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Coal Combustion Waste Impoundment
Round 7 - Dam Assessment Report

Riverside Generating Station (Site 15)

Ash Ponds
MidAmerican Energy Company
Bettendorf, Iowa

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, which flooded more than 300 acres of land, damaging homes and property, is a wake-up call for diligence on coal combustion waste disposal units. We must marshal our best efforts to prevent such catastrophic failure and damage. A first step toward this goal is to assess the stability and functionality of the ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the Riverside Generating Station Ash Pond management units is based on a review of available documents and on the site assessment conducted by Dewberry personnel on Tuesday, September 14, 2010.

The Riverside Generating Station South Ash Pond management unit is **POOR** for continued safe and reliable operation. The south Ash Pond is marginally stable under static steady state seepage conditions and does not meet appropriate safety factors against failure.

PURPOSE AND SCOPE

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

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

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EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the 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. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is to evaluate the condition and potential of waste release from **management units that have not been rated for hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also, after the field visit additional information and studies were received by Dewberry & Davis LLC about the Riverside Ash Pond Dams that were reviewed and used in preparation of this report.

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

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

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

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit, Tuesday, September 14, 2010, and review of technical documentation provided by MidAmerican Energy Company (MidAmerican).

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

The structural stability of the North Ash Pond appears adequate. It should, however, be noted that the North Ash Pond is inactive and no longer receives coal combustion wastes. The south Ash Pond is marginally stable under static steady state seepage conditions and does not meet appropriate safety factors against failure.

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

Adequate capacity and freeboard exist to safely pass the design storm.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

Supporting technical documentation is adequate.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

Descriptions provided are appropriate.

1.1.5 Conclusions Regarding the Field Observations

The visual assessment of the South Ash Pond embankment system was that it was in satisfactory condition and no significant findings were noted.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

Maintenance and methods of operation are adequate for the South Ash Pond.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

Existing surveillance and monitoring programs are adequate.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The South Ash Pond facility is Poor for continued safe and reliable operation. A management unit safety deficiency is recognized for any required loading (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. The South Ash Pond is marginally stable under static steady state seepage conditions and does not meet appropriate safety factors against failure.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

Additional documentation will be required once corrective measures are employed to improve the stability of the South Ash Pond. In addition, slope stability analyses for rapid drawdown conditions and seismic loading conditions should be performed for the South Ash Pond.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

None appear warranted at this time.

1.2.3 Recommendations Regarding the Supporting Technical Documentation

Slope stability analyses for rapid drawdown conditions and seismic loading conditions should be performed for the South Ash Pond.

1.2.4 Recommendations Regarding the Description of the Management Unit(s)

None appear warranted at this time.

1.2.5 Recommendations Regarding the Field Observations

None appear warranted for the South Ash Pond.

1.2.6 Recommendations Regarding the Maintenance and Methods of Operation

None appear warranted for the South Ash Pond.

1.2.7 Recommendations Regarding the Surveillance and Monitoring Program

None appear warranted at this time.

1.2.8 Recommendations Regarding Continued Safe and Reliable Operation

The North Ash Pond is recommended to be deactivated as it no longer receives coal combustion wastes. The South Ash Pond will need to have remedial action to improve the factor of safety against slope instability.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Joe Bannon, MidAmerican
Danielle Leslie, Riverside Generating Station
David Webb, Riverside Generating Station
Doug Haiston, Riverside Generating Station
Carl Upmeyer, Riverside Generating Station
Mike McLaren, Dewberry
Frederic Shmurak, Dewberry

1.3.2 Acknowledgement and Signature

We acknowledge that the Riverside Generating Plant management units referenced herein were assessed on September 14, 2010.

Michael McLaren, P.E.

Frederic Shmurak, P.E.

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

2.1 LOCATION AND GENERAL DESCRIPTION

The Riverside Generating Plant and ash ponds are located east of the intersections of US Highway 67 and Fenno Road in Bettendorf Iowa along the west bank of the Mississippi River. Figure 2.1-1 shows the location of the Riverside Generating Plant within the State of Iowa, while Figure 2.1-2 depicts an aerial view of the Riverside Generating Plant Facility.

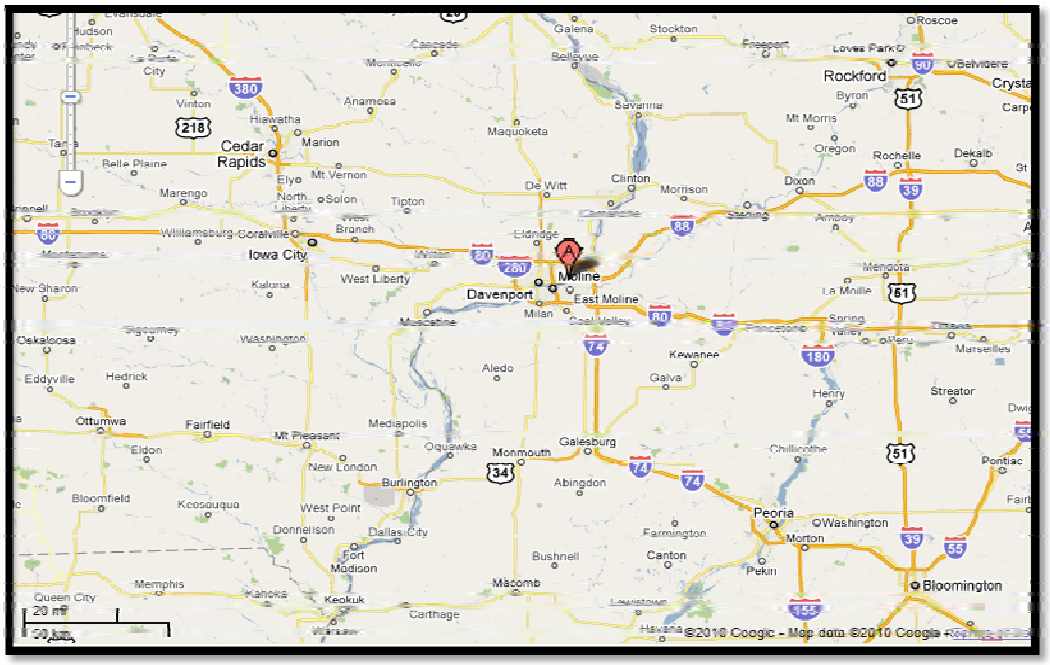


Figure 2.1-1: Riverside Generating Plant Location Map.

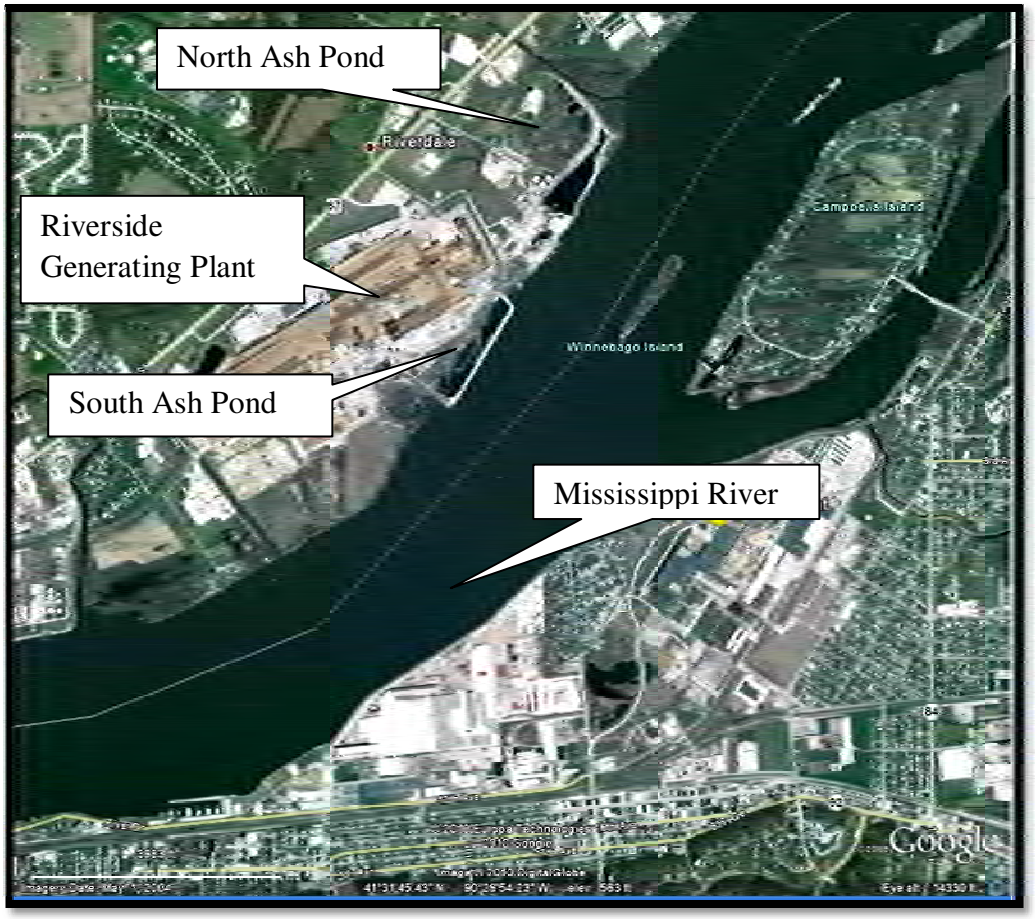


Figure 2.1-2: Riverside Generating Plant Aerial Photograph.

Table 2.1a provides data on the size and dimensions of the two coal combustion waste management units.

Table 2.1a: Summary of Dam Dimensions and Size		
	North Ash Pond	**South Ash Pond**
Dam Height (ft)	12	15
Crest Width (ft)	12	12
Length (ft)	3,375	4,275
Side Slopes (upstream) H:V	2.5:1	2:1
Side Slopes (downstream) H:V	2.5:1	2:1

2.2 SIZE AND HAZARD CLASSIFICATION

The North and South ash pond is impounded by an earthen embankment system consisting of a combination of an incised and diked configuration. Based on data

provided by MidAmerican Energy Company (MEC), the North and South ash pond embankment systems are constructed to a maximum height of 12 and 15 feet, respectively. Side slopes for the North Ash Pond are 2.5(H):1(V) and the South Ash Pond side slopes are 2(H):1(V); crest widths are approximately 12 feet for both ponds. The maximum storage volume corresponding to the top of the embankment is 84 acre-feet for the North Ash Pond and 140-acre-feet for the South Ash pond. The classification for size, based on the height of the dams and storage capacities, is Small in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria (see Table 2.2a for size classification criteria).

Table 2.2a: USACE ER 1110-2-106
Size Classification

	Impoundment	
Category	**Storage (Ac-ft)**	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

No information on the Hazard Classification was provided, but based on observations; a classification of **Low** appears to be appropriate. Per the Federal Guidelines for Dam Safety dated April 2004, a Low Hazard Potential classification applies to those dams where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Considering the low probability of loss of life should the fly ash dam system fail, as well as the relatively small impoundment size of the facilities, a Federal Hazard Classification of Low appears to be appropriate for this facility (see Table 2.2b for Hazard classification criteria).

Table 2.2b: FEMA Federal Guidelines for Dam Safety
Hazard Classification

	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

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

Per MidAmerican, the North Ash Pond solids consist of 5% fly ash, 90% bottom ash & boiler slag, and 5% construction and demolition rubble, as well as excess stormwater runoff from the facility coal pile. The North Ash Pond is no longer active and has not received coal combustion waste materials since 2001. The drainage area is assumed to be the surface area of the pond. The maximum design storage capacity is approximately 135,000 cubic yards (see Table 2.3).

The South Ash Pond solids consist of 5% fly ash, coal pyrites and economizer ash; and 95% bottom ash & boiler slag, as well as excess stormwater runoff from the facility and plant service wastewater. The drainage area is assumed to be the surface area of the pond. The maximum design storage capacity is approximately 226,000 cubic yards (see Table 2.3a).

Table 2.3a: Maximum Capacity of Unit

	North Ash Pond	South Ash Pond
Surface Area (acre)	14.1	12
Total Storage Capacity (acre-feet)	84	140
Total Storage Capacity (cubic yards)	135,000	226,000
Coal Combustion Residue Stored (cubic yards)	81,000	176,000
Crest Elevation (feet)	577	576
Normal Pond Level (feet)	None[1]	571

[1] The North Ash Pond is longer in use and does not maintain a normal pool.

2.4 PRINCIPAL PROJECT STRUCTURES

2.4.1 Earth Embankment

MEC personnel provided limited subsurface data consisting of boring logs used in conjunction with monitoring well installations. Based on the boring logs, it appears the North Ash Pond and South Ash Pond consist of strata of loose silts, sands (including ash) and soft clay soils.

2.4.2 Outlet Structures

The North Ash Pond does not have an outlet structure nor does it maintain a normal pool. Rainfall that falls into the impoundment area generally evaporates and/or percolates into the soil.

The South Ash Pond contains a 15" diameter welded steel decant pipe system that serves as the principal outlet and a secondary 15" diameter welded steel overflow pipe. The principal outlet pipe was flowing at the time of the site visit; the secondary outlet was above the normal pool and dry. Both outlets discharge into a small channel which empties directly into the Mississippi River.

2.5 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

All critical infrastructures were located using aerial photography and might not accurately represent what currently exists down-gradient of the site. Not all critical infrastructures are labeled for clarity purposes. Figure 2.5-1 shows the Riverside Generating Plant and associated critical infrastructure, listed in Table 2.5a.

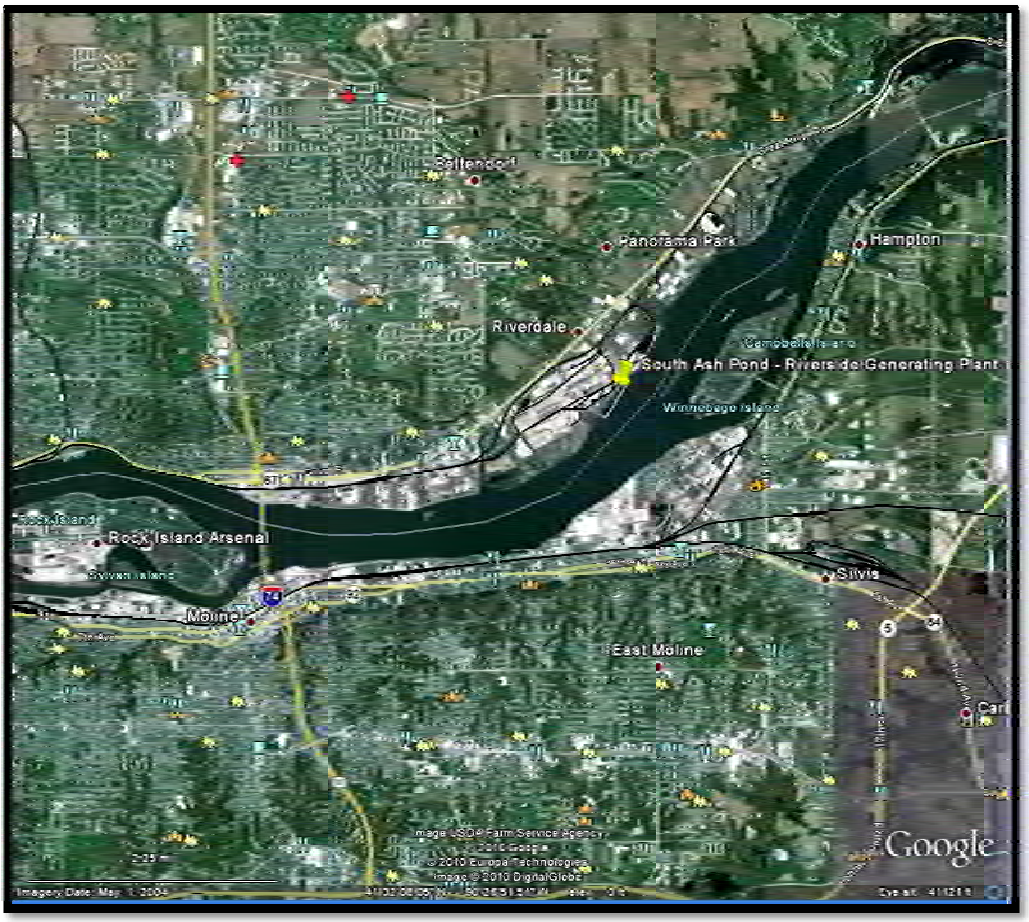


Figure 2.5-1: Critical Infrastructure Map.

Table 2.5a: Critical Infrastructure within 5 Miles Down gradient of Facility

Schools	Schools (Cont.)	Nursing Homes
Eagle Ridge School 2002 Eagle Ridge Drive Silvis, IL 61282-1779	Black Hawk Area Special Ed 4670 11th Street East Moline, IL 61244-4432	Trinity Medical Center at Terrace Park 4500 Utica Ridge Road Bettendorf, IA 5272
Wells Elementary School 490 Avenue of the Cities East Moline, Illinois 61244	East Moline Christian School 900 46th Avenue East Moline, IL 61244-4406	Genesis Physical Occupational & Speech Therapy Outpatient 2300 53rd Avenue Bettendorf, IA 52722-7564
Glenview Middle School 3210 7th St, East Moline, IL 61244	Black Hawk College 301 Avenue of the Cities East Moline, IL 61244-4038	Rick's House of Hope 4867 Forest Grove Road Bettendorf, Iowa 5272
Our Lady of Grace 602 17th Avenue East Moline, IL 61244-2027	Villa Montessori School 2100 48th Street Moline, IL 61265	**Transportation**
Black Hawk Area Special Education 4670 11th Street East Moline, IL 61244-4432	Moline High School 3600 23rd Avenue Moline, Illinois 61265	Interstate I-74 John Deer Expressway (Hwy 5) Highway 92 Highway 84
Hampton Elementary School 206 5th Street Hampton, IL 61256-9662	Roosevelt Elementary School 3530 Avenue of the Cities Moline, IL 61265-4495	**Fire Stations**
Pleasant View Elementary School 6333 Crow Creek Rd Bettendorf, IA 52722-6518	Temple Christian School 2305 7th Avenue Moline, IL 61265-1546	East Moline Fire Department 1523 Morton Drive East Moline, IL 61244-1616
United Township High School 1275 Avenue of the Cities East Moline, IL 61244-4100	Seton Catholic School 1320 16th Avenue Moline, IL 61265-3081	Carbon Cliff Volunteer Fire Department Fire Department Non-Emergency 305 2nd Avenue Carbon Cliff, IL 61239
Blackhawk Phoenix Program 103 3rd Street Carbon Cliff, IL 61239-7711	**Miscellaneous**	
Bowlesburg School 2221 10th Street Silvis, IL 61282-2098	Restaurants Places of Worship Business Residences Rock Island Arsenal	

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

No reports on the safety of the management units were provided.

3.1 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS.

The North Ash Pond is inactive and does not receive coal combustion wastes. The South Ash Pond facility is under regulation by the Iowa Department of Natural Resources. The discharge from the South Ash Pond is permitted under the Federal National Pollutant Discharge Elimination System Program (Permit # IA0003611).

3.2 SUMMARY OF SPILL/RELEASE INCIDENTS

No spills or releases from the Ash Pond facilities have been noted by MEC for this site.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

Original construction of the ash pond facilities appears to be circa 1967 based on Riverside South Fence and Ash Fill Area drawings prepared by Iowa-Illinois Gas and Electric Company, dated 27 March 1967.

4.1.2 Significant Changes/Modifications in Design since Original Construction

No significant changes have been made to the North Ash Pond. The South Ash Pond embankment was originally constructed to a crest elevation of 563.4 ft msl; raised 2 feet in 1970 (to crest elevation 565.4 ft, msl); and finally in 1976 to a crest elevation between 576 and 580 ft msl.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

No significant changes have been made to the North Ash Pond. In 2001, following damage due to Mississippi River flooding, the South Ash Pond embankment crest was broadened to 12 feet and the downstream slope was flattened to the current 2H:1V inclination and rock rip-rap was added to the downstream slope.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

The ash ponds were designed and operated for reservoir sedimentation and sediment storage of fly and bottom ash. Plant process waste water, coal combustion waste, coal pile stormwater runoff, and minimal stormwater runoff around the Ash Pond facility were discharged into the reservoir. Inflow water was treated through gravity settling and deposition, and the treated process water and storm water runoff were discharged through a decant pipe outlet structure to the Mississippi River.

4.2.2 Significant Changes in Operational Procedures Since Original Startup

The North Ash Pond ceased receiving coal combustion wastes in 2001. No documentation was provided describing any significant changes in Operating Procedures for the South Ash Pond.

4.2.3 Current Operational Procedures

The North Ash Pond is idle and continues to store previous sluiced coal ash. Original operational procedures continue to be in effect for the South Ash Pond based on observation and the documents provided.

4.2.4 Other Notable Events since Original Startup

No additional information was provided.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Michael McLaren, P.E. and Frederic Shmurak, P.E. performed a site visit on 14 September 2010, with the participants listed in Section 1.3.1.

The site visit began at 9:00 AM. The weather was clear and warm. Photographs were taken of conditions observed. Please refer to photographs in Appendix B and the Dam Inspection Checklists in Appendix C. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the North Ash Pond embankment system was that it was in an unsatisfactory condition due to the presence of thick woody-stemmed vegetation, dense brush and trees covering the upstream and downstream slope preventing a thorough visual observation. The overall visual assessment of the South Ash Pond embankment system was that it was in satisfactory condition and no significant findings were observed.

5.2 NORTH ASH POND

5.2.1 Crest

The crest had no signs of any rutting, depressions, tension cracks or other indications of settlement or shear failure, and appeared to be in satisfactory condition. See Figure 5.2.1-1.

Figure 5.2.1-1: Crest of North Ash Pond dike.

5.2.2 Upstream/Inside Slope

The upstream/inside slope of the North Ash Pond was covered by thick woody-stemmed vegetation, dense brush and trees; a thorough visual observation could not be performed (see Figure 5.2.2-1).

Figure 5.2.2-1: Crest and Upstream/Inside Slope of North Ash Pond dike.

5.2.3 Downstream/Outside Slope and Toe

The downstream/outside slope and toe of the North Ash Pond was covered by thick woody-stemmed vegetation, dense brush and trees; a thorough visual observation was unattainable. Areas of rill and sheet erosion were visible (see Figure 5.2.3-1 and Figure 5.2.3-2).

Figure 5.2.3-1: Crest and Downstream/Outside Slope of North Ash Pond dike.

Figure 5.2.3-2: Erosion along Downstream/Outside Slope of North Ash Pond dike.

5.2.4 Abutments and Groin Areas

The embankment consists of a raised dike system; therefore the earthen embankment does not abut existing hillsides, rock outcrops or other raised topographic features.

5.3 SOUTH ASH POND

5.3.1 Crest

The crest is covered by graded aggregate base material and had no signs of any rutting, depressions, tension cracks or other indications of settlement or shear failure, and appeared to be in satisfactory condition. (Fig. 5.3.1-1)

Figure 5.3.1-1: Crest and Upstream/Inside Slope of South Ash Pond dike.

5.3.2 Upstream/Inside Slope

The upstream slope of the separation dike is mostly lined with rip rap and stone (Figure 5.3.2-1). Scarps, sloughs, depressions, bulging or other indications of slope instability or signs of erosion were not observed.

Figure 5.3.2-1: Upstream/Inside Slope of South Ash Pond dike.

5.3.3 Downstream/Outside Slope and Toe

The downstream slope is mostly lined with rip rap and stone (Figure 5.3.3-1). Scarps, sloughs, depressions, bulging or other indications of slope instability or signs of erosion were not observed. The toe of this slope is below the normal water surface elevation of the Mississippi River; therefore, visual assessment of seepage could not be performed

Figure 5.3.3-1: Downstream/Outside Slope of South Ash Pond dike.

5.3.4 Abutments and Groin Areas

The embankment consists of a raised dike system; therefore the earthen embankment does not abut existing hillsides, rock outcrops or other raised topographic features.

5.4 OUTLET STRUCTURES

5.4.1 Overflow Structure

The North Ash Pond does not contain an overflow structure (no normal pool is maintained). The South Ash Pond is equipped with a 15-inch diameter welded steel overflow pipe system that was above the normal operating pool at the time of the site visit (Figure 5.4.1-1). The visible portion of the overflow conduit had no apparent deterioration.

Figure 5.4.1-1: Overflow Structure South Ash Pond (note control valve for decant pipe system in foreground).

5.4.2 Outlet Conduit

The North Ash Pond does not contain an outlet structure (no normal pool is maintained). The South Ash Pond is equipped with a regulated 15-inch diameter welded steel decant pipe that was flowing at the time of the site visit (Figure 5.4.2-1). The visible portion of the outlet conduit had no apparent deterioration.

Figure 5.4.2-1: Outlet Conduit for South Ash Pond
(note presence of overflow pipe outlet).

5.4.3 Emergency Spillway

No emergency spillway system is present at either the North Ash Pond or the South Ash Pond.

5.4.4 Low Level Outlet

No low level outlet system is present at either the North Ash Pond or the South Ash Pond.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

No information was provided. The North and South Ash Ponds are mostly diked embankment facilities having a contributing drainage area equal to the surface area of the impoundment; therefore the impounded pool would not be anticipated to experience significant flood stages.

6.1.2 Inflow Design Flood

According to FEMA Federal Guidelines for Dam Safety, the current practice in the design of dams is to use the Inflow Design Flood (IDF) that is deemed appropriate for the hazard potential of the dam and reservoir, and to design spillways and outlet works that are capable of safely accommodating the flood flow without risking the loss of the dam or endangering areas downstream from the dam to flows greater than the inflow. The recommended IDF or spillway design flood for a low hazard small sized structure (See section 2.2), in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria is the 50- to 100-yr frequency (See Table 6.1.2a).

Table 6.1.2a: USACE Hydrologic Evaluation Guidelines Recommended Spillway Design floods

Hazard	Size	Spillway Design Flood
Low	Small	50 to 100-yr frequency
	Intermediate	100-yr to ½ PMF
	Large	½ PMF to PMF
Significant	Small	100-yr to ½ PMF
	Intermediate	½ PMF to PMF
	Large	PMF
High	Small	½ PMF to PMF
	Intermediate	PMF
	Large	PMF

The Probable Maximum Precipitation (PMP) is defined by American Meteorological Society as the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of year. The National Weather Service (NWS) further states that in consideration of our limited knowledge of the complicated processes and interrelationships in storms, PMP values are identified as estimates. The NWS has published application procedures that can be used with PMP estimates to develop spatial and temporal characteristics of a Probable Maximum Storm (PMS). A PMS thus developed can be used with a precipitation-runoff simulation model to calculate a probable maximum flood (PMF) hydrograph.

The 50-year frequency 24-hour rainfall is 5.7-inches and the 100-year frequency, 24 hour rainfall is 6.5 inches. The 6-hour, 10 square mile PMP depth is approximately 26 inches. In order to store and pass the PMP, approximately 2' of freeboard must be present. It is reported that the freeboard for the North Ash Pond is >2-ft and the freeboard for the South Ash Pond is 5-ft; therefore adequate freeboard appears to exist to safely store and pass the full PMP.

6.1.3 Spillway Rating

No spillway rating was provided. The North and South ash ponds are mostly diked embankment facilities having contributing drainage areas equal to the surface area of the impoundments; therefore the impounded pools would not be anticipated to experience significant changes in elevation. The North ash Pond does not contain an outlet system and the South Ash Pond has a regulated 15" steel decant pipe and overflow pipe and, given little change in the normal pool elevation, the resulting discharge rate is expected to be relatively constant.

6.1.4 Downstream Flood Analysis

No downstream flood analysis was provided.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Supporting technical documentation is sufficient.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Adequate capacity and freeboard exists to safely pass the design storm.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

MEC provided structural stability analyses in the Geotechnical Engineering Report, Preliminary Opinions of Global Stability North Ash Containment Pond Embankments, Riverside Generating Station, Louisa County, Iowa dated October 22, 2010 and Geotechnical Engineering Report, Preliminary Opinions of Global Stability South Ash Containment Pond Embankments, Riverside Generating Station, Louisa County, Iowa dated October 27, 2010. These reports documented analyses of slope stability of the levees surrounding the ash pond; specifically under steady state seepage conditions as well as steady state seepage – flood event conditions. As stated in the reports "USGS peak ground acceleration is less than 0.10g for the 100-year earthquake at this site; therefore, seismic loading conditions were not required according the USACE EC 1110-2-6067."

7.1.2 Design Parameters and Dam Materials

Slope stability soil strength parameters appear to be reasonable based on the embankment materials encountered, see Figure 7.1.2-1 and Figure 7.1.2-2.

Material	Saturated Unit Weight (pcf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)
Clay Fill	130	15	250
Residual Soils	120	25	0
Weathered Limestone	135	40	0

Figure 7.1.2-1: North Ash Pond Embankment Material.

Material	Saturated Unit Weight (pcf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)
Sandy Silty Clay (Fill)	100	32	25
Silty Clay (Fill)	100	30	0
Silty Sand (Fill)	100	32	0
Weathered Limestone	135	40	0

Figure 7.1.2-2: South Ash Pond Embankment Material.

7.1.3 Uplift and/or Phreatic Surface Assumptions

Subsurface water levels could not be determined; however they were estimated based on the borings performed for the slope stability analysis, see Figure 7.1.3-1 and Figure 7.1.3-2.

Boring Number	Observed Water Depth (ft) [1]	
	While Drilling	After Drilling
1	10	18
2	none	14½
3	none	none

[1] Below existing grade

Figure 7.1.3-1: North Ash Pond Boring Water Depths.

Boring Number	Observed Water Depth (ft) [1]
	While Drilling
4	14
5	18
6	16
7	11

[1] Below existing grade

Figure 7.1.3-2: South Ash Pond Boring Water Depths.

7.1.4 Factors of Safety and Base Stresses

The report calculated the following safety factors for the North Ash Pond embankments, and showed that safety factors were equal to or greater than minimum Federal Corps of Engineers safety factors (see Figure 7.1.4-1).

Section [2]	Estimated Factor of Safety Obtained from Analysis [1]		
	Steady State Seepage		
	Required Minimum Factor of Safety [3]	Upstream	Downstream
J	1.4	2.0	1.6

1. Reported factors of safety are for deep seated circular "failure" surfaces that emerge near the levee crest. Computed factors of safety for shallow circular "failure" surfaces near the toe of the levee may be smaller.
2. Refer to Ash Pond Plan in Exhibit D-1, for cross section location.
3. Reference: Table 6.1b from EM 1110-2-1913

Figure 7.1.4-1: North Ash Pond Factor of Safety.

The report calculated the following safety factors for the South Ash Pond embankments, and showed that **safety factors were less than minimum Federal Corps of Engineers safety factors** (see Figure 7.1.4-2).

Section[2]	Estimated Factor of Safety Obtained from Analysis [1]		
	Steady State Seepage		
	Required Minimum Factor of Safety [3]	Upstream	Downstream
A	1.4	2.4	1.1
C	1.4	5.7	1.1

1. Reported factors of safety are for deep seated circular "failure" surfaces that emerge near the levee crest. Computed factors of safety for shallow circular "failure" surfaces near the toe of the levee may be smaller.
2. Refer to Ash Pond Plan in Exhibit D-1, for cross section location.
3. Reference: Table 6.1b from EM 1110-2-1913

Figure 7.1.4-2: South Ash Pond Factor of Safety.

Given the less than required safety factor values for slope stability, we recommend that additional studies be performed and remedial action taken to increase the factor of safety against slope failure.

7.1.5 Liquefaction Potential

Liquefaction potential has not been provided by MEC and therefore not assessed for this facility; however, soil conditions do not appear susceptible to liquefaction.

7.1.6 Critical Geological Conditions

No critical geological conditions appear present at the site. Based on the Scott County Geologic Mapping Update prepared by The Iowa DNR and Iowa Geologic Survey dated October 26, 2009, the North and South Ash Ponds reside within the Devonian System Bedrock Geology. Specifically Dolomite, Limestone, Shale, and Minor Sandstone (Wapsipinicon Group) middle Devonian. This area includes the Otis and Pinicon ridge formations, with a total thickness between 18 and 29m (60-95ft). The Otis Formation is dominated by lithographic to sublithographic, pelletal limestone, with minor dolomite near its base. The Pinicon Ridge Formation is characterized by laminated or brecciated, unfossiliferous limestone and dolomite with minor shale. Surficial Geology consists of the Henry formation, Muscatine Mbr. Coarse to fine sand and pebbly sand

mantled with up to 1.5m (5ft) of eolian sand, Kingston Terrace complex in the Mississippi Valley.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Although supporting technical documentation is adequate to assess the structural stability of the North and South Ash Pond, additional documentation will be required once corrective measures are employed to improve the stability of the South Ash Pond. In addition, slope stability analyses for rapid drawdown conditions and seismic loading conditions should be performed for South Ash Pond.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

The structural stability of the North Ash Pond appears adequate. It should, however, be noted that the North Ash Pond is inactive and no longer receives coal combustion wastes. The South Ash Pond is marginally stable under static steady state seepage conditions and does not meet appropriate safety factors against failure.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

Operational procedures are adequate. The facility is operated for reservoir sedimentation and sediment storage; specifically for bottom ash and fly ash residuals. Coal combustion process waste water and stormwater runoff from the facility are discharged into the reservoir, inflow water is treated through gravity settling and deposition, and treated process water and stormwater runoff is discharged through a regulated decant pipe into the Mississippi River.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Maintenance generally is limited to mowing grass when needed. Maintenance procedures appear adequate for the South Ash Pond.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Based on the assessments of this report, operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

Based on the assessments of this report, maintenance procedures for the South Ash Pond appear to be adequate.

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Monthly inspection reports were provided by MEC for March through September 2010. The 2010 (MEC) Ash Pond Inspection checklist Form can be found in Appendix A Doc 03: Smith Report 2010.pdf.

9.2 INSTRUMENTATION MONITORING

No embankment monitoring instrumentation devices (i.e. piezometers) were observed at the facility during the time of the inspection. Monitoring wells are on site, but are used for water quality measurement purposes only.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

No instrumentation is present at the North and South ash ponds.

MidAmerican
ENERGY
OBSESSIVELY, RELENTLESSLY AT YOUR SERVICE.

May 15, 2009

Mr. Richard Kinch
US Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor; N-5783
Arlington, VA 22202 2733

VIA OVERNIGHT MAIL

Re: Surface Impoundment Section 104(e) Request
Riverside Generating Station, Bettendorf, Iowa

Dear Mr. Kinch:

This letter responds to the subject information collection request issued by the United States Environmental Protection Agency (EPA) pursuant to section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9604(e). MidAmerican Energy Company's Riverside Generating Station received your request on May 4, 2009, and this response has been timely submitted within the required ten (10) business days.

MidAmerican Energy Company (MidAmerican) understands that it is not obligated to provide any information or documents protected from disclosure by either attorney-client privilege or the work product doctrine. MidAmerican notes, objects, and reserves all rights to object in the future to EPA's apparent assumption that the residuals or byproducts from the combustion of coal are potential subjects of liability for reimbursement of costs or response under CERCLA; that they are appropriate subjects of the information requests to which MidAmerican is responding; or that they are "hazardous substances" within the meaning of CERCLA. Further, by responding to EPA's request, MidAmerican does not acknowledge that there is any release or threatened release of a hazardous substance, pollutant, or contaminant. MidAmerican also reserves all rights, including rights to object to the requests, not expressly waived.

MidAmerican further objects to this request because it contains undefined and ambiguous terms such as "surface impoundment", "similar diked or bermed management unit(s)", "landfills", "liquid-borne material", "storage or disposal", "no longer receive", "coal combustion residues", "residuals or byproducts", "residues or by-products", and "free liquids", and because the terms "residuals or byproducts" and "residues or by-products" seem to be used interchangeably without an explanation whether the terms are intended to have the same meaning.

Subject to the objections stated herein, MidAmerican provides the following response.

MidAmerican's Riverside Generating Station (RGS) has two surface impoundments. The south surface impoundment receives liquid-borne material for the storage of residuals or by-products from the combustion of coal. The north surface impoundment no longer receives coal combustion residues or by-products, but still contains free liquids. The questions enclosed in the information collection request have been copied below (in italics) with responses for each surface impoundment.

"NORTH SURFACE IMPOUNDMENT" RESPONSES:

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.

To MidAmerican's knowledge, the Riverside Generating Station (RGS) north surface impoundment has not been rated by a Federal or State regulatory agency relative to the National Inventory of Dams criteria.

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

The north surface impoundment was placed into service in 1979. The impoundment has not been expanded from original design. Coal combustion residue was last transported to the north surface impoundment in 2001.

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).

All solid materials in the surface impoundment are coal combustion residue and temporarily stored. The details are as follows:

(1) Fly ash – Approximately 5% of the material is fly ash, coal pyrites and economizer ash. Fly ash is present due to occasional transfer of fly ash during periods of maintenance on the dry fly ash collection system. Coal pyrites are minerals and rocks found in coal that are not milled in the coal pulverizers. Coal pyrites also include a very small amount of unburned coal that is rejected along with the minerals. Economizer ash is lighter than bottom ash and travels to the back-pass of the boiler, but is heavy enough to deposit in the back-pass and not be captured as fly ash. Economizer ash has a consistency similar to sand.
(2) Bottom ash – Approximately 90% of the material is bottom ash and boiler slag.

(3) Boiler slag – This material is included as part of the bottom ash estimate in (2) above. The boiler slag volume can not be separately estimated from the bottom ash mixture.
(4) Flue gas emission control residuals – No flue gas emission control residuals are stored in the surface impoundment.
(5) Other – Approximately 5% of the material is other material. Prior to 1998, the RGS north surface impoundment accepted construction and demolition rubble (e.g. concrete chunks), and sand bags from MidAmerican Energy's Bettendorf Service Center. The impoundment also accepts excess storm water runoff from the facility coal pile.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(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?

The RGS north surface impoundment was not designed by a Professional Engineer, nor was construction under the supervision of a Professional Engineer. As discussed in question #5, inspection and monitoring of the safety of the surface impoundment has been conducted by MidAmerican employees.

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?

MidAmerican employees make monthly rounds of the perimeter of the RGS north surface impoundment looking for visible signs of erosion. The structural integrity of the RGS north surface impoundment not been formally evaluated. The north surface impoundment is at, or near, the surrounding grade on all but the northwest side of the impoundment, and therefore has limited potential to breach in a fashion that would result in a sudden and significant release of contents.

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.

The RGS north surface impoundment has not been the subject of any specific inspections by State or Federal regulatory officials, and MidAmerican is not aware of any planned inspections. However, numerous regulatory agency inspectors have visited the site for

other reasons during the unit's operating history and such inspections may have included a visual observation of the surface impoundment.

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.

There have been no assessments, evaluations or inspections by State or Federal regulatory officials within the past year of the RGS north surface impoundment. No other assessments, evaluations or inspections by State or Federal regulatory officials within the past year referenced safety issues regarding the RGS north surface impoundment.

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(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

The total surface area of the RGS north surface impoundment is 14.1 acres, and the total volumetric storage capacity is estimated to be approximately 135,000 cubic yards of coal combustion residue. As of May 5, 2009, the north surface impoundment was estimated to contain approximately 81,000 cubic yards of coal combustion residue.

The maximum height of the RGS north surface impoundment dike is 12 feet as measured from the old Crow Creek bed on the northwest side of the impoundment, decreasing to even grade along the southern boundary. At least two feet of freeboard is maintained in the surface impoundment.

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).

The north surface impoundment has had no known spills or unpermitted releases within the last ten years.

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

The legal operator and owner of Riverside Generating Station is MidAmerican Energy Company.

"SOUTH SURFACE IMPOUNDMENT" RESPONSES:

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.

To MidAmerican's knowledge, the Riverside Generating Station (RGS) south surface impoundment has not been rated by a Federal or State regulatory agency relative to the National Inventory of Dams criteria.

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

The south surface impoundment was placed into service in 1967. The original south surface impoundment was constructed at 563.4 foot mean sea level (MSL). The surface impoundment was raised by 2 feet (to 565.4 foot MSL) in 1970. In 1976, the surface impoundment was raised again to an elevation between 576 foot and 580 foot MSL, with an 8 foot wide top and a 1:1 slope on both sides, to increase the storage capacity and add protection against Mississippi River flooding. The 1976 expansion in storage capacity was the final expansion of the south surface impoundment. The surface impoundment was repaired in late 2001 due to flood damage caused by the Mississippi River earlier that year. The 2001 repair broadened the top of the surface impoundment to 12 feet and lengthened the Mississippi River side slope to 2:1 (i.e. 2 feet horizontal: 1 foot vertical).

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).

All solid materials in the surface impoundment are coal combustion residue and temporarily stored. The details are as follows:

(1) Fly ash – Approximately 5% of the material is fly ash, coal pyrites and economizer ash. Fly ash is present due to occasional transfer of fly ash during periods of maintenance on the dry fly ash collection system. Coal pyrites are minerals and rocks found in coal that are not milled in the coal pulverizers. Coal pyrites also include a very small amount of unburned coal that is rejected along with the minerals. Economizer ash is lighter than bottom ash and travels to the back-pass of the boiler, but is heavy enough to deposit in the back-pass and not be captured as fly ash. Economizer ash has a consistency similar to sand.
(2) Bottom ash – Approximately 95% of the material is bottom ash and boiler slag.

(3) Boiler slag – This material is included as part of the bottom ash estimate in (2) above. The boiler slag volume can not be separately estimated from the bottom ash mixture.
(4) Flue gas emission control residuals – No flue gas emission control residuals are stored in the surface impoundment.
(5) Other – The RGS south surface impoundment also accepts plant waste water and storm water. Annual storm water is estimated at 8.6 million gallons. Waste water averages 1.2 million gallons per day, and includes plant service waste water (e.g. non-contact bearing cooling water, wash down water), water treatment wastewater from reverse osmosis and the demineralizer, and once-through ash sluice water. Waste water is discharged from the surface impoundment in accordance with the terms and conditions of an Iowa Department of Natural Resources National Pollution Discharge Elimination System permit, via an outfall to the Mississippi River.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(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?

The RGS south surface impoundment was not designed by a Professional Engineer, nor was construction under the supervision of a Professional Engineer. As discussed in question #5, inspection and monitoring of the safety of the surface impoundment has been conducted by MidAmerican employees.

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?

MidAmerican employees make monthly rounds of the perimeter of the RGS south surface impoundment looking for visible signs of erosion. The structural integrity of the RGS south surface impoundment not been formally evaluated.

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.

The RGS south surface impoundment has not been the subject of any specific inspections by State or Federal regulatory officials, and MidAmerican is not aware of any planned

inspections. However, numerous regulatory agency inspectors have visited the site for other reasons during the unit's operating history and such inspections may have included a visual observation of the surface impoundment.

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.

There have been no assessments, evaluations or inspections by State or Federal regulatory officials within the past year of the RGS south surface impoundment. No other assessments, evaluations or inspections by State or Federal regulatory officials within the past year referenced safety issues regarding the RGS south surface impoundment.

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(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

The total surface area of the RGS south surface impoundment is 12 acres, and the total volumetric storage capacity is estimated to be approximately 226,000 cubic yards of coal combustion residue. As of March 1, 2009, the south surface impoundment was estimated to contain approximately 176,000 cubic yards of coal combustion residue. However, material in the surface impoundment is removed at least once per year for beneficial use or final disposal in a municipal solid waste landfill.

The maximum height of the RGS south surface impoundment is approximately 15 feet as measured from the adjacent water level of the Mississippi River on the east side of the impoundment. However, at least 5 feet of freeboard is maintained in the surface impoundment.

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 leak was found on the Mississippi River side of the surface impoundment in 2002, caused by damage from Mississippi River flooding, and was repaired using drilled grout on April 14, 2002. There have been no known leaks or needed repairs since April 14, 2002.

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

The legal operator and owner of Riverside Generating Station is MidAmerican Energy Company. However, the south surface impoundment is located on land that MidAmerican Energy Company leases from the adjacent Alcoa facility.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified 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 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: Reginald R. Soepnel

Title: General Manager – Mississippi River Energy Center

IOWA DEPARTMENT OF NATURAL RESOURCES

National Pollutant Discharge Elimination System (NPDES) Permit

PERMITTEE

MIDAMERICAN ENERGY COMPANY
666 GRAND AVENUE
P.O. BOX 657
DES MOINES, IA 50303

IDENTITY AND LOCATION OF FACILITY

MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION
Section 24, T 78N, R 4E
SCOTT County, Iowa

IOWA NPDES PERMIT NUMBER: 8278101

RECEIVING STREAM

MISSISSIPPI RIVER

DATE OF ISSUANCE: 05-20-1998

ROUTE OF FLOW

DATE OF EXPIRATION: 05-19-2003

YOU ARE REQUIRED TO FILE FOR RENEWAL OF THIS PERMIT BY: 11-20-2002

EPA NUMBER: IA0003611

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

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

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

FOR THE DEPARTMENT OF NATURAL RESOURCES

Larry J. Wilson, Director

By _____
Wayne Farrand, Supervisor
Wastewater Section
ENVIRONMENTAL PROTECTION DIVISION

Facility Name: MidAmerican Energy Company
Facility Number: 82-78-1-01

Outfall Number **DESCRIPTION**

002
Domestic wastewater prior to mixing with other wastestreams.

004
Ash retention pond discharge, various plant sumps, demineralizer waste, and yard drains and metal cleaning wastewater.

009
Boilers #6, #7, and #8 boiler cooling water and boiler ash pit seal water.

011
Transformer cooling water discharge.

013
Continuous cooling water discharge from R5 condenser, R5 turbine oil cooler, and R5 turbine bearing cooling water (combined discharge with Outfalls 014 and 015 to Outfall 801).

014
Cooling water discharge from R 3HS house service turbine condenser, house service air and oil coolers (combined discharge with Outfalls 013 and 015 to Outfall 801).

015
Cooling water discharge from #4 unit turbine condenser and unit oil cooler (combined discharge with Outfalls 013 and 014 to Outfall 801).

801
Non-contact stream turbine cooling water discharge from R5 turbine condenser, R5 turbine oil cooler, R5 turbine bearing cooling system, R3HS turbine condenser, house service air and coil coolers, R4 turbine condenser and R4 oil cooler; blowdown from boilers 6, 7, 8, and 9; lubricating oil cooling water; miscellaneous plant sump; and roof drains - after discharge into forebay anf prior to discharge to the river.

Facility Name: MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION

Permit Number: 8278101

Effluent Limitations

OUTFALL NO.: 002 DOMESTIC WASTEWATER PRIOR TO MIXING WITH OTHER WASTESTREAMS.

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

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
CBOD5	YEARLY	FINAL	40.0000	25.0000		MG/L	1.70	1.04		LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL	45.0000	30.0000		MG/L	1.90	1.30		LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
COLIFORM,FECAL	YEARLY	FINAL			200.0000	#/100 ML				

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

Facility Name: MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION

Effluent Limitations

Permit Number: 8278101

OUTFALL NO.: 004 ASH RETENTION POND DISCHARGE, VARIOUS PLANT SUMPS, DEMINERALIZER WASTE, AND YARD DRAINS AND METAL CLEANING

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

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		1.9500	2.9300	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		15.0000	20.0000	MG/L		125.00	165.00	LBS/DAY
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	100.0000	MG/L		250.00	830.00	LBS/DAY

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

ALTERNATE EFFLUENT LIMITATIONS - OUTFALL 004

Outfall 004 normally discharges ash sluice water, water from various plant sumps, demineralizer waste and storm water which is subject to the effluent limitations specified on page #4 of this permit. Infrequently, metal cleaning wastewater (air preheater wash water and/or boiler cleaning wastewater) is discharged through this same outfall. When is metal cleaning wastewater is discharged, the following effluent limitations apply instead of the effluent limitations specified on page #4.

Parameter	Season	Minimum	30-day Ave mg/l	Daily Max mg/l	30-day Ave lbs/day	Daily Max lbs/day
Flow (MGD)	Periodic/ Final	-	-	0.116	-	-
pH (std units)	Periodic/ Final	6.0	-	9.0	-	-
Oil & Grease	Periodic/ Final	-	15	20	15	19
Copper,t (Cu)	Periodic/ Final	-	-	1.0	-	0.97
Iron,t (Fe)	Periodic/ Final	-	-	1.0	-	0.97
TSS	Periodic/ Final	-	30	100	29	97

Facility Name: MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION

Effluent Limitations

Permit Number: 8278101

OUTFALL NO.: 009 BOILERS #6, #7, AND #8 BOILER COOLING WATER AND BOILER ASH PIT SEAL WATER.

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

Wastewater Parameter	Season	Type	EFFLUENT LIMITATIONS							
			Concentration				Mass			
			7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.5400	1.4400	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		15.0000	20.0000	MG/L		68.00	90.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	100.0000	MG/L		135.00	450.00	LBS/DAY

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

Facility Name: MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION

Permit Number: 8278101

Effluent Limitations

OUTFALL NO.: 011 TRANSFORMER COOLING WATER DISCHARGE.

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

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.4000	1.4400	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		15.0000	20.0000	MG/L		50.00	67.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	100.0000	MG/L		100.00	333.00	LBS/DAY

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

Facility Name: MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION

Effluent Limitations

Permit Number: 8278101

OUTFALL NO.: 801 NON-CONTACT STEAM TURBINE COOLING WATER DISCHARGE FROM R5 TURBINE CONDENSER, R5 TURBINE OIL COOLER, R5 TURB

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

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL			177.0000	MGD				
CHLORINE,TOTAL RESIDUAL	YEARLY	FINAL		.0290	.0440	MG/L		43.00	65.00	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		15.0000	20.0000	MG/L				
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	100.0000	MG/L				

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

Facility Name: MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION

Permit Number: 8278101

Monitoring and Reporting Requirements

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

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

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

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

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

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
002	FLOW	1/WEEK	24 HR TOTAL	RAW WASTE OR FINAL EFFLUENT(FLOW)
002	CBOD5	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
002	TOTAL SUSPENDED SOLIDS	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
002	PH (MINIMUM - MAXIMUM)	1/3 MONTH	GRAB	FINAL EFFLUENT
002	COLIFORM,FECAL	1/3 MONTH	GRAB	FINAL EFFLUENT
004	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
004	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	FINAL EFFLUENT
004	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
004	COPPER,TOTAL (AS CU)	1/MONTH	GRAB	FINAL EFFLUENT
004	IRON,TOTAL (AS FE)	1/MONTH	GRAB	FINAL EFFLUENT
004	OIL AND GREASE	1/MONTH	GRAB	FINAL EFFLUENT
004	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
004	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
004	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
004	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	INTAKE FROM STREAM AFTER TREATMENT OF RAW WATER
004	TOTAL SUSPENDED SOLIDS	1/MONTH	CALCULATED	FINAL EFFLUENT (NET ADDITION)
009	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
009	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	FINAL EFFLUENT
009	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
009	OIL AND GREASE	1/MONTH	GRAB	FINAL EFFLUENT
009	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	INTAKE FROM STREAM AFTER TREATMENT OF RAW WATER

Monitoring and Reporting Requirements

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

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

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

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

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

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
009	TOTAL SUSPENDED SOLIDS	1/MONTH	CALCULATED	FINAL EFFLUENT (NET ADDITION)
011	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
011	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	FINAL EFFLUENT
011	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
011	OIL AND GREASE	1/MONTH	GRAB	FINAL EFFLUENT
011	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	INTAKE FROM STREAM AFTER TREATMENT OF RAW WATER
011	TOTAL SUSPENDED SOLIDS	1/MONTH	CALCULATED	FINAL EFFLUENT (NET ADDITION)
801	FLOW	7/WEEK	24 HR TOTAL	FINAL EFFLUENT
801	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	FINAL EFFLUENT
801	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
801	CHLORINE,TOTAL RESIDUAL	1/2 WEEKS	GRAB	FINAL EFFLUENT
801	OIL AND GREASE	1/MONTH	GRAB	FINAL EFFLUENT
801	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
801	DURATION OF CHLORINE DISCHARGE	1/MONTH	GRAB	FINAL EFFLUENT
801	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
801	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
801	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
801	TOTAL SUSPENDED SOLIDS	1/MONTH	GRAB	INTAKE FROM STREAM
801	TOTAL SUSPENDED SOLIDS	1/MONTH	CALCULATED	FINAL EFFLUENT (NET ADDITION)

Facility Name: MIDAMERICAN ENERGY COMPANY-RIVERSIDE STATION

Permit Number: 8278101 **Special Monitoring Requirements**

Outfall Number	Description
801	FLOW

THE PERMITTEE IS REQUIRED TO KEEP 2 OF 3 GATES AT THE DOWNSTREAM END OF THE FOREBAY CLOSED DURING JUNE, JULY AND AUGUST MONTHS TO INSURE ADEQUATE MIXING.

