COAL ASH IMPOUNDMENT
SITE ASSESSMENT FINAL REPORT

6th Street Power Generating Station
Interstate Power and Light Company
Cedar Rapids, Iowa

Prepared by:

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Bright People. Right Solutions.

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KLEINFELDER PROJECT NUMBER 118953-4

February 28, 2013

KLEINFELDER

I acknowledge that the management units referenced herein:

- Ash Pond 1
- Ash Pond 2
- Ash Pond 3
- Ash Pond 4

were assessed on May 24, 2011.

Signature: ______________________ Date: 2-28-13

Scott M. Mackiewicz, PE
Geotechnical Engineer

EXECUTIVE SUMMARY

Background information taken from the U. S. Environmental Protection Agency's (EPA's) website:

> "Following the December 22, 2008 dike failure at the TVA/Kingston, Tennessee coal combustion waste (CCW) ash pond dredging cell that resulted in a spill of over 1 billion gallons of coal ash slurry, covered more than 300 acres and impacted residences and infrastructure, the EPA is embarking on an initiative to prevent the catastrophic failure from occurring at other such facilities located at electric utilities in an effort to protect lives and property from the consequences of a impoundment or impoundment failure of the improper release of impounded slurry."

As part of the EPA's effort to protect lives and the environment from a disaster similar to that experienced in 2008, Kleinfelder was contracted to perform a site assessment at the 6th Street Power Generating Station that is owned and operated by IPL. This report summarizes the observations and findings of the site assessment that occurred on May 24, 2011.

The coal combustion waste impoundments observed during the site assessment included:

- Ash Pond 1 – Commissioned sometime in the 1930's.
- Ash Pond 2 – Commissioned sometime in the 1930's.
- Ash Pond 3 – Commissioned sometime in the 1930's.
- Ash Pond 4 – Commissioned sometime in the 1930's.

It should be noted that all four ponds are actually individual cells of a single larger impoundment.

Preliminary observations made during the site assessment are documented on the Site Assessment Checklist presented in Appendix A. A copy of this checklist was transmitted to the EPA following the field walk-through. A more detailed discussion of the observations is presented in Section 4, "Site Observations."

The ash pond impoundments are not regulated by any state agency and therefore do not currently have a designated hazard potential classification. Due to the limited potential environmental and economic impacts that a failure of the embankments of these impoundments would present, it is recommended that a Hazard Potential Classification of "Low" be assigned to all four impoundments.

Overall, the site is currently being operated with areas of concern as discussed in Section 6, "Recommendations."

On the date of this site assessment, there appeared to be no immediate threat to the safety of the impoundment embankments. No assurance can be made regarding the impoundments condition after this date. Subsequent adverse weather and other factors may affect the condition.

A brief summary of the Priority 1 and 2 Recommendations is given below. A more detailed discussion is provided in Section 6, "Recommendations."

Priority 1 Recommendations

1. Prepare an Emergency Action Plan (EAP) for the facility.
2. Monitor potential seepage through embankments.
3. Monitor potential erosion in drainage ditch and creek.
4. Control vegetation on the upstream slopes, crest and downstream slopes. Remove trees from the embankments.

Priority 2 Recommendations

1. Repair erosion of embankments.
2. Maintain a log of maintenance and other activities at the bottom ash impoundments and supporting facilities.

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SECTION 1 – INTRODUCTION

1.1 GENERAL

This report has been prepared for the United States Environmental Protection Agency (EPA) to document Kleinfelder's findings and observations from a site assessment of the ash pond impoundments at the 6th Street Power Generating Station on May 24, 2011.

The following sections present a summary of data collection activities, site information and performance history of the facility's ponds made available by the owner (Interstate Power and Light Company-IPL), a summary of site observations, and recommendations resulting from the site assessment.

1.2 PROJECT LOCATION

The 6th Street Power Generating Station is located on the southeastern bank of Cedar Lake at the intersection of 6th street and Interstate 380 in Cedar Rapids, Iowa. The generating station is located in Linn County at approximately latitude 41^{o} 59' 5'' and longitude -91^{o} 40' 6''. The area around the plant is a relatively flat industrial and commercial area with some residential developments nearby.

1.3 SITE DOCUMENTATION

IPL provided the following documents following our assessment to aid in the review of the impoundments:

- March 2009 and April 2010 Ash Pond Safety assessment Reports
- September 1999 Evaluation of pH Excursions in NPDES Regulated Effluent Report
- June 2007 Wastewater Assessment Report
- August 2011 Aether DBS Ash Pond Slope Stability and Hydraulic Analysis
- August 8, 2012 Aether DBS Response USEPA Draft Report Safety of Coal Combustion Waste Ponds 6th Street Generating Station, Cedar Rapids, IA.

SECTION 2 – SITE ASSESSMENT

2.1 ATTENDEES

The site assessment was performed on May 24, 2011 by Brian Havens, PE (Iowa) and Matt Gardella, EIT of Kleinfelder. Other persons present during the site assessment include:

- William Skalitzky – IPL
- Troy Booth – IPL

2.2 IMPOUNDMENTS ASSESSED

The coal combustion waste impoundments observed during the site assessment included:

- Ash Pond 1 – Commissioned sometime in the 1930's.
- Ash Pond 2 – Commissioned sometime in the 1930's.
- Ash Pond 3 – Commissioned sometime in the 1930's.
- Ash Pond 4 – Commissioned sometime in the 1930's.

It should be noted that all four ponds are actually individual cells of a single larger impoundment.

Preliminary observations made during the site assessment are documented on the Site Assessment Evaluation Checklist presented in Appendix A. A more detailed discussion of the observations is presented in Section 4.

2.3 WEATHER DURING ASSESSMENT

The weather experienced during the field walk-through was sunny and clear. Temperatures ranged from 75^{o} to 80^{o} Fahrenheit and wind ranged from zero to 5 miles per hour (mph).

SECTION 3 – SITE INFORMATION AND HISTORY

3.1 SITE INFORMATION AND HISTORY

3.1.1 Site History

The 6th Street Power Generating Station is a coal-fired facility that is in the process of being decommissioned. The facility sits immediately adjacent to Cedar Lake and is approximately 1,000 feet from the Cedar River in Cedar Rapids, Iowa. In June of 2008, record rainfall caused the Cedar River to overtop its banks and flood the 6th Street Power Generating Station and surrounding areas. This flooding severely damaged the facility and, as a result, coal fired energy is not currently being produced at the facility and has not been produced since the flood. However, the ash ponds that were previously utilized for treatment of coal combustion waste (CCW) slurries, primarily bottom ash slurry, are now being used to impound water pumped from floor sumps at the facility. Pumping of water out of these floor sumps was required after the 2008 flood damaged the facility's foundation; infiltration of groundwater continues to seep into the basement, is captured in the floor sump system, and is pumped out into the ash ponds.

Prior to the current operational layout at the 6th Street Power Generating Station, a single ash pond was in place to treat the CCW produced at the facility. Sometime after the original construction of the pond, it was subdivided into the four separate impoundments that can be seen today. In addition to subdividing the original embankment, Interstate 380 was built over the ash ponds with bridge supports extending through Ash Ponds 3 and 4.

3.1.2 Description of Impoundments

The ash ponds are comprised of a single earthen embankment "ring dike" impoundment that has been separated into four cells that are designated as Ponds 1, 2, 3 and 4. CCW slurry pipes inlet at the southwest corners of Ash Pond 1 and Ash Pond 2. All water that is pumped into the series of ash ponds is eventually directed into Ash Pond 4, which acts as a final settling pond, and discharges into an unnamed creek that flows via a corrugated metal pipe into Cedar Lake. There is not a spillway associated with any of the ash ponds. The outlet from Ash Pond 4 consists of a 16-inch steel pipe that runs southwest through the embankment of Ash Pond 4 and discharges into the nearby creek. The outlet pipe has a fixed intake elevation and the discharge flow is not regulated by a sluice gate or other means. At the outfall of this pipe, an access catwalk is used for sampling purposes. Also, located at the outlet location of Ash Pond 4 is an inactive flow meter that is no longer operational after the 2008 flood.

3.1.3 Operating Procedure

Prior to the 2008 flooding, CCW slurry was generally sluiced into Ash Pond 1 (see Figure 2 for pond locations and designations). Pond 1 would gravity feed to Pond 2, Pond 2 would gravity feed to Pond 3 and Pond 3 would gravity feed to Pond 4. If CCW was being dredged from Pond 1, process waters and CCW slurry coming from the plant would be diverted into Pond 2. If CCW was being dredged from Pond 2, the valve from Pond 1 to Pond 2 would be closed and the valve from Pond 1 to Pond 4 would be open. Process waters and CCW slurry were never discharged directly into Ponds 3 and 4 from the plant. Each of the ponds acted as settling basins for the CCW contained in the process water before it was discharged into Cedar Lake. Prior to the 2008 flooding, the CCW would be removed by dredge from the various impoundments every 2-5 years, or as needed, and disposed of as daily cover at a landfill or through other beneficial use projects.

3.2 PERTINENT DATA

A. GENERAL

1. Name .... 6th Street Power Generating Station
2. State .... Iowa
3. County .... Linn
4. Latitude .... 41^{o} 59' 5''
5. Longitude .... -91^{o} 40' 6''
6. Source Intake Waters .... Cedar Lake
7. Year Constructed .... 1930's
8. Modifications .... Separation of single ash pond into 4 cells, I-380 piers placed in ponds 3&4

9. Current Hazard Potential Classification....................None
10. Proposed Hazard Potential Classification....................Low
11. Size Classification....................Unregulated

B. IMPOUNDMENT DETAILS

Ash Pond 1

1. Type....................Earthen Diked
2. Crest Elevation....................Unknown, estimated at 730'
3. Crest Width....................~20 feet
4. Embankment Height....................~10 feet
5. Upstream Slope....................2H:1V
6. Downstream Slope....................2H:1V

Ash Pond 2

1. Type....................Earthen Diked
2. Crest Elevation....................Unknown, estimated at 730'
3. Crest Width....................~20 feet
4. Embankment Height....................~10 feet
5. Upstream Slope....................2H:1V
6. Downstream Slope....................2H:1V

Ash Pond 3

1. Type....................Earthen Diked
2. Crest Elevation....................Unknown, estimated at 730'
3. Crest Width....................~20 feet
4. Embankment Height....................~10 feet
5. Upstream Slope....................2H:1V
6. Downstream Slope....................2H:1V

Ash Pond 4

1. Type....................Earthen Diked
2. Crest Elevation....................Unknown, estimated at 730'
3. Crest Width....................~20 feet
4. Embankment Height....................~10 feet
5. Upstream Slope....................2H:1V
6. Downstream Slope....................2.5H:1V

C. DRAINAGE BASIN

1. Area of Drainage Basin....................Minimal/Unknown
2. Downstream Description....................Industrial/Commercial Area, Cedar Lake leading to Cedar River

D. IMPOUNDMENT CAPACITY AND INLET

Ash Pond 1

1. Impoundment Capacity....................10,900 CY[1]
2. Impoundment Inlet....................Inlet sluice pipe from the generating station

Ash Pond 2

1. Impoundment Capacity ....12,600 CY[1]
2. Impoundment Inlet............Inlet sluice pipe from the generating station & culvert inlet from Pond 1

Ash Pond 3

1. Impoundment Capacity ....65,200 CY[1]
2. Impoundment Inlet.......................................Culvert inlet from Ash Pond 2

Ash Pond 4

1. Impoundment Capacity ....51,300 CY[1]
2. Impoundment Inlet.......................................Culvert inlets from Ash Ponds 1 and 3

E. PRIMARY SPILLWAY

Ash Pond 1

1. Description ....N/A – No Spillway Present

Ash Pond 2

1. Description ....N/A – No Spillway Present

Ash Pond 3

1. Description ....N/A – No Spillway Present

Ash Pond 4

1. Description ....N/A – No Spillway Present

F. OUTLET WORKS

Ash Pond 1

1. Description ....~12-inch PVC Pipe and 30-inch corrugated plastic pipe into Ash Pond 2
2. Location.......................................Northeast embankment
3. Intake Structure................................ None –CMP extends through embankments between ponds
   a. Intake Invert Elevation ....Unknown
4. Discharge Conduit into Ash Pond 2 .... 12-inch PVC and 30-inch corrugated plastic pipe
   a. Length.......................................~30 feet
   b. Diameter.......................................~12 and 30 inches
5. Discharge Conduit into Ash Pond 4 ....12-inch metal pipe with valve
   a. Length.......................................~30 feet
   b. Diameter....................................... ~12 inches
6. Outlet Structure................................None – CMP extends through embankments between ponds
   a. Outlet Invert Elevation ....Unknown
   b. Energy Dissipation.......................................None
7. Discharge Channel.......................................None
8. Discharge Capacity with Water Surface at Top of Bank ....Unknown

Ash Pond 2

1. Description .... 24" Corrugated Metal Pipe Culvert (CMP) into Ash Pond 3
2. Location.......................................Northeast embankment
3. Intake Structure................................None – CMP extends through embankments between ponds

a. Intake Invert Elevation .... Unknown
4. Discharge Conduit .... CMP
   a. Length .... Approximately 60 feet
   b. Diameter .... Approximately 24 inches
5. Outlet Structure .... None – CMP extends through embankments between ponds
   a. Outlet Invert Elevation .... Unknown
   b. Energy Dissipation .... None
6. Discharge Channel .... None
7. Discharge Capacity with Water Surface at Top of Bank .... Unknown

Ash Pond 3

1. Description .... 24-inch metal pipe into Ash Pond 4
2. Location .... Southwest embankment
3. Intake Structure .... None – CMP extends through embankments between ponds
   a. Intake Invert Elevation .... Unknown
4. Discharge Conduit .... 24-inch metal pipe
   a. Length .... Approximately 60 feet
   b. Diameter .... 24 inches
5. Outlet Structure .... None- CMP extends through embankments between ponds
   a. Outlet Invert Elevation .... Unknown
   b. Energy Dissipation .... Unknown
6. Discharge Channel .... None
7. Discharge Capacity with Water Surface at Top of Bank .... Unknown

Ash Pond 4

1. Description .... 16-inch Metal pipe discharging to unnamed creek
2. Location .... Southwest embankment
3. Intake Structure .... None – Pipe stubbed through embankment without flared end section
   a. Intake Invert Elevation .... Unknown
4. Discharge Conduit .... 16-inch metal pipe
   a. Length .... Approximately 50 feet
   b. Diameter .... 16 inches
5. Outlet Structure .... None – walkway on top of pipe to outfall location
   a. Outlet Invert Elevation .... Unknown
   b. Energy Dissipation .... Unknown
6. Discharge Channel .... ~50-foot-wide channel that discharges through culverts to Cedar Lake
7. Discharge Capacity with Water Surface at Top of Bank .... Unknown

G. MANAGEMENT

1. Owner .... IPL
2. Purpose .... Coal-fired energy generation

Note: 1. Information IPL response to EPA request for information letter (2009)

3.3 REGIONAL GEOLOGY AND SEISMICITY

The plant site is situated in the Cedar River Valley on the southeastern side of Cedar Lake. As such, the subsurface conditions are expected to include Quaternary alluvial deposits overlying sedimentary bedrock.

Based on our review of recent soil borings and CPT soundings (Aether DBS 2011) and information from the Web Soil Survey, it appears that the upper alluvial deposits at the site include combinations of clay, peat and silt and sand. Based on our review of data published by the United States Geological Survey (USGS) and review of a historical report (Team Services 2002), the sedimentary rock formations in Linn County include dolomite, chert, shale, sandstone, and limestone and the upper unit appears to be dolomite at this site.

The plant site is situated in a Seismic Zone 1 area. We have noted that the New Madrid Fault has a documented history of seismic activity but is located more than 300 miles south of the plant site.

3.4 HYDROLOGY AND HYDRAULICS

The ash pond impoundments are situated in such a manner that the watershed drainage contributing to the stored volume of the ponds appears to be minimal and most likely limited to the precipitation that falls within the impoundments themselves. Although a current topographic survey of the site and of the impoundments would be needed to determine the exact extents of the watershed, we believe that a negligible amount of surface water runoff drains into the ponds.

We reviewed one document related to hydrology and hydraulics that was prepared by Aether DBS dated August 4, 2011. This study indicates that the ash ponds are capable of storing the 24-hour, 100-year storm event without overtopping provided that the current freeboard levels are maintained and the current operating conditions are maintained. This study also indicates that the water surface level would only be expected to rise 0.5 feet in the event of the 100 year 24 hour storm event. Aether DBS's analysis does not discuss possible consequences in the event of an embankment failure or adequacy of culverts or design details. However, it appears that most of the damage caused by an embankment failure would be limited to the owner's property and to the railroad tracks due to the relatively limited amount of CCW and water stored within the Ash Ponds.

The outlets of Ash Pond 4 and the other impoundments were not functioning due to low surface water elevation levels at the time of assessment. It was inquired if any video assessments had been performed on any of the culverts. It is understood that no video monitoring of culverts had been performed at the 6th Street Generating Station.

3.5 GEOTECHNICAL CONSIDERATIONS

Kleinfelder reviewed a report dated August 4, 2011 by Aether DBS and a response letter dated August 8, 2012 by Aether DBS. This study included stability analyses for a section cut through the embankment at the cell referred to as Pond 4, including a static loading condition and a pseudo-static earthquake loading condition. This section was selected to represent the worst case for all cells (Ponds 1 through 4), and therefore a separate stability analysis for each cell is not necessary. The conclusion presented by Aether DBS is that the outer embankment for the ash ponds should have an acceptable factor of safety (FOS) against failure under the following loading conditions:

- FOS of 1.6 for static/steady seepage loading (1.5 minimum per USACE EM 1110-2-1902)
- FOS of 1.3 for rapid drawdown loading (1.1 to 1.3 minimum per USACE per USACE EM 1110-2-1902)
- FOS of 1.5 for seismic loading (1.0 minimum per FEMA, Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams, May 2005)

It should be noted that the Aether report refers to "The ten most critical failure surfaces for each loading case" as being presented in Appendix F when, in fact, they are presented in Appendix D.

Based on our review of this study and our experience with design and construction of similar embankments, the conclusion presented by Aether DBS seems to be reasonable, provided that seepage through the embankments occurs in a controlled fashion.

Regarding seepage, Aether DBS has noted that the materials used for the lower portion of the embankment construction include bottom ash and boiler slag, with some apparent variability in engineering properties (moisture content, strength, particle size, etc.). In addition, concrete and brick rubble were noted at one of the boring locations. These conclusions were apparently made based on data obtained from soil borings and CPT soundings. It appears that the embankments have varying levels of saturation and that there is some potential for uncontrolled seepage pathways through the embankments, particularly where rubble exists. Uncontrolled seepage, if it occurs and is not mitigated, could reduce the factor of safety against a stability failure to an unacceptable level. Monitoring the embankments for uncontrolled seepage will continue to be an important consideration.

Although we expect that these impoundments were built over wet bottom ash and slag, we believe that the embankment loading conditions and composition are sufficiently different at this site compared to the TVA impoundments so that structural failure of the embankments is unlikely. Our opinion is based on review of the embankment cross section drawings presented in the Aether DBS letter dated August 8, 2012, the CPT data presented in the Aether DBS report dated August 4, 2011 and the stability analyses presented in both of the documents provided by Aether DBS.

3.6 STRUCTURAL COMPONENT CONSIDERATIONS

Structural components involved with the operation of Ponds 1, 2, 3 and 4 include sluice pipe supports running from the generating station to the ash ponds as well as catwalks above the steel pipe between Ponds 3 and 4 and the catwalk structure located above the outfall of pond 4.

Sluice pipes running from the generating station to the ash ponds appear to be supported on metal and concrete stands that appeared to be weathered, although not to the point of structural failure. Due to the age of the facility, continuous assessment and evaluation is merited to determine the condition of the supports as time progresses.

The catwalk structure above the inlet pipe for Pond 4 appears to be weathered and supported by a steel pipe that has significant corrosion almost to the point of structural failure. However, the small catwalk structure does not appear to be essential in the operation of the ash ponds, and the consequences of not being able to access the catwalk appear to be minimal if any.

The steel catwalk structure including stairs near the outfall of Pond 4 appears to be in fair condition. The structure as well as the stairs leading to the catwalk appear to be weathered, but not to the point of structural failure. It appears that a handrail support for the stairs is missing, and should be replaced or studied further to determine the effects of the missing support. Due to the age of the facility, continuous assessment and evaluation is merited to determine the condition of the catwalk and stairs as time progresses.

3.7 PERFORMANCE HISTORY

There have been no previous federal or state assessments of the ash pond impoundments at the 6th Street Power Generating Station related to dam safety. Since 2009, IPL local plant personnel have been performing annual assessments of the impoundments utilizing checklists for dam safety that were prepared internally. Based on observations made by IPL personnel during their in-house assessments, there have been no major incidents involving any of the ash ponds.

3.8 HAZARD POTENTIAL CLASSIFICATION

The ash pond impoundments are not regulated by any state agency and therefore do not currently have a designated Hazard Potential Classification. Due to the limited potential environmental and economic impacts that a failure at any of these impoundments would present by breaching their embankments, it is recommended a Hazard Potential Classification of "Low" be assigned to all four impoundments. A loss of life scenario is not expected as the primary downslope features from the ponds include a set of railroad tracks and Cedar Lake. In addition, it is likely that most of the damage caused by a failure would be limited to the owner's property and to the railroad tracks due to the relatively limited amount of CCW and water stored within the Ash Ponds. However, a hazard analysis would be needed to better define the hazard classification of the impoundments.

3.9 SITE ACCESS

Following a security point check-in to gain permission for access to the 6th Street Generating Station, the owner's representative led the assessment team to the impoundments. A standard vehicle under normal weather conditions can access the impoundments.

SECTION 4 – SITE OBSERVATIONS

The upstream and downstream embankment slopes, crest, downstream toe, inlet and outlet works of the ash ponds were observed during the May 24, 2011 site assessment. A brief summary of the features observed is presented below. More specific observations of the site and facilities are documented in the Site Assessment Checklists provided in Appendix A. Site observation photographs are shown at the end of this section and a map showing the photograph locations is shown on Figure 3.

4.1 ASH POND 1

4.1.1 Upstream Slope

Overall, the upstream slope of the impoundment was in fair condition. Photos 3 and 4 at the end of this section show the conditions of the upstream slope. Specific observations include:

- The upstream slope was laid back at approximately 2H:1V.
- Minor erosion, less than 6 inches deep, was noted on some of the upstream slopes.
- Vegetation was present on the majority of the upstream slope. Vegetation with stem diameters greater than one inch were noted during the assessment.
- Mowing/vegetation control had not been completed on the majority of the upstream slope.
- Riprap/concrete rubble was present on the upstream slopes. It was typically intermittent and sparse.

4.1.2 Crest

Overall, the crest of the impoundment was in fair condition. Photos 3 and 4 at the end of this section show the conditions of the crest. Specific observations include:

- The impoundment crest consists of a graded gravel used as an access route placed on top of the impoundment embankment.
- Overall, the crest was clear of vegetation with only some sparse grasses and minimal bushes observed on the crest.
- No major depressions or rutting were noted on the impoundment crest.
- A chain link fence is located on the southwestern and northwestern sides of the ash pond at the crest. The chain link pole penetrations are located on the crest near the downstream gradebreak.
- Minor erosion was noted on the crest in limited locations. This erosion was typically less than six inches in depth and typically appeared on the edges of the crest, where grade breaks occurred when transitioning to embankment slopes.

4.1.3 Downstream Slope

Overall, the downstream slope was in fair to poor condition. Photo 33 at the end of this section shows the condition of the downstream slope. Specific observations include:

- Erosion, some areas close to 6 inches deep, was noted on some of the downstream slope.
- Penetrations into the downstream embankment, including debris (possibly abandoned pipe), were present.
- Grasses, woody bushes and small trees over 1 inch in diameter were observed on the downstream slope.
- No seepage was observed during the site assessment.

4.1.4 Downstream Toe Area

The toe area of the embankment was in fair to poor condition. Photos 1 and 32 at the end of this section show the conditions of the downstream toe. Key features and observations of this area include:

- Grasses and woody bushes were observed on the downstream slope/toe for the majority of the northwestern embankment.
- A stormwater ditch was present at the northwestern embankment downstream toe with water that was constantly flowing during the assessment.
- No seepage was observed during the site assessment.

4.1.5 Outlet Works

The outlet works of Ash Pond 1 consist of a 12-inch PVC pipe and a 30-inch corrugated plastic pipe culvert that discharges into Ash Pond 2. The culvert does not include a trash rack or any type of controls. In addition, a 12-inch metal pipe with a valve discharges into Ash Pond 4 through the southeastern embankment, this 12-inch metal pipe and valve can be seen in Photo 31 at the end of this section.

- The intake locations of the outlet pipes were not surrounded with riprap.
- Both the PVC and corrugated plastic pipe appeared to be in newer condition with no visible damage.
- The metal pipe and valve appeared to be close to their life expectancy. The operational capacity of the valve was not confirmed, as water was not currently being transported through the pipe.
- No video monitoring of the culverts were available at the time of assessment.
- Overall, the outlet works system appeared to be functioning as intended at the time of assessment.

4.1.6 Impoundment Inlet

Inflow into Ash Pond 1 is via metal piping on the southwestern corner of the impoundment, as well as stormwater runoff that flows naturally into the pond. From this southwest inlet location, the CCW slurry water/floor sump water, flows directly into the pond via a cantilevered metal pipe. The inlet pipe appeared to be in fair condition, and can be seen in Photo 4 at the end of this section.

4.2 ASH POND 2

4.2.1 Upstream Slope

Overall, the upstream slope of the impoundment was in fair condition. Photos 5 through 8 at the end of this section show the conditions of the upstream slope. Specific observations include:

- The upstream slope was laid back at approximately 2H:1V.
- Grasses and woody bushes were observed on the upstream slope. No vegetation with a stem diameter greater than 1 inch was noted during the assessment.
- Minor erosion, less than 6 inches deep, was noted during the assessment on the upstream slopes.
- Riprap/concrete rubble was present on the upstream slopes. It was typically intermittent and sparse.

4.2.2 Crest

Overall, the crest of the impoundment was in fair condition. Photos 6 and 7 show the condition of the crest. Specific observations include:

- The impoundment crest is a gravel access road.
- Sparse grasses and bushes were observed on the crest.
- Minor depressions/rutting were noted on the impoundment crest, but were less than 6 inches in depth.
- Minor erosion was noted on the crest in multiple locations. This erosion was typically less than six inches in depth and typically appeared on the edges of

the crest, where grade breaks occurred when transitioning to embankment slopes.

- A chain link fence is located on the northwestern embankment at the crest. The chain link pole penetrations are located on the crest near the downstream grade break.

4.2.3 Downstream Slope

Overall, the downstream slope was in fair to poor condition. Photo 34 shows the conditions of the downstream slope. Specific observations include:

- Erosion, some areas close to 6 inches deep, was noted on some of the downstream slope.
- Grasses, woody bushes and small trees over 1 inch in diameter were observed on the downstream slope.
- No seepage was observed during the site assessment.

4.2.4 Downstream Toe Area

The toe area of the embankment was in fair to poor condition. Key features and observations of this area include:

- Grasses and woody bushes were observed on the downstream slope/toe for the majority of the northwestern embankment.
- A stormwater ditch was present at the northwestern embankment downstream toe with water that was constantly flowing during the assessment.
- No seepage was observed during the site assessment.

4.2.5 Outlet Works

The outlet works of Ash Pond 2 consist of a 24-inch CMP culvert located at the northeast embankment of the pond. Key features and observations of the outlet works include:

The uncontrolled CMP pipe discharged directly into Ash Pond 4. The embankment surrounding this outlet was vegetated, and the CMP showed signs of corrosion. There was no trash rack associated with this culvert.

4.2.6 Impoundment Inlet

Inflow into Ash Pond 2 occurs through a metal sluice pipe that discharges slurry into the southwest corner of the pond, as well as stormwater runoff that flows naturally into the pond. Flow into the pond is regulated by pumping operations at the plant. The inlet sluice pipe was not operational during the assessment, and showed signs of slight corrosion. However, the sluice pipe appeared that it would operate as intended at the time of assessment. Photos 6-8 at the end of this section show the condition of the impoundment inlet.

4.3 ASH POND 3

4.3.1 Upstream Slope

Overall, the upstream slope of the impoundment was in fair condition. Photos 9, 10, 13, 17, and 21 at the end of this section show the conditions of the upstream slope. Specific observations include:

- The upstream slope was laid back at approximately 2H:1V.
- Minor erosion, less than 6 inches deep, was noted on some of the upstream slopes.
- Grasses, woody bushes and trees were observed on the upstream slope for the majority of the impoundment.
- Mowing/vegetation control had not been completed on the majority of the upstream slope.
- Riprap/concrete rubble was present on the upstream slope. Typically, the riprap/concrete rubble was sparse and missing in places.

4.3.2 Crest

Overall, the crest of the impoundment was in fair to poor condition. Photos 12, 16, 19, and 20 show the condition of the crest. Specific observations include:

- The impoundment crest is a combination of a gravel road and unvegetated embankment.
- Debris such as abandoned buildings and various discarded items were present on the crest.
- Grasses and bushes were observed on the crest.
- Portions of the crest had no vegetative or gravel cover.
- Minor rutting was noted on the impoundment crest.
- On the eastern embankment, additional fill material had been imported after the original construction of the impoundment. It appears that this imported fill material was not compacted properly when it was placed, as the material was very soft and simply walking on the crest left depressions.
- Erosion, less than 6 inches deep, was noted on the crest in multiple locations. This erosion typically appeared on the eastern embankment crest where embankment fill had been dumped on the crest but not compacted properly.

4.3.3 Downstream Slope

Overall, the downstream slope was in fair condition. Photos 14, 19, and 20 show the conditions of the downstream slope. Specific observations include:

- Significant erosion, greater than 6 inches deep, was noted on some of the downstream slopes, particularly on the eastern embankment of the impoundment where embankment fill had not been properly compacted.
- Grasses and woody bushes were observed on the downstream slope and at the toe of the embankment for the majority of the impoundment.

4.3.4 Downstream Toe Area

The toe areas of the embankment were in fair to poor condition. See photos 14, 19, and 34 for the condition of these areas. Key features and observations of these areas include:

- The toe area of the eastern embankment had grasses, bushes, and multiple small trees.
- Mowing/vegetation control had not been completed on the majority of the downstream slope and toe areas.
- A stormwater ditch was present at the northwestern embankment downstream toe with water that was constantly flowing during the assessment.

4.3.5 Outlet Works

The outlet works of Ash Pond 3 consist of a 24-inch welded steel pipe set at an unknown elevation that passes through the southwest embankment into Ash Pond 4. Flow through this pipe is not regulated.

- We understand that video monitoring of the 24-inch metal pipe has not been performed.
- The outlet pipe has rusted completely through in visible locations as seen in photograph 21 at the end of this section.
- Overall, the outlet works system appeared to be functioning as intended at the time of assessment.

4.3.6 Impoundment Inlet

Inflow into Ash Pond 3 is via the discharge conduit from Ash Pond 2 as well as rainfall runoff that flows naturally into the impoundment and stormwater runoff that is transferred from the I-380 downspouts into the pond. The inlet pipe can be seen in photo 10 at the end of this section. In addition, downspouts from I-

380 can be seen in photo 15 at the end of this section. The inlet pipe from Ash Pond 2 appeared to be in fair condition, while the downspouts appeared to be in satisfactory condition.

4.4 ASH POND 4

4.4.1 Upstream Slope

Overall, the upstream slope of the impoundment was in fair condition. Photos 23, 24, and 28 at the end of this section show the conditions of the upstream slope. Specific observations include:

- The upstream slope was laid back at approximately 2H:1V.
- Minor erosion, less than 6 inches deep, was noted on some of the upstream slopes.
- Grasses and woody bushes were observed on the upstream slope of the impoundment.
- Mowing/vegetation control had not been completed on the majority of the upstream slope.

4.4.2 Crest

Overall, the crest of the impoundment was in fair condition. Photos 25, 28 and 30 show the condition of the crest. Specific observations include:

- The impoundment crest is a gravel road.
- Grasses and bushes were observed on the crest.
- No major depressions or rutting were noted on the impoundment crest.
- A fence penetration was present along the southern and eastern embankments near the downstream slope grade transition.

4.4.3 Downstream Slope

Overall, the downstream slope was in fair condition. Photos 26, 27, and 29 show the conditions of the downstream slope. Specific observations include:

* Grasses, woody bushes and small trees were observed on the downstream slope for the majority of the impoundment.

4.4.4 Downstream Toe Area

The toe areas of the embankment were in fair to poor condition. See photos 27, 29, and 32 for the condition of these areas. Key features and observations of these areas include:

* A flowing creek was present immediately at the toe of the southern and eastern embankments.
* The toe area had grasses, some bushes, and multiple small trees.
* On the toe of the eastern and southern embankments, vegetation was not cleared for at least 15 feet from the toe.

4.4.5 Outlet Works

The outlet works of Ash Pond 4 consists of a 16-inch metal pipe stubbed through the southwestern embankment. The outlet was accessible via metal stairs and catwalk that terminated directly above the outfall of the pipe. The outlet is uncontrolled and set at an unknown elevation that cannot be adjusted. The outlet was not operational at the time of assessment due to low water levels in Ash Pond 4.

* We understand that video monitoring of the 16-inch metal pipe has not been performed.
* The 16-inch metal outlet pipe has significant corrosion as can be seen in photo 28.
* Overall, the outlet works system appeared that it could function as intended at the time of assessment.

4.4.6 Impoundment Inlet

Inflow into Ash Pond 4 is via the discharge pipes from Ash Ponds 1 and 3 as well as any rainfall runoff that naturally flows into the impoundment or that is discharged from the I-380 downspouts that terminate in the pond. The inlet pipes can be seen in photos 25 and 31 at the end of this section. The inlet pipes from both Ash Pond 1 and Ash Pond 3 appeared to be in fair to poor condition.

4.5 OTHER

During the assessment, it was inquired if IPL had developed an Emergency Action Plan (EAP) documenting what specific actions and personnel should be implemented or contacted in the case of an emergency at the plant involving the impoundments. Currently, there is not an EAP for the site.

It was inquired if any monitoring equipment was in place in relation to the ash ponds. We understand that monitoring equipment is not in place for the impoundments except for water quality testing purposes.

It was also inquired if Interstate IPL had developed an Operation and Maintenance (O&M) Manual for the 6th Street Power Generating Station impoundments. We understand that IPL has a Corporate Operations and Maintenance Plan as well as a Site Specific Operations and Maintenance Plan.

