FINAL

Coal Combustion Waste Impoundment

Round 7 - Dam Assessment Report

Lansing Generating Station

Interstate Power and Light Company (IPL)
Lansing, Iowa

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

Dewberry, LLC
Fairfax, Virginia

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INTRODUCTION, SUMMARY, CONCLUSION AND RECOMMENDATIONS

The release of over five million cubic yards of coal ash from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, flooded more than 300 acres of land. A first step to prevent such catastrophic failure and damage is to assess the stability and functionality of ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the Interstate Power and Light Company (IPL) coal combustion waste (CCW) management units is based on a review of available documents and on the site assessment conducted by Dewberry personnel on October 5, 2010. We found the supporting technical information to be generally satisfactory (Section 1.1.3). As detailed in Section 1.2 there are several recommendations that may help to maintain a safe and trouble-free operation.

The IPL Ash Pond 1 and 2 Surface Impoundment dikes at the Lansing Station are **SATISFACTORY** for continued safe and reliable operation, with no significant existing or potential management unit safety deficiencies.

PURPOSE AND SCOPE

The U. S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e. management units) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impoundment contents. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present); status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices, and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety.)

In March 2009, the EPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion waste. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA asked utility companies to identify all management units, such as surface impoundments or similar diked or bermed structures and landfills receiving liquid-borne materials, that store or dispose of coal-combustion residuals or by-products, including, but not limited to, fly ash, bottom ash, boiler slag, and flue gas emission control residuals. Utility companies responded with information on the size, design, age, and the amount of material placed in the units so that EPA could gauge which management units had or potentially could rank as having High Hazard Potential. The USEPA and its contractors used the following definitions for this study:

> "Surface Impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling and aeration pits, ponds, and lagoons."
>
> For this study, the earthen materials could include coal combustion residuals. EPA did not provide an exclusion for small units based on whether the placement was temporary or permanent. Furthermore, the study covers not only waste units designated as surface impoundments, but also other units designated as landfills which receive free liquids.
>
> EPA is addressing any land-based units that receive fly ash, bottom ash, boiler slag, or flue gas emission control wastes along with free liquids. If the landfill is receiving coal combustion wastes with liquids limited to that for proper compaction, then there should not be free liquids present and the EPA did not seek information on such units which are appropriately designated a landfill.
>
> In some cases coal combustion wastes are separated from the water, and the water containing minimum levels of fly ash, bottom ash, boiler slag, or flue gas emission control wastes are sent to an impoundment. EPA is including such impoundments in this study, because chemicals of concern may have leached from the solid coal combustion wastes into the waster waters, and the suspended solids from the coal combustion wastes remain.

The purpose of this report is to evaluate the condition and potential of waste release from **management units**. A two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit potential hazard classification (if any) and accepted information provided via telephone communication with a management unit representative.

This evaluation included a site visit. EPA sent two engineers, one licensed in the State of Iowa, for a one-day visit. The two-person team met with the technical and management representatives of the management unit(s) to discuss the engineering characteristics of the unit as part of the site visit. During the site visit the team collected additional information about the management unit(s) to be used in determining the hazard potential classifications of the management unit(s). Subsequent to the site visit the management unit owner provided additional engineering data pertaining to the management unit(s).

Factors considered in determining the hazard potential classification of the management unit(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed in the these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s). The team considered criteria in evaluating the dams under the National Inventory of Dams in making these determinations.

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion waste management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit and review of technical and historical documentation provided by IPL.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The dike embankments and spillways appear to be structurally stable based on the analysis provided to Dewberry for review and observations made during Dewberry's site visit.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

The hydrologic and hydraulic data provided to Dewberry for review indicate that both Ash Pond 1 and Ash Pond 2 have adequate impoundment capacity to contain the 100-year, 24-hour storm event without overtopping the Ash Pond 1 and 2 dikes.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

IPL has provided sufficient information to make this assessment and their staff has been cooperative during the process.

1.1.4 Conclusions Regarding the Field Observations

There were no indications of any unsafe structural conditions. The visible parts of the embankment dams and outlet structures were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability; however the thick vegetation growing on the outer slopes of the pond dikes prevented complete observation. There was no evidence of repaired embankments or prior releases observed during the field assessment. No seepage was observed.

1.1.5 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

Maintenance and methods of operation are adequate, except for tree and vegetation removal. IPL Lansing staff completed a 2009 inspection of the dikes and concluded the trees should be removed. A more rigorous inspection schedule was recommended. There was no evidence of repaired embankments or prior releases observed during the field assessment.

1.1.6 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

Present IPL policy requires an internal inspection of the dikes and facilities once per year with records to be kept for 5 years.

There is no dam monitoring program in place that includes such instruments as observation wells/piezometers, settlement monitoring points, inclinometers, seepage monitoring points, etc. Such monitoring instruments do not appear to be warranted for these low dams.

1.1.7 Classification Regarding Suitability for Continued Safe and Reliable Operation

The facilities are **SATISFACTORY** for continued safe and reliable operation.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Maintenance and Methods of Operation

Removal of tree vegetation and brush vegetation is recommended along all the dike slopes. Removal of the trees and brush vegetation along the Ash Pond 1 west outside dike should be completed once all regulatory approvals are received from the Army Corps of Engineers and Iowa Department of Natural Resources (IDNR). IPL recommended the same tree removal action in their internal April 29, 2009, GENCO standard inspection guide document.

1.2.2 Recommendations Regarding the Surveillance and Monitoring Program

It is further recommended that internal inspection of the outlet structures be performed at a frequency of at least once every 6 months and be documented with a written report.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Joseph P. Klein III, Dewberry
Mark Hoskins, Dewberry
Chad Stobbe, State of Iowa Department of Natural Resources
Doug Hawker, State of Iowa Department of Natural Resources
William Sangster**,** IPL
Bill Skalitzky, Lead Environmental Specialist .Alliant Energy Corporate Services, Inc.
Jenna Wischmeyer, Alliant Energy Corporate Services, Inc.

1.3.2 Acknowledgement and Signature

We acknowledge that the Lansing Generating Station management units referenced herein has been assessed on October 5, 2010.

Mark Hoskins, PE
Registered, IA #19301

Joseph P. Klein III, PE

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2.0 DESCRIPTION OF THE COAL COMBUSTION WASTE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The Lansing Generating Station (LGS) is physically located on the west bank of the Mississippi River, south of the City of Lansing, in Allamakee County, Iowa. A small creek runs along the west side of the ash ponds at a much lower elevation than the ash ponds. The LGS mailing address is 2320 Power Plant Dr., Lansing, IA 52151. The Mississippi River runs eastward along the north side of the facility. See Appendix B – Document 1.11 and Exhibit 1 for an aerial map of the site. There is also a 7 acre IPL maintained landfill that discharges runoff into the south end of Ash Pond 1.

The Lansing Generating Station has two impoundments that receive wastewaters containing coal combustion waste (CCW), including:

- Ash Pond 1 Southerly Surface Impoundment (14.8 acres)
- Ash Pond 2 North Surface Impoundment (0.2 acres)

Both ponds are a partially incised. Ash Pond 1 has a crest elevation of +654 Ft. and a pond bottom elevation of +624 ft. The north dike of Ash Pond 1 forms the south perimeter of Ash Pond 2. Ash Pond 2 has a bottom elevation of +620 Ft. resulting in a maximum Ash Pond 1 embankment height of 34 feet. The embankment dikes were built from excavated pond bottom silty clay.

Ash Pond 2 discharges into a channel directly connected to the Mississippi River. The power plant is located to the north of Ash Pond 2. See Appendix B – Document 1.11 for relative locations of the ponds on an aerial view map of the site.

Both Ash Ponds are unlined basins. Ash Pond 1 is periodically excavated to remove the ash for beneficial reuse and landfill. The adjacent landfill is estimated to be active for another 5 years according to LGS staff. Ash Pond 2 was excavated to remove ash deposits in 2002.

2.2 SIZE AND HAZARD CLASSIFICATION

Ash Pond 1 (south) Surface Impoundment - Maximum dam height is 30 feet above grade, according to furnished information. The total storage capacity is 474,000 cubic yards. Other physical data are summarized in Table 2.1. Ash Pond 1 Size Classification is Small per the USACE Size Classification, see Table 2.2. The Iowa DNR criteria for Dam Classification is presented in Table 2.3. Failure of the west dike would discharge CCW into the adjacent creek and then into the Mississippi River. The failure would not likely cause loss of life but may cause some environmental damage. Therefore, Ash Pond 1 should be given a Low Hazard Dam Classification per Chapter II of the IA DNR Technical Bulletin 16, 1990.

Ash Pond 2 (north) Surface Impoundment - Maximum dam height is 19.0 feet above grade, according to furnished information. Other physical data are summarized in Table 2.1. The dam currently has an undetermined hazard potential rating. Ash Pond 1 Size Classification is Small per the USACE Size Classification, see Table 2.0. Failure of the Ash Pond 2 dike would wash out portions of the railroad track, yet the water would then flow into the northerly channel that directly connects to the Mississippi River. The failure would not likely cause loss of life but would cause some environmental damage, maybe minor economic damage to river navigation, and some potential disruption of generation station operations. Therefore, the Ash Pond 2 should be given a Low Hazard Major Dam Classification per Chapter II and Chapter VI of the IA DNR Technical Bulletin 16, 1990.

Table 2.1: Summary of Dike Dimensions and Size*		
	Ash Pond 1	Ash Pond 2
Dam Height*	30.0’	19'
Crest Width**	15’	15'
Length	~1,600’	~800’
Side Slopes (inside)**	3:1	3:1
Side Slopes (outside)**	3:1	3:1
Hazard Classification***	Low (Low)	Low (Low)

**A review of furnished construction plans indicate dike heights of s 30.0’ for Ash Pond 1 & 19.0’ for Ash Pond 2.*
***Based on furnished design information*
****IA DNR Hazard Classification (EPA Hazard Classification)*

Table 2.2: Size Classification* Per USACE ER 1110-2-106, September 26, 1979		
Category	Impoundment Storage (Acre-Feet)	Dam Height (Feet)
Small	Less than 1,000 but equal to or greater than 50	Less than 40 but equal to or greater than 25
Intermediate	Less than 50,000 but equal to or greater than 1,000	Less than 100 but equal to or greater than 40
Large	Equal to or less than 50,000	Equal to or less than 100

**Note: Size classification may be determined by either storage or height of structure, whichever gives the higher category.*

The Iowa DNR Hazard Classification is presented below.

Table 2.3: Dam Hazard Classification	
Category	Hazard Potential
Multiple Dams	Structures located in areas where failure of a dam could contribute to failure of a downstream dam or dams, the minimum hazard class of the dam shall not be less than that of such downstream structure.
High Hazard	Structures located in areas where failure may create a serious threat of loss of human life or result in serious damage to residential, industrial or commercial areas, important public utilities, public buildings, or major transportation facilities.
Moderate Hazard	Structures located in areas where failure may damage isolated homes, industrial or commercial buildings, moderately traveled roads or railroads, interrupt major utility services, but without substantial risk of loss of life. Structures that of themselves are of public importance.
Low Hazard	Structures located in areas where damages from a failure would be limited to loss of the dam, loss of livestock, damages to farm outbuildings, agricultural lands, and lesser used roads, and where loss of human life is considered unlikely.

Iowa DNR, Technical Bulletin 16 – Design Criteria and Guidelines for Iowa Dams. December 1990.

2.3 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The amount of CCW residuals currently stored in the units and maximum capacities are summarized in Table 2.4. Ash Pond 1 receives fly ash, bottom ash, and boiler slag from coal-fired units at the LGS. Ash Pond 2 receives effluent water after it has passed through the chambered southerly portion of Ash Pond 1. The volumes were estimated by IPL and published in a letter to EPA dated March 27, 2009.

Ash Pond 1 Surface Impoundment - The plant was expanded in 1949 (12 MW), 1957(38 MW) and in 1977(275 MW). Ash Pond 1 was built in 1976 per the permitting plans (Appendix A – Document 1.6). Materials stored in Ash Pond 1 may include fly ash, bottom ash and economizer ash from past sluicing activities. Wastewaters sent to the pond for further treatment include bottom and fly ash sluice waters, non-chemical air heater and boiler wash waters, ash seal water and storm water contributions from the on-site landfill.

At the time of visit, Boiler Unit #4 was sluicing into the pond. Ash is removed from the southern portion of Ash Pond 1 on a regular basis to ensure compliance with the site NPDES permit. Dredged ash is either beneficially reused or landfilled. The intent is to have no net increase of ash in the pond. Most ash settles within the channelized portion of the pond. Normal pool elevation at the time of the inspection was 650.0 feet.

Ash Pond 2 Surface Impoundment - Based on information from IPL, this pond does not contain significant amounts of ash. Most of the ash settles out in Ash Pond 1; ash was excavated from Ash Pond 2 in 2002. Normal pool elevation is about 631 feet.

Table 2.4: Amount of Residuals and Maximum Capacity of Unit*

	Ash Pond 2	Ash Pond 1
Surface Area (acre)	14.8	0.2
Current Storage Volume (Cubic-Yds)	313,000	725
Total Storage Capacity (Cubic-Yds)	474,000	2900

* Volumes taken from March 27, 2009 IPL reply to EPA data request (Appendix A Document 1.10.5)

2.4 PRINCIPAL PROJECT STRUCTURES

2.4.1 Earth Embankment Dam

Ash Pond 1 Surface Impoundment - The west and north dike embankments are constructed of compacted earth fill with a one foot bentonite slope cover. The south dike is adjacent to the landfill and is higher ground. The north dike is the access roadway (Power Plant Road) and has an asphalt crest. The east dike is natural high ground. The source and type of soils used for earth fill is unknown, but from the 1975 plans appears to be excavation from what is now the pond bottom.

Based on provided boring information (Appendix A – Document 1.10), the constructed dikes are predominantly made of silty clay. The length of the levee forming the west embankment of the basins is approximately 1600 LF and the levee forming the north embankment is approximately 700 LF. Ash Pond 1 is completely enclosed by the perimeter dike that includes the embankment that is Power Plant Road.

A representative section of the west dike is shown as cross sections 6 and 8 (Appendix A – Document 1.6). As shown in this exhibit, there is an approximately 15-foot wide levee at the top and the outside slope drops to the creek bed about 30 feet. The slopes are covered with rip-rap. The final grades of the levees and dikes of the Ash Pond 1 and 2 are shown in (Appendix A – Document 1.6). The perimeter dam embankment slopes are 3(H):1(V).

Ash Pond 2 Surface Impoundment - Based on provided boring information (Appendix A – Document 1.10), the constructed dikes are predominantly made of silty clay. The length of the levee forming the north embankment is approximately 800 LF with a crest elevation of 639.0 according to the provided 1975 construction plans. The perimeter dam embankment slopes are 3(H):1(V).

Ash Pond 2 is very small and could have been the 1948 pond for the original smaller facility. When the plant was expanded in 1976, the larger pond was built (Ash Pond 1) and needed a design feature to allow for the hydraulic drop in elevation of about 16 feet to ultimately discharge into the Mississippi River. The final grades of the levees and dikes of the Ash Pond 2 are shown in Appendix A – Document 1.6.

2.4.2 Outlet Structures

Ash Pond 1 Surface Impoundment – CCW water passes through outlet works located at the north end of the pond. The outlet works consist of a concrete box with a 24 inch reinforced concrete pipe (RCP) conduit through the dike to discharge into Ash Pond 2. The discharge pipe extends into a drop structure. Construction details of the Ash Pond 1 drop structure and the Ash Pond 2 outfall structure are within Appendix A – Document 1.1 pages 11 and 12.

The water in Ash Pond 1 at the time of the site visit was at a level of 650 feet, which is 4.0 feet below the perimeter dike crest. At the time of the site visit, the sluice gate of the outlet structure was open and discharge from the structure was observed.

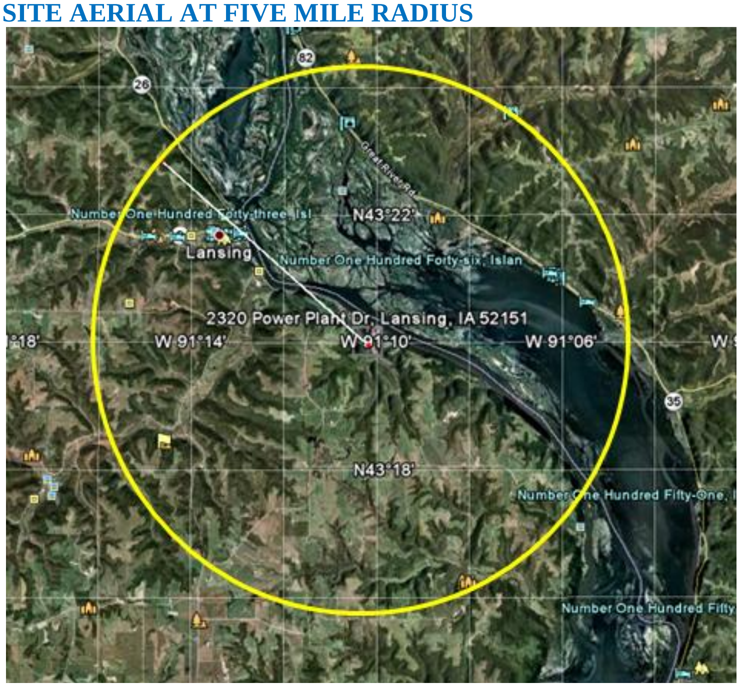
Ash Pond 2 Surface Impoundment – The outlet structure discharges into a channel directly connected to the Mississippi River. Details of this structure are found in Appendix A –Document 1.1. The pond elevation can be adjusted by removing or adding stop logs to a 4.75 foot long rectangular weir. The level of water in the basin at the time of the site visit was at elevation 631 feet, which is 8.0 feet below the dam crest.

2.5 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

Using Google Maps dated 2010, no critical infrastructure was observed within 5 miles in the down gradient direction. In general, the land use downstream from the site is agricultural. There are schools, medical facilities, and veterinary facilities located within the 5 mile radius (mainly in Lansing Iowa upstream of the site). These facilities are noted on the 5 mile radius map included as Exhibit 1.

Flood impacts from a dike failure of the surface impoundment would impact the adjacent stream to the west, then the Mississippi River. No structures would be impacted by the hypothetical failure. Lynxville is 7 miles downstream and Harpers Ferry is 10 miles downstream along the Mississippi River. The City of Lansing is about 4 miles upstream of the Mississippi River and would appear to not be affected by a potential dike failure.

SITE AERIAL AT FIVE MILE RADIUS



3.0 SUMMARY OF RELEVANT REPORTS, PERMITS AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT(S)

IPL provided an inspection report completed on March 29, 2009 that identified some maintenance issues for the dikes. These included removing trees and relocating several beavers that were blocking portions of the adjacent creek. (Appendix A – Document 1.3.2).

3.2 SUMMARY OF LOCAL, STATE AND FEDERAL PERMITS

The LGS embankments are not regulated by a federal or state agency and currently do not have federal or state hazard classifications. Ash Pond 2 discharge is regulated by Iowa Department of Natural Resources (Appendix A – Document 1.4).

The LGS wastewater discharges are currently regulated under NPDES Permit No. 0300100 (Appendix A – Document 1.4). This permit was issued on October 2, 1998 and expired on October 1, 2003 according to the furnished documentation. IPL is authorized to continue discharging under the existing NPDES Permit since the NPDES Permit Renewal Application was submitted at least 180 days prior to the expiration date of the permit.

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS (IF ANY)

North Surface Impoundment - There have been no reported spill/release incidents at this basin.

South Surface Impoundment - There have been no reported spill/release incidents at this basin.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The original design and construction of the LGS impoundments were designed by a Professional Engineer, and was constructed under the supervision of a Professional Engineer.

Plant Construction history - The power plant was built in phases starting in 1948. The ponds as now configured were built in 1977. The plant was significantly enlarged in 1977 from a 38MW generation site to a 339 MW site in 1977. Today the plant generates 339 MW from four contributing boiler units.

Site Grading - The unnamed creek located along the western edge of Ash Pond 1 was relocated according to proposed expansion of the plant dated November 7, 1973 (Appendix A – Document 1.5). The drainage area into the creek is 190 acres and the peak 100 year flow was estimated to be 3300 CFS. The channel was designed for a 100 year velocity of 2.4 CFS and a depth of flow of 12.5 feet with side slopes of 3:1. The original creek was aligned with Ash Pond 1. So Ash Pond 1 is essentially a widened creek bed. The west side dikes were constructed as part of the relocation of the creek to create Ash Pond 1. At some point later the 14.8 acre pond was rebuilt so that the southerly 5.9 acres were channelized in a zip-zag formation to promote settling of the effluent. The present open pond area portion of the original settling pond is about 8.5 acres.

In 1973, the original plans included two drop structures, one 700 LF upstream of Power Plant Road and another near the confluence with the Mississippi River; the two drop structures were never constructed. Also the access road bridge was enlarged to today's box culvert replacing the originally proposed four, 12- foot CMP culverts. The two drop structures were replaced with the drop structure included in the access road box culvert (Power Plant Road).

Ash Pond 1 Surface Impoundment – The pond was constructed in 1976 on top of the existing creek bed. The bed was widened and 19 foot high dikes were constructed at 3:1 slopes with a 15 foot crest width. Fill was placed on the east side of Ash Pond 1 adjacent to high natural ground. This would classify Ash Pond 1 as a side-hill pond and incised partially to enlarge the volume and obtain fill for the west side dike. The soil is predominantly silty-clay according to the boring logs (Appendix A – Document 1.10). A bench on the west side of the pond formed the lowest elevation of the pond floor at approximately 630.0. The basin is lined with 1 foot of bentonite along the inside and outside slopes of the constructed dikes.

Ash Pond 2 Surface Impoundment – This pond serves somewhat as an energy absorbing "drop structure" pond allowing effluent to drop down 19 feet, then discharge into the Mississippi River. The basin is bounded on the south side by the access road (Power Plant Road) and on the other sides by a constructed 19 foot high dike also lined on the slopes with 1 foot of bentonite. From the 1973 plans, the lowest elevation of the pond floor is approximately 618.2, while the crest is at elevation 639.0 feet.

4.1.2 Significant Changes/Modifications in Design since Original Construction

There have been no significant alterations to the construction of the ponds, except the reconfiguration of the lower half of Ash Pond 1 to be a zigzag channel to allow for more settling of the effluent. This also allows the plant to excavate the settled ash from the channel. Culverts are added to the channel to further allow for more efficient settling of the ash.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

There has been no significant repairs/rehabilitation made to the ash ponds since the original construction in 1976.

4.2 SUMMARY OF OPERATIONAL HISTORY

4.2.1 Original Operational Procedures

The furnished documents do not include the original operational procedures. The Ash Pond 1 impoundment is designed and operated primarily for sedimentation of boiler slag and ash sluicing wastewaters. It is presumed that the original operation was much as it is today with respect to how the ash is transported and disposed, i.e., by sluicing with water into the basin where the ash particles are allowed to settle out.

4.2.2 Significant Changes in Operational Procedures since Original Startup

No documents were provided to indicate that basic operational procedures have significantly changed since original startup of Boiler Unit 4 in 1977. Dredging of the bottom and fly ash from Ash Pond 1 for beneficial reuse began when these rules were implemented by the IDNR. Ash not used in the beneficial reuse program is landfilled. The adjacent landfill has an estimated remaining volume of another 5 years according to LGS staff comments during the visit.

4.2.3 Current Operational Procedures

Ash Pond 1 Impoundment - In 2009, the South Ash Pond received about 5.6 million gallons per day of effluent from boiler Units 1-4 (339 MW), per the process diagram provided by IPL (Appendix A – Document 1.7).

Ash Pond 2 Impoundment- This pond does not treat the effluent as much as allows for a more efficient hydraulic connection to the Mississippi River.

4.2.4 Other Notable Events since Original Startup

Based on furnished information and discussions with staff, there are no other notable events since original startup of the ash ponds to report at this time.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Joseph P. Klein III, PE and Mark Hoskins, PE collected available data and documents and made field observations during a site visit on October 5, 2010, in company with the participants listed in Section 1.3. The design engineer of record for Ash Pond 1 and 2 was not present or available to assist with answering questions about these basins. The site visit began at 9:30 AM. Weather conditions during the visit were 70 degrees Fahrenheit, sunny, and dry. Photographs were taken of conditions observed. Additional site photographs referenced below are contained in Appendix B Document 1.12. Use the key map photo aerial to locate the photographs and angle of view.

The overall visual assessment is that the earthen embankments that impound Ash Ponds 1 and 2 are in good condition. **However, the heavy grouping of trees along the outer slope of the west berm of Ash Pond 1 (all along the unnamed creek) should be properly removed.** No other visual signs of imminent instability or inadequacy of the principal structures at these basins that would require emergency remedial action were observed. Due to the thick vegetative growth, some sections of the dike were generally inaccessible for close observation. There were no obvious indications of stability problems. There was some minor erosion adjacent to the zigzag channel within Ash Pond 1, yet this was probably areas recently excavated to remove settled ash.

The increased rainfall has kept elevations of the Mississippi River high through the 2010 summer and therefore during the visit the outfall culvert from Ash Pond 2 was submerged. Water was flowing into the Ash Pond 2 outfall culvert and appeared to be in good operating condition.

5.2 ASH POND 1

5.2.1 Embankment Dike and Basin Area

Crest - The west and north embankments forming Ash Pond 1 were constructed in 1977. The north embankment is the access road. The east and south embankments of Ash Pond 1 are incised into natural ground. The crest around all sides of Ash Pond 1 is accessible with automobiles except a portion of the east side.

No major depressions, sags, tension cracks or other signs of significant settlement or mass soil movement were observed. No tension cracks which might suggest soil shear failure were observed in the crest or along the edge of the crest.

Outside Slope and Toe - The outside slope and toe areas of the west embankment are generally overgrown with trees and small brush. See Figure 5.2.1-1. The west slope also has riprap cover and a foot of Bentonite.

Photograph 5.2.1-1. Pond 1 west side outside dike, looking east.

No significant erosion areas were observed. Generally on the west outside slope there was heavy tree growth and fairly thick undergrowth. Photograph 5.2.1-1 shows an area on the west outside slope of Pond 1. Rip rap was spread across the entire slope. No other obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes were observed. This area does not appear to have any seepage problems. The north side of the access road was generally grassed with some sections of tree growth.

Inside Slope and Basin Area - The inside slope of Ash Pond 1 are grassed and do not show signs of sloughing or erosion (see Figure 5.2.1-2). The channelized section that is designed for excavation of the ash material is generally bare soil and there is minor erosion adjacent to the channel. Culverts have been placed along the zigzag channelized section to help CCW solids settle.

Photograph 5.2.1-2 Pond 1 northwest corner inside dike, looking west.

No slumps, slides, or other signs of shear failure were observed in the visible parts of the slopes above the water level. No significant erosion was noted.

Abutments and Groin Areas - No erosion or displacements were observed where the cross dike ties in to the spoil bank. No erosion, displacements, or noticeable seepage (at outside contact) were observed where the east perimeter dike ties in to high ground at the north end.

5.2.2 Outlet Structures

Overflow Structure - The overflow structure for Ash Pond 1 is located on the north side of the impoundment, see Photograph 5.2.2-.1. The outfall structure is a grated concrete square weir inlet box with adjustable stop-logs. The concrete inlet box surrounding the inlet was observed to be in good condition. Water was flowing into the box during the visit. The outfall RCP culvert is a 24" RCP culvert.

Photograph 5.2.2-1. Pond 1 outfall structure, looking west.

Outlet Conduit - The outfall structure discharges flow from Ash Pond 1 to Ash Pond 2. There are no other outfall paths for Ash Pond 1.

Emergency Spillway - There is no emergency spillway.

Low Level Outlet - There is no low level outlet for Ash Pond 1.

5.3 ASH POND 2

5.3.1 Embankment Dike and Basin Area

Crest - The crest around the west north and east sides of Ash Pond 2 join into the access road. The crest around all sides of Ash Pond 2 is accessible with automobiles. Photograph 5.3.1-1 shows the grassed maintenance access road along the outside slope of the north dike of Ash Pond 2.

Photograph 5.3.1-1. Maintenance road along mid-slope of the embankment of the north dike of Pond 2.

No major depressions, sags, tension cracks or other signs of significant settlement or mass soil movement were observed.

Outside Slope and Toe - The outside slopes and toe areas are generally grassed with some brush growing along the embankment. No major depressions, sags, tension cracks or other signs of significant settlement or mass soil movement were observed.

There are no other obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes.

Inside Slope and Basin Area - The inside slope of Ash Pond 2 is grassed and does not show signs of sloughing or erosion.

No slumps, slides, or other signs of shear failure were observed in the visible parts of the slopes above the water level. No significant erosion was noted.

Abutments and Groin Areas - No erosion or displacements were observed where the cross dike ties in to the spoil bank. No erosion, displacements, or noticeable seepage (at outside contact) were observed where the east perimeter dike ties in to high ground at the north end.

5.3.2 Outlet Structures

Overflow Structure - The outlet structure from Ash Pond 2, see Photograph 5.3.2-1, discharges to a channel directly connected to the Mississippi River. The water from Ash Pond 2 flows over a 4 foot weir, (adjustable with stop-logs) then drops into a 24 inch CMP culvert that discharges into a channel directly connected to the Mississippi River.

Photograph 5.3.2-1. Pond 2 Outfall structure.

Outlet Conduit - The outlet conduit is a CMP culvert that is about 85 feet long with a concrete end section as detailed in Appendix A - Document 1.1 page 11. On October 5, 2010 the channel was under backwater from the Mississippi River and the crown of the downstream end of the 24 inch culvert was not visible. The crown elevation of the 24 inch CMP at the confluence with the channel is 621.75 feet (see construction drawing, Appendix A - Document 1.1).

Emergency Spillway - There is no emergency spillway.

Low Level Outlet - There is no low level outlet at the decant tower.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

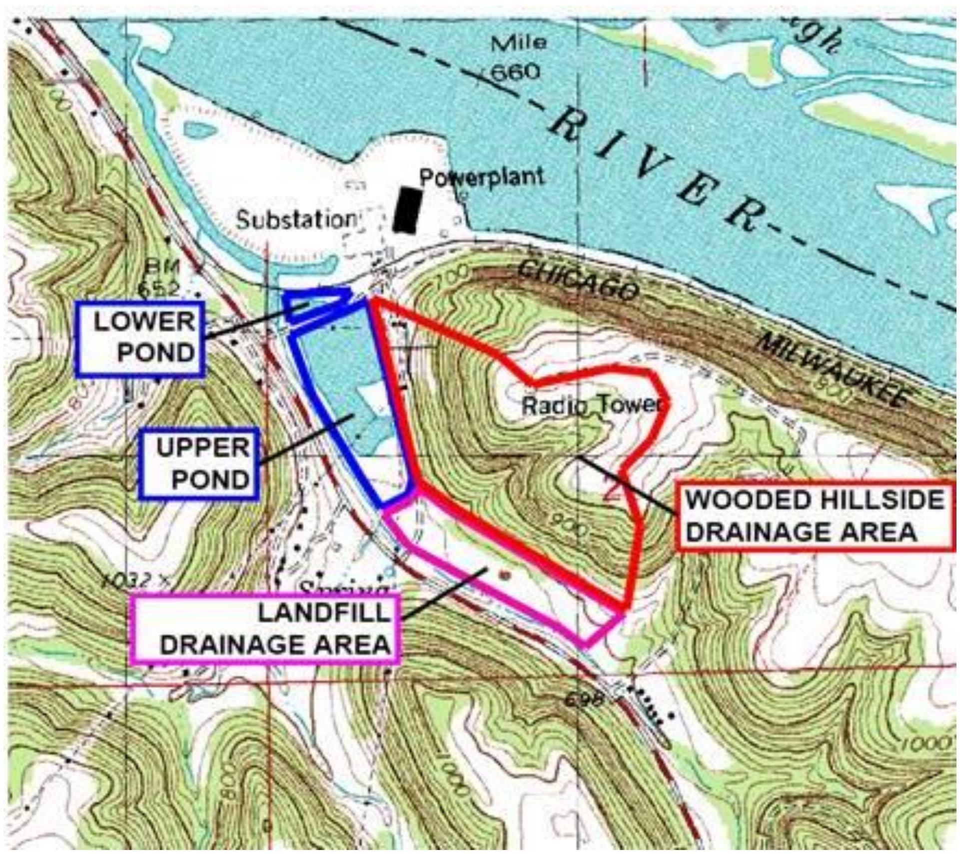
6.1.1 Floods of Record

Flood record information was not provided for these facilities.

6.1.2 Inflow Design Flood

A hydrologic and hydraulic analysis was provided by IPL that estimates runoff from offsite areas into the site pond system and estimates the outfall structure discharge rate and hydraulic grade for a 100 year 24 hour storm event. The outlined (Figure 6.1) wooded hillside is about 57 acres of wooded area, the landfill area is 15.6 acres and the ponds themselves are 15 acres.

Figure 6.1 Drainage basin areas.



The peak inflow from the adjacent and onsite basins is about 210 CFS which is routed through the storage of the two ponds. The ponds attenuate the inflow with an estimated discharge into the Mississippi River of 27 CFS with a peak Ash

Pond 1 elevation of 651.6 for the 100-year, 24-hour event (Appendix A – Document 1.1).

The provided analysis is only for the 10-year storm event, however the Iowa DNR Low Hazard Potential Classification freeboard design flood criterion is P100+0.12 (PMP-P100). For this site the rainfall would increase from 6.2 inches to about (6.2+0.12*(31-6.2) = 9.2 inches of rainfall in 24 hours.
The principal spillway design flood criterion is based on total drainage area to the pond. Low Hazard Dams with a drainage area less than 250 acres criterion for spillway design flood is 10-year frequency. In this case the spillway and outfall structure can handle about 45 CFS which is greater than the 100 year flow of about 27 CFS. If the Mississippi River is at the 50 year elevation then the tailwater elevation is at 630.2 and would only allow for a 27 CFS discharge which is roughly equal to the 100 year peak discharge. For typical FEMA floodplain mapping, a 10 year tailwater is estimated for the 100 year discharge into a much larger basin waterway (like the Mississippi River). Therefore, as submitted, the calculations for inflow and outflow discharge rates are SATISFACTORY.

6.1.3 Spillway Rating

Spillway rating curves are provided for both outfall structures. They are standard 4 foot long rectangular weirs (Appendix A – Document 1.1).

6.1.4 Downstream Flood Analysis

Dewberry has obtained the effective FEMA flood elevations (near river mile 669.0) for the Mississippi River adjacent to the site, see Appendix A Document 1.8 and 1.9. The elevations are provided below:

50 year	630.2 feet
100 year	635.0 feet
500 year	637.2 feet

At the time of the visit the downstream outfall discharge pipe was submerged placing the Mississippi River elevation somewhere between 621 and 623 feet. The bottom elevation of Ash Pond 2 is 620 per the construction plans (Appendix A Document 1.6). The top of dike elevation for Ash Pond 2 is 639 feet which will prevent overtopping by the Mississippi River during the 100 and 500 year events.

<u>Ash Pond 1 Potential Failure</u> - A breach of the west side dike would release water into the adjacent unnamed creek and could release a volume of ash into the adjacent creek which discharges into the Mississippi River. Although construction plans (Appendix A -Document 1.6) show that the bottom of Ash Pond 1 is several feet below the bottom of the constructed embankment the

normal pool elevation of 650 Ft. Failure or misoperation of the embankment could result in a release of water and suspended ash into the adjacent creek.

IPL owns the land that includes the creek that is located at the toe of the west dike, so impoundment discharge due to a failure or misoperation of the dike would result in a discharge onto land owned by IPL. However, as the creek discharges to the Mississippi River about ½-miles from the impoundment, some unsettled ash may reach the river.

Ash Pond 2 Potential Failure - A breach of the north dike could cause effluent to flow over the railroad tracks and into the coal pile. There is a small volume of water within Ash Pond 2 so damage impacts should be minimal.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

The provided hydrologic and hydraulic analysis considers the impact of a single event 100-year, 24-hour storm on Ash Pond 1. The calculation considers offsite flow into the pond and inflow from the southerly adjacent landfill and plant effluent. The analysis considers that the outflow of Ash Pond 2 can meet the peak discharge of Ash Pond 1. The calculations show that Ash Pond 1 available storage can attenuate the inflow from offsite and plant discharges for the 100-year, 24-hour event.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Ash Pond Dike Embankments 1 and 2 – As noted above, the ability of the ponds to safely store and pass the appropriate design flood has been demonstrated through documented analysis.

Since 1977, there have not been any instances of pond effluent discharges during significant flooding events. The ponds appear to meet accepted safety criteria.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

The stability analysis document (Appendix A – Document 1.2) from Sargent & Lundy concludes that the Static, Seismic and Rapid Drawdown analysis are within the factors of safety for the dike embankments located along Ash Ponds 1 and 2. The slope stability analysis was performed using the SLOPE/W computer program version 5.11. For the slope stability analysis a large number of slip lanes were generated and a factor of safety (FS) was determined for each plane. Potential slip circles were analyzed using the Simplified Bishop Method. The minimum acceptable FS values for the static, seismic and rapid drawdown conditions were analyzed in these calculations. The results are summarized in Section 7.1.4.

IPL has provided a slope stability analysis for the south dike of Ash Pond 2 that considers failure by static, rapid drawdown and seismic conditions. This dike appears to be stable according to the report.

7.1.2 Design Parameters and Dike Construction Materials

The June 1973 soil borings for the dikes (Appendix A – Document 1.10) taken to a total depth of 25-48 feet, highlight a sandy clay material for the first 25 feet then transitioning into a sandy layer with occasional gravel. There is a sandy layer about 8 feet down for some borings. Borings 9 and 10 show a sandy layer with some silt down to 25 feet.

The soil conditions shown in borings A-5 and A-6 (Appendix A – Document 1.10) were considered as generally representative of the natural soils beneath the dike. The soils encountered in these borings consist of, from top to bottom:

1. Sandy/Clayey silt named as the Upper Silt/Sand (10 to 18 feet thick), and
2. Gravelly sand with little silt, named as the Lower Silt/Sand.

Sandstone bedrock was encountered in D-1 and D-2 at El. 564 feet and 561 feet, respectively. In both borings, below approximately El. 597 feet, a sandy clay layer was encountered. However, because of its depth and the generally granular nature of the soils above it, this layer does not influence the stability of the dike. Rock parameters were selected by engineering judgment. Therefore, the soil profile between the bottom of the Upper Silt/Sand and the bedrock was not further subdivided into two layers and was considered to consist of the Lower Silt/Sand. In-situ soils to the approximate elevation of 614 feet have SPT Blow Counts (N-

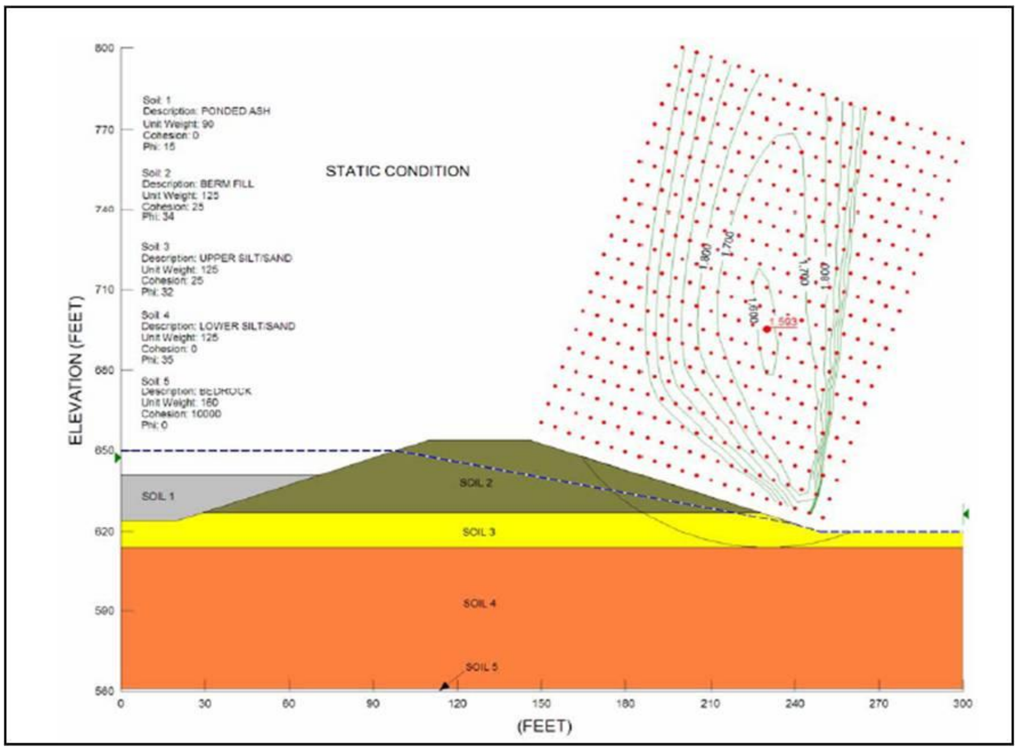
Values) below 10 Blows/ft. Below this depth, the N-Values increase significantly (approximately 20 Blows/ft).

Based on this distinction, the boundary between the Upper and Lower Silt/Sand was placed at this elevation for analysis purposes. The internal friction angle of both materials (32 degrees for the Upper Silt/Sand, and 35 degrees for the Lower Silt/Sand) was estimated using the average N-Values in each layer (Bowles, J.E. (1996) Foundation Analysis and Design, 5th Edition, McGraw Hill).

