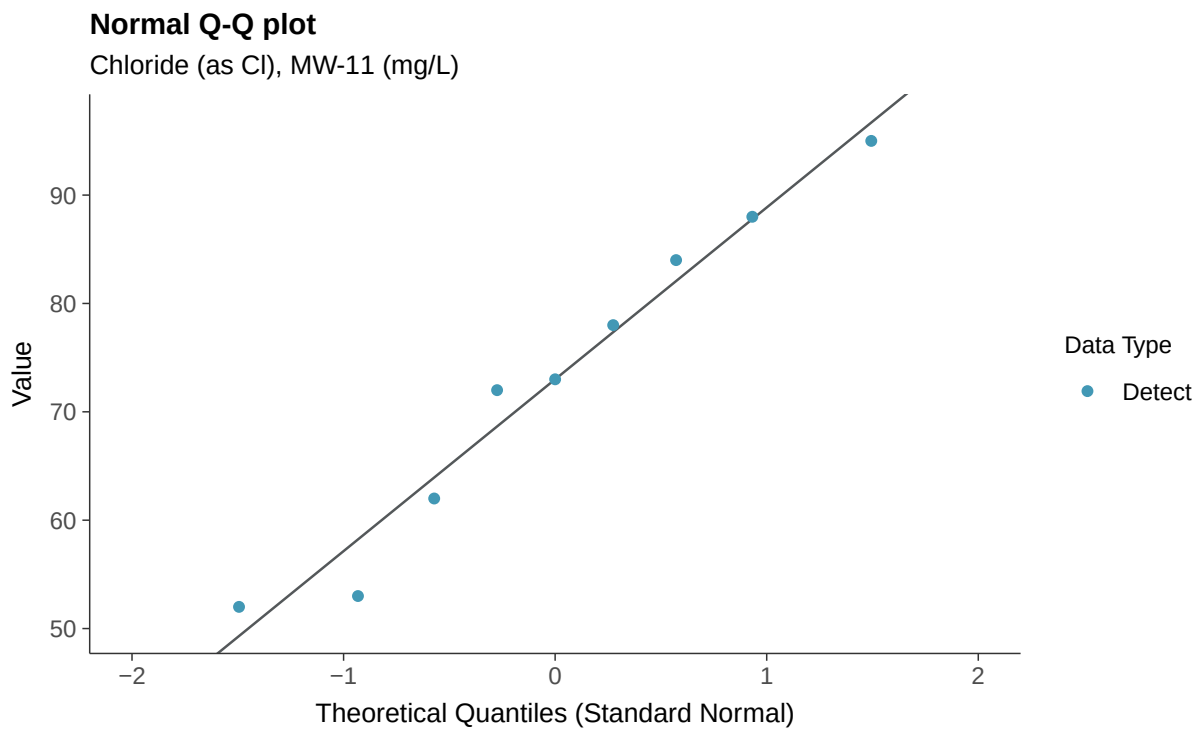
Chloride (as Cl), MW-11 (mg/L)

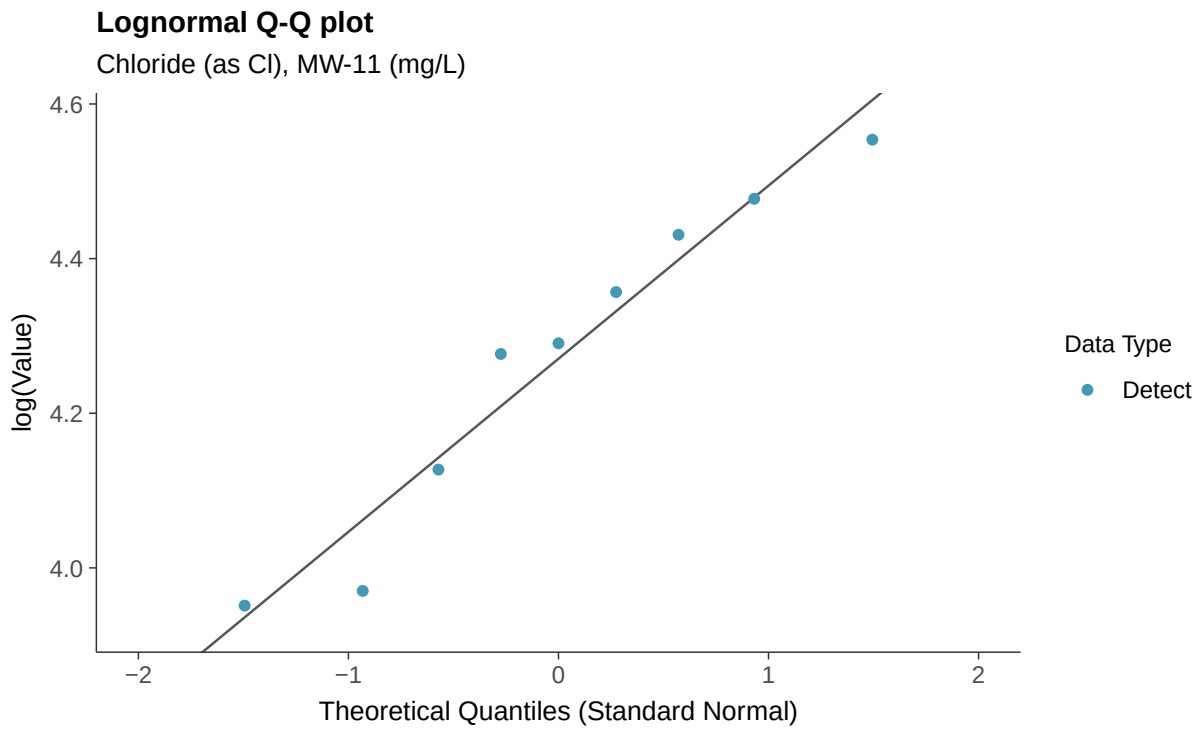


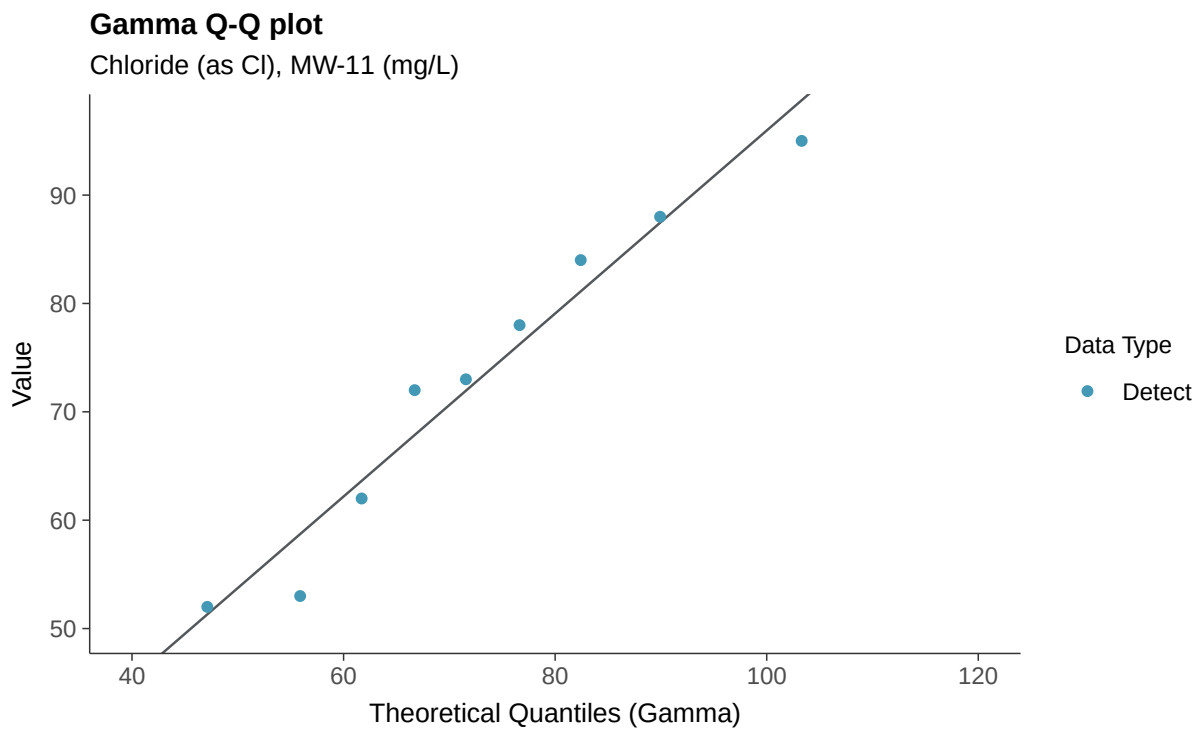
Boxplot by Season

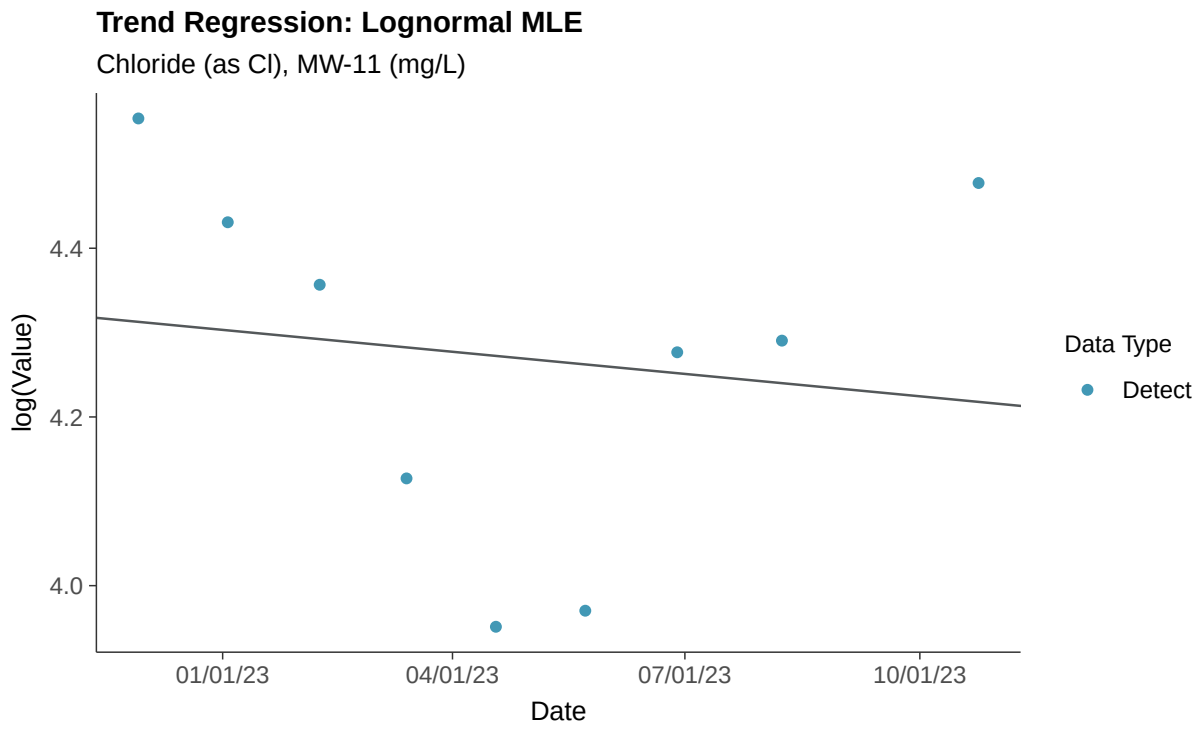
Chloride (as Cl), MW-11 (mg/L)




Normal Q-Q plot
Chloride (as Cl), MW-11 (mg/L)
Value
90
80
70
60
50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

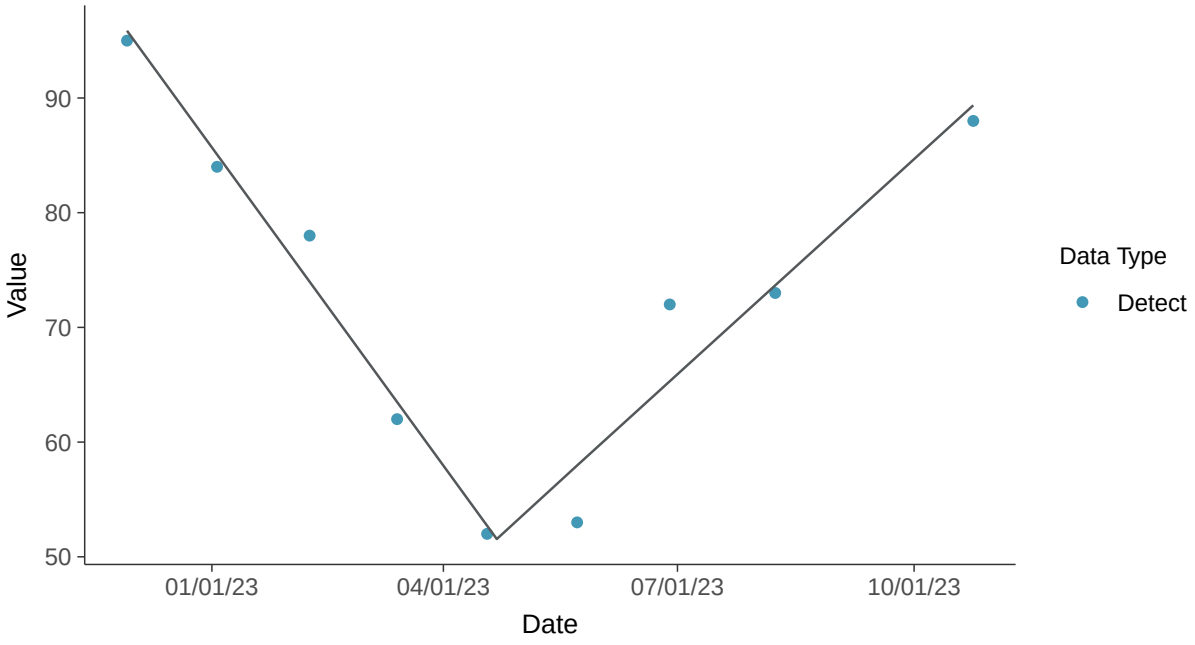

Lognormal Q-Q plot
Chloride (as Cl), MW-11 (mg/L)
log(Value)
4.6
4.4
4.2
4.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chloride (as Cl), MW-11 (mg/L)
Value
90
80
70
60
50
40
60
80
100
120
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chloride (as Cl), MW-11 (mg/L)
log(Value)
4.4
4.2
4.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

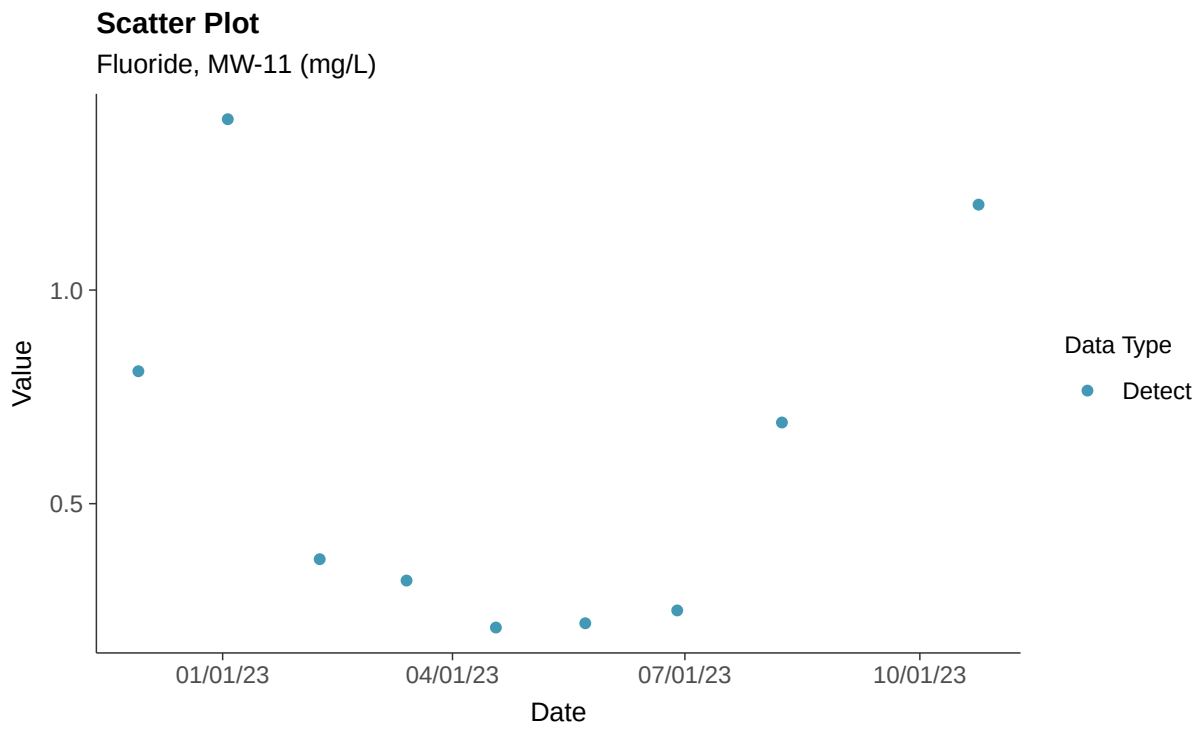
Trend Regression: Piecewise Linear-Linear

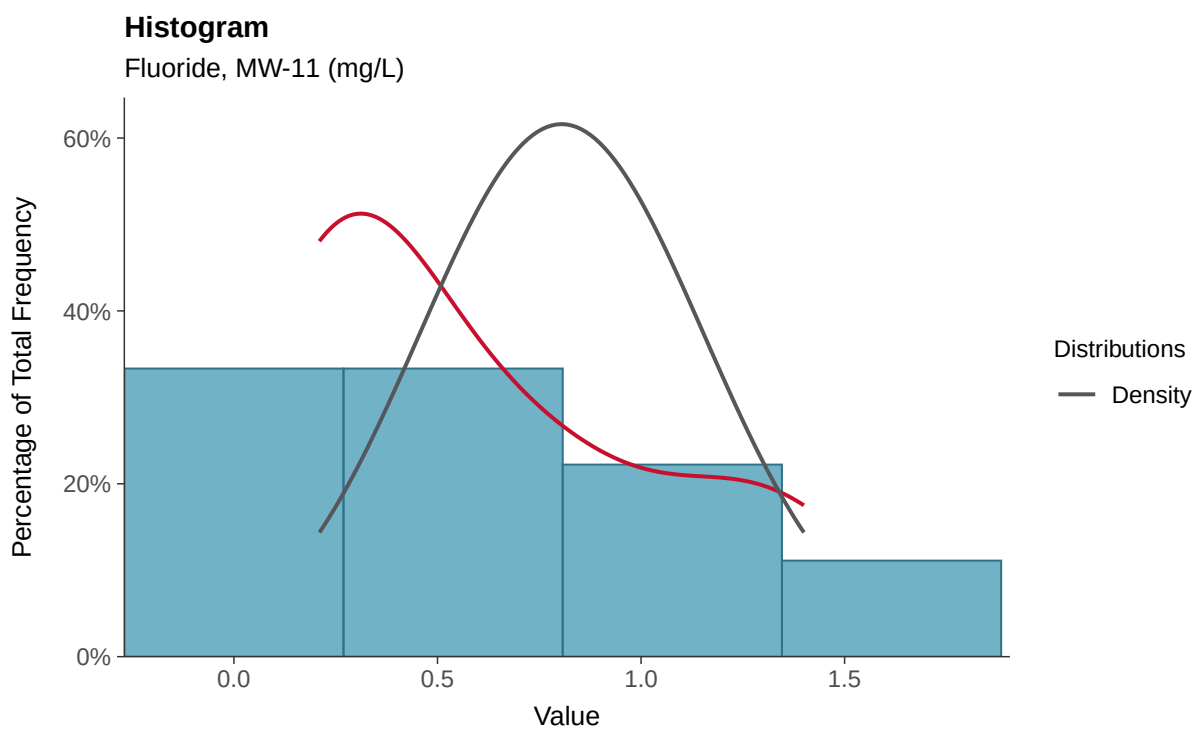
Chloride (as Cl), MW-11 (mg/L)



Appendix III: Fluoride, MW-11

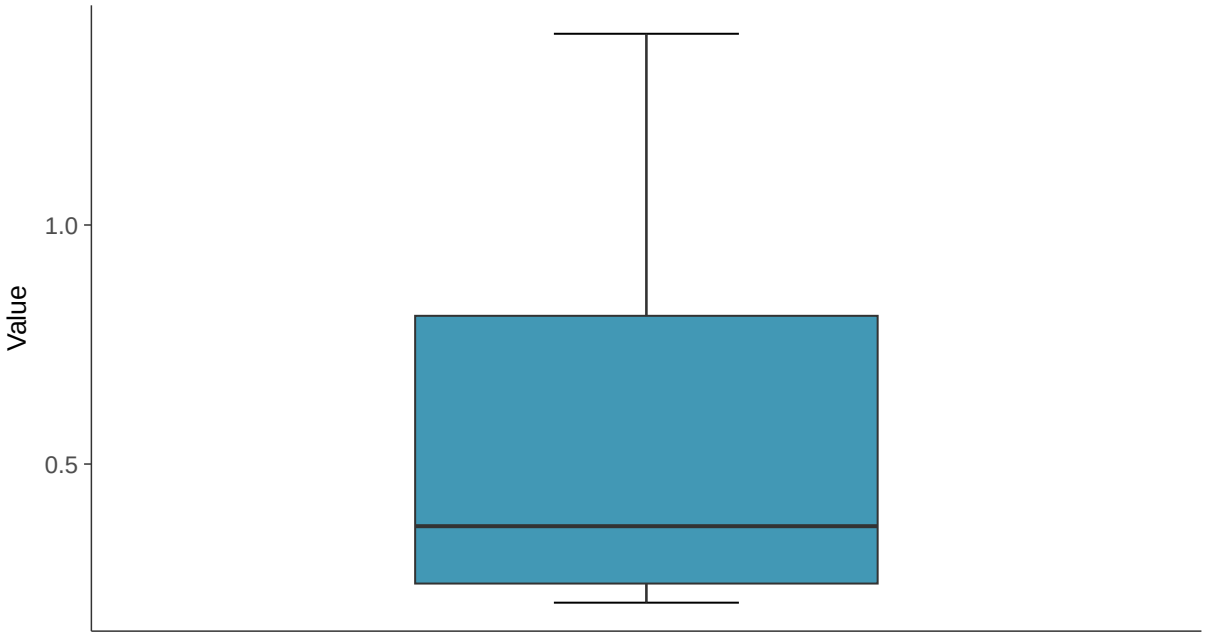
ID: 2_20_4_112





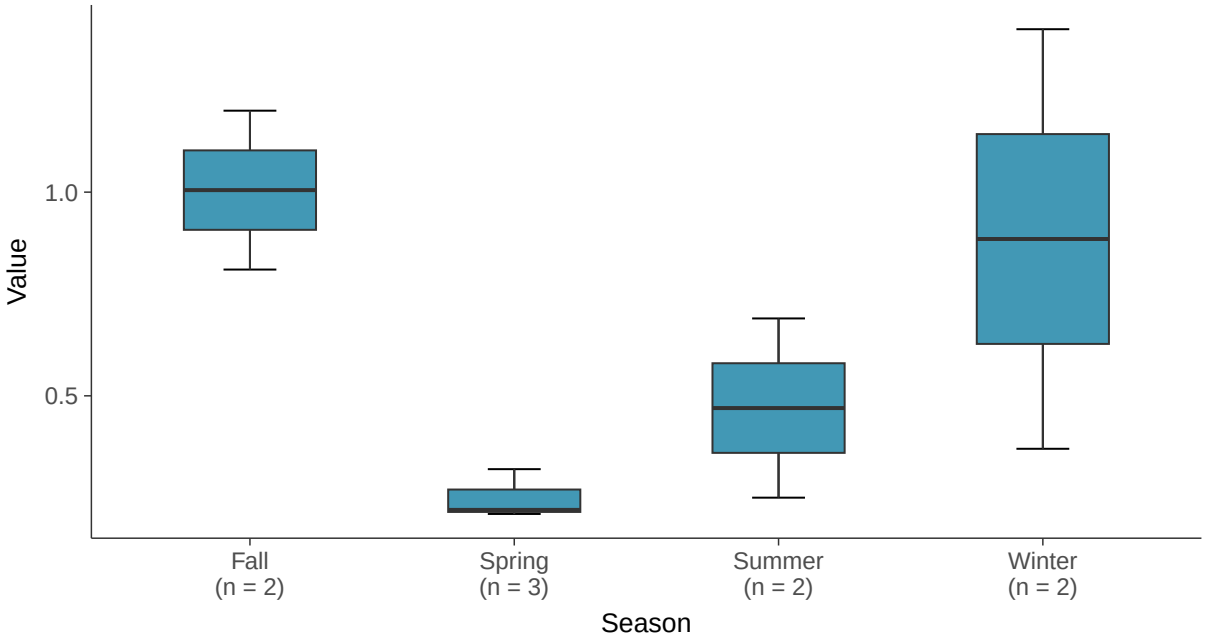
Boxplot

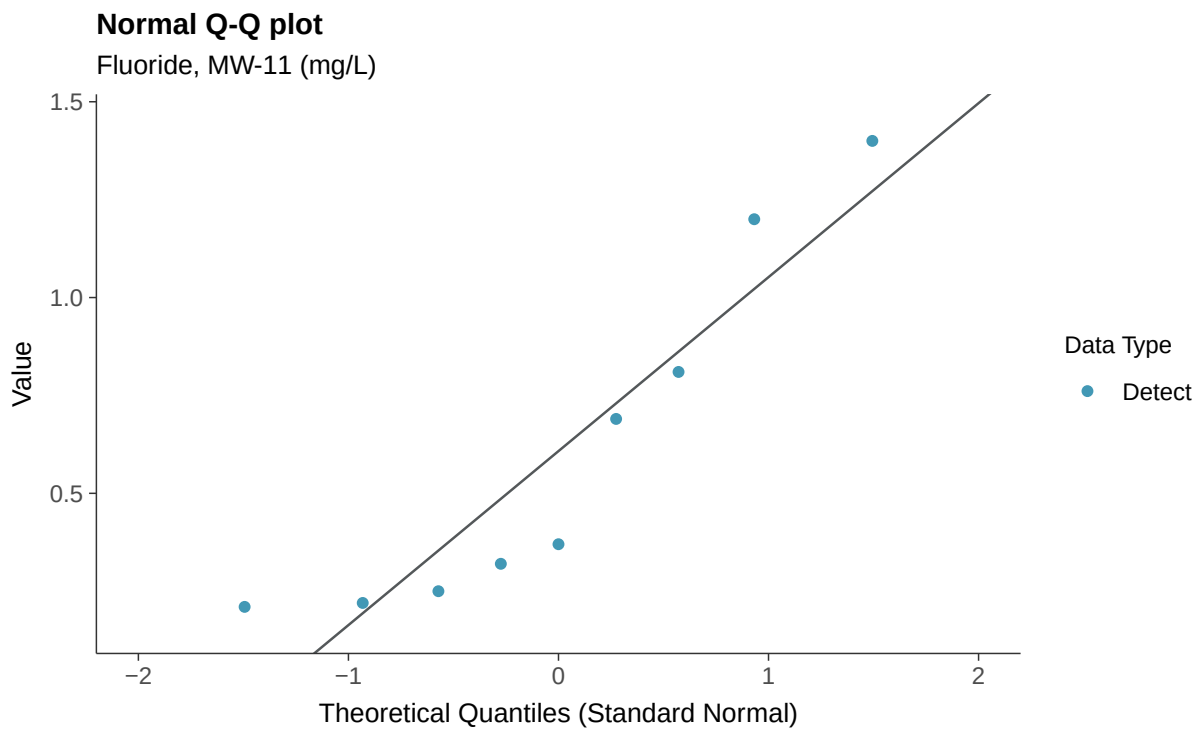
Fluoride, MW-11 (mg/L)

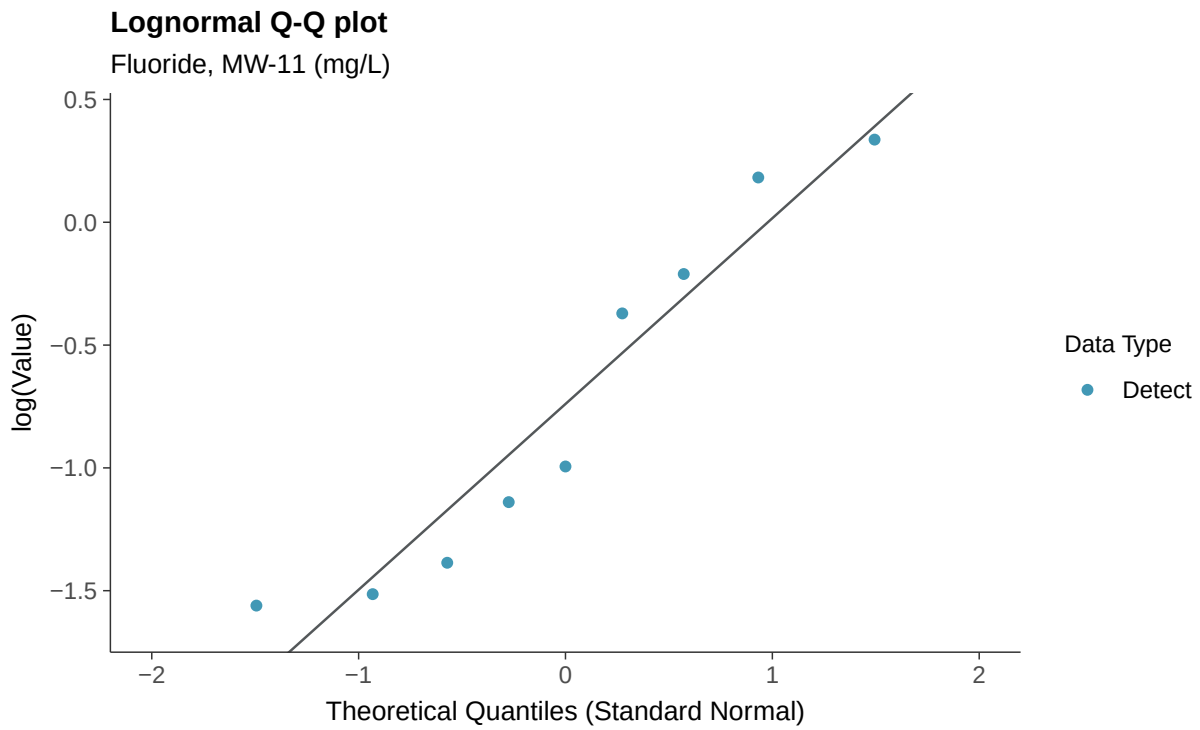


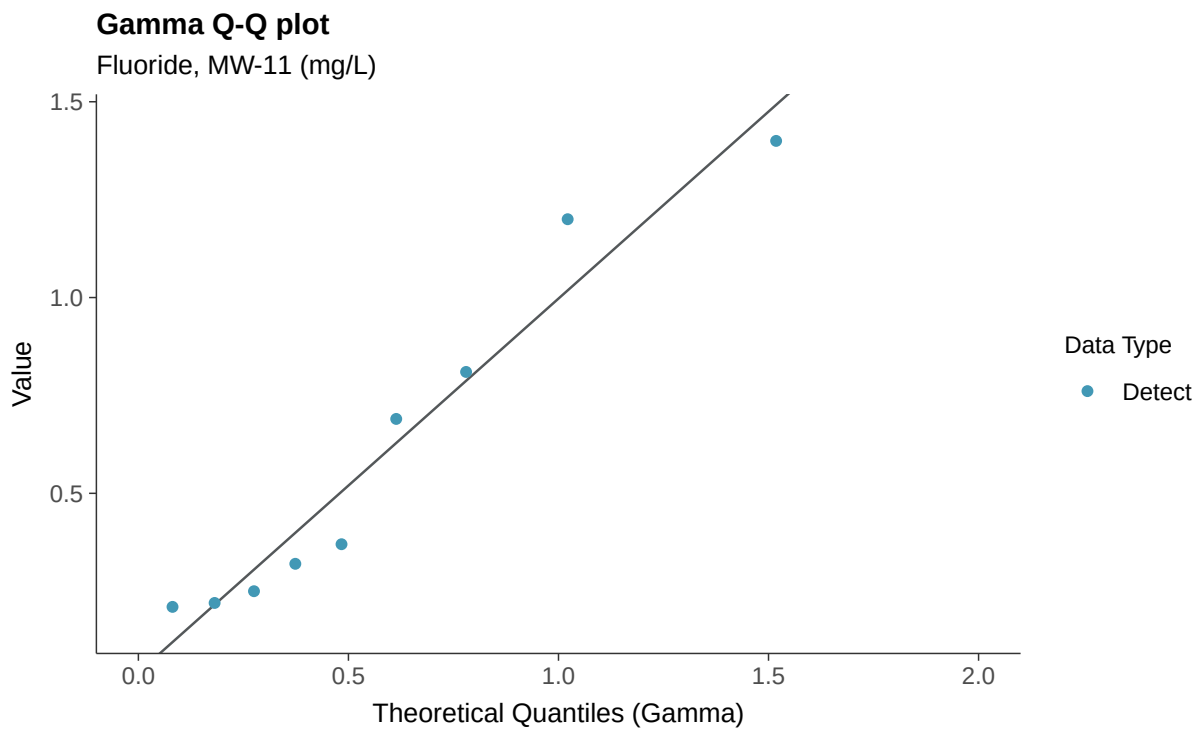
Boxplot by Season

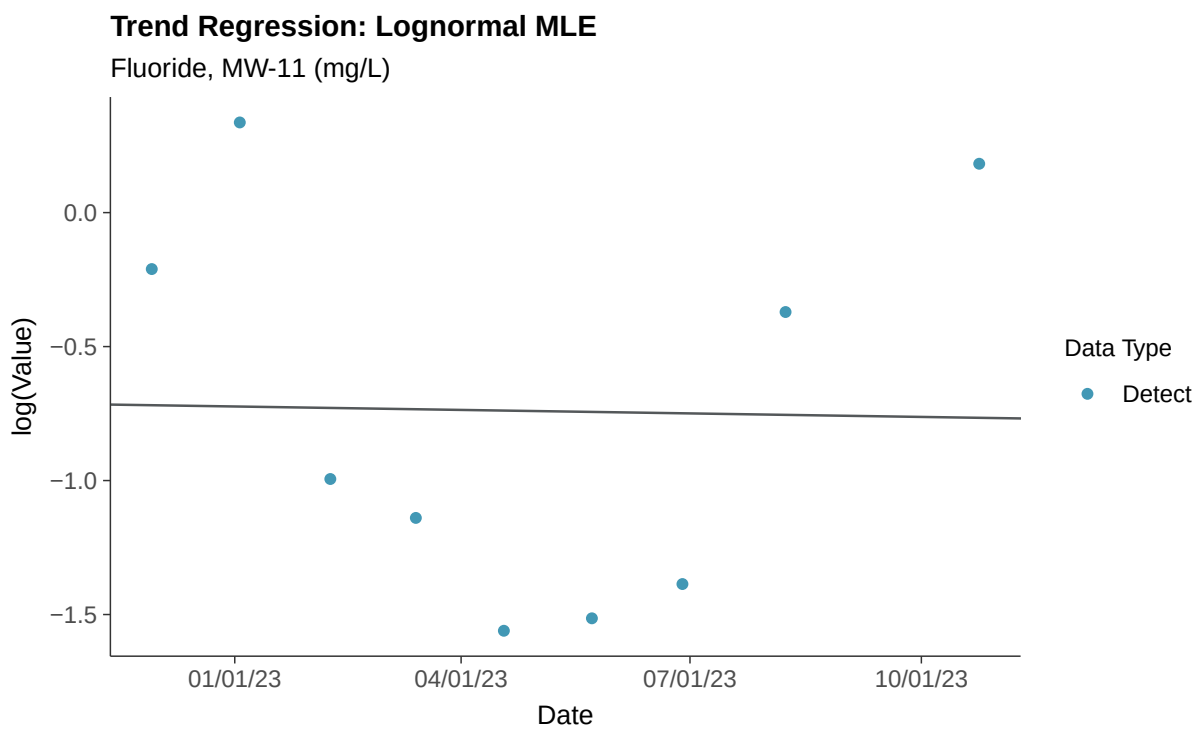
Fluoride, MW-11 (mg/L)




Normal Q-Q plot
Fluoride, MW-11 (mg/L)
Value
1.5
1.0
0.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

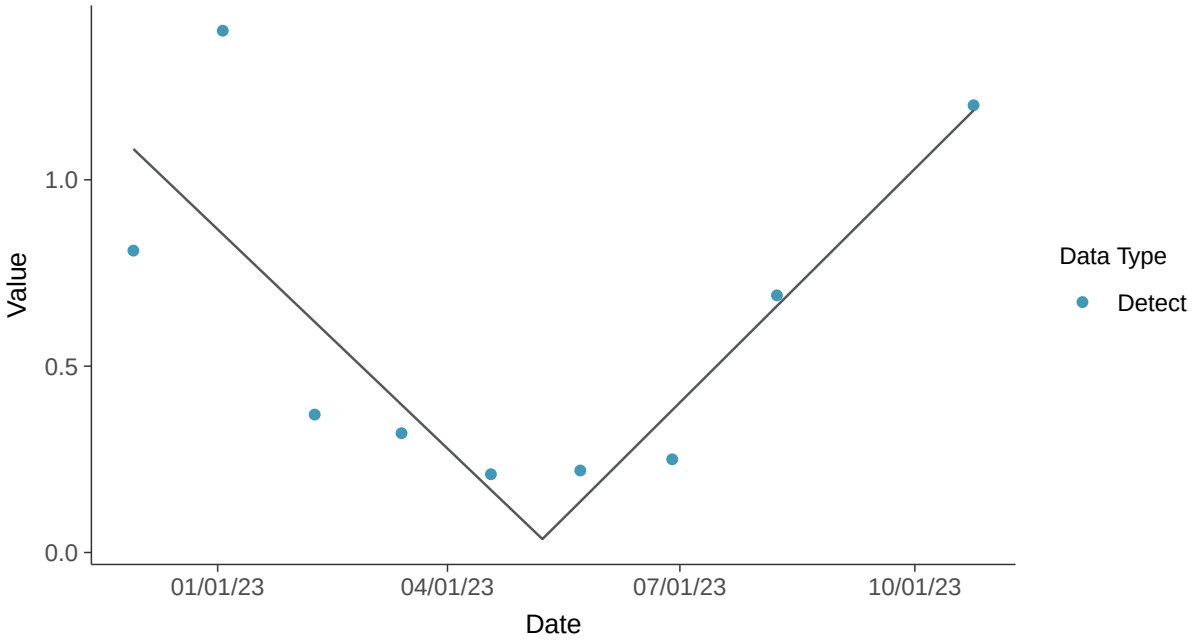

Lognormal Q-Q plot
Fluoride, MW-11 (mg/L)
log(Value)
0.5
0.0
−0.5
−1.0
−1.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride, MW-11 (mg/L)
Value
1.5
1.0
0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride, MW-11 (mg/L)
log(Value)
0.0
−0.5
−1.0
−1.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

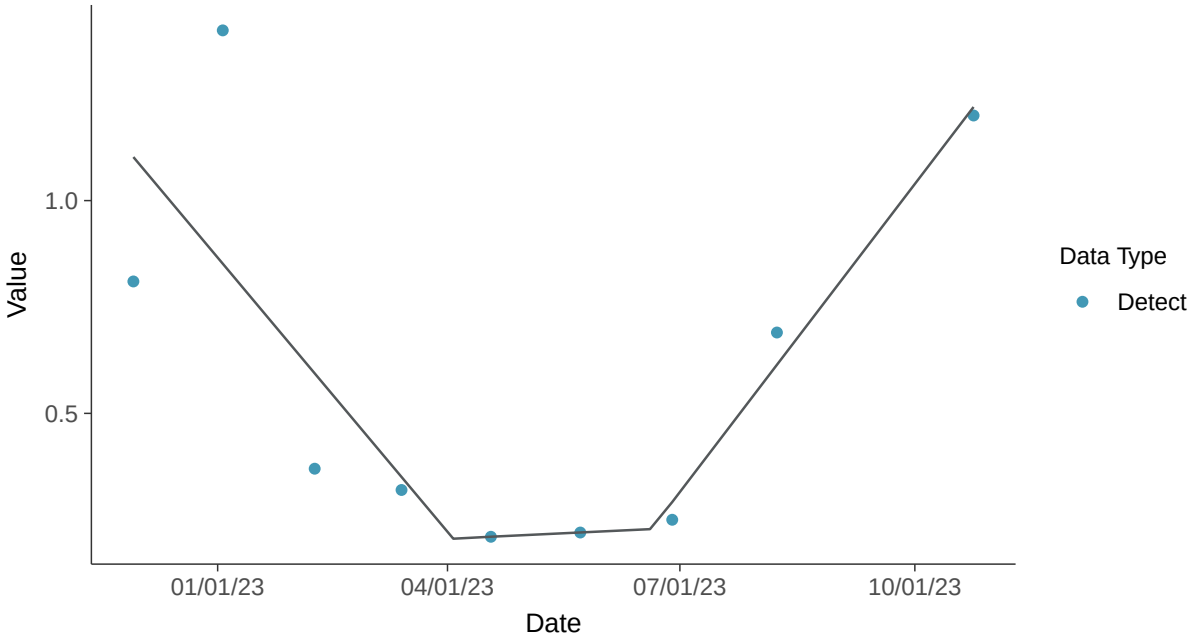
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-11 (mg/L)



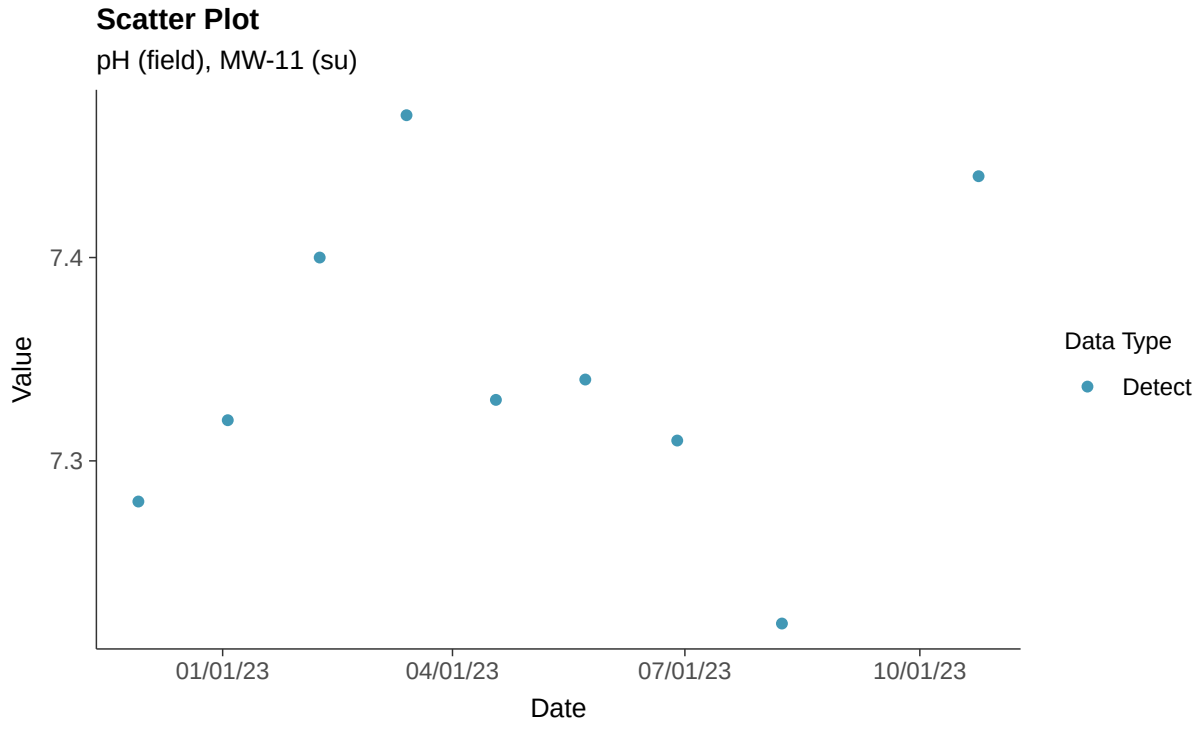
Trend Regression: Piecewise Linear-Linear-Linear

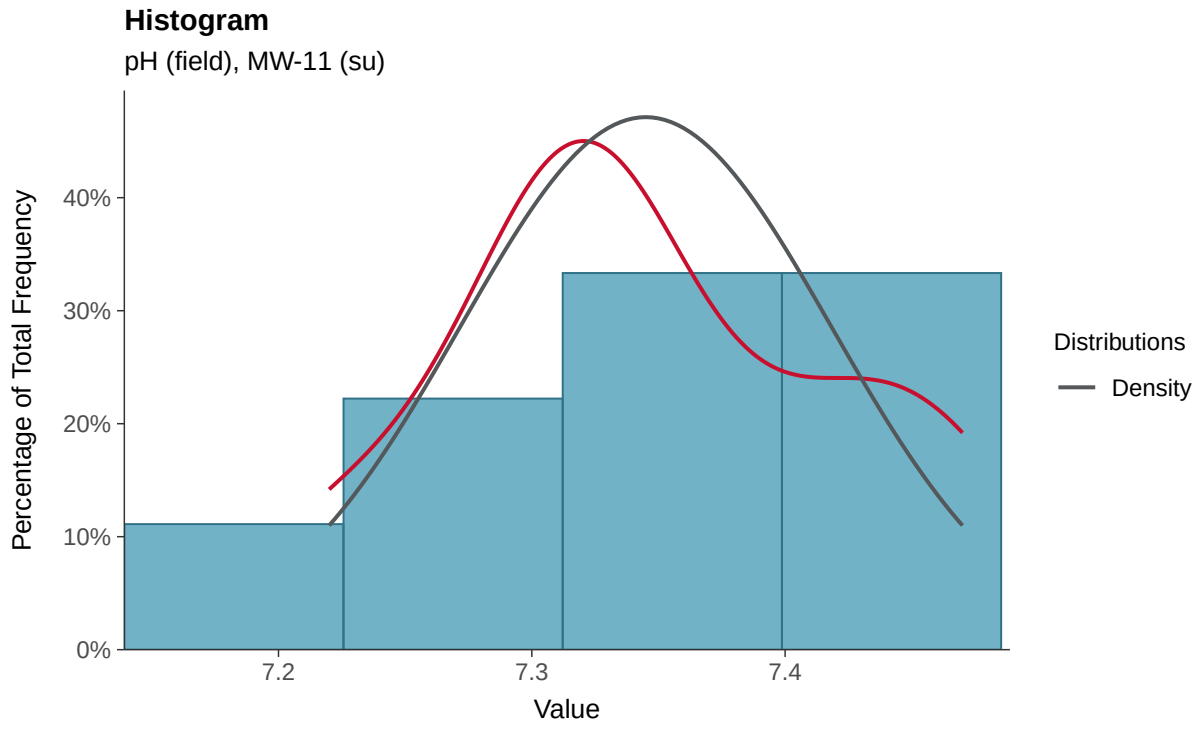
Fluoride, MW-11 (mg/L)



Appendix III: pH (field), MW-11

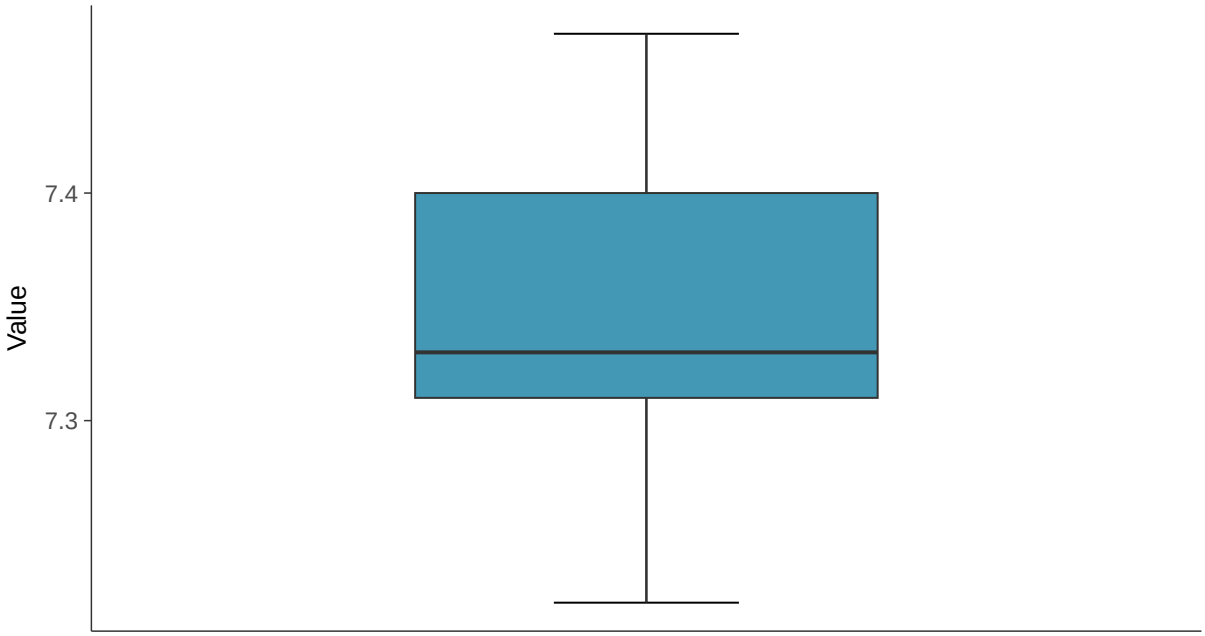
ID: 2_20_4_120





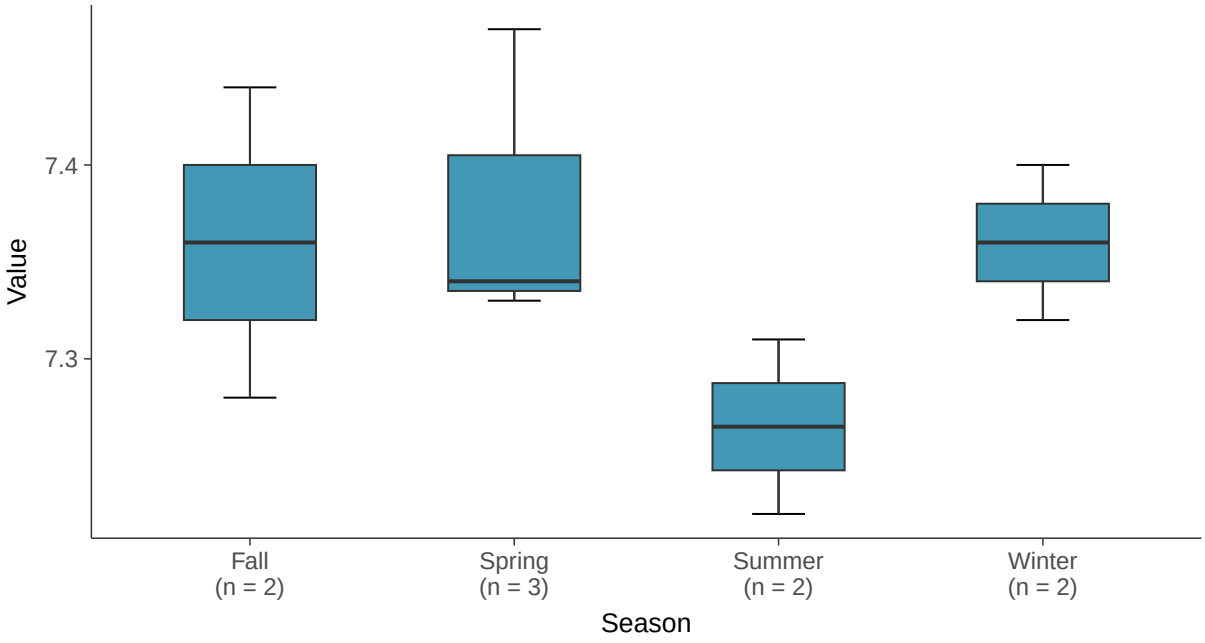
Boxplot

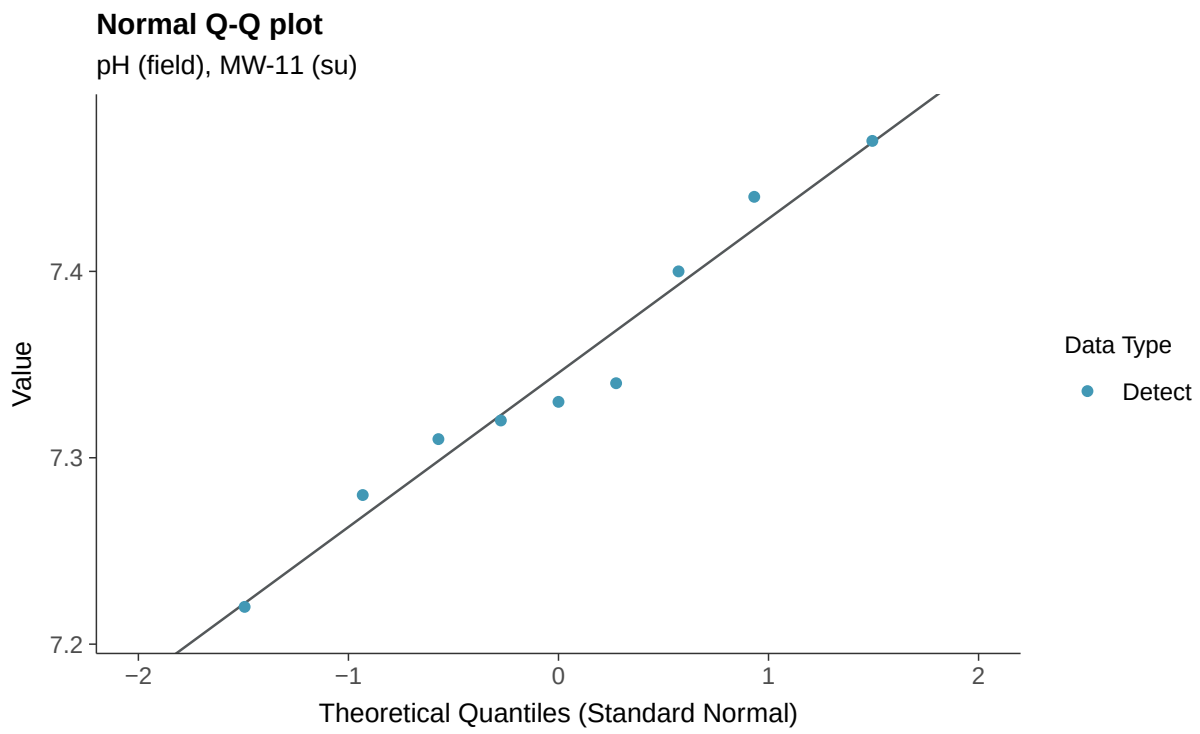
pH (field), MW-11 (su)

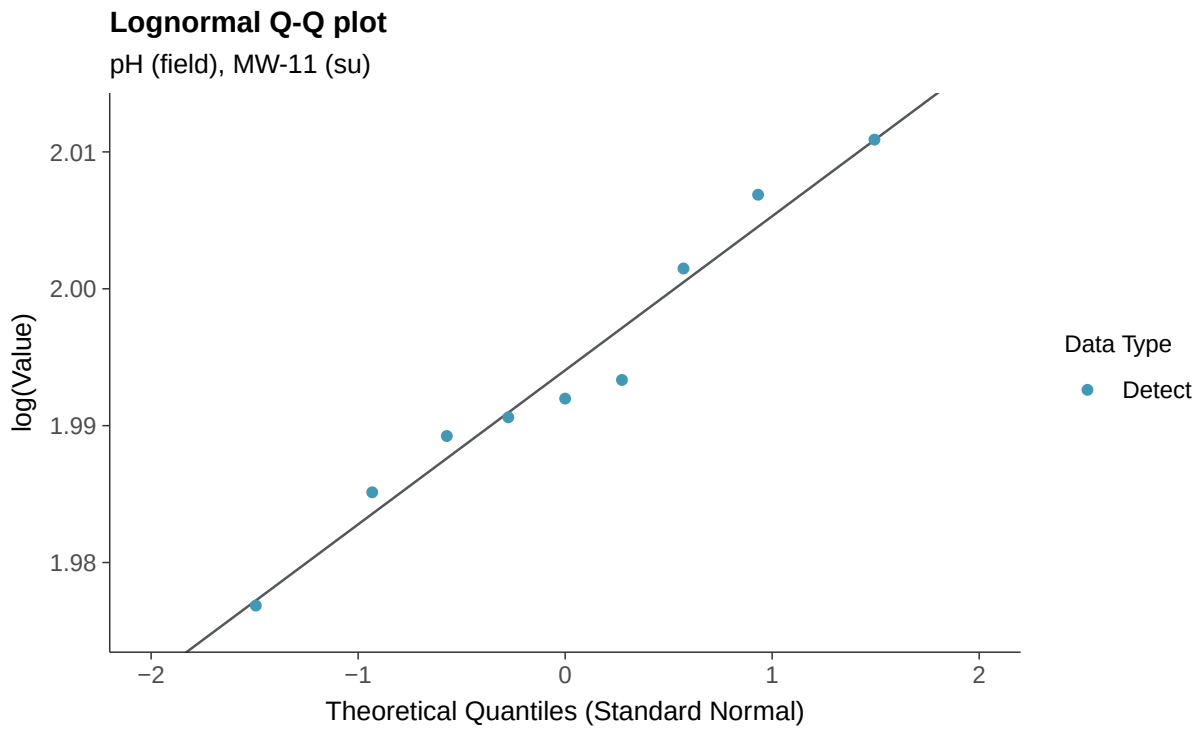


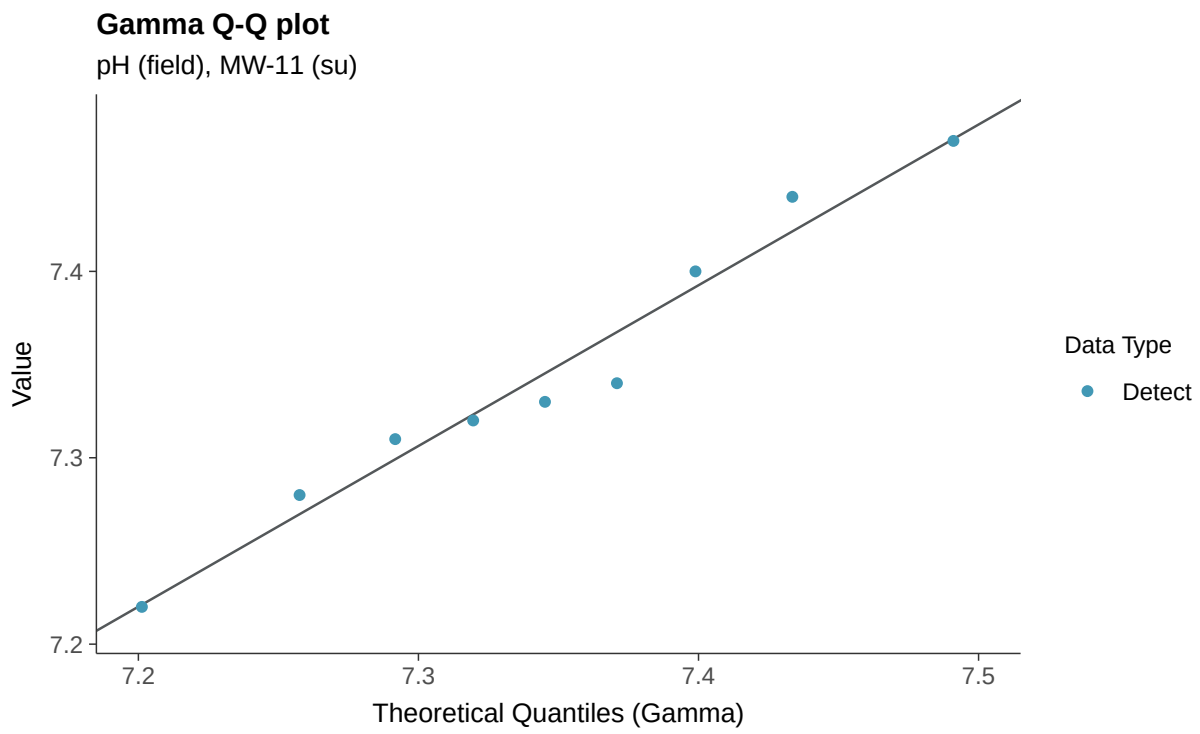
Boxplot by Season

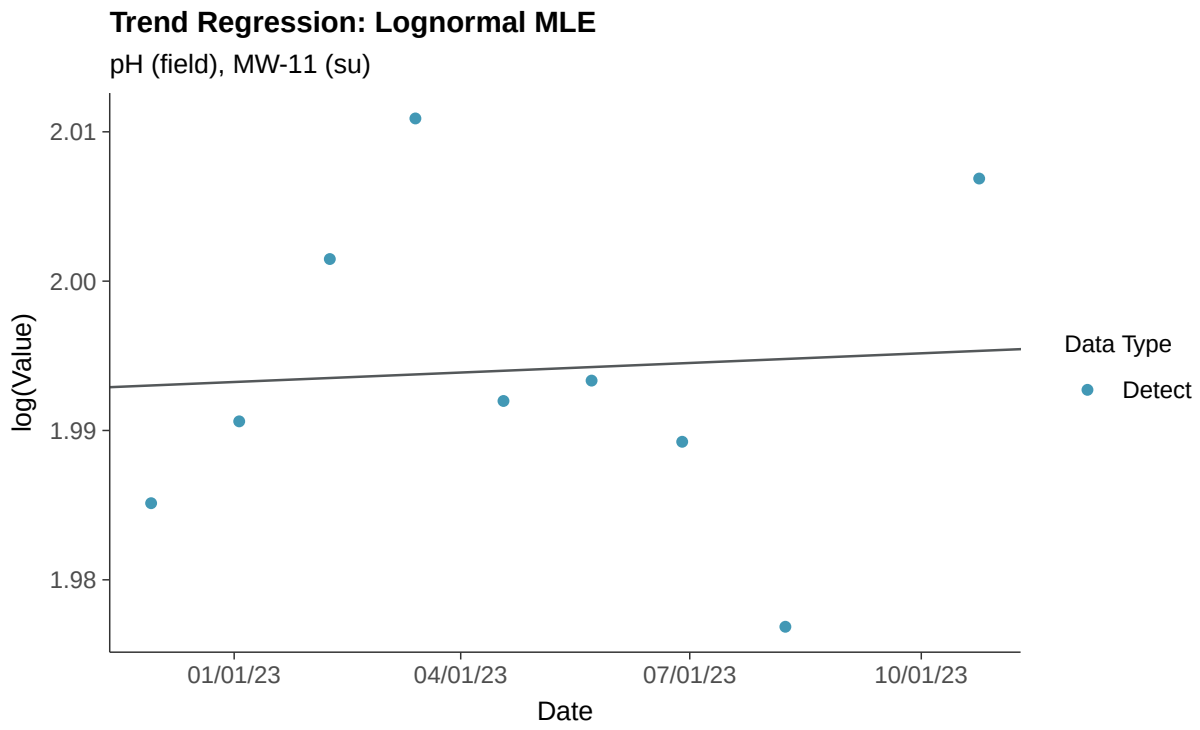
pH (field), MW-11 (su)

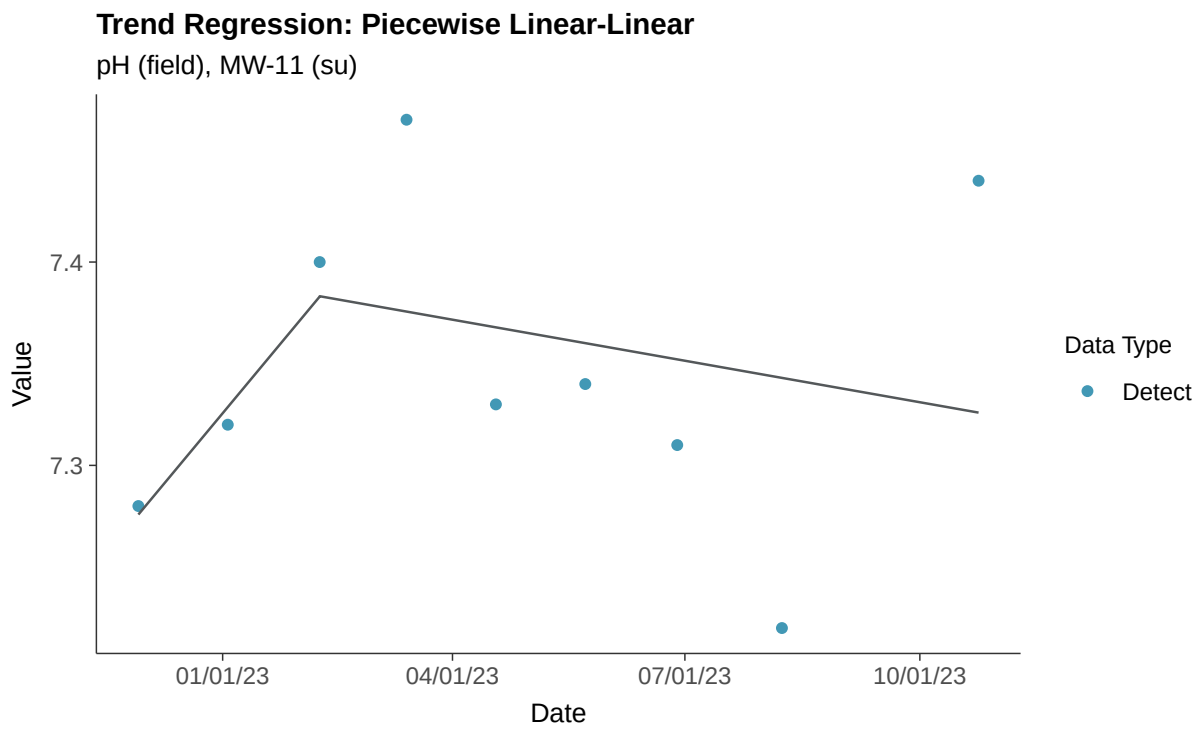



Normal Q-Q plot
pH (field), MW-11 (su)
Value
7.4
7.3
7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
pH (field), MW-11 (su)
log(Value)
2.01
2.00
1.99
1.98
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

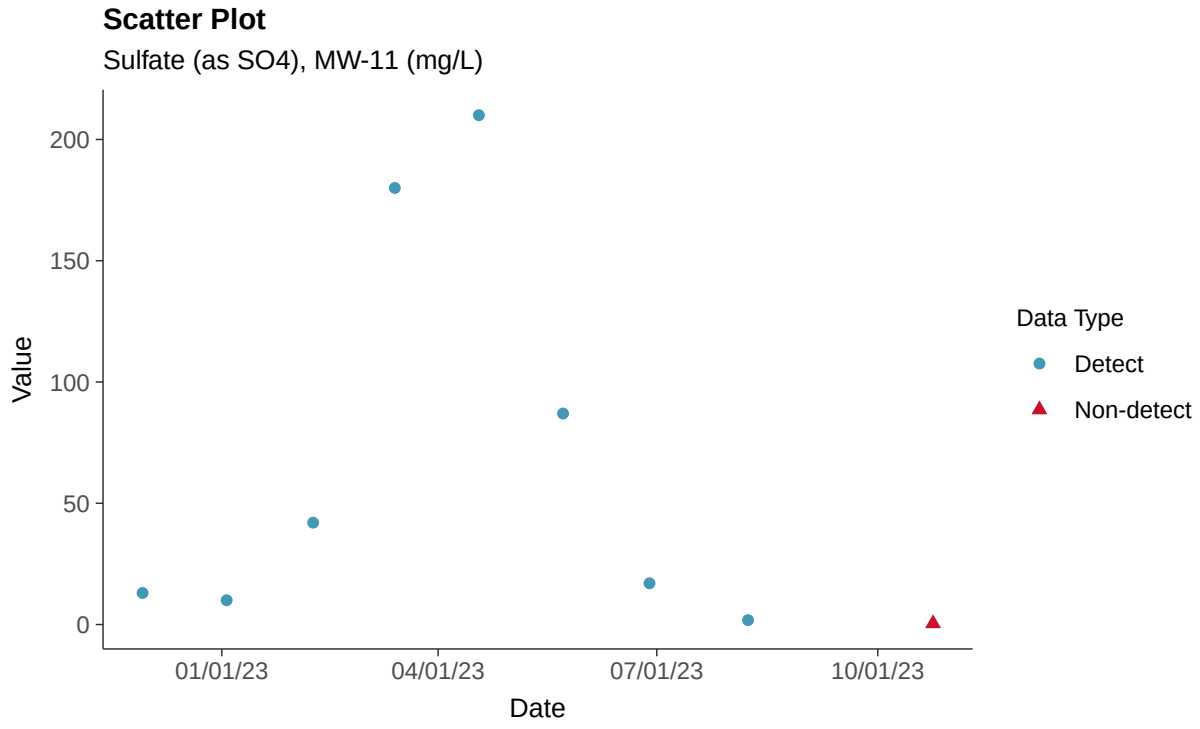

Gamma Q-Q plot
pH (field), MW-11 (su)
Value
7.4
7.3
7.2
7.2
7.3
7.4
7.5
Theoretical Quantiles (Gamma)
Data Type
Detect

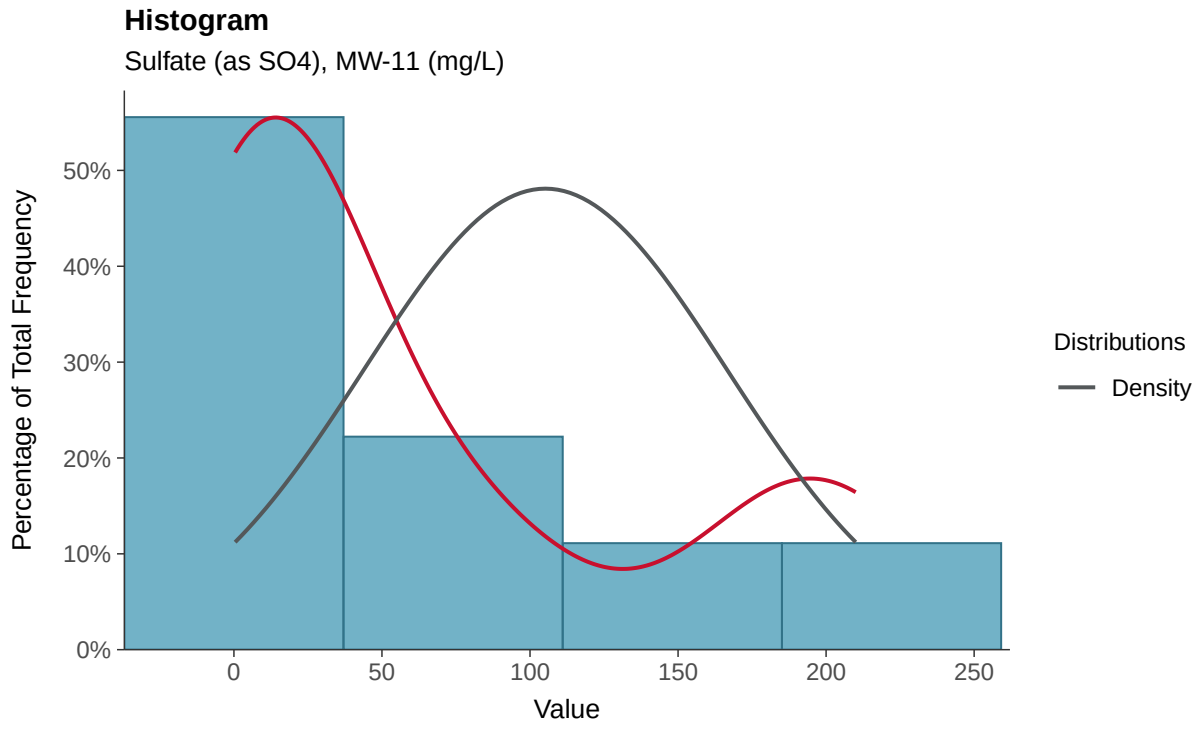

Trend Regression: Lognormal MLE
pH (field), MW-11 (su)
log(Value)
2.01
2.00
1.99
1.98
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
pH (field), MW-11 (su)
Value
7.4
7.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-11

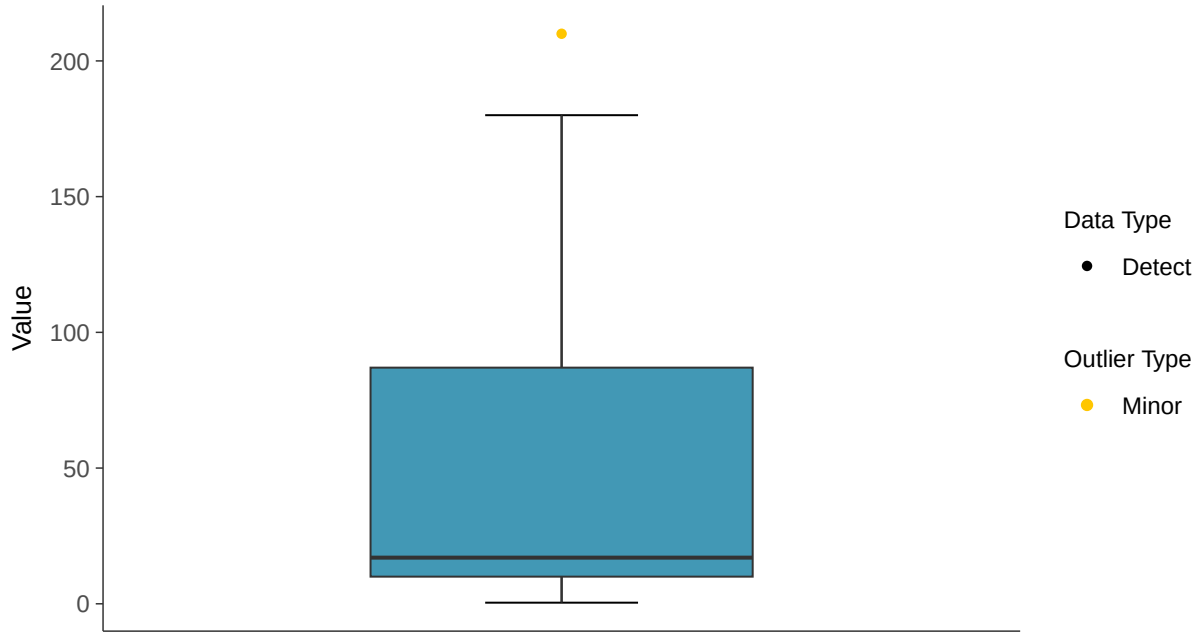
ID: 2_20_4_124





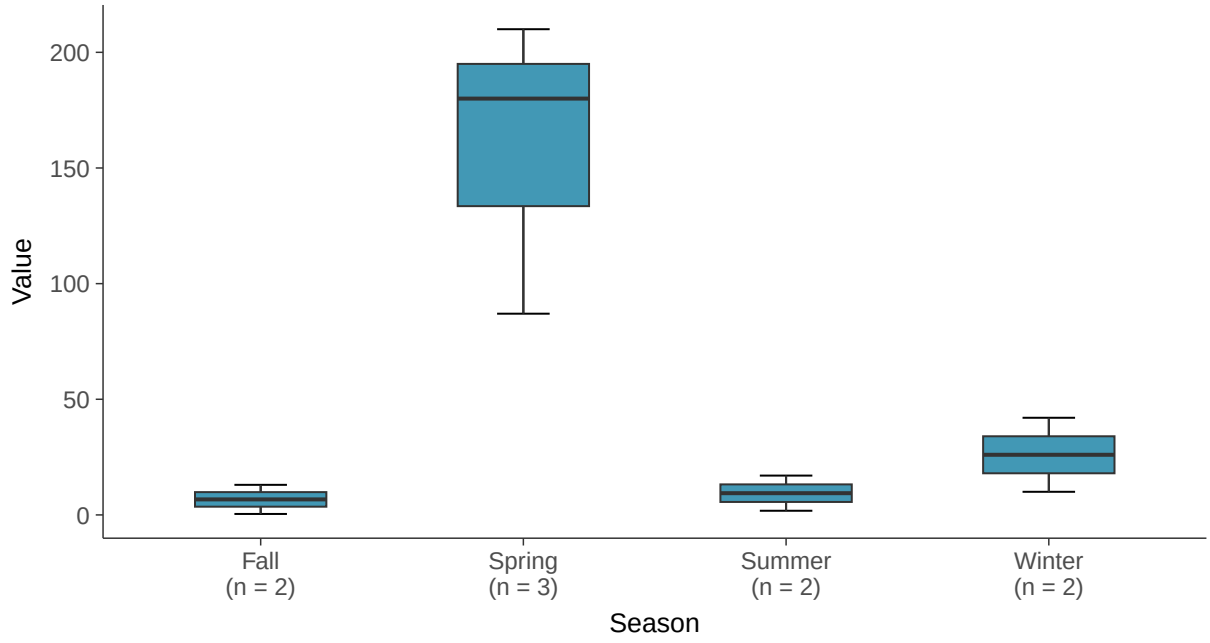
Boxplot

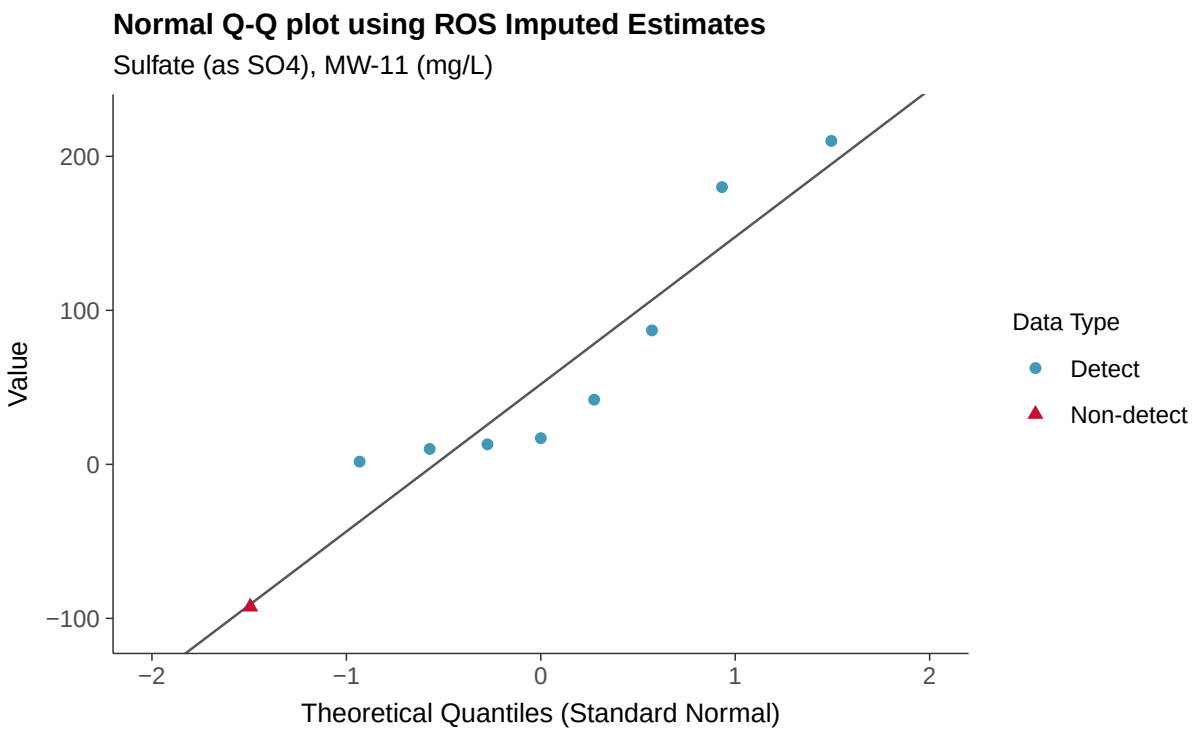
Sulfate (as SO4), MW-11 (mg/L)

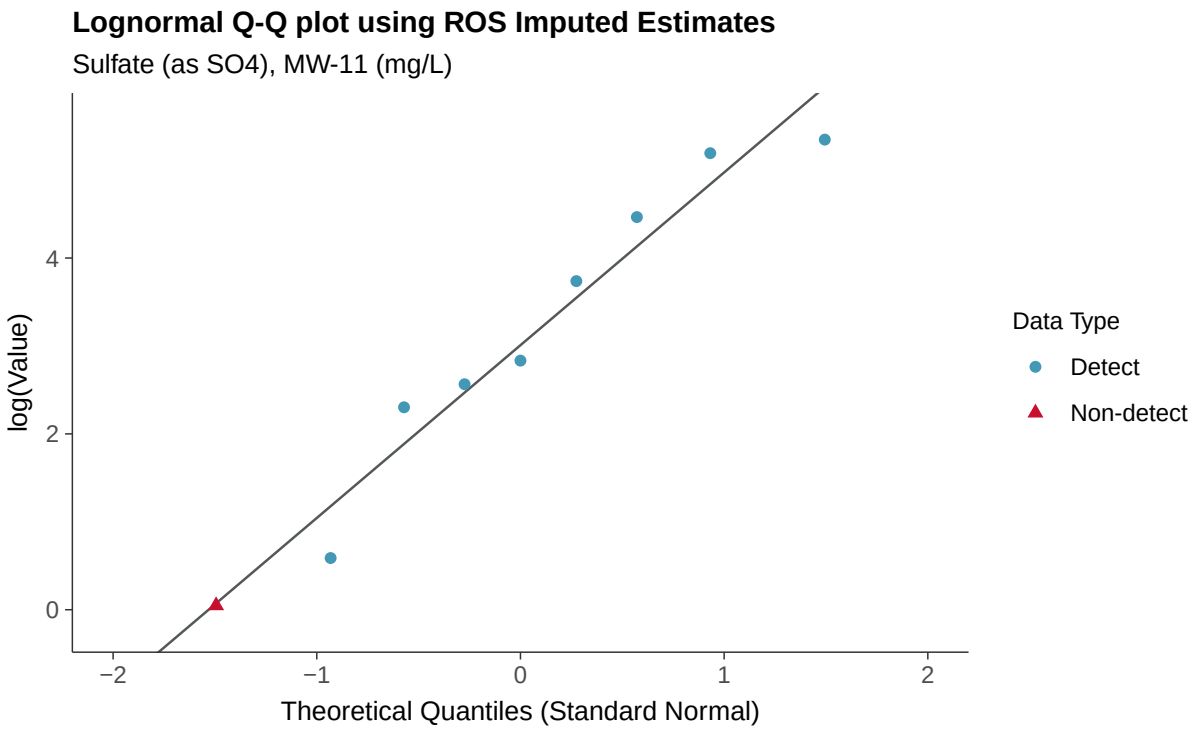


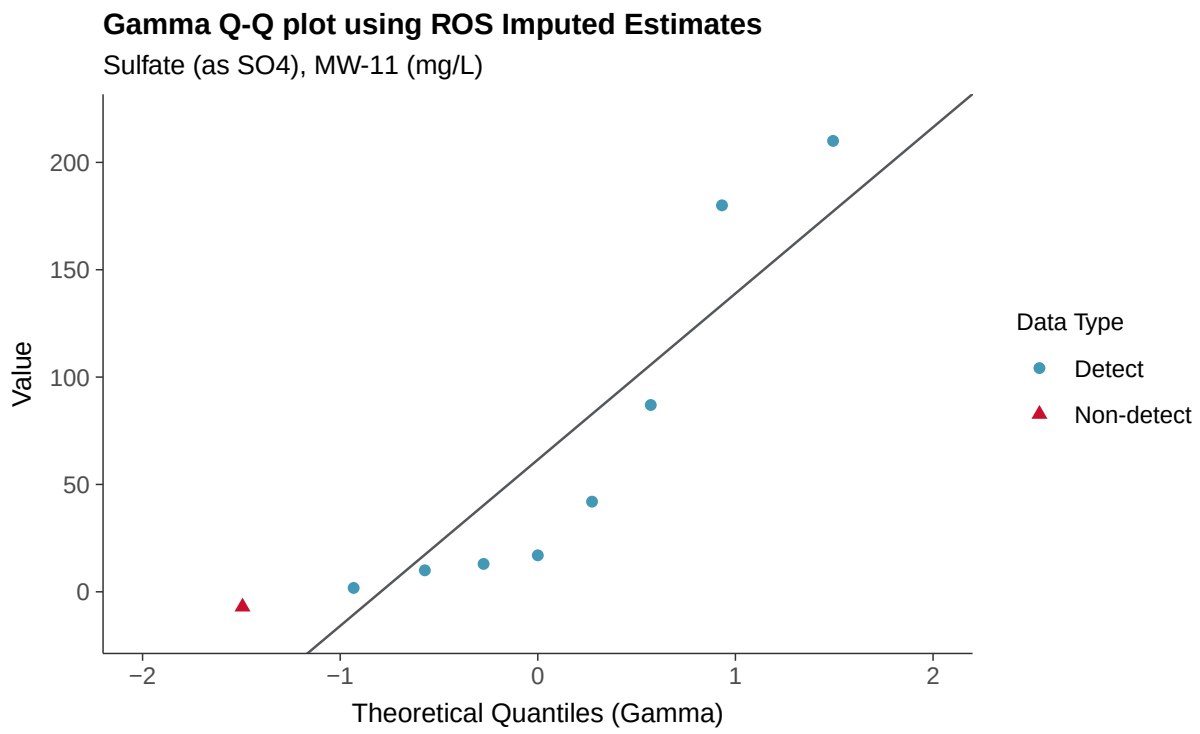
Boxplot by Season

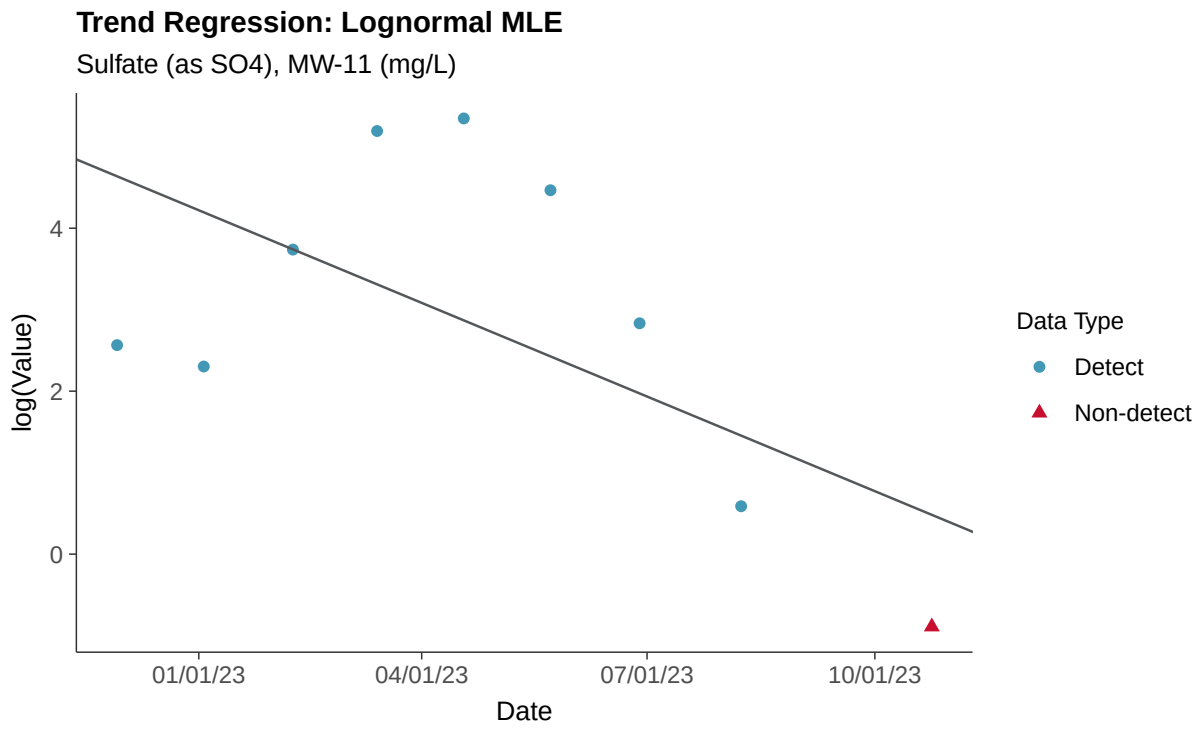
Sulfate (as SO4), MW-11 (mg/L)

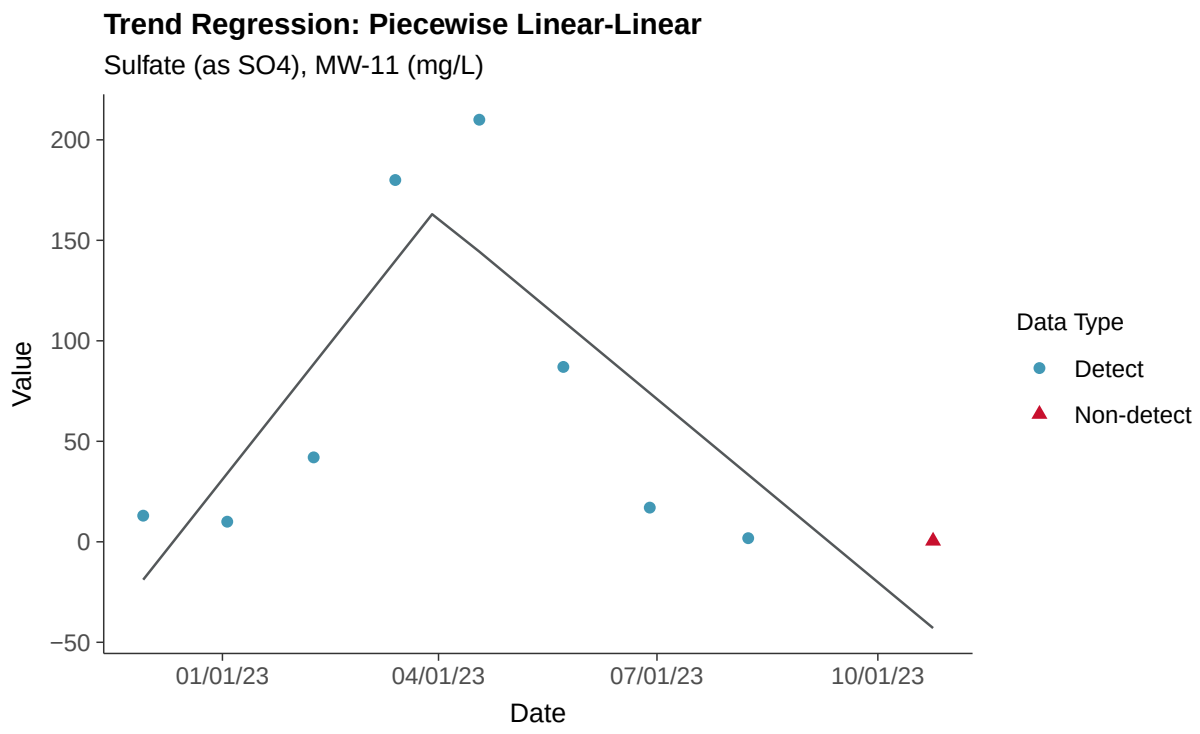


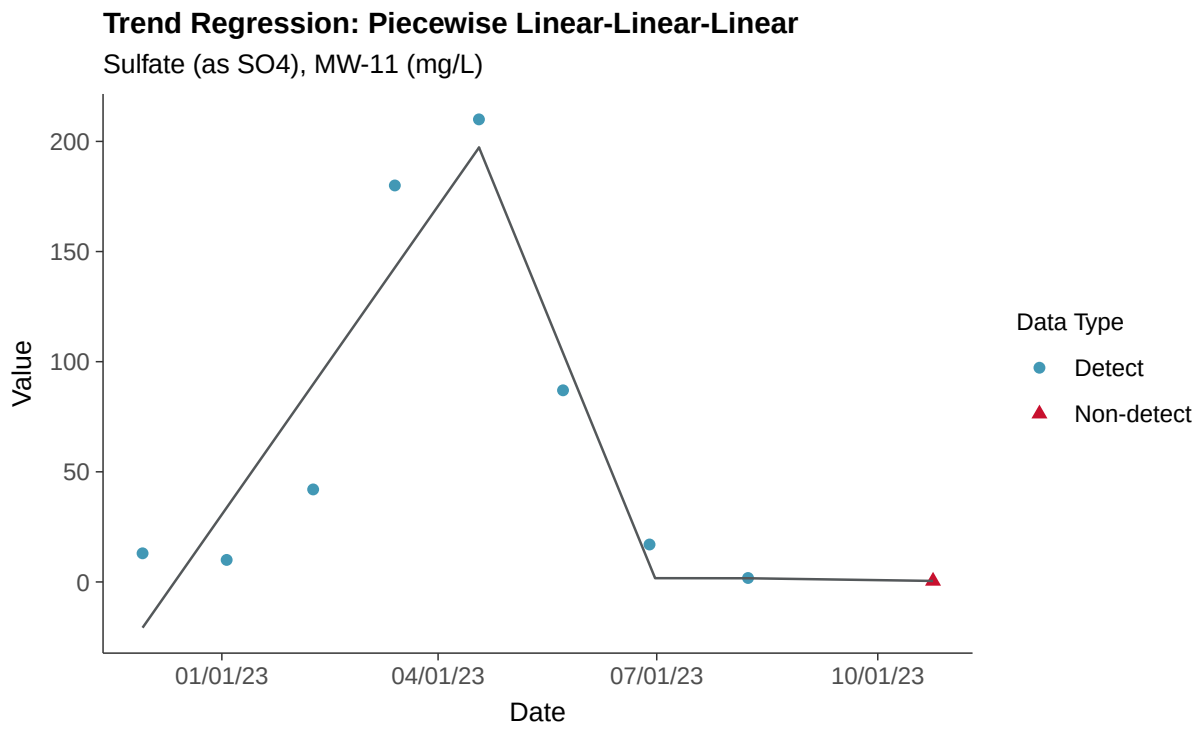

Normal Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-11 (mg/L)
Value
200
100
0
−100
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-11 (mg/L)
log(Value)
4
2
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Sulfate (as SO4), MW-11 (mg/L)
Value
200
150
100
50
0
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

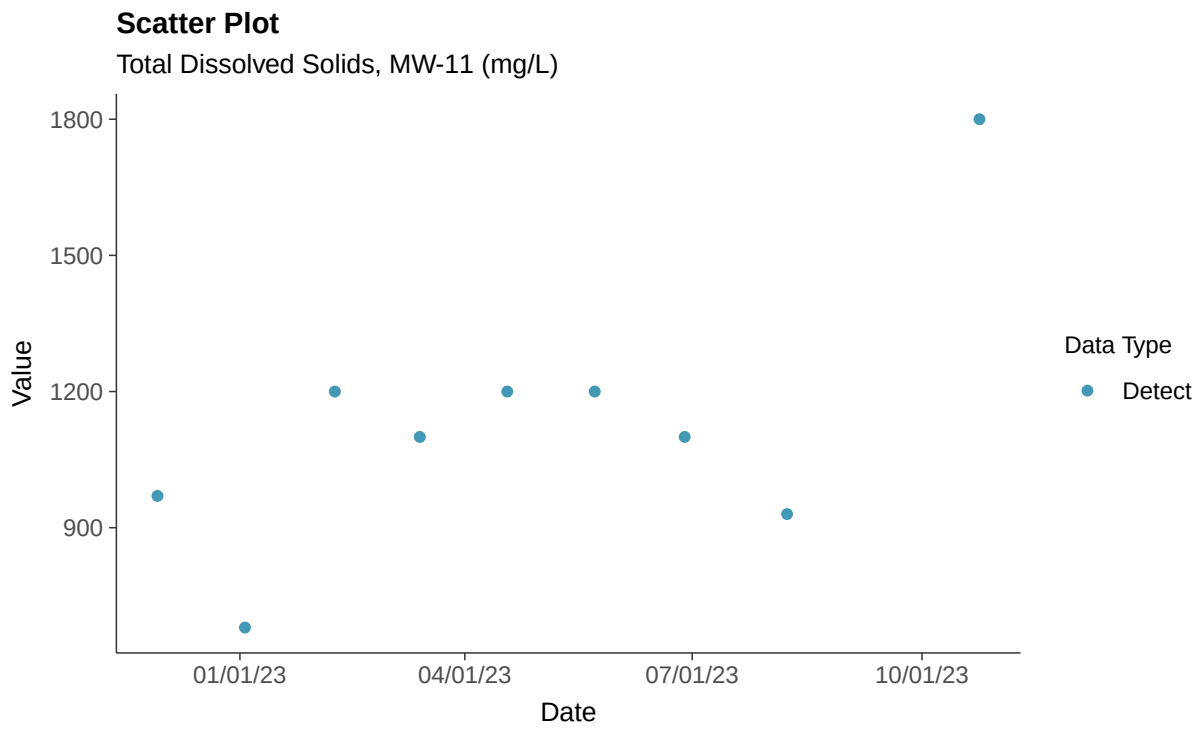

Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-11 (mg/L)
log(Value)
4
2
0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

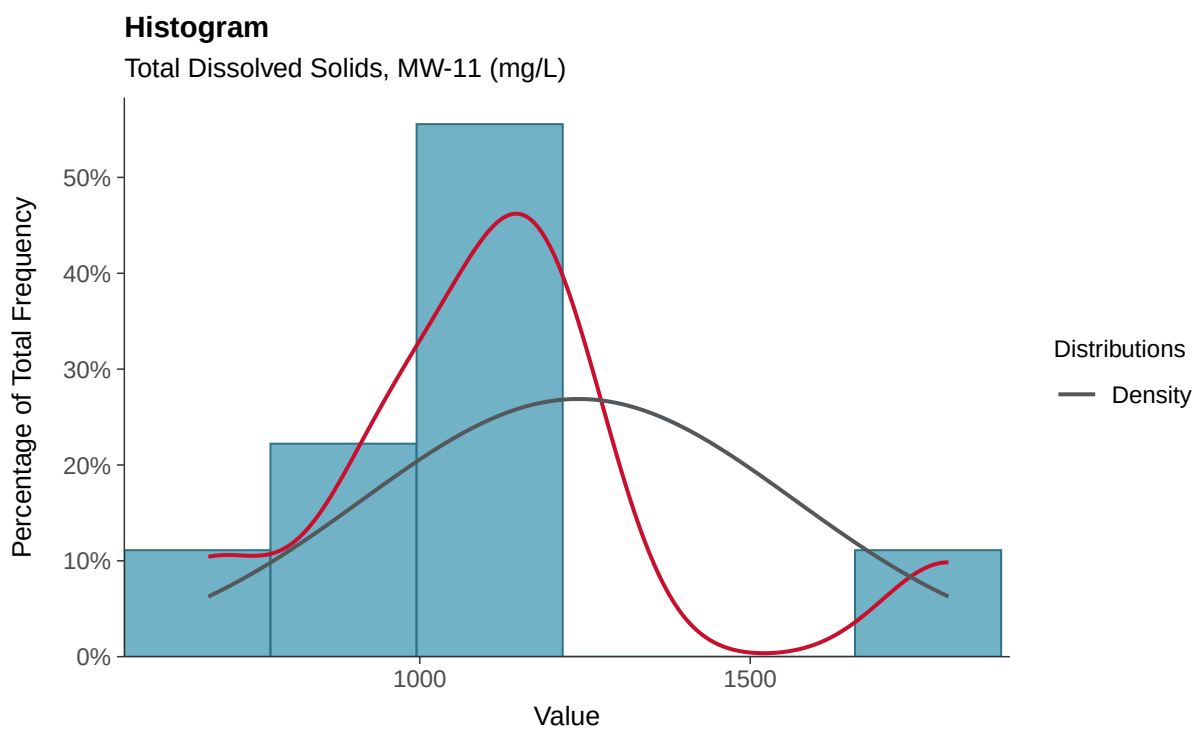

Trend Regression: Piecewise Linear-Linear
Sulfate (as SO4), MW-11 (mg/L)
Value
200
150
100
50
0
−50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Sulfate (as SO4), MW-11 (mg/L)
Value
200
150
100
50
0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Total Dissolved Solids, MW-11

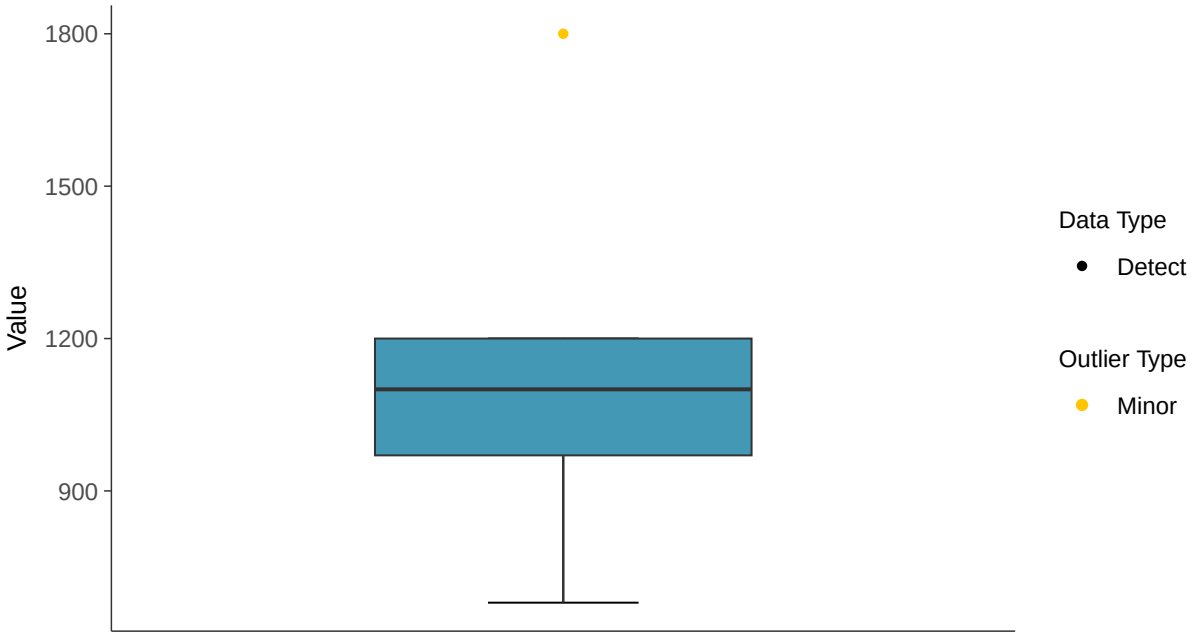
ID: 2_20_4_126





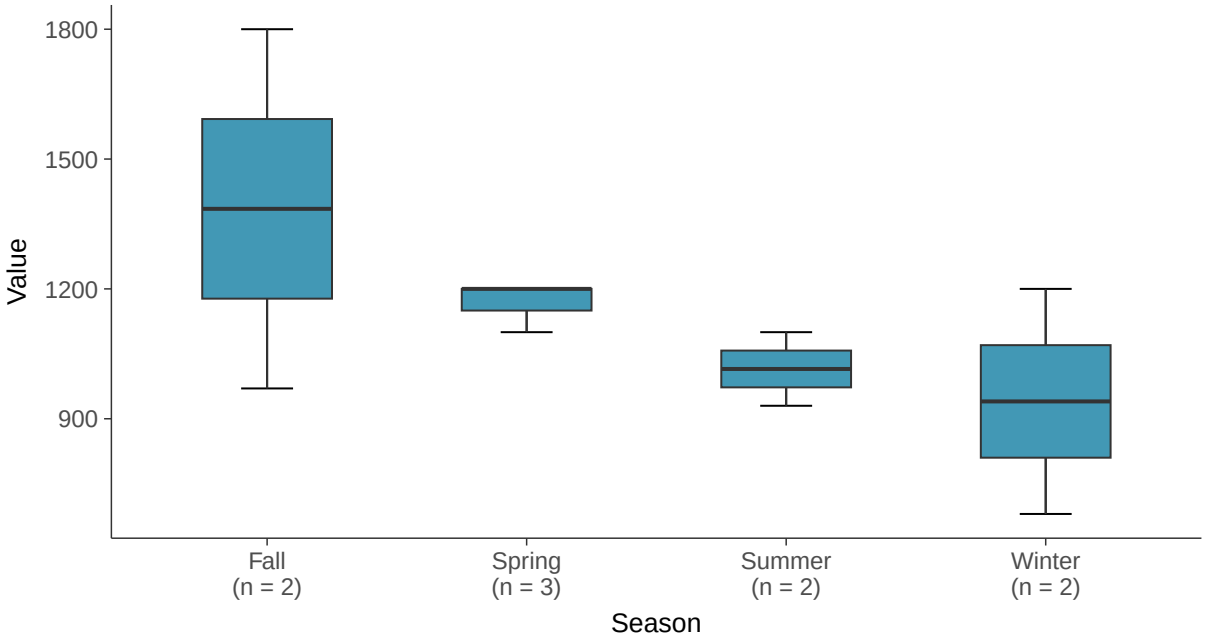
Boxplot

Total Dissolved Solids, MW-11 (mg/L)



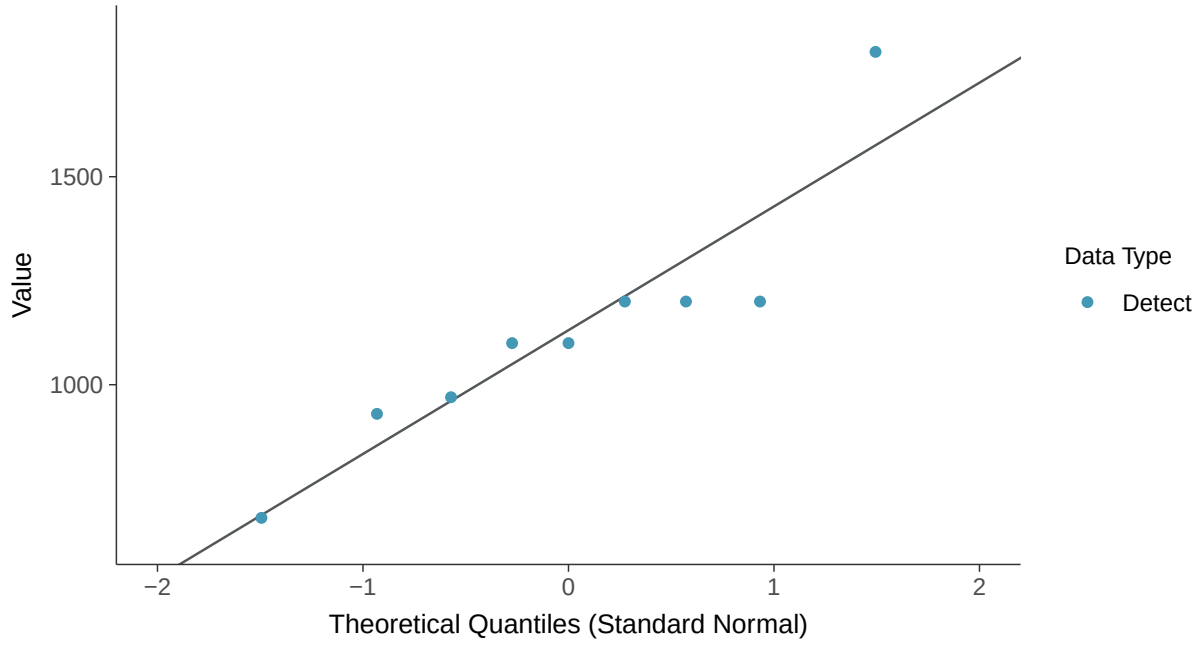
Boxplot by Season

Total Dissolved Solids, MW-11 (mg/L)



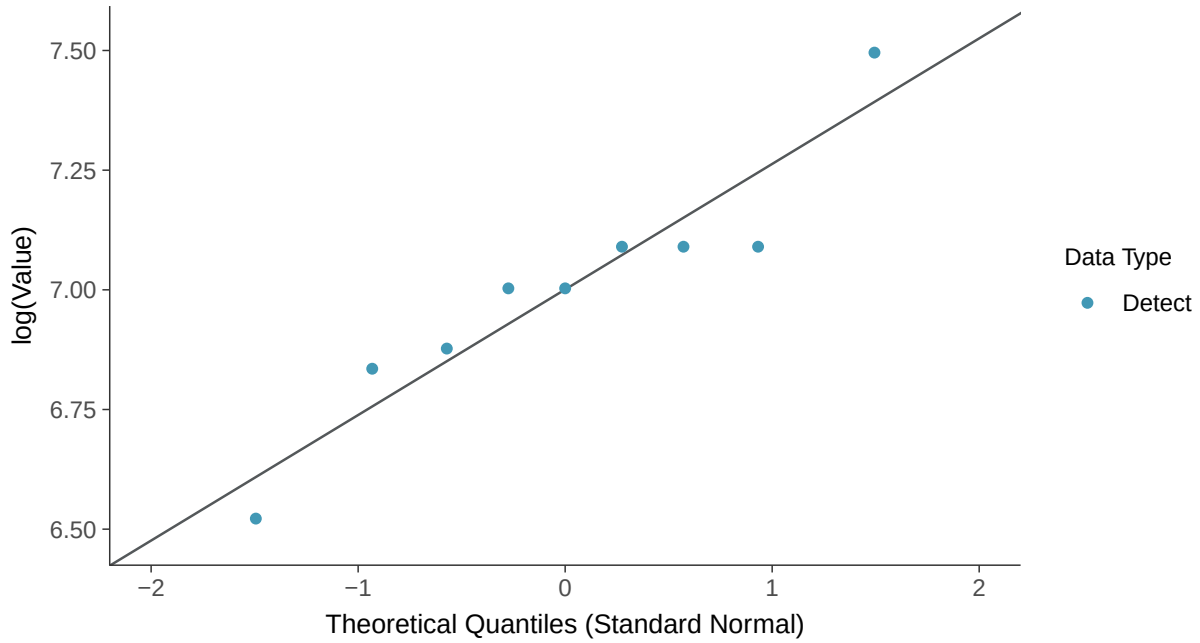
Normal Q-Q plot

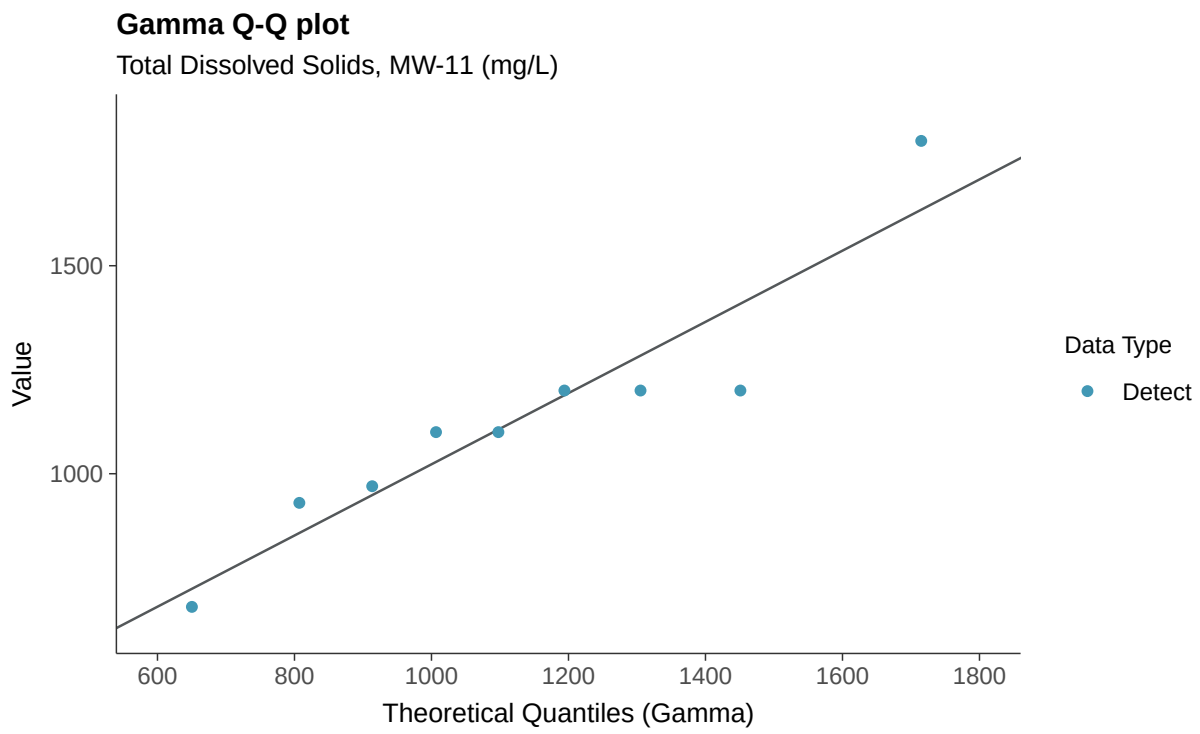
Total Dissolved Solids, MW-11 (mg/L)

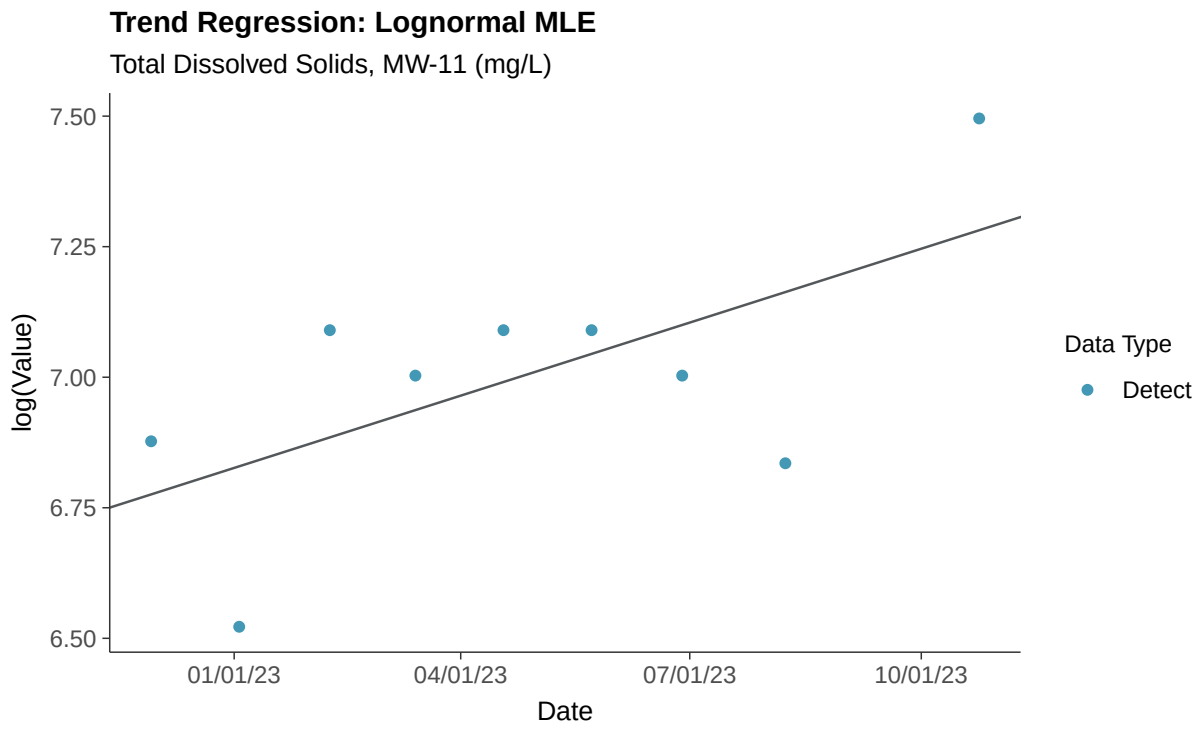


Lognormal Q-Q plot

Total Dissolved Solids, MW-11 (mg/L)

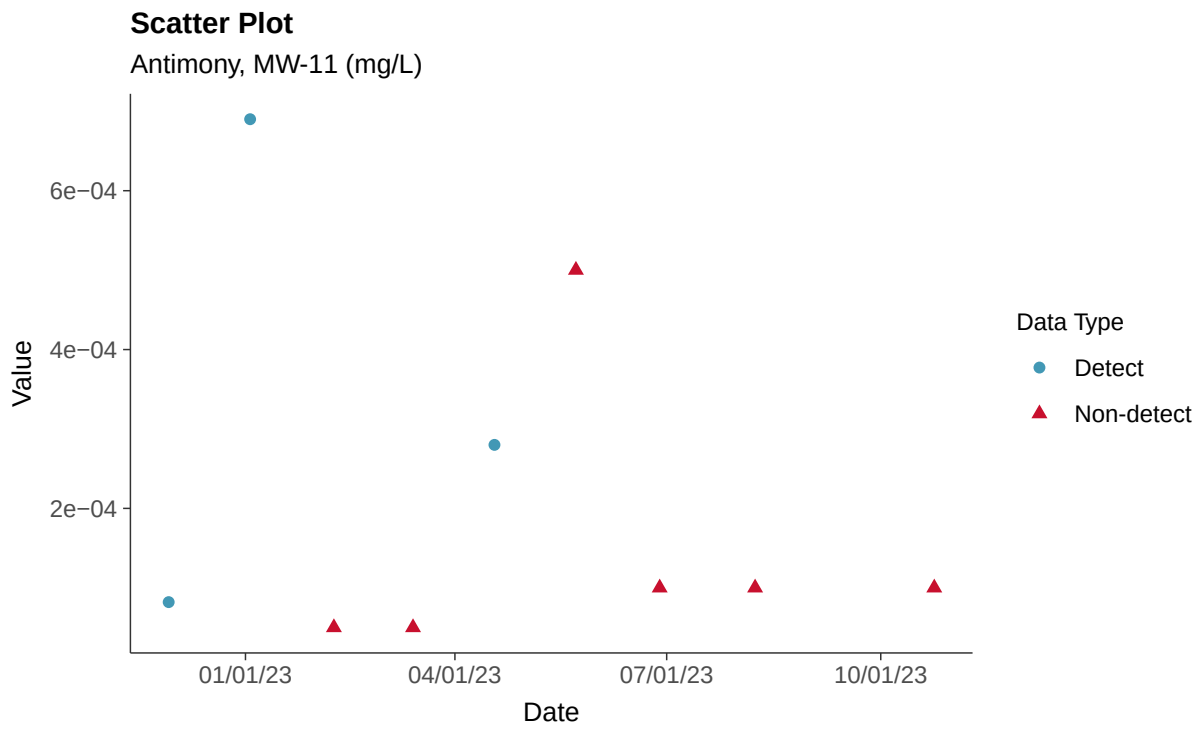


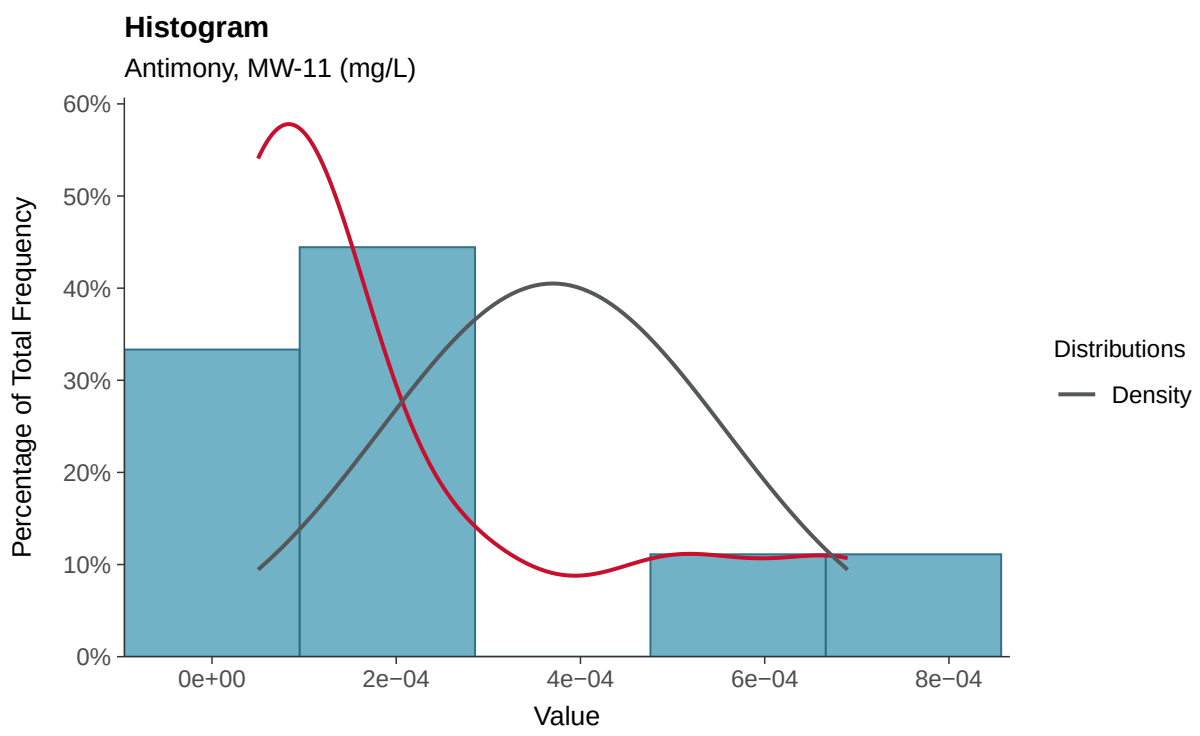

Gamma Q-Q plot
Total Dissolved Solids, MW-11 (mg/L)
Value
1500
1000
600
800
1000
1200
1400
1600
1800
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-11 (mg/L)
log(Value)
7.50
7.25
7.00
6.75
6.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-11

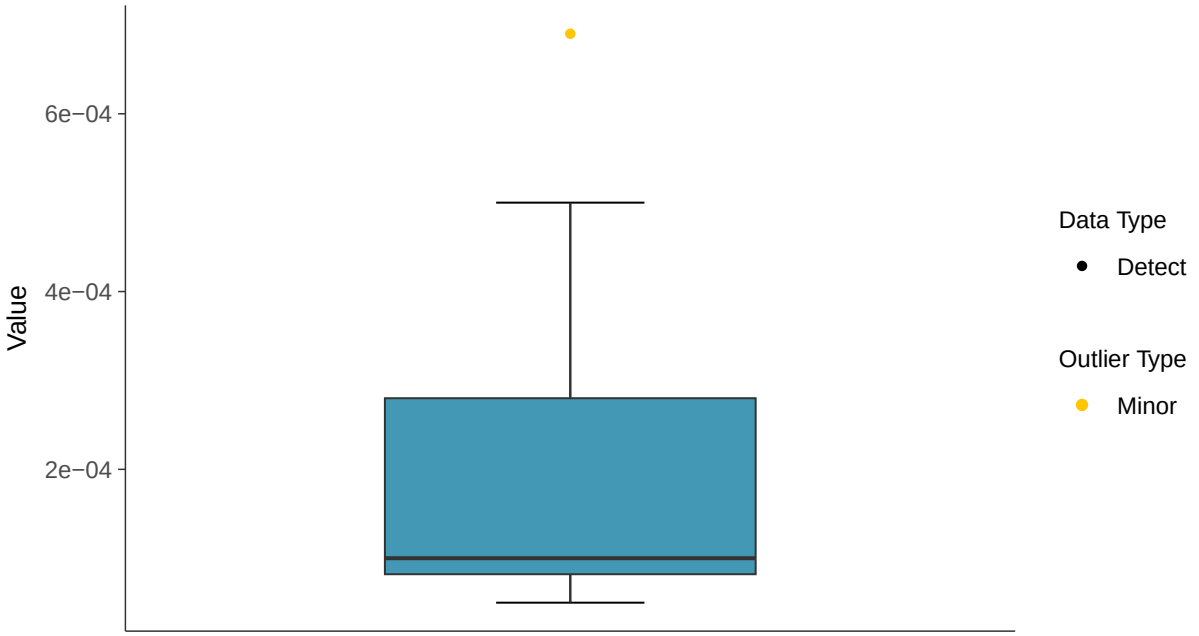
ID: 2_20_5_101





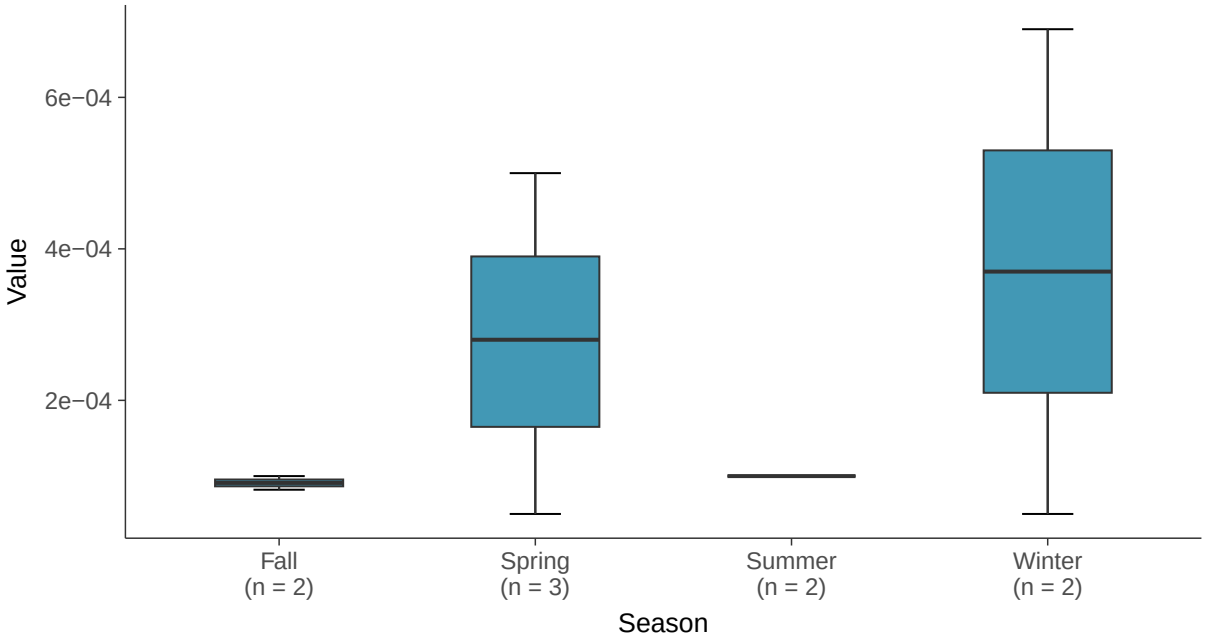
Boxplot

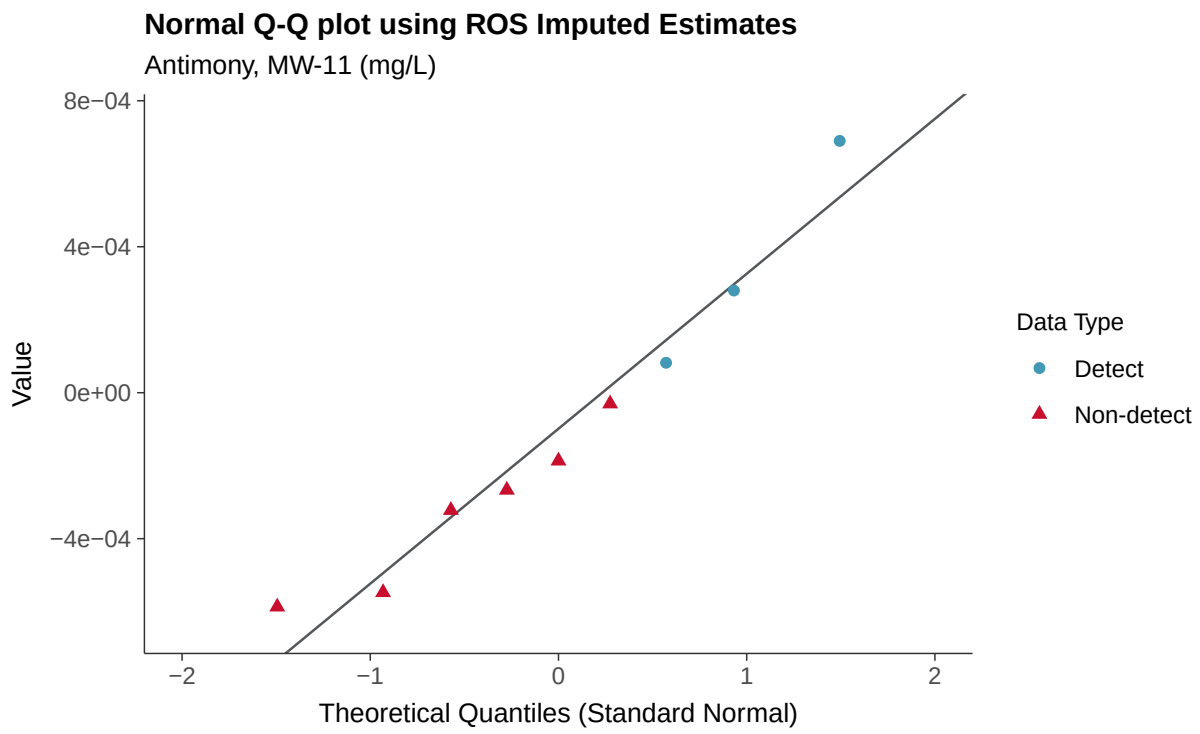
Antimony, MW-11 (mg/L)

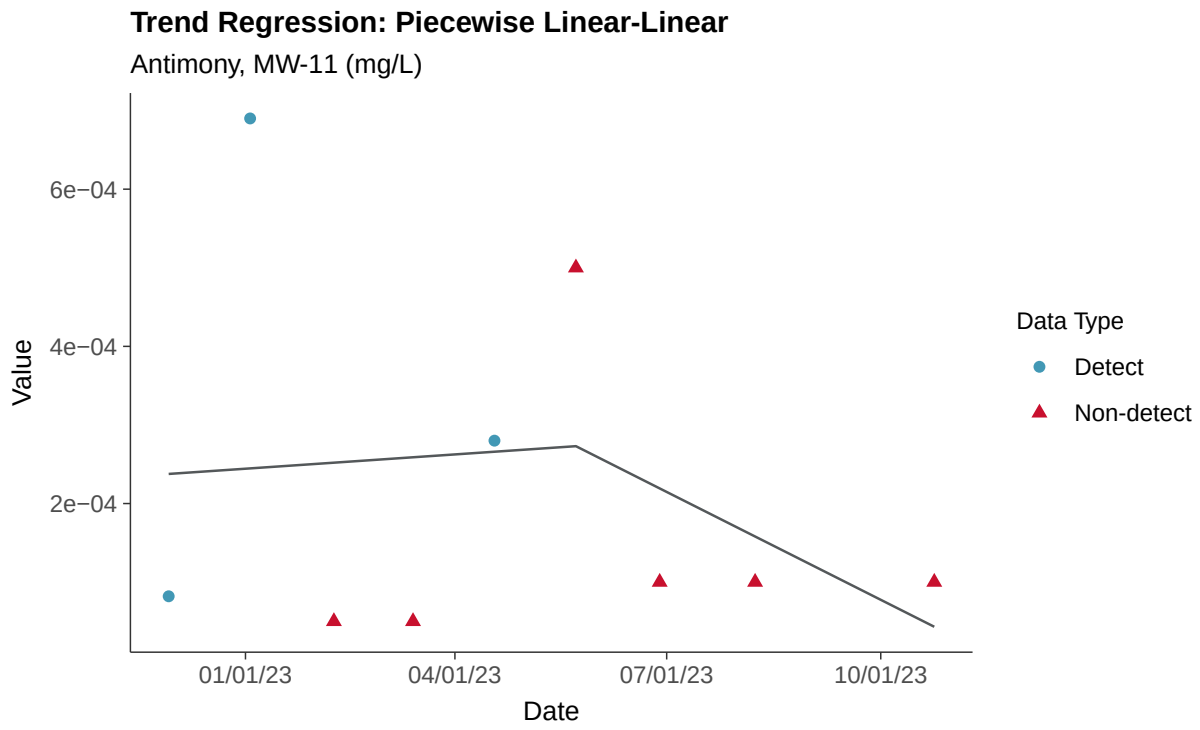


Boxplot by Season

Antimony, MW-11 (mg/L)

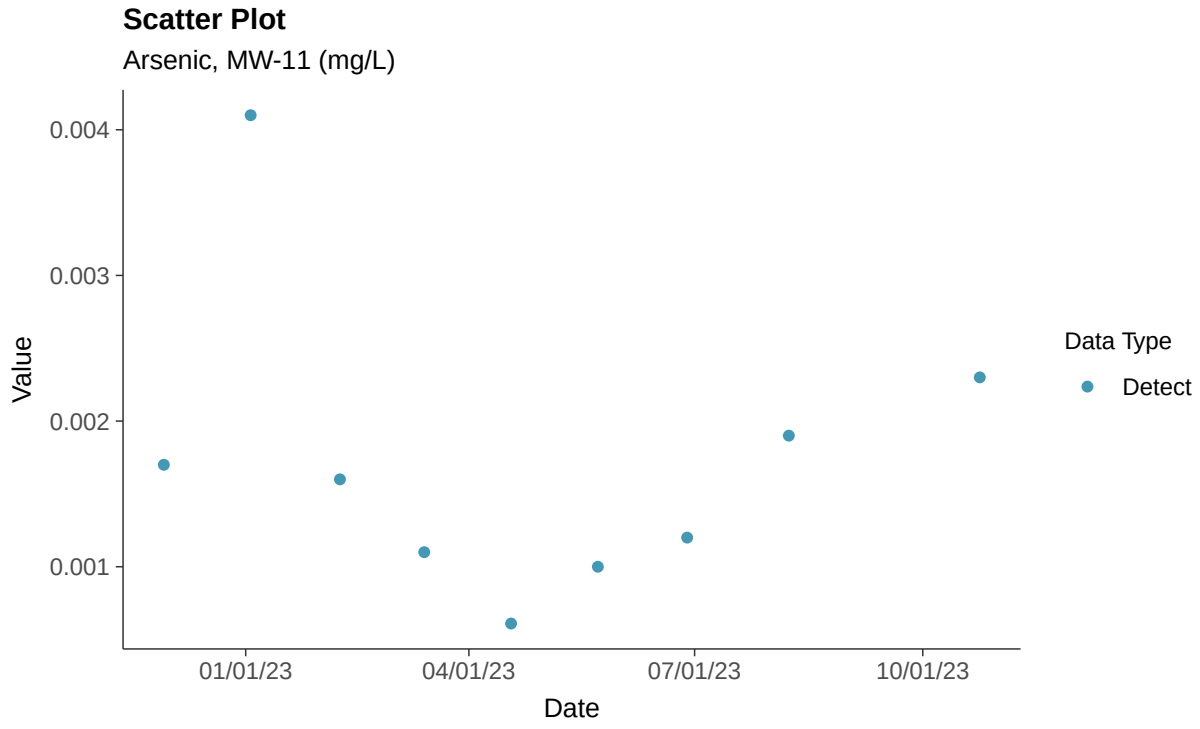


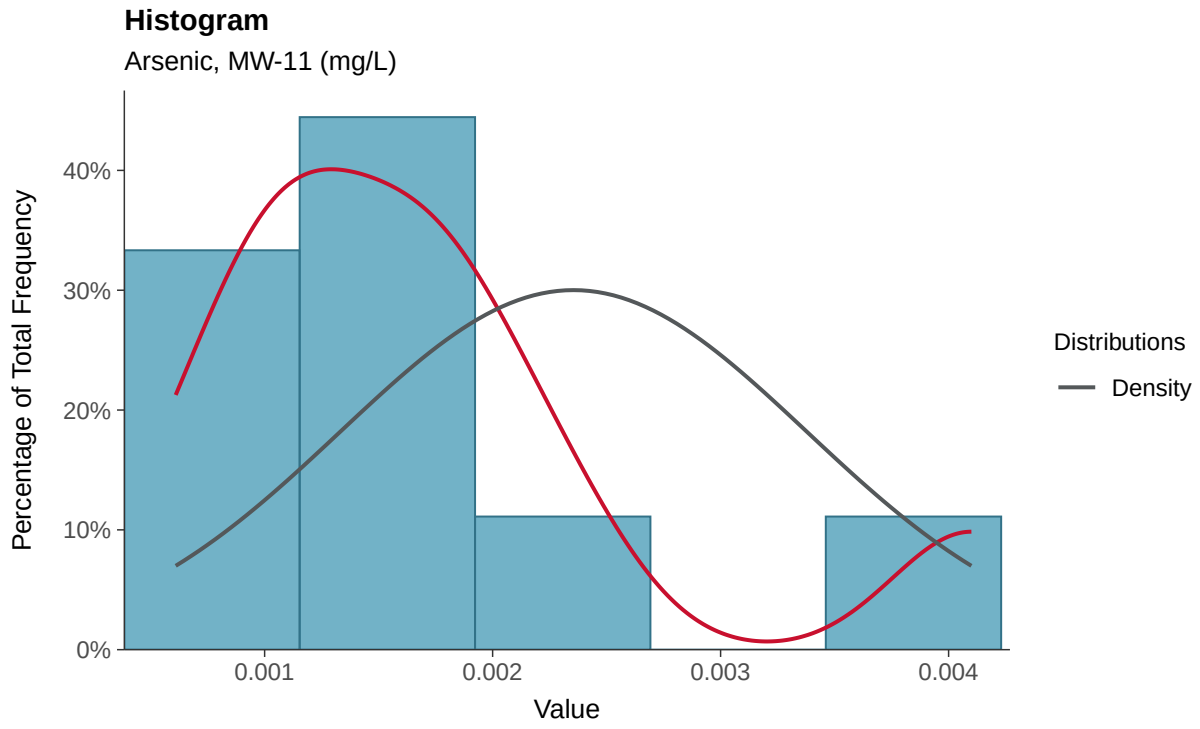

Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-11 (mg/L)
8e−04
4e−04
0e+00
−4e−04
Value
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

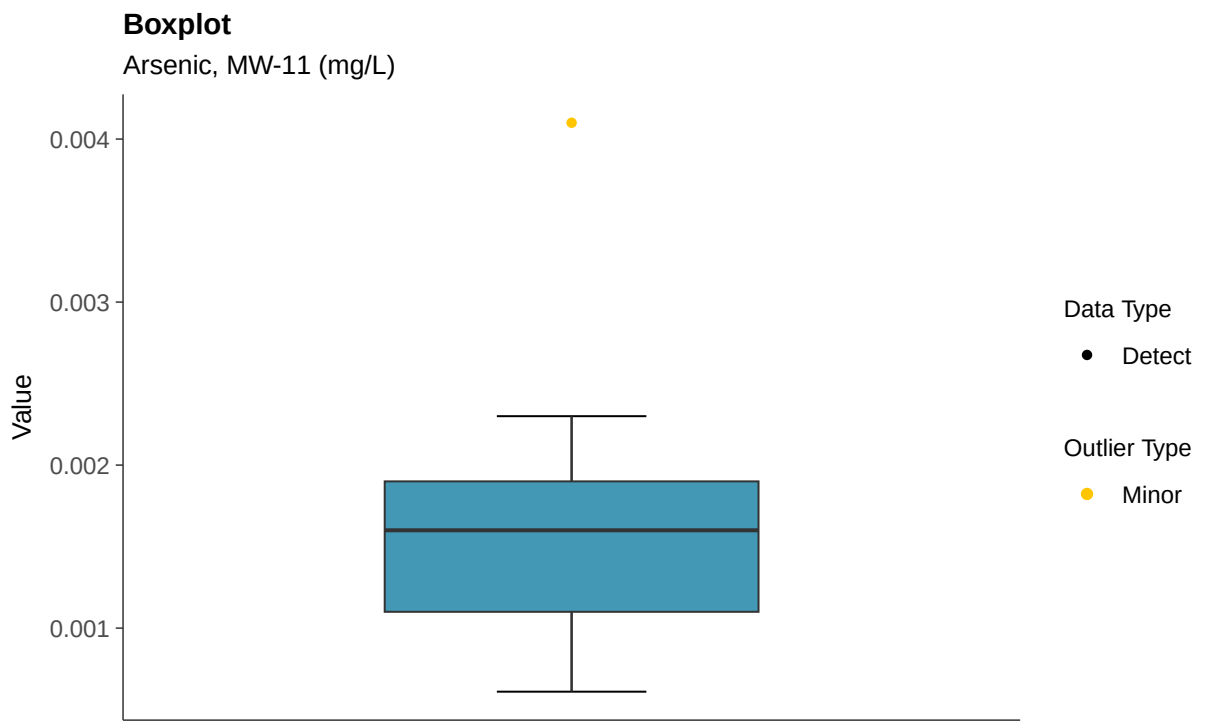

Trend Regression: Piecewise Linear-Linear
Antimony, MW-11 (mg/L)
6e−04
4e−04
2e−04
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

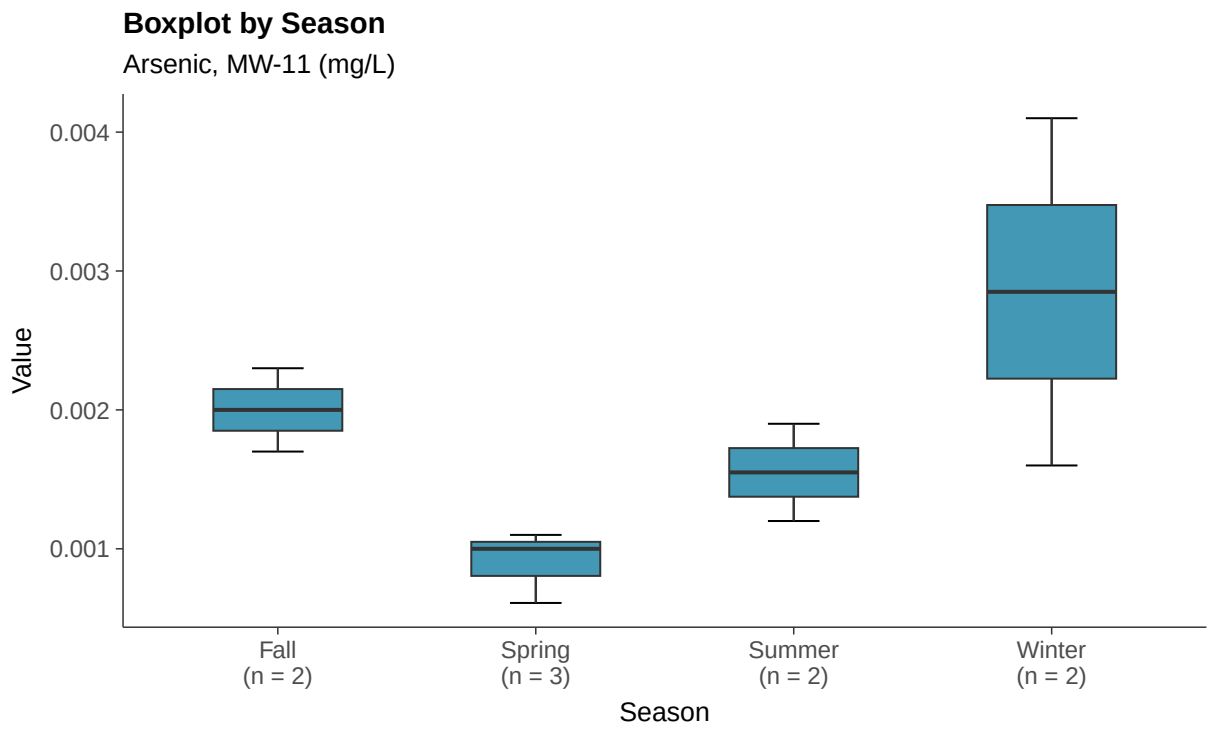
Appendix IV: Arsenic, MW-11

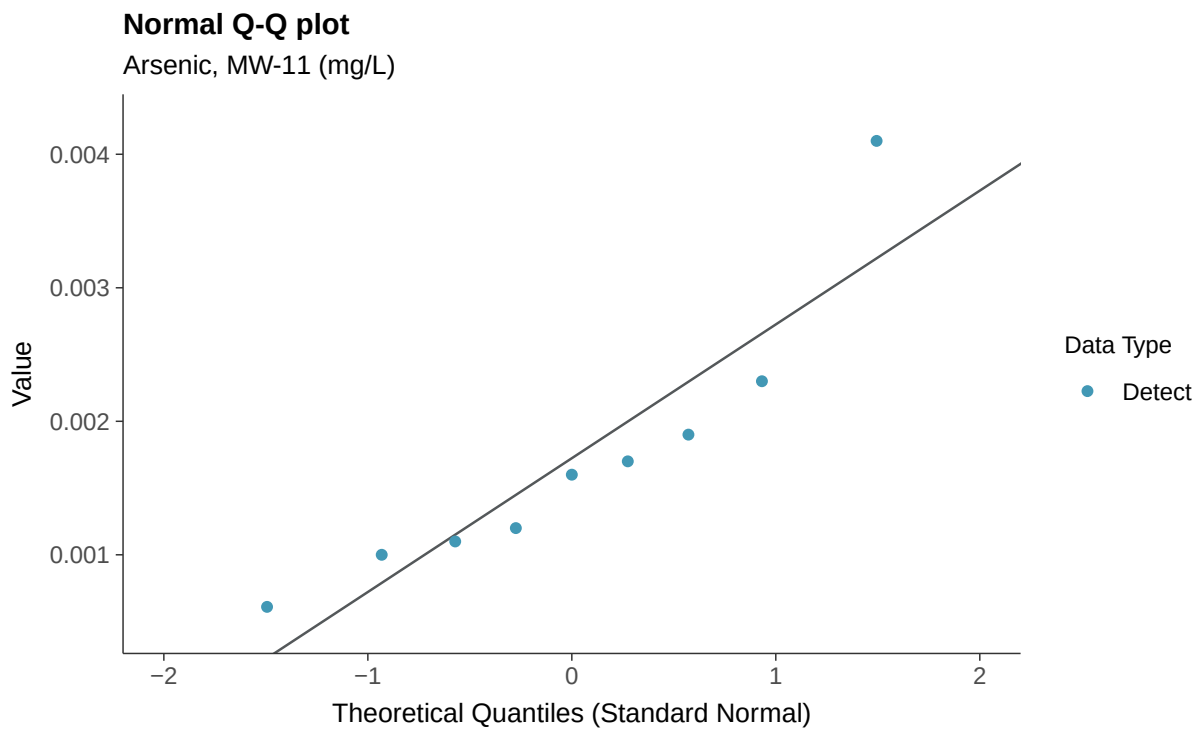
ID: 2_20_5_102

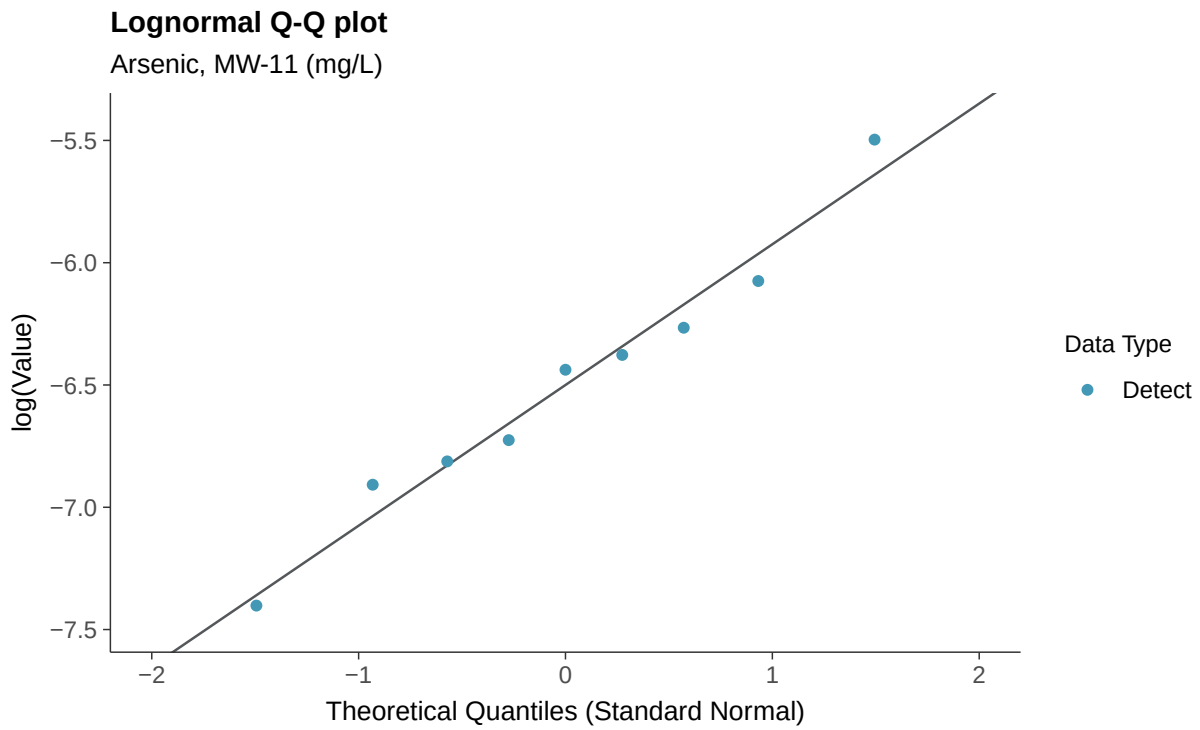


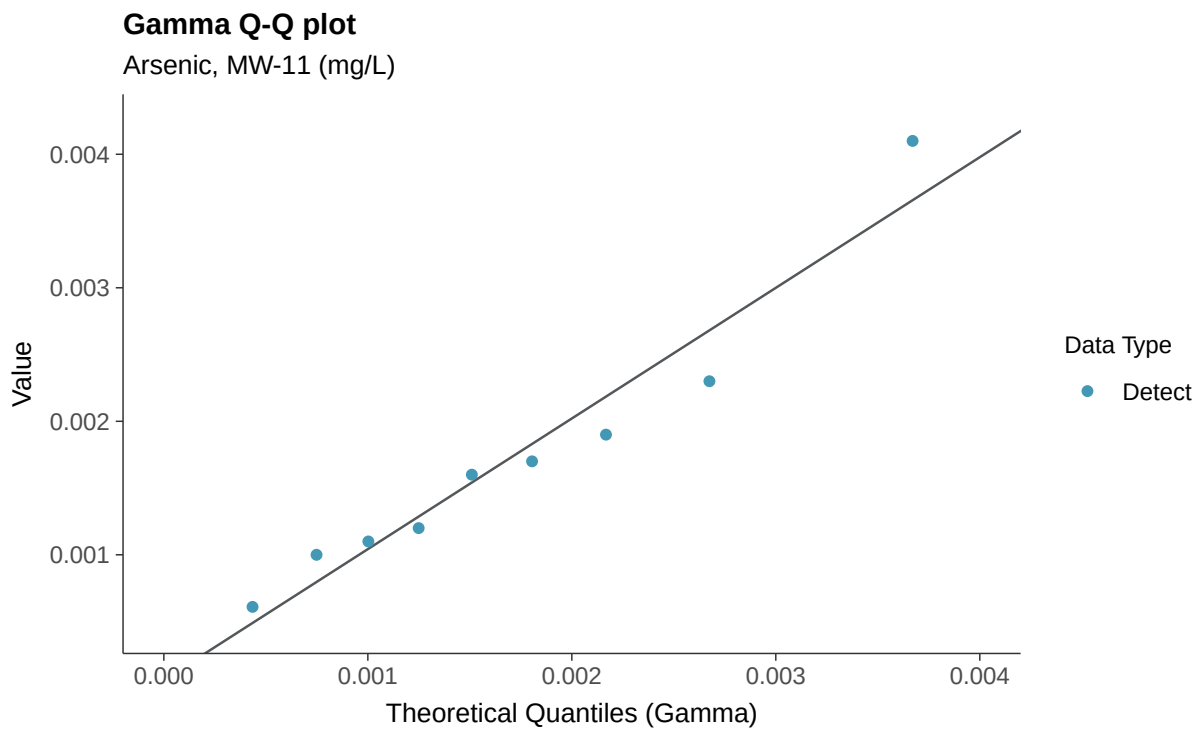


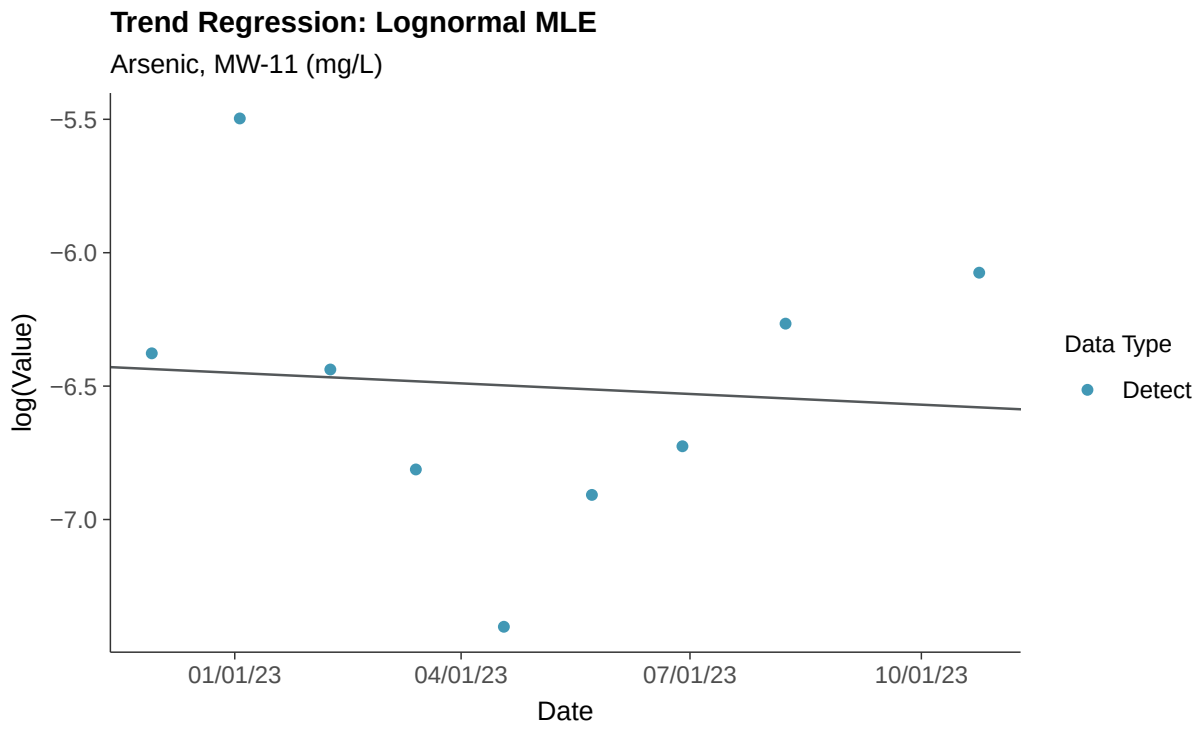

Boxplot
Arsenic, MW-11 (mg/L)
Value
0.004
0.003
0.002
0.001
Data Type
Detect
Outlier Type
Minor


Boxplot by Season
Arsenic, MW-11 (mg/L)
Value
0.004
0.003
0.002
0.001
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season


Normal Q-Q plot
Arsenic, MW-11 (mg/L)
Value
0.004
0.003
0.002
0.001
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

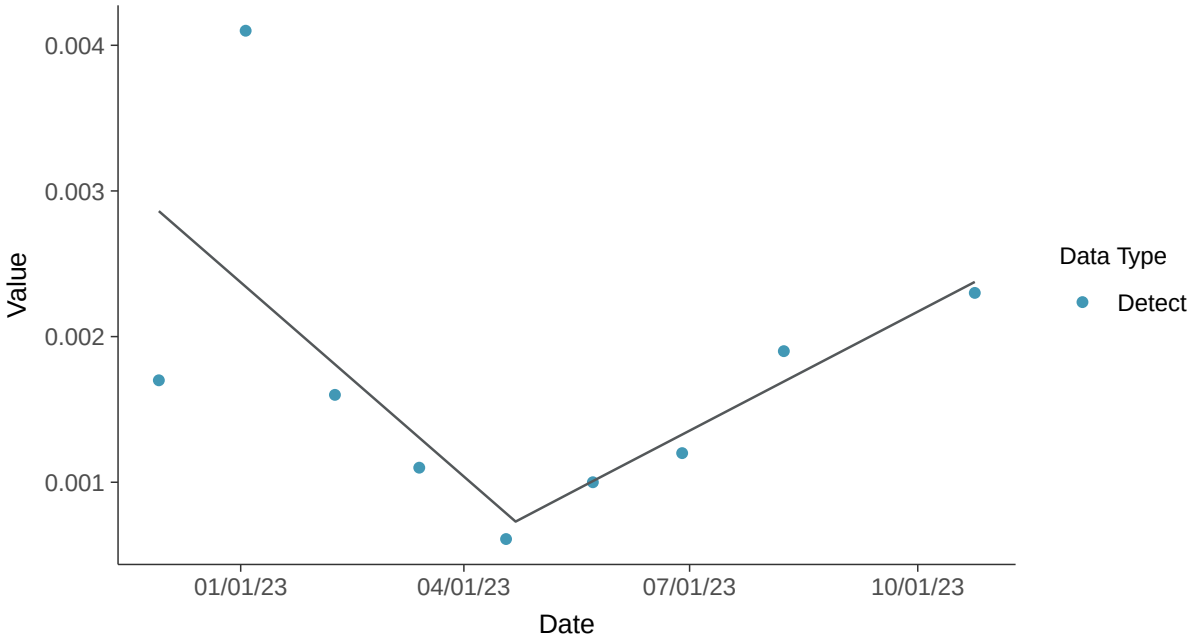

Lognormal Q-Q plot
Arsenic, MW-11 (mg/L)
log(Value)
−5.5
−6.0
−6.5
−7.0
−7.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-11 (mg/L)
Value
0.004
0.003
0.002
0.001
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Arsenic, MW-11 (mg/L)
log(Value)
−5.5
−6.0
−6.5
−7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

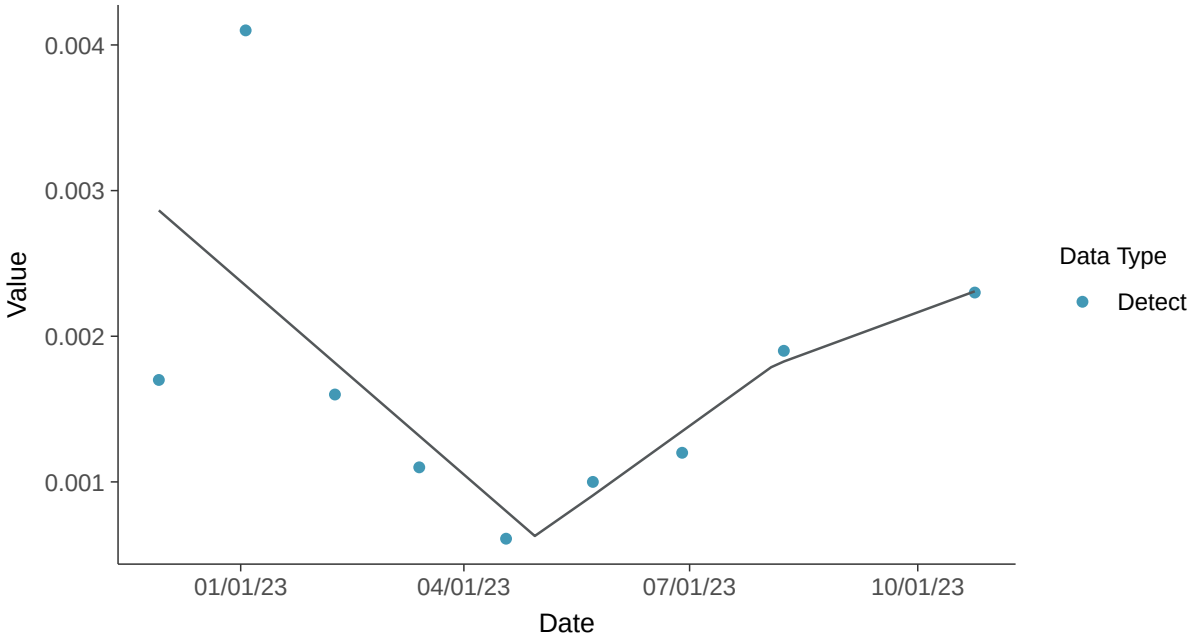
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-11 (mg/L)



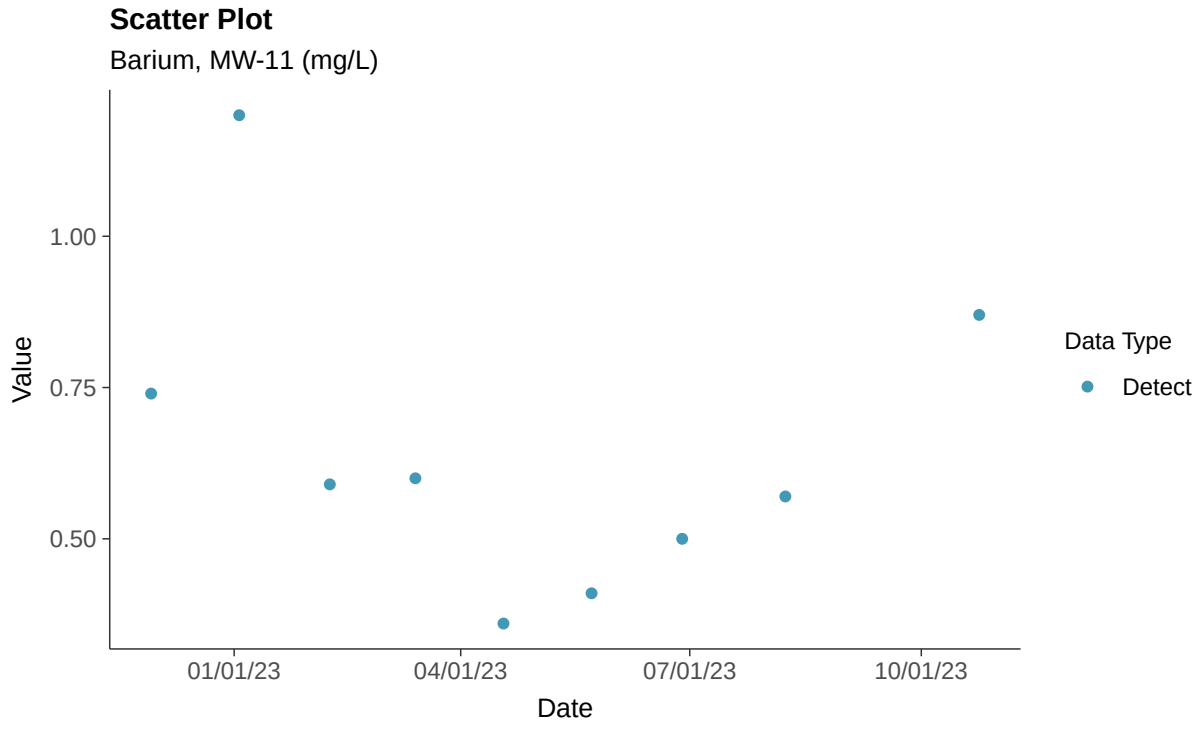
Trend Regression: Piecewise Linear-Linear-Linear

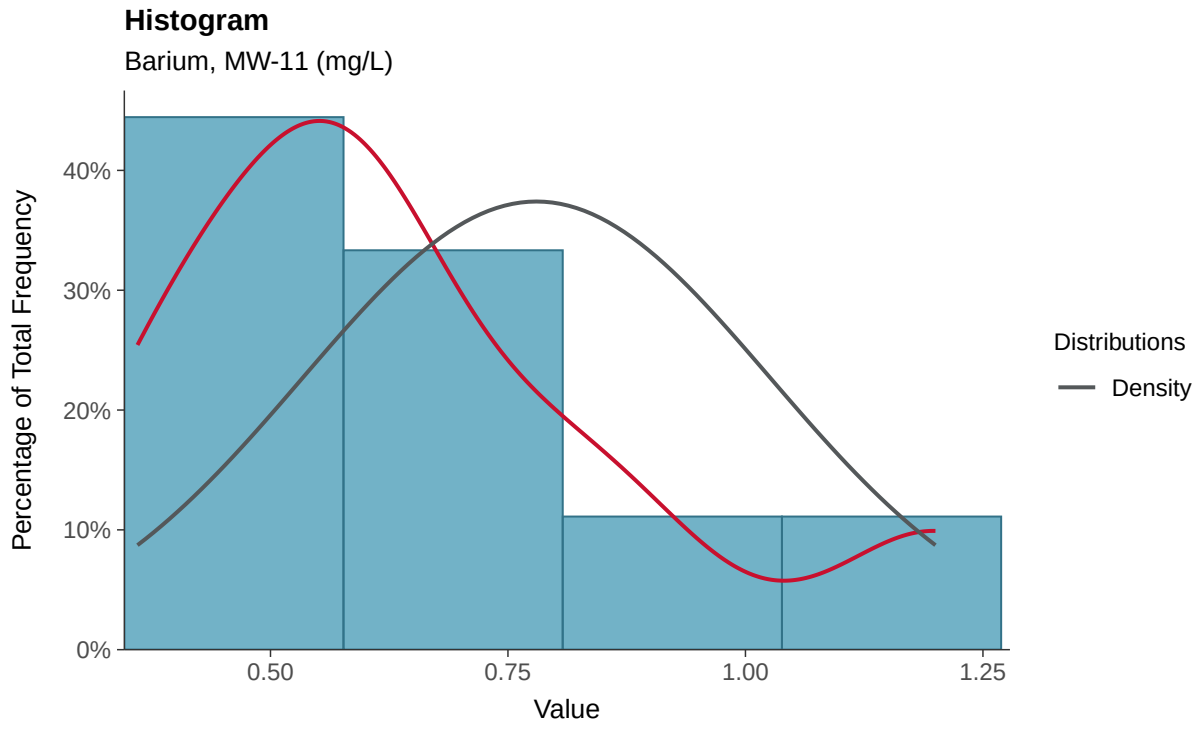
Arsenic, MW-11 (mg/L)



Appendix IV: Barium, MW-11

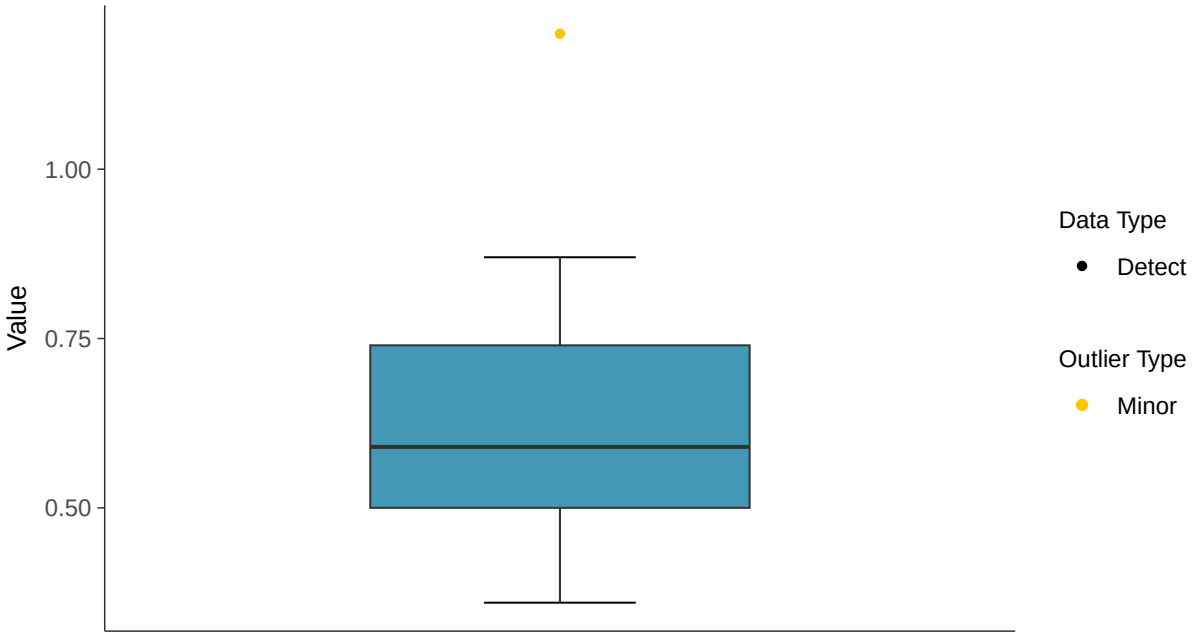
ID: 2_20_5_103





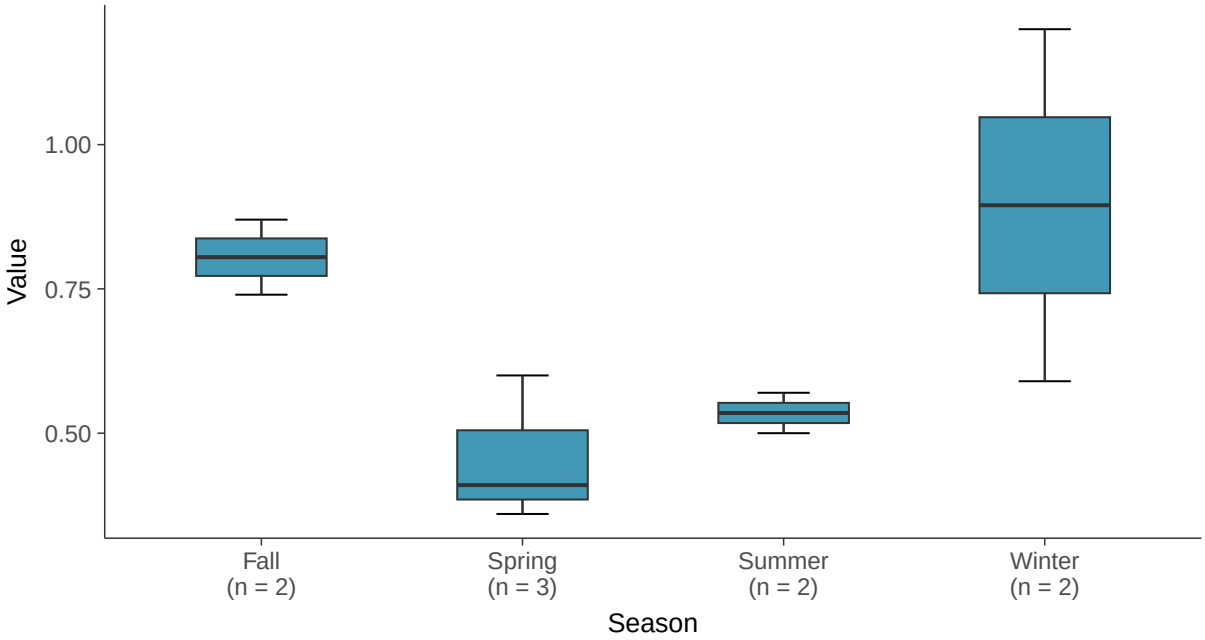
Boxplot

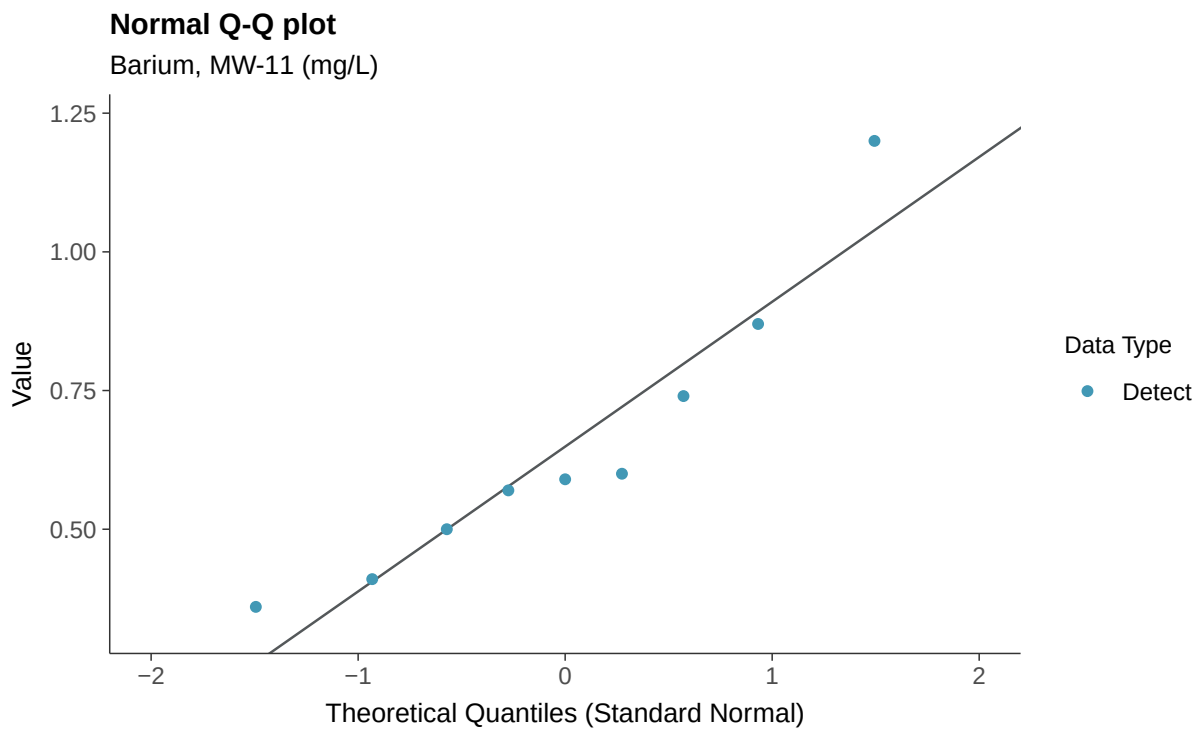
Barium, MW-11 (mg/L)

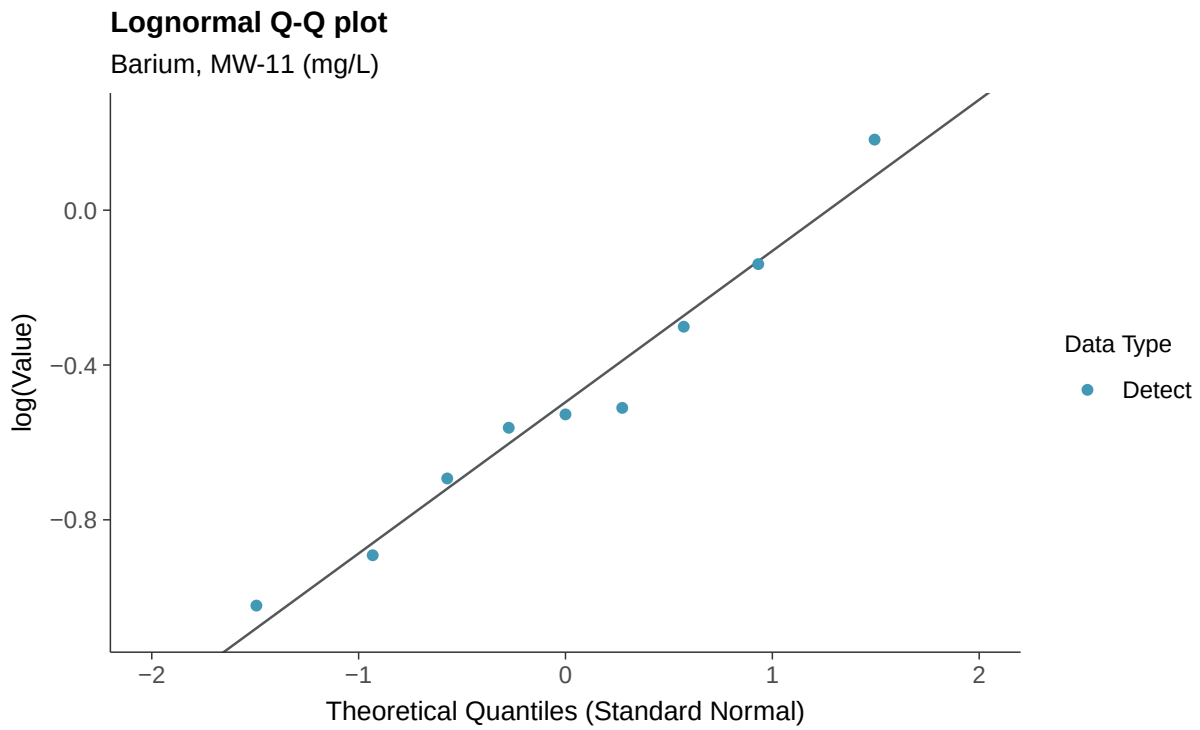


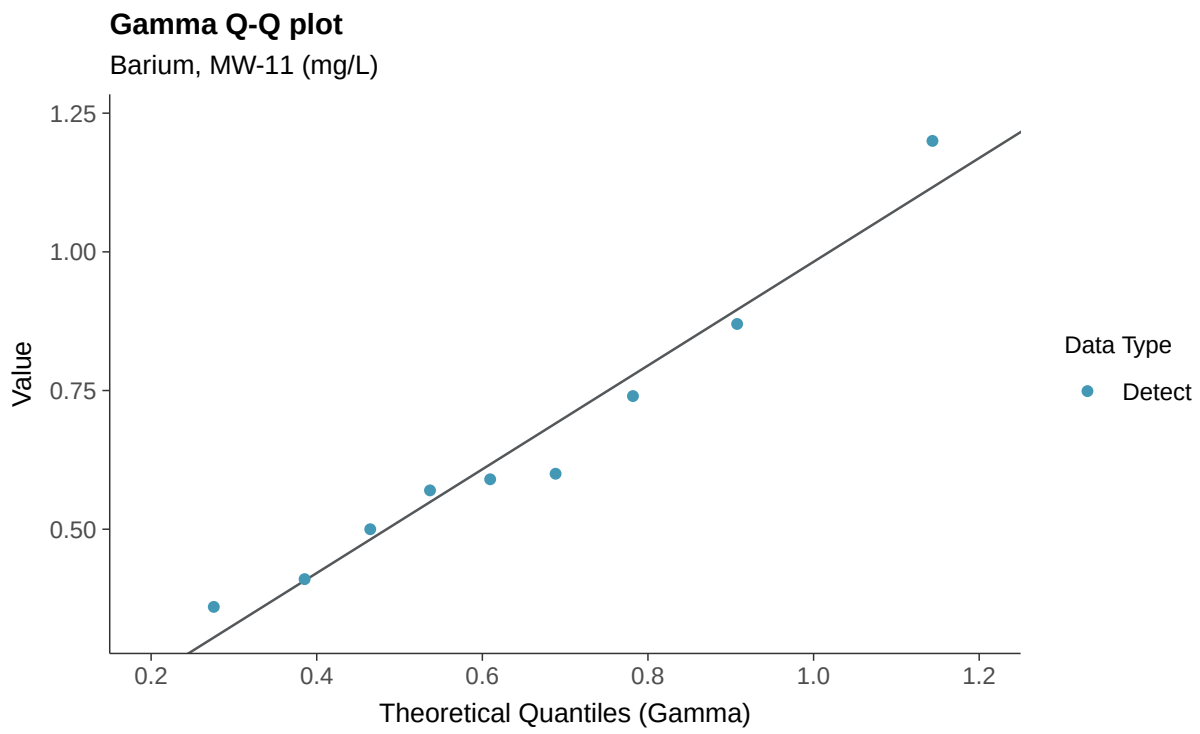
Boxplot by Season

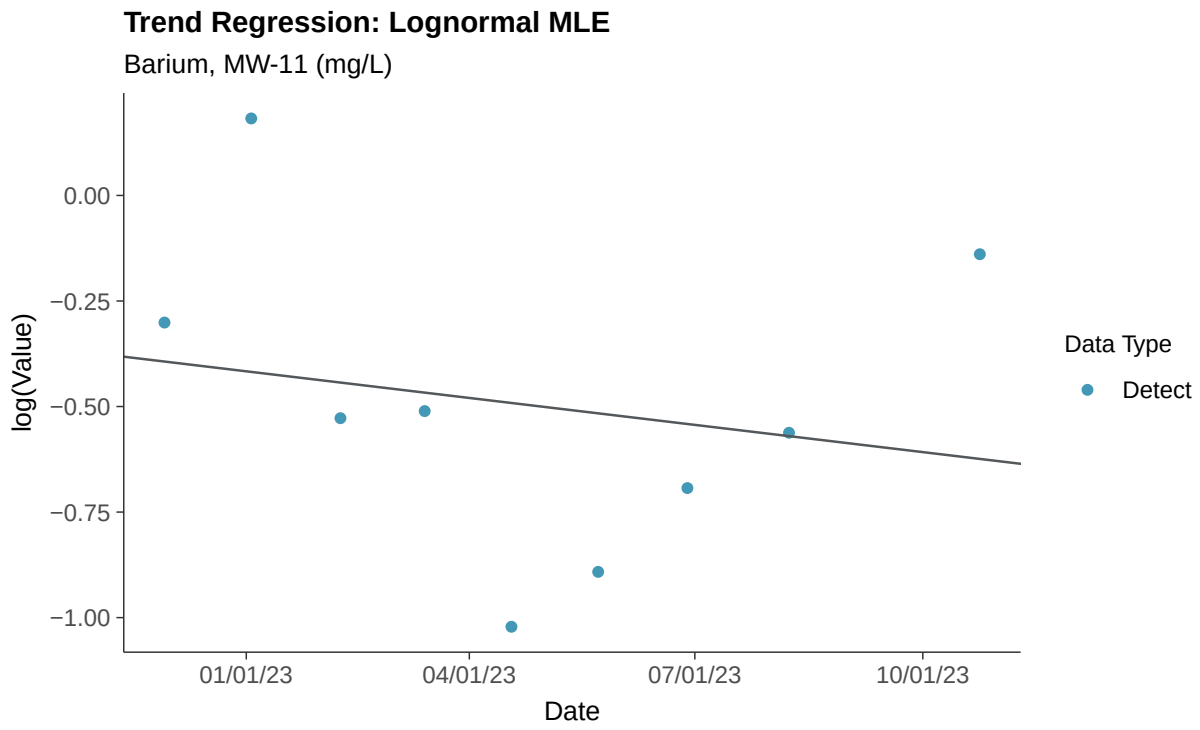
Barium, MW-11 (mg/L)

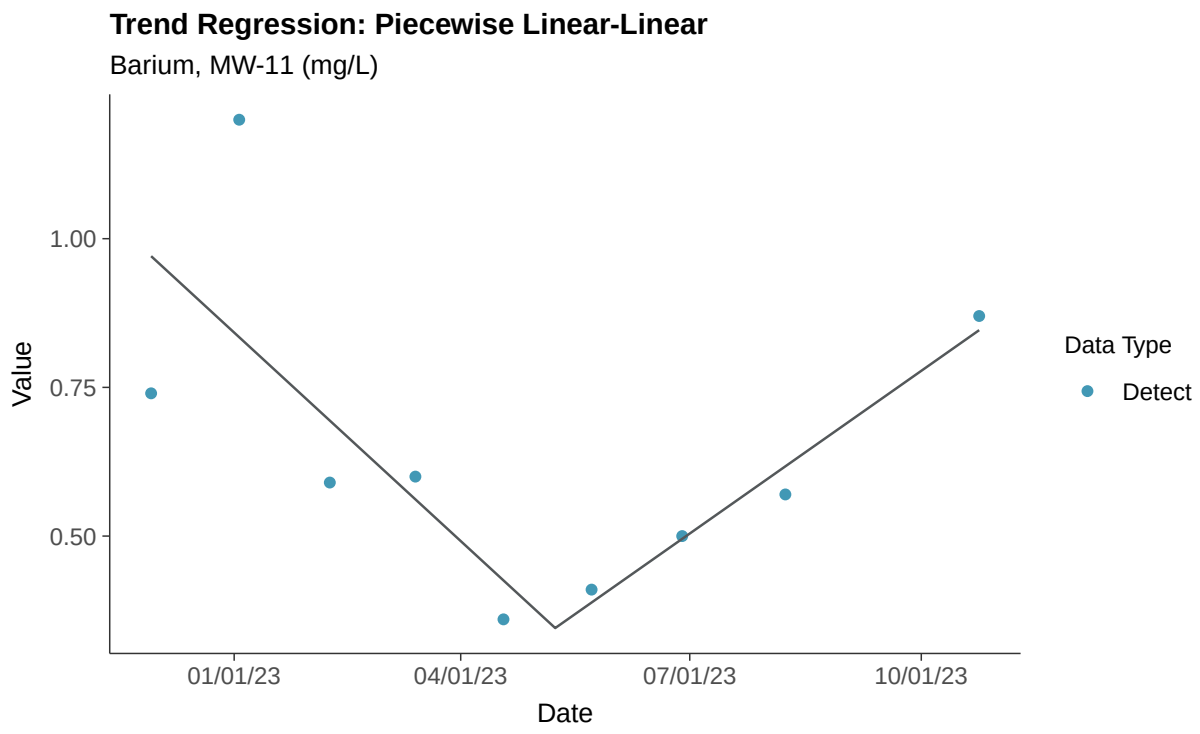



Normal Q-Q plot
Barium, MW-11 (mg/L)
Value
1.25
1.00
0.75
0.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Barium, MW-11 (mg/L)
log(Value)
0.0
−0.4
−0.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

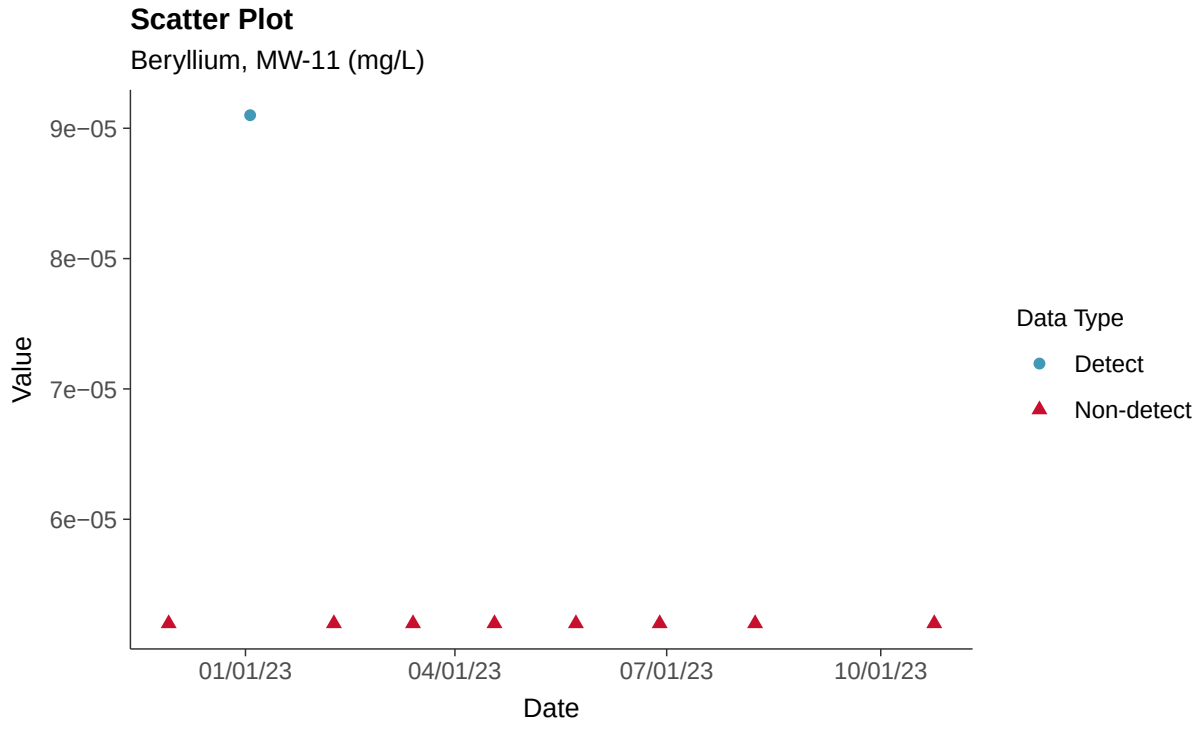

Gamma Q-Q plot
Barium, MW-11 (mg/L)
Value
1.25
1.00
0.75
0.50
0.2
0.4
0.6
0.8
1.0
1.2
Theoretical Quantiles (Gamma)
Data Type
Detect

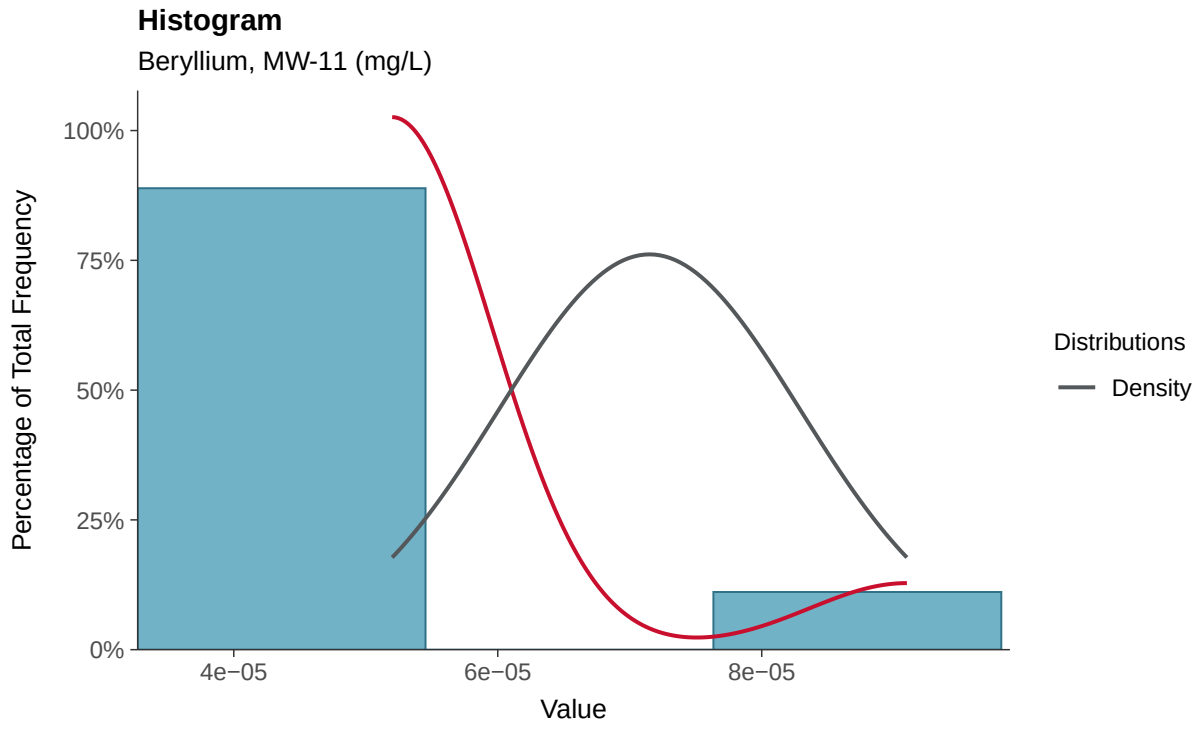

Trend Regression: Lognormal MLE
Barium, MW-11 (mg/L)
log(Value)
0.00
−0.25
−0.50
−0.75
−1.00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Barium, MW-11 (mg/L)
Value
1.00
0.75
0.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Beryllium, MW-11

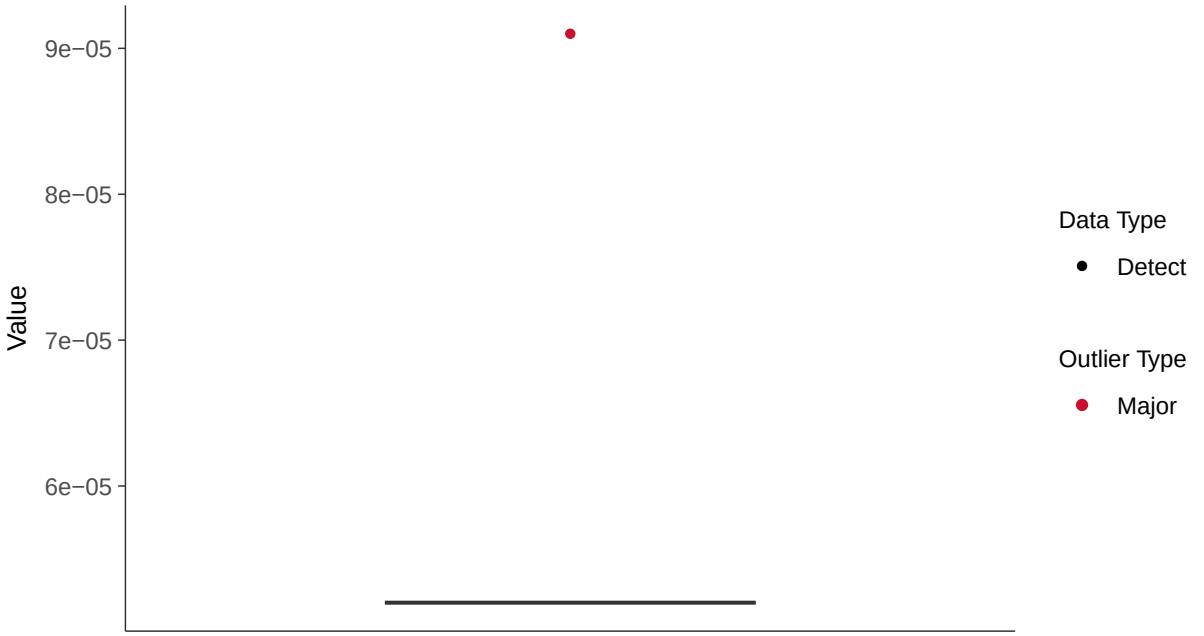
ID: 2_20_5_104





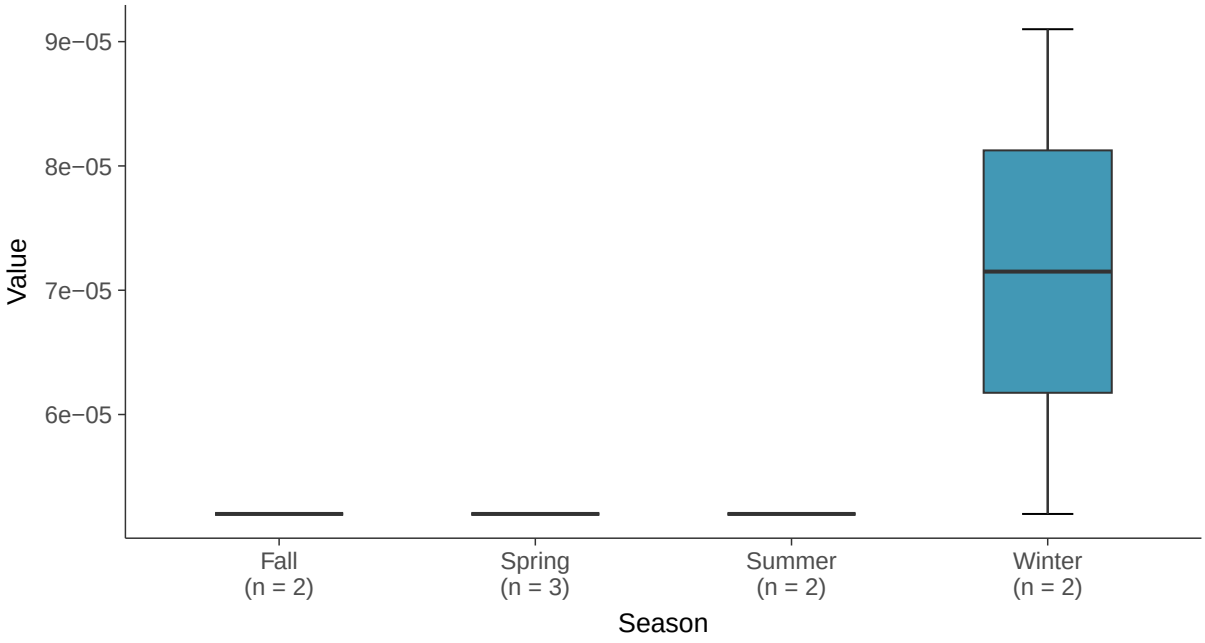
Boxplot

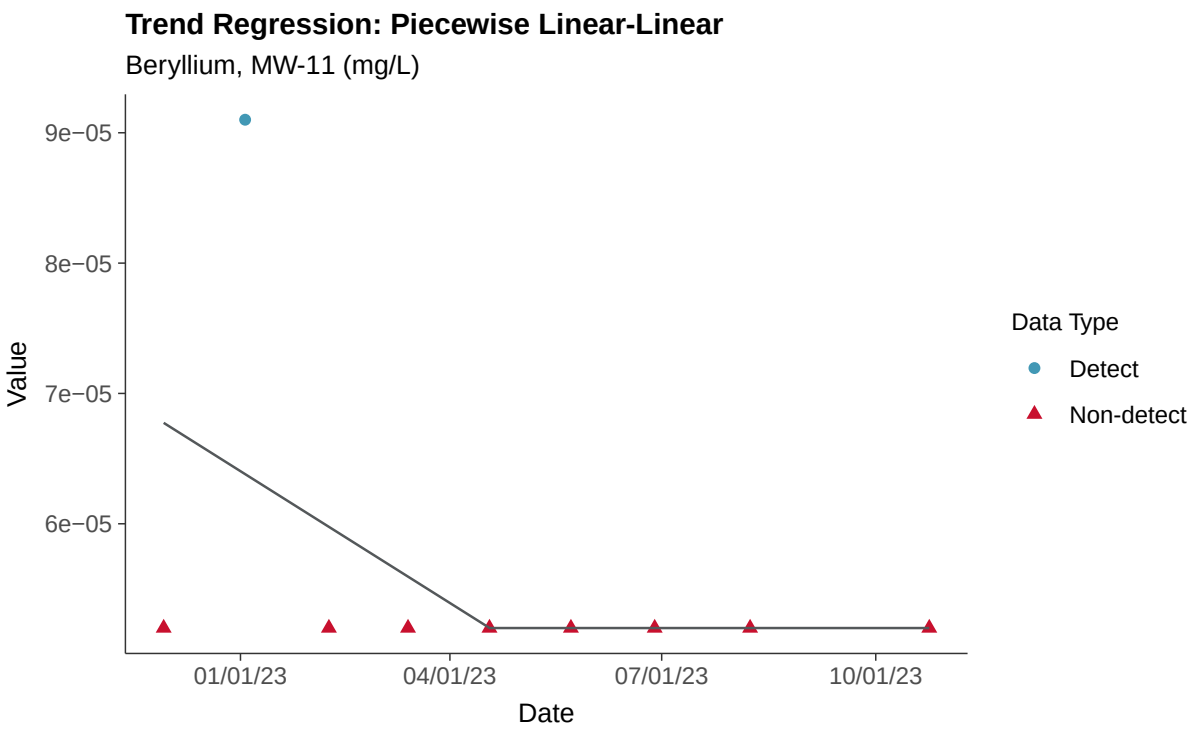
Beryllium, MW-11 (mg/L)



Boxplot by Season

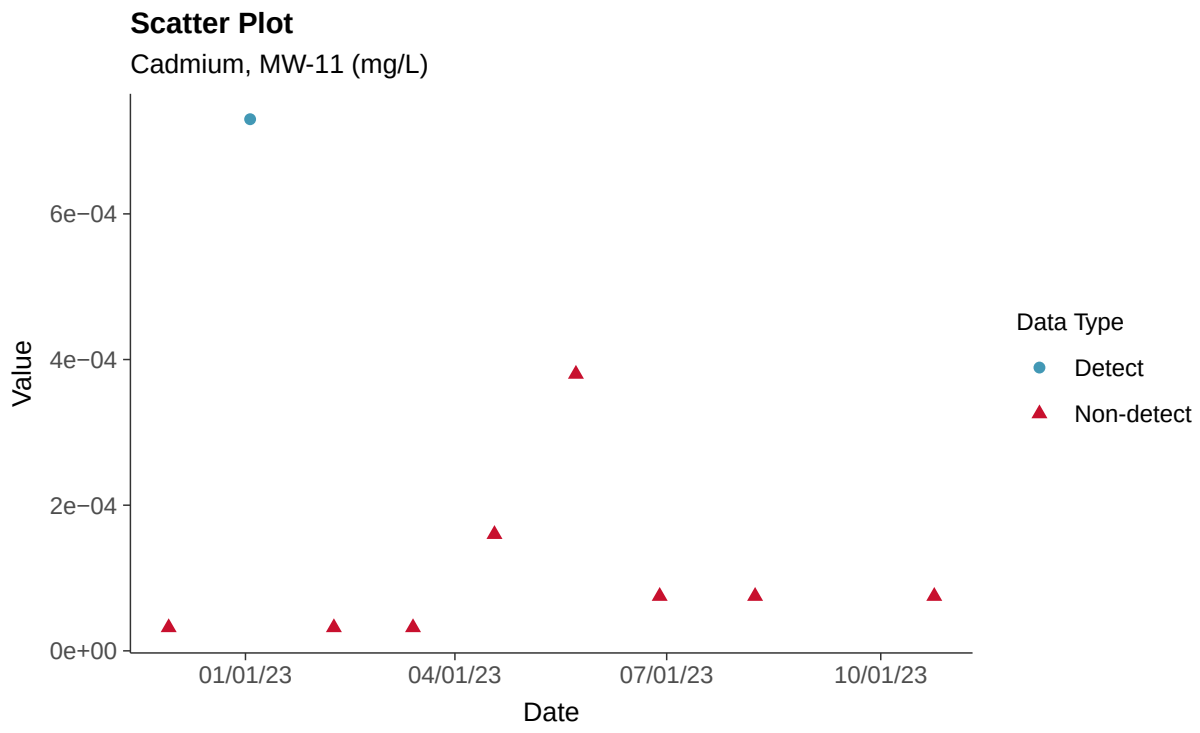
Beryllium, MW-11 (mg/L)

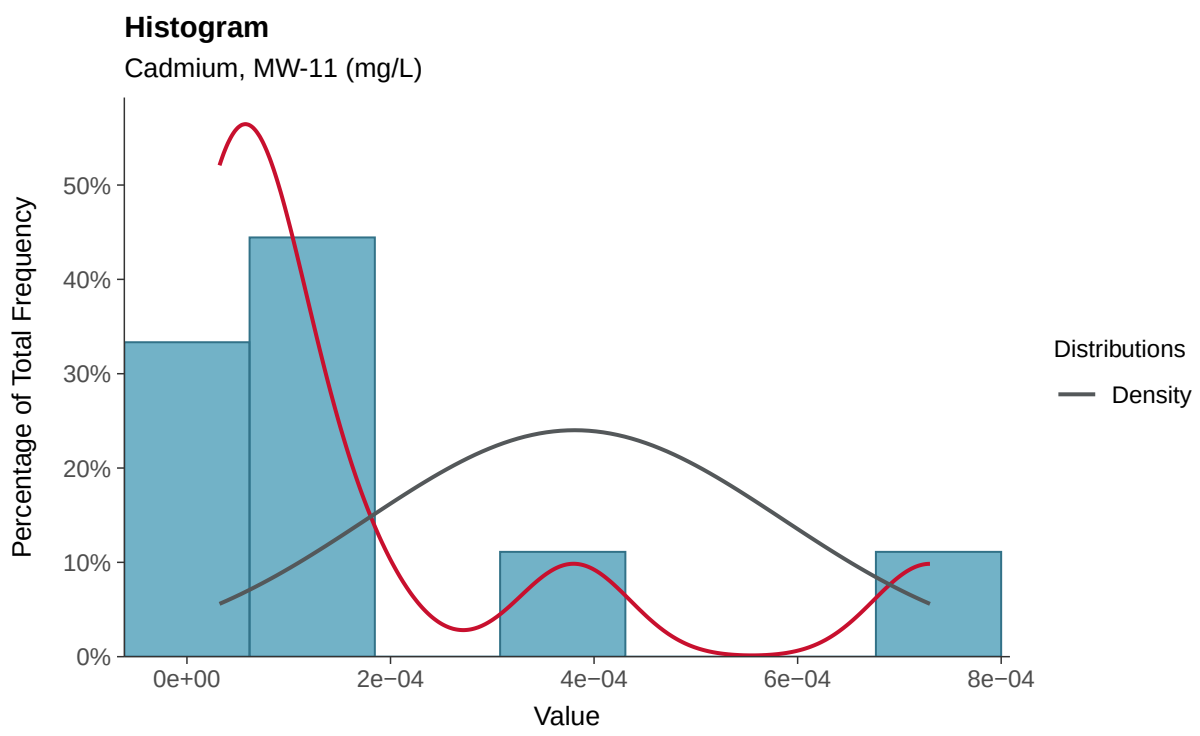



Trend Regression: Piecewise Linear-Linear
Beryllium, MW-11 (mg/L)
9e−05
8e−05
7e−05
6e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Cadmium, MW-11

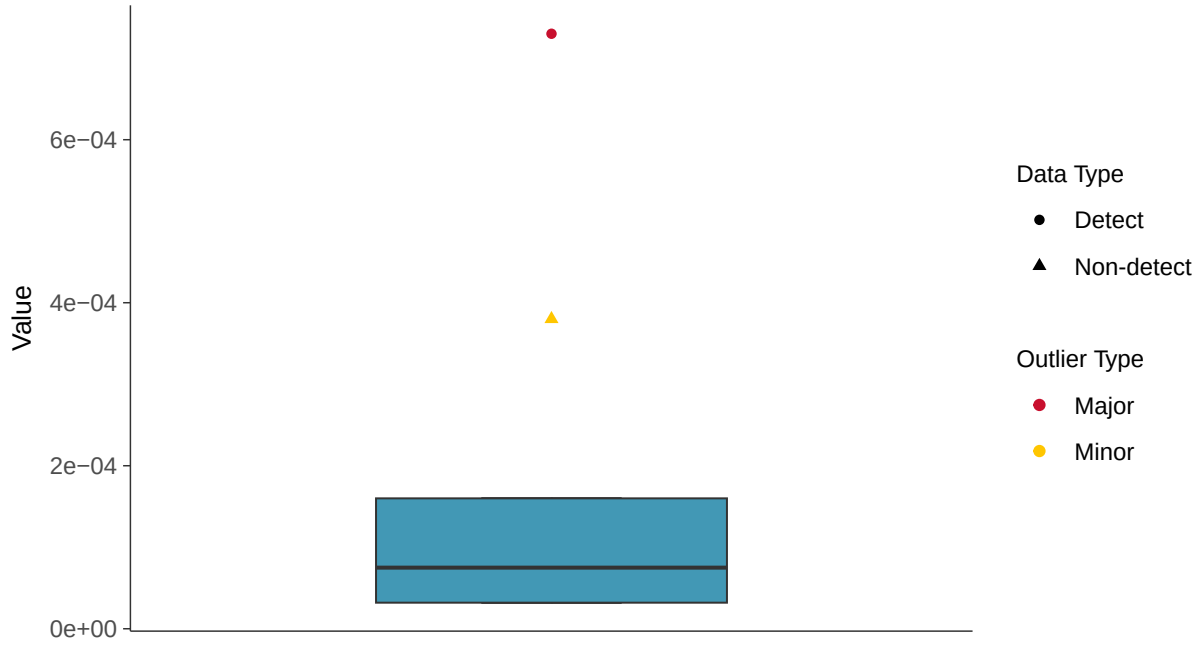
ID: 2_20_5_106





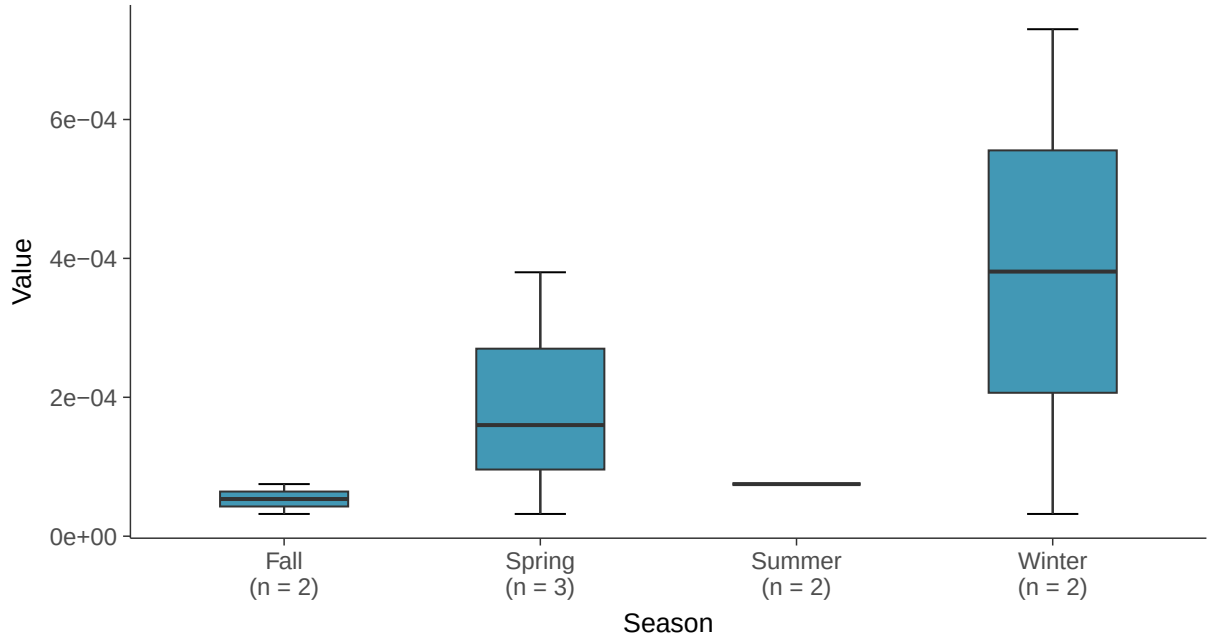
Boxplot

Cadmium, MW-11 (mg/L)



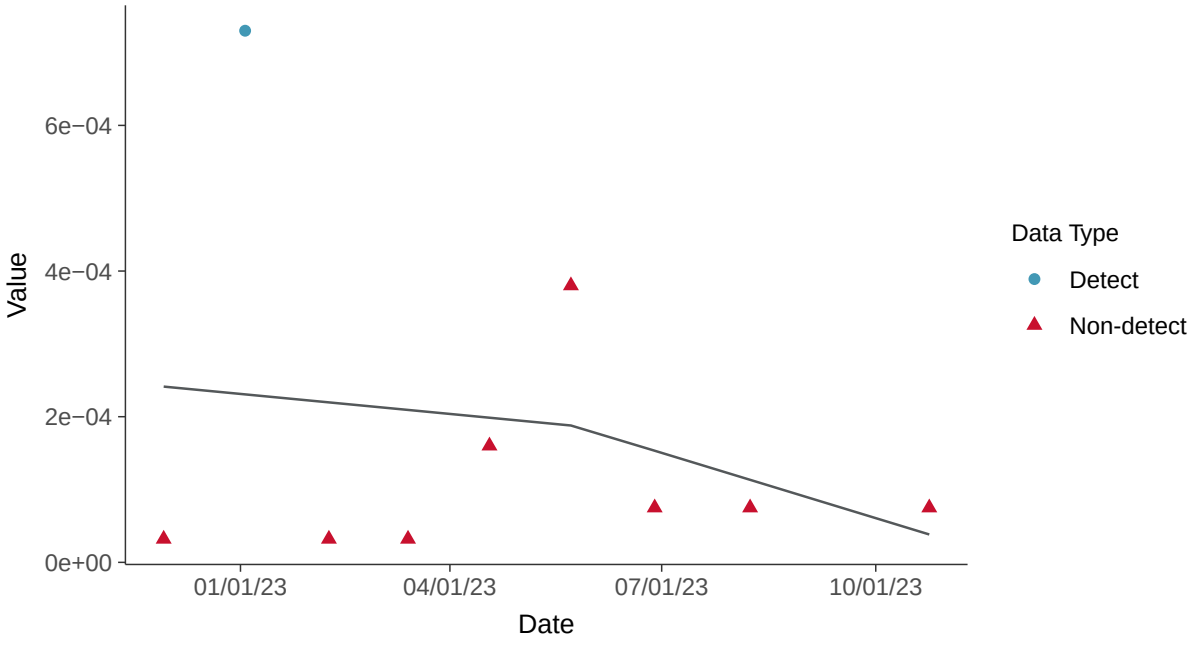
Boxplot by Season

Cadmium, MW-11 (mg/L)



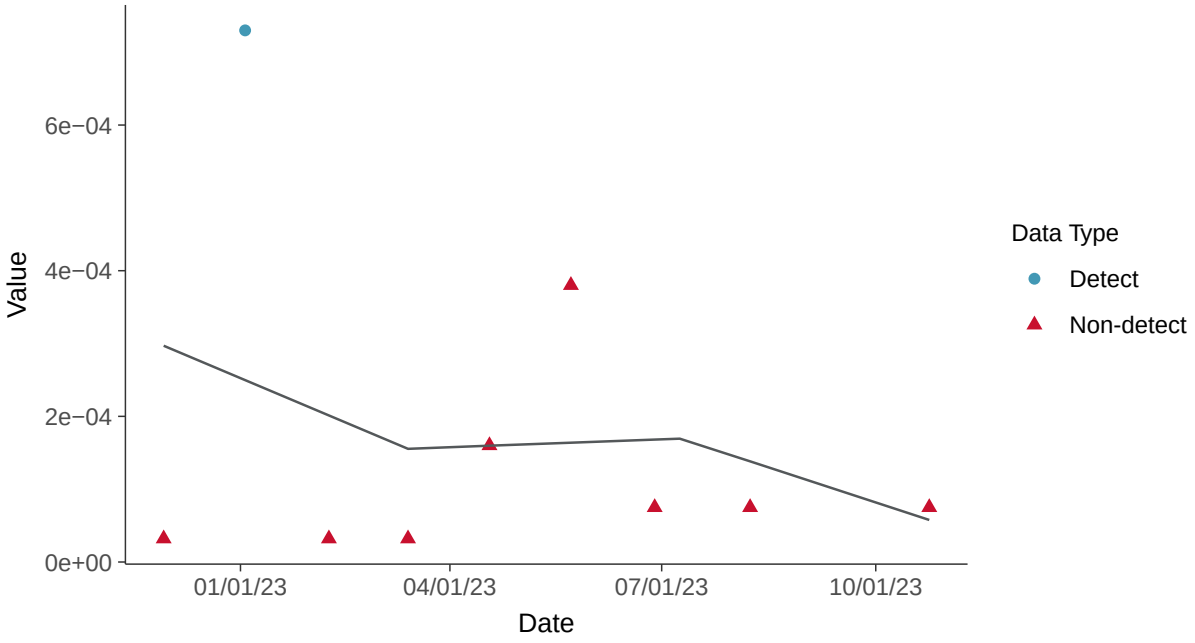
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-11 (mg/L)



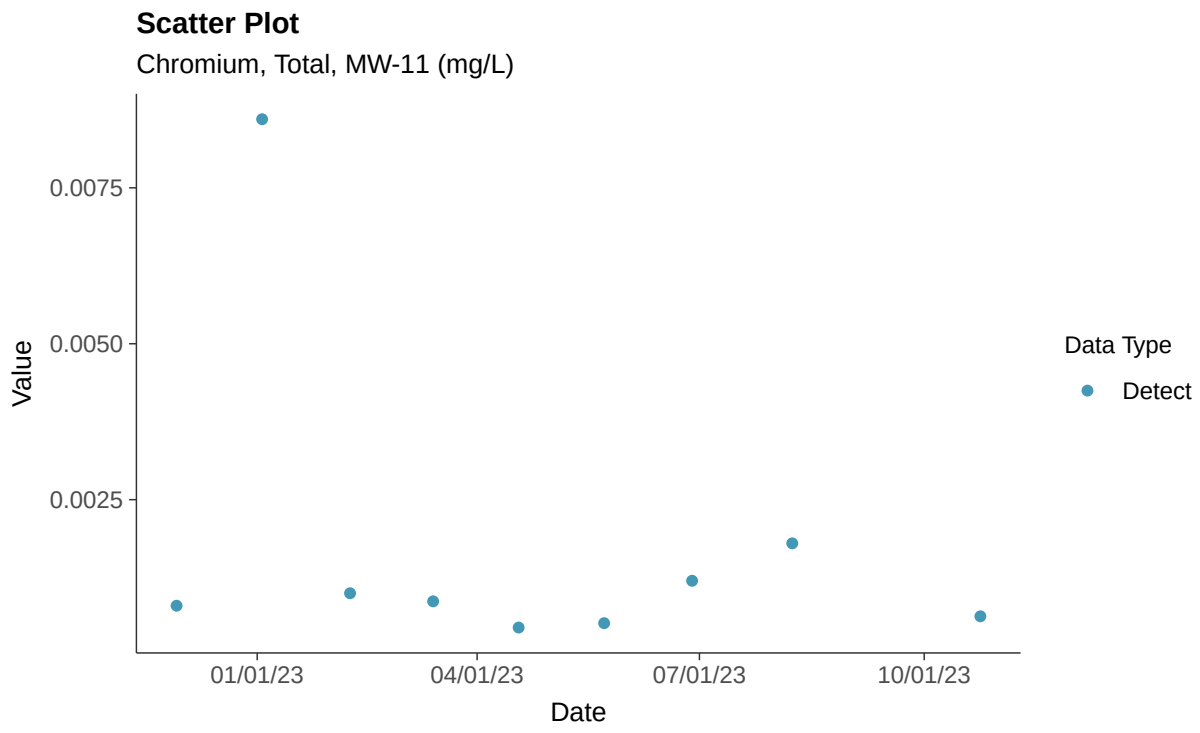
Trend Regression: Piecewise Linear-Linear-Linear

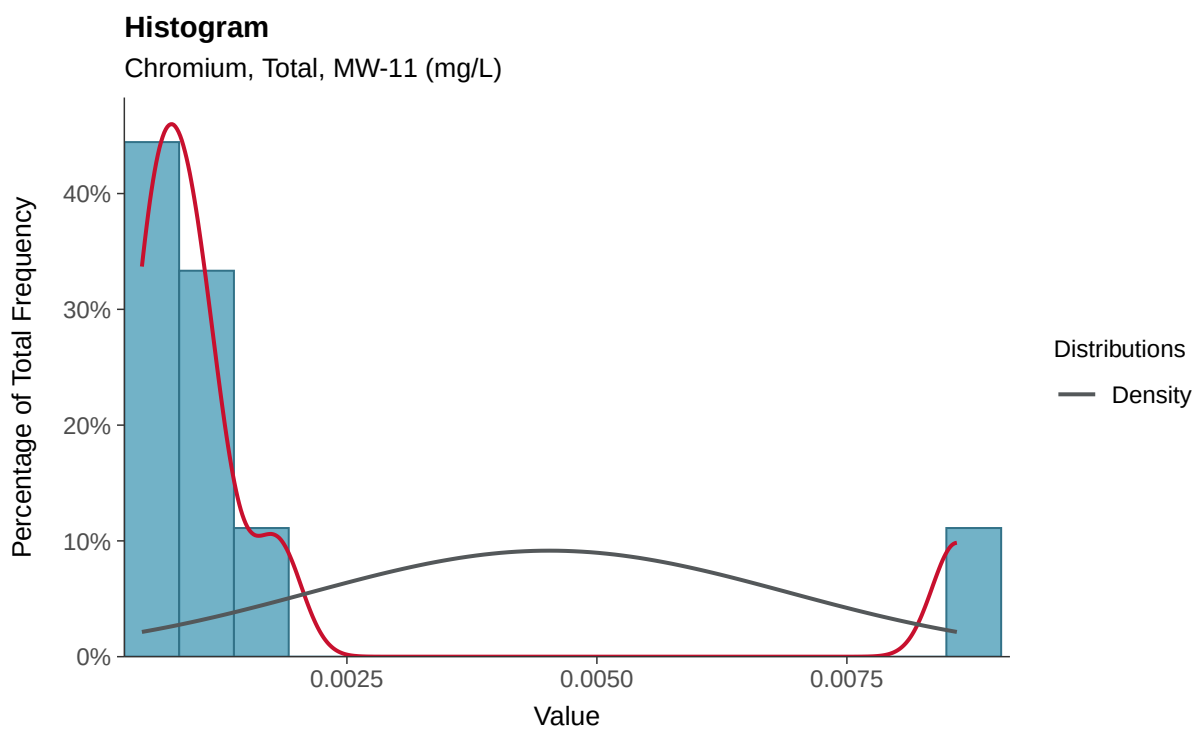
Cadmium, MW-11 (mg/L)



Appendix IV: Chromium, Total, MW-11

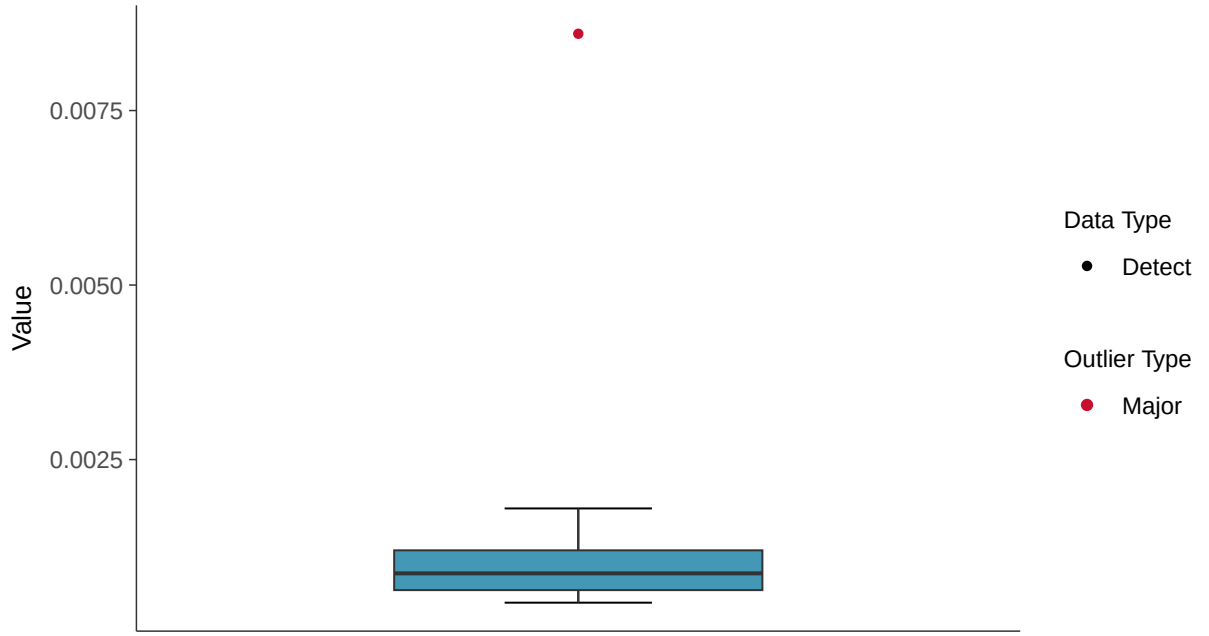
ID: 2_20_5_109





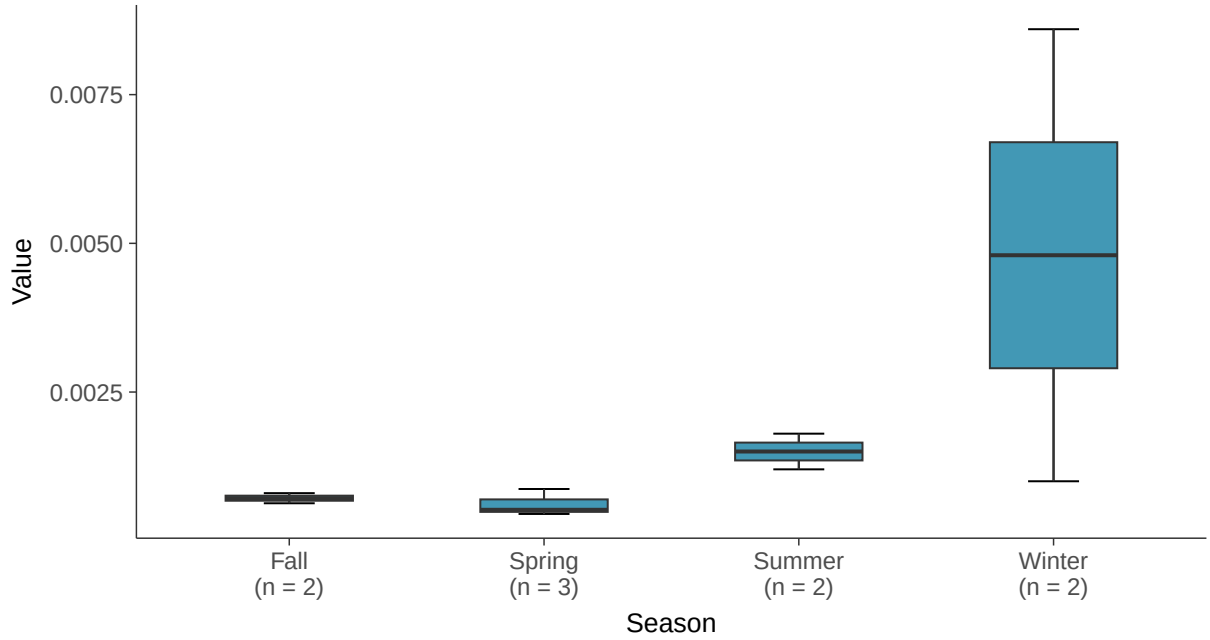
Boxplot

Chromium, Total, MW-11 (mg/L)



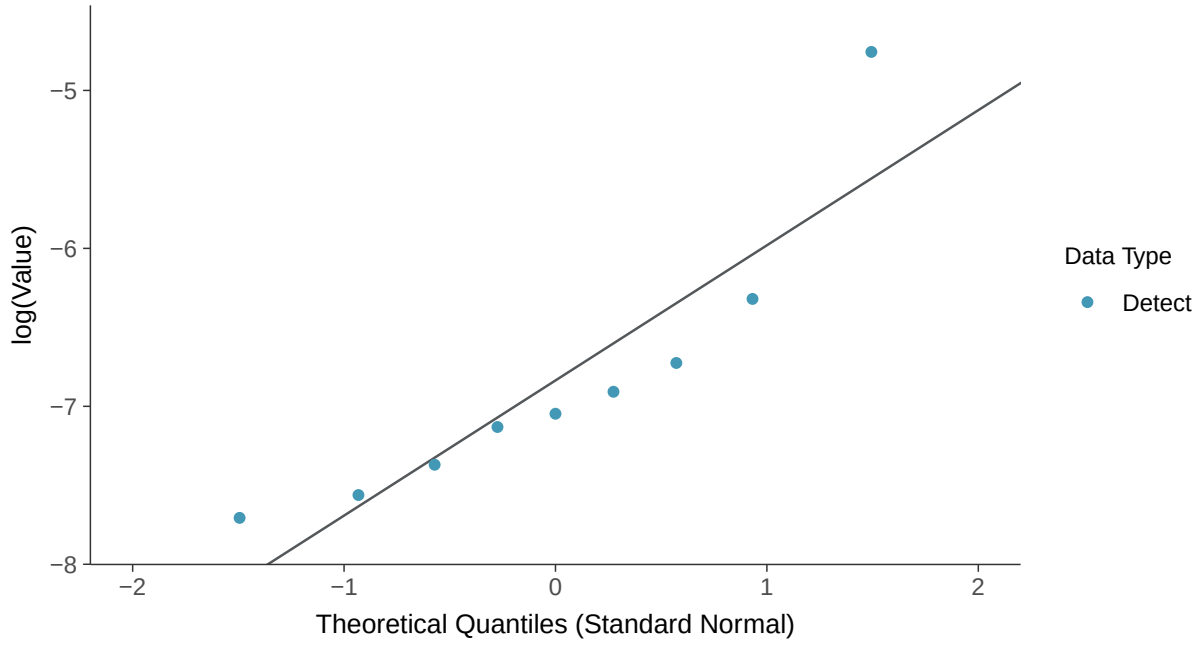
Boxplot by Season

Chromium, Total, MW-11 (mg/L)