Photo 1 – Discharge Pipes into Ash Ponds
May 24, 2011 NPDES# IOWA-5715109

Photo 2 – Corrugated Metal Pipe (CMP) Discharge under Railroad Tracks into Cedar Lake
May 24, 2011 NPDES# IOWA-5715109

Photo 3 – General Conditions Photograph Ash Pond 1
May 24, 2011   NPDES# IOWA-5715109

Photo 4 – Sluice Pipe into Ash Pond 1 (note small trees in embankment)
May 24, 2011   NPDES# IOWA-5715109

Photo 5 – General Conditions Photograph Ash Pond 2
May 24, 2011 NPDES# IOWA-5715109

Photo 6 – Inlet Pipe into Ash Pond 2
May 24, 2011 NPDES# IOWA-5715109

Photo 7 – 12 Inch PVC Pipe Hydraulically Connecting Ash Ponds 1 and 2
May 24, 2011 NPDES# IOWA-5715109

Photo 8 – 30 inch Corrugated Plastic Pipe Hydraulically Connecting Ash Ponds 1 and 2
May 24, 2011 NPDES# IOWA-5715109

Photo 9 – General Conditions Photograph Ash Pond 3
May 24, 2011 NPDES# IOWA-5715109

Photo 10 – General Conditions Photograph Ash Pond 3
May 24, 2011 NPDES# IOWA-5715109

Photo 11 – Ash Pond 3 Unknown Sluice Pipe Approximately 8 Inch Cast Iron Pipe
May 24, 2011 NPDES# IOWA-5715109

Photo 12 – Ash Pond 3-6 Inch Rutting on Crest
May 24, 2011 NPDES# IOWA-5715109

Photo 13 – Ash Pond 3 Vegetated Riprap
May 24, 2011 NPDES# IOWA-5715109

Photo 14 – Ash Pond 3 Embankment (note lack of vegetation)
May 24, 2011 NPDES# IOWA-5715109

Photo 15 – Downspout from Highway Discharging into Ash Pond 3
May 24, 2011 NPDES# IOWA-5715109

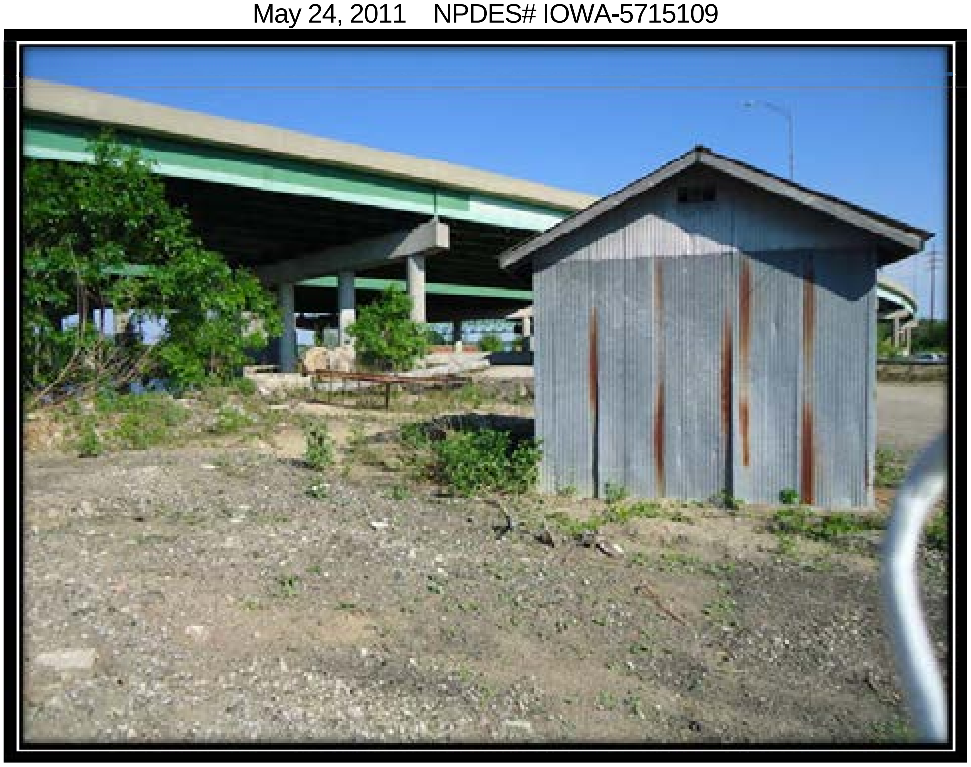


Photo 16 – Debris and Abandoned Building on Crest of Ash Pond 3
May 24, 2011 NPDES# IOWA-5715109

Photo 17 – Ash Pond 3 Concrete Rubble Riprap
May 24, 2011 NPDES# IOWA-5715109

Photo 18 – General Conditions Photograph Ash Pond 3
May 24, 2011 NPDES# IOWA-5715109

Photo 19 – Ash Pond 3 Embankment (note uncompacted soil with a lack of vegetation)
May 24, 2011 NPDES# IOWA-5715109

Photo 20 – Ash Pond 3 Embankment (note difference in embankment height)
May 24, 2011 NPDES# IOWA-5715109

Photo 21 – Ash Pond 3 Outlet Pipe to Ash Pond 4 (note pipe rusted through)
May 24, 2011   NPDES# IOWA-5715109

Photo 22 – Ash Pond 4 Inlet Pipe from Pond 3 (note pipe rusted through)
May 24, 2011   NPDES# IOWA-5715109

Photo 23 – Embankment between Ash Ponds 3 and 4
May 24, 2011 NPDES# IOWA-5715109

Photo 24 – General Conditions Photograph Ash Pond 4
May 24, 2011 NPDES# IOWA-5715109

Photo 25 – General Conditions Photograph Ash Pond 4
May 24, 2011 NPDES# IOWA-5715109

Photo 26 – Ash Pond 4 Downstream Embankment Slope with Heavy Vegetation and Creek at Toe
May 24, 2011 NPDES# IOWA-5715109

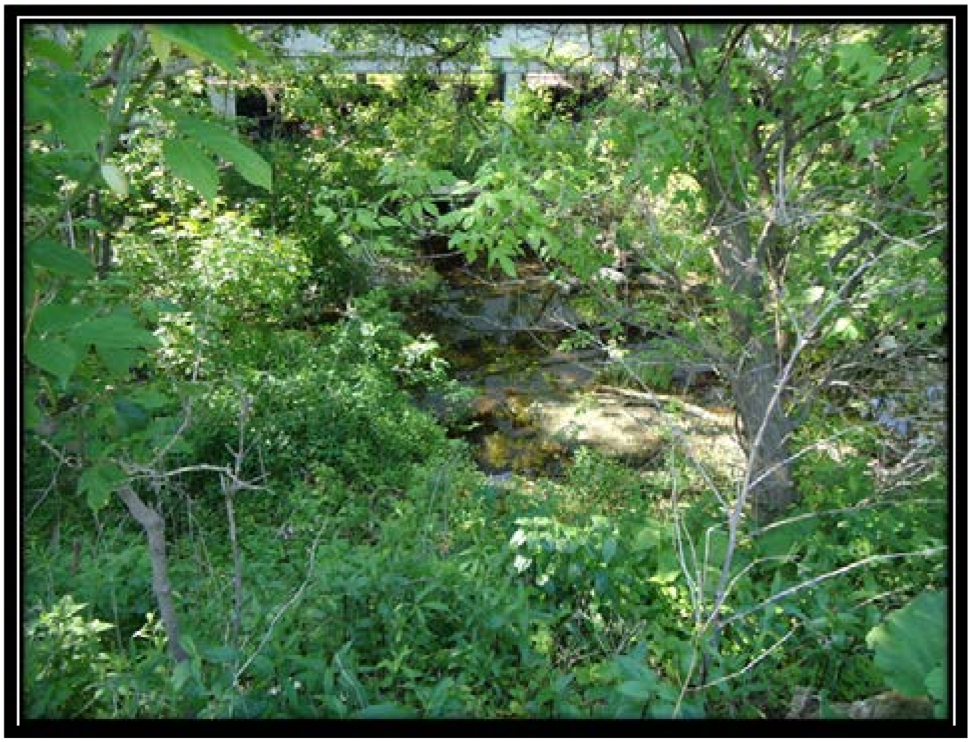


Photo 27 – Ash Pond 4 Landside Embankment Slope with Heavy Vegetation and Creek at Toe
May 24, 2011   NPDES# IOWA-5715109

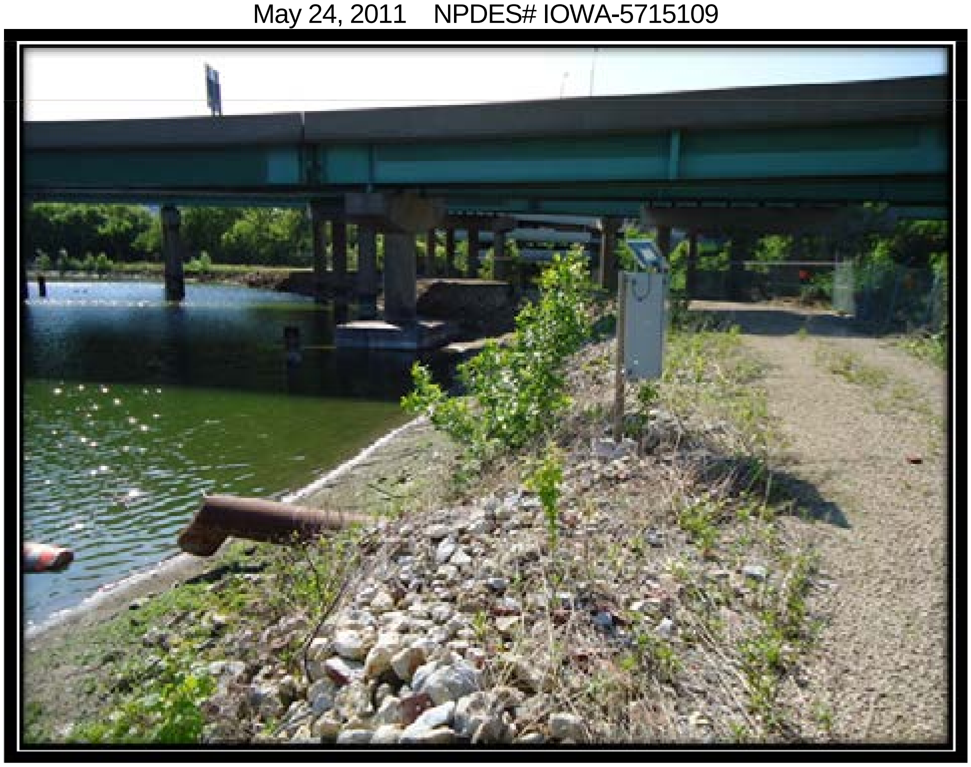


Photo 28 – Ash Pond 4 Outlet Pipe
May 24, 2011   NPDES# IOWA-5715109

Photo 29 – Ash Pond 4 Outlet Pipe Outfall and Walkway
May 24, 2011 NPDES# IOWA-5715109

Photo 30 – Ash Pond 4 Fence Penetration at Crest (typical)
May 24, 2011 NPDES# IOWA-5715109

Photo 31 –Ash Pond 4 Inlet Pipe from Ash Pond 1 (note valve)
May 24, 2011 NPDES# IOWA-5715109

Photo 32 – 24 Inch Reinforced Concrete Pipes in Discharge Channel under Entrance to Ash Ponds
May 24, 2011 NPDES# IOWA-5715109

Photo 33 – Ash Pond 1 Debris in Downstream Slope of Embankment
May 24, 2011 NPDES# IOWA-5715109

Photo 34 – Downstream Slope of Ash Pond 3 (note ditch at toe)
May 24, 2011 NPDES# IOWA-5715109

Photo 35 – Corrugated Metal Pipe Outlet from Ash Ponds to Cedar Lake
May 24, 2011 NPDES# IOWA-5715109

Photo 36 – Sluice Pipe from Generating Station to Ash Ponds
May 24, 2011 NPDES# IOWA-5715109

SECTION 5 – OVERALL CONDITION OF THE FACILITY IMPOUNDMENTS

5.1 ANALYSIS AND CONCLUSIONS

Our analysis is summarized in three general considerations that are presented as follows:

Safety of the Impoundments Including Maintenance and Methods of Operation

Kleinfelder understands that the impoundments have a history of safe performance. However, the future performance of these impoundments will depend on a variety of factors that may change over time, including surface water hydrology, changes in groundwater levels, changes in embankment integrity, etc. Kleinfelder understands that Interstate IPL has prepared a "Corporate Operations and Maintenance Plan" that outlines the proper operations and maintenance of coal combustion ash ponds based on the guidance documents readily available from the US Army Corps of Engineers, FEMA and OSHA. In addition, this plant site has a "Site Specific Operations and Maintenance Plan" that defines the roles; responsibilities; and actions required by the generating station to ensure that the ash ponds are maintained and operated in a safe manner. The site-specific plan includes provisions for a 3rd Party PE to inspect the site on an annual basis to evaluate the site conditions and maintenance activities and to provide additional guidance to improve the overall safety of the ponds. This plan also includes monthly inspections and more detailed quarterly inspections.

Regarding maintenance and methods of operation, Kleinfelder has noted two items, as follows, that present some concern in this regard:

- Trees exist at some locations on embankment slopes.
- An Emergency Action Plan (EAP) is not currently in place at the site to mitigate damage in the event of an emergency related to failure of the impoundment(s).

Structural Stability of the Impoundments

Kleinfelder has reviewed embankment (structural) stability analyses completed by

Aether DBS (see Section 3.5) as a part of the condition assessment that indicate a reasonable factor of safety against embankment failure.

Changes in Design or Operation of the Impoundments Following Initial Construction

The primary changes in design of the impoundments involved construction of Interstate 380, as well as the construction of interior cells to form four individual ash ponds out of the original diked embankment. Construction of I-380 involved constructing foundations to an unknown depth within Ash Ponds 3 and 4 as well as discharging stormwater runoff from the interstate into the Ash Ponds via downspouts that terminate in the impoundments. Construction of the internal berms to create the four ash ponds reduced the original capacity of the pond.

Without design documents to verify the design standards, practices or requirements that were set forth in the original design, it is not possible to determine if the modifications made to the impoundment would have a significant impact on its functionality and overall safety.

Adequacy of Program for Monitoring Performance of the Impoundments

The present monitoring program primarily involves visual assessments by plant personnel. These visual assessments seem to be adequate to address issues, such as surface erosion and general condition of the impoundments. However, a more detailed monitoring program is recommended to be established to quantify various important factors associated with embankment stability. Those factors include, but are not limited to, seepage quantities through the embankment, the amount of sediments carried by the seepage water, and the fluctuation of ground water levels.

5.2 SUMMARY STATEMENT

I acknowledge that the management units referenced herein:

- Ash Pond 1
- Ash Pond 2
- Ash Pond 3
- Ash Pond 4

were personally assessed by me and found to be in the following condition:

FAIR

This rating is based on the embankment (structural) stability conditions that could be impacted by seepage associated with rubble pockets in the embankments. The embankment stability factors of safety calculated by Aether DBS and presented in Section 3.5 do meet the minimum requirements provided that the embankments are not subjected to uncontrolled seepage.

LICENSED PROFESSIONAL ENGINEER SCOTT M. MACKIEWICZ 17539 ★ IOWA ★	*I hereby certify that this engineering document was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.* 2-28-13 Scott M. Mackiewicz, PhD, PE, D. GE (date) My license renewal date is December 31, 2014. Pages or sheets covered by this seal: All

SECTION 6 – RECOMMENDATIONS

6.1 PRIORITY 1 RECOMMENDATIONS

Based on observations during the site assessment, it is recommended that the following actions be taken at the 6th Street Power Generating Station.

1. **Prepare an EAP for the facility by August 31, 2013.** An Emergency Action Plan (EAP) should be prepared for all of the impoundments. The EAP should be added to current O&M Manuals for the site but should also function as a stand-alone document.
2. **Monitor potential seepage through embankments starting by August 31, 2013.** Anomalies within the embankment fill such as concrete rubble suggest some potential for uncontrolled seepage that should be evaluated during periodic assessments of the impoundments.
3. **Monitor potential erosion in drainage ditch and creek starting by August 31, 2013.** Significant erosion caused by the creek on the southeastern embankment of Ash Pond 4, as well as the drainage ditch on the northwest embankment of Ash Ponds 1, 2 and 3, could impact the slope stability of the embankments.
4. **Control vegetation on the upstream slopes, crest and downstream slopes and remove trees from the embankments. Follow Interstate IPL Site Specific Operations and Maintenance Plan and review by third Party PE for specific guidance regarding which trees to remove and the timing of their removal as well as the timing of vegetation control.** Reference can also be made to FEMA Manual 534, Impact of Plants on Earthen Impoundments for guidance on vegetation removal. This manual is available on the FEMA website.

6.2 PRIORITY 2 RECOMMENDATIONS

1. **Repair erosion of embankments by August 31, 2013 if the repairs are required by the Interstate Power and Light IPL Site Specific**

Operations and Maintenance Plan and review by third Party PE. Minor erosion was noticed on various slopes of all the impoundments. Slopes and areas where erosion has occurred should be filled in with the appropriate material, re-dressed, and reseeded to keep erosion from cutting into and compromising the embankment further.

2. **Maintain a log of maintenance and other activities at the bottom ash impoundments and supporting facilities as described in the IPL Site Specific Operations and Maintenance Plan by August 31, 2013.**

6.3 DEFINITIONS

Priority 1 Recommendations: Priority 1 Recommendations involve the correction of severe deficiencies where action is required to ensure the structural safety, operational integrity of a facility, and the safety of the impoundment.

Priority 2 Recommendations: Priority 2 Recommendations are where action is needed or required to prevent or reduce further damage, impair operation, and/or improve or enhance the O&M of the facility. These items do not appear to threaten the safety of the impoundment.

SECTION 7 – GLOSSARY OF TERMS

For the EPA ash pond assessment program, the following glossary of terms shall be used unless otherwise noted.

Hazard Potential Classification

"Hazard Potential" means the possible adverse consequences that result from the release of water or stored contents due to the failure of an impoundment embankment, impoundment, or reservoir, or the mis-operation of the impoundment, reservoir, or appurtenances. The Hazard Potential Classification of an impoundment or reservoir shall not reflect in any way on the current condition of the impoundment or reservoir and its appurtenant works, including the impoundment or reservoir safety, structural integrity, or flood routing capacity. The classifications are described below:

1. **Less than Low Hazard Potential**

   "Less than Low Hazard" means failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

2. **Low Hazard Potential**

   "Low Hazard" means an impoundment or reservoir failure will result in no probable loss of human life and low economic or environmental loss. Economic losses are principally limited to the owner's property.

3. **Significant Hazard Potential**

   "Significant Hazard" means an impoundment or reservoir failure will result in no probable loss of human life but can cause major economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification impoundments or reservoirs are often located in predominantly rural or agricultural areas but could be located in areas with increased population density and significant infrastructure.

4. High Hazard Potential

"High Hazard" means an impoundment or reservoir failure will result in probable loss of human life.

Size Classification

No size classification system could be found on the Iowa DNR website in regards to dam safety.

Overall Classification of Impoundment

In a system similar to the U.S. Department of Interior, "Safety Evaluation of Existing Impoundments" (Seed 1995), when the following terms are capitalized, they denote and shall be used to describe the overall classification of the impoundment as follows:

SATISFACTORY - No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, and seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR – Acceptable performance is expected under all required loading conditions (static, hydrologic, and seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR - A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, and seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY – Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

Reservoir restrictions may be necessary.

Recommendations

Recommendations shall be written concisely and identify the specific actions to be taken. The first word in the recommendation should be an action word (i.e. “Prepare,” “Perform,” or “Submit”). The recommendations shall be prioritized and numbered to provide easy reference. Impoundment safety recommendations shall be grouped, listed, or categorized similar to the U.S. Department of Interior, “Reclamation Manual, Directives and Standards, Review/Examination Program for High- and Significant-Hazard Impoundments,” FAC 01-07 dated July 1998 as follows:

Priority 1 Recommendations: Priority 1 Recommendations involve the correction of severe deficiencies where action is required to ensure the structural safety, operational integrity of a facility, and the safety of the impoundment.

Priority 2 Recommendations: Priority 2 Recommendations are where action is needed or required to prevent or reduce further damage, impair operation, and/or improve or enhance the O&M of the facility. These items do not appear to threaten the safety of the impoundment.

Aether DBS, Ash Pond Slope Stability and Hydraulic Analysis 6th Street Generating Station – Cedar Rapids, Iowa, August 2011

Aether DBS, Response, USEPA Draft Report, Safety of Coal Combustion Waste Ponds, 6th Street Generating Station – Cedar Rapids, Iowa, August 2012

FEMA, Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams, May 2005

Interstate IPL, Surface Pond Visual Inspection, March 2009

Interstate IPL, Surface Pond Visual Inspection, April 2010

Iowa Department of Natural Resources, Interstate Power and Light 6th Street Station Wastewater Facility Inspection, June 2007

Montgomery Watson, Evaluation of pH Excursions in NPDES Regulated Effluent, September 1999

US Department of Agriculture (USDA)/ Natural Resources Conservation Service (NRCS) Web Soil Survey – online

US Department of the Interior, Safety and Evaluation of Existing Impoundments (SEED), 1995

New Jersey Department of Environmental Protection, Impoundment Safety Guidelines for the Inspection of Existing Impoundments, January 2008

US Department of Interior, Reclamation Manual – Directives and Standards – Review/Examination Program for High and Significant Hazard Impoundments, July 1998

US Army Corps of Engineers, Engineering Manual 1110-2-1902, Slope Stability, October 2003

SECTION 9 – LIMITATIONS

The scope of this work is for a preliminary screening for the EPA and plant owner/operator of the visible performance and apparent stability of the impoundment embankments based only on the observable surface features and information provided by the owner/operator. Other features below the ground surface may exist or may be obscured by vegetation, water, debris, or other features that could not be identified and reported. This site assessment and report were performed without the benefit of any soil drilling, sampling, or testing of the subsurface materials, calculations of capacities, quantities, or stability, or any other engineering analyses. The purpose of this assessment is to provide information to the EPA and the plant owner/operator about recommended actions and/or studies that need to be performed to document the stability and safety of the impoundments.

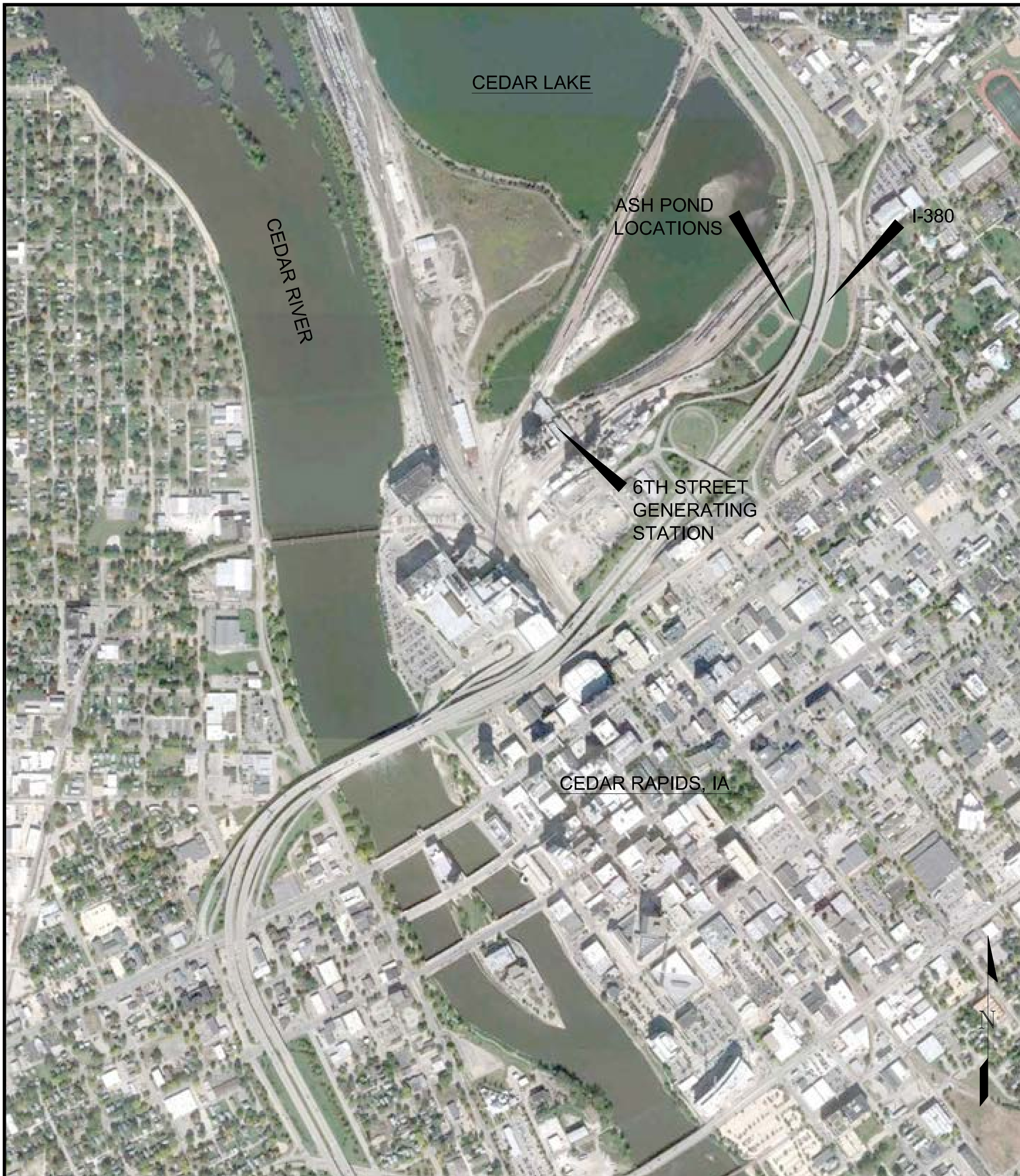
This work was performed by qualified personnel in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession, practicing in the same locality, under similar conditions, and at the date, the services are provided. Kleinfelder's conclusions, opinions, and recommendations are based on a limited number of observations. It is possible that conditions could vary between or beyond the observations made. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. Kleinfelder makes no warranty or guaranty of future embankment stability or safety.

This report may be used only by the client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance but in no event later than one (1) year from the date of the report.

The information, included on graphic representations in this report, has been compiled from a variety of sources and is subject to change without notice.

Kleinfelder makes no representations or warranties, expressed or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. These documents are not intended for use as a land survey product nor are they designed or intended as a construction design document. The use or misuse of the information contained on these graphic representations is at the sole risk of the party using or misusing the information.

Recommendations contained in this report are based on preliminary field observations without the benefit of subsurface explorations, laboratory tests, or detailed knowledge of the existing construction. If the scope of the proposed recommendations changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed and the conclusions of this report are modified or approved in writing by Kleinfelder. Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field.



AERIAL IMAGE
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IMAGE SOURCE: GOOGLE EARTH PRO - IMAGE DATE 08/27/10

KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com	PROJECT NO. 118953 DATE: 06/24/2011 DRAWN BY: MAG CHECKED BY: BDH FILE NAME:	**6th STREET POWER STATION VICINITY MAP** 6TH STREET POWER GENERATING STATION 509 6TH STREET NORTH EAST CEDAR RAPIDS, IA 52402	FIGURE 1

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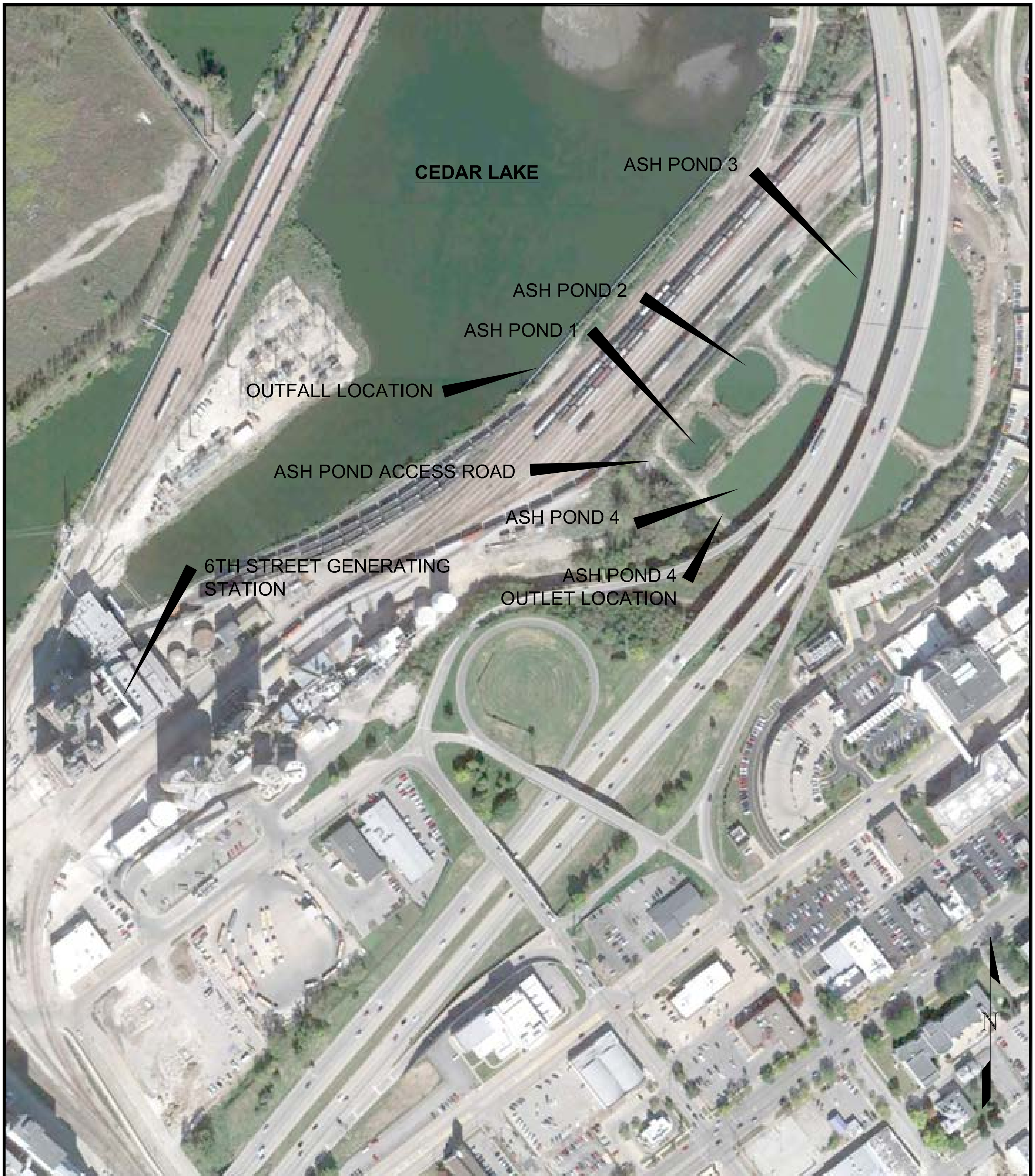

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IMAGE SOURCE: GOOGLE EARTH PRO - IMAGE DATE 08/27/10

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PROJECT NO.	118953
DATE:	06/24/2011
DRAWN BY:	MAG
CHECKED BY:	BDH
FILE NAME:	

6th STREET POWER STATION
AERIAL LOCATION MAP

6TH STREET POWER GENERATING STATION
509 6TH STREET NORTH EAST
CEDAR RAPIDS, IA 52402

FIGURE

2

ATTACHED IMAGES: Images: Ponds (2).jpg
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Den-L:\2008\95399 CAD FILE: S:\118953 EPA Ash Ponds Round 10\6th Street\ LAYOUT: General (2)

FIGURE 3 (1 of 1 sheets)	SCALE: NTS	DATE: 06/24/2011	CHECKED BY: B. HAVENS	DRAWN BY: M. GARDELLA	DESIGNED BY: N/A	

PHOTO PLAN OF INSPECTION POINTS

6TH STREET POWER GENERATING STATION
509 6TH STREET NORTH EAST
CEDAR RAPIDS, IA 52402

KLEINFELDER
Bright People. Right Solutions.
611 Corporate Circle, Suite C
Golden, Colorado 80401
PH. 303-237-6601 FAX. 303-237-6602
www.kleinfelder.com

PROJ. NO. 118953
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NO.	REVISION	BY	DATE
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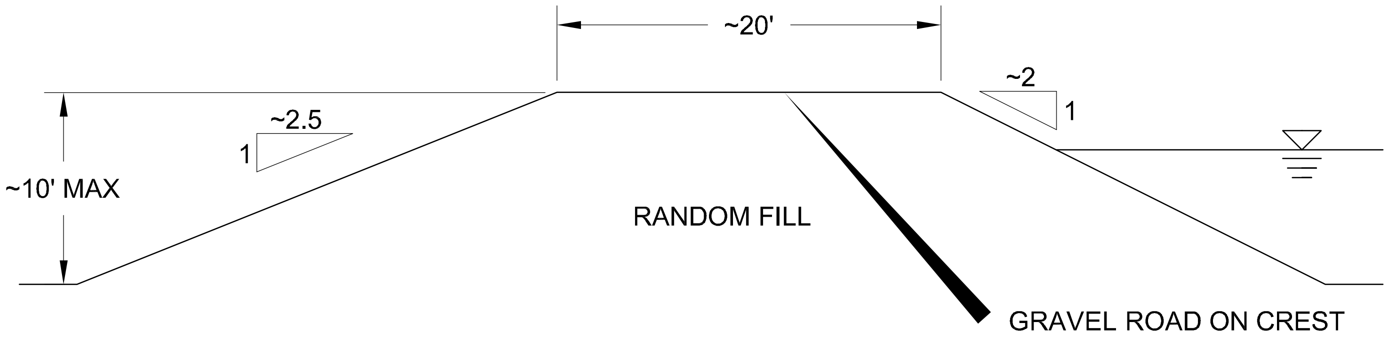

TYPICAL EMBANKMENT CROSS SECTION (ASH POND 4)

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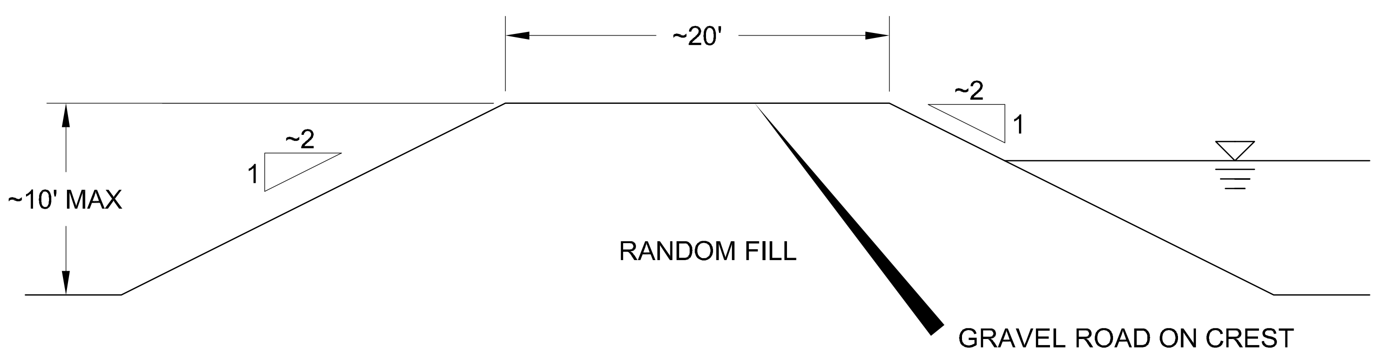

TYPICAL EMBANKMENT CROSS SECTION (ASH PONDS 1-3)

NTS

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PROJECT NO.	118953
DATE:	06/24/2011
DRAWN BY:	MAG
CHECKED BY:	BDH
FILE NAME:	

6th STREET POWER STATION
TYPICAL EMBANKMENT PROFILE
FOR ALL ASH PONDS

6TH STREET POWER GENERATING STATION
509 6TH STREET NORTH EAST
CEDAR RAPIDS, IA 52402

FIGURE
4

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KLEINFELDER

Appendix A

Site Assessment Evaluation Checklists

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: 6TH STREET GENERATING STATION | Date: 05/24/2011

Unit Name: ASH POND 1 | Operator's Name: ALLIANT ENERGY

Unit I.D.: | Hazard Potential Classification: High Significant Low (circled: Low)

Inspector's Name: BRIAN HAVENS + MATT GARDELLA

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?	ANNUALLY USING CHECKLISTS		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	UNKNOWN		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	UNKNOWN		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	UNKNOWN		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A	N/A	Is water exiting outlet flowing clear?	UNKNOWN N/A	
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)?	UNKNOWN		From underdrain?		X
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?	N/A		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?	N/A		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.

Inspection Issue #	Comments
2, 3, 5, 8	NO RECORDS OF ELEVATIONS AVAILIBLE AT THIS TIME. ALL DESIGN DRAWINGS AND RECORD INFORMATION DESTROYED WHEN PLANT WAS FLOODED IN 2008
9	LARGEST TREE DIAMETER ON EMBANKMENT ~ 4 INCHES
23	COLLECTOR DITCH PRESENT ON NORTH WEST POND EMBANKMENT TOE
19	MINOR EROSION NOTED ON DOWNSTREAM EMBANKMENT SLOPE. LESS THAN 6" IN DEPTH AND CONSIDERED MINOR

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # IOWA - 5715109 INSPECTOR BRIAN HAVENS + MATT GARDELLA
Date 05/24/2011

Impoundment Name ASH POND 1
Impoundment Company ALLIANT ENERGY
EPA Region 7
State Agency (Field Office) Addresss 901 NORTH 5TH STREET
KANSAS CITY, KS 66101
Name of Impoundment ASH POND 1
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New x Update ______

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

IMPOUNDMENT FUNCTION: SETTLING POND FOR BOTTOM ASH / IMPOUNDMENT FOR WATER PUMPED FROM PLANT FLOOR SUMPS

Nearest Downstream Town : Name CEDAR RAPIDS, IA
Distance from the impoundment LESS THAN 1 MILE
Impoundment
Location: Longitude 91 Degrees 39 Minutes 48 Seconds
Latitude 41 Degrees 59 Minutes 11 Seconds
State IOWA County LINN

Does a state agency regulate this impoundment? YES ______ NO x (DAM SAFETY NOT MONITORED, ONLY DISCHARGE)

If So Which State Agency? IOWA ENVIRONMENTAL PROTECTION AGENCY (DISCHARGE ONLY)

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.

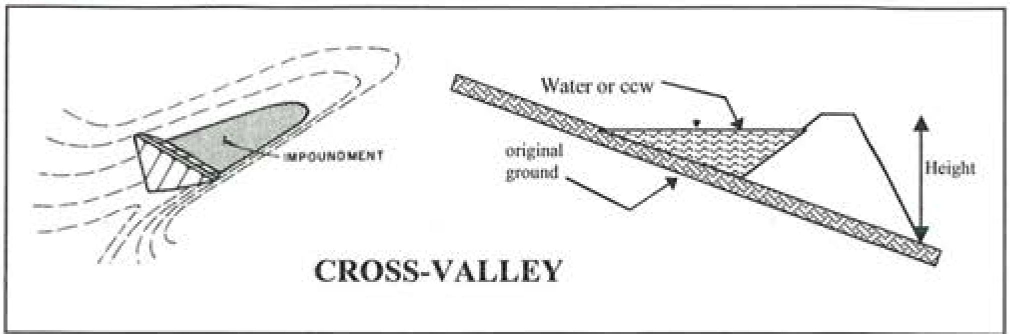
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

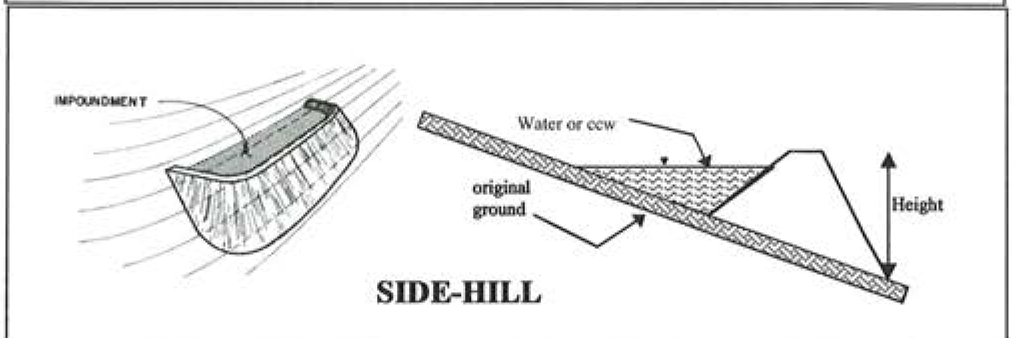
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

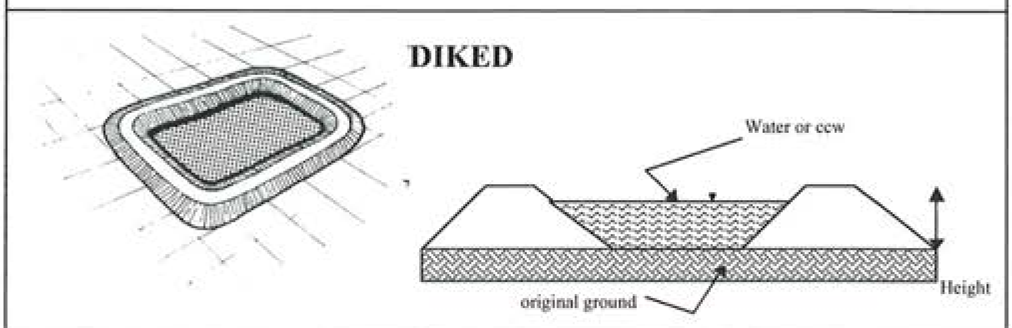
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

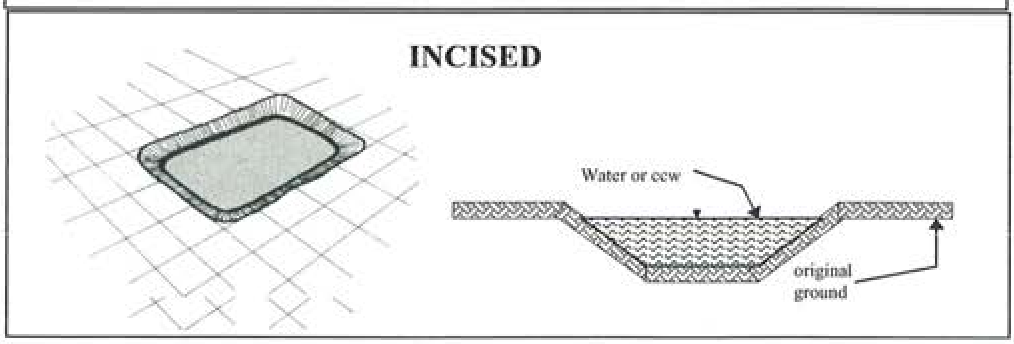
LOSS OF LIFE WOULD NOT BE EXPECTED AS FACILITIES LOCATED IMMEDIATELY ADJACENT TO THE ASH PONDS ARE LIMITED TO A PARKING LOT AND RAILROAD TRACKS. ALSO, MINIMAL WATER AND CCW ARE STORED IN THE RELATIVELY SMALL PONDS. THE ECONOMIC IMPACT OF A FAILURE WOULD MOST LIKELY RESULT IN DAMAGE PRINCIPALLY TO THE OWNERS FACILITY AND WOULD NOT LIKELY POSE ANY MAJOR ENVIRONMENTAL LOSSES DUE TO THE FACILITY'S LOCATION IN RELATION TO MAJOR WATERWAYS AND ENVIRONMENTALLY SENSITIVE AREAS.

