FINAL

Coal Combustion Waste Impoundment
Round 7 - Dam Assessment Report

Meramec Power Station

Ameren Missouri
St. Louis, Missouri

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

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INTRODUCTION, SUMMARY, CONCLUSION AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response the U.S. EPA is assessing the stability and functionality of coal combustion ash impoundments and other management units across the country and, as necessary, identifying any needed corrective measures.

This assessment of the stability and functionality of the Meramec Power Station coal combustion waste (CCW) management units is based on a review of available documents and on the site assessment conducted by Dewberry personnel on September 29, 2010. We found the supporting technical information to be limited (Section 1.1.3). As detailed in Section 1.2 there are several recommendations that may help to maintain a safe and trouble-free operation.

In summary, the Meramec Power Station CCW ponds are rated **POOR** for continued safe and reliable operation (Section 1.1.8). The rating is influenced by the results of the November 2010 Ash Pond Dam Stability Analysis conducted by Reitz & Jens, Inc. Evaluation of the CCW pond embankments show the CCW pond embankments do not meet the minimum required Missouri DNR safety factor for the steady seepage loading conditions. Ameren Missouri has initiated a project to be implemented in 2011 to flatten the existing slopes on the downstream side of Ponds 1, 2, and 4 to improve the factor of safety; the CCW ponds would be rated **SATISFACTORY** upon completion of the project.

PURPOSE AND SCOPE

The U. S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e. management units) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impoundment contents. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present); status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices, and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified 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 early 2009 the USEPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion waste. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

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

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

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

EPA sent two engineers, one licensed in the State of Missouri, for a one-day visit. The two-person team met with technical and management representatives of the utility to discuss the engineering characteristics of the unit as part of the site visit. During the site visit the team collected additional information about the management unit(s) to be used to determine the hazard potential classifications. Subsequent to the site visit the management unit owner provided additional engineering data on the Meramec Power Station to the USEPA and its contractor.

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

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

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.

FINAL

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from the one-day site visit to the Meramec Power Station and review of technical and historical documentation provided by Ameren Missouri.

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

Results from the November 2010 Ash Pond Dam Stability Analysis conducted by Reitz & Jens, Inc. indicate the CCW embankments currently do not meet the minimum required safety factors for steady seepage loading. (See Table 7.1 for the steady seepage Factors of Safety values.) Therefore, the structural soundness of the CCW embankments are currently rated **Poor**. Ameren Missouri has subsequently initiated a project to be completed in 2011 to flatten the existing slopes on the downstream side of Ponds 1, 2, and 4 to improve the factor of safety, see Table 7.2 and Appendix A, Docs 1.11 and 1.12. CCW ponds would be rated **Satisfactory** upon completion of the project.

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

The hydrologic and hydraulic data provided concludes that the 100-year, 24-hour storm event will overtop embankment levees of Pond 1 and Pond 2. Based on 2004 Army Corps of Engineers (USACE) 100-year Mississippi River flood elevation and FEMA August 2, 1995 Flood Insurance Rate Map 29189C0415 H, Meramec Power Station would be inundated during a 100-year flood. There have been no apparent issues with safe containment of water in the basins during significant flooding events in the 45-year experience record of the ash ponds. Based on the history and future downstream slope improvement project, failures of the embankment levees are not anticipated.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The original design documentation was partially illegible and the design sequence was not identified. No other technical documentation about the design of the existing facility is available. Hydrologic/hydraulic analysis was provided for the CCW ponds. An Ash Pond Dam Stability Analysis, conducted by Reitz & Jens, Inc., was provided in 2011 to verify the structural stability of the embankments.

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

Documents describing the CCW ponds were not provided. Ameren Missouri employee descriptions of the CCW ponds were appropriate and sufficient.

1.1.5 Conclusions Regarding the Field Observations

The embankment levee appeared well-maintained, safe, and structurally sound. There are no apparent indications of any unsafe conditions. The visible parts of the embankment levee and outlet structures were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability. Erosion on the inside slope and wooden retaining wall failure were observed at Pond 1. Runoff erosion was observed on the outside slope of the perimeter levee embankment. The outside slope of the levee embankment was observed to be covered in tall grass and brush. An indication of seepage was observed at the outside toe of Pond 4, although visual observations were severely hampered by the presence of tall vegetation. Runoff erosion is being managed through a maintenance program. The seepage area is being monitored and inspected per weekly inspection reports.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

No evidence of major repairs to the embankments or prior releases was observed during the field assessment. Evidence of slope repair due to erosion on the outside slope of the perimeter levee was observed. Maintenance and methods of operation are adequate.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program is generally adequate. The informal weekly and formal annual internal inspections by Ameren Missouri engineers are of sufficient frequency and should continue. Internal inspection of the outlet structures should be performed at a frequency of at least once every 5 years and documented. There is no dam monitoring program in place that includes such instruments as observation wells/piezometers, settlement monitoring points, inclinometers, seepage monitoring points, etc. However, piezometers were installed on the embankment of Pond 7 for ash excavation purposes. Program pond discharge monitoring is in place and will continue in accordance with Missouri Department of Natural Resources (MDNR) Division of Environmental Quality permit requirements.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

In accordance with EPA criteria CCW ponds are currently rated **POOR** for continued safe and reliable operation. The rating is based on the results of the steady seepage loading reported in the November 2010 Ash Pond Dam Stability Analysis conducted by Reitz & Jens, Inc.. The minimum required safety factor for steady seepage loading under static conditions was not met. See Table 1.1 for structural stability rating. Implementation of recommendations as presented below would improve the rating to **SATISFACTORY** based upon subsequent information provided by Ameren Missouri.

Table 1.1: Structural Stability Rating

Category	Description
Satisfactory	No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.
Fair	Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.
Poor	A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.
Unsatisfactory	Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

Modified from the New Jersey Department of Environmental Protection Dam Safety Guidelines for the Inspection of Existing Dams, January 2008.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

The minimum factor of safety for steady seepage required by MDNR and USEPA is not met. Ameren Missouri has initiated a project to be implemented in 2011 to flatten the existing slopes on the downstream side of Pond 1, 2, and 4 to improve the factor of safety to meet and exceed minimum Factors of Safety (see Appendix A, Docs 1.11 and 1.12). According to Ameren Missouri the project cannot begin until river levels recede to normal levels (i.e., Summer 2011). We strongly recommend the dikes be re-configured as quickly as possible.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

The data provided indicates the 100-year, 24-hour storm event will overtop embankment levees of Pond 1 and Pond 2, and the 100-year Mississippi River flood will inundate Meramec Power Station. However, based on the history (including the 2011 flooding) and future downstream slope improvement project, failures of the embankment levees are not anticipated. It is recommended to monitor 100-year, 24-hour storm events for overtopping of the embankment levees and make repairs from potential erosion caused by overtopping.

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

Documented descriptions of the CCW ponds and operational procedures were not provided. An Operation & Maintenance manual for the Meramec PS to provide a summary of the purpose and processes within the CCW ponds is planned by Ameren Missouri in 2011.

1.2.4 Recommendations Regarding the Maintenance and Methods of Operation

It is recommended to continue to monitor the seepage area observed at the outside toe of Pond 4 for changed conditions.

It is recommended to continue to monitor the inside slope and retaining wall of Pond 1.

As recommended in the engineer's report of November 2010, Ameren Missouri must continue to ensure positive drainage is maintained from the inactive ponds.

1.2.5 Recommendations Regarding the Surveillance and Monitoring Program

Internal inspections of the outlet structures with a remote camera or by personnel using confined-space procedures should be conducted on a frequency of at least once every 5 years.

1.2.6 Recommendations Regarding Continued Safe and Reliable Operation

Continued safe and reliable ash management is dependent upon completing the proposed modifications to the downstream side of the dikes for Ponds 1, 2 and 4 as soon as possible. Ameren Missouri should notify USEPA upon completion of the re-configuration project.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

*Jeffrey Crabtree, Dewberry
*James Filson, Dewberry
*Matthew Frerking, Ameren Missouri
*Paul Pike, Ameren Missouri
*Richard Fleschner, Ameren Missouri
*Steve Weiss, Ameren Missouri

*Participated in field dam inspections.

1.3.2 Acknowledgement and Signature

We acknowledge that the management units referenced herein at Meramec Power Station have been assessed on September 29, 2010.

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James Filson

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

2.1 LOCATION AND GENERAL DESCRIPTION

The Meramec Power Station (Meramec PS) is physically located north of the confluence of the Mississippi and Meramec River on the southern point of St. Louis County, Missouri, approximately 2.8 miles southeast of Arnold. The Meramec PS is located on Fine Road, Saint Louis, Missouri 63129. The Missouri Pacific railroad is to the southeast of Meramec PS. See Appendix A – Doc. 1.1 for location of the Meramec PS on an aerial map.

Meramec PS has ten impoundments used for managing coal combustion waste (CCW) that are designated as Retention Pond (Pond 1), Old Fly Ash Pond #489 (Pond 2), New Fly Ash Pond #498 (Pond 3), Bottom Ash Pond #493 (Pond 4), Bottom Ash Pond #492 (Pond 5), Bottom Ash Pond #496 (Pond 6), Fly Ash Pond #494 (Pond 7), Fly Ash Pond #495 (Pond 8), Fly Ash Pond #490 (Pond 9), Fly Ash Pond #491 (Pond 10).

A single perimeter levee creates the impoundment around the west and south sides, and ties into high existing ground on the northeast and southeast side. The perimeter levee forms the embankments of Pond 1, 2, 4, 7, and 8. A private railroad embankment is within the perimeter levee of the plant, and connects to the Missouri Pacific railroad. No offsite drainage enters the impoundment. (Note: The terms “dike” and “dam” are used interchangeably in this report, as are the terms “pond” and “basin.”)

The Meramec PS ponds are characterized as follows:

- Pond 1 is active and receives surface stormwater and discharge from Ponds 3 and 4 .
- Pond 2 is active and receives fly ash and wastewater residual wastes.
- Pond 3 is active, receives fly ash from coal-fired units, and discharges into the Retention Pond.
- Basins designated as Bottom Ash Ponds (Ponds 4, 5, and 6) are in series, and receive bottom ash from coal-fired units, which discharge into the Retention Pond.
- Four inactive fly ash ponds (Ponds 7, 8, 9, and 10) are filled to capacity with coal combustion ash and are no longer active.

See Appendix A – Doc. 1.2 for relative locations of the basins on an aerial view map of the Meramec PS. The basins highlighted in yellow are currently active. Numbered bullets correspond to the location of the photos shown in Section 5.3.

Pond 1 has a surface area of approximately 0.7 acres. The pond is an incised pond with a perimeter dike. The northwest portion of the dike is a relatively short section of outer perimeter levee. The edge of water within the pond is approximately 30 feet from the centerline of the perimeter levee. The design top elevation of the perimeter levee is 418.0 feet (Appendix A – Doc. 1.3). According to the August 2007 Ameren UE Dam Inventory and Inspection Program Phase I Presentation of Field Observation, Analysis and Recommendations, the lowest top of dam elevation - the top of the perimeter levee at Pond 1- is 414.3 feet; the lowest elevation of the outside toe adjacent to the embankment is 389.6 feet (Reitz & Jens, Inc., 2007). The dike is slightly lower than the perimeter levee; it is noted on furnished drawings (Appendix A – Doc. 1.3) to be at an elevation of 416.7 feet at the drainage structure between Ponds 1 and 3, and Ponds 1 and 7. The bottom elevation of Pond 1 is unknown but appears to have been 396.0 feet, based on design information on the furnished drawings (Appendix A – Doc. 1.3). Approximate height of the perimeter dike at Pond 1 is 25 feet according to the November 2010 Ash Pond Dam Stability Analysis conducted by Reitz & Jens, Inc. (Reitz & Jens, Inc., 2010).

The Pond 1 retention pond is an unlined basin that receives onsite surface runoff from Ponds 7 and 8, and discharge from Ponds 3 and Pond 4. Pond 1 was designed to be used for water treatment and chemical stabilization.

Pond 2 has a surface area of approximately 17.6 acres. The pond is diked and bound on the southwest by a relatively short section of the outer perimeter levee. According to furnished drawings (Appendix A – Doc. 1.3), the design top elevation of the perimeter levee is 420.0 feet and the elevation of the top of the concrete base of the outfall structure is 398.0 feet. The bottom elevation of Pond 2 according to furnished drawings (Appendix A – Doc.1.3) is 400.0 feet. Approximate height of the perimeter dike at Pond 2 is 24.5 feet according to the November 2010 Ash Pond Dam Stability Analysis conducted by Reitz & Jens, Inc. (Reitz & Jens, Inc., 2010).

The Pond 2 ash pond is a lined basin that receives onsite surface runoff, fly ash, bottom ash, and wastewater residual wastes. Overflow from Pond 2 discharges into the deactivated Pond 8 fly ash pond. Pond 2 is used for fly ash sedimentation, water treatment, and chemical stabilization.

Pond 3 has a surface area of approximately 13.5 acres. The pond is an incised pond with a perimeter dike, bound on the northeast by the bottom ash ponds, the southwest by the deactivated Pond 7, and to the southeast by the deactivated Pond 9. According to furnished drawings (Appendix A – Doc. 1.3), the design top elevation of the perimeter dike is 425.0 feet and the elevation of the bottom of Pond 2 is 400.0 feet. Thus, the maximum height of the perimeter dike at Pond 3 is approximately 25 feet above the outside toe. The bottom elevation of Pond 3 according to furnished drawings (Appendix A – Doc. 1.3) is 395.0 feet. Thus, the dike may approach a 30-foot height above the Pond 3 bottom.

The Pond 3 ash pond is a lined basin that receives fly ash. Discharge from Pond 3 flows into the Pond 1 retention pond.

Bottom Ash Ponds (***Ponds 4, 5, and 6***) have a combined surface area of approximately 14 acres. Coal combustion residue is sluiced into Pond 6. Drainage from Pond 6 to Pond 4 is conveyed through excavated interior ditches within the ash. Pond 4 is a partially incised pond bound on the west by a relatively short section of the outer perimeter levee. The internal rail road embankment crosses through Pond 4 from the west to the east corner. The incised Ponds 5 and 6 are bound on the northeast by the internal rail road embankment. According to a furnished drawings (Appendix A – Doc. 1.3), the design top elevation of the perimeter levee is 411.5 feet, and Pond 3 embankment dike between Ponds 3 and 4 is at an elevation of 418.0 feet. The elevation of the top of the abandoned outfall pipe is 397.4 feet. Thus, the maximum height of the perimeter levee at Pond 4 is 14.1 feet above the outside toe. Ameren Missouri has listed the maximum height of the perimeter levee as 25 feet. The bottom elevation of Pond 4 is 398.0 feet, based from the May 2010 Steam Electric Questionnaire (OMB Control Number: 2040-0281).

The Ponds 4, 5, and 6 ash ponds are unlined basins that receive bottom ash. Discharge from Pond 4 discharges into Pond 1 retention pond.

Pond 7 and ***Pond 8*** are diked and bound on the west by the outer perimeter levee. Pond 7 is bound by Pond 8 to the south, and to the east by the plant structures, Pond 1 and Pond 3. Ponds 7 and 8 are filled to capacity by fly ash and are no longer active. The southern portion of Pond 7 is currently used for coal storage. Approximate height of the perimeter dike at Pond 7 is 20.8 feet according to the November 2010 Ash Pond Dam Stability Analysis conducted by Reitz & Jens, Inc. (Reitz & Jens, 2010).

Incised ponds, ***Pond 9*** and ***Pond 10***, are filled and deactivated. Presently, the filled and deactivated areas of the ponds support plant equipment, a portion of the internal railroad tracks, and coal storage. Pond 9 is at the center of the site and is bound on the northwest by Pond 3. Pond 10 is bound on the southwest by Pond 2 and the coal storage area on the southeast.

2.2 SIZE AND HAZARD CLASSIFICATION

In the following paragraphs, a hazard potential determination is given on the basis of the Federal Emergency Management Agency (FEMA) hazard potential classification, which has been adopted by USEPA; this classification system and the hazard potential determination and basis are presented on the field observation checklists for the Meramec PS CCW ponds included in Appendix B. The classification for size is given on the basis of the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria, based on the height of the embankment and the impoundment storage capacity.

Physical data for the six ponds below are summarized in Table 2.1.For each of the six ponds no dwellings are downstream of the levee, therefore the levee should be classified Environmental Zone Class III per the MDNR criteria for Environmental Zone classification (Table 2.2). The levee currently has an undetermined hazard potential rating. Failure of the levee would discharge mostly water and some CCW into a tributary to the Meramec River. The failure would not likely cause loss of life, but would cause relatively minor environmental damage. Therefore, per the USEPA classification (Table 2.3) each pond levee should be given a Low (Class III) Hazard Potential Classification, but it should be reviewed periodically to evaluate status of CCW stored in the basin. The USACE size classification is presented in Table 2.4. For each of the six ponds the classification for size, based on the height of the embankment and the basin storage capacity, is Small.

Pond 1 – Maximum dam height is 19.5 feet, according to furnished information. The total storage capacity is 10 acre-feet. The amount of CCW stored in Pond 1 is minor.

Pond 2 - Maximum dam height is 24.5 feet, according to furnished information. The total storage capacity is 300 acre-feet.

Pond 3 - Maximum dam height is 25 feet, according to furnished information. The total storage capacity is 230 acre-feet.

Ponds 4, 5, & 6 - Maximum dam height is 25 feet, according to furnished information, but it appears to be more on the order of 14.1 feet, as previously discussed. The total combined storage capacity of Ponds 4, 5, and 6 is 280 acre-feet.

Table 2.1: Summary of Dam Dimensions and Size

	Pond 1	Pond 2	Pond 3	Ponds 4, 5, & 6
Dam Height	25' **	25' **	25' **	25' **
Crest Width	15'	15'	15'	10'
Length	~79'***	~854'***	~3,320'	~679'***
Side Slopes (inside)	1.5:1*, 3:1	3:1	4:1	---
Side Slopes (outside)	1.5:1	3:1	3:1	2:1
Hazard Classification****	Class III (Low)	Class III (Low)	Class III (Low)	Class III (Low)

**Embankment slope above incised elevation.*
***Based on data in Ameren Missouri's response to EPA's RFI dated March 26, 2009 (See Doc. 1.4 of Appendix A); review of furnished data indicates 19.5' for Pond 1, and 24.5' for Pond 2.*
****Perimeter levee embankment length; total perimeter levee length is approximately 5,400'.*
*****Based on available information and USEPA classification*

Table 2.2: Environmental Zone Classification

Class I	10 or more permanent dwellings or any public building downstream.
Class II	1-9 permanent dwellings, 1 or more campgrounds with permanent water, sewer and electrical services or 1 or more industrial buildings downstream.
Class III	Everything else.

MDNR Division 22 Reservoir Safety Council Rules and Regulations.

Table 2.3: Hazard Potential Classification

Category	Hazard Potential
High Hazard (Class I)	Dams located where failure will likely cause loss of life or serious damage to home(s), industrial and commercial facilities, important public utilities, main highway(s) or railroad(s).
Significant Hazard (Class II)	Dams located where failure will not likely cause loss of life but may damage home(s), industrial and commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important public utilities.
Low Hazard (Class III)	Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

USEPA Hazard Potential Classification

Table 2.4: Size Classification

Category	**Impoundment**	
	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

USACE ER 1110-2-106

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

The amount of CCW residuals currently stored in the units and maximum capacities are summarized in Table 2.5.

Pond 1 - Based on information from Ameren Missouri, this basin contains a minimal amount of fly ash and bottom ash deposited over 33 years. This basin is currently active and remaining storage volume is unknown. The total storage capacity is 10 acre-feet. A normal pool of water is maintained at about elevation 405.0 feet.

Pond 2 - Based on information from Ameren Missouri, this basin contains fly ash, bottom ash, and wastewater residual wastes deposited over 10 years. This basin is currently active and remaining storage volume varies due to the dredging of ash. A total of 260 acre-feet of fly ash and bottom ash material were contained within Pond 2, according to the Ameren Missouri response to EPA's RFI dated March 26, 2009. As of 2009, Pond 2 had an estimated 13 percent remaining storage capacity. Expected closure for Pond 2 is 2012, based on the May 2010 Steam Electric Questionnaire. A normal pool of water is maintained at about elevation 416.5 feet.

Pond 3 - Based on information from Ameren Missouri, this basin contains fly ash deposited over 7 years. This basin is currently active and remaining storage volume varies due to the dredging of ash. A total of 190 acre-feet of fly ash material is contained within Pond 3, according to the Ameren Missouri response to EPA's RFI dated March 26, 2009. As of 2009, Pond 3 had an estimated 17 percent remaining storage capacity. Closure for Pond 3 is estimated to be 2014, based on the May 2010 Steam Electric Questionnaire. A normal pool of water is maintained at about elevation 418.0 feet.

Ponds 4, 5 & 6 - Based on information from Ameren Missouri, this basin contains bottom ash deposited over 60 years. These basins are currently active and remaining storage volume varies due to the dredging of ash. A total of 171 acre-feet of bottom ash material is contained within Ponds 4, 5, and 6 according to the Ameren Missouri response to EPA's RFI dated March 26, 2009. As of 2009, Ponds 4, 5, and 6 had an estimated 39 percent remaining storage capacity. The expected closure for Pond 4 is 2014, per the approved May 2010 Steam Electric Questionnaire. A normal pool of water is maintained at about elevation 408.0 feet.

Table 2.5: Amount of Residuals and Maximum Capacity of Unit*

	Pond 1	Pond 2	Pond 3	Ponds 4, 5 & 6
Surface Area (acre)	0.7	17.6	13.5	14
Current Volume of Stored Ash (acre-feet)	minimal	260	190	171
Total Storage Capacity (acre-feet)	10	300	230	280

*Based on data in Ameren Missouri response to EPA's RFI dated March 26, 2009

2.4 PRINCIPAL PROJECT STRUCTURES

2.4.1 Earth Embankment Dam

Based on boring information for Pond 7 piezometer installation (Appendix A – Doc. 1.5), the perimeter levee at Pond 7 is constructed of silty clay, clay with silt, sand layers, clay with gravel and sand with gravel. The source and type of soils used for the original fill is unknown. The perimeter levee forming the impoundment is approximately 5,400 feet. The ponds are impounded by a perimeter levee and do not receive offsite surface runoff. Doc. 1.3 of Appendix A reflects embankment geometry summarized below.

Pond 1 – A perimeter dike along the north, east, and south sides of Pond 1 ties into the perimeter levee on the northwest side. The basin does not receive offsite surface runoff. Runoff from Ponds 7 and 8 is ditched to Pond 1. Discharges from Pond 3 and Pond 4 flow into Pond 1. The embankment around the basin was raised using compacted clay as fill material. Perimeter levee elevations were raised to an elevation of 418.0 feet, and the perimeter dike to 416.7 feet. Operator records indicate the lowest top of levee elevation is at 414.0 feet. The geometry of Pond 1 consists of 3 horizontal (H) to 1 vertical (V) inside incised slope, 1.7 H to 1 V inside embankment slope, and 1.5 H to 1 V outside slope. Representative sections of the perimeter levee and the perimeter dike are shown in Exhibit 1. As shown in this exhibit, the perimeter levee is 15-feet wide, and the perimeter dike is 8-feet wide. The designs of the perimeter dike and levee are shown in Appendix A – Doc. 1.3. The pond is not lined and no internal drainage measures or toe drains were included in the embankment design for seepage control.

Pond 2 – A perimeter dike along the northeast and southwest of Pond 2 ties into the perimeter levee on the south side and high ground on the southeast side. The basin receives surface runoff from the power station plant facilities area and the basin area. Overflow from Pond 2 discharges into Pond 8 and ultimately flows into Pond 1. The perimeter levee and dike embankment around the basin was raised to an elevation of 420.0 feet. Operator records indicate the lowest top of levee elevation is at 420.2 feet. Compacted ash fill material was used to construct the berm over an existing soil embankment on the interior side of the pond. Pond 2 is lined with 60 MIL HDPE slope liner and a 40 MIL HDPE bottom liner. The geometry of Pond 2 is 3 H to 1 V inside slope, and 1.9 H to 1 V outside slope. Representative sections of the perimeter levee and the perimeter dike are shown in Exhibit 2. As shown in this exhibit, the berms are 15-feet wide. The designs of the perimeter dike and levee are shown in Appendix A – Doc. 1.3. There are no internal drainage measures or toe drains included in the embankment design for seepage control.

Pond 3 – The basin is an incised pond with a perimeter dike. The basin does not receive surface runoff from outside the basin area. Drainage area for the basin is the basin itself. Pond 3 discharges into Pond 1. Pond 3 is lined with 60 MIL HDPE slope liner and 40 MIL HDPE bottom liner. The geometry of Pond 3 consists of 2.5 horizontal (H) to 1 vertical (V) outside slope, and 4 H to 1 V inside slope. The top of the perimeter dike embankment around the basin is at elevation of 423.0 feet. Representative sections of the perimeter dike are shown in Exhibit 3. As shown in this exhibit, the perimeter dike is 15-feet wide. The design of the perimeter dike is shown in Appendix A – Doc. 1.3. There were no internal drainage measures or toe drains included in the embankment design for seepage control.

Ponds 4, 5, & 6 – Pond 4 is bound on the northwest by the perimeter levee, and on the southwest by Pond 3 dike. Ponds 6 and 5 are combined, and a cross dike divides Pond 5 from Pond 4. Flow is conveyed from Pond 5 to Pond 4. The embankment from the Meramec PS internal railroad crosses from the west corner to the east corner of Pond 4. Culvert crossings control flow within Pond 4. Culvert crossings were not observed during the site visit due to heavy vegetation around Pond 4.

The drainage area for the basin is the surface area of Ponds 4, 5, and 6. Pond 4 discharges into Pond 1. A portion of the perimeter levee was raised to an elevation of 411.5 feet. Compacted clay was used for fill material to raise the top of the levee. Operator records indicate the lowest top of levee elevation is at 417.4 feet. The geometry of Pond 4 consists of 2 H to 1 V outside slope. A representative section of the perimeter levee is shown in Exhibit 4. As shown in this exhibit, the perimeter levee is 10-feet wide. The design of the perimeter levee is shown in Appendix A – Doc. 1.3. The ponds are not lined and no internal drainage measures or toe drains were included in the embankment design for seepage control.

2.4.2 Outlet Structures

Pond 1 – Drainage from Pond 3 and Pond 4 are discharged into Pond 1. Water passes through outlet works located at the northwest embankment of Pond 1. The outlet works consist of a skimmer, a seal boom fastened to three pipes at 7.3 feet from the center of the riser pipe which drains to a 24-inch diameter carbon steel (CS) discharge pipe. The discharge pipe projects from the perimeter levee into the tributary to the Meramec River with a 90 degree bend at the end. The skimmer box is used to block entry of floating ash particles. Inverts of the outlet are shown in Appendix A – Doc. 1.3.

The water in the basin, based on operator records, was at a level of 404.0 feet, which is 10.0 feet below the perimeter dam crest. Based on the lowest dam crest elevation based on operator records is 414.0 feet. Basin Information Checklist was provided by Ameren Missouri at the time of site visit, see Appendix A Doc. 1.6.

Pond 2 - The outlet works are located near the northwest corner of the basin and consist of a 10-ft diameter corrugated steel decant structure outlet with seal booms. The decant tower is shown in Appendix A – Doc. 1.3. The outlet pipe is a 36-inch high density polyethylene (HDPE) pipe that extends through the west portion of the perimeter levee and discharges into the Meramec River. The top of the decant tower is at elevation 420 feet, the same as the top of dam elevation, and is accessed by a steel footbridge extending from the dam crest to the top of the decant tower. The level of water in the basin recorded from a staff gauge at the time of the site visit was at elevation 416.5 feet, which is 3.5 feet below design dam crest. The lowest dam crest elevation, based on operator records, is 420.2 feet; available freeboard is 3.7 feet. Basin Information Checklist was provided by Ameren Missouri at the time of site visit, see Appendix A Doc. 1.6.

Overflow from Pond 2 drains into Pond 7 via four 12-inch diameter polyvinyl chloride (PVC) pipes, and ultimately into Pond 1.

Pond 3 – Drainage from Pond 3 is discharged into Pond 1. Water passes through outlet works located at the northwest dike of Pond 3. Outlet works consist of a skimmer, and a drop inlet with a 24-inch HDPE pipe. The discharge pipe projects into the retention pond, Pond 1. The skimmer box is used to block entry of floating debris and ash particles. Inverts of the outlet are shown in Appendix A – Doc. 1.3.

The water in the basin based on operator records was at a level of 418 feet, which is 5.0 feet below the perimeter dam crest. Basin Information Checklist was provided by Ameren Missouri at the time of site visit, see Appendix A Doc. 1.6.

Pond 4 – Drainage from Pond 4 is discharged into Pond 1. Water passes through outlet works located at the northwest dike of Pond 4. The outlet works consist of a drop inlet and an 18-inch diameter CS pipe. The discharge pipe projects into the retention pond, Pond 1. Inverts of the outlet are shown in Appendix A – Doc. 1.3. Inverts and structure information for culvert crossings were not provided.

The water in the basin based on operator records was at a level of 408.0 feet, which is 3.5 feet below the design perimeter dam crest. Lowest dam crest elevation based on operator records is 420.2 feet, available freeboard is 9.4 feet. The Basin Information Checklist was provided by Ameren Missouri at the time of site visit, see Appendix A Doc. 1.6.

2.5 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

Using Google Maps dated 2010, no critical infrastructure was observed within a 5-mile radius. A regional map showing Meramec PS and ash ponds in relationship to "critical" infrastructure within a 5-mile radius is included as Doc. 1.1 of Appendix A. "Critical" infrastructure includes facilities such as schools and hospitals. There are 52 schools and no hospitals located within the 5 mile radius. These facilities are noted on the 5-mile radius map. In general, the confluence of the Meramec River and Mississippi River is immediately downstream of the facilities.

Flood impacts from postulated failure of the perimeter levee at the Meramec PS would primarily impact the Meramec River, but could impact the Mississippi River.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS AND INCIDENTS

The Meramec PS levee (dike) is not regulated for dam safety by a federal or state agency, and currently does not have federal or state hazard classifications. The CCW Pond 1 and Pond 2 discharges are regulated by the Missouri Department of Natural Resources (MDNR) Division of Environmental Quality. Meramec PS dam height is less than 35 feet (i.e., 25 ft) therefore the dams do not require MDNR registration permits for continued operation.

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

Ameren Missouri created an internal Dam Safety Group composed of civil and geotechnical engineers supervised by a professional engineer. The group implements and oversees the Ameren Missouri Dam Safety Program. Ameren Missouri also developed an Emergency Implementing Procedure (EIT) for emergencies involving dam failures or loss of integrity. The EIT contains response procedures to three severity levels of incidents.

Pond 1 – Annual inspections are conducted by Ameren Missouri. No major problems were observed for the 2008 and 2009. No significant deterioration was indicated in the documentation reviewed. A 2007 inspection report, conducted as a part of the AmerenUE Dam Inventory and Inspection Program, identified retention wall and upstream slope failures at Pond 1 (Reitz & Jens, Inc., 2007).

Pond 2 – Weekly inspections conducted by Ameren Missouri were provided for the period September 7, 2010 through September 23, 2010. Wash outs and erosion along several areas on the side of the access roads were identified as needing immediate maintenance. Annual inspections are conducted by Ameren Missouri. No major problems were observed for the 2008 and 2009 inspections. No significant deterioration was indicated in the documentation reviewed. The 2007 inspection report indicated no significant deterioration for Pond 2 in the documentation reviewed (Reitz&Jens, Inc., 2007).

Pond 3 – Annual inspections are conducted by Ameren Missouri. No major problems were observed for 2008 or 2009. No significant deterioration was indicated in the documentation reviewed. The 2007 inspection report indicated no significant deterioration for Pond 3 in the documentation reviewed (Reitz & Jens, Inc., 2007).

Pond 4 – Annual inspections are conducted by Ameren Missouri. No major problems were observed for 2008 or 2009. It is noted that seepage was reported in both inspection reports. No significant deterioration was indicated in the documentation reviewed. The 2007 inspection report indicated no significant deterioration for Pond 4 in the documentation reviewed (Reitz & Jens, Inc., 2007).

3.2 SUMMARY OF LOCAL, STATE AND FEDERAL ENVIRONMENTAL PERMITS

The Meramec PS is currently regulated under the State Operating Permit No. MO-0000361 (see Doc. 1.7 of Appendix A). This permit was effective on May 19, 2000 and expired on May 18, 2005, according to the furnished documentation. Information regarding the pursuit or receipt of permit renewal was not provided.

The facilities at the Meramec PS are regulated for water quality by the Missouri Department of Natural Resources (MDNR) Division of Environmental Quality. Water sampling at the outlet structure of Ponds 1 and 2 are conducted to monitor the quality of the discharge that reaches the Meramec River, and ultimately the Mississippi River.

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS (IF ANY)

There have been no reported spill/release incidents at the Meramec PS CCW basins.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

Original construction records are not available, and design dates on the provided Meramec PS design plans are illegible (see Appendix A, Doc. 1.3). Therefore, little is known of original construction or the sequence of construction of the CCW ponds, other than the year each pond was brought online.

Pond 1 – The basin was brought online in 1977. The incised basin was constructed on the northwest side of the plant within a portion of the original Pond 3. A perimeter dike around the basin ties into the outer perimeter levee. It is bounded on the northeast side by a filled portion of the original Pond 3, on the northeast side by the outer perimeter levee, on the southwest side by a filled portion of the original Pond 7, and on the southeast side by the internal railroad. The lowest elevation on the basin floor is approximately 396.0 feet. The basin was not lined.

Pond 2 – The basin was brought online in 2000. According to provided plans (Appendix A, Doc. 1.3), stormwater from Pond 2 originally was drained into Pond 8. The diked basin was constructed on the southeast side of the plant. It is bounded on the northwest side by Pond 8, southeast side by the internal railroad, the west by the outer perimeter levee, and northeast side by the filled Pond 10 and the coal storage area. The lowest elevation on the basin floor is approximately 400.0 feet.

Pond 3 – The basin was brought online in 2003. The incised basin was constructed on the west side of the plant within the original Pond 3 location. It is bounded on the northwest side by the internal railroad, southwest side by Pond 7, the east by Ponds 4 and 5, southwest side by the coal storage area, and the south by the filled Pond 9. The lowest elevation on the basin floor is approximately 395.0 feet.

Ponds 4, 5, & 6 – The basin was brought online in the 1950s. The basin was constructed adjacent to high ground to the east. The basin is bounded on the east by an access road, on the northwest side by the perimeter levee, on the southwest by Pond 3 and filled original Pond 9, and on the south by the plant facilities. The lowest elevation on the basin floor is unknown. The basin was not lined.

Pond 7 – The basin was brought online in 1965. The basin was constructed at the northwest side of the plant. The basin is bounded on the east side by Pond 3 and Pond 9, on the west side by the perimeter levee, and on the south by Pond 8. The lowest elevation on the basin floor is unknown.

Pond 8 – The basin was brought online in 1965. The basin was constructed between Pond 2 and Pond 7. The basin is bounded on the east side by Pond 10, on the west side by the perimeter levee, on the north by Pond 7, and on the south by Pond 2. The lowest elevation on the basin floor is unknown.

Pond 9 – The basin was brought online in 1965. The basin is bounded on the north side by Pond 3, on the west side by Pond 7, on the south by Pond 10, and on the east by Pond 6. The lowest elevation on the basin floor is unknown.

Pond 10 – The basin was brought online in 1965. The basin is bounded on the east side by Pond 2, on the north side by Pond 9, on the south by a coal storage area, and on the west by plant facilities. The lowest elevation on the basin floor is unknown.

4.1.2 Significant Changes/Modifications in Design since Original Construction

Pond 1 – Based on design information provided (Appendix A, Doc. 1.3), the perimeter levee has been raised to elevation 418.0 feet and the perimeter dike to 416.7 feet. Pond 1 receives surface runoff from Ponds 7 and 8, discharge from Pond 3 and Pond 4, and overflow from Pond 2.

Pond 2 – Based on design information provided (Appendix A, Doc. 1.3), the perimeter levee has been raised to elevation 420.0 feet. A decant structure has been installed since original construction, and Pond 2 discharges directly into the Meramec River. Overflow from Pond 2 discharges into Pond 8 and is ultimately ditched into Pond 1.

Pond 3 – The original basin was filled to capacity. Portions of the original pond support plant equipment and a coal storage area. Pond 1 and the New Fly Ash Pond (Pond 3) are incised within the original Pond 3 basin. Pond 3 discharges directly into Pond 1.

Ponds 4, 5, & 6 – The original outlet structure to the tributary to Meramec River has been abandoned and discharge is directed into Pond 1 via an 18-inch diameter CS pipe. A portion of the perimeter levee at Pond 4 has been raised to elevation 411.5 feet.

Pond 7 – The basin has been filled to capacity and is no longer active. The southern portion of the original basin has been converted into a coal storage area. An internal railroad embankment has been constructed along the outer perimeter levee of the basin.

Pond 8 – The basin has been filled to capacity and is no longer active. A railroad track has been constructed on the dike between Pond 7 and Pond 8.

Pond 9 – The original basin has been filled to capacity and closed. Presently, the basin area supports plant equipment and a portion of the basin area is used for coal storage. A portion of the filled original pond has been incised for Pond 3.

Pond 10 – The original basin has been filled to capacity and closed. Presently, the basin area supports plant equipment and internal railroad tracks.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

There have been no significant repairs/rehabilitation made to the Meramec PS basins since the original construction. Slope repairs have been made along the perimeter levee outside slope due to runoff erosion.

4.2 SUMMARY OF OPERATIONAL HISTORY

4.2.1 Original Operational Procedures

The furnished documents do not include the original operational procedures.

4.2.2 Significant Changes in Operational Procedures since Original Startup

No documents were provided to indicate that basic operational procedures have significantly changed since original startup.

4.2.3 Current Operational Procedures

The Meramec PS CCW ponds are operated and monitored for water quality under a MDNR approved operating permit.

Pond 1 operates mainly as a clarifying pond. Pond 3 and Pond 4 CCW basins decant structures discharge into the basin. A series of ditches directs surface runoff into Pond 1. Water quality is monitored for acceptable pH levels prior to discharge from Pond 1.

Pond 2 operations consist of fly ash sedimentation, water treatment, and chemical stabilization. Ash waste (predominantly bottom ash and fly ash) is mixed with water at the plant and the slurry is pumped to the basin. The CCW slurry is pumped into excavated channels within the basin and gravity settling separates the fine from the coarser materials. Once the channels become full, the ash is excavated. The water flows through channels excavated in the ash to a pond area at the west end of the basin. At the outlet structure in the northwest corner of Pond 2, the water flows to a 10.0-ft diameter corrugated pipe decant structure, then through a 36-in diameter HDPE pipe to the Meramec River. Water quality is monitored for acceptable pH levels prior to discharge from Pond 2.

Pond 3 operation consists of mixing fly ash waste with water at the plant and pumping the slurry to the basin. The CCW slurry is pumped into excavated channels within the basin and gravity settling separates the fine from the coarser materials. Once the channels become full, the ash is excavated. The water flows through channels excavated in the ash to a pond area at the northwest end of the basin. At the outlet structure in the northwest corner of Pond 3, the water flows through a 24-inch diameter HDPE pipe to Pond 1.

Ponds 4, 5, & 6 operation consists of mixing bottom ash waste with water at the plant and pumping the slurry to the basins. The CCW slurry is pumped into excavated channels within Ponds 5 and 6, and gravity settling separates the fine from the coarser materials. Once the channels become full, the ash is excavated. The water flows through channels excavated in the ash to a pond area at Pond 4. At the outlet structure in the northwest corner of Pond 4, the water flows through an 18-inch diameter CS pipe to Pond 1.

4.2.4 Other Notable Events since Original Startup

Based on furnished information, there are no notable events since original startup of Meramec PS basins to report at this time.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Jeffrey Crabtree, PE and James Filson, PE collected available data and documents and made field observations during a site visit on September 29, 2010, in company with the participants listed in Section 1.3. The design engineer of record for Meramec PS CCW ponds was not present or available to assist with answering questions about these basins.

The site visit began at 1:30 PM. Weather conditions during the visit were 85 degrees Fahrenheit, sunny, and dry. Photographs were taken of conditions observed. Photographs referenced below are contained in Section 5.3 following the text descriptions.

The overall visual assessment is that the earthen levee embankment that impounds the Meramec PS CCW ponds is in good condition. No visual signs of imminent instability or inadequacy of the principal structures at these basins that would require emergency remedial action were observed. No evidence of past repairs was observed. No significant findings were noted.

5.2 PONDS

5.2.1 Embankment Dam and Basin Area

Crest

A single perimeter levee creates the impoundment around the west and south sides, and ties into high existing ground on the northeast and southeast side. The outer slope of the levee is tiered. The second tier, the top of the crest, is enclosed within a chain linked fence. Typical views of the crest are shown in Photos 1 and 2. The first tier, the crest of the access road, is on the outer perimeter of the crest and is accessible by automobile from the Meramec PS plant. The gravel and ash-surfaced access road along Pond 2 was observed to be in good condition (Photos 3 and 4). Evidence of a repaired erosion area along the embankment is shown in Photo 5. No major depressions, sags, tension cracks or other signs of significant settlement or mass soil movement were observed. No tension cracks which might suggest soil shear failure were observed in the crest. Gulley erosion was observed at the edge of the first tier crest and downstream slope of the access road and the edge of the second tier crest, see Photos 6 to 8.

Outside Slope and Toe

The outside slope of the second tier of the levee embankment was observed to be maintained free of grass and vegetation, see Photos 1 and 6. The outside slope of the first tier of the levee embankment at Pond 2 is visible in Photos 9 to 11. As shown, the grass and woody vegetation on the outside slope typically was observed to be unmaintained. The outside slope of the first tier of the levee embankment at Pond 8 is visible in Photo 12. As shown, the grass on the outside slope typically was observed to be unmaintained. Evidence of slope erosion repair was observed. The outside slope of the levee embankment at Pond 1 is visible in Photo 13. As shown, the grass and vegetation on the outside slope typically was observed to be unmaintained. The lower part of the outside slope was observed to be submerged by the water. No areas of significant erosion were observed. No obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes were observed.

A perimeter access road at the toe of the levee embankment was submerged at the time of inspection. The submerged perimeter access road is shown in Photos 14 to 19. Photo 14 shows the submerged access road at the toe crossing under the railroad bridge. Photos 20 to 24 show a relatively flat area, approximately 5 feet wide, between the toe of the embankment and the tree line at the outside toe of Pond 7. Organic debris was observed at the outside toe of the levee embankment of Pond 7. A tributary to Meramec River is at the downstream toe along the northwest levee embankment, shown in Photos 25 and 26. The toe of the levee is submerged. Photo 26 shows evidence of outside slope erosion repair. Minor seepage was observed at the outside toe of Pond 4. Photo 27 shows cattails at the outside toe, indicating standing water or consistent moist conditions. No active erosion was observed along the outside toe.

Inside Slope and Basin Area

The inside slope of Pond 1 perimeter dike was observed to be covered in tall vegetation on three sides, and sparse vegetation on the southeast side. Erosion was observed in the inside slope of the perimeter dike. Photo 28 shows wooden retaining wall failure on the west inside slope. The water surface elevation at the time of the inspection was 405.0 feet.

The inside slope of Pond 2 perimeter dike is lined with 60 MIL HDPE slope liner, shown in Photos 29 to 32. Sparse vegetation growth is observed on the slope liner, see Photo 31. Ash build-up was observed at the south side of the pond shown in Photos 29, 30, and 32. The surface of the exposed ash fill is generally covered with brush and woody vegetation. The water surface elevation at the time of the inspection was 416.5 feet. No significant erosion was noted.

The water surface elevation in Pond 3 at the time of the inspection was 413.0 feet. Photo 34 shows the filled fly ash area between Pond 1 and Pond 3. Filled fly ash area was a part of the original Pond 3.

The inside slope of the Pond 4 perimeter embankments were observed to be generally covered in tall vegetation on three sides. The inside slope of the railroad embankment crossing the pond from the west to the east corner of Pond 4 was observed to be generally covered in tall vegetation. See Photos 34 to 39 for inside slope and pond area. Ash build up was not observed within Pond 4 basin area. The water surface elevation within Pond 4 at the time of the inspection was 408.0 feet. Photo 40 shows ash build up with sparse brush vegetation within Ponds 5 and 6. No significant erosion was noted.

The inside basin area of Pond 8 has been filled to capacity with fly ash and is no longer active. Photo 41 shows ash build-up with sparse brush vegetation within Pond 8. No significant erosion was noted.

Abutments and Groin Areas

The abutment and groin areas where the perimeter levee ties into high ground was not observed.

5.2.2 Outlet Structures

Overflow Structure

Pond 1 outflow structure consists of a 24-inch diameter carbon steel (CS) pipe drop inlet with a seal boom skimmer. Photo 42 shows the skimmer and inlet of the outflow structure. A steel footbridge access to the structure is shown in Photo 28. There was no sign of clogging and the water exiting the outlet was observed to be flowing clear.

Pond 2 outflow structure consists of a 10-ft diameter corrugated steel decant structure outlet with seal booms. Photo 43 shows the skimmer, decant tower, and the steel footbridge access to the structure. Pond 2 has four 12-inch PVC pipes that convey overflow from Pond 2 into Pond 8. Photo 32 shows the PVC pipes that pass through the northwest perimeter dike. There was no sign of clogging and the water exiting the outlet was observed to be flowing clear.

Pond 3 outflow structure consists of a drop inlet with a 24-inch HDPE and a skimmer. Pond 3 outflow structure was not observed.

Pond 4 outflow structure consists of a decant structure outlet. Photo 35 shows a portion of the decant structure. Observation of the structure was obstructed by tall vegetation.

Outlet Conduit

The outlet conduit at Pond 1 is a 24-inch diameter carbon steel (CS) pipe that extends through the perimeter levee and into the tributary to the Meramec River with a 90 degree bend at the end, see Photo 44. The outlet end appeared to be in good condition and operating normally. There was no sign of clogging and the water exiting the outlet was observed to be flowing clear.

The outlet conduit at Pond 2 is a 36-inch high density polyethylene (HDPE) pipe that extends through the west portion of the perimeter levee and discharges into the Meramec River with an upward bend at the end, see Photos 45 and 46. Photo 47 shows the outlet conduit discharging into a plunge pool. The outlet end appeared to be in good condition and operating normally. There was no sign of clogging and the water exiting the outlet was observed to be flowing clear.

The Pond 3 24-inch HDPE pipe outlet conduit is submerged and was not observed. The outlet structure discharges into Pond 1.

The Pond 4 18-inch diameter CS pipe outlet conduit is submerged and was not observed. The outlet structure discharges into Pond 1.

Emergency Spillway

There is no emergency spillway.

Low Level Outlet

There is no low level outlet.

5.3 FIELD PHOTOGRAPHS

1. Looking west from access road at levee embankment at Pond 2.

2. Looking east along internal side slope and crest of levee embankment of Pond 2. Note – liner in place.

3. Looking south along embankment between railroad and Pond 2 (#489).

4. Looking Southwest at top of levee embankment of Pond 2 from access road.

5. Repaired erosion area along levee embankment at Pond 8.

6. Looking at runoff erosion along top of levee embankment from runoff at Pond 2.

7. Runoff erosion from edge of crest of access road at Pond 2.

8. Looking at runoff erosion on down side of levee embankment at edge of crest of access road at Pond 8.

9. Looking northwest at outside slope of Pond 2 levee embankment. Note – High water was observed in the Meramec River during site visit. Perimeter access road was submerged.

10. Outside slope of levee embankment at Pond 2. An unknown pipe was observed at the location, see Photo 14.

11. Looking southeast along outside slope of levee embankment of Pond 2. Note - High water was observed in the Meramec River during site visit.

12. Looking at outside slope of levee embankment at Pond 8. Note - Repaired erosion area at edge of crest.

13. Looking northeast along outside slope and toe of the levee embankment along the tributary to Meramec River.

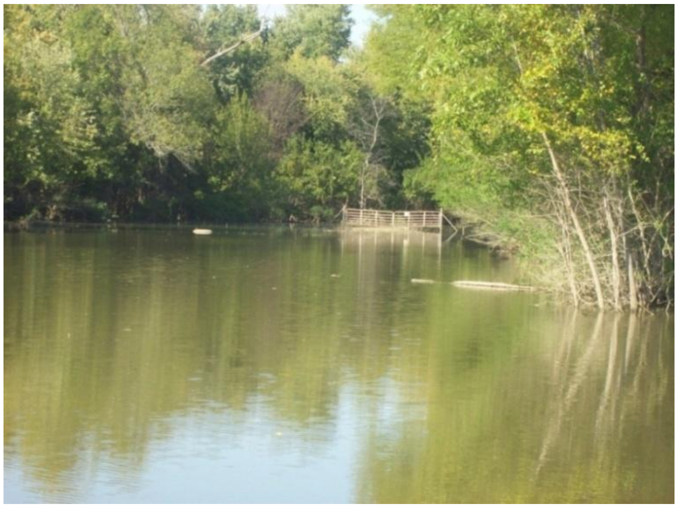
14. Looking at unknown pipe at the outside toe of Pond 2 levee embankment.

15. Looking southeast at railroad bridge. Location of submerged perimeter access road.

16. Looking southeast along perimeter levee embankment. Note - High water was observed in the Meramec River during site visit.

17. Looking southeast at tree line adjacent to submerged perimeter access road.

18. Looking southwest along toe of levee embankment where floodplain is flooded.



19. Looking north at perimeter access road gate. Road under water.

20. Looking south along outside toe of Pond 7.

21. Looking northwest along outside toe and slope of levee embankment of Pond 7. Note - railroad tracks adjacent to top of embankment.

22. Looking northwest along outside toe of levee embankment at Pond 7.

23. Looking north along outside toe of levee embankment at Pond 7. Note - gate for perimeter access road is submerged.

24. Looking northeast along outside toe of levee embankment at Pond 7.

25. Looking southwest along Meramec River just outside from Pond 1 (retention pond) outlet.

26. Evidence of repair to outside slope of levee embankment due to erosion.

27. Looking towards Pond 4 (Bottom Ash Pond) at outside toe and slope of levee embankment. Note - Cat tails.

28. Looking southeast at Pond 1 (retention pond).

29. Looking northwest at Pond 2. Note – Unit has a slope liner.

30. Looking north at Pond 2. Note – Unit has a slope liner.

31. Looking at Pond 2 toward coal storage area. Note - liner with some vegetation.

32. Looking north at overflow pipes and coal storage area. Note - pipe in water for taking water samples.

33. Looking at the Pond 3 ("New" Fly Ash Pond) area in the distance and the fill Fly Ash area to the northeast of Pond 1.

34. Looking through railroad track at southeast side of Pond 4 (Bottom Ash Pond).

35. Looking through railroad tracks at southeast side of pond area of Pond 4.

36. Looking north at northwest side of Pond 4.

37. Looking southeast at railroad tracks between northwest & southeast Pond 4.

38. Looking southwest from railroad track at northwest Pond 4.

39. Looking north at southeast Pond 4 from railroad tracks.

40. Looking towards Pond 5 and 6 (Bottom Ash Pond).

41. Looking northeast at completely filled and deactivated Pond 8 (Fly Ash Pond #495).

42. Looking at retention pond inlet.

43. Looking at Pond 2 (#489) inlet structure.

44. Looking northeast at outfall pipe from Pond 1.

45. Looking west at outfall #009 at Pond 2 toward Meramec River.

46. Outfall #009 from Pond 2.

47. Plunge pool at outfall #009.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Floods of Record

Flood record information was not provided for these facilities. The 2007 inspection report referenced the 1995 Federal Emergency Management Agency (FEMA) Mississippi River base flood elevation as 417.4 feet NGVD at the confluence with Meramec River. The 1995 FEMA Flood Insurance Rate Map of the confluence of the Mississippi and Meramec River is shown in Doc. 1.8 of Appendix A. The reported 100-year flood elevation of the Mississippi River at the Meramec PS in Appendix D of the 2004 Army Corps of Engineers (USACE) Upper Mississippi River System Flow Frequency Study is approximately 415.1 feet NGVD (see Doc. 1.9 of Appendix A).

6.1.2 Inflow Design Flood

As previously mentioned, the Meramec PS dam heights are less than 35 feet, and do not require MDNR registration permits. Based on Environmental Zone Classification III, if safety standards closely follow those given in the Missouri dam safety requirements, the spillway design flood (SDF) criterion is the 100-year frequency rainfall event.

6.1.3 Spillway Rating

No spillway ratings were provided for the outlet works.

6.1.4 Downstream Flood Analysis

No downstream flood analysis has been provided. A qualitative analysis based on field observations and review of available data follows.

Failure by flood overtopping would occur at the lowest elevation at the perimeter levee at Pond 1; this scenario would release an insignificant volume of ash into the Meramec River. A breach of the perimeter levee (considered an unlikely scenario at Ponds 1 and 3) at either Pond 2 or Pond 4 would release water into the Meramec River and could release ash into the Meramec River. Ash in the Meramec River would cause minor environmental impact and may disrupt navigation. The water and ash released by a breach of the perimeter dikes within the levee would be contained within the levee embankment.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

A summary of the analysis of the ability to safely store and pass the inflow design flood was provided in the 2007 AmerenUE Dam Inventory and Inspection Program – Phase I report by Reitz & Jens, Inc.. Basin elevation-storage curves, spillway rating curves, and a dam break analysis are not available for the basins.

Based on assumptions and variables in the referenced analysis in the 2007 Reitz & Jens, Inc. and current reported storage volumes, Pond 2 dike would be overtopped by the 100-year frequency rainfall event. Overflow from Pond 2 discharges into the retention pond, Pond 1.

Pond 3, if assumptions and variables in the referenced analysis in the 2007 Reitz & Jens, Inc. report are currently valid, is able to safely store and pass the 100-year frequency rainfall event. If the current available storage is less than assumed and/or the normal pool is greater than assumed, then the 100-year frequency rainfall event will overtop the dike and discharge into the retention pond, Pond 1.

The Bottom Ash Ponds (Pond 4, 5, and 6), if assumptions and variables in the referenced analysis in the 2007 Reitz & Jens, Inc. report are currently valid, is able to safely store and pass the 100-year frequency rainfall event. If the normal pool is greater than assumed, then the 100-year frequency rainfall event will overtop the dike and discharge into the retention pond, Pond 1.

Deactivated Ponds 7 and 8 are able to provide overflow storage volume for Pond 1. However, during the 100-year frequency rainfall event, the perimeter dike will be overtopped. Available storage within Pond 1 is less than the total contributing runoff from the 100-year frequency rainfall event.

Based on lowest top of levee elevation and the 2004 USACE 100-year flood elevation of 415.0 feet NGVD, Pond 1, Pond 4, and Pond 7 would be inundated during the 100-year frequency rainfall event.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

The ability to safely store and pass the 100-year frequency rainfall event in the active ponds, based on the summary and assumptions referenced in 2007 AmerenUE Dam Inventory and Inspection Program – Phase I report by Reitz & Jens, Inc., is adequate for Ponds 3, 4, 5, and 6. Pond 1 and Pond 2 are not adequate to store and pass the 100-year frequency rainfall event.

There are no records that address containment of water in the basins during significant flooding events that have occurred. Ameren Missouri did report to Dewberry that during the current 2011 major floods along the Meramec and Mississippi Rivers, there has been no overtopping of the levee and the dikes have held. Based on the history and future downstream slope improvement project, failures of the embankment levees are not anticipated. The CCW ponds appear to have satisfactory hydrologic/hydraulic safety.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

No stability analyses were provided for the original design and construction of the perimeter levee. An Ash Pond Dam Stability Analysis was conducted by Reitz & Jens, Inc. in November 2010 after the site visit (Doc 1.10). A subsequent analysis was performed in March 2011 (Doc 1.12).

7.1.2 Design Properties and Parameters of Materials

Pond 2 – In the 2010 Ash Pond Dam Stability Analysis borings of the embankment consists of fly ash, bottom ash, silty clay, and high plastic clay (Reitz&Jens, Inc., 2010). The embankment soils have a computed friction angle of 29°. Foundation soils of Pond 2 consist of silty and moderate to high plasticity clay. The first 9 feet of the foundation soils have a computed friction angle of 23° to 24°. Underlying the silty and moderate to high plasticity clay soils is clay, silt and sand.

Pond 7 – In the 2010 Ash Pond Dam Stability Analysis borings of the embankment consists of clay, silty clay, and clayey silt (Reitz&Jens, Inc., 2010). The embankment and the first 6 feet of the foundation soils have a computed friction angle of 23°. Foundation soils consist of silty soft clay. Underlying soils are stiff clay and silty clay with a computed friction angle of 27°. Sand and silt soils were encountered at 22 feet into the foundation soil, computed friction angle of 30°.

Pond 1 and Pond 3 – In the 2010 Ash Pond Dam Stability Analysis borings of the embankment consists of sandy silt, clayey silt, and silt clay (Reitz&Jens, Inc., 2010). Embankment soils have a computed friction angle of 26°. Foundation soils of Pond 1 and 3 consist of silty clay. The computed friction angle compression of the top 12 feet of the foundation soil is 27°. Underlying soils are stiff clays to clayey silt, silt clay, and sandy silt. The computed friction angle of the underlying soils is 26° to 25°.

7.1.3 Uplift and/or Phreatic Surface Assumptions

Phreatic surface assumptions are taken from the November 2010 Ash Pond Dam Stability Analysis. The downstream sides of the CCW pond embankments were analyzed for steady seepage and seismic seepage loading conditions at full and maximum pond capacity. Piezometer readings from the November 2010 Ash Pond Dam Stability Analysis, show the groundwater elevation to be above the downstream toe elevation. The phreatic line is low through the embankment.

Pond 2 is lined, therefore a phreatic line does not occur through the embankment. From visual observations in the field, the phreatic surface does not crop out on the outside slope of the perimeter levee.

7.1.4 Factors of Safety and Base Stresses

A slope stability analysis conducted in the November 2010 Ash Pond Dam Stability Analysis by Reitz & Jens, Inc. shows the perimeter dike does not meet the MDNR minimum required factor of safety of 1.5 for steady seepage loading (Doc 1.10). The factor of safety results of the seismic loading show the perimeter dike factor of safety is greater than the minimum required factor of safety of 1.0. See tables in Section 7.3.

7.1.5 Liquefaction Potential

This coefficient represents the fraction of the gravitational acceleration applied horizontally to the soil mass directed away from the slope to approximate the lateral forces on the dike mass that occur during an earthquake. Seismic stability analysis was performed for the downstream slope only. A horizontal acceleration of 0.05g or 0.25 of the probable maximum acceleration was added to the steady state seepage model. See summary of results of seismic stability analysis in section 7.3.

7.1.6 Critical Geological Conditions and Seismicity

The reviewed documents did not include any information regarding the critical geological conditions and seismicity used in the original design of perimeter levee or embankment dikes that impound CCW ponds. Minimal subsurface information was provided by the boring log profiles developed during the drilling and piezometer installation within Pond 7 (see Doc. 1.5 in Appendix A). The pertinent boring logs show that the virgin soils in the vicinity (along Pond 7) generally consisted of silty clay and clayey silt underlain by clay and silty clay.

Static water level readings indicate the depth to groundwater to be less than 40 feet. The types of soils within the perimeter levee, shown in the Pond 7 soil boring logs, would not typically be susceptible to liquefaction. However, due to the location of the Meramec PS within the Meramec River floodplain, high static water level in the area, and its proximity to the New Madrid and Wabash Valley seismic zones, the susceptibility of surrounding ground to liquefaction is moderate.

Seismicity – The site of the ash basins is in an area of moderate seismic hazard, however the site is within 150 miles of two known active seismogenic source areas (New Madrid and Wabash Valley seismic zones). Based on USGS Seismic-Hazard Maps for Central and Eastern United States, dated 2008, the Meramec

Power Station, is located in an area anticipated to experience 0.20g or higher peak ground acceleration with a 2-percent probability of exceedance in 50-years.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

The structural stability documentation is adequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Per Table 7.1 below, structural stability under static loading conditions of the perimeter levee embankment is currently unsatisfactory based on the steady seepage loading safety factor results in the November 2010 Ash Pond Dam Stability Analysis (Reitz & Jens, Inc., 2010). The steady seepage loading safety factors do not meet the minimum required safety factor of 1.5 along the perimeter levee for any of the investigated pond dikes. The Reitz & Jens November 2010 report indicates the unsatisfactory Factors of Safety are "due to the steep outside slopes of the perimeter levee". Therefore, the structural soundness of the CCW embankments are rated **UNSATISFACTORY in their current configuration**.

Table 7.1: Factor of Safety (Reitz & Jens, Inc., November 16, 2010)

Load Case	Required Factor of Safety	Cross Section 1	Cross Section 2	Cross Section 3	Cross Section 4	Cross Section 5
Steady Seepage	1.5	1.3	1.4	1.3	1.4	1.2
Earthquake, Steady Seepage	1.0	1.1	1.2	1.1	1.2	1.1

Ameren Missouri has subsequently initiated a project to be completed in late 2011 to flatten the existing slopes on the downstream side of Ponds 1, 2, and 4 to improve the factor of safety, see Table 7.2. Specifically, the proposed project will increase the embankment cross sectional area and improve the factor of safety of the perimeter levee in the cross sections listed in Table 7.2. The Factor of Safety will be increased with these improvements per March 29, 2011 Revised Meramec Plant Stability Analysis. The Factor of Safety will improve for cross sections 1, 3, and 5 to exceed the required 1.5 minimum Factor of Safety. The cross section 6, Pond 4, Factor of Safety for short term is "conditionally marginal" at a value of 1.46. Cross sections 1, 3, 5, and 6 represent Ponds 1, 2, and 4.

Table 7.2: Factor of Safety (Reitz & Jens, Inc., March 29, 2011)

Cross Sections and Pond	Long-term, Static (Min FoS = 1.5)	Seismic, (Min FoS = 1.0)
Cross Section 1, Pond 1	1.8	1.5
Cross Section 3, Pond 2	1.6	1.3
Cross Section 5, Pond 1	2.1	1.7
Cross Section 6, Pond 4	1.5	1.2

Given the improvement in the Factors of Safety, once the CCW ponds are re-configured then their rating would change to **SATISFACTORY.** Preliminary sketches of the flattened dikes are available in this report (Doc 1.11). However, the current river levels of the Mississippi and Meramec Rivers have prevented Ameren from completing the topographical survey along the toe. Based on current river level projections, the survey can not start until July 2011. The current schedule is as follows:

<u>2011 Proposed Schedule for Dike Re-Configuration</u>

- Complete Construction Drawings - end of July (Floodwaters recede)
- Submit Plans to USACE for approval
- Construction commences in Sept-Oct 2011

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATIONAL PROCEDURES

Pond 1 – This basin is mainly used for water treatment and chemical stabilization prior to discharge to a tributary to the Meramec River. Ash waste material from production operations is not placed directly in the basin. Pond 3 and Pond 4 discharge directly into the basin. Surface runoff from Pond 7 and 8 is ditched to Pond 1. Overflow from Pond 2 discharges into surface ditches of Pond 8. Water is monitored and discharged when pH is within permit limits.

Pond 2 – This basin is currently used for fly ash sedimentation, water treatment, and chemical stabilization. Pond 2 receives onsite surface runoff, fly ash, bottom ash, and wastewater residual wastes. Ash waste material is sluiced into the basin. The ash is excavated and placed in windrowed stockpiles to allow the material to drain prior to loading and transport offsite.

Pond 3 – This basin is currently used for storage and disposal of fly ash. Ash waste material is sluiced into the basin. The slurry is pumped into excavated channels within the basin and gravity settling separates the fine from the coarser materials. Once the channels become full, the ash is excavated. The water flows through channels excavated in the ash to a pond area.

Pond 4 – This basin is currently used for storage and disposal of bottom ash. Ash waste material is sluiced into Ponds 5 and 6. The slurry is pumped into excavated channels within the basin and gravity settling separates the fine from the coarser materials. Once the channels become full, the ash is excavated. The water flows through channels excavated in the ash to a pond area in Pond 4.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Maintenance of the impounding embankments and outlet works of the CCW Ponds is performed as needed, as determined by routine (weekly) inspections performed by operating personnel. Vegetation on the embankment slopes and crest is mowed or cut twice a year or whenever it becomes necessary.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATION

8.3.1 Adequacy of Operational Procedures

Operational procedures at the CCW ponds appear to be appropriate and adequate.

8.3.2 Adequacy of Maintenance

No major maintenance issues were observed during the site visit and no major maintenance issues were noted from review of dam inspection reports and checklists. Maintenance of the impounding embankments and outlet works of the CCW ponds appears to be adequate.

9.0 SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Ameren Missouri formed a Dam Safety Group and associated Dam Safety Program supervised by a licensed professional engineer. The program requires Meramec PS to conduct weekly, annual, and special inspections. Employees trained in dam safety, overseen by civil and geotechnical engineers, inspect the CCW embankments following inspection procedures based on the type of dam safety inspection conducted. The weekly and annual inspections are documented on Inspection Checklists.

9.2 INSTRUMENTATION MONITORING

9.2.1 Instrumentation Plan

There is no dam performance monitoring instrumentation in place in the impounding levee embankment. Staff gauges have been installed to measure the water surface elevation.

9.2.2 Instrumentation Monitoring Results

There are no dam performance monitoring instruments.

9.2.3 Dam Performance Data Evaluation

Not applicable.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

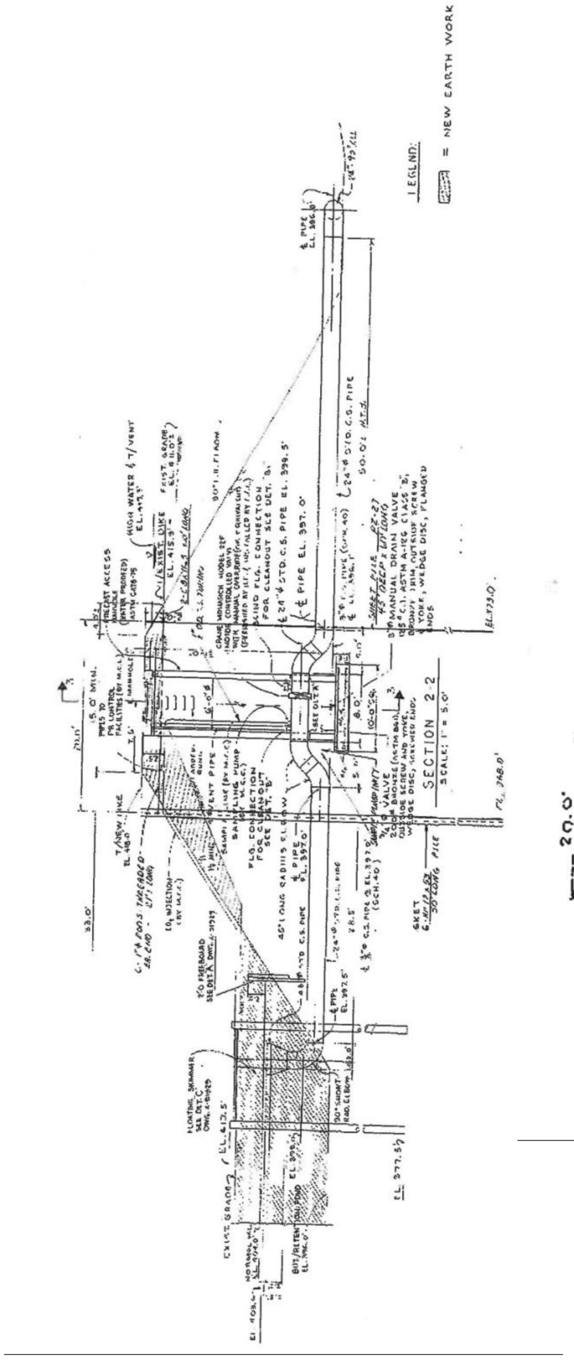
The inspection program is generally adequate based on field observations and the data reviewed by Dewberry. However, internal inspections of the outlet structures with a remote camera or by personnel using confined-space procedures should be conducted on a frequency of at least once every 5 years.

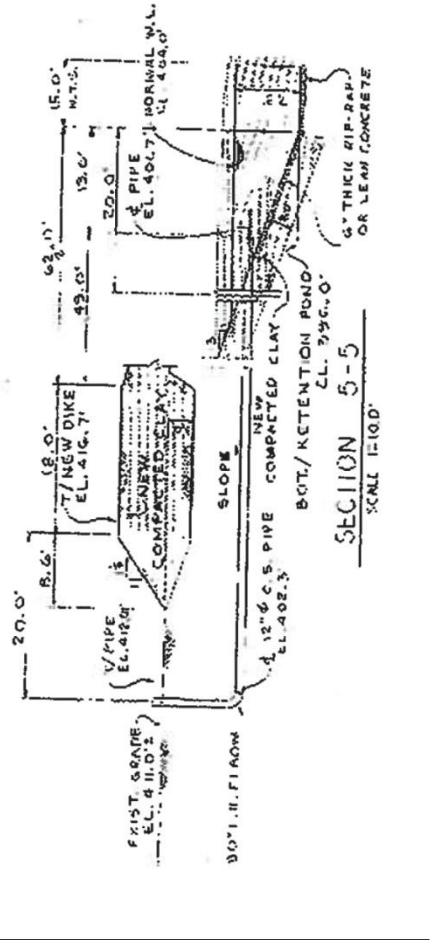
9.3.2 Adequacy of Instrumentation Monitoring Program

There is no dam performance monitoring instrumentation in place. No problem or suspect condition, such as excessive settlement, seepage, shear failure, or displacement was observed in the field that might be reason for installation of instrumentation. In the absence of stability problems or seepage issues, there is no need for performance monitoring instrumentation at this time.