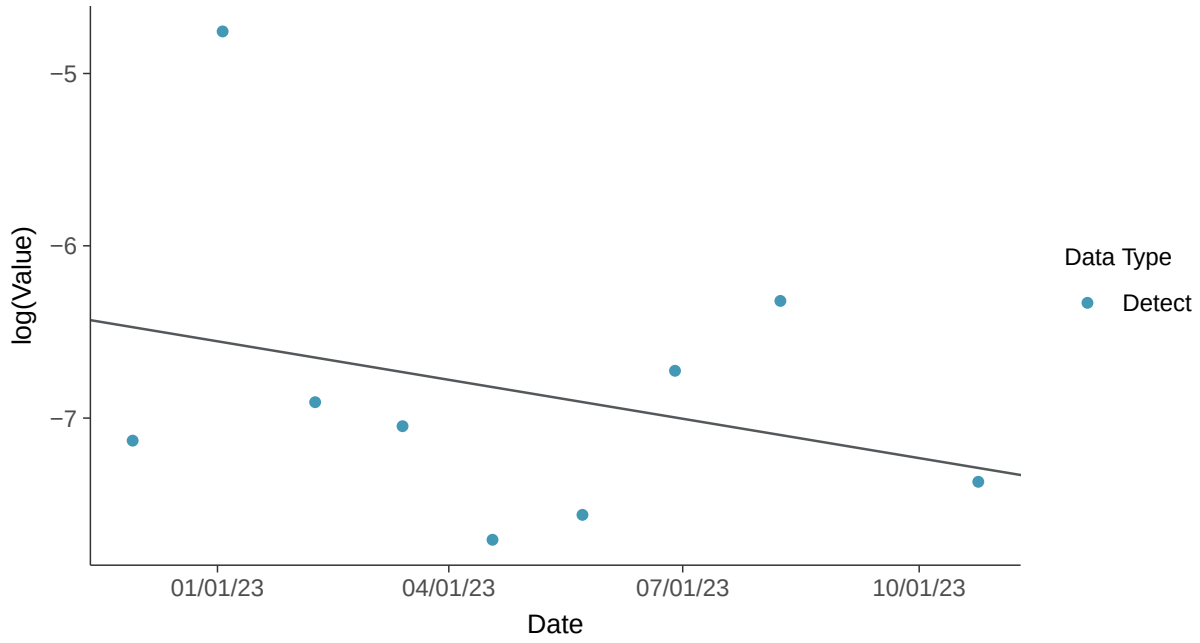
Lognormal Q-Q plot

Chromium, Total, MW-11 (mg/L)



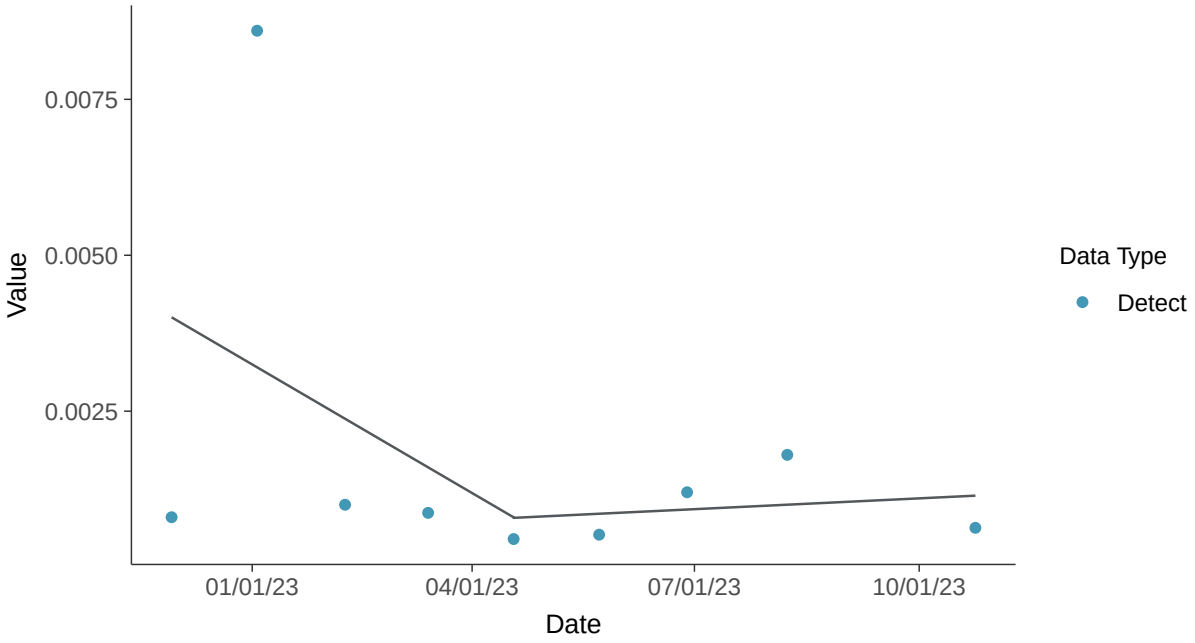
Trend Regression: Lognormal MLE

Chromium, Total, MW-11 (mg/L)



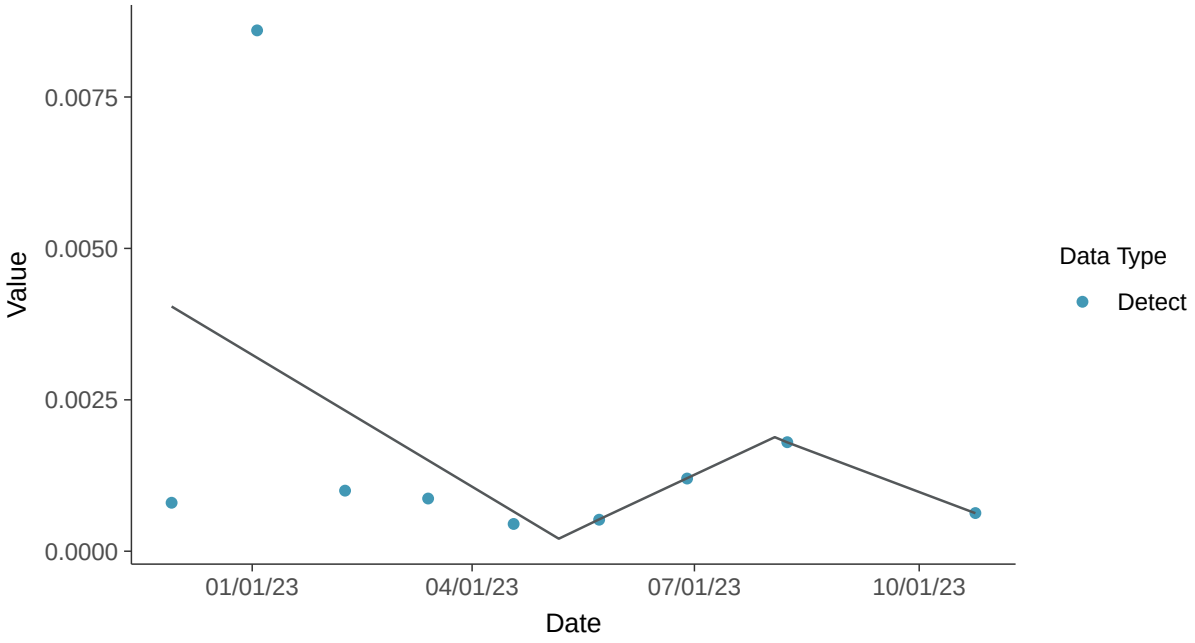
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-11 (mg/L)



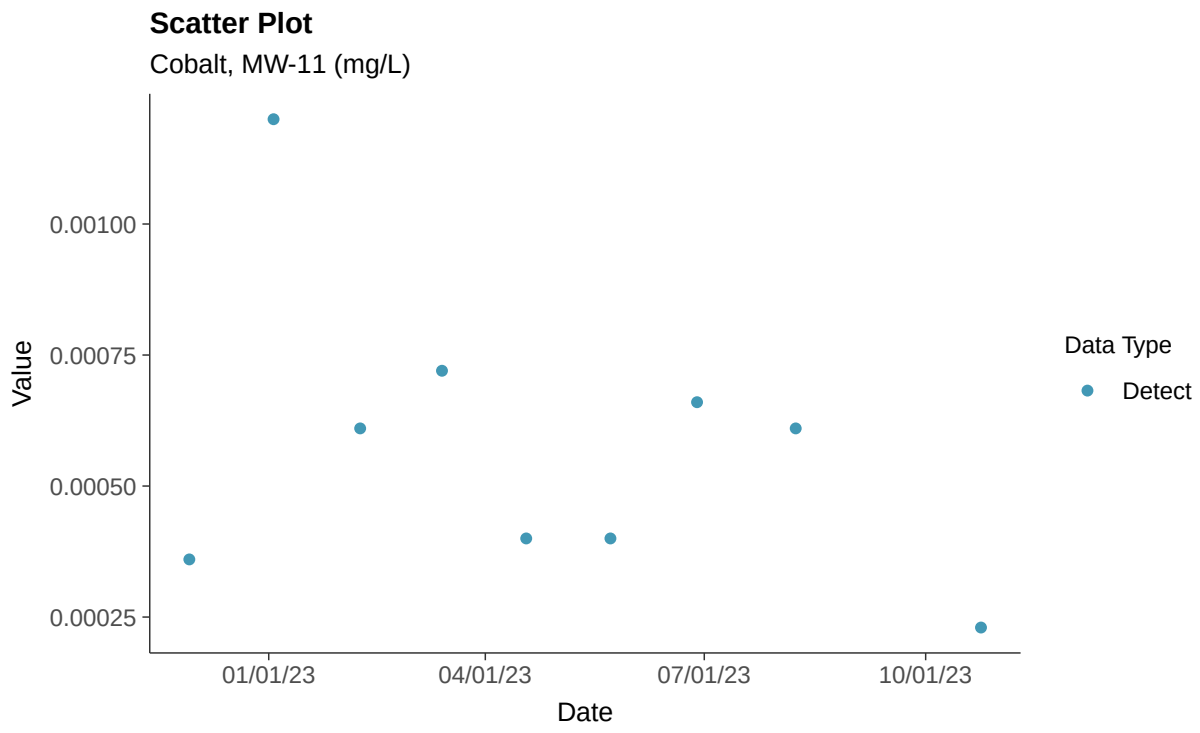
Trend Regression: Piecewise Linear-Linear-Linear

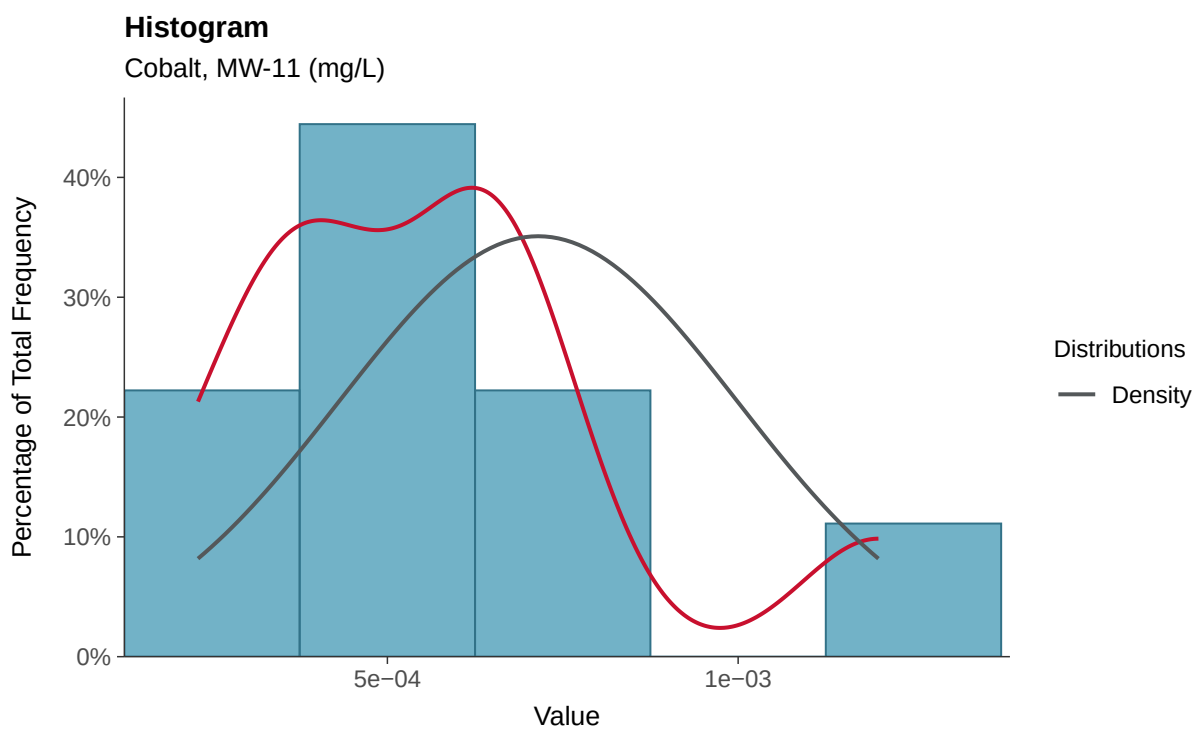
Chromium, Total, MW-11 (mg/L)



Appendix IV: Cobalt, MW-11

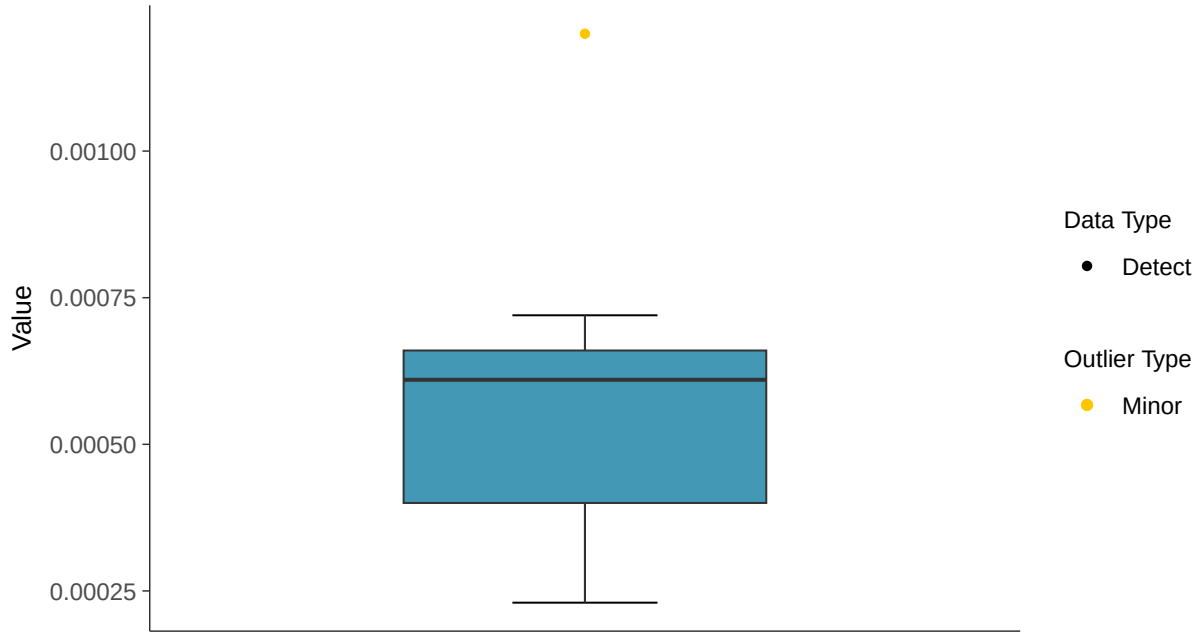
ID: 2_20_5_110





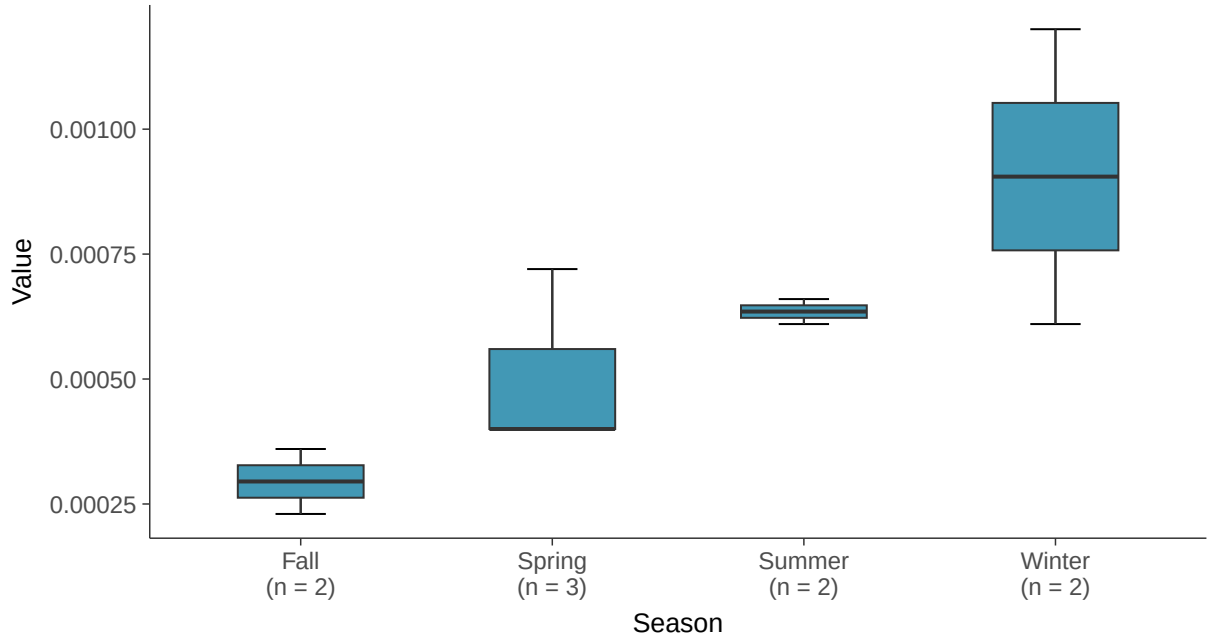
Boxplot

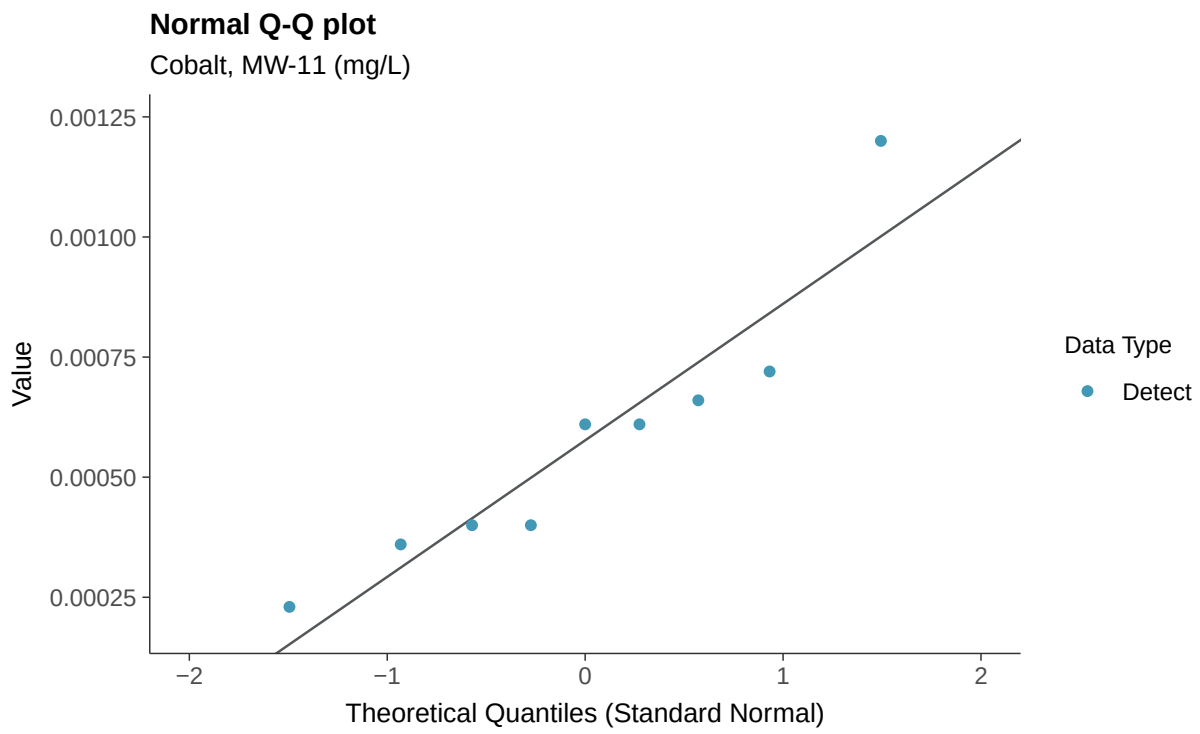
Cobalt, MW-11 (mg/L)

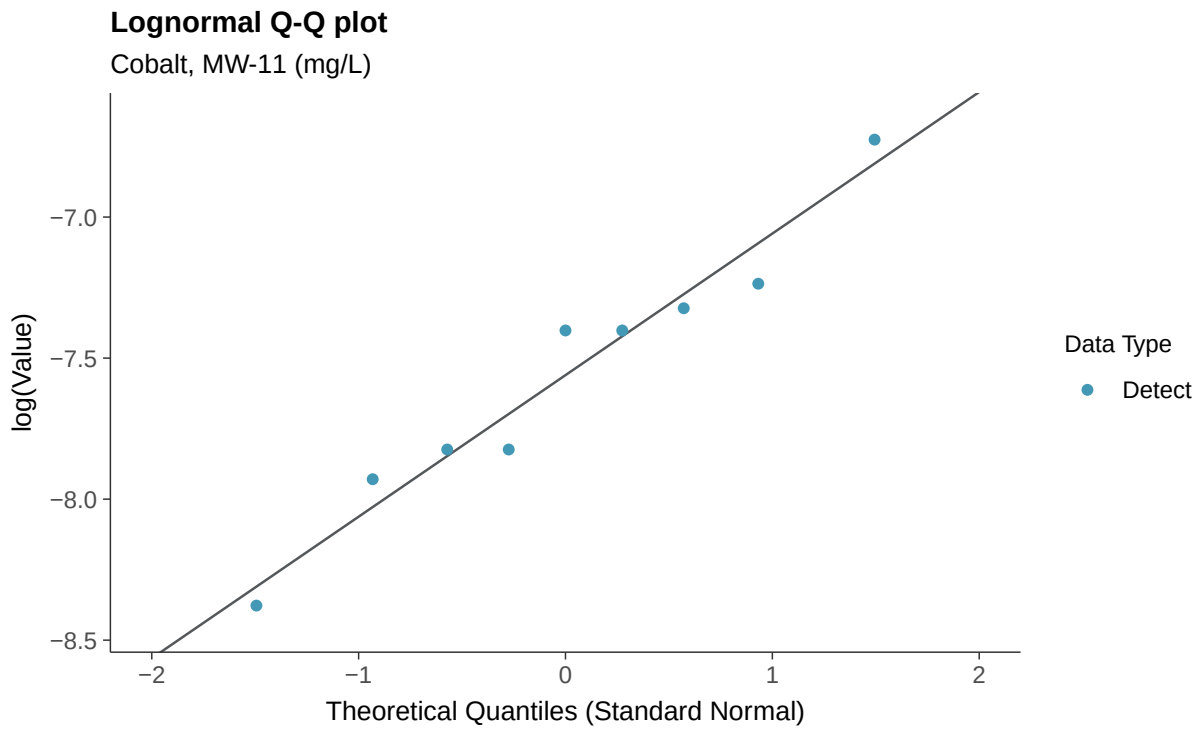


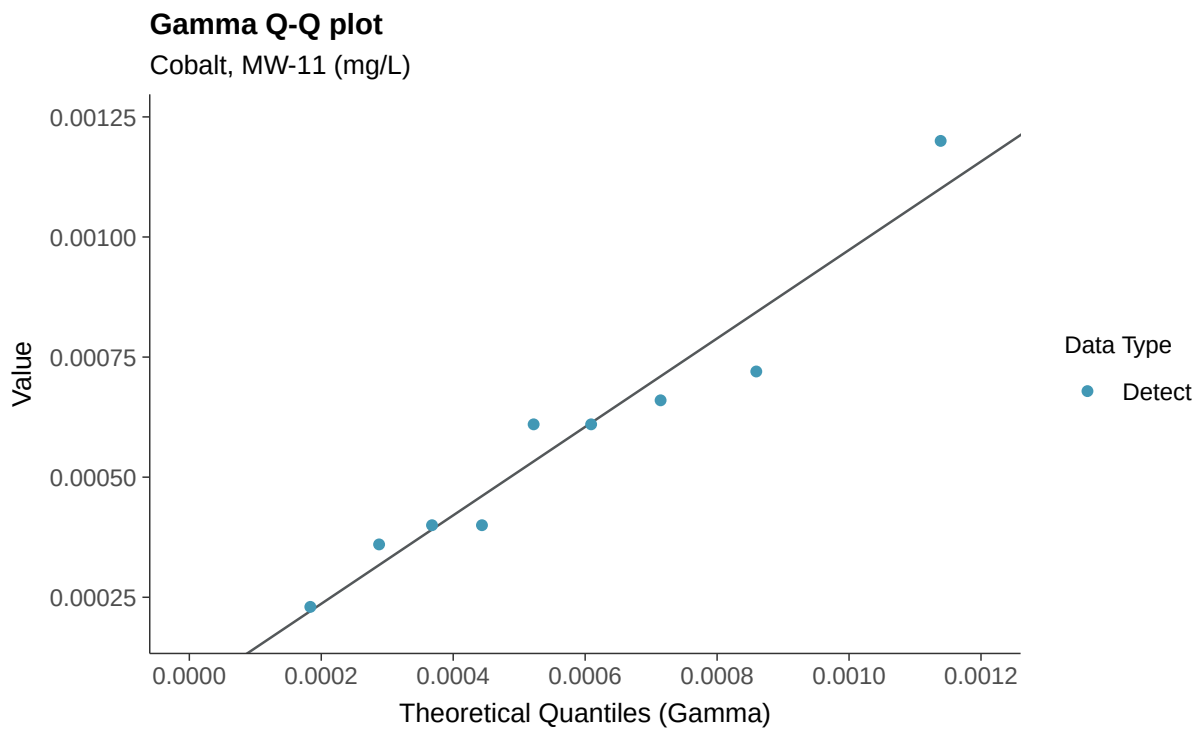
Boxplot by Season

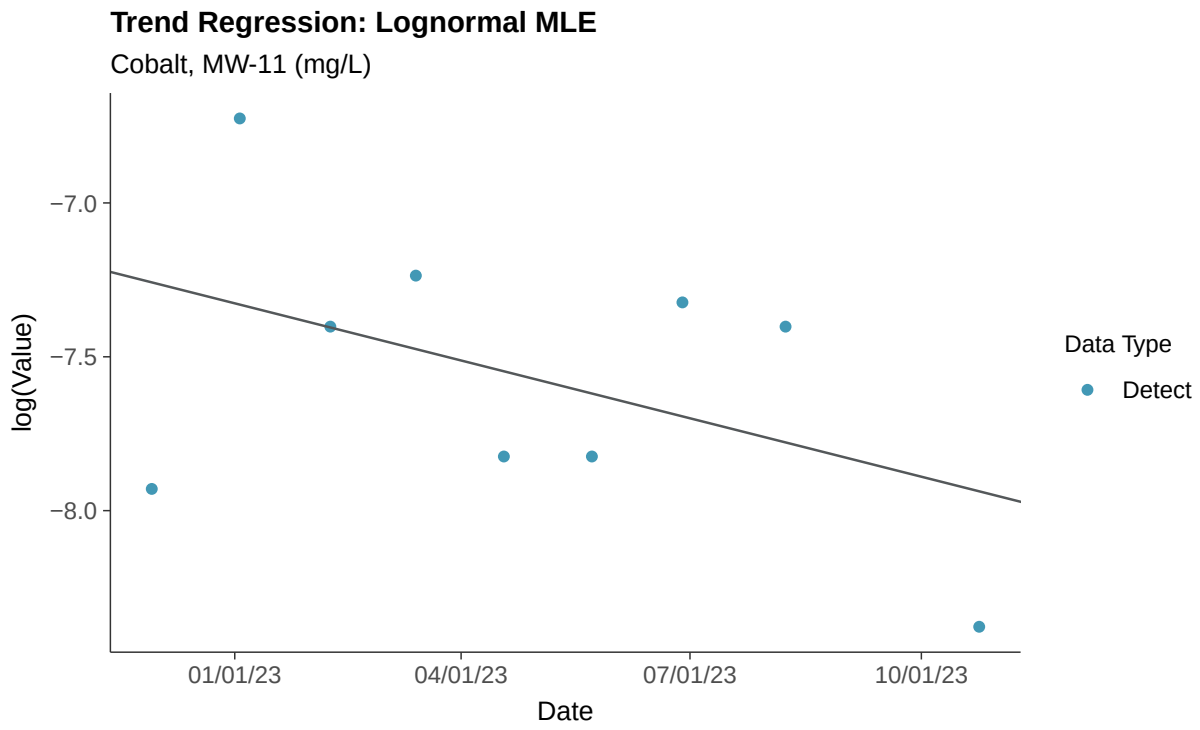
Cobalt, MW-11 (mg/L)




Normal Q-Q plot
Cobalt, MW-11 (mg/L)
Value
0.00125
0.00100
0.00075
0.00050
0.00025
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

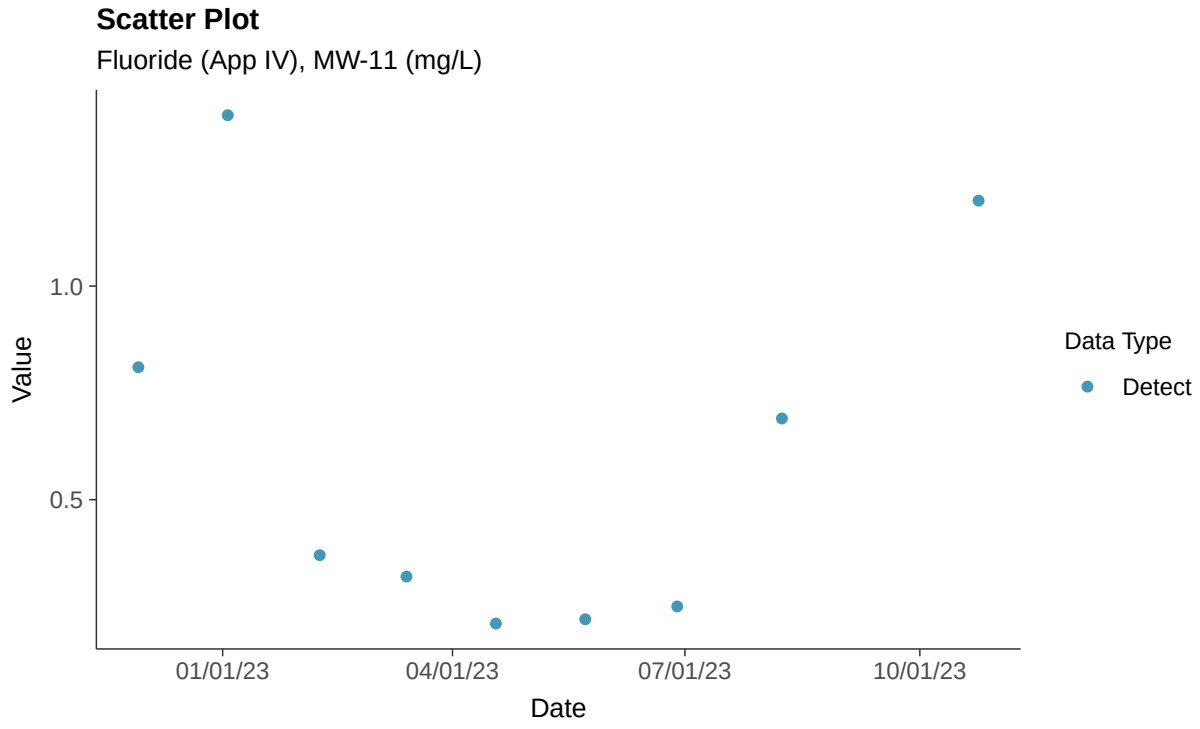

Lognormal Q-Q plot
Cobalt, MW-11 (mg/L)
log(Value)
−7.0
−7.5
−8.0
−8.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

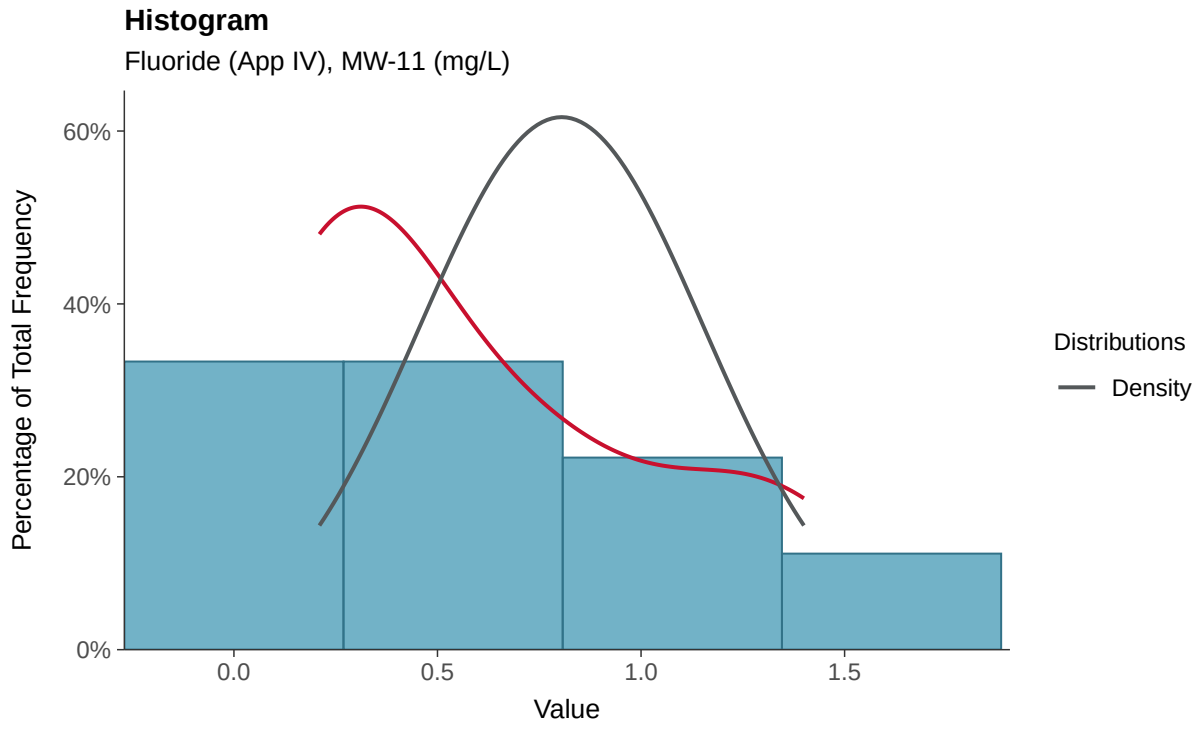

Gamma Q-Q plot
Cobalt, MW-11 (mg/L)
Value
0.00125
0.00100
0.00075
0.00050
0.00025
0.0000
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-11 (mg/L)
log(Value)
−7.0
−7.5
−8.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Fluoride (App IV), MW-11

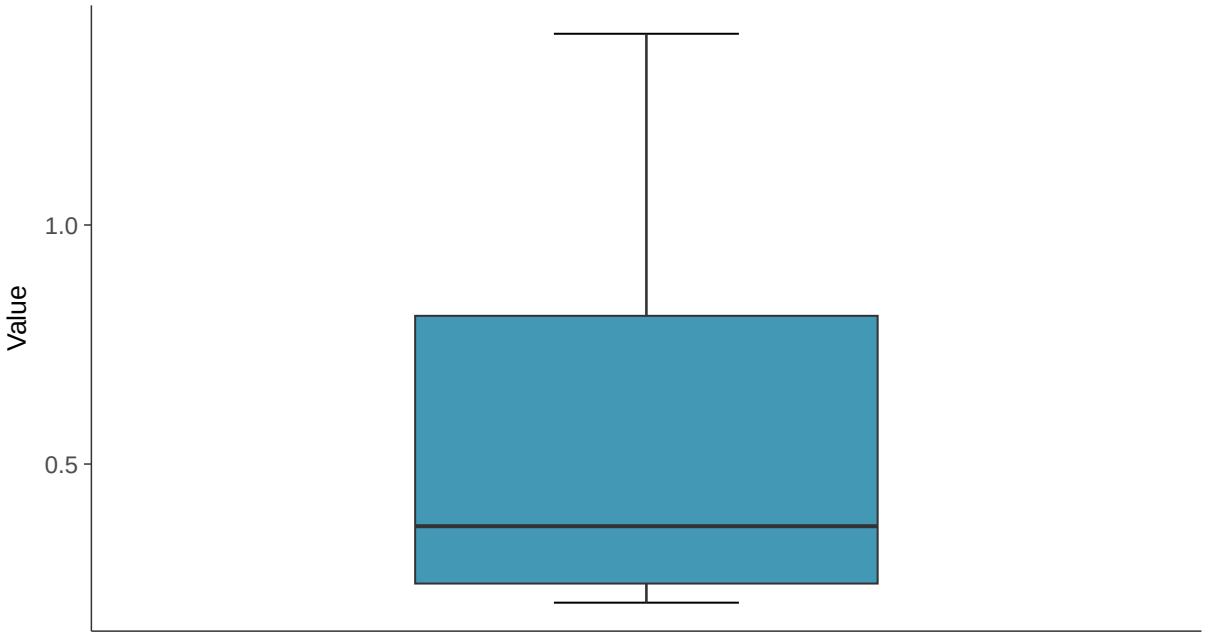
ID: 2_20_5_113





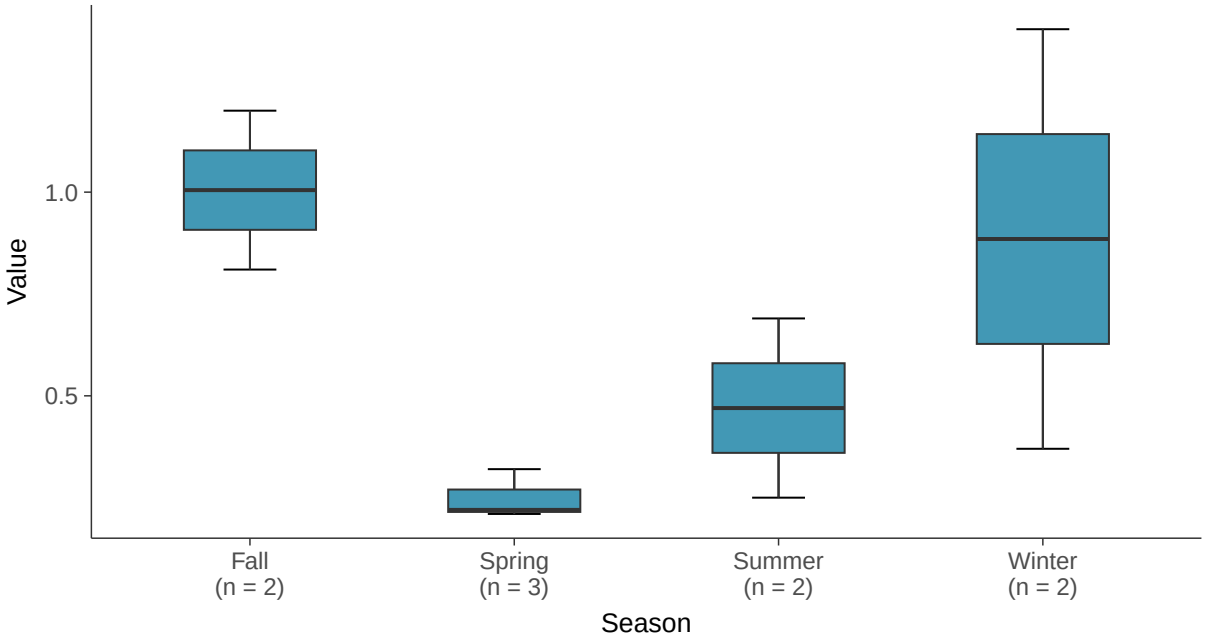
Boxplot

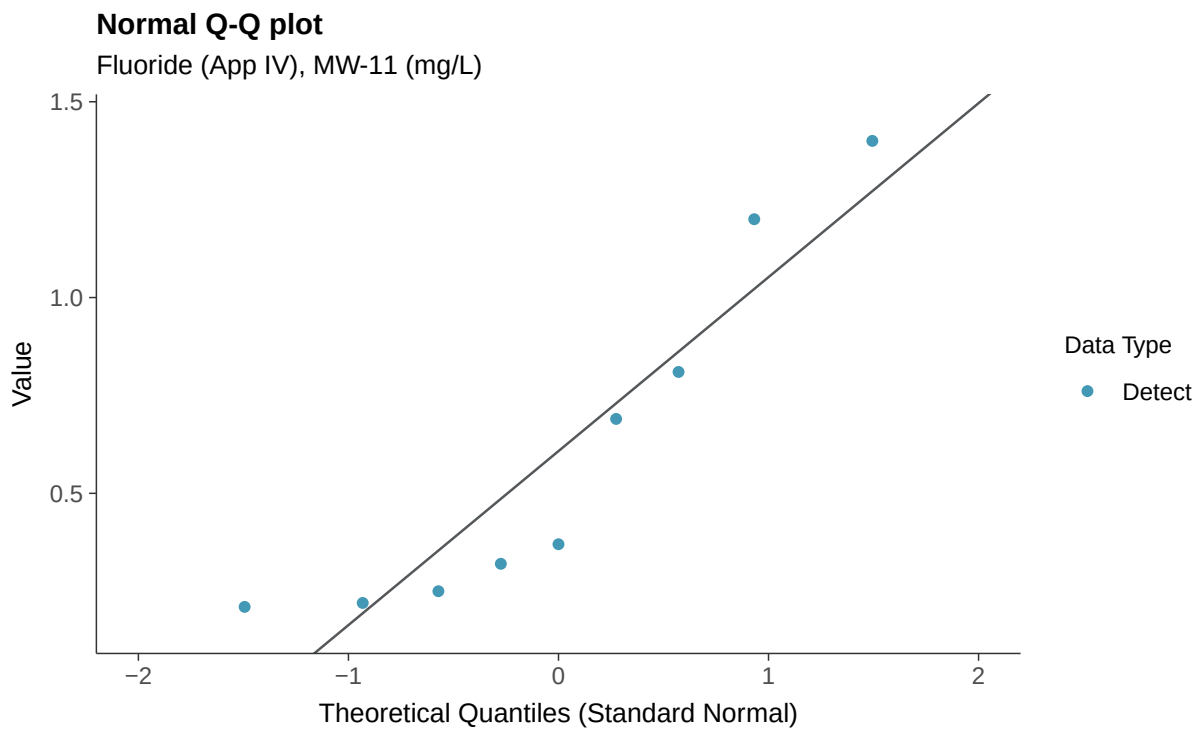
Fluoride (App IV), MW-11 (mg/L)

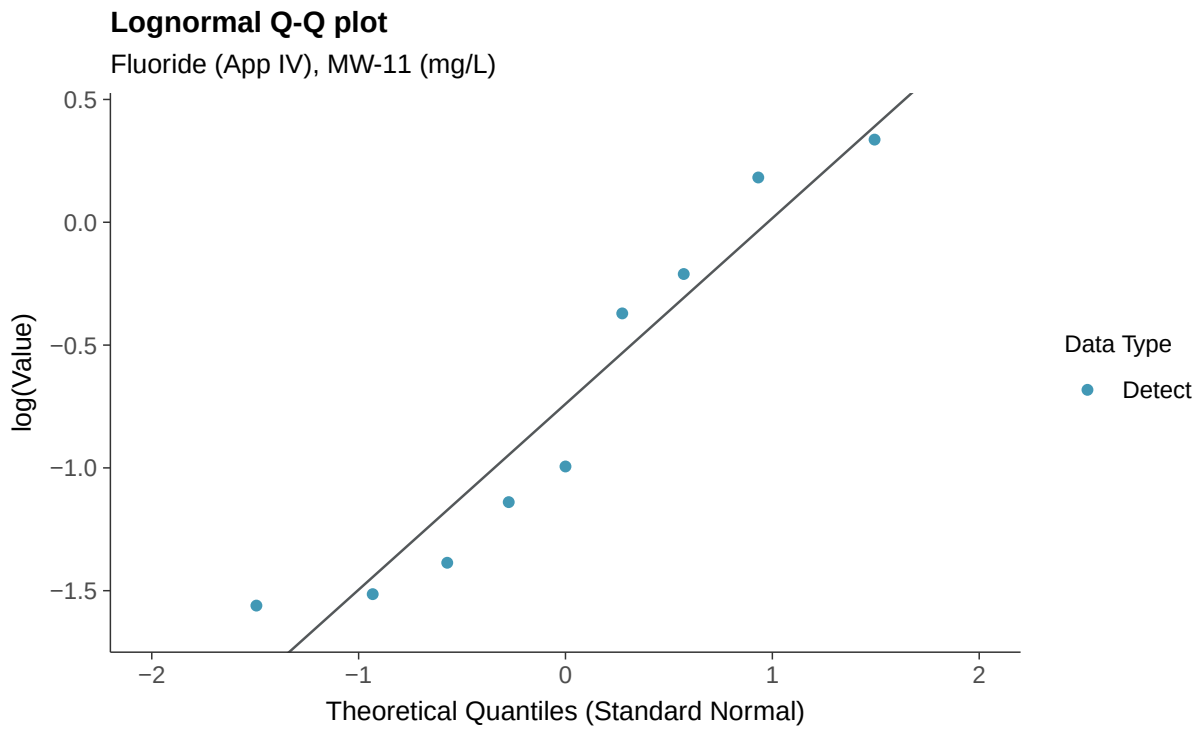


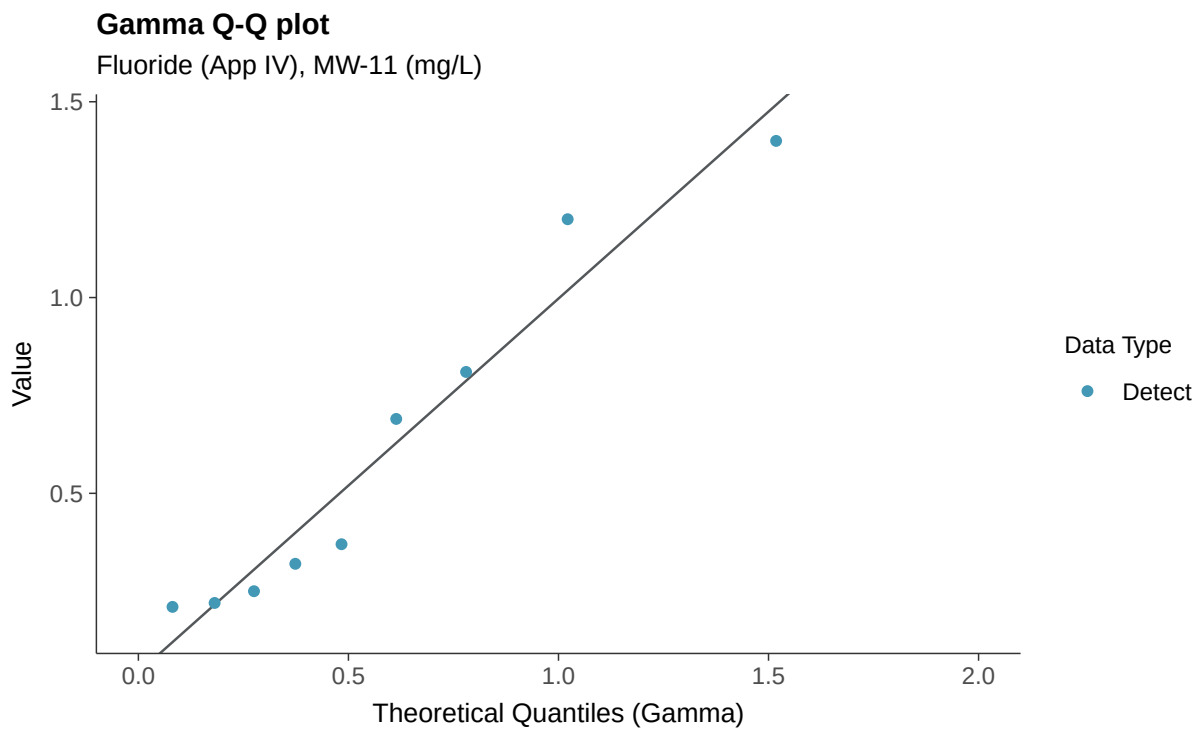
Boxplot by Season

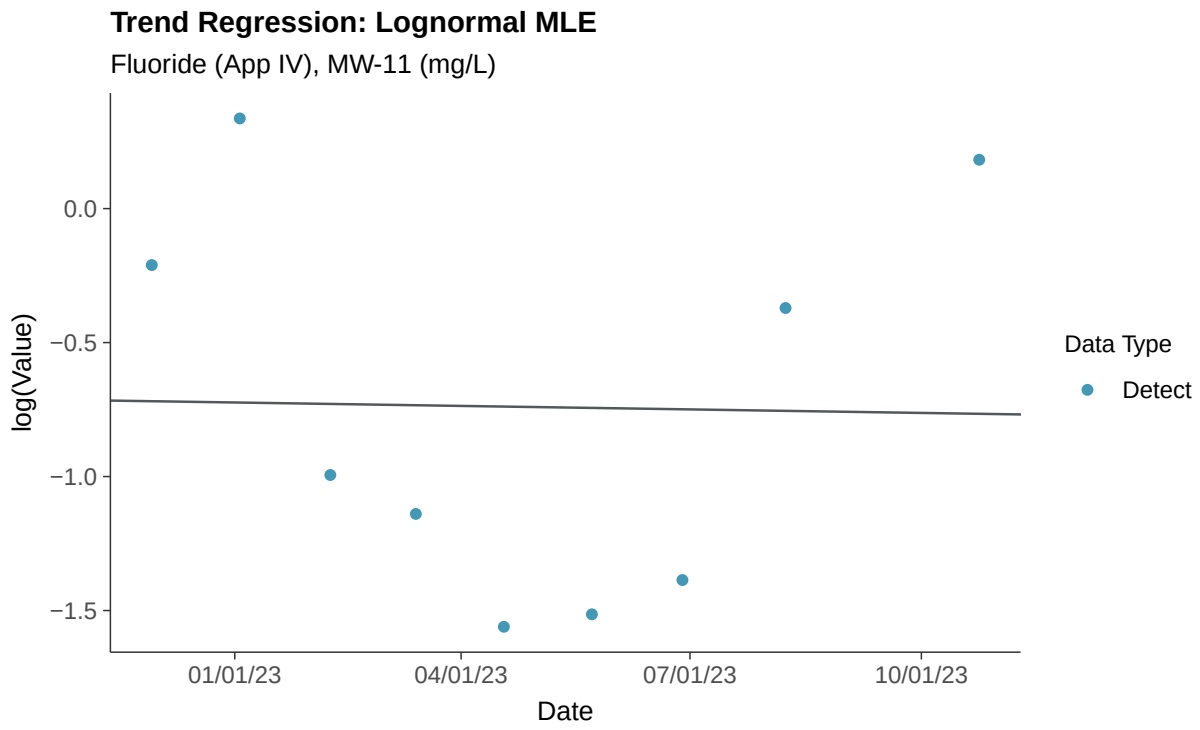
Fluoride (App IV), MW-11 (mg/L)




Normal Q-Q plot
Fluoride (App IV), MW-11 (mg/L)
Value
1.5
1.0
0.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

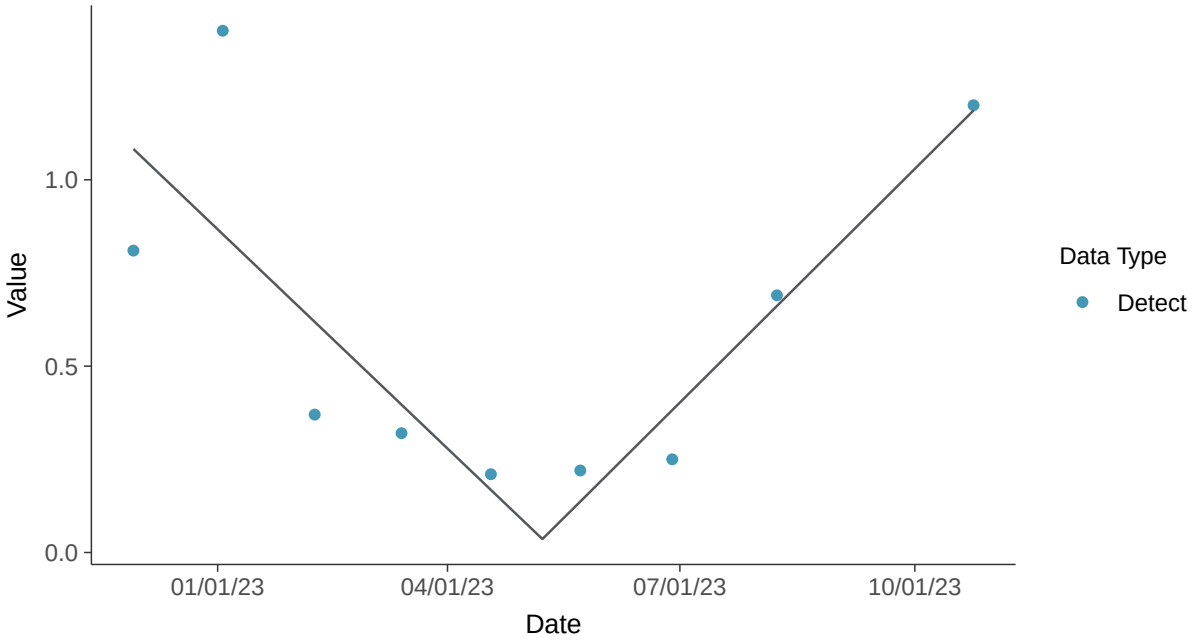

Lognormal Q-Q plot
Fluoride (App IV), MW-11 (mg/L)
log(Value)
0.5
0.0
−0.5
−1.0
−1.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride (App IV), MW-11 (mg/L)
Value
1.5
1.0
0.5
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-11 (mg/L)
log(Value)
0.0
−0.5
−1.0
−1.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

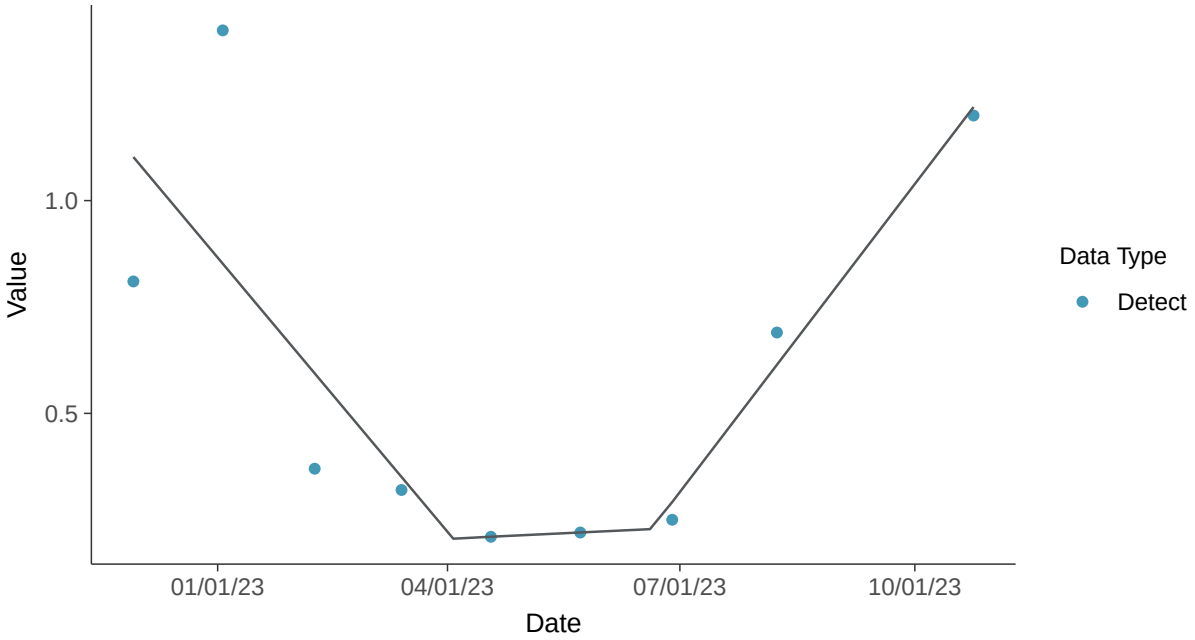
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-11 (mg/L)



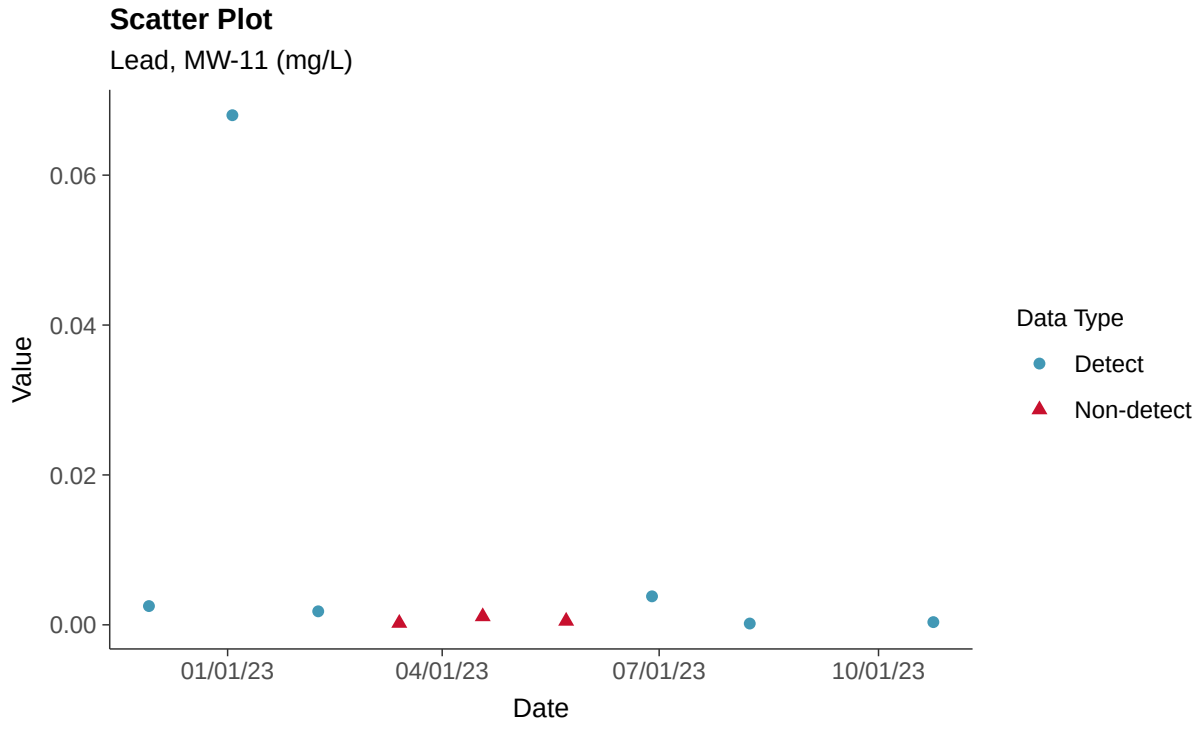
Trend Regression: Piecewise Linear-Linear-Linear

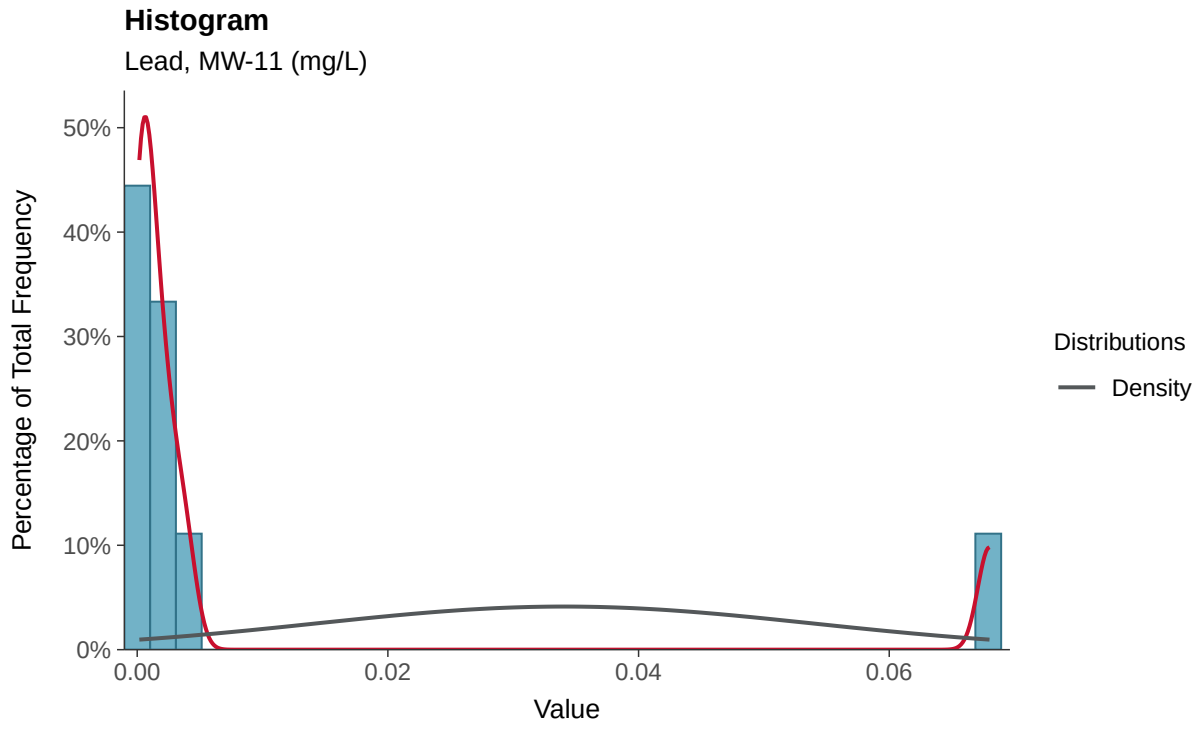
Fluoride (App IV), MW-11 (mg/L)



Appendix IV: Lead, MW-11

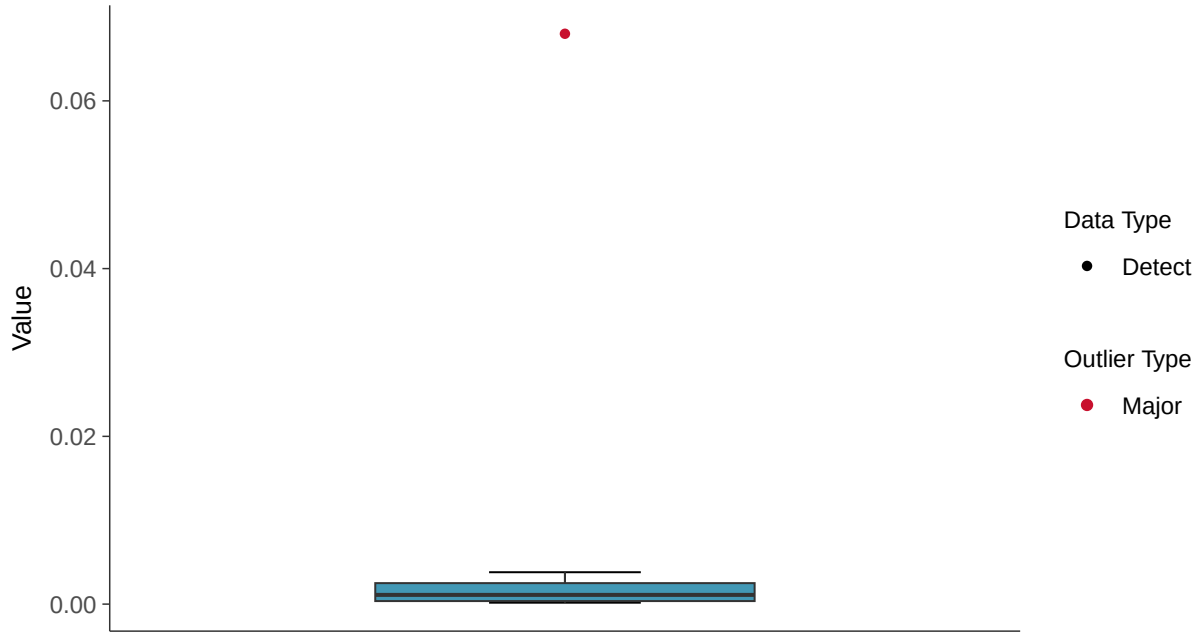
ID: 2_20_5_115





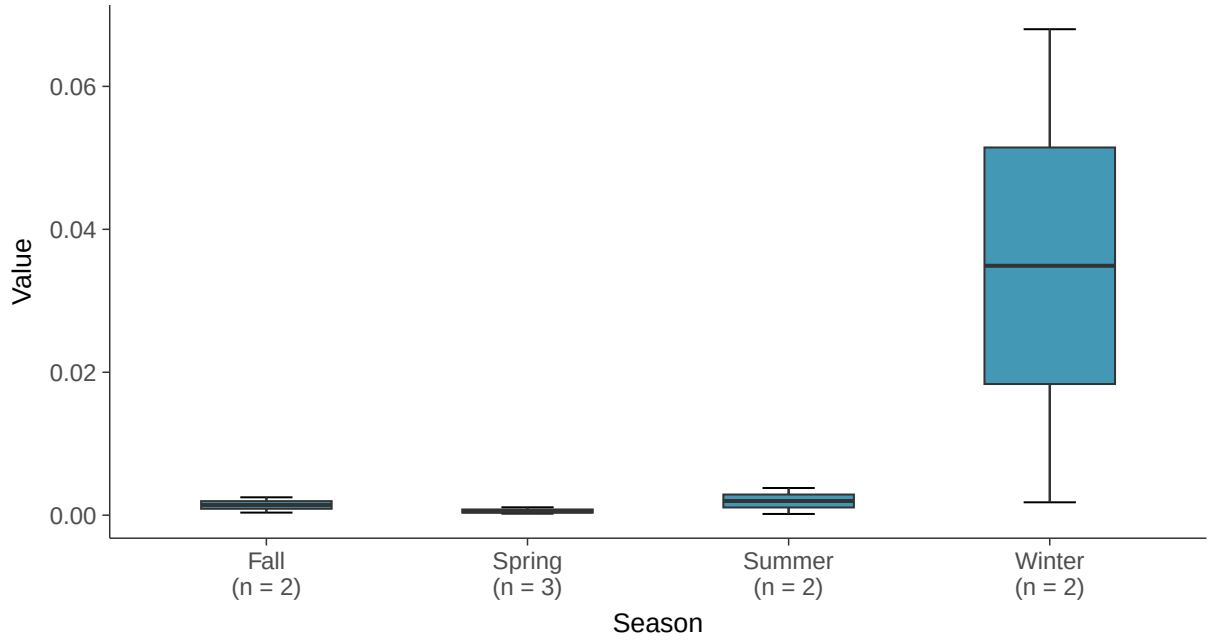
Boxplot

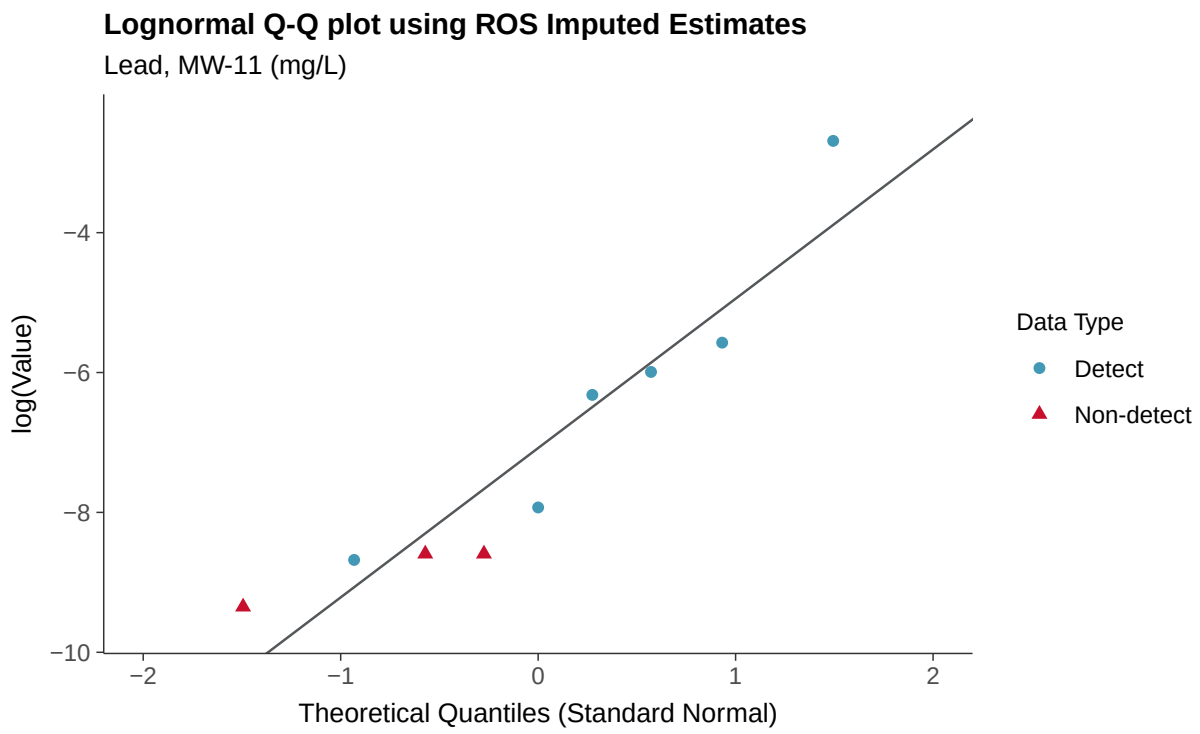
Lead, MW-11 (mg/L)

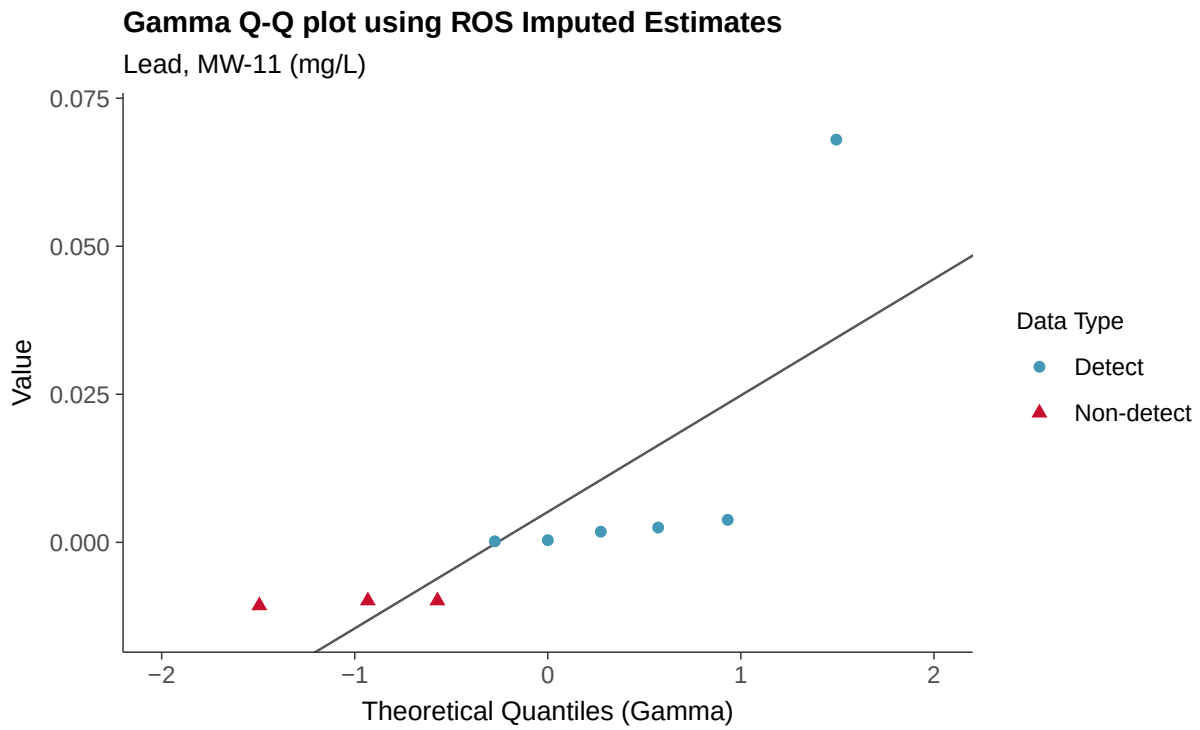


Boxplot by Season

Lead, MW-11 (mg/L)

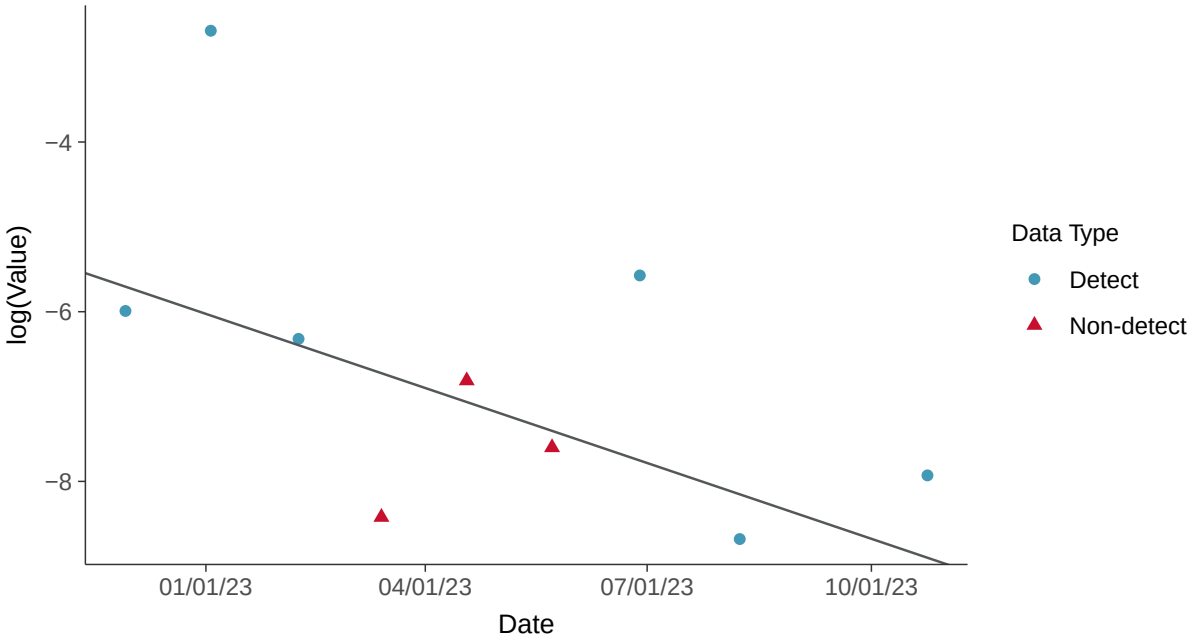



Lognormal Q-Q plot using ROS Imputed Estimates
Lead, MW-11 (mg/L)
log(Value)
−4
−6
−8
−10
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Lead, MW-11 (mg/L)
Value
0.075
0.050
0.025
0.000
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

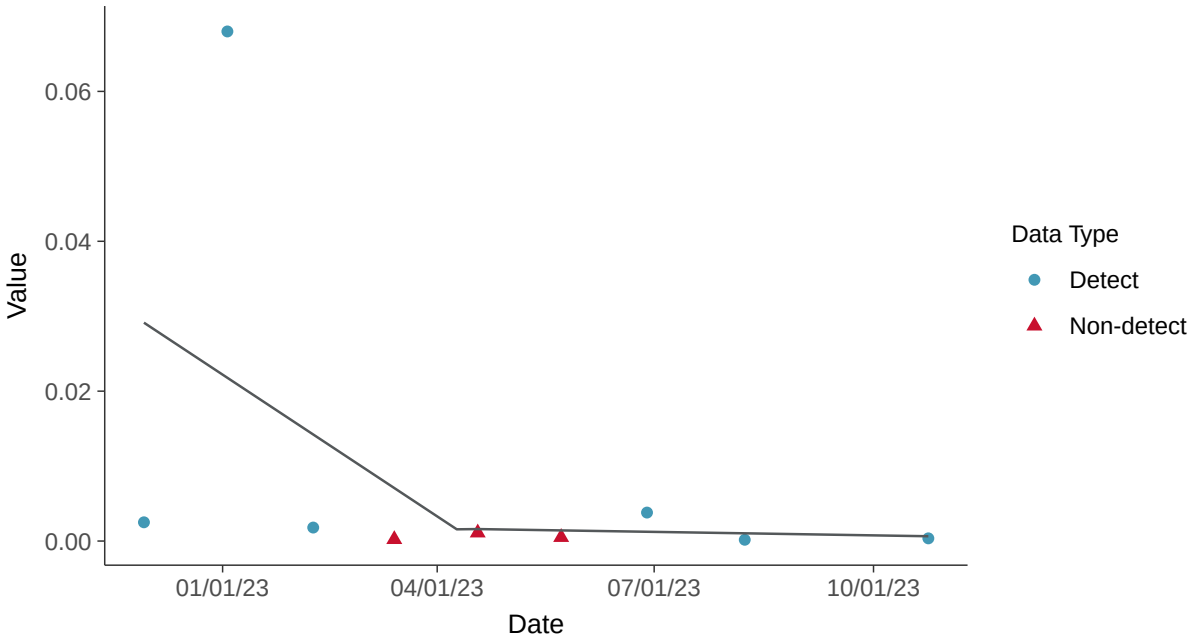
Trend Regression: Lognormal MLE

Lead, MW-11 (mg/L)



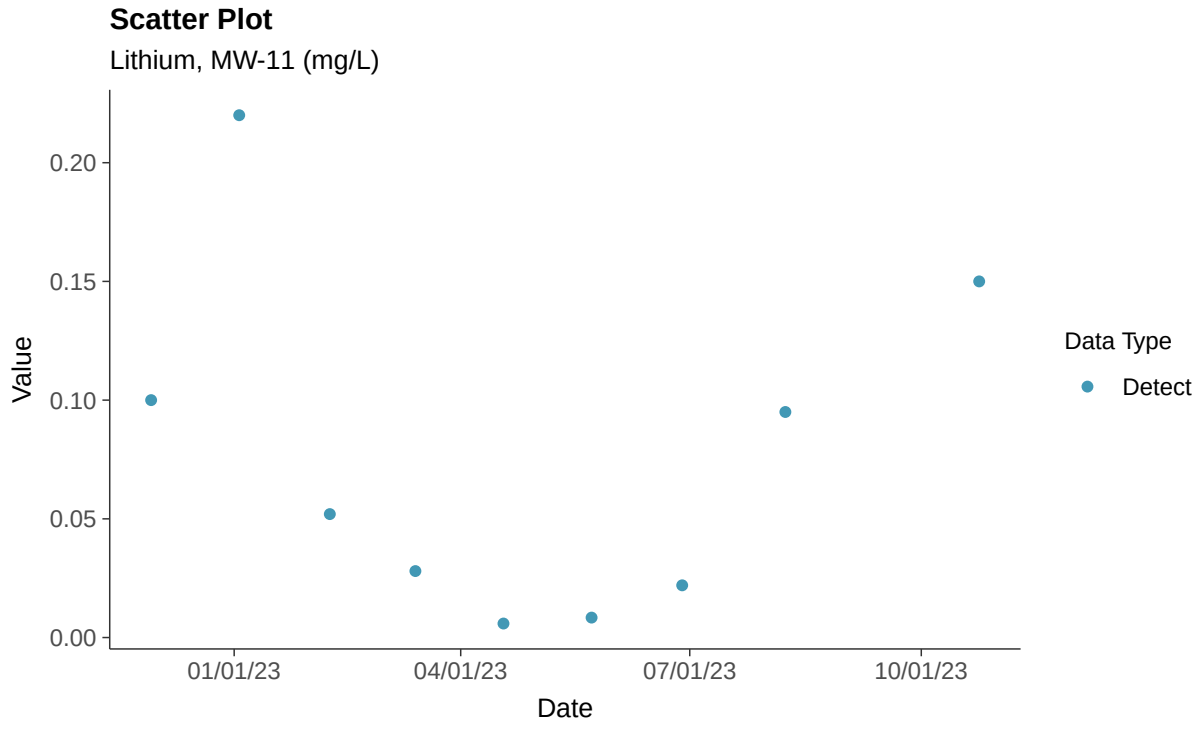
Trend Regression: Piecewise Linear-Linear

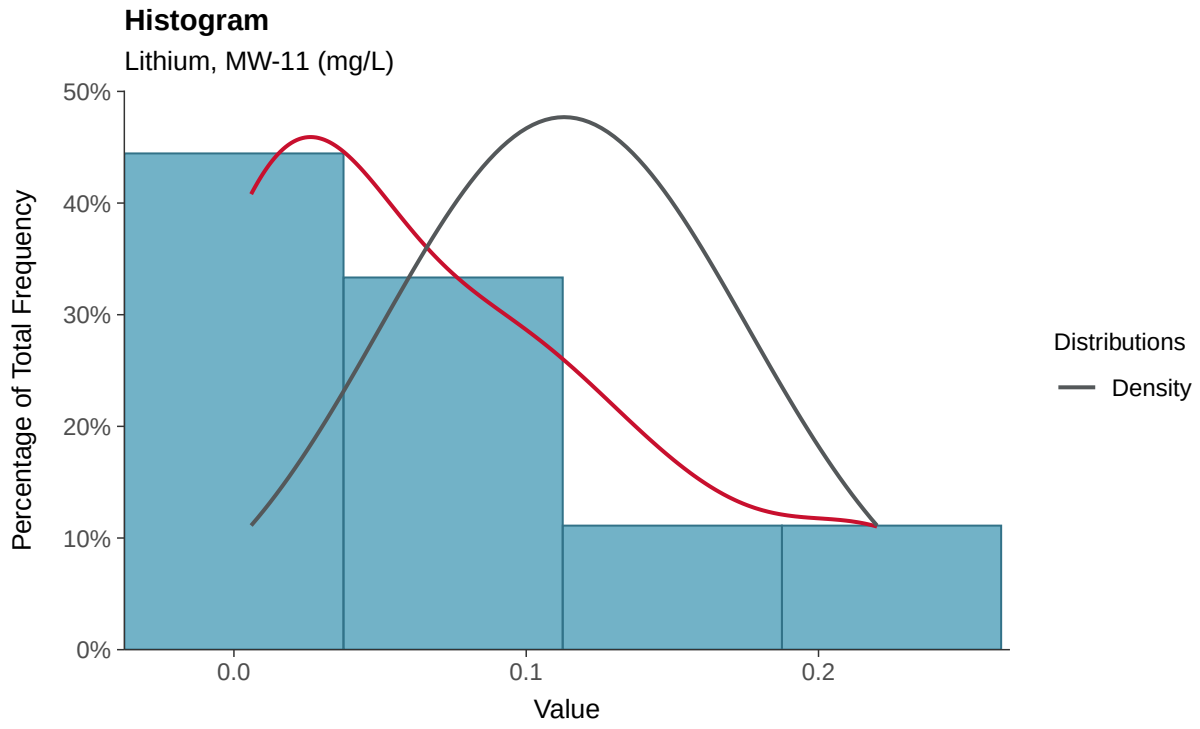
Lead, MW-11 (mg/L)



Appendix IV: Lithium, MW-11

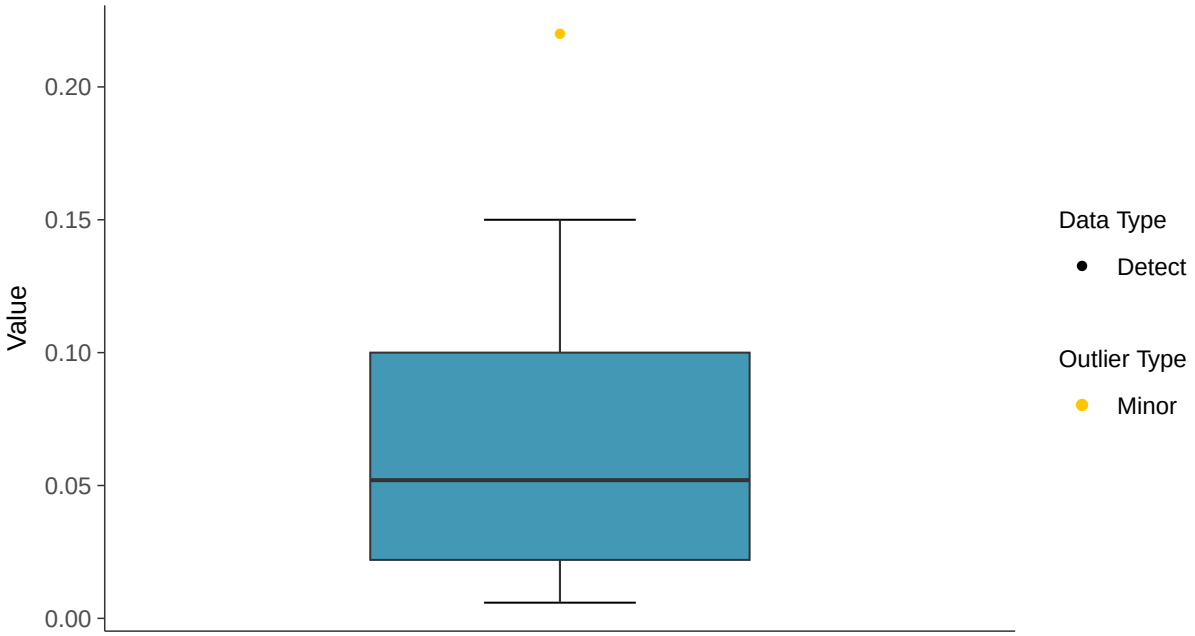
ID: 2_20_5_116





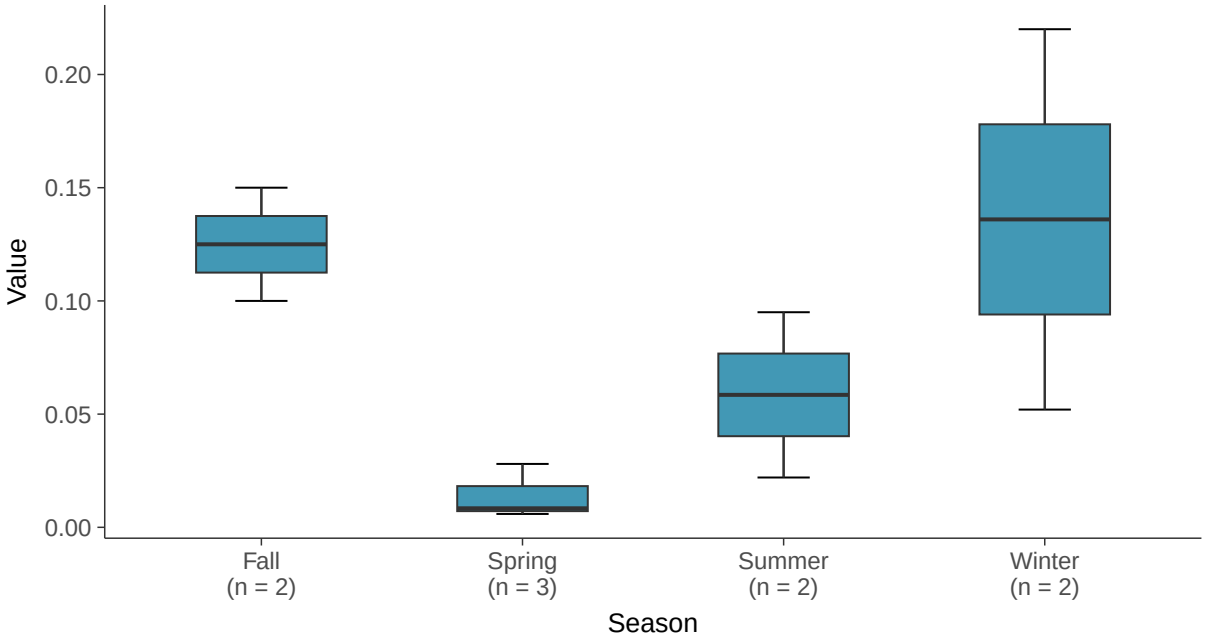
Boxplot

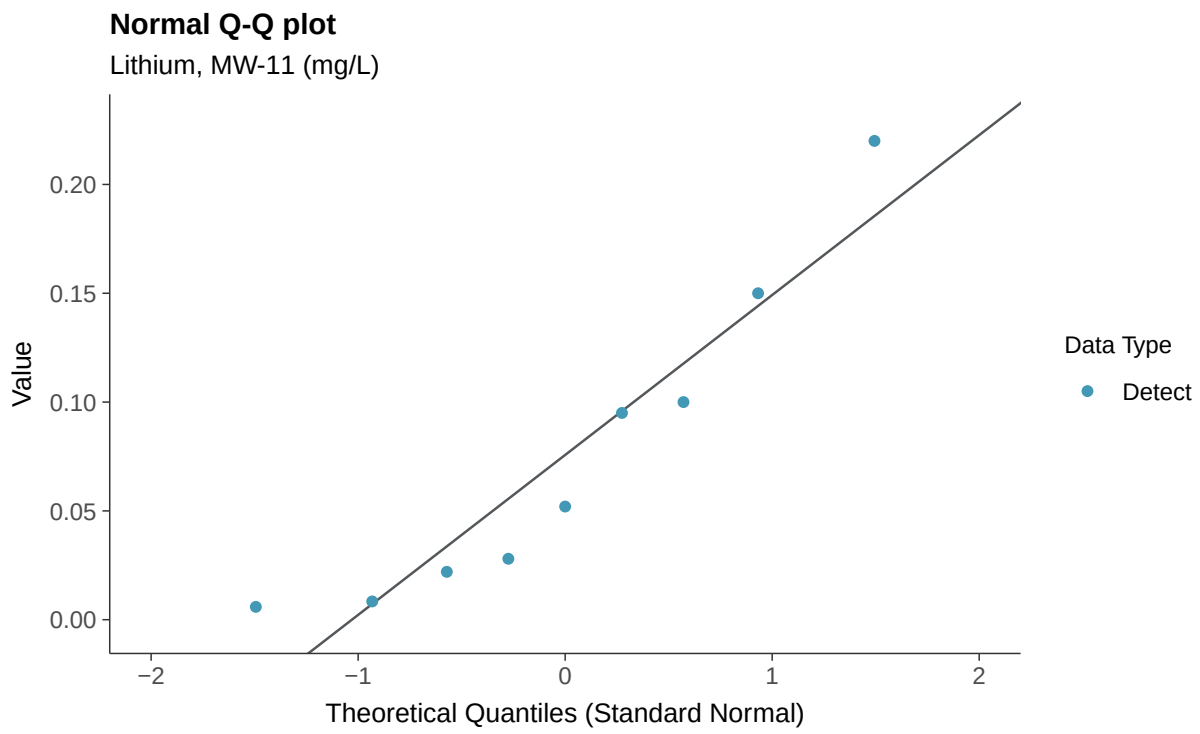
Lithium, MW-11 (mg/L)

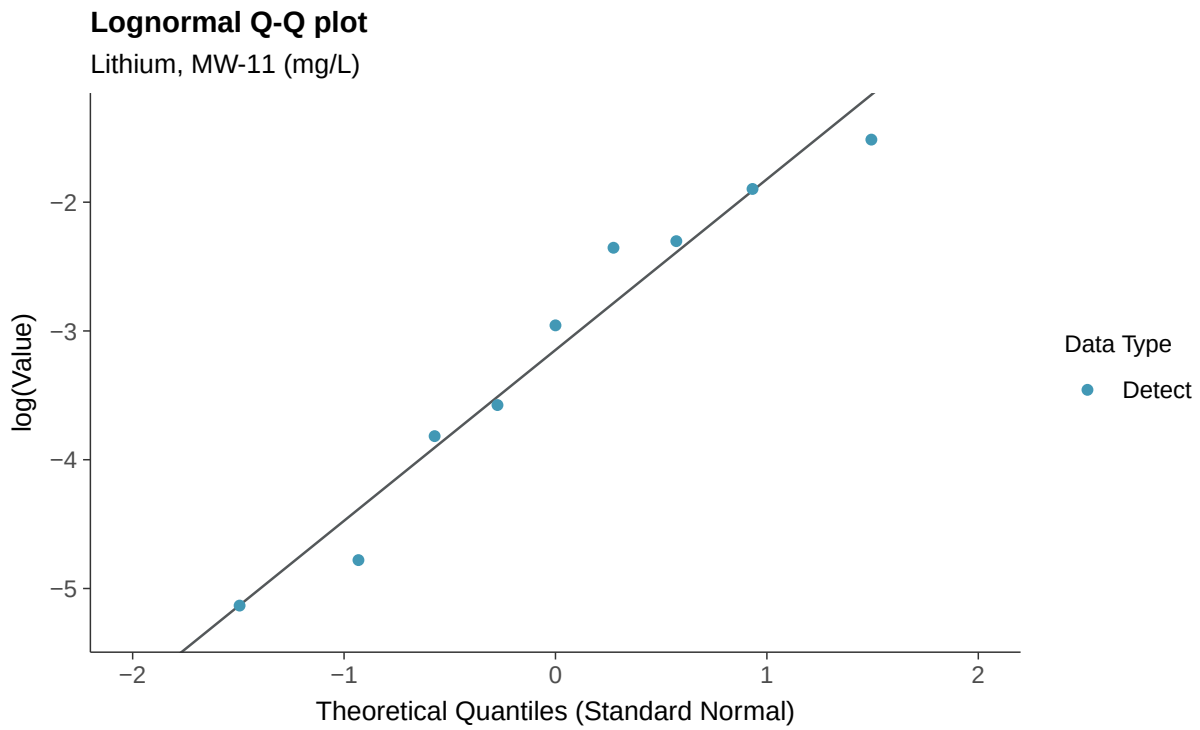


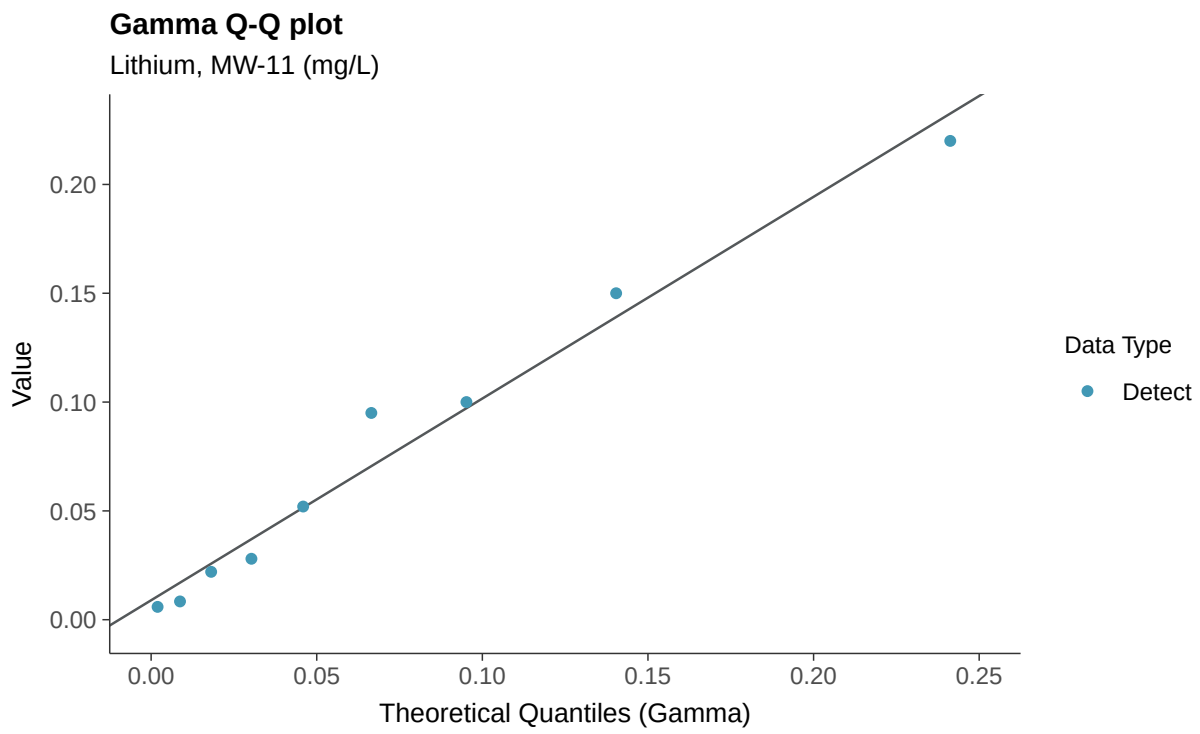
Boxplot by Season

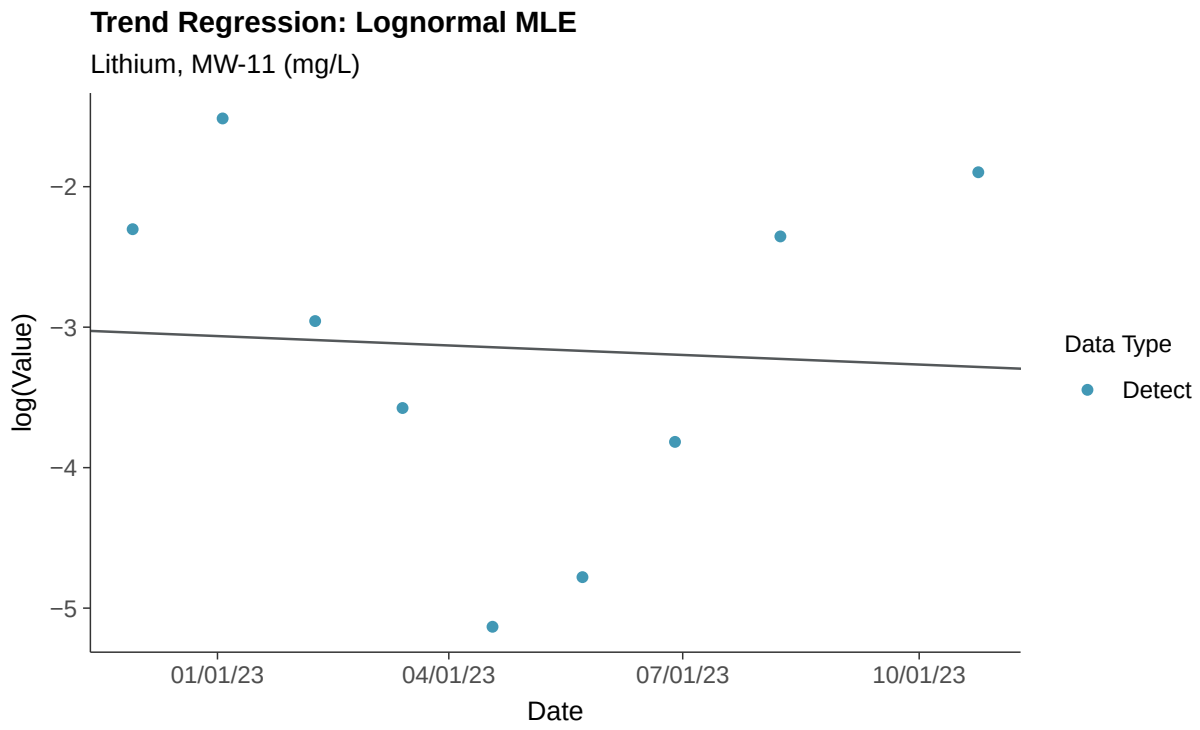
Lithium, MW-11 (mg/L)

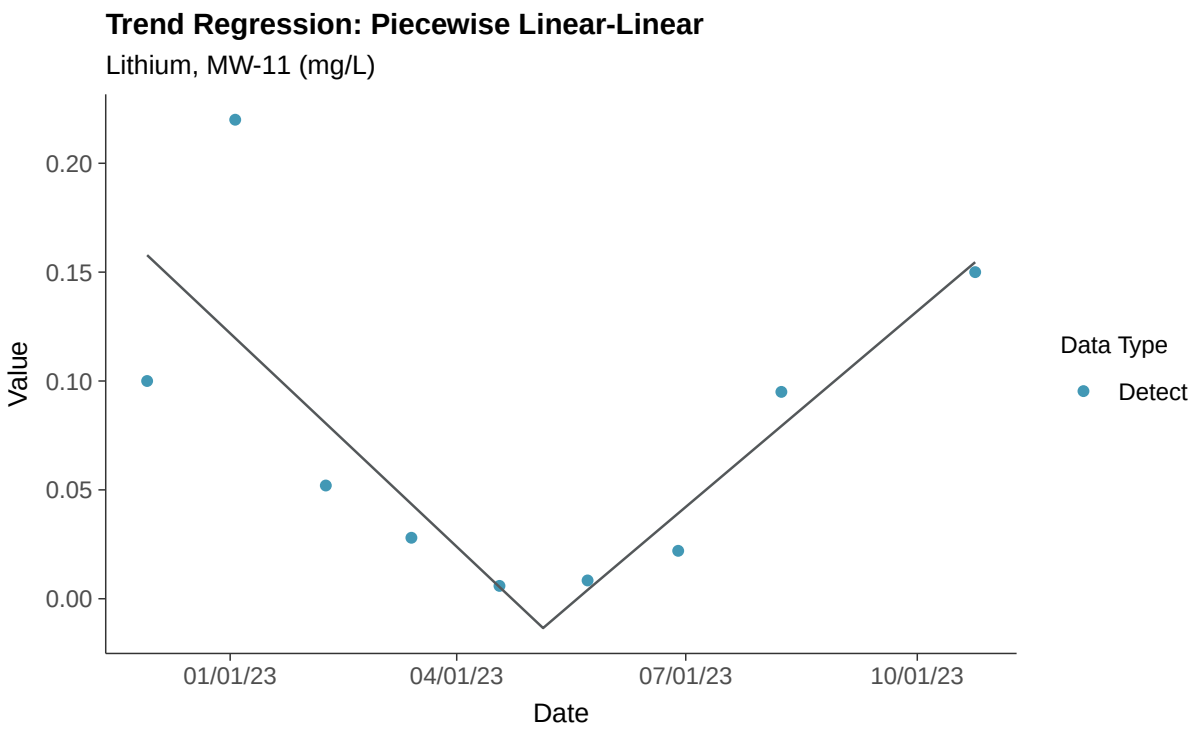



Normal Q-Q plot
Lithium, MW-11 (mg/L)
Value
0.20
0.15
0.10
0.05
0.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-11 (mg/L)
log(Value)
−2
−3
−4
−5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

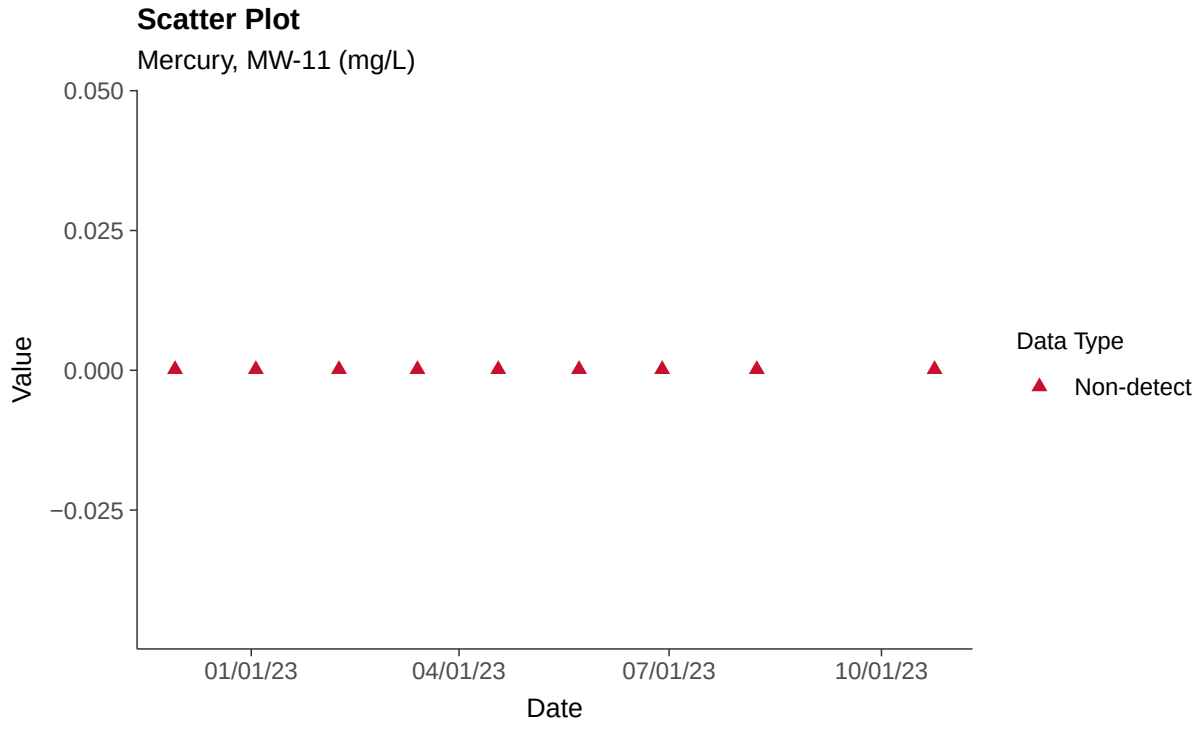

Gamma Q-Q plot
Lithium, MW-11 (mg/L)
Value
0.20
0.15
0.10
0.05
0.00
0.00
0.05
0.10
0.15
0.20
0.25
Theoretical Quantiles (Gamma)
Data Type
Detect

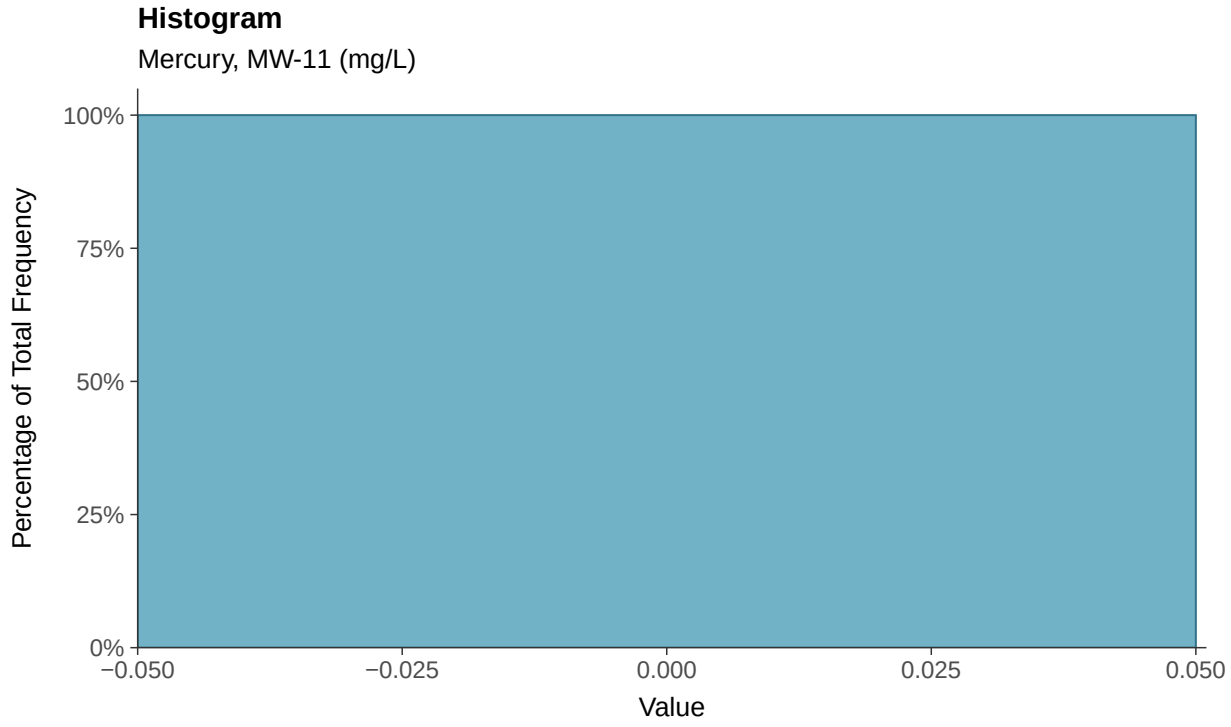

Trend Regression: Lognormal MLE
Lithium, MW-11 (mg/L)
log(Value)
−2
−3
−4
−5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Lithium, MW-11 (mg/L)
Value
0.20
0.15
0.10
0.05
0.00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-11

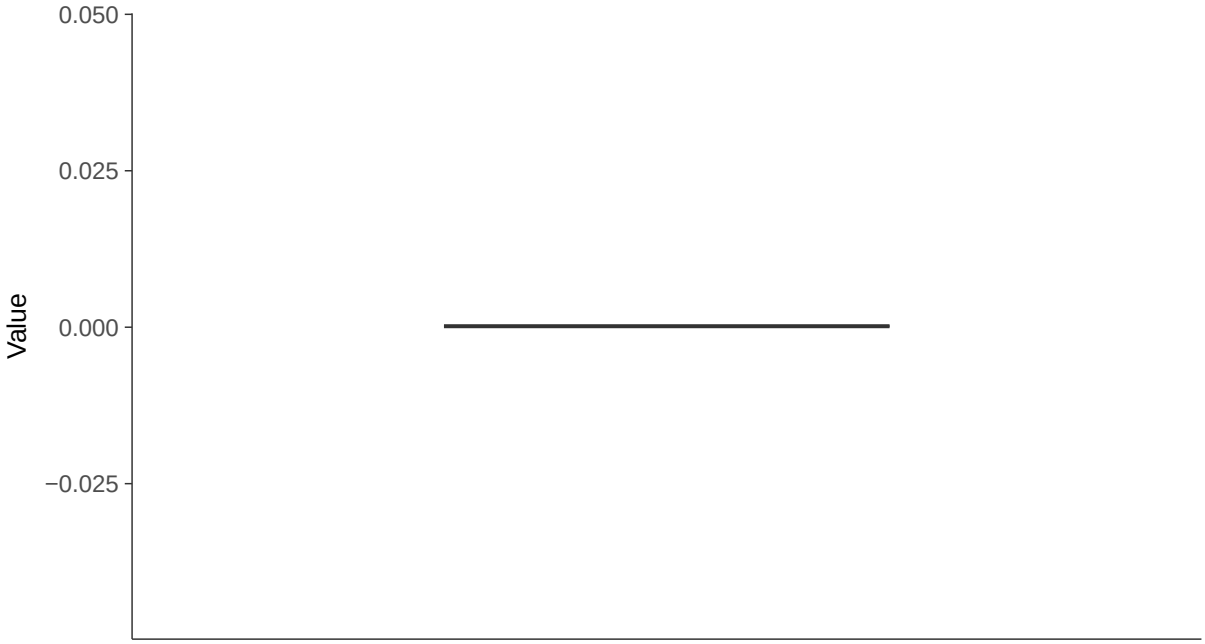
ID: 2_20_5_117





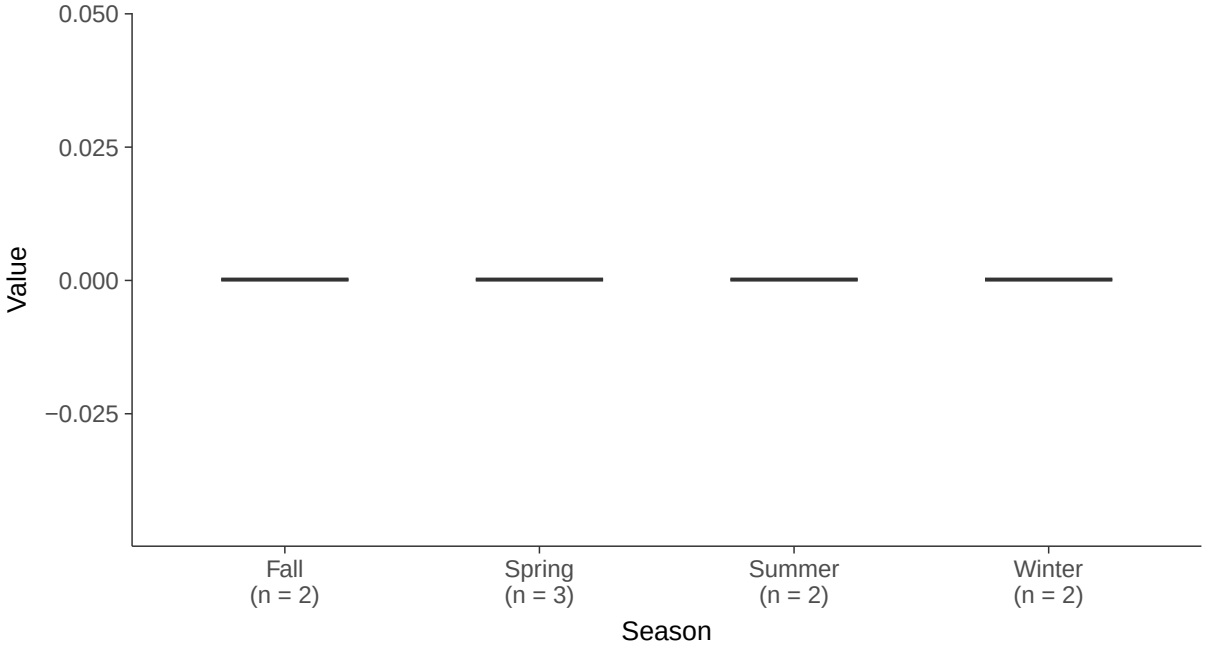
Boxplot

Mercury, MW-11 (mg/L)



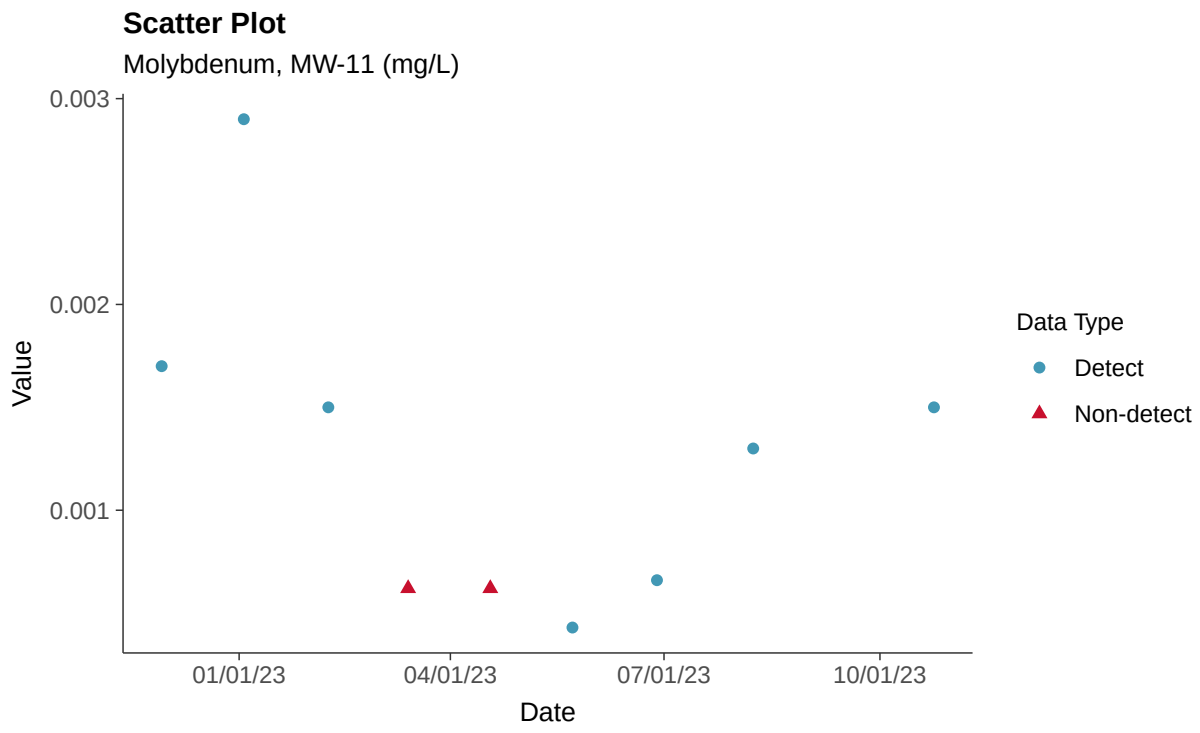
Boxplot by Season

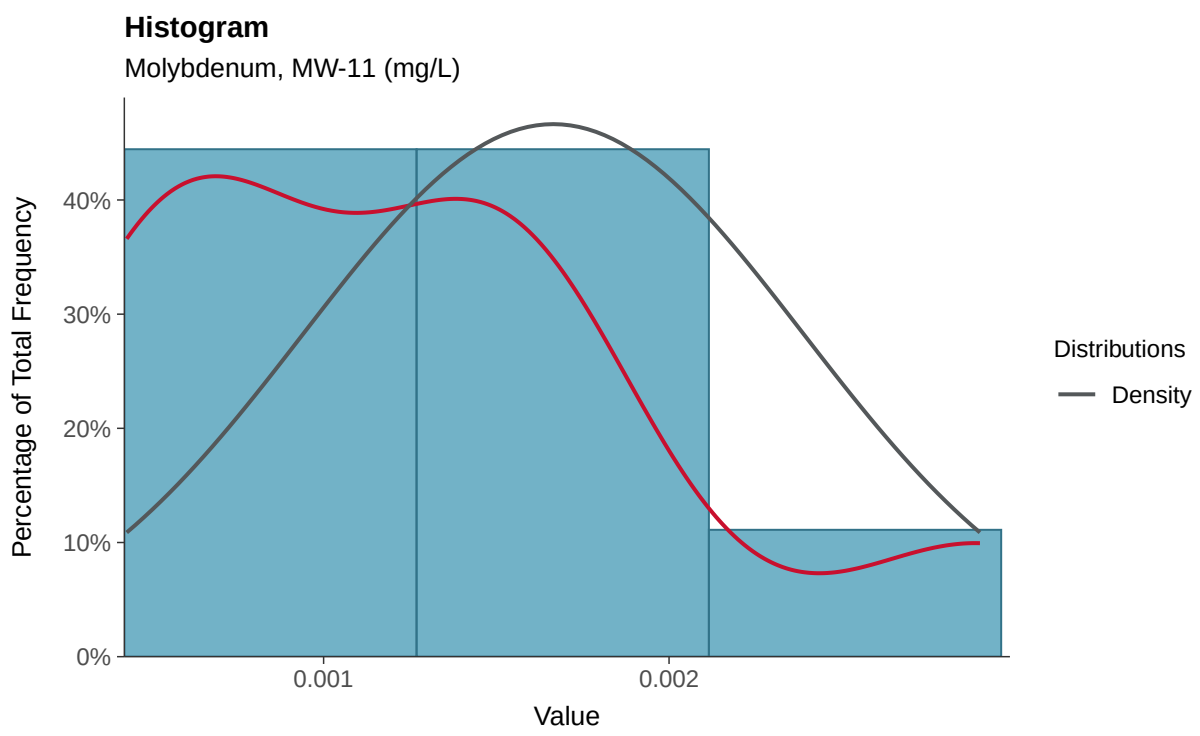
Mercury, MW-11 (mg/L)

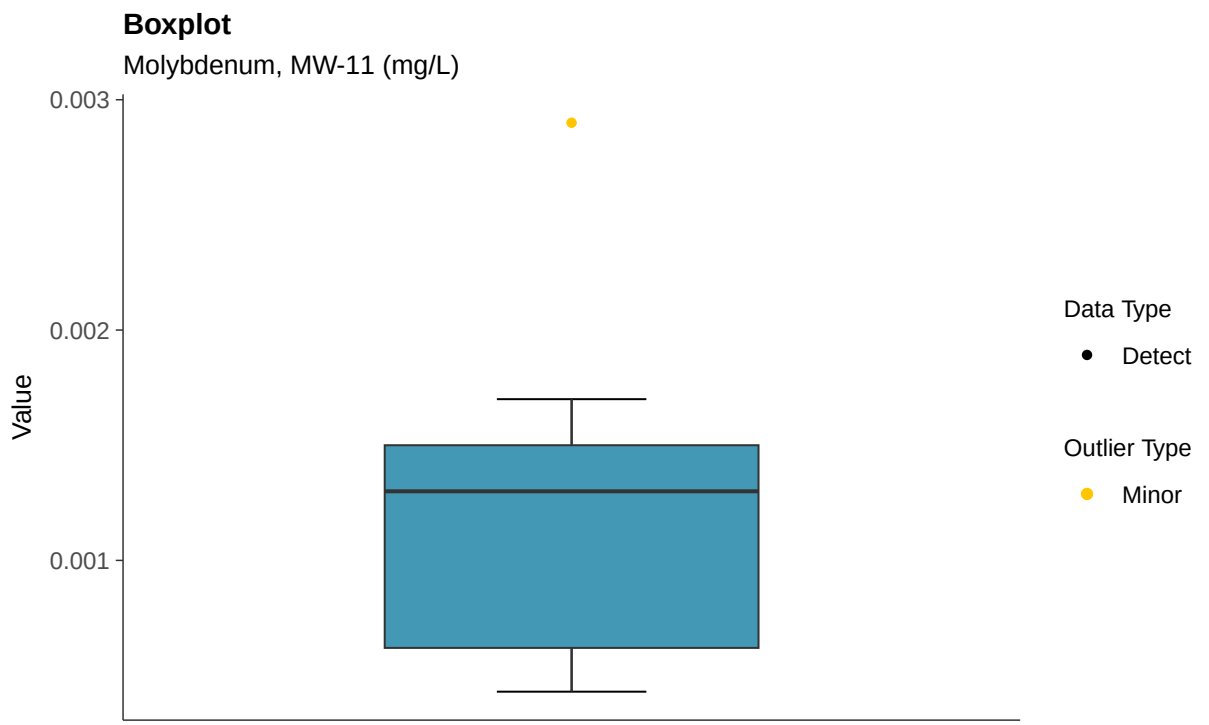


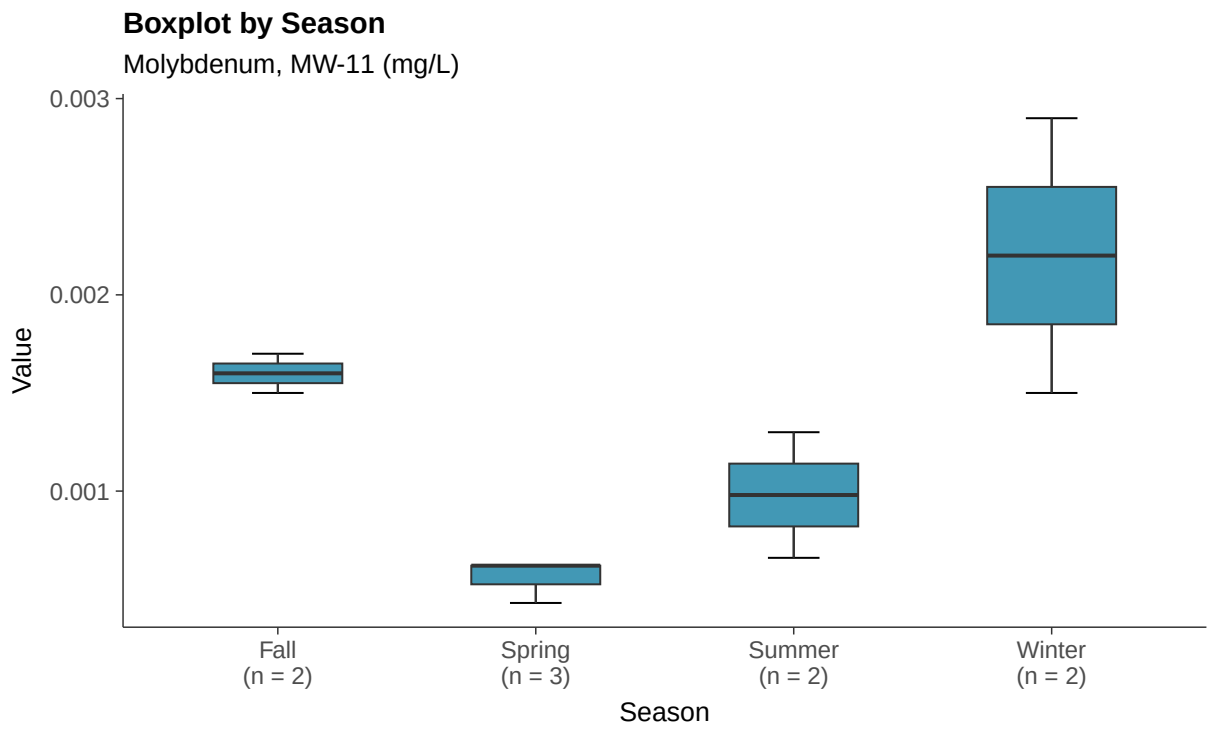
Appendix IV: Molybdenum, MW-11

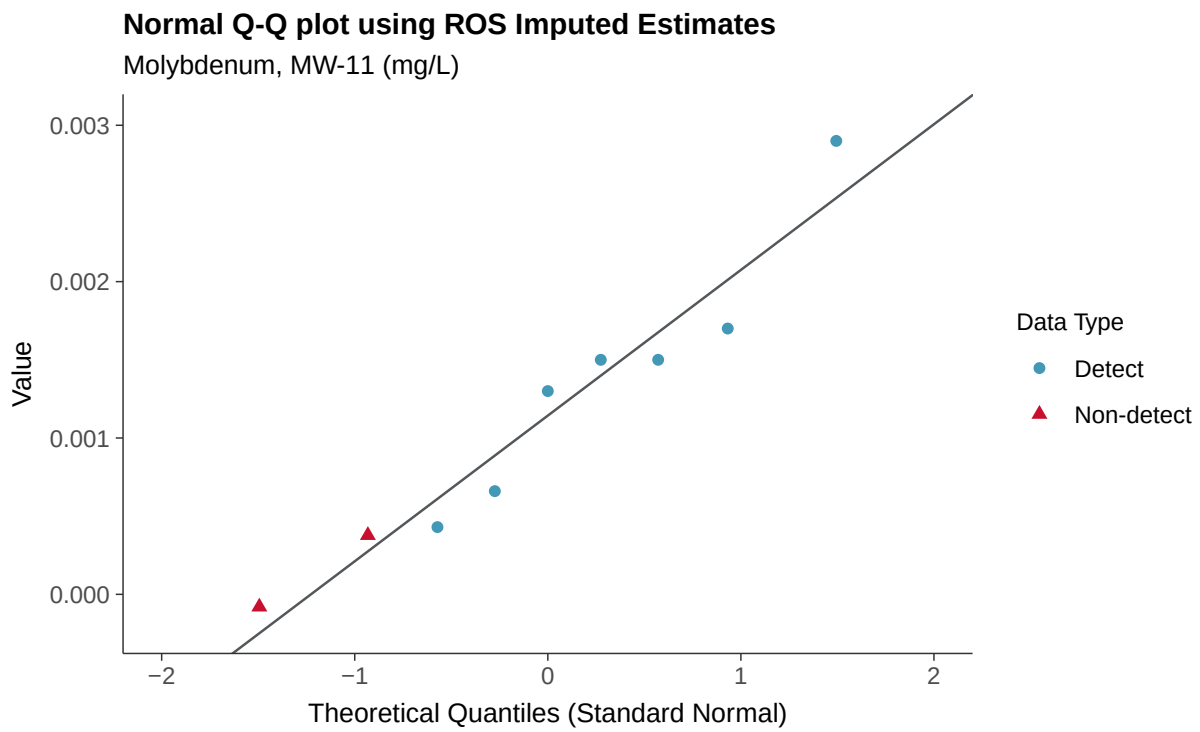
ID: 2_20_5_118

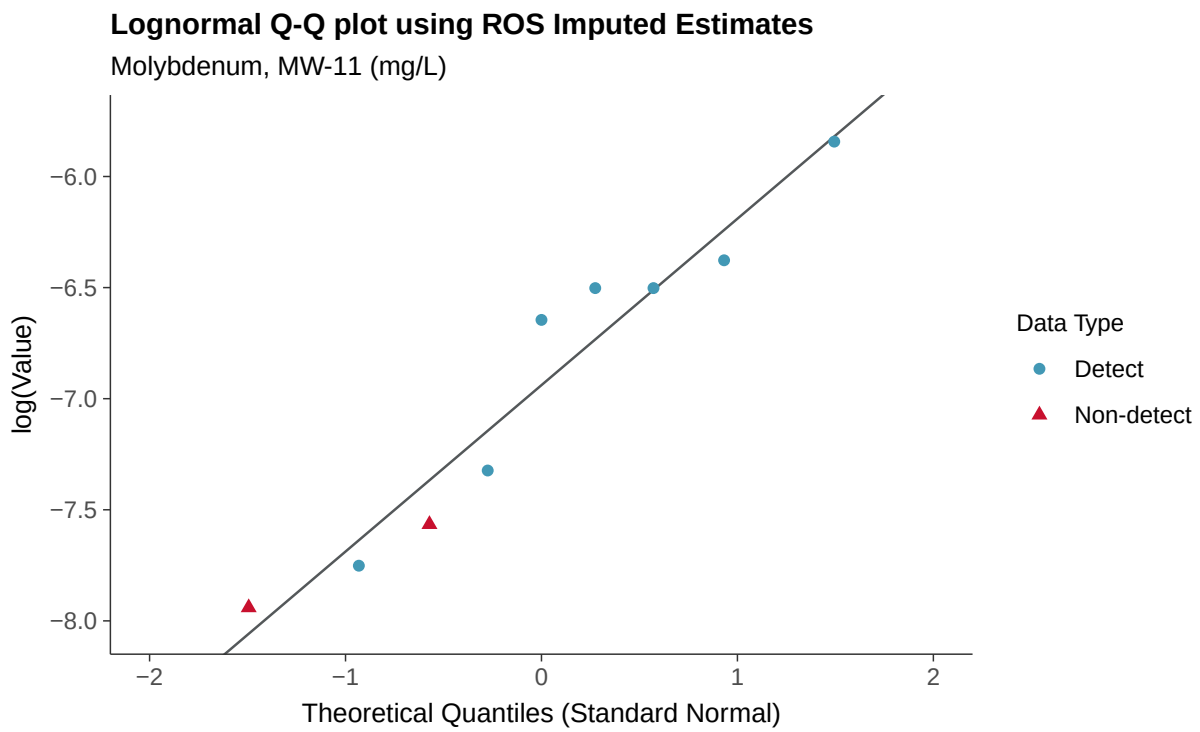


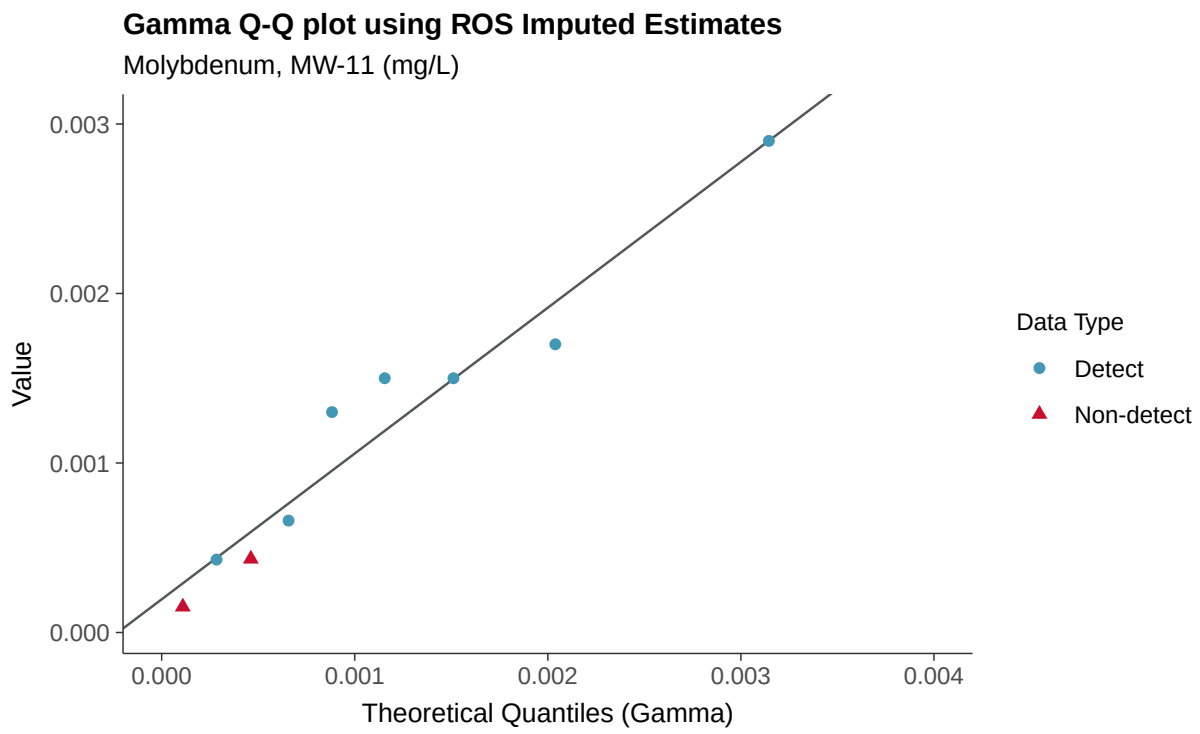


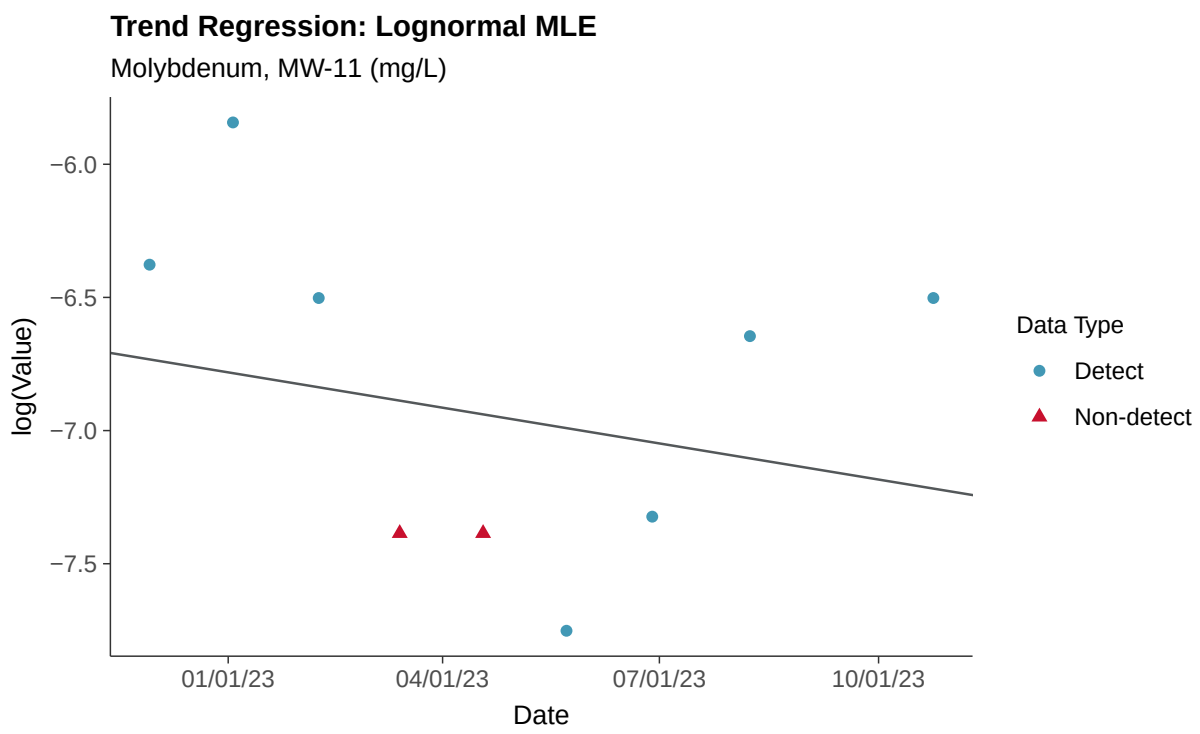

Boxplot
Molybdenum, MW-11 (mg/L)
0.003
0.002
0.001
Value
Data Type
Detect
Outlier Type
Minor

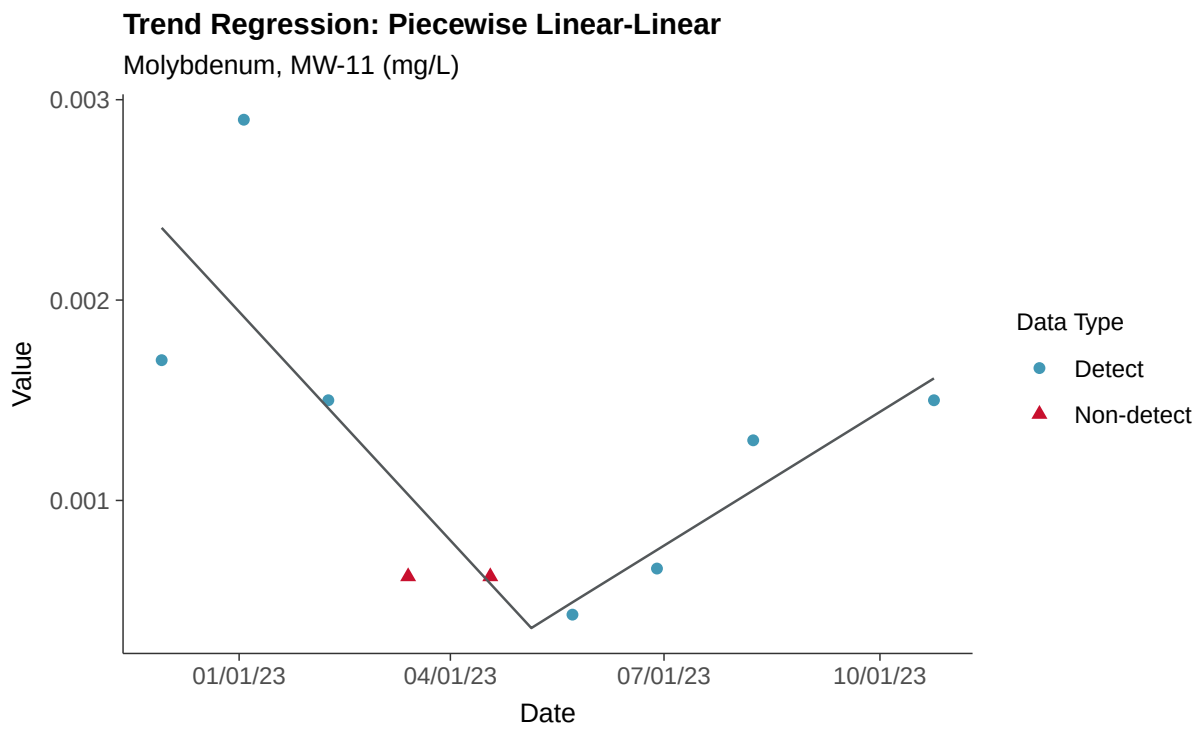

Boxplot by Season
Molybdenum, MW-11 (mg/L)
0.003
0.002
0.001
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

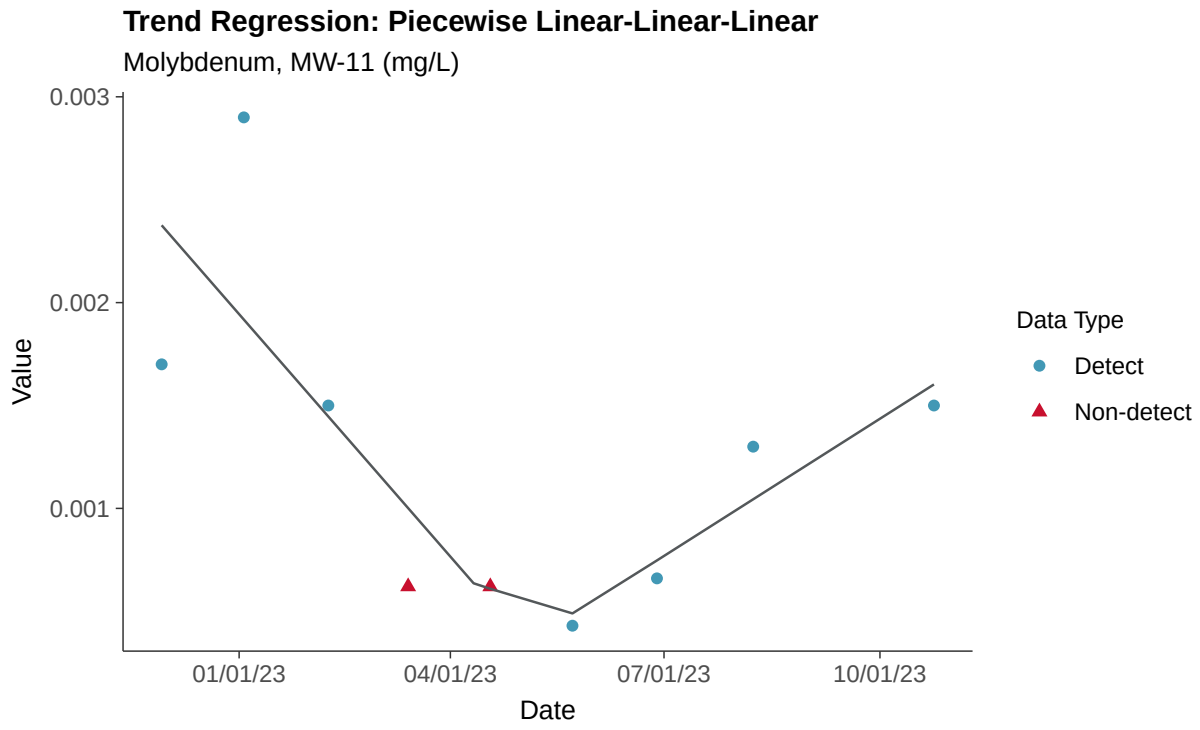

Normal Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-11 (mg/L)
Value
0.003
0.002
0.001
0.000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-11 (mg/L)
log(Value)
−6.0
−6.5
−7.0
−7.5
−8.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Molybdenum, MW-11 (mg/L)
Value
0.003
0.002
0.001
0.000
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

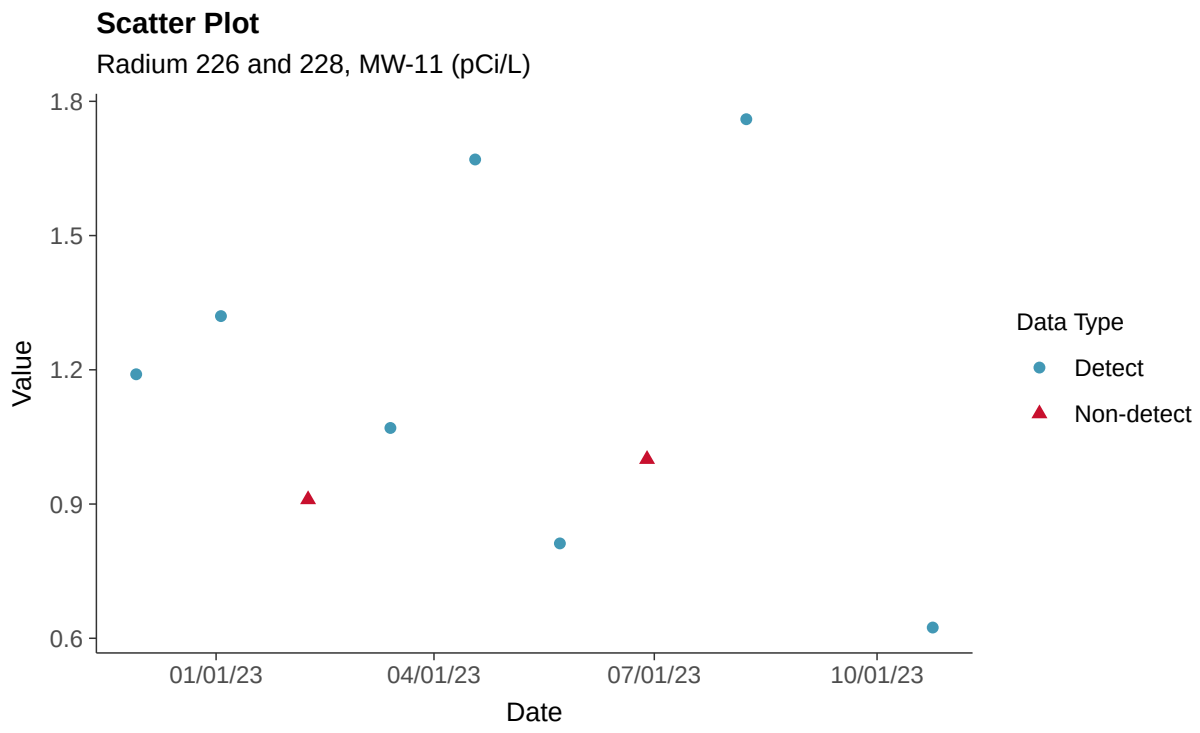

Trend Regression: Lognormal MLE
Molybdenum, MW-11 (mg/L)
log(Value)
−6.0
−6.5
−7.0
−7.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

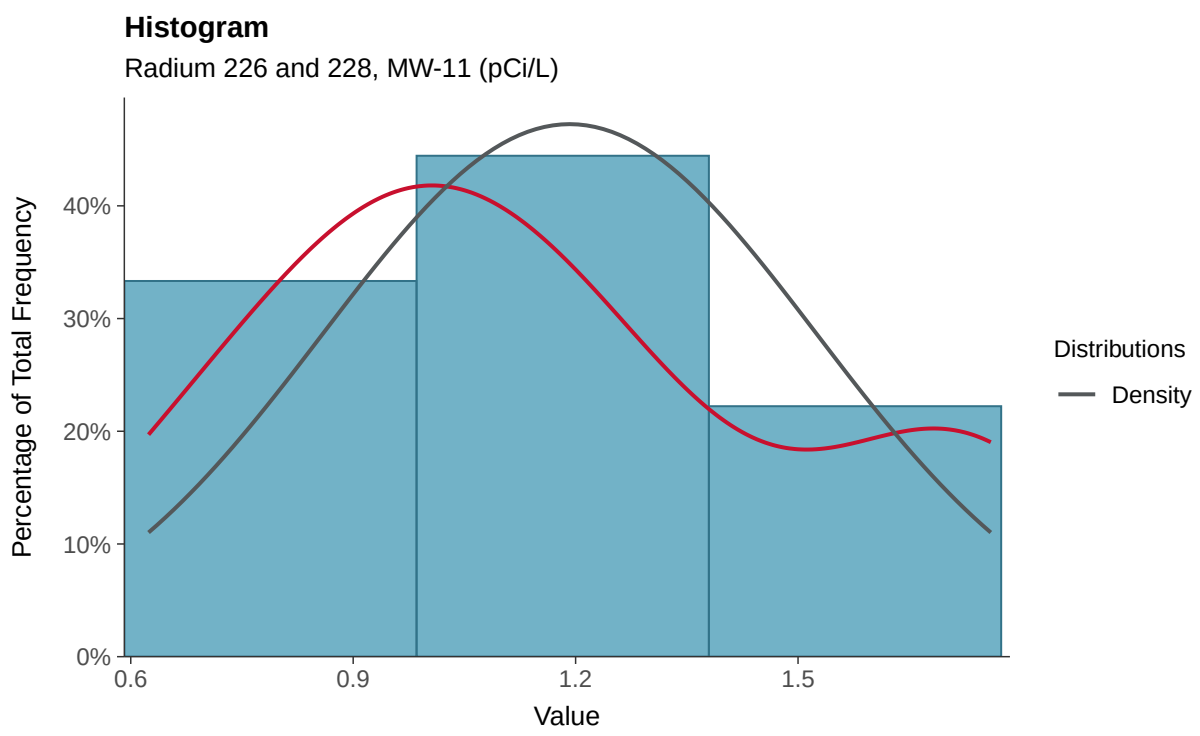

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-11 (mg/L)
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-11 (mg/L)
0.003
0.002
0.001
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Radium 226 and 228, MW-11

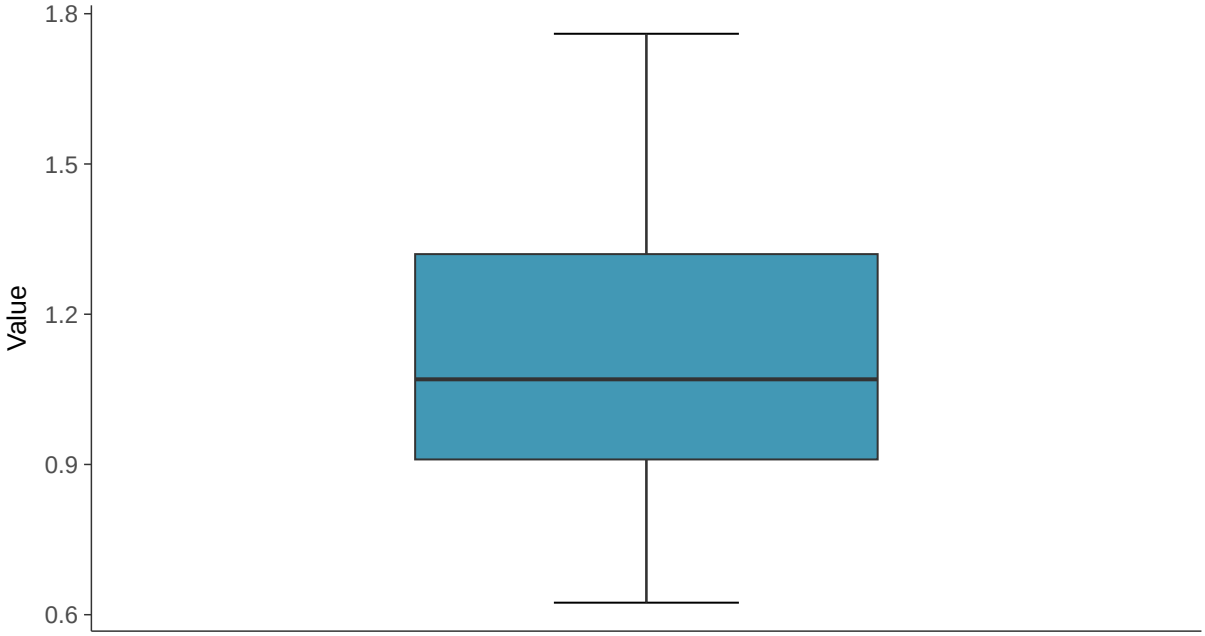
ID: 2_20_5_121





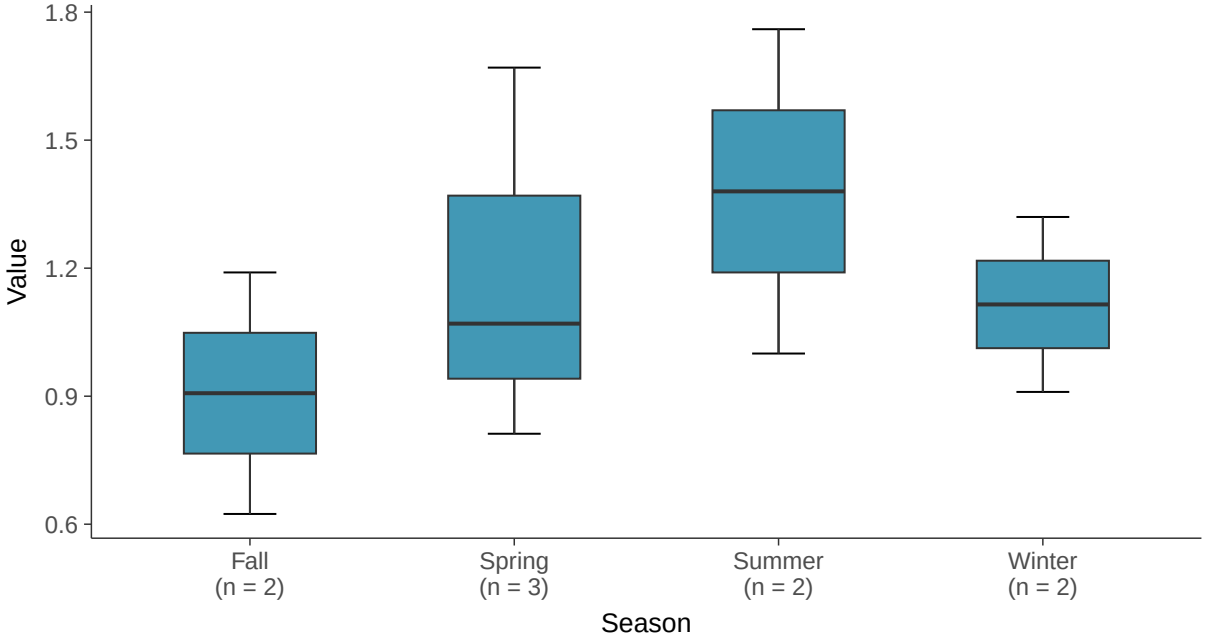
Boxplot

Radium 226 and 228, MW-11 (pCi/L)



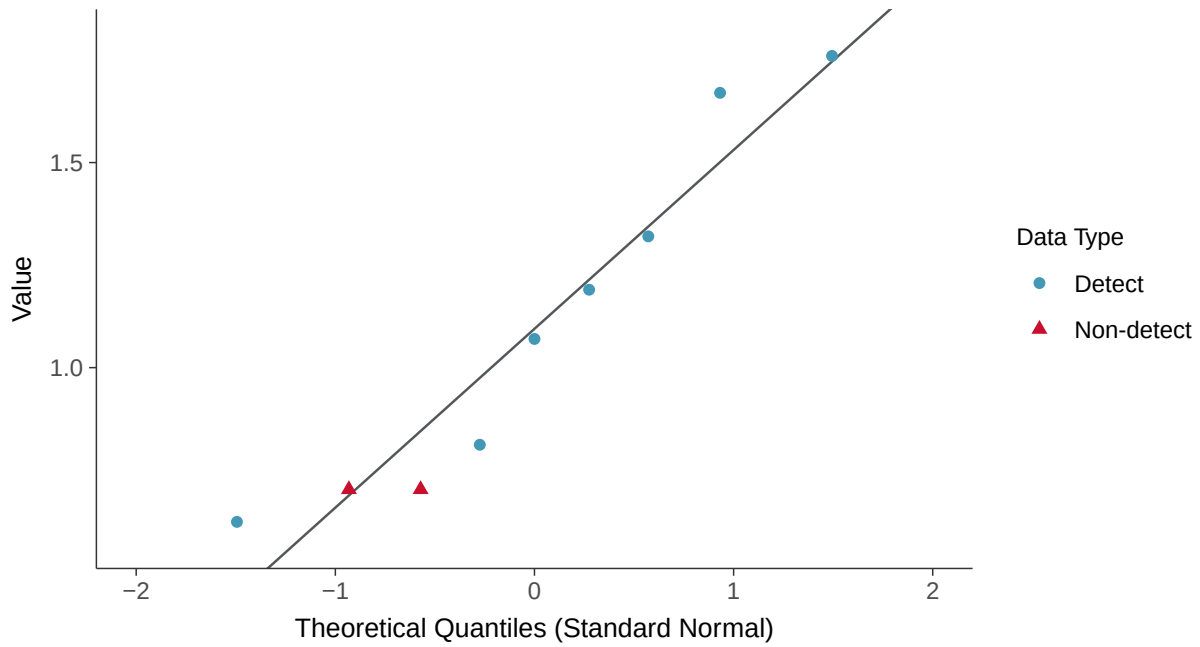
Boxplot by Season

Radium 226 and 228, MW-11 (pCi/L)



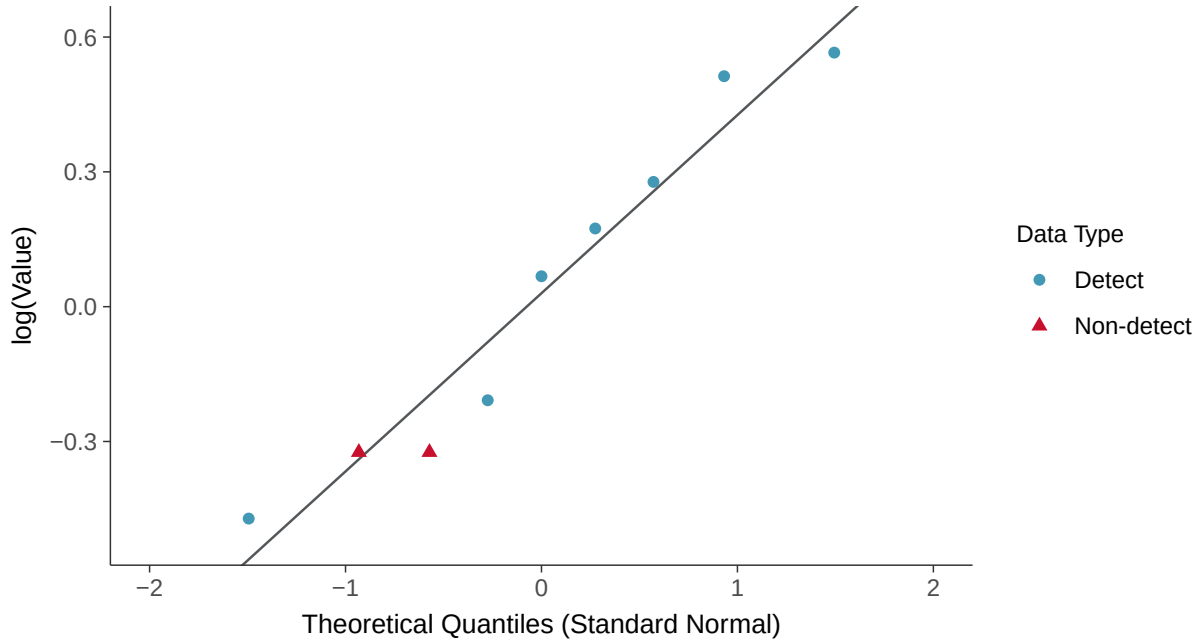
Normal Q-Q plot using ROS Imputed Estimates

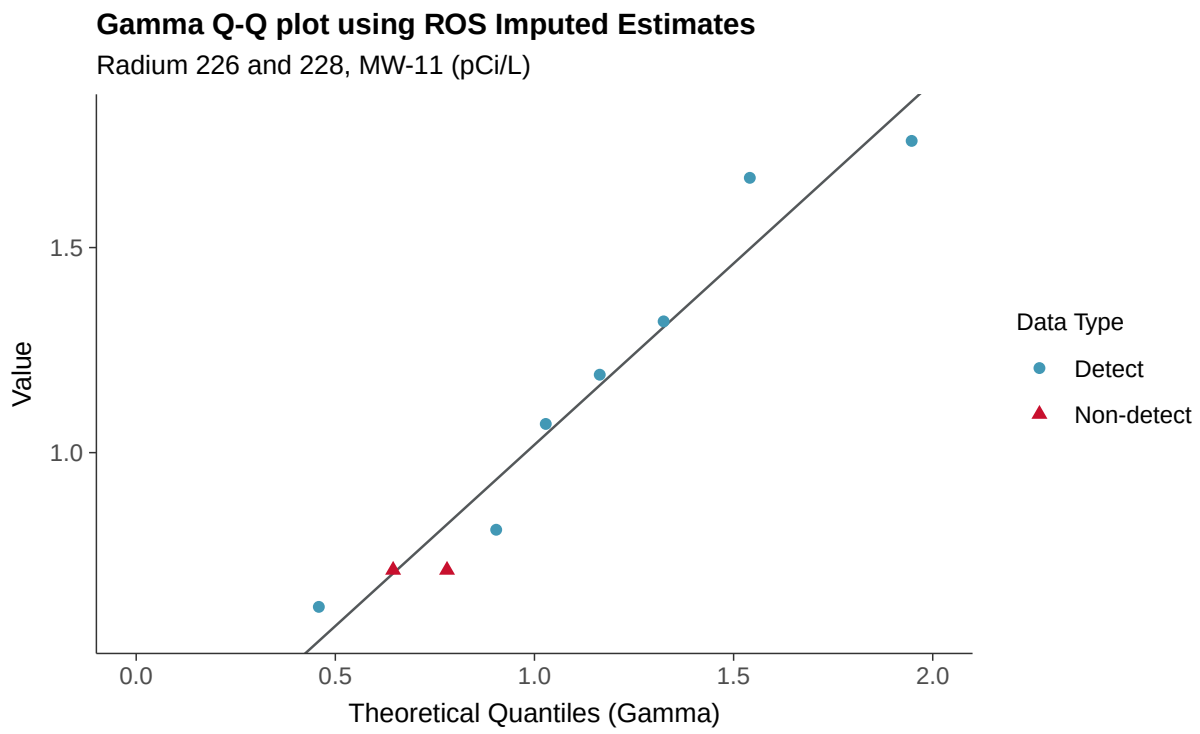
Radium 226 and 228, MW-11 (pCi/L)

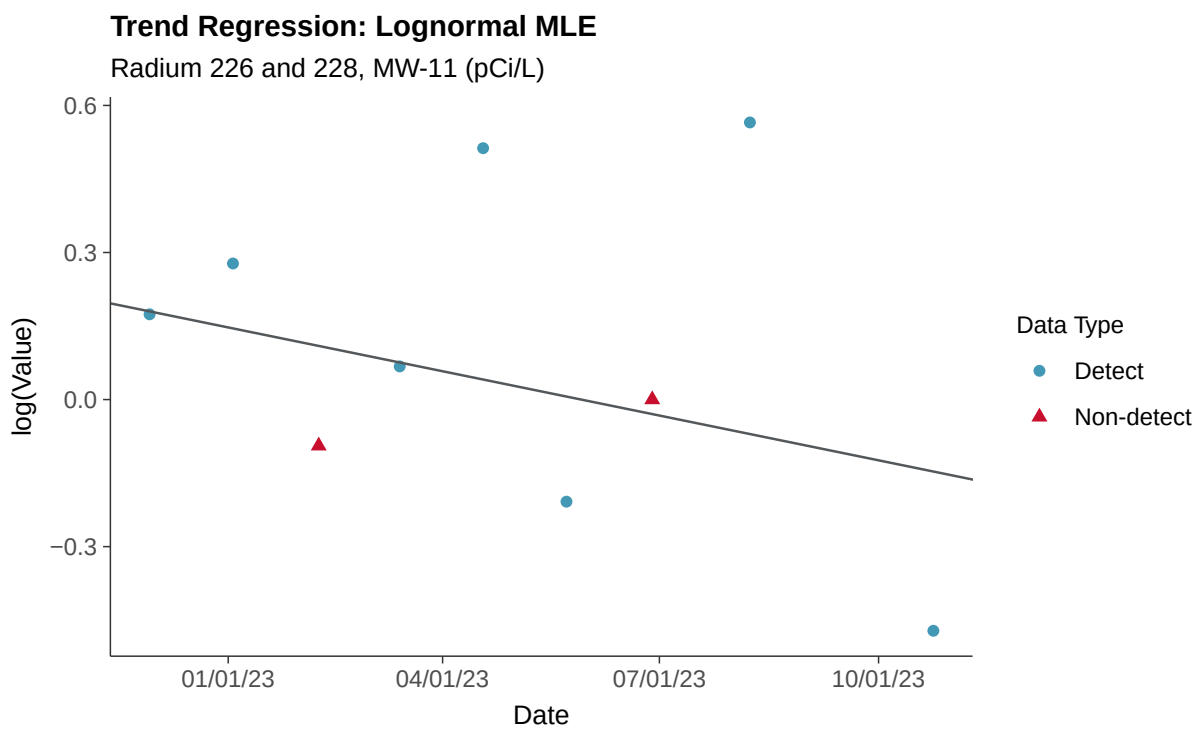


Lognormal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-11 (pCi/L)

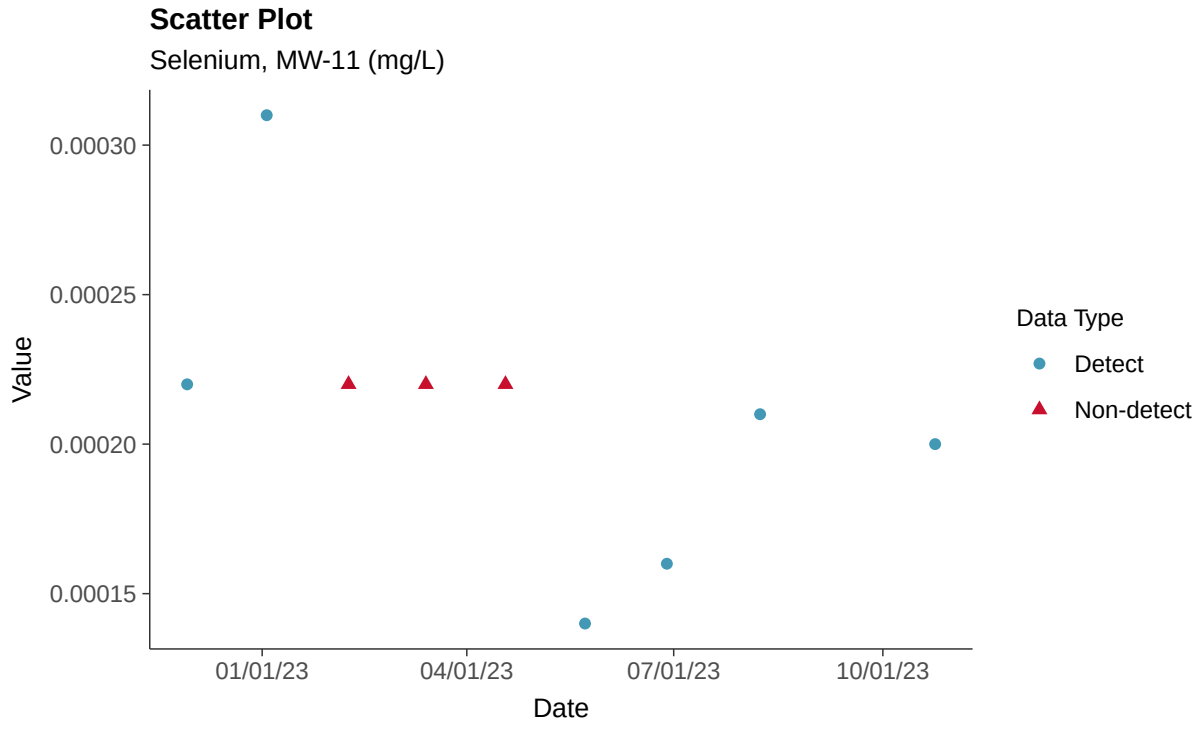


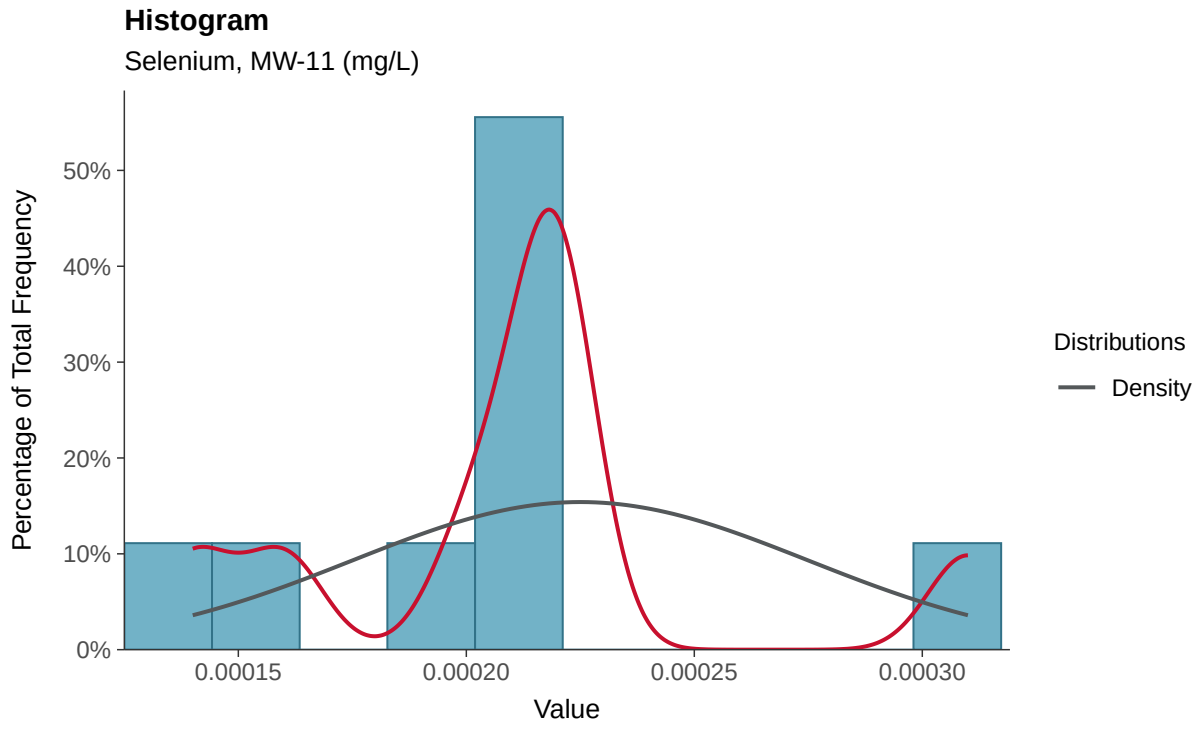

Gamma Q-Q plot using ROS Imputed Estimates
Radium 226 and 228, MW-11 (pCi/L)
Value
1.5
1.0
0.0
0.5
1.0
1.5
2.0
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Radium 226 and 228, MW-11 (pCi/L)
log(Value)
0.6
0.3
0.0
−0.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Selenium, MW-11

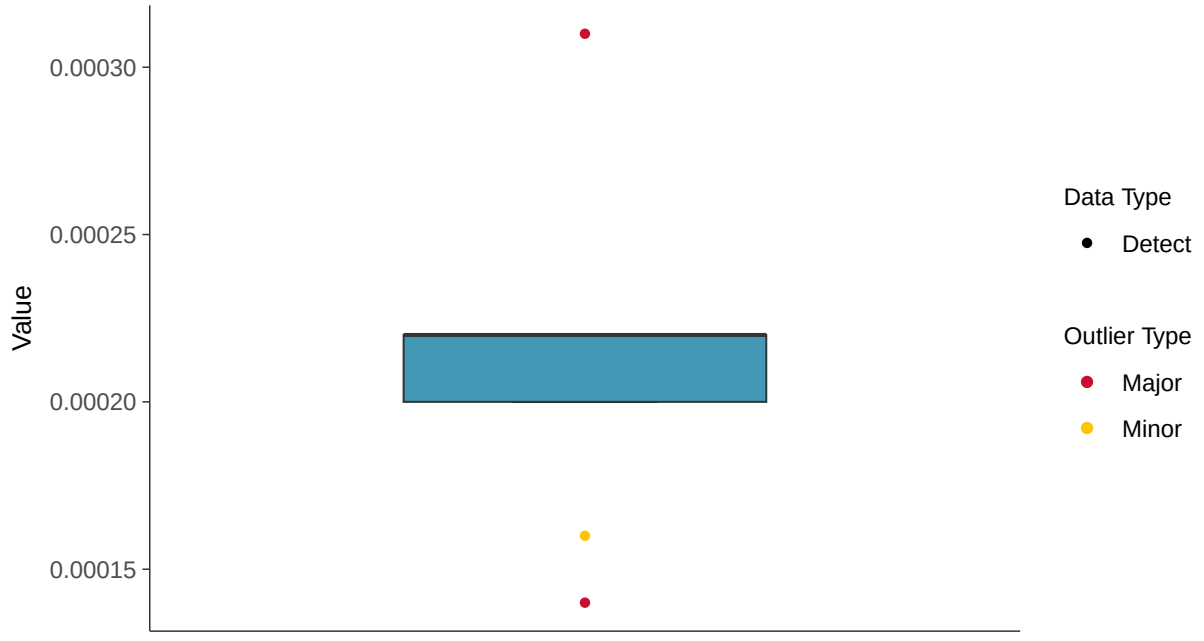
ID: 2_20_5_122





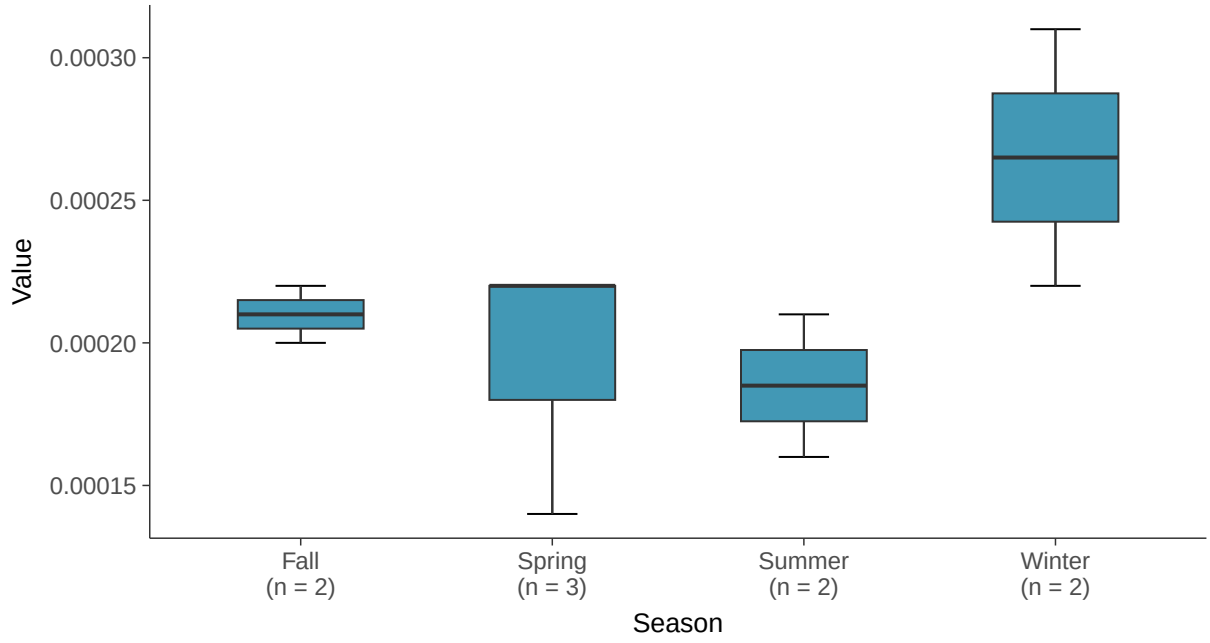
Boxplot

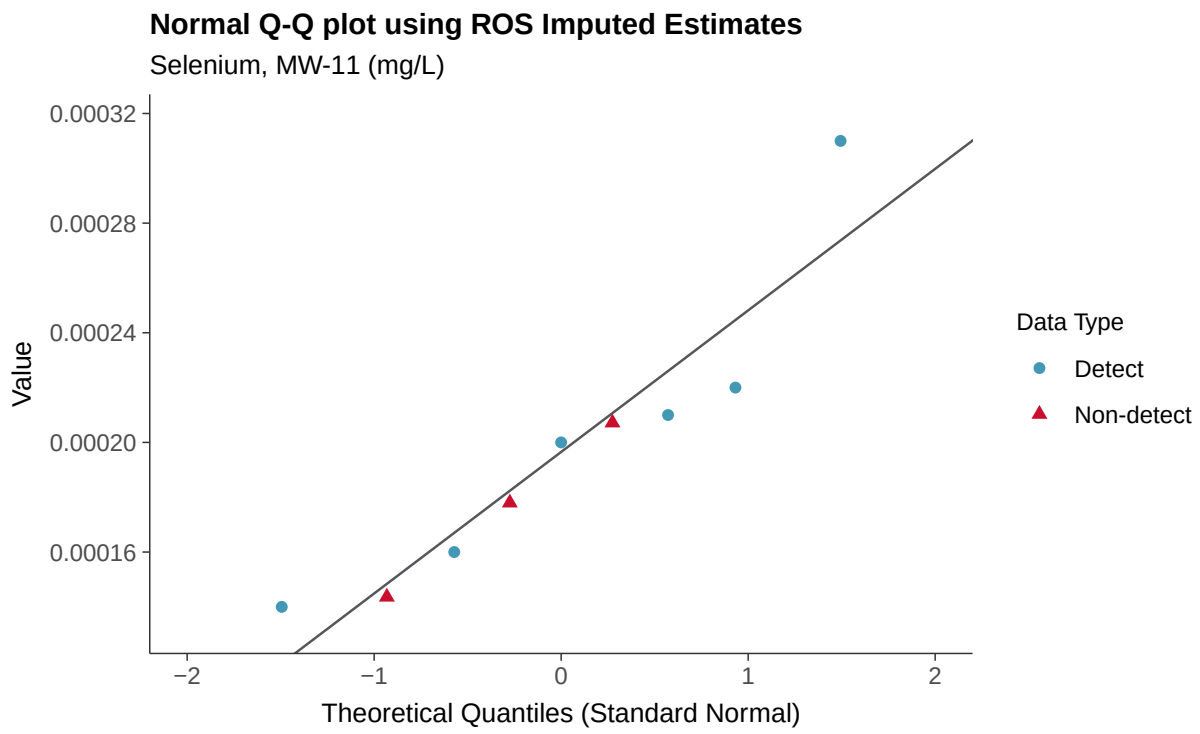
Selenium, MW-11 (mg/L)

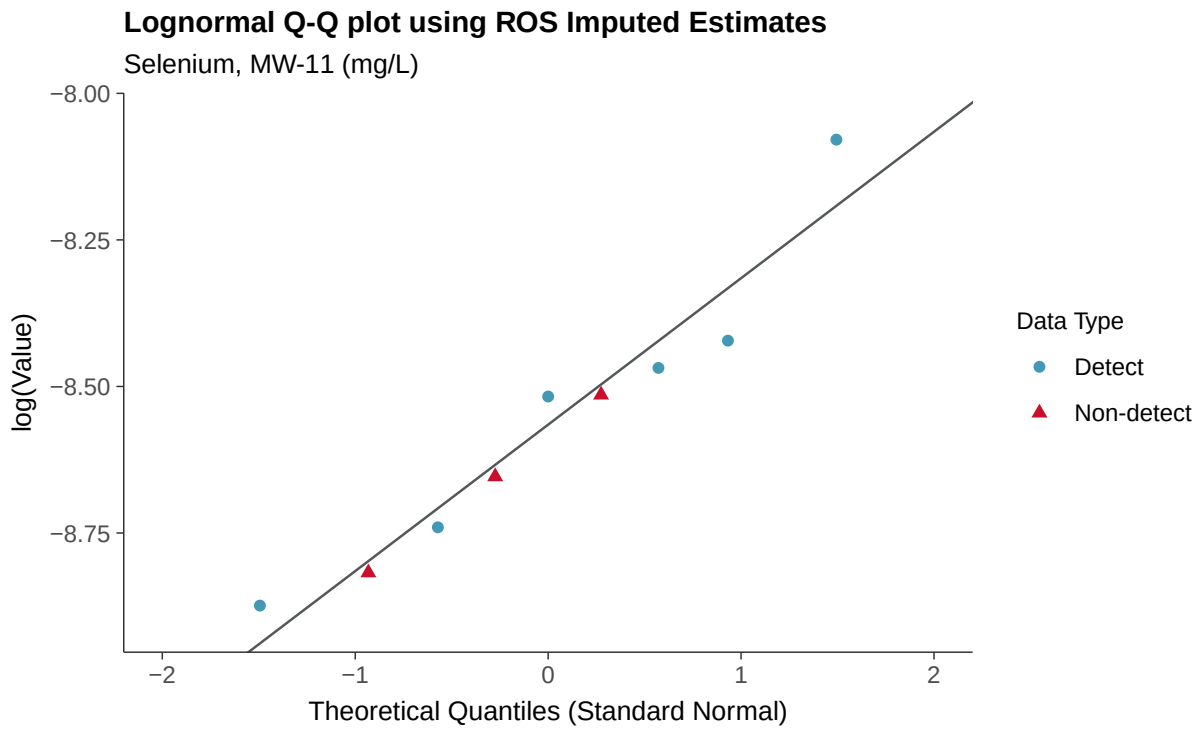


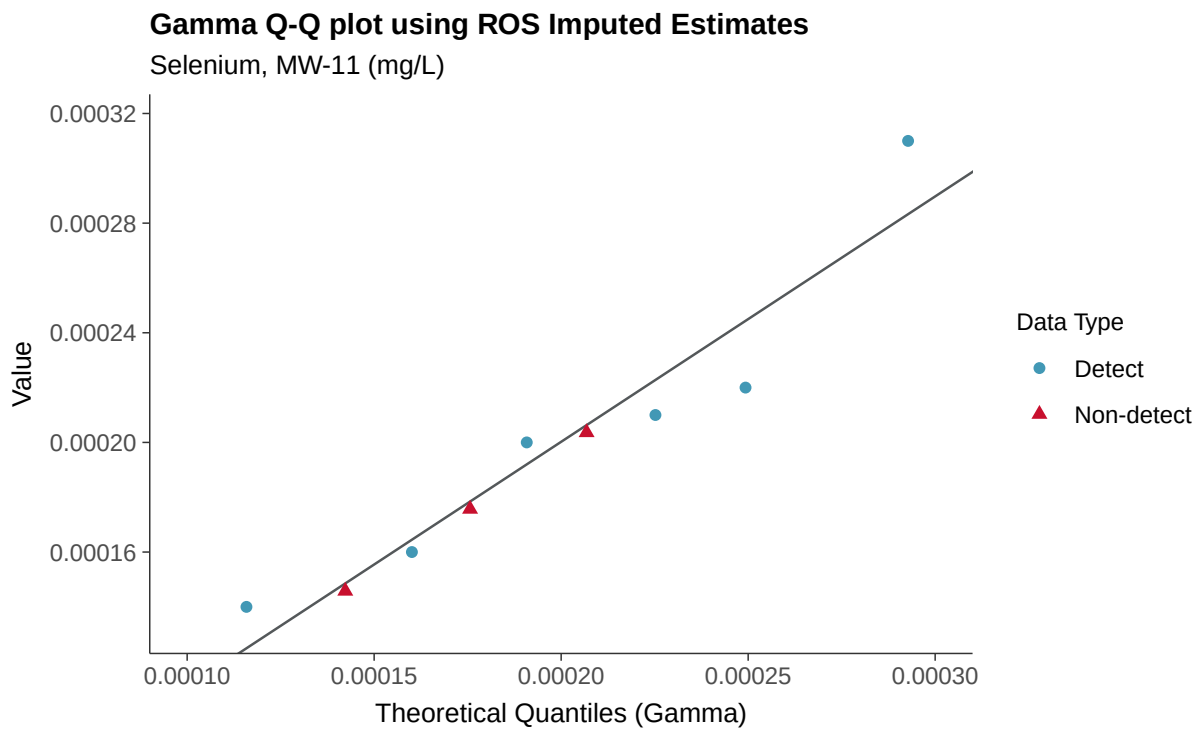
Boxplot by Season

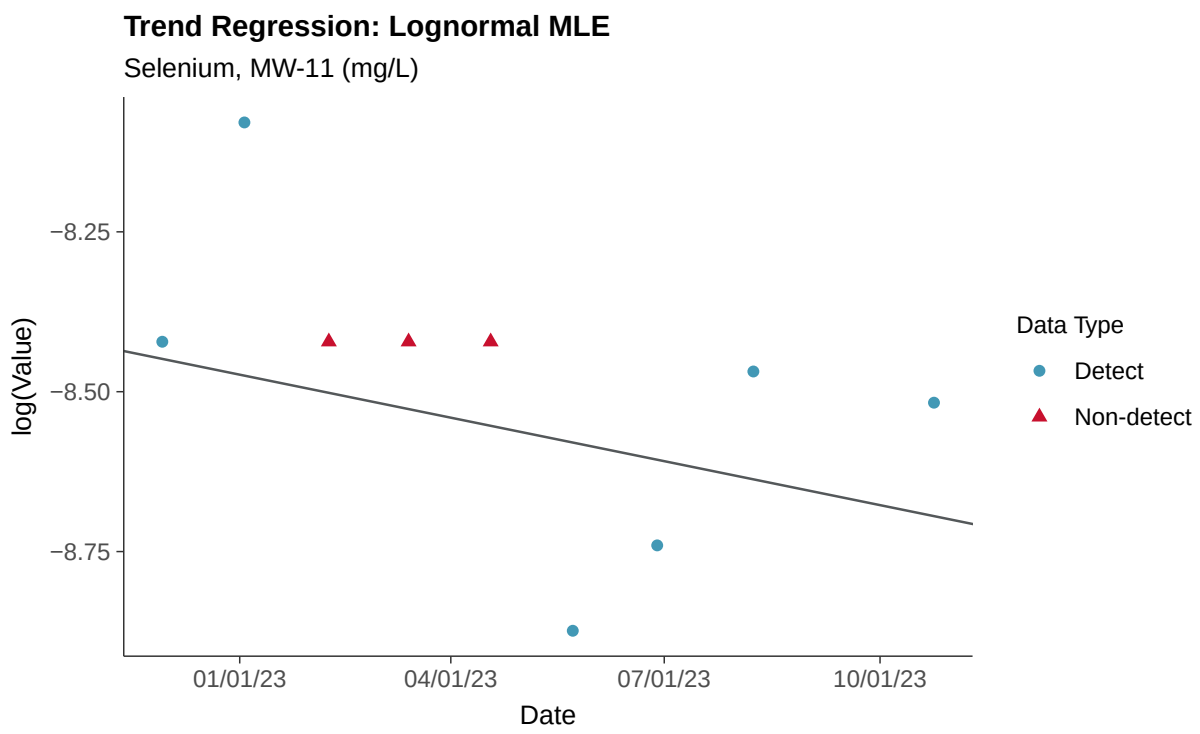
Selenium, MW-11 (mg/L)

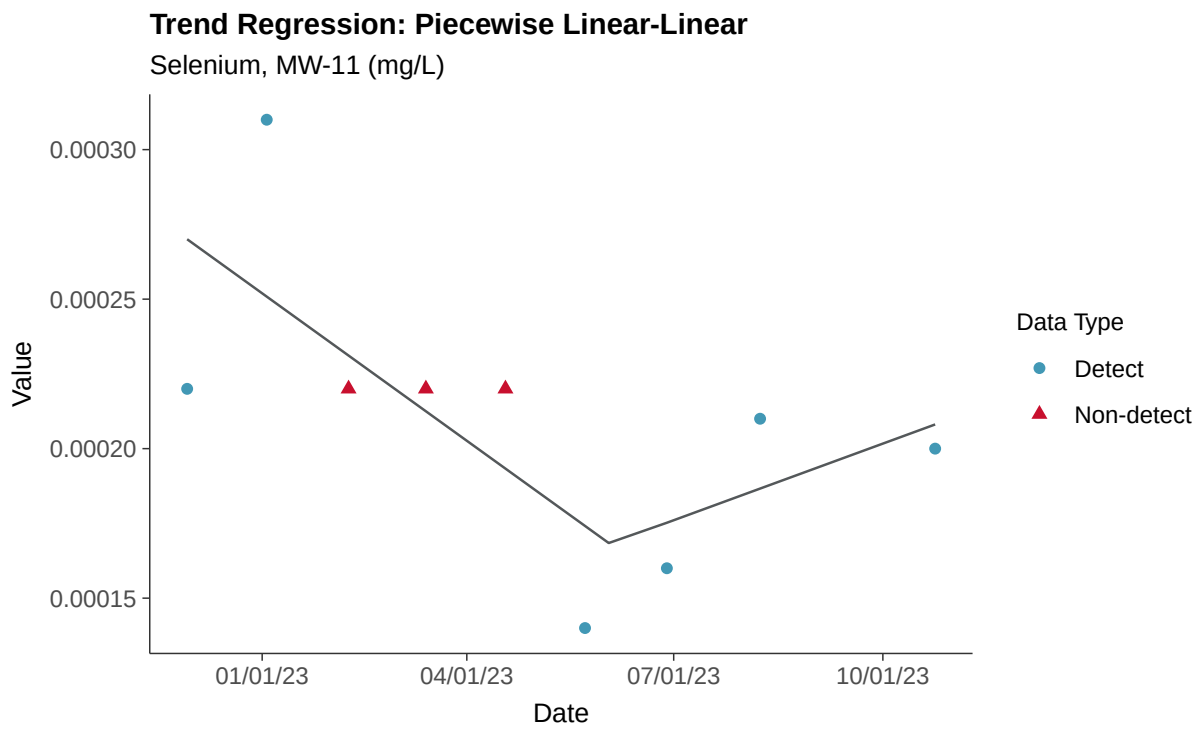


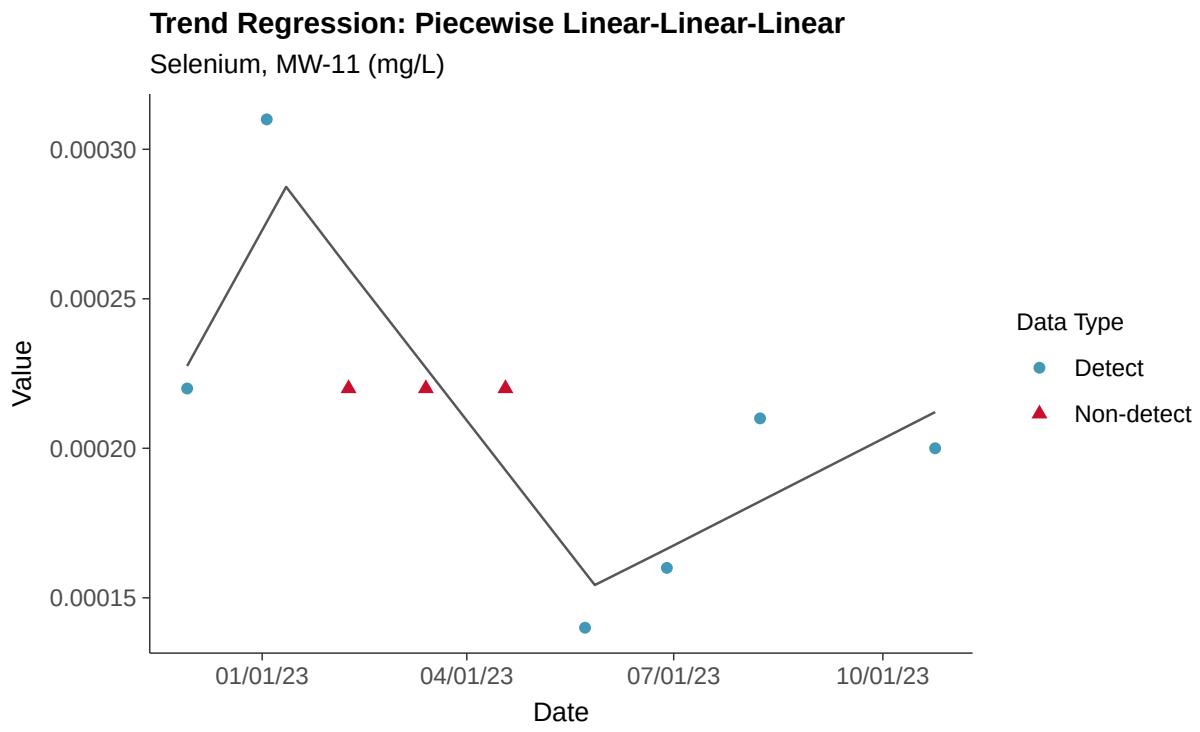

Normal Q-Q plot using ROS Imputed Estimates
Selenium, MW-11 (mg/L)
Value
0.00032
0.00028
0.00024
0.00020
0.00016
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Selenium, MW-11 (mg/L)
log(Value)
−8.00
−8.25
−8.50
−8.75
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Selenium, MW-11 (mg/L)
0.00032
0.00028
0.00024
0.00020
0.00016
Value
0.00010
0.00015
0.00020
0.00025
0.00030
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

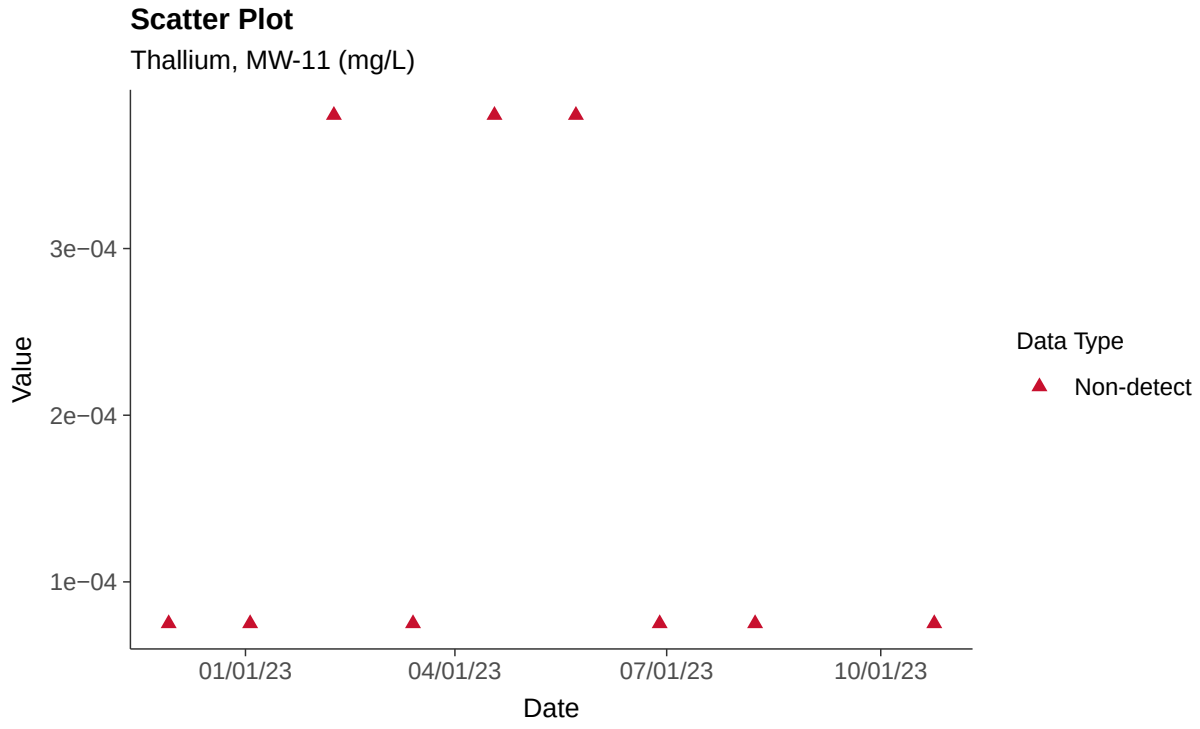

Trend Regression: Lognormal MLE
Selenium, MW-11 (mg/L)
−8.25
−8.50
−8.75
log(Value)
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

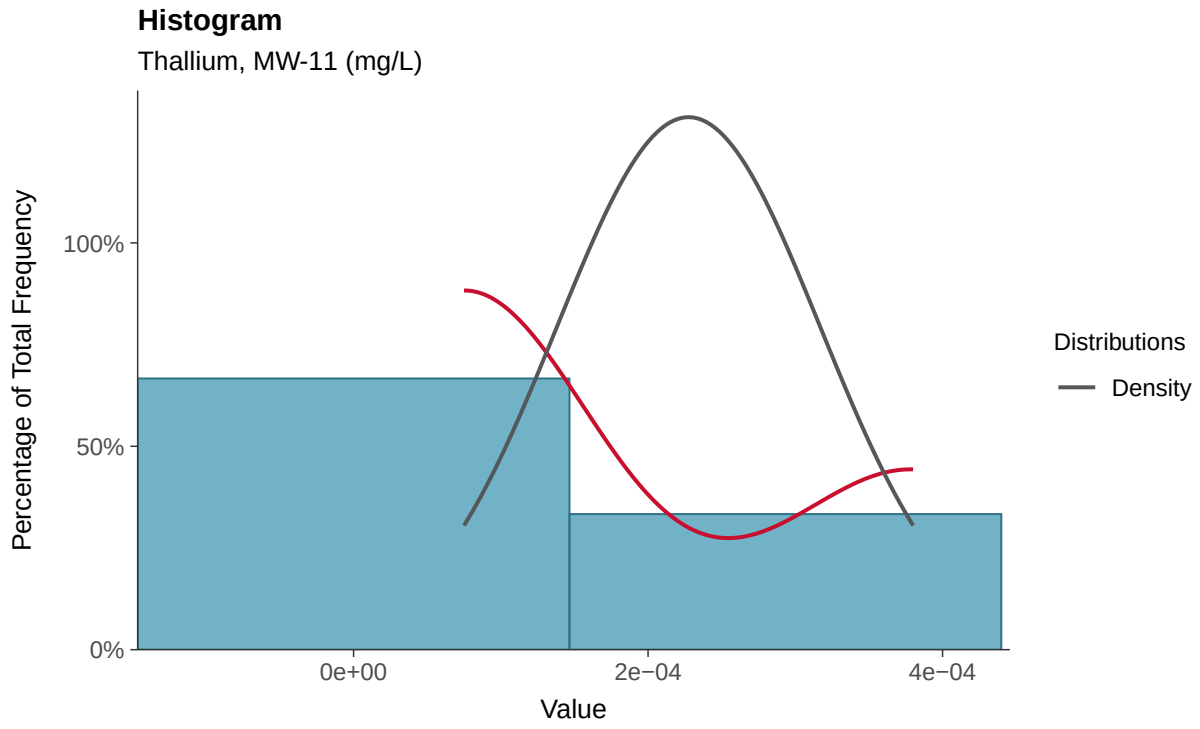

Trend Regression: Piecewise Linear-Linear
Selenium, MW-11 (mg/L)
0.00030
0.00025
0.00020
0.00015
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-11 (mg/L)
0.00030
0.00025
0.00020
0.00015
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Thallium, MW-11

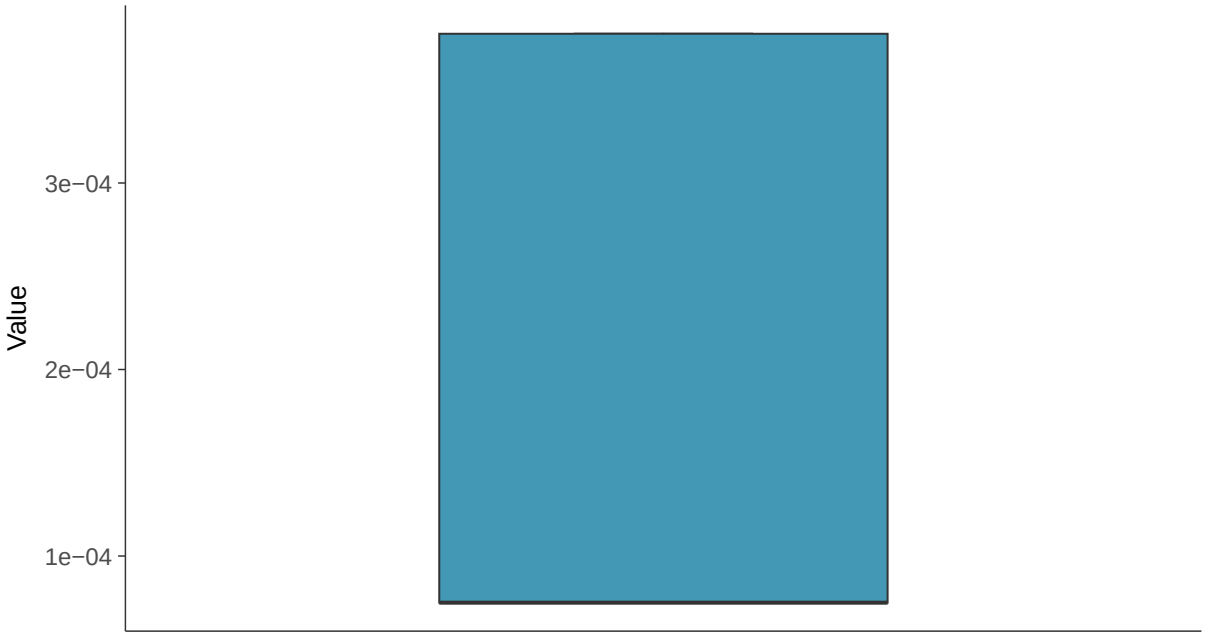
ID: 2_20_5_125





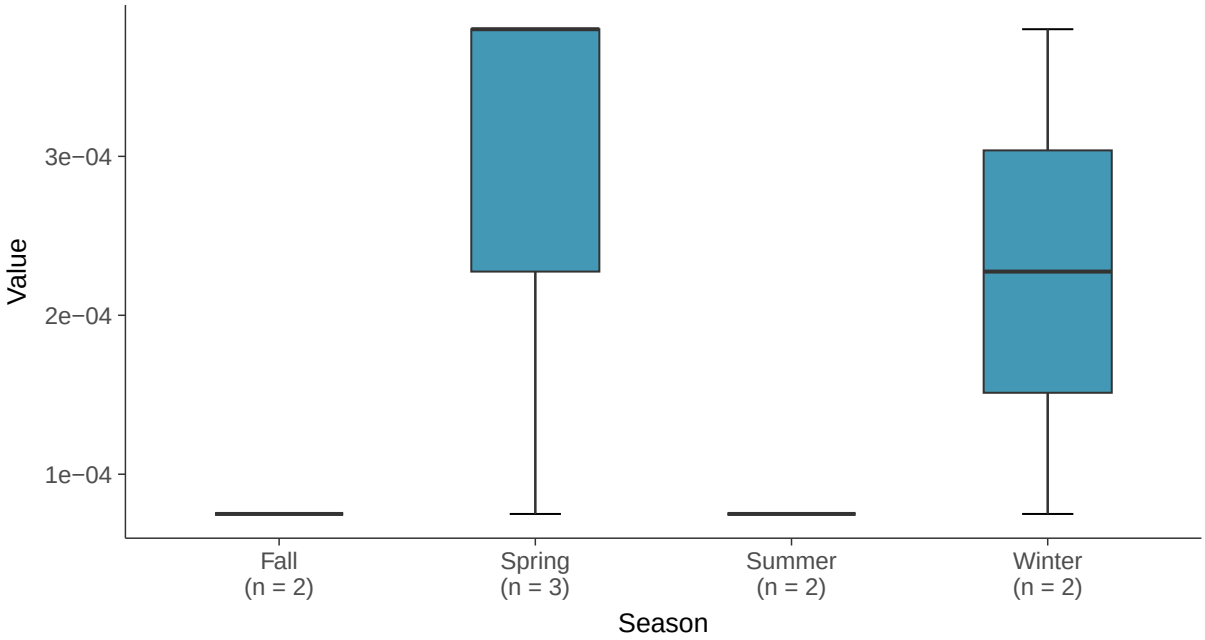
Boxplot

Thallium, MW-11 (mg/L)



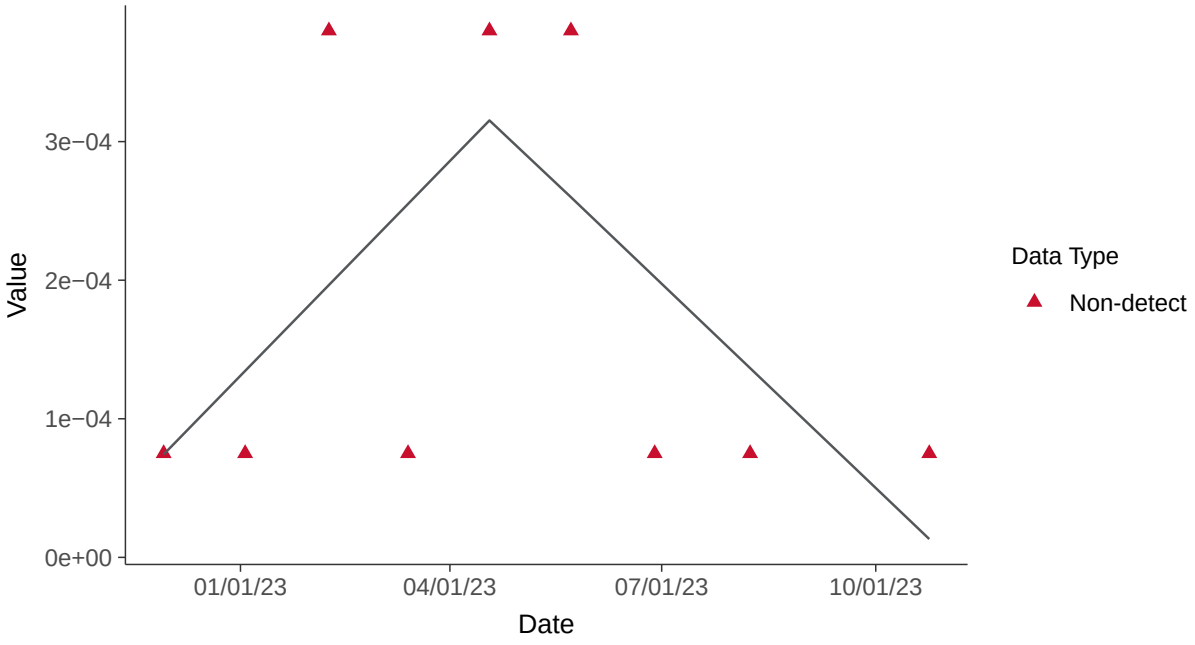
Boxplot by Season

Thallium, MW-11 (mg/L)



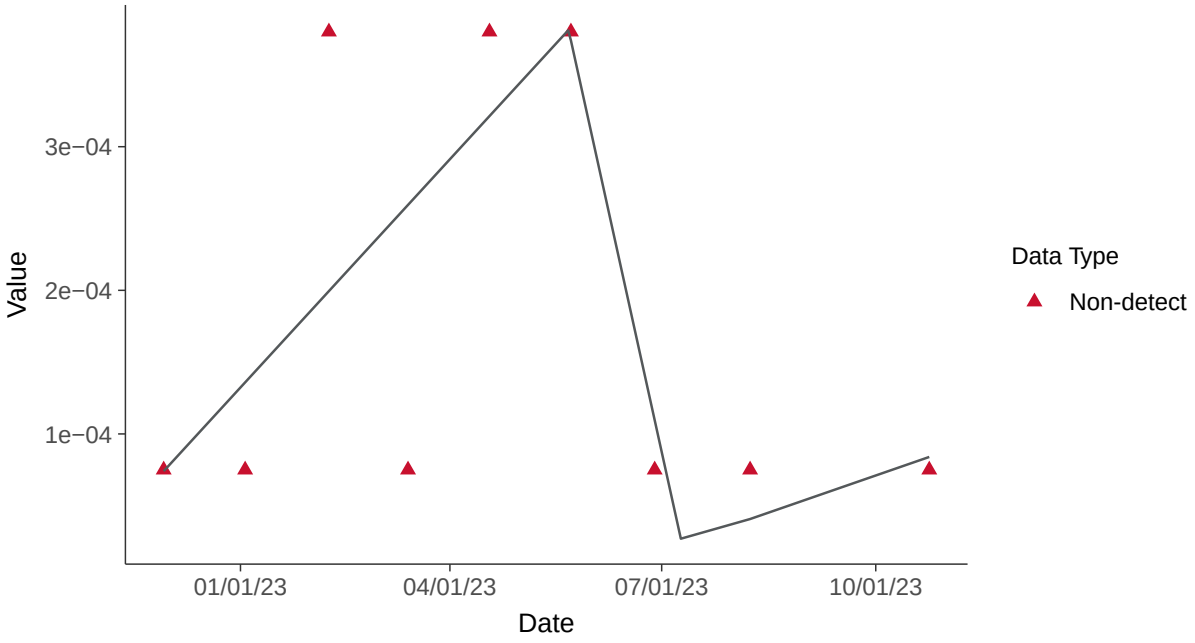
Trend Regression: Piecewise Linear-Linear

Thallium, MW-11 (mg/L)



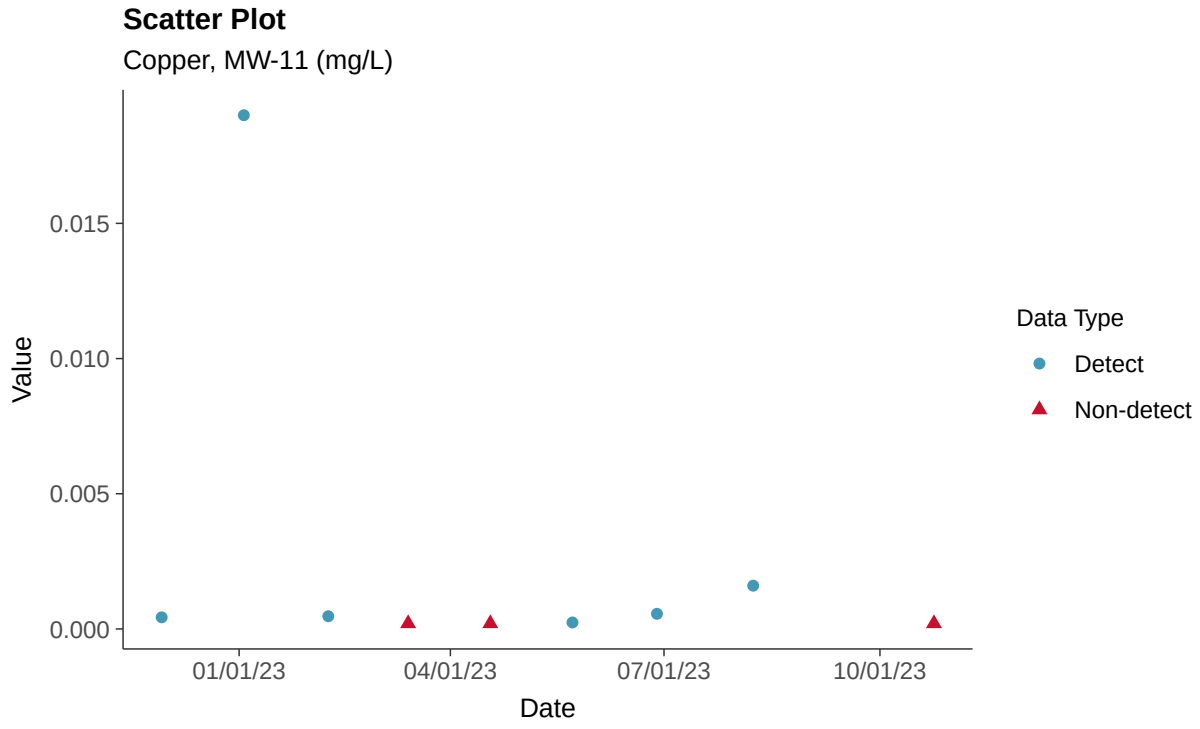
Trend Regression: Piecewise Linear-Linear-Linear

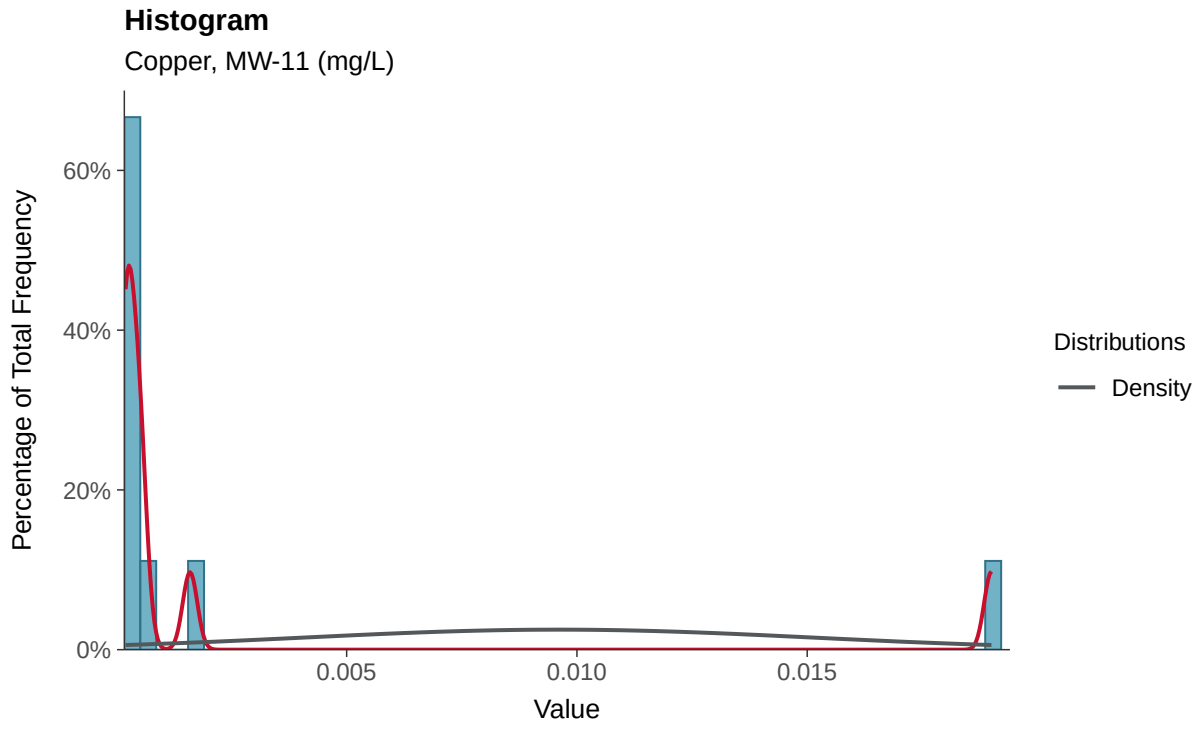
Thallium, MW-11 (mg/L)



Part 115: Copper, MW-11

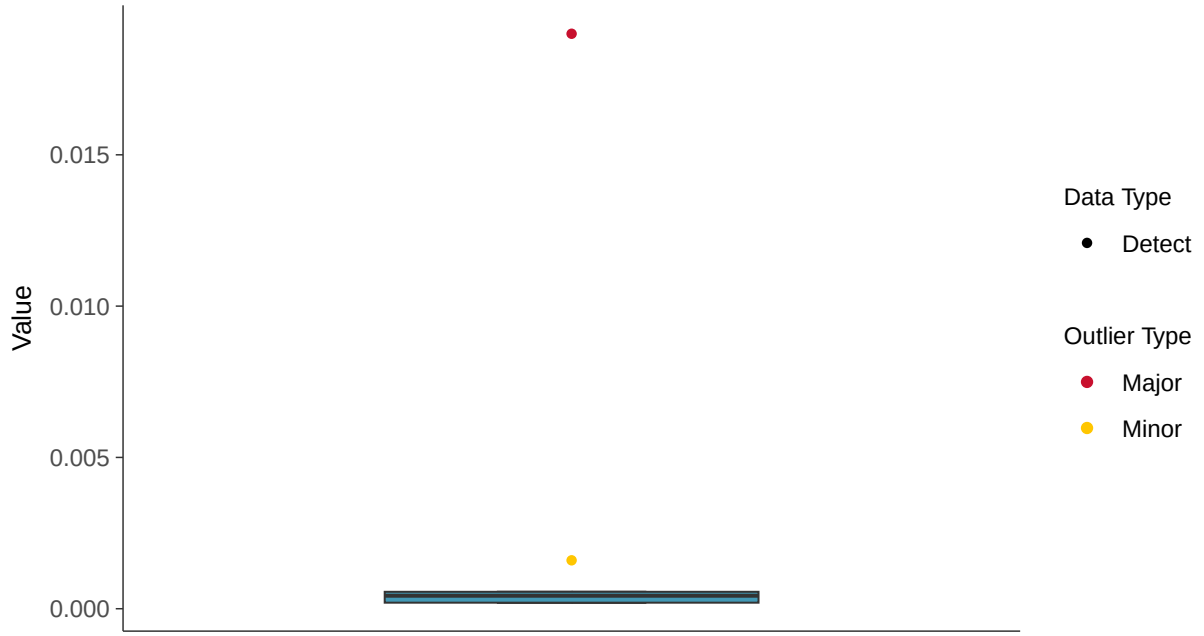
ID: 2_20_6_111





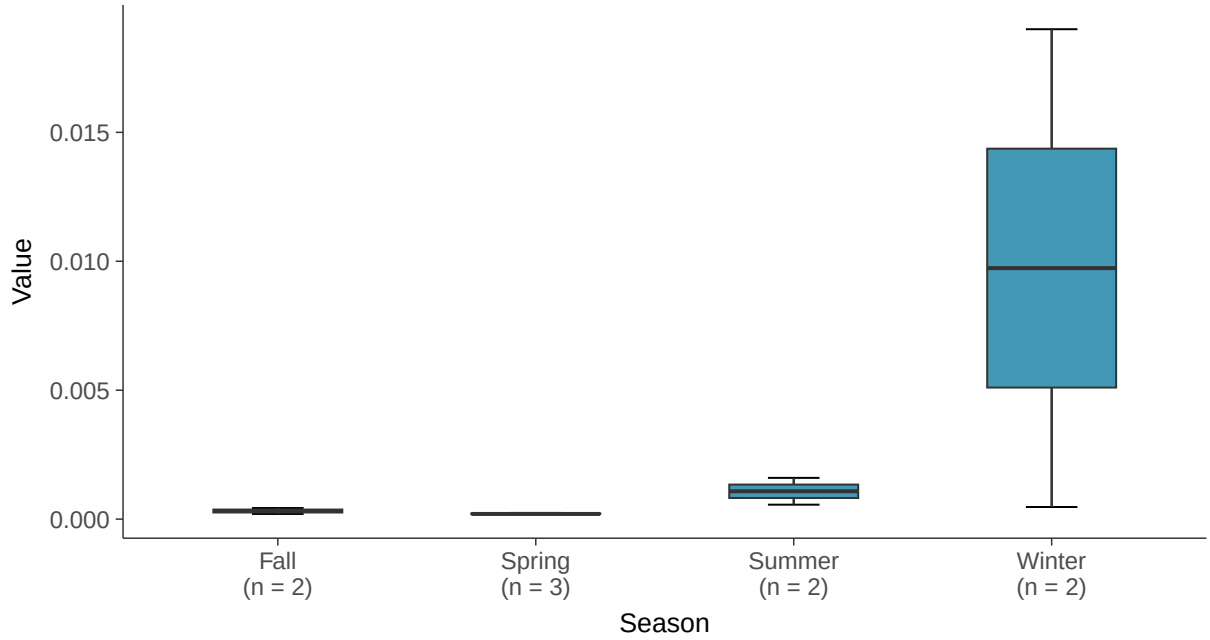
Boxplot

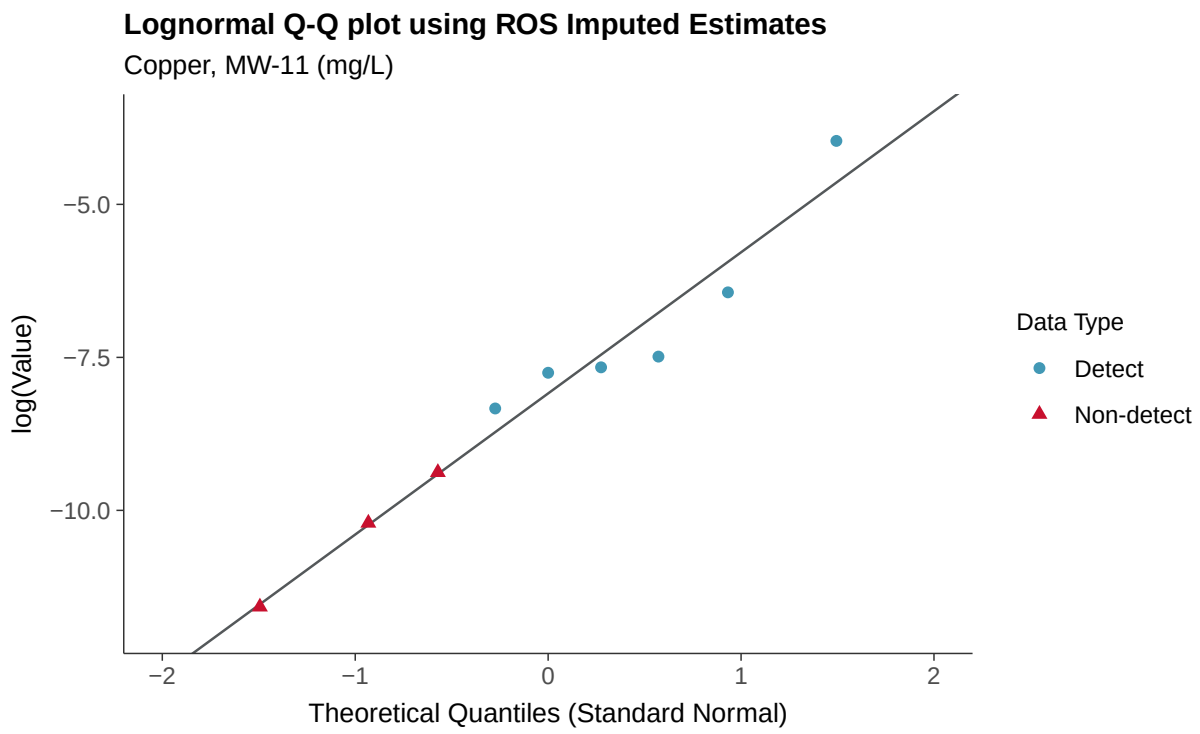
Copper, MW-11 (mg/L)

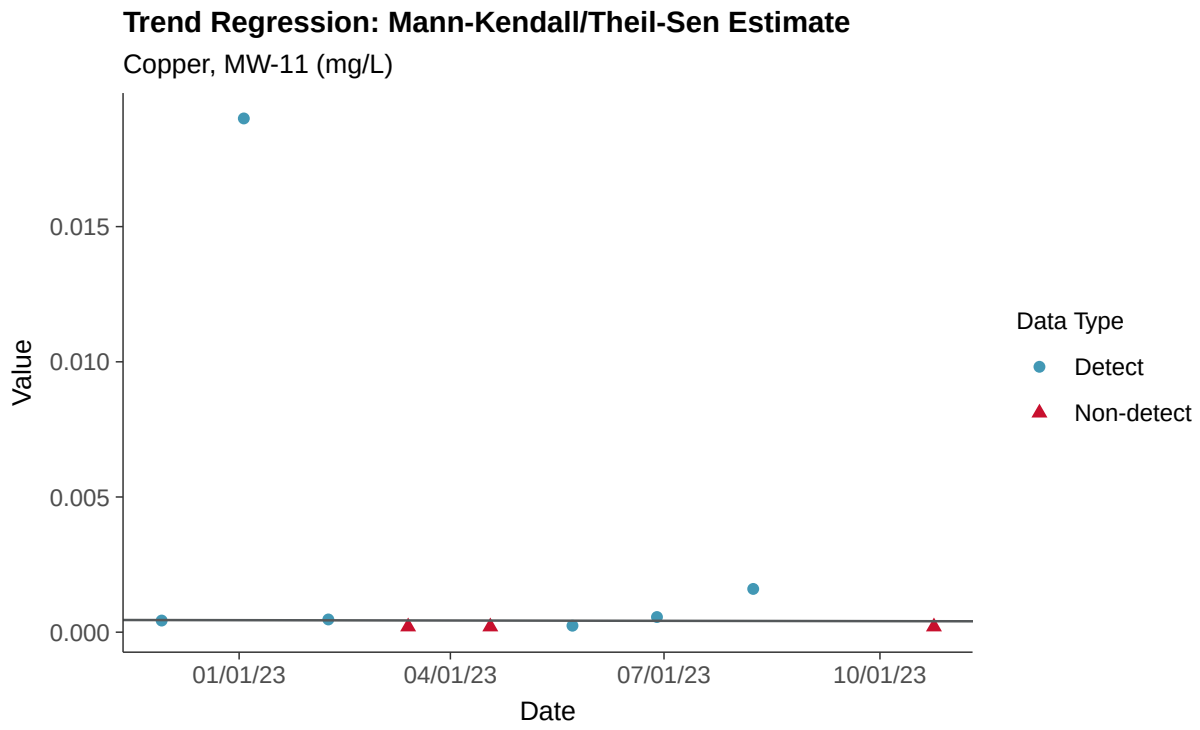


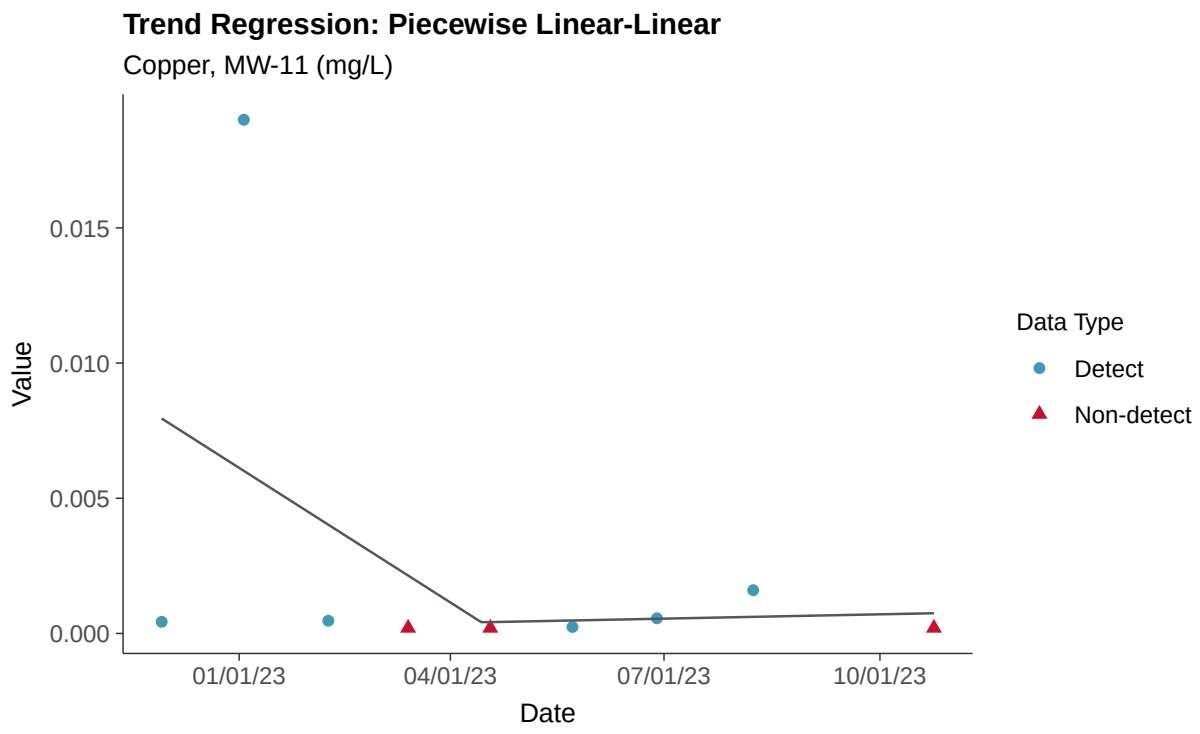
Boxplot by Season

Copper, MW-11 (mg/L)



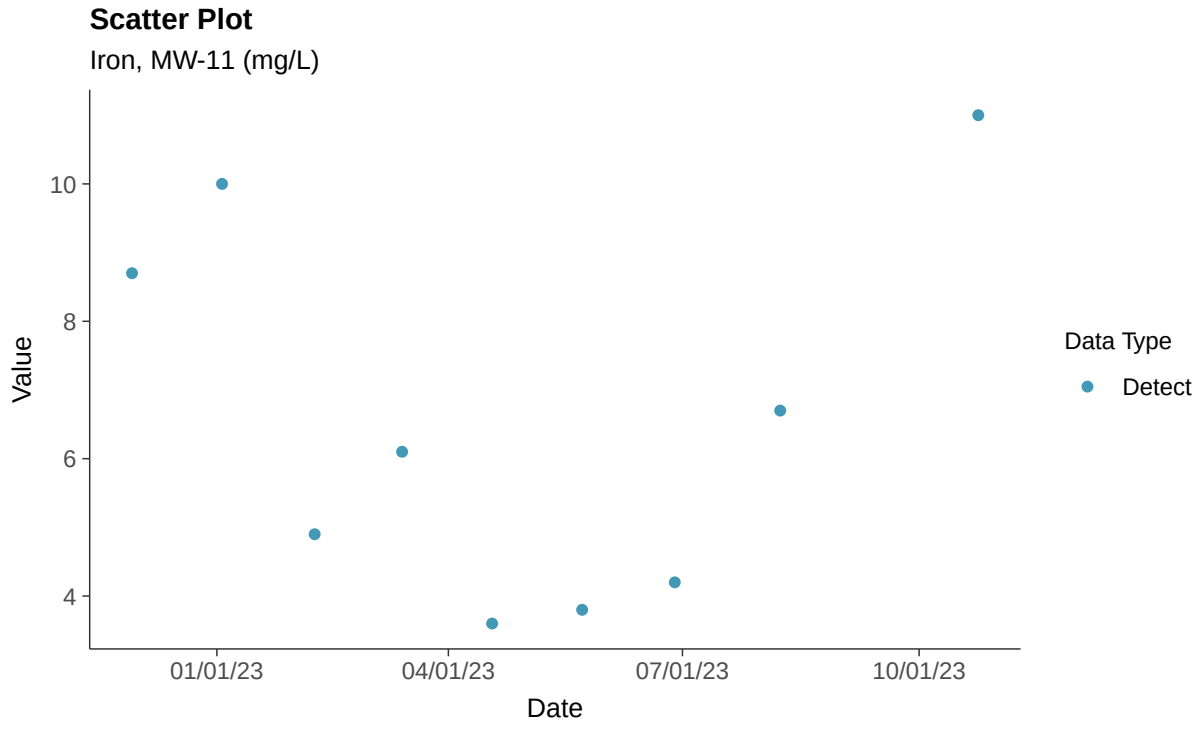

Lognormal Q-Q plot using ROS Imputed Estimates
Copper, MW-11 (mg/L)
log(Value)
−5.0
−7.5
−10.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