CONFIGURATION:









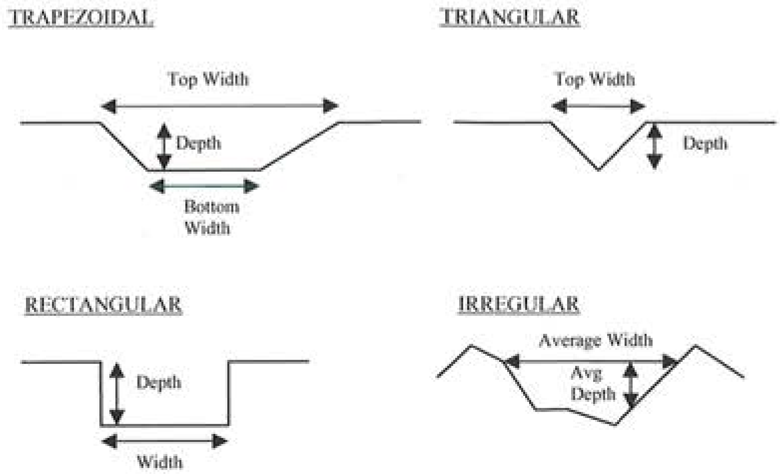
_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height MAX ~ 10' feet Embankment Material EARTH EMBANKMENT
Pool Area ~ 0.3 acres Liner UNKNOWN
Current Freeboard ~6 feet Liner Permeability UNKNOWN

TYPE OF OUTLET (Mark all that apply)

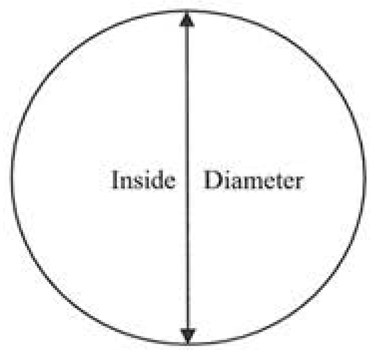
N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



x **Outlet**

~30" inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
x plastic (hdpe, pvc, etc.)
x other (specify) ADDITIONAL OUTLET TO ASH POND 2 IS A 12" PVC PIPE

Is water flowing through the outlet? YES _______ NO x

_____ **No Outlet**

x **Other Type of Outlet** (specify) ADDITONAL 12" CIP PIPE W/ GATE FROM ASH POND 1 TO ASH POND 4

The Impoundment was Designed By UNKNOWN, RECORD DRAWINGS + DESIGN DOCUMENTS NOT AVAILIBLE AT THIS TIME (DESTROYED IN 2008 FLOOD)

Has there ever been a failure at this site? YES __________ NO _x_______

If So When? ______________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES _______ NO _x_____

If So When? ________________

IF So Please Describe: ________________

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ____ NO _x_

If so, which method (e.g., piezometers, gw pumping,...)? ________

If so Please Describe : ________

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: 6TH STREET GENERATING STATION	Date: 05/24/2011
Unit Name: ASH POND 2	Operator's Name: ALLIANT ENERGY
Unit I.D.:	Hazard Potential Classification: High Significant **Low** (circled)
Inspector's Name: BRIAN HAVENS & MATT GARDECCA	

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?	ANNUALLY USING CHECKLISTS		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	UNKNOWN		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	UNKNOWN		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	UNKNOWN		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A	N/A	Is water exiting outlet flowing clear?	UNKNOWN N/A	
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)?	UNKNOWN		From underdrain?		X
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?	N/A		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?	N/A		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.

Inspection Issue #	Comments
2, 3, 5, 8	NO RECORDS OF ELEVATIONS AVAILIBLE AT THIS TIME. ALL DESIGN DRAWINGS AND RECORDS INFORMATION DESTROYED WHEN PLANT WAS FLOODED IN 2008
9	LARGEST TREE DIAMETER ~ 3 INCHES
19	MINOR EROSION NOTED ON DOWNSTREAM SLOPE, LESS THAN 6" SO EROSION CONSIDERED MINOR
23	COLLECTOR DITCH PRESENT AT NORTHWEST POND EMBANKMENT TOE

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # IOWA-5715109 INSPECTOR BRIAN HAVENS, MATT GARDELLA

Date 05/24/2011

Impoundment Name ASH POND 2

Impoundment Company ALLIANT ENERGY

EPA Region 7

State Agency (Field Office) Addresss 901 NORTH 5TH STREET KANSAS CITY, KS 66101

Name of Impoundment ASH POND 2

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

New X Update ____

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

IMPOUNDMENT FUNCTION: SETTLING POND FOR BOTTOM ASH/IMPOUNDMENT FOR WATER PUMPED FROM PLANT FLOOR SUMPS

Nearest Downstream Town : Name CEDAR RAPIDS

Distance from the impoundment LESS THAN 1 MILE

Impoundment Location: Longitude 91 Degrees 39 Minutes 46 Seconds

Latitude 41 Degrees 59 Minutes 13 Seconds

State IOWA County LINN

Does a state agency regulate this impoundment? YES ____ NO X (DAM SAFETY NOT MONITORED ONLY DISCHARGE)

If So Which State Agency? IOWA ENVIRONMENTAL PROTECTION AGENCY (DISCHARGE ONLY)

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.

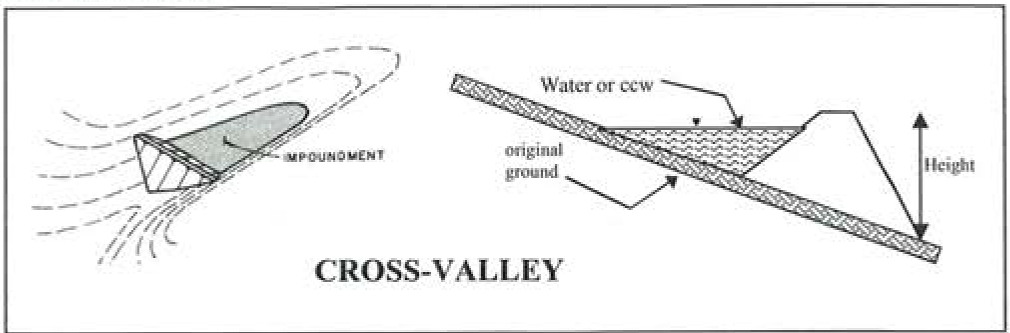
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

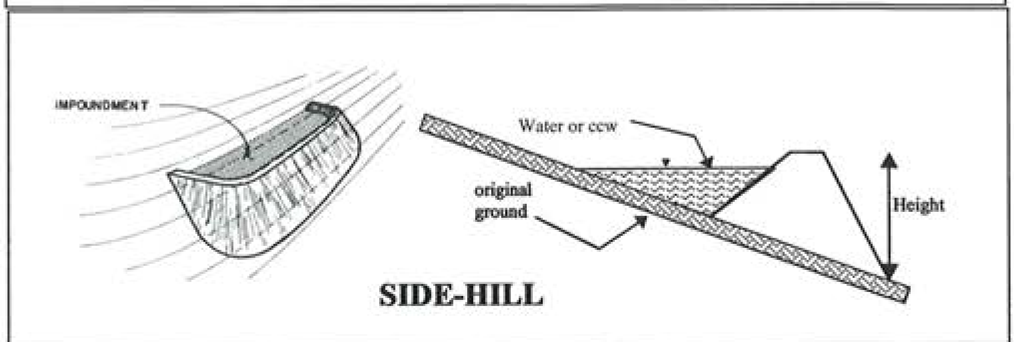
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

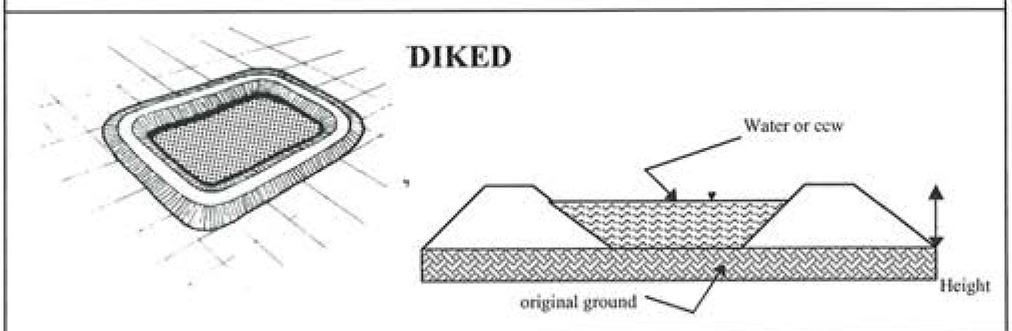
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

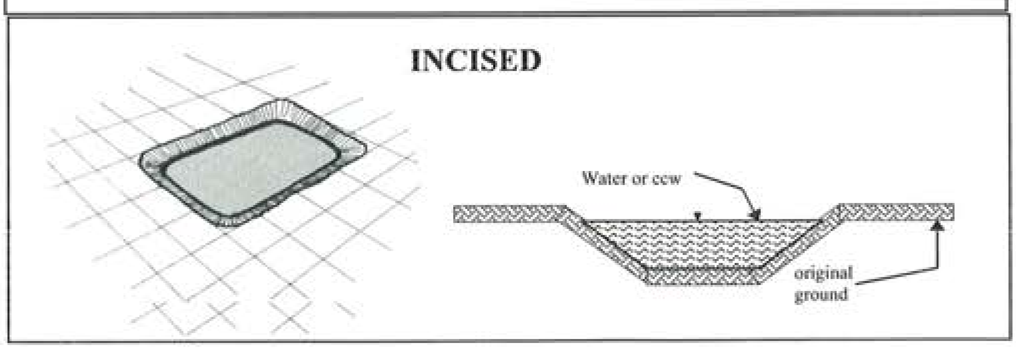
LOSS OF LIFE WOULD NOT BE EXPECTED AS FACILITIES LOCATED IMMEDIATLEY ADJACENT TO THE ASH PONDS ARE LIMITED TO A PARKING LOT AND RAILROAD TRACKS. ALSO, MINIMAL WATER AND CCW ARE STORED IN THE RELATIVELY SMALL PONDS. THE ECONOMIC IMPACT OF A FAILURE WOULD MOST LIKELY RESULT IN DAMAGE PRINCIPALLY TO THE OWNERS FACILITY AND WOULD NOT LIKELY POSE ANY MAJOR ENVIRONMENTAL LOSSES DUE TO THE FACILITY'S LOCATION IN RELATION TO MAJOR WATERWAYS AND ENVIRONMENTALLY SENSITIVE AREAS.

CONFIGURATION:









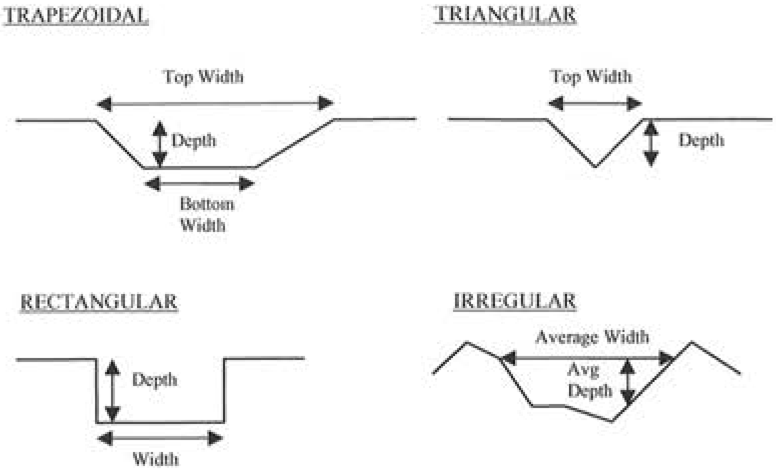
_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height MAX ~10' feet   Embankment Material EARTHEN EMBANKMENT
Pool Area ~0.35 acres   Liner UNKNOWN
Current Freeboard ~4 feet   Liner Permeability UNKNOWN

TYPE OF OUTLET (Mark all that apply)

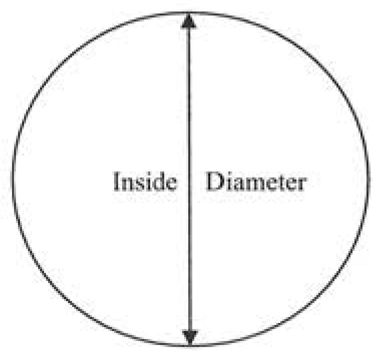
N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



x **Outlet**

~ 24" inside diameter



Material
x corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES _______ NO x

N/A **No Outlet**

N/A **Other Type of Outlet** (specify) ______________________________

The Impoundment was Designed By UNKNOWN - RECORD DRAWINGS + DESIGN DOCUMENTS NOT AVAILIBLE AT THIS TIME (DESTROYED IN 2008 FLOOD)

Has there ever been a failure at this site? YES __________ NO ✓

If So When? __________

If So Please Describe : __________

Has there ever been significant seepages at this site? YES _______ NO __X__

If So When? ____________________

IF So Please Describe: ____________________

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________ NO __x__

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____________________

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: 6TH STREET GENERATING STATION Date: 05/24/2011

Unit Name: ASH POND 3 Operator's Name: ALLIANT ENERGY

Unit I.D.: Hazard Potential Classification: High Significant Low (circled: Low)

Inspector's Name: BRIAN HAVENS + MATT GARDELLA

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?	ANNUALLY USING CHECKLIST		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	UNKNOWN		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	UNKNOWN		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	UNKNOWN		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A	N/A	Is water exiting outlet flowing clear?	UNKNOWN N/A	
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)?	UNKNOWN		From underdrain?		X
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?	N/A		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?	N/A		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.

Inspection Issue #	Comments
2, 3, 5, 8	NO RECORDS OF ELEVATIONS AVAILIBLE AT THIS TIME. ALL DESIGN DRAWINGS AND RECORD INFORMATION DESTROYED WHEN PLANT WAS FLOODED IN 2008.
9	LARGEST TREE DIAMETER ~ 3 INCHES
19	MINOR EROSION NOTED ON THE EMBANKEMENT SLOPE (LESS THAN 6"). UNCOMPACTED FILL HAS BEEN PLACED OVER A PORTION OF THE EASTERN CREST OF THE EMBANKMENT (ABOVE THE NORMAL CREST) WHICH SHOWS ERODIBLE CHARACTERISTICS.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # IOWA-5715109 INSPECTOR BRIAN HAVENS MATT GARDECKA
Date 05/24/2011

Impoundment Name ASH POND 3
Impoundment Company ALLIANT ENERGY
EPA Region 7
State Agency (Field Office) Addresss 901 NORTH 5TH STREET KANSAS CITY, KS 66101
Name of Impoundment ASH POND 3
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update ____

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

IMPOUNDMENT FUNCTION: SETTLING POND FOR BOTTOM ASH / IMPOUNDMENT FOR WATER PUMPED FROM PLANT FLOOR SUMPS

Nearest Downstream Town : Name CEDAR RAPIDS, IA
Distance from the impoundment LESS THAN 1 MILE
Impoundment
Location: Longitude 91 Degrees 39 Minutes 42 Seconds
Latitude 41 Degrees 59 Minutes 14 Seconds
State IOWA County LINN

Does a state agency regulate this impoundment? YES ____ NO X (DAM SAFETY NOT MONITORED ONLY DISCHARGE)

If So Which State Agency? IOWA ENVIRONMENTAL PROTECTION AGENCY (DISCHARGE ONLY)

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.

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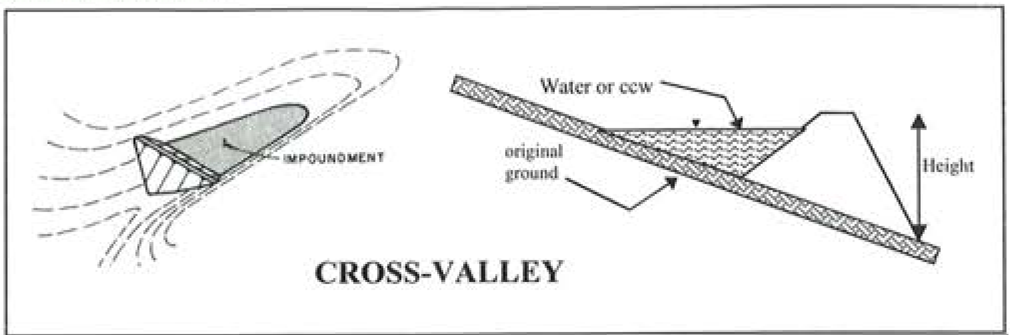
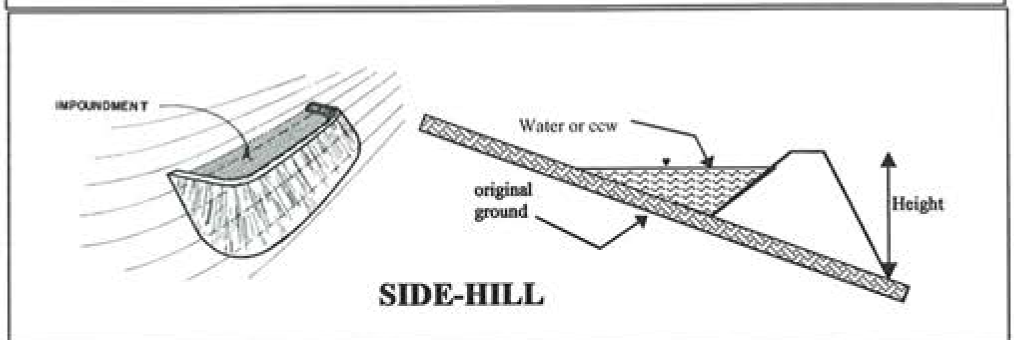
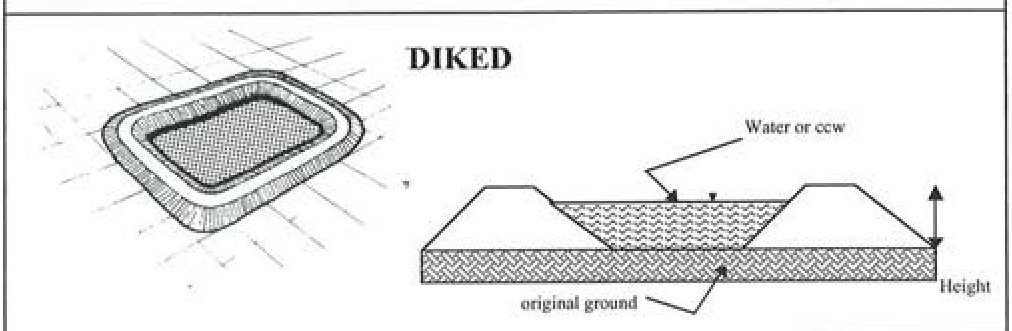
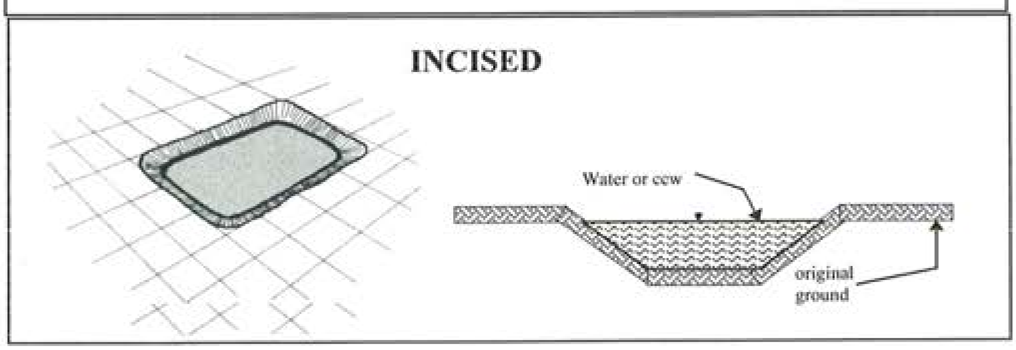
CONFIGURATION:









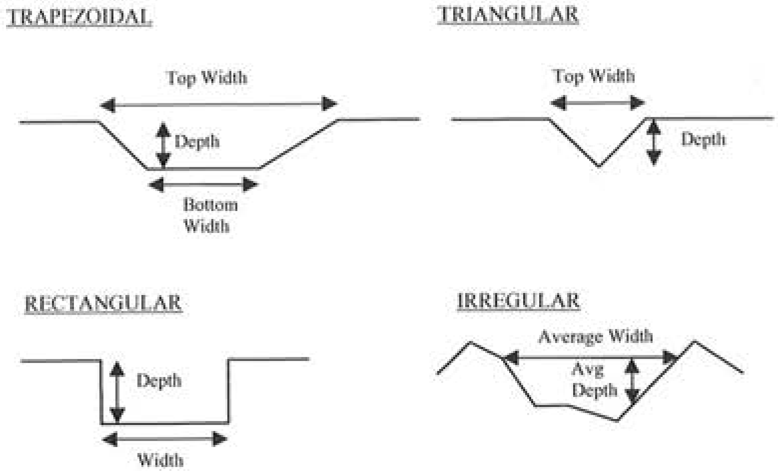
_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height MAX ~ 10' feet Embankment Material EARTHEN EMBANKMENT
Pool Area ~ 4 acres Liner UNKNOWN
Current Freeboard ~4 feet Liner Permeability UNKNOWN

TYPE OF OUTLET (Mark all that apply)

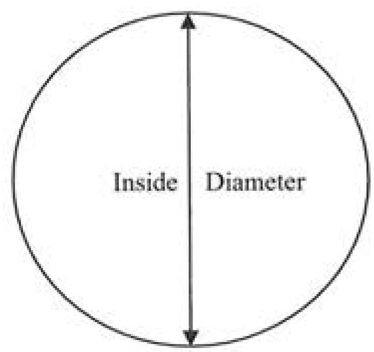
N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



X **Outlet**

24" inside diameter



Material
_____ corrugated metal
X welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES _______ NO _______

N/A **No Outlet**

N/A **Other Type of Outlet** (specify) ______________________________

The Impoundment was Designed By UNKNOWN - RECORD DRAWINGS + DESIGN DOCUMENTS NOT AVAILIBLE AT THIS TIME (DESTROYED IN 2008 FLOOD)

Has there ever been a failure at this site? YES ________ NO X

If So When? ________

If So Please Describe : ________

Has there ever been significant seepages at this site? YES ______ NO __X__

If So When? ______________________

IF So Please Describe: ______________________

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ___ NO X ___

If so, which method (e.g., piezometers, gw pumping,...)? ___

If so Please Describe : ___

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: 6TH STREET GENERATING STATION Date: 05/24/2011

Unit Name: ASH POND 4 Operator's Name: ALLIANT

Unit I.D.: Hazard Potential Classification: High Significant Low (circled: Low)

Inspector's Name: BRIAN HAVENS AND MATT GARDELLA

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?	ANNUALLY USING CHECKLISTS		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	UNKNOWN		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	UNKNOWN		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	UNKNOWN		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	UNKNOWN N/A	
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)?	UNKNOWN		From underdrain?		X
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?	N/A		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?	N/A		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.

Inspection Issue #	Comments
2,3,5,8	NO RECORD OF ELEVATIONS AVAILIBLE AT THIS TIME. ALL DESIGN DRAWINGS AND RECORD INFORMATION DESTROYED WHEN PLANT WAS FLOODED IN 2008.
9	LARGEST TREE DIAMETER ON DOWNSTREAM SLOPE ~ 6 INCHES
23	FLOWING STREAM PRESENT AT DOWNSTREAM EMBANKMENT TOE
19	MINOR EROSION (LESS THAN 6") NOTED ON DOWNSTREAM EMBANKMENT SLOPE
6	FLOW METER PRESENT AT THE DISCHARGE, BUT IS NOT OPERATIONAL. NO RECORD INFORMATION FOR THIS GAUGE IS CURRENTLY AVAILIBLE.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # IOWA-5715109 INSPECTOR BRIAN HAVENS
Date 05/24/2011 MATT GARDELLA

Impoundment Name ASH POND 4
Impoundment Company ALLIANT ENERGY
EPA Region 7
State Agency (Field Office) Addresss 901 NORTH 5TH STREET
KANSAS CITY, KS 66101
Name of Impoundment ASH POND 4
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update ____

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

IMPOUNDMENT FUNCTION: SETTLING POND FOR BOTTOM ASH/IMPOUNDMENT FOR WATER PUMPED FROM PLANT FLOOR SUMPS

Nearest Downstream Town : Name CEDAR RAPIDS, IA
Distance from the impoundment LESS THAN 1 MILE
Impoundment
Location: Longitude 91 Degrees 39 Minutes 44 Seconds
Latitude 41 Degrees 59 Minutes 10 Seconds
State IOWA County LINN

Does a state agency regulate this impoundment? YES ____ NO X (DAM SAFETY NOT MONITORED ONLY DISCHARGE)

If So Which State Agency? IOWA ENVIRONMENTAL PROTECTION AGENCY (DISCHARGE ONLY)

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.

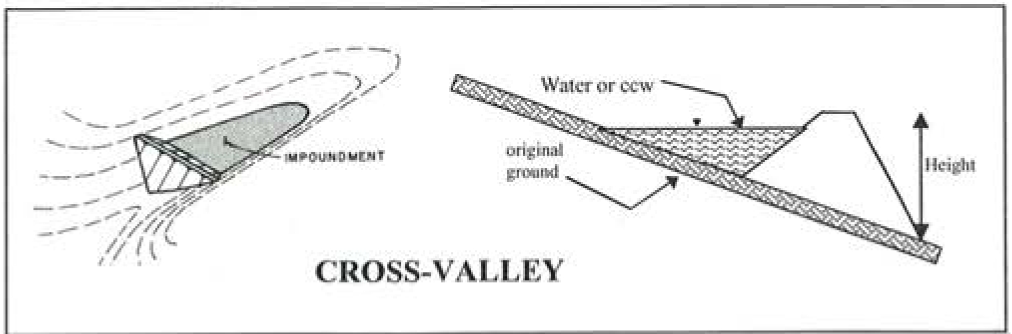
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

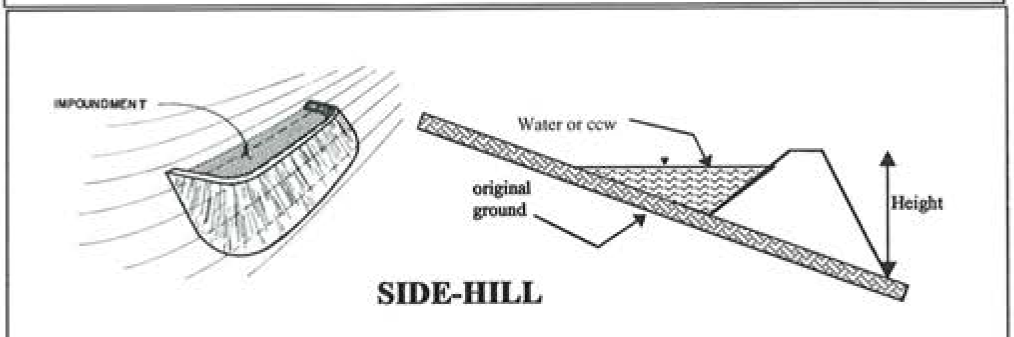
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

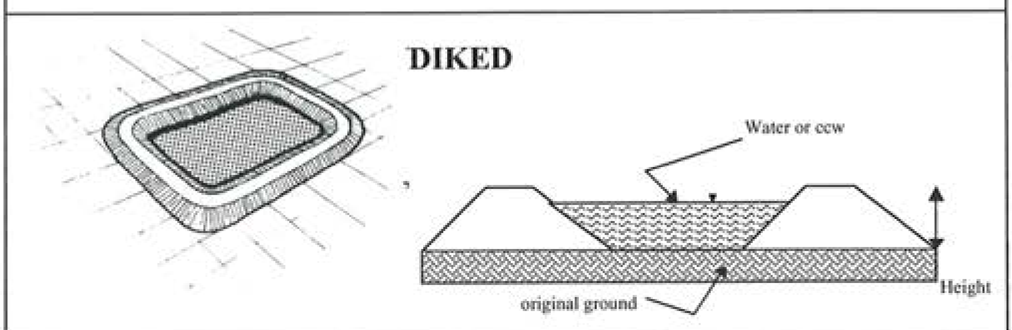
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

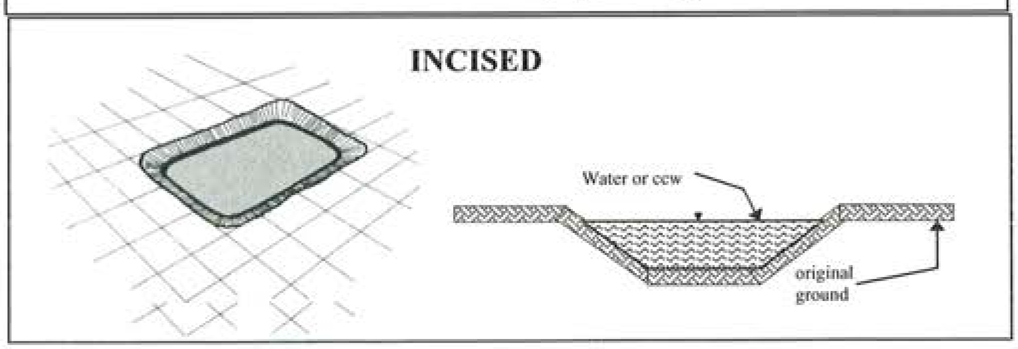
LOSS OF LIFE WOULD NOT BE EXPECTED AS FACILITIES LOCATED IMMEDIATELY ADJACENT TO THE ASH PONDS ARE LIMITED TO A PARKING LOT AND RAILROAD TRACKS. ALSO, MINIMAL WATER AND CCW ARE STORED IN THE RELATIVELY SMALL PONDS. THE ECONOMIC IMPACT OF A FAILURE WOULD MOST LIKELY RESULT IN DAMAGE PRINCIPALLY TO THE OWNERS FACILITY AND WOULD NOT LIKELY POSE ANY MAJOR ENVIRONMENTAL LOSSES DUE TO THE FACILITY'S. LOCATION IN RELATION TO MAJOR WATERWAYS AND ENVIRONMENTALLY SENSITIVE AREAS

CONFIGURATION:









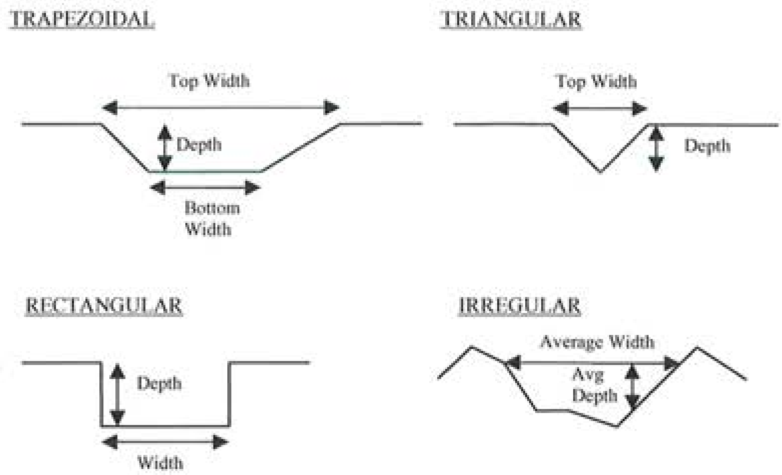
_____ Cross-Valley
_____ Side-Hill
__x__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height ~ 8 feet Embankment Material EARTHEN EMBANKMENT
Pool Area ~ 2.75 acres Liner UNKNOWN
Current Freeboard ~5 feet Liner Permeability UNKNOWN

TYPE OF OUTLET (Mark all that apply)

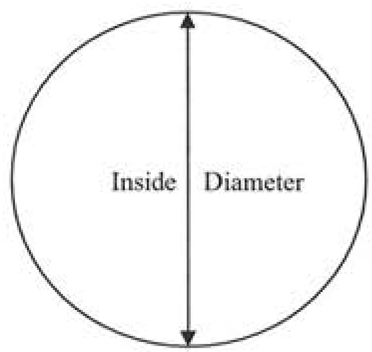
N/A **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



X **Outlet**

15.5" inside diameter



Material
_____ corrugated metal
X welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) __________________

Is water flowing through the outlet? YES _______ NO X

N/A **No Outlet**

N/A **Other Type of Outlet** (specify) ______________________________

The Impoundment was Designed By UNKNOWN- RECORD DRAWINGS AND DESIGN DOCUMENTS UNAVAILIBLE AT THIS TIME (DESTROYED IN 2008 FLOOD)

Has there ever been a failure at this site? YES ________ NO ✓

If So When? ________________________

If So Please Describe : ________________________

Has there ever been significant seepages at this site? YES _______ NO _X_

If So When? ________

IF So Please Describe: ________

Appendix B

Response Letter to the EPA's Section 104(e) Request for Information

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

May 18, 2009

VIA OVERNIGHT DELIVERY

Mr. Richard Kinch
US Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor: N-5738
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 May 4, 2009, the Sixth Street Generating Station, 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 undated. 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 Sixth Street Generating Station'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:

1. 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.
2. The nature or extent of a release or threatened release of a hazardous substance or pollutant or contaminant at or from a vessel or facility.
3. 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. <u>Specific Responses to Items in Enclosure A</u>

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. Ash Pond 1: 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. Ash Pond 2: 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.

c. Ash Pond 3: 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.

d. Ash Pond 4: 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

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

a. Ash Pond 1: IPL believes this pond was commissioned in the 1930s.

b. Ash Pond 2: IPL believes this pond was commissioned in the 1930s.

c. Ash Pond 3: IPL believes this was pond commissioned in the 1930s.

d. Ash Pond 4: IPL believes this pond was commissioned in the 1930s.

---

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. Ash Pond 1: Materials temporarily or permanently contained are

- Fly ash
- Bottom ash
- Coal Fines
- Other: ash transport water, boiler water wash, air heater wash (fly ash), storm water runoff from plant site; plant floor drains, Coal Dumper Building; Interstate 380 Bridge Runoff; Cedar Lake Flood Waters from June 2008 Flood; and boiler blowdown (steam/water).

b. Ash Pond 2: Materials temporarily or permanently contained are

- Fly ash
- Bottom ash
- Coal Fines

- Other: ash transport water, boiler water wash, air heater wash (fly ash), storm water runoff from plant site; plant floor drains, Coal Dumper Building; Interstate 380 Bridge Runoff; Cedar Lake Flood Waters from June 2008 Flood; and boiler blowdown (steam/water).

c. Ash Pond 3: Materials temporarily or permanently contained are

- Fly ash
- Bottom ash
- Coal Fines
- Other: ash transport water, boiler water wash, air heater wash (fly ash), storm water runoff from plant site; plant floor drains, Coal Dumper Building; Interstate 380 Bridge Runoff; Cedar Lake Flood Waters from June 2008 Flood; and boiler blowdown (steam/water).

d. Ash Pond 4: Materials temporarily or permanently contained are

- Fly ash
- Bottom ash
- Other: ash transport water, boiler water wash, air heater wash (fly ash), storm water runoff from plant site; plant floor drains, Coal Dumper Building; Interstate 380 Bridge Runoff; Cedar Lake Flood Waters from June 2008 Flood; 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. Ash Pond 1:

- Based on its review of readily available records, IPL is unable to determine whether the pond was designed by a Professional Engineer.
- Based on its review of readily available records, IPL is unable to determine whether the pond was constructed under the supervision of a Professional Engineer.
- Inspection and monitoring of the safety of the pond is not under the supervision of a Professional Engineer.

b. Ash Pond 2:

- Based on its review of readily available records, IPL is unable to determine whether the pond was designed by a Professional Engineer.

- Based on its review of readily available records, IPL is unable to determine whether the pond was constructed under the supervision of a Professional Engineer.
- Inspection and monitoring of the safety of the pond is not under the supervision of a Professional Engineer.

c. Ash Pond 3:

- Based on its review of readily available records, IPL is unable to determine whether the pond was designed by a Professional Engineer.
- Based on its review of readily available records, IPL is unable to determine whether the pond was constructed under the supervision of a Professional Engineer.
- Inspection and monitoring of the safety of the pond is not under the supervision of a Professional Engineer.

d. Ash Pond 4:

- Based on its review of readily available records, IPL is unable to determine whether the pond was designed by a Professional Engineer.
- Based on its review of readily available records, IPL is unable to determine whether the pond was constructed under the supervision of a Professional Engineer.
- 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. Ash Pond 1:

- IPL conducted a visual structural inspection on March 6, 2009.
- The assessment team inspecting the pond on March 6, 2009, consisted of a Civil Engineer; Senior Environmental Specialist; and a Plant Manager with an Engineering Degree.
- The March 6, 2009, inspection recommended some tree removal on the inside portion of the berm and to monitor the seep along the railroad tracks to determine

if it is coming from the ash pond. This work will be accomplished by plant personnel or contractors working under the direct supervision of plant personnel by December 31, 2009.

- IPL currently has no future assessment/evaluation formally scheduled, but has developed an internal evaluation program which will include periodic assessments.

b. Ash Pond 2:

- IPL conducted a visual structural inspection on March 6, 2009.
- The assessment team inspecting the pond on March 6, 2009, consisted of a Civil Engineer; Senior Environmental Specialist; and a Plant Manager with an Engineering Degree.
- The March 6, 2009, inspection recommended some tree removal on the inside portion of the berm and to monitor the seep along the railroad tracks to determine if it is coming from the ash pond. This work will be accomplished by plant personnel or contractors working under the direct supervision of plant personnel by December 31, 2009.
- IPL currently has no future assessment/evaluation formally scheduled, but has developed an internal evaluation program which will include periodic assessments.

c. Ash Pond 3:

- IPL conducted a visual structural inspection on March 6, 2009.
- The assessment team inspecting the pond on March 6, 2009, consisted of a Civil Engineer; Senior Environmental Specialist; and a Plant Manager with an Engineering Degree.
- The March 6, 2009, inspection recommended some tree removal on the inside portion of the berm. This work will be accomplished by plant personnel or contractors working under the direct supervision of plant personnel by December 31, 2009.
- IPL currently has no future assessment/evaluation formally scheduled, but has developed an internal evaluation program which will include periodic assessments.

d. Ash Pond 4:

- IPL conducted a visual structural inspection on March 6, 2009.
- The assessment team inspecting the pond on March 6, 2009, consisted of a Civil Engineer; Senior Environmental Specialist; and a Plant Manager with an Engineering Degree.
- The March 6, 2009, inspection identified no items/issues requiring action.

- IPL currently has no future assessment/evaluation formally scheduled, but has developed an internal evaluation program which will include periodic assessments.

---

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. Ash Pond 1:

- 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 May 24, 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. Ash Pond 2:

- 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 May 24, 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.

c. Ash Pond 3:

- 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 May 24, 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.

d. Ash Pond 4:

- 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 May 24, 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. Ash Pond 1: There have been no assessments, evaluations, or inspections by a state or federal regulatory agency within the past year.

b. Ash Pond 2: There have been no assessments, evaluations, or inspections by a state or federal regulatory agency within the past year.

c. Ash Pond 3: There have been no assessments, evaluations, or inspections by a state or federal regulatory agency within the past year.

d. Ash Pond 4: 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. Ash Pond 1:

- Surface area: 0.45acres
- Total storage capacity: 10,900 cubic yards; measurement date – April 2009.
- Volume of materials stored: 5,810 cubic yards; measurement date – April 2009.
- Maximum height of management unit: 15 feet

b. Ash Pond 2:
- Surface area: 0.52 acres.
- Total storage capacity: 12,600 cubic yards; measurement date – April 2009.
- Volume of materials stored: 6.750 cubic yards; measurement date – April 2009.
- Maximum height of management unit: 10 feet

c. Ash Pond 3:
- Surface area: 4.04 acres.
- Total storage capacity: 65,200 cubic yards; measurement date – April 2009.
- Volume of materials stored: 13,000 cubic yards; measurement date – April 2009.
- Maximum height of management unit: 10 feet

d. Ash Pond 4:
- Surface area: 3.18 acres.
- Total storage capacity: 51,300 cubic yards; measurement date – April 2009.
- Volume of materials stored: 20,500 cubic yards; measurement date – April 2009.
- Maximum height of management unit: 15 feet

---

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. Ash Pond 1: 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. Ash Pond 2: 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".

c. Ash Pond 3: 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".

d. Ash Pond 4: 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".

