



CLOSURE PLAN

GRAND HAVEN BOARD OF LIGHT AND POWER

J.B. SIMS GENERATING STATION

Closure Plan

Pursuant to 40 CFR 257.102

Units 1 and 2 Inactive Ash Ponds, and Unit 3 Active
East and West Ash Pond Surface Impoundments



Submitted To: Grand Haven Board of Light and Power
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Project No. 1775416/1789024

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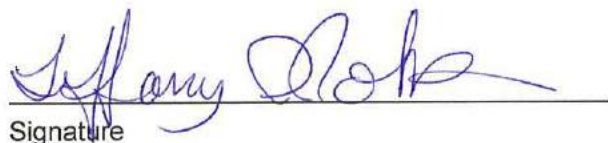


CERTIFICATION

Professional Engineer Certification Statement [40 CFR 257.102(b)(4)]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.102 (40 CFR Part 257.102), I attest that this Closure Plan is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.102.

Golder Associates Inc.


Signature


Date of Report Certification

Tiffany D. Johnson, P.E.
Name

6201049160
Professional Engineer Certification Number





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1.0 INTRODUCTION

On April 17, 2015, the United States Environmental Protection Agency (EPA) issued the Coal Combustion Residual (CCR) Resource Conservation and Recovery Act (RCRA) Rule (40 CFR 257 Subpart D) (“CCR RCRA Rule”) to regulate the beneficial use and disposal of CCR materials generated at coal-fired electrical power generating complexes. In accordance with the CCR RCRA Rule, any CCR surface impoundment or CCR landfill that was actively receiving CCRs on the effective date of the CCR RCRA Rule (October 19, 2015) was deemed to be an “Existing CCR Unit” on that date and subject to self-implementing compliance standards and schedules. The Grand Haven Board of Light and Power (GHBLP) identified four existing CCR surface impoundments at the J.B. Sims Generating Station (JBSGS):

- Units 1 and 2 Inactive Ash Ponds
- Unit 3 Active East Bottom Ash Pond
- Unit 3 Active West Bottom Ash Pond

JBSGS is located on Harbor Island, Grand Haven, Michigan as presented on Figure 1 – Site Location Map. The locations of the Units 1 and 2 Inactive Ash Ponds and Unit 3 Active East and West Bottom Ash Ponds are presented on Figure 2 – General Site Plan.

This closure plan is written pursuant of 40 CFR 257.102(b), and describes the steps necessary to close the JBSGS Ash Ponds in a manner consistent with recognized and generally accepted good engineering practices.



2.0 NARRATIVE DESCRIPTION [40 CFR 257.102(b)(1)(i-iii-v)]

The GHBLP has elected to close the Units 1 and 2 Inactive Ash Ponds by closure in-place with CCR in place and capped with a final cover system over the CCR surface impoundment area. Prior to construction of the final cover, Units 1 and 2 Inactive Ash Ponds will be required to be dewatered by actively pumping the pond contents in a manner that maintains permitted effluent limits. Once pumping is complete, the effluent pipes will be permanently capped to prevent subsequent filling of the pond. Once dewatered, the Units 1 and 2 Inactive Ash Ponds will be regraded and/or backfilled to provide a stable subgrade for the final cover system. Final grades will be reached with construction of a two-foot-thick final cover system designed with a minimum two percent slope to meet performance standard requirements per 40 CFR 257.102(d)(3)(ii). Details of the closure construction are provided in the following sections.

The GHBLP has elected to close the Unit 3 Active East and West Bottom Ash CCR surface impoundments at the JBSGS facility per 40 CFR 257.102(c) for closure by removal of CCR. As per 40 CFR 257(b)(ii), a description of the removal and decontamination procedures are also presented in the sections to follow.

2.1 Unit 1 and 2 Ash Ponds CCR Quantity [40 CFR 257.102(b)(1)(iv-v)]

The Unit 1 and 2 Ash Ponds are expected to have a maximum CCR volume of 81,000 cubic feet and 230,000 cubic feet, respectively, see Table 1, below. The volume was conservatively determined by using the area of each pond and assuming a depth of 6-feet (ERM, 2016). The area covered by the Unit 2 pond includes the small projection to the northeast. The Unit 1 and 2 Ash Ponds are incised ponds that have no evidence of an engineered liner. These ponds will be closed in place.

