NOTE

Subject: EPA Comments on "Draft Coal Combustion Residue Impoundment: Round 12 – Dam Assessment Report – JB Sims Power Plant"

To: File

Date: July 01, 2013

1. On page 1-1, section 1.1.4 "Conclusions Regarding the Description of the Management Unit(s)," please identify which unit is being discussed here.
2. On page 1-2, section 1.1.8 "Classification Regarding Suitability for Continued Safe and Reliable Operations," please refrain from rating the "facility" – each impoundment is to be rated independently. In addition, add a period at the end of the paragraph.
3. On pages 1-2 and 1-3, please include a statement that indicates unless otherwise stated, each recommendation refers to both management units (if this is indeed the case), otherwise, please be specific per recommendation as to which unit it is referring.
4. On page 1-3, section 1.3.2 "Acknowledgement and Signature," please add an "s" at the end of "unit".
5. In section 2.1 "Location and General Description," the report states in the second paragraph on multiple occasions that the ponds are 'treatment' units and that CCR material is being 'treated.' If this is correct, the treatment process should be elaborated. It is typical, as seems to be the case from further description in the draft report, that the units are simply 'storage' or 'disposal' units.
6. In section 2.1 "Location and General Description," the report notes that the East and West Bottom Ash Pond are used exclusively to treat bottom ash from the power plant. However, later in the report in Sections 2.2.3 and 2.2.4, it is noted that Boiler Slag and FGD Gypsum ("synthetic gypsum") are co-managed in the ponds. This discrepancy must be reconciled.
7. In section 2.1 "Location and General Description," the third paragraph should refer to the additional units at the facility as "incised," not "incisions."
8. The resolution of Figure 2.1.b "Site Map" is poor. Should be enhanced if possible.
9. In section 2.2.2 "Bottom Ash," if the frequency of dredging of bottom ash from the ponds is known, it should be stated. If the frequency is irregular or not known, as much should be stated.
10. In section 2.2.3 "Boiler Slag," if the boiler slag is co-managed with bottom ash, it should be elaborated that the boiler slag is also sluiced to the ponds.
11. Section 2.3 "SIZE AND HAZARD CLASSIFICATION," please indicate whether the state or utility have given these units a hazard potential classification.
12. In section 2.5.1 "Earth Embankment," the slope measurements should be in the following format: 3H:1V or 2H:1V.
13. In section 4.1.1 "Original Construction," if the original construction material is known, please address in the report. If the material is not known, state as much.
14. In Section 4.1.3 "Significant Repairs…," the report addresses the process of excavating and incidental removal of the clay liner by excavator. Previously, in Section 1.1.1 "Conclusions…," the report notes that disturbance of the clay liner may be a cause for concern. Will this affect the

structural stability of the unit? That concern, if there is any, should be elaborated in Section 4.1.3. If the replacement of the liner by contractor alleviates any concern with liner disruption, as is apparent in section 4.1.3, then the "concern" statement in 1.1.1 should be removed.

15. On page 5-1, section 5.1, third paragraph. Reword the third paragraph to clarify that there are two units, not "the dam".
16. The characterization of the units in the various sub sections of Section 5.2 and 5.3 lacks the necessary details to substantiate the terms used. Please add this level of detail in the text portions: Section 5.2.1, the crest is said to be in fair condition, however, there is no rationale for this characterization.

    Section 5.2.3, the outside slopes are said to be in fair condition, however, there is no rationale for this characterization. Photo 5.2.3c does indicate presence of bottom ash on the outside slope – this ought to be stated in the text for section 5.2.3 along with the implications that this presents.

    Section 5.3.1, the crest is said to be in fair condition, however, there is no rationale for this characterization.

    Sections 5.3.2 and 5.3.3 inside and outside slopes appeared in fair condition.
17. In section 6.1.3 "Spillway Rating," the information previously provided in the draft report should be made available regarding the design of a spillway in submitted documents, *including* the lack of installation of the spillway at the unit *and any concerns borne from this absence*. Additionally, any information or lack thereof as to the basis for this discrepancy should be noted in section 6.1.3.
18. In section 6.0 "Hydrologic/Hydraulic Safety," any informal observations made by Dewberry should be noted, such as contributory area, outfall information, design flood parameters as required by state based on Hazard Potential Classification, etc.
19. Section 7.1.5 indicates that no liquefaction analysis was provided, there is no recommendation to conduct such analysis in section 1.2. In section 1.2.1 "Recommendations…" the report should note the recommendation that liquefaction potential analysis be performed if required subsequently by a qualitative analysis of soil material.
20. In section 7.2 "Adequacy…," 'docation' is not an English word.
21. Section 7.3 "ASSESSMENT OF STRUCTRUAL STABILITY," indicates that the structural stability of the dam appears to be poor based on site visit and lack of supporting technical information. Is there one dam or two? Please provide substantiation for the Poor rating indicative from the "site visit" – what specifically was seen during the site visit that would classify the structural stability as poor (Additionally, this POOR rating is assessed based on additional factors besides lack of analysis, i.e., liner disruption by excavator, unexplained ponded water at toe of embankment.)? In addition, section 1.1.1 "Conclusions Regarding the Structural Soundness of the Management Unit(s)," states: "The dikes surrounding the East Pond appear to be structurally sound based upon visual inspection." This appears to contradict the assessment in section 7.3.
22. Section 8.3.1 contradicts the statement in section 8.1 – inadequate vs. adequate.
23. In Appendix B, "ADDITIONAL INSPECTION QUESTIONS," for both units, please correct typo in response to second question, replace "as" with "has".

24. On January 13, 2013, Mr. Paul Cederquist of Grand Haven Board of Light & Power alerted EPA that they are currently obtaining quotes to do a complete stability analyses study on each of the ash ponds assessed.

Board of Light and Power
1700 Eaton Drive
Grand Haven, Michigan 49417
616/846-9200
Fax 616/846-3114

General Manager
Annette S. Allen

December 6, 2013

Mr. Stephen Hoffman
US Environmental Protection Agency (5304P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Mr. Hoffman,

This letter is in response to the October 2012 Draft Coal Combustion Residue Impoundment Round 12 – Dam Assessment Report, for JB Sims Power Plant (Site 04), produced by EPA's contractor Dewberry & Davis LLC ("Dewberry"). Grand Haven Board of Light & Power (GHBLP) appreciates the opportunity to comment on the draft report. The GHBLP is concerned that the report does not present an accurate depiction of the current status of the Sims plant ponds, and hopes that this letter and the additional documents that accompany it will assist you in having corrections made prior to finalizing the report.

Ponded Water

In the draft report, Dewberry repeatedly expresses concern about visible ponded water on the JB Sims site and adjacent to the West Pond. While the contractors were on site, we attempted to make clear that this ponded water was the result of recent rain fall, which due to the clay soil on the site does not infiltrate, but ponds and evaporates slowly – often over the course of many days. The ponding issue is discussed in several places in the draft report, and appears to be largely the basis for the draft report's conclusion that the condition of the ponds are "poor." See, Section 5.1, which concludes that, "The overall assessment of the dam was that it was in poor condition due to unexplained ponding downstream of the West Pond embankments." (Emphasis added). Dewberry's comment that the ponding was "unexplained" is baffling and internally inconsistent, given that the caption on Photo 5.3.3e, p. 5-13 of the draft report, notes that "plant personnel said that this [ponding along the toe of West Pond at west and southwest locations] is from rain and a surface that is not very permeable." It is therefore difficult to see how the report can state that the ponding was "unexplained."

Another inconsistency related to the ponding issue is the report's statement that "there were no recent significant rain events prior to Dewberry's site visit." See, p. 5-13 of the draft report. It is unclear what the basis for this statement is, and it is unsupported by the experience of the staff on the site, who report significant recent rainfall. The site visit was conducted August 22, 2012. Official precipitation records for the area show that 1.44 inches of rain had fallen since the beginning of the month, with 1.39 of it in the two weeks preceding the site visit. Daily rainfall records for those days are as follows:

August 16	0.32 inches
August 15	Trace
August 13	0.12 inches
August 10	0.70 inches
August 9	0.25 inches
August 8	Trace

(Data from wunderground.com.) As site personnel explained to Dewberry during their visit, the amount of clay that is in the soils of the area in question results in a considerable amount of storm water ponding. This ponded storm water remains for days following a rain event until it finally evaporates. The presence of ponded storm water on the site was therefore neither unexplained, nor a sign of any structural weakness or defect in the pond embankments.