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

- The Operator is: Interstate Power and Light Company
- The Owner is: Interstate Power and Light Company

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
Managing Attorney

Enclosure: Iowa DNR Wastewater Compliance Inspection Report dated June 18, 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: ______________

Name: John O. Larsen

Title: Vice President - Generation

KLEINFELDER

Appendix C

Documents Provided for Review -
Ash Pond Slope Stability and Hydraulic Analysis 6th Street Generating Station

aether dbs
elemental design build solutions

August 4, 2011

Mr. William Skalitzky 154.015.001
Alliant Energy
4902 N. Biltmore Lane
Madison, WI 53718

Re: Ash Pond Slope Stability and Hydraulic Analysis
6th Street Generating Station – Cedar Rapids, Iowa

Mr. Skalitzky;

Aether DBS, reports our findings from the Ash Pond Slope Stability and Hydraulic Analysis performed for the 6th Street Generating Station. The purpose of the study is evaluation of the stability of the former ash settling ponds under 100-year storm flow and for both seismic and rapid drawdown induced loadings. The analysis is based on existing data on the generating station subsurface conditions, ash pond embankment conditions, and surface drainage arrangements plus new data on the materials of construction in the pond embankments. The data pertinent to the evaluation is provided in the attachments.

The ash pond is capable of containing a SCS Type II, 24-hour, 100 year storm without overtopping. The outer embankment of the ash pond has more than an acceptable factor of safety of 1.5 for static stability and exceeds the acceptable standard of 1.0 for pseudo-static earthquake stability. The pond embankments are constructed primarily of ash and slag with clay fill over the ash and slag at 3 of the 5 geoprobe soil borings. The generating station is not operational and the only flux of water elevation in the ponds is from rainfall obviating the need to assess rapid drawdown.

Background

The Sixth Street Generating Station is located on the shores of Cedar Lake within the city limits of Cedar Rapids, Iowa. Operations began on site in 1888 as a town lighting plant.

The Sixth Street Generating Station is a non-operating fossil-fueled electric generating station consisting of five units. Unit "1/2" (10.0 MW 1921) is retired in place. Units "3/4" (10.0 MW 1925), "5/6" (10.0 MW 1925), "7/8" (15.0 MW 1945), and "9/10" (28.7 MW 1950) can be coal or natural gas fired units.

The facility experienced extensive flood waters up to 6 feet high on the main floor of the plant as a result of the Cedar River cresting at over 31 feet on June 12, 2008. Consequently, the generating station was damaged and is not currently producing steam or electricity. There are no plans by

1050 broadway ave., suite 7, chesterton, in 46304
219.926.5508 fax: 219.926.8446 www.aetherdbs.com

Interstate Power and Light to resume operations and the Ash Ponds are no longer in use to settle bottom ash. The site is staffed by a skeleton crew during normal business hours.

Drainage

Storm water discharges into Cedar Lake, except for the dumper building and plant sumps which is currently piped into the ash ponds starting at Pond 2. Pond 1 (which is connected to Pond 2) is not currently in use. Both Ponds 1 and 2 are small ponds that were routinely dredged every 1 to 2 years for bottom ash removal. The configuration of all four ponds and their proximity to the generating station is shown on Figure 1.

The outlet for Pond 2 flows into Pond 3 whose outlet flows into Pond 4. The effluent from the fourth pond is discharged under an NPDES permit to wetlands that drain northeast under the railroad embankment to nearby Cedar Lake. The I380 highway has drains that discharge directly into the pond system.

All four ash ponds are grouped together east-northeast of the generating plant between the raised railroad yard leading to the generating station along the shore of Cedar Lake and the natural bluffs along the edge of the flood plain, Figure 1. The ponds are filled on low ground adjacent to the natural bluffs and the embankments are approximately five foot higher than the railroad grade fill between the ponds and Cedar Lake. Since the pond embankments are higher than the immediate surrounding area, very little, if any, surface water runoff drains into the ponds.

Hydrology and Hydraulics

On June 21, 2011, Aether DBS observed Pond 2 with approximately two feet of freeboard. Pond 3, the largest pond, had freeboard varying from 2 to 5 feet with little water flow, if any, entering from pond 2. Pond 4 had approximately 5 to 6 feet of freeboard and was neither receiving nor discharging any water. The bypassed Pond 1 had approximately ten feet of freeboard.

Pond 2 was observed briefly receiving inflow once by the Aether DBS field representative while on site June 21st. The pond embankments are approximately ten feet above normal Cedar Lake elevation of 721 feet (based on ten feet of freeboard in Pond 1 with no source of inflow). Because sand underlies the site, the outflow from the ponds is likely by seepage into the ground water table under the site. Runoff from the I380 highway was assumed to be 100% of the highway covering the site.

A 100-year, SCS Type II, 24-hour storm for Linn County, Iowa is 6.5 inches of precipitation[1]. Ignoring all outflows, the entire volume of the storm would be contained in the Ash Ponds with at most 0.5 foot water elevation increase in the ponds. The ash sluicing system is not operating and sump water from the car dumper building and the plant (just 21 gallons per minute on average during 2003 when the plant was still operating, Attachment A) is discharged to the ponds. Therefore, the ponds in

---

[1] United States Department of Commerce, Rainfall Frequency Analysis of the United States,

combination will store the 100-year storm for later exfiltration without overtopping of the embankments.

Investigation Activities

Details for the construction of the (circa 1930s) ash pond are unavailable. Consequently, Aether DBS installed five soil borings on the ash pond embankments. The new boring logs are enclosed as Attachment B. The locations of the borings are indicated on Figure 1.

All five borings show fill from the top of the embankment to a depth from 17 feet to 24 feet. Native soil under the fill was identified as sand (SP or SW) with a thin clay or peat layer present in some of the borings at the native soil interface.

The fill in all five borings was identified as Ash / Slag with a few thin rubble layers and two sand fill layers. Three of the borings showed clay fill at the surface over top of Ash /Slag:

Boring	Surface Clay Fill Thickness
SB-2	7’
SB-3	4.5’
SB-4	4.5’

Cone Penetrometer Tests (CPTs) were also performed at three locations as shown on Figure 1. Two CPTs were performed near Geoprobe borings and one CPT (CPT-3) was performed between CPT-1 and CPT-2. CPT-2 encountered shallow refusal at only 5.5-feet whereas CPT-1 and CPT-2 reached 30-feet and 32-feet respectively (the typical limit of the test equipment). The CPT results indicate that the alluvial sands found under the fill are dense, Attachment B.

A previous sub-surface investigation[2] in 2002 consisted of five borings all drilled from the existing basement floor elevation in the generating plant, Attachment C. The investigation found fill to a depth of 1.2’ to 10.5’ below the top of slab. Below the fill, weathered dolomite rock was found in the four borings that were rock cored.

Ash Pond Embankment Stability

The four ponds are part of a fill structure extending from the natural rock bluff found under the generating station and the nearby hospital and include the fill along the shore of Cedar Lake installed to support the railroad access to the generating station. Consequently, the ponds are incised for the most part into the larger filled area. For example, the top of the embankment is approximately 30 feet wide and 6 feet above the railroad yard at SB-5. At CPT-3 the embankment measures approximately 18 feet wide and is 3 feet high. The most critical embankment is along the southwestern edge of Pond

---

[2] Subsurface Exploration, Proposed Pulverizer Additions, 6th Street Power Plant, Cedar Rapids, Iowa, by Team Services, October 7, 2002

4 because the embankment is approximately ten feet above the low ground where Pond 4 drains to Cedar Lake (approximate top elevation equals 731-feet based on the USGS Topographic Map and Google Earth, Attachment D).

Two dimensional limit equilibrium slope stability analyses were performed on a conservative idealized cross-section that corresponds to the ash pond's outer embankment at SB-3, Figure 1. A steep one to one side slope was assumed with a measured crest width of fifteen feet. The inside ash pond slope was estimated as two to one with a height of fifteen feet above the bottom of the pond including four feet of stored material.

The idealized soil profile is based on SB-3 but the two adjacent borings, SB-2 & SB-4, are both similar. Conservative strength parameters were assigned as follows:

Depth Range	Material	Strength
0' – 5'	Clay	C = 500 PSF
5' – 20'	Ash / Slag	Θ =28 degrees
20' +	Sand (SW)	Θ =32 degrees

Program STABL5M (1996) from Purdue University[3] was used to analyze hundreds of potential slip surfaces for each loading case. The program calculates a factor of safety based on the ratio of the driving forces to the resisting forces along each potential slip surface. A calculated factor of safety greater than one indicates stability along the surface analyzed.

Only two loading cases / failure scenarios were analyzed because the pond is partially incised limiting drainage potential and the top five feet of the embankment is composed of clay. (Clay soils cannot drain quickly; hence short term seepage forces are not a concern.)

1.) Static Conditions – Five feet of freeboard assumed based on observations of 5 to 6 feet of freeboard. The ground water surface is conservatively assumed to reach lake level at the toe of slope. The elevation of the toe of slope is also assumed to be at lake level, the lowest possible level for surface water drainage to the lake.

2.) Earthquake Conditions - The small ponds at the 6th Street Generating Station do not pose a significant risk and contain minimum volumes of coal combustion residue. The procedures of FEMA[4] suggest that the structure rates as a low risk dam. For low risk structures, a probability of 10% in 50 years (return period of 475 years) is an acceptable standard. Consequently, a pseudo-static earthquake analysis was completed using the effective peak ground acceleration

[3] STABL User Manual, By Ronald A. Siegel, Purdue University, June 4, 1975 and STABL5 …The SPENCER Method of Slices: Final Report, By J.R.Carpenter, Purdue University, August 28, 1985

[4] Federal Emergency Management Agency, "Federal Guidelines for Dam Safety", May 2005

for a 475 year return period[5]. With dense alluvium under the site and a shallow top of rock surface, a Site Class "D" was selected for soil amplification giving a probable maximum horizontal earthquake acceleration of 0.024g for the ash ponds (attachment E). The vertical earthquake force is specified as $^{2}/_{3}$ of the horizontal earthquake force[6].

The ten most critical potential failure surfaces for each loading case are shown in Attachment F. The lowest Factor of Safety for each case is:

Embankment Stability Loading Case	Minimum Factor of Safety
Static Conditions	**1.6**
Earthquake Conditions	**1.5**
Rapid Draw Down	**NA**

Conclusion

The Ash Ponds will contain a 100-year 24-hour storm without overtopping.

The stability of the outer Ash Pond embankment adjacent to the wet lands has more than an acceptable Factor of Safety of 1.5 for static conditions[7]. The outer embankment also shows a Factor of Safety greater than the normally acceptable standard for Earthquake loading (factor of safety greater than 1.0 indicating no unacceptable displacement).

Respectfully Submitted,

Thomas C. Wells, P.E.

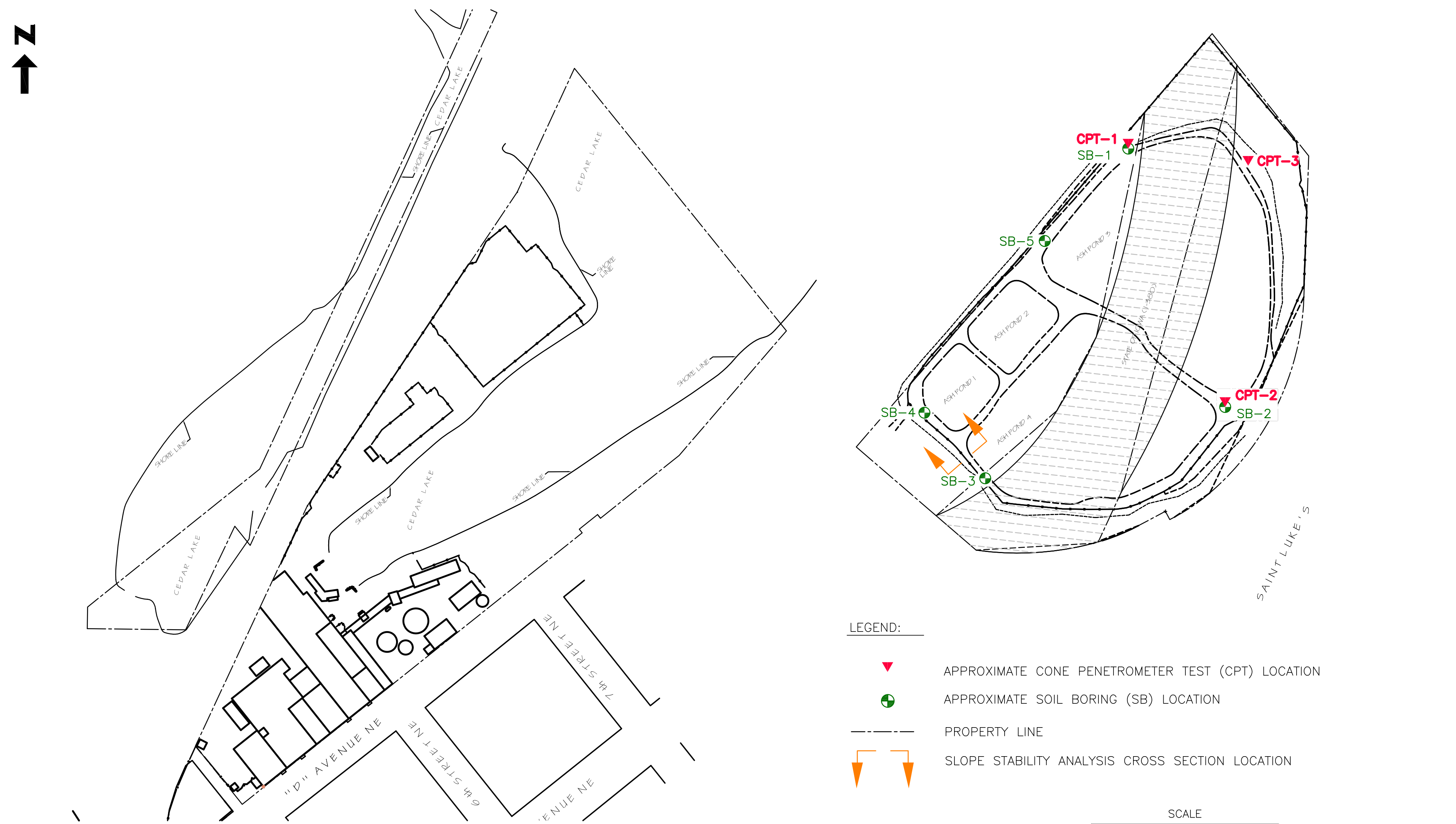
Timothy J. Harrington, P.E.

---

[5] U.S. Army Engineer Research and Development Center, Vicksburg, MS., "DEQAS-R: Standard response spectra and effective peak ground accelerations for seismic design and evaluation" Yule, D. E. Kala, R., and Matheu, E. E. (2005),

[6] N.M. Newmark and W.J. Hall, "Procedures and Criteria for Earthquake Resistant Design", Building Science Series No. 46, National Bureau of Standards, U.S. Dept. of Commerce, Washington, D.C., 1973

[7] USACE, "Engineering Design Slope Stability, EM 1110-2-1902", Table 3-1



REFERENCE:
– ALLIANT ENERGY, 6TH STREET STATION, TITLE V EMISSION POINT PLOT PLAN, DWG. NO. SIXTHSTREET DATED: 05/17/2002

REV	DATE	BY	DESCRIPTION
5			
4			
3			
2			
1			

aether dbs
www.aetherdbs.com

SCALE:	AS SHOWN
DATE:	08-02-2011
DRAWN BY:	RGM
CHKD. BY:	TCW
APPROVED:	08-02-2011

CLIENT / LOCATION
ALLIANT ENERGY
6TH STREET GENERATING STATION
CEDAR RAPIDS, IOWA

DRAWING DESCRIPTION
SITE PLAN

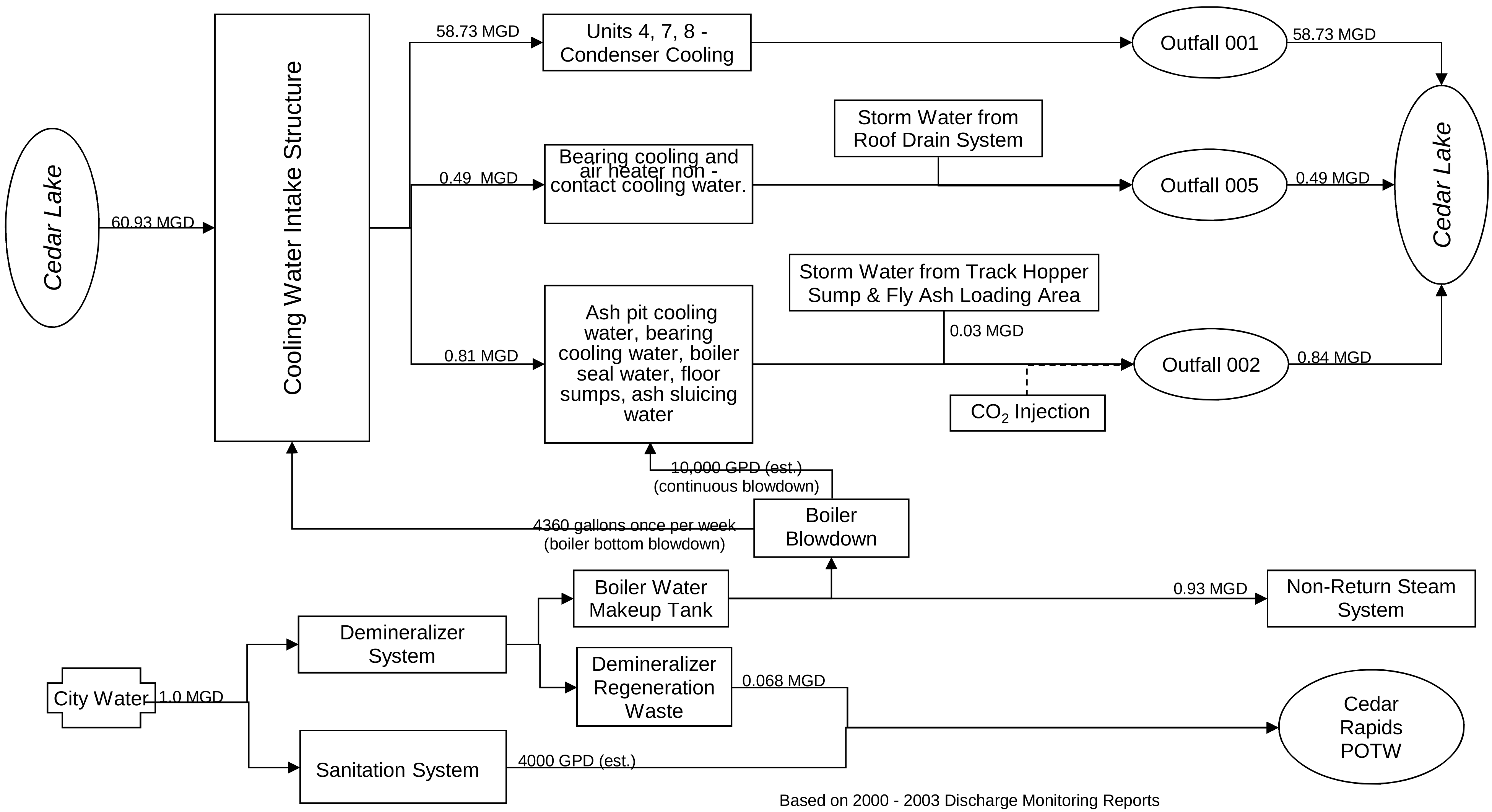
JOB 154.015.001
SHT. 1
DWG. SITE PLAN

Attachment A

6th Street Generating Station Water Usage - 2003

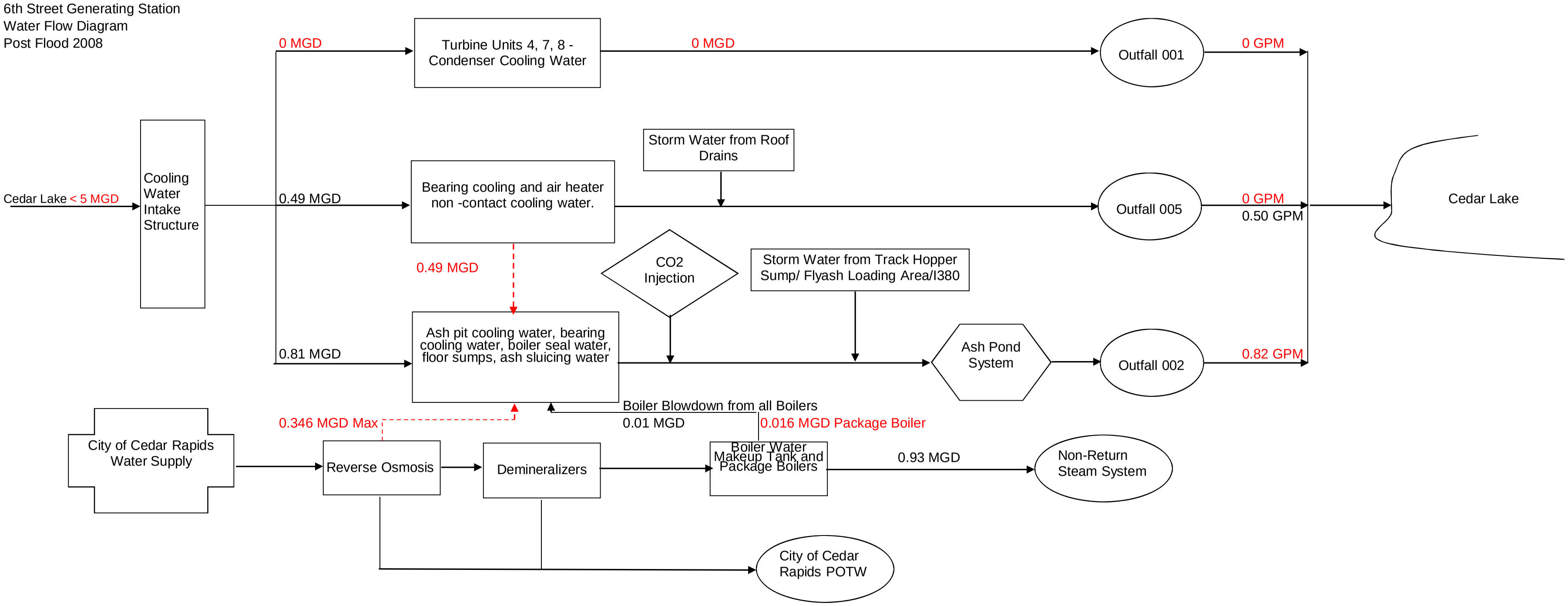
Source: Interstate Power & Light Company

6th Street Generating Station Water Usage - 2003
38887-3.21



Based on 2000 - 2003 Discharge Monitoring Reports
Actual max flow rates are higher
Source : Interstate Power & Light Company

6th Street Generating Station
Water Flow Diagram
Post Flood 2008



Notes:

1) - - - - - -▶ - Future Discharge Point Location or Addition
2) Boiler blowdown from coal fired boilers to intake structure not shown
Estimated rate is approximately 5,000 gallons per week
3) Package Boilers Ratings: 2 @ 75,000 lb/hr; 1 @ 150,000 lb/hr; 1 @ 250,000 lb/hr
4) Once 7/8 & 9/10 coal fired boilers become operational, the two 75,000 lb/hr boilers will be shut down
5) Outfall 005 will contain only storm water until the coal fired units are brought on-line.

Created: 12/2008
By: Bill Skalitzky

Attachment B-1

Boring & CPT Logs

Source:
CABENO Environmental Field Services, LLC, June 21, 2011

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Aether dbs

PROJECT: Alliant 6th St.

COORDINATES: N NOT SURVEYED / E NOT SURVEYED

BORING NO.: *SB1*

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Chris Sullivan*
DATE BEGAN: *06-20-11*
DATE FINISHED: *06-20-11*
GROUND SURFACE ELEVATION:

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION	POCKET PENETROMETER (TONS/FT2)	CONSISTENCY vs. DEPTH	DEPTH IN FEET	PROFILE	DESCRIPTION
						0		GRAVEL; light brown to black; well graded; fine to coarse; dry. (Fill)
	SP1	3.5'/5'						ASH/SLAG; brown to black; well graded; fine to coarse grained; dry to moist. (Fill)
						-5		@ 4.5' grades fine, poorly graded.
▽								@ 6' grades wet, very soft.
	SP2	4'/5'						
						-10		@10' to 15', very soft, no hammer used, push only, no recovery.
	SP3	0/5'						
						-15		
	SP4	3'/5'						CLAY; dark gray to black; low to high plasticity; wet. (CL)
								SAND; gray; medium grained; poorly graded; wet. (SP)
						-20		
	SP5	2.5'/5'						
						-25		@ 25' grades fine to coarse, well graded.
	SP6	1'/5'						
						-30		@ 30' grades olive color, fine grained, poorly graded.
	SP7	5'/5'						
						-35		Bottom of boring @ 36'
								Boring advanced W/ Geoprobe Model 6610DT using 60-inch Macrocore sampling system. Boring backfilled to groundsurface w/ bentonite chips on 06-27-11.
						-40		

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Aether dbs

PROJECT: Alliant 6th St.

COORDINATES: *N NOT SURVEYED* / *E NOT SURVEYED*

BORING NO.: ***SB2***

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Chris Sullivan*
DATE BEGAN: *06-21-11*
DATE FINISHED: *06-21-11*
GROUND SURFACE ELEVATION:

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION	POCKET PENETROMETER (TONS/FT2)	CONSISTENCY vs. DEPTH
	SP1	5'/5'			
▽	SP2	5'/5'			
	SP3	5'/5'			
	SP4	1'/5'			
	SP5	4'/5'			
	SP6	2'/5'			

DEPTH IN FEET	DESCRIPTION
0 to -7	CLAY; olive to dark gray; non-plastic to low plasticity; moist; trace slag, sand & gravel. (Fill) @ 6' is a 6-inch concrete rubble layer.
-7 to -24	ASH/SLAG; brown to black; poorly graded; fine grained; dry to moist. (Fill) @ 22' strong petroleum odor w/ sheen.
-24 to -25	CLAY; black; low to high plasticity; moist. (CL)
-25 to -27.5	PEAT; brown; non-plastic; dry to moist. (PT)
-27.5 to -30	SAND; gray; fine to coarse grained; well graded; wet. (SW)
-30	Bottom of boring @ 30' Boring advanced W/ Geoprobe Model 6610DT using 60-inch Macrocore sampling system. Boring backfilled to groundsurface w/ bentonite chips on 06-21-11.

Depth scale: 0, -5, -10, -15, -20, -25, -30, -35

BORING LOG

CABENO

Environmental Field Services, LLC

CLIENT: Aether dbs

PROJECT: Alliant 6th St.

COORDINATES: *N NOT SURVEYED* *E NOT SURVEYED*

BORING NO.: *SB3*

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Chris Sullivan*
DATE BEGAN: *06-21-11*
DATE FINISHED: *06-21-11*
GROUND SURFACE ELEVATION:

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION	POCKET PENETROMETER (TONS/FT2)	CONSISTENCY vs. DEPTH	DEPTH IN FEET	PROFILE	DESCRIPTION
	SP1	5'/5'				0		CLAY; olive to black; non-plastic to low plasticity; moist; trace slag, sand & gravel. (Fill)
	SP2	2.5'/5'				-5		ASH/SLAG; brown to black; poorly graded; fine grained; dry to moist. (Fill) @ 6' is a 1-foot rubble layer: concrete & brick.
	SP3	3'/5'				-10		
	SP4	0.5'/5'				-15		
▽	SP5	3'/5'				-20		SAND; gray; fine to coarse grained; well graded; wet. (SW)
	SP6	3'/5'				-25		@ 28' grades some Gravely SAND.
						-30		Bottom of boring @ 30' Boring advanced W/ Geoprobe Model 6610DT using 60-inch Macrocore sampling system. Boring backfilled to groundsurface w/ bentonite chips on 06-21-11.
						-35		

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Aether dbs

PROJECT: Alliant 6th St.

COORDINATES: *N NOT SURVEYED* *E NOT SURVEYED*

BORING NO.: *SB4*

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Chris Sullivan*
DATE BEGAN: *06-21-11*
DATE FINISHED: *06-21-11*
GROUND SURFACE ELEVATION:

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION	POCKET PENETROMETER (TONS/FT2)	CONSISTENCY vs. DEPTH	DEPTH IN FEET
	SP1	5'/5'				0 to -5
∇	SP2	4'/5'				-5 to -10
	SP3	2'/5'				-10 to -15
	SP4	3'/5'				-15 to -20
	SP5	3'/5'				-20 to -25
	SP6	3'/5'				-25 to -30

DESCRIPTION

CLAY; brown; non-plastic to low plasticity; moist; trace slag, sand & gravel. (Fill)

@ 3.5' is an 8-inch concrete rubble layer.

ASH/SLAG; brown to black; poorly graded; fine grained; dry to moist. (Fill)

@ 8' grades wet.

SAND; black; fine grained; poorly graded; wet. (Fill)

RUBBLE/FILL; black; brick, rock, wood; sheen covered w/ strong petroleum/tar odor. (Fill)

CLAY; black; low to high plasticity; moist. (CL)

PEAT; brown; non-plastic; dry to moist. (PT)

Clayey SAND; gray; fine grained; poorly graded; wet. (SP)

Bottom of boring @ 30'

Boring advanced W/ Geoprobe Model 6610DT using 60-inch Macrocore sampling system. Boring backfilled to groundsurface w/ bentonite chips on 06-21-11.

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Aether dbs

PROJECT: Alliant 6th St.

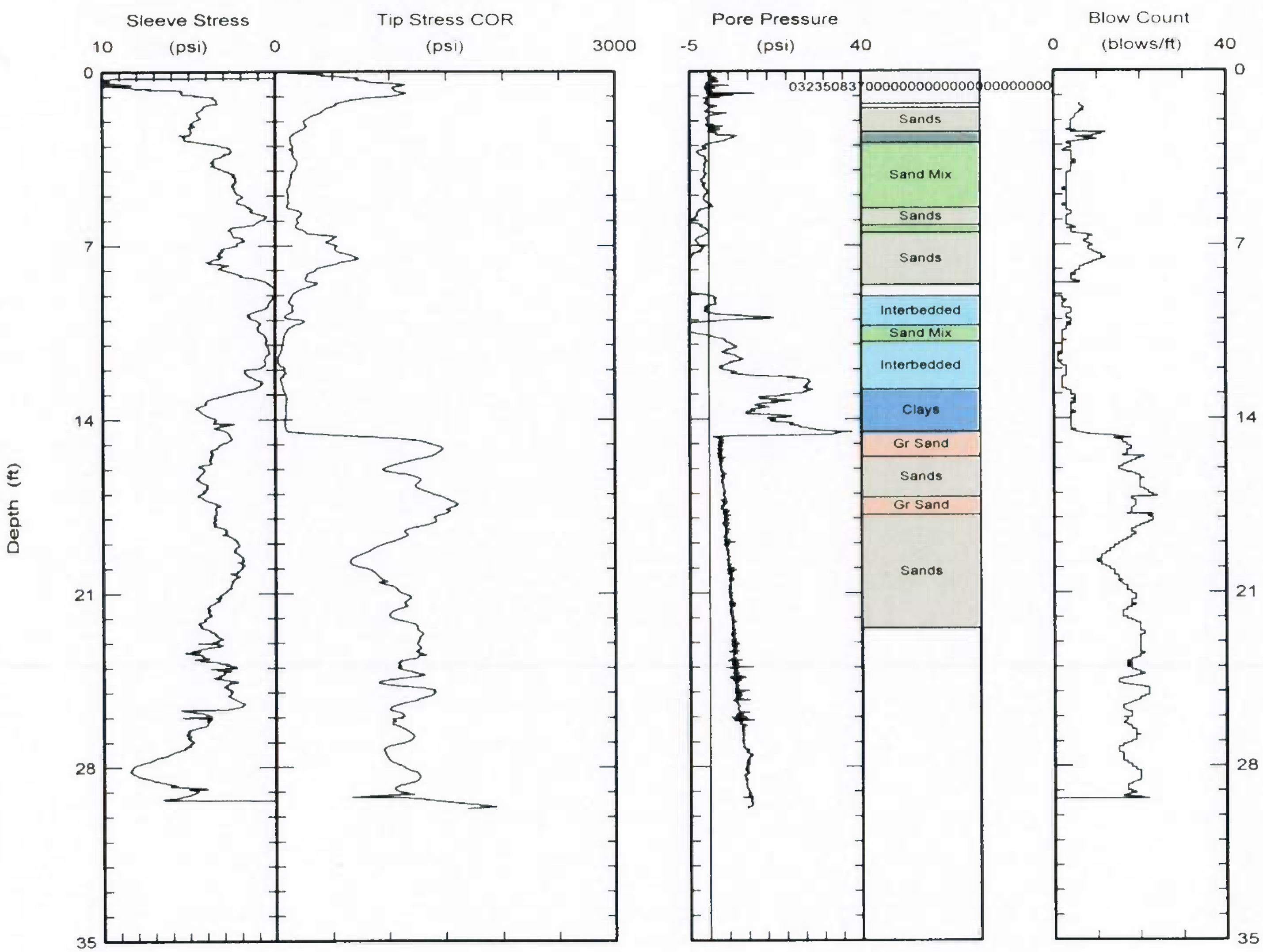
COORDINATES: *N NOT SURVEYED* *E NOT SURVEYED*

BORING NO.: *SB5*

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Chris Sullivan*
DATE BEGAN: *06-21-11*
DATE FINISHED: *06-21-11*
GROUND SURFACE ELEVATION:

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION	POCKET PENETROMETER (TONS/FT2)	CONSISTENCY vs. DEPTH	DEPTH IN FEET	PROFILE	DESCRIPTION
						0		GRAVEL; white; fine to coarse; well graded; dry. (Fill)
	SP1	5'/5'						ASH/SLAG; brown to black; poorly graded; fine grained; dry to moist. (Fill)
						-5		
	SP2	4'/5'						
▽						-10		@ 10' grades wet.
	SP3	3'/5'						
						-15		
	SP4	0/5'						
						-20		
	SP5	0.5'/5'						
						-25		SAND; black; fine grained; poorly graded; wet. (Fill)
	SP6	1'/5'						@ 28' grades fine to coarse, well graded.
						-30		Bottom of boring @ 30' Boring advanced W/ Geoprobe Model 6610DT using 60-inch Macrocore sampling system. Boring backfilled to groundsurface w/ bentonite chips on 06-21-11.
						-35		

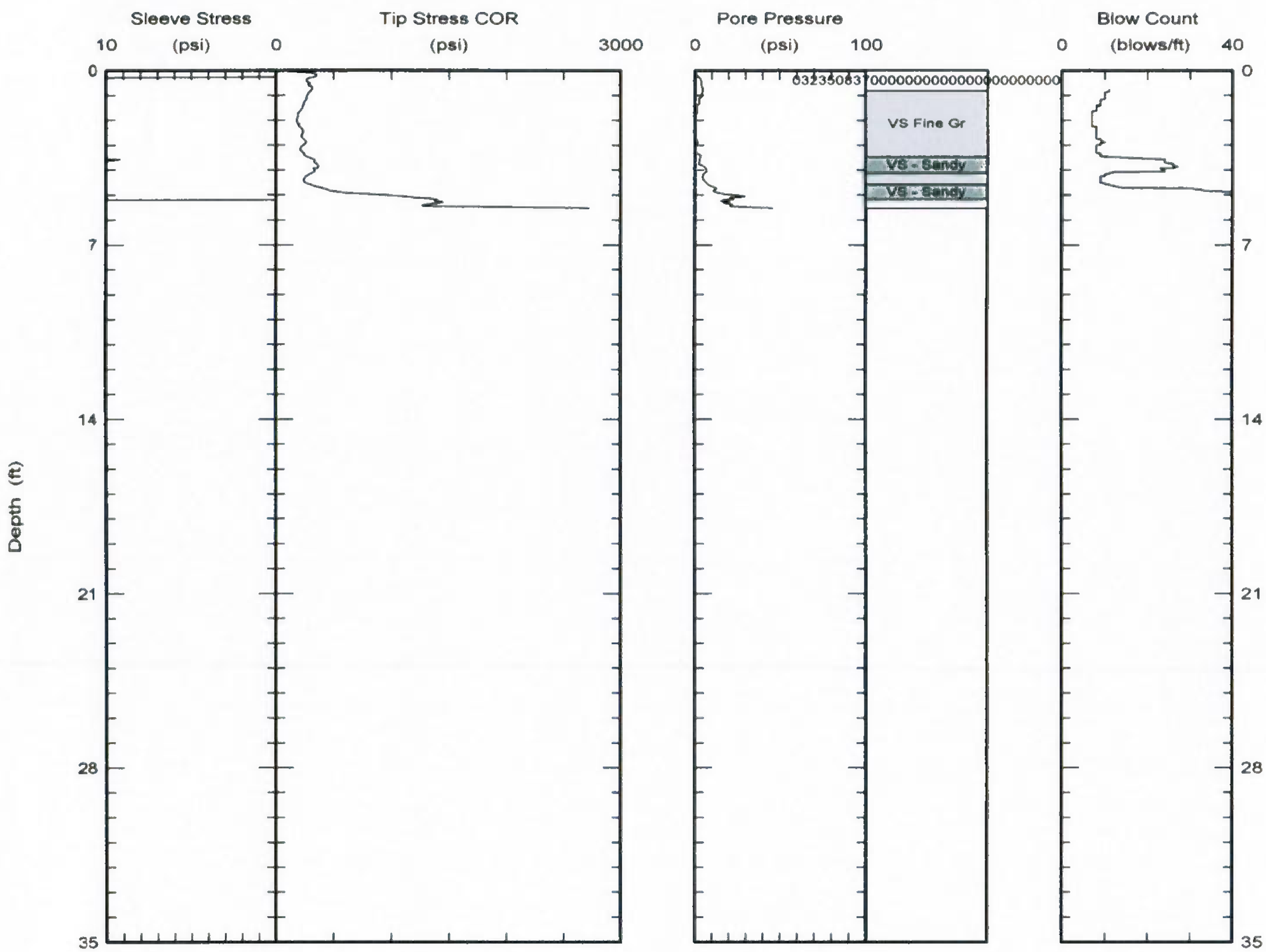
Applied Research Associates, Inc. South Royalton, VT 05068 802-763-8348 cpt@ned.ara.com www.ara.com	Northing: Easting: Elevation:	Date: 21/Jun/2011 Test ID: cpt1 Project: Alliant
	Client: Aetherdbs Job Site: 6th Street	



Maximum depth: 29.68 (ft)

Test ID: cpt1
File: A21U1101C.ECP

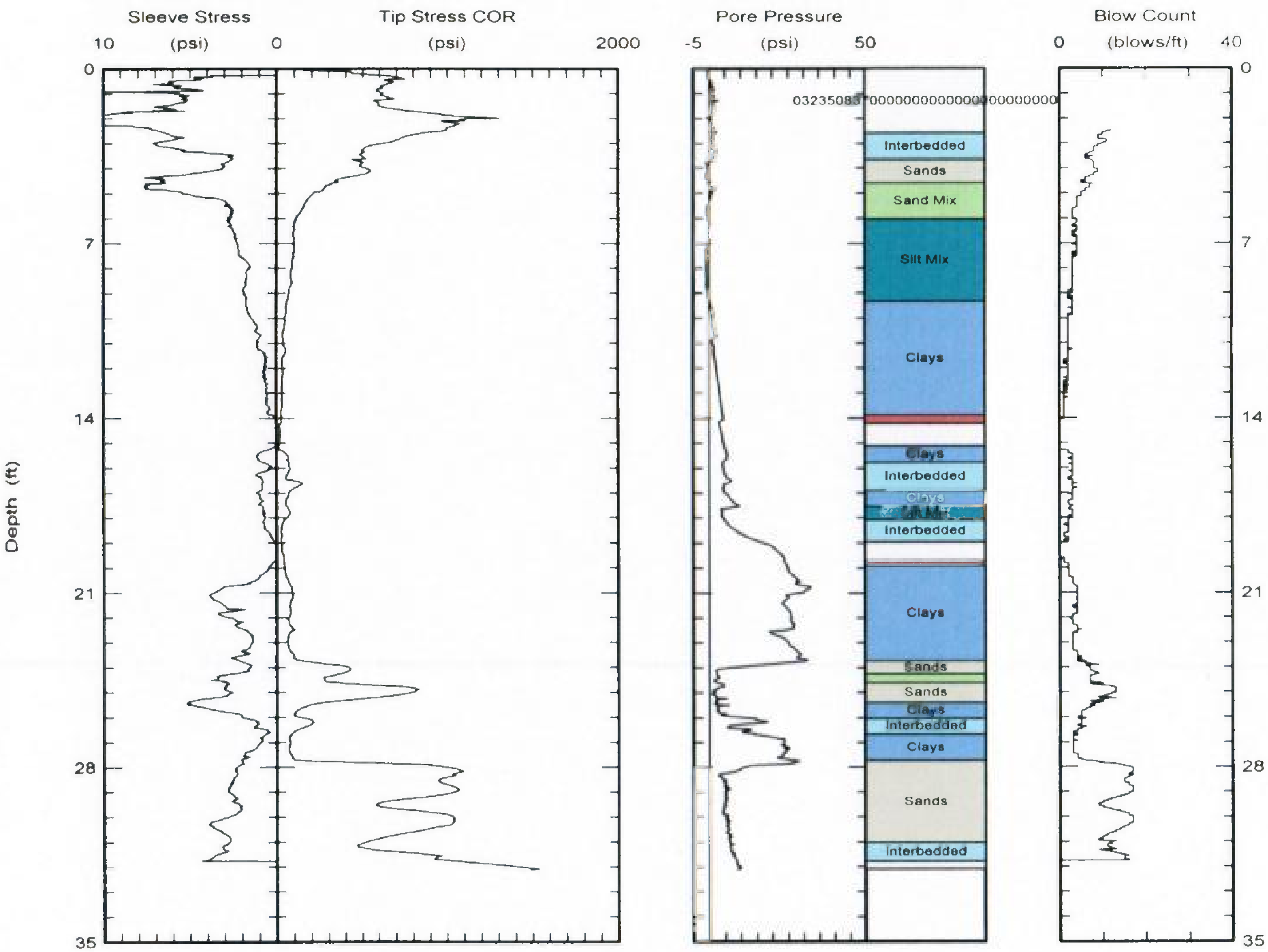
Applied Research Associates, Inc. South Royalton, VT 05068 802-763-8348 cpt@ned.ara.com www.ara.com	Northing: Easting: Elevation:	Date: 21/Jun/2011 Test ID: cpt2 Project: Alliant
	Client: Aetherdbs Job Site: 6th Street	



Maximum depth: 5.53 (ft)

Test ID: cpt2
File: A21U1102C ECP

Applied Research Associates, Inc. South Royalton, VT 05068 802-763-8348 cpt@ned.ara.com www.ara.com	Northing: Easting: Elevation:	Date: 21/Jun/2011 Test ID: cpt3 Project: Alliant
	Client: Aetherdbs Job Site: 6th Street	



Maximum depth: 32.09 (ft)

Test ID: cpt3
File: A21U1103C.ECP

Attachment C

Subsurface Exploration
Proposed Pulverizer Additions
6th Stree Power Plant
Cedar Rapids, Iowa

October 7, 2002

TEAM Services
Des Moines, Iowa

SUBSURFACE EXPLORATION
PROPOSED PULVERIZER ADDITIONS
6TH STREET POWER PLANT
CEDAR RAPIDS, IOWA
TEAM NO. 1-1087
OCTOBER 7, 2002

0	12/13/05	ISSUED REPORT	mjm
REV	DATE	DESCRIPTION	APPRV
SIXTH STREET STATION			**COMMON**
SUBSUFACE EXPLORATION SOILS REPORT			
1-2020-0-D-S0001			

TEAM *Services*
Soil, Environmental and Material Consultants

October 7, 2002

Alliant Energy
200 1st Street S.E.
Cedar Rapids, IA 52406

Attn: Mitch Meyers
Project Engineer

Re: Subsurface Exploration
Proposed Pulverizer Additions
6th Street Power Plant
Cedar Rapids, Iowa
TEAM No. 1-1087

Dear Mr. Meyers:

We have completed the subsurface exploration for the proposed pulverizer additions to be constructed for the existing 6th Street Power Plant in Cedar Rapids, Iowa. The accompanying geotechnical report presents the findings of the subsurface exploration and recommendations concerning the design and construction of foundations for the proposed structures.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service to you in any way, please do not hesitate to contact us.