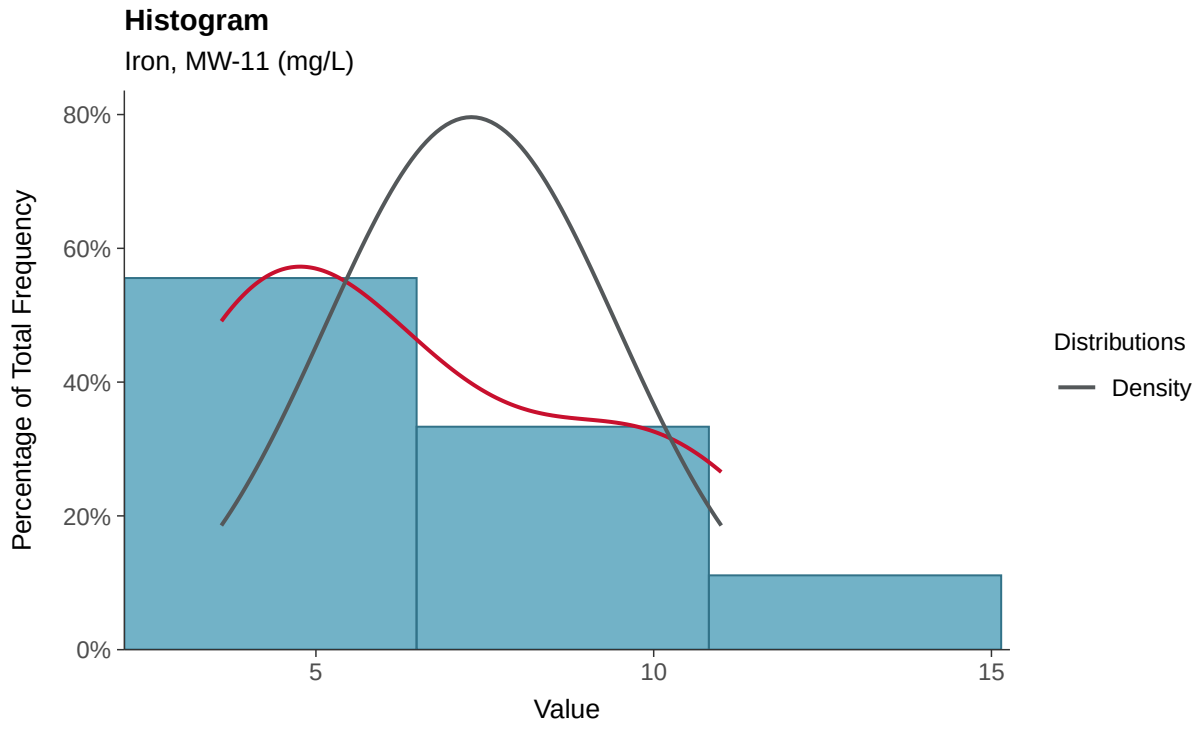

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Copper, MW-11 (mg/L)
Value
0.015
0.010
0.005
0.000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Copper, MW-11 (mg/L)
Value
0.015
0.010
0.005
0.000
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-11

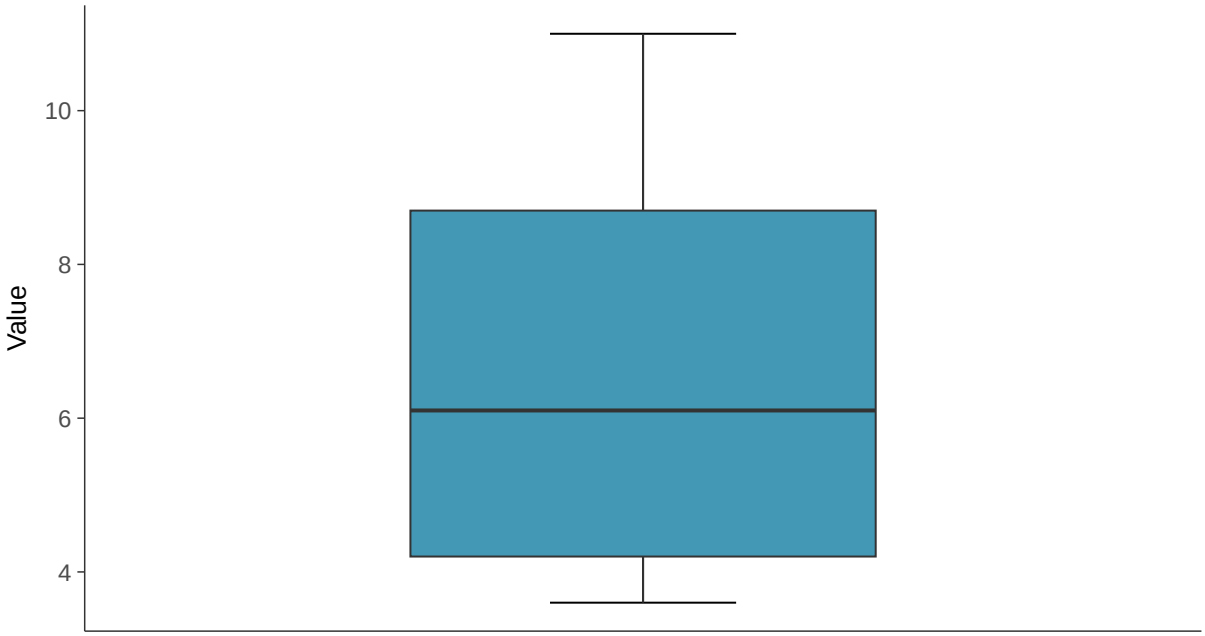
ID: 2_20_6_114





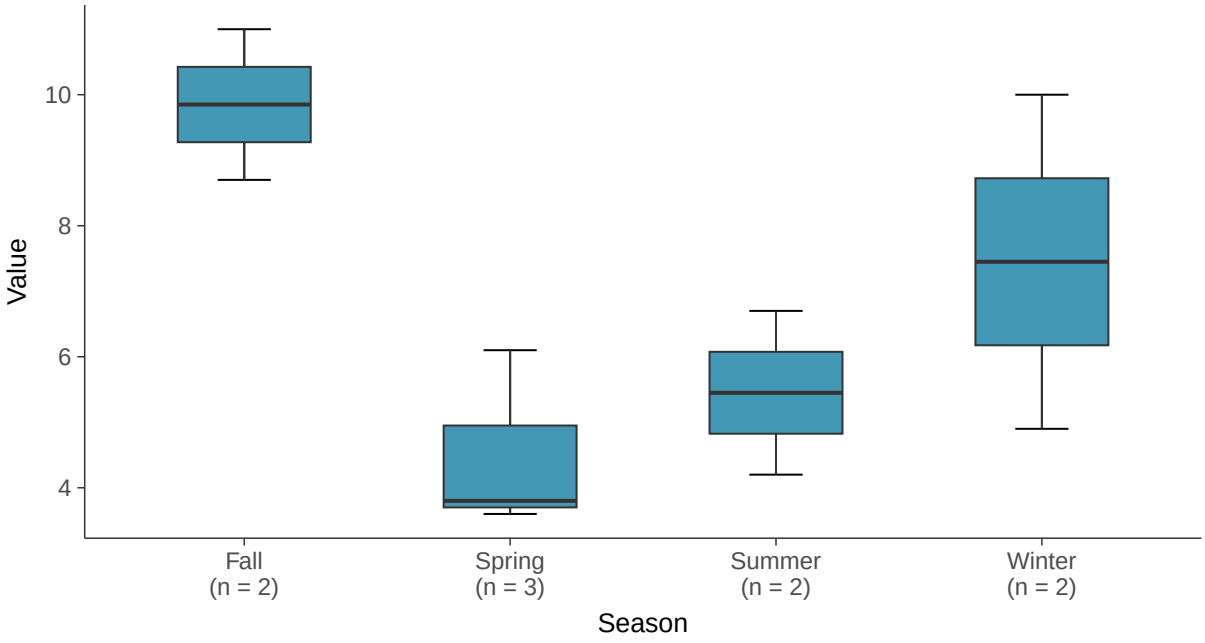
Boxplot

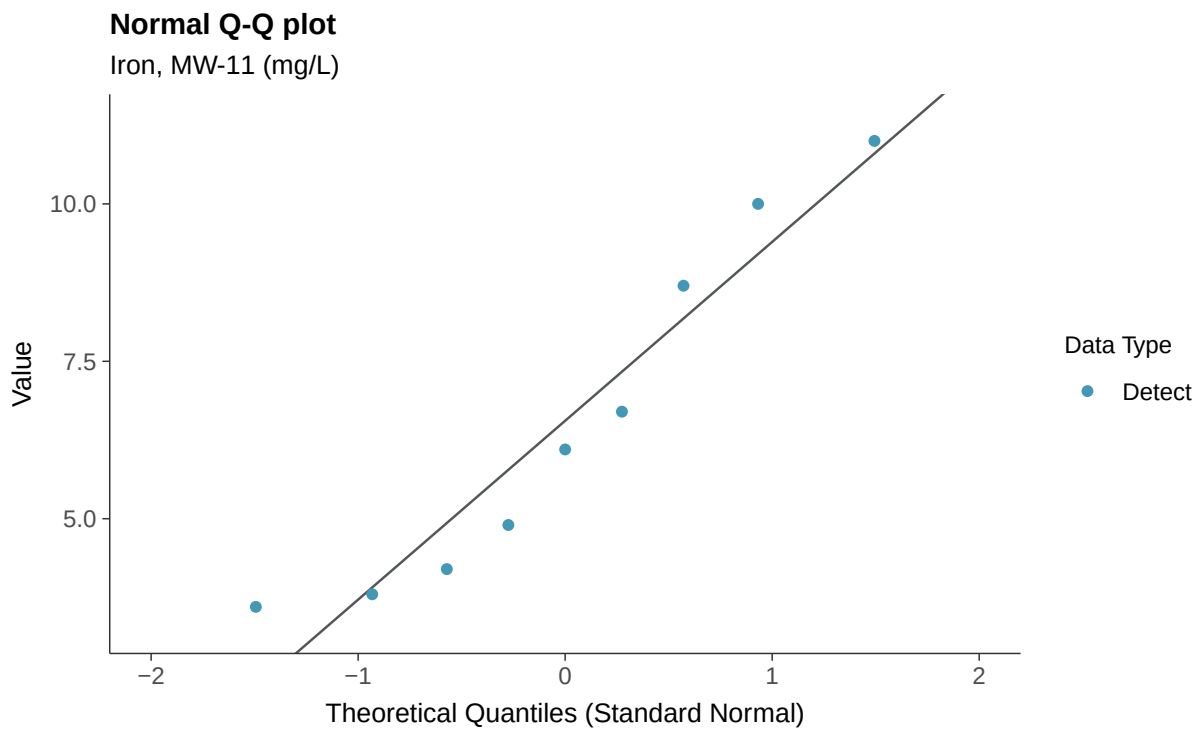
Iron, MW-11 (mg/L)

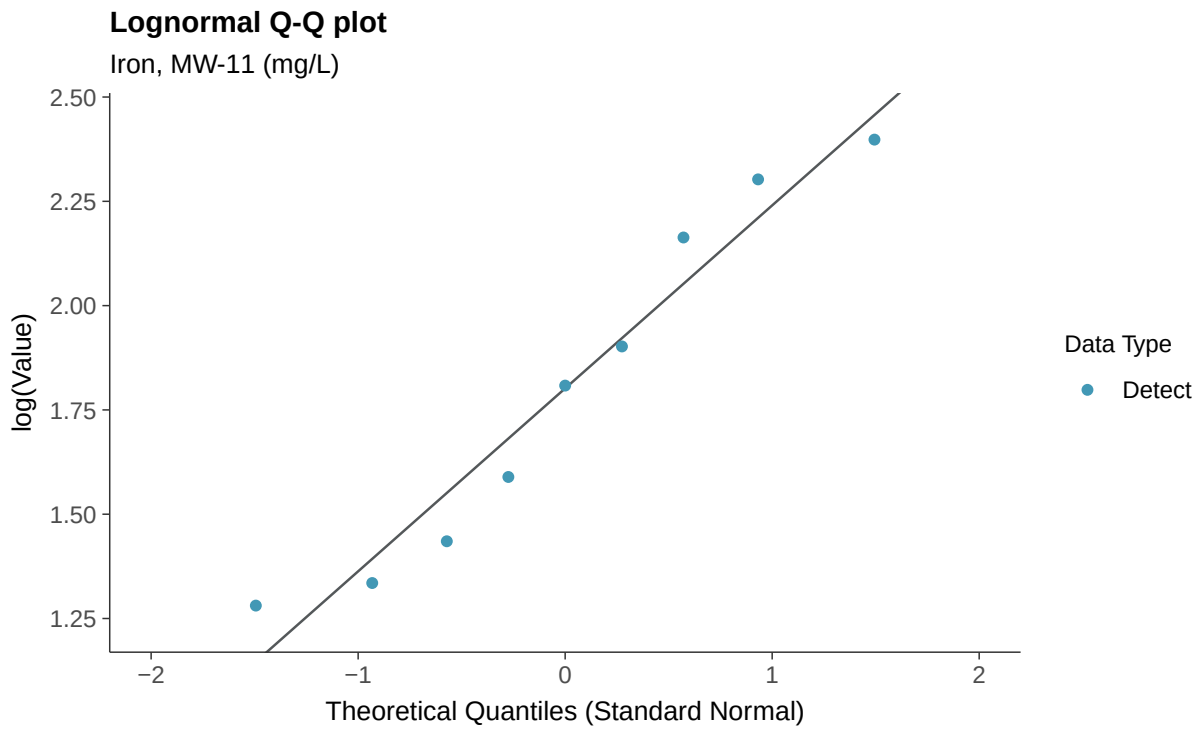


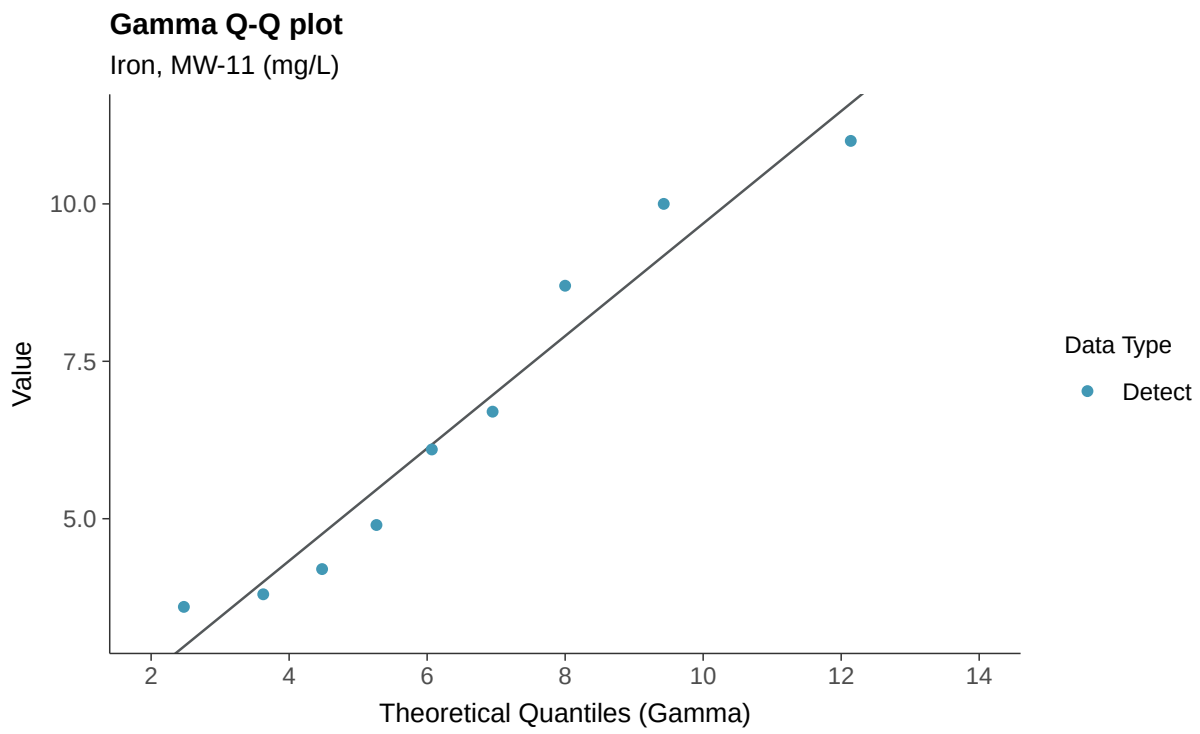
Boxplot by Season

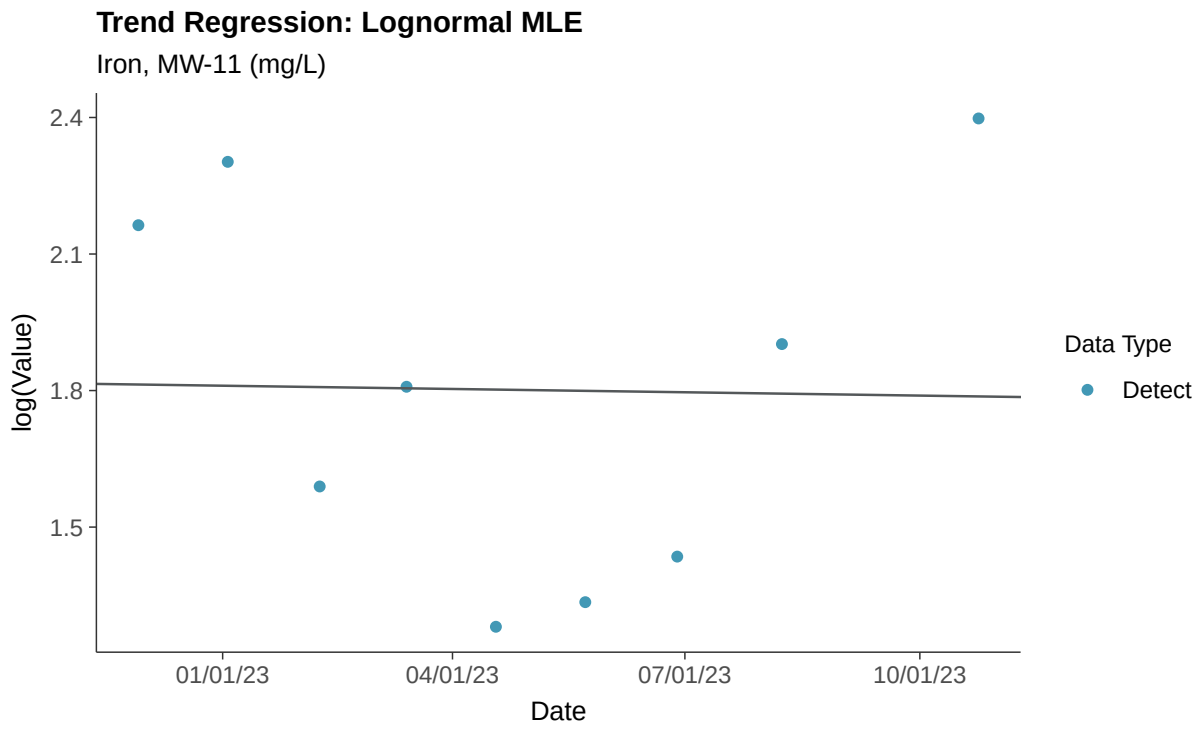
Iron, MW-11 (mg/L)

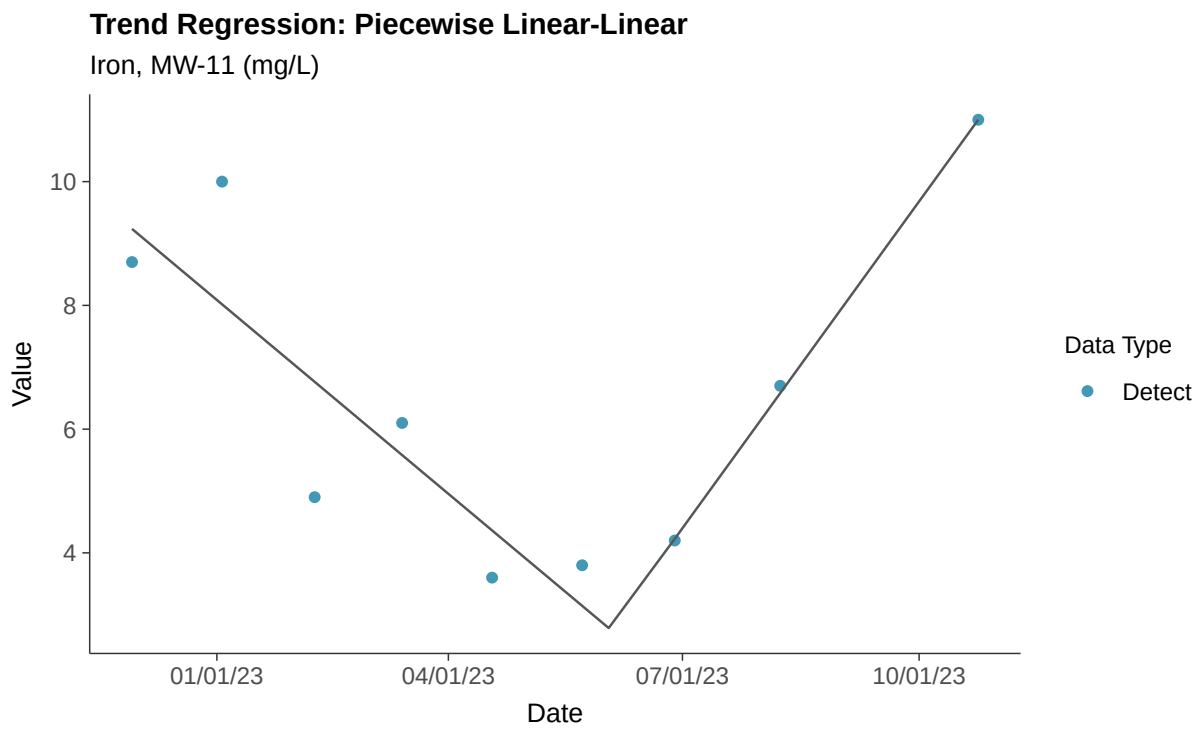



Normal Q-Q plot
Iron, MW-11 (mg/L)
Value
10.0
7.5
5.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-11 (mg/L)
log(Value)
2.50
2.25
2.00
1.75
1.50
1.25
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

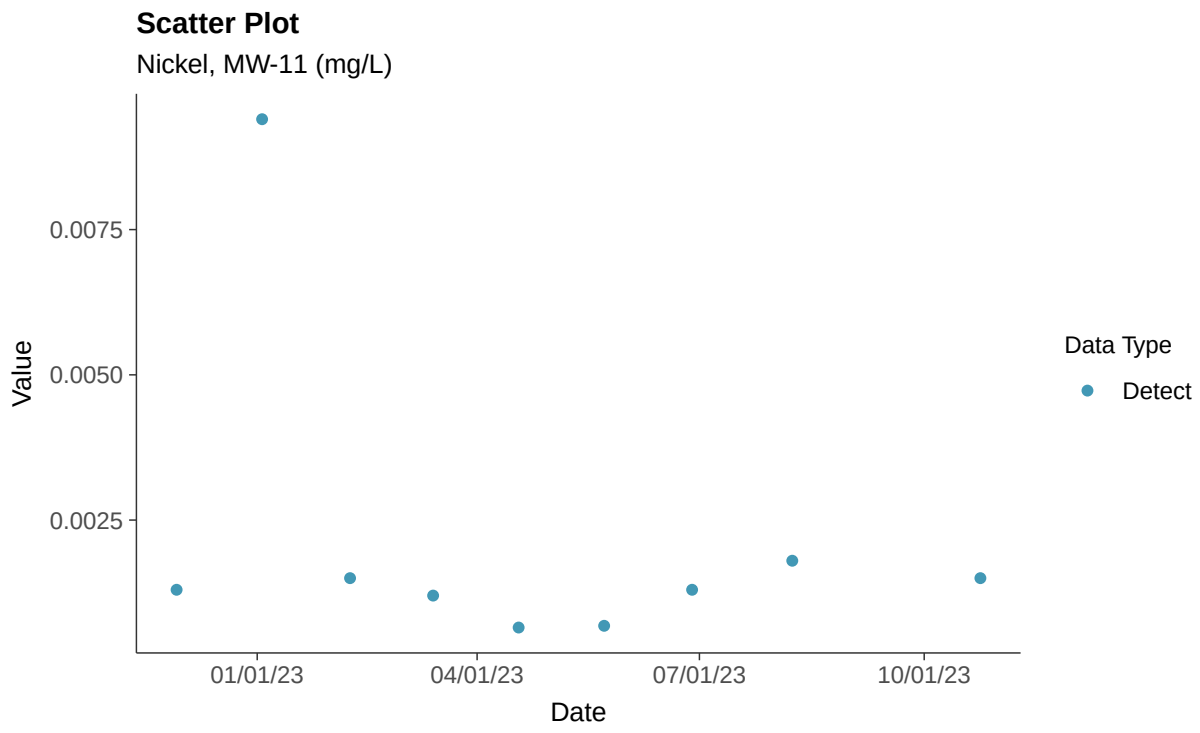

Gamma Q-Q plot
Iron, MW-11 (mg/L)
Value
10.0
7.5
5.0
2
4
6
8
10
12
14
Theoretical Quantiles (Gamma)
Data Type
Detect

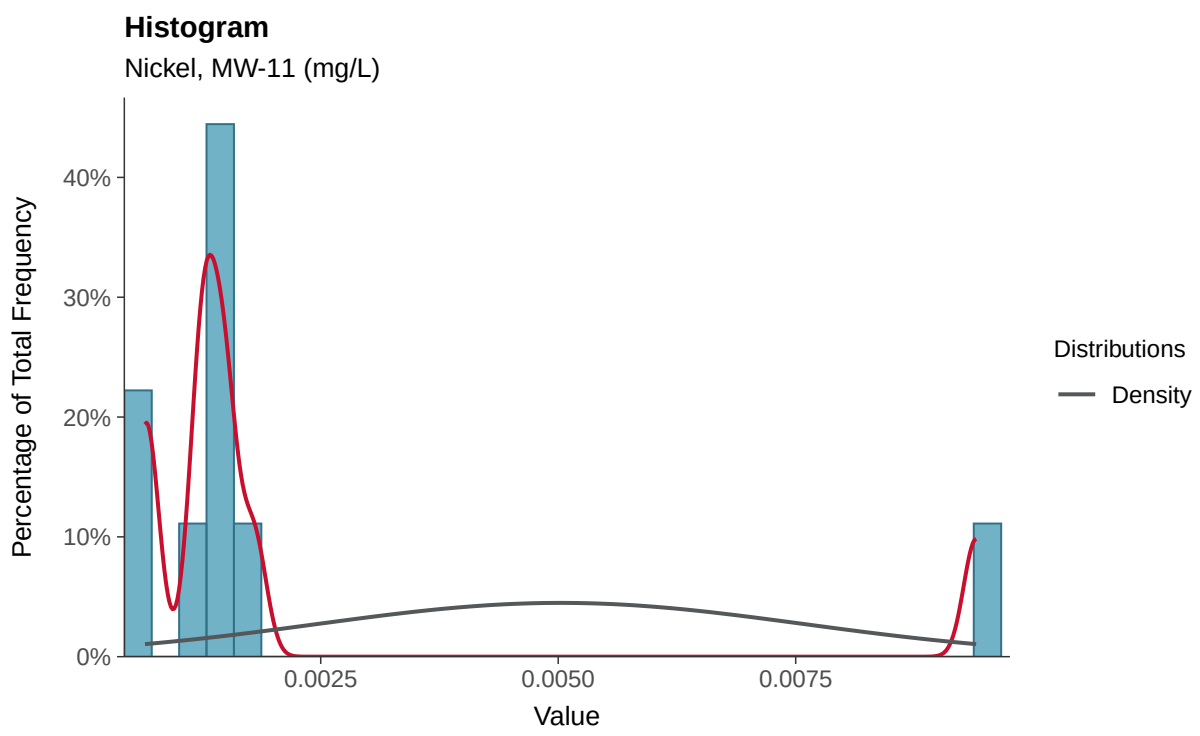

Trend Regression: Lognormal MLE
Iron, MW-11 (mg/L)
log(Value)
2.4
2.1
1.8
1.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-11 (mg/L)
Value
10
8
6
4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-11

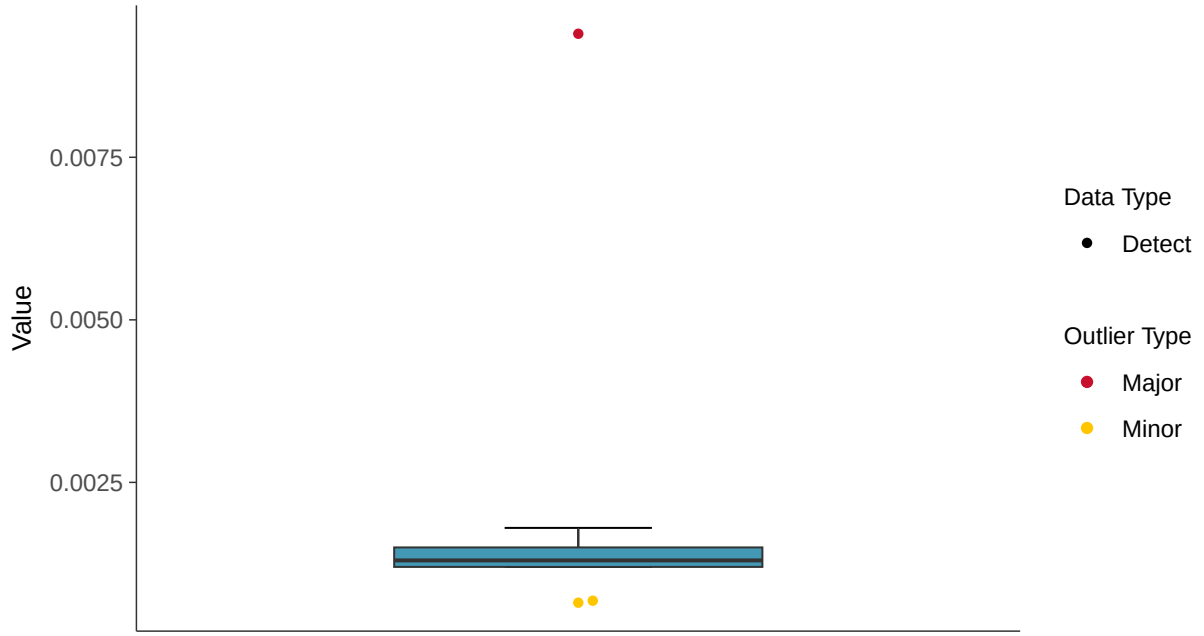
ID: 2_20_6_119





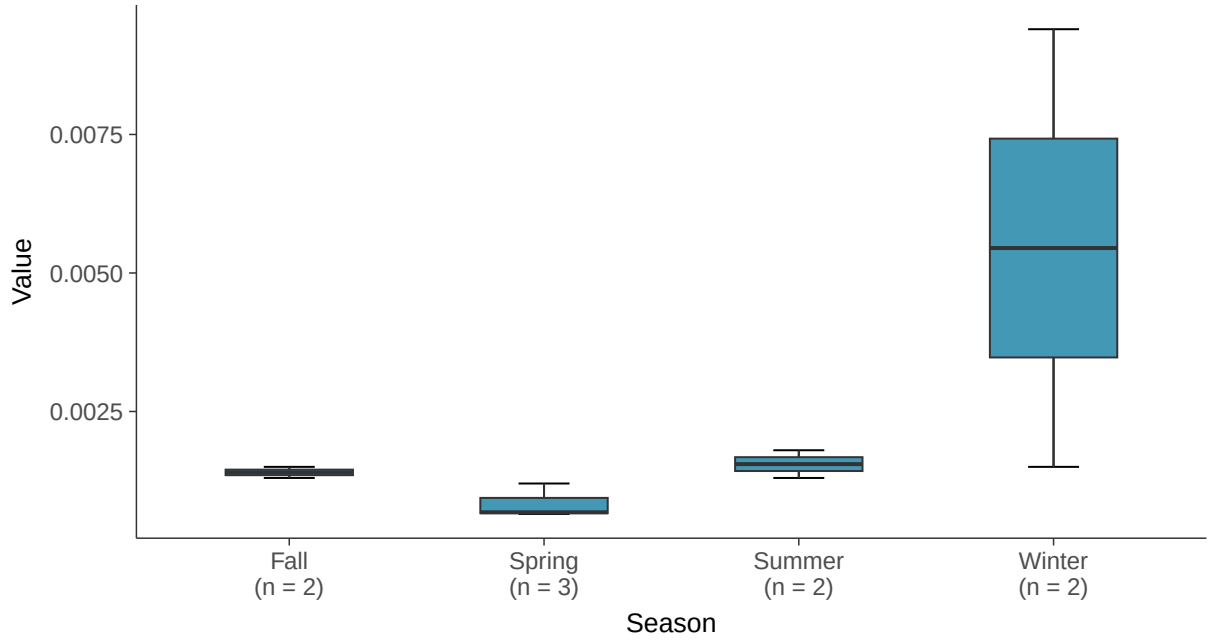
Boxplot

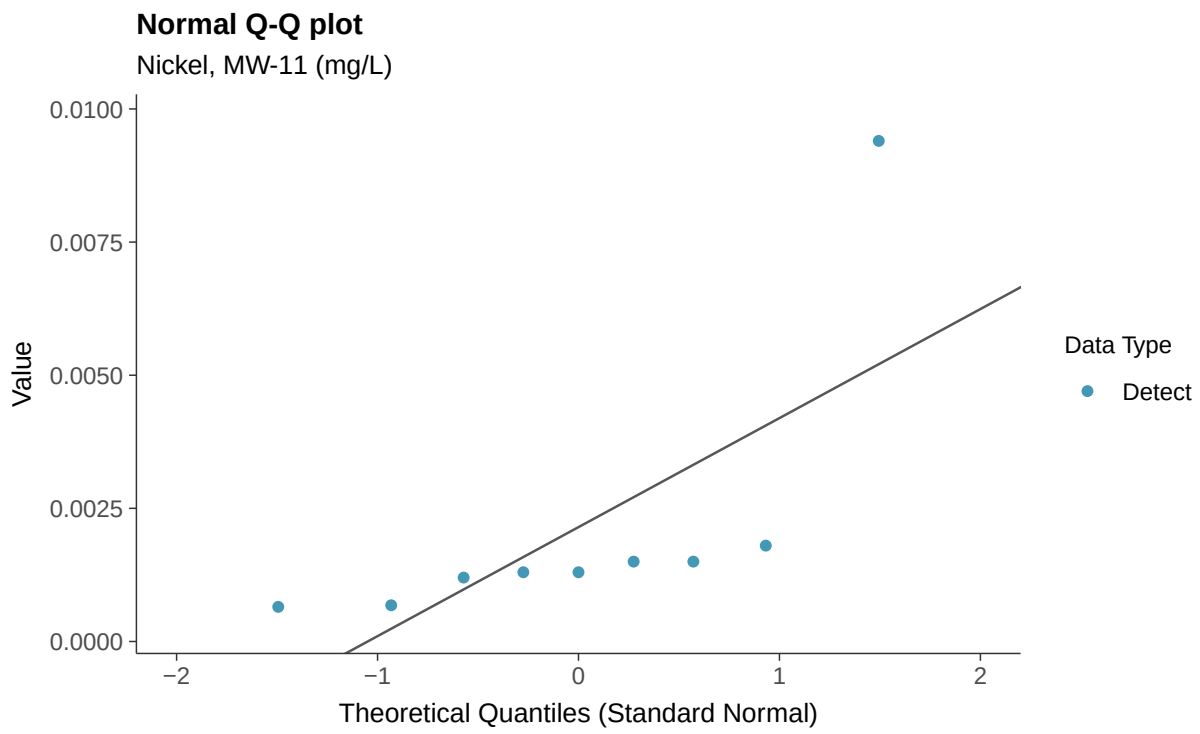
Nickel, MW-11 (mg/L)

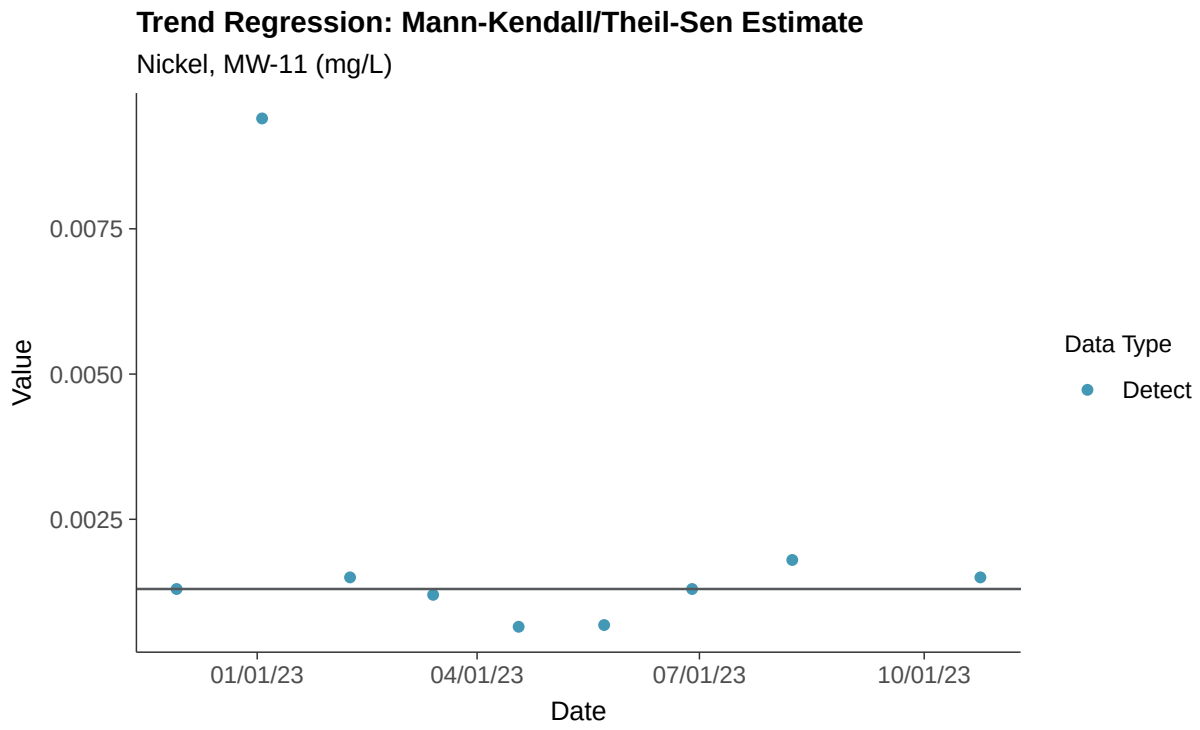


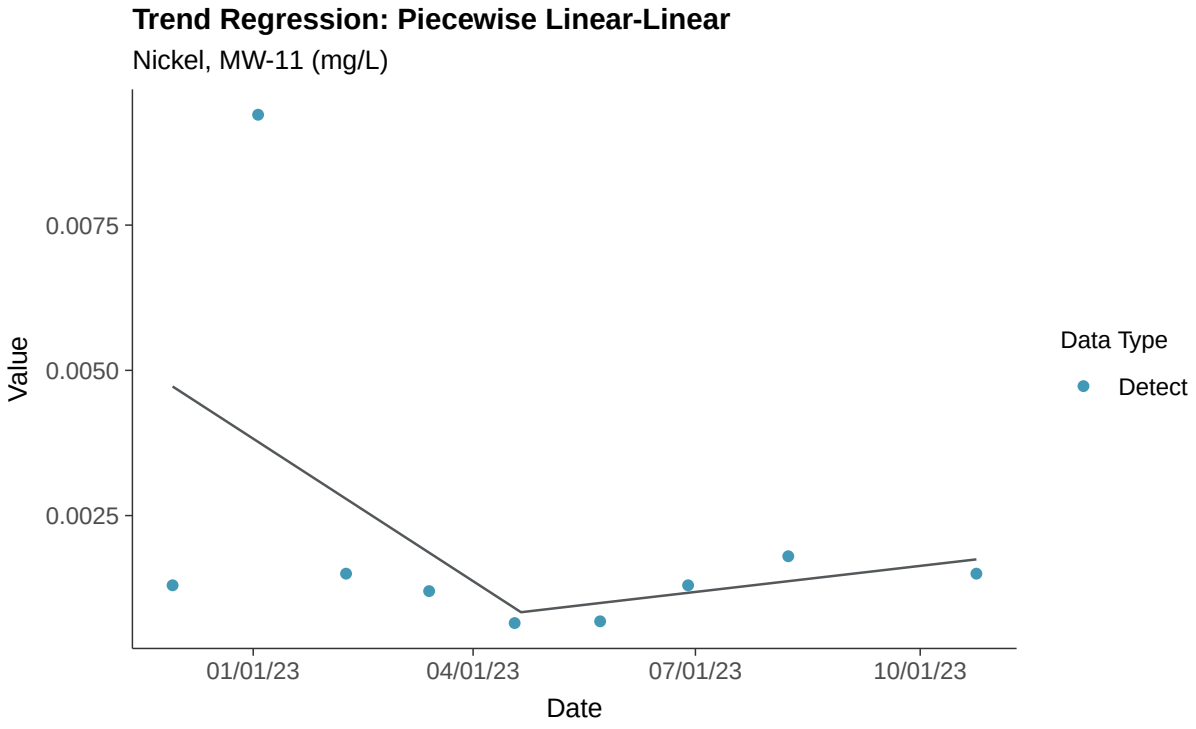
Boxplot by Season

Nickel, MW-11 (mg/L)



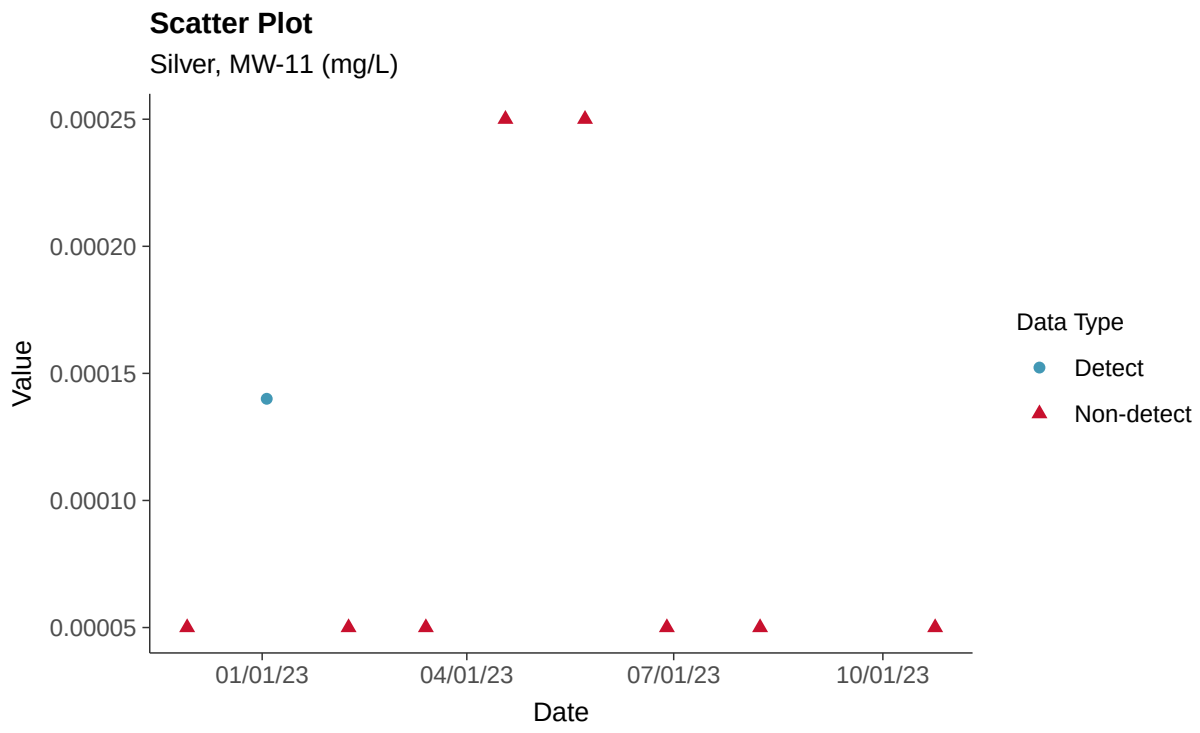

Normal Q-Q plot
Nickel, MW-11 (mg/L)
Value
0.0100
0.0075
0.0050
0.0025
0.0000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

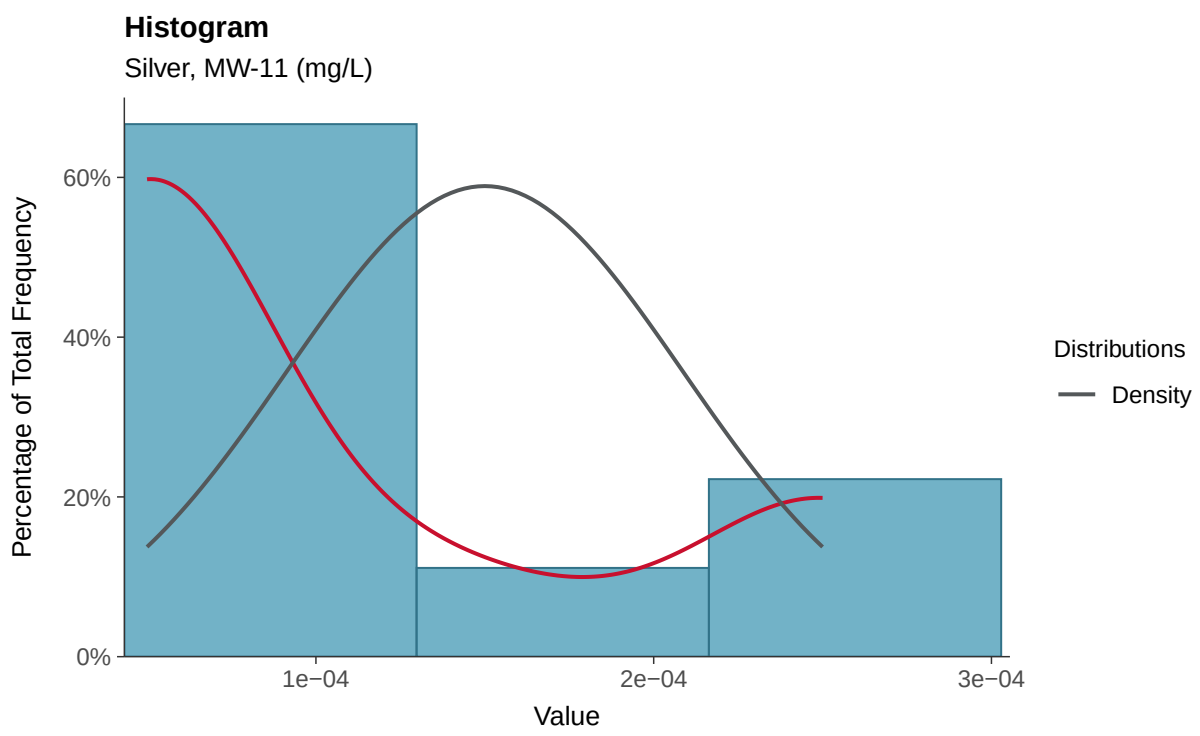

Trend Regression: Mann-Kendall/Theil-Sen Estimate
Nickel, MW-11 (mg/L)
Value
0.0075
0.0050
0.0025
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Nickel, MW-11 (mg/L)
Value
0.0075
0.0050
0.0025
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-11

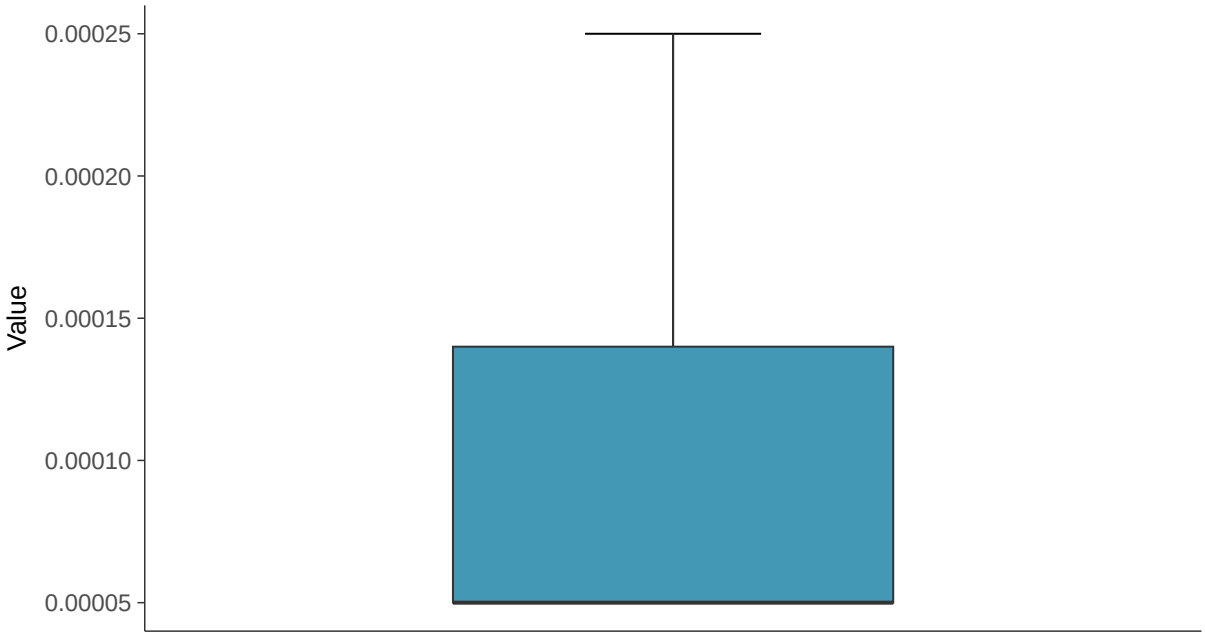
ID: 2_20_6_123





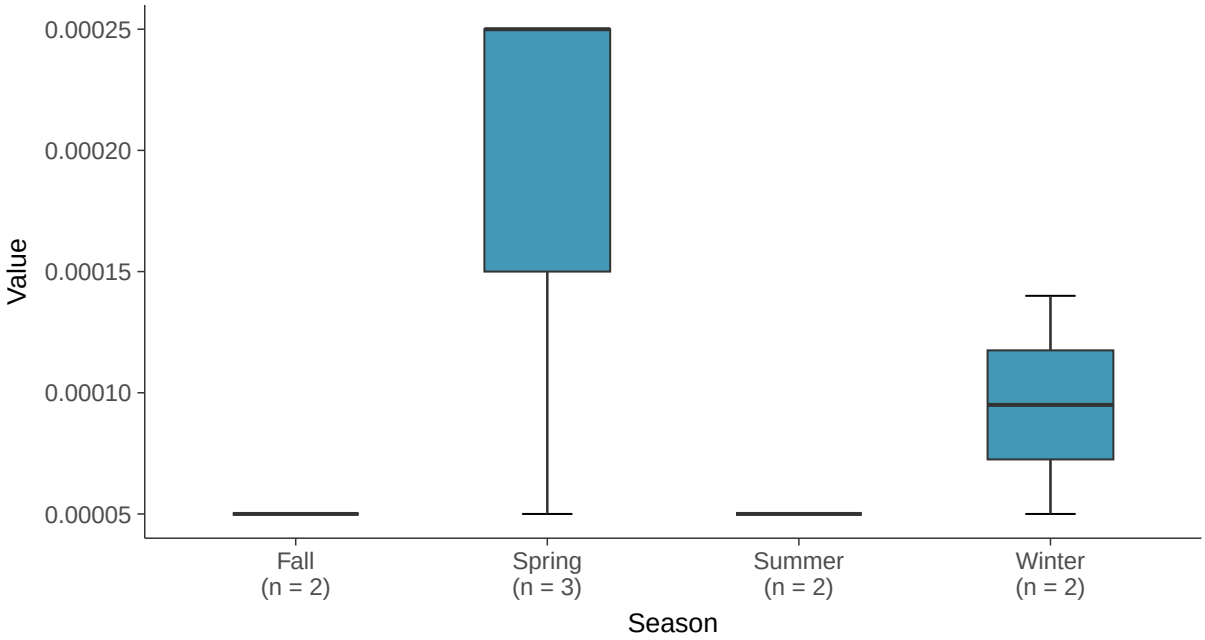
Boxplot

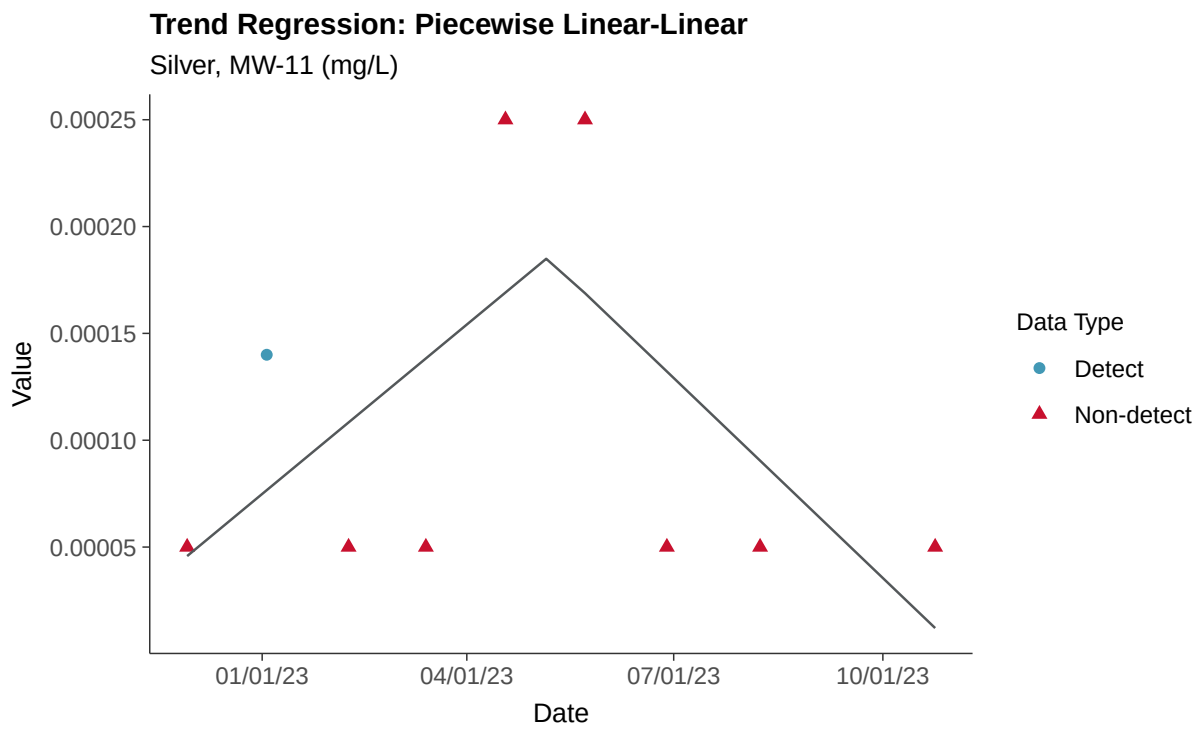
Silver, MW-11 (mg/L)

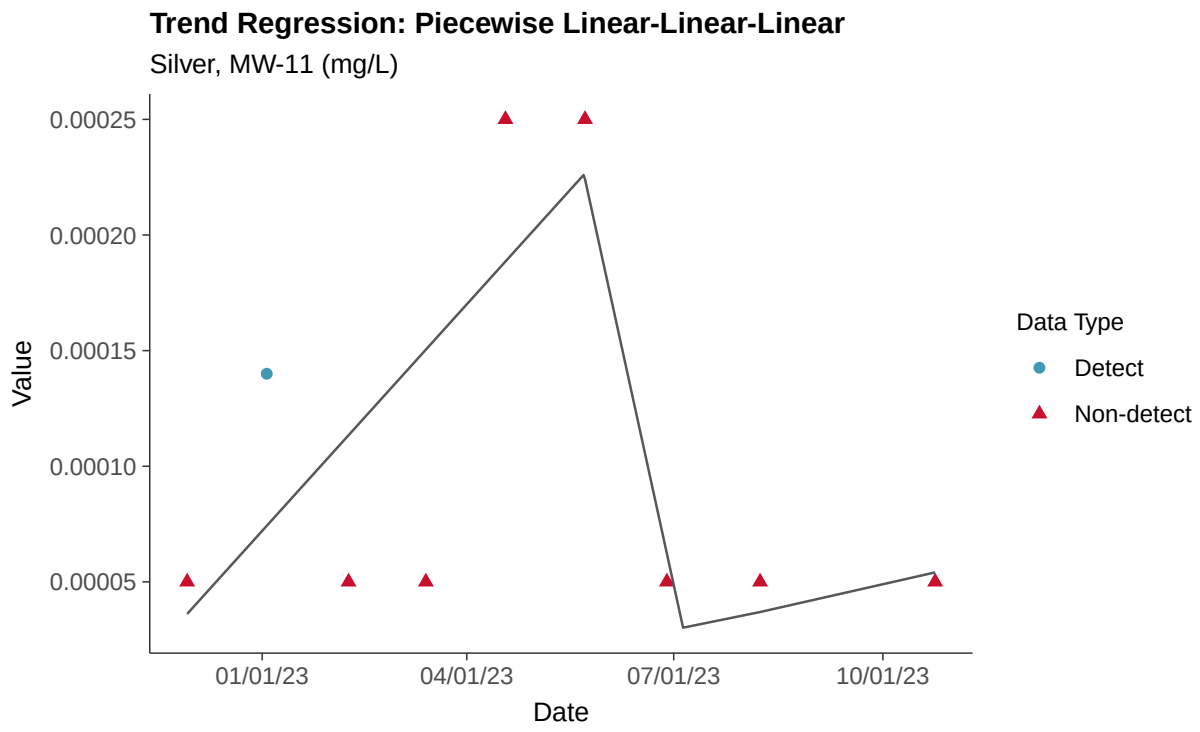


Boxplot by Season

Silver, MW-11 (mg/L)

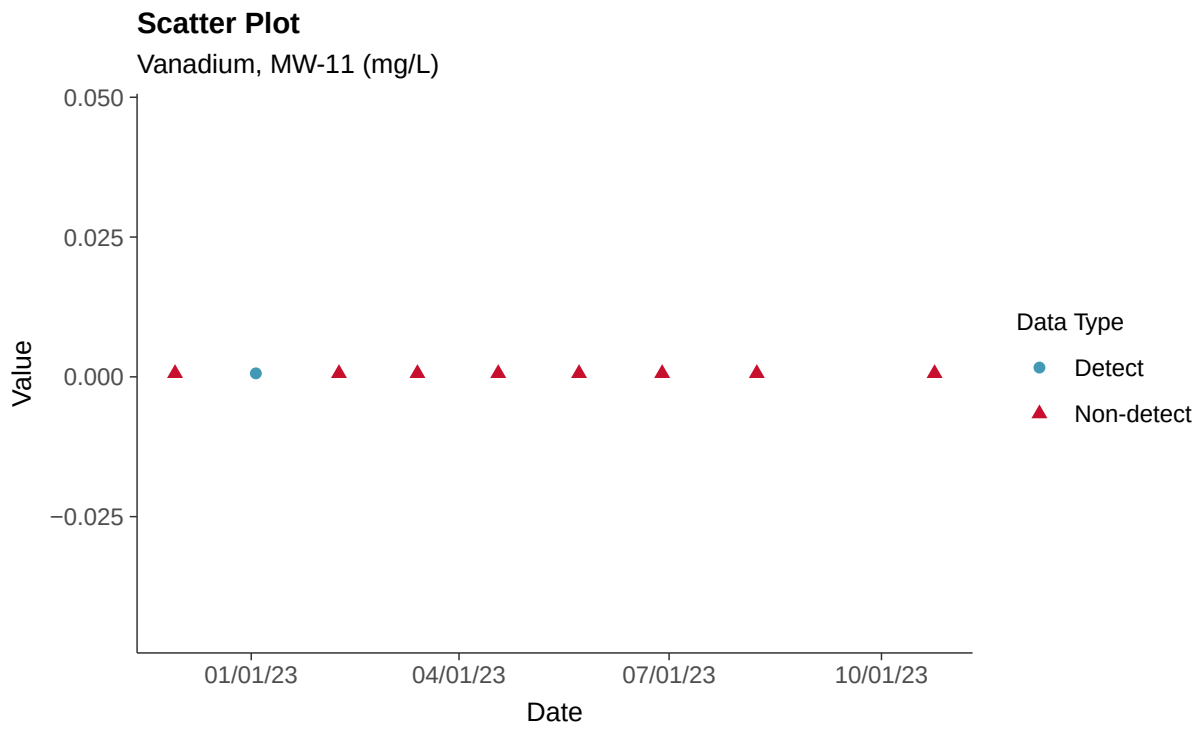


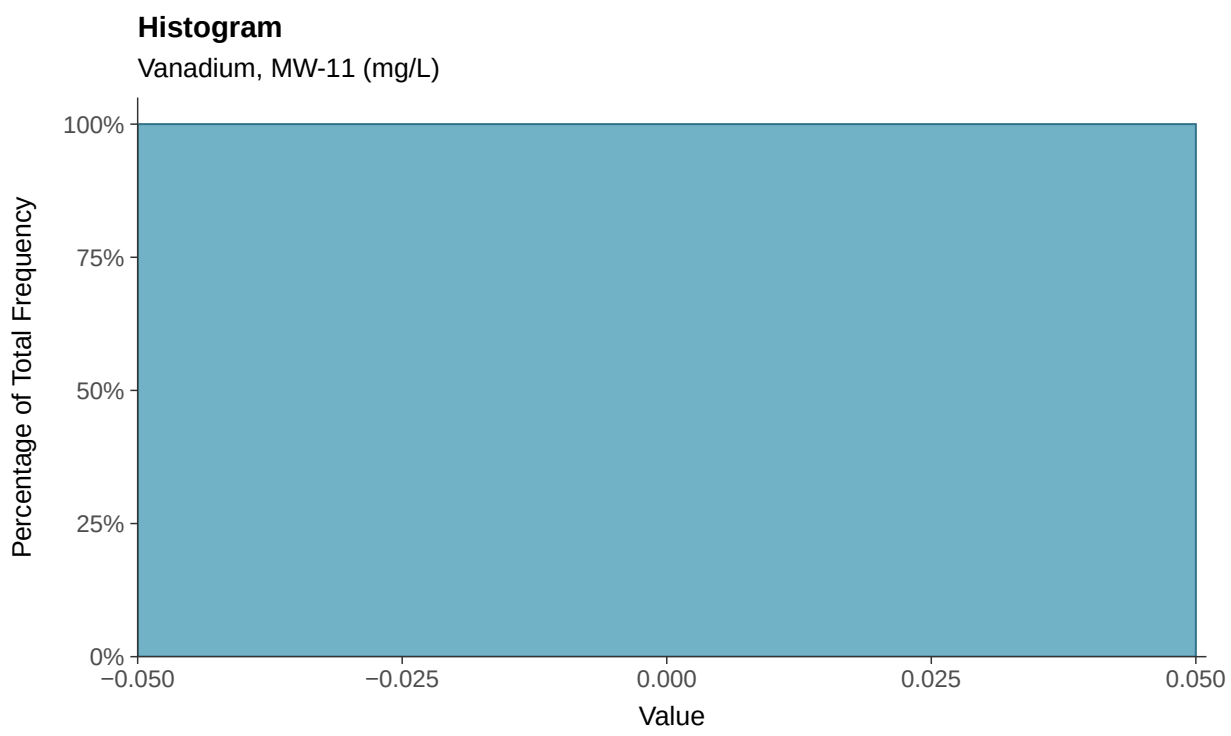

Trend Regression: Piecewise Linear-Linear
Silver, MW-11 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Silver, MW-11 (mg/L)
0.00025
0.00020
0.00015
0.00010
0.00005
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Vanadium, MW-11

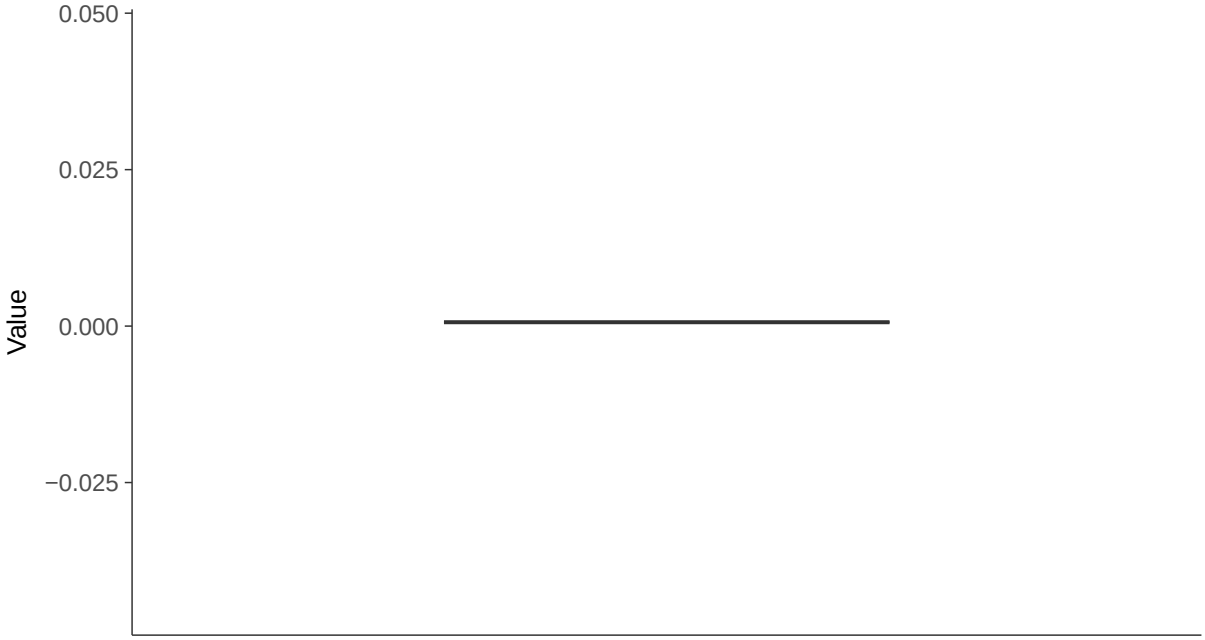
ID: 2_20_6_129





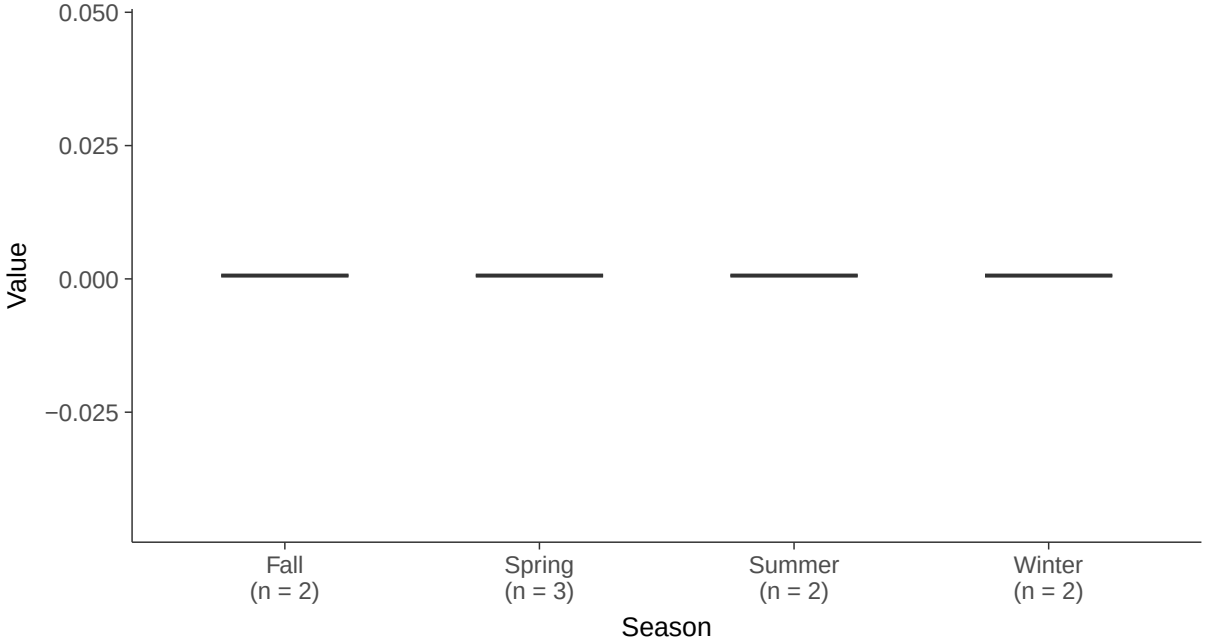
Boxplot

Vanadium, MW-11 (mg/L)



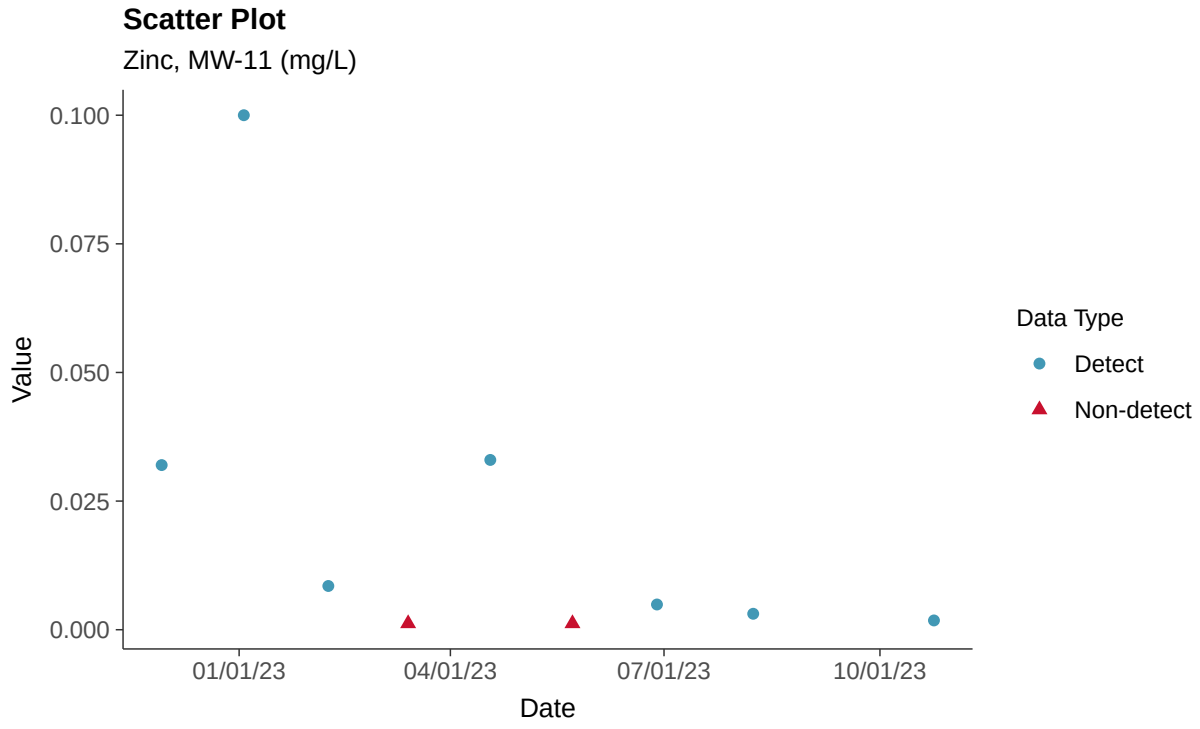
Boxplot by Season

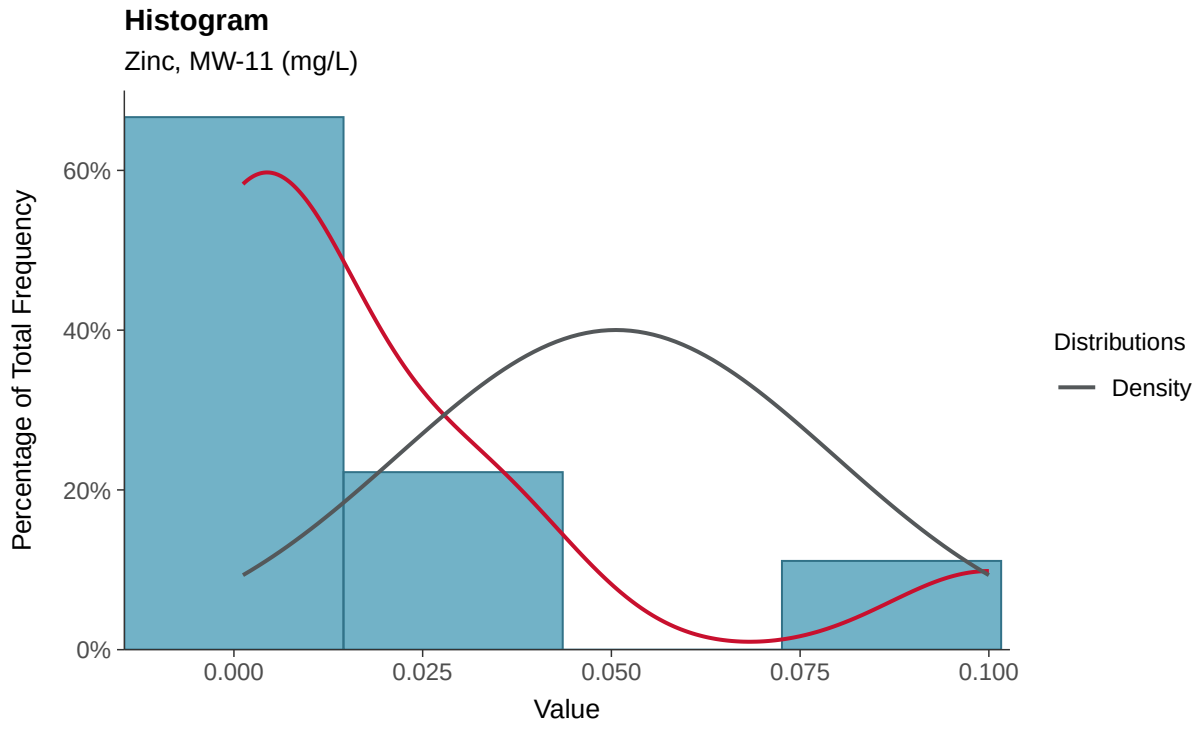
Vanadium, MW-11 (mg/L)



Part 115: Zinc, MW-11

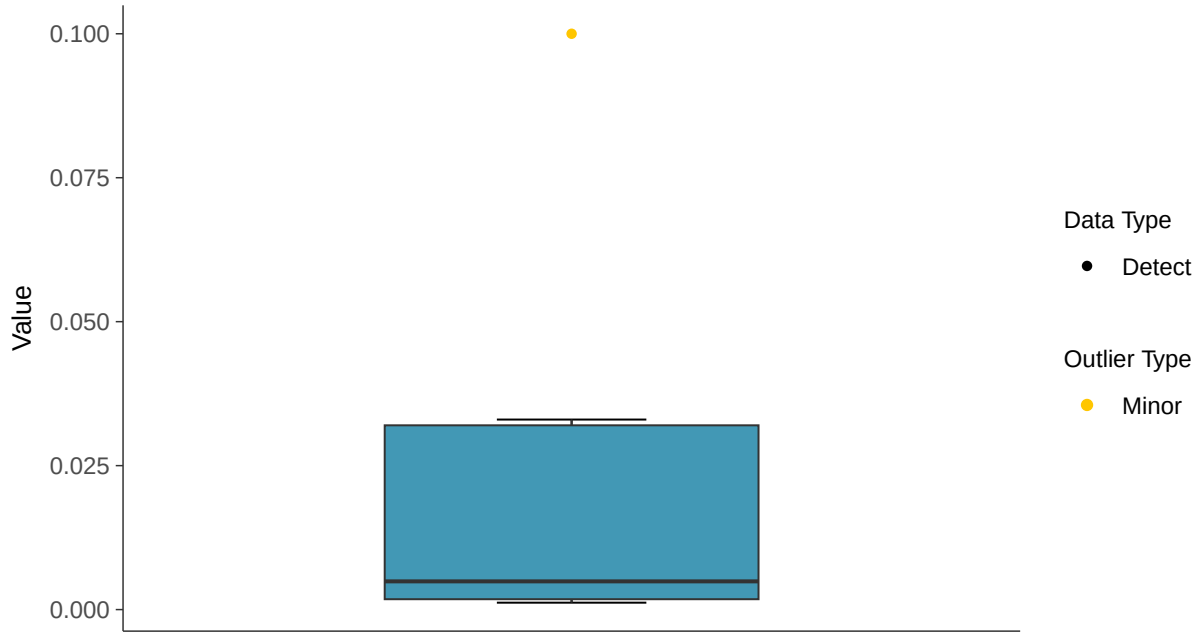
ID: 2_20_6_130





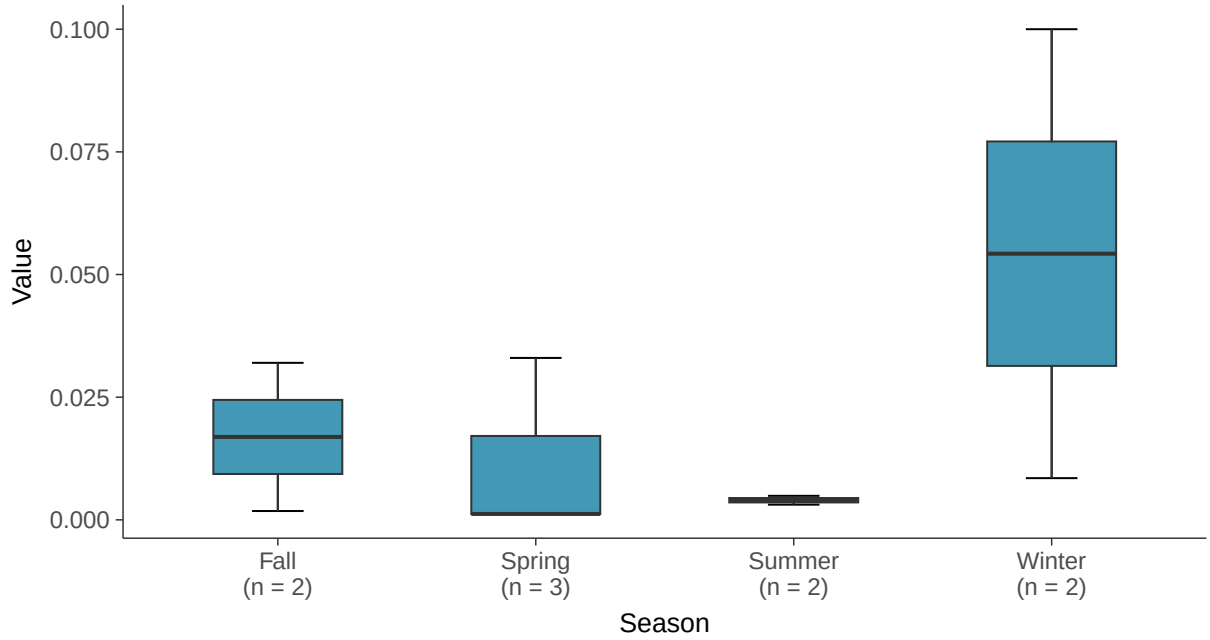
Boxplot

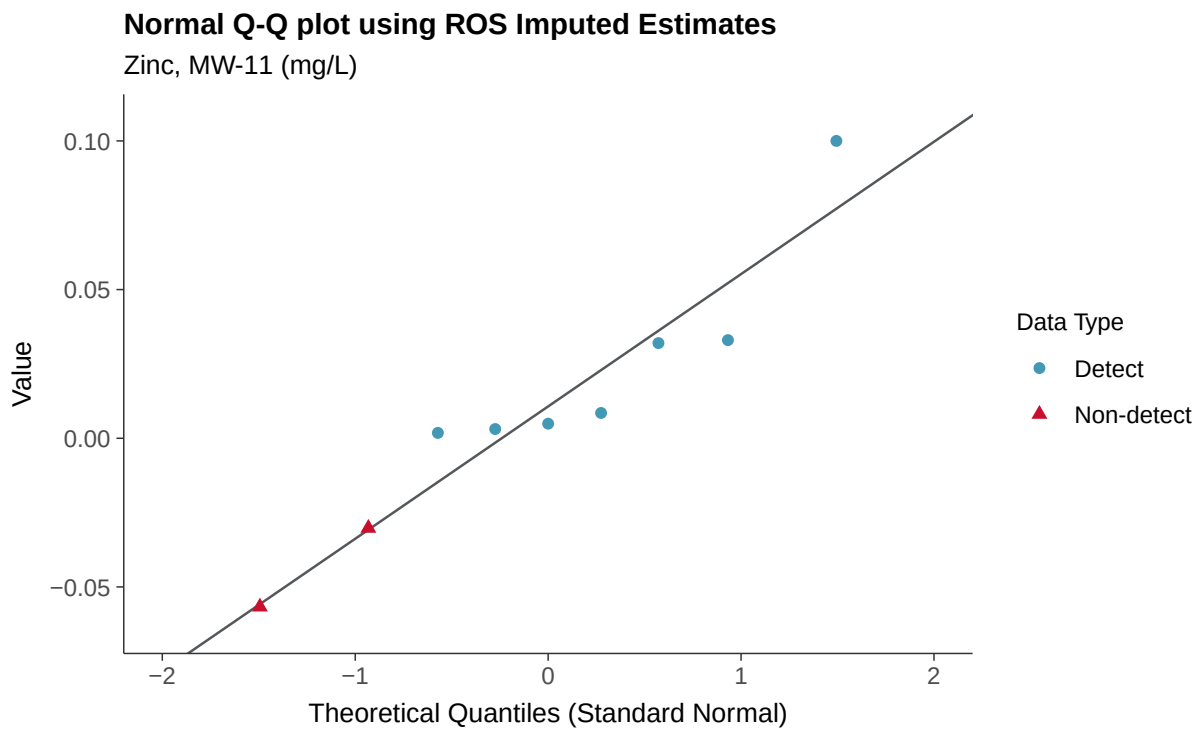
Zinc, MW-11 (mg/L)

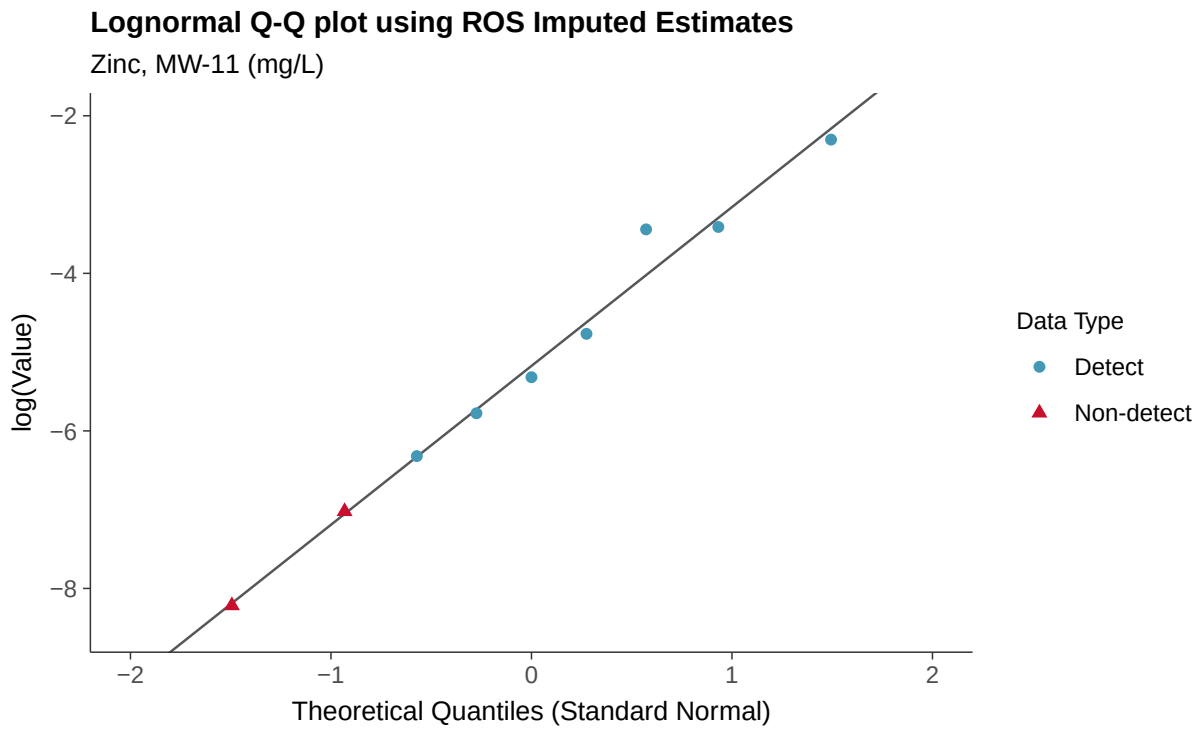


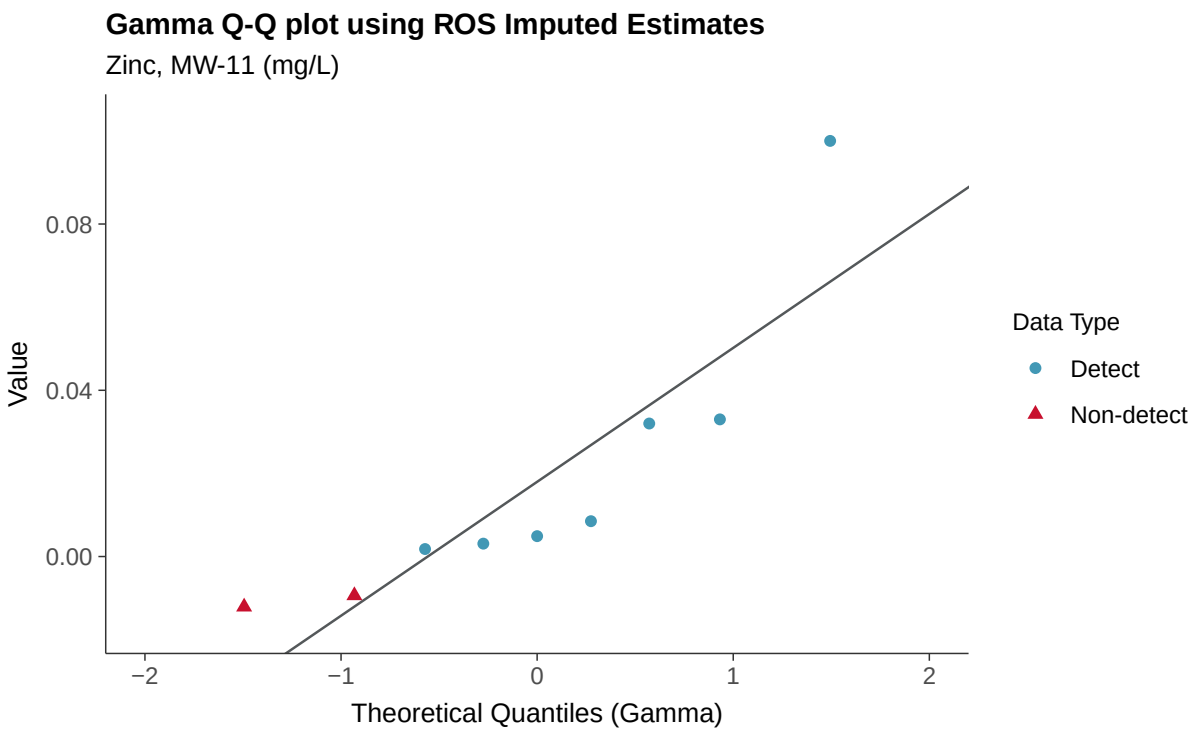
Boxplot by Season

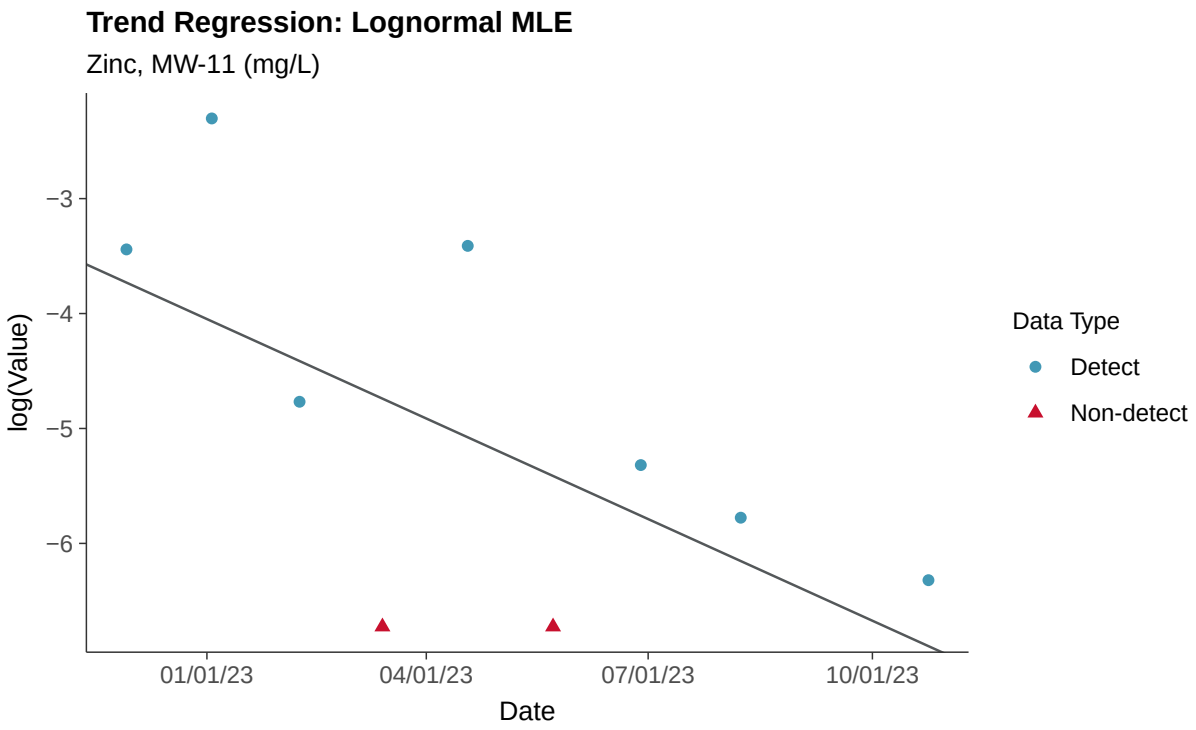
Zinc, MW-11 (mg/L)

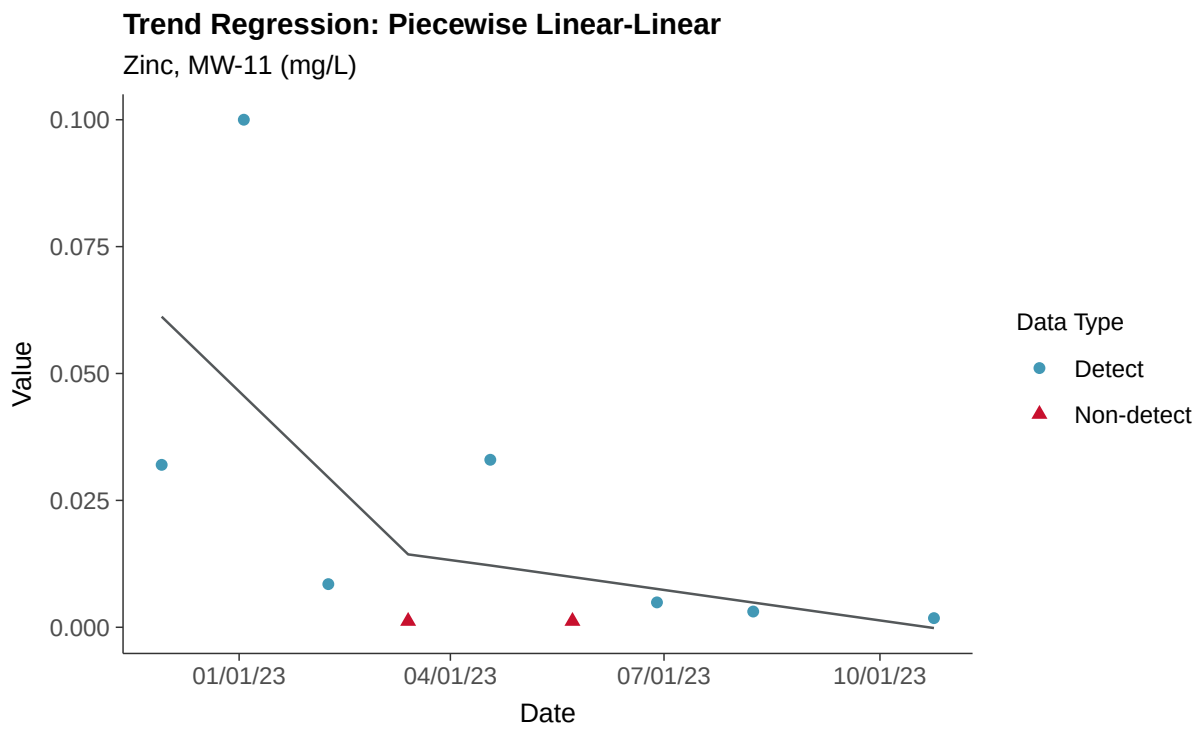



Normal Q-Q plot using ROS Imputed Estimates
Zinc, MW-11 (mg/L)
Value
0.10
0.05
0.00
−0.05
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Zinc, MW-11 (mg/L)
log(Value)
−2
−4
−6
−8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

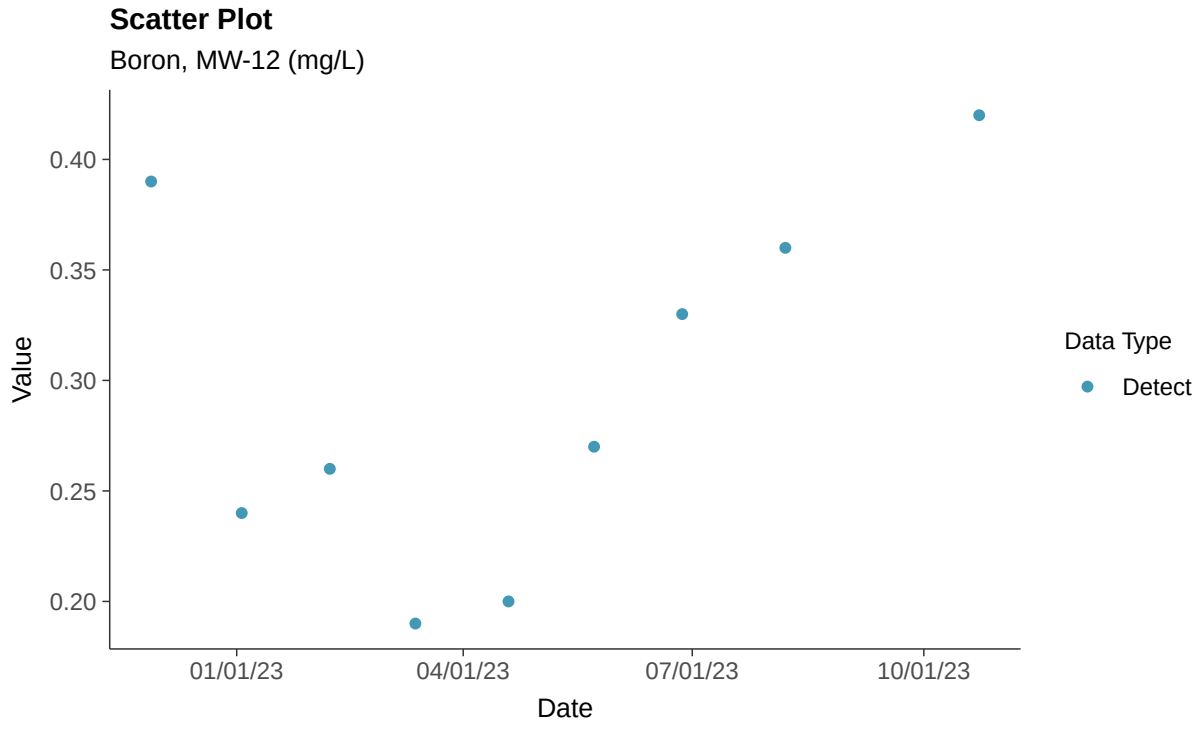

Gamma Q-Q plot using ROS Imputed Estimates
Zinc, MW-11 (mg/L)
Value
0.08
0.04
0.00
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

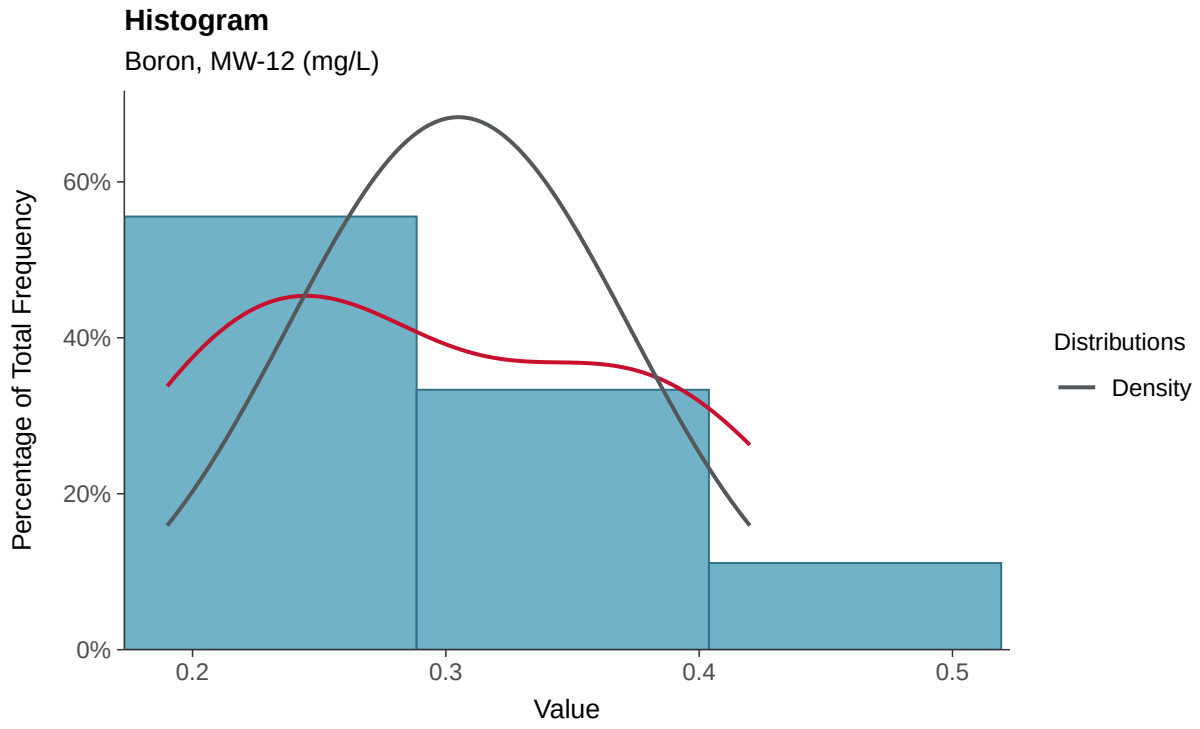

Trend Regression: Lognormal MLE
Zinc, MW-11 (mg/L)
log(Value)
−3
−4
−5
−6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Zinc, MW-11 (mg/L)
0.100
0.075
0.050
0.025
0.000
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix III: Boron, MW-12

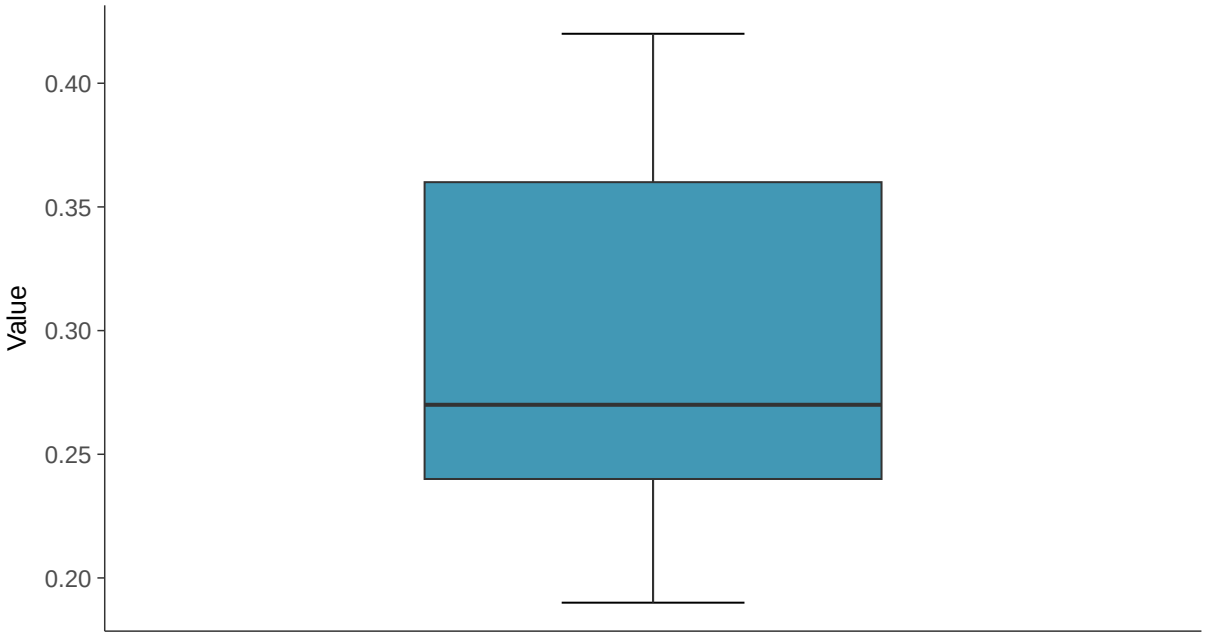
ID: 2_21_4_105





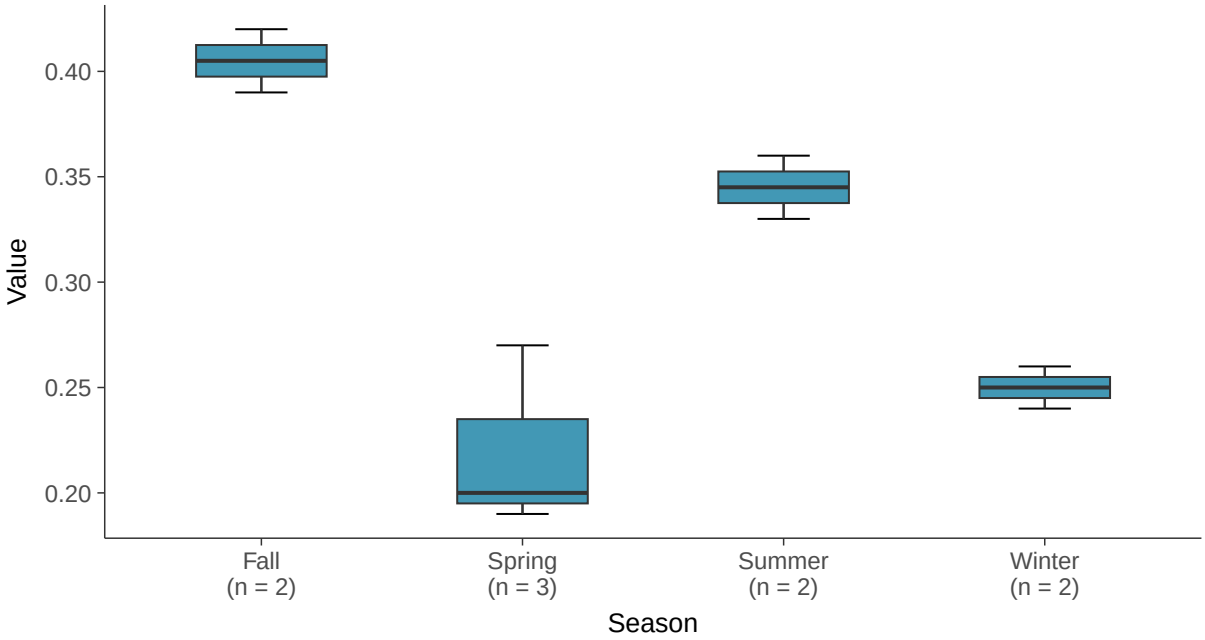
Boxplot

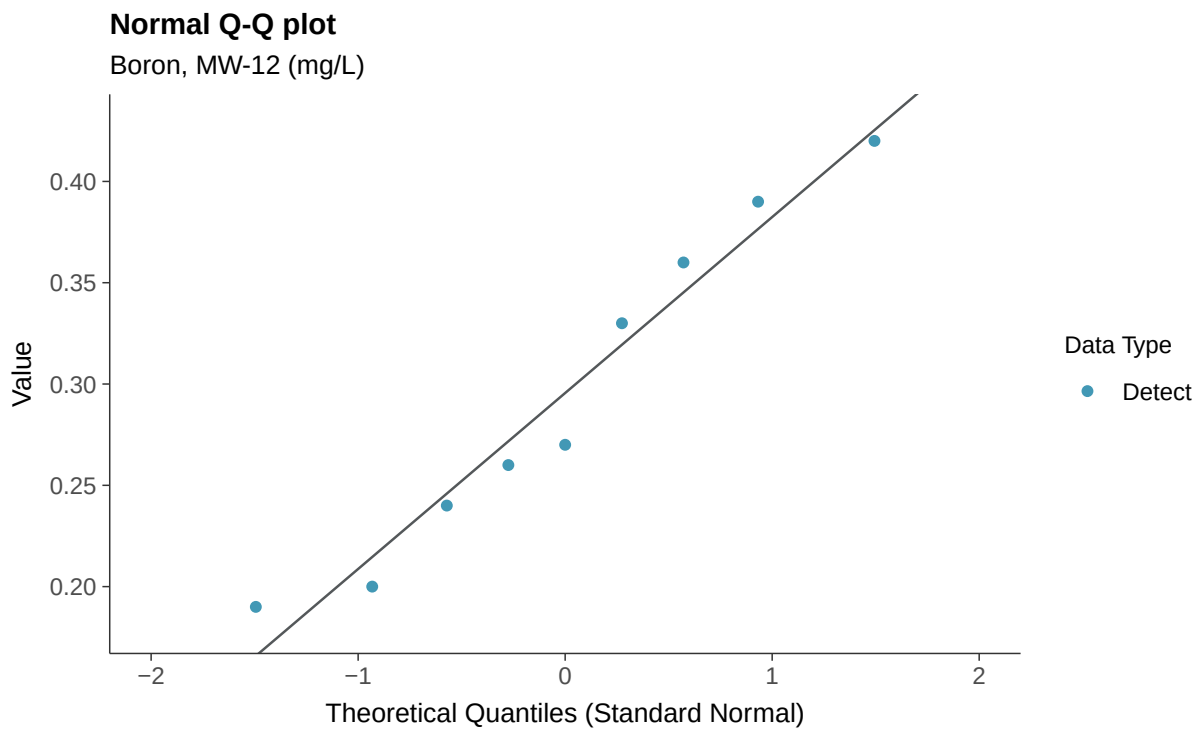
Boron, MW-12 (mg/L)

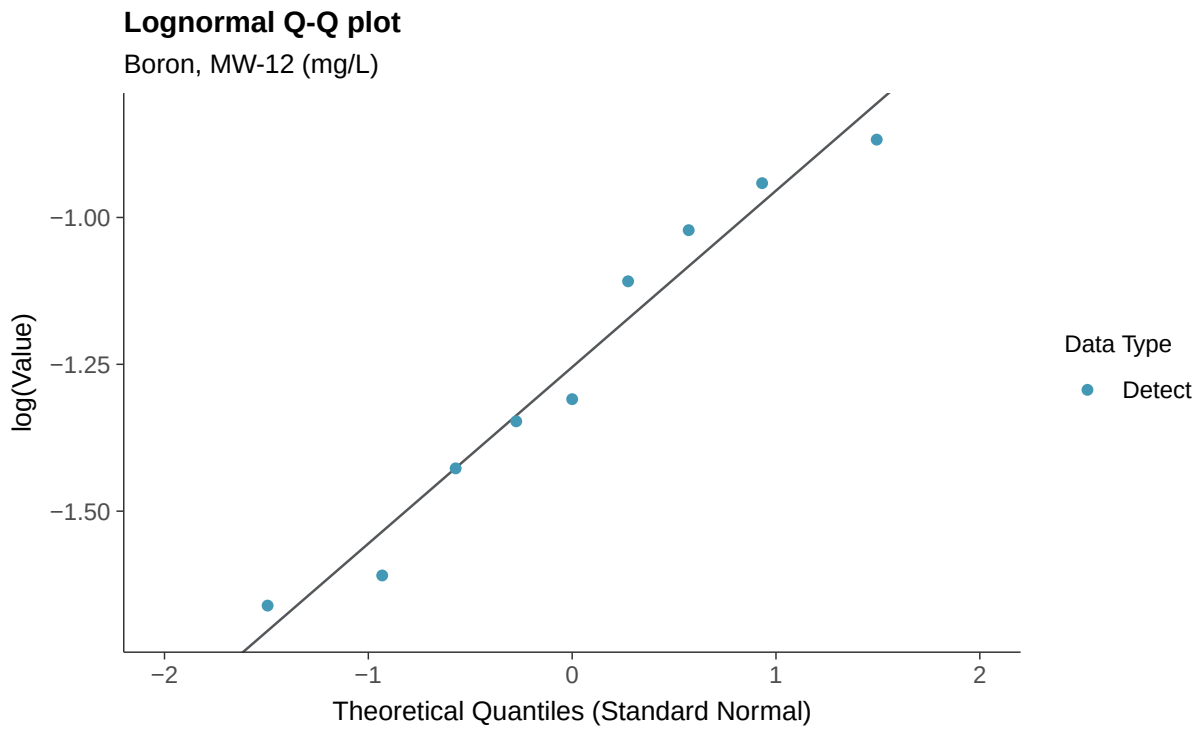


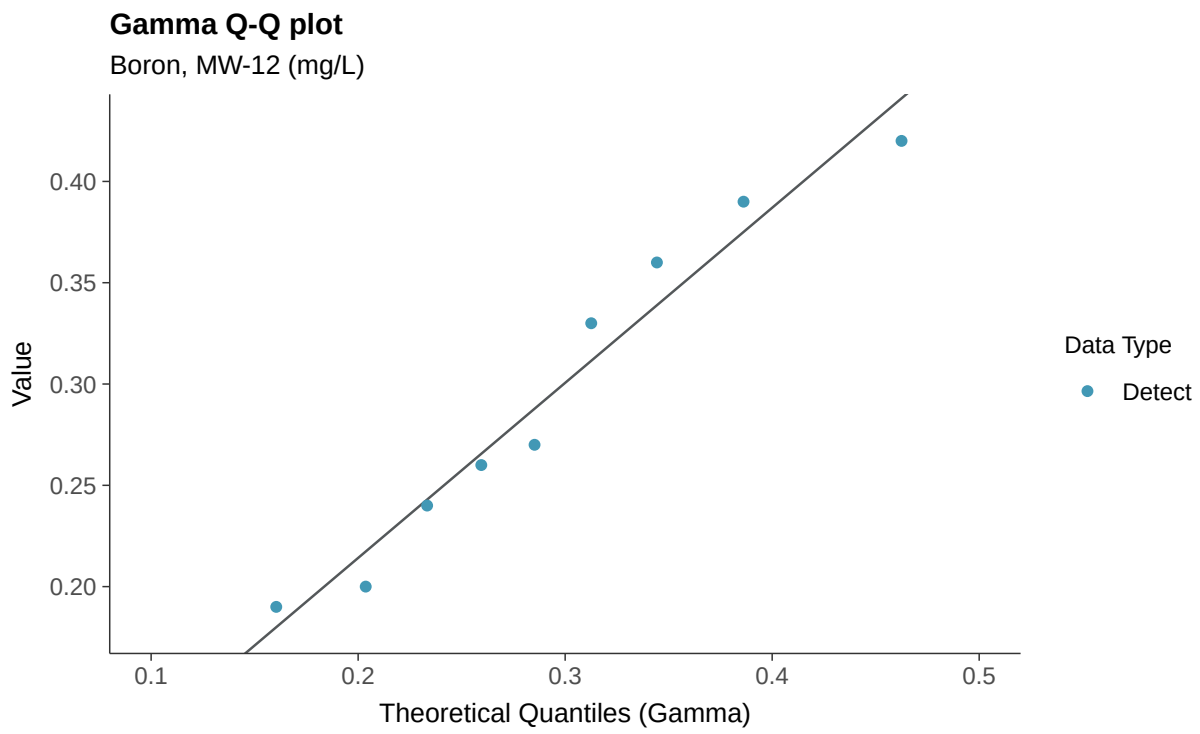
Boxplot by Season

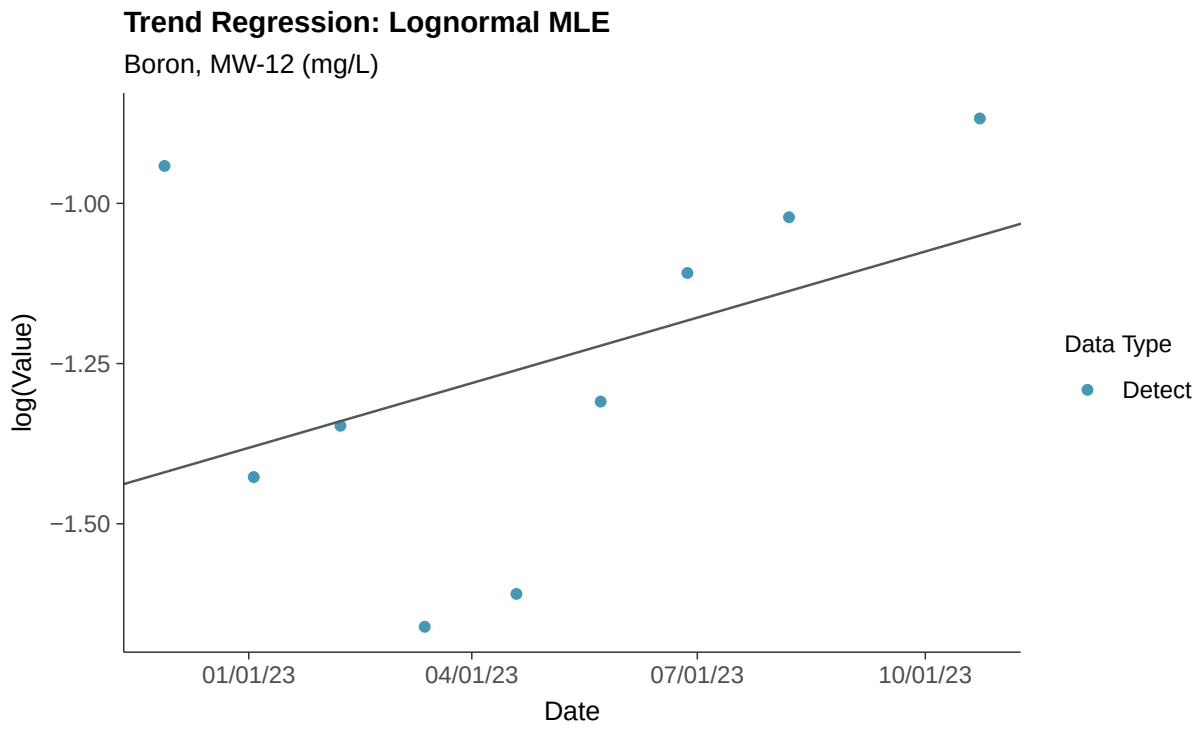
Boron, MW-12 (mg/L)




Normal Q-Q plot
Boron, MW-12 (mg/L)
Value
0.40
0.35
0.30
0.25
0.20
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

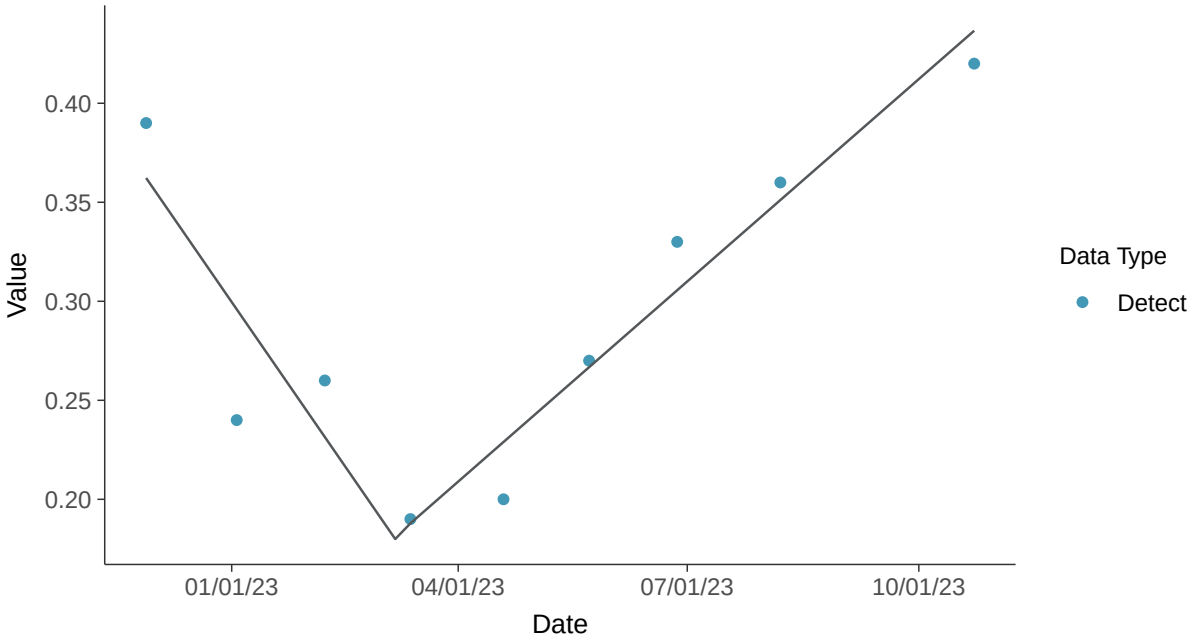

Lognormal Q-Q plot
Boron, MW-12 (mg/L)
log(Value)
−1.00
−1.25
−1.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Boron, MW-12 (mg/L)
Value
0.40
0.35
0.30
0.25
0.20
0.1
0.2
0.3
0.4
0.5
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Boron, MW-12 (mg/L)
log(Value)
−1.00
−1.25
−1.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

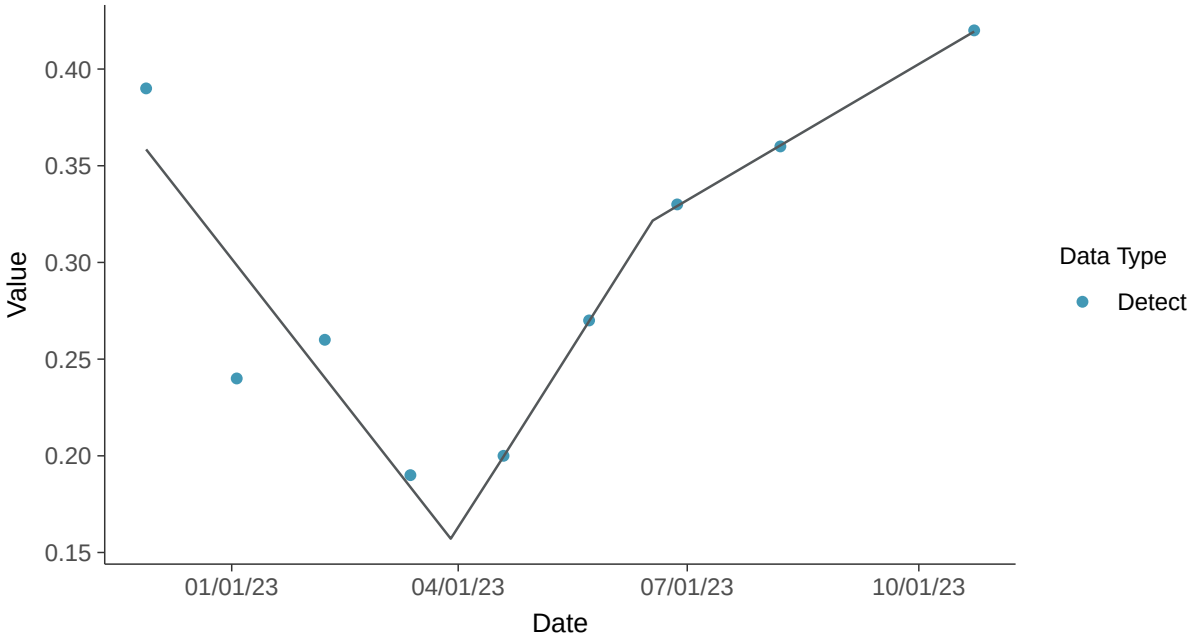
Trend Regression: Piecewise Linear-Linear

Boron, MW-12 (mg/L)



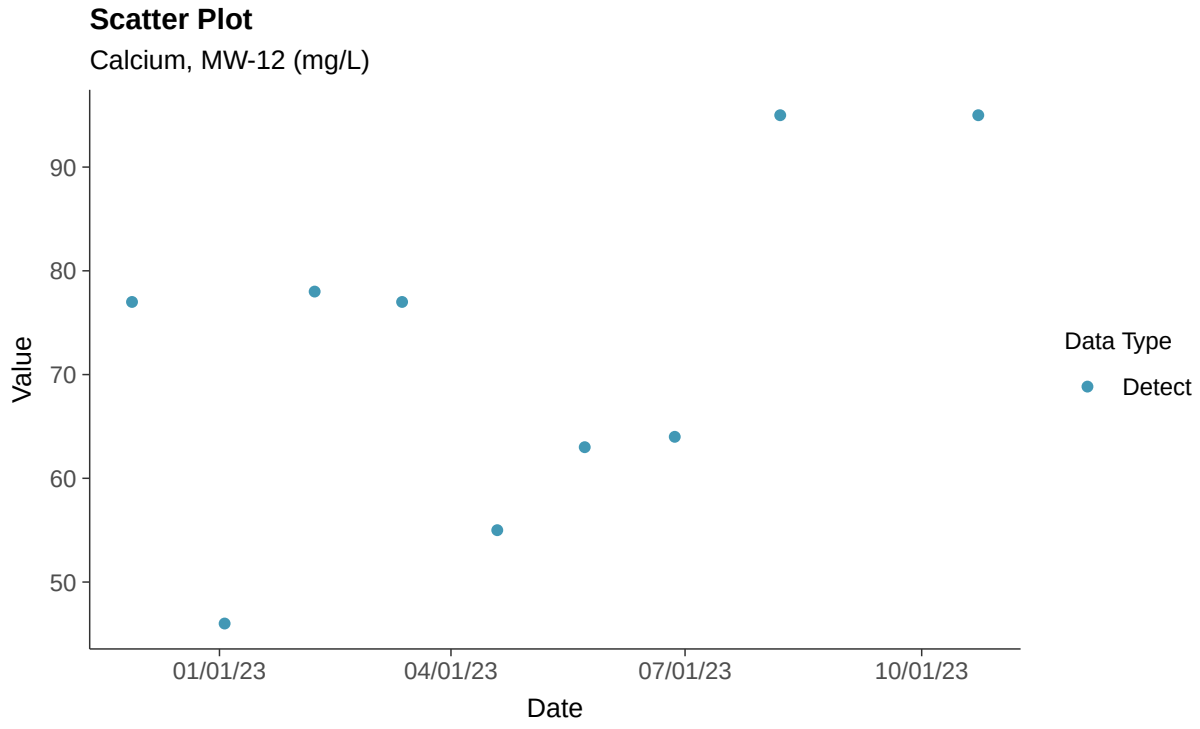
Trend Regression: Piecewise Linear-Linear-Linear

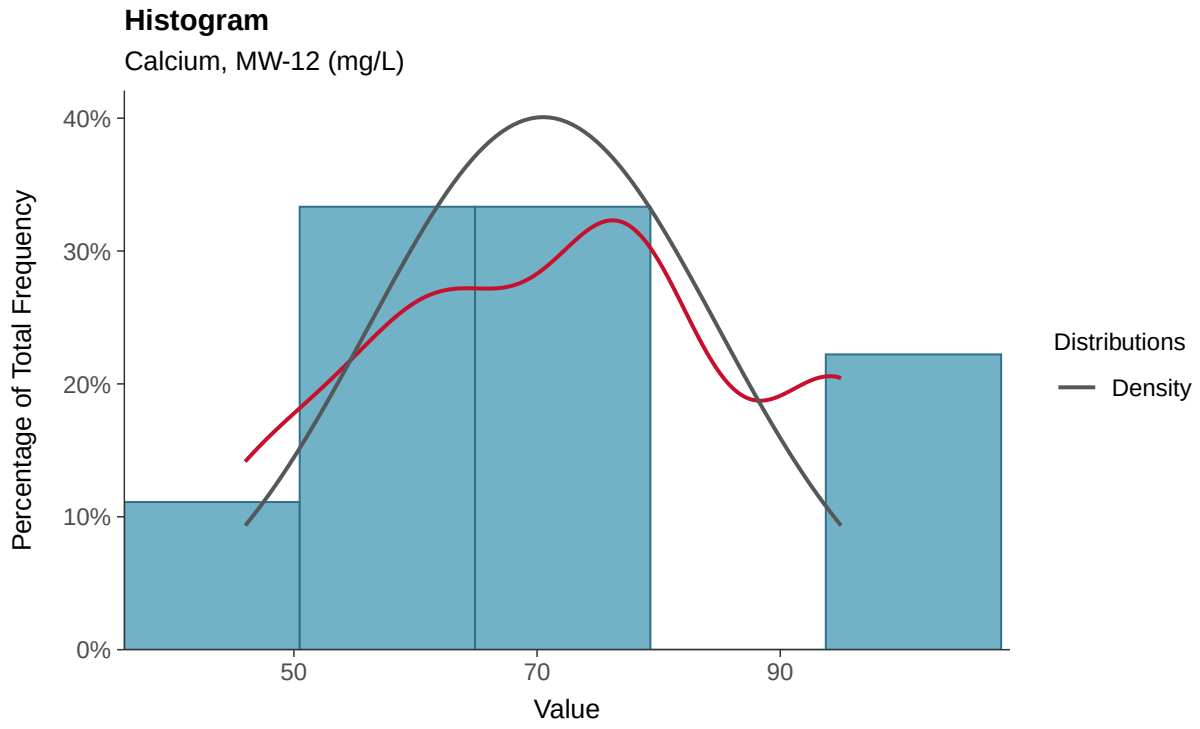
Boron, MW-12 (mg/L)



Appendix III: Calcium, MW-12

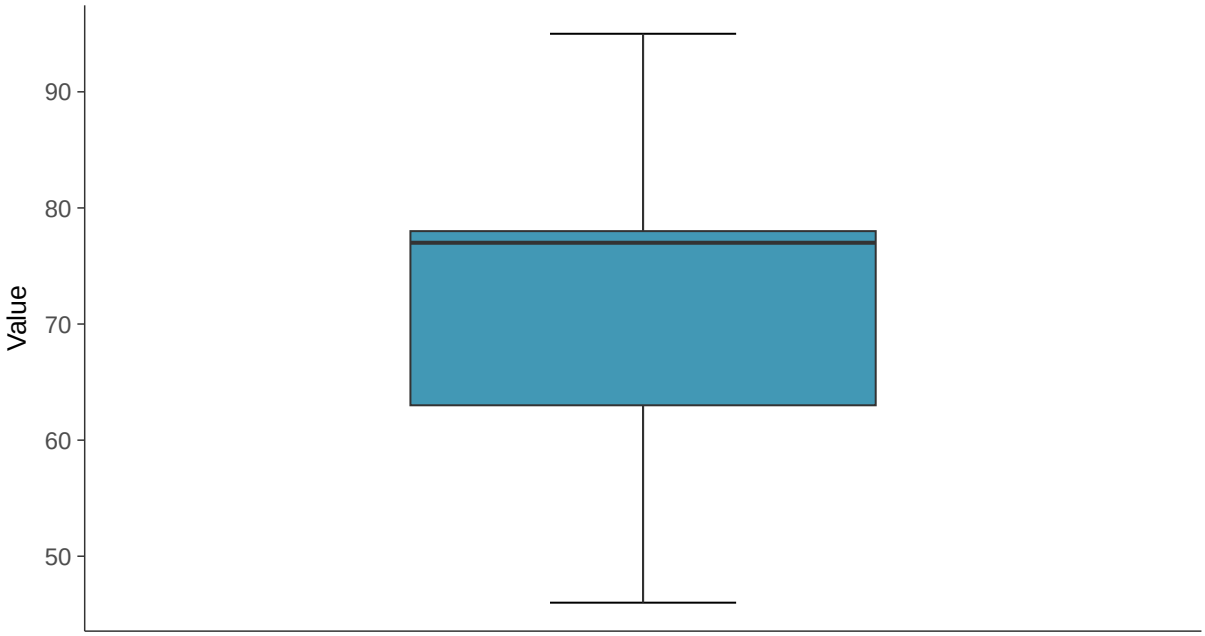
ID: 2_21_4_107





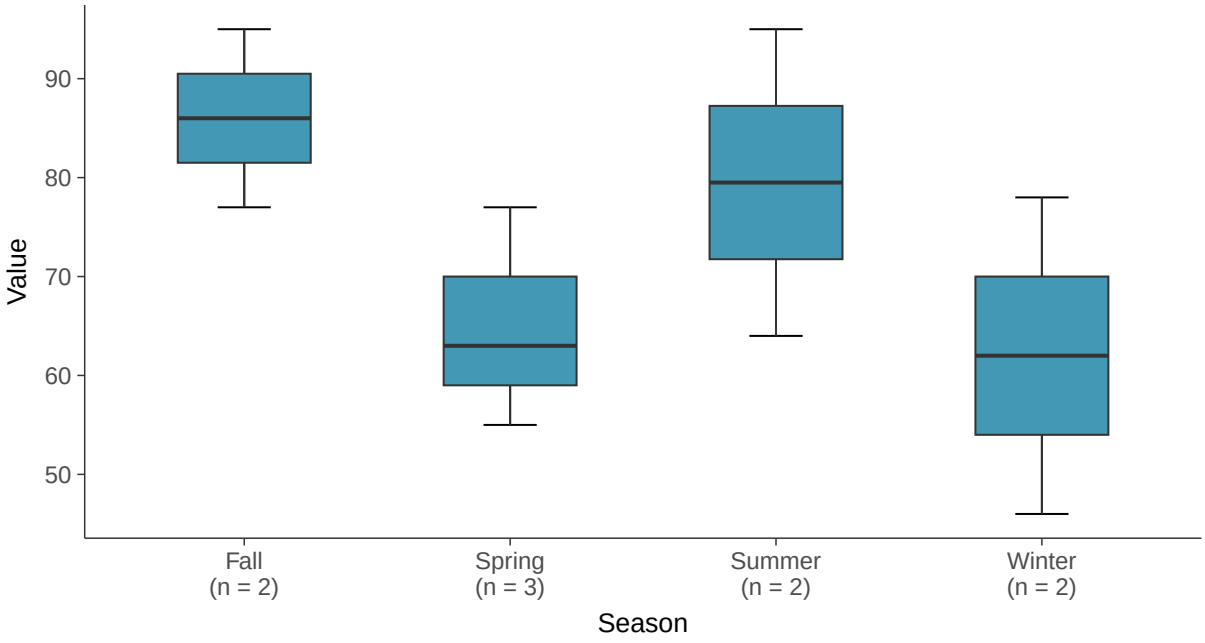
Boxplot

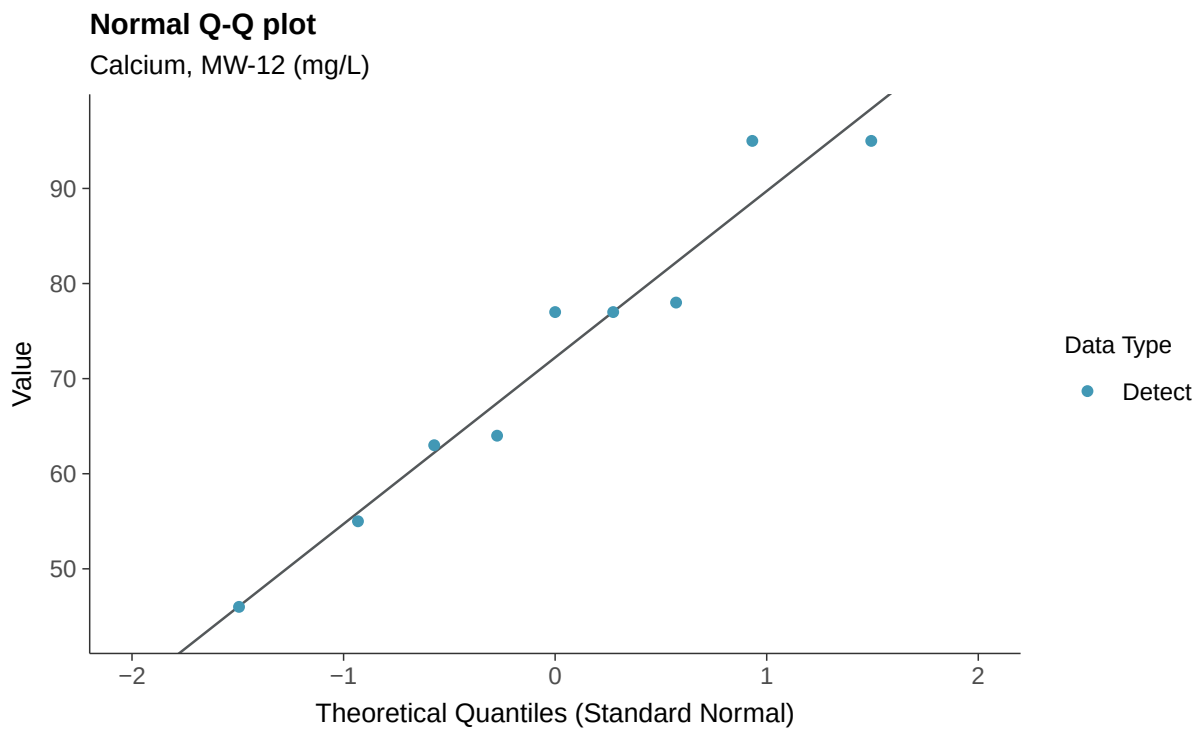
Calcium, MW-12 (mg/L)

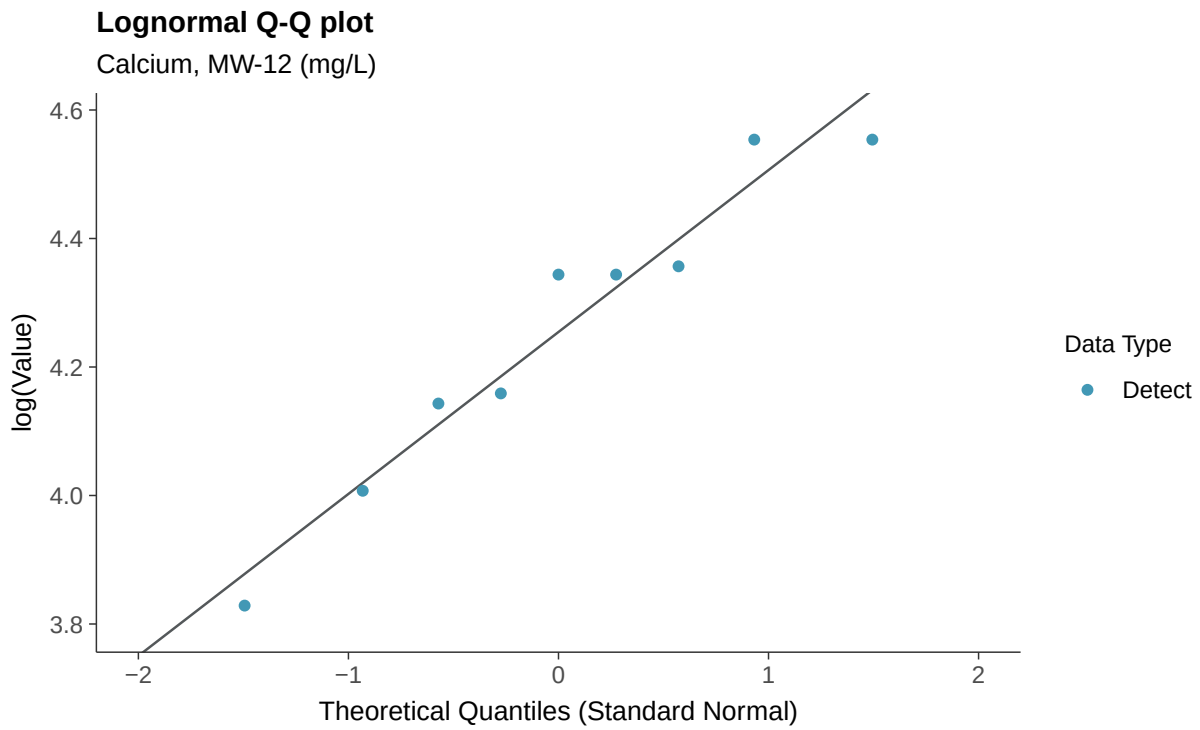


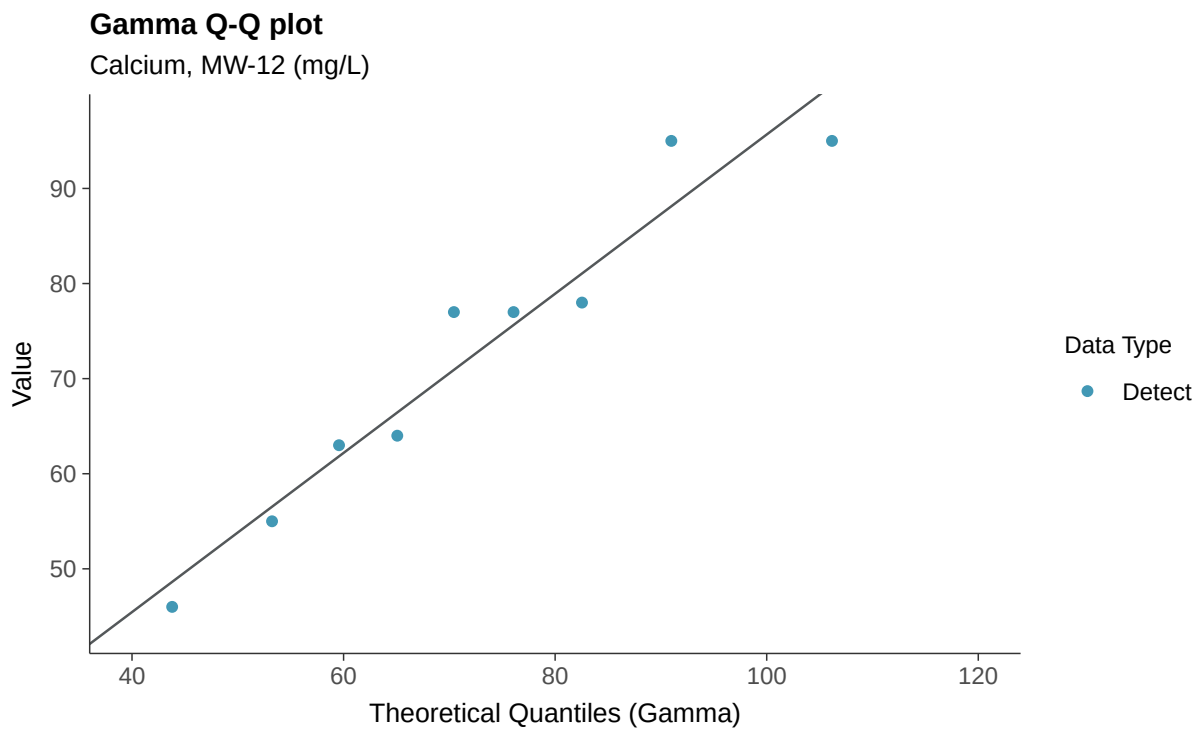
Boxplot by Season

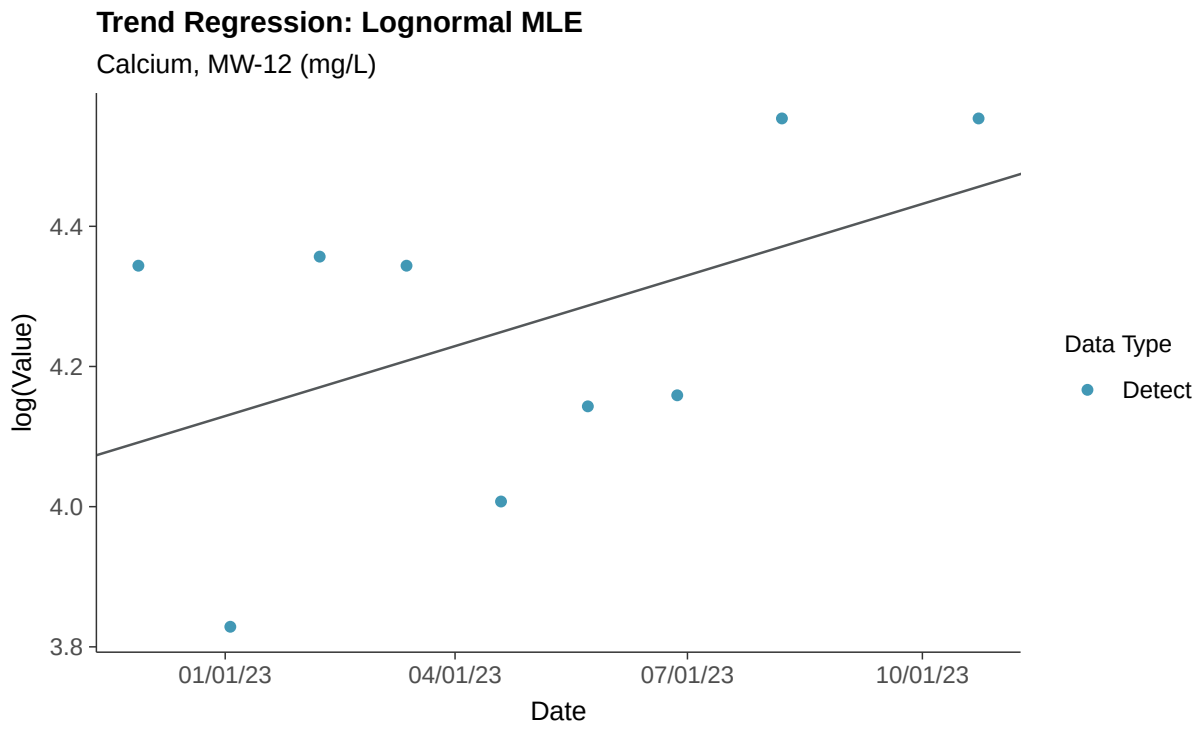
Calcium, MW-12 (mg/L)




Normal Q-Q plot
Calcium, MW-12 (mg/L)
Value
90
80
70
60
50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

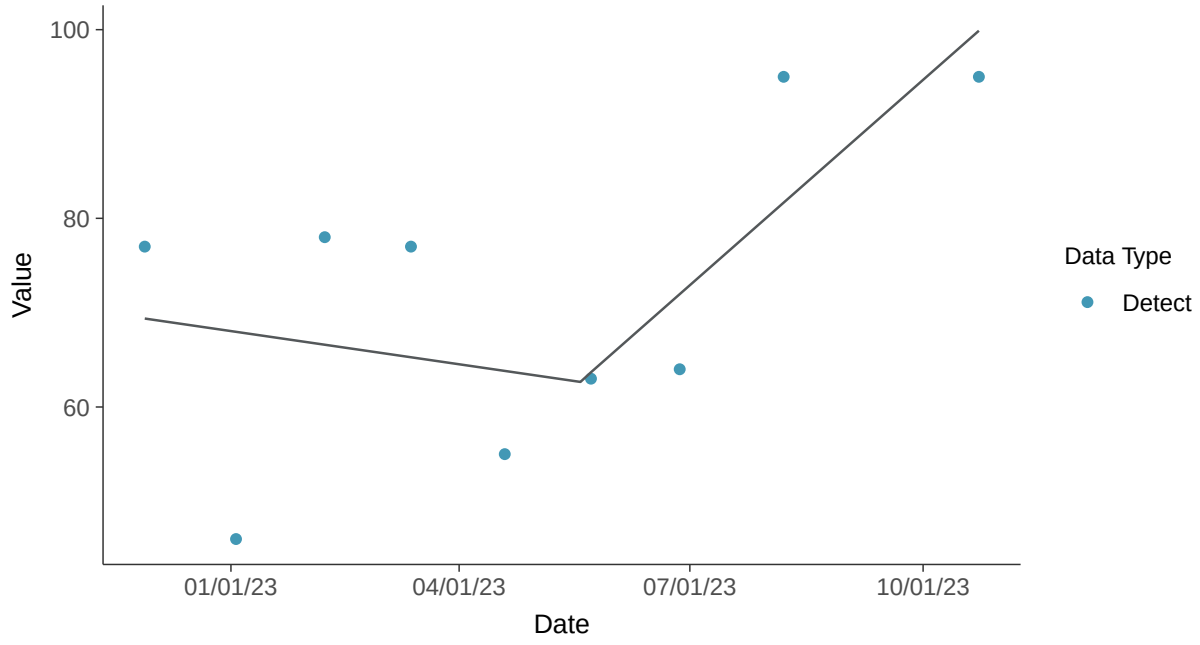

Lognormal Q-Q plot
Calcium, MW-12 (mg/L)
log(Value)
4.6
4.4
4.2
4.0
3.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-12 (mg/L)
Value
90
80
70
60
50
40
60
80
100
120
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-12 (mg/L)
log(Value)
4.4
4.2
4.0
3.8
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

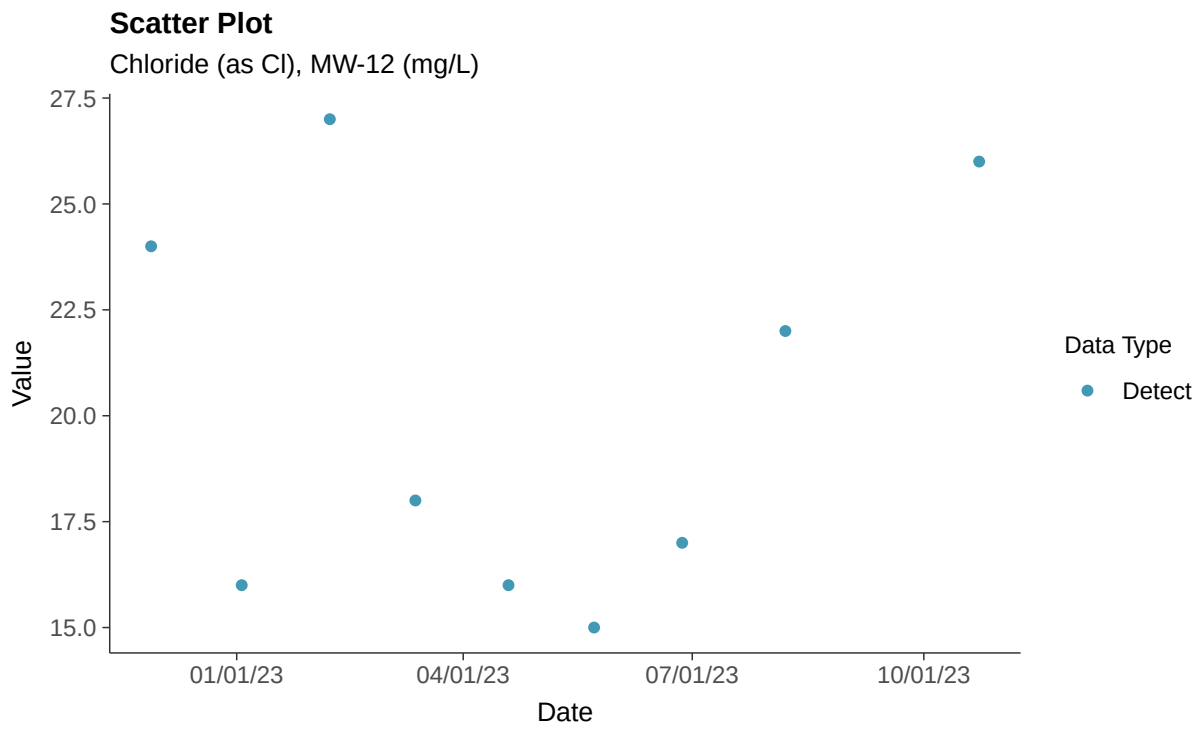
Trend Regression: Piecewise Linear-Linear

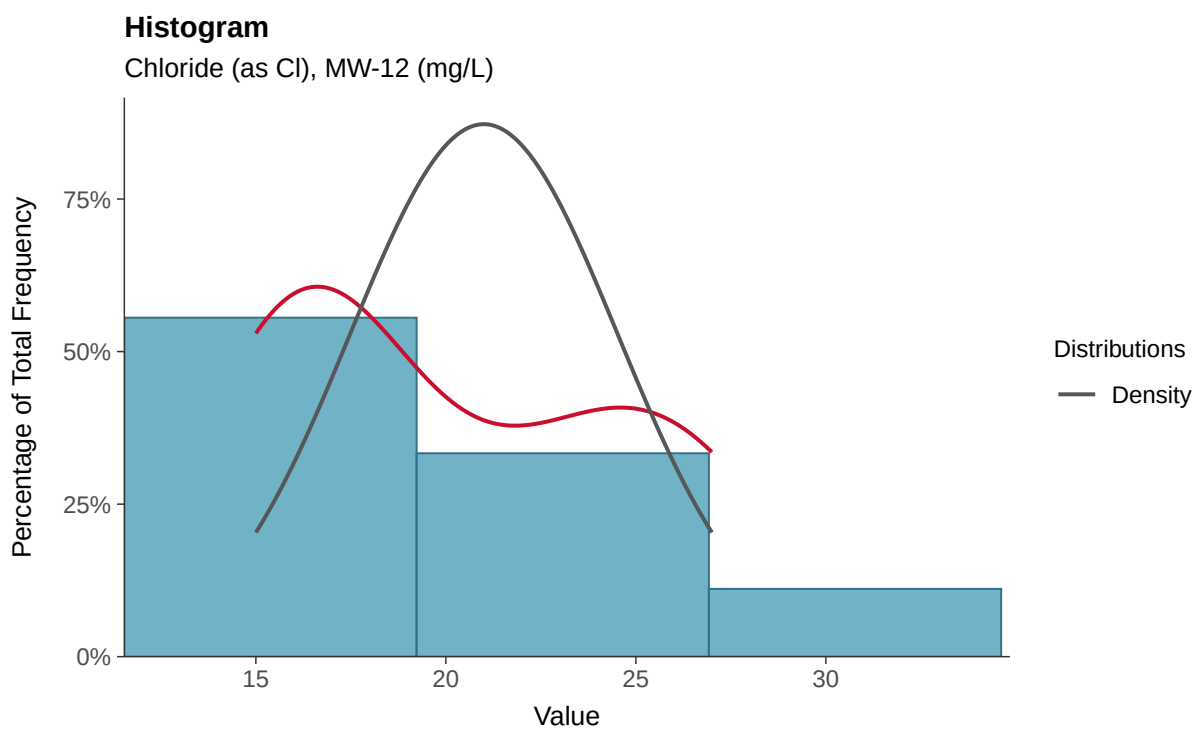
Calcium, MW-12 (mg/L)



Appendix III: Chloride (as Cl), MW-12

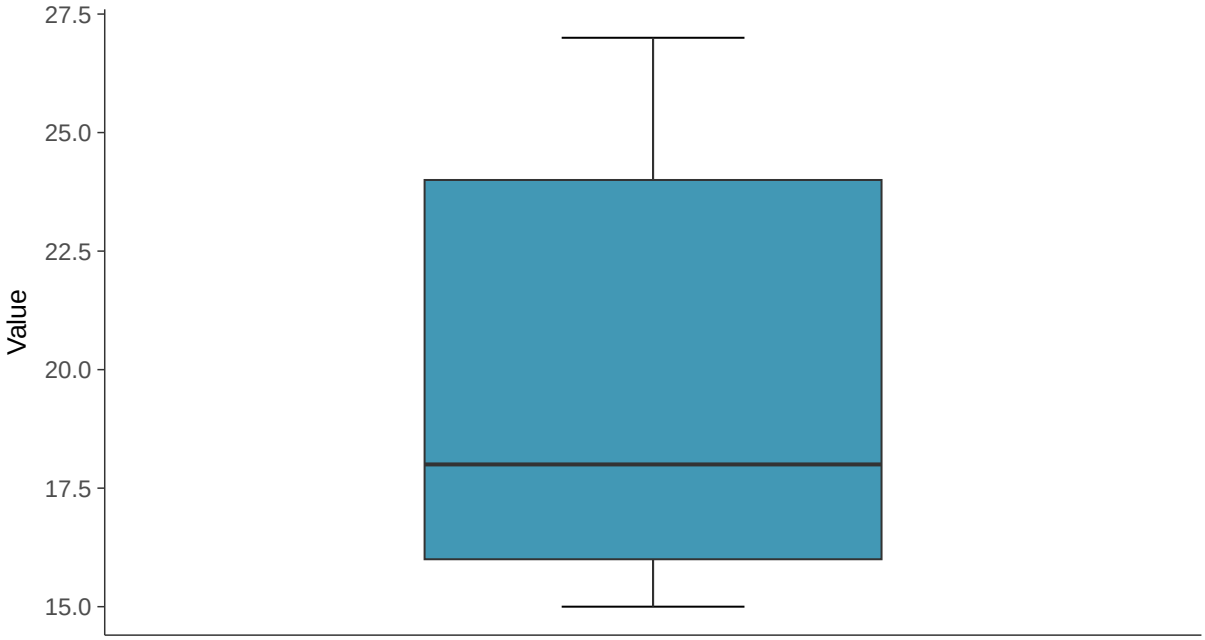
ID: 2_21_4_108





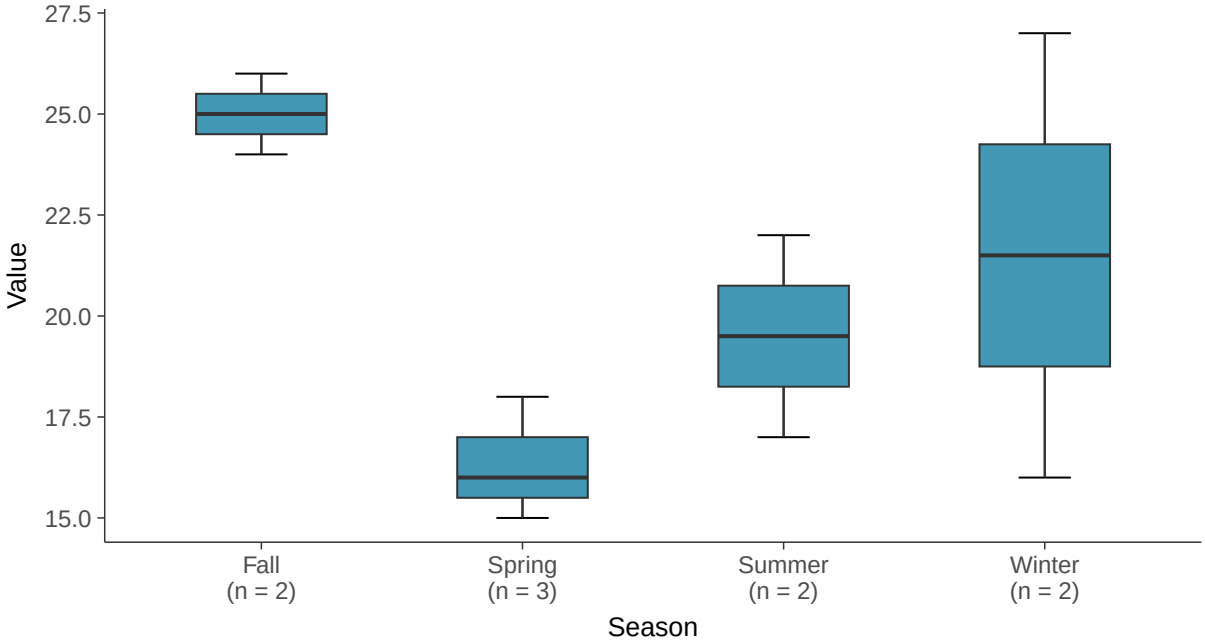
Boxplot

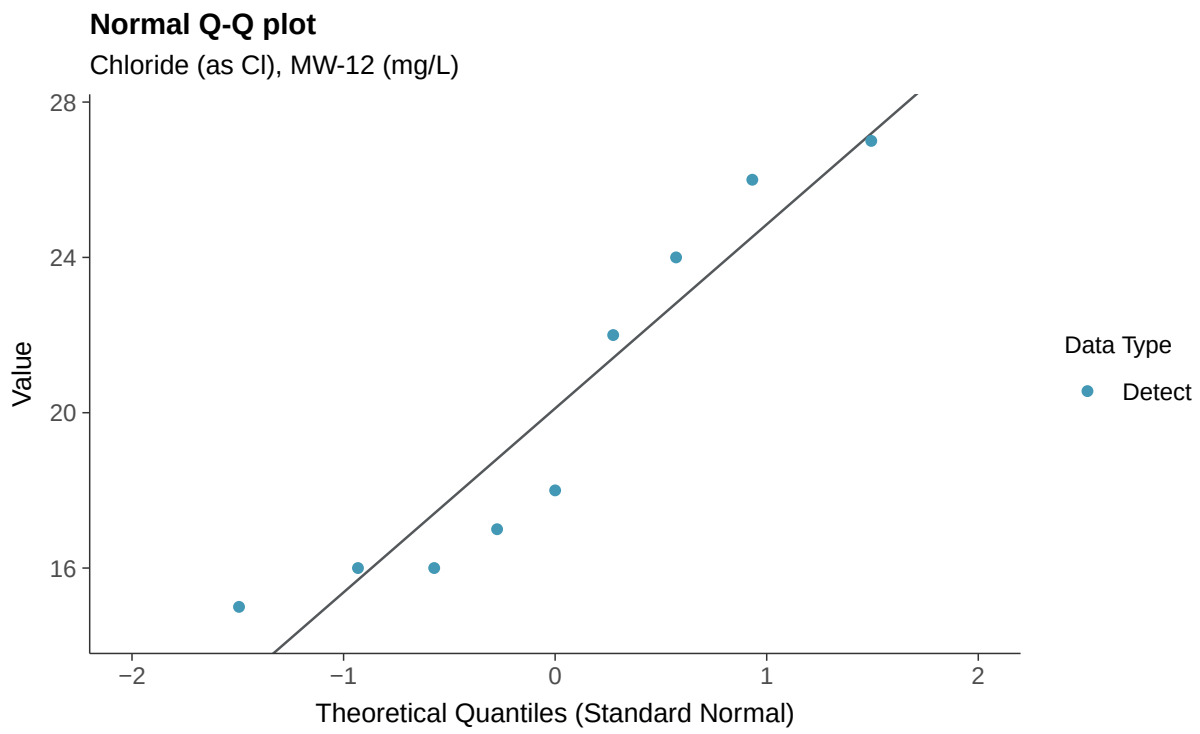
Chloride (as Cl), MW-12 (mg/L)

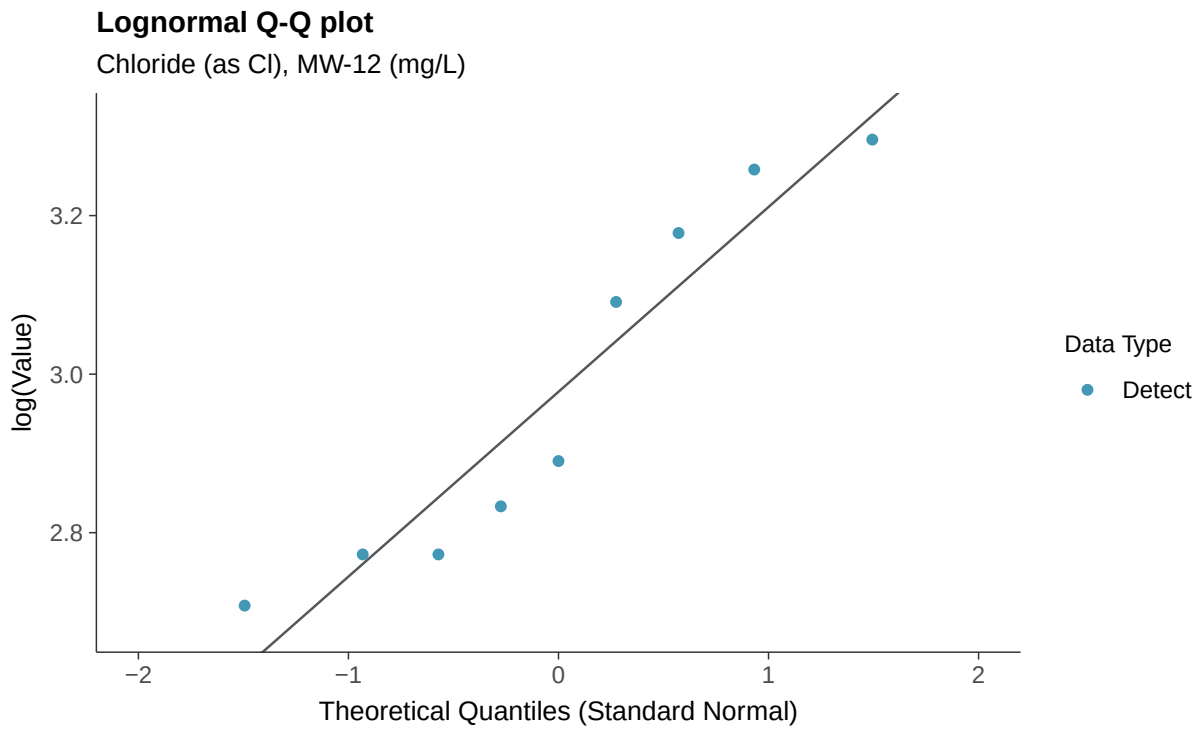


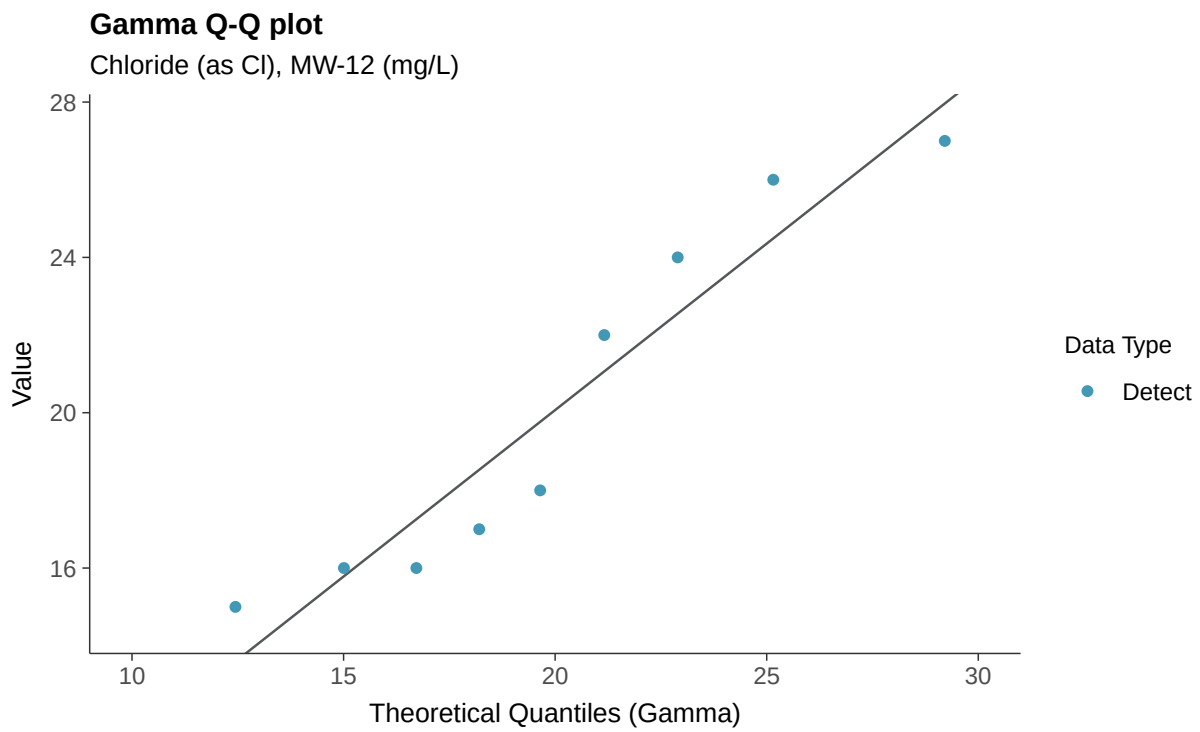
Boxplot by Season

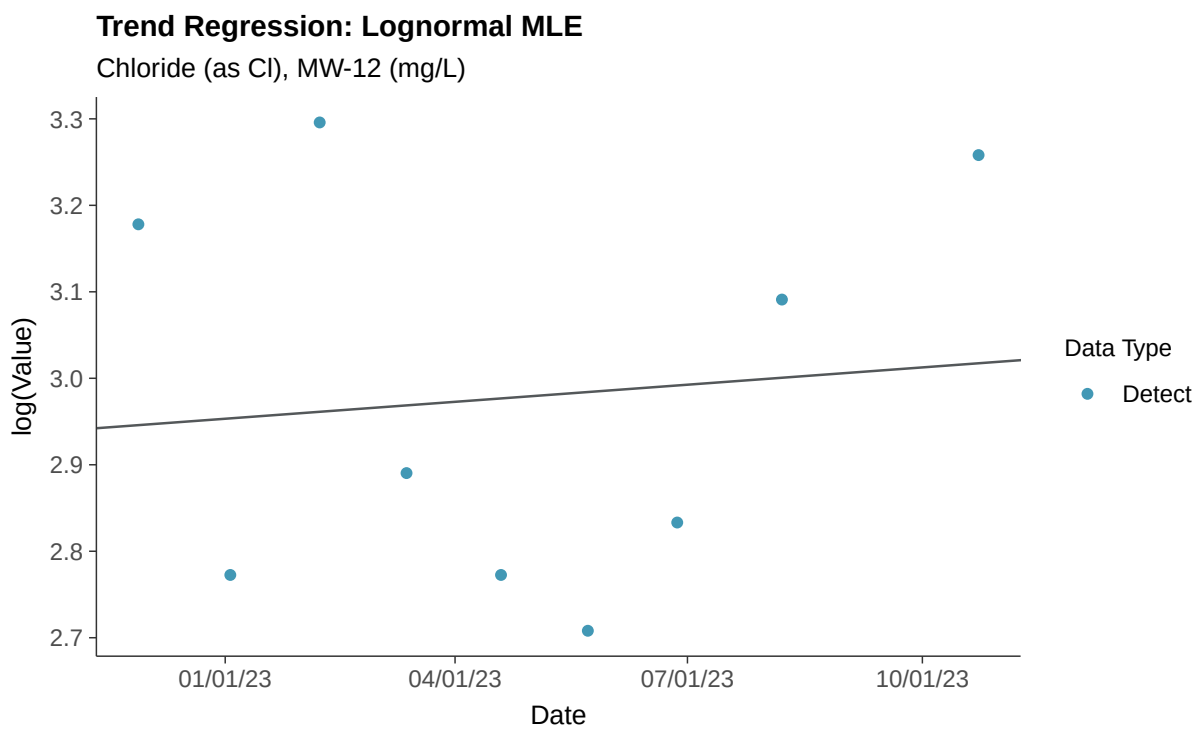
Chloride (as Cl), MW-12 (mg/L)

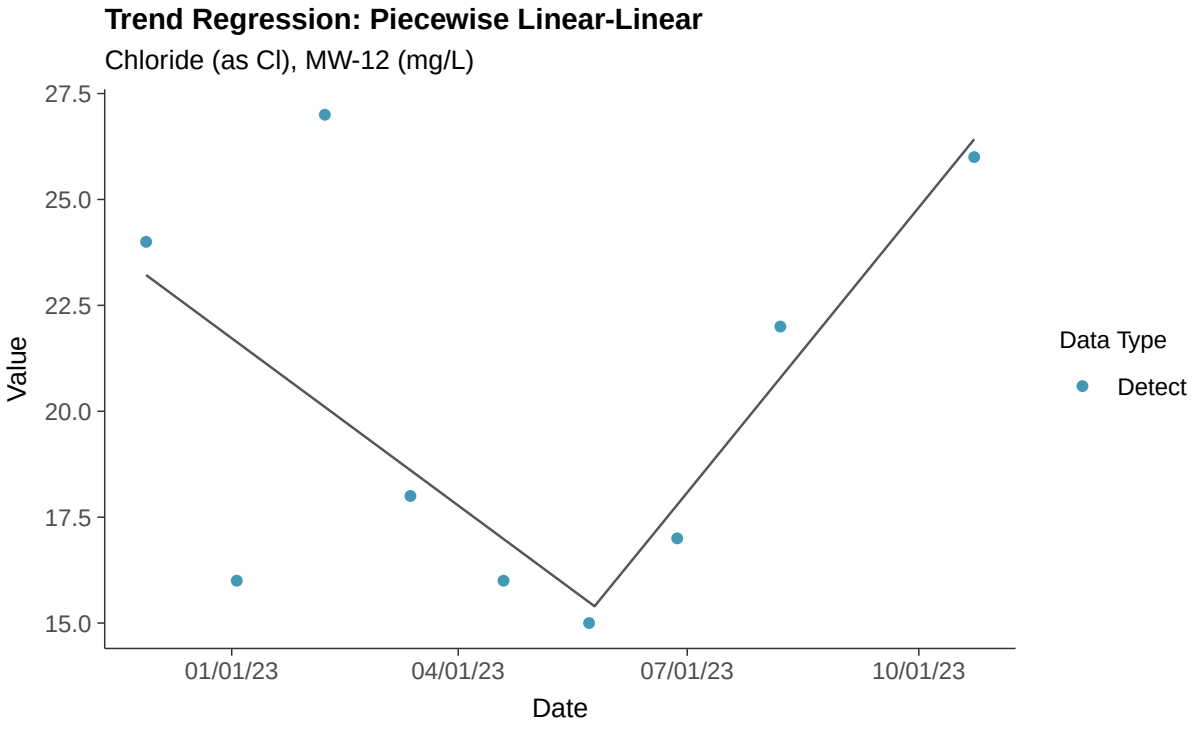



Normal Q-Q plot
Chloride (as Cl), MW-12 (mg/L)
Value
28
24
20
16
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Chloride (as Cl), MW-12 (mg/L)
log(Value)
3.2
3.0
2.8
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

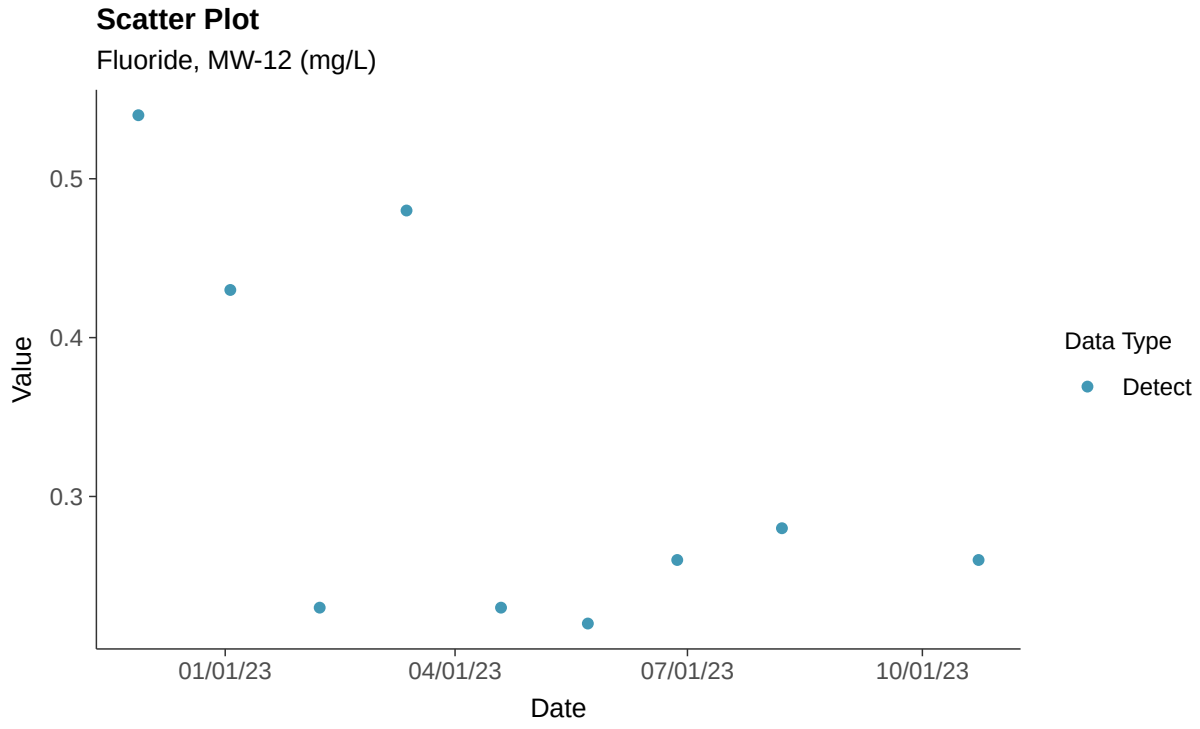

Gamma Q-Q plot
Chloride (as Cl), MW-12 (mg/L)
Value
28
24
20
16
10
15
20
25
30
Theoretical Quantiles (Gamma)
Data Type
Detect

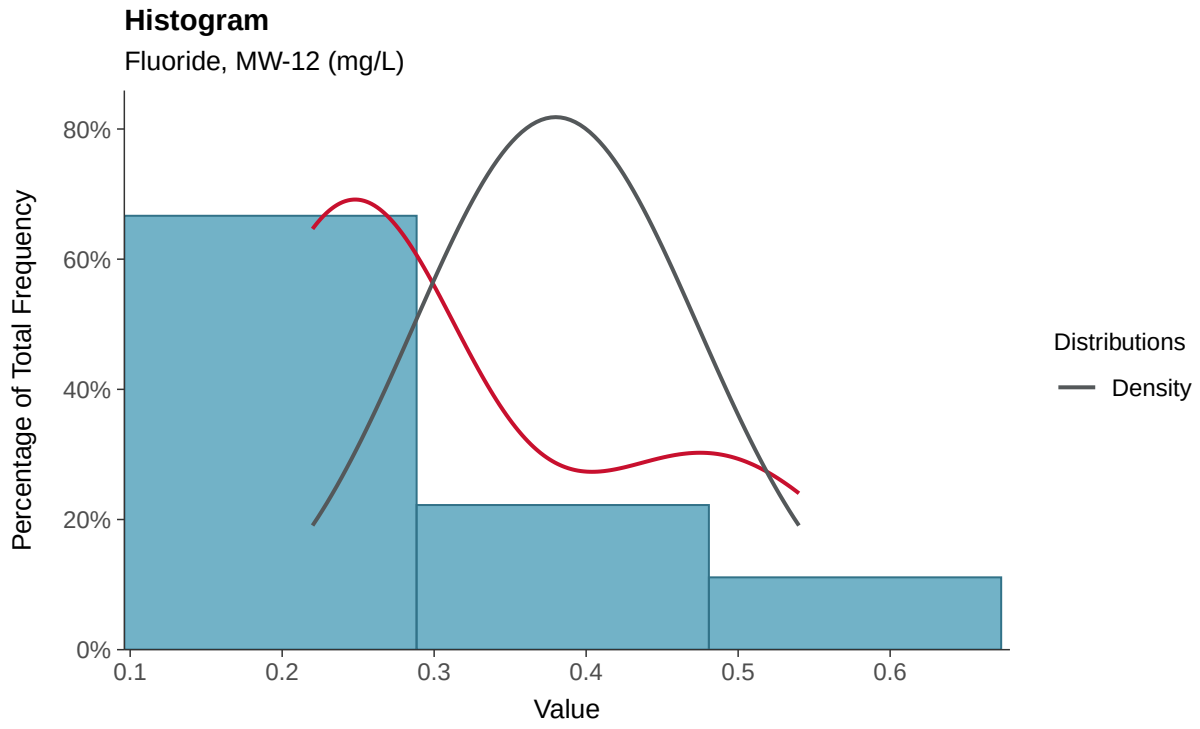

Trend Regression: Lognormal MLE
Chloride (as Cl), MW-12 (mg/L)
log(Value)
3.3
3.2
3.1
3.0
2.9
2.8
2.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Chloride (as Cl), MW-12 (mg/L)
27.5
25.0
22.5
20.0
17.5
15.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Fluoride, MW-12

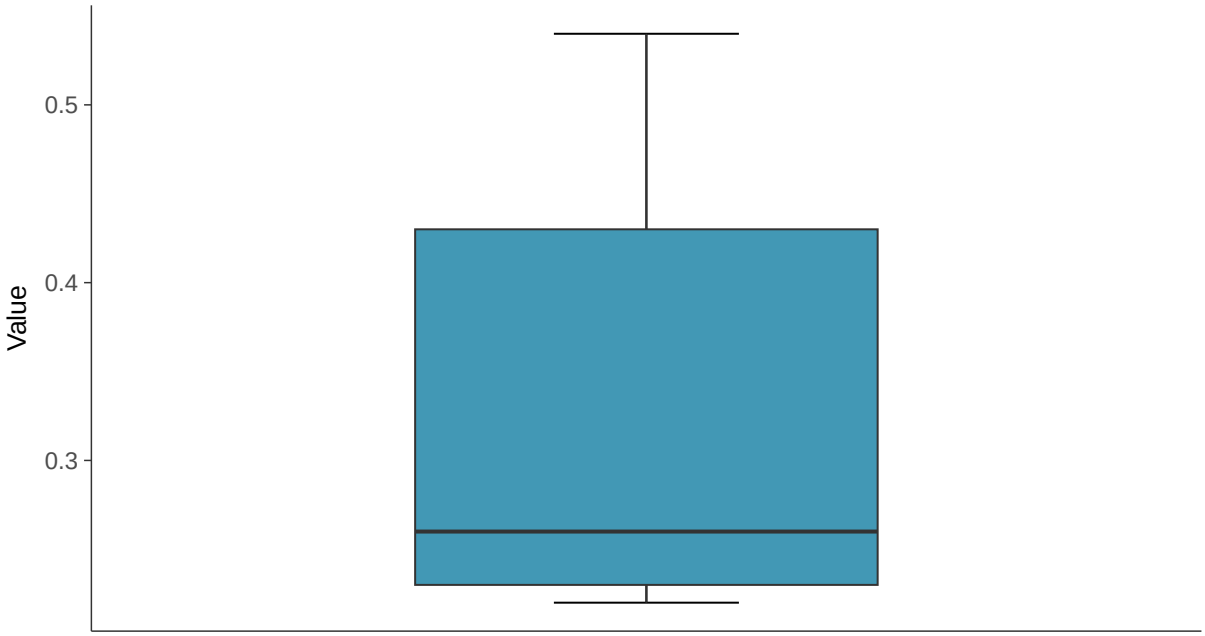
ID: 2_21_4_112





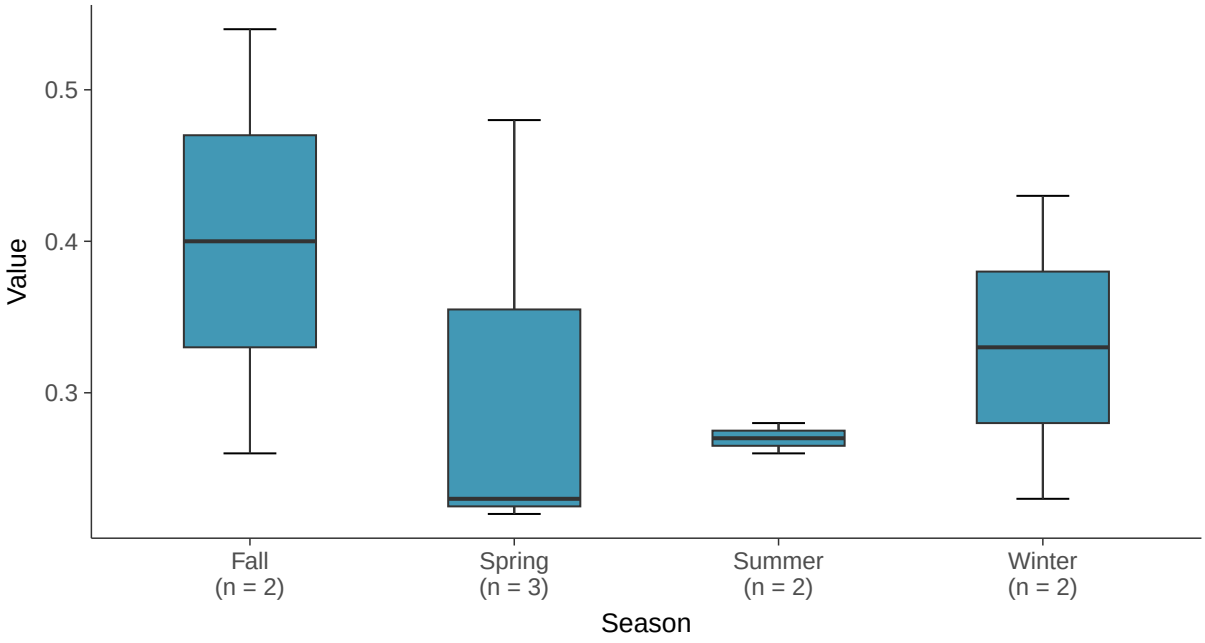
Boxplot

Fluoride, MW-12 (mg/L)



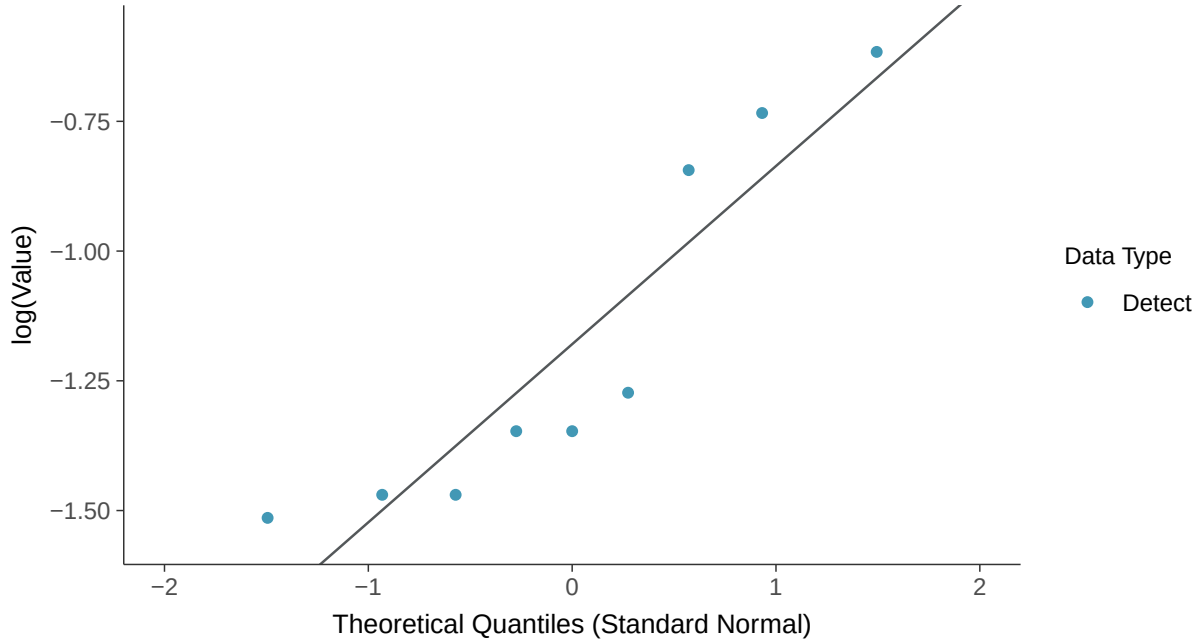
Boxplot by Season

Fluoride, MW-12 (mg/L)



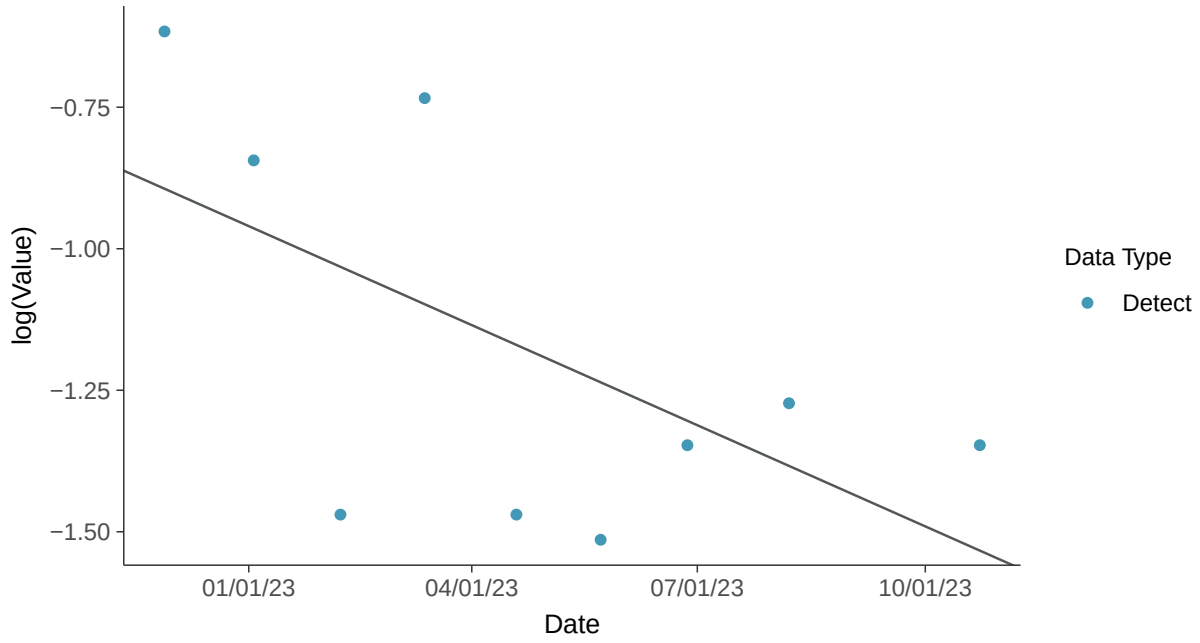
Lognormal Q-Q plot

Fluoride, MW-12 (mg/L)



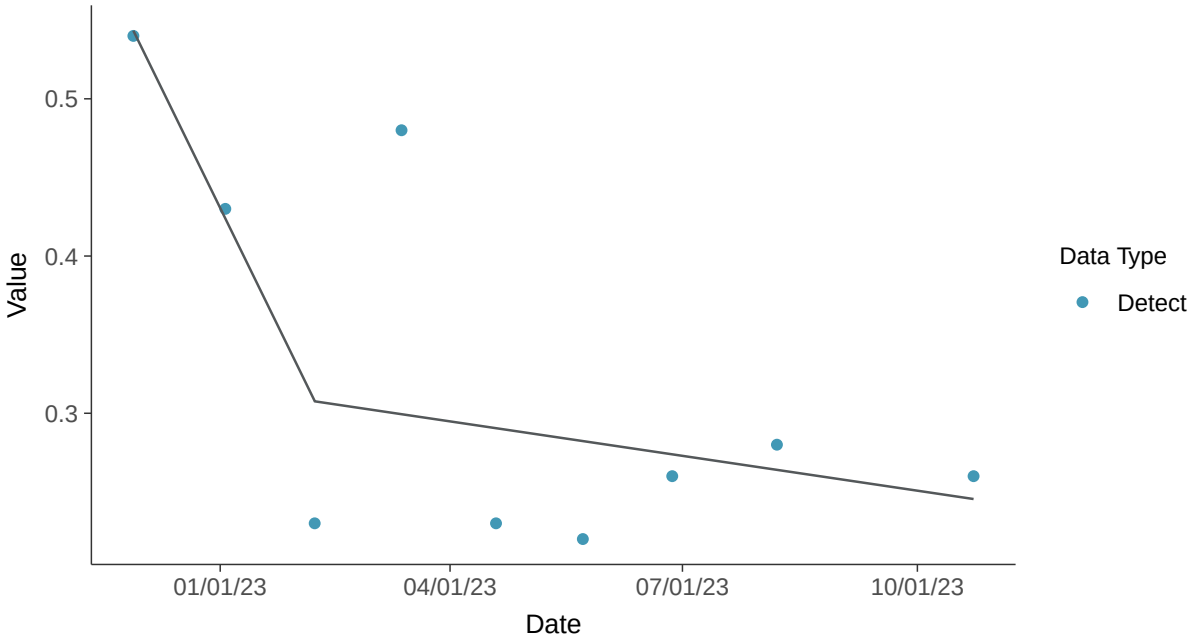
Trend Regression: Lognormal MLE

Fluoride, MW-12 (mg/L)



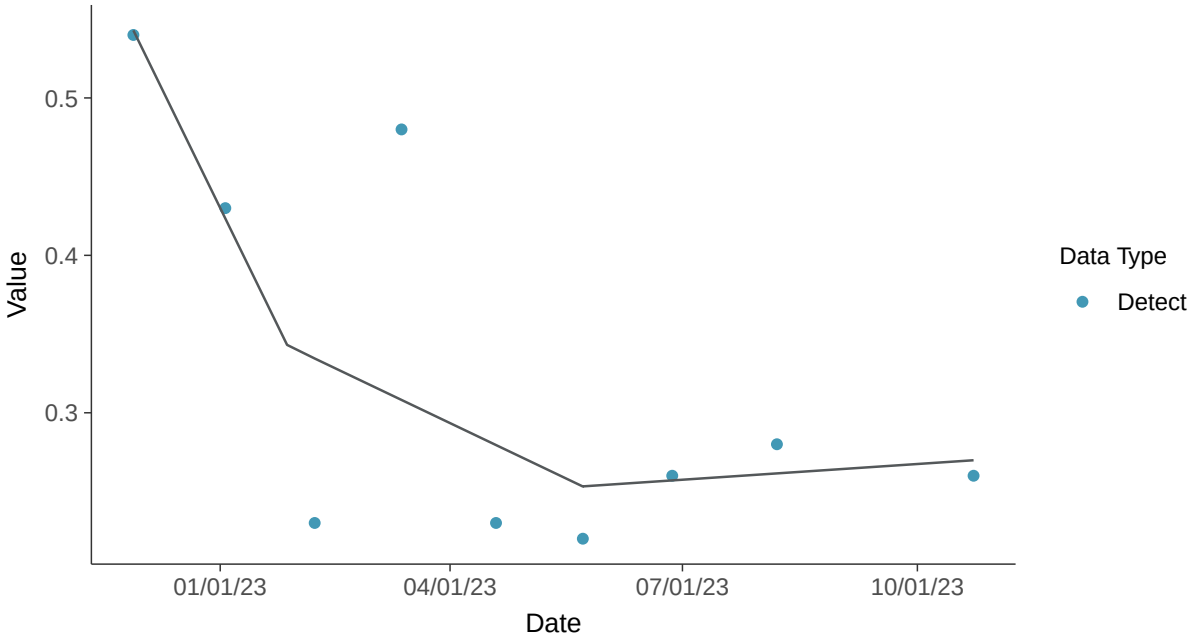
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-12 (mg/L)



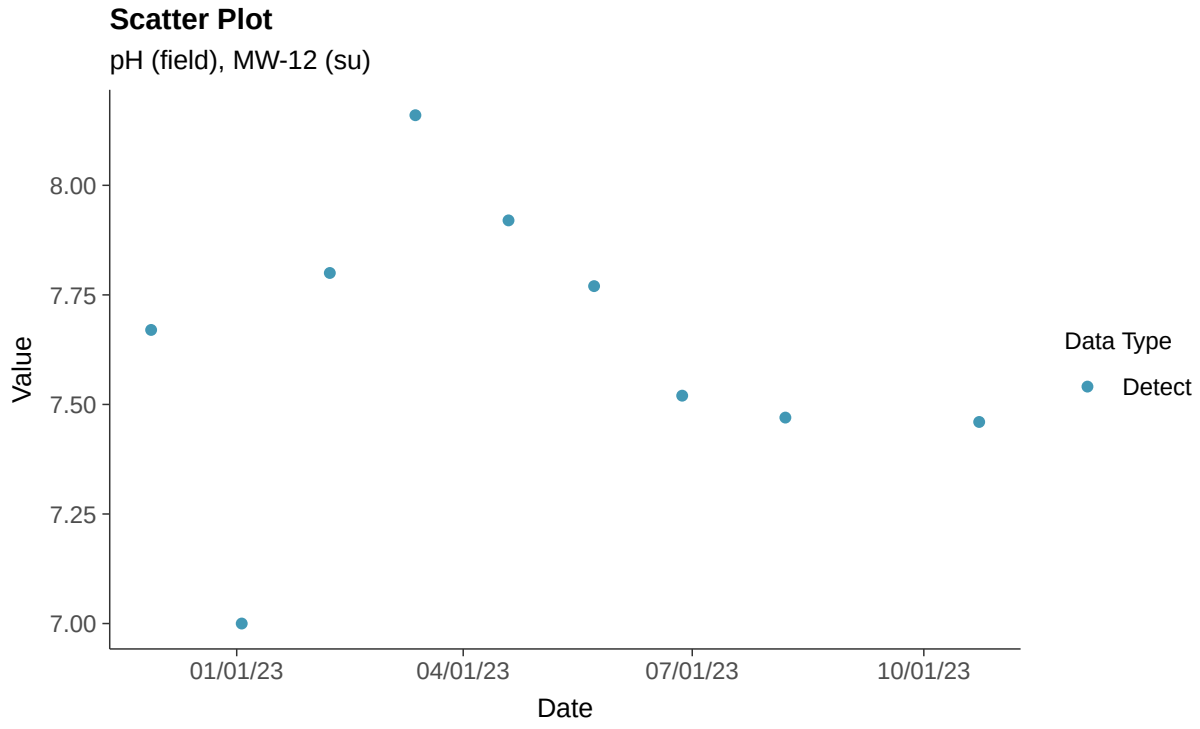
Trend Regression: Piecewise Linear-Linear-Linear

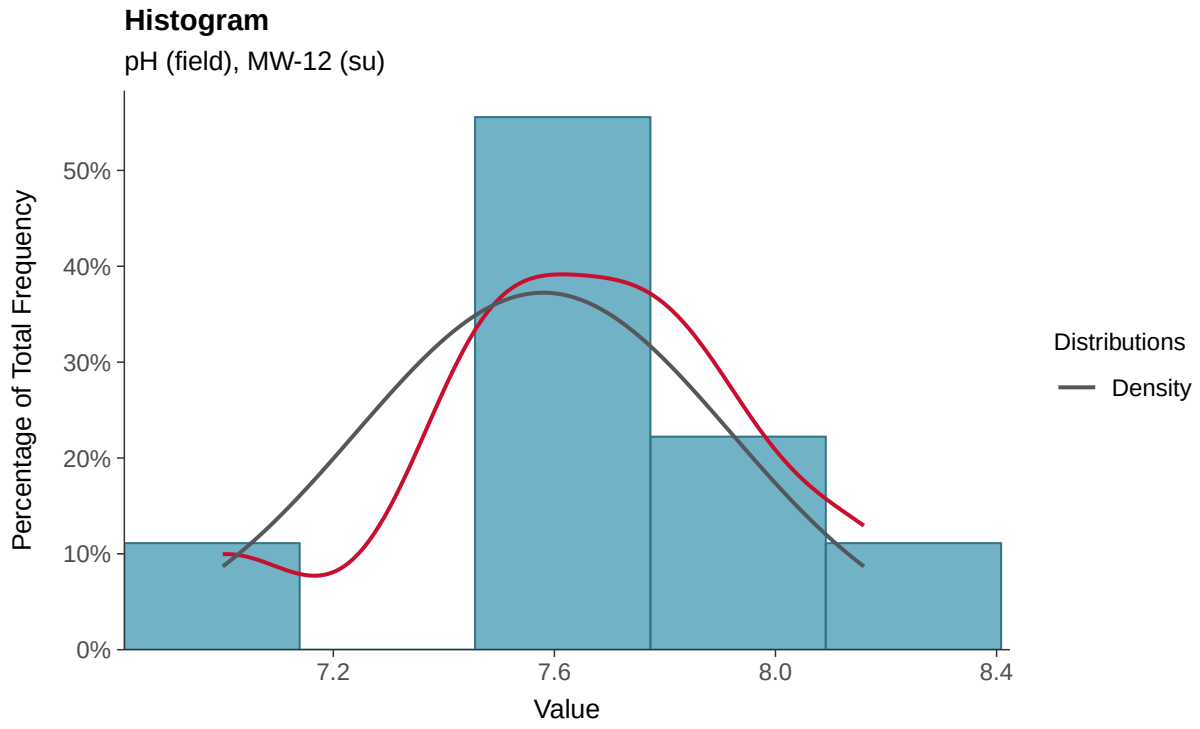
Fluoride, MW-12 (mg/L)



Appendix III: pH (field), MW-12

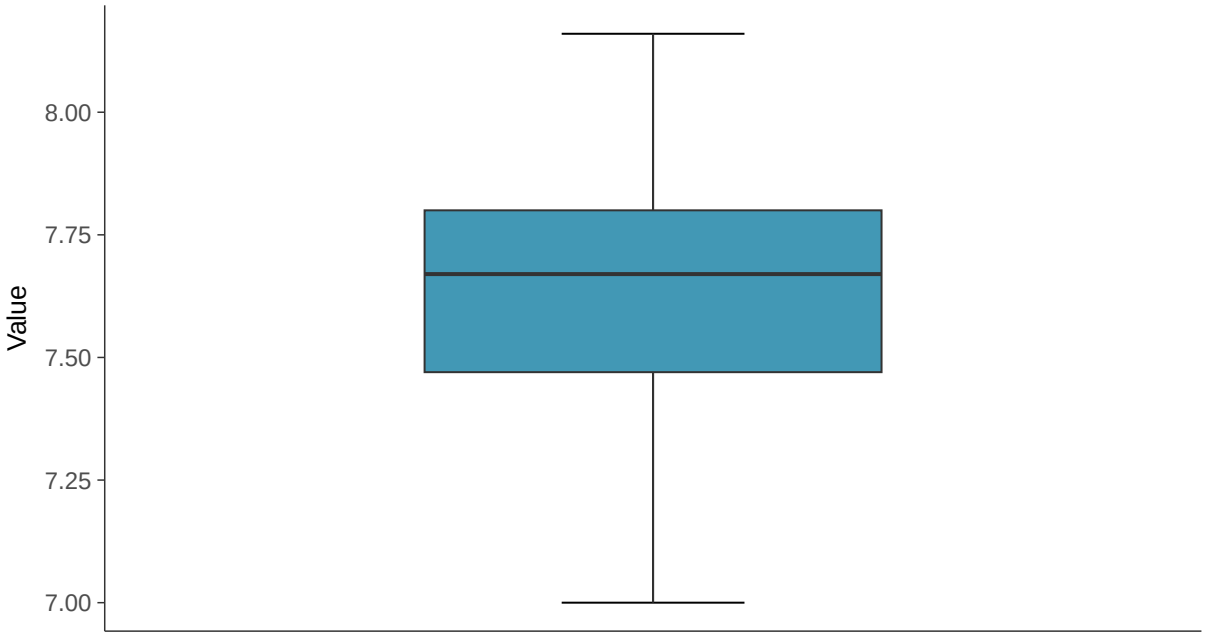
ID: 2_21_4_120





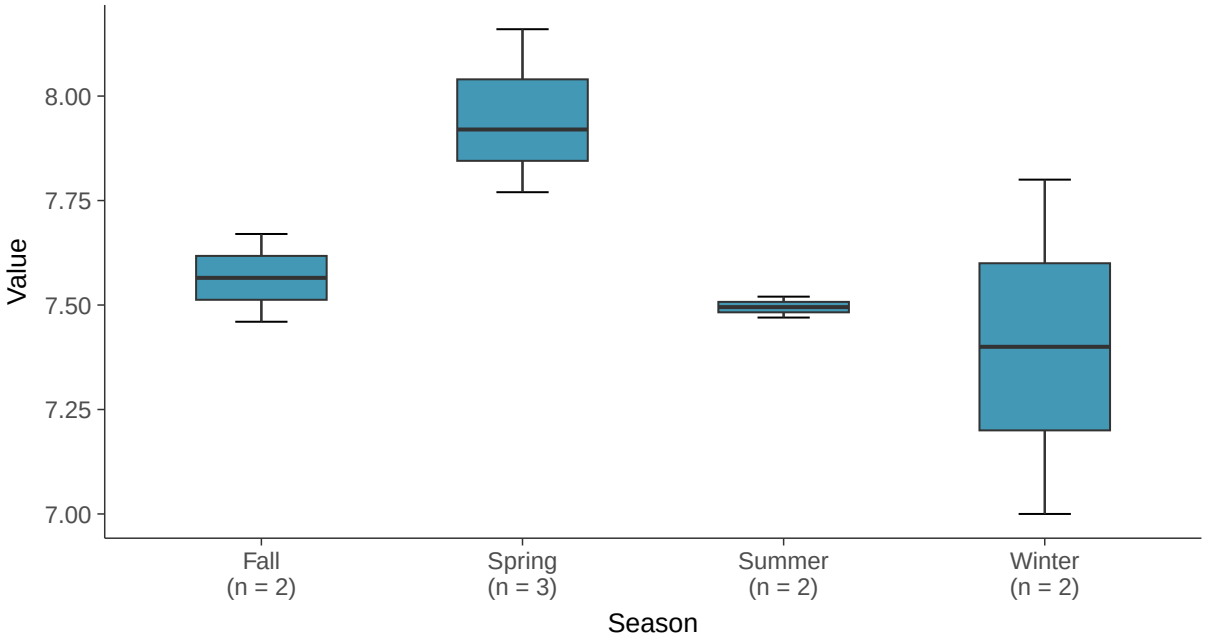
Boxplot

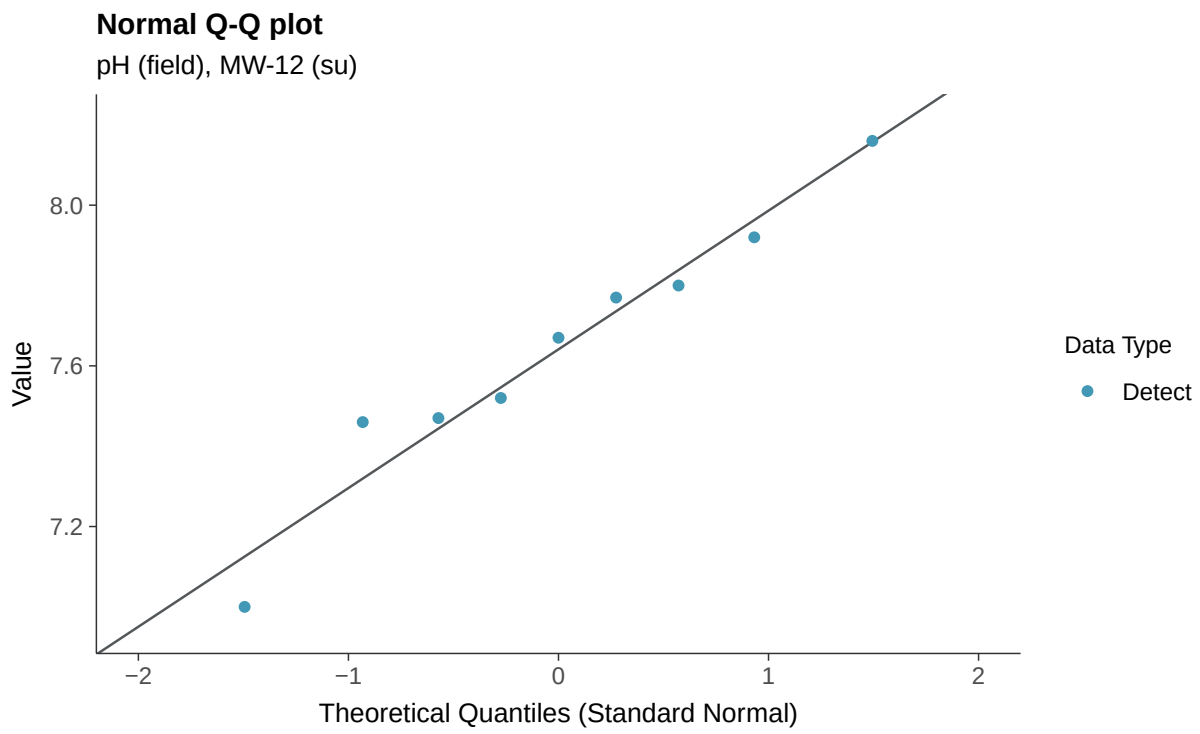
pH (field), MW-12 (su)

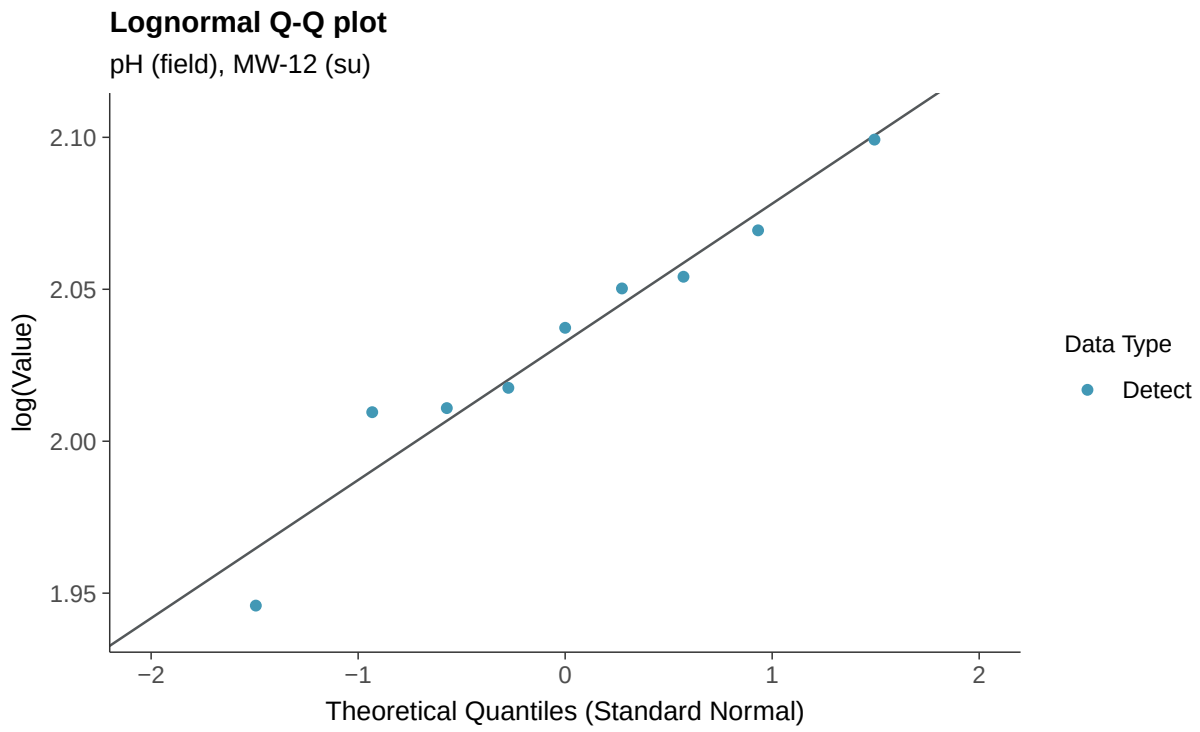


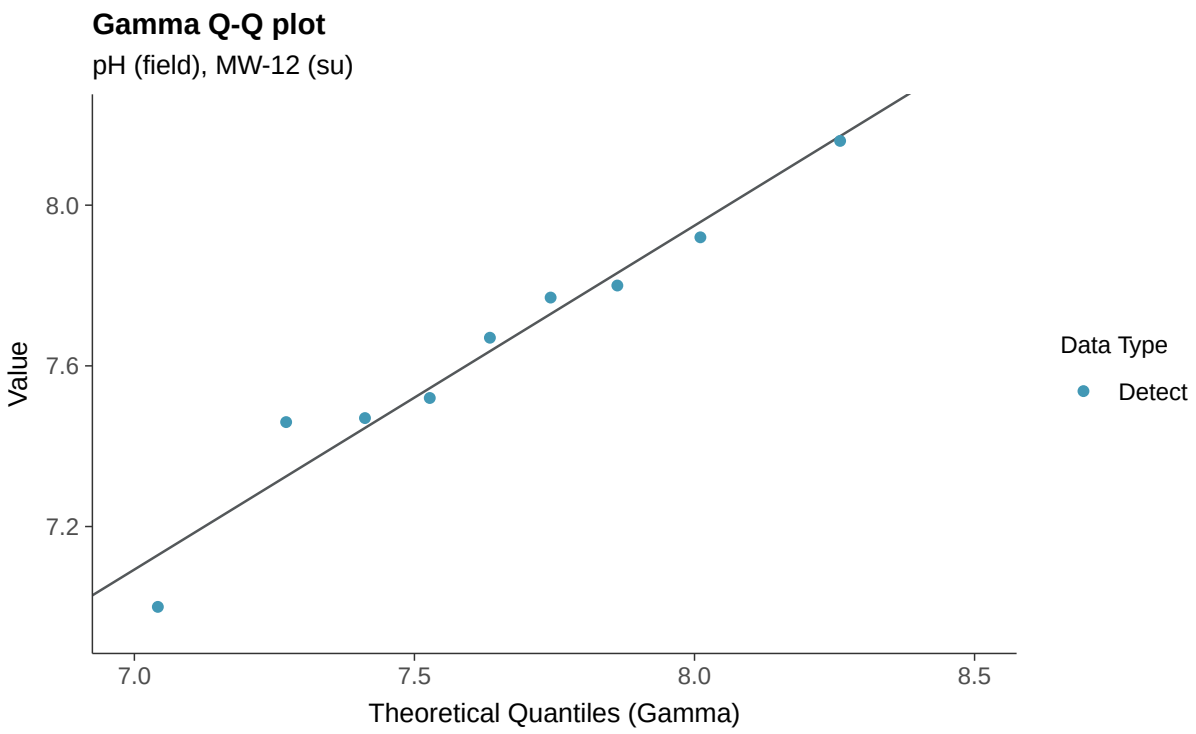
Boxplot by Season

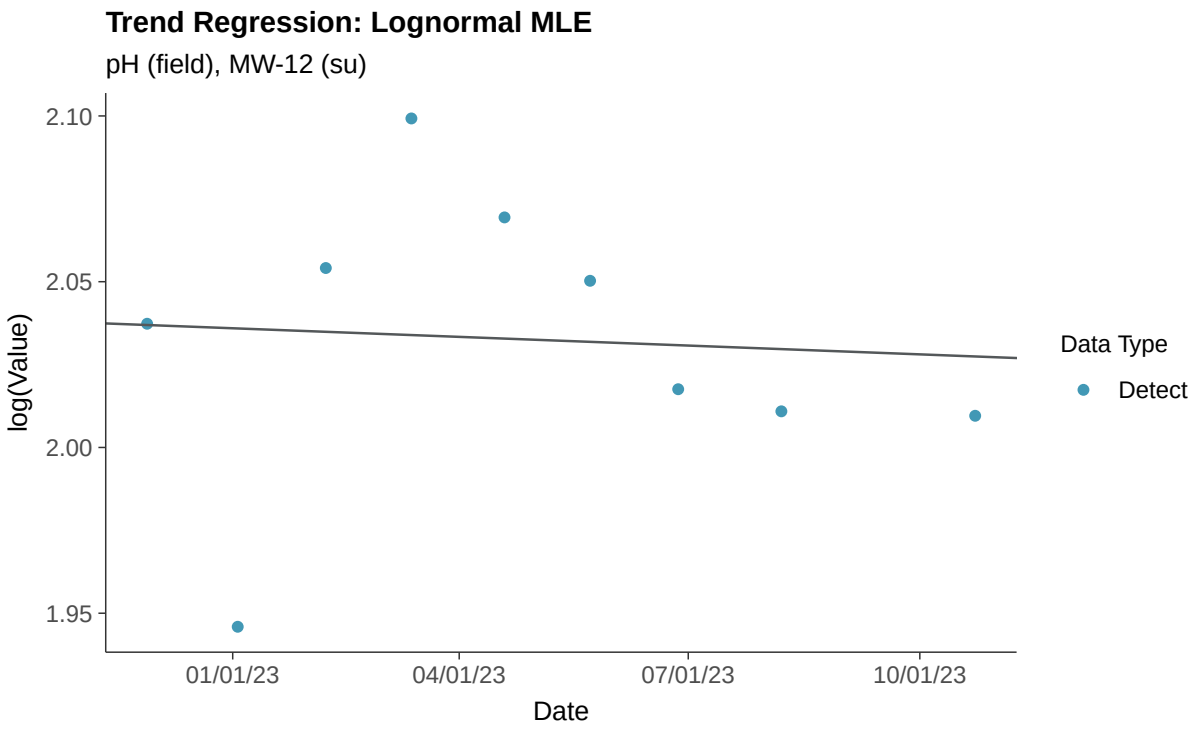
pH (field), MW-12 (su)




Normal Q-Q plot
pH (field), MW-12 (su)
Value
8.0
7.6
7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

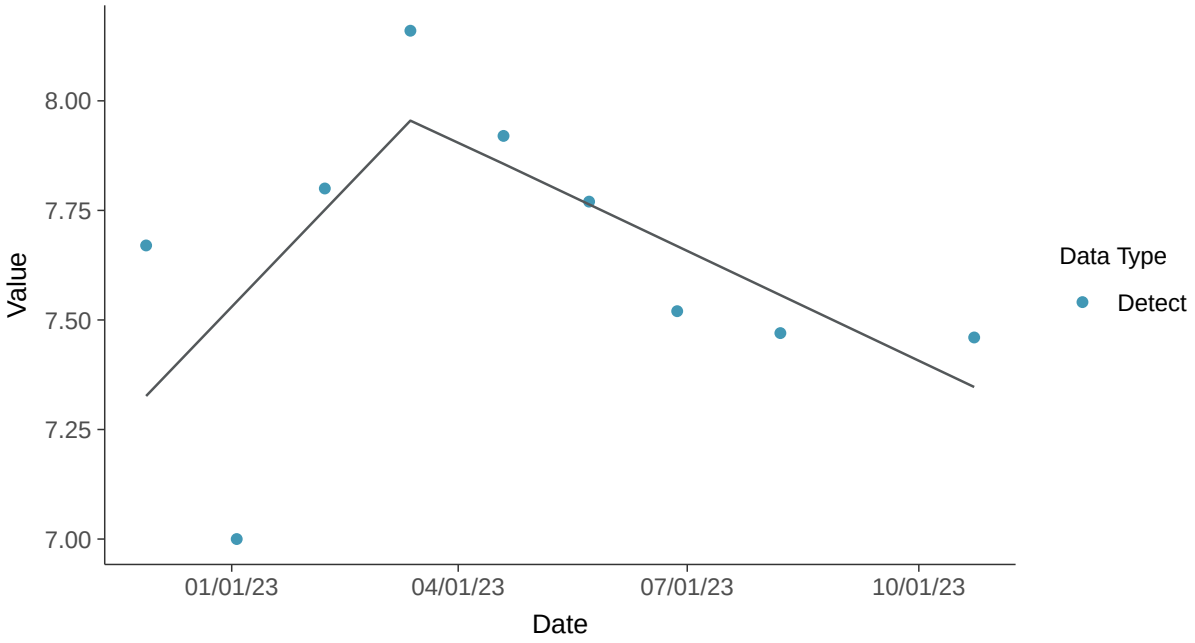

Lognormal Q-Q plot
pH (field), MW-12 (su)
log(Value)
2.10
2.05
2.00
1.95
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
pH (field), MW-12 (su)
Value
8.0
7.6
7.2
7.0
7.5
8.0
8.5
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
pH (field), MW-12 (su)
log(Value)
2.10
2.05
2.00
1.95
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

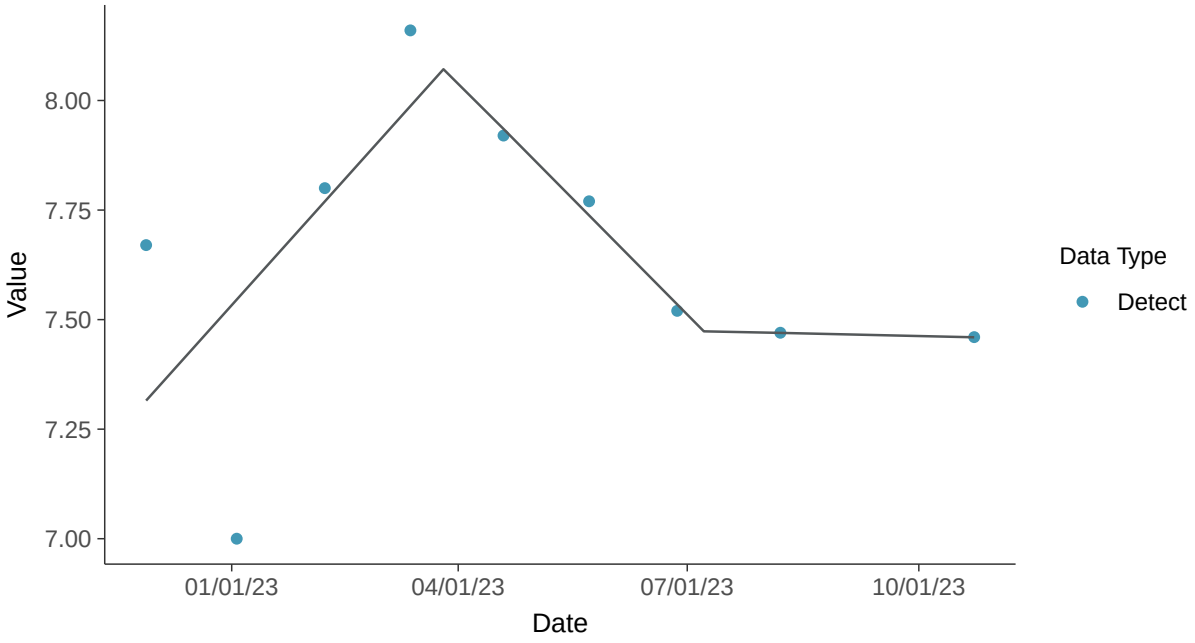
Trend Regression: Piecewise Linear-Linear

pH (field), MW-12 (su)



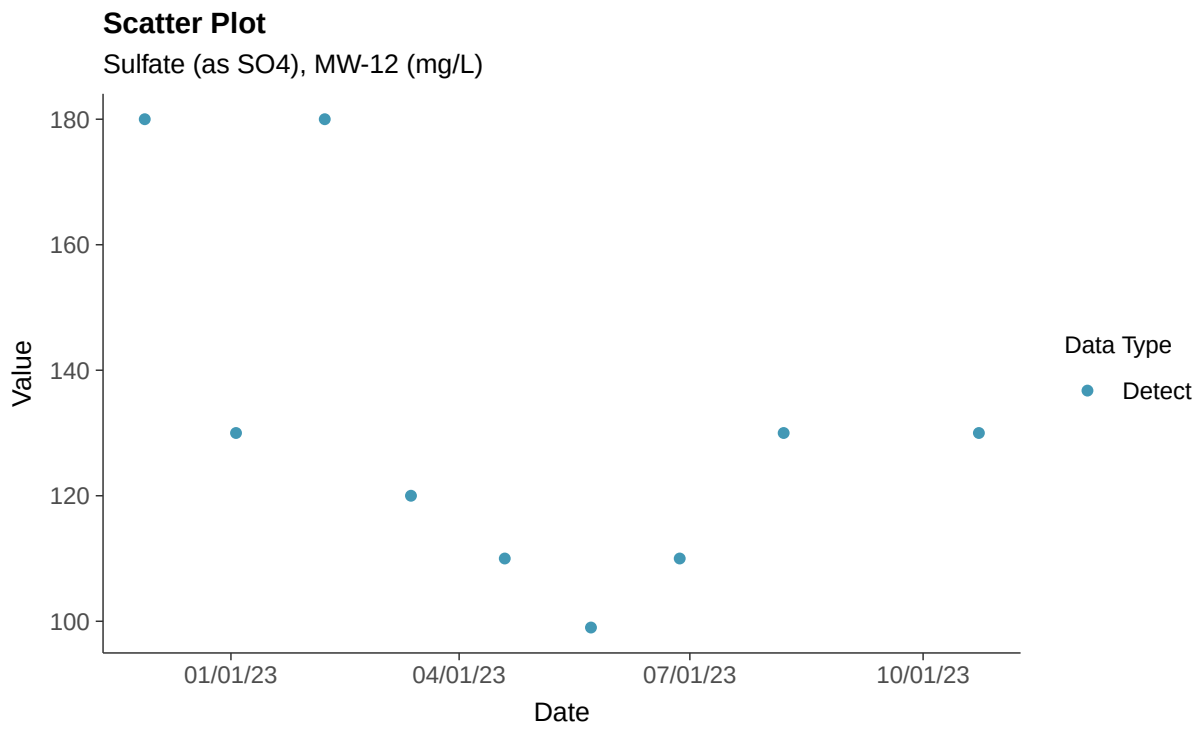
Trend Regression: Piecewise Linear-Linear-Linear

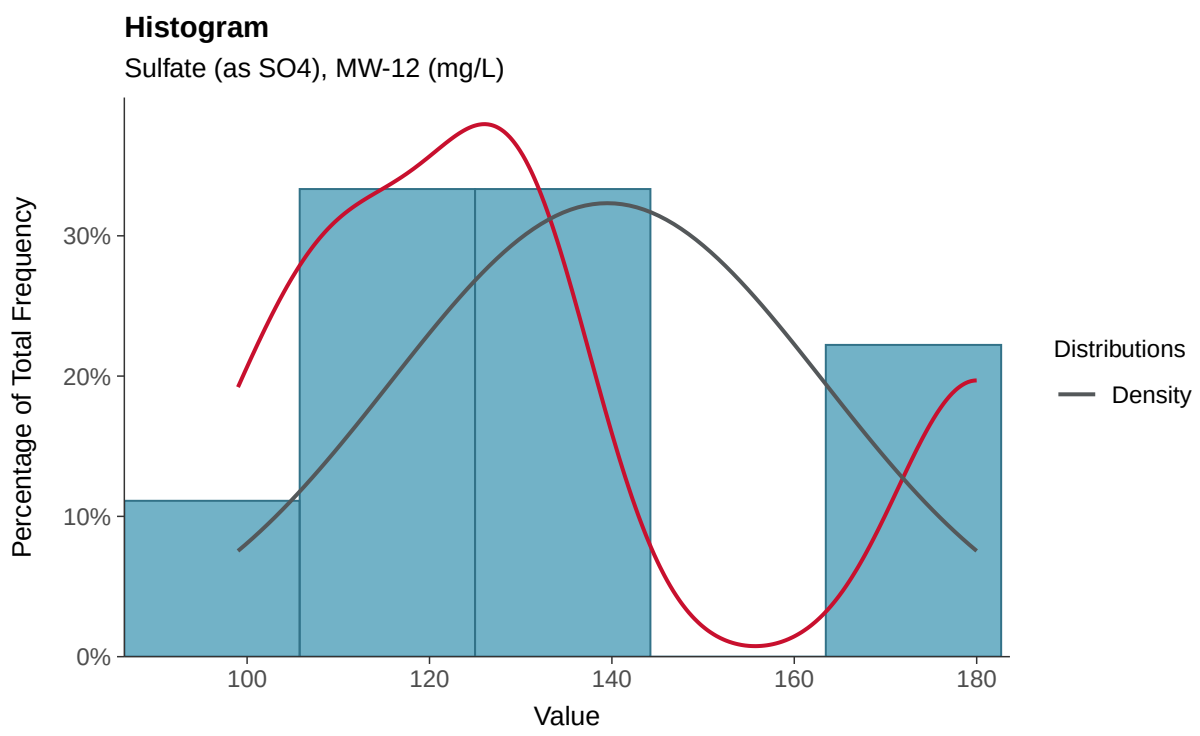
pH (field), MW-12 (su)