The pond area undergoes regular maintenance efforts, and since the site visit the plant has re-sloped and repaved the roadway to the south of the ponds as part of its regular maintenance, in part to redirect storm water. These efforts appear to have been successful. Since the paving modifications, there has been no evidence of storm water ponding in the area in question.

The following pictures were taken on November 1, 2013, one day after receiving 1.07 inches of rain. As evident in the pictures, the upgrading and sloping efforts have considerably improved the ponding of storm water that was previously observed in the middle of the driveway west of the ponds.

We feel that the explanation that was clearly provided to Dewberry during their site visit, together with this additional information we have provided to you about re-grading and paving efforts, should eliminate any concerns that the ponding of storm water on the site indicates any weakness or defect in the pond embankments. On the contrary, the presence of ponded storm water indicates the impervious nature of the clay on the site, and should provide assurance that the ponds are well sealed.

Spillway

Another concern raised by Dewberry is the current lack of a spillway for the East Pond that is identified on original construction documents. That spillway was originally constructed, but later removed when it was determined that it posed a risk to the utility substation and was no longer needed due to the spillway between the East and West Ponds and the manner in which these ponds are operated.

The ponds are not ordinarily used simultaneously, but instead one is drained and cleaned while the other is being filled. Thus, if a large rain event were to occur that resulted in a potential for overflow of the active pond, the spillway between the ponds would be used to reduce the level of that pond by allowing water to pass into the other, empty pond. In the extremely unlikely event that this effort proved insufficient to handle the volume of water, the ponds contain pumps and discharge pipes, and the plant's NPDES permit allows discharge from the plant into the river at a rate of 0.4 MGD to control the water level. This would, on an emergency basis, allow the plant to relieve pressure on the ponds if that should become necessary.

However, it is worth noting as the draft report itself observes, that there have never been any spills, unpermitted releases, or other performance related problems with the ponds or embankments over the last 10 years. See Section 3.3 of the draft report. In fact, to my knowledge there has never been a spill, unpermitted release, or other performance problem with either of the ponds in the entire history of plant operations. This despite the West Michigan lakeshore area having had two 100-year storm events in the last three years. See, http://www.mlive.com/news/grand-rapids/index.ssf/2009/06/100_year_rainstorm_floods_mich.html. We would further note that a designated facility staff person walks the ponds daily. That surveillance, coupled with the 24/7 surveillance cameras discussed below which can be used to view the ponds closely during heavy rain events, enables the plant to monitor and respond to water level changes in a timely fashion. We therefore strongly feel that concerns in the report about the removal of the original spillway are exaggerated, and provide no basis for lowering the rating of the ponds with respect to safety or stability.

Site Security and Monitoring Measures

Dewberry's draft report expresses concern about the adequacy of the surveillance and monitoring program at the site. See Section 9.0. While at the time of Dewberry's visit GHBLP lacked a written surveillance procedure, there were already in place equipment and measures to ensure adequate surveillance of the site and monitoring of the ponds. At least one individual per shift is required to physically inspect the ponds seven days per week. While at the time of the Dewberry visit the facility did not have a written "checklist" for the individual doing the inspection, one is now in process of being drafted and will soon be implemented. Furthermore, the Dewberry report overlooks the presence and use made of the facility's surveillance camera system. This system provides control room operators the ability to monitor the ponds from the control room of the plant on a 24-hour-per-day, 7-day-per-week basis. Lighting around the ponds has been specifically designed for observation at night and the security cameras have the capability to view even in low-light areas.

Dewberry's draft report notes that there is no instrumentation present at the ponds for monitoring water levels. The plant has, in the past, had remote monitoring instrumentation, but found that these instruments were frequently inaccurate and required excessive maintenance. In the end, the above-described regular physical inspections of the ponds, together with the improved lighting and use of cameras, were found to provide better information on the state of the ponds and the water levels. The fact that the facility's ponds since their inception have had a spotless record of operation, as noted above and in the Dewberry draft report, again suggests that Dewberry's concerns about the surveillance and monitoring program are misplaced.

Additional Documentation and Maintenance

Dewberry expressed concerns about a lack of written operational and maintenance procedures. See, *e.g.*, Section 8.0 of the draft report. GHBLP acknowledges these concerns, while at the same time noting that this is a problem with paperwork and not with actual operations. To address these concerns, GHBLP has already begun to implement written procedures that capture the operational and maintenance practices undertaken at the plant. Certain of these procedures that have already been codified are included in the supplementary documents attached to these comments, including pond inspection forms. Additional documents are being developed.

It is worth noting that even as this documentation is being developed, the plant's routine maintenance efforts continue. As an example, as part of the routine and continuing maintenance efforts at the plant, since the August 22, 2012 assessment GHBLP has drained, inspected and dressed various spots in the ponds with clay to ensure that adequate clay thickness is maintained.

In fact, the facility has on record expenditures of $24,353 for pond upgrades (primarily additional clay) over the period from 1999 to 2013. It is also worth noting that the exterminator contract that the plant maintains for pest control involves rodent control on the berms of the ponds.

If Dewberry or other representatives of EPA would like to return to our facility in order to see the features discussed in this response, we would welcome the opportunity to show them to you. We believe that open communication is essential to the production of a fair and accurate report. To that end, feel free to contact me if you would like to schedule a visit, or if you would like further information with respect to any of the topics in our comments. Again, the GHBLP appreciates the opportunity to comment on this report prior to it being finalized.

Sincerely,

Paul Cederquist

Paul Cederquist
Environmental Compliance Manager
Grand Haven Board of Light & Power
616 607 1292
pcederquist@ghblp.org

cc: Tim Lundgren, Esq., Varnum Law Firm
Annette Allen , GHBLP
Jeff Chandler, GHBLP

6656429_1.docx

Enclosures

J.B. Sims Ash Pond Inspection Form DAILY

Date:

Inspector(s):

Approximate Time of Inspection:

East Pond

	Yes	No	Acceptable	Needs Improvement
Adequate pool elevation?				
Pond currently in use?				
Is embankment currently under construction?				
Trees growing on embankment?				
Cracks or scrapes on crest?				
Cracks or scrapes on slope?				
Sloughing or bulging on slopes?				
Major erosion or slope deterioration?				
Evidence of burrowing animals				

West Pond

	Yes	No	Acceptable	Needs Improvement
Adequate pool elevation?				
Pond currently in use?				
Is embankment currently under construction?				
Trees growing on embankment?				
Cracks or scrapes on crest?				
Cracks or scrapes on slope?				
Sloughing or bulging on slopes?				
Major erosion or slope deterioration?				
Evidence of burrowing animals				

Additional Comments:

J.B. Sims Ash Pond Inspection Form

Monthly

Note: Inspection to be conducted by a manager or management appointed personnel

	Yes	No	Date
Evidence of erosion in spillways			
Date of Repair if needed:			
Evidience of erosion on pond walls			
Date of Repair if needed:			

Additional Comments:

From: Paul Cederquist <PCederquist@ghblp.org>
Sent: Friday, December 13, 2013 3:27 PM
To: Hoffman, Stephen
Cc: Annette Allen; Jeff Chandler; Lundgren, Timothy J.
Subject: FW: GHBLP Ash Pond Documents

Mr. Hoffman,

Attached is the ash pond construction file I have recently been able to acquire and would appreciate if you could add it to the response letter I emailed last Friday and the hard copy that arrived via FedEx to you on the following Monday, the 9th of December. Grand Haven Board of Light & Power has been working diligently to obtain as much information as possible to help educate you and your office hopefully providing a better understanding of the J.B. Sims site. If you have any questions please do not hesitate to ask.