Very truly yours,
TEAM Services

Robert E. Doss (IN)

Colby Cunningham, P.E.
Principal Engineer

Robert E. Doss, P.E.
Principal
Iowa No. 12543

TABLE OF CONTENTS

PROJECT INFORMATION

Project information has been provided by Mr. Mitch Meyers of Alliant Energy in telephone conversations and a meeting with our Mr. Colby Cunningham. Several copies of as-built drawing sheets of the plant construction were also provided. The drawings provided included the following:

1. Drawing titled "Title Sheet Iowa Electric Light & Power Company No. 9 Boiler Addition" dated revised 7/29/1948
2. Drawing Titled "Plat of Power Plant Property Showing Location of Blr's #1 and #2 and dated 10/21/1929
3. Drawing Titled "Foundation Plan No. 5 & 6 Boiler Addition to Boiler House" date not clear
4. Drawing Titled "Foundation Plan No. 7 & 8 Boiler Addition to Boiler House", undated.

The planned pulverizer units will be added to the existing structures. Detailed foundation loading information has not been provided. The current design scheme calls for the existing foundations to be utilized to support the loads of the planned pulverizers. Some dynamic loading is anticipated, but is reportedly relatively small in proportion to the mass of the existing foundations. Excavations no more than about 3 to 4 feet below the existing floor elevation (elevation 86 feet, site datum) are currently contemplated.

SITE CONDITIONS

The project site is located in the basement of the Sixth Street Station Power Plant in Cedar Rapids, Iowa. This is an older coal-fired facility that has had several phases of construction to arrive at the current configuration. The plant is located at 5th Street and D Avenue NE in Cedar Rapids, Iowa. The facility is located in the geologic flood plain of the Cedar River. The foundations for the existing structure are concrete spread footings on rock. As-built drawings show that the foundation bearing elevation varies considerably across the site with depths varying from about 4 to 20 feet below the basement floor elevation. Previous borings, performed for the No. 9 Boiler Addition project and shown on the drawing titled "Title Sheet, show bedrock elevations were frequently (in 8 of 10 boring records) above the current basement floor elevation of 86 feet (site datum) in the preconstruction condition. The bedrock was described as "limestone" in the boring logs.

FIELD EXPLORATION

The boring locations were laid out on the site by TEAM Services with the assistance of Alliant Energy representatives. A total of 5 borings were performed. The approximate boring locations are indicated on the Boring Plans in the Appendix. The borings were all drilled in the existing basement floor level, which has a site datum elevation of 86 feet. This elevation was assigned to all of the borings.

Our drilling equipment consisted of a castor-mounted Dietrich D-25 auger drill rig. This rig was rented from the manufacturer because of the strict size constraints necessary for working in the basement of the power plant and moving the drill rig via the access elevator.

Boring 1, 2, 4 and 5 were extended into the bedrock formation. Samples of the rock were obtained by core drilling with an NQ-size diamond bit core barrel. The core sample recovered with this barrel is approximately 2 inches in diameter. Samples of the bedrock were also obtained using-the split-barrel sample. Between sampling intervals, the borehole was advanced by rotary drilling with a tri-cone rock bit. The rock samples were also tagged for identification and returned to the laboratory for testing and classification.

Field logs of the boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling, as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

LABORATORY OBSERVATIONS

Rock Cores

The rock core samples were visually examined and classified. Percent recovery and rock quality designation (RQD) were calculated for these samples and are noted at their depths of occurrence on the boring logs. RQD is the percent of total length cored consisting only of sound pieces at least 4 inches or more in length and is a measure of the integrity of the rock mass in-situ.

As part of the testing program, the samples were classified in the laboratory based on visual observation, texture, and plasticity. The descriptions of the soils indicated on the boring logs are in accordance with the enclosed *General Notes* and the *Unified Soil Classification System*. Estimated group symbols according to the *Unified Soil Classification System* are given on the boring logs. A brief description of this classification system is attached to this report.

SITE GEOLOGY

Surficial deposits at the site include recent alluvium associated with the nearby Cedar River. These deposits include sand and clay which were deposited by flowing water of the Cedar River. The nature of the deposit depends more on the velocity of water flow at the time of deposition than any other single factor, with sands and gravels associated with faster moving water, and silts and clays associated with slower moving or stagnant water.

The bedrock at this site is derived from the Wapsipinicon Formation of the Middle Devonian Series, Devonian Period, Paleozoic Era (some 385 million years ago). The Wapsipinicon formation includes, in order of decreasing prevalence, limestone, dolomite, and shale.

SUBSURFACE CONDITIONS

Conditions encountered at each of the boring locations are indicated on the individual boring logs. Based on the results of the borings, subsurface conditions on the project site can be generalized as follows.

A concrete floor slab having a nominal thickness of about 1 foot was encountered at all five boring locations. Beneath the floor slab, fill was encountered. The fill varied considerably in depth in our borings from a minimum of about 1.2 feet below the top of the slab to a maximum of about 10.5 feet below existing grade. Below the fill, fractured weathered to highly weathered, very poor to fair crystalline dolomite was encountered. The dolomite bedrock was encountered to the maximum depth explored of 22.5 feet. Porosity (vugs) up to 2 cm was encountered in the deeper core depths in Boring 3.

Rock quality (RQD) was typically very poor in the initial core runs at each boring locations. Numerous relatively fresh fractures were visible in the core samples recovered. Substantial variation in foundation bearing elevation of the existing foundations was also encountered. We have considered the possibility that the near surface bedrock at the site may have been disturbed in the initial construction at the site; perhaps by blasting.

GROUNDWATER CONDITIONS

The boring was monitored while drilling and after completion for the presence and level of groundwater. Water levels observed in the boring are noted on the boring logs. During drilling operations, groundwater was not observed at Boring 5 but was encountered at other borings from about 2.5 feet below the existing basement grade. During coring operations at Boring 4, we noted a 100% loss of drilling fluid. These water level observations provide an approximate indication of the groundwater conditions existing on the site at the time the borings were drilled. However, due to the low permeability of the cohesive soils encountered in the borings, longer term monitoring in cased holes or piezometers would be required for a more accurate evaluation of the groundwater conditions.

Groundwater levels may fluctuate several feet with seasonal, industrial and rainfall variations and with changes in the water level in adjacent drainage features including the nearby Cedar River. Normally, the highest groundwater levels occur in late winter and spring, and the lowest levels occur in late summer and fall.

CONCLUSIONS AND RECOMMENDATIONS

General

The proposed pulverizers will be supported primarily on the existing foundations. The existing foundations are variable in their depth. The existing bedrock at the site may have been disturbed in the original construction work, perhaps by blasting. Some of the heavily fractured rock encountered in the upper portions of our borings may in fact be "shot rock". The existing bedrock at the site, where relatively intact, has very substantial bearing capacity and good settlement characteristics suitable for support of even dynamic loads with relatively high bearing pressures. Disturbed rock, which may have been displaced in original construction, is less reliable for support of heavy or dynamic foundation loads.

Detailed information is available regarding bearing elevations of foundations in the vicinity of Borings 1, 2 and 3. The following is a discussion of conditions encountered at each boring location and a comparison to conditions encountered in previous explorations at the site.

Boring 1 is located between Footings 101, 102 and 108. These footings reportedly bear at about 4.5 to 5.5 feet below the basement floor elevation. Our boring data shows bedrock at about 2 ½ feet below the basement floor elevation. Recovery and RQD are very low until about 10.5 feet below existing grade, where the rock quality becomes "fair" and the recovery becomes very good. Initial subsurface exploration data from the site performed for earlier construction suggests that the rock elevation in this area is about elevation 82 to 85 feet.

In Boring 2, the boring was augered to a refusal depth of about 7.5 feet (elevation 78.5 feet). The material encountered prior to auger refusal depth was generally fill with some rubble in it. Boring 2 was drilled between foundations 103 and 125. These foundations bear at elevation 76.5 feet, according to as-built drawing data. Initial borings performed for the original construction at the site show a "rock" elevation of 81.4 feet in this area. Since our sampling in this boring was via auger cuttings, there is a possibility that some of the "rubble" encountered in our borings is actually existing bedrock materials sufficiently weak and fractured to allow penetration of our auger drilling equipment.

Boring 3 was drilled near the southeast corner of foundation 104. This foundation has a bearing elevation of 76.5 feet, according to the as-built drawing provided to us. The nearest boring performed for the original construction shows a top of rock elevation of about 79 feet at this location. Core recovery and rock quality in our boring at this location improve below approximately elevation 72.5 feet.

Borings 4 and 5 were drilled near the south wall of the facility. Bedrock at these locations was previously about elevation 89.5, according to the original borings. Our core recoveries at these locations were generally fairly good. Rock quality was generally very poor to approximately elevation 76.7, where it improved to "fair".

Foundation Design

Assignment of bearing pressures to the upper portions of the rock formation at this site is difficult. However, it appears that the existing foundations were excavated to the limit of the apparent "shot rock" zone to more competent rock. The more competent rock at this site clearly has substantial bearing capacity. We recommend that a design bearing pressure of 10,000 psf be utilized for design of the pulverizer foundations bearing upon the competent rock at the site.

This bearing pressure may also be used to analyze the capacity of the existing foundations and determine their capacity to withstand additional loads.

It appears that the existing foundations are bearing upon the competent rock. However, inspection of the existing foundation bearing surfaces is difficult, and the possibility remains that some of the "shot rock" may be present beneath them. Some risk of settlement under the additional loads imposed by the pulverizers remains. We recommend careful observation of the foundations for signs of settlement as part of the inspection process for this project. This includes observation of the condition of the existing structures as well as measurement of displacements that may occur as a result of new loads. If some settlements do occur, they are likely to be minor, as we anticipate that the layer of "shot rock" beneath the existing foundations is very thin, if it is present at all. The foundations can be improved by injecting a grout into the fractures of the rock.

Foundation Construction

The foundation construction at the site will include primarily excavations to attach the pulverizers to the existing foundations. If new foundations are contemplated, they should be excavated to similar elevations as the existing foundations. The condition of the rock exposed in the excavations should be evaluated on a case-by-case basis by TEAM Services. It is possible that not all of the existing foundations are supported on competent rock and that the new foundations would need to be lowered slightly further. This poses the issue that the existing foundation may be undermined in the process. The risks of undermining will need to be evaluated on a case-by-case basis by TEAM Services.

Construction Groundwater Control

Groundwater was encountered in 4 of the 5 borings drilled at this site. The groundwater was encountered at a shallow depth (2 ½ feet below the slab elevation). Groundwater was not encountered in Boring 4. Boring 4 experienced a 100% loss of drilling fluid during coring operations. These findings suggest an irregular and complex groundwater regime beneath the structure. In the course of constructing the foundations for the new pulverizers, it is possible that groundwater may be encountered in the excavations. In normal construction practices, it is typical that groundwater is lowered below the construction grades until the below grade construction can be completed. We believe it probable that excavation of a sump adjacent to the new foundation excavation will provide an adequate means of groundwater control.

Excavations in Bedrock Material

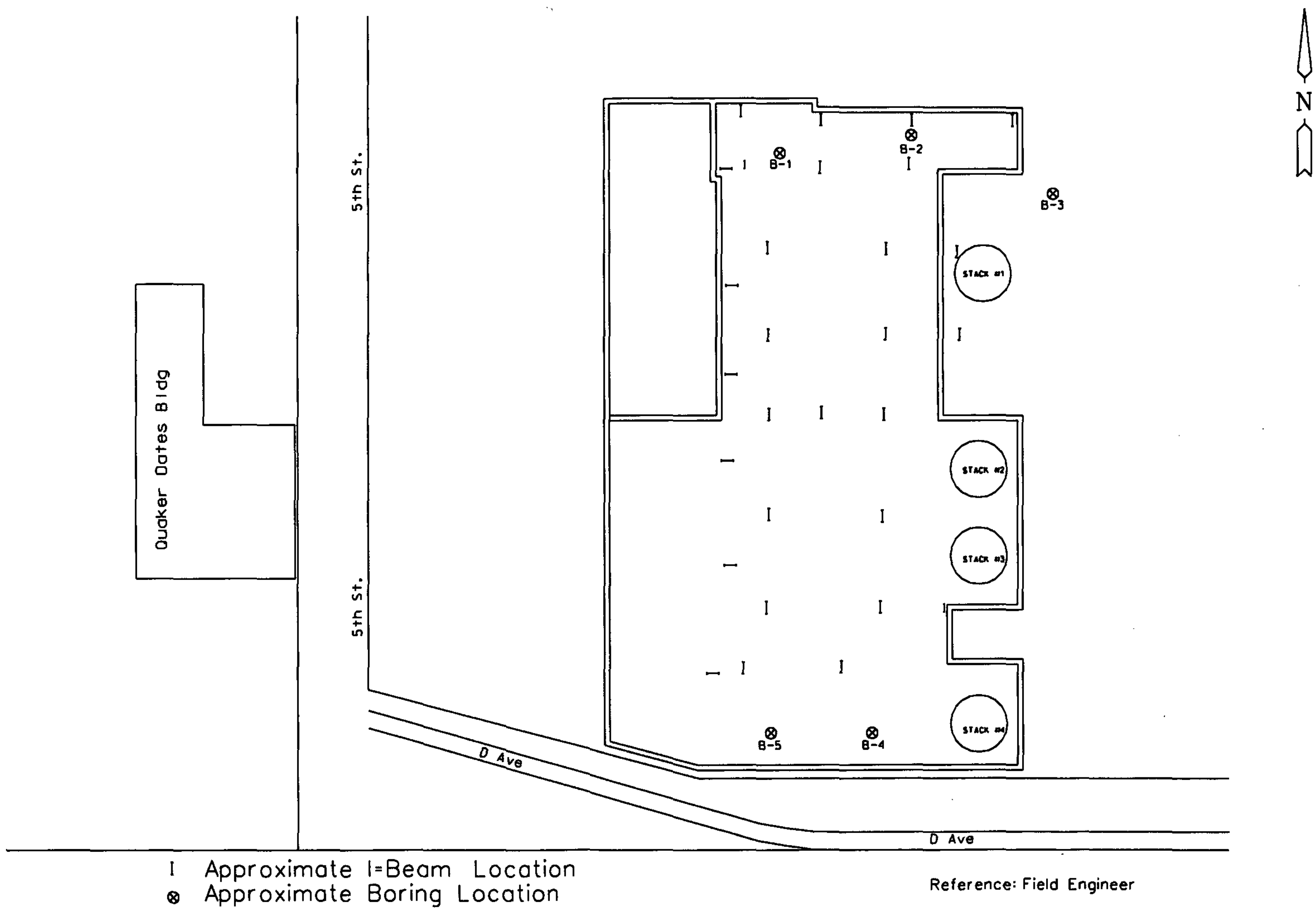
We cored rock at the site with a diamond bit tipped core drill. Normally, coring operations commence in subsurface explorations when auger or bit refusal is encountered. There is usually a strong correlation between the "auger refusal depth" and the limits of the ability of normal earthwork equipment to remove rock on an economical basis. However, in this case, the small drill rig required to access the basement of the power plant has substantially less thrust and torque than drill rigs that we normally use for such work. This puts the typical correlation between the auger refusal depth and earthwork equipment capabilities for rock removal into doubt. In this case, we believe the core recovery percentages provide a somewhat better correlation to machine excavatability than do the auger refusal depths. Based on our boring data, it appears that the rock excavatability differs substantially between the northern borings (B-1, B-2, and B-3) and the southern borings (B-4 and B-5). We estimate that normal excavation techniques are feasible to about 7 to 12 feet in the northern area explored, and only perhaps about 2 feet in the southern borings. Below these depths, it is more likely that pneumatic chipping tools would be needed to excavate the rock. In some cases, pneumatic chipping tools may be needed in some circumstances above these depths, especially where the excavations are more confined and where access restrictions only allow use of very small equipment.

QUALIFICATION OF REPORT

Our evaluation of foundation support conditions has been based on our understanding of the site and project information and the data obtained in our exploration. The general subsurface conditions utilized in our foundation evaluation have been based on interpolation of subsurface data between the borings. In evaluating the boring data, we have examined previous correlations between soil properties and foundation bearing pressures observed in soil conditions similar to those at your site. The discovery of any site or subsurface conditions during construction which deviate from the data outlined in this exploration should be reported to us for our evaluation. The assessment of site environmental conditions or the presence of pollutants in the soil, rock, and groundwater of the site was beyond the scope of this exploration.

It is recommended that the geotechnical engineer be retained to review the plans and specifications so that comments can be provided regarding the interpretation and implementation of the geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observation during the foundation construction phase to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty is provided. In the event that any changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer.



TEAM Services, Inc
333-H S.W. 9th Street
Des Moines, IA 50309

6th Street Pulverizer

Cedar Rapids, Iowa

Boring Plan

Project No. 1-1087

10-07-2002

No Scale

LOG OF BORING NO. 1

OWNER	ARCHITECT/ENGINEER
Iowa Electric Light & Power Company	**Alliant Energy**
SITE **Sixth Street Station,5th Street & D Avenue NE Cedar Rapids, Iowa**	PROJECT **6th Street Pulverizer**

Approx. Surface Elev.: 86.0 ft.

Depth to base (ft.)	Description	Elev. at base (ft.)	Sample Number	Sample Type	Tests / Remarks
1.0	Concrete floor slab	85.0	1	DB	
2.5 ▽	Fill--lean clay, with gravel	83.5	2	AS	
10.5	Highly weathered very poor fractured very fine to medium crystalline DOLOMITE, with microscopic porosity, light gray with light brown staining in joints	75.5	3	DB	REC=43%, RQD=8%
	-- porosity changes to up to 0.5 mm @ about 7.5'		4	DB	REC=40%, RQD=0%
15.5	Weathered fair very fine to medium crystalline DOLOMITE, light gray	70.5	5	DB	REC=95%, RQD=51%
	Bottom of Boring 0.5'W 4'S Column #102				

Blank log columns (no entries): GRAPHIC LOG; USCS SYMBOL; SAMPLES – RECOVERY; SAMPLES – SPT - N BLOWS / FT.; TESTS – MOISTURE, %; TESTS – DRY DENSITY PCF; TESTS – UNCONFINED STRENGTH PSF.

Depth scale marks (ft.): 5, 10, 15

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS			
WL ▽ 2.5'	WD ▼	BORING STARTED	8-27-02
WL		BORING COMPLETED	8-27-02
WL		RIG Rig D-25	FOREMAN TEAM
		APPROVED JCC	JOB # 1-1087

TEAM Services, Inc.

LOG OF BORING NO. 2

OWNER	ARCHITECT/ENGINEER
Iowa Electric Light & Power Company	**Alliant Energy**
SITE **Sixth Street Station,5th Street & D Avenue NE Cedar Rapids, Iowa**	PROJECT **6th Street Pulverizer**

GRAPHIC LOG	DESCRIPTION **Approx. Surface Elev.: 86.0 ft.**	DEPTH (ft.)	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY	SAMPLES: SPT - N BLOWS / FT.	TESTS: MOISTURE, %	TESTS: DRY DENSITY PCF	TESTS: UNCONFINED STRENGTH PSF
	1.0 Concrete floor slab 85.0				HS					
	Fill--rubble, ect ∇			1	AS					
	7.5 78.5	5								
	Auger Refusal @ 7.5' 3'W 12'N Column #103									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS				
WL	∇ 2.5'	WD ▼		
WL				
WL				

TEAM Services, Inc.

BORING STARTED	8-27-02		
BORING COMPLETED	8-27-02		
RIG	Rig D-25	FOREMAN	TEAM
APPROVED	JCC	JOB #	1-1087

LOG OF BORING NO. 3

OWNER	ARCHITECT/ENGINEER
Iowa Electric Light & Power Company	**Alliant Energy**
SITE **Sixth Street Station,5th Street & D Avenue NE Cedar Rapids, Iowa**	PROJECT **6th Street Pulverizer**

Approx. Surface Elev.: 86.0 ft.

Depth (ft.)	DESCRIPTION	Elev.	SAMPLES: NUMBER	SAMPLES: TYPE	RECOVERY	SPT - N BLOWS / FT.	MOISTURE, %	DRY DENSITY PCF	UNCONFINED STRENGTH PSF	
1.0	Concrete floor slab	85.0	1	DB						
6.5	Fill--lean clay, gray and brown mix (water level ∇)	79.5		HS						
10.5	Fill--lean clay, with rock, gray and brown mix	75.5								
	Highly weathered very poor fractured very fine to medium crystalline DOLOMITE, with microscopic porosity, light brown,		2	DB						REC=20% RQD=0%
14.5	-- porosity changes to up to 0.5 cm @ about 14-14.5'	71.5	3	DB						REC=73% RQD=35%
16.5	Weathered fair very fine crystalline DOLOMITE, with microscopic porosity, light gray	69.5								
22.5	Weathered very poor medium crystalline DOLOMITE, light brown -- with porosity up to 2 cm and becomes fair below about 20'	63.5	4	DB						REC=100% RQD=28%
	Bottom of Boring 8'E 0'N Column #104									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS			
WL	∇ 2.5'	WD	▼
WL			
WL			

TEAM Services, Inc.

BORING STARTED	8-28-02		
BORING COMPLETED	8-28-02		
RIG	Rig D-25	FOREMAN	TEAM
APPROVED	JCC	JOB #	1-1087

LOG OF BORING NO. 4

OWNER	ARCHITECT/ENGINEER
Iowa Electric Light & Power Company	**Alliant Energy**
SITE **Sixth Street Station,5th Street & D Avenue NE Cedar Rapids, Iowa**	PROJECT **6th Street Pulverizer**

Approx. Surface Elev.: 86.0 ft.

Depth (ft)	Description	Elev.	Sample No.	Type	Recovery	SPT-N Blows/ft	Moisture, %	Dry Density PCF	Unconfined Strength PSF	Tests
0–1.0	Concrete floor slab	85.0	1	DB						
1.0–1.4	Fill--crushed rock	84.6								
1.4–9.3	Weathered very poor fractured very fine to medium crystalline DOLOMITE, light brown to light gray (∇ water level)	76.7	2	DB						REC=83% RQD=0%
			3	DB						REC=50% RQD=0%
			4	DB						REC=80% RQD=53%
9.3–12.4	Moderately weathered fair medium crystalline DOLOMITE, with small to 2 cm porosity, light gray	73.6								

Bottom of Boring
5'E 10'S Column #2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS		
WL	∇ 2.5	WD $\blacktriangledown$
WL		
WL		

TEAM Services, Inc.

BORING STARTED	8-29-02		
BORING COMPLETED	8-29-02		
RIG	Rig D-25	FOREMAN	TEAM
APPROVED	JCC	JOB #	1-1087

LOG OF BORING NO. 5

OWNER	ARCHITECT/ENGINEER
Iowa Electric Light & Power Company	**Alliant Energy**
SITE **Sixth Street Station,5th Street & D Avenue NE Cedar Rapids, Iowa**	PROJECT **6th Street Pulverizer**

Approx. Surface Elev.: 86.0 ft.

Depth	Description	Elev.	DEPTH (ft.)	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY	SAMPLES: SPT - N BLOWS / FT.	TESTS: MOISTURE, %	TESTS: DRY DENSITY PCF	TESTS: UNCONFINED STRENGTH PSF	
1.0	Concrete floor slab	85.0			1	DB						
1.2	Fill--crushed rock	84.8										
6.2	Weathered very poor fractured very fine to medium crystalline DOLOMITE, light brown to light gray	79.8	5		2	DB						REC=87% RQD=21%

Bottom of Boring
4'E 10'S Column #3

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS			
WL	∇ None	WD	▼
WL			
WL			

TEAM Services, Inc.

BORING STARTED	8-29-02		
BORING COMPLETED	8-29-02		
RIG	Rig D-25	FOREMAN	TEAM
APPROVED	JCC	JOB #	1-1087

UNIFIED SOIL CLASSIFICATION SYSTEM

TEAM Services

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[E]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit – oven dried	< 0.75	OL	Organic clay[K,L,M,N]
			Liquid limit -- not dried			Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay[K,L,M]
			PI plots below "A" line		MH	Elastic silt[K,L,M]
		organic	Liquid Limit -- oven dried	< 0.75	OH	Organic clay[K,L,M,P]
			Liquid Limit -- not dried			Organic silt[K,L,M,O]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

[E]

$$Cu = D_{60}/D_{10} \qquad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

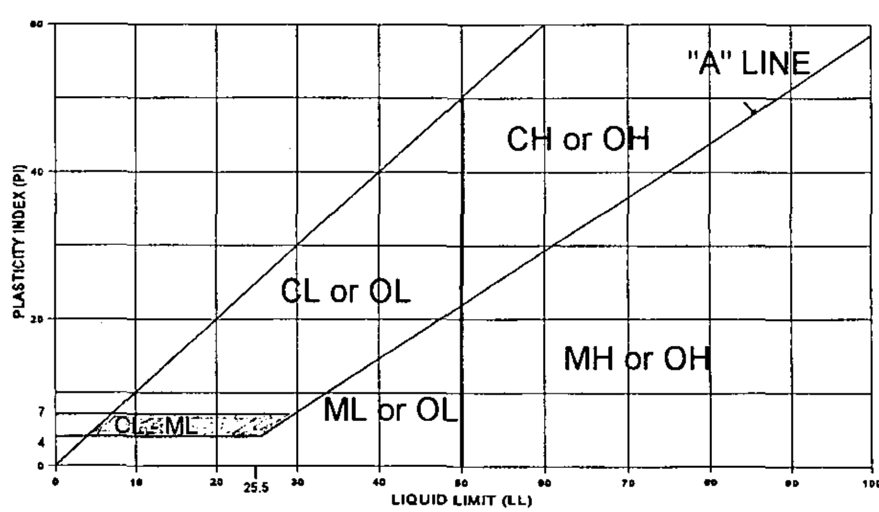
[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[O] PI plots below "A" line.

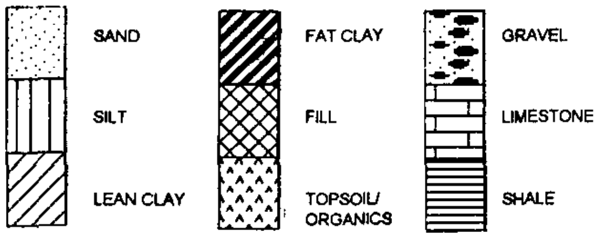
For classification of fine-grained soils and fine-grained fraction of coarse-grained soils.

Equation of "A" Line:
Horizontal at PI = 4 to LL + 25.5.
then PI = 0.73 (LL - 20)



GENERAL NOTES

SOIL and ROCK TYPES



DRILLING & SAMPLING SYMBOLS

SS	Split Spoon - 1 1/2" I.D., 2" O.D., unless otherwise noted
ST	Thin-Walled Tube - 3" O.D., unless otherwise noted
PA	Power Auger
HA	Hand Auger
DB	Diamond Bit - 4", N, B
AS	Auger Sample
HS	Hollow Stem Auger
WS	Wash Sample
RB	Rock Bit
BS	Bulk Sample
DC	Dutch Cone
WB	Wash Bore

CONSISTENCY OF FINE-GRAINED SOILS (major portion passing No. 200 sieve)

Consistency	Unconfined Compressive Strength, Qu, psf	N-Blows/ft* (Approx. Correlation)
Very Soft	< 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,001 - 2,000	5 - 8
Stiff	2,001 - 4,000	9 - 15
Very Stiff	4,001 - 8,000	16 - 30
Hard	8,001 - 16,000	31 - 50
Very Hard	> -16,000	50 +

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N-Blows/ft. *
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	50 - 80
Extremely Dense	80 +

* Standard "N" Penetration Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch OD split spoon, except where noted.

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) (of components also present in sample)	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) (of components also present in sample)	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Size Range
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300 mm to 4.75 mm)
Gravel	3 in. to #4 sieve (75 mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75 mm to 0.075 mm)
Silt or Clay	Passing #200 sieve (0.075 mm)

WATER LEVELS:

▽ Depth groundwater first encountered during drilling

▼ Groundwater level after 24 hours (unless otherwise noted, i.e. "AB" -- after boring)

TERMS DESCRIBING SOIL STRUCTURE

Parting:	paper thin in size
Seam:	1/8" to 3" in thickness
Layer:	greater than 3" in thickness
Ferrous:	containing appreciable quantities of iron
Well-Graded:	having wide range in grain size and substantial amounts of all intermediate sizes.
Poorly-Graded:	predominately one grain size or having a range of sizes with some intermediate sizes missing.
Fissured:	containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical.
Interbedded:	composed of alternate layers of different soil types.
Laminated:	composed of thin layers of varying color and texture.
Slickensided:	having inclined planes of weakness that are slick and glossy in appearance.
NOTE:	Clays possessing slickensided or fissured structure may exhibit lower unconfined strength than indicated above. **Consistency of such soil is interpreted using the unconfined strength along with pocket penetrometer results.**

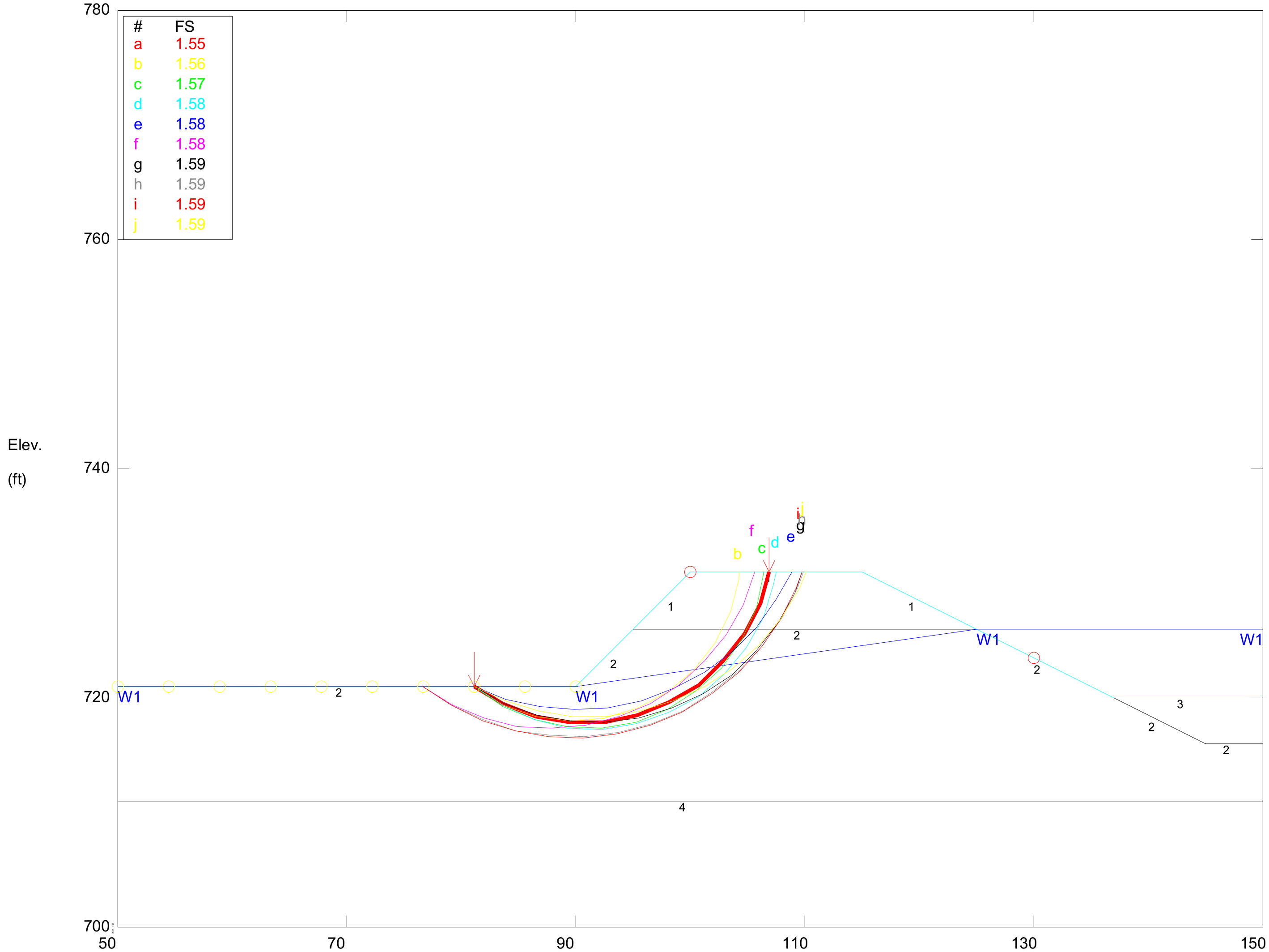
Attachment D

Slope Stability Analyses Results
Ten Most Critical Surfaces Per Analysis
6th Street Generating Station

Source:
Program pcSTABLE5M/si output by Aether dbs, July 31, 2011

Alliant 6th St. Cedar Rapids Pond #4 Static Case

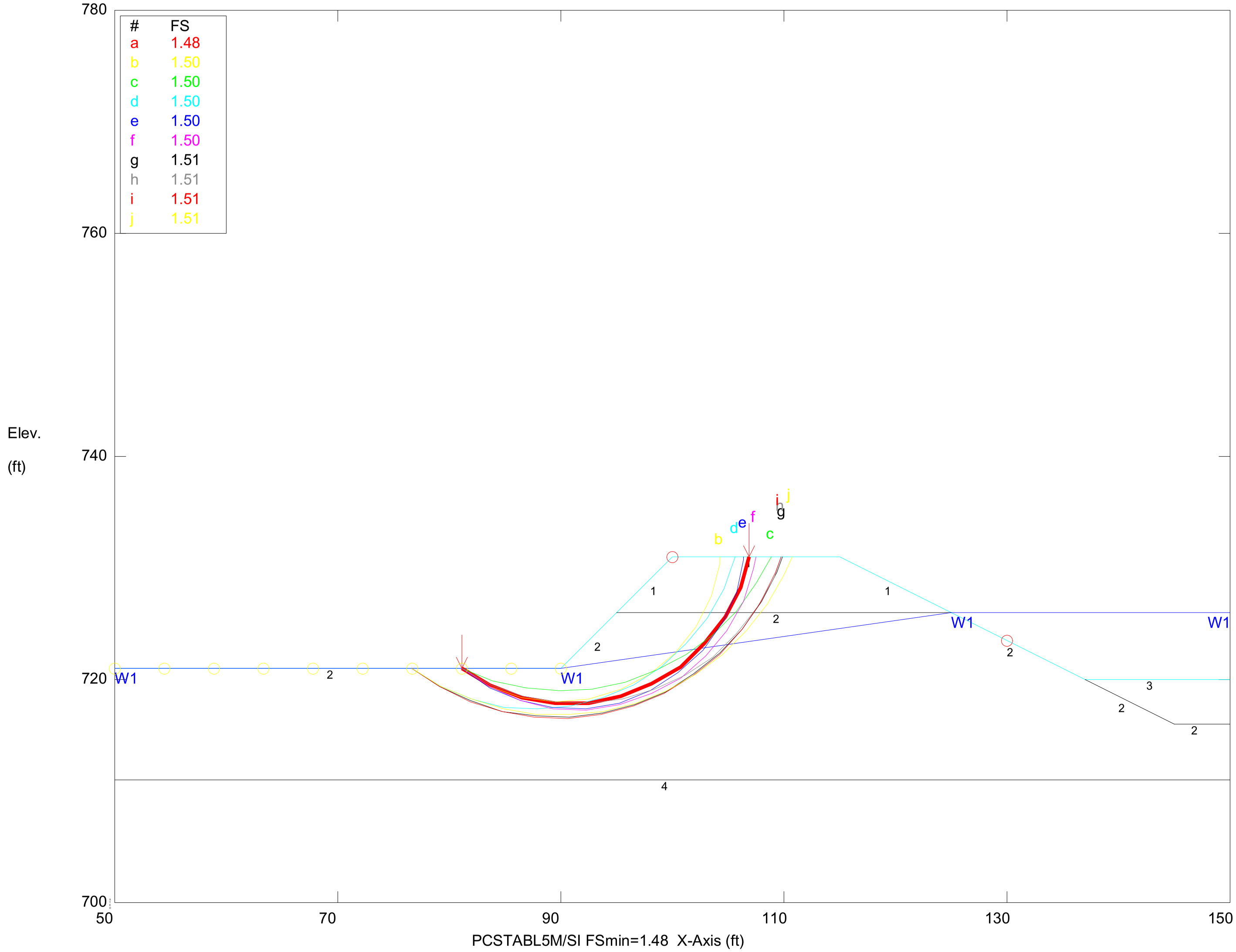
Ten Most Critical. C:6THST11C.PLT By: TCW 08-02-11 11:34am