Facility Name: MidAmerican Energy Company - Riverside Generating Station
Permit Number: 82-78-1-01
Outfall Number: 801

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. For facilities that have not been required to conduct toxicity testing by a previous NPDES permit, the annual toxicity test shall be conducted within three (3) months of permit issuance and at least annually thereafter. For facilities that have been required to conduct toxicity testing by a previous NPDES permit, the annual toxicity test shall be conducted within twelve months (12) of the last toxicity test.

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

3. **The diluted effluent sample must contain a minimum of 80 % effluent and no more than 20 % of culture water.**

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

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

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

Ceriodaphnia and Pimephales Toxicity Effluent Limits

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

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

Facility Name: MidAmerican Energy Company - Riverside Generating Station
Permit Number: 82-78-1-01
Outfall Number: 004

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. For facilities that have not been required to conduct toxicity testing by a previous NPDES permit, the annual toxicity test shall be conducted within three (3) months of permit issuance and at least annually thereafter. For facilities that have been required to conduct toxicity testing by a previous NPDES permit, the annual toxicity test shall be conducted within twelve months (12) of the last toxicity test.

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

3. **The diluted effluent sample must contain a minimum of 3 % effluent and no more than 97 % of culture water.**

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

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

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

Ceriodaphnia and Pimephales Toxicity Effluent Limits

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

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

Facility Name: MidAmerican Energy Company - Riverside Station
Facility Number: 82-78-1-01
Outfall Number: 002

Compliance Schedule

By November 30, 1998, the permittee shall complete construction of the wastewater treatment facility to comply with the final effluent limitations specified on page 3 of this NPDES permit.

The Monitoring and Reporting Requirements for Outfall 002 specified on page #8 become effective upon completion of the wastewater treatment facilities but in no case later than December 1, 1998.

The permittee shall provide written notice of compliance with this schedule no later than January 1, 1999. The written notice shall be sent to:

Wastewater Section
Iowa Department of Natural Resources
Henry A. Wallace Building
900 East Grand
Des Moines, Iowa 50319

STORM WATER DISCHARGE REQUIREMENTS

PART I. COVERAGE UNDER THIS PERMIT

A. Eligibility. These conditions cover all existing discharges composed in whole or in part of stormwater associated with industrial activity as defined in Part V of this permit.

B. Limitations on Coverage. The following storm water discharges associated with industrial activity are NOT covered by these conditions but may be covered by conditions specified elsewhere in this permit:

1. storm water discharges associated with industrial activity subject to an existing effluent guideline limitation for storm water. For the purpose of this permit, the following effluent guideline limitations address storm water: cement manufacturing (40 CFR 411); feedlots (40 CFR 412); fertilizer manufacturing (40 CFR 418); petroleum refining (40 CFR 419); phosphate manufacturing (40 CFR 422); steam electric (coal pile runoff) (40 CFR 423); coal mining (40 CFR 434); mineral mining and processing (40 CFR 436); ore mining and dressing (40 CFR 440); and asphalt emulsion (40 CFR 443).

2. storm water discharges associated with industrial activity from construction activities, except storm water discharges from asphalt plants, concrete plants, and sand and/or gravel operations; and,

3. storm water discharges associated with industrial activity that the Department has shown to be or may reasonably be expected to be contributing to a violation of a water quality standard.

C. Exclusions. Discharges of storm water runoff from mining operations or oil and gas exploration, production, processing, or treatment operations or transmission facilities, composed entirely of flows which are from conveyances or systems of conveyances used for collecting and conveying precipitation runoff and which are not contaminated by contact with, or do not come in contact with, any overburden, raw material, intermediate products, finished products, byproduct, or waste products located on the site of such operations.

PART II. SPECIAL CONDITIONS, MANAGEMENT PRACTICES, AND OTHER NON—NUMERIC LIMITATIONS

A. Releases in Excess of Reportable Quantities. Any owner or operator identified in the pollution prevention plan is subject to the spill notification requirements as specified in 455B.386 of the Iowa Code. Iowa law requires that as soon as possible but not less than six hours after the onset of a "hazardous condition" the Department and local sheriff's office or the office of the sheriff of the affected county be notified.

The storm water pollution prevention plan described in Part II.B. of this permit must be modified within 7 calendar days of knowledge of the release to provide a description of the release and the circumstances leading to the release and to identify and provide for the implementation of steps to prevent the reoccurrence of such releases and to respond to such releases.

B. Storm Water Pollution Prevention Plans. A storm water pollution prevention plan shall be developed for the facility. The storm water pollution prevention plan shall be prepared in accordance with good engineering practices. The plan shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with industrial activity from the facility. The plan shall describe and ensure the implementation of practices which will be used to reduce pollutants in storm water discharges associated with industrial activity at the facility and to assure compliance with the terms and conditions of this permit. Facilities must implement the provisions of the storm water pollution prevention plan required under this part as a condition of this permit.

1. Deadlines for Plan Preparation and Compliance. Preparation of and compliance with the pollution prevention plan shall be as follows.

   a. For storm water discharge associated with industrial activity in existence prior to October 1, 1992, the pollution prevention plan shall be completed within 180 days of the issuance date of this permit and shall be updated as appropriate. The pollution prevention plan shall provide for compliance with the terms of the plan within 365 days of the issuance date of this permit.

   b. For a storm water discharge associated with industrial activity that commences after October 1, 1992, the pollution prevention plan shall be completed before the application for a NPDES permit or permit amendment is submitted to the Department. Compliance with the terms of the pollution prevention plan and this permit will be required with the start of operation.

   c. A pollution prevention plan for storm water discharges associated with industrial activity from an oil and gas exploration, production, processing, or treatment operation or transmission facility that is not excluded according to Part I.C. of this permit shall be completed within 180 days after the exclusion no longer applies. The pollution prevention plan must be implemented within 365 days after the exclusion terminates.

2. a. The pollution prevention plan shall be signed in accordance with standard condition #22 specified elsewhere in this permit, and shall be retained on site in accordance with Part IV.E. of this permit.

   b. The owner or operator of a facility with a storm water discharge subject to this permit shall make plans available upon request to the Department or, in the case of a storm water discharge associated with industrial activity which discharges through a large or medium municipal separate storm sewer system with an NPDES permit, to the municipal operator of the system.

   c. The Department may review the plan at any time and may notify the permittee that the plan does not meet one or more of the minimum requirements of this permit. After such notification from the Department, the permittee shall make changes to the plan, and shall submit to the Department a written certification that the requested changes have been made. Unless otherwise provided by the Department, the permittee shall have 30 days after such notification to make the necessary changes.

3. The permittee shall amend the plan whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to waters of the state, or if the storm water pollution prevention plan proves to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity. Amendments to the plan may be reviewed by the Department in the same manner as Part II.B.2.c. above.

4. The plan shall include, at a minimum, the following items:

   a. Description of Potential Pollutant Sources. Each plan shall provide a description of potential sources which may reasonably be expected to add significant amounts of pollutants to storm water discharges or which may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each plan shall identify all activities and significant materials which may potentially be significant pollutant sources. Each plan shall include, at a minimum:

   a.(1). A site map showing an outline of the drainage area of each storm water outfall; each existing structural control measure to reduce pollutants in storm water runoff; and each surface water body;

   a.(2). A narrative description of known significant materials that have been treated, stored or disposed, in a manner to allow exposure to storm water, during the three years prior to the issuance date of this permit; the method of on—site storage or disposal; materials management practices employed to minimize

contact of these materials with storm water runoff; materials loading and access areas; the location and a description of existing structural and non—structural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives;

a.(3). A list of releases which prompted the existence of a hazardous condition (as defined in Part V of this permit) that occurred at the facility after the issuance date of this permit;

a.(4). For each area of the plant that generates storm water associated with industrial activity with a reasonable potential for containing significant amounts of pollutants, a prediction of the direction of flow, and an estimate of the types of pollutants which are likely to be present in storm water discharges; and,

a.(5). A summary of existing sampling data describing pollutants in storm water discharges.

b. Storm Water Management Controls. The permittee shall develop a description of storm water management controls appropriate to the facility, and, implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at the facility. The description of storm water management controls shall address the following minimum components, including a schedule for implementing such controls:

b.(1). Responsible Person. The plan shall identify a specific individual or individuals within the organization responsible for developing the storm water pollution prevention plan and assisting in its implementation, maintenance, and revision.

b.(2). Risk Identification and Assessment/Material Inventory. The storm water pollution prevention plan shall assess the potential of various sources at the plant to contribute pollutants to storm water discharges associated with industrial activity. The plan shall include an inventory of the types of materials handled. Facilities subject to SARA Title III, Section 313 shall include in the plan a description of releases to land or water of SARA Title III water priority chemicals that have occurred during the three years prior to the issuance date of this permit. Each of the following shall be evaluated for the reasonable potential for contributing pollutants to runoff:

(a). loading and unloading operations;
(b). outdoor storage activities;
(c). outdoor manufacturing or processing activities;
(d). dust or particulate generating processes;
(e). on—site waste disposal practices.

Factors to consider include the toxicity of chemicals; quantity of chemicals used, produced, or discharged; the likelihood of contact with storm water; and history of "hazardous condition" reporting.

b.(3). Preventive Maintenance. The plan shall describe a preventive maintenance program that involves inspection and maintenance of storm water management devices (e.g. cleaning oil/water separators, catch basins) as well as inspecting and testing plant equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters.

b.(4). Good Housekeeping. Good housekeeping requires the maintenance of a clean, orderly facility.

b.(5). Spill Prevention and Response Procedures. Areas where potential spills can occur, and their accompanying drainage points shall be identified clearly in the storm water pollution prevention plan. Where appropriate, material handling procedures and storage requirements should be considered in the plan. Procedures for cleaning up spills shall be identified in the plan and made available to the appropriate personnel. The necessary equipment to implement a clean up shall be available to personnel.

b.(6). Storm Water Management. The plan shall contain a narrative consideration of the appropriateness of traditional storm water management practices (practices other than those which control the source of pollutants). Based on an assessment of the potential of various

sources at the plant to contribute pollutants to storm water discharges associated with industrial activity (see Part II.B.4.b.(2). of this permit), the plan shall provide that measures determined to be reasonable and appropriate shall be implemented and maintained.

b.(7). Sediment and Erosion Prevention. The plan shall identify areas which, due to topography, activities, or other factors, have a high potential for significant soil erosion, and identify measures to limit erosion.

b.(8). Employee Training. Employee training programs shall inform personnel, at all levels of responsibility, of the components and goals of the storm water pollution prevention plan. Training should address topics such as spill response, good housekeeping and material management practices. The pollution prevention plan shall identify periodic dates for such training.

b.(9). Recordkeeping and Internal Reporting Procedures. Incidents such as spills, or other discharges, along with other information describing the quality and quantity of storm water discharges shall be included in the records. Inspection and maintenance activities shall be documented and recorded.

b.(10). Non—Storm Discharges. The plan shall include a certification that storm water only discharges have been tested or evaluated for the presence of non—storm water discharges. The certification shall include a description of the results of any test for the presence of non—storm water discharges, the method used, the date of any testing, and the on—site drainage points that were directly observed during the test. This certification may not be feasible if the facility operating the storm water discharge does not have access to an outfall, manhole, or other point of access to the ultimate conduit which receives the discharge. In such cases, the source identification section of the storm water pollution plan shall indicate why the certification required by this part was not feasible. A discharger that is unable to provide the certification required by this paragraph must notify in accordance with Part IV.A. of this permit.

c. Visual Inspection. Qualified personnel shall inspect designated equipment and plant areas at appropriate intervals specified in the plan, but, except as provided in paragraphs II.B.4.c.(4). and (5)., in no case less than once a year;

c.(1). Material handling areas and other potential sources of pollution identified in the plan in accordance with paragraph II.B.4.a. of this permit shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Structural storm water management measures, sediment and erosin control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly. A visual inspection of equipment needed to implement the plan, such as spill response equipment, shall be made.

c.(2). Based on the results of the inspection, the description of potential pollutant sources identified in the plan in accordance with paragraph II.C.4.a. of this permit and pollution prevention measures identified in the plan in accordance with paragraph II.C.4.b. of this permit shall be revised as appropriate within two (2) weeks of such inspection and shall provide for implementation of any changes to the plan in a timely manner, but in no case less than twelve weeks from the inspection.

c.(3). A report summarizing the scope of the inspection, personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with paragraph II.B.4.c.(2). of the permit shall be made and retained as part of the storm water pollution prevention plan for at least three years. The report shall be signed in accordance with Part II.B.2.a. of this permit.

c.(4). Where annual site inspections are shown in the plan to be impractical because an employee is not stationed or does not routinely visit the site, site inspections required under this part shall be conducted at appropriate intervals specified in the plan, but, in no case less than once in three years.

c.(5). Where annual site inspections are shown in the plan to be impractical because the site is inactive (industrial activity is no longer conducted), site inspections required under this part shall be conducted at appropriate intervals specified in the plan, but, in no case less than once in five years. At least one site inspection shall be conducted prior to October 1, 1994, or the date two years after such site becomes inactive.

d. Special Requirements for Storm Water Discharges Associated with Industrial Activity Through Municipal Separate Storm Sewer Systems Serving a Population of 100,000 or More. The permittee must comply with applicable requirements in municipal storm water management programs developed under NPDES permits issued for the discharge from the municipal separate storm sewer system that receives the facility's discharge provided the discharger has been notified of such conditions.

e. Consistency with Other Plans. Storm water management programs may reflect requirements for Spill Prevention Control and Countermeasure (SPCC) plans under section 311 of the CWA or Best Management Practices (BMP) Programs otherwise required by an NPDES permit and may incorporate any part of such plans into the storm water pollution prevention plan by reference.

f. Additional Requirements for Storm Water Discharge Associated with Industrial Activity from Facilities Subject to SARA Title III, Section 313 Requirements. Storm water pollution prevention plans for facilities subject to reporting requirements under SARA Title III, Section 313 for chemicals which are classified as "Section 313 water priority chemicals" in accordance with the definition in Part V of this permit are required to include, in addition to the information listed above, a discussion of the facility's conformance with the appropriate guidelines listed below:

f.(1). In areas where Section 313 water priority chemicals are stored, processed or otherwise handled, appropriate containment, drainage control and/or diversionary structures shall be provided. At a minimum, one of the following preventive systems or its equivalent shall be used:

f.(1).(a). curbing, culverting, gutters, sewers or other forms of drainage control to prevent or minimize the potential for storm water run—on to come into contact with significant sources of pollutants; or

f.(1).(b). roofs, covers or other forms of appropriate protection to prevent storage piles from exposure to storm water, and wind blowing.

f.(2). If the installation of structures or equipment listed in Parts II.B.4.f.(3).(a).(ii). or II.B.4.f.(3).(c). of this permit is not economically achievable at a given facility, the facility shall develop and implement a spill contingency and integrity testing plan which provides a description of measures that ensure spills or other releases of toxic amounts of Section 313 water priority chemicals do not occur. A spill contingency and integrity plan developed under this paragraph shall comply with the minimum requirements listed in Parts II.B.4.f.(2).(a). through (d).

f.(2).(a). The plan shall include a detailed description which demonstrates that the requirements of paragraphs II.B.4.f.(3).(a).(ii). and II.B.4.f.(3).(c). of this permit are not economically achievable;

f.(2).(b). A spill contingency plan must include, at a minimum:

f.(2).(b).(i). a description of response plans, personnel needs, and methods of mechanical containment;

f.(2).(b).(ii). steps to be taken for removal of spilled Section 313 water priority chemicals;

f.(2).(b).(iii). access to and availability of sorbents and other equipment; and

f.(2).(b).(iv). such other information as required by the Department.

f.(2).(c). The testing component of the alternative plan must provide for conducting integrity testing of storage tanks at least once every five years, and conducting integrity and leak testing of valves and piping a minimum of every year; and

f.(2).(d). A written and actual commitment of manpower, equipment and materials required to comply with the provisions of Parts II.B.4.f.(2).(b). and (c). of this permit and to expeditiously control and remove quantities of Section 313 water priority chemicals that may result in a toxic discharge.

f.(3). In addition to the minimum standards listed under paragraph II.B.4.f.(1). of this permit, the storm water pollution prevention plan shall include a complete discussion of measures taken to conform with the following applicable guidelines:

f.(3).(a). Liquid Storage Areas Where Storm Water Comes into Contact with Equipment or a Tank, Container, or Other Vessel Used for Section 313 Water Priority Chemicals.

f.(3).(a).(i). No tank or container shall be used for the storage of a Section 313 water priority chemical unless its material and construction are compatible with the material stored and conditions of storage such as pressure and temperature, etc.

f.(3).(a).(ii). Secondary containment, sufficient to contain the capacity of the largest single container or tank in a drainage system where Section 313 water priority chemicals are stored shall be provided. If the secondary containment area and its upstream drainage system are subject to precipitation, an allowance for drainage from a 10—year, 24—hour precipitation event shall be provided over and above the volume necessary to contain the largest single tank or container. Either a secondary containment system shall be sufficiently impervious to contain spilled Section 313 water priority chemicals until they can be removed or treated or the plan must include spill contingency provisions which include, at a minimum, a description of response plans, personnel needs, and methods of mechanical containment; steps to be taken for removal of spilled Section 313 water priority chemicals; and access to and availability of sorbents and other equipment. The plant treatment system may be used to provide secondary containment, provided it has sufficient excess holding capacity always available to hold the contents of the largest container in the drainage area plus an allowance for drainage from a 10—year, 24—hour precipitation event.

f.(3).(b). Material Storage Areas for Section 313 Water Priority Chemicals Other Than Liquids. Material storage areas for Section 313 water priority chemicals other than liquids, which are subject to runoff, leaching, or wind blowing, shall incorporate drainage or other control features which will minimize the discharge of Section 313 water priority chemicals.

f.(3).(c). Truck and rail car loading and unloading areas for liquid Section 313 water priority chemicals. Truck and rail car loading and unloading areas for liquid Section 313 water priority chemicals shall be operated to minimize discharges of Section 313 water priority chemicals. Drip pans shall be placed at locations where spillage may occur such as hose connections, hose reels and filler nozzles. Drip pans shall always be used when making and breaking hose connections. A drip pan system shall be installed within the rails of railways to collect spillage from tank cars. Truck loading/unloading docks shall have overhangs or door skirts that enclose the trailer end.

f.(3).(d). In-plant areas where Section 313 water priority chemicals are transferred, processed or otherwise handled. Processing equipment and material handling equipment shall be designed and operated so as to minimize discharges of Section 313 chemicals. Materials used in piping and equipment shall be compatible with the substances handled. Drainage from process and materials handling areas shall be designed as described in paragraphs f.(3).(a)., (b). and (c). of this section. Additional protection, such as covers or guards to prevent wind blowing, spraying or releases from pressure relief vents shall be provided as appropriate to prevent discharge of Section 313 water priority chemicals. Visual inspections or leak tests shall

be provided for overhead piping conveying Section 313 water priority chemicals not equipped with secondary containment.

f.(3).(e). Discharges from areas covered by paragraphs f.(3).(a), (b), (c) or (d).

f.(3).(e).(i). Drainage from areas covered by paragraphs f.(3).(a), (b), (c) or (d) of this part shall be restrained by valves or other positive means to prevent the discharge of a spill or other excessive leakage of Section 313 water priority chemicals. Containment areas may be emptied by pumps or ejectors; however, these shall be manually activated.

f.(3).(e).(ii). Flapper—type drain valves shall not be used to drain containment areas. Valves used for the drainage of containment areas shall, as far as is practical, be of manual, open—and—closed design.

f.(3).(e).(iii). If plant drainage is not engineered as above, the final discharge of all in—plant storm sewers should be equipped to return the spilled material to the facility in the event of an uncontrolled spill of Section 313 water priority chemicals.

f.(3).(e).(iv). Records shall be kept of the frequency and estimated volume (in gallons) of discharges from containment areas.

f.(3).(f). Plant site runoff other than from areas covered by f.(3).(a), (b), (c) or (d). Other areas of the facility (those not addressed in paragraphs f.(3).(a), (b), (c) or (d)), from which runoff which may contain Section 313 water priority chemicals or spills of Section 313 water priority chemicals could cause a discharge, shall incorporate the necessary drainage or other control features to prevent the discharge of spilled or improperly disposed material and ensure the mitigation of pollutants in runoff or leachate.

f.(3).(g). Preventive Maintenance and Housekeeping. All areas of the facility shall be inspected at specific intervals for leaks or conditions that could lead to discharges of Section 313 water priority chemicals or direct contact of storm water with raw materials, intermediate materials, waste materials or products. In particular, plant piping, pumps, storage tanks and bins, pressure vessels, process and material handling equipment, and material bulk storage areas shall be examined for any conditions or failures which could cause a discharge. Inspections shall include examination for leaks, wind blowing, corrosion, support or foundation failure, or other forms of deterioration or noncontainment. Inspection intervals shall be specified in the plan and shall be based on design and operational experience. Different areas may require different inspection intervals. Where a leak or other condition is discovered which may result in significant releases of Section 313 water priority chemicals to the drainage system, corrective action shall be immediately taken or the unit or process shut down until corrective action can be taken. When a leak or noncontainment of a Section 313 water priority chemical has occurred, contaminated soil, debris, or other material must be promptly removed and disposed in accordance with Federal and State requirements and as described in the plan.

f.(3).(h). Facility security. Facilities shall have the necessary security systems to prevent accidental or intentional entry which could cause a discharge. Security systems described in the plan shall address fencing, lighting, vehicular traffic control, and securing of equipment and buildings.

f.(3).(i). Training. Facility employees and contractor personnel using the facility shall be trained in and informed of preventive measures at the facility. Employee training shall be conducted at intervals specified in the plan, but not less than once per year, in matters of pollution control laws and regulations, and in the storm water pollution prevention plan and the particular features of the facility and its operation which are designed to minimize discharges of Section 313 water priority chemicals. The plan shall designate a person who is accountable for spill prevention at the facility and who will set up the necessary spill emergency procedures and reporting requirements so that spills and emergency releases of Section 313 water priority chemicals can be isolated and contained before a

discharge of a Section 313 water priority chemical can occur. Contractor or temporary personnel shall be informed of plant operation and design features in order to prevent discharges or spills from occurring.

g. Salt Storage. Storage piles of salt at a facility that falls under the definition of "storm water discharge associated with industrial activity" where the salt piles are used for deicing or other commercial or industrial purposes shall be enclosed or covered to prevent exposure to precipitation.

h. Non-Storm Water Discharges. Except for flows from fire fighting activities, sources of non-storm water listed in Part III.A.2. of this permit that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

5. All storm water pollution prevention plans received by the Department from the permittee are considered reports that shall be available to the public under Section 308(b) of the CWA and Chapter 22 of the Code of Iowa. However, the permittee may claim any portion of a storm water pollution plan as confidential in accordance with Chapter 22 of the Code of Iowa and Iowa Administrative Code (561)--2.5.

6. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

PART III. NUMERIC EFFLUENT LIMITATIONS

Coal Pile Runoff. Any storm water composed in part or in whole of coal pile runoff shall not exceed a maximum concentration at any time of 50 mg/l total suspended solids. The pH of these discharges shall be within the range of 6.0—9.0. However, any untreated overflow from facilities designed, constructed and operated to treat the volume of coal pile runoff which is associated with a 10 year, 24 hour rainfall event shall not be subject to the limitations of this part.

PART IV. MONITORING AND REPORTING REQUIREMENTS

A. Failure to Certify. Any facility that is unable to provide the certification required under Part II.B.4.(b).(10). (testing for non-storm water discharges) within 180 days of the permit issuance date, must prepare a written description of the procedures used in any test conducted for the presence of non—storm water discharges; the results of the test or other relevant observations; potential sources of non—storm water discharges to the storm sewer; and why adequate tests for such storm sewers were not feasible. This "failure to certify" description must be kept on-site and be made available to the Department upon request.

B. Monitoring Requirements. The following storm water monitoring is required for discharges of "storm water discharge associated with industrial activity".

1. Section 313 of SARA Title III Facilities. During the period beginning on the issuance date and lasting through the expiration date of this permit, facilities subject to requirements to report releases into the environment under Section 313 of SARA Title III for chemicals which are classified as Section 313 water priority chemicals are subject to the following monitoring requirements for storm water discharges associated with industrial activity that come into contact with any equipment, tank, container or other vessel used for storage of a Section 313 water priority chemical, or that are located at a truck or rail car loading or unloading area where a Section 313 water priority chemical is handled;

a. Parameters. The parameters to be measured include:

* oil and grease (mg/l);
* five day biochemical oxygen demand (BOD_5) (mg/l)
* chemical oxygen demand (COD) (mg/l);
* total suspended solids (TSS) (mg/l);
* total Kjeldahl nitrogen (TKN) (mg/l);
* total phosphorus (mg/l);
* pH;
* any Section 313 water priority chemical for

which the facility is subject to reporting requirements under Section 313 of the Emergency Planning and Community Right to Know Act of 1986;
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and,
* an estimate of the total volume (in gallons) of the discharge sampled.

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraphs IV.B.12. or IV.B.13.;

2. Primary Metal Industries. During the period beginning on the issuance date and lasting through the expiration date of this permit, facilities classified as Standard Industrial Classification (SIC) 33 (Primary Metal Industry) are subject to the following monitoring requirements for storm water discharges associated with industrial activity that are discharged from the facility:

a. Parameters. The parameters to be measured include:
* oil and grease (mg/l);
* five day biochemical oxygen demand (BOD_5) (mg/l);
* chemical oxygen demand (COD) (mg/l);
* total suspended solids (TSS) (mg/l);
* total Kjeldahl nitrogen (TKN) (mg/l);
* nitrate plus nitrite nitrogen (mg/l);
* total phosphorus (mg/l);
* pH ;
* total lead (Pb) (mg/l);
* total cadmium (Cd) (mg/l);
* total copper (Cu) (mg/l);
* total arsenic (As) (mg/l);
* total chromium (Cr) (mg/l)
* any pollutant limited in an effluent guideline to which the facility is subject;
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and,
* an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area (e.g. low (under 40%), medium (40% to 65%) or high (above 65%));

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraphs IV.B.12. or IV.B.13.;

3. Land Disposal Units/Incinerators. During the period beginning on the issuance date and lasting through the expiration date of this permit, storm water discharge associated with industrial activity from any active or inactive landfill, land application site, or open dump that received any industrial wastes (except facilities that only receive construction debris) and that have not installed a stabilized final cover, and incinerators that burn hazardous waste and operate under interim status or a permit under Subtitle C of RCRA, are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:

* ammonia (mg/l);
* bicarbonate (mg/l);
* calcium (mg/l);
* chloride (mg/l);
* total iron (mg/l);
* magnesium (total) (mg/l);
* magnesium (dissolved) (mg/l);
* nitrate plus nitrite nitrogen (mg/l);
* potassium (mg/l);
* sodium (mg/l);
* sulfate (mg/l);
* chemical oxygen demand (COD) (mg/l);
* total dissolved solids (TDS) (mg/l);
* total organic carbon (TOC) (mg/l);
* oil and grease (mg/l);
* pH;
* total arsenic (As) (mg/l);
* total barium (Ba) (mg/l);
* total cadmium (Cd) (mg/l);

* total chromium (Cr) (mg/l);
* total cyanide (CN) (mg/l);
* total lead (Pb) (mg/l);
* total mercury (Hg) (mg/l);
* total selenium (Se) (mg/l);
* total silver (Ag) (mg/l);
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and,
* an estimate of the total volume (in gallons) of the discharge sampled.

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraphs IV.B.12. or IV.B.13.;

4. Wood Treatment (chlorophenolic/creosote formulations). During the period beginning on the issuance date and lasting through the expiration date of this permit, storm water discharges associated with industrial activity from areas that are used for wood treatment, wood surface application or storage of treated or surface protected wood at any wood preserving or wood surface facilities that currently use chlorophenolic formulations and/or creosote formulations are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:
* oil and grease (mg/l);
* pH;
* five day biochemical oxygen demand (BOD_5) (mg/l);
* chemical oxygen demand (COD) (mg/l);
* total suspended solids (TSS) (mg/l);
* total phosphorus (mg/l);
* total Kjeldahl nitrogen (TKN) (mg/l);
* nitrate plus nitrite nitrogen (mg/l);
* pentachlorophenol (mg/l);
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and,
* an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area (e.g. low (under 40%), medium (40% to 65%) or high (above 65%)).

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraphs IV.B.12. or IV.B.13.;

5. Wood Treatment (arsenic or chromium preservatives). During the period beginning on the issuance date and lasting through the expiration date of this permit, storm water discharge associated with industrial activity from areas that are used for wood treatment or storage of treated wood at any wood preserving facilities that currently use inorganic preservatives containing arsenic or chromium are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:

* oil and grease (mg/l);
* pH;
* five day biochemical oxygen demand (BOD_5) (mg/l);
* chemical oxygen demand (COD) (mg/l);
* total suspended solids (TSS) (mg/l);
* total phosphorus (mg/l);
* total Kjeldahl nitrogen (TKN) (mg/l);
* nitrate plus nitrite nitrogen (mg/l);
* total arsenic (As) (mg/l);
* total chromium (Cr) (mg/l);
* total copper (Cu) (mg/l);
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and,
* an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area (e.g. low (under

40%), medium (40% to 65%) or high(above 65%)).

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraphs IV.B.12. or IV.B.13.;

6. Coal Pile Runoff. During the period beginning on the issuance date and lasting through the expiration date of this permit, storm water discharge associated with industrial activity from coal pile runoff are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:

* oil and grease (mg/l);
* pH;
* total suspended solids (TSS) (mg/l);
* total copper (Cu) (mg/l);
* total nickel (Ni) (mg/l);
* total zinc (Zn) (mg/l);
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and,
* an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area (e.g. low (under 40%), medium (40% to 65%) or high (above 65%)).

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraphs IV.B.12. or IV.B.13.;

7. Animal Handling / Meat Packing. During the period beginning on the issuance date and lasting through the expiration date of this permit, storm water discharge associated with industrial activity from animal handling areas, manure management (or storage) areas, and production waste management (or storage) areas that are exposed to precipitation at meat packing plants, poultry packing plants, facilities that manufacture animal and marine fats and oils, and facilities that manufacture dog and cat food from meat are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:

* oil and grease (mg/L);
* five day biochemical oxygen demand (BOD_5) (mg/L);
* chemical oxygen demand (COD) (mg/l);
* total suspended solids (TSS) (mg/l);
* total Kjeldahl nitrogen (TKN) (mg/l);
* total phosphorus (mg/l);
* pH;
* fecal coliform (counts per 200 ml)
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and
* an estimate of the total volume (in gallons) of the discharge sampled shall be provided;

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 times per year) except as provided by paragraph IV.B.12. or IV.B.13.;

8. Battery Reclaimers — During the period beginning on the issuance date and lasting through the expiration date of this permit, storm water discharge associated with industrial activity from facilities that reclaim lead acid batteries are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:

* oil and grease (mg/l);
* five day biochemical oxygen demand (BOD_5) (mg/l);
* chemical oxygen demand (COD) (mg/l);
* total suspended solids (TSS) (mg/l);
* total Kjeldahl nitrogen (TKN) (mg/l);
* total phosphorus (mg/l);
* pH;
* lead (Pb) (mg/l)
* the date and duration (in hours) of the storm

event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and
* an estimate of the total volume (in gallons) of the discharge sampled shall be provided;

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraph IV.B.12. or IV.B.13.;

9. Coal-fired Steam Electric Facilities. During the period beginning on the issuance date and lasting through the expiration date of this permit, storm water discharge associated with industrial activity from coal handling sites at coal fired steam electric power generating facilities, except for coal piles, are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:

* oil and grease (mg/l);
* total suspended solids (TSS) (mg/l);
* copper (Cu) (mg/l);
* nickel (Ni) (mg/l);
* zinc (Zn) (mg/l);
* pH;
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and
* an estimate of the total volume (in gallons) of the discharge sampled shall be provided;

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraph IV.B.12. or IV.B.13.;

10. Additional facilities. During the period beginning on the issuance date and lasting through the expiration date of this permit, facilities with storm water discharge associated with industrial activity that: come in contact with storage piles for solid chemicals used as raw materials that are exposed to precipitation at facilities classified as SIC 30 (Rubber and Miscellaneous Plastics Products) or SIC 28 (Chemicals and Allied Products); automobile junkyards with over 250 units; come into contact with lime storage piles that are exposed to precipitation at lime manufacturing facilities; from oil handling sites at oil fired steam electric power generating facilities; from facilities that manufacture asphalt paving mixtures and blocks; from cement manufacturing facilities and cement kilns; from ready—mixed concrete facilities; or from ship building and repairing facilities, are subject to the following monitoring requirements:

a. Parameters. The parameters to be measured include:

* oil and grease (mg/l);
* five day biochemical oxygen demand (BOD_5) (mg/l);
* chemical oxygen demand (COD) (mg/l);
* total suspended solids (TSS) (mg/l);
* total Kjeldahl nitrogen (TKN) (mg/l);
* total phosphorus (mg/l);
* pH;
* any pollutant limited in an effluent guideline to which the facility is subject
* the date and duration (in hours) of the storm event(s) sampled;
* rainfall measurements or estimates (in inches) of the storm event which generated the sampled runoff;
* the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and
* an estimate of the total volume (in gallons) of the discharge sampled shall be provided;

b. Frequency of Monitoring. Sampling shall be conducted at least annually (1 time per year) except as provided by paragraph IV.B.12. or IV.B.13.;

11. Sample Type. For discharges from holding ponds or other impoundments with a retention period greater than 24 hours, (estimated by dividing the volume of the detention pond by the discharge rate) a minimum of one grab sample may be taken. For all other discharges, data shall be reported for both a grab sample and a composite sample. All samples shall be collected from a discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. The grab sample shall be taken during the first hour of the discharge. The composite sample shall either be flow—weighted or time—weighted. Composite samples may be taken with a continuous sampler or as a combination of a minimum of three sample aliquots taken in each hour of discharge for the entire discharge or for the first three hours of the discharge, with each aliquot being separated by a minimum period of fifteen minutes. Only grab samples may be collected and analyzed for the determination of pH, temperature, cyanide, total phenols, residual chlorine, fecal coliform, fecal streptococcus, and oil and grease.

12. Sampling Waiver. When a discharger is unable to collect samples due to adverse climatic conditions, the discharger must explain, in writing, why samples could not be collected, including available documentation of the event, and retain a copy of the explanation in accordance with Part IV.E. of this permit. Adverse climatic conditions which may prohibit the collection of samples include weather that creates dangerous conditions for personnel (such as local flooding, high winds, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

13. Representative Discharge. When a facility has two or more outfalls that, based on a consideration of features and activities within the area drained by the outfall, the permittee reasonably believes discharge substantially identical effluents, the permittee may test the effluent of one of such outfalls and report that the quantitative data also applies to the substantially identical outfall(s). In addition, for each outfall that the permittee believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area (e.g. low (under 40%), medium (40% to 65%) or high (above 65%)) shall be provided.

C. Noncompliance Reporting. Permittees that are not required to monitor must report all incidences of non-compliance, in writing, to the Department at least annually.

D. Reporting.

1. Permittees which are subject to the monitoring requirement of Part III NUMERIC EFFLUENT LIMITATIONS are required to submit signed copies of discharge monitoring results on Discharge Monitoring Report Forms(s) within 30 days after the sampling occurred.

2. Except as provided in Part D.1., permittees are not required to submit results of stormwater monitoring. However, such permittees must retain monitoring results in accordance with Part IV.E. and make the results available to the Department upon request.

3. Additional Notification. Facilities with at least one storm water discharge associated with industrial activity that discharges through a large or medium municipal separate storm sewer system (systems serving a population of 100,000 or more) must submit signed copies of discharge monitoring reports or results to the operator of the municipal separate storm sewer system upon request.

E. Retention of Records.

1. The permittee shall retain a copy of the storm water pollution prevention plan, records of all monitoring information, copies of all reports required by this permit, and records of all data for the duration of the permit or for a period of at least three years from the date of the measurement, report, inspection, etc.

2. Permittees must submit results of stormwater monitoring to the Department upon the request of the Department, and submit a summary of monitoring results as part of the application for renewal of this permit.

PART V. DEFINITIONS

"**Best Management Practices**" ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

"**Bypass**" means the intentional diversion of waste streams from any portion of a treatment facility.

"**Coal pile runoff**" means the rainfall runoff from or through any coal storage pile.

"**CWA**" or "**Clean Water Act**" means the Federal Water Pollution Control Act.

"**Department**" means the Iowa Department of Natural Resources.

"**Flow—weighted composite sample**" means a composite sample consisting of a mixture of aliquots collected at a constant time interval, where the volume of each aliquot is proportional to the flow rate of the discharge.

"**Hazardous condition**" means any situation involving the actual, imminent, or probable spillage, leakage, or release of a hazardous substance on to the land, into a water of the state, or into the atmosphere, which creates an immediate or potential danger to the public health or safety or to the environment. 455B.381(2) 1991, Code of Iowa

"**Hazardous substance**" means any substance or mixture of substances that presents a danger to the public health or safety and includes, but in not limited to, a substance that is toxic, corrosive, or flammable, or that is an irritant or that, in confinement, generates pressure through decomposition, heat, or other means. The following are examples of substances which, in sufficient quantity may be hazardous: acids; alkalis; explosives; fertilizers; heavy metals such as chromium, arsenic, mercury, lead and cadmium; industrial chemicals; paint thinners; paints; pesticides; petroleum products; poisons, radioactive materials; sludges; and organic solvents. "Hazardous substances" may include any hazardous waste identified or listed by the administrator of the United State Environmental Protection Agency under the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976, or any toxic pollutant listed under section 307 of the federal Water Pollution Control Act as amended to January 1, 1977, or any hazardous substance designated under section 311 of the federal Water Pollution Control Act as amended to January 1, 1977, or any hazardous material designated by the secretary of transportation under the Hazardous Materials Transportation Act (49 CFR 172.101). 455B.381(1) , 1991 Code of Iowa

"**Landfill**" means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

"**Land application unit**" means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

"**Large and Medium municipal separate storm sewer system**" means all municipal separate storm sewers that are either:

(i) located in an incorporated place with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census; or

(ii) located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships or towns within such counties; or

(iii) owned or operated by a municipality other than those described in paragraph (i) or (ii) and that are designated by the Department as part of the large or medium municipal separate storm sewer system.

"**Municipality**" means a city, town, borough, county, parish, district, association, or other public body created by or under State law.

"**Runoff coefficient**" means the fraction of total rainfall that will appear at the conveyance as runoff.

"**Section 313 water priority chemical**" means a chemical or chemical categories which are:

1) Listed at 40 CFR 372.65 pursuant to Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, also titled the Emergency Planning and Community Right—to—Know Act of 1986;

2) Present at or above threshold levels at a facility subject to SARA Title III, Section 313 reporting requirements; and

3) Meet at least one of the following criteria:

(i) are listed in Appendix D of 40 CFR 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols) or Table V (certain toxic pollutants and hazardous substances);

(ii) are listed as a hazardous substance pursuant to section 311(b)(2)(A) of the CWA at 40 CFR 116.4; or

(iii) are pollutants for which EPA has published acute or chronic water quality criteria.

"**Severe property damage**" means substantial physical damage to property, damage to treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

"**Storm water**" means storm water runoff, snow melt runoff, and surface runoff and drainage.

"**Storm water discharge associated with industrial activity**" means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the NPDES program under 40 CFR part 122. For the categories of industries identified in paragraphs (i) through (x) of this definition, the term includes, but is not limited to, storm water discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at 40 CFR part 401); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water.

For the categories of industries identified in paragraph (xi) of this definition, the term includes only storm water discharges from all the areas (except access roads and rail lines) that are listed in the previous sentence where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water. For the purposes of this paragraph, material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, finished product, by-product, or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the above described areas. Industrial facilities (including industrial facilities that are Federally, State, or municipally owned or operated that meet the description of the facilities listed in these paragraphs (i)-(xi) of the definition) include those facilities designated under 40 CFR 122.26(a)(1)(v). The following categories of facilities are considered to be engaging in "industrial activity" for purposes of this definition;

(i) Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards under 40 CFR Subchapter N (except facilities with toxic pollutant effluent standards which are exempted under category (xi) of this definition);

(ii) Facilities classified as Standard Industrial Classifications 24 (except 2434), 26 (except 265 and 267), 28 (except 283 and 285), 29, 311, 32 (except 323), 33, 3441, 373;

(iii). Facilities classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive mining operations (except for areas of coal mining operations no longer meeting the definition of a reclamation area under 40 CFR 434.11(1) because the performance bond issued to the facility by the appropriate SMCRA authority has been released, or except for areas of non-coal mining operations which have been released from applicable State or Federal reclamation requirements after December 17, 1990) and oil and gas exploration, production, processing, or treatment operations, or transmission facilities that discharge storm water contaminated by contact with or that has come into contact with, any overburden, raw material, intermediate products, finished products, byproducts or waste products located on the site of such operations; (inactive mining operations are mining sites that are not being actively mined, but which have an identifiable owner/operator; inactive mining sites do not include sites where mining claims are being maintained prior to disturbances associated with the extraction, beneficiation, or processing of mined materials, nor sites where minimal activities are undertaken for the sole purpose of maintaining a mining claim);

(iv) Hazardous waste treatment, storage, or disposal facilities, including those that are operating under interim status or a permit under Subtitle C of RCRA;

(v) Landfills, land application sites, and open dumps that receive or have received any industrial wastes (waste that is received from any of the facilities described under this subsection) including those that are subject to regulation under Subtitle D of RCRA;

(vi) facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards, including but limited to those classified as Standard Industrial Classification 5015 and 5093;

(vii) Steam electric power generating facilities, including coal handling sites;

(viii) Transportation facilities classified Standard Industrial Classifications 40, 41, 42 (exce 4221-4225), 43, 44, 45 and 5171 which have vehic maintenance shops, equipment cleaning operations, airport deicing operations. Only those portions of t facility that are either involved in vehicle maintenan (including vehicle rehabilitation, mechanical repair painting, fueling, and lubrication), equipme cleaning operations, airport deicing operations, which are otherwise identified under paragrapl (i)-(vii) or (ix)-(xi) of this definition are associat with industrial activity;

(ix) Treatment works treating domestic sewage any other sewage sludge or wastewater treatme device or system, used in the storage treatmen recycling, and reclamation of municipal or domest sewage, including land dedicated to the disposal sewage sludge that are located within the confines the facility, with a design flow of 1.0 mgd or mor or required to have an approved pretreatme program under 40 CFR 403. Not included are far lands, domestic gardens or lands used for slud management where sludge is beneficially reused a which are not physically located in the confines of t facility, or areas that are in compliance with 40 CF 503;

(x) Construction activity including clearin grading and excavation activities except: operatio that result in the disturbance of less than five acres total land area which are not part of a larger comm plan of development or sale;

(xi) Facilities under Standard Industri Classifications 20, 21, 22, 23, 2434, 25, 265, 26 27, 283, 285, 30, 31 (except 311), 323, 34 (exce 3441), 35, 36, 37 (except 373), 38, 39, 4221-422 (and which are not otherwise included with categories (ii)-(x));

"Time-weighted composite" means a composi sample consisting of a mixture of equal volu aliquots collected at a constant time interval.

"Uncontrolled sanitary landfill" means landfill, or open dump, whether in operation closed, that does not meet the requirements for run or runoff control established pursuant to subtitle D the Solid Waste Disposal Act.

"10-year, 24-hour precipitation event" means the maximum 24-hour precipitation event with a probable reoccurrence interval of once in 10 years. This information is available in "Weather Bureau Technical Paper No. 40,", May 1961 and may be obtained from the National Climatic Center of the Environmental Data Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Revised 04/05/94

STANDARD CONDITIONS

1. DEFINITIONS

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

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

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

2. DUTY TO COMPLY

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

3. DUTY TO REAPPLY

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

4. NEED TO HALT OR REDUCE ACTIVITY

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

5. DUTY TO MITIGATE

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

6. PROPERTY RIGHTS

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

7. TRANSFER OF TITLE

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

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

8. PROPER OPERATION AND MAINTENANCE

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

9. DUTY TO PROVIDE INFORMATION

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

10. MAINTENANCE OF RECORDS

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

11. PERMIT MODIFICATION, SUSPENSION OR REVOCATION

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

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

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

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

12. SEVERABILITY

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

STANDARD CONDITIONS

13. INSPECTION OF PREMISES, RECORDS, EQUIPMENT, METHODS AND DISCHARGES
You are required to permit authorized personnel to:

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

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

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

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

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

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

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

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

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

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

17. NOTICE OF CHANGED CONDITIONS
You are required to report any changes in existing conditions or information on which this permit is based:

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

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

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

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

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

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

19. UPSET PROVISION

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

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

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

(1) An upset occurred and that the permittee can identify the cause(s) of the upset.

(2) The permitted facility was at the time being properly operated; and

(3) The permittee submitted notice of the upset to the Department in accordance with 40 CFR 122.41(l)(6)(ii)(B).

(4) The permittee complied with any remedial measures required by Item #5 of the Standard Conditions of this permit.

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

20. FAILURE TO SUBMIT FEES

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

21. BYPASSES

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

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

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

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

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

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

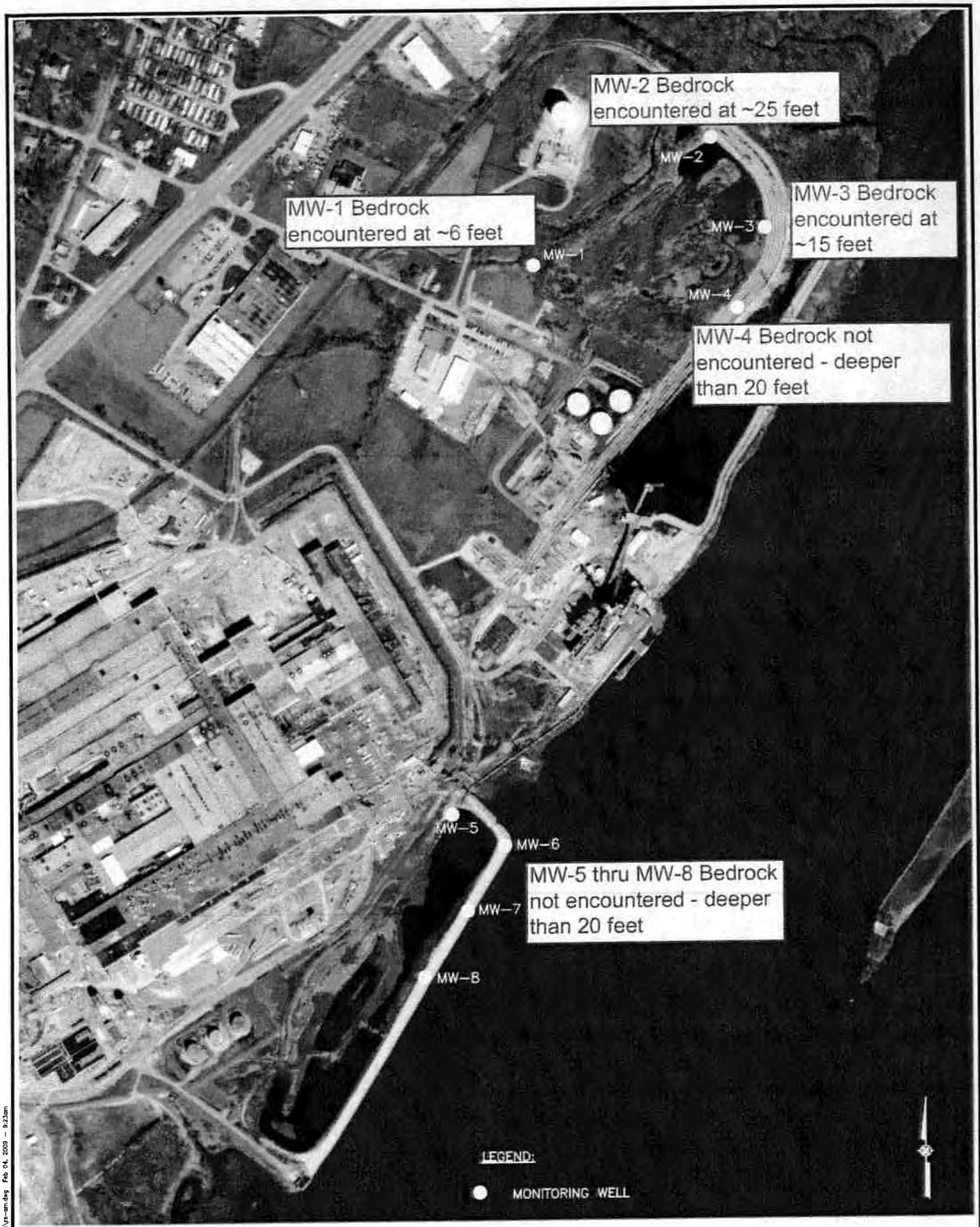
(d) Reporting bypasses. Bypasses shall be reported in accordance with 567-63.6 IAC.