Appendix III: Sulfate (as SO4), MW-12

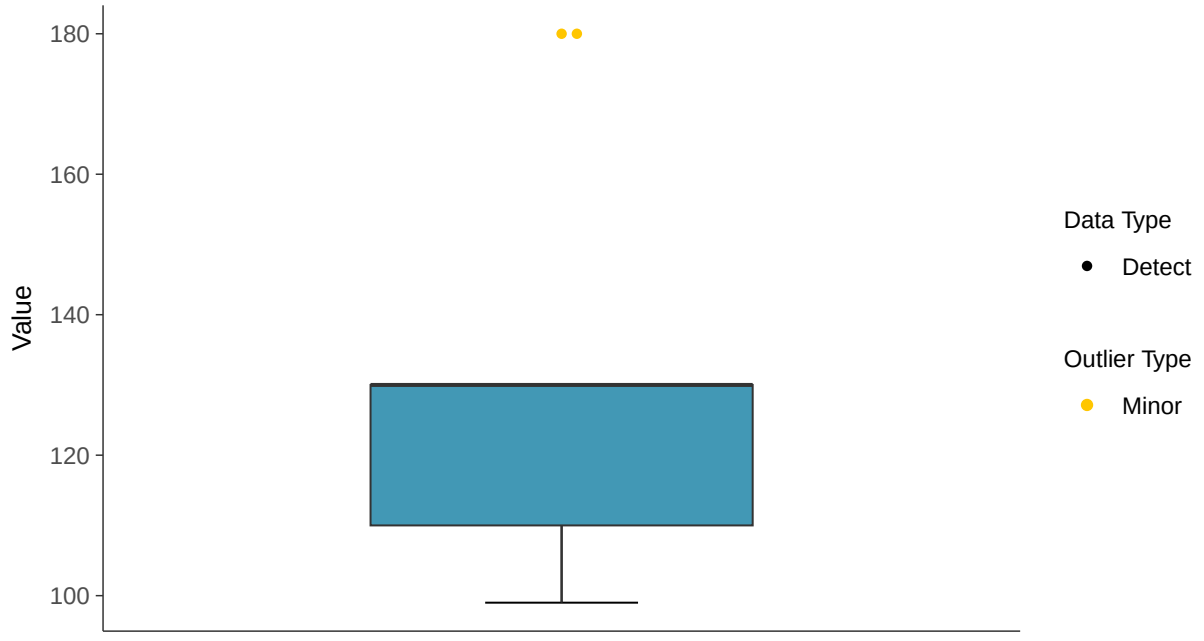
ID: 2_21_4_124





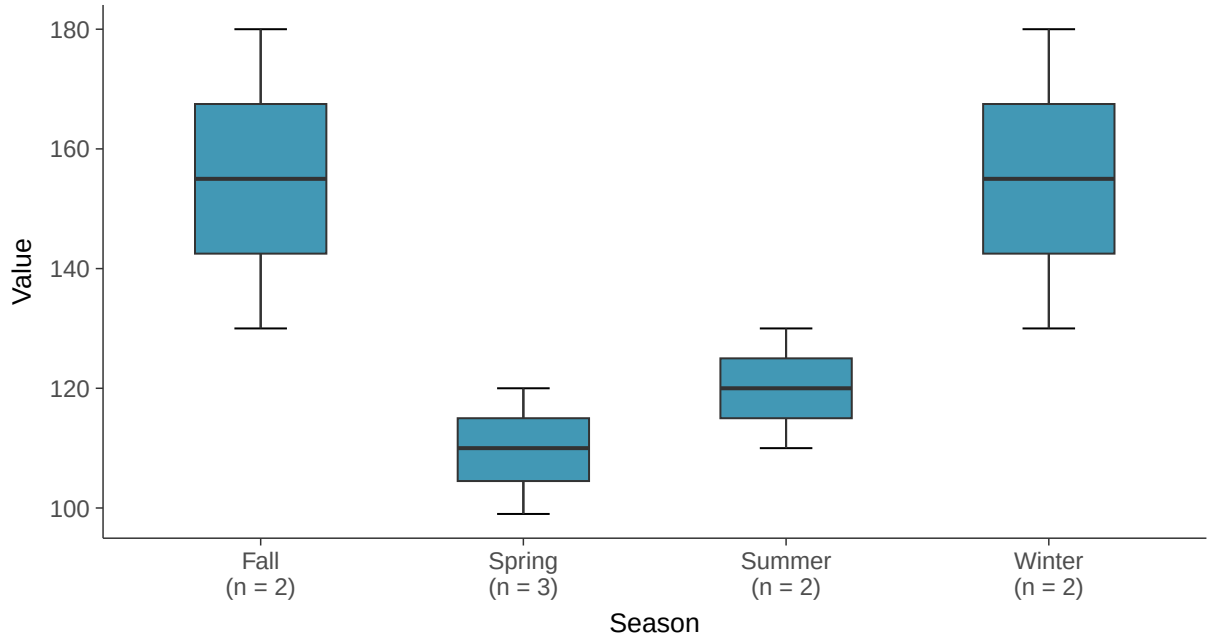
Boxplot

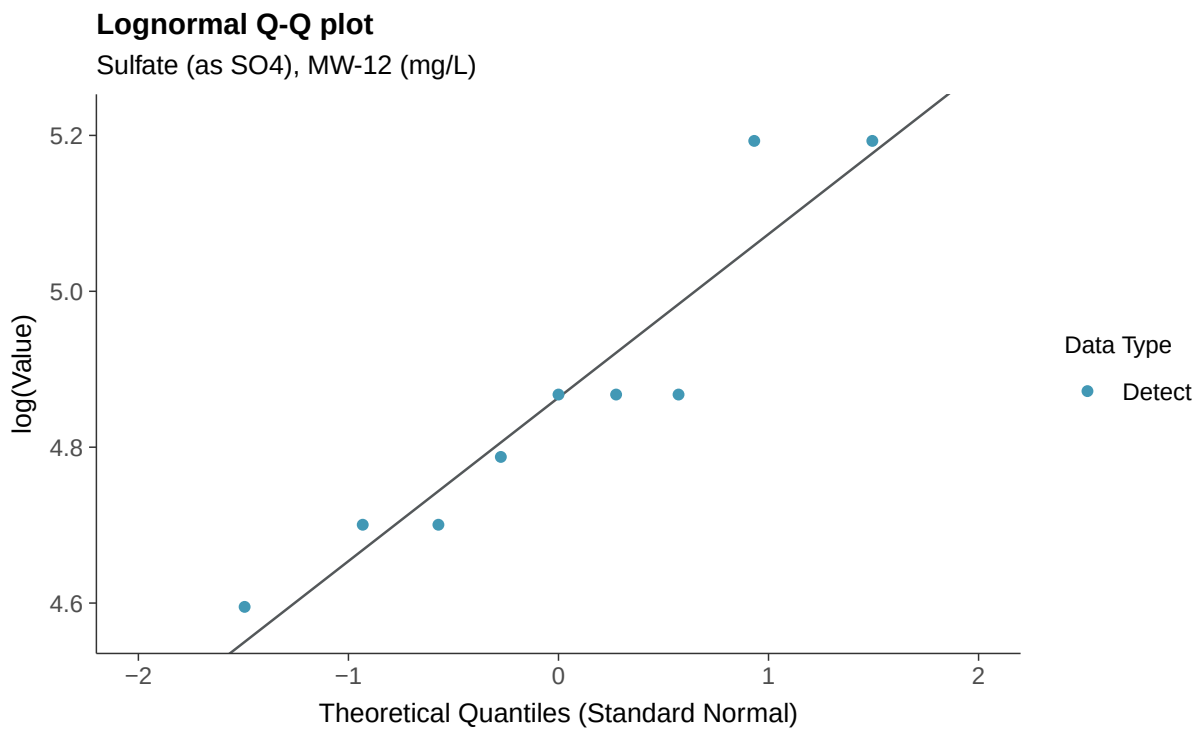
Sulfate (as SO4), MW-12 (mg/L)

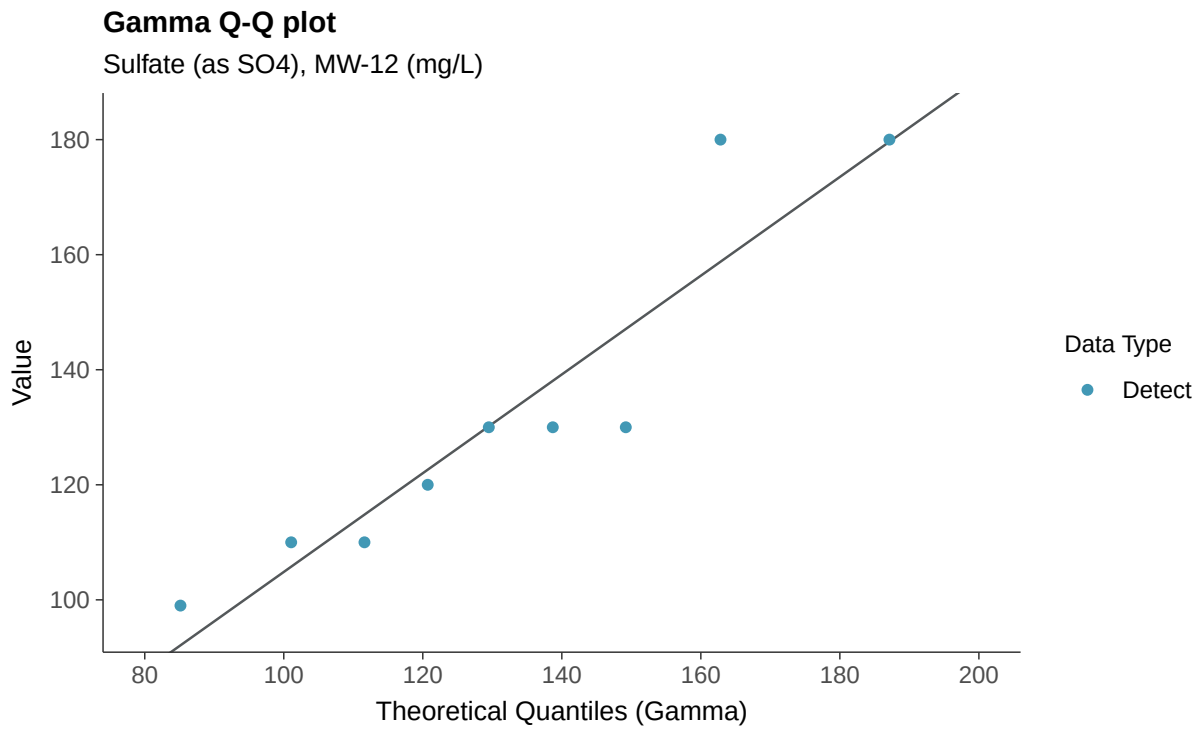


Boxplot by Season

Sulfate (as SO4), MW-12 (mg/L)

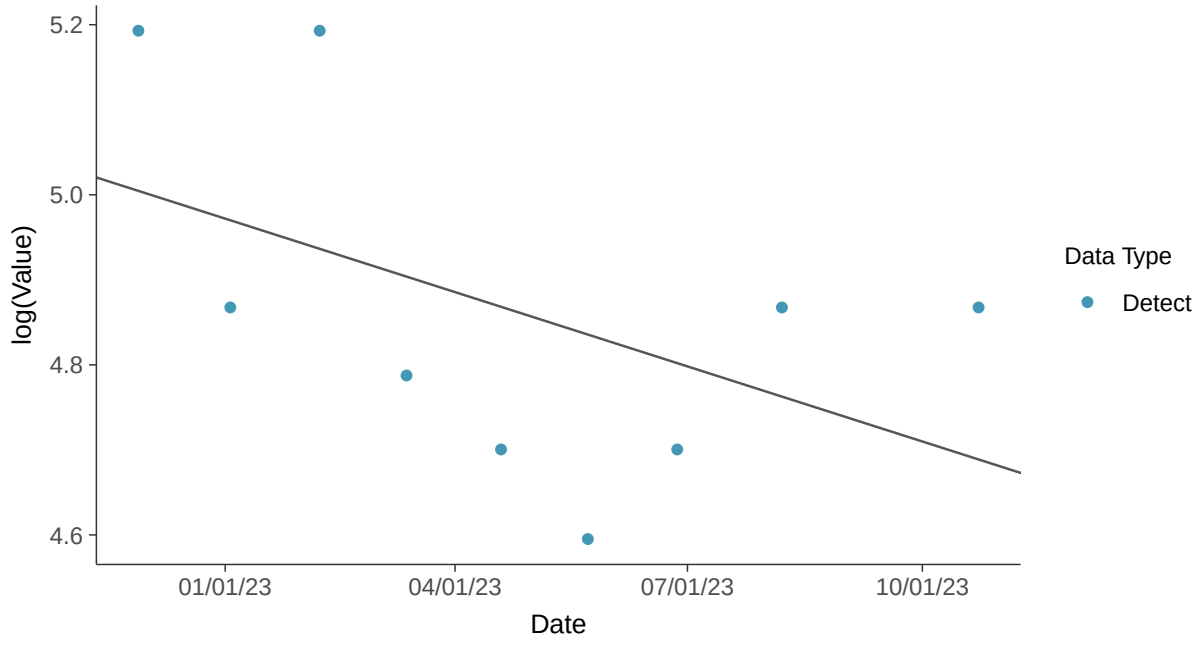



Lognormal Q-Q plot
Sulfate (as SO4), MW-12 (mg/L)
log(Value)
5.2
5.0
4.8
4.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-12 (mg/L)
Value
180
160
140
120
100
80
100
120
140
160
180
200
Theoretical Quantiles (Gamma)
Data Type
Detect

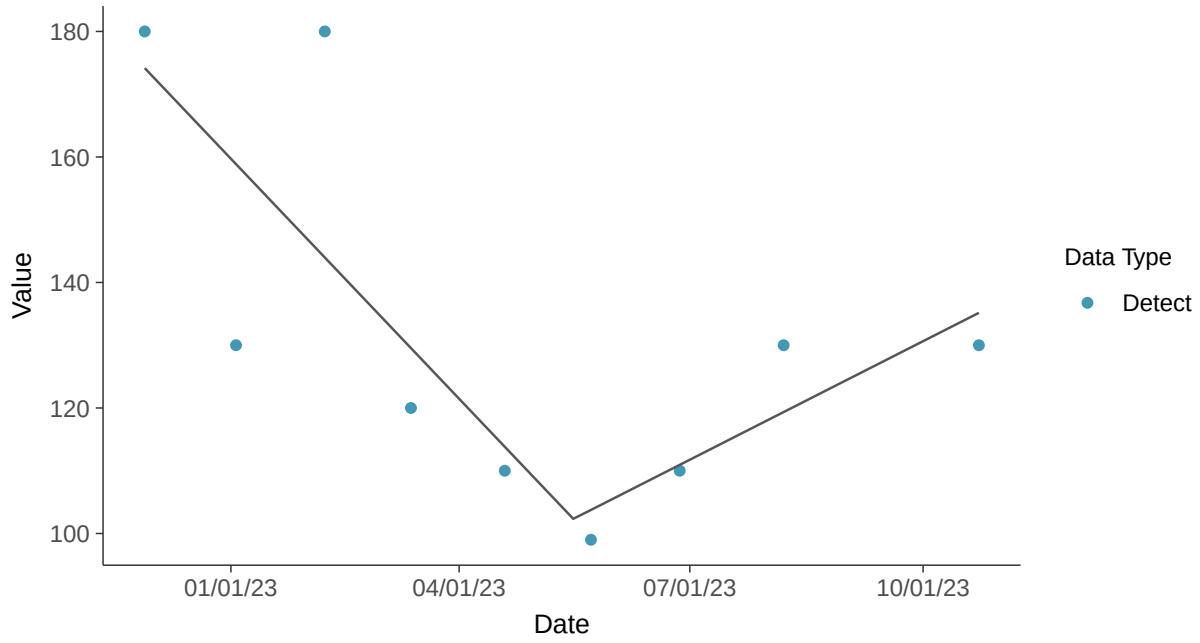
Trend Regression: Lognormal MLE

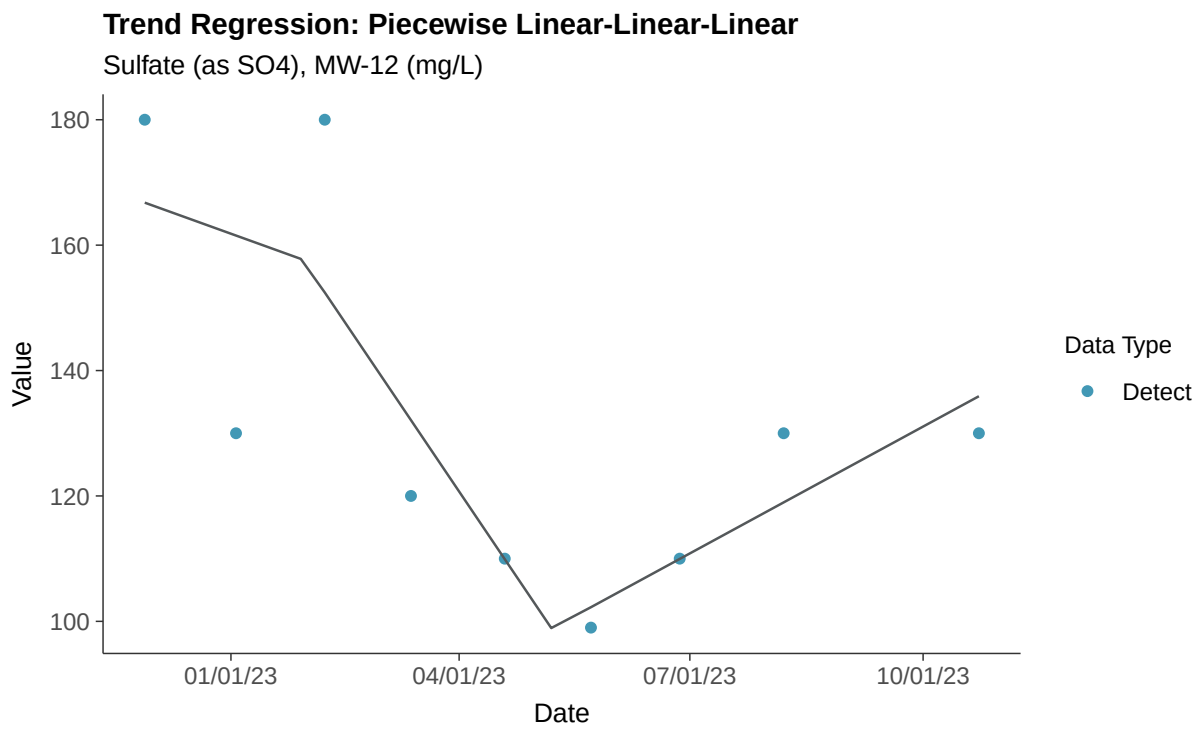
Sulfate (as SO4), MW-12 (mg/L)



Trend Regression: Piecewise Linear-Linear

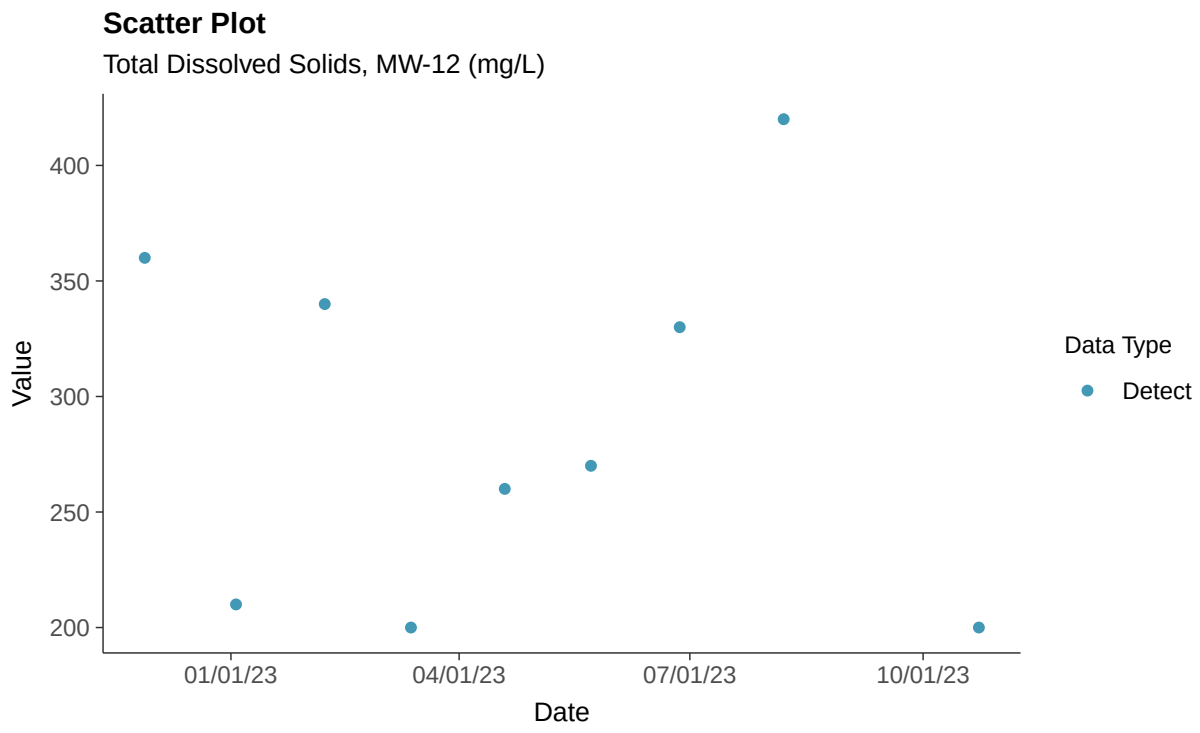
Sulfate (as SO4), MW-12 (mg/L)

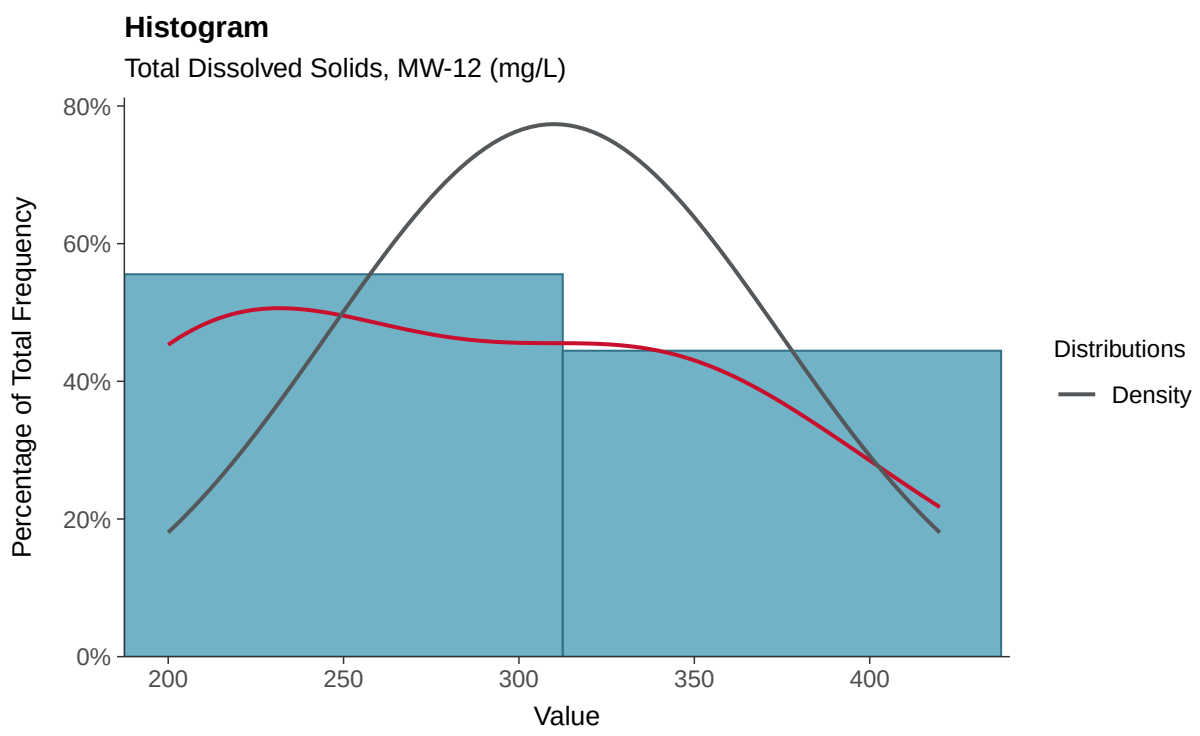



Trend Regression: Piecewise Linear-Linear-Linear
Sulfate (as SO4), MW-12 (mg/L)
180
160
140
120
100
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Total Dissolved Solids, MW-12

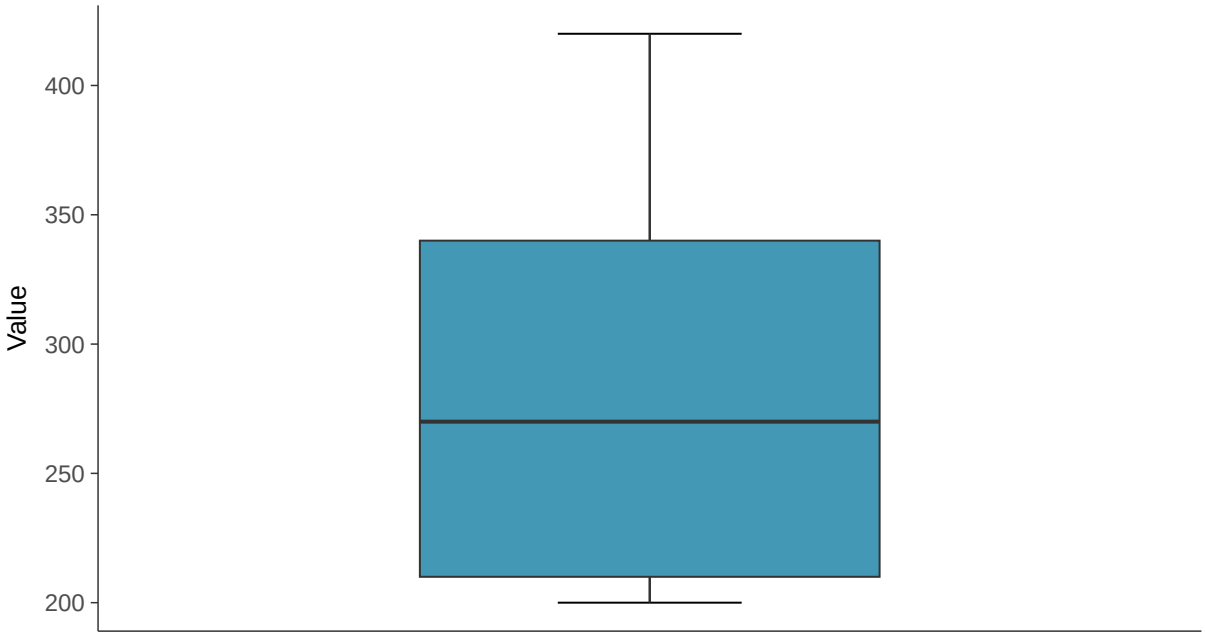
ID: 2_21_4_126





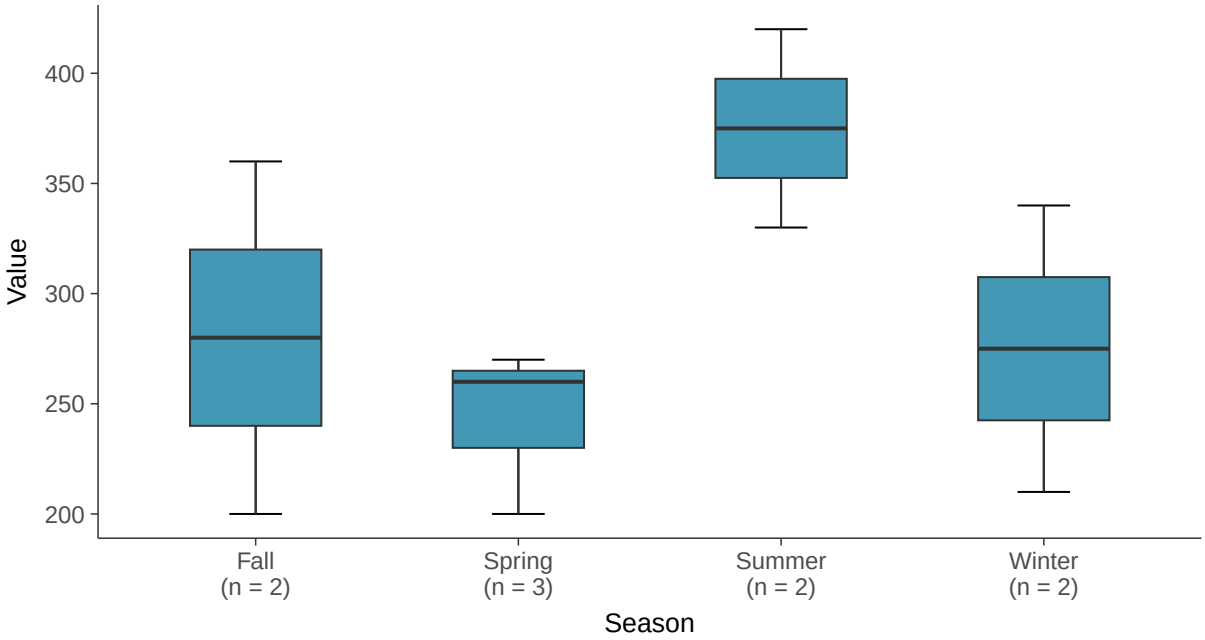
Boxplot

Total Dissolved Solids, MW-12 (mg/L)



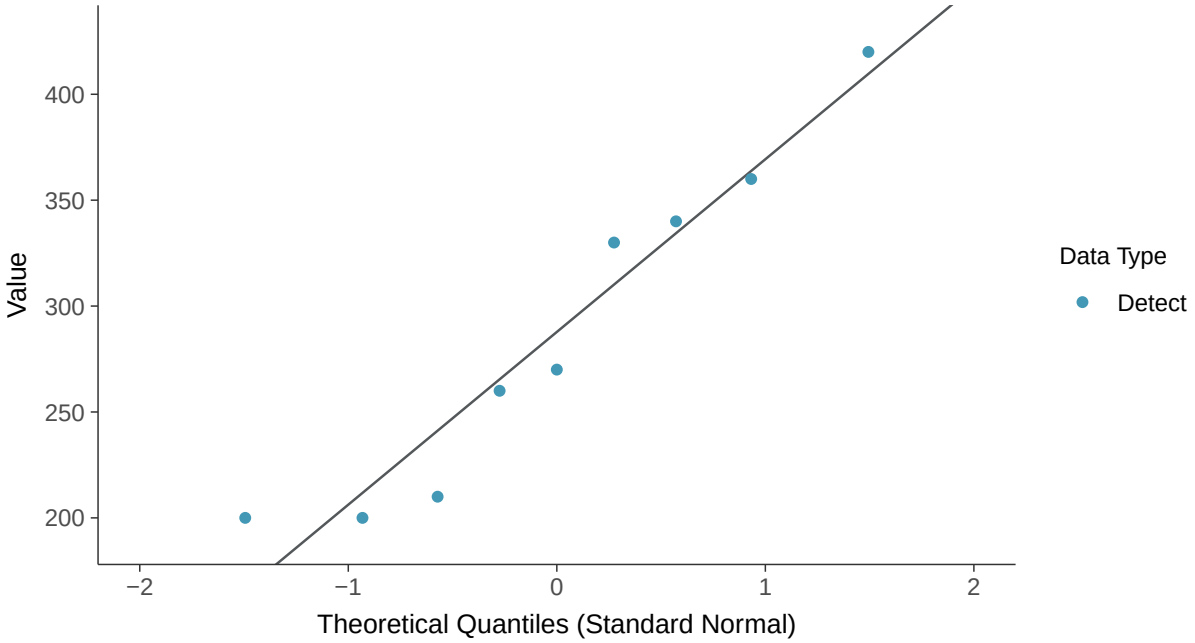
Boxplot by Season

Total Dissolved Solids, MW-12 (mg/L)



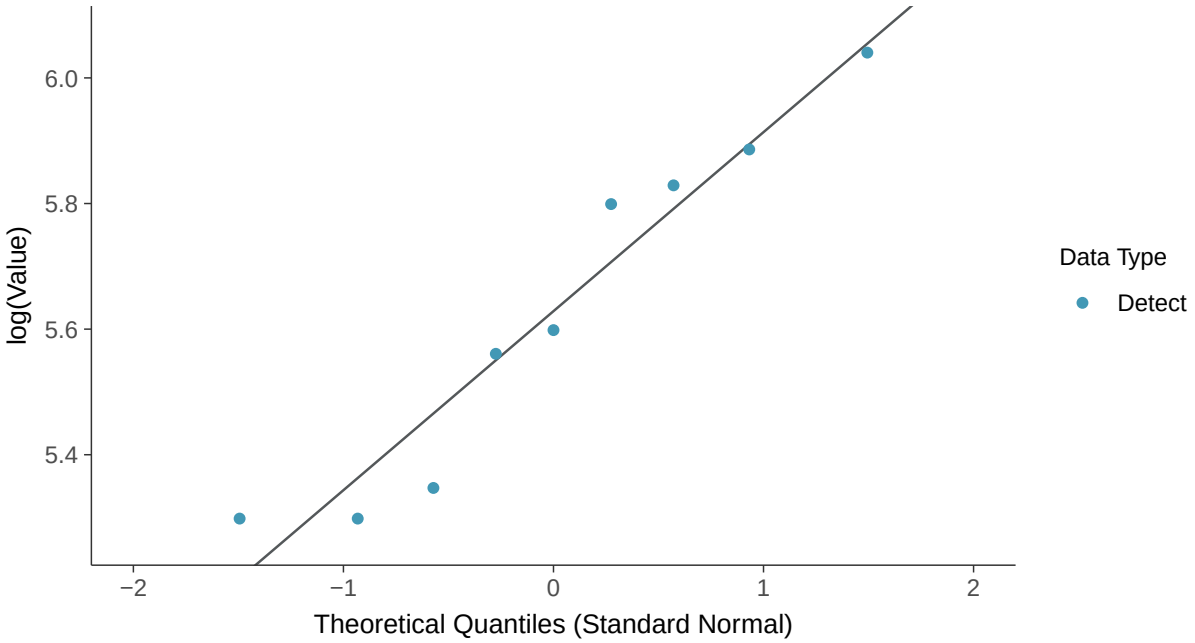
Normal Q-Q plot

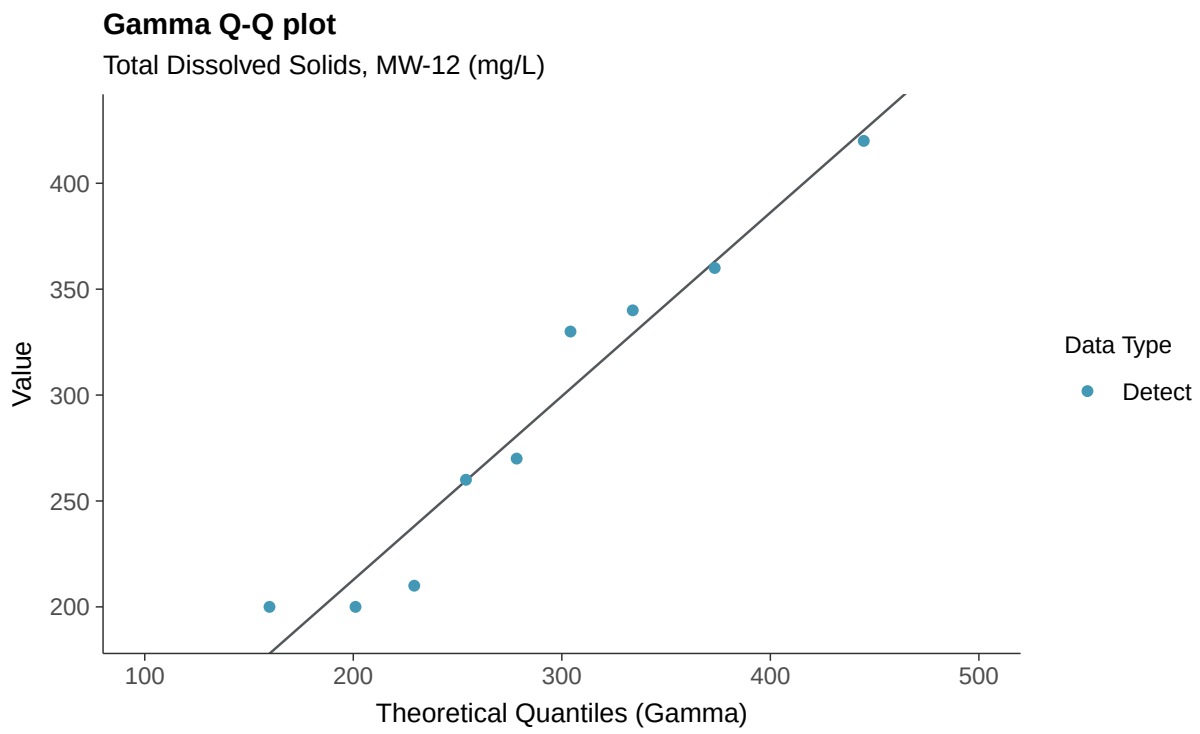
Total Dissolved Solids, MW-12 (mg/L)

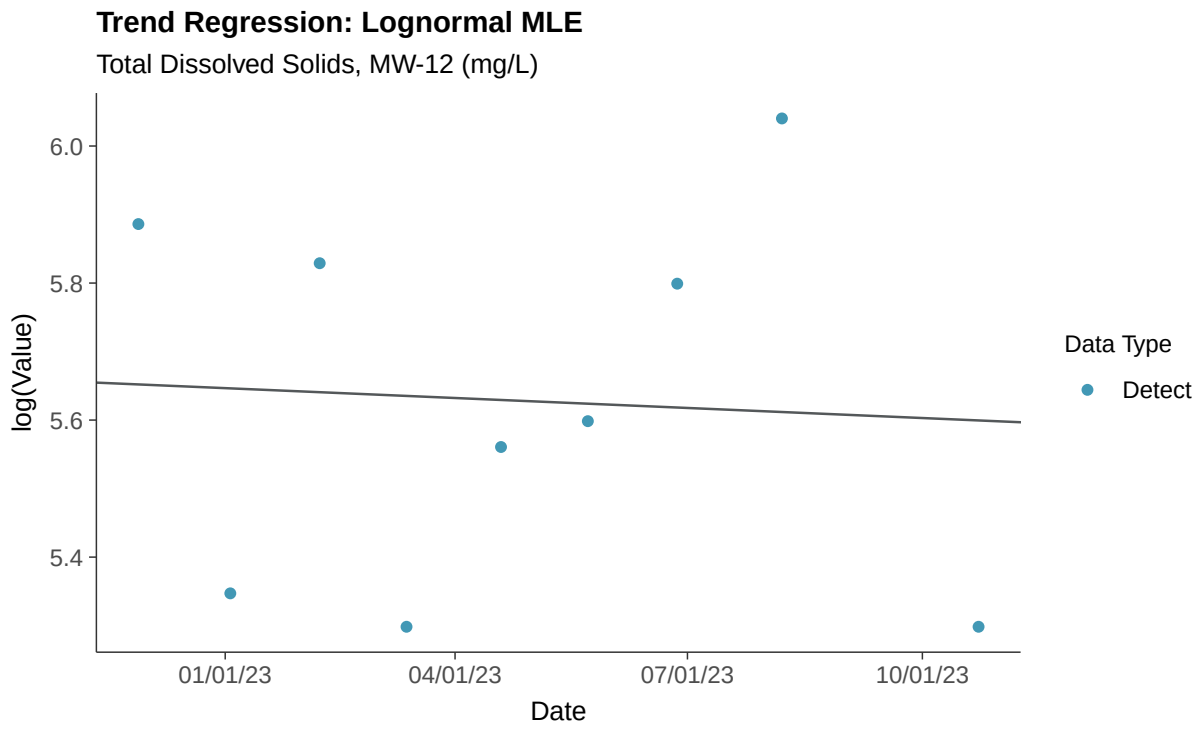


Lognormal Q-Q plot

Total Dissolved Solids, MW-12 (mg/L)

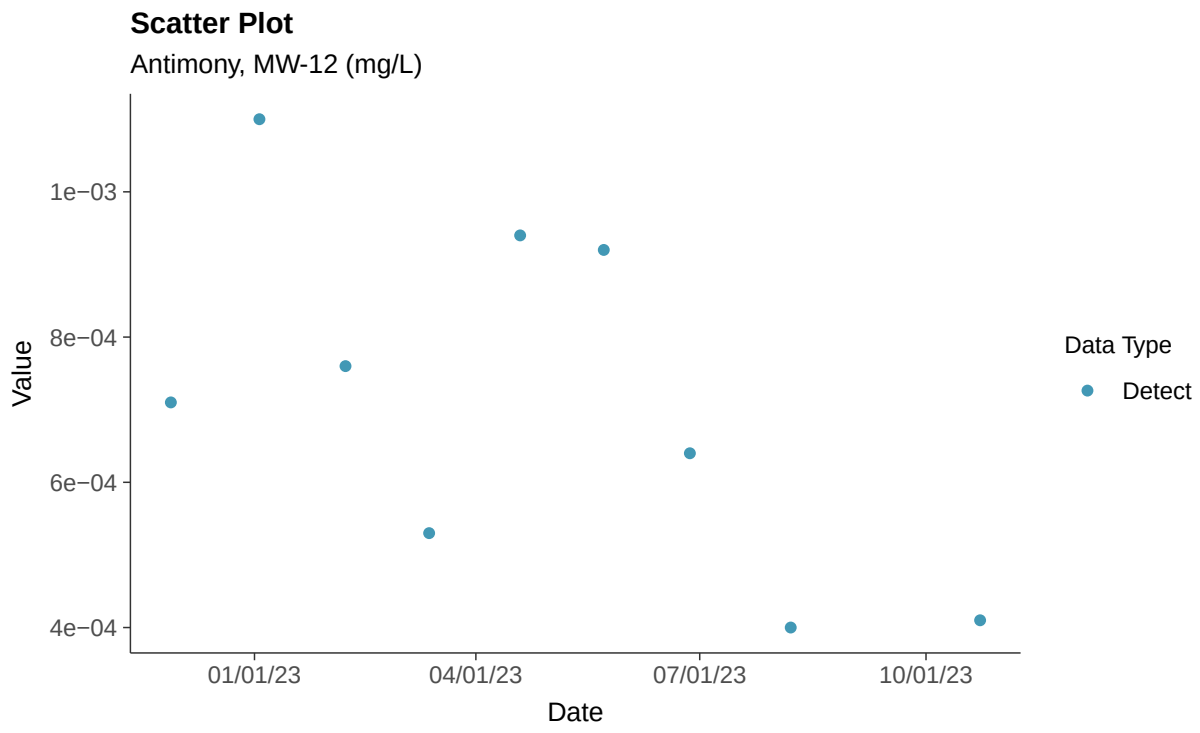


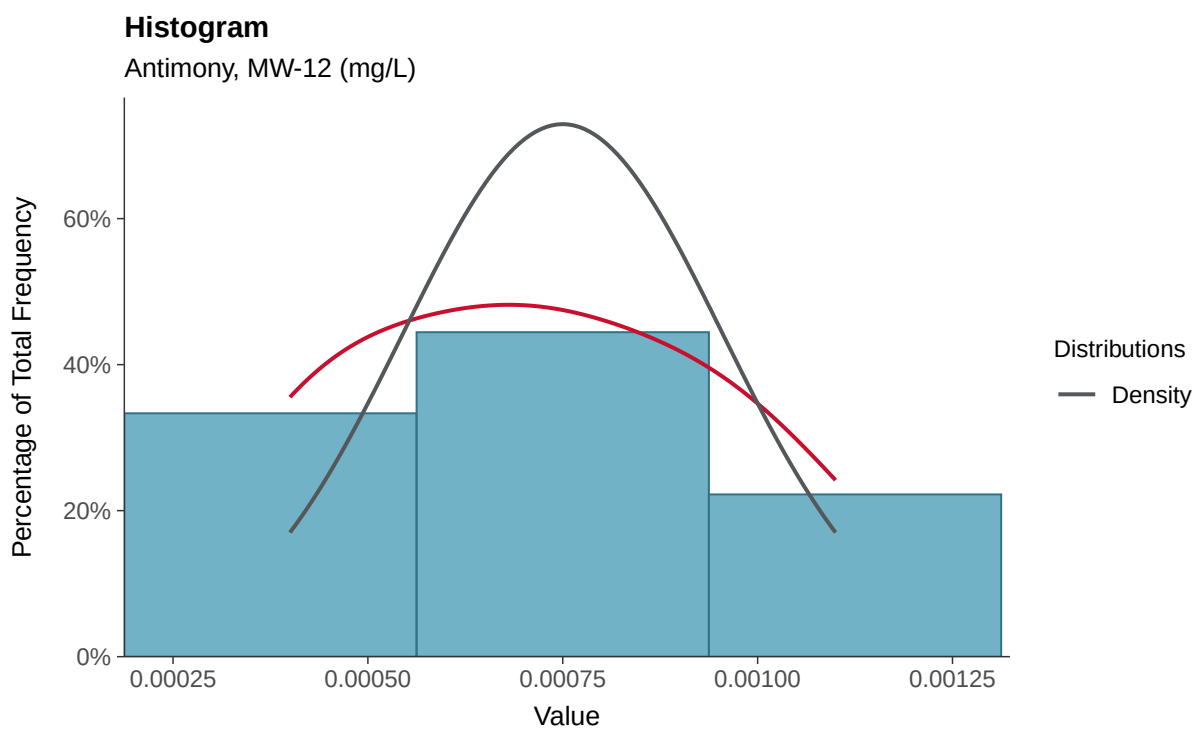

Gamma Q-Q plot
Total Dissolved Solids, MW-12 (mg/L)
Value
400
350
300
250
200
100
200
300
400
500
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-12 (mg/L)
log(Value)
6.0
5.8
5.6
5.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-12

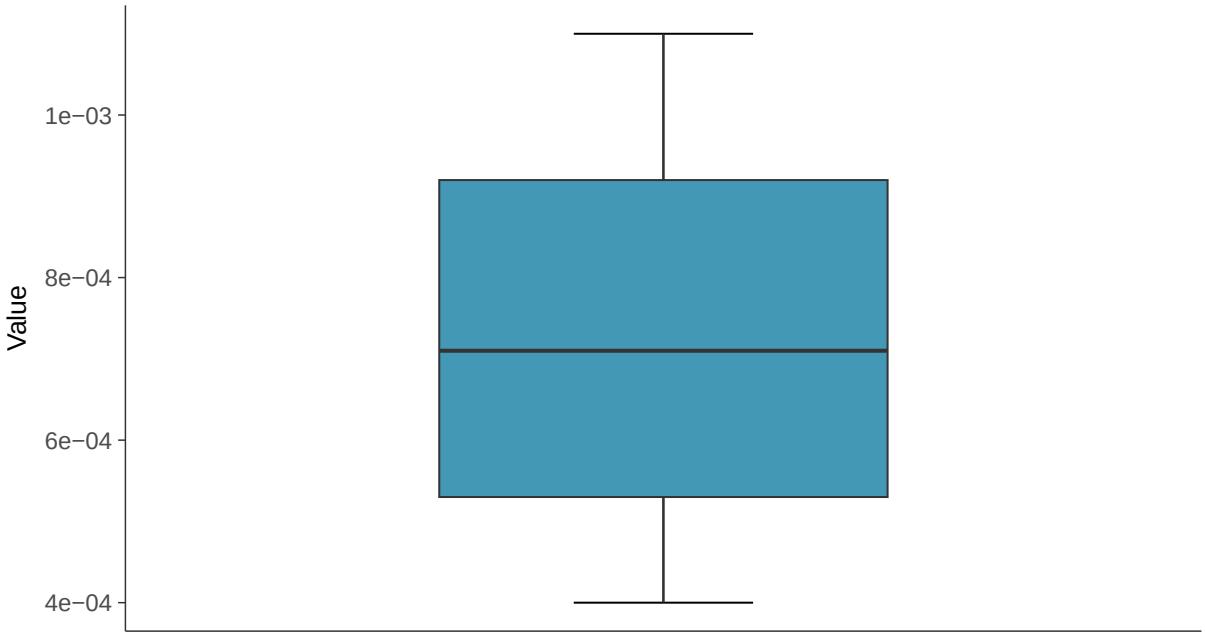
ID: 2_21_5_101





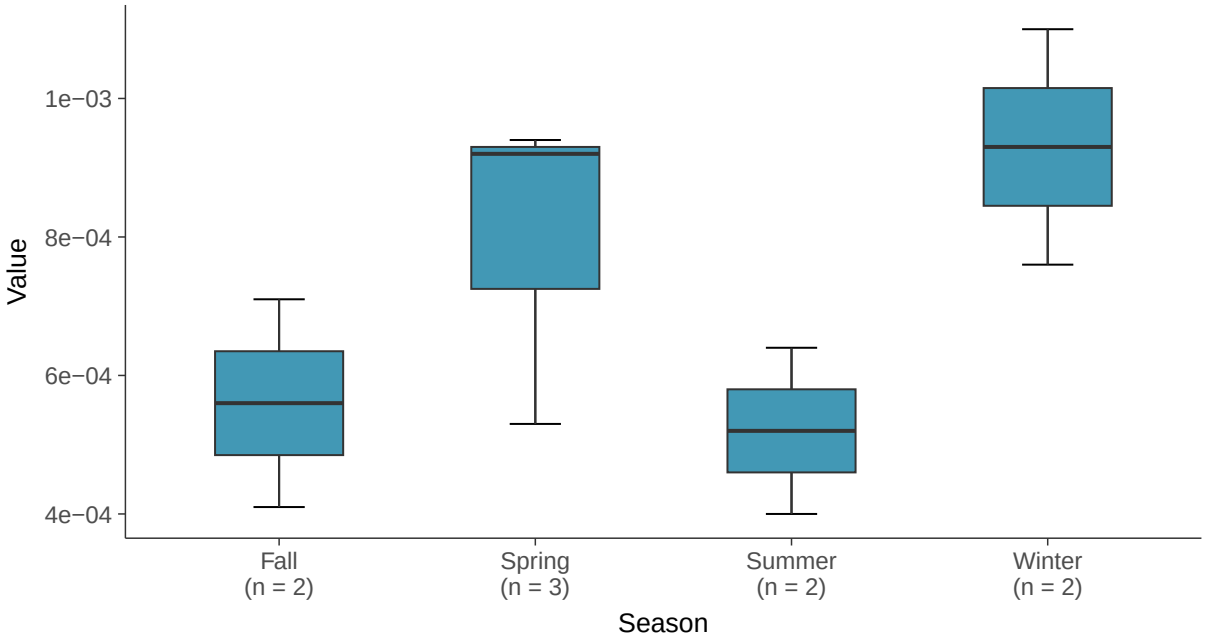
Boxplot

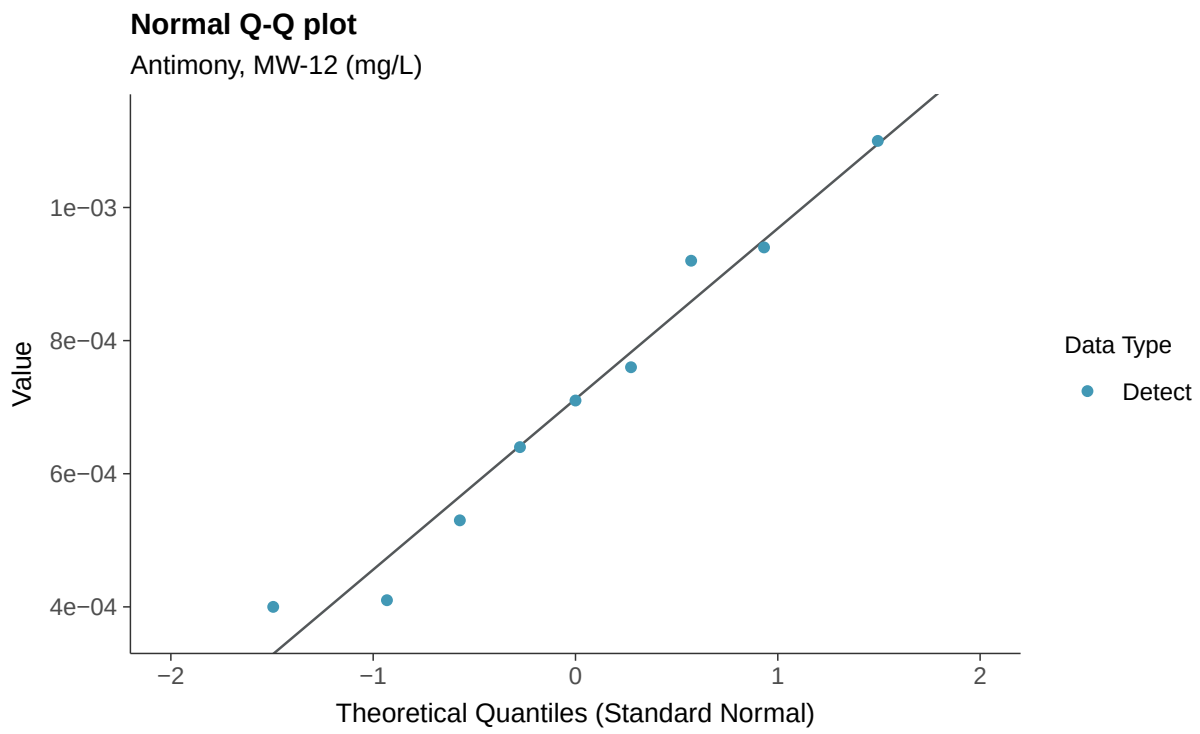
Antimony, MW-12 (mg/L)

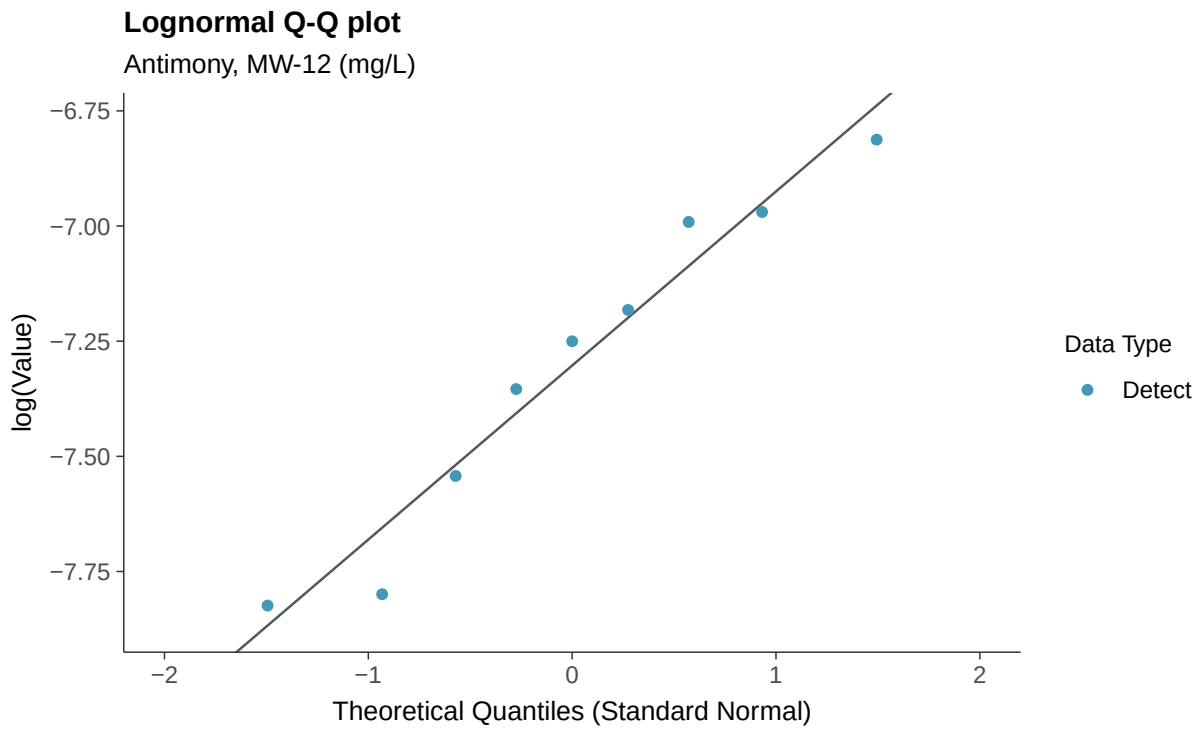


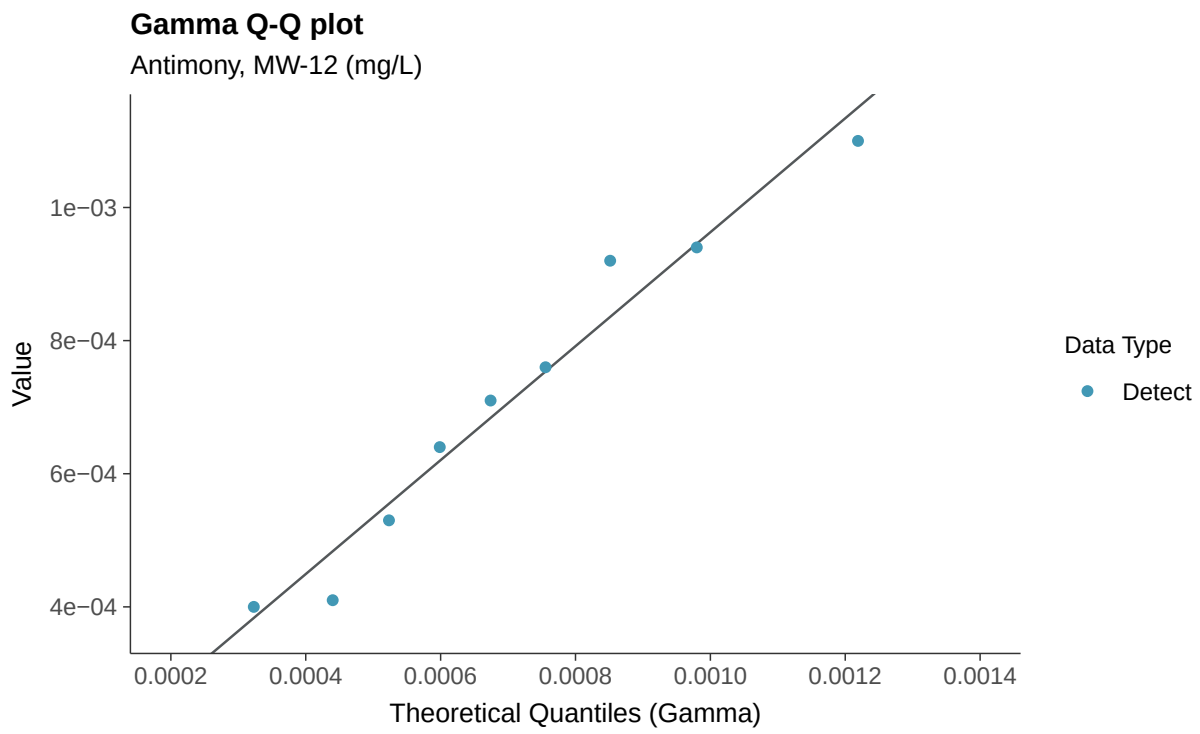
Boxplot by Season

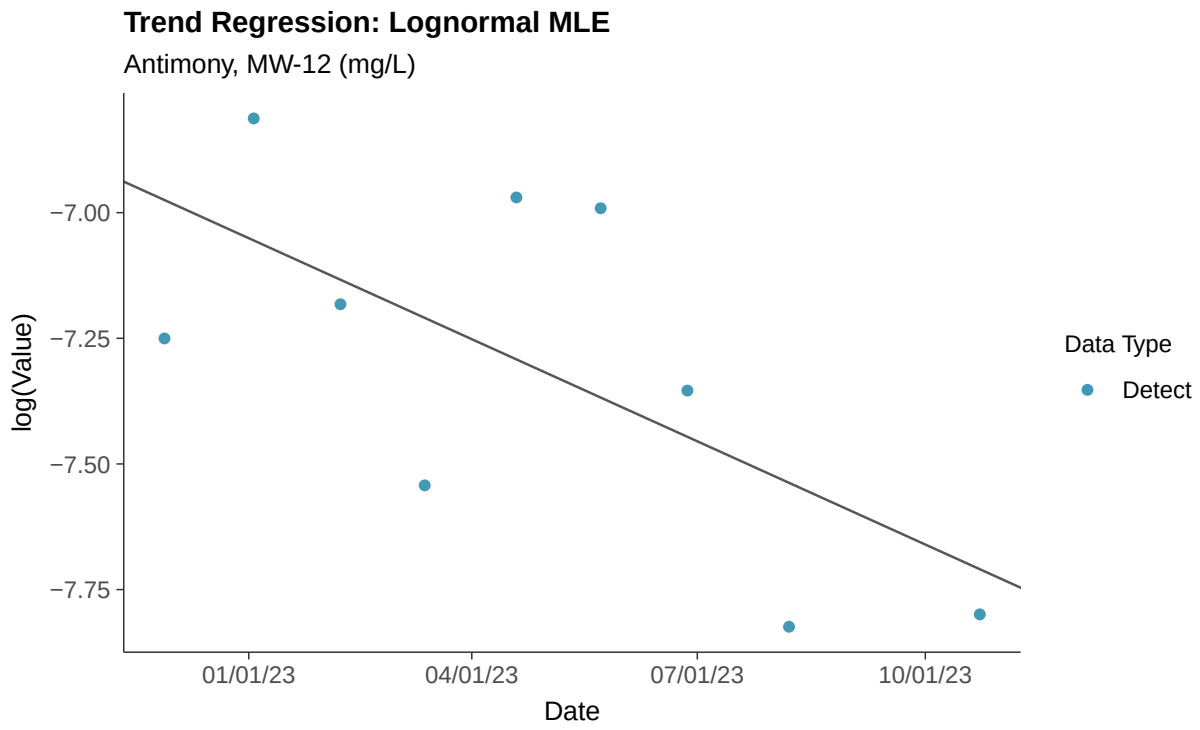
Antimony, MW-12 (mg/L)

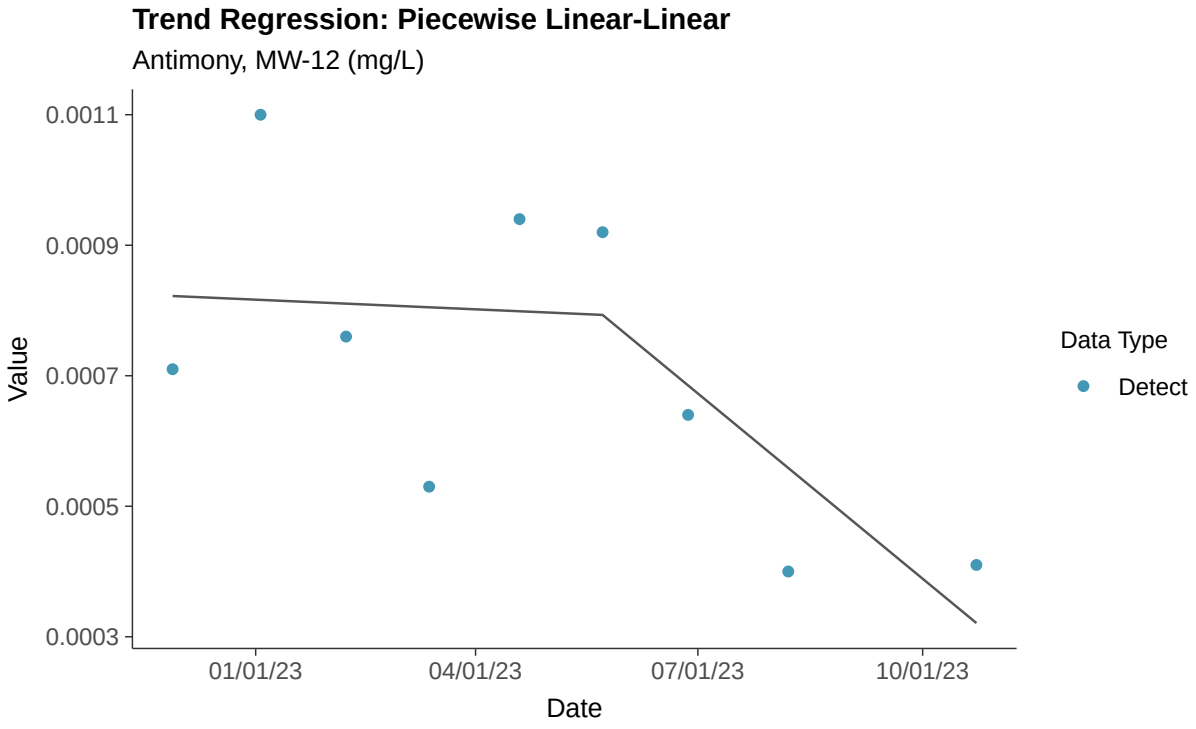



Normal Q-Q plot
Antimony, MW-12 (mg/L)
Value
1e−03
8e−04
6e−04
4e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Antimony, MW-12 (mg/L)
log(Value)
−6.75
−7.00
−7.25
−7.50
−7.75
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

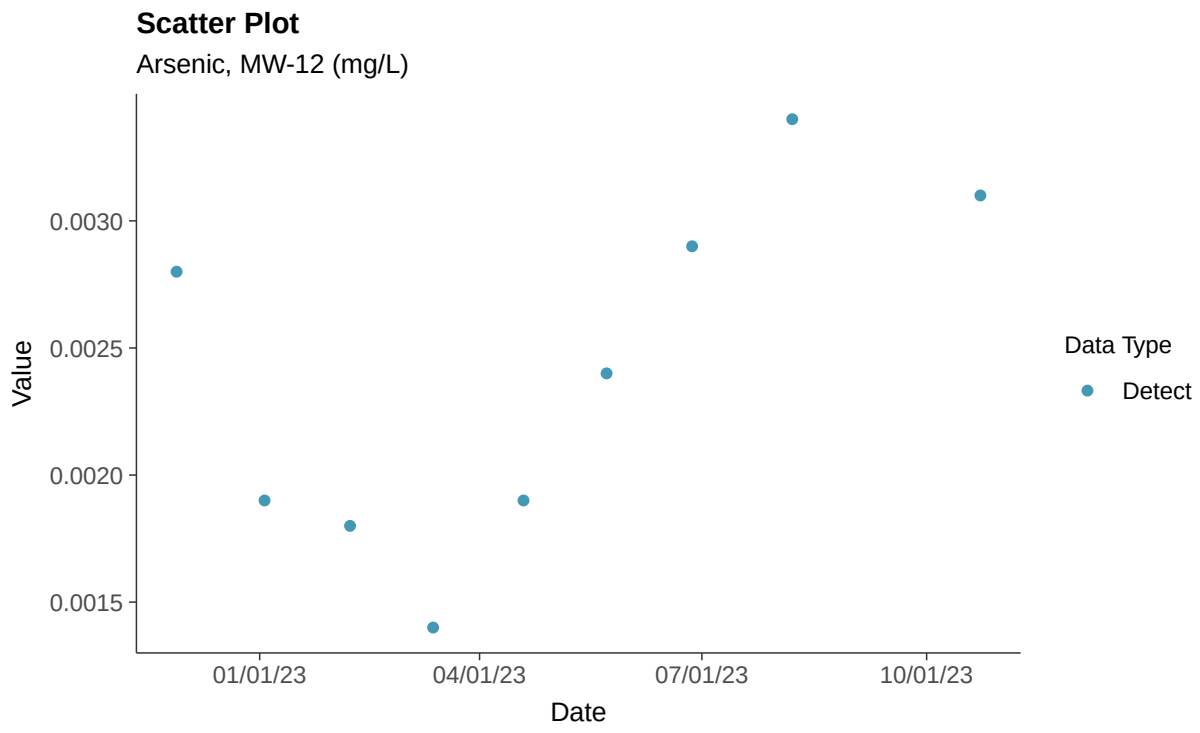

Gamma Q-Q plot
Antimony, MW-12 (mg/L)
Value
1e−03
8e−04
6e−04
4e−04
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
0.0014
Theoretical Quantiles (Gamma)
Data Type
Detect

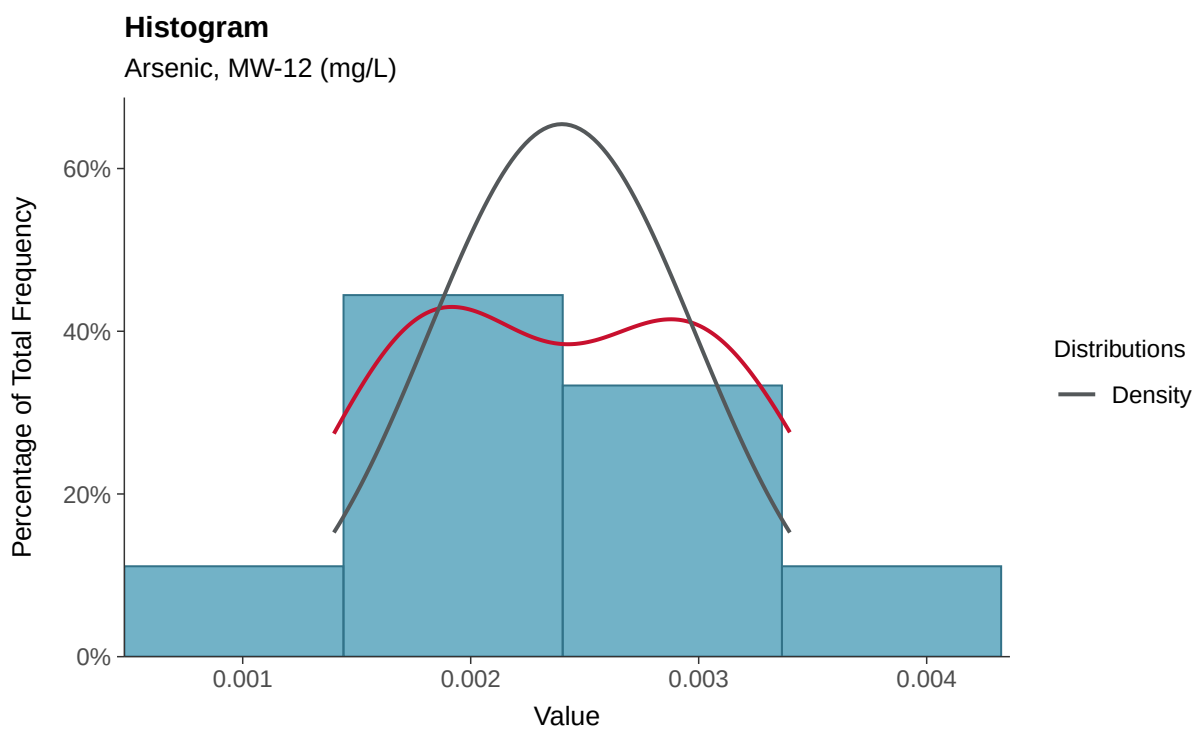

Trend Regression: Lognormal MLE
Antimony, MW-12 (mg/L)
log(Value)
−7.00
−7.25
−7.50
−7.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Antimony, MW-12 (mg/L)
0.0011
0.0009
0.0007
0.0005
0.0003
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Arsenic, MW-12

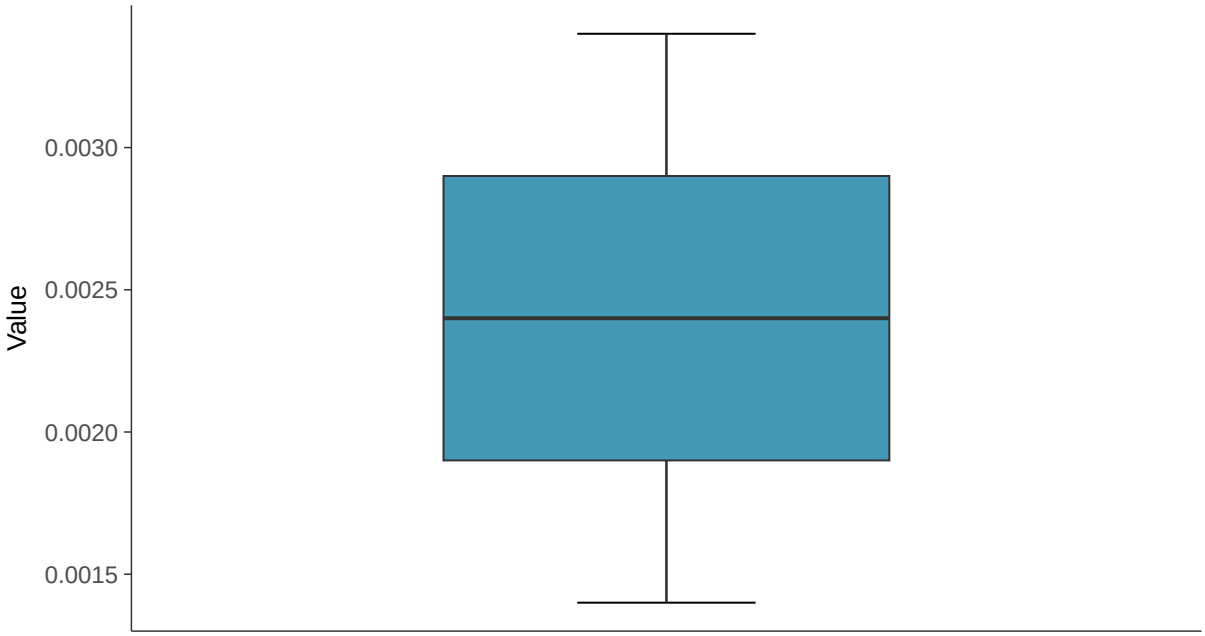
ID: 2_21_5_102





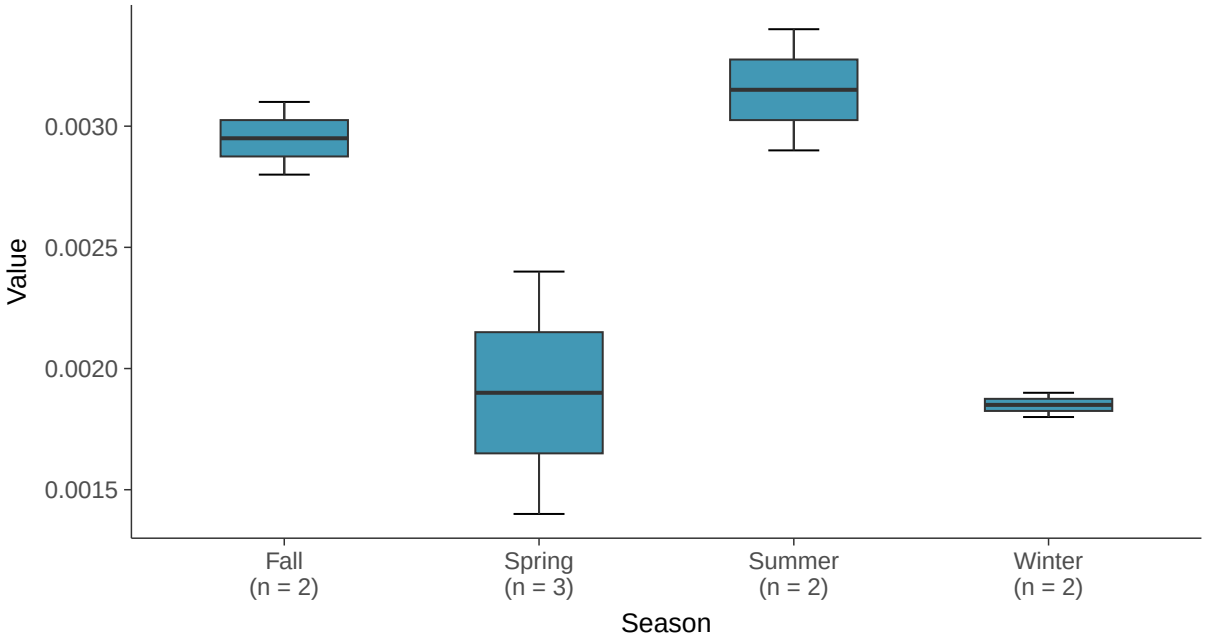
Boxplot

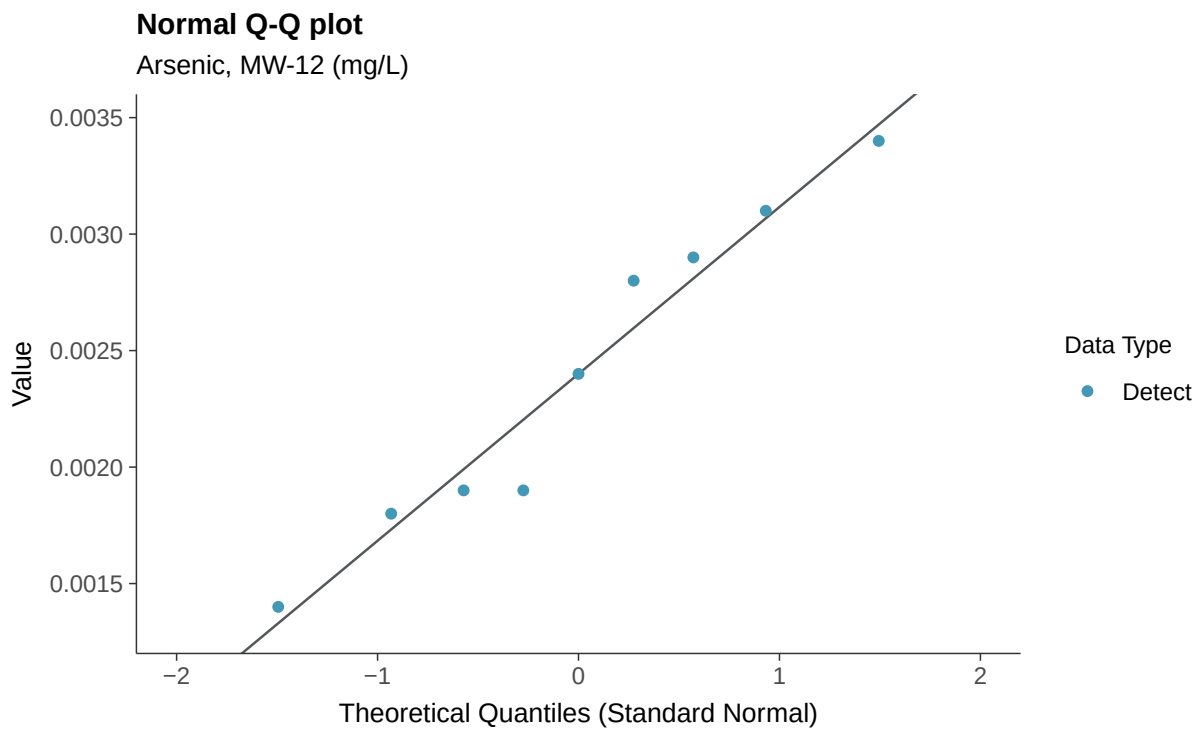
Arsenic, MW-12 (mg/L)

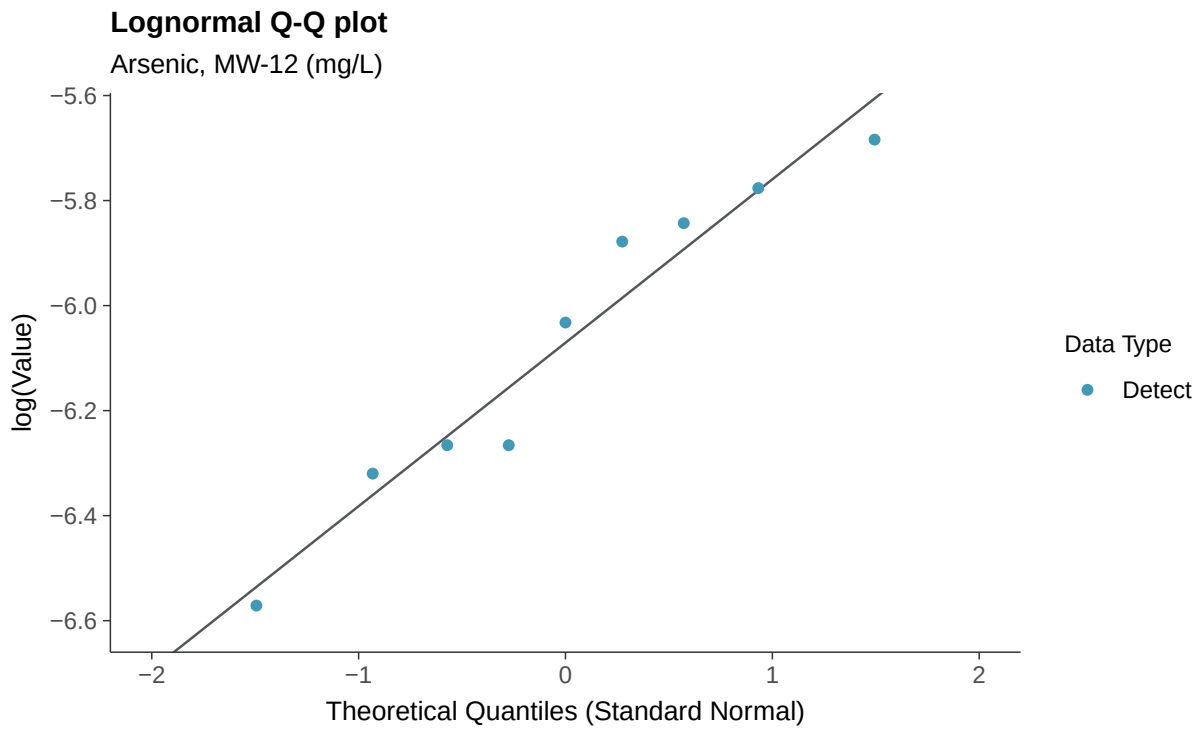


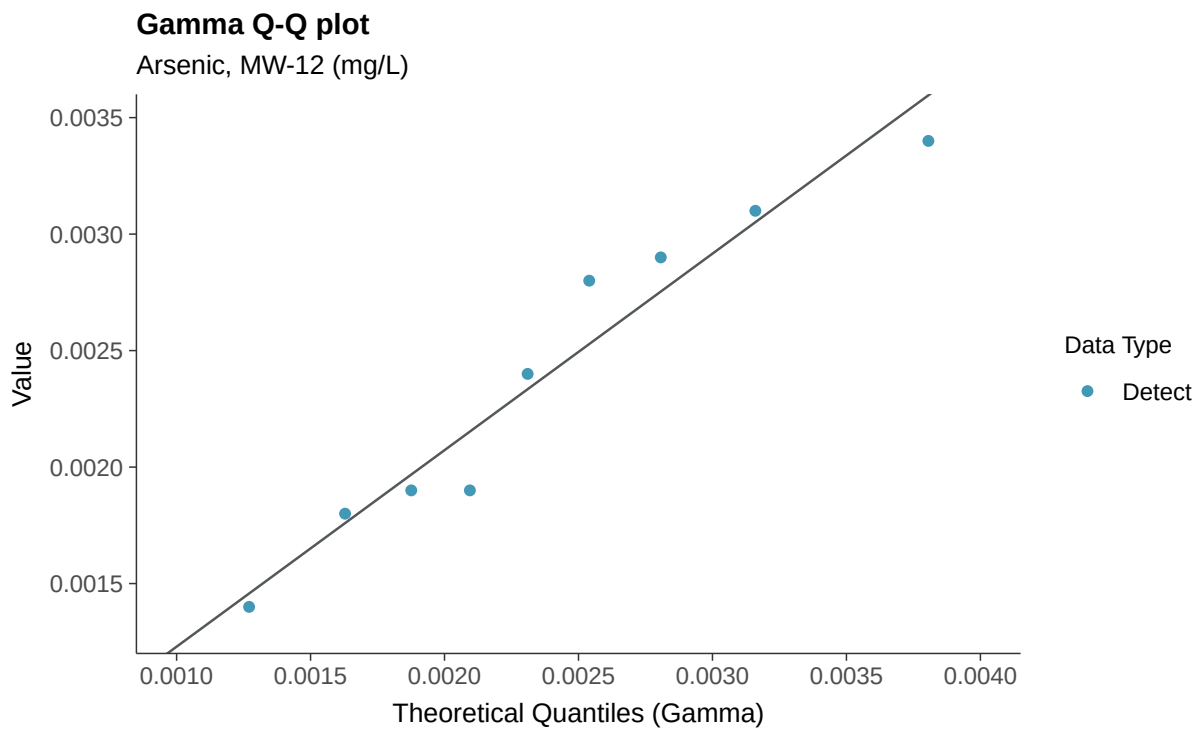
Boxplot by Season

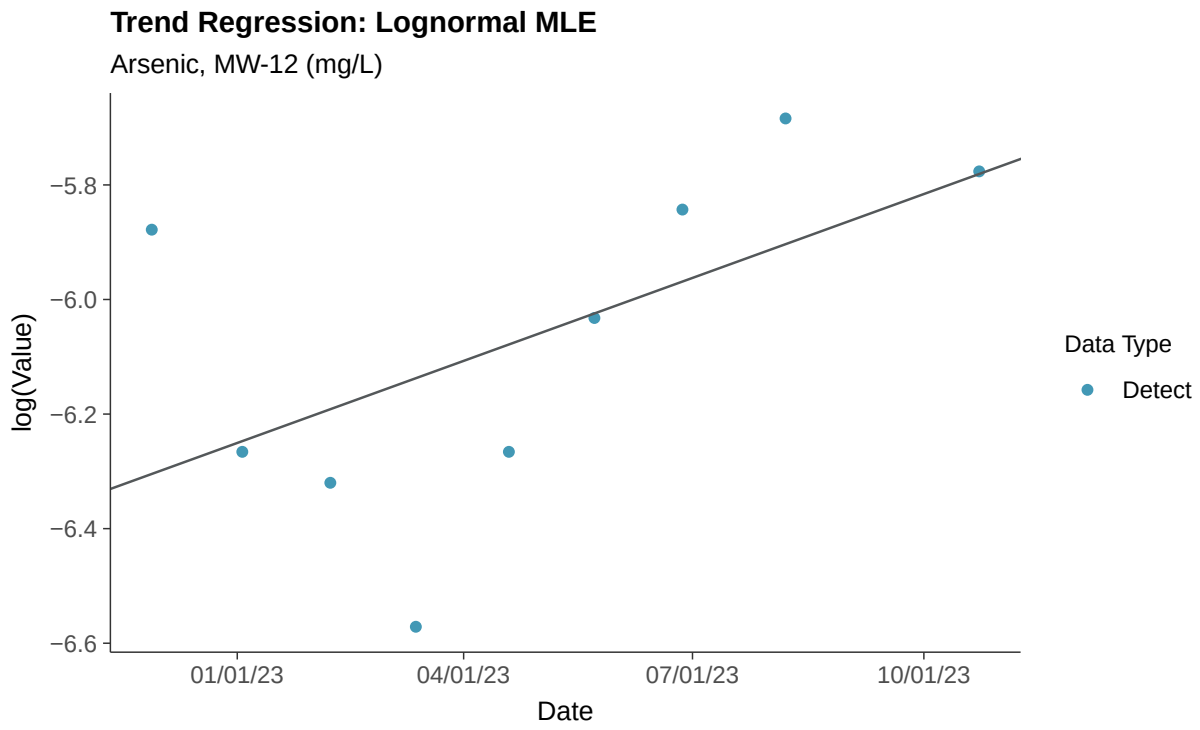
Arsenic, MW-12 (mg/L)

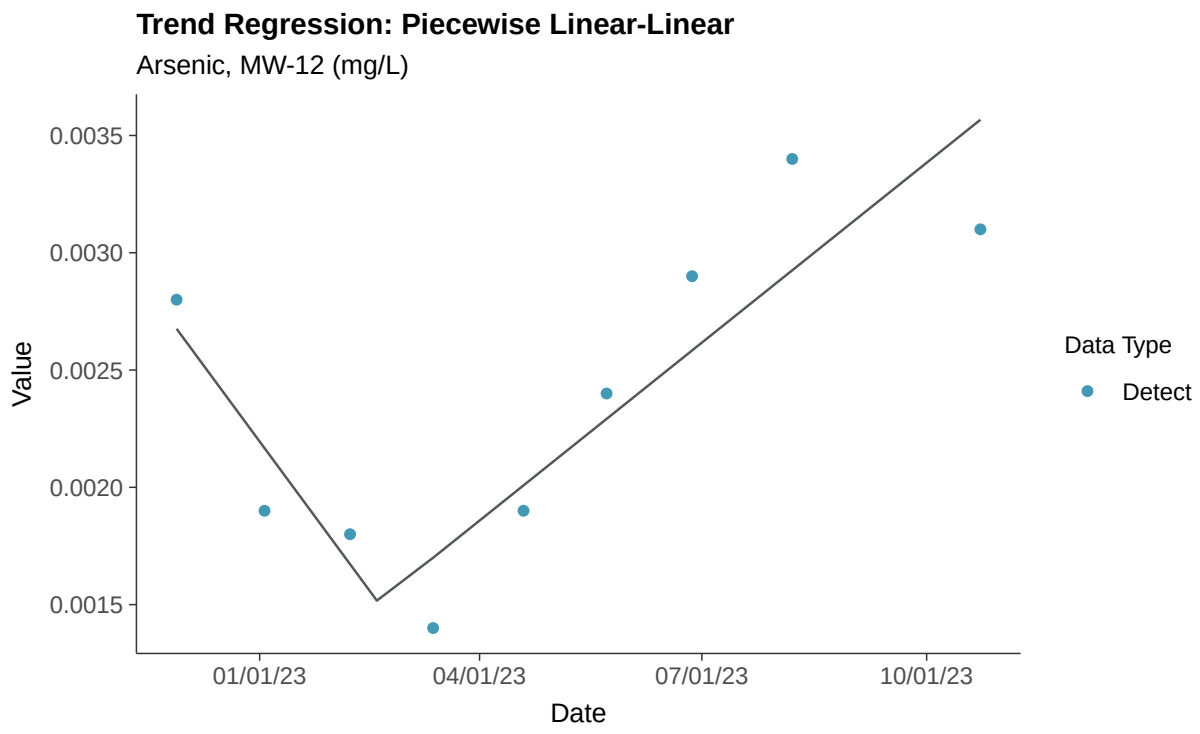


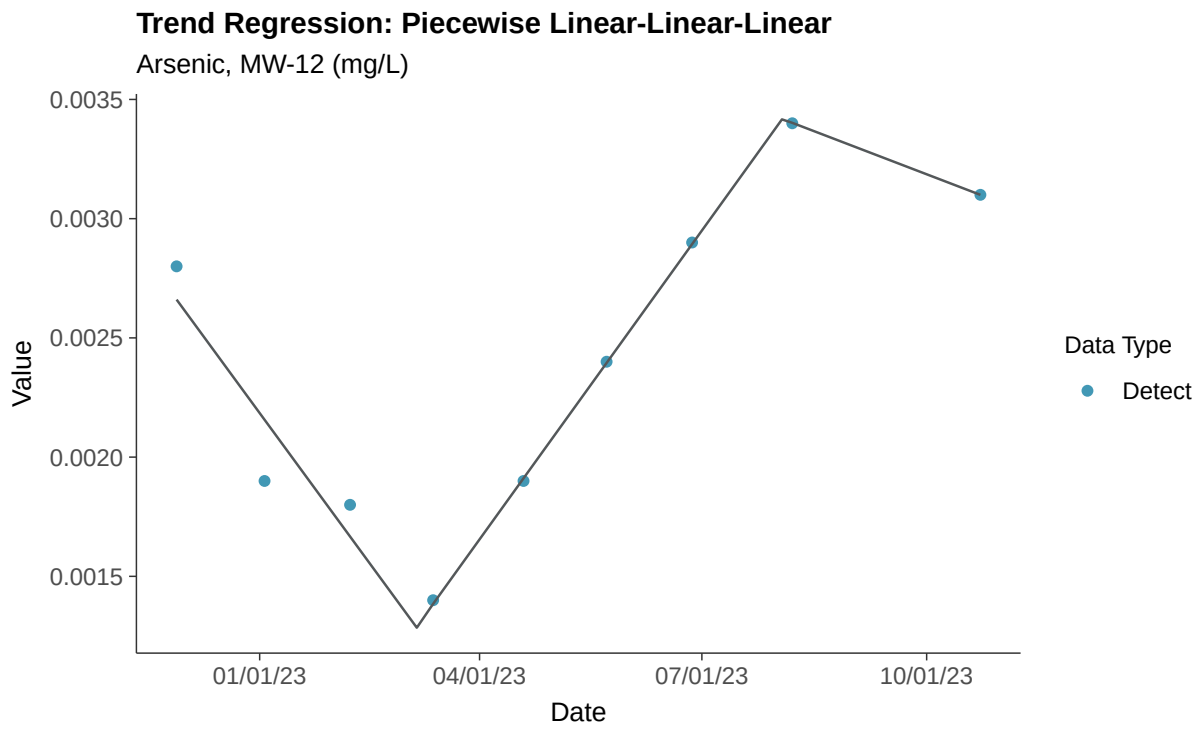

Normal Q-Q plot
Arsenic, MW-12 (mg/L)
Value
0.0035
0.0030
0.0025
0.0020
0.0015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Arsenic, MW-12 (mg/L)
log(Value)
−5.6
−5.8
−6.0
−6.2
−6.4
−6.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-12 (mg/L)
Value
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
Theoretical Quantiles (Gamma)
Data Type
Detect

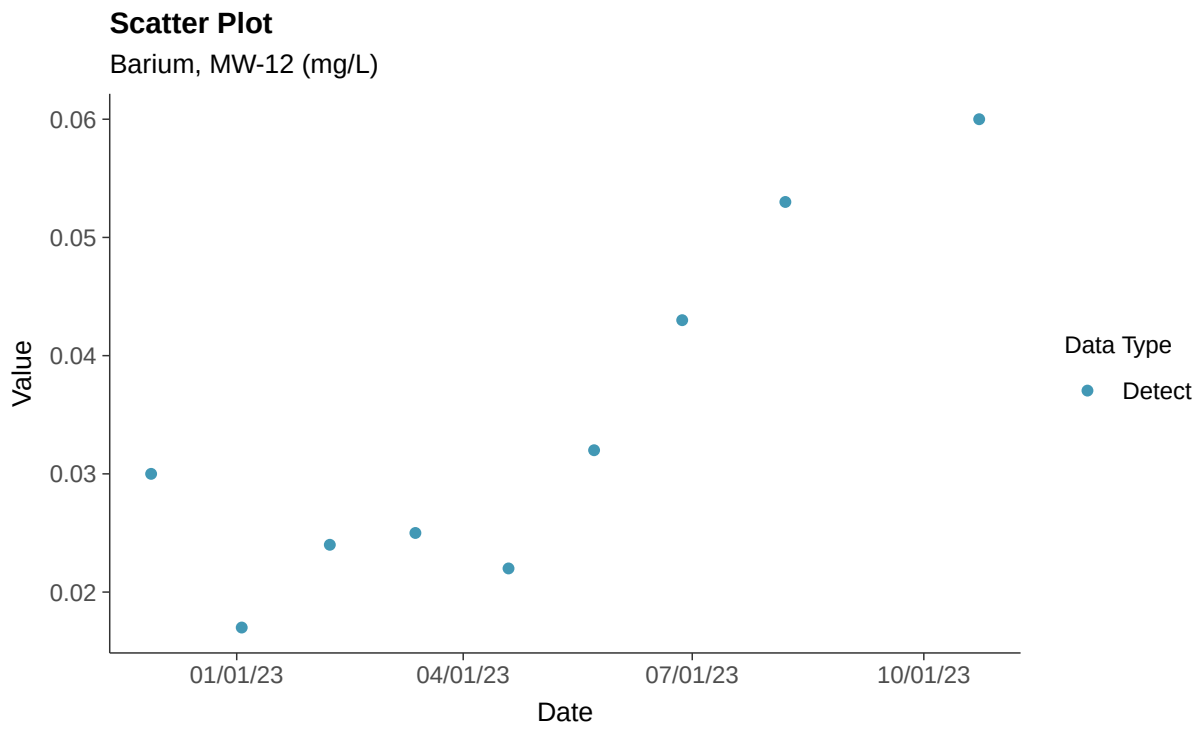

Trend Regression: Lognormal MLE
Arsenic, MW-12 (mg/L)
log(Value)
−5.8
−6.0
−6.2
−6.4
−6.6
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

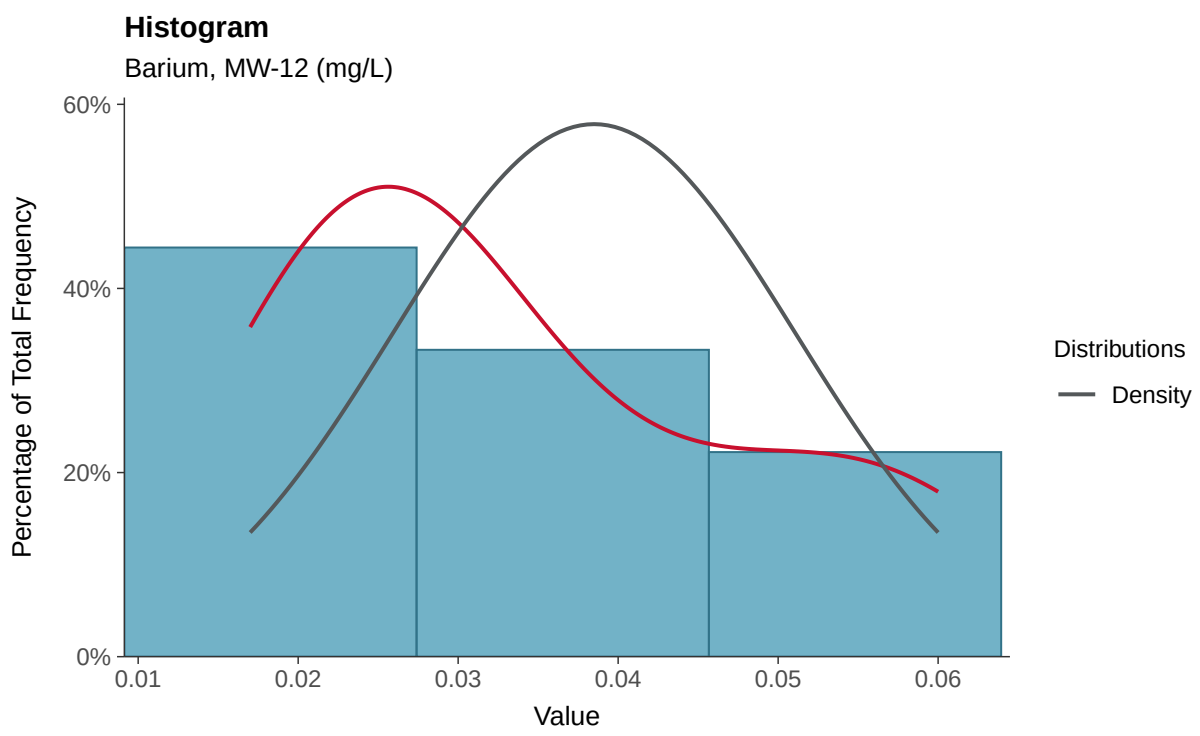

Trend Regression: Piecewise Linear-Linear
Arsenic, MW-12 (mg/L)
0.0035
0.0030
0.0025
0.0020
0.0015
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Arsenic, MW-12 (mg/L)
0.0035
0.0030
0.0025
0.0020
0.0015
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Barium, MW-12

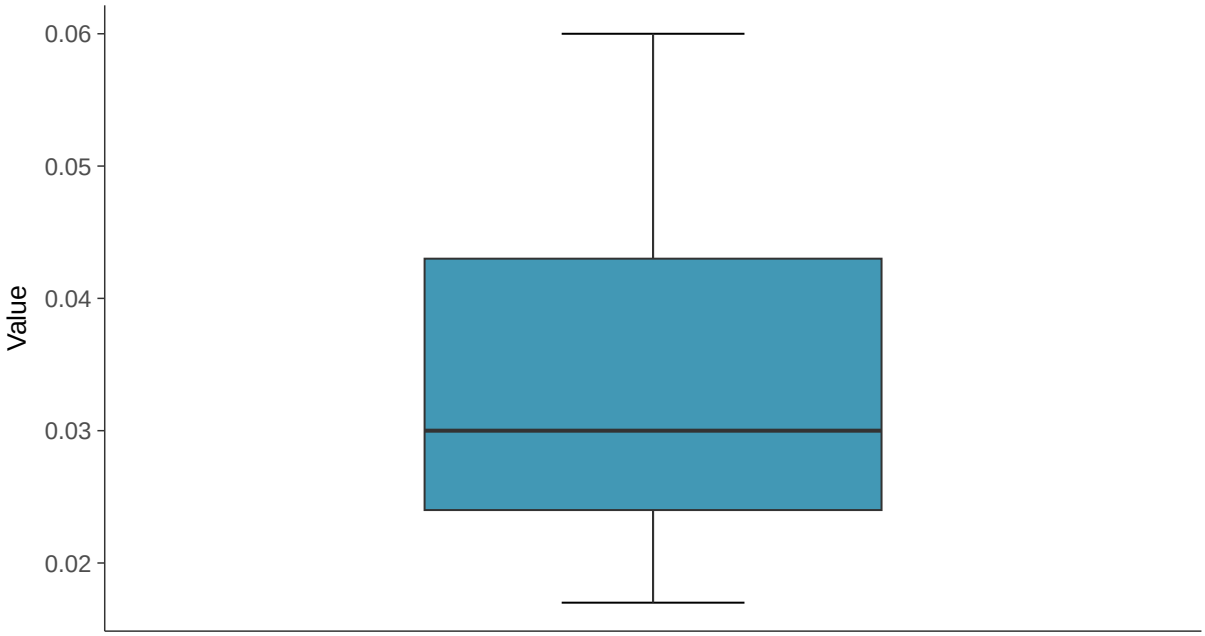
ID: 2_21_5_103





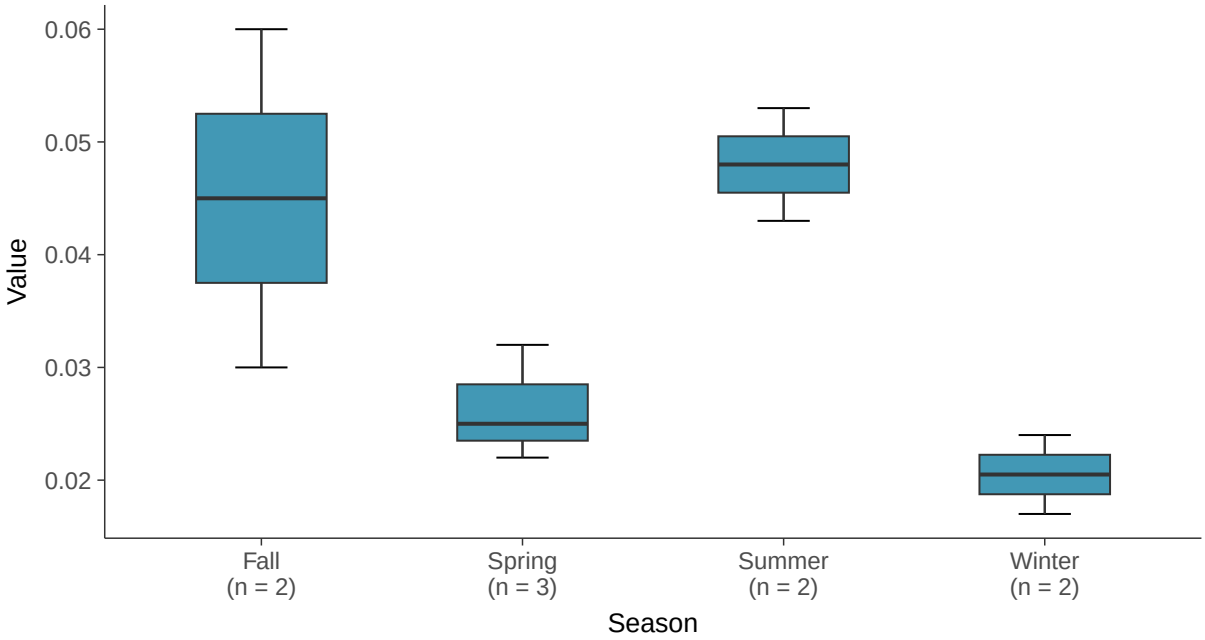
Boxplot

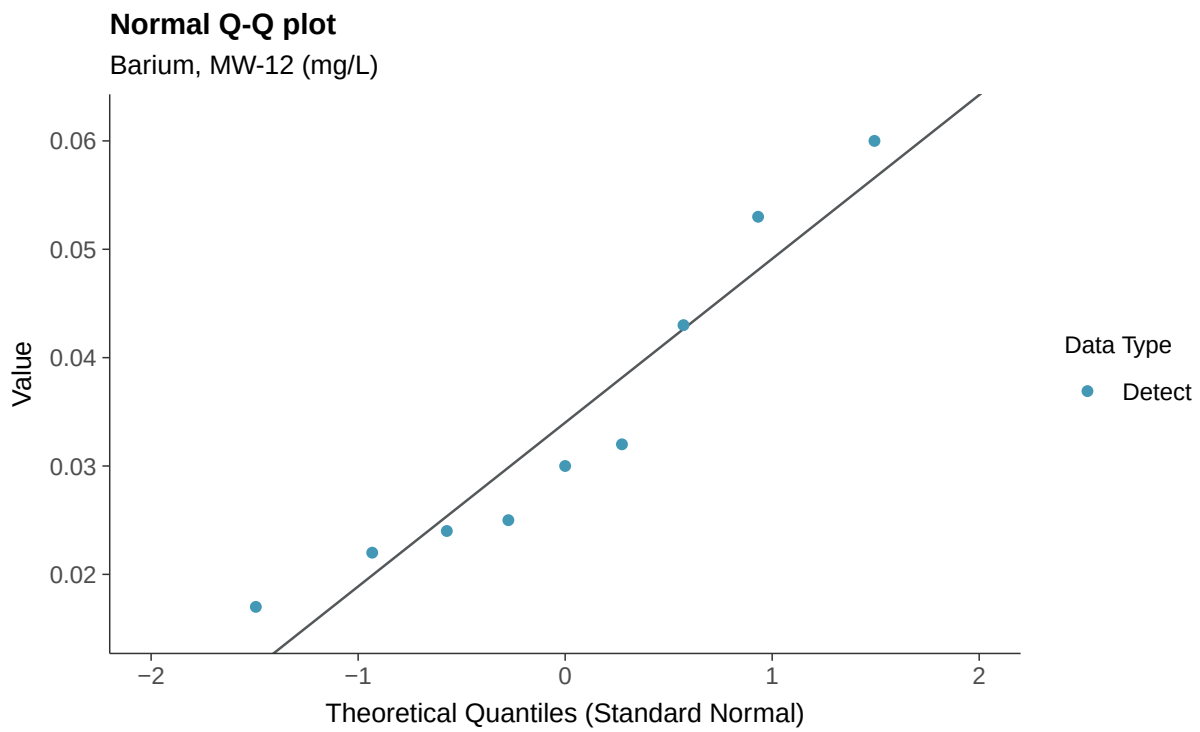
Barium, MW-12 (mg/L)

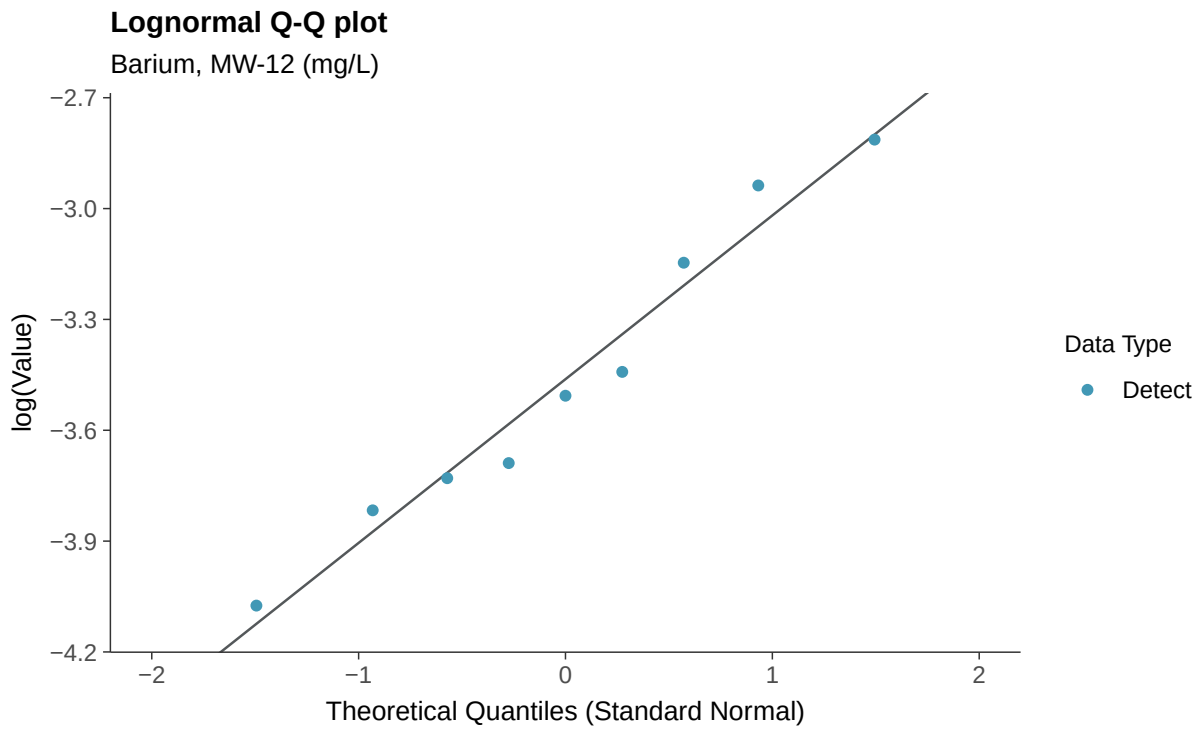


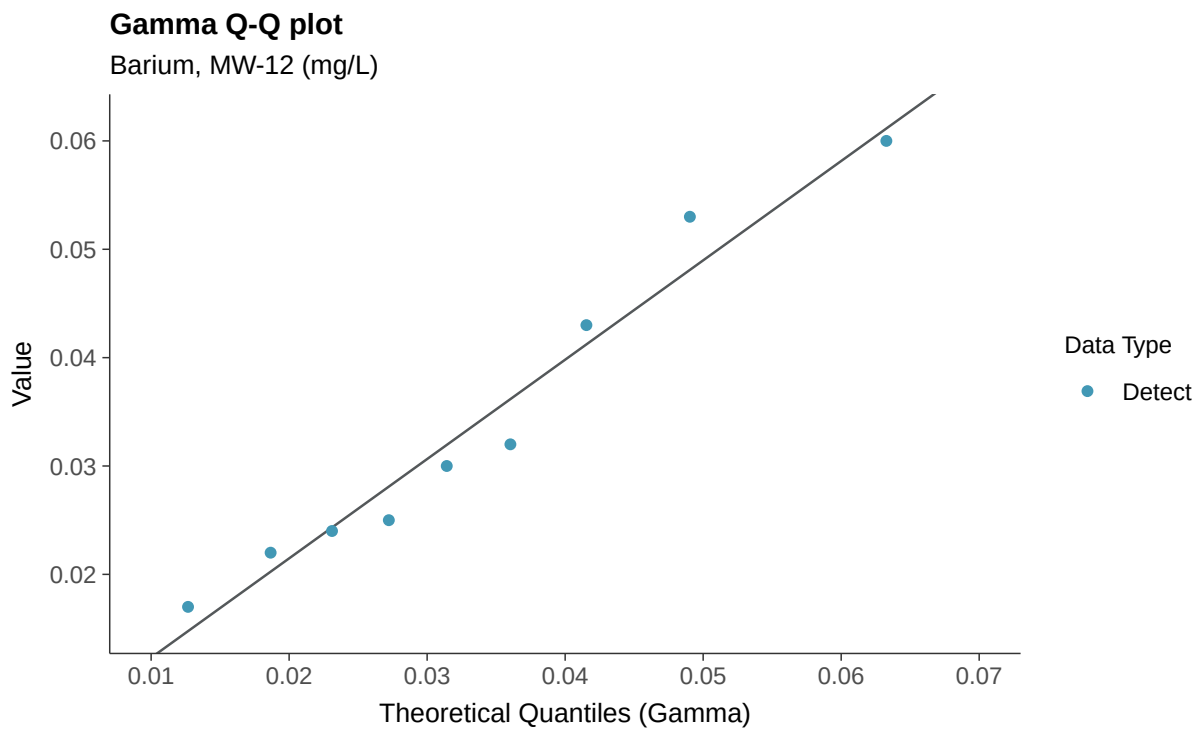
Boxplot by Season

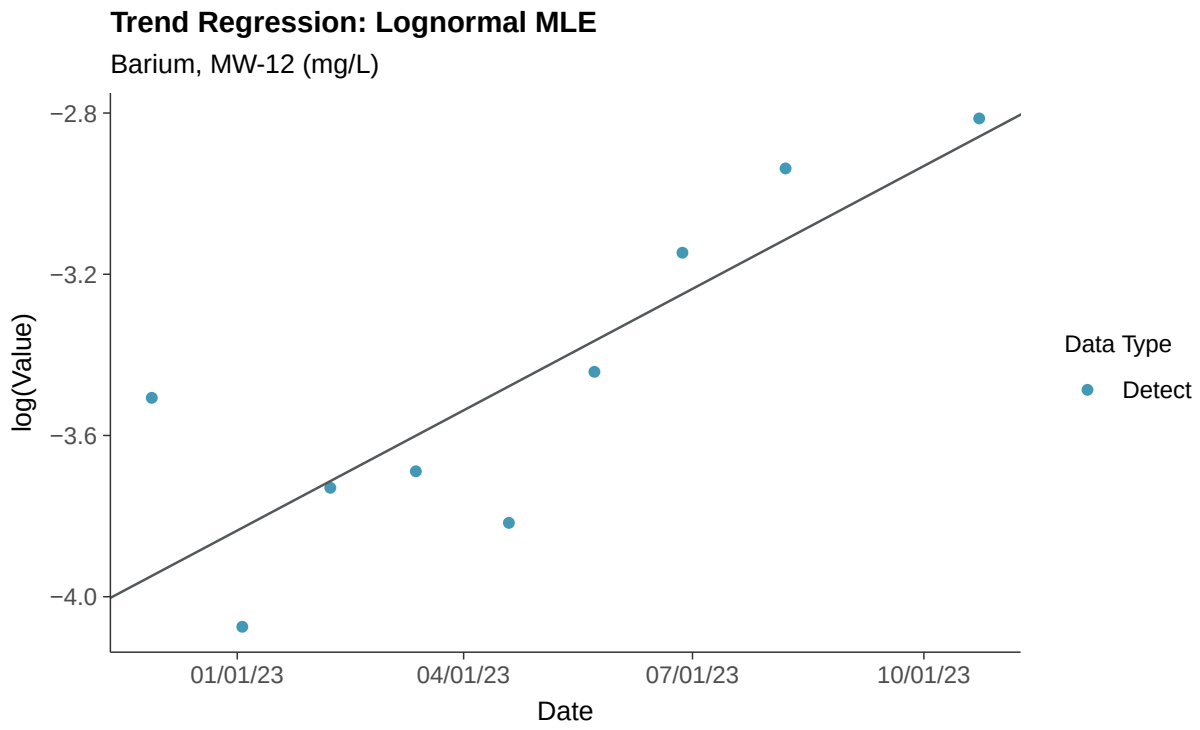
Barium, MW-12 (mg/L)




Normal Q-Q plot
Barium, MW-12 (mg/L)
Value
0.06
0.05
0.04
0.03
0.02
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

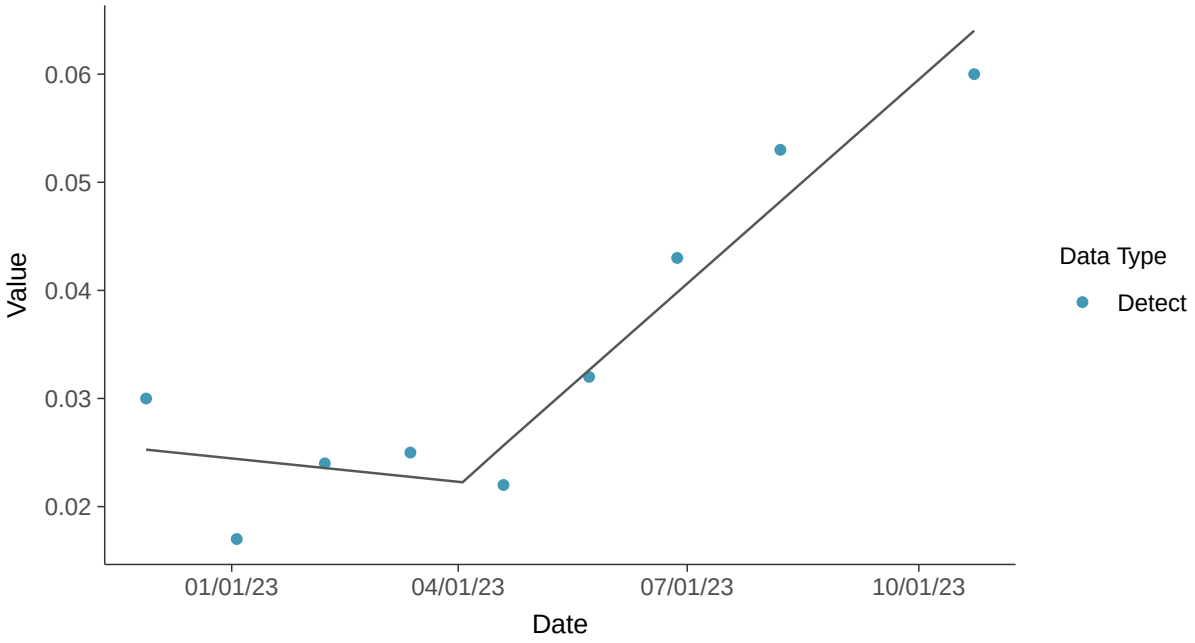

Lognormal Q-Q plot
Barium, MW-12 (mg/L)
log(Value)
−2.7
−3.0
−3.3
−3.6
−3.9
−4.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Barium, MW-12 (mg/L)
Value
0.06
0.05
0.04
0.03
0.02
0.01
0.02
0.03
0.04
0.05
0.06
0.07
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Barium, MW-12 (mg/L)
log(Value)
−2.8
−3.2
−3.6
−4.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

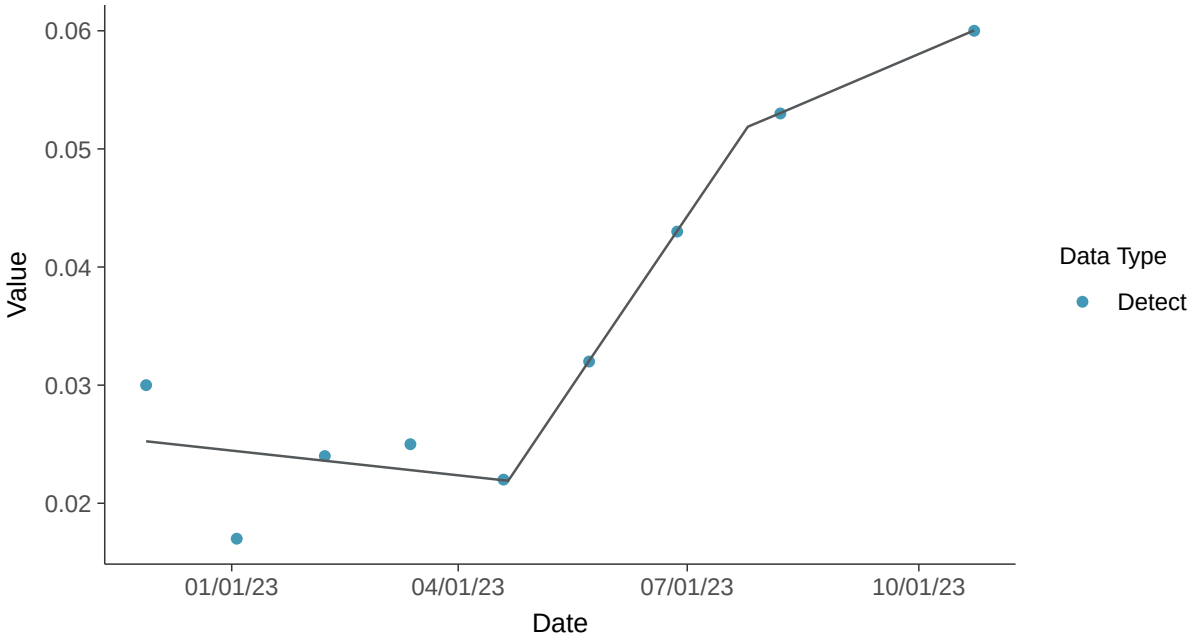
Trend Regression: Piecewise Linear-Linear

Barium, MW-12 (mg/L)



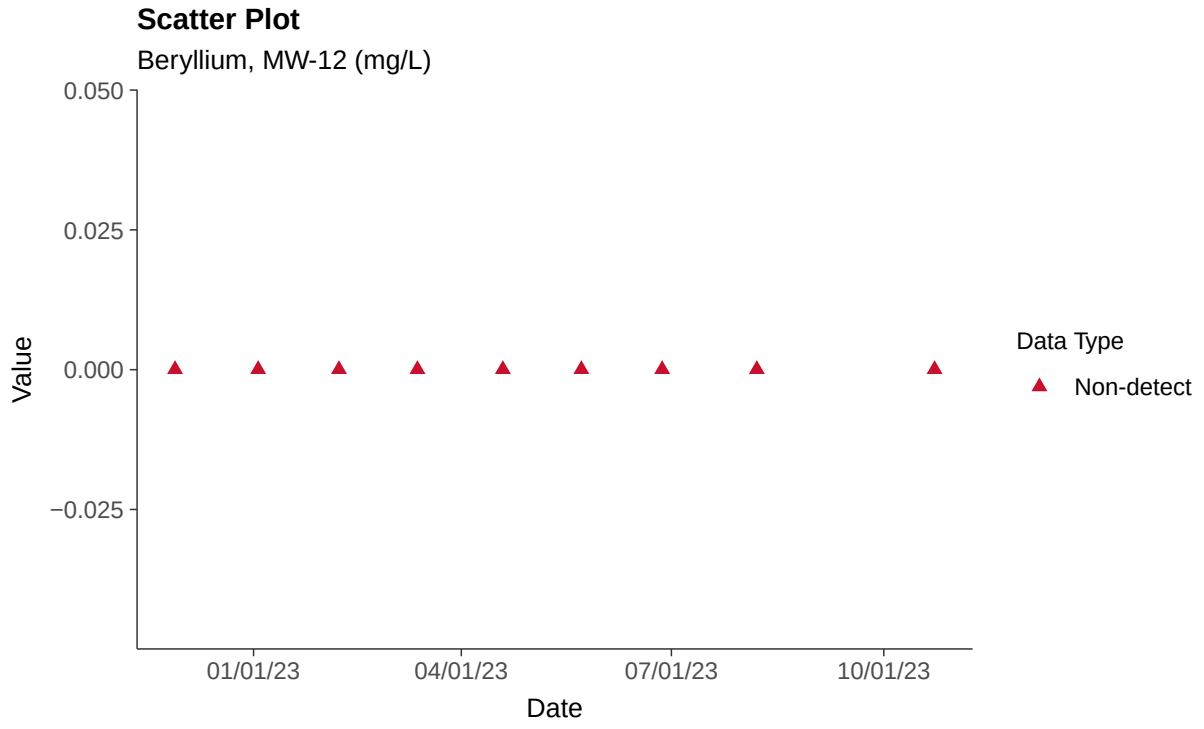
Trend Regression: Piecewise Linear-Linear-Linear

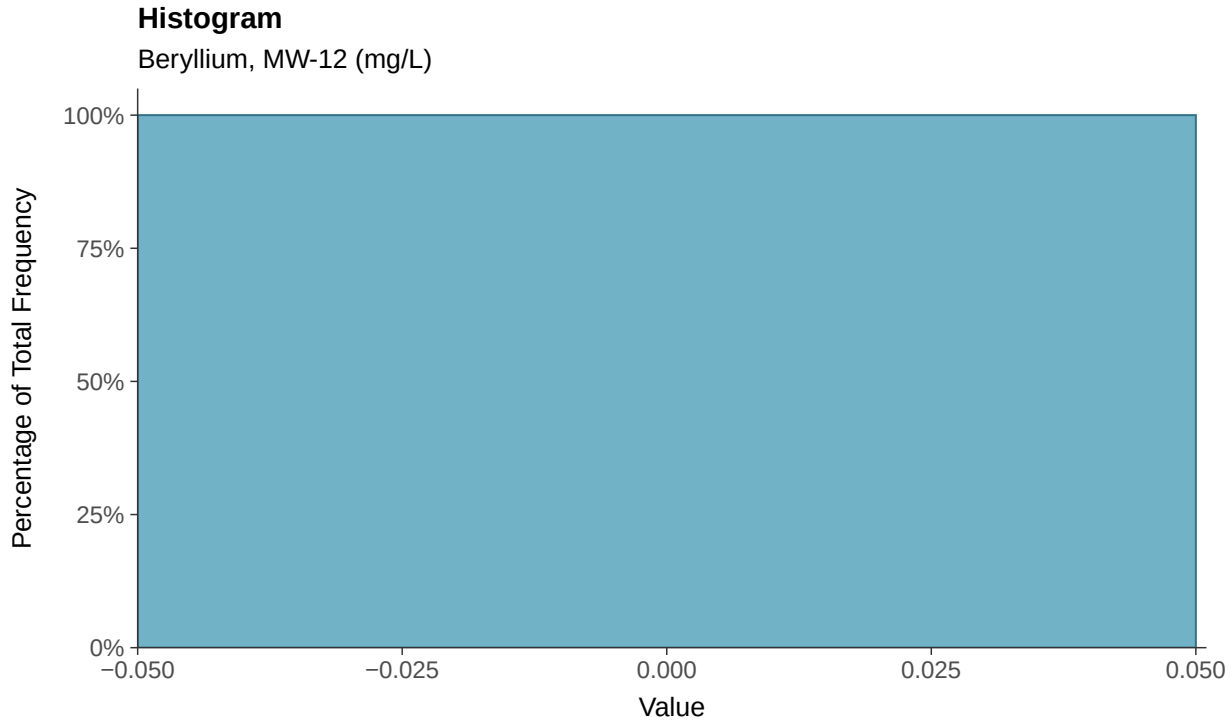
Barium, MW-12 (mg/L)



Appendix IV: Beryllium, MW-12

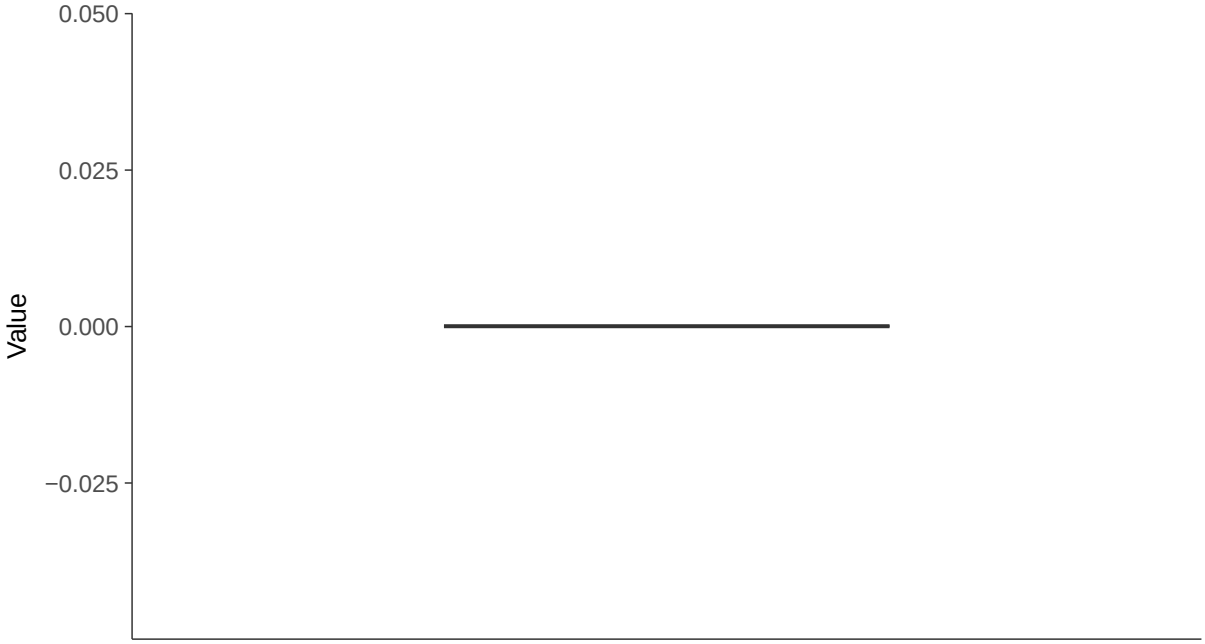
ID: 2_21_5_104





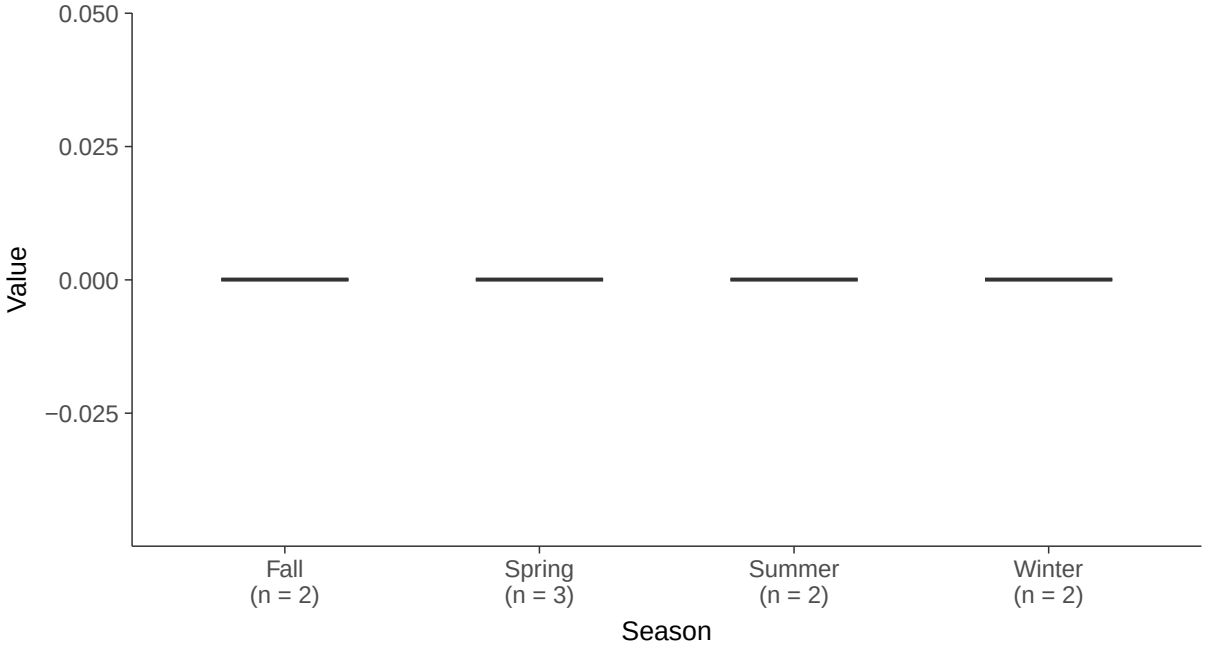
Boxplot

Beryllium, MW-12 (mg/L)



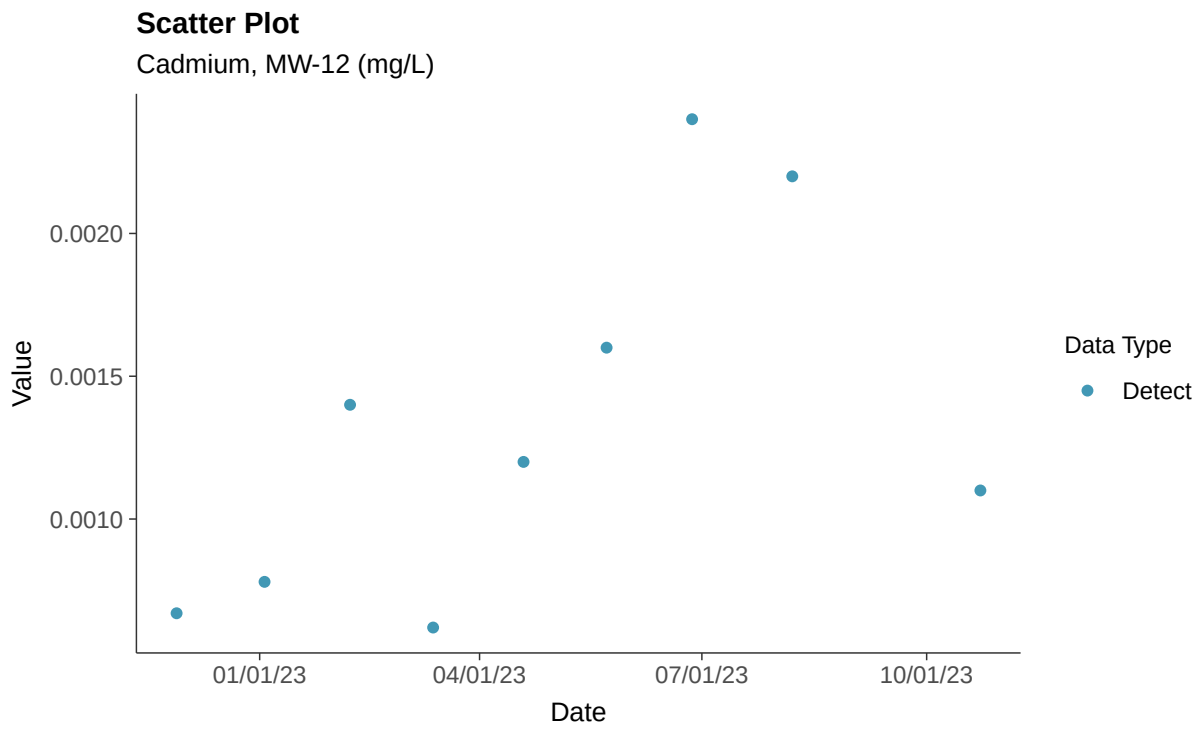
Boxplot by Season

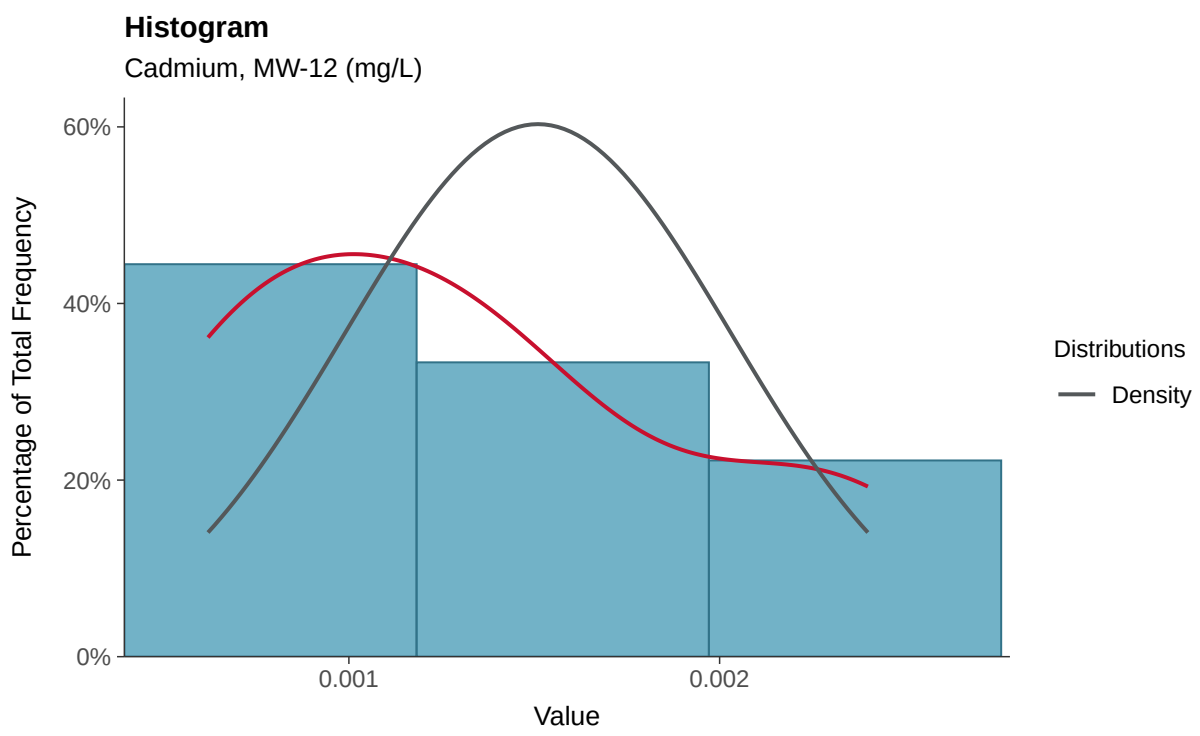
Beryllium, MW-12 (mg/L)



Appendix IV: Cadmium, MW-12

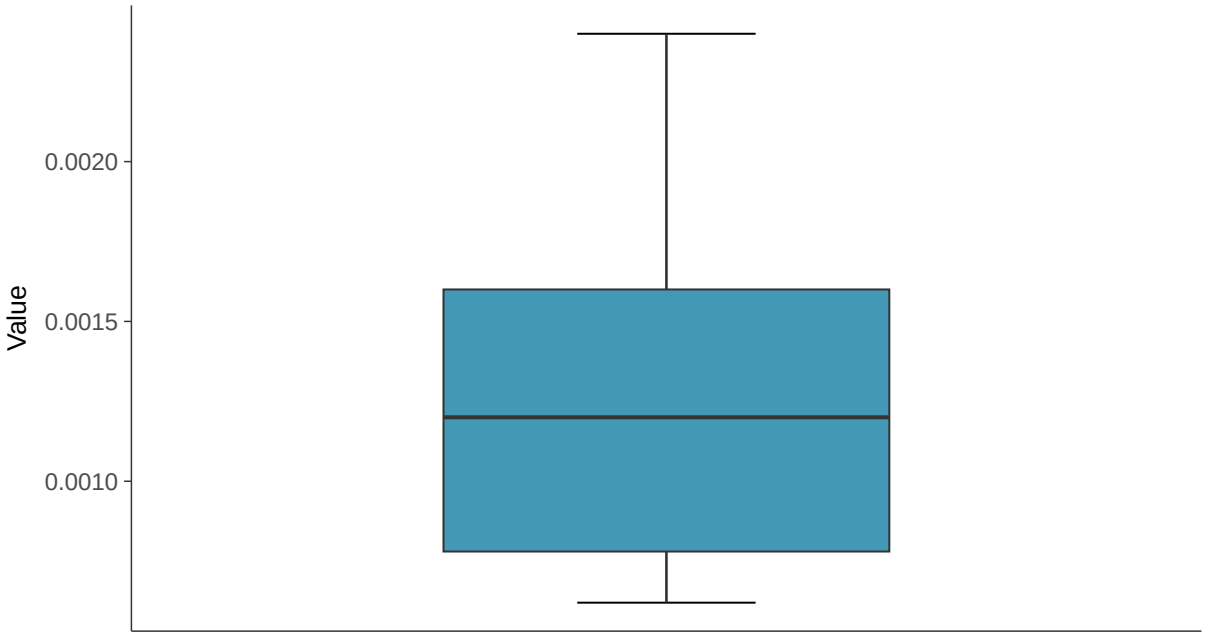
ID: 2_21_5_106





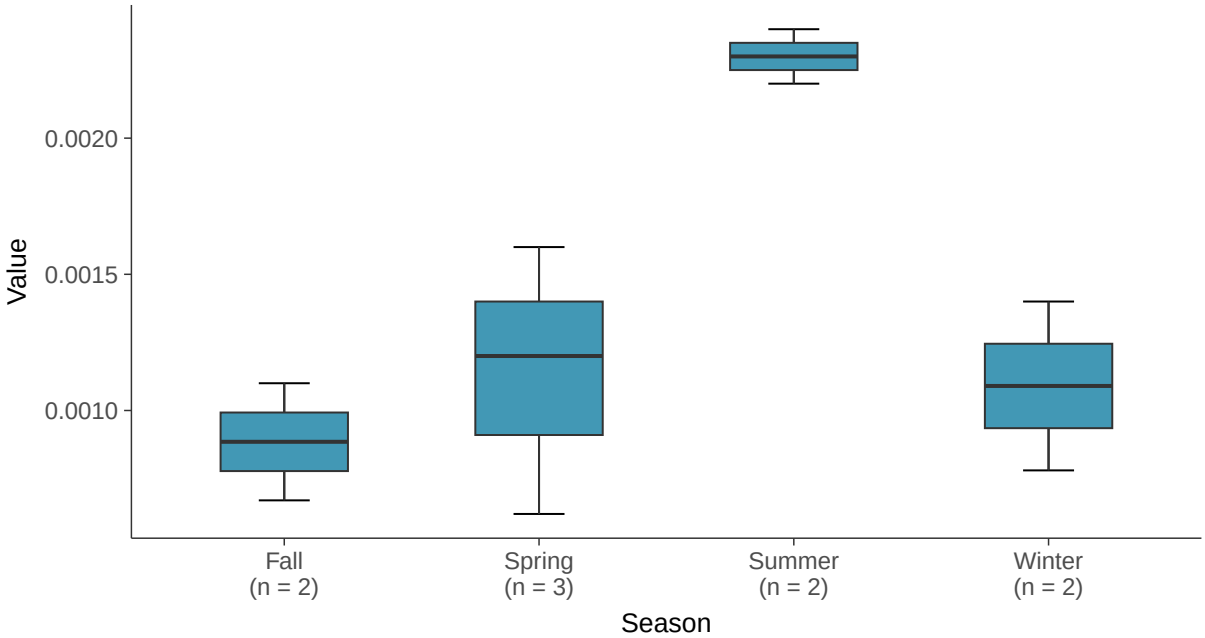
Boxplot

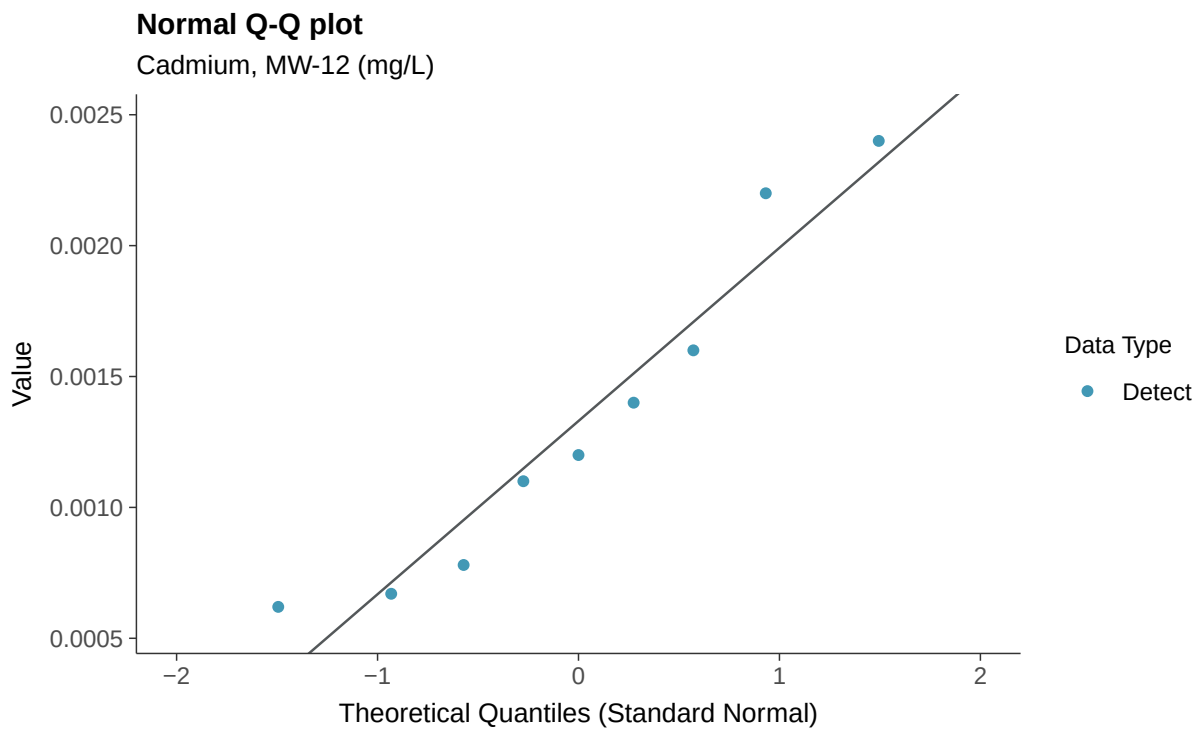
Cadmium, MW-12 (mg/L)

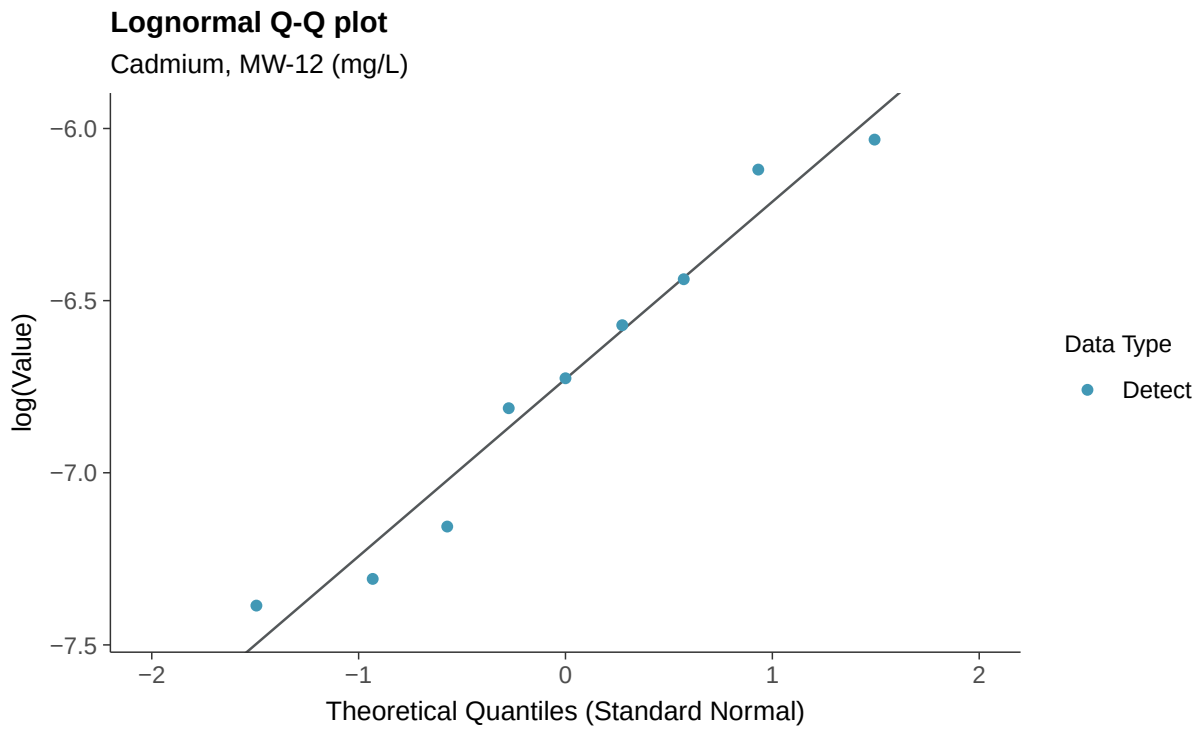


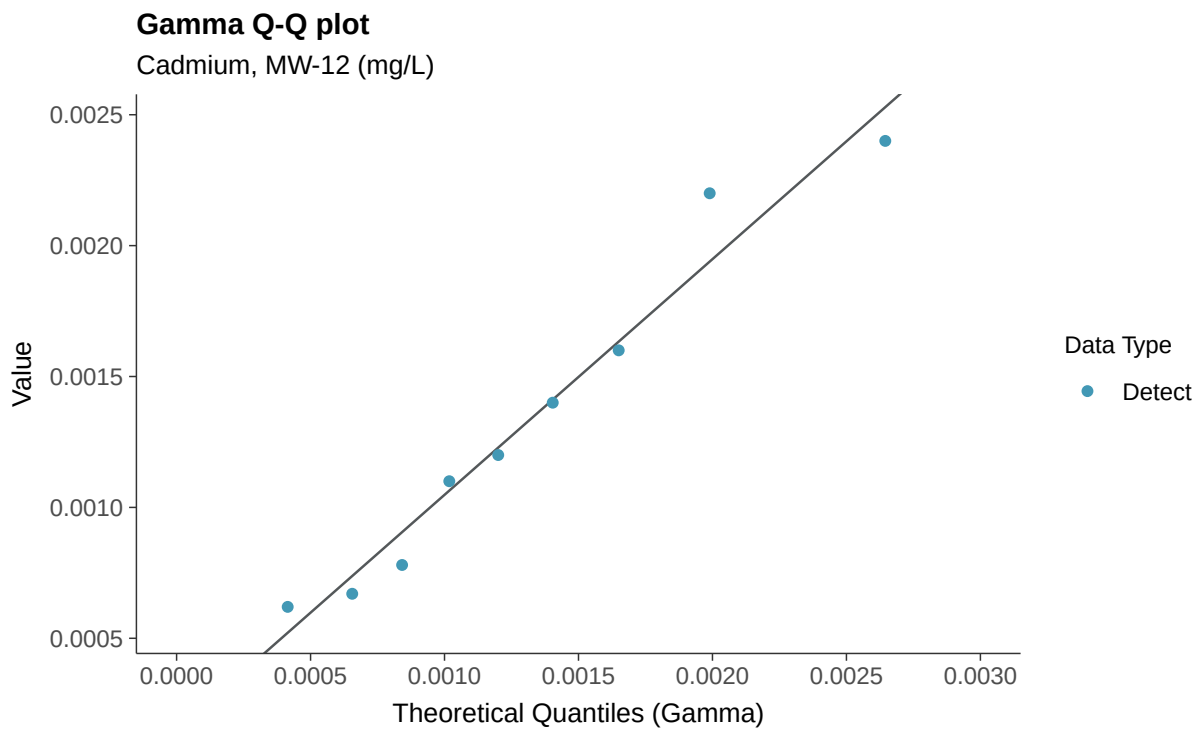
Boxplot by Season

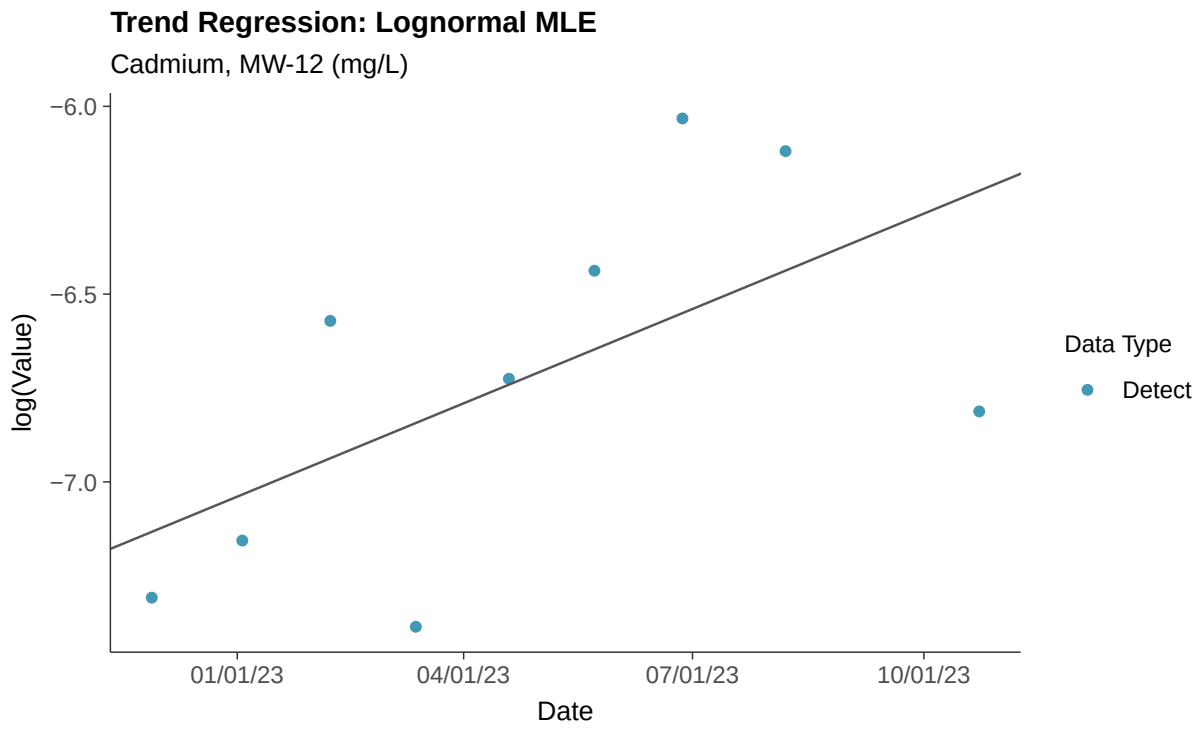
Cadmium, MW-12 (mg/L)




Normal Q-Q plot
Cadmium, MW-12 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
0.0005
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

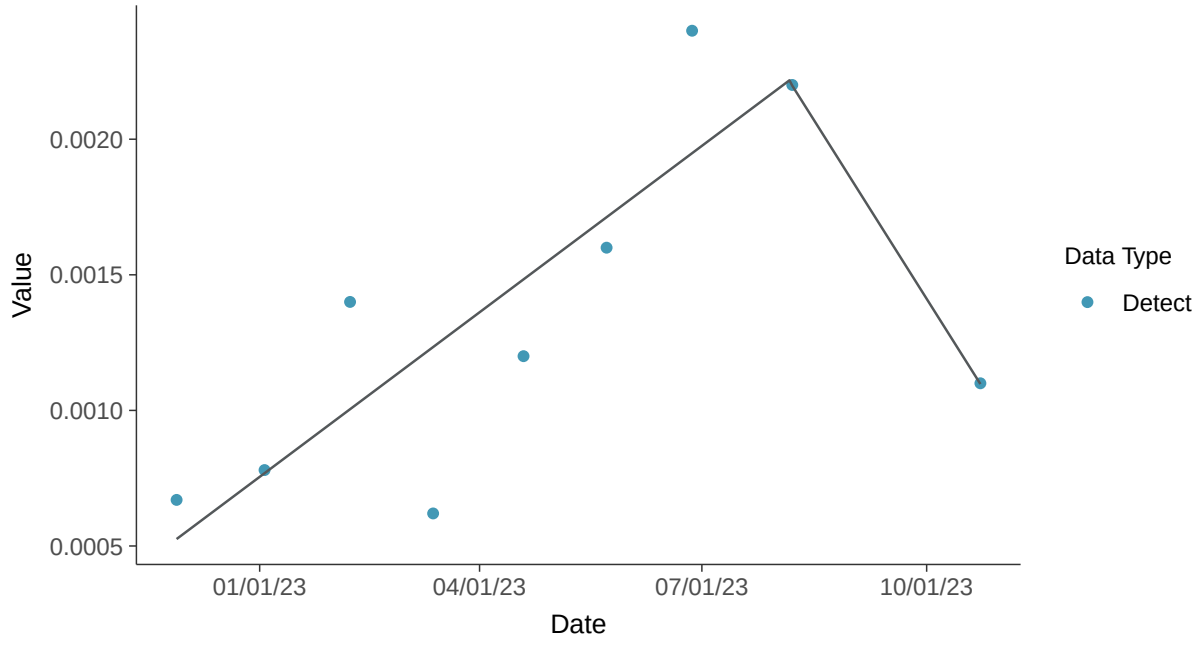

Lognormal Q-Q plot
Cadmium, MW-12 (mg/L)
log(Value)
−6.0
−6.5
−7.0
−7.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Cadmium, MW-12 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Cadmium, MW-12 (mg/L)
log(Value)
−6.0
−6.5
−7.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

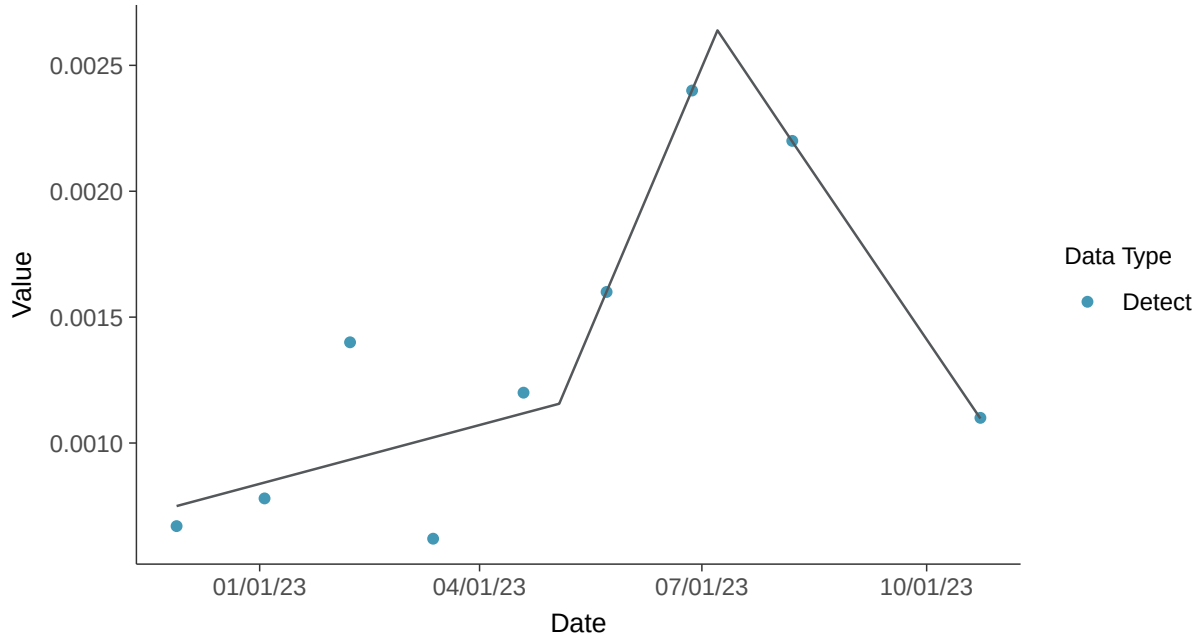
Trend Regression: Piecewise Linear-Linear

Cadmium, MW-12 (mg/L)



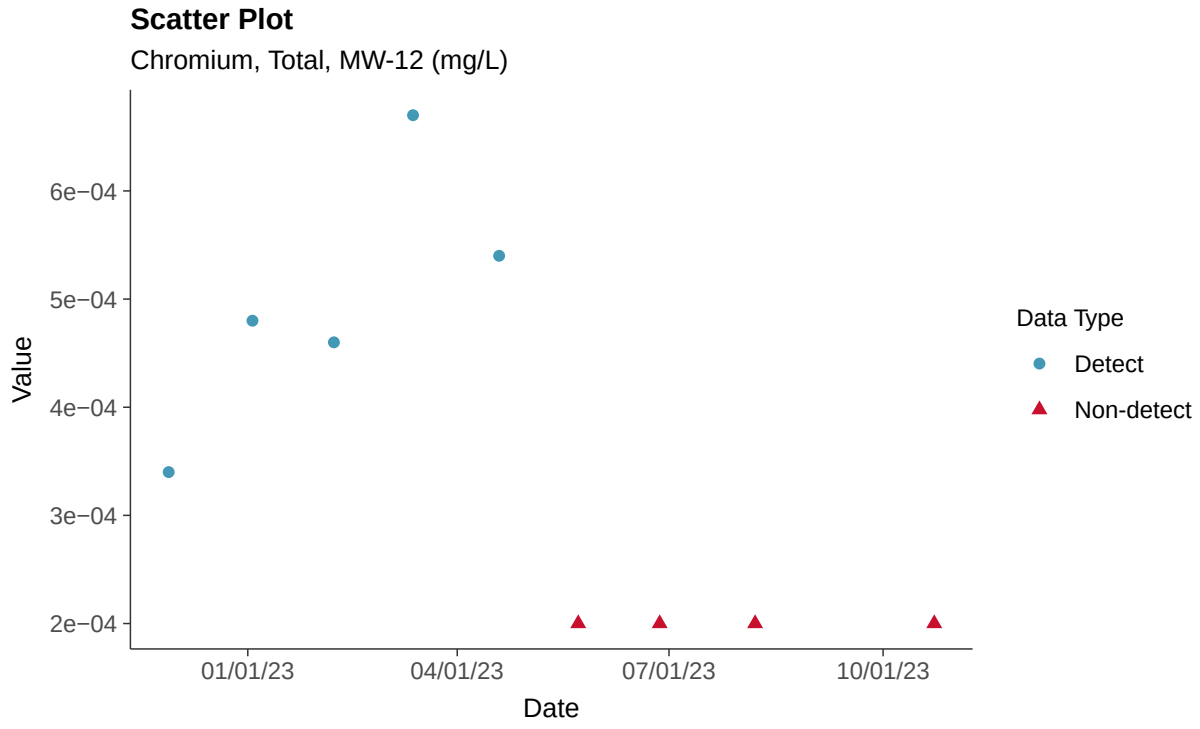
Trend Regression: Piecewise Linear-Linear-Linear

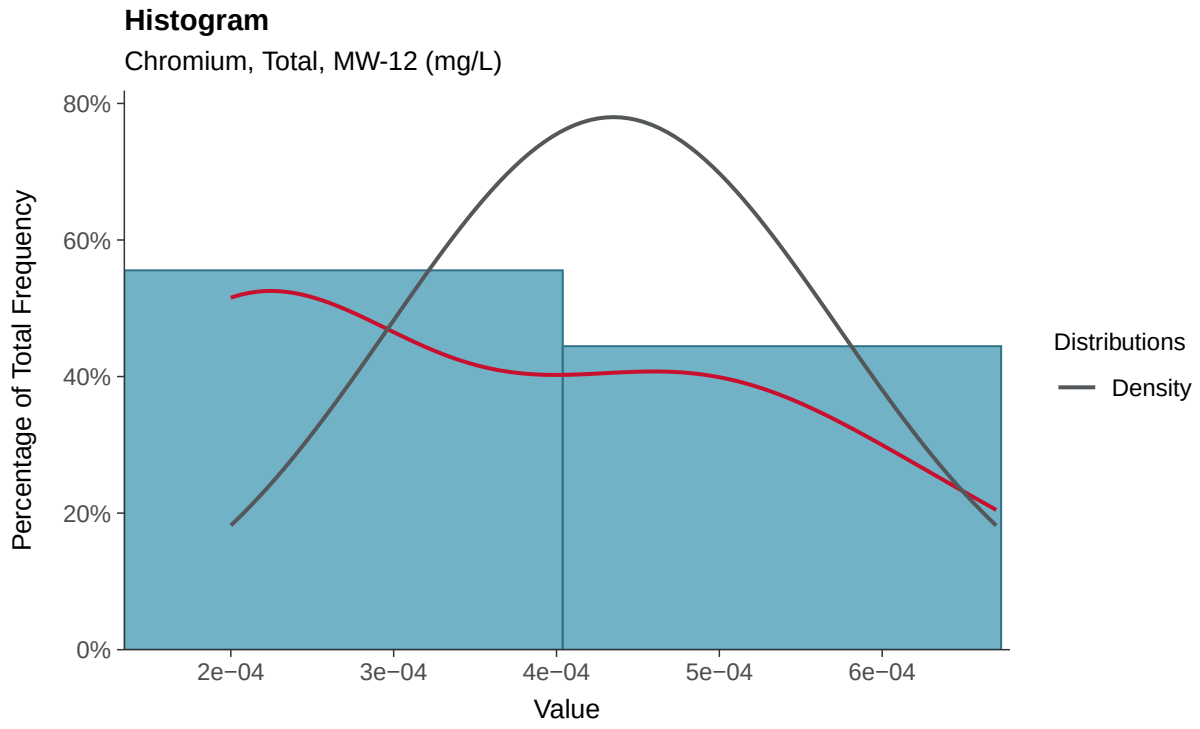
Cadmium, MW-12 (mg/L)



Appendix IV: Chromium, Total, MW-12

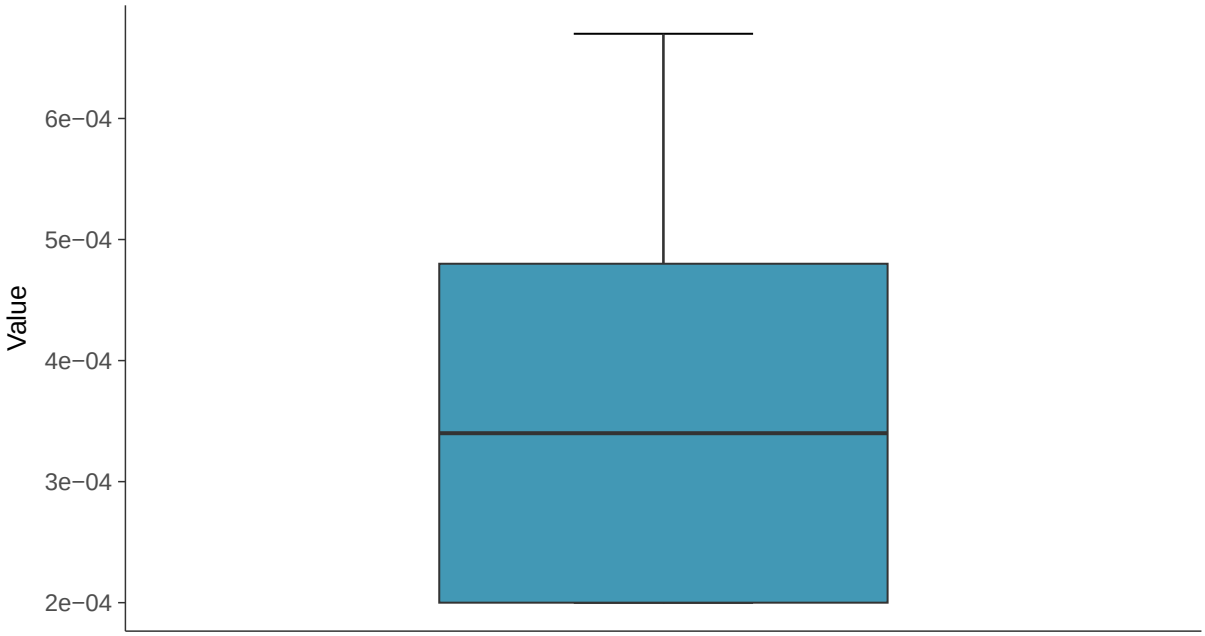
ID: 2_21_5_109





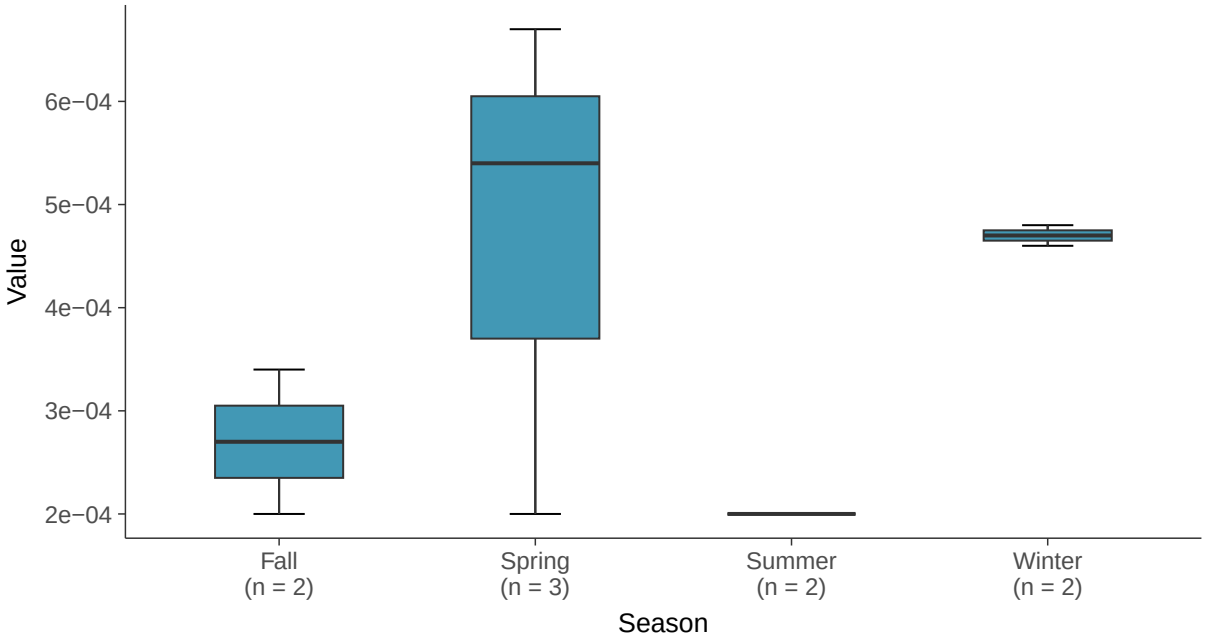
Boxplot

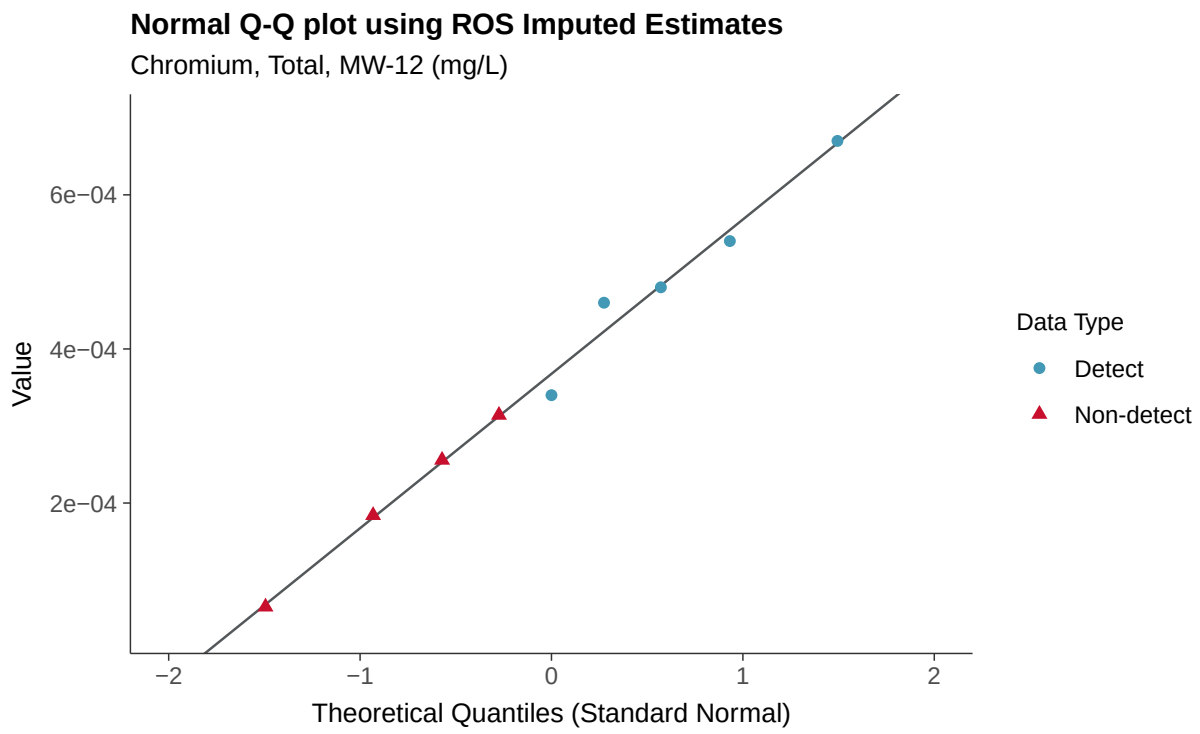
Chromium, Total, MW-12 (mg/L)

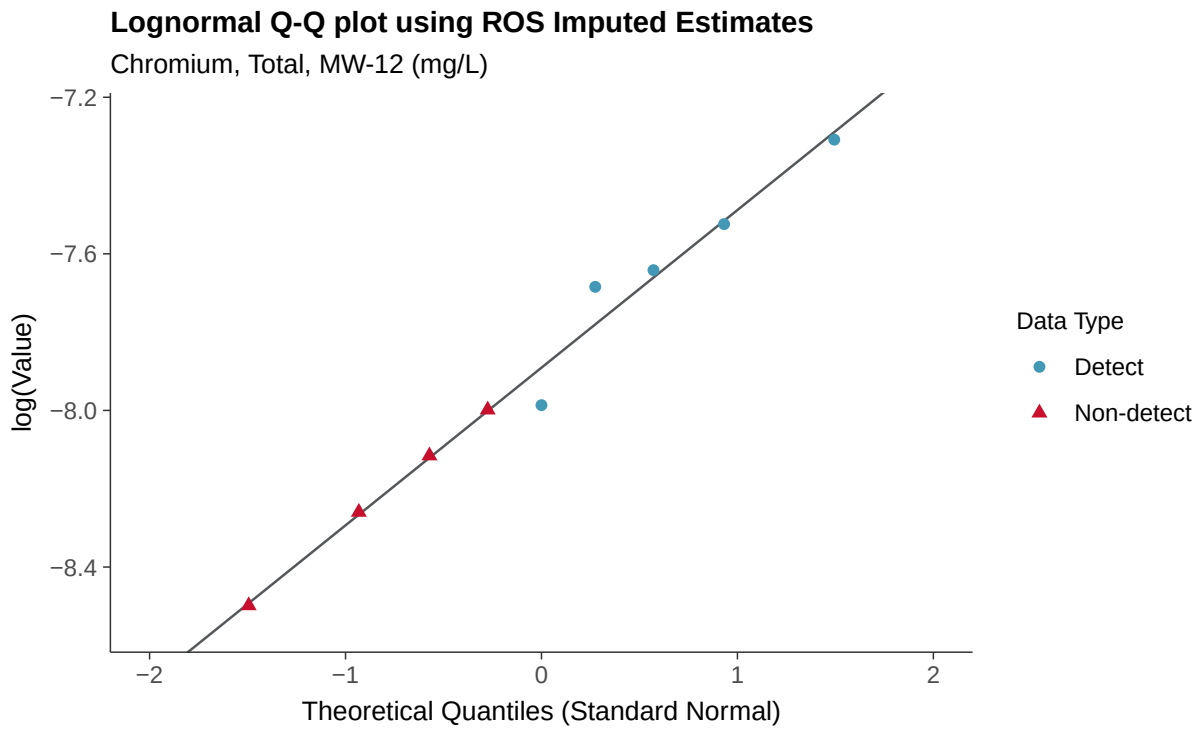


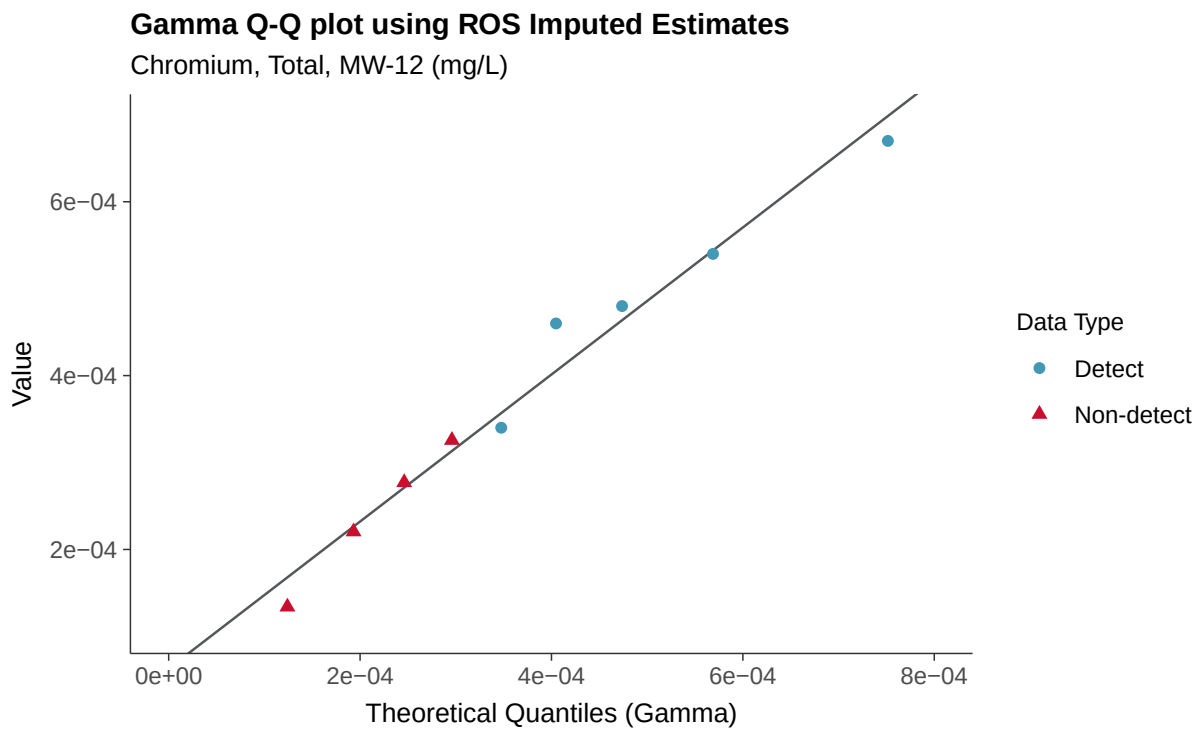
Boxplot by Season

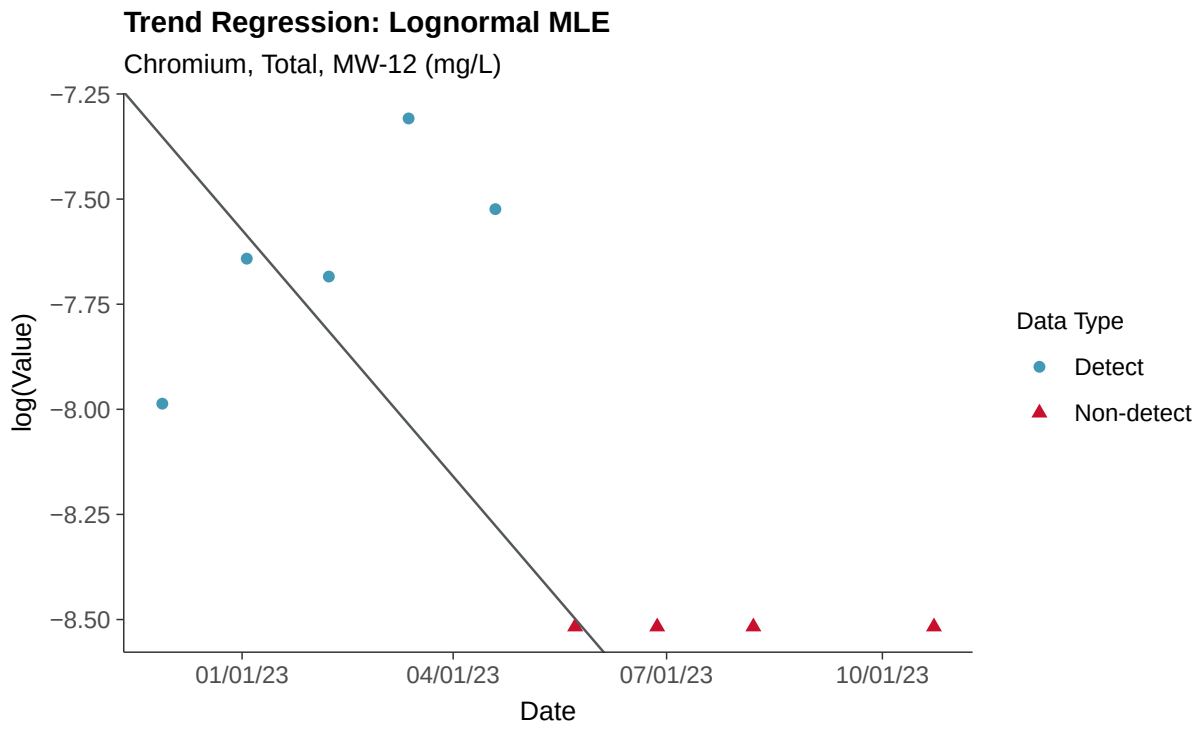
Chromium, Total, MW-12 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Chromium, Total, MW-12 (mg/L)
Value
6e−04
4e−04
2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

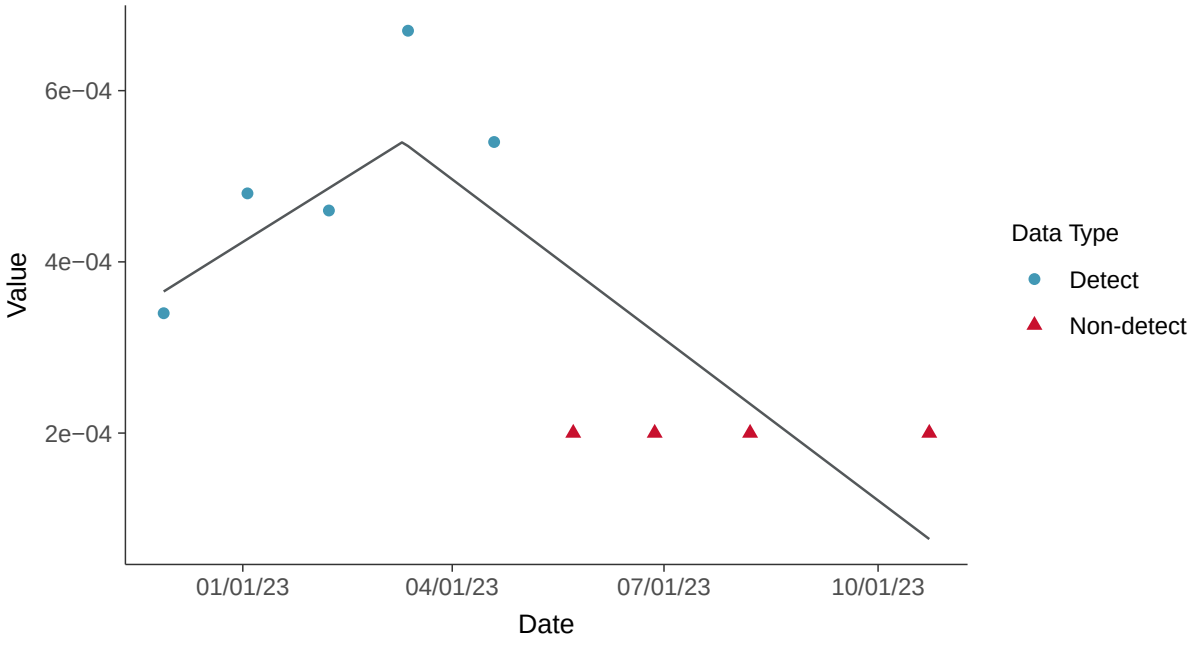

Lognormal Q-Q plot using ROS Imputed Estimates
Chromium, Total, MW-12 (mg/L)
log(Value)
−7.2
−7.6
−8.0
−8.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Chromium, Total, MW-12 (mg/L)
Value
6e−04
4e−04
2e−04
0e+00
2e−04
4e−04
6e−04
8e−04
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-12 (mg/L)
log(Value)
−7.25
−7.50
−7.75
−8.00
−8.25
−8.50
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

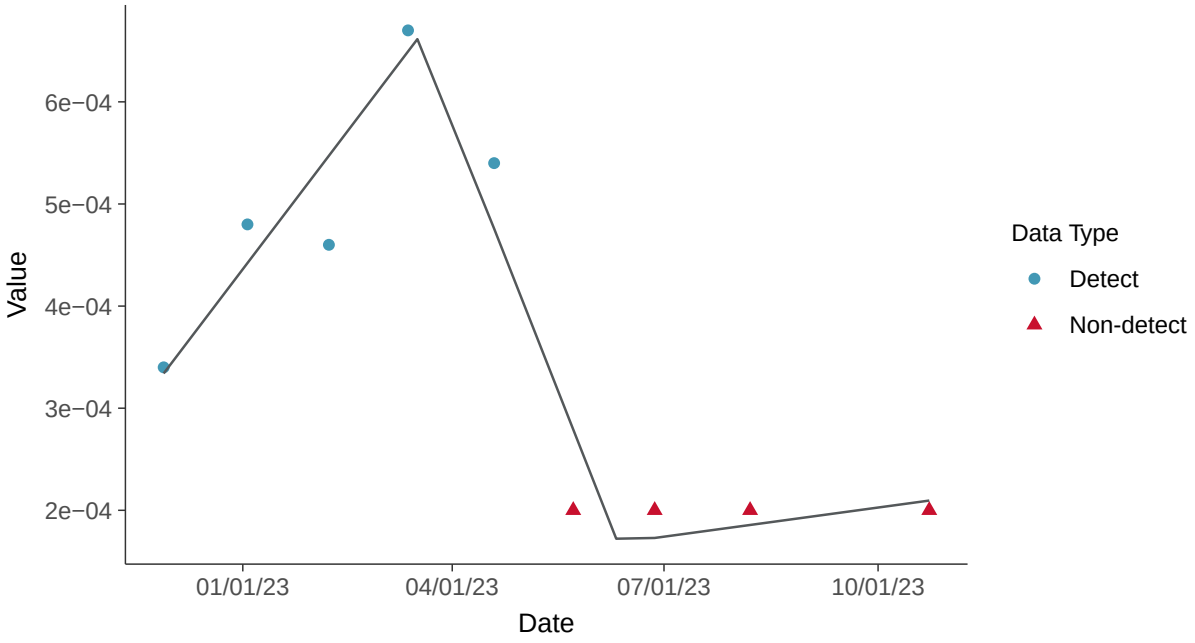
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-12 (mg/L)



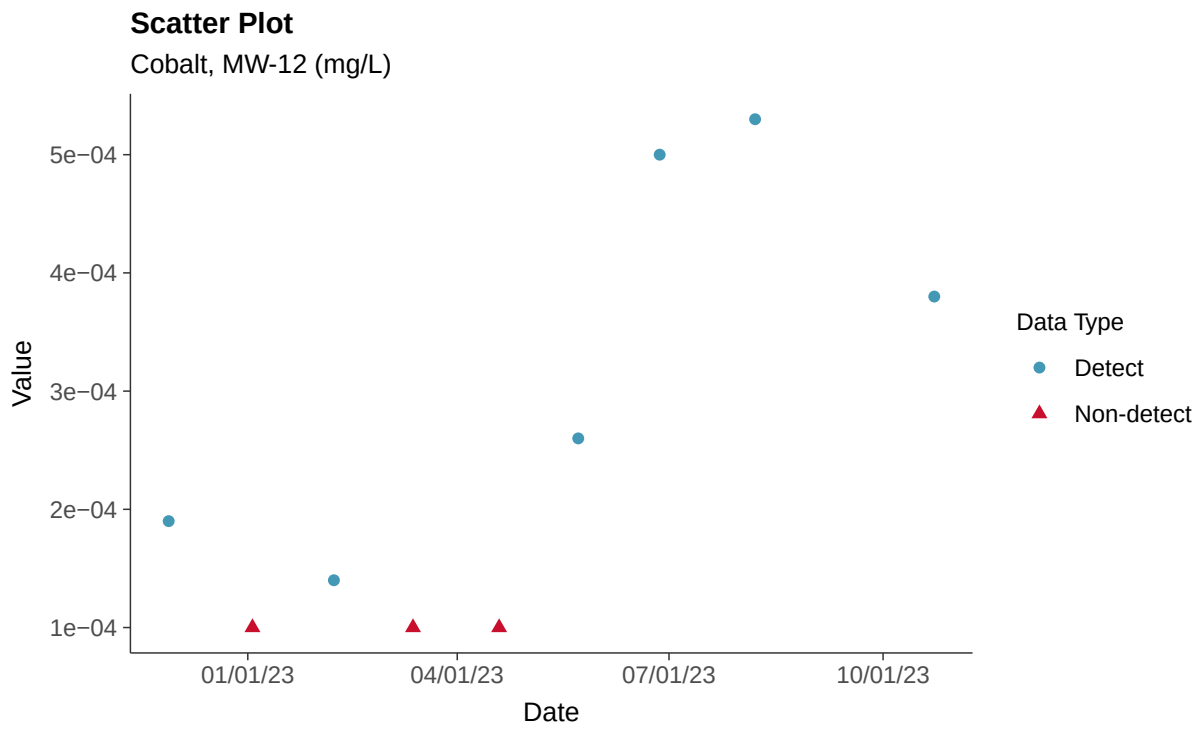
Trend Regression: Piecewise Linear-Linear-Linear

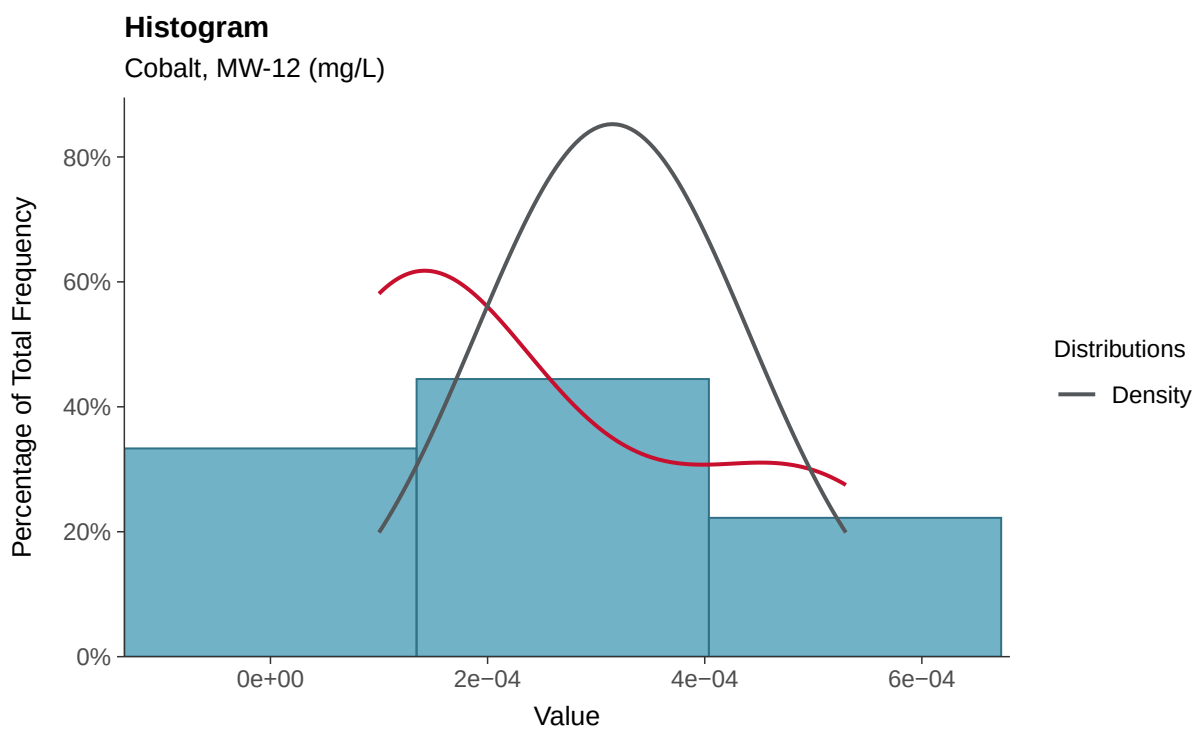
Chromium, Total, MW-12 (mg/L)



Appendix IV: Cobalt, MW-12

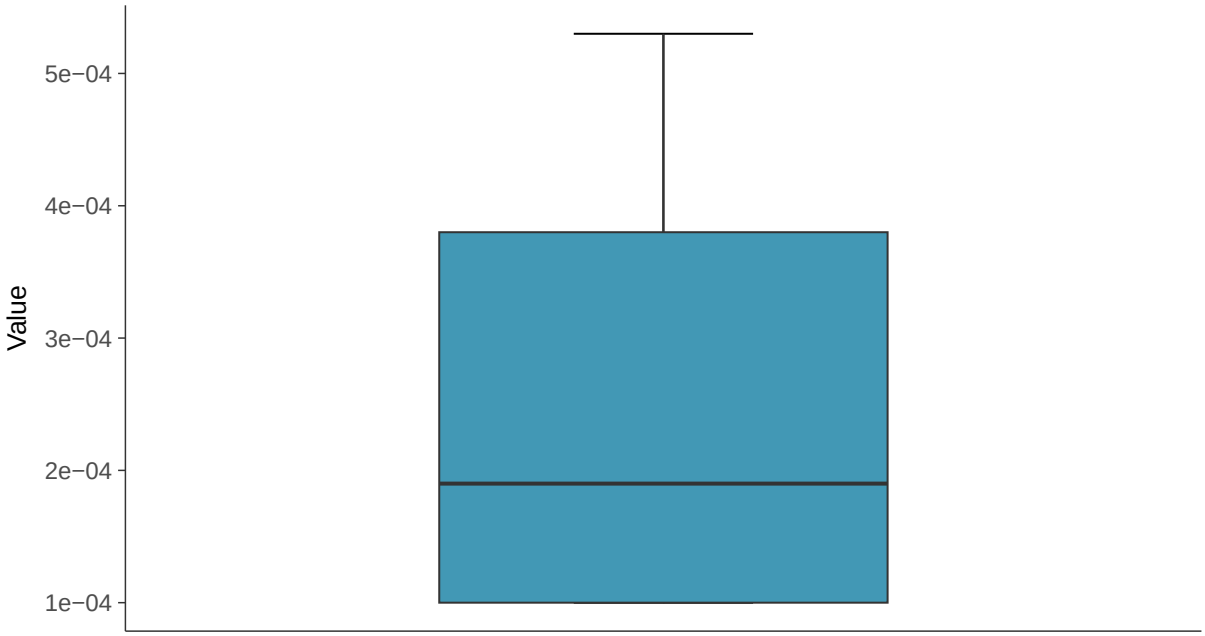
ID: 2_21_5_110





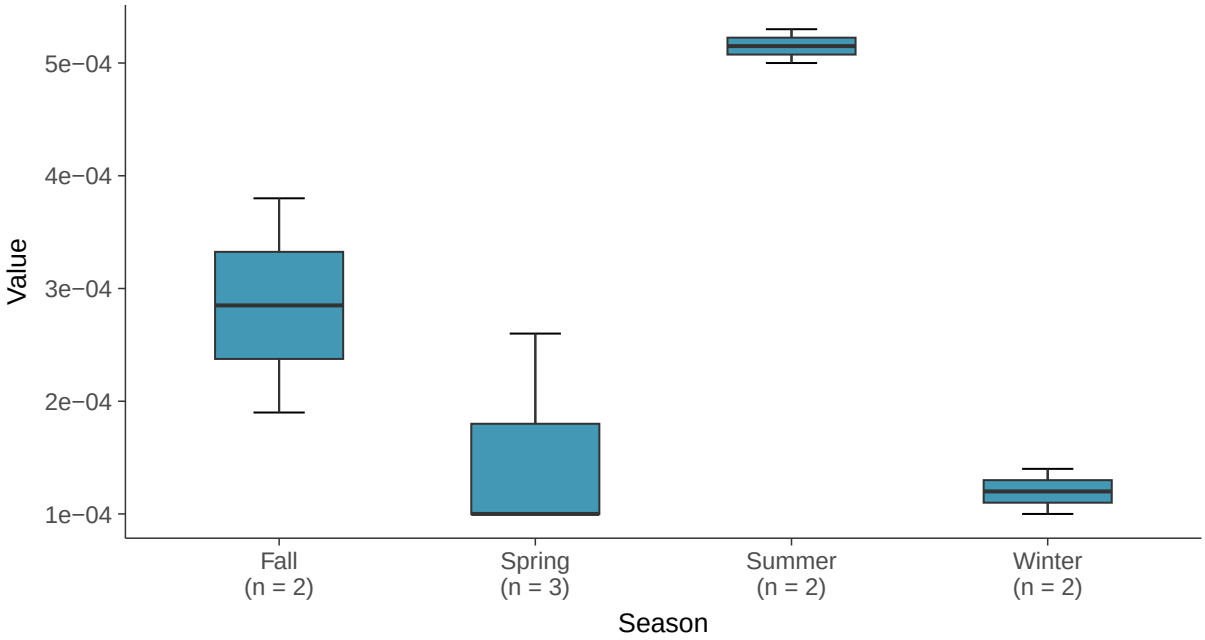
Boxplot

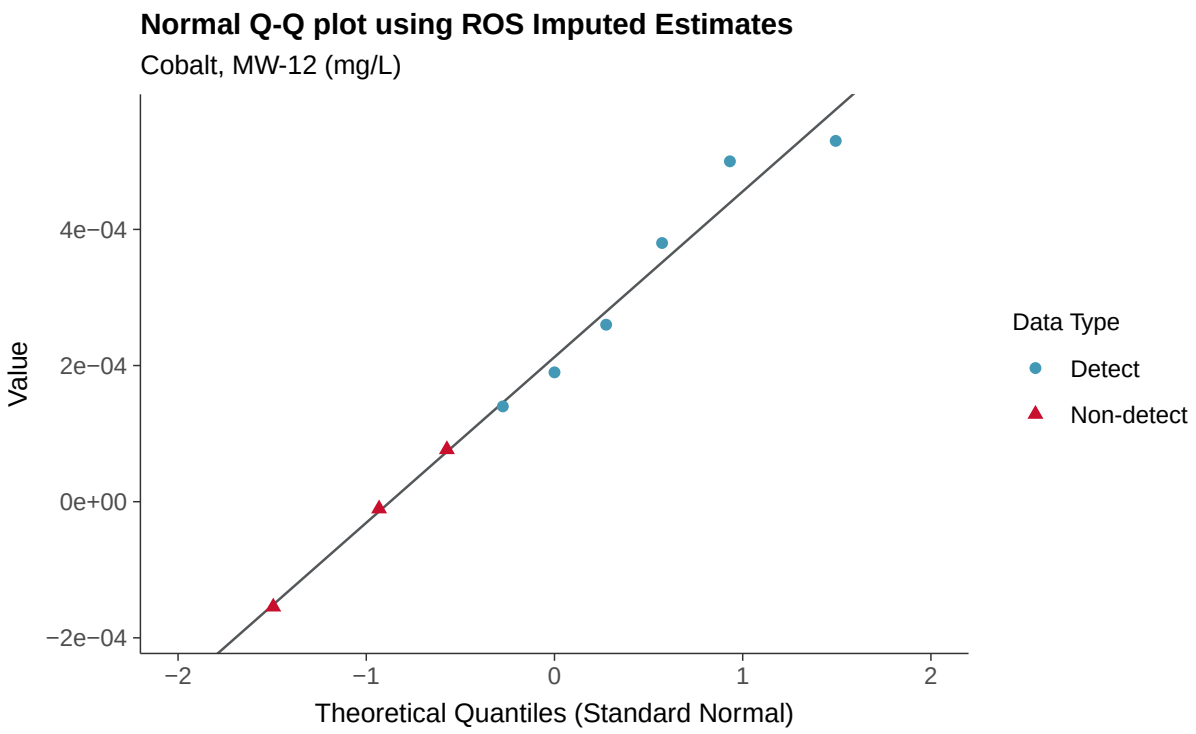
Cobalt, MW-12 (mg/L)

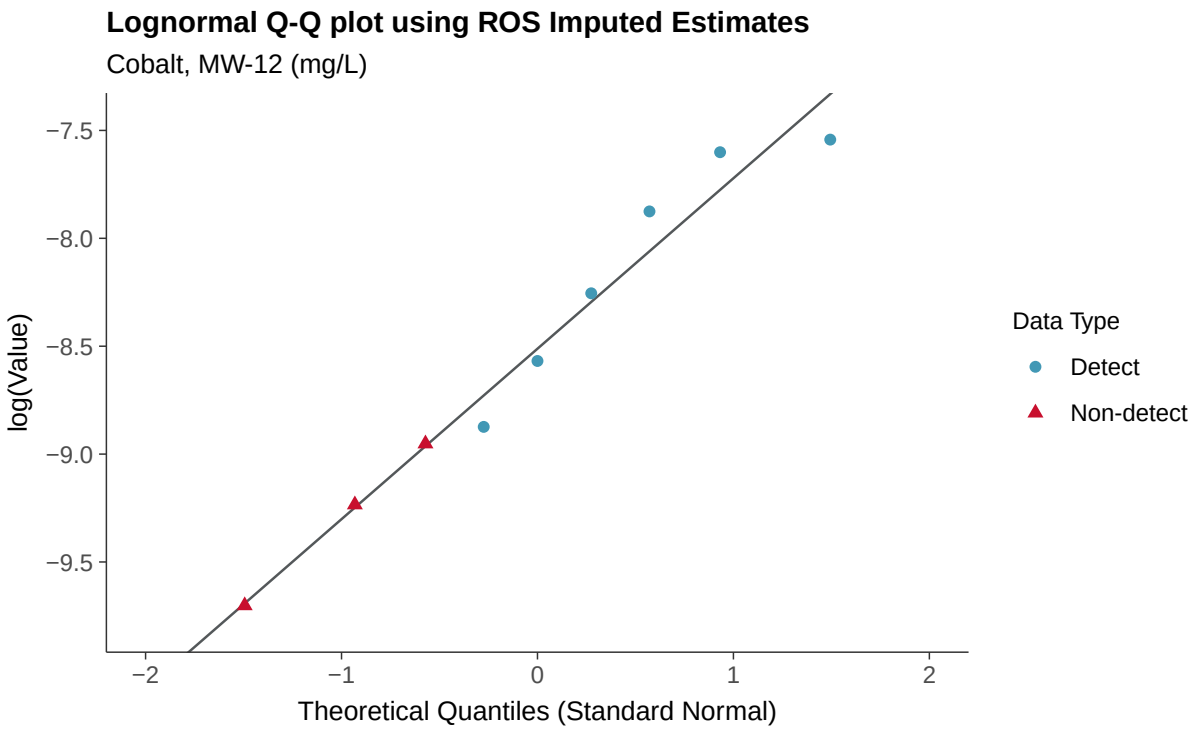


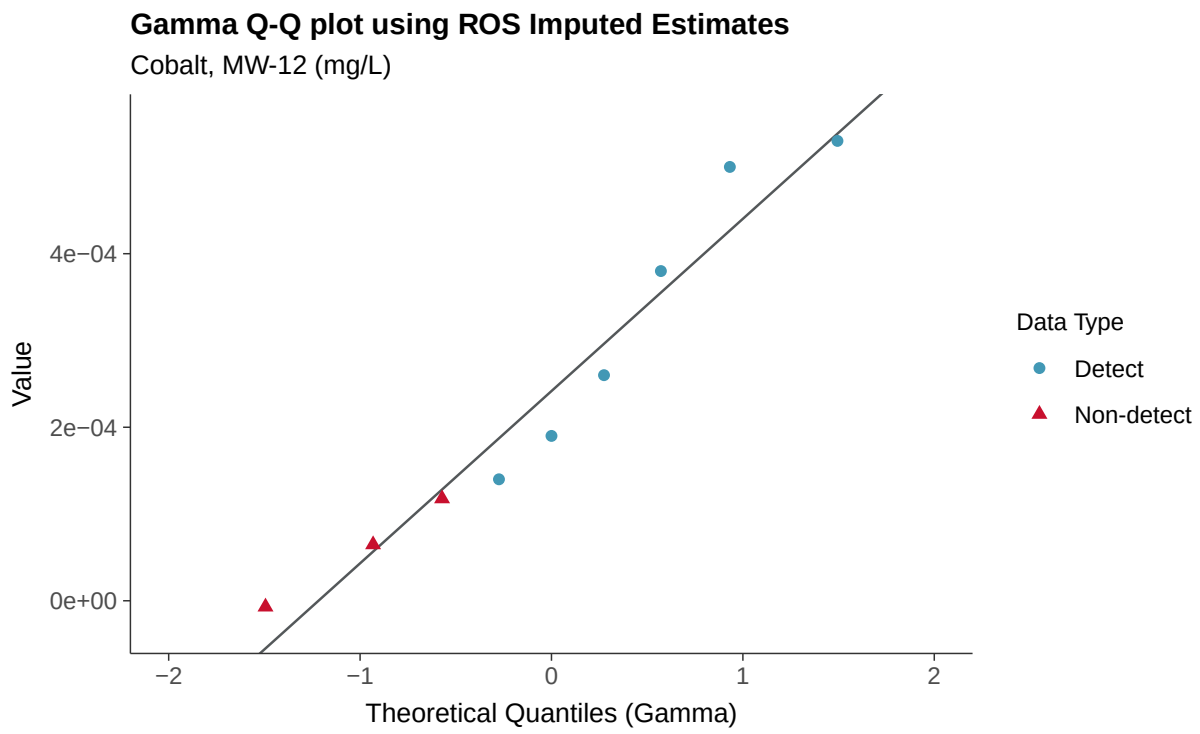
Boxplot by Season

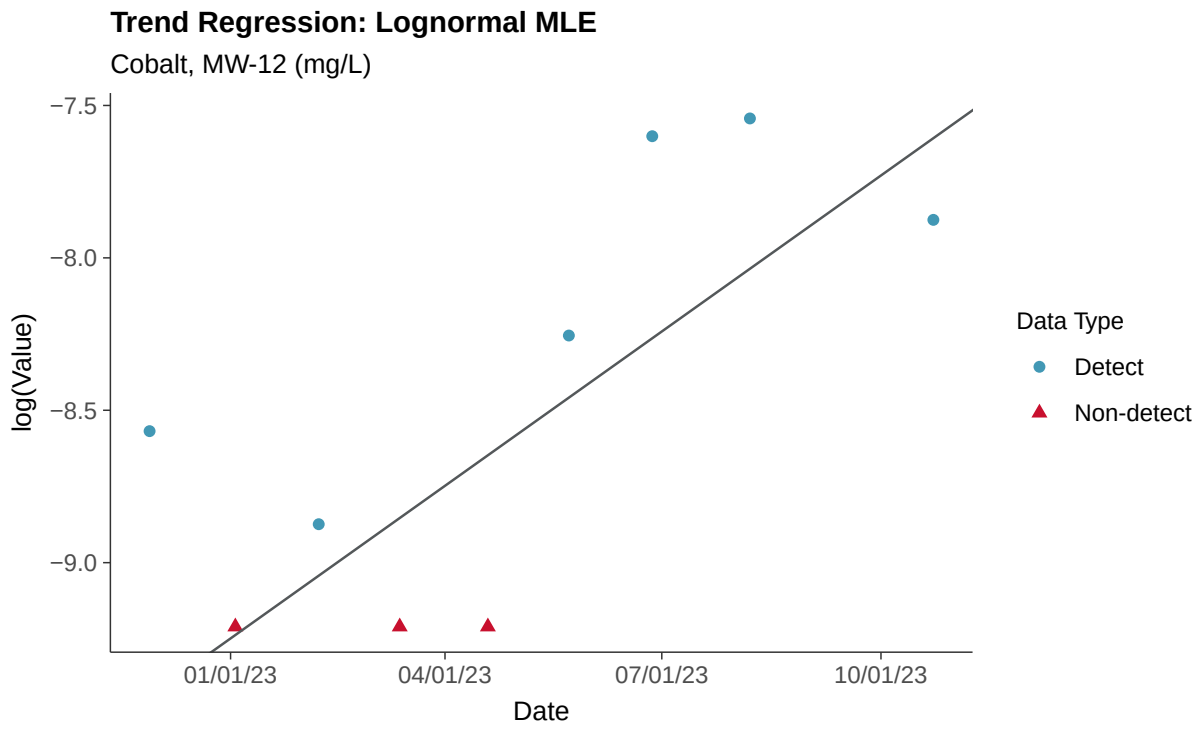
Cobalt, MW-12 (mg/L)




Normal Q-Q plot using ROS Imputed Estimates
Cobalt, MW-12 (mg/L)
Value
4e−04
2e−04
0e+00
−2e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

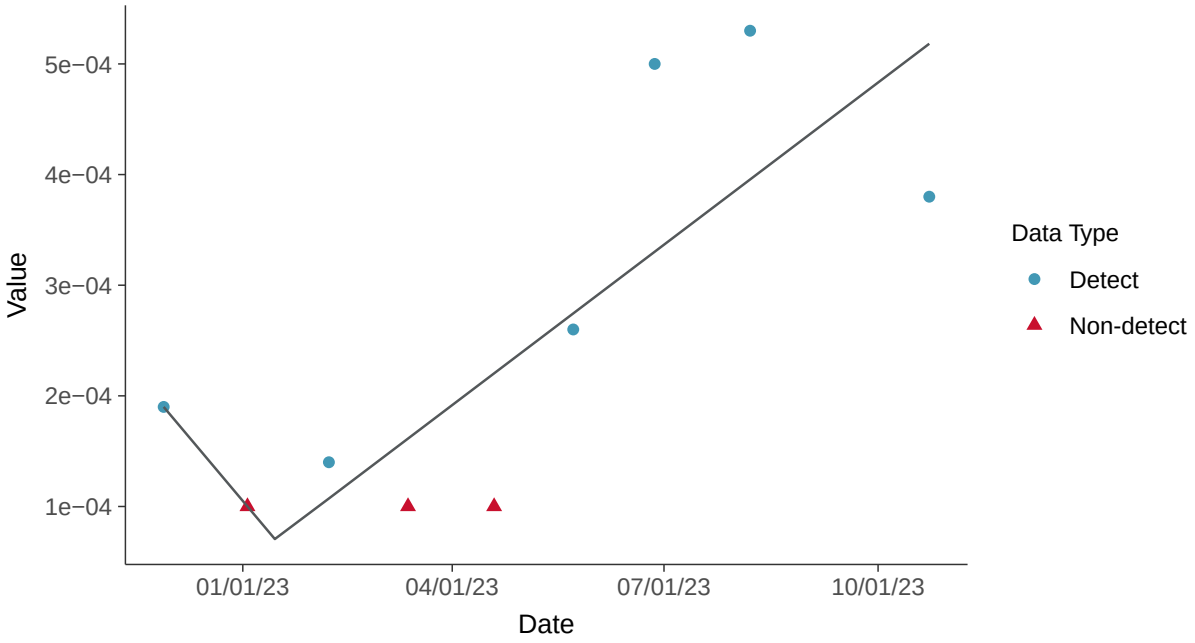

Lognormal Q-Q plot using ROS Imputed Estimates
Cobalt, MW-12 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−9.0
−9.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Gamma Q-Q plot using ROS Imputed Estimates
Cobalt, MW-12 (mg/L)
Value
4e−04
2e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect


Trend Regression: Lognormal MLE
Cobalt, MW-12 (mg/L)
log(Value)
−7.5
−8.0
−8.5
−9.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

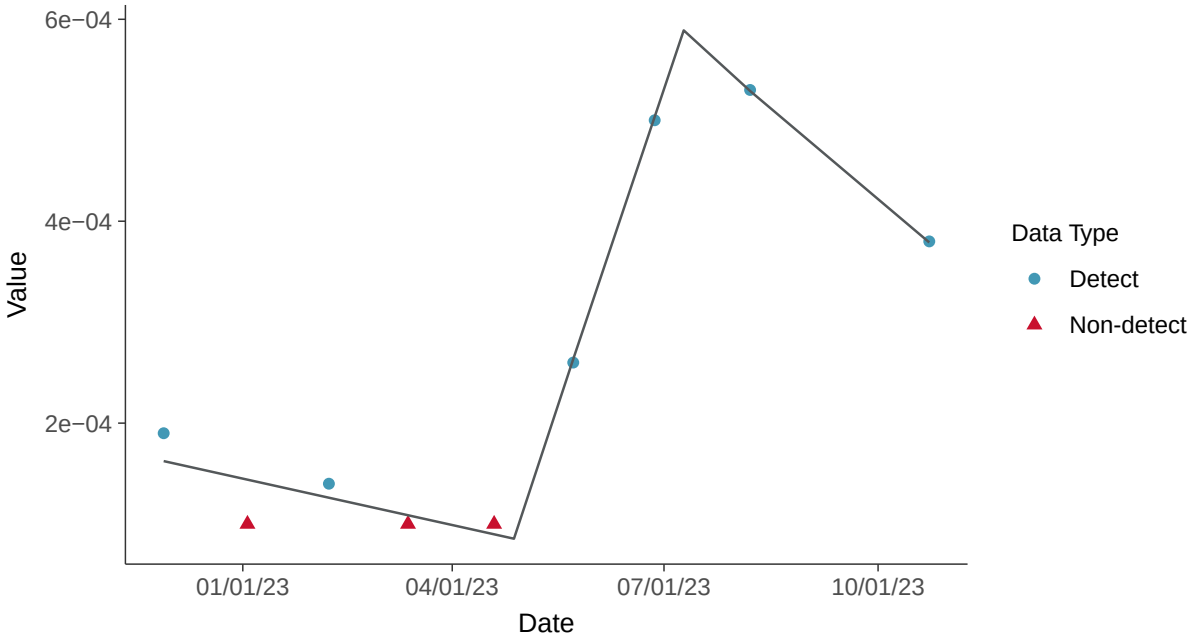
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-12 (mg/L)



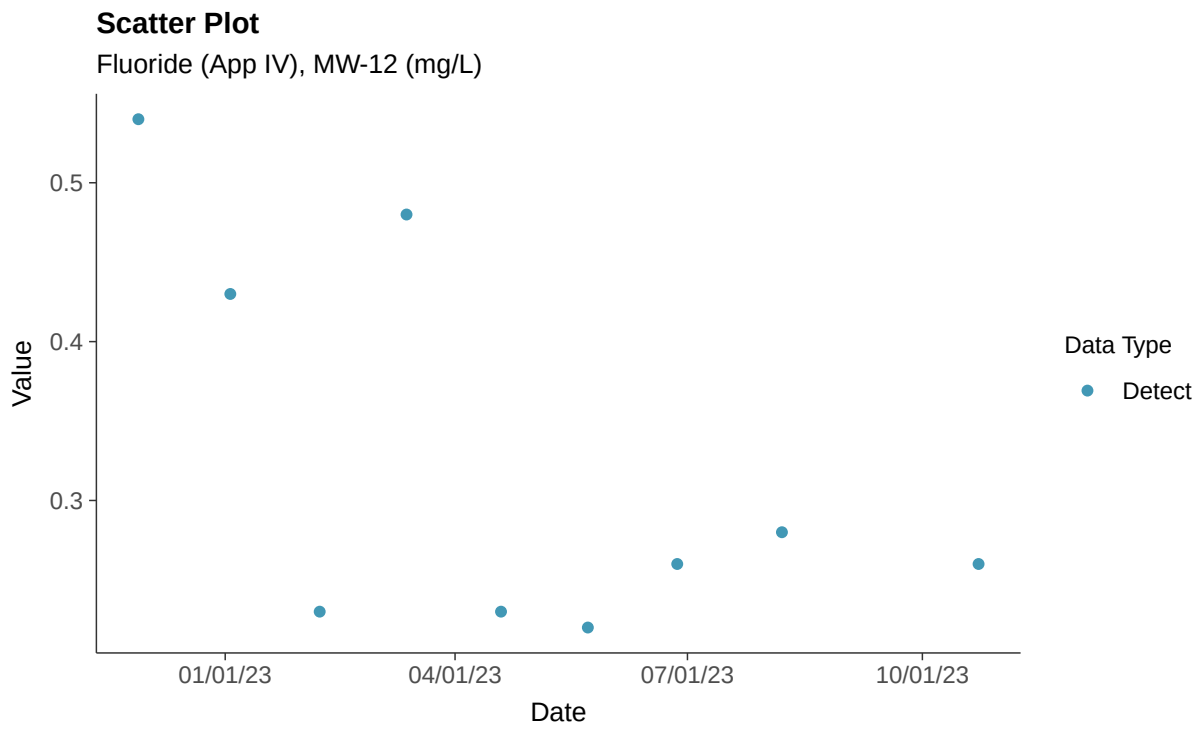
Trend Regression: Piecewise Linear-Linear-Linear

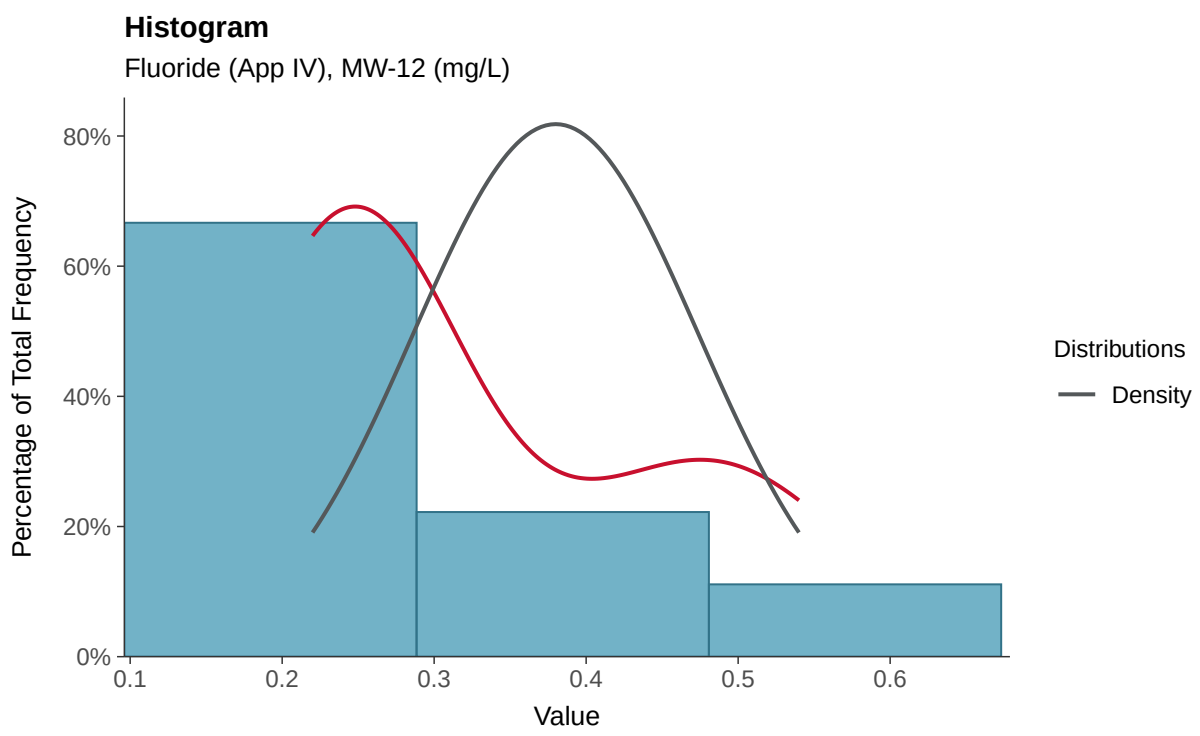
Cobalt, MW-12 (mg/L)



Appendix IV: Fluoride (App IV), MW-12

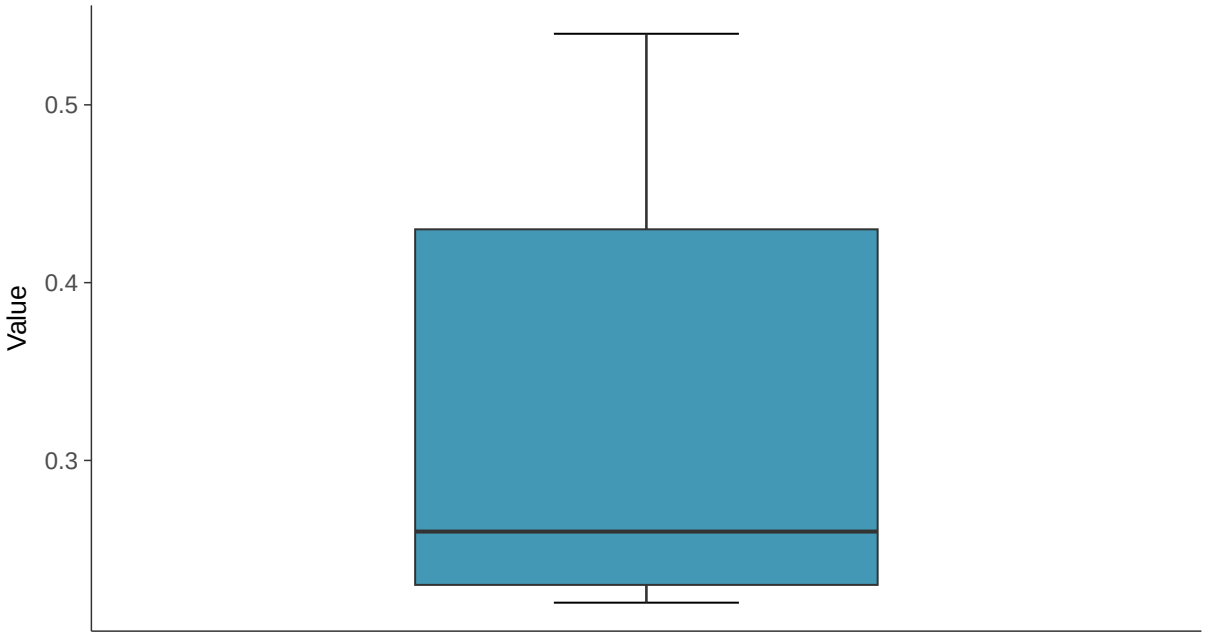
ID: 2_21_5_113





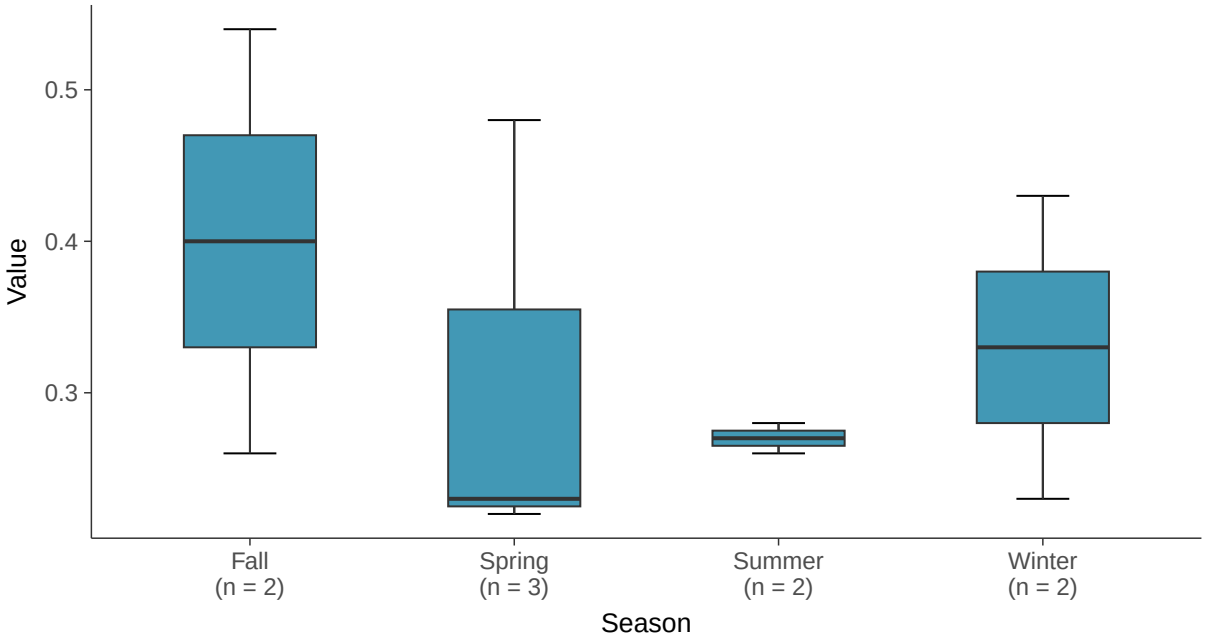
Boxplot

Fluoride (App IV), MW-12 (mg/L)



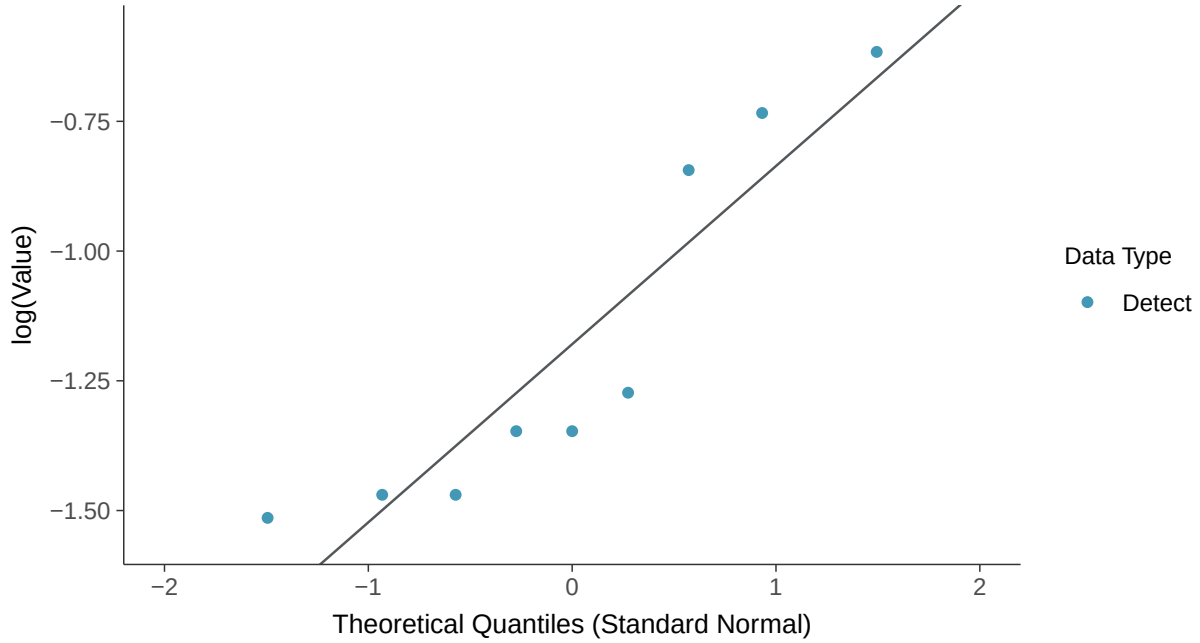
Boxplot by Season

Fluoride (App IV), MW-12 (mg/L)



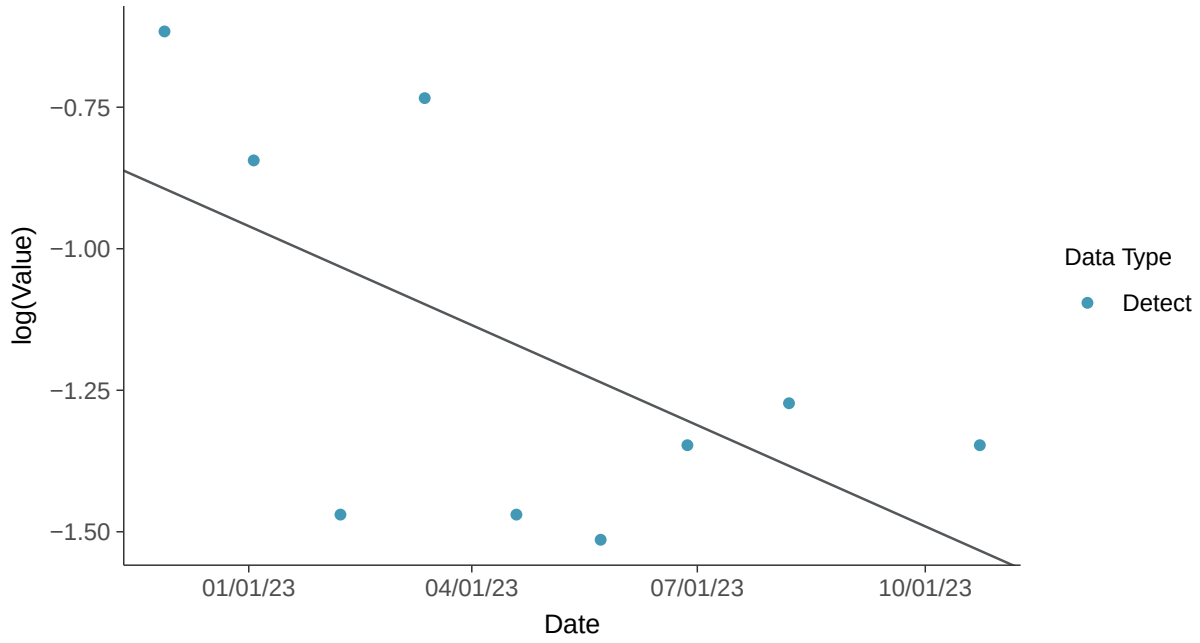
Lognormal Q-Q plot

Fluoride (App IV), MW-12 (mg/L)



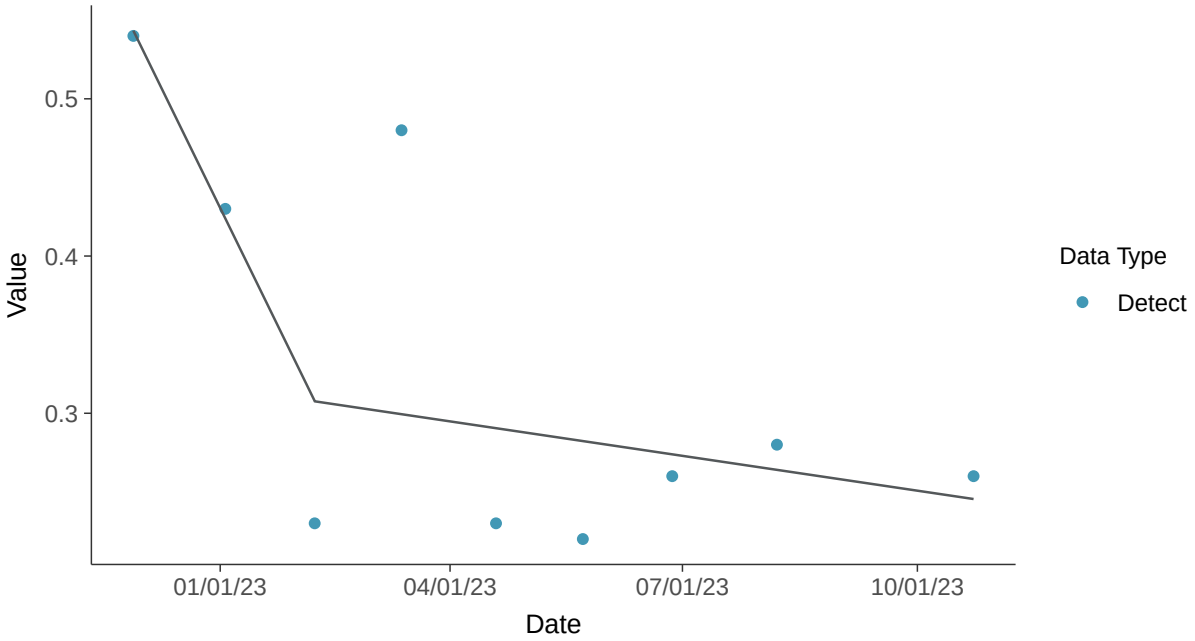
Trend Regression: Lognormal MLE

Fluoride (App IV), MW-12 (mg/L)