Soil Type No.	Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	Clay	125	125	500	0	0	0	W1
2	Ash/Slag	120	120	0	28	0	0	W1
3	Ash	115	115	0	25	0	0	W1
4	Sand	125	125	0	32	0	0	W1

Alliant 6th St. Cedar Rapids Pond #4 Earthquake Case (0.024 & 0.016)

Ten Most Critical. C:6THST21C.PLT By: TCW 08-02-11 11:10am



Soil Type No.	Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	Clay	125	125	500	0	0	0	W1
2	Ash/Slag	120	120	0	28	0	0	W1
3	Ash	115	115	0	25	0	0	W1
4	Sand	125	125	0	32	0	0	W1

Attachment E

Program DEQAS-R Input / Output
6th Street Generating Station

Source:
US Army Corps of Engineers 2005 Program

5th Street Generating Station, Cedar Rapids, IA
Project Number 154.015.001 - Ash Pond Stability
TCW 7/31/2011

Program DEQAS-R Input / Output

Site Parameters

Project/Site Name	6th Street
Longitude (deg)	-91.66
Latitude (deg)	41.99
Dist. to Source (km)	400
Select the Site Class	Site Class Guidance
○ A ○ B ○ C	● D ○ E ○ F
Cancel	Done

Effective Peak Ground Acceleration

Return Period (years)	EPGA (g)	PGA (g)
144	0.0096	0.0062
475	0.0235	0.0156
950	0.0357	0.0241
2475	0.0596	0.0410
5000	0.0851	0.0601

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Appendix C

Documents Provided for Review -
Surface Pond Visual Inspection, March 2009

CONFIDENTIAL BUSINESS INFORMATION

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Sixth Street Generating Station	Friday, March 06, 2009	Ash Pond #1
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny/Cloudy Day	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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		Yes
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	

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Sixth Street Generating Station	Friday, March 06, 2009	Ash Pond #2
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny/Cloudy Day	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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		Yes
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:
Sixth Street Generating Station	Friday, March 06, 2009	Ash Pond #3
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny/Cloudy Day	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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		Yes
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	

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Sixth Street Generating Station	Friday, March 06, 2009	Ash Pond #4
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Bill Skalitzky, Bielka Liriano, and Buddy Hasten	Sunny/Cloudy Day	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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	

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Appendix C

Documents Provided for Review -
Surface Pond Visual Inspection, April 2010

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Sixth Street Generating Station	Wednesday, April 21, 2010	Ash Pond #1
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Barry Richmond, Jenna Wischmeyer	Sunny	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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		Yes
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: Sixth Street Generating Station	DATE COMPLETED: Wednesday, April 21, 2010	LIST POND INSPECTED: Ash Pond #2
INSPECTOR(S): List Below Barry Richmond, Jenna Wischmeyer	WEATHER CONDITIONS: Describe Weather Conditions Sunny	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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		Yes
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	

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME: Sixth Street Generating Station	**DATE COMPLETED:** Wednesday, April 21, 2010	**LIST POND INSPECTED:** Ash Pond #3
INSPECTOR(S): List Below Barry Richmond, Jenna Wischmeyer	**WEATHER CONDITIONS: Describe Weather Conditions** Sunny	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	**SIGNATORY REVIEW:**	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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		Yes
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	

ALLIANT ENERGY SURFACE POND VISUAL INSPECTION

PLANT NAME:	DATE COMPLETED:	LIST POND INSPECTED:
Sixth Street Generating Station	Wednesday, April 21, 2010	Ash Pond #4
INSPECTOR(S): List Below	WEATHER CONDITIONS: Describe Weather Conditions	
Barry Richmond, Jenna Wischmeyer	Sunny	
PLANT MANAGEMENT REVIEW(if applicable): Spell Name	SIGNATORY REVIEW:	
Plant Manager: Troy Booth		
E&S Specialist: Barry Richmond		

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		Yes
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		Yes
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	

Appendix C

Documents Provided for Review -
Evaluation of pH Excursions in NPDES Regulated Effluent

CONFIDENTIAL BUSINESS INFORMATION

EVALUATION OF pH EXCURSIONS IN NPDES REGULATED EFFLUENT

Sixth Street Power Station
Cedar Rapids, Iowa

Montgomery Watson Project No. 1217622

Prepared For:

Alliant Energy

Prepared By:

Montgomery Watson
2100 Corporate Drive
Addison, Illinois 60101

September 1999

MONTGOMERY WATSON

EVALUATION OF pH EXCURSIONS IN NPDES REGULATED EFFLUENT
Alliant Energy
Sixth Street Power Station
Cedar Rapids, Iowa

INTRODUCTION

Montgomery Watson was retained by Alliant Energy (Alliant) to investigate pH excursions in the final NPDES regulated wastewater effluent at their Sixth Street Power Station in Cedar Rapids, Iowa. It is Montgomery Watson's understanding that the facility has been experiencing pH excursions dating back to 1992. Alliant solicited expert advice from Dr. Kent Johnson in 1992 regarding these excursions. Based on a limited study conducted by Dr. Johnson, he concluded that the cause for these pH excursions was the algae in the man made lake, and in the four settling ponds the facility uses for solids removal (Attachment A). More recently, Alliant conducted a pilot pH adjustment study employing CO_2 as the adjustment chemical. Results from this pilot study indicated some pH adjustment using CO_2. Prior to implementing this pH adjustment technology on a full scale, Alliant wanted an external consultant to evaluate the conditions of the four ponds in an effort to determine the cause(s) of the pH excursions and recommendations on how to remedy the NPDES pH violations periodically experienced by the facility. Montgomery Watson was retained by Alliant to provide the following consulting services:

- Conduct a one day site visit of the facility to discuss with Alliant personnel the possible course of action.
- Conduct a two day study to gather pertinent pH, DO and profile (depth) data for each of the four settling ponds.
- Prepare a technical memorandum highlighting the study findings.
- Prepare a detailed report discussing the study objectives, methods, findings and recommendations. This report also provides a summary of cost estimates for different recommendations.

Mr. Srinivas Devulapalli and Mr. Mike Geringer of Montgomery Watson visited the facility on August 12, 1999 to observe the four settling ponds, Cedar Lake, and to review with Alliant personnel the project objectives. Subsequently, Montgomery Watson conducted a two day study of the four settling ponds on August 19 and 20, 1999 to obtain pertinent pH, DO, algae count and profile data. Montgomery Watson prepared a brief technical memorandum on August 31, 1999 highlighting the key findings of the evaluation.

This report serves to discuss the two-day study objectives, findings and recommendations and provides a summary of cost estimates for different recommendations.

WASTEWATER GENERATION AND pH EXCURSIONS

The facility is located in Cedar Rapids, Iowa, adjacent to Cedar Lake. Cedar Lake is a fairly large man made lake serving as a source of fresh water for the facility. The facility is a thermal co-generation facility generating steam and electricity. Cooling water for the boilers is obtained from Cedar Lake. Approximately 150 million gallons a day of fresh water is drawn from the lake by the facility. The facility generates two major wastewater streams, referred to as the bilge and sluice wastewater, that get directed to the settling ponds. Their combined flow is 1 million gallons a day. The bilge wastewater is fairly clean. The sluice wastewater is laden with suspended solids. The combined flow is routed through a series of four settling ponds to settle suspended solids. The effluent from the fourth pond is discharged under a NPDES permit to wetlands that drain to Cedar Lake.

The facility's NPDES regulated discharge to the wetlands has been experiencing excursions of pH since 1992. The effluent pH limits established in the NPDES permit are 6 and 9. Dr. Johnson' s brief study suggested algae activity in the lake and in the ponds as the cause for these excursions. Alliant conducted an internal pH survey, between July 7 and August 2, 1999 of the wastewater in the four ponds, the fresh water intake from the lake and the discharge from Pond #4 to obtain a better picture of these excursions (Attachment B). A review of this pH data suggests a fairly strong diurnal fluctuation of pH in Ponds #2 and 3. Such a consistent diurnal fluctuation in wastewater pH from surface water bodies is typically consistent with algae activity in these ponds. Fresh water intake from the lake had a pH between 7.50 and 8.56 during the day and between 8.22 and 9.47 during the evening. This pH data suggested that the lake water was also experiencing a diurnal pH fluctuation.

Montgomery Watson suspected that the diurnal fluctuation in the pH was caused by algae activity. However, there may be other contributions to the pH increase in the effluent from Pond #4 such as the settled solids in the four ponds. In order to obtain a better glimpse at the pH in these ponds, Montgomery Watson recommended conducting a two-day study to gather pertinent data.

WASTEWATER STUDY OBJECTIVES AND METHODS

Montgomery Watson conducted a two day study on August 19 and 20, 1999 to obtain the following analytical data:

1. pH and temperature across the horizontal and vertical cross-section of each of the four settling ponds.

2. Dissolved Oxygen (DO) across the vertical cross-section of each of the four settling ponds.

3. The pH of the sediment at the bottom of each of the four settling ponds.

4. Collection and analysis of a limited set of representative samples from each pond to determine the algae population, nitrogen and phosphorous concentrations.

5. Review pH adjustment systems, if necessary and provide a brief cost estimate for each recommended system.

Pond #1 was out of service and was being dredged during the entire study period. Therefore, Montgomery Watson could only obtain data for the remaining three ponds and the effluent from Pond #4. Attachment C illustrates the various sampling locations in each of the ponds. Access to each of these locations was by boat. Montgomery Watson prepared a site specific health and safety plan for the planned field activities to ensure the safety of personnel. Data was obtained from six sampling locations in Pond #2, seventeen sampling locations in Pond #3 and sixteen sampling locations in Pond #4. In addition to these sampling locations, the effluent pH of Pond #4 was also monitored during this sampling period. Standard pH, DO and temperature probes and meters were used for this study.

Montgomery Watson also obtained three representative samples from each pond to determine the algae populations. Samples for nitrates and phosphates analysis were also obtained from each pond. The samples were collected three feet below the water surface. The University Hygenic Laboratory was used to analyze samples for algae, nitrogen and phosphorous.

STUDY RESULTS

Wastewater pH, DO and temperature data was obtained from vertical and horizontal cross-section of each pond. Tables 1, 2 and 3 illustrate the pH, DO and temperature profiles across the vertical cross-section of each pond (Attachment D). Table 4 is a summary of algae population and nutrient data for each of the three settling ponds and may also be found in Attachment D. Attachment E illustrates the overall surface configurations of the ponds. The data from each pond suggests that these ponds behave very similar to facultative ponds. In brief, a facultative pond has an average water depth of 8 feet and has distinct aerobic and anaerobic degradation zones. The DO in these ponds decreases with increasing depth and approaches < 1 mg/L at the sediment-water interface. Aerobes and algae therefore thrive in the upper 3 feet where the DO is abundant. The algae tend to cause an increase in pH in such ponds by depleting the CO_2 in these ponds. There is a distinct gradient in the DO profile along the depth of each settling pond at the Sixth Street Power Station. For example, at sampling location #4 in Pond #3, the DO varies between 6.4 mg/L at a wastewater depth of 2 feet below the surface, to a DO of 1.6 mg/L at a wastewater depth of 8.7 feet below the water surface. In most cases, the DO does not reach 1 mg/L due to the lack of any significant biodegradation activity at the bottom of the lake.

Pond #2 is approximately rectangular in shape and measures approximately 150 feet by 115 feet horizontally with an average water depth of 11 feet. The pH of the wastewater in Pond #2 did not change significantly with water depth or horizontal location. The pH in

Pond #2 ranged from 7.6 to 8.6. Sediment pH was in the range of 8.4 and 9.2 indicating an insignificant pH contribution from the sediment to the body of the pond. The DO in Pond #2 varied between 5.6 and 7.3 at a water depth of 2 feet below the water surface to between 4.3 and 5.3 at a water depth of approximately 12 feet. The water temperature of Pond #2 did not vary much and was typically in the range of 83.3 and 88.3 degrees F. Three samples, each collected at an average water depth of 3 feet below the water surface were analyzed for algae population. The algae population in Pond #2 was between 70,000 and 83,000 cells/mL. The inorganic nitrogen level in Pond #2 was approximately 0.4 mg/L and the organic nitrogen level was 1.6 mg/L. Total phosphate (P) was 0.5 mg/L.

Pond #3 is an irregular shaped pond with the longest horizontal dimension of 571 feet. The average water depth of Pond #3 is approximately 8.6 feet. The pH of the wastewater in Pond #3 revealed a limited relationship with water depth or horizontal location. The pH of the wastewater in Pond #3 was between 6.9 and 9.3. Most of the pH observations recorded at approximately 9 were at a water depth of 2 feet below the water surface. The DO in Pond #3 varied between 5.2 and 12.7 mg/L at a water depth of 2 feet below the water surface to a DO between 1.6 and 7 mg/L at an average water depth of 8.6 feet. Sediment pH was between 8.4 and 9.3. Wastewater temperature of Pond #2 did not vary much and was typically between 72.1 and 78.1 degrees F. The algae population in Pond #3 was between 105,000 and 130,000 cells/mL. The inorganic nitrogen level in Pond #3 was <0.1 mg/L and the organic nitrogen level was 1.4 mg/L. Total phosphate (P) was 0.5 mg/L.

Pond #4 is an irregular shaped pond with the longest horizontal dimension of 528 feet. The average water depth of Pond #4 is approximately 8.4 feet. The pH of the wastewater in Pond #4 did not change significantly with horizontal location. Wastewater pH revealed a tendency to be lower with increasing water depth. Typically wastewater pH was between 8.7 and 8.8 at 2 feet below the water surface and between 7.1 and 7.9 at an average water depth of 8.4 feet. Sediment pH was between 8 and 8.8. The DO in Pond #4 varied between 6.2 and 8.5 at a water depth of 2 feet below the water surface. The DO at an average water depth of 8.4 feet was between 2.1 and 5.5. Wastewater temperature did not vary much and was between 73.4 and 75.02 degrees F. The algae population in Pond #4 was relatively insignificant, <= 1,000 cells/mL. The inorganic nitrogen level in Pond #4 was <0.1 mg/L and the organic nitrogen level was 1.5 mg/L. Total phosphate (P) was 0.6 mg/L.

The pH of Pond #4 effluent was between 6.1 and 7.9, and was within the NPDES permit limits of 6 and 9.

DISCUSSION

Data collected between July 7 and August 2, 1999 and on August 19 and 20, 1999 suggests high-level algae activity in Ponds #2 and #3. Algae bloom by photosynthetic activity during the daytime. Photosynthetic activity involves the assimilation of CO_2 in the presence of sunlight. Because light penetration decreases with increasing depth, algae activity is confined only to the upper 3 to 4 feet of each pond. The following equation best describes algae photosynthetic activity:

$CO_2 + 2H_2O$ --------(Light)-> CH_2O (New Algae Cells) + $O_2 + H_2O$

Aerobic photoautotrophs such as blue-green algae fix CO_2 into organic matter generating oxygen. This in brief is the carbon-oxygen cycle in the aerobic zone of the ponds. This phenomenon explains the elevated DO levels at the 2 feet zone in Ponds #2, #3 and #4. Because algae utilize CO_2, this can lead to high pH conditions in Ponds with low alkalinity (Metcalf & Eddy, 1994). In the nighttime, algae are involved in respiration generating CO_2. This phenomenon is best described by the following equation:

$CH_2O + O_2$ -----→ $CO_2 + H_2O$

Metcalf & Eddy also suggest that in many facultative ponds, algae obtain their carbon source from bicarbonate ion. When the bicarbonate ion is used as the carbon source, high diurnal fluctuations in pH are observed.

A review of the pH data on bilge and sluice wastewater revealed 0.5-pH units increase compared to the pH of the raw intake water. However, Montgomery Watson believes that this differential may not be significant enough to influence the pH of the wastewater in the settling ponds. The sediment pH in all of three ponds was not at elevated pH levels above 10 to suggest any influence on the water in each of the ponds. Data collected during July 7 and August 2, 1999 reveals a strong diurnal pH fluctuation in the fresh water intake from Cedar Lake suggesting high-level algae activity in the eutrophic lake.

Montgomery Watson is of the opinion that the pH excursions in the NPDES regulated effluent from Pond #4 are caused by algae activity. It is difficult to predict the behavior of Pond #1 because it was out of service during the two-day study period. However, it is conceivable that Pond #1 accounts for a major portion of solids settlement. There may still be considerable algae activity in the upper 3 to 4 feet of this pond. Pond #2 has a high level of algae activity. The algae bloom in this pond due to a high photosynthetic rate. Utilization of dissolved CO_2 and bicarbonate ion in photosynthetic activity depletes the acidity and buffering capacity of the pond, which in-turn results in an increase in the pond water pH. The high pH of the pond wastewater and the negligible photosynthetic activity during nighttime result in an increased CO_2 dissolution rate, consequently lowering the pond wastewater pH by daytime. This diurnal fluctuation in pH is cyclical and continuous. Pond #3 behaves similar to Pond #2 with increased algae levels. The algae population in Pond #3 is approximately 50 to 90% greater than the algae population in Pond #2. This increased algae bloom can be due to a spillover of algae from Pond #2, higher photosynthetic rate, as well as a different algae strain.
Water in Pond #4 does not exhibit a marked diurnal fluctuation in pH. There could be a variety of reasons for this including lower rate of sunlight penetration, and a lack of bicarbonate ions in water. It must be noted that the effluent from Pond #4 on August 19, 1999 was within the NPDES effluent discharge limits of 6 and 9.

RECOMMENDATIONS

The following pH control remedies are presented for your review and consideration. Although algae appears to be the main contributor to the effluent pH excursions, pH control measures, in addition to algae control, may also be prudent to prevent future NPDES violations.

Algae Control

Montgomery Watson recommends that Alliant consider methods to reduce/control the algae bloom in the ponds as the first step in achieving compliance with the NPDES effluent pH limits. Most algae control methods employ fairly cost-effective treatment technologies and require lower capital costs. Controlling algae in Cedar Lake is an option, but may prove to be expensive owing to the size of the lake. However, by controlling the algae in the ponds, there may sufficient bicarbonate ion and dissolved CO_2 in each of the ponds to neutralize the effluent from the facility. This theory can only be tested by implementing the following outlined algae control.

The pond waters may be suitably colored with a U.S.E.P.A. approved dye to reduce the amount photosynthetic activity. Specific dyes such as Aquashade[R] block out specific sunlight rays critical for photosynthesis. This results in a lower rate for algae bloom and increases the dissolved CO_2 and bicarbonate ion concentrations in the ponds. The dyes typically create an aesthetic blue color to the pond waters. Typically one gallon of the dye concentrate will cover one acre of a pond with an average depth of 4 feet. The maintenance dosage for Aquashade[R] is 1-gallon/acre (4 feet depth)/month. Another widely used algae control chemical is Microbe Lift IND[R]. This chemical removes nutrients necessary for algae bloom from wastewater and generates cellular byproducts which retard the growth of algae. Microbe Lift IND[R] has to be intensively applied for the first 4 weeks (up to 15-gallons/million gallons/week) followed by a maintenance dosage of 2-gallons/million gallons/week. The two algae control chemicals can be easily applied using a portable chemical feed system consisting of a feed solution storage vessel and a feed pump. The selected chemical will be pumped into each of the four settling ponds regularly at the prescribed maintenance dosage rate. These dosage rates may be optimized during the initial few months of the algae control process.

CO_2 Control

The facility has conducted a pilot study to adjust the wastewater pH using CO_2. CO_2 can be used to adjust water or wastewater pH provided the adjustment location is carefully selected. Alliant was considering adjusting the pH in-line prior to discharging the wastewater to Pond #1. In this case, CO_2 will adjust wastewater pH in what is commonly referred to as a closed system, where there are no external forces such as atmospheric gas dissolution rates affecting the pH adjustment process. Wastewater will reach a pH of approximately 6.5, where the CO_2 dissolution rate will equal the CO_2 stripping rate. Further addition of CO_2 will not lower the wastewater pH any further. Once this pH-adjusted wastewater is added to the ponds, several situations can unfold. The CO_2 and carbonate rich wastewater may serve as an excellent carbon source during algae photosynthetic activity, further developing the algae bloom. Also, some of the dissolved CO_2 will tend to escape to the atmosphere on entering an open system. Should the facility consider CO_2 for pH adjustment, Montgomery Watson recommends that the facility treat the final effluent from Pond #4.

Table 5. CO_2 Injection Location
Alliant Energy, Sixth Street Power Station, Cedar Rapids, Iowa

Comparison	Upstream of Pond #1	Downstream of Pond #4
Adjustment of pH	Closed system. Adjustment will be faster in pipe. Once wastewater enters the ponds, the excess CO_2 will escape either by stripping or will be consumed by algae	Open system. Adjustment of pH will be similar to that achieved in laboratory bench-scale testing. Will not be pumping excess CO_2 for algae consumption
Equipment Maintenance	Most of the equipment will not be enclosed, except for sparger system and other miscellaneous items.	All of the equipment will be open to the elements of weather.
Control Over Final Effluent pH	No direct control on final effluent pH. Dependent on several factors such as stripping rates, algae consumption rates, etc. Can only estimate and optimize based on collected data.	Direct control on final effluent pH. System can be designed to achieve a certain set pH using local pH controllers or PLC based controllers. Will provide remote alarm system to operator at the facility indicating a pH excursion event.

Acid Control

Pond #4 final effluent may also be pH-adjusted employing traditional pH adjustment techniques such as sulfuric acid or phosphoric acid addition. A typical acid addition system will consist of a reaction vessel (conical bottom tank) with a automatic pH adjustment system. Pond #4 will be partitioned to create a final effluent lift station within the pond. Wastewater from Pond #4 will be pumped to the reaction vessel (approx. 20,000 gallons capacity). Here, the wastewater will be completely mixed by a rapid speed mixer. The pH of the wastewater in the reaction vessel will be detected by a pH probe, which will convey the measurement to a pH controller. The pH controller will then activate an acid dosing metering pumps to pump acid from an acid storage tank. Once a target pH of 7 or 7.5 has been achieved, the controller deactivates the acid dosing pumps. Because this will be a continuous system, wastewater retention time will also play a key role in designing such a system. Effluent from the reaction vessel may be discharged to the wetlands.

Based on costs associated with the various options, previous studies and permits obtained by Alliant, Montgomery Watson recommends algae control and pH adjustment with CO_2 as the remedy for the NPDES violation. Algae control will restrict the amount of photosynthetic activity in the ponds and restore equilibrium dissolved CO_2 concentration in the ponds. This may result in a lower CO_2 usage overall to adjust the wastewater pH.

COST ESTIMATES FOR RECOMMENDED TREATMENT OPTIONS

Montgomery Watson has developed the following summary of cost estimates for the above recommended treatment options. These costs are budgetary estimates.

Table 6. Budgetary Cost Estimates for Wastewater Treatment Options
Alliant Energy, Sixth Street Power Station, Cedar Rapids, Iowa

Wastewater Treatment Option	Treatment Option Details	Budgetary Capital Expenditure
Algae Control (Aquashade[R])	Addition of a pond shading agent to reduce photosynthetic activity	$75,000[1]
Algae Control (Microbe Lift IND[R])	Addition of a pond nutrient limiting agent to reduce algae bloom via nutrient reduction	$75,000[1]
Wastewater/Water pH Adjustment Employing Traditional Acid Addition	Adjust pH by adding suitable acid. System consists of the following equipment: • Reaction Vessel • Rapid Speed Mixer • A pH Probe and Controller • Acid Dosing Metering Pumps (30 to 50 GPH) • Insulated Acid Storage Tank • Lift Station for Wastewater in Pond #4 • Appropriate insulated piping and electrical connections • Foundations for Acid Storage and Reaction Tank • Containment Structure for System	$450,000[2]
Wastewater/Water pH Adjustment Employing CO_2	Adjust pH by adding CO_2. System consists of the following equipment: • Liquid CO_2 Storage and Addition System • Converter to convert liquid CO_2 into gas phase • Sparging system to inject CO_2	$350,000

Notes:
1: Cost includes regulatory permit application submittal and interaction process, procurement of chemical feed system and chemicals for two applications. Costs also include design and consulting fee.
2: Cost includes design and consulting fee, regulatory permit to install application and interaction process, procurement and installation of specified equipment and initial acid consignment for system. Costs also include start-up and optimization of system.

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Iowa Electric Light and Power Company

November 20, 1992
FG-92-337

Mr. Steve Williams
Waste Water Section
Iowa Department of Natural Resources
Wallace State Office Building
900 E. Grand Avenue
Des Moines, IA 50319

Re: Sixth Street Station, NPDES Permit # 57-15-1-09
Subj: Ash Pond Effluent Outfall 002; pH Evaluation

Attach: Dr. Kent Johnson Report and Supporting Tables

Dear Mr. Williams:

Please find attached documentation which addresses a recent study performed at Iowa Electric's Sixth Street ash ponds. As I mentioned to you over the phone on Nov. 18, 1992, Iowa Electric initiated the study to determine what causal factors are contributing to the pH excursions which are routinely being seen in the ash ponds and in the Cedar Lake during warm seasonal periods. Based on Dr. Johnson's findings, Iowa Electric would like to request that this information be evaluated and considered during the current Sixth Street NPDES Permit renewal process.

As outlined in Dr. Johnson's report, results suggest that sufficient phtosynthetic activity exists within the ash pond system to contribute the majority of the pH increase. Additionally, the high hydraulic retention times of the ash ponds (>5 days), the clarity of the water and the eutrophic state of the Cedar Lake source water, all contribute to the algal productivity of the ash ponds. I have also attached supporting data tables which indicate pH excursions above 8.7 are not uncommon within Cedar Lake, as found in previous Cedar Lake water monitoring studies performed by Dr. Johnson.

We appreciate your department's consideration to this matter. If you have any questions regarding the studies performed, or would like to discuss this matter in general, slease feel free to contact me at (319) 398-4476.

Sincerely,

Alan Arnold
Chemical Engineer, Fossil Division

J. KENT JOHNSON, Ph.D.
Environmental Consultant
P.O. Box 360
North Liberty, IA 52317
(319) 331-0603

October 29, 1992

Mr. Alan J. Arnold
Fossil Generation
Iowa Electric Light and Power CO.
P.O. Box 351
Cedar Rapids, Iowa 51406-0351

Dear Alan:

As you requested in our meeting of October 23, 1992, I have completed a review of the ash pond pH data as reported by Sixth Street Power Station personnel. This review was to identify the causal factors that produce the elevated pH (>9.0) in ash pond discharge, (outfall 002).

I indicated in my letter of September 11, 1992, that I suspected in-situ photosynthetic activity as being a possible cause of the increase in pH as the sluicing water travels through the series of ash ponds. On October 8th and 22nd, I conducted additional samplings of each of the cells in the ash pond series. The parameters of pH, CO_2, alkalinity, hardness, temperature and dissolved oxygen were evaluated for these samples. The results of these analyses strongly suggest that sufficient photosynthetic activity exists in the final two cells to contribute to the majority of the pH increase. Additionally, the high hydraulic retention times (>5 days) of the cells, the clarity of the water and the eutrophic state of the Cedar Lake source water, all contribute to the algal productivity of the ash ponds.

The most effective method of resolving this question is to conduct a diurnal study during the Spring or Summer of 1993. Under algal "bloom" conditions the above parameters will vary greatly during a 24 hour period. This study could be incorporated into the 24 hour study that will be conducted in 1993 Cedar Lake Water Quality Study. The additional costs for this study would be minimum.

Please notify me when the Sixth Street personnel observe pH excursions above 9.0. If you have any additional questions, please give me a call.

Sincerely,

J. Kent Johnson

Table 1--Cedar Lake Water Quality Study--June 28, 1983

Water Quality Analysis	Top A	Bottom A	Top B	Top C	Bottom C	Top D	Bottom D	Top E	Top F	Top G	Top H	Bottom H
Temperature (°C)	26	26	26	23	23	27	27	30	25	24		
Turbidity (NTU)	25	25	20	15	20	30	30	20	20	75		
Color (Std. Unit)	40	40	40	35	40	35	35	40	40	30		
Dissolved Oxygen (mg/L)	7.6	7.2	7.0	4.2	1.4	6.4	5.8	5.0	8.6	6.8		
CO_2 (mg/L)	4.5	4.5	4.5	6.8	11.0		4.5	6.8	2.3	4.5		
Total Alkalinity (mg/L)	104	106	98	86	92		118	102	128	186		
pH	8.0	8.0	8.0	7.5	6.5	8.2	8.2	7.7	7.8	8.1		
Hardness Series (mg/L) -- Total	148	150	156	122	120		186	158	176	268		
Hardness Series (mg/L) -- Ca^{++}	104	102	112	88	94		124	96	120	192		
Phosphate Series (mg/L) -- Total	0.23	0.23	0.22	0.35	0.40	0.28	0.26	0.23	0.21	0.23		
Phosphate Series (mg/L) -- Ortho	0.08	0.08	0.07	0.18	0.20	0.14	0.15	0.09	0.09	0.08		
Ammonia-N (mg/L)	0.12	0.12	0.13	0.08	0.18	0.19	0.18	0.42	0.43	0.17		
Nitrate-N (mg/L)	0.66	0.62	0.46	0.80			0.48	0.65	0.91	11.0		
COD (mg/L)	47	58	38	29	36	39	39	43		15		
Iron - Total (mg/L)	1.58	1.92	1.87	1.35	1.43	1.91	1.72	1.95	1.43	0.59		

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Table 2--Cedar Lake Water Quality Study--August 31, 1983

Water Quality Analysis	Top A	Bottom A	Top B	Top C	Bottom C	Top D	Bottom D	Top E	Top F	Top G	Top H	Bottom H
Temperature (^oC)	29.3	27.3	29.5	30.5	30	29	28.5	31.5	27.8	26	28	28
Turbidity (NTU)	52	54	52	52	52	50	56	54	56	48	48	48
Solids Series - TSS (mg/L)	24	12	36	20	36	32	36	36	48	16	28	28
Dissolved Oxygen (mg/L)	14.2	7.8	13.8	10.5	9.9	10.6	9.2	9.0	12.4	11.6	13.2	10.4
CO_2 (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
Alkalinity (mg/L) -- Pheno	10	10	18	14	0	14	10	8	14	8	12	12
-- Total	84	102	88	98	98	96	98	98	98	96	94	94
pH	9.3	8.7	9.2	8.9		8.9	8.7	8.9	9.1	8.7	9.0	9.0
Hardness Series (mg/L) -- Total	120	86	80	90	106	88	78	78	80	80	76	76
-- Ca^{++}	46	54	44	46	48	52	50	46	52	36	44	44
Phosphate Series (mg/L) -- Total	0.26	0.28	0.48	0.48	0.29	0.30	0.29	0.29	0.29	0.30	0.29	0.29
-- Ortho	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.04	0.06	0.05
Ammonia-N (mg/L)	0.03	0.02	0.03	0.01	0.02	0.03	0.02	<0.01	<0.01	0.01	<0.01	
Nitrate-N (mg/L)	0.50	0.58	0.77	0.84	0.74	0.73	1.00	1.10	1.30	3.50	1.20	
Iron - Total (mg/L)	1.20	1.23	1.18	0.80	0.94	1.09	1.18	1.15	1.30	1.29	1.05	1.07
Grease and Oils (mg/L)	<5		<5					<5			< 5	
COD (mg/L)	50	52	63	50	37	55	32	25	45	19	43	41
BOD_5 (mg/L)	13.5	12.5	14.0	14.1	10.8	13.4	13.2	12.6	12.4	8.8	12.6	10.5

Table 4--Cedar Lake Water Quality Study--October 28, 1983

Water Quality Analysis	Top A	Bottom A	Top B	Top C	Bottom C	Top D	Bottom D	Top E	Top F	Top G	Top H	B[illegible] H
Temperature (°C)	11.7	11.3	11.7	11.8	11.9	12.7	12.2	14.9	11.6	9.5	11.3	
Turbidity (NTU)	20	20	22	18	14	22	24	22	28	52	22	22
Solids Series (mg/L) -- TDS	388		386	364		374		404	368	574	480	
-- TSS	26		30	26		30		36	40	140	32	
-- VSS	26		30	26		28		26	26	32	24	
-- FSS	0		0	0		2		10	14	108	8	
Dissolved Oxygen (mg/L)	11.4	11.0	11.4	9.4	5.2	10.0	9.4	8.8	9.1	10.0	11.4	11.5
CO_2 (mg/L)	0	0	0	2	3	0	0	1	1	1	0	0
Total Alkalinity (mg/L)	140	140	140	130	134	136	134	138	132	208	134	130
pH	8.6	8.5	8.3	8.0	7.7	8.3	8.5	8.0	8.5	8.5	7.9	
Hardness Series (mg/L) -- Total	180	192	184	184	188	204	192	196	200	324	188	196
-- Ca^{++}	132	128	136	136	132	140	132	136	136	236	136	148
Phosphate Series (mg/L) -- Total	0.15	0.19	0.17	0.24	0.24	0.15	0.20	0.22	0.14	0.28	0.21	0.17
-- Ortho	0.13	0.06	0.04	0.16	0.16	0.13	0.02	0.05	0.01	0.10	0.05	0.07
Ammonia-N (mg/L)	0.10	0.16	0.10	0.19	0.22	0.19	0.15	0.29	0.16	<0.03	0.17	0.05
Nitrate-N (mg/L)	1.0	2.1	1.9	0.8	1.0	1.0	1.0	1.0	1.1	8.8	1.1	0.7
Iron - Total (mg/L)	0.98	1.07	1.02	0.75	0.60	1.05	1.09	1.00	1.15	0.75	0.97	0.95
Grease and Oils (mg/L)	<5		<5					<5			<5	
COD (mg/L)	33.9	40.2	46.2	37.8	42.7	37.6	42.7	48.0		14.9	29.4	29.7
BOD_5 (mg/L)	6.2	8.2	6.2	9.2	9.7	7.9	7.0	5.6	5.5	2.3	7.1	7.2

Table 16 Seasonal Comprehesive Monitoring, Water Quality Values

Date	Site	Temp C	Susp Sld mg/L	DO mg/L	Tot Alka mg/L	pH	Tot Hard mg/L	Ca Hard mg/L	NH3 mg/L- N	NO3 mg/L- N	TKN mg/L- N	BOD mg/L	Fecal Col cu/100mL	Fecal Strep cu/100mL	Site
26-Jan-91	A	2.0	14	13.6	132	8.2	192	140	0.5	0.2	1.6	5.4	-	-	A
	A'	2.0	13	13.8	132	8.2	192	140	0.4	0.7	1.7	5.5	-	-	A'
	B	3.5	16	14.1	134	8.3	192	144	0.4	0.1	1.7	5.4	-	-	B
	E	5.0	15	13.8	132	7.8	192	140	0.5	0.4	1.7	5.5	-	-	E
	H	2.5	14	17.7	136	8.7	192	136	0.3	0.4	-	6.5	-	-	H
	I	5.0	16	12.7	130	7.9	196	148	0.5	0.2	1.6	5.5	-	-	I
	J	6.0	16	13.3	134	8.3	196	144	0.4	0.4	1.8	6.0	-	-	J
	K	3.5	15	14.4	130	8.4	192	140	0.4	0.4	1.7	5.9	-	-	K
	L	2.0	13	15.9	138	8.5	192	140	0.3	0.3	1.6	5.6	-	-	L
	M	2.0	13	16.0	140	8.6	196	136	0.3	0.3	1.7	6.9	-	-	M
24-May	A	27.2	31	9.2	90	8.5	122	98	<0.1	0.8	1.6	7.0	1000	500	A
	A'	27.0	33	9.0	92	8.6	122	98	<0.1	0.8	1.6	7.2	980	400	A'
	B	27.4	35	9.8	90	8.7	122	96	<0.1	0.9	1.6	7.2	970	900	B
	E	28.1	20	8.9	86	8.2	118	90	<0.1	1.0	1.5	7.0	600	600	E
	H	27.5	44	11.0	92	8.9	150	124	<0.1	0.9	1.8	7.5	780	400	H
	I	28.2	25	8.8	84	8.2	120	96	<0.1	1.0	1.5	-	700	550	I
	J	27.9	23	9.0	96	8.5	120	94	<0.1	1.0	1.8	7.0	800	500	J
	K	27.0	40	11.5	96	9.0	144	120	<0.1	1.0	1.7	7.6	800	800	K
	L	27.0	42	11.6	94	8.8	140	118	<0.1	0.9	1.7	7.5	850	850	L
	M	26.5	39	12.2	92	8.8	138	118	<0.1	0.9	1.6	8.2	600	750	M
26-Jul	A	27.0	25	-	80	8.8	134	74	<0.1	0.2	2.0	6.6	100	50	A
	A'	27.0	23	9.9	82	8.8	134	74	<0.1	0.1	2.0	6.6	100	100	A'
	B	27.2	28	10.2	78	8.7	132	74	<0.1	0.2	2.1	6.9	200	70	B
	E	28.0	22	9.5	72	8.5	128	72	<0.1	0.1	2.0	6.2	80	120	E
	H	26.5	34	11.5	78	9.2	130	72	<0.1	<0.1	2.1	8.5	130	110	H
	I	28.1	24	9.8	70	8.3	126	74	<0.1	0.1	2.0	6.2	-	200	I

Table 16 (Cont'd) Seasonal Comprehensive Monitoring, Water Quality Values

		Temp C	Susp Sld mg/L	DO mg/L	Tot Alka mg/L	pH	Tot Hard mg/L	Ca Hard mg/L	NH3 mg/L-N	NO3 mg/L-N	TKN mg/L-N	BOD mg/L	Fecal Col cu/100mL	Fecal Strep cu/100mL	Site
26-Jul-91	J	27.8	28	9.9	76	8.6	128	72	<0.1	<0.1	2.0	7.8	120	60	J
	K	26.4	32	11.3	78	9.3	130	72	<0.1	<0.1	-	8.8	100	50	K
	L	26.2	33	11.2	76	9.4	130	74	<0.1	<0.1	2.1	8.6	100	120	L
	M	25.9	36	12.2	78	9.2	130	74	<0.1	<0.1	2.1	8.6	150	150	M
29-Aug	A	29.5	26	9.6	90	8.7	116	98	<0.1	0.2	2.0	5.6	350	600	A
	A'	29.5	24	9.4	90	8.7	114	98	<0.1	0.2	2.0	5.6	380	650	A'
	B	29.4	27	8.6	96	8.6	112	100	<0.1	0.2	2.0	5.9	400	750	B
	E	30.7	22	5.3	92	8.5	110	98	<0.1	0.1	1.9	5.5	300	450	E
	H	28.3	38	12.3	100	9.0	114	100	<0.1	0.2	2.1	6.8	500	750	H
	I	30.8	27	5.2	90	8.4	-	98	<0.1	0.1	1.8	5.6	200	800	I
	J	30.2	35	6.0	92	8.6	114	100	<0.1	0.1	2.0	6.2	250	700	J
	K	28.3	37	10.9	98	8.8	112	102	<0.1	0.2	2.0	6.9	150	600	K
	L	24.4	41	10.7	98	8.9	112	100	<0.1	0.2	2.1	6.7	300	500	L
	M	28.3	40	11.4	94	8.8	116	100	<0.1	0.2	2.2	6.9	110	400	M
27-Sep	A	16.5	19	7.5	98	8.3	134	118	<0.1	0.1	1.5	9.2	1500	300	A
	A'	16.4	20	7.5	96	8.3	134	118	<0.1	0.1	1.6	9.0	1800	450	A'
	B	16.6	24	7.5	98	8.2	136	116	<0.1	0.2	1.6	9.5	2300	780	B
	E	19.0	15	6.7	92	7.8	130	116	<0.1	<0.1	1.5	8.8	1100	400	E
	H	15.9	23	7.4	94	8.4	136	120	<0.1	<0.1	1.7	10.5	1100	200	H
	I	19.3	18	6.5	90	7.9	130	120	<0.1	<0.1	1.6	9.8	1000	490	I
	J	18.7	19	7.0	94	8.3	132	122	<0.1	<0.1	1.5	9.7	1200	300	J
	K	15.6	22	7.3	96	8.4	136	120	<0.1	<0.1	1.4	10.3	1400	140	K
	L	15.0	23	7.4	94	8.2	136	120	<0.1	<0.1	1.5	10.2	1100	190	L
	M	14.9	21	6.6	98	8.0	134	120	<0.1	<0.1	1.4	9.7	1200	150	M