Table 7.1 Estimated Soil Parameters for each Soil Layer

Material	Legend on Figures 3,4,5	Unit Weight (lb/ft^3)	Friction Angle, φ' (Degrees)	Cohesion, c' (lb/ft^2)
Pond Ash	SOIL 1	90	15	0
Dike Fill	SOIL 2	125	34	25
Upper Silt/Sand	SOIL 3	125	32	25
Lower Silt/Sand	SOIL 4	125	35	0
Bedrock	SOIL 5	160	0	10000

Figure 7.2 Static Conditions modeling using SLOPE/W



7.1.3 Uplift and/or Phreatic Surface Assumptions

The phreatic surface assumptions are outlined below for both the static and rapid drawdown conditions. These assumptions are taken from the attached report (Appendix A – Document 1.1)

Static Analysis - The full pond (upstream water level at El. 650 feet) condition was used for the static analysis. A well established water surface (phreatic line) within the dike was also considered. This line started at El. 650 feet at the upstream side, and terminated at approximately El. 623 feet based on a visual evaluation of the wet zone on the downstream side of the dike (S&L examination of the pond dikes on 10/12/2010) (Appendix A – Document 1.2). Only the downstream slope of the dike was evaluated for long-term stability. The output of the analysis for this condition is shown on Figure 7.2, and associated estimated soil parameters for each soil layer are shown in Table 7.1. The level of the ash within the pond does not affect the stability of the downstream face of the dike for the static condition.

Rapid Drawdown Analysis - A rapid lowering of the water level inside the pond due to controlled or uncontrolled operational conditions may create potential instability for the upstream slope of the dike. For the rapid drawdown scenario, the pond water level was considered to be at El. 650 feet. The final pond water level that would cause the FS to drop to approximately 1.2 was determined by trial and error by varying the surface elevation of the pond ash and the water level inside the pond. This condition was achieved at El. 635 feet. At the present time, the pond ash surface is at the approximate elevation of 641 feet. Due to support provided by an additional six (6) feet of ash (El 635 to El. 641), the actual rapid drawdown FS is greater than 1.2. The pond ash levels should be maintained at El 635 feet or higher to avoid potential instability of the upstream face of the dike in the event of a rapid drawdown incidence.

7.1.4 Factors of Safety and Base Stresses

Static Analysis - The minimum FS obtained with the established phreatic surface within the dike was 1.59 (Figure 3). This value exceeds the minimum acceptable FS of 1.5 and is acceptable.

Seismic Analysis - The minimum FS obtained from the pseudo-static seismic analysis was 1.53 (Figure 4). This value exceeds the minimum acceptable FS of 1.15 and is acceptable.

Rapid Drawdown Analysis - The minimum FS obtained from the sudden drawdown condition was 1.22 (Figure 5) with the pond ash level at El. 635 feet. This value is within the acceptable minimum FS range of 1.1 to 1.3. At pond ash levels higher than El. 635, the FS will exceed 1.22.

7.1.5 Liquefaction Potential

The liquefaction potential for this site is low as related to the potential for seismic activity as discussed in the attached Sargent & Lundy report. The seismic slope stability analysis was performed using a horizontal acceleration coefficient. This coefficient represents the fraction of the gravitational acceleration applied horizontally to the soil mass directed away from the slope to approximate the lateral forces on the dike mass that occur during an earthquake. The peak bedrock acceleration for 10-percent non-exceedance level for a 50-year period earthquake was obtained from the U.S. Geological Survey (USGS) earthquake hazards web site (USGS Web Site http://gldims.cr.usgs.gov/website/nshmp2008/viewer.htm (National Seismic Hazard Maps – 2008).) and the USGS Open File Report 2008-1128 as 1.1 percent of the gravitational acceleration (0.011g). This is a small value, and does not affect the slope stability to any significant extent. For the seismic condition, the downstream slope of the dike is more critical, and the seismic stability analysis was performed for the downstream slope only.

7.1.6 Critical Geological Conditions

No documentation of critical geologic conditions was provided for review.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is adequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Based on the provided material, the structural stability of Ash Pond 1 and Ash Pond 2 is rated as SATISFACTORY.

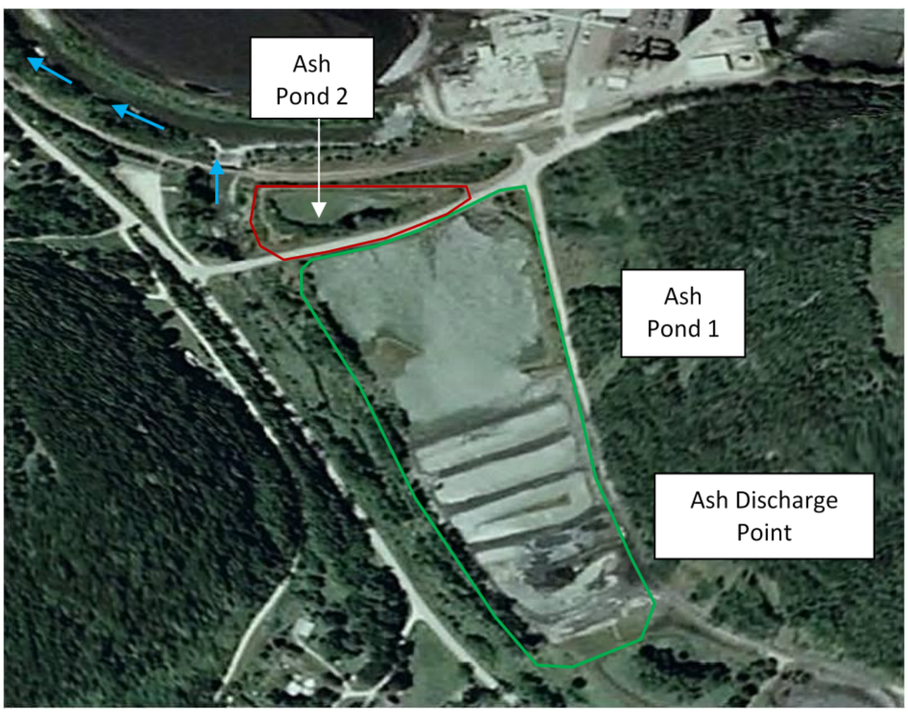
8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

Ash Pond 1 receives bottom and fly ash at the most southerly portion of the pond. As the effluent flows northward through the channelized portion of the pond, the ash settles and is periodically excavated. Other plant effluent is also discharged including boiler wash water, plant site storm water runoff from the land fill, cooling tower blow down, plant floor drains. Other plant wastewaters discharged into Ash Pond 1 for treatment including the following: non-chemical boiler and turbine wash and rinsate waters, boiler blow-down, steam grade water production wastewaters, plant floor drains and storm water runoff from the landfill (see Figure 8.1).

Wet ash is excavated and mounded on the south side of the impoundment as the primary settling basin. Ash transport water flows to the north, into the Ash Pond 1 intake structure and discharged into Ash Pond 2. Power Pant road forms the crest of the dike between the two ponds. The smaller Ash Pond 2 then discharges into an adjacent channel that directly connects to the Mississippi River.

Figure 8.1 Lansing Site Aerial Site Plan



8.2 MAINTENANCE OF THE DIKE AND PROJECT FACILITIES

Documentation of an operations and maintenance plan was not provided to Dewberry for review. Based on observations made during the site visit, the Ash Pond 1 west side dike needs to have many trees removed along the outside slope and toe. The easterly portion of the dike appears to be in good condition. The southerly side is adjacent to the landfill and receives runoff from the landfill through a 24 -inch CMP culvert that discharges directly into the pond.

The channelized portion of the pond has many points were the channel has been recently excavated to remove the fly ash sediment. The channelized sections are connected with 24 inch CMP culverts that also include sediment barriers at their upstream end to promote particulate settling.

In general the Ash Pond 1 inside slope banks are in good condition. The crest access roadway is passable for vehicles along the west dike. The west side outside slope has numerous 3-6 inch trees along the 1500-foot long reach that need to be removed. Removal was recommended by an IPL GENCO pond inspection report written on April 2009. The original rip rap is also still in place along the outside slope, which can hinder slope maintenance, particularly mowing operations

Ash Pond 2 is in good condition with weeds and brushy vegetation growing along the inside and outside slopes. The crest roadway was clear and well maintained. The outfall structure was clear of debris and vegetation. Water was seen discharging out from the structure.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

Although the current maintenance program appears to be adequate for the site, several recommendations are provided to improve maintenance and ensure a trouble free operation:

- Develop a written operations and maintenance plan
- Remove trees from dike embankments for both Ash Ponds

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Surveillance procedures are specified in the IPL Energy "GENCO Standard Guide for Pond Inspections, Procedure No. GENCO-0-OP-402-01" dated April 30, 2009 (See Appendix A – Document 1.3.1). The program requirements include:

- Inspections by knowledgeable plant personnel at intervals determined based on physical construction and arrangement, and local operating conditions, including spring snow melt and flooding. Inspections must be conducted at least annually.
- Additional corporate environmental staff pond inspection conducted a minimum of once per year.

9.2 INSTRUMENTATION MONITORING

Neither Ash Pond 1 or Ash Pond 2 embankments have an instrumentation monitoring system.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, observations made during the site visit, and the size of the embankments, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

No instrumentation is present at either the Ash Pond 1 or ash Pond 2 dikes.

Based on the size of the embankments, the current inspection program, and the observations made during the site visit, an embankment monitoring program is not needed at this time.

APPENDIX A

Document 1.1
Hydrologic and Hydraulic
100 Year Storm Analysis

26 pages

ISSUE SUMMARY

Form SOP-0402-07, Revision 8

DESIGN CONTROL SUMMARY

CLIENT: Alliant Energy — UNIT NO.: N/A — PAGE NO.: 1

PROJECT NAME: **Lansing Power Station**

PROJECT NO.: 12093-025

CALC. NO.: LANS-C-001

S&L NUCLEAR QA PROGRAM APPLICABLE ☐ YES ☒ NO

TITLE: Hydrologic and Hydraulic Analysis of Ash Ponds during the 100-year Storm

EQUIPMENT NO.: N/A

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

Pages 1 through 9
Attachments A through G (17 pages)
Total Pages = 26

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TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE

The purpose of the calculation is to determine the capacity of the existing ash ponds at Lansing Power Station during the design storm (100-year rainfall). There are two ash ponds on the south side of the plant, designated as the upper ash pond and the ash lower pond. The upper pond collects runoff from the upstream drainage area and discharges to the lower pond, which discharges to a channel connected to Mississippi River. The 100-year, 24-hour runoff is routed through the upper pond under normal operating conditions to determine the maximum water level in the pond and the peak discharge from the pond.

2.0 DESIGN INPUT

2.1 The 100-year, 24-hour storm precipitation is 6.2 inches (Reference 1). The NRCS Type 2 storm distribution is applied to create a rainfall hyetograph (Reference 2).

2.2 Pond characteristics (Attachment A, Reference 3)
Upper Pond :
- Top of berm elevation = 654 feet
- Bottom elevation = 624 feet
- Discharge weir length = 4 feet
- Outlet pipe length = 154 feet

Lower Pond:
- Top of berm elevation = 639 feet
- Bottom elevation = 620 feet
- Discharge weir length = 4 feet
- Outlet pipe length = 77 feet

2.3 Manning's roughness coefficient (n) for the outlet pipe is 0.025 (corrugated metal pipe, Reference 4)

2.4 Curve number (CN) values from Reference 2 were assigned to the following contributing drainage areas based on information gathered during a site visit and soil data (Reference 5):
- Wooded Hillside CN = 60 (Good Hydrologic Condition, Hydrologic Soil Group B corresponds to a CN of 55; however, the hillside slope is steep, so the CN was increased to account for increased runoff due to the steep slope)
- Landfill Area CN = 86 (Bare Soil, Hydrologic Soil Group B)

3.0 ASSUMPTIONS

3.1 Time of concentration for entire contributing drainage area is assumed to be 0.2 hours.

3.2 The surface area of the upper pond is 644,888 square feet, as provided during a site visit to Lansing Power Station (Reference 6). The pond surface area is reduced by 15 percent to account for interior dikes. It is assumed that the interior dikes will not impede the flow of runoff through the pond (unverified).

3.3 Pond side slopes are assumed to be 3 Horizontal to 1 Vertical (3H:1V).

3.4 The following initial conditions are assumed for pond routing:
- Top of log elevation (weir crest) in upper pond = 650 feet (unverified)
- Initial water level in upper pond = 650 feet (assumed normal water level in the upper pond based on information provided during a site visit, Reference 6)

- Water level in lower pond = 636 feet (assumed maximum water level with freeboard in the lower pond)
- Tailwater downstream of the lower pond = 620 feet (based on the flat pool elevation in the Mississippi River at the Lansing, IA gaging station, Reference 7)

3.5 The plant process water flowrate under normal operating conditions is assumed to be constant and flows into the pond at approximately 5.575 MGD = 8.6 cfs (Attachment B).

4.0 METHODOLOGY AND ACCEPTANCE CRITERIA

Pond routing is based on the total inflow minus the total outflow is equal to the change in storage for any time interval. Inflows to the pond include direct precipitation, surface runoff from contributing drainage areas, and process water from the plant. Rainfall data for the 100-year, 24-hour storm event was converted into a hyetograph using the NRCS Type 2 storm distribution. NRCS TR-55 methodology is used to characterize the drainage areas and determine the runoff hydrograph. Outflow from the pond is controlled by an outlet structure containing stop logs that act as an overflow weir and a 2-foot diameter outlet pipe.

The following acceptance criteria is used for the ash ponds:

- the upper pond shall collect and convey the 100-year, 24-hour storm event while maintaining adequate freeboard
- the lower pond shall discharge the maximum outflow from the upper pond without overtopping

5.0 CALCULATIONS

5.1 Pond

The stage-storage relationship for the upper pond is established based on assumptions 3.2 and 3.3 and is presented in Attachment C. For pond routing, only the storage capacity above the weir crest or top elevation of the stop logs is considered.

5.2 Drainage Areas

The contributing drainage areas were delineated using topographic maps (Reference 8). The drainage area boundaries are presented in Attachment B.

	Area (acres)	**CN**
Wooded Hillside	57.4	60
Landfill Area	15.6	86
Total	73.0	65.6 (Composite CN)

5.3 Precipitation

The 100-year, 24-hour rainfall depth is 6.2 inches. The NRCS Type 2 storm distribution is used to create a rainfall hyetograph with the following equation (Reference 9):

$$\frac{P_t}{P_{24}} = 0.5 + \left(\frac{t-12}{24}\right)\left(\frac{24.04}{2\times\left|t-12\right|+0.04}\right)^{0.75}$$

Where:

t = time (hrs)
P_t = cumulative rainfall at time t (in)
P_{24} = total rainfall for 24-hour storm event (in)

5.4 Inflow hydrograph

The NRCS Tabular Method is used to develop the inflow hydrograph. The tabular hydrograph from Exhibit 5-II in Reference 2 is selected based on a time of concentration of 0.2 hours and a travel time of 0 hours. According to Reference 2, interpolation based on the Ia/P parameter is acceptable; therefore, the ordinates for Ia/P=0.1 and Ia/P=0.3 were interpolated to find the ordinates for Ia/P=0.17. The inflow hydrograph is developed using the following equation (Reference 2) and is presented in Attachment E:

$$q = q_t \times A_m \times Q$$

Where:

q = hydrograph ordinate at time t (cfs)
q_t = tablular hydrograph unit discharge (cfs/mi^2/inch of runoff)
A_m = drainage area (mi^2)
Q = total runoff (in) = $\frac{(P-0.2S)^2}{(P+0.8S)}$
P = total rainfall (in)
$S = \frac{1000}{CN} - 10$

5.5 Outlet Discharge Rating Curve and Stage-Discharge Relationship

Water is discharged from the pond through a discharge structure consisting of stop logs. The flow over the stop logs discharges through a 2 foot diameter corrugated metal pipe. Depending on the water level in the pond, the outflow is controlled by the smaller of the flow value of either the weir flow or flow through the pipe. A compound rating curve is developed for the outflow from the pond.

Flow over the weir is characterized using the following equation (Reference 4)

$$Q_w = C \times L \times H^{3/2}$$

Where:

Q_w = flow over the weir (cfs)
C = coefficient of discharge = 3.3
L = length of weir = 4 ft
H = head above the weir (ft)

Flow through the pipe is characterized according to the head differential at the upstream and downstream ends of the pipe and headloss through the pipe. The head differential is equal to the total headloss, which is the sum of friction losses, pipe entrance losses and pipe exit losses. This relationship is defined by the following equation (Reference 4).

$$\Delta h = \frac{fLV^2}{2gD} + 0.5\frac{V^2}{2g} + \frac{V^2}{2g}$$

Where:

Δh = differential head across the pipe (ft)
g = gravitational constant = 32.2 ft/s^2
D = diameter of the pipe (ft)
L = length of the pipe (ft)
V = velocity of flow through the pipe (ft/s)
f = friction factor = $\frac{185n^2}{D^{1/3}}$
n = Manning's roughness coefficient = 0.025

This equation is solved to find velocity, which is multiplied by the flow area in the pipe to get a flowrate. The compound rating curve is presented in Attachment F.

5.6 Pond Routing

For a given time interval, the sum of inflows minus the sum of outflows is equal to the change in storage in the pond. The fundamental relationship for reservoir routing is given by the following equation (Reference 10):

$$t\left(\frac{I_1 + I_2}{2}\right) - t\left(\frac{O_1 + O_2}{2}\right) = S_2 - S_1$$

Where:

I = inflow rate (cfs)
O = outflow rate (cfs)
S = storage volume (ft^3)
t = duration of the time interval (sec)
subscripts $_1$ and $_2$ denote the beginning and the end of the time interval, respectively

The above equation was modified to account for each inflow into and the outflow from the upper pond and is rearranged so that all know values are on the left side of the equation, as follows:

$$p_t + w \times t + t\left(\frac{q_i + q_f}{2}\right) + S_i - \frac{t}{2}O_i = S_f + \frac{t}{2}O_f$$

Where:

p_t = the incremental volume of direct precipitation on the pond (ft^3)
w = plant process water flowrate (cfs)
t = duration of the time interval (sec)
q_i = runoff inflow at the beginning of the time interval (cfs)
q_f = runoff inflow at the end of the time interval (cfs)
O_i = outflow at the beginning of the time interval (cfs)
O_f = outflow at the end of the time interval (cfs)
S_i = storage at the beginning of the time interval (ft^3)
S_f = storage at the end of the time interval (ft^3)

Using the stage-storage and rating curve information previously established, a relationship between storage and outflow is developed to solve for the terms on the right side of the equation. The pond routing table and the storage-outflow relationship are presented in Attachment G.

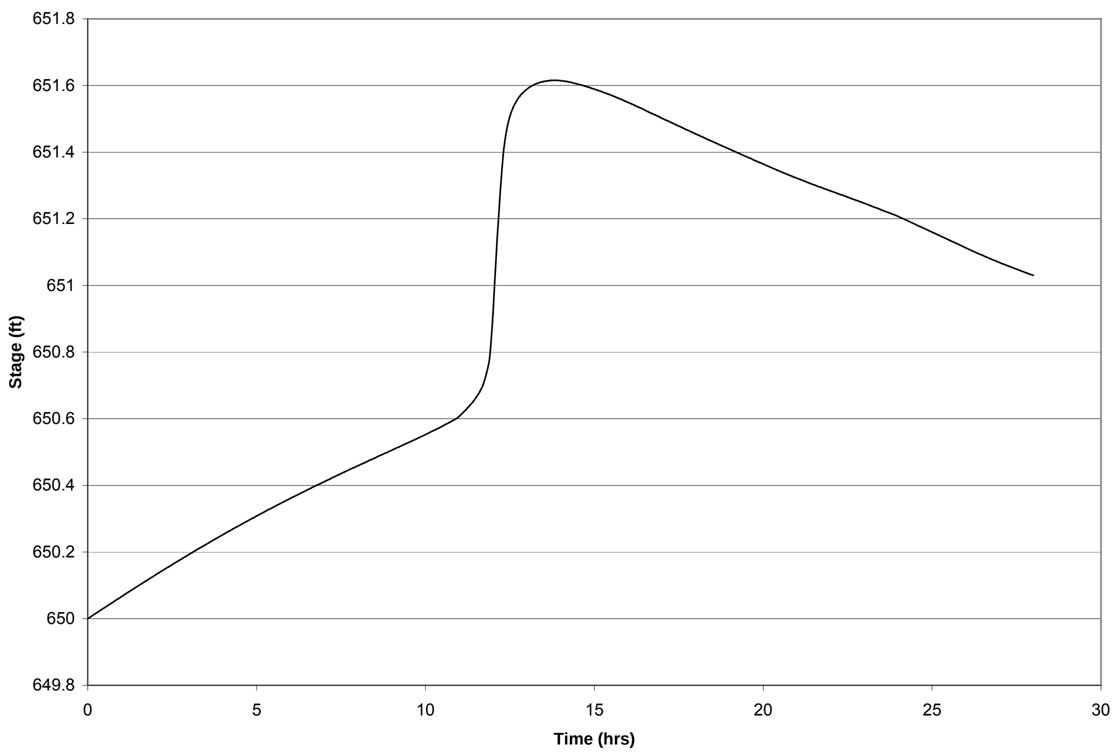
Pond routing is not performed on the lower pond due to its limited storage capacity. Instead, it is assumed that discharge from the upper pond flows through the lower pond. Therefore, the maximum potential discharge from the lower pond must be greater than the maximum discharge from the upper pond. Maximum discharge from the lower pond outlet is estimated to be 45 cfs using the pipe flow equation modified from Section 5.5 as presented below:

$$Q = A\sqrt{\frac{2g\Delta h}{\frac{fL}{D}+1.5}} = 3.14\sqrt{\frac{2\times 32.2\times(636-620)}{\frac{0.09\times 77}{2}+1.5}} = 45 \text{ cfs}$$

6.0 RESULTS AND CONCLUSIONS

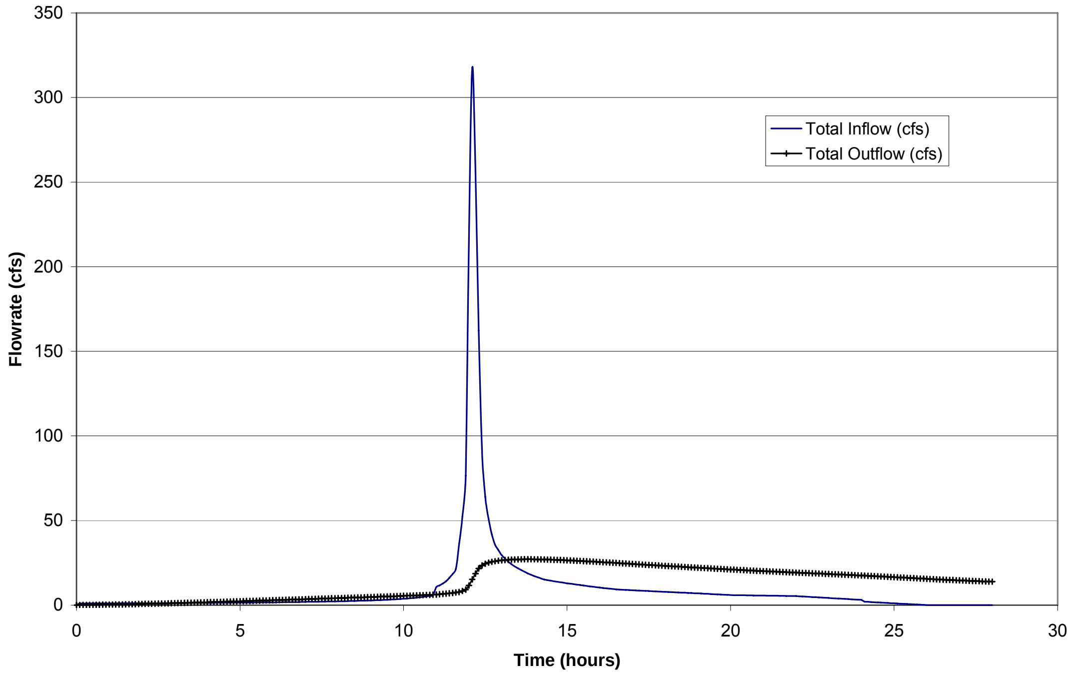
The maximum water level in the upper pond during the 100-year, 24-hour storm is 651.6 feet. The 2.4-foot freeboard is considered adequate. A plot of stage versus time is presented in Figure 1.

Figure 1: Upper Pond Stage vs Time



The maximum discharge from the upper pond is 27.1 cfs. The inflow-outflow hydrographs for the pond are presented in Figure 2. The lower pond has the capacity to pass flows up to 45 cfs and therefore is able to pass the maximum discharge from the upper pond.

Figure 2: Inflow and Outflow Hydrographs for the Upper Pond



Based on these results, the Lansing Generating Station ash ponds meet the acceptance criteria. Additional storm water storage in the upper pond may be obtained by removing additional stop logs to lower the operating water level in the pond.

7.0 REFERENCES

1. U.S. Department of Commerce, Weather Bureau. Technical Paper No. 40: Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years. Washington, D.C.: 1961.

2. Natural Resources Conservation Service. Technical Report No. 55: Urban Hydrology for Small Watersheds. Washington, D.C.: U.S. Department of Agriculture, NRCS, 1986.

3. Ash Pond Outlet Drawings (Attachment A):
   - Drawing No. S-213, Revision E. Weir Box No. 1 and No. 2 – Plan Sections and Details Ash Settling Basin, Lansing Power Station Unit 4. Dated 02/25/1975.
   - Drawing No. S-214, Revision E. Weir Box No. 3 – Plan and Sections Ash Settling Basin, Lansing Power Station Unit 4. Dated 01/30/1976.

4. King, H.W. and Brater, E.F. Handbook of Hydraulics, Fifth Edition. McGraw-Hill. 1963.

5. Natural Resources Conservation Service: Allamakee County, Iowa Soil Survey. Version 14, Mar 10, 2009. NRCS Web Soil Survey: http://websoilsurvey.nrcs.usda.gov (accessed October 19, 2010)

6. Personal communication with Andrew Johnson during site visit to Lansing Power Station on October 12, 2010.

7. U.S. Army Corps of Engineers: St. Paul District. Upper Mississippi River Gage Information. http://www.mvp-wc.usace.army.mil (accessed October 25, 2010)

8. U.S. Geological Survey. Lansing quadrangle, Iowa-Wisconsin [map]. 1:24,000. 7.5 Minute Series. Reston, Va: United States Department of the Interior, USGS, 1983.

9. Haan, C.T., et al. Design Hydrology and Sedimentology for Small Catchments. Academic Press, 1994.

10. Chow, Ven Te. Handbook of Applied Hydrology. McGraw-Hill. 1964.

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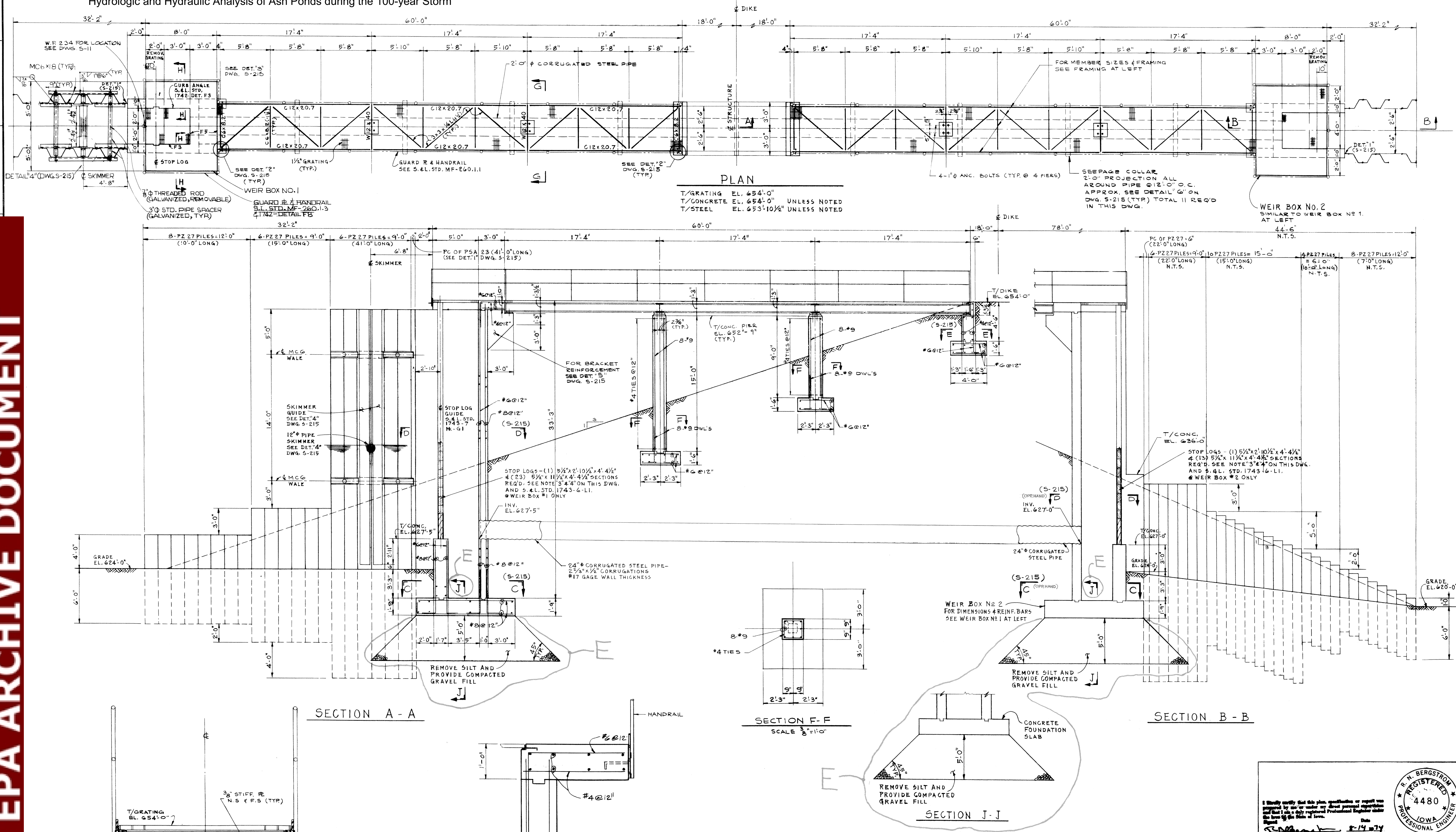
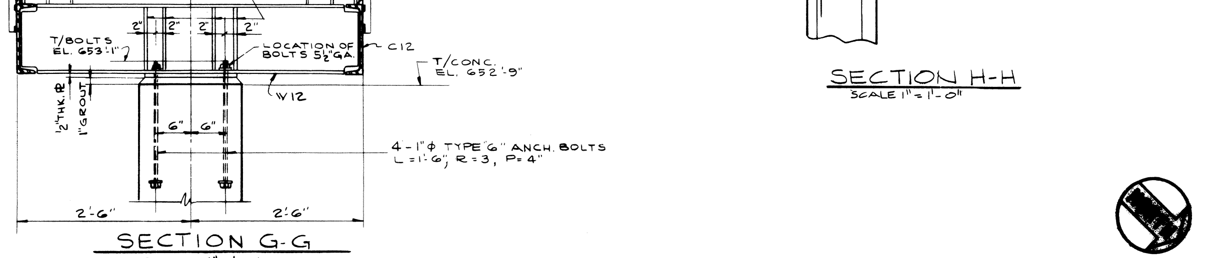




NOTES	
1.	FOR GENERAL NOTES SEE DWG. S-
2.	ALL GRATINGS, CURB ANGLES, HANDRAIL & HANDRAIL POSTS SHALL BE GALVANIZED.
3.	STOP LOG TIMBER SHALL BE - DENSE SELECTED STRUCTURAL GRADE DOUGLAS-FIR AND BE TREATED WITH CREOSOTE PRESERVATIVE, 1" MIN. PENETRATION & CREOSOTE RETENTION OF 8.0 LBS PER CUBIC FOOT.
4.	FURNISH ONE "SECTION" OF STOP LOG WHICH CONSISTS OF 3-5½"x11½" WIDE TIMBERS FASTENED TOGETHER AS A UNIT AS INDICATED IN S.&L. STD. DWG. 1743-6 FOR BOTTOM PART OF EACH "SET". COAT HEAVILY WITH BITUMINOUS PAINT BETWEEN TIMBERS. FURNISH SINGLE 5½"x11½" WIDE STOP LOGS FOR ALL OTHERS.

REFERENCE DRAWINGS	
S-215	WEIR BOX Nº1, Nº2 & Nº3 - SECTIONS & DETAILS

Drawing Release Record

Rev.	Date	Init.	Description
	3-28-74	ASC	FOR MATERIAL ONLY
A	8-28-74	ASC	FOR CONSTRUCTION
B	9-5-74	ASC	STOP LOGS CHG'D
C	9-25-74		DIMENSIONS CHANGED
D	7-7-75	ASC	REV. ELEVATIONS REV. PILING
E	2-25-75		COMPACTED GRAVEL FILL ADDED

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.
Signed R. N. Bergstrom Date 8-14-1974
R. N. Bergstrom, P.E. Iowa Reg. No. 4480

R. N. BERGSTROM REGISTERED 4480 IOWA PROFESSIONAL ENGINEER

WEIR BOX NO.1 & NO.2 - PLAN SECTIONS & DETAILS ASH SETTLING BASIN

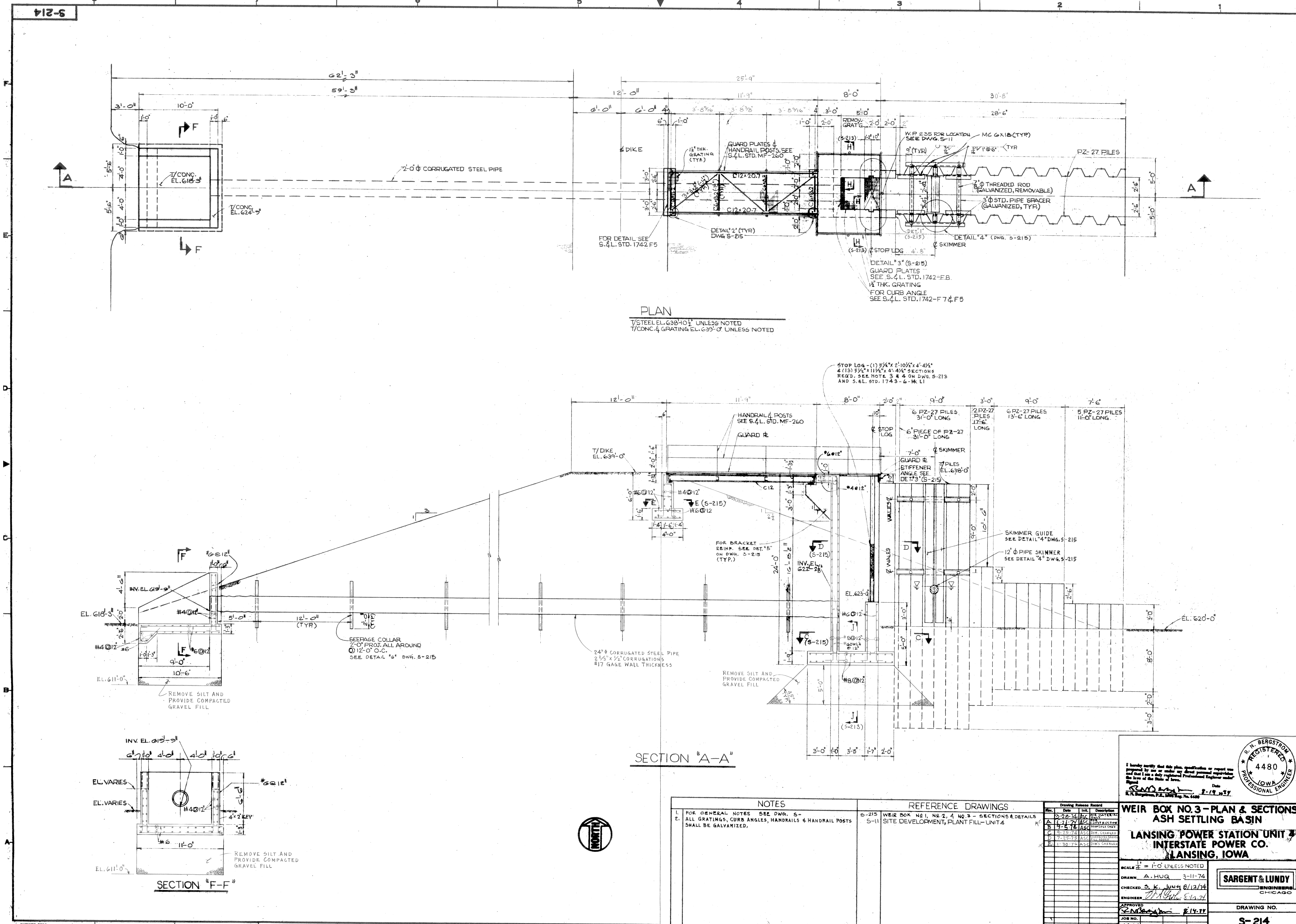
LANSING POWER STATION UNIT 4
INTERSTATE POWER CO.
LANSING, IOWA

SCALE ¼"=1'-0" UNLESS NOTED
DRAWN S.J.C. 12-13-73
CHECKED S. K. JUNG 8/12/74
ENGINEER 8-12-74
APPROVED 8.14.74
JOB NO. 4644

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. S-213

CONFIDENTIAL BUSINESS INFORMATION



PROCESS FLOW INFORMATION

{In Archive} Fw: Process flow rate Lansing Iowa

BRIAN A KRAMERIC to: DANIEL C KOCUNIK, JOSEPH M PODGE 10/14/2010 01:12 PM

History: This message has been forwarded.
Archive: This message is being viewed in an archive.

The attachment on the bottom is new

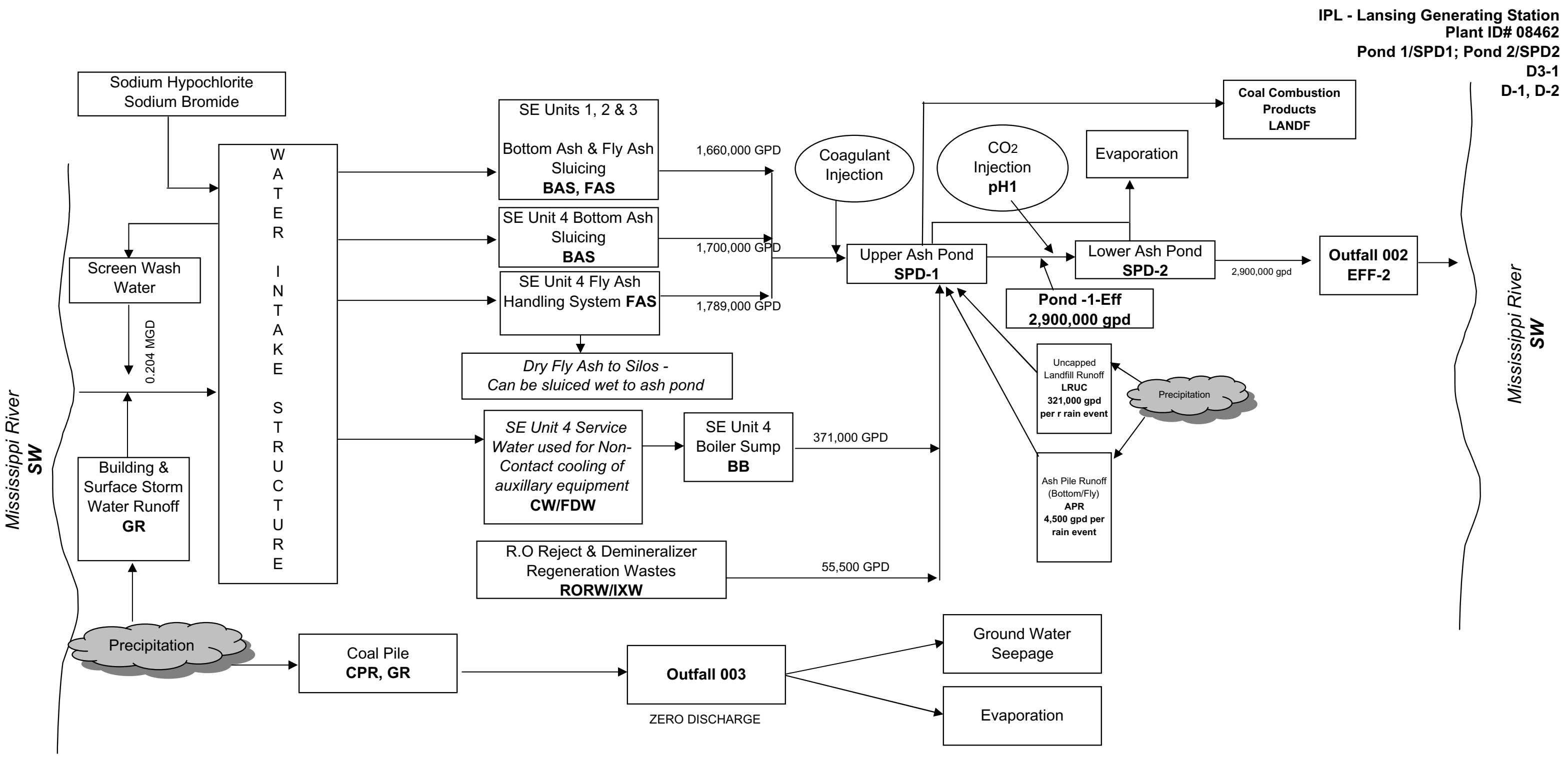
bak

----- Forwarded by BRIAN A KRAMERIC/Sargentlundy on 10/14/2010 01:10 PM -----

From: "Johnson, Andrew" <AndrewJohnson@alliantenergy.com>
To: <BRIAN.A.KRAMERIC@sargentlundy.com>
Date: 10/14/2010 11:42 AM
Subject: Process flow rate Lannsing Iowa

bak LAN D3-1 D-1 and D-2.pdf

CONFIDENTIAL BUSINESS INFORMATION



Upper Pond Stage-Storage Relationship

Table 1: Stage-Storage Calculation for Upper Pond from Elevation 641 feet to 654 feet

Water Surface Elevation	Surface Area [(1)]	Surface Area Reduced 15% [(2)]	Incremental Volume [(3)]	Cumulative Volume
(ft)	(sq ft)	(sq ft)	(cu ft)	(cu ft)
654	644888	548154.8	543139	6335035
653	633104	538138.4	533400	5791896
652	621972	528676.2	523969	5258496
651	610913	519276.05	514600	4734527
650	599927	509937.95	505292	4219927
649 [(5)]	589013	500661.05	496047	3714635
648	578173	491447.05	486863	3218588
647	567405	482294.25	477741	2731725
646	556709	473202.65	468652	2253984
645	546019	464116.15	459654	1785332
644	535537	455206.45	450746	1325678
643	525060	446301	441872	874932
642	514656	437457.6	433060	433060
641 [(4)]	504325	428676.25	0	0

Notes:

(1) Surface area of 644,888 square feet was provided by Alliant Energy during a site trip (Reference 6). Surface areas at lower water surface elevations are estimated assuming 3H:1V pond side slopes.