FINAL

EXHIBIT 1: REPRESENTATIVE POND 1 EMBANKMENT SECTIONS





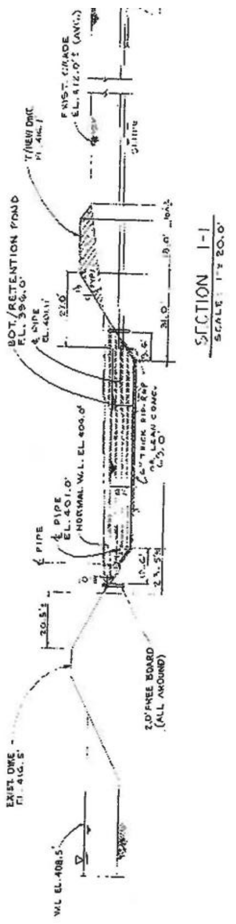


EXHIBIT 2: REPRESENTATIVE POND 2 EMBANKMENT SECTIONS

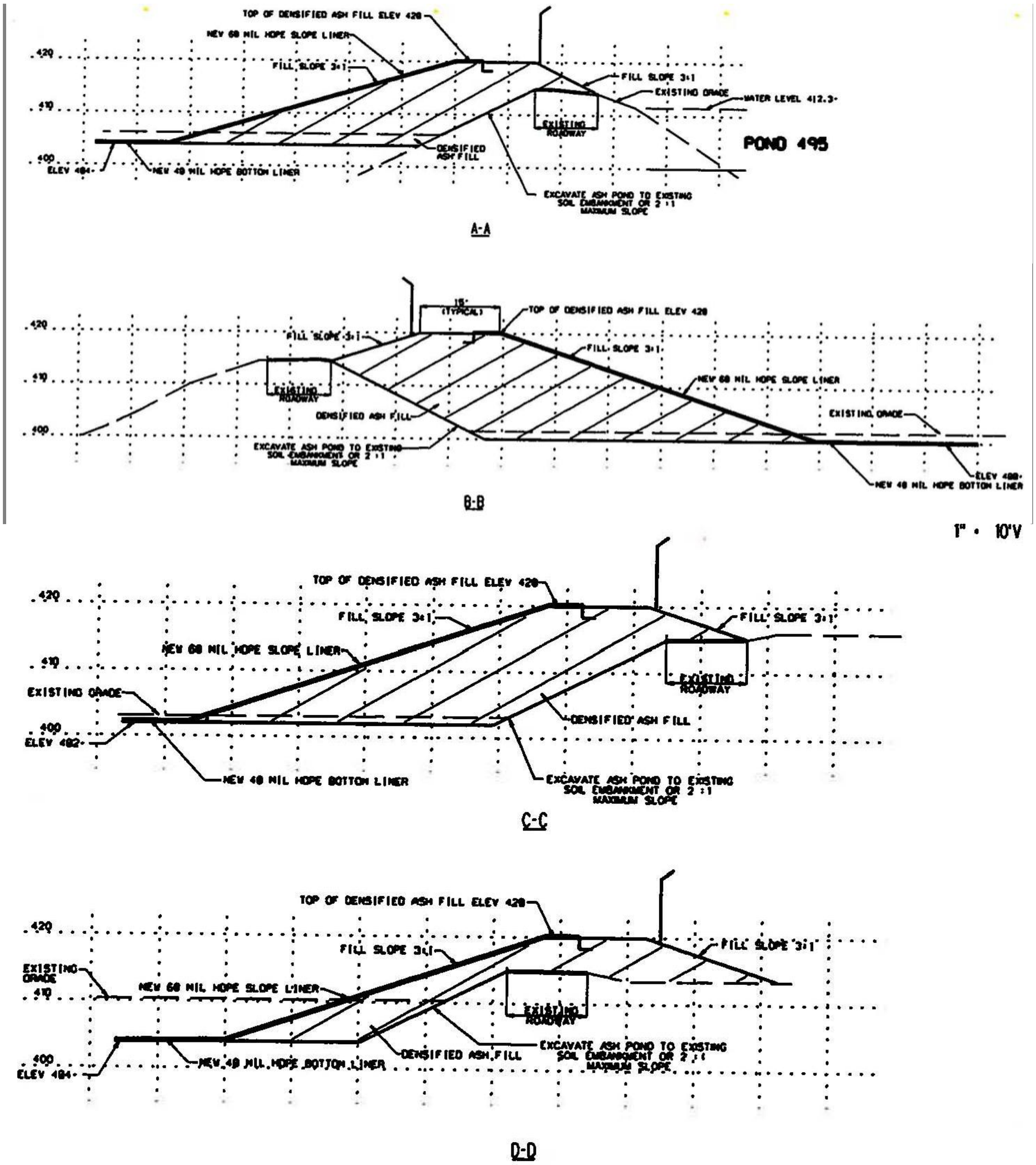
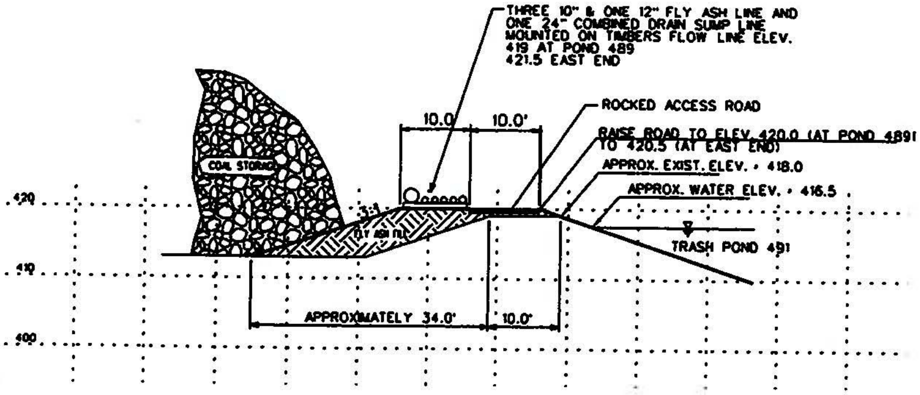
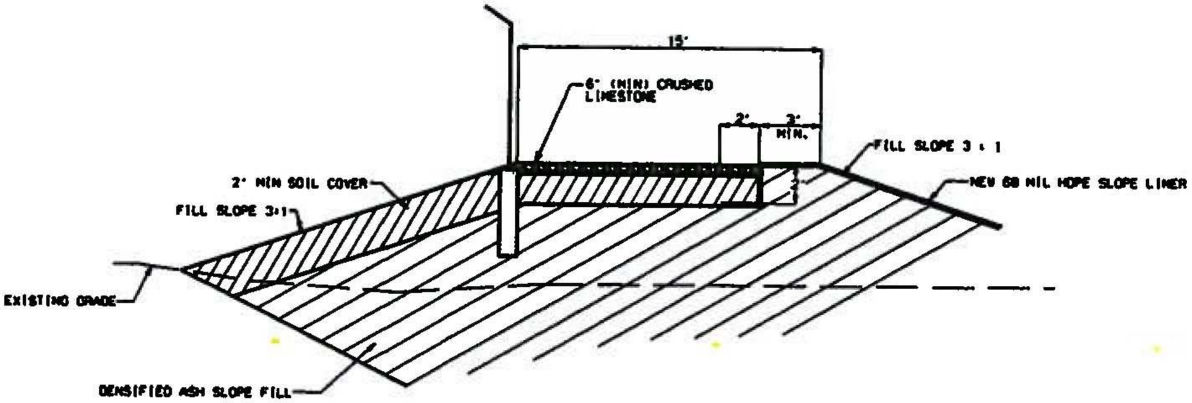


EXHIBIT 2 CONTINUED: REPRESENTATIVE POND 2 EMBANKMENT SECTIONS



E-E
SECTION LOOKING WEST THRU LEVEE
BETWEEN POND 491 & COAL PILE



TYPICAL LEVEE CAP AT POND 489
SCALE 1/4" = 1'

FINAL

EXHIBIT 3: REPRESENTATIVE POND 3 EMBANKMENT SECTIONS

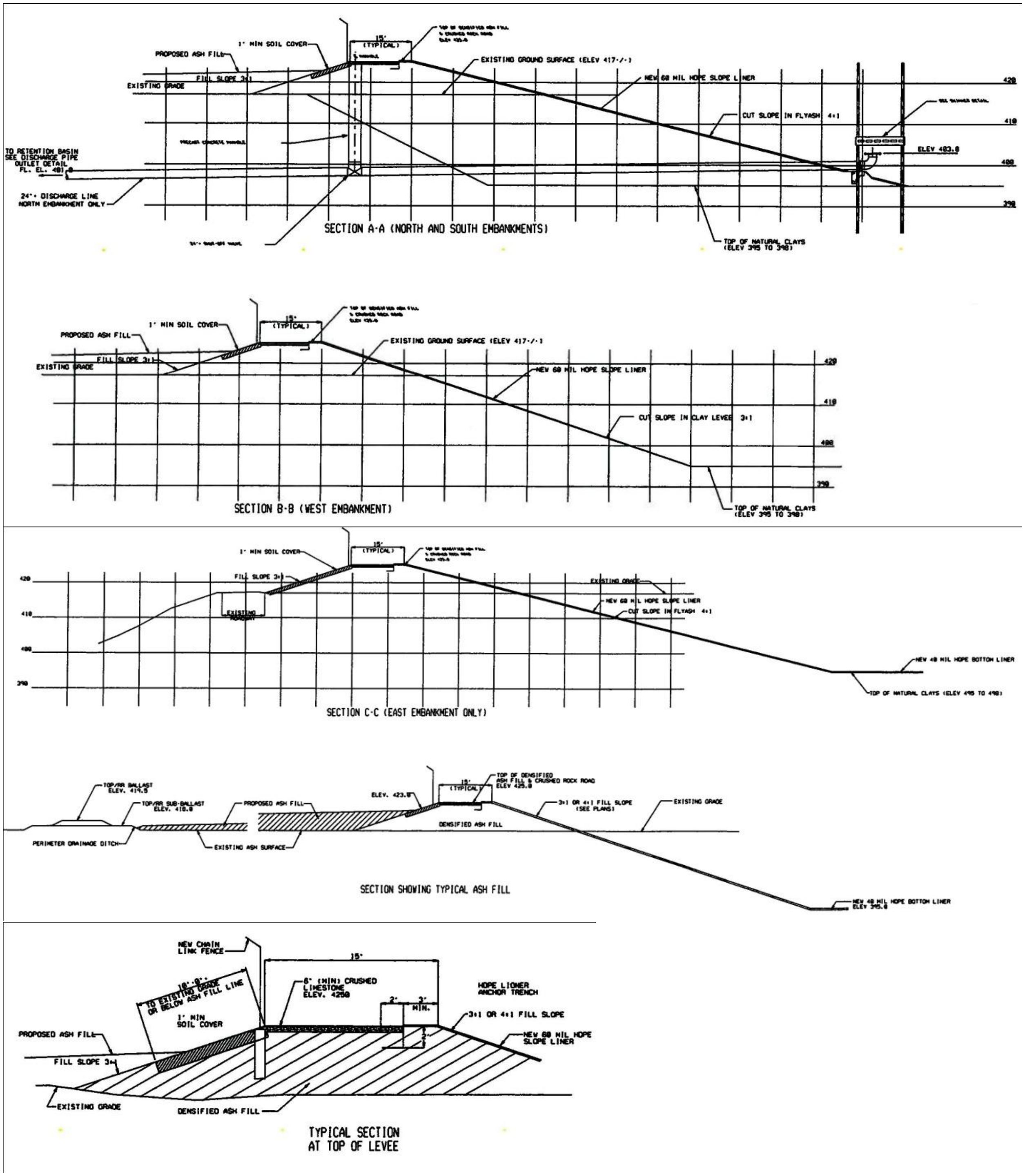
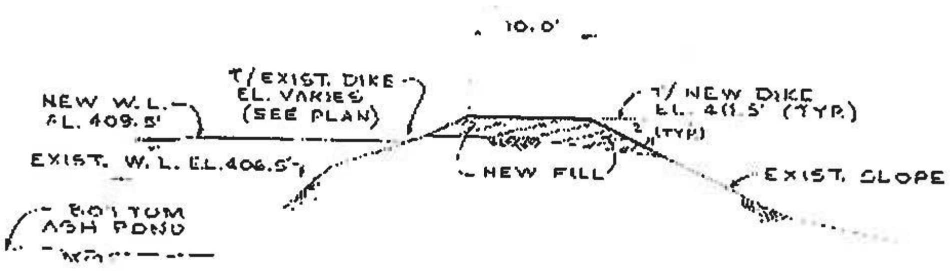
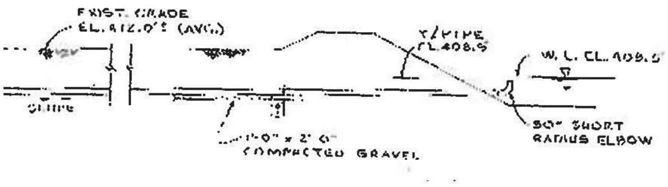


EXHIBIT 4: REPRESENTATIVE POND 4 EMBANKMENT SECTION

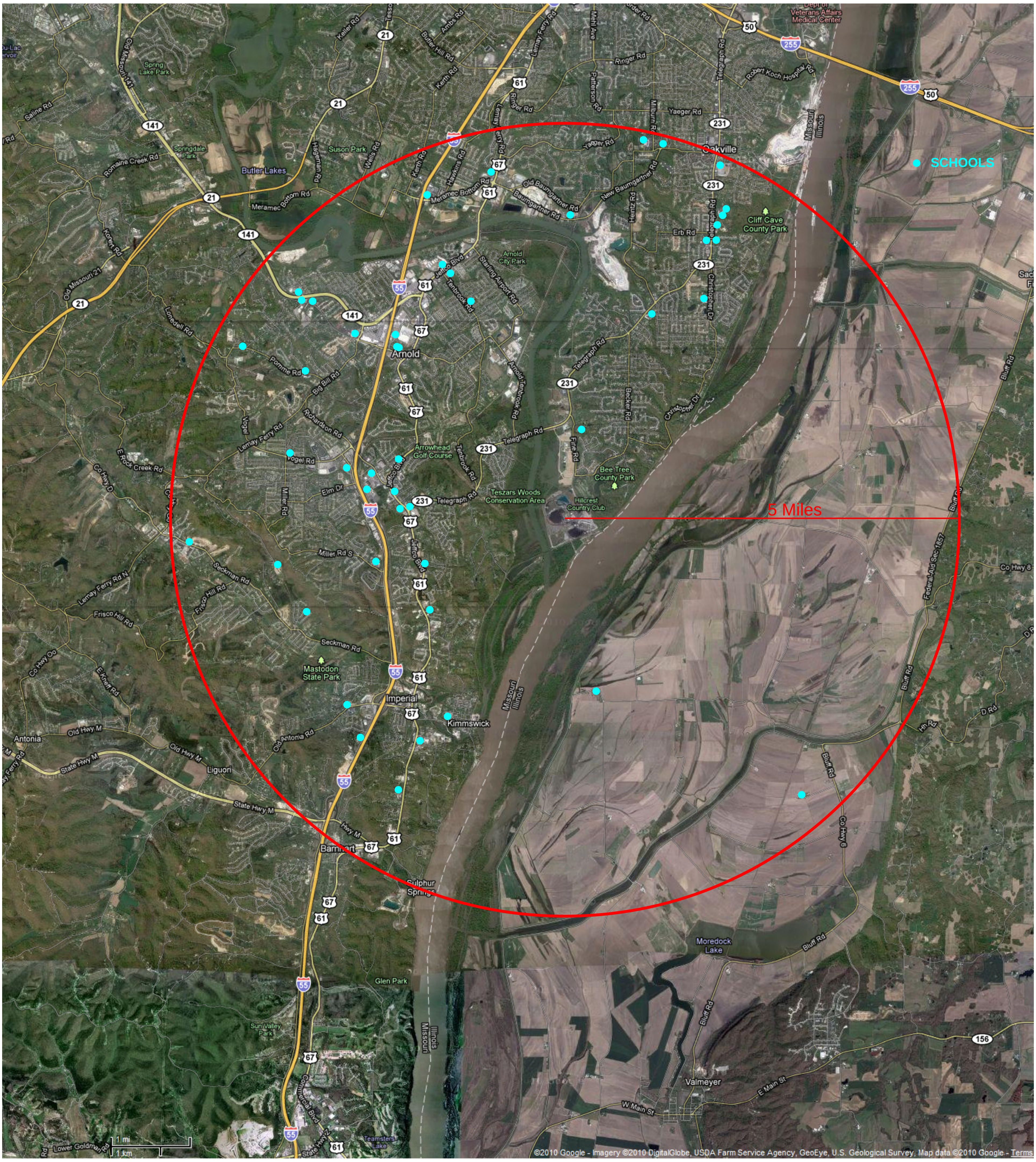


TYPICAL SECTION THRU DIKE AT NORTH BOTTOM ASH POND
SCALE: 1/8" = 1'-0"



APPENDIX A

DOC 1.1 MERAMEC POWER STATION VICINITY MAP (5-MILE)



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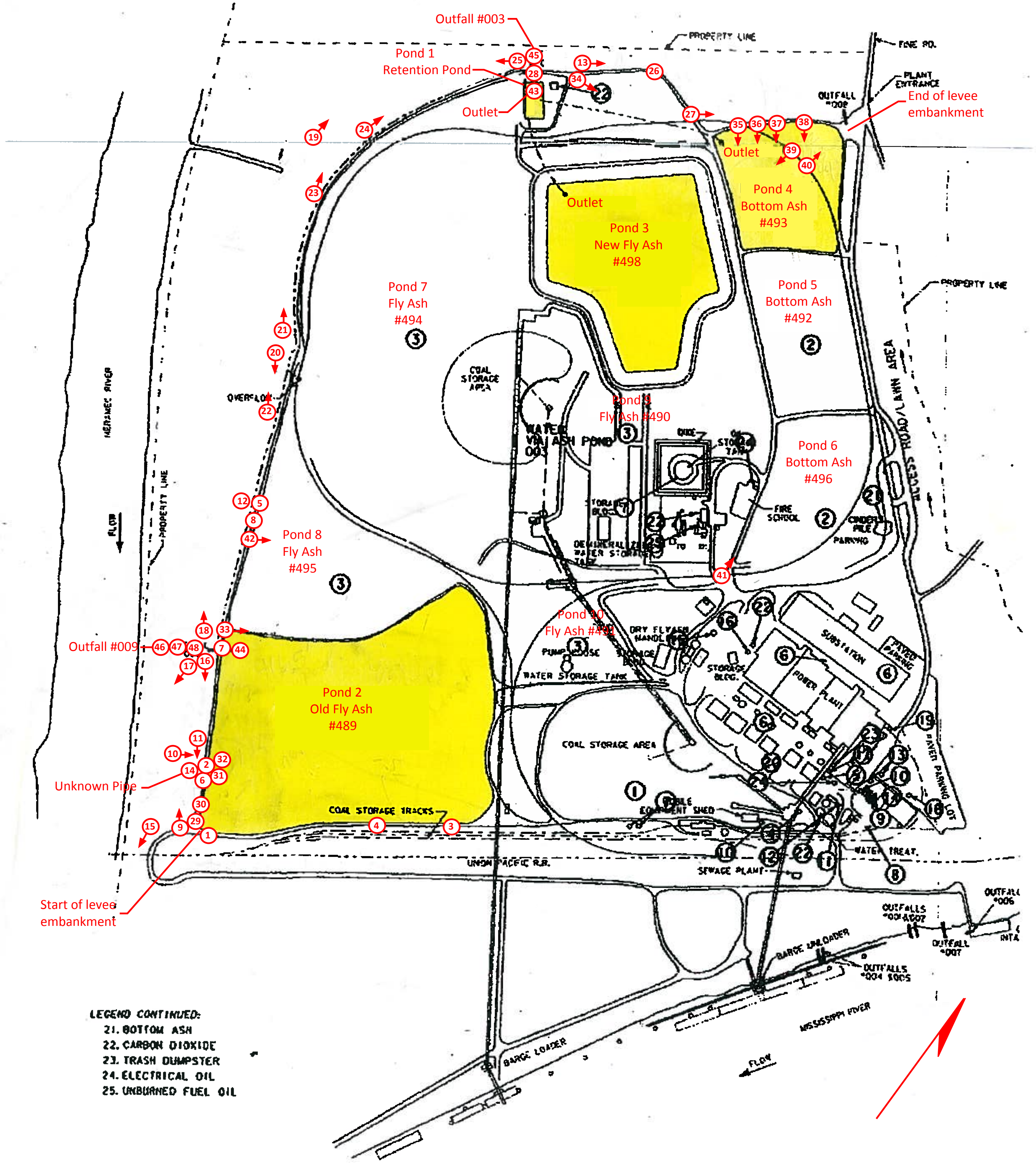
APPENDIX A

DOC 1.2 MERAMEC POWER STATION MAP



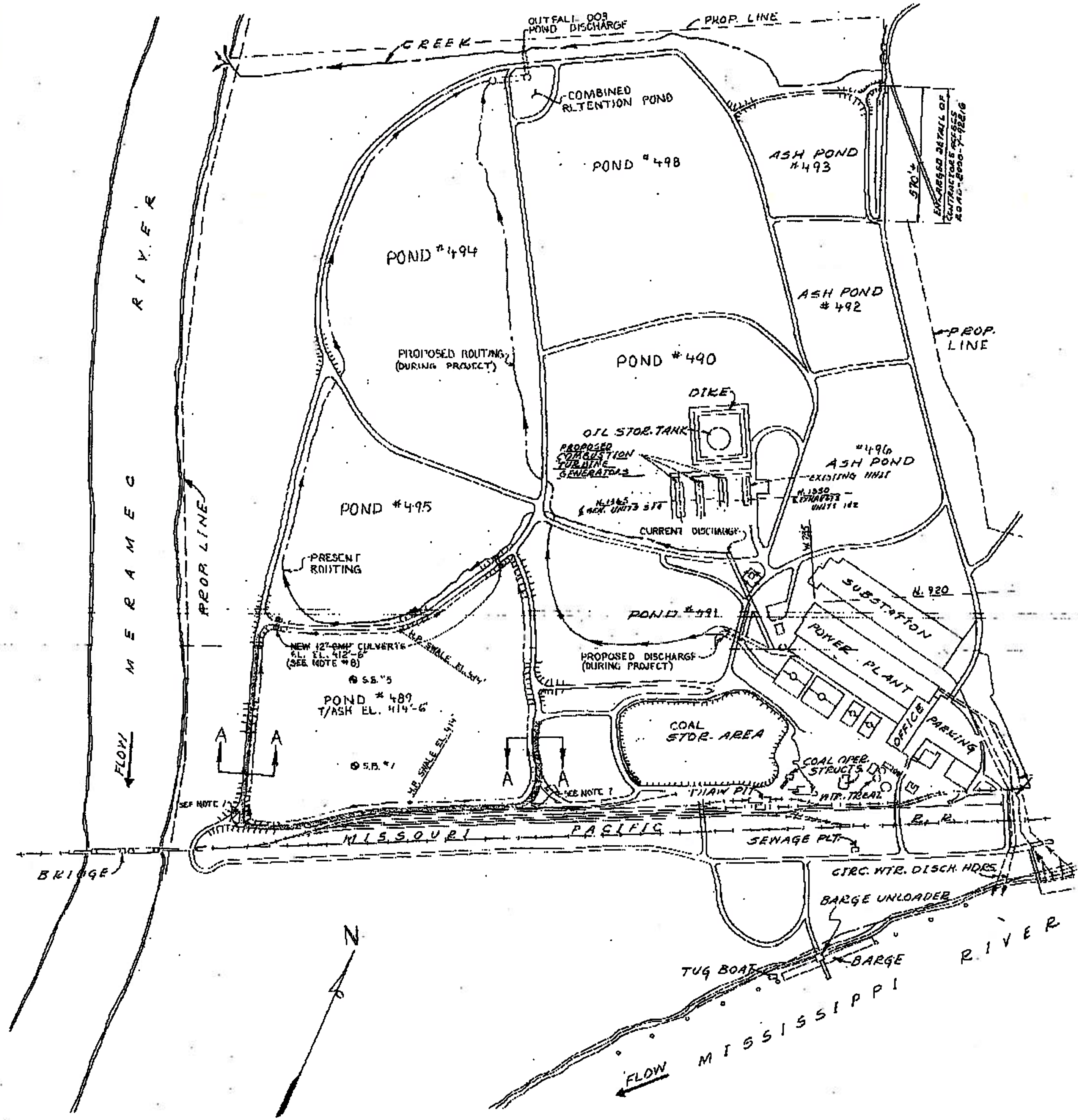
LEGEND CONTINUED:

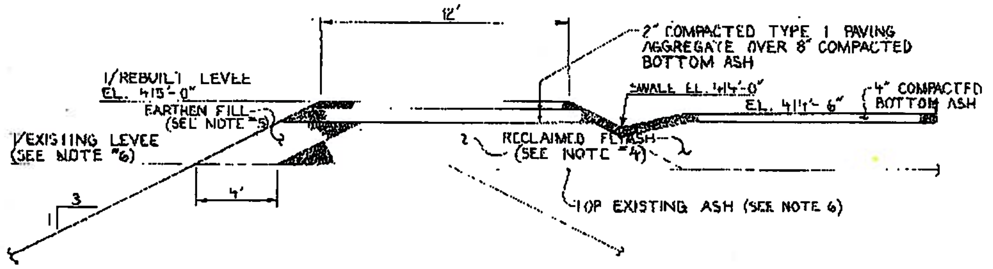
21. BOTTOM ASH
22. CARBON DIOXIDE
23. TRASH DUMPSTER
24. ELECTRICAL OIL
25. UNBURNED FUEL OIL

APPENDIX A

DOC 1.3 MERAMEC PLANT PLANS

REVISIONS
REV. 0 NO. E296
FIRST 1951/E





SECTION A-A
LEVEE RENOVATION

CONFIDENTIAL INFORMATION

NOTES:

1) DEPRESSED SECTIONS OF POND #489 LEVEES SHALL FIRST BE RESTORED TO THEIR ORIGINAL TOP-OF-LEVEE ELEVATION 415', AS SHOWN IN SECTION A-A.

2) FLYASH SHALL BE RECLAIMED FROM POND #495 BY APPROPRIATE METHODS. FLYASH SHALL BE DRYED, PLACED AND COMPACTED IN POND #489, TO AN EL. OF 414'-6".

3) METHODS OF DRYING (I.E. MOISTURE REDUCTION) SHALL BE RESTRICTED SUCH THAT ANY RESULTING RUNOFF BE KEPT WITHIN EXISTING ASH POND LIMITS AND BE ROUTED TO THE EXISTING PERMITTED DISCHARGE.

4) RECLAIMED FLYASH SHALL BE PLACED IN LOOSE LIFTS NOT TO EXCEED 8-12 INCHES, AND IMMEDIATELY COMPACTED AT OPTIMUM MOISTURE CONTENT BY MEANS OF A VIBRATORY ROLLER. SEE SPECIFICATION FOR COMPACTION REQUIREMENT. (SEE ALSO NOTE #9)

5) EARTHEN MATERIAL REQUIRED FOR EROSION PROTECTION AND CONTAINMENT SHALL CONFORM TO CL, CH, ML, OR MH SOIL CLASSIFICATIONS, AS GIVEN BY ASTM DESIGNATION D-2487. THIS MATERIAL SHALL BE COMPACTED WITH A SHEEPS-FOOT TYPE COMPACTOR. SEE SPECIFICATION FOR COMPACTION REQUIREMENT. (SEE ALSO NOTE #9)

6) SEE TOPOGRAPHIC MAP DRAWING 8020-W-122627 FOR EXISTING ELEVATIONS.

7) REBUILD ACCESS ROADS TO RENOVATED LEVEE TO PROVIDE SMOOTH TRANSITIONS FOR SMALL VEHICLES.

8) TWO NEW CULVERTS WILL BE INSTALLED AS SHOWN TO PROVIDE STORMWATER DRAINAGE FROM POND #489 INTO POND #495.

9) COMPACTION SPECIFICATIONS SHOULD YIELD PERMEABILITIES WITHIN THE REPAIRED LEVEE AS FOLLOWS:
CLAY FILL LESS THAN 10^{-7} CM/SEC.
FLYASH - LESS THAN 10^{-4} CM/SEC.

10) SURVEY MONUMENT #2 SHALL BE RAISED TO ELEVATION 415'-0"±2". SEE DRAWING 8020 W-122627 FOR LOCATION.

11) S.B. #5/7 - SOIL BORINGS (SEE U.E. SPEC. FC-2392, APPENDIX E)

12) RENOVATED LEVEE SHOWN THUS ▨

13) ALL WORK SHALL BE DONE IN ACCORDANCE WITH U.E. SPECIFICATION FC 2392.

REFERENCE DRAWING:
TOPOGRAPHIC MAP ---------------- 8020-W-122627

*8020 Y-122626 *

THOMAS LEE HOLLENKAMP
NUMBER E-18247

DRAWN 5/6/91 SCOTT HELD
CHKD. P.O.
SUPV. 5-7-91
APPD. 5-1-91 R. KINDER
UNION ELECTRIC COMPANY
ST. LOUIS, MO.

PROPERTY PLAN
ASH RETENTION PONDS

LOCATION 001005
MERAMEC PLANT
CLASS 02010
8020-Y-122626
REV. 0

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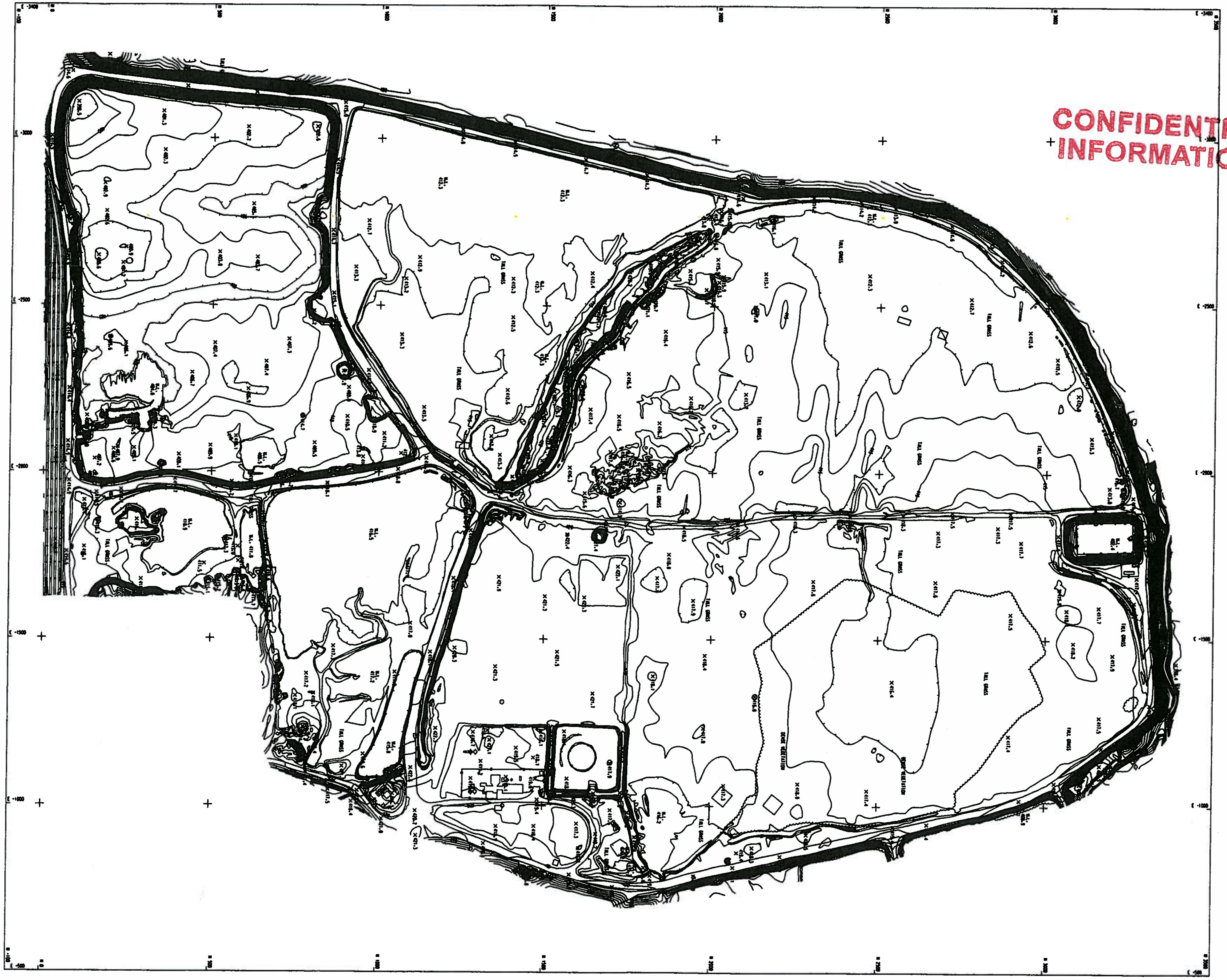
REVISIONS
REV. 0
FIRST ISSUE

CONFIDENTIAL INFORMATION



NOTE:
SEE AMEREN DRAWING NUMBER 8020-X-144200 FOR ASH POND 469 MODIFICATIONS

LEGEND

▬	Sidewalk	—320—	Index Contour	X 325.6	Spot Elevation		Railroad
▭	Building	———	Intermediate Contour		Single Tree		Paved Road
▭	Foundation		Depression Contour	⊙	Located Object		Unpaved Road
	Fence		Guard Rail	●	Catch Basin		Trail
	Wall	▲	Swamp Symbol	○	Manhole		Pipe line
	Tree Line	▲	Control Point		Pole		Driveway
	Stream			●	Sign		
	Brush/Shrub Line			◇	Fire Hydrant		
				■	Light Pole		

NOTE: DASHED CONTOURS MAY BE UNRELIABLE.

PREPARED FOR Ameren

M. ENGLUND

PROPERTY
TOPO MAP
ASH PONDS

001005
MERAMEC PLANT
02010

Ameren
ST. LOUIS, MISSOURI
8020-X-144271
0

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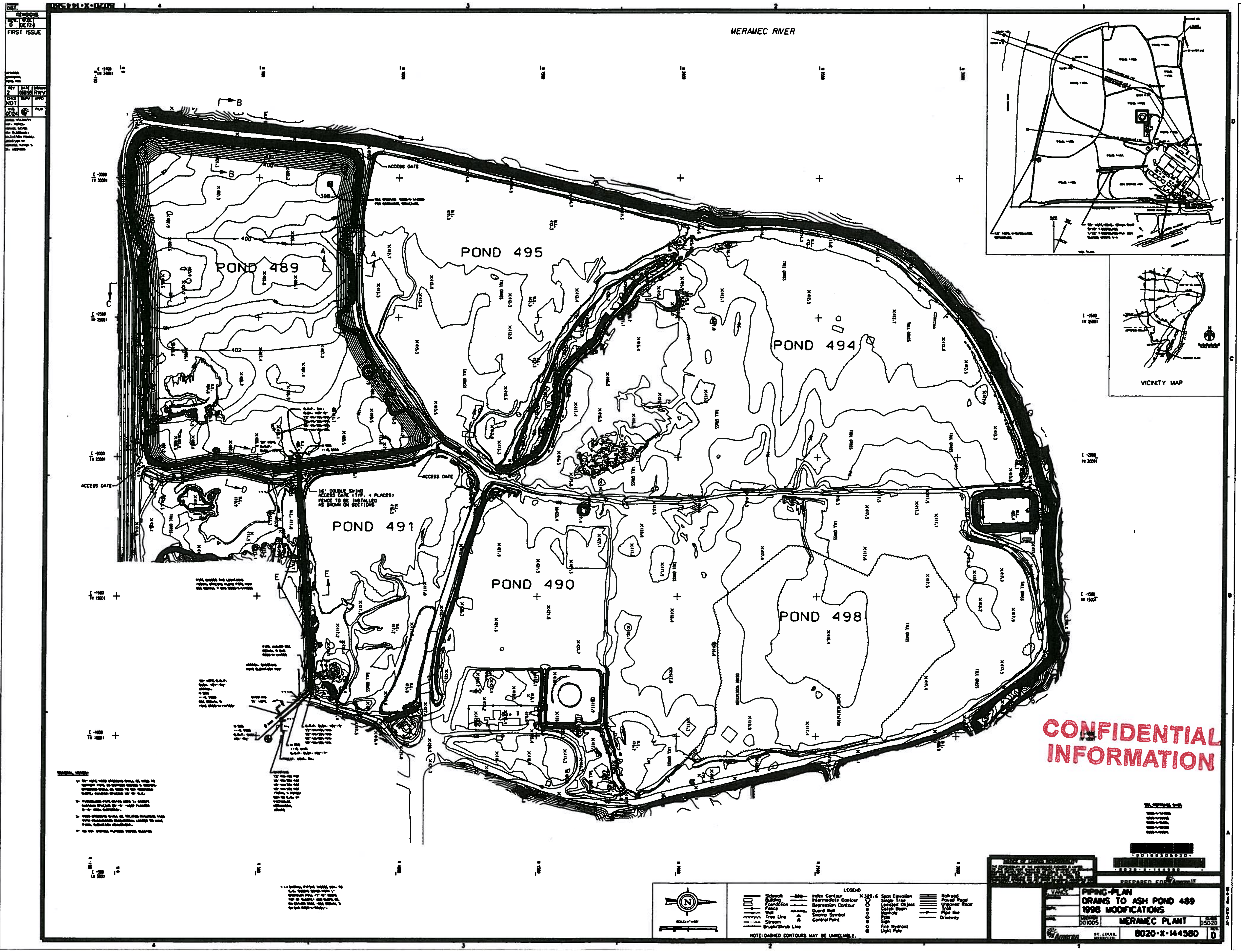

PREPARED FOR Ameren UE

A. VANCE

PIPING-PLAN
DRAINS TO ASH POND 489
1998 MODIFICATIONS

001005

MERAMEC PLANT

05020

Ameren

ST. LOUIS, MISSOURI

8020-X-144580

0

CONFIDENTIAL INFORMATION

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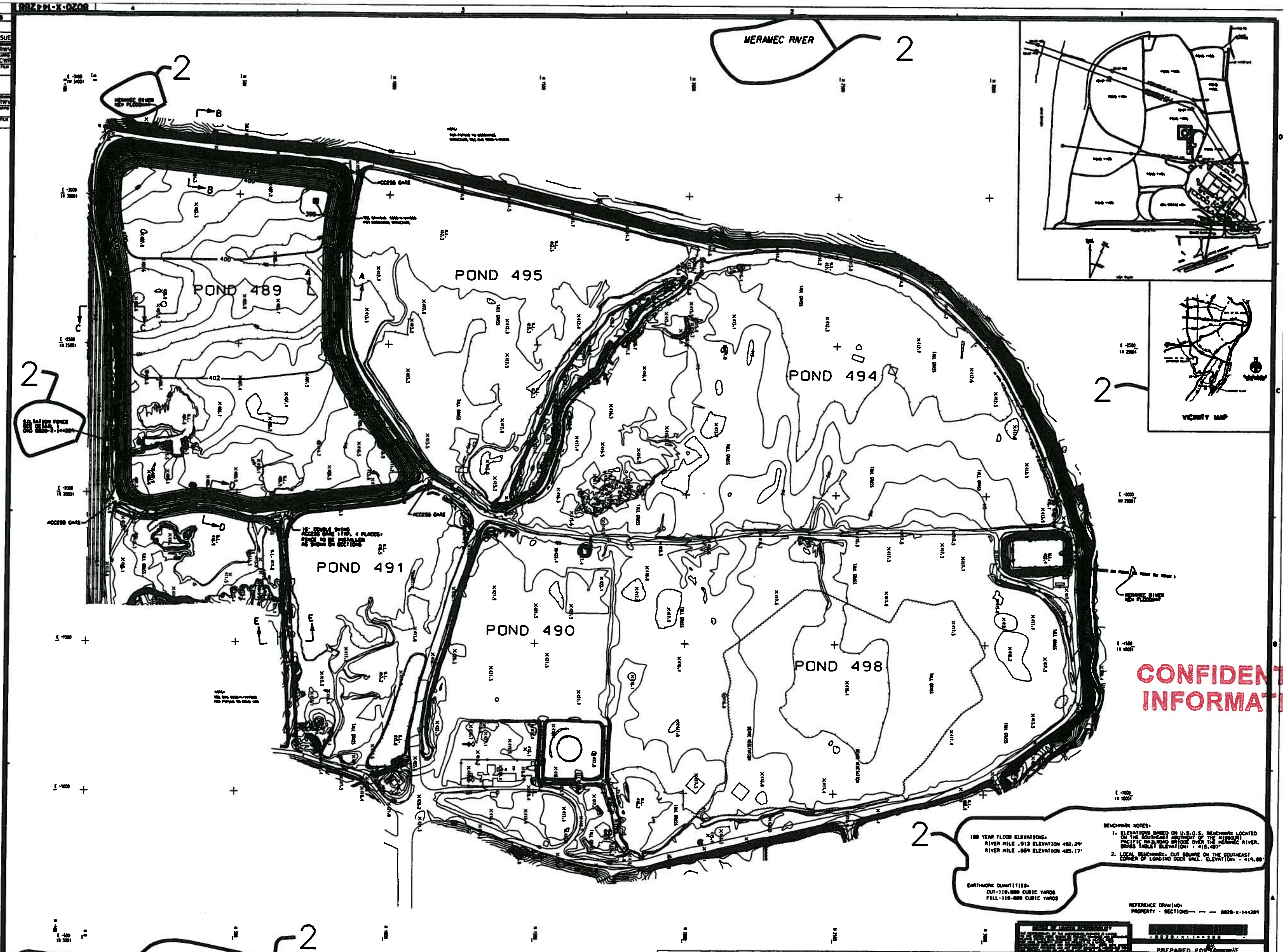


2

100 YEAR FLOOD ELEVATIONS:
RIVER MILE .513 ELEVATION 482.29'
RIVER MILE .659 ELEVATION 485.17'

EARTHWORK QUANTITIES:
CUT-110,000 CUBIC YARDS
FILL-110,000 CUBIC YARDS

BENCHMARK NOTES:

1. ELEVATIONS BASED ON U.S.G.S. BENCHMARK LOCATED ON THE SOUTHEAST ABUTMENT OF THE MISSOURI PACIFIC RAILROAD BRIDGE OVER THE MERAMEC RIVER. BRASS TABLET ELEVATION: = 418.487'
2. LOCAL BENCHMARK. CUT SQUARE ON THE SOUTHEAST CORNER OF LOADING DOCK WALL. ELEVATION: = 419.00'

REFERENCE DRAWING:
PROPERTY - SECTIONS— — — 8020-X-144289

CONFIDENTIAL INFORMATION

2

COMPANY ADDRESS
AMEREN UE
ONE AMEREN PLAZA
1901 CHOUTEAU AVE.
ST. LOUIS, MO 63103

COMPANY MAILING ADDRESS
AMEREN UE
P.O. BOX 66149
ST. LOUIS, MO 63166-6149

PLANT ADDRESS
AMEREN UE
MERAMEC PLANT
8200 FINE ROAD
ST. LOUIS COUNTY, MO 63129

LEGEND

	Sidewalk	320	Index Contour	× 325.6	Spot Elevation		Railroad
	Building		Intermediate Contour		Single Tree		Paved Road
	Foundation		Depression Contour		Located Object		Unpaved Road
	Fence		Guard Rail	●	Catch Basin		Trail
	Wall	▲	Swamp Symbol		Manhole		Pipe line
	Tree Line	▲	Control Point		Pole		Driveway
	Stream			●	Sign		
	Brush/Shrub Line				Fire Hydrant		
				●	Light Pole		

NOTE: DASHED CONTOURS MAY BE UNRELIABLE.

8020-X-144288

PREPARED FOR Ameren UE

L.ENGLUND
NOT CHK'D
4-3-98
ZACH
4-6-98
C.W. REZSONYA

PROPERTY - PLAN
FLYASH POND 489
RECLAMATION AND NEW LINER

001005
MERAMEC PLANT
02010

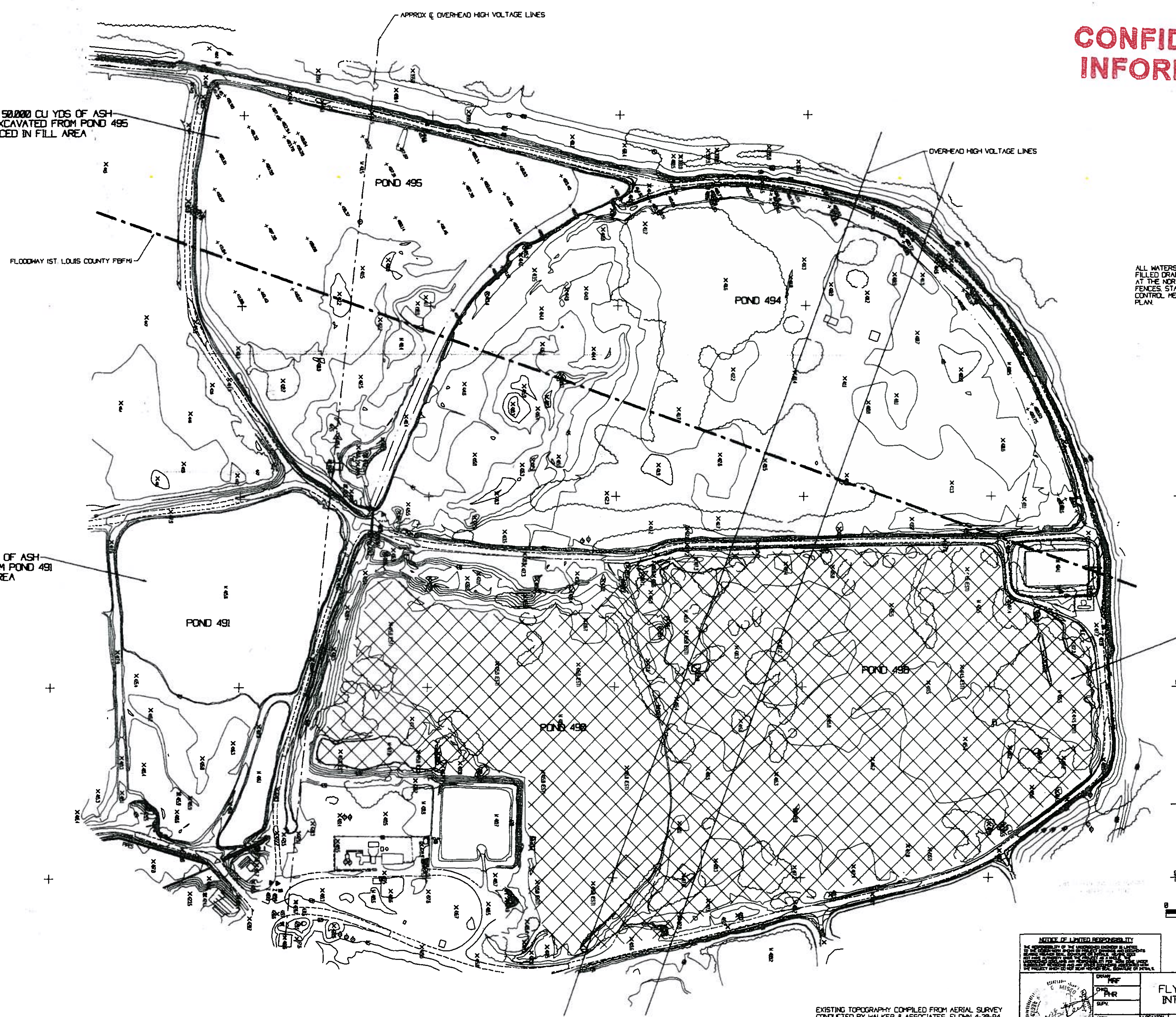
Ameren
ST. LOUIS, MISSOURI
8020-X-144288
2

8020-X-135359

CONFIDENTIAL INFORMATION

APPROX. 50,000 CU YDS OF ASH TO BE EXCAVATED FROM POND 495 AND PLACED IN FILL AREA

APPROX. 50,000 CU YDS OF ASH TO BE EXCAVATED FROM POND 491 AND PLACED IN FILL AREA



ALL WATERSHED AREAS TO BE EXCAVATED OR FILLED DRAIN TO THE EXISTING SETTLING BASIN AT THE NORTH END OF POND 498. NO SILT FENCES, STAKED BALES OR OTHER EROSION CONTROL MEASURES WILL BE UTILIZED IN THIS PLAN.

PROPOSED FILL AREA
FINAL ELEVATION 418±
APPROX 100,000 CU YDS

EXISTING TOPOGRAPHY COMPILED FROM AERIAL SURVEY CONDUCTED BY WALKER & ASSOCIATES, FLOWN 4-20-94.

NOTICE OF LIMITED RESPONSIBILITY

SEPTEMBER 19, 1994

DRAWN	MRF
CHKD.	PHR
SUPV.	
APPD.	

FLYASH POND 491 & 495
INTERIM GRADING PLAN

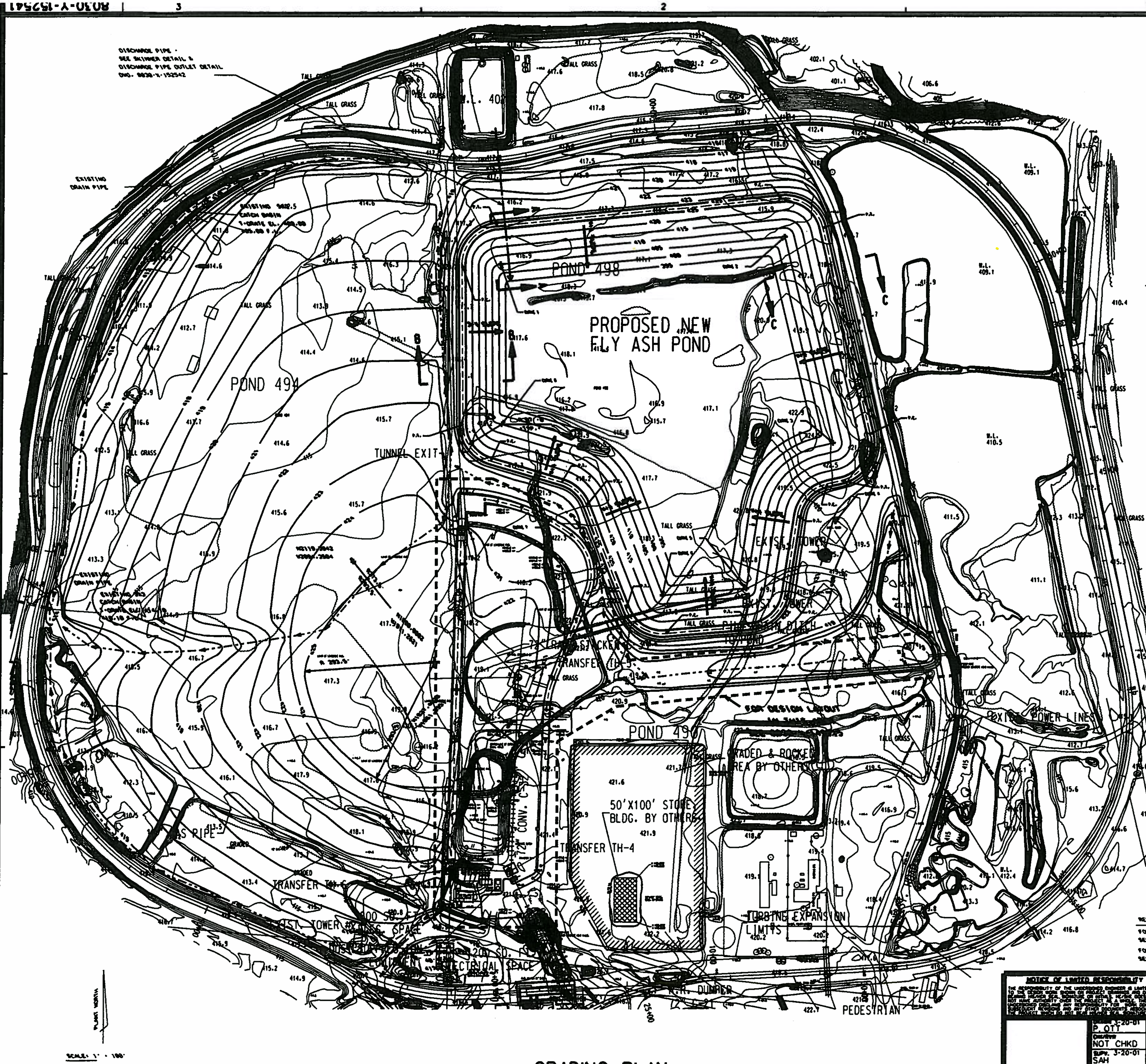
LOCATION		CLASS
000005	MERAMEC POWER PLANT	02010

UNION ELECTRIC COMPANY
ST. LOUIS, MO.

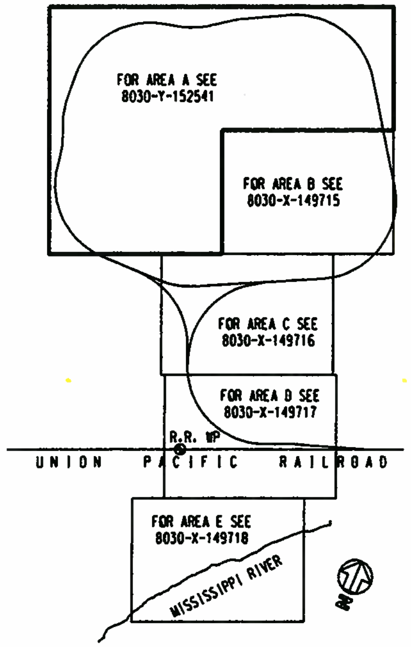
8020-X-135359

REV. 0

PRINT DIST.		
REVISIONS		
REV. 0	W.O. 10775	
FIRST ISSUE.		
REV 1	DATE 032001	DRAWN PDO
CHKD NOT	SUPV SAH	APPD
W.O. 10775		FILM
ADDED COORDINATES AND RADIUS FOR NEW CONC. PADS, SHOWED EXISTING CATCH BASINS		
REV 2	DATE 040201	DRAWN MLE
CHKD NOT	SUPV SAH	APPD
W.O. 10775		FILM
REVISED CONTOURS PER ENGINEERING COMMENTS		
REV 3	DATE 041701	DRAWN MGL
CHKD NOT	SUPV SAH	APPD
W.O. 10775		FILM
REVISED CONTOURS PER ENGINEERING COMMENTS		
REV 4	DATE 042001	DRAWN MGL
CHKD NOT	SUPV SAH	APPD
W.O. 10775		FILM
REVISED CONTOURS PER ENGINEERING COMMENTS		
REV 5	DATE 051501	DRAWN DAG
CHKD	SUPV	APPD
W.O. 10775		FILM
REVISED CONTOURS PER ENGINEERING COMMENTS ADD DISCHARGE PIPE FROM FLY ASH POND TO RETENTION BASIN & TABLE		



GRADING PLAN



AREA KEY PLAN

TOTAL CUT 220.000yd^3
TOTAL FILL 221.800yd^3

TABLE

CURVE NO.	RADIUS	CENTER	P.C. POINT @ CURVATURE	P.T. POINT @ TANGENCY
1	87'-6"	N2795.9654 W1766.7163	N2794.9985 W1854.2110	N2883.0642 W1775.0847
2	87'-6"	N2857.8626 W1122.4817	N2944.9616 W1130.8501	N2878.1002 W1037.3542
3	87'-6"	N2389.1821 W1011.0613	N2409.4196 W925.9338	N2303.9035 W991.4702
4	87'-6"	N2211.0398 W1004.8965	N2296.3184 W1024.4876	N2223.8795 W1091.4493
5	87'-6"	N2058.1369 W1204.4941	N2045.2973 W1117.9412	N1970.9244 W1197.4075
6	87'-6"	N2042.6838 W1394.6702	N1955.4713 W1387.5836	N2011.3974 W1476.3856
7	87'-6"	N2216.2748 W1648.5213	N2247.5612 W1566.8058	N2300.2443 W1623.9170
8	87'-6"	N2432.0871 W1762.6952	N2348.1176 W1787.2994	N2431.1202 W1850.1898

CONFIDENTIAL INFORMATION

REFERENCE DRAWINGS:

FOR SECTION CUTS AND TYPICAL SECTIONS SEE 8030-Y-152542

FOR ADDITIONAL DESIGN LAYOUTS SEE 8030-X-149714 & 8030-X-149715

NOTICE OF LIMITED RESPONSIBILITY

THE RESPONSIBILITY OF THE UNDERSIGNED ENGINEER IS LIMITED TO THE DESIGN WORK SHOWN ON PROJECT DRAWINGS AND DOCUMENTS BEARING HIS/HER SEAL, SIGNATURE OR INITIALS. HE/SHE DOES NOT HAVE AUTHORITY OVER THE PROJECT AS A WHOLE. THE UNDERSIGNED DISCLAIMS ANY RESPONSIBILITY FOR WORK DONE UNDER SUBSEQUENT REVISIONS AND ANY OTHER DOCUMENTS ASSOCIATED WITH THE PROJECT WHICH DO NOT BEAR HIS/HER SEAL, SIGNATURE OR INITIALS.

8030-Y-152541

PREPARED FOR AmerenUE

DRAWN 3-20-01 P. OTT	PROPERTY - SITE PLAN AREA A NEW ASH POND AND GRADING OVER PONDS 490, 494 & 498
CHKD/ENGR NOT CHKD	
SUPV. 3-20-01 SAH	
APPD.	LOCATION 001005 / MERAMEC PLANT / CLASS 02010
Ameren ST. LOUIS, MISSOURI	8030-Y-152541 / REV. 5

37-13-118 Rev. 9-85

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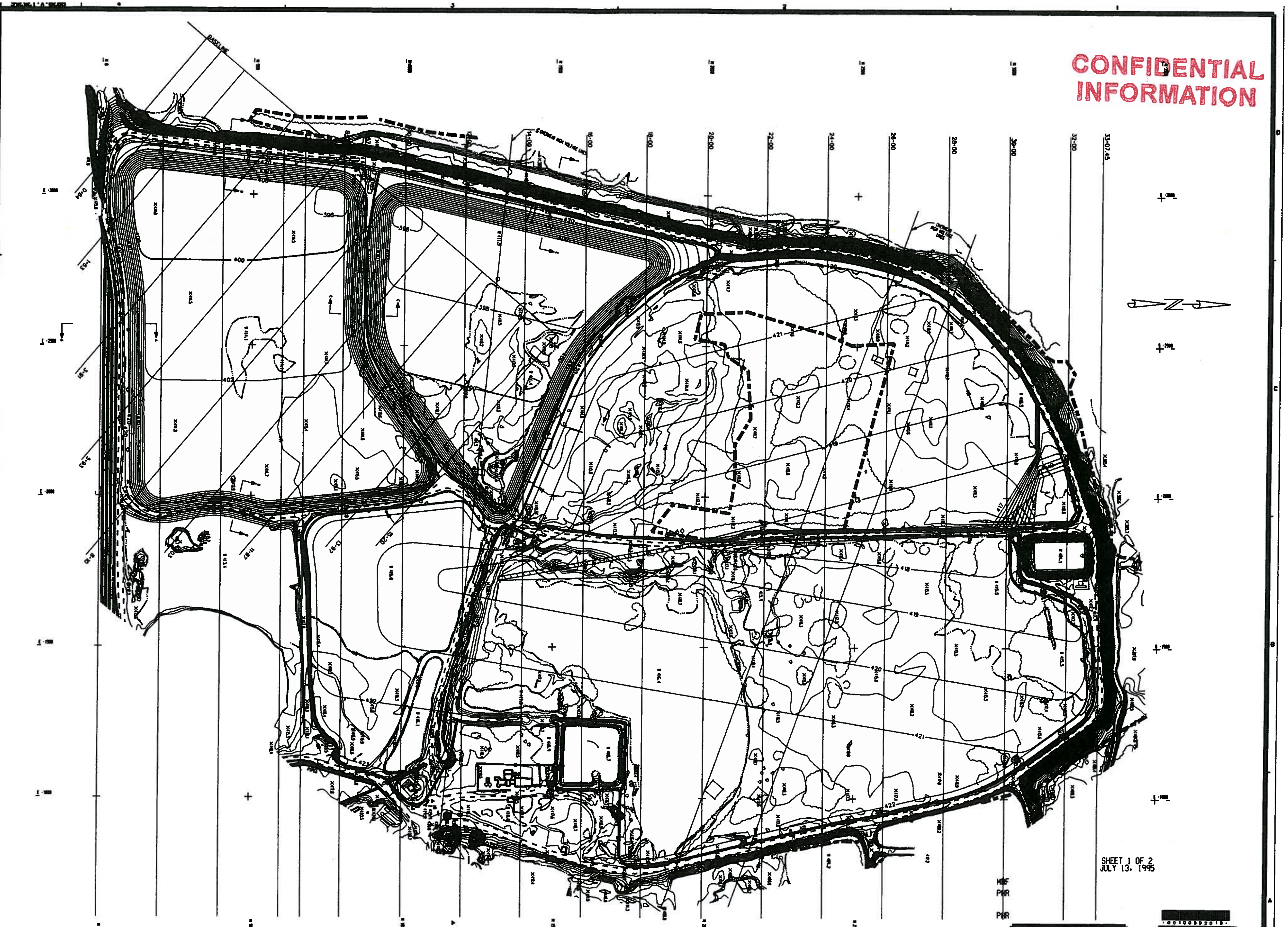
REVISIONS

REV.	ECO.
0	E124

FIRST ISSUE

CONFIDENTIAL INFORMATION



SHEET 1 OF 2
JULY 13, 1995

NOTE: ELEVATIONS SHOWN IN PONDS 495, 497, 494 & 498 ARE APPROXIMATE TOP OF HDPE LINER. AN ADDITIONAL 1.0 FT. THICK SOIL LAYER SHALL BE PLACED ON TOP OF LINER PER TYPICAL CROSS SECTIONS.

EXISTING TOPOGRAPHY FROM PHOTOGRAMMETRIC DIGITAL DATA, PHOTOS FLOWN BY WALKER & ASSOCIATES APRIL 28, 1994.

*ASH PONDS HAVE NOT BEEN MODIFIED TO THIS DESIGN

LEGEND

▬ ▬ ▬	Sidewalk	× 325.6	Spot Elevation
▭	Building		Single Tree
	Foundation	⊙	Located Object
	Fence	●	Catch Basin
	Wall	○	Manhole
	Tree Line		Pole
	Stream	●	Sign
	Index Contour		Railroad
	Intermediate Contour		Paved Road
	Depression Contour		Unpaved Road
	Approximate Contour		Trail
	Guard Rail		Pipe line
▲	Swamp Symbol	○	Fire Hydrant
▲	Control Point	●	Light Pole

·0010050201 0·
·0020·X·135356·

PREPARED FOR AmerenUE

H. ENGLUND

FLYASH PONDS 489 AND 495
RECLAMATION

001005

MERAMEC POWER PLANT

Ameren ST. LOUIS, MISSOURI

0020·X·135356

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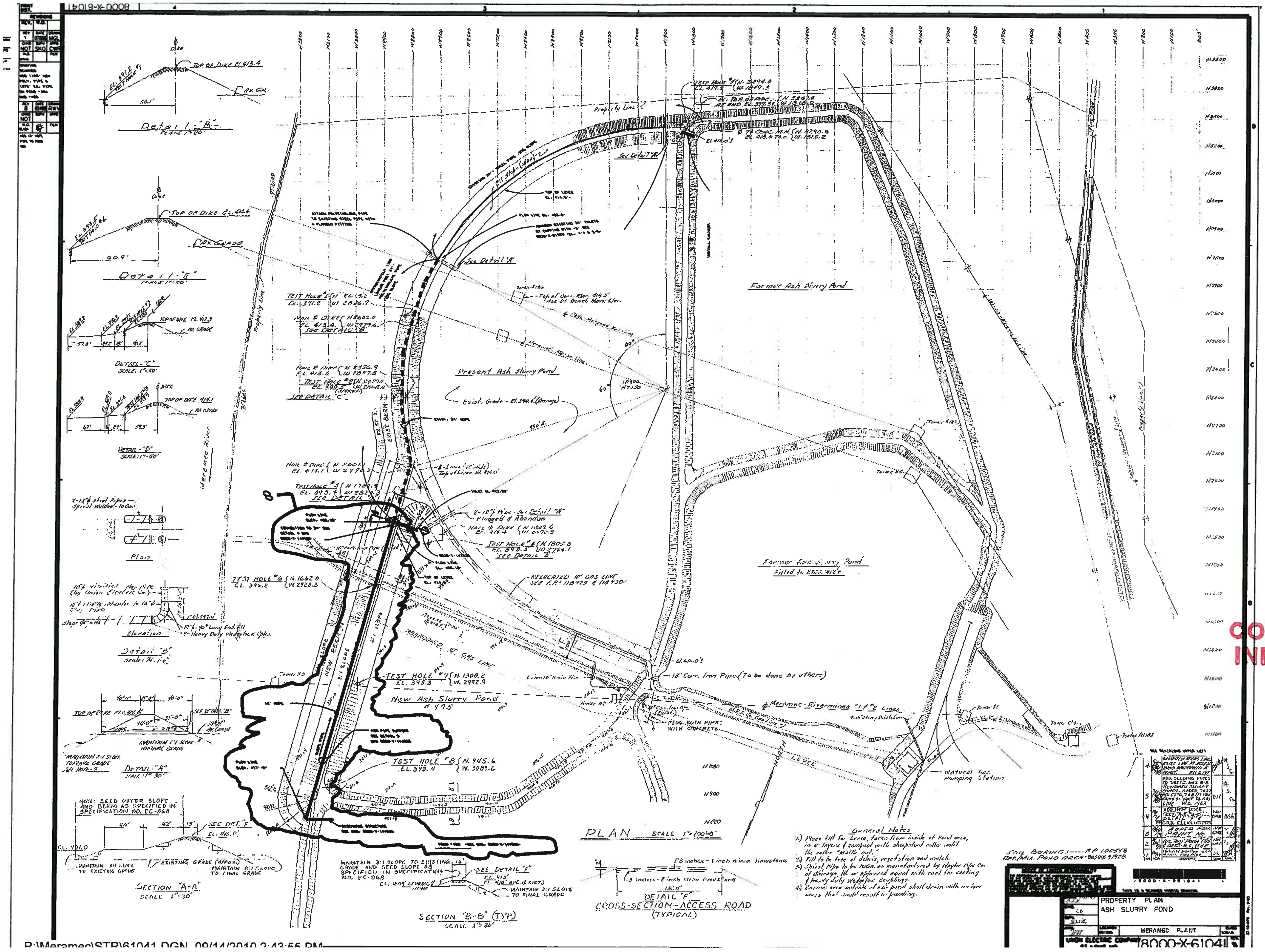

General Notes

1.) Place fill for Levee, taken from inside of Pond area, in 6" layers & compact with sheepsfoot roller until the roller "walks out."
2.) Fill to be free of debris, vegetation and mulch.
3.) Spiral Pipe to be 10Ga. as manufactured by Naylor Pipe Co. of Chicago, Ill. or approved equal with coal tar coating & heavy duty Wedgelock Couplings.
4.) Unused area outside of ash pond shall drain with no low areas that would result in ponding.

Soil Borings----F.P. 100548
Ref. Mix. Pond Area-8050X-41928

8000-X-061041

PROPERTY PLAN
ASH SLURRY POND

MERAMEC PLANT

UNION ELECTRIC COMPANY

8000-X-61041

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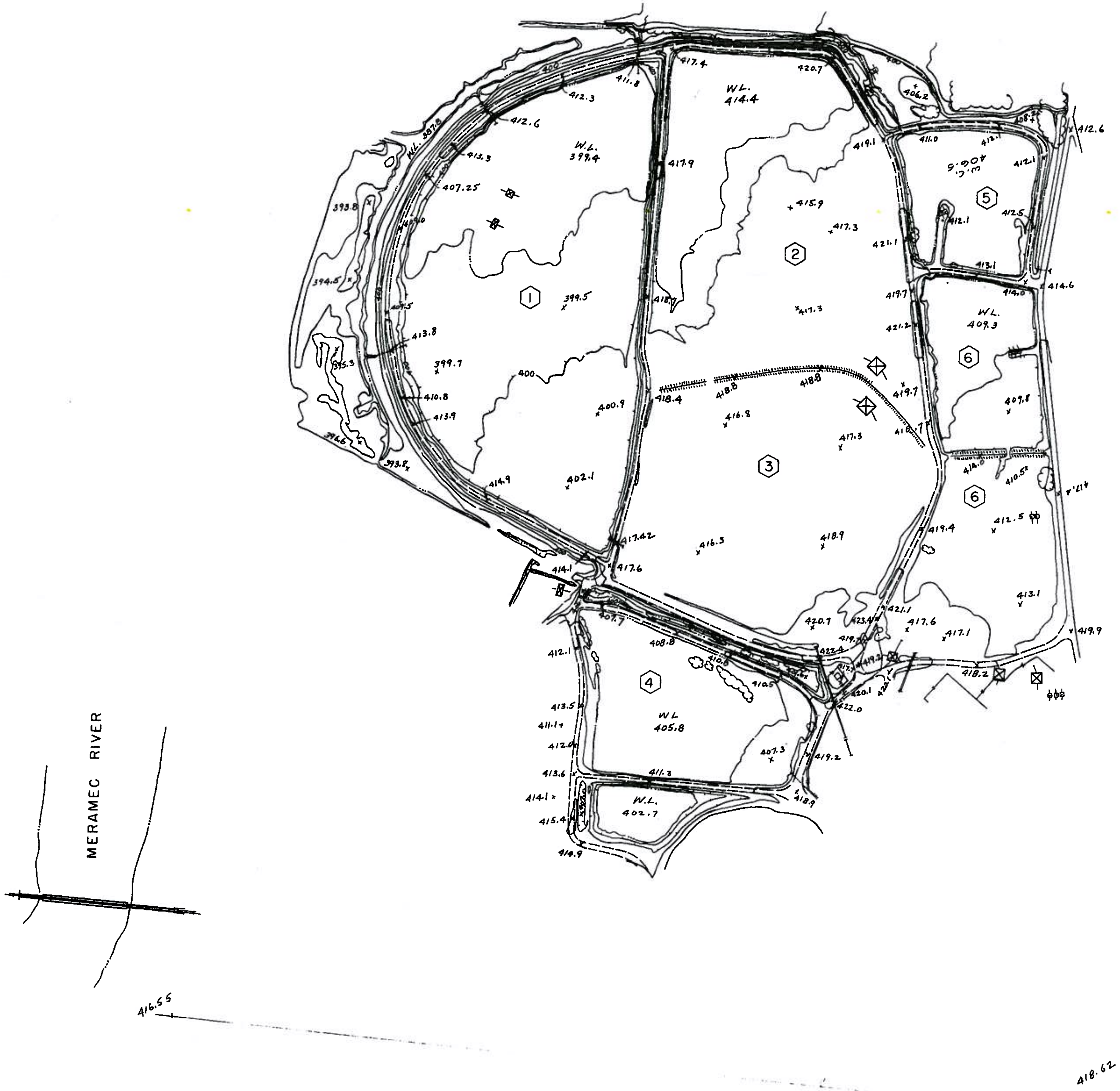
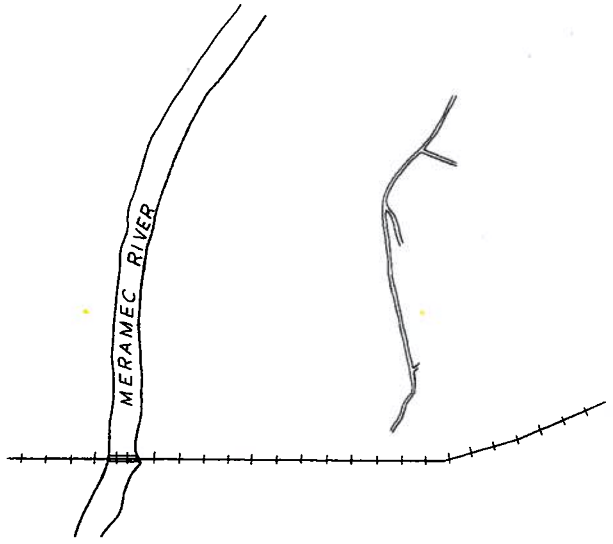
CONFIDENTIAL INFORMATION

8020-W-122627





KEY PLAN

POND	AREA, SQ. FT. TOP OF LEVEE	AREA, SQ. FT. TOE OF LEVEE
① FLY ASH POND IN USE	1,330,000	1,185,400
② NORTH FILLED FLY ASH POND	1,051,000	933,500
③ SOUTH FILLED FLY ASH POND	930,400	864,500
④ REFUSE BURNING ASH POND	429,200	380,700
⑤ NORTH BOTTOM ASH POND	249,900	214,400
⑥ SOUTH BOTTOM ASH POND	698,000	620,000

REFERENCE SURDEX CORP. PHOTOGRAPH
NO. 708-135 AND 708-136 DATED 12-1-72

CONFIDENTIAL INFORMATION

PREPARED FOR
UNION ELECTRIC COMPANY
SCALE: 1"=200'
5' CONTOURS
BY
SURDEX CORP. CHESTERFIELD MO.