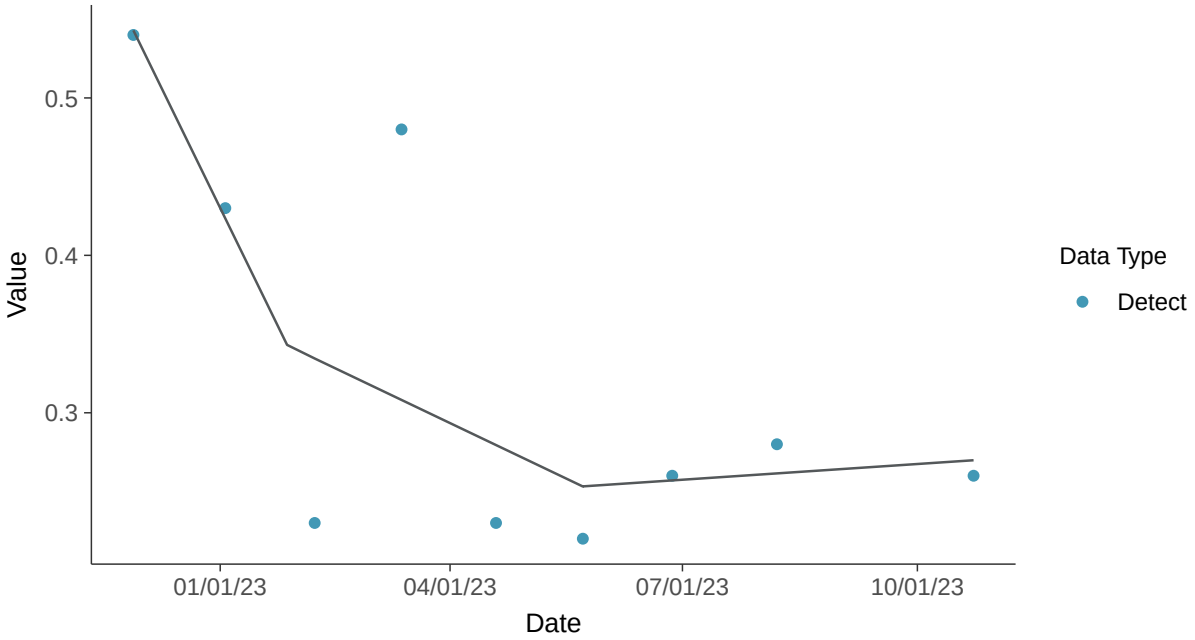
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-12 (mg/L)



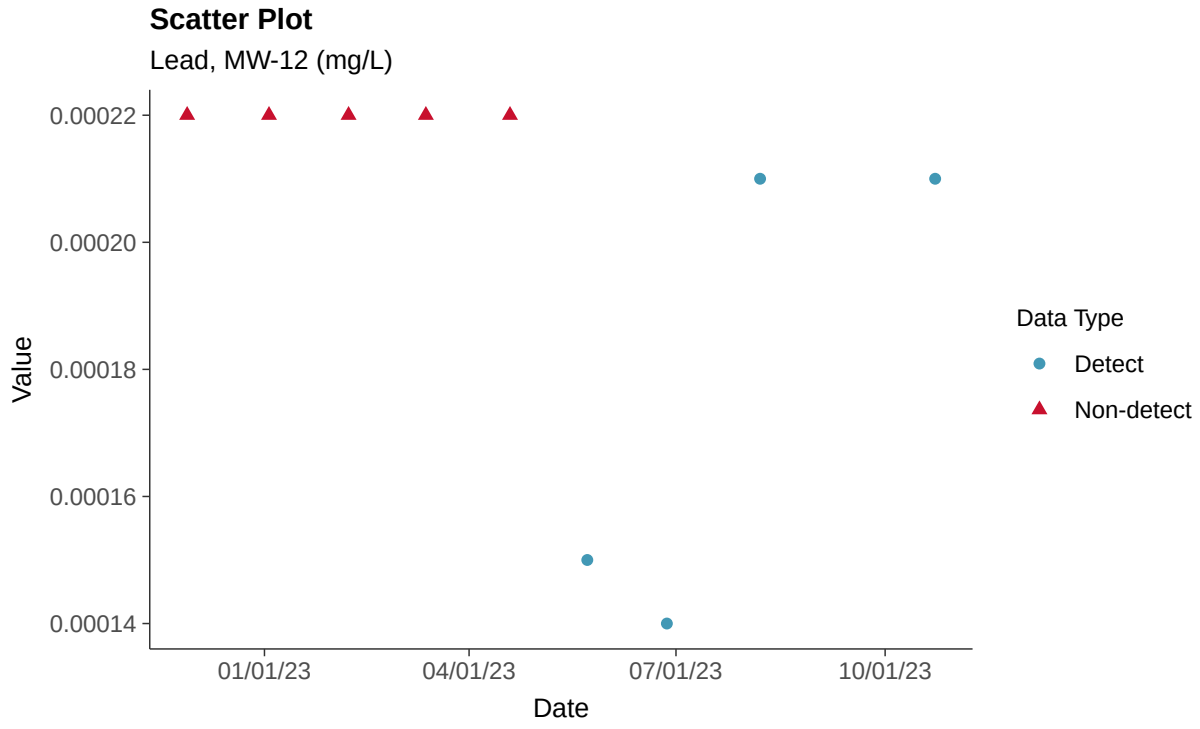
Trend Regression: Piecewise Linear-Linear-Linear

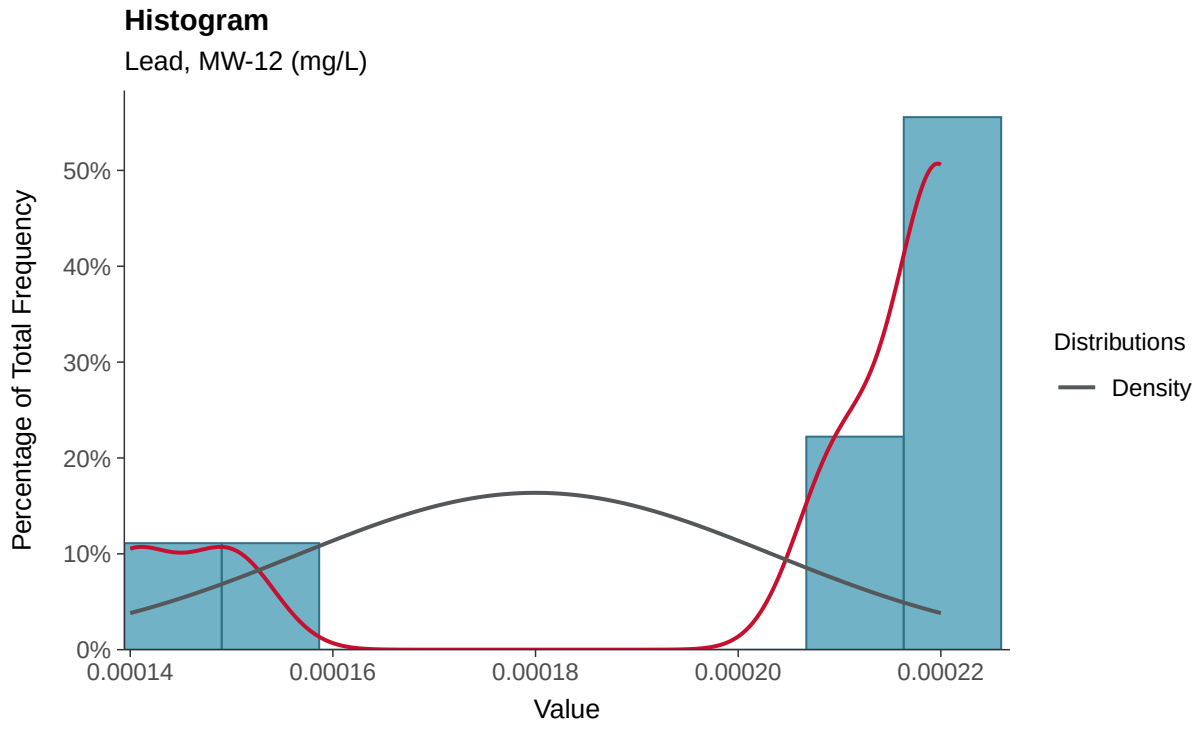
Fluoride (App IV), MW-12 (mg/L)



Appendix IV: Lead, MW-12

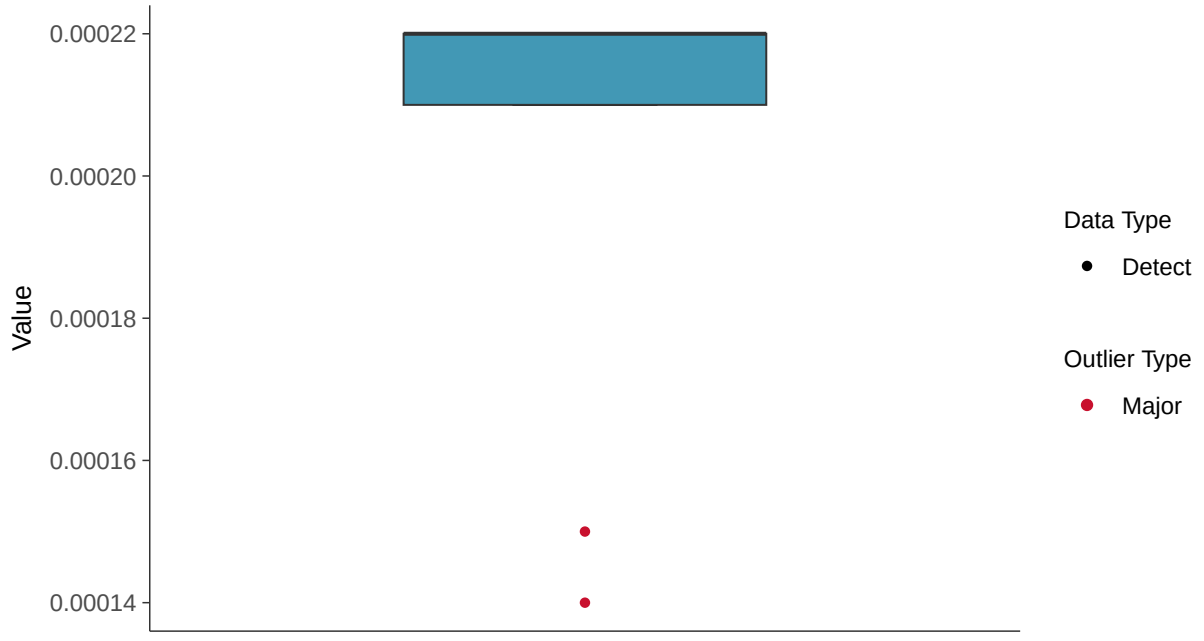
ID: 2_21_5_115





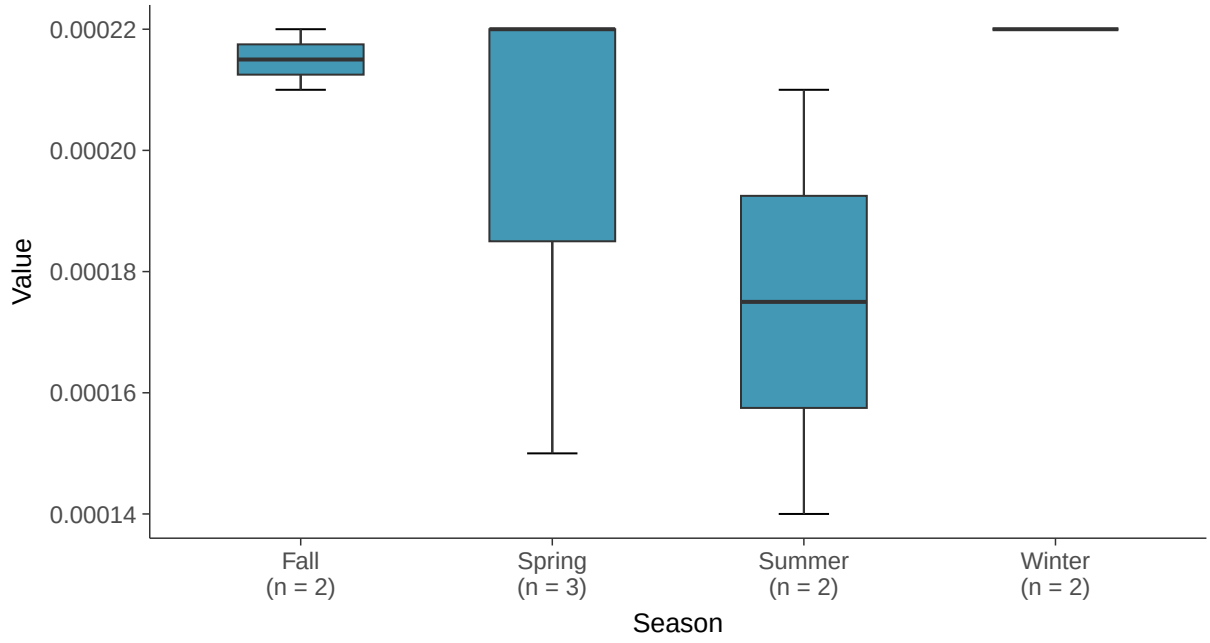
Boxplot

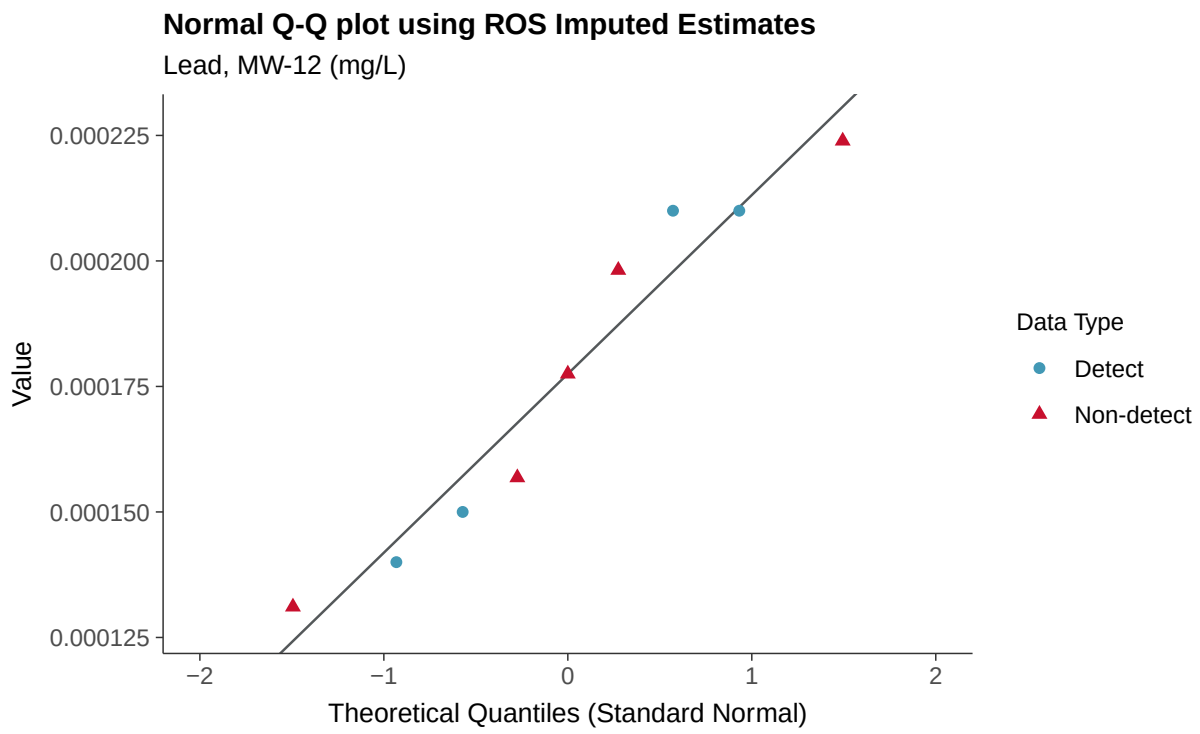
Lead, MW-12 (mg/L)

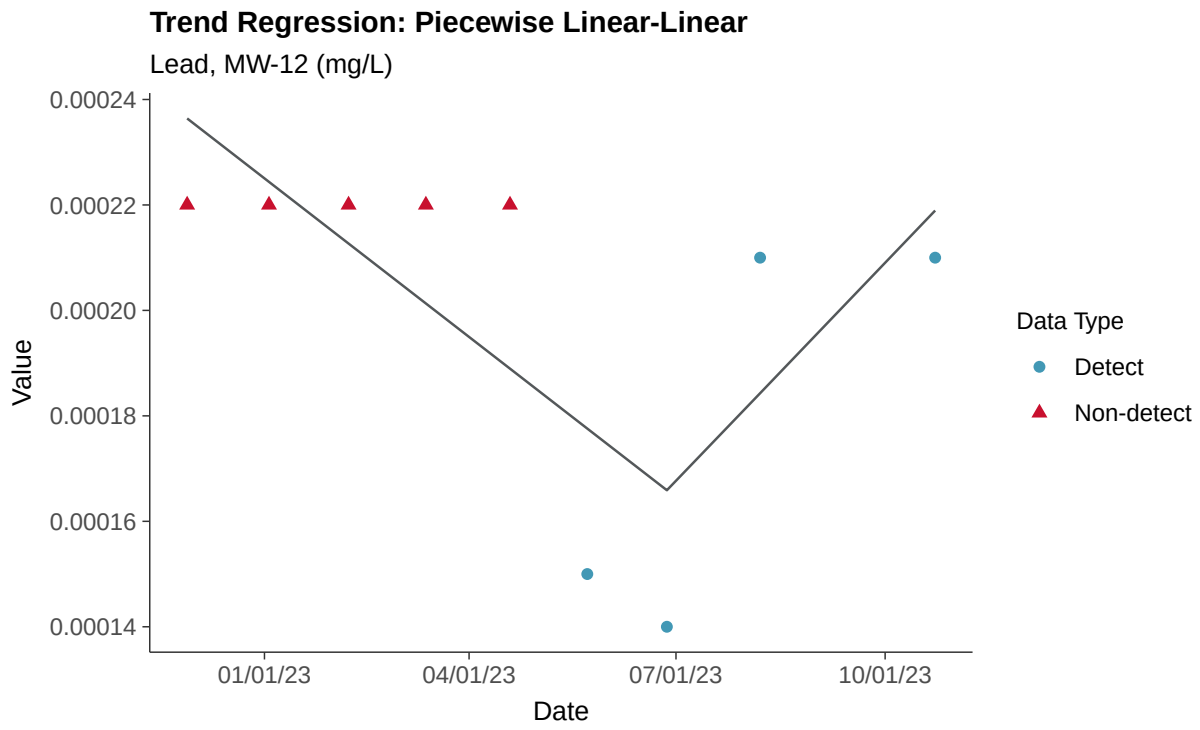


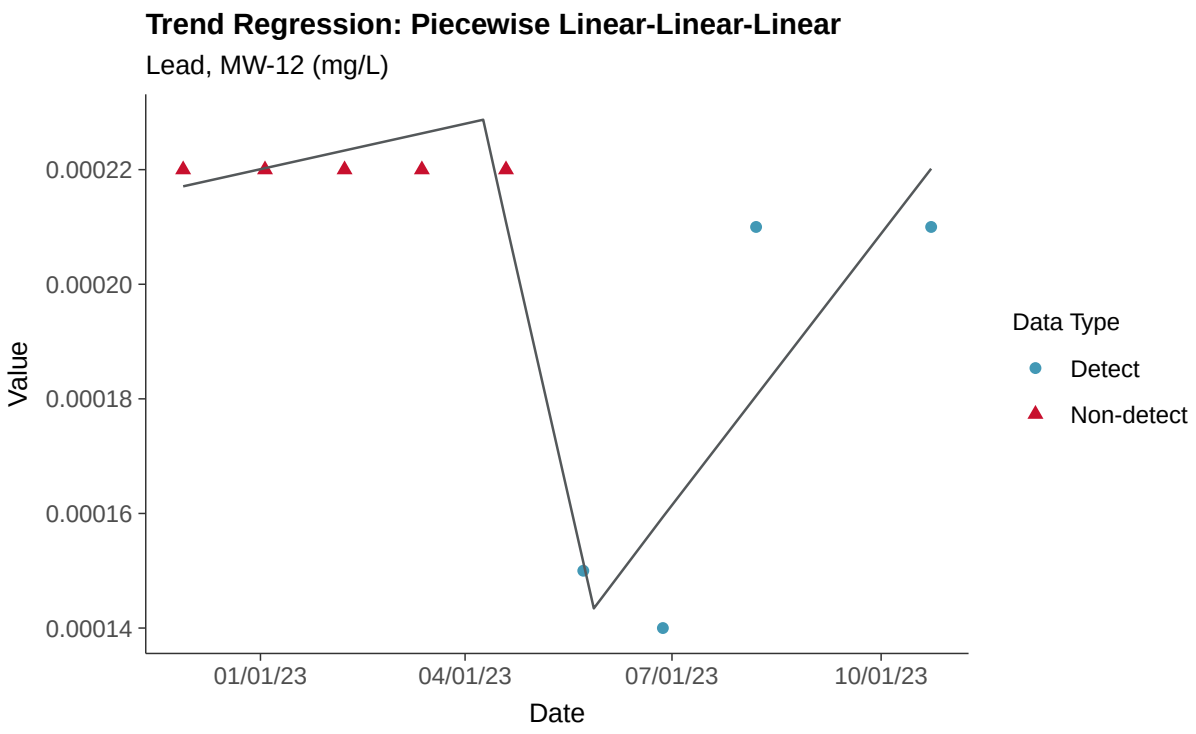
Boxplot by Season

Lead, MW-12 (mg/L)



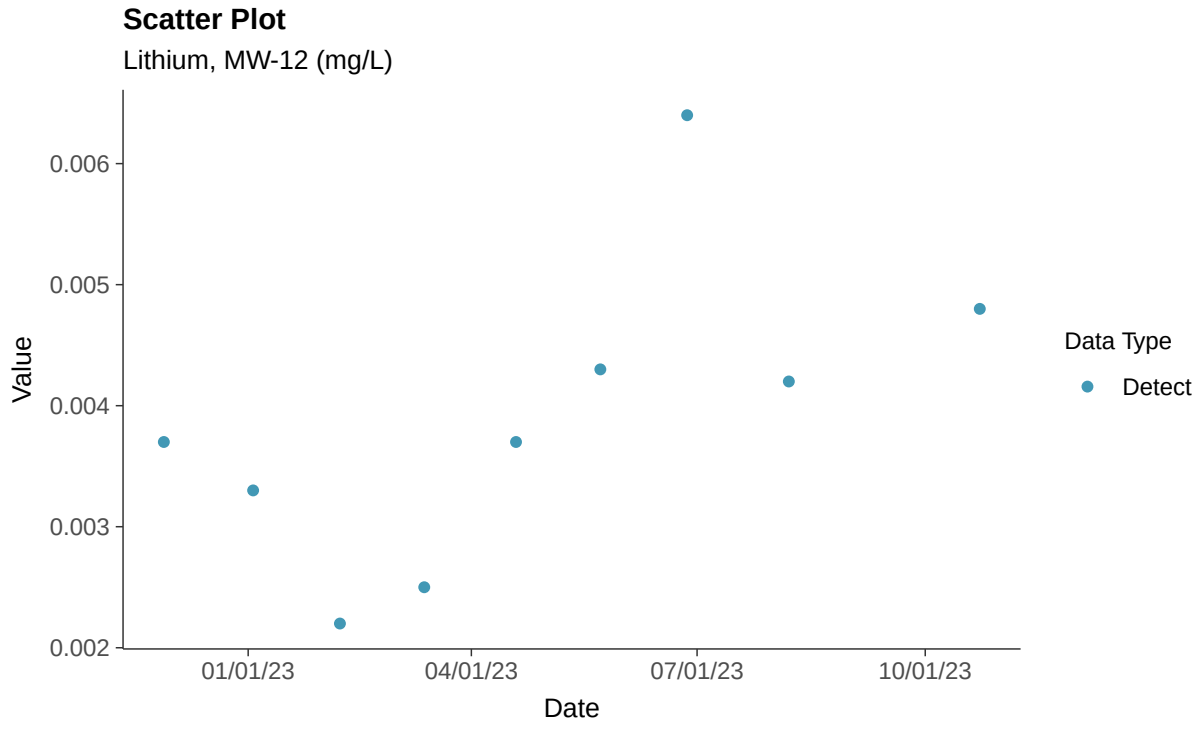

Normal Q-Q plot using ROS Imputed Estimates
Lead, MW-12 (mg/L)
Value
0.000225
0.000200
0.000175
0.000150
0.000125
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

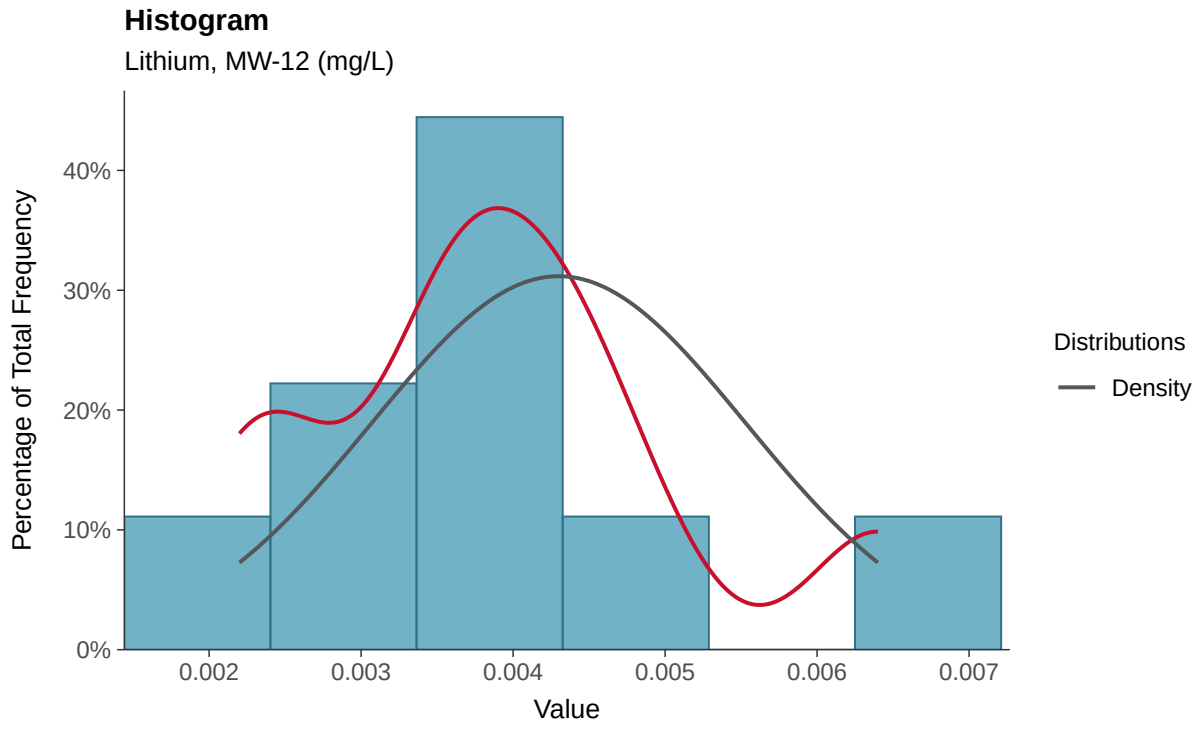

Trend Regression: Piecewise Linear-Linear
Lead, MW-12 (mg/L)
Value
0.00024
0.00022
0.00020
0.00018
0.00016
0.00014
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-12 (mg/L)
Value
0.00022
0.00020
0.00018
0.00016
0.00014
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lithium, MW-12

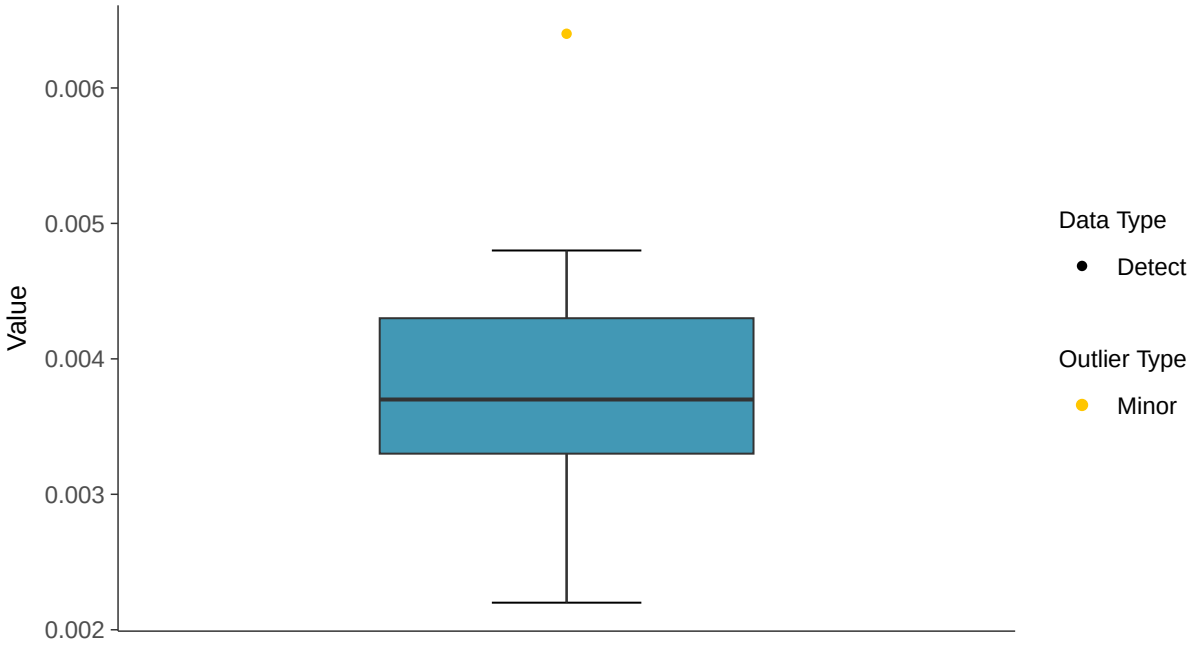
ID: 2_21_5_116





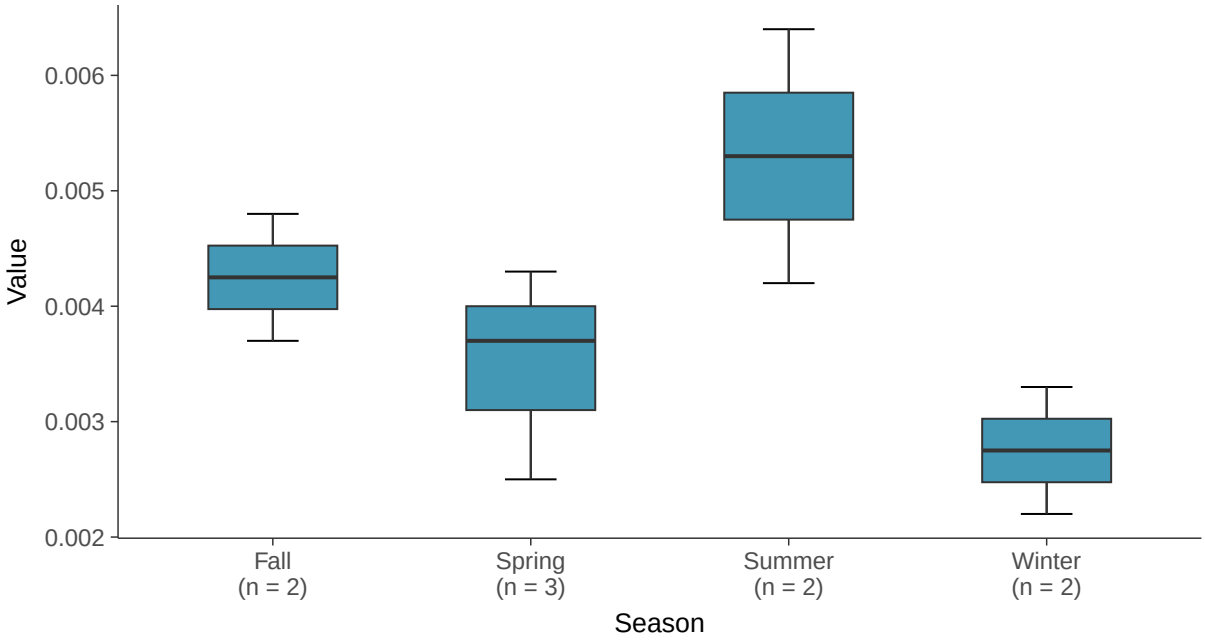
Boxplot

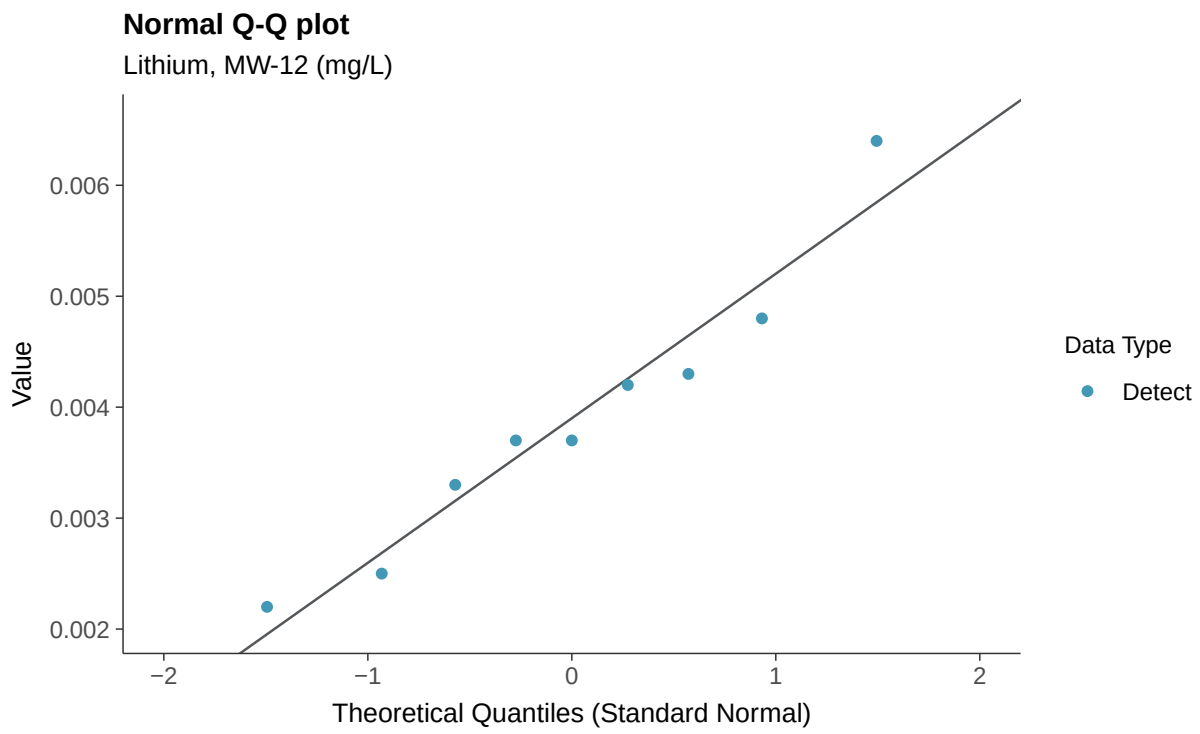
Lithium, MW-12 (mg/L)

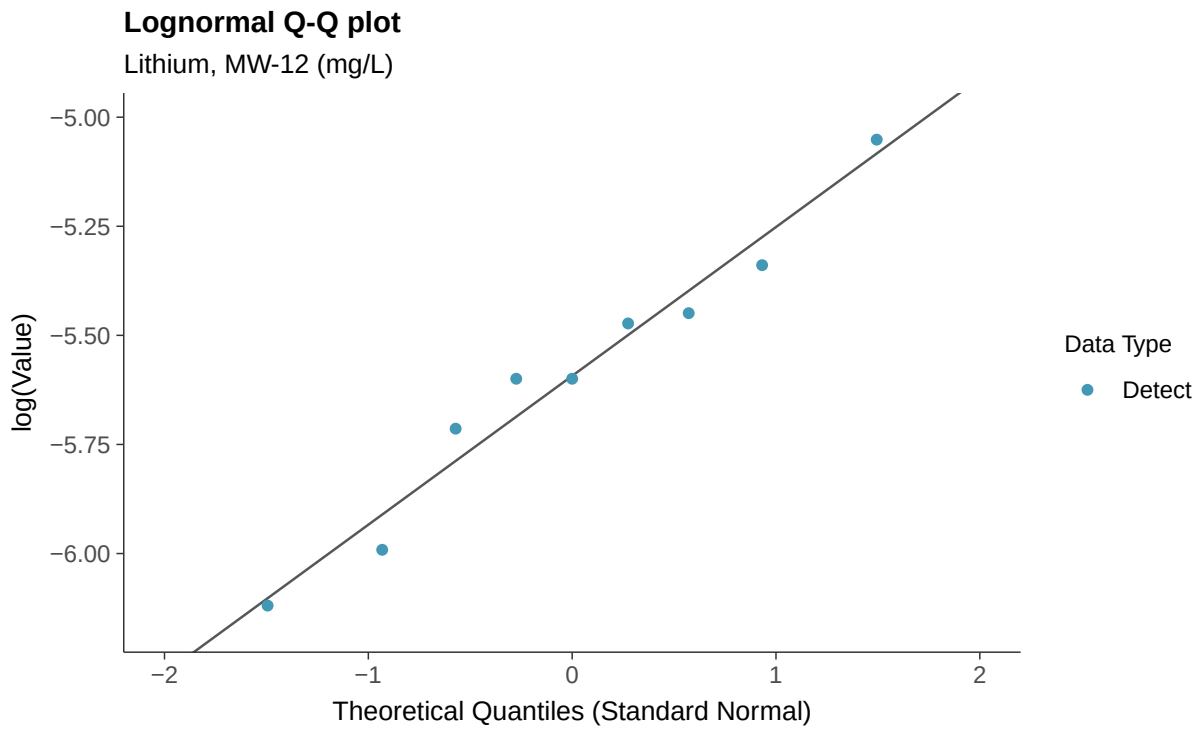


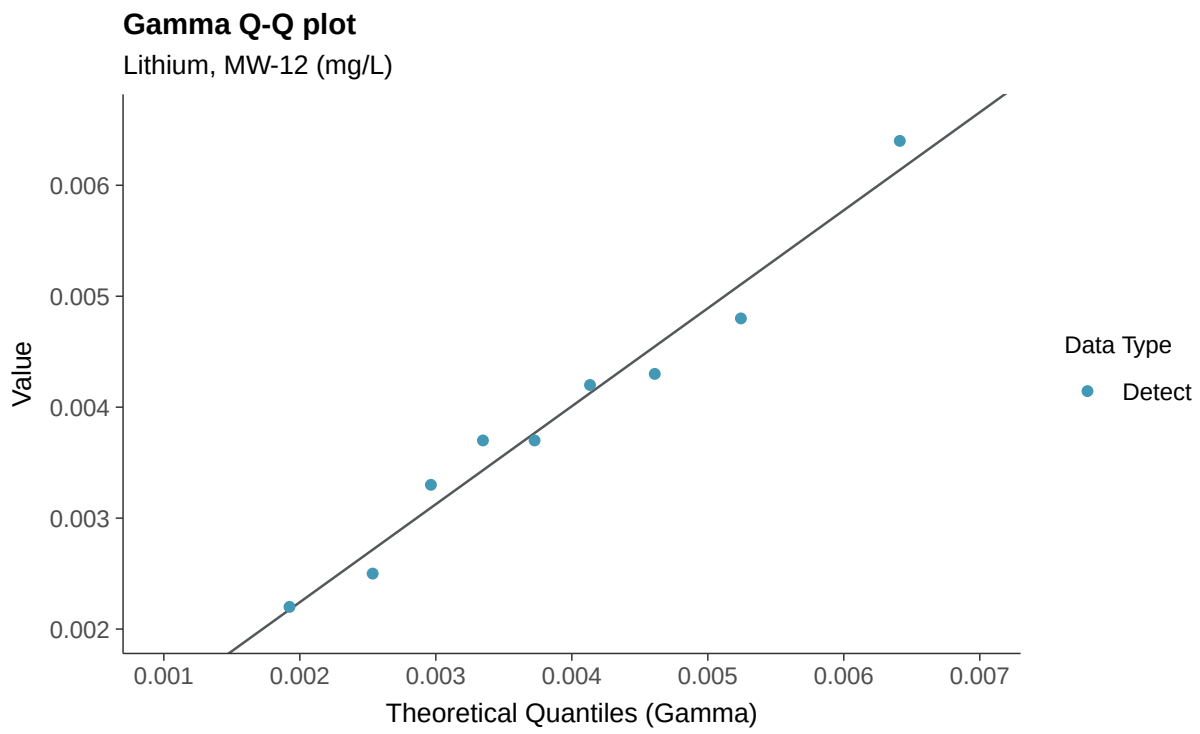
Boxplot by Season

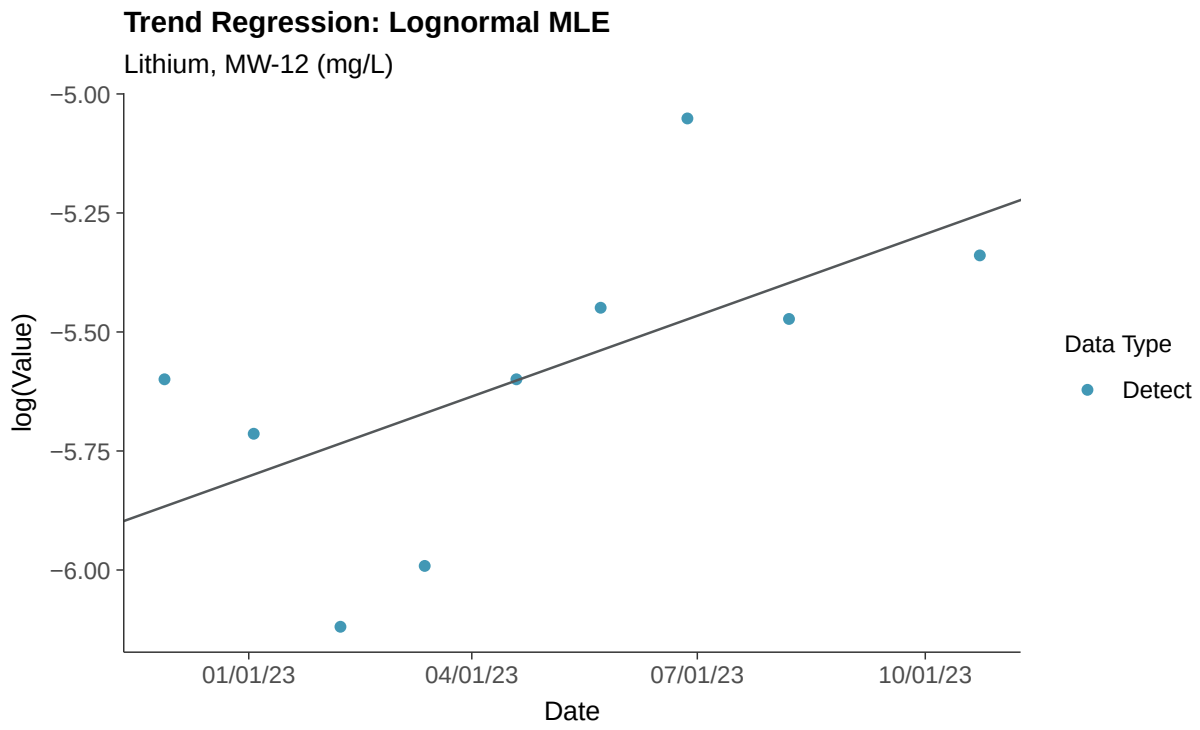
Lithium, MW-12 (mg/L)

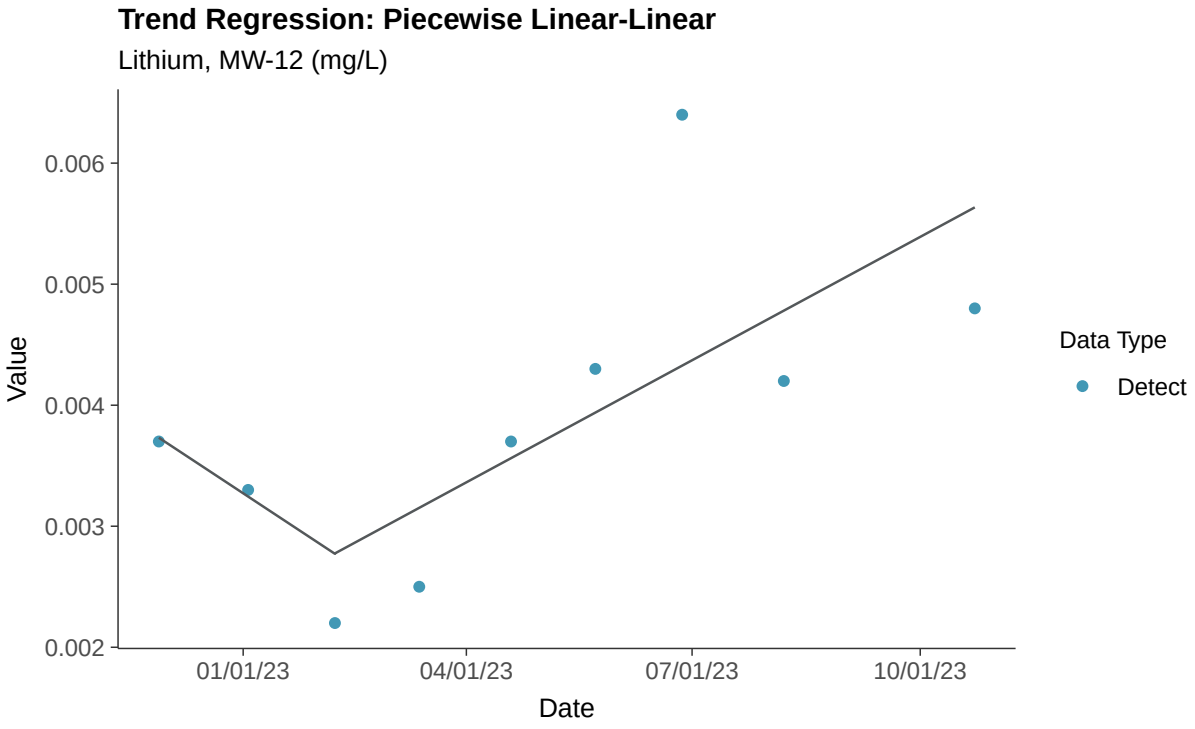


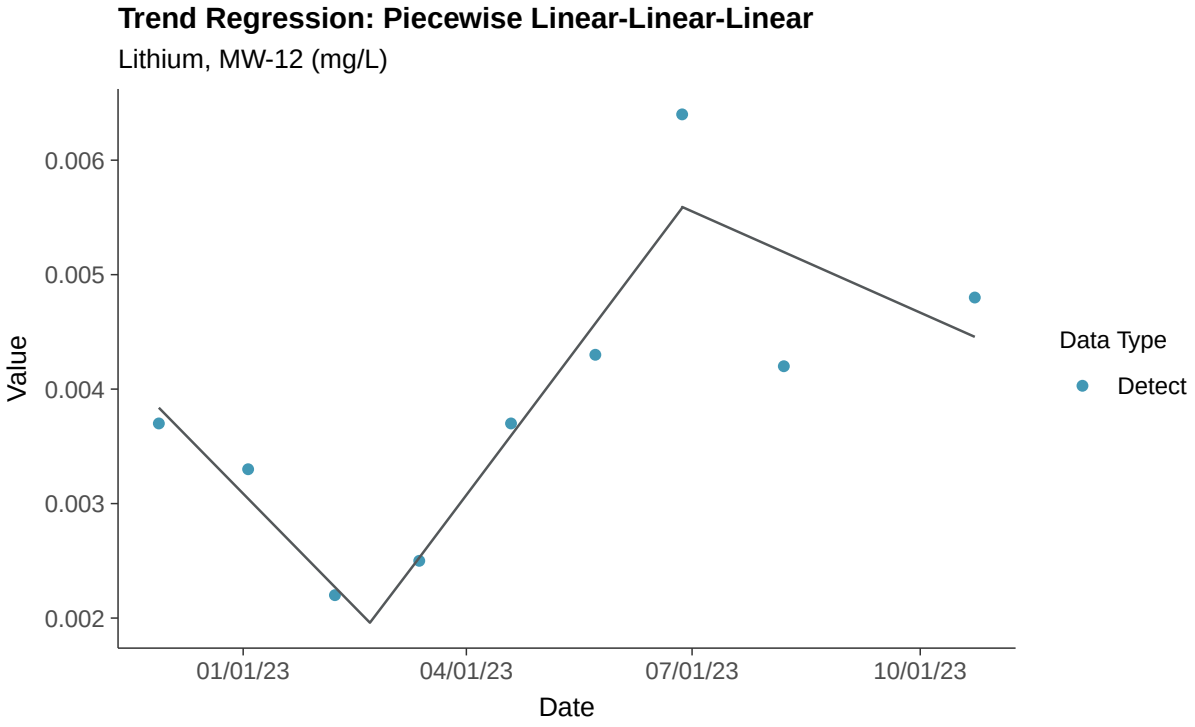

Normal Q-Q plot
Lithium, MW-12 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-12 (mg/L)
log(Value)
−5.00
−5.25
−5.50
−5.75
−6.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Lithium, MW-12 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
0.001
0.002
0.003
0.004
0.005
0.006
0.007
Theoretical Quantiles (Gamma)
Data Type
Detect

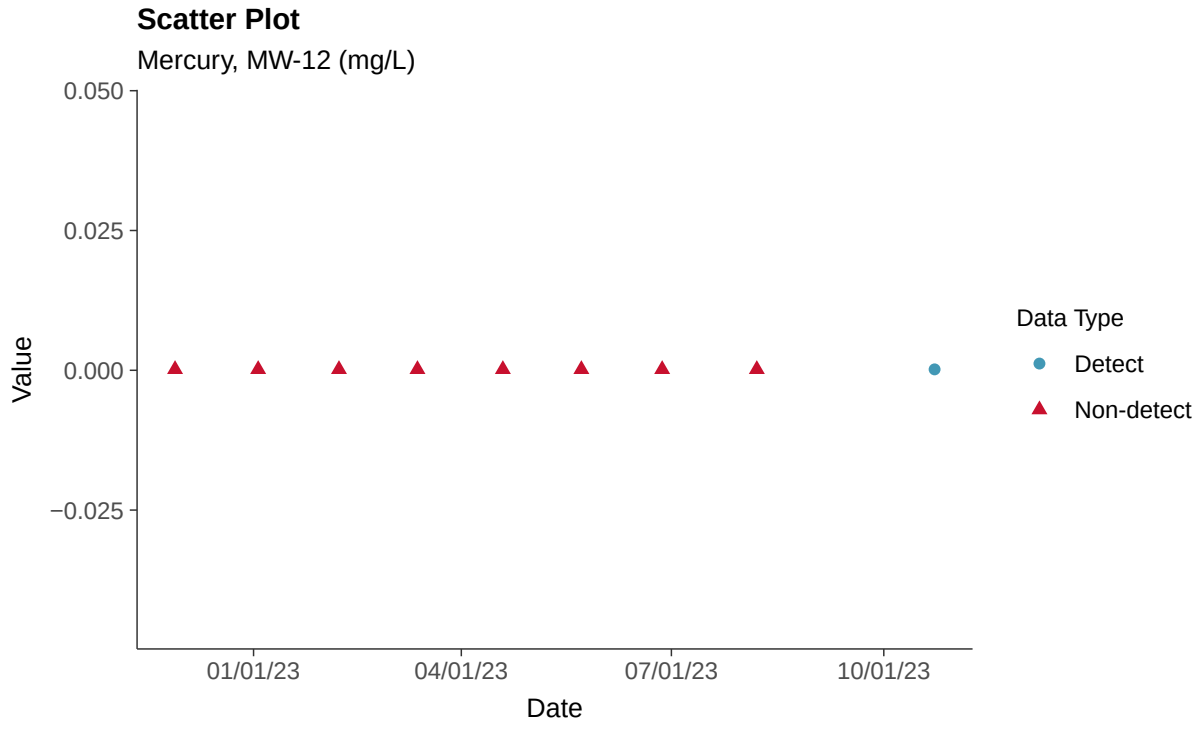

Trend Regression: Lognormal MLE
Lithium, MW-12 (mg/L)
log(Value)
−5.00
−5.25
−5.50
−5.75
−6.00
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

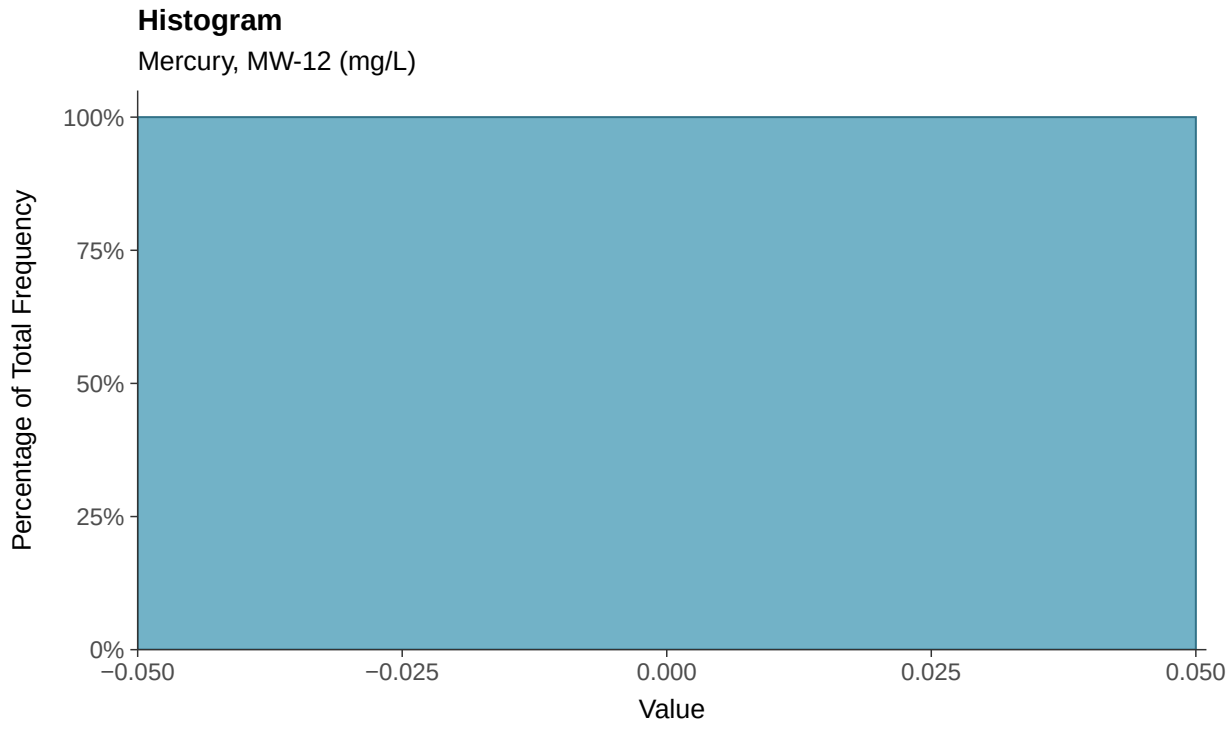

Trend Regression: Piecewise Linear-Linear
Lithium, MW-12 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Lithium, MW-12 (mg/L)
Value
0.006
0.005
0.004
0.003
0.002
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-12

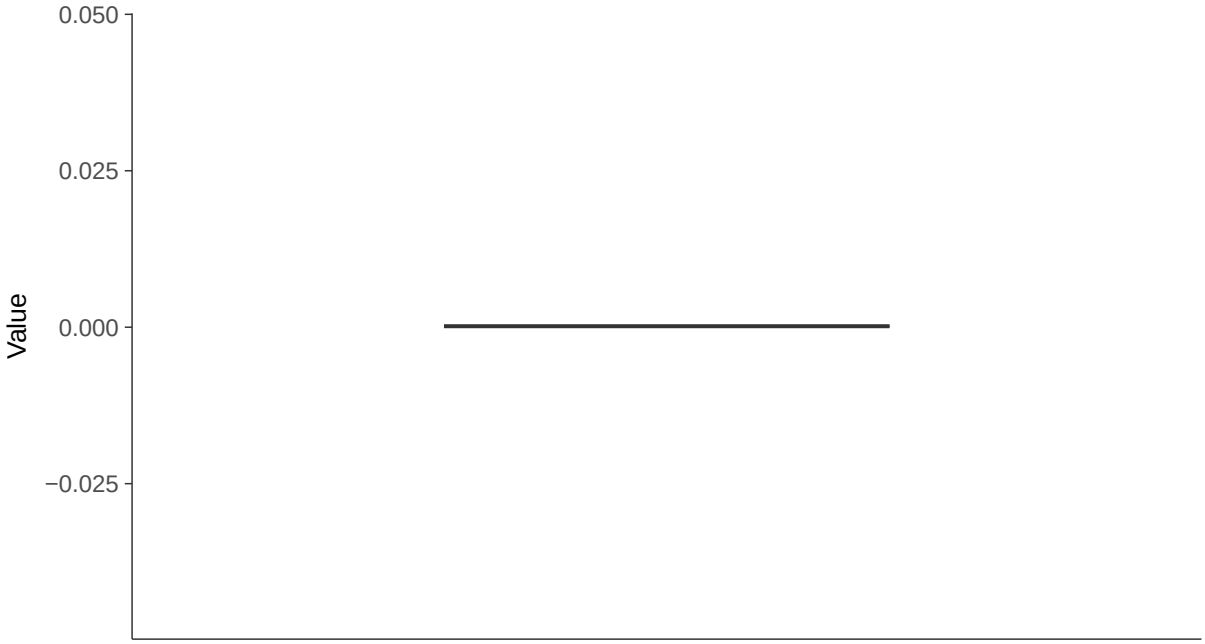
ID: 2_21_5_117





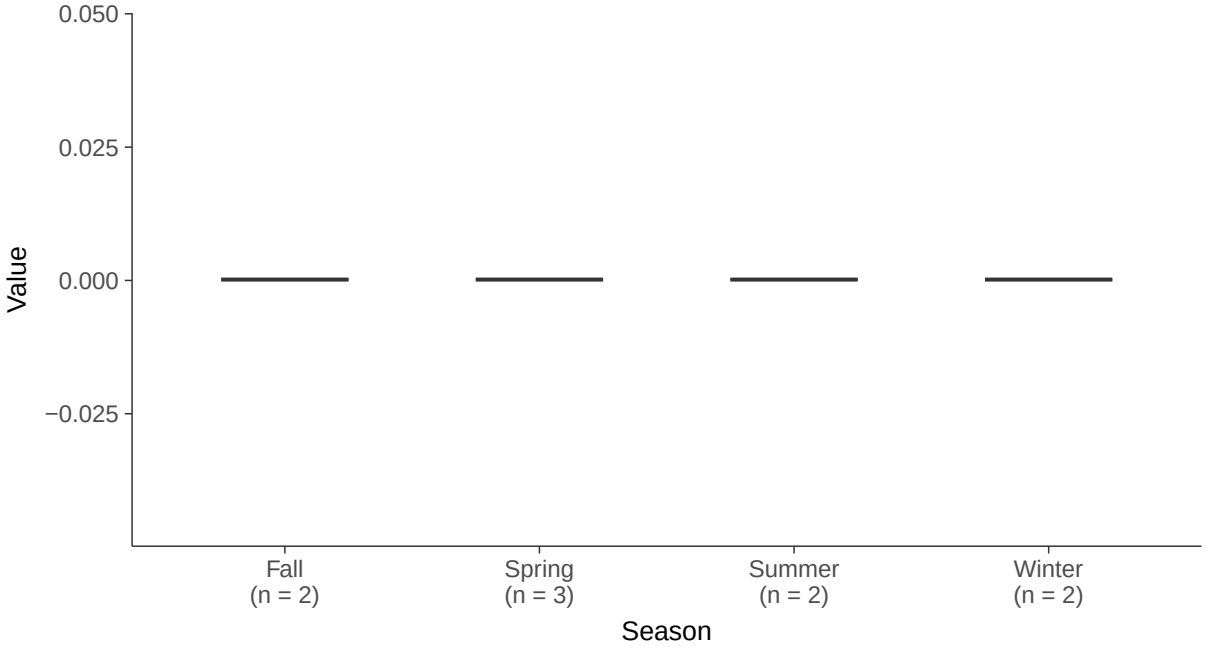
Boxplot

Mercury, MW-12 (mg/L)



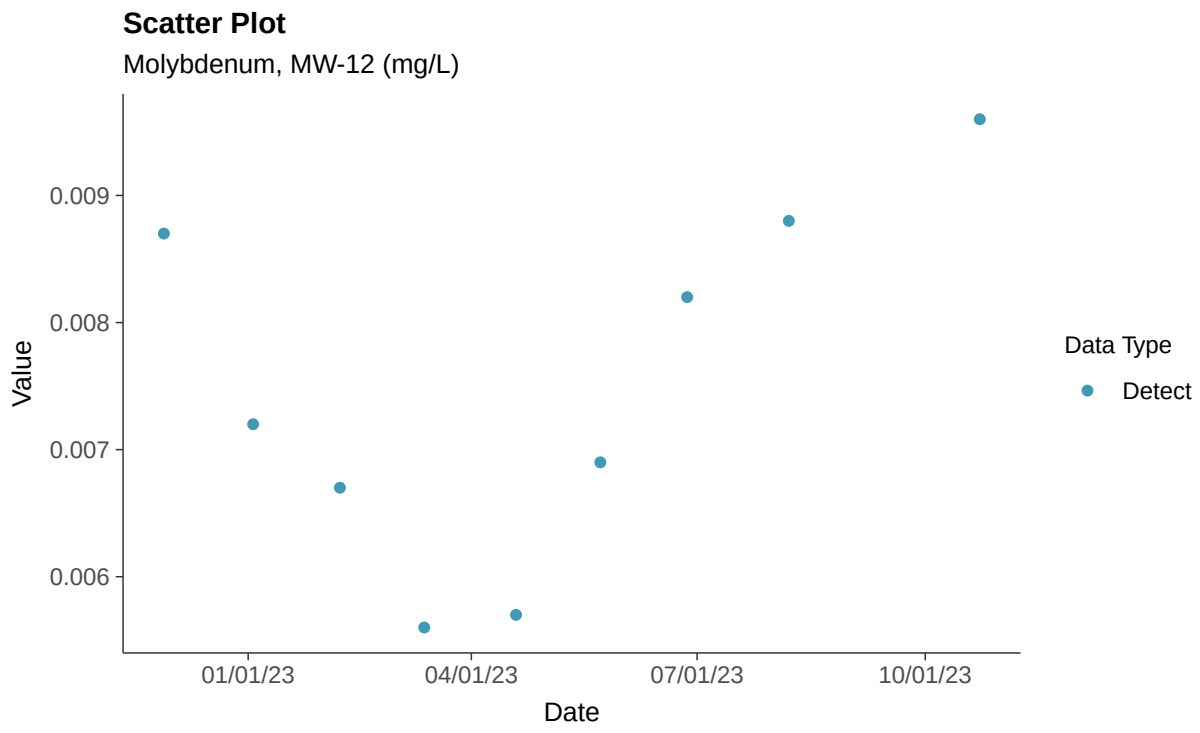
Boxplot by Season

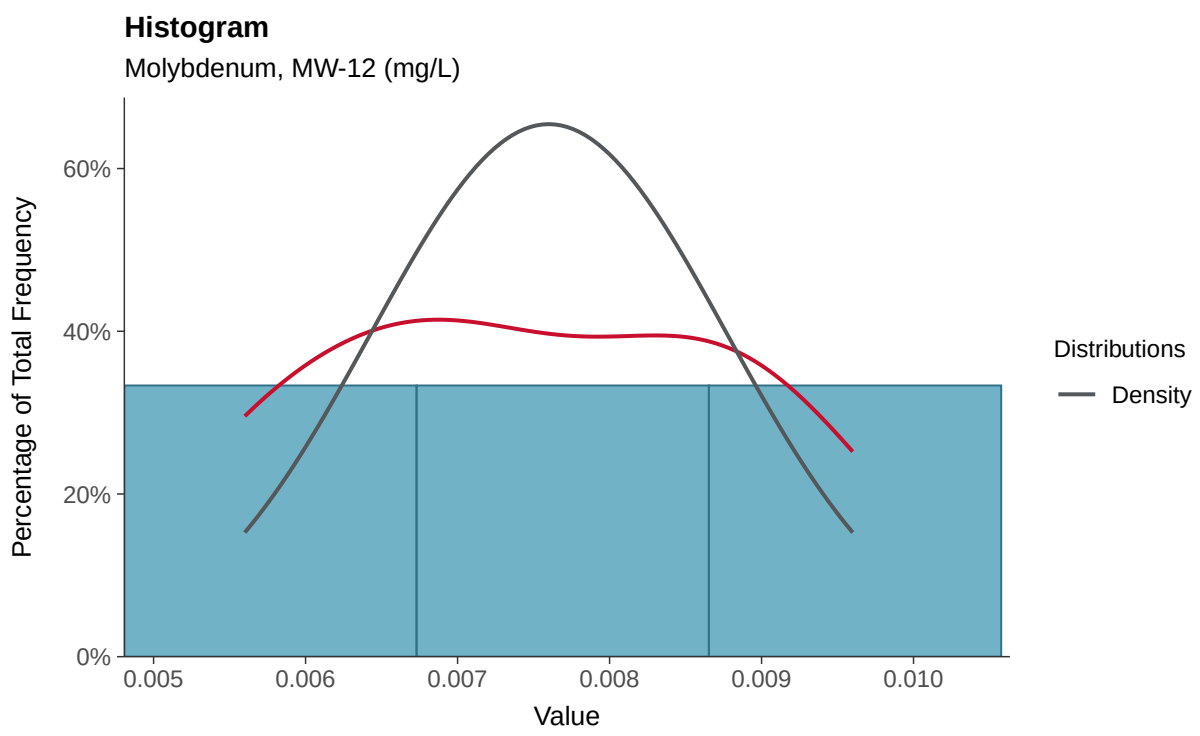
Mercury, MW-12 (mg/L)



Appendix IV: Molybdenum, MW-12

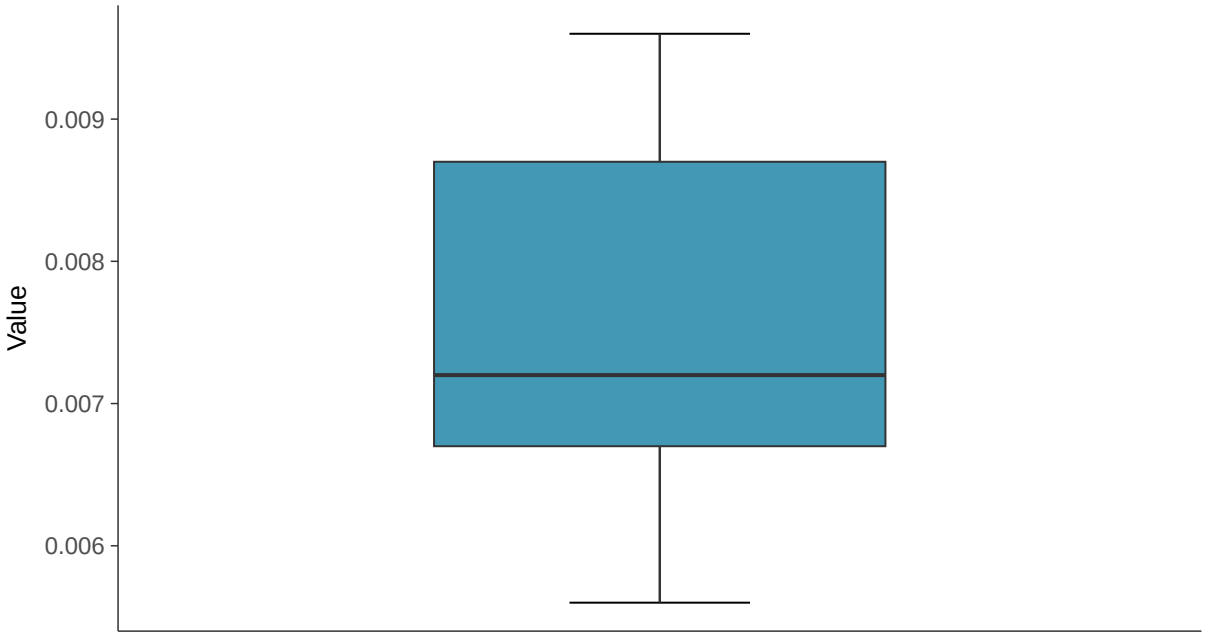
ID: 2_21_5_118





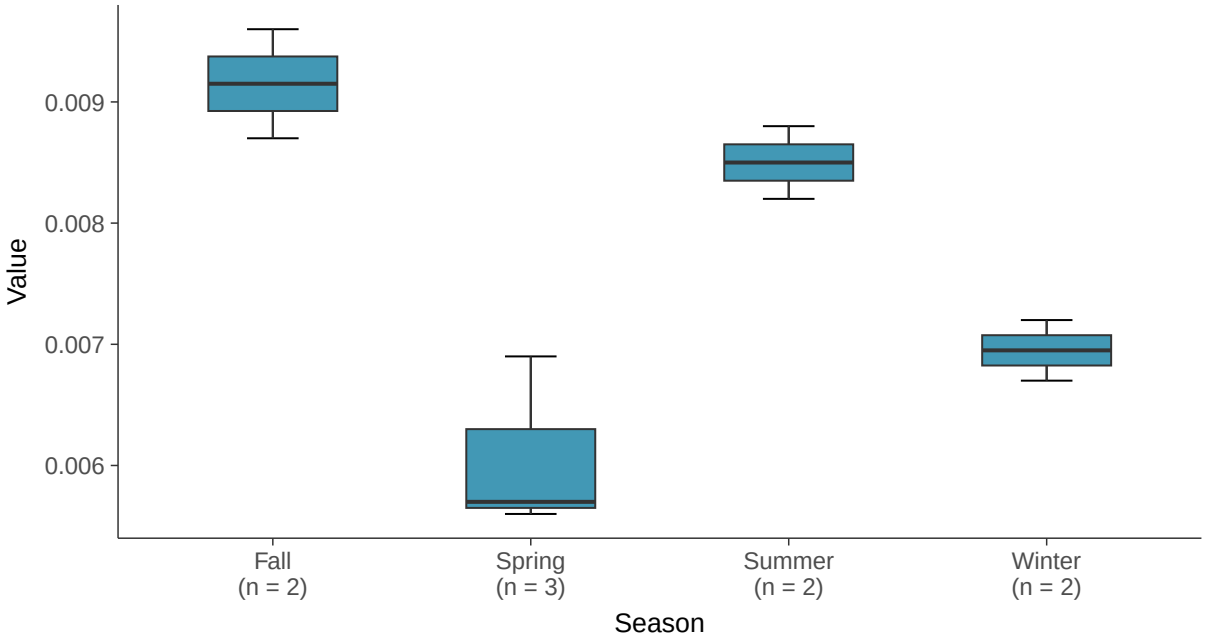
Boxplot

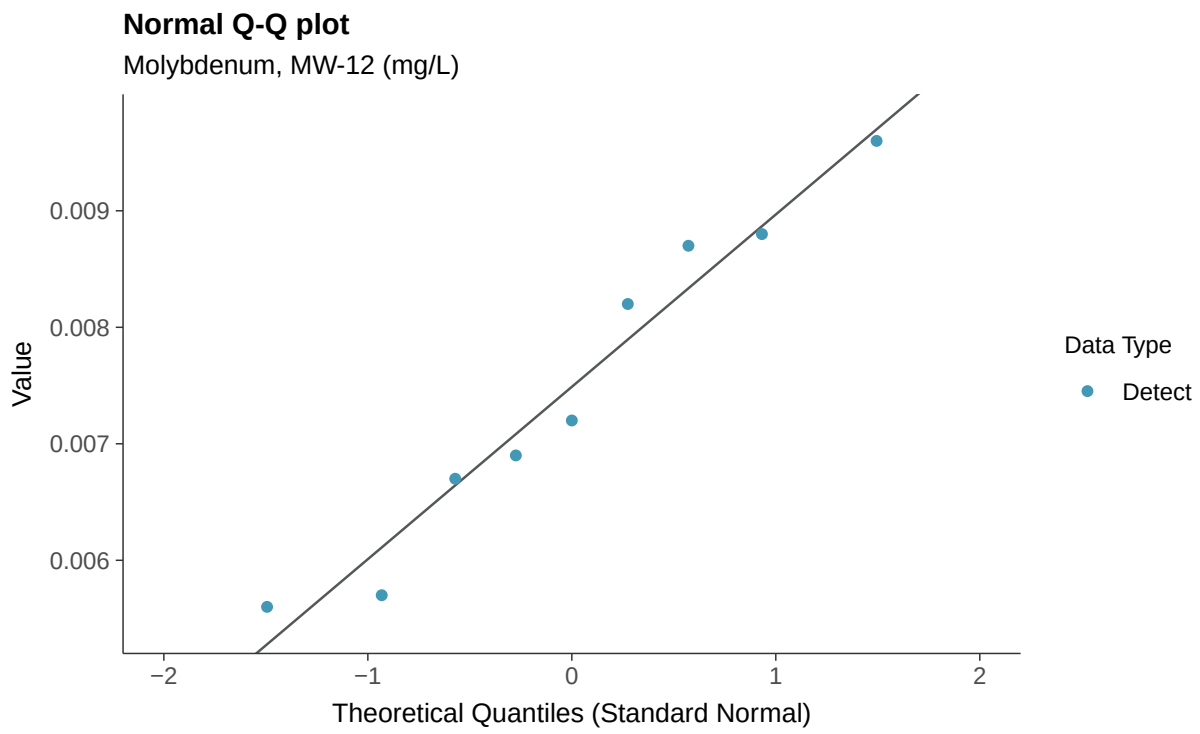
Molybdenum, MW-12 (mg/L)

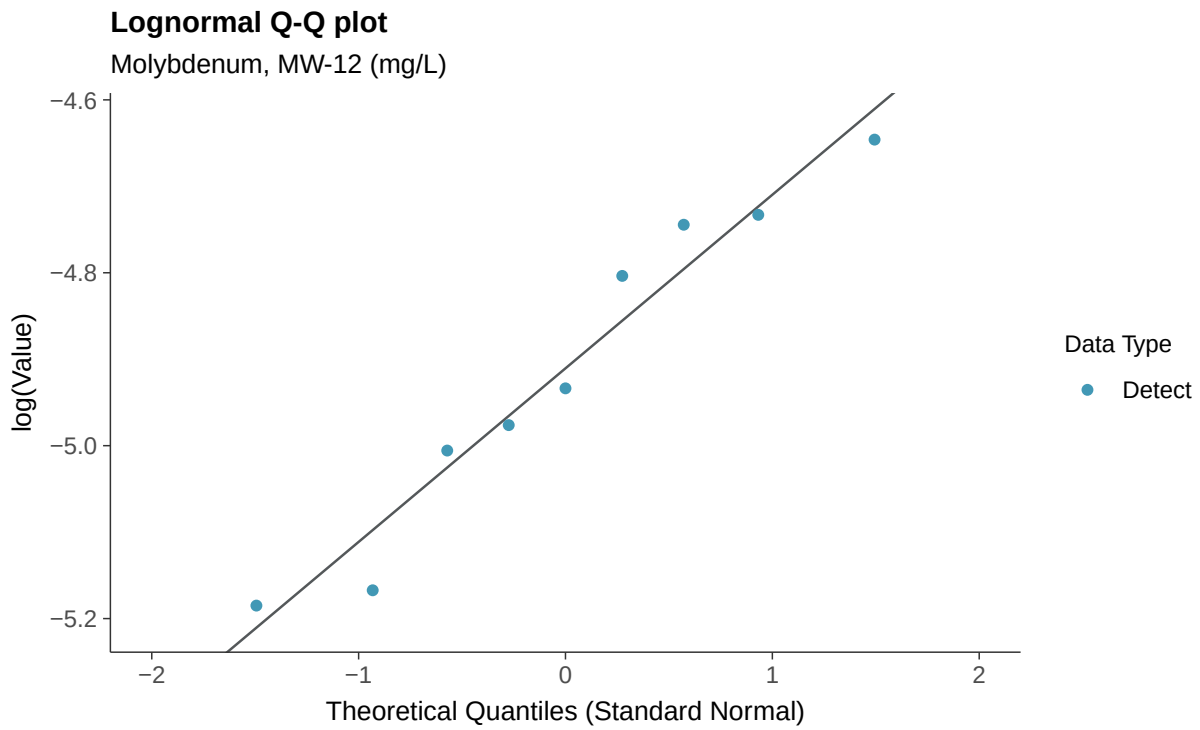


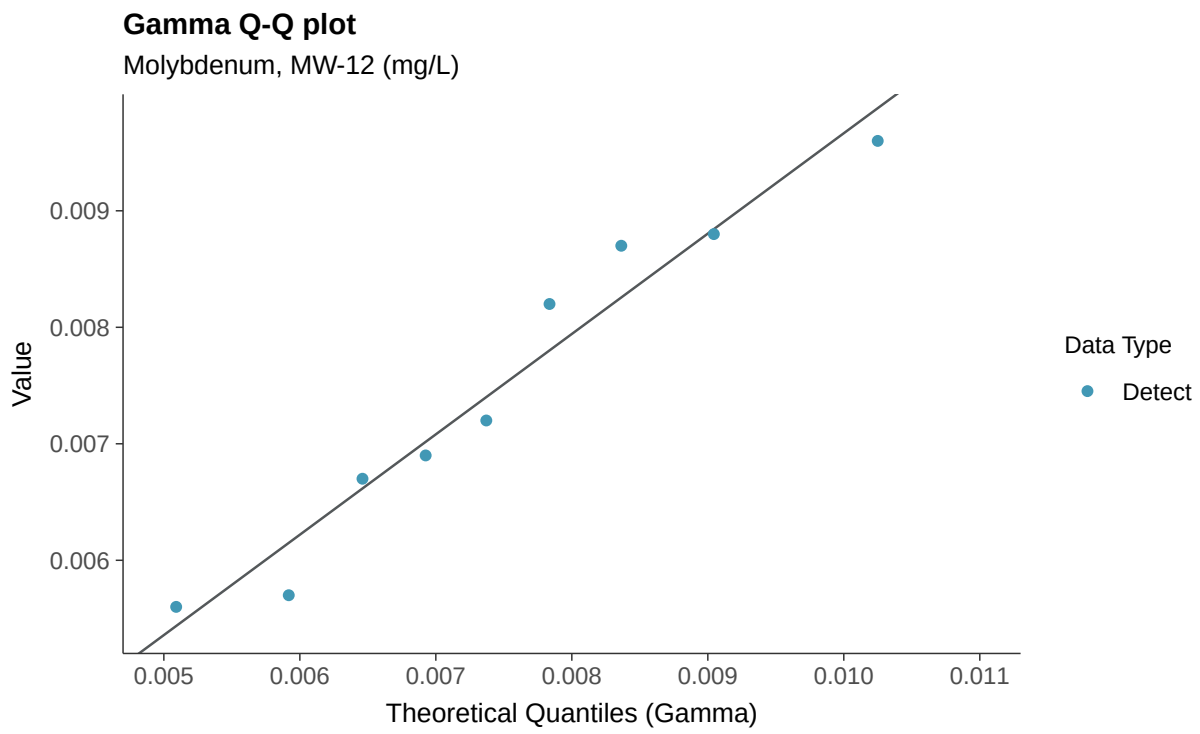
Boxplot by Season

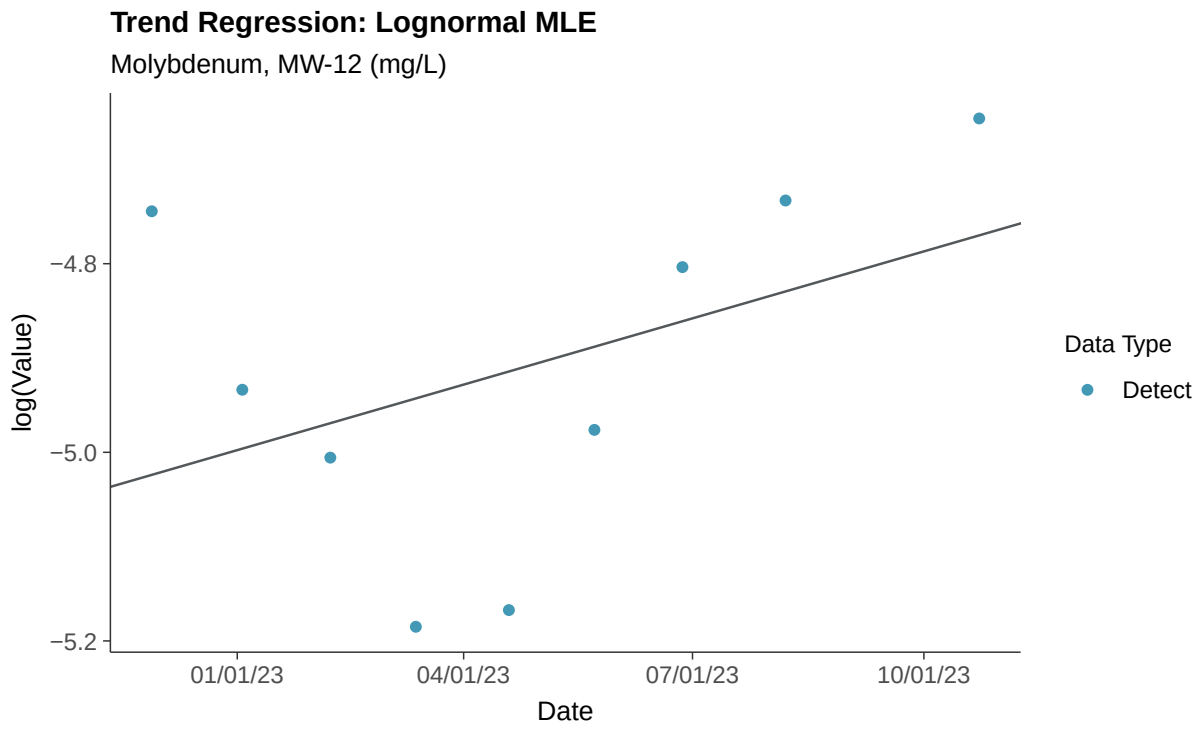
Molybdenum, MW-12 (mg/L)




Normal Q-Q plot
Molybdenum, MW-12 (mg/L)
Value
0.009
0.008
0.007
0.006
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

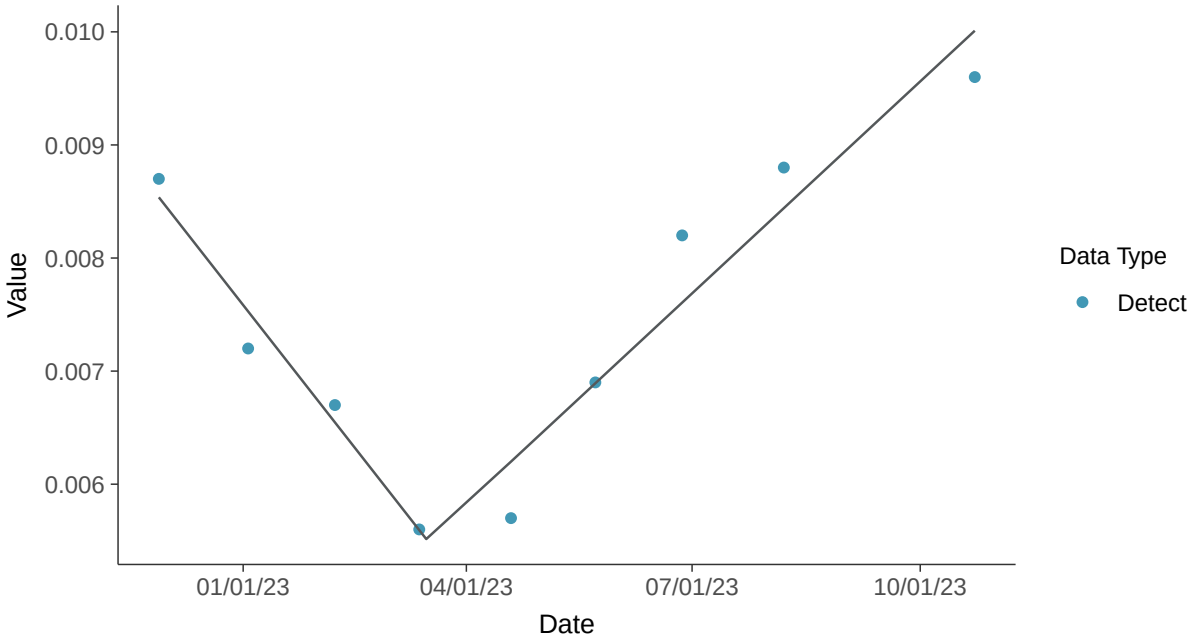

Lognormal Q-Q plot
Molybdenum, MW-12 (mg/L)
log(Value)
−4.6
−4.8
−5.0
−5.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Molybdenum, MW-12 (mg/L)
Value
0.009
0.008
0.007
0.006
0.005
0.006
0.007
0.008
0.009
0.010
0.011
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Molybdenum, MW-12 (mg/L)
log(Value)
−4.8
−5.0
−5.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

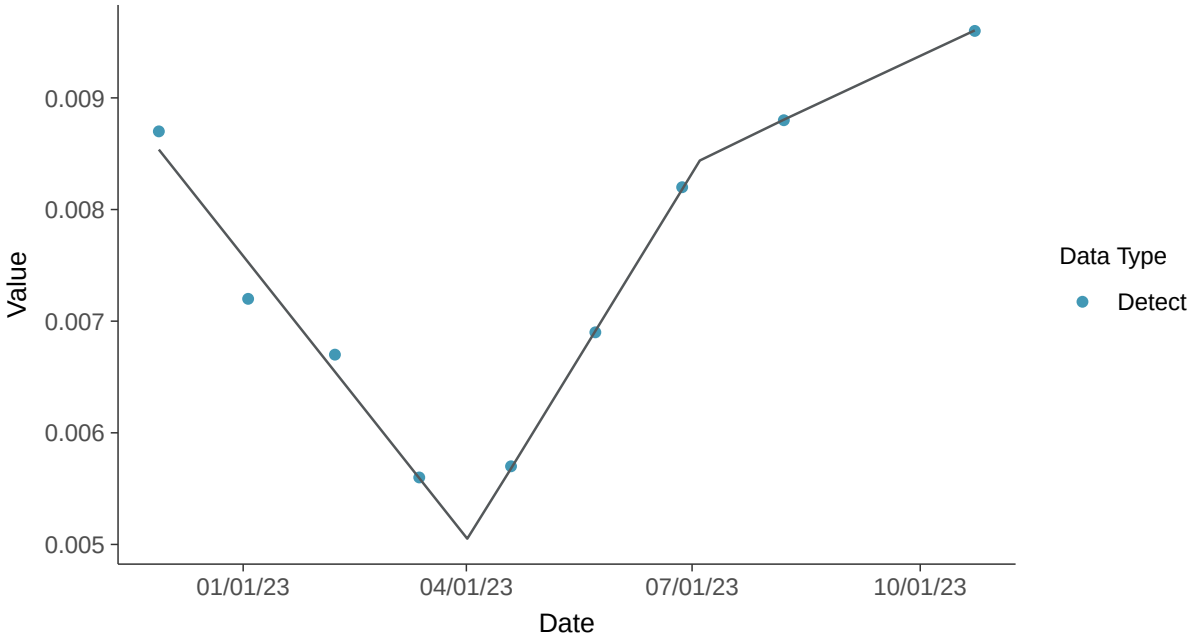
Trend Regression: Piecewise Linear-Linear

Molybdenum, MW-12 (mg/L)



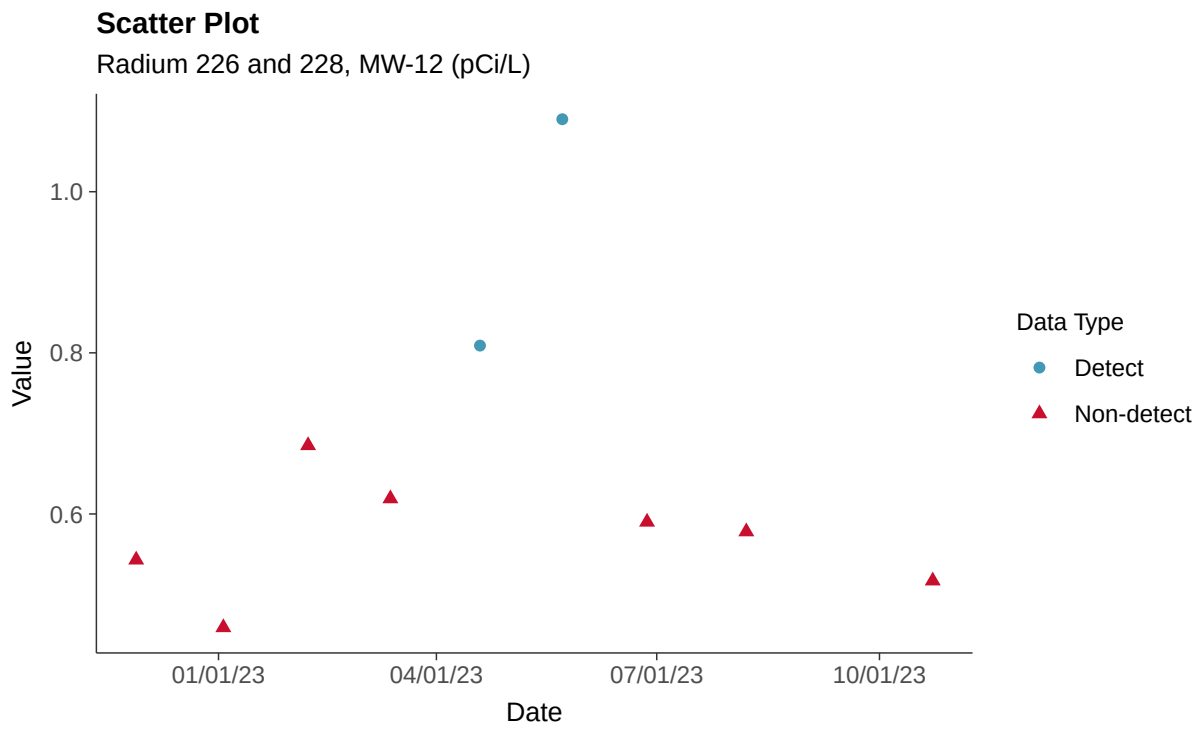
Trend Regression: Piecewise Linear-Linear-Linear

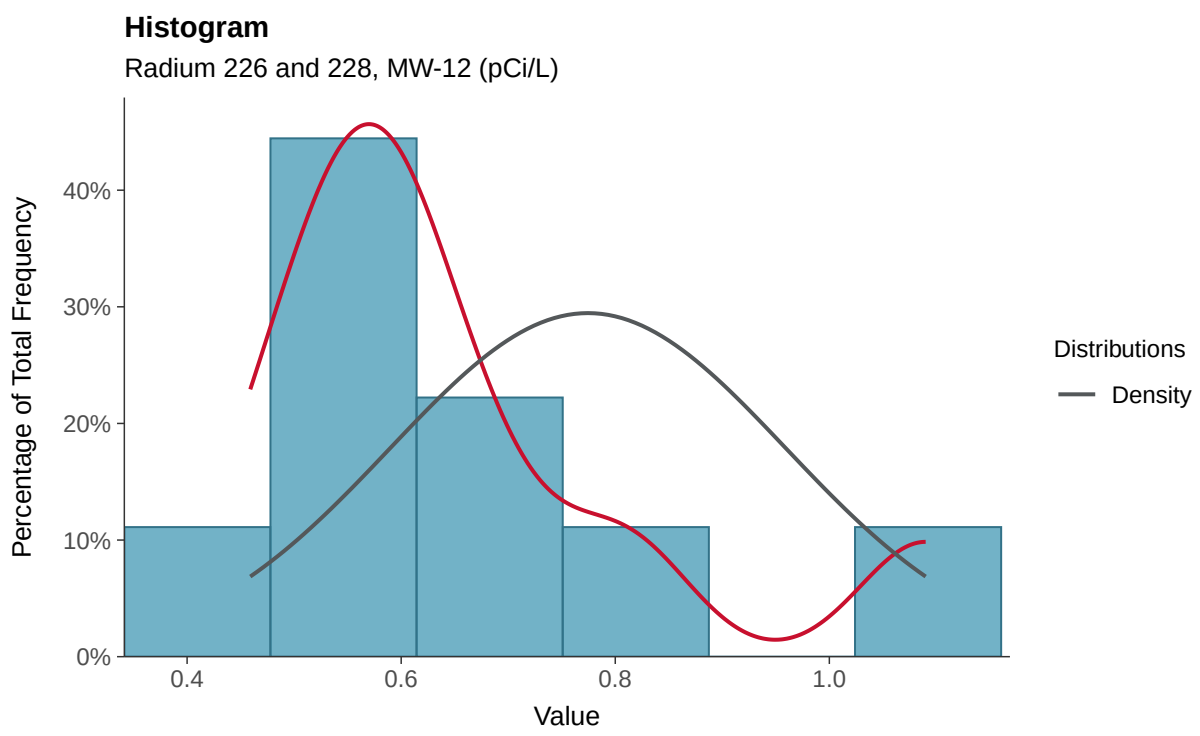
Molybdenum, MW-12 (mg/L)



Appendix IV: Radium 226 and 228, MW-12

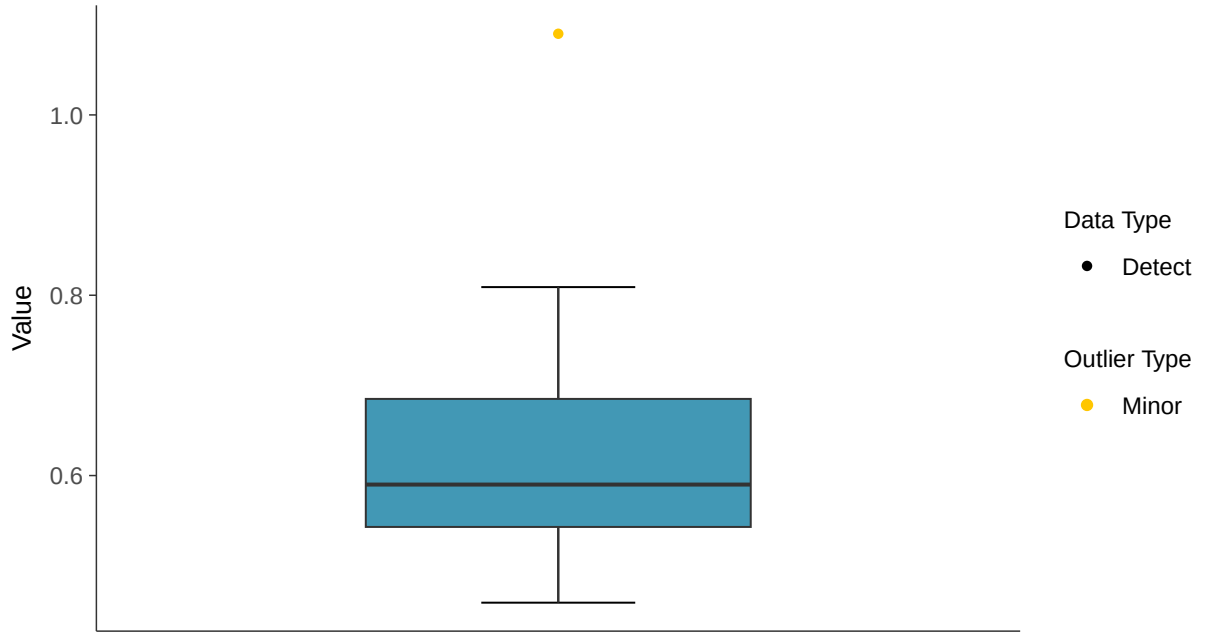
ID: 2_21_5_121





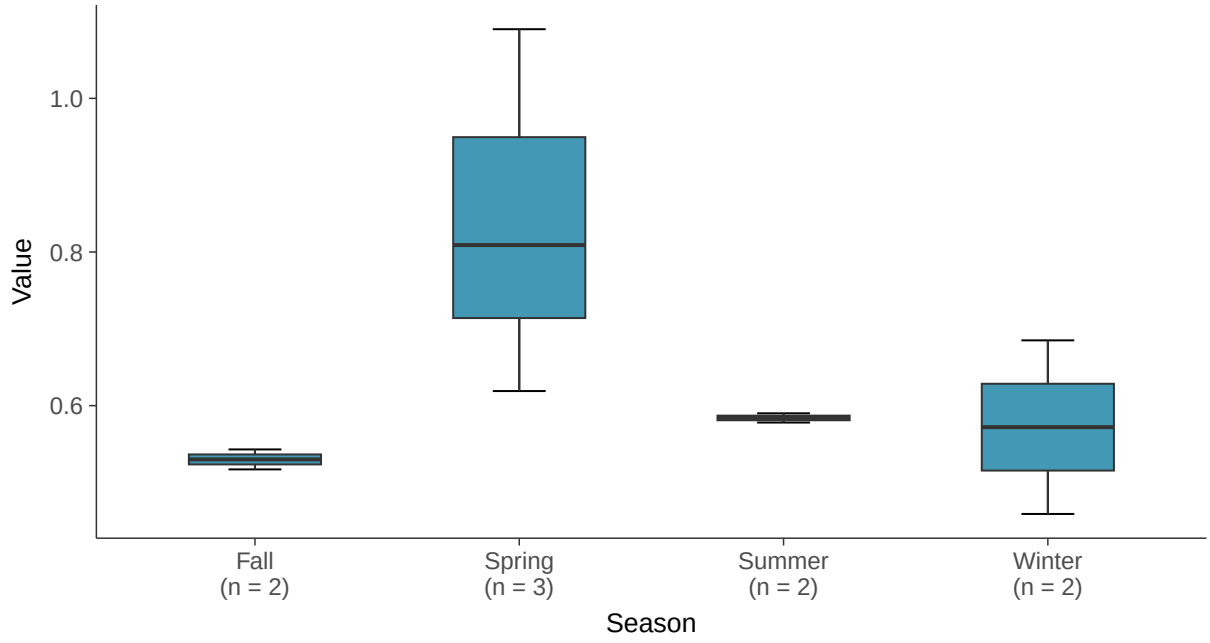
Boxplot

Radium 226 and 228, MW-12 (pCi/L)



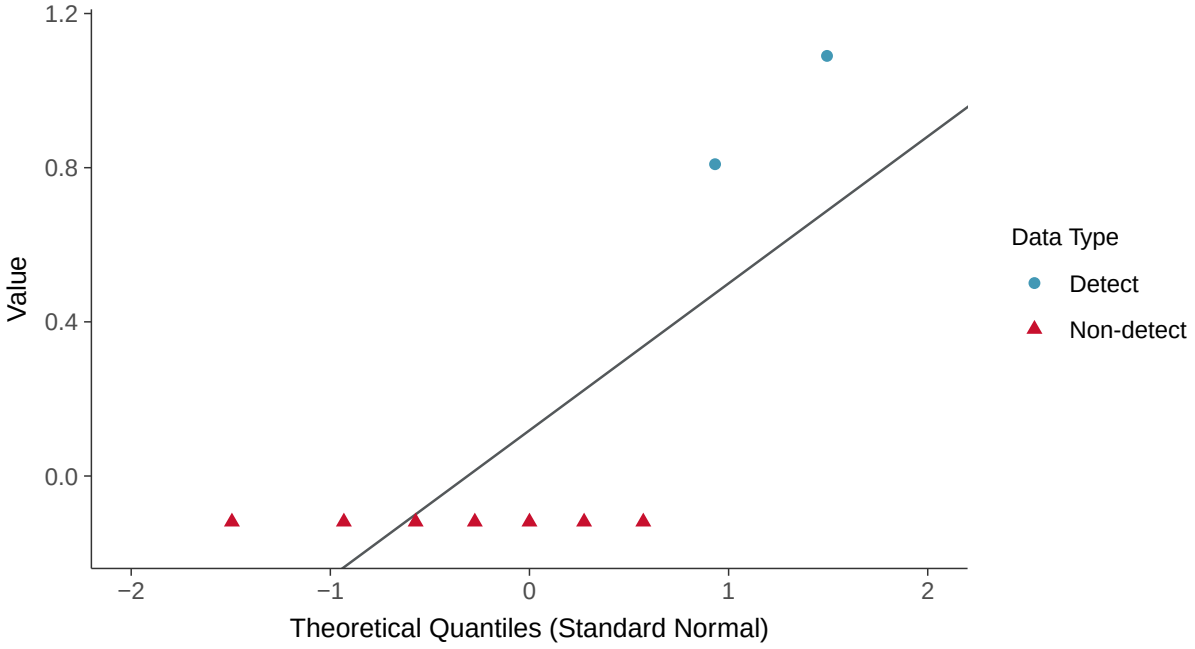
Boxplot by Season

Radium 226 and 228, MW-12 (pCi/L)



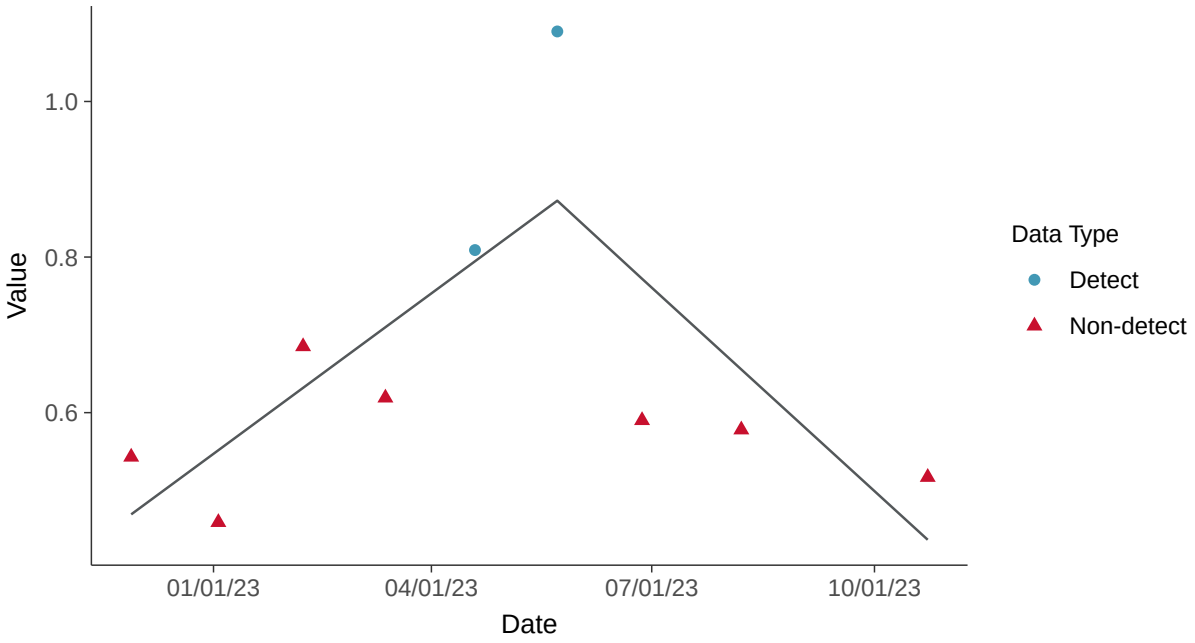
Normal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-12 (pCi/L)



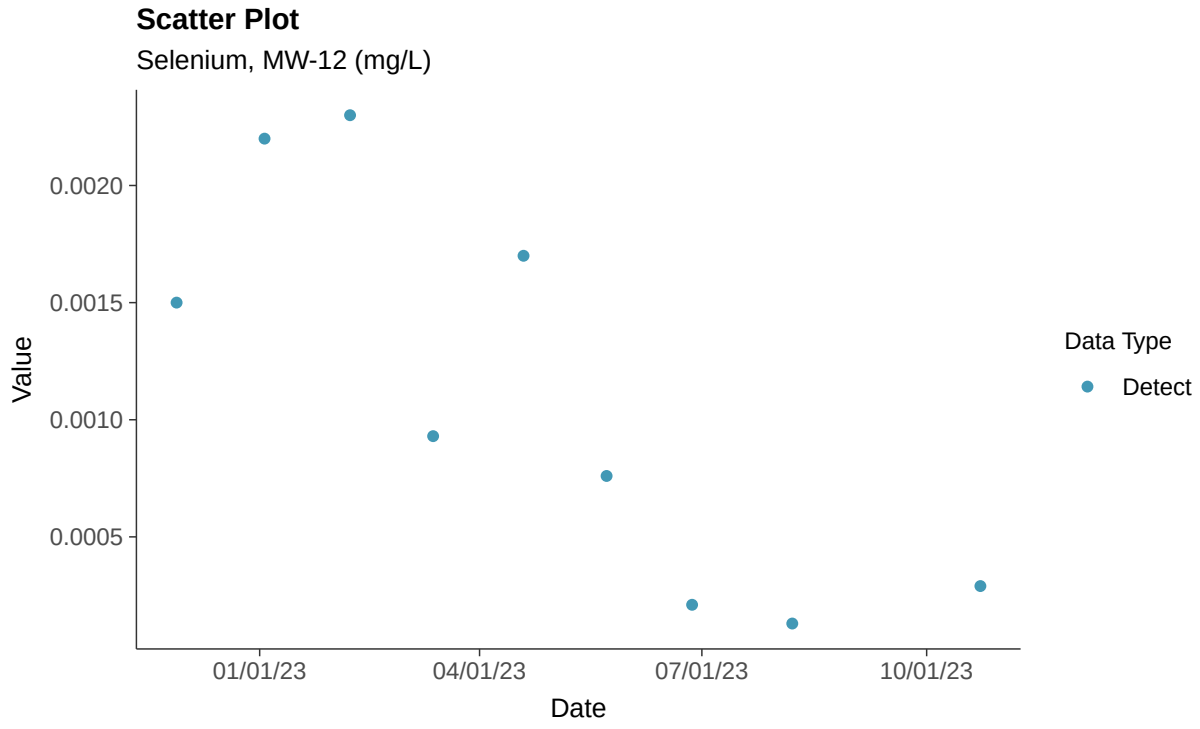
Trend Regression: Piecewise Linear-Linear

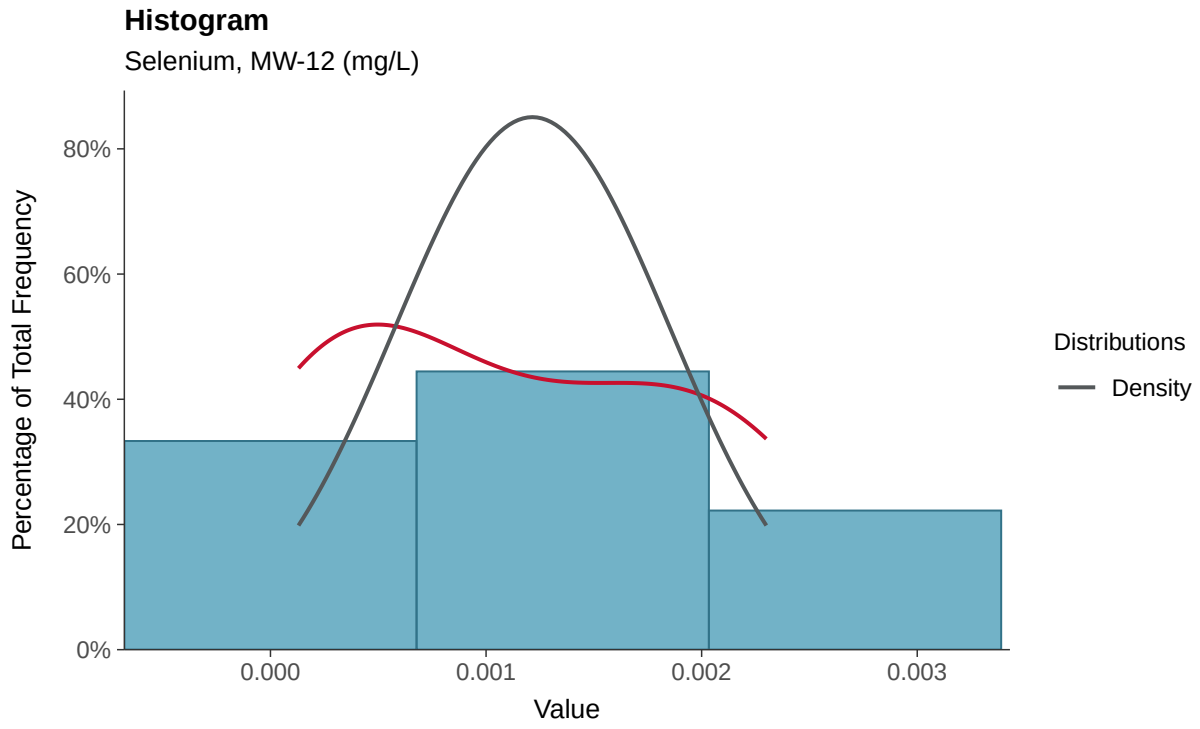
Radium 226 and 228, MW-12 (pCi/L)



Appendix IV: Selenium, MW-12

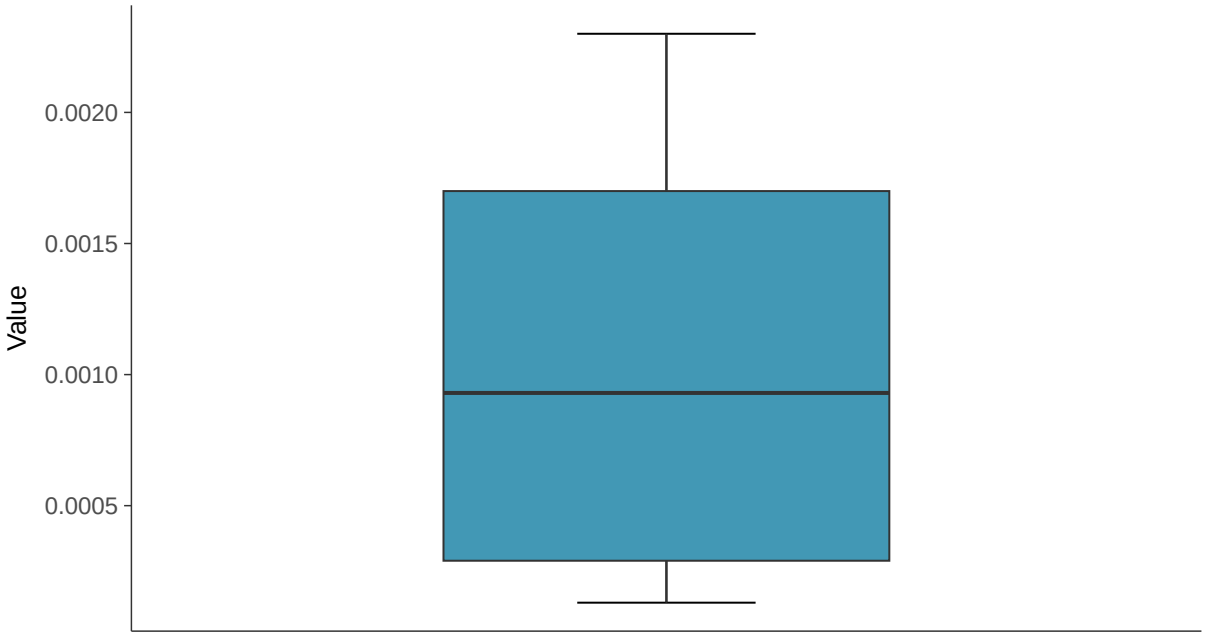
ID: 2_21_5_122





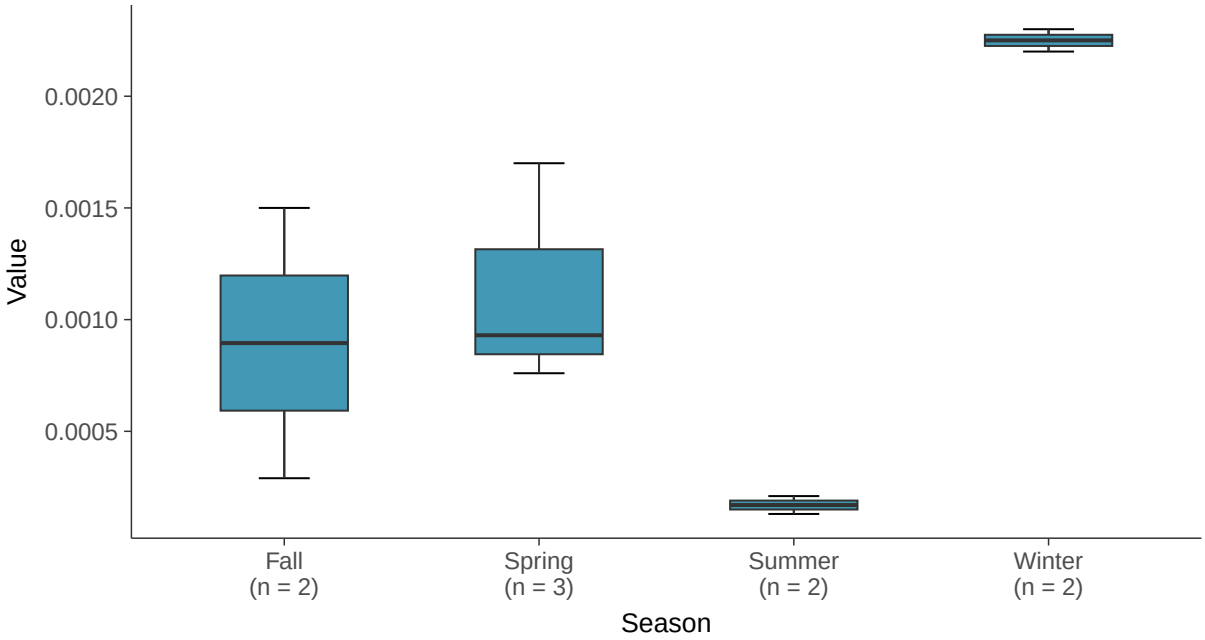
Boxplot

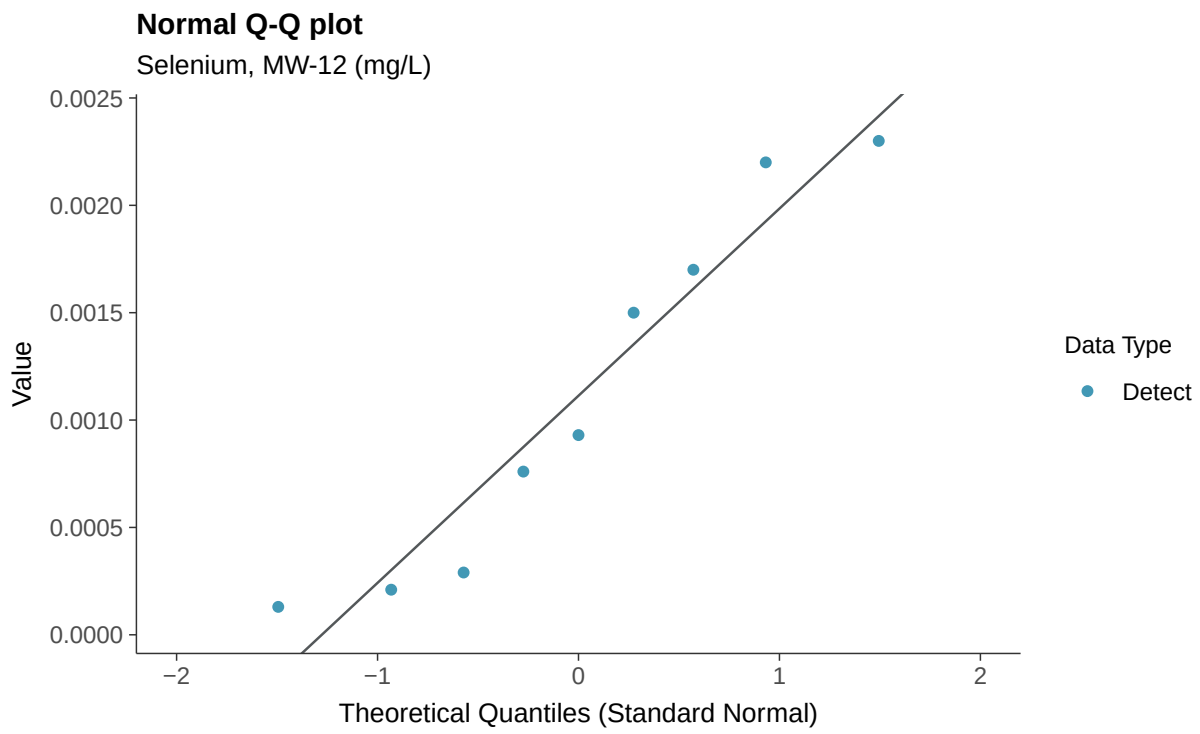
Selenium, MW-12 (mg/L)

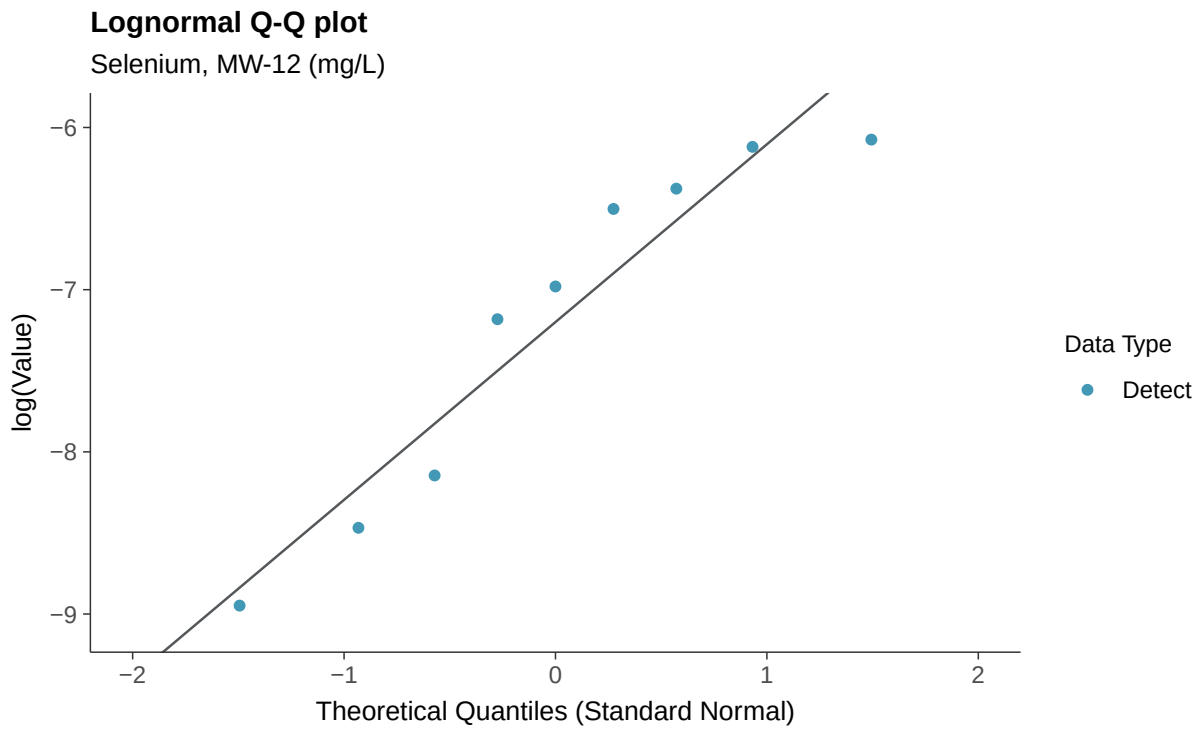


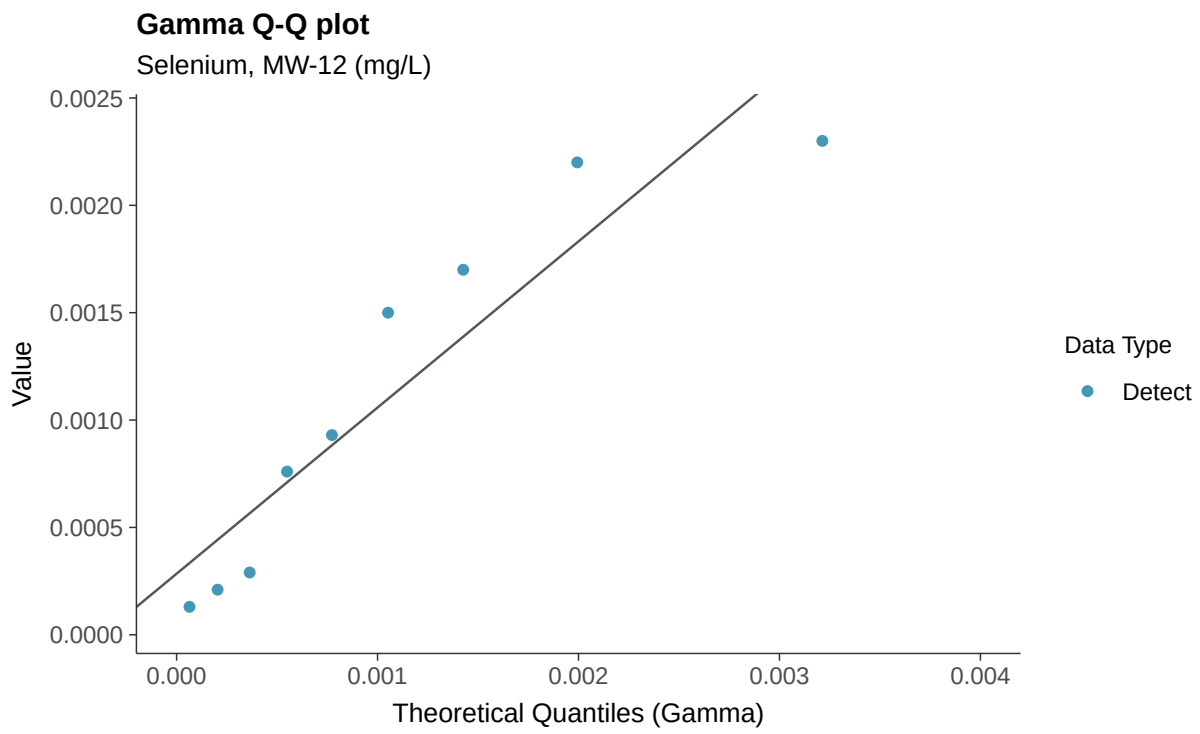
Boxplot by Season

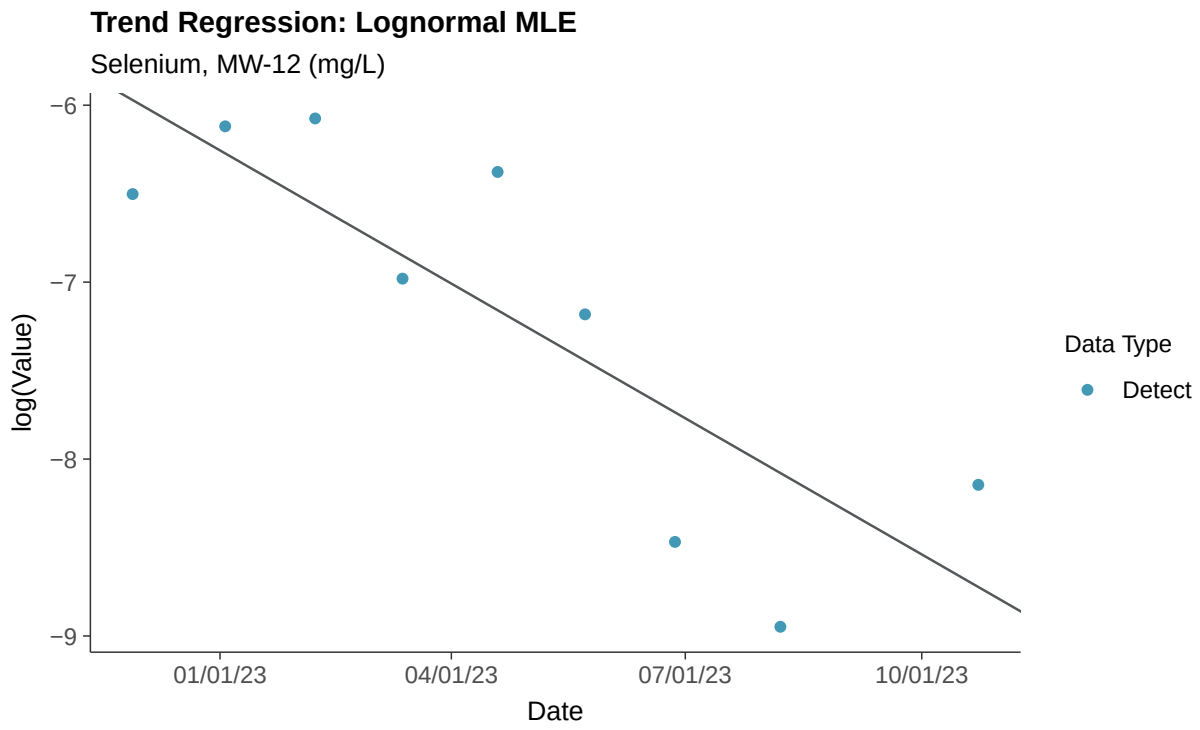
Selenium, MW-12 (mg/L)




Normal Q-Q plot
Selenium, MW-12 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

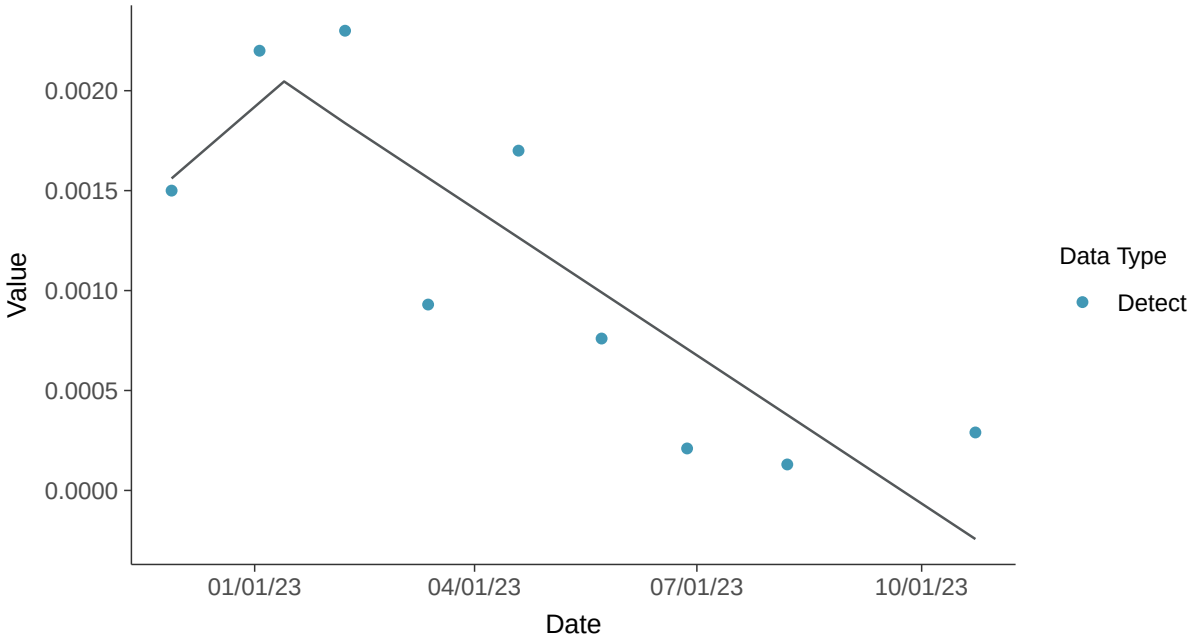

Lognormal Q-Q plot
Selenium, MW-12 (mg/L)
log(Value)
−6
−7
−8
−9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Selenium, MW-12 (mg/L)
Value
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.000
0.001
0.002
0.003
0.004
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Selenium, MW-12 (mg/L)
log(Value)
−6
−7
−8
−9
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

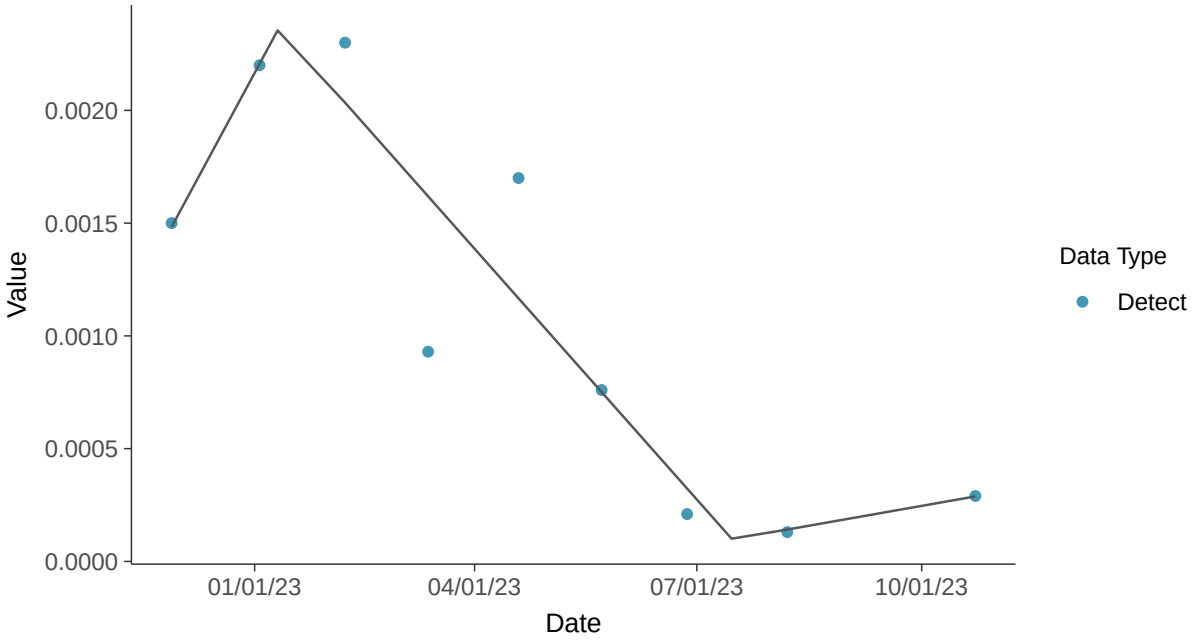
Trend Regression: Piecewise Linear-Linear

Selenium, MW-12 (mg/L)



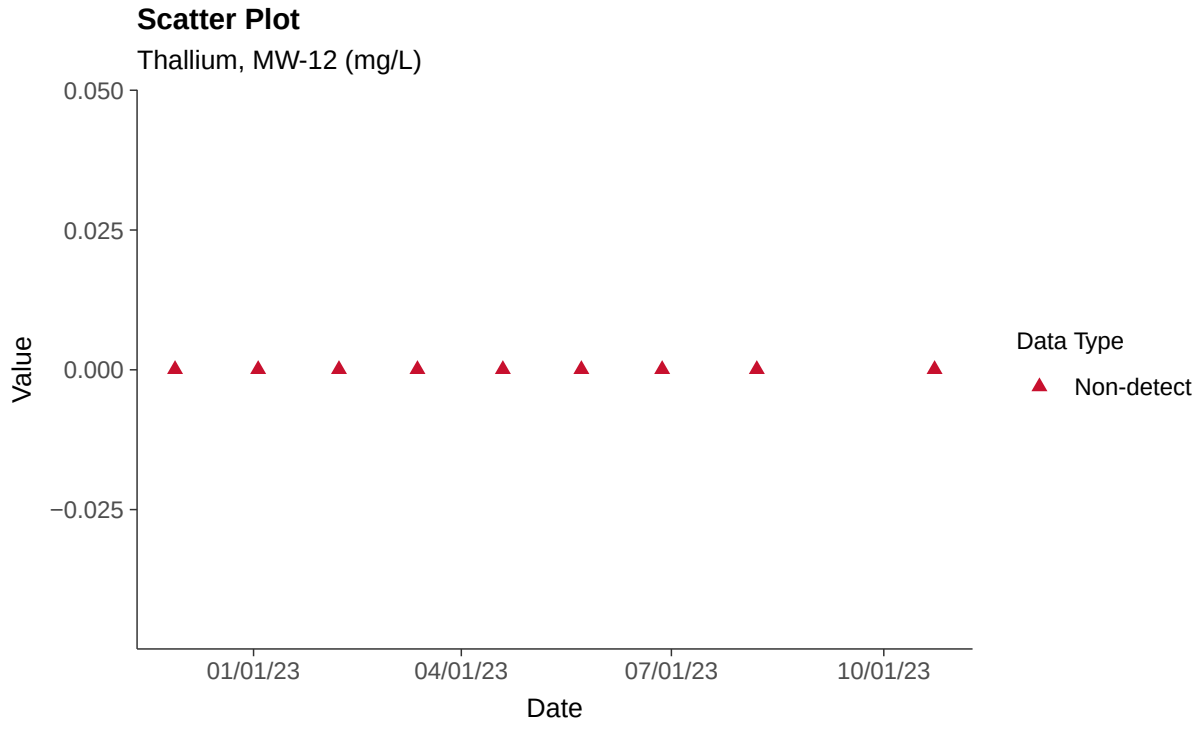
Trend Regression: Piecewise Linear-Linear-Linear

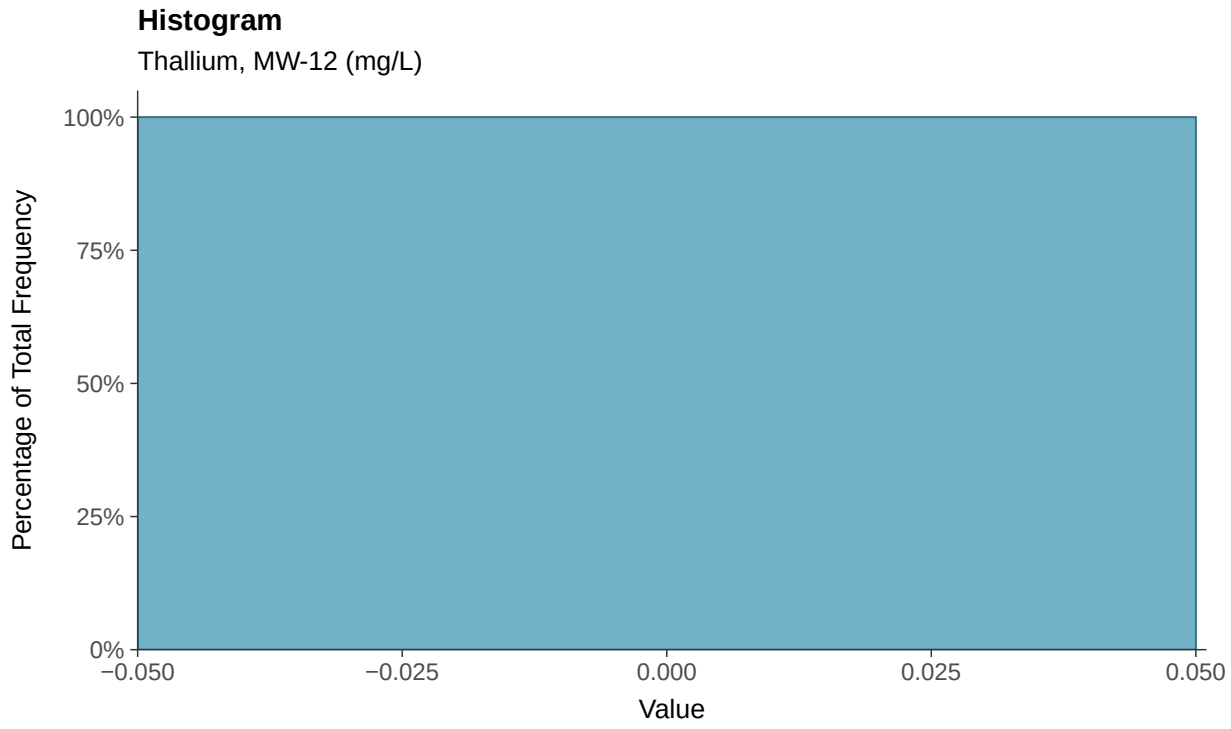
Selenium, MW-12 (mg/L)

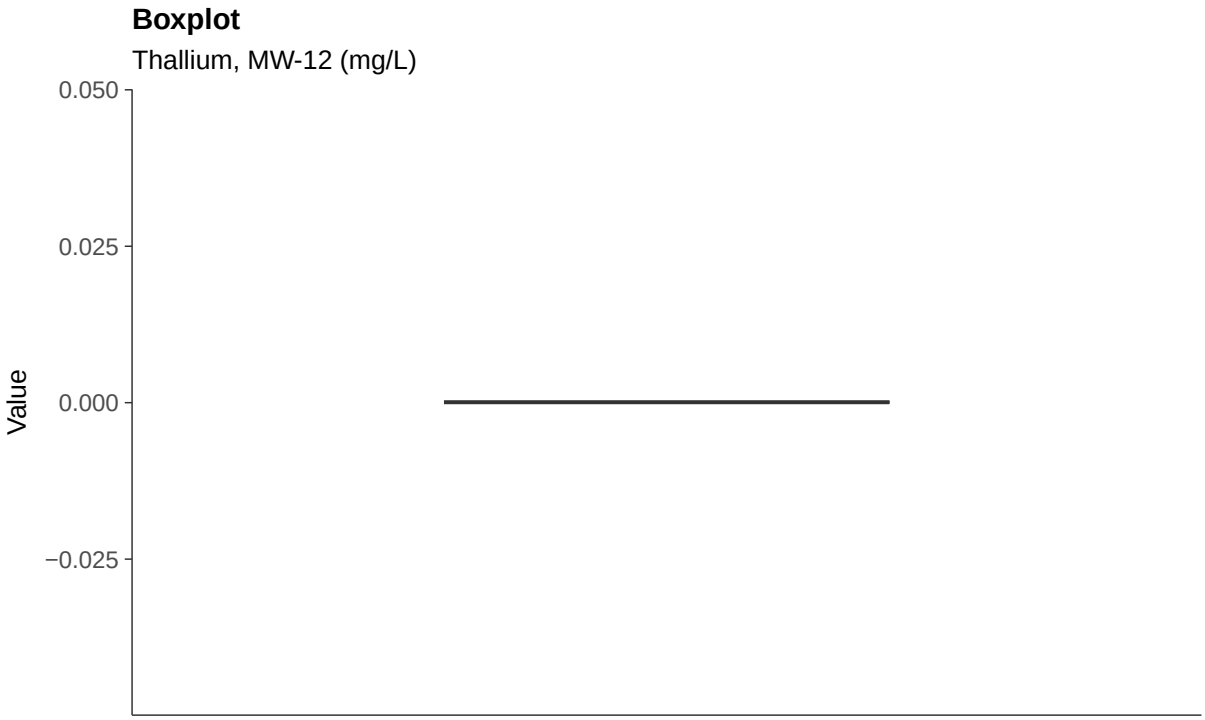


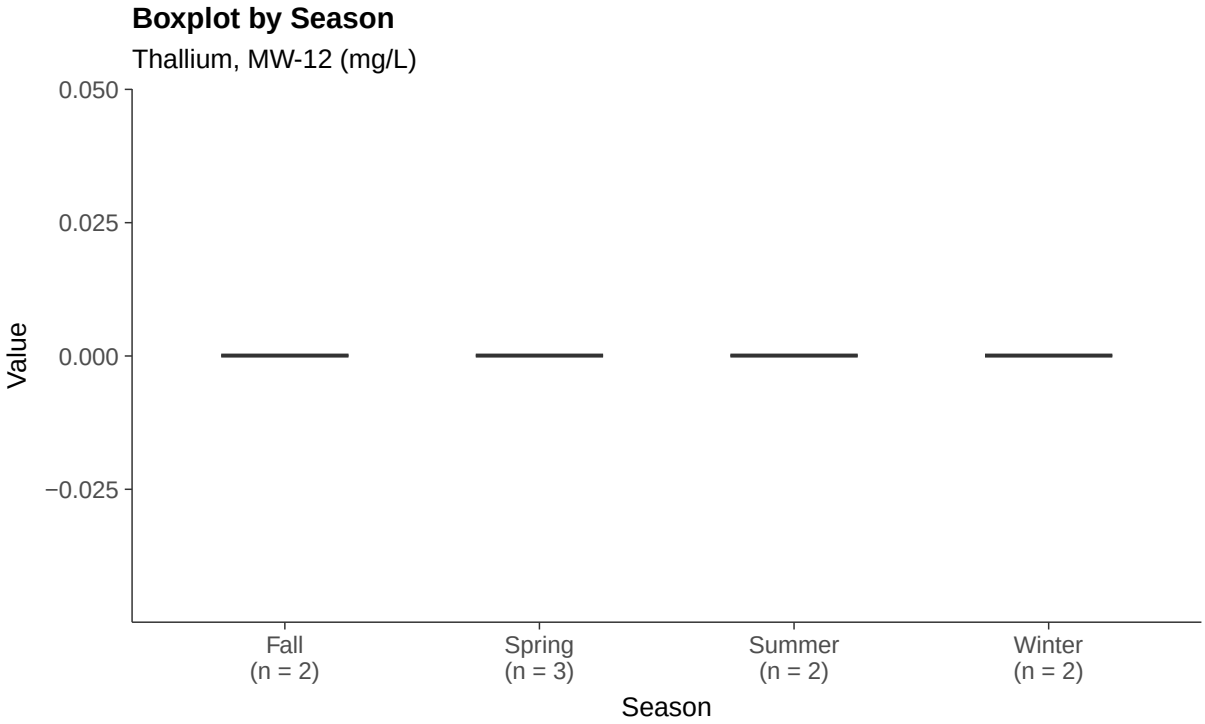
Appendix IV: Thallium, MW-12

ID: 2_21_5_125



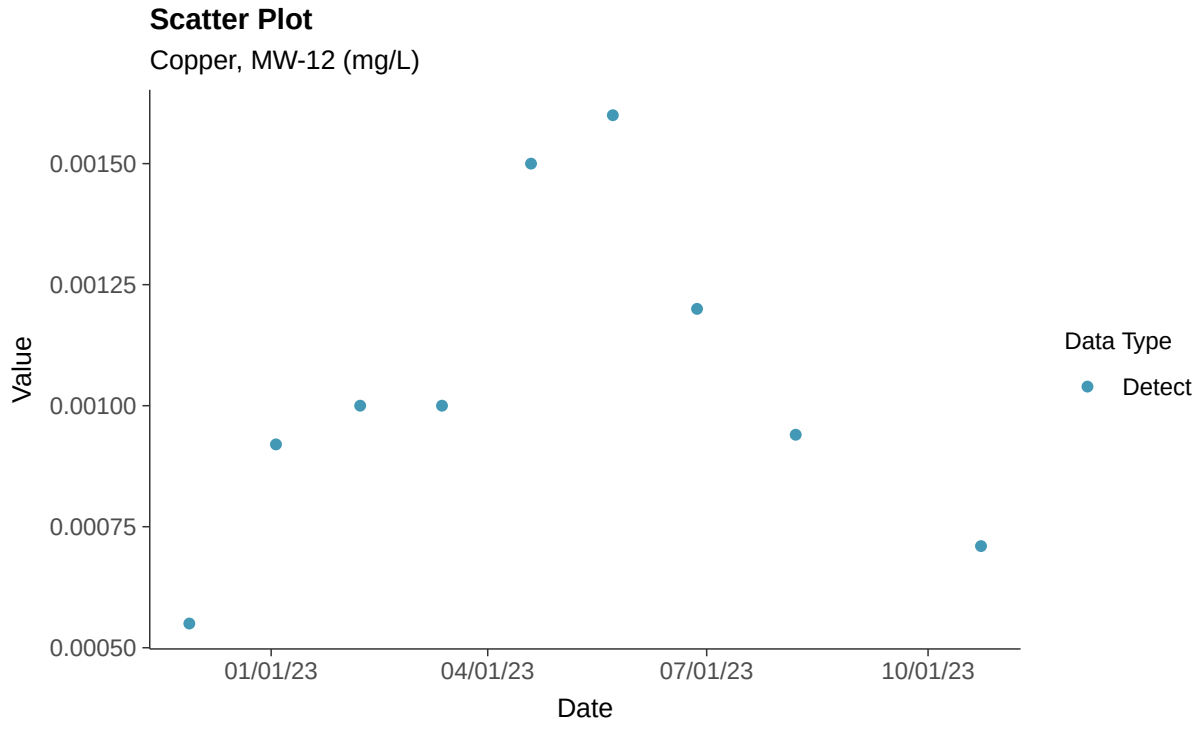


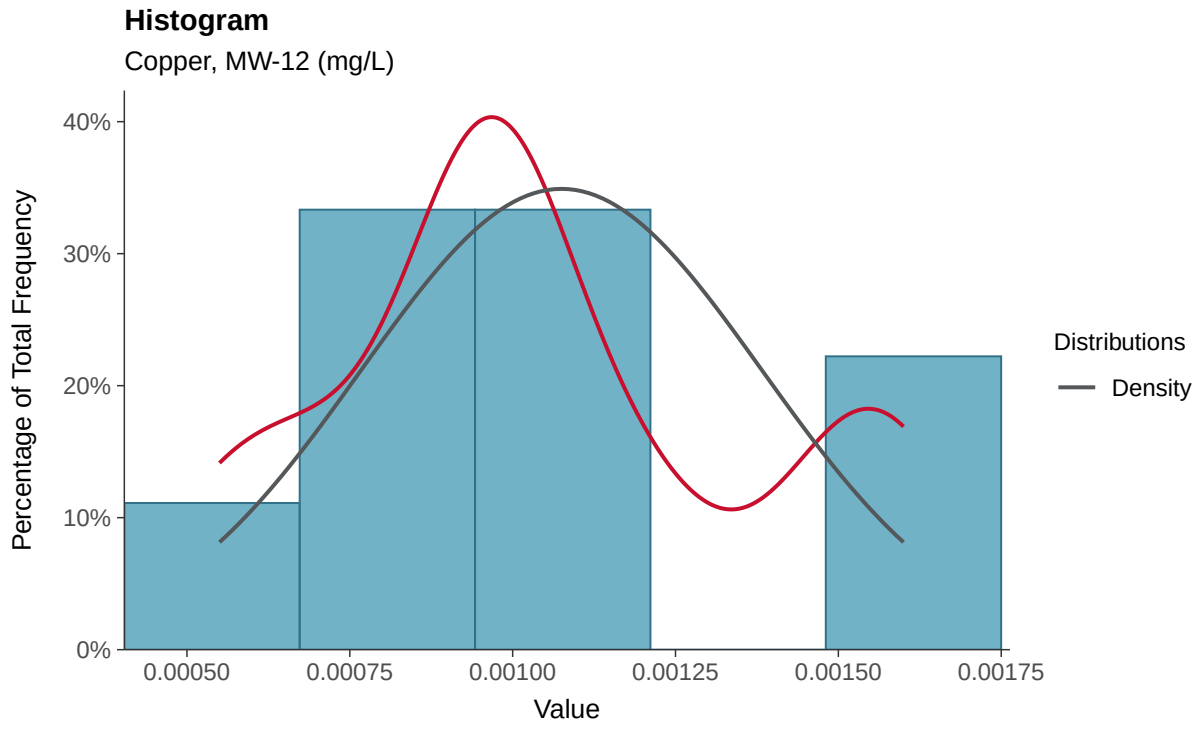

Boxplot
Thallium, MW-12 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Thallium, MW-12 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

Part 115: Copper, MW-12

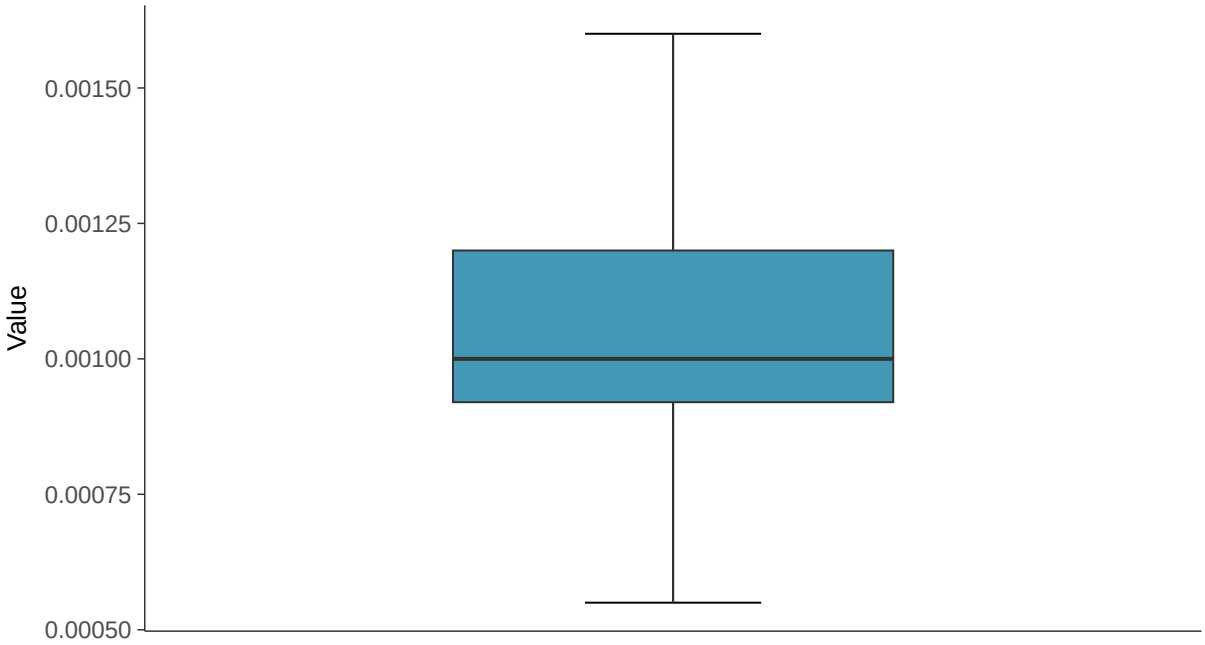
ID: 2_21_6_111





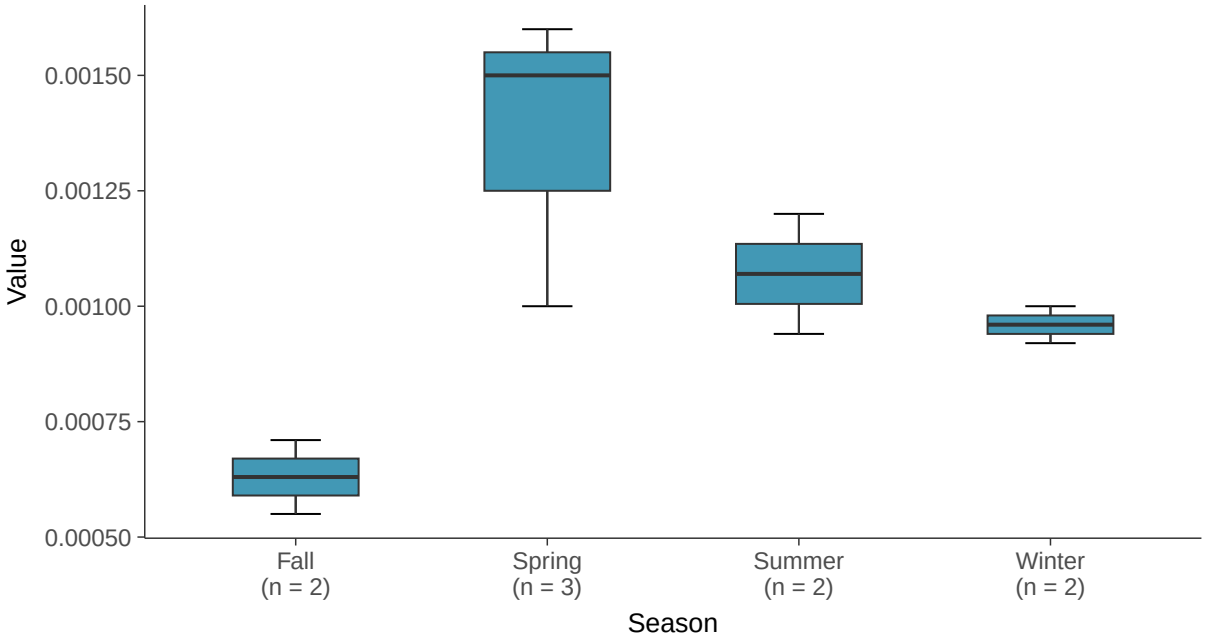
Boxplot

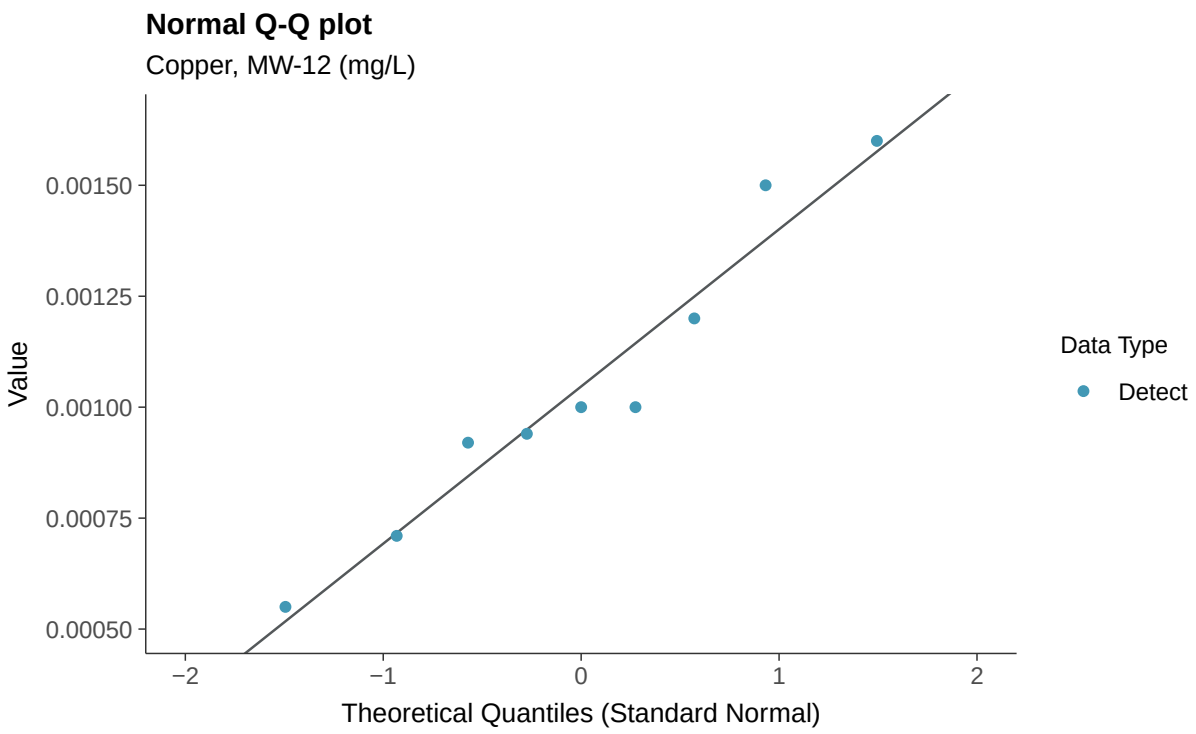
Copper, MW-12 (mg/L)

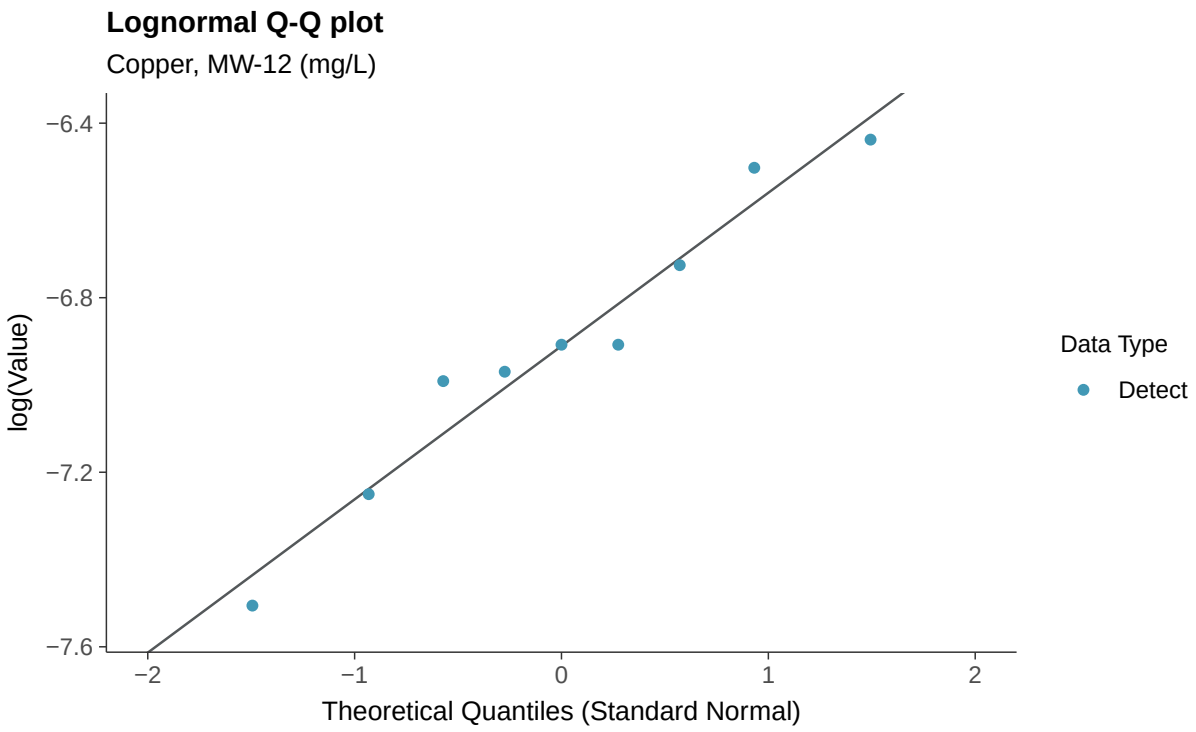


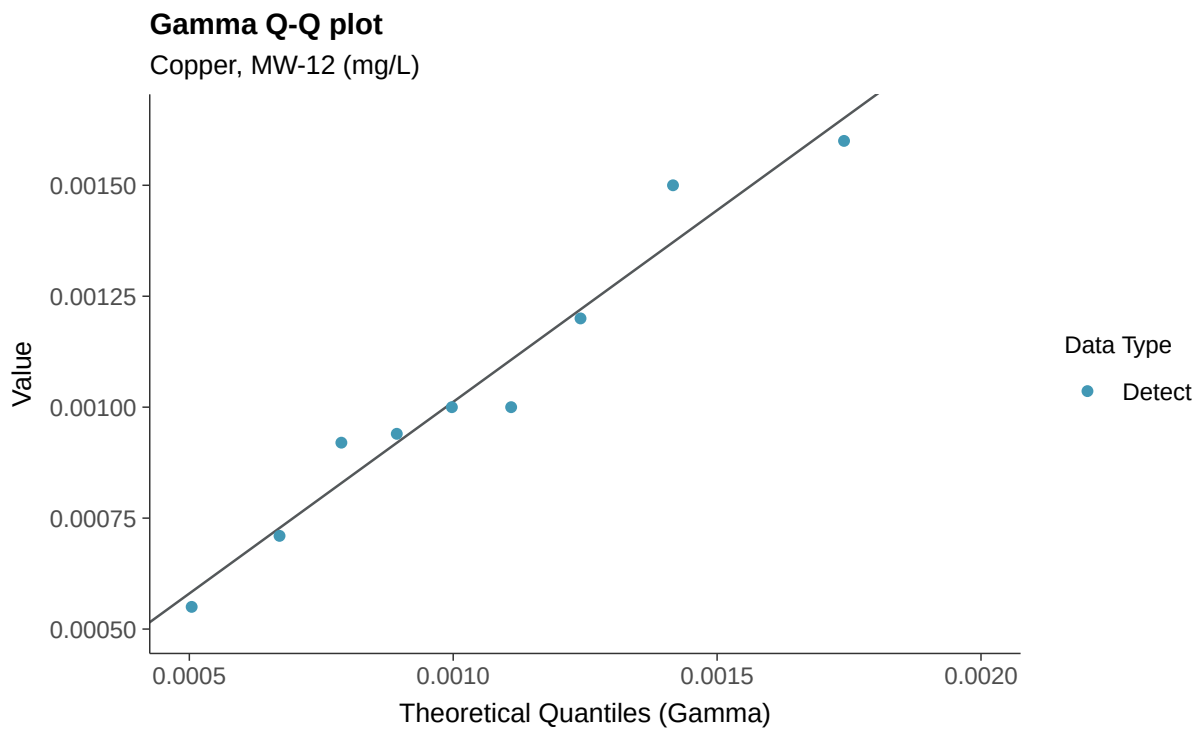
Boxplot by Season

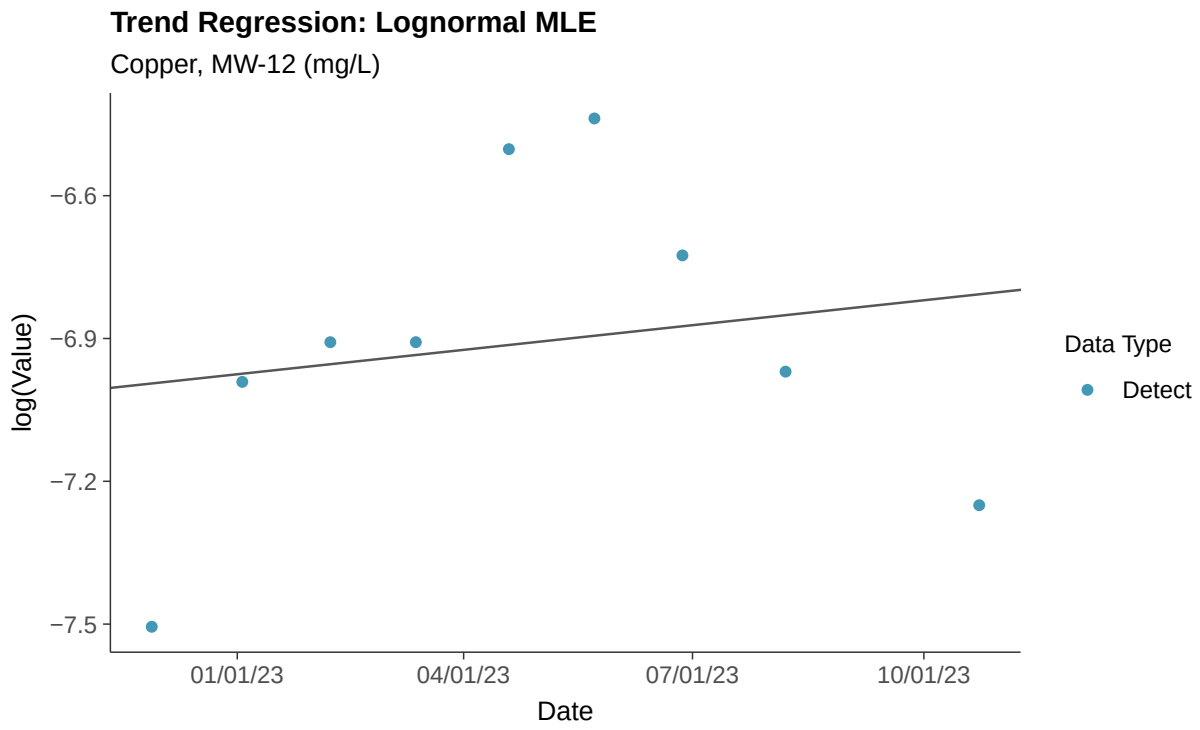
Copper, MW-12 (mg/L)

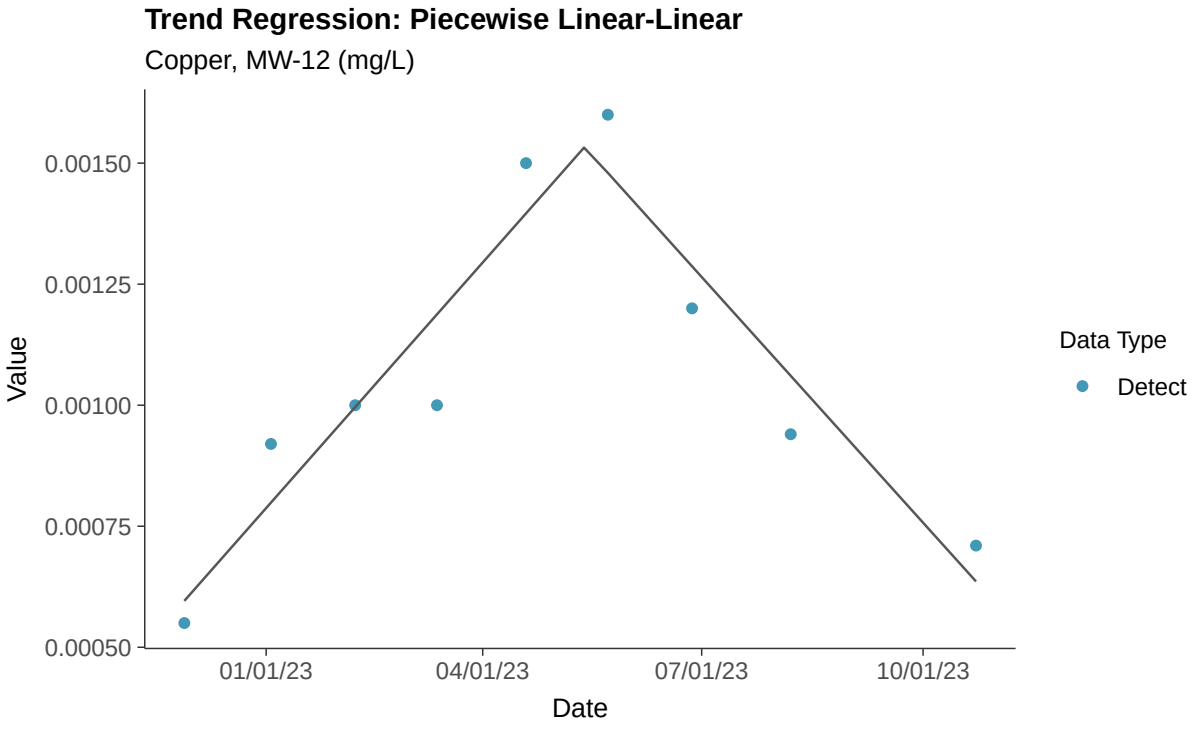


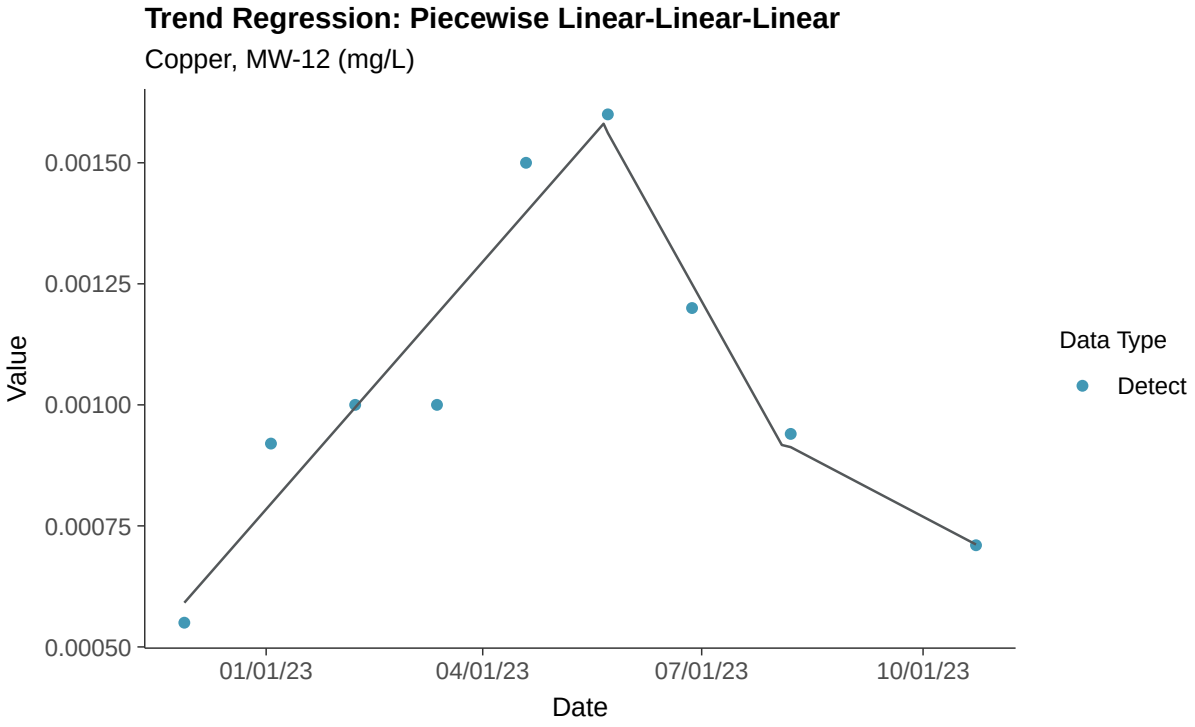

Normal Q-Q plot
Copper, MW-12 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
0.00050
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Copper, MW-12 (mg/L)
log(Value)
−6.4
−6.8
−7.2
−7.6
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Copper, MW-12 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
0.00050
0.0005
0.0010
0.0015
0.0020
Theoretical Quantiles (Gamma)
Data Type
Detect

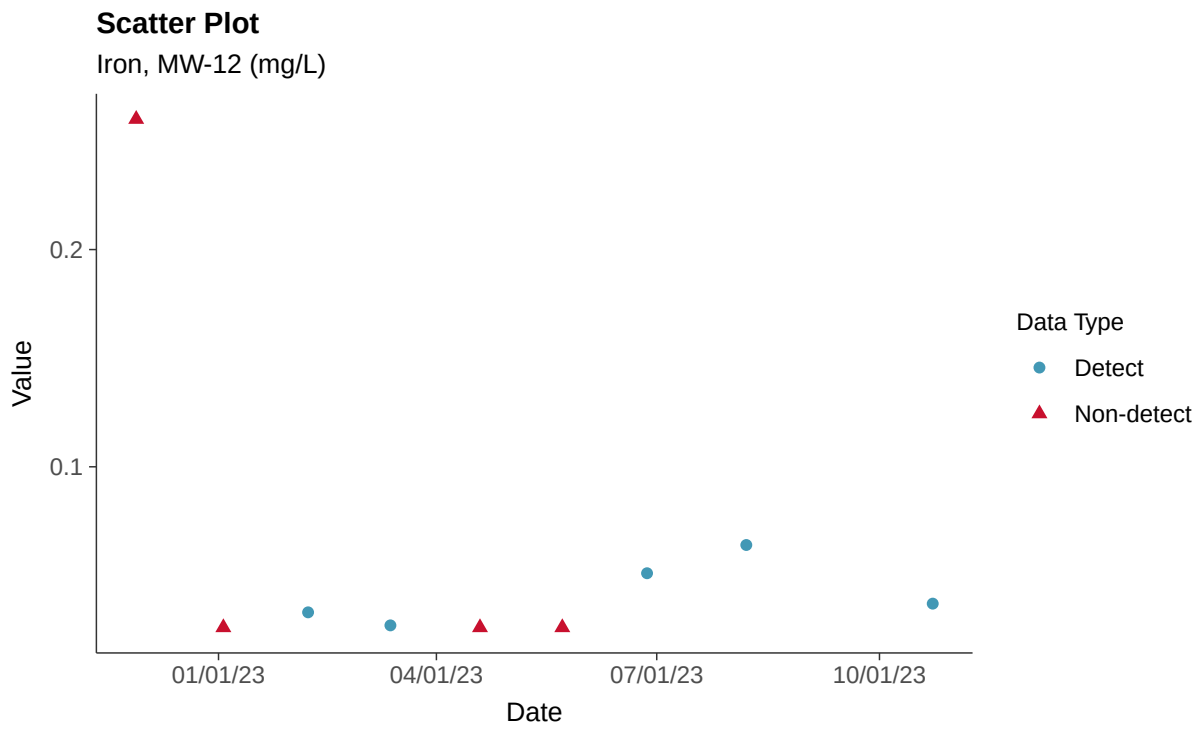

Trend Regression: Lognormal MLE
Copper, MW-12 (mg/L)
log(Value)
−6.6
−6.9
−7.2
−7.5
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

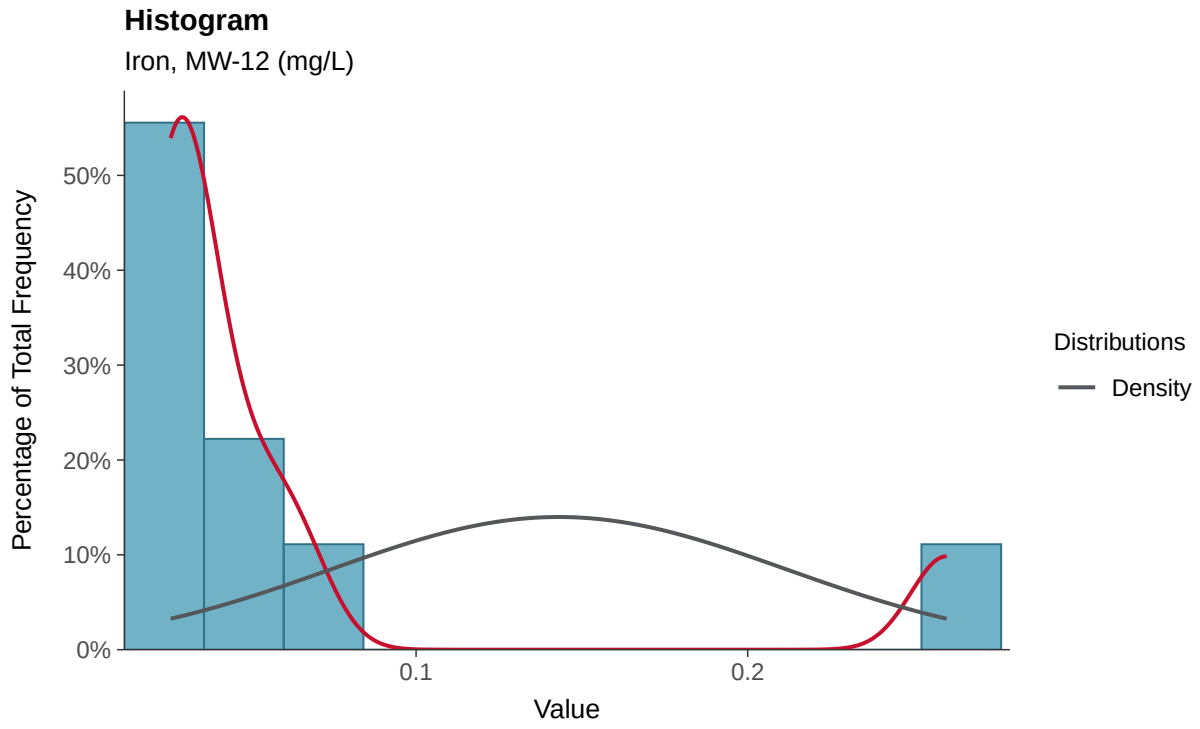

Trend Regression: Piecewise Linear-Linear
Copper, MW-12 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
0.00050
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Copper, MW-12 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
0.00050
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Iron, MW-12

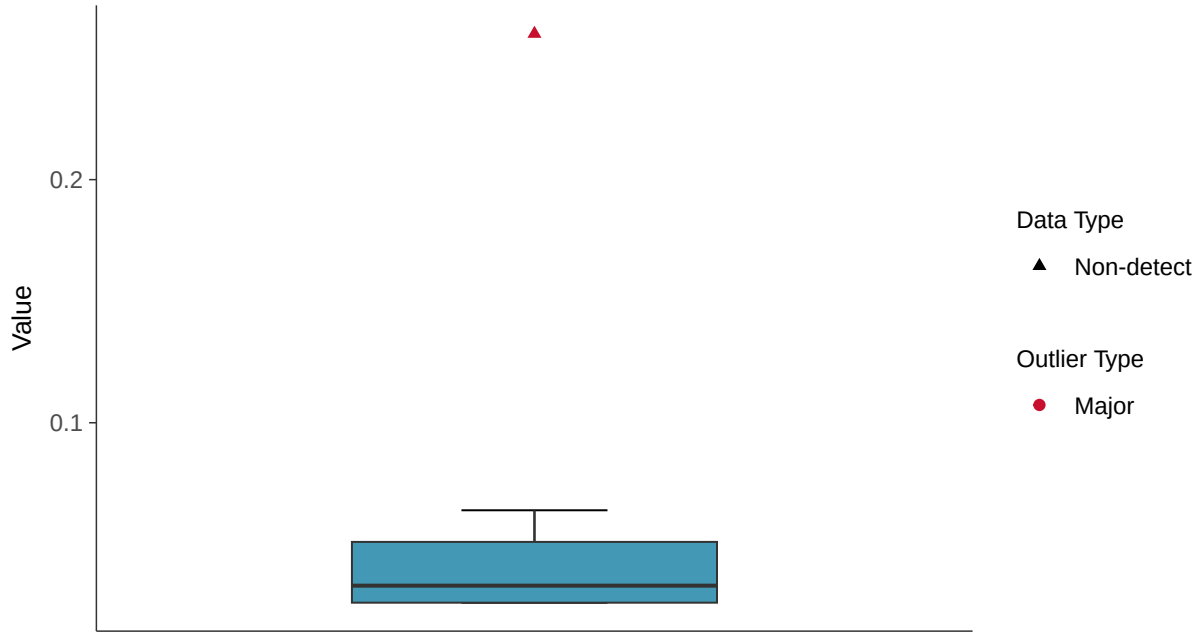
ID: 2_21_6_114





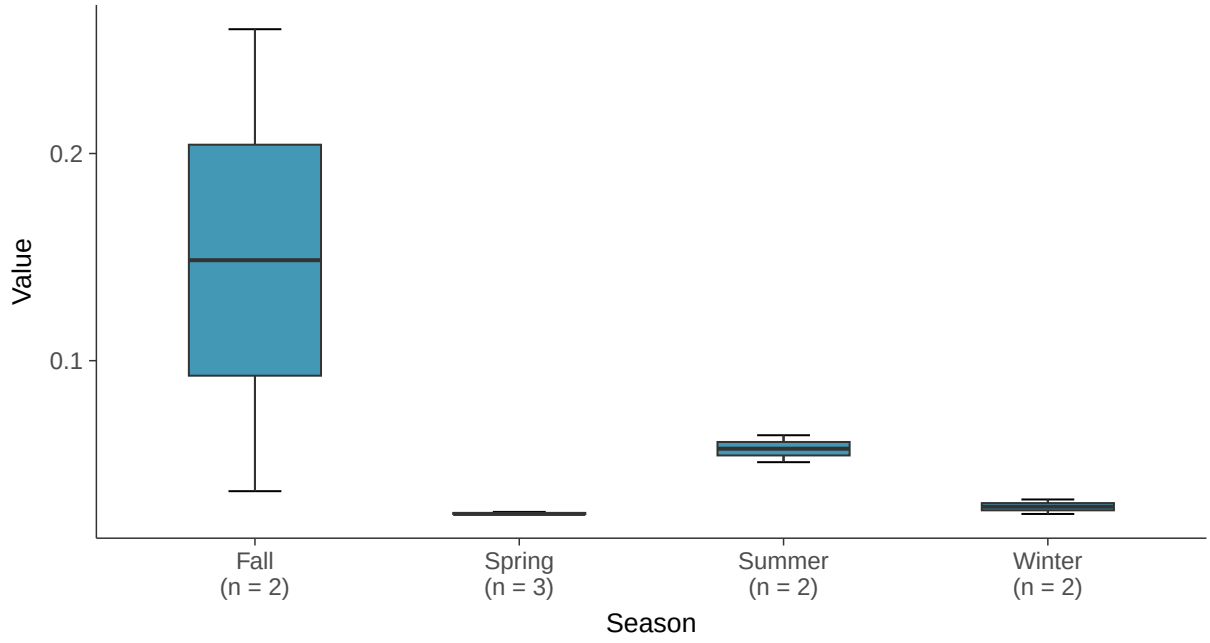
Boxplot

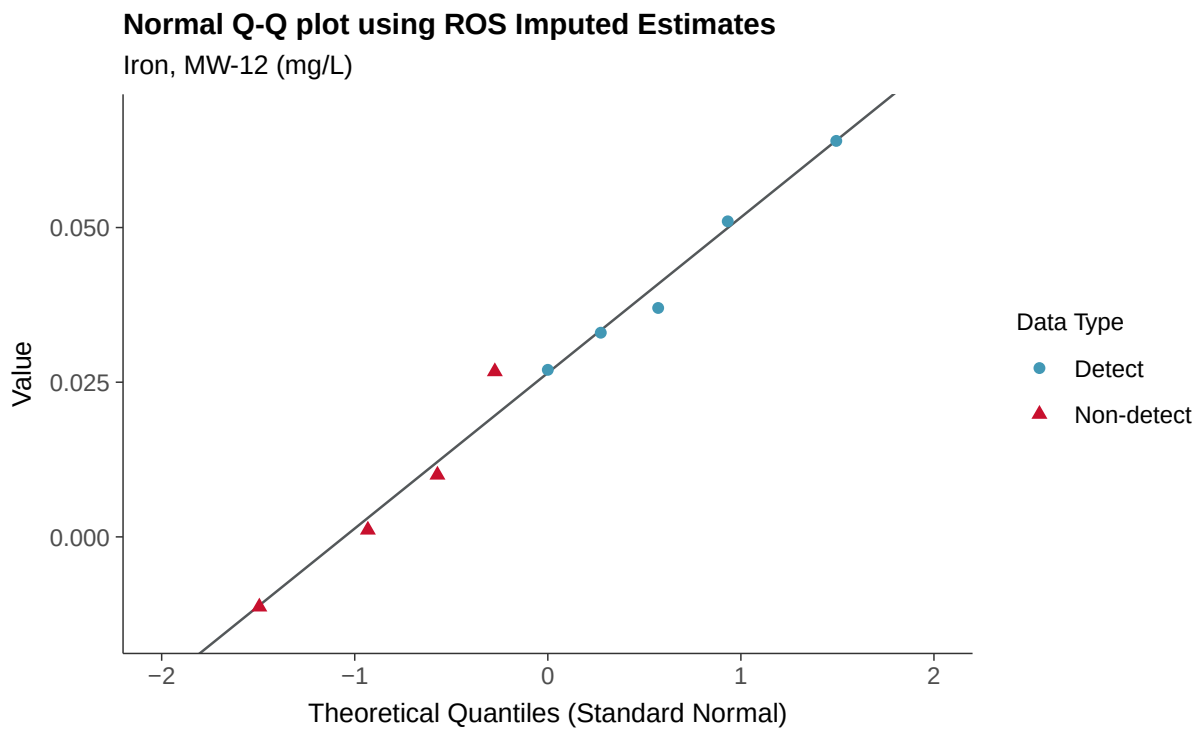
Iron, MW-12 (mg/L)

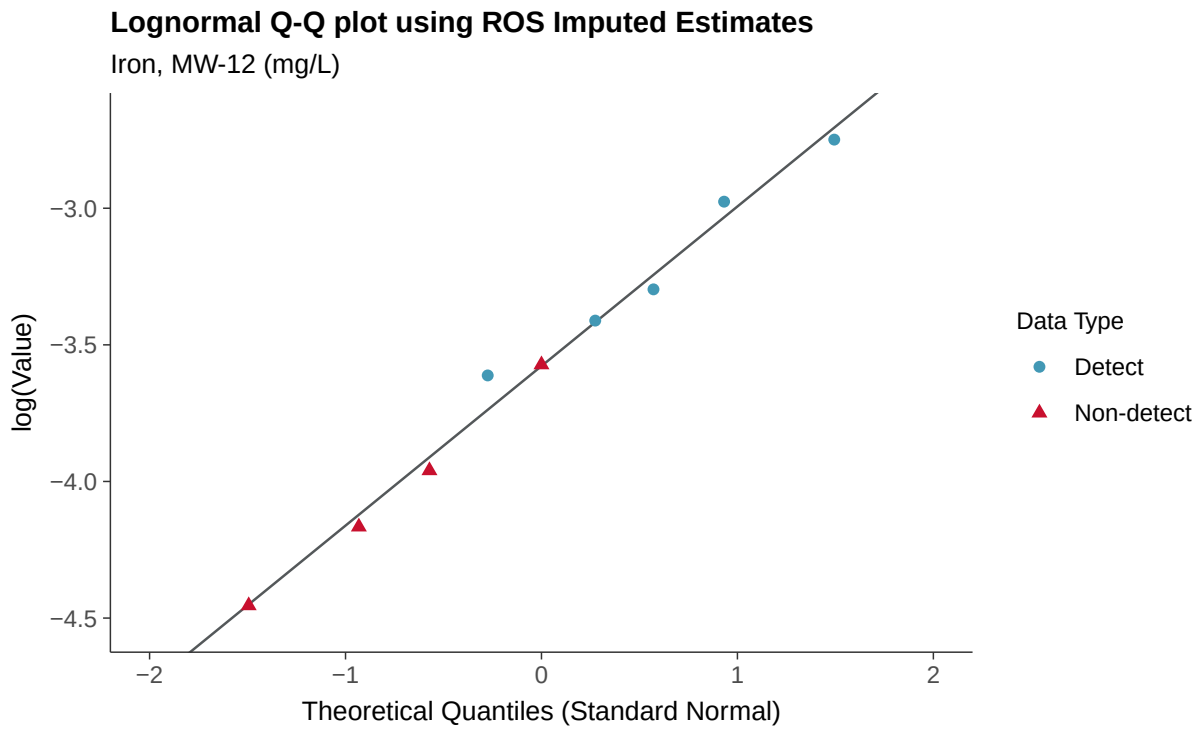


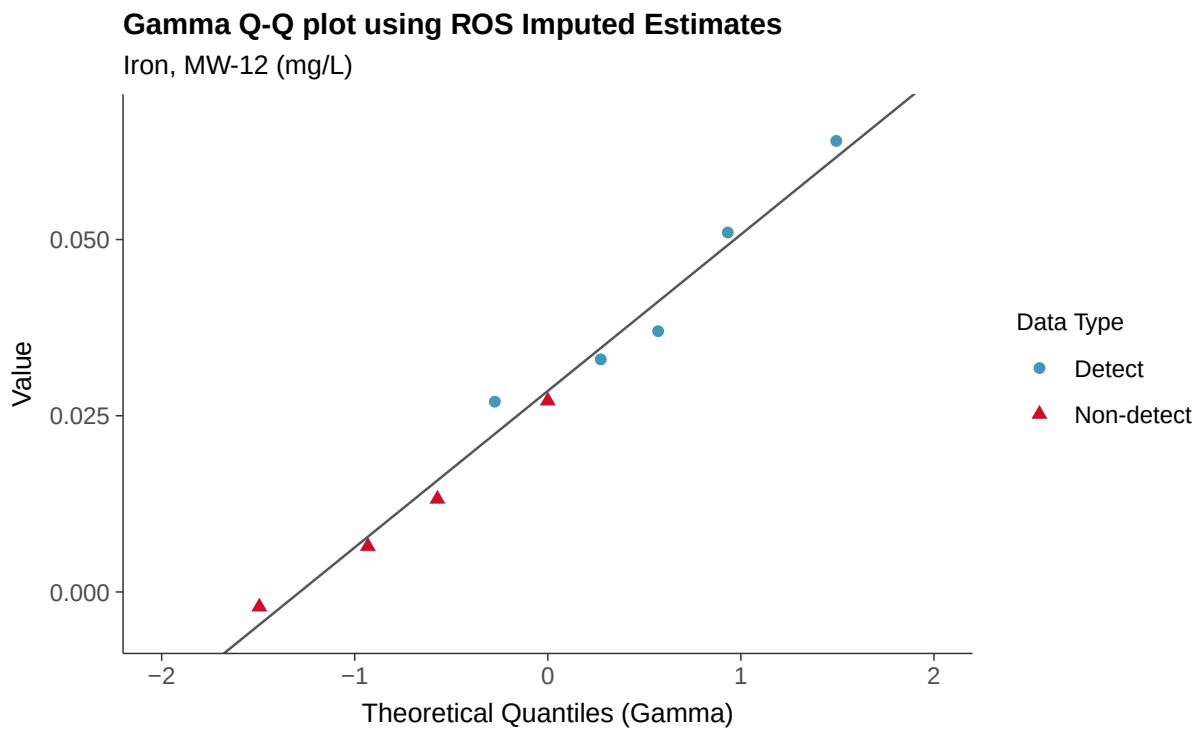
Boxplot by Season

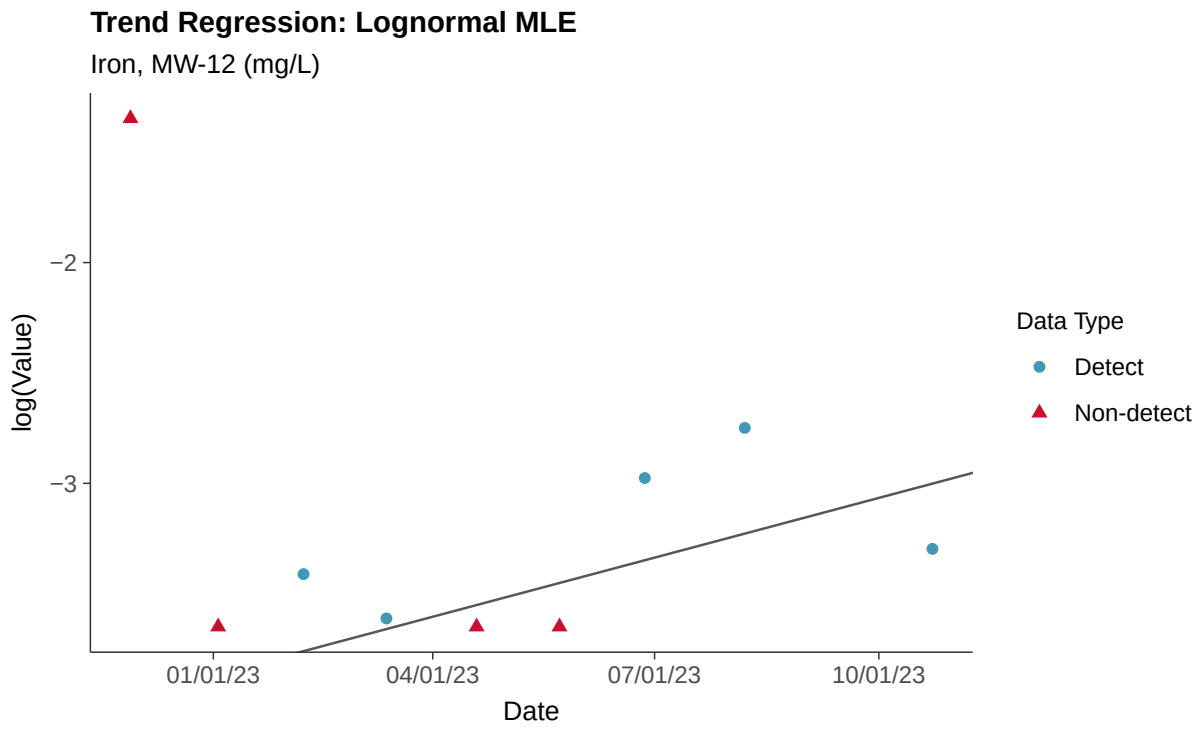
Iron, MW-12 (mg/L)

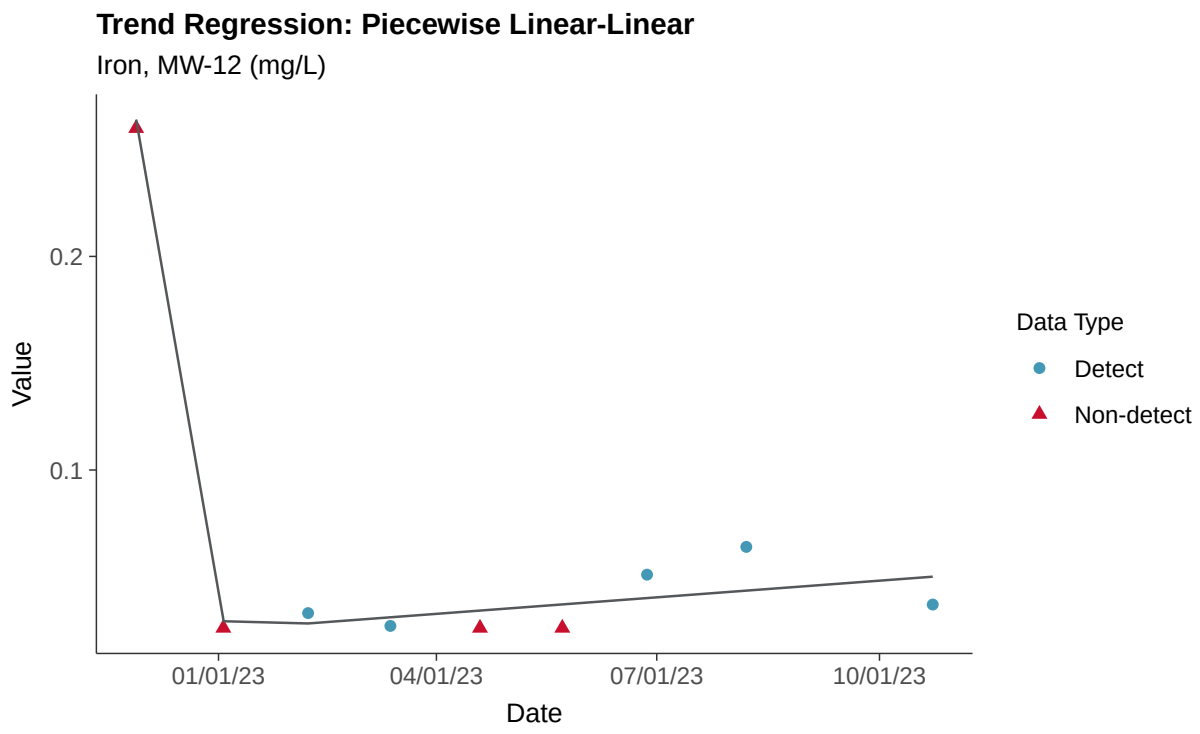



Normal Q-Q plot using ROS Imputed Estimates
Iron, MW-12 (mg/L)
Value
0.050
0.025
0.000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Lognormal Q-Q plot using ROS Imputed Estimates
Iron, MW-12 (mg/L)
log(Value)
−3.0
−3.5
−4.0
−4.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

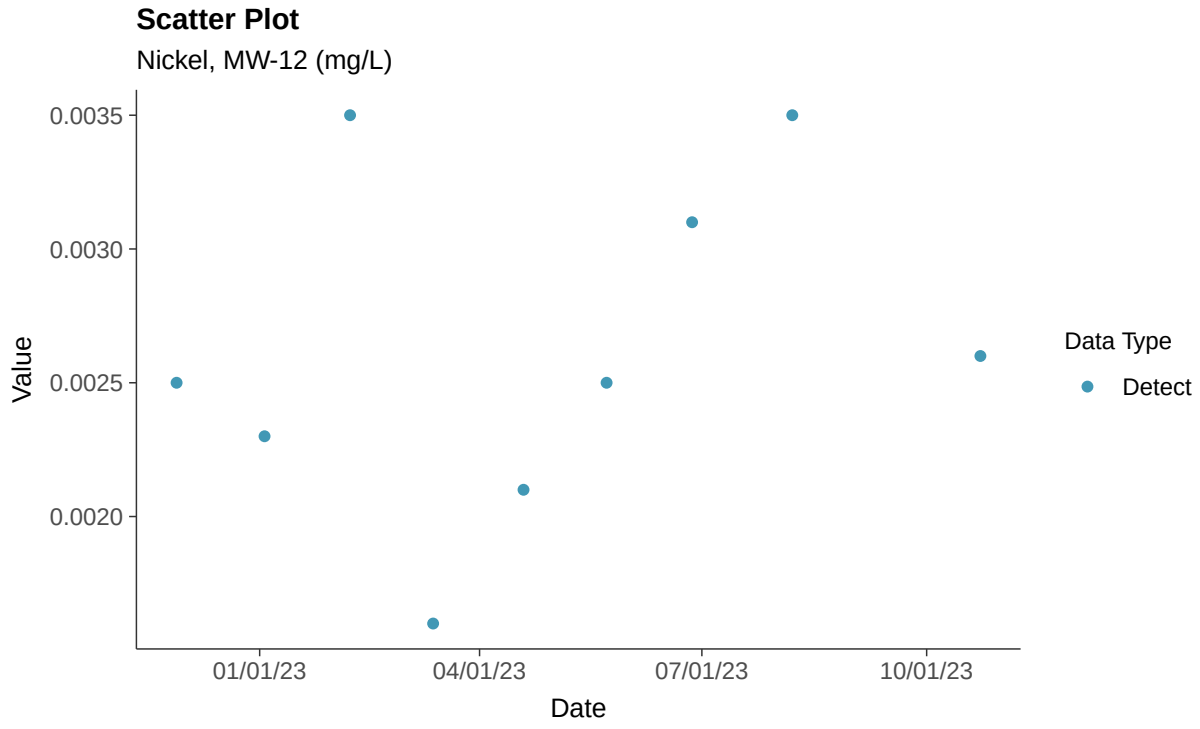

Gamma Q-Q plot using ROS Imputed Estimates
Iron, MW-12 (mg/L)
Value
0.050
0.025
0.000
−2
−1
0
1
2
Theoretical Quantiles (Gamma)
Data Type
Detect
Non-detect

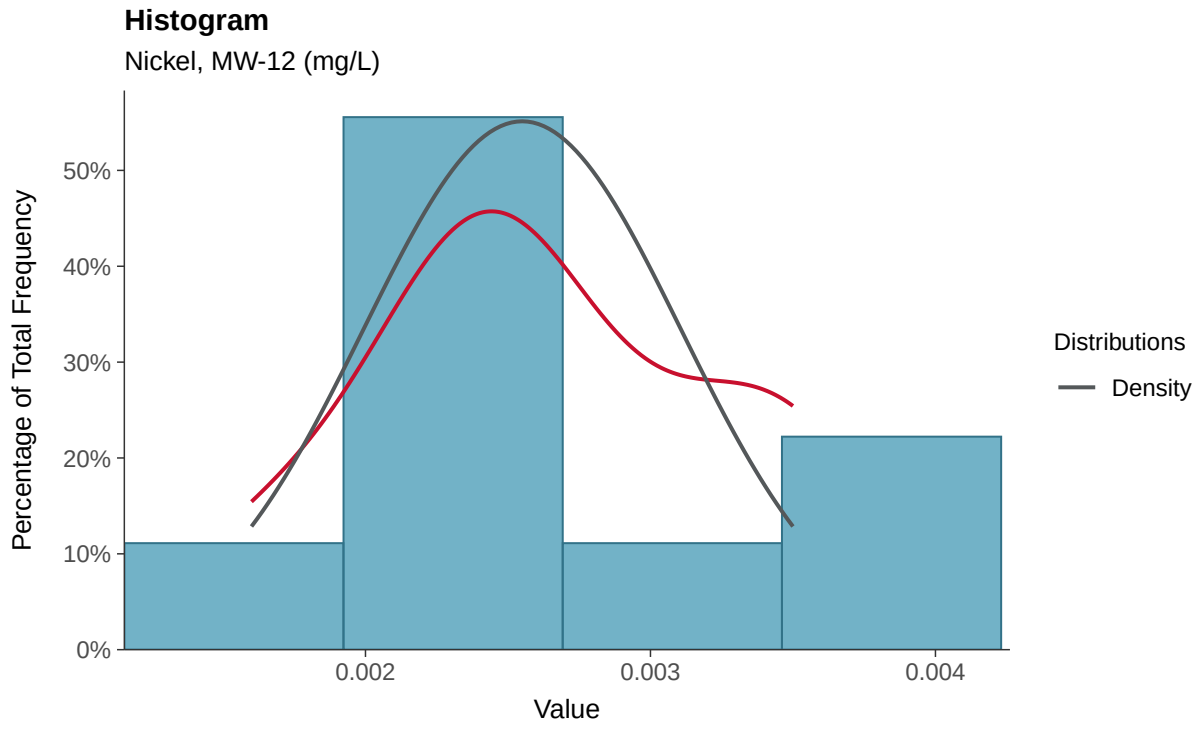

Trend Regression: Lognormal MLE
Iron, MW-12 (mg/L)
log(Value)
−2
−3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-12 (mg/L)
Value
0.2
0.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Nickel, MW-12

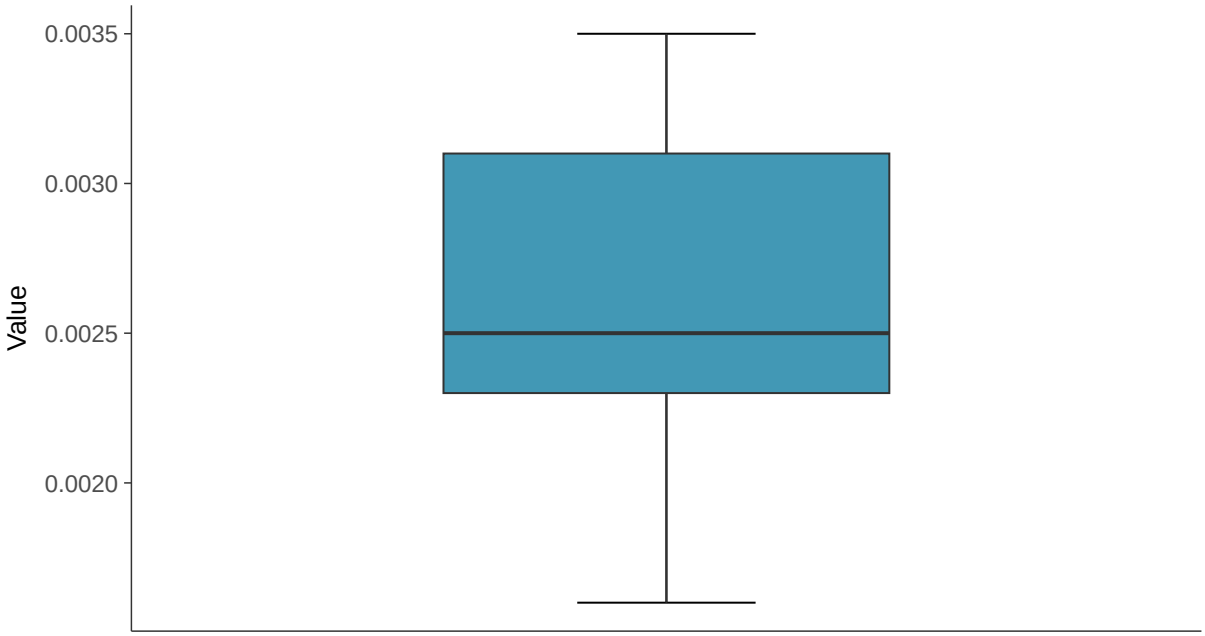
ID: 2_21_6_119





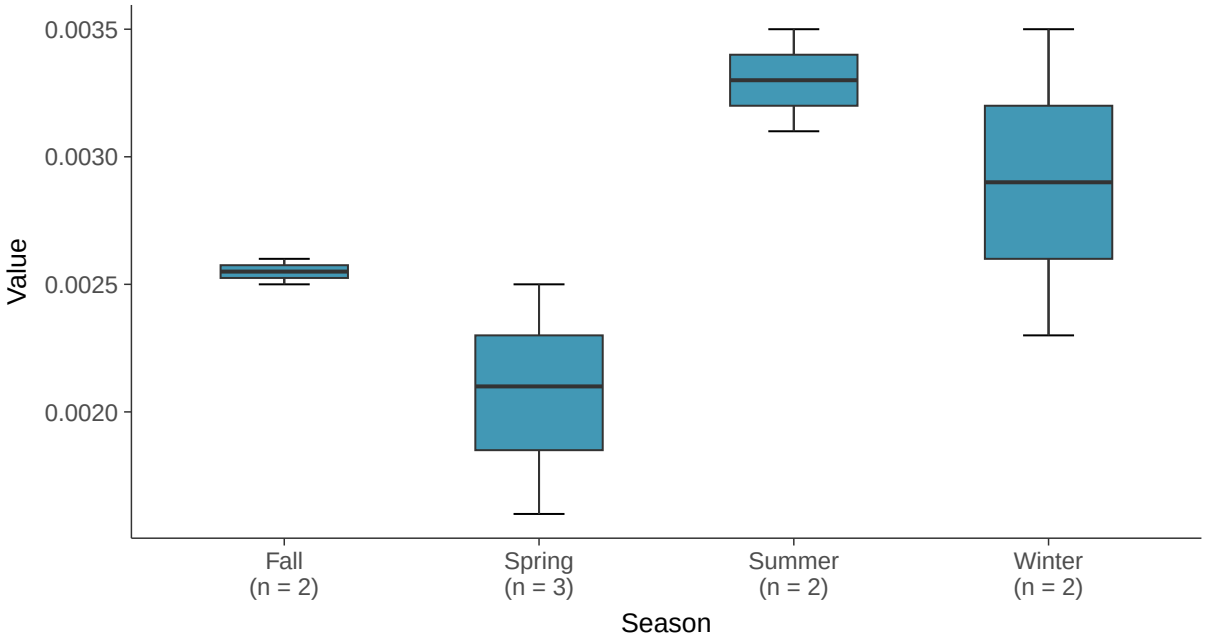
Boxplot

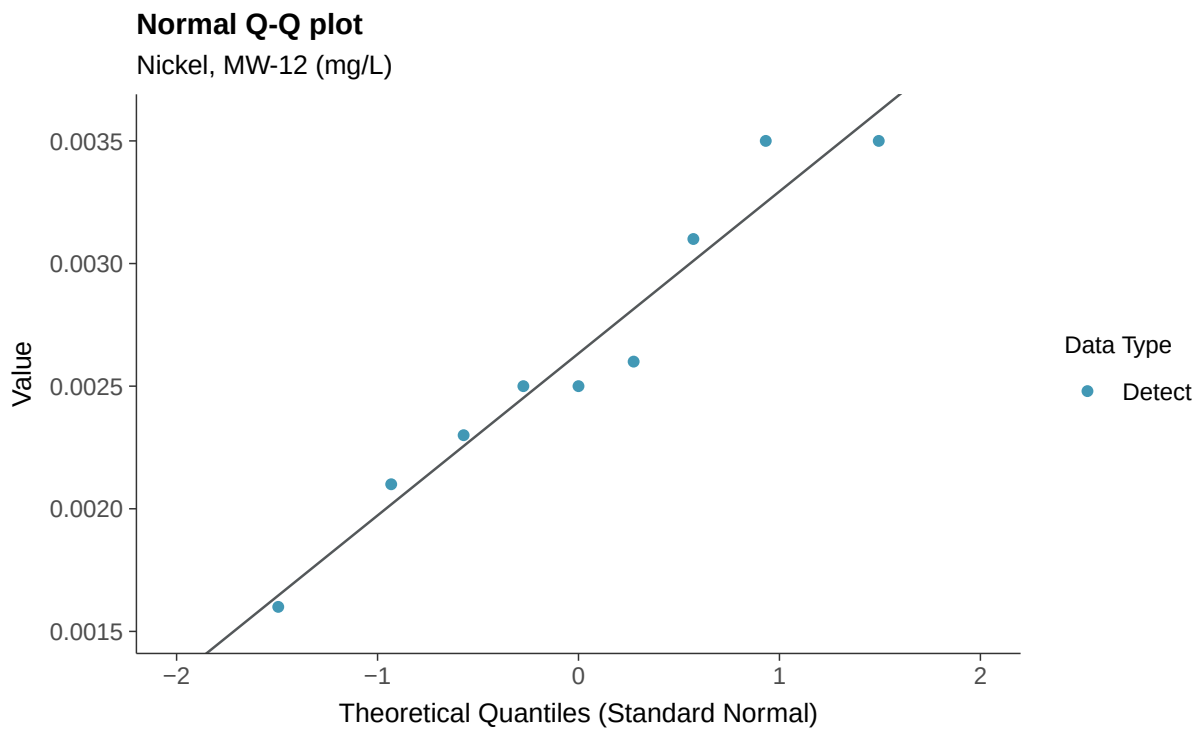
Nickel, MW-12 (mg/L)

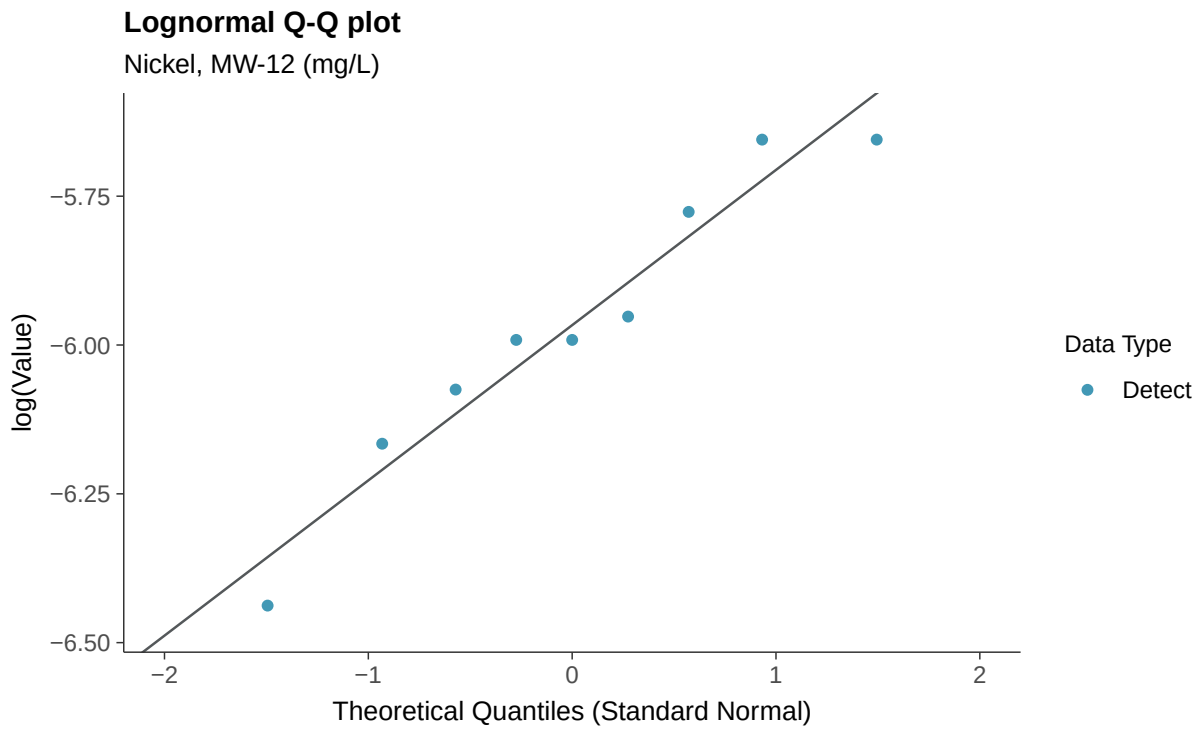


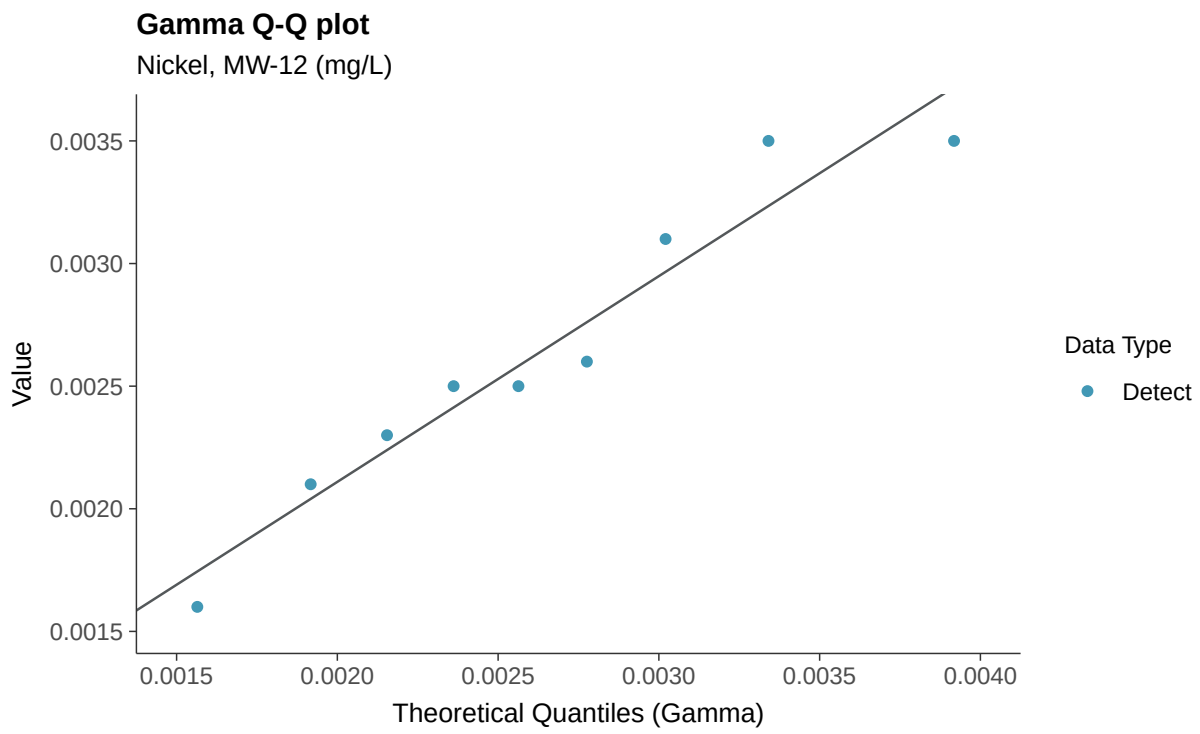
Boxplot by Season

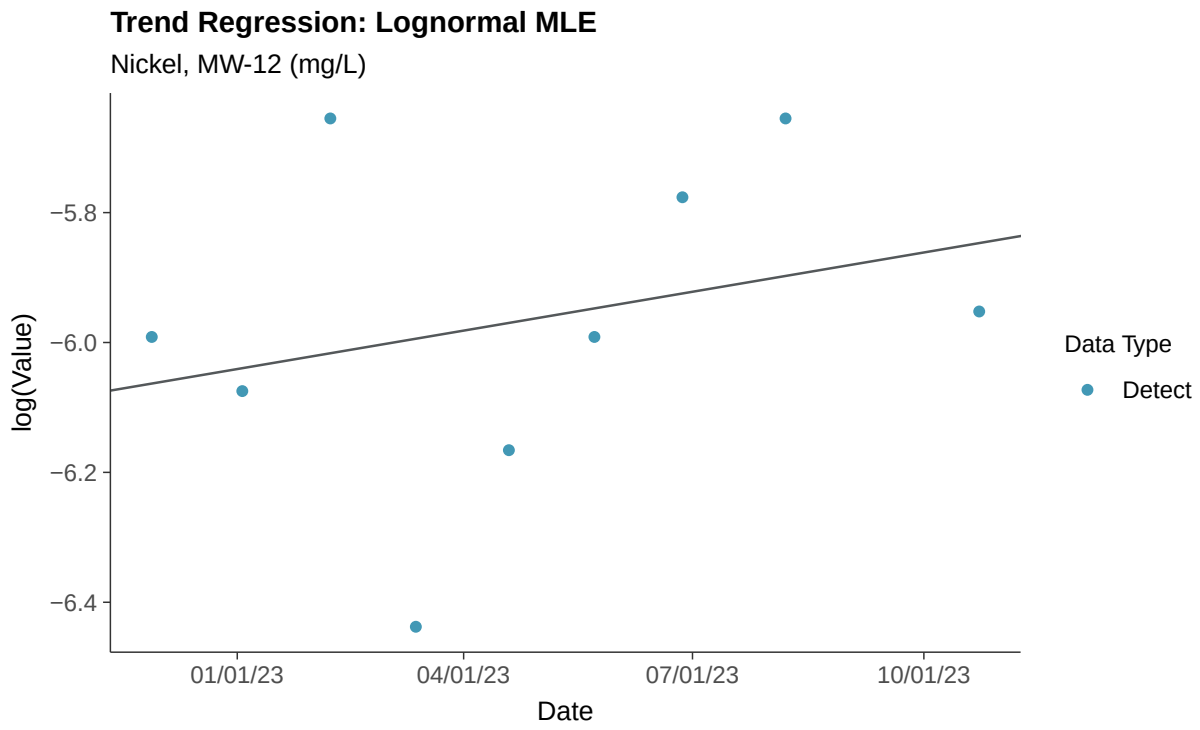
Nickel, MW-12 (mg/L)

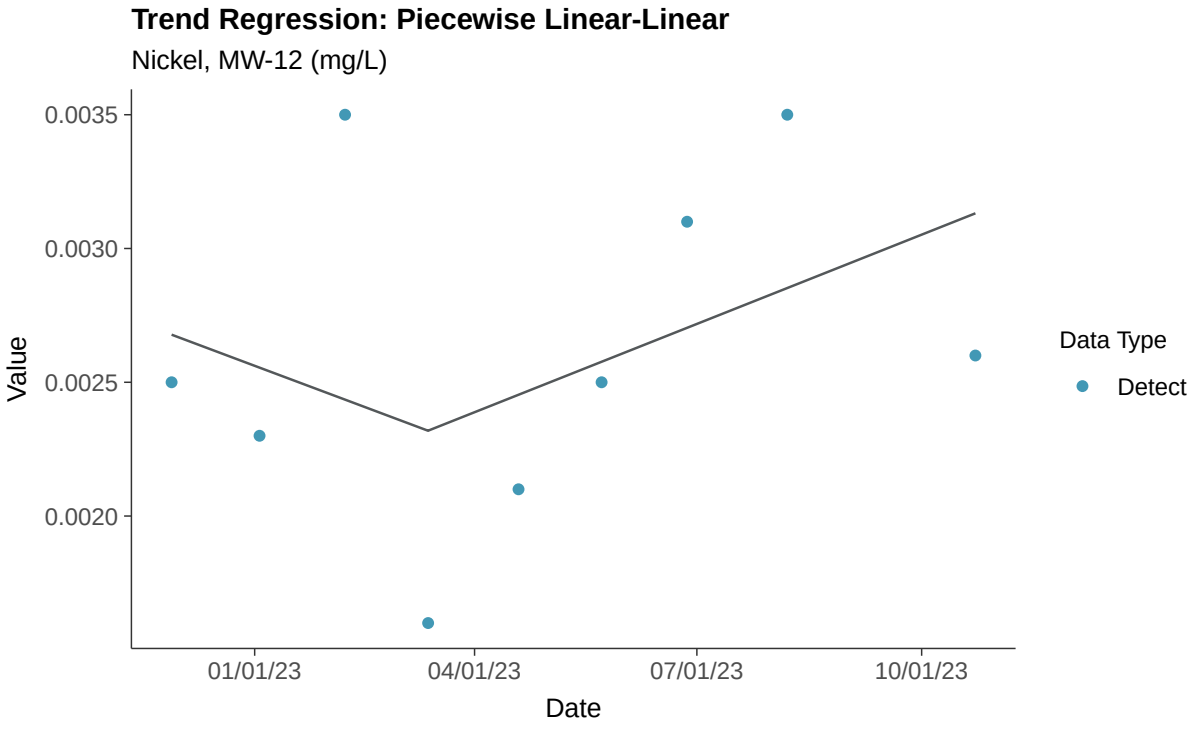


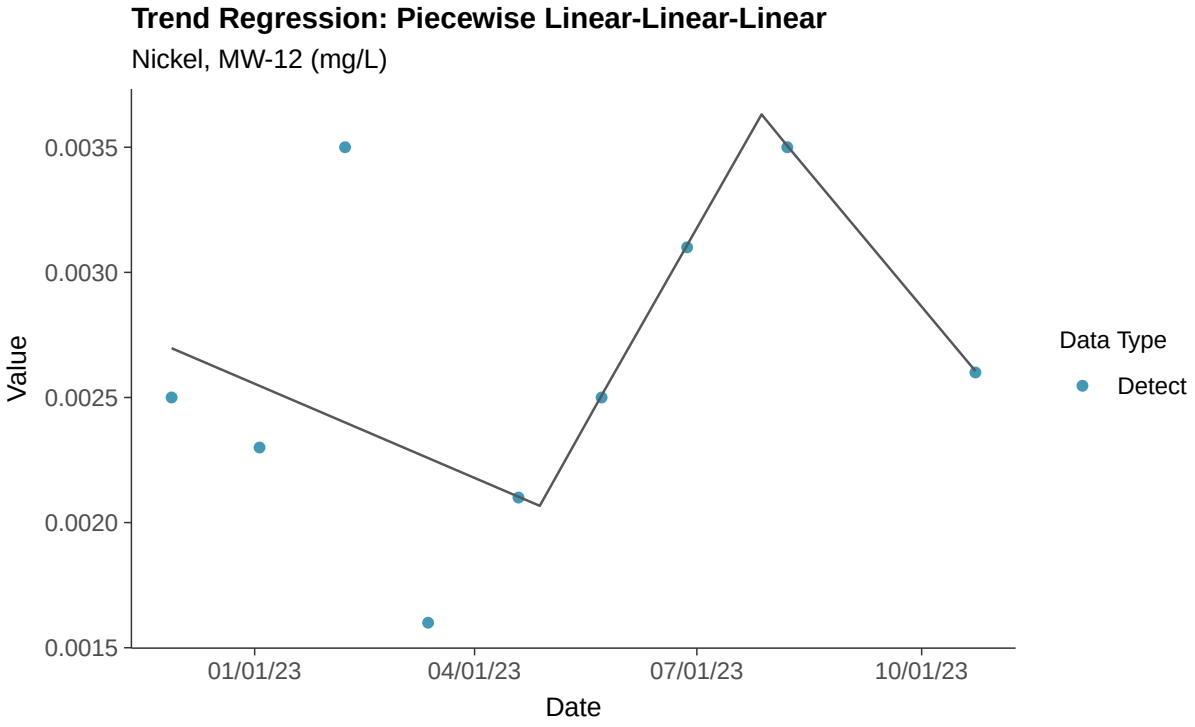

Normal Q-Q plot
Nickel, MW-12 (mg/L)
Value
0.0035
0.0030
0.0025
0.0020
0.0015
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Nickel, MW-12 (mg/L)
log(Value)
−5.75
−6.00
−6.25
−6.50
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Nickel, MW-12 (mg/L)
Value
0.0035
0.0030
0.0025
0.0020
0.0015
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
Theoretical Quantiles (Gamma)
Data Type
Detect

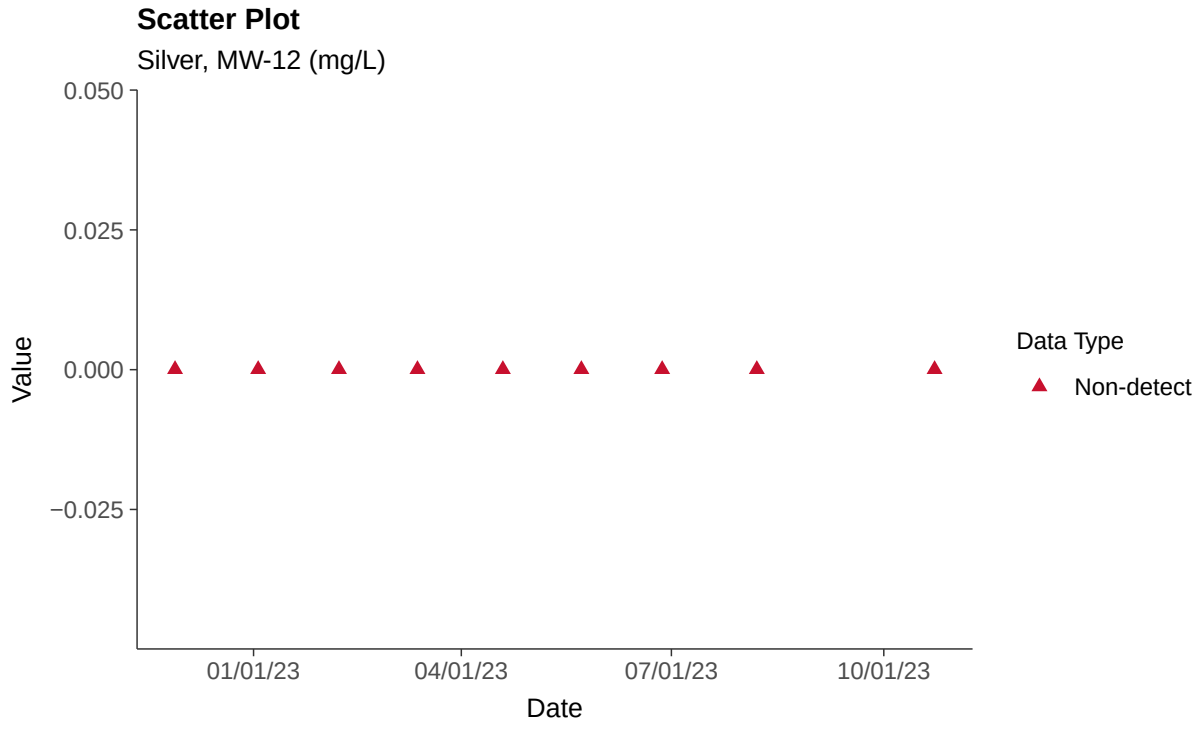

Trend Regression: Lognormal MLE
Nickel, MW-12 (mg/L)
log(Value)
−5.8
−6.0
−6.2
−6.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

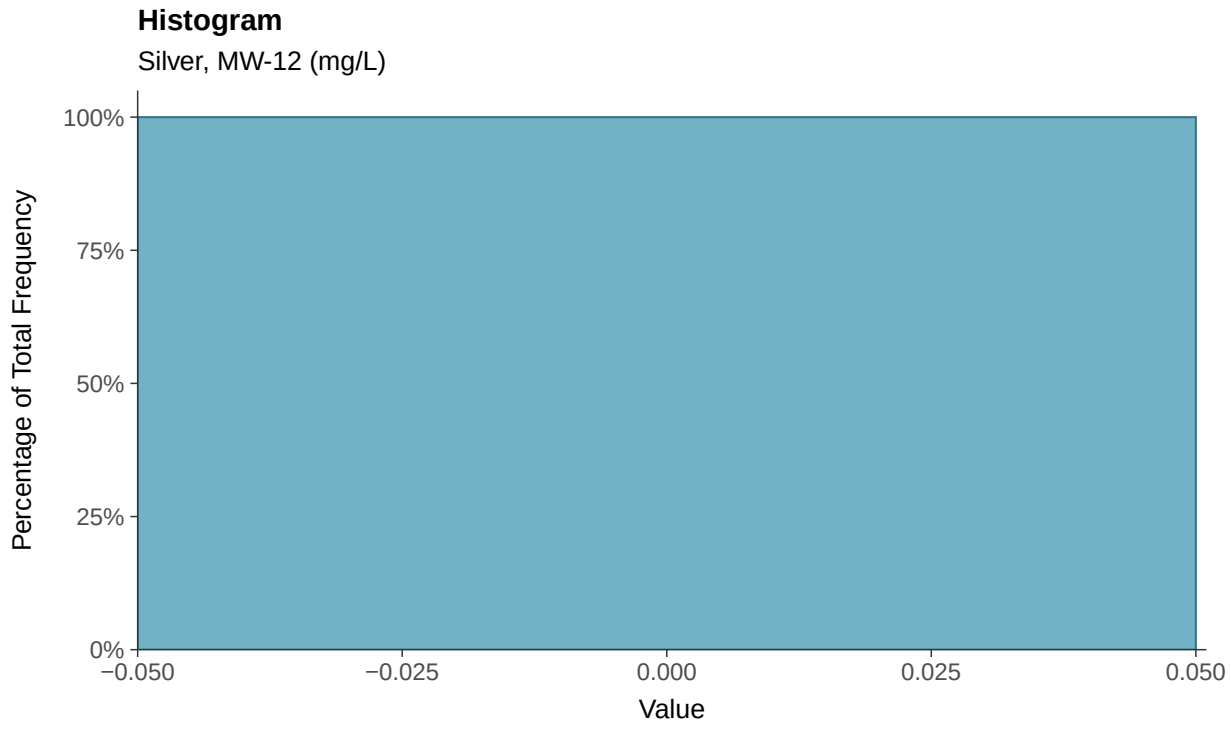

Trend Regression: Piecewise Linear-Linear
Nickel, MW-12 (mg/L)
0.0035
0.0030
0.0025
0.0020
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-12 (mg/L)
0.0035
0.0030
0.0025
0.0020
0.0015
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-12