Table 3

Water Temperature, Dissolved Oxygen, pH and Alkalinity Data Collected in the Cedar Lake Study August 31 and September 1, 1983

Date	Time (hrs)	Temp (°C)	Dissolved Oxygen (mg/L)	pH	Alkalinity (mg/L) Phth	Alkalinity (mg/L) Tot
			Location A			
Aug 31	1437	29.0	13.6	9.2	12	86
Aug 31	2005	29.0	12.1	9.3	12	96
Sept 1	0021	28.0	10.4	9.0	12	96
Sept 1	0615	27.0	7.2	8.6	8	102
Sept 1	1340	29.3	14.2	9.3	24	94
			Location B			
Aug 31	1521	29.0	12.2	9.1	12	94
Aug 31	2000	28.3	11.8	9.2	16	98
Sept 1	0012	27.5	9.2	8.9	12	96
Sept 1	0604	26.5	6.6	8.3	10	100
Sept 1	1327	29.5	13.8	9.2	24	92
			Location F			
Aug 31	1542	30.5	15.0	9.2	12	86
Aug 31	1941	29.5	13.5	9.2	14	82
Aug 31	2340	28.0	11.4	8.9	10	86
Sept 1	0537	27.0	7.2	8.3	0	100
Sept 1	1133	27.7	12.4	9.1	14	96
			Location H			
Aug 31	1555	29.5	13.8	9.1	16	96
Aug 31	1950	29.0	13.2	9.2	14	92
Aug 31	2354	28.5	10.8	9.0	12	88
Sept 1	0548	27.0	10.0	8.8	12	92
Sept 1	1146	28.0	13.2	9.0	8	86

TABLE 1

Water Quality Analysis
Cedar Lake Study - January 1984

Parameter	Location								
	A Top	A Bot	C Top	C Bot	I	E	H	J	K
Temperature (°C)	3	5	6	6	7	7	3	7	3
D.O. (mg/L)	7.8	7.6	3.4	4.7	8.0	8.1	8.0	7.9	8.6
Alkalinity-Total (mg/L)	220	222	154	156	218	224	218	226	222
pH	7.5	7.3	7.0	7.0	7.6		7.1	7.6	7.6
NH_3^+ (mg/L-N)	1.0	1.1	0.8	2.4	1.1	1.1	1.0	1.0	1.0
NO_3^- (mg/L-N)	1.4	1.3	2.0	10.1	1.6	1.6	1.5	1.5	1.5

Table 1

Water Quality Analysis
Cedar Lake Study - January 198[illegible]

	Location									
	A Top	A Bot	C Top	C Bot	I	E	H	J	K	L
1. Temperature (°C)	3	4	6	5	7	7		6		6
2. D.O. (mg/L)	14.6	13.1	8.2	4.3	13.1	14.0		14.0		14.5
3. Alkalinity-Total (mg/L)	194.0	188.0	136.0	148.0	208.0	198.0		198.0		194.0
4. pH	8.1	8.1	7.7	7.4	8.0	8.1		8.1		8.2
5. NH_3^+ (mg/L-N)	0.12	0.33	1.20	0.25	0.64	0.30		0.31		0.20
6. NO_3 (mg/L-N)	1.61	1.53	2.75	2.16	1.61	1.54		1.53		1.61
7. PO_4 (mg/L-P)	0.17	0.39	0.11	0.15	0.18	0.19		0.19		0.17
8. Total Coliforms	<10	<10	200	350	<10	10		<10		<10
9. Fecal Coliforms	<10	<10	10	20	<10	<10		<10		<10
10. BOD	7.6	8.3	>16.0	7.3	6.5	6.6		6.6		6.9

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Units of pH

1991 INTERIM REPORT

Cedar Lake Routine Sampling Locations:

Date 1990	F Ave. C	RR Bridge D	Outfall F	McCloud Z
Oct-10	7.4	8.7	8.9	-
Nov-28	-	8.5	-	-
Dec-05	-	8.4	-	-
Date 1991				
Jan-01	-	8.8	-	-
Jan-16	-	8.1	-	-
Jan-26	7.1	8.1	8.3	-
Feb-08	7.1	9	8.9	-
Feb-22	7.2	9.1	9.2	7.8
Mar-08	7.9	8.4	9.3	8
Mar-20	7.8	9.1	8.4	7.9
Apr-05	8.3	8.9	8.9	7.8
Apr-19	6.6	7.6	8.4	7.2
May-10	7.3	8.5	8.8	8.2
May-24	8.6	8.5	8.7	7.9
Jun-07	8.4	8.4	8.7	7.9
Jun-24	8.5	8.1	8.8	8.1
Jul-12	8.6	8.5	8.9	8
Jul-26	8.5	8.7	9.1	8
Aug-08	8.8	8.9	8.5	7.5
Aug-29	7.1	8.2	8.8	8
Sep-12	7.1	7.7	8.3	7.6
Sep-27	9.3	8.1	7.8	7.6
Oct-10	7.2	9	8.6	7.9
Oct-24	7.3	8.3	7.7	7.7
Nov-07	7.4	7.6	8	8.3
Nov-21	6.6	6.6	6.8	7.5
Dec-05	6.5	6.8	7.3	7.4
Dec-19	6.4	6.8	7.6	7.1

Water Temperature, Dissolved Oxygen, pH and Alkalinity Data Collected in the Cedar Lake Diurnal Variation Study, August 29 & 30, 1991

Sample Location	Date 1991	Time hrs	Temp C	Dissolved Oxygen mg/L	pH	Alkalinity Phth mg/L as CaCO3	Alkalinity Total mg/L as CaCO3
Site A	29-Aug	1400	29.5	9.6	[illegible]	10	90
	29-Aug	2001	28.8	7.8	8.5	12	90
	30-Aug	205	28.0	7.4	8.2	1	92
	30-Aug	807	27.8	7.0	7.9	8	98
	30-Aug	1320	28.7	9.8	8.6	10	94
Site B	29-Aug	1345	29.4	8.6	8.6	8	96
	29-Aug	2013	28.5	8.7	8.7	10	96
	30-Aug	224	28.1	8.5	8.5	10	94
	30-Aug	822	27.6	8.3	8.3	2	102
	30-Aug	1330	28.3	8.7	8.7	10	98
Site D	29-Aug	1247	29.9	6.5	8.2	0	80
	29-Aug	2033	29.3	6.3	8.3	1	86
	30-Aug	234	28.6	6.0	8.0	0	84
	30-Aug	837	28.0	7.4	8.0	0	84
	30-Aug	1341	28.6	8.6	8.4	1	88
Site F	29-Aug	1319	27.9	11.3	[illegible]	14	92
	29-Aug	2104	27.1	9.8	8.7	14	88
	30-Aug	258	26.8	8.6	8.3	0	90
	30-Aug	850	27.5	7.2	8.1	0	106
	30-Aug	1418	28.1	10.9	8.9	12	98
Site H	29-Aug	1259	28.3	12.3	9.0	16	100
	29-Aug	2057	28.0	11.8	8.9	16	96
	30-Aug	246	27.8	10.2	8.9	14	92
	30-Aug	845	27.5	9.6	[illegible]	14	96
	30-Aug	1403	28.4	10.9	9.0	10	92

pH Comparison

Date	AM/PM	Screen House 1	Bilge Line 2	Sluice Line 3	Pnod #2 Inlet 4	Pond #3 Inlet 5	Pond #3 Outlit 6	Pond #4 Outlit 7	Interstate Runoff 8	Discharge Stream 9	F ave. Storm Sewer 10	Ceder Lake Causeway 11	Cedar Lake Outlit 12
7/7/99	AM	7.82		7.92	7.94	8.22	9.32	8.68		8.50	8.26	8.39	8.19
7/7/99	PM	9.19	8.39		9.36	9.69	9.78	9.41		9.19	9.89	9.51	9.97
7/8/99	AM	7.57		8.30	8.36	8.50	9.48	8.99		8.69	8.05	7.99	7.91
7/8/99	PM	8.68	8.65		9.14	9.45	9.41	9.03		9.00	9.20	8.99	9.06
7/9/99	AM	8.32	9.23		9.45	8.52	9.28	9.21		9.05	9.31	9.26	9.44
7/9/99	PM	9.47	8.99		9.53	9.80	10.01	9.74		9.15	9.93	9.81	9.99
7/12/09	AM	8.32		8.58	8.86	8.79	9.15	8.98		8.79	8.38	8.68	8.15
7/12/99	PM	9.03	9.00		8.78	9.30	9.26	9.01		8.81	9.38	8.41	8.95
7/13/99	AM	8.20		8.82	8.64	8.52	9.18	8.90		8.69	8.14	8.42	7.88
7/13/99	PM	9.15	8.83		9.13	9.35	9.44	9.66		8.83	9.05	9.16	9.04
7/14/99	AM	8.38	8.57		8.91	8.76	9.26	9.10		8.87	8.08	8.74	8.01
7/14/99	PM	8.82		8.82	9.41	9.55	9.65	9.29		8.56	9.28	9.16	8.90
7/15/99	AM	8.49	8.70		3.87	8.94	9.41	9.40		9.30	8.30	8.99	8.00
7/15/99	PM	9.27	8.27		9.20	9.33	9.49	9.55		9.41	8.64	8.66	8.90
7/16/99	AM	8.56		8.51	8.61	9.19	9.73	9.52		9.39	8.35	8.61	7.57
7/16/99	PM	9.28	8.48		9.02	9.35	9.58	9.64		9.48	9.34	9.02	8.92
7/19/99	AM	7.94		9.08	8.52	8.57	9.79	9.70	8.75	9.27	8.18	8.18	8.07
7/19/99	PM	9.06	8.07		8.72	9.08	9.80	9.72		9.60	8.61	7.75	90.60
7/20/99	AM	7.53	8.27		8.35	8.22	9.48	9.53	8.50	9.24	7.95	7.92	7.93
7/20/99	PM	8.60	8.22		8.86	9.08	9.70	9.94		9.60	8.94	8.38	8.84
7/21/99	AM	7.51		8.13	8.43	8.27	9.41	9.40	8.27	9.19	8.01	7.99	8.05
7/21/99	PM	9.46	7.89		8.61	9.27	9.82	9.69		9.54	9.68	8.95	9.56
7/22/99	AM	7.62		8.18	8.23	8.24	9.36	9.40		9.21	7.99	7.90	7.91
7/22/99	PM	8.97	8.35		9.11	9.58	9.77	9.48		9.49	9.21	9.38	9.34
7/23/99	AM	7.50		8.10	8.07	7.98	9.38	9.34		9.15	7.87	8.02	7.73
7/23/99	PM	9.00	7.90		8.45	8.72	9.31	9.37	7.64	9.43	8.79	8.80	8.52
7/26/99	AM	7.72		7.92	8.62	8.92	9.71	9.79	8.00	7.62			7.80
7/26/99	PM	8.38	9.52		9.73	9.90	10.01	9.95		9.09			9.34
7/27/99	AM	7.38			8.53	8.43	9.36	9.57		7.89	7.82	8.08	8.27
7/27/99	PM	8.22			9.05	9.66	9.64	9.91		8.17	8.63	8.20	9.17
7/28/99	AM	7.76		8.60	8.70	8.58	9.26	9.92	8.08	8.07	7.86	8.09	8.21
7/28/99	PM	9.25	9.43		9.70	9.92	10.10	9.98		8.82	9.30	8.93	9.40
7/29/99	AM	8.30		8.70	8.96	8.96	9.37	9.56		8.10	8.37	8.40	8.36
7/29/99	PM	9.32			9.41	9.62	9.80	9.61		8.04	9.20	9.04	9.32
7/30/99	AM	8.14		8.51	8.75	8.81	9.27	9.64		8.15	8.65	8.49	7.84
7/30/99	PM	9.10	8.62		9.23	9.76	10.01	9.74		9.81	9.13	8.64	9.08
8/2/99	AM	8.21		8.75	9.11	8.90	9.35	9.45	7.77	9.20	8.64	8.76	7.88
8/2/99	PM	9.41	8.95		9.04	9.05	9.76	9.63		9.48	9.20	9.22	8.83

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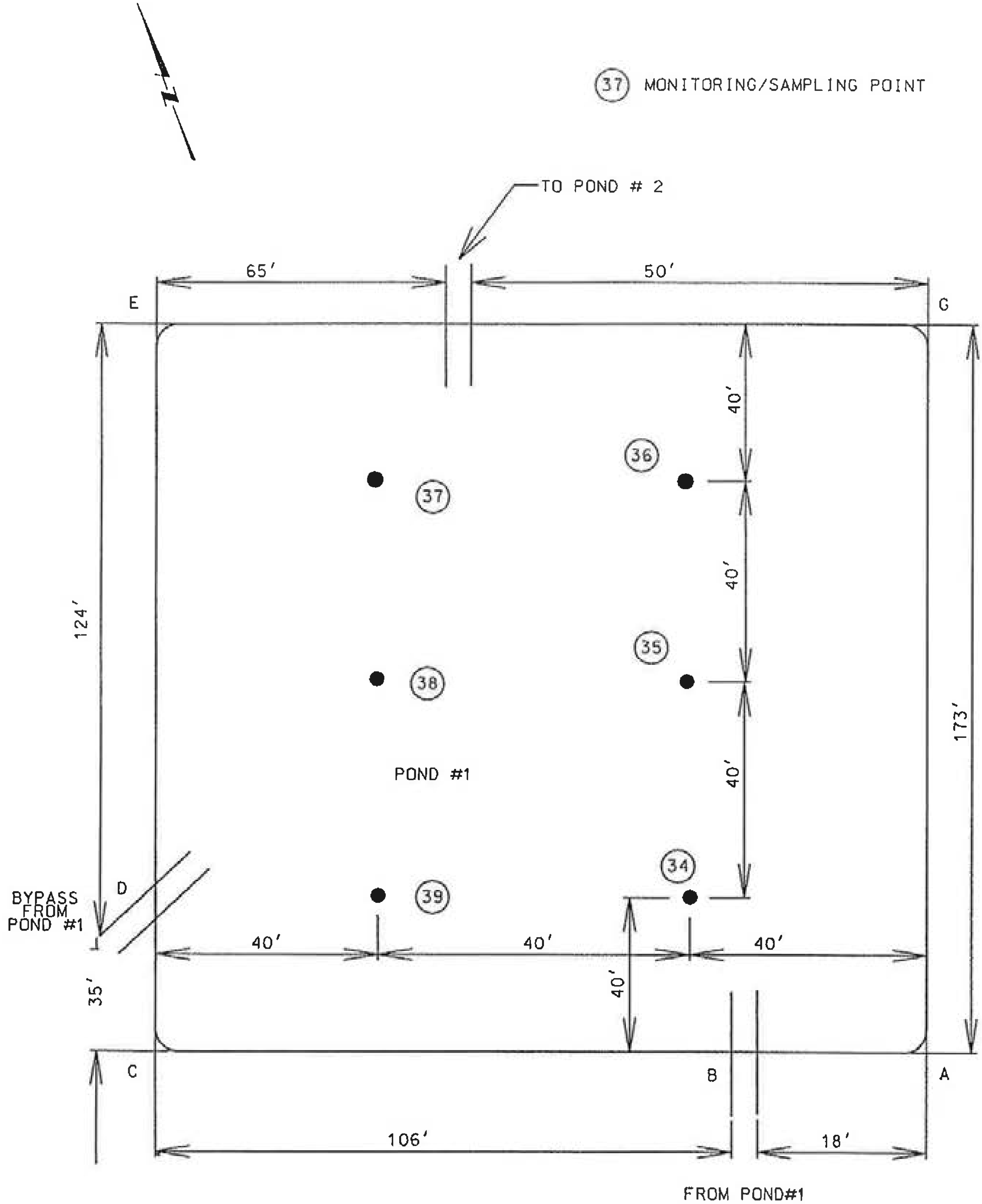

MONTGOMERY WATSON Chicago, Illinois	ALLIANT ENERGY- IES UTILITIES 509 Sixth St. NE Cedar Rapids, IA	RETENTION PONDS	FIGURE 1

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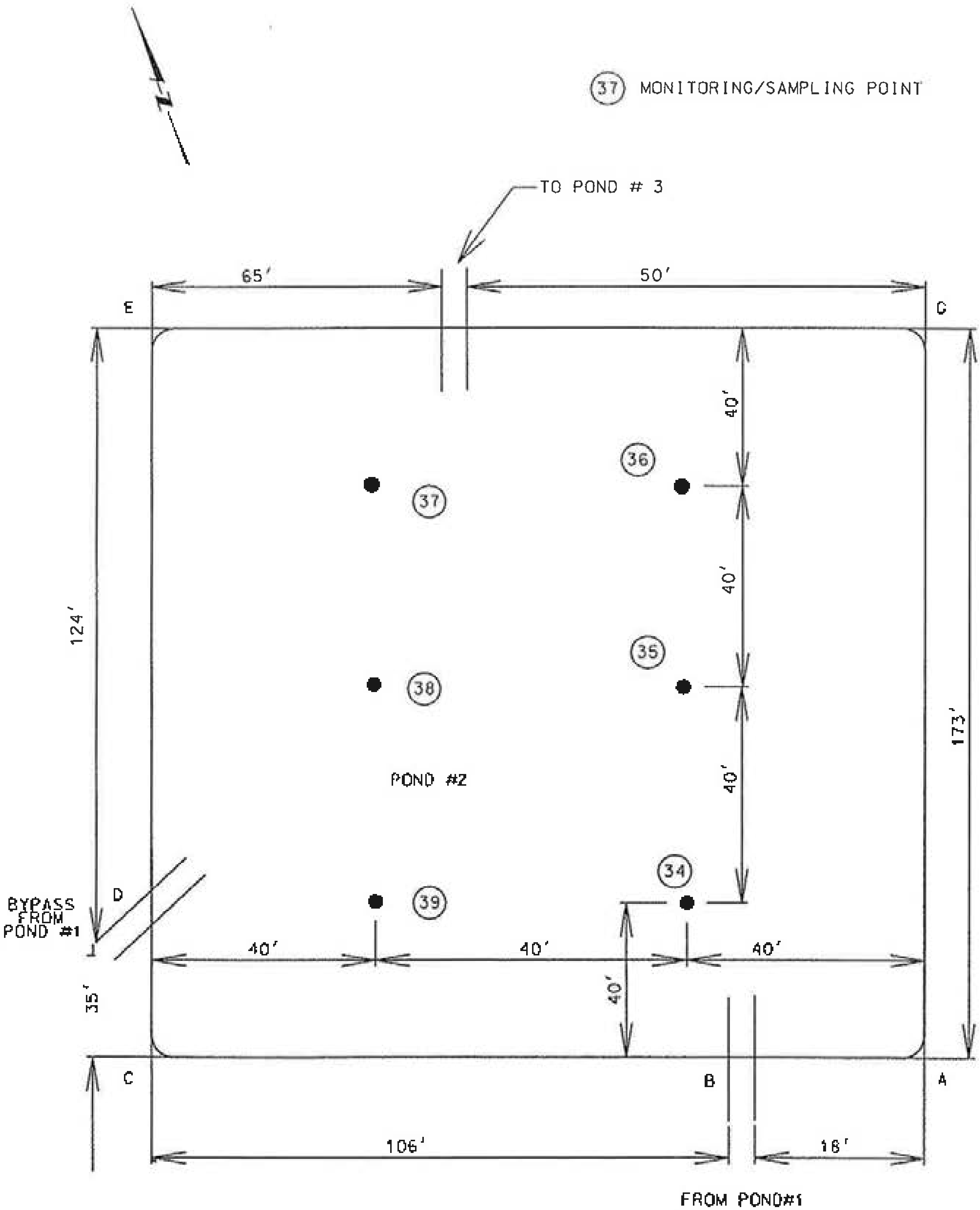

MONTGOMERY WATSON Chicago, Illinois	ALLIANT ENERGY— IES UTILITIES 505 Sixth St. NE Cedar Rapids, IA	RETENTION PONDS	FIGURE 2

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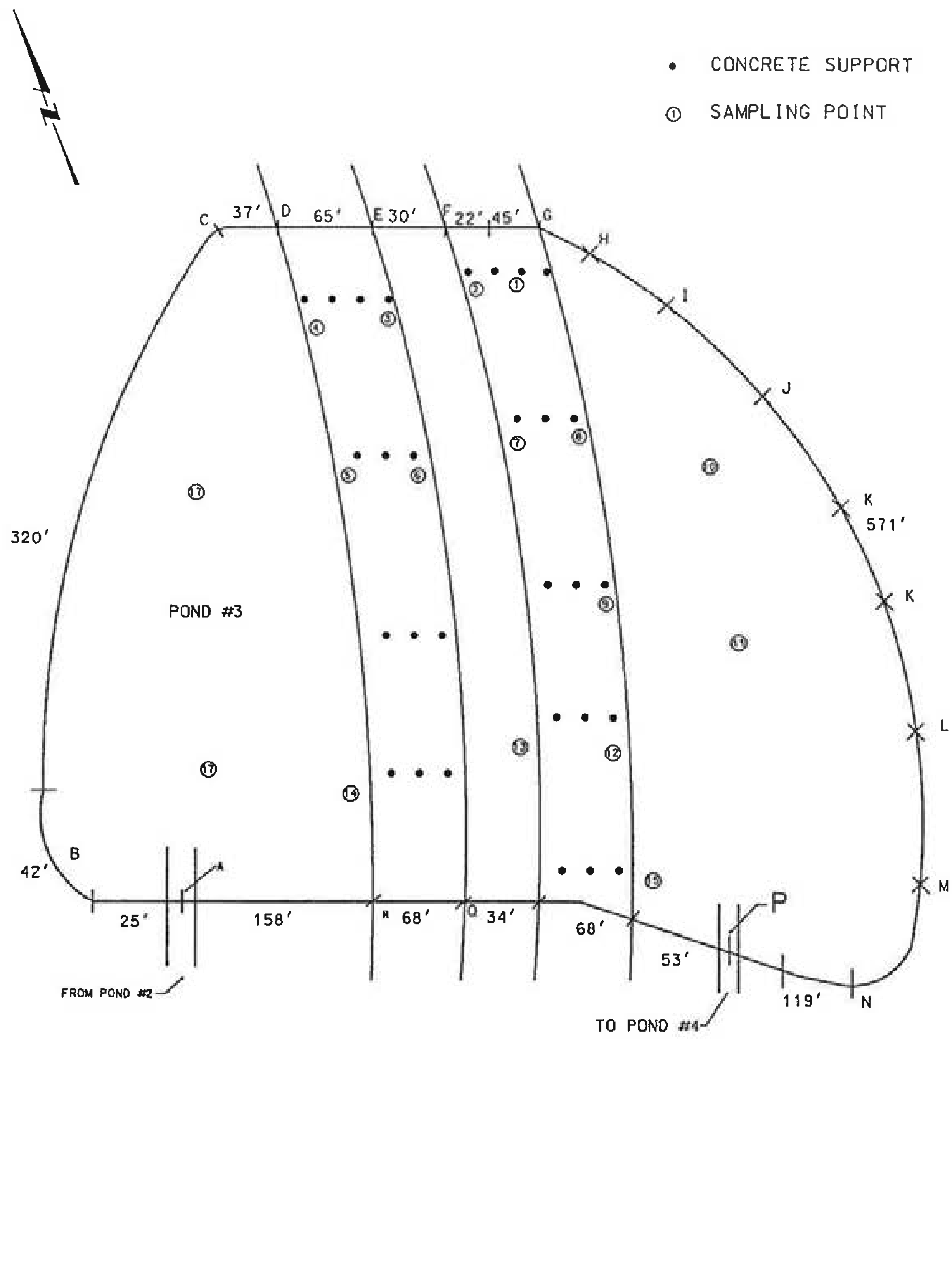
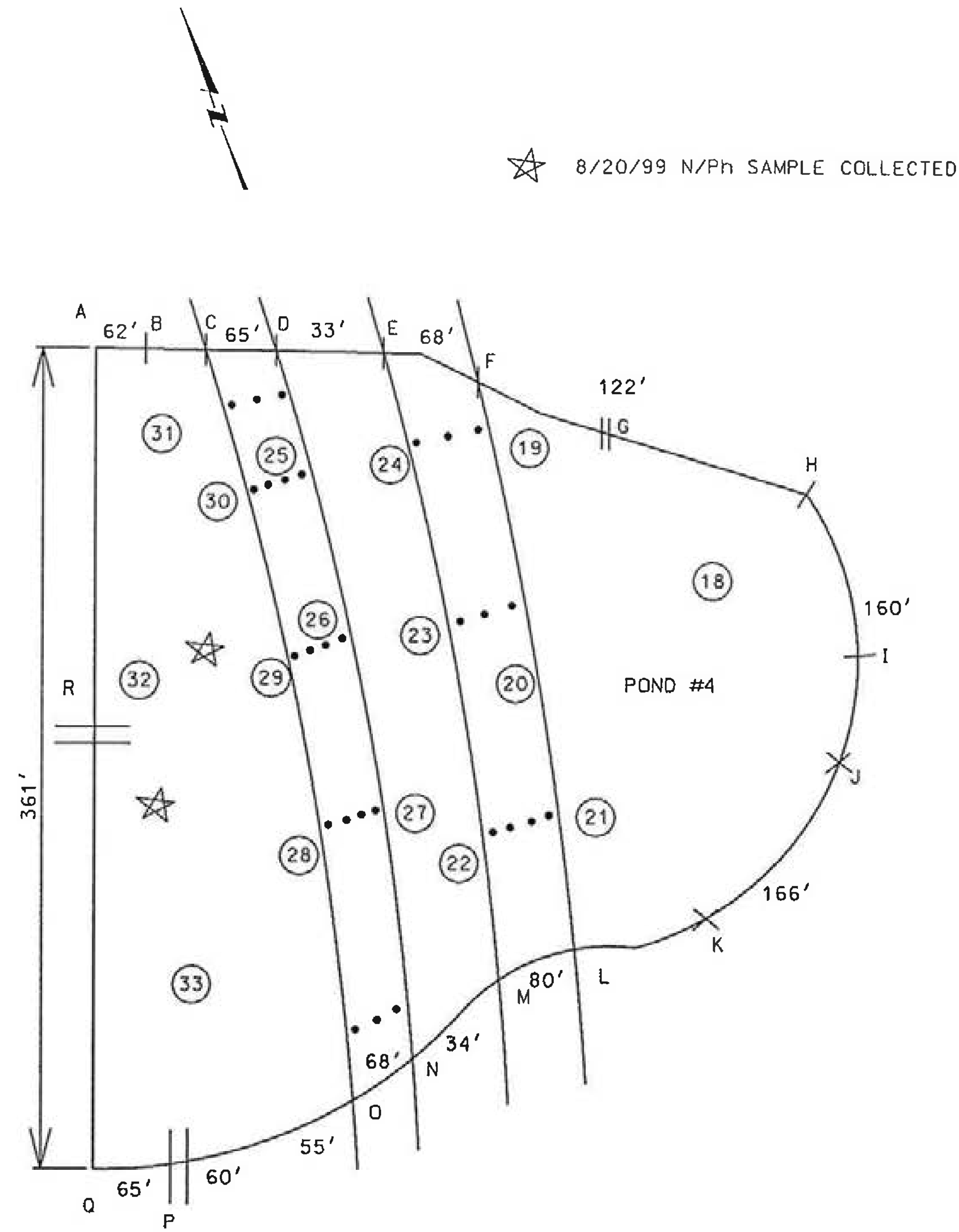


MONTGOMERY WATSON Chicago, Illinois	ALLIANT ENERGY- IES UTILITIES 509 Sixth St. NE Cedar Rapids, IA	RETENTION PONDS	FIGURE 3



MONTGOMERY WATSON Chicago, Illinois	ALLIANT ENERGY- IES UTILITIES 509 Sixth St. NE Cedar Rapids. IA	RETENTION PONDS	FIGURE 4

Table 1: Summarization of Pond 2
Water and Sediment Analytical Results

Alliant Energy

Pond	Monitoring Location	Media	Depth (feet)	pH	DO (mg/L)	Temp (°C)
2	34	Water	2.0	8.1	7.0	30.5
		Water	6.5	8.3	4.7	30.3
		Water	11.7	8.4	4.5	30.3
		Sediment	12.1	8.4	NA	29.4
	35	Water	2.0	7.9	6.6	30.1
		Water	5.0	7.6	4.8	30.3
		Water	9.6	7.9	4.3	30.2
		Sediment	10.0	8.3	NA	28.8
	36	Water	2.0	8.1	7.3	30.2
		Water	5.0	7.6	5.3	30.4
		Water	9.6	7.8	5.3	30.4
		Sediment	10.0	8.6	NA	29.6
	37	Water	2.0	7.9	5.6	30.4
		Water	5.0	7.7	5.5	30.4
		Water	8.2	7.9	5.4	30.4
		Sediment	8.6	9.2	NA	31.3
	38	Water	2.0	7.9	5.8	30.6
		Water	6.0	7.8	5.4	30.5
		Water	11.8	8.6	4.9	30.3
		Sediment	12.2	8.8	NA	30.4
	39	Water	2.0	8.1	6.6	30.8
		Water	7.0	7.7	5.8	30.6
		Water	12.5	7.8	5.3	30.4
		Sediment	12.9	8.7	NA	30.2

Notes:
pH of DI water added to sediment samples = 8.5
NA = Not Applicable

Table 2: Summarization of Pond 3
Water and Sediment Analytical Results

Alliant Energy

Pond	Monitoring Location	Media	Depth (feet)	pH	DO (mg/L)	Temp (°C)
3	1	Water	2.0	8.3	5.4	24.7
		Water	6.0	8.3	4.5	24.7
		Sediment	6.4	8.3	NA	23.1
	2	Water	2.0	8.7	5.2	24.7
		Water	6.6	7.1	3.6	24.7
		Sediment	7.0	8.3	NA	NA
	3	Water	2.0	8.8	6.7	24.8
		Water	7.5	7.2	2.8	24.7
		Sediment	7.9	8.1	NA	22.9
	4	Water	2.0	8.8	6.4	24.8
		Water	8.7	6.9	1.6	24.6
		Sediment	9.1	9.0	NA	23.2
	5	Water	2.0	9.0	7.3	24.8
		Water	9.0	7.1	2.4	24.6
		Sediment	9.4	8.4	NA	23.2
	6	Water	2.0	8.9	7.8	24.7
		Water	8.3	7.0	4.6	24.5
		Sediment	8.7	8.4	NA	23.4
	7	Water	2.0	8.9	7.5	24.8
		Water	8.5	8.2	4.7	24.6
		Sediment	8.9	8.2	NA	23.2
	8	Water	8.0	8.8	6.5	24.7
		Water	8.8	8.2	5.2	24.6
		Sediment	9.2	8.3	NA	22.3
	9	Water	2.0	9.1	9.6	25.1
		Water	9.3	7.3	5.9	24.6
		Sediment	9.7	8.0	NA	23.4
	10	Water	2.0	9.1	8.9	25.0
		Water	9.0	7.4	4.5	24.6
		Sediment	9.4	8.7	NA	23.8
	11	Water	2.0	9.2	10.4	25.3
		Water	9.0	7.3	4.6	24.7
		Sediment	9.4	8.5	NA	24.0
	12	Water	2.0	9.2	9.3	25.2
		Water	9.0	7.3	6.4	24.5
		Sediment	9.4	8.2	NA	24.0
	13	Water	2.0	9.2	9.9	25.2
		Water	8.4	7.7	5.7	24.7

Table 2: Summarization of Pond 3

Water and Sediment Analytical Results

Alliant Energy

		Sediment	8.8	8.5	NA	24.3
	14	Water	2.0	9.2	7.1	25.4
		Water	7.8	7.4	5.5	24.7
		Sediment	8.2	8.4	NA	24.1
	15	Water	2.0	9.3	9.6	25.5
		Water	8.5	7.3	5.6	24.6
		Sediment	8.9	8.3	NA	24.1
	16	Water	2.0	9.3	9.3	25.6
		Water	5.0	8.6	7.0	24.9
		Sediment	5.4	8.5	NA	25.4
	17	Water	2.0	9.3	12.7	25.3
		Water	5.5	8.9	6.5	24.8
		Water	9.6	7.9	5.4	24.8
		Sediment	10.0	7.5	NA	25.0

Notes:
pH of DI water added to sediment samples = 6.7
NA = Not Applicable

Table 3: Summarization of Pond 4
Water and Sediment Analytical Results

Alliant Energy

Pond	Monitoring Location	Media	Depth (feet)	pH	DO (mg/L)	Temp (°C)
4	18	Water	2.0	8.7	7.3	23.7
		Water	6.1	7.6	4.6	23.2
		Sediment	6.5	8.2	NA	23.1
	19	Water	2.0	8.7	7.8	23.4
		Water	6.8	7.3	4.1	23.3
		Sediment	7.2	8.2	NA	23.4
	20	Water	2.0	8.7	7.0	23.4
		Water	4.5	8.7	4.5	23.1
		Water	8.8	7.3	2.1	23.1
		Sediment	9.2	8.2	NA	23.2
	21	Water	2.0	8.8	6.9	23.7
		Water	6.6	7.7	4.4	23.4
		Sediment	7.0	8.6	NA	23.3
	22	Water	2.0	8.7	7.4	23.5
		Water	6.9	8.5	5.5	23.4
		Sediment	7.3	8.1	NA	23.4
	23	Water	2.0	8.7	6.2	23.5
		Water	7.8	7.8	3.4	23.2
		Sediment	8.2	8.3	NA	23.2
	24	Water	2.0	8.8	8.5	23.5
		Water	4.5	8.7	5.1	23.4
		Water	6.8	7.7	4.3	23.3
		Sediment	7.2	8.6	NA	23.2
	25	Water	2.0	8.8	7.9	23.6
		Water	5.0	8.6	4.5	23.3
		Water	8.0	7.9	3.6	23.1
		Sediment	8.4	8.2	NA	23.0
	26	Water	2.0	8.8	7.3	23.6
		Water	4.2	8.7	5.3	23.4
		Water	6.6	7.7	3.8	23.1
		Sediment	7.0	8.4	NA	22.5
	27	Water	2.0	8.8	7.6	23.9
		Water	3.5	8.2	5.2	23.4
		Water	7.0	7.1	3.5	23.2
		Sediment	7.4	8.1	NA	23.1

Table 3: Summarization of Pond 4
Water and Sediment Analytical Results

Alliant Energy

	28	Water	2.0	8.8	7.5	23.8
		Water	4.5	8.7	4.8	23.5
		Water	7.7	7.2	2.7	23.2
		Sediment	8.1	8.0	NA	23.6
	29	Water	2.0	8.8	8.3	23.8
		Water	4.5	8.5	4.5	23.4
		Water	8.0	7.4	4.2	23.1
		Sediment	8.4	8.3	NA	23.9
	30	Water	2.0	8.7	6.7	23.6
		Water	5.0	8.6	4.6	23.4
		Water	8.5	7.5	3.9	23.2
		Sediment	8.9	8.5	NA	23.8
	31	Water	2.0	8.7	8.0	23.5
		Water	5.0	8.5	4.0	23.3
		Water	8.8	7.4	3.3	23.2
		Sediment	9.2	8.5	NA	23.4
	32	Water	2.0	8.8	7.7	23.7
		Water	5.0	8.5	4.5	23.3
		Water	8.2	7.2	3.9	23.1
		Sediment	8.6	8.8	NA	23.6
	33	Water	2.0	8.8	7.6	23.7
		Water	4.5	8.6	3.4	23.4
		Water	7.6	7.4	2.8	23.2
		Sediment	8.0	8.5	NA	23.2
	Outfall	Water #1	NA	6.1	9.7	23.4
		Water #2	NA	7.3	10.0	23.1
		Water #3	NA	7.9	9.6	23.1

Notes:
pH of DI water added to sediment samples = 6.7
NA = Not Applicable

Table 4: Analytical Results from August 1999 Wastewater Study

Sample Collection Date	Sample Number	Algal Cells (cells/ml)	Nitrate & Nitrite Nitrogen as N (mg/L)	Total Kjeldahl Nitrogen as N (mg/L)	Total Phosphate as P (mg/L)	Collection Site	Pond Number
8/19/99	9960253	105,000	--	--	--	38a	3
	9960254	120,000	--	--	--	316a	3
	9960255	130,000	--	--	--	311a	3
	9960256	111,000	--	--	--	317a	3
	9960261	--	<0.1	1.4	0.5	316n	3
	9960257	< 1000	--	--	--	431a	4
	9960258	< 1000	--	--	--	433a	4
	9960259	< 1000	--	--	--	419a	4
	9960260	<1000	--	--	--	421a	4
8/20/99	9960262	77,000	--	--	—	234a	2
	9960263	70,000	--	--	--	239a	2
	9960264	78,000	--	--	--	235a	2
	9960265	83,000	--	--	--	237a	2
	9960266	--	0.4	1.6	0.5	237np	2
	9960267	--	<0.1	1.5	0.6	2-136np	4

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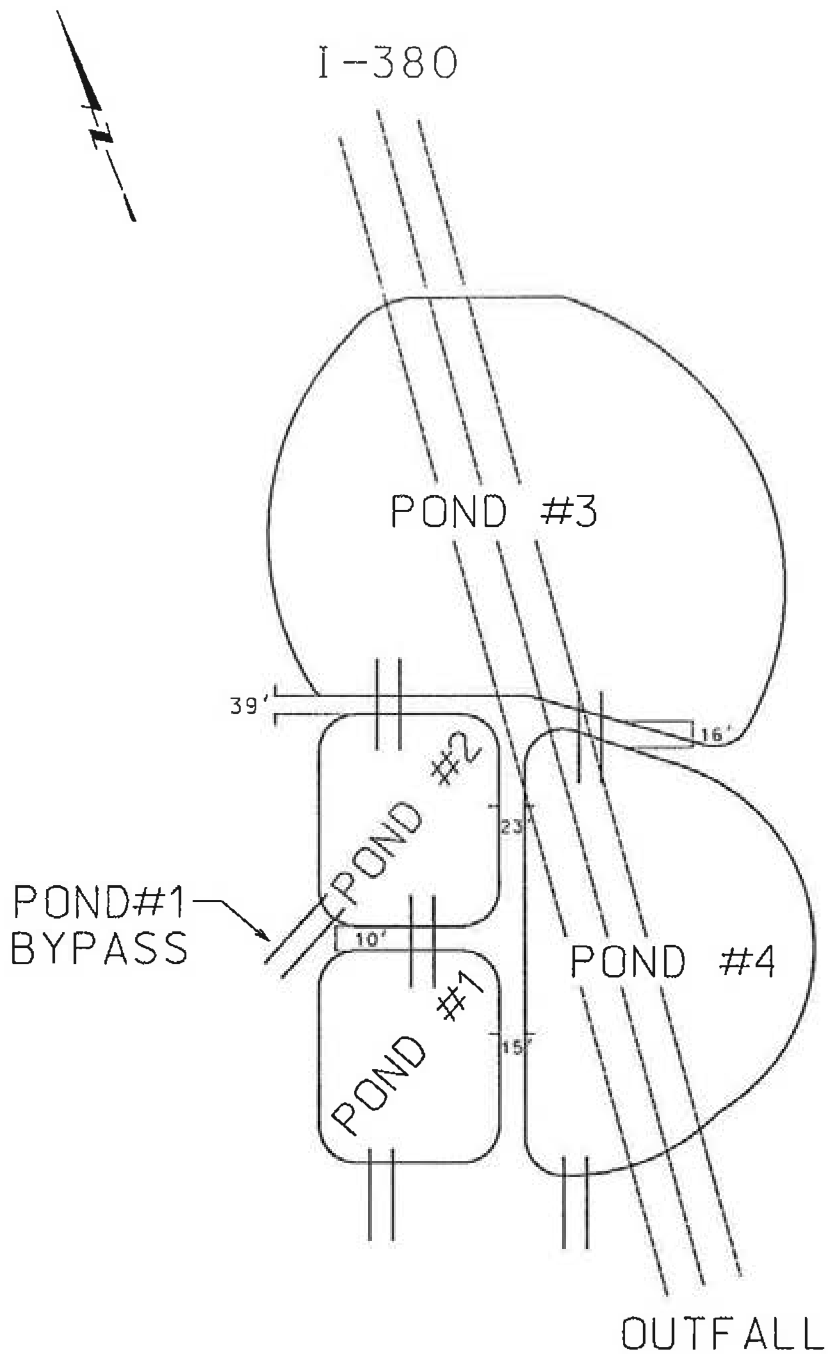

MONTGOMERY WATSON Chicago, Illinois	ALLIANT ENERGY- IES UTILITIES 509 Sixth St. NE Cedar Rapids, IA	RETENTION PONDS	FIGURE 5

aether dbs

elemental design build solutions

August 8, 2012

154.017.002

Mr. William Skalitzky
Alliant Energy Corporate Services
4902 N. Biltmore Lane
Madison, WI 53718

Response
USEPA Draft Report
Safety of Coal Combustion Waste Ponds
6th Street Generating Station
Cedar Rapids, Iowa

Dear Mr. Skalitzky

Aether DBS provides a response to the Draft Report issued by United States Environmental Protection Agency (USEPA) commenting on the structural safety analysis of the coal combustion waste pond on the 6th Street Generating Station property. The draft report was prepared by Kleinfelder and is dated May 2, 2012.