22. SIGNATORY REQUIREMENTS

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

23. USE OF CERTIFIED LABORATORIES

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



DESIGNED BY	ADAM NEWMAN	
DRAWN BY	NORA DAY	
CHECKED BY	ADAM NEWMAN	
APPROVED BY	KEVIN ARMSTRONG	
PROJECT MANAGER	KEVIN ARMSTRONG	

0 300 600
SCALE IN FEET

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

TITLE: **MONITORING WELL LOCATIONS**

MWH

FIGURE: 2

REVISION:

FILE NAME:

P:\CAD\Midamerican\Bettendorf--Riverside\Vis--am.dwg Feb 04, 2009 - 8:23am

North

Property Boundary

Impoundment Boundary

Map Not To Scale

Map-1
Riverside Station
Plant ID: 1081

Ash Pond Inspection checklist Form – Riverside Generating Station

Inspector's Name: DAVID WEBB Date: 9/8/2010

	Bottom Ash Pond		Temporary Ash Pond	
	YES	NO	YES	NO
Is the top of the dike free of cracks or settlement?	X			X
Is the wall/slope of the dike free of cracks or erosion?	X		X	
Is the dike free of visible signs of seeps or leaks? (inspect the entire slope and inlet and outlet piping)	X		X	
Is the ash surface free of depressions, sinkholes, and whirlpools?	X		X	
Is the top or slopes of the bottom ash dike free of trees and large vegetation?	X		—	—
Are fugitive dust emissions under control?	X		X	

Explanation for "NO" answers. Include expected repairs and work order numbers.

SMALL DEPRESSION ON TEMP ASH POND DIKE.
PREVIOUSLY MENTIONED.
DETERMINED NO ACTION NEEDED AT THIS TIME.
DOES NOT APPEAR TO BE CHANGING.

Other comments: _____

Inspector Signature: David A Webb

Riverside environmental file 1.9.2
Rev DAW 7-2-2010

Ash Pond Inspection checklist Form – Riverside Generating Station

Inspector's Name: DAVID WEBB Date: 8/2/2010

	Bottom Ash Pond		Temporary Ash Pond	
	YES	NO	YES	NO
Is the top of the dike free of cracks or settlement?	X		X	
Is the wall/slope of the dike free of cracks or erosion?	X			X
Is the dike free of visible signs of seeps or leaks? (inspect the entire slope and inlet and outlet piping)	X		X	
Is the ash surface free of depressions, sinkholes, and whirlpools?	X		X	
Is the top or slopes of the bottom ash dike free of trees and large vegetation?	X			X
Are fugitive dust emissions under control?	X		X	

Explanation for "NO" answers. Include expected repairs and work order numbers.

TEMP ASH POND INSPECTED BY DOUG HAISTON AND VANCE EDMONSON.
THEY DETERMINED NO ACTION IS REQUIRED AT THIS TIME.
WO # 1026556 FROM LAST MONTH WAS "FINISHED" WITHOUT ACTION.

Other comments: _____

Inspector Signature: David Webb

Riverside environmental file 1.9.2
Rev DAW 7-2-2010

Ash Pond Inspection checklist Form – Riverside Generating Station

Inspector's Name: DAVID WEBB Date: 7/2/2010

	Bottom Ash Pond		Temporary Ash Pond	
	YES	NO	YES	NO
Is the top of the dike free of cracks or settlement?	X			X
Is the wall/slope of the dike free of cracks or erosion?	X		X	
Is the dike free of visible signs of seeps or leaks? (inspect the entire slope and inlet and outlet piping)	X		X	
Is the ash surface free of depressions, sinkholes, and whirlpools?	X		X	
Is the top or slopes of the bottom ash dike free of trees and large vegetation?	X		—	
Are fugitive dust emissions under control?	X		X	

Explanation for "NO" answers. Include expected repairs and work order numbers.

TEMP ASHPOND DIKE SURFACE ACROSS FROM LNG PLANT HAS A DEPRESSION / SETTLEMENT AREA THAT NEEDS TO BE FILLED IN.
WO# 1026556

Other comments:

Inspector Signature: David Webb

Riverside environmental file 1.9.2
Rev DAW 7-2-2010

Ash Pond Inspection Checklist Form – Louisa and Riverside Generating Stations

Circle: Louisa Bottom Ash Pond

Riverside Bottom Ash Pond

Louisa CCR Landfill

Riverside Temp Ash Area

Inspector's Name: DAVID WEBB

Date: 6/3/2010

Answer each question as "Yes" or "No". All "No" answers must be explained below with how the deviation will be remedied.

	Yes	No
Is the top of the dike free of cracks or settlement?	X	
Is the wall/slope of the dike free of cracks or erosion?	X	
Is the dike free of visible sign of seeps or leaks? Inspect entire slope, inlet and outlet piping, and "boils" from beneath a stream or pond if applicable.	X	
Are trash-racks clean and in place (LGS bottom ash pond only)?	—	—
Is the CCR landfill free of standing water (LGS CCR landfill only)?		—
Is the ash surface free of depressions, sinkholes or whirlpools?	X	
Is the top or slopes of the dike free of trees and large vegetation (bottom ash ponds only)?	X	
Are fugitive dust emissions under control?	X	

Explanation for "No" answers, include expected repairs and work order numbers:

MINOR WASH-OUTS. WILL REMIND VANCE TO CHECK/FIX.

Other comments: _____

Inspector signature: David Webb

Louisa environmental file 3.1.1.6 or Riverside environmental file 1.9.2

Rev JDW 12-4-09

Ash Pond Inspection Checklist Form – Louisa and Riverside Generating Stations

Circle: Louisa Bottom Ash Pond

Louisa CCR Landfill

Riverside Bottom Ash Pond

Riverside Temp Ash Area

Inspector's Name: DAVID WEBB

Date: 5/6/2010

Answer each question as "Yes" or "No". All "No" answers must be explained below with how the deviation will be remedied.

	Yes	No
Is the top of the dike free of cracks or settlement?	X	
Is the wall/slope of the dike free of cracks or erosion?		X
Is the dike free of visible sign of seeps or leaks? Inspect entire slope, inlet and outlet piping, and "boils" from beneath a stream or pond if applicable.	X	
Are trash-racks clean and in place (LGS bottom ash pond only)?	—	
Is the CCR landfill free of standing water (LGS CCR landfill only)?	—	
Is the ash surface free of depressions, sinkholes or whirlpools?	X	
Is the top or slopes of the dike free of trees and large vegetation (bottom ash ponds only)?	X	
Are fugitive dust emissions under control?	X	

Explanation for "No" answers, include expected repairs and work order numbers:

SMALL AMOUNTS OF EROSION / WASH-OUTS AROUND TEMP ASH AREA, AND ASH POND. NO WORSE THAN TWO MONTHS AGO.

Other comments: VANCE WILL FILL IN WASH-OUTS AS WEATHER PERMITS

Inspector signature: David A Webb

Louisa environmental file 3.1.1.6 or Riverside environmental file 1.9.2

Rev JDW 12-4-09

Ash Pond Inspection Checklist Form – Louisa and Riverside Generating Stations

Circle: Louisa Bottom Ash Pond

Riverside Bottom Ash Pond

Louisa CCR Landfill

Riverside Temp Ash Area

Inspector's Name: DAVID WEBB

Date: 4/14/2010

Answer each question as "Yes" or "No". All "No" answers must be explained below with how the deviation will be remedied.

	Yes	No
Is the top of the dike free of cracks or settlement?	X	
Is the wall/slope of the dike free of cracks or erosion?	X	
Is the dike free of visible sign of seeps or leaks? Inspect entire slope, inlet and outlet piping, and "boils" from beneath a stream or pond if applicable.	X	
Are trash-racks clean and in place (LGS bottom ash pond only)?		
Is the CCR landfill free of standing water (LGS CCR landfill only)?		
Is the ash surface free of depressions, sinkholes or whirlpools?	X	
Is the top or slopes of the dike free of trees and large vegetation (bottom ash ponds only)?	X	
Are fugitive dust emissions under control?	X	

Explanation for "No" answers, include expected repairs and work order numbers:

SAME AS LAST MONTH

SOME WASH OUTS NEED ATTENTION

VANCE WILL PUT DOWN GRAVEL

Other comments: _____

Inspector signature: David J Webb

Louisa environmental file 3.1.1.6 or Riverside environmental file 1.9.2

Rev JDW 12-4-09

Ash Pond Inspection Checklist Form – Louisa and Riverside Generating Stations

Circle: Louisa Bottom Ash Pond

Riverside Bottom Ash Pond

Louisa CCR Landfill

Riverside Temp Ash Area

Inspector's Name: DAVID WEBB

Date: 3/23/2010

Answer each question as "Yes" or "No". All "No" answers must be explained below with how the deviation will be remedied.

	Yes	No
Is the top of the dike free of cracks or settlement?	X	
Is the wall/slope of the dike free of cracks or erosion?		X
Is the dike free of visible sign of seeps or leaks? Inspect entire slope, inlet and outlet piping, and "boils" from beneath a stream or pond if applicable.	X	
Are trash-racks clean and in place (LGS bottom ash pond only)?	—	
Is the CCR landfill free of standing water (LGS CCR landfill only)?	—	
Is the ash surface free of depressions, sinkholes or whirlpools?	X	
Is the top or slopes of the dike free of trees and large vegetation (bottom ash ponds only)?	X	
Are fugitive dust emissions under control?	X	

Explanation for "No" answers, include expected repairs and work order numbers:

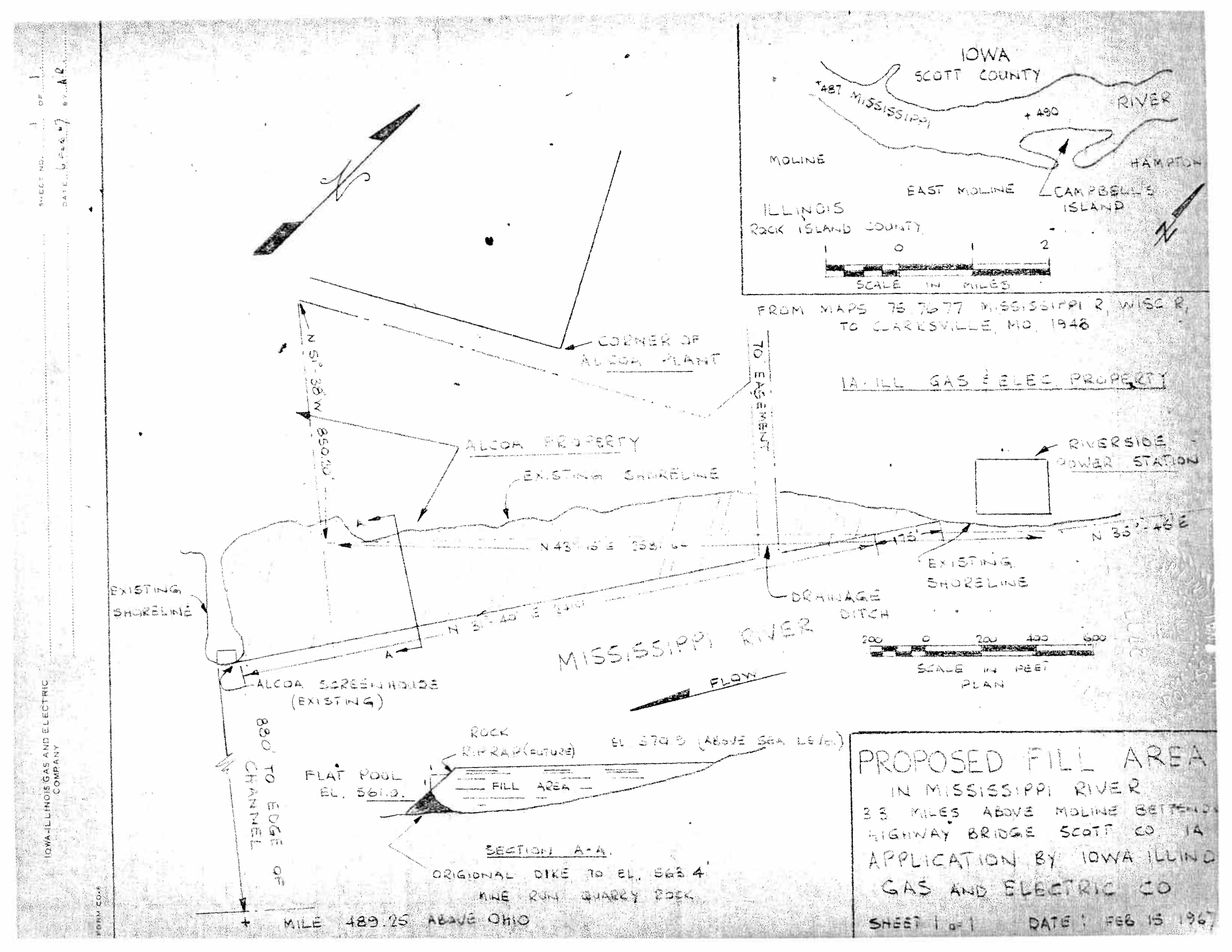
SMALL WASHOUTS THAT WILL BE REPAIRED AS SOON AS SOIL IS DRY ENOUGH TO ALLOW VEHICLES. VANCE/HALSTON HAVE BEEN NOTIFIED. THIS APPLIES TO BOTH BOTTOM ASH & TEMP ASH PONDS PHOTOS UPLOADED TO ECMS SYSTEM.

Other comments: _____

Inspector signature: David P Webb

Louisa environmental file 3.1.1.6 or Riverside environmental file 1.9.2

Rev JDW 12-4-09



PROPOSED FILL AREA

IN MISSISSIPPI RIVER

3.3 MILES ABOVE MOLINE GETTER'S HIGHWAY BRIDGE SCOTT CO. IA

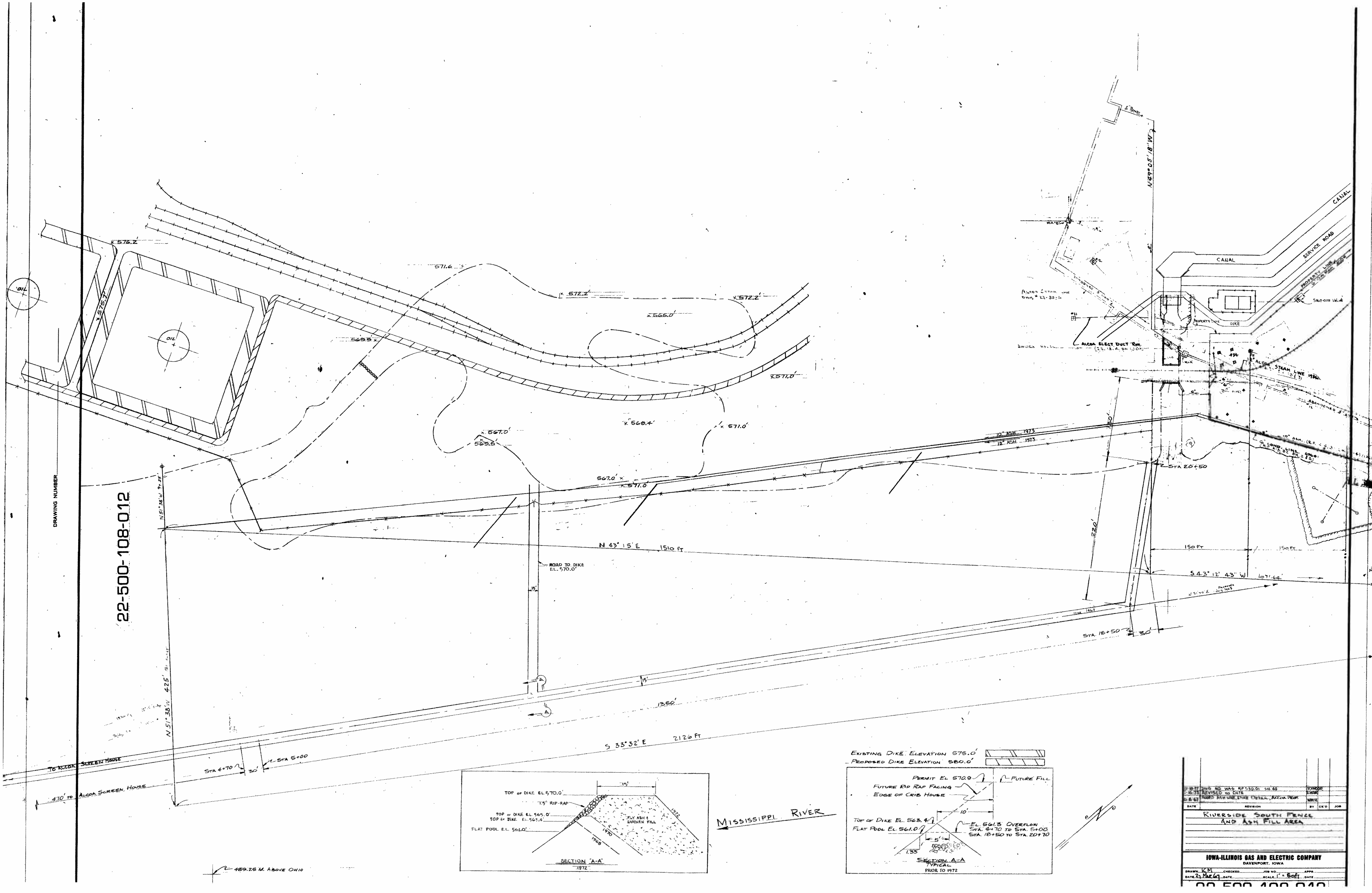
APPLICATION BY IOWA ILLINOIS GAS AND ELECTRIC CO

SHEET 1 OF 1 DATE: FEB 15 1967

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

SHEET NO. 1 OF 1 DATE (Orig.) BY A.R.

FORM CO-6


22-500-108-012
DRAWING NUMBER
CANAL
SERVICE ROAD
N 43° 15' E 1510 Ft
S 43° 12' 43" W
N 51° 38' W 425'
S 33° 32' E 2126 Ft
ROAD TO DIKE EL. 570.0'
STA 20+50
STA 18+50
STA 4+70
STA 5+00
TO ALCOA SCREEN HOUSE
470' TO ALCOA SCREEN HOUSE
MISSISSIPPI RIVER
489.25 M. ABOVE OHIO
EXISTING DIKE ELEVATION 575.0'
PROPOSED DIKE ELEVATION 580.0'
TOP OF DIKE EL 570.0'
7.5' RIP-RAP
TOP OF DIKE EL 565.0'
TOP OF DIKE EL 563.4'
FLAT POOL EL 561.0'
FLY ASH & EARTHEN FILL
SECTION "A-A"
1972
PERMIT EL 570.9
FUTURE FILL
FUTURE RIP RAP FACING
EDGE OF CRIB HOUSE
TOP OF DIKE EL 563.4
FLAT POOL EL 561.0
EL 561.3 OVERFLOW
STA 4+70 TO STA 5+00
STA 18+50 TO STA 20+70
SECTION A-A
TYPICAL
PRIOR TO 1972
DWG NO WAS RP 530.01 SH. 40
REVISED TO DATE
ADDED RIP-RAP, DIKE DETAIL, ALCOA PROP.
DATE
REVISION
BY
CK'D
JOB
RIVERSIDE SOUTH FENCE
AND ASH FILL AREA
IOWA-ILLINOIS GAS AND ELECTRIC COMPANY
DAVENPORT, IOWA
DRAWN KM
CHECKED
JOB NO.
APPR.
DATE 27 MAR 67
DATE
SCALE 1" = 80 ft
DATE

#9 ACID CLEANING
LIQUID CONTAINMENT

ASH SLUICE
PIPE
SUPPORTS

10" #9 ASH
SLUICE

GRID BASE
AT PH 32
AND 10" LINE

12"-800' ASH
SLUICE LINE

8" SUMP
LINES

EDGE OF
ASH SHELF

DECANT
TUBE

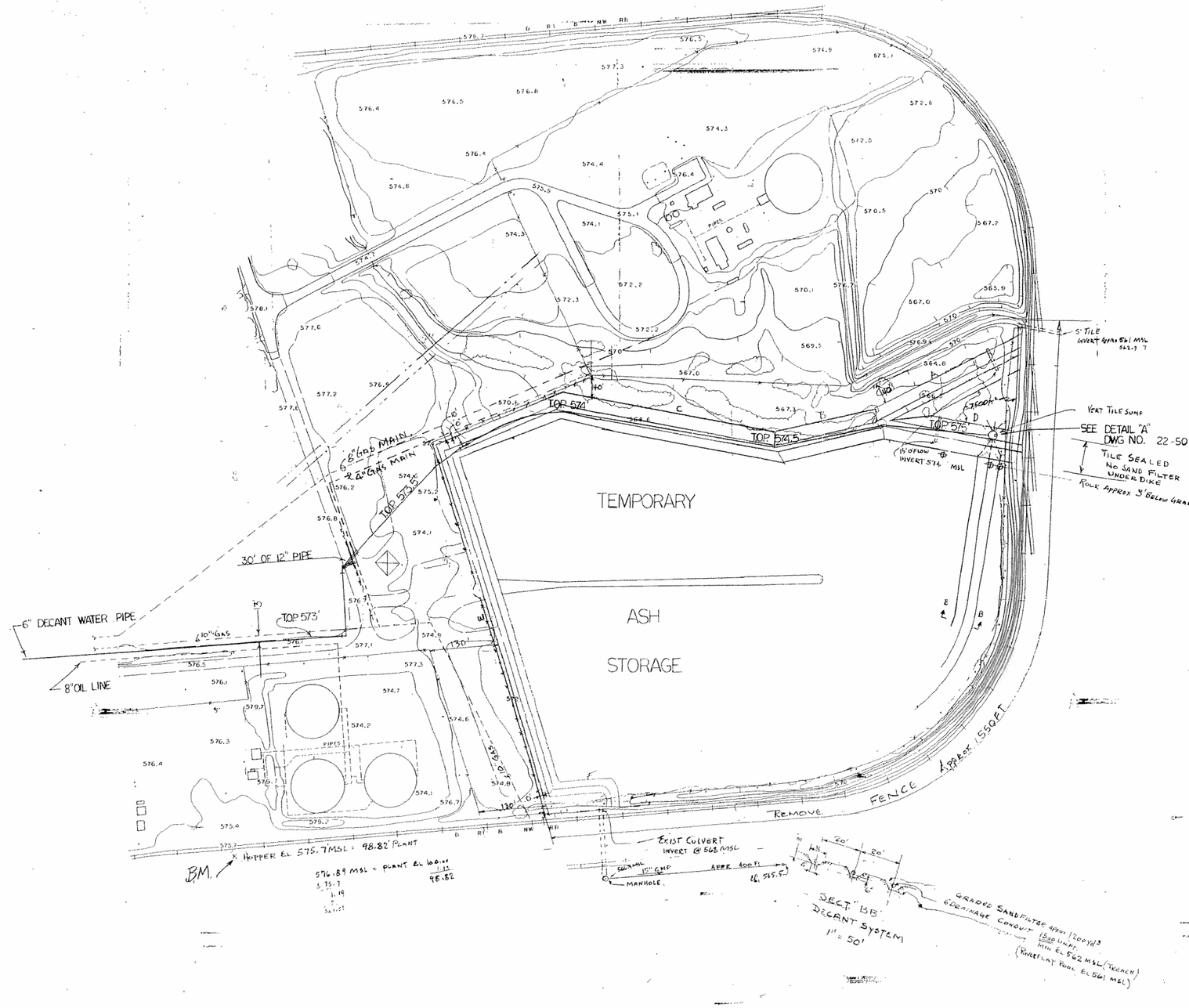
BOTTOM OF ASH POND
ELEVATIONS 5XX.X

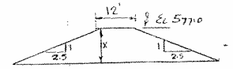
WATER LEVEL
ON 8-23-79
574.0 MSL

RIVERSIDE ACTIVE ASH POND
SOUNDINGS OF 8-23-79
LAYOUT AND GRID SYSTEM
IOWA-ILLINOIS GAS & ELECTRIC CO.

COPY

22-500-143-008





SCALE
50 0 50 100 150 200
1 INCH = 100 FEET

UNCHECKED ELEVATION 375.7
SURFACED ROAD
UNSURFACED ROAD
BUILDINGS
STREAM
FENCE
TREES
TRAIL
SWAMP OR MARSH
RAIL ROAD
UTILITY POLES
PIPES PIPE
BRIDGE
CATCH BASIN
MANHOLE
CULVERT
FIRE HYDRANT FH
CULTIVATION LINE
MAIL BOX MB
SECTION CORNER
BENCH MARK X BM
VERTICAL & HORIZONTAL CONTROL
VERTICAL CONTROL
HORIZONTAL CONTROL

CONTOUR INTERVAL 2 FOOT

HORIZONTAL CONTROL :

BASED ON LOCAL HORIZONTAL DATUM .
VERTICAL CONTROL :

BASED ON LOCAL VERTICAL DATUM

DATE OF PHOTOGRAPHY '78

CONTROL SURVEY RUN BY CLIENT

TOPOGRAPHIC SURVEY
PREPARED BY

TRI-STATE AERO ENGINEERING
BETTENDORF, IOWA

	DATE	REVISION	BY	CK'D	JOB
C	10-11-79	ADDED 6" DECANT WATER PIPE	BG		
B	10-28-78	ADDED 15" TILE & MANHOLE @ C-1 & C-7 CULV.	KM		
A	10-1-78	ADDED TILE SUMP & TILE WASTE	KM		
	11-8-78	RELEASED FOR BID	KM		

LNG TEMP ASH STORAGE

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY
DAVENPORT, IOWA

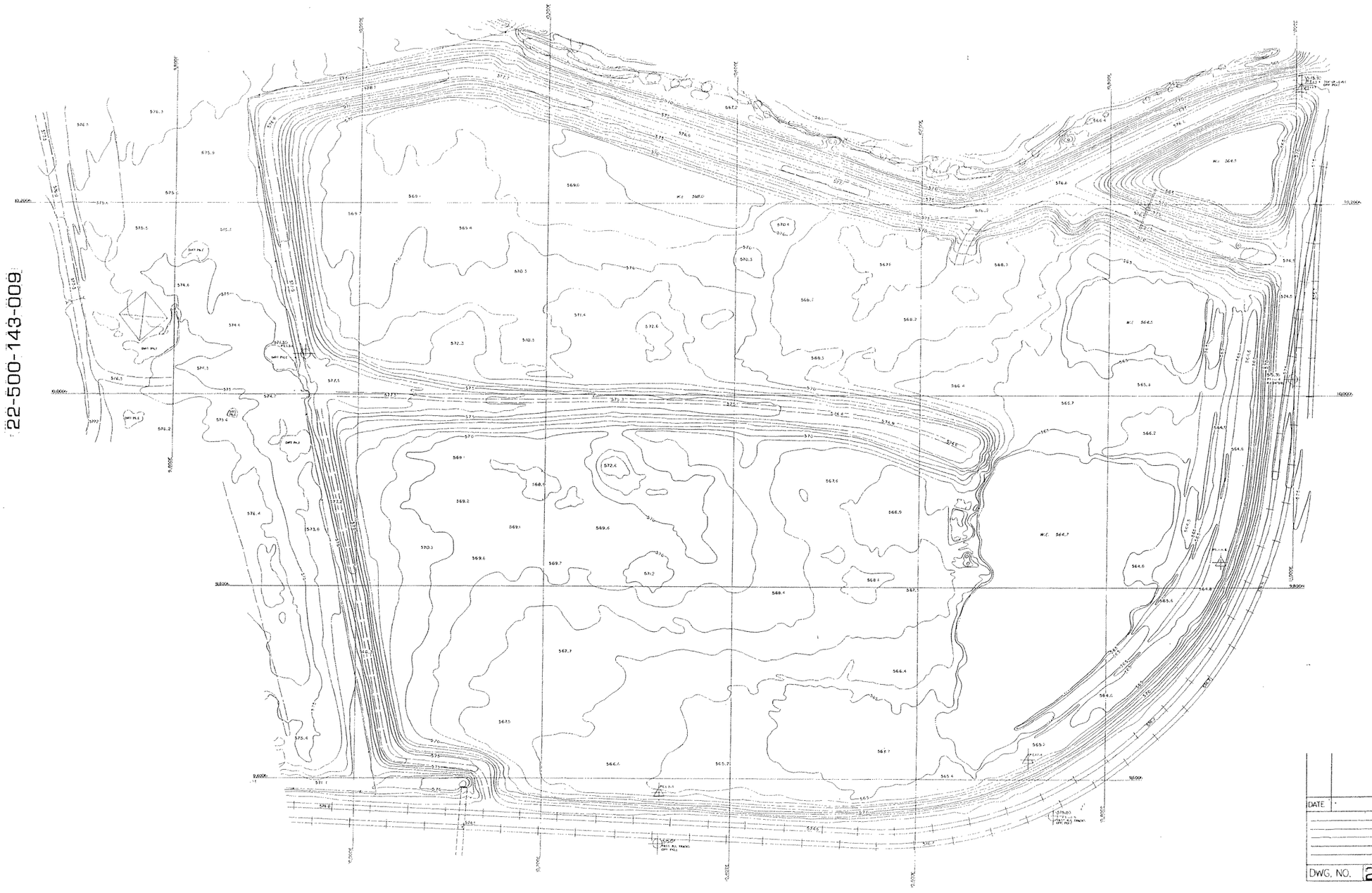
DRAWN R.V. CHECKED JOB NO. APPR.
DATE 11-4-78 DATE SCALE DATE

DWG. NO. 22-500-143-008 C

TS-2546

COPY

22-500-143-009



IOWA-ILLINOIS GAS & ELECTRIC CO.
RIVERSIDE STATION

TEMPORARY ASH STORAGE AREA

UNCHECKED ELEVATION	575.7
SURFACED ROAD	
UNSURFACED ROAD	
BUILDINGS	
STREAM	
FENCE	
TREES	
TRAIL	
SWAMP OR MARSH	
RAIL ROAD	
UTILITY POLES	
PIPES	
BRIDGE	
CATCH BASIN	
MANHOLE	
CULVERT	
FIRE HYDRANT	
CULTIVATION LINE	
MAIL BOX	
SECTION CORNER	
BENCH MARK	X BM
VERTICAL & HORIZONTAL CONTROL	
VERTICAL CONTROL	
HORIZONTAL CONTROL	

CONTOUR INTERVAL 1 FOOT

HORIZONTAL CONTROL:

BASED ON LOCAL HORIZONTAL DATUM
VERTICAL CONTROL:

BASED ON LOCAL VERTICAL DATUM
COMPILED BY STEREOPHOTOGRAMMETRIC
METHOD FROM AERIAL PHOTOGRAPHY
DATE OF PHOTOGRAPHY 3/16/79

CONTROL SURVEY RUN BY TRI-STATE

TOPOGRAPHIC SURVEY
PREPARED BY

TRI STATE AERO ENGINEERING
BETTENDORF, IOWA

DATE	REVISION	BY	REV. LETTER
		KKT	

LNG
ASH STORAGE
BASE ELEV.

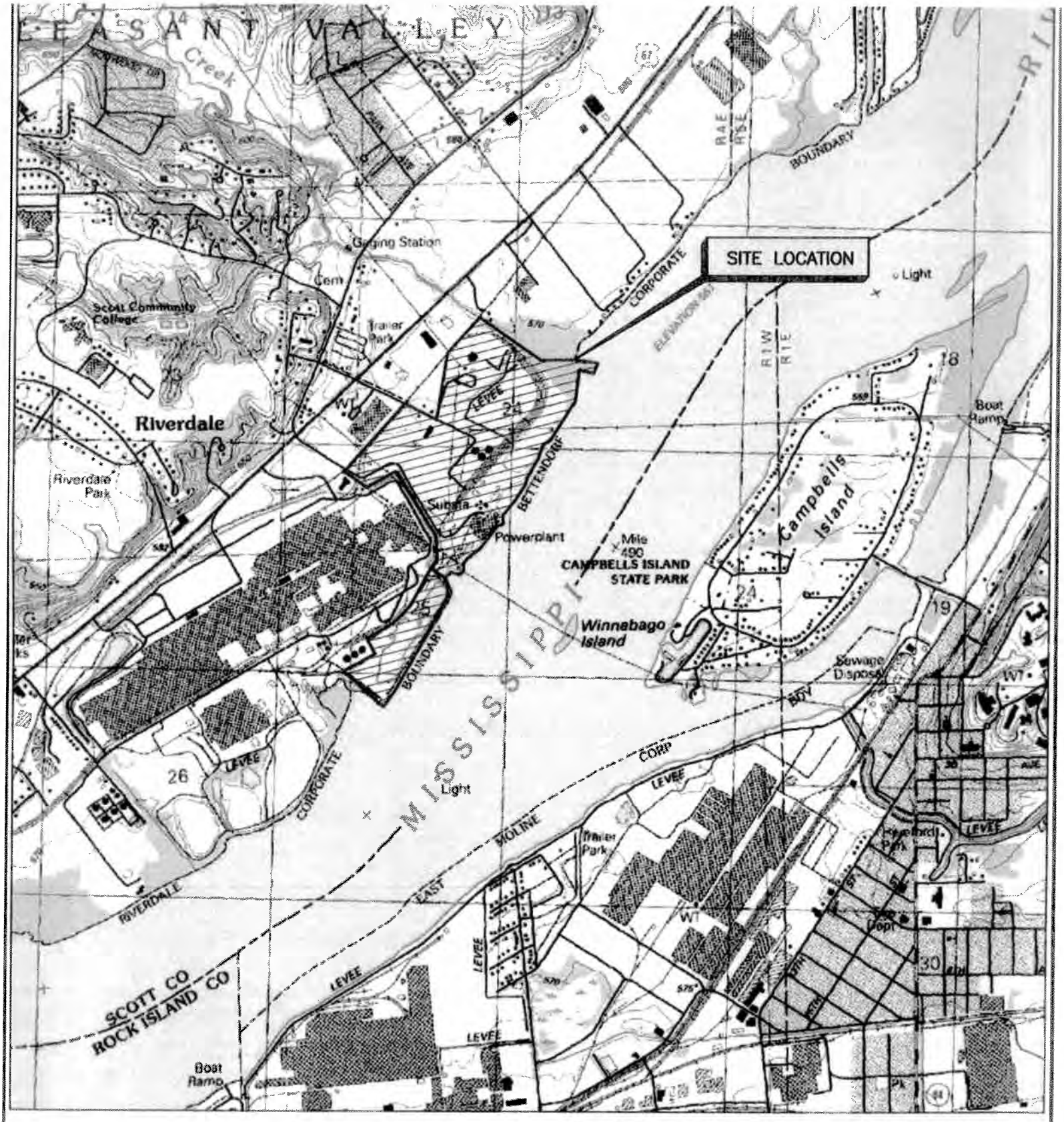
DWG. NO. 22-500-143-009

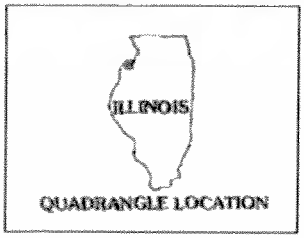
DESIGNED BY	ADAM NEWMAN	
DRAWN BY	NORA DAY	
CHECKED BY	ADAM NEWMAN	
APPROVED BY	KEVIN ARMSTRONG	
PROJECT MANAGER	KEVIN ARMSTRONG	

0 300 600
SCALE IN FEET

MANAGING OFFICE: DES MOINES, IOWA
PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA
TITLE:

MWH





SITE LOCATION: TOWNSHIP 78 NORTH, RANGE 4 EAST, SECTION 24
SCOTT COUNTY, IOWA

MAP SOURCE: U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE
SILVIS, ILL–IOWA (1991)

DESIGNED BY		
DRAWN BY	NORA DAY	
CHECKED BY		
APPROVED BY	KEVIN ARMSTRONG	

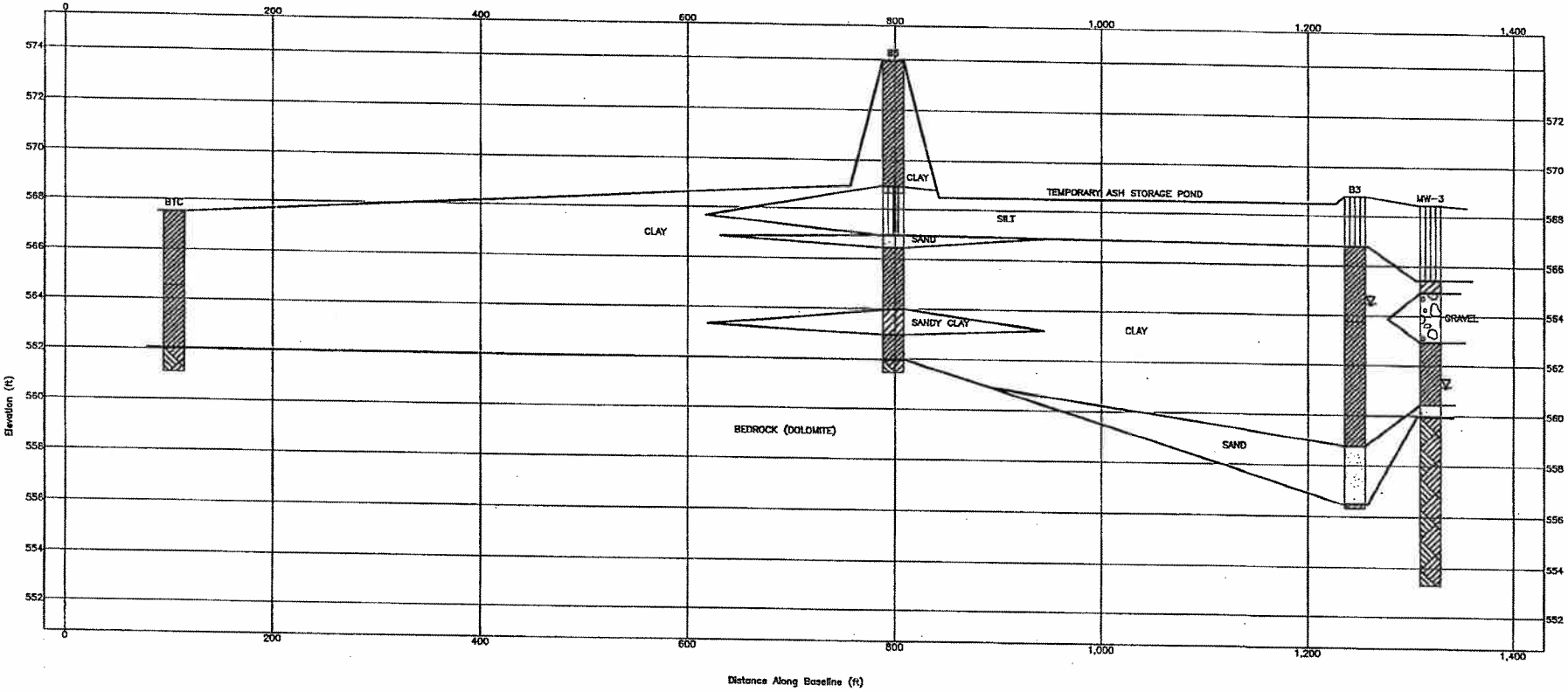
0 1000 2000

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

TITLE

MWH



LITHOLOGY GRAPHICS

- USCS Low Plasticity Clay
- Bedrock
- USCS Silt
- USCS Poorly-graded Gravel
- USCS Poorly-graded Sand
- USCS Clayey Sand

VERTICAL EX. = 25

0 50 100

SCALE IN FEET

DESIGNED BY	SCOTT HANSEN
DRAWN BY	NORA DAY
CHECKED BY	SCOTT HANSEN
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

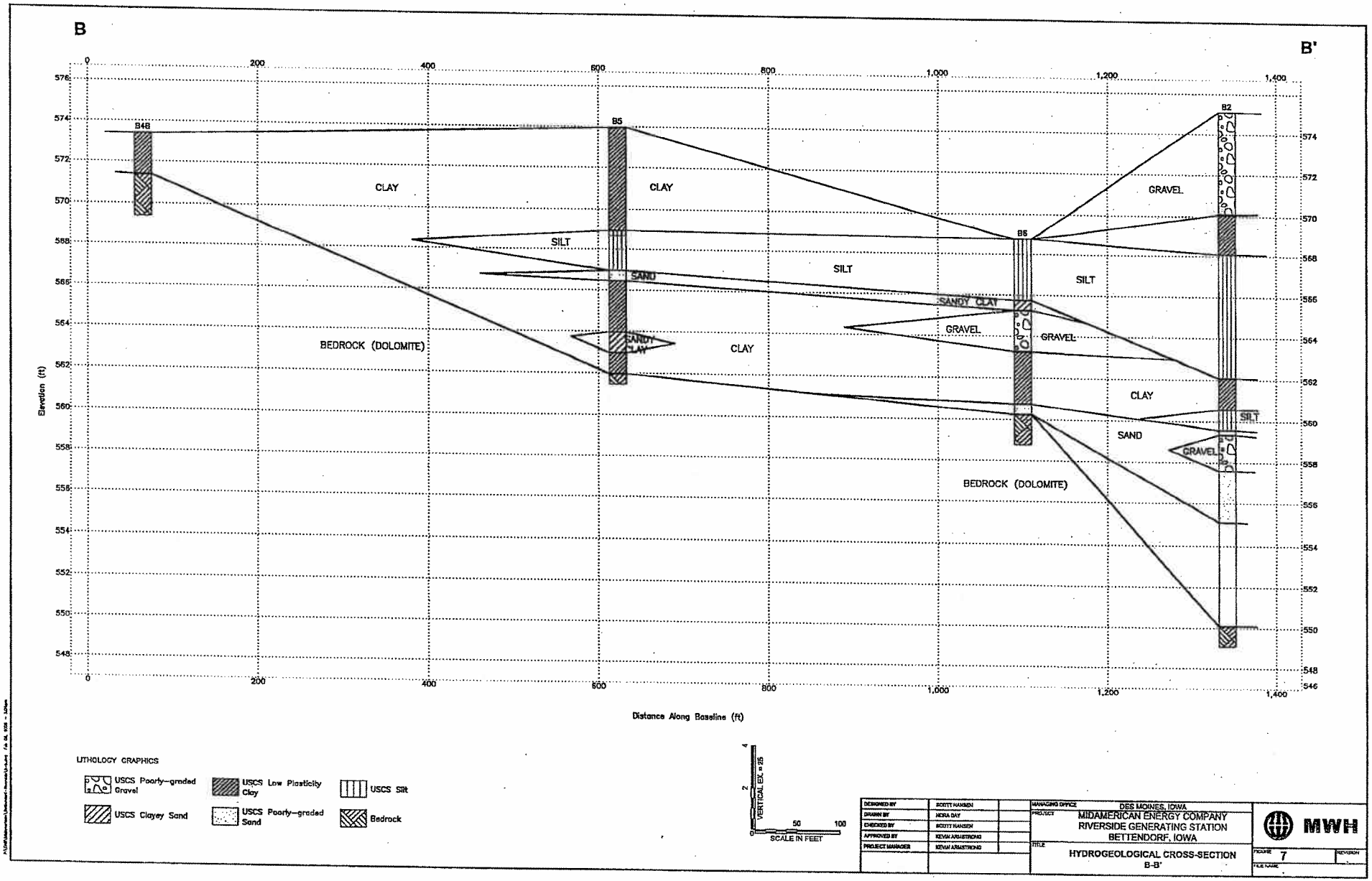
TITLE: HYDROGEOLOGICAL CROSS-SECTION
A-A'

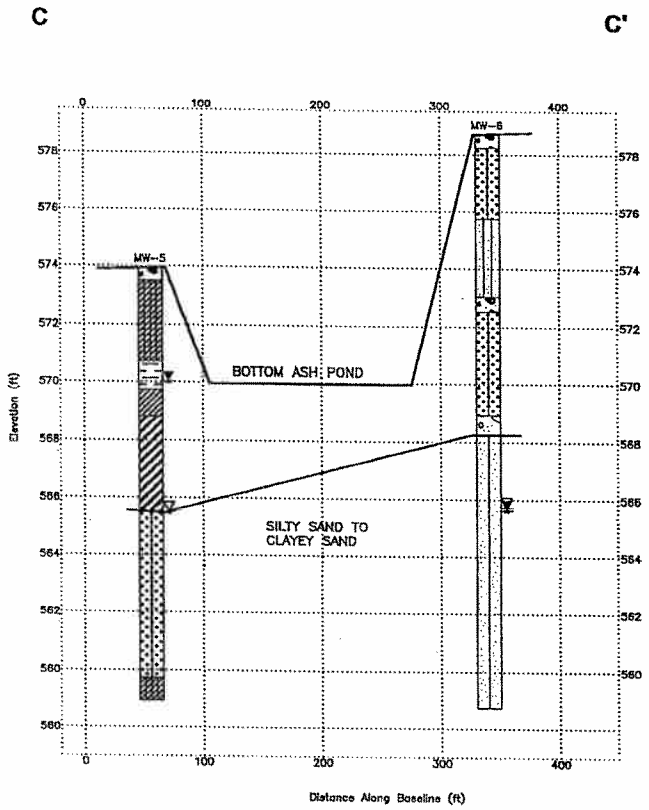
MWH

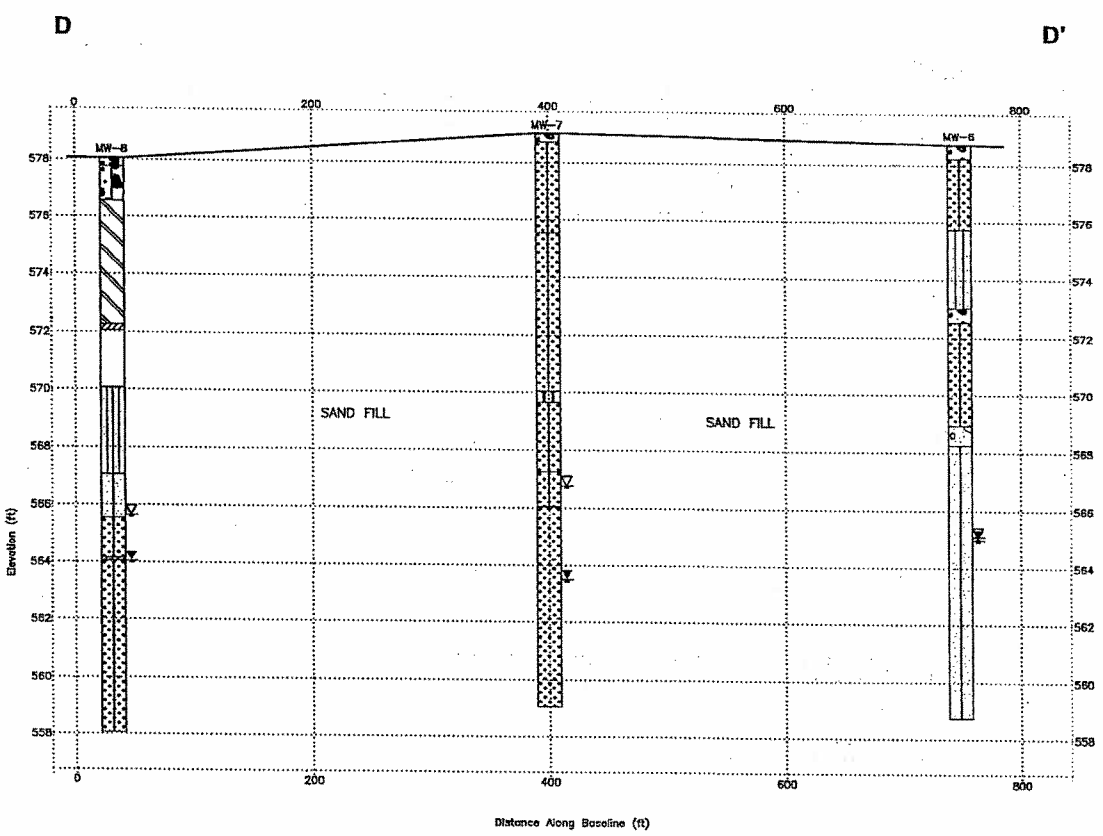
FIGURE: 6

REVISION:

FILE NAME:


B
B'
B4B
B5
B6
B2
CLAY
CLAY
GRAVEL
SILT
SILT
SILT
SAND
SANDY CLAY
GRAVEL
GRAVEL
SANDY CLAY
CLAY
BEDROCK (DOLOMITE)
CLAY
SILT
SAND
GRAVEL
BEDROCK (DOLOMITE)
Elevation (ft)
Distance Along Baseline (ft)
0
200
400
600
800
1,000
1,200
1,400
576
574
572
570
568
566
564
562
560
558
556
554
552
550
548
546
LITHOLOGY GRAPHICS
USCS Poorly-graded Gravel
USCS Low Plasticity Clay
USCS Silt
USCS Clayey Sand
USCS Poorly-graded Sand
Bedrock
VERTICAL EX. = 25
SCALE IN FEET
50
100
DESIGNED BY SCOTT HANSEN
DRAWN BY NORA DAY
CHECKED BY SCOTT HANSEN
APPROVED BY KEVIN ARMSTRONG
PROJECT MANAGER KEVIN ARMSTRONG
MANAGING OFFICE DES MOINES, IOWA
PROJECT MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA
TITLE HYDROGEOLOGICAL CROSS-SECTION
B-B'
MWH
FIGURE 7
REVISION
FILE NAME





LITHOLOGY GRAPHICS

- USCS Well-graded Gravel
- USCS Poorly-graded Gravelly Sand
- USCS Low to High Plasticity Clay
- USCS Well-graded Sand with Clay
- USCS Poorly-graded Sand with Silt
- USCS Low Plasticity Sandy Clay
- USCS Silty Sand
- USCS Elastic Silt
- USCS Sandy Silt
- USCS Well-graded Sandy Gravel
- USCS Well-graded Sand
- USCS Low Plasticity Clay
- USCS Well-graded Sand with Silt
- USCS Well-graded Gravel with Clay

VERTICAL EXC = 25

SCALE IN FEET

DESIGNED BY	SCOTT HANSEN	MANAGING OFFICE	DES MOINES, IOWA
DRAWN BY	NORA BAY	PROJECT	MIDAMERICAN ENERGY COMPANY RIVERSIDE GENERATING STATION BETTENDORF, IOWA
CHECKED BY	SCOTT HANSEN		
APPROVED BY	KEVIN ARMSTRONG		
PROJECT MANAGER	KEVIN ARMSTRONG	TITLE	HYDROGEOLOGICAL CROSS-SECTION C-C' AND D-D'

MWH

FIGURE 8

REVISION

FILE NAME

Drilling Log

MWH

Monitoring Well **MW-4**

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *574.36 ft* North *-356* East *1015*

Top of Casing *574.03 ft* Water Level Initial ▽*556.53* 01/15/08 12:00 Static ▼*563.43* 01/15/08 13:15