(2) The surface area of the pond is reduced by 15 percent to account for interior dikes.

(3) The following equation for the volume of a truncated pyramid is used to determine incremental volume between any two water surface elevations:

$$V = \frac{1}{3} \times h \times \left(A_1 + A_2 + \sqrt{A_1 \times A_2} \right)$$

Where:

V = Volume (cubic feet)
A_1 = Surface Area at Elevation 1 (square feet)
A_2 = Surface Area at Elevation 2 (square feet)
h = Difference between Elevation 1 and Elevation 2 (feet)

(4) Although the design drawings show the bottom of pond elevation at 624 feet (Reference 3) the top of the ash storage is considered to be at elevation 641, based on information obtained during a site visit (Reference 6).

(5) The volume below the top of stop log elevation is considered to be zero for pond routing. Refer to Table 2 for the stage-storage data used for pond routing.

Table 2: Stage-Storage Data above Stop Log Top Elevation for Upper Pond

Water Surface Elevation	Incremental Volume	Cumulative Volume
(ft)	(cu ft)	(cu ft)
650	505292	0
651	514600	514600
652	523969	1038569
653	533400	1571969
654	543139	2115108

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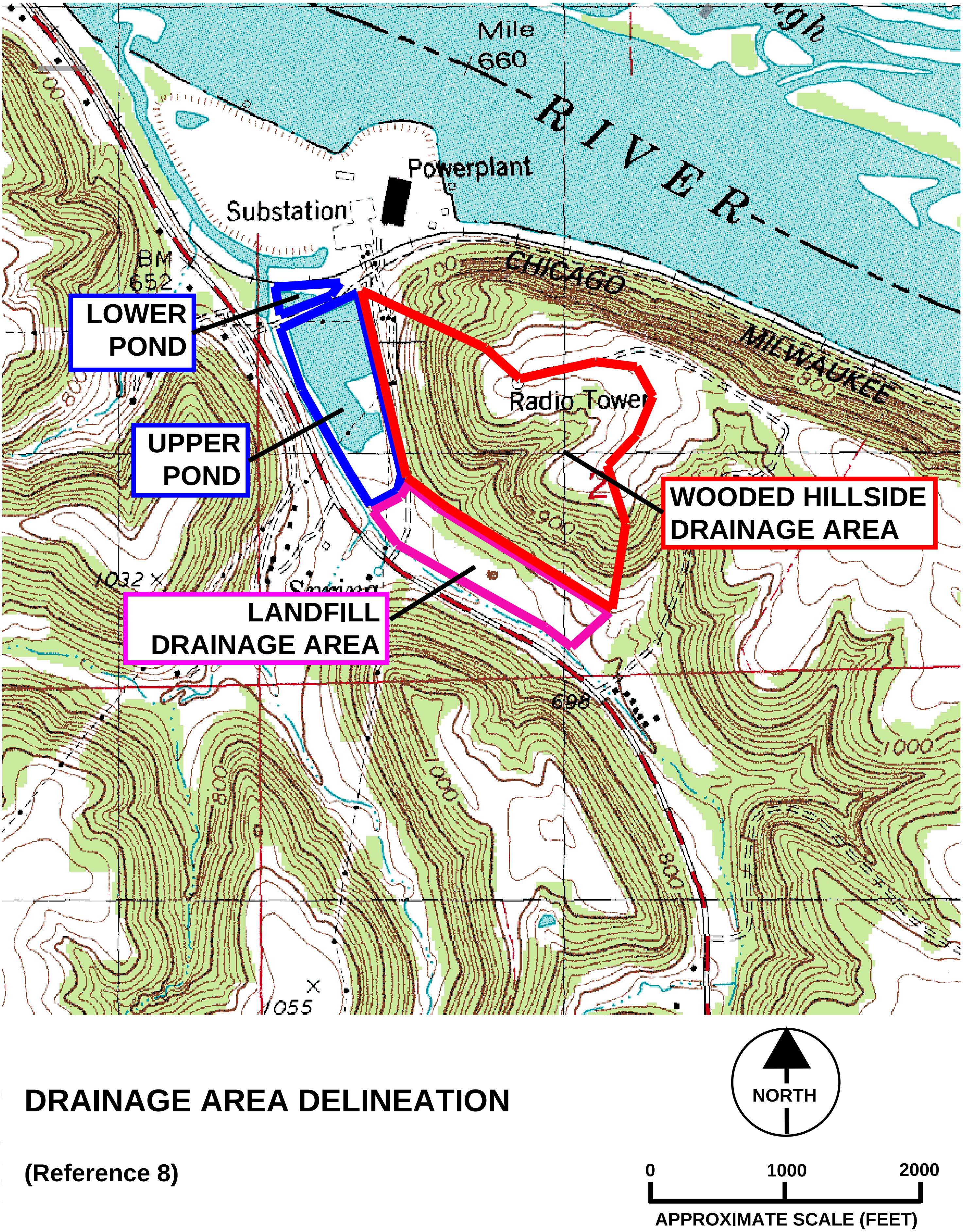
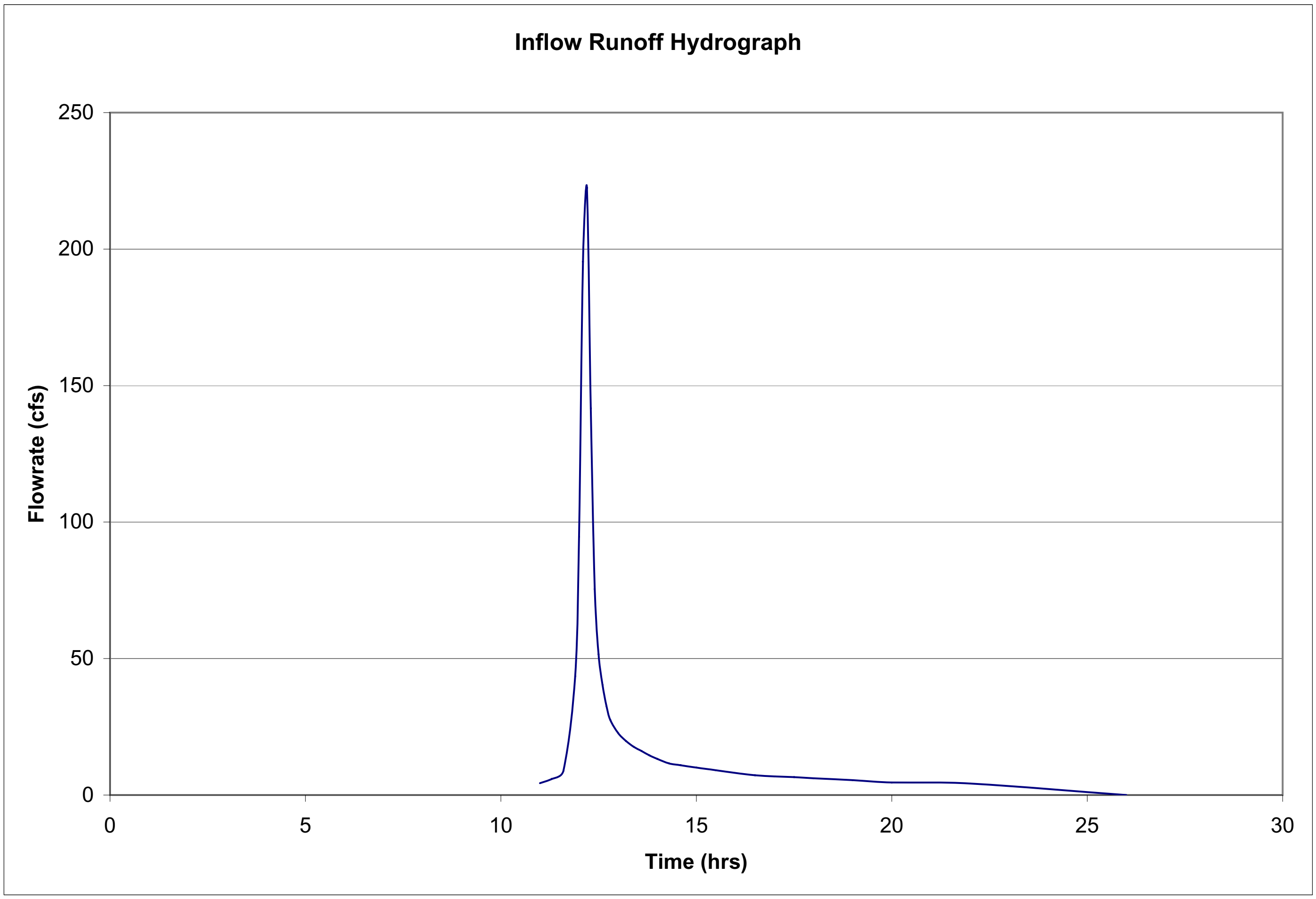


DRAINAGE AREA DELINEATION

(Reference 8)


Inflow Runoff Hydrograph
Flowrate (cfs)
250
200
150
100
50
0
0
5
10
15
20
25
30
Time (hrs)

INFLOW RUNOFF HYDROGRAPH

A	73	ac
A_m	0.1141	sq mile
CN	65.6	
S	5.24	
Ia	1.05	
P	6.2	inches
Ia/P	0.17	
Q	2.55	inches

Tc	0.2	hours
Tt	0	hours
time interval	0.1	hours

From Exhibit 5-II (Reference 2)

					(Interpolated)	(Note 1)
	Ia/P = 0.1		Ia/P = 0.3		Ia/P = 0.17	Hydrograph Ordinate
T (hrs)	qt		qt		qt	q (cfs)
11	23		0		14.95	4.35
11.3	31		0		20.15	5.87
11.6	47		0		30.55	8.89
11.9	209		39		149.50	43.53
12	403		180		324.95	94.61
12.1	739		545		671.10	195.40
12.2	800		697		763.95	222.43
12.3	481		497		486.60	141.68
12.4	250		276		259.10	75.44
12.5	166		198		177.20	51.59
12.6	128		158		138.50	40.33
12.7	102		130		111.80	32.55
12.8	86		110		94.40	27.49
13	70		93		78.05	22.73
13.2	61		81		68.00	19.80
13.4	54		73		60.65	17.66
13.6	49		67		55.30	16.10
13.8	44		61		49.95	14.54
14	40		56		45.60	13.28
14.3	35		49		39.90	11.62
14.6	33		46		37.55	10.93
15	30		43		34.55	10.06
15.5	27		39		31.20	9.08
16	24		35		27.85	8.11
16.5	21		32		24.85	7.24
17	20		30		23.50	6.84
17.5	19		29		22.50	6.55
18	18		27		21.15	6.16
19	16		24		18.80	5.47
20	13		21		15.80	4.60
22	12		19		14.45	4.21
26	0		0		0	0

Note 1: $q = q_t \times A_m \times Q$

UPPER POND OUTLET DISCHARGE RATING

		(Note 1)	(Note 2)	(Note 3)
		Weir	Pipe	Controlling Q
Elevation (ft)	H (ft)	Q_w (cfs)	Q_p (cfs)	(cfs)
650	0	0.0	32.2	0.0
650.1	0.1	0.4	32.3	0.4
650.2	0.2	1.2	32.5	1.2
650.3	0.3	2.2	32.6	2.2
650.4	0.4	3.3	32.7	3.3
650.5	0.5	4.7	32.8	4.7
650.6	0.6	6.1	32.9	6.1
650.7	0.7	7.7	33.0	7.7
650.8	0.8	9.4	33.1	9.4
650.9	0.9	11.3	33.2	11.3
651	1	13.2	33.4	13.2
651.1	1.1	15.2	33.5	15.2
651.2	1.2	17.4	33.6	17.4
651.3	1.3	19.6	33.7	19.6
651.4	1.4	21.9	33.8	21.9
651.5	1.5	24.2	33.9	24.2
651.6	1.6	26.7	34.0	26.7
651.7	1.7	29.3	34.1	29.3
651.8	1.8	31.9	34.2	31.9
651.9	1.9	34.6	34.3	34.3
652	2	37.3	34.5	34.5
652.1	2.1	40.2	34.6	34.6
652.2	2.2	43.1	34.7	34.7
652.3	2.3	46.0	34.8	34.8
652.4	2.4	49.1	34.9	34.9
652.5	2.5	52.2	35.0	35.0
652.6	2.6	55.3	35.1	35.1
652.7	2.7	58.6	35.2	35.2
652.8	2.8	61.8	35.3	35.3
652.9	2.9	65.2	35.4	35.4
653	3	68.6	35.5	35.5
653.1	3.1	72.0	35.6	35.6
653.2	3.2	75.6	35.7	35.7
653.3	3.3	79.1	35.8	35.8
653.4	3.4	82.8	35.9	35.9
653.5	3.5	86.4	36.0	36.0
653.6	3.6	90.2	36.1	36.1
653.7	3.7	93.9	36.2	36.2
653.8	3.8	97.8	36.3	36.3
653.9	3.9	101.7	36.4	36.4
654	4	105.6	36.5	36.5

Notes:

1. $Q_w = C \times L \times H^{3/2} = 3.3 \times 4 \times H^{3/2}$

2. $Q_p = A\sqrt{\dfrac{2g\Delta h}{\dfrac{fL}{D}+1.5}} = 3.14\sqrt{\dfrac{2\times 32.2\times(EL-636)}{\dfrac{0.09\times 154}{2}+1.5}}$

3. Controlling Q = Minimum of Q_w and Q_p

		(Note 1)				(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)	
Time	Precip Depth	Direct Precip	Process Flow	Runoff (initial)	Runoff (final)	Storage (initial)	Discharge (initial)	$S_f + O_f*t/2$	Storage (final)	Discharge (final)	Stage (final)
t		p_t	w	q_i	q_f	S_i	O_i		S_f	O_f	
(hrs)	(in)	(cu ft)	(cfs)	(cfs)	(cfs)	(cu ft)			(cu ft)	(cfs)	(ft)
0	0.0065	350	8.6	0	0	0	0	3446	3441	0.03	650.01
0.1	0.0066	352	8.6	0	0	3441	0.03	6884	6874	0.06	650.01
0.2	0.0066	354	8.6	0	0	6874	0.06	10314	10299	0.08	650.02
0.3	0.0066	357	8.6	0	0	10299	0.08	13737	13717	0.11	650.03
0.4	0.0067	359	8.6	0	0	13717	0.11	17152	17127	0.14	650.03
0.5	0.0067	361	8.6	0	0	17127	0.14	20559	20529	0.17	650.04
0.6	0.0068	364	8.6	0	0	20529	0.17	23959	23924	0.19	650.05
0.7	0.0068	366	8.6	0	0	23924	0.19	27351	27311	0.22	650.05
0.8	0.0069	369	8.6	0	0	27311	0.22	30736	30691	0.25	650.06
0.9	0.0069	371	8.6	0	0	30691	0.25	34114	34064	0.28	650.07
1	0.0070	374	8.6	0	0	34064	0.28	37484	37429	0.30	650.07
1.1	0.0070	376	8.6	0	0	37429	0.30	40847	40788	0.33	650.08
1.2	0.0071	379	8.6	0	0	40788	0.33	44203	44139	0.36	650.09
1.3	0.0071	382	8.6	0	0	44139	0.36	47552	47482	0.39	650.09
1.4	0.0072	384	8.6	0	0	47482	0.39	50893	50819	0.41	650.10
1.5	0.0072	387	8.6	0	0	50819	0.41	54228	54146	0.46	650.11
1.6	0.0073	390	8.6	0	0	54146	0.46	57550	57458	0.51	650.11
1.7	0.0073	393	8.6	0	0	57458	0.51	60856	60756	0.56	650.12
1.8	0.0074	396	8.6	0	0	60756	0.56	64148	64039	0.60	650.12
1.9	0.0074	399	8.6	0	0	64039	0.60	67425	67308	0.65	650.13
2	0.0075	402	8.6	0	0	67308	0.65	70688	70562	0.70	650.14
2.1	0.0075	405	8.6	0	0	70562	0.70	73937	73802	0.75	650.14
2.2	0.0076	408	8.6	0	0	73802	0.75	77171	77028	0.80	650.15
2.3	0.0077	411	8.6	0	0	77028	0.80	80391	80239	0.84	650.16
2.4	0.0077	414	8.6	0	0	80239	0.84	83598	83437	0.89	650.16
2.5	0.0078	418	8.6	0	0	83437	0.89	86790	86621	0.94	650.17
2.6	0.0078	421	8.6	0	0	86621	0.94	89969	89792	0.99	650.17
2.7	0.0079	424	8.6	0	0	89792	0.99	93135	92949	1.03	650.18
2.8	0.0080	428	8.6	0	0	92949	1.03	96287	96093	1.08	650.19
2.9	0.0080	432	8.6	0	0	96093	1.08	99426	99223	1.13	650.19
3	0.0081	435	8.6	0	0	99223	1.13	102552	102341	1.17	650.20
3.1	0.0082	439	8.6	0	0	102341	1.17	105665	105444	1.23	650.20
3.2	0.0082	443	8.6	0	0	105444	1.23	108761	108529	1.29	650.21
3.3	0.0083	447	8.6	0	0	108529	1.29	111840	111597	1.35	650.22
3.4	0.0084	450	8.6	0	0	111597	1.35	114901	114648	1.41	650.22
3.5	0.0085	454	8.6	0	0	114648	1.41	117946	117682	1.46	650.23
3.6	0.0085	459	8.6	0	0	117682	1.46	120973	120699	1.52	650.23
3.7	0.0086	463	8.6	0	0	120699	1.52	123984	123700	1.58	650.24
3.8	0.0087	467	8.6	0	0	123700	1.58	126978	126684	1.64	650.25
3.9	0.0088	471	8.6	0	0	126684	1.64	129956	129651	1.69	650.25
4	0.0089	476	8.6	0	0	129651	1.69	132918	132603	1.75	650.26
4.1	0.0089	480	8.6	0	0	132603	1.75	135865	135539	1.81	650.26
4.2	0.0090	485	8.6	0	0	135539	1.81	138795	138460	1.86	650.27
4.3	0.0091	490	8.6	0	0	138460	1.86	141710	141365	1.92	650.27
4.4	0.0092	495	8.6	0	0	141365	1.92	144610	144255	1.97	650.28
4.5	0.0093	500	8.6	0	0	144255	1.97	147495	147130	2.03	650.29
4.6	0.0094	505	8.6	0	0	147130	2.03	150366	149990	2.08	650.29
4.7	0.0095	510	8.6	0	0	149990	2.08	153221	152836	2.14	650.30

		(Note 1)				(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)	
Time	Precip Depth	Direct Precip	Process Flow	Runoff (initial)	Runoff (final)	Storage (initial)	Discharge (initial)	$S_f + O_f*t/2$	Storage (final)	Discharge (final)	Stage (final)
t		p_t	w	q_i	q_f	S_i	O_i		S_f	O_f	
(hrs)	(in)	(cu ft)	(cfs)	(cfs)	(cfs)	(cu ft)			(cu ft)	(cfs)	(ft)
4.8	0.0096	516	8.6	0	0	152836	2.14	156063	155667	2.20	650.30
4.9	0.0097	521	8.6	0	0	155667	2.20	158889	158481	2.26	650.31
5	0.0098	527	8.6	0	0	158481	2.26	161697	161278	2.33	650.31
5.1	0.0099	533	8.6	0	0	161278	2.33	164488	164058	2.39	650.32
5.2	0.0100	539	8.6	0	0	164058	2.39	167263	166821	2.45	650.32
5.3	0.0101	545	8.6	0	0	166821	2.45	170021	169568	2.51	650.33
5.4	0.0103	551	8.6	0	0	169568	2.51	172763	172299	2.58	650.33
5.5	0.0104	557	8.6	0	0	172299	2.58	175489	175014	2.64	650.34
5.6	0.0105	564	8.6	0	0	175014	2.64	178199	177713	2.70	650.35
5.7	0.0106	571	8.6	0	0	177713	2.70	180894	180397	2.76	650.35
5.8	0.0108	578	8.6	0	0	180397	2.76	183574	183066	2.82	650.36
5.9	0.0109	585	8.6	0	0	183066	2.82	186239	185721	2.88	650.36
6	0.0110	593	8.6	0	0	185721	2.88	188890	188361	2.94	650.37
6.1	0.0112	600	8.6	0	0	188361	2.94	191527	190987	3.00	650.37
6.2	0.0113	608	8.6	0	0	190987	3.00	194151	193600	3.06	650.38
6.3	0.0115	616	8.6	0	0	193600	3.06	196761	196200	3.12	650.38
6.4	0.0116	625	8.6	0	0	196200	3.12	199359	198786	3.18	650.39
6.5	0.0118	633	8.6	0	0	198786	3.18	201944	201361	3.24	650.39
6.6	0.0120	642	8.6	0	0	201361	3.24	204516	203923	3.30	650.40
6.7	0.0121	652	8.6	0	0	203923	3.30	207077	206473	3.36	650.40
6.8	0.0123	661	8.6	0	0	206473	3.36	209626	209011	3.42	650.41
6.9	0.0125	671	8.6	0	0	209011	3.42	212162	211534	3.49	650.41
7	0.0127	681	8.6	0	0	211534	3.49	214684	214045	3.55	650.42
7.1	0.0129	692	8.6	0	0	214045	3.55	217193	216543	3.62	650.42
7.2	0.0131	703	8.6	0	0	216543	3.62	219691	219028	3.68	650.43
7.3	0.0133	714	8.6	0	0	219028	3.68	222177	221503	3.74	650.43
7.4	0.0135	726	8.6	0	0	221503	3.74	224651	223966	3.81	650.44
7.5	0.0137	739	8.6	0	0	223966	3.81	227115	226419	3.87	650.44
7.6	0.0140	751	8.6	0	0	226419	3.87	229569	228861	3.93	650.44
7.7	0.0142	765	8.6	0	0	228861	3.93	232014	231295	4.00	650.45
7.8	0.0145	779	8.6	0	0	231295	4.00	234451	233720	4.06	650.45
7.9	0.0148	793	8.6	0	0	233720	4.06	236879	236137	4.12	650.46
8	0.0150	809	8.6	0	0	236137	4.12	239300	238547	4.18	650.46
8.1	0.0153	825	8.6	0	0	238547	4.18	241715	240951	4.25	650.47
8.2	0.0157	841	8.6	0	0	240951	4.25	244124	243349	4.31	650.47
8.3	0.0160	859	8.6	0	0	243349	4.31	246528	245742	4.37	650.48
8.4	0.0163	877	8.6	0	0	245742	4.37	248929	248131	4.43	650.48
8.5	0.0167	897	8.6	0	0	248131	4.43	251326	250518	4.49	650.49
8.6	0.0171	917	8.6	0	0	250518	4.49	253722	252903	4.55	650.49
8.7	0.0175	938	8.6	0	0	252903	4.55	256117	255287	4.61	650.50
8.8	0.0179	961	8.6	0	0	255287	4.61	258513	257671	4.68	650.50
8.9	0.0183	985	8.6	0	0	257671	4.68	260910	260056	4.75	650.51
9	0.0188	1010	8.6	0	0	260056	4.75	263308	262442	4.81	650.51
9.1	0.0193	1037	8.6	0	0	262442	4.81	265709	264830	4.88	650.51
9.2	0.0198	1066	8.6	0	0	264830	4.88	268113	267222	4.95	650.52
9.3	0.0204	1097	8.6	0	0	267222	4.95	270524	269621	5.02	650.52
9.4	0.0210	1130	8.6	0	0	269621	5.02	272943	272028	5.09	650.53
9.5	0.0217	1165	8.6	0	0	272028	5.09	275373	274445	5.16	650.53

		(Note 1)				(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)	
Time	Precip Depth	Direct Precip	Process Flow	Runoff (initial)	Runoff (final)	Storage (initial)	Discharge (initial)	$S_f + O_f*t/2$	Storage (final)	Discharge (final)	Stage (final)
t		p_t	w	q_i	q_f	S_i	O_i		S_f	O_f	
(hrs)	(in)	(cu ft)	(cfs)	(cfs)	(cfs)	(cu ft)			(cu ft)	(cfs)	(ft)
9.6	0.0224	1203	8.6	0	0	274445	5.16	277816	276875	5.23	650.54
9.7	0.0231	1244	8.6	0	0	276875	5.23	280274	279321	5.30	650.54
9.8	0.0240	1288	8.6	0	0	279321	5.30	282752	281786	5.37	650.55
9.9	0.0249	1336	8.6	0	0	281786	5.37	285252	284274	5.44	650.55
10	0.0258	1389	8.6	0	0	284274	5.44	287780	286789	5.51	650.56
10.1	0.0269	1446	8.6	0	0	286789	5.51	290339	289335	5.58	650.56
10.2	0.0281	1510	8.6	0	0	289335	5.58	292936	291918	5.65	650.57
10.3	0.0294	1580	8.6	0	0	291918	5.65	295577	294546	5.73	650.57
10.4	0.0309	1659	8.6	0	0	294546	5.73	298269	297224	5.81	650.58
10.5	0.0325	1747	8.6	0	0	297224	5.81	301023	299963	5.88	650.58
10.6	0.0344	1847	8.6	0	0	299963	5.88	303848	302774	5.96	650.59
10.7	0.0365	1962	8.6	0	0	302774	5.96	306759	305670	6.05	650.59
10.8	0.0390	2095	8.6	0	0	305670	6.05	309773	308669	6.13	650.60
10.9	0.0419	2250	8.6	0	4.35	308669	6.13	313695	312569	6.25	650.61
11	0.0453	2436	8.6	4.35	4.86	312569	6.25	318633	317481	6.41	650.62
11.1	0.0495	2661	8.6	4.86	5.36	317481	6.41	323924	322742	6.57	650.63
11.2	0.0547	2941	8.6	5.36	5.87	322742	6.57	329618	328404	6.74	650.64
11.3	0.0614	3301	8.6	5.87	6.88	328404	6.74	335881	334633	6.94	650.65
11.4	0.0704	3783	8.6	6.88	7.89	334633	6.94	342920	341632	7.15	650.66
11.5	0.0831	4465	8.6	7.89	8.89	341632	7.15	350926	349594	7.40	650.68
11.6	0.1027	5519	8.6	8.89	20.44	349594	7.40	362157	360763	7.75	650.70
11.7	0.1376	7394	8.6	20.44	31.98	360763	7.75	379294	377798	8.32	650.73
11.8	0.2204	11842	8.6	31.98	43.53	377798	8.32	404831	403182	9.16	650.78
11.9	0.8179	43957	8.6	43.53	94.61	403182	9.16	473451	471367	11.58	650.92
12	0.8179	43957	8.6	94.61	195.40	471367	11.58	568537	565804	15.18	651.10
12.1	0.2204	11842	8.6	195.40	222.43	565804	15.18	653219	649864	18.64	651.26
12.2	0.1376	7394	8.6	222.43	141.68	649864	18.64	722539	718647	21.62	651.39
12.3	0.1027	5519	8.6	141.68	75.44	718647	21.62	762452	758237	23.42	651.46
12.4	0.0831	4465	8.6	75.44	51.59	758237	23.42	784450	780056	24.41	651.51
12.5	0.0704	3783	8.6	51.59	40.33	780056	24.41	799086	794568	25.10	651.53
12.6	0.0614	3301	8.6	40.33	32.55	794568	25.10	809566	804961	25.58	651.55
12.7	0.0547	2941	8.6	32.55	27.49	804961	25.58	817200	812531	25.94	651.57
12.8	0.0495	2661	8.6	27.49	25.11	812531	25.94	823085	818366	26.22	651.58
12.9	0.0453	2436	8.6	25.11	22.73	818366	26.22	827788	823030	26.43	651.59
13	0.0419	2250	8.6	22.73	21.26	823030	26.43	831536	826746	26.61	651.60
13.1	0.0390	2095	8.6	21.26	19.80	826746	26.61	834538	829723	26.75	651.60
13.2	0.0365	1962	8.6	19.80	18.73	829723	26.75	836901	832065	26.86	651.61
13.3	0.0344	1847	8.6	18.73	17.66	832065	26.86	838723	833871	26.95	651.61
13.4	0.0325	1747	8.6	17.66	16.88	833871	26.95	840080	835217	27.02	651.61
13.5	0.0309	1659	8.6	16.88	16.10	835217	27.02	841045	836174	27.06	651.61
13.6	0.0294	1580	8.6	16.10	15.32	836174	27.06	841635	836758	27.09	651.61
13.7	0.0281	1510	8.6	15.32	14.54	836758	27.09	841863	836985	27.10	651.62
13.8	0.0269	1446	8.6	14.54	13.91	836985	27.10	841770	836892	27.10	651.62
13.9	0.0258	1389	8.6	13.91	13.28	836892	27.10	841393	836518	27.08	651.61
14	0.0249	1336	8.6	13.28	12.72	836518	27.08	840756	835887	27.05	651.61
14.1	0.0240	1288	8.6	12.72	12.17	835887	27.05	839883	835021	27.01	651.61
14.2	0.0231	1244	8.6	12.17	11.62	835021	27.01	838781	833929	26.96	651.61
14.3	0.0224	1203	8.6	11.62	11.39	833929	26.96	837517	832677	26.89	651.61

		(Note 1)				(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)	
Time	Precip Depth	Direct Precip	Process Flow	Runoff (initial)	Runoff (final)	Storage (initial)	Discharge (initial)	$S_f + O_f*t/2$	Storage (final)	Discharge (final)	Stage (final)
t		p_t	w	q_i	q_f	S_i	O_i		S_f	O_f	
(hrs)	(in)	(cu ft)	(cfs)	(cfs)	(cfs)	(cu ft)			(cu ft)	(cfs)	(ft)
14.4	0.0217	1165	8.6	11.39	11.16	832677	26.89	836156	831326	26.83	651.60
14.5	0.0210	1130	8.6	11.16	10.93	831326	26.83	834700	829883	26.76	651.60
14.6	0.0204	1097	8.6	10.93	10.71	829883	26.76	833156	828353	26.69	651.60
14.7	0.0198	1066	8.6	10.71	10.50	828353	26.69	831530	826740	26.61	651.60
14.8	0.0193	1037	8.6	10.50	10.28	826740	26.61	829823	825048	26.53	651.59
14.9	0.0188	1010	8.6	10.28	10.06	825048	26.53	828039	823279	26.45	651.59
15	0.0183	985	8.6	10.06	9.86	823279	26.45	826186	821441	26.36	651.59
15.1	0.0179	961	8.6	9.86	9.67	821441	26.36	824269	819541	26.27	651.58
15.2	0.0175	938	8.6	9.67	9.47	819541	26.27	822292	817580	26.18	651.58
15.3	0.0171	917	8.6	9.47	9.28	817580	26.18	820257	815561	26.08	651.57
15.4	0.0167	897	8.6	9.28	9.08	815561	26.08	818164	813487	25.99	651.57
15.5	0.0163	877	8.6	9.08	8.89	813487	25.99	816018	811358	25.89	651.57
15.6	0.0160	859	8.6	8.89	8.69	811358	25.89	813819	809178	25.78	651.56
15.7	0.0157	841	8.6	8.69	8.50	809178	25.78	811569	806947	25.68	651.56
15.8	0.0153	825	8.6	8.50	8.30	806947	25.68	809270	804667	25.57	651.55
15.9	0.0150	809	8.6	8.30	8.11	804667	25.57	806923	802340	25.46	651.55
16	0.0148	793	8.6	8.11	7.93	802340	25.46	804534	799971	25.35	651.54
16.1	0.0145	779	8.6	7.93	7.76	799971	25.35	802108	797565	25.24	651.54
16.2	0.0142	765	8.6	7.76	7.58	797565	25.24	799645	795124	25.12	651.54
16.3	0.0140	751	8.6	7.58	7.41	795124	25.12	797148	792647	25.01	651.53
16.4	0.0137	739	8.6	7.41	7.24	792647	25.01	794617	790137	24.89	651.53
16.5	0.0135	726	8.6	7.24	7.16	790137	24.89	792070	787612	24.77	651.52
16.6	0.0133	714	8.6	7.16	7.08	787612	24.77	789526	785089	24.65	651.52
16.7	0.0131	703	8.6	7.08	7.00	785089	24.65	786985	782569	24.53	651.51
16.8	0.0129	692	8.6	7.00	6.92	782569	24.53	784447	780053	24.41	651.51
16.9	0.0127	681	8.6	6.92	6.84	780053	24.41	781913	777540	24.29	651.50
17	0.0125	671	8.6	6.84	6.78	777540	24.29	779387	775034	24.18	651.50
17.1	0.0123	661	8.6	6.78	6.73	775034	24.18	776871	772539	24.07	651.49
17.2	0.0121	652	8.6	6.73	6.67	772539	24.07	774366	770054	23.95	651.49
17.3	0.0120	642	8.6	6.67	6.61	770054	23.95	771871	767579	23.84	651.48
17.4	0.0118	633	8.6	6.61	6.55	767579	23.84	769386	765115	23.73	651.48
17.5	0.0116	625	8.6	6.55	6.47	765115	23.73	766909	762658	23.62	651.47
17.6	0.0115	616	8.6	6.47	6.39	762658	23.62	764435	760205	23.50	651.47
17.7	0.0113	608	8.6	6.39	6.32	760205	23.50	761966	757755	23.39	651.46
17.8	0.0112	600	8.6	6.32	6.24	757755	23.39	759500	755309	23.28	651.46
17.9	0.0110	593	8.6	6.24	6.16	755309	23.28	757038	752867	23.17	651.45
18	0.0109	585	8.6	6.16	6.09	752867	23.17	754582	750431	23.06	651.45
18.1	0.0108	578	8.6	6.09	6.02	750431	23.06	752134	748003	22.95	651.45
18.2	0.0106	571	8.6	6.02	5.95	748003	22.95	749695	745583	22.84	651.44
18.3	0.0105	564	8.6	5.95	5.88	745583	22.84	747263	743172	22.73	651.44
18.4	0.0104	557	8.6	5.88	5.82	743172	22.73	744840	740768	22.62	651.43
18.5	0.0103	551	8.6	5.82	5.75	740768	22.62	742425	738373	22.51	651.43
18.6	0.0101	545	8.6	5.75	5.68	738373	22.51	740018	735986	22.40	651.42
18.7	0.0100	539	8.6	5.68	5.61	735986	22.40	737620	733607	22.29	651.42
18.8	0.0099	533	8.6	5.61	5.54	733607	22.29	735230	731237	22.19	651.41
18.9	0.0098	527	8.6	5.54	5.47	731237	22.19	732849	728875	22.08	651.41
19	0.0097	521	8.6	5.47	5.39	728875	22.08	730472	726517	21.97	651.40
19.1	0.0096	516	8.6	5.39	5.30	726517	21.97	728098	724162	21.86	651.40

		(Note 1)				(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)	
Time	Precip Depth	Direct Precip	Process Flow	Runoff (initial)	Runoff (final)	Storage (initial)	Discharge (initial)	$S_f + O_f*t/2$	Storage (final)	Discharge (final)	Stage (final)
t		p_t	w	q_i	q_f	S_i	O_i		S_f	O_f	
(hrs)	(in)	(cu ft)	(cfs)	(cfs)	(cfs)	(cu ft)			(cu ft)	(cfs)	(ft)
19.2	0.0095	510	8.6	5.30	5.21	724162	21.86	725725	721807	21.76	651.40
19.3	0.0094	505	8.6	5.21	5.12	721807	21.76	723352	719454	21.66	651.39
19.4	0.0093	500	8.6	5.12	5.04	719454	21.66	720980	717100	21.55	651.39
19.5	0.0092	495	8.6	5.04	4.95	717100	21.55	718609	714748	21.45	651.38
19.6	0.0091	490	8.6	4.95	4.86	714748	21.45	716238	712396	21.35	651.38
19.7	0.0090	485	8.6	4.86	4.78	712396	21.35	713869	710045	21.24	651.37
19.8	0.0089	480	8.6	4.78	4.69	710045	21.24	711501	707695	21.14	651.37
19.9	0.0089	476	8.6	4.69	4.60	707695	21.14	709133	705346	21.04	651.36
20	0.0088	471	8.6	4.60	4.58	705346	21.04	706779	703011	20.94	651.36
20.1	0.0087	467	8.6	4.58	4.56	703011	20.94	704451	700701	20.83	651.36
20.2	0.0086	463	8.6	4.56	4.54	700701	20.83	702148	698416	20.73	651.35
20.3	0.0085	459	8.6	4.54	4.52	698416	20.73	699869	696155	20.64	651.35
20.4	0.0085	454	8.6	4.52	4.50	696155	20.64	697615	693919	20.54	651.34
20.5	0.0084	450	8.6	4.50	4.48	693919	20.54	695386	691707	20.44	651.34
20.6	0.0083	447	8.6	4.48	4.46	691707	20.44	693180	689518	20.34	651.33
20.7	0.0082	443	8.6	4.46	4.44	689518	20.34	690998	687353	20.25	651.33
20.8	0.0082	439	8.6	4.44	4.42	687353	20.25	688839	685212	20.15	651.33
20.9	0.0081	435	8.6	4.42	4.40	685212	20.15	686704	683093	20.06	651.32
21	0.0080	432	8.6	4.40	4.38	683093	20.06	684591	680996	19.97	651.32
21.1	0.0080	428	8.6	4.38	4.36	680996	19.97	682501	678923	19.88	651.31
21.2	0.0079	424	8.6	4.36	4.34	678923	19.88	680433	676871	19.79	651.31
21.3	0.0078	421	8.6	4.34	4.33	676871	19.79	678386	674841	19.70	651.31
21.4	0.0078	418	8.6	4.33	4.31	674841	19.70	676362	672832	19.61	651.30
21.5	0.0077	414	8.6	4.31	4.29	672832	19.61	674359	670844	19.53	651.30
21.6	0.0077	411	8.6	4.29	4.27	670844	19.53	672376	668876	19.44	651.29
21.7	0.0076	408	8.6	4.27	4.25	668876	19.44	670413	666928	19.36	651.29
21.8	0.0075	405	8.6	4.25	4.23	666928	19.36	668469	664999	19.28	651.29
21.9	0.0075	402	8.6	4.23	4.21	664999	19.28	666545	663090	19.20	651.28
22	0.0074	399	8.6	4.21	4.10	663090	19.20	664624	661183	19.12	651.28
22.1	0.0074	396	8.6	4.10	4.00	661183	19.12	662692	659265	19.04	651.28
22.2	0.0073	393	8.6	4.00	3.89	659265	19.04	660747	657336	18.95	651.27
22.3	0.0073	390	8.6	3.89	3.79	657336	18.95	658792	655395	18.87	651.27
22.4	0.0072	387	8.6	3.79	3.68	655395	18.87	656825	653443	18.79	651.26
22.5	0.0072	384	8.6	3.68	3.58	653443	18.79	654847	651480	18.71	651.26
22.6	0.0071	382	8.6	3.58	3.47	651480	18.71	652859	649506	18.62	651.26
22.7	0.0071	379	8.6	3.47	3.37	649506	18.62	650860	647522	18.54	651.25
22.8	0.0070	376	8.6	3.37	3.26	647522	18.54	648850	645528	18.46	651.25
22.9	0.0070	374	8.6	3.26	3.16	645528	18.46	646831	643524	18.37	651.25
23	0.0069	371	8.6	3.16	3.05	643524	18.37	644801	641510	18.29	651.24
23.1	0.0069	369	8.6	3.05	2.95	641510	18.29	642762	639486	18.20	651.24
23.2	0.0068	366	8.6	2.95	2.84	639486	18.20	640713	637453	18.11	651.23
23.3	0.0068	364	8.6	2.84	2.73	637453	18.11	638655	635410	18.03	651.23
23.4	0.0067	361	8.6	2.73	2.63	635410	18.03	636588	633358	17.94	651.23
23.5	0.0067	359	8.6	2.63	2.52	633358	17.94	634512	631298	17.85	651.22
23.6	0.0066	357	8.6	2.52	2.42	631298	17.85	632426	629228	17.77	651.22
23.7	0.0066	354	8.6	2.42	2.31	629228	17.77	630333	627150	17.68	651.21
23.8	0.0066	352	8.6	2.31	2.21	627150	17.68	628230	625064	17.59	651.21
23.9	0.0065	350	8.6	2.21	2.10	625064	17.59	626119	622969	17.50	651.21