Paul Cederquist
Environmental Compliance Manager
Grand Haven Board of Light & Power
616 607 1292

CITY OF GRAND HAVEN, MICHIGAN
BOARD OF LIGHT AND POWER
J. B. SIMS STATION, UNIT 3

ASH POND CONSTRUCTION

FILE 7728.71.0200

Black & Veatch
Engineers-Architects

BLACK & VEATCH
OF MICHIGAN
CONSULTING ENGINEERS

TEL. (913) 967-2000
TELEX 42-6263

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS: P.O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

City of Grand Haven, Michigan
Board of Light and Power
J. B. Sims Station, Unit 3

August 19, 1983
File: 7728.71.0200.01
Ref.: Ash Pond Construction

Grand Haven Board of Light and Power
650 Harbor Avenue
Grand Haven, Michigan 49417

Attention: Mr. Jack J. Buckner
General Manager

Gentlemen:

This report is a summary of design and construction activities associated with the bottom ash pond for the J. B. Sims Unit 3 project. The report provides a detailed historical account of design and construction work on the pond, and includes a cost summary for work related to construction improvements.

The Board should be aware of the improved pond's flexibility of use and operation. This pond system is consistent with the overall high-quality design and construction of the total project. With the pond improvements, Unit 3 should provide economical and reliable power to the Board's customers for many years to come.

The cost associated with the pond improvement was adequately covered by the overall project contingency fund. This fund was specifically established to account for such events, which are sometimes encountered on a project of this magnitude and complexity. This event did not cause the overall project to go over budget. The project was constructed for the amount budgeted at the initiation of engineering and included in the bond prospectus.

Black & Veatch is confident that the improved pond will provide long-term reliable and efficient service. This confidence is reinforced by our knowledge of the extra engineering that went into the design and construction management for the improvement.

We will be available for further discussion if the Board should feel it is appropriate.

Very truly yours,

BLACK & VEATCH

Thomas E. Kalin
Project Manager

elw
Enclosure

TABLE OF CONTENTS

LIST OF APPENDICES

CITY OF GRAND HAVEN, MICHIGAN
BOARD OF LIGHT AND POWER
J. B. SIMS STATION, UNIT 3

ASH POND CONSTRUCTION

1.0 INTRODUCTION

The design of the J. B. Sims Unit 3 project includes a two-cell bottom ash pond. The pond dikes were originally constructed with a sandy material and the pond bottom and interior slopes of the dikes were covered with 1 foot of compacted clay to seal the pond and control seepage. When the pond was initially filled with water, piping was noted around the ash water reclaim structure. Repair of the piping problem proved to be less than satisfactory. Subsequently, it was noted that the pond was leaking along the perimeter.

The piping and leakage was caused by differential settlement. The reclaim structure is supported on piles, and settlement of the pond interior dike and bottom caused a separation of the clay lining which resulted in piping between the pond cells. Leakage to the outside of the dikes was caused by differential settlement between the pond bottom and dikes.

Several different design alternatives for pond repair and modification were evaluated in detail. It was concluded that the pond should be rebuilt with dikes constructed totally of compacted clay with a 3-foot thick clay bottom. Drainage piping was modified to accommodate anticipated settlements. The new construction started on April 11, 1983. The ash pond was placed in service on July 25, 1983.

The following sections of this report contain a summary of design criteria and modifications, weekly construction progress reports, and construction quality assurance. Appendix A is a System Description for the Bottom Ash Handling and Storage System which described pond operation. Appendix B contains construction photographs for pond modification and repair. Appendix C is a detailed cost report.

2.0 DESIGN IMPROVEMENTS AND MODIFICATIONS

This section presents a description of the design criteria improvements and modifications to the Bottom Ash Handling and Storage System for Unit 3 at the J. B. Sims Station.

2.1 DESIGN CRITERIA

The design criteria for the bottom ash storage ponds were based on the results of the review of the previous pond experience, geotechnical investigations, analyses, and operational requirements.

(1) Operating Level. Maximum pond operating level of Elevation 592.0 feet.

(2) Seepage Control. Seepage control measures shall withstand the anticipated settlements across the pond area. The seepage control measures shall withstand the anticipated differential settlements between the embankments, piping, and pile-supported structures.

(3) Reclaim Operations. The pond shall be designed for ash reclaim operations. The design shall consider access for mobile reclaim equipment and loading operations.

(4) Piping. Piping shall withstand settlement across the pond area and differential settlement between the embankments and pile-supported structures.

2.2 DETAILED DESIGN

2.2.1 Seepage Control

The primary concern of the seepage control system for the storage pond is maintaining the integrity of the system during settlement of the ponds. The original 1-foot thick clay liner system did not withstand the differential settlements resulting in cracks through the liner and separation of the liner at structure interfaces. The resulting leakage led to piping of the embankment materials along the ASA-B drain pipe, under the reclaim structure, and through the interior dike.

The seepage control methods evaluated consisted of the following.

(1) Stabilization of the pond foundation to minimize settlement of the pond area and reconstructing the clay liner.

(2) Reduction in the pond load by modifying the Bottom Ash Storage and Handling System to reduce the anticipated settlements.

(3) Perimeter slurry wall cutoff.

(4) Synthetic liner.

(5) Clay dikes with clay basin liner.

Considerable costs would be incurred to eliminate the anticipated settlements. Additional construction time would be required to eliminate this settlement prior to reconstruction of the pond. The limited construction schedule and extra costs of stabilization of the foundation in addition to the costs of reconstructing the pond eliminated this option from further consideration.

The option of reducing the pond load would reduce the operational flexibility and ash storage capacity of the facility. The limited size of the ponds eliminated this option from further consideration.

The evaluations of the options for sealing the ponds concluded that the clay dike and basin liner option would best fulfill the operational, schedule, and design constraints. The main advantages of a clay dike section are the ability to maintain seepage control integrity through foundation settlement, resistance to piping failures, and the elimination of operational constraints on the storage system. Special seepage control measures were included at interfaces between the clay dikes, liner, and structures as follows.

(1) The basin liner thickness was increased to 3 feet to provide assurance against cracking of the liner due to general pond settlement.

(2) A cutoff wall was constructed around the reclaim structure to prevent a recurrence of piping under the structure due to separation of the subgrade and the base of the pile-supported reclaim structure. Existing voids under the structure were grouted to minimize the load on the cutoff wall.

(3) A synthetic liner was attached to the reclaim structure and extended into the basin clay liner. The synthetic liner was designed such that the integrity of the seal between the reclaim structure and basin liner would be maintained during differential settlements.

(4) Bentonite was packed into gaps between the reclaim structure and the clay embankments. The high swelling characteristic of this material will help prevent seepage immediately adjacent to the reclaim structure wall.

(5) The ASA-A and ASA-B drain lines were encased in clay for a length of 30 feet to prevent a recurrence of the piping problem along these lines at the reclaim structure.

2.2.2 Piping

The piping design was modified to eliminate the following problems associated with the original design.

(1) Shearing of the ASA-A and ASA-B drain lines due to differential movements between the reclaim structure and dike.

(2) Erosion of the dike at pipe discharges.

(3) Improper drainage of the ASA-B drain line to the existing ash pond.

The original design of the drain lines consisted of fiberglass pipe, rigidly encased in the reclaim structure walls embedded at the base of the embankments. The moment and shear loads placed on these drain lines due to the differential settlements at the face of the reclaim structure resulted in the failure of both lines. The pond design modifications eliminate this problem as follows.

(1) Flexible high-density polyethylene pipe (HDPE) has been substituted for the section of the fiberglass piping of the ASA-A and ASA-B drain lines at the reclaim structure. The pipe material is sufficiently flexible to accommodate the anticipated deflection without failure of the pipe.

(2) The shear load on the HDPE pipes at the structure wall has been minimized or eliminated by supporting the soil load on an oversized heavy steel culvert, providing sufficient room for movement without loading the HDPE pipe. The culvert has been filled with a bentonite slurry to prevent piping of material into the culvert.

The potential for erosion of the dike embankment from pipe discharges and failure of the seepage control measures have been reduced due to the following design modifications.

(1) The interior dike is constructed entirely of clay. Therefore, surface erosion will not result in the seepage problem associated with a relatively thin surface liner.

(2) Clay is less susceptible to erosion than sand.

(3) Two discharge lines with large discharge rates, the ash water makeup and air separator (fly ash exhauster), have been relocated to discharge directly into the ash water reclaim structure.

During construction of the ASA-B drain line, it was noted that this line was not draining to the existing ash pond. The drainage system was modified so that the intended drainage from the new bottom ash storage pond is routed to the existing ash pond.