Hole Depth *20.0ft* Screen: Diameter *2 in* Length *15.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch Bore* Sampling Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/15/2008* Completion Date *1/15/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		574.36
0	0.0				GW	Surface - coarse angular GRAVEL (imported) ballast over medium to large gravel with coal dust.		
	1.2				CL ML	Silty CLAY, soft, brown, moderate plasticity, low moisture, no odor.		570
5	0.0		4 5 4		CL	CLAY, soft, light brown, with black organic silty nodules, low molsture, no odor.		
	0.0	100%	5 5 7		CL ML	Silty CLAY, soft, brown, some fine sand, stiff at 7 feet, dark brown at 7.8 feet, no odor.		
	0.0	100%	9 9 0					565
10	0.0	100%	3 4 6		CL	Fine sandy CLAY, soft, brown, some miosture, no odor.		
	0.0	100%	3 4 6		CL ML CL	Silty CLAY, soft, dark brown, moist, moderate plasticity, no odor. Fine sandy CLAY w/ some silt, reddish/light brown, moist, no odor		
	0.0	100%	7 1 3		CL ML	Silty CLAY, soft, dark grey, moist, some small well-rounded gravel from 14-15.7, no odor.		560
15	0.0	100%	4 5 2					
	0.0	100%	3 4 4		CL	CLAY, soft, light grey; brown silty mottles with trace small-medium sand, moist-wet, no odor.		
	0.0	100%	1 2 2		MH CL	Clayey SILT with some fine well rounded gravel, light grey/light brown, wet, no odor. Fine sandy CLAY, soft, ligth brown/light grey, moist-wet, no odor.		555
20	0.0	100%	2 3 9 8 14			Weathered BEDROCK, very hard fractured clayey SILT, light grey, wet.		
								550
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-5**

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *573.93 ft* North *-2708* East *-328*

Top of Casing *573.86 ft* Water Level Initial ▽*565.46* 01/15/08 15:50 Static ▼*569.96* 01/16/08 08:10

Hole Depth *15.0ft* Screen: Diameter *2 in* Length *10.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch Sampler* Backfill/Radon *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/15/2008* Completion Date *1/15/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		573.93
0					GW	Surface - coarse angular GRAVEL (imported).		
					CL	Mottled silty CLAY, soft-stiff, reddish brown, moist, no odor.		
	0.0		3 3 10 8					
		100%			OL	Organic silty CLAY, small roots, soft, dark brown, moist, no odor.		570 ▼
			3 2 4		CL	Mottled fine sandy CLAY, some small coal fragments, brown/light grey, moist, no odor.		
5	0.0					CLAY, soft, some small fragments of coal and weathered sandstone, moist-wet, no odor.		
		100%	3 2 3 2 2		CH			
	0.0		2 1					▽
		100%	1 1 1 1			Clayey fine SAND with fine subangular gravel, dark brown, wet, no odor.		565
10	0.0		0 0 6 1		SC			
		100%						
	0.0		1 1 1 2					560
15		100%			CL	Silty CLAY, soft to stiff, dark brown, moist-wet, no odor.		
								555
20								
								550
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-6**

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *578.75 ft* North *-2856* East *-84*

Top of Casing *578.10 ft* Water Level Initial ▽*565.1* 01/16/08 14:30 Static ▼*565* 01/17/08 08:30

Hole Depth *20.0ft* Screen: Diameter *2 in* Length *15.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-Inch Split Spoon* Sampling Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/16/2008* Completion Date *1/16/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		578.75
0					GW	Surface - coarse angular GRAVEL (imported).		
					SW SC	Clayey fine SAND w/ some fine angular gravel, dark brown, moist-wet, no odor.		
	0.0					Silty fine-coarse SAND, dark brown, moist, no odor.		575
5	0.0		4 3 8		SM			
		100%	5		GW	Coarse GRAVEL, angular/subangular, with dark brown/light brown silty fine/medium sand, moist, no odor.		
	0.0		3 2 5		SW SM	Silty fine SAND, dark brown, moist, no odor.		
		100%	4 1 1					570
	0.0		7 4					
10		100%	1		SP	Coarse SAND, light brown, some angular to well rounded fine gravel with small wood fragments, moist, no odor.		
	0.0		3 1 2			Silty fine SAND, dark brown, coarse angular gravel at 12 feet, some medium angular gravel at 13 - 14.2 feet, some clay at 15.5 - 16 feet, moist, wet at 13 feet, no odor.		
		100%	2 1 1					
	0.0		1 1 1					565
15		100%	0 0 0		SP SM			
	0.0		0 0 1					
		100%	1 1 1					560
	0.0		0 0 0					
20		100%	0					
								555
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-7**

Page: 1 of 1

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *579.05 ft* North *-3158* East *-259*

Top of Casing *578.56 ft* Water Level Initial ▽*566.76* 01/16/08 11:35 Static ▼*563.51* 01/17/08 09:30

Hole Depth *20.0ft* Screen: Diameter *2 in* Length *15.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch Split Spoon* Sampling Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/16/2008* Completion Date *1/16/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
0					GW	Gravel Surface - coarse angular GRAVEL (imported).		579.05
	0.0				SW SC	Clayey fine SAND, dark brown, moist-wet, no odor.		
	1.2							
						Silty fine SAND, dark brown, slightly moist, no odor.		575
5	0.0	100%	4 5 4 5 5 7 9 9		SW SM			
	0.0	100%	0 3 4 6 3 4 6 7		MH	Clayey SILT, light brown, moist, no odor.		570
10	0.0	100%			SW SC	Clayey fine SAND, dark brown, moist-wet, no odor.		
	0.0	100%			SW SM	Silty fine SAND, dark brown, wet, no odor.		
	0.0	100%	1 3 4 5 2 3 4 4 1 2 2 2 3 9		SW	Fine to medium SAND, brown, trace silt, some small angular fragments of sandstone at 17.5 feet, wet, well drained, no odor.		565
15	0.0	100%						
	0.0	100%						560
20	0.0	100%	8 14					
								555
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-8**

Project: Riverside Generating Station — Owner: MidAmerican Energy Company

Location: 6001 State Street, Bettendorf, Iowa — Project Number: 1914068.0101

Surface Elev.: 578.06 ft — North: -3465 — East: -462

Top of Casing: 577.65 ft — Water Level Initial: ▽565.65 01/16/08 09:00 — Static: ▼564.05 01/17/08 10:10

Hole Depth: 20.0ft — Screen: Diameter: 2 in — Length: 15.0 ft — Type/Size: PVC/0.01 in

Hole Diameter: 8.25 in — Casing: Diameter: 2 in — Length: 4.7 ft — Type: PVC

Drill Co.: Thiele Geotech, Inc. — Drilling Method: Hollow Stem Auger/24-inch Sampler — Sand Pack: NA

Driller: Dave Mather — Driller Reg. #: 7892 — Log By: Adam Newman

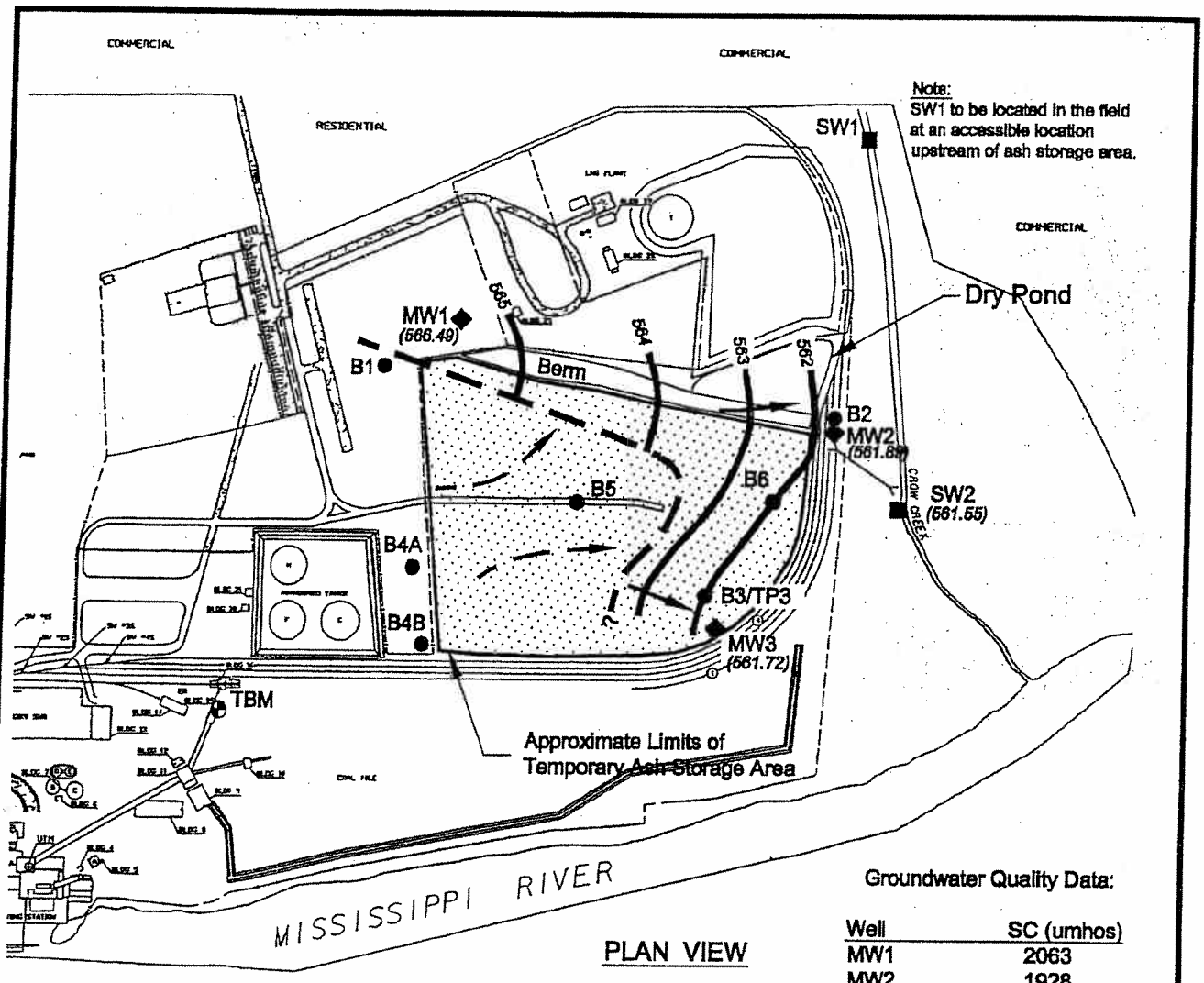
Start Date: 1/16/2008 — Completion Date: 1/16/2008 — Checked By: K. Armstrong

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		578.06
0					GW	Surface - coarse angular GRAVEL (imported).		
					GW GC	Coarse angular GRAVEL with brown clay, wet, no odor.		
	0.0				CL	CLAY, soft, brown, moderate plasticity, some small angular gravel and fine sand, some moisture, no odor.		575
5	0.0	100%	0 2 2 2 2 1 0 1 0		CL	Fine sandy CLAY, soft, reddish brown, moist, no odor.		
		0%				No recovery.		570
	0.0	100%	1 0 0 0 0 0 1		ML	Fine sandy SILT with interbedded reddish brown fine sandy clay, very soft, moist, no odor.		
10	0.0	100%	1 1 1 1 0 1 1		SP SM	Silty fine to coarse SAND, dark brown, wet at 12 feet, no odor.		
▽	0.0	100%			SW SC	Clayey fine SAND, some small fragments of sandstone at 13.8 feet, brown/dark brown, wet, no odor.		565
▼					CL	CLAY, soft, moderate to low plasticity, light brown, moist, no odor.		
15	0.0	100%	4 4 4 8 4 3 2 3 3 3 2 7		SW SM	Silty fine SAND, dark brown, wet, no odor.		560
	0.0	100%						
20	0.0	100%						555
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09



PLAN VIEW

Groundwater Quality Data:

Well	SC (umhos)
MW1	2063
MW2	1928
MW3	2342

Legend:

- ◆ Monitoring Well Location
- ■ Surface Water Sample Location
- ● Boring Location
- (561.55) Groundwater Elevation
- → Inferred Groundwater Flow
- – → Inferred Direction of Unsaturated Flow
- – – – Approx. Extent of Shallow Bedrock (no water)
- ——— Groundwater Contour
- ⊕ TBM Temporary Benchmark NW Corner of Slab = 573.08 (ft. MSL)

N

0 400 800

SCALE IN FEET

DATE: 12/15/00

NORTH JACKSON COMPANY
111 Third Ave. South - Suite 110
Minneapolis, MN 55401

Figure 2

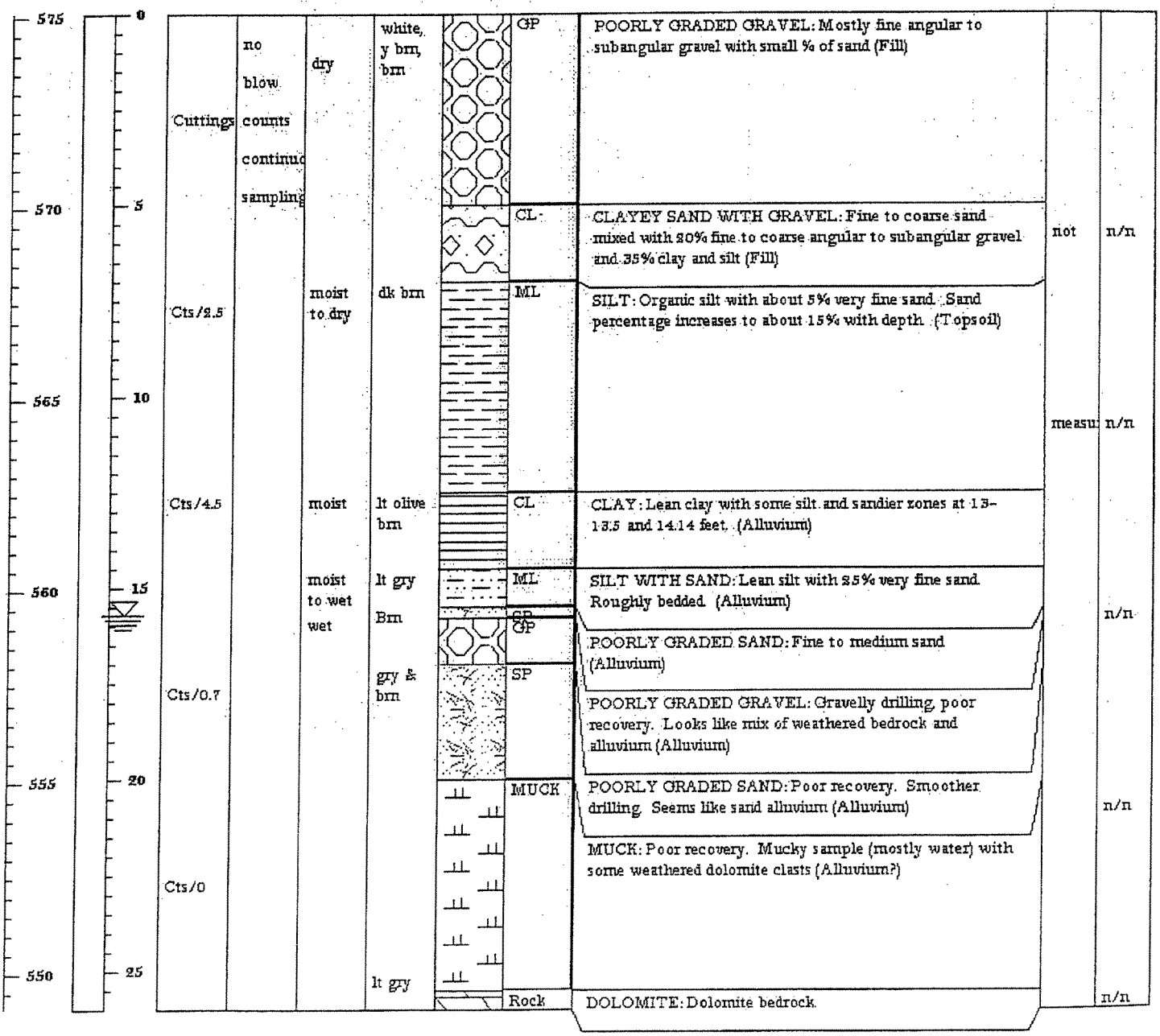
INVESTIGATION SAMPLE LOCATIONS

RIVERSIDE GENERATING STATION - Bettendorf, Iowa

MIDAMERICAN ENERGY CO.
Davenport, Iowa

North Jackson Company Boring Log

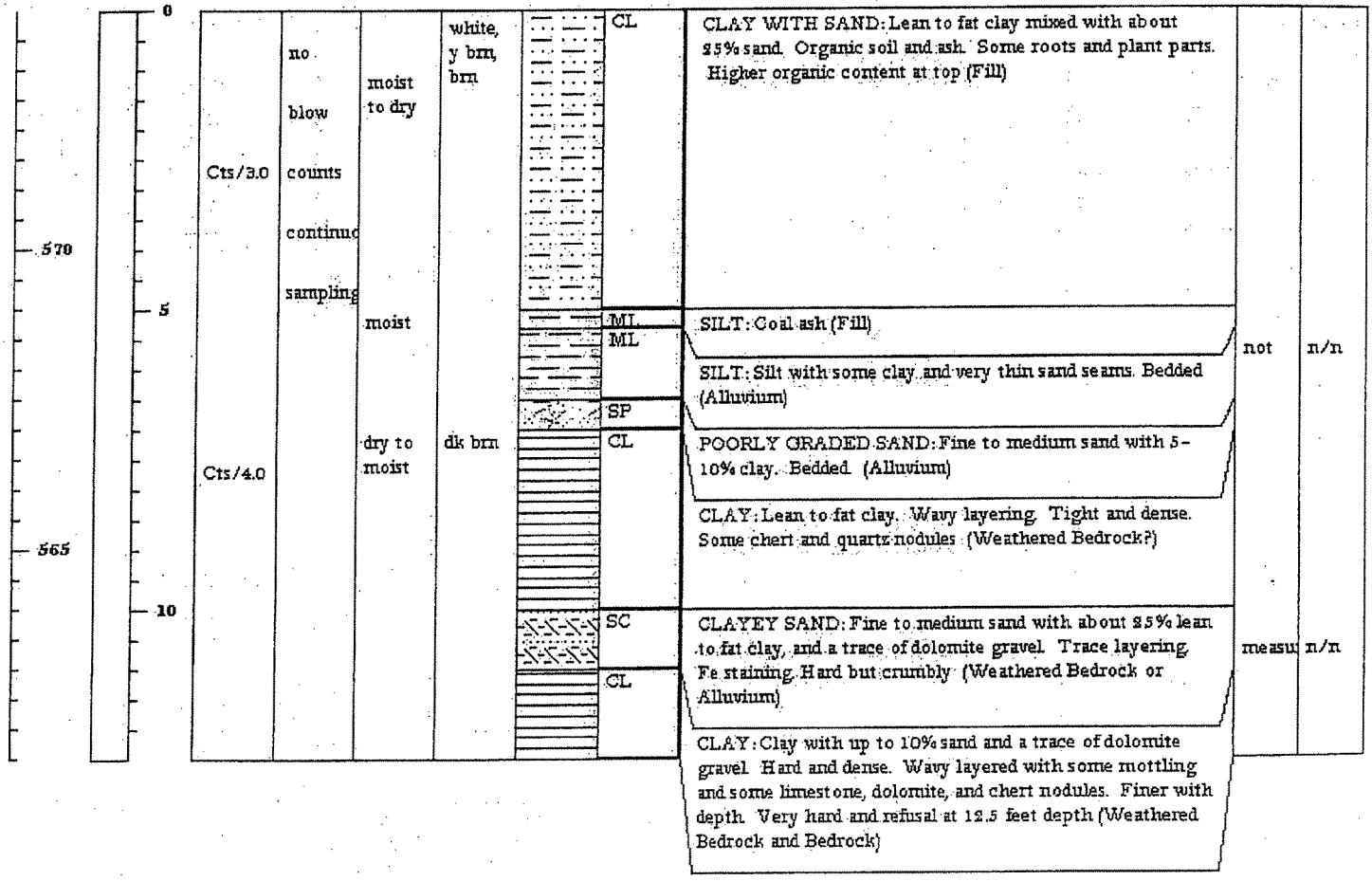
Boring No:	TP2	**Depth of Boring (ft)**	26	**Start Date:**	10-31-00
Client:	MidAmerican Energy Co	**Rig Type:**	B62 Mobil Drill	**Finish Date:**	10-31-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	MW-2
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	577.9
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	82.52
Company	Aquadrill	**Surface Elevation:**	575.1		



Elev (MSL)	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
575	0	Cuttings	no blow counts continuc sampling	dry	white, y brn, brn	GP	POORLY GRADED GRAVEL: Mostly fine angular to subangular gravel with small % of sand (Fill)		
570	5					CL	CLAYEY SAND WITH GRAVEL: Fine to coarse sand mixed with 20% fine to coarse angular to subangular gravel and 35% clay and silt (Fill)	not	n/n
		Cts/2.5		moist to dry	dk brn	ML	SILT: Organic silt with about 5% very fine sand. Sand percentage increases to about 15% with depth. (Topsoil)		
565	10							measu	n/n
		Cts/4.5		moist	lt olive brn	CL	CLAY: Lean clay with some silt and sandier zones at 13-13.5 and 14.14 feet. (Alluvium)		
560	15			moist to wet wet	lt gry Brn	ML GP	SILT WITH SAND: Lean silt with 35% very fine sand. Roughly bedded. (Alluvium)		n/n
							POORLY GRADED SAND: Fine to medium sand (Alluvium)		
		Cts/0.7			gry & brn	SP	POORLY GRADED GRAVEL: Gravelly drilling, poor recovery. Looks like mix of weathered bedrock and alluvium (Alluvium)		
555	20					MUCK	POORLY GRADED SAND: Poor recovery. Smoother drilling. Seems like sand alluvium (Alluvium)		n/n
		Cts/0					MUCK: Poor recovery. Mucky sample (mostly water) with some weathered dolomite clasts (Alluvium?)		
550	25				lt gry	Rock	DOLOMITE: Dolomite bedrock.		n/n

North Jackson Company Boring Log

Boring No:	TP5	**Depth of Boring (ft)**	12.5	**Start Date:**	10-30-00
Client:	MidAmerican Energy Co	**Rig Type:**	B62 Mobil Drill	**Finish Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	none
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	573.98		



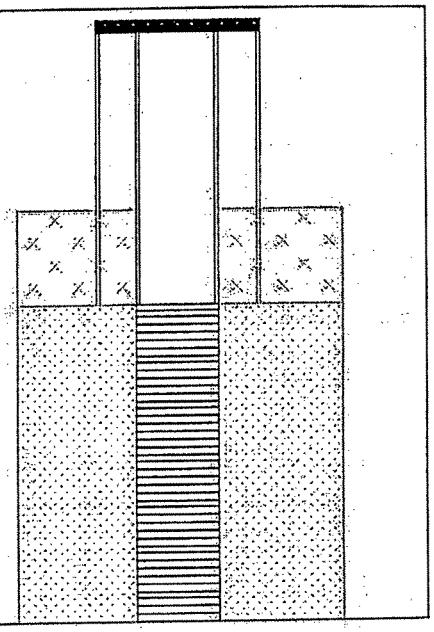
North Jackson Company Boring Log

Boring No:	B3/TP3	**Depth of Boring (ft)**	12.45	**Start Date:**	10-30-00
Client:	Mid American Energy Co	**Rig Type:**	B52 Mobil Drill	**Finish Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	MW3
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	571.46
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	7
Company	Aquadrill	**Surface Elevation:**	568.78		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
		0				white, y brn, brn		ML	CLAY: Clay with some silt. Coal Ash (Fill)		
				no blow counts continuc sampling	moist moist/w moist/dr				CLAY: Lean to fat clay with roots (Organic Soil)		
			3.5					SC			
565								GP			
		5			Wet seams			CL	CLAY WITH SAND: Lean to fat clay with some silt and about 15% sand. Wavy bedding. Stiff, dense and some sand seams. Some mottling. Some wet sand seams. (Mixed Alluvium and/or Weathered Bedrock)	not measu	n/n
			4		Wet	dk brn		SP			
560								BR			
		10							POORLY GRADED SAND WITH GRAVEL: Fine to medium sand with about 25% coarse to fine gravel. (Alluvium) Refusal on bedrock at 10.5 feet depth.		

North Jackson Company Well Log

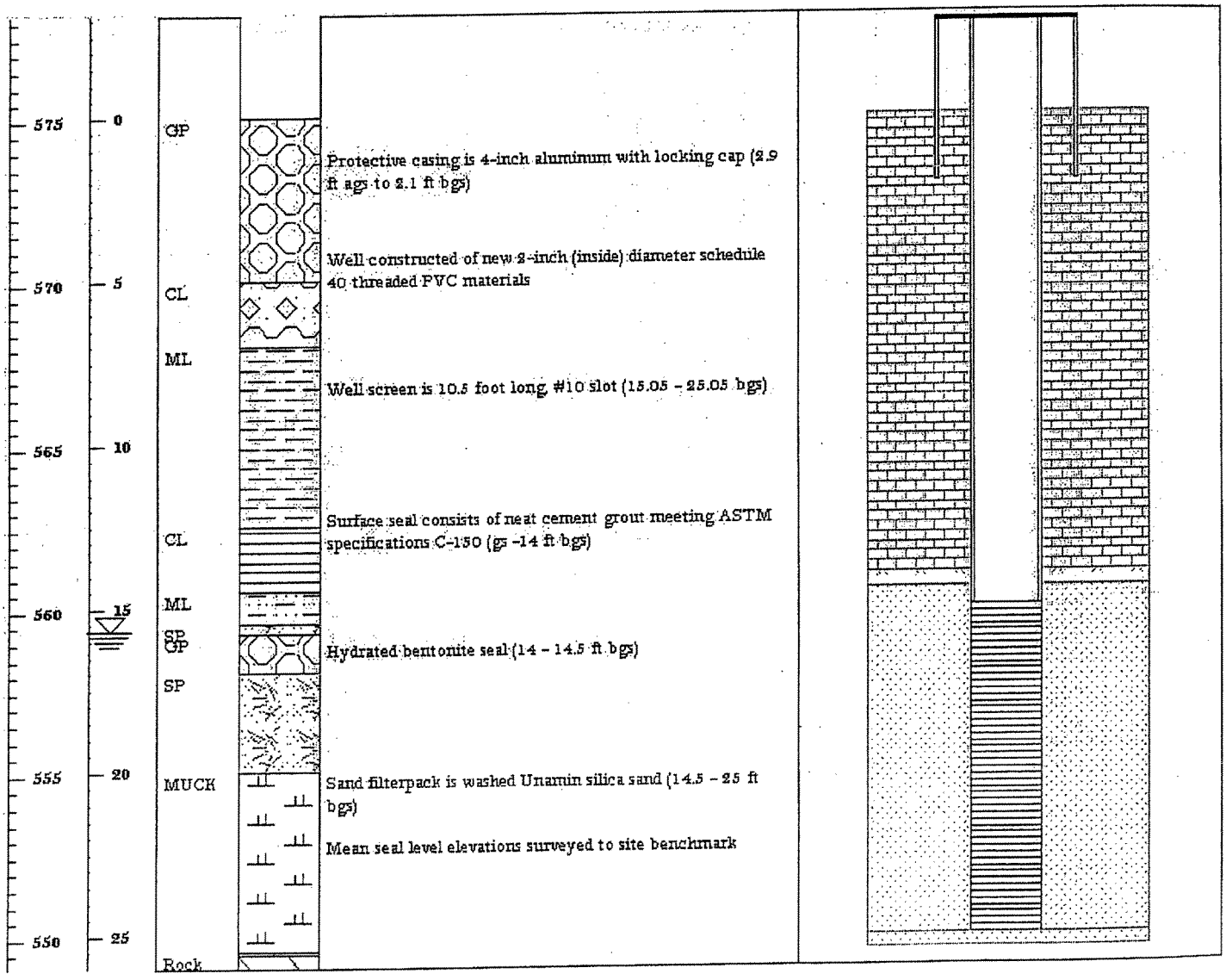
Well No:	MW-1	**Total Depth Well (ft)**	9.45	**Riser Elevation**	561.84
Client:	MidAmerican Energy Co.	**Rig Type:**	B52-Mobil Drill	**Start Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Finish Date:**	11-1-00
Geologist	Todd Warner	**Northing:**	nm	**Ref. Boring No:**	B1C
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	1.8
Company	Aquadrill	**Ground Elevation:**	568.29	**Water Elevation**	566.49

Elev (MSL)	Depth (ft)	ASTM Class	Profile	Well Construction Comments	Well Construction
570	0	ML		Protective casing is 4-inch diameter square aluminum with locking cap (3 ft ags to 1.5 ft bgs).	
				Well constructed with new, 2-inch (inside diameter) schedule 40 threaded PVC materials	
565		ML		Well screen is 5-foot long #10 slot (1.5 ft bgs to 6.5 ft bgs)	
	5			Surface seal consists of granulated bentonite (gs to 1.5 ft bgs)	
		WB		Sand filter pack consists of washed Unamin silica sand (1.5 ft	

North Jackson Company Well Log

Well No:	MW-2	**Total Depth Well (ft)**	27.85	**Riser Elevation**	577.9
Client:	Mid American Energy Co	**Rig Type:**	B52 Mobil Drill	**Start Date:**	10-31-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Finish Date:**	10-31-00
Geologist	Todd Warner	**Northing:**	nr	**Ref. Boring No:**	TP2
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	15.7
Company	Aquadrill	**Ground Elevation:**	575.1	**Water Elevation**	562.2

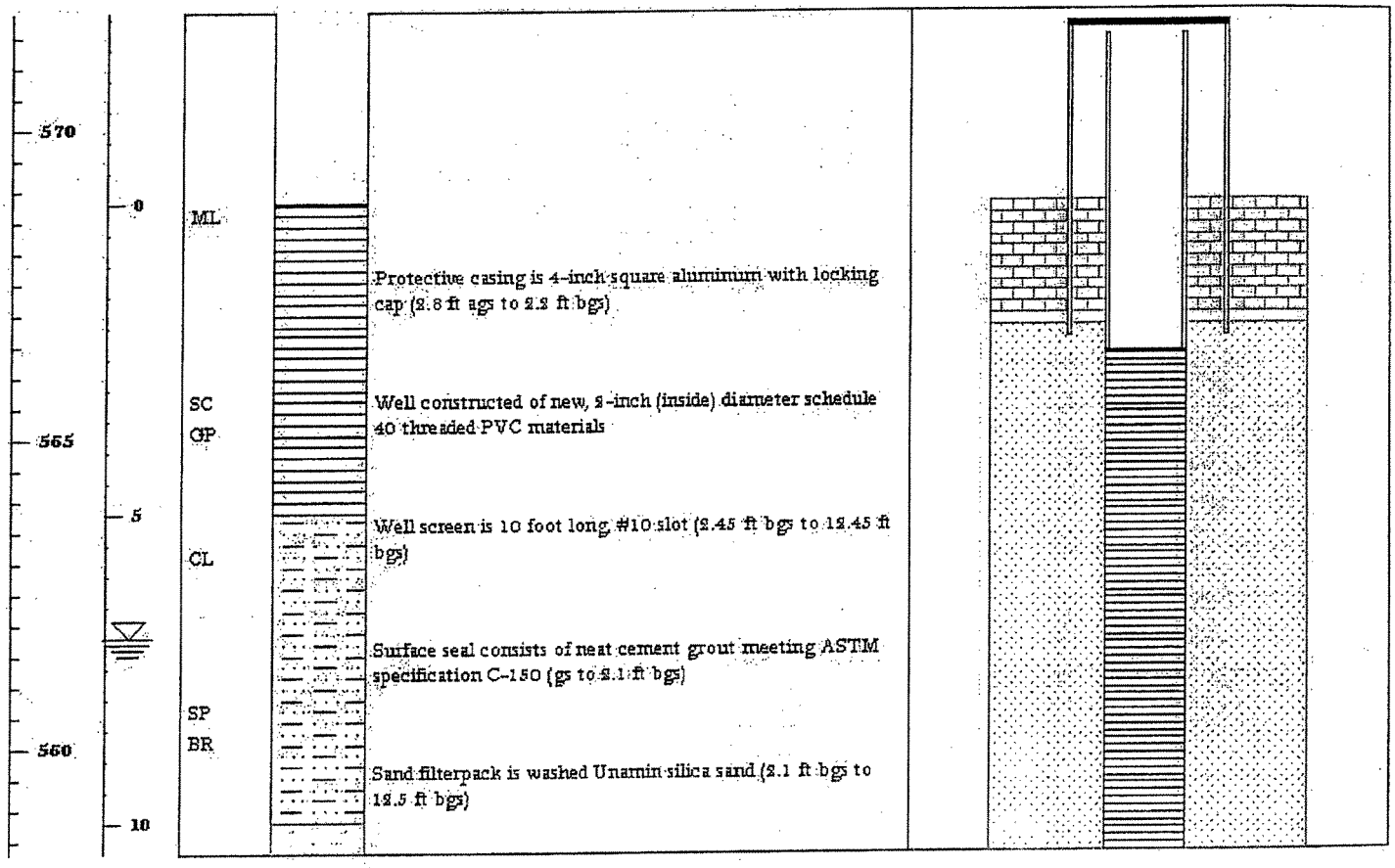
Elev (MSL)	Depth (ft)	ASTM Class	Profile	Well Construction Comments	Well Construction



North Jackson Company Well Log

Well No:	MW3	**Total Depth Well (ft)**	15.15	**Riser Elevation**	571.48
Client:	MidAmerican Energy Co	**Rig Type:**	B52 Mobil Drill	**Start Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Finish Date:**	10-30-00
Geologist	Todd Warner	**Northing:**	nr	**Ref. Boring No:**	B3
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	9.76
Company	Aquadrill	**Ground Elevation:**	568.78	**Water Elevation**	559.02

Elev (MSL)	Depth (ft)	ASTM Class	Profile	Well Construction Comments	Well Construction



North Jackson Company Boring Log

Boring No:	B1A	**Depth of Boring (ft)**	3	**Start Date:**	11-1-00
Client:	Mid American Energy Co.	**Rig Type:**	B62-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	570.66		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
570		0	Cut	no blows	moist dry	Y brn Gry, lt gry		CL	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil)	nm	n/n
								BR	DOLOMITE: Dolomite bedrock. Refusal at about 3 or 4 feet below ground. Very hard		

North Jackson Company Boring Log

Boring No:	B1B	**Depth of Boring (ft)**	5	**Start Date:**	11-1-00
Client:	Mid American Energy Co.	**Rig Type:**	B52-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	570.66		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
570		0	Cut	no blows	moist dry	Y brn Gry, lt gry		CL	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil)	nm	n/n
		5						BR	DOLOMITE: Dolomite bedrock. Drill approximately 3.5 ft into bedrock. Very hard		

North Jackson Company Boring Log

Boring No:	B1C	**Depth of Boring (ft)**	6.45	**Start Date:**	11-1-00
Client:	Mid American Energy Co.	**Rig Type:**	B52-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	MW-1
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	561.84
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	89.61
Company	Aquadrill	**Surface Elevation:**	568.29		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
565		0 5	Cut Cts/4.5	no blows	moist/w wet	Dk brn		ML	SILT: Lean organic silt with a trace of sand (Wetland deposit)	nm	n/n
								ML	GRAVELLY SILT WITH SAND: Mixed sand, gravel, and organic soil (Wetland deposit)		
								WB	DOLOMITE: Weathered dolomite bedrock. End boring at 6.5 feet on very hard rock.		n/n

North Jackson Company Boring Log

Boring No:	B4A	**Depth of Boring (ft)**	4.5	**Start Date:**	11-1-00
Client:	Mid American Energy Co.	**Rig Type:**	B52-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	571.13		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
570		0	Cut	no blows	moist dry	Y brn Gry, lt gry		CL Rock	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil) DOLOMITE: Dolomite bedrock. Refusal at 4.5 feet. Very hard rock. No water.	nm	n/n

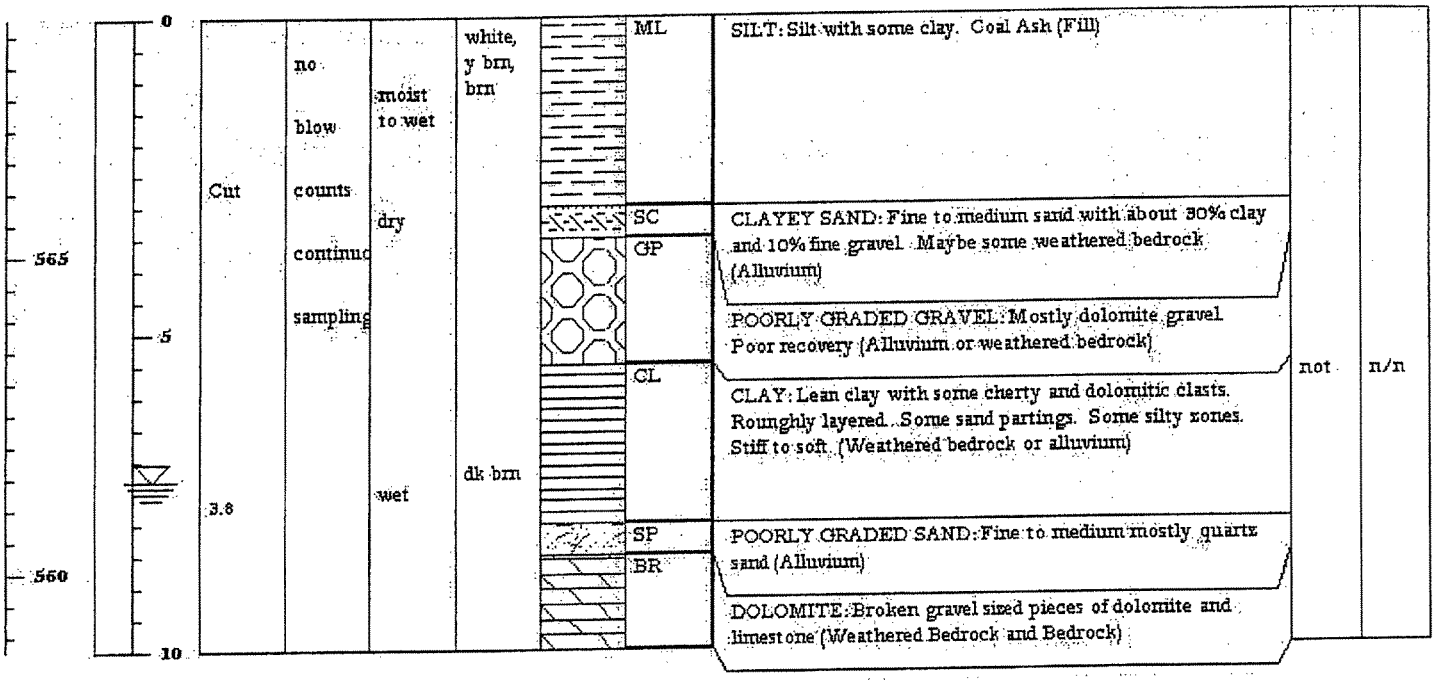
North Jackson Company Boring Log

Boring No:	B4B	**Depth of Boring (ft)**	4	**Start Date:**	10-30-00
Client:	Mid American Energy Co.	**Rig Type:**	B52-Mobil Drill	**Finish Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	573.88		

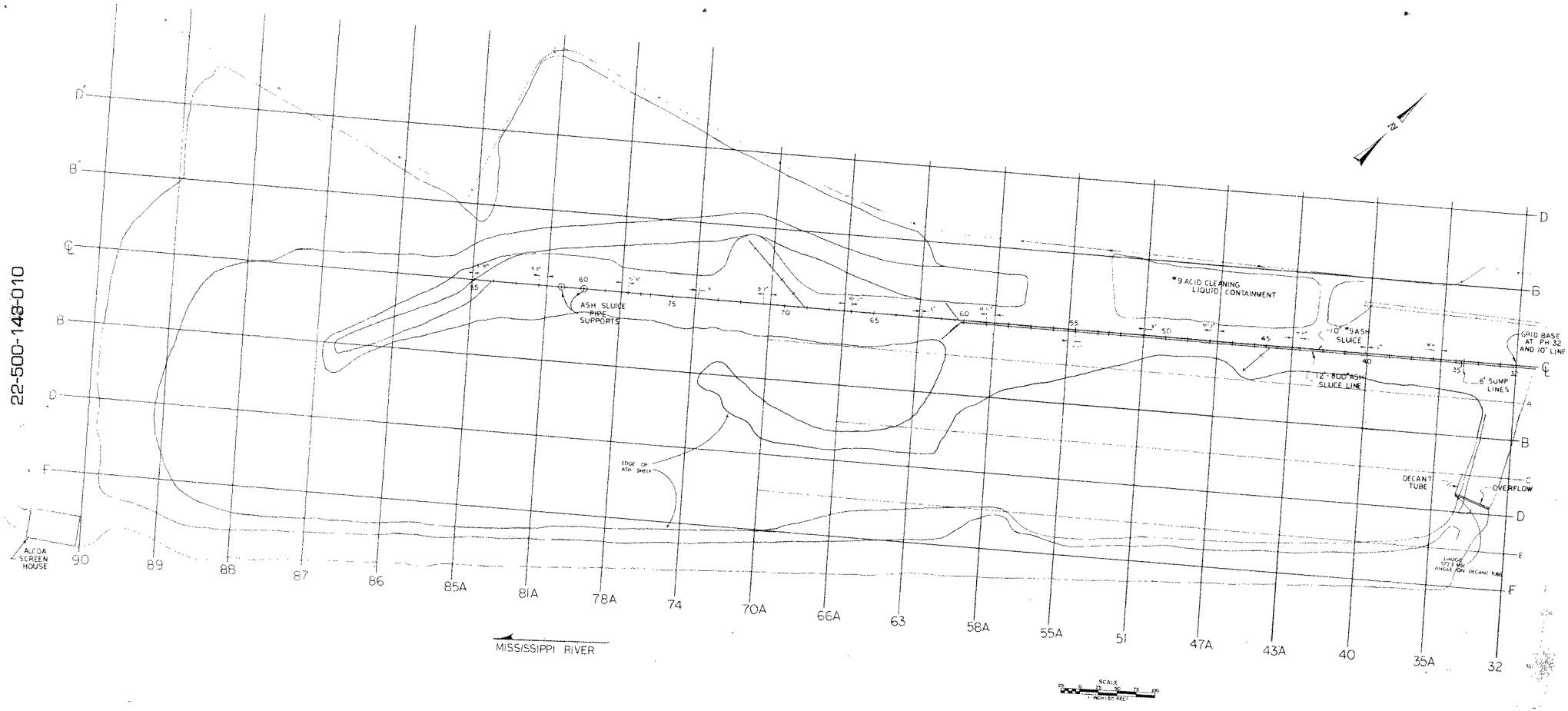
Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
		0									
				no	moist	Y brn		CL	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil)	nm	n/n
570			Cut	blows	dry	Gry, lt gry		Rock	DOLOMITE: Dolomite bedrock. Refusal at 4 feet. Very hard rock. No water.		

North Jackson Company Boring Log

Boring No:	B6	**Depth of Boring (ft)**	10	**Start Date:**	11-1-00
Client:	MidAmerican Energy Co	**Rig Type:**	B62 Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	none
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	568.76		



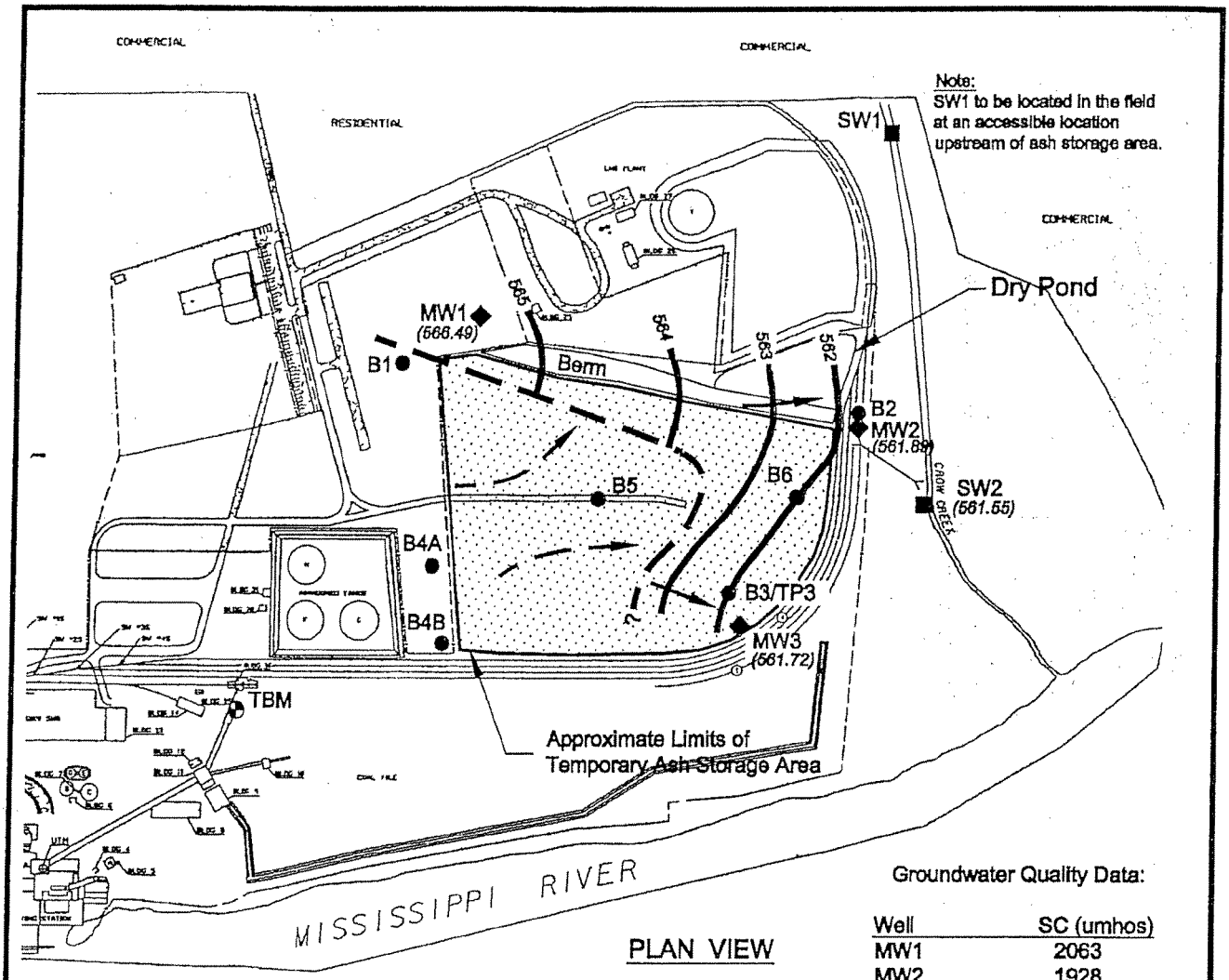
22-500-148-010



NOTES:
GRID LINES ON 100' CENTERS

REV LTR	DATE	REVISION	BY	CK'D
B	11-26-69	Rim Hold Hor		
A	3-26-70	GENERAL	BEG	TWS

RIVERSIDE ACTIVE ASH POND
LAYOUT AND GRID SYSTEM
IOWA-ILLINOIS GAS & ELECTRIC CO.
DRAWN BEG CK'D
DATE 5-18-33 DATE
SCALE 1"=50'
DWG. NO. 22-500-143-010



DATE: 12/15/00

NORTH JACKSON COMPANY 111 Third Ave. South - Suite 110 Minneapolis, MN 55401	Figure 2 INVESTIGATION SAMPLE LOCATIONS RIVERSIDE GENERATING STATION - Bettendorf, Iowa	MIDAMERICAN ENERGY CO. Davenport, Iowa

North Jackson Company Boring Log

Boring No:	TP2	**Depth of Boring (ft)**	26	**Start Date:**	10-31-00
Client:	MidAmerican Energy Co	**Rig Type:**	B52 Mobil Drill	**Finish Date:**	10-31-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	MW-2
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	577.9
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	82.52
Company	Aquadrill	**Surface Elevation:**	575.1		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
575		0				white, y brn, brn		GP	POORLY GRADED GRAVEL: Mostly fine angular to subangular gravel with small % of sand (Fill)		
570		5	Cuttings	no blow counts continuc sampling	dry			CL	CLAYEY SAND WITH GRAVEL: Fine to coarse sand mixed with 20% fine to coarse angular to subangular gravel and 35% clay and silt (Fill)	not	n/n
			Cts/2.5		moist to dry	dk brn		ML	SILT: Organic silt with about 5% very fine sand. Sand percentage increases to about 15% with depth. (Topsoil)		
565		10								measu	n/n
			Cts/4.5		moist	lt olive brn		CL	CLAY: Lean clay with some silt and sandier zones at 13-13.5 and 14.14 feet. (Alluvium)		
560		15			moist to wet	lt gry		ML	SILT WITH SAND: Lean silt with 35% very fine sand. Roughly bedded. (Alluvium)		n/n
					wet	Brn		SP	POORLY GRADED SAND: Fine to medium sand (Alluvium)		
			Cts/0.7			gry & brn		SP	POORLY GRADED GRAVEL: Gravelly drilling, poor recovery. Looks like mix of weathered bedrock and alluvium (Alluvium)		
555		20						MUCK	POORLY GRADED SAND: Poor recovery. Smoother drilling. Seems like sand alluvium (Alluvium)		n/n
			Cts/0						MUCK: Poor recovery. Mucky sample (mostly water) with some weathered dolomite clasts (Alluvium?)		
550		25				lt gry		Rock	DOLOMITE: Dolomite bedrock.		n/n

North Jackson Company Boring Log

Boring No:	TP5	**Depth of Boring (ft)**	12.5	**Start Date:**	10-30-00
Client:	MidAmerican Energy Co	**Rig Type:**	B62 Mobil Drill	**Finish Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	none
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	573.98		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
570		0	Cts/3.0	no blow counts continuc sampling	moist to dry	white, y brn, brn		CL	CLAY WITH SAND: Lean to fat clay mixed with about 85% sand. Organic soil and ash. Some roots and plant parts. Higher organic content at top (Fill)		
		5			moist			ML	SILT: Coal ash (Fill)	not	n/n
								ML	SILT: Silt with some clay and very thin sand seams. Bedded (Alluvium)		
								SP	POORLY GRADED SAND: Fine to medium sand with 5-10% clay. Bedded. (Alluvium)		
			Cts/4.0		dry to moist	dk brn		CL	CLAY: Lean to fat clay. Wavy layering. Tight and dense. Some chert and quartz nodules (Weathered Bedrock?)		
565		10						SC	CLAYEY SAND: Fine to medium sand with about 85% lean to fat clay, and a trace of dolomite gravel. Trace layering. Fe staining. Hard but crumbly (Weathered Bedrock or Alluvium)	measu	n/n
								CL	CLAY: Clay with up to 10% sand and a trace of dolomite gravel. Hard and dense. Wavy layered with some mottling and some limestone, dolomite, and chert nodules. Finer with depth. Very hard and refusal at 12.5 feet depth (Weathered Bedrock and Bedrock)		

North Jackson Company Boring Log

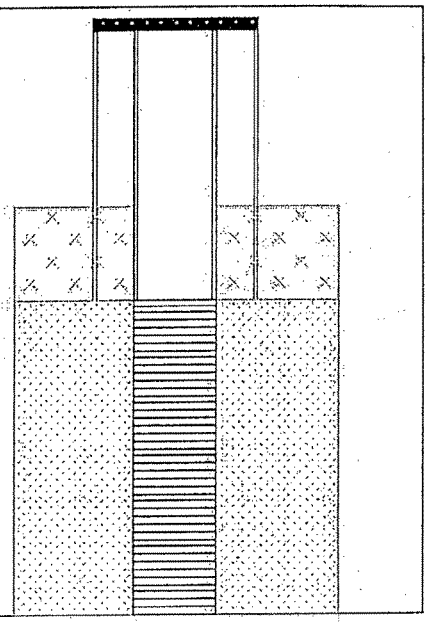
Boring No:	B3/TP3	**Depth of Boring (ft)**	12.45	**Start Date:**	10-30-00
Client:	Mid American Energy Co	**Rig Type:**	B52 Mobil Drill	**Finish Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	MW3
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	571.48
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	7
Company	Aquadrill	**Surface Elevation:**	568.78		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
		0		no blow counts continuc sampling	moist moist/w moist/dr	white, y brn, brn		ML	CLAY: Clay with some silt. Coal Ash (Fill)		
			3.5						CLAY: Lean to fat clay with roots (Organic Soil)		
565								SC			
								GP			
		5			Wet seams				CLAY WITH SAND: Lean to fat clay with some silt and about 15% sand. Wavy bedding. Stiff, dense and some sand seams. Some mottling. Some wet sand seams. (Mixed Alluvium and/or Weathered Bedrock)	not measu	n/n
								CL			
			4		Wet	dk brn					
560								SP			
								BR			
		10							POORLY GRADED SAND WITH GRAVEL: Fine to medium sand with about 25% coarse to fine gravel (Alluvium) Refusal on bedrock at 10.5 feet depth.		