		(Note 1)				(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)	
Time	Precip Depth	Direct Precip	Process Flow	Runoff (initial)	Runoff (final)	Storage (initial)	Discharge (initial)	$S_f + O_f*t/2$	Storage (final)	Discharge (final)	Stage (final)
t		p_t	w	q_i	q_f	S_i	O_i		S_f	O_f	
(hrs)	(in)	(cu ft)	(cfs)	(cfs)	(cfs)	(cu ft)			(cu ft)	(cfs)	(ft)
24	0	0	8.6	2.10	2.00	622969	17.50	623653	620521	17.40	651.20
24.1	0	0	8.6	2.00	1.89	620521	17.40	621185	618072	17.30	651.20
24.2	0	0	8.6	1.89	1.79	618072	17.30	618717	615621	17.20	651.19
24.3	0	0	8.6	1.79	1.68	615621	17.20	616246	613168	17.10	651.19
24.4	0	0	8.6	1.68	1.58	613168	17.10	613773	610713	17.00	651.18
24.5	0	0	8.6	1.58	1.47	610713	17.00	611298	608256	16.90	651.18
24.6	0	0	8.6	1.47	1.37	608256	16.90	608821	605797	16.80	651.17
24.7	0	0	8.6	1.37	1.26	605797	16.80	606342	603336	16.70	651.17
24.8	0	0	8.6	1.26	1.16	603336	16.70	603861	600873	16.60	651.16
24.9	0	0	8.6	1.16	1.05	600873	16.60	601378	598408	16.50	651.16
25	0	0	8.6	1.05	0.95	598408	16.50	598893	595941	16.40	651.16
25.1	0	0	8.6	0.95	0.84	595941	16.40	596407	593472	16.30	651.15
25.2	0	0	8.6	0.84	0.74	593472	16.30	593918	591002	16.20	651.15
25.3	0	0	8.6	0.74	0.63	591002	16.20	591428	588529	16.10	651.14
25.4	0	0	8.6	0.63	0.53	588529	16.10	588935	586055	16.00	651.14
25.5	0	0	8.6	0.53	0.42	586055	16.00	586442	583579	15.90	651.13
25.6	0	0	8.6	0.42	0.32	583579	15.90	583946	581102	15.80	651.13
25.7	0	0	8.6	0.32	0.21	581102	15.80	581448	578622	15.70	651.12
25.8	0	0	8.6	0.21	0.11	578622	15.70	578949	576141	15.60	651.12
25.9	0	0	8.6	0.11	0	576141	15.60	576448	573659	15.50	651.11
26	0	0	8.6	0	0	573659	15.50	573965	571193	15.40	651.11
26.1	0	0	8.6	0	0	571193	15.40	571517	568763	15.30	651.10
26.2	0	0	8.6	0	0	568763	15.30	569105	566369	15.20	651.10
26.3	0	0	8.6	0	0	566369	15.20	566728	564007	15.11	651.09
26.4	0	0	8.6	0	0	564007	15.11	564383	561679	15.02	651.09
26.5	0	0	8.6	0	0	561679	15.02	562071	559383	14.93	651.09
26.6	0	0	8.6	0	0	559383	14.93	559791	557118	14.85	651.08
26.7	0	0	8.6	0	0	557118	14.85	557542	554885	14.76	651.08
26.8	0	0	8.6	0	0	554885	14.76	555325	552683	14.67	651.07
26.9	0	0	8.6	0	0	552683	14.67	553138	550511	14.59	651.07
27	0	0	8.6	0	0	550511	14.59	550981	548370	14.51	651.06
27.1	0	0	8.6	0	0	548370	14.51	548854	546258	14.43	651.06
27.2	0	0	8.6	0	0	546258	14.43	546757	544175	14.35	651.06
27.3	0	0	8.6	0	0	544175	14.35	544689	542121	14.27	651.05
27.4	0	0	8.6	0	0	542121	14.27	542649	540096	14.19	651.05
27.5	0	0	8.6	0	0	540096	14.19	540638	538098	14.11	651.04
27.6	0	0	8.6	0	0	538098	14.11	538654	536128	14.03	651.04
27.7	0	0	8.6	0	0	536128	14.03	536698	534186	13.96	651.04
27.8	0	0	8.6	0	0	534186	13.96	534769	532270	13.88	651.03
27.9	0	0	8.6	0	0	532270	13.88	532867	530381	13.81	651.03
28	0	0	8.6	0	0	530381	13.81	530991	528518	13.74	651.03
	0	0	8.6	0	0	528518	13.74	529141	526681	13.67	651.02

Notes:

1. Direct precipitation on the pond equals incremental precipitation depth times total pond area.

2. Initial storage equals the final storage of the previous time step (except for time t = 0, when storage = 0)

3. Initial discharge equals the final storage of the previous time step (except for time t = 0, when discharge = 0)

4. $S_f + O_f * t/2 = p_t + w \times t + t\left(\frac{q_i + q_f}{2}\right) + S_i - \frac{t}{2}O_i$

5. Knowing the value of $S_f + O_f * t/2$, storage is determined using the Stage-Storage-Discharge Relationship (see page G8)

6. Knowing the value of $S_f + O_f * t/2$, outflow is determined using the Stage-Storage-Discharge Relationship (see page G8)

UPPER POND STAGE-STORAGE-DISCHARGE RELATIONSHIP

Top Elevation of Stop Logs 650 feet
Time Interval (t) 360 seconds

Elevation (ft)	Stage (ft)	Storage S (ft^3)	Discharge O (cfs)	S + t/2*O
650	0	0	0.0	0.00
650.1	0.1	51460	0.4	51535
650.2	0.2	102920	1.2	103133
650.3	0.3	154380	2.2	154770
650.4	0.4	205840	3.3	206441
650.5	0.5	257300	4.7	258140
650.6	0.6	308760	6.1	309864
650.7	0.7	360220	7.7	361612
650.8	0.8	411680	9.4	413380
650.9	0.9	463140	11.3	465169
651	1	514600	13.2	516976
651.1	1.1	566997	15.2	569738
651.2	1.2	619394	17.4	622517
651.3	1.3	671791	19.6	675312
651.4	1.4	724188	21.9	728123
651.5	1.5	776585	24.2	780949
651.6	1.6	828981	26.7	833790
651.7	1.7	881378	29.3	886645
651.8	1.8	933775	31.9	939513
651.9	1.9	986172	34.3	992355
652	2	1038569	34.5	1044771
652.1	2.1	1091909	34.6	1098130
652.2	2.2	1145249	34.7	1151490
652.3	2.3	1198589	34.8	1204849
652.4	2.4	1251929	34.9	1258208
652.5	2.5	1305269	35.0	1311567
652.6	2.6	1358609	35.1	1364926
652.7	2.7	1411949	35.2	1418285
652.8	2.8	1465289	35.3	1471644
652.9	2.9	1518629	35.4	1525003
653	3	1571969	35.5	1578362
653.1	3.1	1626283	35.6	1632694
653.2	3.2	1680597	35.7	1687027
653.3	3.3	1734911	35.8	1741360
653.4	3.4	1789225	35.9	1795692
653.5	3.5	1843539	36.0	1850025
653.6	3.6	1897852	36.1	1904357
653.7	3.7	1952166	36.2	1958689
653.8	3.8	2006480	36.3	2013022
653.9	3.9	2060794	36.4	2067354
654	4	2115108	36.5	2121686

APPENDIX A

Document 1.2
Soil Stability Analysis

13 pages

ISSUE SUMMARY
Form SOP-0402-07, Revision 8

DESIGN CONTROL SUMMARY

CLIENT:	Alliant Energy	UNIT NO.:	PAGE NO.: 1
PROJECT NAME:	**Lansing Power Station**		
PROJECT NO.:	12093-025	S&L NUCLEAR QA PROGRAM	
CALC. NO..:	LANS-SS-001	APPLICABLE ☐ YES ☒ NO	
TITLE:	Slope Stability Analyses - Ash Settling Pond Dikes		
EQUIPMENT NO.:			

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

Calculation starts on this page. Added pages 2 through 13.

INPUTS/ ASSUMPTIONS
☒ VERIFIED
☐ UNVERIFIED

REVIEW METHOD:	Detailed	REV.:	0
STATUS:	☒ APPROVED ☐ SUPERSEDED BY CALCULATION NO. ☐ VOID	DATE FOR REV.:	10/22/2010
PREPARER:	E. Sabri Motan *E. Sabri Motan*	DATE:	10/20/2010
REVIEWER:	Wei R. Wu *[signature]*	DATE:	10/22/2010
APPROVER:	Daniel C. Kocunik *Daniel C. Kocunik*	DATE:	10/22/2010

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

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REVIEW METHOD:		REV.:	
STATUS:	☐ APPROVED ☐ SUPERSEDED BY CALCULATION NO. ☐ VOID	DATE FOR REV.:	
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REVIEW METHOD:		REV.:	
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APPROVER:		DATE:	

NOTE: PRINT AND SIGN IN THE SIGNATURE AREAS

Total Number of Pages: 13

TABLE OF CONTENTS

1.0 Purpose

The purpose of this calculation is to determine the factors of safety of the slopes of the existing Ash Settling Pond dikes at the Alliant Energy Lansing Power Station near Lansing, Iowa.

2.0 Design Input

- Dike cross-section locations and the cross-section dimensions were obtained from References 1 and 2.
- The location of the dike section analyzed (Section 11) is shown on Figure 1. The pond dike is highest at Section 11. Therefore, this section was analyzed to address the most critical stability condition.
- The subsoil profile was obtained from References 3, 4, and 5. The nearest borings (with Standard Penetration Test data) to the dike are A-5 and A-6. These are 25-ft deep borings. D-1 and D-2 have been drilled through the dike and both reach the bedrock. However, no SPT data are available for these borings.
- Top elevation of the dike is approximately El. 654 feet (per Reference 2).
- The approximate bottom of pond elevations are 624 feet in the Upper Pond, and 620 feet in the Lower Pond (References 1 and 2).
- The Upper Pond contains sedimented ash to the approximate elevation of 641 feet (Verbal communication, A. Johnson of Alliant Energy). The water level inside the pond is considered at El. 650 feet. The Lower Pond was considered as empty. This is conservative.
- The pond face slopes are 3 Horizontal-to-1 Vertical (3H:1V) per Reference 2.
- Compaction criteria for the dike fill was obtained from Reference 6 page 2-2-3. Minimum relative density specified is 75 percent per ASTM D 2049.
- The horizontal acceleration value used in the seismic analysis was obtained from References 7 and 8.

3.0 Assumptions

There are no assumptions or engineering judgment type decisions that require further verification.

4.0 Methodology and Criteria

The slope stability analyses were performed using SLOPE/W program Version 5.11 (Reference 9). This program has been verified and validated in accordance with S&L SOP 0204 procedures. The S&L program number is 03.7.747-5.11. The runs were performed on Computer # ZD 6409. For the slope stability analyses, in each run, a large number of slip planes were generated and the factor of safety against sliding (FS) was determined for each plane. The slip planes were represented by circular arcs. The potential slip circles were analyzed using the Simplified Bishop Method which is routinely used for slope stability evaluations (Reference 10). Figure 2 shows the rectangular grid that forms the center points of the potential slip circles. At each grid point, a number of circles (tangent to each of the closely-spaced horizontal lines in the bottom portion of the figure) are generated. The minimum factor of safety for each grid point is determined and registered by the software for each grid point. Once all grid points are covered in this manner, the minimum of all the calculated FS values, the center of the most critical slip circle with the lowest FS, and the slip surface are displayed by the software. These are shown on the output sheet generated for each case analyzed (Figures 3 through 5).

The minimum acceptable FS values for the static, seismic, and the rapid drawdown conditions analyzed in this calculation are as follows:

1. Static: 1.5 (Reference 11)
2. Seismic: 1.15 (Reference 12)
3. Rapid Drawdown: 1.1 to 1.3 (Reference 11)

Analyses are described in detail in Section 5.0.

5.0 Calculations

Subsoil Conditions

The soil conditions shown in borings A-5 and A-6 (Reference 4) were considered as generally representative of the natural soils beneath the dike.

The soils encountered in these borings consist of, from top to bottom:

1. Sandy/Clayey silt named as the Upper Silt/Sand (10 to 18 feet thick), and
2. Gravelly sand with little silt, named as the Lower Silt/Sand.

Sandstone bedrock was encountered in D-1 and D-2 at El. 564 feet and 561 feet, respectively (Reference 5). In both borings, below approximately El. 597 feet, a sandy clay layer was encountered. However, because of its depth and the generally granular nature of the soils above it, this layer does not influence the stability of the dike. Rock parameters were selected by engineering judgment. Therefore, the soil profile between the bottom of the Upper Silt/Sand and the bedrock was not further subdivided into two layers and was considered to consist of the Lower Silt/Sand.

In-situ soils to the approximate elevation of 614 feet have SPT Blow Counts (N-Values) below 10 Blows/ft. Below this depth, the N-Values increase significantly (approximately 20 Blows/ft). Based on this distinction, the boundary between the Upper and Lower Silt/Sand was placed at this elevation for analysis purposes. The internal friction angle of both materials (32 degrees for the Upper Silt/Sand, and 35 degrees for the Lower Silt/Sand) was estimated using the average N-Values in each layer (Reference 13, p. 163).

For the in-situ Upper Silt/Sand, a small amount of cohesion (25 lb/ft^2) was also estimated based on its silt content.

The internal friction angle of the dike fill was estimated based on the minimum Relative Density of 75 percent specified in Reference 6. The dike materials were obtained by dredging the river bottom, and based on the design drawings and information in Reference 6, from excavation of the upper 5 to 10 feet of the soil profile within the pond area. Therefore, a small amount of cohesion (along with a friction angle) could be assigned to the dike fill. The 12-inch thick layer of bentonite-amended slope face on both sides of the dike does not materially affect the overall dike stability, and therefore was incorporated into the dike fill. However, cohesion provided by this layer could prevent shallow sloughing of the berm face and can increase the veneer stability of the berm. Based on our past experience with similar materials and engineering judgment, the internal friction angle of the medium to dense compacted silt/sand would be within the range of 34 to 38 degrees (See also Reference 13, p. 163). Considering medium compaction, a friction angle of 34 degrees was conservatively assigned to the dike fill, as well as a cohesion value of 25 lb/ft^2.

Fly ash and bottom ash have relatively high (up to 35 degrees, or higher occasionally) friction angles in dry or consolidated condition. However, the fly ash in the Upper Pond is still very wet and generally unconsolidated. Therefore, a relatively small friction angle (15 degrees) was assigned to it.

Table 1 shows the estimated soil parameters for each material as used in the analyses.

TABLE 1

Material	Legend on Figures 3,4,5	Unit Weight (lb/ft^3)	Friction Angle, φ' (Degrees)	Cohesion, c' (lb/ft^2)
Pond Ash	SOIL 1	90	15	0
Dike Fill	SOIL 2	125	34	25
Upper Silt/Sand	SOIL 3	125	32	25
Lower Silt/Sand	SOIL 4	125	35	0
Bedrock	SOIL 5	160	0	10000

Slope Stability Analyses

The analyses were performed for Static, Seismic (Pseudo-Static), and Rapid Drawdown conditions.

Static Analysis

The full pond (upstream water level at El. 650 feet) condition was used for the static analysis. A well-established water surface (phreatic line) within the dike was also considered. This line started at El.

650 feet at the upstream side, and terminated at approximately El. 623 feet based on a visual evaluation of the wet zone on the downstream side of the dike (S&L examination of the pond dikes on 10/12/2010). Only the downstream slope of the dike was evaluated for long-term stability. The output of the analysis for this condition is shown on Figure 3. The level of the ash within the pond does not affect the stability of the downstream face of the dike for the static condition.

Seismic Analysis

The seismic slope stability analysis was performed using a horizontal acceleration coefficient. This coefficient represents the fraction of the gravitational acceleration applied horizontally to the soil mass directed away from the slope to approximate the lateral forces on the dike mass that occur during an earthquake.

The peak bedrock acceleration for 10-percent nonexceedance level for a 50-year period earthquake was obtained from the U.S. Geological Survey (USGS) earthquake hazards web site (Reference 7) and the USGS Open File Report 2008-1128 (Reference 8) as 1.1 percent of the gravitational acceleration (0.011g). This is a very small value, and did not affect the slope stability to any significant extent. For the seismic condition, the downstream slope of the dike is more critical, and the seismic stability analysis was performed for the downstream slope only.

For the analysis, a lateral load equivalent to 1.1 percent of the weight of the soil mass was applied to the slope by the software. This represents the lateral force generated during an earthquake on the dike, and is assumed to act at the same intensity during the earthquake (i.e., pseudo-static condition). In pseudo-static analyses, typically 2/3 to ¾ of the peak acceleration is applied to the soil mass as an average value during the earthquake since the acceleration history during an earthquake goes through a large number of acceleration cycles, all but one less than the peak acceleration. However, bedrock motions can also amplify, attenuate, or remain approximately at the same levels as the earthquake waves travel upward from the rock toward the soil surface. Recognizing the potential for some amplification through the in-situ soils, the full bedrock acceleration obtained from the above references was applied at the soil surface.

“Effective Stress” strength parameters for the dike material and the in-situ soils were used in the analysis since the earthquake acceleration levels for the site are very small and will not be capable of generating any significant excess porewater pressures (beyond hydrostatic pressure) within the body of the dike that may be trapped in the zone below the phreatic surface which would cause a reduction in the soil strength during an earthquake.

The output of the analysis for this condition is shown on Figure 4. The level of the ash within the pond does not affect the stability of the downstream face of the dike for the seismic condition.

Rapid Drawdown Analysis

A rapid lowering of the water level inside the pond due to controlled or uncontrolled operational conditions may create potential instability for the upstream slope of the dike. The basic mechanism that causes the instability condition is the loss of support from the weight of the water located over the upstream slope whereas the porewater pressures within the body of the dike can not dissipate rapidly by drainage due to limited hydraulic conductivity of the dike material. The net result is increased weight of the soil (no longer buoyant, but still saturated) creating an increased downward pull of the dike materials whereas the shear strength of the soil remains essentially unchanged due to lack of drainage within the dike. This causes a reduction in the slope FS relative to the full pond condition.

Under normal conditions, the pond water levels are generally stable due to controlled discharge through a weir structure. A very fast drop in the pond water levels, in all likelihood, would be a result of a dike failure, or an earthquake event. During rapid drawdown, the phreatic surface within the dike will gradually drop, and the time-rate of this drop will be a function of the hydraulic conductivity of the berm material and that of the bentonite-amended slope face. In rapid drawdown analyses, the phreatic surface is conservatively assumed to remain constant. The purpose of the rapid drawdown analyses is to investigate the potential for additional dike failures caused by such drops in the pond water levels.

For the rapid drawdown scenario, the pond water level was considered to be at El. 650 feet. The final pond water level that would cause the FS to drop to approximately 1.2 was determined by trial and error by varying the surface elevation of the pond ash and the water level inside the pond. This condition was achieved at El. 635 feet. At the present time, the pond ash surface is at the approximate elevation of 641 feet. Due to support provided by an additional six (6) feet of ash (El 635 to El. 641), the actual rapid drawdown FS is greater than 1.2. However, it is recommended that the pond ash levels be maintained at El 635 feet or higher to avoid potential instability of the upstream face of the dike in the event of a rapid drawdown incidence.

The output of the analysis for this condition is on Figure 5.

Results

Figures 3 through 5 contain the results of the runs with the minimum factors of safety indicated.

Static Analysis

The minimum FS obtained with the established phreatic surface within the dike was 1.59 (Figure 3). This value exceeds the minimum acceptable FS of 1.5 and is acceptable.

Seismic Analysis

The minimum FS obtained from the pseudo-static seismic analysis was 1.53 (Figure 4). This value exceeds the minimum acceptable FS of 1.15 and is acceptable.

<u>Rapid Drawdown Analysis</u>

The minimum FS obtained from the sudden drawdown condition was 1.22 (Figure 5) with the pond ash level at El. 635 feet. This value is within the acceptable minimum FS range of 1.1 to 1.3. At pond ash levels higher than El. 635, the FS will exceed 1.22.

6.0 Summary

Based on the results above, for the present conditions, the perimeter dikes around the ash settling ponds meet the minimum FS requirements and are considered stable.

The ash within the Upper Ash Pond does not affect the static and seismic stability of the downstream face of the Upper Pond Perimeter Dike. The level of the ash and the water level within the pond do influence the rapid drawdown stability of the upstream slope of the dike. To maintain a safe upstream slope for the rapid drawdown condition, it is recommended that the ash levels within the Upper Pond be maintained at or above El. 635 feet.

7.0 References

1. Sargent&Lundy Drawing S-11 “Site Development Plant Fill Unit 4, Lansing Power Station, Interstate Power Company, Lansing, Iowa”, Rev. H, project number not legible, dated 7/20/1973.
2. Sargent&Lundy Drawing S-14 “Site Development Ash Dike Sections – Sheet 1, Lansing Power Station, Interstate Power Company, Lansing, Iowa”, Rev. E, Project No. 4644-07, dated 9/9/1977.
3. Sargent&Lundy Drawing S-1 “Boring Location Plan Unit 4, Lansing Power Station, Interstate Power Company, Lansing, Iowa”, Rev. D, Project No. 4644-03, dated 9/9/1977.
4. Sargent&Lundy Drawing S-3 “Soil Boring Logs Sheet 1, Lansing Power Station, Interstate Power Company, Lansing, Iowa”, Rev. A, Project No. 4644-03, dated 9/10/1973.
5. Sargent&Lundy Drawing S-6 “Soil Boring Logs Sheet 4, Lansing Power Station, Interstate Power Company, Lansing, Iowa”, Rev. A, Project No. 4644-03, dated 9/9/1977.
6. Sargent&Lundy Specification G-3105 “General Work – Lansing Power Station – Unit 4, Division 2 – Site Work”, Rev. R, November 15, 1973.
7. USGS Web Site http://gldims.cr.usgs.gov/website/nshmp2008/viewer.htm (National Seismic Hazard Maps – 2008).
8. USGS (2008) “Documentation for the 2008 Update of the United States National Seismic Hazard Maps”, Open File Report 2008-1128.
9. GEO-SLOPE International Ltd. (2002) “SLOPE/W for Slope Stability Analysis”, Version 5.11.
10. Huang, Y.H. (1983) <u>Stability Analysis of Earth Slopes</u>, Van Nostrand - Reinhold, 305 pp.
11. U.S. Army Corps of Engineers (2003) <u>Slope Stability</u>, EM 1110-2-1902.
12. NAVFAC (1986) <u>Soil Mechanics,</u> Design Manual 7.1, Department of the Navy, Naval Facilities Engineering Command.
13. Bowles, J.E. (1996) <u>Foundation Analysis and Design</u>, 5th Edition, McGraw-Hill.

Slope Stability Analyses - Ash Settling Pond Dikes				Calc. No. LANS-SS-001	
				Rev. 0	Date
	Safety-Related	X	Non Safety-Related	Page 9 of	

Client	Alliant Energy	Prepared by: E.S. Motan	Date
Project	Lansing Power Station	Reviewed by	Date
Proj. No.	12093-025	Approved by	Date

FIGURE 1

Sargent & Lundy LLC	Slope Stability Analyses - Ash Settling Pond Dikes			Calc. No. LANS-SS-001	
				Rev. 0	Date
	Safety-Related	X	Non Safety-Related	Page 10 of	

Client	Alliant Energy	Prepared by: E.S. Motan	Date
Project	Lansing Power Station	Reviewed by	Date
Proj. No.	12093-025	Approved by	Date

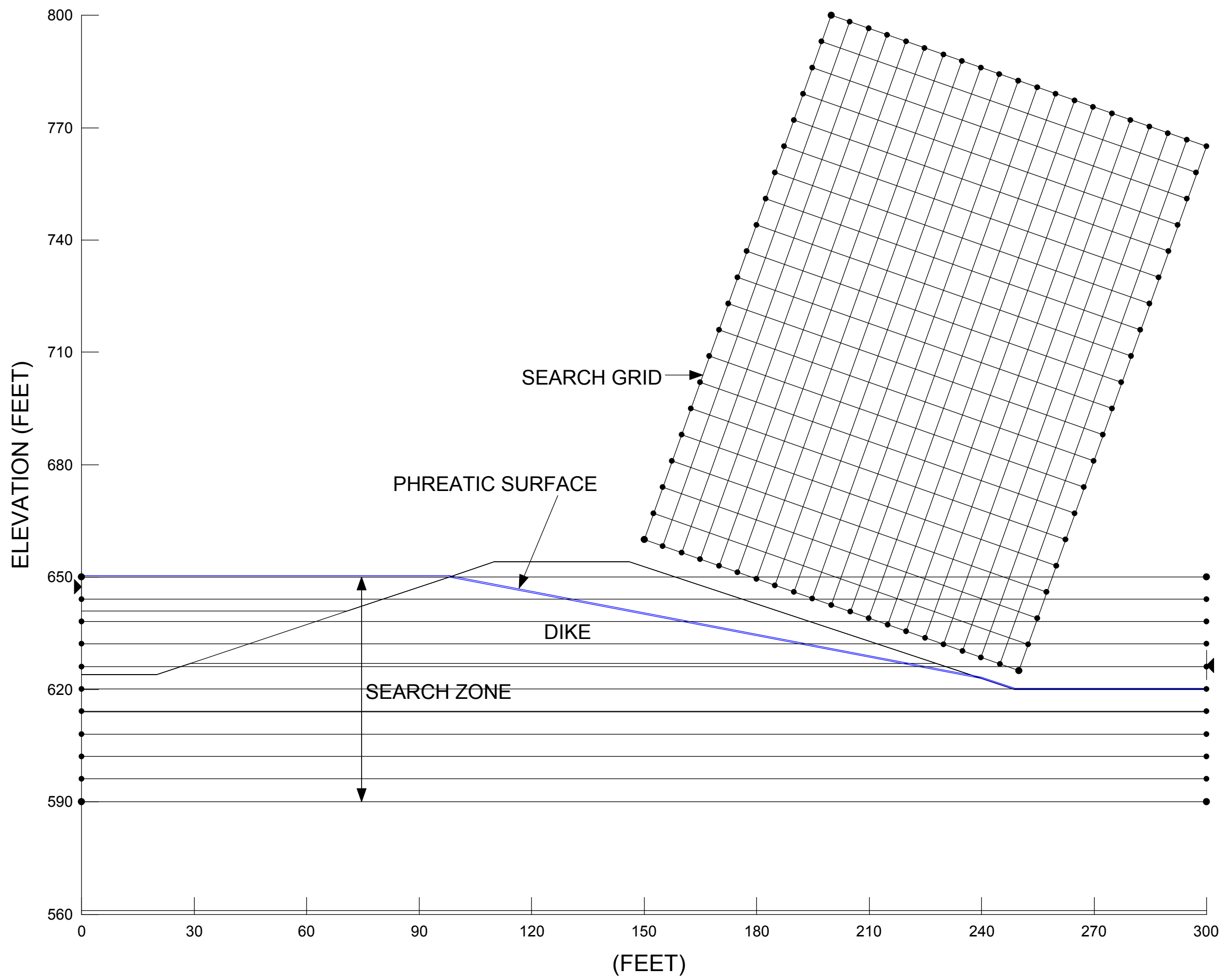


FIGURE 2

Client	Alliant Energy	Prepared by: E.S. Motan	Date
Project	Lansing Power Station	Reviewed by	Date
Proj. No.	12093-025	Approved by	Date

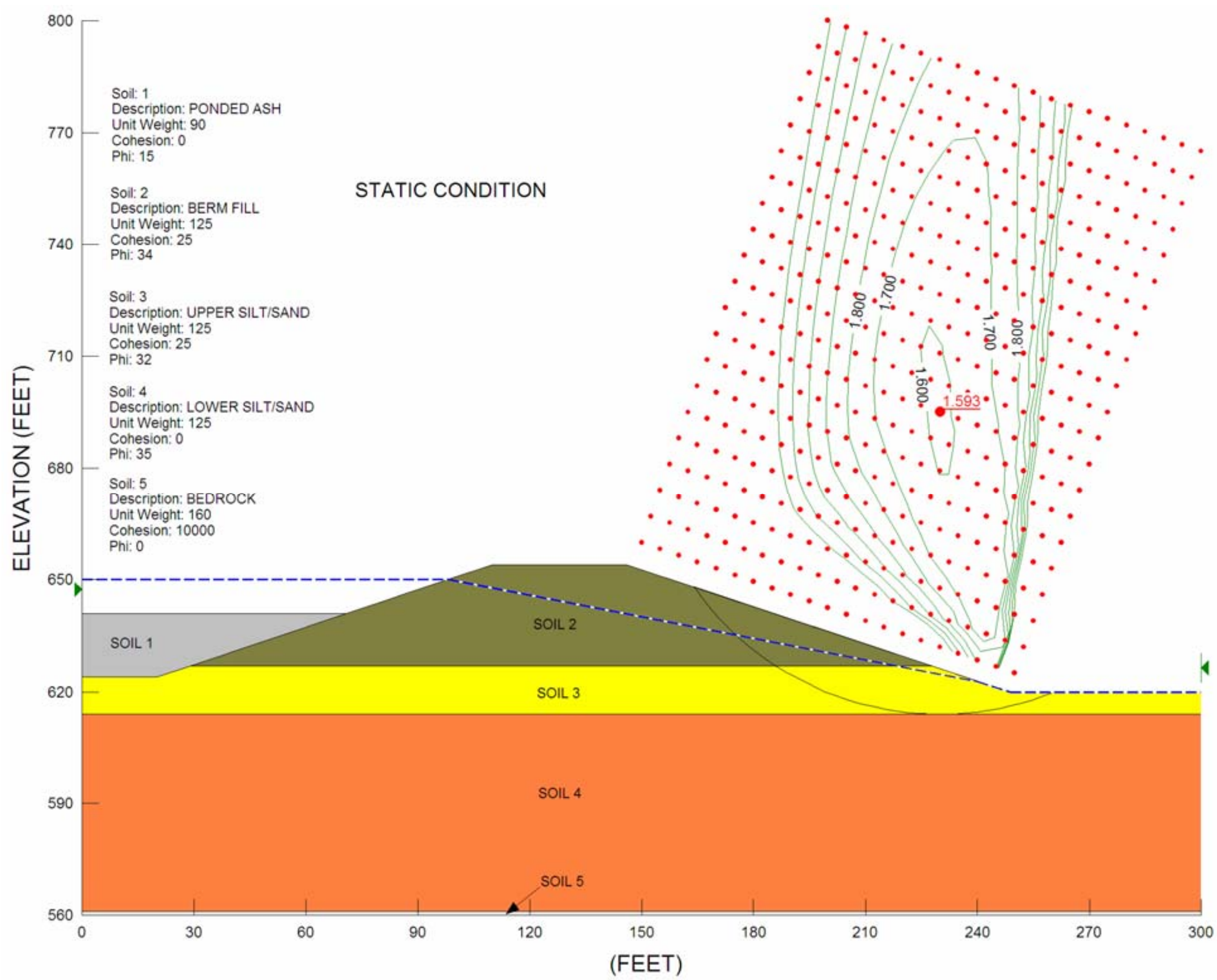


FIGURE 3

Client	Alliant Energy	Prepared by: E.S. Motan	Date
Project	Lansing Power Station	Reviewed by	Date
Proj. No.	12093-025	Approved by	Date

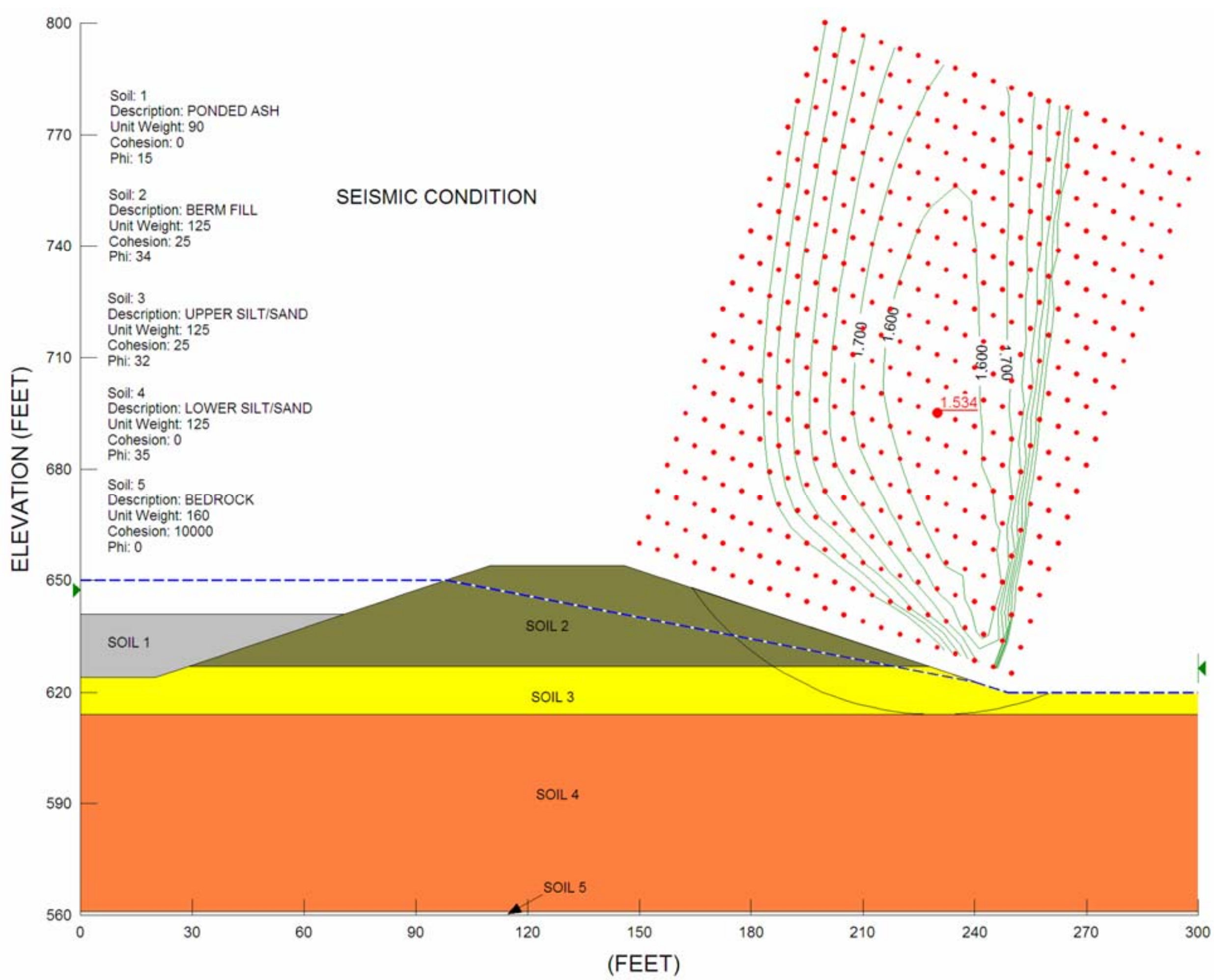


FIGURE 4

Client	Alliant Energy	Prepared by: E.S. Motan	Date
Project	Lansing Power Station	Reviewed by	Date
Proj. No.	12093-025	Approved by	Date

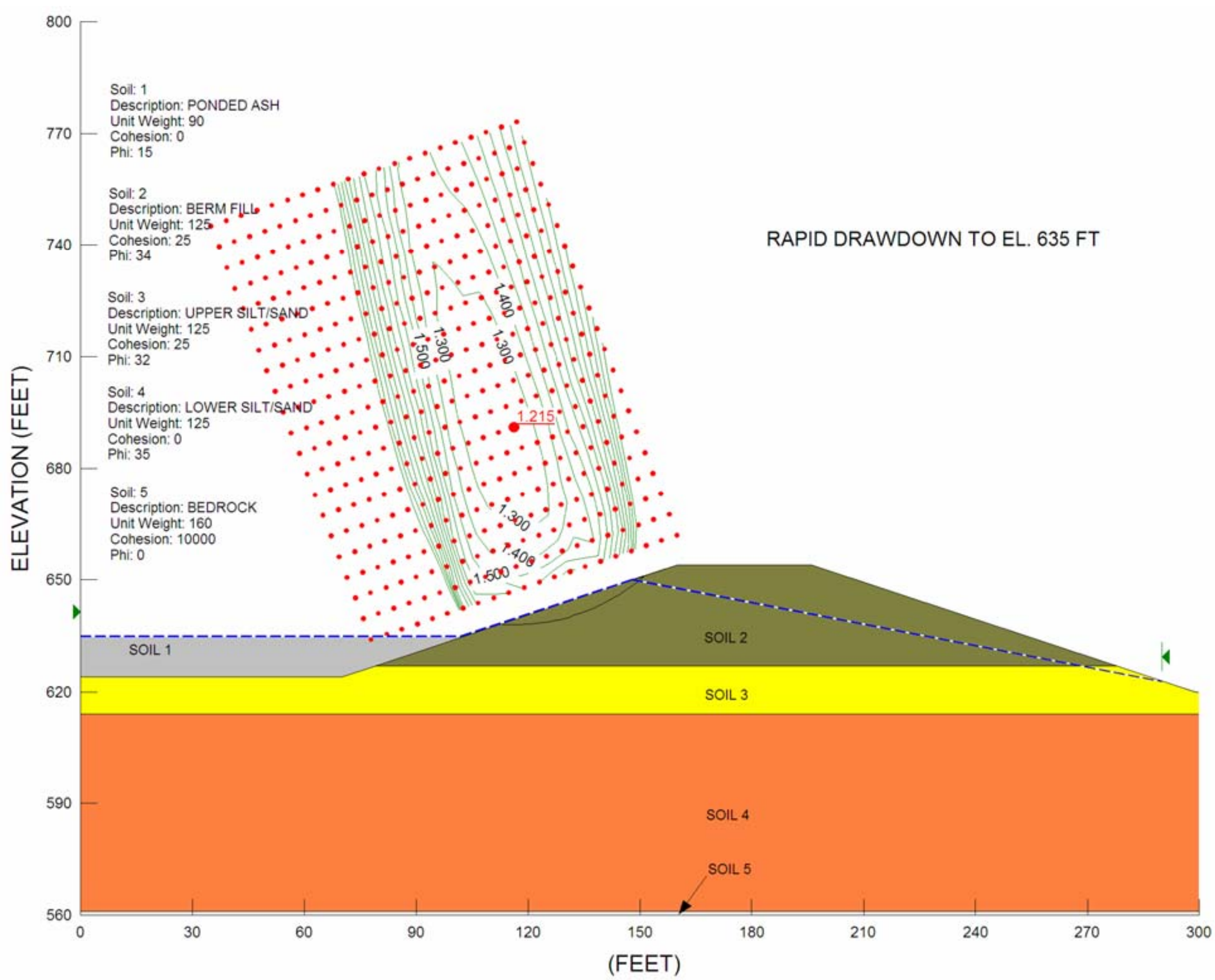


FIGURE 5

APPENDIX A

Document 1.3.1

GENCO Standard Guide for Pond Inspections

5 pages

CONFIDENTIAL BUSINESS INFORMATION

GENCO STANDARD GUIDE FOR POND INSPECTIONS

Procedure No. GENCO-0-OP-402-01

Approved By: Paul Treangen
Regional Director Generation West
Date: 4/29/2009

Terry Kouba
Regional Director Generation Central
Date: 4/30/2009

Linda Poe
Regional Director Generation East
Date: 4/30/2009

CONFIDENTIAL BUSINESS INFORMATION

TABLE OF CONTENTS

ENCLOSURES

1. GENCO Pond Inspection Guide

GENCO STANDARD GUIDE FOR POND INSPECTIONS

1. INTRODUCTION

Alliant Energy owns numerous generating stations and other facilities that utilize engineered process water systems (ash ponds) to handle coal combustion byproducts (e.g., bottom ash, economizer ash, and fly ash) coal pile and landfill storm water runoff, and cooling ponds. In nearly every case, state mandated monitoring and water quality testing requirements are associated with the discharges of these ponds and a compromise of the structural integrity of these ponds could lead to an uncontrolled or unmonitored discharge to the environment.

2. OBJECTIVE

The purpose of this Guide is to formalize guidance regarding routine Pond inspections including frequency of inspections, management review requirements, and guidance on issue resolution. This procedure will be utilized by all GENCO power plants to establish a comprehensive and corporate-wide compliance and inspection program for ash ponds, storm water runoff ponds including coal piles and landfill ponds, and cooling ponds (if applicable). Failure to routinely inspect and document the integrity of ponds can result in unidentified structural or operational problems that if unresolved can lead to noncompliance with environmental requirements. Encl (1) provides a general overview of the inspection process as well as detailed instructions and a checklist for performing and documenting the inspections.