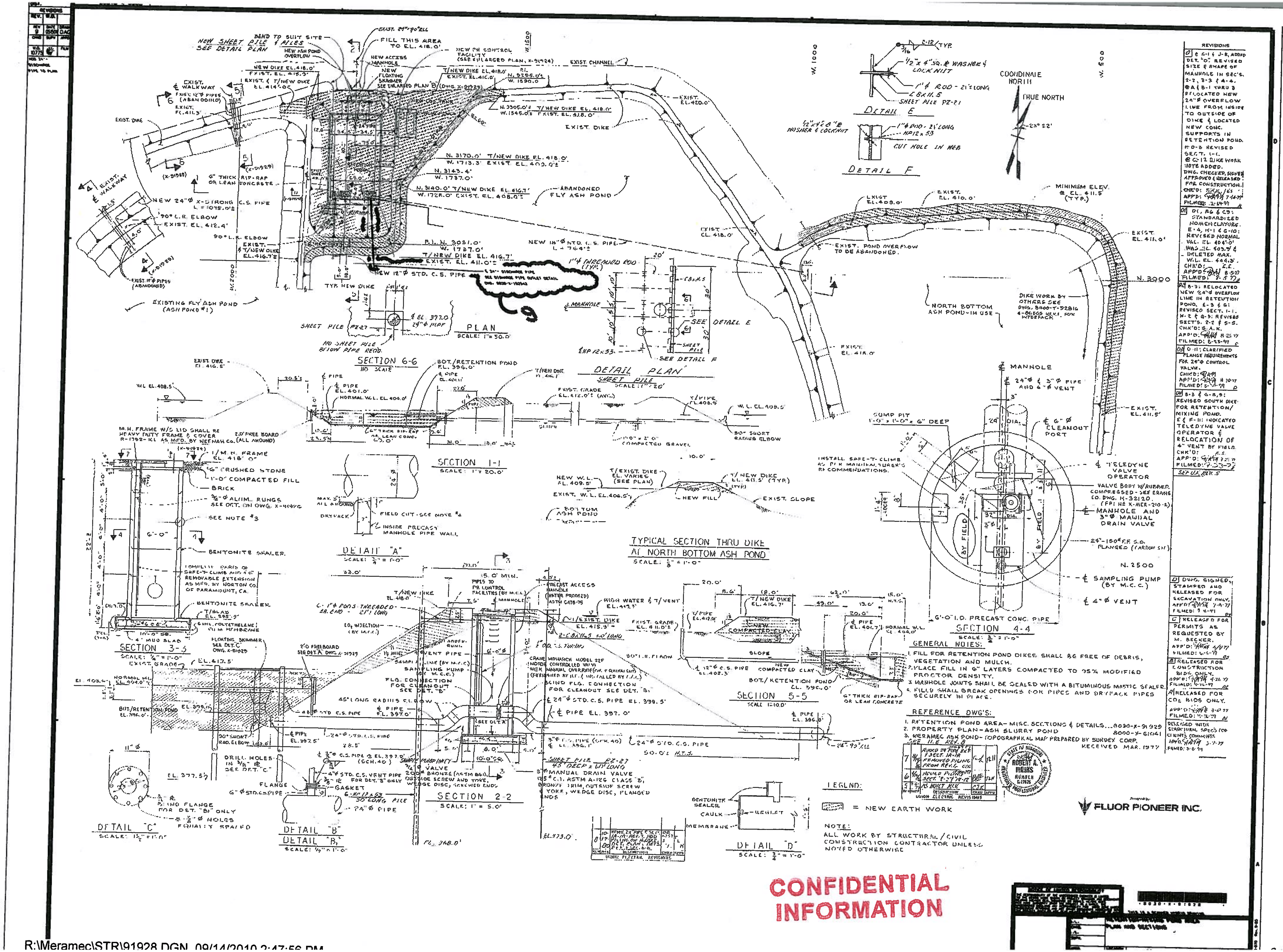
PROPERTY PLAN
ASH PONDS

REV	DATE	DESCRIPTION	CHKD	APPD

DRAWN CHKD. SUPD APPD DATE SCALE JOB 02010

UNION ELECTRIC SYSTEM ST. LOUIS, MO.
LOCATION **MERAMEC PLANT**

8000-Y-73581



GENERAL NOTES:

1. FILL FOR RETENTION POND DIKES SHALL BE FREE OF DEBRIS, VEGETATION AND MULCH.
2. PLACE FILL IN 6" LAYERS COMPACTED TO 95% MODIFIED PROCTOR DENSITY.
3. MANHOLE JOINTS SHALL BE SEALED WITH A BITUMINOUS MASTIC SEALER.
4. FILLS SHALL BREAK OPENINGS FOR PIPES AND DRYPACK PIPES SECURELY IN PLACE.

REFERENCE DWG'S:

1. RETENTION POND AREA- MISC. SECTIONS & DETAILS...8030-X-91929
2. PROPERTY PLAN-ASH SLURRY POND 8000-X-61041
3. MERAMEC ASH POND- TOPOGRAPHICAL MAP PREPARED BY SURDEX CORP. RECEIVED MAR. 1977

SEE U.E. REV. 8

7	4/4/78	ADDED 24" PIPE EXT. & SECT. 1A-1R REMOVED PILING FROM REV. 6	CJK	RH
6	4/4/78	MOVED PILING SECT. 2-2 & 7-12		RH
5	7-6-77	AS BUILT REV.	CJK	
REV.	DATE	DESCRIPTION	CHKD	APPD

UNION ELECTRIC REVISIONS

ROBERT A. MARKS
NUMBER E-17525

LEGEND:

▨ = NEW EARTH WORK

NOTE:
ALL WORK BY STRUCTURAL/CIVIL CONSTRUCTION CONTRACTOR UNLESS NOTED OTHERWISE

FLUOR PIONEER INC.

8030-X-91928

REVISIONS

0 @ G-1 & J-8, ADDED DET. "D". REVISED SIZE & SHAPE OF MANHOLE IN SEC'S. 2-2, 3-3 & 4-4. @ A & B-1 THRU 3 RELOCATED NEW 24"Ø OVERFLOW LINE FROM INSIDE TO OUTSIDE OF DIKE & LOCATED NEW CONC. SUPPORTS IN RETENTION POND. @ D-3 REVISED SECT. 1-1. @ C-12 DIKE WORK NOTE ADDED. DWG. CHECKED, SIGNED APPROVED & RELEASED FOR CONSTRUCTION.
CHK'D: S.A.K./ES
APP'D: 7-14-77
FILMED: 7-14-77

01 D1, B6 & C9: STANDARDIZED NOMENCLATURE. E-4, K-1 & G-10: REVISED NORMAL W.L. EL. 404.0' WAS EL. 403.9' & DELETED MAX. W.L. EL. 444.3'.
CHK'D: E.E.
APP'D: 8-5-77
FILMED: 8-5-77

02 B-3: RELOCATED NEW 24"Ø OVERFLOW LINE IN RETENTION POND. E-3 & G: REVISED SECT. 1-1. K-2 & G-5: REVISED SECT'S. 2-2 & 5-5.
CHK'D: S.A.K.
APP'D: 8-25-77
FILMED: 8-25-77

03 D-11: CLARIFIED FLANGE REQUIREMENTS FOR 24"Ø CONTROL VALVE.
CHK'D:
APP'D: 8-30-77
FILMED: 8-30-77

04 B-3 & G-8, 9: REVISED SOUTH DIKE FOR RETENTION/MIXING POND. E & F-11: INDICATED TELEDYNE VALVE OPERATOR & RELOCATION OF 4" VENT BY FIELD.
CHK'D: E.S.
APP'D: 9-23-77
FILMED: 9-23-77

SEE U.E. REV. 5

D DWG. SIGNED, STAMPED AND RELEASED FOR EXCAVATION ONLY.
APP'D: 7-8-77
FILMED: 7-8-77

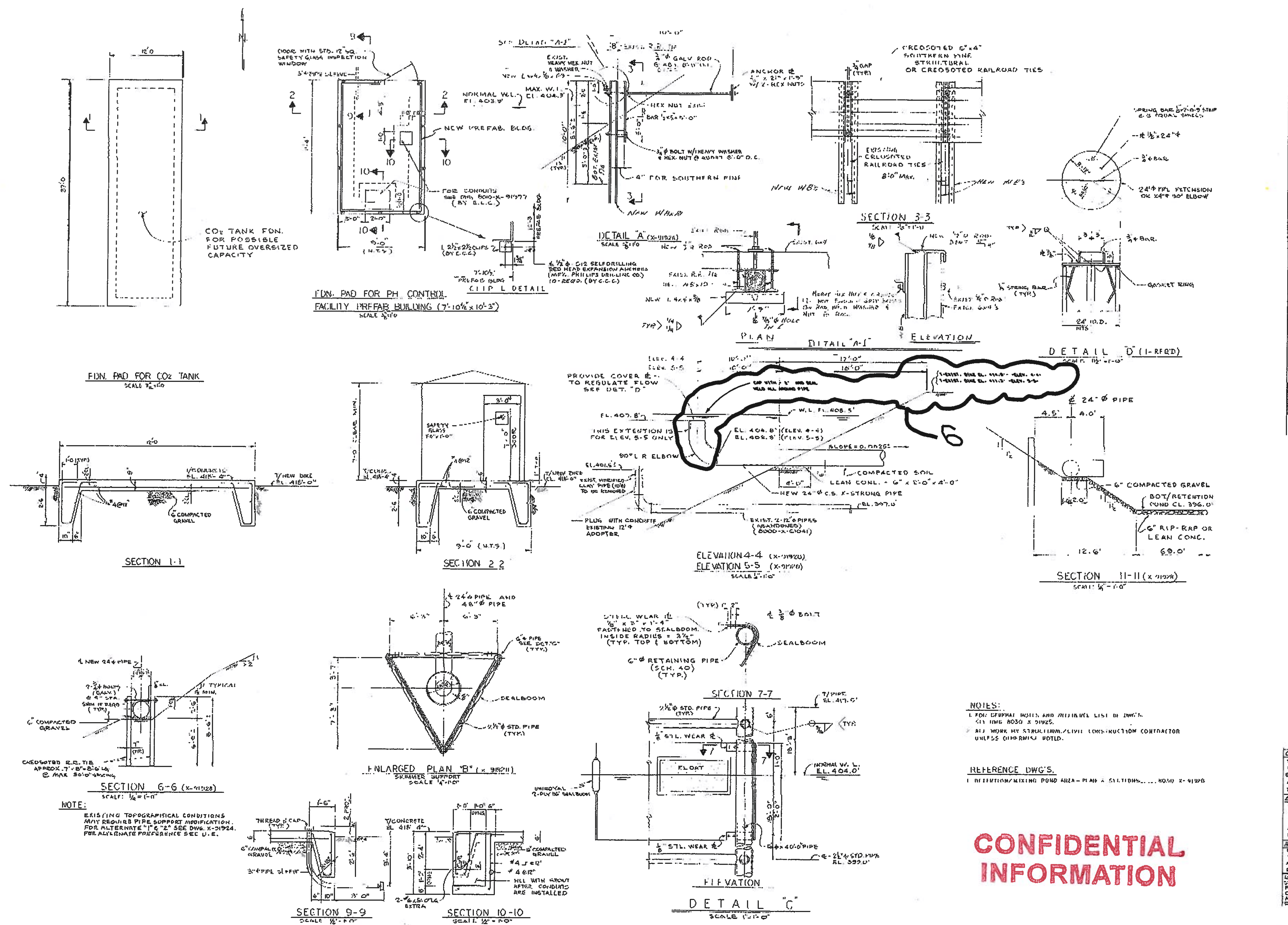
C RELEASED FOR PERMITS AS REQUESTED BY M. BECKER.
APP'D: 6/4/77
FILMED: 6-6-77

B RELEASED FOR CONSTRUCTION BIDS ONLY.
APP'D: 4-26-77
FILMED: 4-26-77

A RELEASED FOR COE BIDS ONLY.
APP'D: 3-8-77
FILMED: 4-12-77

RELEASED WITH STRUCTURAL SPEC'S FOR CLIENTS COMMENTS
APP'D: 3-7-77
FILMED: 3-8-77

CONFIDENTIAL INFORMATION



NOTE:
EXISTING TOPOGRAPHICAL CONDITIONS MAY REQUIRE PIPE SUPPORT MODIFICATION. FOR ALTERNATE "1" & "2" SEE DWG. X-91924. FOR ALTERNATE PREFERENCE SEE U.E.

NOTES:
1. FOR GENERAL NOTES AND REFERENCE LIST OF DWG'S. SEE DWG 8030 X 91925.
2. ALL WORK BY STRUCTURAL/CIVIL CONSTRUCTION CONTRACTOR UNLESS OTHERWISE NOTED.

REFERENCE DWG'S.
1. DETENTION/MIXING POND AREA – PLAN & SECTIONS.......8030 X-91920

CONFIDENTIAL INFORMATION

REVISIONS

0 REVISED DIM. & ADDED DIM. & NOTE IN DET. "A". REVISED SEC'S. 4-4 & 5-5. E-1 & F-12 DELETED SECTION 8-8. & H-2 ADDED NOTE. DWG. CHECKED, SIGNED, APPROVED & RELEASED FOR CONSTRUCTION. CHK'D: S.A.K./ES APP'D: 7-14-77 FILMED: 7-29-77

01 J-2: REVISED NOTE. G-3: INDICATED EXIST. SLOPE 1:2 WAS 2:2.5. H-1: REVISED MAX. WAS ABOUT. H-3: INDICATED NORMAL W.L. EL. 404.0' & DELETED MAX. W.L. EL. 404.3'. G-5 & H-8: INCREASED 6" PIPE POST LENGTH BY 10'-0" & ADDED 2½"Φ PIPE BRACING. CHK'D: E.S. APP'D: 8-5-77 FILMED: 8-5-77

02 C-4: RELEASED "HOLD" REVISED 11'-4" WAS 11'-0" & INDICATED HOLD-DOWN CLIPS. REVISED DOOR LOCATION. C-5: ADDED 10-½"Φ EXP. ANCHORS & DET. C-5: RELOCATED DOOR. CHK'D: E.S. APP'D: RM/E.C. 8-8-77 FILMED: 8-12-77

03 I-12: ADDED SECTION 11-11. J-8: CHANGED LENGTH OF PIPE. CHK'D: S.A.K. APP'D: 8-25-77 FILMED: 8-29-77

04 J-8: PIPE BRCG. SHOWN AS INDICATED IN SECTION 2-2 X-91929. E-12: ADDED 6" RIP-RAP AS ENCIRCLED. CHK'D: E.S. APP'D: 9-23-77 FILMED: 7-23-77

SEE U.E. REV. 5

REV.	DATE	DRAWN
5		
CHKD	SUPV.	APPD
W.O.		FILM

ADD REVISION TO DETAIL "A" AND DETAIL "A-1"

CONT. UPPER LEFT

C DWG. SIGNED, STAMPED AND RELEASED FOR EXCAVATION ONLY. APP'D: 7-8-77 FILMED: 7-8-77

B RELEASED FOR PERMITS AS REQUESTED BY M. BECKER. APP'D: FILMED:

A RELEASED FOR CONSTRUCTION BIDS ONLY. APP'D: 4-26-77 FILMED: 4-26-77

RELEASED WITH STRUCTURAL SPEC'S FOR CLIENTS COMMENTS ONLY. APP'D: 3-7-77 FILMED: 3-8-77

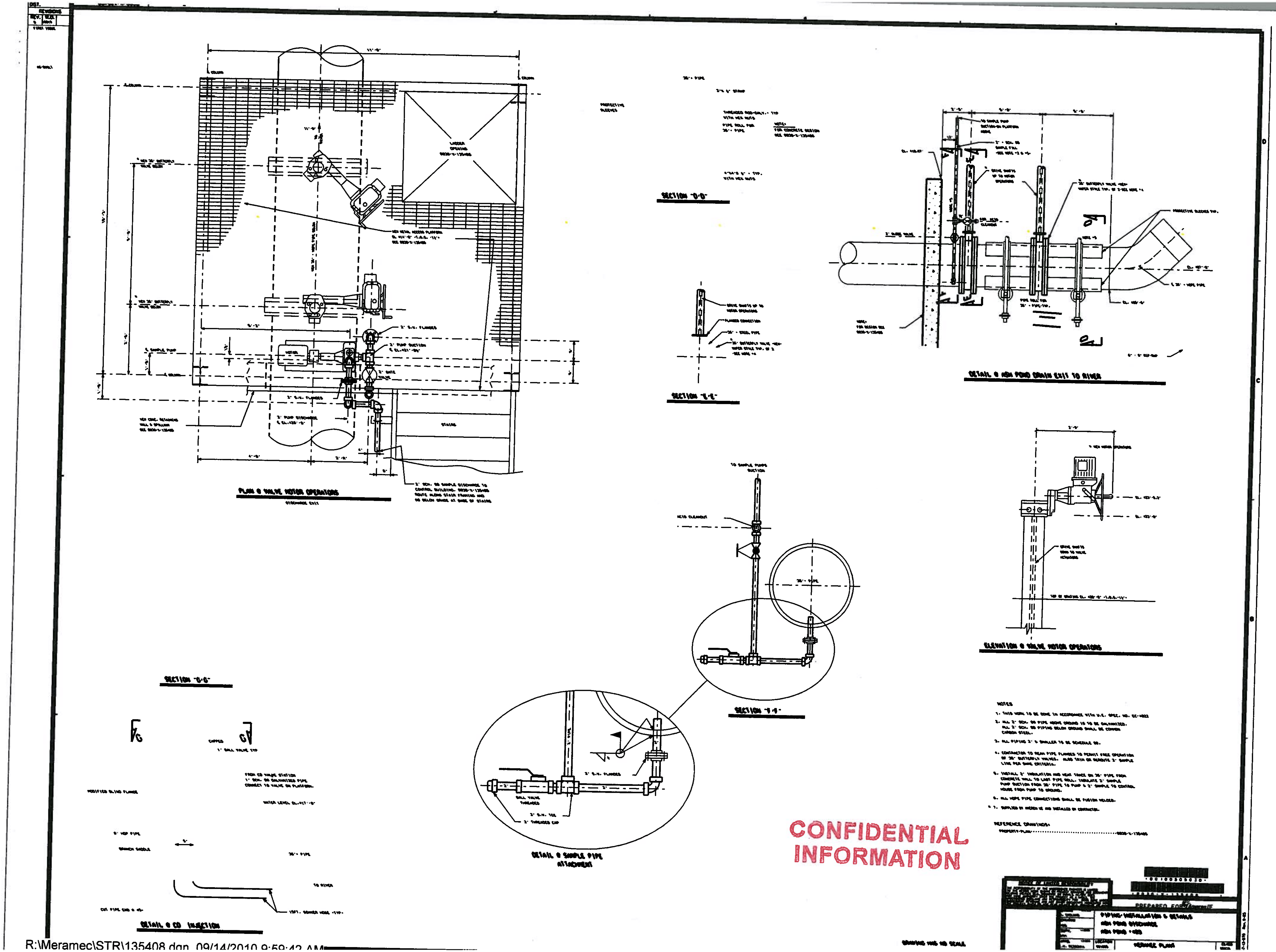
Designed by
FLUOR PIONEER INC.
CHICAGO ILLINOIS 60606

8030-X-91929

STATE OF MISSOURI
ROBERT A. [illegible]
NUMBER E-17535
REGISTERED PROFESSIONAL ENGINEER

MERAMEC PLANT
UNION ELECTRIC COMPANY
ST. LOUIS, MO.
8030-X-91929

8030-X-91929



NOTES

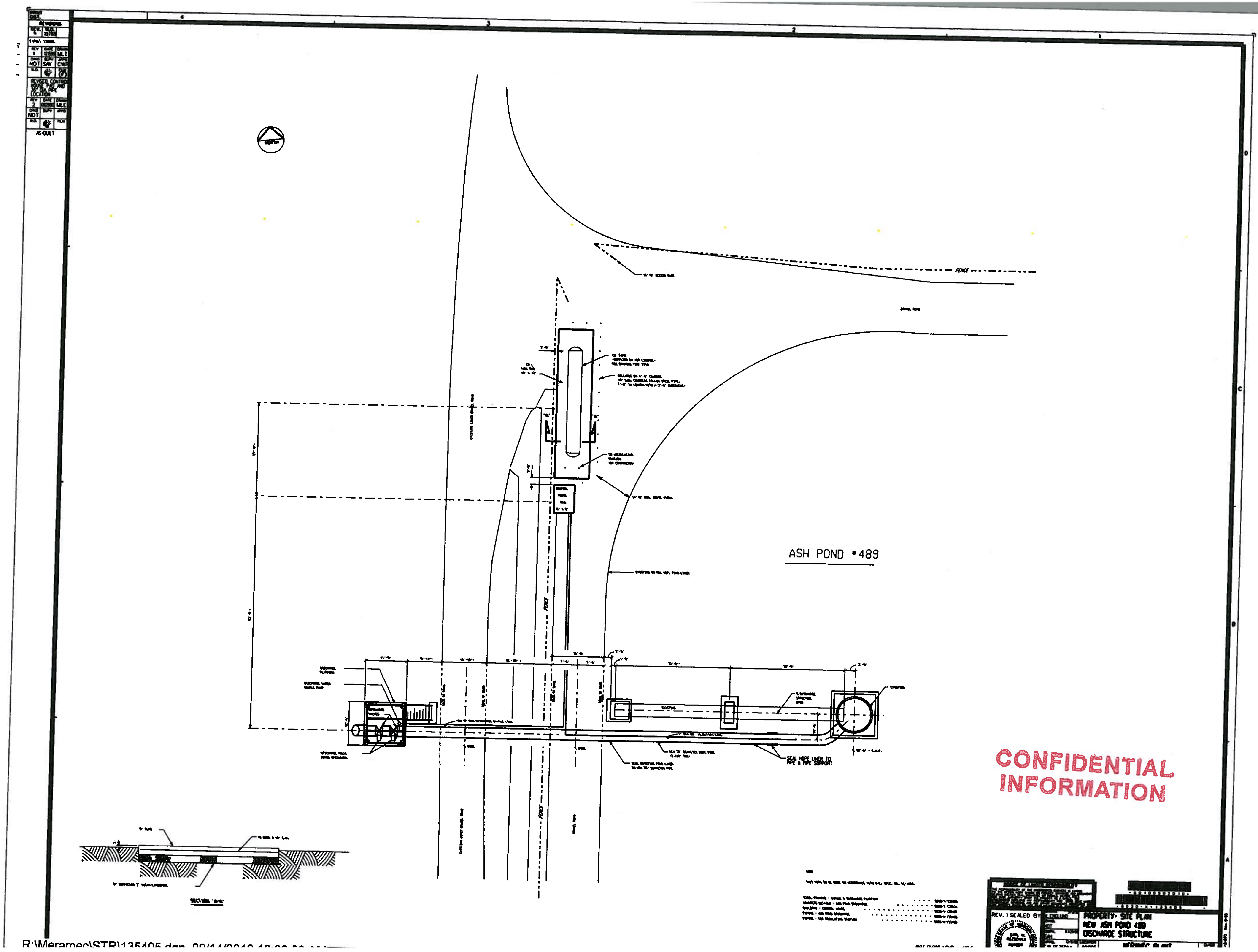
1. THIS WORK TO BE DONE IN ACCORDANCE WITH U.E. SPEC. NO. EC-4022
2. ALL 2" SCH. 80 PIPE ABOVE GROUND IS TO BE GALVANIZED. ALL 2" SCH. 80 PIPING BELOW GROUND SHALL BE COMMON CARBON STEEL.
3. ALL PIPING 2" & SMALLER TO BE SCHEDULE 80.
4. CONTRACTOR TO REAM PIPE FLANGES TO PERMIT FREE OPERATION OF 30" BUTTERFLY VALVES. ALSO TRIM OR REROUTE 2" SAMPLE LINE PER SAME CRITERIA.
5. INSTALL 2" INSULATION AND HEAT TRACE ON 30" PIPE FROM CONCRETE WALL TO LAST PIPE ROLL. INSULATE 2" SAMPLE PUMP SUCTION FROM 30" PIPE TO PUMP & 2" SAMPLE TO CONTROL HOUSE FROM PUMP TO GROUND.
6. ALL HDPE PIPE CONNECTIONS SHALL BE FUSION WELDED.

* 7. SUPPLIED BY AMEREN UE AND INSTALLED BY CONTRACTOR.

REFERENCE DRAWINGS:

PROPERTY PLAN.. [illegible]

CONFIDENTIAL INFORMATION



CONFIDENTIAL INFORMATION

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REVISIONS

REV.	W.O.
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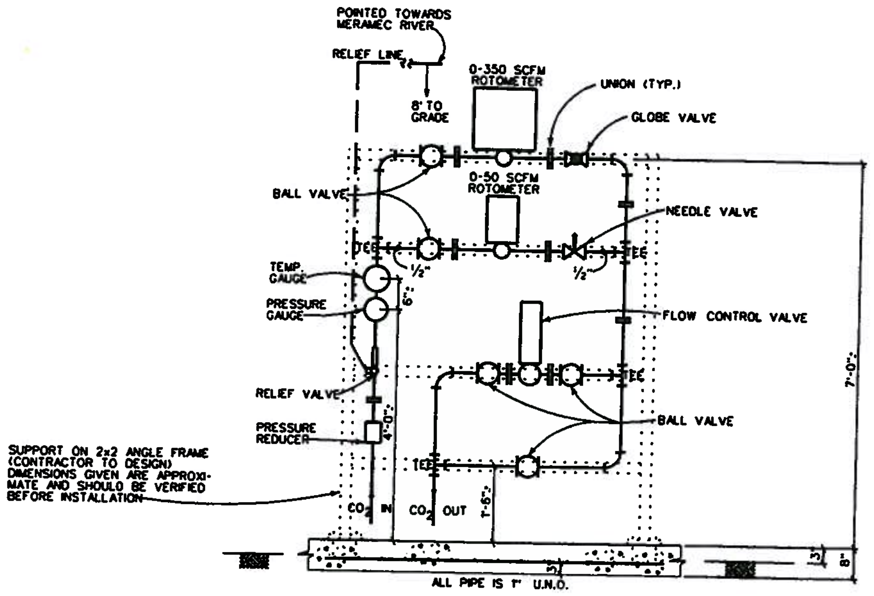
FIRST ISSUE



DETAIL 1

CO_2 REGULATING STATION
LOOKING WEST

EQUIPMENT LIST

PRESSURE GAUGE	ASHCROFT "DURAGAUGE" #1349SS 4½" BACK ½" NPT 0-100 psig, AISI 316SS BOURDON SYSTEM, 4½" FACE, BACK STEM, ½" NPT, ALUMINUM CASE, COLOR BLACK.
TEMPERATURE GAUGE	ASHCROFT INDUSTRIAL BIMETAL THERMOMETER, CODE 50CI60R025, -20/120 F, 5" DIA. DIAL, ½" NPT REAR CONNECTION, 2½" STEM.
ROTOMETER	DIRECT READING CO_2 FLOWMETER, 0-350 SCFM, 1" NPT CONNECTIONS.
ROTOMETER	DIRECT READING CO_2 FLOWMETER, 0-40 SCFM, ½" NPT CONNECTIONS.
CONTROL VALVE	1" NPT CONNECTIONS, FURNISHED BY UNION ELECTRIC CO.
PRESSURE REDUCING VALVE CO_2	CASHCO PRESSURE REDUCING REGULATOR, TYPE 1000 HP, 1" NPT CONNECTIONS, BRASS BODY, OPTION 1000-5 FOR CRYOGENIC SERVICE, 40-80 psig SPRING RANGE, 300#/hr MAX FLOW, 300 psig INLET PRESSURE, 50 psig OUTLET PRESSURE.
RELIEF VALVE CO_2	CASHCO RELIEF VALVE, MODEL 1164, 1" NPT CONNECTIONS, BRONZE BODY, OPTION 5 FOR CRYOGENIC SERVICE, 300#/hr MAX FLOW, 70-150 psig SPRING RANGE, RELIEVE AT 90 psig.

THIS DRAWING HAS NO SCALE

PREPARED FOR

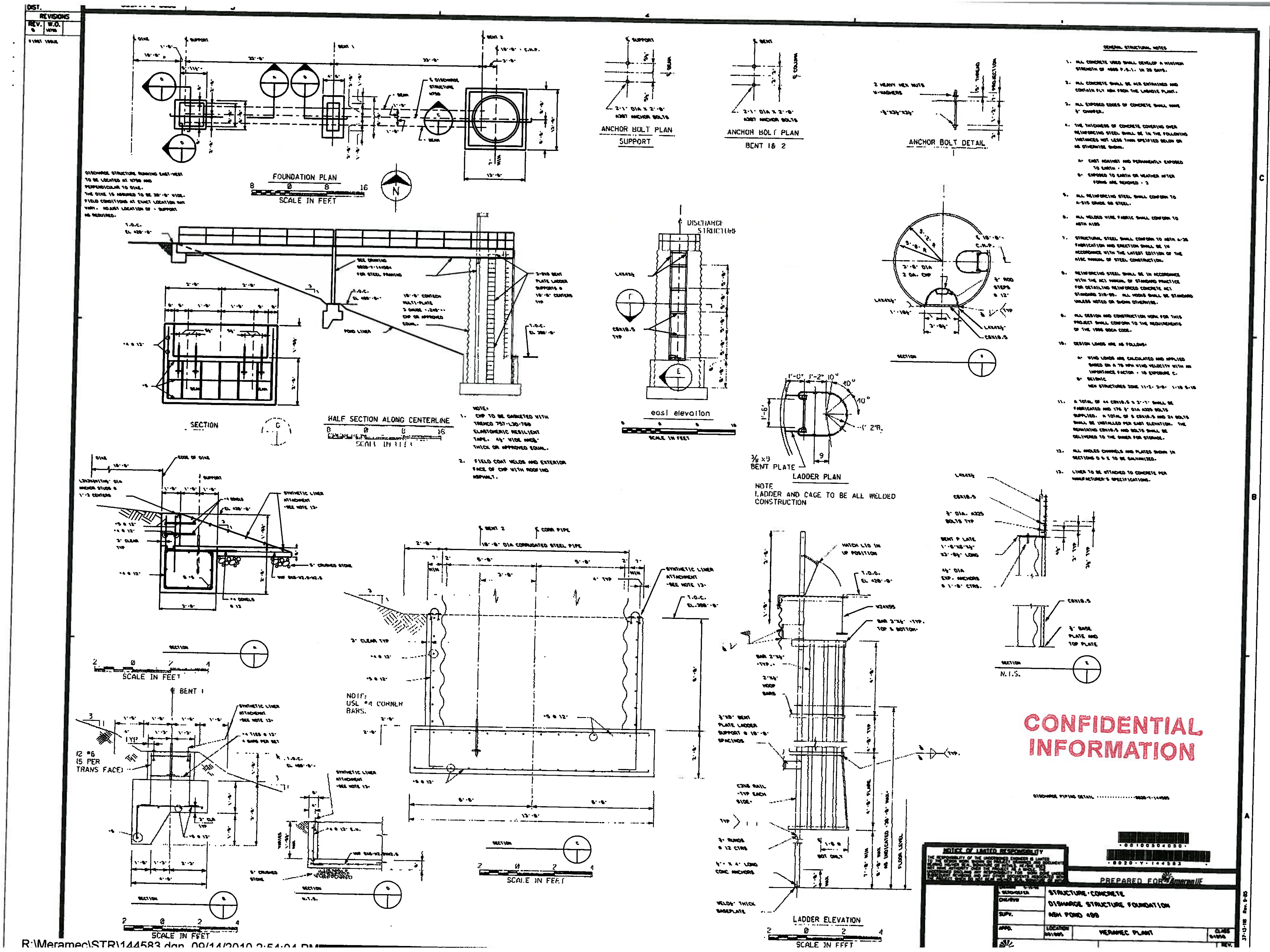
M.L. ENGLUND
P. OTT

PIPING INSTALLATION AND DETAILS
CO2 REGULATING STATION
ASH POND 489

001005
MERAMEC PLANT

NOTES:

1. THIS WORK TO BE DONE IN ACCORDANCE WITH U.E. SPEC. NO. EC-402



DISCHARGE PIPING DETAIL 8020-Y-144585

CONFIDENTIAL INFORMATION

GENERAL STRUCTURAL NOTES

1. ALL CONCRETE USED SHALL DEVELOP A MINIMUM STRENGTH OF 4000 P.S.I. IN 28 DAYS.

2. ALL CONCRETE SHALL BE AIR ENTRAINED AND CONTAIN FLY ASH FROM THE LABADIE PLANT.

3. ALL EXPOSED EDGES OF CONCRETE SHALL HAVE 3/4" CHAMFER.

4. THE THICKNESS OF CONCRETE COVERING OVER REINFORCING STEEL SHALL BE IN THE FOLLOWING INSTANCES NOT LESS THAN SPECIFIED BELOW OR AS OTHERWISE SHOWN.
   - A. CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH - 3
   - B. EXPOSED TO EARTH OR WEATHER AFTER FORMS ARE REMOVED - 2

5. ALL REINFORCING STEEL SHALL CONFORM TO A-615 GRADE 60 STEEL.

6. ALL WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185

7. STRUCTURAL STEEL SHALL CONFORM TO ASTM A-36 FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE AISC MANUAL OF STEEL CONSTRUCTION.

8. REINFORCING STEEL SHALL BE IN ACCORDANCE WITH THE ACI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE ACI STANDARD 318-89. ALL HOOKS SHALL BE STANDARD UNLESS NOTED OR SHOWN OTHERWISE.

9. ALL DESIGN AND CONSTRUCTION WORK FOR THIS PROJECT SHALL CONFORM TO THE REQUIREMENTS OF THE 1996 BOCA CODE.

10. DESIGN LOADS ARE AS FOLLOWS:
   - A. WIND LOADS ARE CALCULATED AND APPLIED BASED ON A 70 MPH WIND VELOCITY WITH AN IMPORTANCE FACTOR - 10 EXPOSURE C.
   - B. SEISMIC
     NEW STRUCTURES ZONE II-2, 2-B, 1/10 S-10

11. A TOTAL OF 44 C8X18.5 X 2'-7" SHALL BE FABRICATED AND 176 3/4" DIA A325 BOLTS SUPPLIED. A TOTAL OF 5 C8X18.5 AND 24 BOLTS SHALL BE INSTALLED PER EAST ELEVATION. THE REMAINING C8X18.5 AND BOLTS SHALL BE DELIVERED TO THE OWNER FOR STORAGE.

12. ALL ANGLES CHANNELS AND PLATES SHOWN IN SECTIONS D & E TO BE GALVANIZED.

13. LINER TO BE ATTACHED TO CONCRETE PER MANUFACTURER'S SPECIFICATIONS.

NOTICE OF LIMITED RESPONSIBILITY

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•8020-Y-144583•

PREPARED FOR AmerenUE

STRUCTURE-CONCRETE
DISHARGE STRUCTURE FOUNDATION
ASH POND 483

CHK/REV
SUPV.
APPD.
LOCATION 061005
MERAMEC PLANT
CLASS 0485A
REV.

37-13-118 Rev. 9-85

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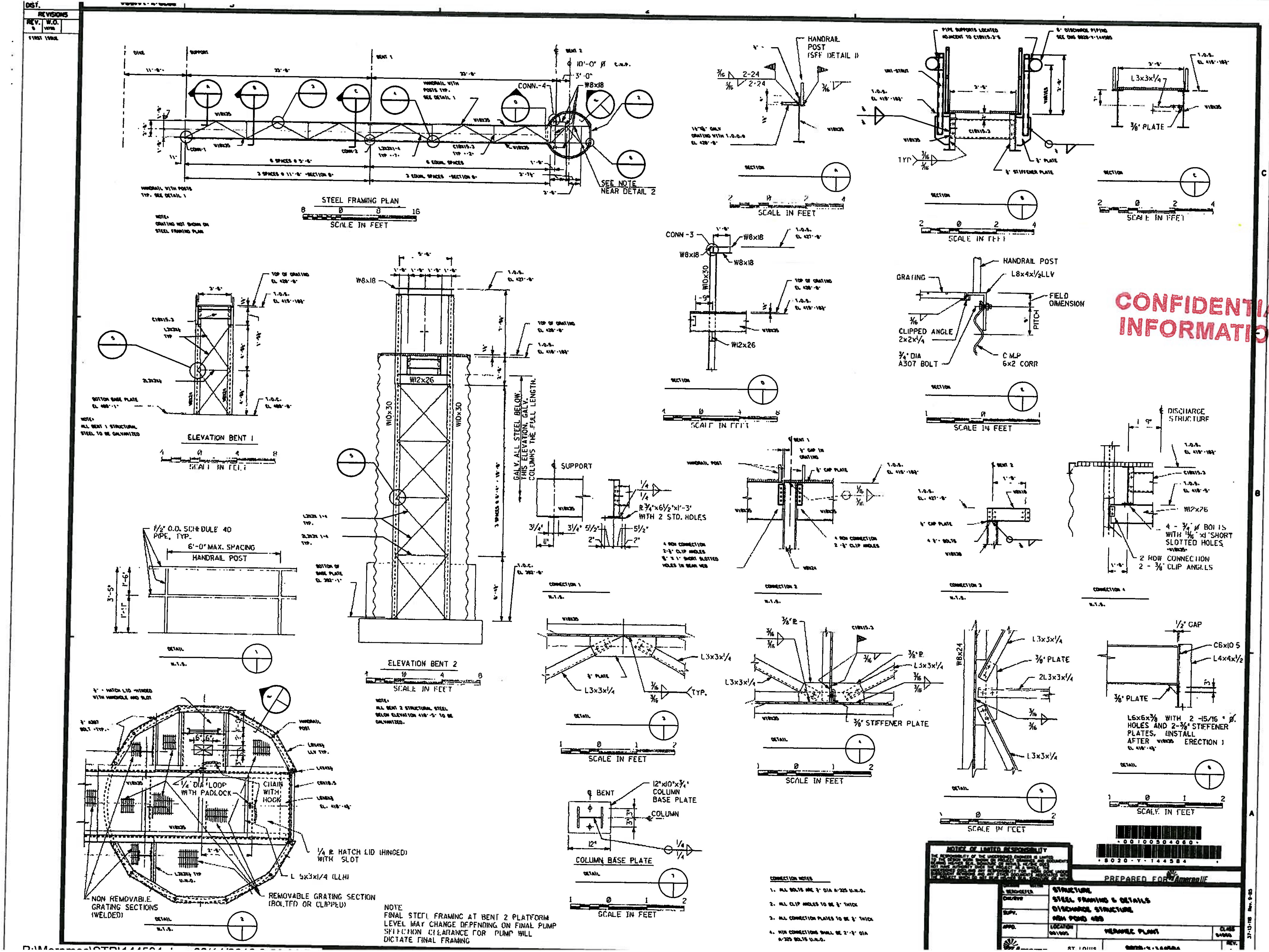


NOTE
FINAL STEEL FRAMING AT BENT 2 PLATFORM LEVEL MAY CHANGE DEPENDING ON FINAL PUMP SELECTION. CLEARANCE FOR PUMP WILL DICTATE FINAL FRAMING

CONNECTION NOTES

1. ALL BOLTS ARE 3/4" DIA A-325 U.N.O.
2. ALL CLIP ANGLES TO BE 3/8" THICK
3. ALL CONNECTION PLATES TO BE 3/8" THICK
4. MIN CONNECTIONS SHALL BE 2 - 3/4" DIA A-325 BOLTS U.N.O.

NOTICE OF LIMITED RESPONSIBILITY

PREPARED FOR AmerenUE

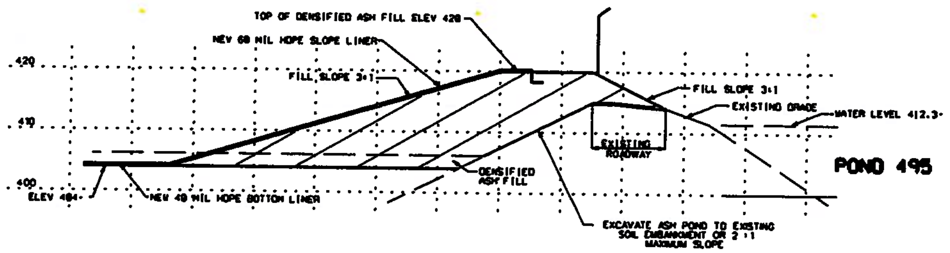
STRUCTURE
STEEL FRAMING & DETAILS
DISCHARGE STRUCTURE
ASH POND 485

SUPV.
APPD.
LOCATION
MERAMEC PLANT
CLASS
ST. LOUIS
8020-Y-144584
REV.

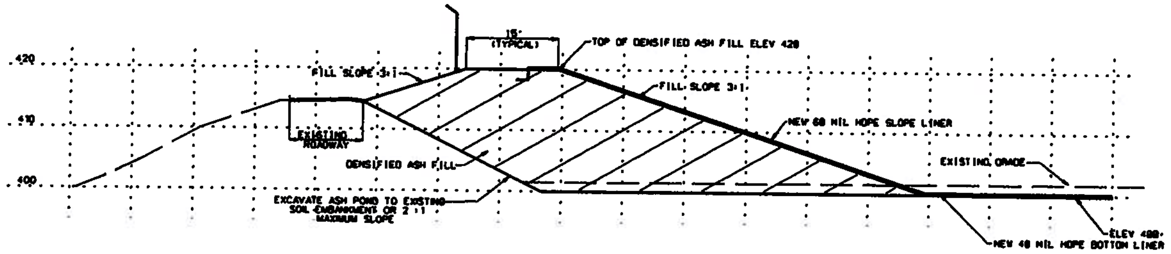
37-13-118 Rev. 9-85

REVISIONS

REV. 0	W.O. E124	Ⓕ
FIRST ISSUE		
REV 1		RWV
NOT	RACH	CWR
W.O. 0E124		FILM
ADDED SECTION E		
REV 2		RWV
NOT		
W.O. 0E124		FILM
ADDED SILTATION FENCE DETAIL		

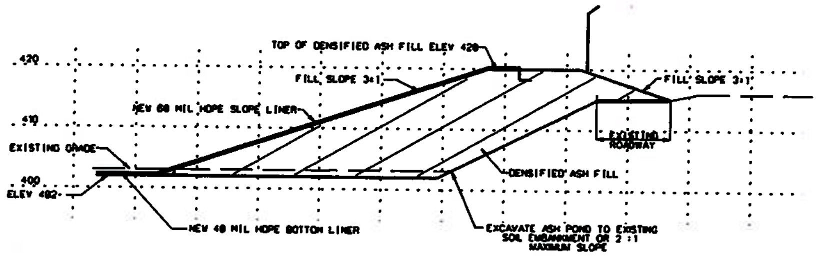


A-A

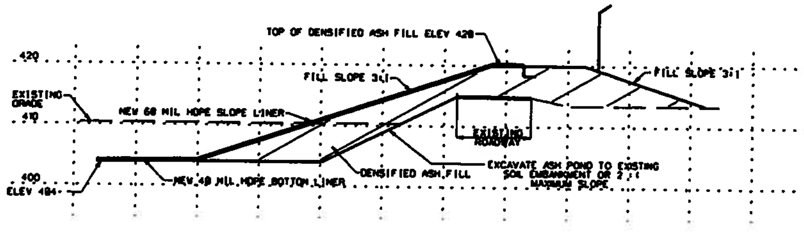


B-B

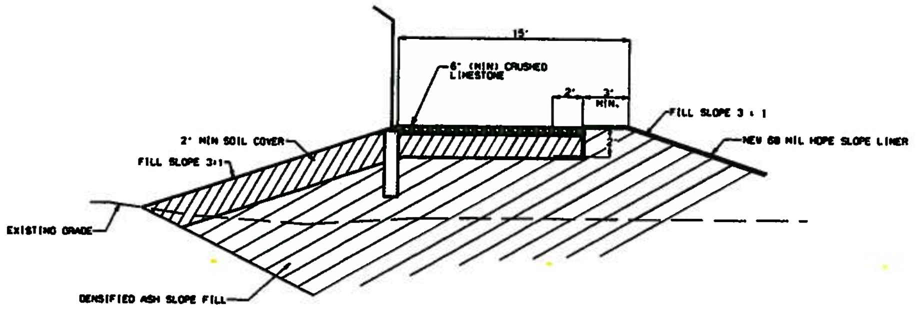
TYPICAL SECTIONS
SCALE 1" = 10'H
1" = 10'V



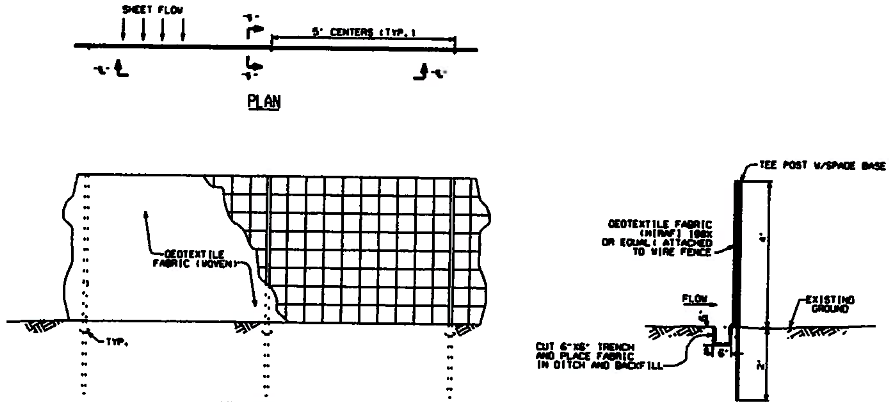
C-C



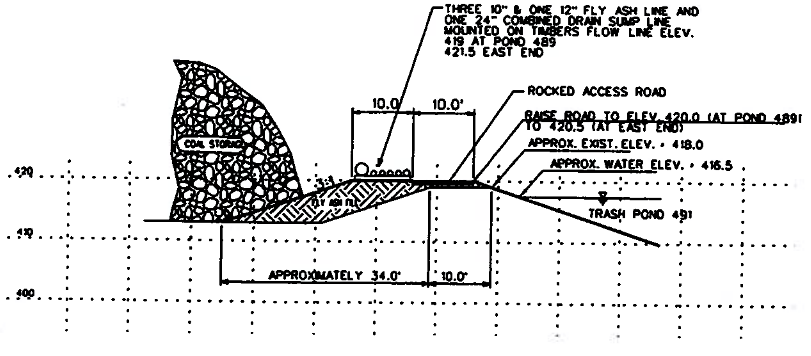
D-D



TYPICAL LEVEE CAP AT POND 489
SCALE 1/4" = 1'



DETAIL 1
SILTATION FENCE
N.T.S.



E-E
SECTION LOOKING WEST THRU LEVEE
BETWEEN POND 491 & COAL PILE

CONFIDENTIAL
INFORMATION

• 0 0 1 0 0 5 0 2 0 1 0 •

• 8 0 2 0 • X • 1 4 4 2 8 9 •

PREPARED FOR

P. OTT	PROPERTY - SECTIONS FLYASH POND 489 RECLAMATION AND NEW LINER
NOT CHKD	
4-3-98 RACH	
4-3-98 REZSONYA	
001005	MERAMEC PLANT
02010	

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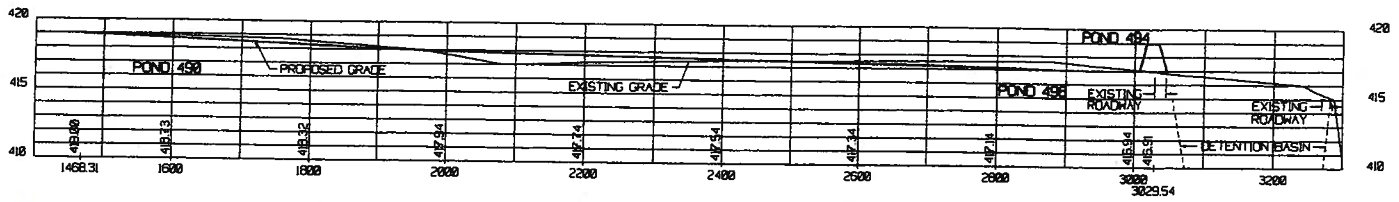
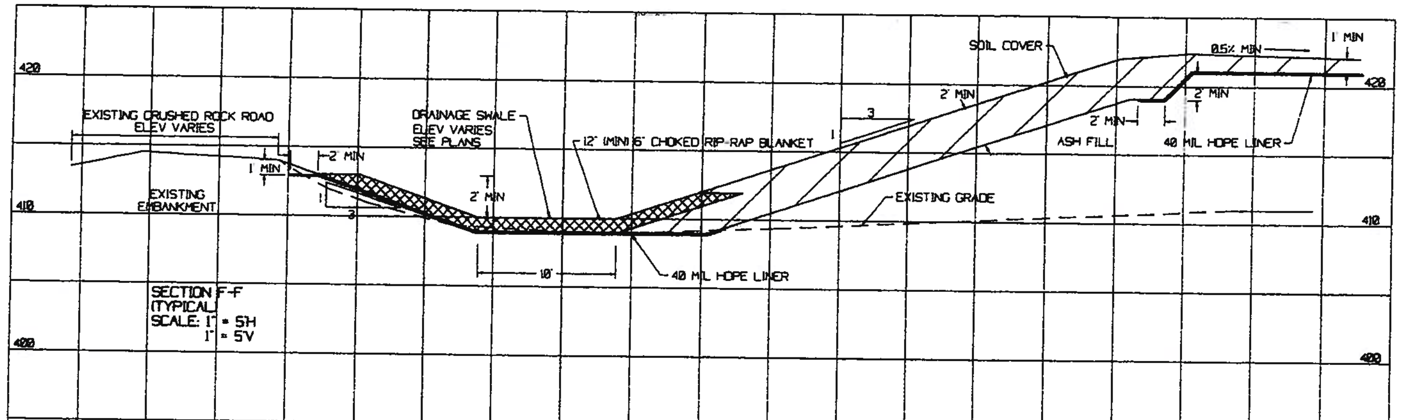
REVISIONS

REV. | NO.

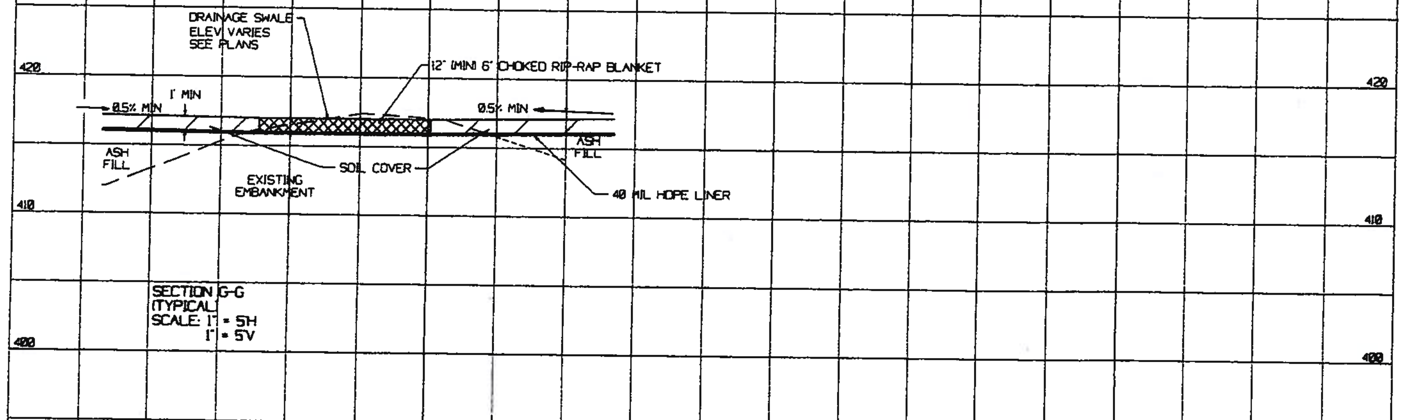
8020-X-135358



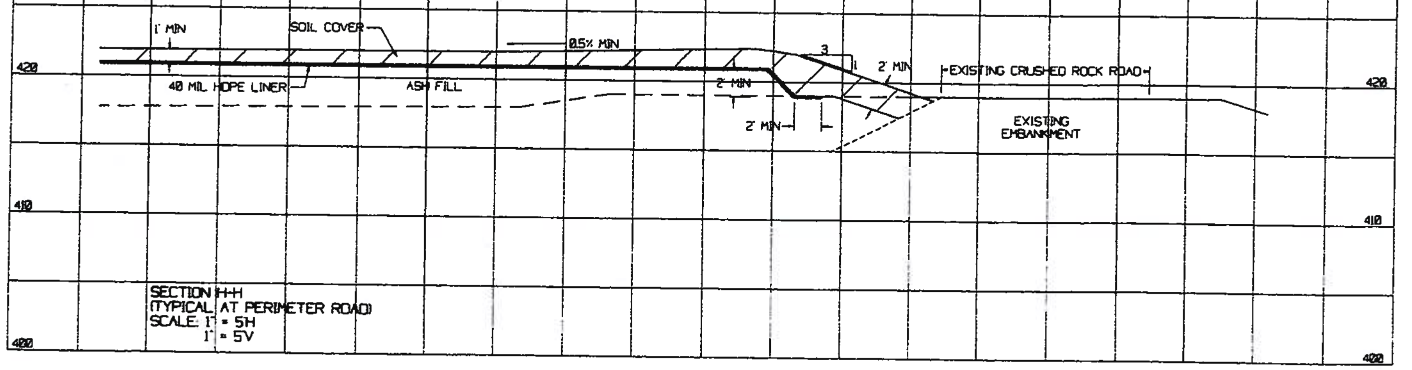
SECTION E-E (ROAD PROFILE)
SCALE 1" = 100H
1" = 5V



SECTION F-F
(TYPICAL)
SCALE: 1" = 5H
1" = 5V



SECTION G-G
(TYPICAL)
SCALE: 1" = 5H
1" = 5V



SECTION H-H
(TYPICAL AT PERIMETER ROAD)
SCALE: 1" = 5H
1" = 5V

CONFIDENTIAL
INFORMATION

NOTICE OF LIMITED RESPONSIBILITY

[illegible]

SEPTEMBER 14, 1994

DRAWN
CHKD.
SUPV.
APPD.

FLYASH POND 489
RECLAMATION

LOCATION
001005

MERAMEC POWER PLANT

CLASS
02010

UNION ELECTRIC COMPANY
ST. LOUIS, MO.

8020-X-135358

REV.
0

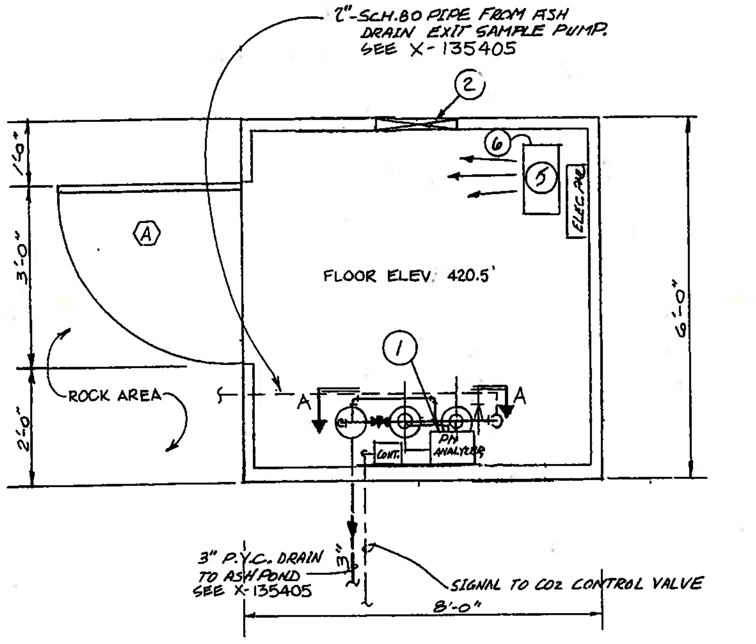
PRINT DIST.

REVISIONS

REV.	W.O.
0	E144

FIRST ISSUE

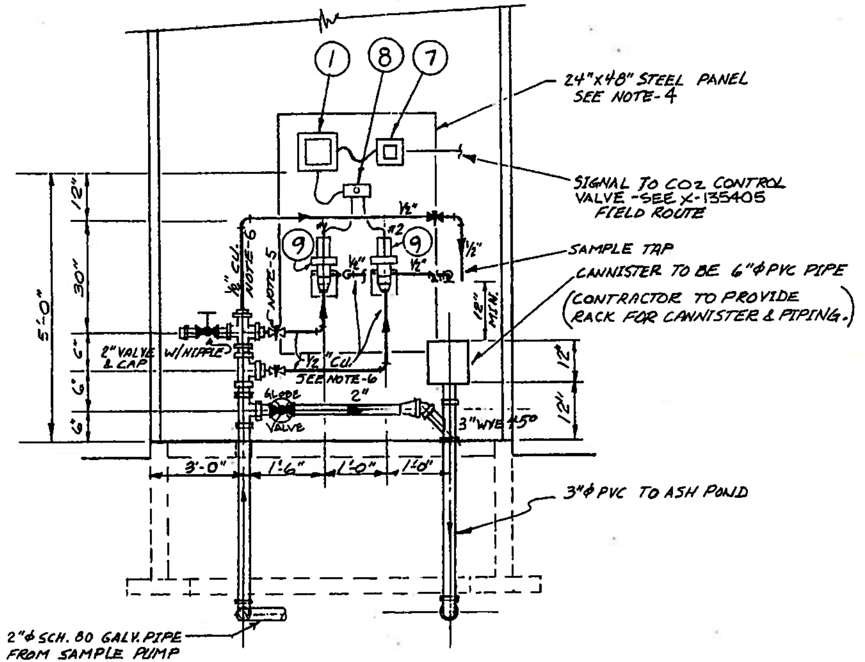
8030-Y-135407



PLAN @ SAMPLE CONTROL HOUSE

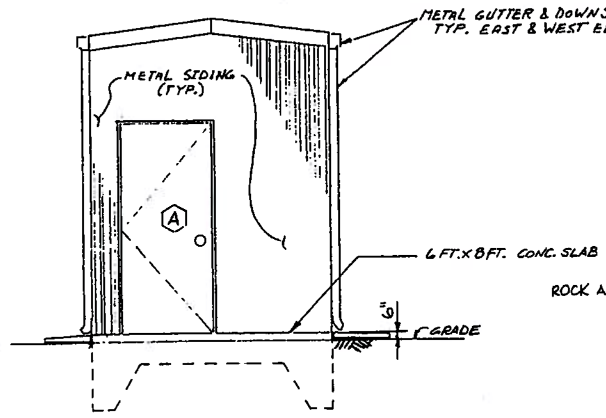
NO SCALE

FOR CONTROL HOUSE LOCATION, SEE X-135405

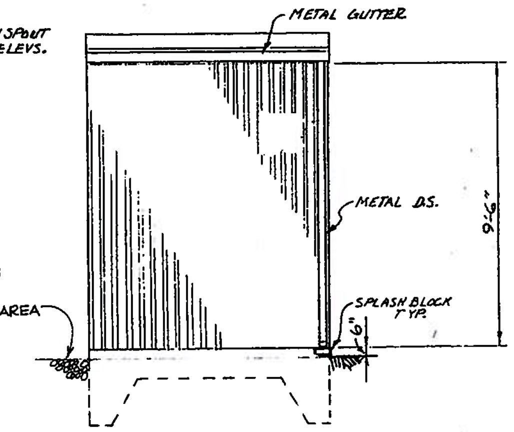


ELEVATION A-A

NO SCALE

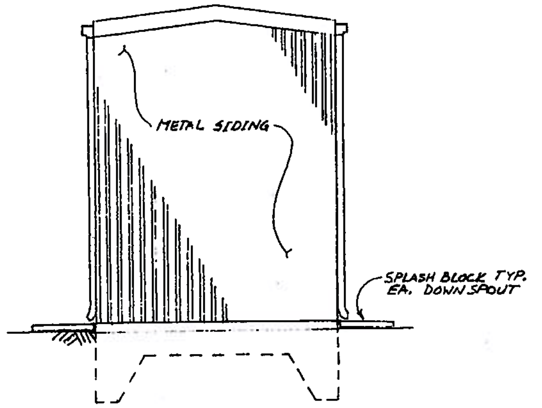


SOUTH ELEVATION

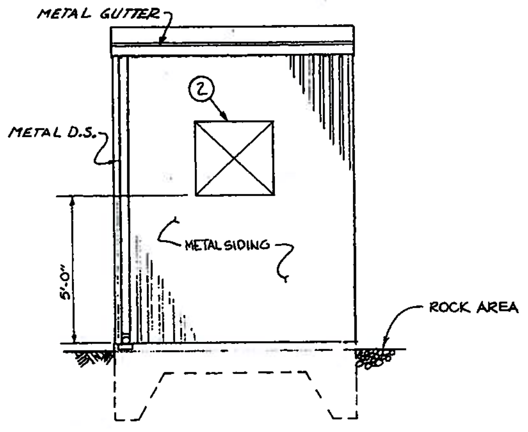


EAST ELEVATION

NOTE:
FOR BUILDING FDN.
SEE X-135521



NORTH ELEVATION



WEST ELEVATION

EQUIPMENT BILL OF MATERIAL

ITEM NO.	ITEM QTY.	DESCRIPTION	REMARKS
1	1	#pH400-P-U-1*A/U MICROPROCESSOR pH ANALYZER YOKOGAWA	MOUNT ON STL. PANEL SEE NOTE-4 BY AMEREN-UE
2	1	110V AIR CONDITIONER - SEE SPECIFICATION FOR DESIGN CRITERIA	
~~3~~	~~1~~	~~EXHAUST FAN - NEW YORK BLOWER MODEL E82-H W/ MOTOR SIDE FAN GUARD, AUTOMATIC SHUTTER, 115V, 1Φ MOTOR.~~	
~~4~~	~~1~~	~~THERMOSTAT (EXHAUST FAN) BARBER-COLEMAN #TC-4111. MOUNT SENSING BULB ON EXHAUST FAN GUARD.~~	
5	1	UNIT HEATER - MARLEY "Q-MARK" MODEL MUH-03-81. 3.0 KW, 480V, 3Φ, WITH WALL & CEILING MOUNTING BRACKET #MMB-5, WITH POWER DISCONNECT SWITCH MPDS-25.	
6	1	THERMOSTAT (UNIT HEATER) MARLEY "Q-MARK" MODEL WR-1E30-S.	MOUNT ON WALL 3'-6" A.F.F.
7	1	#UT37-A13301*A/SPD CONTROLLER YOKOGAWA	MOUNT ON STL. PNL SEE NOTE-4 BY AMEREN-UE
8	1	SWITCH BOX	MOUNT ON STL. PNL. SEE NOTE-4 BY AMEREN-UE
9	2	FLOW-THROUGH SENSOR ASSEMBLY #FF20-S33-FNU-C2-SA-T YOKOGAWA	MOUNT ON STL. PNL. SEE NOTE-4 BY AMEREN-UE

DOOR SCHEDULE

DOOR NO.	DOOR SIZE	DESCRIPTION
A	1-3°x7°x1¾"	HOLLOW METAL FLUSH TYPE DOOR (INSULATED) W/ PRESSED METAL FRAME (5½" STD.), 1½ PAIR FULL MORTISED 2 B.B HINGE-4½"x4½" x 0.134 GA. HOSPITAL TYPE. PROVIDE "LCN" 4040 DOOR CLOSER, LOCKSET 66B, BEST CYLINDER & CONSTRUCTION CORE. PROVIDE FLOOR MOUNTED STOP W/HOLD OPEN IVES 449. DOOR TO BE FULLY WEATHERSTRIPPED, HAVE ALUMINUM THRESHOLD (NATIONAL GUARD #525) & DOOR BOTTOM SEAL (NATIONAL GUARD #19). ALL HARDWARE US26D FINISH.

NOTES:
1) ALL HARDWARE TO BE US26D FINISH.
2). LOCKSETS TO RECIEVE "BEST" CYLINDERS. PERMANENT CORES TO BE PROVIDED BY UNION ELECTRIC CO. .
3). CONSTRUCTION CORES TO BE PROVIDED BY CONTRACTOR

NOTES:
1. THIS WORK TO BE DONE IN ACCORDANCE WITH U.E. SPEC. NO. EC-4022.
2. (DELETED)
3. (DELETED)
4. 24"x48" STEEL PANEL AND ITEMS 1, 7, 8 & 9 FURNISHED BY U.E. CO. & INSTALLED BY CONTRACTOR. PIPING & ELECTRICAL CONNECTIONS SUPPLIED BY CONTRACTOR.
5. VALVES FOR ½" COPPER TUBING TO SENSORS TO BE WHITEY NEEDLE VALVES, BRONZE BODY, TYPICAL.
6. COPPER TUBING CONNECTIONS TO BE MADE WITH SWAGLOK FITTINGS.