North Jackson Company Well Log

Well No:	MW-1	**Total Depth Well (ft)**	9.45	**Riser Elevation**	561.84
Client:	MidAmerican Energy Co.	**Rig Type:**	B52-Mobil Drill	**Start Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Finish Date:**	11-1-00
Geologist	Todd Warner	**Northing:**	nm	**Ref. Boring No:**	B1C
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	1.8
Company	Aquadrill	**Ground Elevation:**	568.29	**Water Elevation**	566.49

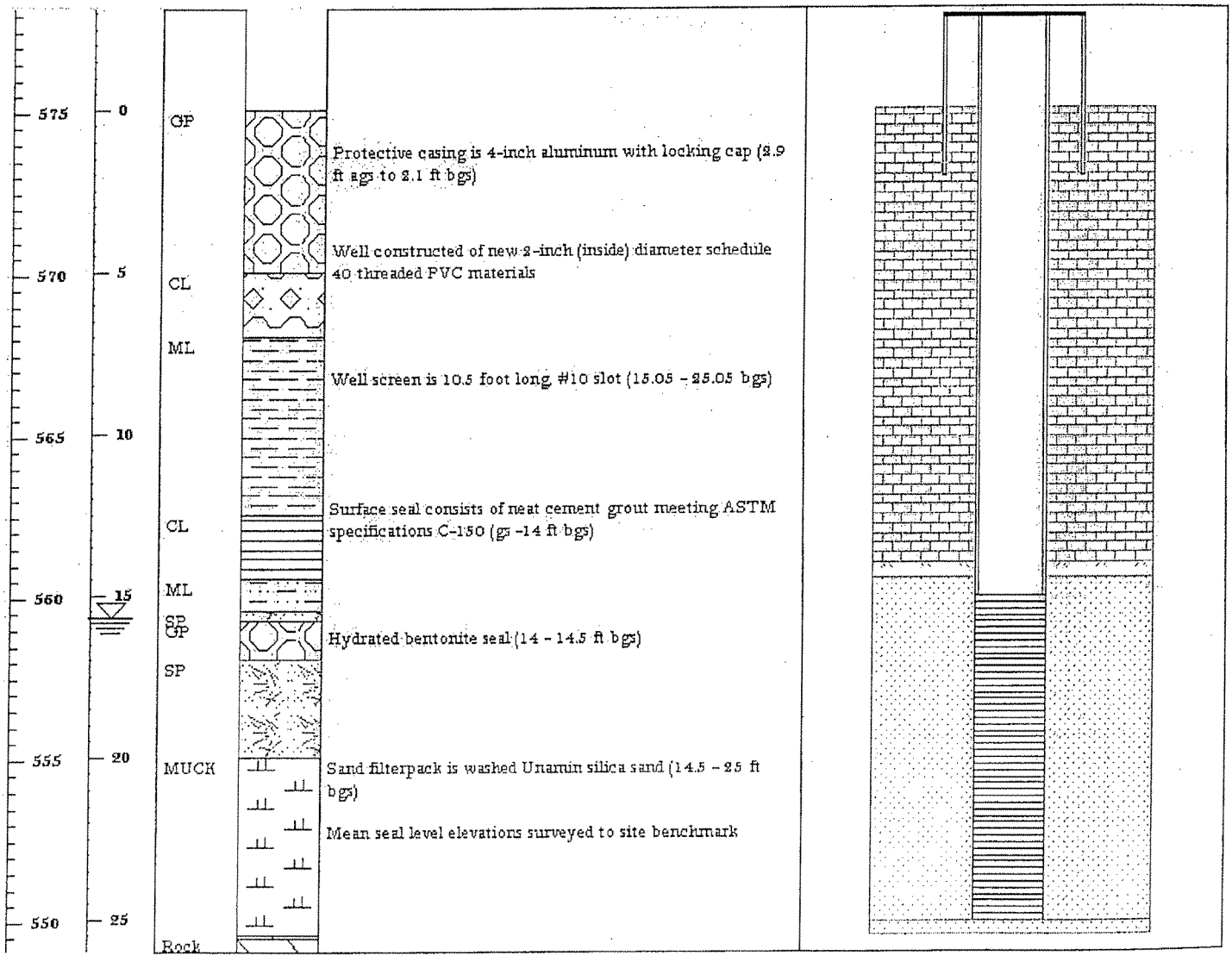
Elev (MSL)	Depth (ft)	ASTM Class	Profile	Well Construction Comments	Well Construction
570	0	ML		Protective casing is 4-inch diameter square aluminum with locking cap (3 ft ags to 1.5 ft bgs). Well constructed with new, 2-inch (inside diameter) schedule 40 threaded PVC materials	
565	5	ML		Well screen is 5-foot long #10 slot (1.5 ft bgs to 6.5 ft bgs)	
				Surface seal consists of granulated bentonite (gs to 1.5 ft bgs)	
		WB		Sand filter pack consists of washed Unamin silica sand (1.5 ft	



North Jackson Company Well Log

Well No:	MW-2	**Total Depth Well (ft)**	27.85	**Riser Elevation**	577.9
Client:	MidAmerican Energy Co	**Rig Type:**	B52 Mobil Drill	**Start Date:**	10-31-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Finish Date:**	10-31-00
Geologist	Todd Warner	**Northing:**	nr	**Ref. Boring No:**	TP2
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	15.7
Company	Aquadrill	**Ground Elevation:**	575.1	**Water Elevation**	562.2

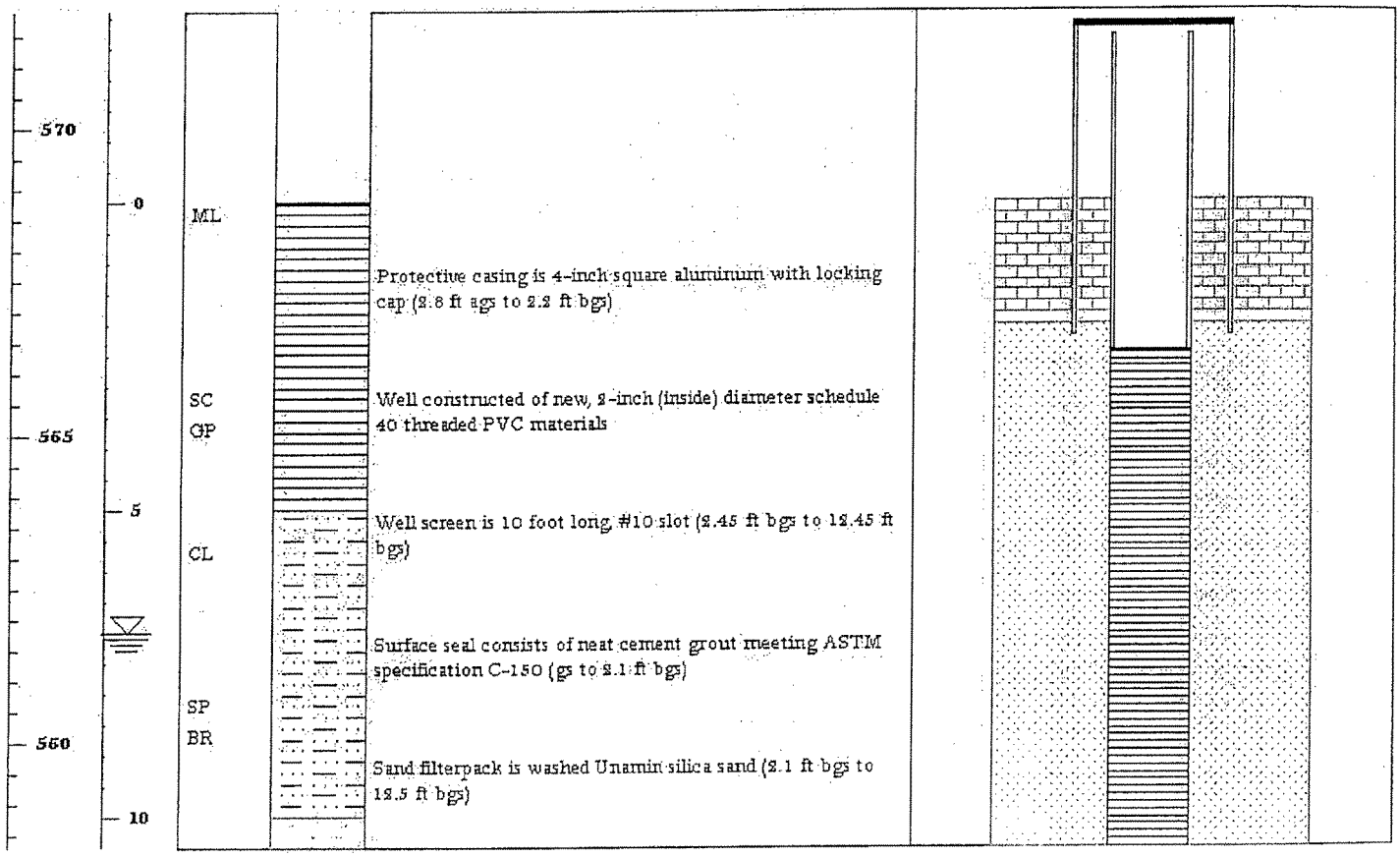
Elev (MSL)	Depth (ft)	ASTM Class	Profile	Well Construction Comments	Well Construction



North Jackson Company Well Log

Well No:	MW3	**Total Depth Well (ft)**	15.15	**Riser Elevation**	571.48
Client:	Mid American Energy Co	**Rig Type:**	B52 Mobil Drill	**Start Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Finish Date:**	10-30-00
Geologist	Todd Warner	**Northing:**	nr	**Ref. Boring No:**	B3
Driller:	Dennis	**Easting:**	nr	**Water Depth (ft)**	9.76
Company	Aquadrill	**Ground Elevation:**	568.78	**Water Elevation**	559.02

Elev (MSL)	Depth (ft)	ASTM Class	Profile	Well Construction Comments	Well Construction
570	0	ML		Protective casing is 4-inch square aluminum with locking cap (2.8 ft ags to 2.2 ft bgs)	
		SC		Well constructed of new, 2-inch (inside) diameter schedule 40 threaded PVC materials	
565	5	CL		Well screen is 10 foot long, #10 slot (2.45 ft bgs to 12.45 ft bgs)	
				Surface seal consists of neat cement grout meeting ASTM specification C-150 (gs to 2.1 ft bgs)	
		SP			
560	10	BR		Sand filterpack is washed Unamin silica sand (2.1 ft bgs to 12.5 ft bgs)	



North Jackson Company Boring Log

Boring No:	B1A	**Depth of Boring (ft)**	3	**Start Date:**	11-1-00
Client:	Mid American Energy Co.	**Rig Type:**	B62-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	570.66		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
570		0	Cut	no blows	moist dry	Y brn		CL	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil)	nm	n/n
						Gry, lt gry		BR	DOLOMITE: Dolomite bedrock. Refusal at about 3 or 4 feet below ground. Very hard		

North Jackson Company Boring Log

Boring No:	B1B	**Depth of Boring (ft)**	5	**Start Date:**	11-1-00
Client:	MidAmerican Energy Co.	**Rig Type:**	B52-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	570.66		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor / Sheen
570		0	Cut	no blows	moist	Y brn		CL	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil)	nm	n/n
		5			dry	Gry, lt gry		BR	DOLOMITE: Dolomite bedrock. Drill approximately 3.5 ft into bedrock. Very hard		

North Jackson Company Boring Log

Boring No:	B1C	**Depth of Boring (ft)**	6.45	**Start Date:**	11-1-00
Client:	Mid American Energy Co.	**Rig Type:**	B52-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	MW-1
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	561.84
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	89.61
Company	Aquadrill	**Surface Elevation:**	568.29		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
565		0	Cut Cts/4.5	no blows	moist/w wet	Dk brn		ML	SILT: Lean organic silt with a trace of sand (Wetland deposit)	nm	n/n
		5						ML	GRAVELLY SILT WITH SAND: Mixed sand, gravel, and organic soil (Wetland deposit)		
								WB	DOLOMITE: Weathered dolomite bedrock. End boring at 6.5 feet on very hard rock.		n/n

North Jackson Company Boring Log

Boring No:	B4A	**Depth of Boring (ft)**	4.5	**Start Date:**	11-1-00
Client:	MidAmerican Energy Co.	**Rig Type:**	B52-Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	571.13		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
570		0	Cut	no blows	moist dry	Y brn Gry, lt gry		CL	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil)	nm	n/n
								Rock	DOLOMITE: Dolomite bedrock. Refusal at 4.5 feet. Very hard rock. No water.		

North Jackson Company Boring Log

Boring No:	B4B	**Depth of Boring (ft)**	4	**Start Date:**	10-30-00
Client:	Mid American Energy Co.	**Rig Type:**	B62-Mobil Drill	**Finish Date:**	10-30-00
Project:	Riverside	**Drilling Method**	4 1/4" ID HSA	**Well No:**	na
Geologist	Todd Warner	**Northing:**	nm	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nm	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	573.88		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
		0	Cut	no blows	moist dry	Y brn Gry, lt gry		CL	CLAY: Lean to fat clay, some organics and 5-35% sand (Topsoil)	nm	n/n
570								Rock	DOLOMITE: Dolomite bedrock. Refusal at 4 feet. Very hard rock. No water.		

North Jackson Company Boring Log

Boring No:	B6	**Depth of Boring (ft)**	10	**Start Date:**	11-1-00
Client:	Mid American Energy Co	**Rig Type:**	B52 Mobil Drill	**Finish Date:**	11-1-00
Project:	Riverside	**Drilling Method**	4 1/4" HSA	**Well No:**	none
Geologist	Todd Warner	**Northing:**	nr	**Riser Elevation**	na
Driller:	Dennis	**Easting**	nr	**Water Depth (ft)**	none
Company	Aquadrill	**Surface Elevation:**	568.76		

Elev (MSL)	Lab Sample	Depth (ft)	Sample Type/ Rec (ft)	Blows Per 0.5'	Moisture	Color	Profile	ASTM Soil Class	Description	PID (ppm)	Odor/Sheen
		0	Cut	no blow counts continuo sampling	moist to wet	white, y brn, brn		ML	SILT: Silt with some clay. Coal Ash (Fill)	not	n/n
					dry			SC	CLAYEY SAND: Fine to medium sand with about 30% clay and 10% fine gravel. Maybe some weathered bedrock (Alluvium)		
565		5						GP	POORLY GRADED GRAVEL: Mostly dolomite gravel. Poor recovery (Alluvium or weathered bedrock)		
								CL	CLAY: Lean clay with some cherty and dolomitic clasts. Roughly layered. Some sand partings. Some silty zones. Stiff to soft. (Weathered bedrock or alluvium)		
		3.8			wet	dk brn		SP	POORLY GRADED SAND: Fine to medium mostly quartz sand (Alluvium)		
560		10						BR	DOLOMITE: Broken gravel sized pieces of dolomite and limestone (Weathered Bedrock and Bedrock)		

DESIGNED BY	ADAM NEWMAN	
DRAWN BY	NORA DAY	
CHECKED BY	ADAM NEWMAN	
APPROVED BY	KEVIN ARMSTRONG	
PROJECT MANAGER	KEVIN ARMSTRONG	

0 300 600
SCALE IN FEET

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

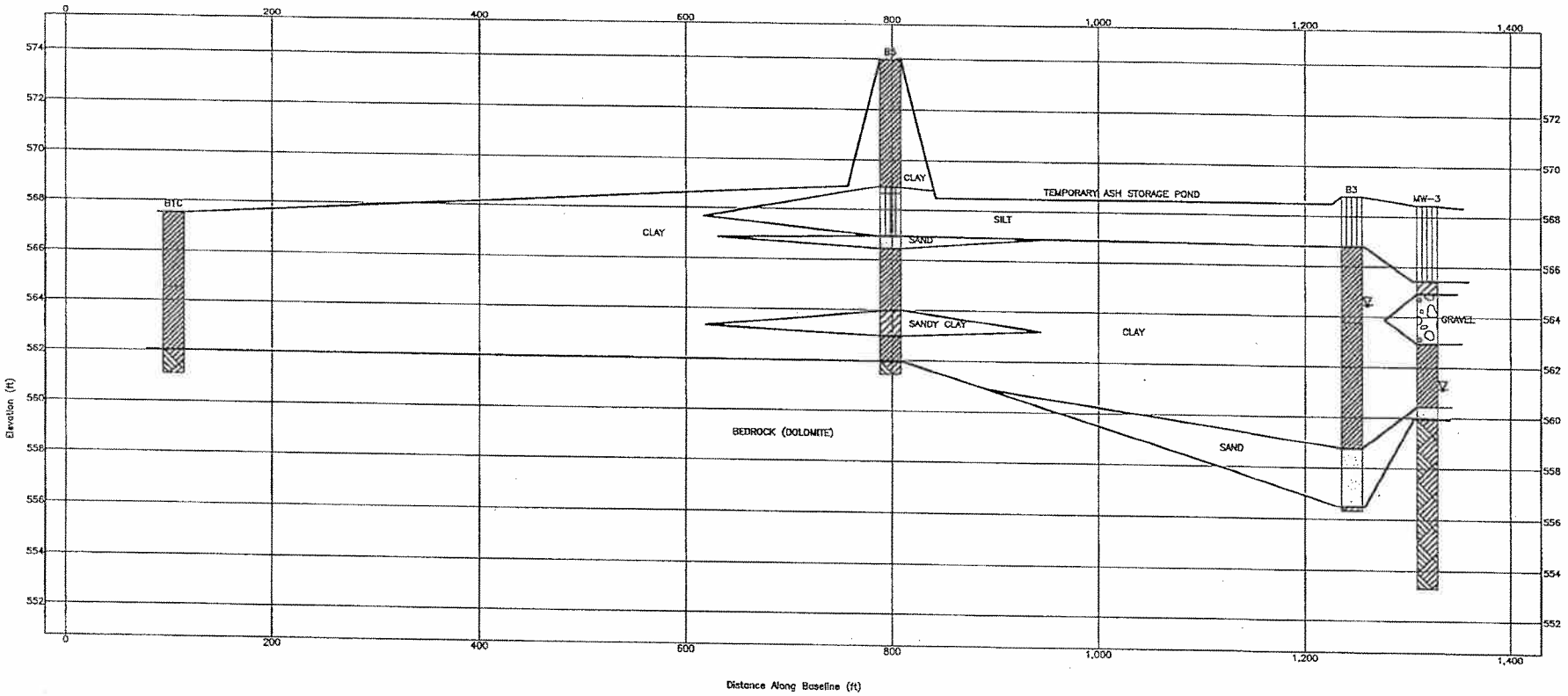
TITLE: **HYDROGEOLOGIC CROSS-SECTION MAP**

MWH

FIGURE 5

REVISION

FILE NAME



LITHOLOGY GRAPHICS

- USCS Low Plasticity Clay
- Bedrock
- USCS Silt
- USCS Poorly-graded Gravel
- USCS Poorly-graded Sand
- USCS Clayey Sand

VERTICAL EX. = 25

0 50 100

SCALE IN FEET

DESIGNED BY	SCOTT HANSEN	
DRAWN BY	NORA DAY	
CHECKED BY	SCOTT HANSEN	
APPROVED BY	KEVIN ARMSTRONG	
PROJECT MANAGER	KEVIN ARMSTRONG	

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

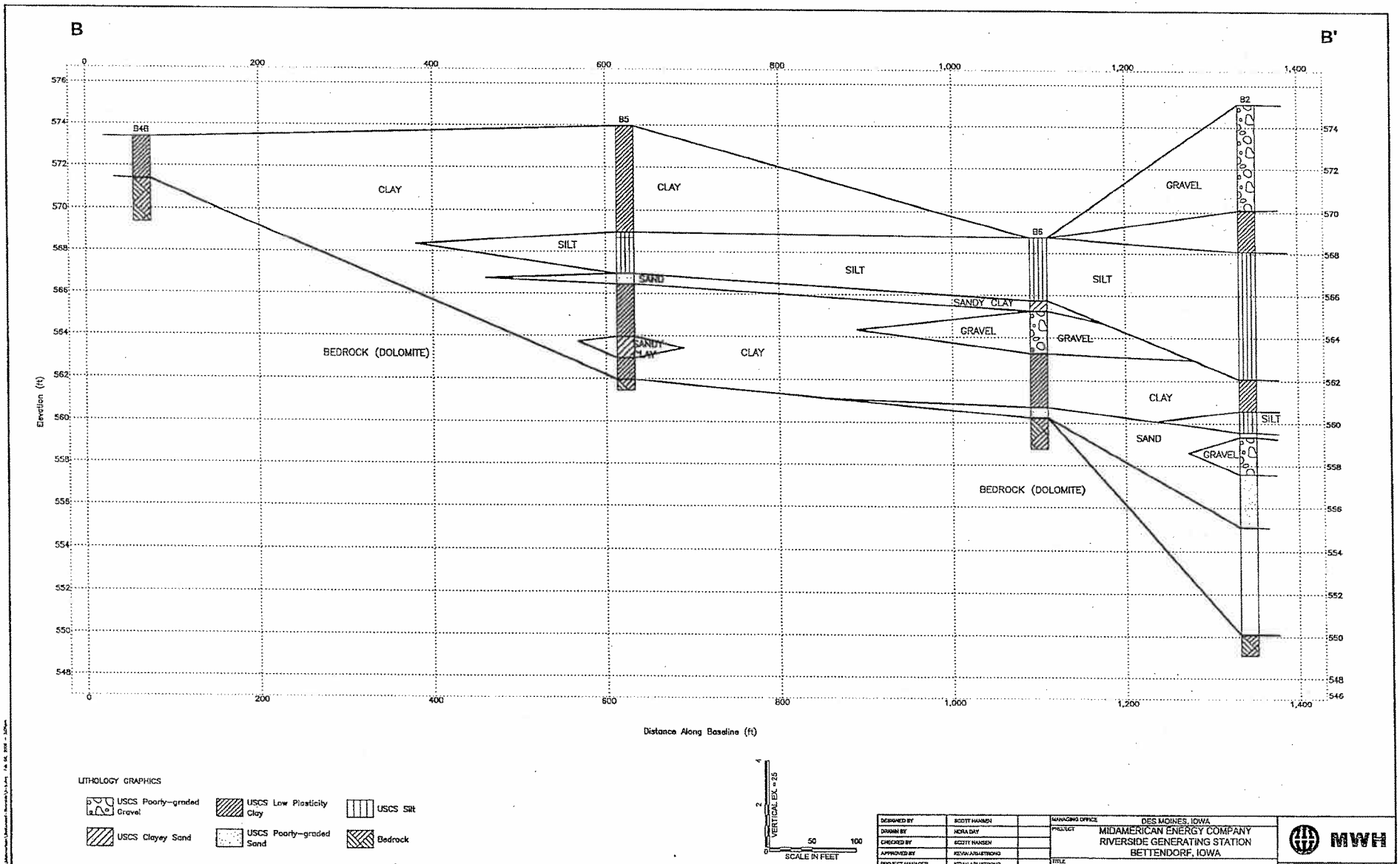
TITLE: HYDROGEOLOGICAL CROSS-SECTION
A-A'

MWH

FIGURE: 6

REVISION:

FILE NAME:



DESIGNED BY	SCOTT HANSEN
DRAWN BY	NORA DAY
CHECKED BY	SCOTT HANSEN
APPROVED BY	KEVIN ARMSTRONG
PROJECT MANAGER	KEVIN ARMSTRONG

MANAGING OFFICE: DES MOINES, IOWA

PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

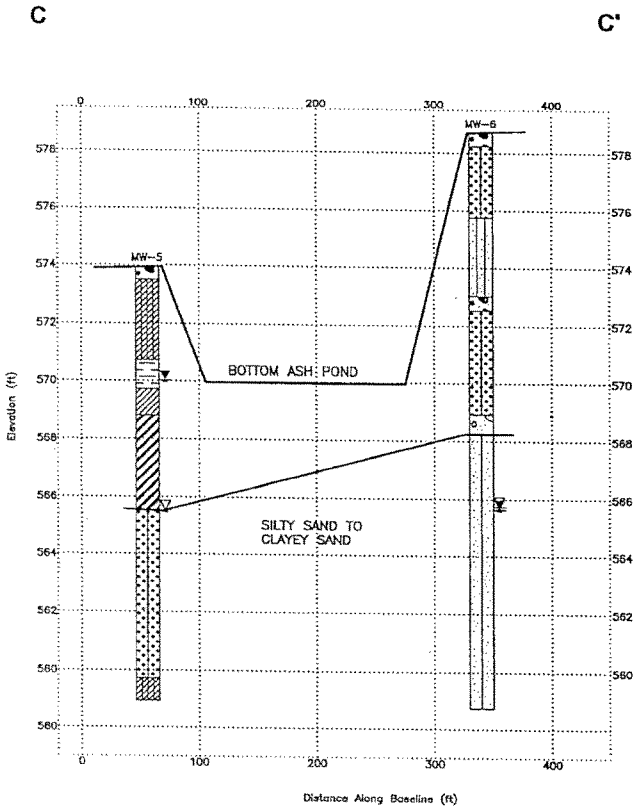
TITLE: HYDROGEOLOGICAL CROSS-SECTION
B-B'

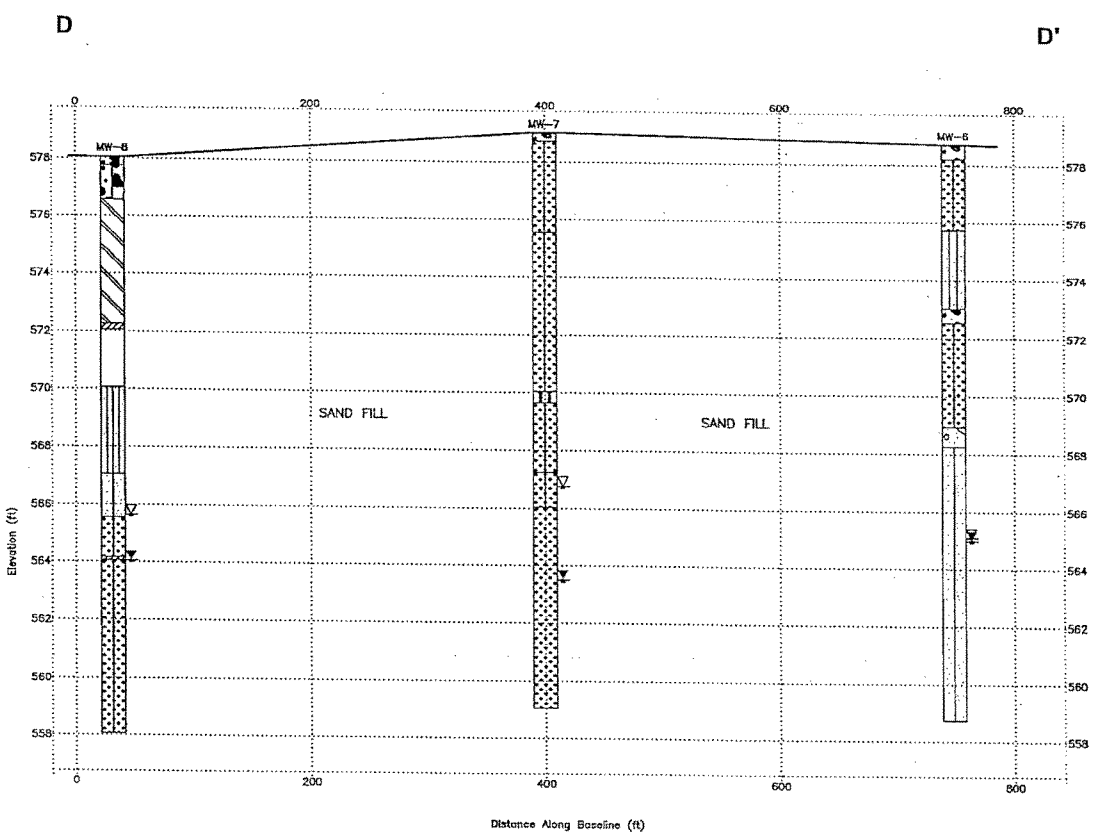
MWH

FIGURE: 7

REVISION

FILE NAME





LITHOLOGY GRAPHICS

- USCS Well-graded Gravel
- USCS Well-graded Sand with Clay
- USCS Silty Sand
- USCS Well-graded Sandy Gravel
- USCS Well-graded Sand with Silt
- USCS Poorly-graded Gravelly Sand
- USCS Poorly-graded Sand with Silt
- USCS Elastic Silt
- USCS Well-graded Sand
- USCS Well-graded Gravel with Clay
- USCS Low to High Plasticity Clay
- USCS Low Plasticity Sandy Clay
- USCS Sandy Silt
- USCS Low Plasticity Clay

VERTICAL EX. = 25

SCALE IN FEET

DESIGNED BY	SCOTT HANSEN	MANAGING OFFICE	DES MOINES, IOWA
DRAWN BY	NORA DAY	PROJECT	MIDAMERICAN ENERGY COMPANY RIVERSIDE GENERATING STATION BETTENDORF, IOWA
CHECKED BY	SCOTT HANSEN		
APPROVED BY	KEVIN ARMSTRONG		
PROJECT MANAGER	KEVIN ARMSTRONG	TITLE	HYDROGEOLOGICAL CROSS-SECTION C-C' AND D-D'
		FIGURE	8
		REVISION	
		FILE NAME	

MWH

Drilling Log

MWH

Monitoring Well **MW-4**

Page: 1 of 1

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *574.36 ft* North *-356* East *1015*

Top of Casing *574.03 ft* Water Level Initial ▽*556.53* 01/15/08 12:00 Static ▼*563.43* 01/15/08 13:15

Hole Depth *20.0ft* Screen: Diameter *2 in* Length *15.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch* Sampling Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/15/2008* Completion Date *1/15/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		574.36
0	0.0				GW	Surface - coarse angular GRAVEL (imported) ballast over medium to large gravel with coal dust.		
	1.2				CL ML	Silty CLAY, soft, brown, moderate plasticity, low moisture, no odor.		570
5	0.0		4 5		CL	CLAY, soft, light brown, with black organic silty nodules, low moisture, no odor.		
		100%	4 5 5		CL ML	Silty CLAY, soft, brown, some fine sand, stiff at 7 feet, dark brown at 7.8 feet, no odor.		
	0.0	100%	7 9 9					
	0.0	100%	0 3 4		CL	Fine sandy CLAY, soft, brown, some miosture, no odor.		565
10 ▼	0.0	100%	6 3 4		CL ML CL	Silty CLAY, soft, dark brown, moist, moderate plasticity, no odor. Fine sandy CLAY w/ some silt, reddish/light brown, moist, no odor		
	0.0	100%	6 7 1		CL ML	Silty CLAY, soft, dark grey, moist, some small well-rounded gravel from 14-15.7, no odor.		
15	0.0	100%	3 4 5					560
	0.0	100%	2 3 4		CL	CLAY, soft, light grey; brown silty mottles with trace small-medium sand, moist-wet, no odor.		
▽	0.0	100%	4 1 2		MH CL	Clayey SILT with some fine well rounded gravel, light grey/light brown, wet, no odor.		▽
	0.0		2 2 3			Fine sandy CLAY, soft, ligth brown/light grey, moist-wet, no odor.		555
20		100%	9 8 14			Weathered BEDROCK, very hard fractured clayey SILT, light grey, wet.		
								550
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-5**

Page: 1 of 1

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *573.93 ft* North *-2708* East *-328*

Top of Casing *573.86 ft* Water Level Initial ▽*565.46* 01/15/08 15:50 Static ▼*569.96* 01/16/08 08:10

Hole Depth *15.0ft* Screen: Diameter *2 in* Length *10.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch Split Spoon* Sampling Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/15/2008* Completion Date *1/15/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		573.93
0					GW	Surface - coarse angular GRAVEL (imported).		
			3 3 10 8		CL	Mottled silty CLAY, soft-stiff, reddish brown, moist, no odor.		
	0.0	100%			OL	Organic silty CLAY, small roots, soft, dark brown, moist, no odor.		570 ▼
5	0.0	100%	3 2 4 3		CL	Mottled fine sandy CLAY, some small coal fragments, brown/light grey, moist, no odor.		
	0.0	100%	2 3 2 2		CH	CLAY, soft, some small fragments of coal and weathered sandstone, moist-wet, no odor.		▽
	0.0	100%	1 1 1 1		SC	Clayey fine SAND with fine subangular gravel, dark brown, wet, no odor.		565
10	0.0	100%	0 0 6 1					
	0.0	100%	1 1 1 2		CL	Silty CLAY, soft to stiff, dark brown, moist-wet, no odor.		560
15								555
20								550
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-6**

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *578.75 ft* North *-2856* East *-84*

Top of Casing *578.10 ft* Water Level Initial ▽*565.1* 01/16/08 14:30 Static ▼*565* 01/17/08 08:30

Hole Depth *20.0ft* Screen: Diameter *2 in* Length *15.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch Rotation* Sampling Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/16/2008* Completion Date *1/16/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		578.75
0					GW	Surface - coarse angular GRAVEL (imported).		
					SW SC	Clayey fine SAND w/ some fine angular gravel, dark brown, moist-wet, no odor.		
	0.0							
					SM	Silty fine-coarse SAND, dark brown, moist, no odor.		575
5	0.0	100%	4 3 8 5		GW	Coarse GRAVEL, angular/subangular, with dark brown/light brown silty fine/medium sand, moist, no odor.		
	0.0	100%	3 2 5 4		SW SM	Silty fine SAND, dark brown, moist, no odor.		
	0.0	100%	1 1 7 4					570
10	0.0	100%	1 3 1 2		SP	Coarse SAND, light brown, some angular to well rounded fine gravel with small wood fragments, moist, no odor.		
	0.0	100%	2 1 1 1			Silty fine SAND, dark brown, coarse angular gravel at 12 feet, some medium angular gravel at 13 - 14.2 feet, some clay at 15.5 - 16 feet, moist, wet at 13 feet, no odor.		
	0.0	100%	1 0 0 0					565 ▽▼
15	0.0	100%	0 0 0 0		SP SM			
	0.0	100%	0 1 1 1					560
	0.0	100%	1 0 0 0					
20								555
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-7**

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *579.05 ft* North *-3158* East *-259*

Top of Casing *578.56 ft* Water Level Initial ▽*566.76* 01/16/08 11:35 Static ▼*563.51* 01/17/08 09:30

Hole Depth *20.0ft* Screen: Diameter *2 in* Length *15.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch Split Spoon* Backfill Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

Start Date *1/16/2008* Completion Date *1/16/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
0						Gravel		579.05
					GW	Surface - coarse angular GRAVEL (imported).		
	0.0				SW SC	Clayey fine SAND, dark brown, moist-wet, no odor.		
	1.2							
						Silty fine SAND, dark brown, slightly moist, no odor.		575
5	0.0	100%	4 5 4 5 5 7 9 9		SW SM			
	0.0	100%	0 3 4 6 3 4 6 7		MH	Clayey SILT, light brown, moist, no odor.		570
10	0.0	100%			SW SC	Clayey fine SAND, dark brown, moist-wet, no odor.		
	0.0	100%			SW SM	Silty fine SAND, dark brown, wet, no odor.		
	0.0	100%	1 3 4 5 2 3 4 4		SW	Fine to medium SAND, brown, trace silt, some small angular fragments of sandstone at 17.5 feet, wet, well drained, no odor.		565
15	0.0	100%	1 2 2 2 3 9 8 14					
	0.0	100%						560
20	0.0	100%						
								555
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09

Drilling Log

MWH

Monitoring Well **MW-8**

Project *Riverside Generating Station* Owner *MidAmerican Energy Company*

Location *6001 State Street, Bettendorf, Iowa* Project Number *1914068.0101*

Surface Elev. *578.06 ft* North *-3465* East *-462*

Top of Casing *577.65 ft* Water Level Initial ▽*565.65* 01/16/08 09:00 Static ▼*564.05* 01/17/08 10:10

Hole Depth *20.0ft* Screen: Diameter *2 in* Length *15.0 ft* Type/Size *PVC/0.01 in*

Hole Diameter *8.25 in* Casing: Diameter *2 in* Length *4.7 ft* Type *PVC*

Drill Co. *Thiele Geotech, Inc.* Drilling Method *Hollow Stem Auger/24-inch Split Spoon* Sampling Method *NA*

Driller *Dave Mather* Driller Reg. # *7892* Log By *Adam Newman*

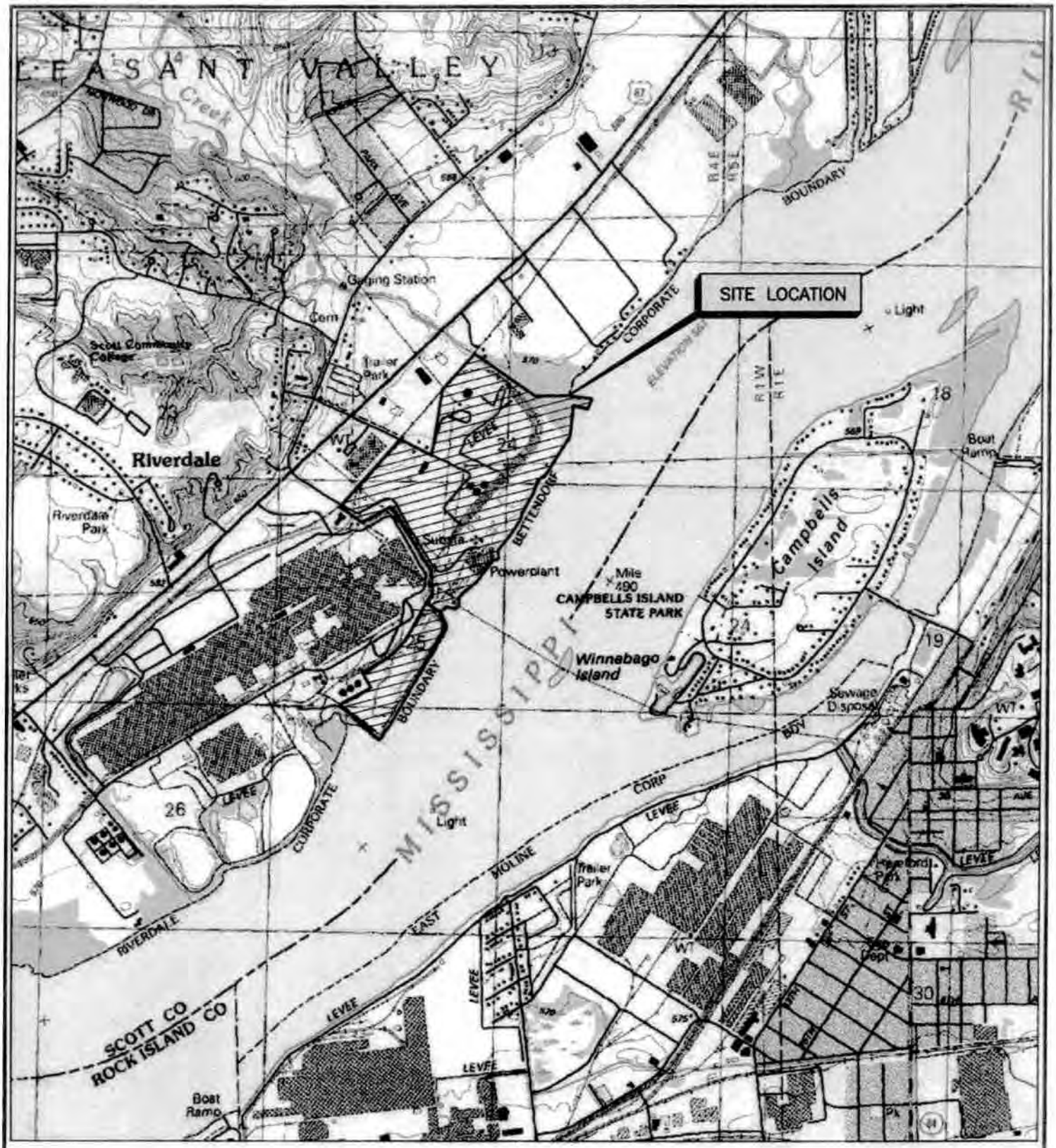
Start Date *1/16/2008* Completion Date *1/16/2008* Checked By *K. Armstrong*

COMMENTS

Bentonite Grout | Bentonite Granules | Grout | Portland Cement | Sand Pack | Sand Pack

Depth (ft)	PID (ppm)	% Recovery	Blow Count Recovery	Graphic Log	USCS	Description (Color, Moisture, Texture, Structure, Odor) Geologic Descriptions are Based on the USCS.	Well Completion	Elevation (ft)
						Gravel		578.06
0					GW	Surface - coarse angular GRAVEL (imported).		
					GW GC	Coarse angular GRAVEL with brown clay, wet, no odor.		
	0.0				CL	CLAY, soft, brown, moderate plasticity, some small angular gravel and fine sand, some moisture, no odor.		575
5	0.0	100%	0 2 2 2		CL	Fine sandy CLAY, soft, reddish brown, moist, no odor.		
			1 0 1 0			No recovery.		
		0%						570
	0.0		1 0 0 0		ML	Fine sandy SILT with interbedded reddish brown fine sandy clay, very soft, moist, no odor.		
10	0.0	100%	0 1 1 1		SP SM	Silty fine to coarse SAND, dark brown, wet at 12 feet, no odor.		
▽	0.0	100%	1 0 1 1		SW SC	Clayey fine SAND, some small fragments of sandstone at 13.8 feet, brown/dark brown, wet, no odor.		565
▼	0.0	100%	4 4 4 8		CL	CLAY, soft, moderate to low plasticity, light brown, moist, no odor.		
15	0.0	100%	4 3 2 3		SW SM	Silty fine SAND, dark brown, wet, no odor.		
	0.0	100%	3 2 3 7					560
20								555
25								

Drilling Log MW-4 TO MW-8.GPJ MWH IA.GDT 2/12/09



QUADRANGLE LOCATION

SITE LOCATION: TOWNSHIP 78 NORTH, RANGE 4 EAST, SECTION 24
SCOTT COUNTY, IOWA

MAP SOURCE: U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE
SILVIS, ILL–IOWA (1991)

DESIGNED BY		
DRAWN BY	NORA DAY	
CHECKED BY		
APPROVED BY	KEVIN ARMSTRONG	
PROJECT MANAGER	KEVIN ARMSTRONG	

0 1000 2000
SCALE IN FEET

MANAGING OFFICE: DES MOINES, IOWA
PROJECT: MIDAMERICAN ENERGY COMPANY
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

TITLE: **SITE LOCATION MAP**

MWH

FIGURE 1 REVISION

FILE NAME

Geotechnical Engineering Report

Preliminary Opinions of Global Stability
North Ash Containment Pond Embankments
Riverside Generating Station
Bettendorf, Iowa

October 22, 2010

Terracon Project No. 07105081

Prepared for:
HGM Associates, Inc.
Council Bluffs, Iowa

Prepared by:
Terracon Consultants, Inc.
Bettendorf, Iowa

Terracon

October 22, 2010

HGM Associates, Inc
640 5th Avenue
Council Bluffs, Iowa 51502

Attention: Mr. Terry Smith, P.E.

Re: Geotechnical Engineering Report
Preliminary Opinions of Global Stability
North Ash Containment Pond Embankments
Riverside Generating Station
Bettendorf, Iowa
Terracon Project No. 07105081

Dear Mr. Smith:

Terracon Consultants, Inc. (Terracon) conducted a limited subsurface exploration to obtain data concerning subsurface conditions for our use in performing limited global stability analyses of selected Ash Containment Pond embankments at the Riverside Generating Station (RGS) as described in our Proposal P07100280 dated September 27, 2010. This report presents the findings of the subsurface exploration and provides the results of our limited slope stability analyses. The limited scope of exploration and analyses is considered limited and cursory and is not intended to meet any particular regulatory guidelines, but rather to provide preliminary opinions regarding global stability.

We appreciate the opportunity to provide the limited geotechnical consulting services for this project and are prepared to provide more in-depth analyses as recommended in this report. Please contact us if you have any questions regarding this report.

Sincerely,

Terracon Consultants, Inc.

Vaughn Rupnow, P.E.
Iowa No. 19259

W. Ken Beck, P.E.
Iowa No. 10684

VER/WKB/N:\Projects\2010\07105081/07105081 Report.doc

Attachments

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Consultants to the EPA are currently conducting an audit of the north ash containment pond located at the Riverside Generating Station (RGS) in Bettendorf, Iowa. MidAmerican Energy Company (MEC) requested Terracon Consultants, Inc. (Terracon) conduct limited analyses of global stability of the earth embankments that surround the ash pond. Terracon understands this report will be provided to the EPA consultants to assist with their audit. Terracon conducted a subsurface exploration to obtain data concerning subsurface conditions for use in performing the requested limited global stability analyses of selected Ash Containment Pond embankments located at RGS. Three (3) borings (B-1 through B-3) were completed to depths of approximately 13½ to 23½ feet below the existing ground surface. Boring locations are shown on the Location Diagram in Appendix A. Laboratory tests were performed on the samples recovered from the borings.

This report presents the findings of the subsurface exploration and provides the results of our limited slope stability analyses. An abbreviated summary of findings, results, and recommendations are presented below. This report must be read in its entirety for a comprehensive understanding of our analyses and the limitations of this report.

- For this study, slope geometry was taken from survey cross sections supplied by HGM Associates, Inc. (HGM), and material strength properties were estimated from available laboratory testing conducted on a limited number of samples obtained from the exploratory borings. Subsurface geometry was based on conditions encountered at borings conducted along the crest of embankments. Piezometric surfaces were inferred based on elevations of static water surface levels in the ponds provided by HGM and short term water levels recorded at borings.

- Stability analyses were performed for the north pond section using the computer program Slide V5.0. Analyses searched for circular failure arcs on the upstream and downstream slope for the Steady Stage Seepage condition at the maximum pool elevations, and the phreatic lines within the levees were estimated for the model. According to the USGS, the peak ground acceleration is less than 0.10g for the 100-year earthquake at this site. Therefore, no seismic evaluation is required (EC 1110-2-6067 Paragraph 9h.6).

- The stability analysis results were compared with US Army Corps of Engineers (USACE) minimum requirements for earthen levees contained in Table 6.1b from USACE EM 1110-2-1913. Models of all analyzed embankment sections exhibit factors of safety greater than or equal to 1.4 for the steady state seepage conditions. The results are summarized in a table in Section 4.4 of this report.

- Global stability of pond embankment slopes is dependent upon the specific subsurface conditions at the base of the embankment slopes. Without boring data at the toes of the embankments, conditions from the borings were used for the embankment toe; however, subsurface conditions could vary. Models do not reflect variations in stratigraphy or shear strength that may occur across an embankment cross-section.

GEOTECHNICAL ENGINEERING REPORT
PRELIMINARY OPINIONS OF GLOBAL STABILITY
NORTH ASH CONTAINMENT POND EMBANKMENTS
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

Terracon Project No. 07105081
October 22, 2010

1.0 INTRODUCTION

Consultants to the EPA are currently conducting an audit of the north ash containment pond located at the Riverside Generating Station (RGS) in Bettendorf, Iowa. MidAmerican Energy Company (MEC) requested Terracon Consultants, Inc. (Terracon) conduct limited analyses of global stability of the earth embankments that surround the ash pond. Terracon understands this report will be provided to the EPA consultants to assist with their audit. Terracon conducted a limited subsurface exploration to obtain data concerning subsurface conditions for our use in performing the requested cursory global stability analyses of selected Ash Containment Pond embankments located at RGS. Three (3) borings (B-1 through B-3) were completed to depths of approximately 13½ to 23½ feet below the existing ground surface. Logs of the borings along with a Boring Location Sketch are included in Appendix A of this report.

This study was performed in general accordance with our proposal number P07100280 dated September 27, 2010.

2.0 PROJECT INFORMATION

2.1 Project Description

	Description
Background	Consultants to the EPA are currently conducting an audit of the north ash containment pond located at the Riverside Generating Station (RGS) in Bettendorf, Iowa. MidAmerican Energy Company (MEC) requested Terracon conduct cursory analyses of slope stability of the levees surrounding the ash ponds. MEC will provide our report to the EPA consultant.

	Description
Limitations of this Study	Terracon performed a limited evaluation of the slope stability of the existing levees surrounding the north ash containment pond at the RGS facility. Due to the limited scope of exploration and short time period allowed for these analyses, this study is not comprehensive, nor intended to meet any specific regulatory guidelines, but rather a preliminary study. Opinions of global stability are based on simplified models developed as described in this report. Rigorous analyses of embankment stability will require performance of additional exploratory borings and laboratory tests, and should include analyses of underseepage.
Additional Information	On September 23 and 24, 2010, representatives of Terracon and MEC met at the site. Locations of the embankments/levees were selected and boring locations staked based on visual observations of current conditions. HGM provided survey cross-sections of the levees, extending into the pond area and beyond the toe on the opposite side from the pond.