3. DISCUSSION

Each generating station or facility with a pond system, that may pose a risk to the environment and the company, generally has a system that is unique to their site. This guide along with Encl (1) is meant to provide general guidance to each plant manager or site director to perform routine inspections of their pond systems to allow prompt identification of problems or potential problems. Although no formal state guidelines exist in Iowa, Minnesota, or Wisconsin regarding pond inspections, each plant manager or site director is responsible to ensure that these pond systems operate properly with discharges that are within permit limits and with no breeches in structural integrity.

The GENCO inspection guidelines are a tool for plant or site management to help standardize routine pond inspections. Deficiencies that are identified during the process should be properly vetted through the environmental and engineering groups to determine what corrective actions are required and what state permitting or approvals are necessary to conduct corrective actions.

4. GENCO POND INSPECTION GUIDELINES

4.1 Pond Inspection Periodicities

1. Due to the uniqueness of each plant or site's pond systems, plant managers, site directors, environmental specialists, and engineering representatives must jointly determine inspection periodicities. Routine inspection periodicities should be determined based upon physical construction and arrangement and should also take historical environmental factors into account (e.g. spring melt and flooding). However, ponds should be inspected at a minimum of once per year in accordance with Enclosure (1). Additionally, corporate environmental will participate in site pond inspections a minimum of once a year.

2. To facilitate planning and execution of these inspections each plant should set up a task in Enviance or Maximo to ensure that the inspections are performed and documented at the desired periodicity.

4.2 Pond Inspection Procedure

1. Inspections- knowledgeable plant personnel (corporate environmental if applicable) will use Enclosure (1) as a standard checklist to perform the required pond inspections. Inspectors should review previous inspection reports to review past issues and corrective actions prior to each pond inspection. Inspectors will complete Encl (1) for each pond inspected and note any concerns on page two Encl (1). Inspectors shall take pictures of any discrepant conditions and attach them to the report to allow corporate environmental and engineering resources to better understand the exact nature of the concern.

2. Review Requirements- the Plant Manager and Environmental and Safety Specialist will review the report with the inspector(s) and sign off on the inspection form.

3. Issue Resolution- plant management will determine how to correct any deficiencies noted during the inspection process. Outside assistance may be required in some cases.

a. Prior to commencing the work, Corporate Environmental shall be contacted to review solutions; and to determine if any type of permitting or approval is required from the State, Federal, or County Agencies.

b. Engineering shall be contacted to resolve any structural concerns of a dike or levee (e.g. tree removal or erosion).

4.3 Record Retention- plants shall maintain a copy of each pond's Encl (1) inspection results for a period of five years. This requirement may be met by attaching an electronic copy of the Encl (1) pond Inspection results for each pond to the Enviance task or Maximo PM that tracks the inspections.

5.0 Revision / Review Record

Any amendments or revisions to this procedure **must** be approved by GENCO Regional Directors

Revision / Review Record				
Revision	**Reason for Revision**	**Date**	**Author**	**Approved By**
Original	Initial Issue of new GENCO Procedure	4/30/09	Buddy Hasten	Paul Treangen Terry Kouba Linda Poe

**** End of Procedure ****

APPENDIX A

Document 1.3.2

Alliant Energy Surface Pond Visual Inspection -Lansing Generating Station

21 pages

Lansing Generating Station Ash Ponds Satellite View
By Using Google Map

No.
1 Coal Runoff Basin
2 Secondary Ash Settling Basin
3 Main Ash Settling Basin

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Lansing Generating Station	Thursday, March 12, 2009	Coal Pile Runoff Basin, Secondary, and Main Ash Settling Basin
INSPECTOR(S): List Below	WEATHER CONDITIONS:	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny, Cold	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	HIGH TEMP: 7^{0}F	
Plant Manager: Hank Sangster	LOW TEMP: MINUS 1^{0}F	
Operations Manager: Martin Burkhardt	WIND: From N 3mph	PRESS: 30.74 ↑ inches
Maintenance Manager: None	SIGNATORY REVIEW:	
E&S Specialist: Andrew Johnson		

Description:

On Thursday, March 12, 2009 we (the inspector group) visited Lansing Generating Station, and we noticed some beaver activities and trees along the Northwest and West side of the Main Ash Settling Basin.

We, Alliant Energy ash pond inspectors, recommend to monitor the animals activities and to cut those trees located on the Northwest side of the Main Ash Settling Basin before the roof penetrate the levee or dike adjacent.

Base on the Independent Levee Investigation Team: Trees that are planted on top of or adjacent to the levee structure can result in significant damage. Trees that are blown over in ***high wind conditions*** , not only create a large void that can destabilize the levee or dike, but ***the root systems associated with the tree can result in preferred piping channels if the roots are pulled out of the dike or levee*** (such as if a tree is blown over in a strong wind storm.) ***To mitigate possible impacts of tree damage on levees or dikes*** , design and maintenance guidelines generally specify that trees be ***kept clear of the dike or levee structure.***

CONFIDENTIAL BUSINESS INFORMATION

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Lansing Generating Station	12-Mar-09	Coal Pile Runoff Basin
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny, Cold	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Hank Sangster		
Operations Manager: Martin Burkhardt		
Maintainence Manager: None		
E&S Specialist: Andrew Johnson		

1. Dike/Levee Integrity	Yes	No	Action Needed?
Visual Signs of Animal Activity into the dike wall that may impact the integrity of the dike wall?		X	
Trees growing on top or side of dike in which the root system may impact the integrity of the dike wall?	X		Cut Trees off
Woody type shrubs growing on top or side of dike in which the root system may impact the integrity of the dike wall?		X	
Any visual seeps of water through the dike wall?		X	
Any areas of soft soil/dead vegetation on the dike wall?		X	
Any areas of eroison caused either by wind eroison; storm water runoff into or outside the dike wall?		X	
Any evidence of ash pond water washing over the dike wall?		X	
Where applicable, are any of the valving or piping used to control the discharge from a pond leaking?			N/A
Any ponding of water outside the dike wall?		X	
2. Outfall Structure			
Any areas of erosion or animal activity near or at the entrance of the outfall structure or pipe that may cause wastewater to travel along the outside of the pipe?		X	
Any areas of erosion; animal activity; swirling of wastewater on the discharge side of the outfall structure that may impact the integrity of the dike or structure?		X	
Woody type shrubs growing on top or side of dike in which the root system may impact the integrity of the dike wall?		X	
3. Visable Solids			
Is there a build up of settled ash visible near the dike walls or discharge structure?		X	

CONFIDENTIAL BUSINESS INFORMATION

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Lansing Generating Station	12-Mar-09	Secondary Ash Settling Basin
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny, Cold	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Hank Sangster		
Operations Manager: Martin Burkhardt		
Maintainence Manager: None		
E&S Specialist: Andrew Johnson		

1. Dike/Levee Integrity	Yes	No	Action Needed?
Visual Signs of Animal Activity into the dike wall that may impact the integrity of the dike wall?	X		Monitor
Trees growing on top or side of dike in which the root system may impact the integrity of the dike wall?	X		Cut Trees off
Woody type shrubs growing on top or side of dike in which the root system may impact the integrity of the dike wall?		X	
Any visual seeps of water through the dike wall?		X	
Any areas of soft soil/dead vegetation on the dike wall?		X	
Any areas of eroison caused either by wind eroison; storm water runoff into or outside the dike wall?		X	
Any evidence of ash pond water washing over the dike wall?		X	
Where applicable, are any of the valving or piping used to control the discharge from a pond leaking?			N/A
Any ponding of water outside the dike wall?		X	
2. Outfall Structure			
Any areas of erosion or animal activity near or at the entrance of the outfall structure or pipe that may cause wastewater to travel along the outside of the pipe?		X	
Any areas of erosion; animal activity; swirling of wastewater on the discharge side of the outfall structure that may impact the integrity of the dike or structure?		X	
Woody type shrubs growing on top or side of dike in which the root system may impact the integrity of the dike wall?		X	
3. Visable Solids			
Is there a build up of settled ash visible near the dike walls or discharge structure?		X	

CONFIDENTIAL BUSINESS INFORMATION

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Lansing Generating Station	12-Mar-09	Main Ash Settling Basin
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny, Cold	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Hank Sangster		
Operations Manager: Martin Burkhardt		
Maintainence Manager: None		
E&S Specialist: Andrew Johnson		

1. Dike/Levee Integrity	Yes	No	Action Needed?
Visual Signs of Animal Activity into the dike wall that may impact the integrity of the dike wall?	X		Monitor
Trees growing on top or side of dike in which the root system may impact the integrity of the dike wall?	X		Cut Trees off
Woody type shrubs growing on top or side of dike in which the root system may impact the integrity of the dike wall?		X	
Any visual seeps of water through the dike wall?		X	
Any areas of soft soil/dead vegetation on the dike wall?		X	
Any areas of eroison caused either by wind eroison; storm water runoff into or outside the dike wall?		X	
Any evidence of ash pond water washing over the dike wall?		X	
Where applicable, are any of the valving or piping used to control the discharge from a pond leaking?			N/A
Any ponding of water outside the dike wall?		X	
2. Outfall Structure			
Any areas of erosion or animal activity near or at the entrance of the outfall structure or pipe that may cause wastewater to travel along the outside of the pipe?		X	
Any areas of erosion; animal activity; swirling of wastewater on the discharge side of the outfall structure that may impact the integrity of the dike or structure?		X	
Woody type shrubs growing on top or side of dike in which the root system may impact the integrity of the dike wall?		X	
3. Visable Solids			
Is there a build up of settled ash visible near the dike walls or discharge structure?		X	

NOTES or OBSERVATIONS

Provide a description of the issue or observation below:

ISSUE	Description and Location of Issue	Maximo Work Order #	Due Date	Date Completed
Trees along the levee	On the West side and Northwest of the Main Ash Settling Basin			
Animals activities	Monitor the beavers activities, locate on the West side of the Main Ash Settling Basin			

Review this Sheet Prior to each Inspection

CONFIDENTIAL BUSINESS INFORMATION

LGS - Main Ash Settling Basin Pic #1

LGS - Main Ash Settling Basin Pic #2

LGS - Main Ash Settling Basin Pic #3

LGS - Main Ash Settling Basin Pic #4


LGS - Main Ash Settling Basin Pic #5


LGS - Main Ash Settling Basin Pic #6


LGS - Main Ash Settling Basin Pic #7


LGS - Main Ash Settling Basin Pic #8


LGS - Main Ash Settling Basin Pic #9


LGS - Main Ash Settling Basin Pic #10


LGS - Main Ash Settling Basin Pic #11


LGS - Main Ash Settling Basin Pic #12

CONFIDENTIAL BUSINESS INFORMATION

LGS - Main Ash Settling Basin Pic #13

LGS - Main Ash Settling Basin Pic #14

LGS - Main Ash Settling Basin Pic #15

LGS - Coal Pile Runoff Basin Pic #16

LGS - Coal Pile Runoff Basin Pic #17

LGS - Coal Pile Runoff Basin Pic #18

ALLIANT ENERGY SURFACE POND PHOTO LOG

PLANT NAME: Lansing Generating Station

DATE	PHOTO NUMBER	DESCRIPTION of the PHOTO
3/12/2009	LGS Pic #1	No comment
3/12/2009	LGS Pic #2	No comment
3/12/2009	LGS Pic #3	No comment
3/12/2009	LGS Pic #4	No comment
3/12/2009	LGS Pic #5	No comment
3/12/2009	LGS Pic #6	No comment
3/12/2009	LGS Pic #7	Monitor animals activities
3/12/2009	LGS Pic #8	Cut off the trees on the West side of the Main Ash Settling Basin
3/12/2009	LGS Pic #9	Cut off the trees on the West side of the Main Ash Settling Basin
3/12/2009	LGS Pic #10	Cut off the trees on the West side of the Main Ash Settling Basin
3/12/2009	LGS Pic #11	Cut off the trees on the West side of the Main Ash Settling Basin
3/12/2009	LGS Pic #12	Cut off the trees on the West side of the Main Ash Settling Basin
3/12/2009	LGS Pic #13	Cut off the trees on the Northwest side of the Main Ash Settling Basin
3/12/2009	LGS Pic #14	Cut off the trees on the Northwest side of the Main Ash Settling Basin
3/12/2009	LGS Pic #15	Cut off the trees on the Northwest side of the Main Ash Settling Basin
3/12/2009	LGS Pic #16	Monitor for over flooding in the Coal Pile Runoff Basin
3/12/2009	LGS Pic #17	Monitor for over flooding in the Coal Pile Runoff Basin
3/12/2009	LGS Pic #18	Monitor for over flooding in the Coal Pile Runoff Basin

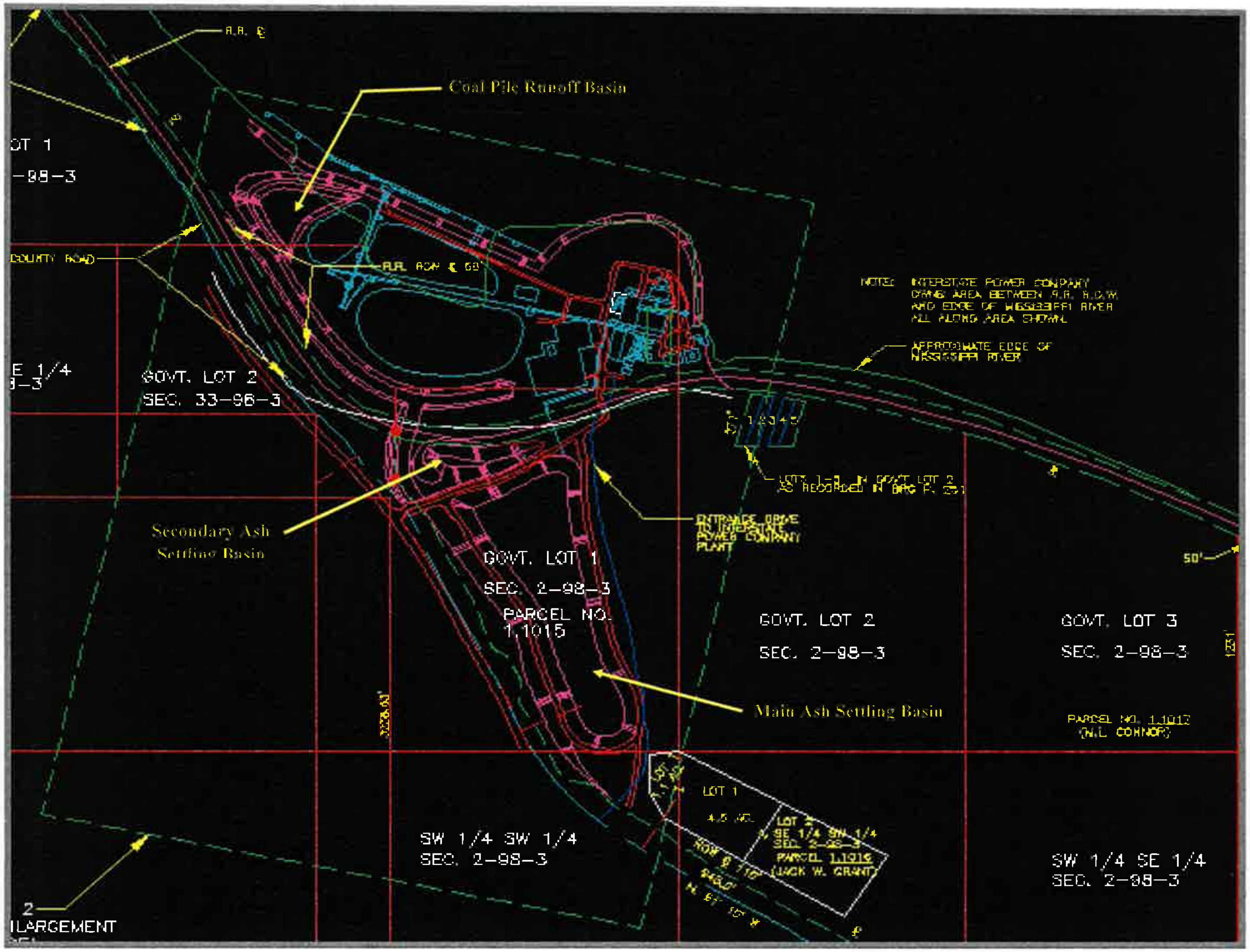
CONFIDENTIAL BUSINESS INFORMATION

	INSPECTION FORM INSTRUCTIONS	
1)	**Plant Name**	Insert name of facility being inspected
2)	**Date**	List date of when inspection was completed
3)	**List Pond Inspected**	List plant name of pond being inspected. For plants with multiple ponds, use one inspection form per pond. Example: Coal Pile Runoff Pond
4)	**Inspectors**	List name of employee(s) who performed the inspection
5)	**Weather Conditions**	List the current weather conditions (cloud cover/precip/temp/wind strength) If there was a substantial rain or runoff event, please note as well
6)	**Plant Mgmt Review**	Plant Management staff is required to review and sign off on the inspection form.
		It is advisible that 1 member of the plant management team review the report with the inspector(s)
7)	**Signatory Review**	Each plant management staff must sign off on the report
8)	**Inspection Process**	Physically walk around each side of the pond looking for conditions present on the report Answer each question and note any issues on page 2. If any issue is discovered, please note the location of the area in question and the steps taken to resolve the issue Examples: For animal caused issues, contracted with a Alliant Approved Company to remove/relocate the animals For erosion/dead vegitation issues, filled in the area and applied grass seed For large trees and woody shrubs, removed or cut down the trees/shrubs For wind erosion, used clean rip/rap to prevent futher eroison For seepage/dike integrity issues, try to determine the source of the issue and eliminate. If seepage continues, may need to perform soil structual analysis and repair dike.

INSPECTION PROCESS	
Inspection Frequency	Minimum inspection frequency is as follow: Spring/Summer/Fall. Inspections can be combined with other inspections
Additional Inspection Frequencies	In addition to item #1 above, inspections should take (at the descretion of the Plant Manager) during these events Large Rain Event or meltoff and flood events (other than typical spring events)
Pictures	Pictures are a great opportunity to capture existing condtions and allows a site to compare from year to year Pictures shall be taken during the initial inspection and then during each Spring Inspection Pictures shall be taken at the same location each year. These areas will be defined during the initial inspection Pictures shall be taken to show areas of concern that are observed during each inspection and attached to the report
Addressing Items of Concern	Inspectors will review the pictures and the inspection form with Plant Management Staff. Decisions shall be made to address the current issue. Corporate Environmental shall be contacted regarding the issue; review of solutions; and determine if any type of Permitting or Approval is required, prior to commencing the work, from the State Agency; Federal Agenicies; or County Agencies Engineering shall be contacted regarding structural concerns of a dike or what might the impact be to the integrity of the Dike if a trees or other living objects are removed (root concerns)
Review of Records	Prior to a new year of inspections, plant staff shall review the previous year inspections to review past issues and if they were resolved Total Suspended Soilds (TSS) analysis from past Discharge Monitoring Reports shall be reviewed each year to determine if the ponds require more intensive dredging

CONFIDENTIAL BUSINESS INFORMATION

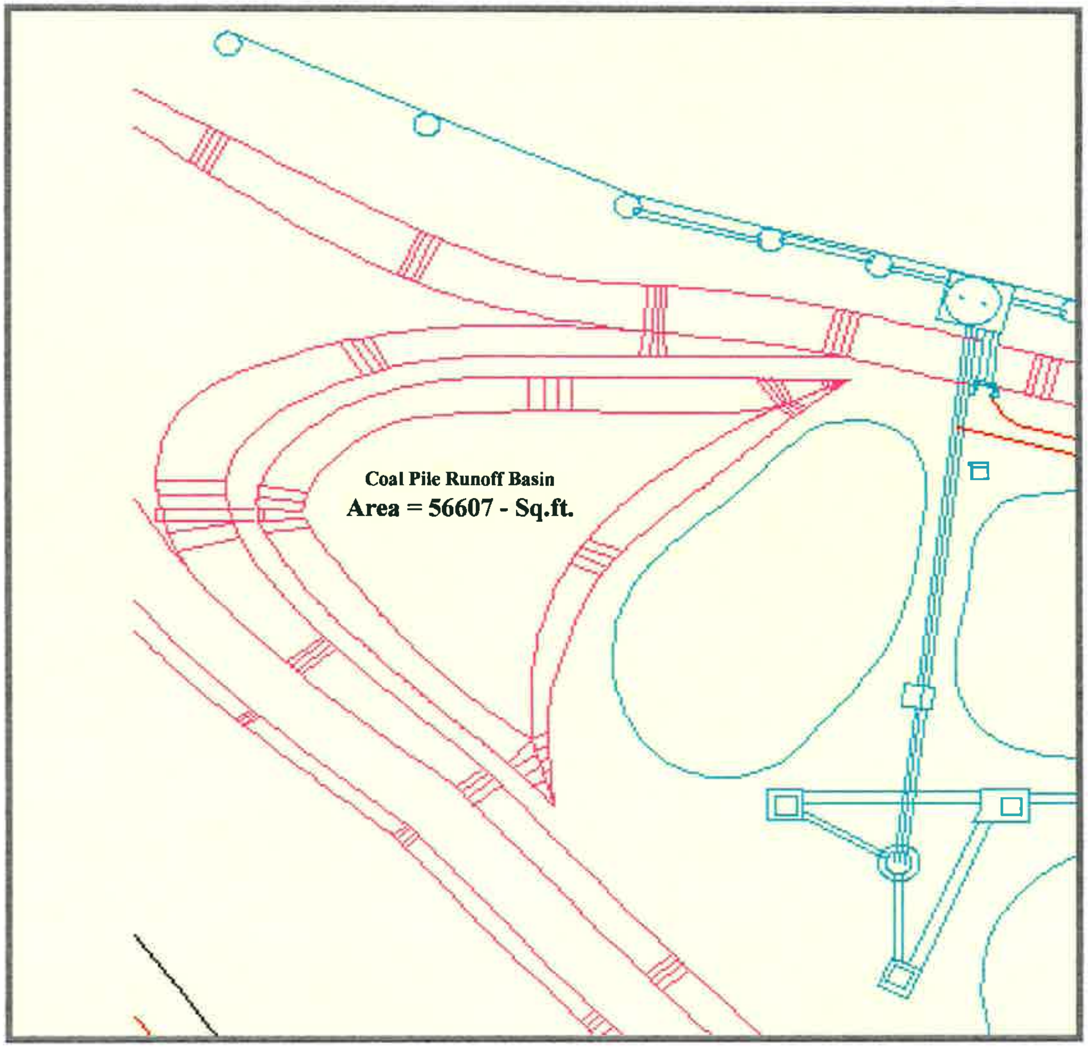
Lansing Generating Station - Ash Settling Basin



Bielka A. Liriano
Projects Engineer - Central
1000 Main St
Dubuque, IA 52003
(563) 584-7337 (office)
(563) 513-8145 (Cell)

9/28/2010
6:07 PM

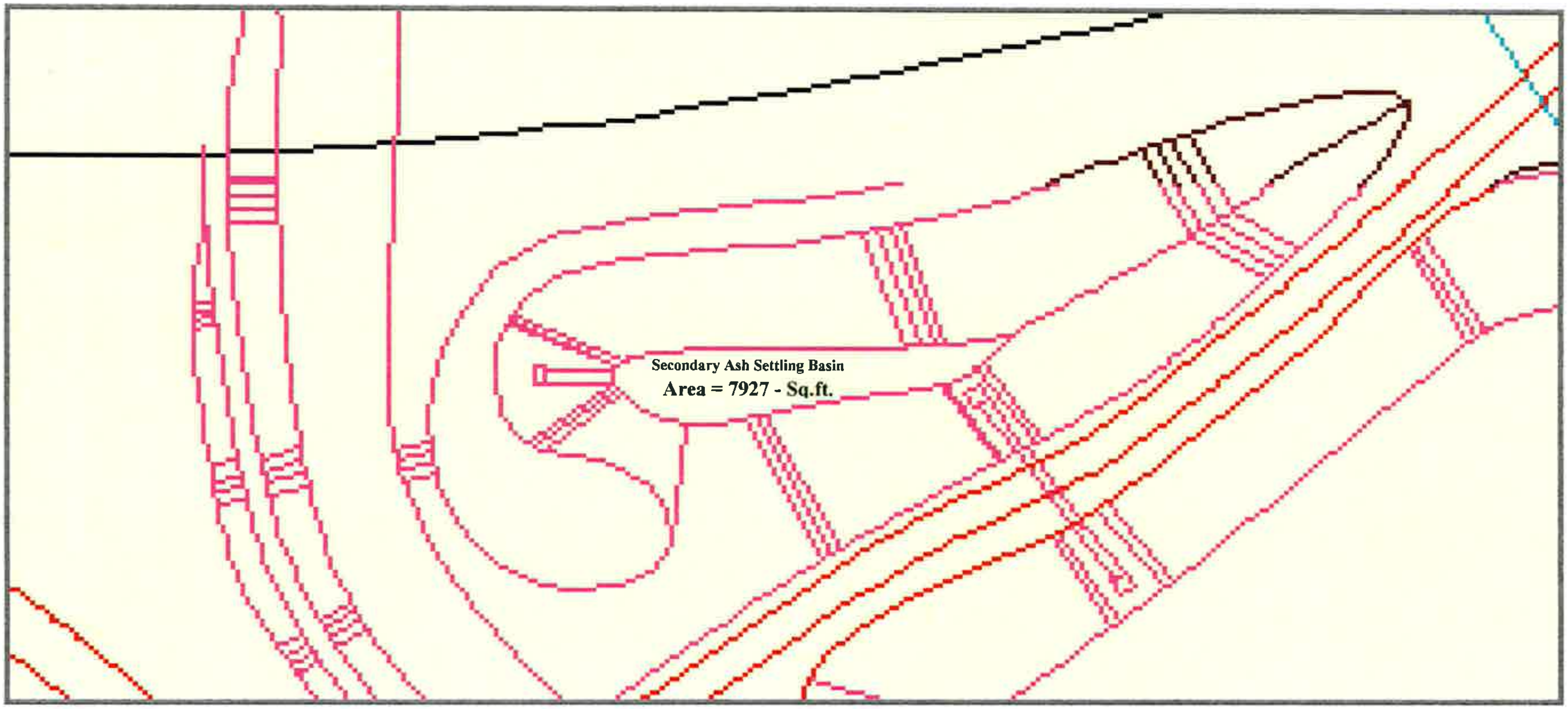
Lansing Generating Station - Coal Pile Runoff Basin
Total Area Calculations by using AutoCAD LT 2007 Software



Bielka A. Liriano
Projects Engineer - Central
1000 Main St
Dubuque, IA 52003
(563) 584-7337 (office)
(563) 513-8145 (Cell)

9/28/2010
6:07 PM

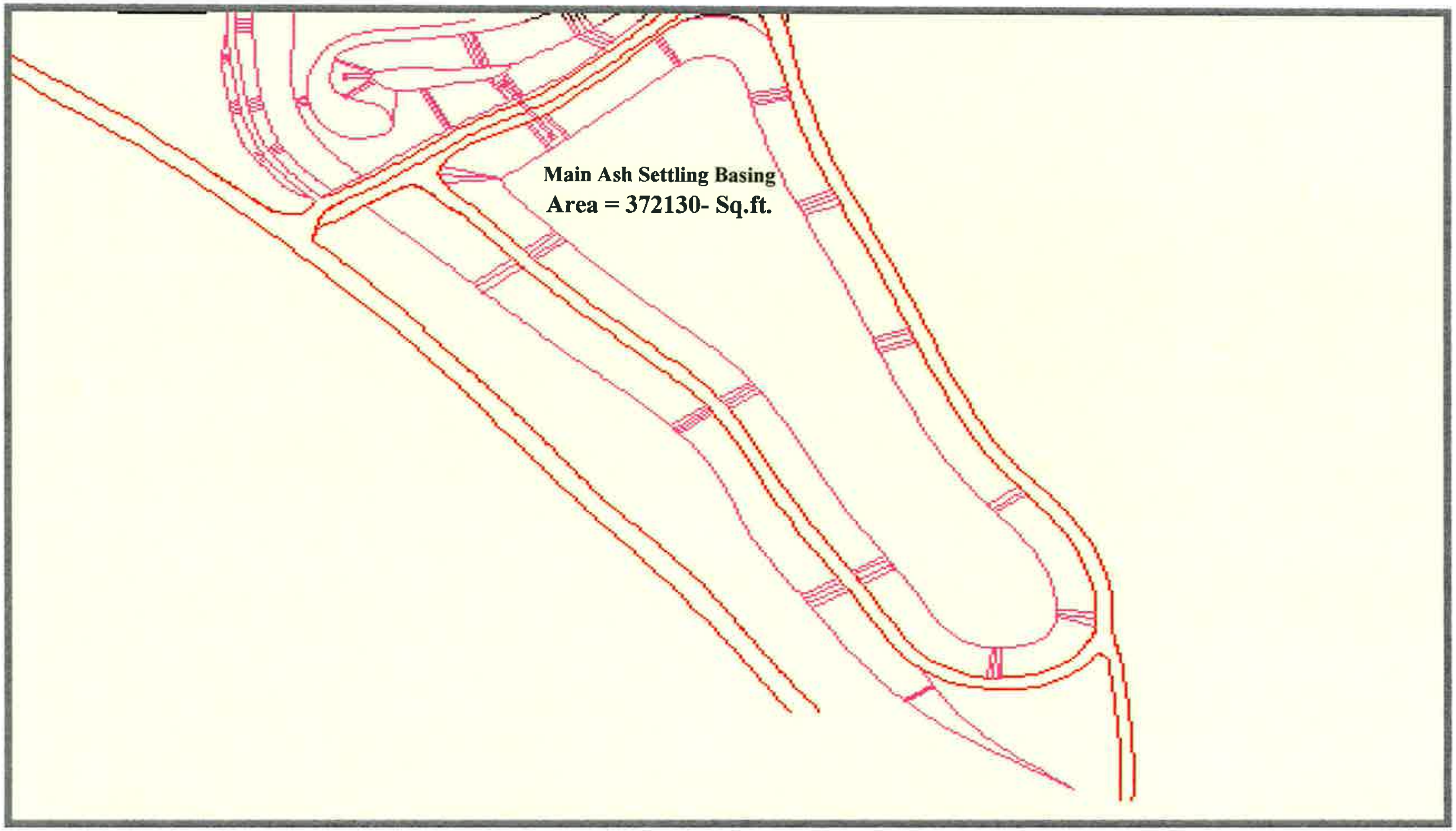
Lansing Generating Station - Secondary Ash Settling Basin
Total Area Calculations by using AutoCAD LT 2007 Software



Bielka A. Liriano
Projects Engineer - Central
1000 Main St
Dubuque, IA 52003
(563) 584-7337 (office)
(563) 513-8145 (Cell)

9/28/2010
6:01 PM

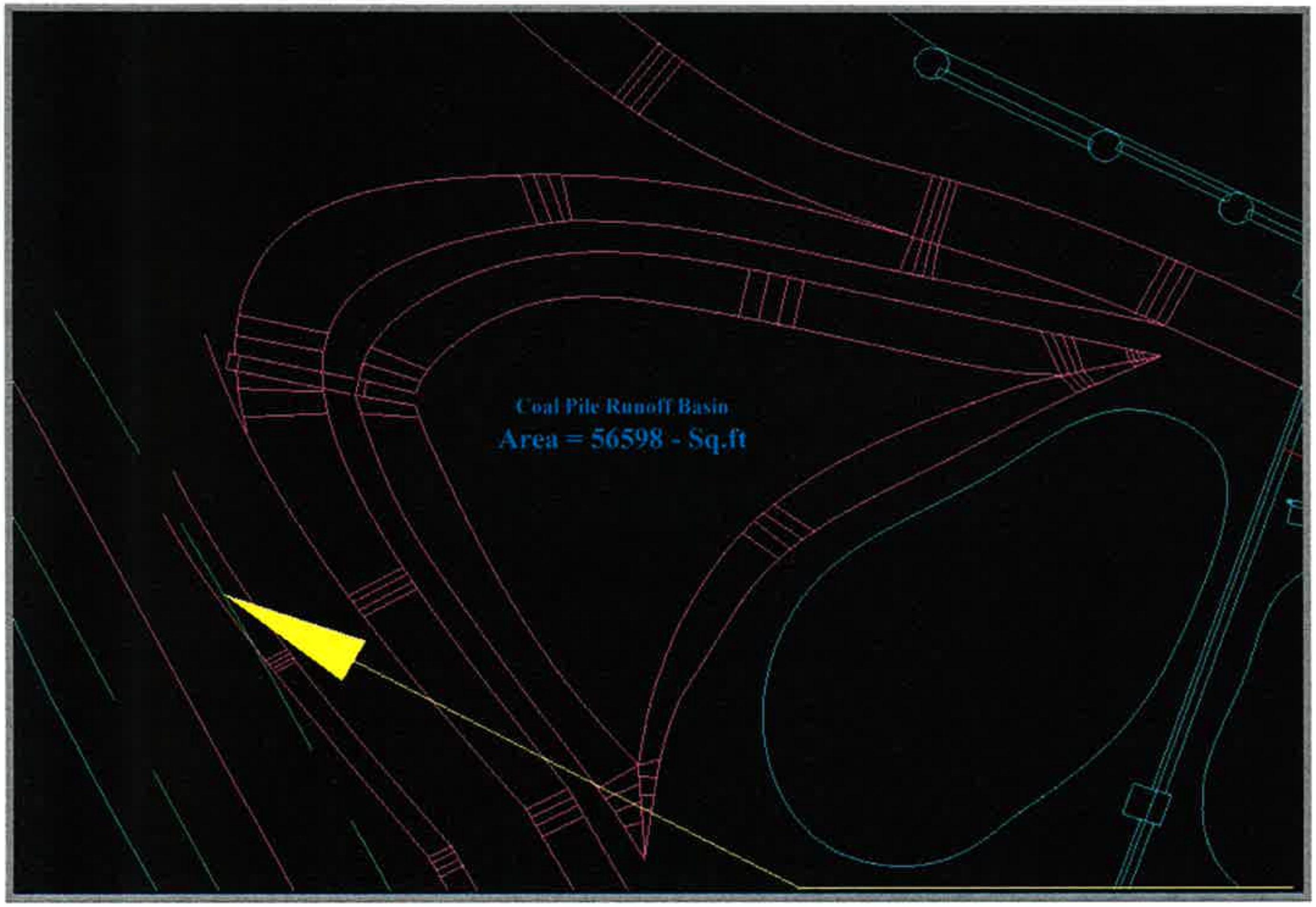
Lansing Generating Station - Main Ash Settling Basin
Total Area Calculations by using AutoCAD LT 2007 Software



Bielka A. Liriano
Projects Engineer - Central
1000 Main St
Dubuque, IA 52003
(563) 584-7337 (office)
(563) 513-8145 (Cell)

9/28/2010
6:08 PM

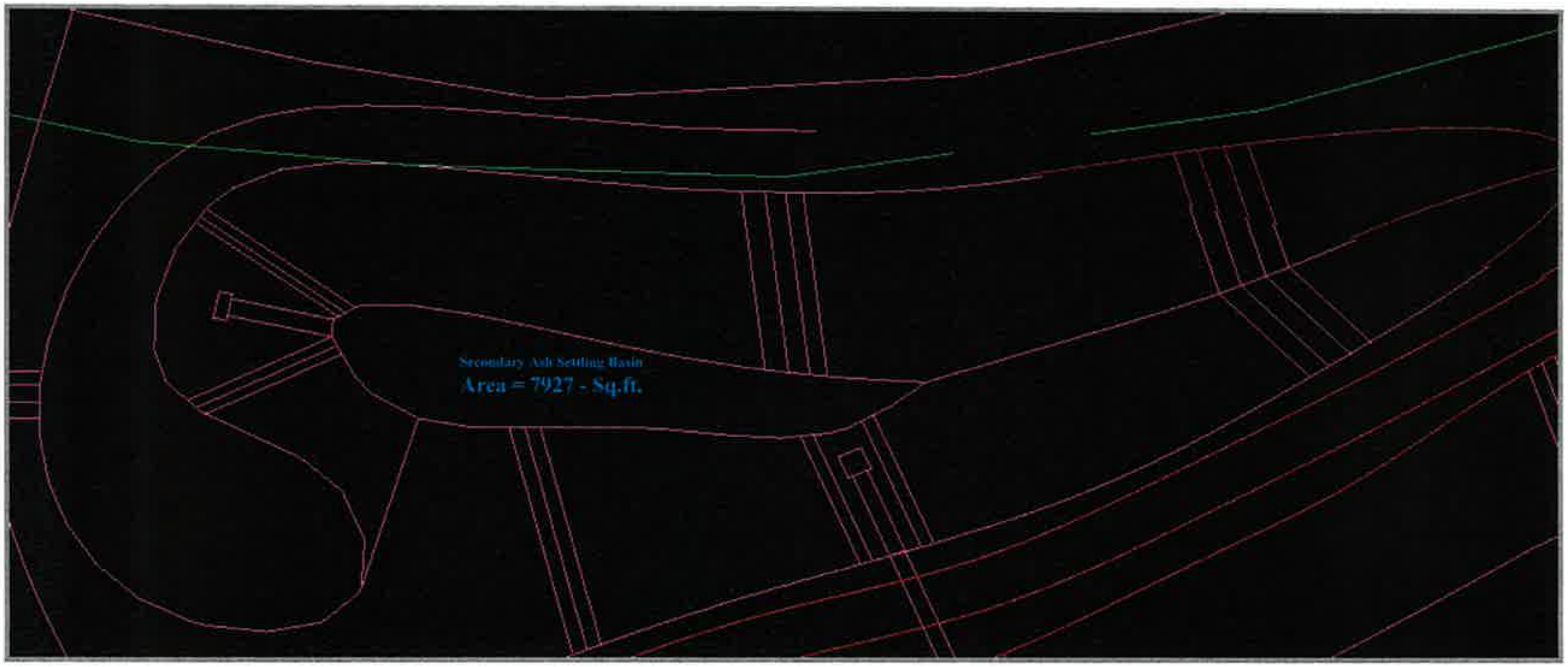
Lansing Generating Station - Coal Pile Runoff Basin
Total Area Calculations by using Bentley View V8i Software



Bielka A. Liriano
Projects Engineer - Central
1000 Main St
Dubuque, IA 52003
(563) 584-7337 (office)
(563) 513-8145 (Cell)

9/28/2010
6:08 PM

Lansing Generating Station - Secondary Ash Settling Basin
Total Area Calculations by using Bentley View V8i Software



Bielka A. Liriano
Projects Engineer - Central
1000 Main St
Dubuque, IA 52003
(563) 584-7337 (office)
(563) 513-8145 (Cell)

9/28/2010
6:13 PM

Lansing Generating Station - Main Ash Settling Basin
Total Area Calculations by using Bentley View V8i Software

Bielka A. Liriano
Projects Engineer - Central
1000 Main St
Dubuque, IA 52003
(563) 584-7337 (office)
(563) 513-8145 (Cell)

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6:13 PM

APPENDIX A

Document 1.4
NPDES Permit

17 pages

IOWA DEPARTMENT OF NATURAL RESOURCES
National Pollutant Discharge Elimination System (NPDES) Permit

PERMITTEE

INTERSTATE POWER COMPANY
1000 MAIN STREET
P. O. BOX 769
DUBUQUE, IA 52004

IDENTITY AND LOCATION OF FACILITY

INTERSTATE POWER CO. LANSING STATION
Section 2, T 98N, R 3W
ALLAMAKEE County, Iowa

See attached amendment

IOWA NPDES PERMIT NUMBER: 0300100

DATE OF ISSUANCE: 10-02-1998

DATE OF EXPIRATION: 10-01-2003

RECEIVING STREAM

MISSISSIPPI RIVER

CERTIFIED
P 156384450
Return Receipt Requested

ROUTE OF FLOW

YOU ARE REQUIRED TO FILE
FOR RENEWAL OF THIS PERMIT BY: 04-04-2003

EPA NUMBER: IA0003735

This permit is issued pursuant to the authority of section 402(b) of the Clean Water Act (33 U.S.C 1342(b)), Iowa Code section 455B.174, and rule 567—64.3, Iowa Administrative Code. You are authorized to operate the disposal system and to discharge the pollutants specified in this permit in accordance with the effluent limitations, monitoring requirements and other terms set forth in this permit.

You may appeal any conditions of this permit by filing a written notice of appeal and request for administrative hearing with the director of this department within 30 days of your receipt of this permit.

Any existing, unexpired Iowa operation permit or Iowa NPDES permit previously issued by the department for the facility identified above is revoked by the issuance of this Iowa NPDES operation permit.

FOR THE DEPARTMENT OF NATURAL RESOURCES

Larry J. Wilson, Director

By [signature]
Wayne Farrand, Supervisor
Wastewater Section
ENVIRONMENTAL PROTECTION DIVISION

Facility Name: INTERSTATE POWER CO. LANSING STATION

Permit Number: 0300100

Outfall Number	Description
001	DISCHARGE CONSISTS OF CONDENSER COOLING WATER, BOILERS 1,2 & 3 BLOWDOWN, AND FLOOR DRAINS FROM ORIGINAL PLANT.
002	DISCHARGE CONSISTS OF ASH TRANSPORT WATER, AIR PREHEATER WASH, METAL CLEANING WASTE, PRECIPATOR WASH, WATER TREATMENT PLAN T WASTEWATER, AND BOILER # 4 BLOWDOWN.
003	COAL PILE RUNOFF.