2.2.3 Reclaim Operations

The pond layout was modified to improve the ash reclaim operations. The ash truck loading operation was somewhat limited by access to the ponds, restricted by piping in the area of the reclaim operation, and required longer hauls by the front-end loader. Ash truck hauling operations were required to pass through the main plant area. Loading operations were located on the south side of the ponds over and between the piping supporting the pond operation with a high potential for damage.

The efficiency and safety of the reclaim operations was improved by the new pond layout. The reclaim operations were relocated to the north side of the pond, removing its impact on the main plant areas. The reclaim operations are not restricted by pond piping, minimizing the possibility of damage and interruption of normal pond operations.

The operation of the pond for reclaim operations has been improved by increasing the width of the north dike crest, ease of access to the dike, and construction of a loading platform for trucks. The entire north dike crest is reserved entirely for reclaim operations. The loading platform permits mobile equipment to load haul trucks from the dike crest and limits ash spillage outside the pond limits. The width of the dike crests does not restrict the maneuverability of the reclaim equipment. Gravel surfacing was provided on all roadways, access ramps, and the interior slope of the north dike in order to provide a stable work surface for the mobile equipment.

2.2.4 Overflow Spillways

The modifications to the pond include concrete-lined overflow spillways to channel any excess water to the existing ash pond in a controlled manner to prevent erosion failure of the dikes. The original design did not provide adequately for controlling excess flow into the ponds. Overfilling of the ponds due to failure of the automatic level control could result in overtopping of the dikes.

2.3 MODIFICATION SUMMARY DRAWING REFERENCE

The following lists drawings summarizing the modifications.

Category	Item	Drawing
Seepage Control	Dike Cross Section	Drawing S1005 Section 3
	Reclaim Structure Cutoff Wall	Drawing S1005 Section 8 Detail A
		Drawing S2015 Section 1 Sections 2 and 2A
	Synthetic Liner--Clay Joint	Drawing S1005 Section 8 Detail A
		Drawing 2015 Section 1 Sections 2 and 2A
	HDPE Pipe Encasement	Drawing S1005 Section 10
Piping	ASA-A Drain Settlement Detail	Drawing A2004 Section 6 Detail A
	ASA-B Drain Settlement Drawing Detail	A2004 Section 6 Detail C
	ASA-G, ASA-F Pipe Relocation	Drawing A2002 Drawing A2004 Detail D Section 7 Detail E Section 8
	ASA-B Drainage	Drawing S1004

Category	Item	Drawing
Reclaim Operation	Layout	Drawing S1004
	Retaining Wall	Drawing S1005 Section 5
	Access Ramp	Drawing S1005 Section 4 Section 9
Overflow Spillway	Layout	Drawing S1004
	Center Dike	Drawing S1005 Section 10
	Exterior Dike	Drawing S1005 Section 6
	Cross Sections	Drawing S1005 Section 7

3.0 WEEKLY CONSTRUCTION PROGRESS

This section contains construction progress information for the weekly periods of April 11 through July 19, 1983.

<u>Monday, April 11 through Friday, April 15</u>

Weather Delays		None.
Progress		
	Earthwork	Neutralized pond wastes and began dewatering. Began removing center dike.
	Structures	None.
	Piping	Removed heat trace, insulation and electrical conduit at discharge pipes. Removed valves at discharge points and bottom ash line.
Problems		Scrubber wastes had to be pumped into ponds due to scrubber thickener problems. Thus, the pond wastes had to be neutralized and pumped out again delaying the pond repair.

<u>Monday, April 18 through Friday, April 22</u>

Weather Delays		None.
Progress		
	Earthwork	Dewatered ponds. Continued removing sand dikes.
	Structures	Removed splash pad at the south end of the central dike.
	Piping	Installed temporary piping to Units 1 and 2 pond. Excavated at the point of the Abco pipe leak.
Problems		None.

Monday, April 25 through Friday, April 29

Weather Delays	None.
Progress	
Earthwork	Continued excavation of pond dikes and basin.
Structures	None.
Piping	Underground temporary ash lines were placed into service.
Problems	Underground Abco pipe pulled apart which shut down ash system. Hertel repaired break.

Monday, May 2 through Friday, May 6

Weather Delays	None.
Progress	
Earthwork	Completed the major earthwork removal of the ponds. Clay placement to begin on Monday, May 9.
Structures	None.
Piping	None.
Problems	None.

Monday, May 9 through Saturday, May 14

Weather Delays	Saturday, May 14, rainy weather hampered and eventually shut down construction operations for the day.
Progress	
Earthwork	Completed excavation of localized high spots in the pond bottoms.
	Began constructing compacted clay liner over the base of the ponds.
Structures	Installed the sheet steel cutoff wall around the ash water reclaim structure.
	Began hand compaction of clay around the ash water reclaim structure.
	Began installation of the Hypalon membrane around the ash water reclaim structure.
Piping	None.
Problems	Problems associated with hand compaction were first observed. Trouble in achieving specified densities were attributed to high clay moisture contents.
	Rain on Saturday, May 14, hampered and eventually shut down construction operations for the day.

Monday, May 16 through Friday, May 20

Weather Delays	Rain and the resulting wet clay conditions prevented any clay work to take place Thursday, May 19, and Friday, May 20.
Progress	
Earthwork	Continued placing clay over the base of the ponds.
	Started placing clay along the east and south dikes.
Structures	Completed Hypalon attachment to the structure.
	Continued backfill and hand compaction of clay around the structure to the approximate elevation of 583.5 feet.
	Drilled grout hole through the concrete slab of the ash water reclaim structure in preparation for pressure grouting.
Piping	Raised the existing piping at the south end of the pond (ASA-C, DRA-B, CCCA, ASA-G, and ASA-F) to plan grade. Piping had settled since it was originally installed (approximately 11.5 inches).
	Hand compacted sand under and around the raised piping.
Problems	Cool temperatures caused difficulty in seaming the Hypalon. Solved by the application of artificial heat.
	Mud was witnessed pumping through 3 feet of clay. The area was excavated and found to be a localized problem and backfilled.
	Rain prevented any clay work to be performed on Thursday, May 19, and Friday, May 20.

Monday, May 23 through Friday, May 27

Weather Delays	Due to rainy weather and the resulting wet conditions, no clay placement took place the week of May 23 through May 27.
Progress	
Earthwork	None.
Structures	Installed additional grout pipes and pressure grouted beneath the ash water reclaim structure. Completed the hypalon membrane seaming.
Piping	None.
Problems	Inclement, rainy weather shut down clay placement for the week of May 23 through May 27.

Tuesday, May 31 through Friday, June 3

Weather Delays	Rain prevented clay work to be continued on the following dates: Tuesday, May 31; Wednesday, June 1; Thursday a.m., June 2; and Friday, June 3.
Progress	
Earthwork	Continued building west and south dikes. Compacted clay on the pond floor to an approximate elevation of 585 feet.
Structures	Compacted clay around the ash water reclaim structure. Lapped Hypalon membrane to allow for settlement and compacted clay over it.
Piping	None.
Problems	Rain throughout the week prevented clay work to be done on Tuesday, May 31; Wednesday, June 1; Thursday (a.m.), June 2; and Friday, June 3.

Monday, June 6 through Saturday, June 11

Weather Delays	None.
Progress	
Earthwork	Placed and compacted clay along the west, east, and south dikes.
Structures	Continued hand compaction around the reclaim structure.
Piping	Excavated and began installation of the 12-inch diameter ASA-A Abco pipe and hand compacted backfill behind the pipe installation.
	Enlarged openings in the ash water reclaim structure to accommodate the polyethylene pipe flanges.
Problems	Compaction problems were incurred and attributed to the high water content of the clay borrow. Varying clay moistures at the borrow site presented occasional problems in obtaining compactable clay.

Monday, June 13 through Friday, June 17

Weather Delays	None.
Progress	
Earthwork	Continued placing clay along the east, west, and south dike.
Structures	Formed in the stop log walls on the east and west ends of the ash water reclaim structure.
	Layed out, excavated, and prepared the subbase for the bin retaining wall.
Piping	Excavated and installed the ASA-B, 6-inch diameter polyethylene pipe from the north side of the structure.
	Grouted in place the 6-inch diameter and 12-inch diameter polyethylene pipes and placed culverts around pipes.
	Hand compaction of clay around the polyethylene pipes.
	Clay was compacted in place along the center dike. Hand compaction techniques being used above the piping and near the structure.
	Mixed the bentonite slurry and allowed to hydrate through the weekend.
Problems	Some compaction problems resulting from occasional high moisture clay.