2.2 Site Location and Description

Item	Description
Location	The north ash containment pond is located north of the Riverside main plant structure in Bettendorf, Iowa.
Pond Descriptions	Terracon understands that the ponds at RGS are utilized primarily for bottom ash disposal which is deposited in the ponds in a wet condition (sluiced). Terracon understands that the RGS has been in operation since the early 1900's and uses eastern/Midwest coal. It is believed that the pond is used for containment of top and bottom ash. The north pond was heavily vegetated to the extent that the condition of both embankment slopes could not be easily observed. We understand that both embankments and levees are maintained by MEC.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Profile

Borings were conducted from the levee crest. Subsurface conditions encountered at the borings are described below:

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Stratum 1 (Embankment Fill)	8 to 10 feet	clay with varying sand content	N/A
Stratum 2 [1] (Alluvium)	21½ feet at Boring 1 13 feet at Boring 2	fine to medium sand with gravel, clayey sand with gravel (SP, SC)	medium dense
Stratum 3 [2] (Residual Soil)	15 feet	silty clay with weathered gravel (CL/ML)	medium stiff
Stratum 4 [3] (Rock)	13½ to 23½ feet	weathered limestone	NA

[1] present at Borings 1 and 2
[2] present at Boring 3
[3] extended to the termination depth of the borings

3.2 Water Level Observations

The boreholes were observed while drilling for the presence and level of groundwater. The water levels observed are noted on the attached boring logs, and are summarized below. Subsurface water levels could not be determined since water or drilling slurry was used to advance the boreholes. The boreholes were grouted after drilling using a cement-bentonite mixture. A relatively long period of time is necessary for a groundwater level to develop and stabilize in a borehole. Longer term monitoring in cased holes or piezometers would be required for a more accurate evaluation of the groundwater conditions.

Boring Number	Observed Water Depth (ft) [1]	
	While Drilling	After Drilling
1	10	18
2	none	14½
3	none	none

[1] Below existing grade

Fluctuations of the water levels will occur due to fluctuations in the water level of the Mississippi River, the ash pond, seasonal variations in the amount of rainfall and runoff, and other factors

not evident at the time the borings were performed. Subsurface water levels during construction or at other times in the life of the structure will be higher or lower than the levels indicated in the boring logs. Perched water conditions can also develop overlying clay layers. The possibility of groundwater level fluctuations and development of perched water conditions should be considered when developing the design and construction plans for the project.

4.0 GLOBAL STABILITY OF ASH POND EMBANKMENTS

4.1 Mechanics of Slope Stability

In slope stability analyses, the *Factor of Safety* is considered to be the sum of resisting forces (those forces which resist movement) divided by the sum of driving forces (those forces which promote movement). Therefore, for a slope to be stable, the resisting forces must be greater than the driving forces and their ratio, or Factor of Safety, must be greater than 1. The acceptable factor of safety for any particular slope depends upon many factors. Consequences of slope failure are one factor. The extent to which subsurface material properties and geometry are known is another very important factor.

Movements related to instability can occur rapidly or slowly. Analyses techniques are based on principles of mechanics. Input parameters include slope geometry, material strength, presence and orientation of discrete subsurface layers and water (piezometric) pressure.

For this study, slope geometry was taken from survey cross sections supplied by HGM, material strength properties were estimated from available laboratory test data obtained by testing samples obtained from the limited number of exploratory borings. Subsurface geometry was based on conditions encountered at borings conducted along the crest of embankments. Piezometric surfaces were estimated based on elevations of static water surface levels in the ponds provided by HGM and short term water levels recorded at borings.

4.2 Selection of Embankment Sections for Analysis

Survey cross sections of the existing embankments at distinct locations were provided by HGM. Terracon selected one (1) of the provided cross sections for slope stability. Sections J was modeled.

4.3 Subsurface Profile and Shear Strength Parameters

Data obtained from our exploratory borings, the topographical survey of the site, and laboratory tests, were used to constitute the slope models for performing global stability analyses of the existing embankments.

Borings were performed at the crest of the levees. The subsurface profiles for the analysis models were interpreted and extrapolated from the nearest boring. Since borings were only performed at the crest of the existing levees and no information was available regarding the

conditions at the toe of the embankments, we considered that stratum elevations encountered at the borings or cone soundings represented a relatively level contact between strata.

The slope stability analyses utilized cohesion and friction angle values determined primarily from correlations with data from index tests performed on the samples recovered from borings and experience with similar soils. The shear strength parameters used in our analyses are summarized below:

Material	Saturated Unit Weight (pcf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)
Clay Fill	130	15	250
Residual Soils	120	25	0
Weathered Limestone	135	40	0

4.4 Results of Analyses

Stability analyses were performed for the north pond section using the computer program Slide V5.0. Analyses searched for circular failure arcs on the upstream and downstream slope for the Steady Stage Seepage condition at the maximum pool elevations, and the phreatic lines within the levees were estimated for the model. According to the USGS, the peak ground acceleration is less than 0.10g for the 100-year earthquake at this site. Therefore, no seismic evaluation is required (EC 1110-2-6067 Paragraph 9h.6).

	Estimated Factor of Safety Obtained from Analysis [1]		
	Steady State Seepage		
Section[2]	Required Minimum Factor of Safety [3]	Upstream	Downstream
J	1.4	2.0	1.6

1. Reported factors of safety are for deep seated circular "failure" surfaces that emerge near the levee crest. Computed factors of safety for shallow circular "failure" surfaces near the toe of the levee may be smaller.
2. Refer to Ash Pond Plan in Exhibit D-1, for cross section location.
3. Reference: Table 6.1b from EM 1110-2-1913

Based on these limited analyses, the analyzed embankment section exhibits factors of safety greater than 1.4. Graphical results of the slope stability analyses for all cases are in Appendix D.

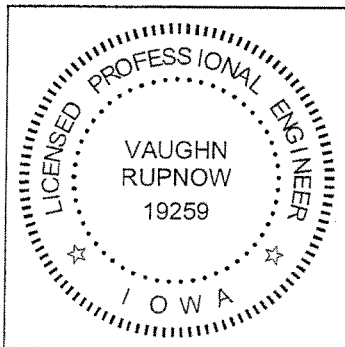
Global stability of pond embankment slopes is dependent upon subsurface conditions at the base of the embankment slopes. Without boring data at the toes of the embankments, conditions at the toe were estimated from the crest borings. Our models do not reflect variations in stratigraphy or shear strength that typically occurs across an embankment section.

5.0 GENERAL COMMENTS

The limited global stability analyses presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. The models for global stability analysis were developed using survey data provided by others. Subsurface stratigraphy for each model was extrapolated from nearby borings; actual conditions may be different and such differences would affect the results of our analyses. More in-depth analyses would require additional exploration and laboratory tests. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident without further exploration.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

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 warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that the actual embankment conditions are found to vary from the analyses models described in this report, the analyses and opinions expressed herein shall not be considered valid unless Terracon reviews the actual conditions and further verifies the analyses and opinions of this report in writing.

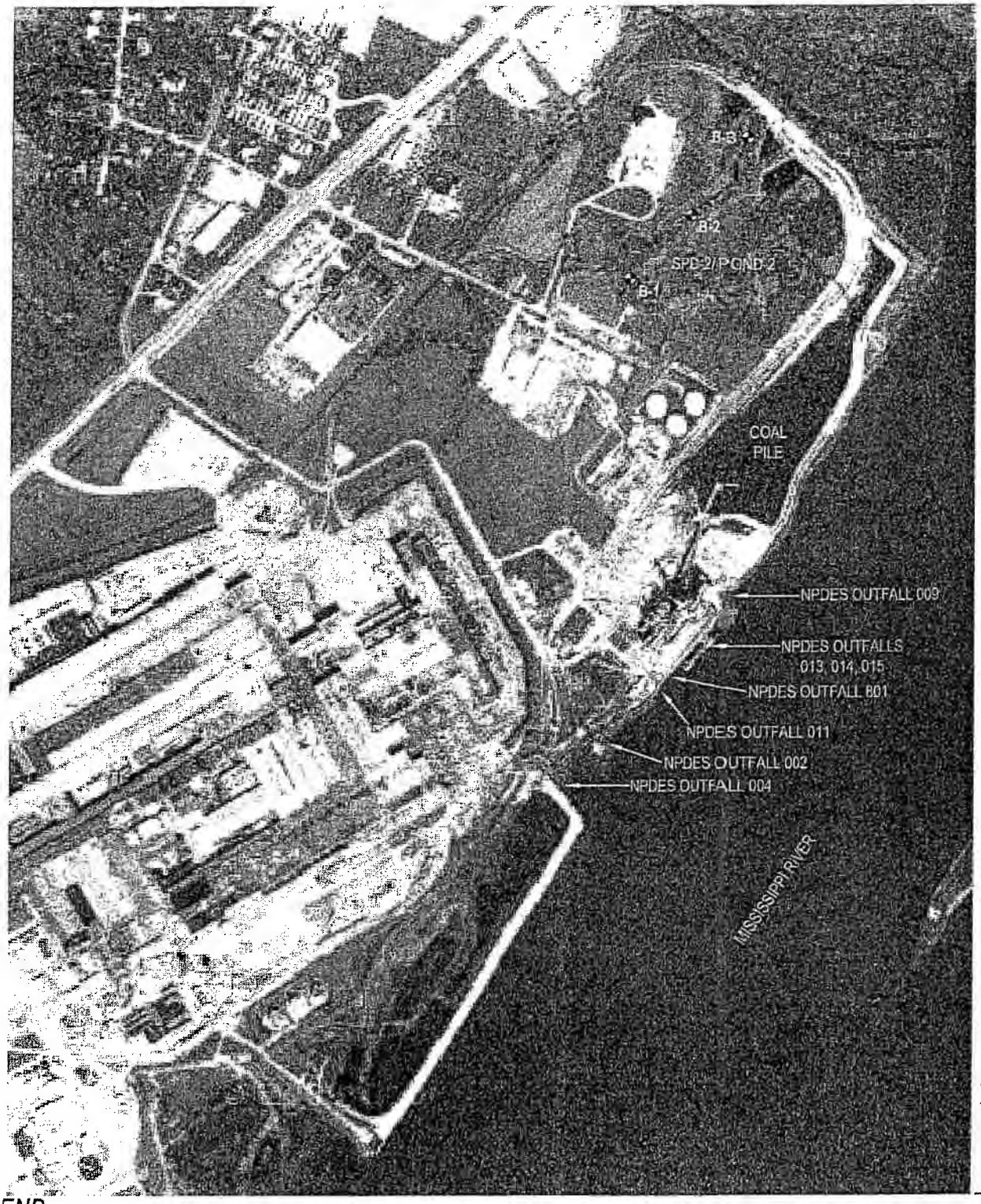


I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Vaughn Rupnow, P.E. — Date: 10/22/2010

My license renewal date is December 31, 2010.

APPENDIX A
FIELD EXPLORATION



LEGEND

⌖ APPROXIMATE BORING LOCATION

NOT TO SCALE

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr:	WKB
Drawn By:	DWD
Checked By:	WKB/MRF
Approved By:	WKB

Project No.	07105081
Scale:	AS SHOWN
File No.	GEO07105081-1
Date:	OCT. 2010

Terracon
Consulting Engineers and Scientists
870 40th Avenue Bettendorf, Iowa 52722
(563) 355-0702 (563) 355-4789

BORING LOCATION SKETCH

NORTH ASH CONTAINMENT POND
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

EXHIBIT

A-1

BORING NO. 1

CLIENT: HGM Associates, Inc.

SITE: Riverside Generating Station, Bettendorf, Iowa

PROJECT: Ash Containment Ponds - North Pond

Approx. Surface Elev.: 576 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	DESCRIPTION
			PA						**FILL. CLAY WITH VARYING SAND CONTENT** Brown and Gray
		1	ST	16		10		*6000	
		2	ST	23		20		*9000	
5			PA						
		3	ST	24		18	107	7230	
8									568
	SP	4	ST	16		17			**FINE TO MEDIUM SAND WITH GRAVEL (ALLUVIUM)** Brown ▽ Medium Dense
10			PA						
	SP	5	SS	18	17	19			Mixed with severely weathered gravel below about 13½ feet
15			PA						▼
	SP	6	SS	16	15	27			
20			PA						
21.5									554.5
									WEATHERED LIMESTONE* ** Light Gray
23.5									552.5
		7	SS	1	50/1"	13			BOTTOM OF BORING

***Classification of rock materials has been estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Pocket Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 10	WD	▼ 18	AB
WL	▽		▼	
WL				

Terracon

BORING STARTED	9-28-10		
BORING COMPLETED	9-28-10		
RIG	550	FOREMAN	SS
APPROVED	VER	JOB #	07105081

BOREHOLE 99 BORING LOGS NORTH POND.GPJ TERRACON.GDT 10/12/10

Exhibit A-2

BORING NO. 2

CLIENT: HGM Associates, Inc.

SITE: Riverside Generating Station, Bettendorf, Iowa

PROJECT: Ash Containment Ponds - North Pond

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	Approx. Surface Elev.: 575 ft									
	FILL, CLAY WITH VARYING SAND CONTENT Dark Brown and Brown				PA					
				1	ST	16		16		*9000
				2	ST	15		16		*8000
		5			PA					
				3	ST	14		16	116	6700
				4	ST	19		23	110	3570
	10 565	10			PA					
	CLAYEY SAND WITH GRAVEL (ALLUVIUM)*** Brown									
	13 562									
	13.5 WEATHERED LIMESTONE**** 561.5 Light Gray			5	SS	2	50/2"	16		
	BOTTOM OF BORING									

***Soil descriptions are based on the driller's field classification of disturbed samples.

***Classification of rock materials has been estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Pocket Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	▽	▼ 14.5	AB
WL	▼	▼	
WL			

Terracon

BORING STARTED			9-28-10
BORING COMPLETED			9-28-10
RIG	550	FOREMAN	SS
APPROVED	VER	JOB #	07105081

BOREHOLE 99 BORING LOGS NORTH POND.GPJ TERRACON.GDT 10/12/10

Exhibit A-3

BORING NO. 3

CLIENT: HGM Associates, Inc.

SITE: Riverside Generating Station, Bettendorf, Iowa

PROJECT: Ash Containment Ponds - North Pond

Approx. Surface Elev.: 575 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	DESCRIPTION
			PA						**FILL, CLAY WITH VARYING SAND CONTENT** Brown and Gray
		1	ST	24		12		*4000	
		2	ST	24		16	112	6240	
5			PA						
		3	ST	24		21		*4000	
		4	ST	15		18	110	*7000	
10			PA						10 565 **SILTY CLAY WITH WEATHERED GRAVEL (RESIDUAL)** Brown, Medium Stiff
	CL ML	5	SS	18		18		*1500	
15			PA						15 560 **WEATHERED LIMESTONE*** ** Light Gray
		6	SS	14	50/2"	28			18.5 556.5 BOTTOM OF BORING

***Classification of rock materials has been estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Pocket Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	9-28-10		
BORING COMPLETED	9-28-10		
RIG	550	FOREMAN	SS
APPROVED	VER	JOB #	07105081

BOREHOLE 99 BORING LOGS NORTH POND.GPJ TERRACON.GDT 10/12/10

Exhibit A-4

Field Exploration Description

The borings were performed at the locations selected by Terracon and MEC as shown on the attached Boring Location Sketch (Exhibit A-1). Ground surface elevations indicated on the boring logs are approximate and have been rounded to the nearest foot. The elevations were estimated from the levee cross sections provided by HGM Associates, Inc. The elevations of the soil borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were advanced with a track-mounted drilling rig utilizing continuous flight hollow-stem augers to advance the boreholes. Representative soil samples were obtained using both thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is hydraulically pushed into the ground to obtain samples of cohesive and moderately cohesive soils. In the split-barrel sampling procedure, a standard 2-inch (outside diameter) split-barrel sampling spoon is driven into the ground with a 140-pound Central Mine Equipment (CME) automatic SPT hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value and are provided on the boring logs at their depths of occurrence. The blow counts, also referred to as SPT N-values are used to help estimate the relative density of granular soil and the consistency of cohesive soils. The samples were transported to our laboratory for testing and classification. The boreholes were grouted with a cement-bentonite slurry.

The drill crew prepared a field log for each boring. Each log included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The 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.

APPENDIX B
LABORATORY TESTING

Laboratory Testing

The samples obtained from the borings were tested in our laboratory to determine their water contents. Dry densities were obtained and unconfined compressive strength tests were performed on selected tube samples. A pocket penetrometer was used to help estimate the approximate unconfined compressive strength of some cohesive samples. The pocket penetrometer provides a better estimate of soil consistency than visual examination alone. The laboratory test results are presented on the boring logs.

The soil samples were classified in the laboratory based on visual observation, texture and plasticity. The soil descriptions and estimated group symbols presented on the boring logs for native soils are in general accordance with the Unified Soil Classification System (USCS) and the attached General Notes. A summary of the USCS is also attached.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon – 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 3" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0-1	Very Soft
500 – 1,000	2-4	Soft
1,001 – 2,000	4-8	Medium Stiff
2,001 – 4,000	8-15	Stiff
4,001 – 8,000	15-30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
> 50	> 99	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

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

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	> 30

GENERAL NOTES

Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz, ($Si0_2$), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (½ inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

DEGREE OF WEATHERING:

SLIGHT	Slight decomposition of parent material on joints. May be color change.
MODERATE	Some decomposition and color change throughout.
HIGH	Rock highly decomposed, may be extremely broken.

Classification of rock materials has been estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	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 [D]	$Cu \geq 6$ 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 / Liquid limit - not dried	< 0.75	OL	Organic clay [K,L,M,N] / 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 / Liquid limit - not dried	< 0.75	OH	Organic clay [K,L,M,P] / Organic silt [K,L,M,Q]
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] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[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.

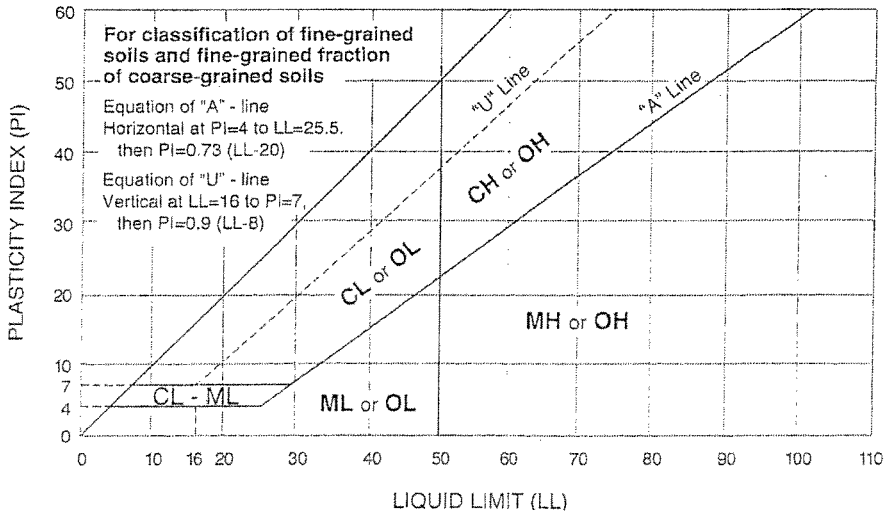
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

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

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

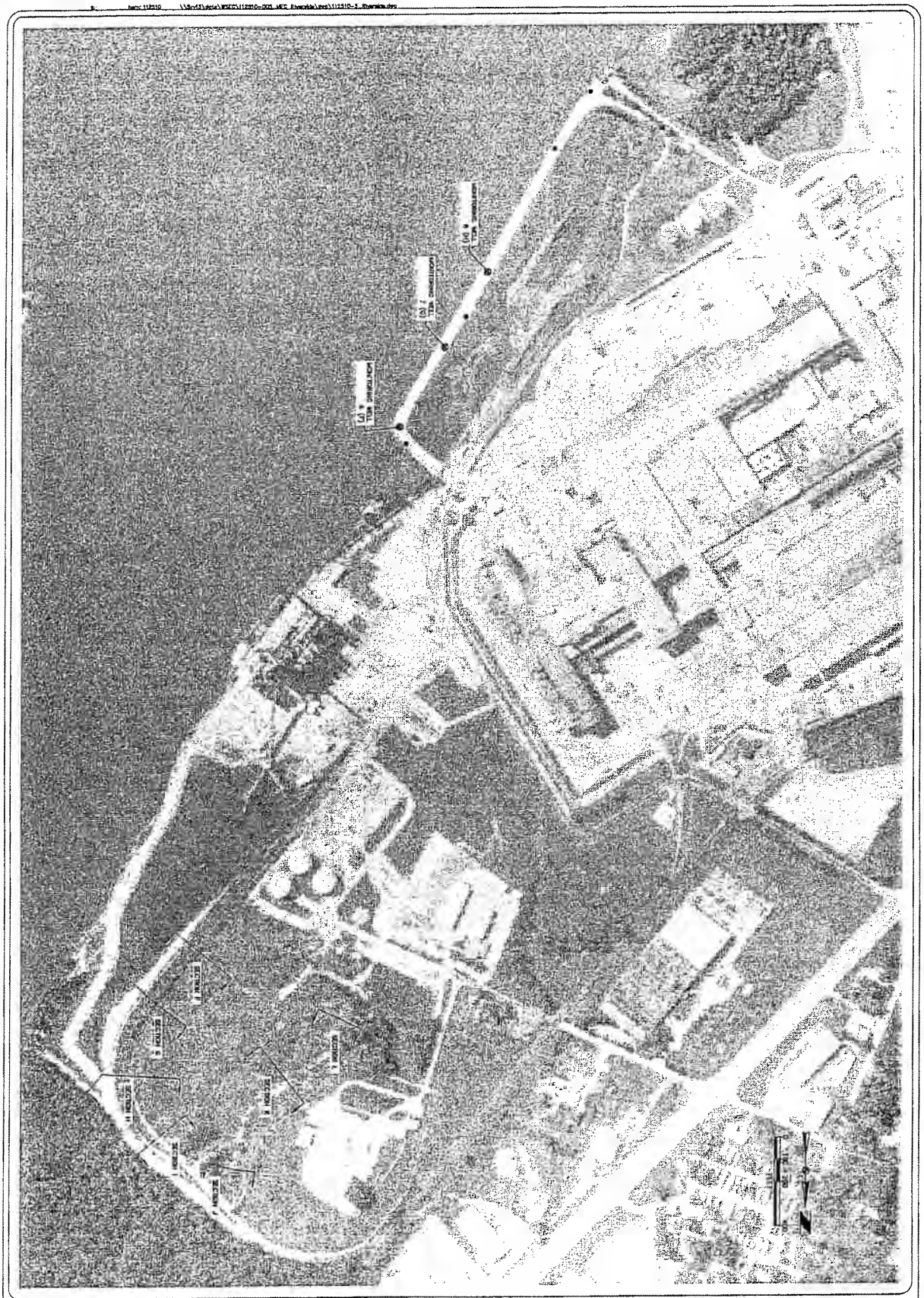
[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



APPENDIX D

Slope Stability Analyses



project RIVERSIDE IMPOUNDMENT PONDS
BERM STABILITY

client MIDAMERICAN ENERGY COMPANY
7215 NAVAJO STREET, COUNCIL BLUFFS, IOWA 51501

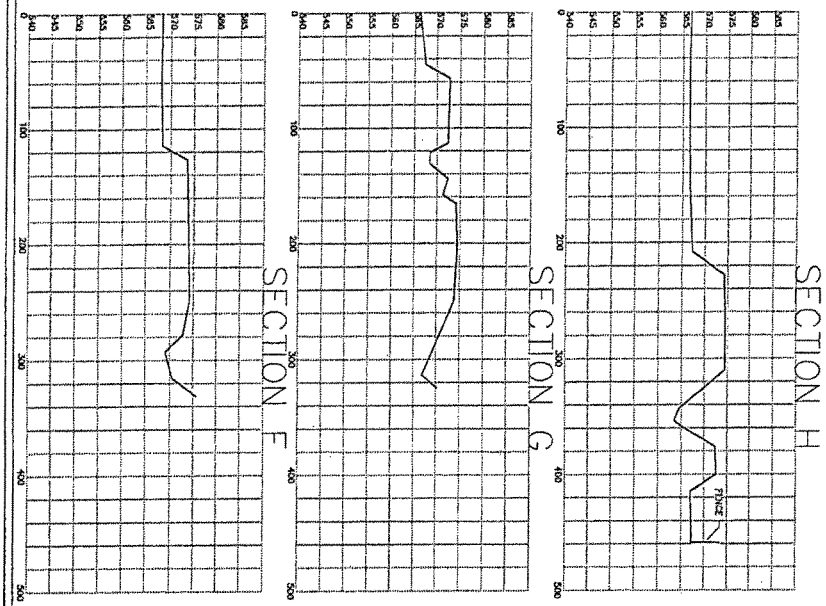
sheet NORTH POND SITE PLAN

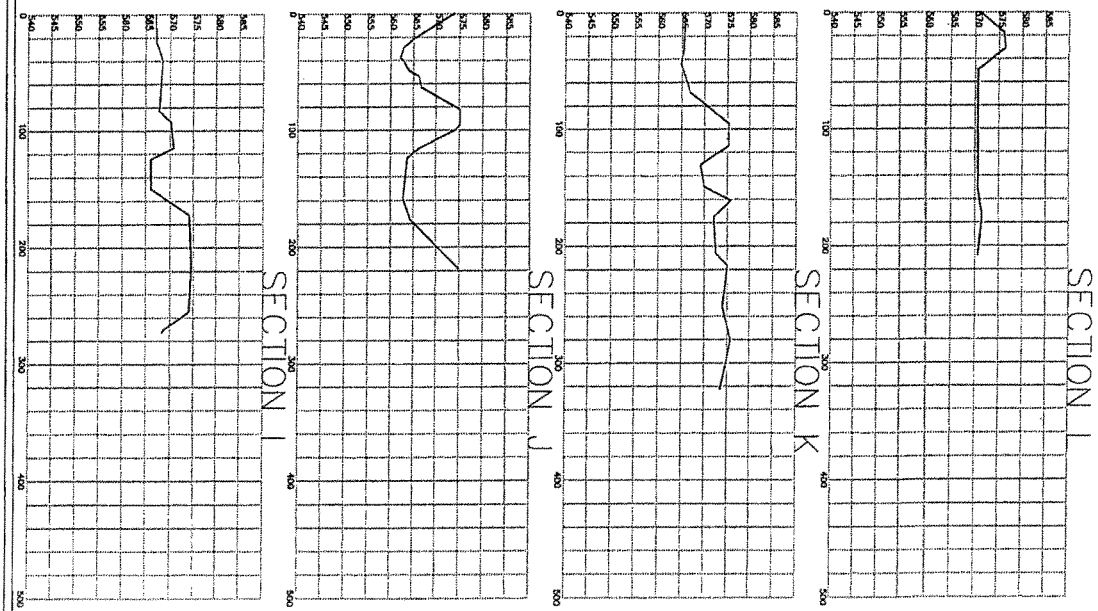
project no. 112510
sheet 1 OF 2

DEF drawn
DEF designed
TLS approved
SEE T.I.D. date revision date

hgm ASSOCIATES INC.
640 FIFTH AVENUE COUNCIL BLUFFS, IOWA
PHONE: (712) 323-0530

Exhibit D-1





project: RIVERSIDE IMPOUNDMENT PONDS
BERM STABILITY

client: MIDAMERICAN ENERGY COMPANY
7218 NAVAJO STREET, COUNCIL BLUFFS, IOWA 51501

sheet: NORTH POND CROSS SECTIONS

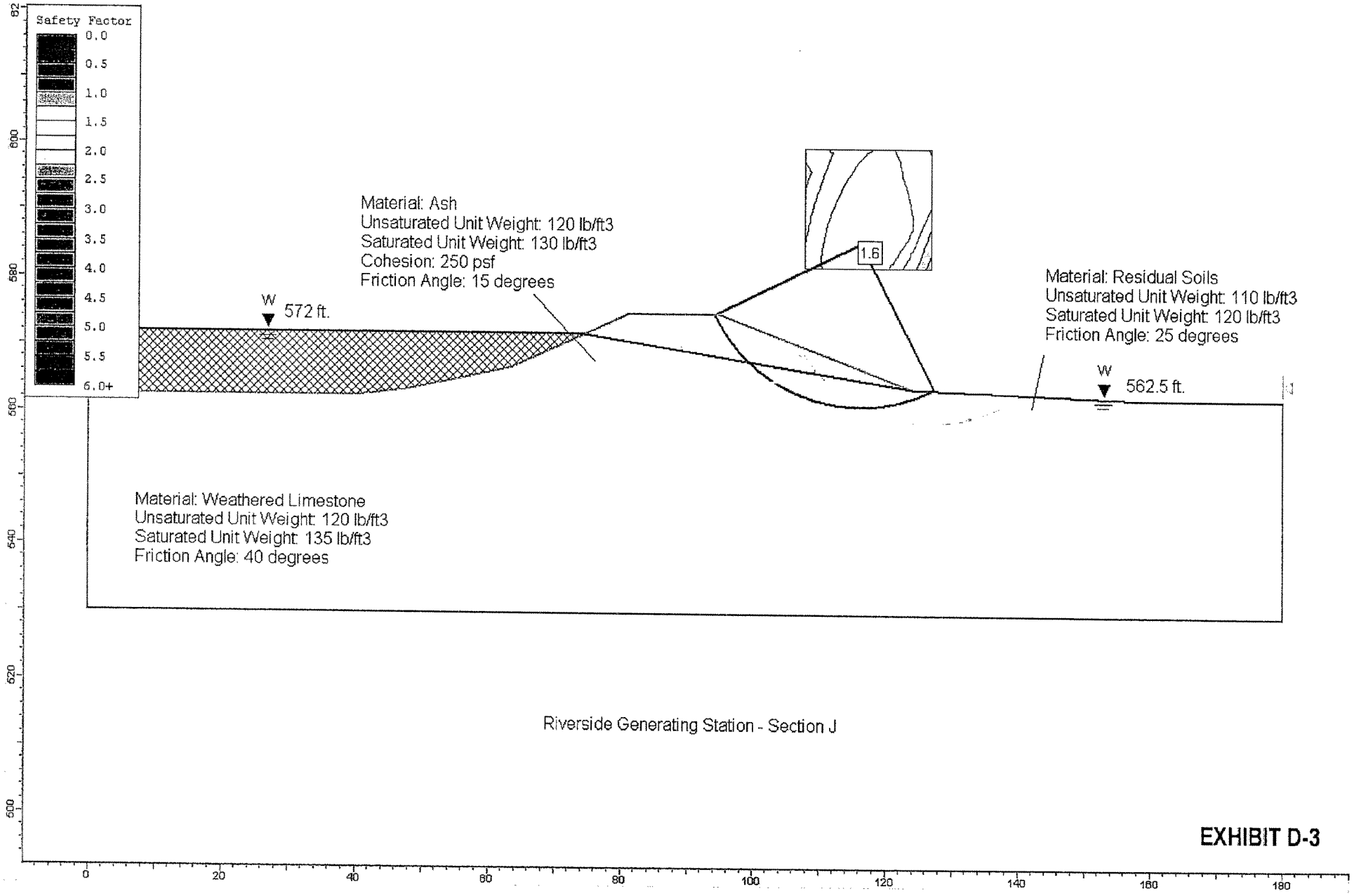
project no. 112510

sheet 2 OF 2

DRF drawn
DRF designed
TLS approved
SEPT '10 date

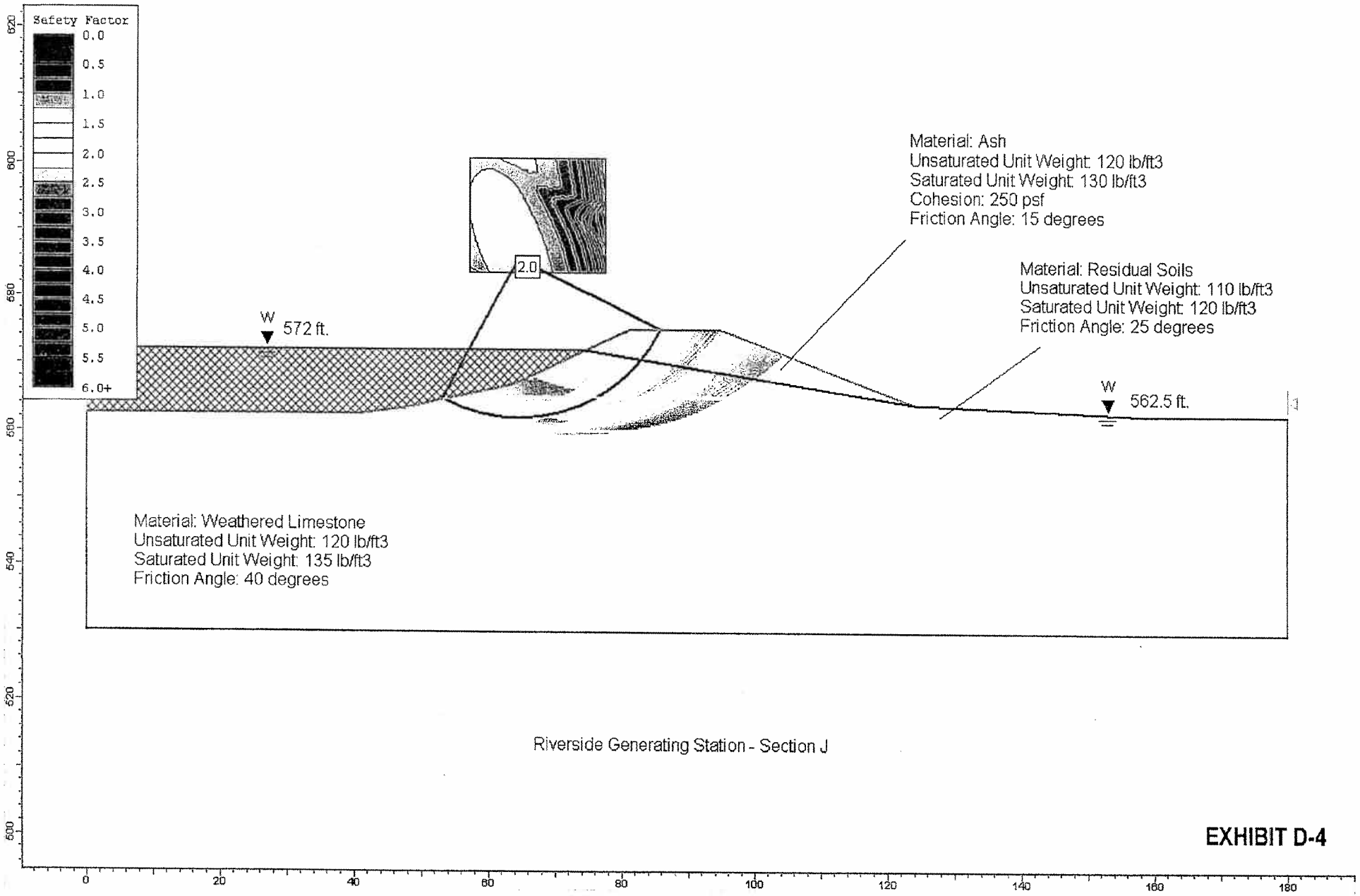
hgm ASSOCIATES INC.
640 FIFTH AVENUE COUNCIL BLUFFS, IOWA
PHONE: (712) 323-0530

Exhibit D-2



Riverside Generating Station - Section J

EXHIBIT D-3



Riverside Generating Station - Section J

EXHIBIT D-4

Geotechnical Engineering Report

Preliminary Opinions of Global Stability
South Ash Containment Pond Embankments
Riverside Generating Station
Bettendorf, Iowa

October 27, 2010

Terracon Project No. 07105081

Prepared for:
HGM Associates, Inc.
Council Bluffs, Iowa

Prepared by:
Terracon Consultants, Inc.
Bettendorf, Iowa

Terracon

October 27, 2010

HGM Associates, Inc
640 5th Avenue
Council Bluffs, Iowa 51502

Attention: Mr. Terry Smith, P.E.

Re: Geotechnical Engineering Report
Preliminary Opinions of Global Stability
South Ash Containment Pond Embankments
Riverside Generating Station
Bettendorf, Iowa
Terracon Project No. 07105081

Dear Mr. Smith:

Terracon Consultants, Inc. (Terracon) conducted a limited subsurface exploration to obtain data concerning subsurface conditions for our use in performing limited global stability analyses of selected Ash Containment Pond embankments at the Riverside Generating Station (RGS) as described in our Proposal P07100280 dated September 27, 2010 and our Supplement to Agreement for Services dated October 11, 2010. This report presents the findings of the subsurface exploration and provides the results of our limited slope stability analyses. The limited scope of exploration and analyses is considered cursory and is not intended to meet any particular regulatory guidelines, but rather to provide preliminary opinions regarding global stability.

We appreciate the opportunity to provide the limited geotechnical consulting services for this project and are prepared to provide additional analyses as recommended in this report. Please contact us if you have any questions regarding this report.

Sincerely,

Terracon Consultants, Inc.

Vaughn Rupnow, P.E.
Iowa No. 19259

W. Ken Beck, P.E.
Iowa No. 10684

VER/WKB/N:\Projects\2010\07105081/07105081 Supplemental Report.doc

Attachments

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Consultants to the EPA are currently conducting an audit of the south ash containment pond located at the Riverside Generating Station (RGS) in Bettendorf, Iowa. MidAmerican Energy Company (MEC) requested Terracon Consultants, Inc. (Terracon) conduct limited analyses of global stability of the earth embankments that surround the ash pond. Terracon understands this report will be provided to the EPA consultants to assist with their audit. Terracon conducted a subsurface exploration to obtain data concerning subsurface conditions for use in performing the requested limited global stability analyses of selected Ash Containment Pond embankments located at RGS. Four (4) borings (B-4 through B-7) were completed to depths of approximately 28½ feet below the existing ground surface. Cone Penetrometer Test (CPT) soundings and Vane Shear Tests (VST) were conducted to supplement the borings; however the cone could not penetrate through fill layers at Boring 4. Boring locations are shown on the Location Diagram in Appendix A. Laboratory tests were performed on the samples recovered from the borings.

This report presents the findings of the subsurface exploration and provides the results of our limited slope stability analyses. An abbreviated summary of findings, results, and recommendations are presented below. This report must be read in its entirety for a comprehensive understanding of our analyses and the limitations of this report.

- For this study, slope geometry was taken from survey cross sections supplied by HGM Associates, Inc. (HGM), and material strength properties were estimated from available laboratory testing conducted on a limited number of samples obtained from the exploratory borings and the in-situ CPT and VST testing. Subsurface geometry was based on conditions encountered at borings conducted along the crest of embankments. Piezometric surfaces were inferred based on elevations of static water surface levels in the pond provided by HGM, short term water levels recorded at borings, and the Mississippi River stage.

- Stability analyses were performed for the south pond section using the computer program Slide V5.0. Analyses searched for circular failure arcs on the upstream and downstream slope for the Steady Stage Seepage (effective stress) condition at the maximum pool elevations, and the phreatic lines within the levees were estimated for the model. According to the USGS, the peak ground acceleration is less than 0.10g for the 100-year earthquake at this site. Therefore, no seismic evaluation is required (EC 1110-2-6067 Paragraph 9h.6).

- The stability analysis results were compared with US Army Corps of Engineers (USACE) minimum requirements for earthen levees contained in Table 6.1b from USACE EM 1110-2-1913. Models of the two analyzed embankment sections exhibit factors of less than 1.4 for the steady state seepage conditions. The presence of random zones of more dense or

gravelly layers within the embankment soils may potentially increase the stability of the embankment above that estimated in our analysis; however, a more rigorous exploration and analysis would be required to evaluate this potential. The results are summarized in a table in Section 4.4 of this report. We recommend that further analyses be conducted to further evaluate the stability and to determine what remedial measures may be necessary to improve the Factor of Safety.

- The analyses were based on the two borings in which the soils exhibited the weakest consistencies. Analyses of the other locations explored are anticipated to indicate higher factors of safety. Global stability of pond embankment slopes is dependent upon the specific subsurface conditions at the base of the embankment slopes. Without boring data at the toes of the embankments, conditions from the borings were used for the embankment toe; however, subsurface conditions could vary. Models do not reflect variations in stratigraphy or shear strength that may occur across an embankment cross-section.

GEOTECHNICAL ENGINEERING REPORT
PRELIMINARY OPINIONS OF GLOBAL STABILITY
SOUTH ASH CONTAINMENT POND EMBANKMENTS
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

Terracon Project No. 07105081
October 27, 2010

1.0 INTRODUCTION

Consultants to the EPA are currently conducting an audit of the south ash containment pond located at the Riverside Generating Station (RGS) in Bettendorf, Iowa. MidAmerican Energy Company (MEC) requested Terracon Consultants, Inc. (Terracon) conduct limited analyses of global stability of the earth embankments that surround the ash pond. Terracon understands this report will be provided to the EPA consultants to assist with their audit. Terracon conducted a limited subsurface exploration to obtain data concerning subsurface conditions for our use in performing the requested cursory global stability analyses of selected Ash Containment Pond embankments located at RGS. Four (4) borings (B-4 through B-7) were completed to depths of approximately 28½ feet below the existing ground surface. Cone Penetrometer Test (CPT) soundings and Vane Shear Tests (VST) were conducted to supplement the borings; however the cone could not penetrate through fill layers at Boring 4. Logs of the borings along with a Boring Location Sketch are included in Appendix A of this report.

This study was performed in general accordance with our proposal (Terracon No. P07100280) dated September 27 and our Supplement to Agreement for Services dated October 11, 2010.

2.0 PROJECT INFORMATION

2.1 Project Description

	Description
Background	Consultants to the EPA are currently conducting an audit of the south ash containment pond located at the Riverside Generating Station (RGS) in Bettendorf, Iowa. MidAmerican Energy Company (MEC) requested Terracon conduct cursory analyses of slope stability of the levees surrounding the ash ponds. MEC will provide our report to the EPA consultant.

	Description
Limitations of this Study	Terracon performed a limited evaluation of the slope stability of the existing levees surrounding the south ash containment pond at the RGS facility. Due to the limited scope of exploration and short time period allowed for these analyses, this study is not comprehensive, nor intended to meet any specific regulatory guidelines, but rather a preliminary study. Opinions of global stability are based on simplified models developed as described in this report. Rigorous analyses of embankment stability will require performance of additional exploration and laboratory tests, and should include analyses of underseepage.
Additional Information	On September 23 and 24, 2010, representatives of Terracon and MEC met at the site. Locations of the embankments/levees were selected and boring locations staked based on visual observations of current conditions. HGM provided survey cross-sections of the levees, extending into the pond area and beyond the toe on the opposite side from the pond.

2.2 Site Location and Description

Item	Description
Location	The south ash containment pond is located south of the Riverside main plant structure in Bettendorf, Iowa.
Pond Descriptions	Terracon understands that the ponds at RGS are utilized primarily for bottom ash disposal which is deposited in the ponds in a wet condition (sluiced). Terracon understands that the RGS has been in operation since the early 1900's and uses western sub-bituminous coal. It is believed that the pond is used for containment of bottom ash. The south pond is surrounded on three sides by an embankment/levee that extends into the river. Based on our field observations, the south pond appeared to be essentially free of vegetation on the river side and in reasonable good condition with no apparent visible erosion channels or vector issues. However, the pond side of the embankment was vegetated and could not be observed for obvious indications of erosion or vector issues. We understand that both embankments and levees are maintained by MEC.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Profile

Borings were conducted from the levee crest. Subsurface conditions encountered at the borings are described below:

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Stratum 1 (Embankment Fill)	26 to 27 feet	varying concentrations of clay, silt, sand, and gravel	N/A
Stratum 2 [1] (Rock)	28½ feet	weathered limestone	NA

[1] extended to the termination depth of the borings

3.2 Water Level Observations

The boreholes were observed while drilling for the presence and level of groundwater. The water levels observed are noted on the attached boring logs, and are summarized below. The boreholes were grouted after drilling using a cement-bentonite mixture. A relatively long period of time is necessary for water levels to develop and stabilize in a borehole. Longer term monitoring in cased holes or piezometers would be required for a more accurate evaluation of the groundwater conditions.

Boring Number	Observed Water Depth (ft) [1]
	While Drilling
4	14
5	18
6	16
7	11

[1] Below existing grade

Fluctuations of the water levels will occur due to fluctuations in the water level of the Mississippi River, the ash pond, seasonal variations in the amount of rainfall and runoff, and other factors not evident at the time the borings were performed. Subsurface water levels during construction or at other times in the life of the structure will be higher or lower than the levels indicated in the boring logs. Perched water conditions can also develop overlying clay layers. The possibility of groundwater level fluctuations and development of perched water conditions should be considered when developing the design and construction plans for the project.

4.0 GLOBAL STABILITY OF ASH POND EMBANKMENTS

4.1 Mechanics of Slope Stability

In slope stability analyses, the *Factor of Safety* is considered to be the sum of resisting forces (those forces which resist movement) divided by the sum of driving forces (those forces which promote movement). Therefore, for a slope to be stable, the resisting forces must be greater than the driving forces and their ratio, or Factor of Safety, must be greater than 1. The acceptable factor of safety for any particular slope depends upon many factors. Consequences of slope failure are one factor. The extent to which subsurface material properties and geometry are known is another very important factor.

Movements related to instability can occur rapidly or slowly. Analyses techniques are based on principles of mechanics. Input parameters include slope geometry, material strength, presence and orientation of discrete subsurface layers and water (piezometric) pressure.

For this study, slope geometry was taken from survey cross sections supplied by HGM, material strength properties were estimated from available laboratory test data obtained by testing samples obtained from the limited number of exploratory borings and the CPT and VST testing. Subsurface geometry was based on conditions encountered at borings conducted along the crest of embankments. Piezometric surfaces were estimated based on elevations of static water surface levels in the ponds provided by HGM and short term water levels recorded at borings.

4.2.1 Selection of Embankment Sections for Analysis

Survey cross sections of the existing embankments at distinct locations were provided by HGM. Terracon selected two (2) of the provided cross sections for slope stability. Sections A and C were modeled, which correspond to Borings 6 and 7, which were the two borings in which the soils exhibited the weakest consistencies.

4.3 Subsurface Profile and Shear Strength Parameters

Data obtained from our exploratory borings, the topographical survey of the site, and laboratory tests, were used to constitute the slope models for performing global stability analyses of the existing embankments. Our models utilized a river level of 562 feet, and pond water levels of 574 and 575 feet were used for sections A and C, respectively.

Borings, CPT, and VST tests were performed at the crest of the levees. The subsurface profiles for the analysis models were interpreted and extrapolated from the nearest boring. Since borings were only performed at the crest of the existing levees and no information was available regarding the conditions at the toe of the embankments, we considered that stratum elevations encountered at the borings or cone soundings represented a relatively level contact between strata.

The slope stability analyses utilized cohesion and friction angle values determined primarily from correlations with data from index tests performed on the samples recovered from borings and experience with similar soils. Although the tests indicate the soils exhibit cohesion or apparent cohesion under undrained conditions, it is not generally appropriate under effective stress parameters to assign very much, if any, cohesion to these soil types. Doing so would increase the Factors of Safety. The shear strength parameters used in our analyses are summarized below:

Material	Saturated Unit Weight (pcf)	Effective Friction Angle (degrees)	Effective Cohesion (psf)
Sandy Silty Clay (Fill)	100	32	25
Silty Clay (Fill)	100	30	0
Silty Sand (Fill)	100	32	0
Weathered Limestone	135	40	0

4.4 Results of Analyses

Stability analyses were performed for the south pond section using the computer program Slide V5.0. Analyses searched for circular failure arcs on the upstream and downstream slope for the Steady Stage Seepage (effective stress) condition at the maximum pool elevations, and the phreatic lines within the levees were estimated for the model. According to the USGS, the peak ground acceleration is less than 0.10g for the 100-year earthquake at this site. Therefore, no seismic evaluation is required (EC 1110-2-6067 Paragraph 9h.6).

	Estimated Factor of Safety Obtained from Analysis [1]		
	Steady State Seepage		
Section[2]	Required Minimum Factor of Safety [3]	Upstream	Downstream
A	1.4	2.4	1.1
C	1.4	5.7	1.1

1. Reported factors of safety are for deep seated circular "failure" surfaces that emerge near the levee crest. Computed factors of safety for shallow circular "failure" surfaces near the toe of the levee may be smaller.
2. Refer to Ash Pond Plan in Exhibit D-1, for cross section location.
3. Reference: Table 6.1b from EM 1110-2-1913

Models of the two analyzed embankment sections exhibit factors of less than 1.4 for the steady state seepage conditions. The presence of random zones of more dense or gravelly layers within the embankment soils may potentially increase the stability of the embankment above that estimated in our analysis; however, a more rigorous exploration and analysis would be required to evaluate this potential. We recommend that further analyses be conducted to further evaluate

stability of the embankment and to determine what remedial measures may be necessary to improve the Factor of Safety. Graphical results of the slope stability analyses for all cases are in Appendix D.

The analyses were based on the two borings in which the soils exhibited the weakest consistencies. Global stability of pond embankment slopes is dependent upon subsurface conditions at the base of the embankment slopes. Without boring data at the toes of the embankments, conditions at the toe were estimated from the crest borings. Our models do not reflect variations in stratigraphy or shear strength that typically occurs across an embankment section.