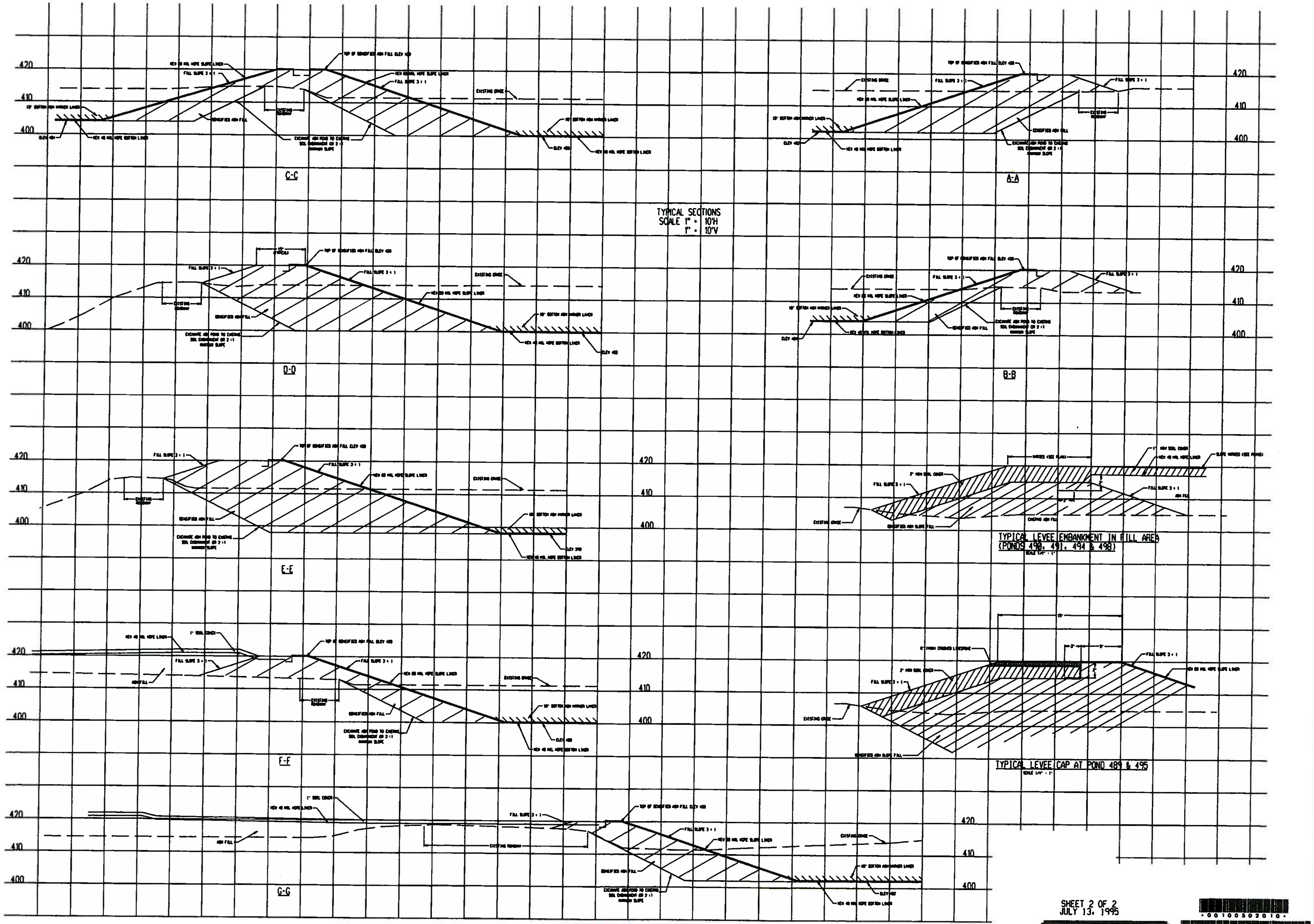
REFERENCE DRAWINGS:
8030-X-135405 ----PROPERTY PLAN

THIS DRAWING HAS NO SCALE

8030-Y-135407

DRAWN 8-12-99 M. ENGLUND
CHKD. NOT
SUPV. 10-21-99 JAH
APPD. 12/16/99 C.W. Roelson
BUILDING-PLAN
SAMPLE CONTROL BUILDING
ASH POND 489
LOCATION 001005
MERAMEC PLANT
CLASS 03020
UNION ELECTRIC COMPANY
ST. LOUIS, MO.
8030-Y-135407
REV. 0

REVISIONS		
REV.	W.O.	
0	E124	
FIRST ISSUE		



C-C

A-A

TYPICAL SECTIONS
SCALE 1" = 10'H
1" = 10'V

D-D

B-B

E-E

TYPICAL LEVEE EMBANKMENT IN FILL AREA
(PONDS 490, 491, 494 & 498)

F-F

TYPICAL LEVEE CAP AT POND 489 & 495

G-G

SHEET 2 OF 2
JULY 13, 1995

• 0 0 1 0 0 5 0 2 0 1 0 •

• 8 0 2 0 • X • 1 3 5 3 5 7 •

CONFIDENTIAL
INFORMATION

* ASH PONDS HAVE NOT BEEN MODIFIED TO THIS DESIGN

PREPARED FOR AmerenUE

FLYASH PONDS 489 AND 495
RECLAMATION

MERAMEC POWER PLANT

ST. LOUIS

8020-X-135357

0

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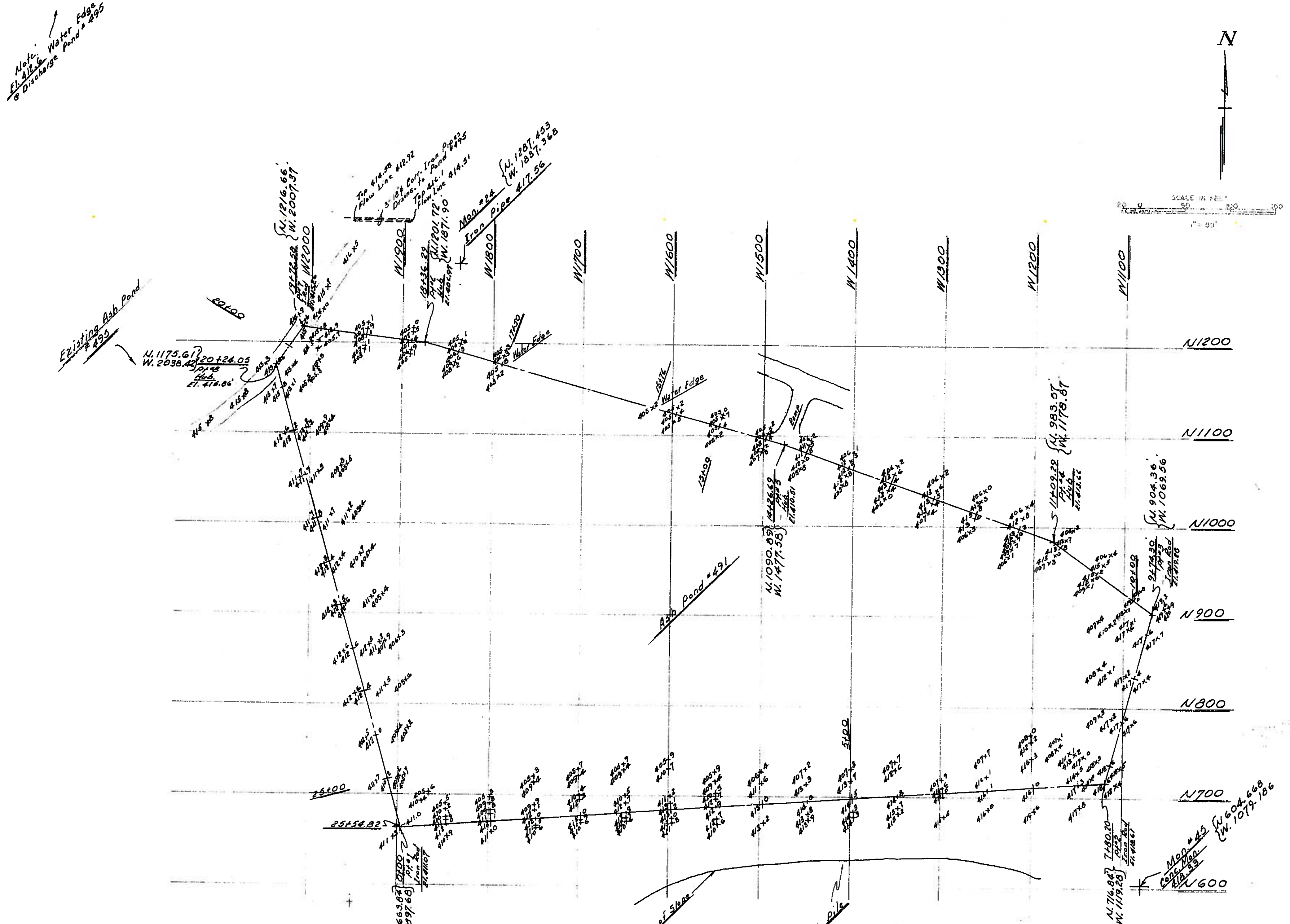
PRINT DIST.

8000-Y-54505

REVISIONS Ⓔ

REV.	W.O.	
First Issue		



Note!
N. 604.668
W. 1079.186 } Plant Coordinates

Prop Plan Ash Slurry Ponds 8000-Z-61041

CONFIDENTIAL INFORMATION

DRAWN 12-29-88 R. Weber	PROPERTY PLAN SURVEY CROSS SECTIONS ASH POND 491
CHKD. R. Weber	
SUPV.	
APPD.	LOCATION 001005 · MERAMEC PLANT · CLASS 02010
UNION ELECTRIC COMPANY ST. LOUIS, MO.	8000-Y-54505 · REV. 0

37-13-118 Rev. 4-73

CONFIDENTIAL INFORMATION

8000-X-92766

PRINT DIST.

REVISIONS

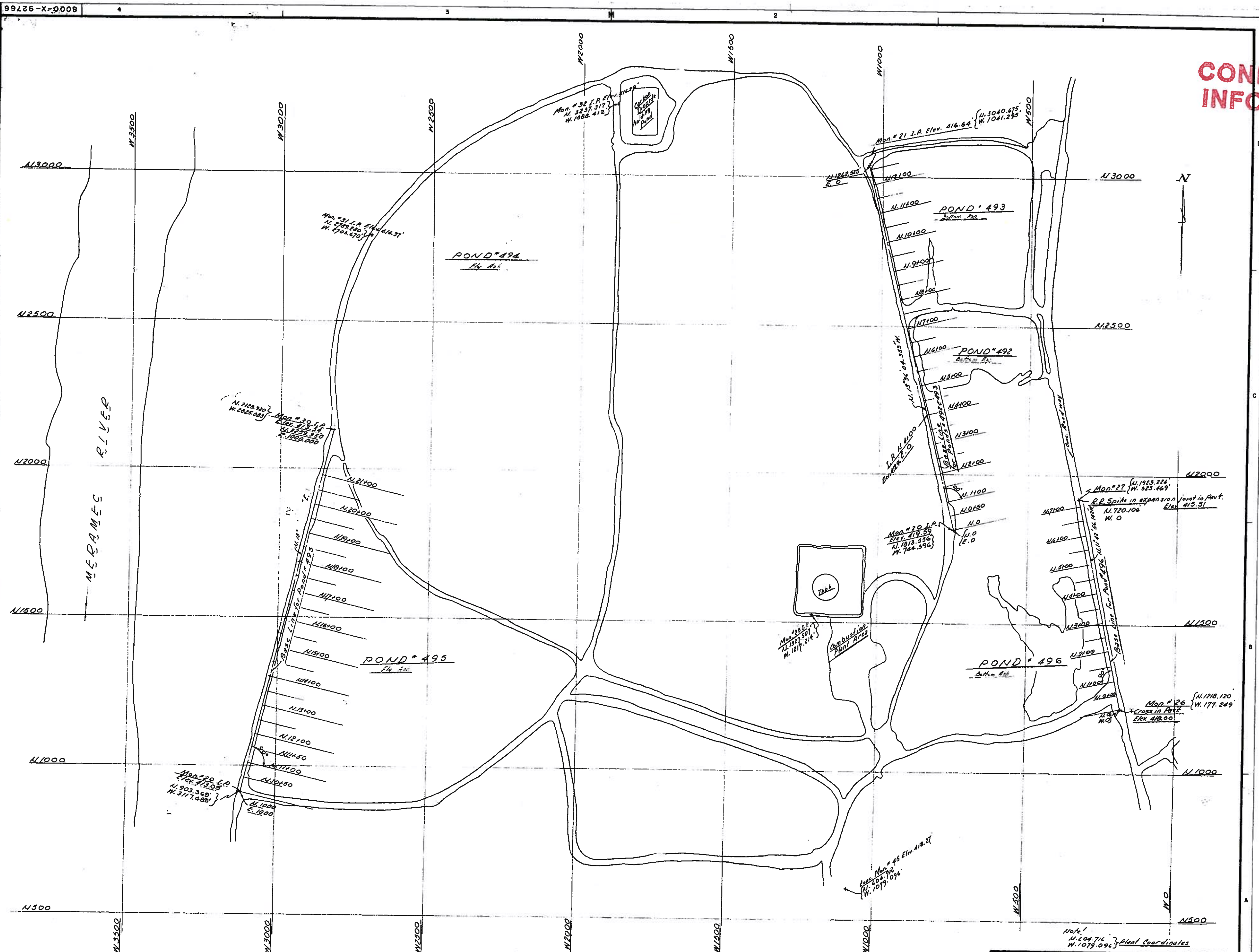
REV.	W.O.
1	

Redrawn. Title & Number chg.

REV.	DATE	DRAWN
2	7-17-85	RB
CHKD.	SUPV.	APPD.
RBB	E.H.L.	
W.O.		

CHGD. MON. #25, 29 & 30, REM. 24 & 28, CHGD R.E. ~~CO-ORD~~, REV. GRID.

REV. 3 CHGD. MON. 20 ELEV. & PLANT CO-ORD 1/14/91 ZAT



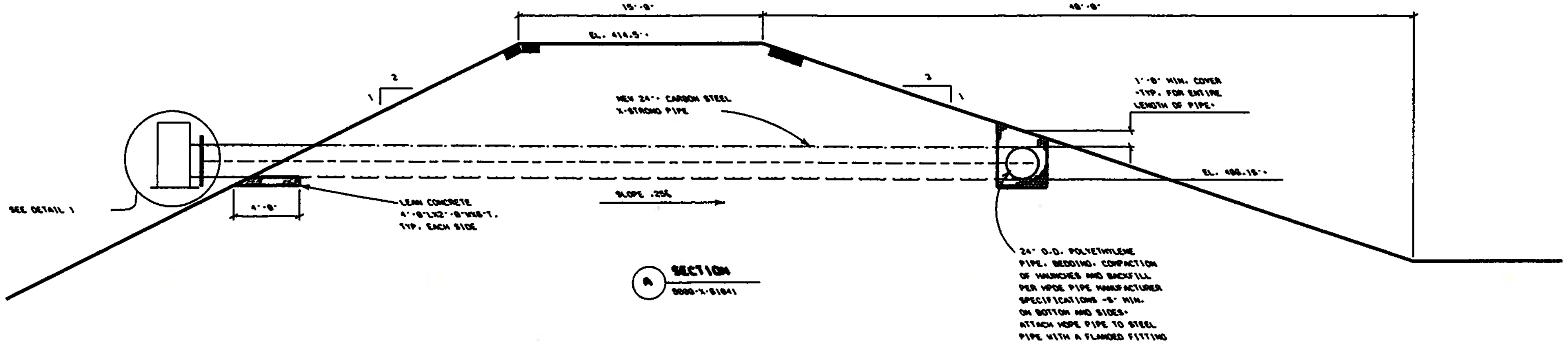
Note!
N. 606.716
W. 1079.096 } Plant Coordinates

DRAWN 3-16-84 R. Weber	PROPERTY PLAN SURVEY ASH POND #492 THRU #496 INSTRUMENT PT. LOCATION
CHKD. 3-16-84 H. Mittner	
SUPV. HEM	
APPD	LOCATION 001005 MERAMEC PLANT CLASS 02010
UNION ELECTRIC COMPANY ST. LOUIS, MO.	8000-X-92766 REV. 3

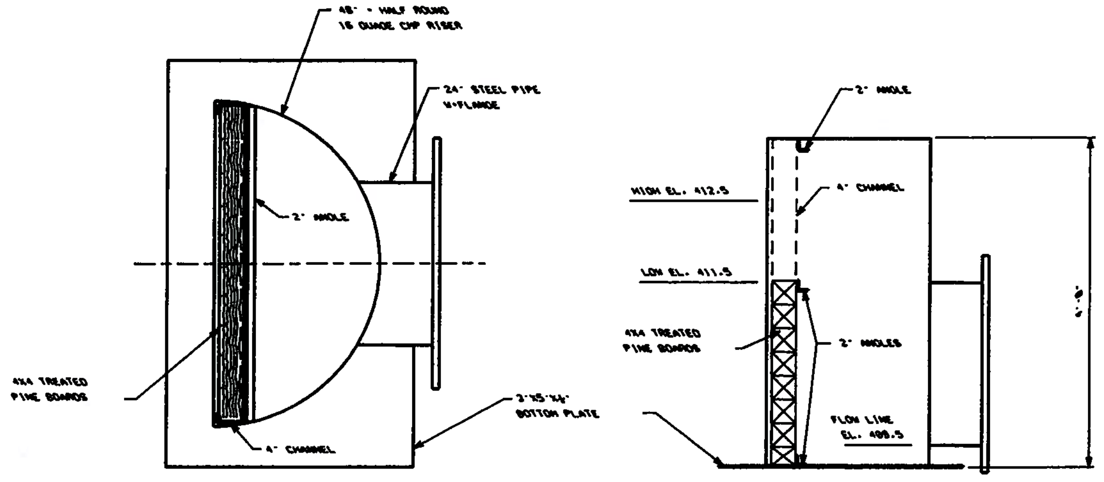
8000-X-92766

PRINT DIST.		
REVISIONS		
REV. 0	W.O.	
FIRST ISSUE		
REV 1	DATE 052298	DRAWN RWV
CHKD DAG	SUPV	APPD
W.O.		FILM

ADDED DECANT STRUCTURE



A SECTION
8000-X-81041



PLAN

ELEVATION

DETAIL 1

ENLARGED VIEW OF DECANT STRUCTURE

CONFIDENTIAL INFORMATION

NOTES:

1. THIS WORK TO BE DONE IN ACCORDANCE WITH U.E. SPEC. NO. EC-3572

REFERENCE DRAWINGS:
8000-X-81041·····SITE PLAN
8020-X-81928·····PARTIAL PLAN & SECTIONS
8020-X-81929·····MISC. DETAILS

NOTICE OF LIMITED RESPONSIBILITY

THE RESPONSIBILITY OF THE UNDERSIGNED ENGINEER IS LIMITED TO THE DESIGN WORK SHOWN ON PROJECT DRAWINGS AND DOCUMENTS [illegible]

REV. 0 SEALED BY

CARL W. REZSONYA
NUMBER E-18282

DRAWN MIKE LOWRY	PIPING-ASH POND DISCHARGE POND #494 & #495 1996 ADDITION
CHKD. NOT CHKD.	
SUPV. STEVE OTT	
APPD. 7-25-96 C.W. REZSONYA	LOCATION 001005
	MERAMEC PLANT
	CLASS 05030
UNION ELECTRIC COMPANY ST. LOUIS, MO.	8020-Y-141535
	REV. 1

8020-Y-141535

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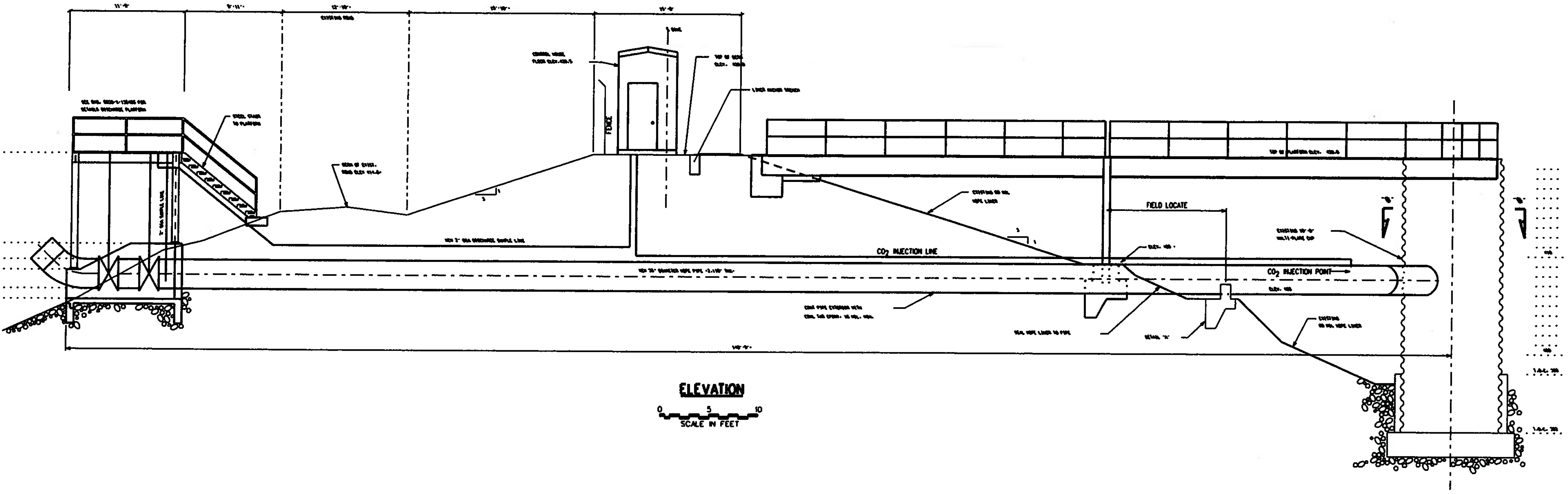
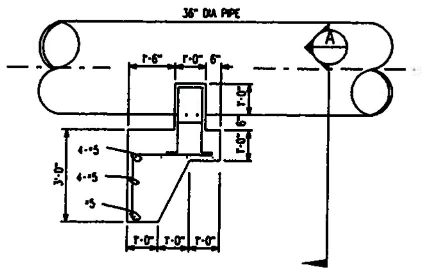
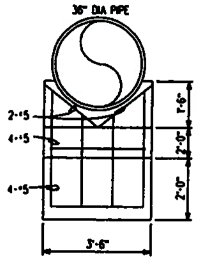
CONFIDENTIAL INFORMATION



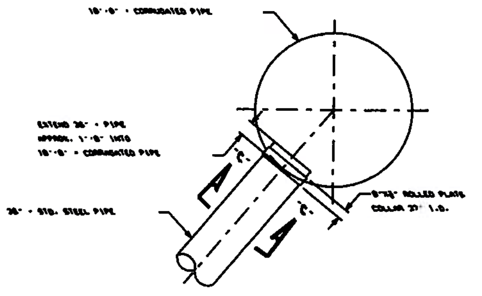
ELEVATION



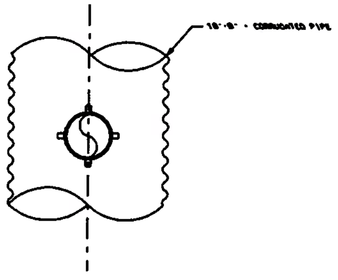
DETAIL "A"



SECTION "A"



SECTION "B"



SECTION "C"

NOTE

THIS WORK TO BE DONE IN ACCORDANCE WITH U.E. SPEC. NO. EC-4022.

STEEL FRAMING - INTAKE & DISCHARGE PLATFORM . . . . [illegible]
CONCRETE DETAILS - ASH POND DISCHARGE . . . . [illegible]
BUILDING - CONTROL HOUSE . . . . [illegible]
PIPING - ASH POND DISCHARGE . . . . [illegible]
PIPING - CO2 REGULATING STATION . . . . [illegible]

1993 FLOOD LEVEL - 419.6

·0010050201·

·8030-X-147376·

PREPARED FOR AmerenUE

REV.0 SEALED BY

MERAMEC PLANT

ST. LOUIS,

8030-X-147376

8030-X-152542

PRINT DIST.		
REVISIONS		
REV. 0	W.O.	
FIRST ISSUE		
REV 1	DATE 041801	DRAWN MGL
CHKD NOT	SUPV	APPD
W.O. 10775		FILM
BOTTOM OF LINER WAS EL. 405.0'		
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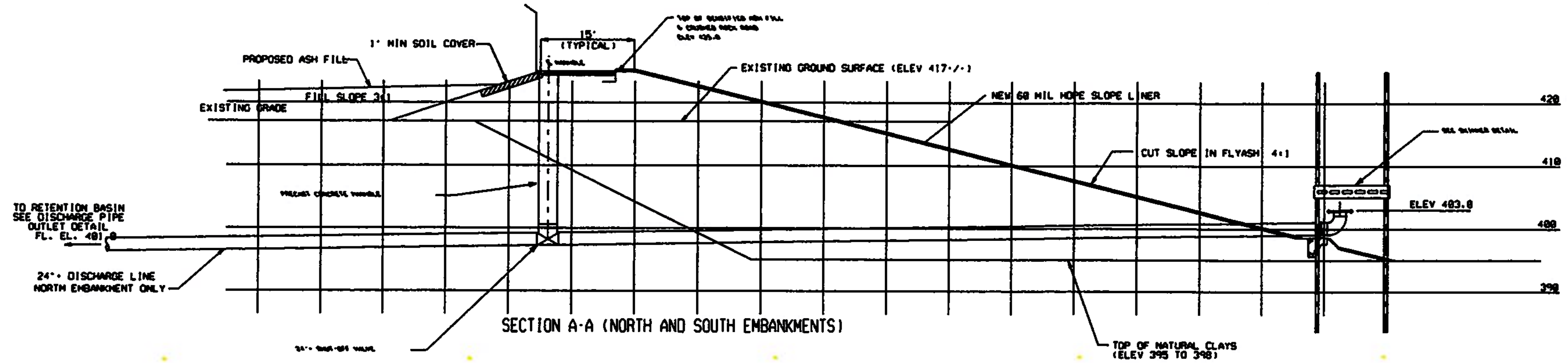
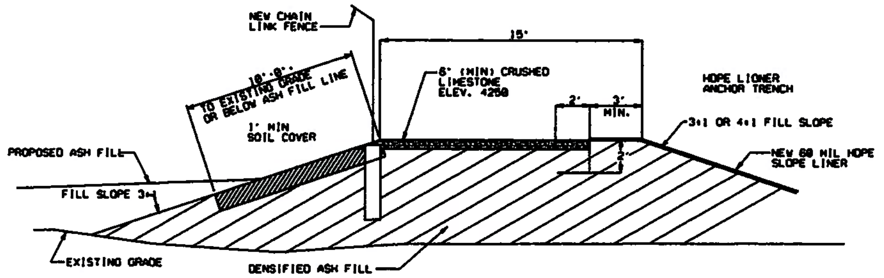
CHKD	SUPV	APPD
W.O. 10775		FILM
REV. DWG. PER ENGINEER'S COMMENTS; REV. DWG. SIZE		

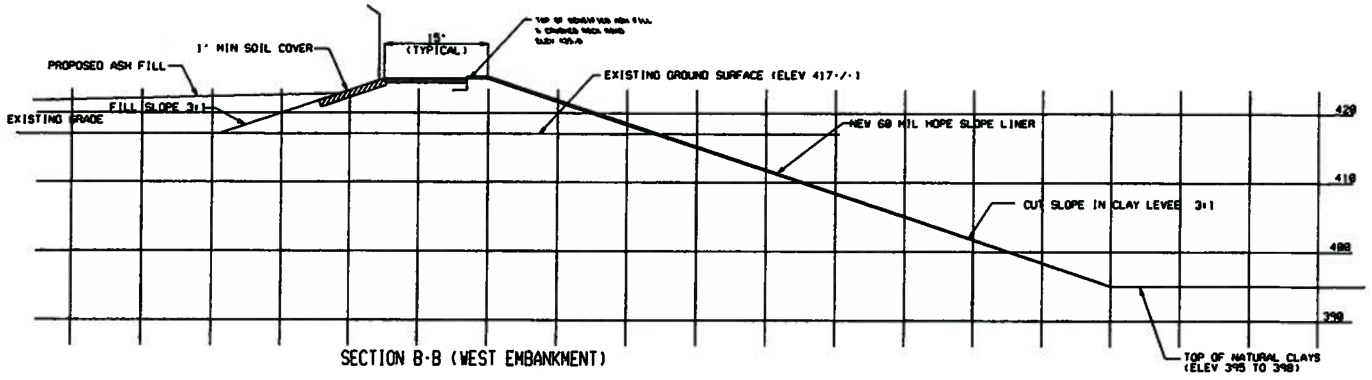


SECTION A-A (NORTH AND SOUTH EMBANKMENTS)

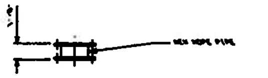


TYPICAL SECTION
AT TOP OF LEVEE

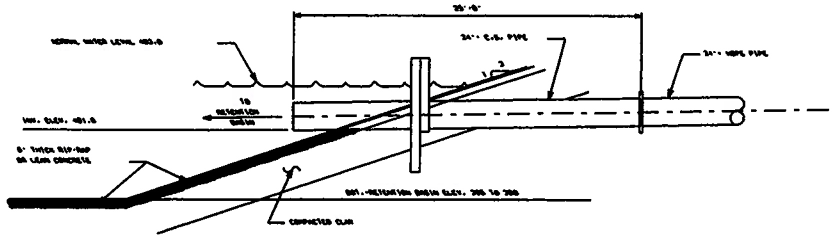
CONFIDENTIAL INFORMATION



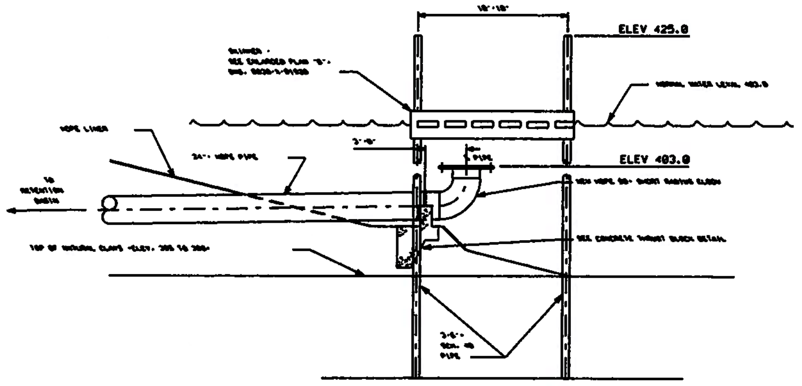
SECTION B-B (WEST EMBANKMENT)



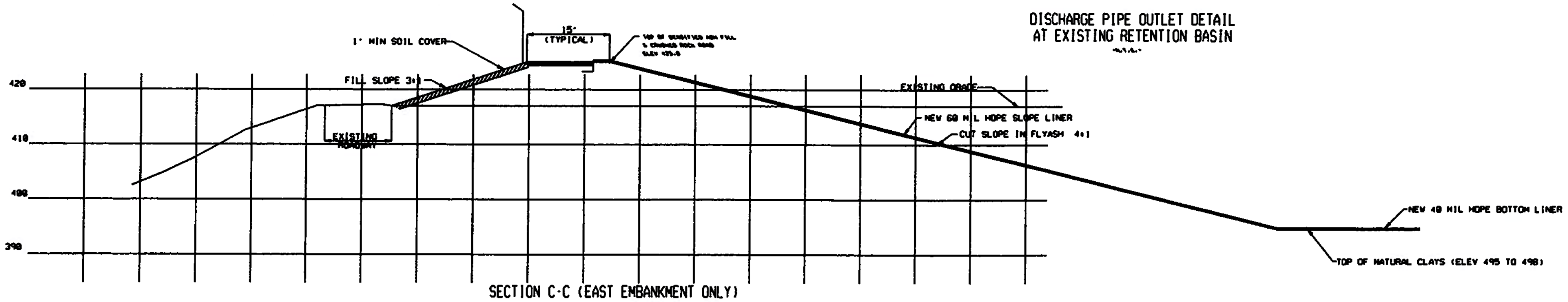
SKIMMER EXTENSION SECTION DETAIL



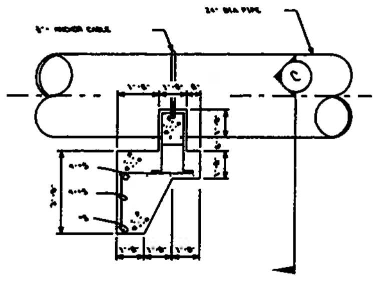
DISCHARGE PIPE OUTLET DETAIL
AT EXISTING RETENTION BASIN



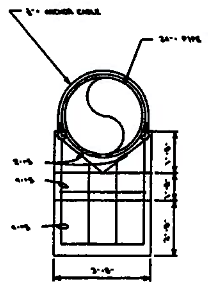
SKIMMER DETAIL
AT NORTH EMBANKMENT ONLY



SECTION C-C (EAST EMBANKMENT ONLY)



CONCRETE THRUST BLOCK DETAIL



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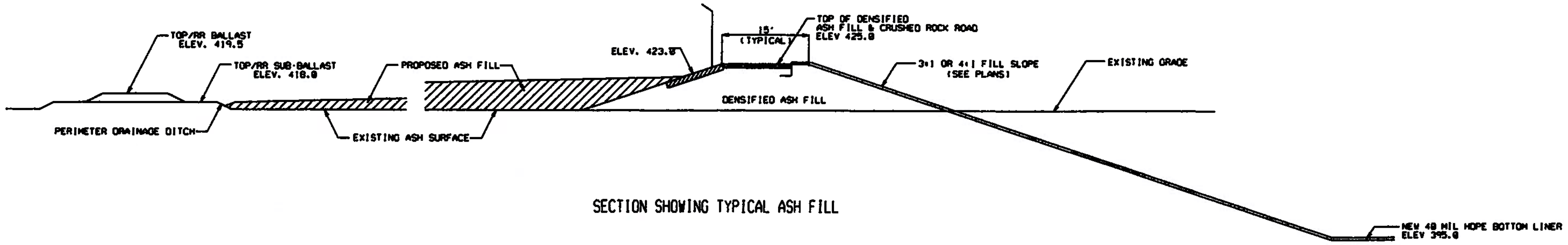

SECTION SHOWING TYPICAL ASH FILL

REFERENCE DRAWINGS:
ASH POND AND FILL AREA _ _ _ _ _ _ _ _ _ _ 8030-Y-154541

NOTICE OF LIMITED RESPONSIBILITY

PREPARED FOR AmerenUE

P. OTT 032101
NOT CHKD
SUPV. 032101 SAH

PROPERTY - SECTIONS
NEW ASH POND AND GRADING
OVER PONDS 490, 494 & 498

LOCATION 001005
MERAMEC PLANT
CLASS 02010

Ameren ST. LOUIS, MISSOURI
8030-X-152542
REV. 2

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PRINT DIST.

REVISIONS

REV.		
A		

ISSUED FOR PERMIT

REV	DATE	DRAWN
B	10-4-80	JB
CHKD	SUPV	APPD
LML	DM	DM
W.O.		FILM

ISSUED FOR BIDDING

REV	DATE	DRAWN
C	10-19-80	JB
CHKD	SUPV	APPD
LML	DM	DM
W.O.		FILM

REVISIONS

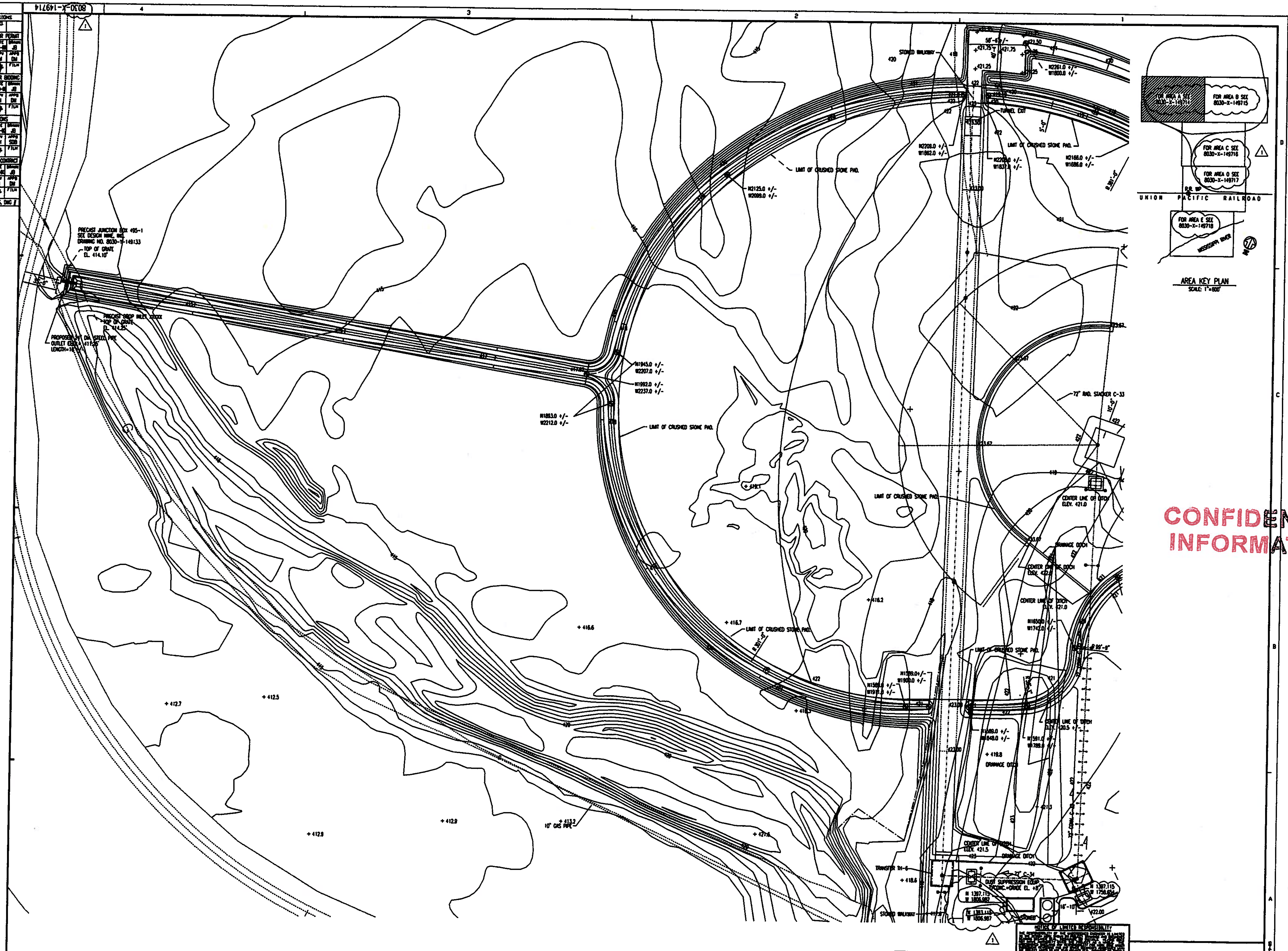
REV	DATE	DRAWN
0	12-11-80	JB
CHKD	SUPV	APPD
SOB	TUH	SOB
W.O.		FILM

ISSUED FOR CONTRACT

REV	DATE	DRAWN
1	3-17-80	JB
CHKD	SUPV	APPD
AO	DM	DM
W.O.		FILM

COORDINATES, DWG #

8030-X-149714



NOTICE OF LIMITED RESPONSIBILITY

[illegible]

1154-10303

SCALE: 1"=30'

CONSULTANT

Energy Associates, P.C.
MONTVILLE, NEW JERSEY 07045

DRAWN	C.T.
CHKD.	L.M.L.
SUPV.	D.M.
APPD.	D.M.

SITE GRADING PLAN
AREA A

LOCATION		CLASS
001005	MERAMEC RAIL FACILITIES	02010

REV.

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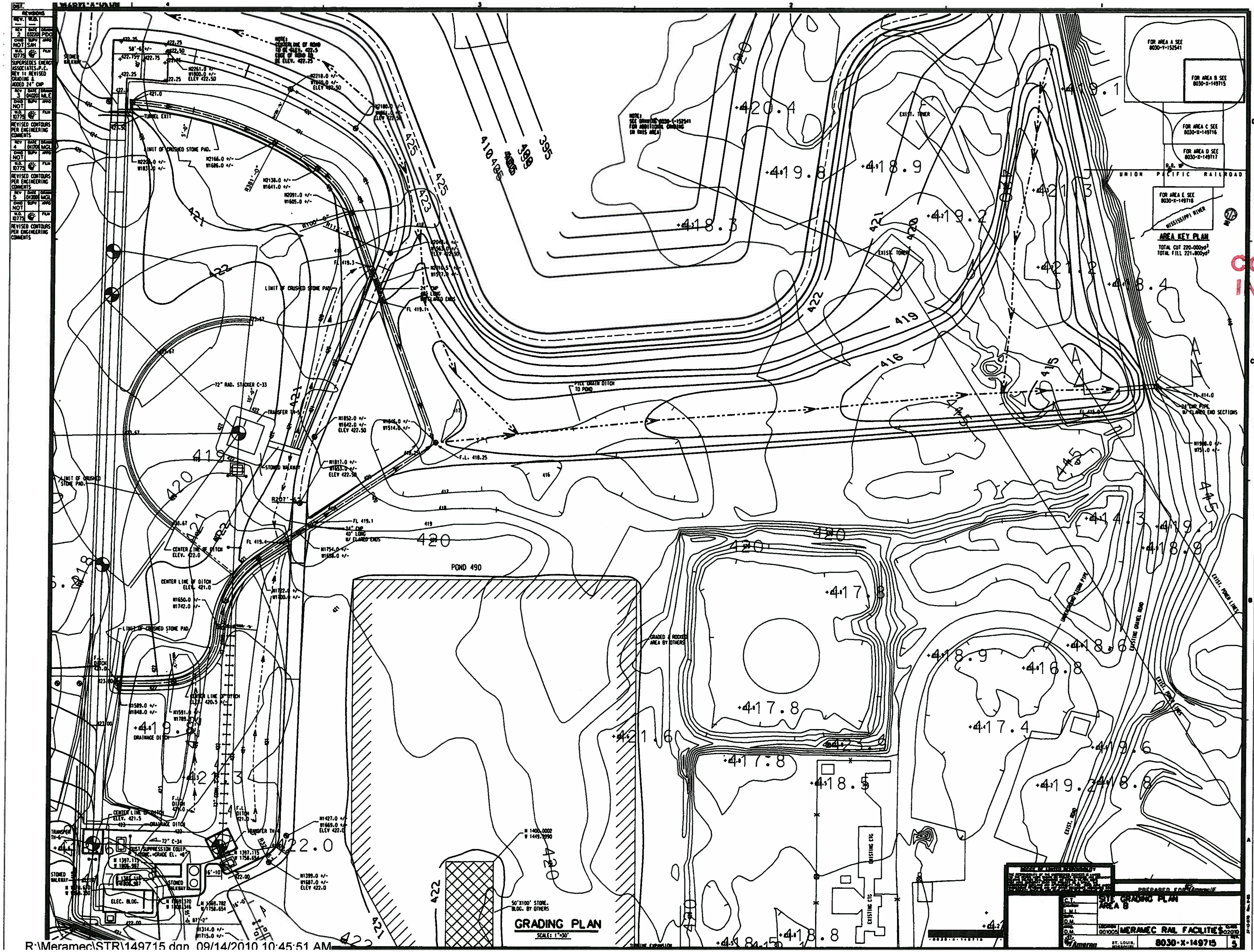

DIST.

REVISIONS

REV.	W.O.	
—	—	
REV 2	DATE 032201	DRAWN PDC
CHKD NOT	SUPV SAH	APPD
W.O. 10775		FILM

SUPERSEDES ENERGY ASSOCIATES,P.C. REV 1: REVISED GRADING & ADDED 24" CMP

REV 3	DATE 040201	DRAWN MLE
CHKD NOT	SUPV	APPD
W.O. 10775		FILM

REVISED CONTOURS PER ENGINEERING COMMENTS

REV 4	DATE 041701	DRAWN MGL
CHKD NOT	SUPV	APPD
W.O. 10775		FILM

REVISED CONTOURS PER ENGINEERING COMMENTS

REV 5	DATE 041201	DRAWN MGL
CHKD NOT	SUPV	APPD
W.O. 10775		FILM

REVISED CONTOURS PER ENGINEERING COMMENTS

PREPARED FOR AmerenUE

C.T.
L.M.L.
D.M.
D.M.

SITE GRADING PLAN
AREA B

LOCATION 001005

MERAMEC RAIL FACILITIES

CLASS 02010

Ameren ST. LOUIS, MISSOURI

8030-X-149715

REV. 5

CONFIDENTI
INFORMATIO

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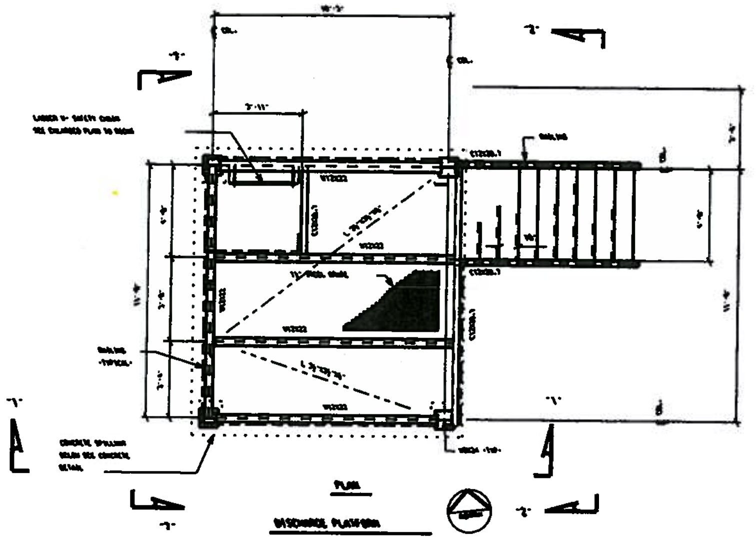
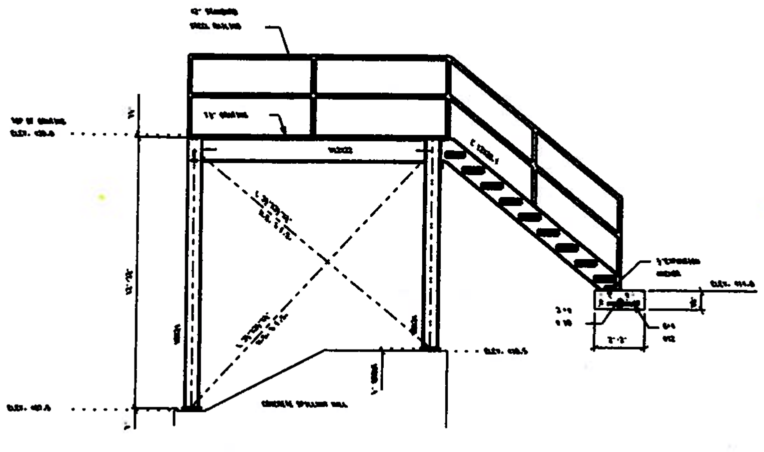
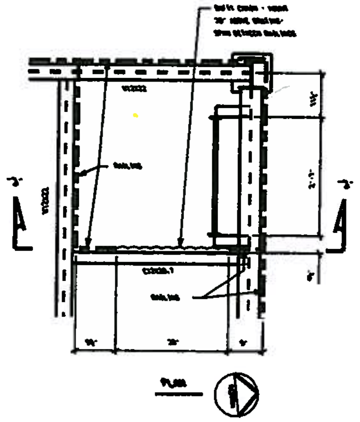


PLAN

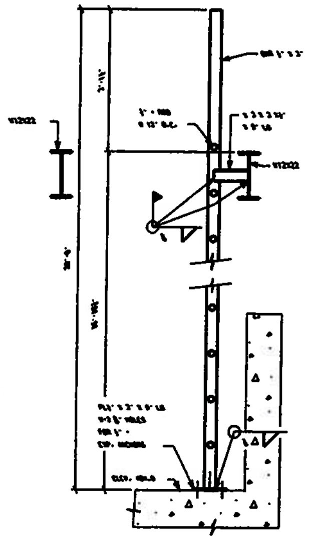
DISCHARGE PLATFORM



ELEVATION "1-1"

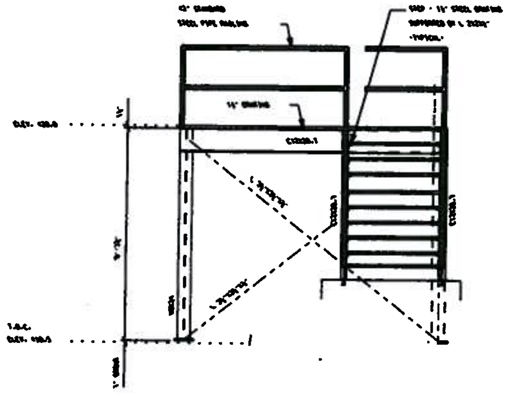


PLAN



SECTION "3-3"

PLATFORM LADDER



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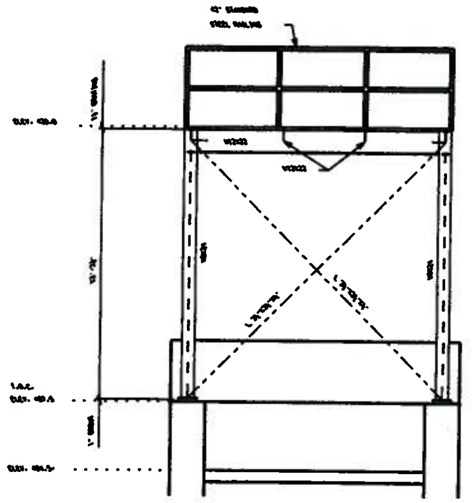

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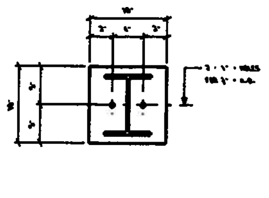


BASE PLATE DETAIL

TYPICAL

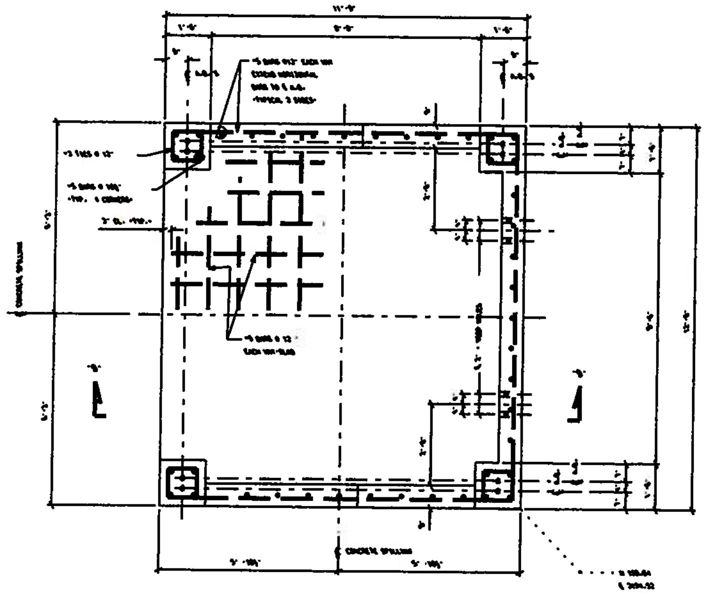
NOTES

[illegible]

•00100504060•

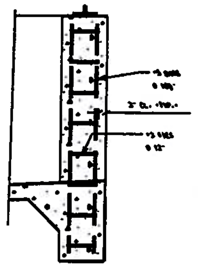
STRUCTURE - STEEL
ASH POND - DISCHARGE STRUCT.

LOCATION 001005
MERAMEC PLANT
CLASS 04060
UNION ELECTRIC COMPANY
8030-X-135406
REV. 0



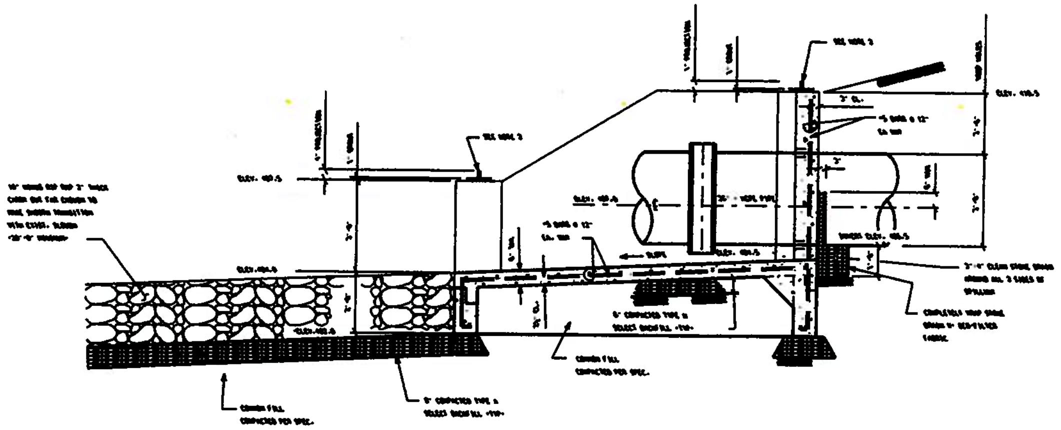
PLAN

CONCRETE SPILLWAY



DETAIL

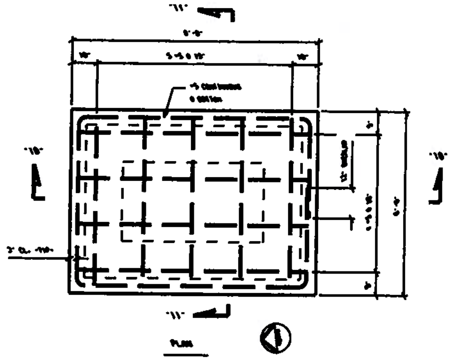
TYPICAL COLUMN SECTION



SECTION "9-9"

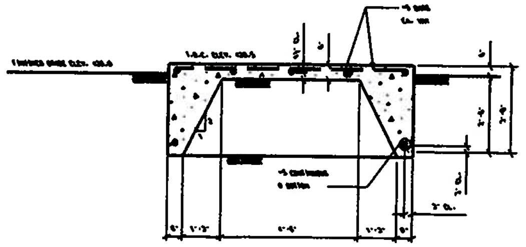
CONCRETE SPILLWAY

CONFIDENTIAL
INFORMATION

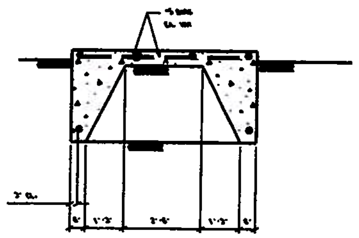


PLAN

CONTROL HOUSE FOUNDATION



SECTION "10-10"



SECTION "11-11"

REV. 0 SEALED B

00100504050

8030-X-135521

STRUCTURE - CONCRETE
ASH POND - DISCHARGE STRUCT.

C.W. REZSONYA 001005

MERAMEC PLANT

04050

UNION ELECTRIC COMPANY

8030-X-135521

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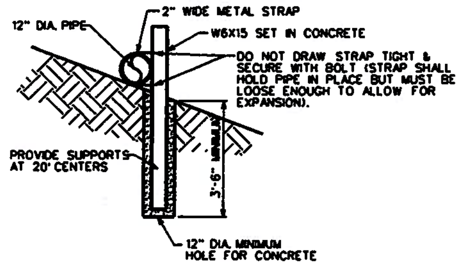
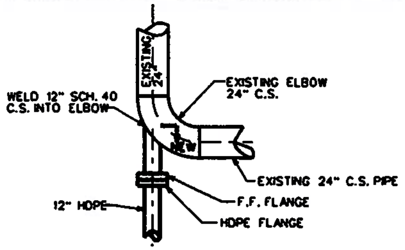
8030-X-135521

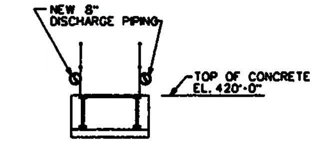
REVISIONS
REV. | REQ.
ISSUE FOR B



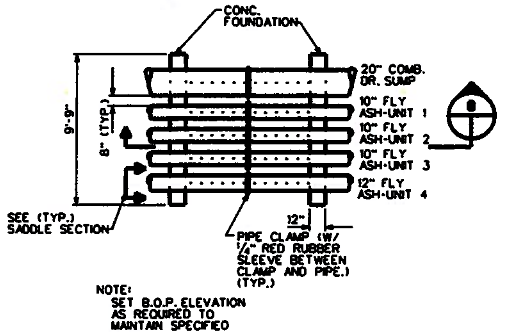
TYPICAL PIPE SUPPORT ⑤
NOT TO SCALE
8000-X-61041



CONN. TO EXIST. 24" HDPE PIPE ④
NOT TO SCALE
8000-X-61041

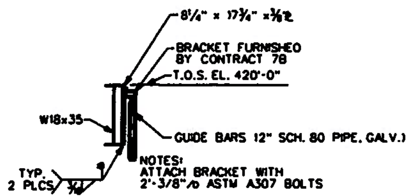


SECTION Ⓐ
SCALE IN FEET



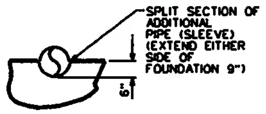
NOTE:
SET B.O.P. ELEVATION AS REQUIRED TO MAINTAIN SPECIFIED SLOPE

PIPE ANCHOR-ONE REQUIRED ⑥
PLAN NOT TO SCALE
8020-X-144580

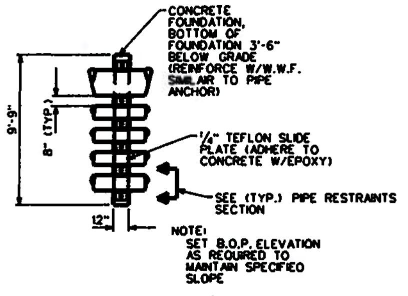


NOTES:
ATTACH BRACKET WITH 2'-3/8"⌀ ASTM A307 BOLTS

UPPER GUIDE RAIL BRACKET DETAIL ③
NOT TO SCALE

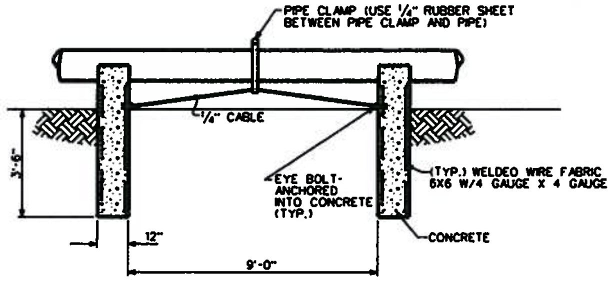


(TYP.) SADDLE SECTION FOR PIPE ANCHOR
NOT TO SCALE

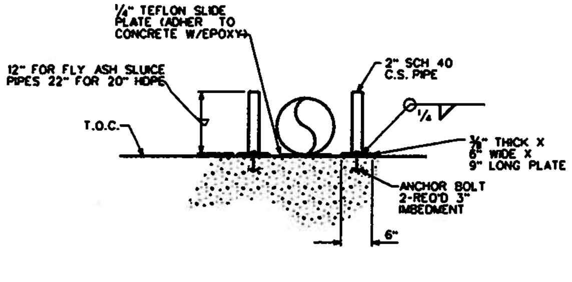


NOTE:
SET B.O.P. ELEVATION AS REQUIRED TO MAINTAIN SPECIFIED SLOPE

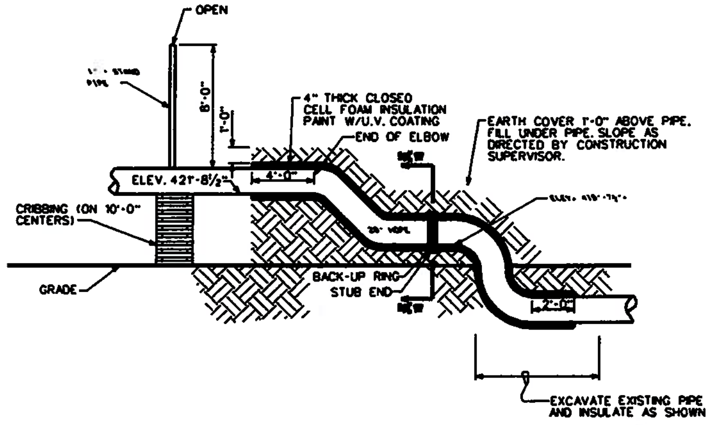
PIPE GUIDE-TWO REQUIRED ⑦
PLAN NOT TO SCALE
8020-X-144580



ELEVATION OF PIPE ANCHOR ⑧
NOT TO SCALE



(TYP.) PIPE RESTRAINTS SECTION
NOT TO SCALE
(FOR PIPE GUIDE)



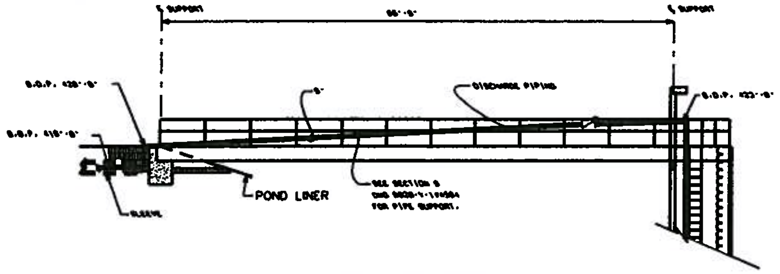
COMBINED DRAIN SUMP DISCHARGE TRANSITION ABOVE GRADE
NOT TO SCALE
8020-X-144580

DISCHARGE PUMPS FOR NEW ASH POND-MERAMEC PLANT

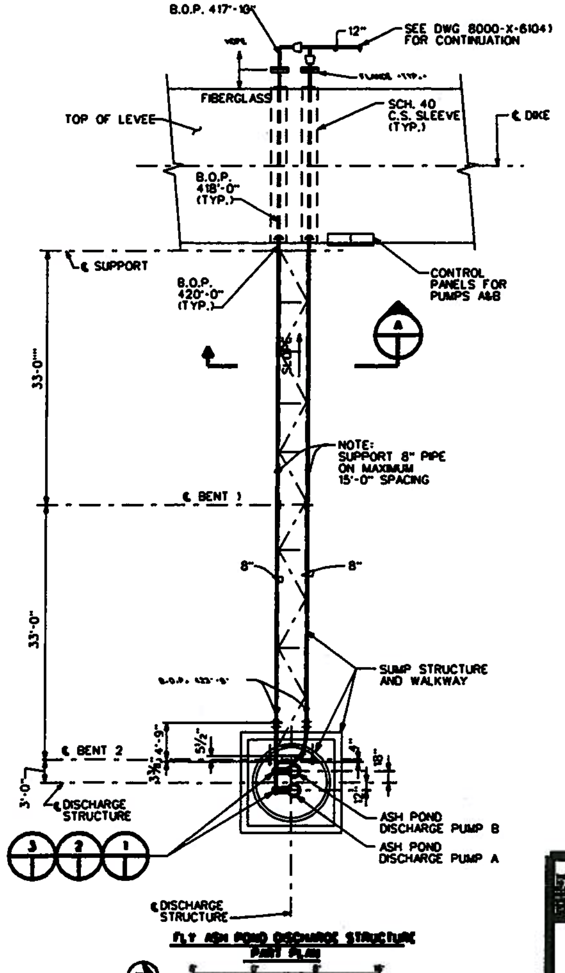
PLAN MARK	MANUFACTURER	MODEL	WEIGHT	CAPACITY	MOTOR	POWER SUPPLY TO MOTOR	REMARKS/ MANUFACTURER'S ACCESSORIES TO BE PROVIDED
PUMP A AND PUMP B	FLYGT SUBMERSIBLE PUMP WITH DISCHARGE ASSEMBLY AND GUIDE RAIL SYSTEM.	C-3170 3-. IMPELLER CODE 442. DISCHARGE SIZE 8"	1350 LBS. APPROX.	1325 GPM @ 50'	20 HP	460-3-60	1,2,3,4,5

REMARKS:

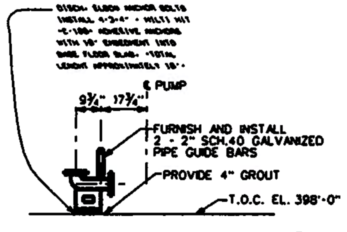
1. FURNISH 8" BALL CHECK VALVE WITH EACH PUMP (FLYGT FLANGED NO. TYPE 5087.)
2. FURNISH DISCHARGE ASSEMBLY FOR CONNECT-DISCONNECT FROM ABOVE SUMP AND GUIDE RAIL SYSTEM WITH PUMP (FLYGT 374 TO 85).
3. FURNISH DUPLEX PUMP CONTROL PANEL WITH NEMA 4X ENCLOSURE. ALL PUMP CONTROLS, STARTERS, CONTROL TRANSFORMER, ALARMS AND ACCESSORIES SHALL BE FACTORY INSTALLED IN THE PANEL. ALL SHORT-CIRCUIT AND OVERLOAD PROTECTION SHALL BE INCLUDED. CONTROLS AND MOTORS SHALL INCLUDE THERMAL AND LEAK DETECTION AN ALARM HORN AND AUXILIARY CONTACTS SHALL BE INCLUDED. CONTROLS SHALL AUTOMATICALLY RESET UPON LOSS OF POWER AND TRANSFER BETWEEN LEAD-LAG PUMPS UPON RESTART. FOUR LIQUID LEVEL SENSORS SHALL BE INSTALLED IN THE SUMP (FROM BOTTOM TO TOP): 1ST SENSOR SHALL STOP ALL PUMPS WHEN WATER IS LOWER THAN TOP OF VOLUTE. 2ND SENSOR SHALL START LEAD PUMP WHEN LEVEL IS ABOVE TOP OF VOLUTE. 3RD SENSOR SHALL START LAG PUMP WHEN LEVEL IS ABOVE TOP OF VOLUTE. 4TH SHALL INITIATE HI-LEVEL ALARM WHEN LEVEL IS ABOVE TOP OF VOLUTE. (FLYGT F-2000 BASIC 3- DUPLEX CONTROL PANEL.)
4. FURNISH FLYGT ENM-10 LIQUID LEVEL SENSORS.
5. LIFTING CHAIN AND SAFETY CABLE.



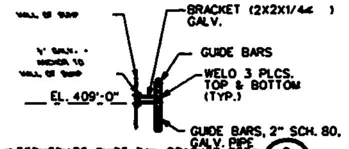
ASH POND DISCHARGE STRUCTURE
NOT TO SCALE



FLY ASH POND DISCHARGE STRUCTURE PART PLAN
SCALE IN FEET

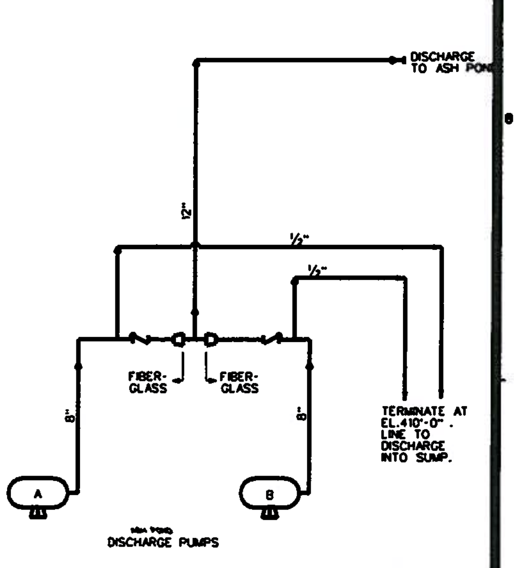


DISCHARGE ELBOW FOUNDATION DETAIL ①
NOT TO SCALE



INTERMEDIATE GUIDE RAIL BRACKET DETAIL ②
NOT TO SCALE

CONFIDENTIAL INFORMATION



ASH POND DISCHARGE FLOW DIAGRAM
NOT TO SCALE

•00100505020•
•8020-X-144585•

PREPARED FOR Ameren

R. VANCE

PIPING-PLAN & DETAILS
FLY ASH-ASH POND DRAIN PIPIN
1998 ASH HANDLING MODS.

USERID 001005 | MERAMEC PLANT | CODE 05020

Ameren ST. LOUIS, MISSOURI | 8020-X-144585 | REV. 0

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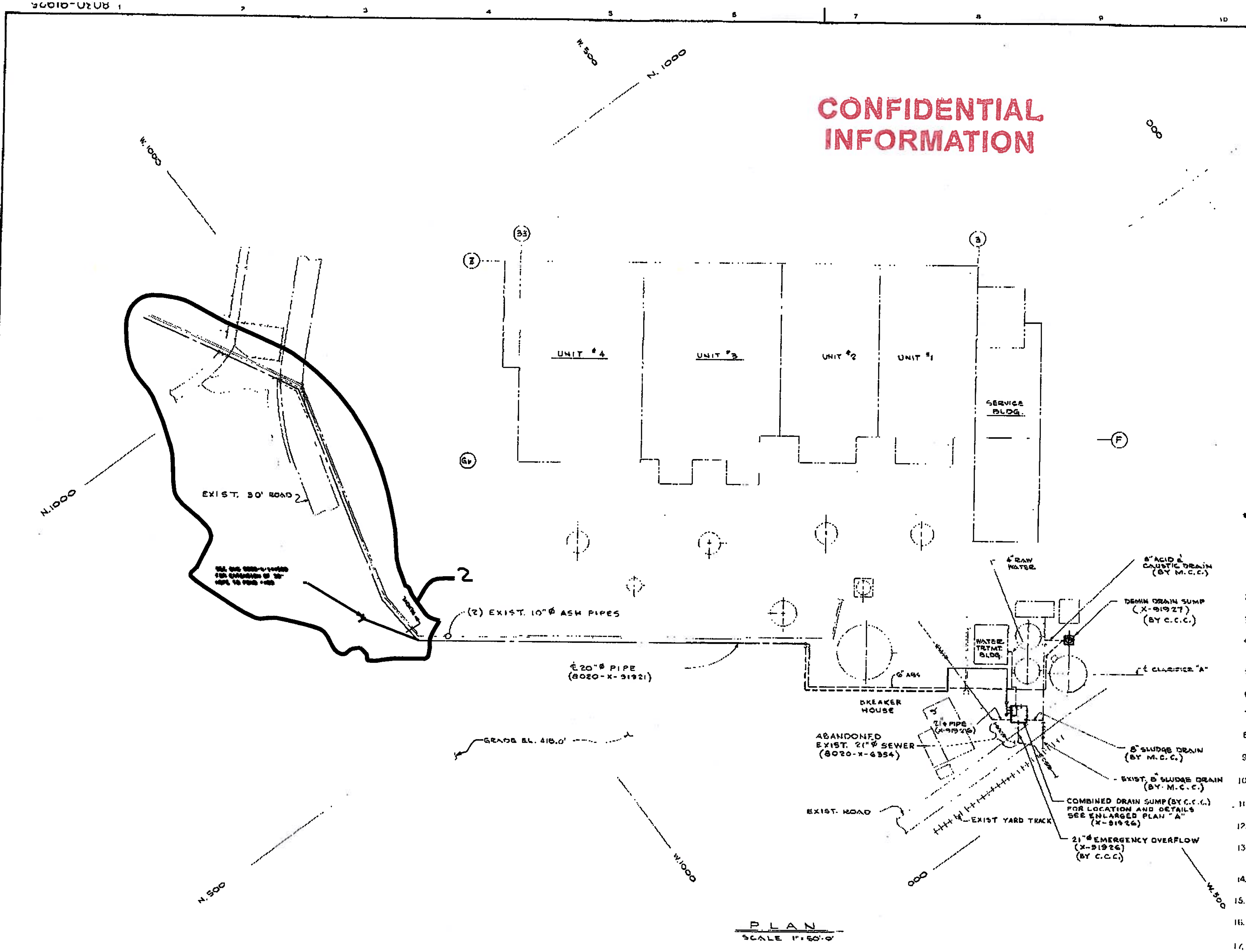
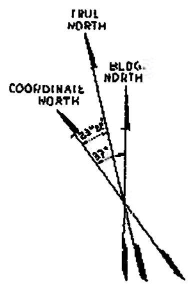
CONFIDENTIAL INFORMATION



PLAN
SCALE 1"=50'-0"



REVISIONS
Ø D-8 TO E-1 TO 6, UPDATE OF C.D.S. DISCHARGE LINE PER U.E. INFO. @ D-9 REVISED SIZE OF DRAIN FROM 6" TO 8". @ H-8,9 & 10 ADDED NOTE 19. DWG. CHECKED, SIGNED, STAMPED & RELEASED FOR CONSTRUCTION. CHK'D: E.S. APP'D: 7-14-77 FILMED: 7-24-77
SEE U.E. REV. 1

INDEX OF FLUOR PIONEER DRAWINGS

1. 8030-X-91925 PLANT DRAINAGE PLAN-STRUCTURAL COMPONENTS.
2. 8030-X 91926-COMBINED DRAIN SUMP REINF. CONC.-PLAN SECTIONS & DETAILS.
3. 8030-X-91927-DEMINERALIZER DRAIN SUMP-CONC. FDN. & STRUCTURAL STEEL DETAILS.
4. 8030-X-91928-RETENTION POND AREA-PLAN & SECTIONS
5. 8030-X-91929-RETENTION POND AREA-FDN. & MISC. SECTIONS AND DETAILS.
6. 8030-X-91974-PLANT DRAINAGE-MISC. STRUCTURAL MODIFICATION

LIST OF UNION ELECTRIC REFERENCE DRAWINGS

1. 8000-W-20288-PROPERTY-GENERAL YARD PLAN.
2. 8000-X-21496-PROPERTY PLAN-WEST YARD-UNIT #4.
3. 8000-X-27412-PROPERTY PLAN-YARD-1961 SURFACING & PAVING-SHEET #1.
4. 8020-X-6354 —PIPING INSTALLATION-DRAINS, SLUDGE & SANITARY LINES-SOUTH YARD.
5. 8020-X-23390-PIPING-ASH SLURRY DISCHARGE TO SLURRY POND-SHEET #2-UNIT #1.