2.2 Unit 3 Ash Ponds CCR Quantity [40 CFR 257.102(b)(1)(iv-v)]

The Unit 3 East and West Bottom Ash Ponds are expected to have a maximum CCR volume of 68,000 cubic feet and 77,000 cubic feet, respectively, see Table 1, below. The Unit 3 East and West Bottom Ash Ponds were constructed with compacted clay berms and liner system, so the CCR contained within the ponds will be the only CCR materials to remove.

**Table 1: Ash Pond Dimensions and Size**

Dimension	Units	Unit 1 ¹ Pond	Unit 2 ¹ Pond	Unit 3 West Pond ²	Unit 3 East Pond ²
Year of Construction	year	1978-1981	1968-1973	1983	1983
Surface Area	acre	0.3	0.9	0.3	0.2
Total CCR Storage Capacity (with 2 feet of freeboard)	cubic feet	81,000 ³	230,000 ³	77,000	68,000
Current Crest Elevation	ft-amsl ⁴	580	580	591.2 to 592.7	591.2 to 592.7
Normal Pond Elevation	ft-amsl ⁴	580	580	588 to 590	588 to 590
Inflow	MGD	Inactive ⁵	Inactive ⁵	0.5 ⁶	0.5 ⁶
Recent Liner Modifications	Year	NA	NA	2013 ⁷	2013 ⁷
Clay Liner Thickness	feet	0	0	>3	>3
Clay Liner Permeability	centimeters per second	NA	NA	3x10 ⁻⁷	3x10 ⁻⁷

Notes:

- 1) Construction documents unavailable. Information gathered from aerial photograph and USGS topographic maps.
- 2) Information from USEPA (2012), Black and Veatch (1983), and Soils & Structures (2016).
- 3) Assumes an average depth of 6 feet.
- 4) ft-amsl = feet above mean sea level.
- 5) No further inflow. Ponds are no longer actively in use.
- 6) Per GHBLP personnel, GHBLP circulates approximately 0.5 MGD and blows down approximately 0.030 MGD. MGD = million gallons per day.
- 7) During the process of removing bottom ash from each pond, using an excavator, some of the clay liner can become disturbed or removed. GHBLP periodically hires an earthworks contractor to repair the clay liner. The most recent relining was completed in September 2013.

2.3 Closure Construction Sequence [40 CFR 257.102(b)(1)(ii)]

2.3.1 Dewatering

The CCR units will be dewatered by actively pumping the water in a manner that maintains permitted effluent limits. Upon reaching an equilibrium groundwater elevation, active pumping will cease. The influent and effluent pipes in each CCR unit will be permanently capped and abandoned to prevent subsequent filling of the ponds.

2.3.2 Unit 1 and 2 Ponds - Closure in Place of CCR [40 CFR 257.102(d)]

Once sufficient water has been decanted, the CCR will be regraded and compacted until the surface grading is determined to be acceptable to place structural fill. Once existing CCR in the Units 1 and 2 Inactive Ash Ponds is regraded to provide a uniform surface to support fill materials, excess on-site and imported material will be used as fill to meet the surrounding grades. A 24-inch-thick final cover system will overlay the top of



liner grade; it is designed with a proposed minimum 2.0 percent slope to prevent future impoundment of water, sediment, or slurry; prevent/control the release of waste; limit the effects of settlement; and minimize erosion.

The final cover system will be 24 inches thick and consist of a 40 mil thick HDPE geomembrane (infiltration layer) overlain 18 inches of protective cover soil. The protective cover will be overlain with a 6-inch thick erosion layer. The erosion layer consists of topsoil, seed, fertilizer, and mulch in accordance with MDOT Standard Specification 816 – Turf Establishment.

Together, the final cover system is designed to:

- Provide a final cover permeability less than 1.0×10^{-5} centimeter per second (cm/sec)
- Control contaminated runoff
- Minimize the need for maintenance
- Control, minimize, or eliminate post-closure infiltration of liquids
- Minimize releases of CCR and leachate into ground and surface waters or the atmosphere
- Prevent the sloughing or movement of the liner

The system is designed with a minimum two percent slope to:

- Prevent/limit the future impoundment of water, sediment, and slurry
- Minimize erosion
- Prevent/control the release of waste
- Limit the effects of settlement/subsidence

CCR Rule states in Part 257.102 that the “permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less.” Since Units 1 and 2 Inactive Ash Ponds were constructed without an engineered liner system, and the natural subsoils present are sandy soils, it has been conservatively assumed that the subgrade soils have a permeability of 1×10^{-5} centimeters per second (cm/sec) or more. Therefore, the final cover system will be designed conservatively to have a permeability of 1×10^{-7} cm/sec or less using one of two options; Option 1 - a combination of the HDPE geomembrane overlain by 18-inches of protective soil, or Option 2 - 18-inches of soil with a permeability of less than 1×10^{-7} cm/sec. The published permeability of a typical HDPE geomembrane is 1×10^{-12} cm/sec or less (GSE, 2012).