5.0 GENERAL COMMENTS

The limited global stability analyses presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. The models for global stability analysis were developed using survey data provided by others. Subsurface stratigraphy for each model was extrapolated from nearby borings; actual conditions may be different and such differences would affect the results of our analyses. More in-depth analyses would require additional exploration and laboratory tests. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident without further exploration.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

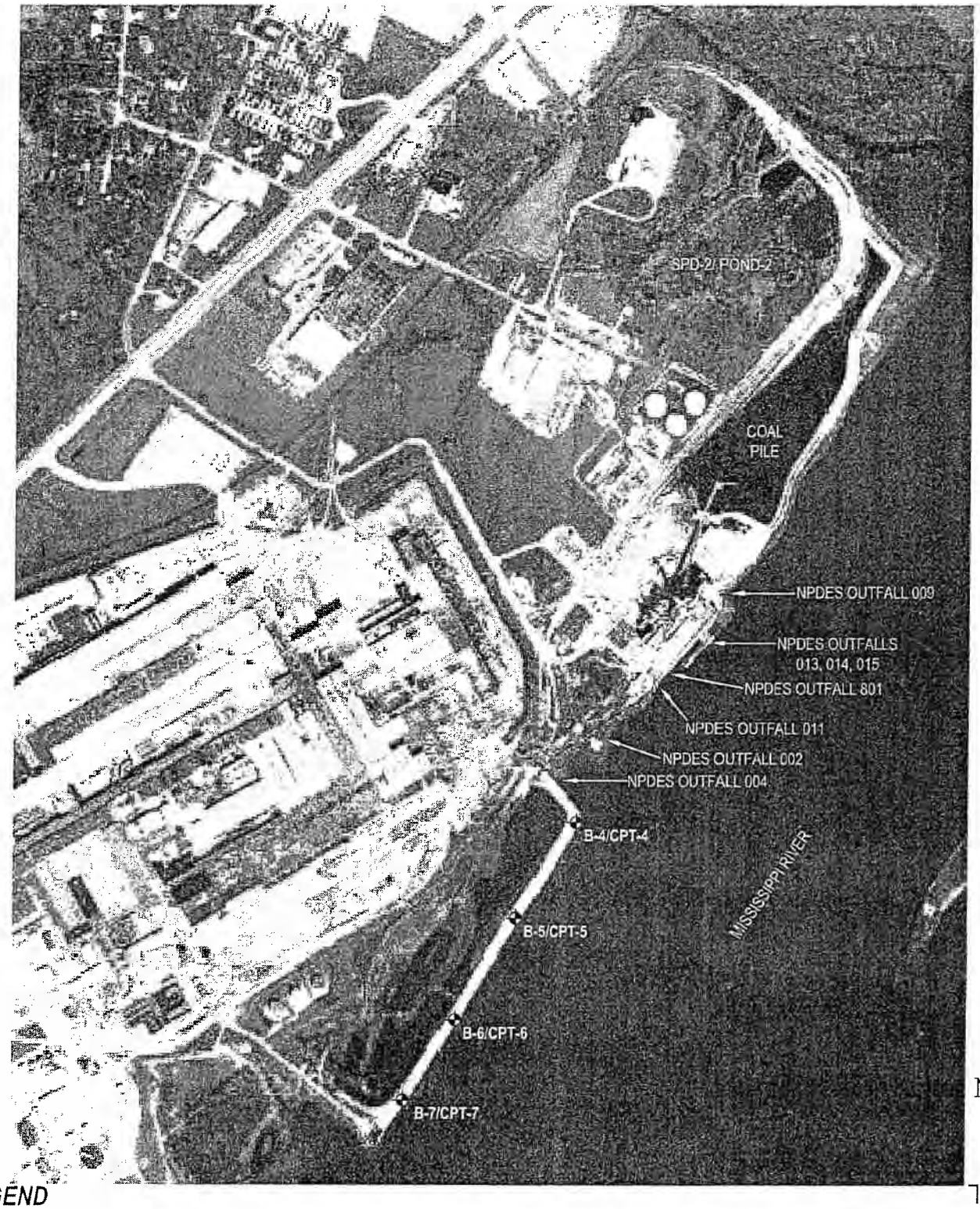
This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that the actual embankment conditions are found to vary from the analyses models described in this report, the analyses and opinions expressed herein shall not be considered valid unless Terracon reviews the actual conditions and further verifies the analyses and opinions of this report in writing.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Vaughn Rupnow, P.E. — Date: 10/27/2010

My license renewal date is December 31, 2010.

APPENDIX A
FIELD EXPLORATION



LEGEND

⌖ APPROXIMATE BORING LOCATION

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

NOT TO SCALE

Project Mngr:	WKB
Drawn By:	DWD
Checked By:	WKB/MRF
Approved By:	WKB

Project No.	07105081
Scale:	AS SHOWN
File No.	GE007105081-1
Date:	OCT. 2010

Terracon
Consulting Engineers and Scientists
870 40th Avenue Bettendorf, Iowa 52722
(563) 355-0702 (563) 355-4789

BORING LOCATION SKETCH

SOUTH ASH CONTAINMENT POND
RIVERSIDE GENERATING STATION
BETTENDORF, IOWA

EXHIBIT

A-1

BORING NO. 4

CLIENT: HGM Associates, Inc.

SITE: Riverside Generating Station, Bettendorf, Iowa

PROJECT: Ash Containment Ponds - South Pond

Boring Location: River Stage

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	Approx. Surface Elev.: 578 ft									
	FILL, SANDY LEAN CLAY Brown and Dark Brown				HS					
				1	ST	9		16	108	2700
	Possible void from 2 feet to 7 feet				HS					
	8 / 570	5								
	FILL, SILT, SAND, AND GRAVEL Dark Gray			2	SS	4	2	21		*1000
	Fine to medium gravel with stiff at Sample 2	10			HS					
	Silty sand and gravel at Sample 3 ▽			3	SS	14	3	41		
		15			HS					
	Sitly fine sand at Sample 4			4	SS	18	WOH	121		
		20			HS					
	Silty clay with sand at Sample 5			5	SS	18	6	30		
	26 / 552	25			HS					
	WEATHERED LIMESTONE*** Light Gray									
	28.5 / 549.5									
	BOTTOM OF BORING			6	SS		50/2"	10		

***Classification of rock materials has been estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

WOH = Sampler advanced the entire sampling interval under the weight of the hammer and rods alone.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Pocket Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 14	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	9-29-10		
BORING COMPLETED	9-29-10		
RIG	550	FOREMAN	SS
APPROVED	VER	JOB #	07105081

BOREHOLE 99 BORING LOGS SOUTH POND.GPJ TERRACON.GDT 10/22/10

BORING NO. 5

CLIENT: HGM Associates, Inc.

SITE: Riverside Generating Station, Bettendorf, Iowa

PROJECT: Ash Containment Ponds - South Pond

Boring Location: River Stage

Approx. Surface Elev.: 580 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
					HS					
	FILL, SANDY SILTY CLAY, TRACE GRAVEL Dark Gray			1	SS	18	3	30		
					HS					
				2	ST	20		42	77	*8000
		5			HS					
				3	ST	22		26	89	*9000
					HS					
				4	SS	16	4	20		*1500
	Higher gravel content below about 6 feet	10			HS					
				5	SS	6	2	21		
		15			HS					
	18 ▽ 562									
	FILL, SILTY FINE SAND, TRACE GRAVEL Dark Gray			6	SS	18	3	51		
		20			HS					
				7	SS	18		50		
		25			HS					
	27 553									
	WEATHERED LIMESTONE* ** Light Gray			8	SS	15	50/0"	13		
	30 550									
	BOTTOM OF BORING									

***Classification of rock materials has been estimated by the drill crew from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Pocket Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 18	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	9-29-10		
BORING COMPLETED	9-29-10		
RIG	550	FOREMAN	SS
APPROVED	VER	JOB #	07105081

BOREHOLE 99 BORING LOGS SOUTH POND.GPJ TERRACON.GDT 10/22/10

Exhibit A-3

BORING NO. 6

CLIENT: HGM Associates, Inc.

SITE: Riverside Generating Station, Bettendorf, Iowa

PROJECT: Ash Containment Ponds - South Pond

Boring Location: River Stage

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	Approx. Surface Elev.: 577 ft									
	FILL, SANDY SILTY CLAY, TRACE GRAVEL Dark Gray				HS					
				1	ST	11		65	50	660
				2	ST	15		85	47	440
		5			HS					
				3	ST	11		94	44	560
				4	ST	18		27	93	370
		10			HS					
				5	SS	16	2	39		*500
	▽	15			HS					
	High gravel content below about 18 feet			6	SS	18	7	31		*1000
		20			HS					
				7	SS	6	2	36		
	26 551	25			HS					
	WEATHERED LIMESTONE* ** Light Gray									
	30 547			8	SS			18		
	BOTTOM OF BORING	30								

***Classification of rock materials has been estimated by the drill crew from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Pocket Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 16	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	9-29-10		
BORING COMPLETED	9-29-10		
RIG	550	FOREMAN	SS
APPROVED	VER	JOB #	07105081

BOREHOLE 99 BORING LOGS SOUTH POND.GPJ TERRACON.GDT 10/22/10

Exhibit A-4

BORING NO. 7

CLIENT: HGM Associates, Inc.

SITE: Riverside Generating Station, Bettendorf, Iowa

PROJECT: Ash Containment Ponds - South Pond

Boring Location: River Stage

Approx. Surface Elev.: 576 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
FILL, SILTY SAND WITH GRAVEL Dark Gray				HS					
			1	SS	8	27	32		*500
High gravel content below about 4 feet			2	HS SS	8	2	31		*1000
	5			HS					
			3	ST	8		30		*1500
8 / 568									
FILL, SILTY CLAY WITH SAND, TRACE GRAVEL Dark Gray ▽			4	HS SS	18	WOH	108		
	10			HS					
			5	SS	10	WOH	65		
	15			HS					
			6	SS	18	WOH	61		
	20			HS					
			7	SS	18	2	60		
	25			HS					
26.5 / 549.5									
WEATHERED LIMESTONE*** Light Gray			8	SS	0	50/0"			
30 / 546									
BOTTOM OF BORING									

***Classification of rock materials has been estimated by the drill crew from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

WOH = Sampler advanced the entire sampling interval under the weight of the hammer and rods alone.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Pocket Penetrometer
**CME 140 lb. SPT automatic hammer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 11	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	9-29-10		
BORING COMPLETED	9-29-10		
RIG	550	FOREMAN	SS
APPROVED	VER	JOB #	07105081

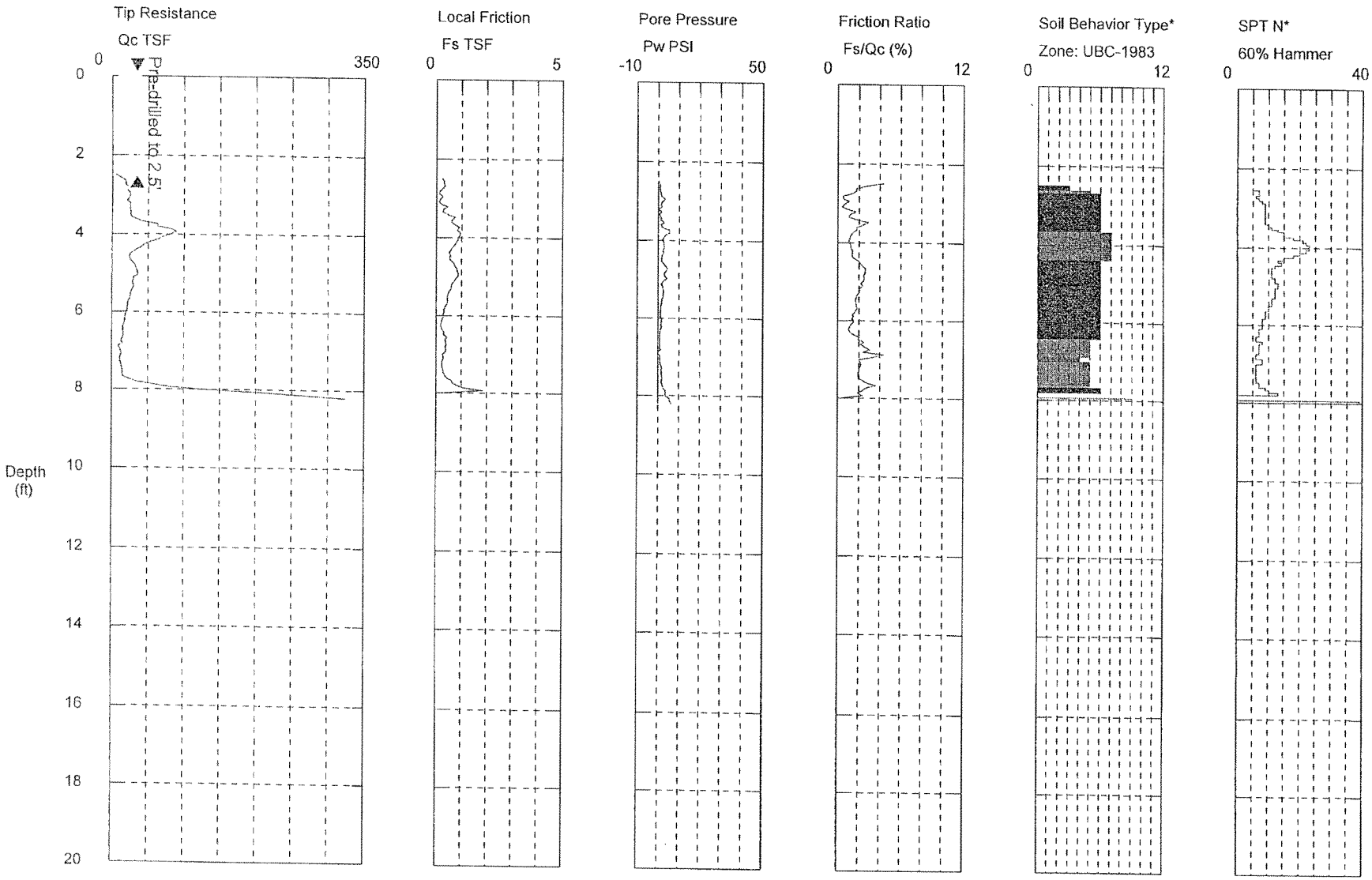
BOREHOLE 99 BORING LOGS SOUTH POND.GPJ TERRACON.GDT 10/22/10

Exhibit A-5

Terracon

Operator: GF Jr
Sounding: CPT-5a
Cone Used: DSG1119

CPT Date/Time: 10/20/2010 4:48:27 PM
Location: Ash Containment Pond
Job Number: 07105081



Maximum Depth = 8.20 feet

Depth Increment = 0.066 feet

1 sensitive fine grained
2 organic material
3 clay
Pre-Drill 2' 6"

4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt

7 silty sand to sandy silt
8 sand to silty sand
9 sand

10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

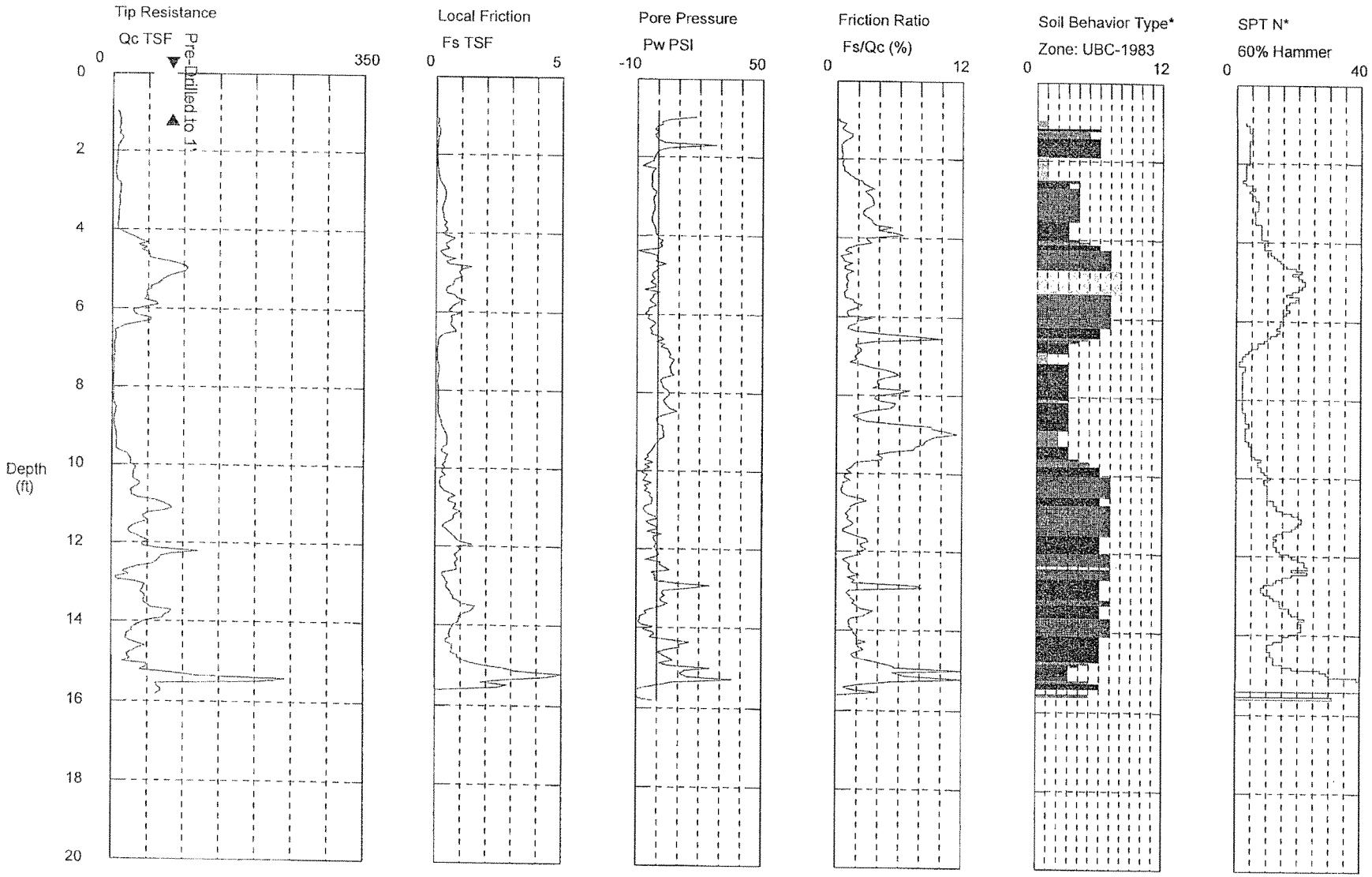
*Soil behavior type and SPT based on data from UBC-1983

Exhibit A-6

Terracon

Operator: GF Jr
Sounding: CPT-6
Cone Used: DSG1119

CPT Date/Time: 10/20/2010 3:13:23 PM
Location: Ash Containment Pond
Job Number: 07105081



Maximum Depth = 15.81 feet

Depth Increment = 0.066 feet

1 sensitive fine grained
2 organic material
3 clay
Pre-Drill 12"

4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt

7 silty sand to sandy silt
8 sand to silty sand
9 sand

10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

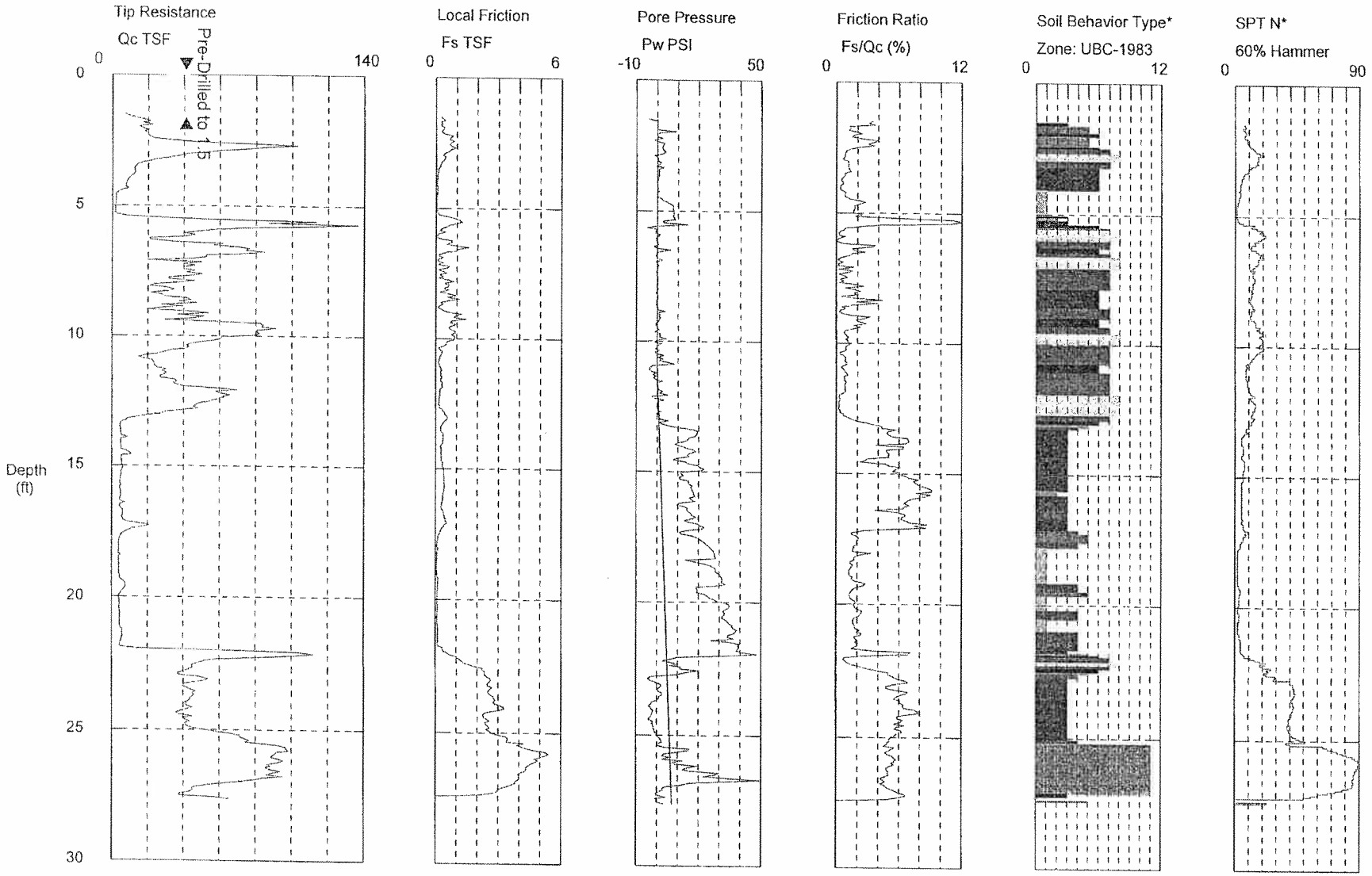
*Soil behavior type and SPT based on data from UBC-1983

Exhibit A-7

Terracon

Operator: GF Jr
Sounding: CPT-7b
Cone Used: DSG1119

CPT Date/Time: 10/20/2010 1:34:07 PM
Location: Ash Containment Pond
Job Number: 07105081



Maximum Depth = 27.62 feet

Depth Increment = 0.066 feet

1 sensitive fine grained
2 organic material
3 clay
Pre-Drill to 1.5'

4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt

7 silty sand to sandy silt
8 sand to silty sand
9 sand

10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

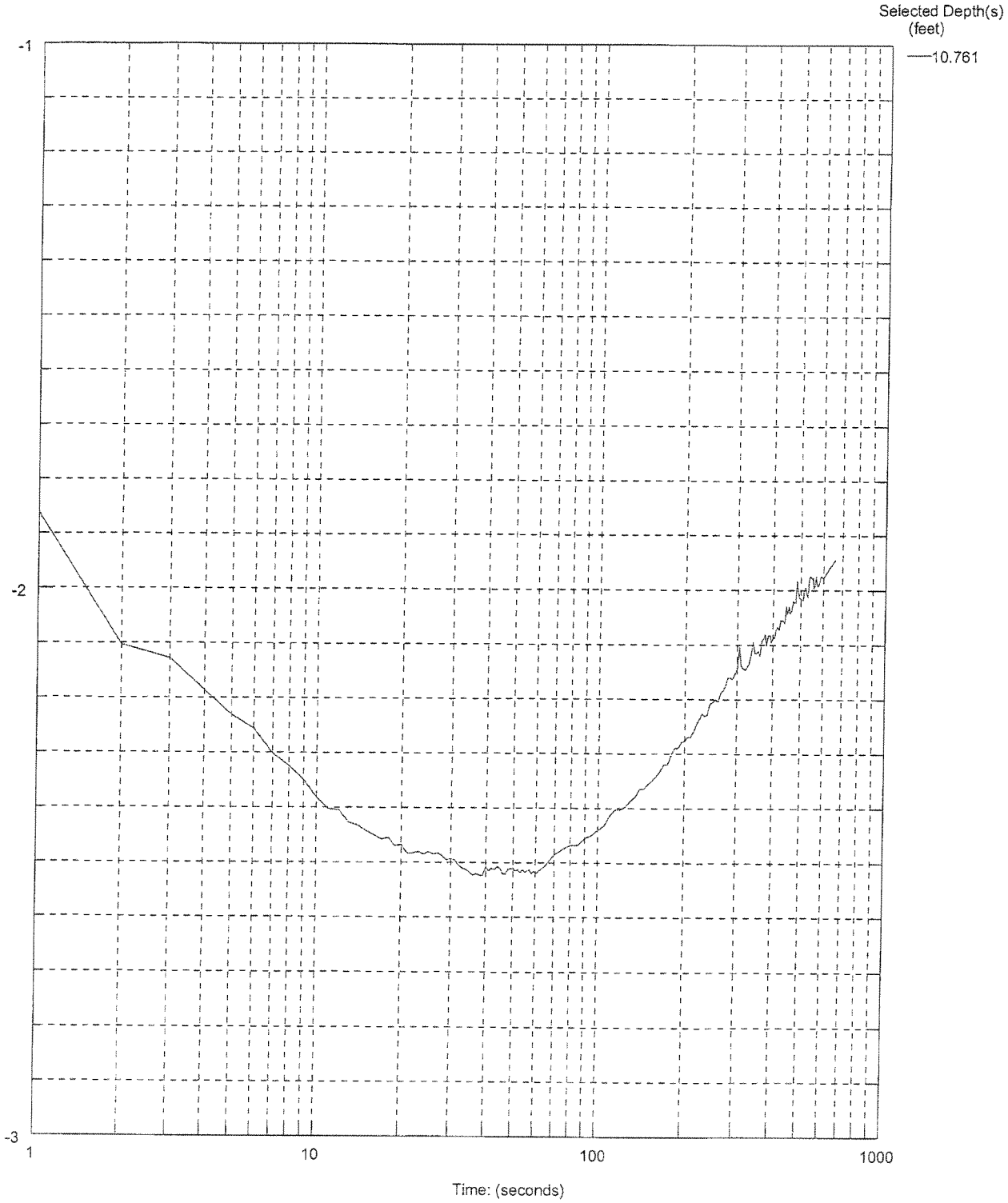
*Soil behavior type and SPT based on data from UBC-1983

Exhibit A-8

Terracon

Operator GF Jr
Sounding: CPT-6
Cone Used: DSG1119

CPT Date/Time: 10/20/2010 3:13:23 PM
Location: Ash Containment Pond
Job Number: 07105081



Maximum Pressure = -1.852 psi
Hydrostatic Pressure = 4.67 psi

PLOTTED BY - jw
PLOTTED ON - 12/02/08

Exhibit A-9

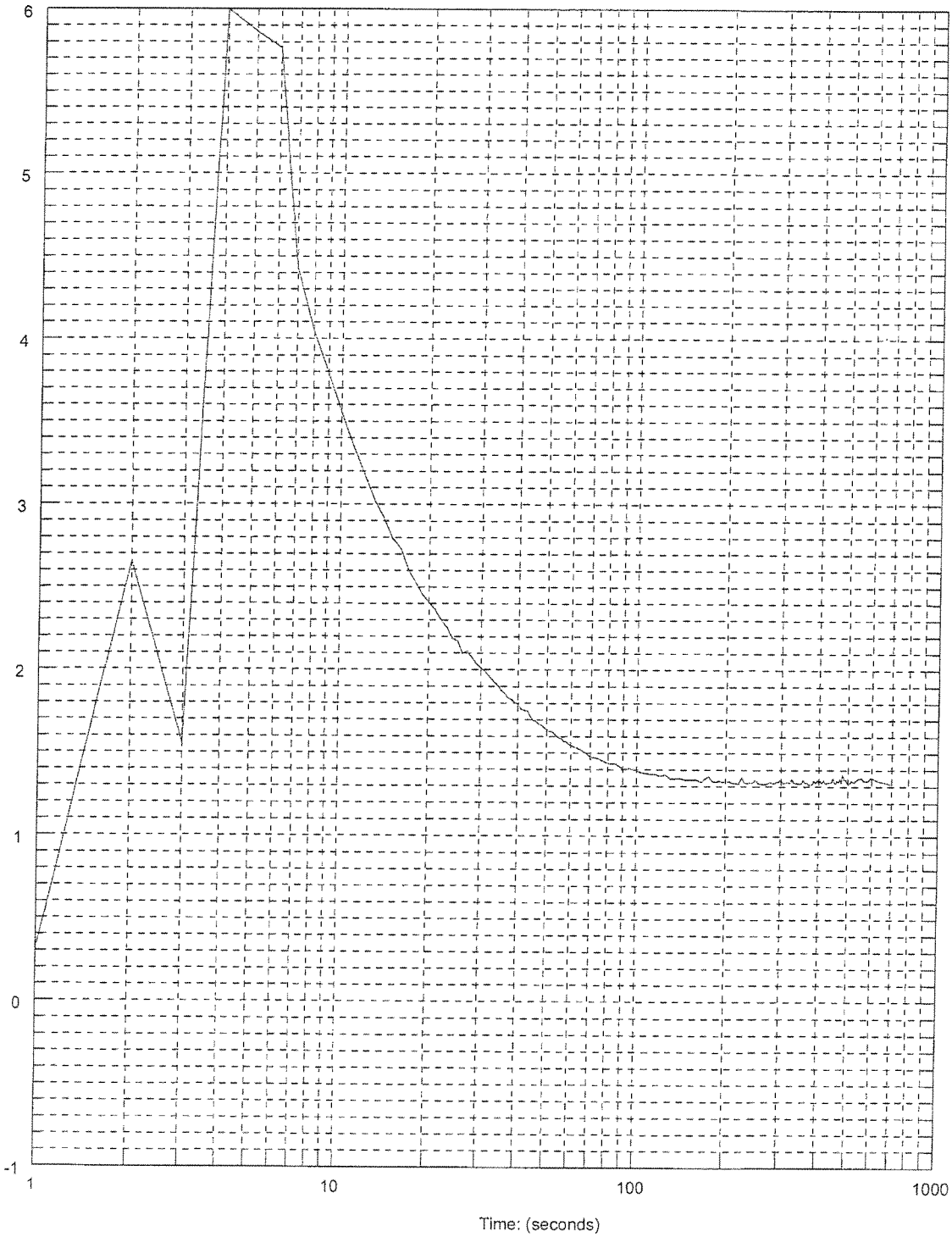
Terracon

Operator GF Jr
Sounding: CPT-6
Cone Used: DSG1119

CPT Date/Time: 10/20/2010 3:13:23 PM
Location: Ash Containment Pond
Job Number: 07105081

Selected Depth(s) (feet)

13.714



Maximum Pressure = 5.996 psi
Hydrostatic Pressure = 5.952 psi

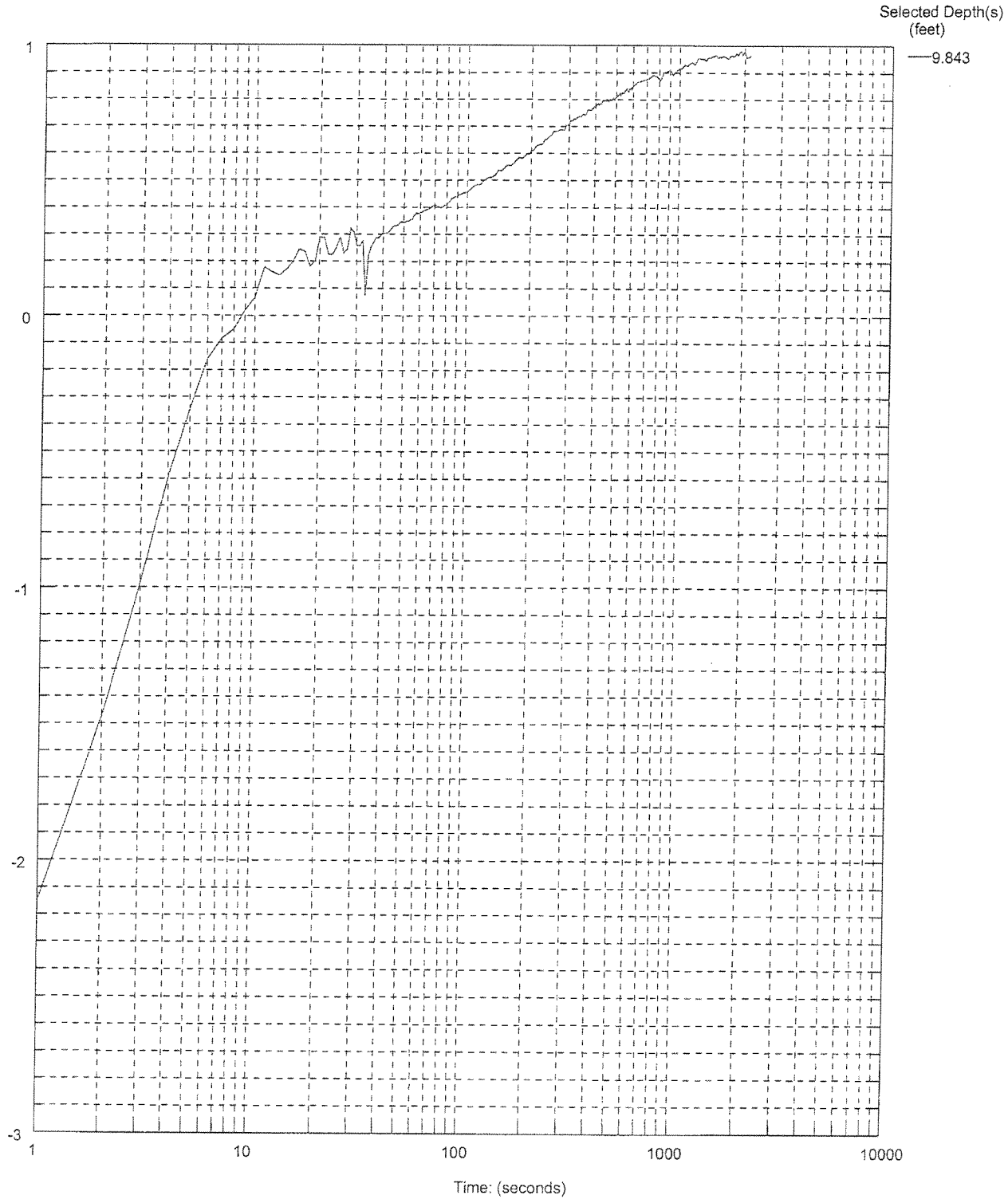
PLOTTED BY - jw
PLOTTED ON - 12/02/08

Exhibit A-10

Terracon

Operator GF Jr
Sounding: CPT-7b
Cone Used: DSG1119

CPT Date/Time: 10/20/2010 1:34:07 PM
Location: Ash Containment Pond
Job Number: 07105081



Maximum Pressure = 0.981 psi
Hydrostatic Pressure = 4.272 psi

PLOTTED BY - jw
PLOTTED ON - 12/02/08

Exhibit A-11

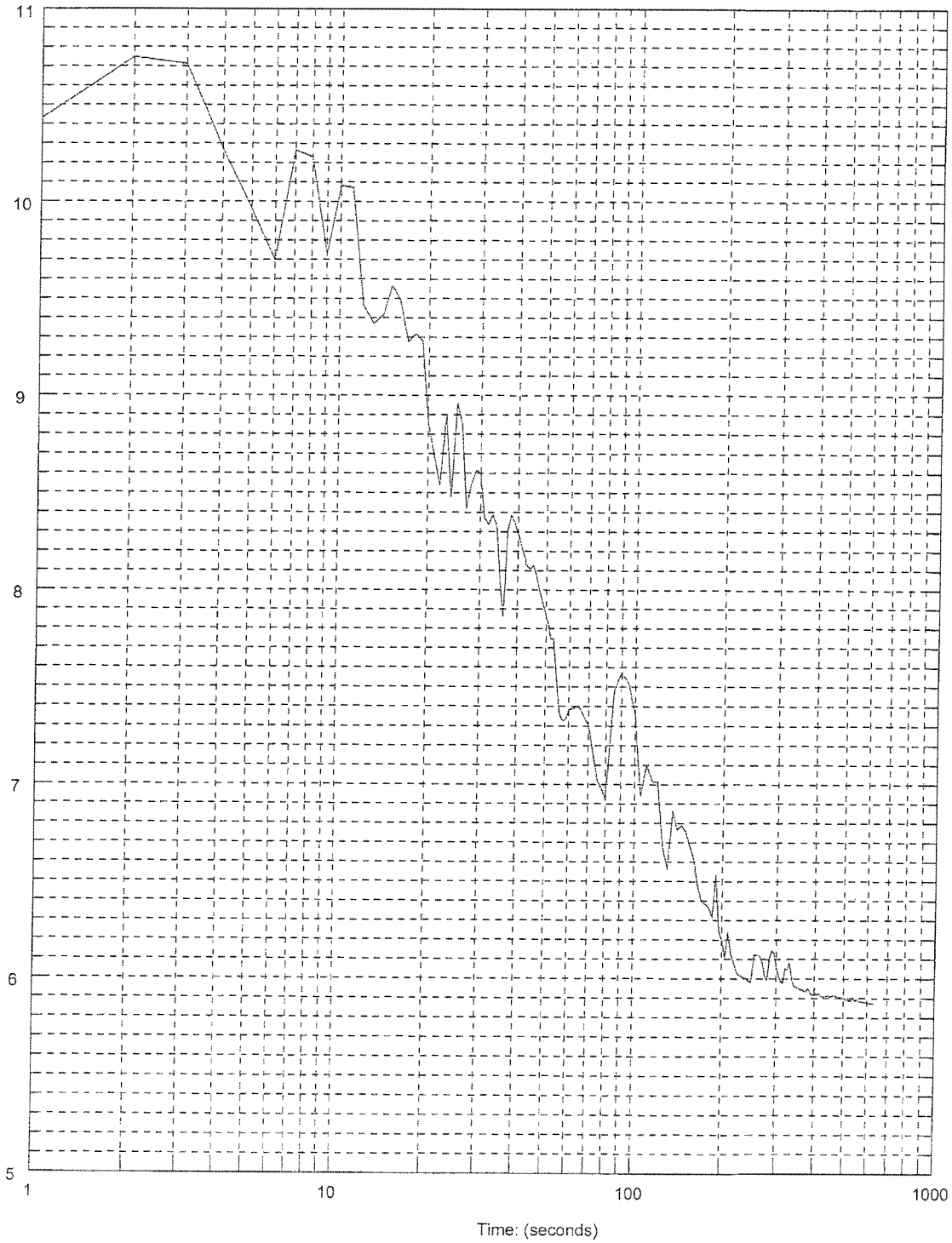
Terracon

Operator GF Jr
Sounding: CPT-7b
Cone Used: DSG1119

CPT Date/Time: 10/20/2010 1:34:07 PM
Location: Ash Containment Pond
Job Number: 07105081

Selected Depth(s) (feet)

20.932

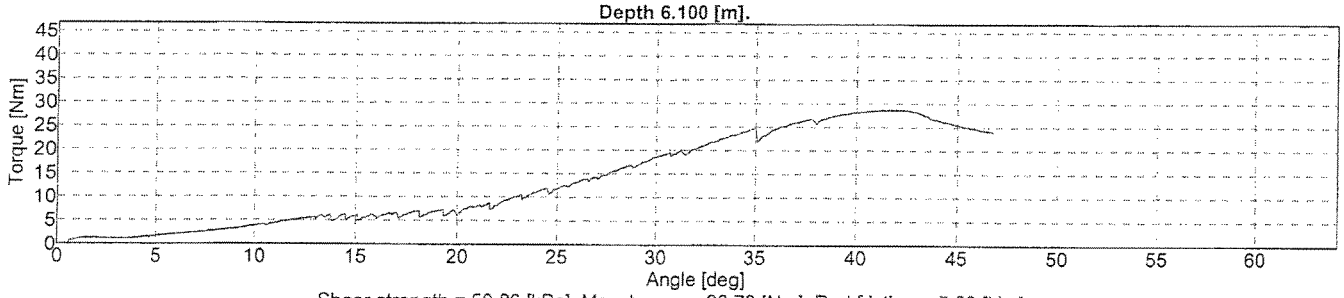


Maximum Pressure = 10.748 psi
Hydrostatic Pressure = 9.084 psi

PLOTTED BY - jw
PLOTTED ON - 12/02/08

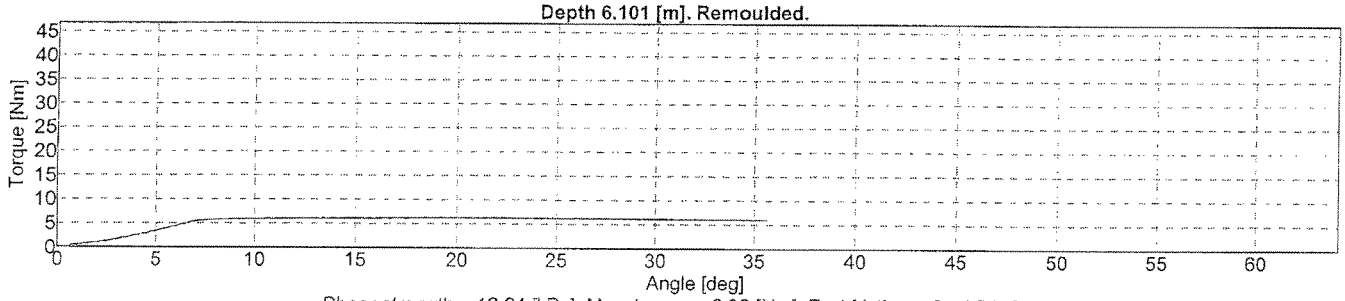
Exhibit A-12

Depth 6.100 [m].



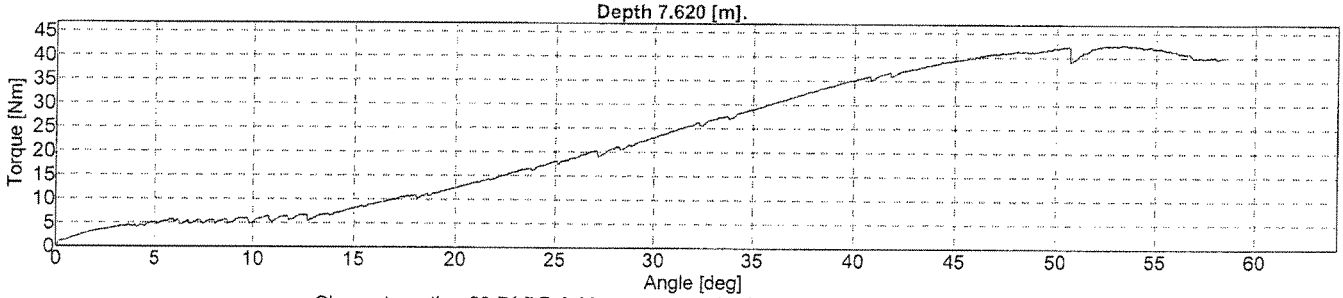
Shear strength = 50.86 [kPa], Max. torque = 28.72 [Nm], Rod friction = 5.60 [Nm]

Depth 6.101 [m]. Remoulded.



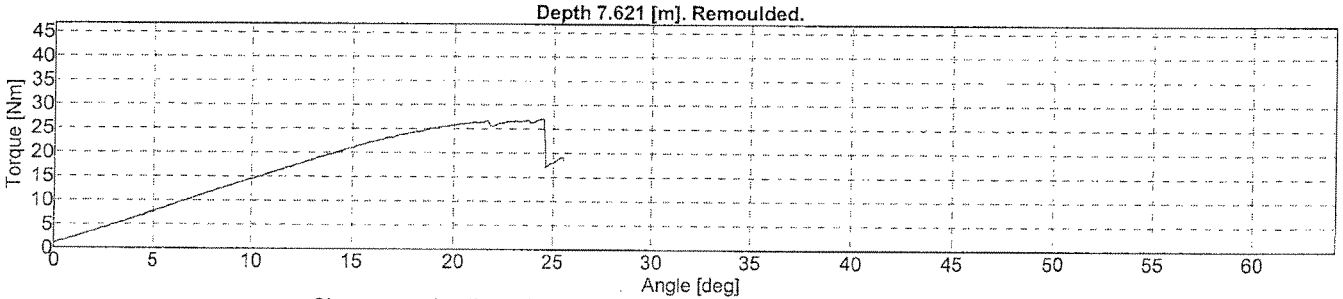
Shear strength = 12.94 [kPa], Max. torque = 6.32 [Nm], Rod friction = 0.44 [Nm]

Depth 7.620 [m].



Shear strength = 82.74 [kPa], Max. torque = 42.54 [Nm], Rod friction = 4.93 [Nm]

Depth 7.621 [m]. Remoulded.

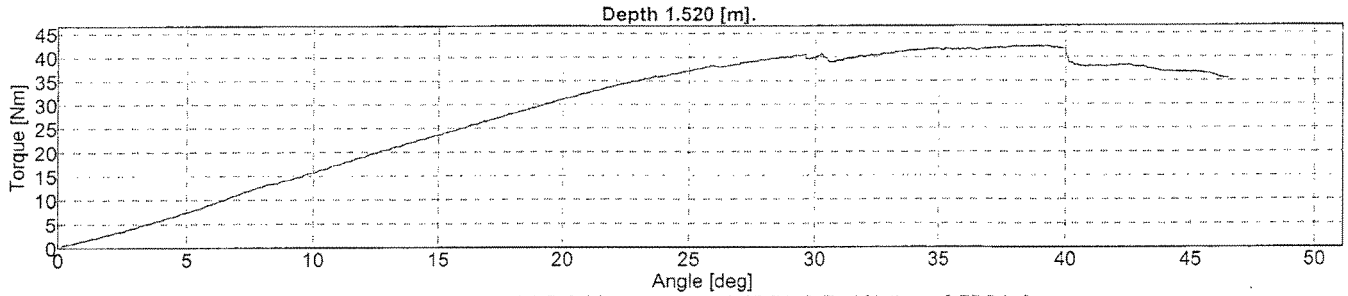


Shear strength = 56.52 [kPa], Max. torque = 27.02 [Nm], Rod friction = 1.33 [Nm]

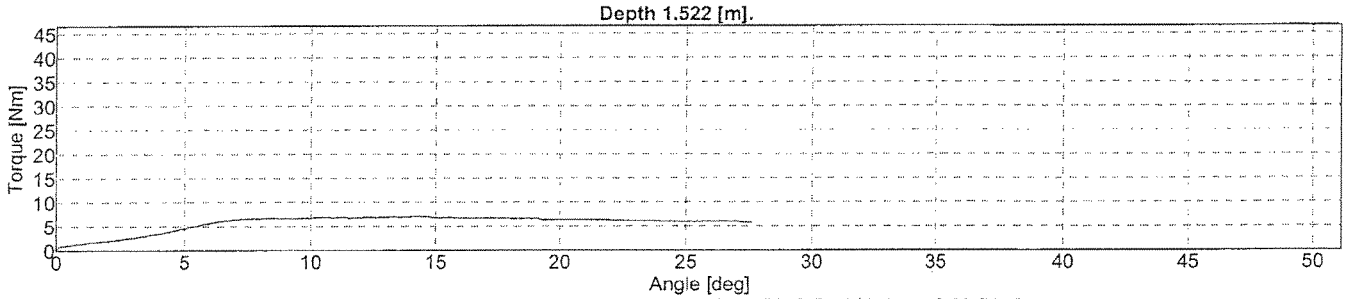
Terracon
Consulting Engineers & Scientists

Location: Riverside Generating Station	Position: See Location Diagram	Ground level: 578	Test ID: B-4
Project ID: 07105081	Client: HGM Associates, Inc	Date: 10/21/2010	Scale: 1:100
Project: Ash Containment Pond Embankments		Page: 1/1	Fig.: VST-1
Vane type & size: Rectangular end, 10.0 x 5.0 cm		File: Iowa B-4.vct	

Exhibit A-13



Shear strength = 91.52 [kPa], Max. torque = 42.35 [Nm], Rod friction = 0.75 [Nm]

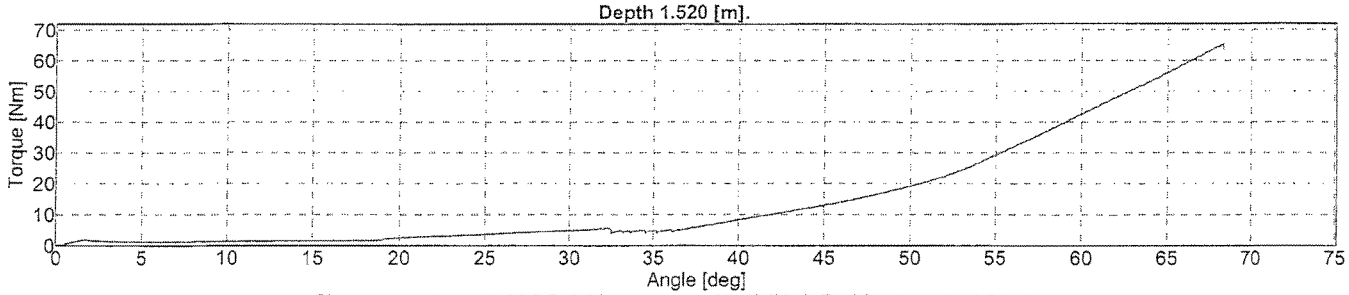


Shear strength = 13.53 [kPa], Max. torque = 7.07 [Nm], Rod friction = 0.92 [Nm]

Terracon
Consulting Engineers & Scientists

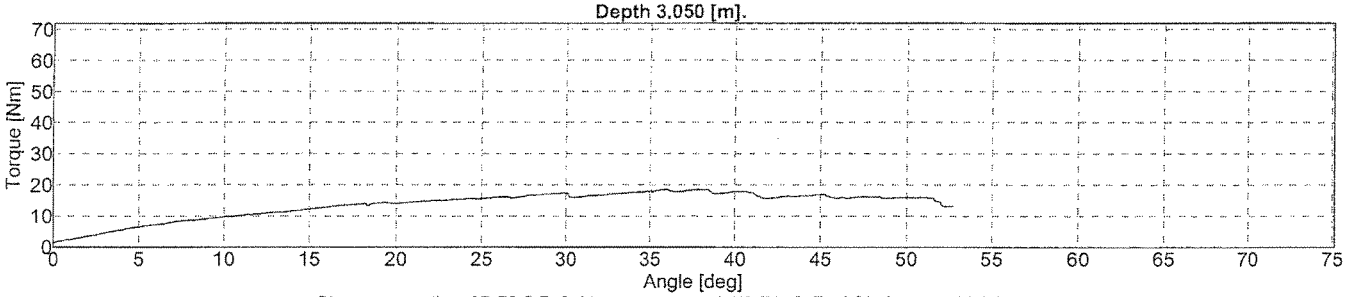
Location	Position	Ground level	Test ID.
Riverside Generating Station	See Location Diagram	580	B-5
Project ID	Client	Date	Scale
07105081	HGM Associates, Inc.	10/21/2010	1:100
Project		Page	Fig.
Ash Containment Pond Embankments		1/1	VST-2
Vane type & size		File	
Rectangular end, 10.0 x 5.0 cm		Iowa B-5.vct	

Depth 1.520 [m].