GENERAL NOTES

1. FOR SPECIFICATION, SEE SPECIFICATION NO. MER-207
2. ALL REINFORCED CONCRETE WORK SHALL CONFORM TO THE "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" ACI-318-71
3. CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
4. ALL EXPOSED CONCRETE EDGES ABOVE GRADE TO 6" BELOW NEW FINISH GRADE SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED.
5. ALL FINAL EXPOSED CONCRETE SURFACES SHALL BE FINISHED IMMEDIATELY UPON REMOVAL OF FORM WORK.
6. CONCRETE CONSTRUCTION JOINTS AND RE-BAR LAP JOINTS OTHER THAN SHOWN ON DRAWINGS MUST BE APPROVED BY THE ENGINEER.
7. REINFORCING BAR STEEL SHALL BE DEFORMED BILLET STEEL AND CONFORM TO ASTM SPECIFICATION A-615 GRADE 60.
8. REINFORCING BARS SHALL BE CLEAN AND FREE OF ALL DEFECTS AND SECURELY TIED IN PLACE BEFORE POURING CONCRETE.
9. ALL WATERSTOPS SHALL BE LABYRINTH TYPE B 3 BY WATER SEALS INC. UNLESS OTHERWISE NOTED.
10. STEEL PIPES FOR HANDRAILS & RETAINING PIPES FOR SKIMMER SHALL CONFORM TO ASTM A-120 OR A-53 GRADE "B".
11. ALL STRUCTURAL STEEL & ANCHOR BOLTS SHALL BE ASTM A-36 UNLESS OTHERWISE NOTED.
12. WELDING ELECTRODES SHALL BE E60XX UNLESS OTHERWISE NOTED.
13. ALL STEEL BEAM CONNECTIONS SHALL BE STANDARD FRAMED BEAM CONNECTIONS WITH 7/8"Ø ASTM-A-307 BOLTS UNLESS OTHERWISE NOTED.
14. ALL CONCRETE PIPES SHALL CONFORM TO ASTM C-76 CLASS III WALL B UNLESS OTHERWISE NOTED.
15. MANHOLE SHALL CONFORM TO THE REQUIREMENTS OF ASTM C 478-75.
16. GRATING EXPOSED TO WEATHER SHALL BE SERRATED AND GALVANIZED.
17. MAXIMUM DESIGN SOIL PRESSURE = 2.5 KSF.
18. DESIGN GROUND WATER LEVEL AT EL.418-0".

NOTE:

19. MINIMUM SLOPES INDICATED ON DRAWINGS FOR TEMPORARY EXCAVATION ARE RECOMMENDED VALUES. STEEPER SLOPES MAY BE USED AT CONTRACTOR'S OPTION DEPENDING ON EXISTING SOIL CONDITION PROVIDED ALL APPLICABLE OSHA REQUIREMENTS ARE MET.

CAD FILE SENT TO
BURNS & MCDONNELL
[illegible]
7/20/2007

• SCANNED HYBRID DRAWING •

B RELEASED FOR PERMITS AS REQUESTED BY M. BECKER.
APP'D: RAM 6/1/77
FILMED: 6-2-77 02

A RELEASED FOR CONSTRUCTION BIDS ONLY.
APP'D: RAM 4-26-77
FILMED: 4-26-77 01

RELEASED WITH STRUCTURAL SPECIFICATIONS FOR CLIENT'S COMMENTS ONLY
APP'D: RAM 7-7-77
FILMED: 3-8-77

CAUTION
PRIOR TO ALL FUTURE EXCAVATIONS, CHECK WITH "AS-BUILT UNDERGROUND SERVICES"

ROBERT A. MARKS
NUMBER E-17575

REV	DATE	DESCRIPTION	CHKD	APPD
2	9-12-86	EXTENDED 20" HDPE PIPE		
1	7-82	AS BUILT REVISION	OJK	

UNION ELECTRIC REVISIONS

LEGEND:

C.C.C. INDICATES STRUCTURAL/CIVIL - CONSTRUCTION CONTRACTOR
M.C.C. -"- MECHANICAL CONSTRUCTION CONTRACTOR
E.C.C. -"- ELECTRICAL CONSTRUCTION CONTRACTOR
U.E -"- UNION ELECTRIC CO.

8030-X-91925-0

UNION ELECTRIC COMPANY
ST. LOUIS, MISSOURI
001 MERAMEC PLANT 020

PLANT DRAINAGE PLAN
STRUCTURAL COMPONENTS

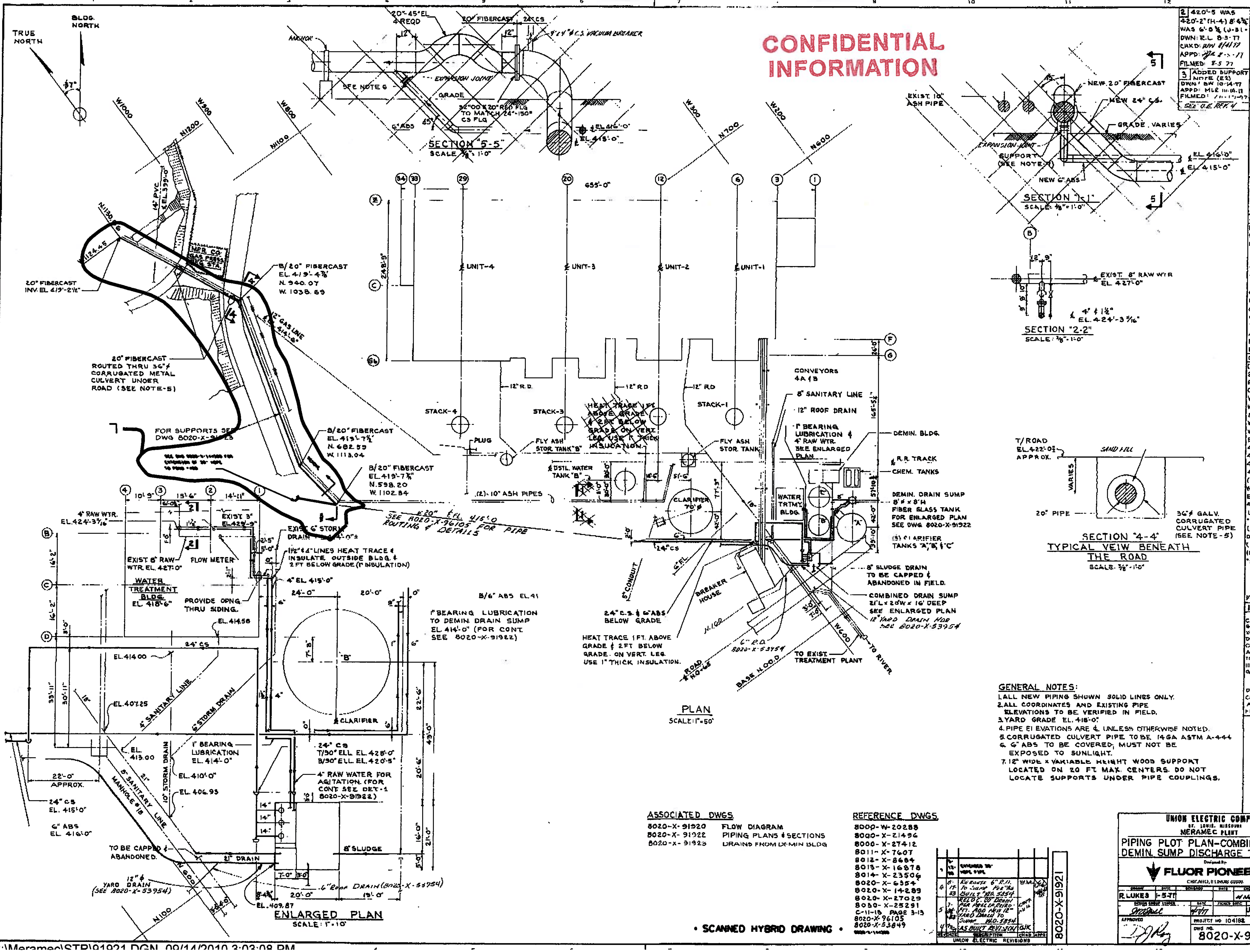
Designed By
FLUOR PIONEER INC.
CHICAGO, ILLINOIS

DRAWN	DATE	DESIGNED	DATE	CHECKED	DATE	SCALE
R.Z.	3-8-77	R.Z.	3-8-77	E.S.	4-15-77	

DESIGN GROUP LEADER	DATE	FILMED DATE	FLUOR PIONEER INC. NO.
	7-12-77		12E MP-99-P0-0001

APPROVED
PROJECT NO. 104192
SHT.
DWG. NO. 8030-X-91925
REVISION 2

CONFIDENTIAL INFORMATION



GENERAL NOTES:

1. ALL NEW PIPING SHOWN SOLID LINES ONLY.
2. ALL COORDINATES AND EXISTING PIPE ELEVATIONS TO BE VERIFIED IN FIELD.
3. YARD GRADE EL. 418'-0".
4. PIPE ELEVATIONS ARE ℄ UNLESS OTHERWISE NOTED.
5. CORRUGATED CULVERT PIPE TO BE 14 GA ASTM A-444
6. 6" ABS TO BE COVERED, MUST NOT BE EXPOSED TO SUNLIGHT.
7. 12" WIDE x VARIABLE HEIGHT WOOD SUPPORT LOCATED ON 20 FT. MAX. CENTERS. DO NOT LOCATE SUPPORTS UNDER PIPE COUPLINGS.

ASSOCIATED DWGS.

8020-X-91920	FLOW DIAGRAM
8020-X-91922	PIPING PLANS & SECTIONS
8020-X-91925	DRAINS FROM DEMIN BLDG

REFERENCE DWGS.

8000-W-20288
8000-X-21496
8000-X-27412
8011-X-7607
8012-X-8684
8013-X-16878
8014-X-23506
8020-X-6354
8020-X-14289
8020-X-27029
8030-X-25291
C-11-15 PAGE 3-13
8020-X-96105
8020-X-53849

• SCANNED HYBRID DRAWING •

REVISIONS

RELEASED FOR INFORMATION & REVIEW ONLY. FILMED: 11-9-76

A REDRAWN & RELEASED FOR INFORMATION & REVEIW ONLY. FILMED: 2-18-77

B REVISED PIPE ROUTING OF 24" & 6" ABS TO ASH POND & 6" ABS TO AVOID EXIST. PIPE NEAR CLARIFER "A" (E-9). ADDED SECT "3-3" (A-5) & SECT "4-4" (F-11). UPDATED SECT "1-1" (B-11) & SECT "2-2" (D-11) REVISED LINE TO DEMIN. DRAIN SUMP (E-9) ISSUED FOR BIDS. FILMED: 4-26-77

C ADDED 1" BEARING LUBRICATION LINE FROM WTR. TRTMT. BLDG. TO COMB. DRAIN SUMP (E-4) & DEMIN. DRAIN SUMP (E-4). UPDATED SECT. "2-2" (D-4). RERDUTED 24" & 6" ABS (E-3-4-5 & 6) UPDATED SECT. "1-1" (B-11) & SECT. "4-4" (F-11). DELETED SECT. "3-3" (B-5). ADDED NOTE-6 (H-11). REISSUED FOR BIDS. FILMED: 5-23-77

0 ADDED NOTE-7 (H-11). 20" PIPE WAS 24" (C-1, C-3, E 4 & 5, F-5 COORD. N. 1130.66 WAS W. 1130.66, W 1124.45 WAS N. 1124.45 (C-1) W. 1113.04 WAS W. 1102.84 (E-4). EL. 419'-2½" WAS 414'-0" (C-1), EL. 419'-4⅞" WAS 417'-0" (C 3), EL. 419'-7½" WAS 418'-0" (E-4), EL 419'-7⅞" WAS 418'-6" (E-4), EL. 420'-2½" WAS 419'-0" (F-5). UPDATED SECTS "1-1" (B-11) & "4-4" (F-11). SUMP DISCH. WAS 16" (J-8) ADDED NOTE (D 6 & F 7) & SECT. "5-5" (A-5)
ISSUED FOR CONSTRUCTION (PERMIT)
FILMED: 6-30-77

1 20" FIBERCAST WAS FIBERGLASS (C1, D1, C3, E4, F5). REROUTED 6" ABS TO CONNECT TO 20" FIBERCAST (B5, B11) DELETED 6" ABS FROM CULVERT PIPE (E12). ADDED HEAT TRACE TO 4" LINE & EXTENDED HEAT TRACE BELOW GROUND FOR 1½" (F8)
ISSUED FOR CONSTRUCTION
DWN: BW 7-13-77
CHKD: WW 7/15/77
APPD: 7-14-77
FILMED: 7-29-77

2 420'-5 WAS 420'-2" (H-4) 8'-4¾" WAS 6'-0¾ (J-8)
DWN: R.L. 8-3-77
CHKD: WW 8/4/77
APPD: 8-5-77
FILMED: 8-5 77

3 ADDED SUPPORT NOTE (E2)
DWN: BW 10-14-77
APPD: MLE 10-14-77
FILMED: 10-17-77

SEE U.E. REV. 4

REV	DATE	DESCRIPTION	CHKD	APPD
7	12-	[illegible]		
6	8-17-83	REROUTE 6" R.D. TO SUMP PER "AS BUILT" W.O. 5854	W.M.	
5	7-83	RELOC. 20" DRAIN PER PRELIM. REIRO. FIT. ADD NEW 12" YARD DRAIN TO SUMP W.O. 5854		
4		AS BUILT REVISION	GJK	

UNION ELECTRIC REVISIONS

8020-X-91921

DONALD J. ROY
NUMBER E-37013

UNION ELECTRIC COMPANY
ST. LOUIS, MISSOURI
MERAMEC PLANT

PIPING PLOT PLAN-COMBINED SUMP & DEMIN. SUMP DISCHARGE TO ASH POND

Designed By
FLUOR PIONEER INC.
CHICAGO, ILLINOIS

DRAWN	DATE	DESIGNED	DATE	CHECKED	DATE	SCALE
R. LUKES	1-5-77			H Nixon	4/8/77	AS NOTED

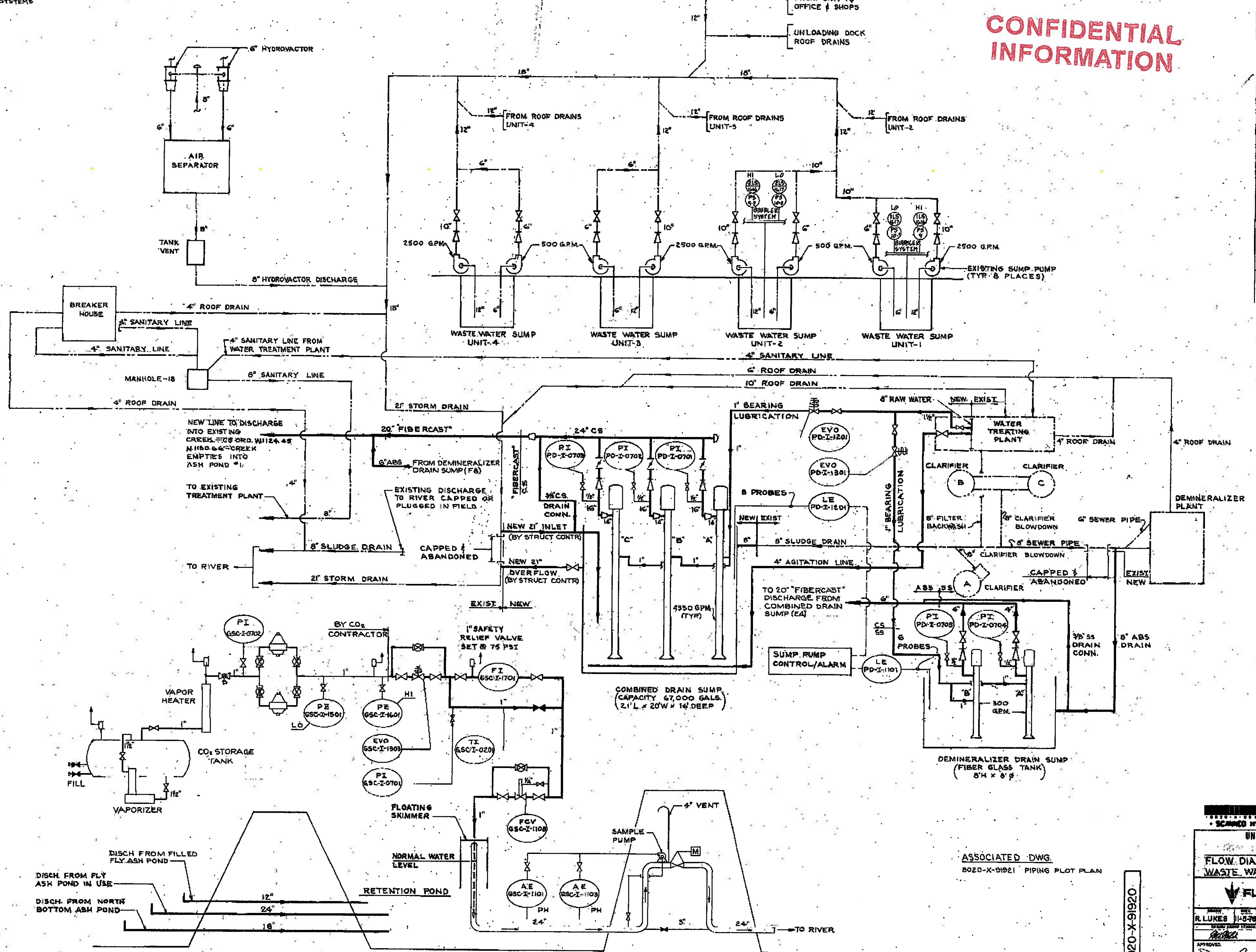
DESIGN GROUP LEADER: 4/8/77
FLUOR PIONEER INC. NO.: UE-MP-99-PD-1000
APPROVED:
PROJECT NO 104182
DWG NO. 8020-X-91921
REVISION 7

P:\Meramec\STP\91921.DGN 09/14/2010 3:03:08 PM

REV.	DATE	DRAWN
4	10-25-93	PJM
CHKD	SUPV.	APPD.
PO	Jlw	
W.O.		FILM

ADDED BUBBLER SYSTEMS

CONFIDENTIAL INFORMATION



ASSOCIATED DWG.

8020-X-91921 PIPING PLOT PLAN

8020-X-91920

1 20" "FIBERCAST" WAS FIBERGLASS (E4 & E5). REROUTED DEMIN DRAIN SUMP DISCH (F8 & E4). IDENT COMB DRAIN SUMP INLET & OVERFLOW AS BY STRUCT CONTR (F5) 3/8" DRAIN TO COMB DR SUMP & DEMIN DR SUMP WAS 1/2" (E5 & G10). ADDED 17" FILLED FLYASH POND LINE (J1). SHOWED MATL BREAK IN 1" BEARING LUBE LINE TO DEMIN DR SUMP (G9)
ISSUED FOR CONSTRUCTION
DWN: BW 7-13-77
CHKD: WW 7/13/77
APPD: 7-14-77
FILMED: 7-14-77

2 1" TO FLOATING SKIMMER WAS 1/2" (G5 & H5). 1" SAFETY VA WAS 1/2" (G5) REVISED CO2 SYSTEM SUPPLIED BY CO2 CONTR (G1-G4)
DWN: BW 7-28-77
CHKD: WW 7/29/77
APPD: 8-5-77
FILMED: 8-5-77

3 ADDED NO. GSC-I-0702 TO PI (G2). REV VALVE FCV-GSC-I-1108 (H5). 4350 GPM WAS 5000 (F7) ADDED REP TO COMB DR SUMP PUMP (E6)
DWN: BW 9-6-77
CHKD: WW 9/6/77
APPD: WW 9/6/77
FILMED: 9-16-77

SEE UPPER LEFT

REVISIONS

RELEASED FOR INFORMATION & REVIEW ONLY
FILMED: 11-9-76

A RELEASED FOR INFORMATION & REVIEW ONLY
FILMED: 1-18-77

B ADDED COMB. DRAIN SUMP 21"φ OVERFLOW DISCH. (F6). REVISED PIPE SIZES ON DISCH. FROM COMB. DRAIN SUMP FROM 14"φ TO 16"φ (E-7), MAIN DISCH. HEADER FROM 20"φ TO 24"φ (E-5), AND DISCH. FROM RETENTION POND FROM 18"φ TO 24"φ (J-3).
ISSUED FOR BIDS.
FILMED: 4-12-77

C DELETED 6" DRAIN FROM DEMIN. BLDG & ADDED 8" DRAIN FROM EXIST. 8" (G-11)
ISSUED FOR BIDS.
FILMED: 4-26-77

D ADDED 1" BEARING LUBRICATION LINE TO COMB. DRAIN SUMP (F-7) & DEMIN. DRAIN SUMP (G-9) CHANGED COORD N.1124.45 WAS N. 1176 & W.1130.66 WAS W.1059.01 (E-2 & F-8). CHANGED LINE SIZE 24" WAS 20" (J-3).
REISSUED FOR BIDS.
FILMED: 5-23-77

0 RELOCATED RELIEF VALVE TO BE ADJACENT TO ROTOMETER & PI & TI TO BE UPSTREAM OF ROTOMETER (G-4) RELOCATED SUCT FOR SAMPLE PUMP IN MANHOLE (J-6). ADDED EVO NUMBERS (E-8). 20" DISCH. WAS 24" (E-4). ADDED NOTE (E-7) COORD W.1124.45 WAS N. 1124.45 & N. 1130.66 WAS W1130.66 (E-3 & F-8) COMB. DRAIN SUMP PUMPS WERE 6000 GPM & 16" DISCH. (E-7 & F7). DEMIN. DRAIN SUMP PUMPS HAD 3" DISCH. (F9 & 10). ADDED FIBERGLASS NOTE (E-5) ADDED 1/2" DRAIN LINE CONN. (E-8 & G-12).
ISSUED FOR CONSTRUCTION (PERMIT)
FILMED: 6-30-77

DONALD J. RAY
NUMBER E-17613

8020-X-091920
SCANCO HYDRO DRAWING

UNION ELECTRIC COMPANY
ST. LOUIS, MISSOURI
MERAMEC PLANT

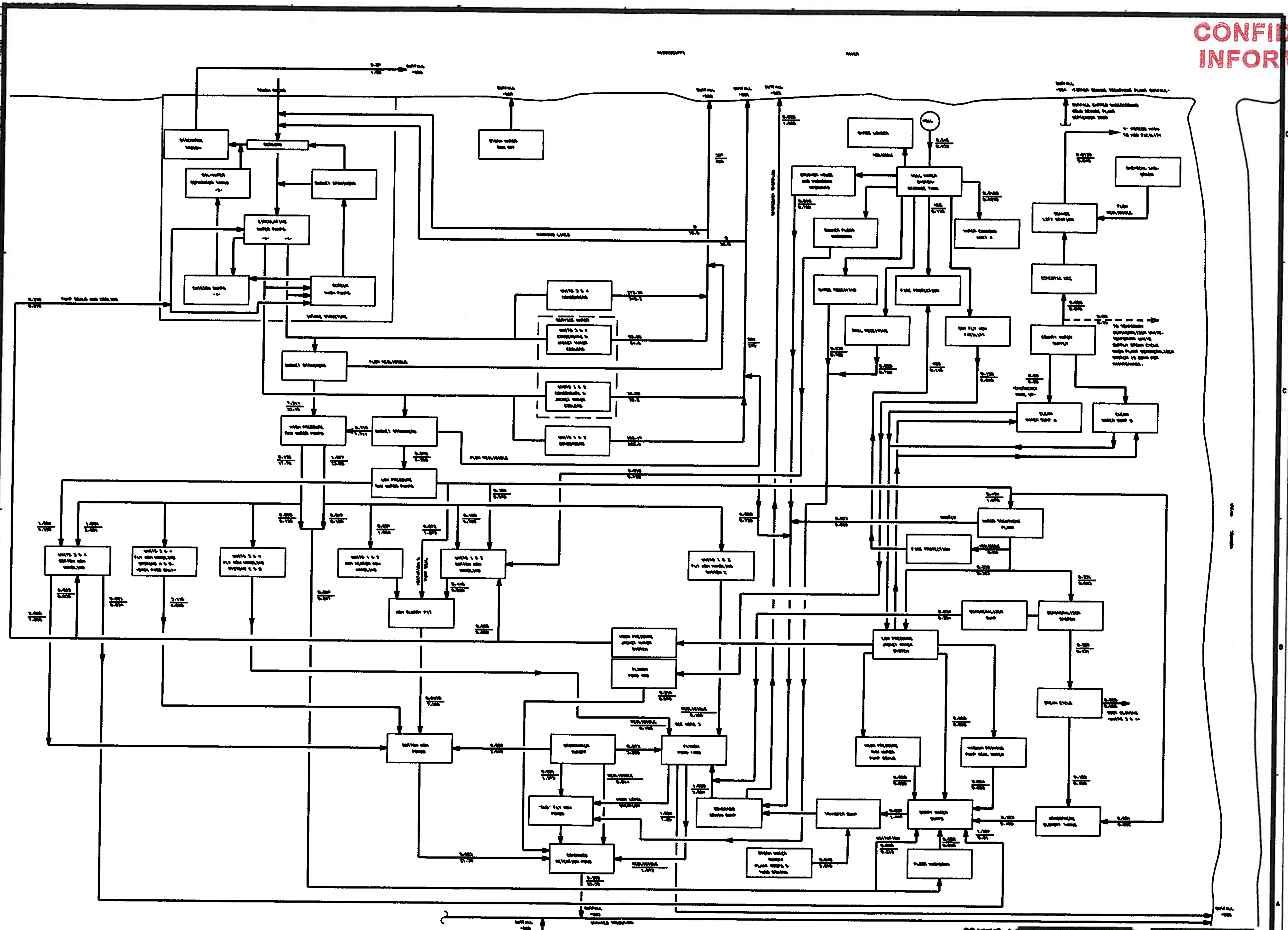
FLOW DIAGRAM
WASTE WATER TREATMENT

Designed by
FLUOR PIONEER INC.
CHICAGO, ILLINOIS 60603

DRAWN	DATE	CHECKED	DATE	CHECKED	DATE	SCALE
R. LUKES	11-5-76	L. FLOOD	11-8-76	L. FLOOD	11-8-76	NONE

DATE 5/23/77
UE-MP-99-PD-0100

APPROVED
PROJECT NO. 10492
SHT. 1
DWG. NO. 8020-X-91920
REVISION 4



DRAWING 1

8000-X-053973

PREPARED FOR Ameren UE

P. OTT
NOT CHKD
S.K. OTT
M.F. BOLLINGER 001005

NPDES FLOW DIAGRAM
WATER BALANCE
FOLLOWING PROPOSED MODIFICATIO

MERAMEC PLANT 05050

Ameren ST. LOUIS, MISSOURI

8000-X-53973 11

SUPERSEDES 8000-X-53973 REV 5 DATE 10-29-92

APPENDIX A

DOC 1.4 AMERENUE RESPONSE TO EPA'S RFI

AmerenUE Response

Meramec Power Station
8200 Fine Road
St. Louis, Missouri 63129

1. Coal-combustion by-product surface impoundments at this Station are not classified as dams by State or Federal regulatory agencies so they have not been rated.

2. See table below.

Management Unit	Year Commissioned or Expanded
Old Fly Ash Pond	2000
Retention Pond	1977
Bottom Ash Ponds (3)	1950s
New Fly Ash Pond	2003

None of these units have been expanded.

3. See table below.

Management Unit	Materials Contained in Unit*
Old Fly Ash Pond	1, 5
Retention Pond	1, 2
Bottom Ash Ponds	2
New Fly Ash Pond	1

– other ?

*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.

Other types of materials that are temporarily or permanently contained in the unit(s) include, but are not limited to residual wastes remaining following treatment of wastewater from these systems: primary water treatment; boiler water make-up treatment; laboratory and sampling streams; boiler blowdown; floor drains; coal pile run off; house service water systems; and pyrites.

4. The management units at this facility were designed by a Professional Engineer. The construction of the management units were done under the supervision of a Professional Engineer. And, inspection and monitoring of the safety of the waste management units is under the supervision of a Professional Engineer.

5. The most recent annual internal professional engineering inspection of the management units occurred in 2009. Since these management units are not classified by regulation as dams the evaluation only included a visual inspection of the units. AmerenUE has formed a Dam Safety Group consisting of civil and geotechnical engineers who oversee the implementation of the company Dam Safety Program and this Group is supervised by a licensed Professional Engineer. The Dam Safety Program requires routine, annual and special inspection of the ash ponds and employees performing these inspections receive dam safety training. If maintenance issues are identified in these visual inspections, then corrective actions are taken by either plant employees or contractors to remedy the issue and final acceptance of the work is reviewed and evaluated by Dam Safety Group personnel.

6. No State, or Federal regulatory official has inspected or evaluated the safety (structural integrity) of the management unit(s), and we are not aware of a planned state or federal inspection or evaluation in the future.

7. Not applicable, see response to Question 6.

8. See table below.

Management Unit	Surface Area (Acres)	Total Storage Capacity (Acre-ft)	Volume of Stored Ash (Acre-ft)	Maximum Height of Unit (ft.)
Old Fly Ash Pond #494, 495	17.6	300	260	25
Retention Pond ✓	0.7	10	minimal	25
Bottom Ash Ponds 492, 496-493	14	280	171	25
New Fly Ash Pond 498	13.5	230	190	25

9. Assuming that brief history means incident(s) which could have occurred in the last ten (10) years, we are not aware of any spills or unpermitted releases of coal-combustion by-products from our surface impoundments to surface water or to the land.

10. The current legal owner and operator at the facility is AmerenUE

Ameren Services

Environmental Services
314.554.2388 (Phone)
314.554.4182 (Facsimile)
ppike@ameren.com

One Ameren Plaza
1901 Chouteau Avenue
PO Box 66149
St. Louis, MO 63166-6149

May 4, 2009

Mr. Richard Kinch
US Environmental Protection Agency (53306P)
!200 Pennsylvania Avenue, NW
Washington, DC 20460

RE: Request for Information under Section 104 (e) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9604(e)

Dear Mr. Kinch:

This letter is in response to the letter sent to Mr. Thomas Voss who is the Chief Executive Officer of AmerenUE regarding the United States Environmental Protection Agency's request for information relating to the surface impoundments or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material from a surface impoundment used for 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.

AmerenUE operates four coal-fired power stations in Missouri and responses for those facilities were sent to you within the required ten (10) business days of receipt of their letters. AmerenUE has no additional facilities which have surface impoundments or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material from a surface impoundment used for 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.

Although our surface impoundments are not considered to be dams by State or Federal regulations, we are subject to State and Federal NPDES regulations and have had Agency personnel inspect these units. We are providing a full and complete response to each separate request for information set forth in your Enclosure A (attached) with responses corresponding to numbering in your questions. If you have any further questions please feel free to contact Paul Pike at (314) 554-2388.

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.

Sincerely,

Michael L. Menne
Vice President – Environmental Services

Ameren Services

Environmental Services
314.554.2388 (Phone)
314.554.4182 (Facsimile)
ppike@ameren.com

One Ameren Plaza
1901 Chouteau Avenue
PO Box 66149
St. Louis, MO 63166-6149

March 26, 2009

Mr. Richard Kinch
US Environmental Protection Agency (53306P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

RE: Request for Information under Section 104 (e) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9604(e)

Dear Mr. Kinch:

This letter and attachments are AmerenUE's response to the United States Environmental Protection Agency's request for information relating to the surface impoundments or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material from a surface impoundment used for 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.

AmerenUE operates four coal-fired power stations in Missouri. Although our surface impoundments are not considered to be dams by State or Federal regulations, we are subject to State and Federal NPDES regulations and have had Agency personnel inspect these units. We are providing a full and complete response to each separate request for information set forth in your Enclosure A (attached) with responses corresponding to numbering in your questions. If you have any further questions please feel free to contact Paul Pike at (314) 554-2388.

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.

Sincerely,

Michael L. Menne
Vice President – Environmental Services

Enclosure A

Please provide the information requested below for each surface impoundment or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material for the storage of 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. This includes units that no longer receive coal combustion residues or by-products, but still contain free liquids.

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, 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.

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

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).

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?

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?

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.

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.

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.

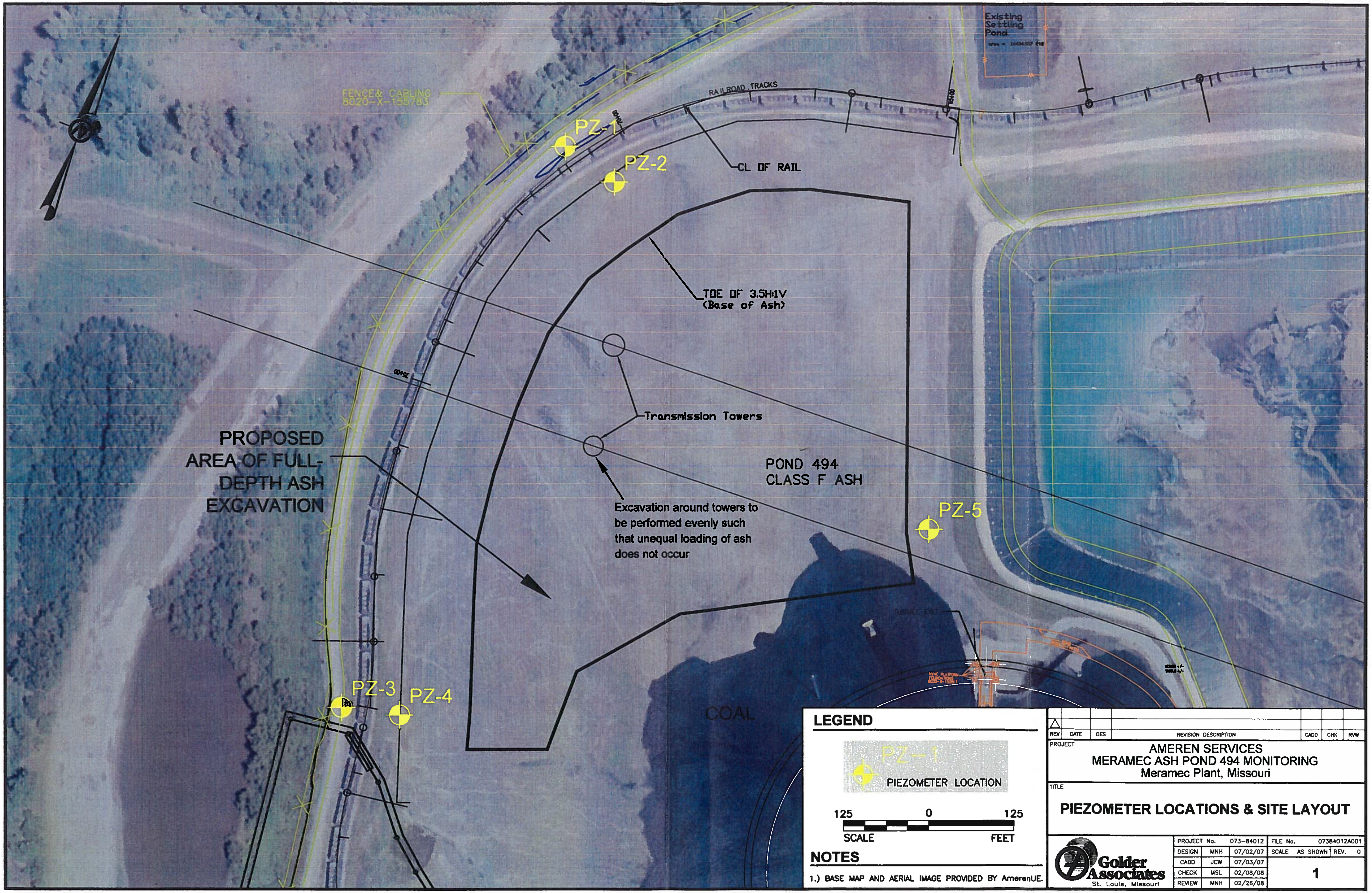
9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases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

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

APPENDIX A

DOC 1.5 ASH POND #494 DRILLING AND PIEZOMETER INSTALLATION FIGURES AND LOGS

FIGURES



Excavation around towers to be performed evenly such that unequal loading of ash does not occur

NOTES

1.) BASE MAP AND AERIAL IMAGE PROVIDED BY AmerenUE.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
△						

PROJECT

AMEREN SERVICES
MERAMEC ASH POND 494 MONITORING
Meramec Plant, Missouri

TITLE

PIEZOMETER LOCATIONS & SITE LAYOUT

Golder Associates
St. Louis, Missouri

PROJECT No.		073-84012	FILE No.	07384012A001
DESIGN	MNH	07/02/07	SCALE AS SHOWN	REV. 0
CADD	JCW	07/03/07		
CHECK	MSL	02/08/08	1	
REVIEW	MNH	02/26/08		

TABLES

TABLE 1
PIEZOMETER CONSTRUCTION DETAILS - MERAMEC POWER PLANT

Piezometer ID	Ground Surface Elevation (ft MSL)	Borehole Depth (ft BGS)	Top of Piezometer Casing Elevation (ft MSL)	Piezometer Screen Length (feet)	Piezometer Screen Depth (ft BGS)		Piezometer Screen Elevation (ft MSL)		Static Water Level 10/25/07
					Top	Bottom	Top	Bottom	ft MSL
PZ-1	413.25	41.5	416.30	9.6	31.6	41.2	381.7	372.1	392.80
PZ-2	416.20	25.0	419.05	9.6	15.1	24.7	401.1	391.5	400.26
PZ-3	414.30	45.0	417.36	9.9	34.7	44.6	379.6	369.7	385.85
PZ-4	414.57	25.0	417.27	9.6	15.1	24.7	399.5	389.9	400.80
PZ-5	420.32	25.0	423.39	9.5	15.1	24.7	405.2	395.6	405.55

Notes:

ft BGS - feet Below Ground Surface
ft MSL - Mean Sea Level
Wells surveyed by Sterling Co. Engineers & Surveyors.

Checked by: JCW
Reviewed by: MNH

TABLE 2
SUMMARY OF GEOTECHNICAL LABORATORY RESULTS - MERAMEC POWER PLANT

Sample Identification	Sample Type	Sample Depth (ft)	Soil Classification	Natural Moisture %	Atterberg Limits				Unit Weight		Additional Tests Conducted (See Abbreviations)
					L.L.	P.L.	P.I.	L.I.	Moisture %	Dry (lb/cuft)	
PZ-1 S-002	SS	9 -10.5	CL	25.7	40	21	19	0.23	NA	NA	
PZ-1 S-003	ST	14.5 - 16.5	CH	32.5	61	23	38	0.24	37.1	83.8	T
PZ-1 S-007	SS	29.5 - 31	CH	31.8	67	24	43	0.18	NA	NA	
PZ-3 S-002	SS	9 - 10.5	CH	39.8	67	24	43	0.36	NA	NA	
PZ-3 S-003	ST	14 - 16	CH	37.8	77	27	50	0.22	37.9	81.2	T
PZ-3 S-007	SS	29 - 30.5	CH	38.5	59	22	37	0.45	NA	NA	

ABBREVIATIONS:
- LIQUID LIMIT (L.L.)
- PLASTIC LIMIT (P.L.)
- PLASTICITY INDEX (P.I.)
- LIQUIDITY INDEX (L.I.)
- TRIAXIAL COMPRESSIVE STRENGTH (T)
- NOT APPLICABLE (NA)

Checked By: MNH

APPENDICIES

APPENDIX A
PIEZOMETER BOREHOLE LOGS

RECORD OF BOREHOLE PZ-1

SHEET 1 of 3

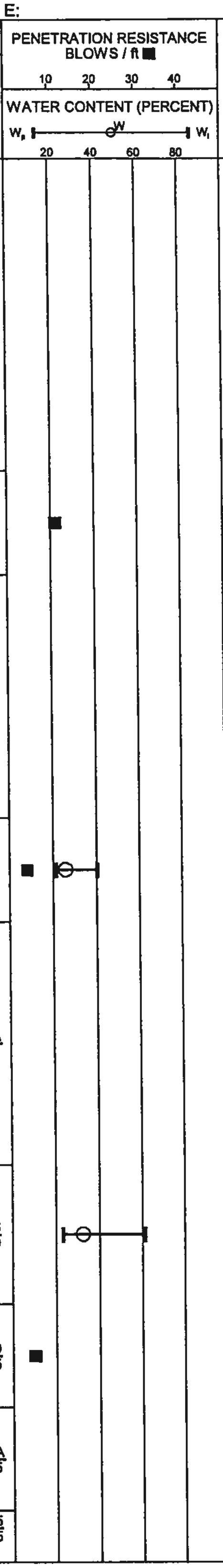
PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/14/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 413.25
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	REMARKS
0	4.25 Inch ID HSA	(0-9.5) Firm, medium gray (N5) to black (N1) with mottled appearance, CLAYEY SILT, trace fine sand, moist (ML)	ML			HSA	N/A	N/A	N/A / 4.5	
5					1	SS	2 6 5	11	1.3 / 1.5	
						HSA	N/A	N/A	N/A / 3.5	
10		(9.5-39.5) Soft, medium gray (N5), SILTY CLAY, trace F-C sand, moist (CL)	CL	403.8 / 9.5	2	SS	1 2 2	4	0.8 / 1.5	
						HSA	N/A	N/A	N/A / 3.5	
15		below 14.5, predominantly CLAY (CH)	CH	398.8 / 14.5	3	SH	N/A	N/A	1.6 / 2.0	
					4	SS	2 2 3	5	0.9 / 1.5	
						HSA	N/A	N/A	N/A / 1.5	
20		19.5-21.0, trace organics		393.8 / 19.5	5	SS		13	0.5 / 1.5	



Log continued on next page

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-1

SHEET 2 of 3

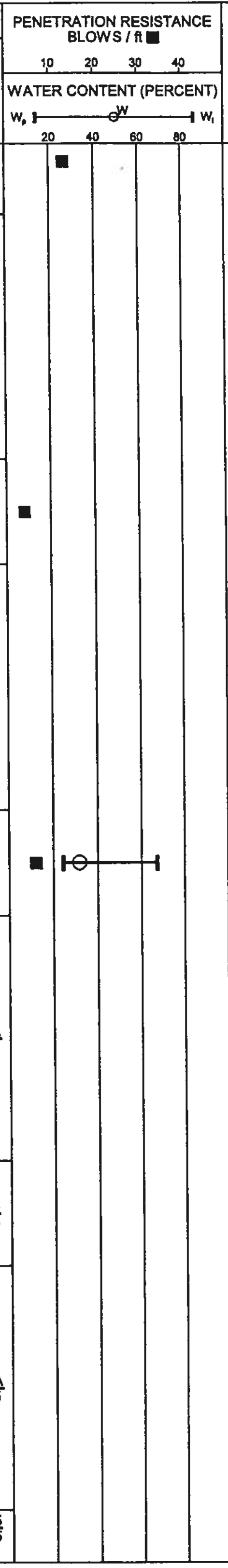
PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/14/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 413.25
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	REMARKS
20	4.25 Inch ID HSA	below 14.5, predominantly CLAY (CH) *(Continued)*	CH	▨		5	SS	3 5 8	13	0.5 / 1.5	
							HSA	N/A	N/A	N/A / 3.5	
25						6	SS	0 2 2	4	1.2 / 1.5	
							HSA	N/A	N/A	N/A / 3.5	
30		below 29.5, moderate reddish brown (10R 4/6) mottling, wet			383.8 29.5	7	SS	2 2 4	6	1.5 / 1.5	
							HSA	N/A	N/A	N/A / 3.5	
35		below 34.5, very soft, trace fine sand			378.8 34.5	8	SS	N/A WH 2	2	1.5 / 1.5	
							HSA	N/A	N/A	N/A / 3.5	
40			ML		373.8 39.5 373.5	9	SS		2	1.5 / 1.5	



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SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-1

SHEET 3 of 3

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/14/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 413.25
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■ (10 20 30 40) WATER CONTENT (PERCENT) W_p ⊢—O^W—⊣ W_l (20 40 60 80)	REMARKS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT		
40		39.8-40.0 & 40.4-40.6, F-C sand & F gravel seams (39.5-41.0) Very soft, medium gray (N5), CLAYEY SILT, little F-C sand & F gravel, wet (ML) *(Continued)*	ML		39.8 372.3 41.0	9	SS	1 1 1	2	1.5 / 1.5	■	
		END BOREHOLE AT 41.0 FEET BGS.										
45												
50												
55												
60												

GOLDER STL RECORD OF BOREHOLE MERAMEC FLY ASH BORING LOGS.GPJ GLDR_CO.GDT 2/26/08

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-2

SHEET 1 of 2

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/15/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 416.20
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft ■ (10 20 30 40) / WATER CONTENT (PERCENT) Wp ——○W—— Wl (20 40 60 80)	REMARKS
0	4.25 INCH HSA	(0.0-26.5) Soft, medium gray (N5), FLY ASH, moist (FILL)										
							HSA	N/A	N/A	N/A 4.5		
5						1	SS	2 3 11	14	1.0 1.5	■	
							HSA	N/A	N/A	N/A 3.5		
10		Below 10.0, becomes very soft, wet	N/A		406.2 10.0	2	SS	1 2 1	3	1.5 1.5	■	
							HSA	N/A	N/A	N/A 3.5		
15						3	SS	N/A WH WH	WH	0.2 1.5		
							HSA	N/A	N/A	N/A 3.5		
20						4	SS		WH	1.5 1.5		

Log continued on next page

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-2

SHEET 2 of 2

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/15/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 416.20
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft ■ 10 20 30 40 / WATER CONTENT (PERCENT) Wp ⊢—○W—⊣ Wl 20 40 60 80	REMARKS
20	4.25 INCH HSA	(0.0-26.5) Soft, medium gray (N5), FLY ASH, moist (FILL) *(Continued)*	N/A	▨		4	SS	N/A WH WH	WH	1.5 1.5		
							HSA	N/A	N/A	N/A 4.0		Rods heaving. Added ~20gals of water.
25						5	SS	N/A WH WH	WH	1.5 1.5		
		END BOREHOLE @ 26.5 FEET BGS.			389.7 26.5							
30												
35												
40												

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-3

SHEET 1 of 3

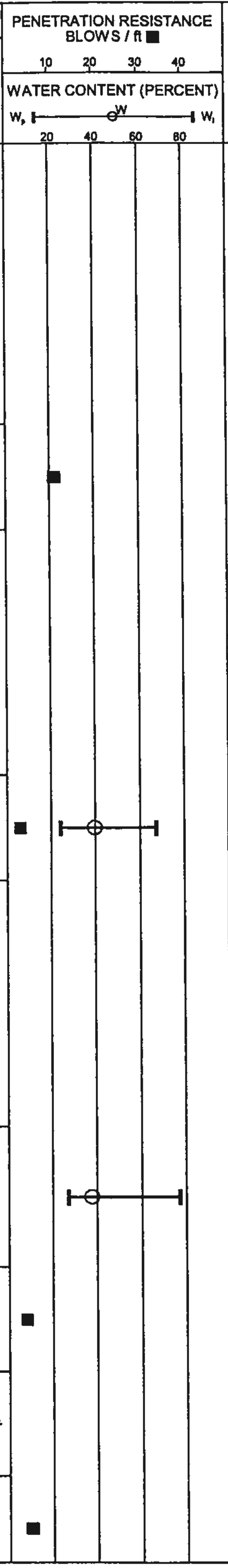
PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/13/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 414.30
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	REMARKS
0	4.25 INCH ID HSA	(0.0-9.0) Compact, medium gray (N5) to light gray (N7), SANDY F-C GRAVEL, dry (GW)				HSA	N/A	N/A	N/A / 4.0	
5			GW		1	SS	5 / 5 / 6	11	0.9 / 1.5	
						HSA	N/A	N/A	N/A / 3.5	
10		(9.0-35.2) Soft, medium gray (N5) to dark yellowish brown (10YR 4/2), SILTY CLAY, trace F-C sand, moist (CH)		405.3 / 9.0	2	SS	1 / 2 / 1	3	0.8 / 1.5	
						HSA	N/A	N/A	N/A / 3.5	
15			CH		3	SH	N/A	N/A	1.5 / 2.0	
					4	SS	1 / 2 / 2	4	0.5 / 1.5	
						HSA	N/A	N/A	N/A / 1.5	
20					5	SS	2 / 2 / 3	5	1 / 1.5	



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SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MNH
CHECKED: MNH
DATE: 2/26/08

RECORD OF BOREHOLE PZ-3

SHEET 2 of 3

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/13/2007
DRILL RIG: CME 75D

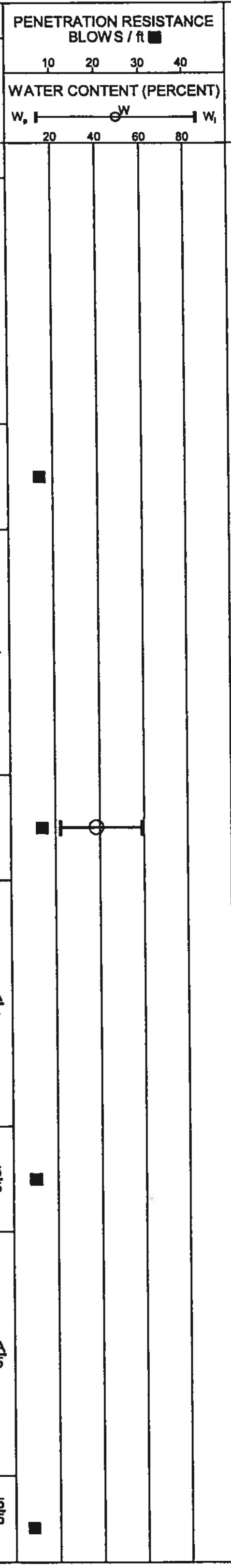
DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 414.30
INCLINATION: -90

BORING METHOD: 4.25 INCH ID HSA

DEPTH (feet)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)
20	(9.0-35.2) Soft, medium gray (N5) to dark yellowish brown (10YR 4/2), SILTY CLAY, trace F-C sand, moist (CH) *(Continued)*	CH	▨	
25	Below 24.0, medium dark gray (N4), trace organics & fiberous plant matter, CH plasticity.		▨	390.3 24.0
30	Below 29.0, medium gray (N5) with dark yellowish brown (10YR 4/2) mottling, trace organics (CH)		▨	385.3 29.0
35	(35.2-36.0) Very soft, medium gray (N5), CLAYEY SILT, trace F sand, wet (ML)	ML	▨	379.1 35.2
	(36.0-42.0) Soft, medium gray (N5) and dark yellowish brown (10YR 4/2) mottling, SILTY CLAY, wet (CL)	CL	▨	378.3 36.0
40	Log continued on next page			

NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT
5	SS		5	1 / 1.5
	HSA	N/A	N/A	N/A / 3.5
6	SS	1 3 4	7	1.3 / 1.5
	HSA	N/A	N/A	N/A / 3.5
7	SS	1 3 4	7	1.5 / 1.5
	HSA	N/A	N/A	N/A / 3.5
8	SS	1 3 2	5	1.5 / 1.5
	HSA	N/A	N/A	N/A / 3.5
9	SS	1 2 2	4	1.5 / 1.5



REMARKS

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MNH
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-3

SHEET 3 of 3

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/13/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 414.30
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft ■ 10 20 30 40 / WATER CONTENT (PERCENT) W_p ⊢—○W—⊣ W_l 20 40 60 80	REMARKS
40	4.25 INCH ID HSA	(36.0-42.0) Soft, medium gray (N5) and dark yellowish brown (10YR 4/2) mottling, SILTY CLAY, wet (CL) *(Continued)*	CL			9	SS		4	1.5 / 1.5		
					372.3 42.0		HSA	N/A	N/A	N/A / 1.5		
		(42.0-45.5) C SAND & F GRAVEL, wet, (GP-SP)				10	SS	N/A	N/A	1.5 / 1.5		@ ~42 Feet, encountered C SAND and F GRAVEL, sand heaved to 41 feet BGS after drilling to 44 feet BGS. Collected sample of heave material representative of 42-44 feet BGS material.
45					368.8 45.5		HSA	N/A	N/A	N/A / 2.0		
		END BOREHOLE AT 45.5 FEET BGS.										
50												
55												
60												

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MNH
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-4

SHEET 1 of 2

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/15/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 414.57
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft ■ 10 20 30 40 / WATER CONTENT (PERCENT) Wp W Wl 20 40 60 80	REMARKS
0	4.25 INCH HSA	(0.0-26.5) Very soft, medium gray (N5), FLY ASH, moist (FILL)		▨								
				▨			HSA	N/A	N/A	N/A 4.0		
5				▨		1	SS	1 2 1	3	1.5 1.5	■	
				▨			HSA	N/A	N/A	N/A 3.5		
10		Below 10.0, wet		▨	404.6 10.0	2	SS	N/A WH 1	1	1.0 1.5		
				▨			HSA	N/A	N/A	N/A 3.5		
15				▨		3	SS	N/A WH WH	WH	18 1.5		
				▨			HSA	N/A	N/A	N/A 3.5		
20				▨		4	SS	N/A WH 1	1	1.5 1.5		

Log continued on next page

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-4

SHEET 2 of 2

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/15/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 414.57
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■ 10 20 30 40 WATER CONTENT (PERCENT) W_p ⊢—○W—⊣ W_l 20 40 60 80	REMARKS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC/ATT		
20	4.25 INCH HSA	(0.0-26.5) Very soft, medium gray (N5), FLY ASH, moist (FILL) *(Continued)*		▨		4	SS		1	1.5/1.5		
				▨			HSA	N/A	N/A	N/A/4.5		
25				▨								
				▨	388.1	5	SS	N/A WH WH	WH	1.5/1.5		
		END BOREHOLE AT 26.5 FEET BGS.			26.5							
30												
35												
40												

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-5

SHEET 1 of 2

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/15/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 420.32
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC ATT	PENETRATION RESISTANCE BLOWS / ft ■ 10 20 30 40 WATER CONTENT (PERCENT) W_p W W_l 20 40 60 80	REMARKS
0	4.25 INCH HSA	(0.0-26.5) Firm, medium gray (N5), FLY ASH, moist (FILL)					HSA	N/A		N/A 4.0		
5						1	SS	4 8 8	16	1.3 1.5	■	
							HSA	N/A		N/A 3.5		
		Below 9.0, Very soft, medium gray (N5) to dark gray (N3) striations.			411.3 9.0	2	SS	1 1 1	2	1.0 1.5	■	
10		Belwo 10.0, wet			410.3 10.0							
							HSA	N/A		N/A 3.5		
15						3	SS	1 1 1	2	1.5 1.5	■	
							HSA	N/A		N/A 3.5		
20						4	SS	N/A 1 1	2	1.5 1.5	■	

Log continued on next page

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

RECORD OF BOREHOLE PZ-5

SHEET 2 of 2

PROJECT: Ameren - Meramec Fly Ash
PROJECT NUMBER: 073-84012
LOCATION: Ash Pond #494

DRILLING METHOD: 4.25 Inch ID HSA
DRILLING DATE: 8/15/2007
DRILL RIG: CME 75D

DATUM: LOCAL
AZIMUTH: N/A
COORDINATES: N: E:

ELEVATION: 420.32
INCLINATION: -90

DEPTH (feet)	BORING METHOD	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC ATT	PENETRATION RESISTANCE BLOWS / ft ■ 10 20 30 40 WATER CONTENT (PERCENT) W_p ⊢ W ⊣ W_l 20 40 60 80	REMARKS
20	4.25 INCH HSA	(0.0-26.5) Firm, medium gray (N5), FLY ASH, moist (FILL) *(Continued)*		▨		4	SS		2	1.5 1.5		
							HSA	N/A		N/A 4.5		
25						5	SS	N/A WH WH	WH	1.5 1.5		
		END BOREHOLE AT 26.5 FEET BGS.			393.8 26.5							
30												
35												
40												

SCALE: 1 in = 2.5 ft
DRILLING CONTRACTOR: Lane Western
DRILLER: D. Mahurin

LOGGED: MRF
CHECKED: MNH
DATE: 2/26/08

Golder Associates

APPENDIX B
PIEZOMETER CONSTRUCTION LOGS AND MDNR CERTIFICATION RECORDS

ABOVE GROUND PIEZOMETER CONSTRUCTION LOG PZ-1

PROJECT NAME: Ameren/Meramec Fly Ash

PROJECT NUMBER: 073-84012

SITE NAME: Meramec Plant

LOCATION: Meramec Plant Pond# 494, St. Louis, MO

CLIENT: AmerenUE

SURFACE ELEVATION: 413.25 feet MSL

GEOLOGIST: MRF

NORTHING:

EASTING:

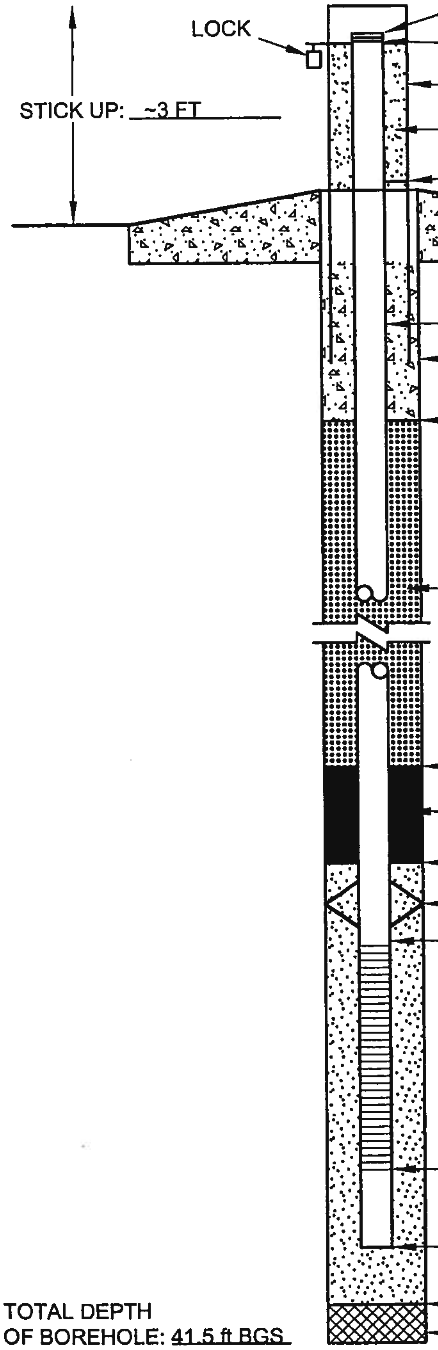
DRILLER: Dale Mahurin

STATIC WATER LEVEL: 392.80 feet MSL

COMPLETION DATE: 8/14/2007

DRILLING COMPANY: Layne Western

DRILLING METHODS: 4.25-inch HSA



STICK UP: ~3 FT

TOP OF CASING ELEVATION: 416.30 feet MSL

PROTECTIVE CASING (yes / no): Yes

PEA GRAVEL OR SAND

WEEP HOLE

GROUND SURFACE ELEVATION: 413.25 feet MSL

DIAMETER OF RISER PIPE (in.): 2.0

DIAMETER OF BOREHOLE (in.): ~6

CONCRETE SEAL DEPTH (ft. bgs): 3.0

TYPE AND AMOUNT OF ANNULAR SEAL: 2.0 bags Groutwell (50 lbs each)

TOP OF BENTONITE SEAL DEPTH (ft. bgs): 23.0

TYPE AND AMOUNT OF BENTONITE SEAL: 2 bag Enviroplug (50 lbs each)

TOP OF SAND PACK DEPTH (ft. bgs): 28.0

CENTRALIZER (yes / [✓ no]) - TYPE: N/A

TOP OF SCREEN DEPTH (ft. bgs): 31.6

TYPE OF SCREEN: Boart Longyear Machine Slotted (Schedule 40)

SCREEN SLOT SIZE (in.): 0.010

SIZE OF SAND PACK: 20/40 Silica (NSF)

AMOUNT OF SAND: 7 bags (50 lbs each) Unimin Filter Silica

BOTTOM OF SCREEN DEPTH (ft. bgs): 41.2

BOTTOM OF WELL DEPTH (ft. bgs): 41.5

BOTTOM OF FILTER PACK (ft. bgs): 41.5

TOTAL DEPTH OF BOREHOLE: 41.5 ft BGS

TYPE AND AMOUNT OF BACKFILL: N/A

ADDITIONAL NOTES: Water level at ~23.38 feet BGS on 8/14/2007 @ 1115

CHECKED BY: JCW

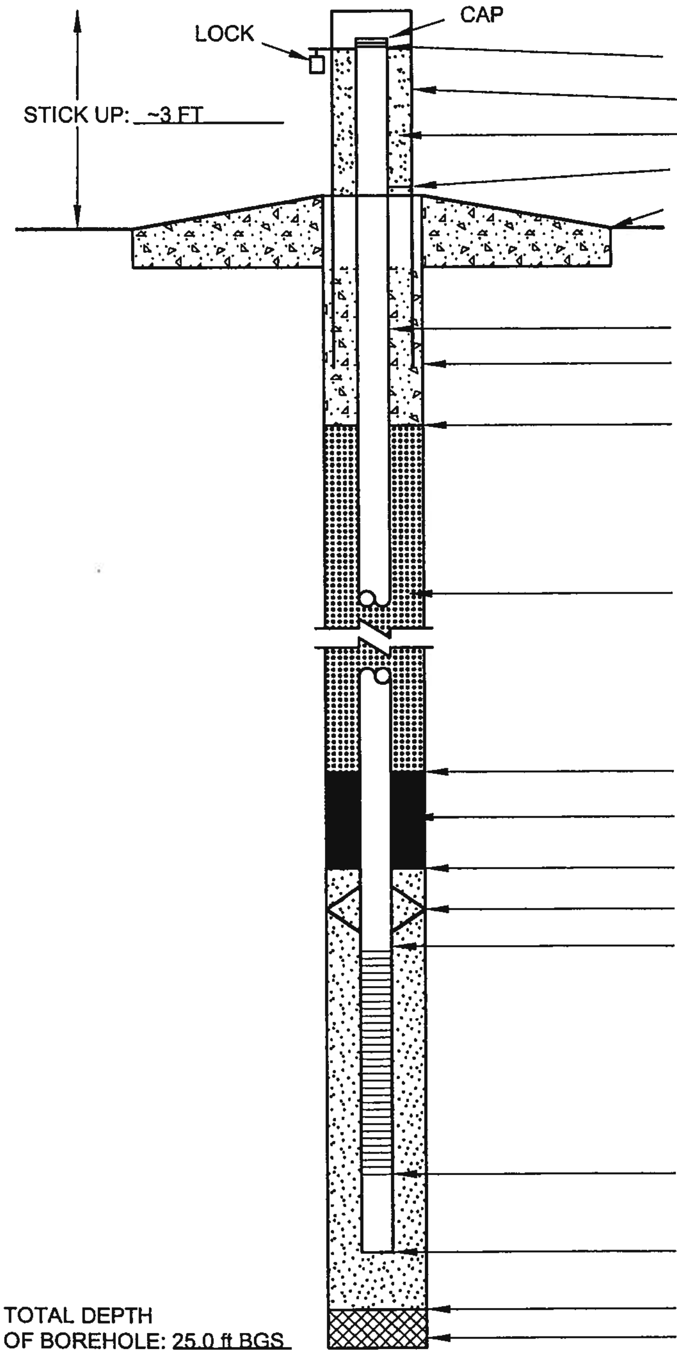
DATE CHECKED: 2/26/08

PREPARED BY: MRF

Golder Associates

ABOVE GROUND PIEZOMETER CONSTRUCTION LOG PZ-2

PROJECT NAME: Ameren/Meramec Fly Ash		PROJECT NUMBER: 073-84012
SITE NAME: Meramec Plant		LOCATION: Meramec Plant Pond# 494, St. Louis, MO
CLIENT: AmerenUE		SURFACE ELEVATION: 416.20 feet MSL
GEOLOGIST: MRF	NORTHING:	EASTING:
DRILLER: Dale Mahurin	STATIC WATER LEVEL: 400.26 feet MSL	COMPLETION DATE: 8/15/2007
DRILLING COMPANY: Layne Western		DRILLING METHODS: 4.25-inch HSA



STICK UP: ~3 FT

TOP OF CASING ELEVATION: 419.05 feet MSL

PROTECTIVE CASING (yes / no): Yes

PEA GRAVEL OR SAND

WEEP HOLE

GROUND SURFACE ELEVATION: 416.20 feet MSL

DIAMETER OF RISER PIPE (in.): 2.0

DIAMETER OF BOREHOLE (in.): ~6

CONCRETE SEAL DEPTH (ft. bgs): 3.0

TYPE AND AMOUNT OF ANNULAR SEAL: N/A

TOP OF BENTONITE SEAL DEPTH (ft. bgs): 3.0

TYPE AND AMOUNT OF BENTONITE SEAL: 2 bag Enviroplug (50 lbs each)

TOP OF SAND PACK DEPTH (ft. bgs): 12.0

CENTRALIZER (yes / [✓ no]) - TYPE: N/A

TOP OF SCREEN DEPTH (ft. bgs): 15.1

TYPE OF SCREEN: Boart Longyear Machine Slotted (Schedule 40)

SCREEN SLOT SIZE (in.): 0.010

SIZE OF SAND PACK: 20/40 Silica (NSF)

AMOUNT OF SAND: 6 bags (50 lbs each) Unimin Filter Silica

BOTTOM OF SCREEN DEPTH (ft. bgs): 24.7

BOTTOM OF WELL DEPTH (ft. bgs): 25.0

TOTAL DEPTH OF BOREHOLE: 25.0 ft BGS

BOTTOM OF FILTER PACK (ft. bgs): 25.0

TYPE AND AMOUNT OF BACKFILL: N/A

ADDITIONAL NOTES:

CHECKED BY: JCW

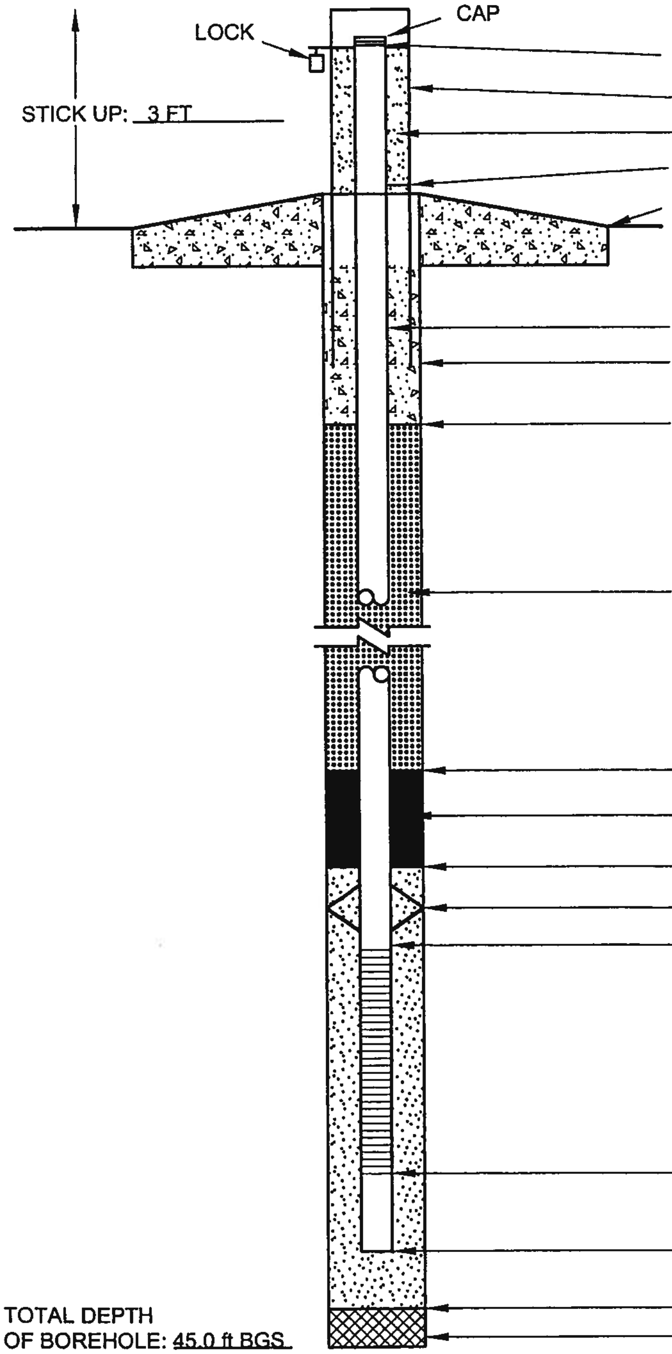
DATE CHECKED: 2/26/08

PREPARED BY: MRF

Golder Associates

ABOVE GROUND PIEZOMETER CONSTRUCTION LOG PZ-3

PROJECT NAME: Ameren/Meramec Fly Ash
PROJECT NUMBER: 073-84012
SITE NAME: Meramec Plant
LOCATION: Meramec Plant Pond# 494, St. Louis, MO
CLIENT: AmerenUE
SURFACE ELEVATION: 414.30 feet MSL
GEOLOGIST: MNH
NORTHING:
EASTING:
DRILLER: Dale Mahurin
STATIC WATER LEVEL: 385.85 feet MSL
COMPLETION DATE: 8/14/2007
DRILLING COMPANY: Layne Western
DRILLING METHODS: 4.25-inch HSA



STICK UP: 3 FT
TOP OF CASING ELEVATION: 417.36 feet MSL
PROTECTIVE CASING (yes / no): Yes
PEA GRAVEL OR SAND
WEEP HOLE
GROUND SURFACE ELEVATION: 414.30 feet MSL
DIAMETER OF RISER PIPE (in.): 2.0
DIAMETER OF BOREHOLE (in.): ~6
CONCRETE SEAL DEPTH (ft. bgs): 3.0
TYPE AND AMOUNT OF ANNULAR SEAL: 2.0 bags Groutwell (50 lbs each)
TOP OF BENTONITE SEAL DEPTH (ft. bgs): 28.0
TYPE AND AMOUNT OF BENTONITE SEAL: 2 bag Enviroplug (50 lbs each)
TOP OF SAND PACK DEPTH (ft. bgs): 32.5
CENTRALIZER (yes / [✓ no]) - TYPE: N/A
TOP OF SCREEN DEPTH (ft. bgs): 34.7
TYPE OF SCREEN: Boart Longyear Machine Slotted (Schedule 40)
SCREEN SLOT SIZE (in.): 0.010
SIZE OF SAND PACK: 20/40 Silica (NSF)
AMOUNT OF SAND: 7.5 bags (50 lbs each) Unimin Filter Silica
BOTTOM OF SCREEN DEPTH (ft. bgs): 44.6
BOTTOM OF WELL DEPTH (ft. bgs): 45.0
BOTTOM OF FILTER PACK (ft. bgs): 45.0
TYPE AND AMOUNT OF BACKFILL: N/A
TOTAL DEPTH OF BOREHOLE: 45.0 ft BGS