2.3.3 Unit 3 East and West Ponds - Closure by Removal of CCR [40 CFR 257.102(c)]

After final receipt of CCR and dewatering activities are complete, CCR will be removed from the units. The above grade portion of the compacted clay impoundment berms will then be graded inward to reduce interior slopes and to minimize additional storm water run-on from outside of the impoundment boundary. Clean fill material from the JBSGS site and/or other offsite sources may need to be imported in order to attain the proposed post source removal grades.



Soil sampling will be conducted in the field during closure activities to provide multiple lines of physical evidence documenting CCR removal. It is anticipated that the CCR removal will continue a nominal extent into the existing compacted clay liner.

2.3.4 Post Closure Groundwater Monitoring

After closure, groundwater monitoring concentrations will be analyzed to confirm no exceedance of the protection standard established by 40 CFR 257.95(h), for the Unit 3 Active East and West Bottom Ash Ponds.

Groundwater monitoring will be conducted to document that constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit do not exceed the groundwater protection standards per 40 CFR 257.95(h) for constituents listed in Table 2, below. Closure will be documented as complete when two consecutive quarterly groundwater monitoring events demonstrate no exceedances.

Groundwater monitoring wells were installed around the Unit 3 East and West Bottom Ash Ponds to establish a groundwater monitoring system under 40 CFR 257.91(e)(1) during the fourth quarter of 2016. Additional monitoring wells are planned be installed to address the Units 1 and 2 inactive Ash Ponds. In conformance with 40 CFR 257.93, a groundwater sampling and analysis procedure plan was developed for the groundwater monitoring program. The plan was prepared by others and should include direction on how to perform or acquire the following:

- | | |
|---|---|
| ■ Groundwater elevations | ■ Quality assurance/Quality control (QA/QC) |
| ■ Sample collection and handling procedures | ■ Investigation derived waste (IDW) |
| ■ Equipment decontamination procedures | ■ Field documentation |
| ■ Chain of custody control | ■ Analytical suite and procedures |
| ■ Sample preservation and shipment | ■ Optional additional analyses |
| | ■ Data evaluation |

The minimum of two consecutive quarterly groundwater monitoring events to initiate the detection monitoring program are currently being collected to confirm that groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to 40 CFR 257.95(h) for constituents listed in Table 2. If a statistically significant increase over background levels for one or more of the constituents listed in Table 2 is detected after the self-implementing schedule milestone of October 17, 2016 to establish a detection monitoring program, then GHBLP will follow the self-implementing schedule outlined in 40 CFR 257.93(h) and 257.95(g). The initial collection and presentation of data will be certified in an annual groundwater monitoring and corrective action report no later than January 31, 2018 per 40 CFR 257.90(e) and annually, thereafter, until groundwater monitoring concentrations do not exceed the



groundwater protection standard established pursuant to 40 CFR 257.95(h) for constituents listed in Table 2.

Table 2 – Groundwater Assessment Monitoring Constituents

Common Name		
Antimony	Chromium	Mercury
Arsenic	Cobalt	Molybdenum
Barium	Fluoride	Selenium
Beryllium	Lead	Thallium
Cadmium	Lithium	Radium 226 and 228 combined



3.0 SCHEDULE [40 CFR 257.102(B)(1)(VI)]

3.1 Introduction

GHBLP will initiate closure by providing notification pursuant to 40 CFR 257.102(e). Pursuant of 40 CFR 257.102(e)(i), notification shall take place no later than 30 days after the units receive the known final receipt of waste for the active ponds. In accordance with 40 CFR 257.102(f)(1)(ii), closure activities are expected to be completed within five years of the notification of intent to initiate closure.

3.2 Units 1 and 2 Inactive Ash Pond Closure Commencement

For this section, Option 1 will be used for the closure commencement schedule, as it will take longer than Option 2 to construct. Option 1 is the geomembrane and protective soil option. Option 2 is the soil only option. Both options shall have an equivalent maximum 1×10^{-7} cm/sec permeability and a minimum 18-inch thick layer.