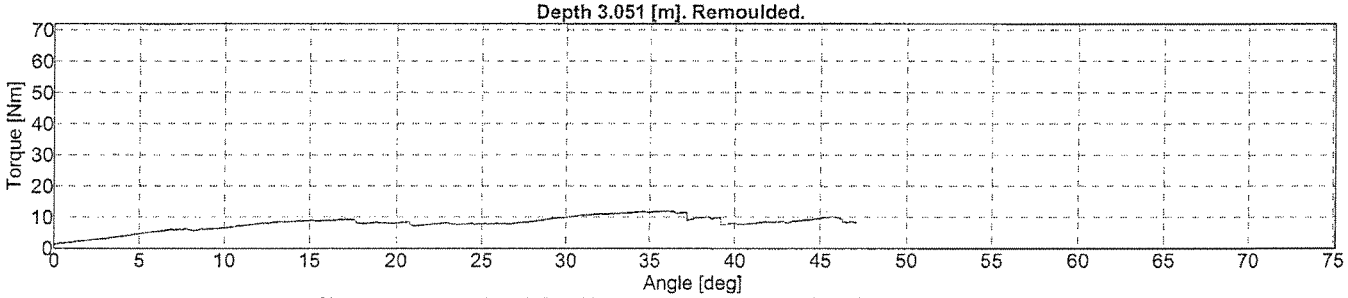
Shear strength = 140.65 [kPa], Max. torque = 65.42 [Nm], Rod friction = 1.49 [Nm]

Depth 3.050 [m].



Shear strength = 37.73 [kPa], Max. torque = 18.59 [Nm], Rod friction = 1.44 [Nm]

Depth 3.051 [m]. Remoulded.

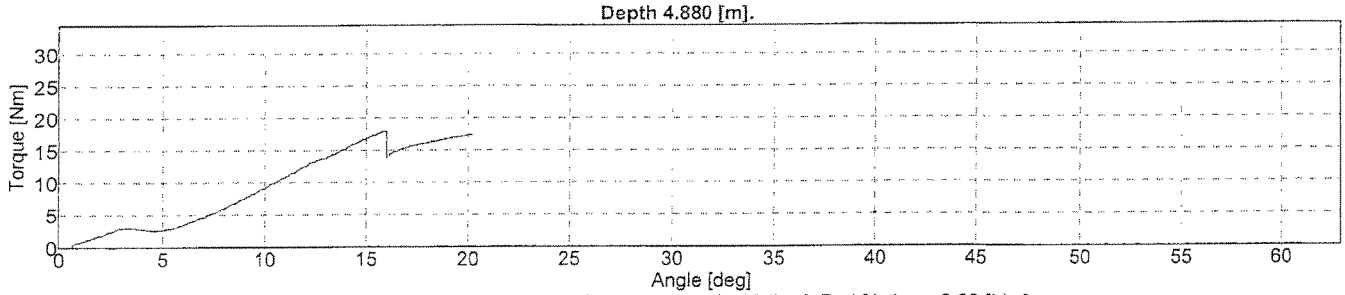


Shear strength = 23.43 [kPa], Max. torque = 11.98 [Nm], Rod friction = 1.33 [Nm]

Terracon
Consulting Engineers & Scientists

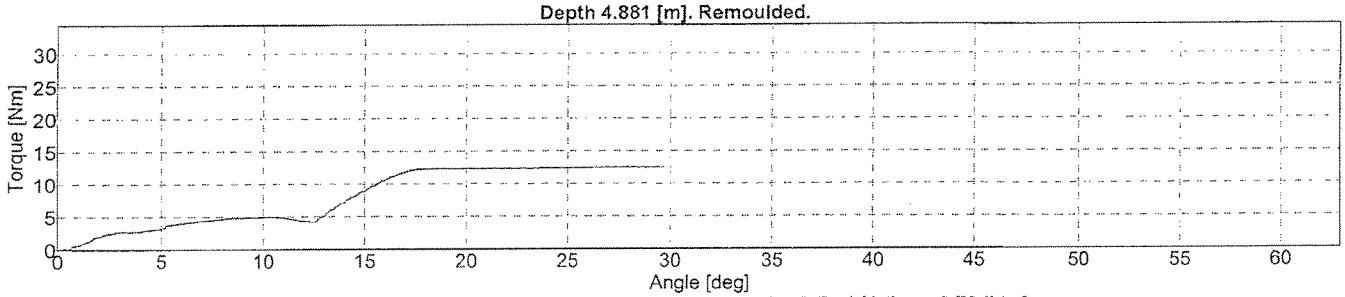
Location: Riverside Generating Station	Position: See Location Diagram	Ground level: 577	Test ID.: B-6
Project ID: 07105081	Client: HGM Associates, Inc.	Date: 10/21/2010	Scale: 1:100
Project: Ash Containment Pond Embankments		Page: 1/1	Fig.: VST-3
Vane type & size: Rectangular end, 10.0 x 5.0 cm		File: Iowa B-6.vct	

Depth 4.880 [m].



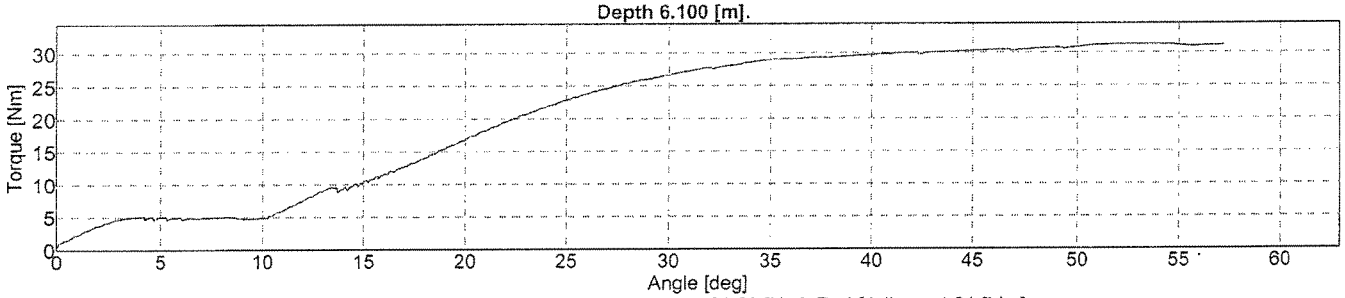
Shear strength = 33.57 [kPa], Max. torque = 17.92 [Nm], Rod friction = 2.66 [Nm]

Depth 4.881 [m]. Remoulded.



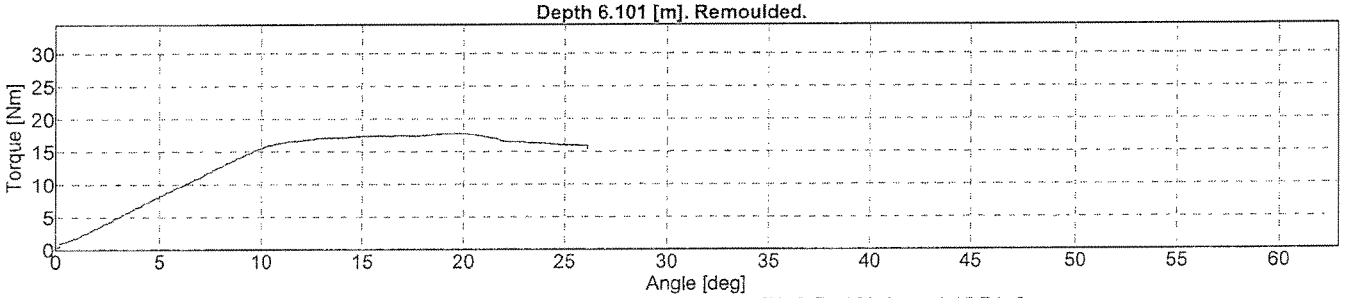
Shear strength = 21.63 [kPa], Max. torque = 12.53 [Nm], Rod friction = 2.70 [Nm]

Depth 6.100 [m].



Shear strength = 58.28 [kPa], Max. torque = 31.30 [Nm], Rod friction = 4.81 [Nm]

Depth 6.101 [m]. Remoulded.



Shear strength = 36.50 [kPa], Max. torque = 17.74 [Nm], Rod friction = 1.15 [Nm]

Terracon
Consulting Engineers & Scientists

Location: Riverside Generating Station	Position: See Location Diagram	Ground level: 576	Test ID.: B-7
Project ID: 07105081	Client: HGM Associtates, Inc.	Date: 10/21/2010	Scale: 1:100
Project: Ash Containment Pond Embankments		Page: 1/1	Fig.: VST-4
Vane type & size: Rectangular end, 10.0 x 5.0 cm		File: IowaB-7-1.vct	

Exhibit A-16

Field Exploration Description

The borings and CPT soundings were performed at the locations selected by Terracon and MEC as shown on the attached Boring Location Sketch (Exhibit A-1). Ground surface elevations indicated on the boring logs are approximate and have been rounded to the nearest foot. The elevations were estimated from the levee cross sections provided by HGM Associates, Inc. The elevations of the soil borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were advanced with a track-mounted drilling rig utilizing continuous flight hollow-stem augers to advance the boreholes. Representative soil samples were obtained using both thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is hydraulically pushed into the ground to obtain samples of cohesive and moderately cohesive soils. In the split-barrel sampling procedure, a standard 2-inch (outside diameter) split-barrel sampling spoon is driven into the ground with a 140-pound Central Mine Equipment (CME) automatic SPT hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value and are provided on the boring logs at their depths of occurrence. The blow counts, also referred to as SPT N-values are used to help estimate the relative density of granular soil and the consistency of cohesive soils. The samples were transported to our laboratory for testing and classification. The boreholes were grouted with a cement-bentonite slurry.

The drill crew prepared a field log for each boring. Each log included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The 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.

The CPT soundings were performed using ATV-mounted equipment. The CPT procedure involves hydraulically advancing a steel cone shaped device attached to steel rods with flush-joint couplings. The sounding unit has electronic strain gauges that measure the point resistance, sleeve friction and pore-water pressure. A depth encoder device monitors penetration as the rods are hydraulically pushed into the ground. The system is interfaced with a computer that records the referenced parameters every two to four centimeters. These parameters can be correlated to a variety of soil properties, including strength and density. The in-situ data and the approximate soil types empirically estimated from the data are reported on the attached CPT sounding logs.

The VST analyses were performed with a Geotech EVT 2000 Electrical Field Vane Apparatus using a 65mm by 130mm rectangular end vane within borings at target depths. At the beginning of each test, apparent rod friction was measured during initial rotation through a 20-degree slip-coupling. Remolded tests were performed at selected depths after the initial test and after rotating the vane through 10 revolutions.

APPENDIX B
LABORATORY TESTING

Laboratory Testing

The samples obtained from the borings were tested in our laboratory to determine their water contents. Dry densities were obtained and unconfined compressive strength tests were performed on selected tube samples. A pocket penetrometer was used to help estimate the approximate unconfined compressive strength of some cohesive samples. The pocket penetrometer provides a better estimate of soil consistency than visual examination alone. The laboratory test results are presented on the boring logs.

The soil samples were classified in the laboratory based on visual observation, texture and plasticity. The soil descriptions and estimated group symbols presented on the boring logs for native soils are in general accordance with the Unified Soil Classification System (USCS) and the attached General Notes. A summary of the USCS is also attached.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon – 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 3" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0-1	Very Soft
500 – 1,000	2-4	Soft
1,001 – 2,000	4-8	Medium Stiff
2,001 – 4,000	8-15	Stiff
4,001 – 8,000	15-30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
> 50	> 99	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

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

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other Constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	> 30

GENERAL NOTES

Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz, ($Si0_2$), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (½ inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

DEGREE OF WEATHERING:

SLIGHT	Slight decomposition of parent material on joints. May be color change.
MODERATE	Some decomposition and color change throughout.
HIGH	Rock highly decomposed, may be extremely broken.

Classification of rock materials has been estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	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 [D]	$Cu \geq 6$ 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,Q]
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] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[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.

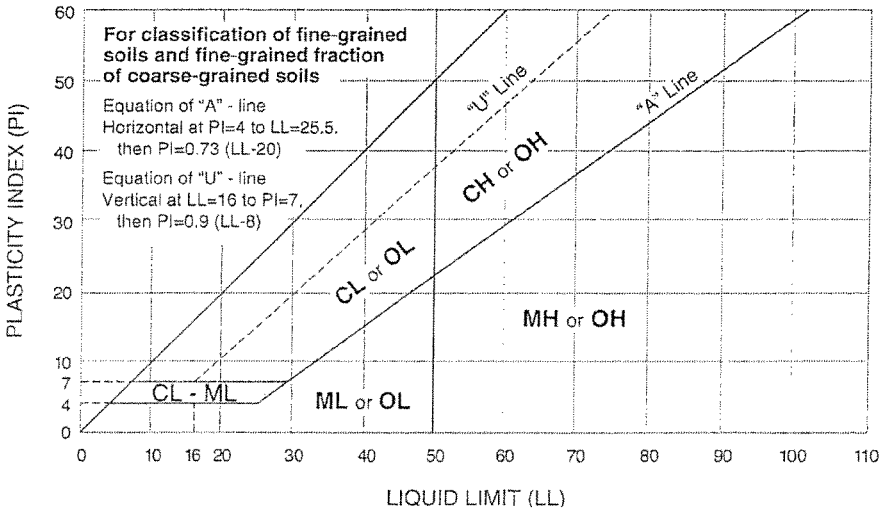
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

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

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

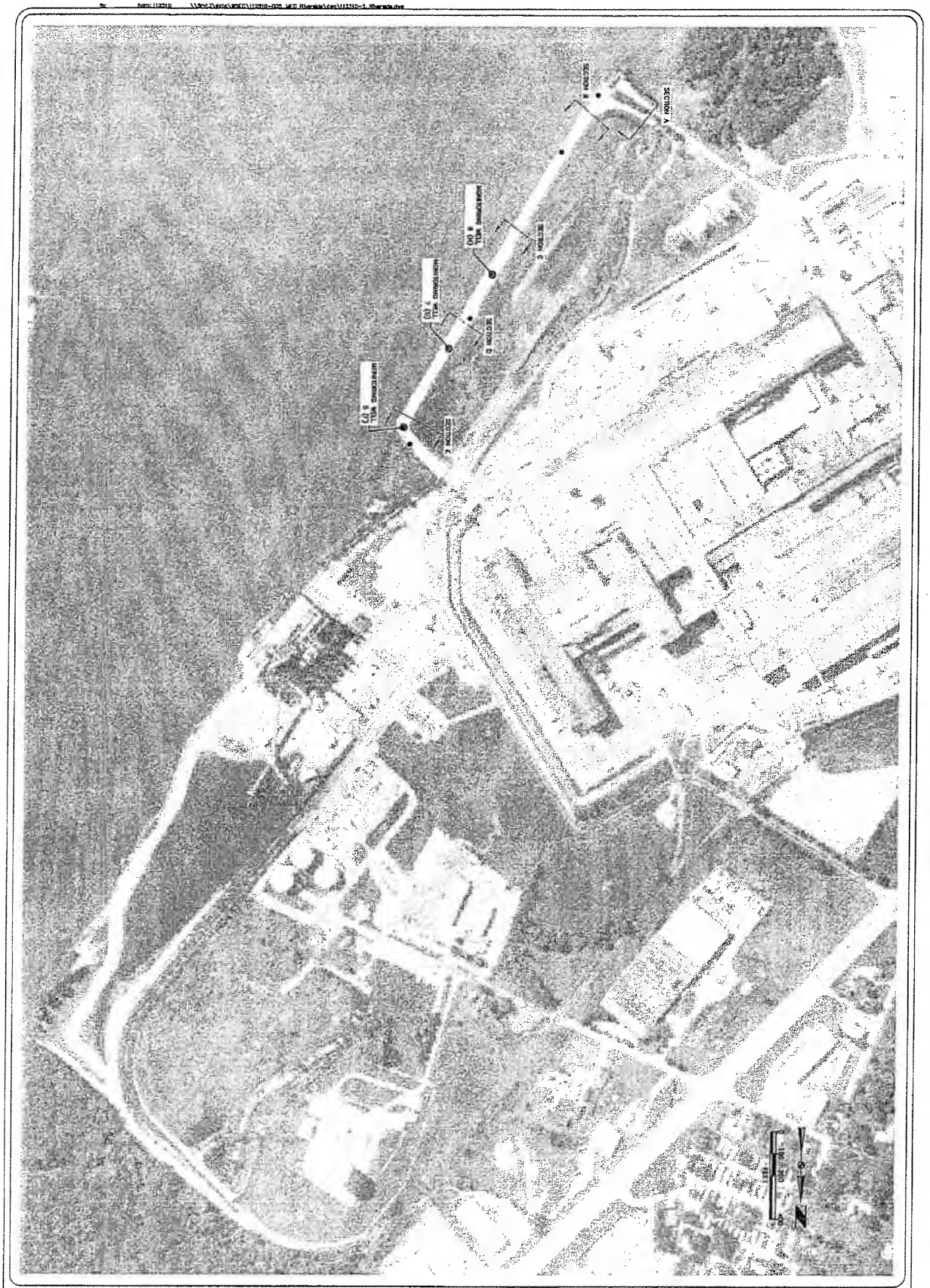
[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



APPENDIX D

Slope Stability Analyses



project RIVERSIDE IMPOUNDMENT PONDS
BERM STABILITY

client MIDAMERICAN ENERGY COMPANY
7215 NAVAJO STREET, COUNCIL BLUFFS, IOWA 51501

sheet SOUTH POND SITE PLAN

project no. 112510

sheet 1 OF 2

DEF drawn

DEF designed

TLS approved

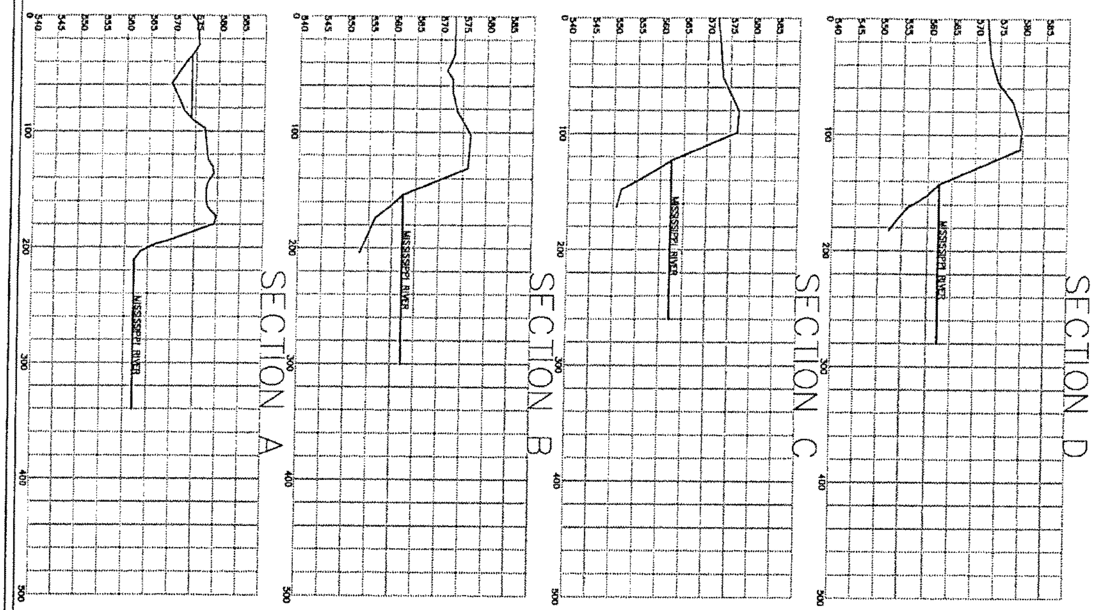
SEPT '10 date

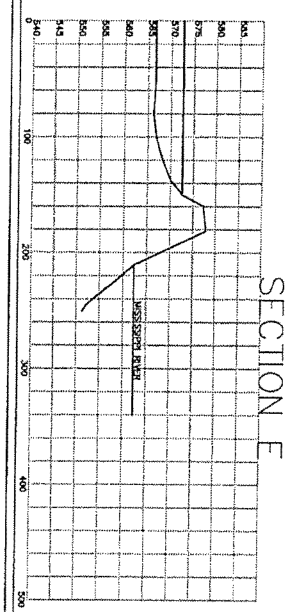
revision

date

hgm
ASSOCIATES INC.
640 FIFTH AVENUE COUNCIL BLUFFS, IOWA
PHONE: (712) 323-0530

Exhibit D-1





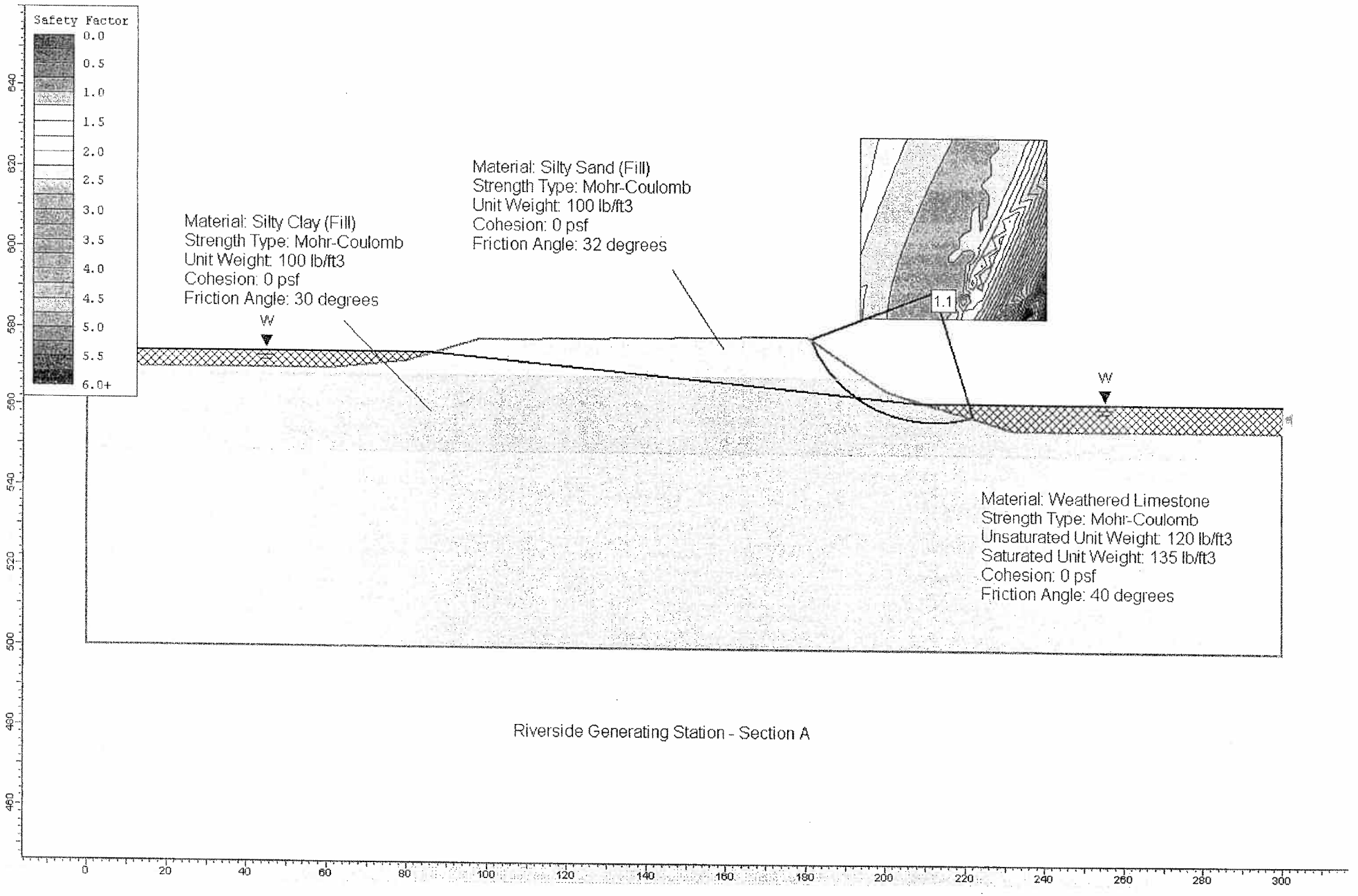
project no.	112510
sheet	2 OF 2

project RIVERSIDE IMPOUNDMENT PONDS
BERM STABILITY
client MIDAMERICAN ENERGY COMPANY
7215 NAVAJO STREET, COUNCIL BLUFFS, IOWA 51501
sheet **SOUTH POND CROSS SECTIONS**

drawn	DEF
designed	DEF
approved	TLS
date	SEPT '10

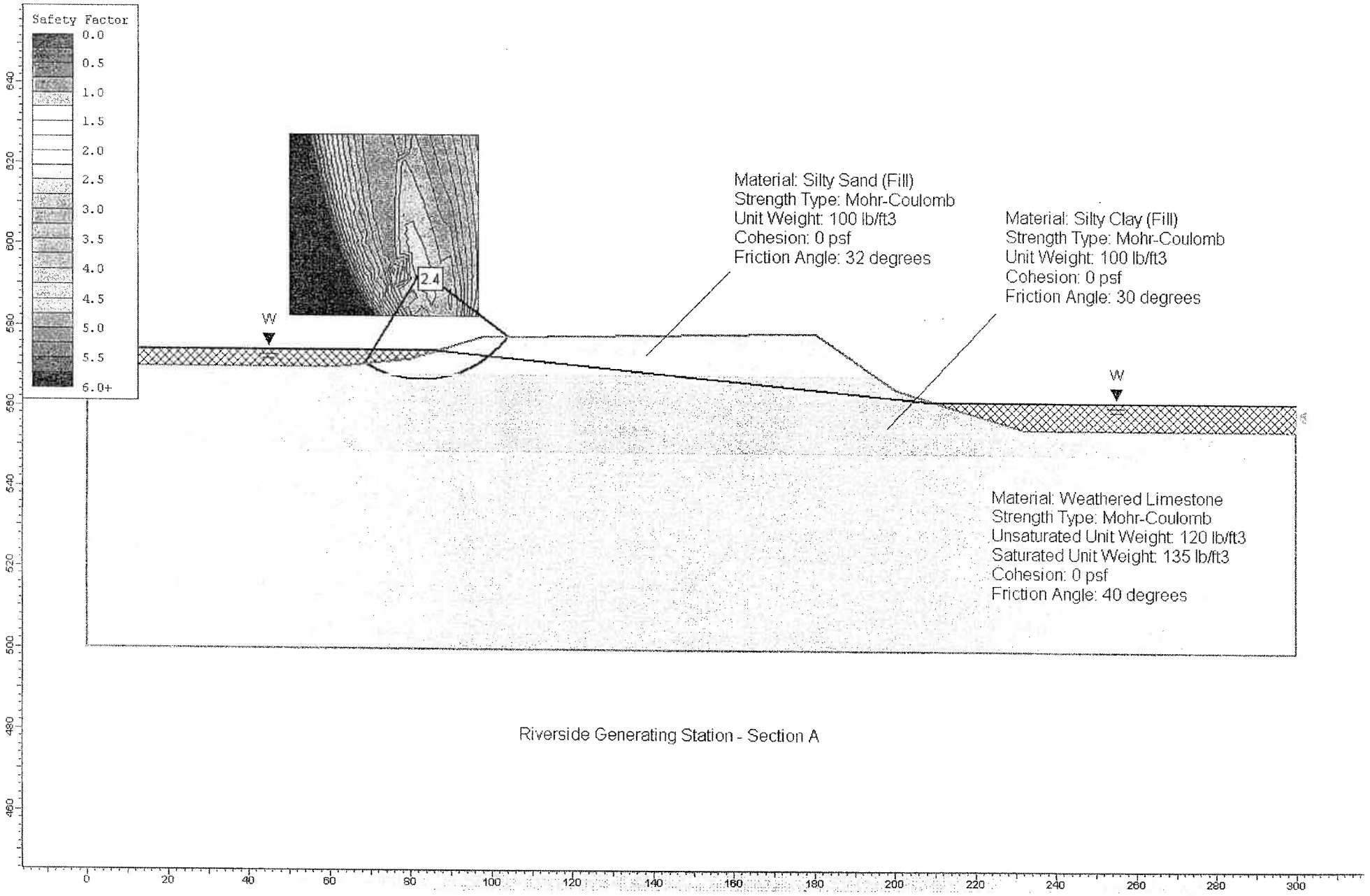
hgm ASSOCIATES INC.
640 FIFTH AVENUE COUNCIL BLUFFS, IOWA
PHONE: (712) 323-0530

Exhibit D-2



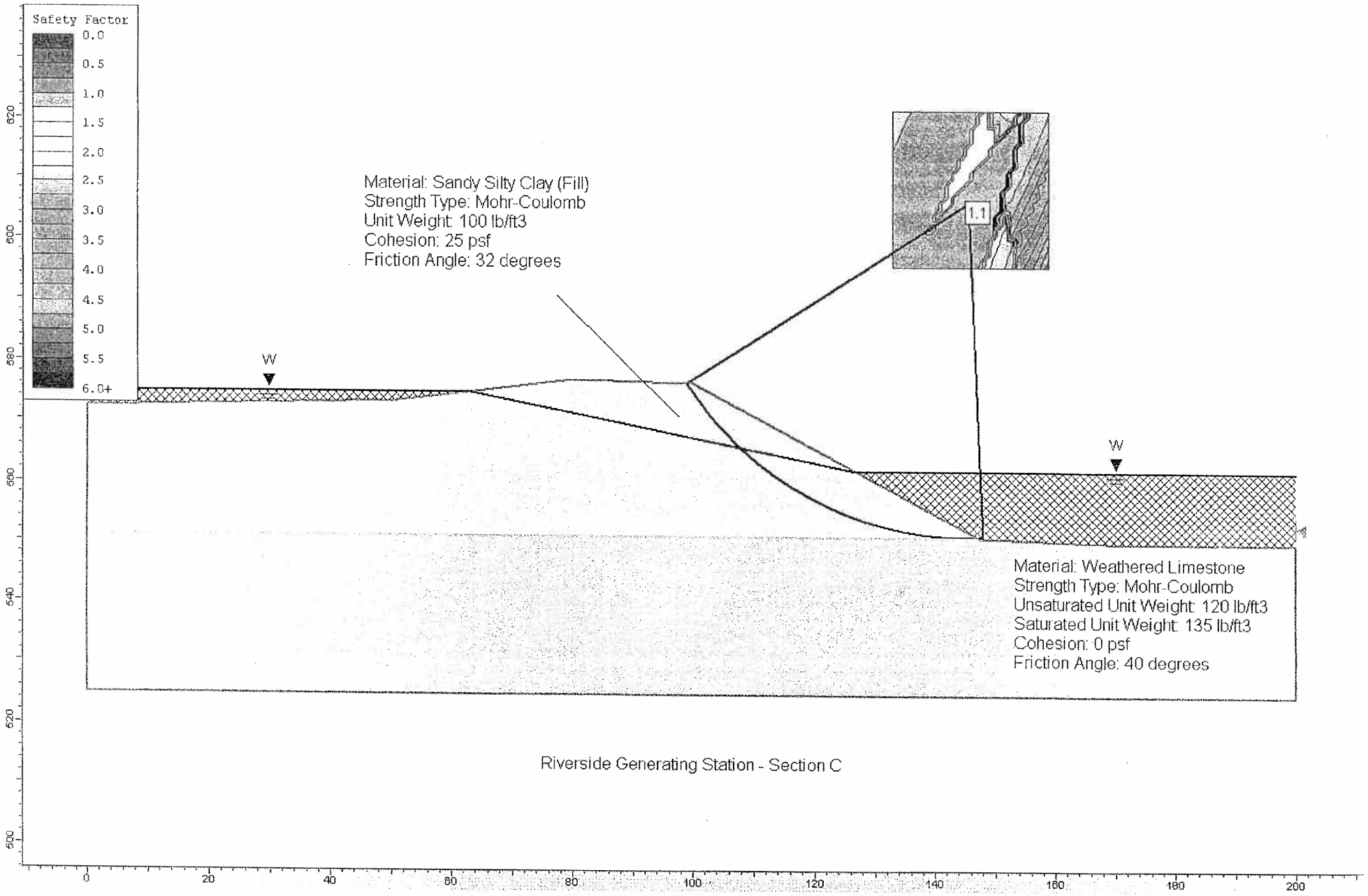
Riverside Generating Station - Section A

Exhibit D-3



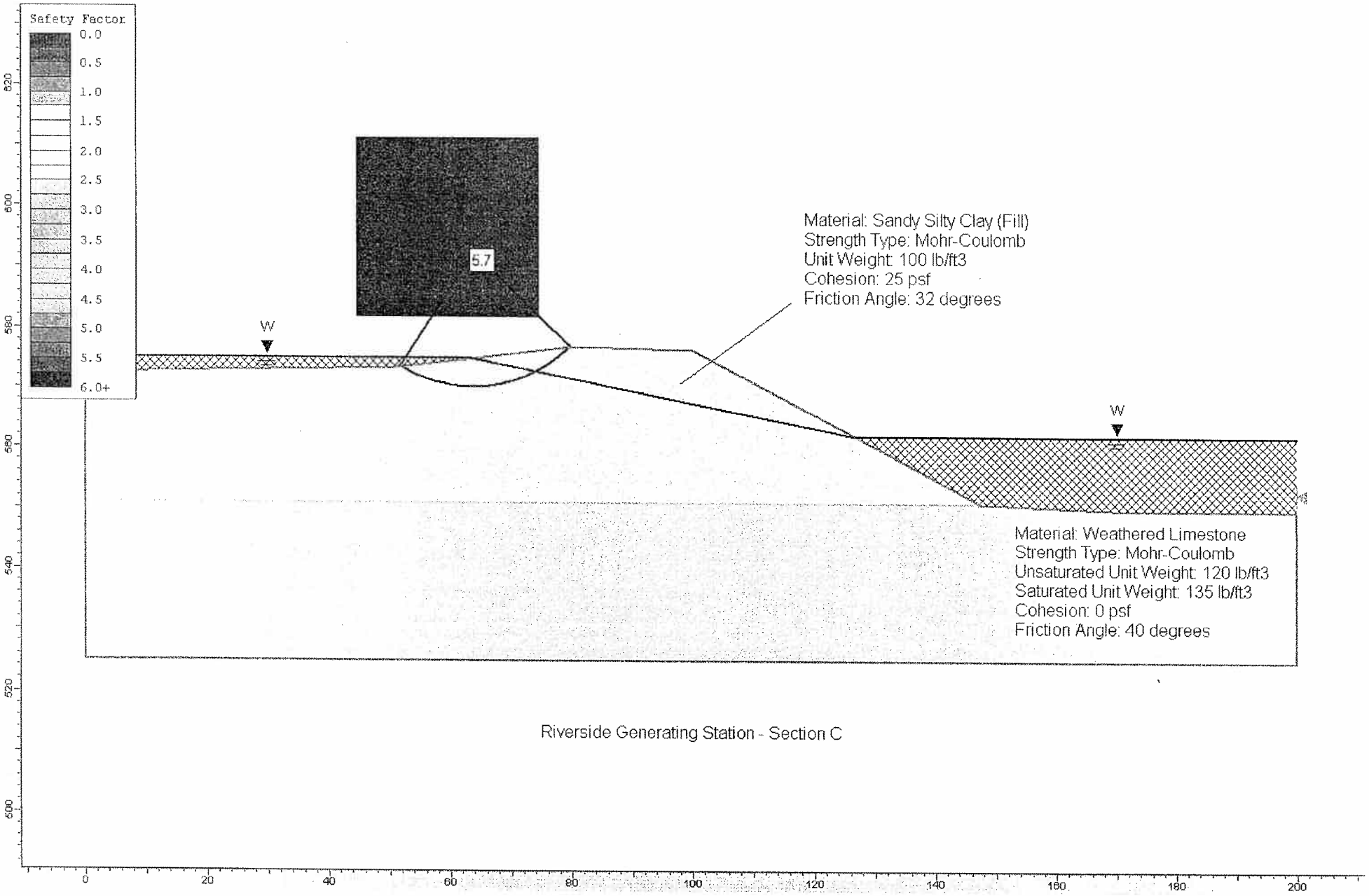
Riverside Generating Station - Section A

Exhibit D-4



Riverside Generating Station - Section C

Exhibit D-5



Riverside Generating Station - Section C

Exhibit D-6

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Riverside Generating Station Date: 14 SEPT 2010

Unit Name: NORTH ASH POND Operator's Name: Mid American

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

Inspector's Name: Frederic SHMURAK & Michael McLAREN

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?	MONTHLY ANNUALLY	✓	18. Sloughing or bulging on slopes?		*
2. Pool elevation (operator records)?	NO POOL		19. Major erosion or slope deterioration?	✓	
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	577		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?		N/A	Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		✓	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)?		N/A	From underdrain?		N/A
9. Trees growing on embankment? (If so, indicate largest diameter below)	✓		At isolated points on embankment slopes?		*
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		*
11. Is there significant settlement along the crest?		✓	Over widespread areas?		*
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		*
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		*
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		N/A
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?	✓	
17. Cracks or scarps on slopes?		*	24. Were Photos taken during the dam inspection?	✓	

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

9. Brush & Trees < 6" DIAMETER

17. DOWNSTREAM SLOPE covered by Dense Brush and NOT observed

18. DOWNSTREAM SLOPE covered by Dense Brush and NOT observed

19. Widespread Rill EROSION Along downstream slope

21. DOWNSTREAM SLOPE covered by Dense Brush and NOT observed

23. PORTION of downstream TOE ADJACENT TO Small channel

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # NONE INSPECTOR Dewberry
Date 14 SEPT 2010

Impoundment Name NORTH ASH POND - Riverside Generating Plant
Impoundment Company Mid American
EPA Region VII
State Agency (Field Office) Addresss _____

Name of Impoundment NORTH ASH POND
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update _____

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

IMPOUNDMENT FUNCTION: COAL COMBUSTION WASTE STORAGE

Nearest Downstream Town : Name Riverdale IA & Bettendorf IA
Distance from the impoundment 1-Mile
Impoundment
Location: Longitude 90 Degrees 26 Minutes 46 Seconds
Latitude 41 Degrees 32 Minutes 39 Seconds
State IA County SCOTT

Does a state agency regulate this impoundment? YES _____ NO ✓

If So Which State Agency? _____

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.

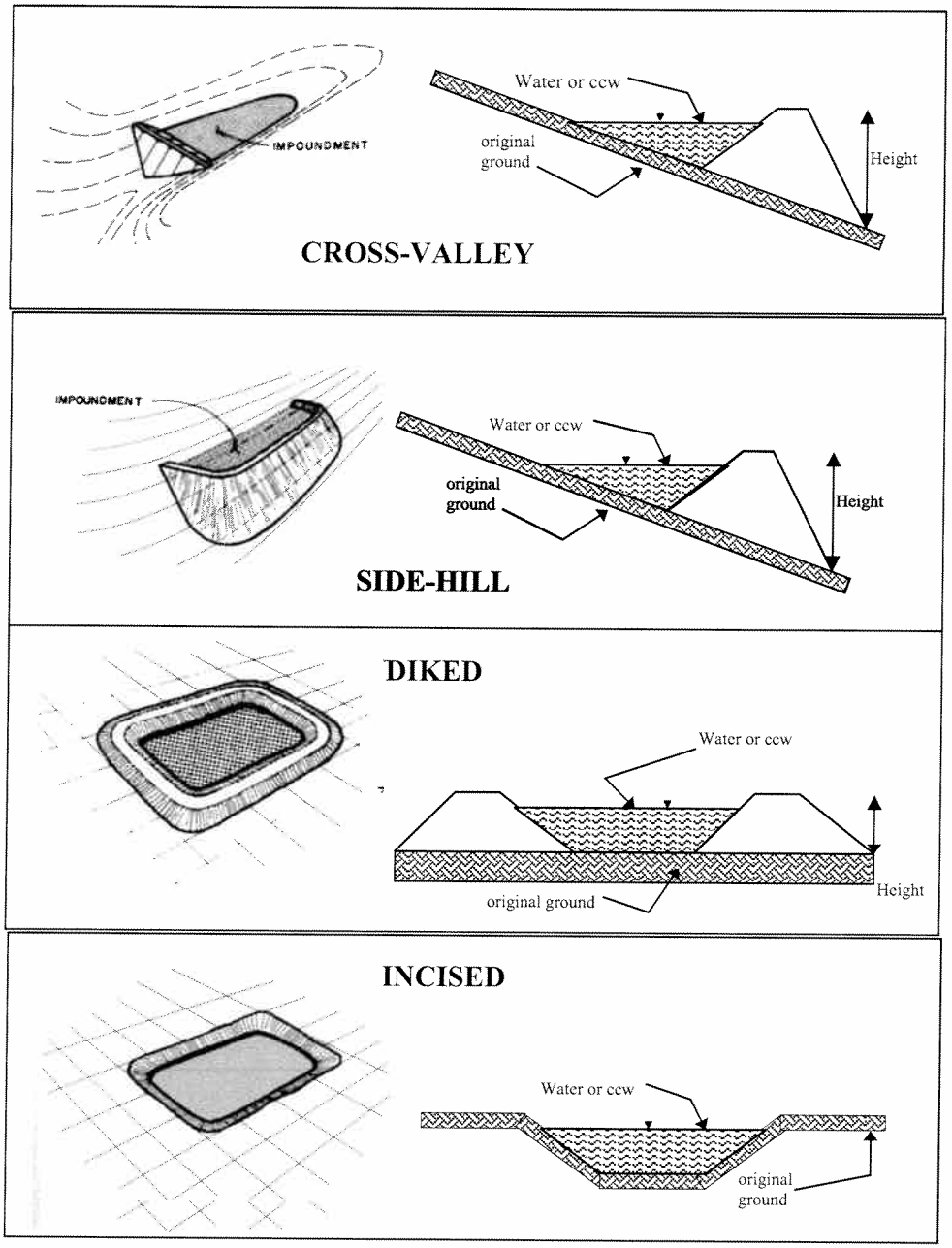
__✓__ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

_____ **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:

CONFIGURATION:



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

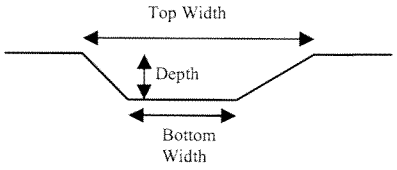
Embankment Height 12 feet
Pool Area 14.1 acres
Current Freeboard >2 feet
Embankment Material Ash & EARTH SOIL
Liner NONE
Liner Permeability N/A

TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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

TRAPEZOIDAL



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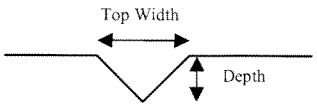
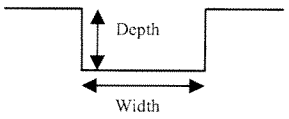
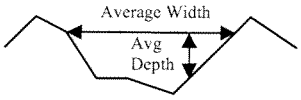


RECTANGULAR

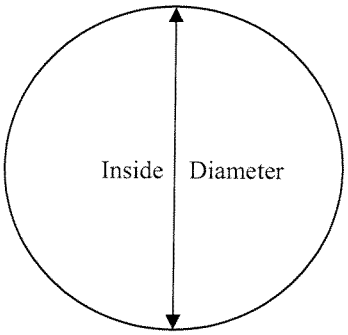


IRREGULAR



_____ **Outlet**

_____ inside diameter



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

_____

Is water flowing through the outlet? YES _____ NO _____

✓ **No Outlet**

_____

_____ **Other Type of Outlet** (specify) _____

The Impoundment was Designed By UNKNOWN - APPLICATION BY IOWA & ILLINOIS GAS and ELECTRIC

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 ✓

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 ✓

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: Riverside Generating Station Date: 14 SEPT 2010

Unit Name: SOUTH ASH POND Operator's Name: Mid American

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

Inspector's Name: Frederic SHMURAK & Michael McLAREN

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?	MONTHLY ANNUALLY		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	571		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?			20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	576		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?		N/A	Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		✓	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)?		N/A	From underdrain?		N/A
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?	✓	
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

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

3. OUTLET INVERT ELEVATION NOT AVAILABLE

23. MISSISSIPPI River Along DOWNSTREAM SLOPE

NOTE: POOL ELEVATION & FREEBOARD Reported by Operator

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # 8278101 INSPECTOR Dewberry
Date 14 SEPT 2010

Impoundment Name SOUTH ASH POND - Riverside Generating Plant
Impoundment Company Mid American
EPA Region VII
State Agency (Field Office) Addresss

Name of Impoundment NORTH ASH POND
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update _____

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

IMPOUNDMENT FUNCTION: COAL COMBUSTION WASTE DEPOSITION & STORAGE

Nearest Downstream Town : Name Riverdale IA & Bettendorf IA
Distance from the impoundment 1-Mile
Impoundment Location:
Longitude 90 Degrees ~~26~~ 27 Minutes ~~46~~ 06 Seconds
Latitude 41 Degrees 32 Minutes ~~39~~ 08 Seconds
State IA County SCOTT

Does a state agency regulate this impoundment? YES _____ NO ✓

If So Which State Agency? _____

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.

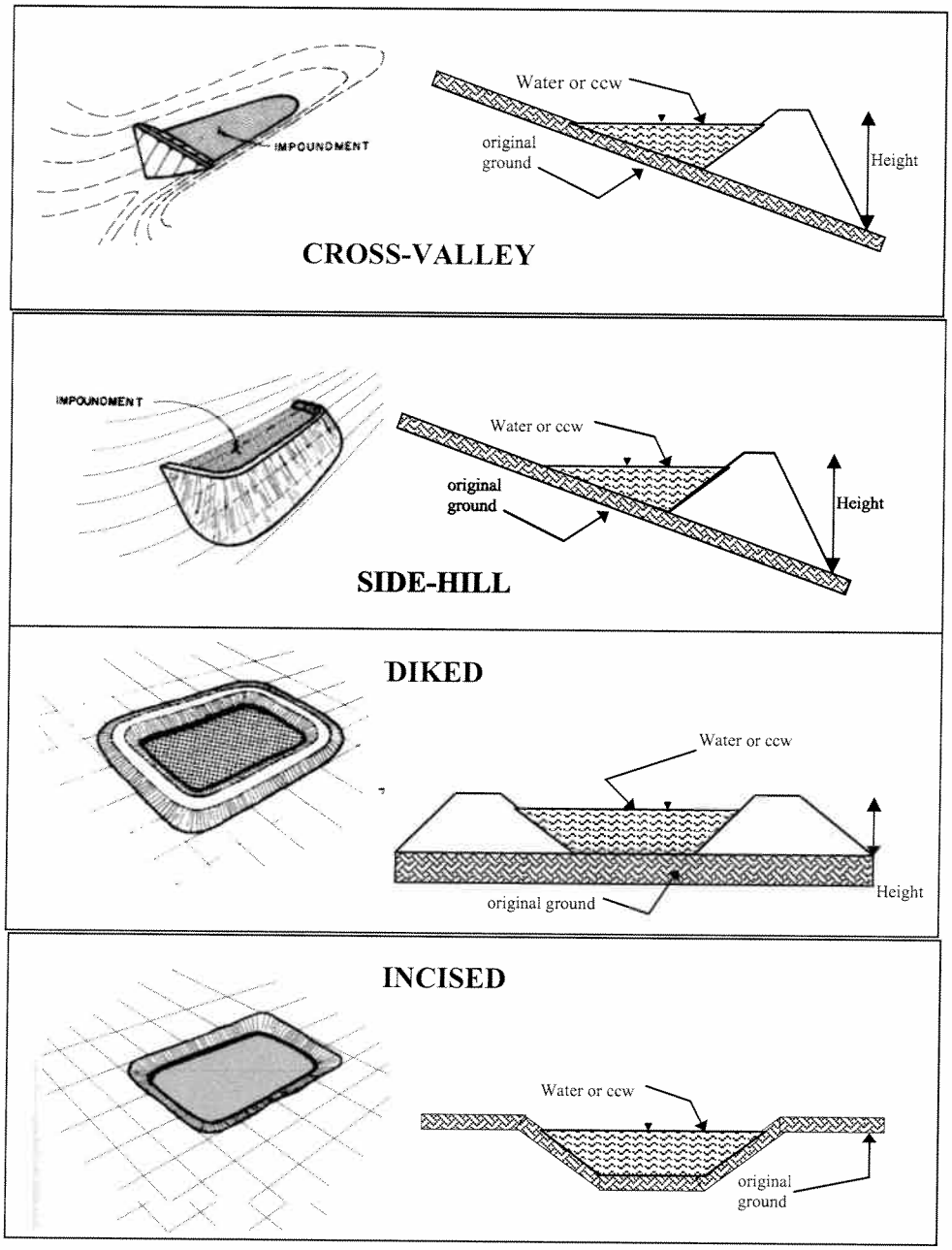
__✓__ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

_____ **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:

CONFIGURATION:



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

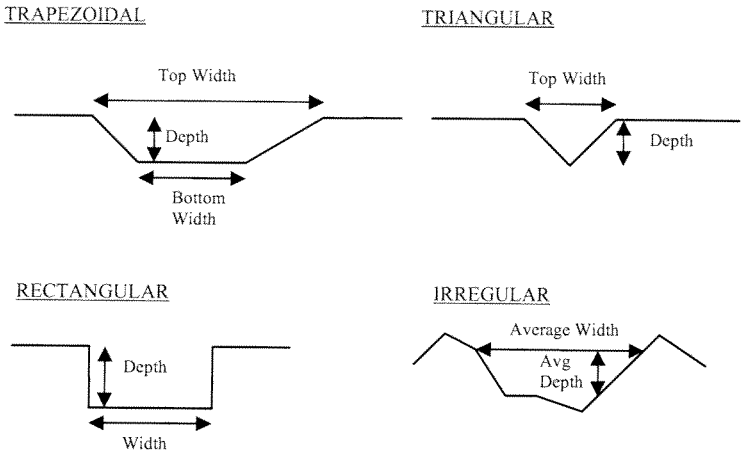
Embankment Height 15 feet
Pool Area 12 acres
Current Freeboard 5 feet (REPORTED)

Embankment Material FLY ASH & EARTH FILL
Liner NONE
Liner Permeability N/A

TYPE OF OUTLET (Mark all that apply)

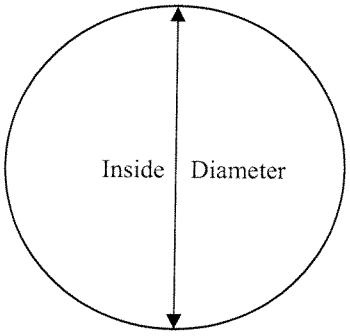
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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



_____ **Outlet**

15" inside diameter



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

_____

Is water flowing through the outlet? YES ✓ NO _____

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) 15" Ø STEEL OVERFLOW PIPE

The Impoundment was Designed By UNKNOWN - APPLICATION BY IOWA and ILLINOIS GAS & ELECTRIC CO. 1967

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 ✓

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 ✓

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

If so Please Describe : _____