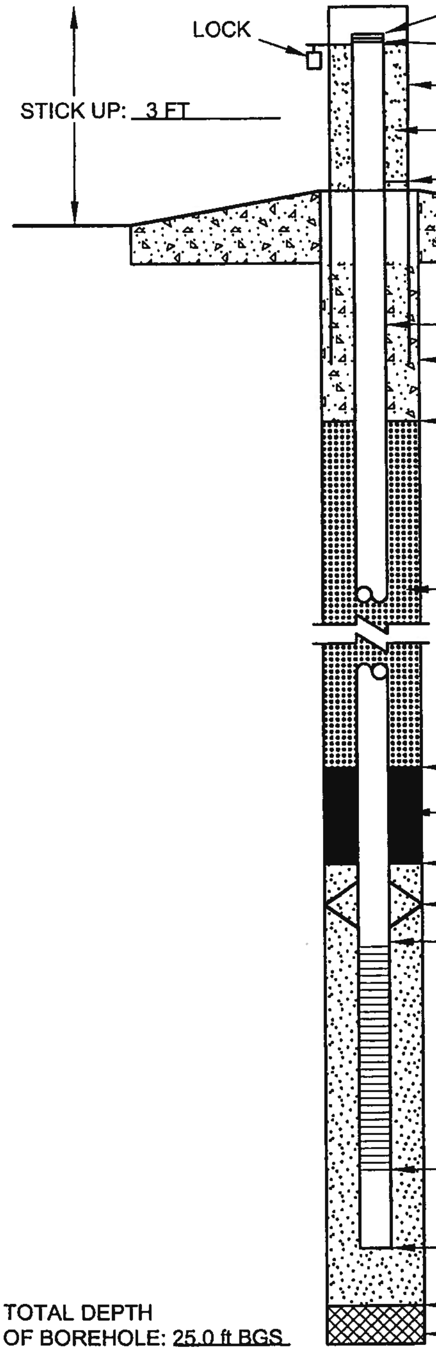
ADDITIONAL NOTES: Water level ~37.3 feet BGS
Water level @ 32.55 feet BGS on 8/14/2007 @1055

CHECKED BY: JCW
DATE CHECKED: 2/26/08
PREPARED BY: MNH

Golder Associates

ABOVE GROUND PIEZOMETER CONSTRUCTION LOG PZ-4

PROJECT NAME: Ameren/Meramec Fly Ash
PROJECT NUMBER: 073-84012
SITE NAME: Meramec Plant
LOCATION: Meramec Plant Pond# 494, St. Louis, MO
CLIENT: AmerenUE
SURFACE ELEVATION: 414.57 feet MSL
GEOLOGIST: MRF
NORTHING:
EASTING:
DRILLER: Dale Mahurin
STATIC WATER LEVEL: 400.8 feet MSL
COMPLETION DATE: 8/15/2007
DRILLING COMPANY: Layne Western
DRILLING METHODS: 4.25-inch HSA



STICK UP: 3 FT

TOP OF CASING ELEVATION: 417.27 feet MSL
PROTECTIVE CASING (yes / no): Yes
PEA GRAVEL OR SAND
WEEP HOLE
GROUND SURFACE ELEVATION: 414.57 feet MSL
DIAMETER OF RISER PIPE (in.): 2.0
DIAMETER OF BOREHOLE (in.): ~6
CONCRETE SEAL DEPTH (ft. bgs): 3.0
TYPE AND AMOUNT OF ANNULAR SEAL: N/A
TOP OF BENTONITE SEAL DEPTH (ft. bgs): 3.0
TYPE AND AMOUNT OF BENTONITE SEAL: 2 bag Enviroplug (50 lbs each)
TOP OF SAND PACK DEPTH (ft. bgs): 12.0
CENTRALIZER (yes / [✓ no]) - TYPE: N/A
TOP OF SCREEN DEPTH (ft. bgs): 15.1
TYPE OF SCREEN: Boart Longyear Machine Slotted (Schedule 40)
SCREEN SLOT SIZE (in.): 0.010
SIZE OF SAND PACK: 20/40 Silica (NSF)
AMOUNT OF SAND: 6 bags (50 lbs each) Unimin Filter Silica
BOTTOM OF SCREEN DEPTH (ft. bgs): 24.7
BOTTOM OF WELL DEPTH (ft. bgs): 25.0
BOTTOM OF FILTER PACK (ft. bgs): 25.0
TYPE AND AMOUNT OF BACKFILL: N/A

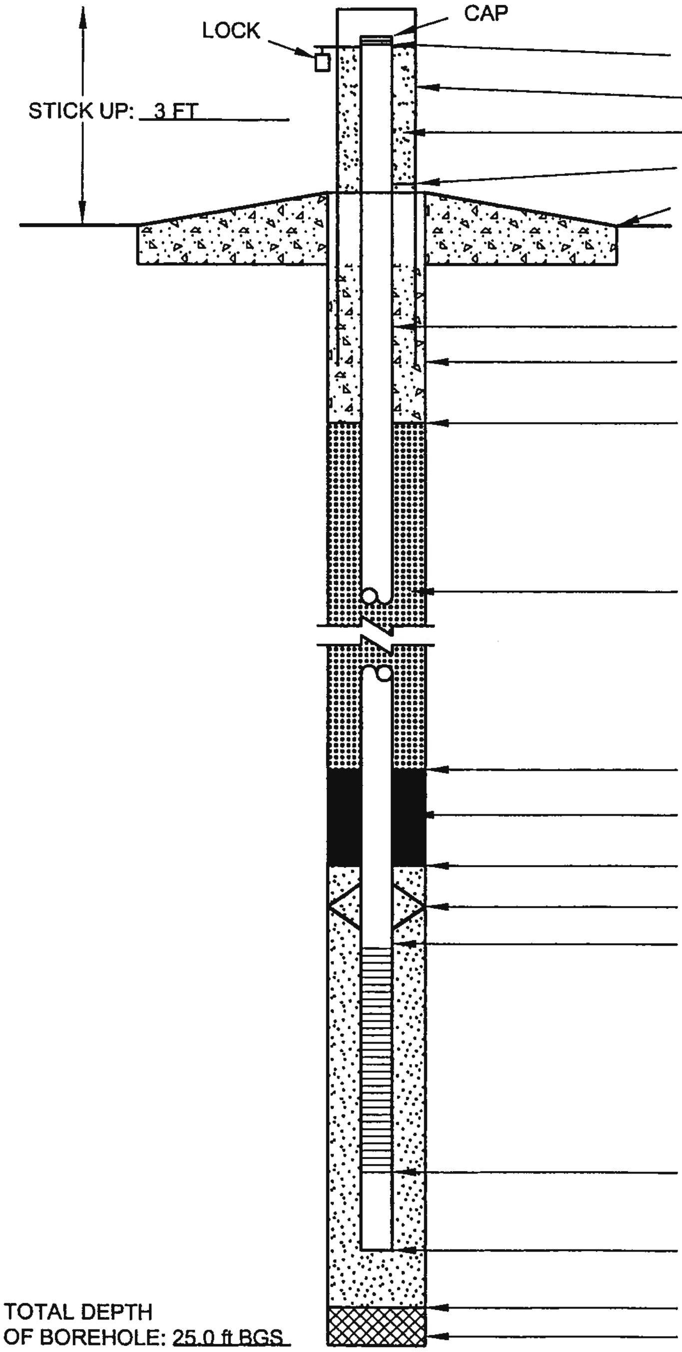
TOTAL DEPTH OF BOREHOLE: 25.0 ft BGS

ADDITIONAL NOTES: Water level at ~23.38 feet BGS on 8/14/2007 @ 1115

CHECKED BY: JCW
DATE CHECKED: 2/26/08
PREPARED BY: MRF

ABOVE GROUND PIEZOMETER CONSTRUCTION LOG PZ-5

PROJECT NAME: Ameren/Meramec Fly Ash
PROJECT NUMBER: 073-84012
SITE NAME: Meramec Plant
LOCATION: Meramec Plant Pond# 494, St. Louis, MO
CLIENT: AmerenUE
SURFACE ELEVATION: 420.32 feet MSL
GEOLOGIST: MRF
NORTHING:
EASTING:
DRILLER: Dale Mahurin
STATIC WATER LEVEL: 405.55 feet MSL
COMPLETION DATE: 8/15/2007
DRILLING COMPANY: Layne Western
DRILLING METHODS: 4.25-inch HSA



STICK UP: 3 FT

TOP OF CASING ELEVATION: 423.39 feet MSL
PROTECTIVE CASING (yes / no): Yes
PEA GRAVEL OR SAND
WEEP HOLE
GROUND SURFACE ELEVATION: 420.32 feet MSL
DIAMETER OF RISER PIPE (in.): 2.0
DIAMETER OF BOREHOLE (in.): ~6
CONCRETE SEAL DEPTH (ft. bgs): 3.0
TYPE AND AMOUNT OF ANNULAR SEAL: N/A
TOP OF BENTONITE SEAL DEPTH (ft. bgs): 3.0
TYPE AND AMOUNT OF BENTONITE SEAL: 2 bag Enviroplug (50 lbs each)
TOP OF SAND PACK DEPTH (ft. bgs): 12.0
CENTRALIZER (yes / [✓ no]) - TYPE: N/A
TOP OF SCREEN DEPTH (ft. bgs): 15.1
TYPE OF SCREEN: Boart Longyear Machine Slotted (Schedule 40)
SCREEN SLOT SIZE (in.): 0.010
SIZE OF SAND PACK: 20/40 Silica (NSF)
AMOUNT OF SAND: 7 bags (50 lbs each) Unimin Filter Silica
BOTTOM OF SCREEN DEPTH (ft. bgs): 24.7
BOTTOM OF WELL DEPTH (ft. bgs): 25.0
BOTTOM OF FILTER PACK (ft. bgs): 25.0
TYPE AND AMOUNT OF BACKFILL: N/A

TOTAL DEPTH
OF BOREHOLE: 25.0 ft BGS

ADDITIONAL NOTES:

CHECKED BY: JCW
DATE CHECKED: 2/26/08
PREPARED BY: MRF

MISSOURI DEPARTMENT OF
NATURAL RESOURCES
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY
REF. NO. 383660
DATE RECEIVED
C.R. NO.
CHECK NO.
STATE WELL NUMBER
REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY
ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

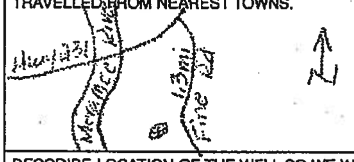
OWNER NAME: Ameren UE
WELL NUMBER: PZ-1
VARIANCE GRANTED BY THE D.N.R ☐ NO ☐ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 1901 Chouteau
CITY: St. Louis
STATE: MO
ZIP CODE: 63103
SITE NAME: Ameren UE - Meramec Plant
CONTACT NAME: Kevin Gerhardt
SITE ADDRESS: Fine Rd
CITY: St. Louis
STATE: MO
ZIP CODE: 63129
VARIANCE NUMBER

PROPOSED USE OF WELL
☐ GAS MONITORING WELL ☐ MONITORING
☐ EXTRACTION WELL ☒ PIEZOMETERS

TYPE OF POTENTIAL SITE
☐ HAZARDOUS MATERIAL ☐ LANDFILL
☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T.
☒ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY)
☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☐ METALS ☐ V.O.C.
☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.



LOCATION OF WELL
LAT. 38 . 24 . 14 "
LONG. 90 . 20 . 42 "
AREA
ELEV
COUNTY St. Louis
SMALLEST LARGEST
_____ 1/4 _____ 1/4 _____ 1/4
SEC. 3 TWN. 42 N. RNG. 6 [✓ E] OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: Fly Ash Pond
DRILLER NOTES:

TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH OF PROTECTIVE CASING: 5 FT.
DIAMETER OF PROTECTIVE CASING: 4 x 4 IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: 12 IN. 2.5 FT.
PROTECTIVE CASING MATERIAL: ☒ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP? ☒ YES ☐ NO

WEEP HOLE? ☒ YES ☐ NO
VENTED CAP? ☐ YES ☒ NO
LENGTH OF FLUSH MOUNT: N/A FT.
DIAMETER OF FLUSH MOUNT: N/A IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: N/A IN. FT.
SURFACE COMPLETION GROUT ☒ CONCRETE 24" x 24" ☐ OTHER

RISER PIPE DETAIL
LENGTH: 34 FT.
DIAMETER: 2 IN.
WEIGHT OR SDR#: 40
DIAMETER OF DRILL HOLE: 8 IN.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER
GLUED ☐ YES ☒ NO

BENTONITE SEAL
LENGTH OF SEAL: 3 FT.
MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK
LENGTH: 12.5 FT.
DEPTH TO TOP OF PRIMARY FILTER PACK: 29 FT.
SECONDARY FILTER PACK LENGTH: N/A FT.

ANNULAR SEAL
☒ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE
Groutwell
BAGS OF CEMENT USED
% OF BENTONITE USED
WATER USED/BAG _____ GAL
LENGTH: 23.5 FT.

WELL SCREEN
LENGTH: 10 FT.
DIAMETER: 2 IN.
DIAMETER OF DRILL HOLE: 8 IN.
DEPTH TO TOP OF SCREEN: 31.5 FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	30	Silty gumbo clay
30	41.5	Gumbo clay w/ silt & sand layers

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED
TOTAL DEPTH: 41.5'

SIGNATURE (PRIMARY CONTRACTOR)
PERMIT NUMBER: 1351 WPM
STATIC WATER LEVEL: 25.5 FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 8-16-07

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER) X
PERMIT NUMBER: 1358 WPM
DATE: 8/31/07
SIGNATURE (PUMP INSTALLER) X N/A
PERMIT NUMBER: N/A
DATE: 8/31/07

MO 780-1415 (2-06)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $75 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MISSOURI DEPARTMENT OF
NATURAL RESOURCES
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

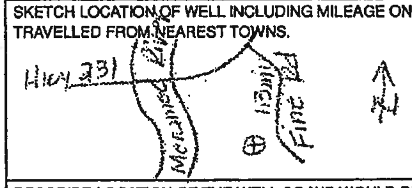
OFFICE USE ONLY REF. NO. 383861	DATE RECEIVED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Ameren UE		WELL NUMBER: PZ-2		VARIANCE GRANTED BY THE D.N.R ☒ NO ☐ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 1901 Chouteau	CITY: St. Louis	STATE: mo	ZIP CODE: 63103	
SITE NAME: Ameren UE - Meramec Plant	CONTACT NAME: Kevin Gerhardt			
SITE ADDRESS: Fine Rd	CITY: St. Louis	STATE: mo	ZIP CODE: 63129	VARIANCE NUMBER

PROPOSED USE OF WELL	TYPE OF POTENTIAL SITE	MONITORING FOR: (CHECK ALL THAT APPLY)
☐ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☒ PIEZOMETERS	☐ HAZARDOUS MATERIAL ☐ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☒ WATER LEVEL DRAWDOWN	☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.



LOCATION OF WELL
LAT. 38 . 24 . 15 .
LONG. 90 . 20 . 40 .
AREA
ELEV
COUNTY St. Louis
SMALLEST ____ 1/4 ____ 1/4 ____ 1/4 LARGEST
SEC. 3 TWN. 42 N. RNG. 6 [✓ E] OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: Fly Ash Pond

DRILLER NOTES:

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☒ ABOVE GROUND ☐ FLUSH MOUNT	5 FT.	4x4 IN.	12 IN. 2.5 FT.	☒ STEEL ☐ ALUMINUM ☐ PLASTIC	☒ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☒ YES ☐ NO	☐ YES ☒ NO	N/A FT.	N/A IN.	N/A IN. FT.	☒ CONCRETE 24"x24" ☐ OTHER

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	GLUED
17.5 FT.	2 IN.	40	8 IN.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER	☐ YES ☒ NO

BENTONITE SEAL — LENGTH OF SEAL: 3 FT. — MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK

LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
12 FT.	13 FT.	N/A FT.

ANNULAR SEAL
☒ BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE Grout Well
☐ CEMENT/BENTONITE SLURRY
BAGS OF CEMENT USED ______
% OF BENTONITE USED ______
WATER USED/BAG ______ GAL
LENGTH 7.5 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
10 FT.	2 IN.	8 IN.	15 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	25	Fly ash

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 25'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL	DATE WELL DRILLING WAS COMPLETED
	1251 WPM	12.5' FEET FROM MEASURING POINT	8-16-07

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	1258 WPM	8/31/07	X N/A	N/A	N/A

MO 780-1415 (2-06)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $75 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MISSOURI DEPARTMENT OF NATURAL RESOURCES
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY REF. NO. 383862	DATE RECEIVED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

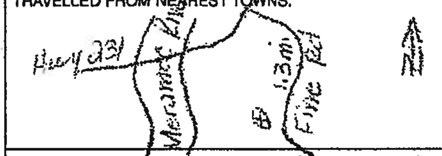
OWNER NAME: Ameren UE
WELL NUMBER: PZ-3
VARIANCE GRANTED BY THE D.N.R: ☒ NO ☐ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 1901 Chouteau
CITY: St. Louis STATE: MO ZIP CODE: 63103
SITE NAME: Ameren UE - Meramec Plant
CONTACT NAME: Kevin Gerhardt
SITE ADDRESS: Fine Rd
CITY: St. Louis STATE: MO ZIP CODE: 63129
VARIANCE NUMBER:

PROPOSED USE OF WELL: ☐ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☒ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☒ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.



LOCATION OF WELL
LAT. 38 · 34 · 35 ·
LONG. 90 · 20 · 41 ·
AREA
ELEV
COUNTY St. Louis
SMALLEST ____ 1/4 ____ 1/4 ____ LARGEST 1/4
SEC. 3 TWN. 42 N. RNG. 6 [✓ E] OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: Fly Ash Pond
DRILLER NOTES:

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH OF PROTECTIVE CASING: 5 FT.
DIAMETER OF PROTECTIVE CASING: 4x4 IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: 12 IN. 2.5 FT.
PROTECTIVE CASING MATERIAL: ☒ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP? ☒ YES ☐ NO

WEEP HOLE? ☒ YES ☐ NO
VENTED CAP? ☐ YES ☒ NO
LENGTH OF FLUSH MOUNT: n/a FT.
DIAMETER OF FLUSH MOUNT: n/a IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: n/a IN. FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE 24" x 24" ☐ OTHER ____

RISER PIPE DETAIL
LENGTH: 37.5 FT.
DIAMETER: 2 IN.
WEIGHT OR SDR#: 40
DIAMETER OF DRILL HOLE: 8 IN.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER ____
GLUED: ☐ YES ☒ NO
SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO n/a

BENTONITE SEAL
LENGTH OF SEAL: 3 FT.
MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

PRIMARY FILTER PACK
LENGTH: 12 FT.
DEPTH TO TOP OF PRIMARY FILTER PACK: 33 FT.
SECONDARY FILTER PACK LENGTH: n/a FT.

ANNULAR SEAL
☒ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE Grout Well
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG ____ GAL
LENGTH: 27.5 FT.

WELL SCREEN
LENGTH: 10 FT.
DIAMETER: 2 IN.
DIAMETER OF DRILL HOLE: 8 IN.
DEPTH TO TOP OF SCREEN: 35 FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER ____

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	2	Silty clay
2	5	Clay & gravel
5	41	Silty gumbo clay
41	45	Sand & gravel

MULTIPLE CASED WELLS ☐ YES ☑ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 45'

SIGNATURE (PRIMARY CONTRACTOR)
PERMIT NUMBER: 1251 WPM
STATIC WATER LEVEL: 32.5 FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 8/16/07

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER) X Thomas N. Mah Jr.
PERMIT NUMBER: 1258 WPM
DATE: 8/31/07
SIGNATURE (PUMP INSTALLER) X n/a
PERMIT NUMBER: n/a
DATE: n/a

MO 780-1415 (2-06)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $75 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MISSOURI DEPARTMENT OF NATURAL RESOURCES
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY
REF. NO. 383863
DATE RECEIVED
C.R. NO.
CHECK NO.
STATE WELL NUMBER
REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY
ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Ameren UE
WELL NUMBER: PZ-4
VARIANCE GRANTED BY THE D.N.R: ☒ NO ☐ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 1901 Chouteau
CITY: St. Louis
STATE: MO
ZIP CODE: 63103
SITE NAME: Ameren UE - Meramec Plant
CONTACT NAME: Kevin Gerhardt
SITE ADDRESS: Fine Rd
CITY: St. Louis
STATE: MO
ZIP CODE: 63129
VARIANCE NUMBER

PROPOSED USE OF WELL: ☐ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☒ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☒ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL
LAT. 38 · 24 · 34 ·
LONG. 90 · 20 · 40 ·
AREA
ELEV
COUNTY: St. Louis
SMALLEST ____ 1/4 ____ 1/4 ____ 1/4 LARGEST
SEC. 3 TWN. 42 N. RNG. 6 [✓ E] OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: Fly Ash Pond
DRILLER NOTES:

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH OF PROTECTIVE CASING: 5 FT.
DIAMETER OF PROTECTIVE CASING: 4x4 IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: 12 IN. 2.5 FT.
PROTECTIVE CASING MATERIAL: ☒ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP? ☒ YES ☐ NO

WEEP HOLE? ☒ YES ☐ NO
VENTED CAP? ☐ YES ☒ NO
LENGTH OF FLUSH MOUNT: n/a FT.
DIAMETER OF FLUSH MOUNT: n/a IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: n/a IN. FT.
SURFACE COMPLETION GROUT: ☒ CONCRETE 24" x 24" ☐ OTHER ____

RISER PIPE DETAIL
LENGTH: 17.5 FT.
DIAMETER: 2 IN.
WEIGHT OR SDR#: 40
DIAMETER OF DRILL HOLE: 8 IN.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER ____
GLUED: ☐ YES ☒ NO

BENTONITE SEAL
LENGTH OF SEAL: 3 FT.
MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO n/a

PRIMARY FILTER PACK
LENGTH: 12 FT.
DEPTH TO TOP OF PRIMARY FILTER PACK: 13 FT.
SECONDARY FILTER PACK LENGTH: n/a FT.

ANNULAR SEAL
☒ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE
Grout Well
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG ____ GAL
LENGTH: 7.5 FT.

WELL SCREEN
LENGTH: 10 FT.
DIAMETER: 2 IN.
DIAMETER OF DRILL HOLE: 8 IN.
DEPTH TO TOP OF SCREEN: 15 FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER ____

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	35	Fly ash

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 35'

SIGNATURE (PRIMARY CONTRACTOR)
PERMIT NUMBER: 1251 WPM
STATIC WATER LEVEL: 12.5 FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 8/16/07

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER) X
PERMIT NUMBER: 1258 WPM
DATE: 8/31/07
SIGNATURE (PUMP INSTALLER) X n/a
PERMIT NUMBER: n/a
DATE: n/a

MO 780-1415 (2-06)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $75 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MISSOURI DEPARTMENT OF NATURAL RESOURCES
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY
REF. NO. 383864
DATE RECEIVED
C.R. NO.
CHECK NO.
STATE WELL NUMBER
REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY
ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

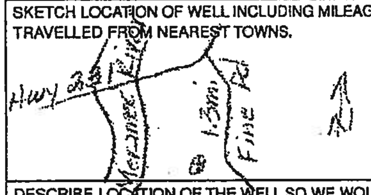
OWNER NAME: Ameren UE
WELL NUMBER: PZ-5
VARIANCE GRANTED BY THE D.N.R: ☒ NO ☐ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 1901 Chouteau
CITY: St. Louis
STATE: MO
ZIP CODE: 63103
SITE NAME: Ameren UE - Meramec Plant
CONTACT NAME: Kevin Gerhardt
SITE ADDRESS: Fine Rd
CITY: St. Louis
STATE: MO
ZIP CODE: 63129
VARIANCE NUMBER:

PROPOSED USE OF WELL: ☐ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☒ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☒ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.



LOCATION OF WELL
LAT. 38 . 24 . 21 "
LONG. 90 . 20 . 33 .
AREA
ELEV
COUNTY: St. Louis
SMALLEST ____ 1/4 ____ 1/4 ____ 1/4 LARGEST
SEC. 3 TWN. 42 N. RNG. 6 [✓ E] OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: Fly Ash Pond
DRILLER NOTES:

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH OF PROTECTIVE CASING: 5 FT.
DIAMETER OF PROTECTIVE CASING: 4x4 IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: 12 IN. 2.5 FT.
PROTECTIVE CASING MATERIAL: ☒ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP?: ☒ YES ☐ NO

WEEP HOLE?: ☒ YES ☐ NO
VENTED CAP?: ☐ YES ☒ NO
LENGTH OF FLUSH MOUNT: n/a FT.
DIAMETER OF FLUSH MOUNT: n/a IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: n/a IN. FT.
SURFACE COMPLETION GROUT: ☒ CONCRETE 24" x 24" ☐ OTHER ______

RISER PIPE DETAIL
LENGTH: 17.5 FT.
DIAMETER: 2 IN.
WEIGHT OR SDR#: 40
DIAMETER OF DRILL HOLE: 8 IN.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER ______
GLUED: ☐ YES ☒ NO

BENTONITE SEAL
LENGTH OF SEAL: 3 FT.
MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO n/a

PRIMARY FILTER PACK
LENGTH: 12 FT.
DEPTH TO TOP OF PRIMARY FILTER PACK: 13 FT.
SECONDARY FILTER PACK LENGTH: n/a FT.

ANNULAR SEAL
☒ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE
Grout Well
BAGS OF CEMENT USED ______
% OF BENTONITE USED ______
WATER USED/BAG ______ GAL
LENGTH: 7.5 FT.

WELL SCREEN
LENGTH: 10 FT.
DIAMETER: 2 IN.
DIAMETER OF DRILL HOLE: 8 IN.
DEPTH TO TOP OF SCREEN: 15 FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER ______

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	25	Fly ash

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 25'

SIGNATURE (PRIMARY CONTRACTOR):
PERMIT NUMBER: 1251 WPM
STATIC WATER LEVEL: 12.5' FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 8/14/07

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER): X Thomas K. M
PERMIT NUMBER: 1258 WPM
DATE: 8/31/07
SIGNATURE (PUMP INSTALLER): X n/a
PERMIT NUMBER: n/a
DATE: n/a

MO 780-1415 (2-06)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $75 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

APPENDIX C
GEOTECHNICAL ANALYSIS FORMS

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: AMEREN / MERAMEC
PROJECT NUMBER: 073-84012
SAMPLE ID: PZ-1 S-002 **SAMPLE DEPTH:** 9 - 10.5'
SAMPLE TYPE: BAG

SAMPLE PREPARATION

Wet or Dry: Wet

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION		LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows			28	28	
Weight of Wet Soil & Tare (gm)	26.86	26.96	55.37	55.55	69.92
Weight of Dry Soil & Tare (gm)	25.07	25.14	45.51	45.78	59.62
Weight of Tare (gm)	16.69	16.66	20.23	20.69	19.49
Weight of Water (gm)	1.79	1.82	9.86	9.77	10.30
Weight of Dry Soil (gm)	8.38	8.48	25.28	25.09	40.13
Water Content %	21.36	21.46	39.00	38.94	25.67

	TRIAL 1	TRIAL 2
BLOWS:	28	28
K VALUE:	1.014	1.014

PLASTIC LIMIT (PL) 21

LIQUID LIMIT (LL) 40

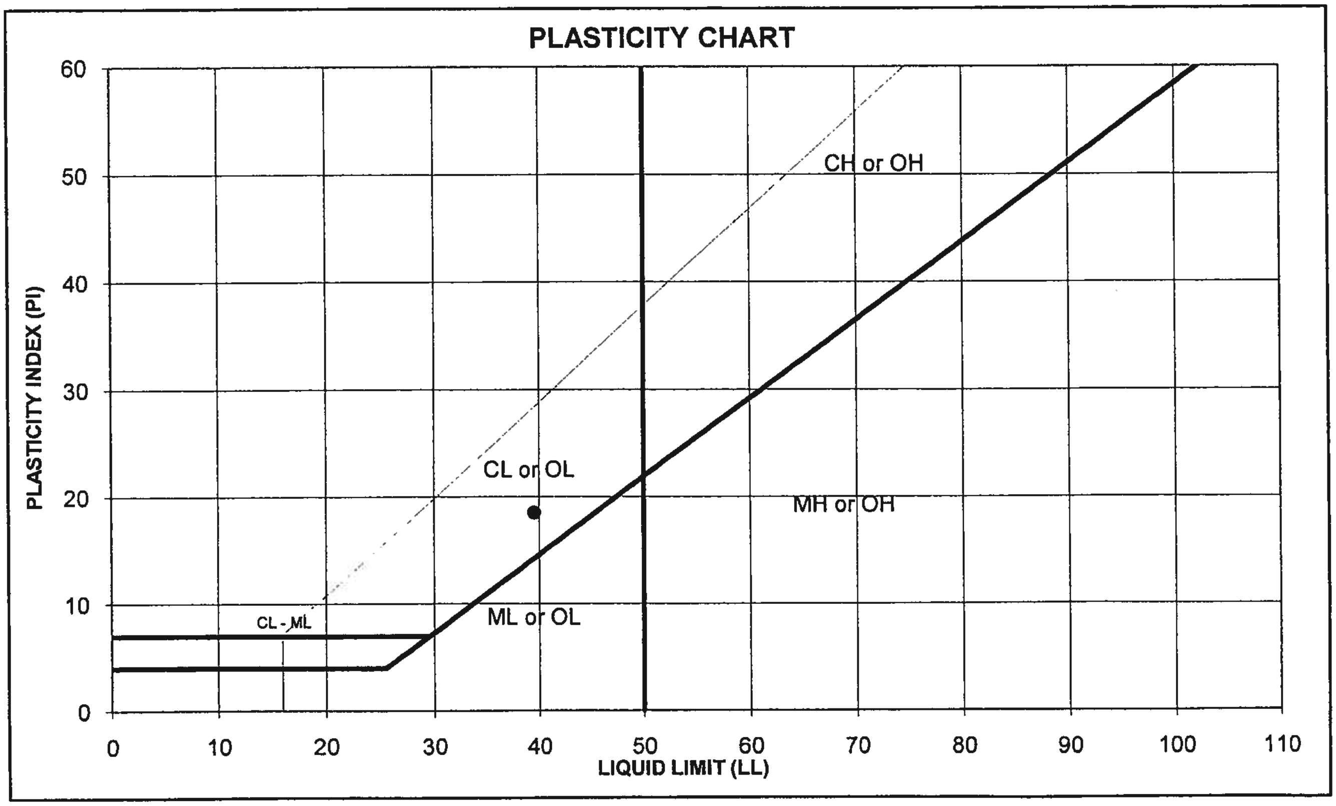
PLASTICITY INDEX (PI) 19

LIQUIDITY INDEX (LI) 0.23

NOTE:

DESCRIPTION Grayish brown, silty CLAY, trace sand

USCS CL



TECH	FC
DATE	20-Aug-07
CHECK	PCM
REVIEW	MNH

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME:	**AMEREN / MERAMEC**
PROJECT NUMBER:	**073-84012**
SAMPLE ID:	**PZ-1 S-003**
SAMPLE TYPE:	**SHELBY TUBE**

SAMPLE DEPTH: **14.5 - 16.5'**

SAMPLE PREPARATION

Wet or Dry: Wet

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION		**LIQUID LIMIT DETERMINATION**		**NATURAL MOISTURE**
Number of Blows			23	23	
Weight of Wet Soil & Tare (gm)	26.95	27.49	54.47	54.40	104.39
Weight of Dry Soil & Tare (gm)	24.99	25.50	41.95	41.88	83.57
Weight of Tare (gm)	16.62	17.02	21.50	21.44	19.53
Weight of Water (gm)	1.96	1.99	12.52	12.52	20.82
Weight of Dry Soil (gm)	8.37	8.48	20.45	20.44	64.04
Water Content %	23.42	23.47	61.22	61.25	32.51

	TRIAL 1	TRIAL 2
BLOWS:	**23**	**23**
K VALUE:	**0.99**	**0.99**

PLASTIC LIMIT (PL) 23

LIQUID LIMIT (LL) 61

PLASTICITY INDEX (PI) 38

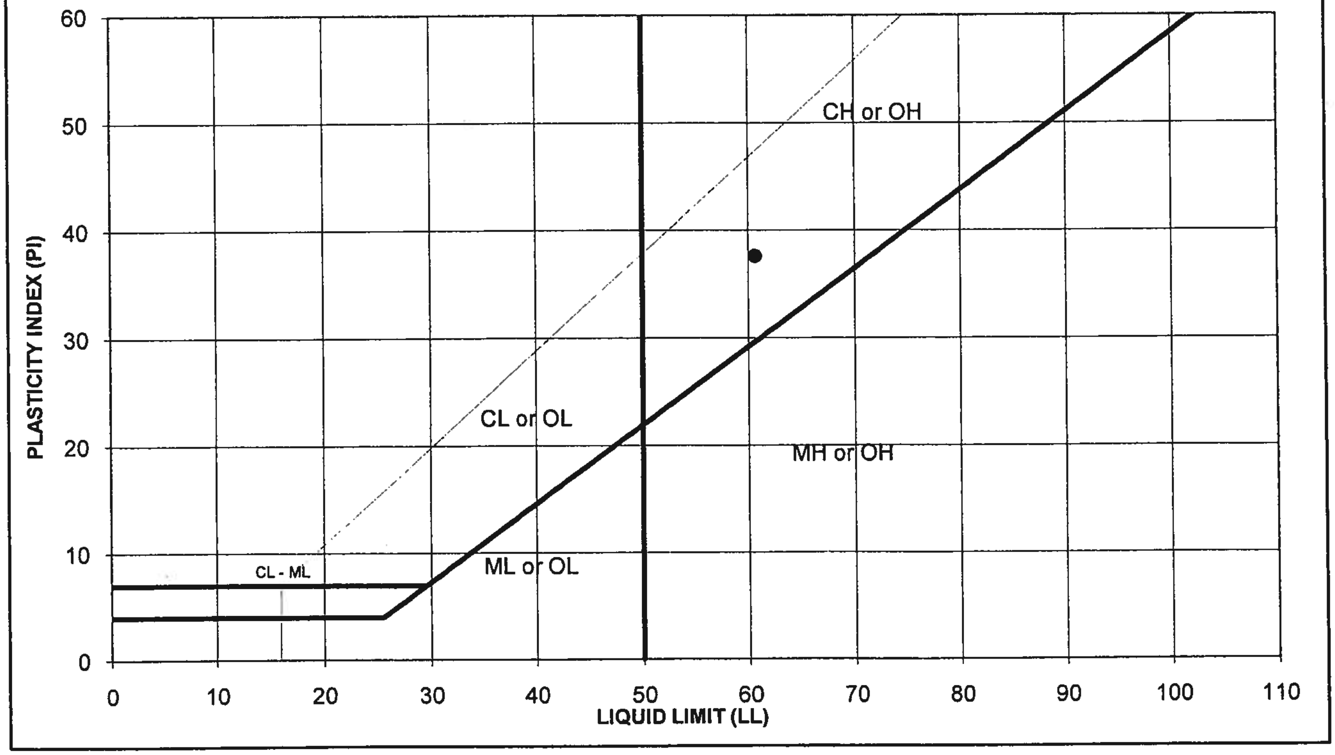
LIQUIDITY INDEX (LI) 0.24

NOTE:

DESCRIPTION Brown & Gray, CLAY, some sand pockets

USCS CH

PLASTICITY CHART



TECH	FC
DATE	21-Aug-07
CHECK	PCM
REVIEW	MNH

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: AMEREN / MERAMEC
PROJECT NUMBER: 073-84012
SAMPLE ID: PZ-1 S-007 **SAMPLE DEPTH:** 29.5 - 31'
SAMPLE TYPE: BAG

SAMPLE PREPARATION

Wet or Dry: Wet

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION		LIQUID LIMIT DETERMINATION	
Number of Blows			30	30
Weight of Wet Soil & Tare (gm)	26.85	26.70	50.91	51.66
Weight of Dry Soil & Tare (gm)	24.86	24.75	39.01	39.78
Weight of Tare (gm)	16.69	16.59	20.87	21.64
Weight of Water (gm)	1.99	1.95	11.90	11.88
Weight of Dry Soil (gm)	8.17	8.16	18.14	18.14
Water Content %	24.36	23.90	65.60	65.49

	TRIAL 1	TRIAL 2
BLOWS:	30	30
K VALUE:	1.022	1.022

NATURAL MOISTURE
68.72
56.83
19.42
11.89
37.41
31.78

PLASTIC LIMIT (PL): 24

LIQUID LIMIT (LL): 67

PLASTICITY INDEX (PI): 43

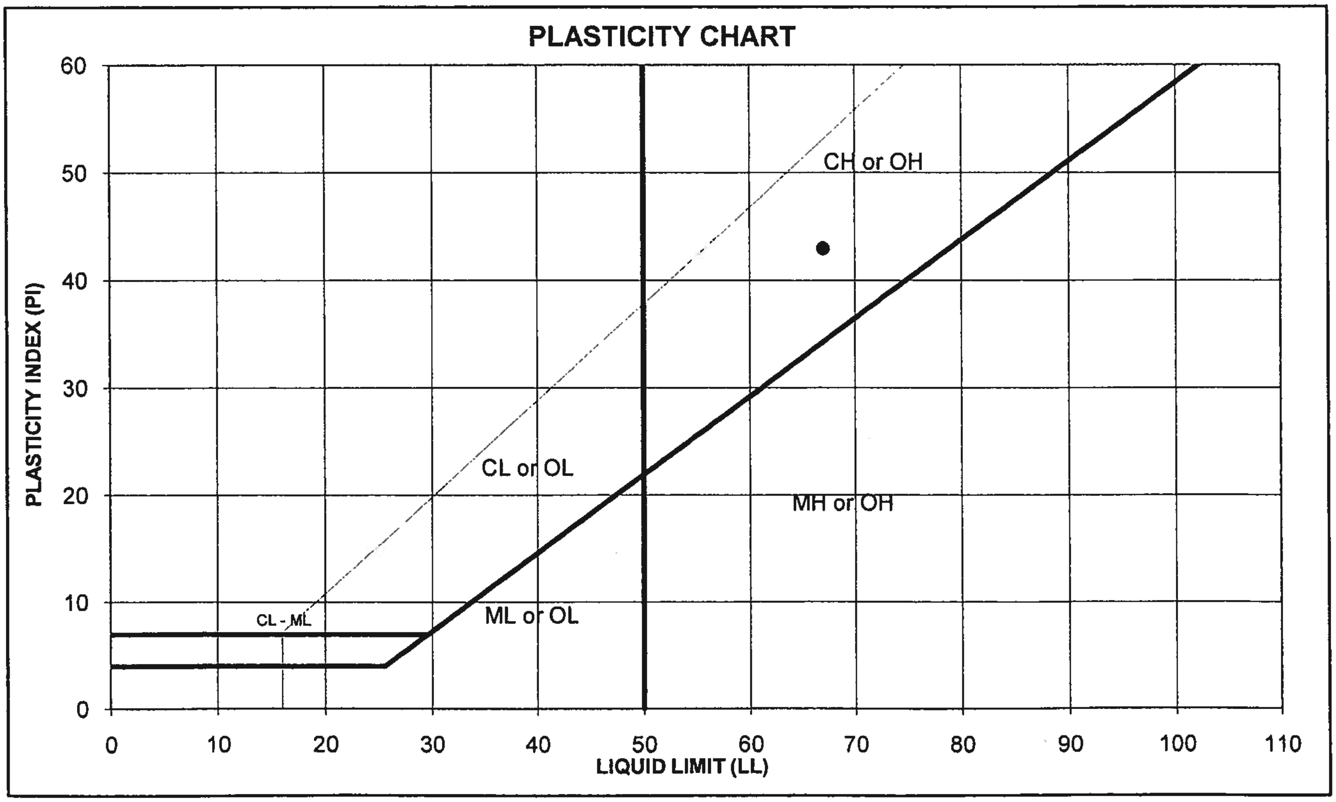
LIQUIDITY INDEX (LI): 0.18

NOTE:

DESCRIPTION Brown, CLAY, some silt

USCS CH

PLASTICITY CHART



TECH	FC
DATE	20-Aug-07
CHECK	PCM
REVIEW	MNH

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME:	**AMEREN / MERAMEC**
PROJECT NUMBER:	**073-84012**
SAMPLE ID:	**PZ-3 S-002**
SAMPLE TYPE:	**BAG**

SAMPLE DEPTH: **9 - 10.5'**

SAMPLE PREPARATION

Wet or Dry: Wet

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION		LIQUID LIMIT DETERMINATION	
Number of Blows			30	30
Weight of Wet Soil & Tare (gm)	31.68	31.89	46.05	45.87
Weight of Dry Soil & Tare (gm)	29.66	29.94	34.52	34.31
Weight of Tare (gm)	21.41	21.83	16.91	16.68
Weight of Water (gm)	2.02	1.95	11.53	11.56
Weight of Dry Soil (gm)	8.25	8.11	17.61	17.63
Water Content %	24.48	24.04	65.47	65.57

	TRIAL 1	TRIAL 2
BLOWS:	**30**	**30**
K VALUE:	**1.022**	**1.022**

NATURAL MOISTURE

53.83
43.90
18.97
9.93
24.93
39.83

PLASTIC LIMIT (PL): 24

LIQUID LIMIT (LL): 67

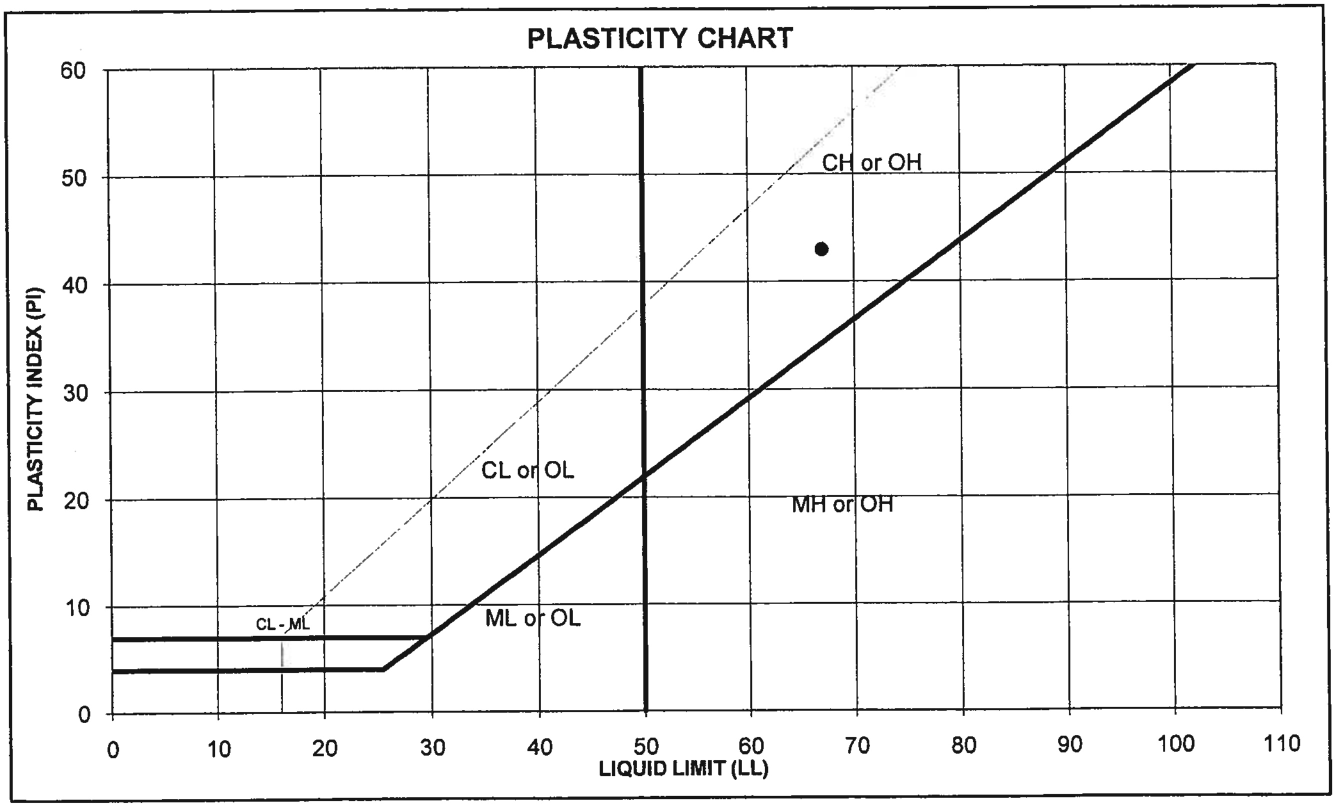
PLASTICITY INDEX (PI): 43

LIQUIDITY INDEX (LI): 0.36

NOTE:

DESCRIPTION: Brown, CLAY, some silt

USCS: CH



TECH	FC
DATE	20-Aug-07
CHECK	PCM
REVIEW	MNH

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME:	**AMEREN / MERAMEC**		
PROJECT NUMBER:	**073-84012**		
SAMPLE ID:	**PZ-3 S-003**	**SAMPLE DEPTH:**	**14 - 16'**
SAMPLE TYPE:	**SHELBY TUBE**		

SAMPLE PREPARATION

Wet or Dry: Wet

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION		**LIQUID LIMIT DETERMINATION**		**NATURAL MOISTURE**
Number of Blows			20	20	
Weight of Wet Soil & Tare (gm)	27.16	27.25	53.89	54.34	89.23
Weight of Dry Soil & Tare (gm)	24.98	25.00	39.61	40.15	70.11
Weight of Tare (gm)	16.74	16.72	21.42	22.11	19.50
Weight of Water (gm)	2.18	2.25	14.28	14.19	19.12
Weight of Dry Soil (gm)	8.24	8.28	18.19	18.04	50.61
Water Content %	26.46	27.17	78.50	78.66	37.78

	TRIAL 1	TRIAL 2
BLOWS:	20	20
K VALUE:	0.974	0.974

PLASTIC LIMIT (PL): 27

LIQUID LIMIT (LL): 77

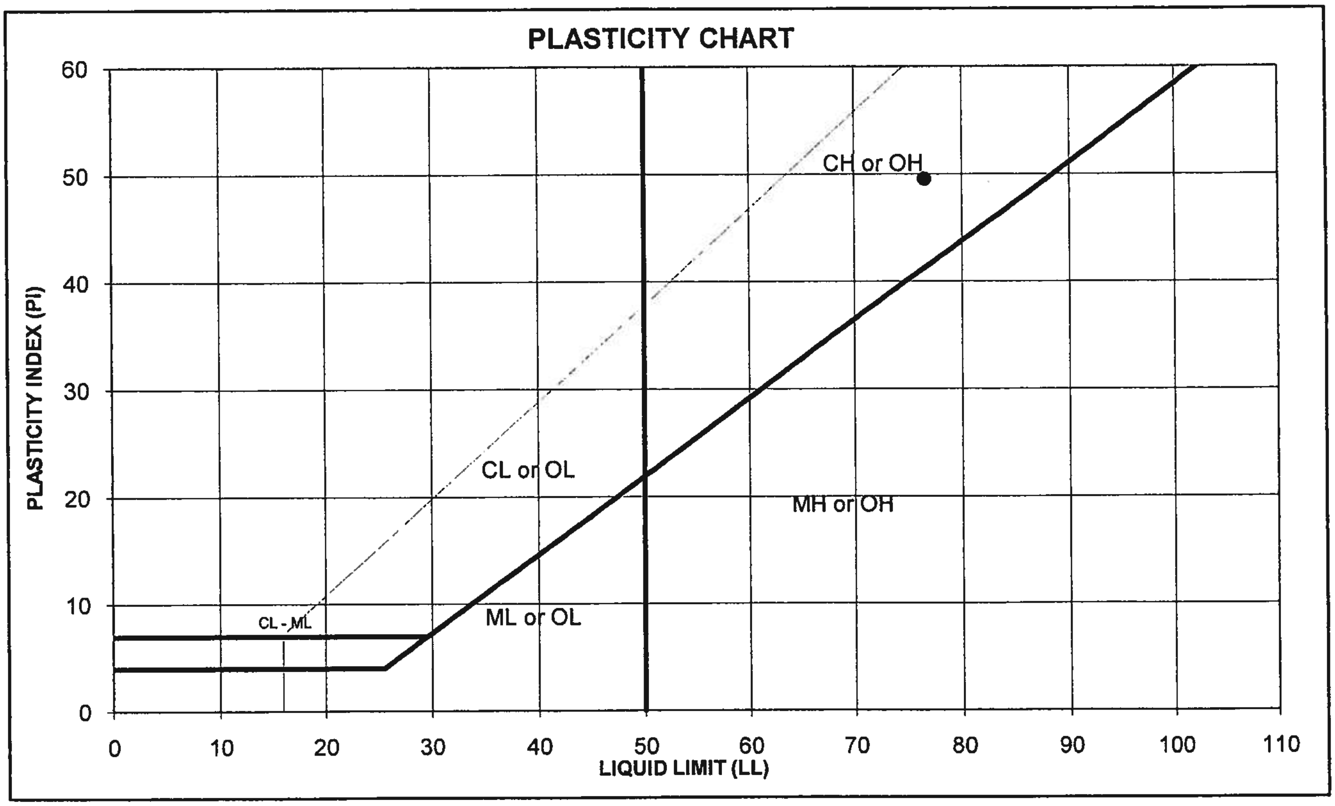
PLASTICITY INDEX (PI): 50

LIQUIDITY INDEX (LI): 0.22

NOTE:

DESCRIPTION: Brown & Gray, CLAY, trace of sand

USCS: CH



TECH	FC
DATE	21-Aug-07
CHECK	PCM
REVIEW	MNH

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: AMEREN / MERAMEC
PROJECT NUMBER: 073-84012
SAMPLE ID: PZ-3 S-007
SAMPLE DEPTH: 29 - 30.5'
SAMPLE TYPE: BAG

SAMPLE PREPARATION

Wet or Dry: Wet

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION		LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows			20	20	
Weight of Wet Soil & Tare (gm)	27.46	26.96	51.97	52.54	71.27
Weight of Dry Soil & Tare (gm)	25.60	25.12	40.32	40.97	56.91
Weight of Tare (gm)	17.22	16.78	20.91	21.75	19.59
Weight of Water (gm)	1.86	1.84	11.65	11.57	14.36
Weight of Dry Soil (gm)	8.38	8.34	19.41	19.22	37.32
Water Content %	22.20	22.06	60.02	60.20	38.48

	TRIAL 1	TRIAL 2
BLOWS:	20	20
K VALUE:	0.974	0.974

PLASTIC LIMIT (PL) 22

LIQUID LIMIT (LL) 59

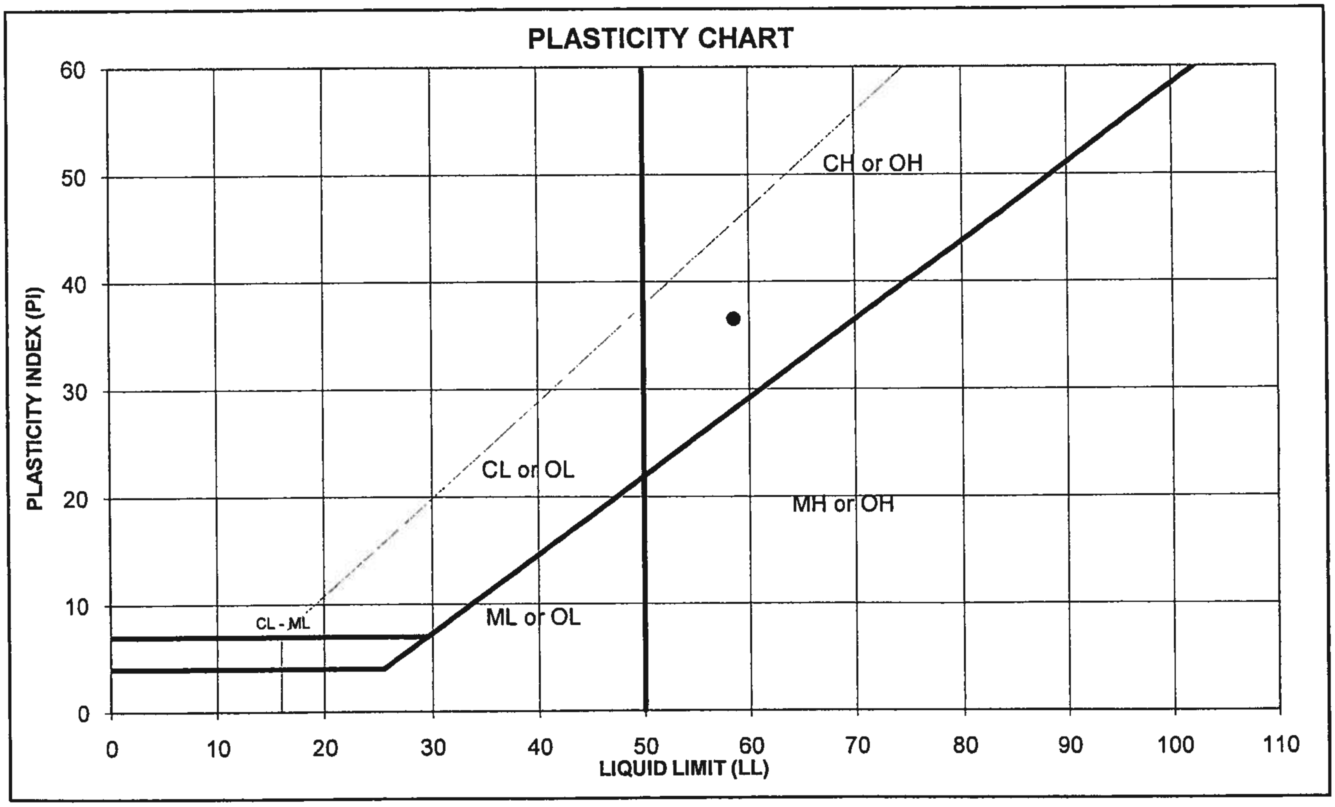
PLASTICITY INDEX (PI) 37

LIQUIDITY INDEX (LI) 0.45

NOTE:

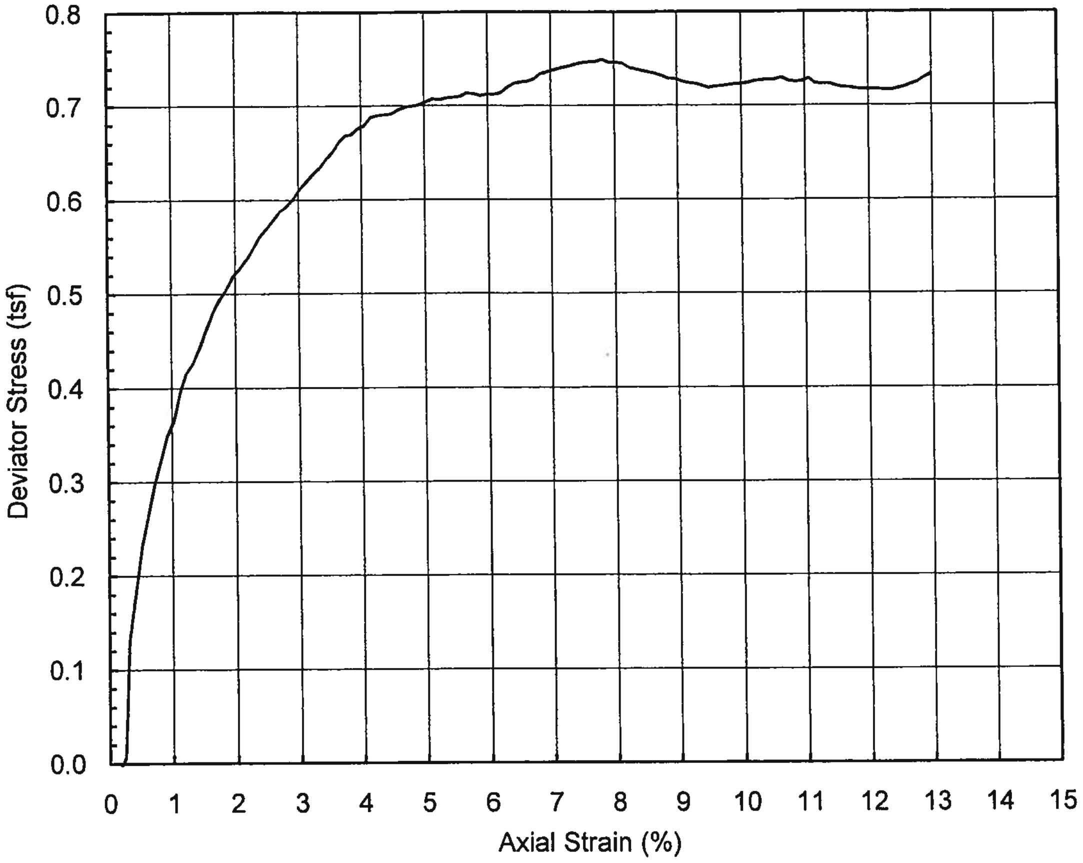
DESCRIPTION Brown, CLAY, some silt

USCS CH



TECH	FC
DATE	20-Aug-07
CHECK	PCM
REVIEW	MNH

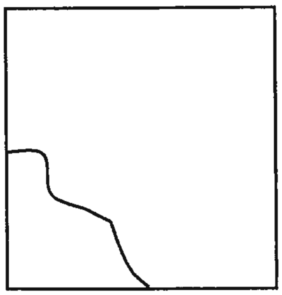
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Brown and Gray Clay with some Sand						
LL	61	PI	38	LI	0.4	USCS	CH

Depth (ft)	14.50	Confining Pressure (psi)	13.0
Specimen Height (inch)	5.915	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.836	Peak Deviator Stress (tsf)	0.75
Initial Specimen Weight (g)	1127.3	Axial Strain at Peak Stress (%)	7.8
Moist Unit Weight (pcf)	115.0		
Initial Water Content (%)	37.1		
Initial Dry Unit Weight (pcf)	83.8		

Project Title	Ameren / Meramec
Project Number	073-84012
Sample Type	Shelby Tube
Sample ID	PZ-1 S-3
Comments	

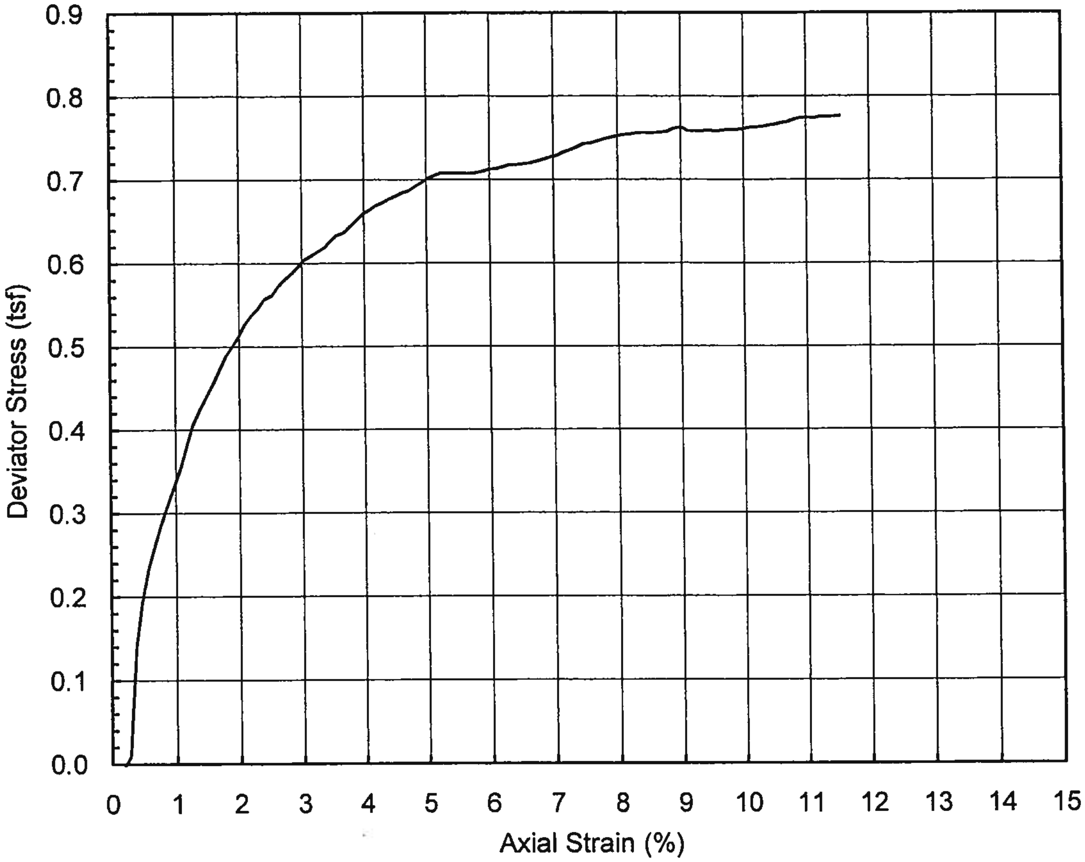


Failure Sketch

Golder Associates

Performed by	PN
Date	20-Aug-07
Check	PCM
Review	MNH

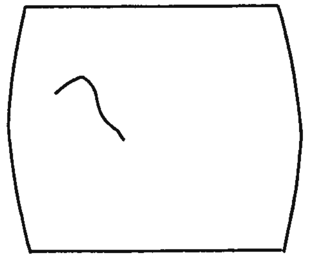
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Specimen Description	Brown & Gray Clay with trace of sand						
LL	77	PI	50	LI	0.2	USCS	CH

Depth (ft)	14.00	Confining Pressure (psi)	13.0
Specimen Height (inch)	5.950	Strain Rate (%/min)	1.0
Specimen Diameter (inch)	2.853	Peak Deviator Stress (tsf)	0.78
Initial Specimen Weight (g)	1118.3	Axial Strain at Peak Stress (%)	11.5
Moist Unit Weight (pcf)	112.0		
Initial Water Content (%)	37.9		
Initial Dry Unit Weight (pcf)	81.2		

Project Title	Ameren / Meramec
Project Number	073-84012
Sample Type	Shelby Tube
Sample ID	PZ-3 S-3
Comments	



Failure Sketch

Performed by	PN
Date	20-Aug-07
Check	PCM
Review	MNH

Golder Associates

APPENDIX D
SLUG TESTING ANALYSIS FORMS

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-1

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

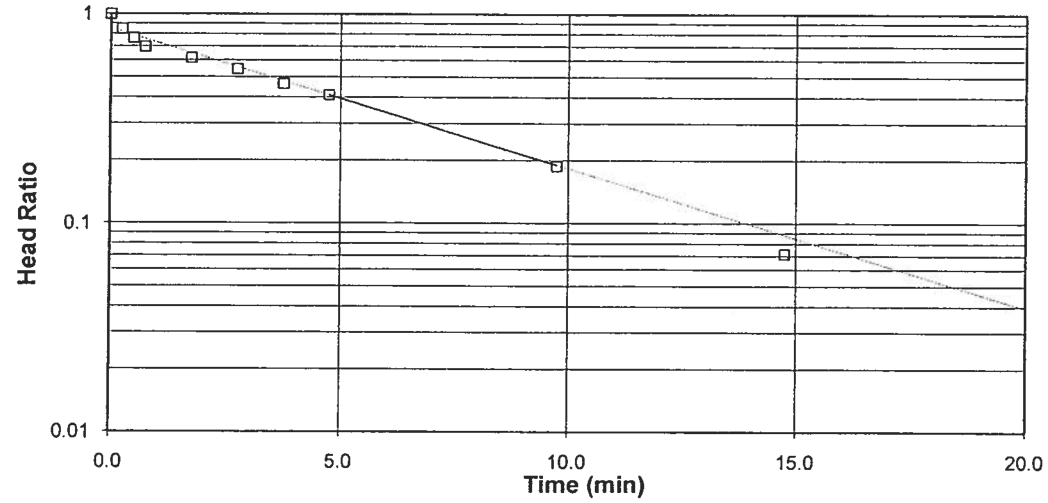
where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 9.6
t_1 = 4.75
t_2 = 9.75
h_1/h_0 = 0.41
h_2/h_0 = 0.19

RESULTS

K=	1.03E-04	cm/sec
K=	2.92E-01	ft/day



Project Name: Meramec Fly Ash
Project No.: 073-84012
Test Date: 08/17/07

Analysis By: JCW
Checked By: MSL
Analysis Date: 2/26/2008

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-2

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:

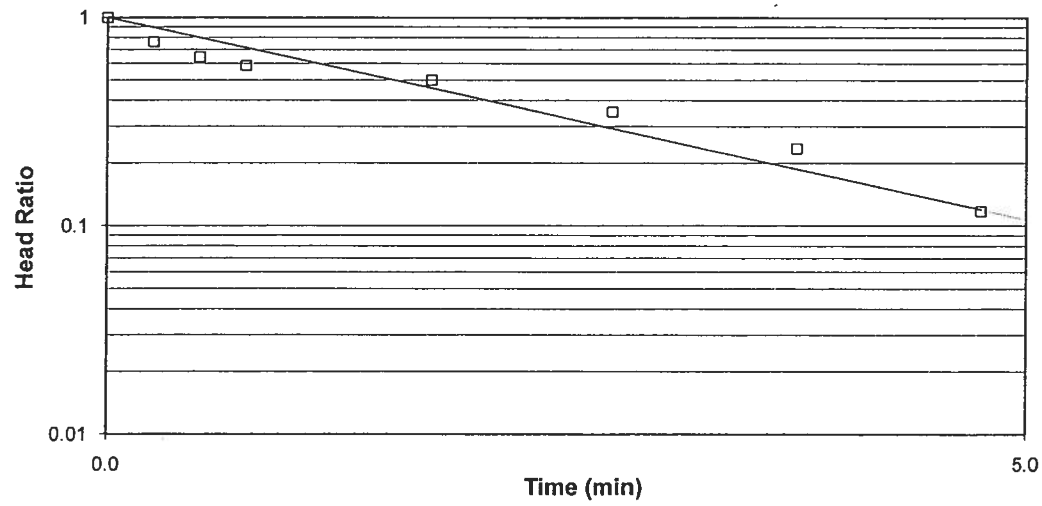
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 6.17
t_1 = 0
t_2 = 4.75
h_1/h_0 = 1.00
h_2/h_0 = 0.12

RESULTS

K= 4.09E-04 cm/sec
K= 1.16E+00 ft/day



Project Name: Meramec Fly Ash
Project No.: 073-84012
Test Date: 08/17/07

Analysis By: JCW
Checked By: MSL
Analysis Date: 2/26/2008

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-3

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

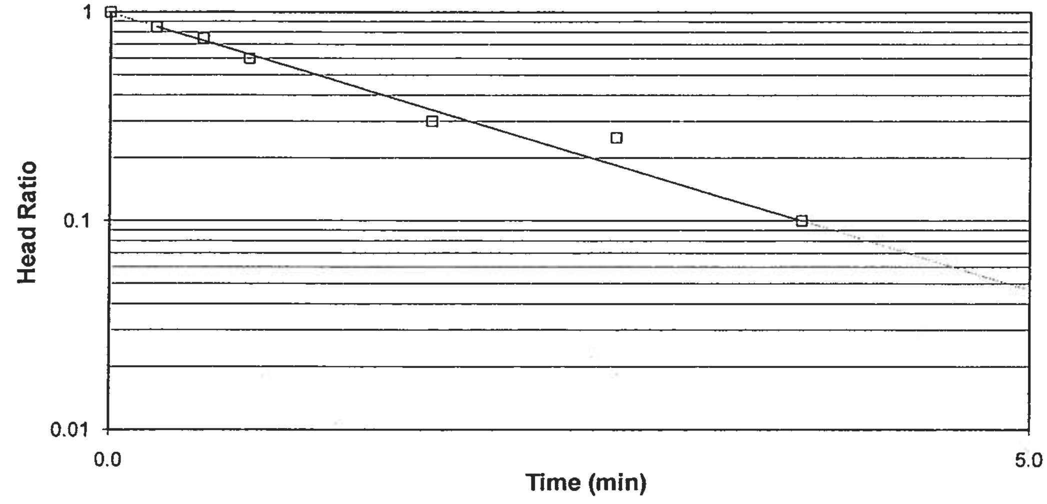
where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c =	0.08
R_e =	0.25
L_e =	3.59
t_1 =	0.25
t_2 =	3.75
h_1/h_0 =	0.85
h_2/h_0 =	0.10

RESULTS

K=	8.00E-04	cm/sec
K=	2.27E+00	ft/day



Project Name: Meramec Fly Ash
Project No.: 073-84012
Test Date: 08/17/07

Analysis By: JCW
Checked By: MSL
Analysis Date: 2/26/2008

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-4

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

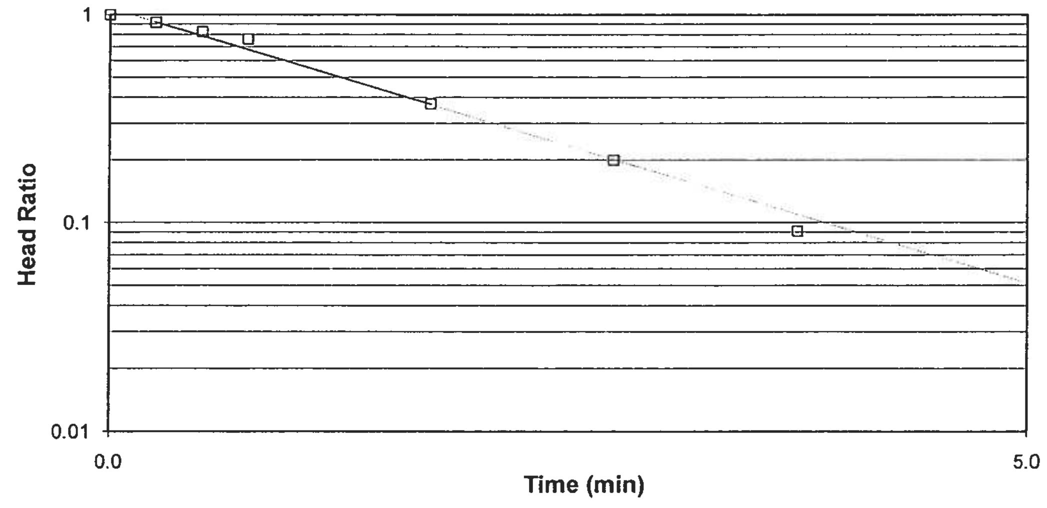
where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 9.6
t_1 = 0.25
t_2 = 1.75
h_1/h_0 = 0.92
h_2/h_0 = 0.37