Facility Name: INTERSTATE POWER CO. LANSING STATION

Effluent Limitations

Permit Number: 0300100

OUTFALL NO.: 001 DISCHARGE CONSISTS OF CONDENSER COOLING WATER, BOILERS 1,2 & 3 BLOWDOWN, AND FLOOR DRAINS FROM ORIGINAL PLANT.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		293.5000	298.0000	MGD				
CHLORINE,TOTAL RESIDUAL	YEARLY	FINAL		.0270	.0410	MG/L		67.00	101.00	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		15.0000	20.0000	MG/L		2.10	2.80	LBS/DAY
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	100.0000	MG/L		4.20	14.10	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: INTERSTATE POWER CO. LANSING STATION

Effluent Limitations

Permit Number: 0300100

OUTFALL NO.: 002 DISCHARGE CONSISTS OF ASH TRANSPORT WATER, AIR PREHEATER, METAL CLEANING WASTE, PRECIPATOR WASH, WASTEWATER

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		5.0400	7.5600	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.4600	.6900	MG/L		20.00	30.00	LBS/DAY
IRON,TOTAL (AS FE)	YEARLY	FINAL		1.3000	2.0000	MG/L		57.00	86.00	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		15.0000	20.0000	MG/L		631.00	841.00	LBS/DAY
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC
COPPER,TOTAL (AS CU)	YEARLY	FINAL			1.0000	MG/L			.42	LBS/DAY
IRON,TOTAL (AS FE)	YEARLY	FINAL			1.0000	MG/L			.42	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	100.0000	MG/L		1261.00	4203.00	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: INTERSTATE POWER CO. LANSING STATION

Permit Number: 0300100

Effluent Limitations

OUTFALL NO.: 003 COAL PILE RUNOFF.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	EFFLUENT LIMITATIONS Concentration 7 Day Average	Concentration 30 Day Average	Concentration Daily Maximum	Concentration Units	Mass 7 Day Average	Mass 30 Day Average	Mass Daily Maximum	Mass Units
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL			50.0000	MG/L				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: Interstate Power Co. - Lansing Station
Permit Number: 03-00-1-00
Outfall No. : 001

NON-STANDARD EFFLUENT LIMITATIONS

Wastewater Parameter

Total Residual Chlorine:

Neither Free Available Chlorine nor Total Residual Chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge Free Available Chlorine or Total Residual Chlorine at any one time.

Total Suspended Solids and Oil & Grease:

Mass limits shall be calculated as follows:
(measured concentration in discharge in mg/l) (8.34) (Boiler Blowdown flow in mg/l)

The mass limits for Total Suspended Solids (TSS) and Oil & Grease (O&G) for Outfall #001 were calculated using a flow of 0.0167 mgd, the flow of Boiler Blowdown discharged to Outfall #001 shown in application. The daily mass discharge of TSS and O&G through Outfall #001 shall be calculated by using the above formula where the Boiler Blowdown is the actual discharge flow of Boiler Blowdown but not greater than 0.0167 mgd.

OUTFALL NO.: 002 DISCHARGE CONSISTS OF ASH TRANSPORT WATER, AIR PREHEATER WASH, METAL CLEANING WASTE, PRECIPATOR WASH, WATER TREA

Wastewater Parameter	Non-Standard Limits
TOTAL SUSPENDED SOLIDS	EFFLUENT LIMITATIONS SHALL BE CALCULATED ON THE BASIS OF POLLUTANTS PRESENT AFTER ANY TREATMENT STEPS HAVE BEEN PERFORMED ON THE INTAKE WATER. ONLY WATER WITHDRAWN FROM AND RETURNED TO THE MISSISSIPPI RIVER MAY BE USED IN THESE CALCULATIONS.

Facility Name: INTERSTATE POWER CO. LANSING STATION

Permit Number: 0300100

Non-Standard Effluent Limitations

OUTFALL NO.: 003 COAL PILE RUNOFF.

Wastewater Parameter	Non-Standard Limits
TOTAL SUSPENDED SOLIDS	ANY UNTREATED OVERFLOW FROM FACILITIES DESIGNED, CONSTRUCTED AND OPERATED TO TREAT THE VOLUME OF COAL PILE RUNOFF WHICH IS ASSOCIATED WITH A 10-YEAR, 24-HOUR RAINFALL EVENT SHALL NOT BE SUBJECT TO THE TOTAL SUSPENDED SOLIDS LIMITATIONS SPECIFIED IN PAGE 5.

Facility Name: INTERSTATE POWER CO. LANSING STATION

Permit Number: 0300100

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by, or approved by, the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
001	FLOW	7/WEEK	24 HR TOTAL	FINAL EFFLUENT
001	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	FINAL EFFLUENT
001	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
001	CHLORINE,TOTAL RESIDUAL	1/2 WEEKS	GRAB	SAMPLING TO OCCUR DURING PERIOD OF CHLORINE DISCHARGE
001	OIL AND GREASE	1/MONTH	GRAB	FINAL EFFLUENT
001	TEMPERATURE	7/WEEK	GRAB	FINAL EFFLUENT
001	DURATION OF CHLORINE DISCHARGE	7/WEEK	GRAB	MONTHLY REPORT
001	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
001	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
001	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	INTAKE FROM STREAM
001	TOTAL SUSPENDED SOLIDS	1/MONTH	MEASUREMENT	FINAL EFFLUENT (NET ADDITION)
002	FLOW	1/WEEK	24 HR TOTAL	FINAL EFFLUENT
002	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	FINAL EFFLUENT
002	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
002	COPPER,TOTAL (AS CU)	1/MONTH	GRAB	FINAL EFFLUENT
002	IRON,TOTAL (AS FE)	1/MONTH	GRAB	FINAL EFFLUENT
002	OIL AND GREASE	1/MONTH	GRAB	FINAL EFFLUENT
002	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	INTAKE FROM STREAM
002	COPPER,TOTAL (AS CU)	1/MONTH	GRAB	CHEMICAL METAL CLEANING WASTES PRIOR TO MIXING WITH OTHER WASTESTREAMS

Facility Name: INTERSTATE POWER CO. LANSING STATION

Permit Number: 0300100

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by, or approved by, the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
002	IRON,TOTAL (AS FE)	1/MONTH	GRAB	CHEMICAL METAL CLEANING WASTES PRIOR TO MIXING WITH OTHER WASTESTREAMS
002	TOTAL SUSPENDED SOLIDS	1/MONTH	MEASUREMENT	FINAL EFFLUENT (NET ADDITION)
003	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	FINAL EFFLUENT
003	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT

Facility Name: Interstate Power Company - Lansing Power Station
Permit Number: 03-00-1-00

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. For facilities that have not been required to conduct toxicity testing by a previous NPDES permit, the annual toxicity test shall be conducted within three months of permit issuance and at least annually thereafter. For facilities that have been required to conduct toxicity testing by a previous NPDES permit, the initial annual toxicity test shall be conducted within twelve months (12) of the last toxicity test.

2. The test organisms that are to be used for acute toxicity testing shall be *Ceriodaphnia dubia* and *Pimephales promelas*. The acute toxicity testing procedures used to demonstrate compliance with permit limits shall be those listed in 40 CFR Part 136 and adopted by reference in rule 567--63.1(1). The method for measuring acute toxicity is specified in USEPA. 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio August 1993, EPA/600/4-90/027F.

3. **Outfall #001**:The diluted effluent sample must contain a minimum of 83.8% effluent and no more than 16.2% of culture water.
   Outfall #002:The diluted effluent sample must contain a minimum of 8.1% effluent and no more than 91.9% of culture water.

4. One valid positive toxicity result will require quarterly testing for effluent toxicity.

5. Two successive valid positive toxicity results or three positive results out of five successive valid effluent toxicity tests will require a toxic reduction evaluation to be completed to eliminate the toxicity.

6. A non-toxic test result shall be indicated as a "1" on the monthly operation report. A toxic test result shall be indicated as a "2" on the monthly operation report. DNR Form 542-1381 shall also be submitted to the DNR field office along with the monthly operation report.

Ceriodaphnia and Pimephales Toxicity Effluent Limits

The 30 day average mass limit of "1" for the parameters Acute Toxicity, Ceriodaphnia and Acute Toxicity, Pimephales means no positive toxicity results.

Definition: "Positive toxicity result" means a statistical difference of mortality rate between the control and the diluted effluent sample. For more information see USEPA. 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio August 1993, EPA/600/4-90/027F.

SPECIAL CONDITIONS APPLICABLE TO THE ZEBRA MUSSEL CONTROL PROGRAM

The permittee is authorized to use chemical treatments to prevent and control zebra mussel infestations subject to the following special conditions:

1. The permittee must comply at all times with the effluent limitations, monitoring and reporting requirements and all other requirements specified in this NPDES permit and amendments thereto.

2. The duration of each chemical molluscicide treatment shall be as short as possible to effect control but in no case shall any single treatment exceed 24 hours in duration.

3. The maximum number of chemical molluscicide treatments each year is four (4). Treatments should be planned to occur immediately after each zebra mussel spawning period and at 1-2 times throughout the remainder of the year.

4. The following effluent limitations shall be met at the end of the discharge pipe:

Active Ingredient	Limit
dimethylalkylamine	90 µg/l
alkyl dimethyl benzyl ammonium chloride	430 µg/l
didecyldimethylammonium chloride	160 µg/l

5. Detoxification with bentonite clay or another absorptive medium is required whenever a non-oxidizing molluscicide containing quaternary ammonium compounds is used unless the permittee can demonstrate with engineering calculations that the concentration of quaternary ammonium compounds in the final discharge will not exceed the limits specified in #4 above.

6. When a molluscicide containing any of the above listed active ingredients is used, monitoring for the active ingredient shall be conducted each day of treatment. The analyses shall be performed on a 24 hr composite sample of the final effluent from outfall #001 using a test method capable of measuring at the specified concentration.

7. The permittee shall conduct acute toxicity tests using Ceriodaphnia dubia and Pimephales promelas during the first treatment with any molluscicide not previously tested. The tests shall be performed in accordance with the requirements for toxicity testing specified on page #11 of this permit except that only outfall #001 need be tested. The results shall be submitted to the department's Wastewater Section and shall clearly identify the facility number, outfall number, date(s) of the test and the brand name of the molluscicide.

8. The mechanism for feeding chemicals used for controlling zebra mussels shall be designed to shut down when the raw water intake is not operating to prevent the discharge of chemical through the intake structure. A anti-siphon device shall also be incorporated in

the design, if possible, to prevent the discharge of chemical remaining in the line after the chemical feed pump shuts down.

9. As new information is received and reviewed, and the results of the approved treatments evaluated, previously unanticipated environmental impacts might be detected. This permit may be amended or, revoked and reissued, if unanticipated environmental or human health impacts occur or are reported from other locations in scientific literature. The permittee is encouraged to continually evaluate alternative methods of zebra mussel control and to investigate innovative, non-chemical methods of preventing zebra mussels from interfering with facility operations.

STANDARD CONDITIONS

1. DEFINITIONS

(a) 7 day average means the sum of the total daily discharges by mass, volume or concentration during a 7 consecutive day period, divided by the total number of days during the period that measurements were made. Four 7 consecutive day periods shall be used each month to calculate the 7-day average. The first 7-day period shall begin with the first day of the month.

(b) 30 day average means the sum of the total daily discharges by mass, volume or concentration during a calendar month, divided by the total number of days during the month that measurements were made.

(c) daily maximum means the total discharge by mass, volume or concentration during a twenty-four hour period.

2. DUTY TO COMPLY

You must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Issuance of this permit does not relieve you of the responsibility to comply with all local, state and federal laws, ordinances, regulations or other legal requirements applying to the operation of your facility.
{See 40 CFR 122.41(a) and 567-64.3(11) IAC}

3. DUTY TO REAPPLY

If you wish to continue to discharge after the expiration date of this permit you must file an application for reissuance at least 180 days prior to the expiration date of this permit.
{See 567-64.8(1) IAC}

4. NEED TO HALT OR REDUCE ACTIVITY

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
{See 567-64.7(5)(j) IAC}

5. DUTY TO MITIGATE

You shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
{See 567-64.7(5)(i) IAC}

6. PROPERTY RIGHTS

This permit does not convey any property rights of any sort or any exclusive privileges.

7. TRANSFER OF TITLE

If title to your facility, or any part of it, is transferred the new owner shall be subject to this permit.
{See 567-64.14 IAC}

You are required to notify the new owner of the requirements of this permit in writing prior to any transfer of title. The Director shall be notified in writing within 30 days of the transfer

8. PROPER OPERATION AND MAINTENANCE

All facilities and control systems shall be operated as efficiently as possible and maintained in good working order. A sufficient number of staff, adequately trained and knowledgeable in the operation of your facility shall be retained at all times and adequate laboratory controls and appropriate quality assurance procedures shall be provided to maintain compliance with the conditions of this permit.
{See 40 CFR 122.41(e) and 567 64.7(5)(f) IAC}

9. DUTY TO PROVIDE INFORMATION

You must furnish to the Director, within a reasonable time, any information the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. You must also furnish to the Director, upon request, copies of any records required to be kept by this permit.

10. MAINTENANCE OF RECORDS

You are required to maintain records of your operation in accordance with 567-63.2 IAC.

11. PERMIT MODIFICATION, SUSPENSION OR REVOCATION

(a) This permit may be modified, suspended, or revoked and reissued for cause including but not limited to those specified in 567-64.3(11) IAC.

(b) This permit may be modified due to conditions or information on which this permit is based, including any new standard the department may adopt that would change the required effluent limits.
{See 567-64.3(11)© IAC}

(c) If a toxic pollutant is present in your discharge and more stringent standards for toxic pollutants are established under Section 307(a) of the Clean Water Act, this permit will be modified in accordance with the new standards.
{See 567-64.7(5)(g) IAC}

The filing of a request for a permit modification, revocation or suspension, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

12. SEVERABILITY

The provisions of this permit are severable and if any provision or application of any provision to any circumstance is found to be invalid by this department or a court of law, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected by such finding.

13. INSPECTION OF PREMISES, RECORDS, EQUIPMENT, METHODS AND DISCHARGES

You are required to permit authorized personnel to:

(a) Enter upon the premises where a regulated facility or activity is located or conducted or where records are kept under conditions of this permit.

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit.

(c) Inspect, at reasonable times, any facilities, equipment, practices or operations regulated or required under this permit.

(d) Sample or monitor, at reasonable times, for the purpose of assuring compliance or as otherwise authorized by the Clean Water Act.

14. TWENTY-FOUR HOUR REPORTING

You shall report any noncompliance that may endanger human health or the environment. Information shall be provided orally within 24 hours from the time you become aware of the circumstances. A written submission that includes a description of noncompliance and its cause; the period of noncompliance including exact dates and times, whether the noncompliance has been corrected or the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent a reoccurrence of the noncompliance must be provided within 5 days of the occurrence. The following instances of noncompliance must be reported within 24 hours of occurrence:

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit.
{See 40 CFR 122.44(g)}

(b) Any upset which exceeds any effluent limitation in the permit.
{See 40 CFR 122.44(n)}

(c) Any violation of a maximum daily discharge limit for any of the pollutants listed by the Director in the permit to be reported within 24 hours.
{See 40 CFR 122.44(g)}

15. OTHER NONCOMPLIANCE

You shall report all instances of noncompliance not reported under Condition #14 at the time monitoring reports are submitted.

16. ADMINISTRATIVE RULES

Rules of this Department which govern the operation of your facility in connection with this permit are published in Part 567 of the Iowa Administrative Code (IAC) in Chapters 60-64 and 120-122. Reference to the term "rule" in this permit means the designated provision of Part 567 of the Iowa Administrative Code.

17. NOTICE OF CHANGED CONDITIONS

You are required to report any changes in existing conditions or information on which this permit is based:

(a) Facility expansions, production increases or process modifications which may result in new or increased discharges of pollutants must be reported to the Director in advance. If such discharges will exceed effluent limitations, your report must include an application for a new permit.
{See 567-64.7(5)(a) IAC}

(b) If any modification of, addition to, or construction of a disposal system is to be made, you must first obtain a written permit from this Department.
{See 567-64.2 IAC}

(c) If your facility is a publicly owned treatment works or otherwise may accept waste for treatment from industrial contributors see 567-64.3(5) IAC for further notice requirements.

(d) You shall notify the Director as soon as you know or have reason to believe that any activity has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited in this permit.
{See 40 CFR 122.42(a)}

You must also notify the Director if you have begun or will begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application

18. OTHER INFORMATION

Where you become aware that you failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report, you must promptly submit such facts or information.

19. UPSET PROVISION

(a) Definition - "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

(b) Effect of an upset. An upset constitutes an affirmative defense in an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph *"c"* of this condition are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

(c) Conditions necessary for demonstration of an upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate through properly signed, contemporaneous operating logs, or other relevant evidence that;

(1) An upset occurred and that the permittee can identify the cause(s) of the upset.
(2) The permitted facility was at the time being properly operated; and
(3) The permittee submitted notice of the upset to the Department in accordance with 40 CFR 122.41(l)(6)(ii)(B).
(4) The permittee complied with any remedial measures required by Item #5 of the Standard Conditions of this permit.

(d) Burden of Proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

20. FAILURE TO SUBMIT FEES

This permit may be revoked, in whole or in part, if the appropriate permit fees are not submitted within thirty (30) days of the date of notification that such fees are due.

21. BYPASSES

(a) Definition - Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

(b) Prohibition of bypass, Bypass is prohibited and the department may take enforcement action against a permittee for bypass unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance;

(3) The permittee submitted notices as required by paragraph *"d"* of this section.

(c) The Director may approve an anticipated bypass after considering its adverse effects if the Director determines that it will meet the three conditions listed above.

(d) Reporting bypasses. Bypasses shall be reported in accordance with 567-63.6 IAC.

22. SIGNATORY REQUIREMENTS

Applications, reports or other information submitted to the Department in connection with this permit must be signed and certified as required by 567-64.3(8) IAC.

23. USE OF CERTIFIED LABORATORIES

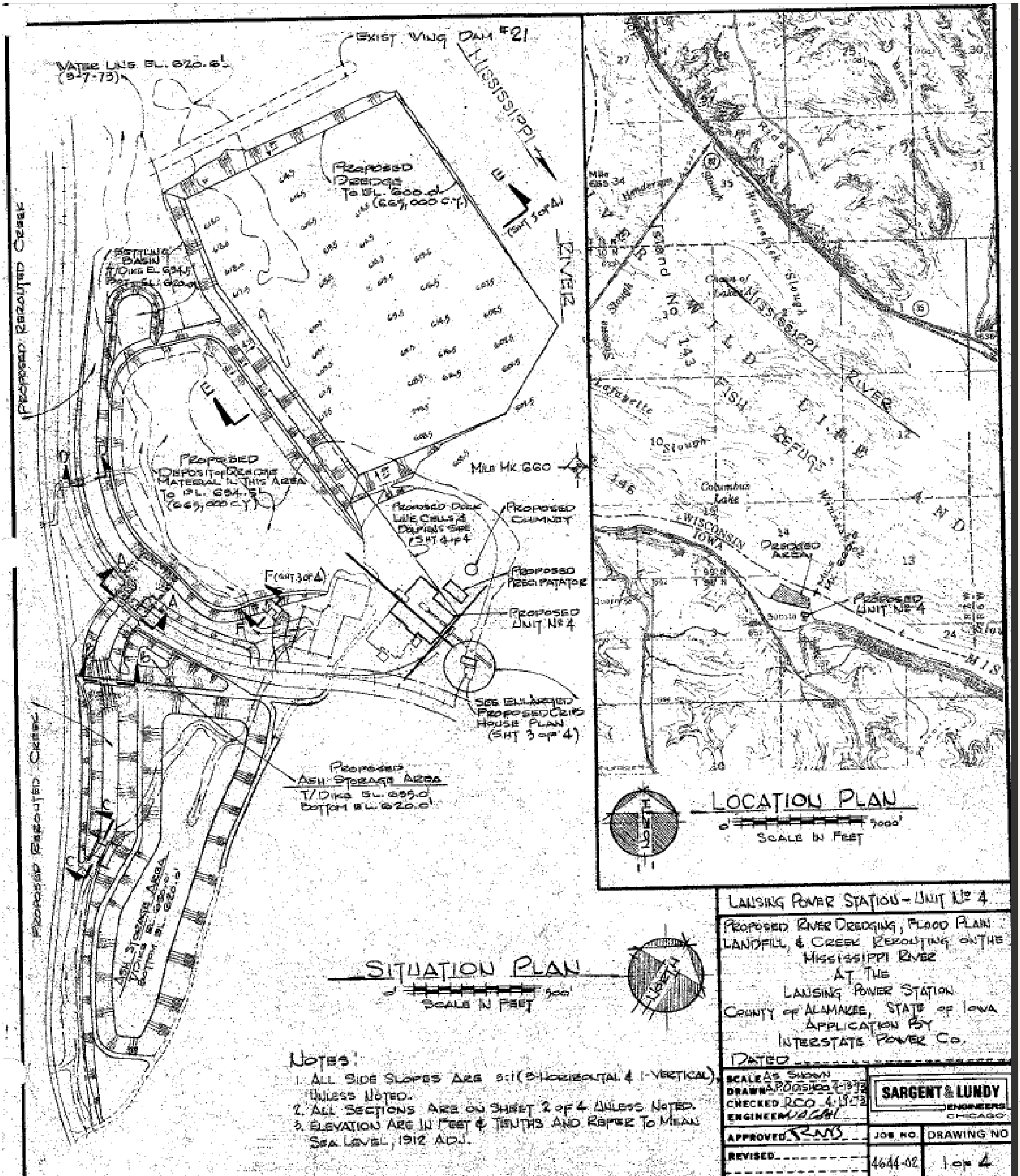
Effective October 1, 1996, analyses of wastewater, groundwater or sewage sludge that are required to be submitted to the department as a result of this permit must be performed by a laboratory certified by the State of Iowa. Routine, on-site monitoring for pH, temperature, dissolved oxygen, total residual chlorine and other pollutants that must be analyzed immediately upon sample collection, settleable solids, physical measurements, and operational monitoring tests specified in 567-63.3(4) are excluded from this requirement.

APPENDIX A

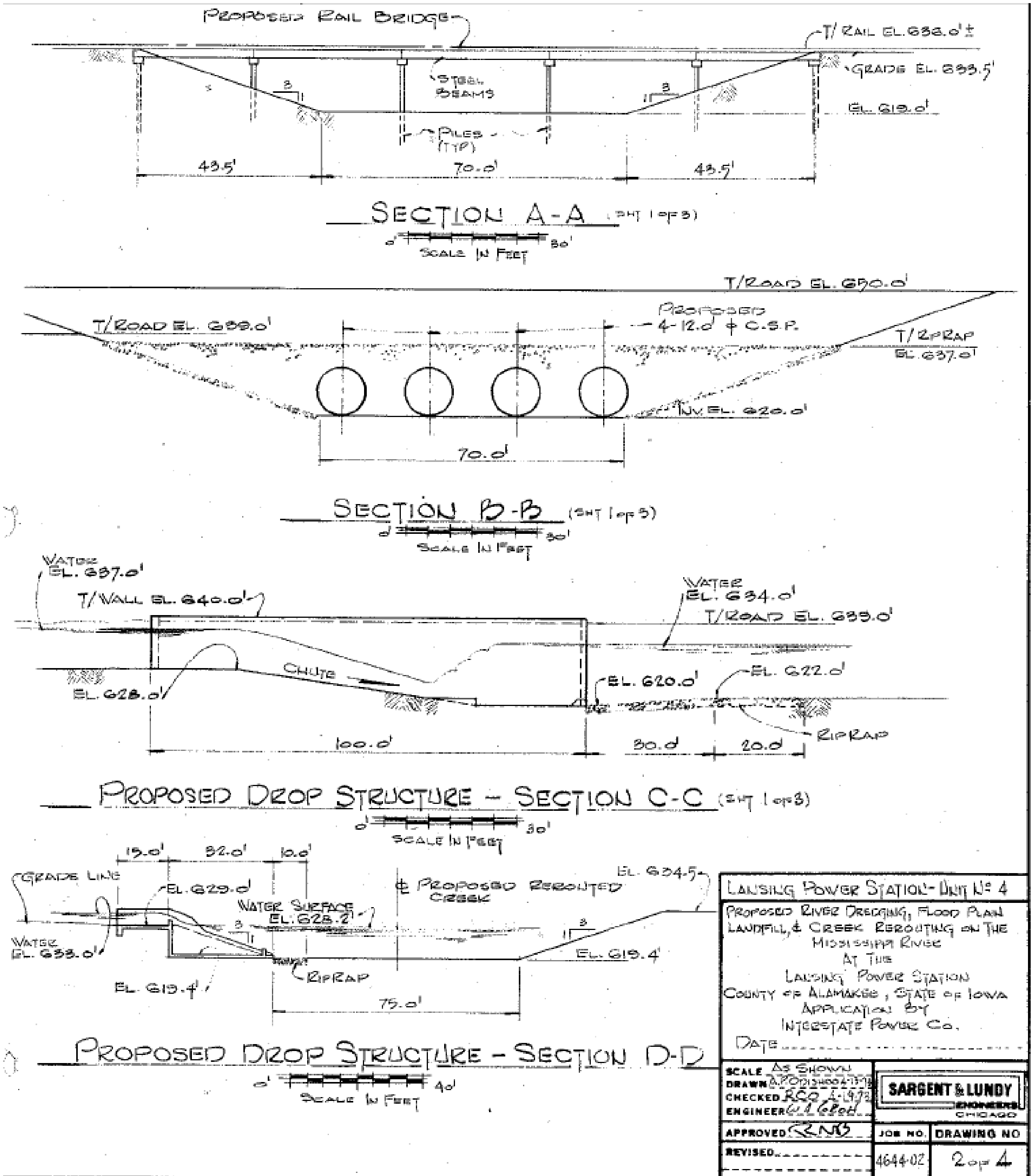
Document 1.5

Lansing Power Station Unit #4 Permit Plans (1973)

2 pages



Doc 1.5 Lansing Power Station Unit 4 Permit Plans (1973)
Page 1 of 2



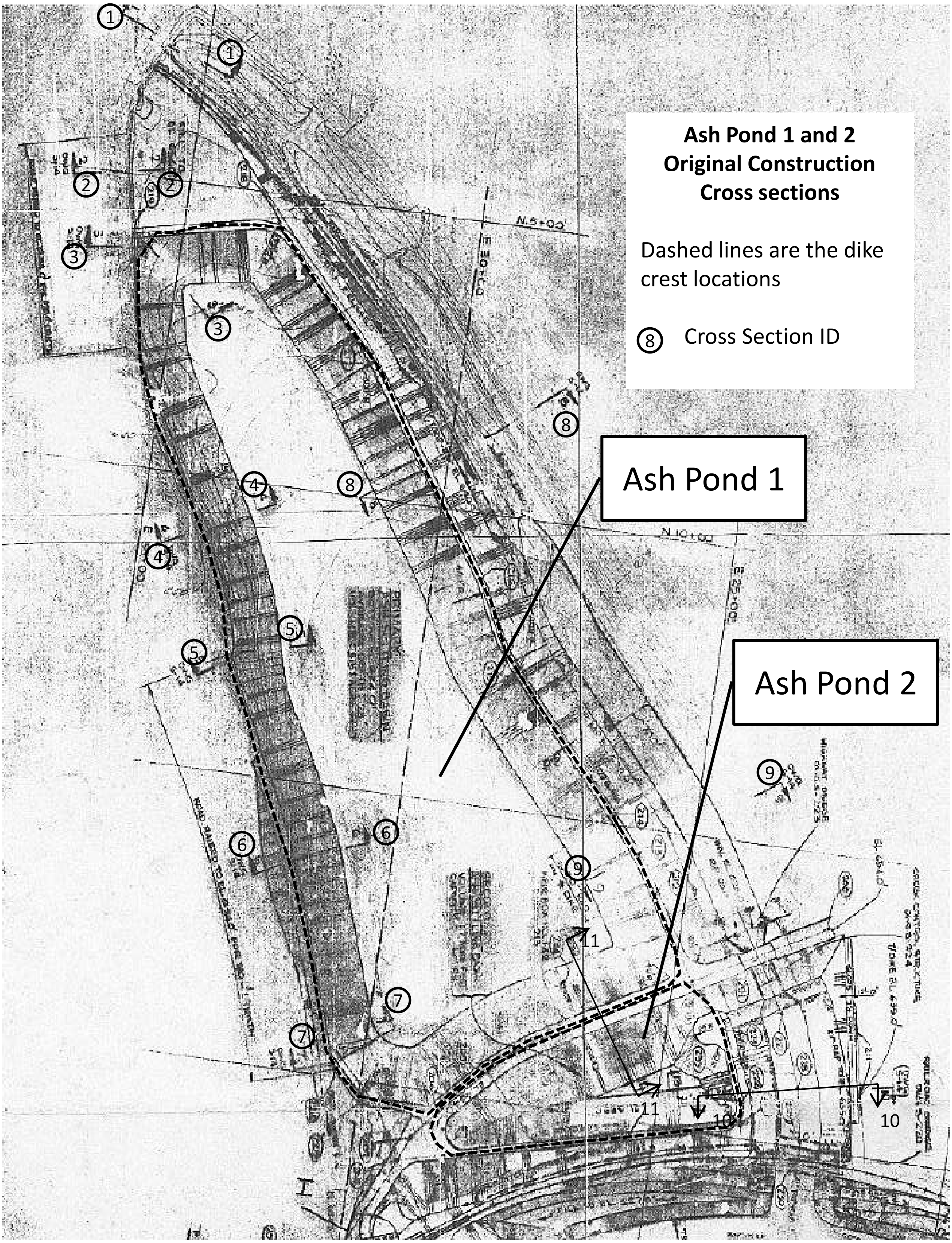
Doc 1.5 Lansing Power Station Unit 4 Permit Plans (1973)
Page 2 of 2

APPENDIX A

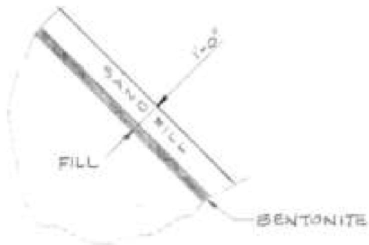
Document 1.6

Ash Pond 1 and 2 Original Construction Cross Sections

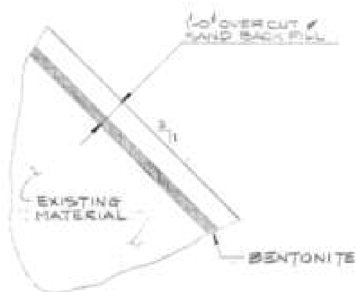
7 pages



Doc 1.6 Ash Pond 1 and 2 Original Construction Cross sections Key Map page 1 of 7



TYPICAL NEW SLOPED DIKE SECTION



TYPICAL EXISTING SLOPED DIKE SECTION

NOTES

1. WORK THIS DWG. WITH DWGS S-10 & S-11
2. ALL FILL SHALL CONFORM TO SPEC G-3109.
3. ASH DIKE SECTIONS 4, 5 & 6 REVISED AS PER FIELD INFORMATION DATED 7/30/76.

REFERENCE DRAWINGS

S-10	SITE DEVELOPMENT-COFFERDAM & DREDGING PLAN
S-11	SITE DEVELOPMENT-PLANT FILL - UNIT 4

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.
Signed [signature] Date 6-5-1974

SITE DEVELOPMENT
ASH DIKE SECTIONS - SHEET 1
LANSING POWER STATION
INTERSTATE POWER COMPANY
LANSING, IOWA

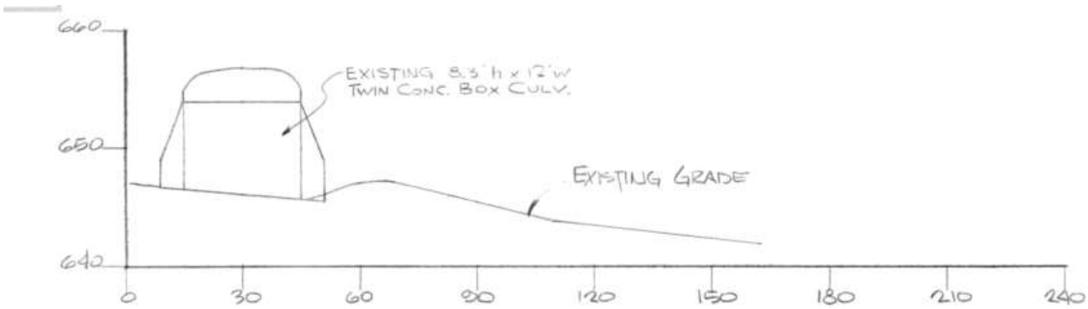
Rev.	Date	Init.	Description
	6-7-74		
A	12-23-74		
B		GHV	
C	7-5-75	GHV	
D		GHV	
E	4-9-77		

SCALE VERT 1" = 10' HORIZ 1" = 50'
DRAWN G.R. BOVE 5-20-74
CHECKED R.C. ODEGAARD 5-28-74
ENGINEER [signature] 5-31-74
APPROVED [signature] 6-5-74
JOB NO. A044-03

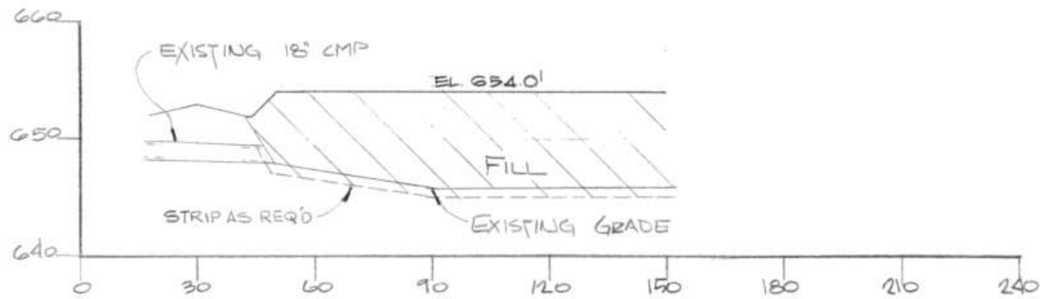
SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. S-14

Doc 1.6 Ash Pond 1 and 2 Original Construction Cross sections Title Block page 2 of 7



SECTION 1-1



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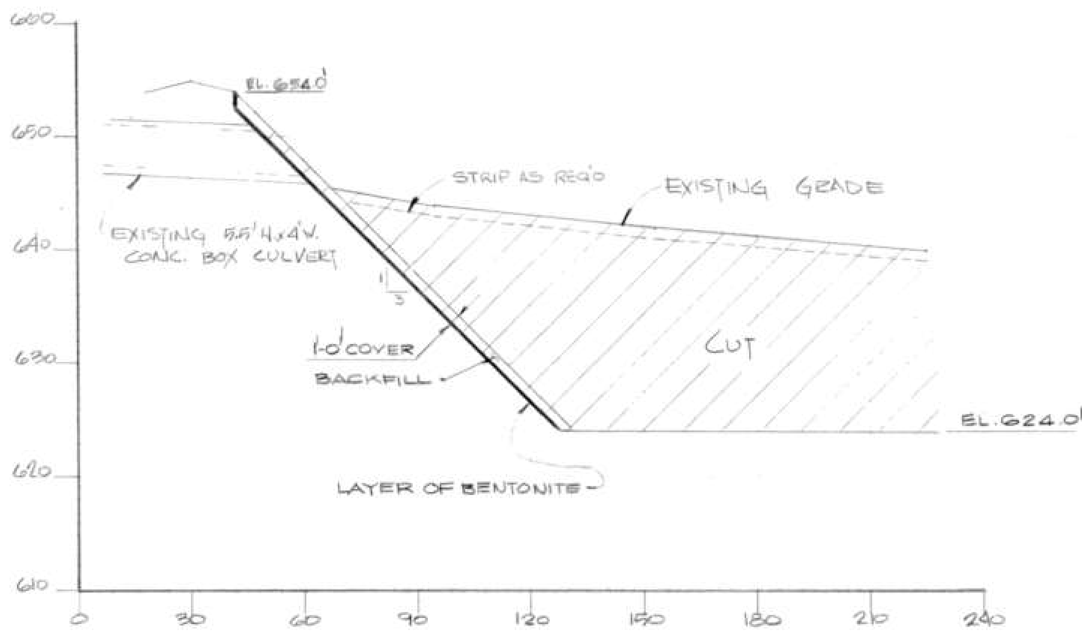
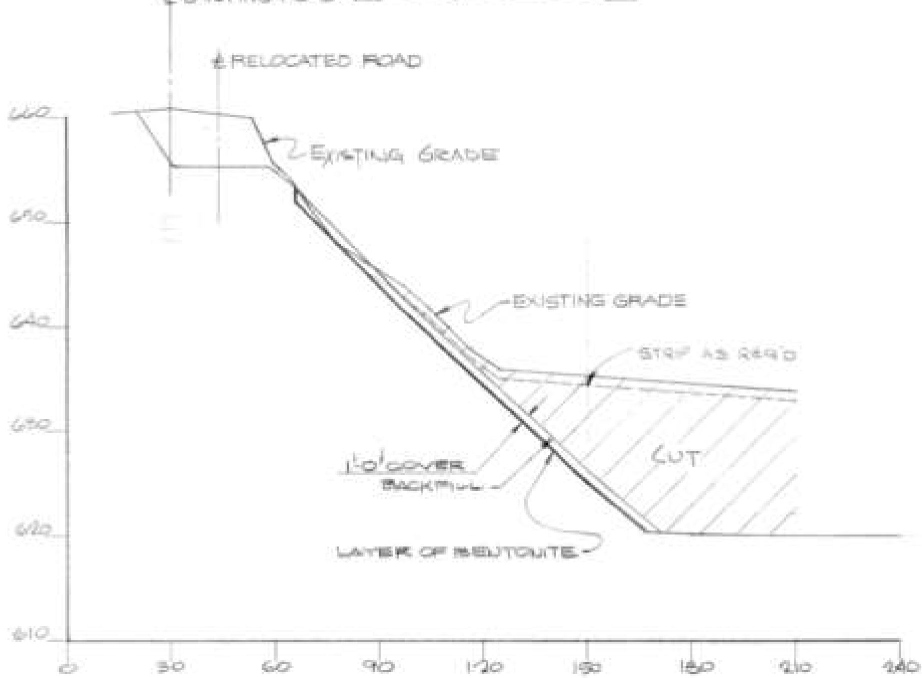


℄ EXISTING ROAD SECTION 3-3

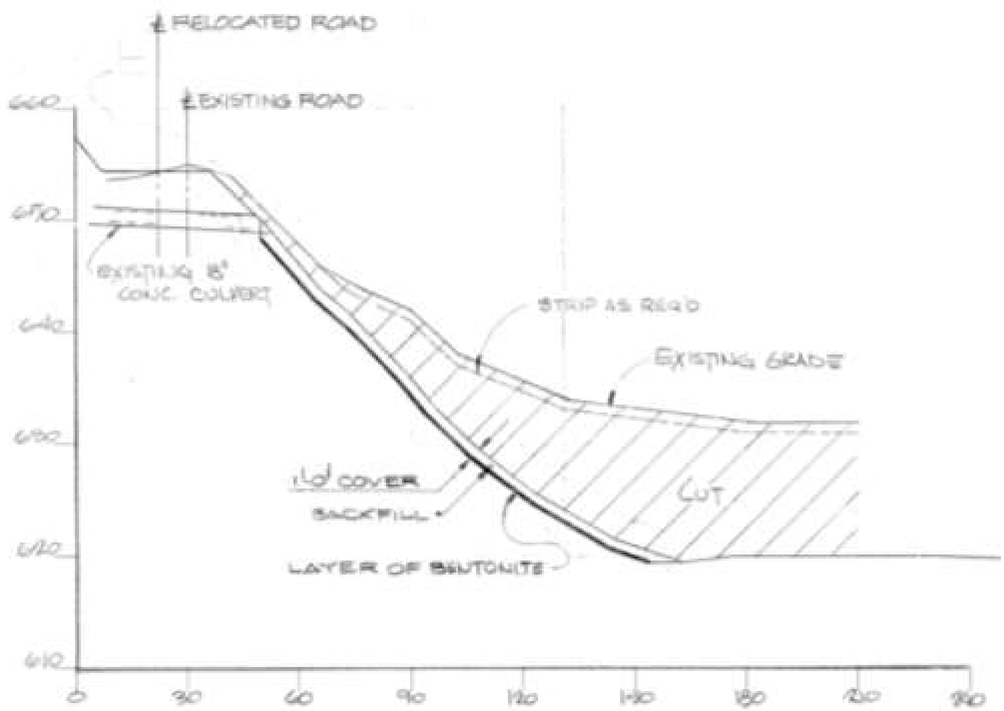
Doc 1.6 Ash Pond 1 Original Construction Cross sections