On average, it is anticipated that 5,000 cy of earthwork (cut/fill/placement/compaction) can be completed each day. This yields approximately three days to fill in the approximately 6 foot deep Units 1 and 2 Inactive Ash Ponds, once dewatered. Once the Option 1 grading is complete, the 40 mil HDPE geomembrane will be installed. One liner crew can place approximately 45,000 square feet per day and; therefore, it is expected that it will take two working days to complete the geosynthetics installation.

Once the geosynthetics are installed, the protective cover can be placed. The protective cover will require placement of approximately 3,000 cy. Assuming a placement rate of 5,000 cy per day yields one working day. The erosion layer will overlay the protective cover. Approximately 1,000 cy of erosion layer is required. Assuming a placement rate of 5,000 cy per day yield one working days.

The erosion layer will require seed, fertilizer, and mulch and should be planted by mid-August so the seed can be established and cut before winter. With proper equipment, the closed area can be seeded, fertilized, and mulched in one day. A breakdown of the schedule is provided below in Table 3 – Closure Schedule Production Estimate.

**Table 3 – Units 1 and 2 Inactive Ash Pond Closure Schedule Production Estimate (Option 1 only, geomembrane plus protective soil)**

Closure Component	Quantity	Units	Construction Rate	Rate Units	Required Time in Days
Grading layer fill	12,000	cubic yards	5,000	cubic yards per day	3
40-mil HDPE geomembrane (infiltration layer)	53,000	square feet	45,000	square feet per day	2
18-inch-thick sand layer (protective cover)	3,000	cubic yards	5,000	cubic yards per day	1
6-inch-thick topsoil (erosion layer)	1,000	cubic yards	5,000	cubic yards per day	1
Seed, fertilizer, mulch (erosion layer)	53,000	square feet	300,000	square feet per day	1
Workdays Required =					8

It is anticipated that closure construction will begin on or before June 5, 2023 in order to comply with the closure schedule. Conservatively assuming a start to finish construction schedule, the final cover construction will take approximately 1.5 weeks. Using these assumptions results in completion of the final cover construction on August 4, 2023, which complies with the October 1, 2023 closure deadline. Table 4 – Conceptual Final Cover Construction Schedule Milestones contains a list of milestone dates that were developed as part of the closure construction schedule to demonstrate that closure will be completed within the self-implementing closure schedule per 40 CFR 257.102(f)(1)(ii).



Table 4 – Units 1 and 2 Inactive Ash Pond Conceptual Final Cover Construction Schedule Milestones

Closure Component	Start Date	End Date
Monitor groundwater	January 1, 2018	October 1, 2023
Notification of closure	NA	October 1, 2018
Final Cover Construction	June 5, 2023	June 13, 2023
Closure activities complete	NA	June 30, 2023
Certified closure report	NA	December 31, 2023
Post-closure care period	January 1, 2024	December 31, 2053

3.3 Unit 3 Active East and West Bottom Ash Pond Closure Commencement

As per 40 CFR 257.102(e)(3), closure of the Unit 3 Active East and West Bottom Ash impoundment has commenced when JBSGS has ceased sluicing CCR into the impoundments and performs any of the following actions or activities:

- Taken any steps necessary to implement this written closure plan;
- Submitted a completed application for any required state or agency permit or permit modification; or
- Taken steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the closure of a CCR unit.

Once the removal of CCR has been completed, at least two consecutive quarterly groundwater monitoring events will be necessary to complete the clean closure certification. Table 5 – Conceptual CCR Removal Schedule Milestones contains a list of milestone dates that were developed as part of the closure construction schedule to demonstrate that closure will be completed within the self-implementing closure schedule per 40 CFR 257.102(f)(1)(ii).