Monday, June 20 through Saturday, June 25

Weather Delays	None.
Progress	
Earthwork	Brought the south, east, and west dikes to grade (594 feet) and dressed the slopes.
	Brought the center dike to an elevation of 584 feet.
	Began construction of the north dike.
Structures	Began assembly and installation of the bin retaining wall.
	Continued hand compaction of clay around the ash water reclaim structure.
Piping	Placed the bentonite slurry and hand compacted clay around the culverts.
	Excavated for and began the installation of the 6-inch diameter ASA-G and the 10-inch ASA-F pipes.
	Excavated for the heat trace conduit and the water level probe conduit.
Problems	Some compaction problems resulting from high moisture clay.

Monday, June 27 through Friday, July 1

Weather Delays	Monday, June 27, rain hampered clay work and conduit installation.
Progress	
Earthwork	Continued building the north dike.
	Continued construction of the access ramp.
Structures	Finished assembly of the bin retaining wall, installed the filter fabric, and began backfilling with granular material.
Piping	Began installation of 1-1/2-inch diameter and 2-inch diameter electrical conduit through center dike trench.
	Insulated 10-inch diameter ASA-F steel pipe.
	Backfilled center dike pipe trench using hand-compaction techniques.
	Continued welding the 10-inch steel pipe.
Problems	None.

Tuesday, July 5 through Friday, July 8

Weather Delays	None.
Progress	
Earthwork	Continued construction of the north dike and access ramp.
Structures	Completed backfill of the bin retaining wall.
	Formed in the thrust blocks for the 12-inch diameter ASA-A pipes and the 6-inch Bondstrand drain line.
	Layed out and began forming the overflow weir on the east dike.
Piping	Continued installation of the 6-inch diameter bottom ash line and support pedestals.
	Installed the timber pipe supports near the structure and the 6-inch diameter ASA-G and 10-inch diameter ASA-F piping over the supports and into the ash water reclaim structure. Timber supports were backfilled.
Problems	None.

Monday, July 11 through Friday, July 15

Weather Delays	None.
Progress	
Earthwork	Shaped the slopes of the north dike.
	Cross sections were taken by surveyor to obtain final clay volume.
Structures	Excavated, formed, and poured the overflow weirs on the east and center dike. Also, the splash pad at the south end of the center dike.
	Installed settlement monitoring points.
Piping	Excavated and installed the remaining 6-inch diameter Bondstrand ASA-B drain line.
	Poured thrust blocks for the ASA-A and ASA-B pipe.
Problems	None.

Monday, July 18 through Tuesday, July 19

Weather Delays	None.
Progress	
Earthwork	Began placing topsoil on the exterior slopes of the pond dikes.
	Placed road gravel on the access ramp and the working area atop the north dike.
	Moistened and rolled the clay bottom of the ponds to seal the shrinkage cracks.
Structures	Installed screens and stop log gates.
	Compacted clay around overflow weirs after stripping the forms.
	Poured center section and the west slope of the center dike overflow weir.
Piping	Installed heat trace and insulation around the piping at the location of the center dike overflow weir and backfilled.
Problems	None.

4.0 CONSTRUCTION QUALITY ASSURANCE

Construction inspection was maintained full time during the majority of the reconstruction of the ash ponds to assure the proper implementation of the design improvements. The scope of the quality assurance work is detailed below.

4.1 EARTHWORK

Proper compaction necessary to prevent seepage, piping, and to maintain the structural integrity of the ponds during the anticipated settlements was tightly controlled throughout the job. The specified compaction requirement for the clay fill was 90 per cent of the maximum density as determined by ASTM D698. Soils inspection was provided continuously throughout the ash pond earthwork by Soils & Structures, Inc. A nuclear density meter was used to monitor the density of the compacted clay and to establish an average compaction effort required to achieve the specified density. Density tests were taken at random intervals or whenever low compaction was suspected. The soils technician worked under the direction of the B&V Resident Engineer.

Immediately before flooding the ponds, the pond floors were moistened and rolled in order to seal any shrinkage cracks which had formed. The ponds were flooded immediately after rolling.

4.2 PIPING

Inspection of the ash pond piping installations centered around the following areas of importance.

4.2.1 Pipe Embedment

The plastic piping used for the ash pond construction is flexible piping. The major portion of supporting strength for flexible piping is the lateral pressure exerted by the soil on the sides of the pipe. Thus, proper compaction of the embedment (below and adjacent to the pipe) is an important part of the pipe installation. All pipe construction was inspected for properly compacted embedment composed of clean sands to assure lateral and vertical support and to guard against the dangers of puncture from foreign objects.

Pipe construction at or below the ground water table presents additional installation considerations. In order to assure adequate support from the subbase, these pipe trenches were overexcavated, dewatered, and backfilled with compacted sand before pipe installation.

4.2.2 Hand Compaction Around and Above Piping

This phase of inspection assured that no piece of heavy machinery was allowed to move over or near the piping before proper cover was placed by hand compaction techniques. Requiring proper soil cover over the piping before allowing machine compaction eliminated concerns of fractured, crushed, or disjointed piping. These types of problems which would only become evident at the time the ponds were put into service would cause significant repair costs due to the location of the piping; therefore, great care was exercised using continuous inspection and hand-compaction techniques.

4.2.3 Free Movement of Settlement Connections

Due to the nature of the existing site soils, the pipe connections to the pile-supported, ash water reclaim structure must be able to accommodate settlement. The improved pipe connection designs were uncommon installations and were constructed with close regard for detail. The construction inspection during these piping connections assured the following:

(1) Proper alignment and grade of the 12-inch diameter ASA-A polyethylene pipes and the 6-inch diameter ASA-B polyethylene pipes.

(2) Correct installation of the 24-inch and 30-inch diameter steel culverts encasing the 12-inch diameter ASA-A and the 6-inch diameter ASA-B piping.

(3) Chipping of the concrete lip along the ash water reclaim structure to allow free settlement of the 30-inch diameter culverts.

(4) Monitoring the mixing, hydration, and placement of the bentonite slurry.

4.3 SEEPAGE CONTROL

Construction was monitored as it relates to controlling water flow through the clay or flow between the clay and adjacent structures. To control seepage around structures, hand compaction techniques were used to obtain the specified compaction. To eliminate water from piping along and under the reclaim structure and along the polyethylene pipes, three measures were taken.

(1) Backfilled the polyethylene pipes in compacted clay.

(2) Installed a Hypalon (plastic sheet) seepage cutoff.

(3) Placed dry bentonite (in the shrinkage cracks) between the ash water reclaim structure wall and the clay dike.

4.4 PRESSURE GROUTING AND SEEPAGE BARRIER

Pressure grouting procedures were monitored to assure that the voids under the ash water reclaim structure caused by earlier settlements were filled with grout. To prevent piping under the ash water reclaim structure, a sheet pile cutoff wall was constructed around the base of the reclaim structure.

APPENDIX A

SYSTEM DESCRIPTION FOR ASH HANDLING AND STORAGE SYSTEM

CITY OF GRAND HAVEN, MICHIGAN
BOARD OF LIGHT AND POWER
J. B. SIMS STATION UNIT 3

SYSTEM DESCRIPTION FOR BOTTOM ASH HANDLING AND STORAGE SYSTEM

1.0 SYSTEM DESCRIPTION

1.1 FUNCTION

The function of the Bottom Ash Storage and Handling System is to provide means for the removal and storage of the following wastes.

(1) Bottom ash.

(2) Pulverizer rejects.

(3) Neutralization basin wastes.

(4) Bottom ash hopper overflow water.

(5) Fly ash exhauster water.

(6) Scrubber thickener emergency drains.

The system is designed to operate on a closed cycle with water reclaim from the ash pond.

Two ash ponds are included in the system. The ash ponds are operated in a cyclic manner with the active pond receiving ash and other waste streams while the inactive pond is being cleaned of ash accumulated from previous use.