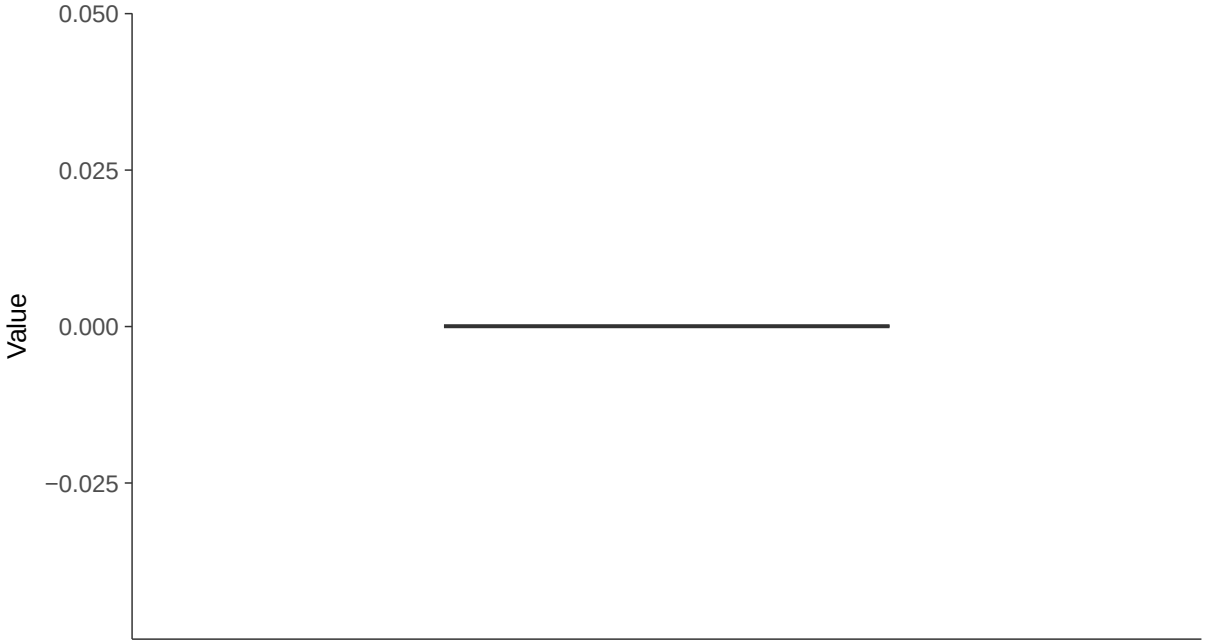
ID: 2_21_6_123





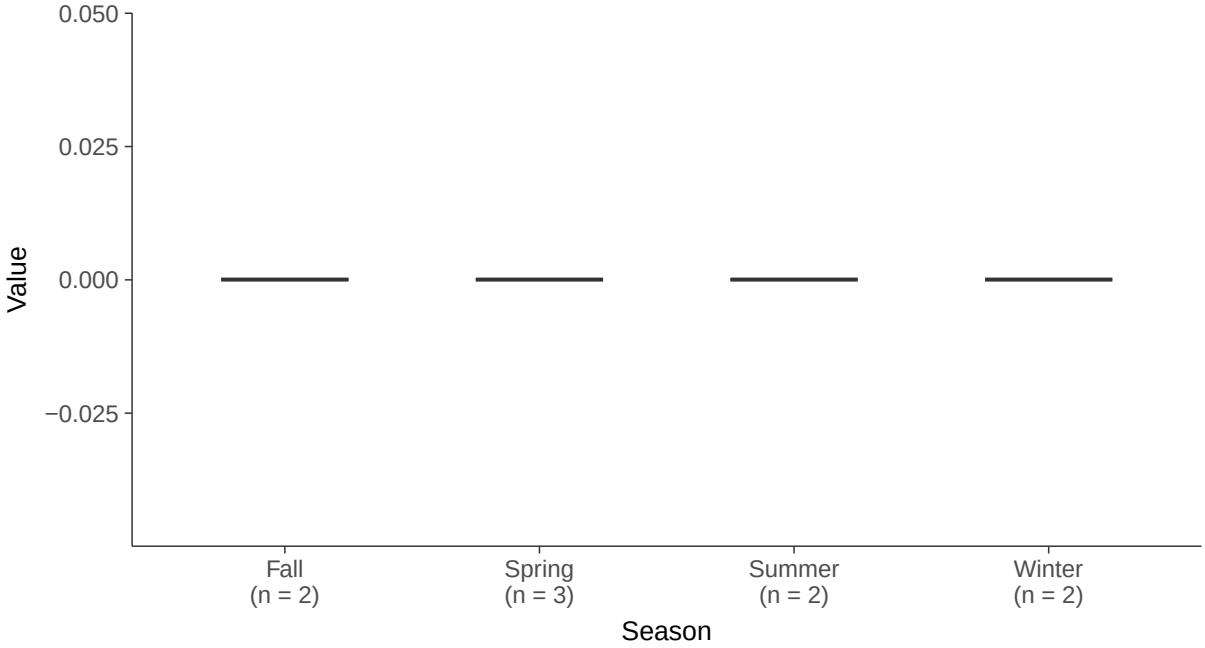
Boxplot

Silver, MW-12 (mg/L)



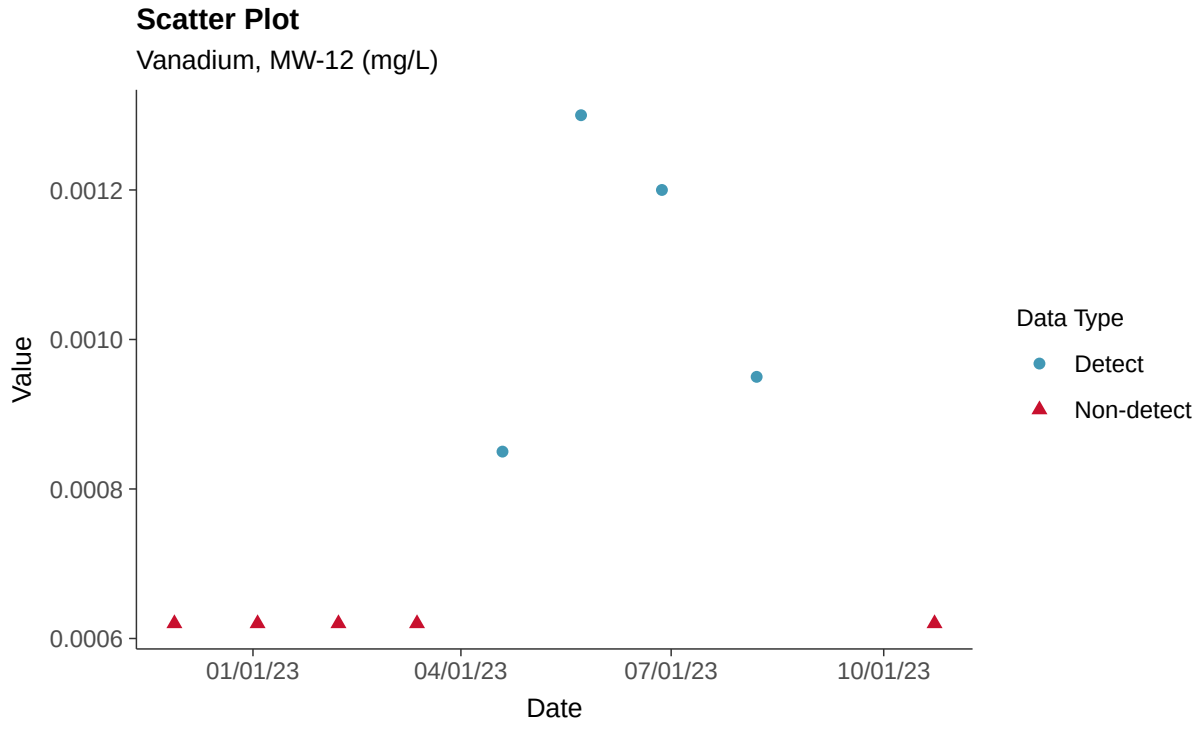
Boxplot by Season

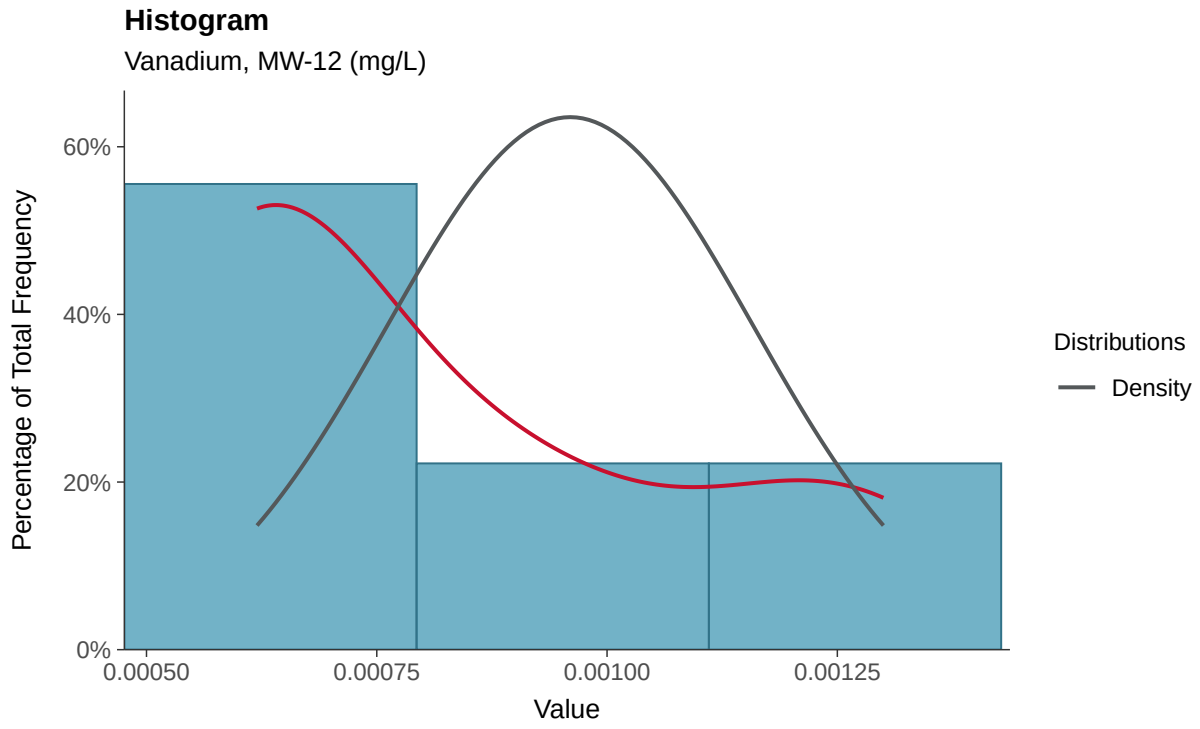
Silver, MW-12 (mg/L)



Part 115: Vanadium, MW-12

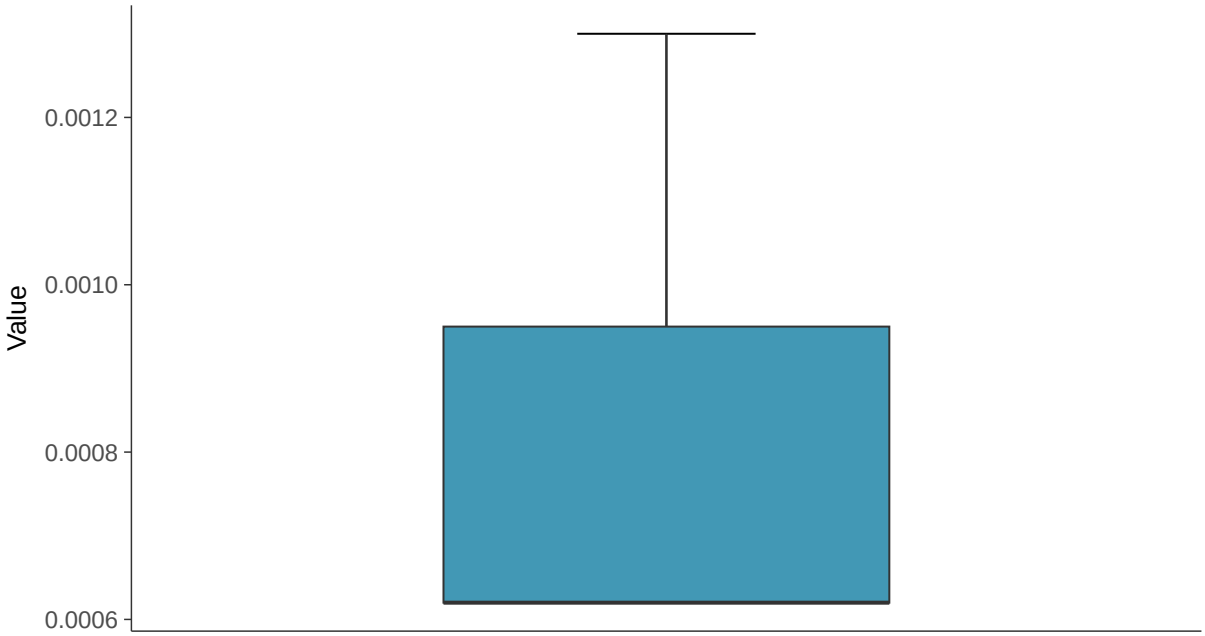
ID: 2_21_6_129





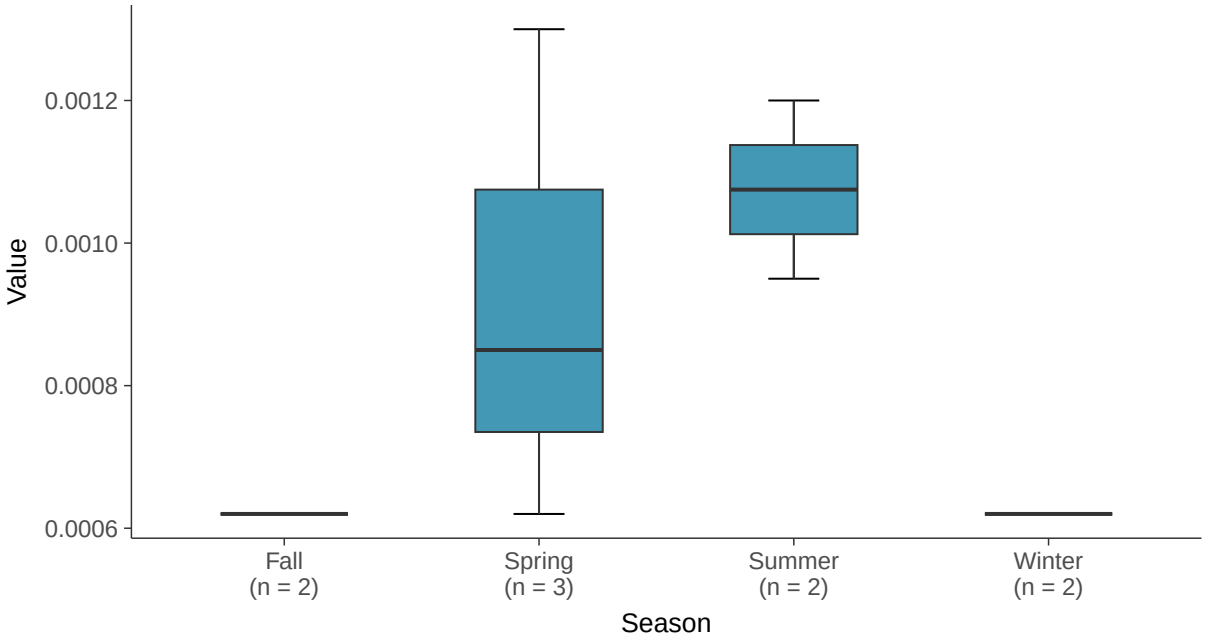
Boxplot

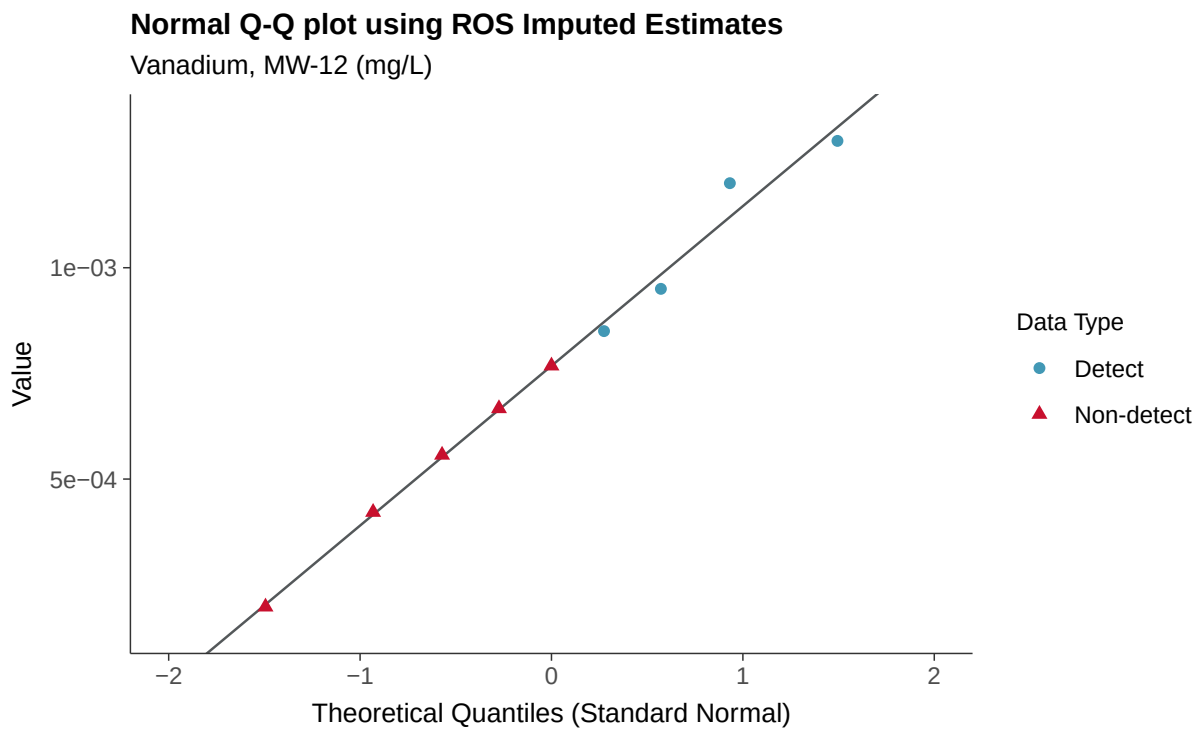
Vanadium, MW-12 (mg/L)

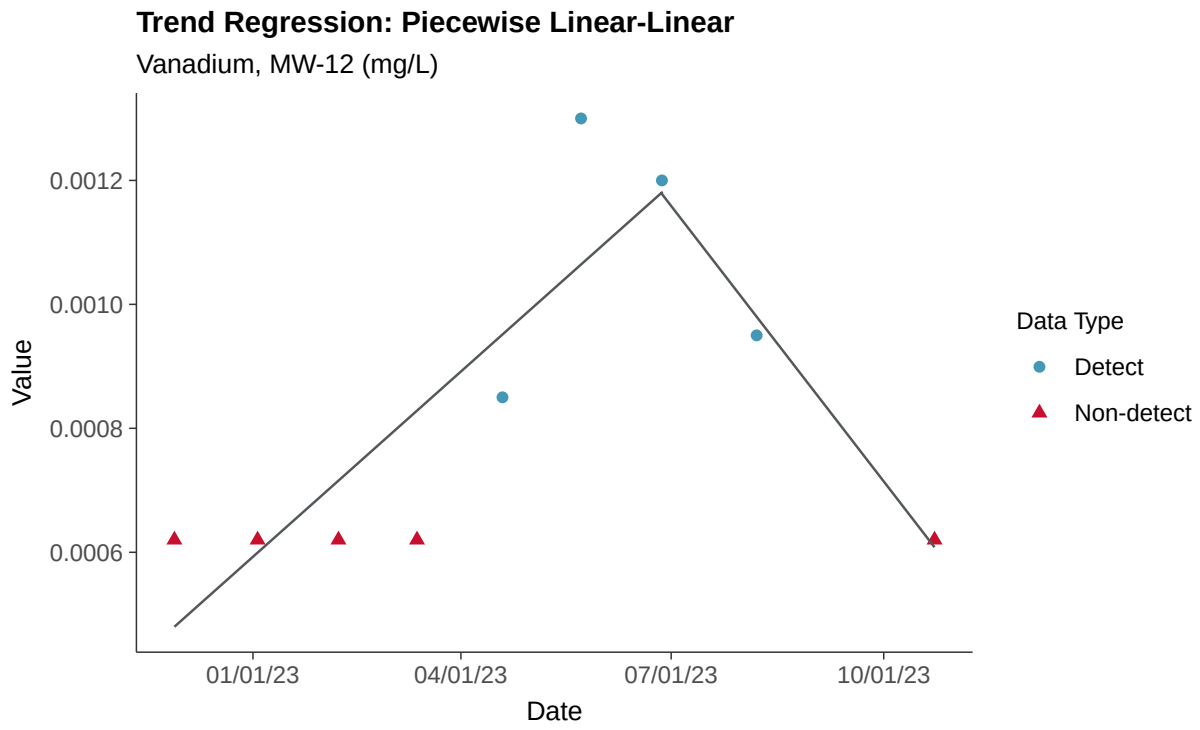


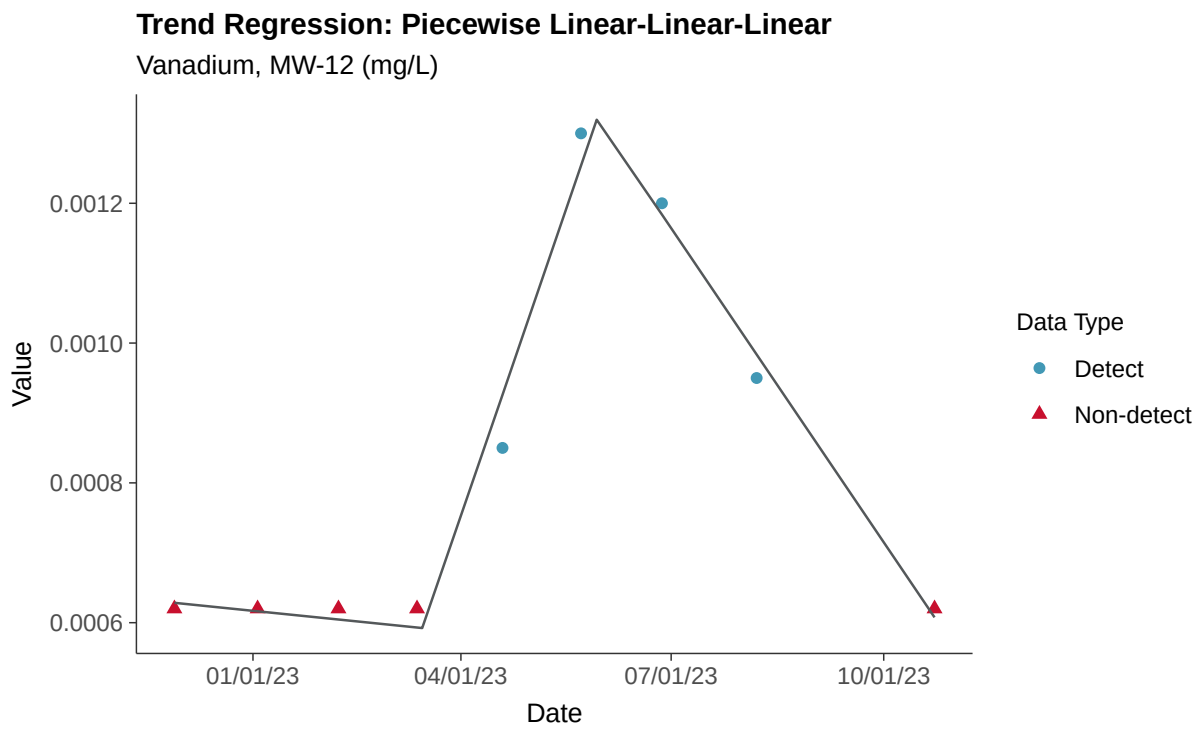
Boxplot by Season

Vanadium, MW-12 (mg/L)



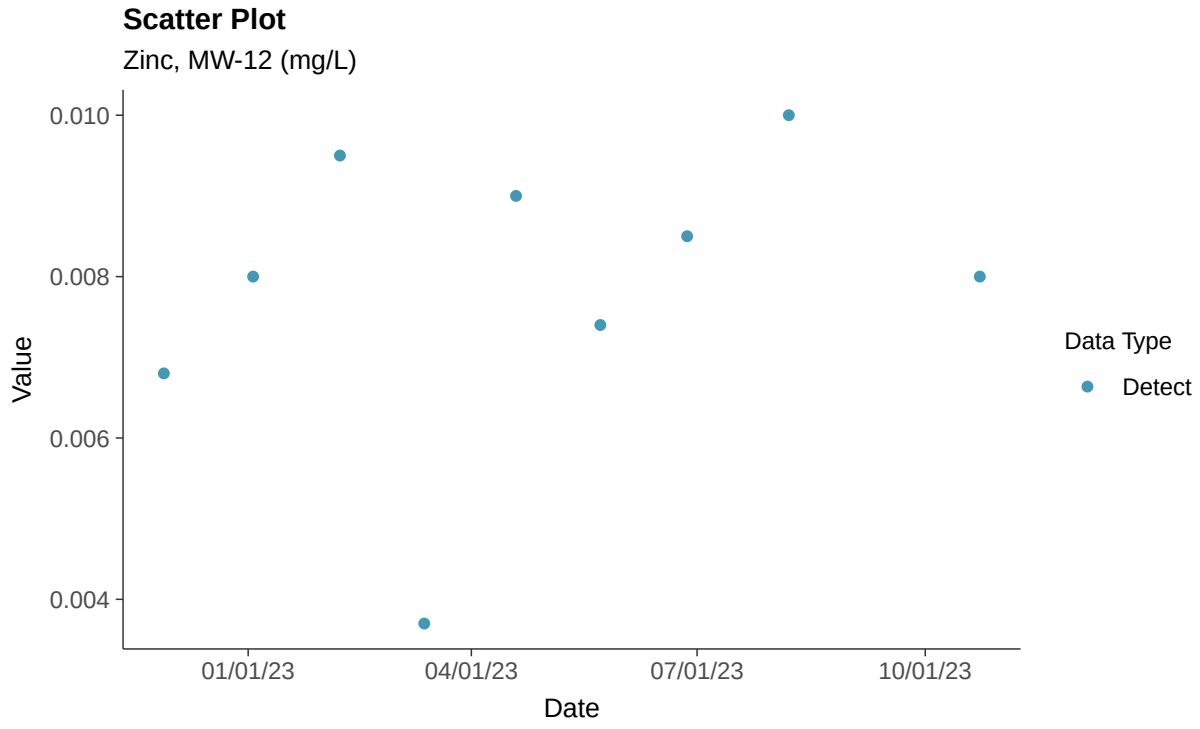

Normal Q-Q plot using ROS Imputed Estimates
Vanadium, MW-12 (mg/L)
Value
1e−03
5e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

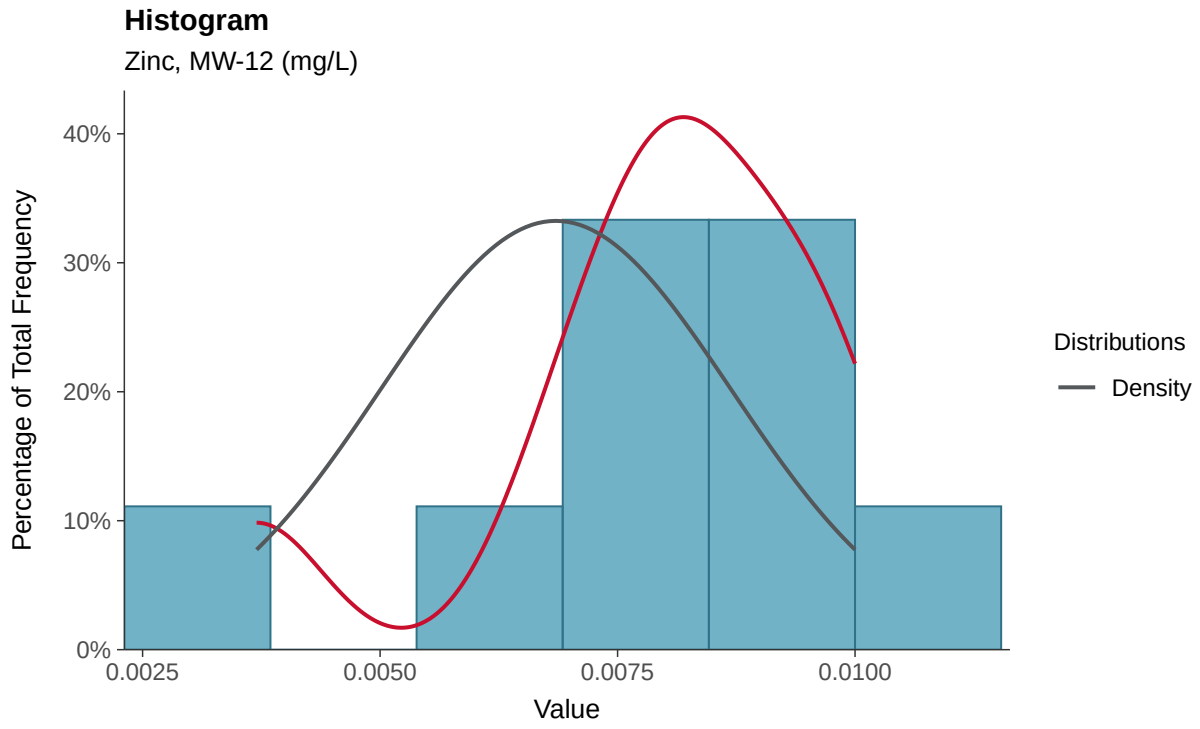

Trend Regression: Piecewise Linear-Linear
Vanadium, MW-12 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Vanadium, MW-12 (mg/L)
Value
0.0012
0.0010
0.0008
0.0006
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Zinc, MW-12

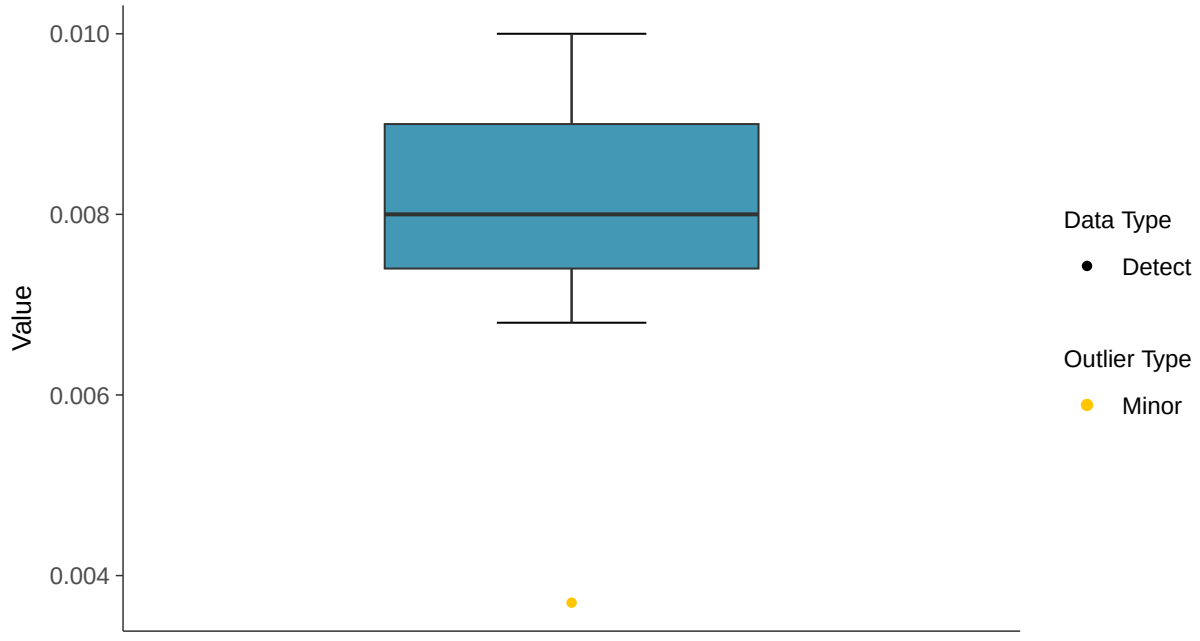
ID: 2_21_6_130





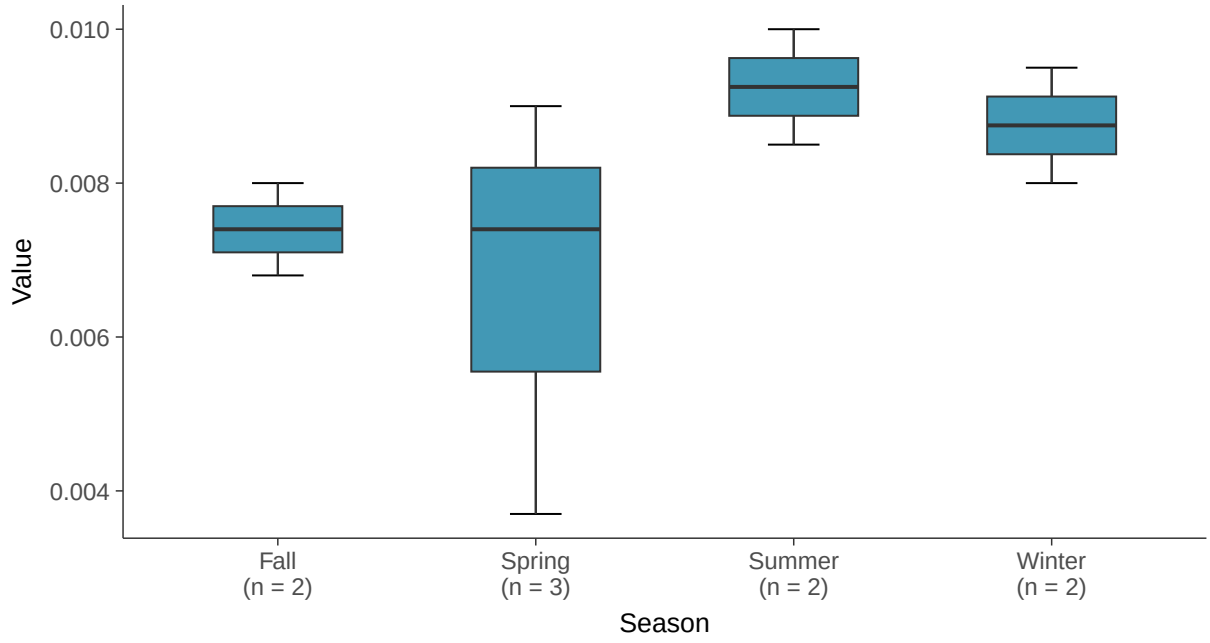
Boxplot

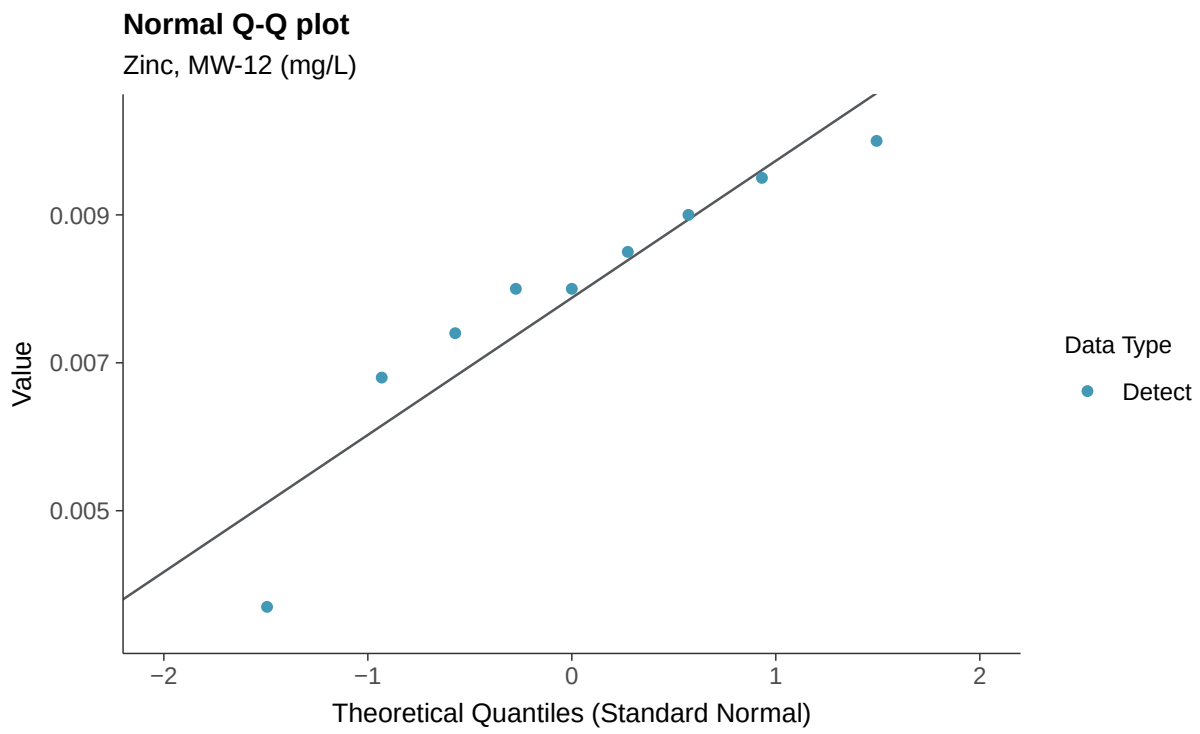
Zinc, MW-12 (mg/L)

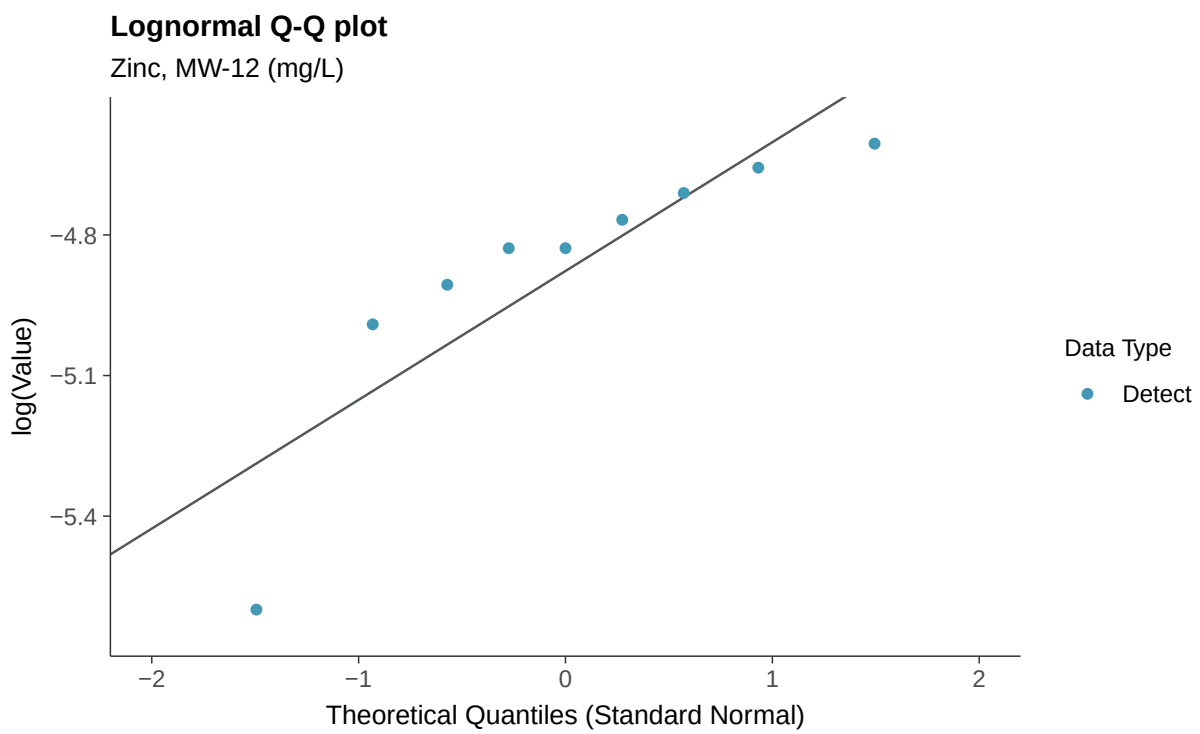


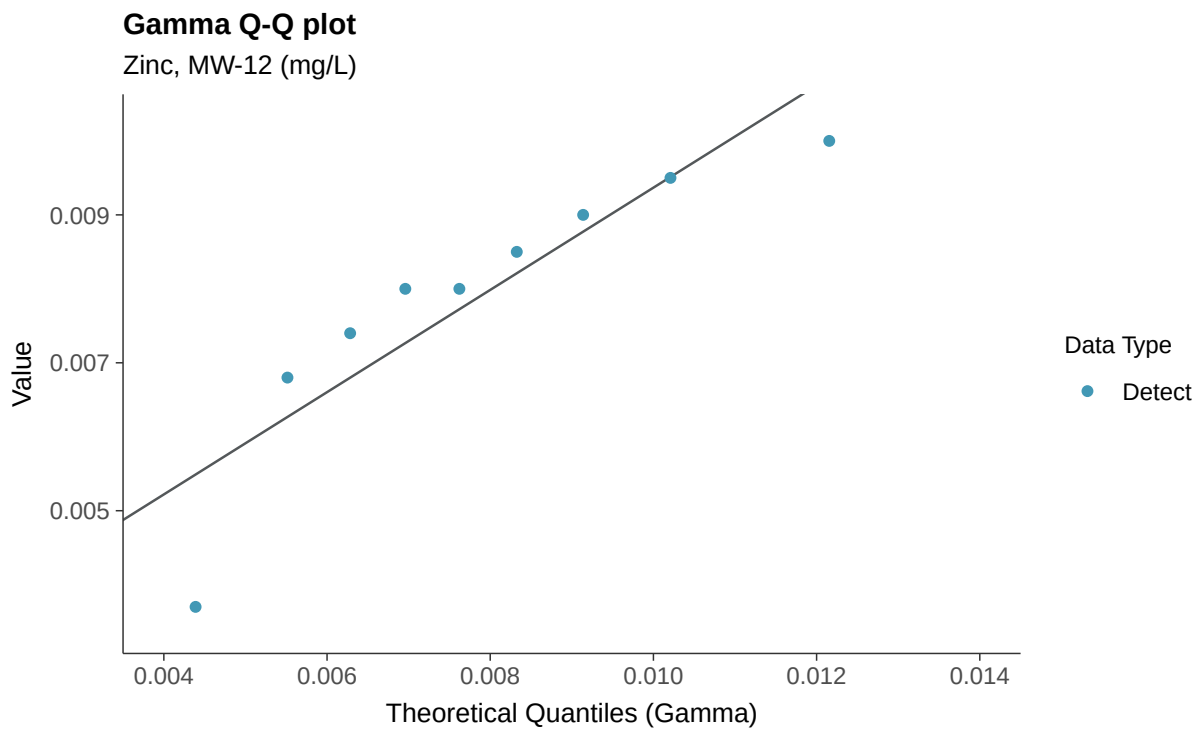
Boxplot by Season

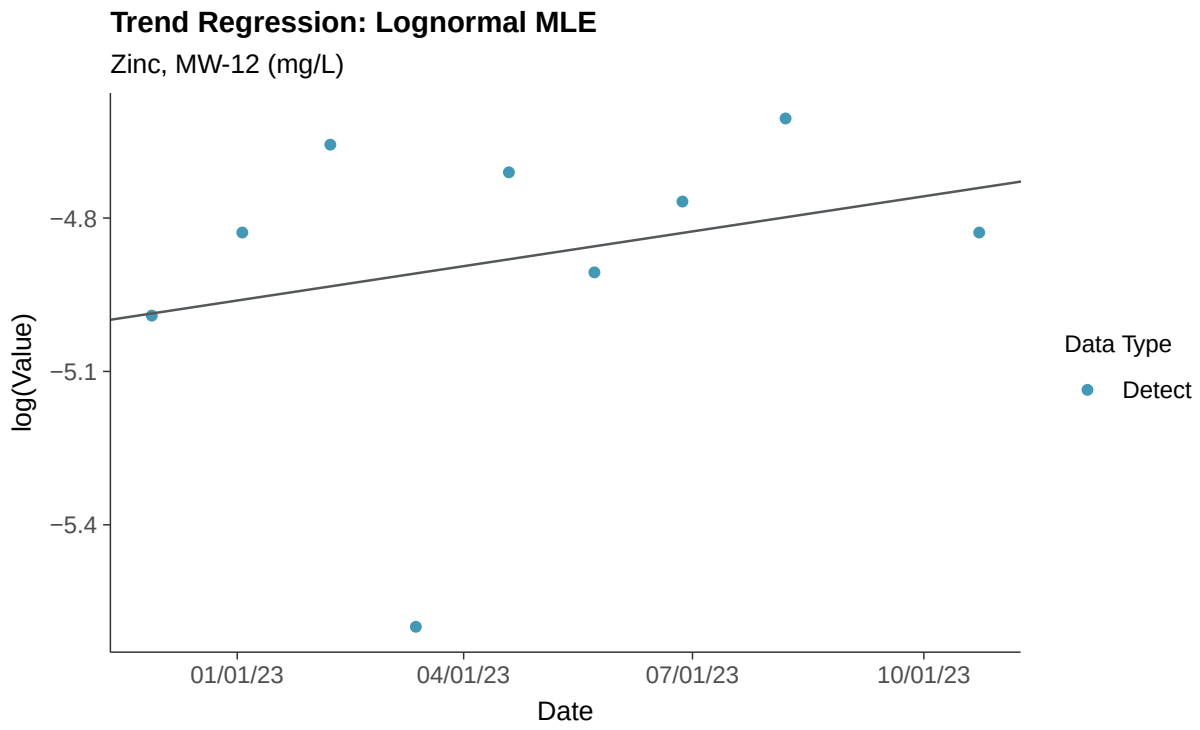
Zinc, MW-12 (mg/L)

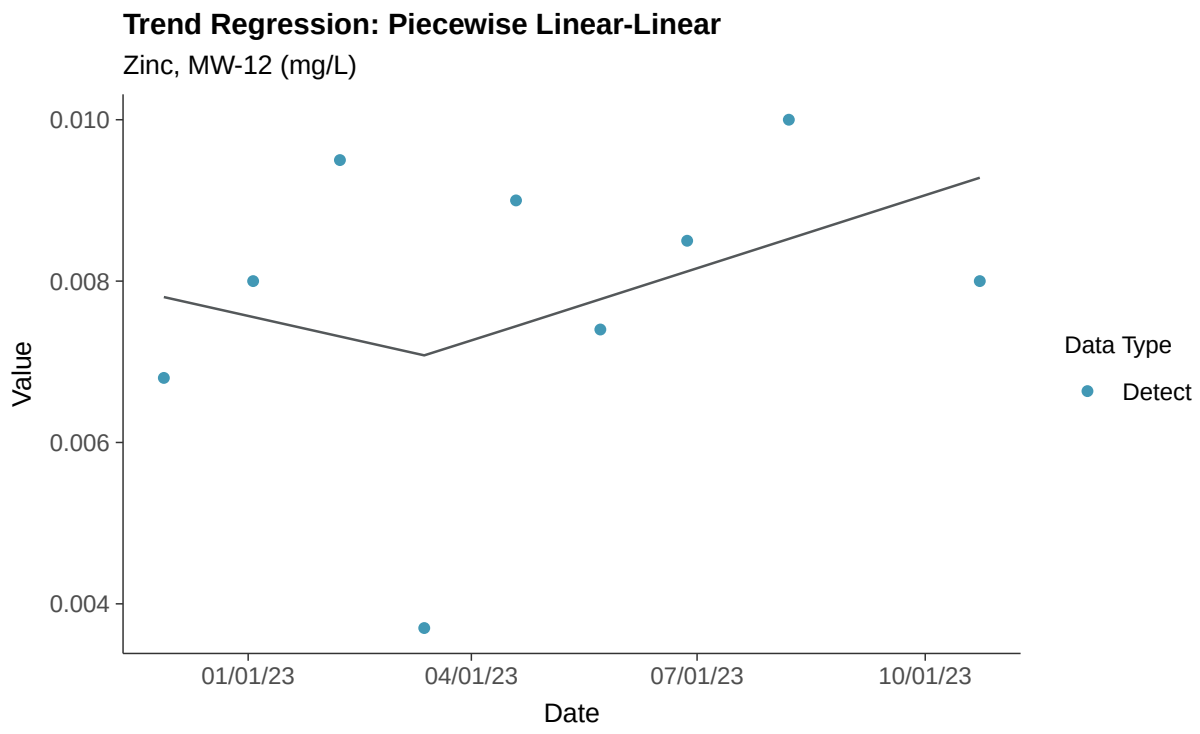


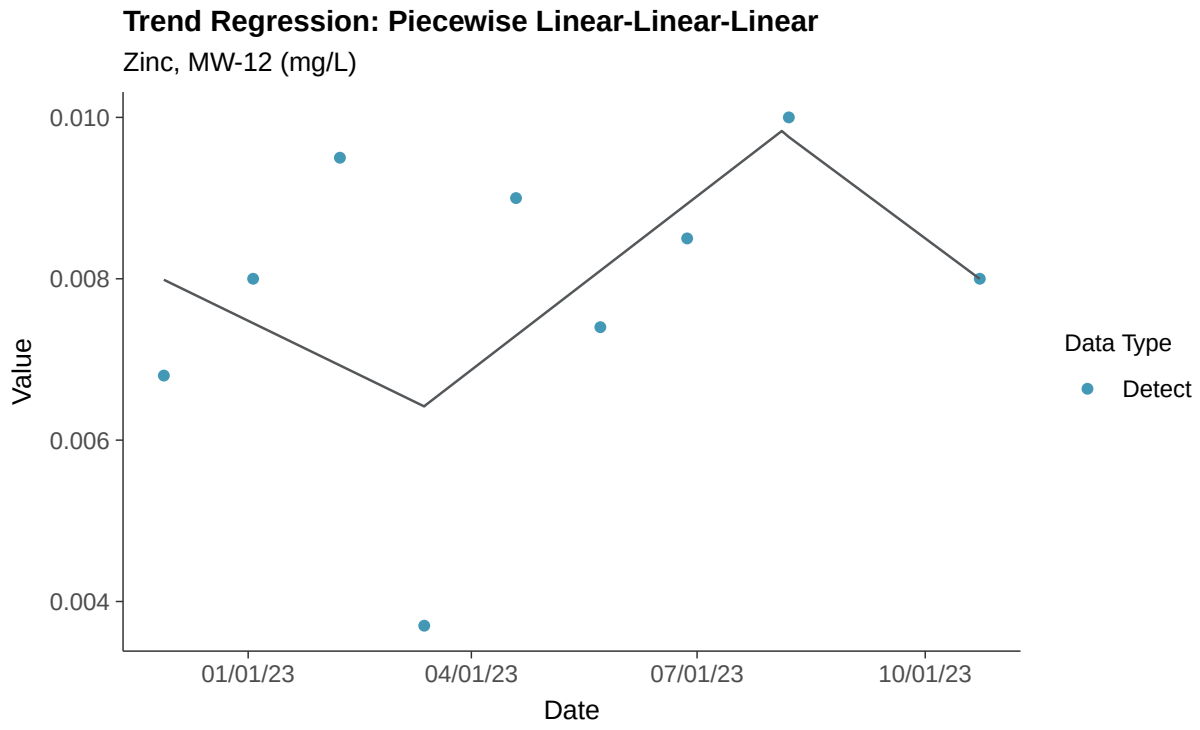

Normal Q-Q plot
Zinc, MW-12 (mg/L)
Value
0.009
0.007
0.005
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Zinc, MW-12 (mg/L)
log(Value)
−4.8
−5.1
−5.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Zinc, MW-12 (mg/L)
Value
0.009
0.007
0.005
0.004
0.006
0.008
0.010
0.012
0.014
Theoretical Quantiles (Gamma)
Data Type
Detect

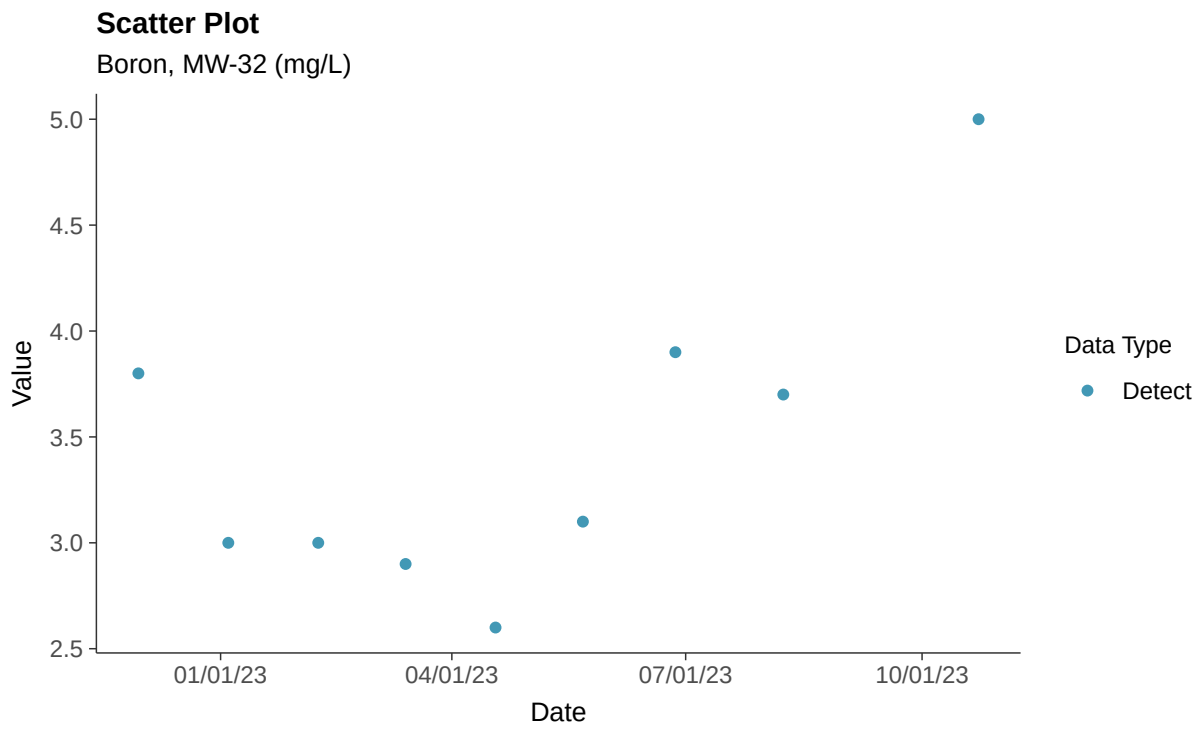

Trend Regression: Lognormal MLE
Zinc, MW-12 (mg/L)
log(Value)
−4.8
−5.1
−5.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

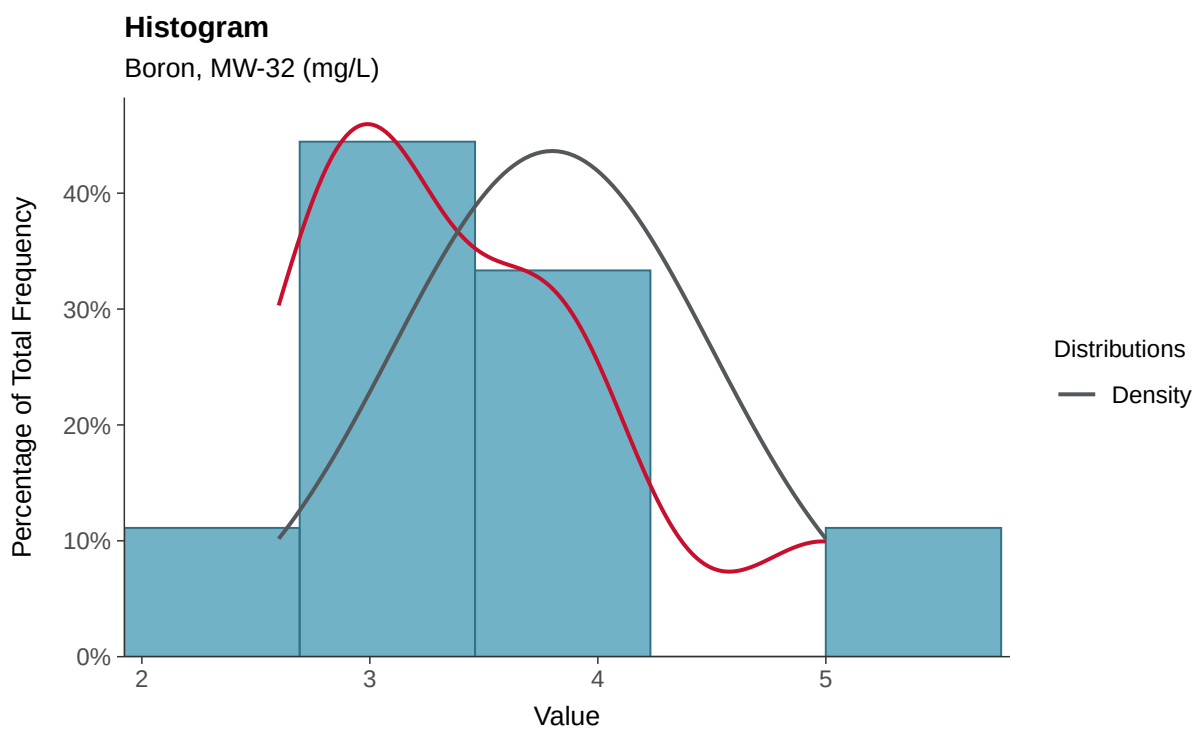

Trend Regression: Piecewise Linear-Linear
Zinc, MW-12 (mg/L)
0.010
0.008
0.006
0.004
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Zinc, MW-12 (mg/L)
0.010
0.008
0.006
0.004
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Boron, MW-32

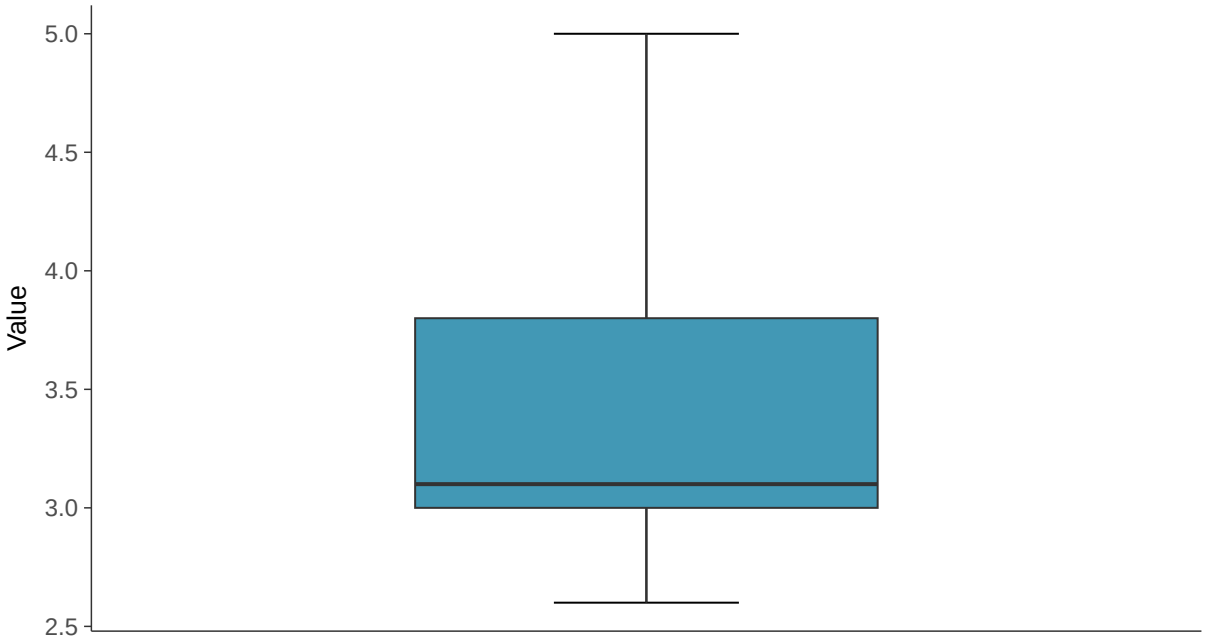
ID: 2_27_4_105





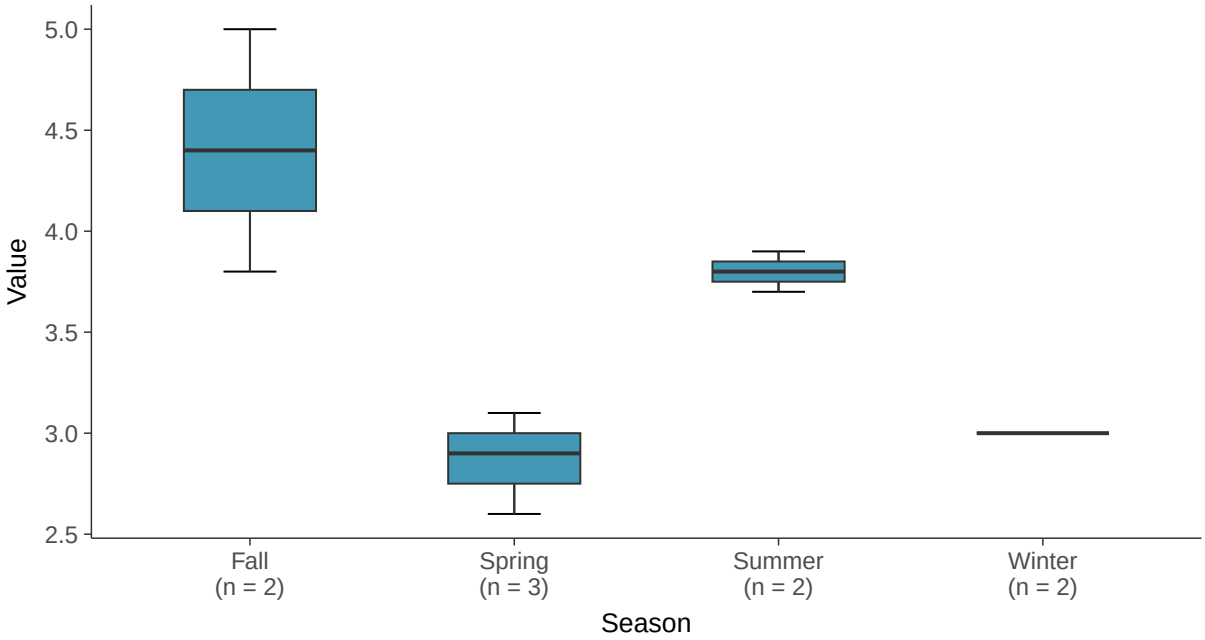
Boxplot

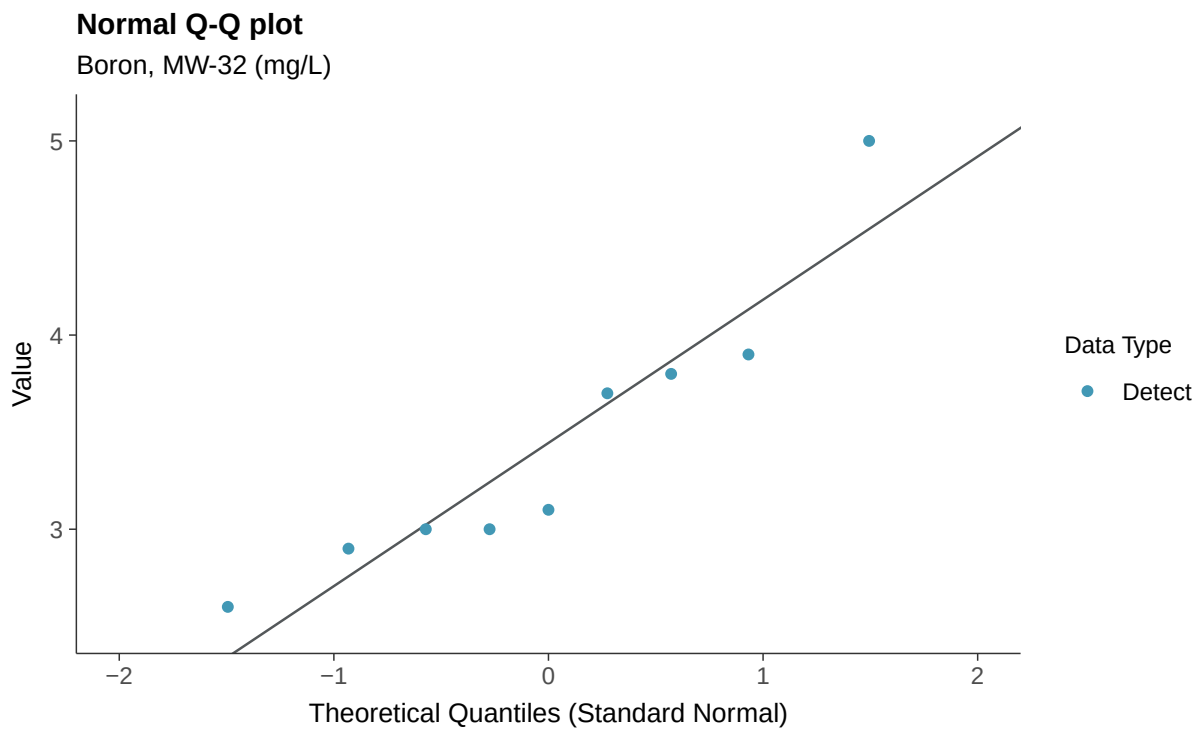
Boron, MW-32 (mg/L)

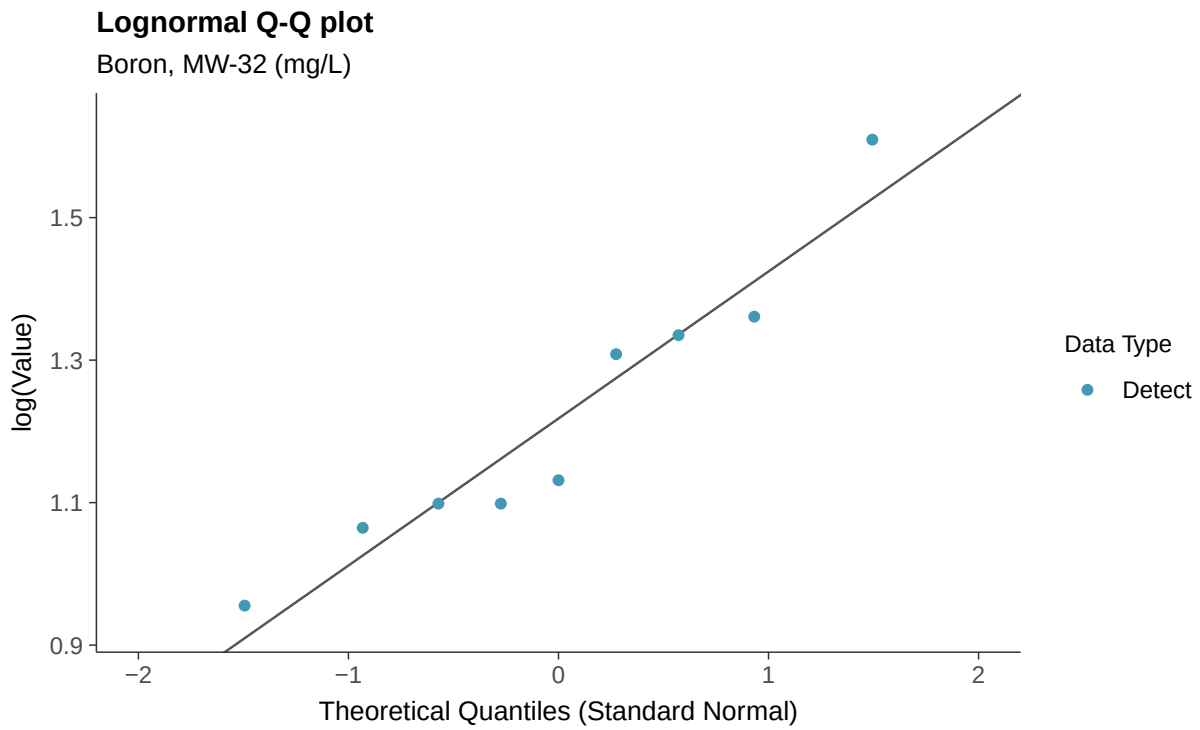


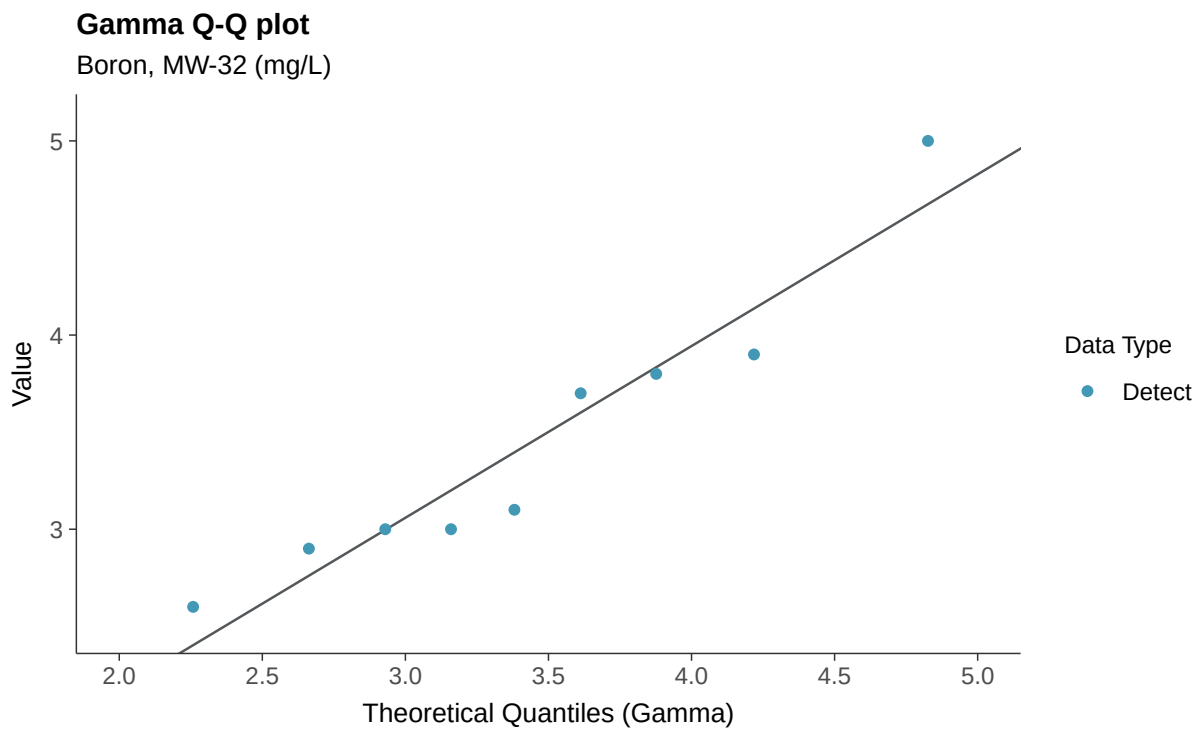
Boxplot by Season

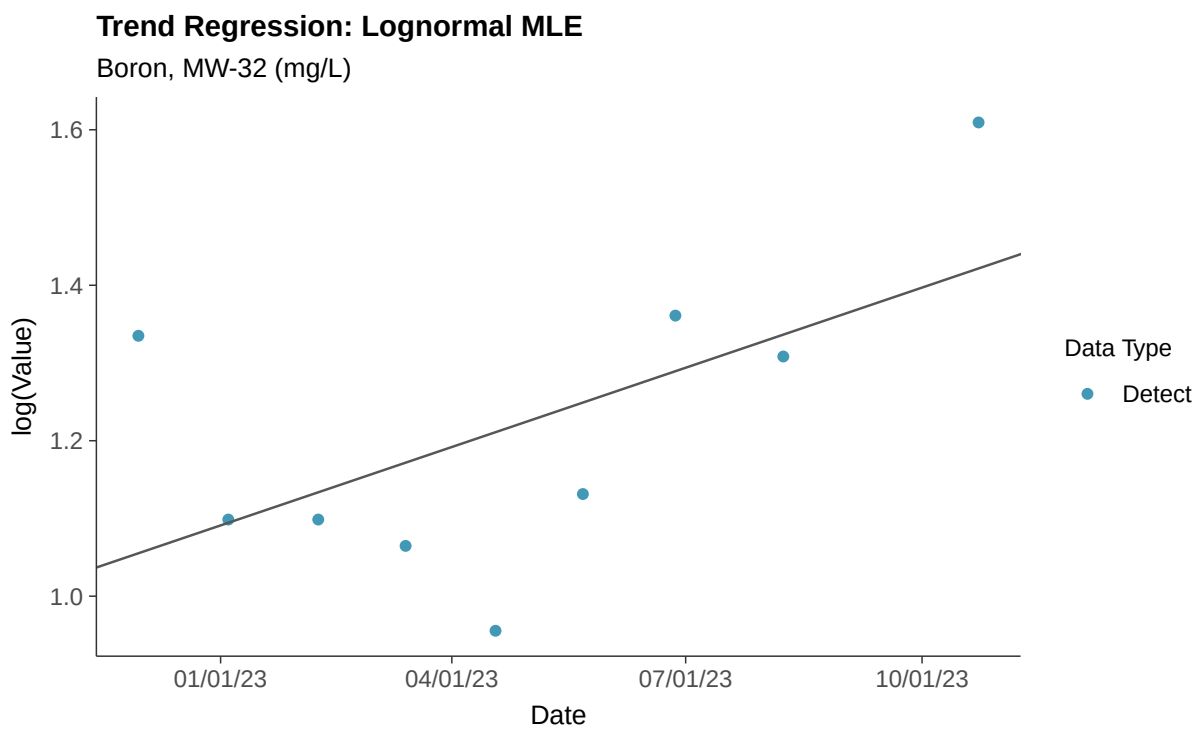
Boron, MW-32 (mg/L)

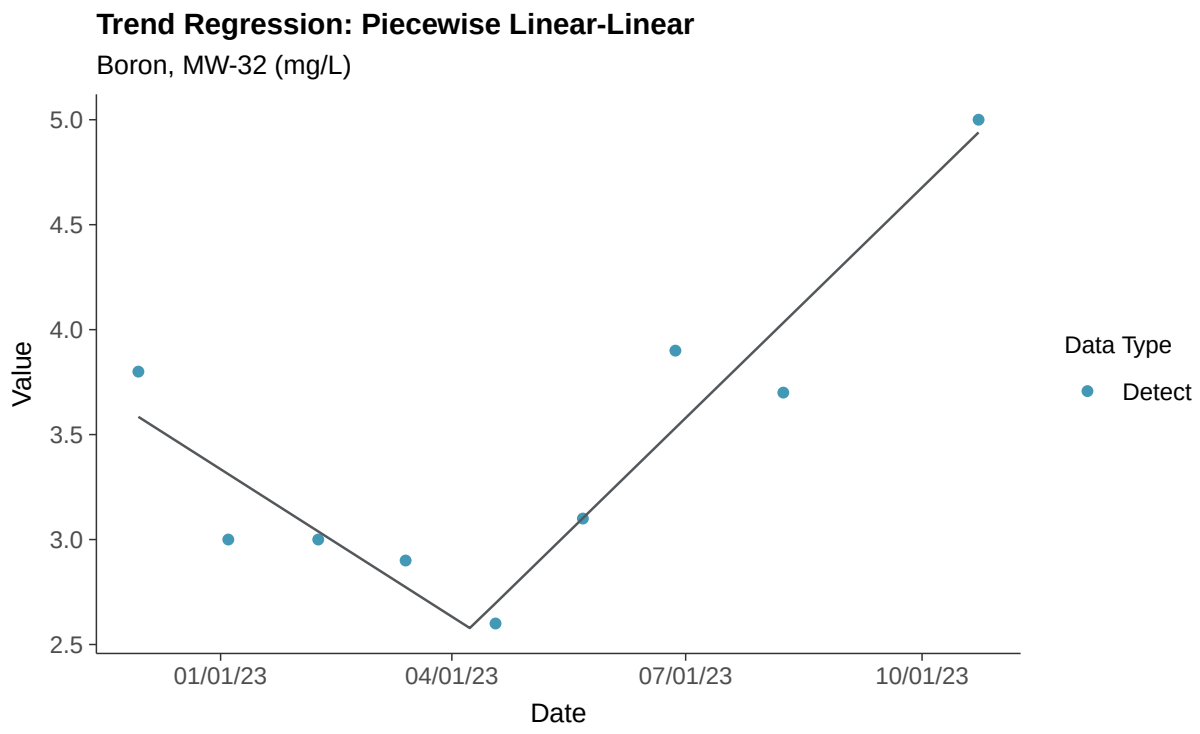



Normal Q-Q plot
Boron, MW-32 (mg/L)
Value
5
4
3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Boron, MW-32 (mg/L)
log(Value)
1.5
1.3
1.1
0.9
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

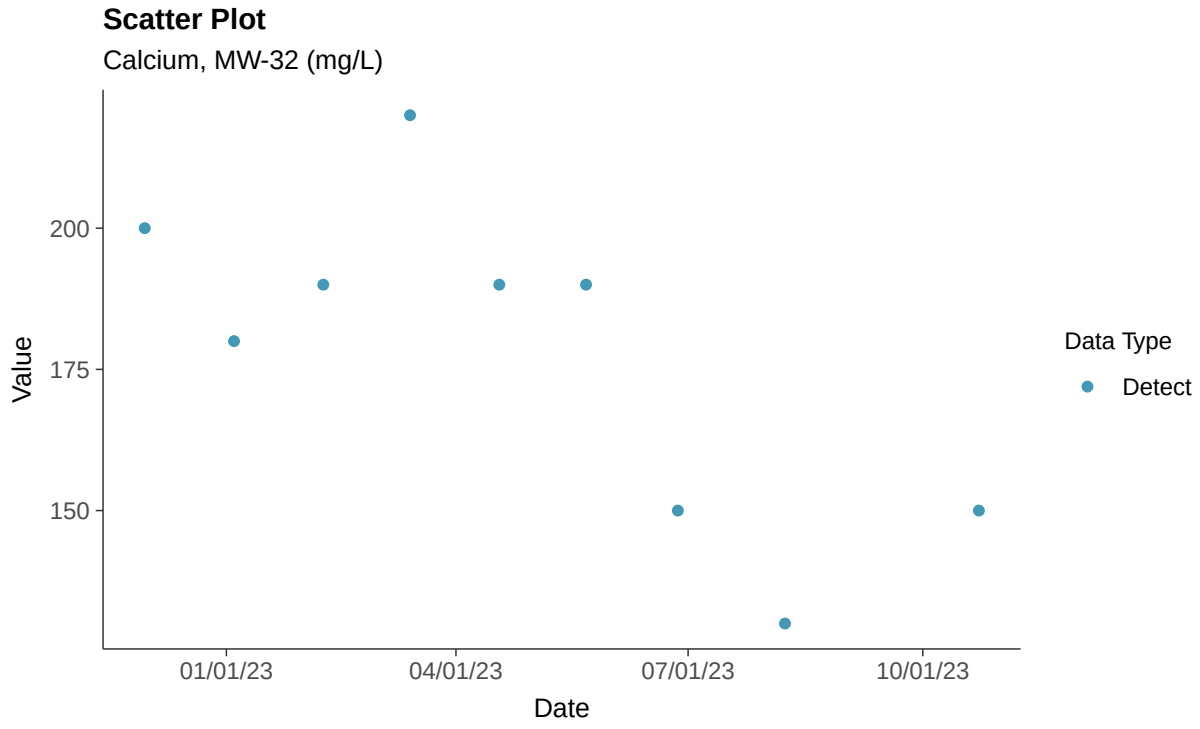

Gamma Q-Q plot
Boron, MW-32 (mg/L)
Value
5
4
3
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Theoretical Quantiles (Gamma)
Data Type
Detect

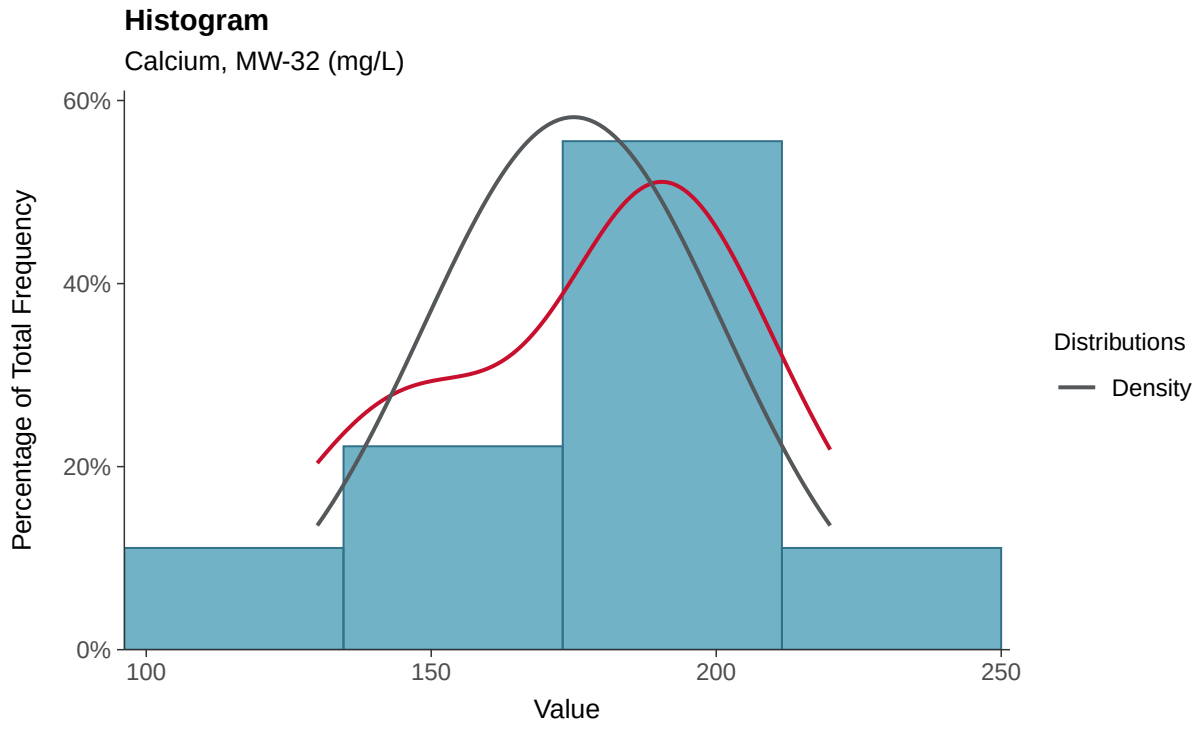

Trend Regression: Lognormal MLE
Boron, MW-32 (mg/L)
log(Value)
1.6
1.4
1.2
1.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Boron, MW-32 (mg/L)
5.0
4.5
4.0
3.5
3.0
2.5
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Calcium, MW-32

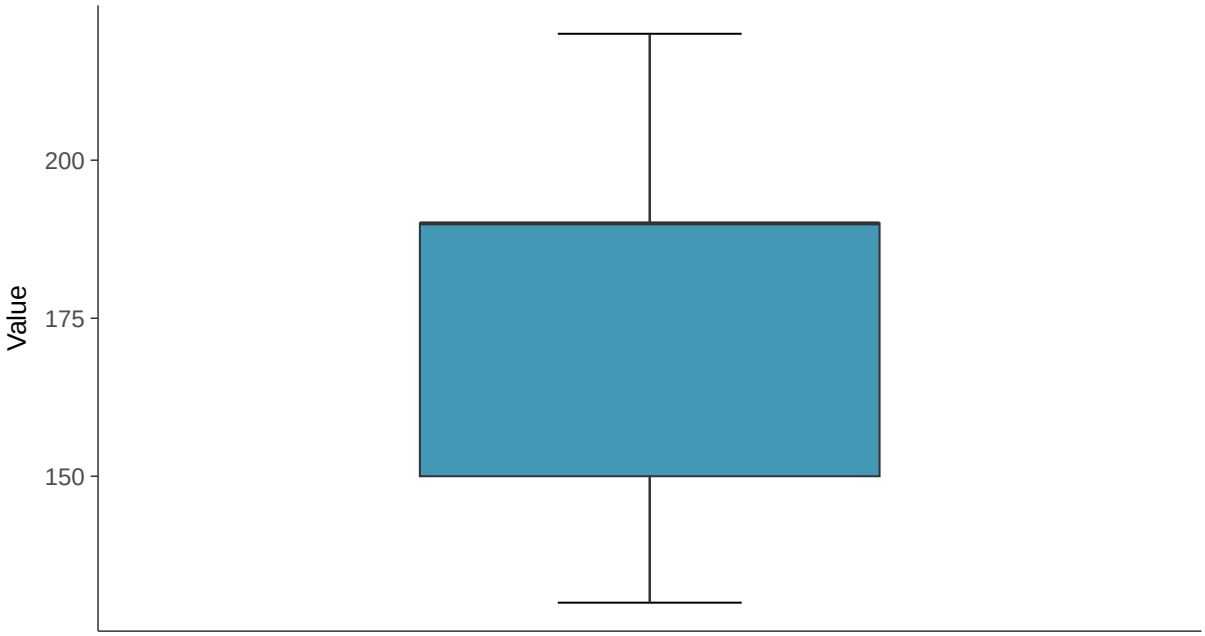
ID: 2_27_4_107





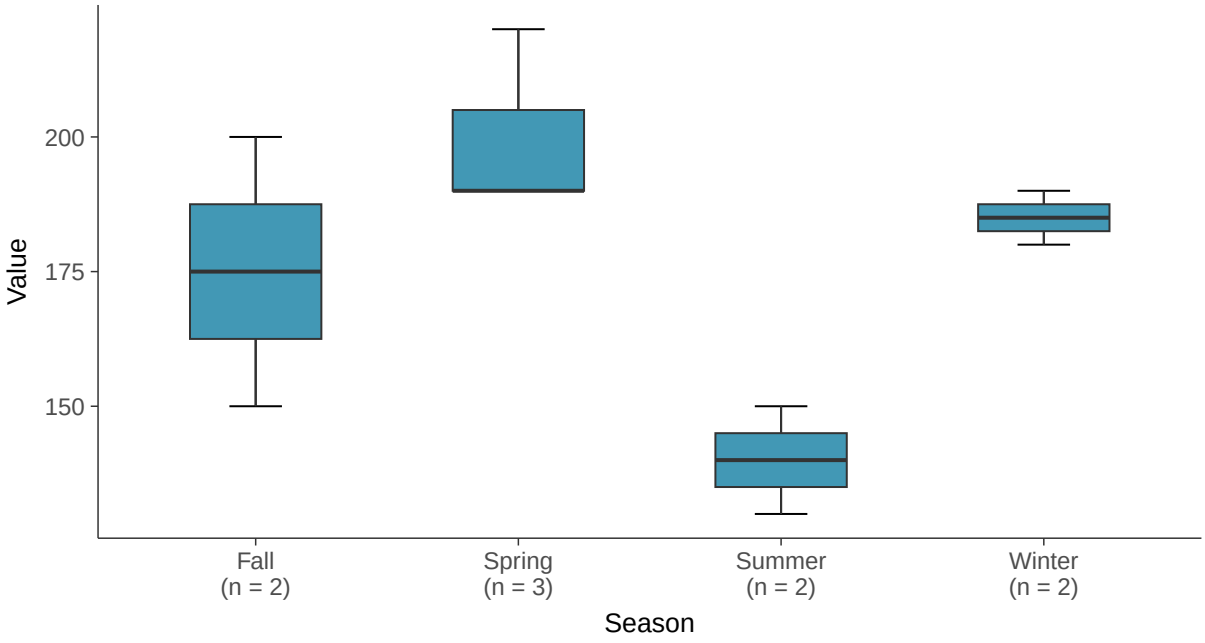
Boxplot

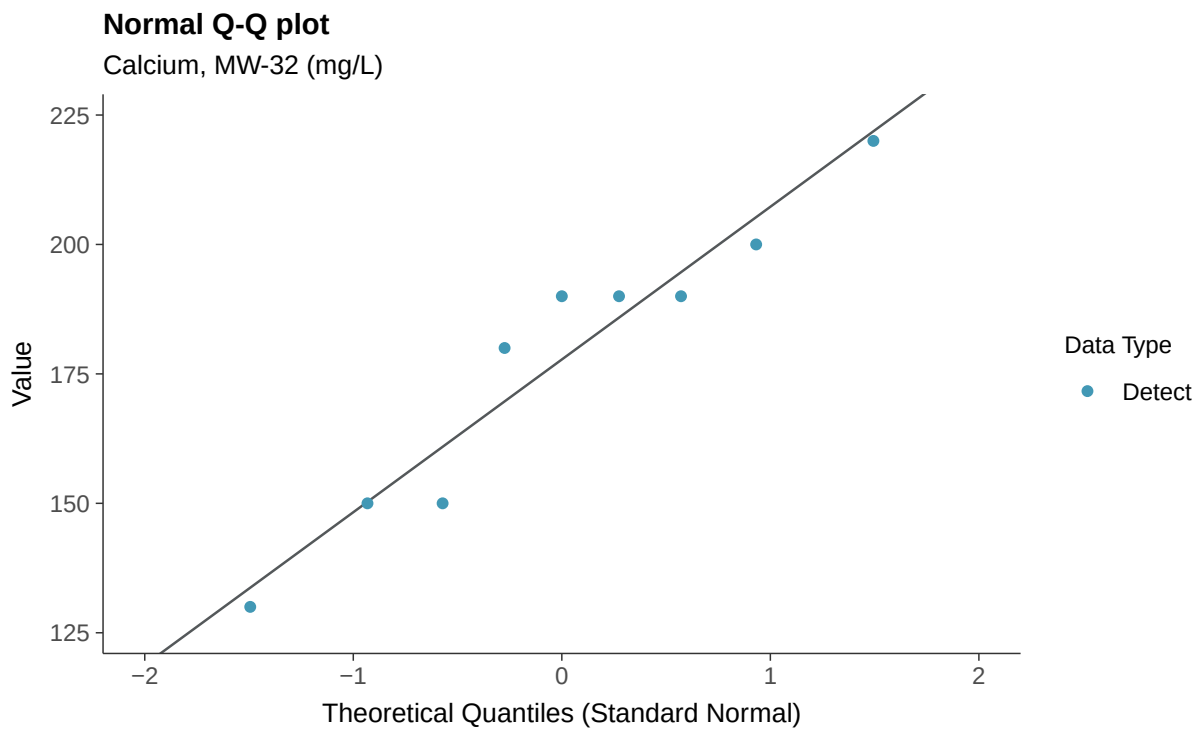
Calcium, MW-32 (mg/L)

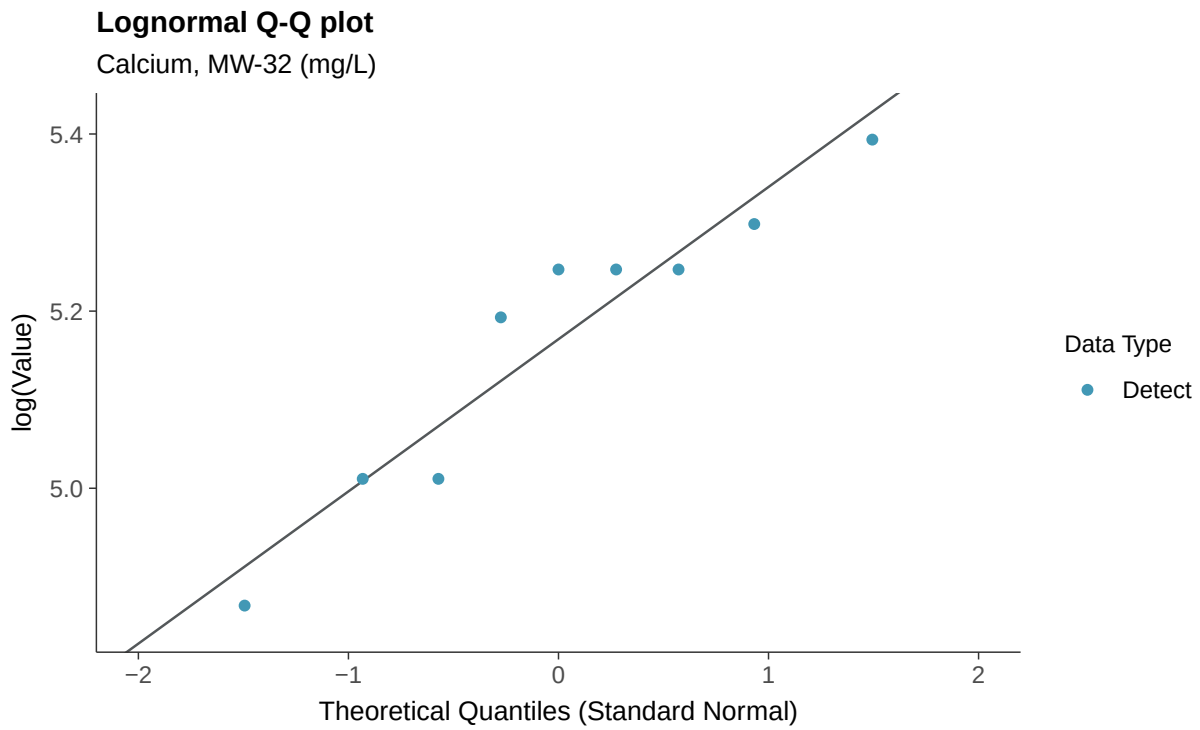


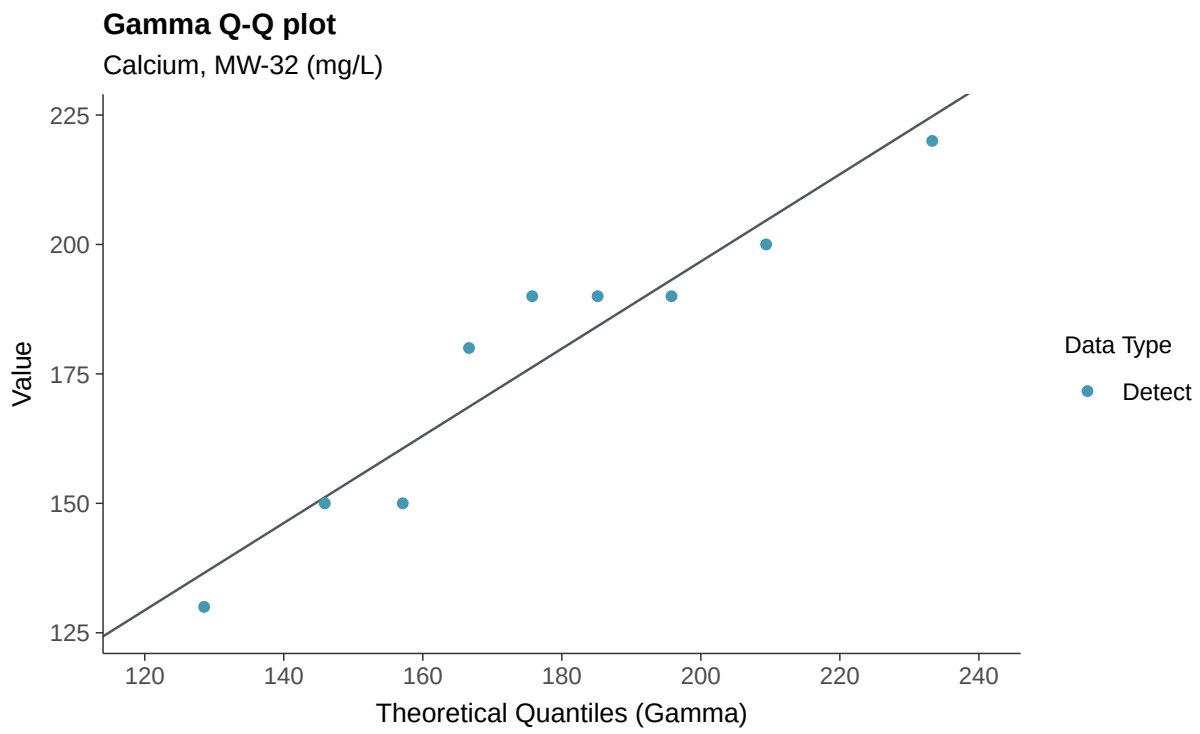
Boxplot by Season

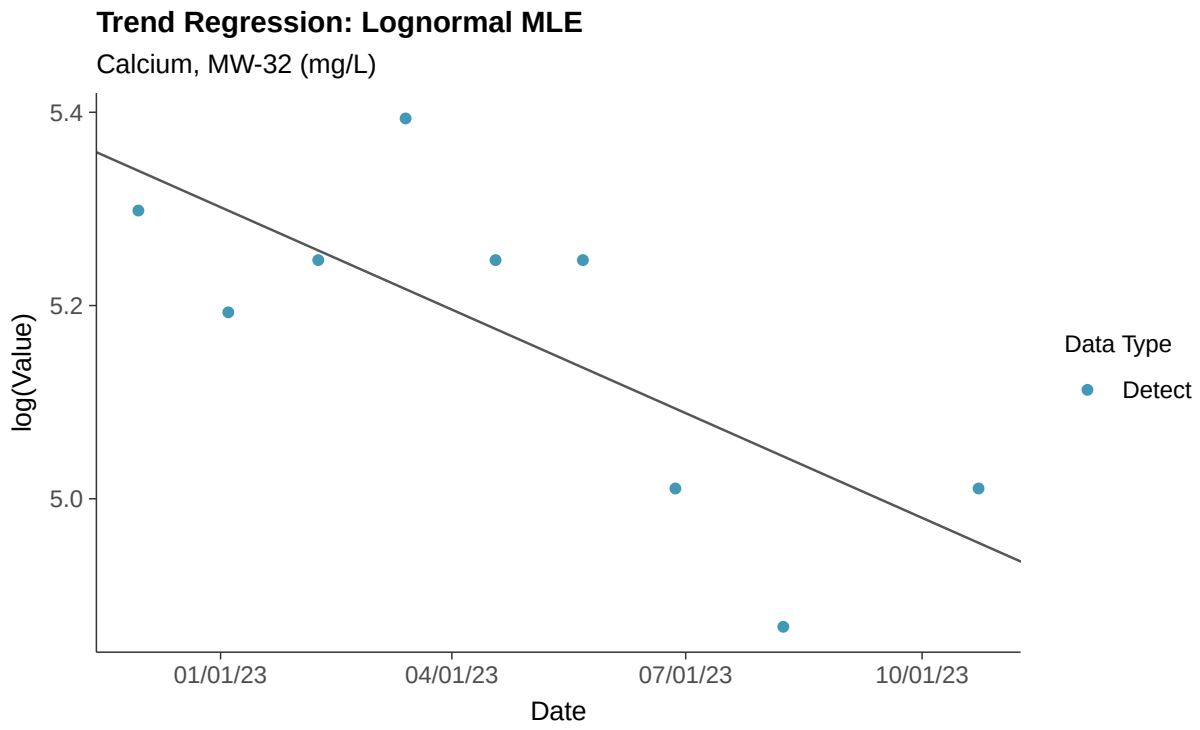
Calcium, MW-32 (mg/L)




Normal Q-Q plot
Calcium, MW-32 (mg/L)
Value
225
200
175
150
125
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

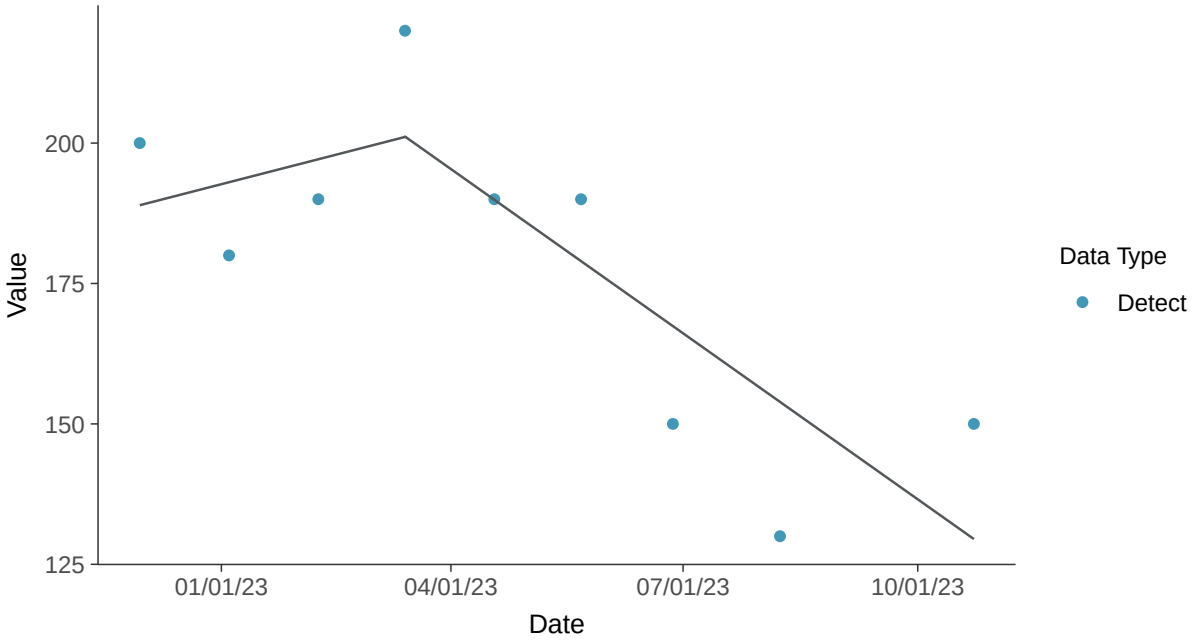

Lognormal Q-Q plot
Calcium, MW-32 (mg/L)
log(Value)
5.4
5.2
5.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Calcium, MW-32 (mg/L)
Value
225
200
175
150
125
120
140
160
180
200
220
240
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Calcium, MW-32 (mg/L)
log(Value)
5.4
5.2
5.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

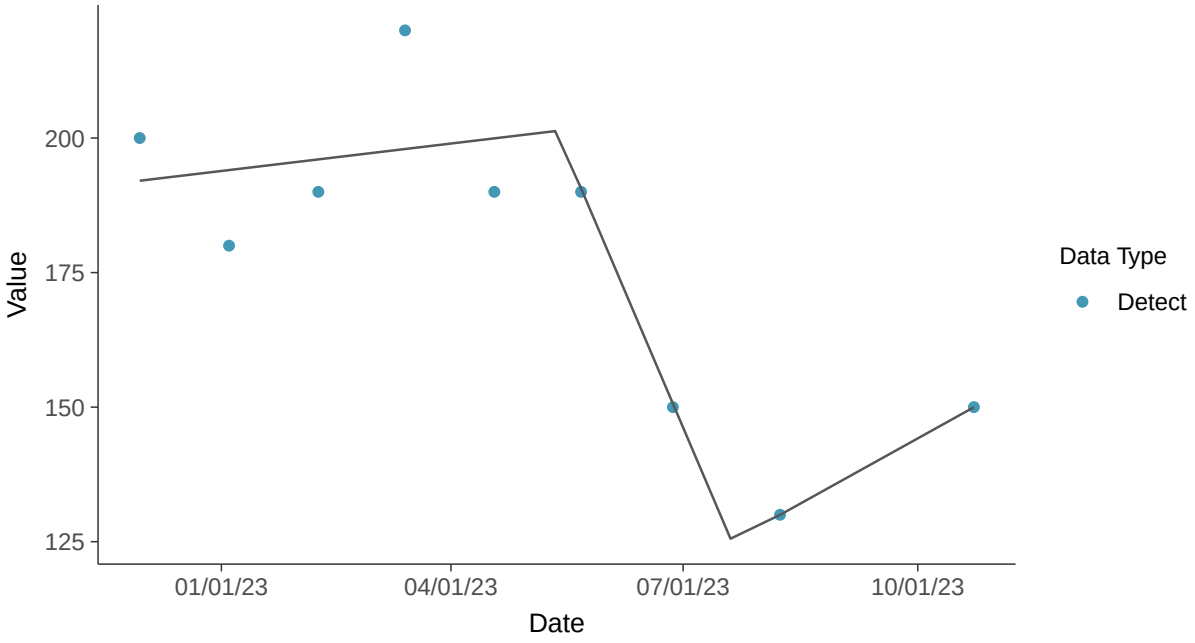
Trend Regression: Piecewise Linear-Linear

Calcium, MW-32 (mg/L)



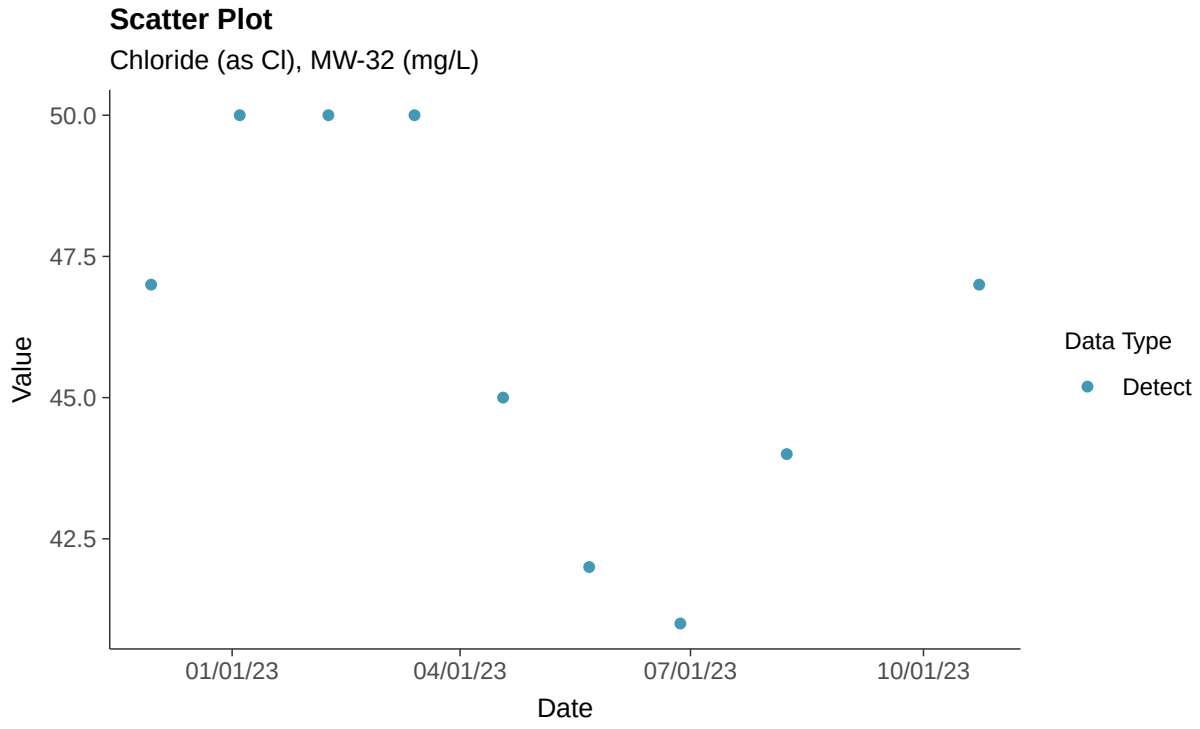
Trend Regression: Piecewise Linear-Linear-Linear

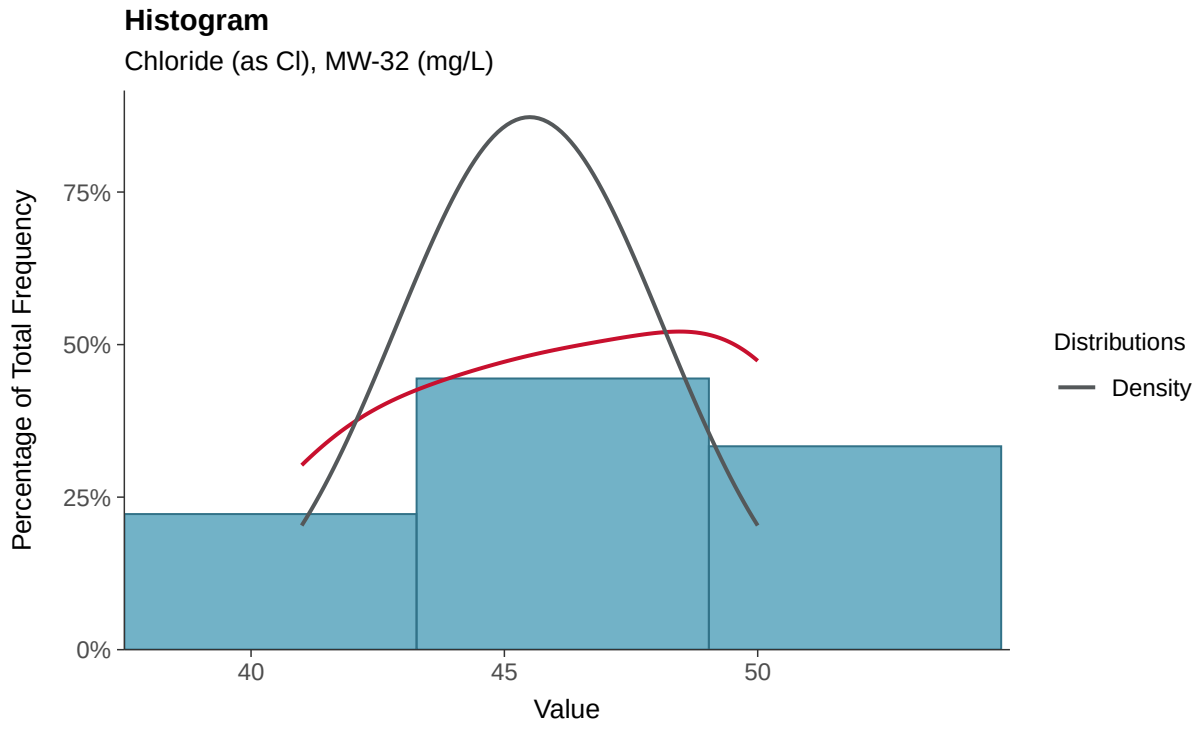
Calcium, MW-32 (mg/L)



Appendix III: Chloride (as Cl), MW-32

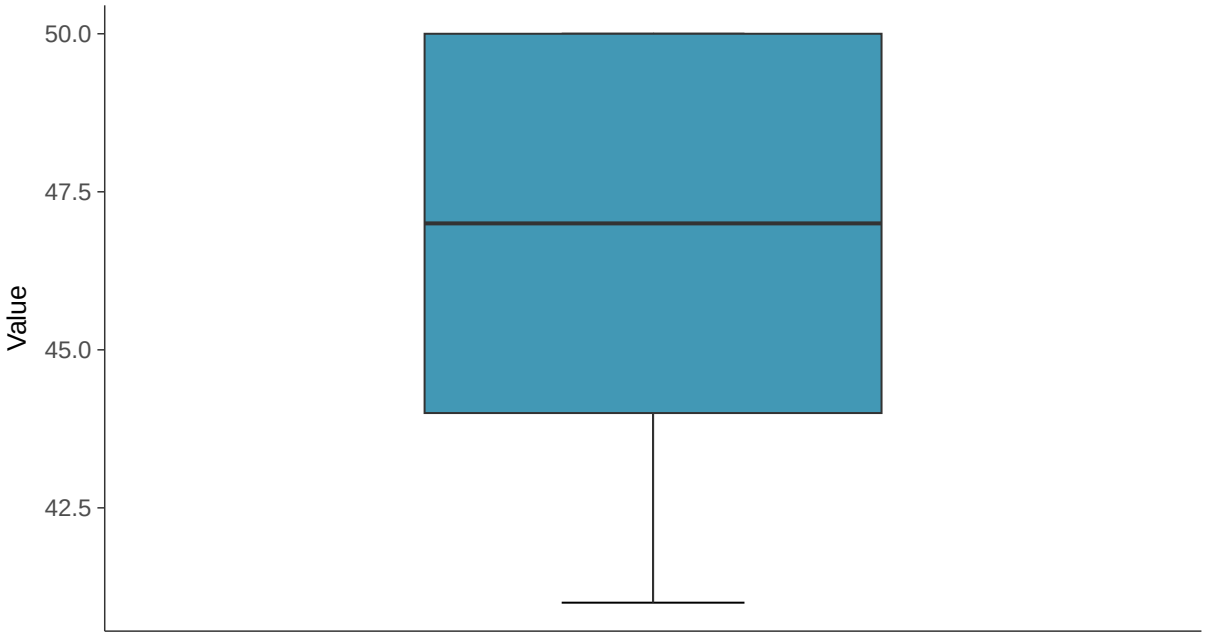
ID: 2_27_4_108





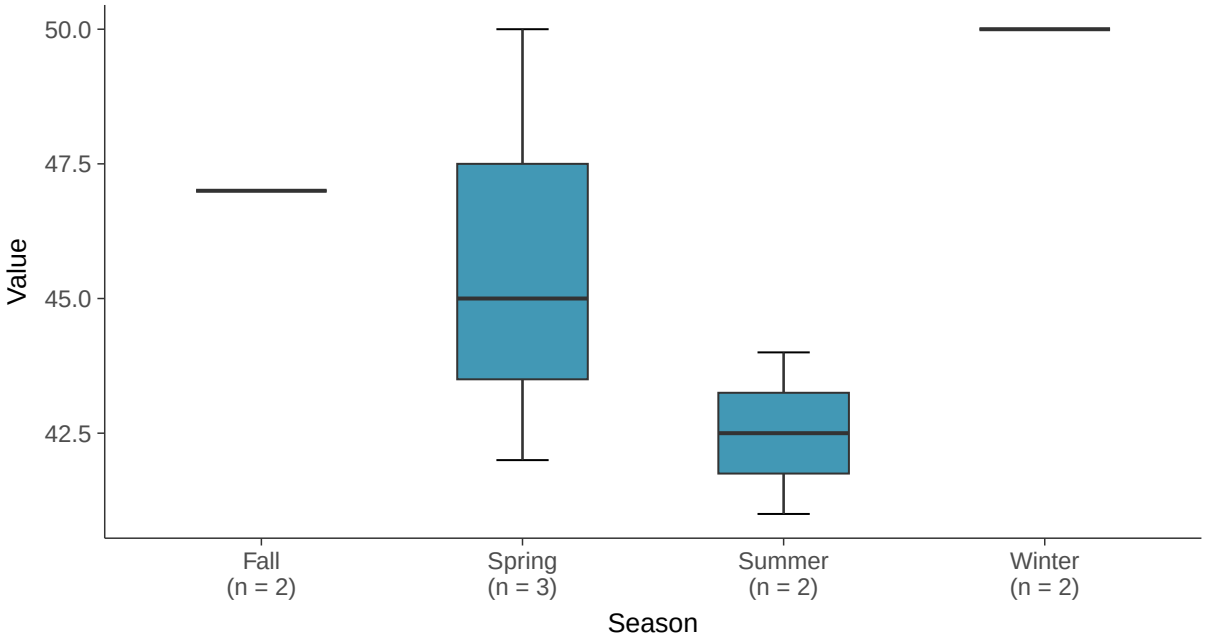
Boxplot

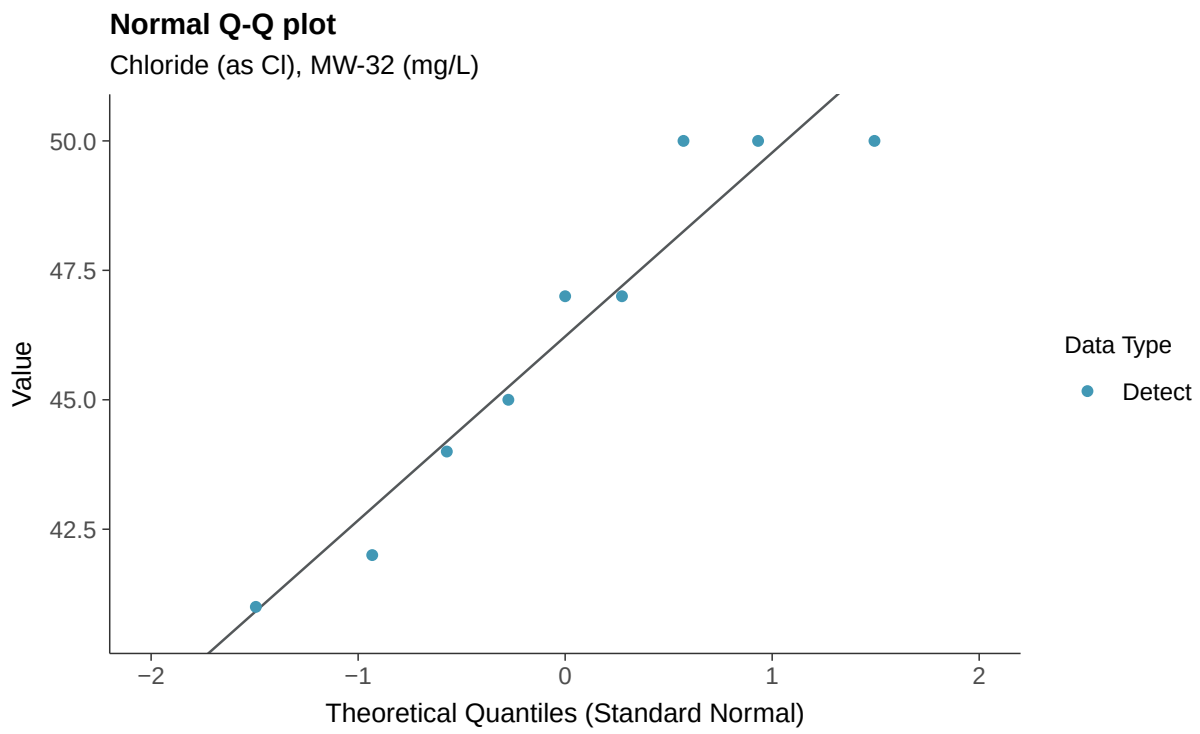
Chloride (as Cl), MW-32 (mg/L)

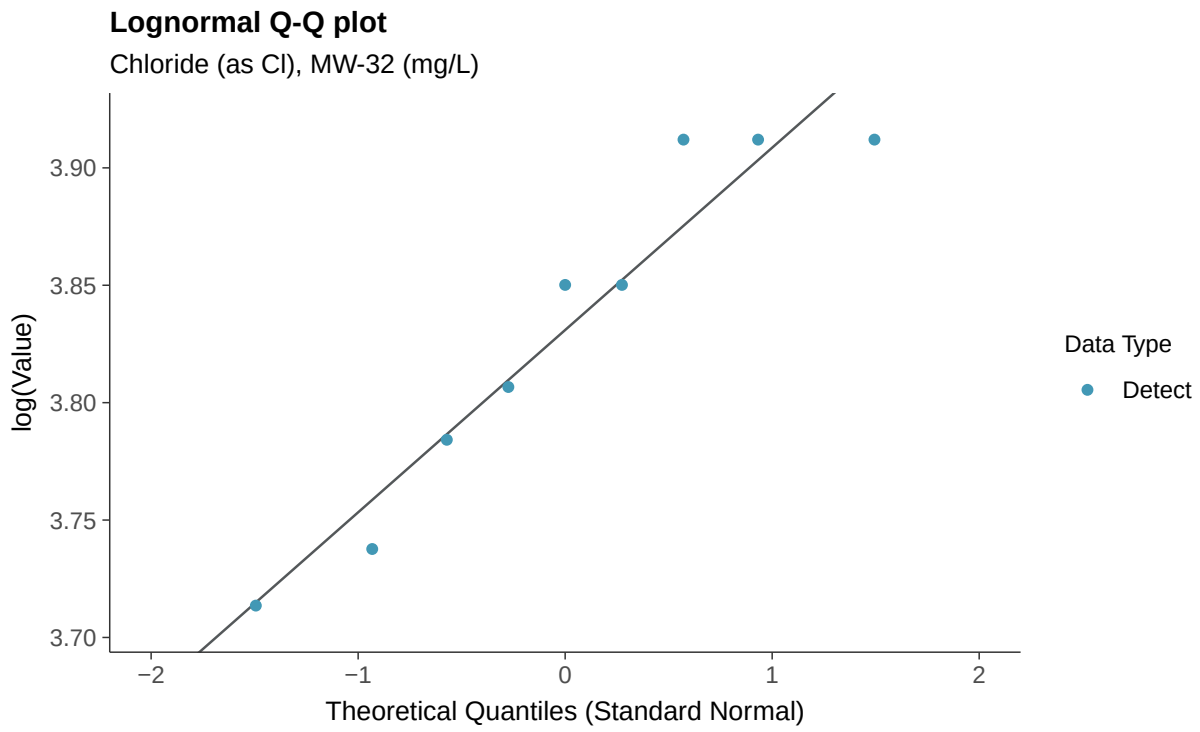


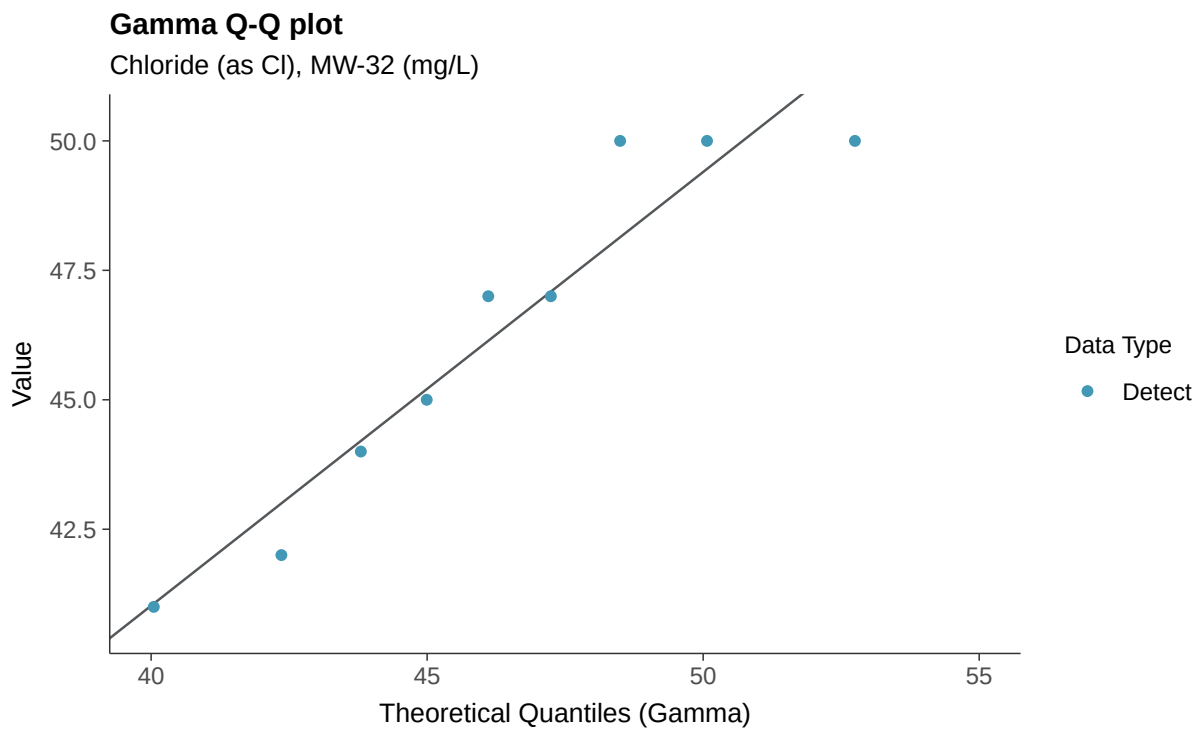
Boxplot by Season

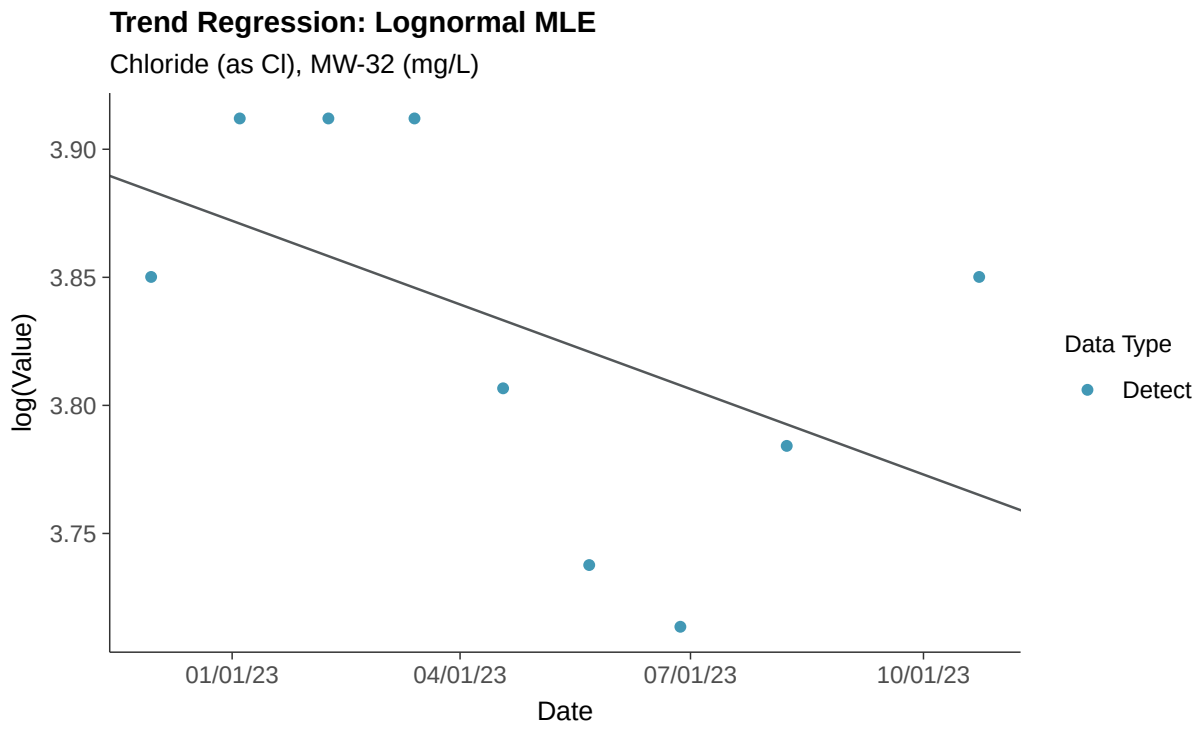
Chloride (as Cl), MW-32 (mg/L)




Normal Q-Q plot
Chloride (as Cl), MW-32 (mg/L)
Value
50.0
47.5
45.0
42.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

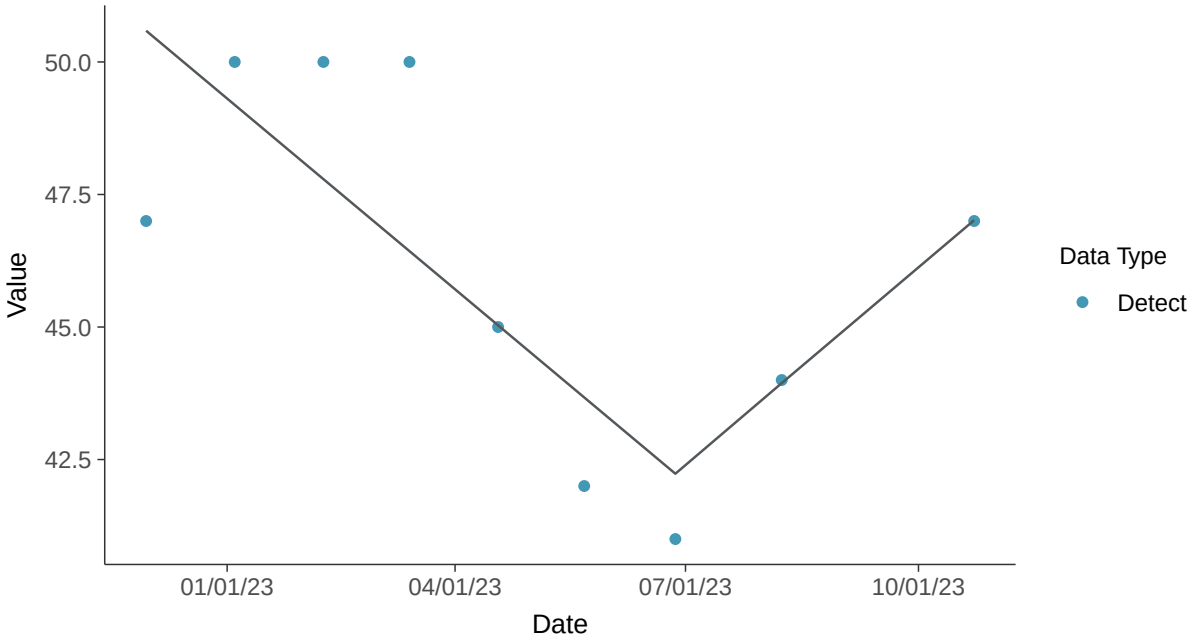

Lognormal Q-Q plot
Chloride (as Cl), MW-32 (mg/L)
log(Value)
3.90
3.85
3.80
3.75
3.70
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chloride (as Cl), MW-32 (mg/L)
Value
50.0
47.5
45.0
42.5
40
45
50
55
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chloride (as Cl), MW-32 (mg/L)
log(Value)
3.90
3.85
3.80
3.75
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

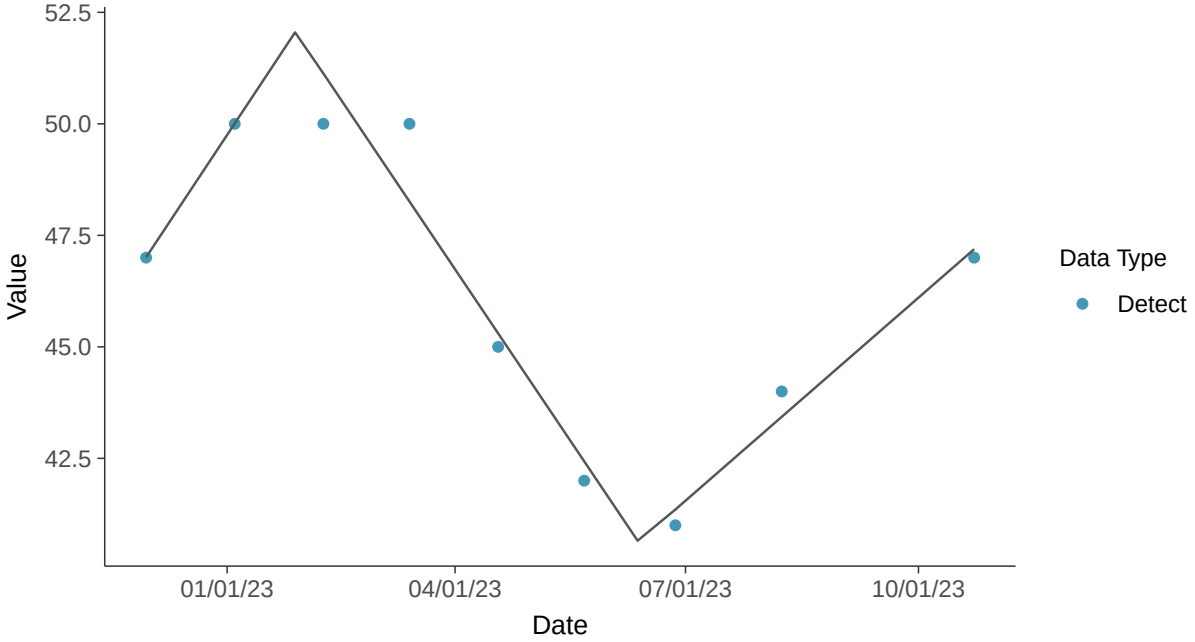
Trend Regression: Piecewise Linear-Linear

Chloride (as Cl), MW-32 (mg/L)



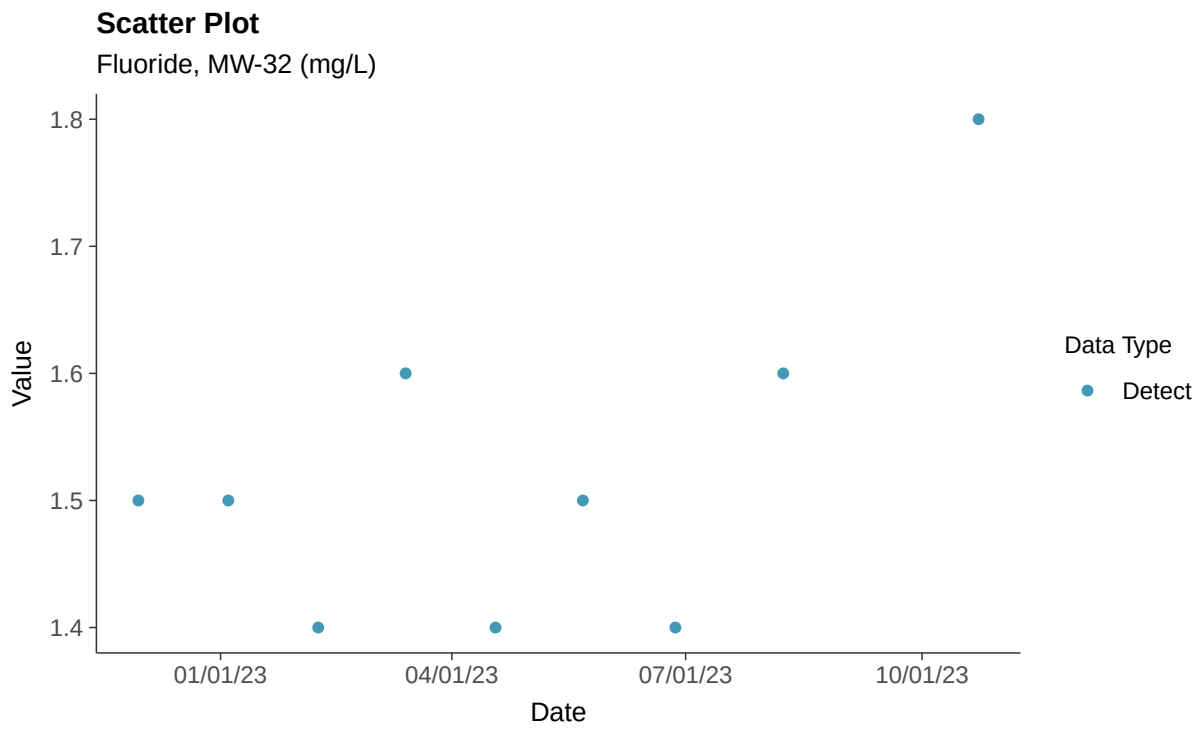
Trend Regression: Piecewise Linear-Linear-Linear

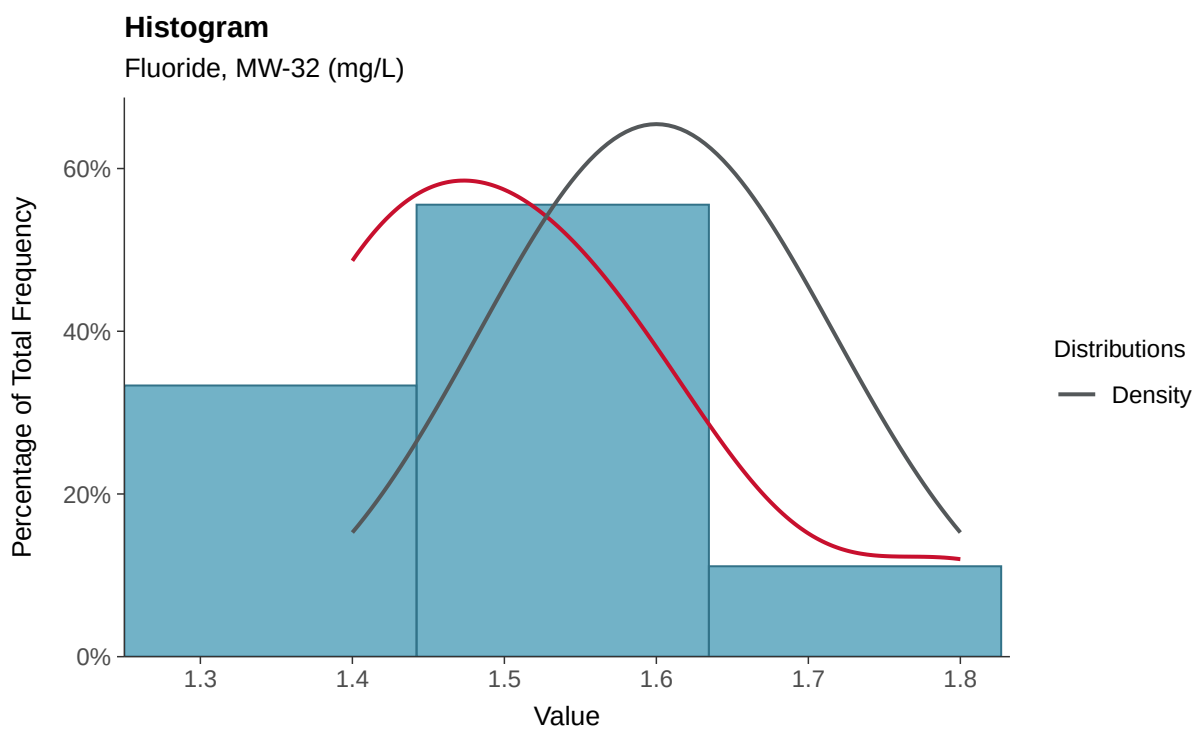
Chloride (as Cl), MW-32 (mg/L)



Appendix III: Fluoride, MW-32

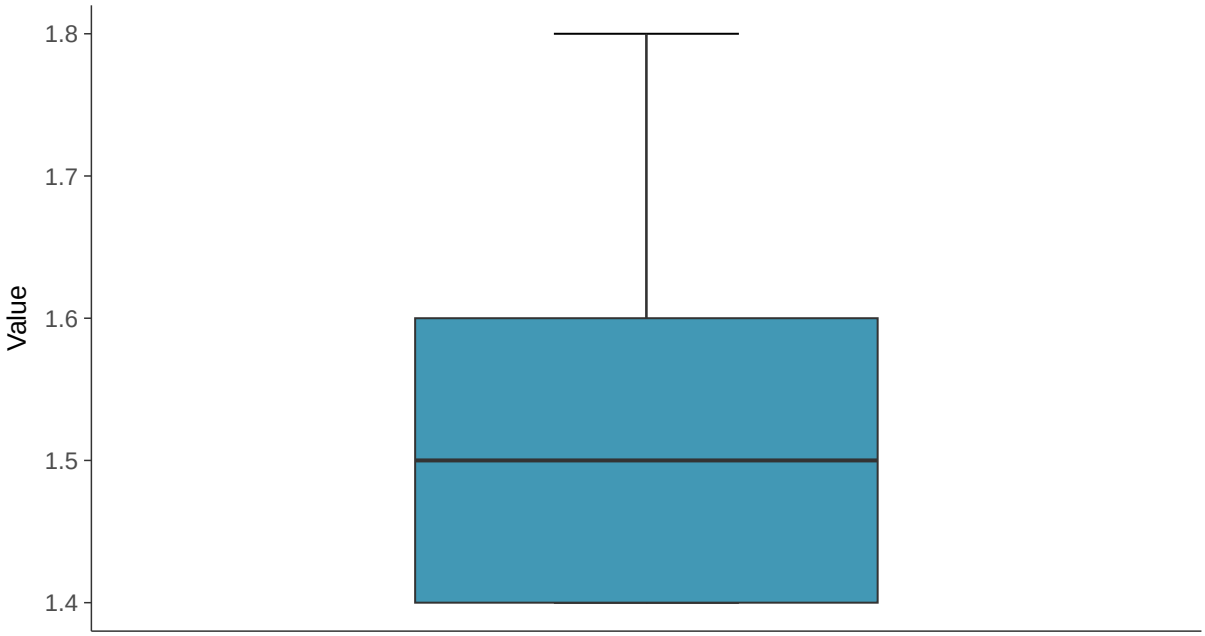
ID: 2_27_4_112





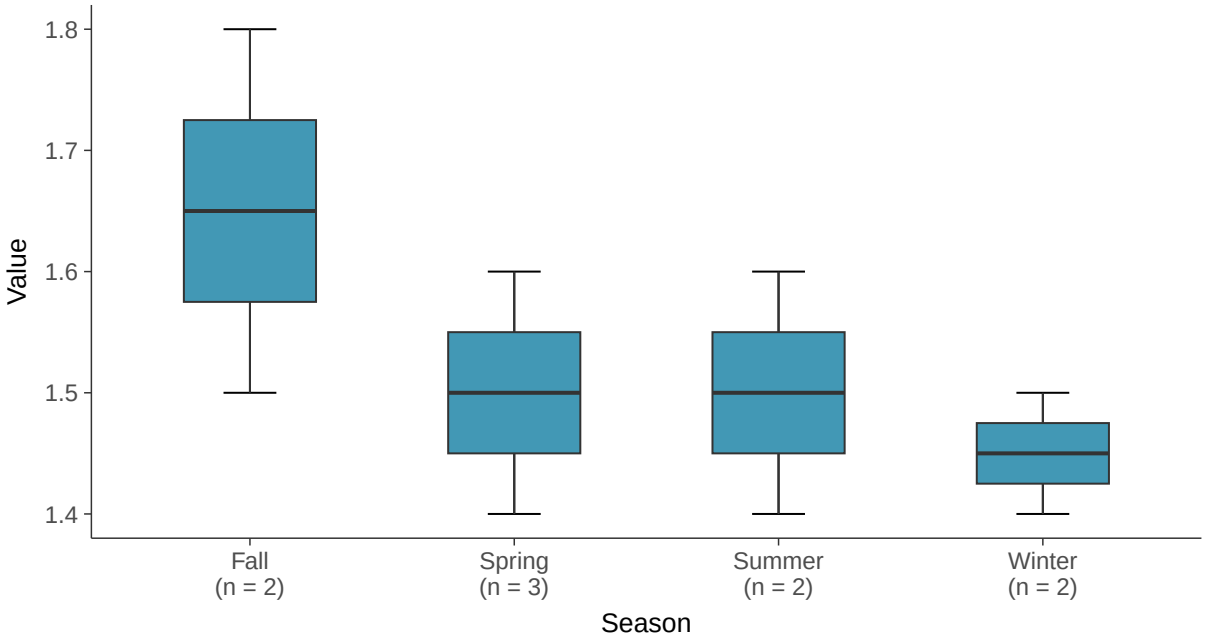
Boxplot

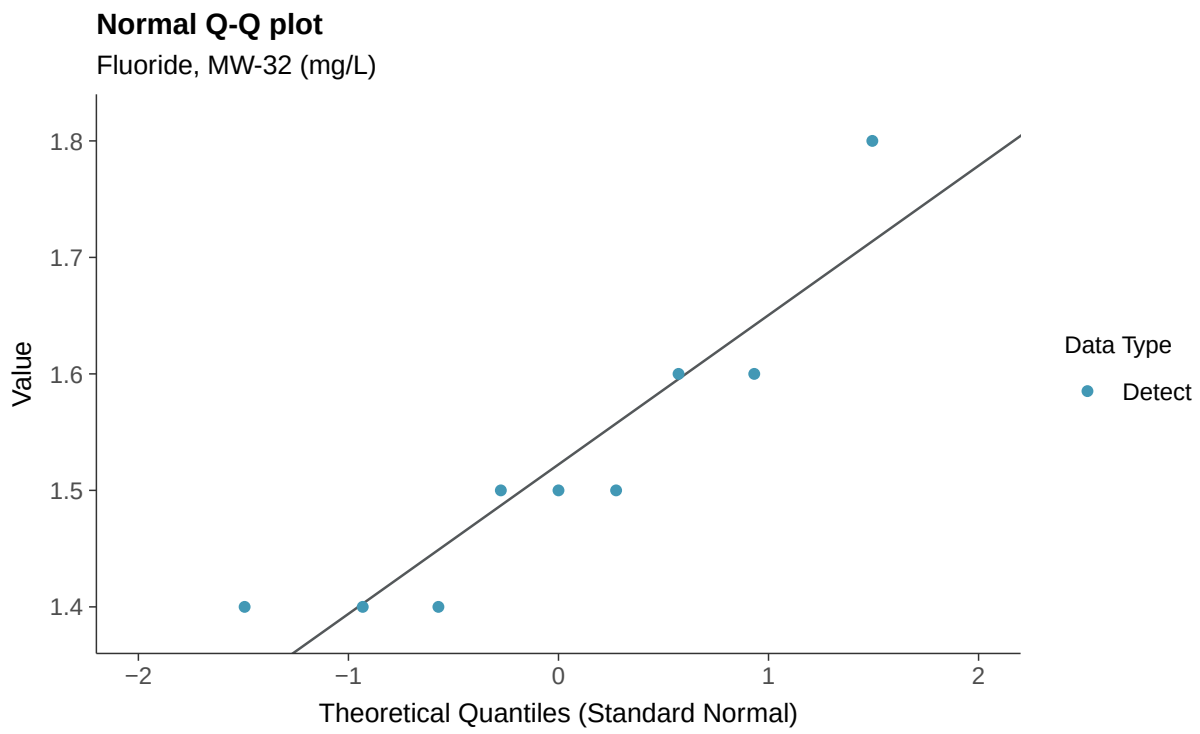
Fluoride, MW-32 (mg/L)

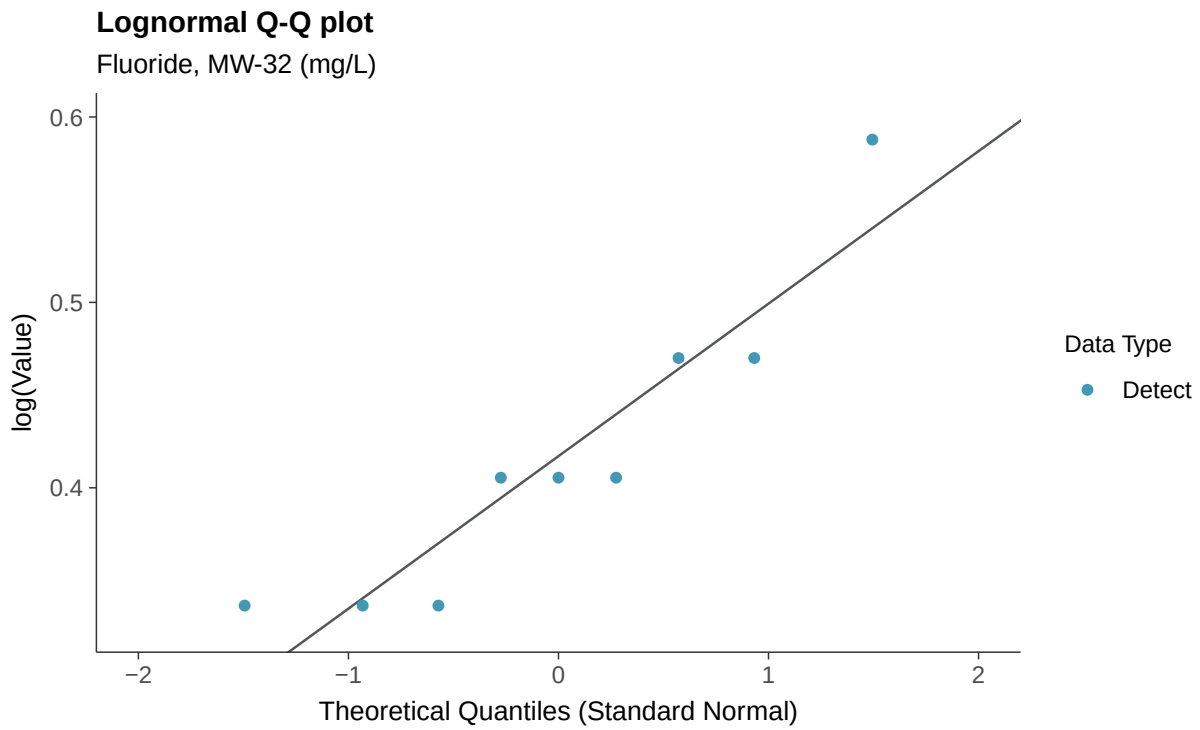


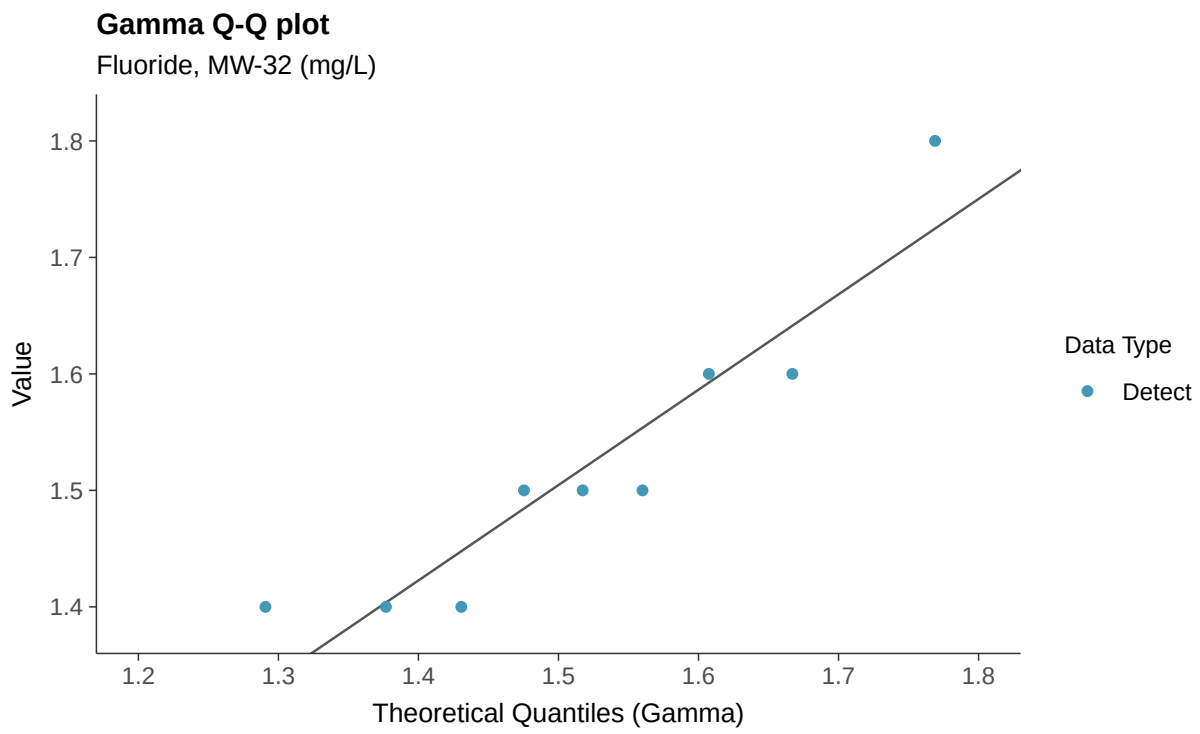
Boxplot by Season

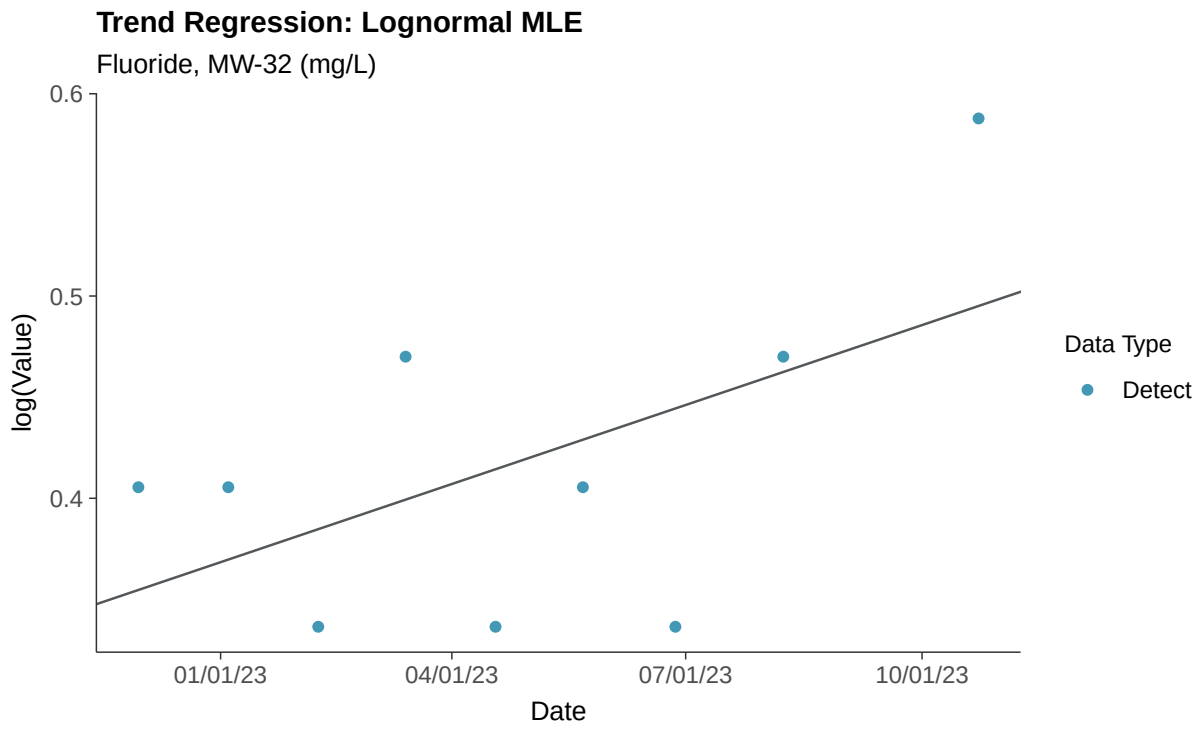
Fluoride, MW-32 (mg/L)




Normal Q-Q plot
Fluoride, MW-32 (mg/L)
Value
1.8
1.7
1.6
1.5
1.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

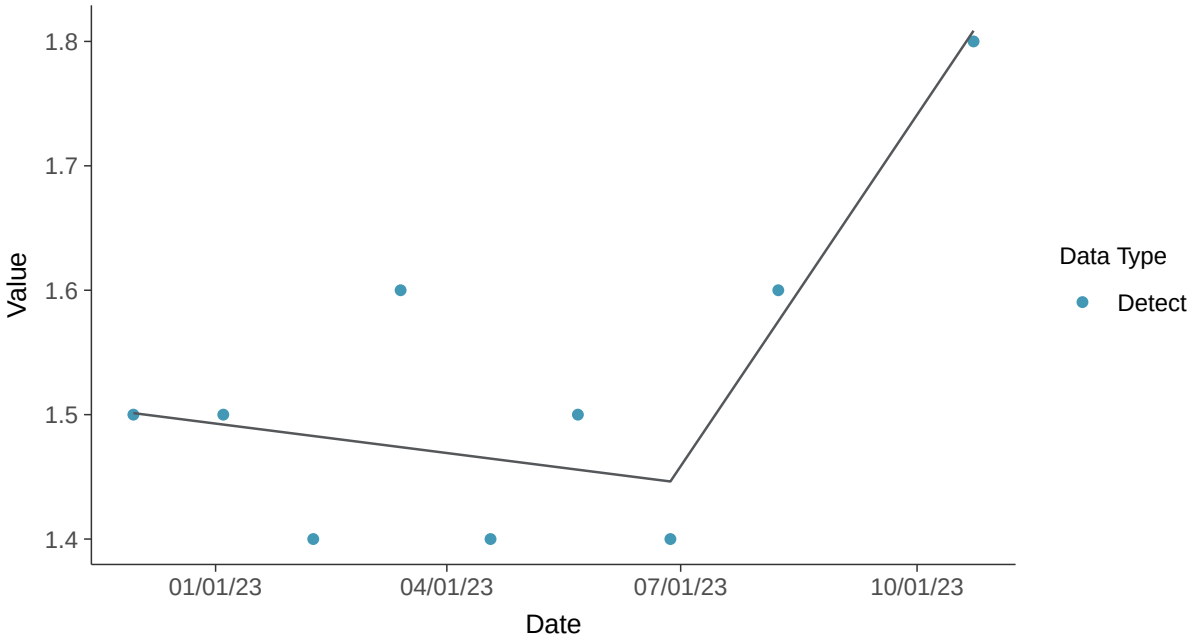

Lognormal Q-Q plot
Fluoride, MW-32 (mg/L)
log(Value)
0.6
0.5
0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Fluoride, MW-32 (mg/L)
Value
1.8
1.7
1.6
1.5
1.4
1.2
1.3
1.4
1.5
1.6
1.7
1.8
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride, MW-32 (mg/L)
log(Value)
0.6
0.5
0.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

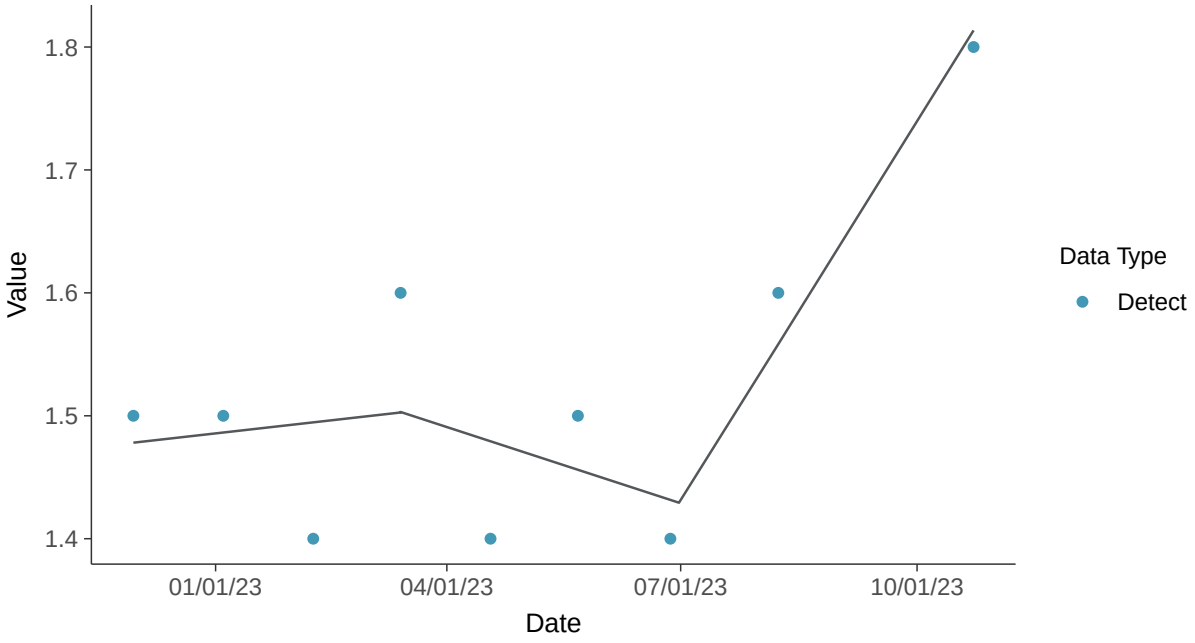
Trend Regression: Piecewise Linear-Linear

Fluoride, MW-32 (mg/L)



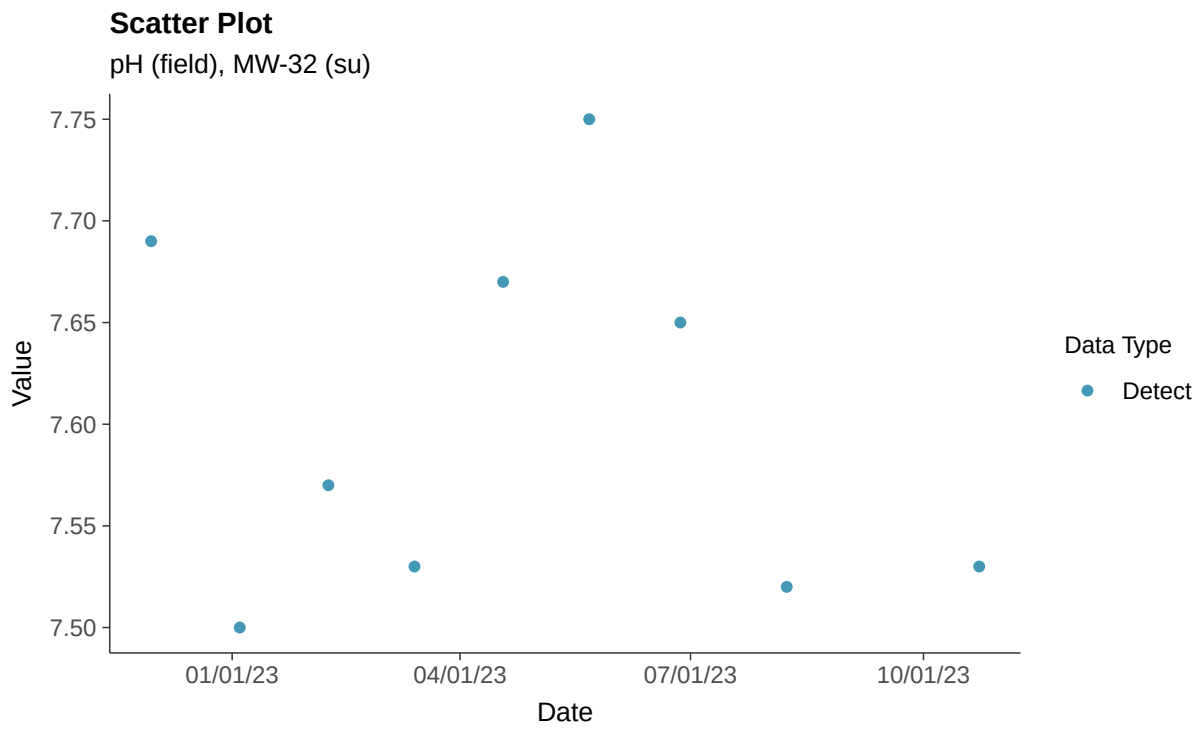
Trend Regression: Piecewise Linear-Linear-Linear

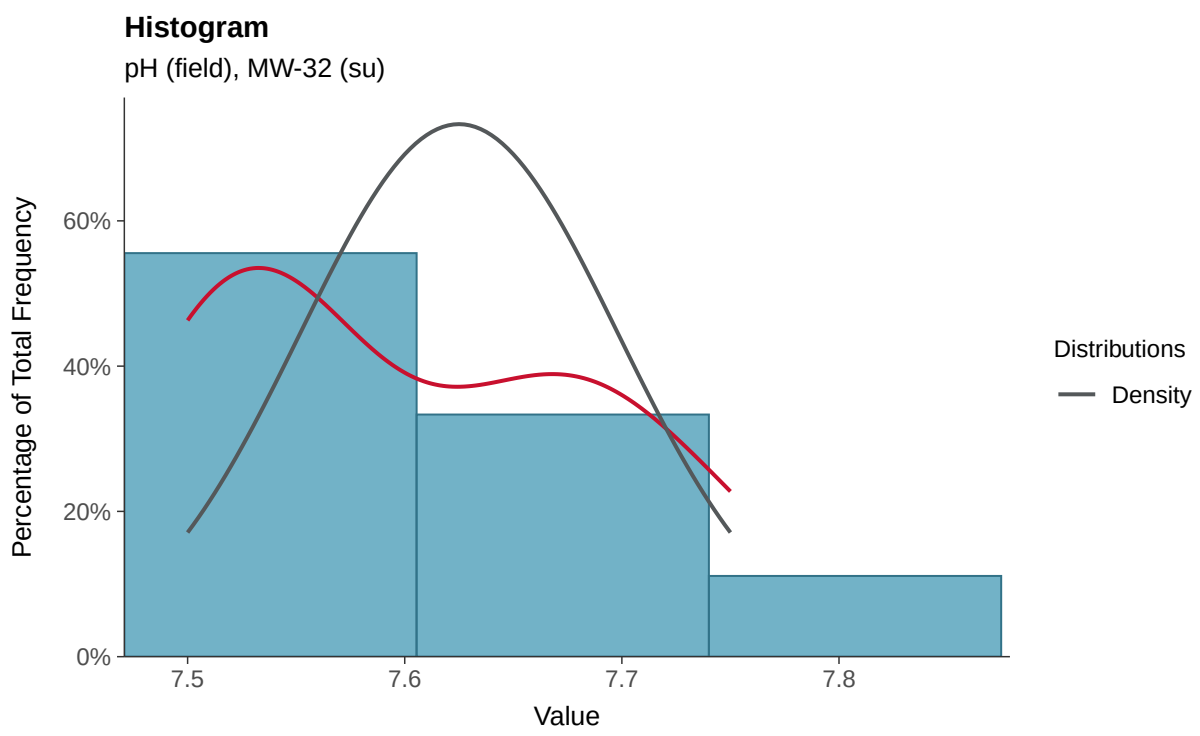
Fluoride, MW-32 (mg/L)



Appendix III: pH (field), MW-32

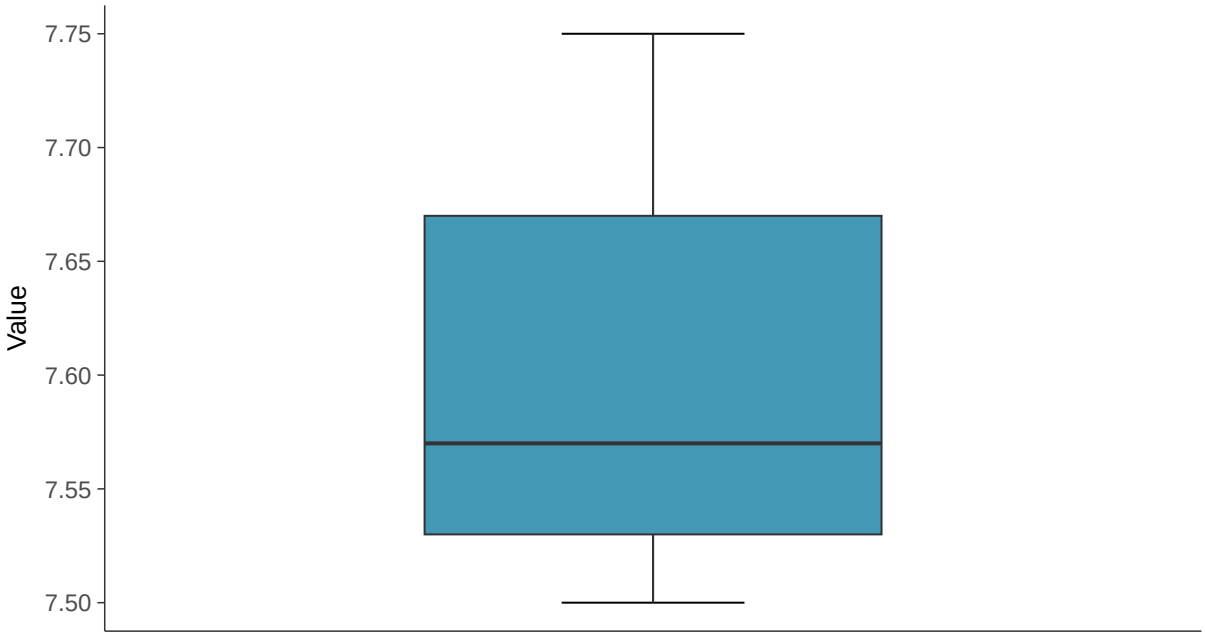
ID: 2_27_4_120





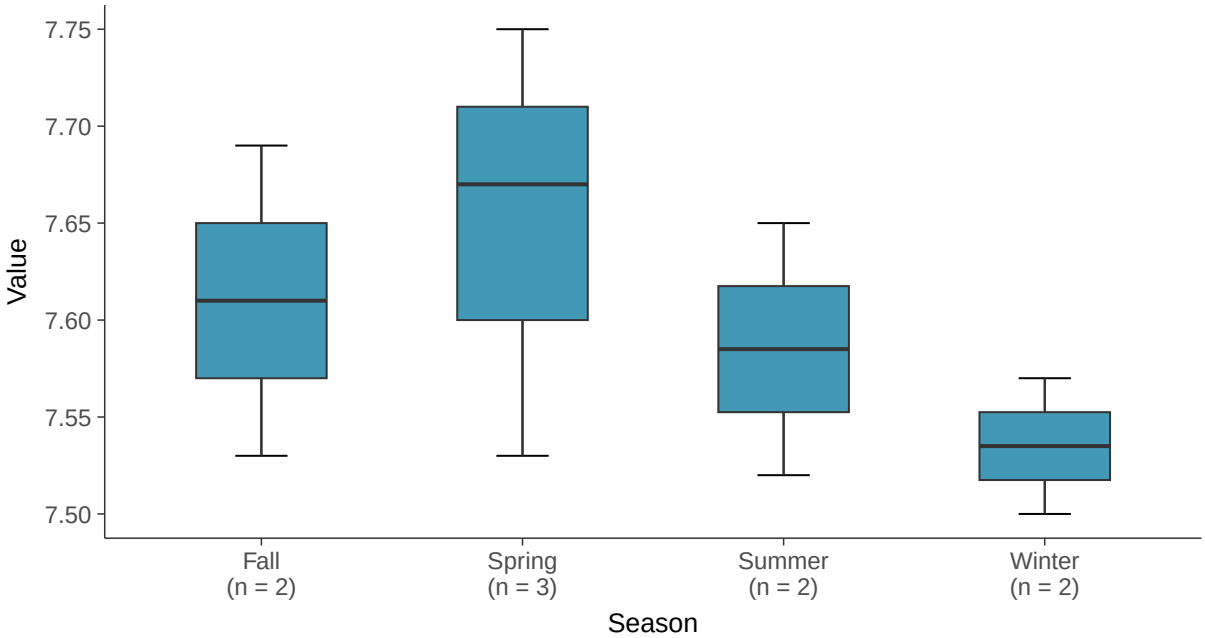
Boxplot

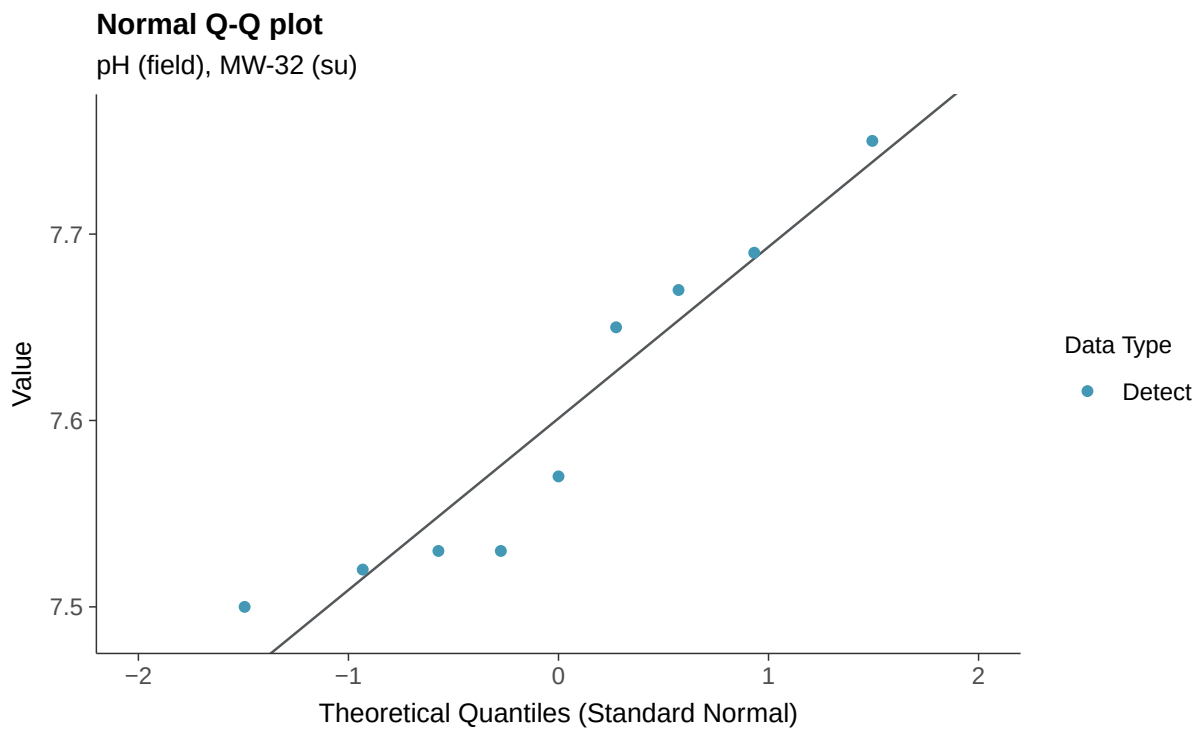
pH (field), MW-32 (su)

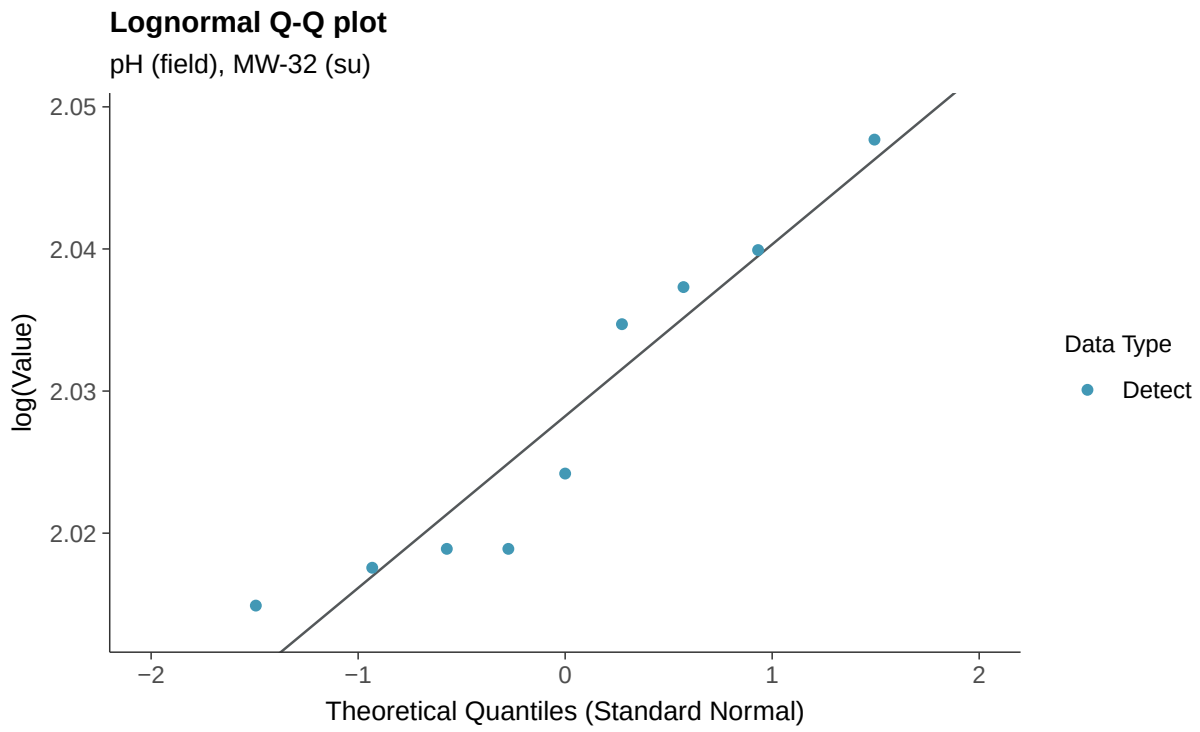


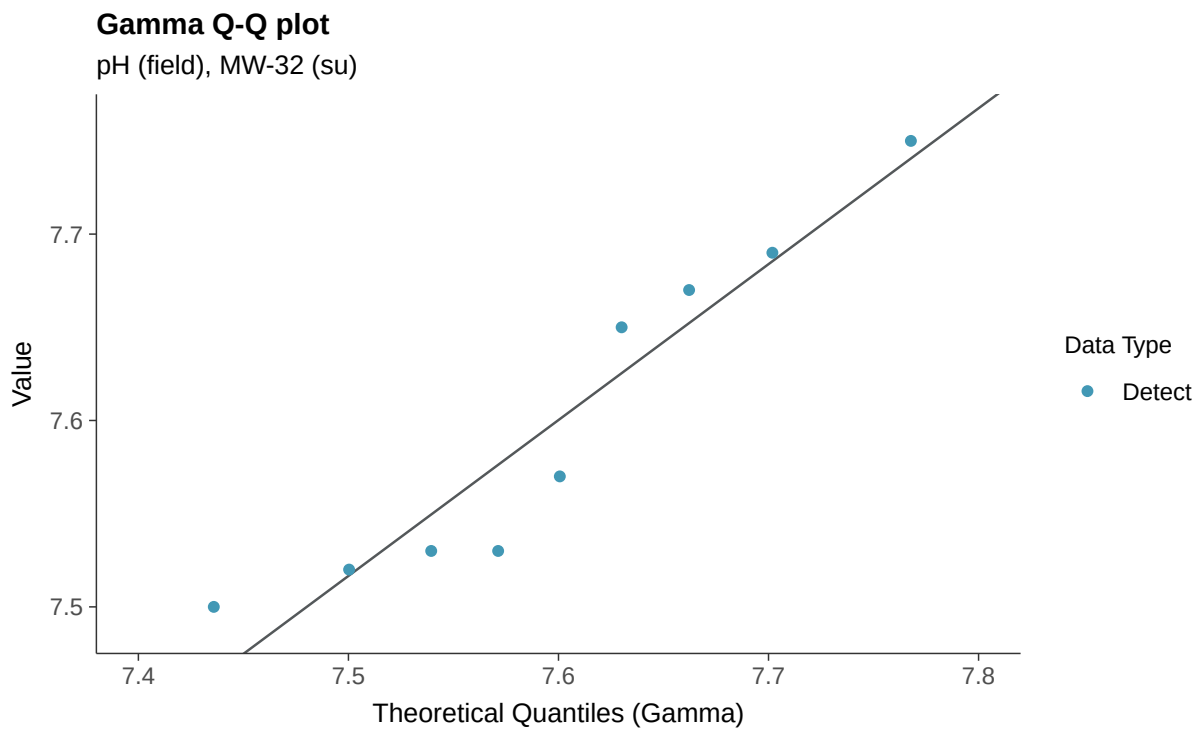
Boxplot by Season

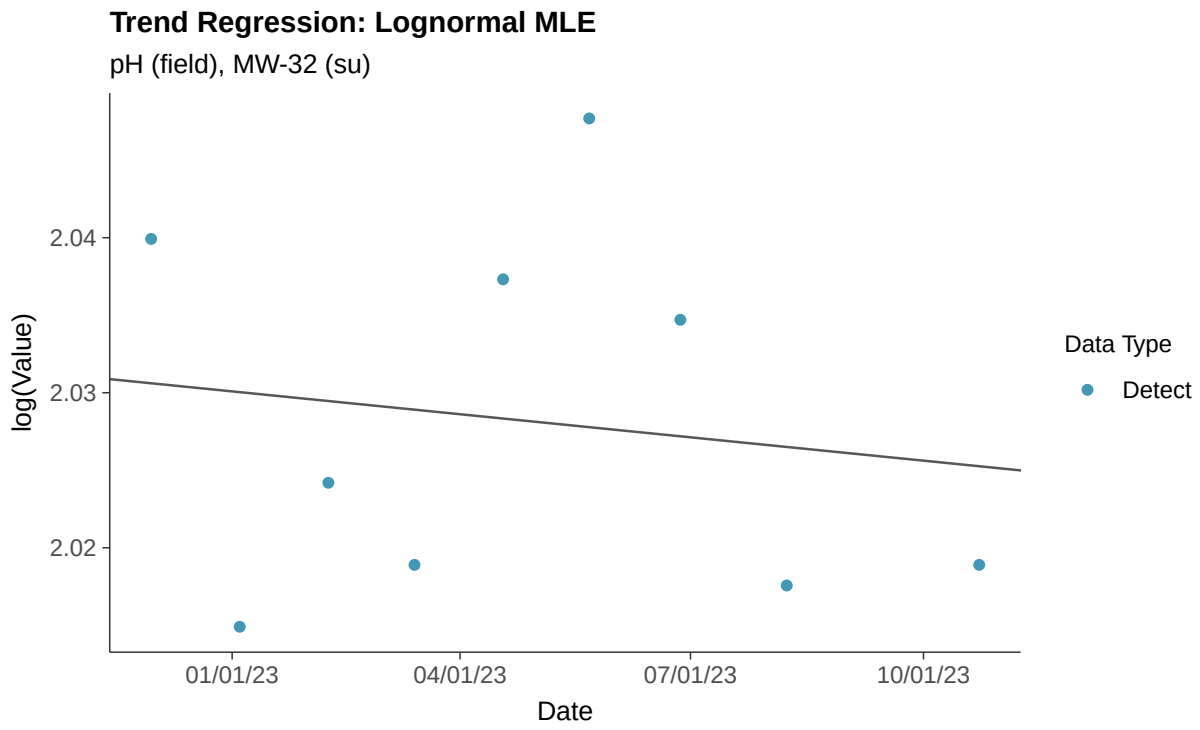
pH (field), MW-32 (su)

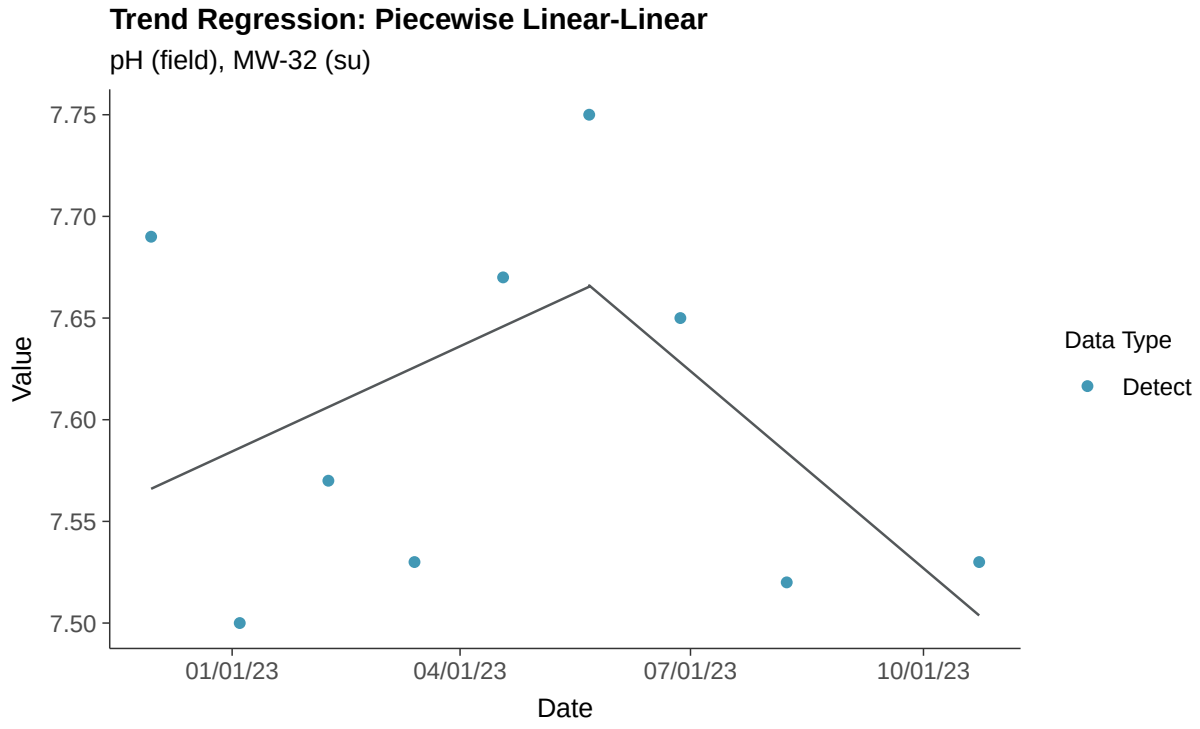


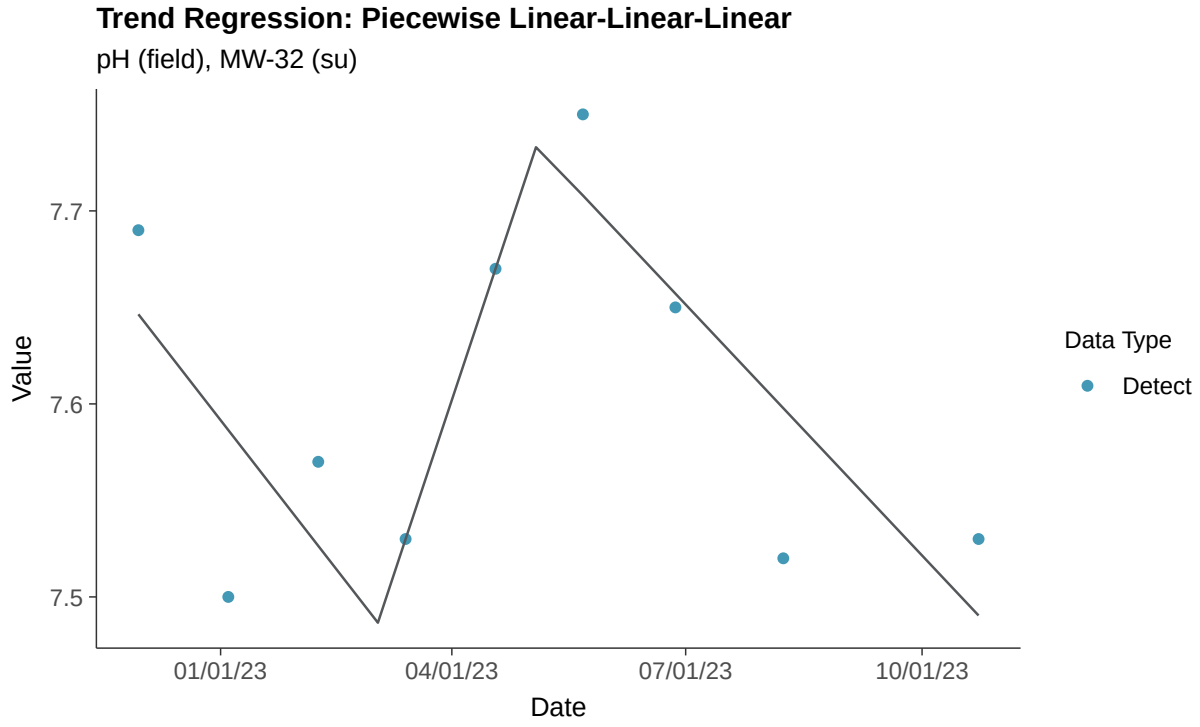

Normal Q-Q plot
pH (field), MW-32 (su)
Value
7.7
7.6
7.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
pH (field), MW-32 (su)
log(Value)
2.05
2.04
2.03
2.02
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
pH (field), MW-32 (su)
Value
7.7
7.6
7.5
7.4
7.5
7.6
7.7
7.8
Theoretical Quantiles (Gamma)
Data Type
Detect

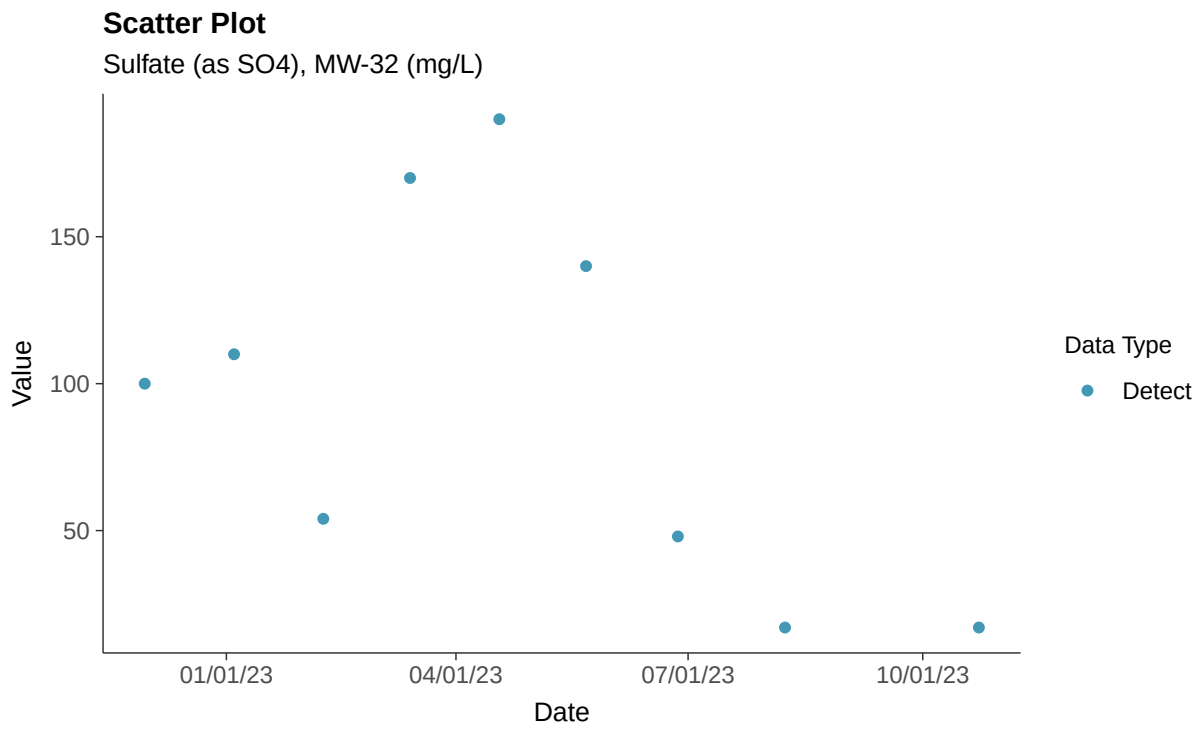

Trend Regression: Lognormal MLE
pH (field), MW-32 (su)
log(Value)
2.04
2.03
2.02
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

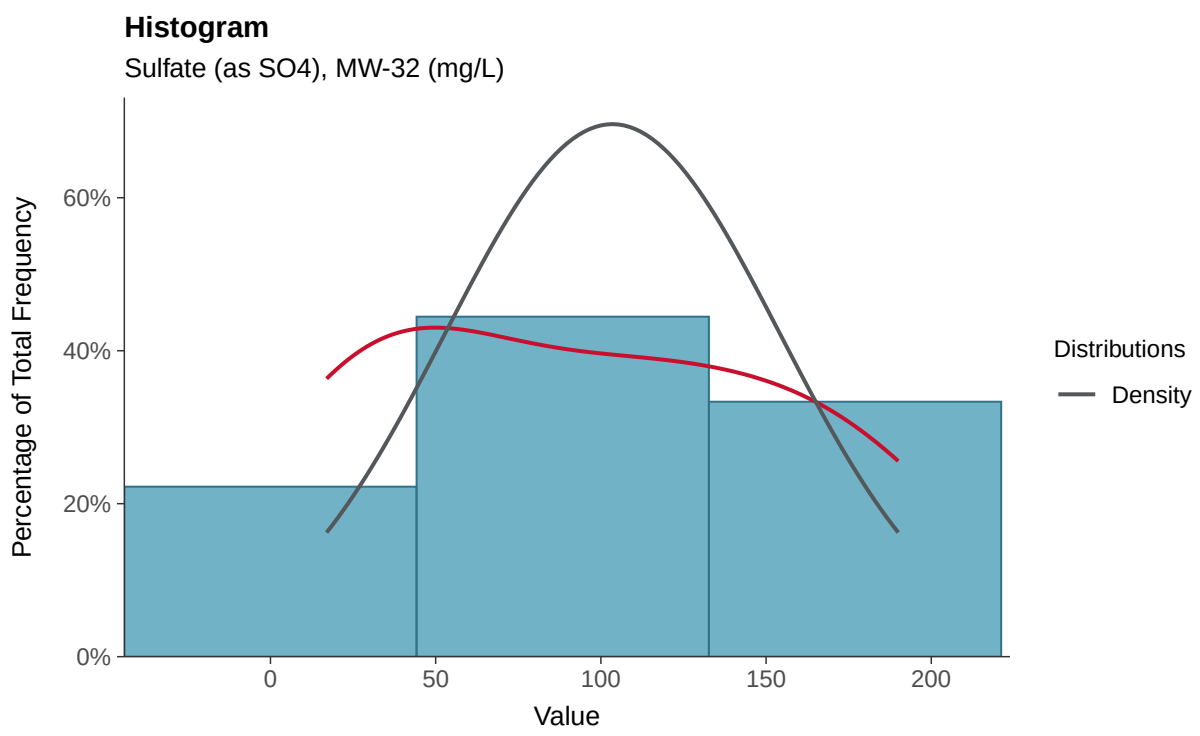

Trend Regression: Piecewise Linear-Linear
pH (field), MW-32 (su)
7.75
7.70
7.65
7.60
7.55
7.50
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
pH (field), MW-32 (su)
7.7
7.6
7.5
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix III: Sulfate (as SO4), MW-32

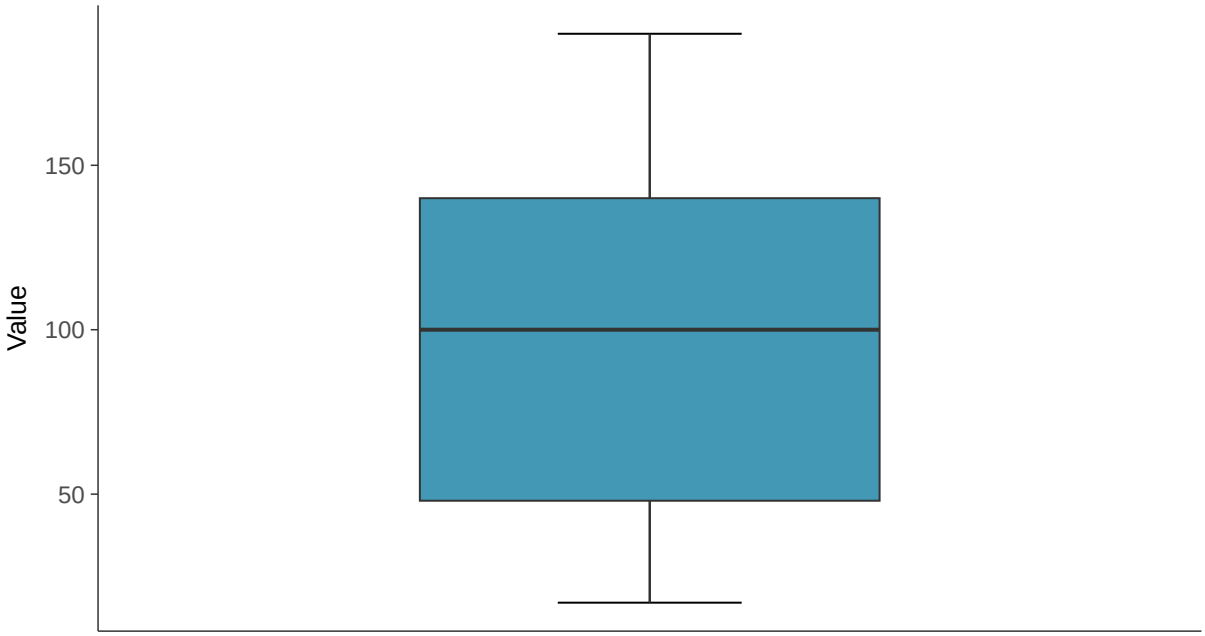
ID: 2_27_4_124





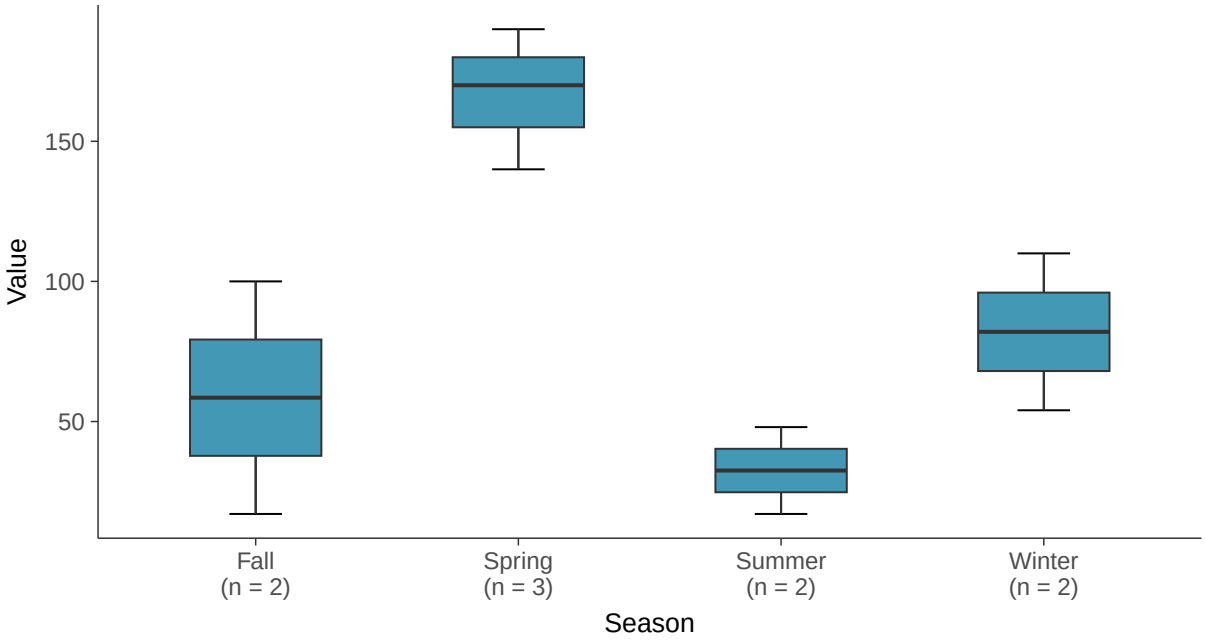
Boxplot

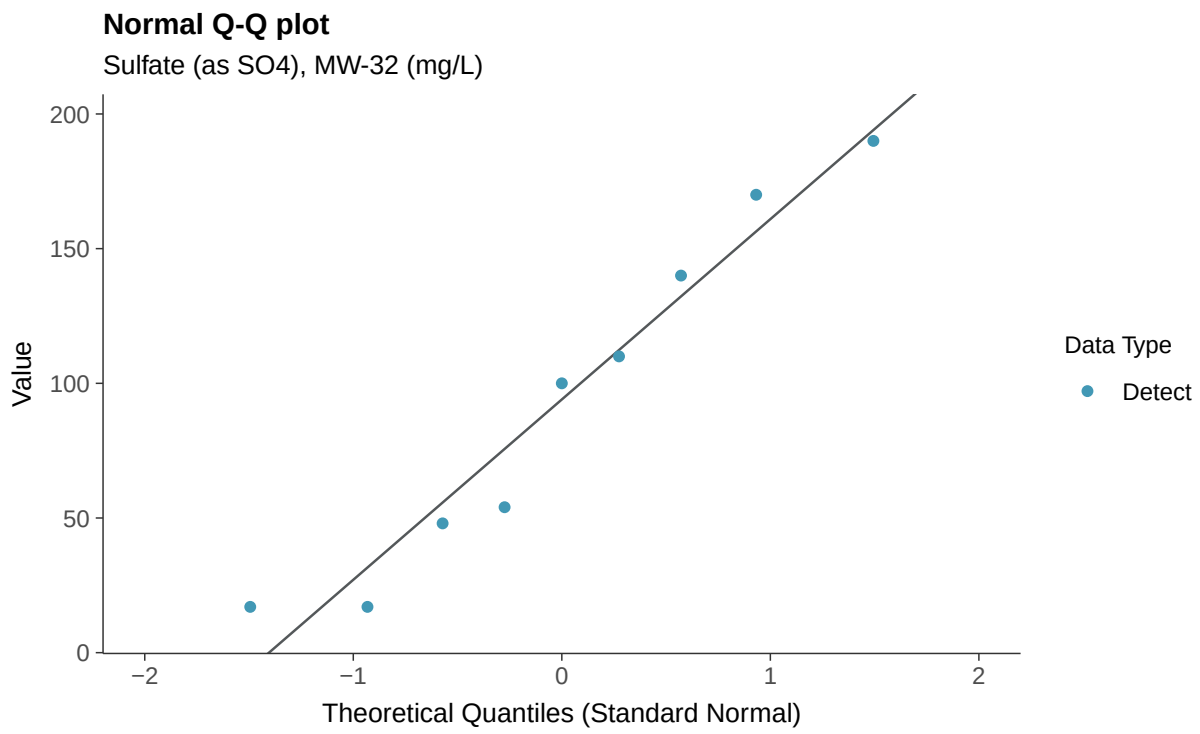
Sulfate (as SO4), MW-32 (mg/L)

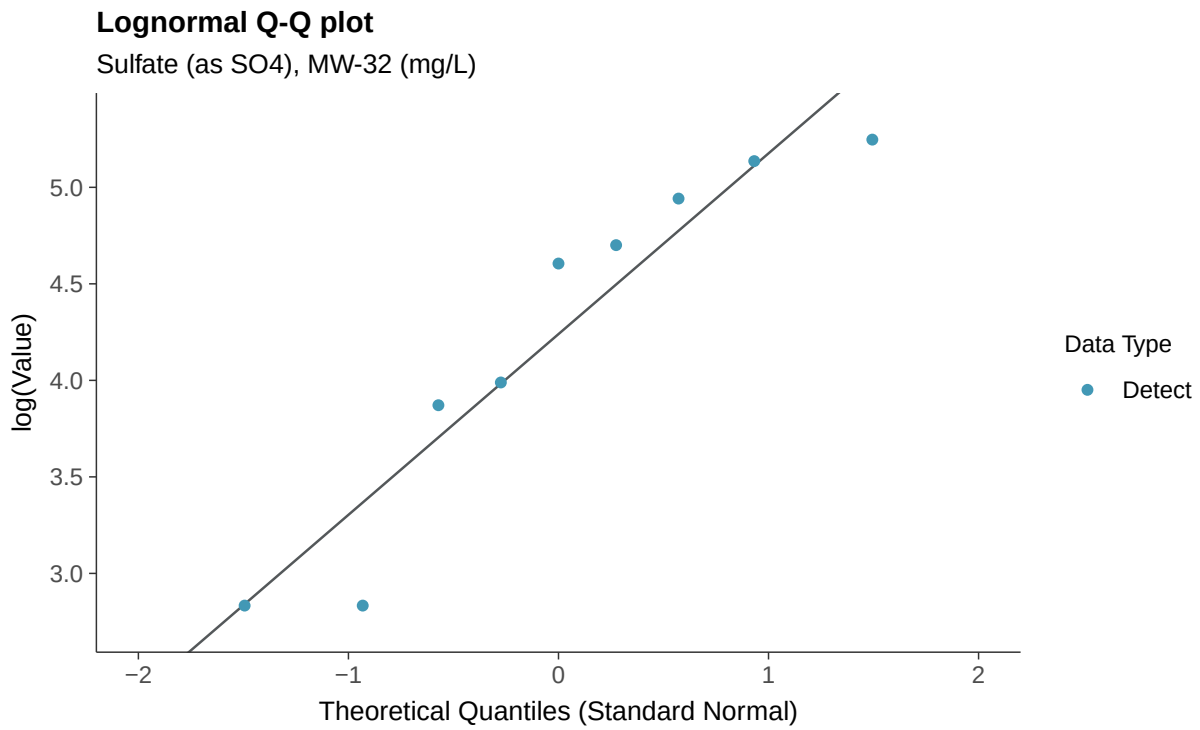


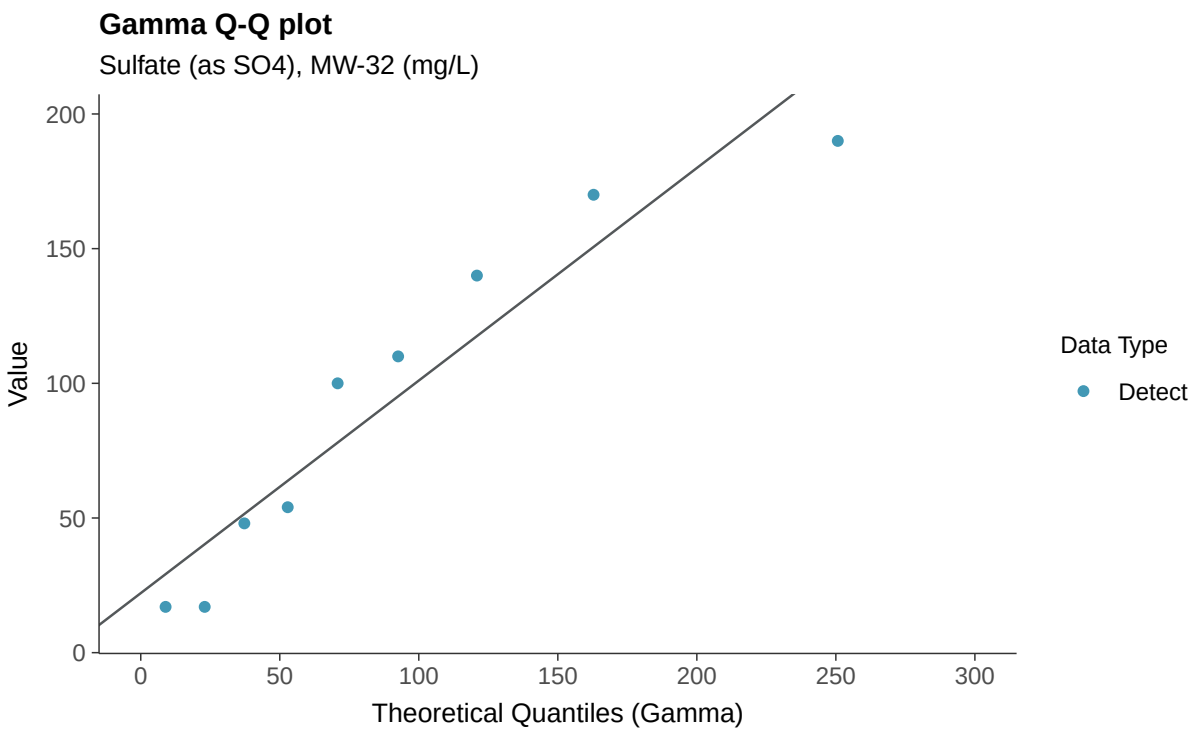
Boxplot by Season

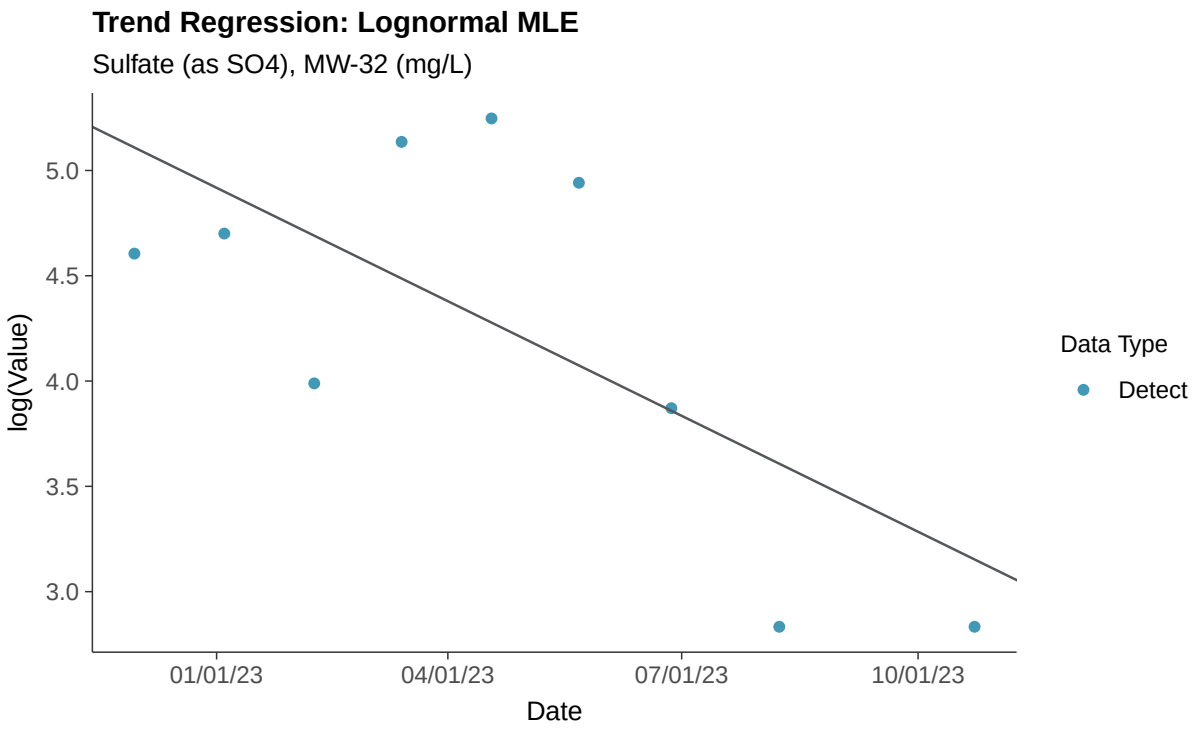
Sulfate (as SO4), MW-32 (mg/L)




Normal Q-Q plot
Sulfate (as SO4), MW-32 (mg/L)
Value
200
150
100
50
0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

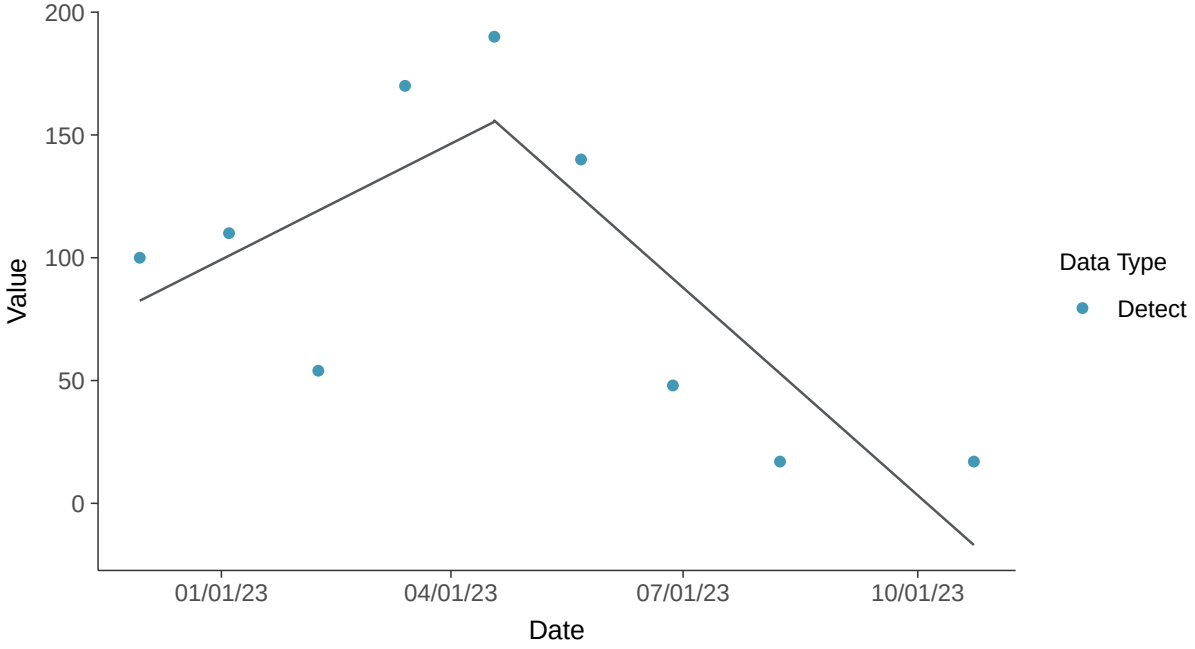

Lognormal Q-Q plot
Sulfate (as SO4), MW-32 (mg/L)
log(Value)
5.0
4.5
4.0
3.5
3.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Sulfate (as SO4), MW-32 (mg/L)
Value
200
150
100
50
0
0
50
100
150
200
250
300
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Sulfate (as SO4), MW-32 (mg/L)
log(Value)
5.0
4.5
4.0
3.5
3.0
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

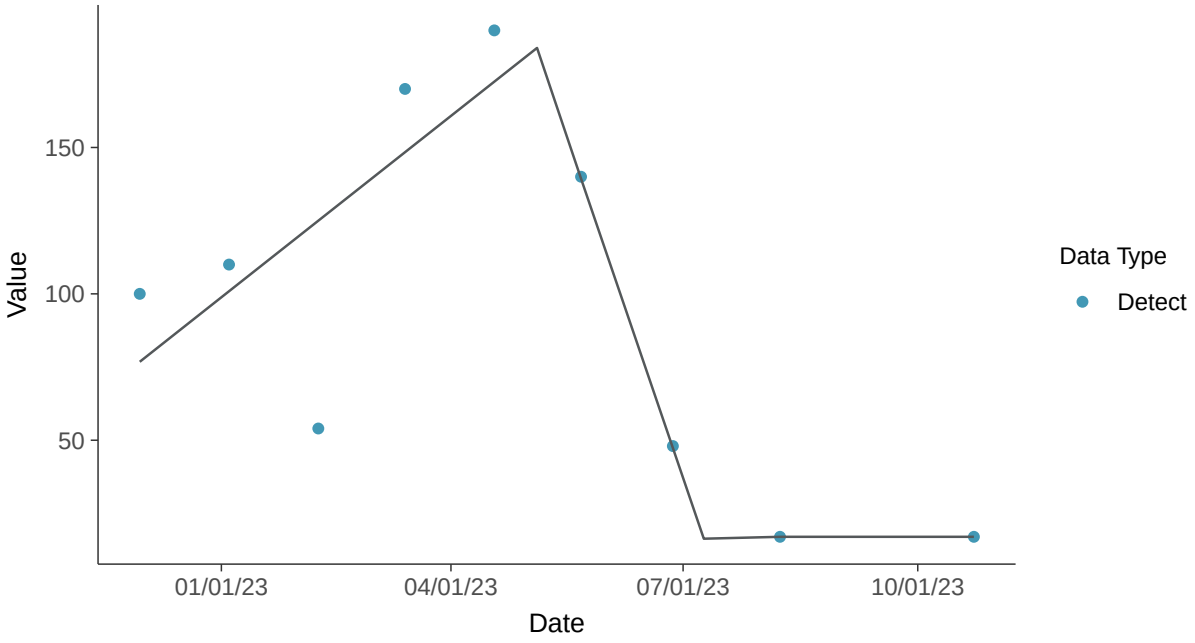
Trend Regression: Piecewise Linear-Linear

Sulfate (as SO4), MW-32 (mg/L)



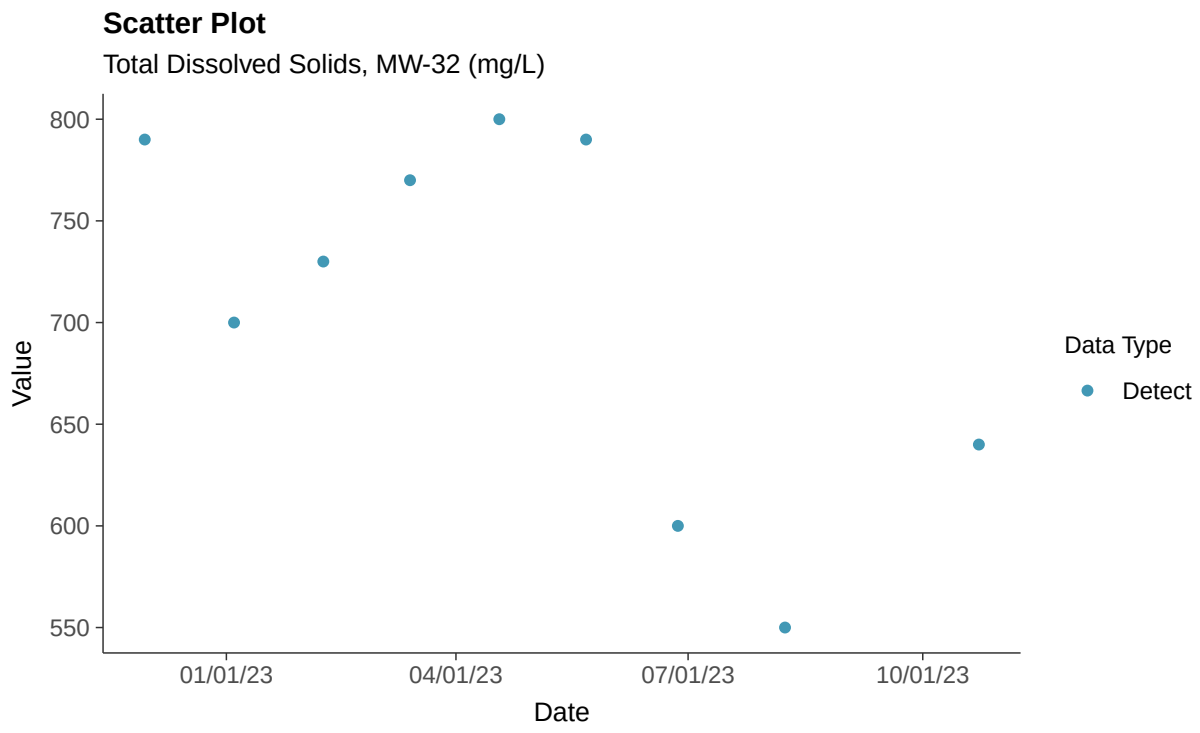
Trend Regression: Piecewise Linear-Linear-Linear

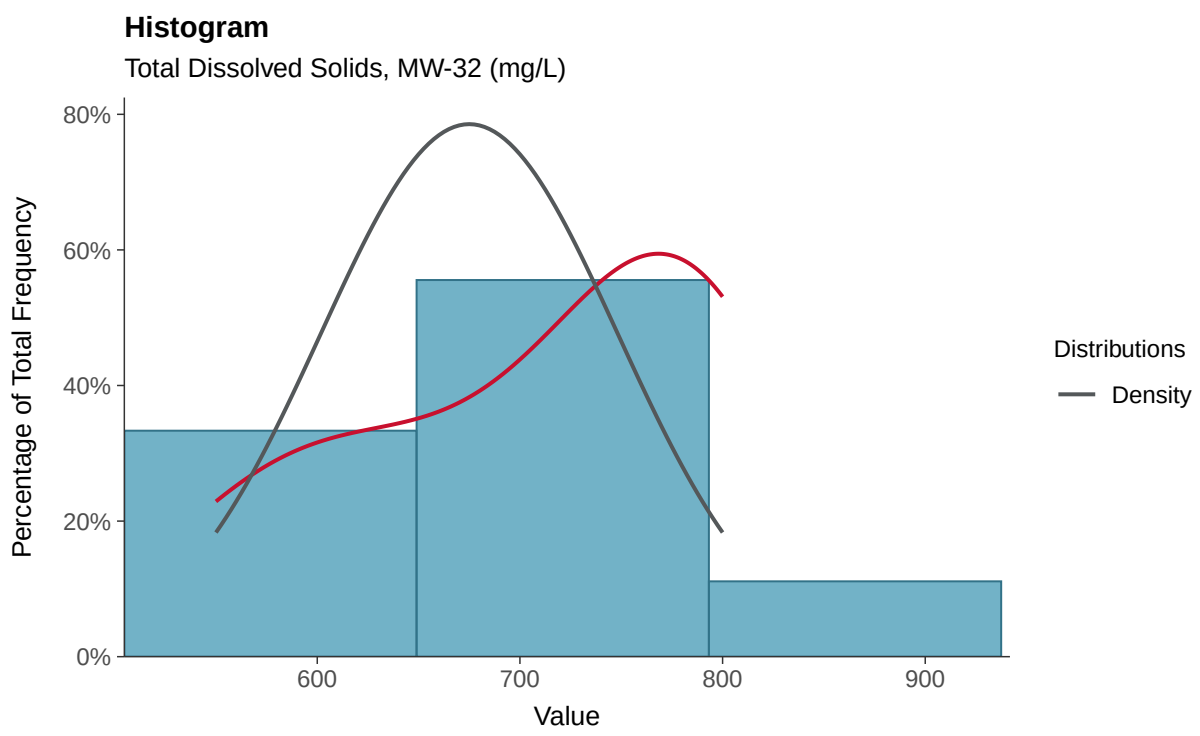
Sulfate (as SO4), MW-32 (mg/L)



Appendix III: Total Dissolved Solids, MW-32

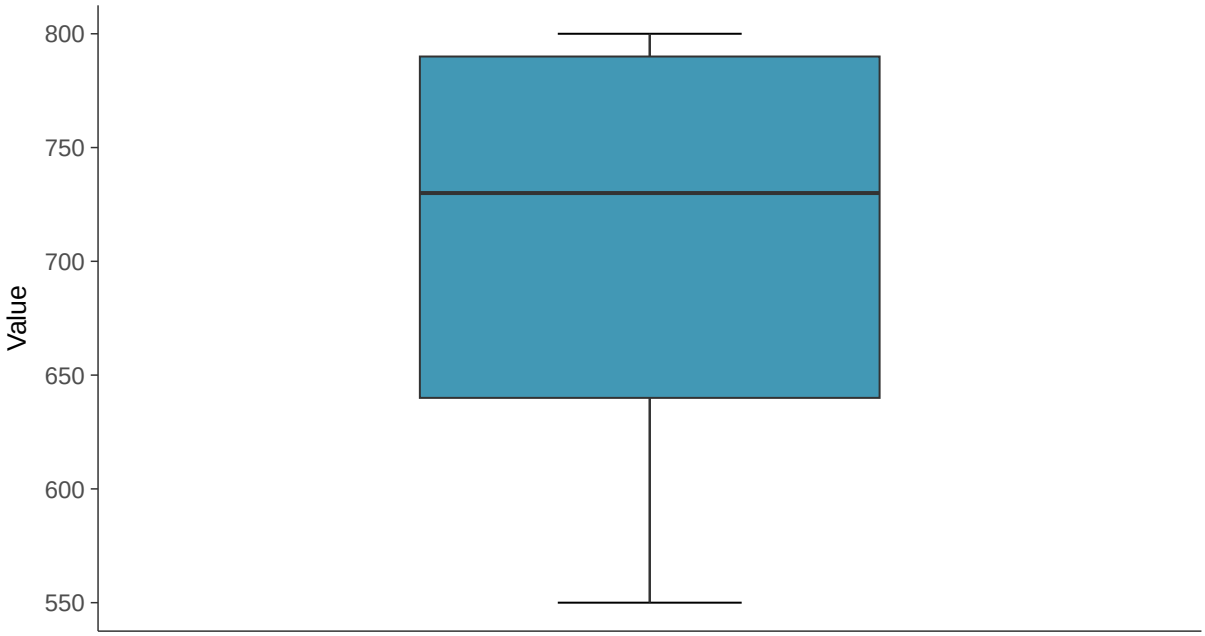
ID: 2_27_4_126





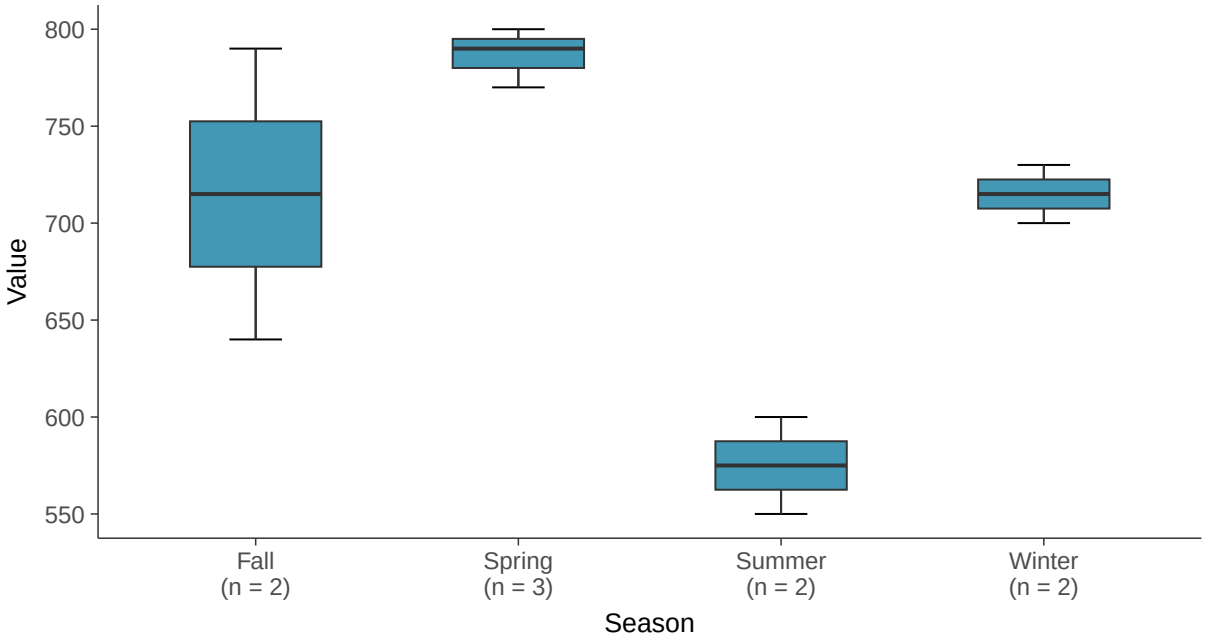
Boxplot

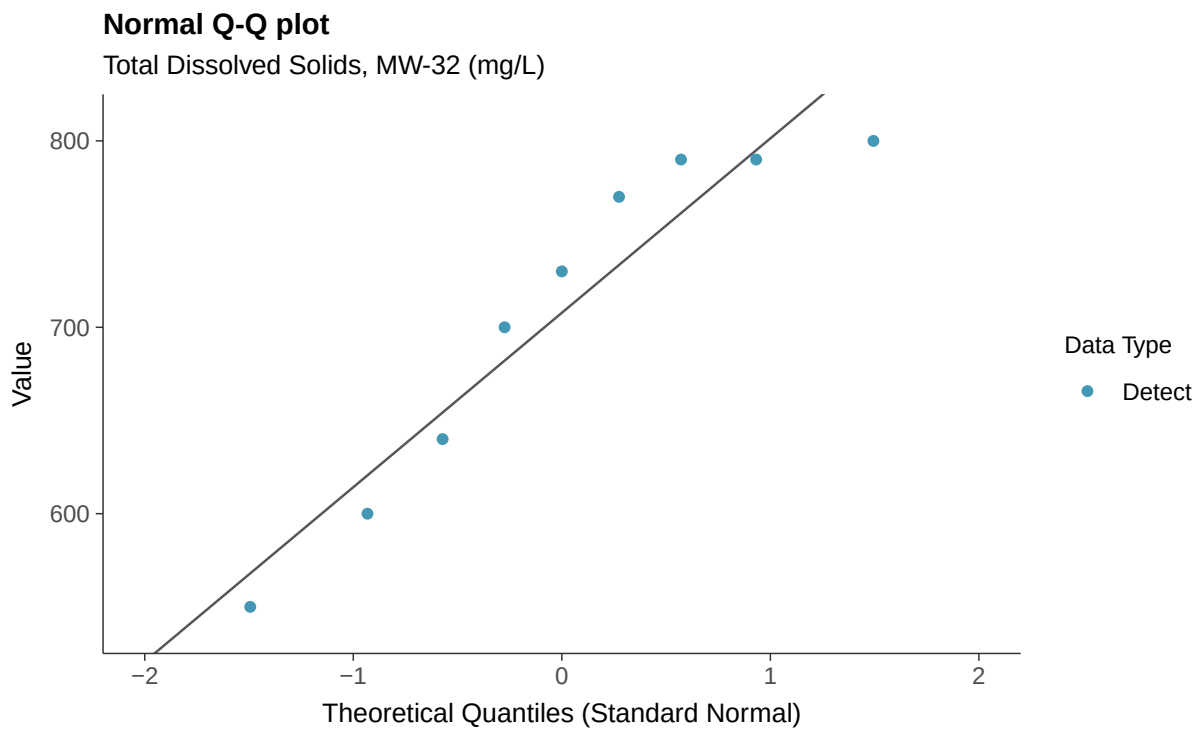
Total Dissolved Solids, MW-32 (mg/L)