Table 5 – Unit 3 Active East and West Bottom Ash Pond Conceptual CCR Removal Schedule Milestones

Closure Component	Start Date	Estimated End Date
Monitor groundwater	January 1, 2017	December 2025
Notification of closure	NA	January 2025
Removal of CCR and areas affected by releases of the CCR unit	May 2025	August 2025
Document constituent concentrations do not exceed groundwater protection standards	September 2025	December 2025
Closure activities complete	NA	January 2026
Certified closure report	NA	March 2026

3.4 Closure Deadline Extension [40 CFR 257.102(f)(2)]

As previously indicated in Section 3.1, closure of existing CCR surface impoundments must be completed within five years of initiating closure in accordance with 40 CFR 257.102(f)(1)(ii). A deadline extension can be obtained as outlined in 40 CFR 257.102(f)(2) if completion of closure is not feasible within five years (e.g., shortened construction season, significant weather delays during construction, time required for dewatering CCR, delays due to state or local permitting or approval, etc.). An extension must include a narrative description that demonstrates closure is not feasible in the required timeframe in accordance with 40 CFR 257.102(f)(2)(i, iii). The closure deadline for the CCR units at the JBSGS may be extended up to two years per 40 CFR 257.102(f)(2)(ii)(A).



4.0 AMENDMENTS

GHBLP may amend the closure plan in the future as provided for in 40 CFR 257.102(b)(3). A record of all amendments to the plan will be tracked in the log below.

Closure Plan Amendments Log

Date	Name and Title of Reviewer(s)	Amendment(s) Made
April 2017	Paul Cederquist, Environmental Compliance Specialist	Initial Closure Plan Issued
December 2017	Paul Cederquist, Environmental Compliance Specialist	Revision to include closure plan for Units 1 and 2 Inactive Ash Ponds



5.0 REFERENCES

Black & Veatch. 1983. City of Grand Haven, Michigan Board of Light and Power J.B. Sims Station, Unit 3 Ash Pond Construction Report.

Environmental Resource Management Michigan Inc. 2016. Coal Ash Delineation Sampling Results, Grand Haven Board of Light and Power, Grand Haven, Michigan.

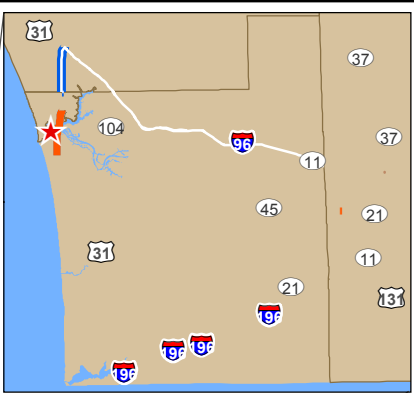
"Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," Title 40 – Protection of the Environment Part 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.

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USEPA. 2012. DRAFT - Coal Combustion Residue Impoundment, Round 12 - Dam Assessment Report, JB Sims Power Plant (Site 04), East and West Bottom Ash Ponds, Grand Haven Board of Power and Light, Grand Haven, Michigan, Prepared for: United States Environmental Protection Agency Office of Resource Conservation and Recovery, Prepared by: Dewberry & Davis, LLC Fairfax, Virginia, Dated October 2012.

USEPA (Environmental Protection Agency). 2015. Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. 40 CFR Part 257. Effective Date October 19, 2015.



CLIENT			
GRAND HAVEN BOARD OF LIGHT AND POWER			
HARBOR ISLAND DRIVE			
GRAND HAVEN, MI			
PROJECT			
CCR RULE COMPLIANCE			
TITLE			
SITE LOCATION MAP			
CONSULTANT		YYYY-MM-DD	2017-03-20
		PREPARED	JJS
		DESIGN	JJS
		REVIEW	RS
		APPROVED	TDJ
PROJECT No.		CONTROL	FIGURE
1775461		1775461A000-GIS.mxd	1
		Rev.	
		0	



UNIT 3 WEST
BOTTOM ASH
POND

UNIT 3 EAST
BOTTOM ASH
POND

UNIT 1 ASH POND

UNIT 2 ASH POND

J.B.SIMS
GENERATING
STATION

GRAND
RIVER

NPDES OUTFALL
LOCATION



REFERENCE(S)

Service Layer Credits: Source: ESRI, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

CLIENT

GRAND HAVEN BOARD OF LIGHT AND POWER
HARBOR ISLAND DRIVE
GRAND HAVEN, MI

CONSULTANT



YYYY-MM-DD 2017-03-20

DESIGNED JJS

PREPARED JJS

REVIEWED RS

APPROVED TDJ

PROJECT

CCR RULE COMPLIANCE

TITLE

OVERALL SITE PLAN

PROJECT NO.
1775461

CONTROL

REV.

FIGURE
2

Last Edited By: jcdmuer Date: 2017-03-20 Time: 11:03:07 AM | Printed By: jcdmuer Date: 2017-03-20 Time: 11:03:18 AM
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