Cross Sections 1-1 to 3-3 page 3 of 7

SECTION 3-3

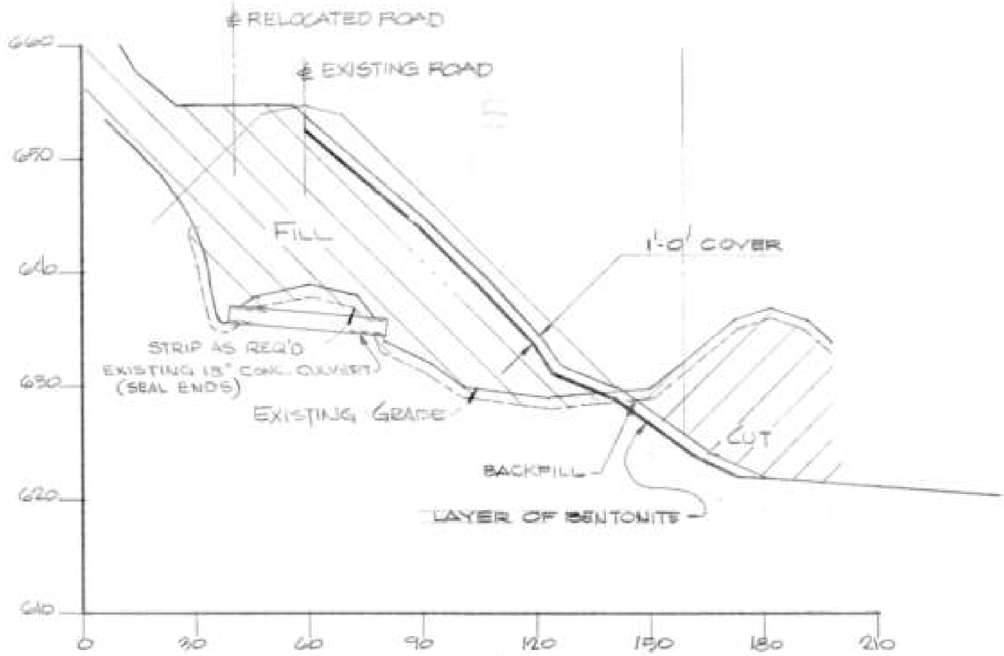


SECTION 4-4

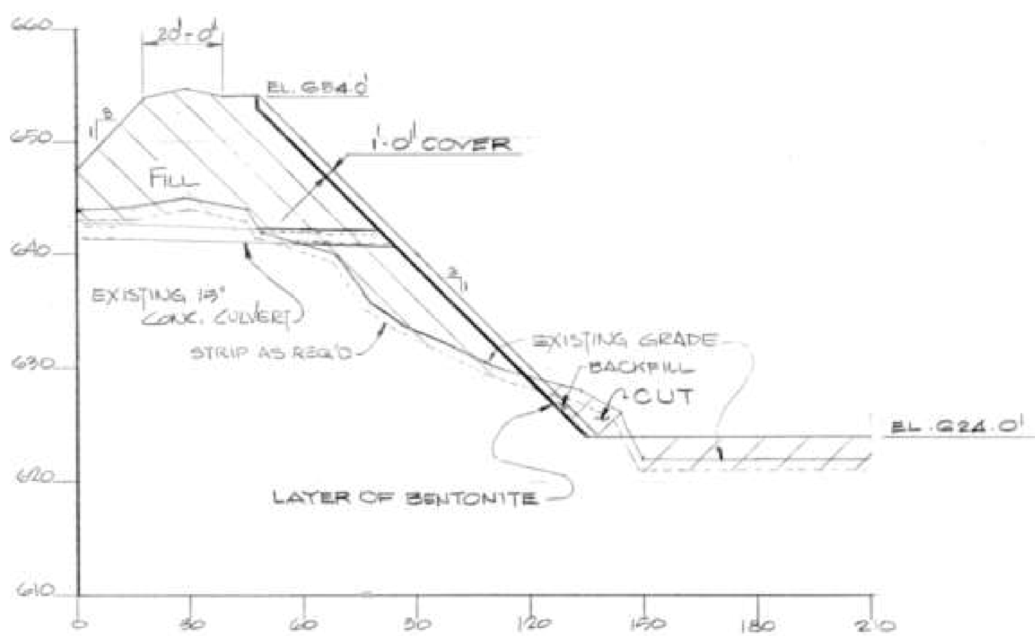


SECTION 5-5

Doc 1.6 Ash Pond 1 Original Construction Cross sections
Cross Sections 4-4 to 5-5 page 4 of 7

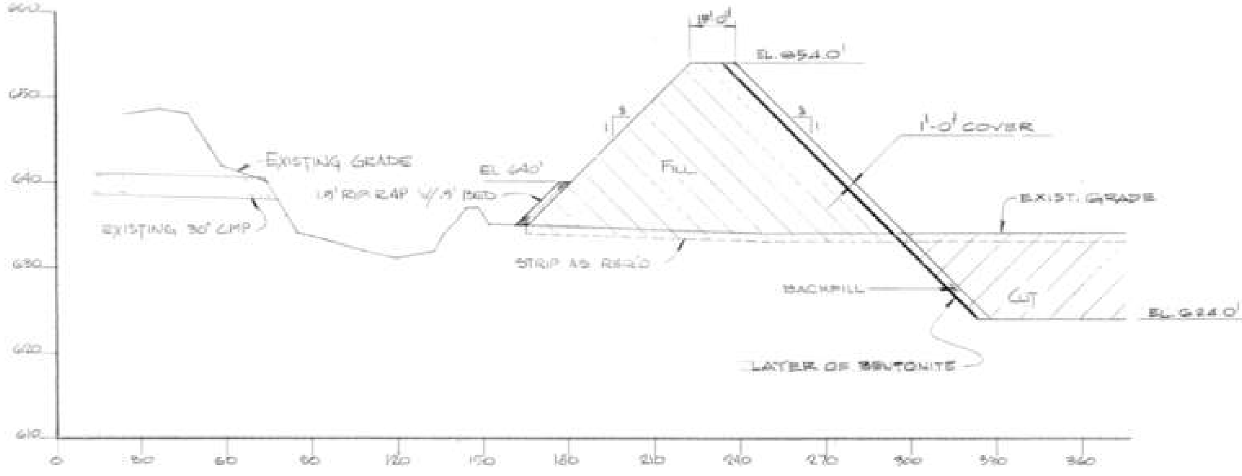


SECTION 6-6

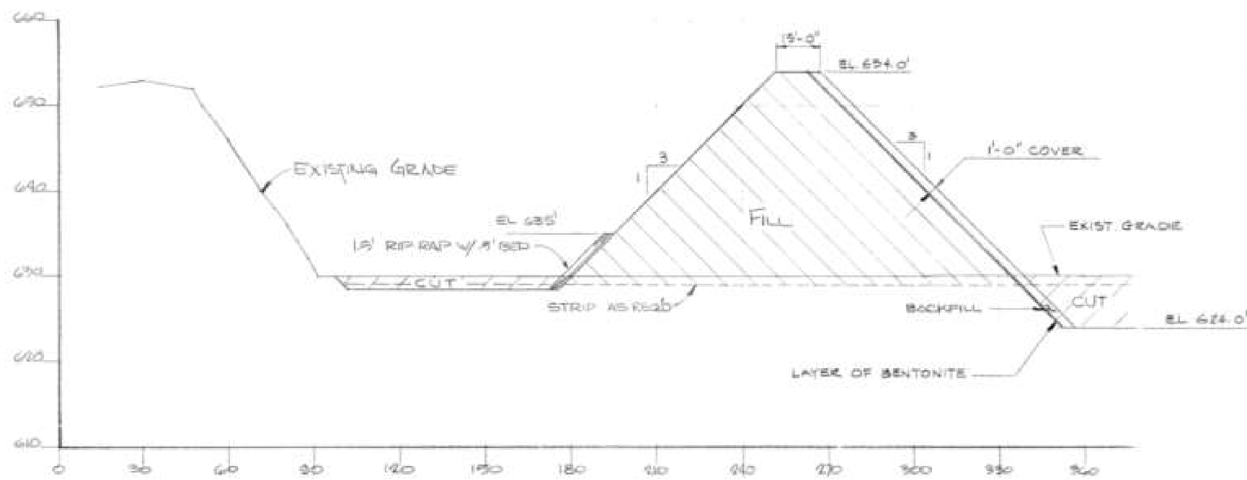


SECTION 7-7

Doc 1.6 Ash Pond 1 Original Construction Cross sections
Cross Sections 6-6 to 7-7 page 5 of 7

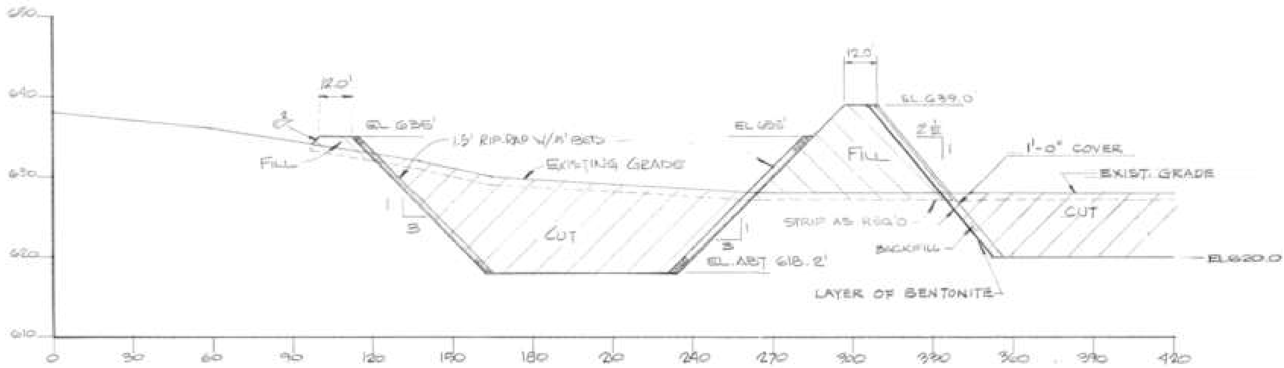


SECTION 8-8

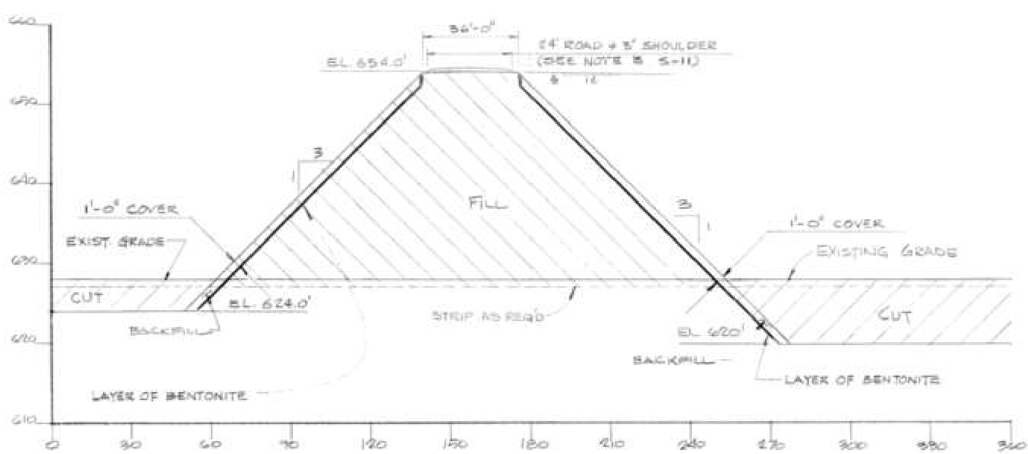


SECTION 9-9

Doc 1.6 Ash Pond 1 Original Construction Cross sections
Cross Sections 8-8 to 9-9 page 6 of 7



SECTION 10-10



SECTION 11-11

Doc 1.6 Ash Pond 1 and 2 Original Construction Cross sections

Cross Sections 10-10 to 11-11 page 7 of 7

APPENDIX A

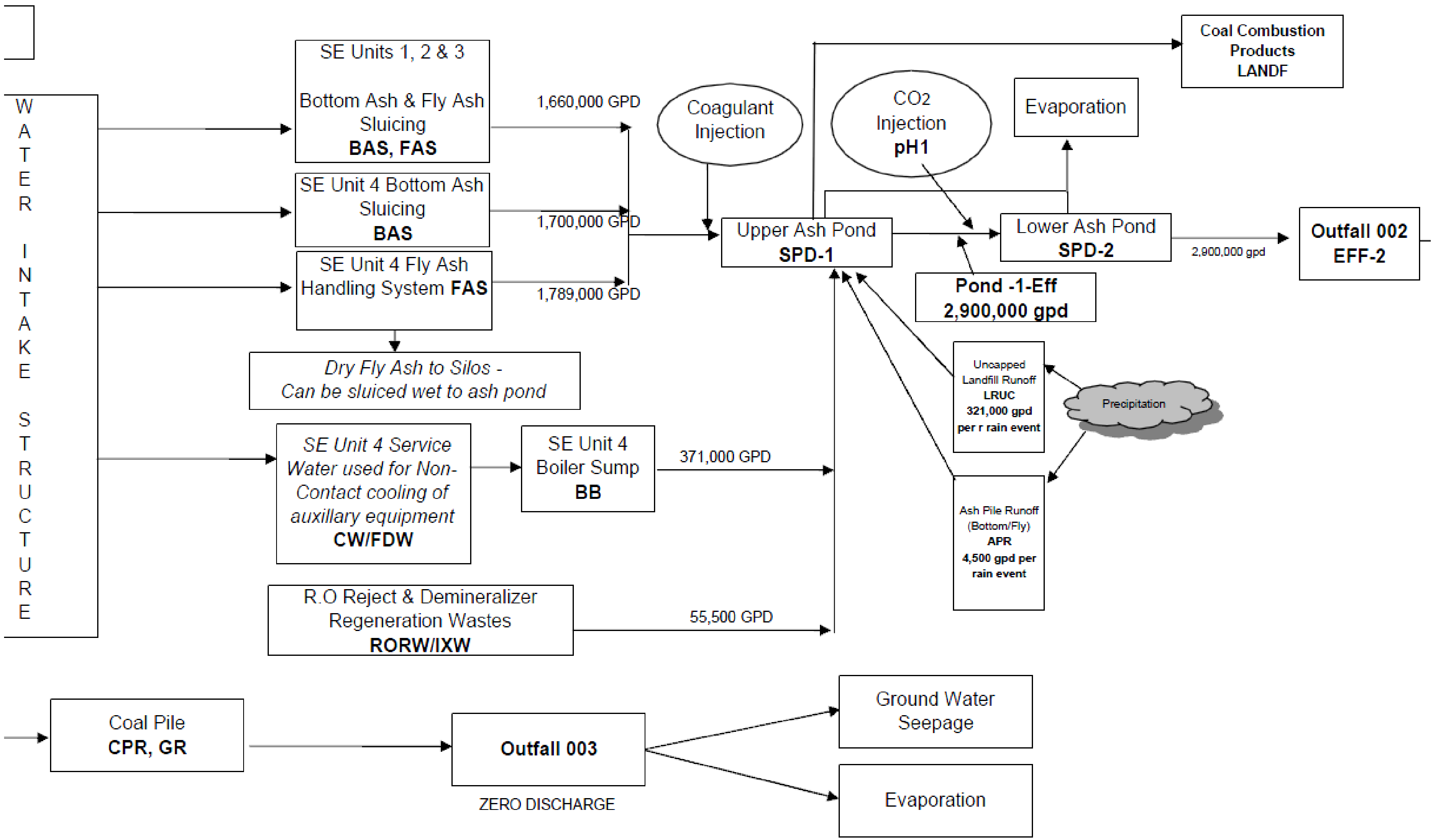
Document 1.7

Power Plant Operation Diagram
Discharge Volumes (GPD) from each Boiler Unit

1 page

IPL - Lansing (

Pond 1/SI

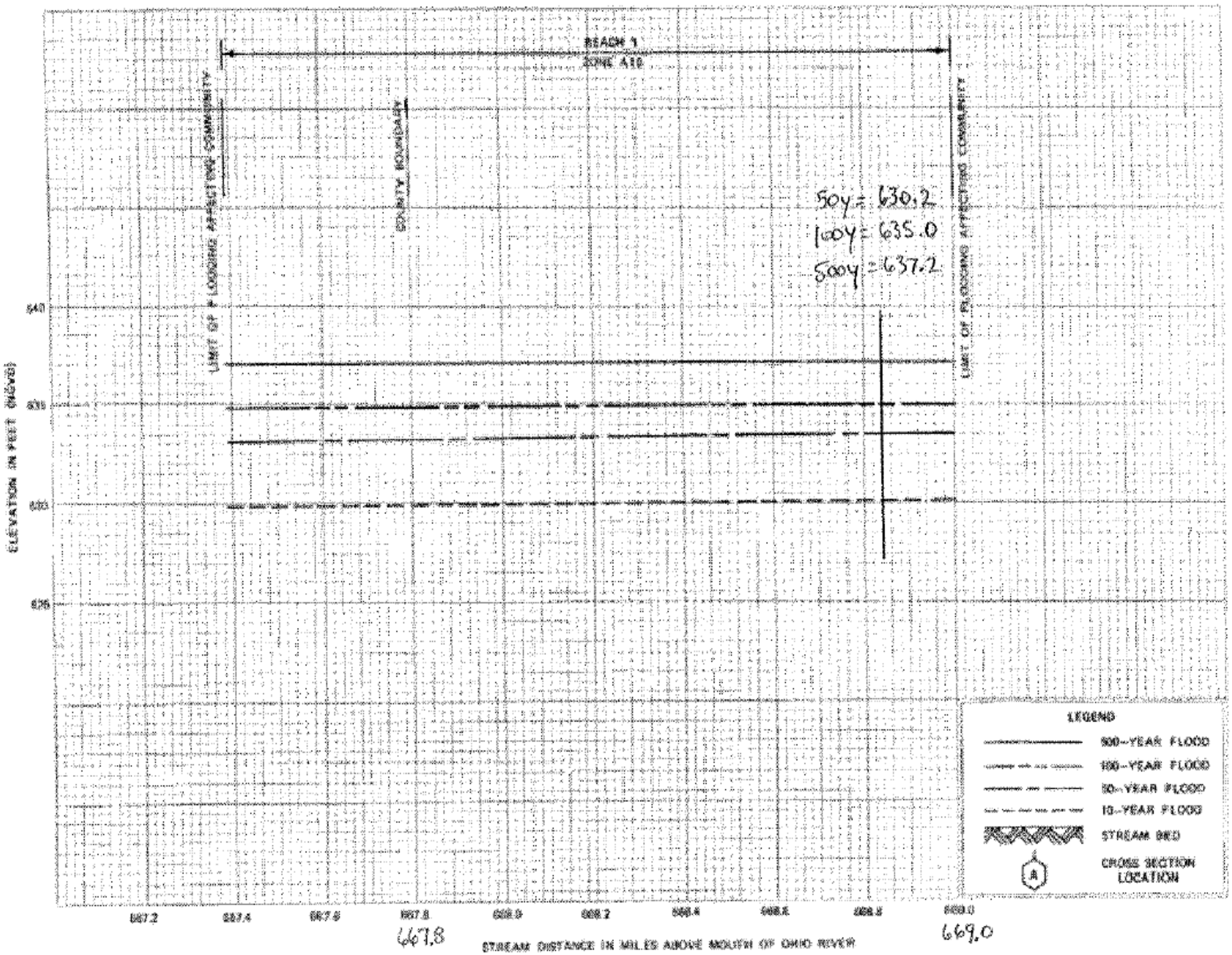


APPENDIX A

Document 1.8

Mississippi River FEMA Flood Profile (FIS 1991)

1 page



FLOOD PROFILES

MISSISSIPPI RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF DE SOTO, WI
(VERNON AND CRAWFORD COS.)

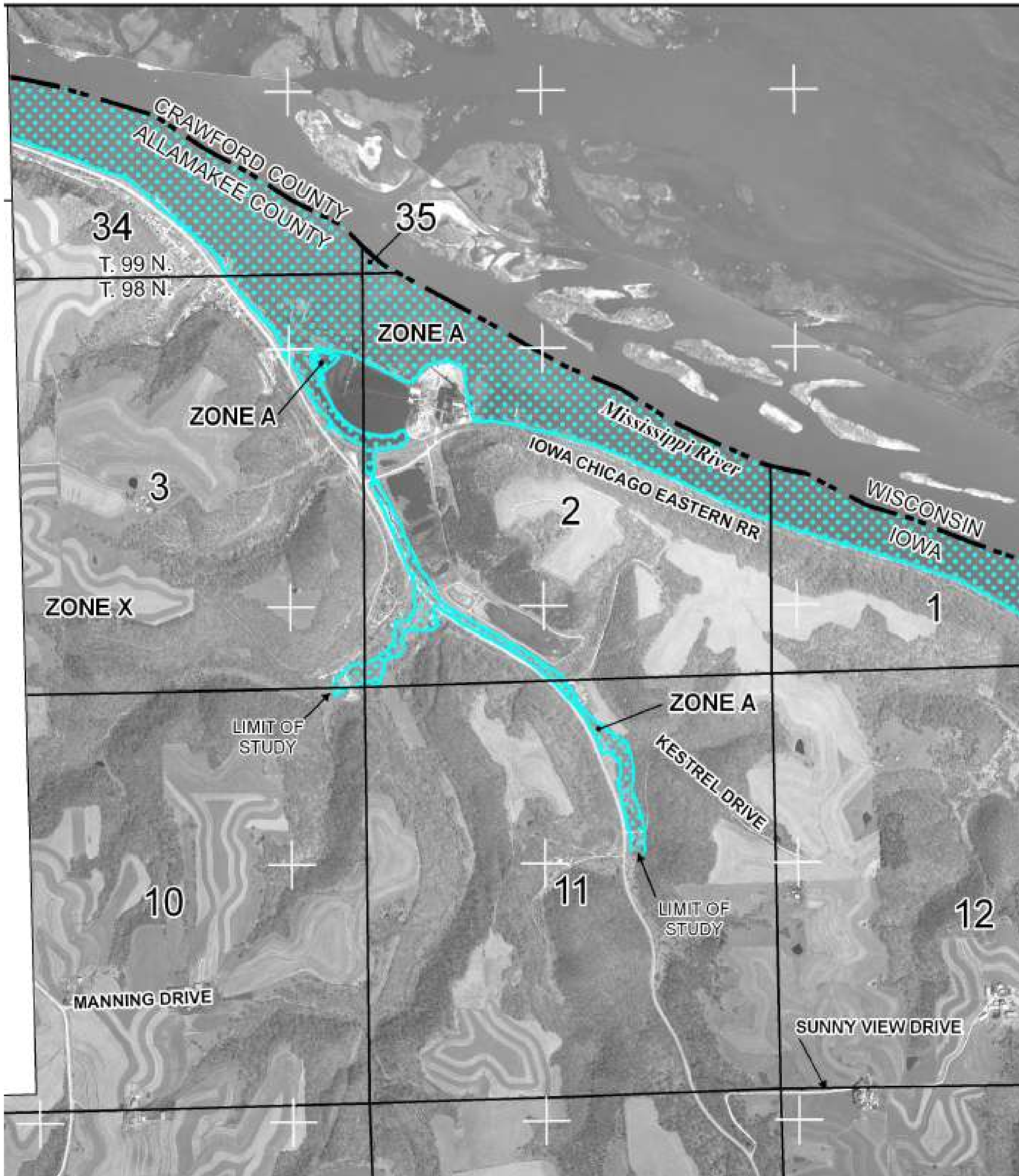
01P

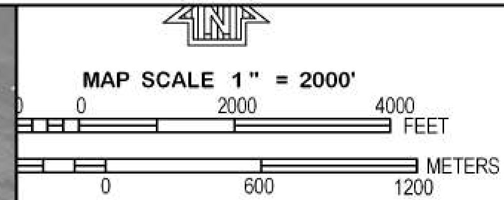
APPENDIX A

Document 1.9

FEMA FIRM Panel Floodplain Map (Sept 2009)

1 page





NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0300B

FIRM
FLOOD INSURANCE RATE MAP

ALLAMAKEE COUNTY, IOWA
AND INCORPORATED AREAS

PANEL 300 OF 550

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ALLAMAKEE COUNTY	190005	0300	B

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
19005C0300B

EFFECTIVE DATE
SEPTEMBER 25, 2009

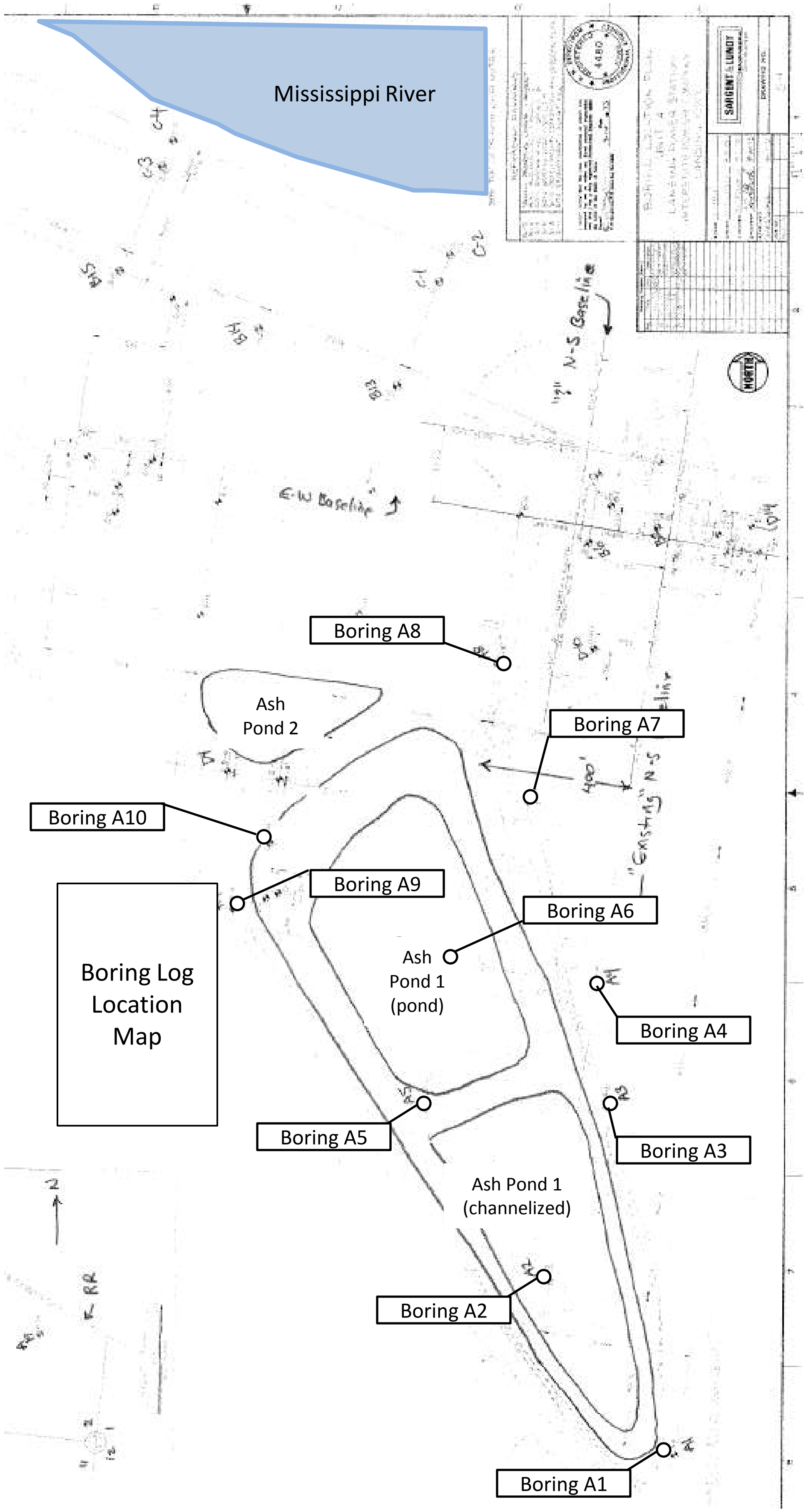
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX A

Document 1.10
Ash Pond Area Soil Boring Logs (1977)

11 pages


Mississippi River
Boring A8
Ash
Pond 2
Boring A7
Boring A10
Boring A9
Boring A6
Boring Log
Location
Map
Ash
Pond 1
(pond)
Boring A4
Boring A5
Boring A3
Ash Pond 1
(channelized)
Boring A2
Boring A1

BORING A-1

FOR Interstate Power Company

LOCATION Lansing, Iowa Elev. 654.7 Boring No. A1

GROUND WATER		Time after drilling	1/4 Hour	24 Hour
While drilling				
Before casing removal		Depth to water	15'0"	15'0"
After casing removal		Depth to cave in		

Start 25.73
Unit 11
Chief

Depth | Number | Blows on Sampler | Sample Recovery | Total Blows | VISUAL FIELD CLASSIFICATION and REMARKS | Casing/Probe, Weight, Drop | Unconfined Strength | Number | Blows on Casing / Probe | Casing Method

Sample	Visual Field Classification and Remarks
Bag 1, 0'-6'	Light Brown Fine to Medium Sand, Silty, Some to Little Clay, Little Small to Large Gravel
Bag 2, 6'-11'	Lacking Gravel
Bag 3, 11'-16'	
	End of Hole 25'0"

BORING A-2

FOR: Interstate Power Plant

LOCATION: Lansing, Iowa — Elev. 636.9 — Boring No. A2

GROUND WATER			
While drilling		Time after drilling	1/4 Hour
Before casing removal		Depth to water	
After casing removal		Depth to cave-in	5'3" Wet

Start: 6-4-73
Unit: 11
Chief: HF

Casing/Probe ___ Weight ___ Drop ___

Drilling Method: HA

Sample No.	Visual Field Classification and Remarks
Bag 1, 0'-5'	Gray Silt, Sandy, Clayey to Trace Clay
Bag 2, 5'-10'	
Bag 3, 15'-20'	
Bag 4, 20'-25'	

End of Hole 25'-0"

BORING A-3

FOR Interstate Power Company

LOCATION Lanning, Iowa Elev. 653.9 Boring No. A3

GROUND WATER				
While drilling		Time after drilling	1/4 Hour	Start 6-?-73
Before casing removal		Depth to water	24'6"	Unit 11
After casing removal		Depth to cave		Chief [illegible]

Sample No. | Moisture | Blows on Sampler 0/6, 6/12 | Sample Recovery | Type Blows | VISUAL FIELD CLASSIFICATION AND REMARKS | Casing/Probe, Weight, Drop | Unconfined Strength | Boulders | Blows on Casing, Probe | Drilling Method

FA

Bag 1 0'-10'

Bag 2 10'-20'

Bag 3 20'-40'

Grey Silt, Sandy, Clayey to Trace Clay

Greenish-Brown Sandy [illegible], Some Clay, Occasional Sandstone Pieces

End of Hole 40'-0"

BORING A-4

FOR Interstate Power Company

LOCATION Lansing, Iowa Elev. 667.9 Boring No. A-4

GROUND WATER			
While drilling		Time after drilling	
Before casing removal		Depth to water	
After casing removal		Depth to cave in	

Start 6-1-73
Unit Hand Auger
Chief [illegible]

Sample No.	[illegible]	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	[illegible]	[illegible]	Blows on Casing	Blows on [illegible]	[illegible]
Bag 1 [illegible]						Light Brown Fine Sand, Silty, Some Small to Large Limestone Pieces					HA
						End of Hole 3'-0"					

Casing/Probe ____ Weight ____ Drop ____

BORING A-5

FOR Interstate Power Company

LOCATION Lansing, Iowa — Elev. 629.2 — Boring No. A-5

GROUND WATER				
While drilling	13'0"	Time after drilling	1/4 Hour	Start 6-5-73
Before casing removal		Depth to water	18'0"	Unit 9
After casing removal		Depth to cave-in		Chief HF

Casing/Probe ___ Weight ___ Drop ___

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N	Visual Field Classification and Remarks	Drilling Method
						2" Black silt topsoil	
1	M	4	4	▇	8	Gray Silt, Sandy, Clayey to Trace Clay	SS
2	M	1	5	▇	9		SS
3	M	3	3	▇	6		SS
4	M	7	7	▇	12	Gray Clayey Silt, Organic, Little Sand	SS
5	W	4	4	▇	8		SS
6	W	1	[illegible]	▇	[illegible]		SS
7	W	5	6	▇	11		SS
8	W	6	7	▇	17	Gravelly Sand, Little to Trace Silt, Some Cobbles and/or Boulders	SS
9	W	8	8	▇	[illegible]		SS
10	W	10	11	▇	21		SS
						End of Hole 25'0"	

BORING A-6

FOR Interstate Power Company

LOCATION Lansing, Iowa Elev. 629.2 Boring No. A 6

GROUND WATER					
While drilling	12'6"	Time after drilling	1/4 Hour		Start 6-5-73
Before casing removal		Depth to water	13'8"		Unit 9
After casing removal		Depth to cave-in			Chief JJE

Casing/Probe ___ Weight ___ Drop ___

VISUAL FIELD CLASSIFICATION AND REMARKS

Sample No.		Blows on Sampler 0/6	Blows on Sampler 6/12	Total Blows	Drilling Method
1	M	4	3	7	SS
2	M	3	3	6	SS
3	M	5	3	8	SS
4	M	3	5	9	SS
5	M	4	3	7	SS
6	W	4	5	9	SS
7	W	6	6	12	SS
8	W	8	8	16	SS
9	W	11	10	21	SS
10	W	10	13	23	SS

4" Black Silt topsoil

Gray Silt, Sandy, Clayey to Trace Silt

Gray Clayey Silt, Organic, Little Sand

Gravelly Sand, Little to Trace Silt, Some Cobbles and/or Boulders

Silty

End of Hole

BORING A-7

FOR Interstate Power Company

LOCATION Lansing, Iowa Elev. 639.6

Boring No. A7

GROUND WATER
- While drilling —
- Before casing removal —
- After casing removal —
- after drilling 1/4 Hour
- Depth to water 25'
- Depth to cave-in —

Start 6-5-73
Unit 41
Chief HF

Sample No.	Blows on Sampler 0-6	Blows on Sampler 6-12	Depth (ft)	VISUAL FIELD CLASSIFICATION AND REMARKS
			0–35	Greenish-Brown Sandy Silt, Some Clay, Occasional Sandstone Pieces
Bag 1, 0'-10'				
Bag 2, 10'-15'				
Bag 3, 15'-25'				
			35	Very Wet, Mucky
Bag 4, 25'-40'			40	End of Hole 40'0"

BORING A-0

FOR Interstate Power Company

LOCATION Lansing, Iowa Elev. 630.8 Boring No. A8

GROUND WATER			
While drilling		Time after drilling	3/4 Hour 24 Hours
Before casing removal		Depth to water	10'0" 12'0"
After casing removal		Depth to cave in	

Start 5-25-73
Unit 11
Chief HF

Sample No.	Moisture	Blows on Sampler 6/6	6/12		Total Blows	Visual Field Classification and Remarks	Unconfined Strength	Density	Blows on Casing	Probe	
Bag 1 0'-6'						Light Brown Fine to Medium Sand, Silty, Some to Little Clay, Little Small to Large Gravel					1A
Bag 2 6'-11'											
Bag 3 11'-16'											
Bag 4 16'-25'											
						End of Hole 25'0"					

BORING A-9

FOR Interstate Power Company

LOCATION Lansing, Iowa   Elev. 652.3   Boring No. A 9

GROUND WATER	While drilling	Time after drilling 1/4 Hour	Start 6-2-71
	Before casing removal	Depth to water	Unit 11
	After casing removal	Dry - cave in 21'0" Wet	Chief IIF

VISUAL FIELD CLASSIFICATION AND REMARKS

Casing/Probe
Weight
Drop

Drilling Method: FA

Depth	Visual Field Classification and Remarks
0'–45'	Light Brown Fine Sand, Trace Silt
45'–50'	Occasional Pieces of Gravel
50'	End of Hole 50'0"

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

Bar(?) 0'-50'

BORING A-10

FOR Interstate Power Company

LOCATION Lansing, Iowa — Elev. 635.6 — Boring No. A-10

GROUND WATER				
While drilling		Time after drilling	1/4 Hour	Start 3-26-73
Before casing removal		Depth to water		Unit 11
After casing removal		Depth to cave-in	12'4" Wet	Chief HF

Sample No.	Moisture	Blows on Sampler 0/6	6/12	Sample Recovery	Total Blows	Depth	Visual Field Classification and Remarks	Unconfined Strength	Rock	Blows on Casing	Probe	Casing Method
												FA
Bag 1 0'-6'						5	Light Brown Fine to Medium Sand, Silty, Some to Little Clay, Little Small to Large Gravel					
Bag 2 6'-11'						10						
Bag 3 11'-16'						15						
						20						
						25	End of Hole 25'0"					

APPENDIX A

Document 1.10.5
Lansing Generating Station Response to EPA Request for Information

14 pages

ALLIANT ENERGY

Alliant Energy Corporate Services, Inc.
Legal Department
200 First Street SE
P.O. Box 351
Cedar Rapids, IA 52406-0351

Office: 319.786.4505
www.alliantenergy.com

March 27, 2009

Mr. Richard Kinch
US Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor: N-56
Arlington, VA 22202-2733

RE: Response to Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act

Dear Mr. Kinch:

On March 13, 2009, the Lansing Generating Station ("LGS"), a facility owned and operated by Interstate Power and Light Company ("IPL"), on whose behalf this response is submitted, received a "Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act" (hereinafter "Request") from the United States Environmental Protection Agency ("EPA"). EPA's Request was dated March 9, 2009. EPA's Request required a response within 10 business days of receipt; therefore, this response is timely filed.

EPA's Request seeks information relating to LGS's surface impoundments or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material from a surface impoundment used for storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. EPA seeks responses to ten specific questions set forth in Enclosure A to the Request.

This letter and the enclosed documents respond to EPA's Request. IPL has made diligent and good faith efforts to provide documents and information that are in its possession and which IPL could reasonably collect and prepare for production within the timeframe allotted.

A. General Objections

Based on its review of and good-faith efforts to respond timely to the Request, IPL wishes to note for the record that it has several objections to the form and content of the Request.

IPL objects to the Request on the grounds that it is unduly burdensome and overly broad, seeks irrelevant information, is vague and unclear in its scope, requires legal conclusions to be made, and is otherwise unreasonable, thereby exceeding EPA's authority under CERCLA Section 104(e).

IPL objects to the Request to the extent that it seeks information beyond the scope of EPA's authority under Section 104(e) of CERCLA. Section 104(e) authorizes EPA to request, upon reasonable notice, information or documents relating to the following:

> (A) The identification, nature, and quantity of materials which have been or are generated, treated, stored, or disposed of at a vessel or facility or transported to a vessel or facility.
> (B) The nature or extent of a release or threatened release of a hazardous substance or pollutant or contaminant at or from a vessel of facility.
> (C) Information relating to the ability of a person to pay for or to perform a cleanup.

IPL does not object to questions relating to the (1) type and quantity of materials stored, temporarily or permanently, in the surface impoundments and (2) nature and extent of actual releases or threatened releases; however, IPL believes that the other questions in the Request, e.g., structural integrity, dates of commissioning/expansion, PE certifications, etc., are beyond the scope of EPA's authority under Section 104(e).

IPL also objects to the extent that the Request seeks information that may be subject to attorney-client privilege or other applicable privilege, or which constitutes protected attorney work product, or which is otherwise not discoverable.

Where the questions in the Request are vague, ambiguous, overbroad, or beyond the scope of EPA's CERCLA Section 104(e) authority, IPL has made appropriate and reasonable efforts to provide responsive information to the best of its ability to interpret the questions. Subject to and without waiving its objections, IPL states that it is providing information at this time based on its review conducted in response to the specific items in the Request. In the event that IPL discovers additional responsive material, it will submit such material to EPA as soon as reasonably possible.

Because EPA has requested that IPL respond to this request within only 10 business days, IPL has not had the opportunity to determine whether the responsive contents of this letter constitute **"confidential business information,"** as defined by 40 CFR Part 2, Subpart B. Therefore, with the exception of the Iowa Department of Natural Resources inspection report provided in response to item number 6 of EPA's Enclosure A, IPL requests that **EPA treat this letter and the narrative responses within as "confidential business information."**

Finally, IPL objects to the following phrase as vague, unclear, and ambiguous: "surface impoundment or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material for storage or disposal of residual or by-products from the combustion of coal." For purposes of this Request, IPL interprets this phrase to mean:

1. Any surface impoundment that directly receives coal combustion by-products (CCB) in a liquid-borne manner (i.e., water mixed with ash) from the coal combustion process in the boiler, as well as any subsequent surface impoundments through which this CCB and water mixture may pass before the water exits the CCB management units via the NPDES permitted discharge point. This includes current operating CCB management units, as well as any surface impoundments which historically received CCB and which still contain free liquids.
2. IPL's interpretation of this phrase does not include storm water retention ponds, coal pile runoff retention ponds, cooling water ponds, etc. which may contain small incidental amounts of CCB which was transmitted via rain waters or as fugitive dust. These ponds and impoundments were neither designed nor intended for temporary or long-term storage or disposal of CCB.

B. Specific Responses to Items in Enclosure A

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or less-than-Low Hazard Potential, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

a. Main Ash Pond: Based on its review of readily available records and interviews with long term staff, IPL has not identified that this pond was ever rated relative to the "National Inventory of Dams" criteria by any federal or state regulatory agency.
b. Lower Ash Pond: Based on its review of readily available records and interviews with long term staff, IPL has not identified that this pond was ever rated relative to the "National Inventory of Dams" criteria by any federal or state regulatory agency.

2. What year was each management unit commissioned and expanded?

a. Main Ash Pond: Commissioned in approximately 1975.

b. Lower Ash Pond: Commissioned in approximately 1975.