RESULTS

K=	4.07E-04	cm/sec
K=	1.15E+00	ft/day



Project Name: Meramec Fly Ash
Project No.: 073-84012
Test Date: 08/17/07

Analysis By: JCW
Checked By: MSL
Analysis Date: 2/26/2008

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-5

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

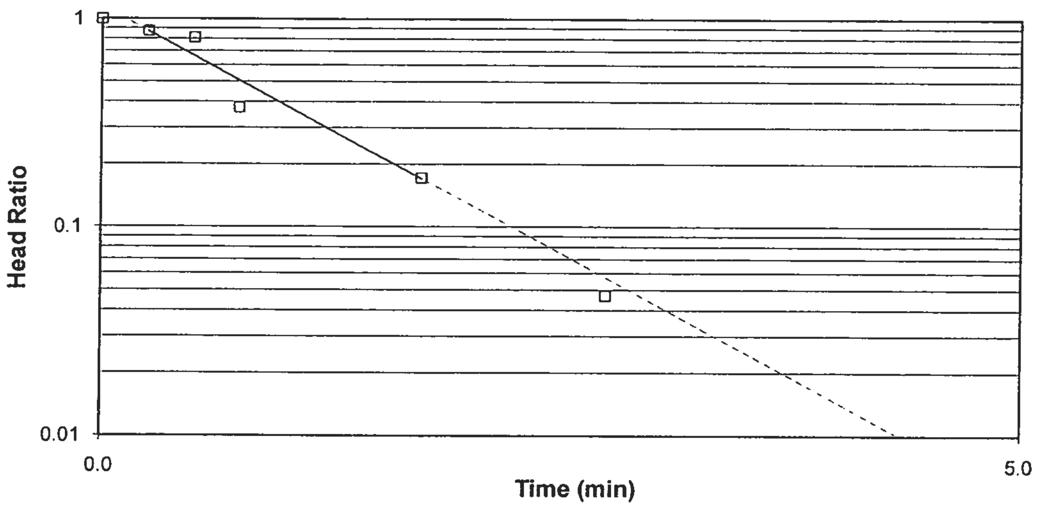
where: r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS

r_c = 0.08
R_e = 0.25
L_e = 7.93
t_1 = 0.25
t_2 = 1.75
h_1/h_0 = 0.87
h_2/h_0 = 0.17

RESULTS

K= 8.37E-04 cm/sec
K= 2.37E+00 ft/day



Project Name: Meramec Fly Ash
Project No.: 073-84012
Test Date: 08/17/07

Analysis By: JCW
Checked By: MSL
Analysis Date: 2/26/2008

APPENDIX A

DOC 1.6 AVAILABLE INFORMATION CHECKLISTS

Available Information Checklist

Coal Combustion Waste Impoundment (CCWI) Dam

MERAMEC RETENTION POND

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
1. Descriptive Information:	X		
a) Impoundment Capacity (Normal & Max) **(435600 FT^3 ORIGINAL DESIGN)**	X		
b) Impoundment Surface Area (0.7 ACRES)	X		
c) Hazard Classification (CLASS III)	X		
d) Freeboard (Normal & Min) **(10 FT NORMAL 2 FT MIN)**	X		
e) Maximum Dam Height (24.7 FT)	X		
f) Dam Crest Elevation (414 FT)	X		
g) Crest Width (15 FT)	X		
h) Upstream Slope Inclination (3H 1V)	X		
i) Downstream Slope Inclination (3H 1V)	X		
j) Spillway Type, Size, & Crest Elevation			X
k) Outlet Condit Type, Size, & Max Flow Capacity (24 INCH DIAMETER CS PIPE – 30CFS	X		
l) Historical Maximum Pond Elevation	X		
m) Year Built	X		
n) Design Life (MAY VARY)	X		
o) Specific Wastes Permitted in Impoundment	X		
p) Other (describe)			
2. Regional Map showing CCWI & schools, hospitals, etc. w/i 5 mi downgradient		X	
3. Management Unit Dwgs:			
a) Plans	X		
b) Sections	X		
c) Elevations	X		
d) Other (describe)			
4. Design Information:			
a) Name of Designer of Record	X		
b) Design Assumptions			X
c) Design Analyses			X

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
d) Spillway Design Flood or Design Basis			X
e) Slope Stability Factors of Safety (ONGOING STABILITY ANALYSIS)			X
f) Design Soil Properties and Parameters (ONGOING STABILITY ANALYSIS)			X
g) Other (describe)			
5. Permits:			
a) NPDES? Number? MO-0000361	X		
b) Dam Safety - Operating Permit? Number?			X
c) Other (describe)			
6. Subsurface Information:			
a) Geology	X		
b) Geotechnical Report	X		
c) Test Boring Logs	X		
d) Subsurface Profiles	X		
f) Other (describe)			
7. Monitoring Information:			
a) Observation Wells/Piezometer Readings			X
b) Seepage Readings		X	
c) Settlement Readings		X	
d) Alignment Readings		X	
e) Inclinometer Readings			X
f) Time vs Reading Graphs			X
g) Other (describe)			
8. Instrumentation Dwgs:			
a) Location Plan			X
b) Section Views			X
c) Other (describe)			

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
9. Operation, Maintenance, & Surveillance:			
a) Operating Procedures			
b) Maintenance Procedures			
c) Inspection Procedures	X		
d) Third Party Inspection Reports			
e) Other (describe)			
10. Emergency Action Plan		X	
11. Inundation Map			X

Outfalls 003
[illegible] 007
489

Available Information Checklist

Coal Combustion Waste Impoundment (CCWI) Dam

MERAMEC POND 489

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
1. Descriptive Information:	X		
a) Impoundment Capacity (Normal & Max) **(13068000 FT^3 ORIGINAL DESIGN)**	X		
b) Impoundment Surface Area (17.6 ACRES)	X		
c) Hazard Classification (CLASS III)	X		
d) Freeboard (Normal & Min) **(4.4 FT NORMAL 2 FT MIN)**	X		
e) Maximum Dam Height (24.7 FT)	X		
f) Dam Crest Elevation (420.2 FT)	X		
g) Crest Width (15 FT)	X		
h) Upstream Slope Inclination (3H 1V)	X		
i) Downstream Slope Inclination (1.5H:1V)	X		
j) Spillway Type, Size, & Crest Elevation			X
k) Outlet Condit Type, Size, & Max Flow Capacity (36 INCH DIAMETER HDPE - 54 CFS)	X		
l) Historical Maximum Pond Elevation	X		
m) Year Built	X		
n) Design Life (MAY VARY)	X		
o) Specific Wastes Permitted in Impoundment	X		
p) Other (describe)			
2. Regional Map showing CCWI & schools, hospitals, etc. w/i 5 mi downgradient		X	
3. Management Unit Dwgs:			
a) Plans	X		
b) Sections	X		
c) Elevations	X		
d) Other (describe)			
4. Design Information:			
a) Name of Designer of Record	X		
b) Design Assumptions			X
c) Design Analyses			X

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
d) Spillway Design Flood or Design Basis			X
e) Slope Stability Factors of Safety (ONGOING STABILITY ANALYSIS)			X
f) Design Soil Properties and Parameters (ONGOING STABILITY ANALYSIS)			X
g) Other (describe)			
5. Permits:			
a) NPDES? Number? MO-0000361	X		
b) Dam Safety - Operating Permit? Number?			X
c) Other (describe)			
6. Subsurface Information:			
a) Geology	X		
b) Geotechnical Report	X		
c) Test Boring Logs	X		
d) Subsurface Profiles	X		
f) Other (describe)			
7. Monitoring Information:			
a) Observation Wells/Piezometer Readings			X
b) Seepage Readings		X	
c) Settlement Readings		X	
d) Alignment Readings		X	
e) Inclinometer Readings			X
f) Time vs Reading Graphs			X
g) Other (describe)			
8. Instrumentation Dwgs:			
a) Location Plan			X
b) Section Views			X
c) Other (describe)			

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
9. Operation, Maintenance, & Surveillance:			
a) Operating Procedures			
b) Maintenance Procedures			
c) Inspection Procedures	X		
d) Third Party Inspection Reports			
e) Other (describe)			
10. Emergency Action Plan		X	
11. Inundation Map			X

Available Information Checklist

Coal Combustion Waste Impoundment (CCWI) Dam

MERAMEC FLY ASH POND 498

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
1. Descriptive Information:	X		
a) Impoundment Capacity (Normal & Max) **(10018800 FT^3 ORIGINAL DESIGN)**	X		
b) Impoundment Surface Area (13.5 ACRES)	X		
c) Hazard Classification (CLASS III)	X		
d) Freeboard (Normal & Min) **(5 FT NORMAL 2 FT MIN)**	X		
e) Maximum Dam Height (24.7 FT)	X		
f) Dam Crest Elevation (423 FT)	X		
g) Crest Width (15 FT)	X		
h) Upstream Slope Inclination (3H 1V)	X		
i) Downstream Slope Inclination (3H:1V)	X		
j) Spillway Type, Size, & Crest Elevation			X
k) Outlet Condit Type, Size, & Max Flow Capacity (24 INCH DIAMETER HDPE PIPE	X		
l) Historical Maximum Pond Elevation	X		
m) Year Built	X		
n) Design Life (MAY VARY)	X		
o) Specific Wastes Permitted in Impoundment	X		
p) Other (describe)			
2. Regional Map showing CCWI & schools, hospitals, etc. w/i 5 mi downgradient		X	
3. Management Unit Dwgs:			
a) Plans	X		
b) Sections	X		
c) Elevations	X		
d) Other (describe)			
4. Design Information:			
a) Name of Designer of Record	X		
b) Design Assumptions			X
c) Design Analyses			X

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
d) Spillway Design Flood or Design Basis			X
e) Slope Stability Factors of Safety (ONGOING STABILITY ANALYSIS)			X
f) Design Soil Properties and Parameters (ONGOING STABILITY ANALYSIS) ✓			X
g) Other (describe)			
5. Permits:			
a) NPDES? **Number? MO-0000361**	X		
b) Dam Safety - Operating Permit? **Number?**			X
c) Other (describe)			
6. Subsurface Information:			
a) Geology	X		
b) Geotechnical Report	X		
c) Test Boring Logs	X		
d) Subsurface Profiles	X		
f) Other (describe)			
7. Monitoring Information:			
a) Observation Wells/Piezometer Readings			X
b) Seepage Readings		X	
c) Settlement Readings		X	
d) Alignment Readings		X	
e) Inclinometer Readings			X
f) Time vs Reading Graphs			X
g) Other (describe)			
8. Instrumentation Dwgs:			
a) Location Plan			X
b) Section Views			X
c) Other (describe)			

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
9. Operation, Maintenance, & Surveillance:			
a) Operating Procedures			
b) Maintenance Procedures			
c) Inspection Procedures	X		
d) Third Party Inspection Reports			
e) Other (describe)			
10. Emergency Action Plan		X	
11. Inundation Map			X

Available Information Checklist

Coal Combustion Waste Impoundment (CCWI) Dam

MERAMEC BOTTOM ASH POND

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
1. Descriptive Information:	X		
a) Impoundment Capacity (Normal & Max) **(12196800 FT^3 ORIGINAL DESIGN)**	X		
b) Impoundment Surface Area (14 ACRES)	X		
c) Hazard Classification (CLASS III)	X		
d) Freeboard (Normal & Min) **(7.9 FT NORMAL 2 FT MIN)**	X		
e) Maximum Dam Height (24.7 FT)	X		
f) Dam Crest Elevation (417.4 FT)	X		
g) Crest Width (15 FT)	X		
h) Upstream Slope Inclination (3H 1V)	X		
i) Downstream Slope Inclination (3H:1V)	X		
j) Spillway Type, Size, & Crest Elevation			X
k) Outlet Condit Type, Size, & Max Flow Capacity (18 INCH DIAMETER CS PIPE)	X		
l) Historical Maximum Pond Elevation	X		
m) Year Built	X		
n) Design Life (MAY VARY)	X		
o) Specific Wastes Permitted in Impoundment	X		
p) Other (describe)			
2. Regional Map showing CCWI & schools, hospitals, etc. w/i 5 mi downgradient		X	
3. Management Unit Dwgs:			
a) Plans	X		
b) Sections	X		
c) Elevations	X		
d) Other (describe)			
4. Design Information:			
a) Name of Designer of Record	X		
b) Design Assumptions			X
c) Design Analyses			X

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
d) Spillway Design Flood or Design Basis			X
e) Slope Stability Factors of Safety (ONGOING STABILITY ANALYSIS)			X
f) Design Soil Properties and Parameters (ONGOING STABILITY ANALYSIS)			X
g) Other (describe)			
5. Permits:			
a) NPDES? Number? MO-0000361 ✓	X		
b) Dam Safety - Operating Permit? Number?			X
c) Other (describe)			
6. Subsurface Information:			
a) Geology	X		
b) Geotechnical Report	X		
c) Test Boring Logs	X		
d) Subsurface Profiles	X		
f) Other (describe)			
7. Monitoring Information:			
a) Observation Wells/Piezometer Readings			X
b) Seepage Readings		X	
c) Settlement Readings		X	
d) Alignment Readings		X	
e) Inclinometer Readings			X
f) Time vs Reading Graphs			X
g) Other (describe)			
8. Instrumentation Dwgs:			
a) Location Plan			X
b) Section Views			X
c) Other (describe)			

Available Information Checklist (Continued)

Coal Combustion Waste Impoundment (CCWI) Dam

ITEM DESCRIPTION	PROVIDED BY UTILITY		
	YES	NO	N/A
9. Operation, Maintenance, & Surveillance:			
a) Operating Procedures			
b) Maintenance Procedures			
c) Inspection Procedures	X		
d) Third Party Inspection Reports			
e) Other (describe)			
10. Emergency Action Plan		X	
11. Inundation Map			X

APPENDIX A

DOC 1.7 MISSOURI STATE OPERATING PERMIT

STATE OF MISSOURI
Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

February 22, 2002

AmerenUE
One Ameren Plaza
PO Box 66149 (MC-602)
St. Louis, MO 63166

Dear Permittee:

State Operating Permit No. MO-0000361 originally issued on May 19, 2000 is hereby modified as per the enclosed. This modification increases the daily maximum limit on thermal discharges. The attached permit is for your official record.

Please read your permit and attached Standard Conditions. They contain important information on monitoring requirements, effluent limitations, sampling frequencies and reporting requirements.

This modification does not affect any monitoring or analysis of the effluent that may be necessary to comply with other requirements of your permit or other state regulations and does not in any way relieve you of your obligations to achieve the final effluent limitations as provided in the permit.

This permit is both your federal discharge permit and your new state operating permit and replaces all previous state operating permits for this facility. In all future correspondence regarding this facility, please refer to your state operating permit number and facility name as shown on page one of the permit.

If you have any questions concerning this permit, please do not hesitate to call this office or our St. Louis Regional Office, 9200 Watson Road, Suite 201, St. Louis, MO 63127-1017.

Sincerely,

WATER POLLUTION CONTROL PROGRAM

Philip A. Schroeder, Chief
Permit Section

PAS:jc

Enclosure

c: St. Louis Regional Office

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No. MO-0000361

Owner: Union Electric Company
Address: One Ameren Plaza, P.O. Box 66149, St. Louis, MO 63166

Continuing Authority: Same as above
Address: Same as above

Facility Name: Ameren UE, Meramec Power Plant
Facility Address: 8200 Fine Road, St. Louis, MO 63129

Legal Description: SW ¼, Sec. 3, T42N, R6E, St. Louis County
Latitude/Longitude: See page 2

Receiving Stream: See page 2
First Classified Stream and ID: See page 2
USGS Basin & Sub-watershed No.: See page 2

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

See page 2

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051.6 of the Law.

May 19, 2000
Effective Date

February 22, 2002
Revised

May 18, 2005
Expiration Date

Stephen M. Mahfood, Director, Department of Natural Resources
Executive Secretary, Clean Water Commission

Interim Director of Staff, Clean Water Commission

MO 780-0041 (10-93)

FACILITY DESCRIPTION (continued)

Outfall #001 - Power Plant - SIC #4911

Non-contact cooling water.
Design flow is 245 MGD.
Actual flow is 134 MGD.
Latitude/Longitude: +3824039/-09019574
Receiving Stream: Mississippi River (P)
First Classified Stream and ID: Mississippi River (P) (01707)
USGS Basin & Sub-watershed No.: (07140101-070004)

Outfall #002 - Power Plant - SIC #4911

Non-contact cooling water.
Design flow is 405 MGD.
Actual flow is 251 MGD.
Latitude/Longitude: +3824039/-09019574
Receiving Stream: Mississippi River (P)
First Classified Stream and ID: Mississippi River (P) (01707)
USGS Basin & Sub-watershed No.: (07140101-070004)

Outfall #003 - Power Plant - SIC #4911

Bottom ash pond/stormwater.
Design flow is 22.8 MGD.
Actual flow is 0.95 MGD.
Latitude/Longitude: +3824289/-09020362
Receiving Stream: Unnamed Tributary to Meramec River (U)
First Classified Stream and ID: Meramec River (P) (02183)
USGS Basin & Sub-watershed No.: (07140102-080004)

Outfall #004 - Domestic (Human) Sewage - SIC #4952

Extended aeration/sewage treatment plant/sludge disposal is by contract hauler.
Design population equivalent is 238.
Design flow is 0.046 MGD.
Actual flow is 0.028 MGD.
Design sludge production is 4.28 dry tons/year.
Latitude/Longitude: +3823586/-09020033
Receiving Stream: Mississippi River (P)
First Classified Stream and ID: Mississippi River (P) (01707)
USGS Basin & Sub-watershed No.: (07140101-070004)

Outfall #005

Emergency overflow from combined drain sump.
Design flow is 2.0 MGD.
Actual flow is 0.0 MGD.
Latitude/Longitude: +3823586/-09020033
Receiving Stream: Mississippi River (P)
First Classified Stream and ID: Mississippi River (P) (01707)
USGS Basin & Sub-watershed No.: (07140101-070004)

Outfall #006

Caisson sump/screen wash.
Design flow is 1.5 MGD.
Actual flow is 0.43 MGD.
Latitude/Longitude: +3824037/-09019555
Receiving Stream: Mississippi River (P)
First Classified Stream and ID: Mississippi River (P) (01707)
USGS Basin & Sub-watershed No.: (07140101-070004)

FACILITY DESCRIPTION (continued)

Outfall #007
Storm water runoff from the paved employee parking lot and an area which surrounds the oil storage building.
36-inch concrete pipe.
Design flow is 0.39 MGD.
This outfall will not be monitored during this permit period.
Latitude/Longitude: +3824030/-09019569
Receiving Stream: Mississippi River (P)
First Classified Stream and ID: Mississippi River (P) (01707)
USGS Basin & Sub-watershed No.: (07140101-070004)

Outfall #008
Storm water runoff from the plant access road and adjacent lawn areas.
24-inch corrugated metal pipe.
Design flow is 0.123 MGD.
This outfall will not be monitored during this permit period.
Latitude/Longitude: +3824323/-09020193
Receiving Stream: Unnamed Tributary to Meramec River (U)
First Classified Stream and ID: Meramec River (P) (02183)
USGS Basin & Sub-watershed No.: (07140102-080004)

Outfall #009 - Power Plant - SIC #4911
Flyash pond #489/storm water/low volume waste.
Design flow is 14.9 MGD.
Actual flow is 8.0 MGD.
Latitude/Longitude: +3823565/-09020411
Receiving Stream: Meramec River (P)
First Classified Stream and ID: Meramec River (P) (02183)
USGS Basin & Sub-watershed No.: (07140102-080004)

PERMIT NUMBER MO-0000361

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges hall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MONITORING REQUIREMENTS MEASUREMENT FREQUENCY	SAMPLE TYPE
<u>Outfall #001</u> - non-contact Cooling water						
Flow	MGD	*		*	once/weekday**	24 hr. estimate
Temperature, Intake	°F	*		*	once/weekday**	grab
Temperature, Outfall	°F	*		*	once/weekday**	grab
Thermal Discharge	btu/hr	$1.54x10^9$		*	once/weekday**	n/a
<u>Outfall #002</u> - non-contact cooling water						
Flow	MGD	*		*	once/weekday**	24 hr. estimate
Temperature, Intake	°F	*		*	once/weekday**	grab
Temperature, Outfall	°F	*		*	once/weekday**	grab
Thermal Discharge	btu/hr	$3.23x10^9$			once/weekday**	n/a
<u>Outfall #003</u> - ash pond						
low	MGD	*		*	once/week	24 hr. estimate
Intake Total Suspended Solids***	mg/L	*		*	once/week	grab
Effluent Total Suspended Solids***	mg/L	*		*	once/week	grab
Net Total Suspended Solids***	mg/L	100		30	once/week	grab
Oils and Grease	mg/L	20		15	once/month	grab
pH - Units	SU	****		****	once/week	grab
Sulfate (as SO^4)	mg/L	*		*	once/quarter*****	grab

MONITORING REPORTS SHALL BE SUBMITTED <u>QUARTERLY</u>, THE FIRST REPORT IS DUE <u>July 28, 2002.</u>

Whole Effluent Toxicity (WET) Test	% Survival	(See Special Condition #3)	initial/year	grab

MONITORING REPORTS SHALL BE SUBMITTED <u>ANNUALLY</u>; THE FIRST REPORT IS DUE <u>October 28, 2002</u>. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.

B. STANDARD CONDITIONS

IN ADDITION TO SPECIFIED CONDITIONS STATED HEREIN, THIS PERMIT IS SUBJECT TO THE ATTACHED <u>Parts I & III</u> STANDARD CONDITIONS DATED <u>October 1, 1980 and August 15, 1994</u>, AND HEREBY INCORPORATED AS HOUGH FULLY SET FORTH HEREIN.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

PAGE NUMBER 5 of 12

PERMIT NUMBER MO-0000361

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges shall controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Outfall #004 - Sewage treatment plant						
Flow	MGD	*		*	once/month	24 hr. estimate
Biochemical Oxygen Demand$_5$	mg/L		45	30	once/quarter*****	******
Total Suspended Solids	mg/L		45	30	once/quarter*****	******
pH - Units	SU	****		****	once/quarter*****	grab
Aeration Tank Testing						
Total Suspended Solids	mg/L	*		*	once/month	grab
Settleability	mg/L	*		*	once/month	grab
Dissolved Oxygen	mg/L	*		*	once/month	grab
Outfall #005 - emergency sump overflow						
Flow	MGD	*		*	(Note 2)	24 hr. estimate
Total Suspended Solids***	mg/L	100		30	(Note 2)	grab
Oil and Grease	mg/L	20		15	(Note 2)	grab
pH - Units	SU	****		****	(Note 2)	grab
Outfall #006 -caisson sump						
Flow	MGD	*		*	once/quarter*****	24 hr. estimate
Total Suspended Solids***	mg/L	*		*	once/quarter*****	(Note 3)
Oil & Grease	mg/L	20		15	once/quarter*****	(Note 3)
pH - Units	SU	*******		*******	once/quarter*****	(Note 3)

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE July 28, 2002.

B. STANDARD CONDITIONS

IN ADDITION TO SPECIFIED CONDITIONS STATED HEREIN, THIS PERMIT IS SUBJECT TO THE ATTACHED Parts I & III STANDARD CONDITIONS DATED October 1, 1980 and August 15, 1994, AND HEREBY INCORPORATED AS THOUGH FULLY SET FORTH HEREIN.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS	PAGE NUMBER 6 of 12 PERMIT NUMBER MO-0000361

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges hall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Outfalls #007 & #008 - (See Special Condition 15)						
Outfall #009 - Flyash Pond #489						
Flow	MGD	*		*	once/week	24 hr. estimate
Intake Total Suspended Solids***	mg/L	*		*	once/week	grab
Effluent Total Suspended Solids***	mg/L	*		*	once/week	grab
Net Total Suspended Solids***	mg/L	100		30	once/week	grab
Oil and Grease	mg/L	20		15	once/month	grab
pH - Units	SU	****		****	once/week	grab
Sulfate (as SO^4)	mg/L	*		*	once/quarter*****	grab
hole Effluent Toxicity (WET) test	% Survival	See Special Condition #3			initial/year	grab

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE July 28, 2002. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.

B. STANDARD CONDITIONS

IN ADDITION TO SPECIFIED CONDITIONS STATED HEREIN, THIS PERMIT IS SUBJECT TO THE ATTACHED Parts I & III STANDARD CONDITIONS DATED October 1, 1980 and August 15, 1994, AND HEREBY INCORPORATED AS THOUGH FULLY SET FORTH HEREIN.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

* Monitoring requirement only.

** One each weekday means: Monday, Tuesday, Wednesday, Thursday and Friday.

*** Intake Total Suspended Solids values may be used to calculate "net" limitations, however permittee must continue to maintain the ash pond system for adequate retention time for settling. River solids present in intake water are "treated" in the ash pond system but treatment levels are dependent on concentration and types of river solids present in intake water.

**** pH is measured in pH units and is not to be averaged. The pH is limited to the range of 6.0-9.0 pH units.

***** Once per quarter in the months of February, May, August and November.

****** A composite sample made up from a minimum of four grab samples collected within a 24 hour period with a minimum of two hours between each grab sample.

******* pH is limited to not less than 6.0 nor greater than the source water. A pH analysis of the source water shall accompany the Discharge Monitoring Reports.

Note 1 - Reserved.

Note 2 - Measurement frequency shall be once/day when discharge occurs. Monitor only when discharge occurs. Report as no-discharge when a discharge does not occur during the report period.

Note 3 - Individual grab samples shall be collected from each Cassion sump and immediately composited for analysis. These samples will be collected prior to mixing with river water used for screen washing.

C. SPECIAL CONDITIONS

1. This permit may be reopened and modified, or alternatively revoked and reissued, to:
   (a) Comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
      (1) contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
      (2) controls any pollutant not limited in the permit.
   (b) Incorporate new or modified effluent limitations or other conditions, if the result of a waste load allocation study, toxicity test or other information indicates changes are necessary to assure compliance with Missouri's Water Quality Standards.
   (c) Incorporate new or modified effluent limitations or other conditions if, as the result of a watershed analysis, a Total Maximum Daily Load (TMDL) limitation is developed for the receiving waters which are currently included in Missouri's list of waters of the state not fully achieving the state's water quality standards, also called the 303(d) list.

   The permit as modified or reissued under this paragraph shall also contain any other requirements of the Clean Water Act then applicable.

2. All outfalls must be clearly marked in the field.

C. SPECIAL CONDITIONS (continued)

. Whole Effluent Toxicity (WET) tests will be conducted as follows:

SUMMARY OF WET TESTING FOR THIS PERMIT				
OUTFALLS	A.E.C. %	FREQUENCY	SAMPLE TYPE	MONTH
#001, #002, #003 & #009	10%	annually	24 hr. composite	January

At the Ameren UE, Meramec Plant, Whole Effluent Toxicity (WET) tests will be required for Outfalls #001 and #002 only if biocides are used. If the WET test indicates toxicity in the first year of biocide use, the test must be run annually for the duration of the permit or until biocide use is discontinued.

a. Test Schedule and Follow-Up Requirements

(1) Perform a single-dilution test in the months and at the frequency specified above.

If the test passes the effluent limit do not repeat test until the next test period. Submit results with the annual report.
If the test fails the effluent limit a multiple dilution test shall be performed within 30 days, and biweekly thereafter until one of the following conditions are met:

(a) THREE CONSECUTIVE MULTIPLE-DILUTION TESTS PASS. No further tests need to be performed until next regularly scheduled test period.
(b) A TOTAL OF THREE MULTIPLE-DILUTION TESTS FAIL.

(2) The permittee shall submit a summary of all test results for the test series to the Planning Section of the WPCP, DNR, Box 176, Jefferson City, MO within 14 days of the third failed test. DNR will contact the permittee with initial guidance on conducting a toxicity identification evaluation (TIE) or toxicity reduction evaluation (TRE). The permittee shall submit a plan for conducting a TIE or TRE to the Planning Section of the WPCP within 60 days of the date of DNR's letter. This plan must be approved by DNR before the TIE or TRE is begun. A schedule for completing the TIE or TRE shall be established in the plan approval.

(3) Upon DNR's approval, the TIE/TRE schedule may be modified if toxicity is intermittent during the TIE/TRE investigations. A revised WET test schedule may be established by DNR for this period.

(4) If a previously completed TIE has clearly identified the cause of toxicity, additional TIEs will not be required as long as effluent characteristics remain essentially unchanged and the permittee is proceeding according to a DNR approved schedule to complete a TRE and reduce toxicity. Regularly scheduled WET testing as required in part b.(1) will be required during this period.

(5) In addition to the WET test summary report required in part (2), all failing test results shall be reported to DNR within 14 days of the availability of results.

(6) All WET test results for the reporting period shall be summarized and submitted to DNR by the end of the following October. When WET test sampling is required to run over one DMR period, each DMR report shall contain information generated during the reporting period.

<u>C. SPECIAL CONDITIONS</u> (continued)

[illegible]. Whole Effluent Toxicity (WET) tests (continued)

b. PASS/FAIL procedure and effluent limitations

(1) To pass a single-dilution test, mortality observed in the AEC test concentration shall not be significantly different (at the 95% confidence level; $p = 0.05$) than that observed in the upstream receiving-water control. The appropriate statistical tests of significance will be those outlined in the most current USEPA acute toxicity manual or those specified by the MDNR.

(2) To pass a multiple-dilution test:

(a) the computed percent effluent at the edge of the zone of initial dilution (AEC) must be less than three-tenths (0.3) of the LC_{50} concentration for the most sensitive of the test organisms, or,
(b) all dilutions equal to or greater than the AEC must be nontoxic. Failure of one multiple-dilution test is considered an effluent limit violation.

c. Test Conditions

(1) Test species: Ceriodaphnia dubia and fathead minnows, Pimephales promelas. Organisms used in WET testing should come from cultures reared for the purpose of conducting toxicity tests and should be cultured in a manner consistent with the most current USEPA guidelines. All test animals should be cultured as described in EPA-600/4-90/027.

(2) Test period: 48 hours at the "Acceptable Effluent Concentration" (AEC) specified above.

(3) When dilutions are required, upstream receiving stream water will be used as dilution water. If upstream water is unavailable or if mortality in the upstream water exceeds 10%, "reconstituted" water will be used. Procedures for generating reconstituted water will be supplied by the Department of Natural Resources (DNR).

(4) Tests should be initiated immediately after the sample is collected, but tests must be initiated no later than 36 hours after collection.

(5) Single-dilution tests will be run with:

(a) Effluent at the AEC concentration;
(b) 100% receiving-stream water (if available), collected upstream of the outfall at a point beyond any influence of the effluent; and
(c) reconstituted water.

(6) Multiple-dilution tests will be run with:

(a) 100%, 50%, 25%, 12.5%, and 6.25% effluent, unless the AEC is less than 25% effluent, in which case dilutions will be 4 times the AEC, two times the AEC, AEC, 1/2 AEC and 1/4 AEC.
(b) 100% receiving-stream water (if available), collected upstream of the outfall at a point beyond any influence of the effluent; and
(c) reconstituted water.

(7) If reconstituted-water control mortality for a test species exceeds 10%, the entire test will be rerun.

C. SPECIAL CONDITIONS (continued)

Changes in Discharges of Toxic Substances

The permittee shall notify the Director as soon as it knows or has reason to believe:

(a) That any activity has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:"
  (1) One hundred micrograms per liter (100 ug/L);
  (2) Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,5 dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
  (3) Five (5) times the maximum concentration value reported for the pollutant in the permit application;
  (4) The level established in Part A of the permit by the Director.

(b) That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant, which was not reported in the permit application.

5. Report as no-discharge when a discharge does not occur during the report period.

6. General Criteria. The following water quality criteria shall be applicable to all waters of the state at all times including mixing zones. No water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:

  (a) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
  (b) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;
  (c) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
  (d) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life;
  (e) There shall be no significant human health hazard from incidental contact with the water;
  (f) There shall be no acute toxicity to livestock or wildlife watering;
  (g) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community;
  (h) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247.

7. There shall be no discharge of polychlorinated biphenyl compounds.

8. Discharge of wastewater from this facility must not be alone or in combination with other sources cause the receiving stream to violate the following:

  (a) Water temperatures and temperature differentials specified in Missouri Water Quality Standards shall be met.

Any pesticide discharge from any point source shall comply with the requirements of Federal Insecticide, Fungicide and Rodenticide Act, as amended (7 U.S.C. 136 et. seq.) and the use of such pesticides shall be in a manner consistent with its label.

C. SPECIAL CONDITIONS (continued)

0. Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day.

11. An upset provision, identical to the upset provision set forth at 40 CFR 122.41(n), is hereby incorporated in this permit.

12. Sludge and Biosolids Use For Domestic Wastewater Treatment Facilities (Outfall #004)

    (a) Permittee shall comply with the pollutant limitations, monitoring, reporting, and other requirements in accordance with the attached permit Standard Conditions, Part III dated June 22, 1993.
    (b) Site-Specific conditions applicable to this facility are as follows: N/A

13. Treatment or Storage of Ash from Power Plants

    (a) Disposal of ash is not authorized by this permit.
    (b) This permit does not pertain to permits for disposal of ash or exemptions for beneficial uses of ash under the Missouri Solid Waste Management Law and regulations.
    (c) This permit does not authorize off-site storage, use or disposal of ash in regard to water pollution control permits required under 10 CSR 20-6.015 and 10 CSR 20-6.200.
    (d) Subsurface discharges from wastewater treatment ponds or ash ponds shall, at the property boundary, meet the effluent limitations for subsurface waters of the the state under 10 CSR 20-7.015(7), with appropriate consideration of up-gradient water quality.

14. Permittee is exempt from Clean Water Act section 311 reporting for sulfuric acid and sodium hydroxide as per 40 CFR 117.12.

15. Outfalls #007 & #008 - The company has elected to use best management practices (BMP's) on these outfalls. Monitoring is waived for this permit cycle. If problems occur, monitoring may be reestablished by the department. Periodic inspection of these outfalls will be carried out by AmerenUE to ascertain that BMP's are working.

SUMMARY OF TEST METHODOLOGY FOR WHOLE-EFFLUENT TOXICITY TESTS

Whole-effluent-toxicity test required in NPDES permits shall use the following test conditions when performing single or multiple dilution methods. Any future changes in methodology will be supplied to the permittee by the Missouri Department of Natural Resources (MDNR). Unless otherwise specified by MDNR, procedures should be consistent with Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, EPA/600/4-90/027.

Test conditions for *Ceriodaphnia dubia*:

Test duration:	48 h
Temperature:	25 ± 2°C
Light Quality:	Ambient laboratory illumination
Photoperiod:	16 h light, 8 h dark
Size of test vessel:	30 mL (minimum)
Volume of test solution:	15 mL (minimum)
Age of test organisms:	<24 h old
No. of animals/test vessel:	5
No. of replicates/concentration:	4
No. of organisms/concentration:	20 (minimum)
Feeding regime:	None (feed prior to test)
Aeration:	None
Dilution water:	Upstream receiving water; if no upstream flow, synthetic water modified to reflect effluent hardness.
Endpoint:	Mortality (Statistically significant difference from upstream receiving water control at p# 0.05)
Test acceptability criterion:	90% or greater survival in controls

Test conditions for (*Pimephales promelas*):

Test duration:	48 h
Temperature:	25 ± 2°C
Light Quality:	Ambient laboratory illumination
Photoperiod:	16 h light/ 8 h dark
Size of test vessel:	250 mL (minimum)
Volume of test solution:	200 mL (minimum)
Age of test organisms:	1-14 days (all same age)
No. of animals/test vessel:	10
No. of replicates/concentration:	4 (minimum) single dilution method 2 (minimum) multiple dilution method
No. of organisms/concentration:	40 (minimum) single dilution method 20 (minimum) multiple dilution method
Feeding regime:	None (feed prior to test)
Aeration:	None, unless DO concentration falls below 4.0 mg/L; rate should not exceed 100 bubbles/min.
Dilution water:	Upstream receiving water; if no upstream flow, synthetic water modified to reflect effluent hardness.
Endpoint:	Mortality (Statistically significant difference from upstream receiving water control at p# 0.05)

Test Acceptability criterion:90% or greater survival in controls

APPENDIX A

DOC 1.8 1995 FEMA FLOOD INSURANCE RATE MAP

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

ST. LOUIS COUNTY,
MISSOURI AND
INCORPORATED AREAS

PANEL 415 OF 420
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ST. LOUIS COUNTY, UNINCORPORATED AREAS	290327	0415	H

MAP NUMBER
29189C0415 H

EFFECTIVE DATE:
AUGUST 2, 1995

Federal Emergency Management Agency

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

APPENDIX A

DOC 1.9 EXCERPT FROM APPENDIX D OF THE 2004 USACE UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY

TABLE D-30 CONTINUED TABULAR RESULTS MISSISSIPPI RIVER FREQUENCY

RIVER MILE	STATION NAME	50.0%	20.0%	10.0%	5.0%	4.0%	2.0%	1.0%	0.5%	0.2%
158.21		397.3	402.8	405.8	408.5	409.4	411.9	413.9	414.9	416.8
158.50	WATERS POINT	397.4	402.9	406.0	408.6	409.6	412.0	414.0	415.0	417.0
158.67		397.5	403.0	406.0	408.7	409.6	412.1	414.1	415.1	417.1
159.23		397.8	403.3	406.3	409.0	410.0	412.4	414.4	415.4	417.4
159.73		398.1	403.6	406.6	409.3	410.2	412.7	414.6	415.7	417.7
160.18		398.3	403.8	406.8	409.6	410.5	413.0	414.9	415.9	417.9
160.71		398.6	404.1	407.1	409.8	410.8	413.3	415.1	416.2	418.2
160.71	MERAMEC RIVER	398.6	404.1	407.1	409.8	410.8	413.3	415.1	416.2	418.2
161.24		398.9	404.3	407.4	410.1	411.1	413.6	415.4	416.4	418.5
161.86		399.2	404.7	407.7	410.5	411.4	413.9	415.7	416.8	418.8
162.38		399.5	404.9	408.0	410.8	411.7	414.2	416.0	417.1	419.1
162.99		399.9	405.2	408.3	411.1	412.0	414.5	416.3	417.4	419.4
163.30		400.0	405.4	408.4	411.3	412.2	414.7	416.5	417.5	419.6
163.80		400.3	405.6	408.7	411.5	412.5	415.0	416.7	417.8	419.8
164.20		400.5	405.8	408.9	411.7	412.7	415.2	416.9	418.0	420.1
164.67		400.8	406.1	409.1	412.0	413.0	415.5	417.2	418.3	420.3
165.25		401.1	406.4	409.4	412.3	413.3	415.8	417.5	418.6	420.6
165.81		401.4	406.7	409.7	412.6	413.6	416.1	417.8	418.9	420.9
166.40		401.7	407.0	410.0	412.9	413.9	416.5	418.1	419.2	421.2
167.03		402.1	407.3	410.4	413.3	414.3	416.8	418.4	419.5	421.6
167.52		402.3	407.5	410.6	413.5	414.6	417.1	418.7	419.8	421.8
168.13		402.7	407.8	410.9	413.9	414.9	417.4	419.0	420.1	422.2
168.75	JEFFERSON BARRACKS	403.0	408.2	411.3	414.2	415.2	417.8	419.3	420.4	422.5
168.80		403.0	408.2	411.3	414.2	415.3	417.8	419.3	420.4	422.5
168.81		403.0	408.2	411.3	414.2	415.3	417.8	419.3	420.5	422.5
168.92		403.1	408.3	411.4	414.3	415.3	417.9	419.4	420.5	422.6

APPENDIX A

DOC 1.10 LETTER TO USEPA FROM AMEREN MISSOURI MARCH 2, 2011, INCLUDING REITZ & JENS STABILITY REPORT, NOVEMBER 16, 2010

Ameren

Ameren Services

March 2, 2011

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

Re: Ameren Missouri
Meramec Power Station
Dewberry & Davis, LLC Coal Combustion Waste Impoundment
Round 7 – Dam Assessment Report

Dear Mr. Hoffman:

Below are Ameren Missouri's responses to the Dewberry & Davis, LLC draft dam safety assessment of the coal combustion waste (CCW) impoundments at the Meramec Power Station. The draft report was received by Ameren Missouri from the U.S. EPA on February 4, 2011. We have also enclosed a copy of our recently completed stability analysis of the Meramec CCW impoundments as requested by your consultant. Please note that we have recently revised the designation for our Company from AmerenUE to Ameren Missouri.

Recommendations from the Dewberry & Davis, LLC report are presented in **bold faced** type and our responses are provided in regular type.

1.2.1 Recommendations Regarding the Structural Stability: None appear warranted at this time to satisfy a critical need. An embankment stability analysis is being conducted and will be available at the end of year of 2010. A copy of this analysis is requested.

Response: The subsurface investigation and stability analysis for the Meramec Power Station mentioned in the assessment has been completed and a copy of the report is enclosed with this letter for the EPA's review. Ameren has initiated a project to be implemented in 2011 which will flatten the existing slopes on the downstream side of Pond 489, Pond 493, and the Retention Pond. This project will increase the embankment cross-sectional area and improve the factor of safety of the perimeter levee in these sections. Based on the implementation of this project and engineering data and evaluation provided in this report, we request the overall condition ratings for the ponds be reevaluated prior to issuing the final report.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety: It is recommended that Ameren Missouri review and document the design flood for the CCW basins. It is also recommended that Ameren Missouri review and document the effects of the 100-year frequency rainfall event with the Mississippi River flood elevation on the plant.

Response: A Hydraulic evaluation of the Meramec Plant was completed as part of the Phase I Report by Reitz & Jens, Inc. dated August 31, 2007. The hydraulic evaluation performed by Reitz & Jens documents the effects of the 100-year, 24-hour rainfall event. This report shows that the ponds have sufficient storage for the 100-year 24-hour storm when the starting pool elevation is at or below normal. This report also states when the Mississippi River is at the 100-year flood elevation reported by FEMA, the Retention Pond and Pond 495 will be inundated. A copy of this report was sent to your consultants (Dewberry & Davis, LLC) with the "Request for Data" letter dated October 6, 2010.

1.2.3 Recommendations Regarding the Supporting Technical Documentation: Provide documentation as recommended above in Subsections 1.21 and 1.22

Response: See the above responses for 1.2.1 &1.2.2.

1.2.4 Recommendations Regarding the Description of the Management Unit(s): Documented descriptions of the CCW ponds and operational procedures were not provided. It is recommended that the purpose and processes within the CCW ponds be summarized in an operational manual.

Response: Currently Ameren Missouri does not have a formal Operation & Maintenance procedure for the Meramec Power Station. Ameren plans to develop an Operation & Maintenance manual for the Meramec Power Station in 2011.

1.2.5 Recommendations Regarding the Field Observations: None appear warranted at this time.

Response: No action required.

1.2.6 Recommendations Regarding the Maintenance and Methods of Operation. The recommendations include the following:

- **It is recommended that woody vegetation be removed from embankment slopes and groin areas, and embankment slopes and toe areas be mowed at least twice annually**
- **It is recommended that the seepage area observed at the outside of Pond 4 continue to be monitored for changed conditions.**
- **It is recommended that the inside slope and retaining wall of Pond 1 be monitored and maintained.**

Response: The individual bullet items are discussed below in order.

- Woody vegetation was removed from the perimeter levee in October 2009. Routine maintenance of the slopes will be performed to ensure woody vegetation is controlled.
- The seepage area outside Pond 4 is monitored by plant staff during weekly inspections, and annually by Dam Safety. Changed conditions will be evaluated and addressed accordingly.
- The inside slope and retaining wall of Pond 1 is monitored by plant staff during weekly inspections, and annually by Dam Safety. Maintenance will be performed as required.

1.2.7, Recommendations Regarding the Surveillance and Monitoring Program: It is recommended that internal inspection of the outlet structures be performed at a frequency of at least once every 5 years and be documented with a written report.

Response: A thorough inspection of the outlet structures is performed annually by Dam Safety and plant personnel. A written report is generated with each annual inspection.

1.2.8, Recommendations Regarding Continued Safe and Reliable Operation: No additional recommendations for continued safe and reliable operation appear warranted at this time.

Response: No action required.

Business Confidentiality Claim

We request the Draft Dam Safety Assessment Report for the Meramec Power Station prepared by Dewberry & Davis, LLC, as well as our responses to this report remain confidential. We also request the attached Meramec Ash Pond Dam Stability Analysis Report be kept confidential. This request is made in accordance with the procedures described in 40 CFR, Part 2, Subpart B.

When initially submitting support documents to Dewberry & Davis, LLC for preparation of their report we also designated the following materials as confidential:

- Plans of the embankment
- EIP
- Dam Safety Program for AmerenUE Non-Hydro Facilities
- AmerenUE Dam Inventory Inspection Program
- August 31, 2007 Phase I Report
- EPA Questionnaire
- February 26, 2008 Ash Pond #494 Drilling and Piezometer installation
- 2008 and 2009 Annual Inspection Reports
- Weekly Inspection Reports

If you need further information, please feel free to contact me at 314-554-2388.

Sincerely,

Paul R. Pike
Environmental Science Executive
Environmental Services
T 314.554.2388
F 314.554.4182
ppike@ameren.com

Enclosures

REITZ & JENS, INC.
CONSULTING ENGINEERS

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fax: 314.993.4177
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November 16, 2010

CONFIDENTIAL

Mr. Matt Frerking
Managing Supervisor – Dam Safety
Ameren Missouri
3700 South Lindberg, MC F-604
Sunset Hills, Missouri 63127

RE: Ash Pond Dam Stability Analysis
Meramec Power Station

Dear Mr. Frerking:

This report presents our findings and recommendations from the geotechnical field investigations, laboratory testing, land survey, and slope stability analyses of the dams impounding the ash ponds at the Meramec Power Station. The investigation, testing and analyses was done in general accordance with our proposal dated January 29, 2010, and Ameren Missouri's request for proposal dated December 9, 2009. The purpose of this project is to evaluate the stability of the ash pond dams and conduct the necessary land surveys, subsurface explorations, and laboratory testing to define the critical section at each location. The slope stability analysis conducted was for the load cases required by the Missouri Department of Natural Resources (MDNR). The results of the slope stability analysis were compared to the required safety factors for the type and assumed hazard classification of each dam.

In 2007, Reitz & Jens (RJ) completed the Phase I: AmerenUE Dam Inventory and Inspection Program project. This project was a preliminary study and consisted of determining the existing condition and classification status of the dams at Rush Island, Meramec, Labadie and Sioux Power Stations and developing a site specific inspection program at each power station. The project involved field inspections, surveys, site reconnaissance, research of current registration requirements, and pertinent computations. Site specific recommendations for future inspections were developed which include inspection templates, frequency of monitoring and maintenance recommendations. The study reported that the height of the Meramec dam was approximately 24.7 feet, and that the dams did not fall under the current MDNR regulation that requires all dams 35 feet or more in height to be regulated. The report also found no dwellings downstream of the dams and if regulation were necessary the dams would be categorized within Environmental Site Class III. The MDNR dam safety regulations have not changed since the 2007 report.

SURVEY

A land survey was conducted to determine the elevation profile along the crest of the dam. The extents of the survey were chosen to include the areas with the greatest elevation difference between the crest and the downstream toe and the segments impounding water or unconsolidated sediment. Cross-sections were also surveyed at multiple locations at each plant to determine the slope heights and geometry. Zahner and Associates, Inc. conducted the survey, as a subcontractor to RJ. At the Meramec Power Station an elevation survey of the crest was conducted over approximately 4,600 lineal feet. Elevation profile measurements were taken at 100 foot intervals. The extents of the elevation profile are shown in Figure 1 and a plot of the measured elevations is presented in Appendix B. A total of five cross-sections were surveyed, one adjacent to Pond 489, two adjacent to Pond 494 and two on the Retention Pond and Pond 498. Plots of the cross-sections are shown in Appendix A. From the cross-section surveys, the approximate maximum height of the Meramec dam is 24 feet at cross-section 3. The dam height surveyed during this project is in close agreement with that found during the Phase I: AmerenUE Dam Inventory and Inspection Program project. Due to high river levels during most of this project, the survey was not extended far enough to capture the creek running along the north side of the dam. Based on the preliminary findings from the Phase I project, the height of the dam may be increased with additional survey data from this area.

GEOTECHNICAL FIELD INVESTIGATION AND LAB TESTING

Geotechnical field investigations were conducted using rotary drilling and cone penetrometer test (CPT) soundings. The quantity of borings and soundings, and the approximate locations at the power station are shown in Figure 1. The boring locations were selected by RJ based on previous experience at these locations, to fill in gaps were there was no subsurface data, slope geometry and to provide soil profiles representative of as much of the embankment as possible. The elevations of the ground surface at the boring locations were measured by Zahner and Associates, Inc. The borings were made by Terra Drill, Inc. of Dupo, Illinois, as a subcontractor to Reitz & Jens. The borings were advanced through the soil using 4.25-in. I.D. hollow-stem augers. Mud rotary drilling was not necessary in either of the auger drilling locations. Holes were backfilled with cement grout, which was tremmied from the bottom to the top.

The CPT soundings were also made by Terra Drill, Inc. using a Geo-probe rig, under a subcontract with Reitz & Jens. The cone penetrometer consists of a 1.5-inch diameter, 100 MPa capacity, electronic piezocone (CPTu), which records tip pressure, sleeve friction and porewater pressure as it is hydraulically pushed into the ground. The testing was carried out according to ASTM D5778. The holes were backfilled the same day with Bentonite pellets.

The field investigation was done under the direction of a Reitz & Jens' geological engineer or geotechnical technician, who determined the sampling intervals and the termination depths, operated the CPT equipment, and logged the borings. The boring logs for the Meramec Power Station are presented in Figures 2-1 to 2-2. Logs of CPT soundings are presented in Figures 3-1 to 3-8. The keys and notes for the boring logs and CPT soundings are shown in Figures 2-0 and 3-0, in that order.

Samples of subsurface materials were obtained using rotary drilling methods at about 2.5-foot intervals for the first 10 feet, at 5-foot intervals below 10 feet. Two types of samplers were used: 1) a hydraulically pushed, 3-in. O.D., thin-walled Shelby tube sampler (ASTM D-1587); and 2) a 2-in. O.D., split-spoon sampler driven by an automatic hammer in conjunction with a Standard Penetration Test (ASTM D-1586). Published tests have shown that the blow counts from a Standard Penetration Test (SPT) using an automatic hammer are about 75% of the blow counts obtained using a manual 140-lbs. drop hammer, rope and cathead. Manual SPT hammers have been used to develop correlations between SPTs and soil properties, therefore, the blow counts, or N-values, from an automatic hammer should be increased by about one-third in order to use such correlations. The uncorrected blow counts are shown on the boring logs. The disturbed split-spoon samples obtained were visually classified in the field and sealed in glass jars to prevent loss of moisture, for later testing in the laboratory. The relatively undisturbed Shelby tube samples were sealed in the tubes and were extruded from the tubes immediately prior to testing in the lab.

All of the recovered samples were visually described in our laboratory in general accordance with the Unified Soil Classification System and the Standard Test Method for Classification, Description, and Identification of Soils (ASTM D-2487 and D-2488). Index tests were also performed and included: water content and dry unit weight tests (ASTM D-2216). The results of these index tests appear on the individual boring logs. Unconsolidated undrained (UU) triaxial compression tests (ASTM D2850) and consolidated undrained (CU) triaxial compression tests (ASTM D-4767) with pore pressure measurement were performed on selected Shelby tube samples of the fine grained samples, to obtain better measurements of the *in situ* total and effective shear strength properties. The results of the UU and CU triaxial shear strength tests are presented with the boring logs in Figures 2-3 and 2-4.

The field data from the CPT soundings were analyzed in the office using the program CPT-pro, Ver. 5.49 by Geosoft. The program automatically applies corrections for depth, and post/pre-data collection baseline readings. These corrected field data are plotted in the CPT logs, which are field tip resistance (q_c), sleeve friction (f_s) and pore water pressure (u2). Soil type was determined based upon the Robertson (1986) method[1]. Undrained shear strength (s_u) was calculated for cohesive materials based upon the Lunne (1997) method[2]. Equivalent Standard Penetration Test (SPT) N_{60} values were calculated using procedures recommended by Robertson (1986)[1]. The equivalent N_{60} values were used to verify the computed internal friction angle (ϕ) in sands and s_u in fine-grain soils. The estimate of ϕ in coarse soils was based upon the measured q_c values using Bowles (1996).[3] The computed parameters N_{60}, s_u and ϕ are also plotted in the CPT logs.

PIEZOMETER INSTALLATION AND MONITORING

A temporary piezometer was installed to help define the line of seepage through the dam. The piezometer was located at the upstream crest, with the tip located in the lower most embankment fill above the native soils. The location of the piezometer is shown in Figure 1, and a description of the tip elevation is noted in the boring log. PZ-1 was located along the north side of the dam near the Retention Pond.

The piezometer was constructed using 1-inch inside diameter Schedule 40 PVC pipe, 0.010-inch factory machine-slotted screen and was capped with an above grade well protector. The bottom 10 feet of the piezometer was screened and backfilled with filter sand.

Readings were obtained from the piezometer and compared to the pool elevation. A table containing the piezometer readings is shown below. The temporary piezometer was removed after several readings

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[1] Robertson, P.K., et al. (1986), "Use of Piezometer Cone Data," *Proceedings of the ASCE Specialty Conference In Situ 86: Use of In Situ Tests in Geotechnical Engineering*, ASCE.

[2] Lunne, T., Robertson, P.K. and Powell, J.J.M. (1997). *Cone Penetration Testing in Geotechnical Practice*. Published by Blackie Academic * Professional.

[3] Bowles, Joseph E. (1996). *Foundation Analysis and Design*. 5th ed., McGraw-Hill, page 180.

were obtained and the hole was grouted closed with cement grout. Additional readings were obtained from existing piezometers at the plant. The existing piezometers are generally located on the east side of Pond 494. Existing piezometer PZ-1 is located near cross-section 4 and existing piezometer PZ-3 is located near CPT sounding P-5. Readings from the existing piezometers are presented in the following table.

Meramec Power Station

Date	Piezometer	Reading	Groundwater Elevation (ft)	Ground Surface Elevation (ft)	Tip Elevation (ft)	Pond Elevation (ft)
8/31/2010	PZ-1 (RJ)	17.9	398.6	413.6	386.6	-
9/7/2010	PZ-1 (RJ)	18.8	397.7	413.6	386.6	-
10/8/2010	PZ-1 (RJ)	16.3	400.2	413.6	386.6	-
8/31/2010	PZ-1*	17.7	398.6	413.3	371.8	-
9/7/2010	PZ-1*	18.6	397.7	413.3	371.8	-
8/31/2010	PZ-3*	27.4	390.0	414.3	369.3	-
9/7/2010	PZ-3*	28.6	388.7	414.3	369.3	-

*Existing permanent piezometer

MERAMEC POWER STATION

The Meramec Power Station is located at the southern most point in St. Louis County, Missouri near the confluence of the Meramec and Mississippi Rivers. The plant is located south of the City of Oakville and east of the City of Arnold. The Meramec River is adjacent to the plant on the west. To the east is the Mississippi River. The confluence of these two rivers is directly south of the plant. To the north of the plant is a small creek, wooded uplands and Meramec River floodplain.

The Meramec Dam is a single stage industrial dam. The dam impounds an area of approximately 138-acres for coal combustion ash sedimentation and water treatment purposes. The impoundment area was estimated from an aerial photo. The perimeter of the dam has a length of approximately 6,400-lineal-feet (lf). This dam forms the perimeter of several smaller impoundments. These impoundments include the Retention Pond, the New Ash Pond, Pond 489, Ponds 490-496 and Pond 498. All or portions of ponds 490, 491, 494, 495 and 498 have been filled to capacity with coal combustion ash, and are now supporting plant equipment.

An elevation profile was run on the Meramec Dam from the southwest corner of Pond 489 to the railroad track crossing near Pond 493. The total distance of the profile was approximately 4,600 feet and the minimum and maximum crest elevation was 413.3 and 419.5, in that order. A plot of the elevation profile is shown in Appendix C. Five cross-sections were also surveyed and the approximate locations and drawings depicting the sections are shown in Appendix B. The downstream slope angles for the various sections varied from 1.7 (H) to 2.5 (H) on 1 (V). One section was adjacent to Pond 498, 2 were adjacent to Pond 494, and 2 were adjacent to the Retention Pond and Pond 498.

Pond 489

Cross-section 3 was measured near the outfall for Pond 489. The survey showed that the upstream slopes were approximately 3 (H) to 1 (V) and the downstream slopes were approximately 1.9 (H) to 1 (V). The embankment height at this section is approximately 24.5 feet.

At this section an auger boring was drilled at the centerline of the crown and a CPT sounding was conducted at the toe. The drilling revealed that the dam fill generally consists of fly ash, bottom ash, silty clay, and high plastic clay. The coarse grain fill was typically medium dense and the fine grained fill was stiff. A UU test was conducted on a specimen of high plastic clay which was sampled from the fill. The measured s_u of the material was approximately 1900 psf. For modeling purposes we estimated that the ϕ of the fill is approximately 29°.

The top 18 feet of the foundation soil consisted of silty and moderate to high plasticity clay soils. The stiffness was soft to firm in the top 9 feet and became slightly stiffer from 9 to 18 feet. Based on correlations for N-values in clay and CPT soundings, we estimate that the top 9 feet of the foundation soil has a ϕ of 23° and from 9 to 18 feet the ϕ is 24°. Beneath the clay and to a depth of approximately 43 feet, clay, silt and sand were observed. The soil is generally soft or loose and CPT soundings indicated ϕ values ranging from 22.5° to 25°.

Pond 494

Cross-sections 2 and 4 were measured adjacent to Pond 494. At section 2 the upstream slopes were very steep in the top half of the dam and were sloped at 1.6 (H) to 1 (V) and became less steep in the lower half of the dam at 2.4 (H) to 1 (V). The approximate height of the dam at this location was 15.3 feet. Cross-section 4 was located to the north of section 2. The slopes at section 4 varied from approximately 1.9 (H) to 2.5 (H) on 1 (V). The height of the dam at this location was approximately 20.8 feet.

Five CPT soundings were conducted near the locations of these sections. Two were located at the crest of the dam and three were located at the toe. The data obtained from the soundings was averaged to come up with a profile representative of both sections. The embankment fill generally consisted of clay, although thin silty clay and clayey silt layers were observed near the top of the embankment. Based on data obtained from the CPT soundings we modeled the embankment fill in these locations with a ϕ of 23° and an effective cohesion of 200 psf.

The top 6 feet of the foundation soil consisted of soft clay. Using the data obtained from the CPT soundings we estimated the ϕ of the clay to be 23°. Underlying the clay was stiff clay and silty clay. Using the shear strengths obtained from a CU test in the silty clay foundation soil, we modeled this stratum with a ϕ of 27° and an effective cohesion of 100 psf. At a depth of approximately 22 feet into the foundation, sand and silt was encountered. The CPT soundings show that the ϕ of these strata are approximately 30°.

Retention Pond and Pond 498

Cross-sections 1 and 5 were measured near the Retention Pond and Pond 498. The upstream slopes at sections 1 and 5 were 2 (H) on 1 (V) and 1.7 (H) on 1 (V), respectively. Section 1 has a height of approximately 18 feet and the height of section 5 is roughly 19.5 feet. Due to floodwater, the cross-section surveys were stopped prior to reaching the creek which runs adjacent to the ponds on the north. For modeling purposes, survey data from the Phase I project was used to approximate the location, slope angels and elevations of the top of bank and bottom of the creek. The survey data from the Phase I project increases the height of the cross-section to approximately 25 feet.

One auger boring and one CPT sounding were conducted in the crown, and one CPT sounding was conducted at the toe, near these sections. A piezometer was installed at the location of the auger boring. The embankment fill consisted of sandy silt, clayey silt and silty clay. Fly and bottom ash were also observed in the samples obtained from the auger boring. The embankment fill was modeled with a ϕ of 26° based on the N-values and CPT soundings.

The top 12 feet of the foundation soil was silty clay. A CU test was run on a specimen obtained in this stratum. The test data showed that the stratum had a ϕ of 27° and an effective cohesion of 100 psf. Beneath the silty clay 5 feet of stiff clay was observed. Based on the CPT soundings we estimate the ϕ of the clay to be 26°. Clayey silt, silty clay, and sandy silt were observed at a depth of 17 feet in the foundation to the boring termination depth. The coarse grained strata were generally loose to medium dense and the cohesive strata were soft to firm, and using the CPT soundings a ϕ of 25° was used for modeling purposes.

Slope Stability Analysis Results

The stability of each cross-section was analyzed for the steady seepage and seismic load cases. The steady seepage case was analyzed using piezometric data obtained from the piezometer installed during this project and from existing piezometers installed adjacent to Pond 494. It was assumed that the piezometric levels will not vary widely because most of the impounded area is filled with ash. Each piezometer was located at the upstream crest of the dam. For Pond 489 no seepage was assumed to occur from the pond because it is lined with high-density polyethylene (HDPE).

For the seismic load case a horizontal acceleration of 0.0575 g or 0.25 of the probable maximum acceleration (PMA) was added to the steady state seepage model. The seismic load was taken from 10 CSR 22-3 for St. Louis County (Zone D) and for an environmental site class III dam.

The analysis show for the steady seepage load case the calculated factor of safety is less than the required factor of safety by the MDNR. This analysis limited the search for critical failure surfaces to those that significantly impact the dam. The factor of safety is lower for shallow slope failures. For the seismic load case the factor of safety exceeded that required by the MDNR.

Meramec Power Station

Load Case	Required Factor of Safety	Factor of Safety				
		Cross-Section 1	Cross-Section 2	Cross-Section 3	Cross-Section 4	Cross-Section 5
Steady Seepage	1.5	1.3	1.4	1.3	1.4	1.2
Earthquake, Steady Seepage	1.0	1.1	1.2	1.1	1.2	1.1

CONCLUSIONS

The stability of the Meramec Dam was analyzed for steady seepage and seismic load cases. For the seismic load case the calculated factor of safety was greater than the minimum required by MDNR for an environmental site class III dam, but for the steady seepage load case the factor of safety for all five cross-sections is below the minimum required. The low factor of safeties for the steady seepage case is primarily due to the steep downstream slope angles, which generally are steeper than 2 (H) on 1 (V). In addition, the upper most strata of the foundation soil generally consist of soft clay.

The impounded area of the ponds is generally filled to capacity with coal combustion ash. As a result the line of seepage from the impounded area is relatively low within the embankment. This was confirmed with the piezometric levels measured during this project. Positive drainage should be maintained within the impounded area. Should the line of seepage rise within the embankment, the stability of the slopes and the factor of safety will be less.

Please let us know if you have any questions regarding this report or any aspects of the project. We appreciate this opportunity to continue our working relationship with Ameren Missouri.

Sincerely,
REITZ & JENS, Inc.

Donald S Eskridge

Jeff Bertel

Donald S. Eskridge, P.E.
Principal

Jeff Bertel, P.E.
Project Engineer

The following figures are attached and complete this report:

Figure 1	Boring Location Map
Figure 2-0	Key to Boring Logs
Figures 2-1 to 2-2	Logs of Borings
Figures 2-3 to 2-4	Graphs of CU and UU tests
Figure 3-0	Key to CPT Soundings
Figure 3-1 to 3-8	Logs of CPT Soundings
Appendix A	Cross-sections
Appendix B	Elevation Profile
	Graphical Depictions of Slope Stability Models

Copies submitted: 5

Elevation Profile Survey Limits
Locations of Cross-sections and Borings

REITZ & JENS, INC.
CONSULTING ENGINEERS

Figure 1

KEY TO BORING LOGS

Symbol	Description
KEY TO SOIL SYMBOLS	
▦	Crushed Limestone
▩	Miscellaneous FILL
▨	Medium to high plastic CLAY
▧	Low plastic Silty CLAY (CL)
MISCELLANEOUS SYMBOLS	
▽	Water table during drilling
●	Moisture content (%)
▲	N-value from Standard Penetration Test, ASTM D-1586 (blows/ft)
■	Shear strength from Pocket Penetrometer (tsf)
SOIL SAMPLERS	
◩	2-in. O.D. Split-Spoon
◫	3-in. O.D. Shelby Tube

Notes:

1. Details of the drilling and sampling program are presented in the general introduction of the report.

2. Stratification lines shown on the logs represent approximate soil boundaries; actual changes in strata may be gradual or occur between samples.

Figure 2-0

REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG

PROJECT: Ash Pond Stability
Meramec Power Plant
CLIENT: Ameren Missouri

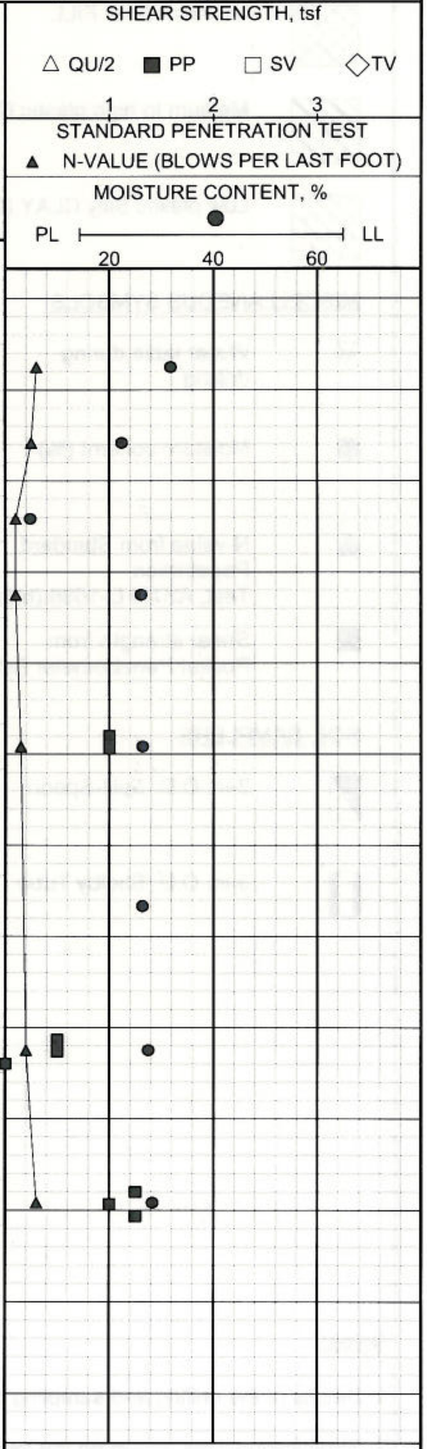
DATE DRILLED: 08-09-10

BORING NUMBER: **PZ-1**
LOCATION:
COORD. N 937323.42 E 864991.49
ELEVATION: 413.6 DATUM: NAVD88
FIGURE: 2-1 SHEET 1 OF 1

DEPTH (FEET)	ELEVATION
0	
6	408
12	402
18	396
24	390
30	384
36	378

PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
100	FILL, gray with trace dark gray, firm, very silty clay to clayey silt, with trace limonite and fly ash	3-3-3	31.8
100		1-2-3	22.4
6	Becoming very loose, and silty sand to sandy silt, gray, with fine sand, and trace fly ash and cinders	1-1-1	4.8
100	Becoming soft, and silty clay to clayey silt, dark gray and brown, with fly ash	0-1-1	26.1
100	Becoming silty clay to very silty clay, with decayed roots and wood	1-1-2	26.4
	PZ-1, screened interval from 17' to 27'		
79	Becoming firm, silty clay, gray to brownish gray, with pockets of very silty clay and high plastic clay, and trace rock	96.8	26.4
100	Silty CLAY (CL), gray to brownish gray, firm, with trace lignite	1-2-2	27.5
100	Becoming moderately plastic, and silty to slightly silty, with trace limonite and iron stains	1-2-4	28.3
	Boring terminated at 30'6"		

THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES: ACTUAL STRATIFICATION MAY BE GRADUAL.