Aether DBS concurs with the finding that the ponds on the 6th Street Generating Station should be assigned a **low hazard potential**.

In the conclusion of the draft report Kleinfelder finds that:

"The conclusion presented by Aether DBS is that the outer embankment for the ash ponds should have an acceptable Factor of Safety (FOS) against failure under static and seismic loading scenarios including a minimum FOS of 1.6 for static loading and 1.5 for seismic loading. Based on our review of this study and our experience with design and construction of similar embankments, the conclusion presented by Aether DBS seems to be reasonable, provided that seepage through the embankments occurs in a controlled fashion."

After providing this finding on the safety analysis, Kleinfelder provides a United States Army Corps of Engineers (USACE) condition rating of **POOR** to the ponds. Since a POOR rating implies that a dam safety issue exists that requires remedial action and since Kleinfelder found no such deficiency, Aether requested clarification from USEPA.

On July 12, 2012, USEPA[1] responded that the POOR condition rating was justified based on three points lifted from the Kleinfelder report. The issues are:

1. Variability of the properties of the embankment materials (moisture content, strength, particle size, permeability) could result in uncontrolled seepage pathways resulting in a reduced the factor of safety as calculated by Aether. In particular the occurrence of rubble in one of the geoprobe borings taken in June 2011 is noted as a concern that would result in uncontrolled seepage.
2. Construction of I-380 piers in the ponds will result in some instability of the ponds and/or flow capacity limitation.
3. Uncontrolled seepage from rubble pockets in the embankment or tree roots on the downstream slope.

Before responding to the concerns, recapitulations of the known facts about the site are in order to properly address the concerns that lead to the Kleinfelder condition rating.

<u>Response and Additional Information</u>

The 6th street generating station began as an early city electric light plant in 1888. Around 1910, Iowa Electric Light and Power constructed a dam on McLoud Run[2] a tributary to the Cedar River for the provision of cooling water. Prior to 1910 the area of the present Coal Combustion Ash Ponds was low ground with an elevation of 708 to 712 feet as determined by the Aether borings taken in June 2011. Cedar Lake is controlled by the dam installed in the early 1900's at water elevation 721. The coal combustion ash ponds lay between the railroad embankments on the southeast shore of Cedar Lake and a bluff rising up from what was originally McLoud Run. The borings taken in June 2011 show that coal combustion waste fills the area between the railroad embankment and the bluff. The current ash pond embankments are constructed on top of the earlier coal combustion waste with a crest elevation of approximately730 feet and were built after the construction of Cedar Lake.

The rubble fill in boring SB-4 that is the subject of the Kleinfelder comment is at 21 to 23 feet below the crest of the present embankment. This places the rubble below the coal combustion waste and indicates fill that predates the 1910 creation of Cedar Lake. Photograph 1 (in Attachment A) shows a picture of the core recovered from SB-4 showing the limestone and brick rubble that was found in this location below the coal combustion waste and above the original ground surface of clay and peat.

When the borings were installed in June 2011, the approximate geometry of the embankment at each boring location was measured by Aether. Figure 1 shows the field measurements of the crest width, upstream and downstream slopes and the location of the adjacent pond water at SB-3 (Pond 4) and SB-4 (Pond 1). The measurements show that

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[1] Craig Dufficy to Stephen Hoffman, Memorandum "Alliant Energy 6th Street Generating Station Draft Report Condition Rating Evaluation, July 12, 2012

[2] Cedar Rapids Gazette, May 20, 2011 (http://thegazette.com/2011/05/20/power-plant-removal-could-save-cedar-lake/ accessed 7/18/2012)

the crest widths in the higher sections of the embankment range from 15 to 30-foot. The inboard and outboard slopes are as steep as 1H to 1V on some slopes (The steep slopes are covered with rip rap, Photograph 2). From these variations, Aether chose to analyze the highest embankment near the outlet of Pond 4 where the crest was at the minimum width of 15-feet and the toe of the slope is at the water surface of Cedar Lake at elevation 721.

In June of 2008, the watershed of the Cedar River experienced a storm that caused flow through Cedar Rapids exceeding the 500-year return period event. During the flood the 6^{th} street generating station recorded 6-feet of water on the floor of the station. At the same time the coal combustion waste ponds were fully inundated by the flood flow, Photograph 3. When the flood waters receded, the embankments of the coal combustion waste ponds were subjected to rapid drawdown of the phreatic water surface by sequential lowering of the water elevation on both sides of the embankments. After the flood wave ebbed, Alliant Energy completed an inspection of the coal combustion waste pond embankments that showed no damage from erosion or gully wash outs. No embankment repairs have been conducted by Alliant Energy. The only observed damage was the toppling over of the flow meter, which was unrelated to embankment stability.

An extended analysis of the cross-section of the embankment on Pond 4 presented by Aether[3] in 2011 is shown in Attachment B. The result was completed by increasing the phreatic water elevation in the embankment cross-section to saturate the entire thickness of the coal combustion waste. The factor of safety under this rapid drawdown type of loading condition is 1.3. The result shows why the ponds were not structurally impacted by the recession of the 2008 flood inundation.

Response to Kleinfelder Findings

The findings expressed in the Kleinfelder report indicate that the reason for the POOR rating is the potential for reduced factor of safety under some unusual seepage event. If this is the case then the rating should have been FAIR based on the definitions of the USACE in section 7.0 of the Kleinfelder report.

The clarification of information presented herein and the additional information shown herein, lead Aether to the conclusion that the appropriate rating under the USACE system is SATISFACTORY. The presence of rubble fills 10-foot below the toe of the current embankments is not a stability factor for the embankments. The impact of unusual seepage events was tried and tested by the flood of 2008.

The soil parameters used for the surface clay and the ash/slag embankment and coal combustion waste fill are very conservative strength selections and are found to be "reasonable" for the conditions by Kleinfelder. The actual CCW dike material, as measured by Cone Penetrometer Testing (CPT), is much stronger than that specified in the stability analyses; a friction angle of 28 degrees with no cohesion. An average

[3] Aether DBS, "Ash Pond Stability and Hydraulic Analysis, 6^{th} Street Generating Station, Cedar Rapids, Iowa, August 4, 2011

friction angle of 40 degrees was calculated from CPT-1 measurements. The fiction angle standard deviation is only 6 degrees over the 17 foot thickness. (The original ground surface is at a depth of 17 feet there as determined by the adjacent SB-1). CPT-3 produced similar results whereas CP-2 apparently hit an obstruction at only 5 feet.

The embankments at 6th street are relatively wide at the crest, have rip rap protection on the outer slopes and contain only minimum volumes of water. The facility is undergoing the regulatory closure process and there are no plans to use the ponds as coal combustion waste ponds in the future.

Aether DBS believes the condition assessment for the 6th Street Coal Combustion Waste Ponds should be a **SATISFACTORY** rating.

The qualifications of the authors in geotechnical engineering are offered by curriculum vita, Attachment C.

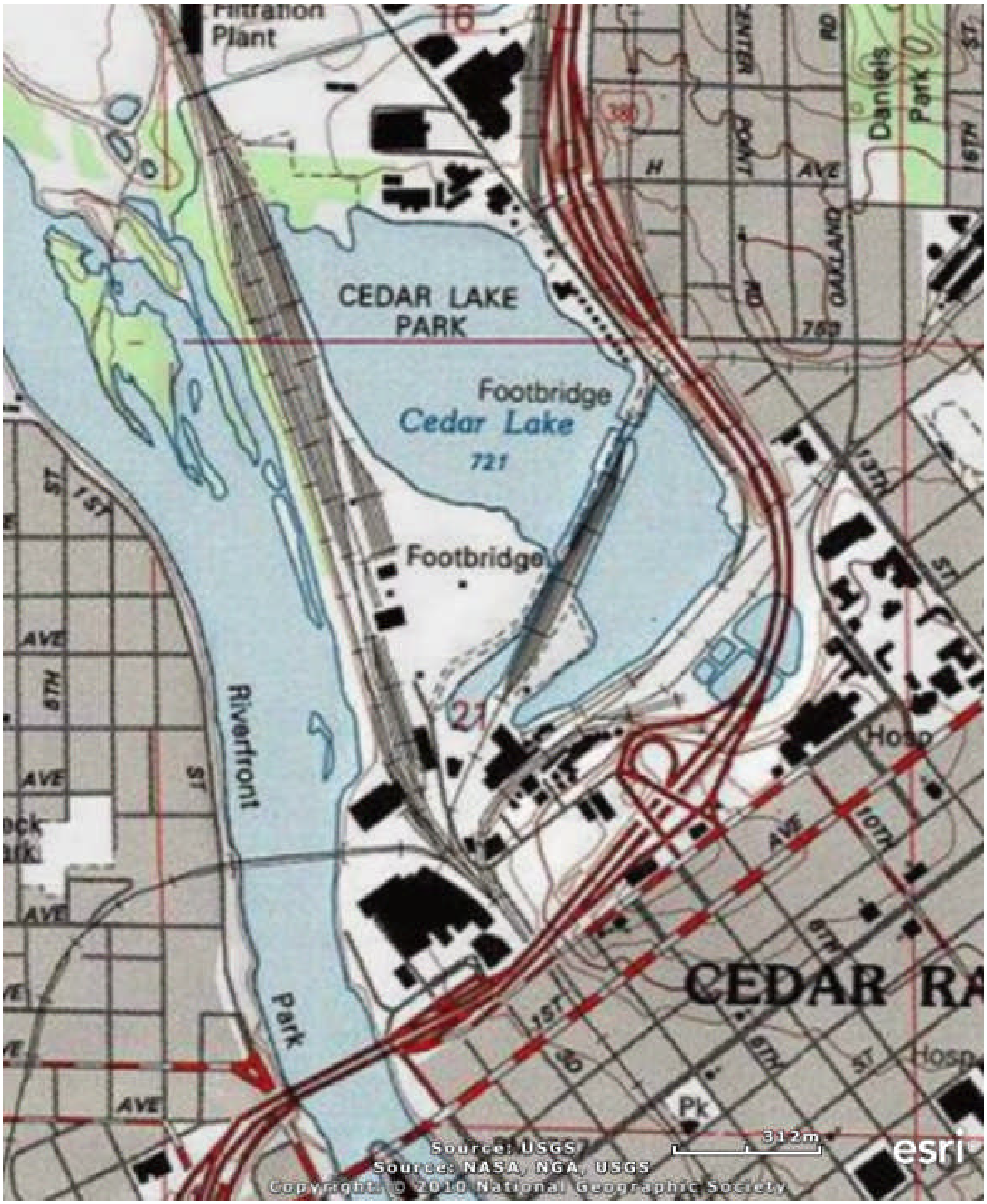
If you have any questions, please call or e-mail.

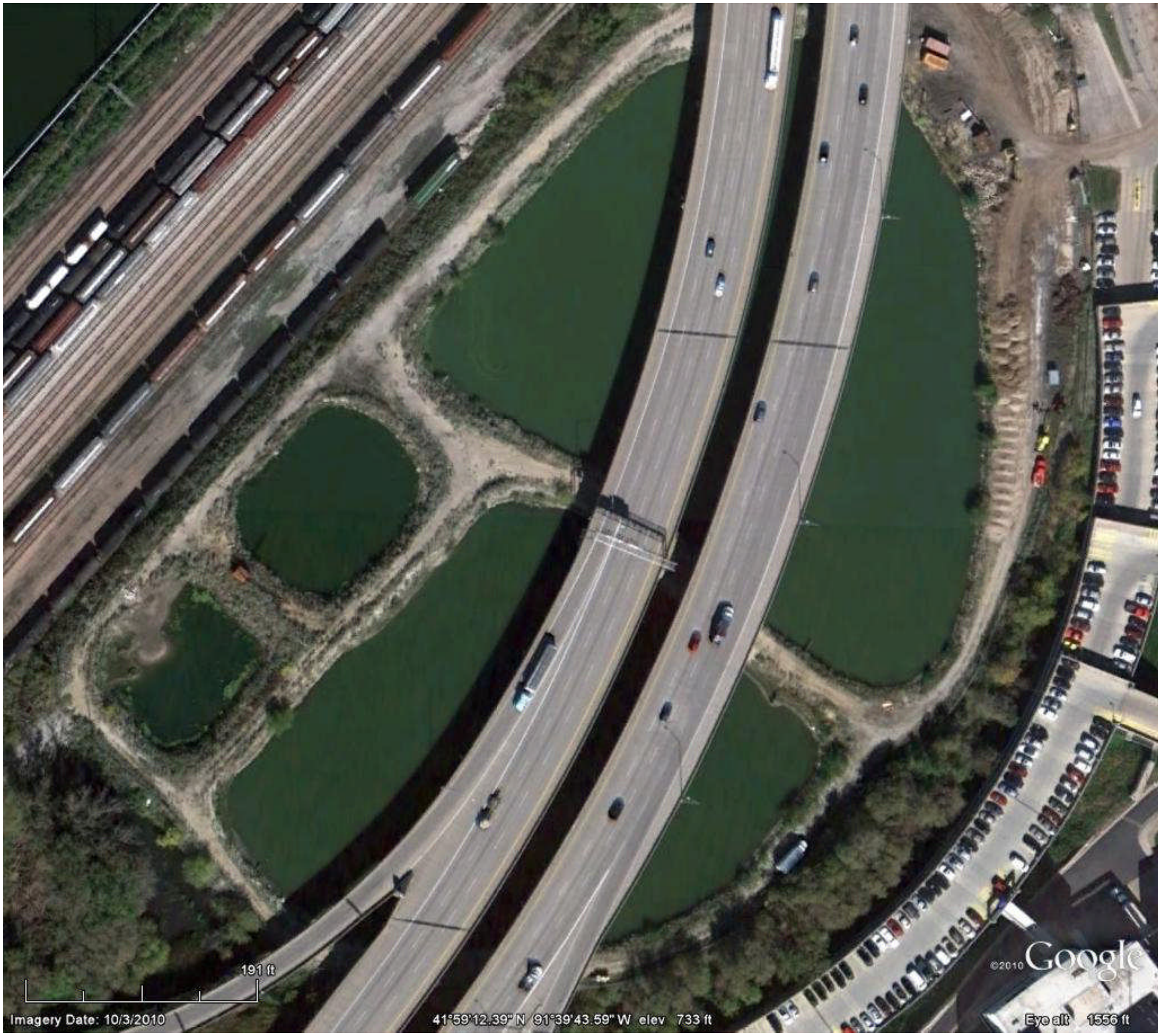
Very truly yours,

Timothy J. Harrington, P.E.

Thomas C. Wells, P.E.

6th Street Generating Plant, Cedar Rapids, Iowa





Ash Ponds

Sixth Street Generating Station, Cedar Rapids, Iowa

Google Earth Accessed 7/31/2011 by TCW

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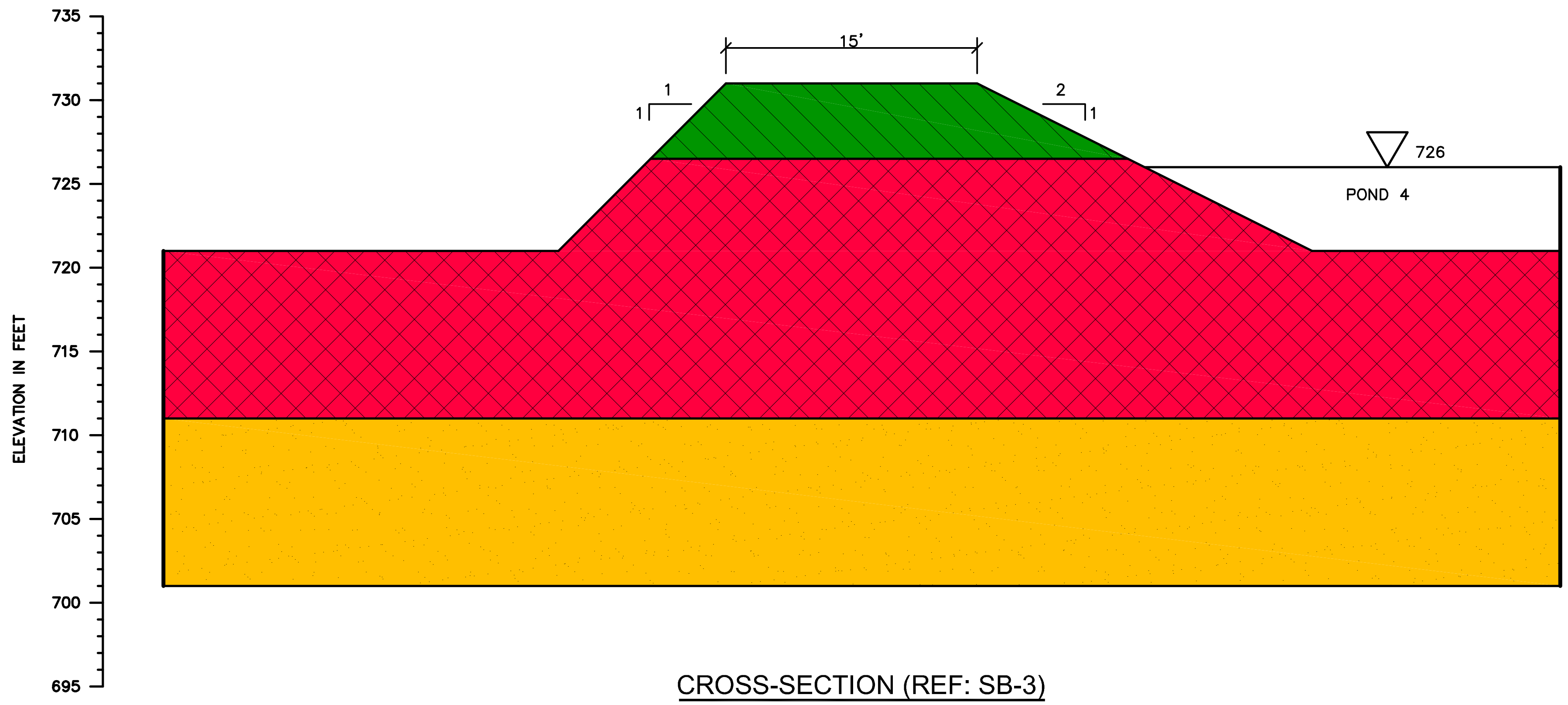
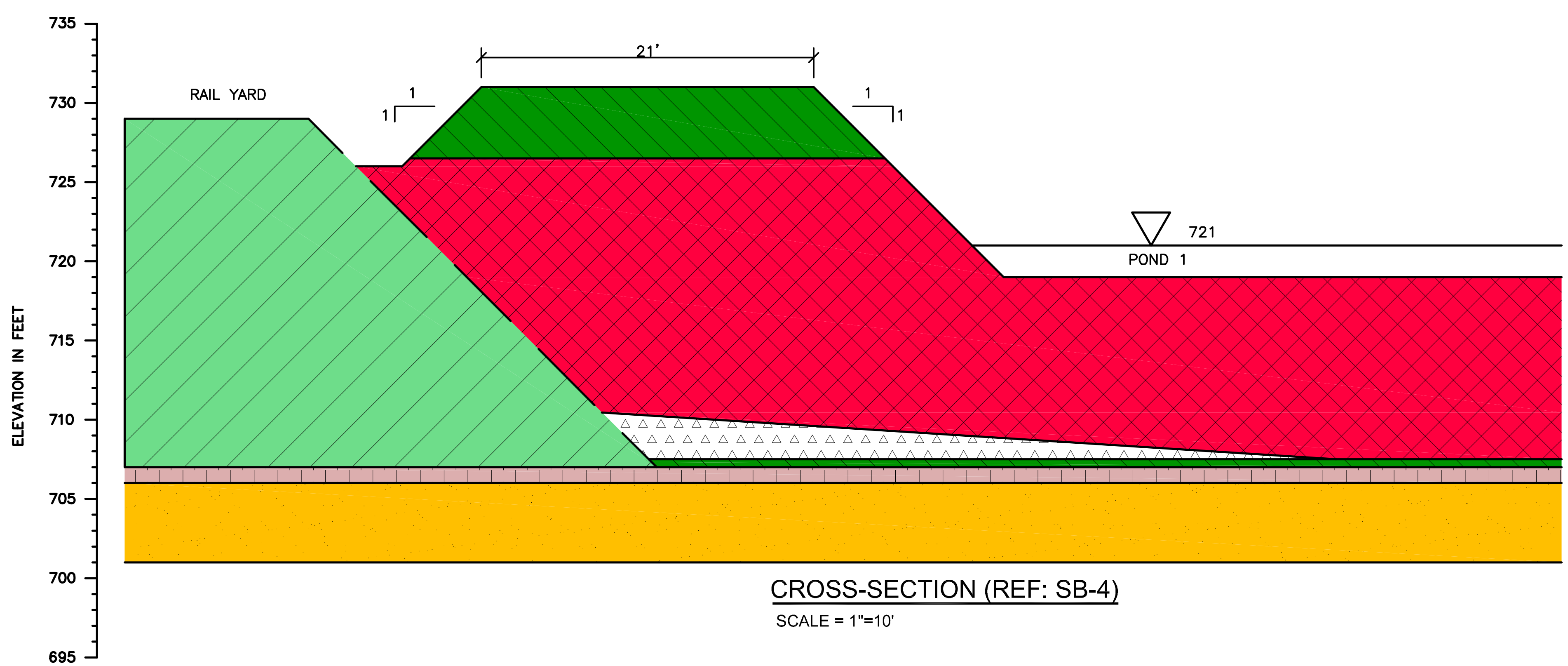


CROSS-SECTION (REF: SB-3)

SCALE = 1"=10'

LEGEND:

- GRAVEL
- ASH/SLAG (CCW)
- CLAY
- SAND (ORIGINAL GROUND)
- RUBBLE/FILL (PRIOR TO CCW)
- PEAT (ORIGINAL GROUND)
- RAIL YARD FILL



CROSS-SECTION (REF: SB-4)

SCALE = 1"=10'

NOTE:
1. CEDAR LAKE WATER ELEVATION 721'.

REV	DATE	BY	DESCRIPTION
5			
4			
3			
2			
1			

aether dbs
www.aetherdbs.com

SCALE:	AS SHOWN
DATE:	7-23-12
DRAWN BY:	JFD
CHKD. BY:	
APPROVED:	

CLIENT / LOCATION

INTERSTATE POWER AND LIGHT
COAL COMBUSTION WASTE PONDS
6TH STREET GENERATING STATION
CEDAR RAPIDS, IOWA

DRAWING DESCRIPTION

EMBANKMENT CROSS-SECTIONS
SOUTH END OF CCW PONDS

JOB 154.017.002.001

SHT. FIGURE 1

DWG. 154017-EMB XSEC

Attachment A

PHOTOGRAPHS

Response to USEPA Draft Report
6th Street Generating Station

Source:
Aether DBS, Site Investigation - June 11, 2011
Andrea Lynn Photograph, Cedar Rapids, Iowa
(http://www.andrealynnphoto.com/CRflood2008/ accessed 6/18/2012)

Photograph 1 Rubble Fill at Contact Between Original Ground Surface and CCW (SB-4)

Photograph 2 Outboard Slope at Stability Analysis Cross-Section at SB-3

Photograph 3 Water at Flood Peak, June 13, 2008

Attachment B

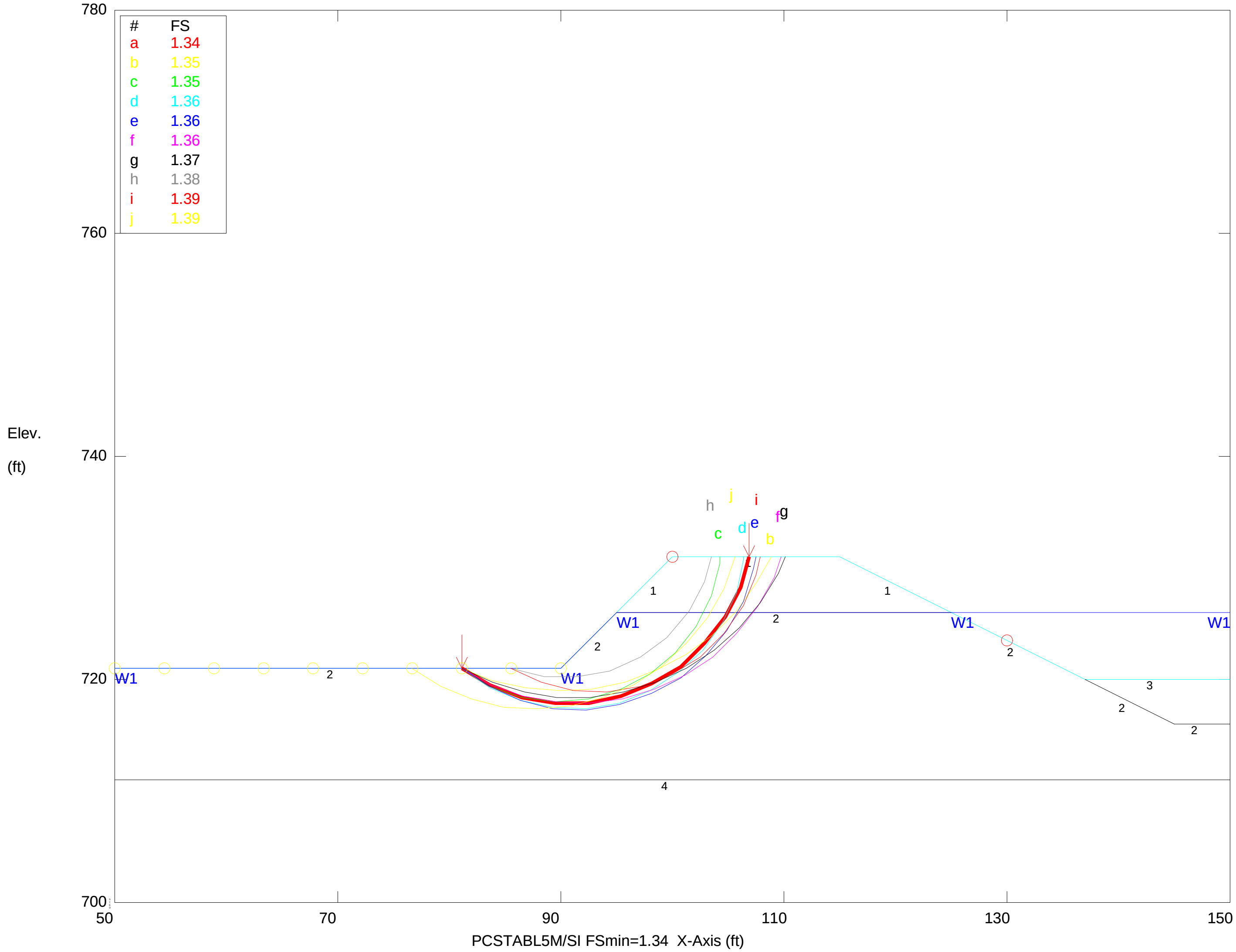
Slope Stability Analysis Results
Ten Most Critical Surfaces Per Analysis

Response to USEPA Draft Report
6th Street Generating Station

Source:
Program pcSTABLE5M/si output by Aether DBS, July 19, 2012

Alliant 6th St. Cedar Rapids Pond #4 Static Case

Ten Most Critical. C:6THST11D.PLT By: TCW 07-19-12 8:01am



Soil Type No.	Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	Clay	125	125	500	0	0	0	W1
2	Ash/Slag	120	120	0	28	0	0	W1
3	Ash	115	115	0	25	0	0	W1
4	Sand	125	125	0	32	0	0	W1

Attachment C

Curriculum Vita
Mr. Timothy J. Harrington, P.E.
Mr. Thomas C. Wells, P.E.

Aether DBS

TIMOTHY HARRINGTON, P.E.
Principal

PROFESSIONAL ENGINEERING LICENSES
New Jersey, 1985 (GE 30238); Delaware, 1987 (7145); New York, 1986 (62728-1); Pennsylvania, 1979 (28505-E); Michigan, 1980 (27309); Indiana, 1981 (19646); Illinois, 1984 (062-041983); California, 1983 (35743); Georgia, 1984 (14874); Florida, 1982 (31484); Wisconsin 2003 (36243)

QUALIFICATIONS
Mr. Harrington has 37 years in the application of engineering solutions to the management and completion of projects involving many geotechnical, and environmental remediation components, specializing in soil and sediment remediation. He has:

- Managed Large Remediation Projects from design through construction
- Managed complex Superfund projects with intertwined design, regulatory and construction issues
- Negotiated for single and multiple PRP groups to receive agency approval of remedial actions
- Negotiate for single and multiple PRP groups to drive completion of construction remediation
- Developed innovative solutions that satisfy agency objectives and reach owner goals for the project
- Recognized as an expert on contaminate sediment and soil remediation in several USEPA regions
- Consulted on the recovery of fly ash from the Emory River in Kingston, Tennessee

Geotechnical Engineering Experience:
Mr. Harrington has consulted on the design and construction of systems to control slope stability and liquefaction of loose soils.

- Consultant on the means and methods of recovering 2.5 million cubic yards of fly ash from the Emory River near Kingston Tennessee.
- Personal observation of the fly ash impoundment failure at Kingston shortly after the failure and before the start of remedial action.
- Stability analysis and design for facilities in dune sand around Lake Michigan to maintain excavations.
- Stability analysis of Uranium Tailings ponds constructed by hydraulic placemnt methods in New Mexico.
- Design of systems to stabilize Uranium Tailings ponds by controlling seepage on the embankment face.
- Design of methods to remediate loose soil to control liquefaction by compaction and/or drainage methods.

- Liquefaction testing of soils by both laboratory and field methods.

EXPERIENCE

Principal and Senior Environmental Engineer, aether DBS., Naperville , IL

Mr. Harrington's firm was acquired in January of 2006 by Hard Hat Services (now aether DBS). Both firms coming together increased respectively each others' capabilities as well as offered additional services to their clients. Mr. Harrington manages major environmental remediation efforts and solutions as well as being responsible for the Chesterton, Indiana office. His expertise is in soils, sediment and marine environments.

President, Harrington Engineering & Construction, Inc., Chesterton, IN

Mr. Harrington was owner and provider of engineering and construction management services on domestic and international projects. Projects include design and construction management for the rebuilding of intake structures in Lake Michigan, removal and processing of sediment containing lead shot to restore beneficial reuse of a critical ocean shore environment, design of an upland landfill to contain sediment from the Fox River in Green Bay, Wisconsin, design of an in-water landfill in Auckland, New Zealand to contain low solids content sediment, and services on numerous facilities to construct or repair dock walls and marinas, resolve drainage problems and repair unstable slopes.

Canonie Environmental Services Corporation, Chesterton, IN

As vice president of the construction services division, Mr. Harrington was responsible for the direction of operations in the eastern USA. Projects included the construction of an upland disposal facility at the 102^{nd} street site in Tonowanda, New York and the excavation of sediment from the St. Lawrence River, soil thermal treatment on high plasticity clay in Memphis, Tennessee, and site restoration including the removal of lime sludge and riverbank restoration in western Pennsylvania.

Rust Remedial Services Inc., Chicago, IL

Mr. Harrington served as Vice President and General Manager responsible for the operations of the Northern Region and the Thermal Operations groups. He managed work under contract totaling approximately $400,000,000 and including numerous jobs where sediment remediation was a part of the total remedy including the Brio site in Houston, Texas, the construction of landfills in New York and Massachusetts, and removal of solidified sludge from two 20-acre basins in Southern New Jersey.

Canonie Environmental Services Corporation, Chesterton, IN

Mr. Harrington served as vice president of eastern operations responsible for design and construction projects, project manager, and project engineer for design and construction field engineering. Work included the design and construction of in-water and upland landfill's at Waukegan Harbor, Illinois, design and construction of a cap and slope protection for remnant sediments in the Hudson River, work on landfills caps in New Jersey and Indiana, and numerous projects working as a geotechnical engineering consultant on failure investigations.

D'Appolonia Consulting Engineers, Inc., Pittsburgh, PA
Mr. Harrington worked as a project engineer on projects to build power plants, on the investigation and design of mine tailing impoundments for uranium tailings in New Mexico, on design of underground mine works for the waste isolation pilot plant in New Mexico, and on several projects for water supply and dewatering of aquifer formations.

EDUCATION

Michigan State University – Masters of Science in Civil Engineering (Geotechnical and Structural Engineering Specialty)
Michigan State University – Bachelor of Science in Civil Engineering

CERTIFICATIONS

- 40-Hour OSHA HAZWOPER Training
- 8-Hour Refresher for 40-Hour Hazardous Training
- Certificates for Continuing Education from ACI, AISI, SJI and others for Renewal of Professional Licensing

PROFESSIONAL ACTIVITIES

American Society of Civil Engineers
American Concrete Institute

THOMAS CHARLES WELLS, P.E.

Senior Project Engineer

PROFESSIONAL ENGINEERING LICENSE

Michigan, 1991 (6201036924)

QUALIFICATIONS

Mr. Wells has over 35 years of geoenvironmental engineering and database management / programming experience. As a senior engineer for Aether DBS, Mr. Wells has supplied both office and field based engineering and information technology support services.

As a Professional Engineer, Mr. Wells has considerable experience in the key areas of geotechnical, environmental, hydrology, hydraulic, and foundation engineering. He has continued to practice in these areas as a part of his engineering/database focus.

Geotechnical Engineering Experience:
Mr. Wells has contributed to many heavy construction projects involving industrial facilities and environmental remediation. Geotechnical engineering related projects / tasks have included:

- Performed stability analyses for 8 miles of I-74 in Dearborn County, Indiana following a major interstate highway embankment failure. The stability investigation led to the design of a corrective berm on a similar nearby side-hill highway embankment.
- Performed stability analyses for a riparian fill design following the foundation soil failure of approximately 800 feet of ore yard at Sparrows Point, Maryland.
- Analyzed the extreme settlement (3-4 feet) of Chemical Storage Tanks in Paulsboro, New Jersey.
- Investigated and analyzed a slope stability failure along the St. Joseph River in Michigan.
- Analyzed a slope stability failure along the Grand Calumet River in Gary, Indiana and designed a corrective slope.
- Development and improvement of a 1-D finite-difference numerical model to simulate large-strain soil/sediment consolidation for use in predicting the large settlements that occur in hydraulically placed sediment.

EXPERIENCE

<u>WELLS Technical Services, Chesterton / Union Mills, IN</u>
As a sole Proprietor serving primarily Aether DBS (formerly Harrington Engineering & Construction), Envirocon, Inc. and Locus Technologies, Mr. Wells supplies engineering and information technology support services on a project-by-project basis. Aether DBS specializes in Sediment Restoration Services, Marine Design, Environmental Engineering, and Site Remediation. Envirocon is a full-service environmental remediation, demolition and civil construction contractor. Locus Technologies is an engineering and construction management firm based in northern California and serving primarily the environmental market. Locus Technologies is the leader in on-demand world-wide-web based Environmental Data Management Software, Services and Solutions.

Harding Lawson Associates, Chicago, IL
As an associate engineer in the Chicago office, Mr. Wells contributed to multiple projects and systems including HLADBMS (the Harding Lawson Associates DataBase Management System). HLADBMS was used to manage site characterization data generated by environmental projects. Mr. Wells also served as the North Carolina Low Level Radioactive Waste Facility feasibility project database administrator in Raleigh, NC during the project start-up phase November 1996 through March 1997.

Canonie Environmental Services Corporation
Mr. Wells served as a Technical Manager / Staff Consultant where he provided engineering and information technology support to both the technical and administrative staffs. Mr. Wells also acted as the drafting supervisor and network administrator at times (while performing his other roles). Geotechnical and Environmental project work included ground water & hydraulic modeling, geotechnical analysis & foundation design and geoenvironmental data management.

Environmental construction management tasks included the development of a construction equipment cost management system and the development of a companywide environmental construction cost estimating system used to estimate project costs totaling millions of dollars.

D'Appolonia Consulting Engineers, Inc., Pittsburgh, PA
Mr. Wells acted as the Computer department's liaison with the technical staff, supported project usage of the PRIME® super-minicomputers, and Mr. Wells also assisted with ground water modeling projects. During his first project assignment beyond graduate school, Mr. Wells authored a flood-routing program for a probable maximum flood study. During this period as a staff engineer, Mr. Wells performed pile driving, slope stability, and foundation analyses. He designed foundations, waste embankments, earthen dams, drainage channels, and spillways.

EDUCATION

Penn State University – Certificate in Geographic Information Systems
Michigan State University – Masters of Science in Civil Engineering (Geotechnical and Hydraulics / Hydrology Engineering Specialty)
Michigan State University – Bachelor of Science in Civil Engineering

CERTIFICATIONS

- 40-Hour OSHA HAZWOPER Training
- 8-Hour Refresher for 40-Hour Hazardous Training
- Certificates for Continuing Education from ASTM, Purdue University and others

PROFESSIONAL ACTIVITIES

American Society of Civil Engineers