---

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash: (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other", please specify the other types of materials that are temporarily or permanently contained in the unit(s).

a. Main Ash Pond: Materials temporarily or permanently contained are

- Fly ash
- Bottom ash
- Other: ash transport water, boiler water wash, air heater wash (fly ash), steam grade water production wastewaters, storm water runoff from landfill, plant floor drains, and boiler blowdown (steam/water).

b. Lower Ash Pond: Materials temporarily or permanently contained are

- Fly ash
- Bottom ash
- Other: ash transport water, boiler water wash, air heater wash (fly ash), steam grade water production wastewaters, storm water runoff from landfill, plant floor drains, and boiler blowdown (steam/water).

---

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management (s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?'

a. Main Ash Pond:

- Based on its review of readily available records, IPL believes the original pond was designed by a Professional Engineer.
- Based on its review of readily available records, IPL believes that the original pond was constructed under the supervision of a Professional Engineer, but no supporting documentation is available.

- Inspection and monitoring of the safety of the pond is not under the supervision of a Professional Engineer.

b. Lower Ash Pond:

- Based on its review of readily available records, IPL believes the original pond was designed by a Professional Engineer.
- Based on its review of readily available records, IPL believes that the original pond was constructed under the supervision of a Professional Engineer, but no supporting documentation is available.
- Inspection and monitoring of the safety of the pond is not under the supervision of a Professional Engineer.

---

5. When did the company last assess or evaluate the safety (i. e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

a. Main Ash Pond:

- IPL conducted a visual structural inspection on March 12, 2009.
- The assessment team inspecting the pond on March 12th consisted of a Civil Engineer; Senior Environmental Specialist; and a Plant Manager with an Engineering Degree.
- The March 12th inspection identified no items/issues requiring action. No future planned actions are scheduled at this time.
- IPL currently has no future assessment/evaluation scheduled, but is working to develop an internal evaluation program including periodic inspections.

b. Lower Ash Pond:

- IPL conducted a visual structural inspection on March 12, 2009.
- The assessment team inspecting the pond on March 12th consisted of a Civil Engineer; Senior Environmental Specialist; and a Plant Manager with an Engineering Degree.
- The March 12th inspection identified no items/issues requiring action. No future planned actions are scheduled at this time.

- IPL currently has no future assessment/evaluation scheduled, but is working to develop an internal evaluation program including periodic inspections.

---

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation.
Please provide a copy of the most recent official inspection report or evaluation.

a. Main Ash Pond:

- This pond is part of a wastewater management unit subject to an NPDES permit. The Iowa Department of Natural Resources performed a Facility Wastewater Inspection on March 6, 2007. The inspection report does not include an evaluation of the structural integrity of the pond.
- IPL is not aware of any planned state or federal regulatory agency future inspection to evaluate the safety (structural integrity) of this pond.
- A copy of the Iowa Department of Natural Resources Facility Wastewater Inspection report is attached for your awareness.

b. Lower Ash Pond:

- This pond is part of a wastewater management unit subject to an NPDES permit. The Iowa Department of Natural Resources performed a Facility Wastewater Inspection on March 6, 2007. The inspection report does not include an evaluation of the structural integrity of the pond.
- IPL is not aware of any planned state or federal regulatory agency future inspection to evaluate the safety (structural integrity) of this pond.
- A copy of the Iowa Department of Natural Resources Facility Wastewater Inspection report is attached for your awareness.

---

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and if so, describe the actions that have been or are being taken to deal with the issue or issues.
Please provide any documentation that you have for these actions.

a. Main Ash Pond: There have been no assessments, evaluations, or inspections by a state or federal regulatory agency within the past year.

b. Lower Ash Pond: There have been no assessments, evaluations, or inspections by a state or federal regulatory agency within the past year.

---

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of materials currently stored in each of the management unit(s). Please provide the date that the volume measurement was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

a. Main Ash Pond:
   - Surface area: 14.8 acres.
   - Total storage capacity: 474,000 cubic yards (measurement date - 1999)
   - Volume of materials stored: 313,000 cubic yards (measurement date - 1999)
   - Maximum height of management unit: 20 feet (estimated)

b. Lower Ash Pond:

c. Surface area: 0.2 acres

d. Total storage capacity: unknown; no design drawing could be located. However, estimated to be approximately 10 feet deep, which would translate to approximately 2900 cubic yards. (date of estimate – March, 2009)

e. Volume of materials stored: unknown, but an estimated 90% of solid materials were dredged from pond in 2002. Ash materials have been added to this pond since 2002; pond is estimated to be less than 25% filled, which would be less than approximately 725 cubic yards. (date of estimate – March, 2009)

f. Maximum height of management unit: 8 feet (estimated)

---

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

a. Main Ash Pond: IPL is not aware of any known spills or unpermitted releases from this pond within the past 10 years. For purposes of this question, all discharges exiting the pond via the discharge point governed under the NPDES permit, including any water quality exceedances, are interpreted to be "permitted releases".

b. Lower Ash Pond: IPL is not aware of any known spills or unpermitted releases from this pond within the past 10 years. For purposes of this question, all discharges exiting the pond via the discharge point governed under the NPDES permit, including any water quality exceedances, are interpreted to be "permitted releases".

---

10. Please identify all current legal owner(s) and operator(s) at the facility.

a. Main Ash Pond: Interstate Power and Light Company is the sole owner and operator of Lansing Power Station.

b. Lower Ash Pond: Interstate Power and Light Company is the sole owner and operator of Lansing Power Station.

C. Confidentiality of IPL's Response.

As noted above, IPL requests that EPA treat the information submitted herein as "confidential business information".

* * * *

Please find attached the affidavit of John Larsen, Vice President-Generation, that is being submitted with this response to the information request. Please feel free to contact me at (319) 786-4686 if you have any questions concerning this response.

Very truly yours,

Daniel L. Siegfried

Daniel L. Siegfried
Managing Attorney

Enclosure: Iowa DNR Wastewater Compliance Inspection Report dated 6 March 2007

Certification

I certify that the information contained in this response to EPA's request for information and the accompanying documents is, based on my personal belief and my knowledge of the actions taken to respond to the information request and subject to the explanation that follows, true, accurate, and complete. The response points out ambiguities and other difficulties in responding to the request, and where that is true, a good faith effort has been made to provide information that is reasonably available and responsive to the request. As to the portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to reasonably assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Signature: [signature]

Name: John O. Larsen

Title: Vice President - Generation

Fields of Opportunities

STATE OF IOWA

CHESTER J. CULVER, GOVERNOR
PATTY JUDGE, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
RICHARD A. LEOPOLD, DIRECTOR

March 6, 2007

CERTIFIED MAIL

Alliant Energy
Interstate Power & Light – Lansing Power Plant
2320 Power Plant Drive
Lansing, IA 52151

ATTN: Matt Cox, Environmental Manager

RE: Alliant - Lansing Wastewater Treatment Facility Inspection
NPDES Permit #: 0300100

Dear Mr. Cox:

Enclosed is the report of the recent inspection of the above facility conducted by Sue Miller of the Field Office #1 staff.

We believe you will find the report self-explanatory and strongly encourage you to take action on the requirements and/or recommendations listed at the end of the report.

If you have any questions about the inspection or report, please contact Sue Miller or myself at this office.

Sincerely,

Mike Wade

Mike Wade
Environmental Specialist

cc: IDNR Records Center (w/encl.)
Bill Skalitzky, Alliant Energy, PO Box 77007, Madison, WI 53707-1007, (w/encl.)
File: Ind WW/Alliant-Lansing
eFile: 03 WW Lansing Alliant 020107 ins sjm

IOWA DEPARTMENT OF NATURAL RESOURCES
WASTEWATER TREATMENT FACILITY INSPECTION

NPDES Permit #: 0300100

FACILITY INFORMATION

FACILITY	NAME: Alliant Energy – Interstate Power and Light Co.- Lansing Power Station				
	RESPONSIBLE AUTHORITY/OWNER: Alliant Energy				
	ADDRESS: 2320 Power Plant Drive	CITY: Lansing	STATE: Iowa	ZIP: 52151	PHONE: 563-538-3110
RESPONSIBLE OPERATOR	NAME: Matt Cox	GRADE: NA		CERTIFICATION NUMBER: NA	

DESIGN CAPACITY	AVERAGE MGD: NA	MAXIMUM MGD: NA	POUNDS BOD/DAY: NA	PE (BOD): NA
NOW TREATING	AVERAGE MGD: NA	MAXIMUM MGD NA	POUNDS CBOD/DAY: NA	PE (BOD): NA
	PERIOD REVIEWED: 1/1/03-12/31/06	POPULATION SERVED:		
RECEIVING STREAM	Unnamed tributary to Mississippi River A1, B(WW1)			

GENERAL DESCRIPTION:	001 Non-contact cooling water, boiler blowdown, and floor drains 002 Ash transport water and sumps from the plant. 003 Sealed

INSPECTION INFORMATION

INSPECTION	DATE THIS INSPECTION: 02/01/07	DATE LAST INSPECTION: 01/30/03	PURPOSE: Routine Compliance Inspection and Complaint Investigation
PERSONS INTERVIEWED	NAME: Matt Cox Hank Sangster Ted Shonts Glen Thomas	TITLE: Environmental Manager Plant Manager Former Environmental Manager Maintenance	

NPDES PERMIT COMPLIANCE SUMMARY

SELF-MONITORING	Operation Reports Submitted: ☒ Sat. ☐ Marg.* ☐ Unsat.*	Required Data on Reports: ☒ Sat. ☐ Marg.* ☐ Unsat.*	Testing Adequacy: ☒ Sat. ☐ Marg.* ☐ Unsat.*
EFFLUENT LIMITATIONS	SELF-MONITORING RESULTS: ☒ Satisfactory ☐ Marginal* ☐ Unsatisfactory*		
SAMPLES THIS INSPECTION	TYPE: None		LAB DATA ATTACHED? ☐ Yes ☐ No
	RESULTS: ☐ Satisfactory ☐ Marginal* ☐ Unsatisfactory*		
	VISUAL APPEARANCE OF EFFLUENT: Outafll 001 clear; Outfall 002 cloudy Outfall 003 No discharge	VISUAL APPEARANCE OF RECIEIVING STREAM: Outfall 001 no visible impact Outfall 002 receiving stream is cloudy	
COMPLIANCE SCHEDULE	COMPLIANCE WITH SCHEDULE: ☐ Sat. ☐ Marg.* ☐ Unsat.*	NEXT ITEM DUE:	DATE DUE:

* Explain in Comments and Recommendations Section

AUTHENTICATION

INSPECTOR:	NAME: Sue Miller, Environmental Specialist Sue Miller	DATE: 3/6/07
REVIEWER:	NAME: Mike Wade, Environmental Specialist: Mike Wade	DATE: 3-6-07

NPDES PERMIT COMPLIANCE:

The monthly operation reports (MORs) were reviewed for the reporting period from January 1, 2003 through December 31, 2006.

Self- Monitoring — The operation reports were submitted regularly and on time; and it appears that the wastewater testing parameters of the NPDES permit are being consistently entered at the required frequencies.

FACILITY EVALUATION:

General Description — There are two permitted outfalls at this facility. Outfall 001 discharges into an unnamed tributary to the Mississippi River that has been widened into a canal.

Outfall 001

Outfall 001 consists of non-contact condenser cooling water, boiler blowdown and floor drains from the old plant. The raw source of this water is the Mississippi River.

Outfall 002

Outfall 002 consists of the discharge from the facility's ash handling system, the ash settling pond and sumps within the facility. A flocculant, MMP-80 is added to the settling pond. The discharge from Outfall 002 is visibly changing the clarity of the receiving stream. This office received a complaint regarding the discharge from Outfall 002. An aerial view of the outfall location clearly shows that the discharge is impacting the stream.

Outfall 003

Outfall 003 consists of storm water run off from the coal pile into a settling pond. This outfall has been sealed and no longer discharges.

Flow Measurement —

Time clocks on the recirculating pumps are used for calculating influent flow for Outfalls 001. This method of flow needs to be recalibrated at least every six months to take into account for impeller wear. These calibrations need to be kept with other maintenance records.

Outfall 002 has an American Sigma 980 flow meter on the effluent that was installed in 2004.

Effluent Sampling—

The facility permit currently requires grab samples at both Outfall 001 and 002. Because of the possibility that grab samples may miss slugs of solids being discharged, the company must begin collecting 24-hour composite samples for total suspended solids (TSS) of the effluent at Outfall 002.

In addition, 567 IAC Subrule 61.3(2)"f" states *"The turbidity of the receiving water shall not be increased by more than 25 Nephelometric turbidity units by any point source discharge."* Visual observations lead me to suspect that the turbidity is being increased excessively by the discharge from Outfall 002. Therefore, the company must collect upstream and down stream turbidity samples from the receiving stream.

Iron

Administrative Consent Order (ACO) No. 2005-WW-17 was issued to provide interim effluent limits for iron at Outfall 002 until the facility permit is issued. The interim effluent limits for iron are 5.0 mg/l and 210.7 pounds per day NET ADDITION. The ACO further outlines the calculation for net addition. The company has been reporting total iron on its monthly operating reports, however. The company must begin reporting net addition for iron on the monthly operation reports that are submitted to the department.

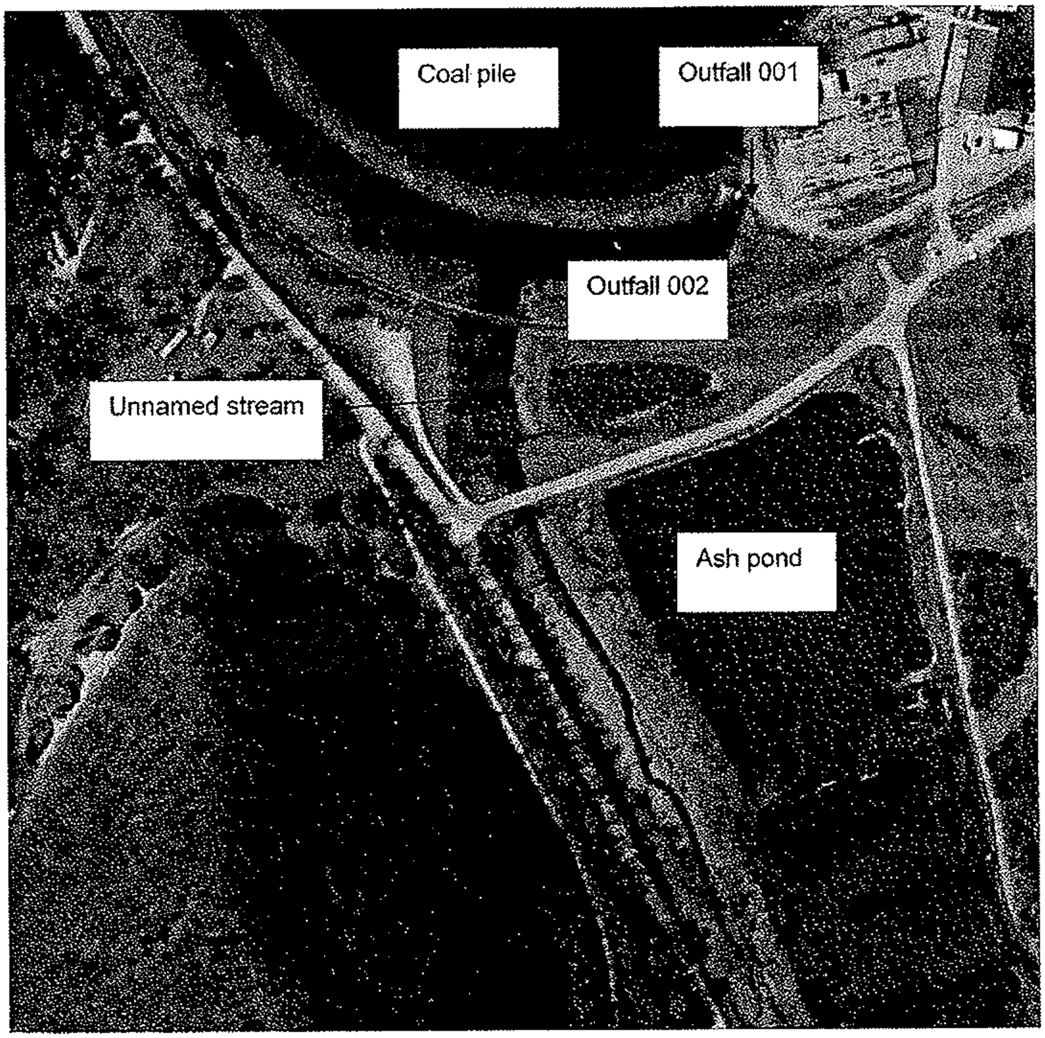
Bottom Ash Disposal—
The company removes settled ash from the ash ponds. This ash is hauled for disposal at the permitted CCR landfill located east of the plant.

SUMMARY OF REQUIREMENTS

1. Because of the possibility that grab samples may miss slugs of solids being discharged, within 30 days, the company must begin collecting 24-hour composite samples for total suspended solids (TSS) of the effluent at Outfall 002. The results must be reported on the monthly operating reports.

2. Visual observations lead me to suspect that the turbidity is being increased excessively by the discharge from Outfall 002. Therefore, the company must collect upstream and down stream turbidity samples from the receiving stream.

3. The company must begin reporting net addition for iron on the monthly operation reports that are submitted to the department.


Coal pile
Outfall 001
Outfall 002
Unnamed stream
Ash pond

APPENDIX B

Site Photographs

Document 1.11
Lansing Station Aerial map and Photograph Index

1 page

Lansing Generating Station Photograph Map Index

APPENDIX B

Site Photographs

Document 1.12
Lansing Station Site Photographs

16 pages

Picture 1.1
Entrance sign along Power Plant Road

Picture 1.2
Pond 1 Northeast corner inside dike Looking east

Picture 1.3
Pond 1 north inside dike Looking east

Picture 1.4
Pond 1 Northwest corner inside dike Looking west

Picture 1.5
Pond 1 East inside dike Looking east (Outfall structure)

Picture 1.6
Pond 1 North inside dike Looking west

Picture 1.7
Power Plant Road Pond 1 north dike crest Looking east

Picture 1.8
Pond 1 North outside dike Looking east

Picture 1.9
Pond 1 West crest and inside dike Looking south

Picture 1.10
Pond 1 West outside dike Looking south

Picture 1.11
Pond 1 West Crest dike Looking north

Picture 1.12
Pond 1 West outside berm Looking north (Note creek bed)

Picture 1.13
Pond 1 East side inside dike Looking east

Picture 1.14
Pond 1 Begin channelized area Looking east

Picture 1.15
Pond 1 First channelized interior berm Looking east

Picture 1.16
Pond 1 Culvert connection in channelized area

Picture 1.17
Pond 1 Third interior dike Looking east

Picture 1.18
Pond 1 Upstream end of culvert fabric filtered inflow

Picture 1.19
Pond 1 Small eroded areas adjacent to channelized portion

Picture 1.20
Pond 1 Outfall end of channelized section culvert

Picture 1.21
Pond 1 Discharge point east inside dike Looking east

Picture 1.22
Pond 1 Small eroded area adjacent to channelized portion

Picture 1.23
Pond 1 West inside dike Looking north

Picture 1.24
Pond 1 Southwest inside dike Looking southeast

Picture 1.25
Pond 1 Southeast corner inside dike Looking northeast

Picture 1.26 Pond 1 Ash spoil on south crest of dike
Landfill in background. Note landfill runoff culvert

Picture 1.27
Pond 1 Southwest inside dike Looking southwest

Picture 1.28
Pond 1 East inside dike Looking north

Picture 1.29
Pond 1 South inside dike Looking west

Picture 1.30
Pond 1 At discharge area Looking north

Picture 1.31
Pond 1 Within channelized area Looking north

Picture 1.32
Pond 1 Within channelized area Looking east

Picture 1.33
Pond 1 West outside dike Looking east and upward

Picture 1.34
Pond 1 West outside dike Looking north at toe

Picture 1.35
Pond 1 West outside dike Looking south at unnamed creek

Picture 1.36
Pond 1 West outside dike Looking east

Picture 1.37
Pond 1 West outside dike Looking north

Picture 1.38
Pond 1 West outside dike Looking north

Picture 1.39
Pond 1 West outside dike Looking north

Picture 1.40
Pond 1 West outside dike Looking north

Picture 1.41
Pond 1 West outside dike Looking south tree covered dike

Picture 1.41
Outfall path Downstream side of Access Road Looking north

Picture 1.42
Pond 1 North outside dike Looking east

Picture 2.1
Pond 2 Crest and North outside dike Looking east

Picture 2.2
Pond 2 Crest & North Outside dike Looking west

Picture 2.3
Pond 2 South inside dike Looking south

Picture 2.4
Pond 2 West inside dike Looking west

Picture 2.5
Pond 2 North, east and south inside dike Looking east

Picture 2.6
Pond 2 North outside dike Looking east

Picture 2.7
Pond 2 North outside dike Looking east

Picture 2.8
Pond 2 North Crest and outside dike Looking east

Picture 2.9
Pond 2 North outside dike Looking south

Picture 3.1
Outfall Pond 1 Intake Structure Looking west

Picture 3.2
Outfall Pond 1 Intake Structure Looking east

Picture 3.3
Outfall Pond 1 Intake detail filter fabric

Picture 3.4
Outfall Pond 1 Intake staff gauge

Picture 3.5
Outfall Pond 2 Inflow drop Structure Looking south

Picture 3.6
Outfall Pond 2 Upstream end of Outflow structure

Picture 3.7
Outfall Pond 2 Upstream end of Outflow Structure

Picture 3.8
Outfall Pond 2 Upstream end of Outflow Structure (on deck)

Picture 3.9
Outfall Downstream end of access road box culvert

Picture 3.10
Outfall Access Road box culvert Looking south

Picture 3.11
Outfall Pond 2 discharge area into channel Looking north

Picture 3.12
Outfall Access Road box culvert Looking south

APPENDIX C

Site Checklists

Document 1.13

Ash Pond 1
Field Observation Checklist

10 pages

Site Name:	**Lansing Generating Station**	**Date:**	**5 October 2010**
Unit Name:	**Ash Pond 1 (Upper)**	**Operator's Name:**	**Interstate Power & Light**
Unit I.D.:		**Hazard Potential Classification:**	High ☐ Significant ☐ Low X
	Inspector's Name:	Mark Hoskins, P.E., Joseph P. Klein, III, P.E.	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	650		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	627.4		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	See Note 20	
5. Lowest dam crest elevation (operator records)?	654		Is water exiting outlet, but not entering inlet?	See Note 20	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	See Note 20	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?	N/A	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?	X		At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
8	Foundation clearing and grubbing requirements included in original project specifications reviewed on site.
9	Trees present on down gradient slope of west dike. Tree diameter generally 3 to 5 inches, some larger.
10	South dike crest is paved County road for public access to waste transfer station. Pavement crack appear to be paving lane joints
20	Primary spillway discharge is conveyed in a corrugated metal pipe through the south dike to the lower ash pond. Invert of pipe discharge was below water elevation on the lower ash pond at the time of the site observations.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit 0300100 **INSPECTOR** Mark Hoskins, P.E & Joe Klein, P.E.

Date 5 October 2010
Impoundment Name Outfall No. 001

Impoundment Company Interstate Power Company
EPA Region 7

State Agency State of Iowa Department of Natural Resources, Environmental Service Division
(Field Office) Address 502 E. 9th Street, Des Moines, IA 50319
Name of Impoundment Ash Pond 1

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** X

	Yes	No
Is impoundment currently under construction?	☐	X
Is water or ccw currently being pumped into the impoundment?	X	☐

IMPOUNDMENT FUNCTION: Receives sluiced coal combustion waste, fly ash landfill runoff, condenser cooling water and plant floor drain discharge

Nearest Downstream Town Name: Lynxville, Wisconsin

Distance from the impoundment: 8 miles

Location:

Latitude	43	Degrees	20	Minutes	5.8	Seconds	**N**
Longitude	91	Degrees	10	Minutes	1.5	Seconds	**W**

State Iowa **County** Allamakee

	Yes	No
Does a state agency regulate this impoundment?	X	☐

If So Which State Agency? Iowa Department of Natural Resources

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

X **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

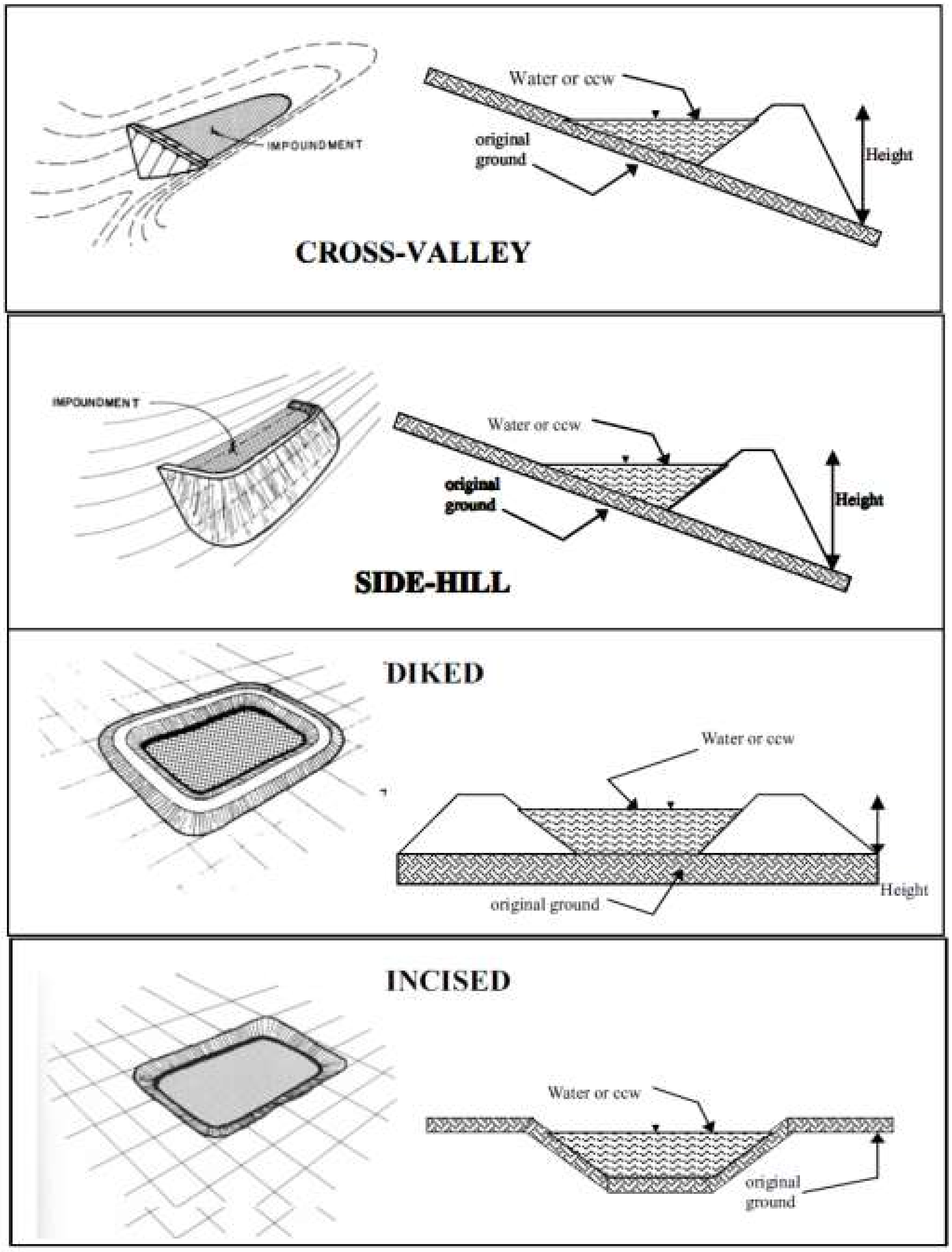
☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Based on the 30 ft. height of the dam and direct access to the Mississippi river across only land owned by Interstate Power and Light Co., failure or misoperation of the dike is not expected to result in loss of human life. The economic impact is expected to include Company owned property and ash recovery from the Mississippi River.

The existing creek valley adjacent to the upper ash impoundment is expected to retain a significant portion of ash released in the event of a dike failure or misoperation mitigating the impact to the Mississippi River.

CONFIGURATION:



- [ ] Cross-Valley
- [X] Side-Hill
- [ ] Diked
- [ ] Incised (form completion optional)
- [ ] Combination Incised/Diked

Embankment Height (ft) 30

Pool Area (ac) 14.8

Current Freeboard (ft) 4

Embankment Material Well graded sand

Liner Bentonite cap On down gradient slope

Liner Permeability Not documented

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

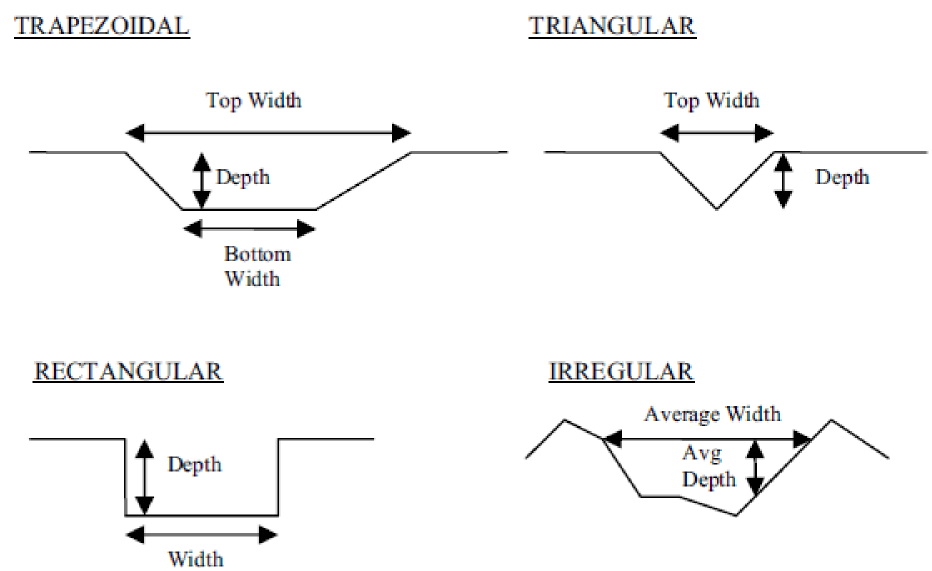
☐ Rectangular

☐ Irregular

depth (ft)

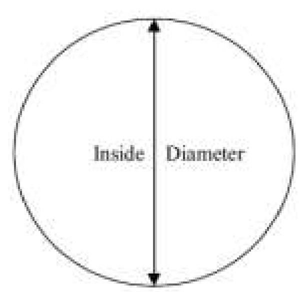
average bottom width (ft)

top width (ft)



X **Outlet**

24" inside diameter



Material

X corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

The Impoundment was Designed By Sargent & Lundy Engineers

	Yes	No
Has there ever been a failure at this site?	☐	X
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	X
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	X
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

<u>**ADDITIONAL INSPECTION QUESTIONS**</u>

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

Construction drawings indicate embankment constructed over natural ground. Original configuration has not been altered.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Documentation not provided during site visit. Owner is conducting additional search for design documentation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

Neither photographic documentation nor observations during the site visit showed evidence of prior releases, failures or patchwork on the dikes.

APPENDIX C

Site Checklists

Document 1.14

Ash Pond 2
Field Observation Checklist

10 pages

Site Name:	**Lansing Generating Station**	**Date:**	**5 October 2010**
Unit Name:	**Ash Pond 2 (Lower)**	**Operator's Name:**	**Interstate Power & Light**
Unit I.D.:		**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low X**
	Inspector's Name:	Mark Hoskins, P.E., Joseph P. Klein, III, P.E.	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	631		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	622.2		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?	See Note 20	
5. Lowest dam crest elevation (operator records)?	639		Is water exiting outlet, but not entering inlet?	See Note 20	
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	See Note 20	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?	N/A	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
8	Foundation clearing and grubbing requirements included in original project specifications reviewed on site.
9	Trees present on down gradient slope of west dike. Tree diameter generally 3 to 5 inches, some larger. Tree present no both slopes of north dike. Tree diameter range from scrub (less than 1-inch) to 3-inches
20	Primary spillway discharge is conveyed in a corrugated metal pipe through the west dike to a stream along the side of the Lower Ash Pond. Stream empties into the Mississippi River at the plant boundary. River level at the time of the site visit raised the stream level to above the spillway pipe elevation.

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit 0300100 **INSPECTOR** Mark Hoskins, P.E & Joe Klein, P.E.

Date 5 October 2010
Impoundment Name Outfall No. 001

Impoundment Company Interstate Power Company
EPA Region 7

State Agency State of Iowa Department of Natural Resources, Environmental Service Division
(Field Office) Address 502 E. 9th Street, Des Moines, IA 50319
Name of Impoundment Ash Pond 2 (Lower)

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ☐ **Update** X

	Yes	No
Is impoundment currently under construction?	☐	X
Is water or ccw currently being pumped into the impoundment?	X	☐

IMPOUNDMENT FUNCTION: Receives sluiced coal combustion waste, fly ash landfill runoff, condenser cooling water and plant floor drain discharge

Nearest Downstream Town Name: Lynxville, Wisconsin

Distance from the impoundment: 8 miles

Location:

Latitude	43	Degrees	20	Minutes	6.1	Seconds	N
Longitude	91	Degrees	10	Minutes	1.5	Seconds	W

State Iowa **County** Allamakee

	Yes	No
Does a state agency regulate this impoundment?	X	☐

If So Which State Agency? Iowa Department of Natural Resources

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

X **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

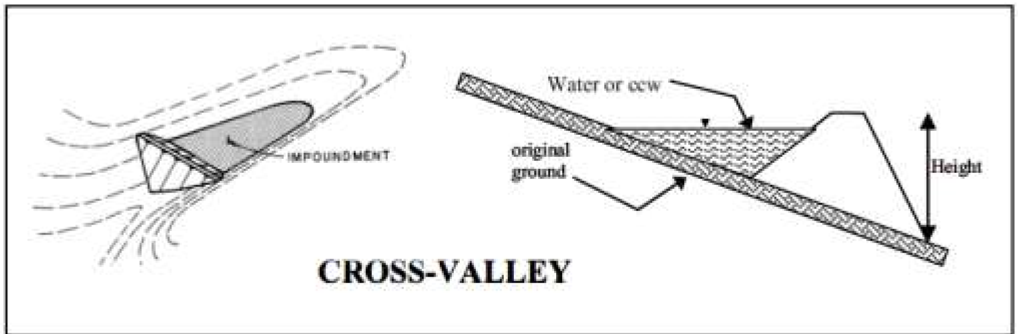
☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

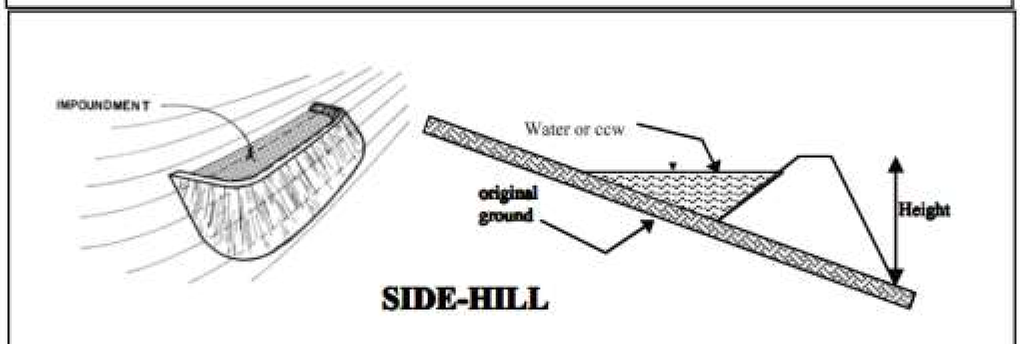
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

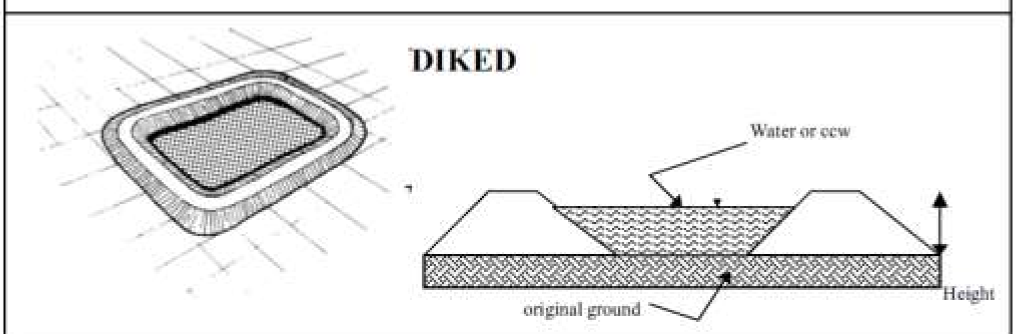
Based on the 8 ft. height of the dam and direct access to the Mississippi river across only land owned by Interstate Power and Light Co., failure or misoperation of the dike is not expected to result in loss of human life. The economic impact is expected to include Company owned property and ash recovery from the Mississippi River.

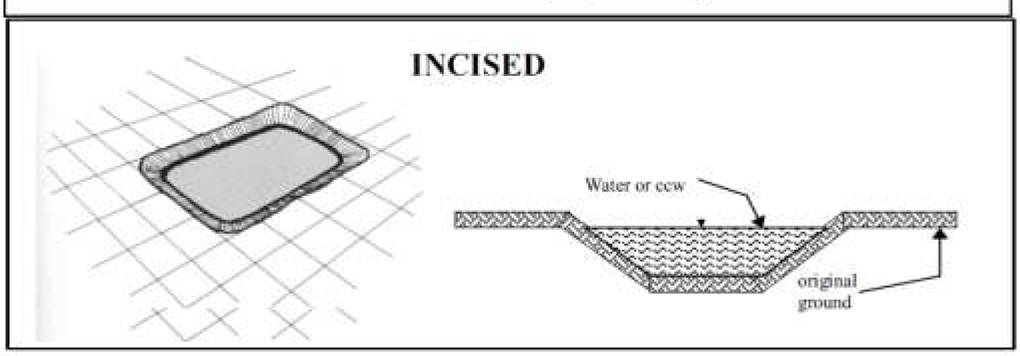
The existing creek valley adjacent to the upper ash impoundment is expected to retain a significant portion of ash released in the event of a dike failure or misoperation mitigating the impact to the Mississippi River.

CONFIGURATION:









☐	Cross-Valley	X	Side-Hill	X	Diked
☐	Incised (form completion optional)			☐	Combination Incised/Diked

Embankment Height (ft)	8	**Embankment Material**	Well graded sand
Pool Area (ac)	0.2	**Liner** Bentonite cap	On down gradient slope
Current Freeboard (ft)	4	**Liner Permeability**	Not documented

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

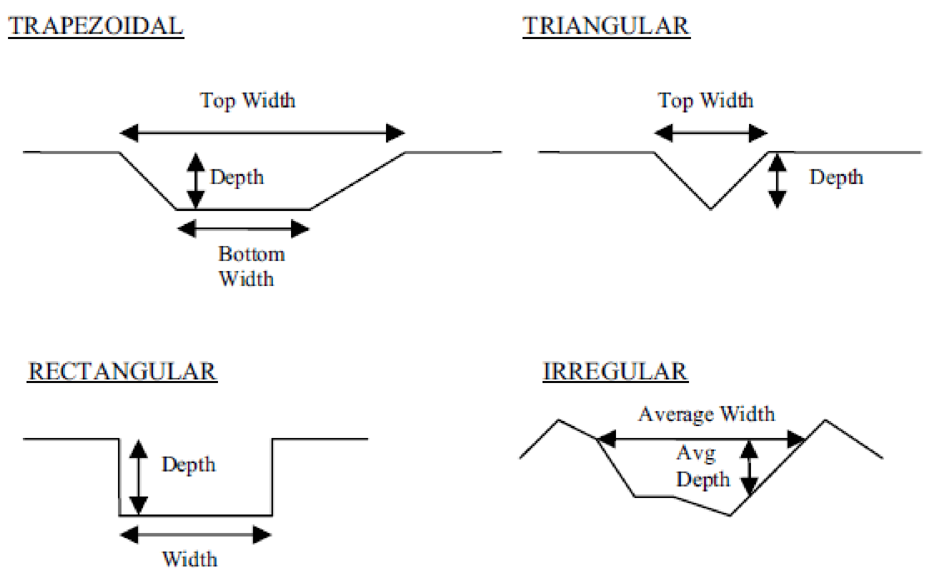
☐ Rectangular

☐ Irregular

depth (ft)

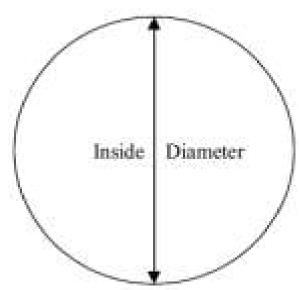
average bottom width (ft)

top width (ft)



X **Outlet**

24" inside diameter



Material

X corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify): See Checklist Note 20

The Impoundment was Designed By Sargent & Lundy Engineers

	Yes	No
Has there ever been a failure at this site?	☐	X
If So When?		

If So Please Describe :

	Yes	No
Has there ever been significant seepages at this site?	☐	X
If So When?		

If So Please Describe :

	Yes	No
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?	☐	X
If so, which method (e.g., piezometers, gw pumping,...)?		

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

Construction drawings indicate embankment constructed over natural ground. Original configuration has not been altered.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

Documentation not provided during site visit. Owner is conducting additional search for design documentation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

Neither photographic documentation nor observations during the site visit showed evidence of prior releases, failures or patchwork on the dikes.