1.2 GENERAL DESCRIPTION AND DESIGN BASIS

The bottom ash ponds are used for the temporary storage of bottom ash, pulverizer rejects and various wastewaters. Decanted water is reclaimed from the ponds for subsequent use and recycle to the plant. Two high-pressure ash water pumps are used for sluicing bottom ash and to operate the fly ash exhauster. Two low-pressure ash water pumps provide ash hopper cooling water and other miscellaneous services. Two ash hopper overflow pumps direct water to the ash ponds.

1.2.1 Ash Ponds

Two ash ponds are located north of the plant. The ponds have a common center dike. An ash water reclaim structure is located in the center dike near the north end of the ponds. The reclaim structure is designed so that water can be reclaimed from either pond. The dike for both ponds have a top elevation of 594 feet and a bottom elevation of 585 feet. The water storage volumes for each pond with a two-foot and four-foot freeboard are as follows.

	Storage Volume, ft^3	
Pond	2 ft freeboard	4 ft freeboard
3A (East Pond)	68,000	43,000
3B (West Pond)	77,000	49,000

The ponds were sized to make maximum use of the area available to the north of the plant. Sizing also included considerations for the temporary storage of material in the scrubber thickener should it be required that the thickener be emptied under emergency conditions.

Each pond should contain approximately 140 days of ash production when the unit is operated under average annual load conditions assuming that the ponds are operated with a four-foot freeboard (water level 590 feet) and that 70 per cent of the pond water storage volume can be effectively used for ash storage.

1.2.2 Ash Water Pumps and Ash Hopper Overflow Pumps

Two high-pressure ash water pumps provide sluice water for bottom ash removal and operation of the fly ash exhauster. Two low-pressure ash water pumps provide water for bottom ash hopper cooling and other miscellaneous services. The high-pressure and low-pressure pumps take suction from the ash water reclaim located in the center dike of the ash ponds. Two ash hopper overflow pumps take suction from the ash hopper overflow tank and direct the wastewater to the ash ponds.

During normal operation, one low-pressure ash water pump operates continuously to supply ash hopper cooling and seal trough makeup. One high-pressure ash water pump is operated intermittenly as required to sluice bottom ash and pulverizer rejects to the pond and to transport fly ash to the storage silo. The second high-pressure and second low-pressure pump serve as backup for the operating pumps.

To assure adequate suction pressure for the low-pressure ash water pump, fly ash transport operations should be interrupted when sluicing bottom ash and pulverizer rejects to the pond. This does not present an operational problem for the fly ash system since it is designed to allow approximately 50 per cent downtime at full load maximum ash collection rates.

2.0 COMPONENT DESCRIPTION

2.1 ASH POND CONSTRUCTION

The ash ponds are constructed with clay dikes and a three-foot thick clay bottom. The tops of the dikes are at 594 feet elevation and the top of the clay bottom is at 585 feet elevation resulting in a maximum pond depth of nine feet.

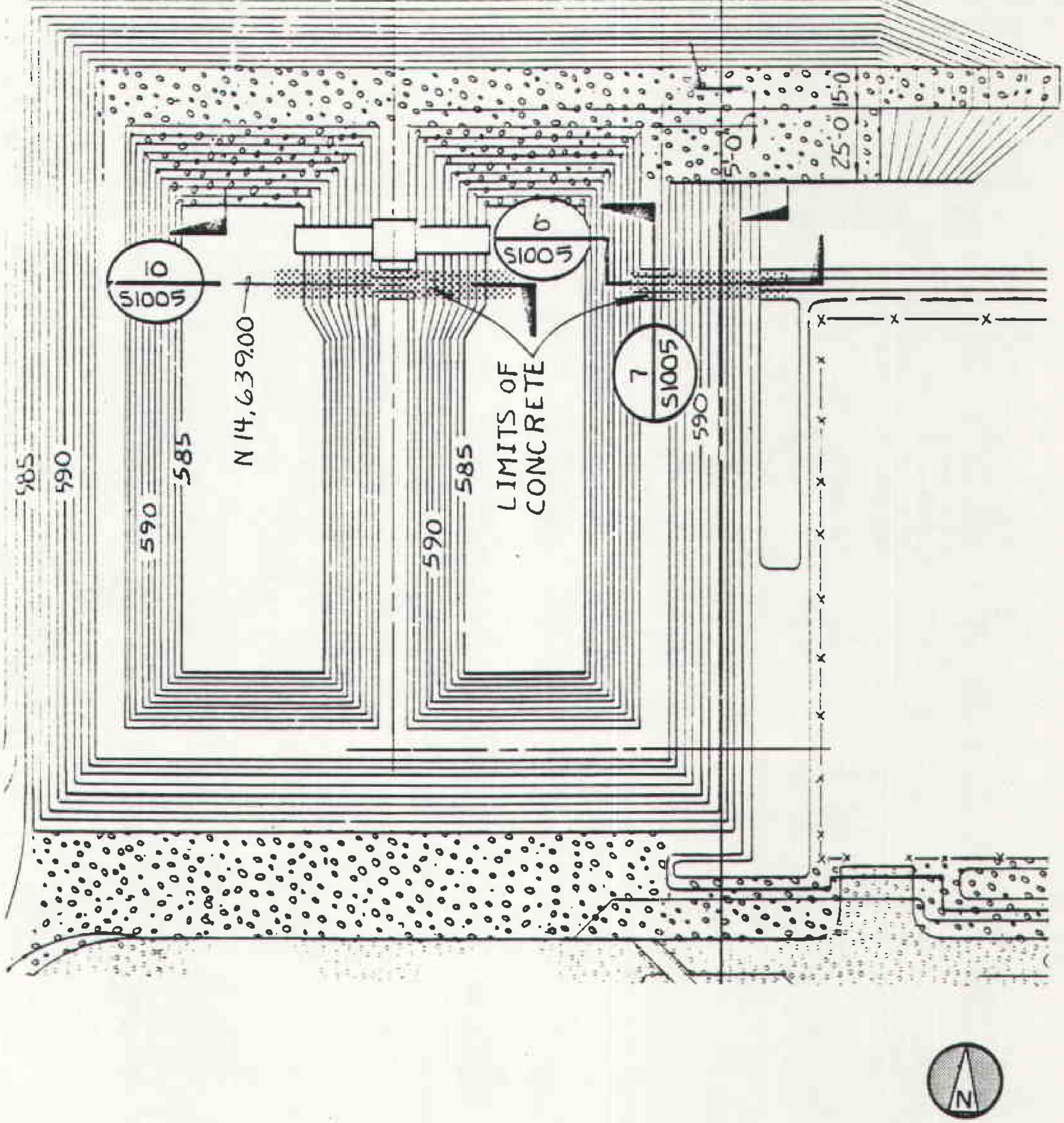
The interior (center) dike is constructed with 2H to 1V side slope on both sides and is 10 feet wide at the top. Exterior dikes on the west, east and north sides are constructed with 2H to 1V interior slopes and 3H to 1V exterior slopes and are 10 feet wide at the top. The interior of the north dike has a slope of 3H to 1V and is covered with 12 inches of riprap or waste rock to protect the clay slope while removing ash from the pond. The top of the north dike is 20 feet wide and an ash loading area 20 feet by 60 feet is located adjacent to the north dike. The loading area includes a truck loading dock for transport of ash off-site. A ramp with 6H to 1V slope is provided at the north dike for access to the top of the dike. The exteriors of the west, north and east dikes are covered with four inches of top soil and seeded for erosion control.

Figure 2-1 shows a general arrangement drawing for the pond and ash loading areas.

2.2 RECLAIM STRUCTURE

Water is reclaimed through the reclaim structure and is piped back to the power plant for reuse. The reclaim structure is located in the center dike near the north end of the ponds and is designed to serve both ponds. A division wall in the center of the reclaim structure restricts water flow between ponds.

The reclaim structure includes a drain pipe extending through the north dike so that drain water from Ash Pond 3A or 3B can be directed to the existing Units 1 and 2 ash storage area. Water is reclaimed from either side of the structure through a 12-inch pipe buried in the center dike that extends back to the power plant.