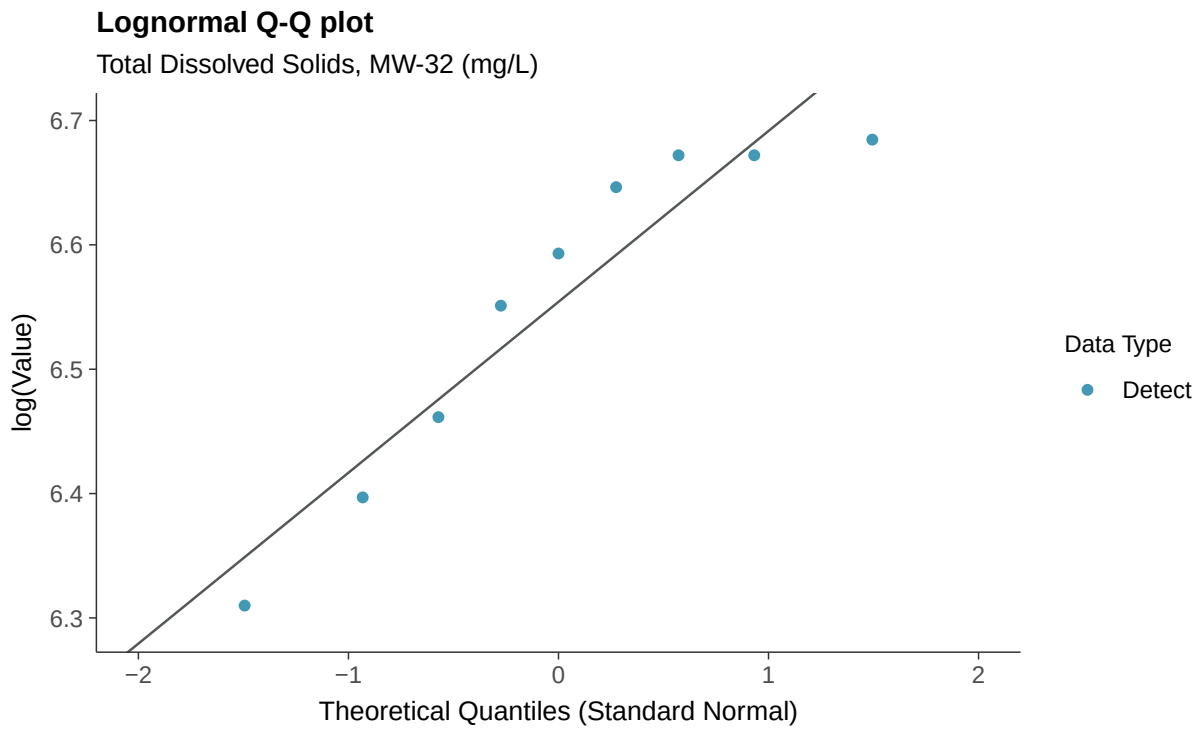


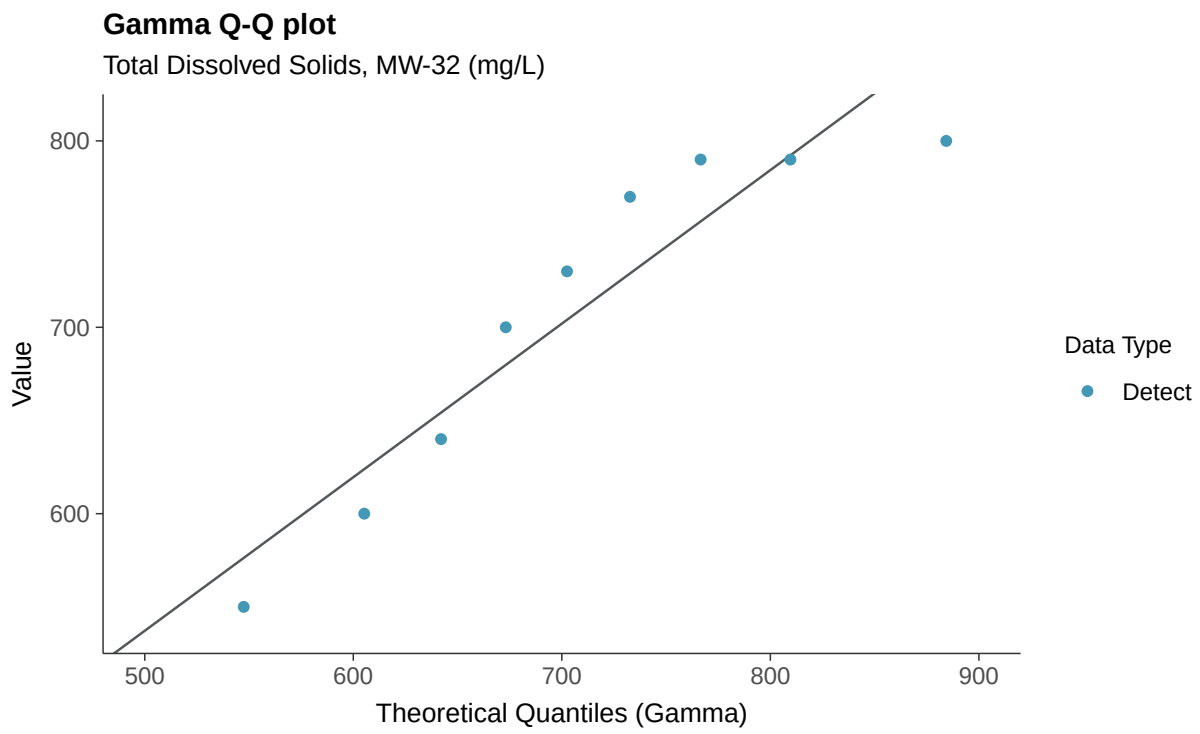
Boxplot by Season

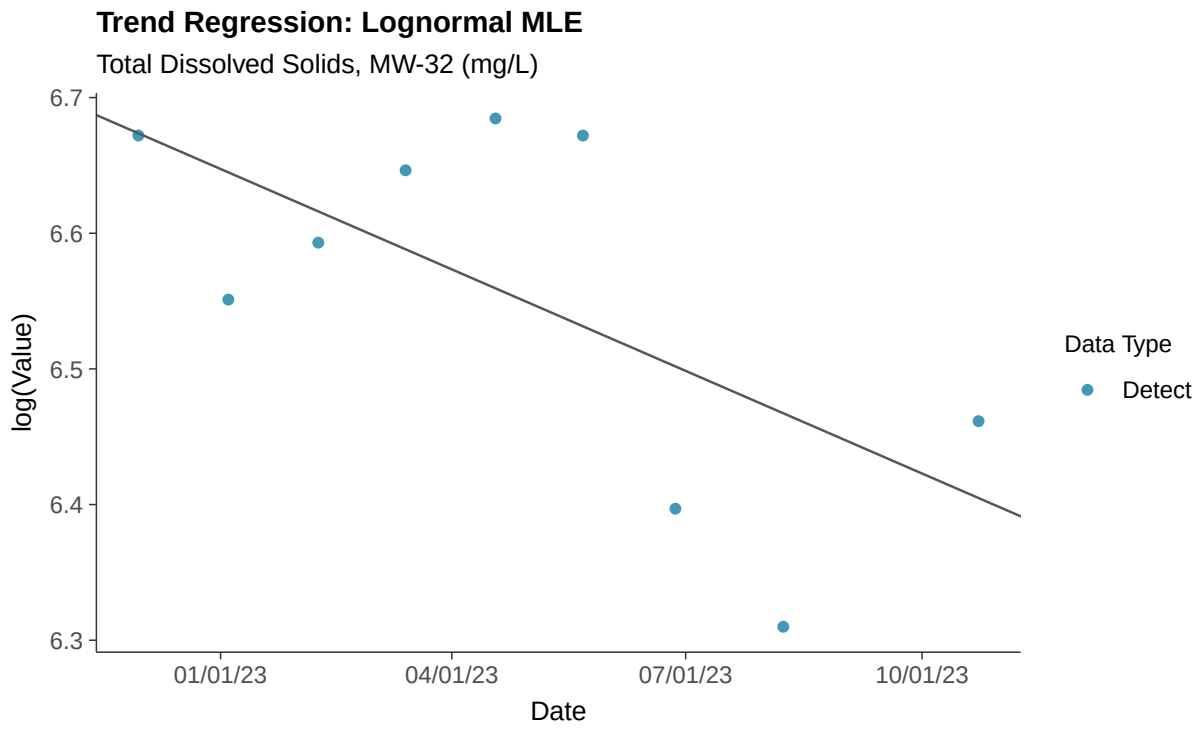
Total Dissolved Solids, MW-32 (mg/L)

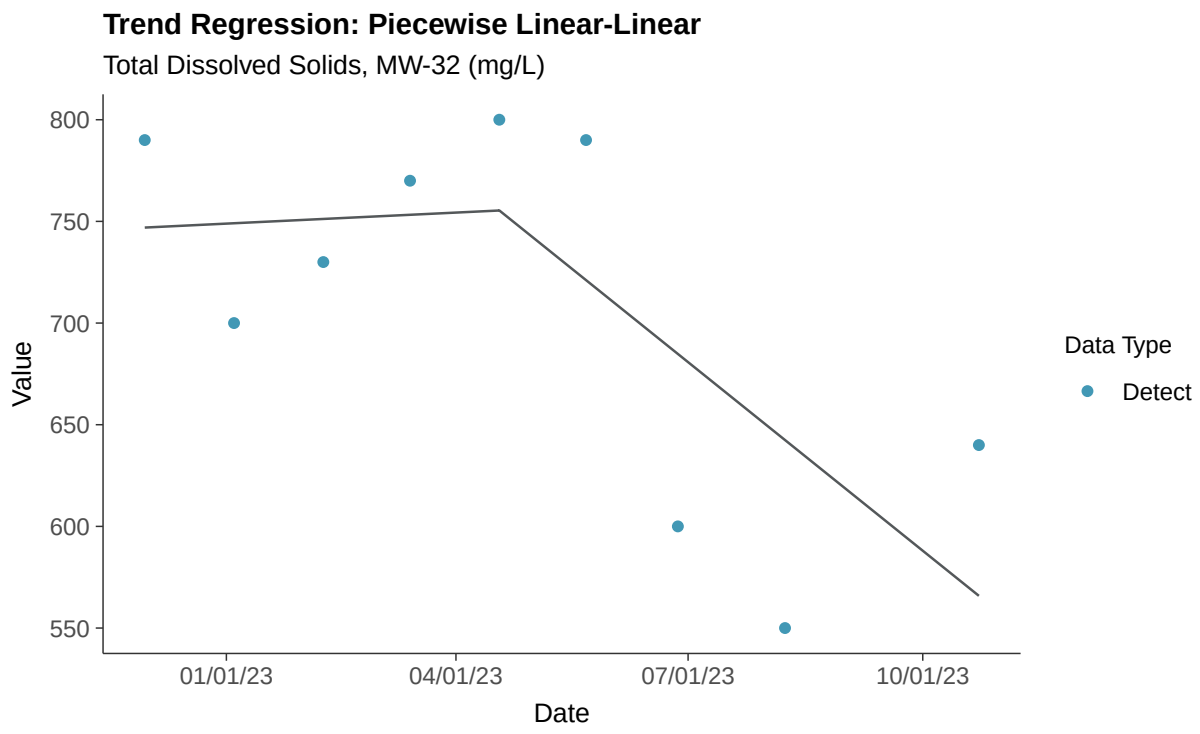



Normal Q-Q plot
Total Dissolved Solids, MW-32 (mg/L)
Value
800
700
600
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Total Dissolved Solids, MW-32 (mg/L)
log(Value)
6.7
6.6
6.5
6.4
6.3
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

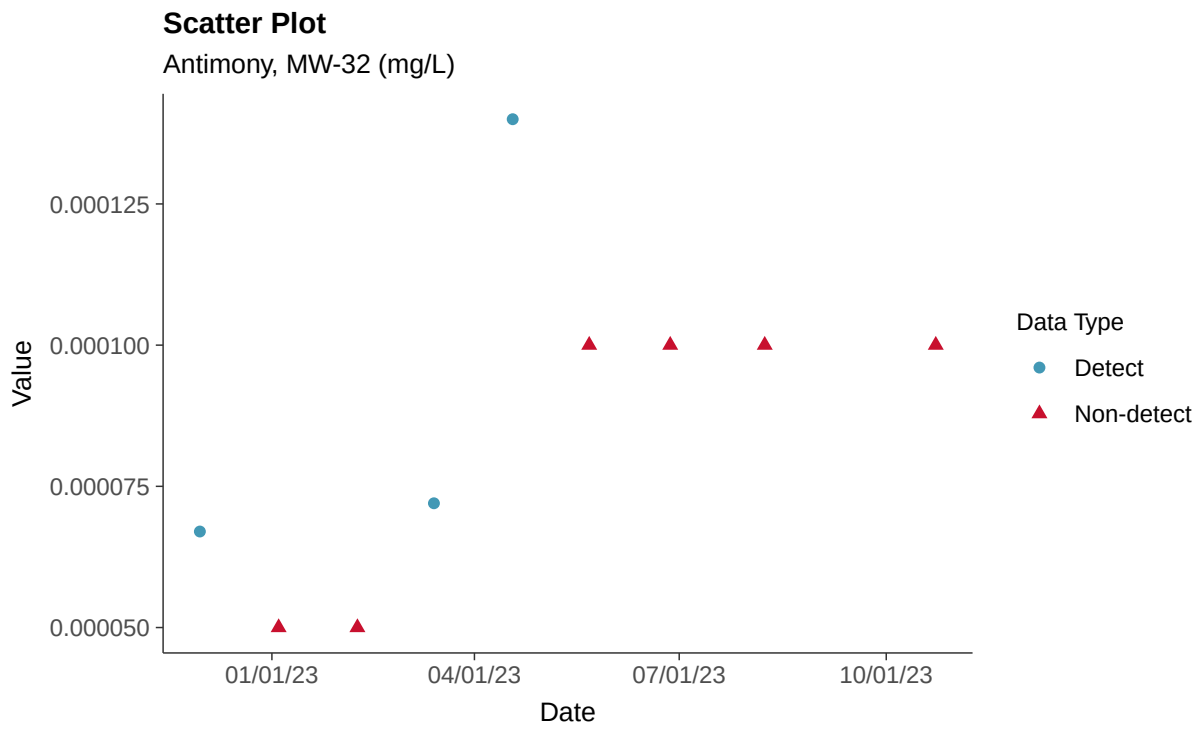

Gamma Q-Q plot
Total Dissolved Solids, MW-32 (mg/L)
Value
800
700
600
500
600
700
800
900
Theoretical Quantiles (Gamma)
Data Type
Detect

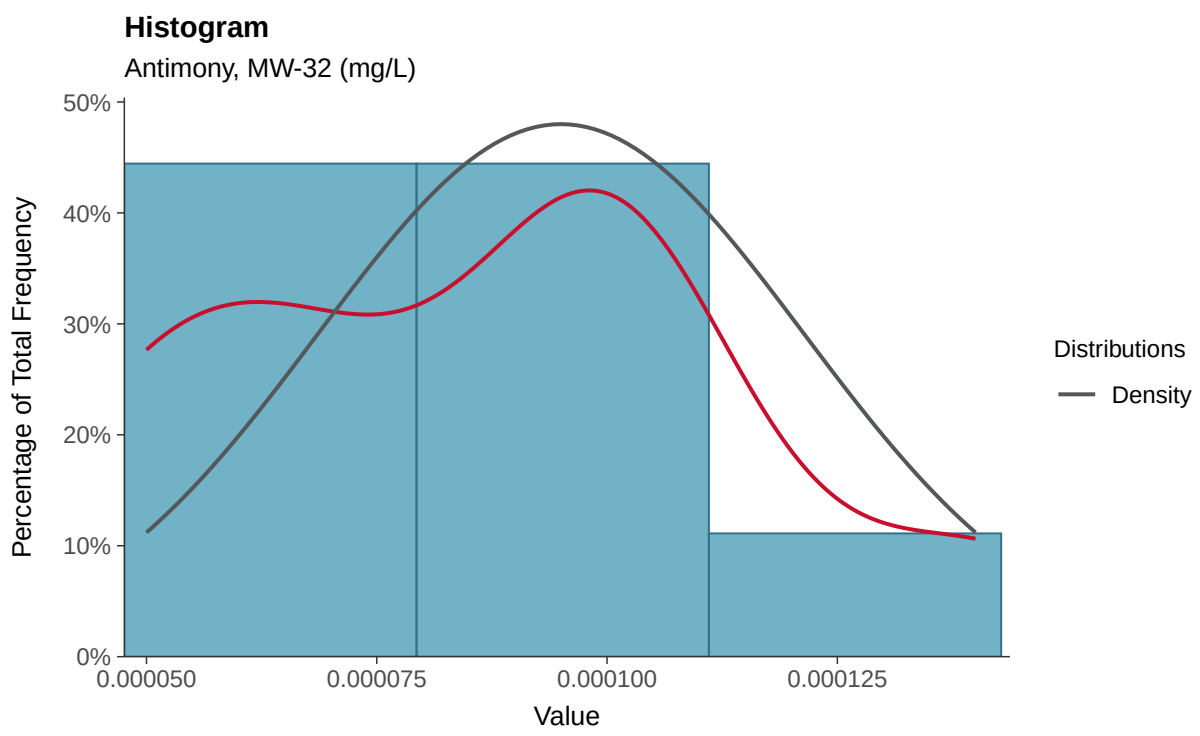

Trend Regression: Lognormal MLE
Total Dissolved Solids, MW-32 (mg/L)
log(Value)
6.7
6.6
6.5
6.4
6.3
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Total Dissolved Solids, MW-32 (mg/L)
800
750
700
650
600
550
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Antimony, MW-32

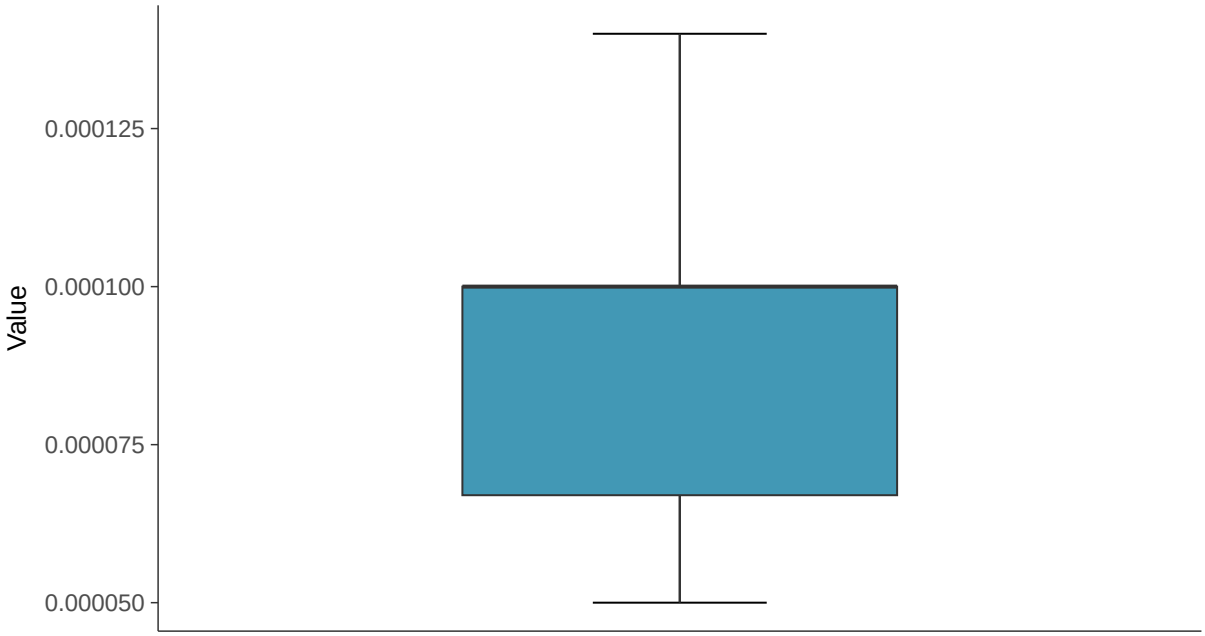
ID: 2_27_5_101





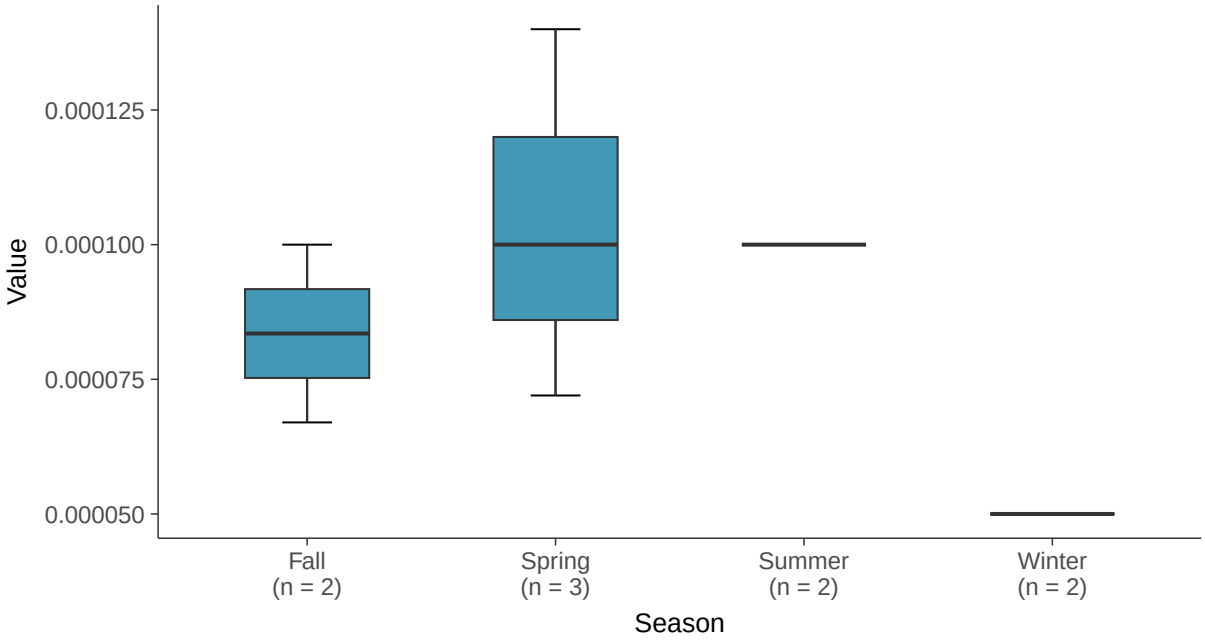
Boxplot

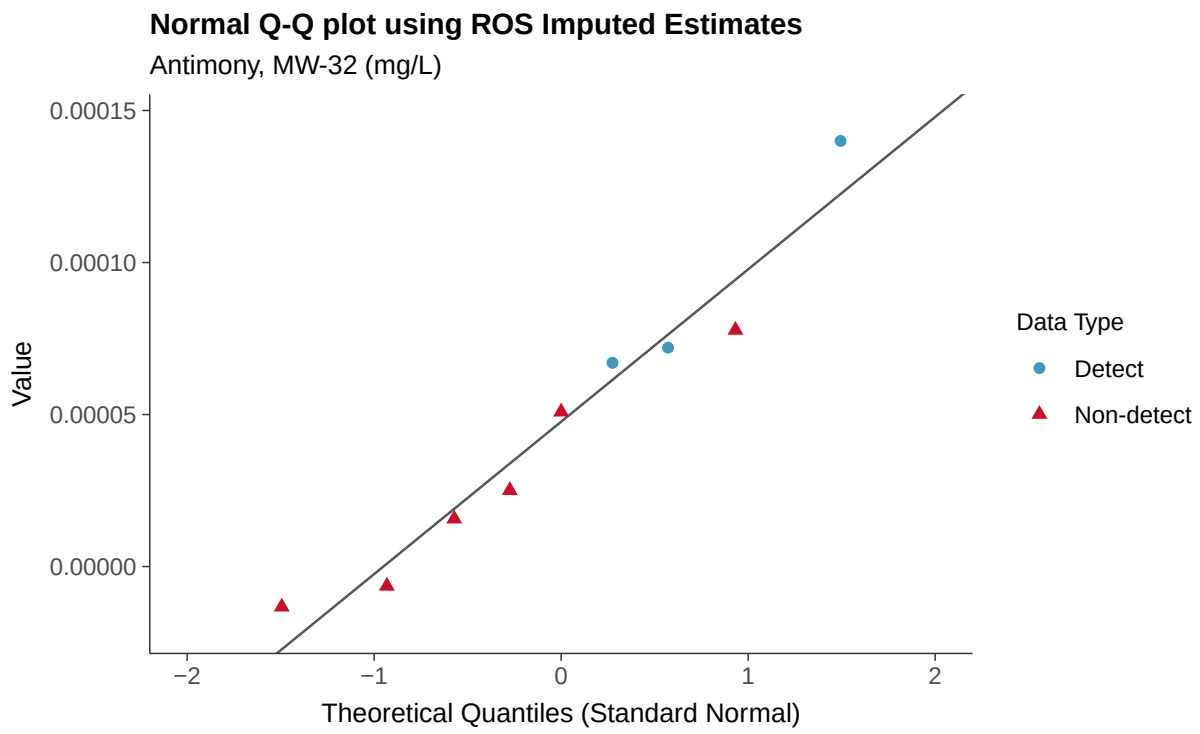
Antimony, MW-32 (mg/L)

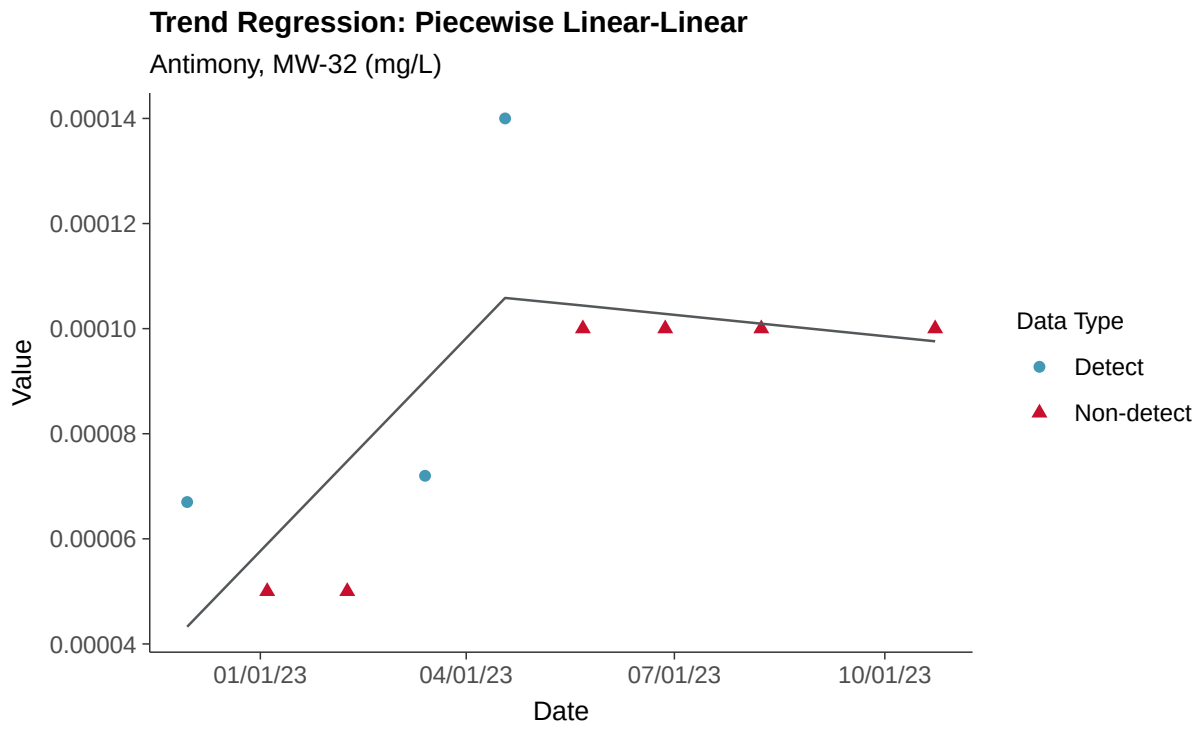


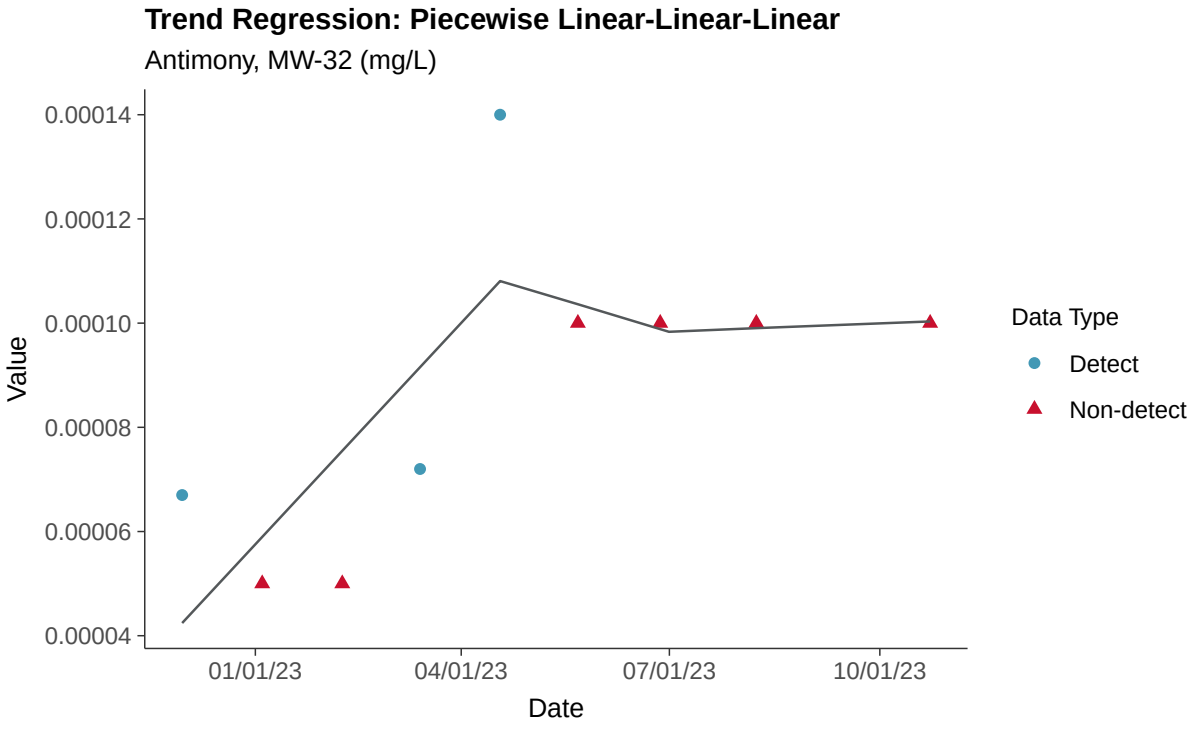
Boxplot by Season

Antimony, MW-32 (mg/L)



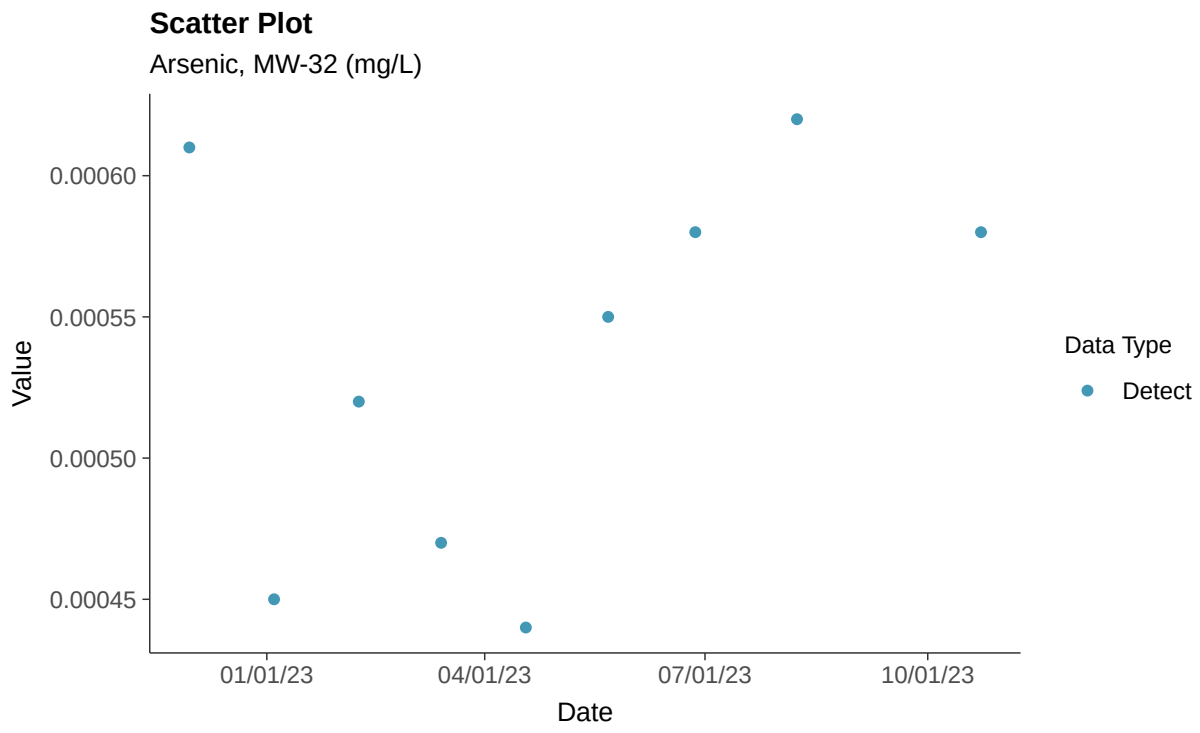

Normal Q-Q plot using ROS Imputed Estimates
Antimony, MW-32 (mg/L)
Value
0.00015
0.00010
0.00005
0.00000
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

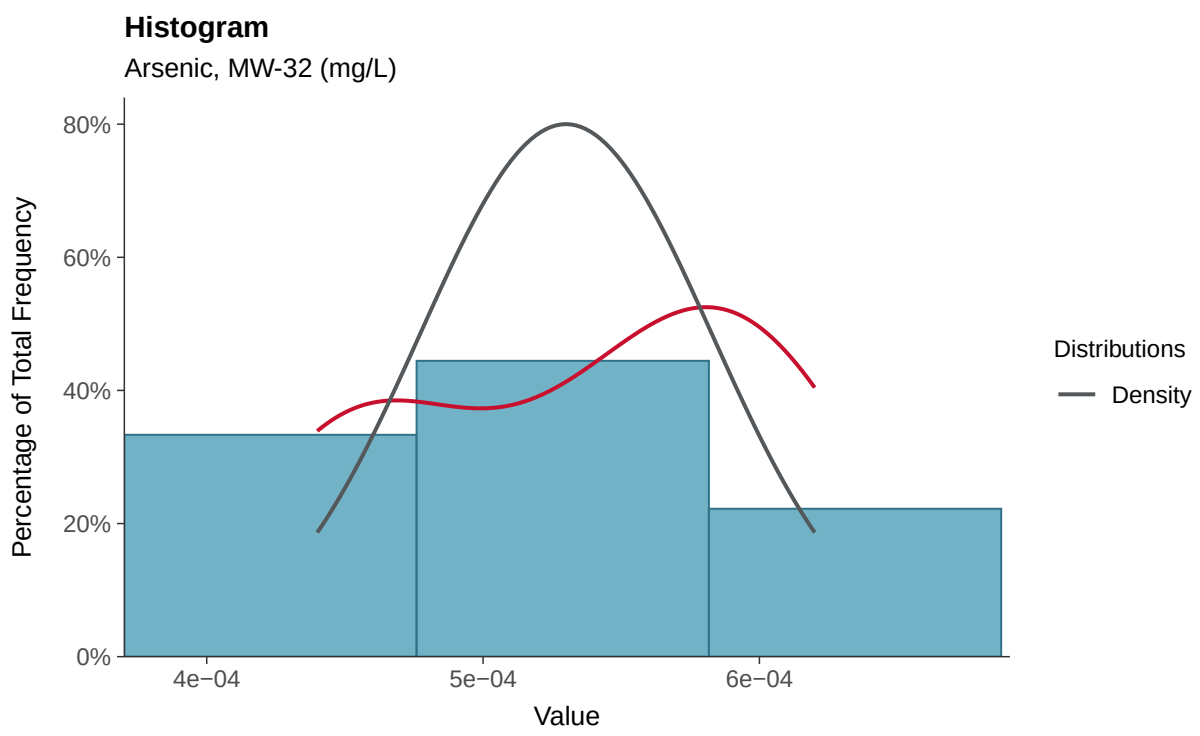

Trend Regression: Piecewise Linear-Linear
Antimony, MW-32 (mg/L)
Value
0.00014
0.00012
0.00010
0.00008
0.00006
0.00004
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Antimony, MW-32 (mg/L)
0.00014
0.00012
0.00010
0.00008
0.00006
0.00004
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Arsenic, MW-32

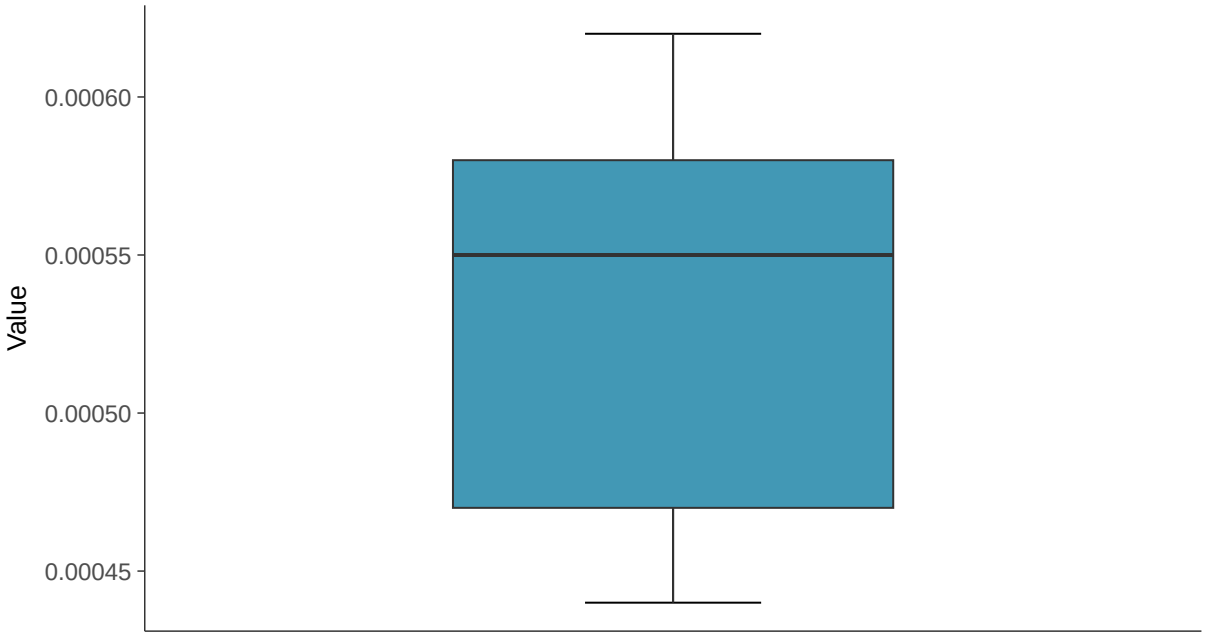
ID: 2_27_5_102





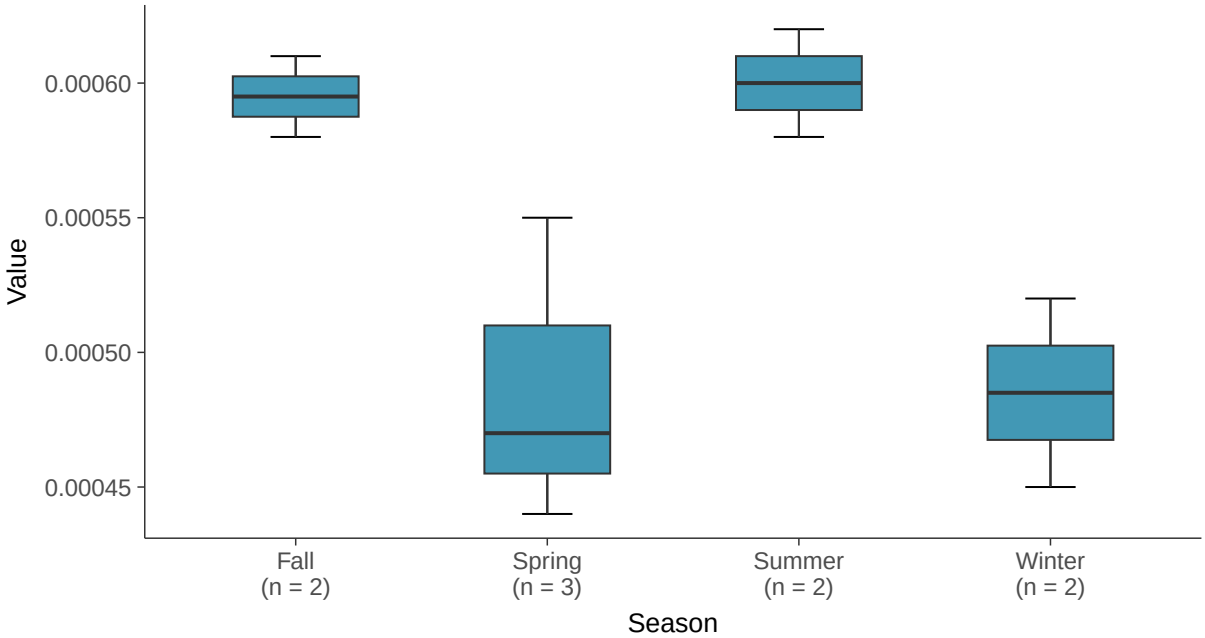
Boxplot

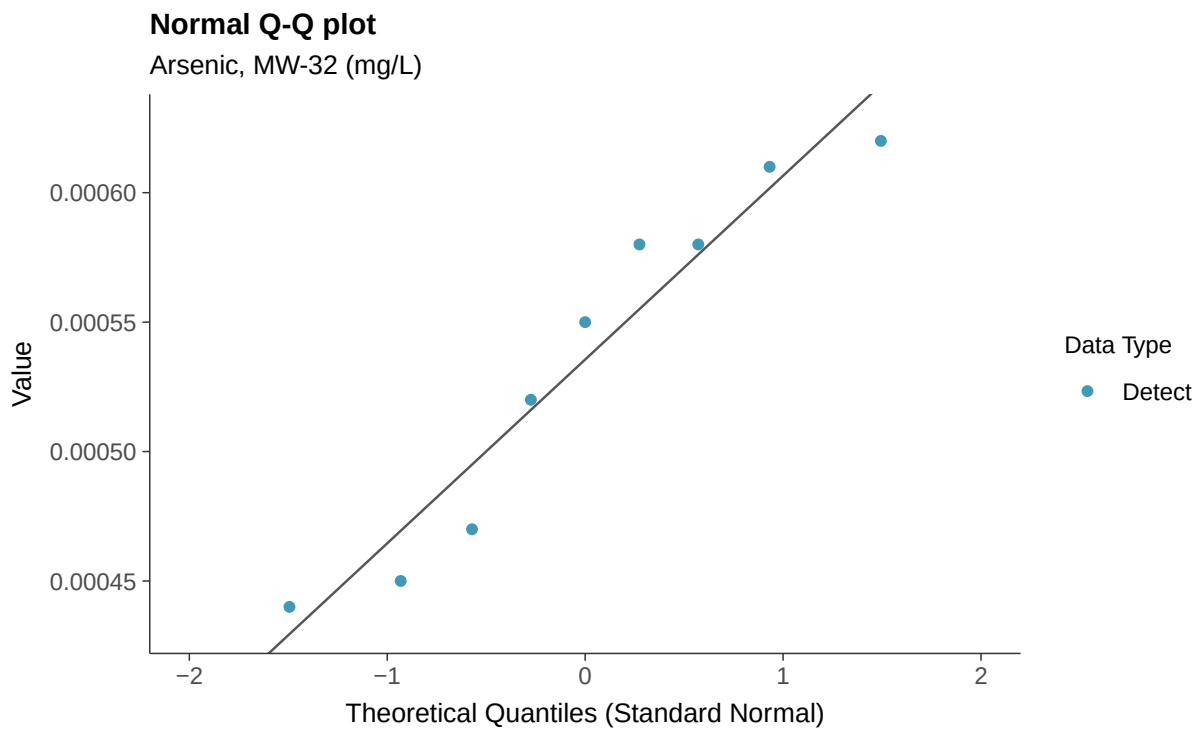
Arsenic, MW-32 (mg/L)

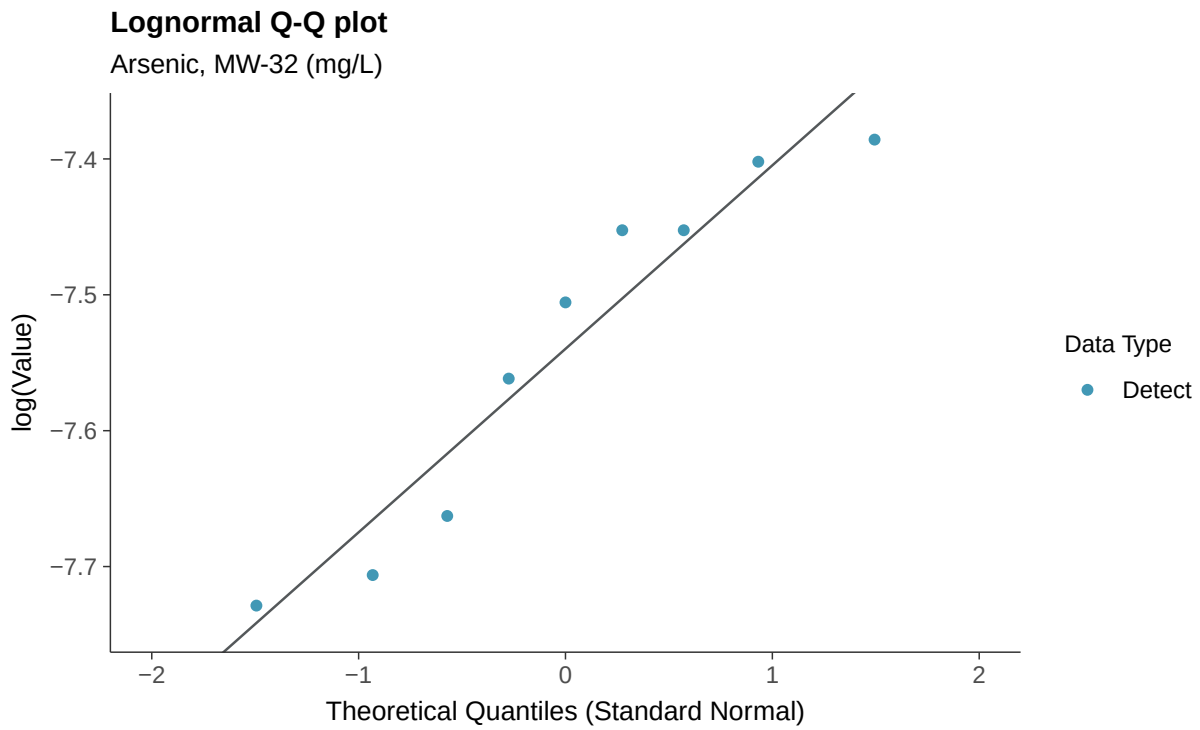


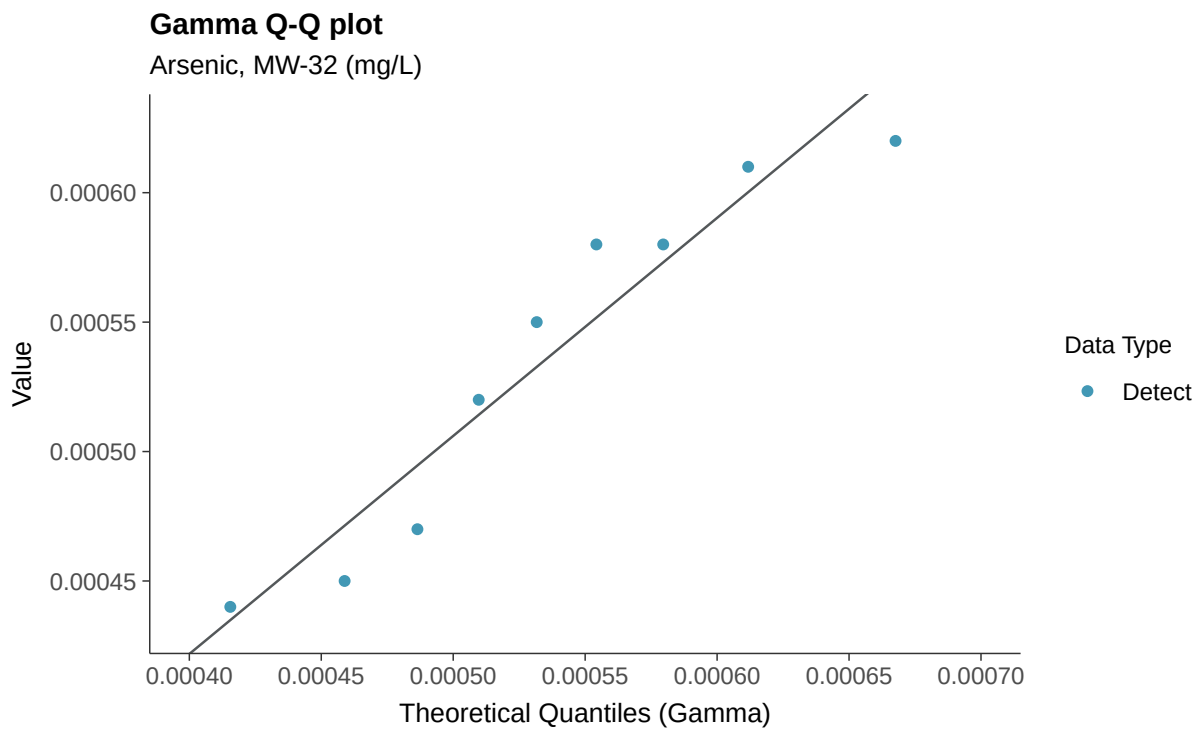
Boxplot by Season

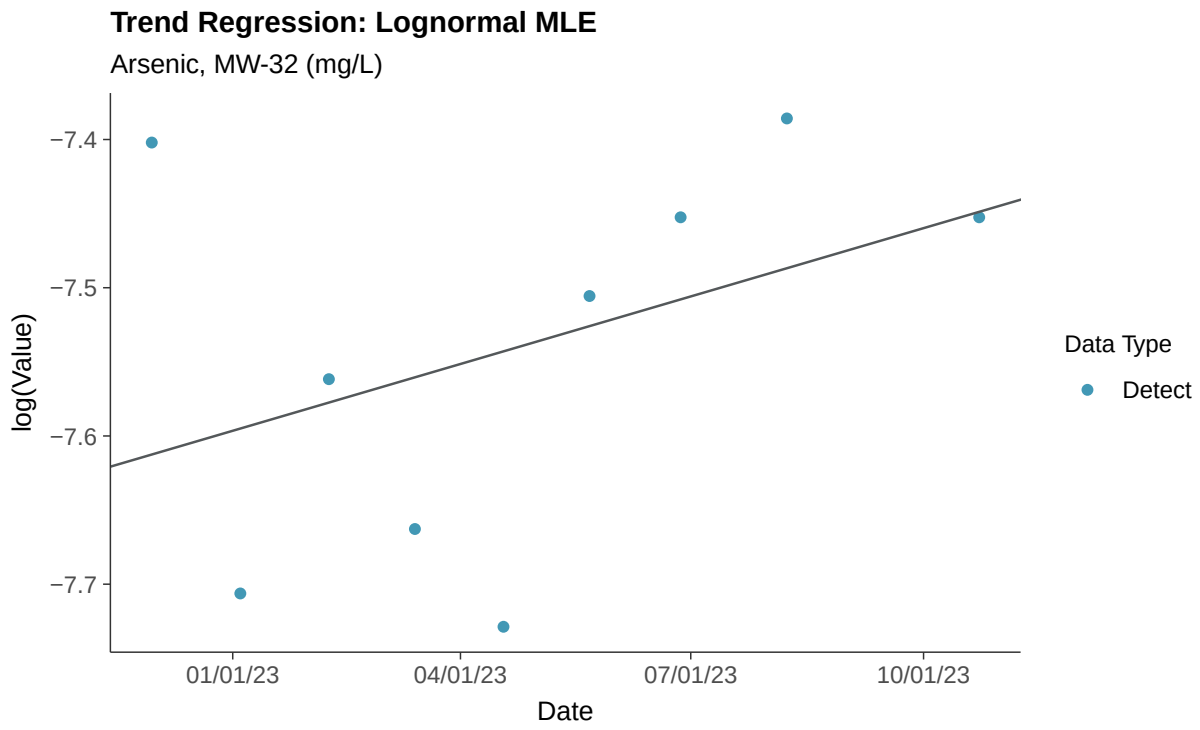
Arsenic, MW-32 (mg/L)




Normal Q-Q plot
Arsenic, MW-32 (mg/L)
Value
0.00060
0.00055
0.00050
0.00045
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

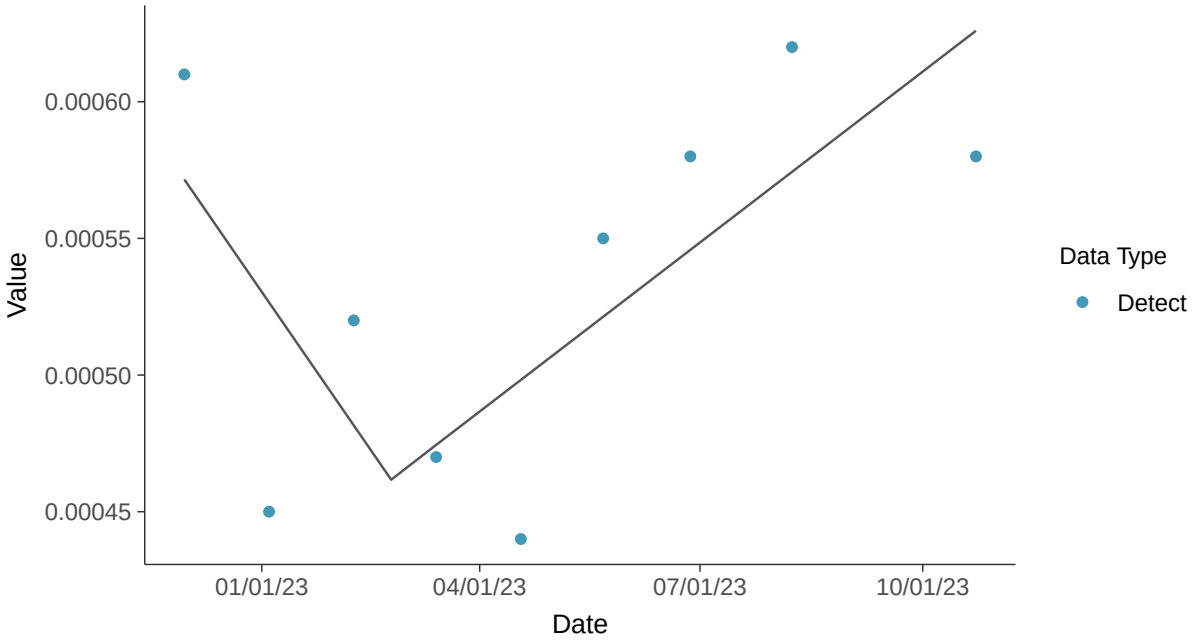

Lognormal Q-Q plot
Arsenic, MW-32 (mg/L)
log(Value)
−7.4
−7.5
−7.6
−7.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Arsenic, MW-32 (mg/L)
Value
0.00060
0.00055
0.00050
0.00045
0.00040
0.00045
0.00050
0.00055
0.00060
0.00065
0.00070
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Arsenic, MW-32 (mg/L)
log(Value)
−7.4
−7.5
−7.6
−7.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

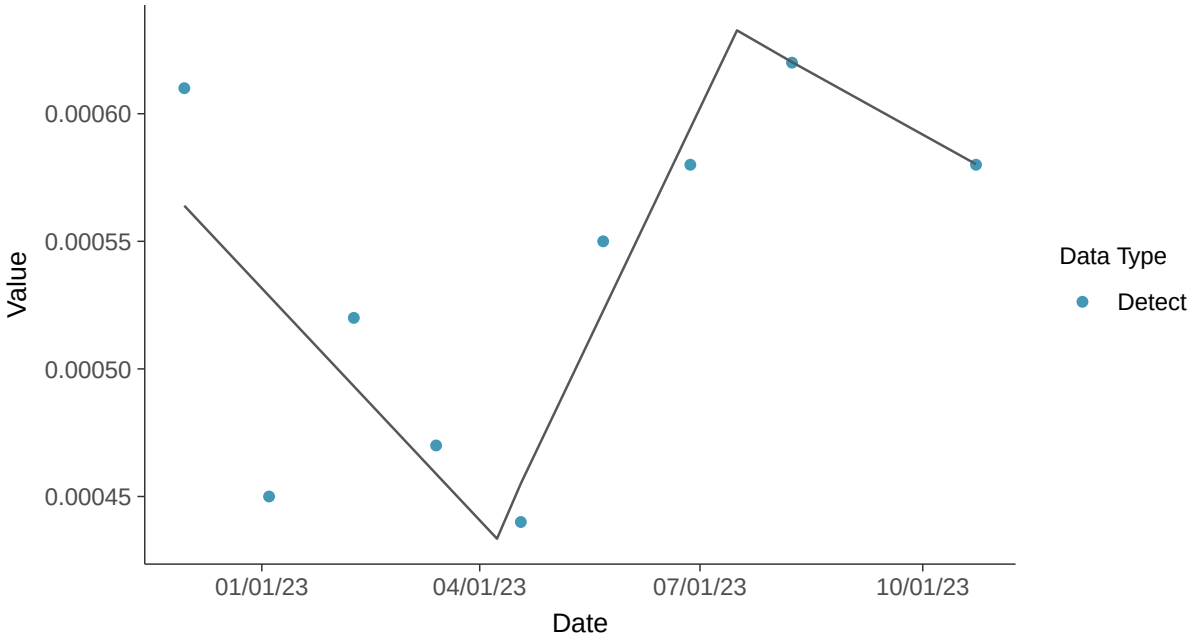
Trend Regression: Piecewise Linear-Linear

Arsenic, MW-32 (mg/L)



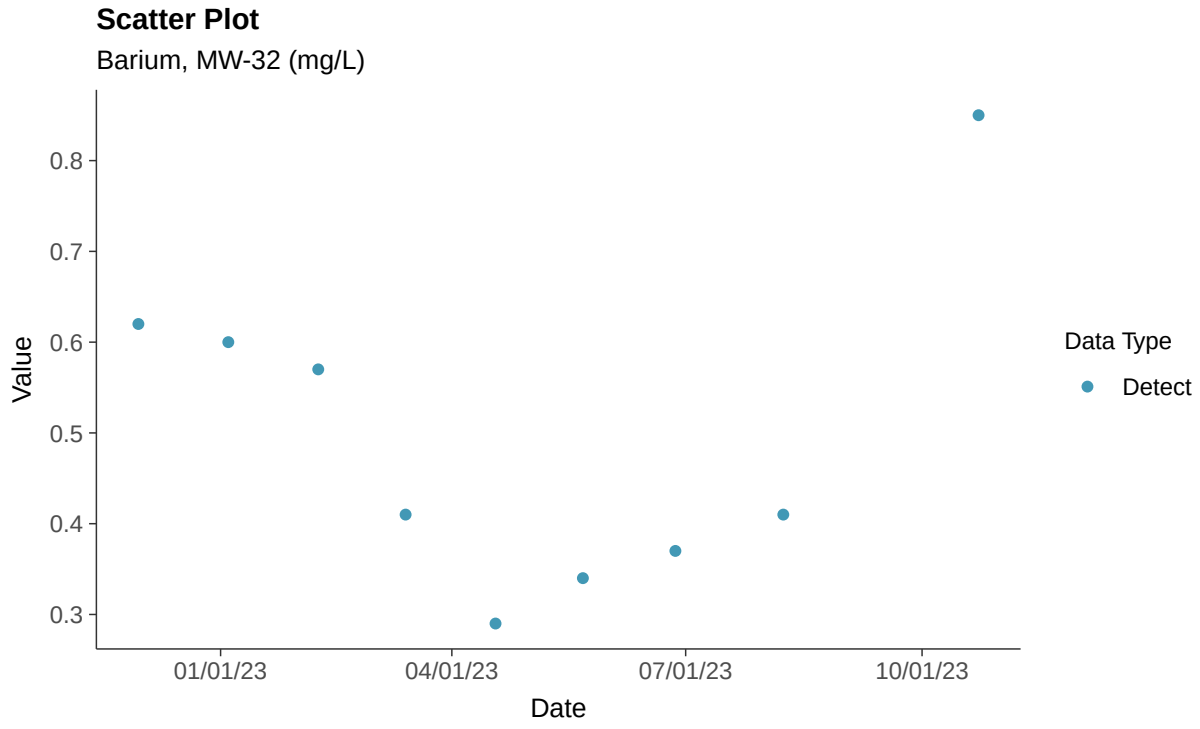
Trend Regression: Piecewise Linear-Linear-Linear

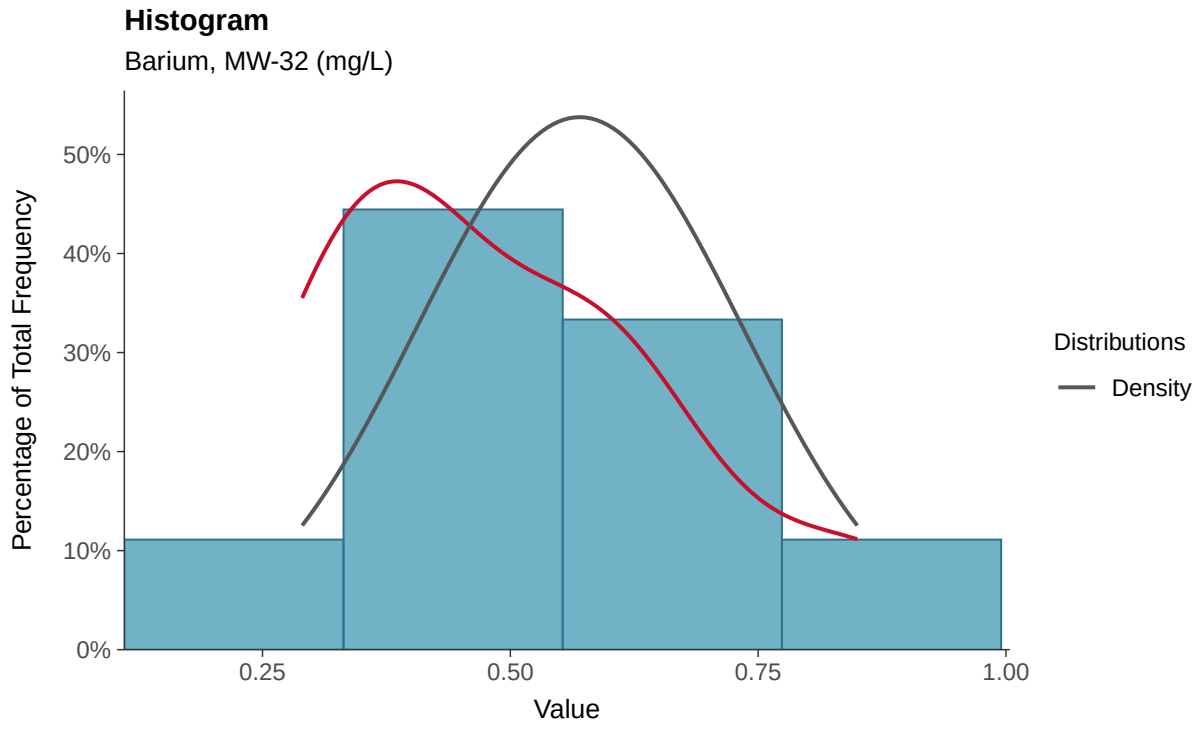
Arsenic, MW-32 (mg/L)



Appendix IV: Barium, MW-32

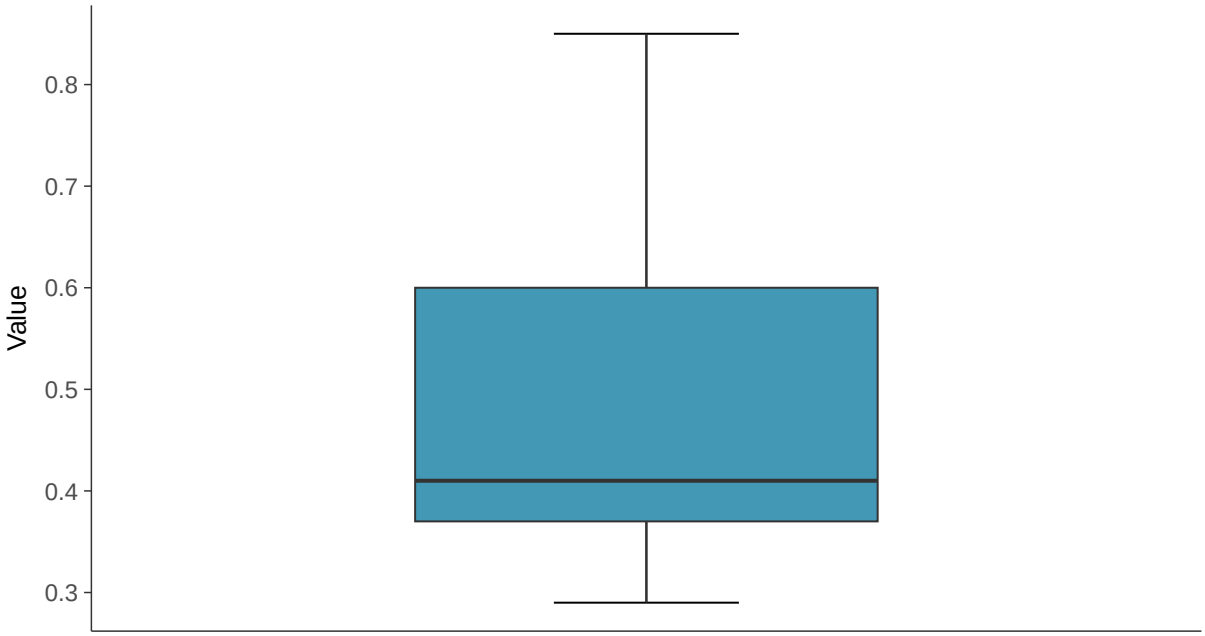
ID: 2_27_5_103





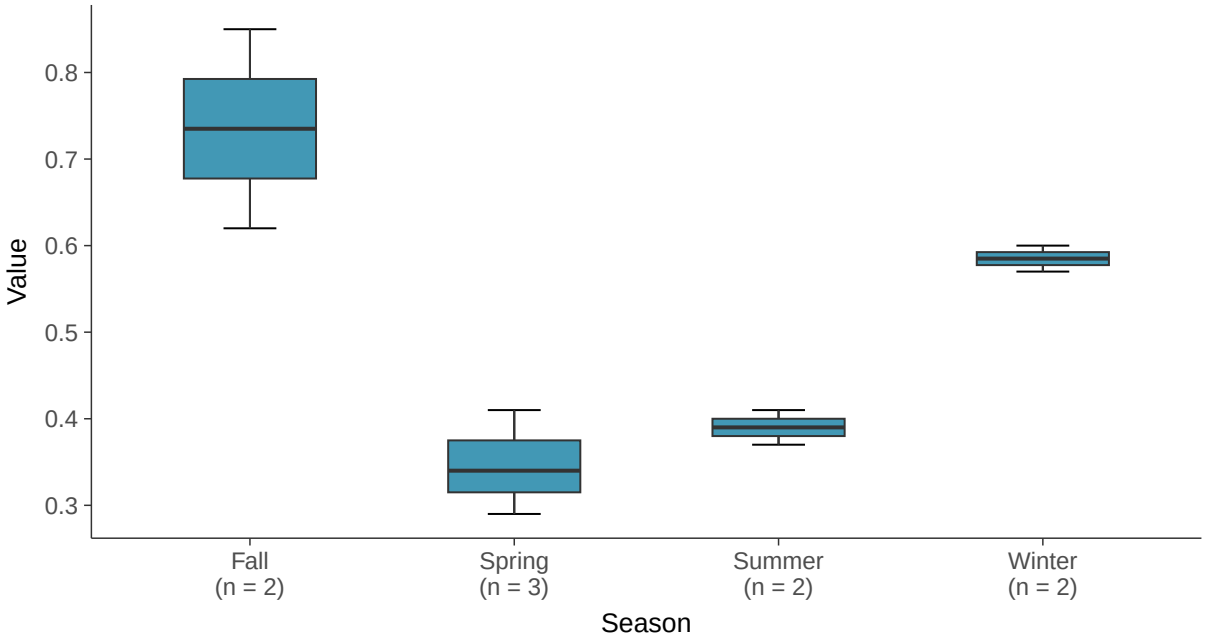
Boxplot

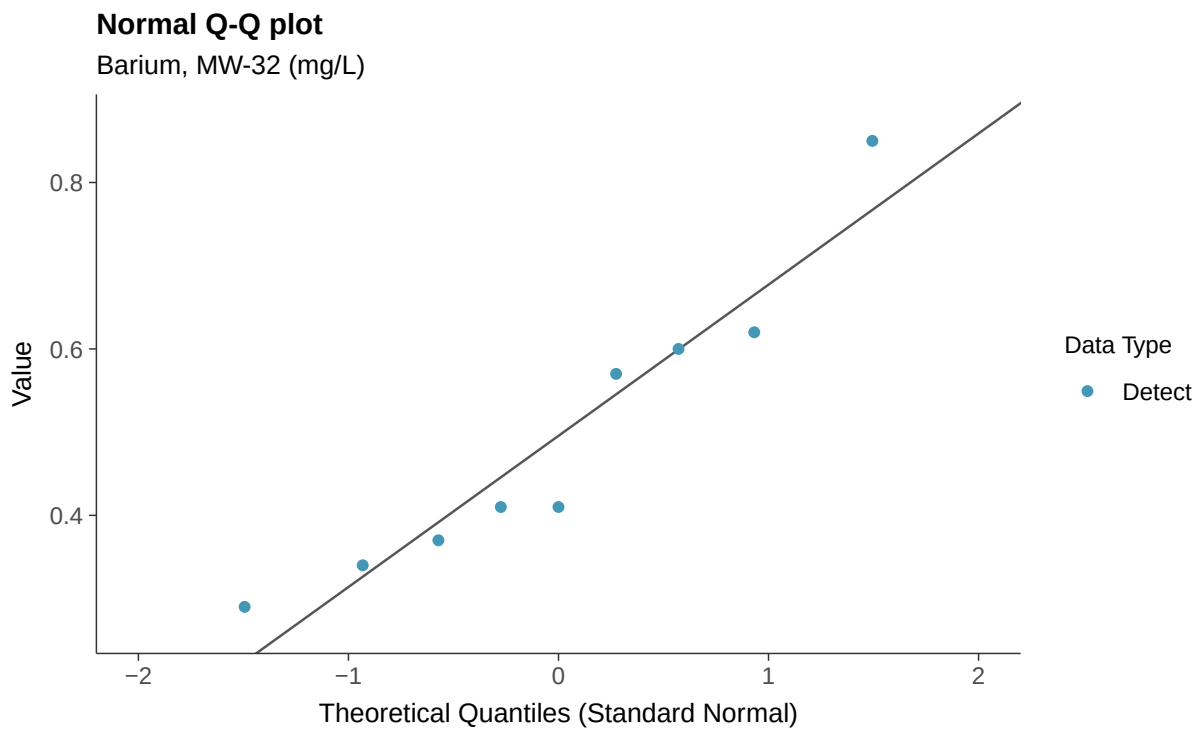
Barium, MW-32 (mg/L)

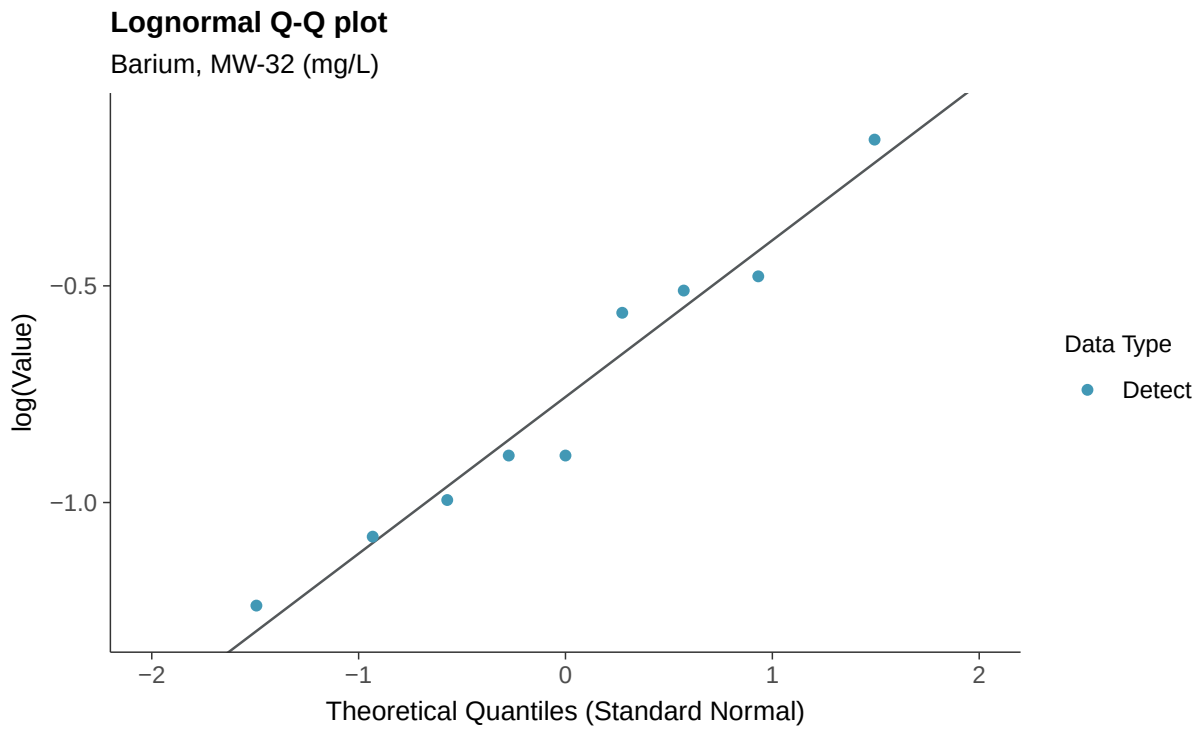


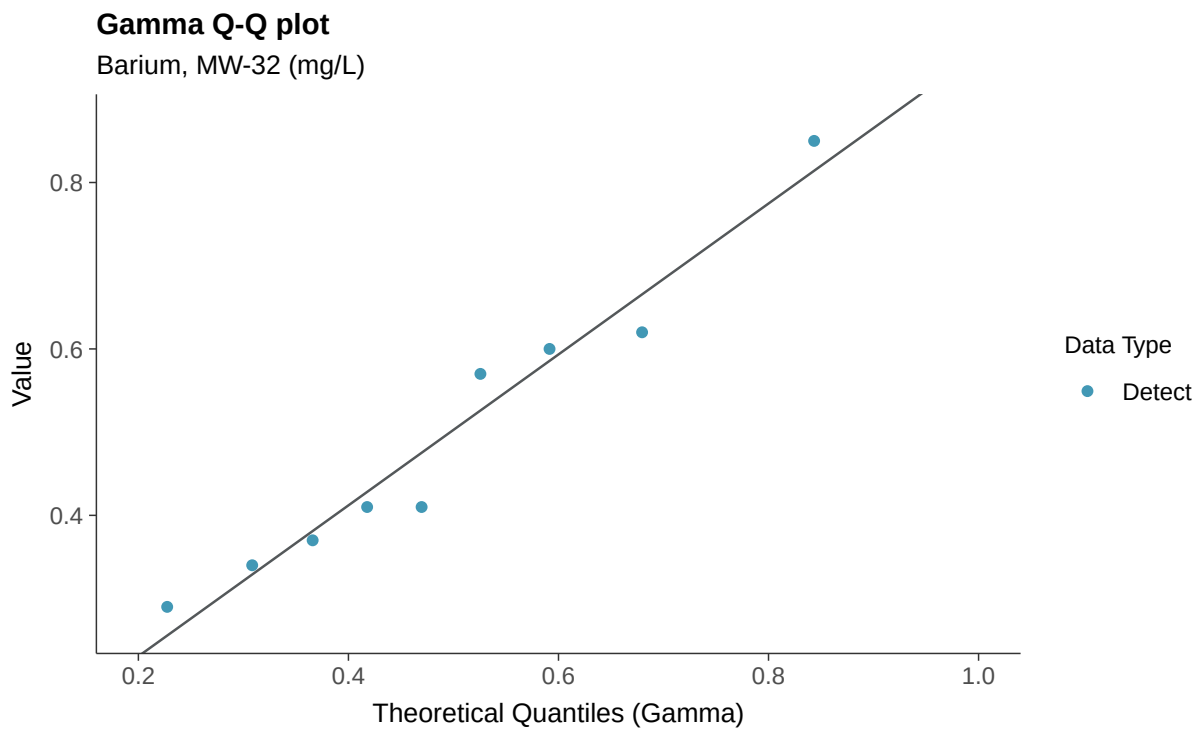
Boxplot by Season

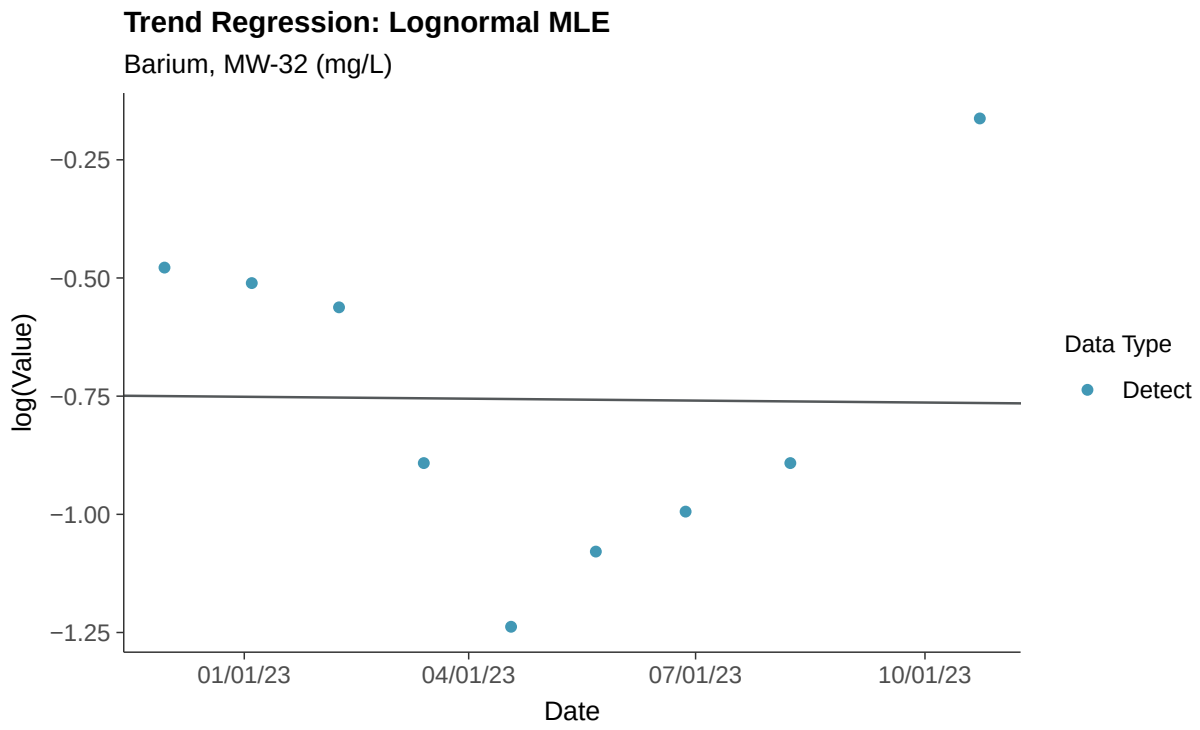
Barium, MW-32 (mg/L)




Normal Q-Q plot
Barium, MW-32 (mg/L)
Value
0.8
0.6
0.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

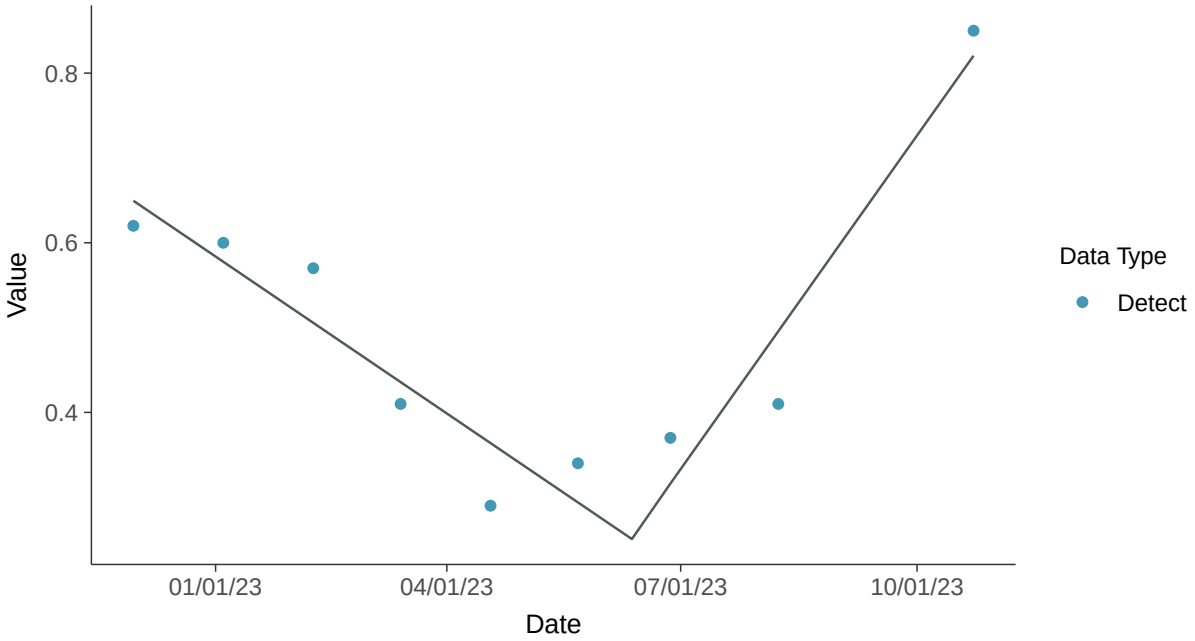

Lognormal Q-Q plot
Barium, MW-32 (mg/L)
log(Value)
−0.5
−1.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Barium, MW-32 (mg/L)
Value
0.8
0.6
0.4
0.2
0.4
0.6
0.8
1.0
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Barium, MW-32 (mg/L)
log(Value)
−0.25
−0.50
−0.75
−1.00
−1.25
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

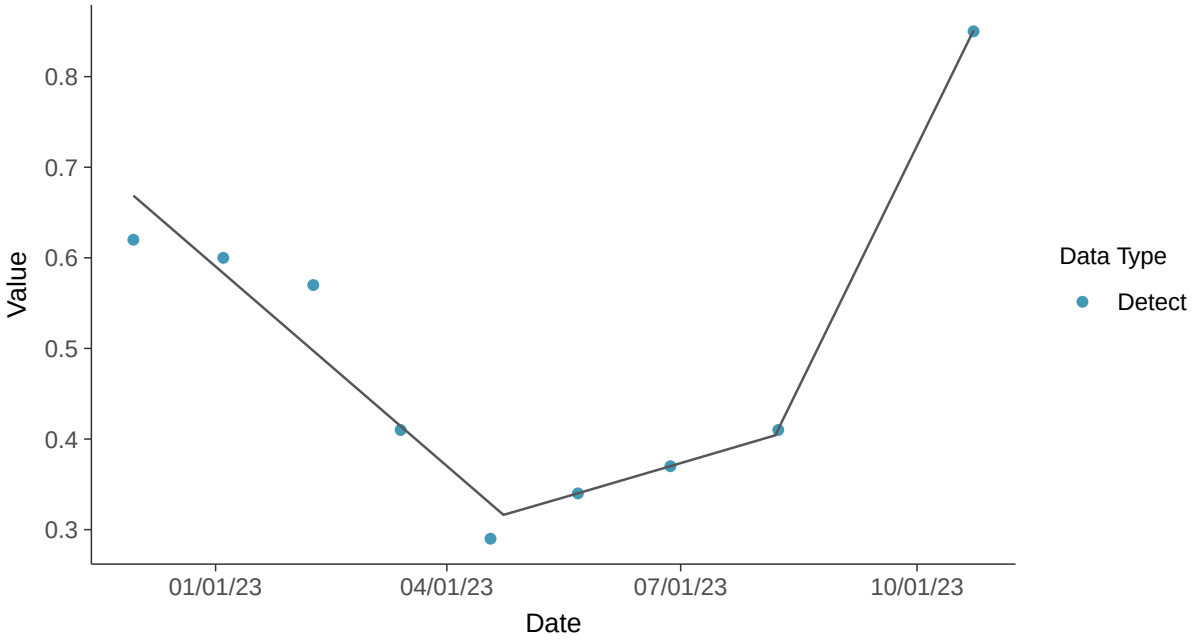
Trend Regression: Piecewise Linear-Linear

Barium, MW-32 (mg/L)



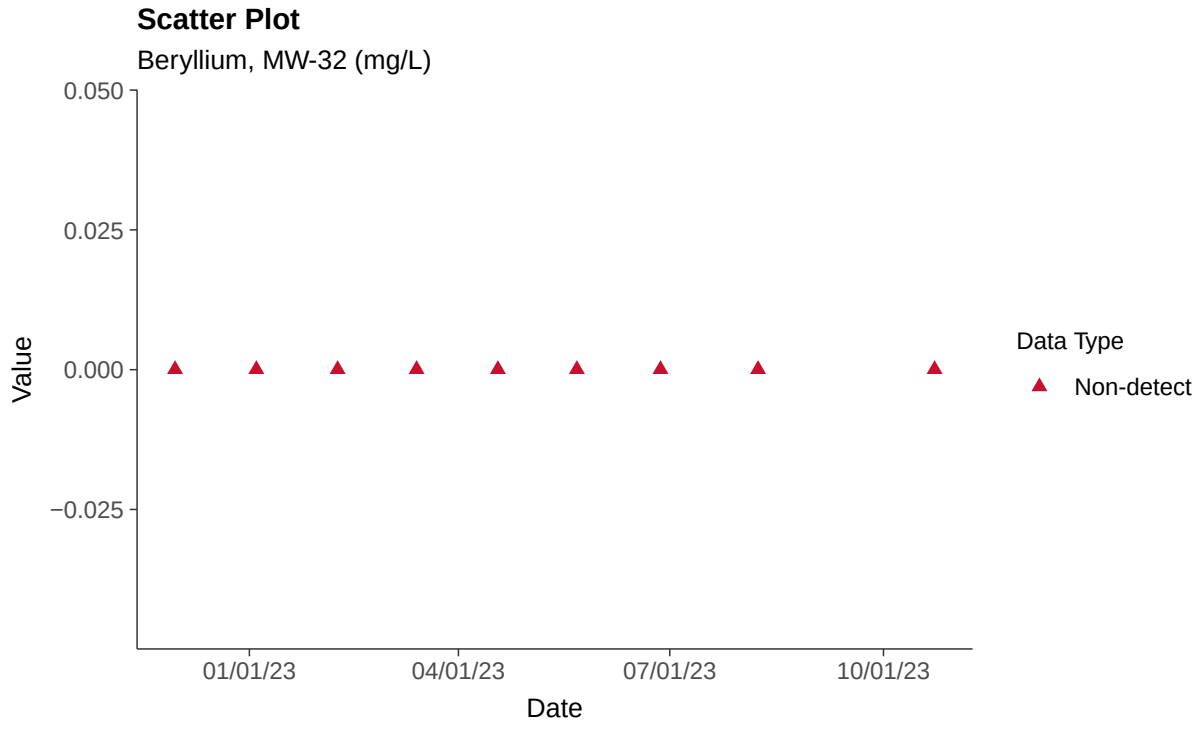
Trend Regression: Piecewise Linear-Linear-Linear

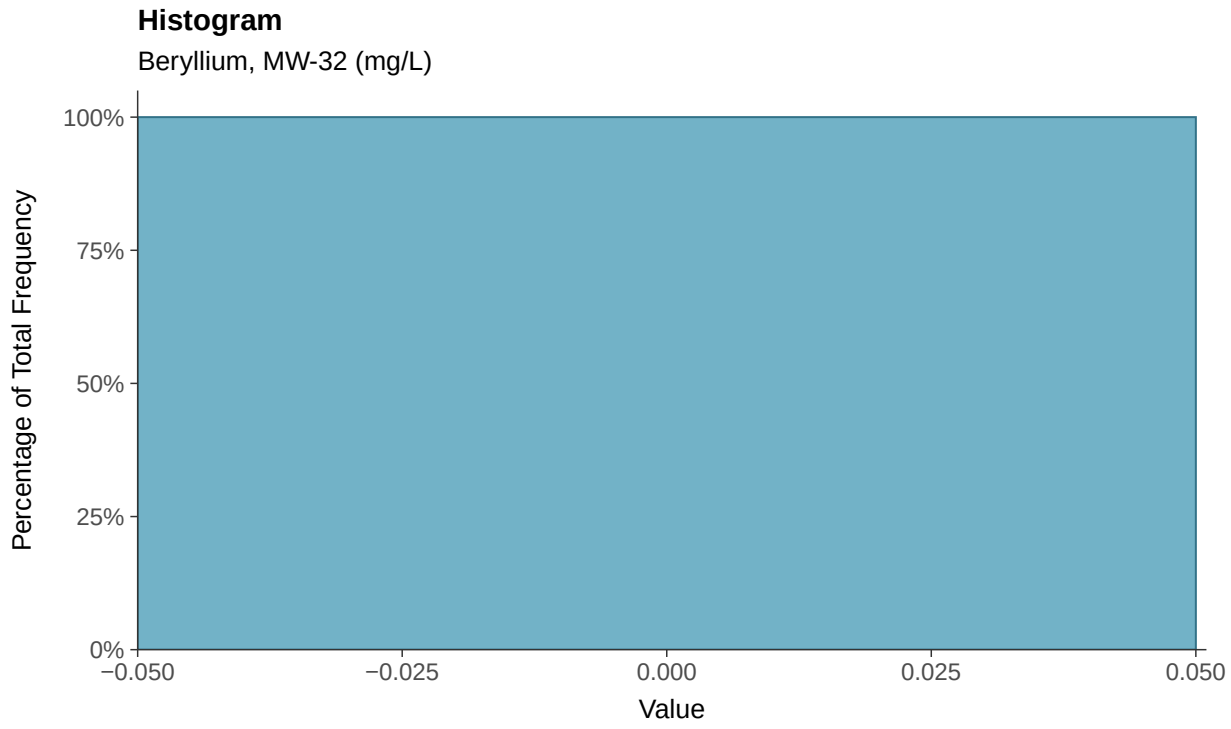
Barium, MW-32 (mg/L)

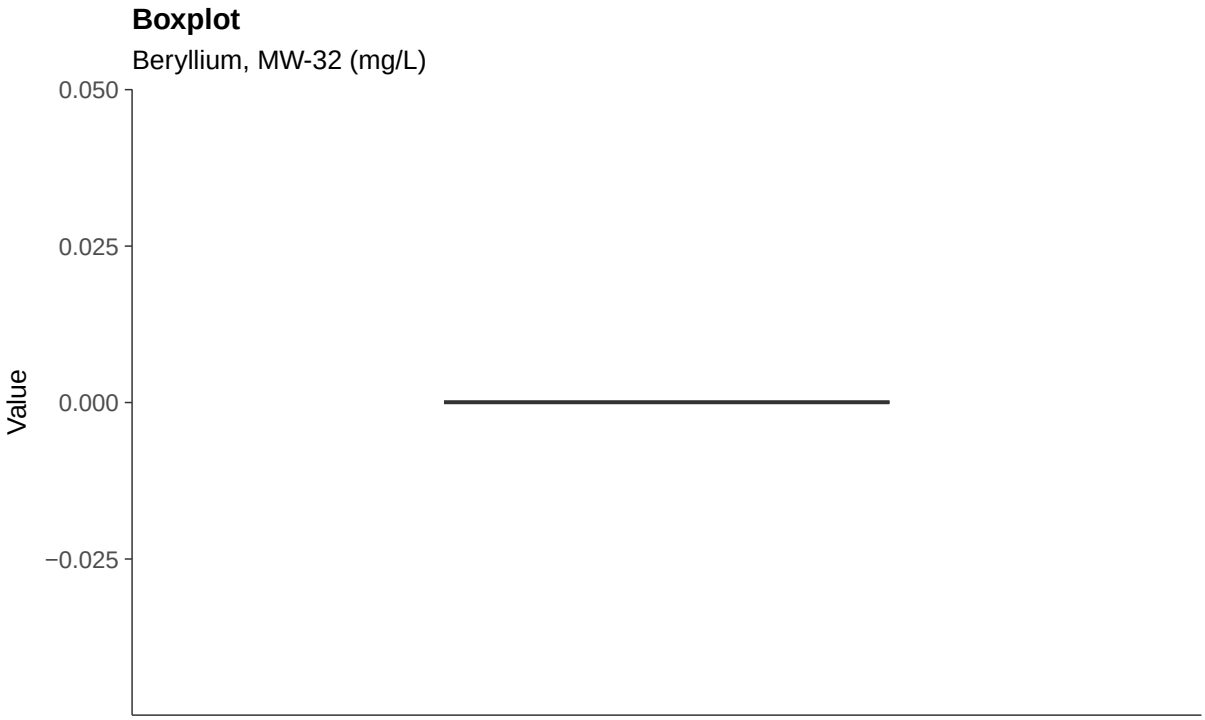


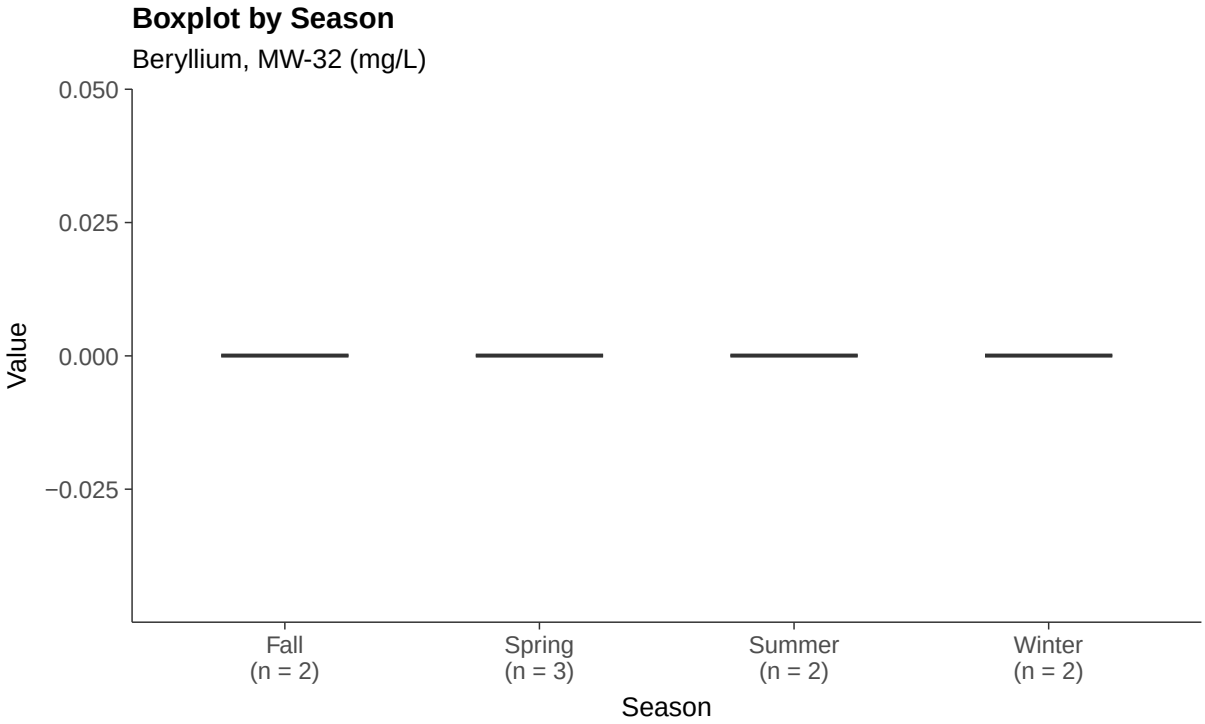
Appendix IV: Beryllium, MW-32

ID: 2_27_5_104



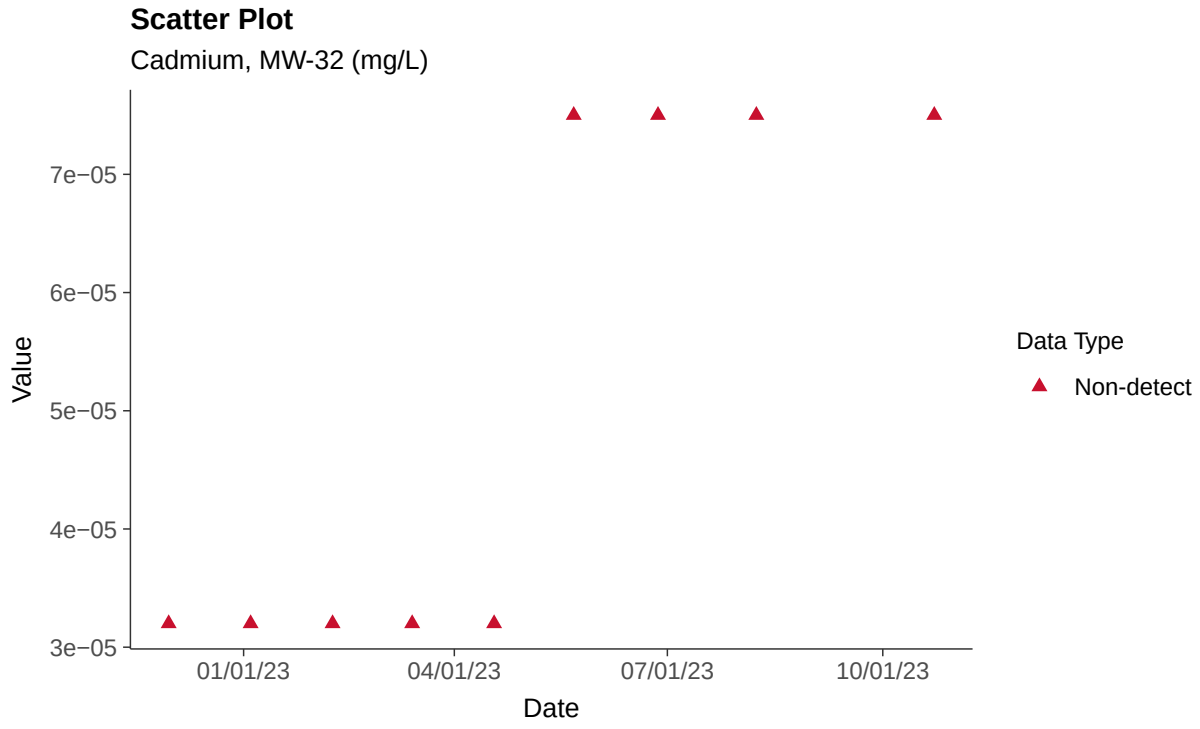


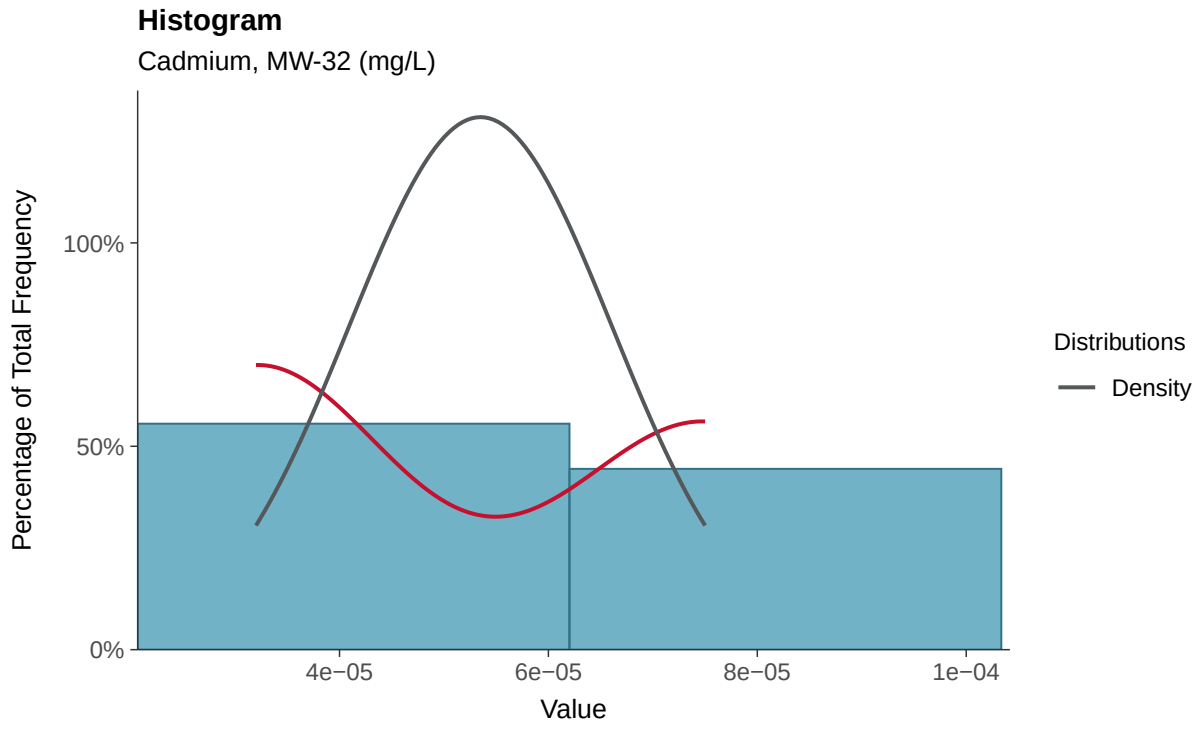

Boxplot
Beryllium, MW-32 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Beryllium, MW-32 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

Appendix IV: Cadmium, MW-32

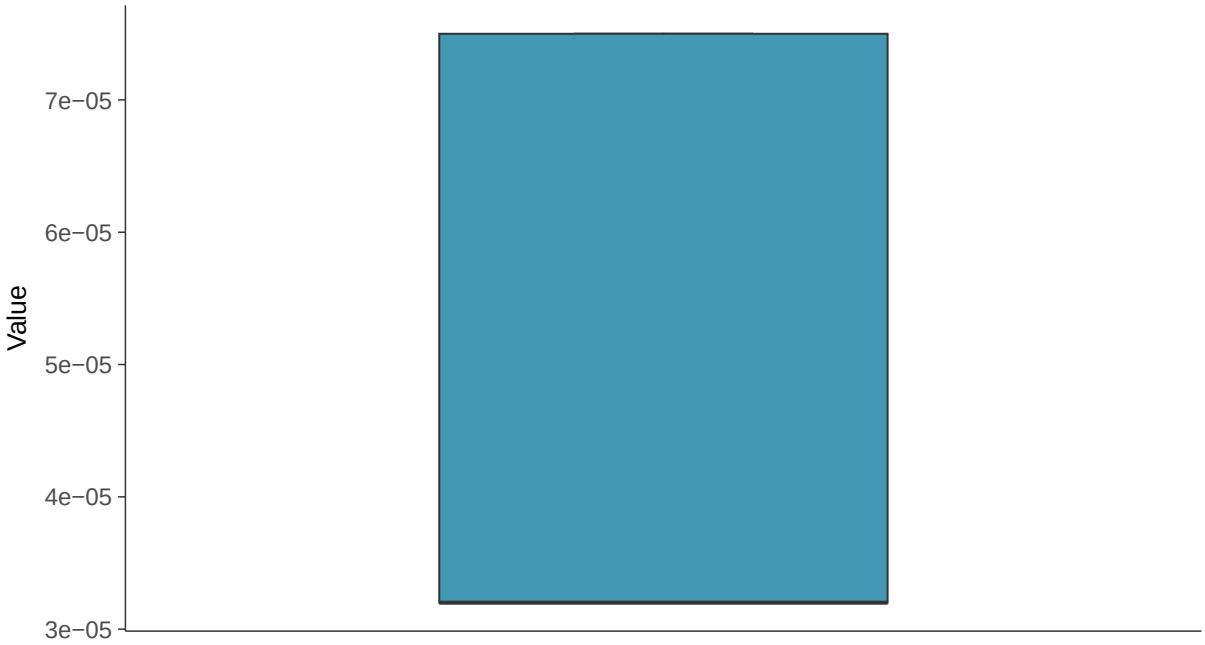
ID: 2_27_5_106





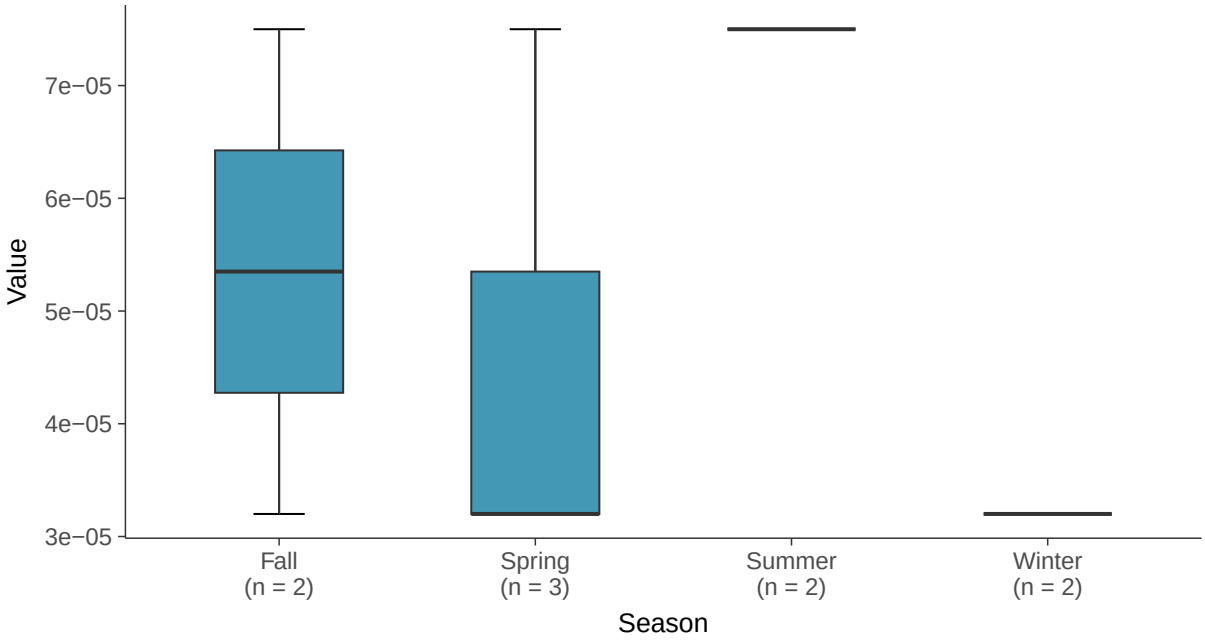
Boxplot

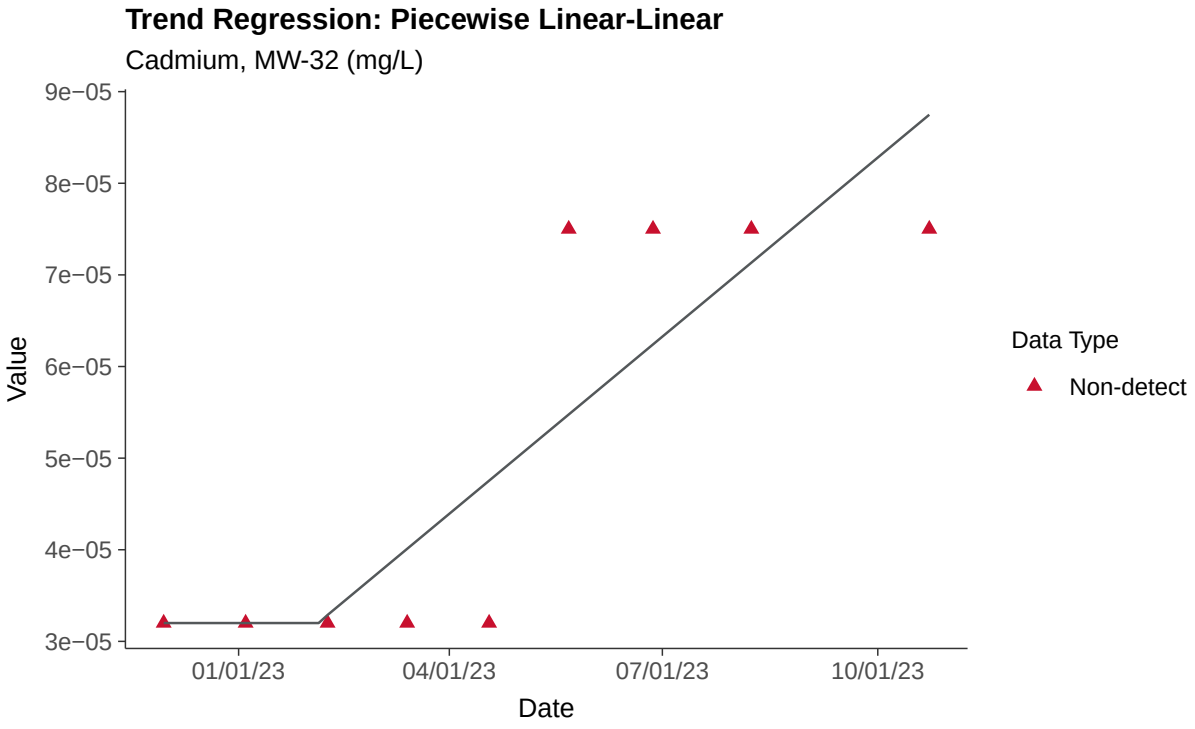
Cadmium, MW-32 (mg/L)

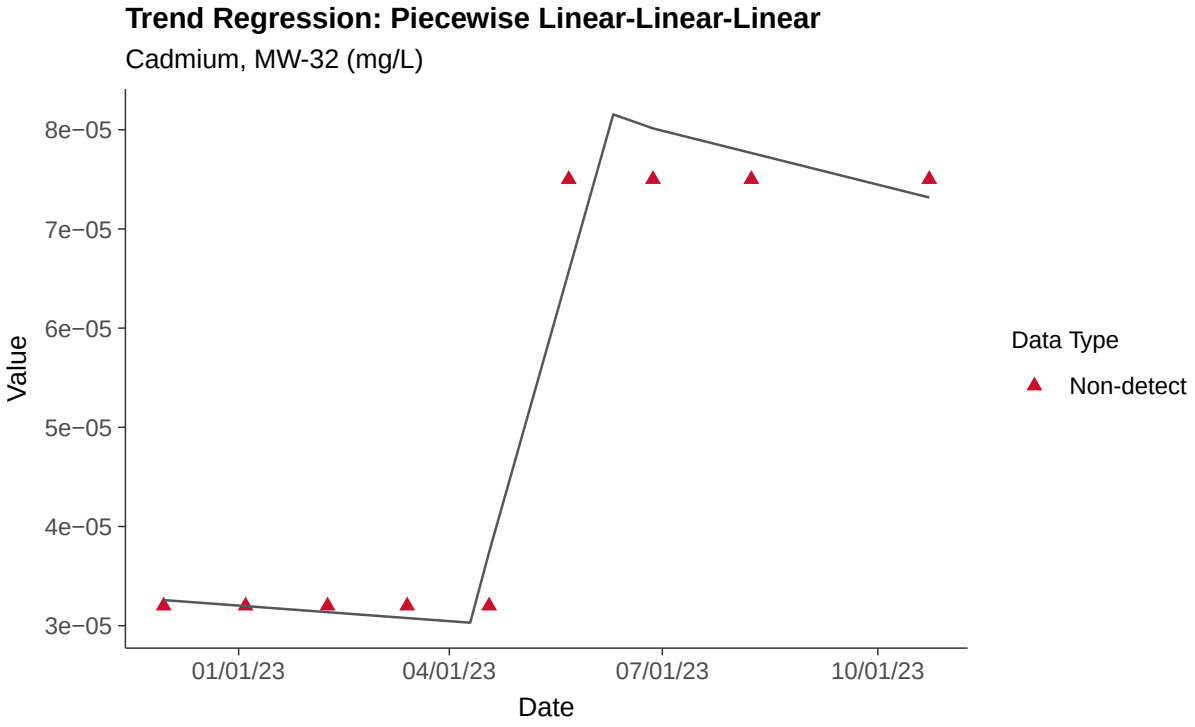


Boxplot by Season

Cadmium, MW-32 (mg/L)

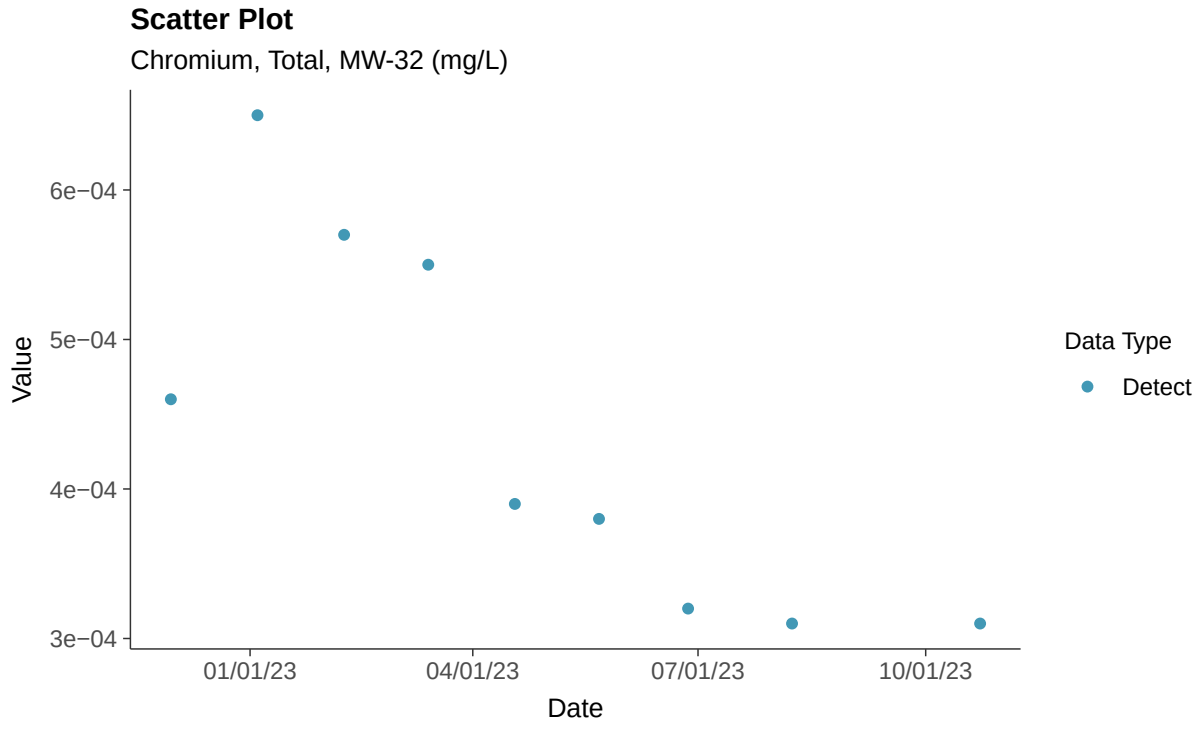


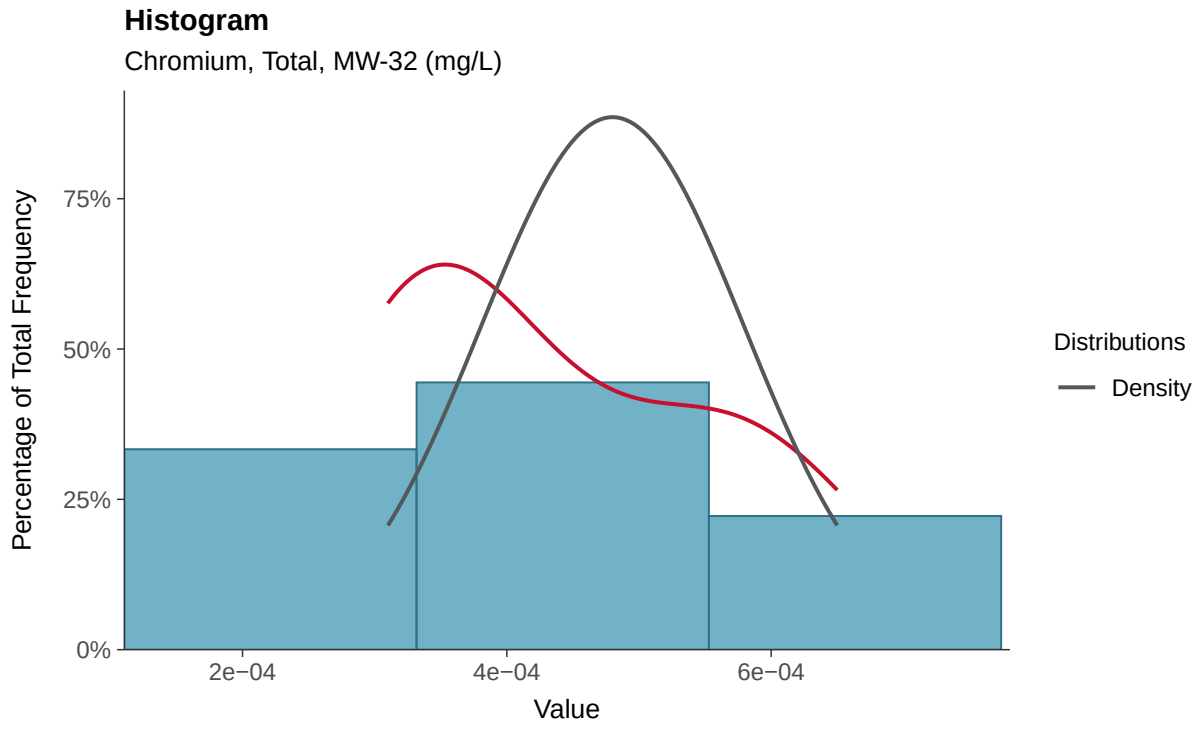

Trend Regression: Piecewise Linear-Linear
Cadmium, MW-32 (mg/L)
9e−05
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Cadmium, MW-32 (mg/L)
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

Appendix IV: Chromium, Total, MW-32

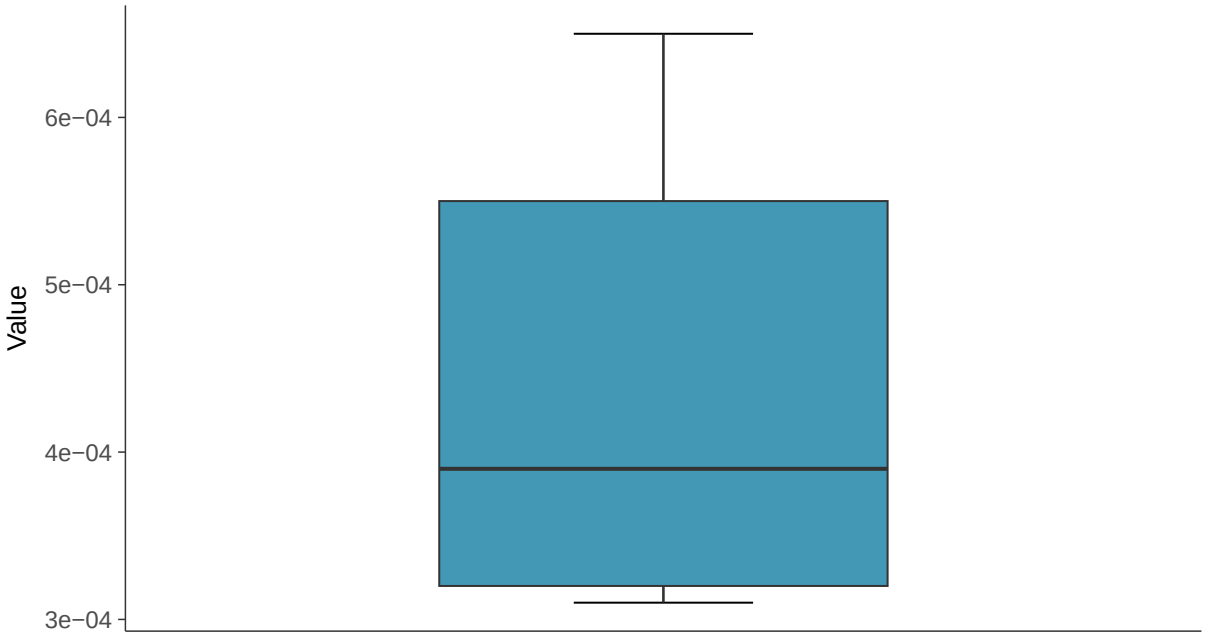
ID: 2_27_5_109





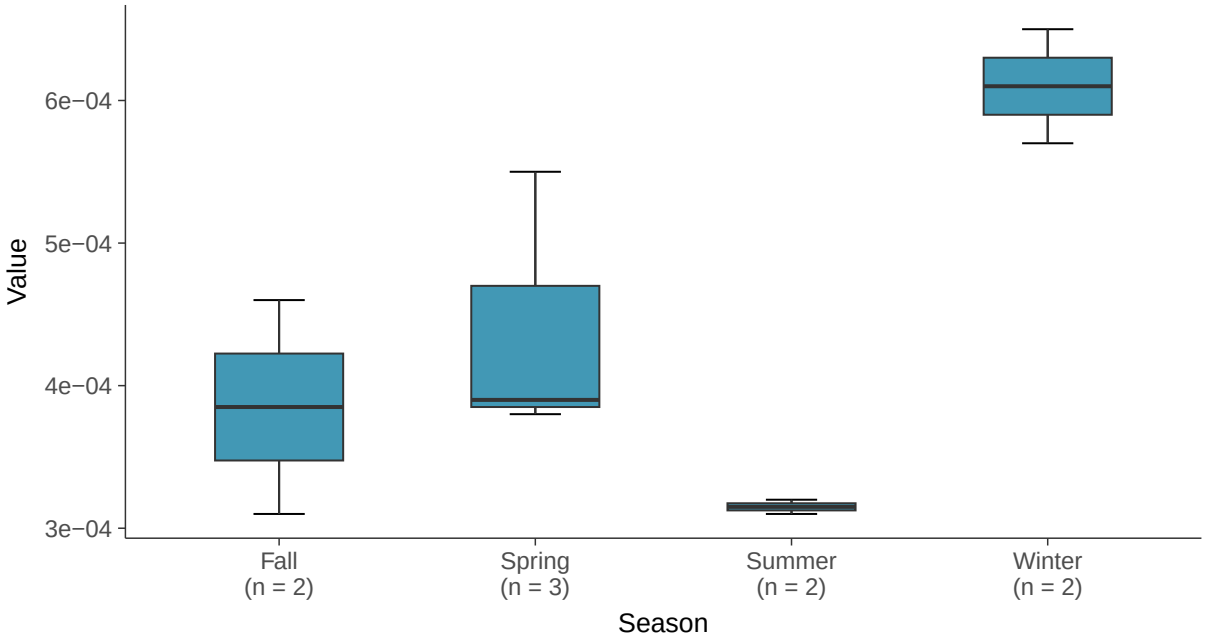
Boxplot

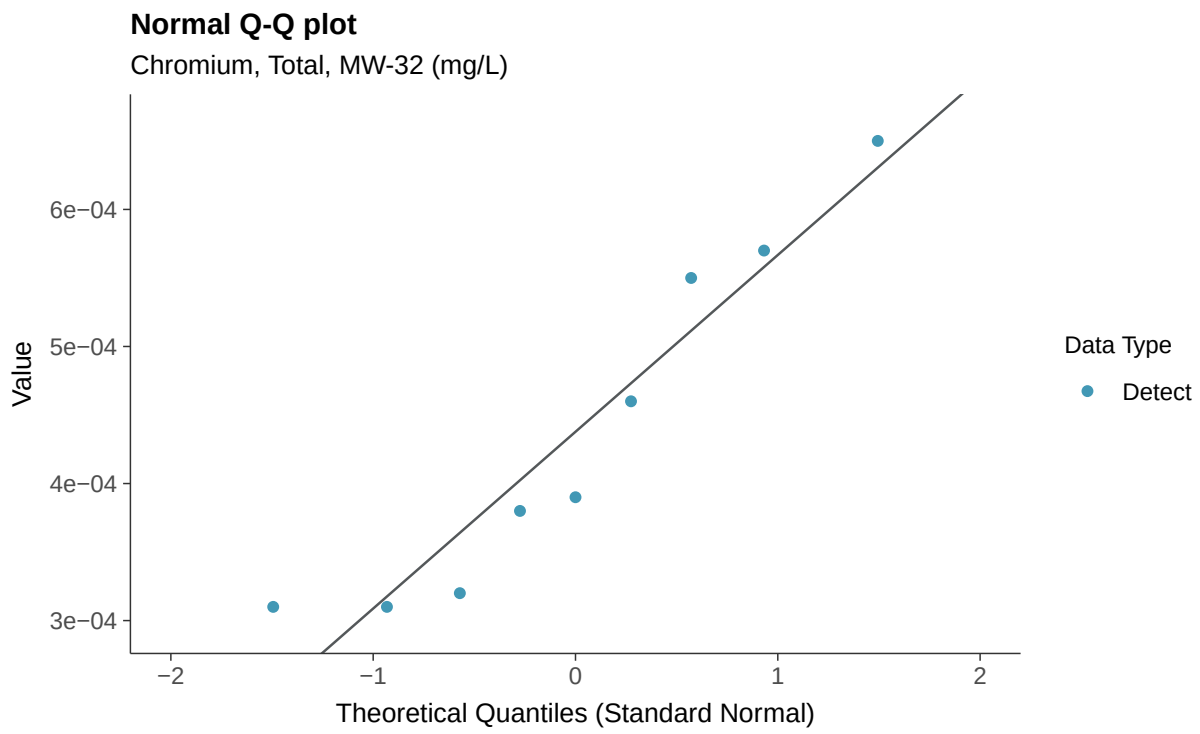
Chromium, Total, MW-32 (mg/L)

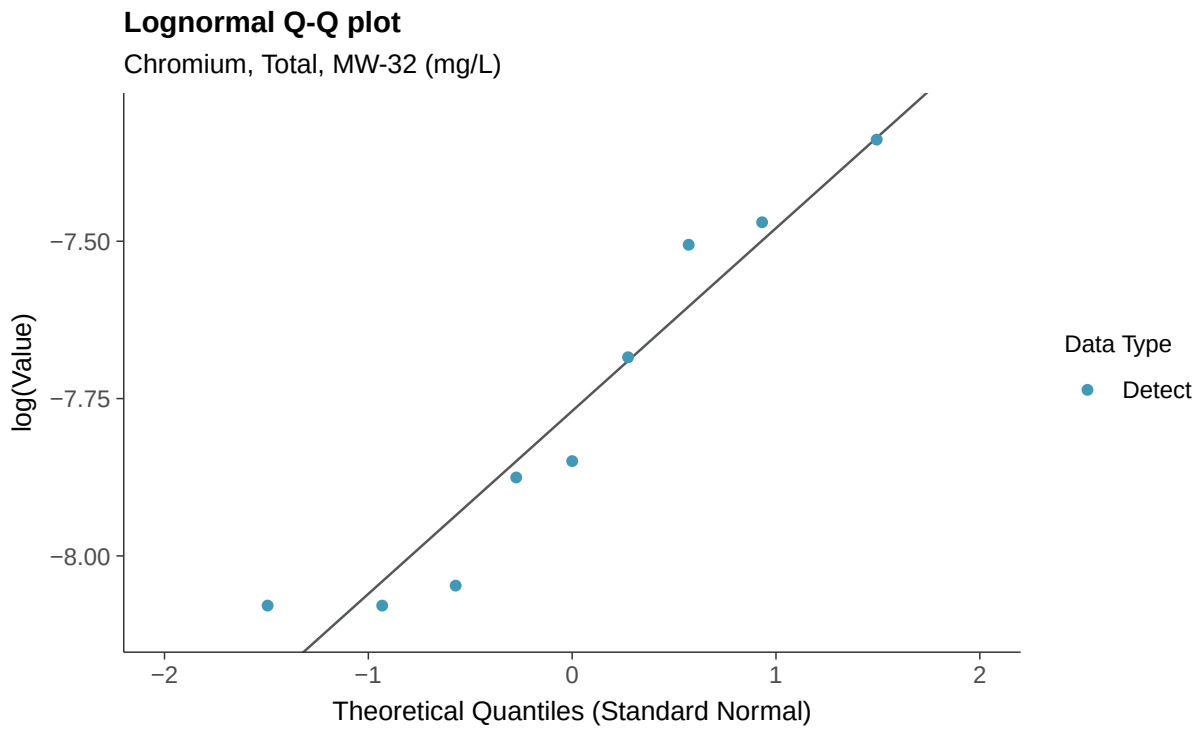


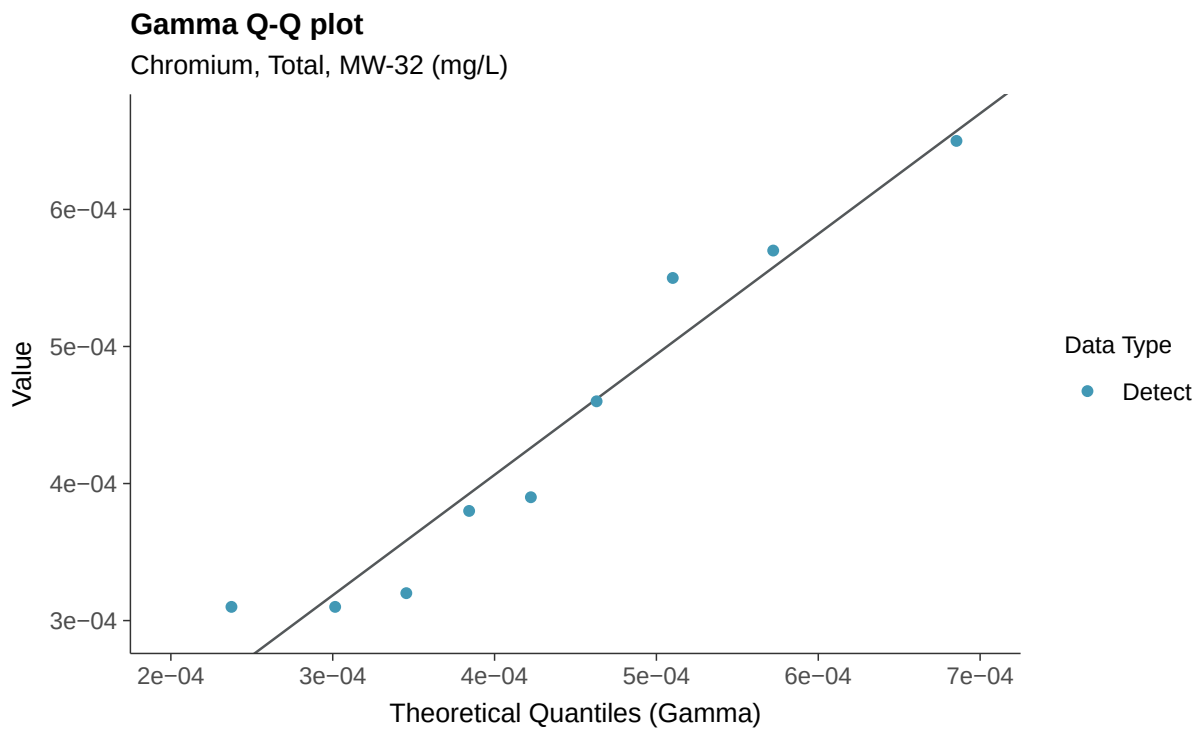
Boxplot by Season

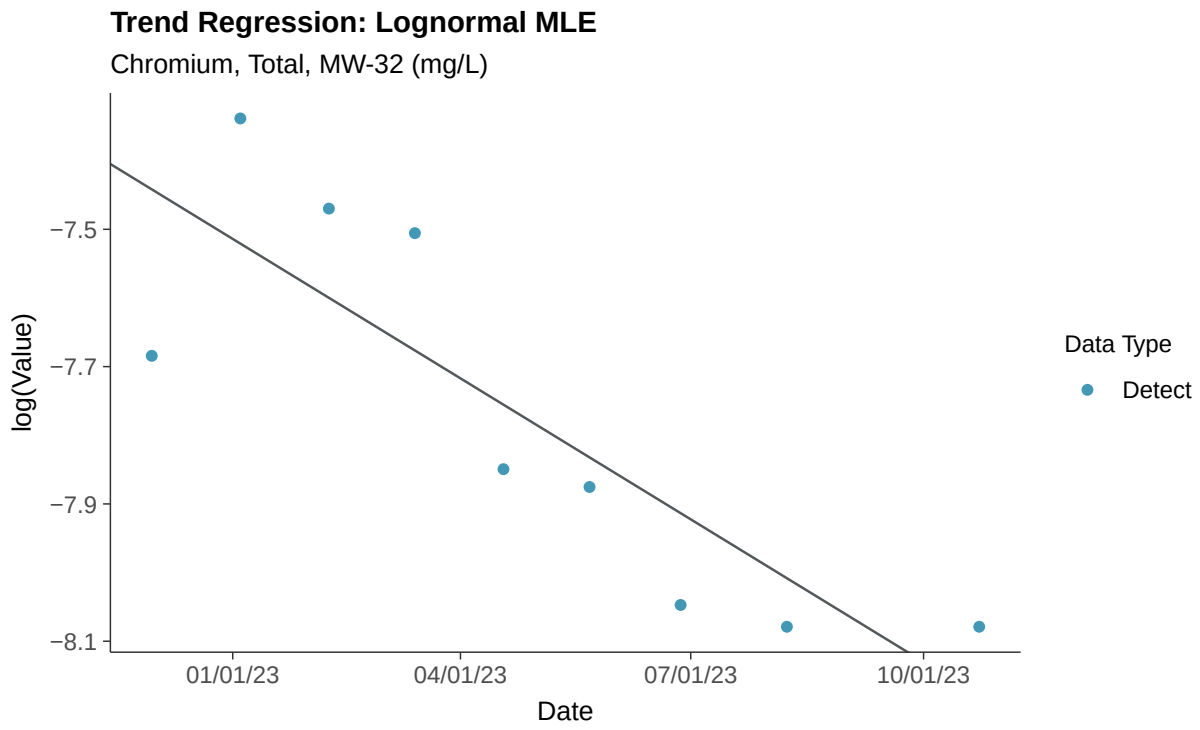
Chromium, Total, MW-32 (mg/L)




Normal Q-Q plot
Chromium, Total, MW-32 (mg/L)
Value
6e−04
5e−04
4e−04
3e−04
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

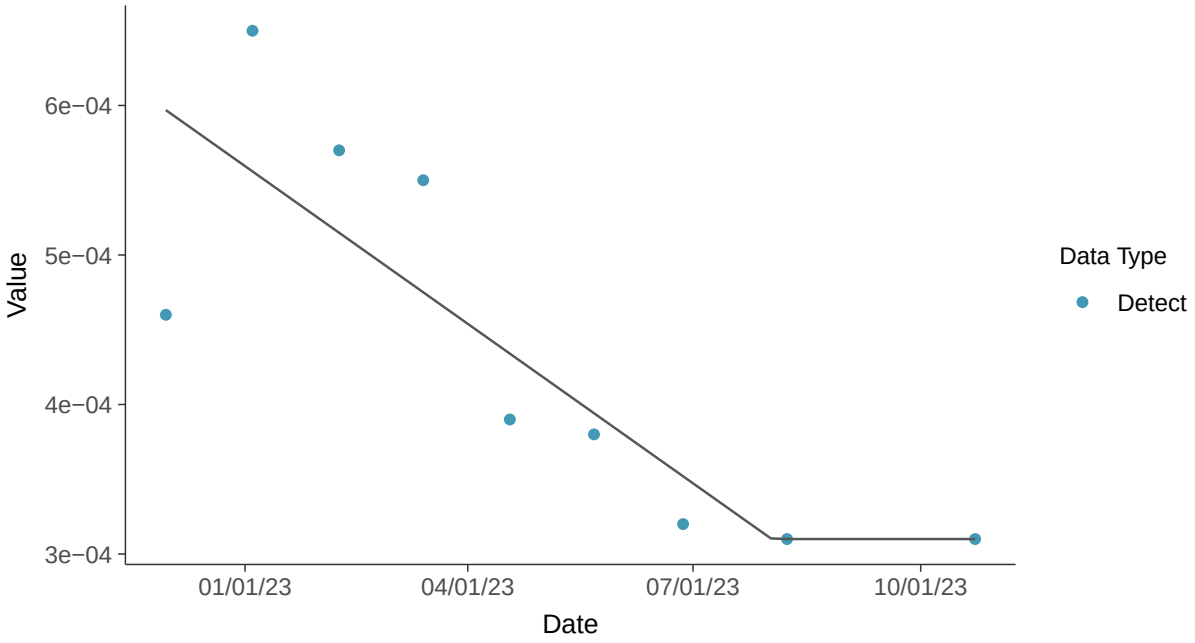

Lognormal Q-Q plot
Chromium, Total, MW-32 (mg/L)
log(Value)
−7.50
−7.75
−8.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Chromium, Total, MW-32 (mg/L)
Value
6e−04
5e−04
4e−04
3e−04
2e−04
3e−04
4e−04
5e−04
6e−04
7e−04
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Chromium, Total, MW-32 (mg/L)
log(Value)
−7.5
−7.7
−7.9
−8.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

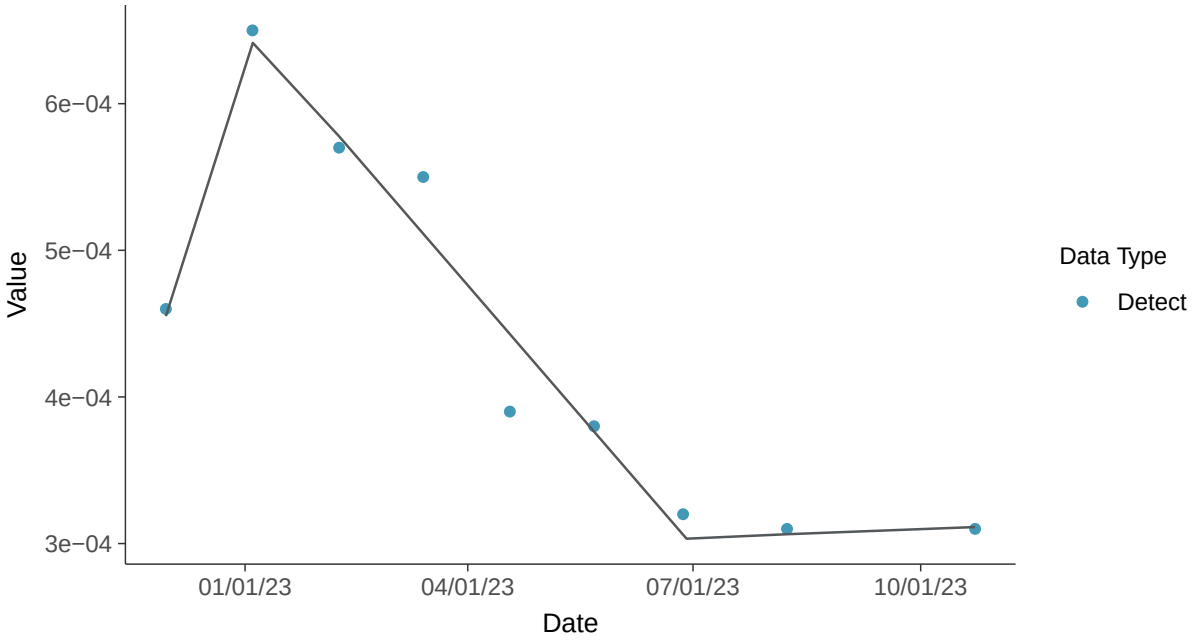
Trend Regression: Piecewise Linear-Linear

Chromium, Total, MW-32 (mg/L)



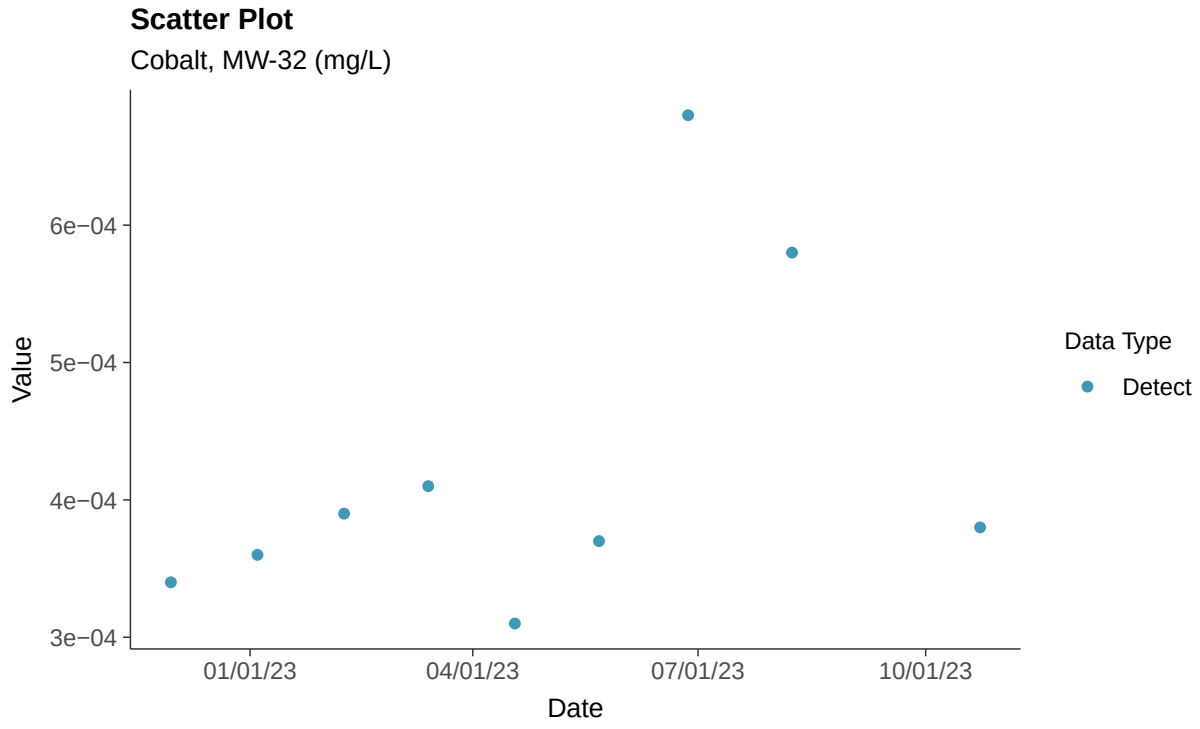
Trend Regression: Piecewise Linear-Linear-Linear

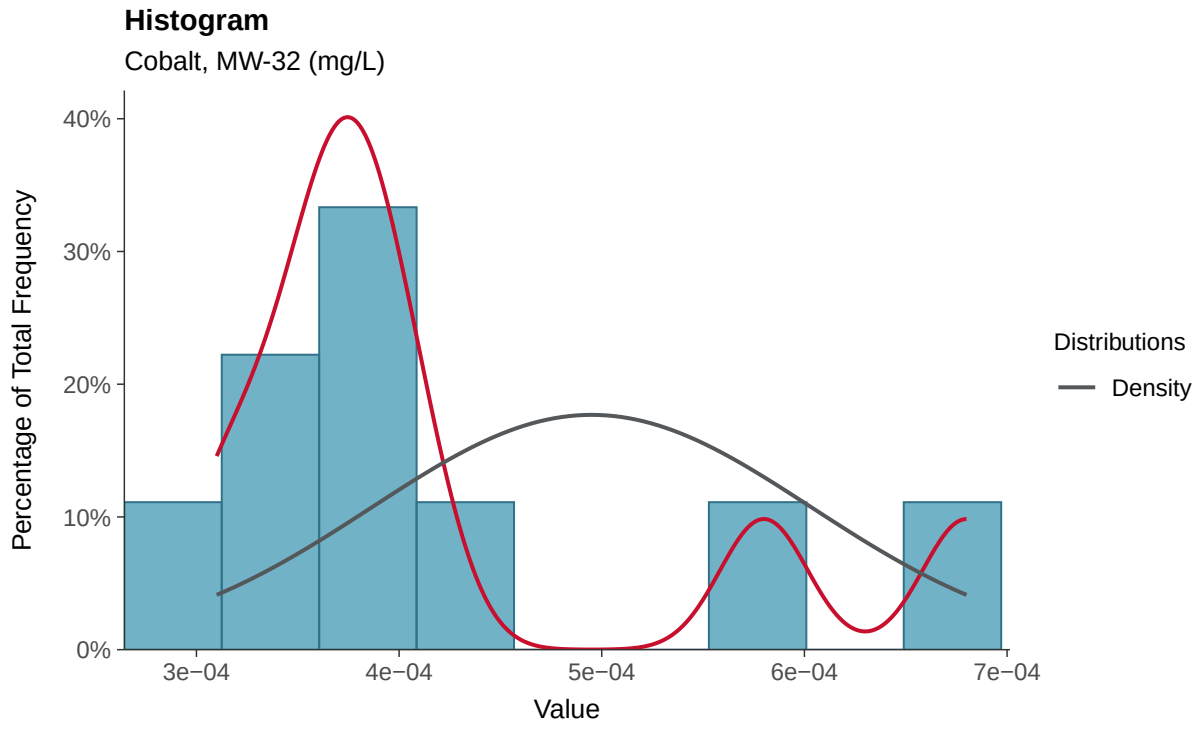
Chromium, Total, MW-32 (mg/L)



Appendix IV: Cobalt, MW-32

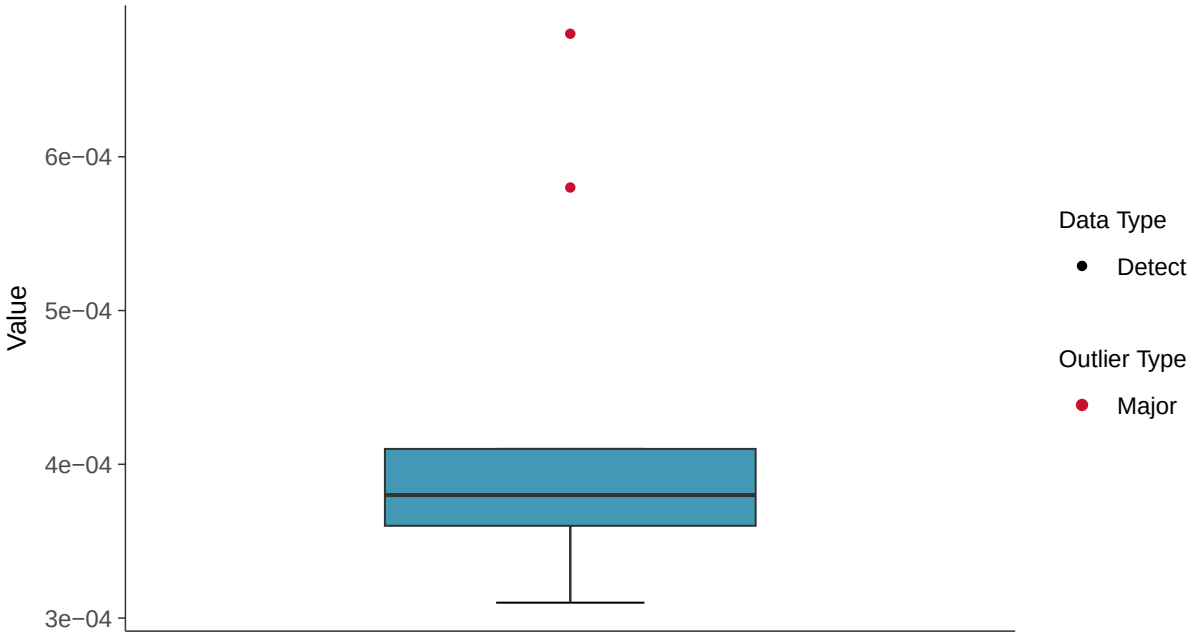
ID: 2_27_5_110





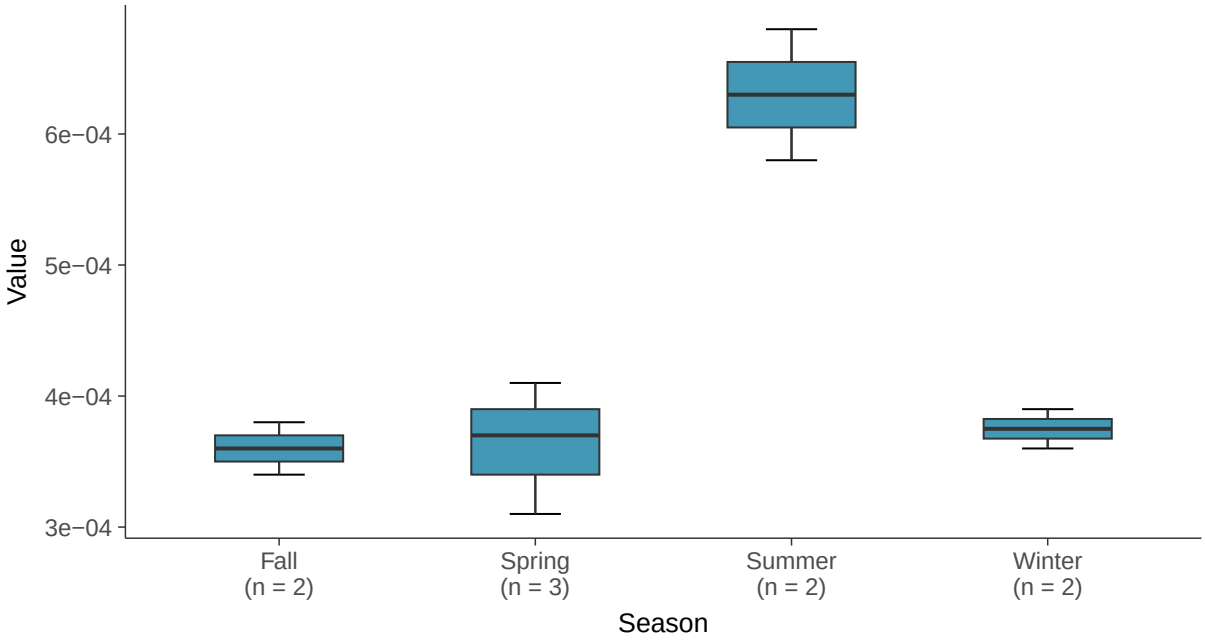
Boxplot

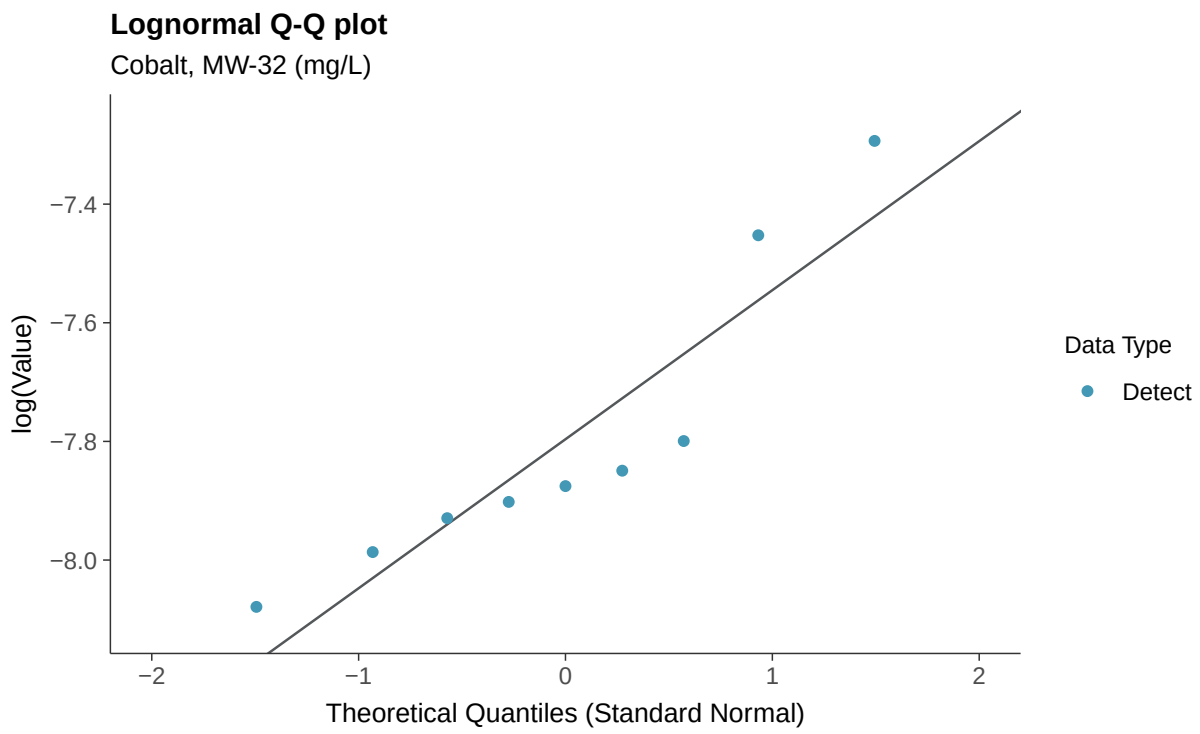
Cobalt, MW-32 (mg/L)

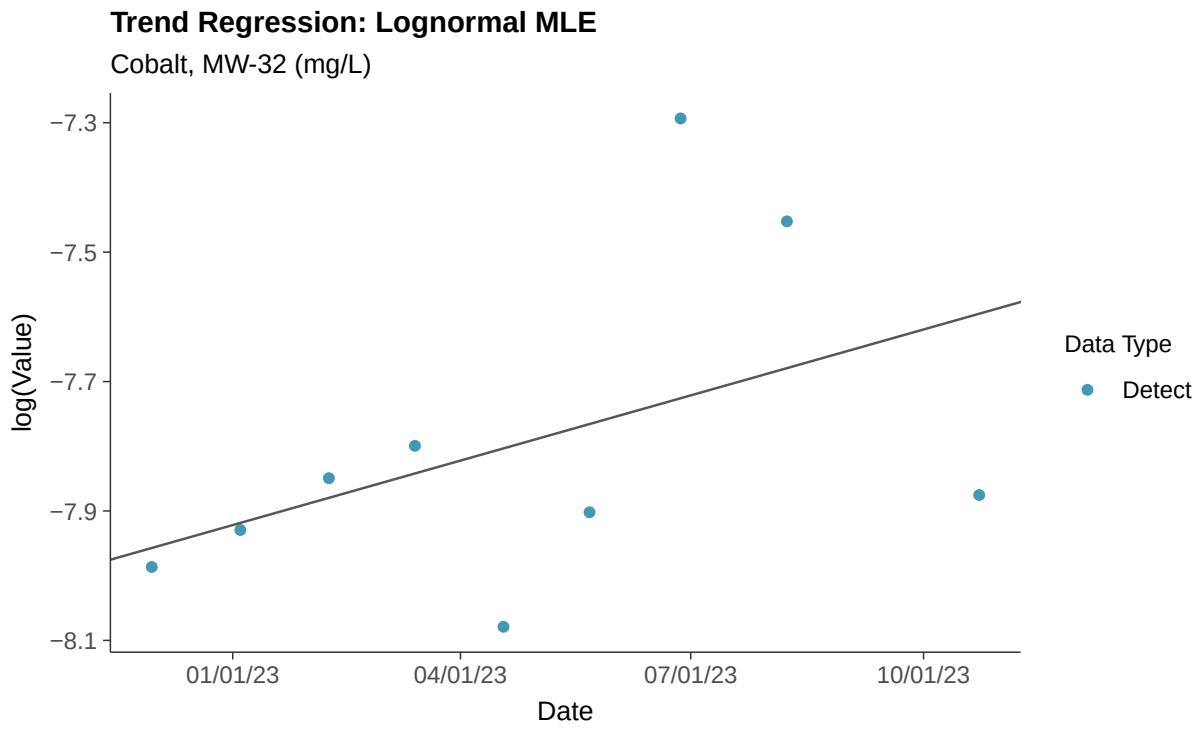


Boxplot by Season

Cobalt, MW-32 (mg/L)

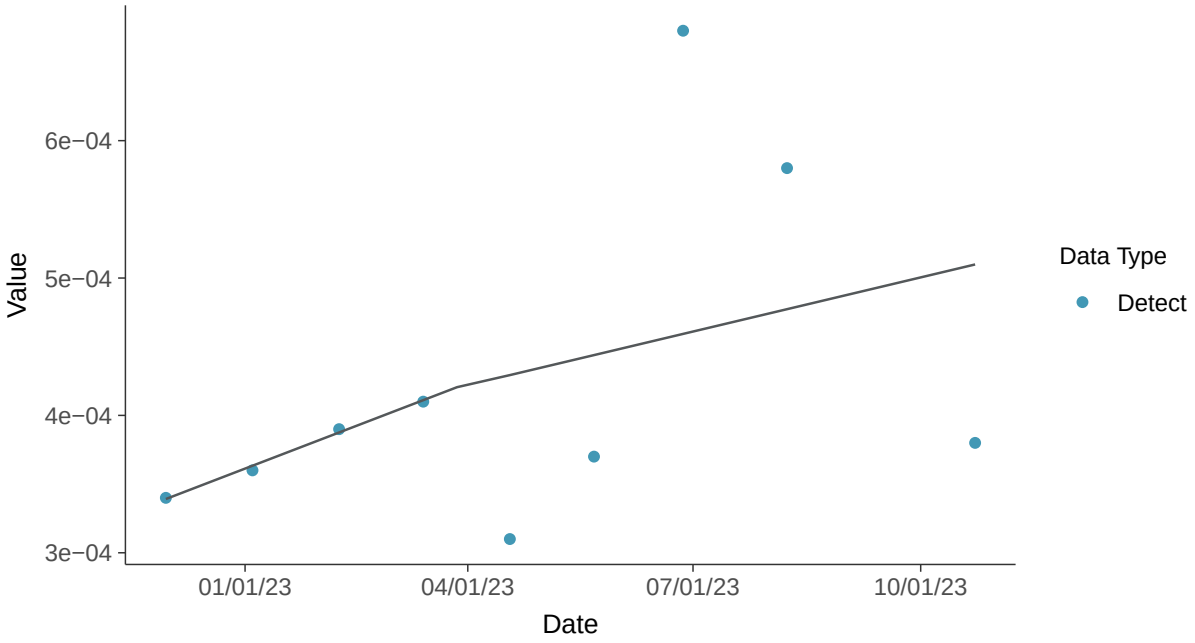



Lognormal Q-Q plot
Cobalt, MW-32 (mg/L)
log(Value)
−7.4
−7.6
−7.8
−8.0
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Lognormal MLE
Cobalt, MW-32 (mg/L)
log(Value)
−7.3
−7.5
−7.7
−7.9
−8.1
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

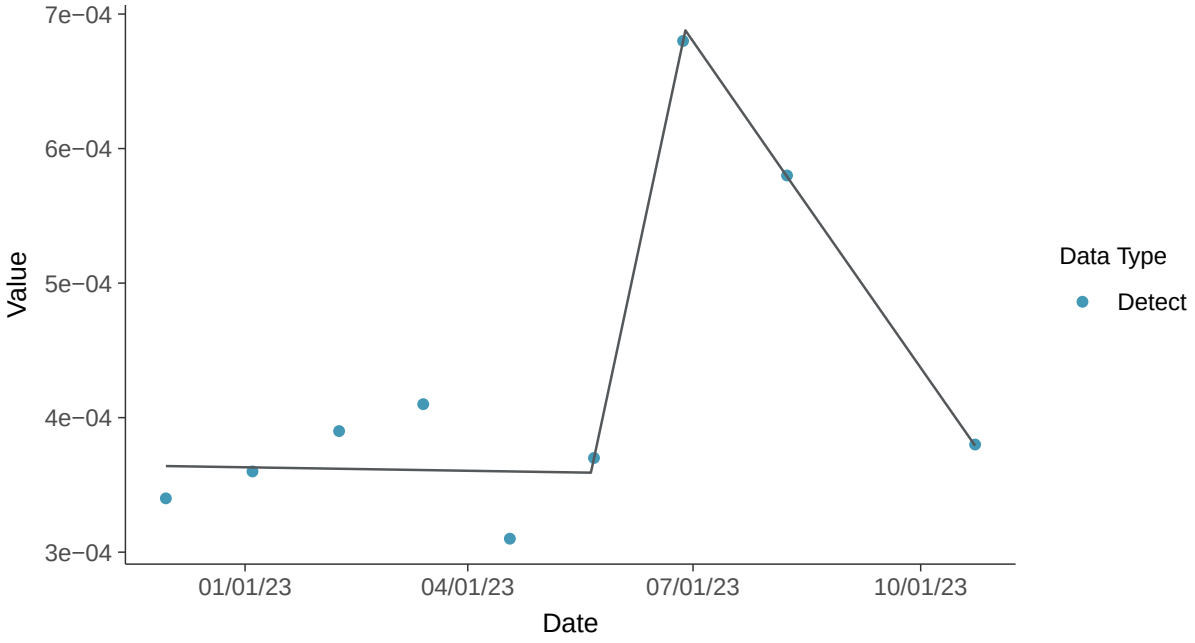
Trend Regression: Piecewise Linear-Linear

Cobalt, MW-32 (mg/L)



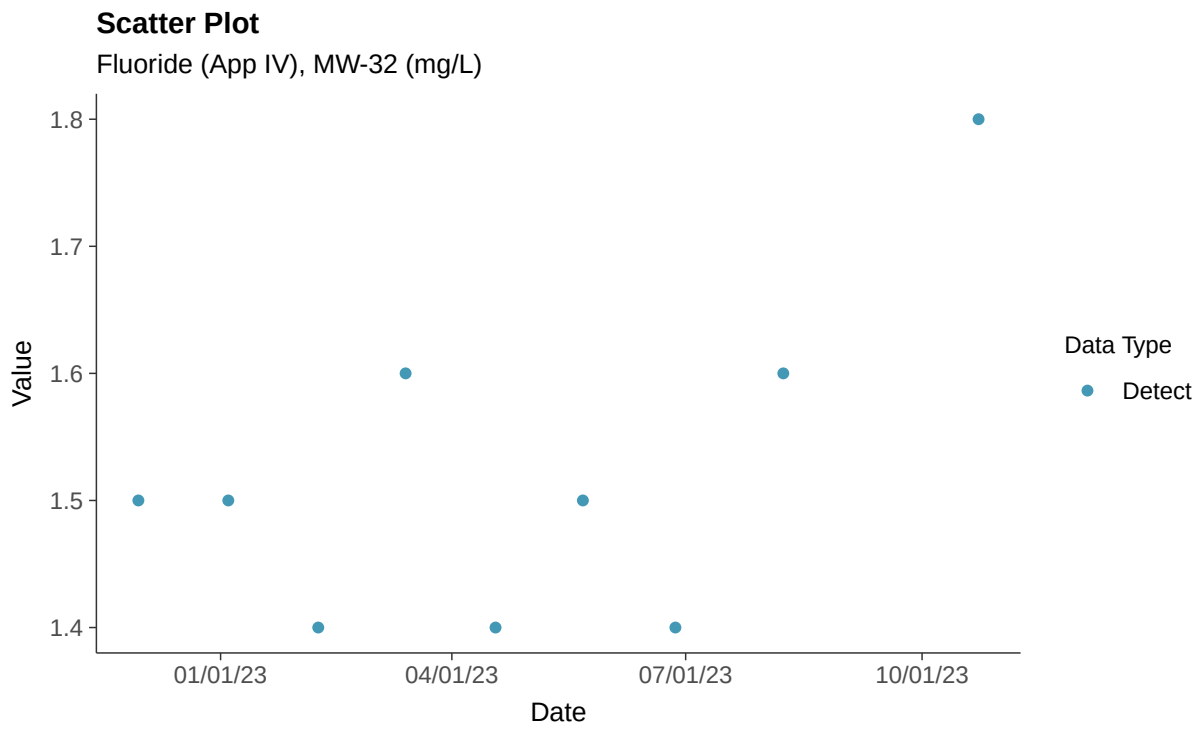
Trend Regression: Piecewise Linear-Linear-Linear

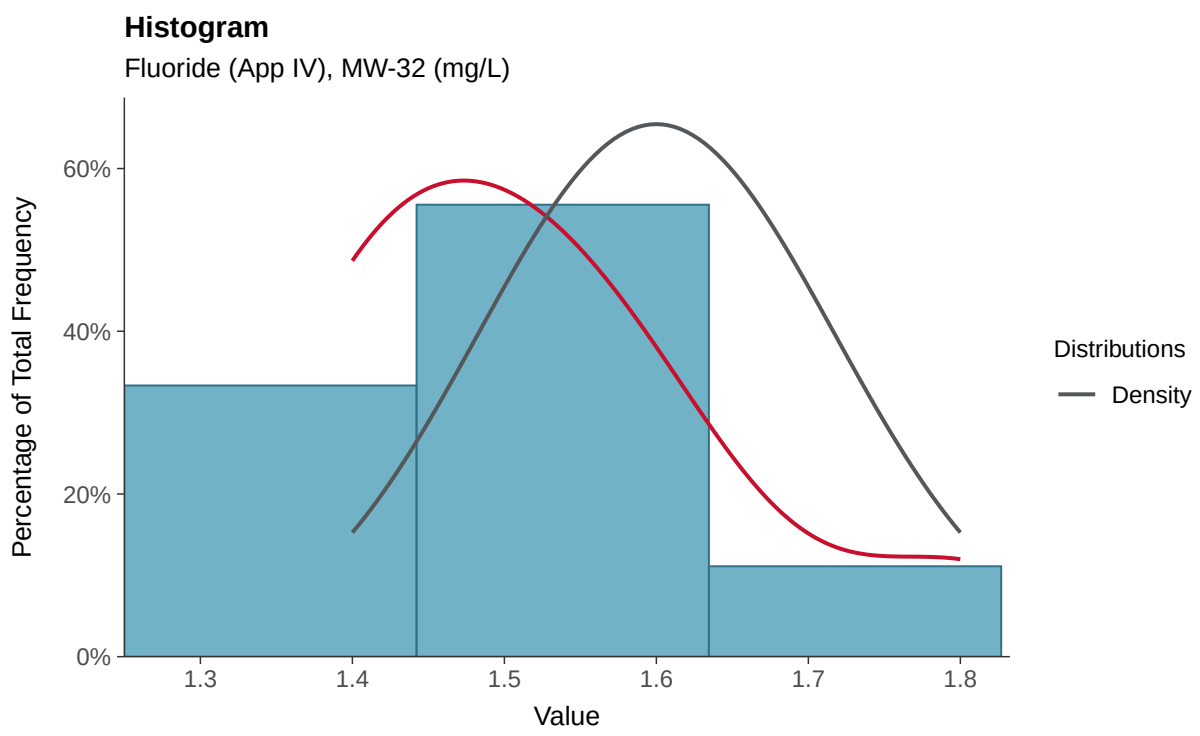
Cobalt, MW-32 (mg/L)



Appendix IV: Fluoride (App IV), MW-32

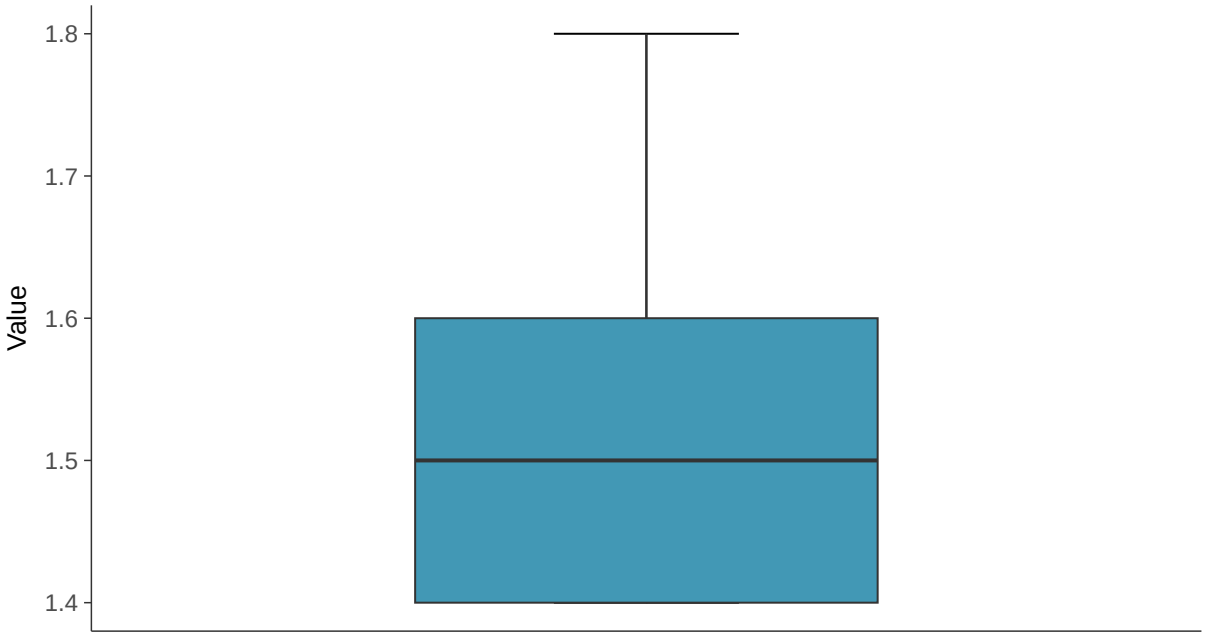
ID: 2_27_5_113





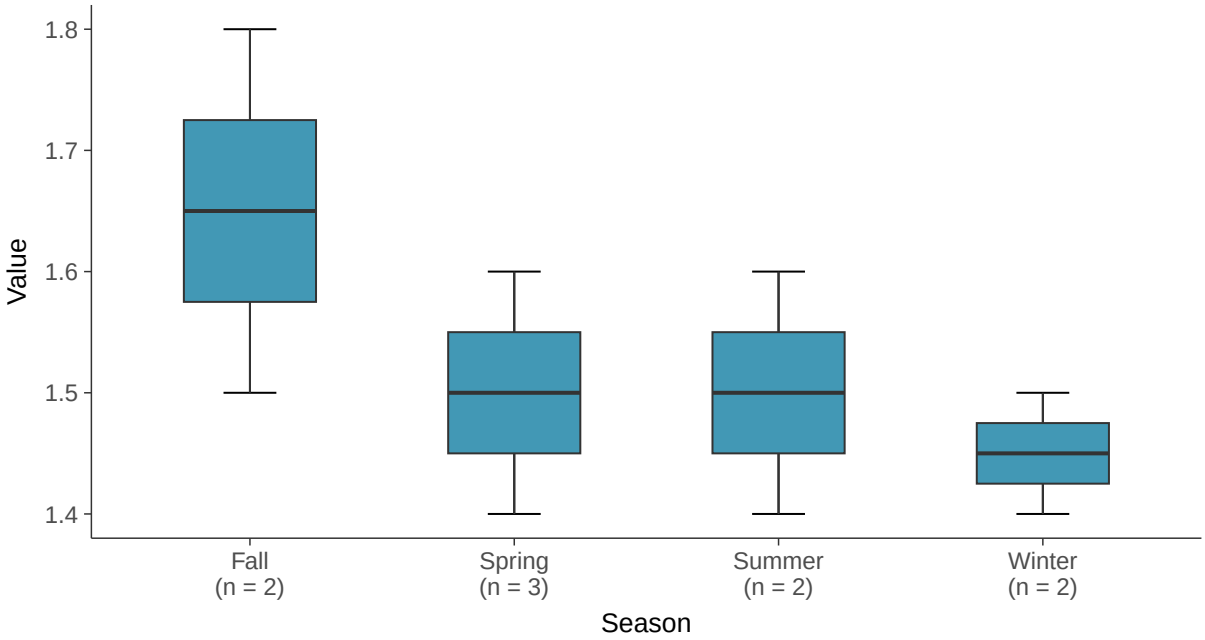
Boxplot

Fluoride (App IV), MW-32 (mg/L)



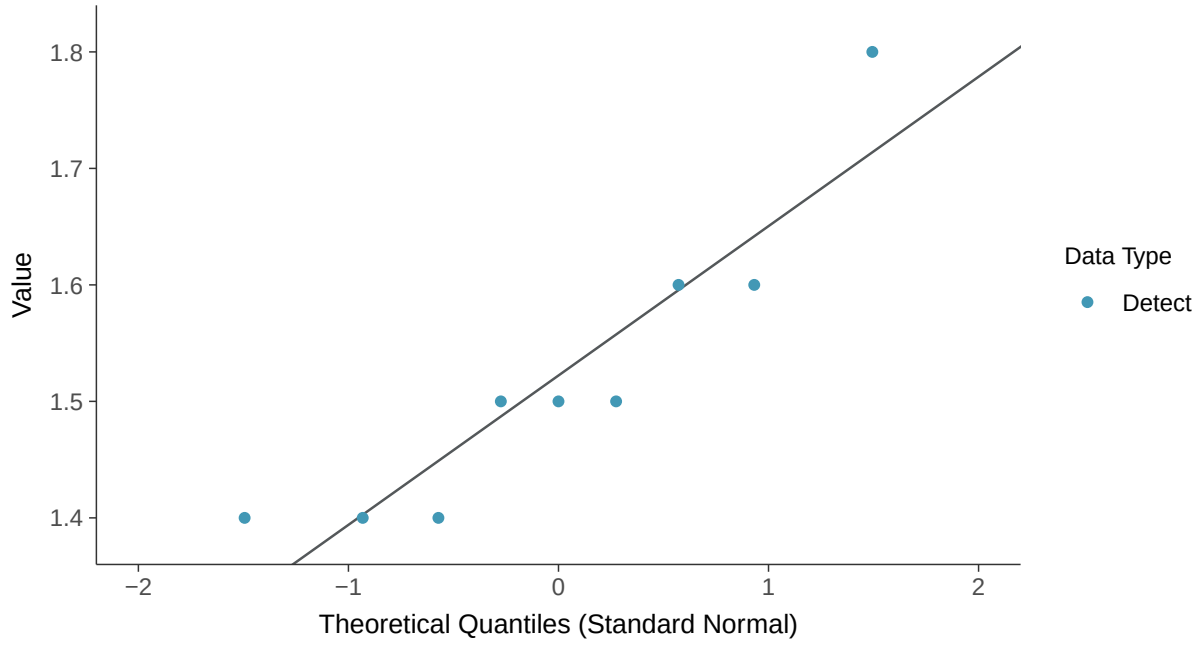
Boxplot by Season

Fluoride (App IV), MW-32 (mg/L)



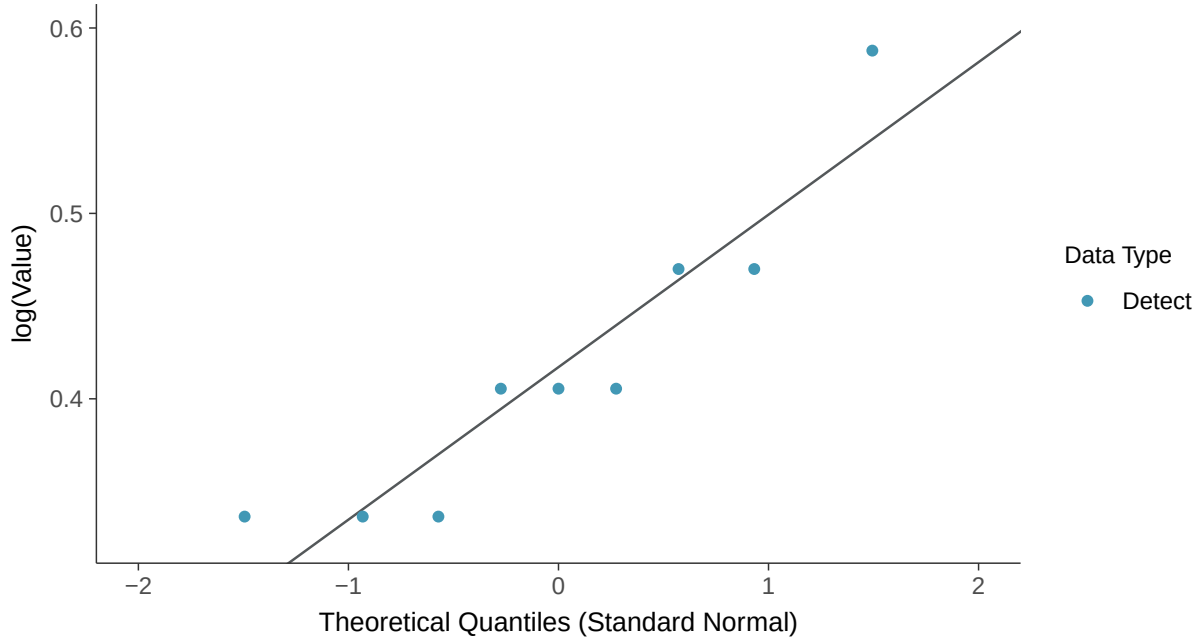
Normal Q-Q plot

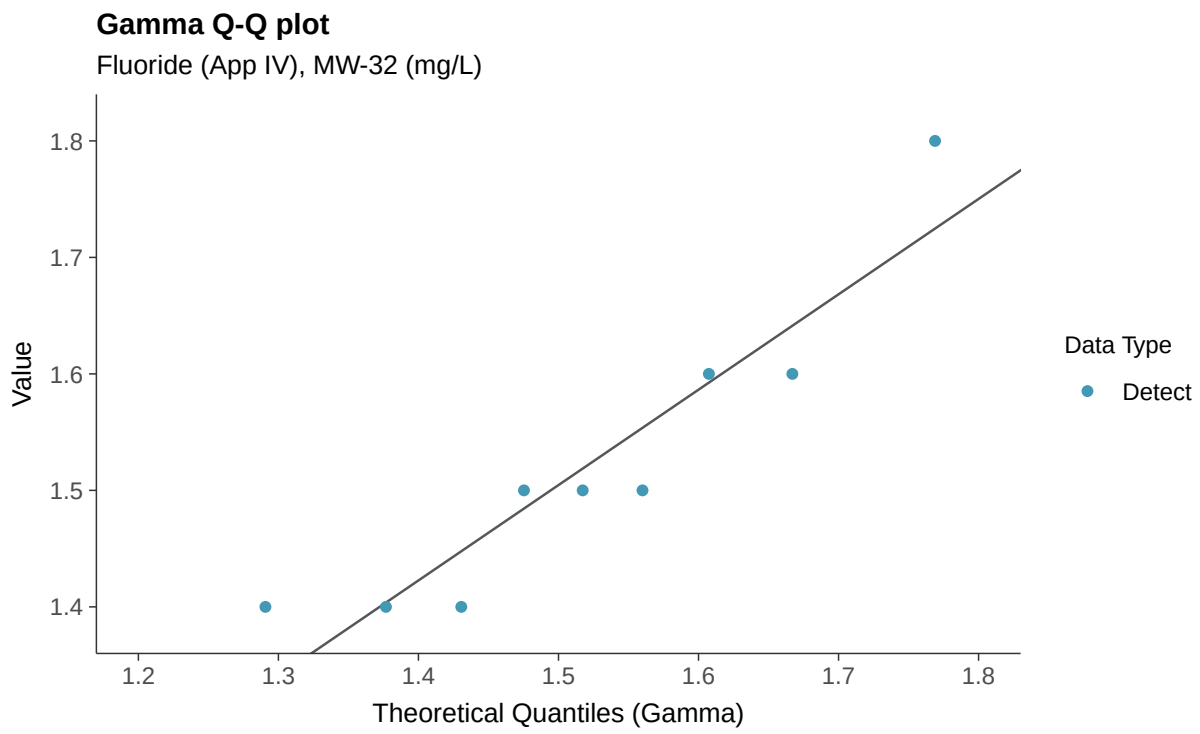
Fluoride (App IV), MW-32 (mg/L)

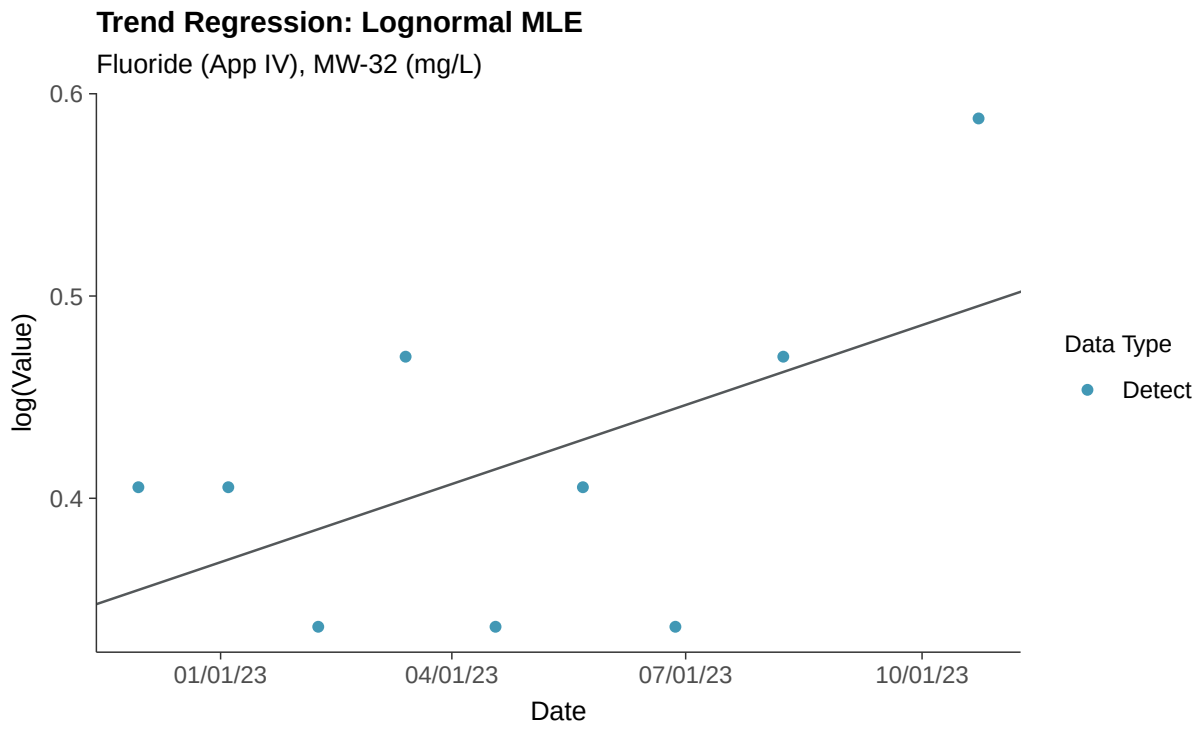


Lognormal Q-Q plot

Fluoride (App IV), MW-32 (mg/L)

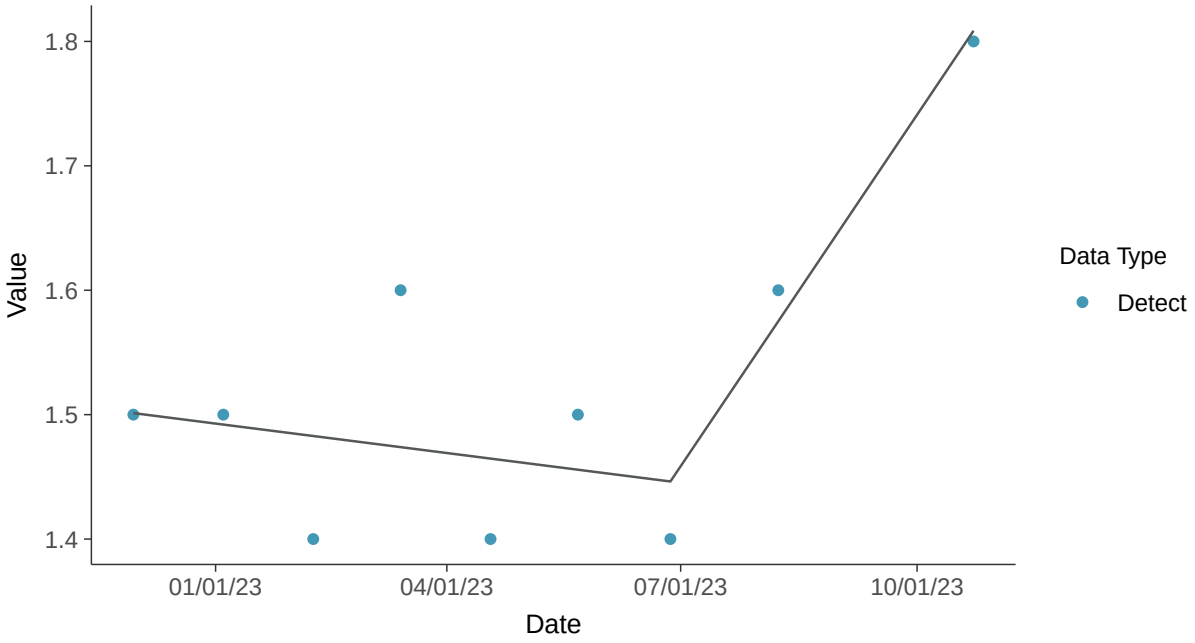



Gamma Q-Q plot
Fluoride (App IV), MW-32 (mg/L)
Value
1.8
1.7
1.6
1.5
1.4
1.2
1.3
1.4
1.5
1.6
1.7
1.8
Theoretical Quantiles (Gamma)
Data Type
Detect


Trend Regression: Lognormal MLE
Fluoride (App IV), MW-32 (mg/L)
log(Value)
0.6
0.5
0.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

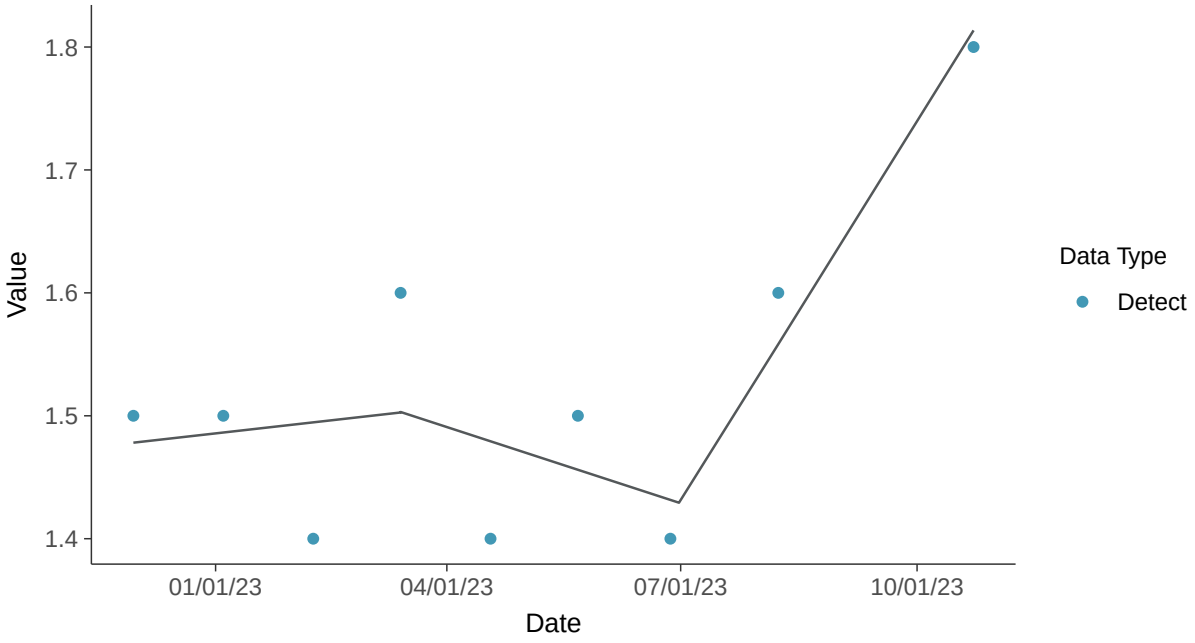
Trend Regression: Piecewise Linear-Linear

Fluoride (App IV), MW-32 (mg/L)



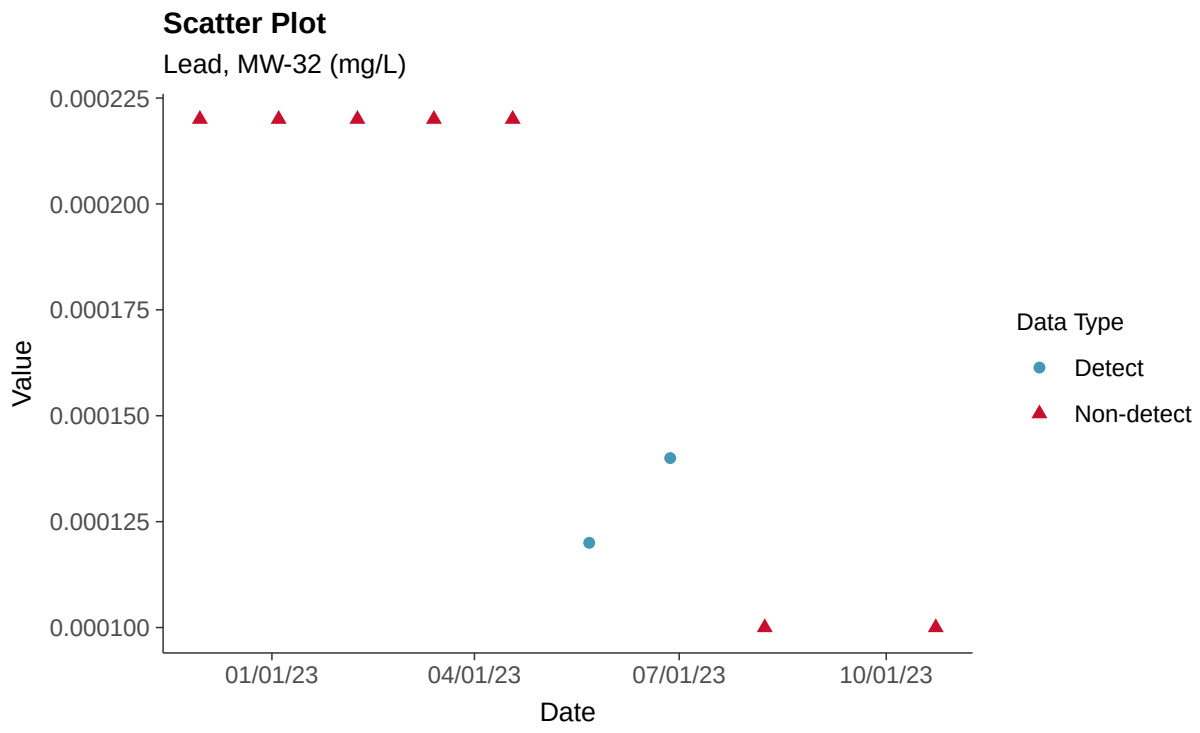
Trend Regression: Piecewise Linear-Linear-Linear

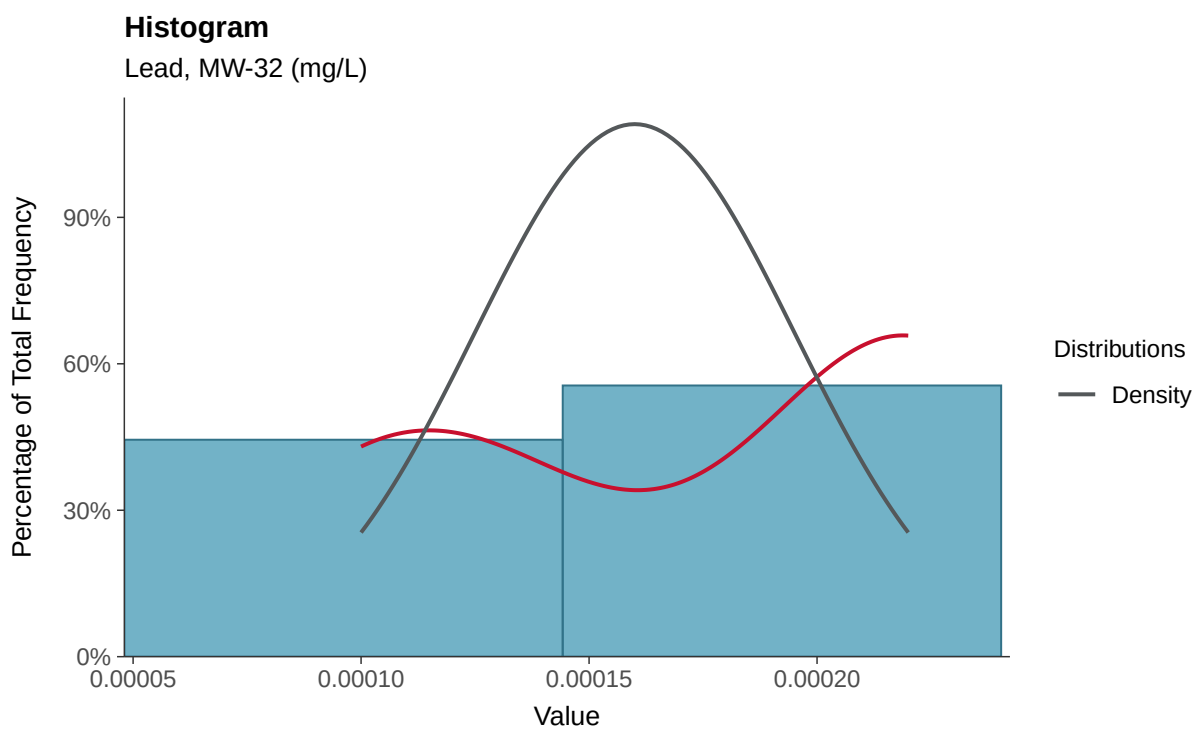
Fluoride (App IV), MW-32 (mg/L)



Appendix IV: Lead, MW-32

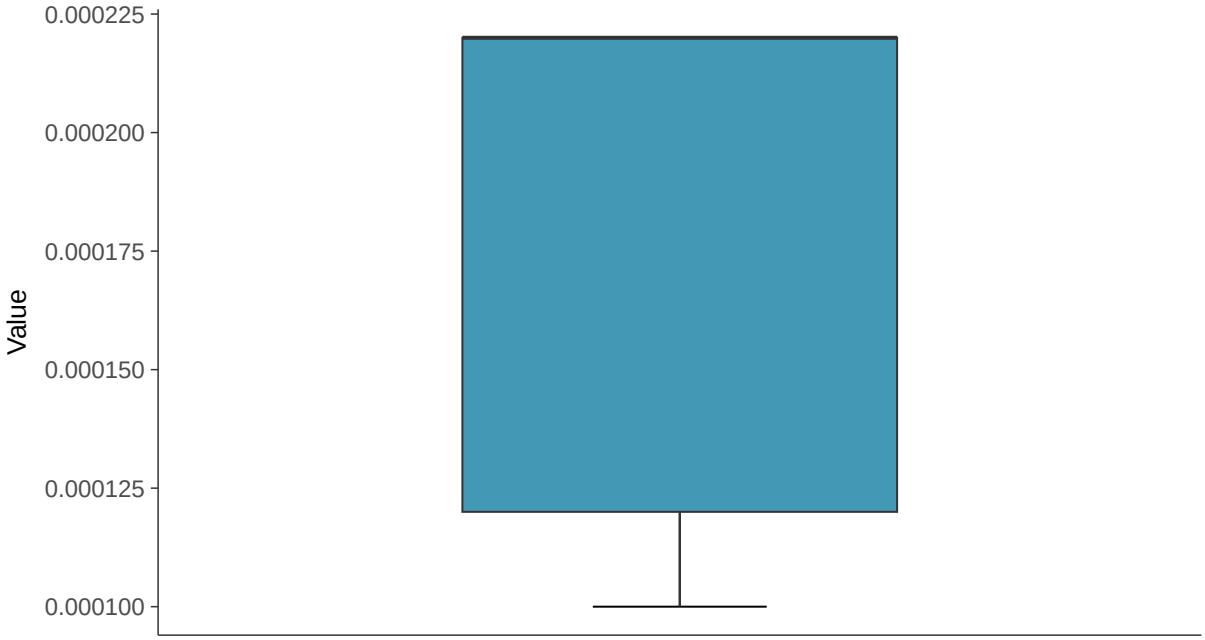
ID: 2_27_5_115





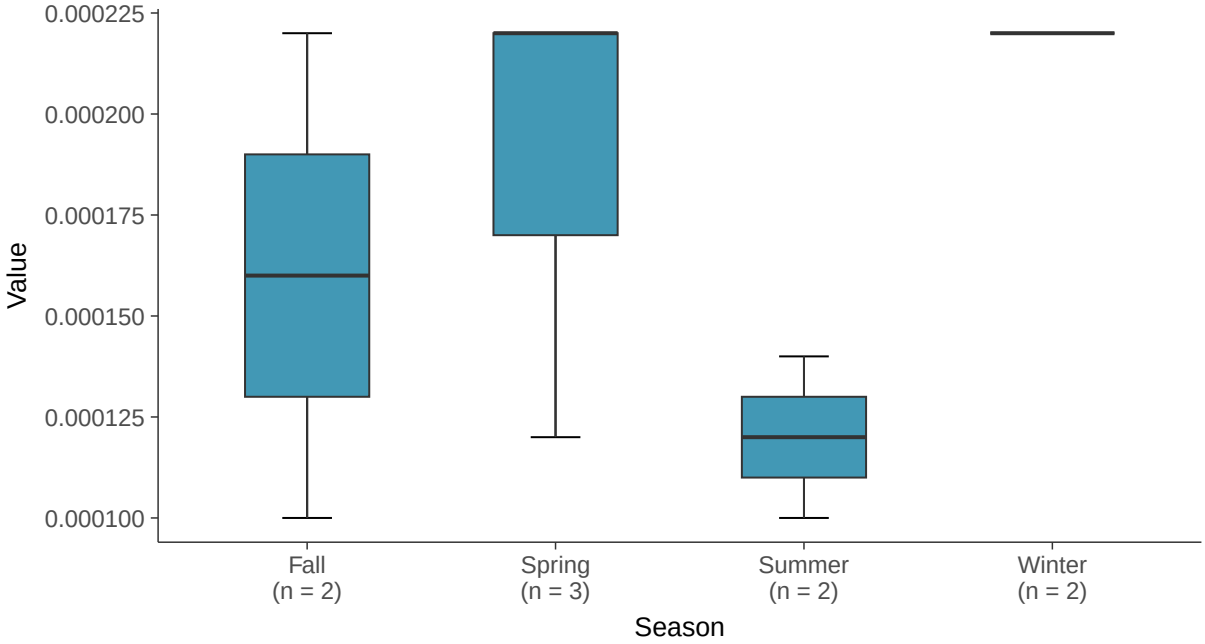
Boxplot

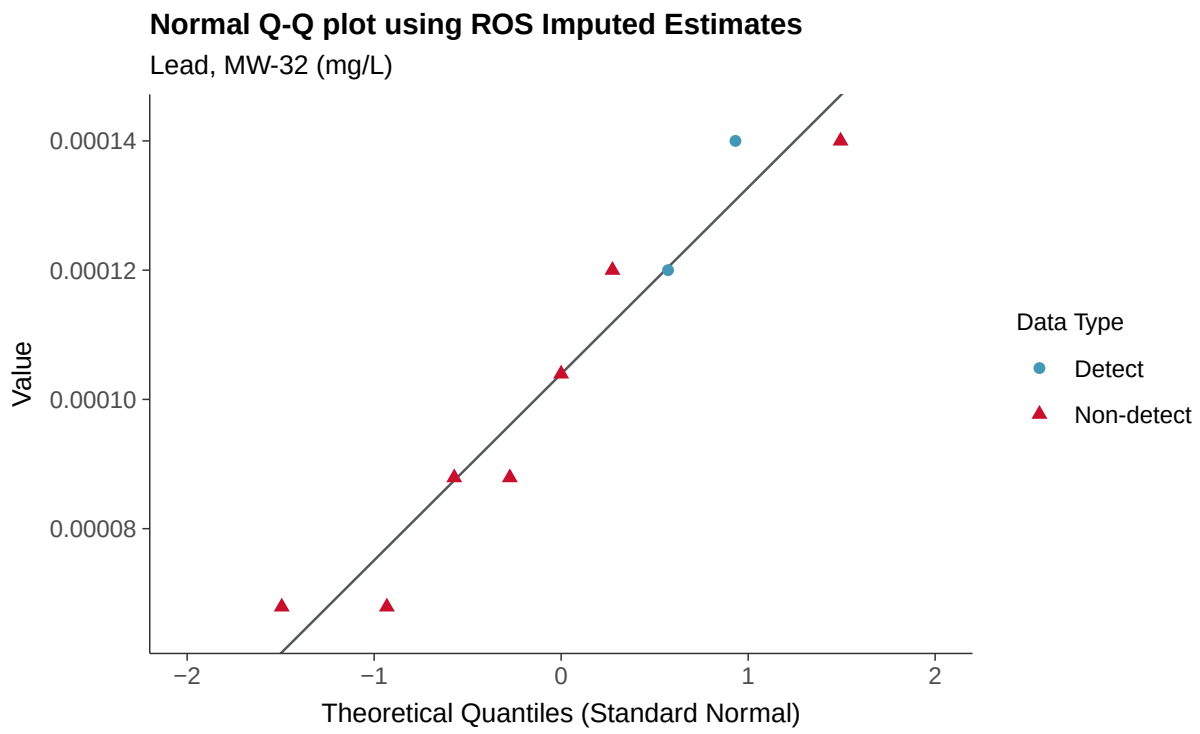
Lead, MW-32 (mg/L)

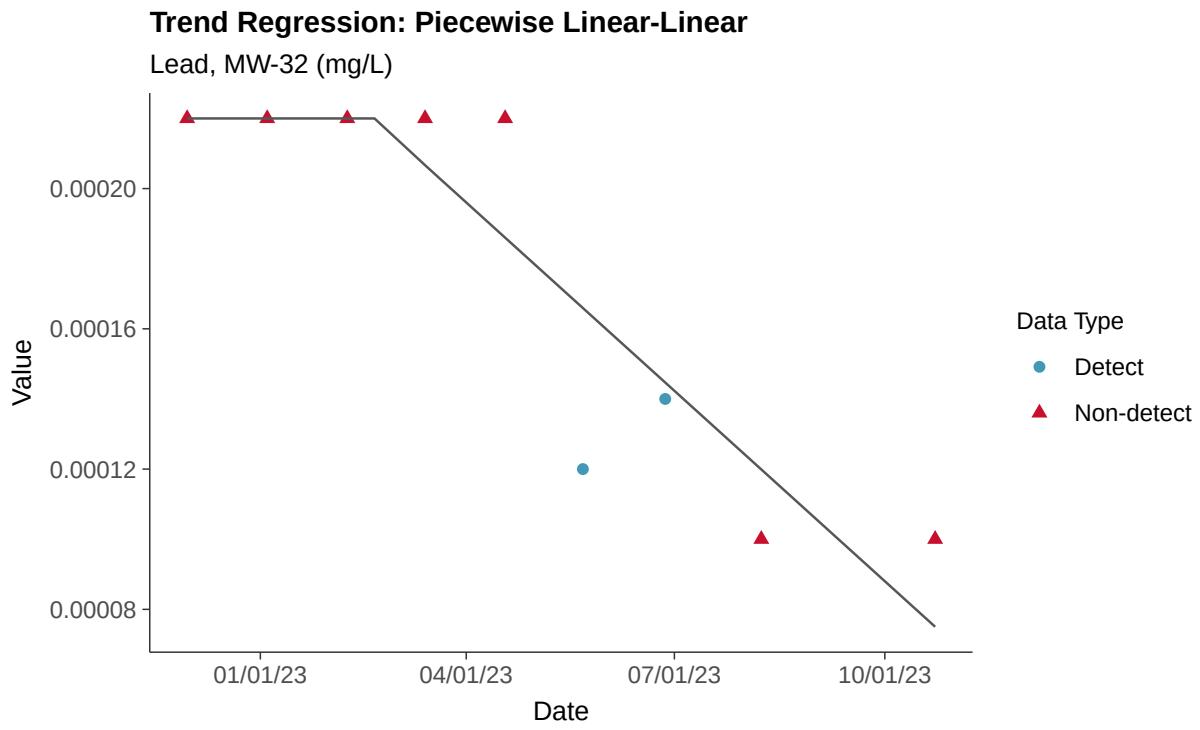


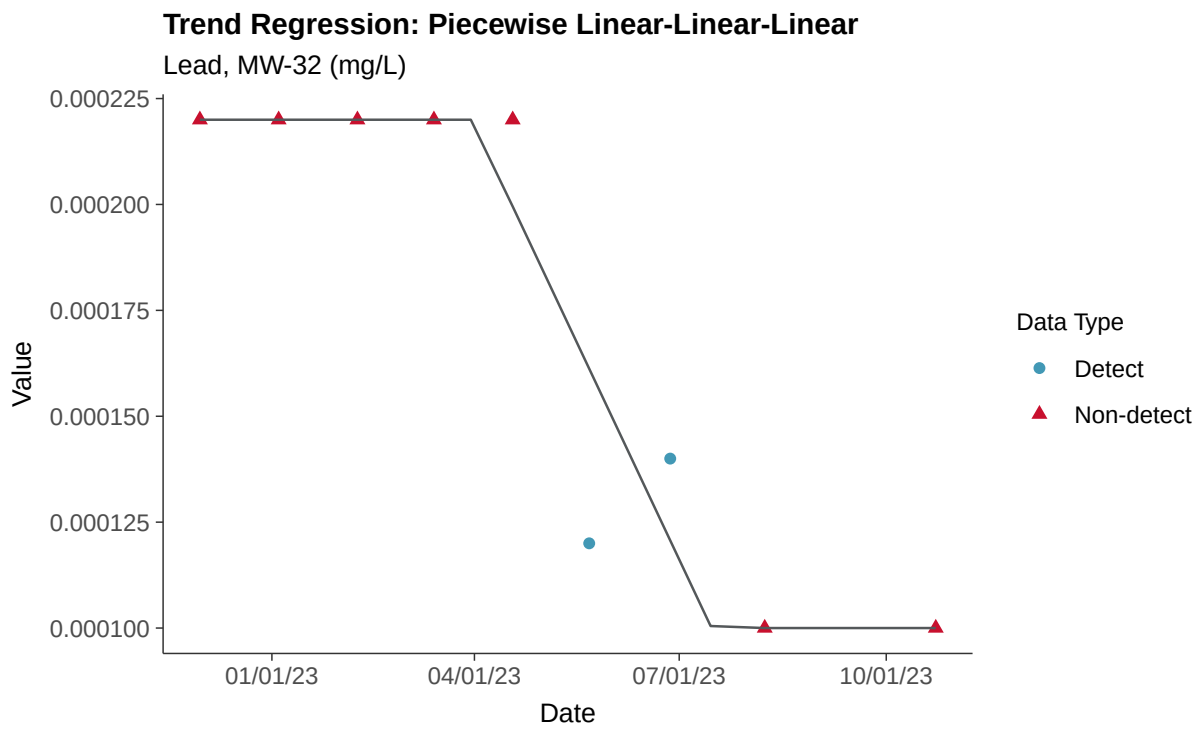
Boxplot by Season

Lead, MW-32 (mg/L)



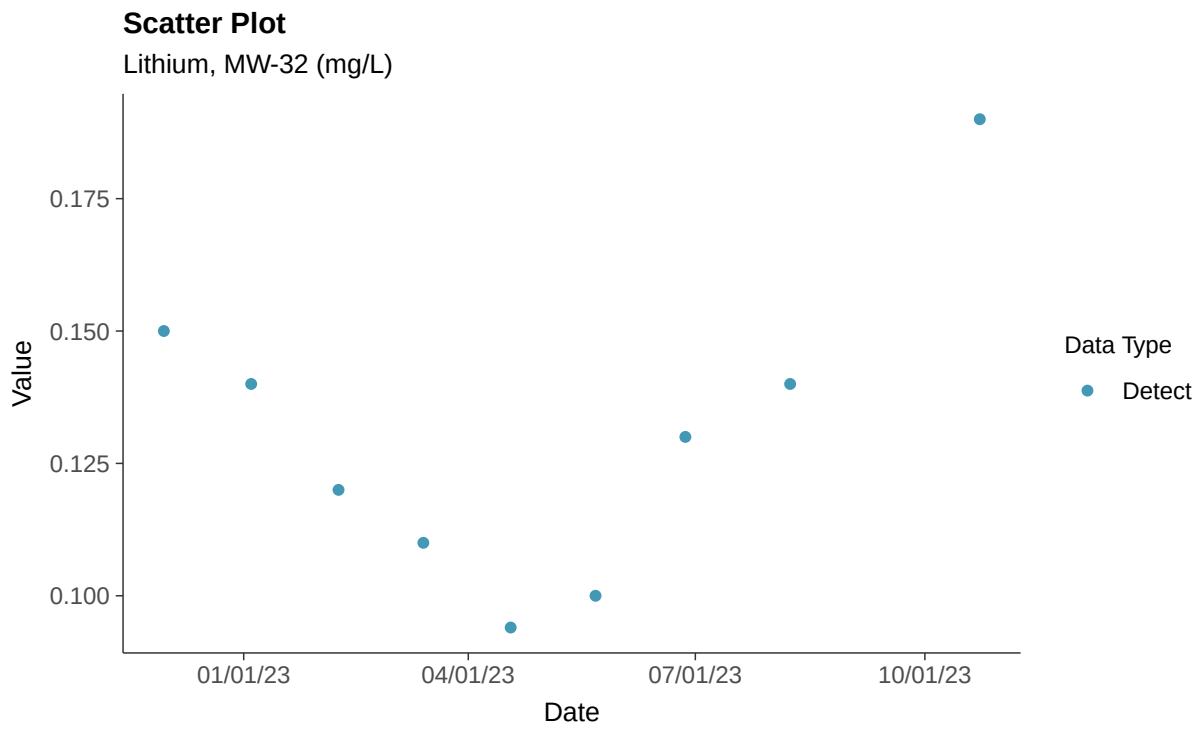

Normal Q-Q plot using ROS Imputed Estimates
Lead, MW-32 (mg/L)
Value
0.00014
0.00012
0.00010
0.00008
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect

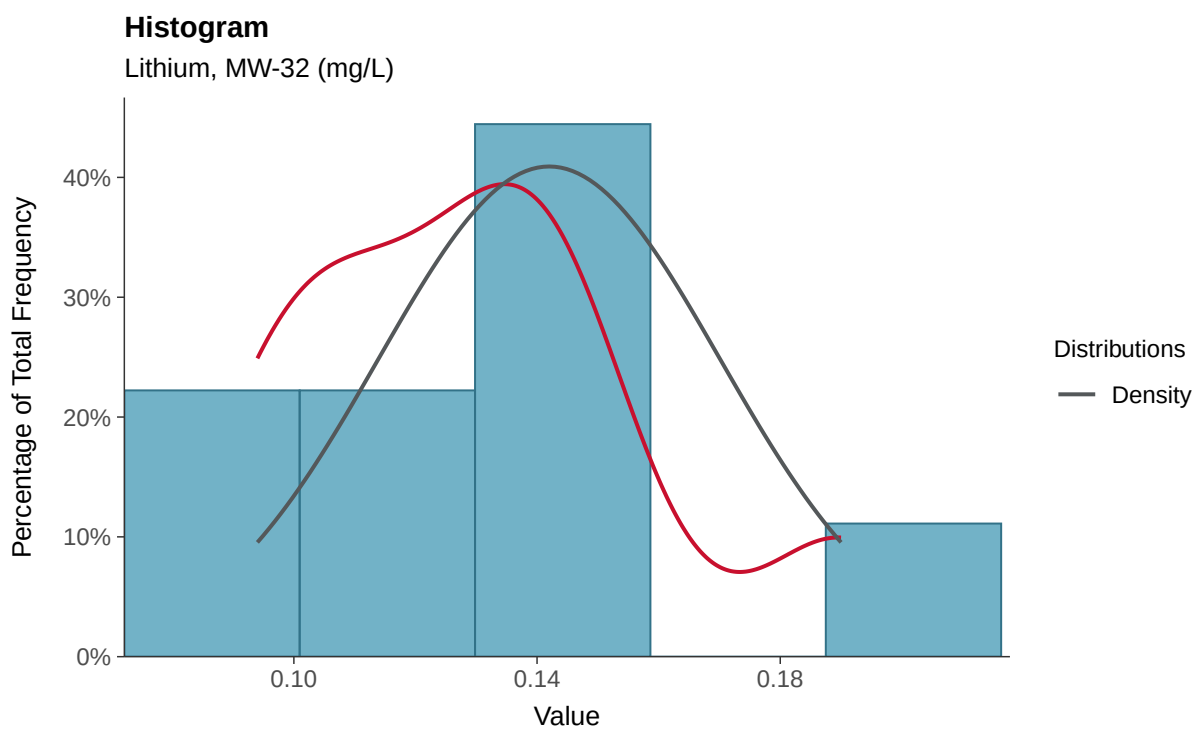

Trend Regression: Piecewise Linear-Linear
Lead, MW-32 (mg/L)
Value
0.00020
0.00016
0.00012
0.00008
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear-Linear
Lead, MW-32 (mg/L)
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Appendix IV: Lithium, MW-32

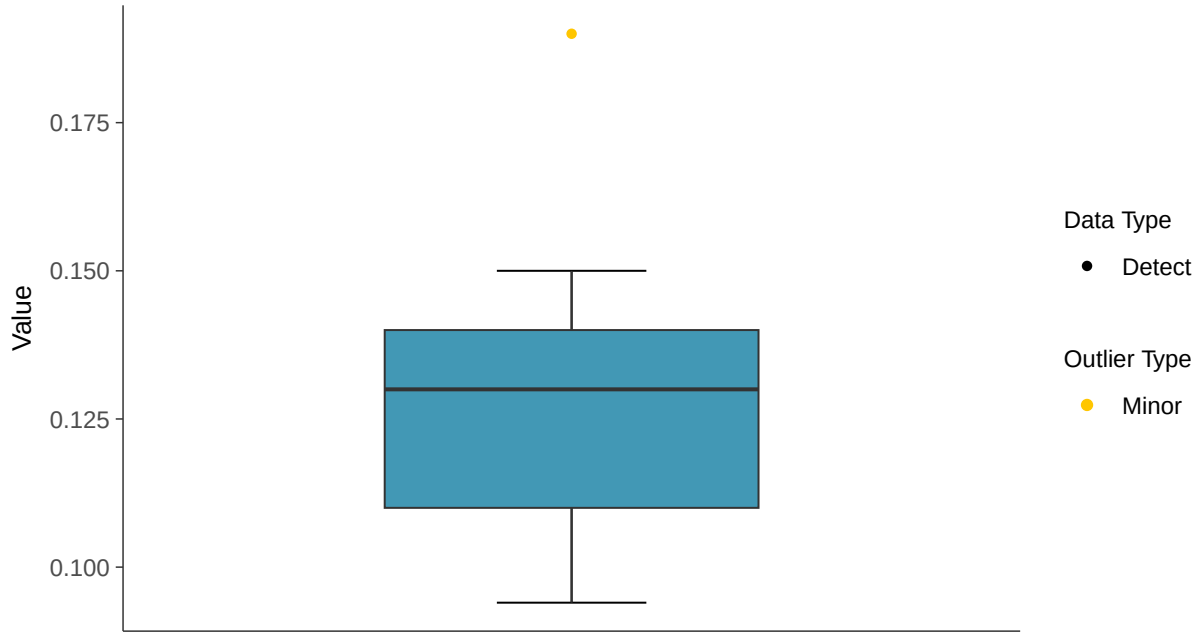
ID: 2_27_5_116





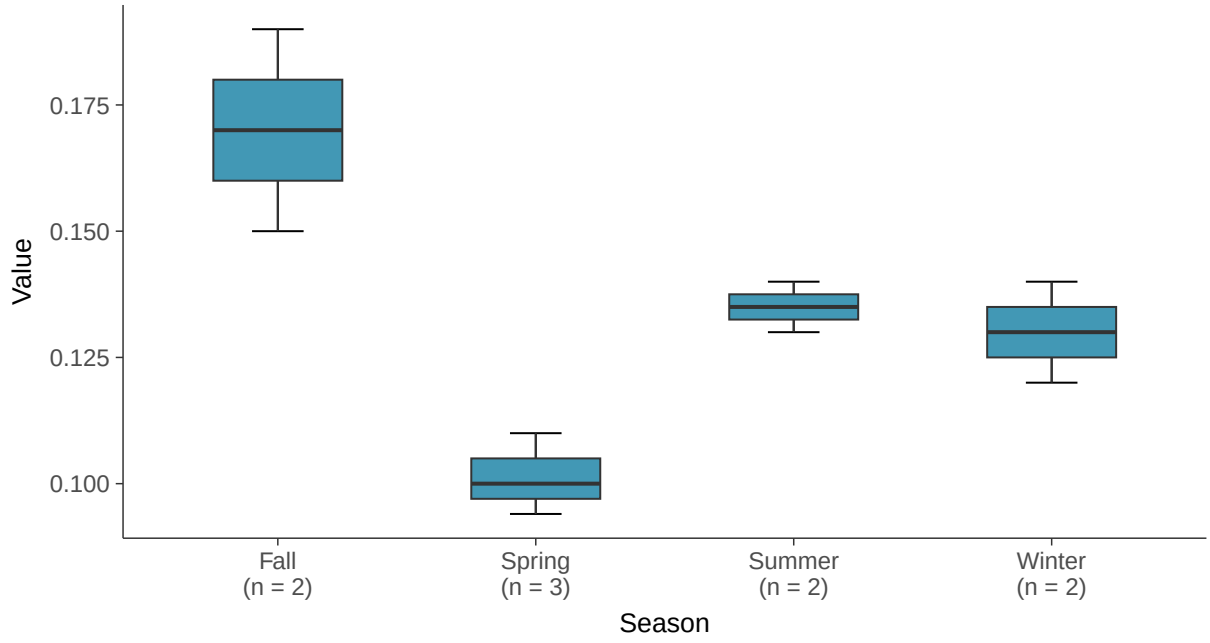
Boxplot

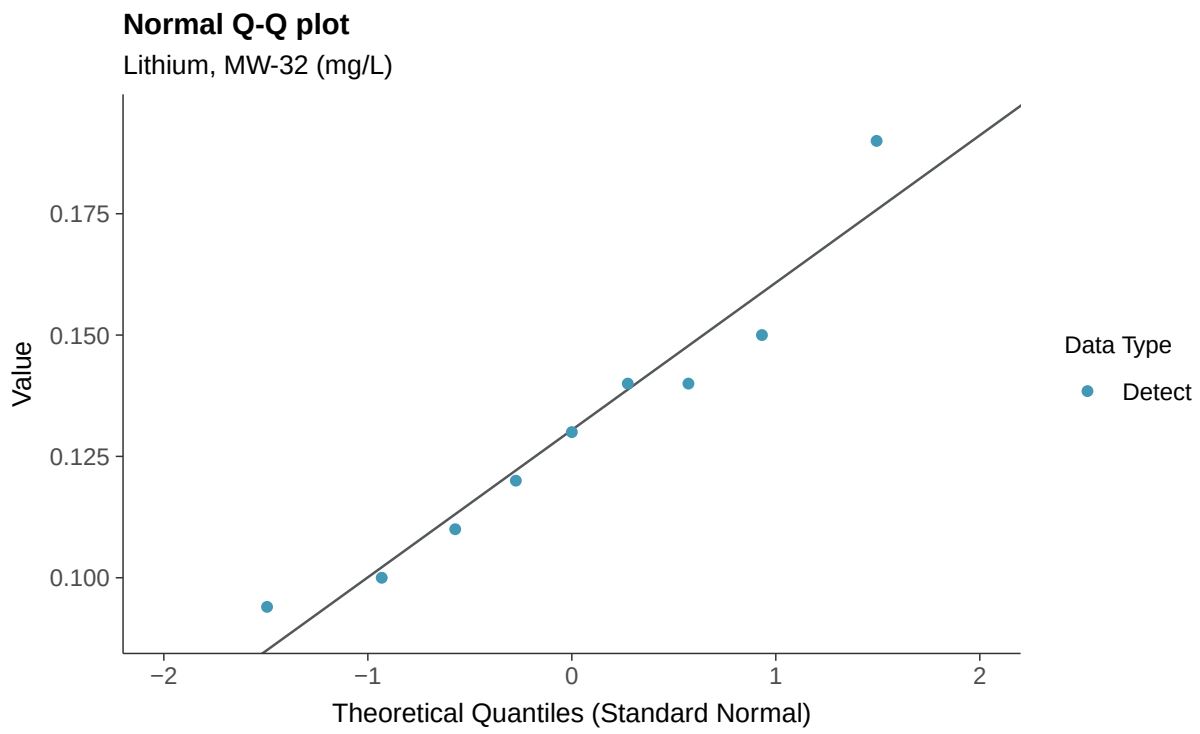
Lithium, MW-32 (mg/L)

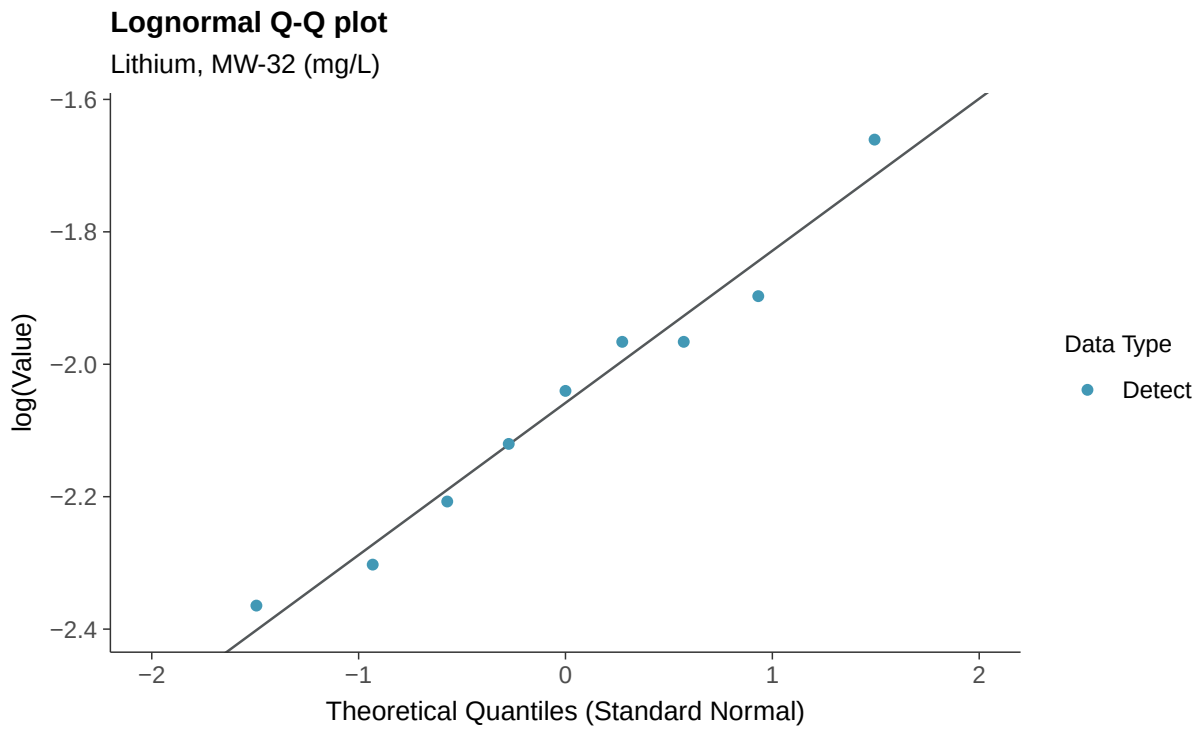


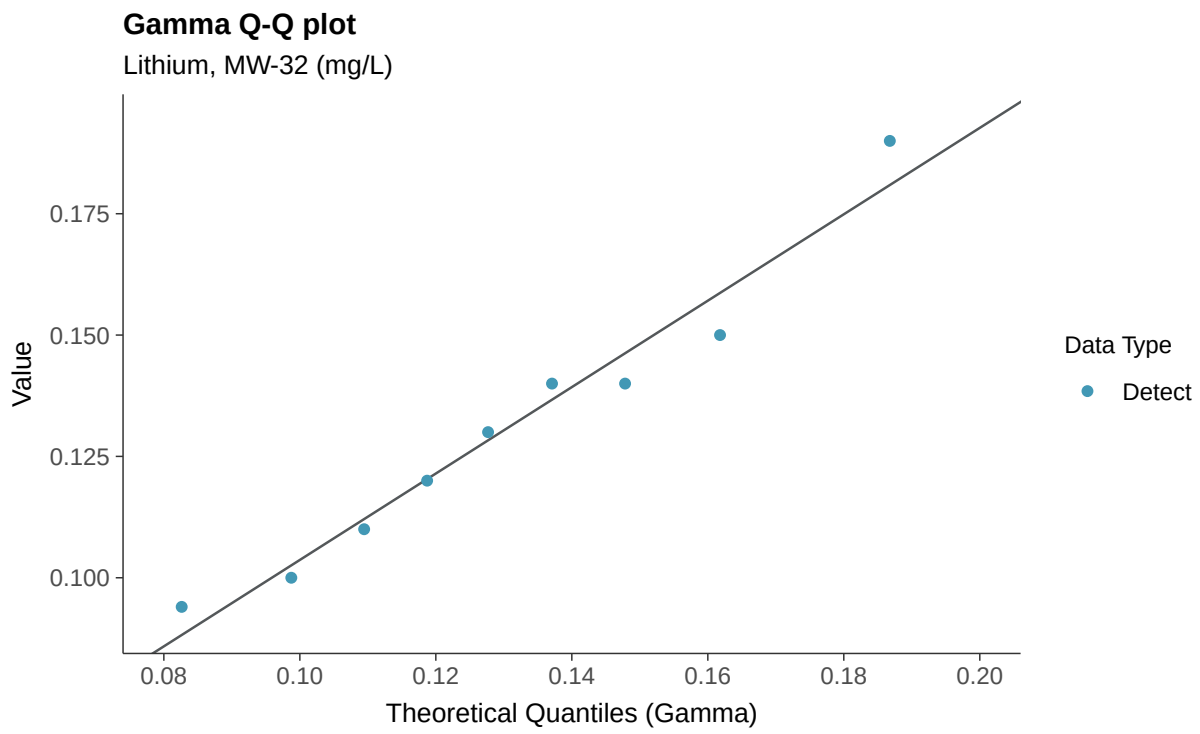
Boxplot by Season

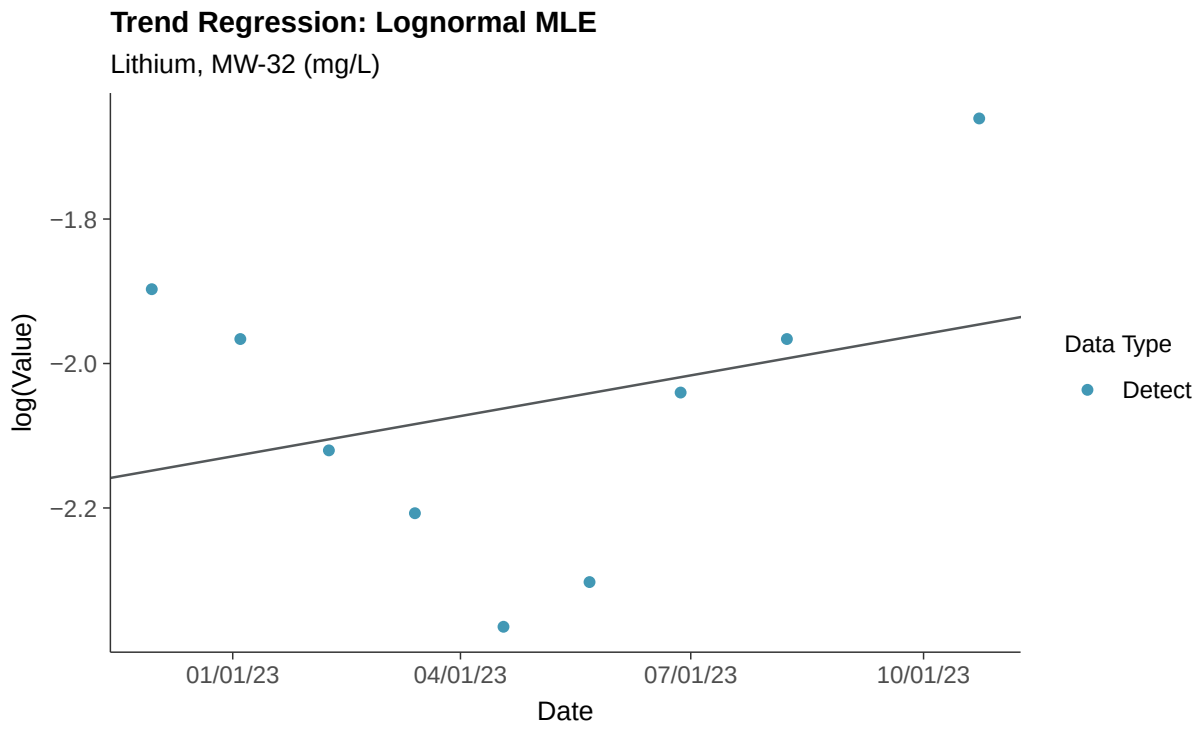
Lithium, MW-32 (mg/L)