Note: Taken From B&V Drawing S1004

ASH PONDS

FIGURE 2-1

Ash pond makeup water and fly ash exhauster water is introduced at the reclaim structure. Other waste streams enter the pond on the south end of the center dike. Piping of waste streams to the ponds is equipped with valving that allows the streams to be directed to either pond. Ash sluice water enters the pond on the south end.

2.3 ASH WATER PUMPS AND PIPING

The bottom ash system includes two high-pressure ash water pumps which take suction from the reclaim structure. Each pump is designed for 1,325 gpm at 440 feet. The high-pressure ash water pumps provide the intermittent water requirements of the bottom ash and pulverizer rejects sluicing system. The pumps also provide motive water for the fly ash system vacuum exhauster. The ash sluice and exhauster water is directed to the active ash pond.

The bottom ash system includes two low-pressure pumps designed for 320 gpm at 140 feet which takes suction from the reclaim structure. These pumps provide continuous seal and cooling water for the ash hopper and miscellaneous intermittent low-pressure water services. Overflows from the ash hopper are collected in a tank and pumped to the active ash pond.

The planned operational water level of 590 feet elevation will require that both the high-pressure and low-pressure pumps be primed prior to operation. The pumps will be primed by using the condenser water box priming unit to draw water from the suction piping into the pumps. A guage glass and vacuum priming float valve is installed at the high point of each pump casing. Normally, the condenser waterbox and ash water pumps will be maintained full of water by the vacuum priming unit and operator action is not required to prime the pumps. However, if an excessive amount of air is being pulled from any piece of equipment served, the vacuum priming unit will not be able to hold the prime in the pumps. Therefore, it is important to look at the guage glass to verify that a pump is primed before starting. After the pump is started, it will maintain prime without aid from the vacuum priming unit.

It is necessary to avoid excessive pump runout flows caused by worn sluice nozzles or orifices. Adequate suction pressure exists to run a single high-pressure pump in excess of its rating; however, low-pressure pump flow must not exceed the pump rating. Flow rates should be checked occasionally by monitoring pump differential pressure.

3.0 OPERATING PROCEDURES

The following provides recommended operating procedures for the bottom ash storage and handling system. Actual operating experience with the system will allow the development of more specific procedures. The intent of the following paragraphs is to set forth a suggested operating procedure from which a more specific procedure can be developed by the Boards operating personnel as they gain actual operating experience with the system.

Because of settling associated with the initial pond construction, it is recommended that the bottom ash ponds by initially operated at a nominal water level of 590 feet. With a 594 feet elevation at the top of the new clay dikes and a pond bottom elevation of 585 feet, the ponds will have a maximum depth of 9 feet. Operation at a nominal water level of 590 feet will provide a water depth of five feet. Settlement of the dikes will be monitored during operation. The Board may choose to operate the ponds at a higher water level after settlement has ceased or the rate of settlement has decreased significantly. Maximum suggested nominal water level is 592 feet which will provide a two-foot freeboard.

3.1 INITIAL OPERATION

Pond 3A should be prepared to receive ash by installing three 15-inch stop logs in the reclaim structure and the pond filled to 590 feet. With three stop logs in place, there will be approximately 15 inches of water over the upper stop log when the pond water level is 590 feet.

Stop logs should be installed in the reclaim structure on the inactive pond side and the water level maintained at a relatively low level so that significant storage volume is available for use in the event that it is determined that the scrubber thickener should be emptied to the pond.

3.2 NORMAL OPERATION

Prior to operation of the ash water pumps, it must be verified that the pumps are primed as discussed in Section 2. Bottom ash may then be sluiced to the south end of Ash Pond 3A. The ash pipe will be set so that the ash deposit start near the south dike. Ash will build up along the south dike and eventually protrude from the pond water surface. The ash pipe should then be extended to the north to allow a reasonably uniform filling of the pond from south to north.

The sluice water will be reclaimed and pumped back to the plant for reuse. It is anticipated that bottom ash will be sluiced once per day during normal unit operation. Based on the load model contained in the PROJECT DESIGN MANUAL and the typical properties of the Indiana Coal actually purchased for Unit 3, the average daily bottom ash production rate will be approximately 230 ft^3/day. Each pond should contain approximately 140 days of average ash production assuming that 70 per cent of the pond water storage volume at 590 feet can be effectively used for ash storage.

Pond filling with ash must be carefully monitored so that the ponds are not filled to the extent that the ash reclaim water has a significant solids content. An inventory of ash in the ponds should be maintained to determine filling rates and estimate time to fill the active pond. Sounding could be made to plot a filling profile for the ponds. After the ponds have been filled several times, the operating staff will have more specific knowledge of pond filling rates and actual useable ash storage volumes for each pond.

3.3 POND CHANGEOVER

When the active ash pond has been filled to the maximum practical extent, the ash discharge and other waste discharges will be directed to the "empty" pond, Pond 3B. The pond will be prepared to receive ash by establishing the nominal 590 feet water level prior to receiving ash. Stop logs will be in place and the pond may receive ash. Filling of Ash Pond 3B will continue as described above for Ash Pond 3A operation.

3.4 INACTIVE POND CLEANING

The filled ash pond, Pond 3A, should remain undisturbed for approximately one week to allow maximum settling of solid. The pond should then be drained in preparation for removal and transport of bottom ash to off-site permanent storage. The pond will be drained to the Units 1 and 2 ash storage area. The discharge permit for the Units 1 and 2 ash storage area has a limitation of not more than 110,000 gallons per day. Discharge to the existing Unit 1 and 2 ash storage area will be by gravity drain from the reclaim structure. Initial drainage from Pond 3A should be to a level equal to the top of the upper stop log. Stop logs should be removed one at a time with complete drainage intervals between removal of subsequent stop logs. After the last stop log is removed, the pond should be allowed to drain for one to two days before ash removal is initiated.

Ash will be removed from the pond with a front-end loader and placed in a truck positioned along side the ash loading area.

The inside slopes of the south dikes for both Ash Ponds 3A and 3B will have a 3H to 1V slope with a protective layer of rock over the clay dike. The front-end loader operation must be carefully controlled so as to not damage the three-foot thick clay lining which seals the bottom of the ash ponds. Protection of the liner should not be a particular problem since it should be obvious if the loader "gets into" the clay. The operator must be constantly aware of the potential damage to the bottom and interior dikes, and should plan to leave sufficient (approximately 6-inches) ash in the pond bottom. A scouring of the interior of the ash pond is not necessary or prudent. The operator must be made aware that his job is to remove bulk quantities of ash while protecting the pond bottom and dikes.

3.5 OPERATING OBSERVATION

The interior of the cleaned pond should be examined for evidence of settling. The water filled active and reserve ash ponds should be examined along the exterior toe of the dikes for evidence of leakage or water seepage from the pond interiors. The dikes should be examined on a daily basis for the first few months of operation and then weekly thereafter. Elevation monuments are provided on the pond dikes at each corner and center of the north-south dikes for measurements to determine settling rates. Observation of the pond dike during the first months of operation will give an early indication of the rate of settlement to be expected. Should significant settlement occur, additional clay can be placed on the dikes.

1. Excavation showing existing discharge piping in the south end of interior pond. Temporary piping visible in the background.

2. Existing discharge piping showing approximately 11.5" of differential settlement.

3. Temporary piping leading to Units 1 & 2 ash pond.

4. Initial lifts of clay over east pond bottom.

5. Sheet steel cutoff wall in place at reclaim structure.

6. North side of the ash water reclaim structure with cutoff wall bolted in place.

7. Spreading the initial lift of clay onto the southwest quadrant of the ash ponds.

8. Density test using a nuclear density meter.

9. Hand compaction of sand backfill along the north side of the ash water reclaim structure. Sand backfill providing stable subgrade for clay liner adjacent to the structure.