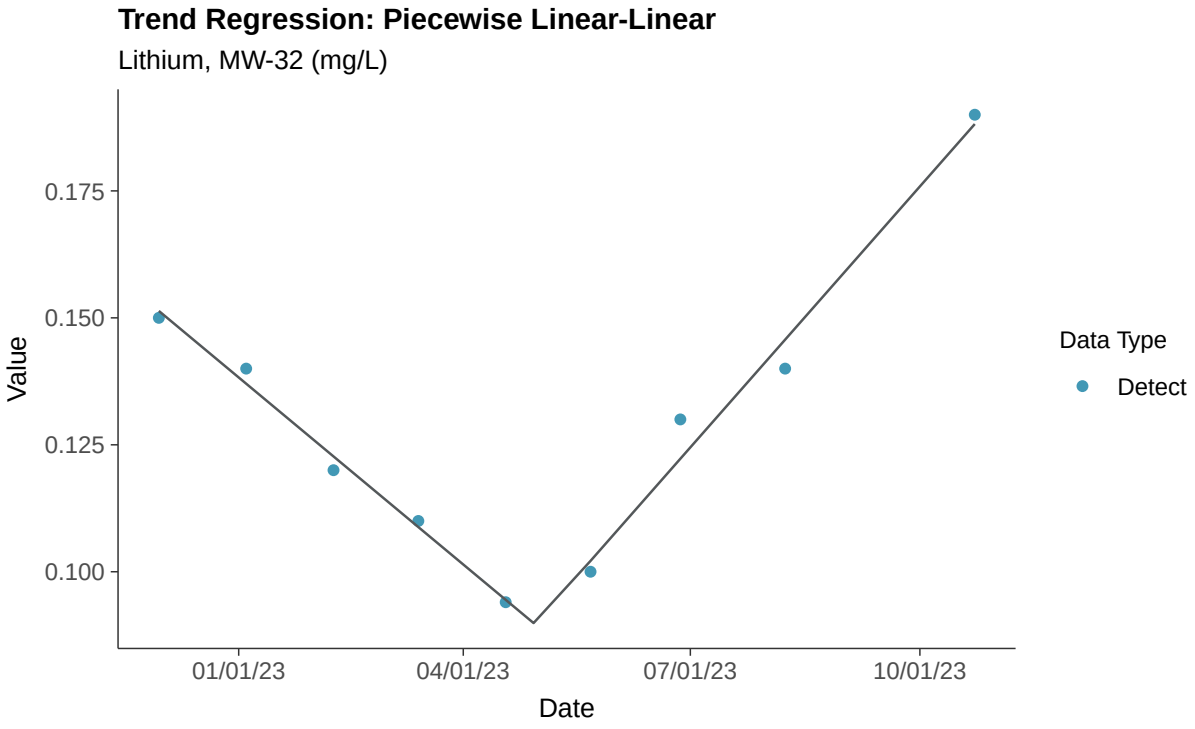



Normal Q-Q plot
Lithium, MW-32 (mg/L)
Value
0.175
0.150
0.125
0.100
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Lithium, MW-32 (mg/L)
log(Value)
−1.6
−1.8
−2.0
−2.2
−2.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

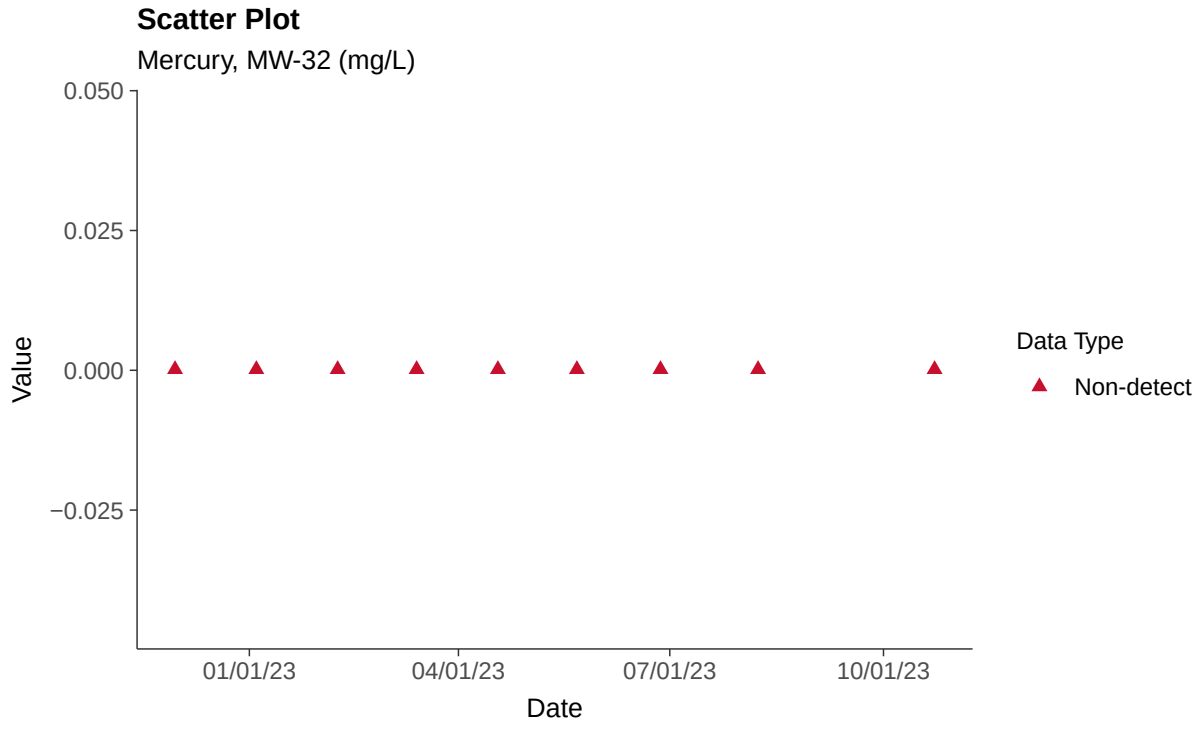

Gamma Q-Q plot
Lithium, MW-32 (mg/L)
Value
0.175
0.150
0.125
0.100
0.08
0.10
0.12
0.14
0.16
0.18
0.20
Theoretical Quantiles (Gamma)
Data Type
Detect

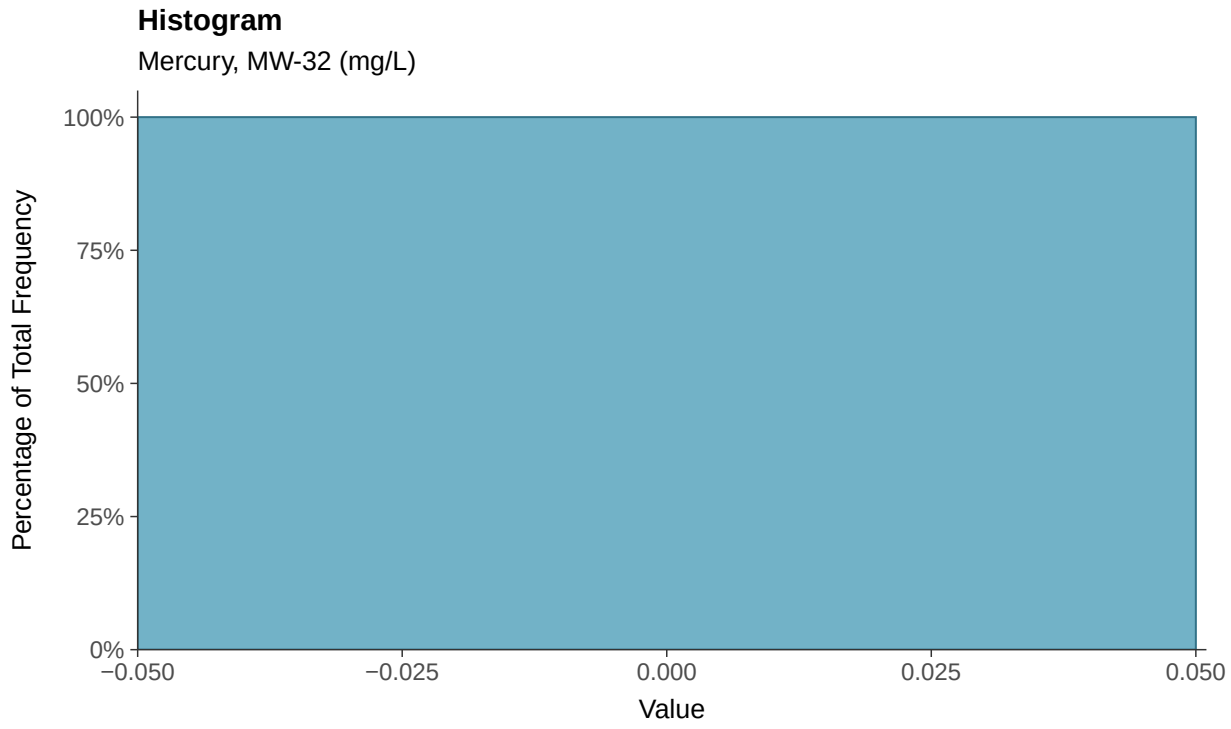

Trend Regression: Lognormal MLE
Lithium, MW-32 (mg/L)
log(Value)
−1.8
−2.0
−2.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Lithium, MW-32 (mg/L)
Value
0.175
0.150
0.125
0.100
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Mercury, MW-32

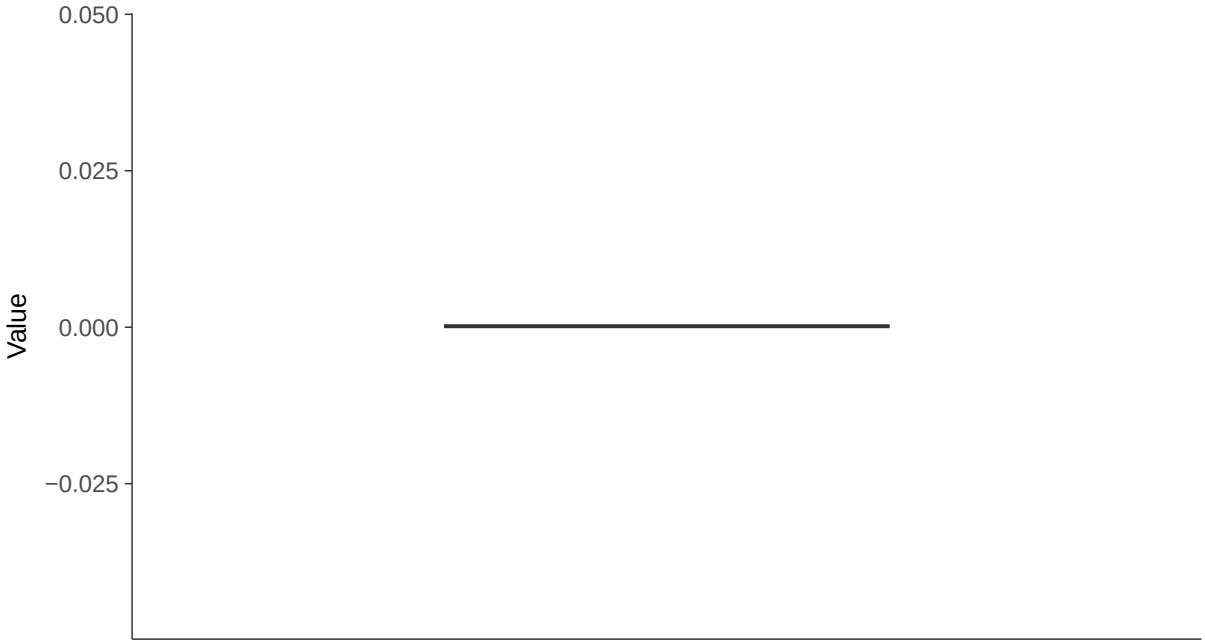
ID: 2_27_5_117





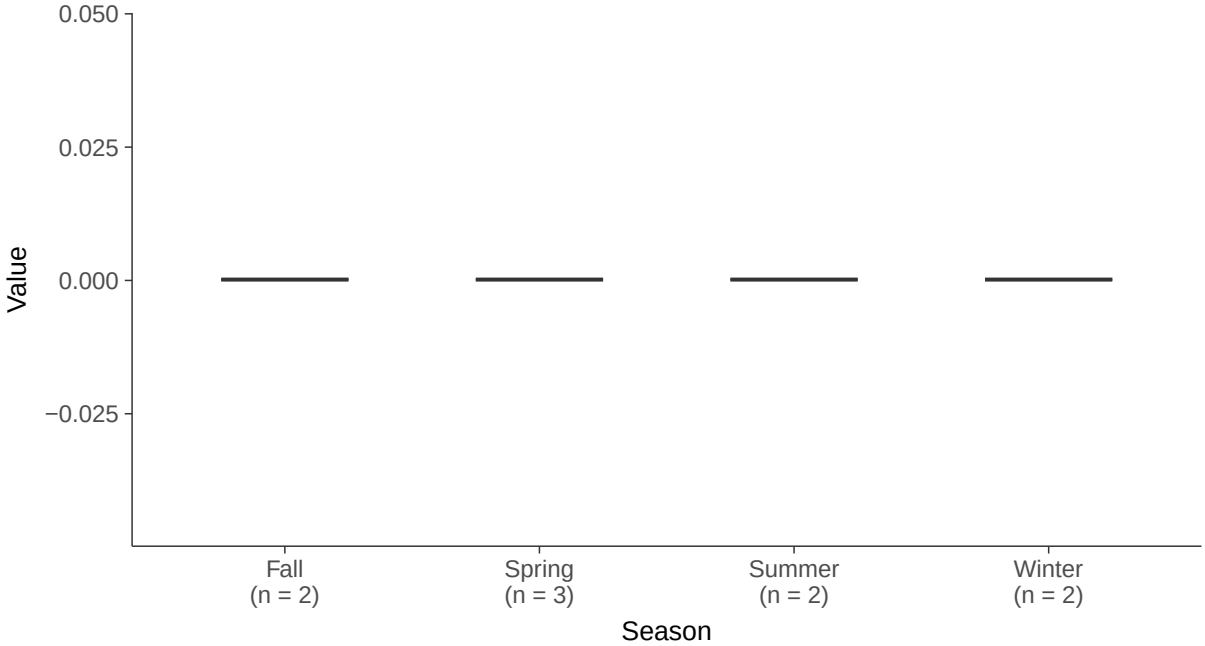
Boxplot

Mercury, MW-32 (mg/L)



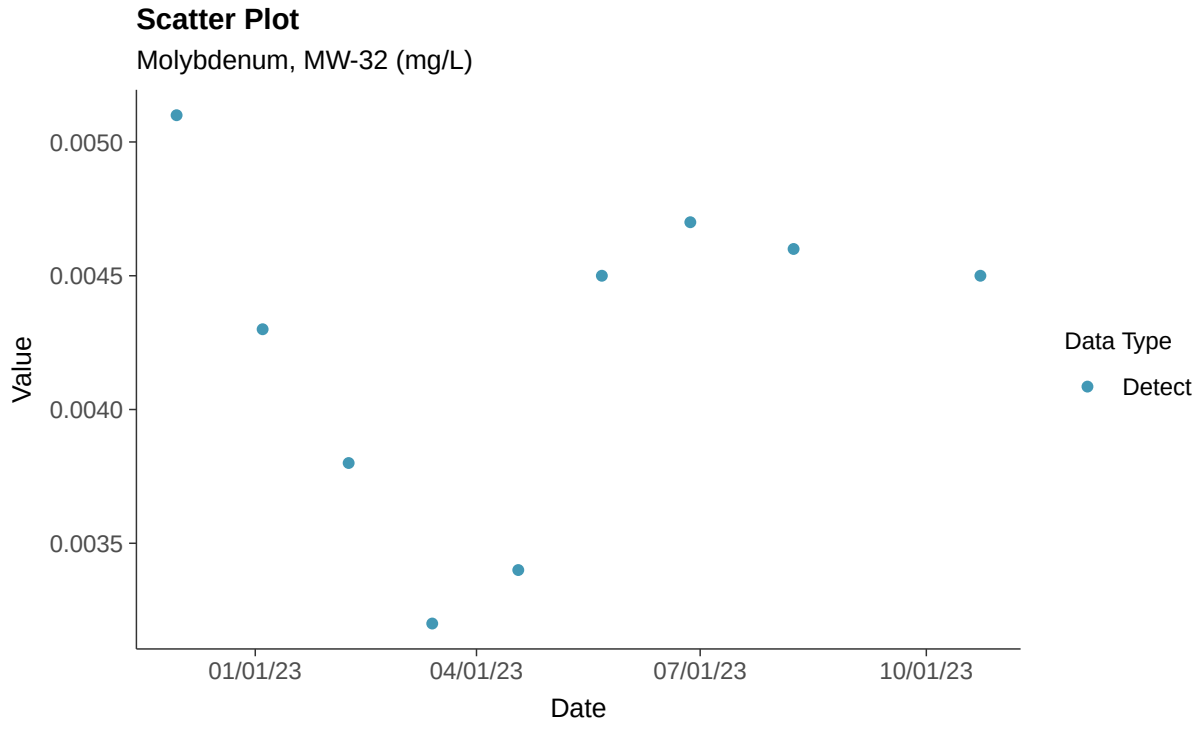
Boxplot by Season

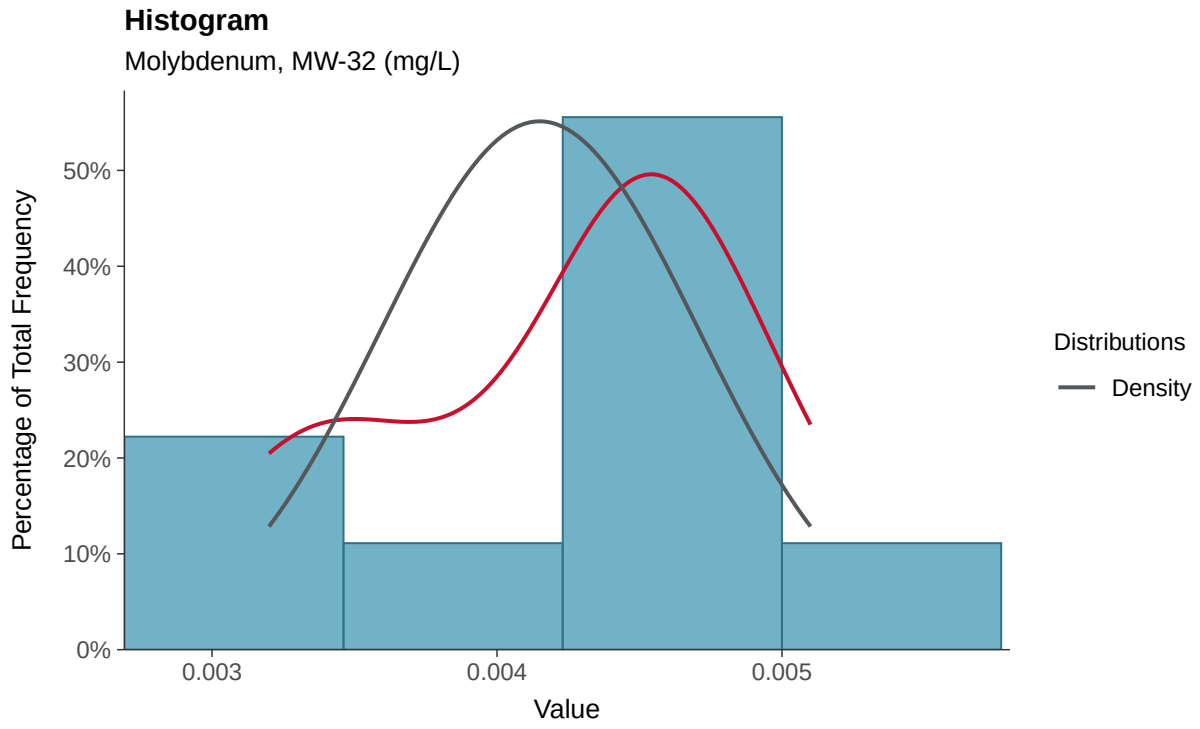
Mercury, MW-32 (mg/L)



Appendix IV: Molybdenum, MW-32

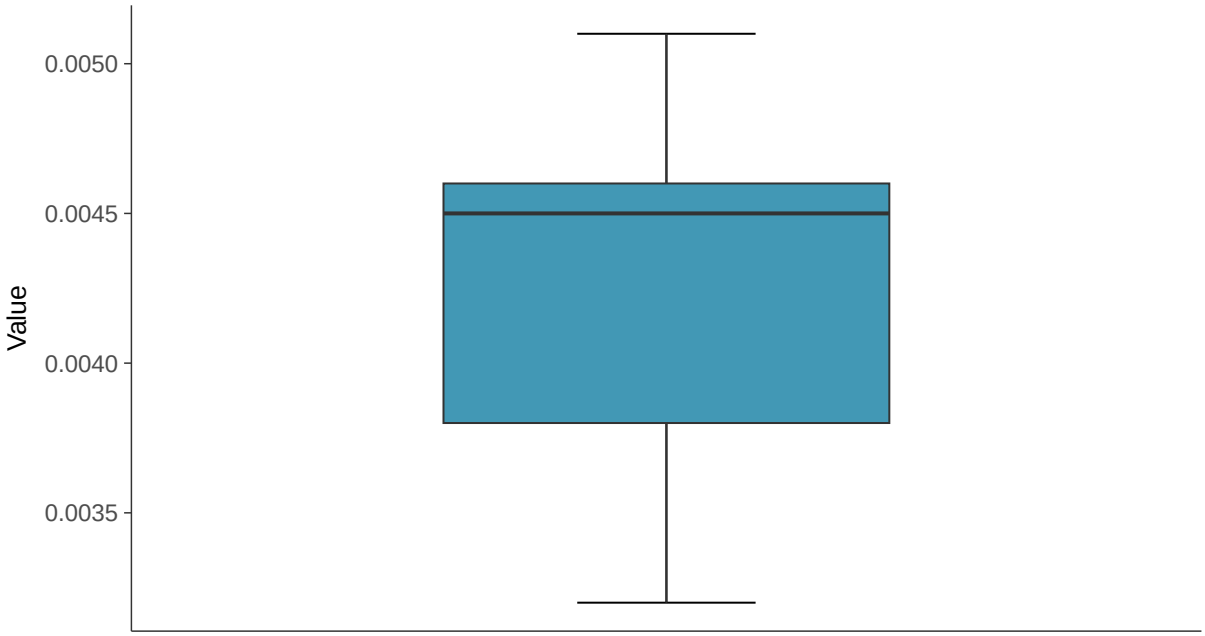
ID: 2_27_5_118





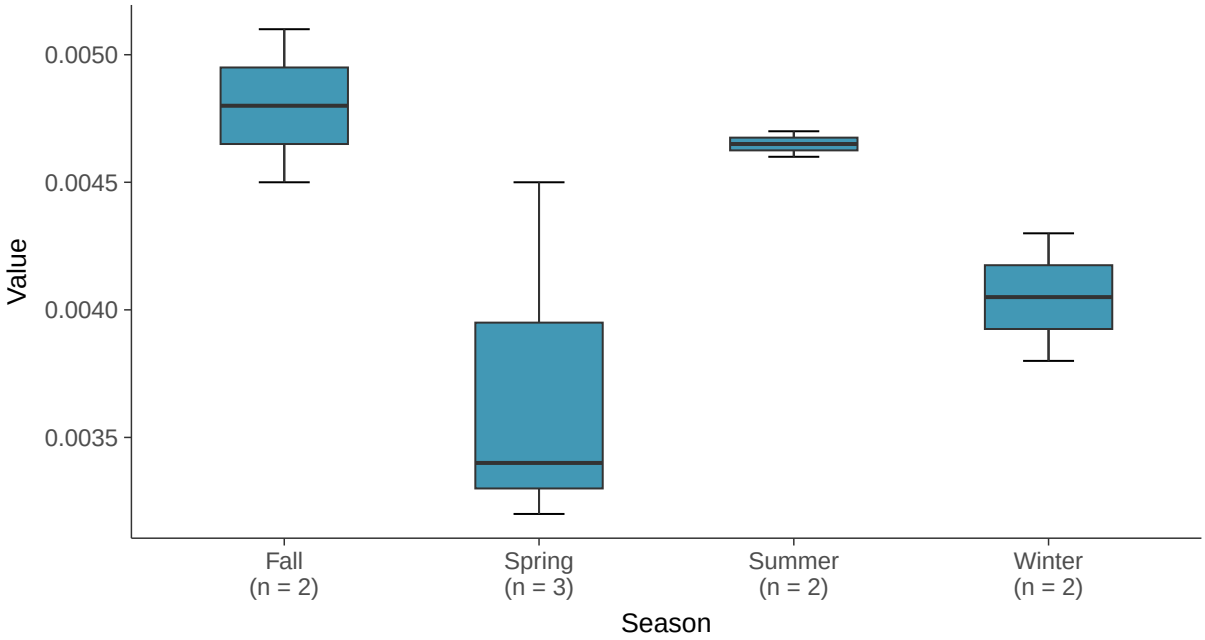
Boxplot

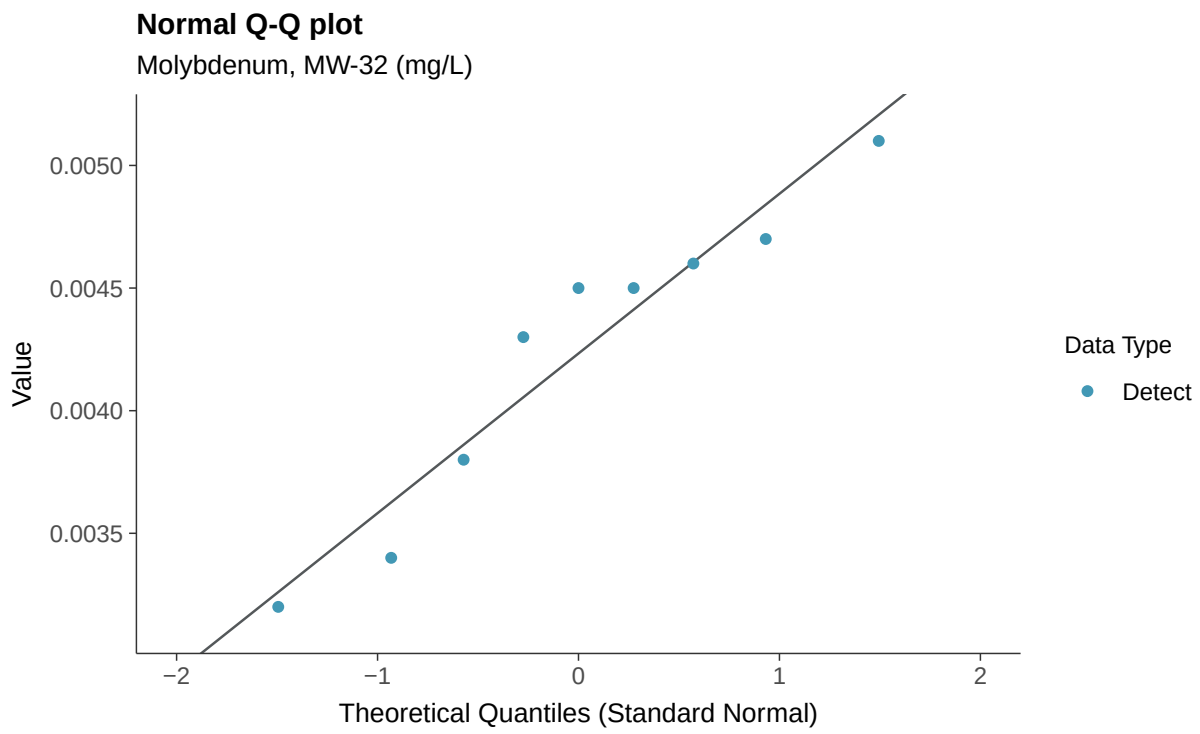
Molybdenum, MW-32 (mg/L)

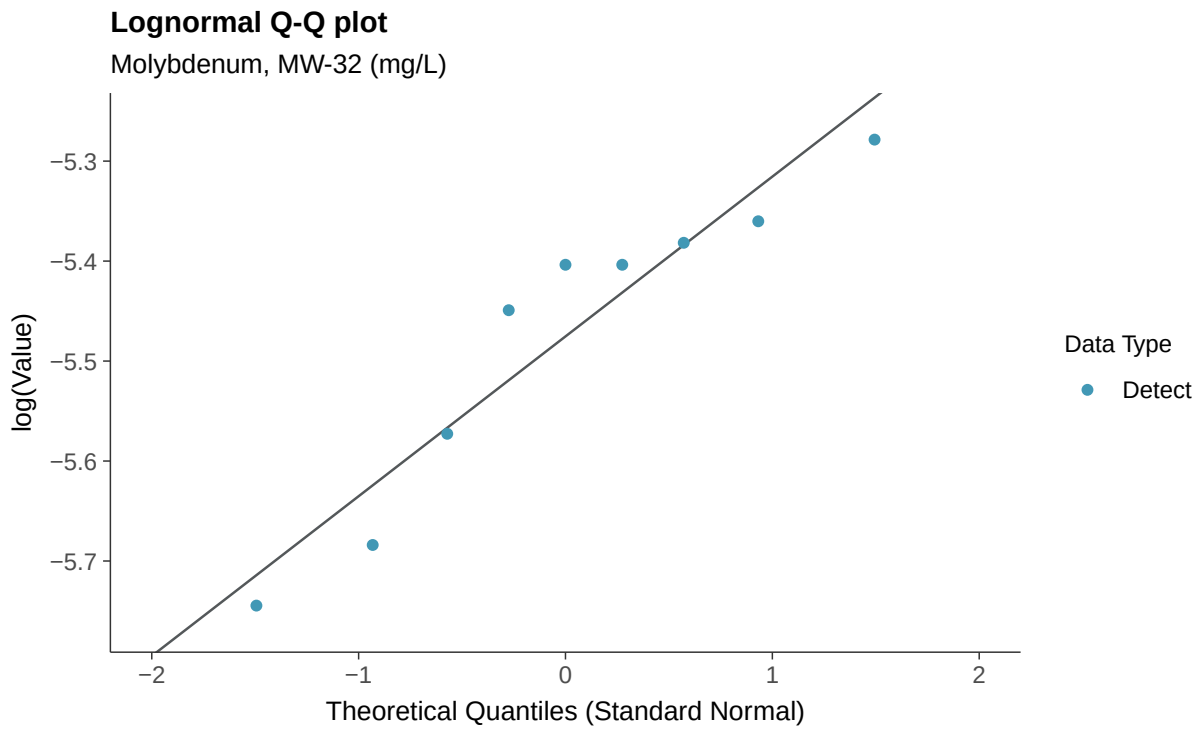


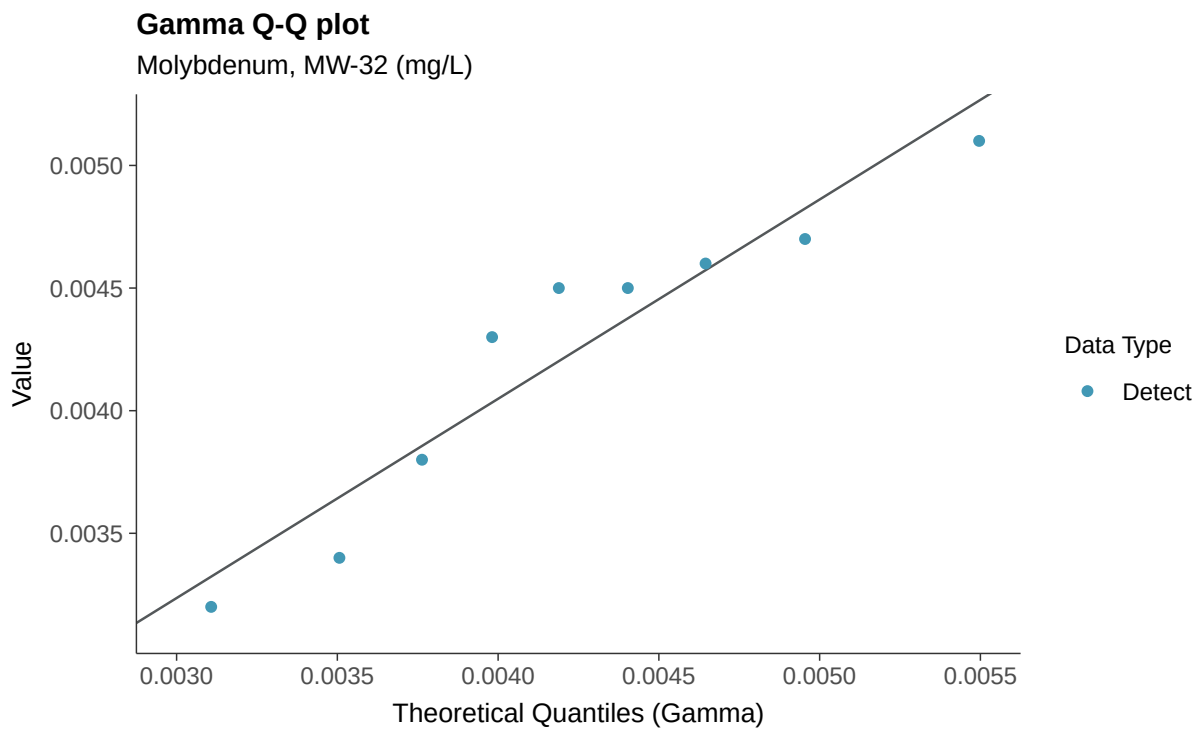
Boxplot by Season

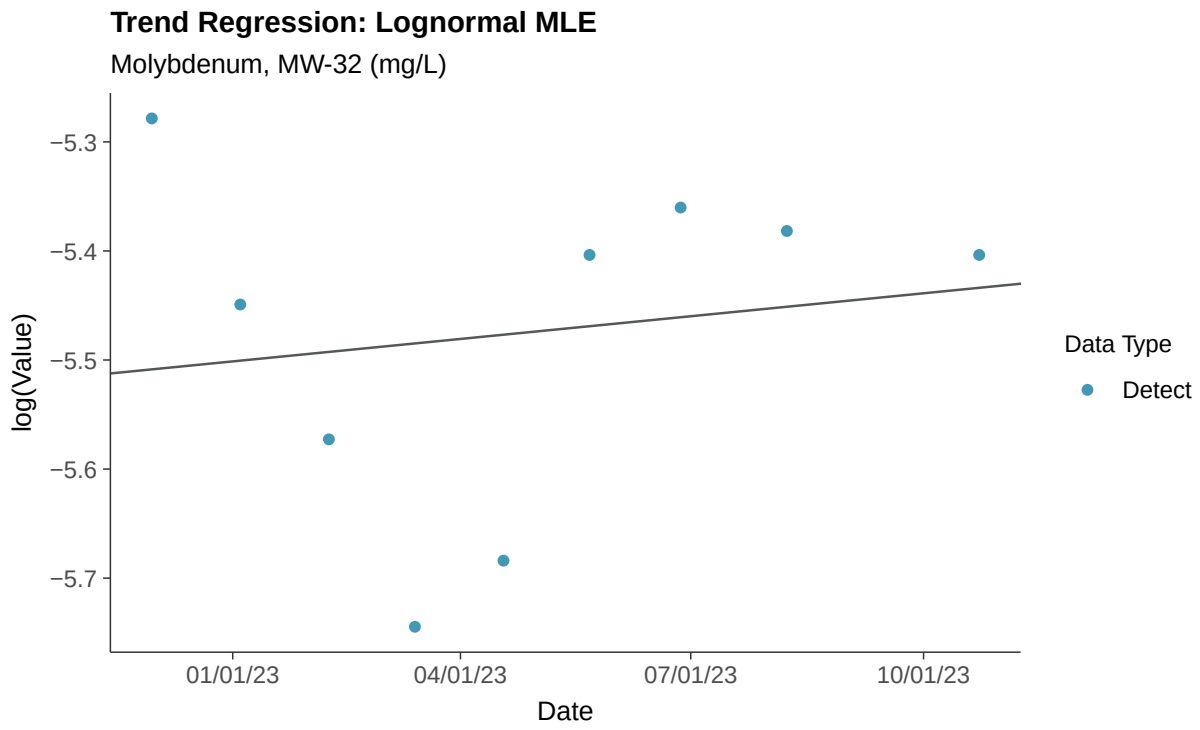
Molybdenum, MW-32 (mg/L)

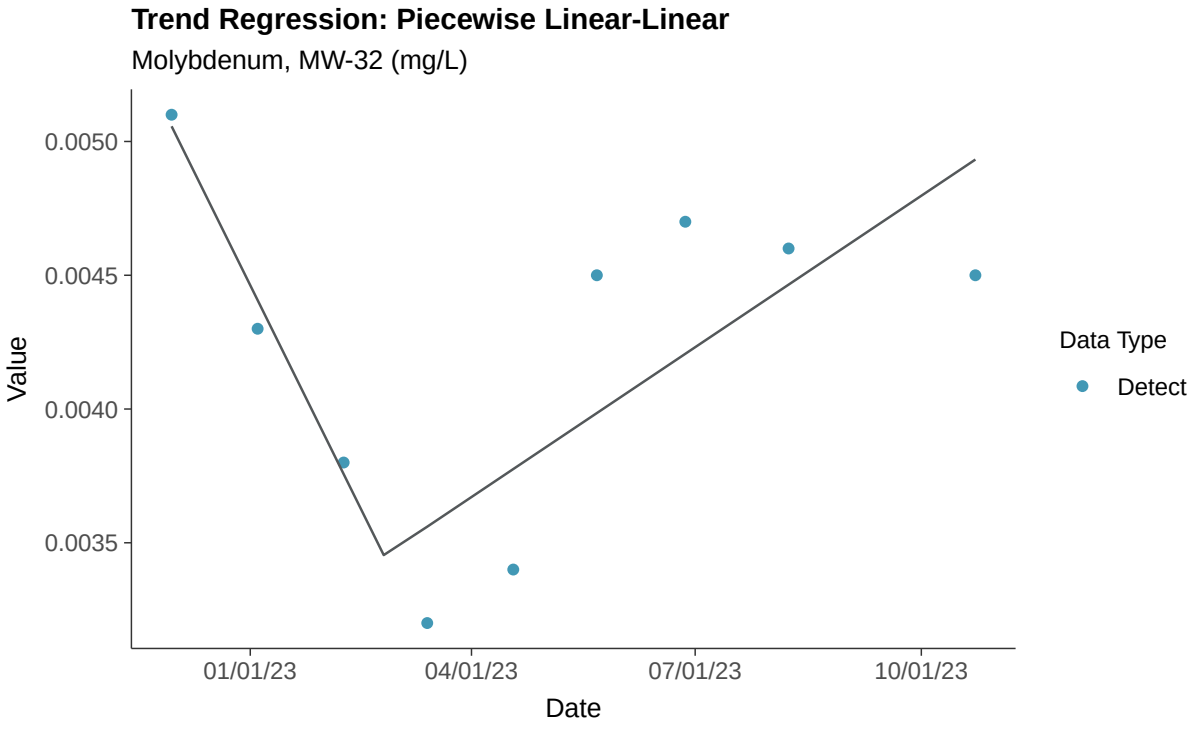


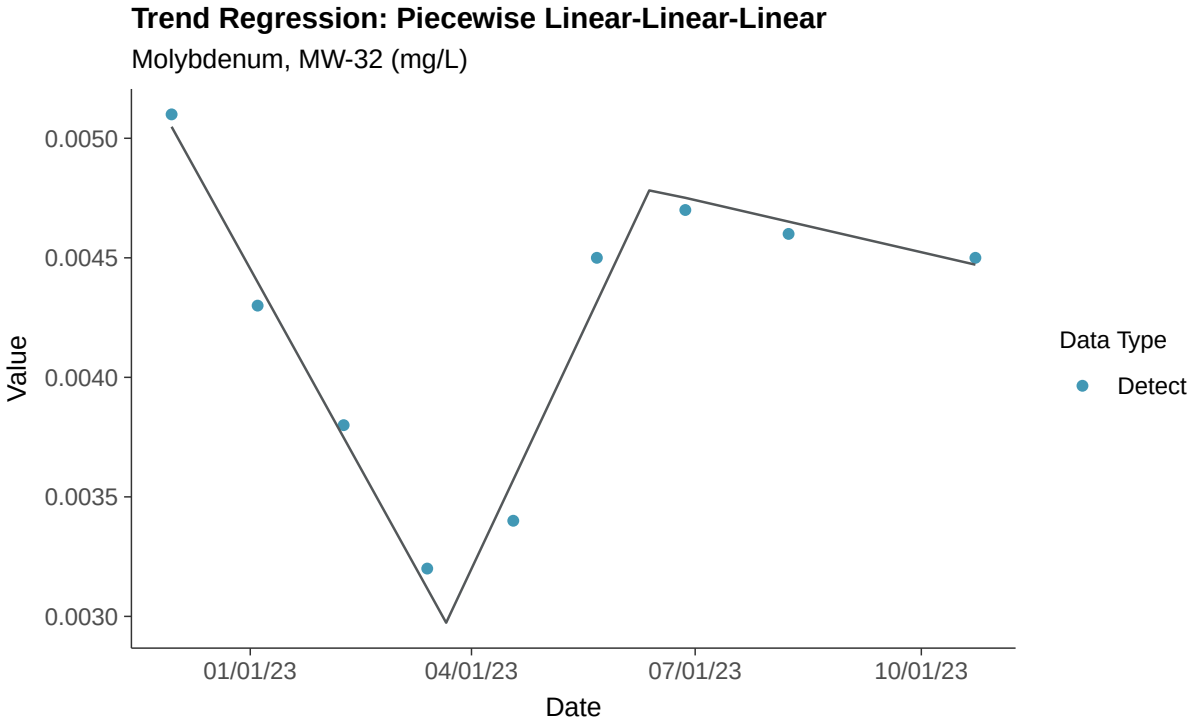

Normal Q-Q plot
Molybdenum, MW-32 (mg/L)
Value
0.0050
0.0045
0.0040
0.0035
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Molybdenum, MW-32 (mg/L)
log(Value)
−5.3
−5.4
−5.5
−5.6
−5.7
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Molybdenum, MW-32 (mg/L)
Value
0.0050
0.0045
0.0040
0.0035
0.0030
0.0035
0.0040
0.0045
0.0050
0.0055
Theoretical Quantiles (Gamma)
Data Type
Detect

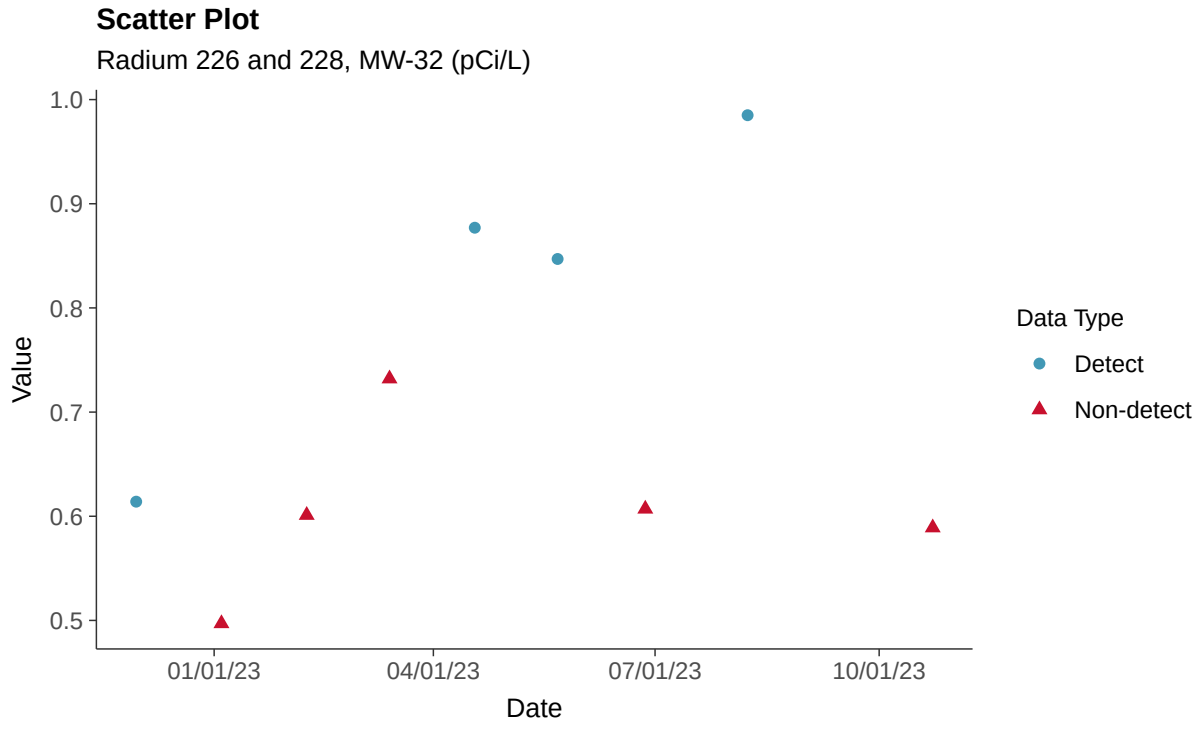

Trend Regression: Lognormal MLE
Molybdenum, MW-32 (mg/L)
log(Value)
−5.3
−5.4
−5.5
−5.6
−5.7
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

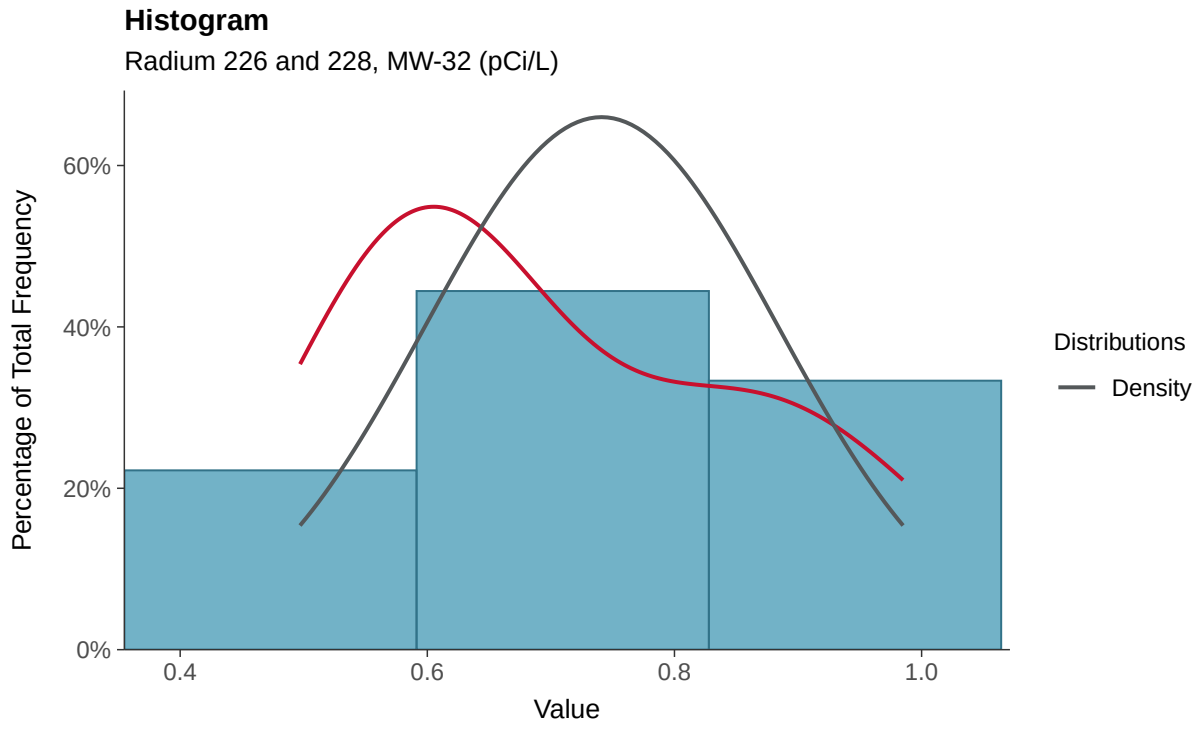

Trend Regression: Piecewise Linear-Linear
Molybdenum, MW-32 (mg/L)
0.0050
0.0045
0.0040
0.0035
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Molybdenum, MW-32 (mg/L)
0.0050
0.0045
0.0040
0.0035
0.0030
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Appendix IV: Radium 226 and 228, MW-32

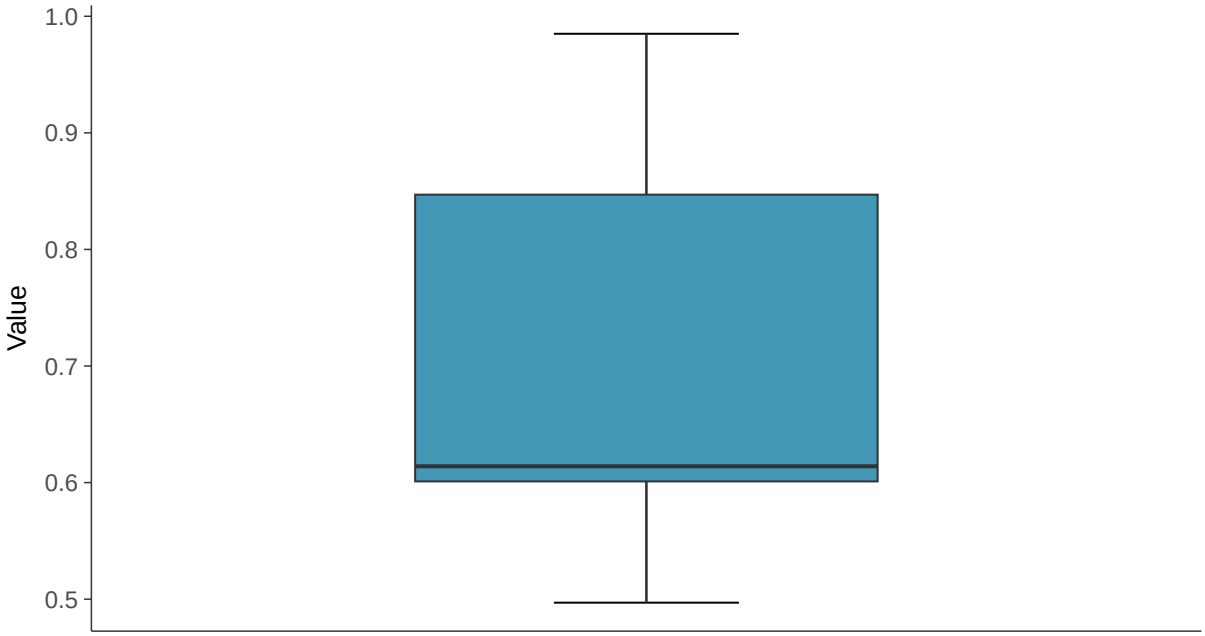
ID: 2_27_5_121





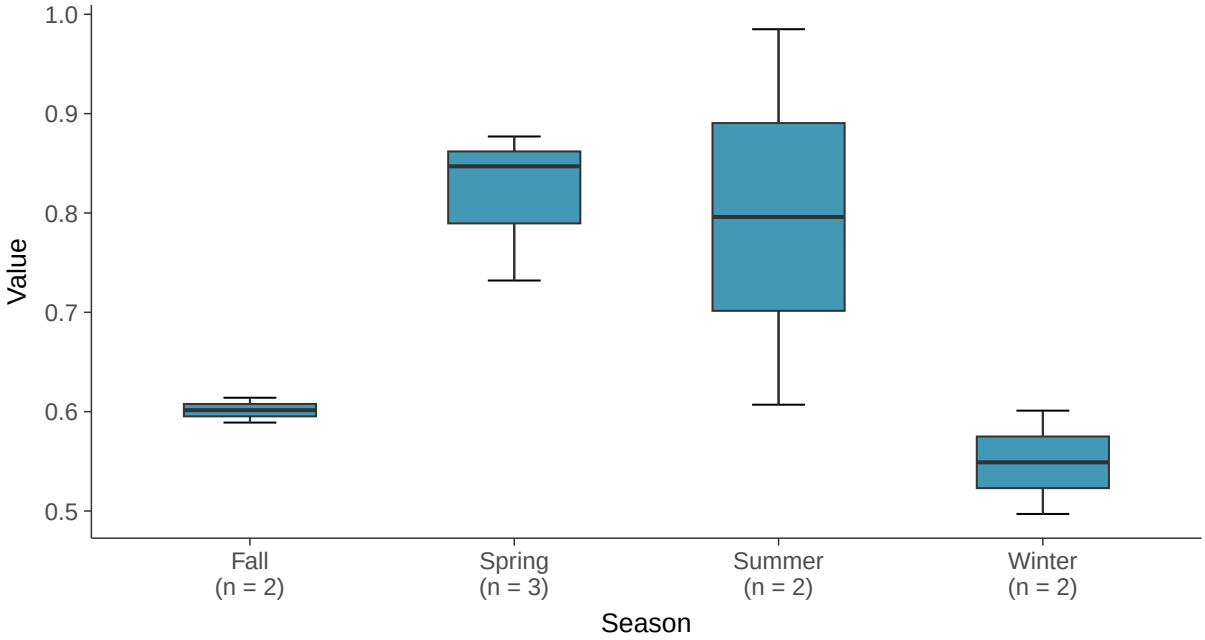
Boxplot

Radium 226 and 228, MW-32 (pCi/L)



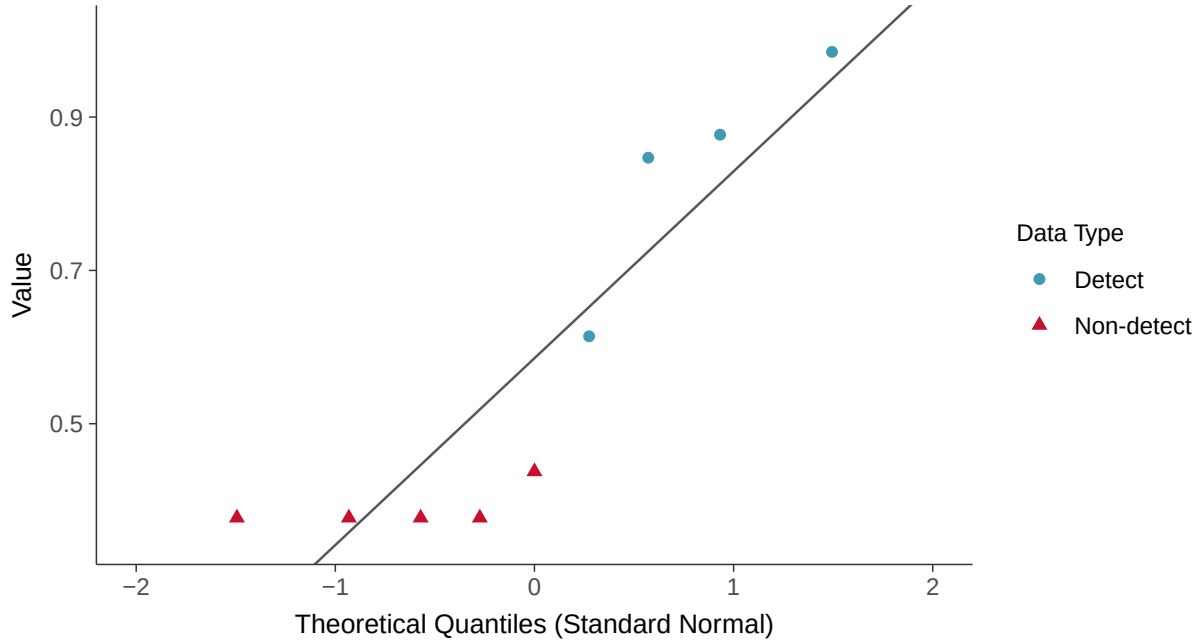
Boxplot by Season

Radium 226 and 228, MW-32 (pCi/L)



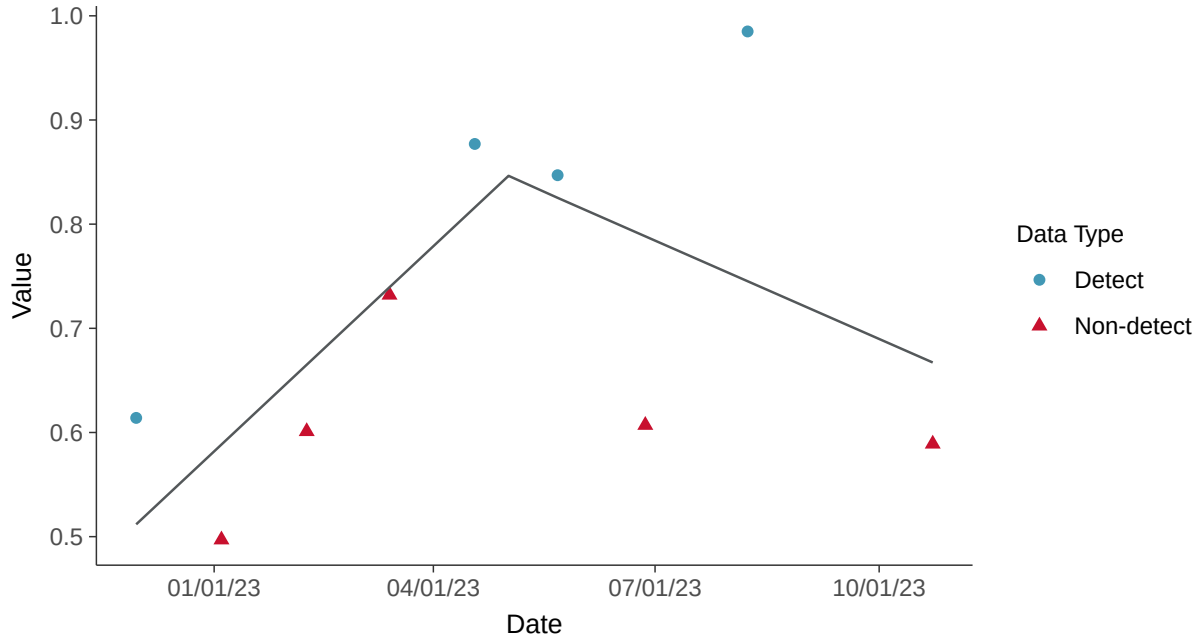
Normal Q-Q plot using ROS Imputed Estimates

Radium 226 and 228, MW-32 (pCi/L)



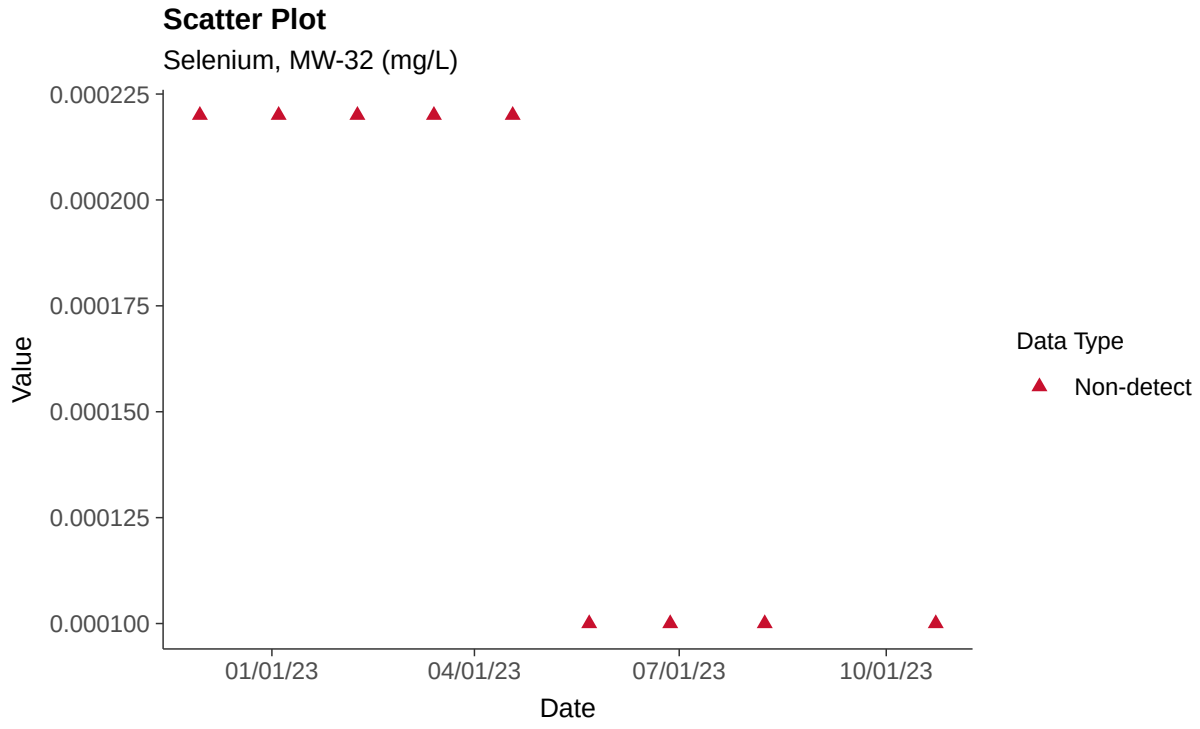
Trend Regression: Piecewise Linear-Linear

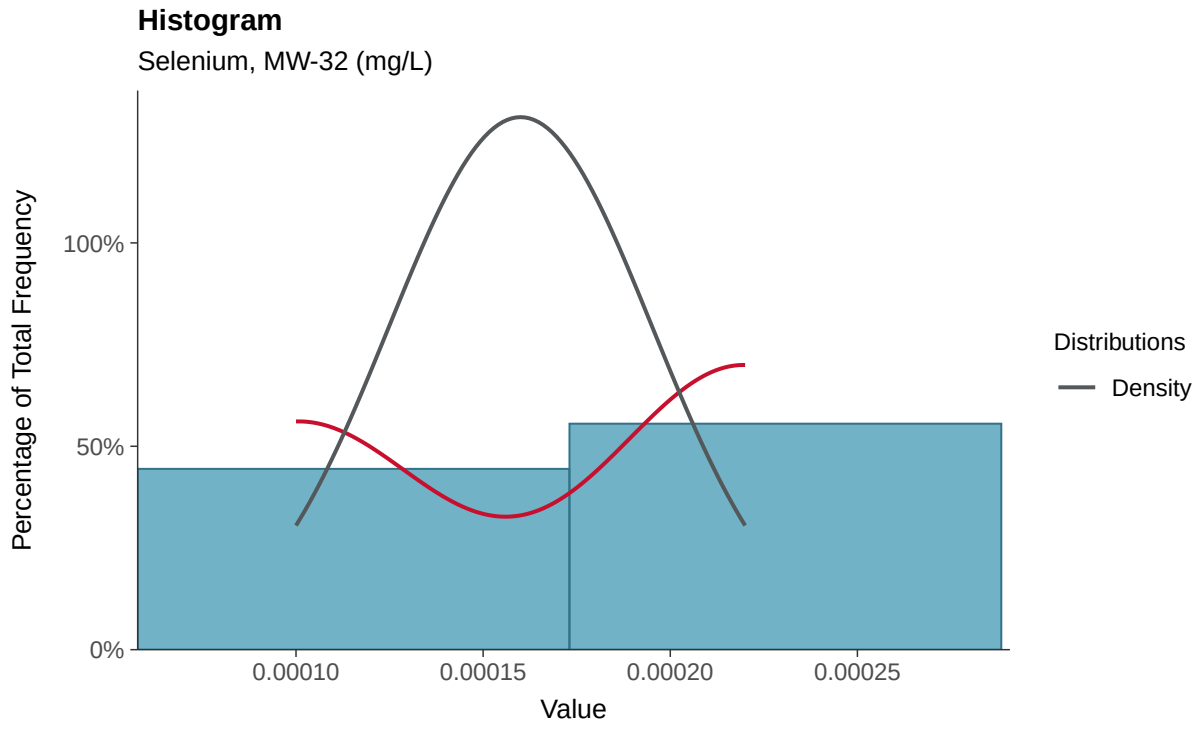
Radium 226 and 228, MW-32 (pCi/L)

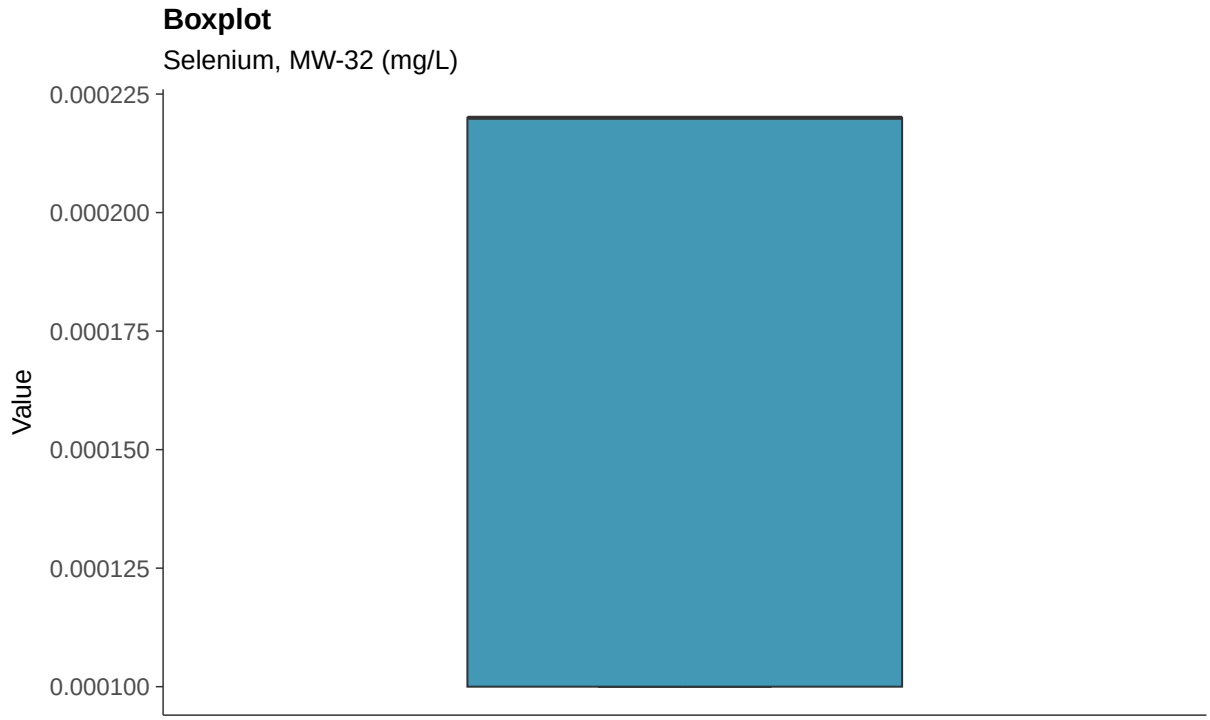


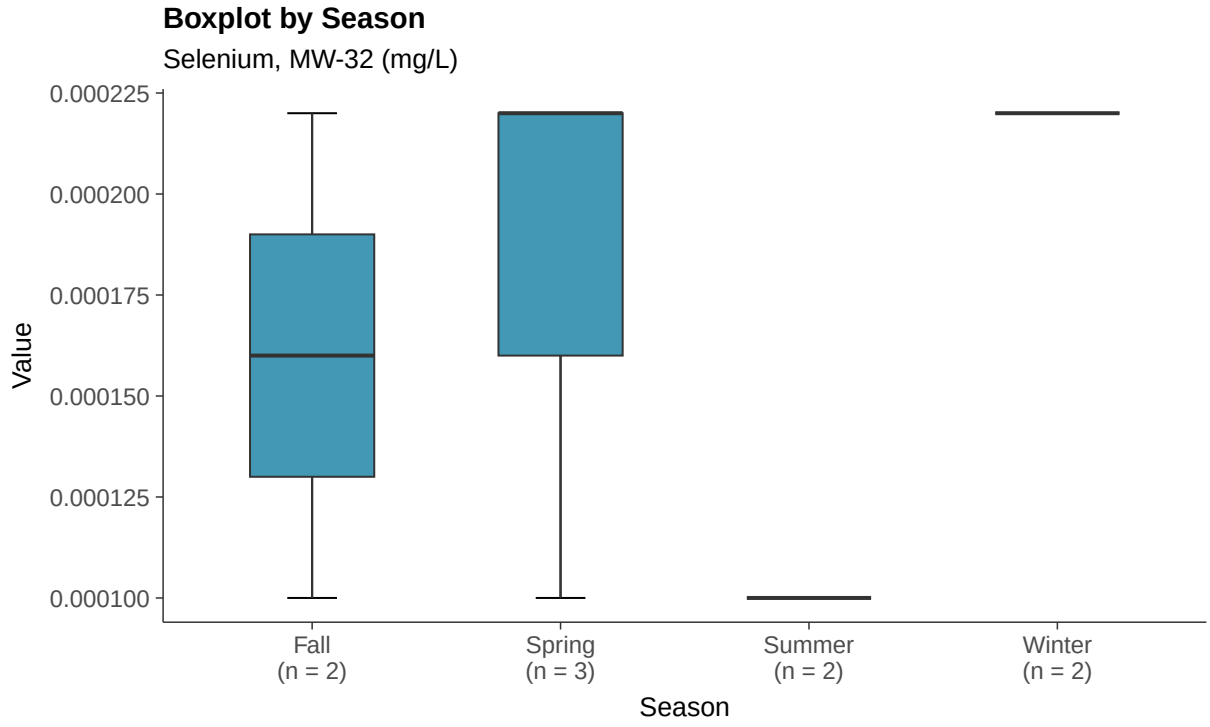
Appendix IV: Selenium, MW-32

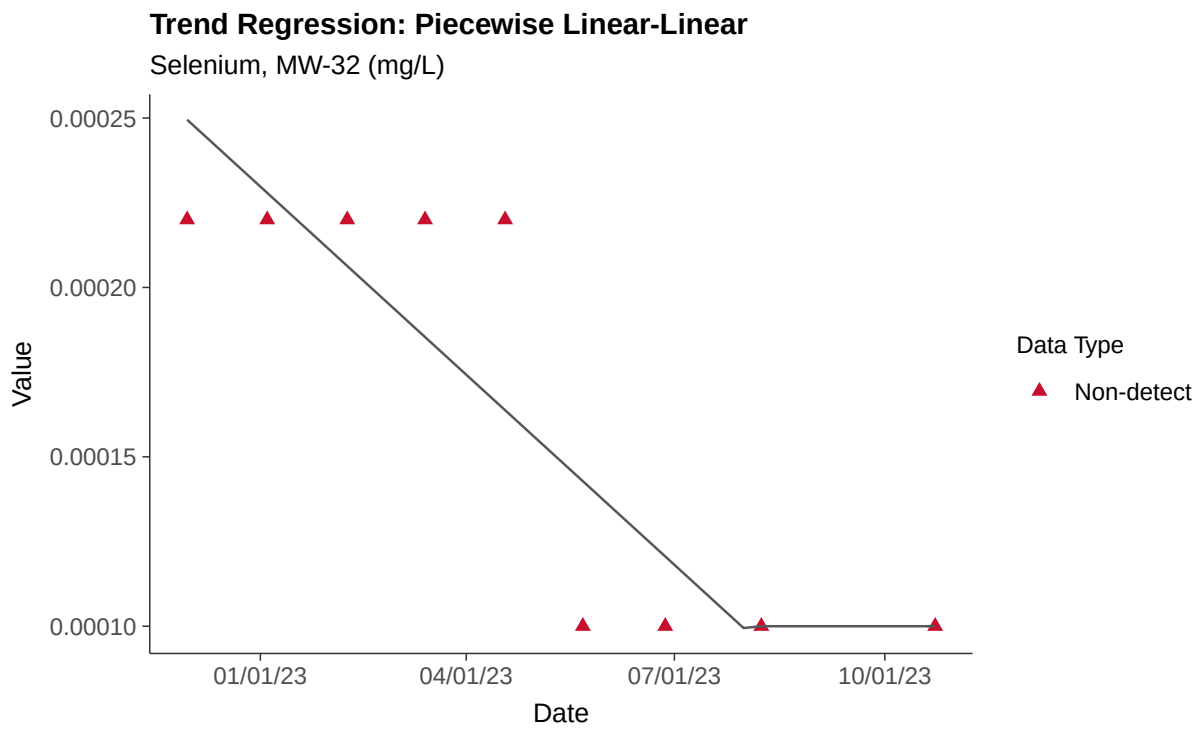
ID: 2_27_5_122

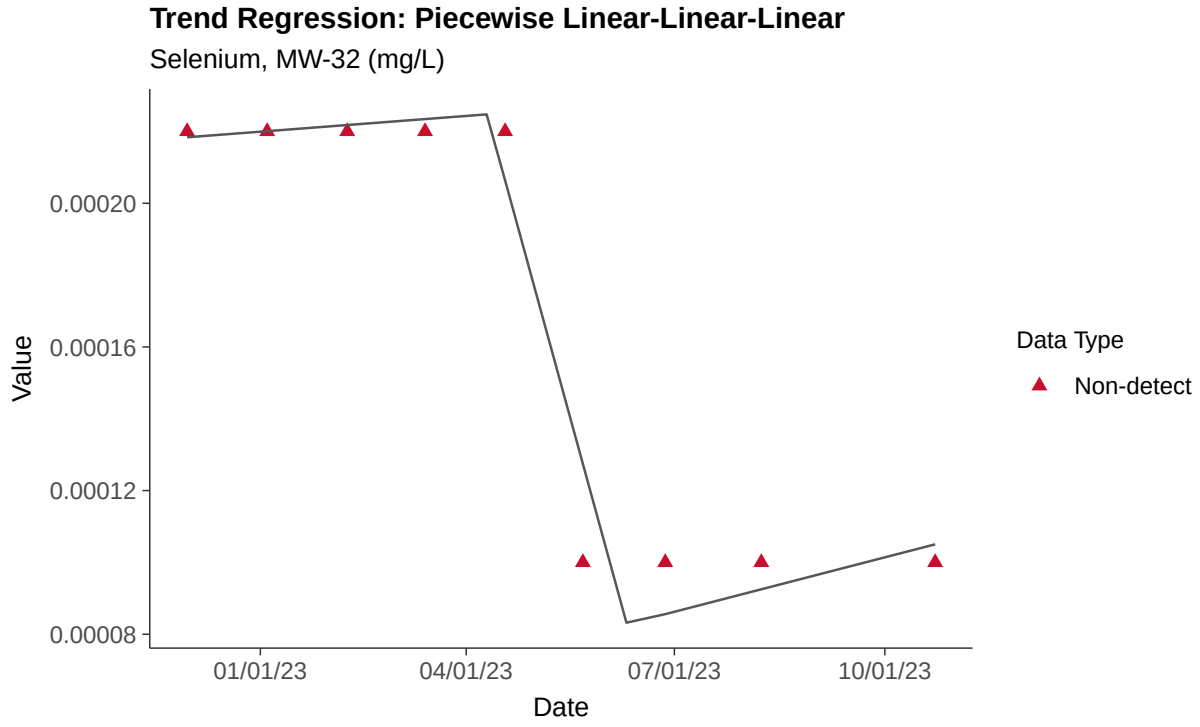





Boxplot
Selenium, MW-32 (mg/L)
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100
Value

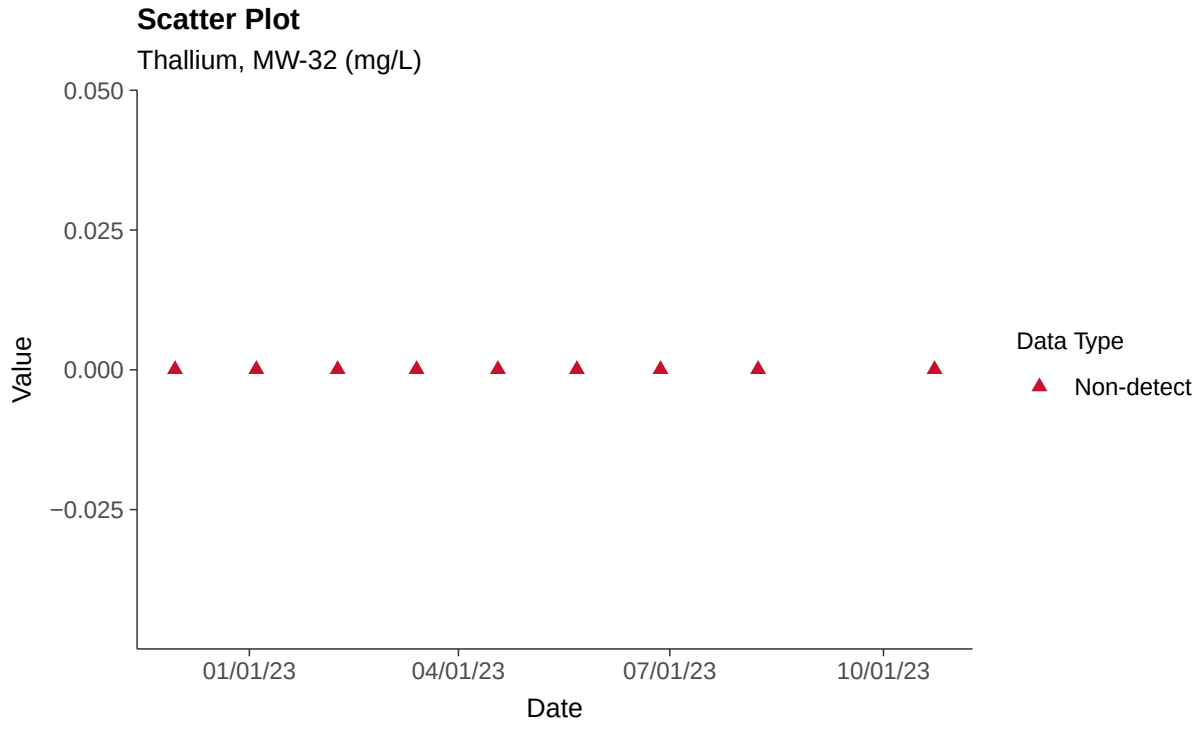

Boxplot by Season
Selenium, MW-32 (mg/L)
0.000225
0.000200
0.000175
0.000150
0.000125
0.000100
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

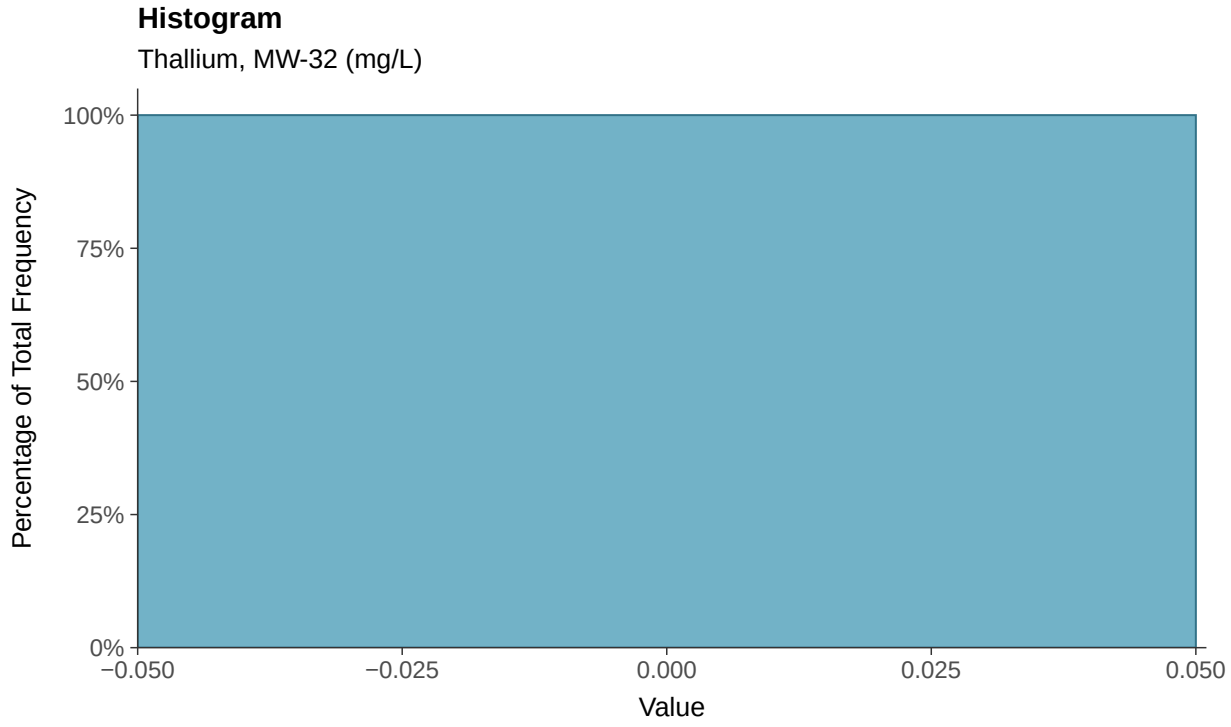

Trend Regression: Piecewise Linear-Linear
Selenium, MW-32 (mg/L)
0.00025
0.00020
0.00015
0.00010
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

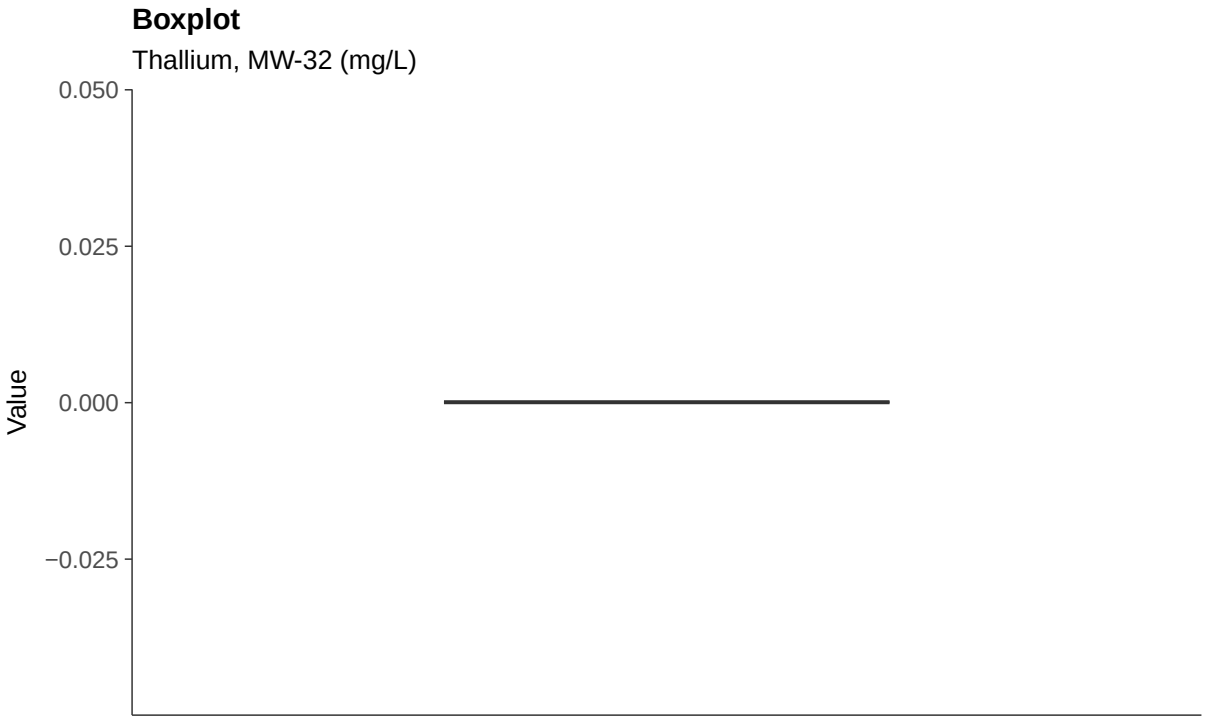

Trend Regression: Piecewise Linear-Linear-Linear
Selenium, MW-32 (mg/L)
0.00020
0.00016
0.00012
0.00008
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Non-detect

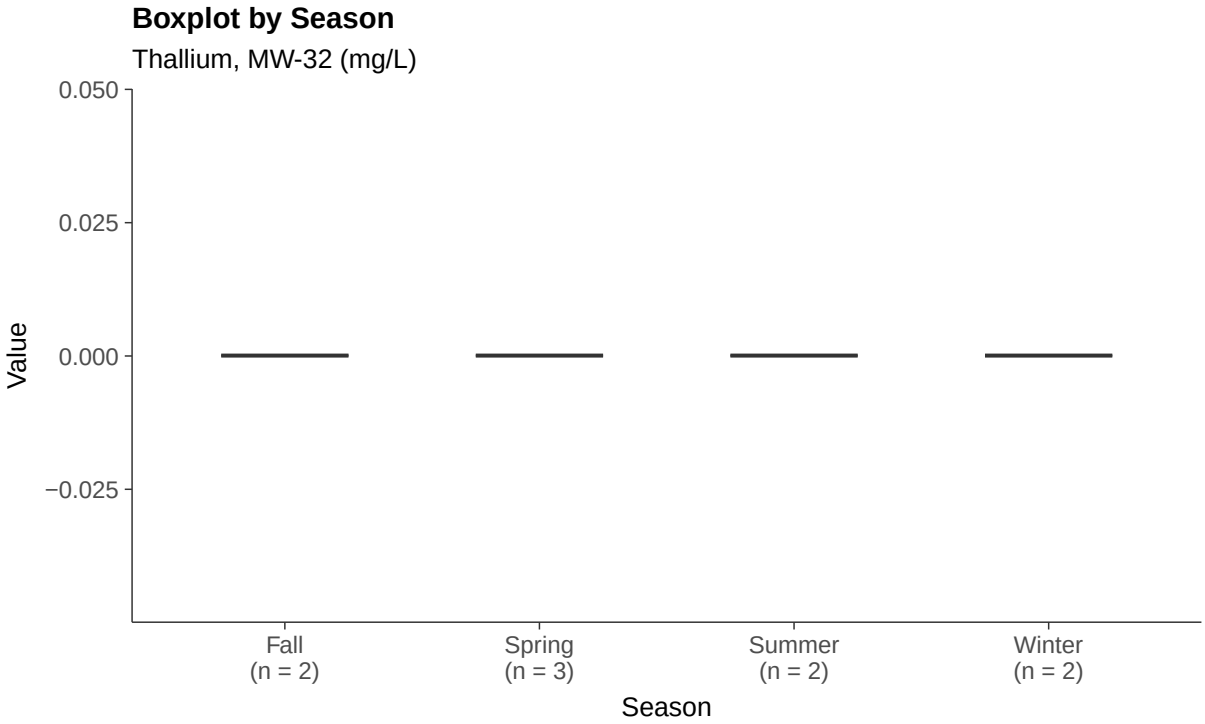
Appendix IV: Thallium, MW-32

ID: 2_27_5_125



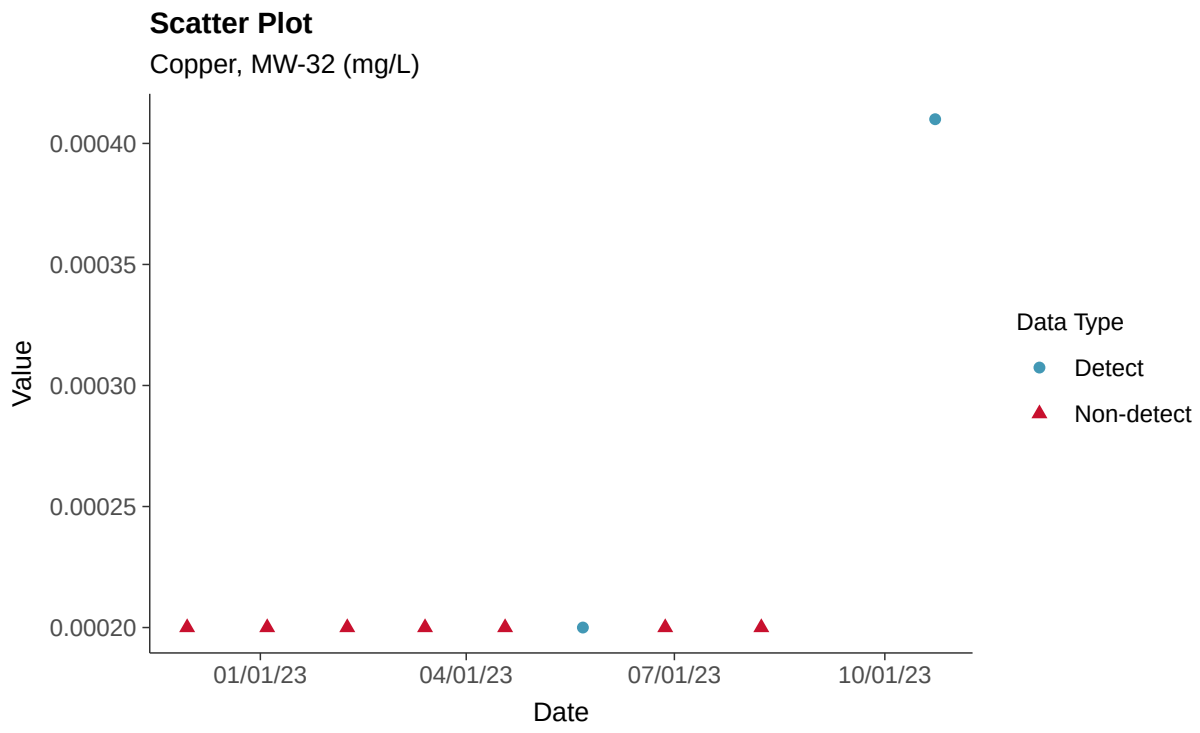


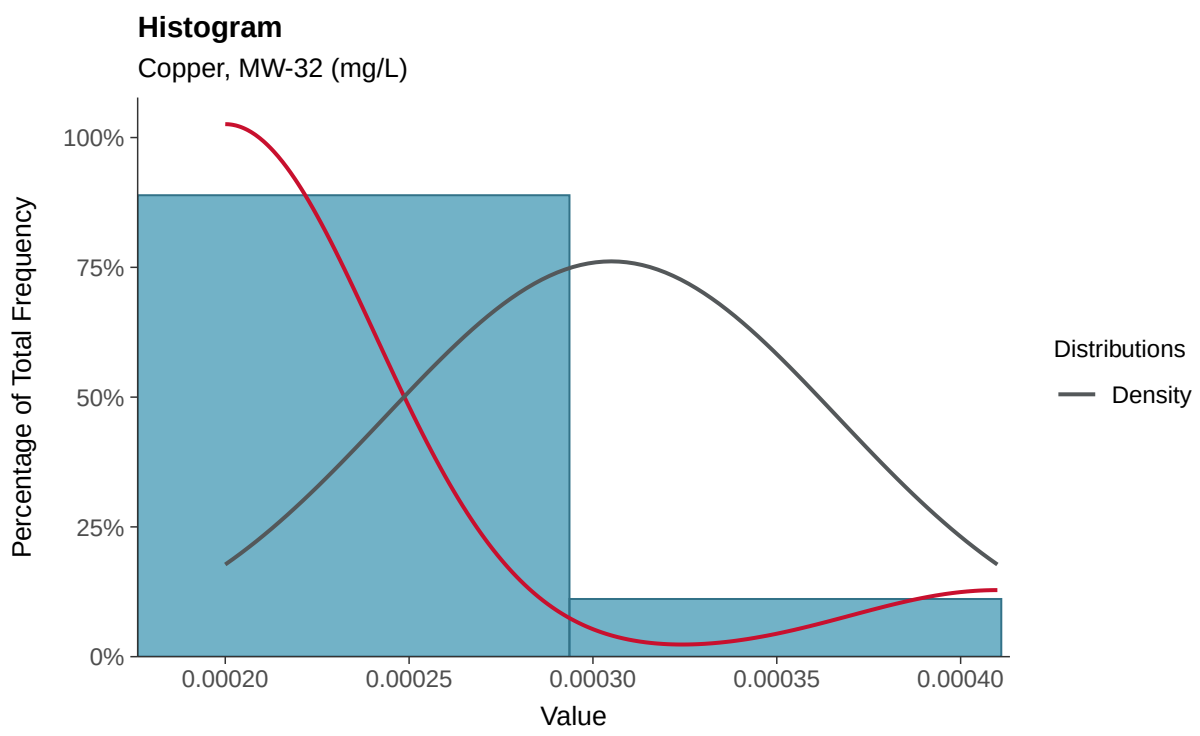

Boxplot
Thallium, MW-32 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Thallium, MW-32 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

Part 115: Copper, MW-32

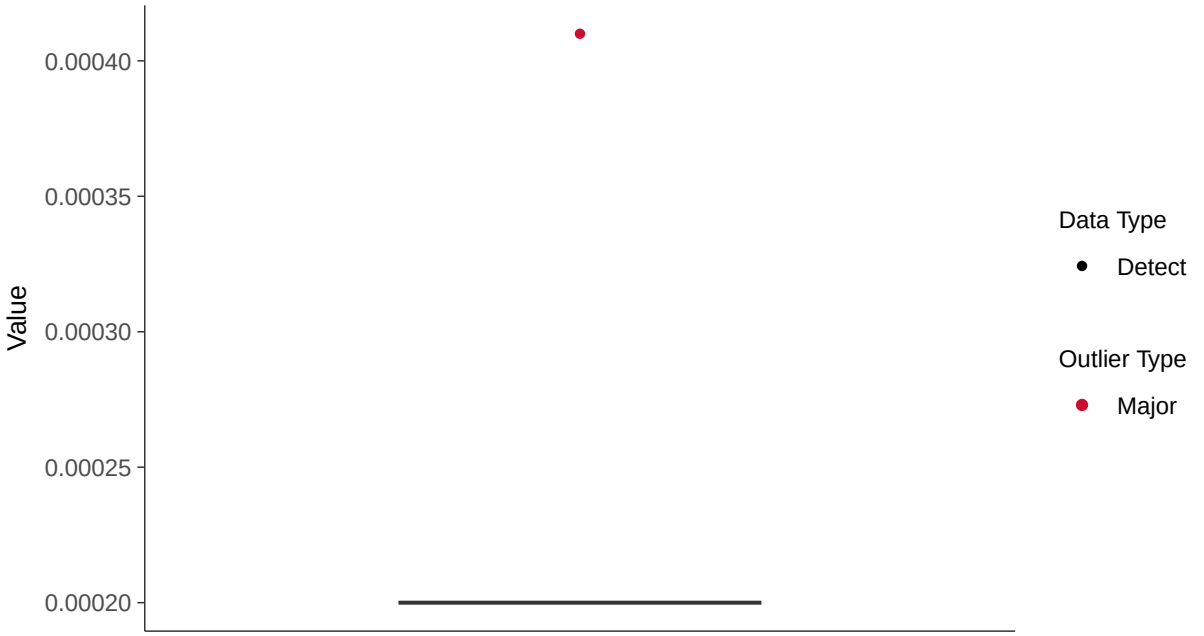
ID: 2_27_6_111





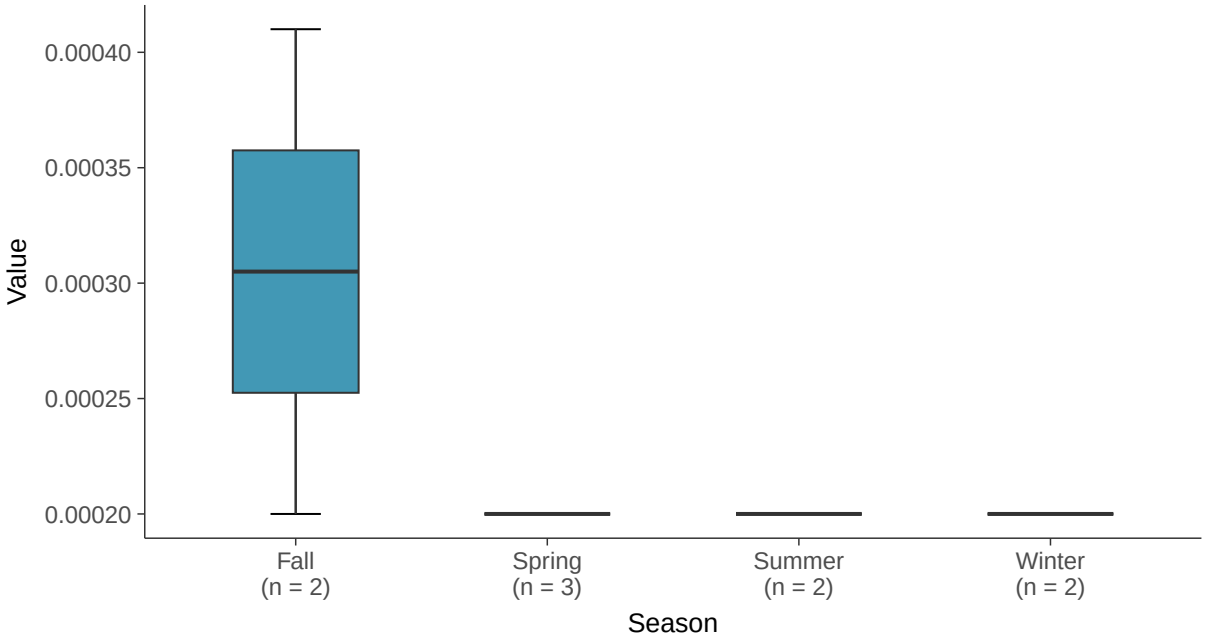
Boxplot

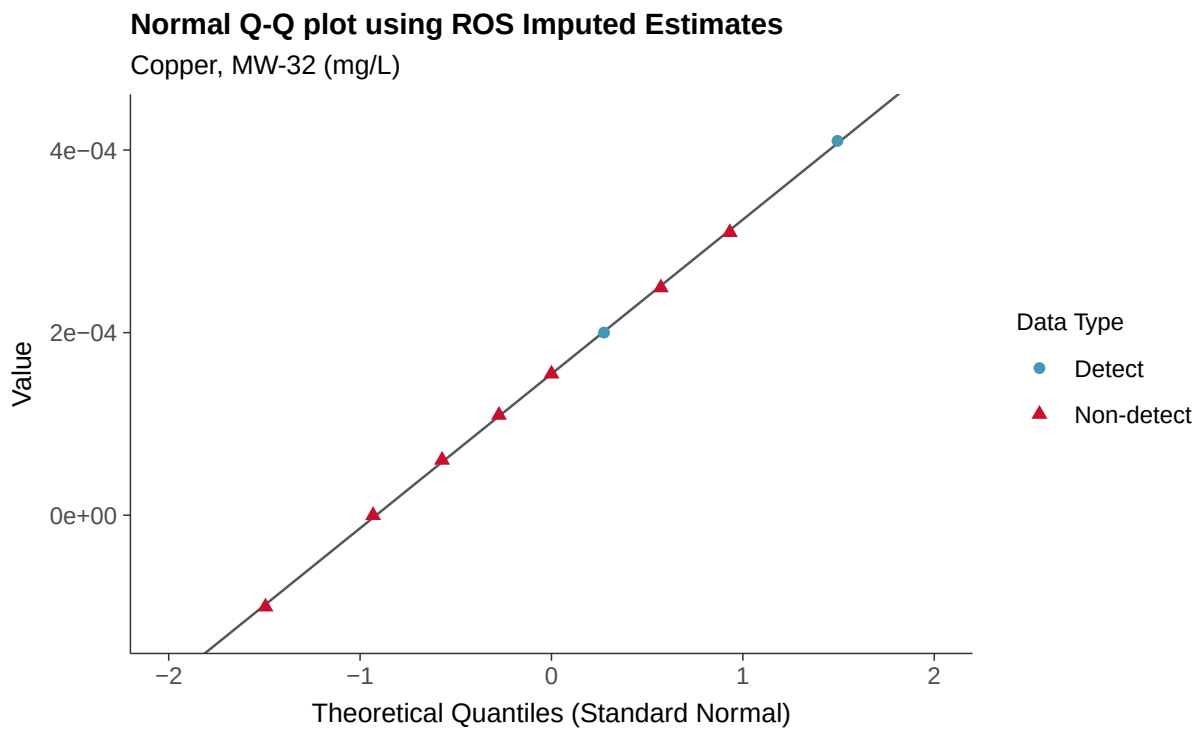
Copper, MW-32 (mg/L)

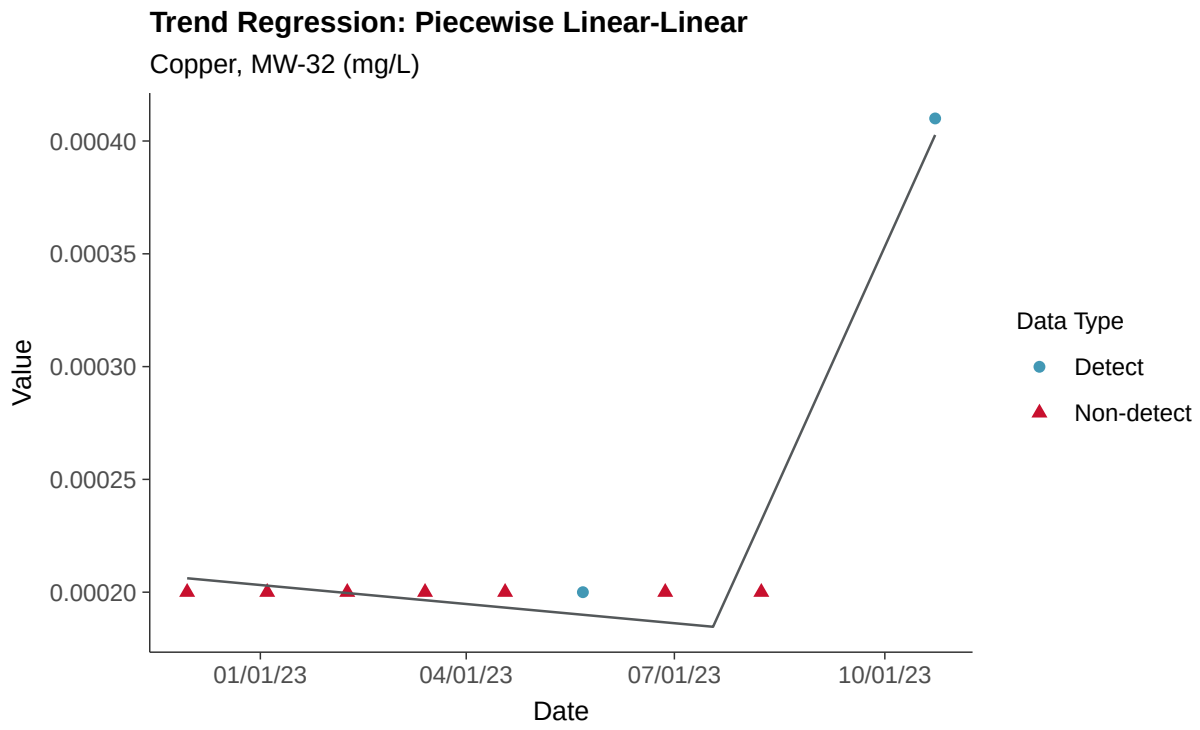


Boxplot by Season

Copper, MW-32 (mg/L)

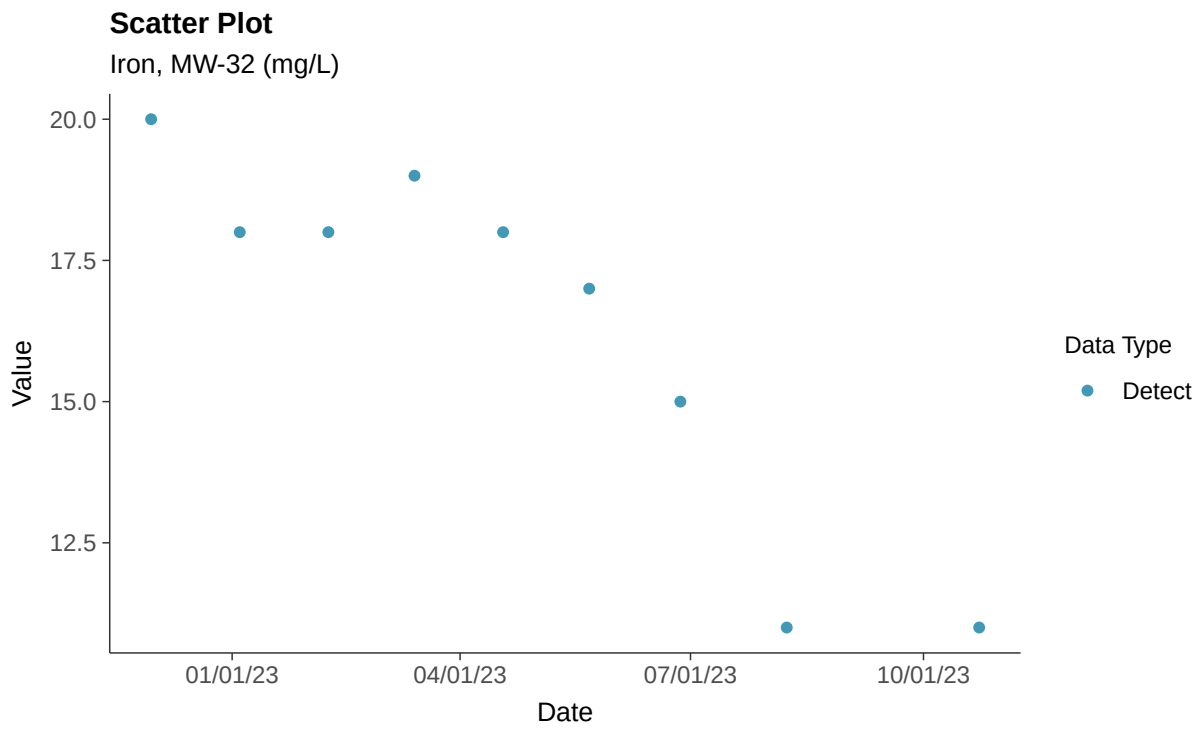


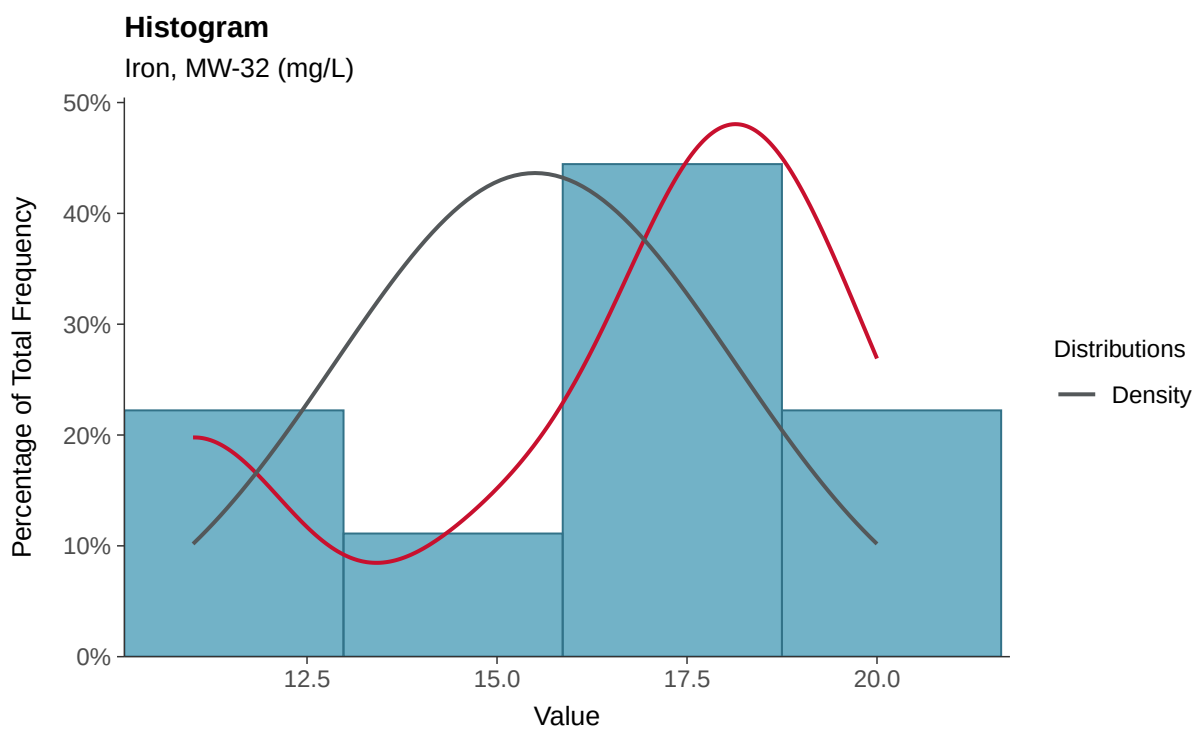

Normal Q-Q plot using ROS Imputed Estimates
Copper, MW-32 (mg/L)
Value
4e−04
2e−04
0e+00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect
Non-detect


Trend Regression: Piecewise Linear-Linear
Copper, MW-32 (mg/L)
Value
0.00040
0.00035
0.00030
0.00025
0.00020
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect
Non-detect

Part 115: Iron, MW-32

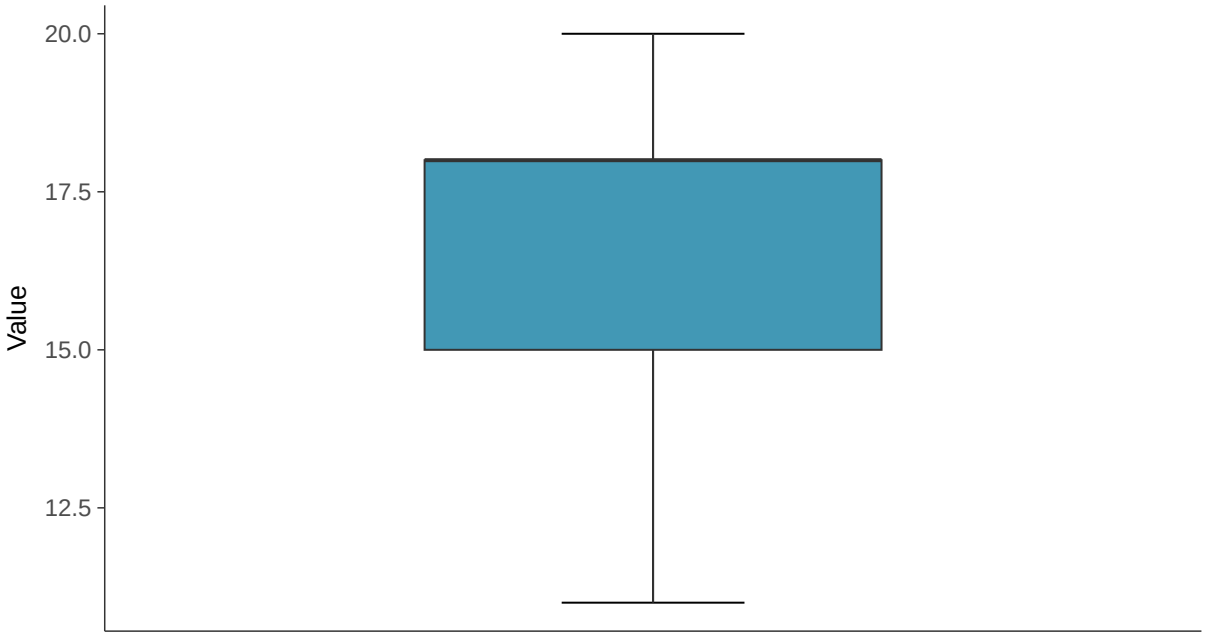
ID: 2_27_6_114





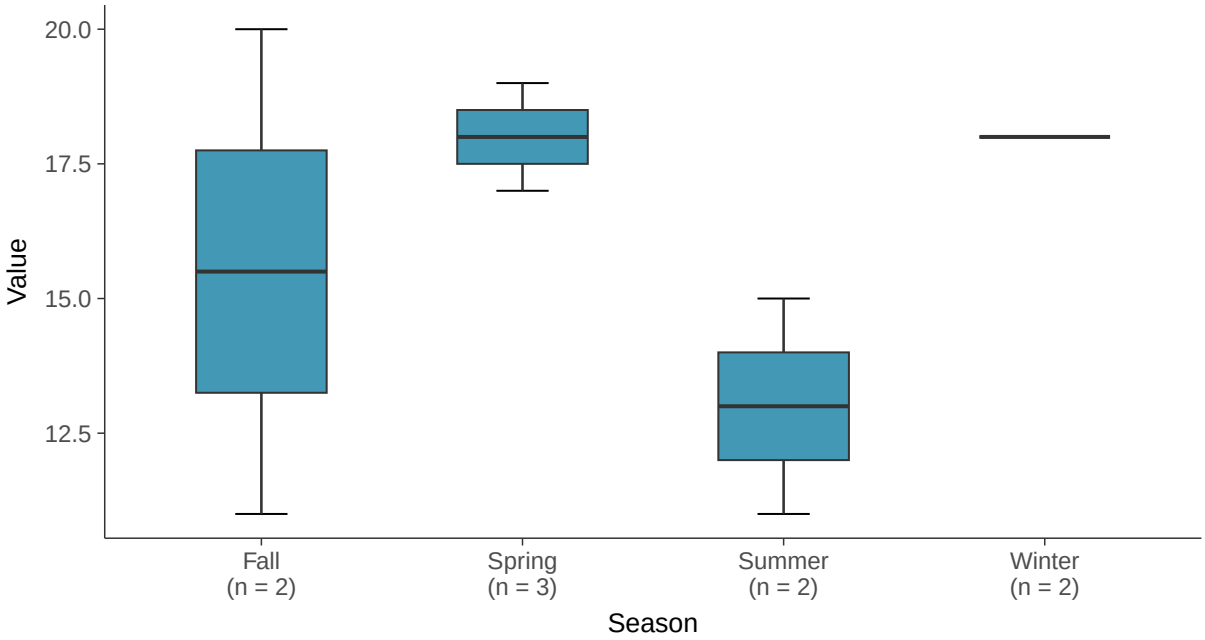
Boxplot

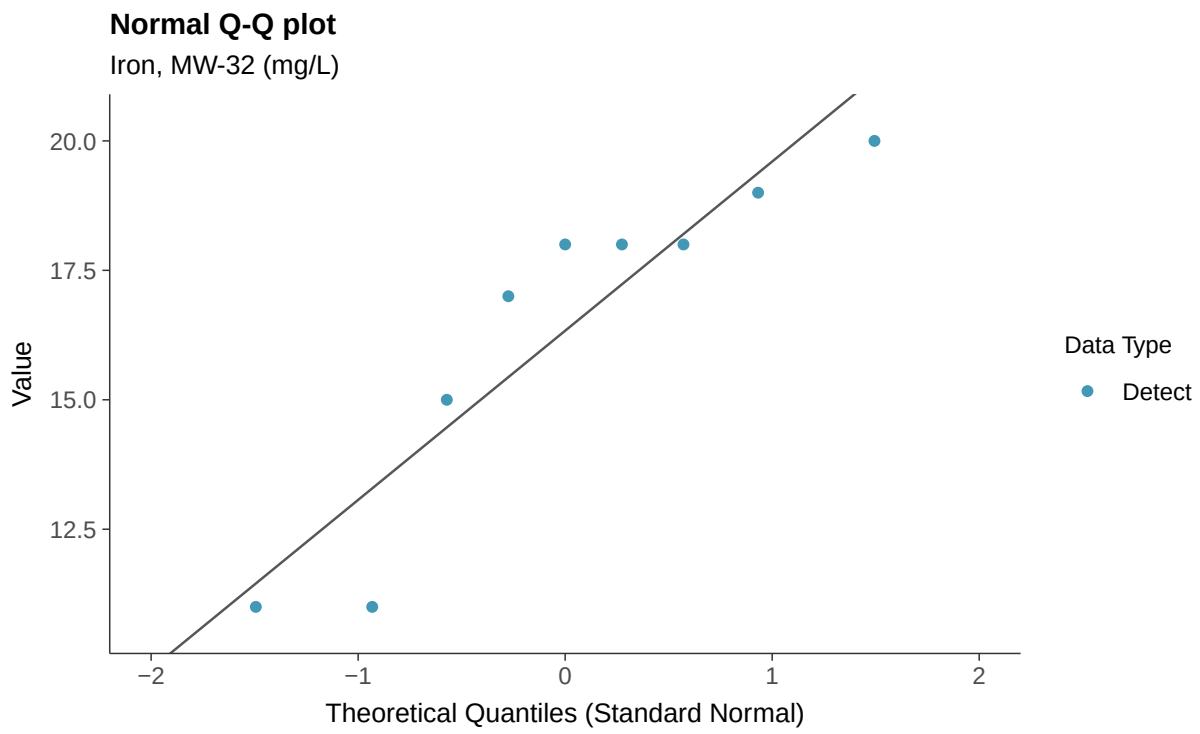
Iron, MW-32 (mg/L)

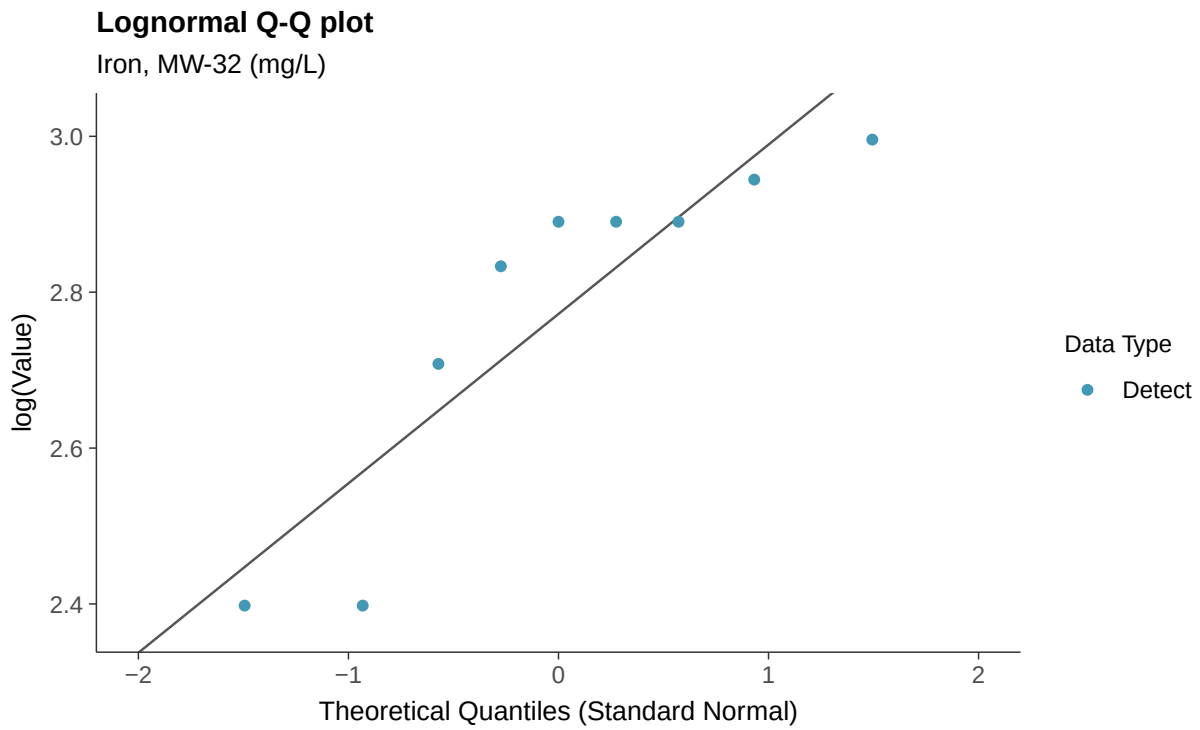


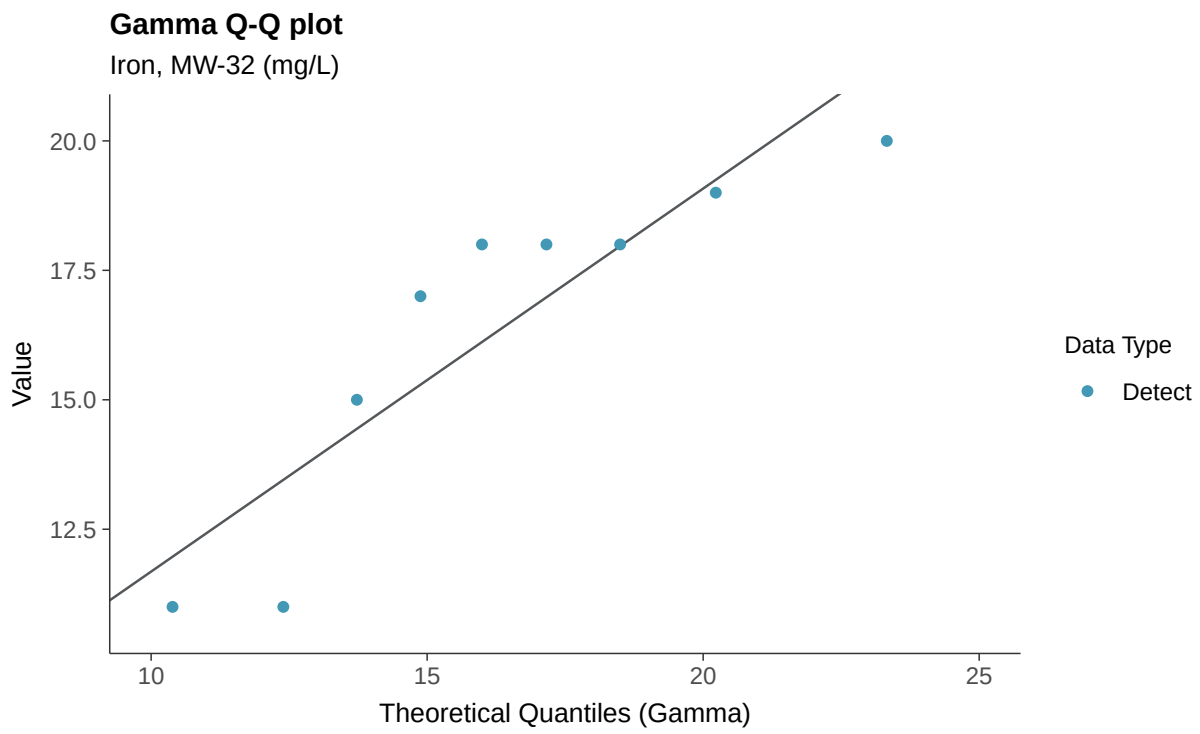
Boxplot by Season

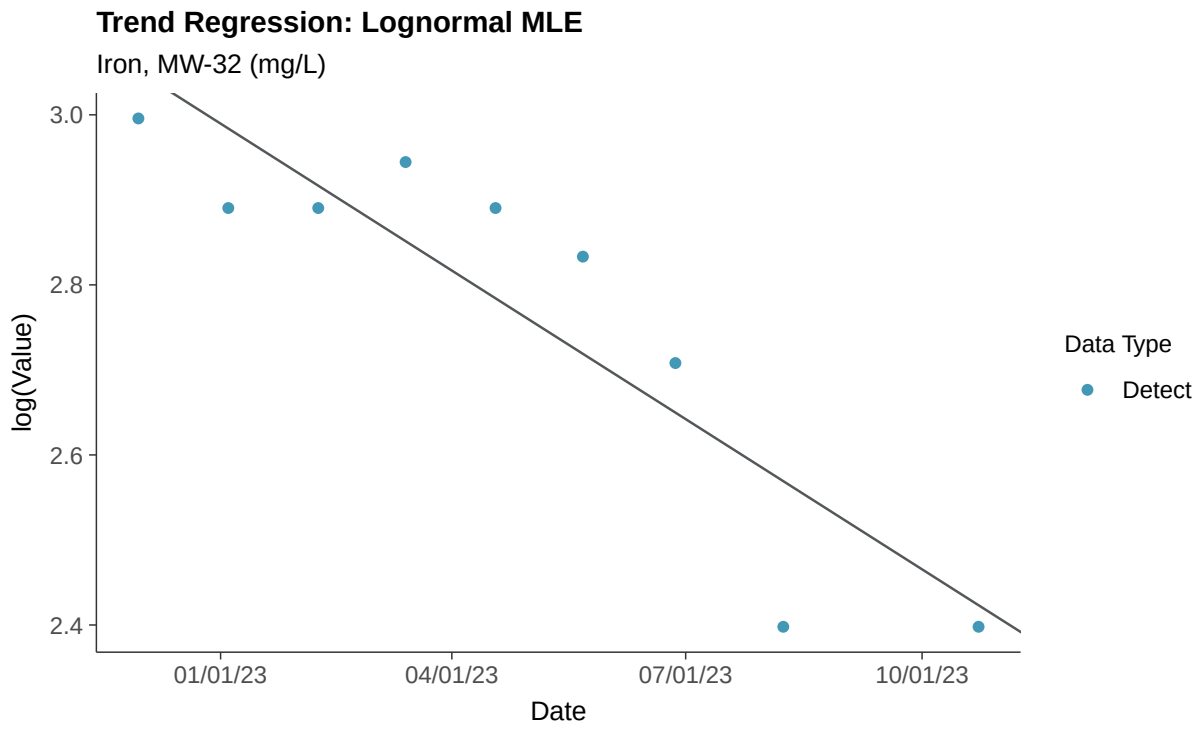
Iron, MW-32 (mg/L)

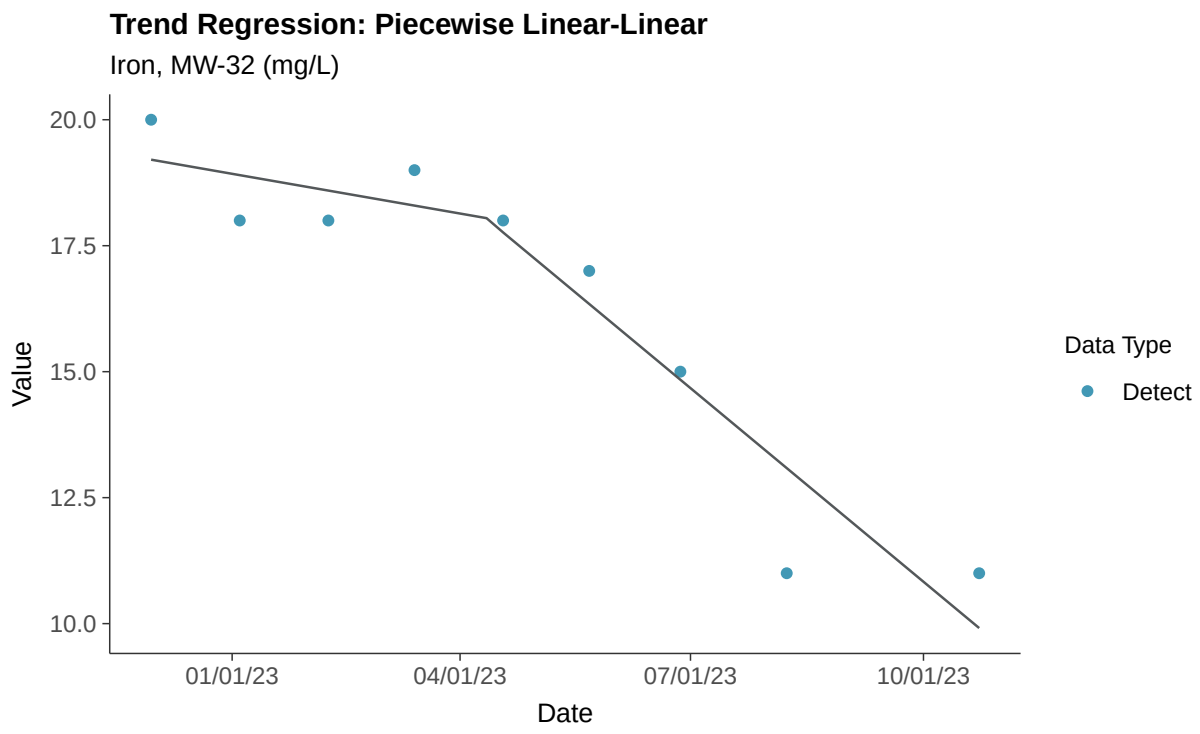



Normal Q-Q plot
Iron, MW-32 (mg/L)
Value
20.0
17.5
15.0
12.5
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Iron, MW-32 (mg/L)
log(Value)
3.0
2.8
2.6
2.4
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect

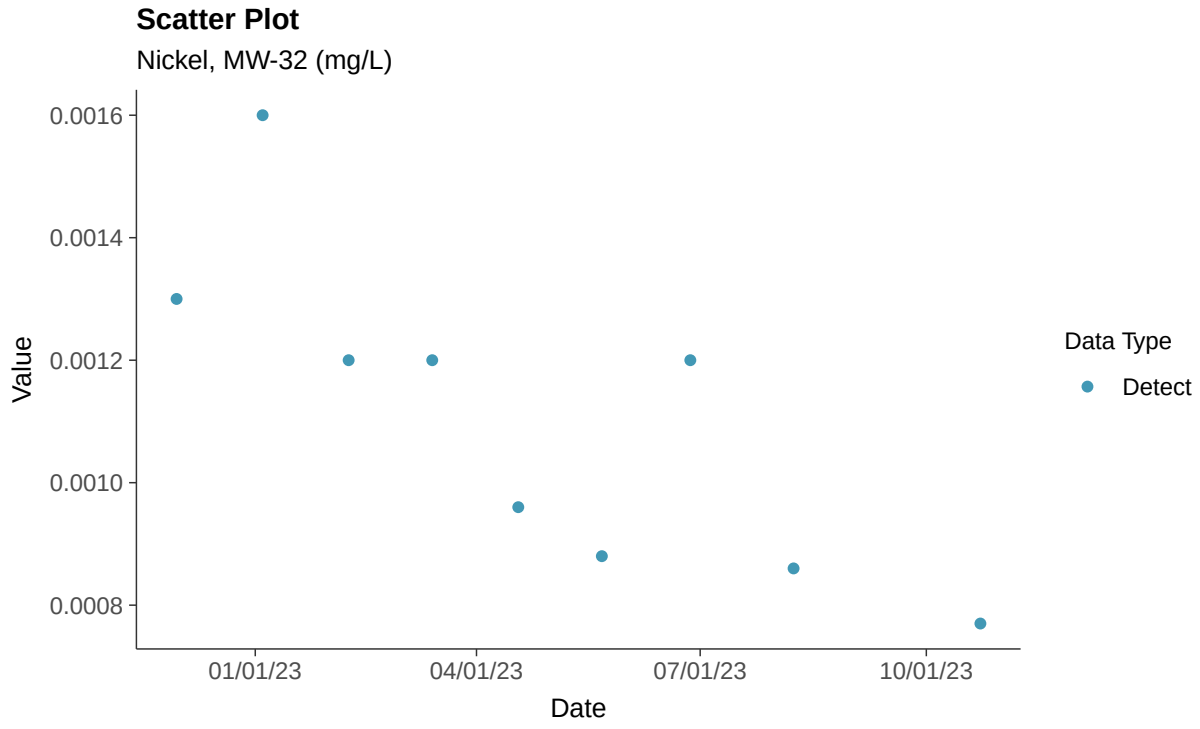

Gamma Q-Q plot
Iron, MW-32 (mg/L)
Value
20.0
17.5
15.0
12.5
10
15
20
25
Theoretical Quantiles (Gamma)
Data Type
Detect

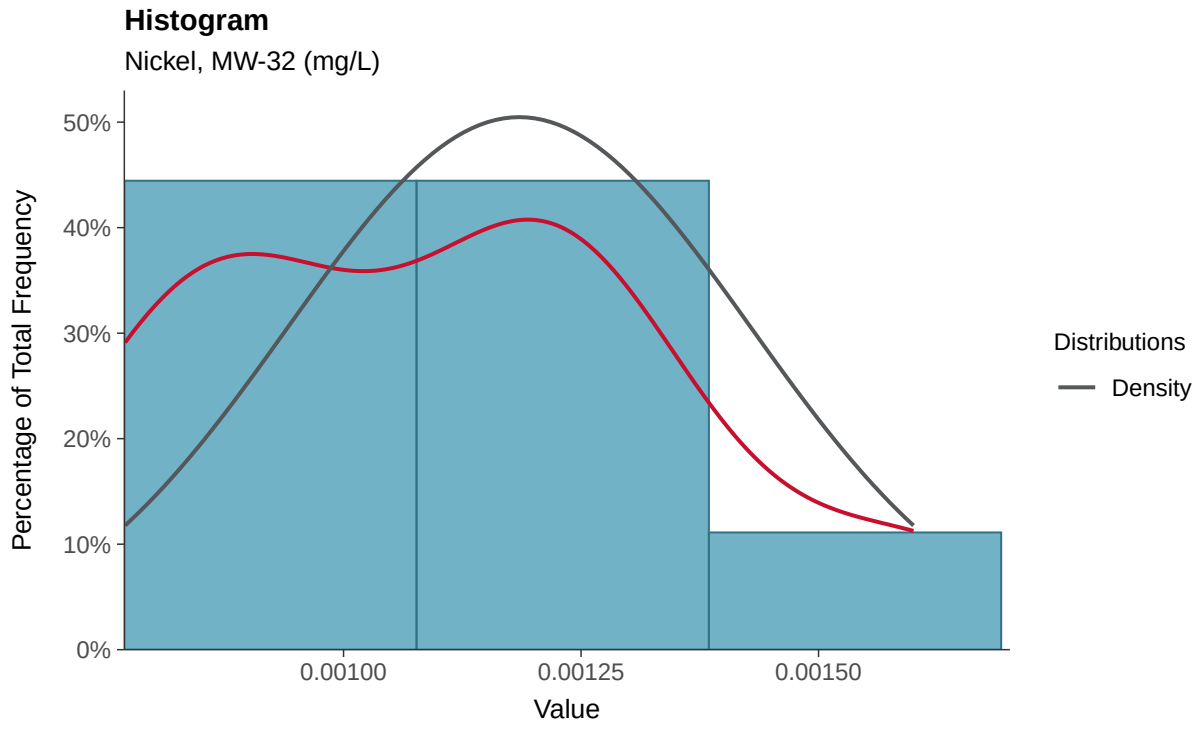

Trend Regression: Lognormal MLE
Iron, MW-32 (mg/L)
log(Value)
3.0
2.8
2.6
2.4
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear
Iron, MW-32 (mg/L)
20.0
17.5
15.0
12.5
10.0
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Nickel, MW-32

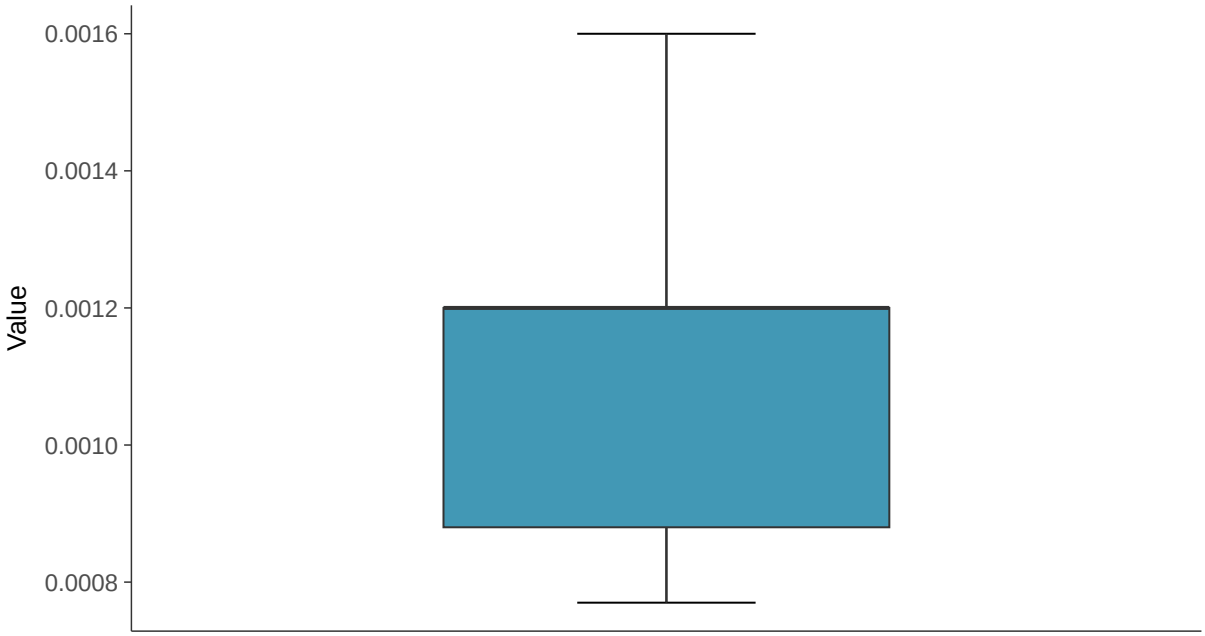
ID: 2_27_6_119





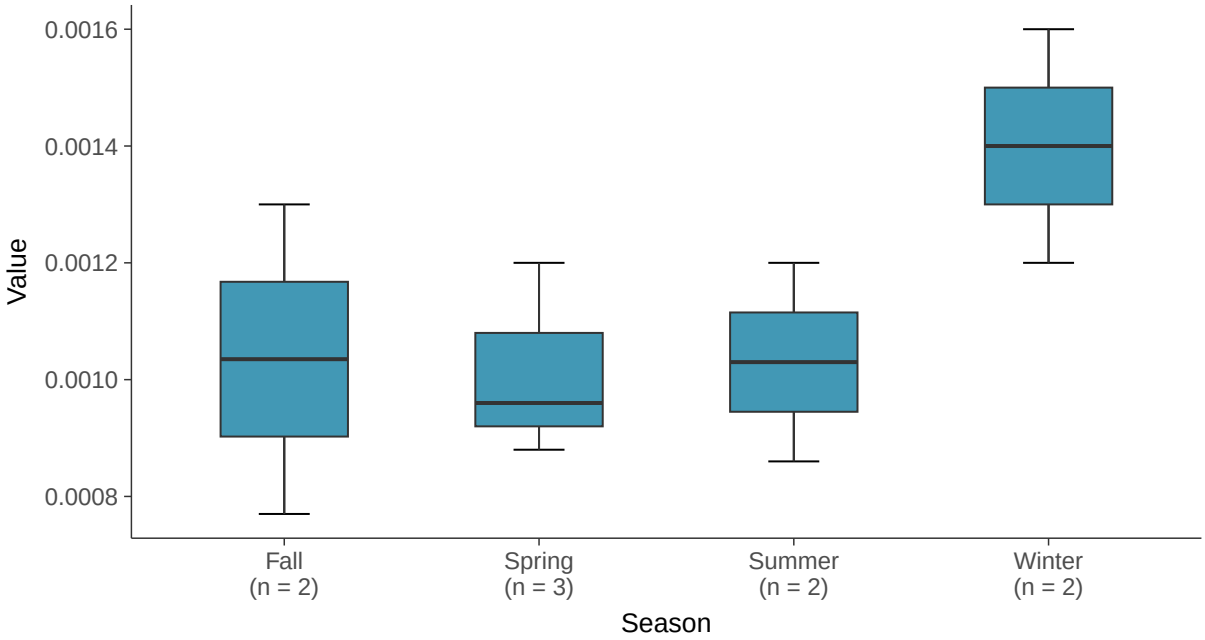
Boxplot

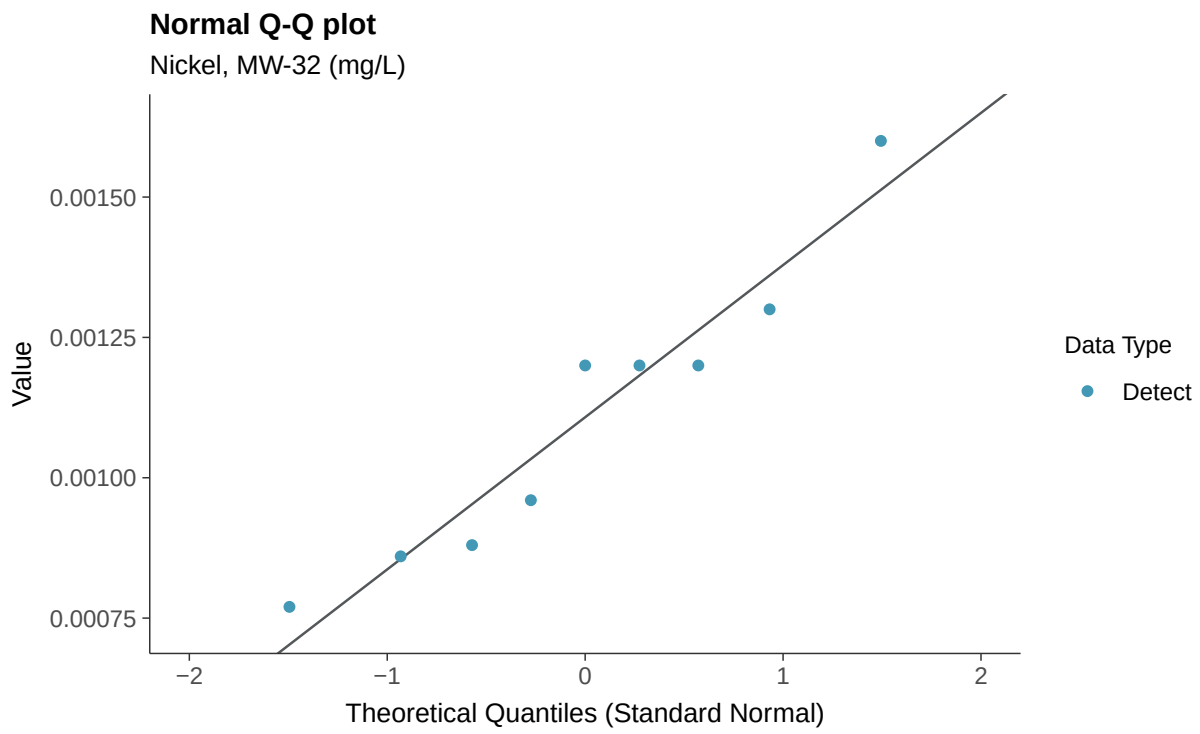
Nickel, MW-32 (mg/L)

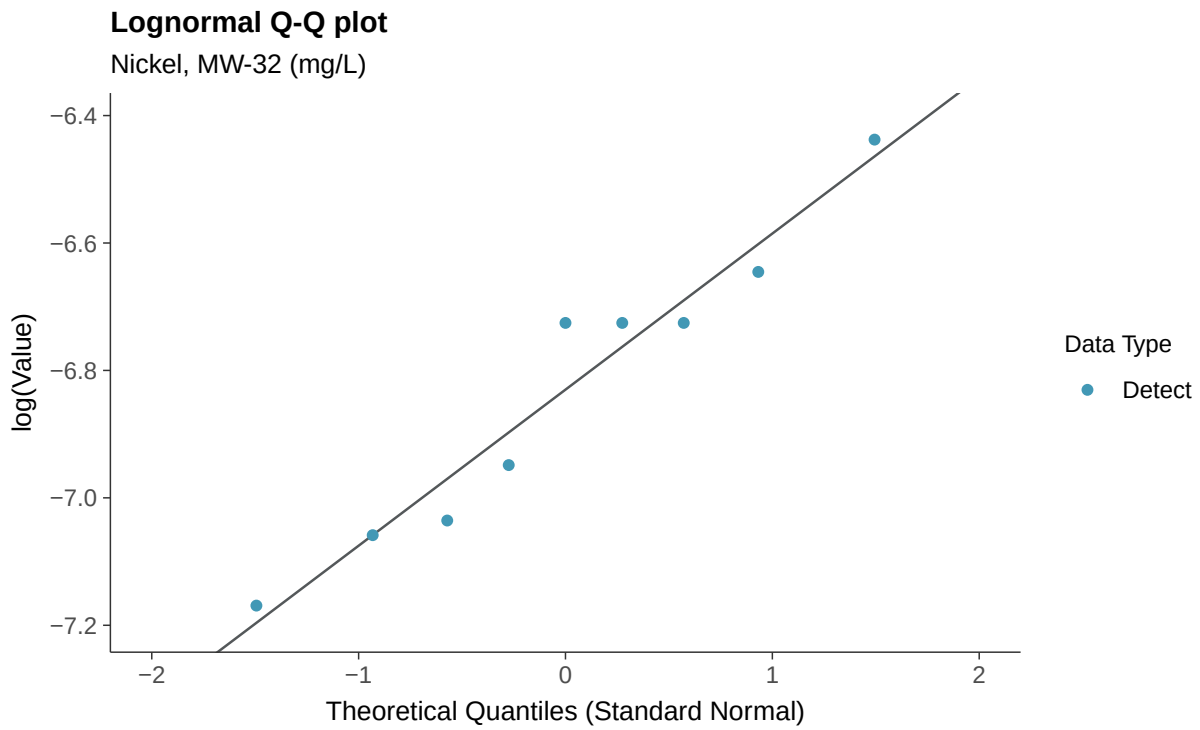


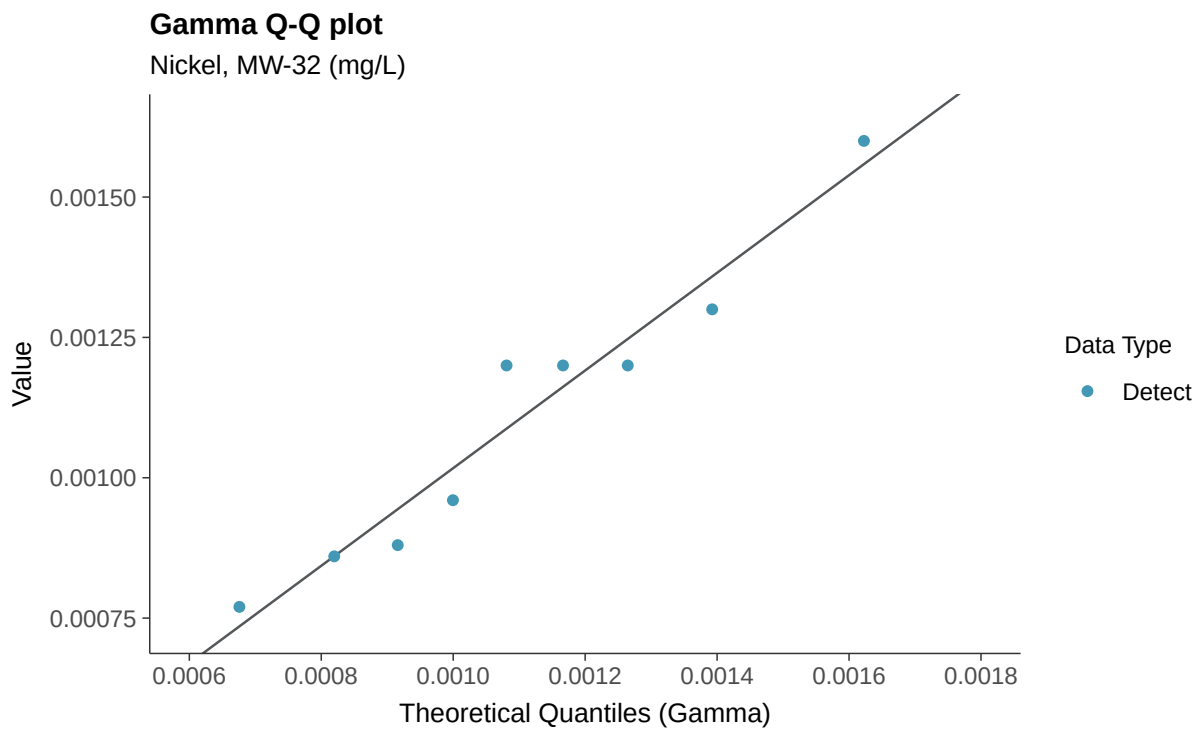
Boxplot by Season

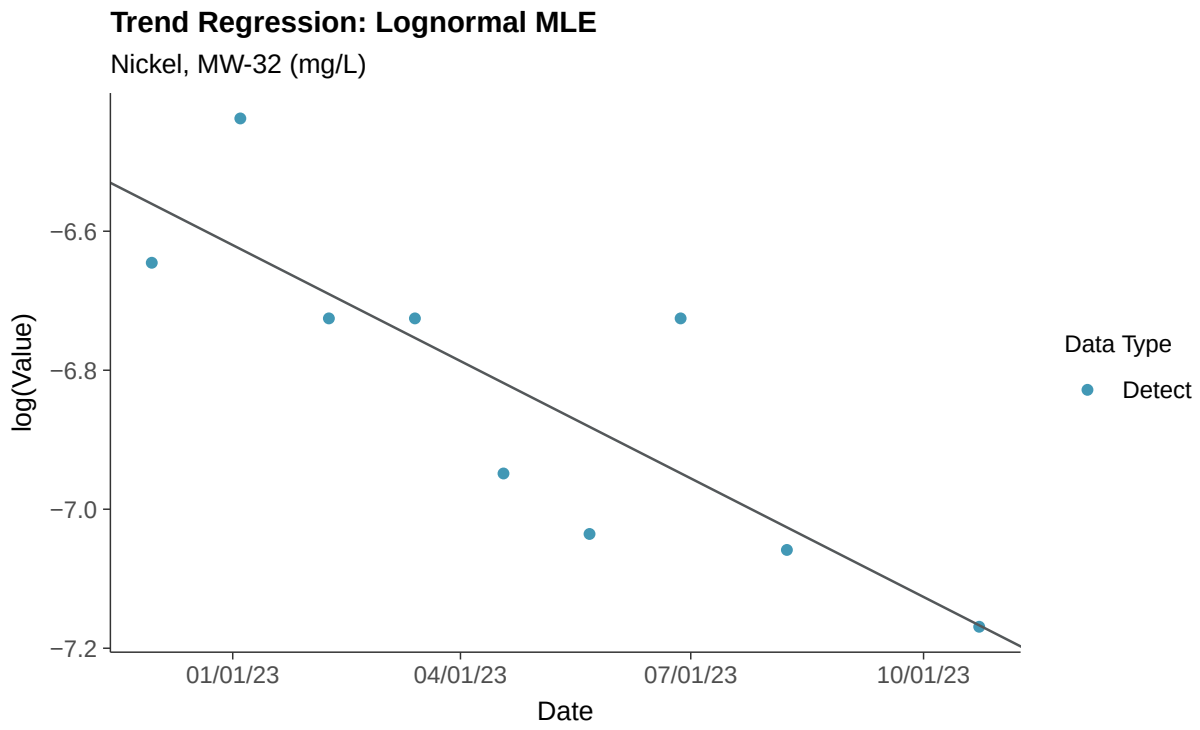
Nickel, MW-32 (mg/L)

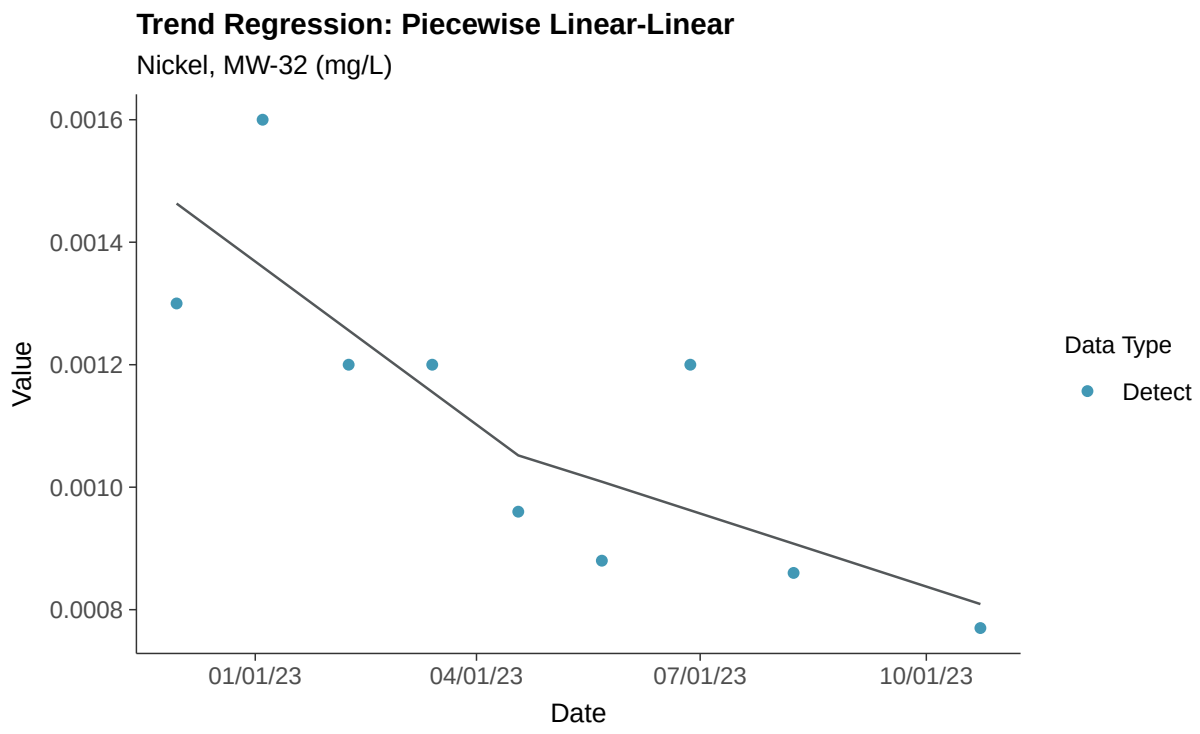


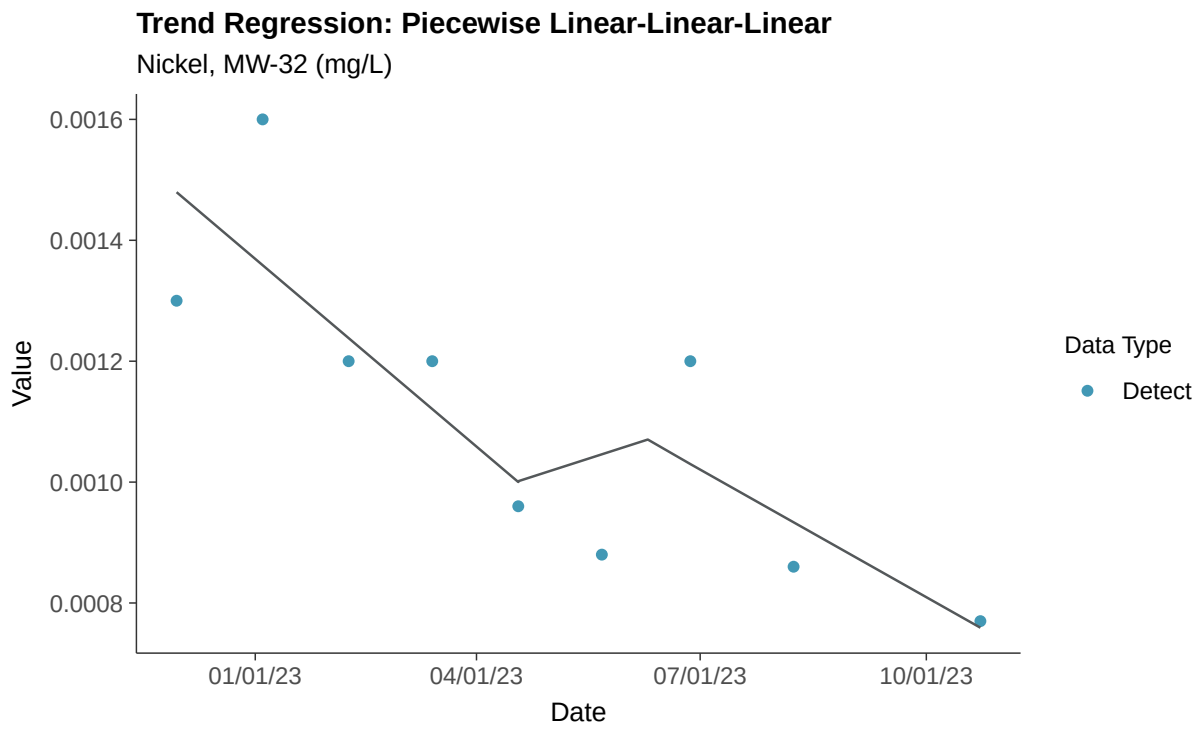

Normal Q-Q plot
Nickel, MW-32 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Lognormal Q-Q plot
Nickel, MW-32 (mg/L)
log(Value)
−6.4
−6.6
−6.8
−7.0
−7.2
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Gamma Q-Q plot
Nickel, MW-32 (mg/L)
Value
0.00150
0.00125
0.00100
0.00075
0.0006
0.0008
0.0010
0.0012
0.0014
0.0016
0.0018
Theoretical Quantiles (Gamma)
Data Type
Detect

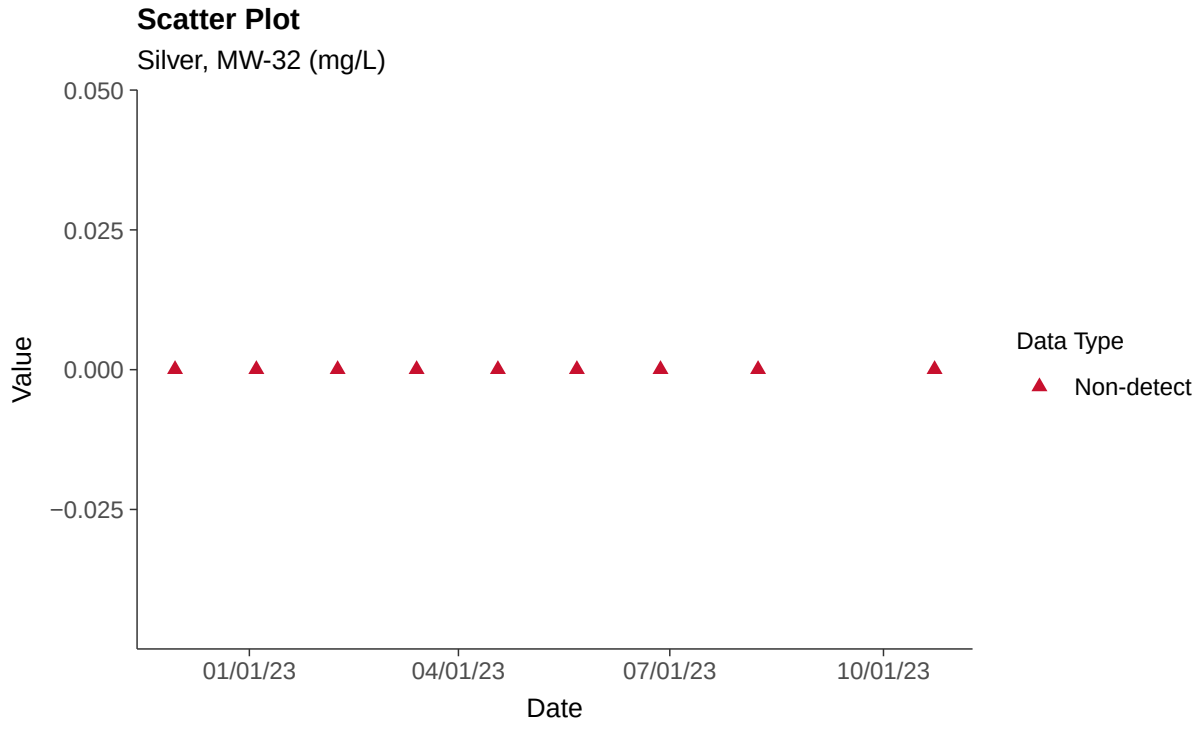

Trend Regression: Lognormal MLE
Nickel, MW-32 (mg/L)
log(Value)
−6.6
−6.8
−7.0
−7.2
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

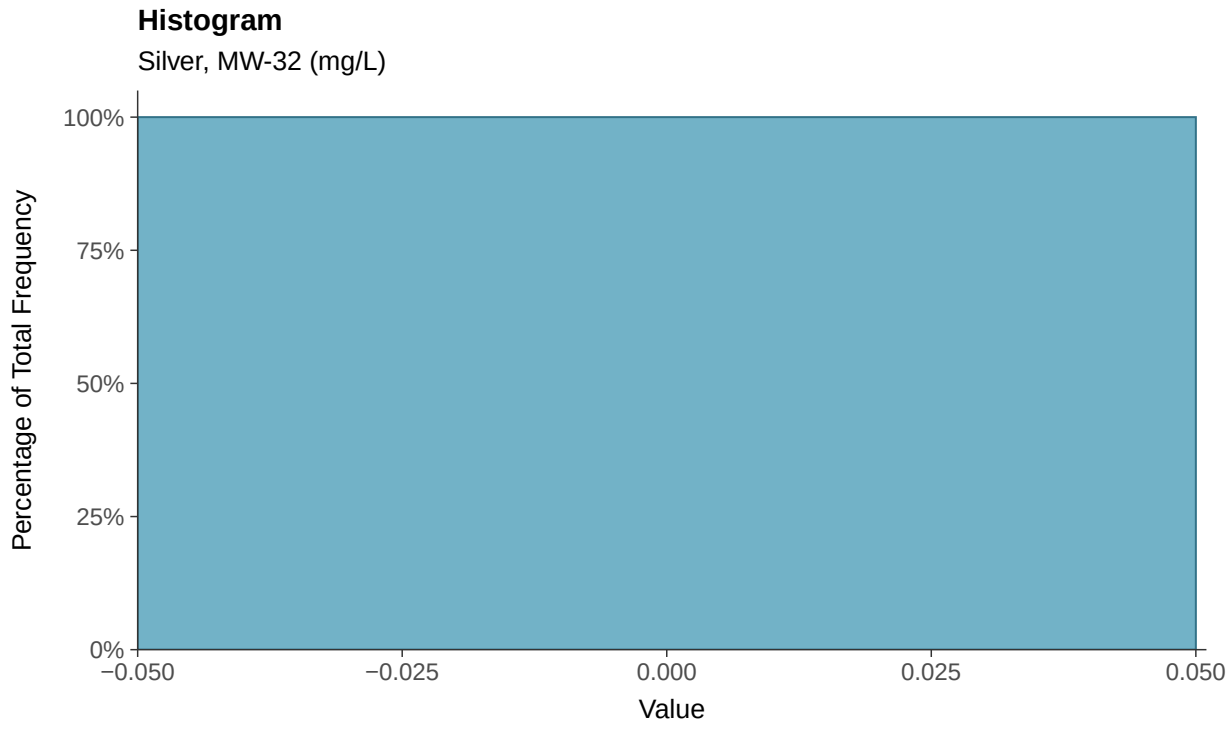

Trend Regression: Piecewise Linear-Linear
Nickel, MW-32 (mg/L)
0.0016
0.0014
0.0012
0.0010
0.0008
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect


Trend Regression: Piecewise Linear-Linear-Linear
Nickel, MW-32 (mg/L)
0.0016
0.0014
0.0012
0.0010
0.0008
Value
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Part 115: Silver, MW-32

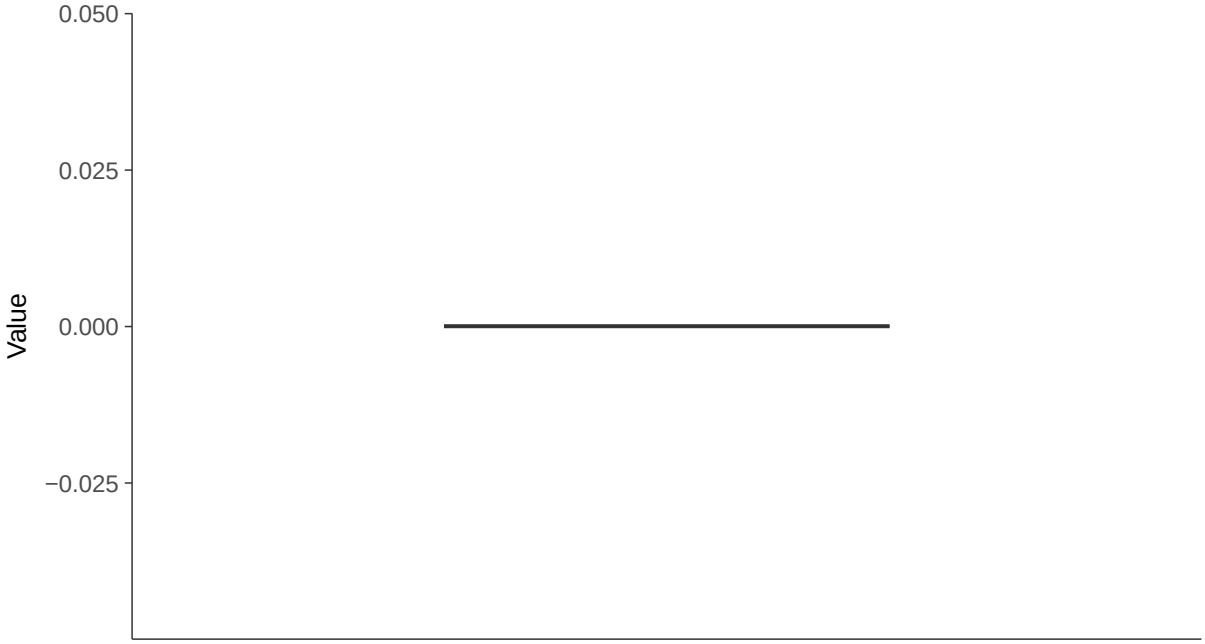
ID: 2_27_6_123





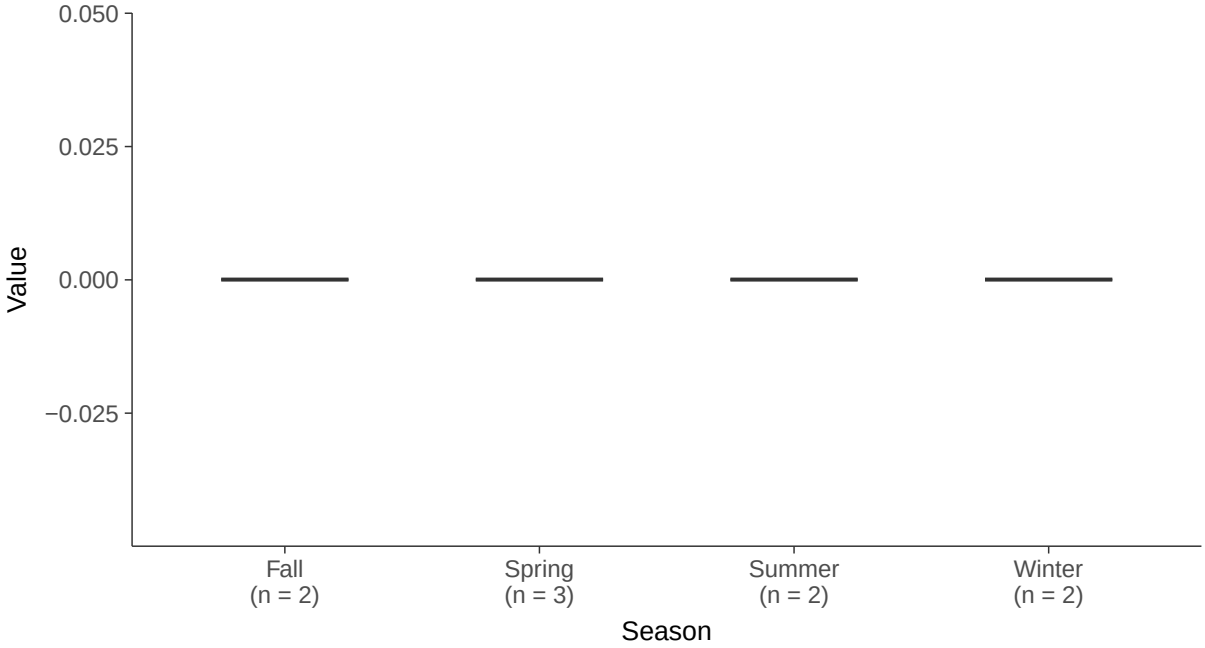
Boxplot

Silver, MW-32 (mg/L)



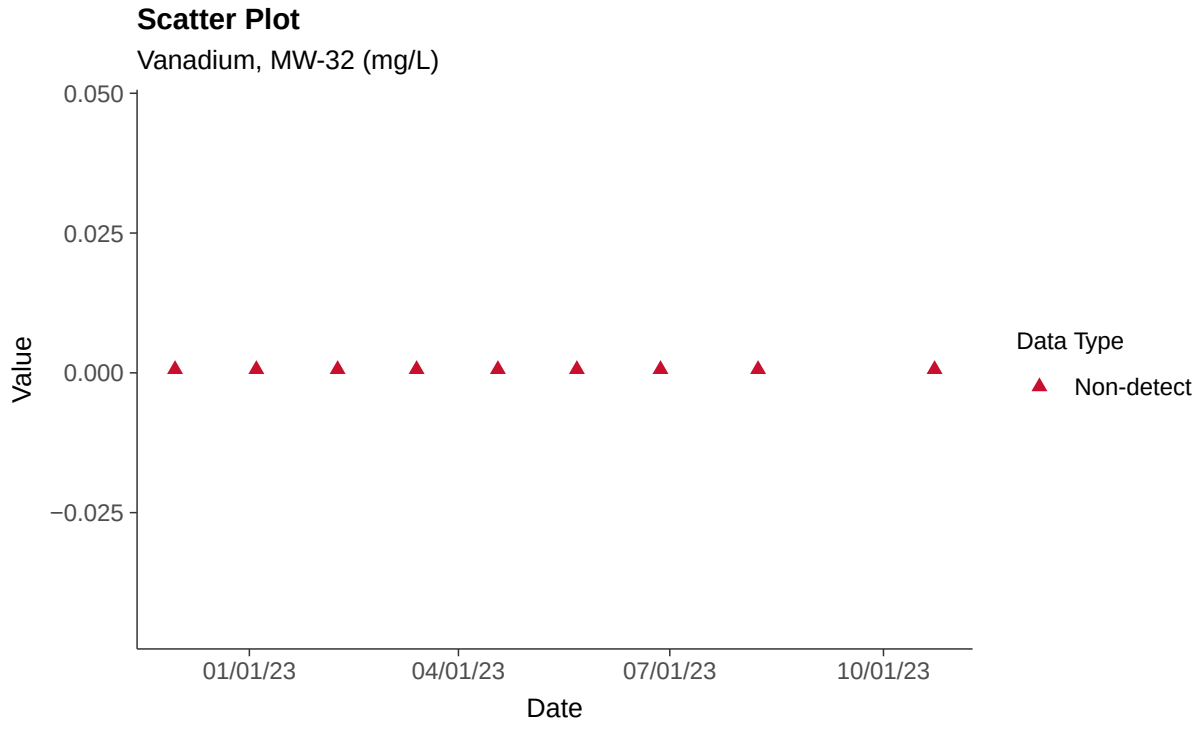
Boxplot by Season

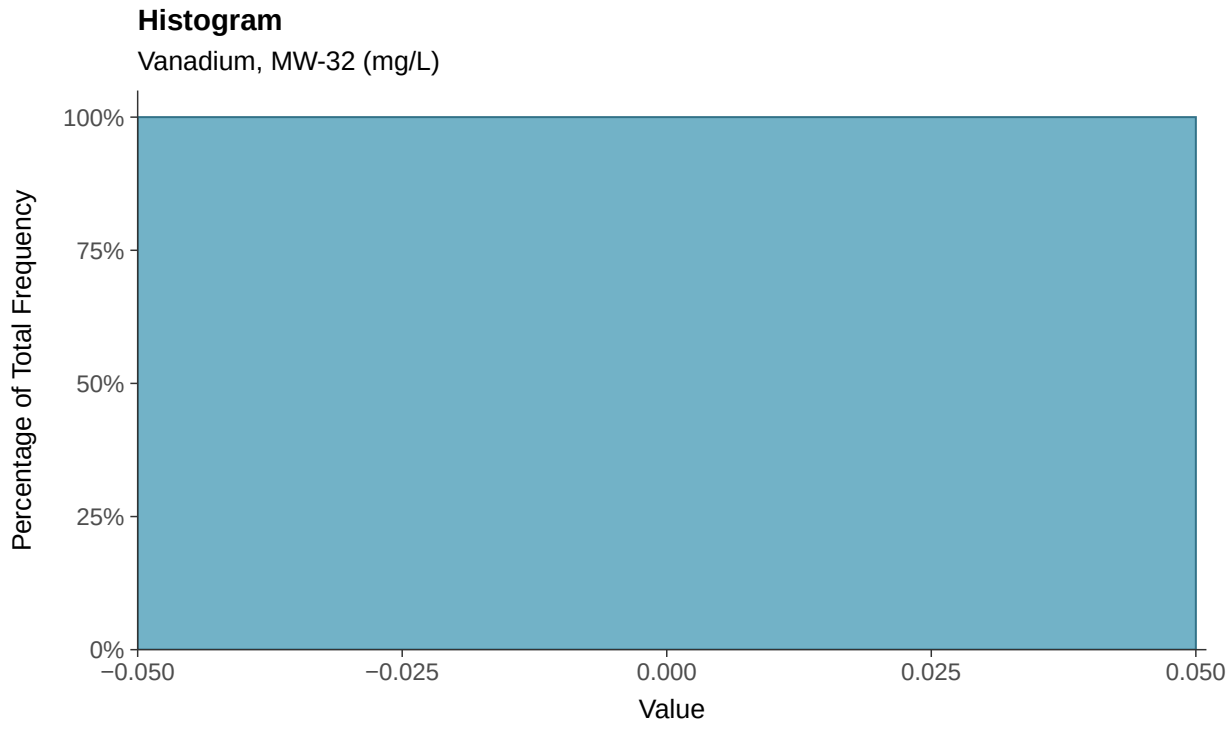
Silver, MW-32 (mg/L)

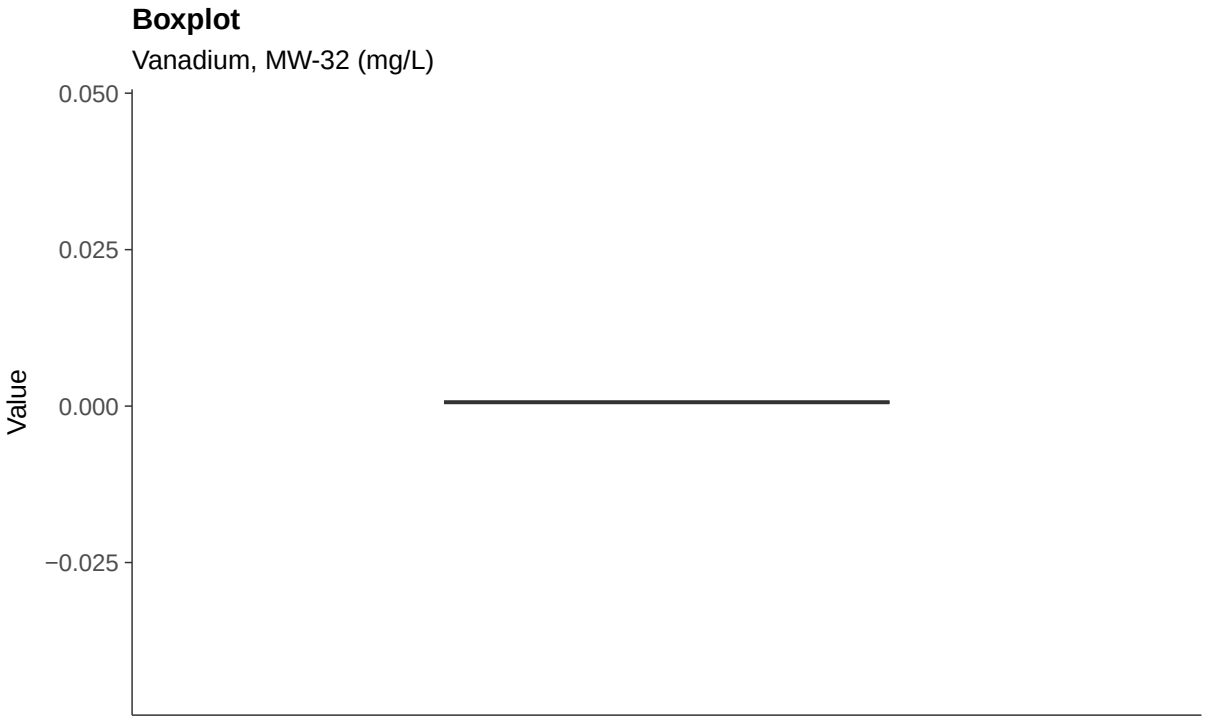


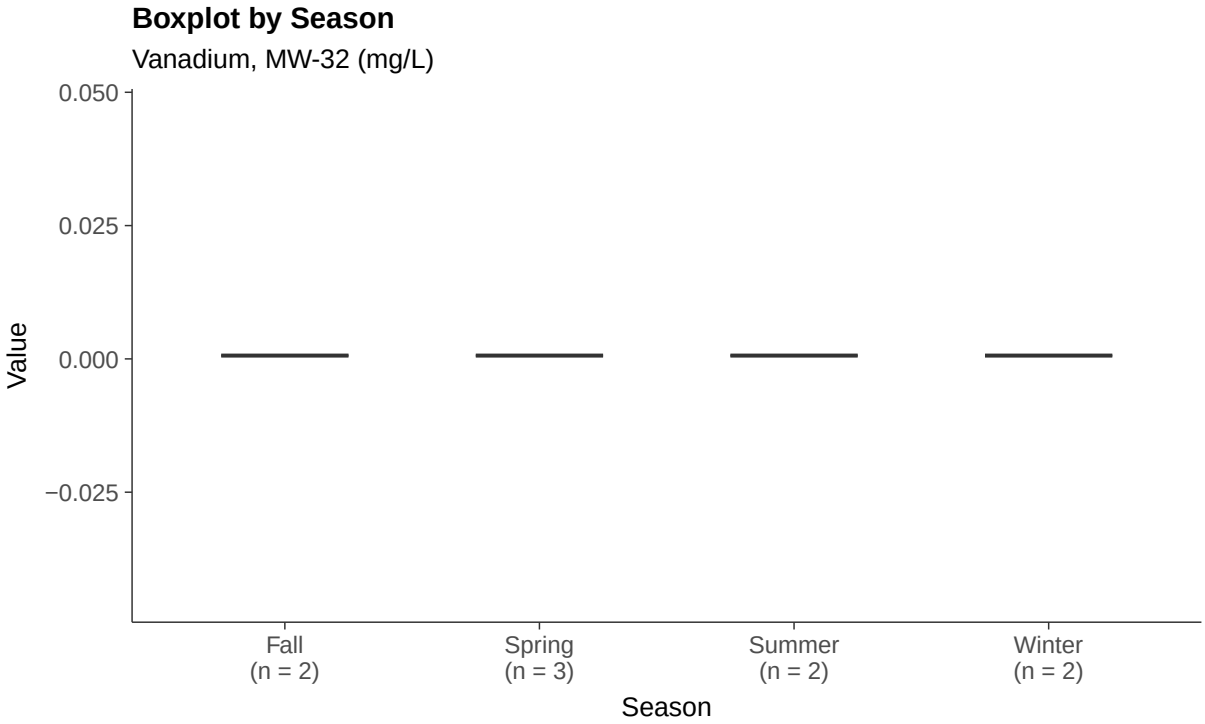
Part 115: Vanadium, MW-32

ID: 2_27_6_129



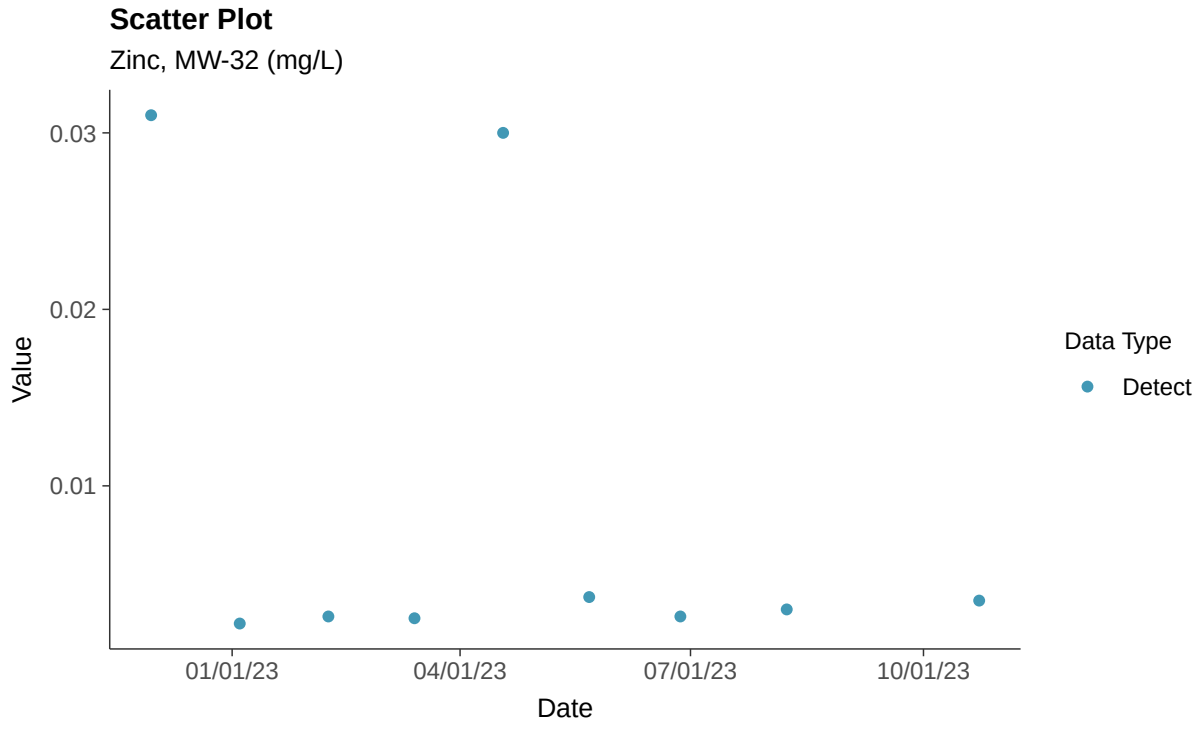


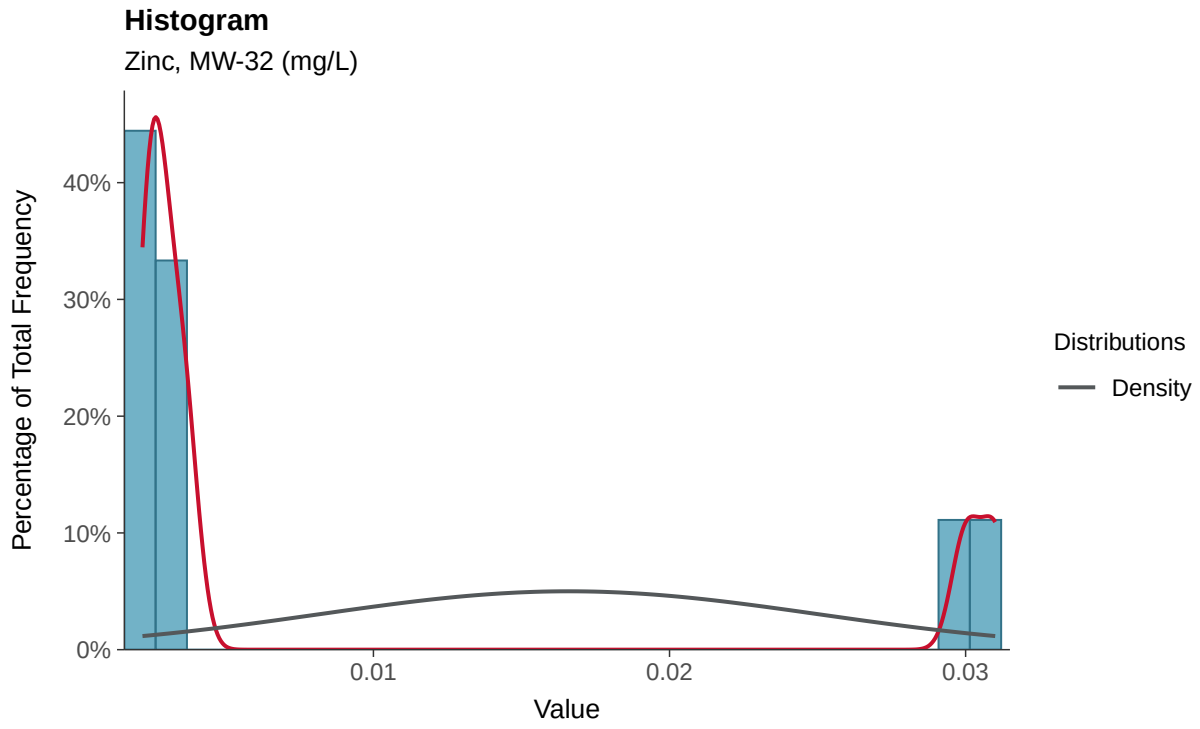

Boxplot
Vanadium, MW-32 (mg/L)
0.050
0.025
0.000
−0.025
Value


Boxplot by Season
Vanadium, MW-32 (mg/L)
0.050
0.025
0.000
−0.025
Value
Fall
(n = 2)
Spring
(n = 3)
Summer
(n = 2)
Winter
(n = 2)
Season

Part 115: Zinc, MW-32

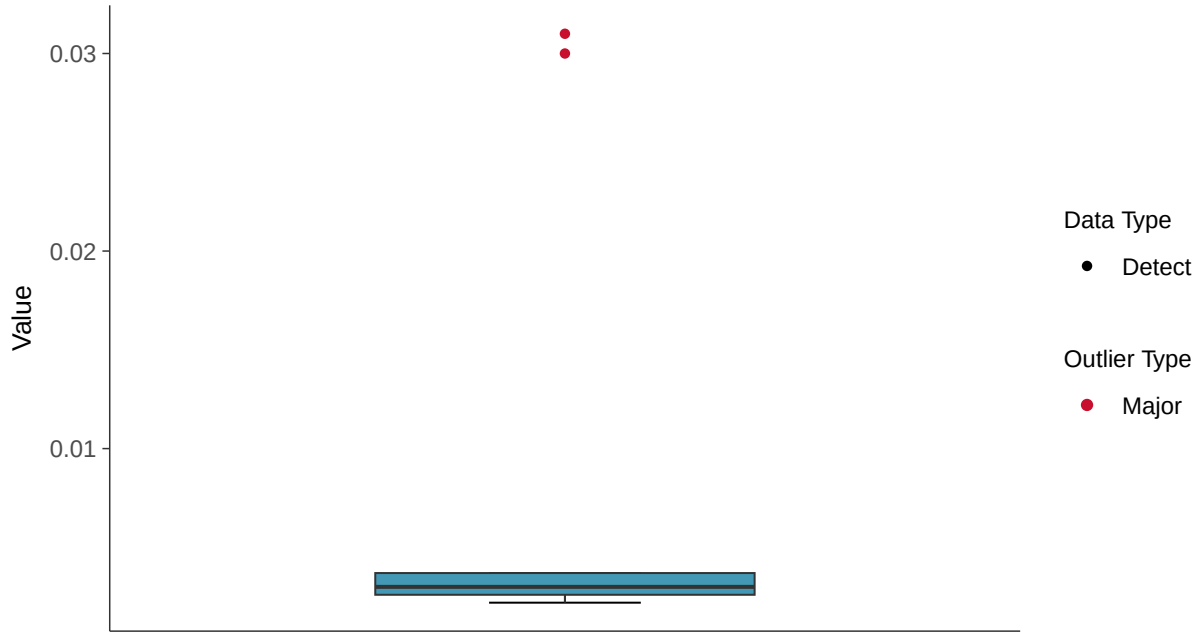
ID: 2_27_6_130





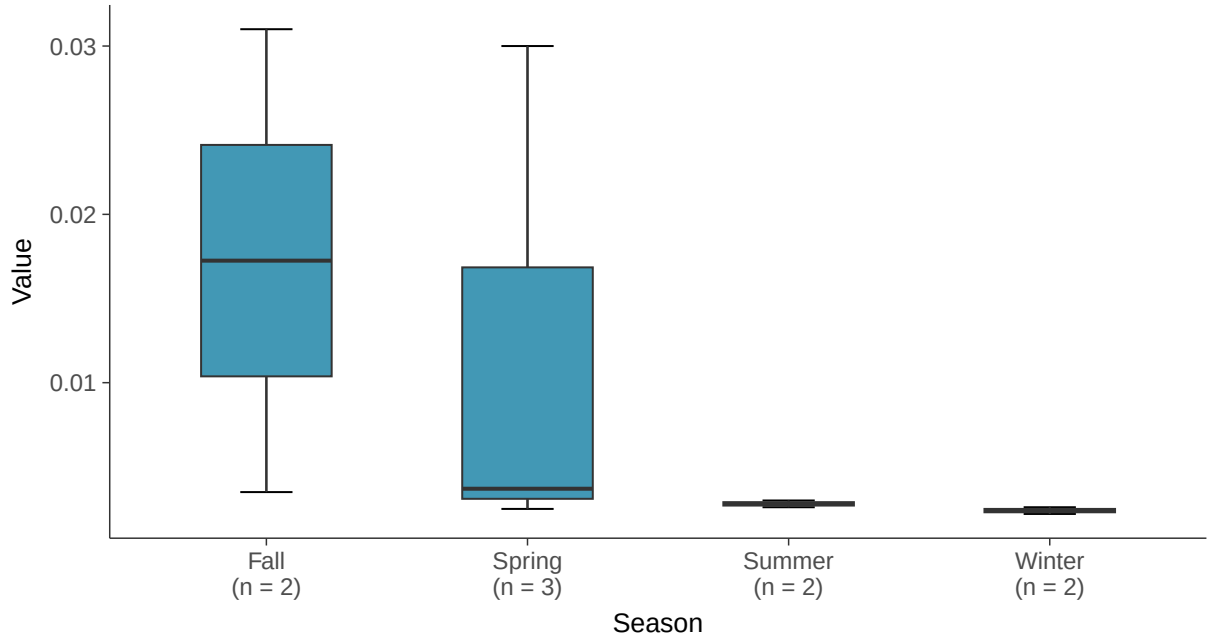
Boxplot

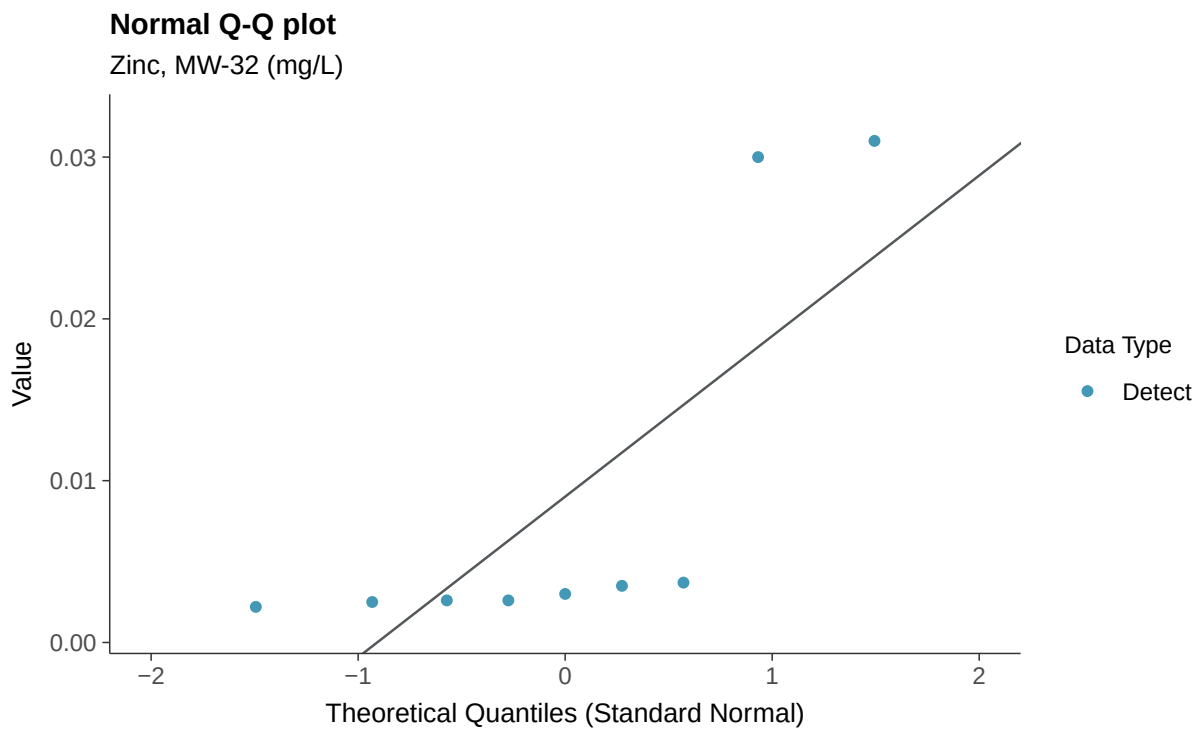
Zinc, MW-32 (mg/L)

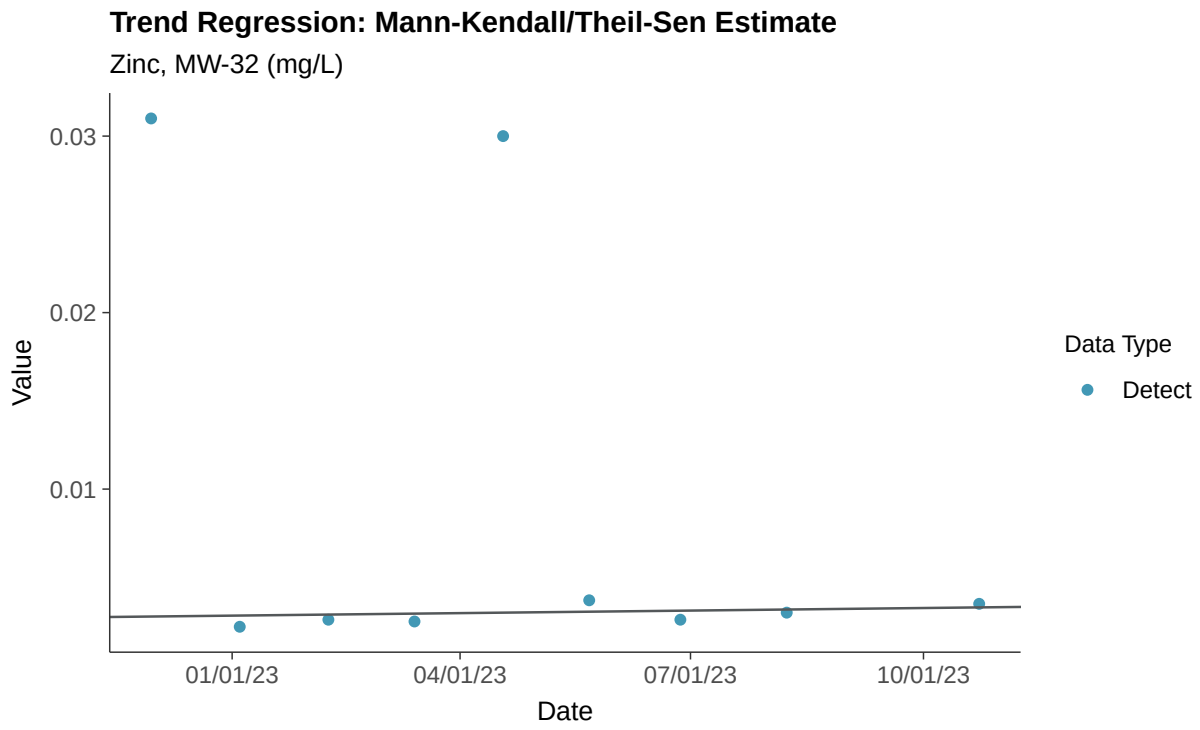


Boxplot by Season

Zinc, MW-32 (mg/L)




Normal Q-Q plot
Zinc, MW-32 (mg/L)
Value
0.03
0.02
0.01
0.00
−2
−1
0
1
2
Theoretical Quantiles (Standard Normal)
Data Type
Detect


Trend Regression: Mann-Kendall/Theil-Sen Estimate
Zinc, MW-32 (mg/L)
Value
0.03
0.02
0.01
01/01/23
04/01/23
07/01/23
10/01/23
Date
Data Type
Detect

Grand Haven (State Program): Unit 1/2 & 3A/B as of October, 2023

95% Lower Confidence Limits for Assessment Monitoring

Well	Type	Constituent	Unit	n	% NDs	Range of Sampling Period	Method	LCL
MW-01R	Appendix III	Boron	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	89
MW-01R	Appendix III	Calcium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	190
MW-01R	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	120
MW-01R	Appendix III	Fluoride	mg/L	9	0%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	8.8
MW-01R	Appendix III	pH (field)	su	9	0%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	7.68
MW-01R	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-29 to 2023-10-24	Adjusted Gamma LCL	240
MW-01R	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	2300
MW-01R	Appendix IV	Antimony	mg/L	9	22%	2022-11-29 to 2023-10-24	Gamma MLE Bootstrap LCL	0.00026
MW-01R	Appendix IV	Arsenic	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.0011
MW-01R	Appendix IV	Barium	mg/L	9	0%	2022-11-29 to 2023-10-24	Adjusted Gamma LCL	0.25
MW-01R	Appendix IV	Beryllium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.00020
MW-01R	Appendix IV	Cadmium	mg/L	9	67%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000062
MW-01R	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.0016
MW-01R	Appendix IV	Cobalt	mg/L	9	0%	2022-11-29 to 2023-10-24	Adjusted Gamma LCL	0.0012
MW-01R	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	8.8
MW-01R	Appendix IV	Lead	mg/L	9	22%	2022-11-29 to 2023-10-24	Gamma MLE Bootstrap LCL	0.00073
MW-01R	Appendix IV	Lithium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	2.0
MW-01R	Appendix IV	Mercury	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-01R	Appendix IV	Molybdenum	mg/L	9	11%	2022-11-29 to 2023-10-24	Gamma MLE Bootstrap LCL	0.00065
MW-01R	Appendix IV	Radium 226 and 228	pCi/L	9	56%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.656
MW-01R	Appendix IV	Selenium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.00053
MW-01R	Appendix IV	Thallium	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-01R	Part 115	Copper	mg/L	9	56%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-01R	Part 115	Iron	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.39
MW-01R	Part 115	Nickel	mg/L	9	0%	2022-11-29 to 2023-10-24	Adjusted Gamma LCL	0.0017
MW-01R	Part 115	Silver	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-01R	Part 115	Vanadium	mg/L	9	22%	2022-11-29 to 2023-10-24	Normal MLE LCL	0.00037
MW-01R	Part 115	Zinc	mg/L	9	11%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-06	Appendix III	Boron	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	8.9
MW-06	Appendix III	Calcium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	240
MW-06	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	72
MW-06	Appendix III	Fluoride	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	1.1
MW-06	Appendix III	pH (field)	su	9	0%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	7.17
MW-06	Appendix III	Sulfate (as SO4)	mg/L	9	11%	2022-11-29 to 2023-10-24	Normal MLE LCL	5.8
MW-06	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	1200
MW-06	Appendix IV	Antimony	mg/L	9	78%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-06	Appendix IV	Arsenic	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.00058
MW-06	Appendix IV	Barium	mg/L	9	0%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	1.3
MW-06	Appendix IV	Beryllium	mg/L	9	89%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-06	Appendix IV	Cadmium	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-06	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.0016
MW-06	Appendix IV	Cobalt	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.00052
MW-06	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	1.1
MW-06	Appendix IV	Lead	mg/L	9	67%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-06	Appendix IV	Lithium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.18
MW-06	Appendix IV	Mercury	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-06	Appendix IV	Molybdenum	mg/L	9	67%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00025
MW-06	Appendix IV	Radium 226 and 228	pCi/L	9	22%	2022-11-29 to 2023-10-24	Normal MLE LCL	0.588
MW-06	Appendix IV	Selenium	mg/L	9	56%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-06	Appendix IV	Thallium	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-06	Part 115	Copper	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-06	Part 115	Iron	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	16
MW-06	Part 115	Nickel	mg/L	9	22%	2022-11-29 to 2023-10-24	Normal MLE LCL	0.00074
MW-06	Part 115	Silver	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-06	Part 115	Vanadium	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-06	Part 115	Zinc	mg/L	9	11%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-08	Appendix III	Boron	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	4.9
MW-08	Appendix III	Calcium	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	130
MW-08	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	22
MW-08	Appendix III	Fluoride	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.69
MW-08	Appendix III	pH (field)	su	9	0%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	7.16
MW-08	Appendix III	Sulfate (as SO4)	mg/L	9	33%	2022-12-01 to 2023-10-24	Gamma MLE Bootstrap LCL	3.2
MW-08	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	500
MW-08	Appendix IV	Antimony	mg/L	9	33%	2022-12-01 to 2023-10-24	Normal MLE LCL	0.000045

MW-08	Appendix IV	Arsenic	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.022
MW-08	Appendix IV	Barium	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	1.2
MW-08	Appendix IV	Beryllium	mg/L	9	100%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-08	Appendix IV	Cadmium	mg/L	9	100%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-08	Appendix IV	Chromium, Total	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.00079
MW-08	Appendix IV	Cobalt	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.00045
MW-08	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.69
MW-08	Appendix IV	Lead	mg/L	9	78%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-08	Appendix IV	Lithium	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.095
MW-08	Appendix IV	Mercury	mg/L	9	100%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-08	Appendix IV	Molybdenum	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.00085
MW-08	Appendix IV	Radium 226 and 228	pCi/L	9	22%	2022-12-01 to 2023-10-24	Normal MLE LCL	0.793
MW-08	Appendix IV	Selenium	mg/L	9	56%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.00014
MW-08	Appendix IV	Thallium	mg/L	9	100%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-08	Part 115	Copper	mg/L	9	56%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-08	Part 115	Iron	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	17
MW-08	Part 115	Nickel	mg/L	9	0%	2022-12-01 to 2023-10-24	Normal LCL	0.0010
MW-08	Part 115	Silver	mg/L	9	100%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-08	Part 115	Vanadium	mg/L	9	100%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-08	Part 115	Zinc	mg/L	9	22%	2022-12-01 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-09	Appendix III	Boron	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	5.5
MW-09	Appendix III	Calcium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	300
MW-09	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	12
MW-09	Appendix III	Fluoride	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	2.4
MW-09	Appendix III	pH (field)	su	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	7.20
MW-09	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	230
MW-09	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	1100
MW-09	Appendix IV	Antimony	mg/L	9	56%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000073
MW-09	Appendix IV	Arsenic	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.0013
MW-09	Appendix IV	Barium	mg/L	9	0%	2022-11-28 to 2023-10-24	Lognormal H-LCL	0.30
MW-09	Appendix IV	Beryllium	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-09	Appendix IV	Cadmium	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-09	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0021
MW-09	Appendix IV	Cobalt	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.00041
MW-09	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	2.4
MW-09	Appendix IV	Lead	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-09	Appendix IV	Lithium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.29
MW-09	Appendix IV	Mercury	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-09	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.018
MW-09	Appendix IV	Radium 226 and 228	pCi/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.678
MW-09	Appendix IV	Selenium	mg/L	9	22%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00022
MW-09	Appendix IV	Thallium	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-09	Part 115	Copper	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-09	Part 115	Iron	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	17
MW-09	Part 115	Nickel	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0011
MW-09	Part 115	Silver	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-09	Part 115	Vanadium	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-09	Part 115	Zinc	mg/L	9	67%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-18	Appendix III	Boron	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	2.1
MW-18	Appendix III	Calcium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	290
MW-18	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	20
MW-18	Appendix III	Fluoride	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	3.6
MW-18	Appendix III	pH (field)	su	9	0%	2022-11-30 to 2023-10-24	Normal LCL	7.10
MW-18	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	650
MW-18	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	1300
MW-18	Appendix IV	Antimony	mg/L	9	22%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00012
MW-18	Appendix IV	Arsenic	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.020
MW-18	Appendix IV	Barium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.016
MW-18	Appendix IV	Beryllium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-18	Appendix IV	Cadmium	mg/L	9	22%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.00010
MW-18	Appendix IV	Chromium, Total	mg/L	9	89%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00018
MW-18	Appendix IV	Cobalt	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0024
MW-18	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	3.6
MW-18	Appendix IV	Lead	mg/L	9	67%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-18	Appendix IV	Lithium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.031
MW-18	Appendix IV	Mercury	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-18	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.012
MW-18	Appendix IV	Radium 226 and 228	pCi/L	9	67%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.501
MW-18	Appendix IV	Selenium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.00027

MW-18	Appendix IV	Thallium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-18	Part 115	Copper	mg/L	9	0%	2022-11-30 to 2023-10-24	Adjusted Gamma LCL	0.00046
MW-18	Part 115	Iron	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	5.3
MW-18	Part 115	Nickel	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0057
MW-18	Part 115	Silver	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-18	Part 115	Vanadium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-18	Part 115	Zinc	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.046
MW-19	Appendix III	Boron	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	1.8
MW-19	Appendix III	Calcium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	450
MW-19	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	42
MW-19	Appendix III	Fluoride	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	1.9
MW-19	Appendix III	pH (field)	su	9	0%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	6.82
MW-19	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	890
MW-19	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	1800
MW-19	Appendix IV	Antimony	mg/L	9	89%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-19	Appendix IV	Arsenic	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0044
MW-19	Appendix IV	Barium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.037
MW-19	Appendix IV	Beryllium	mg/L	9	33%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.000053
MW-19	Appendix IV	Cadmium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-19	Appendix IV	Chromium, Total	mg/L	9	44%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.00011
MW-19	Appendix IV	Cobalt	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.00041
MW-19	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	1.9
MW-19	Appendix IV	Lead	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-19	Appendix IV	Lithium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.091
MW-19	Appendix IV	Mercury	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-19	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0089
MW-19	Appendix IV	Radium 226 and 228	pCi/L	9	33%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.600
MW-19	Appendix IV	Selenium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-19	Appendix IV	Thallium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-19	Part 115	Copper	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-19	Part 115	Iron	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	14
MW-19	Part 115	Nickel	mg/L	9	11%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.0015
MW-19	Part 115	Silver	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-19	Part 115	Vanadium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-19	Part 115	Zinc	mg/L	9	78%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-20	Appendix III	Boron	mg/L	9	0%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.82
MW-20	Appendix III	Calcium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	110
MW-20	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	65
MW-20	Appendix III	Fluoride	mg/L	9	0%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.21
MW-20	Appendix III	pH (field)	su	9	0%	2022-11-30 to 2023-10-24	Normal LCL	7.24
MW-20	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	43
MW-20	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	640
MW-20	Appendix IV	Antimony	mg/L	9	22%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.000065
MW-20	Appendix IV	Arsenic	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0013
MW-20	Appendix IV	Barium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.39
MW-20	Appendix IV	Beryllium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-20	Appendix IV	Cadmium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-20	Appendix IV	Chromium, Total	mg/L	9	56%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00019
MW-20	Appendix IV	Cobalt	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0012
MW-20	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.21
MW-20	Appendix IV	Lead	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0018
MW-20	Appendix IV	Lithium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.059
MW-20	Appendix IV	Mercury	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-20	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0040
MW-20	Appendix IV	Radium 226 and 228	pCi/L	9	56%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.499
MW-20	Appendix IV	Selenium	mg/L	9	56%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00011
MW-20	Appendix IV	Thallium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-20	Part 115	Copper	mg/L	9	11%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.00022
MW-20	Part 115	Iron	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	18
MW-20	Part 115	Nickel	mg/L	9	0%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.0078
MW-20	Part 115	Silver	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-20	Part 115	Vanadium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-20	Part 115	Zinc	mg/L	9	0%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.024
MW-30	Appendix III	Boron	mg/L	9	0%	2022-11-30 to 2023-10-23	Adjusted Gamma LCL	1.8
MW-30	Appendix III	Calcium	mg/L	9	0%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	400
MW-30	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	110
MW-30	Appendix III	Fluoride	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	1.0
MW-30	Appendix III	pH (field)	su	9	0%	2022-11-30 to 2023-10-23	Normal LCL	6.91
MW-30	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	790

MW-30	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	2100
MW-30	Appendix IV	Antimony	mg/L	9	89%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-30	Appendix IV	Arsenic	mg/L	9	22%	2022-11-30 to 2023-10-23	Normal MLE LCL	0.00021
MW-30	Appendix IV	Barium	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.054
MW-30	Appendix IV	Beryllium	mg/L	9	89%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000052
MW-30	Appendix IV	Cadmium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000032
MW-30	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.0079
MW-30	Appendix IV	Cobalt	mg/L	9	0%	2022-11-30 to 2023-10-23	Adjusted Gamma LCL	0.00095
MW-30	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	1.0
MW-30	Appendix IV	Lead	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00022
MW-30	Appendix IV	Lithium	mg/L	9	0%	2022-11-30 to 2023-10-23	Adjusted Gamma LCL	0.11
MW-30	Appendix IV	Mercury	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00016
MW-30	Appendix IV	Molybdenum	mg/L	9	33%	2022-11-30 to 2023-10-23	Normal MLE LCL	0.00026
MW-30	Appendix IV	Radium 226 and 228	pCi/L	9	56%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.526
MW-30	Appendix IV	Selenium	mg/L	9	67%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00011
MW-30	Appendix IV	Thallium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000075
MW-30	Part 115	Copper	mg/L	9	78%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00020
MW-30	Part 115	Iron	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	1.6
MW-30	Part 115	Nickel	mg/L	9	22%	2022-11-30 to 2023-10-23	Normal MLE LCL	0.00072
MW-30	Part 115	Silver	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-30	Part 115	Vanadium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00062
MW-30	Part 115	Zinc	mg/L	9	78%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.0012
MW-31	Appendix III	Boron	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	4.1
MW-31	Appendix III	Calcium	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	160
MW-31	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	98
MW-31	Appendix III	Fluoride	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	4.7
MW-31	Appendix III	pH (field)	su	9	0%	2022-12-01 to 2023-10-23	Normal LCL	7.75
MW-31	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	130
MW-31	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	780
MW-31	Appendix IV	Antimony	mg/L	9	44%	2022-12-01 to 2023-10-23	Normal MLE LCL	0.000052
MW-31	Appendix IV	Arsenic	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	0.0012
MW-31	Appendix IV	Barium	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	0.14
MW-31	Appendix IV	Beryllium	mg/L	9	100%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.000052
MW-31	Appendix IV	Cadmium	mg/L	9	100%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.000032
MW-31	Appendix IV	Chromium, Total	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	0.0020
MW-31	Appendix IV	Cobalt	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	0.00016
MW-31	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	4.7
MW-31	Appendix IV	Lead	mg/L	9	89%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.00010
MW-31	Appendix IV	Lithium	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	0.050
MW-31	Appendix IV	Mercury	mg/L	9	100%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.00016
MW-31	Appendix IV	Molybdenum	mg/L	9	0%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.0011
MW-31	Appendix IV	Radium 226 and 228	pCi/L	9	33%	2022-12-01 to 2023-10-23	Normal MLE LCL	0.441
MW-31	Appendix IV	Selenium	mg/L	9	56%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.00012
MW-31	Appendix IV	Thallium	mg/L	9	100%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.000075
MW-31	Part 115	Copper	mg/L	9	89%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.00020
MW-31	Part 115	Iron	mg/L	9	0%	2022-12-01 to 2023-10-23	Normal LCL	0.64
MW-31	Part 115	Nickel	mg/L	9	100%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.00065
MW-31	Part 115	Silver	mg/L	9	100%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-31	Part 115	Vanadium	mg/L	9	100%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.00062
MW-31	Part 115	Zinc	mg/L	9	67%	2022-12-01 to 2023-10-23	Nonparametric LCL around the Median	0.0012
MW-02	Appendix III	Boron	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	88
MW-02	Appendix III	Calcium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	190
MW-02	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	130
MW-02	Appendix III	Fluoride	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	8.7
MW-02	Appendix III	pH (field)	su	9	0%	2022-11-28 to 2023-10-24	Normal LCL	7.14
MW-02	Appendix III	Sulfate (as SO4)	mg/L	9	56%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.41
MW-02	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	1700
MW-02	Appendix IV	Antimony	mg/L	9	22%	2022-11-28 to 2023-10-24	Normal MLE LCL	0.00013
MW-02	Appendix IV	Arsenic	mg/L	9	0%	2022-11-28 to 2023-10-24	Adjusted Gamma LCL	0.0077
MW-02	Appendix IV	Barium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.44
MW-02	Appendix IV	Beryllium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.00026
MW-02	Appendix IV	Cadmium	mg/L	9	67%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000041
MW-02	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.032
MW-02	Appendix IV	Cobalt	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0048
MW-02	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	8.7
MW-02	Appendix IV	Lead	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0019
MW-02	Appendix IV	Lithium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	1.2
MW-02	Appendix IV	Mercury	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-02	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-28 to 2023-10-24	Lognormal H-LCL	0.0061

MW-02	Appendix IV	Radium 226 and 228	pCi/L	9	33%	2022-11-28 to 2023-10-24	Normal MLE LCL	0.968
MW-02	Appendix IV	Selenium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.00092
MW-02	Appendix IV	Thallium	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-02	Part 115	Copper	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0014
MW-02	Part 115	Iron	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	22
MW-02	Part 115	Nickel	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.018
MW-02	Part 115	Silver	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-02	Part 115	Vanadium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0025
MW-02	Part 115	Zinc	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.0022
MW-03	Appendix III	Boron	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	3.9
MW-03	Appendix III	Calcium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	350
MW-03	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	160
MW-03	Appendix III	Fluoride	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.54
MW-03	Appendix III	pH (field)	su	9	0%	2022-11-28 to 2023-10-24	Normal LCL	7.28
MW-03	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	320
MW-03	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	2200
MW-03	Appendix IV	Antimony	mg/L	9	56%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000092
MW-03	Appendix IV	Arsenic	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.00072
MW-03	Appendix IV	Barium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.30
MW-03	Appendix IV	Beryllium	mg/L	9	78%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-03	Appendix IV	Cadmium	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-03	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0040
MW-03	Appendix IV	Cobalt	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.00065
MW-03	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.54
MW-03	Appendix IV	Lead	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00022
MW-03	Appendix IV	Lithium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.038
MW-03	Appendix IV	Mercury	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-03	Appendix IV	Molybdenum	mg/L	9	78%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00025
MW-03	Appendix IV	Radium 226 and 228	pCi/L	9	11%	2022-11-28 to 2023-10-24	Normal MLE LCL	0.997
MW-03	Appendix IV	Selenium	mg/L	9	33%	2022-11-28 to 2023-10-24	Normal MLE LCL	0.00020
MW-03	Appendix IV	Thallium	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-03	Part 115	Copper	mg/L	9	56%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-03	Part 115	Iron	mg/L	9	0%	2022-11-28 to 2023-10-24	Adjusted Gamma LCL	1.1
MW-03	Part 115	Nickel	mg/L	9	11%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00087
MW-03	Part 115	Silver	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-03	Part 115	Vanadium	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-03	Part 115	Zinc	mg/L	9	56%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-04	Appendix III	Boron	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	3.8
MW-04	Appendix III	Calcium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	340
MW-04	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	180
MW-04	Appendix III	Fluoride	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	1.1
MW-04	Appendix III	pH (field)	su	9	0%	2022-11-28 to 2023-10-24	Normal LCL	7.31
MW-04	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	410
MW-04	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	1800
MW-04	Appendix IV	Antimony	mg/L	9	67%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-04	Appendix IV	Arsenic	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.00075
MW-04	Appendix IV	Barium	mg/L	9	0%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.11
MW-04	Appendix IV	Beryllium	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-04	Appendix IV	Cadmium	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-04	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.0032
MW-04	Appendix IV	Cobalt	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.00043
MW-04	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	1.1
MW-04	Appendix IV	Lead	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-04	Appendix IV	Lithium	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.058
MW-04	Appendix IV	Mercury	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-04	Appendix IV	Molybdenum	mg/L	9	22%	2022-11-28 to 2023-10-24	Normal MLE LCL	0.00056
MW-04	Appendix IV	Radium 226 and 228	pCi/L	9	11%	2022-11-28 to 2023-10-24	Normal MLE LCL	1.08
MW-04	Appendix IV	Selenium	mg/L	9	56%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00017
MW-04	Appendix IV	Thallium	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-04	Part 115	Copper	mg/L	9	89%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-04	Part 115	Iron	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	5.5
MW-04	Part 115	Nickel	mg/L	9	0%	2022-11-28 to 2023-10-24	Normal LCL	0.011
MW-04	Part 115	Silver	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-04	Part 115	Vanadium	mg/L	9	100%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-04	Part 115	Zinc	mg/L	9	67%	2022-11-28 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-07	Appendix III	Boron	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	11
MW-07	Appendix III	Calcium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	130
MW-07	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	13
MW-07	Appendix III	Fluoride	mg/L	9	11%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.081

MW-07	Appendix III	pH (field)	su	9	0%	2022-11-30 to 2023-10-24	Normal LCL	6.76
MW-07	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	19
MW-07	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	560
MW-07	Appendix IV	Antimony	mg/L	9	89%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-07	Appendix IV	Arsenic	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.00018
MW-07	Appendix IV	Barium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.31
MW-07	Appendix IV	Beryllium	mg/L	9	67%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-07	Appendix IV	Cadmium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-07	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.00031
MW-07	Appendix IV	Cobalt	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.00087
MW-07	Appendix IV	Fluoride (App IV)	mg/L	9	11%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.081
MW-07	Appendix IV	Lead	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-07	Appendix IV	Lithium	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	0.0054
MW-07	Appendix IV	Mercury	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-07	Appendix IV	Molybdenum	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00025
MW-07	Appendix IV	Radium 226 and 228	pCi/L	9	22%	2022-11-30 to 2023-10-24	Normal MLE LCL	0.712
MW-07	Appendix IV	Selenium	mg/L	9	89%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00010
MW-07	Appendix IV	Thallium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-07	Part 115	Copper	mg/L	9	89%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-07	Part 115	Iron	mg/L	9	0%	2022-11-30 to 2023-10-24	Normal LCL	14
MW-07	Part 115	Nickel	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00065
MW-07	Part 115	Silver	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-07	Part 115	Vanadium	mg/L	9	100%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-07	Part 115	Zinc	mg/L	9	67%	2022-11-30 to 2023-10-24	Nonparametric LCL around the Median	0.0012
MW-10	Appendix III	Boron	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	12
MW-10	Appendix III	Calcium	mg/L	9	0%	2022-11-29 to 2023-10-23	Adjusted Gamma LCL	200
MW-10	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	150
MW-10	Appendix III	Fluoride	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	4.7
MW-10	Appendix III	pH (field)	su	9	0%	2022-11-29 to 2023-10-23	Normal LCL	7.56
MW-10	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	310
MW-10	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	1700
MW-10	Appendix IV	Antimony	mg/L	9	56%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-10	Appendix IV	Arsenic	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	0.00038
MW-10	Appendix IV	Barium	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	0.21
MW-10	Appendix IV	Beryllium	mg/L	9	33%	2022-11-29 to 2023-10-23	Normal MLE LCL	0.000013
MW-10	Appendix IV	Cadmium	mg/L	9	100%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.000032
MW-10	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	0.0030
MW-10	Appendix IV	Cobalt	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	0.00035
MW-10	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	4.7
MW-10	Appendix IV	Lead	mg/L	9	78%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.00012
MW-10	Appendix IV	Lithium	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	0.81
MW-10	Appendix IV	Mercury	mg/L	9	100%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.00016
MW-10	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	0.0029
MW-10	Appendix IV	Radium 226 and 228	pCi/L	9	89%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.645
MW-10	Appendix IV	Selenium	mg/L	9	11%	2022-11-29 to 2023-10-23	Normal MLE LCL	0.00029
MW-10	Appendix IV	Thallium	mg/L	9	100%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.000075
MW-10	Part 115	Copper	mg/L	9	67%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.00020
MW-10	Part 115	Iron	mg/L	9	0%	2022-11-29 to 2023-10-23	Normal LCL	3.6
MW-10	Part 115	Nickel	mg/L	9	33%	2022-11-29 to 2023-10-23	Gamma MLE Bootstrap LCL	0.00066
MW-10	Part 115	Silver	mg/L	9	100%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-10	Part 115	Vanadium	mg/L	9	89%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.00062
MW-10	Part 115	Zinc	mg/L	9	22%	2022-11-29 to 2023-10-23	Nonparametric LCL around the Median	0.0012
MW-11	Appendix III	Boron	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	3.4
MW-11	Appendix III	Calcium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	220
MW-11	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	64
MW-11	Appendix III	Fluoride	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.33
MW-11	Appendix III	pH (field)	su	9	0%	2022-11-29 to 2023-10-24	Normal LCL	7.30
MW-11	Appendix III	Sulfate (as SO4)	mg/L	9	11%	2022-11-29 to 2023-10-24	Gamma MLE Bootstrap LCL	24
MW-11	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	940
MW-11	Appendix IV	Antimony	mg/L	9	67%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-11	Appendix IV	Arsenic	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.0011
MW-11	Appendix IV	Barium	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.49
MW-11	Appendix IV	Beryllium	mg/L	9	89%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000052
MW-11	Appendix IV	Cadmium	mg/L	9	89%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000032
MW-11	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-29 to 2023-10-24	Lognormal H-LCL	0.00096
MW-11	Appendix IV	Cobalt	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.00040
MW-11	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	0.33
MW-11	Appendix IV	Lead	mg/L	9	33%	2022-11-29 to 2023-10-24	Gamma MLE Bootstrap LCL	0.00070
MW-11	Appendix IV	Lithium	mg/L	9	0%	2022-11-29 to 2023-10-24	Adjusted Gamma LCL	0.040

MW-11	Appendix IV	Mercury	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00016
MW-11	Appendix IV	Molybdenum	mg/L	9	22%	2022-11-29 to 2023-10-24	Normal MLE LCL	0.00052
MW-11	Appendix IV	Radium 226 and 228	pCi/L	9	22%	2022-11-29 to 2023-10-24	Normal MLE LCL	0.830
MW-11	Appendix IV	Selenium	mg/L	9	33%	2022-11-29 to 2023-10-24	Normal MLE LCL	0.00015
MW-11	Appendix IV	Thallium	mg/L	9	100%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000075
MW-11	Part 115	Copper	mg/L	9	33%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00020
MW-11	Part 115	Iron	mg/L	9	0%	2022-11-29 to 2023-10-24	Normal LCL	4.8
MW-11	Part 115	Nickel	mg/L	9	0%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00068
MW-11	Part 115	Silver	mg/L	9	89%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.000050
MW-11	Part 115	Vanadium	mg/L	9	89%	2022-11-29 to 2023-10-24	Nonparametric LCL around the Median	0.00062
MW-11	Part 115	Zinc	mg/L	9	22%	2022-11-29 to 2023-10-24	Gamma MLE Bootstrap LCL	0.0064
MW-12	Appendix III	Boron	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.24
MW-12	Appendix III	Calcium	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	62
MW-12	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	17
MW-12	Appendix III	Fluoride	mg/L	9	0%	2022-11-28 to 2023-10-23	Lognormal H-LCL	0.27
MW-12	Appendix III	pH (field)	su	9	0%	2022-11-28 to 2023-10-23	Normal LCL	7.44
MW-12	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-28 to 2023-10-23	Adjusted Gamma LCL	110
MW-12	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	240
MW-12	Appendix IV	Antimony	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.00056
MW-12	Appendix IV	Arsenic	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.0020
MW-12	Appendix IV	Barium	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.025
MW-12	Appendix IV	Beryllium	mg/L	9	100%	2022-11-28 to 2023-10-23	Nonparametric LCL around the Median	0.000052
MW-12	Appendix IV	Cadmium	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.00093
MW-12	Appendix IV	Chromium, Total	mg/L	9	44%	2022-11-28 to 2023-10-23	Normal MLE LCL	0.000020
MW-12	Appendix IV	Cobalt	mg/L	9	33%	2022-11-28 to 2023-10-23	Normal MLE LCL	0.000029
MW-12	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-28 to 2023-10-23	Lognormal H-LCL	0.27
MW-12	Appendix IV	Lead	mg/L	9	56%	2022-11-28 to 2023-10-23	Nonparametric LCL around the Median	0.00015
MW-12	Appendix IV	Lithium	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.0031
MW-12	Appendix IV	Mercury	mg/L	9	89%	2022-11-28 to 2023-10-23	Nonparametric LCL around the Median	0.00016
MW-12	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.0066
MW-12	Appendix IV	Radium 226 and 228	pCi/L	9	78%	2022-11-28 to 2023-10-23	Nonparametric LCL around the Median	0.517
MW-12	Appendix IV	Selenium	mg/L	9	0%	2022-11-28 to 2023-10-23	Adjusted Gamma LCL	0.00063
MW-12	Appendix IV	Thallium	mg/L	9	100%	2022-11-28 to 2023-10-23	Nonparametric LCL around the Median	0.000075
MW-12	Part 115	Copper	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.00084
MW-12	Part 115	Iron	mg/L	9	44%	2022-11-28 to 2023-10-23	Normal MLE LCL	0.014
MW-12	Part 115	Nickel	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.0022
MW-12	Part 115	Silver	mg/L	9	100%	2022-11-28 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-12	Part 115	Vanadium	mg/L	9	56%	2022-11-28 to 2023-10-23	Nonparametric LCL around the Median	0.00062
MW-12	Part 115	Zinc	mg/L	9	0%	2022-11-28 to 2023-10-23	Normal LCL	0.0067
MW-32	Appendix III	Boron	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	3.0
MW-32	Appendix III	Calcium	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	160
MW-32	Appendix III	Chloride (as Cl)	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	44
MW-32	Appendix III	Fluoride	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	1.4
MW-32	Appendix III	pH (field)	su	9	0%	2022-11-30 to 2023-10-23	Normal LCL	7.55
MW-32	Appendix III	Sulfate (as SO4)	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	54
MW-32	Appendix III	Total Dissolved Solids	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	650
MW-32	Appendix IV	Antimony	mg/L	9	67%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-32	Appendix IV	Arsenic	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.00049
MW-32	Appendix IV	Barium	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.39
MW-32	Appendix IV	Beryllium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000052
MW-32	Appendix IV	Cadmium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000032
MW-32	Appendix IV	Chromium, Total	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.00036
MW-32	Appendix IV	Cobalt	mg/L	9	0%	2022-11-30 to 2023-10-23	Lognormal H-LCL	0.00037
MW-32	Appendix IV	Fluoride (App IV)	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	1.4
MW-32	Appendix IV	Lead	mg/L	9	78%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00010
MW-32	Appendix IV	Lithium	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.11
MW-32	Appendix IV	Mercury	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00016
MW-32	Appendix IV	Molybdenum	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.0038
MW-32	Appendix IV	Radium 226 and 228	pCi/L	9	56%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.589
MW-32	Appendix IV	Selenium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00010
MW-32	Appendix IV	Thallium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000075
MW-32	Part 115	Copper	mg/L	9	78%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00020
MW-32	Part 115	Iron	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	14
MW-32	Part 115	Nickel	mg/L	9	0%	2022-11-30 to 2023-10-23	Normal LCL	0.00094
MW-32	Part 115	Silver	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.000050
MW-32	Part 115	Vanadium	mg/L	9	100%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.00062
MW-32	Part 115	Zinc	mg/L	9	0%	2022-11-30 to 2023-10-23	Nonparametric LCL around the Median	0.0025