10. Hand compaction of clay around the ash water reclaim structure.

11. Raising the existing piping in the south end of the ash ponds.

12. Tamping sand under the piping after raising to plan grade.

13. Close proximity of the ground water table to the bottom of the clay lining.

14. Beginning construction of the east dike.

15. Coring through the concrete slab of the ash water reclaim structure for pressure grouting of voids beneath slab.

16. Compacting clay around the reclaim structure.

17. Installing additional bolts through the sheet steel cutoff wall.

18. Fitting the hypalon to the reclaim structure.

19. Placing the butyl strip during the hypalon attachment.

20. Bolting in place the redwood boards.

21. Hand compaction around the reclaim structure. Plywood is used to protect the hypalon during compaction.

22. Cleaning the hypalon prior to solvent welding a corner seam.

23. Cleaning the hypalon prior to seaming.

24. Heat lamps and pads used to supply artificial heat during the hypalon seaming process.

25. Installation of a hypalon hood at the corners of the ash water reclaim structure.

26. Preparing hypalon for seaming of a hood by cleaning the hypalon with trichoretylene.

27. Completed hypalon hood.

23. Pressure grouting under the ash water reclaim structure.

29. Water flowing from a grout tube caused by grout being pumped in at another location.

30. Mud forced through three feet of compacted clay from soft subsoil.

31. Excavation of mud pumping area revealed that it was a localized problem and the area was backfilled.

32. Constructing the east dike. End of May

33. Clay placement along the west dike. End of May

34. Hypalon membrane lapped and ready for burial.

35. 12" Ø ASA-A Abco pipe set in trench through the center dike.

36. Hand compaction of clay around piping at the south end of the ponds.

37. Hand compaction of clay along the ASA-A pipe trench.

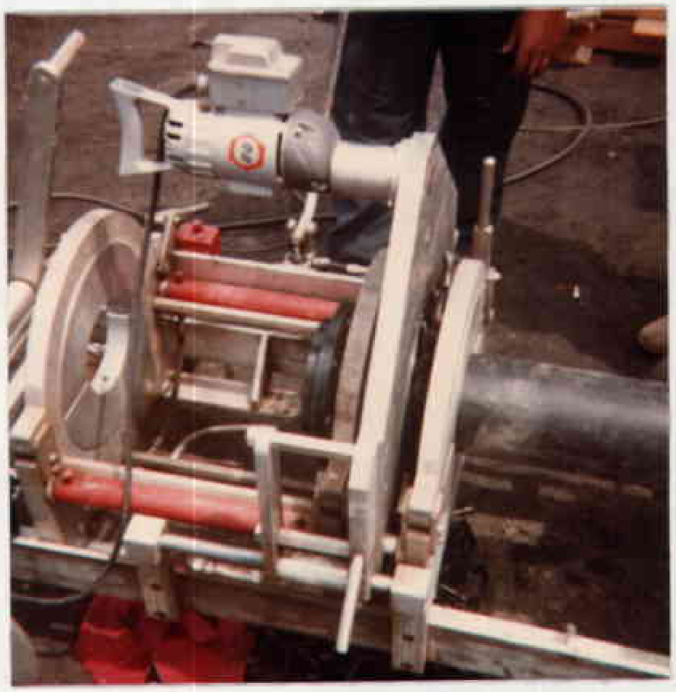
38. Chipping away the concrete lip on the south side of the ash water reclaim structure to allow free settlement of the 30" Ø culverts surrounding the 12" Ø ASA-A polyethylene piping.

39. Enlarging the openings in the south side of the reclaim structure to allow direct insertion of the 12" Ø polyethylene pipes.

40. West pond construction - Early June

41. East pond construction. Early June

42. Welding the flanges on the polyethylene piping.



43. Beginning construction of the bin retaining wall.

44. Bin-Wall construction, Mid June.

45. East pond construction progress, Mid June

46. West pond construction progress. Mid June

47. Connection of 12" Ø ABCO pipe into two 12" Ø polyethylene pipes. ASA-A line.

48. Sand backfill being placed around the ABCO piping. Clay backfill was used around the polyethylene piping.

49. Placing the 30" Ø culverts in the pipe trench on the south side of the reclaim structure.

50. 12" Ø polyethylene pipes extending into the reclaim structure.

51. 12" Ø polyethylene piping grouted in place. The holes in the culverts are to be used to pump in bentonite slurry.

52. Culvert ends capped with celotex and plywood to allow free movement of the culvert around 12" Ø polyethylene pipes.

53. Installation of the 6" Ø ASA-B drain line to the north of the ash water reclaim structure.

54. Re-steel set in place for the stop log wall at the west end of the structure.

55. Grooming the inside slope of the east dike.

56. Combining water and bentonite to form a slurry with a specific gravity between 1.03 and 1.05.

57. Pouring bentonite into a temporary hydration pond.

58. A diaphram pump and come-alongs were used to mix bentonite prior to placement.

59. Pumping bentonite slurry into the backfilled culverts.

60. Welding the culvert caps after the bentonite slurry was placed.

61. Excavating the pipe trench for the 10" Ø steel ASA-F piping and the 6" Ø bondstrand ASA-G piping.

62. 6" Ø ASA-G piping being installed

63. 10" Ø steel ASA-F piping through the center dike

64. Heat trace conduit installation at the south end of the center dike.

65. 10" ASA-F and 6" ASA-G piping installation at the ash water reclaim structure.

66. Hand compaction of granular backfill in the bin retaining wall

67. East pond construction progress. Late June

68. West pond construction progress. Late June

69. Shrinkage between the ash water reclaim structure and the clay dike. Cracks were filled with dry bentonite.

70. Bottom ash line installation at the south end of the center dike.

71. Grading for the east dike overflow wier.

72. Completing backfill of the bin retaining wall and trimming off excess filter fabric.

73. Installing timber pipe supports at the south side of the reclaim structure.

74. Piping installation at the south side of the reclaim structure

75. Final grading for the east dike overflow wier.

76. Forming up the center dike overflow wier.

77. Pouring the center dike overflow wier

78. Heat tracing and insulating the piping through the center dike at the location of the overflow wier.

79. Piping insulated and heat traced at the south side of the reclaim structure.

80. East pond construction Mid July

81. West pond construction progress. Mid July

82. Ash truck loading area with road gravel surfacing.

83. 6" ASA-B bond strand drain line exit point. Picture is oriented along the north dike toe.

84. East pond partially filled with water and ready for use.

APPENDIX C
COST REPORT

APPENDIX C

COST REPORT

The following costs were incurred during modification of the ash pond.

Field Resident Engineering

Manday - 57

Expenses - $3,075.05

Field Testing

Firm - Soil and Structures

Cost - $10,354.67

Clay Material

Firm - Dykehouse

Cost - $61,797.50

General Contractor

Firm - Utley-James, Inc.

Total Final Cost - $452,143.36

Note: The following letter summarizes the above cost. All backup materials for the amounts shown for Subcontractors and Utley-James are contained in Change Orders 11, 13 and 14.

cc: D.S. Lindberg - w/o att.
G. Eaton - w/o att.
R. Robbins - w/o att.

Utley-James, Inc.
P.O. Box 1100 □ Pontiac, Michigan 48056 □ Phone: (313) 566-4070

AUG 17 1983

GRAND HAVEN, MICH.
B&V OF MICHIGAN
PROJECT 7728
File: 71.0200.01

P. J. Adam
F. C. Wallace
... Rain
... Castor
... Coleman
... Compean
K. F. Eberle
R. D. Hubbell
M. J. Huggins
D. M. Lefebvre
M. L. Noel
C. J. Ulary
R. H. Wright
R. HUBBELL w/enc.

August 15, 1983

Black & Veatch
1500 Meadow Lake Parkway
Kansas City, MO. 64114

Attn: Roger Mawby

RE: J.B. SIMS - UNIT 3
GRAND HAVEN, MI
SPECIFICATION #7728.71.0200
ASH POND REPAIR WORK
OUR F.O. #43

Gentlemen:

We hereby submit our final cost summary of the Ash Pond Repair Work on the above subject job.

Subcontractor	Final Cost Total
Elzinga & Volkers	$ 327,863.74
Hertel Plumbing & Heating	91,125.37
Harlo Corporation	6,130.86
Jackson Power	448.00
Sub-Total	425,567.97
General Contractor 5% Mark-Up	21,278.39
Work by General Contractor's Forces (Including Mark-Up)	5,297.65
Total Final Cost	$ 452,143.36

All back up for the above time and material work is attached for your review. Please forward a contract change order to cover the additional repair cost not covered by previous change orders #11 and #13.

If you have any questions or comments, please advise.

Very truly yours,

UTLEY-JAMES, INC.

Mike Kettlewell

Mike Kettlewell
Project Engineer

MK/jfg

Attachment