DRILLER: Terra Drill
METHOD: HSA
TYPE OF SPT HAMMER: Automatic
HAMMER EFFICIENCY (%):
LOGGED BY: J. Pruett

WATER LEVELS: DURING DRILLING 29 FEET
_____ BORING DRY AT COMPLETION OF DRILLING
AT _____ FEET AFTER _____ HOURS
AT _____ FEET AFTER _____ HOURS

PIEZOMETER: INSTALLED AT _____ FEET

File:

REITZ & JENS, INC.
CONSULTING ENGINEERS

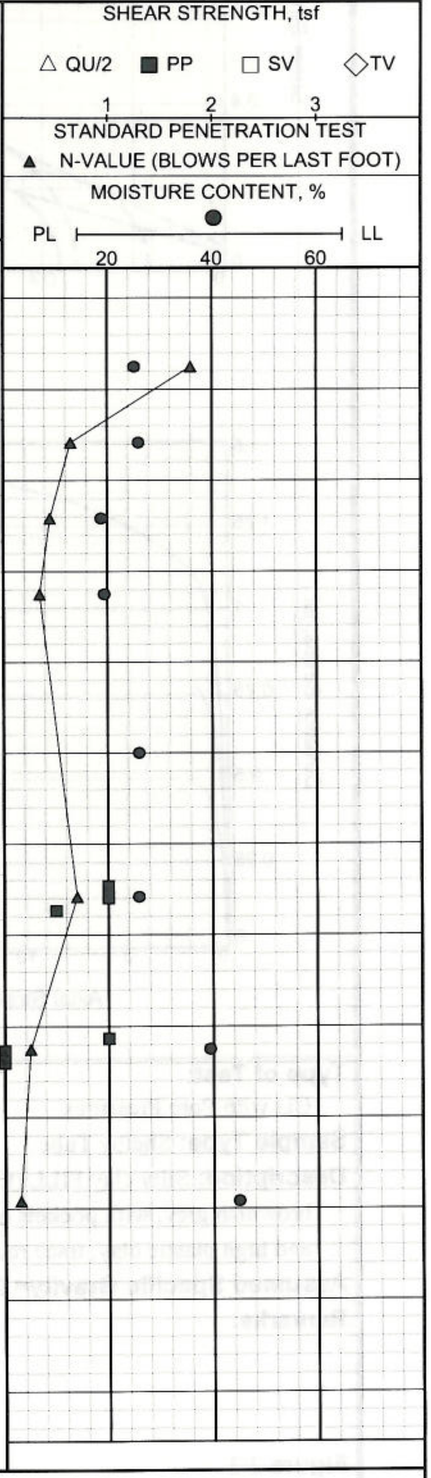
BORING LOG

PROJECT: Ash Pond Stability
Meramec Power Plant
CLIENT: Ameren Missouri

DATE DRILLED: 08-09-10

BORING NUMBER: **B-2**
LOCATION:
COORD. N 934544.23 E 864910.61
ELEVATION: 414.0 DATUM: NAVD88
FIGURE: 2-2 SHEET 1 OF 1

DEPTH (FEET)	ELEVATION	Water Table	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0	414					3" Crushed Aggregate Pavement		
					100	FILL, gray to dark gray, fly ash, dense	8-17-19	25.2
					100	Becoming medium dense, with bottom ash and trace fine sand	4-7-6	26.0
6	408				56	With some brown silty clay, and crushed limestone gravel up to 1" diameter	1-4-5	18.8
					100		1-3-4	19.4
12	402							
					83	Becoming high plastic clay, gray and dark gray, stiff, with trace organics	97.1	26.0
18	396							
					100	Becoming slightly silty, moderate to high plasticity, and dark gray-brown, with trace fine sand and crushed limestone	3-7-7	25.9
24	390	▽			100	Silty CLAY (CL-CH), grayish brown, firm, moist, moderate to high plasticity	1-2-3	39.4
30	384				100	Becoming gray and brownish gray, with decayed roots	0-1-2	44.9
						Boring terminated at 30'6"		
36	378							



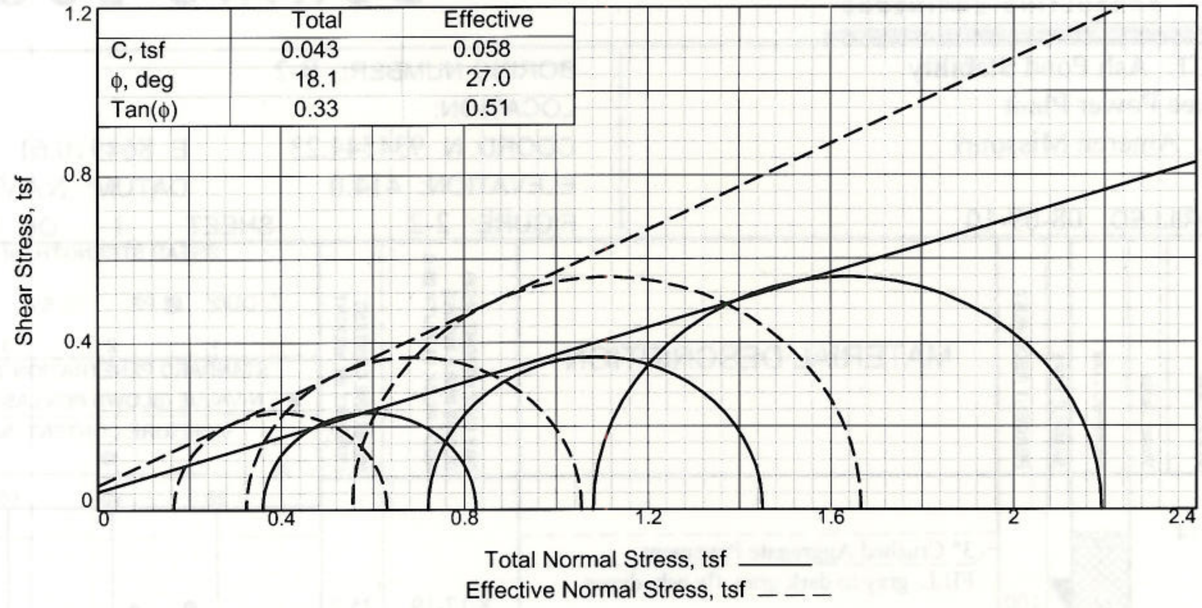
THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES: ACTUAL STRATIFICATION MAY BE GRADUAL.

DRILLER: Terra Drill
METHOD: HSA
TYPE OF SPT HAMMER: Automatic
HAMMER EFFICIENCY (%):
LOGGED BY: J. Pruett

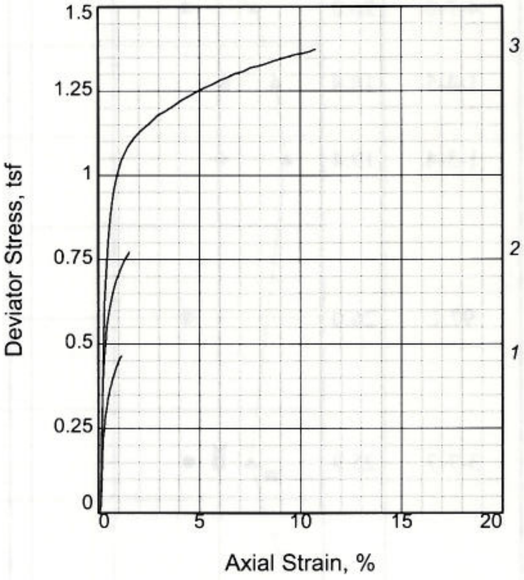
WATER LEVELS: DURING DRILLING 24 FEET
____ BORING DRY AT COMPLETION OF DRILLING
AT ____ FEET AFTER ____ HOURS
AT ____ FEET AFTER ____ HOURS

PIEZOMETER: INSTALLED AT ____ FEET

File:



	Total	Effective
C, tsf	0.043	0.058
ϕ, deg	18.1	27.0
Tan(ϕ)	0.33	0.51



		1	2	3
Sample No.		1	2	3
Initial	Water Content,	26.4	26.4	26.4
	Dry Density, pcf	96.8	96.8	96.8
	Saturation,	98.6	98.6	98.6
	Void Ratio	0.7098	0.7098	0.7098
	Diameter, in.	2.84	2.84	2.84
	Height, in.	5.81	5.81	5.81
At Test	Water Content,	26.0	25.4	25.1
	Dry Density, pcf	98.0	98.8	99.4
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.6878	0.6736	0.6647
	Diameter, in.	2.83	2.84	2.86
	Height, in.	5.78	5.70	5.60
Strain rate, %/min.		0.01	0.01	0.01
Back Pressure, tsf		3.96	4.32	5.04
Cell Pressure, tsf		4.32	5.04	6.12
Fail. Stress, tsf		0.46	0.73	1.11
Total Pore Pr., tsf		4.15	4.72	5.57
Ult. Stress, tsf				1.37
Total Pore Pr., tsf				5.48
σ_1 Failure, tsf		0.63	1.05	1.67
σ_3 Failure, tsf		0.17	0.32	0.55

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: Silty clay FILL (CL), grey and brownish grey, with pockets of very silty clay and high plastic clay, trace rock

Assumed Specific Gravity= 2.65

Remarks:

Client: Ameren Missouri

Project: Ash Pond Stability

Source of Sample: PZ-1 **Depth:** 19

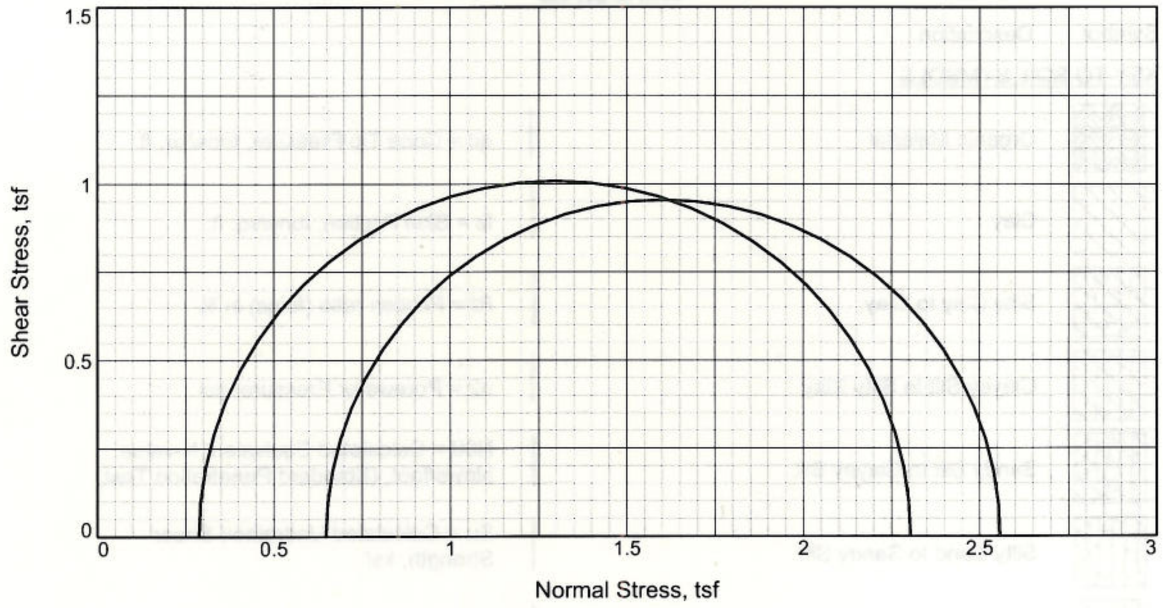
Sample Number: ST-6

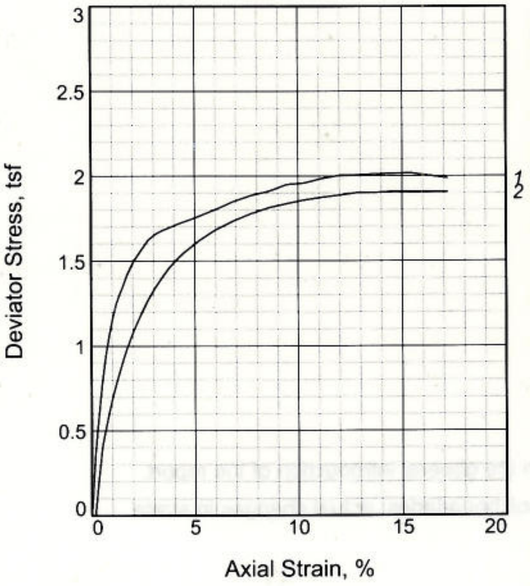
Proj. No.: 2010012488 **Date:** 8/9/10

REITZ & JENS, INC.
CONSULTING ENGINEERS

Figure 2-3

Tested By: K. Kocher **Checked By:** J. Bertel





	Sample No.	1	2
Initial	Water Content,	23.5	26.9
	Dry Density, pcf	99.2	96.2
	Saturation,	91.7	97.6
	Void Ratio	0.6870	0.7385
	Diameter, in.	2.85	2.85
	Height, in.	5.82	5.82
At Test	Water Content,	23.5	26.9
	Dry Density, pcf	99.2	96.2
	Saturation,	91.7	97.6
	Void Ratio	0.6870	0.7385
	Diameter, in.	2.85	2.85
	Height, in.	5.82	5.82
	Strain rate, %/min.	0.83	0.83
	Back Pressure, tsf	0.00	0.00
	Cell Pressure, tsf	0.29	0.65
	Fail. Stress, tsf	2.02	1.91
	Ult. Stress, tsf		
	σ_1 Failure, tsf	2.30	2.56
	σ_3 Failure, tsf	0.29	0.65

Type of Test:
Unconsolidated Undrained
Sample Type: Shelby Tube
Description: Clay Fill (CH), mottled gray and dark gray, with trace organics, high plasticity

Assumed Specific Gravity= 2.68
Remarks:

Client: Ameren Missouri

Project: Ash Pond Stability

Source of Sample: B-2 **Depth:** 14
Sample Number: ST-5
Proj. No.: 2010012488 **Date:** 08-11-10

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Figure 2-4

Tested By: J. David/J. Pruett **Checked By:** J. Bertel

LEGEND

Symbol	Description
KEY TO SOIL SYMBOLS	
≋	Organic Material
▨	Clay
▨	Silty Clay to Clay
▨	Clayey Silt to Silty Clay
⁘	Sandy Silt to Clayey Silt
▥	Silty Sand to Sandy Silt
⁘	Sand to Silty Sand
⁘	Sand
●	Gravelly Sand to Sand

🟦 qc = Cone Tip Pressure, tons/sq. ft.

🟥 fs = Skin Friction, tons/sq. ft.

🟩 Rf = Friction ratio (fs/qc) in %

🟫 u2 = Porewater Pressure, psi

⬛ N60 = Calculated Equivalent N-value, blows/foot, (Standard Penetration Test)

🟪 Su = Calculated Undrained Shear Strength, ksf

🟩 Phi = Friction Angle, degrees

Notes:

1. Details of the drilling and sampling program are presented in the general introduction of the report.
2. Stratification lines shown on the log represent approximate soil boundaries; actual changes in strata may be gradual.

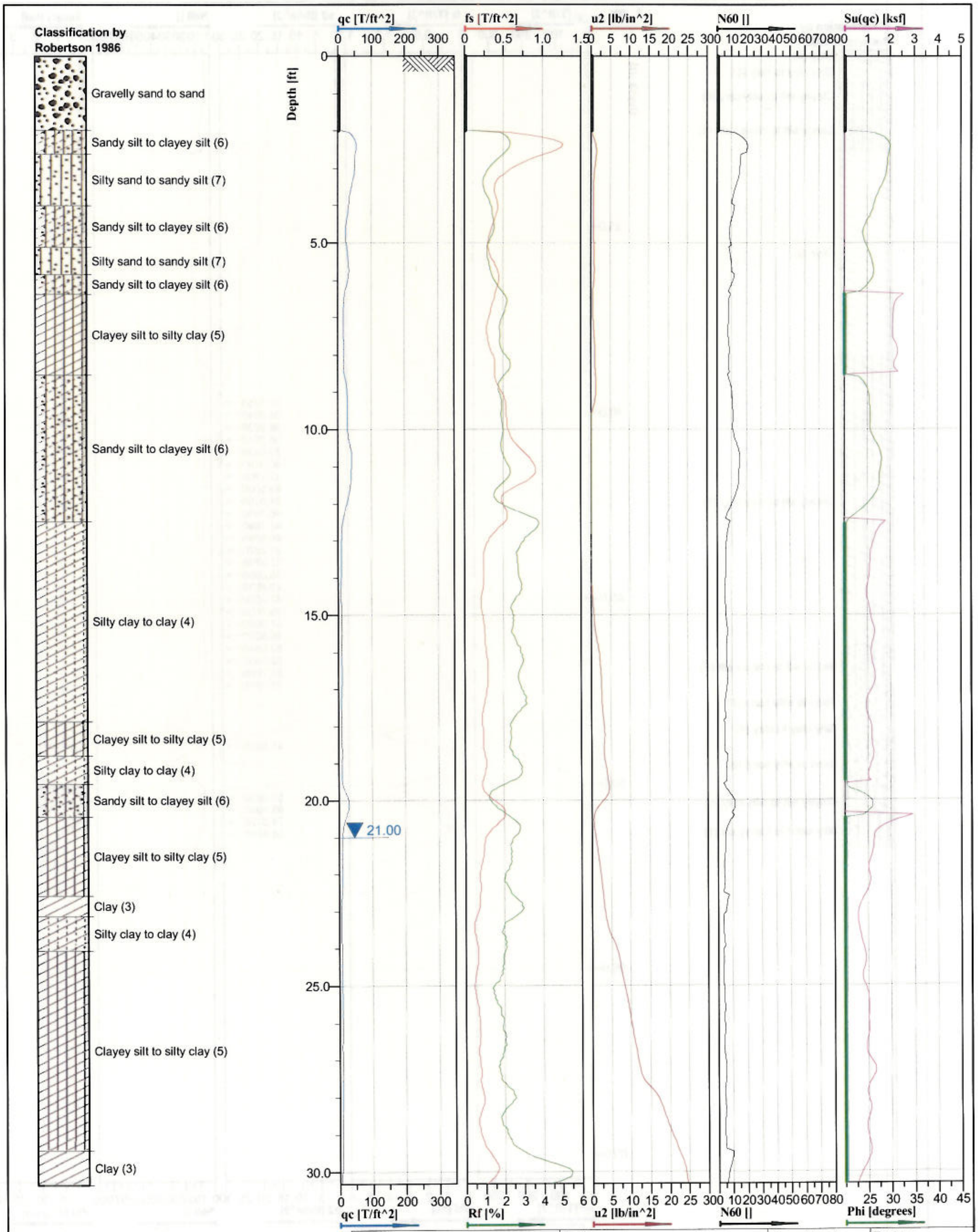
---

[1] Robertson et al. (1986) *Use of piezometer cone data.* Proceedings of the ASCE Specialty Conference: In Situ 86: Use of In Situ Tests in Geotechnical Engineering. ASCE 1986

[2] Lunne, T. Robertson, P.K. and Powell, J.J.M. (1997) Cone Penetration Testing in Geotechnical Practice, Published by Blackie Academic & Professional.

[3] Bowles, Joseph E. (1996) Foundation Analysis and Design. McGraw-Hill. 5th ed. Page 180.

Figure 3-0



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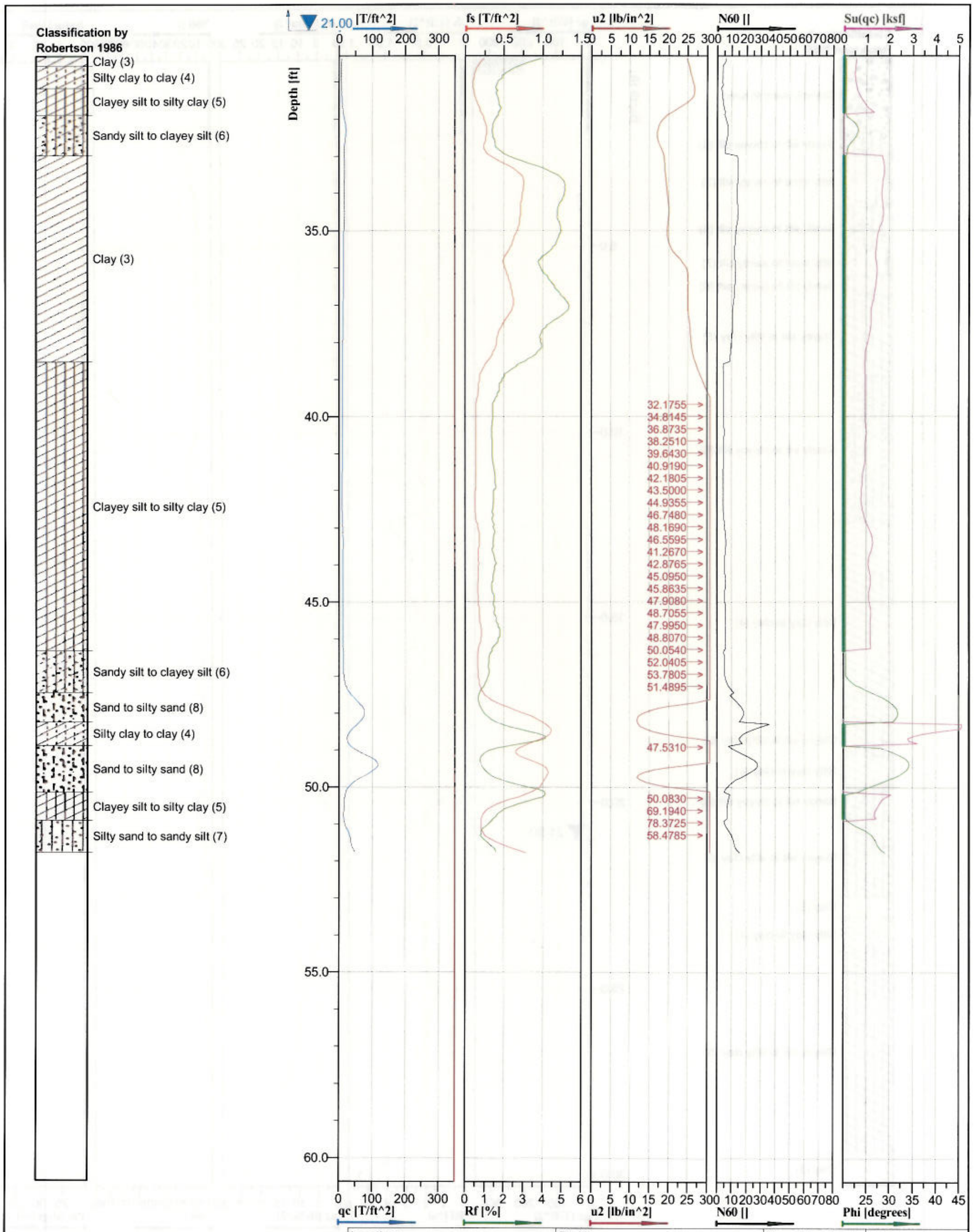
U2

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant	Position: X: 937555.35 ft, Y: 865357.78 ft	Ground level: 417.49	Test no: P-1
Project ID: 2010012488	Client: Ameren Missouri	Date: 10/7/2010	Scale: 1 : 42
Project: Ameren: Meramec Ash Pond Stability Analysis		Page: 1/2	Fig: 3-1
		File: Meramec P-1.cpd	



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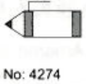
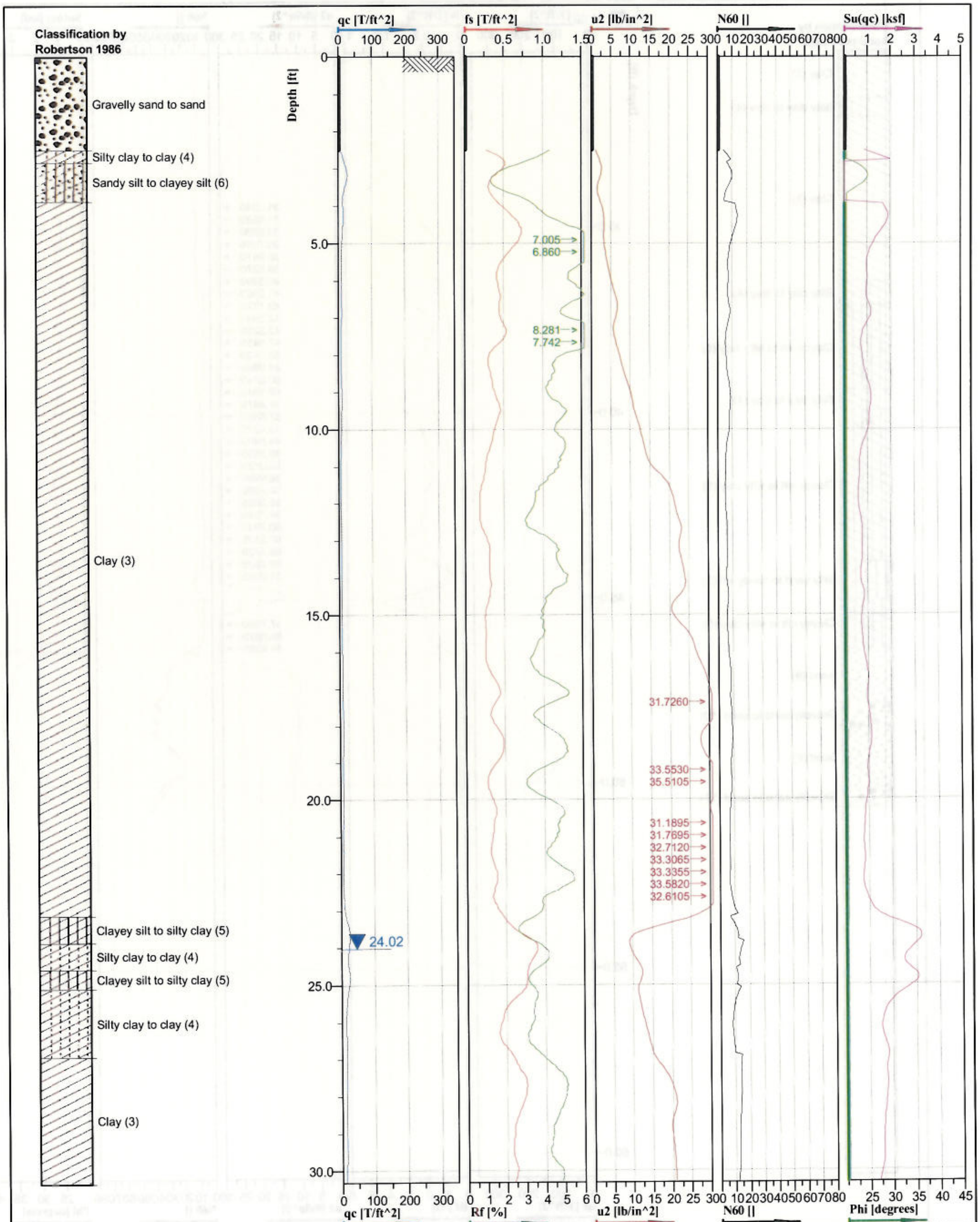


Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant
Position: X: 937555.35 ft, Y: 865357.78 ft
Ground level: 417.49
Test no: P-1
Project ID: 2010012488
Client: Ameren Missouri
Date: 10/7/2010
Scale: 1 : 42
Project: Ameren: Meramec Ash Pond Stability Analysis
Page: 2/2
Fig: 3-1
File: Meramec P-1.cpd



Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant	Position: X: 936802.95 ft, Y: 864543.54 ft	Ground level: 414.57	Test no: P-2
Project ID: 2010012488	Client: Ameren Missouri	Date: 10/7/2010	Scale: 1 : 42
Project: Ameren: Meramec Ash Pond Stability Analysis		Page: 1/2	Fig: 3-2
		File: Meramec P-2.cpd	

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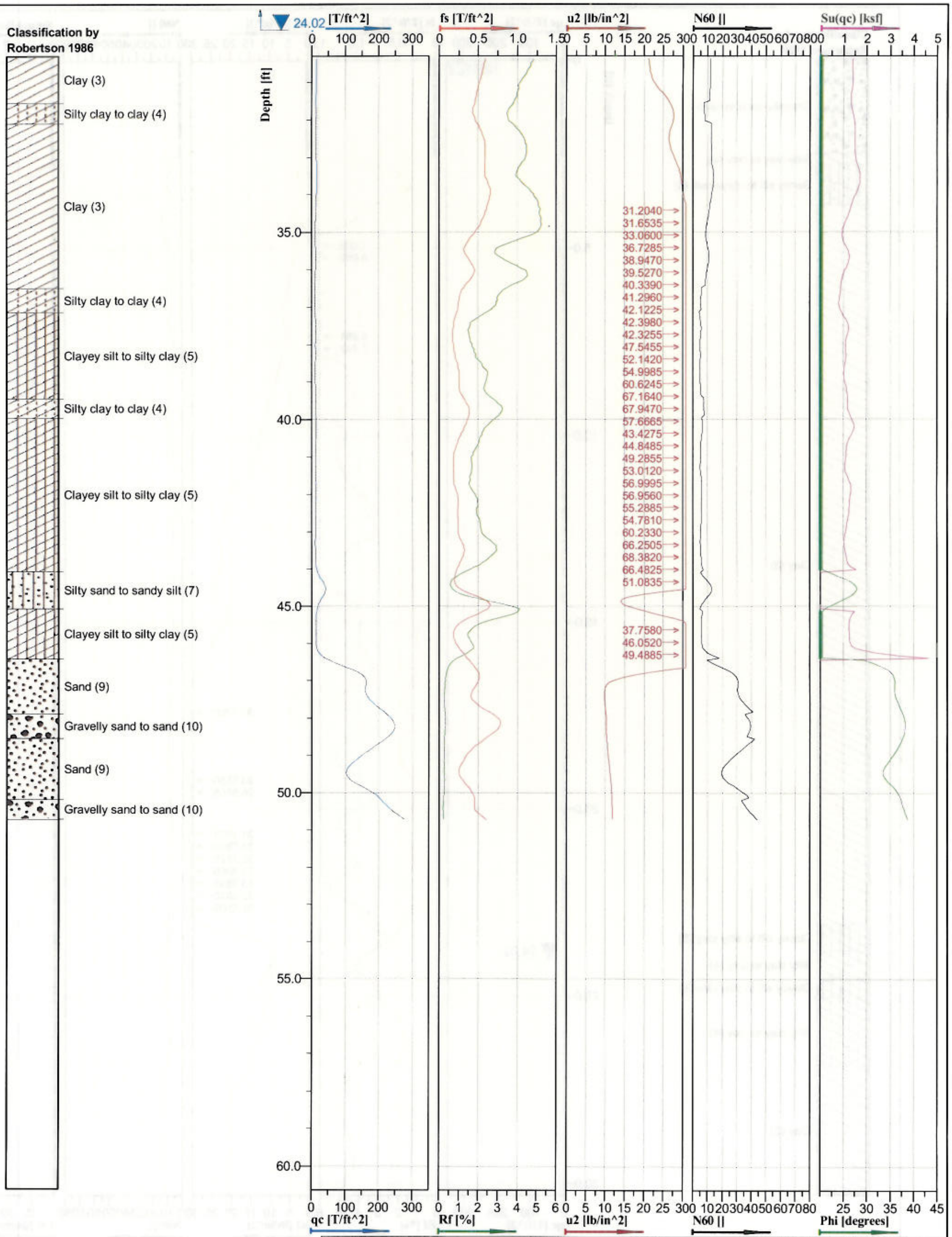

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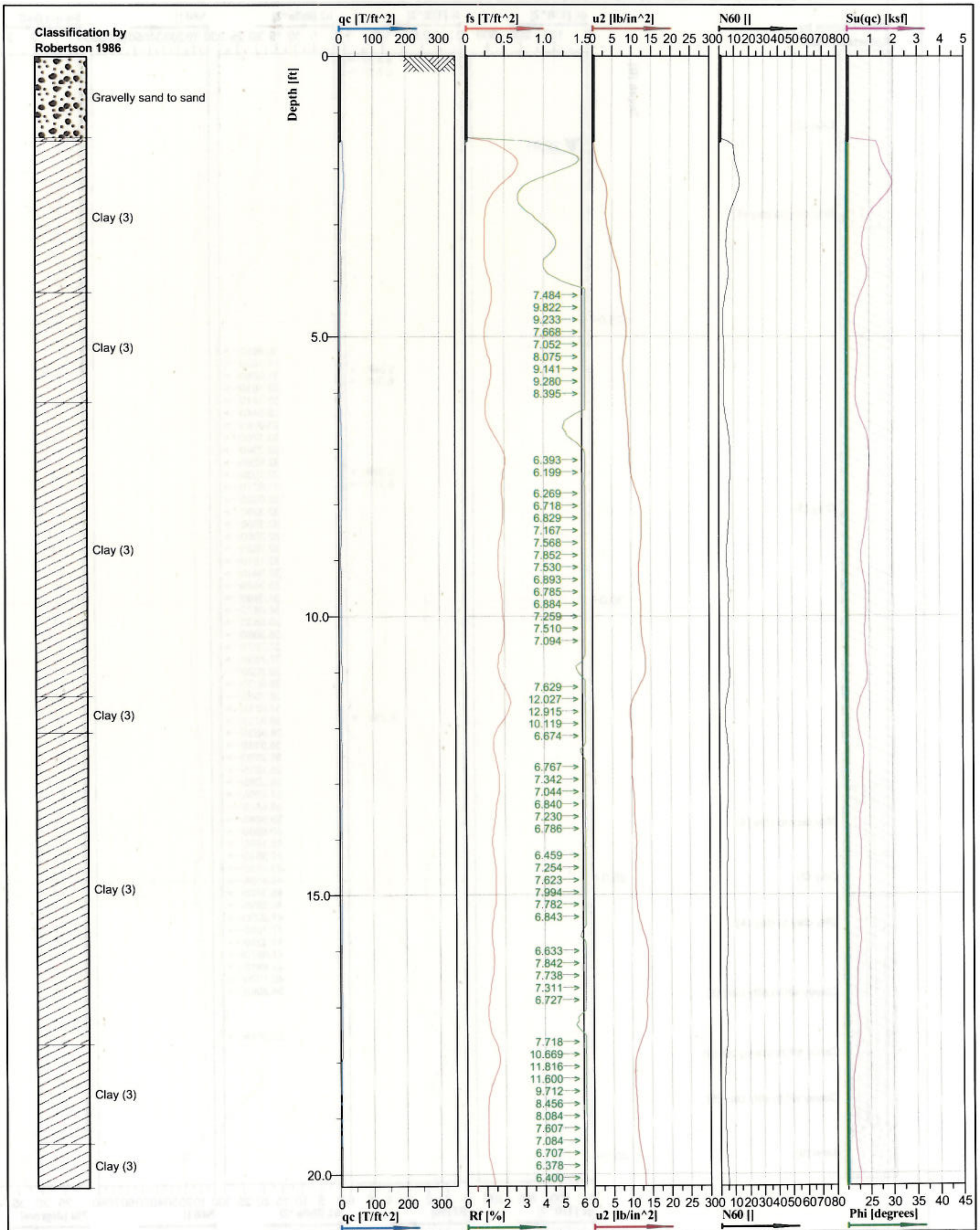
Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant
Position: X: 936802.95 ft, Y: 864543.54 ft
Ground level: 414.57
Test no: P-2
Project ID: 2010012488
Client: Ameren Missouri
Date: 10/7/2010
Scale: 1 : 42
Project: Ameren: Meramec Ash Pond Stability Analysis
Page: 2/2
Fig: 3-2
File: Meramec P-2.cpd



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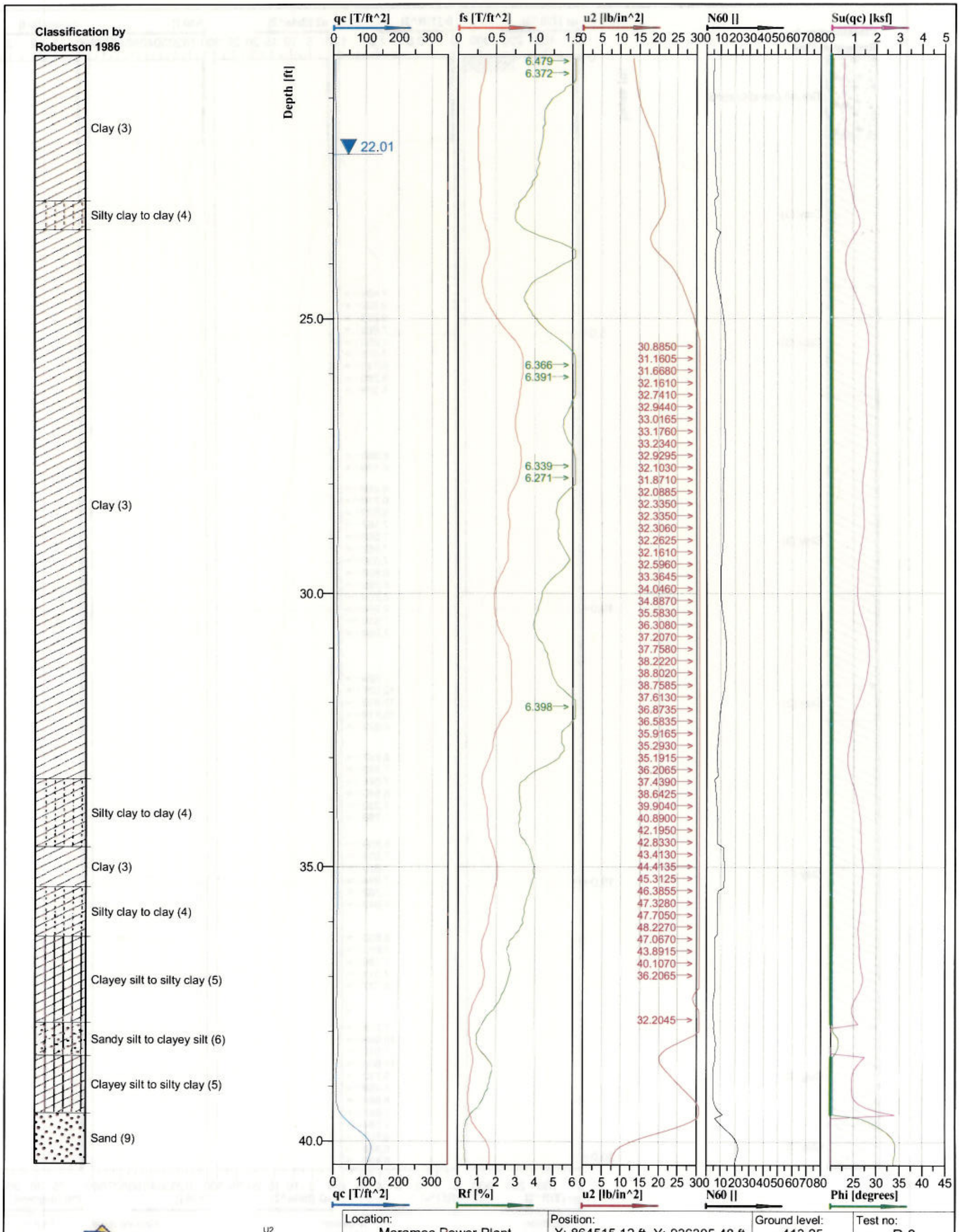
U2

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant
Position: X: 864515.12 ft, Y: 936305.48 ft
Ground level: 413.25
Test no: P-3
22.01
Project ID: 2010012488
Client: Ameren Missouri
Date: 10/7/2010
Scale: 1 : 28
Project: Ameren: Meramec Ash Pond Stability Analysis
Page: 1/3
Fig: 3-3
File: Meramec PZ-2.cpd



Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant	Position: X: 864515.12 ft, Y: 936305.48 ft	Ground level: 413.25	Test no: P-3
Project ID: 2010012488	Client: Ameren Missouri	Date: 10/7/2010	Scale: 1 : 28
Project: Ameren: Meramec Ash Pond Stability Analysis		Page: 2/3	Fig: 3-3
		File: Meramec PZ-2.cpd	

REITZ & JENS, INC.
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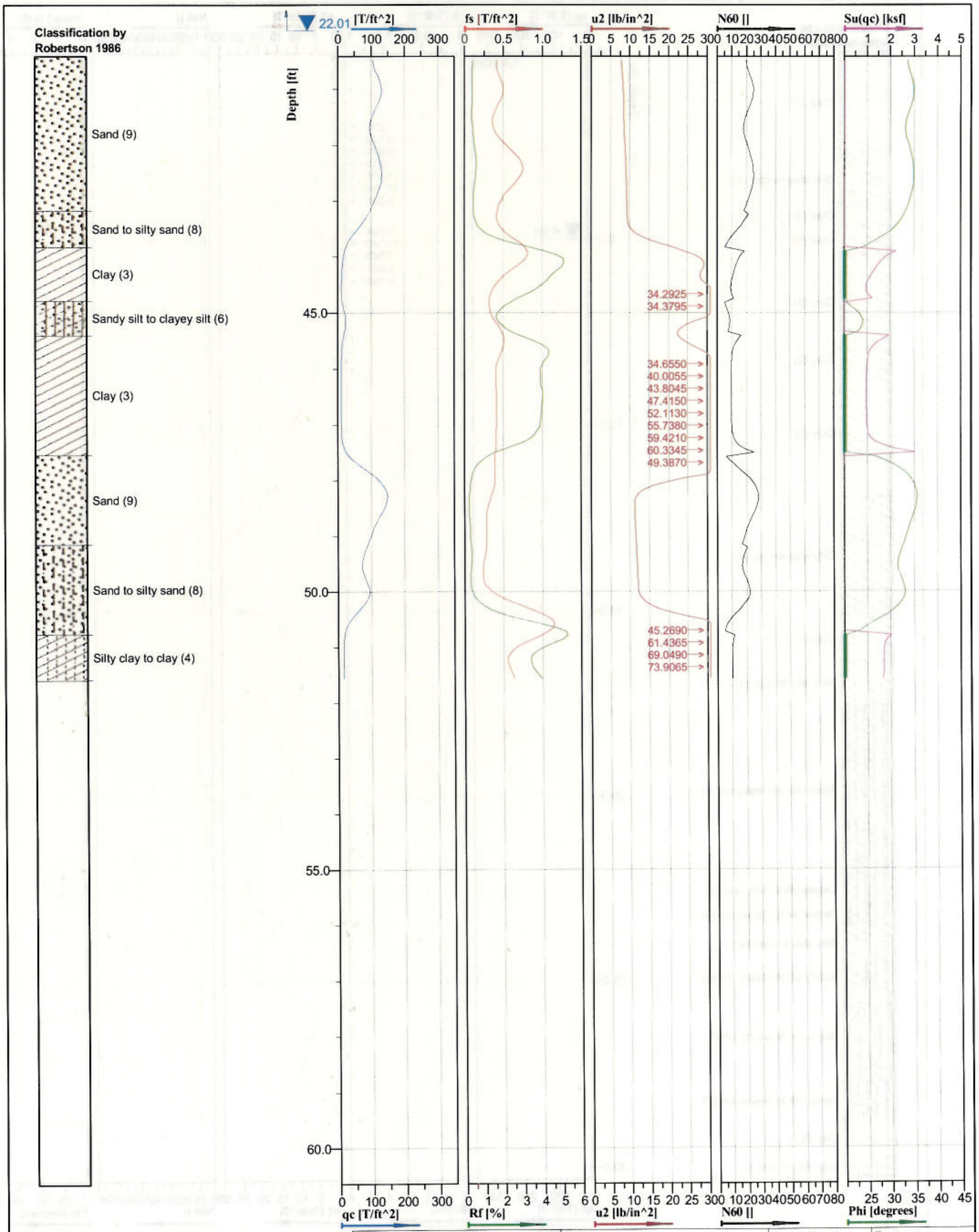

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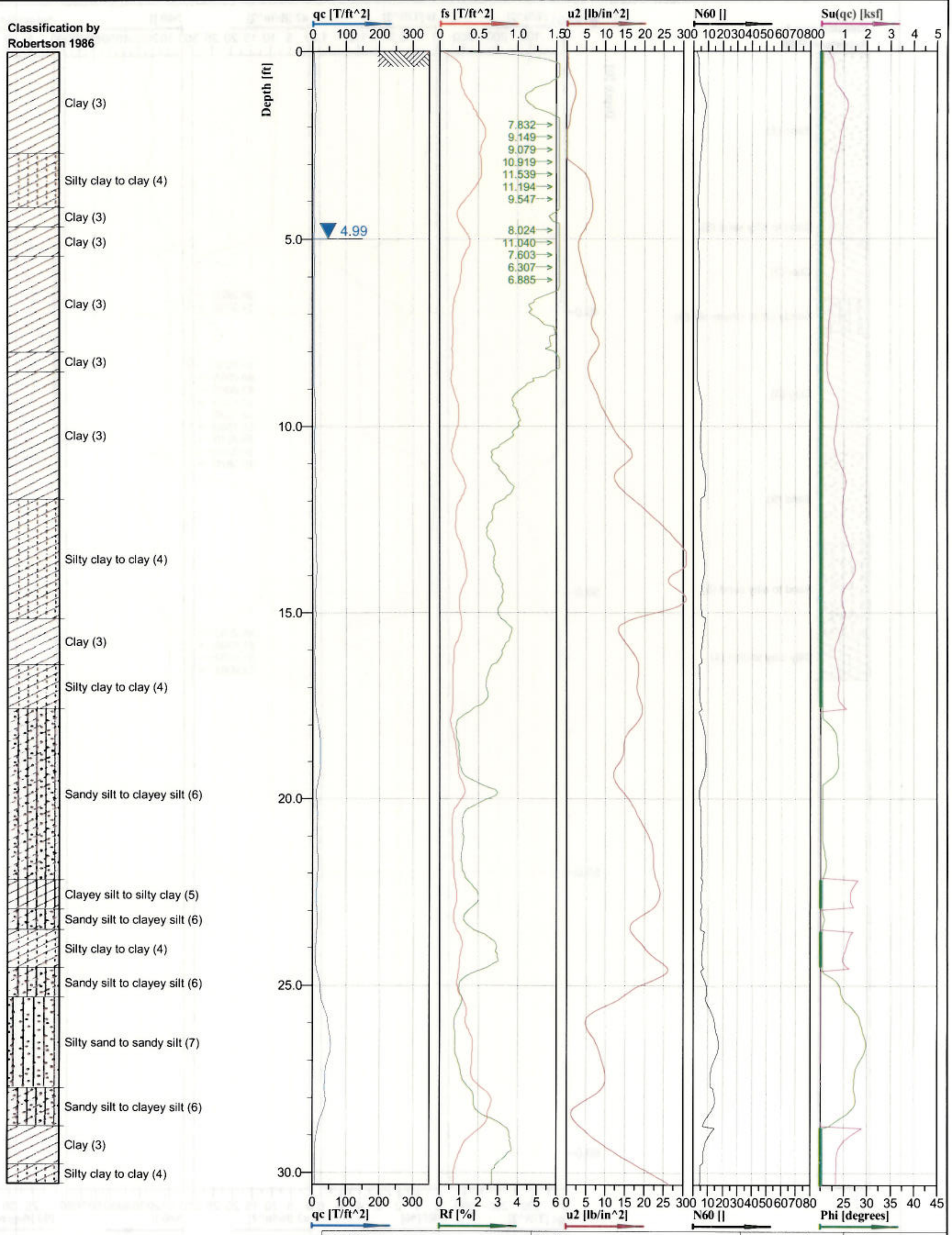
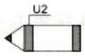
U2

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant	Position: X: 864515.12 ft, Y: 936305.48 ft	Ground level: 413.25	Test no: P-3
Project ID: 2010012488	Client: Ameren Missouri	Date: 10/7/2010	Scale: 1 : 28
Project: Ameren: Meramec Ash Pond Stability Analysis		Page: 3/3	Fig: 3-3
		File: Meramec PZ-2.cpd	





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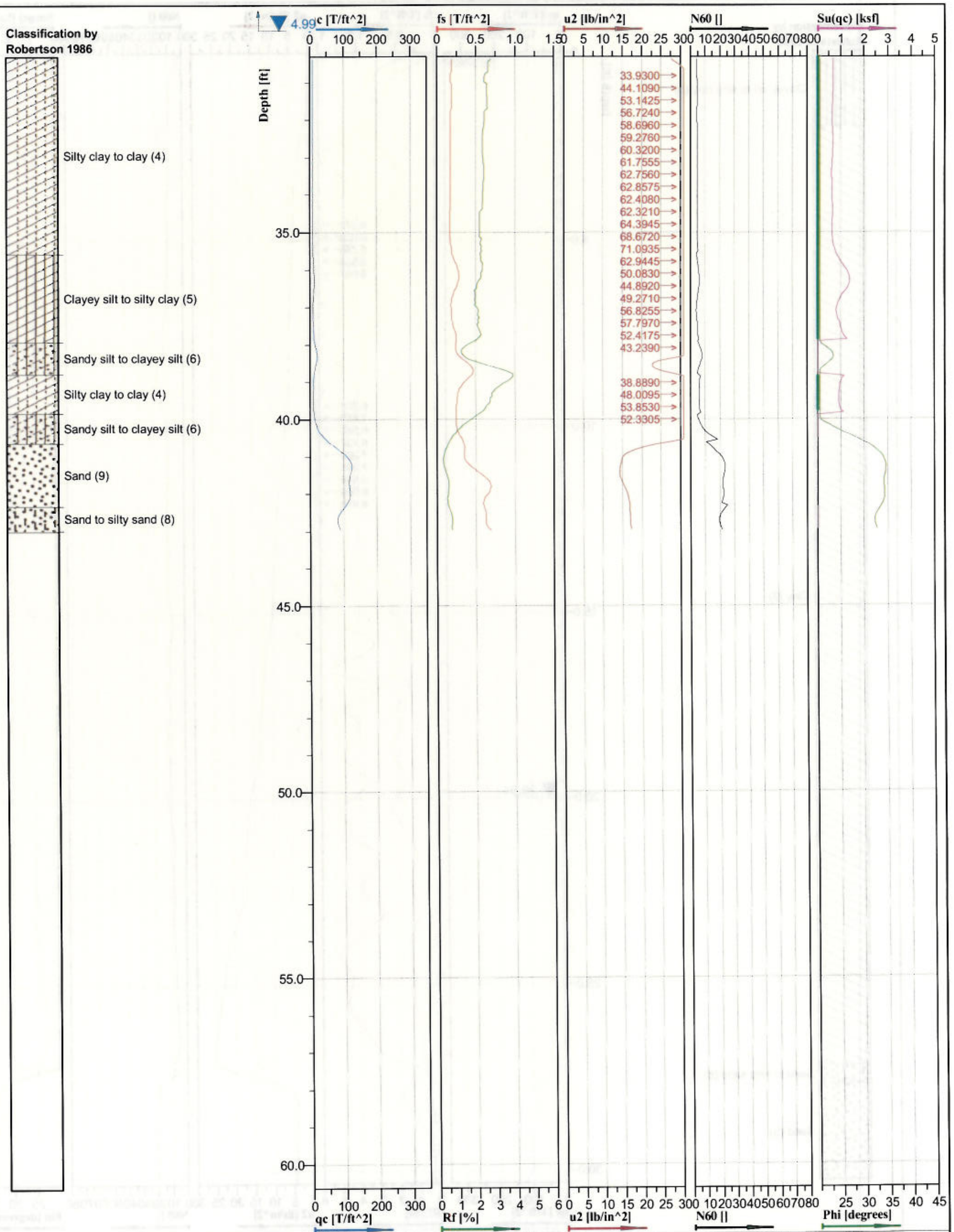
Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant	Position: X: 864848.16 ft, Y: 934529.04 ft	Ground level: 394.26	Test no: P-4
Project ID: 2010012488	Client: Ameren Missouri	Date: 10/7/10	Scale: 1 : 42
Project: Ameren: Meramec Ash Pond Stability Analysis		Page: 1/2	Fig: 3-4
		File: Meramec P-4.cpd	



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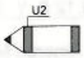

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Power Plant	Position: X: 864848.16 ft, Y: 934529.04 ft	Ground level: 394.26	Test no: P-4
Project ID: 2010012488	Client: Ameren Missouri	Date: 10/7/10	Scale: 1 : 42
Project: Ameren: Meramec Ash Pond Stability Analysis		Page: 2/2	Fig: 3-4
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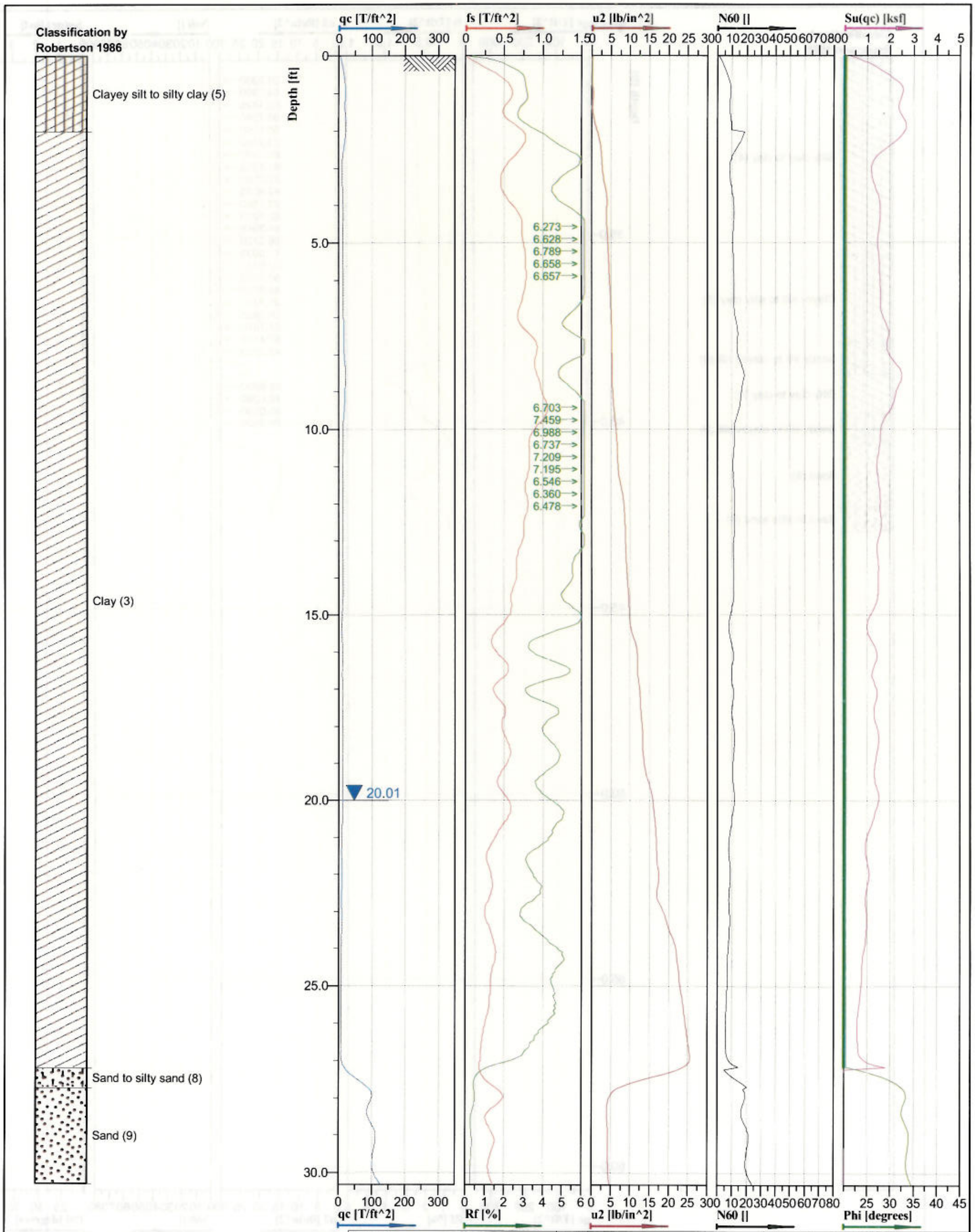

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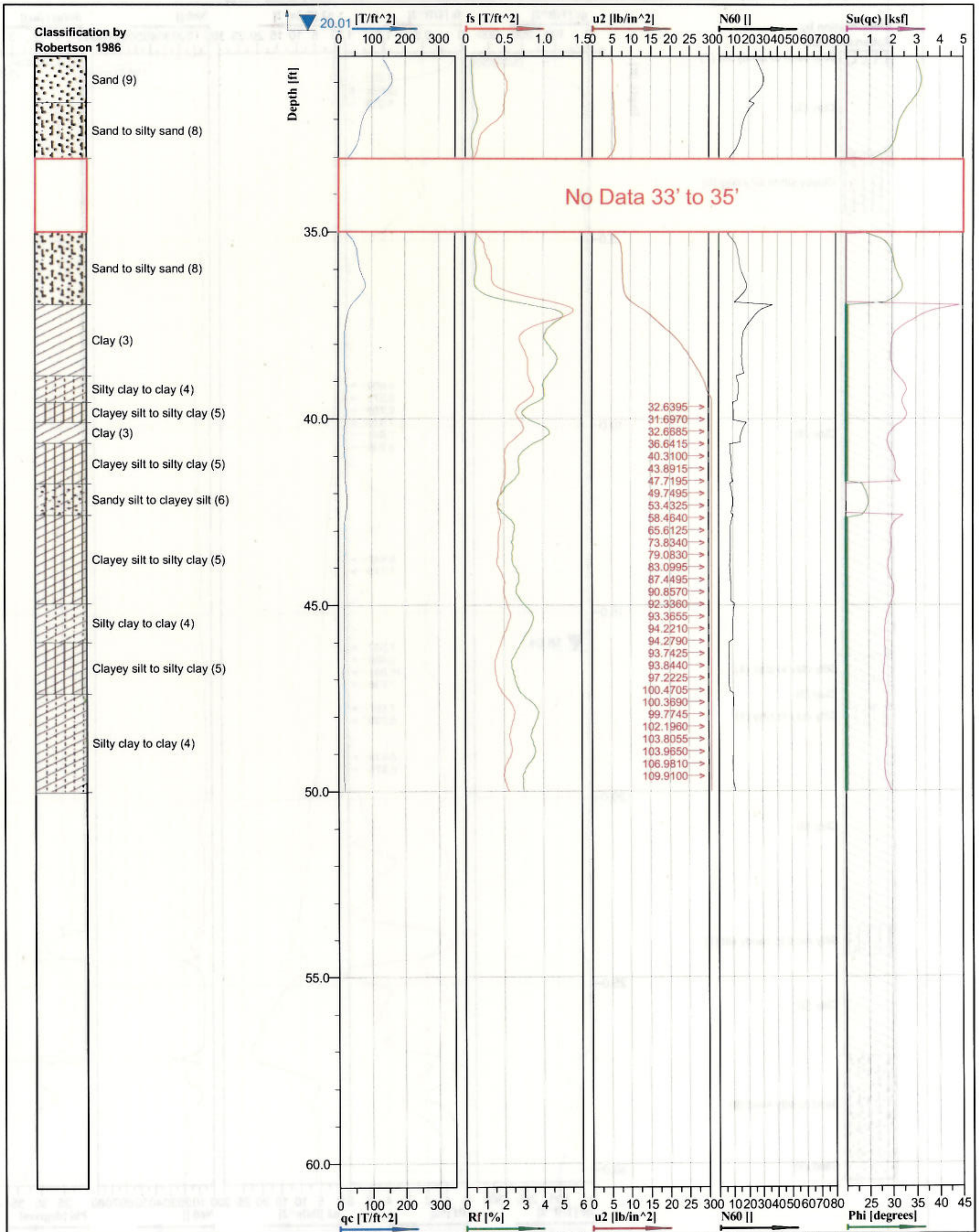
Consulting Engineers

U2
Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Ash Ponds
Position: X: 864538.12 ft, Y: 936033.50 ft
Ground level: 398.00
Test no: P-5
Project ID: 2010012488
Client: Ameren Missouri
Date: 11/2/2010
Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses
Page: 1/2
Fig: 3-5
No data 33' to 35'
File: meramec p-5.cpd

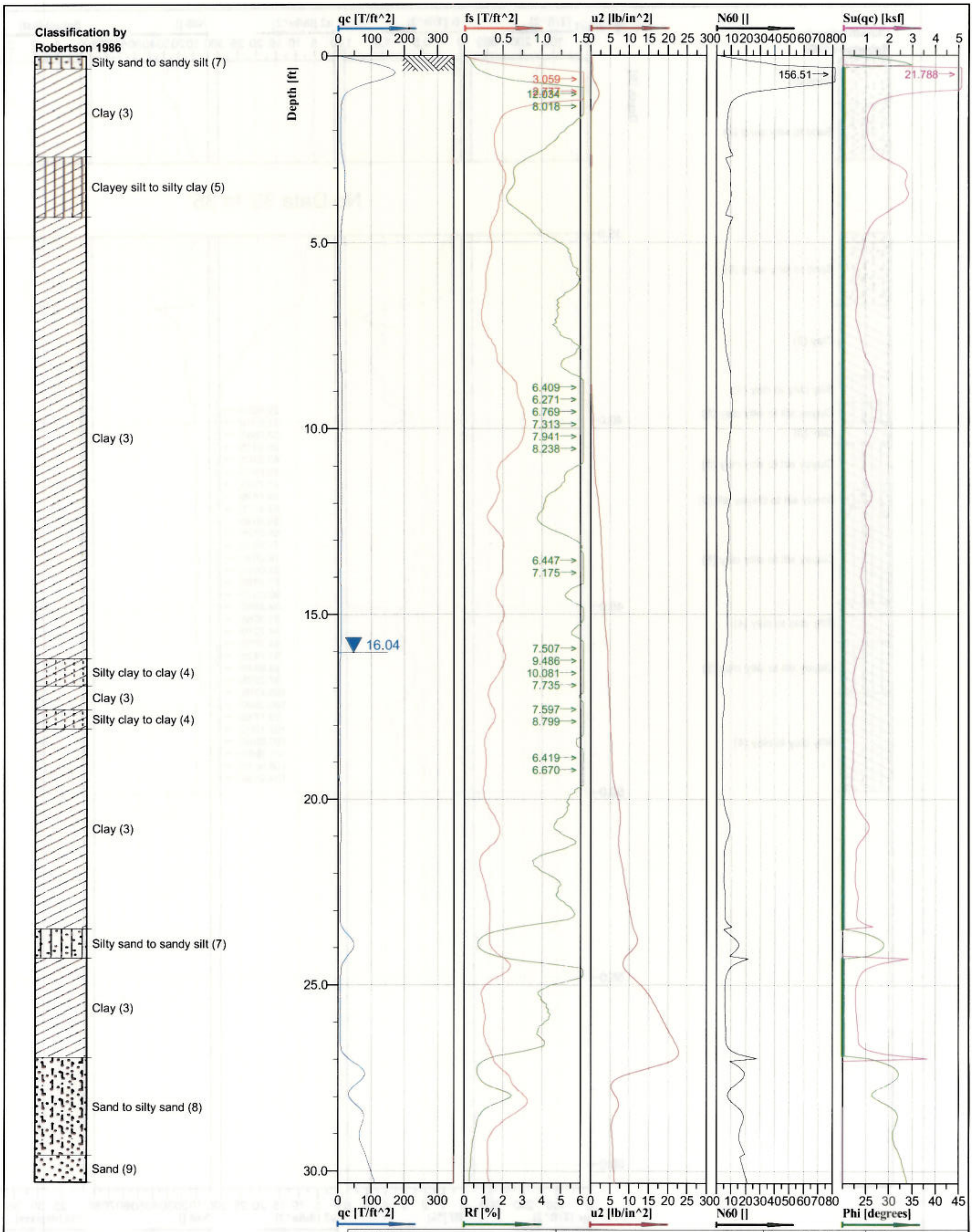


Reitz & Jens, Inc.
CONSULTING ENGINEERS

U2

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Ash Ponds
Position: X: 864538.12 ft, Y: 936033.50 ft
Ground level: 398.00
Test no: P-5
Project ID: 2010012488
Client: Ameren Missouri
Date: 11/2/2010
Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses
Page: 2/2
Fig: 3-5
No data 33' to 35'
File: meramec p-5.cpd



Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Ash Ponds	Position: X: 864498.59 ft, Y: 936885.56 ft	Ground level: 396.69	Test no: P-6
Project ID: 2010012488	Client: Ameren Missouri	Date: 11/2/2010	Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses		Page: 1/2	Fig: 3-6
		File: meramec p-6.cpd	

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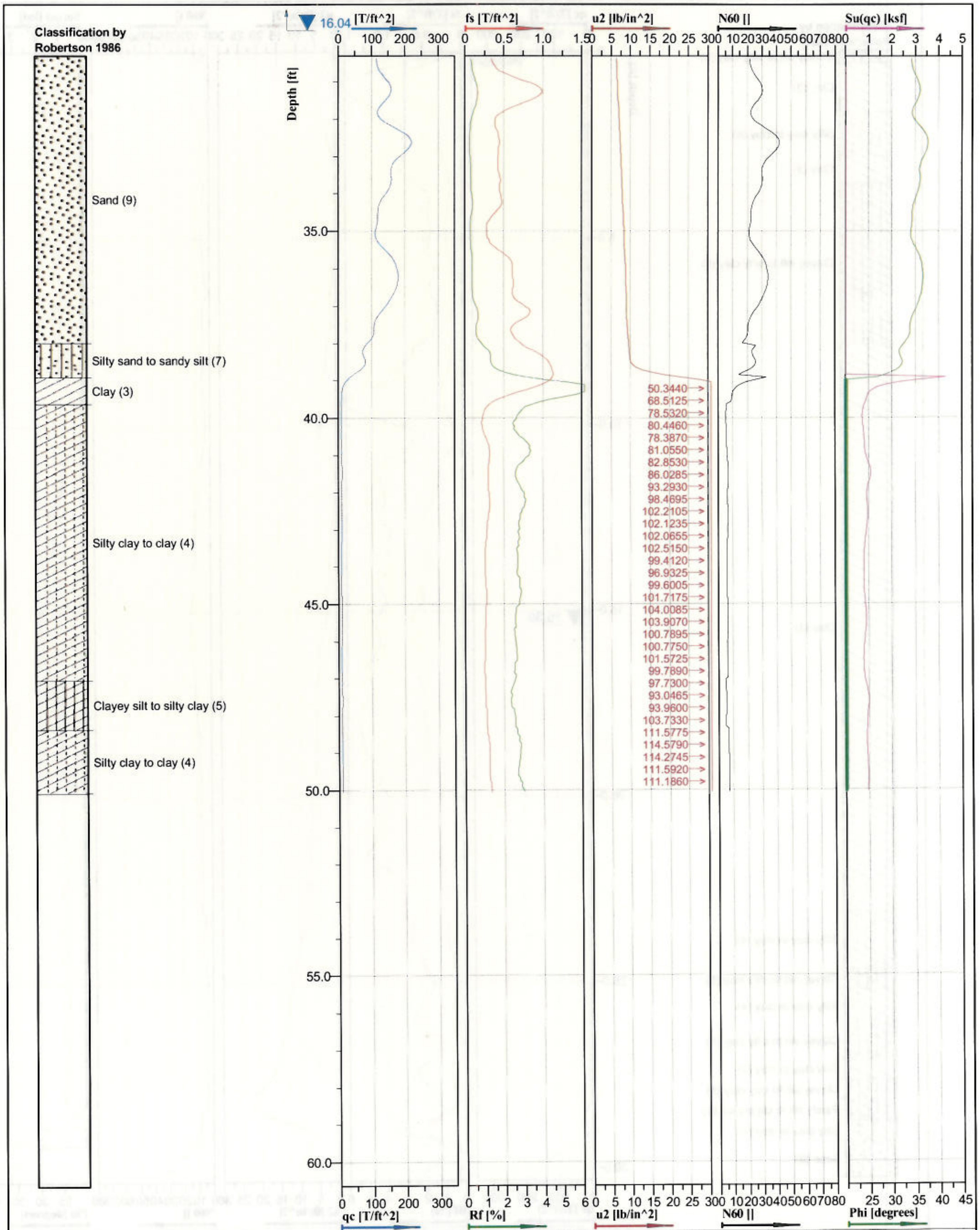
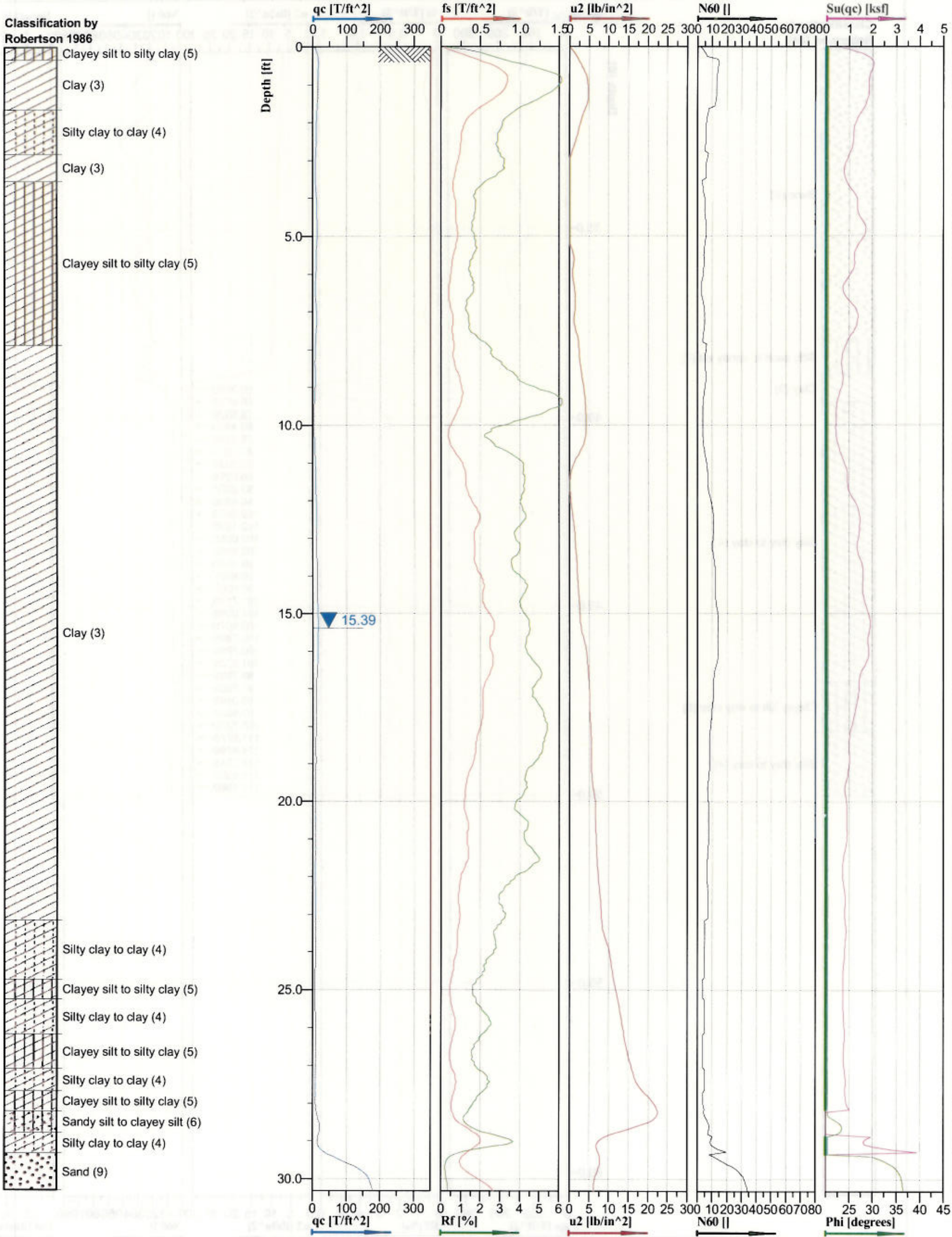


REITZ & JENS, INC.
CONSULTING ENGINEERS

U2

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Ash Ponds	Position: X: 864498.59 ft, Y: 936885.56 ft	Ground level: 396.69	Test no: P-6
Project ID: 2010012488	Client: Ameren Missouri	Date: 11/2/2010	Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses		Page: 2/2	Fig: 3-6
		File: meramec p-6.cpd	



Location: Meramec Ash Ponds	Position: X: 864861.25 ft, Y: 937323.69 ft	Ground level: 397.60	Test no: P-7
Project ID: 2010012488	Client: Ameren Missouri	Date: 11/2/2010	Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses		Page: 1/2	Fig: 3-7
		File: meramec b-1.cpd	

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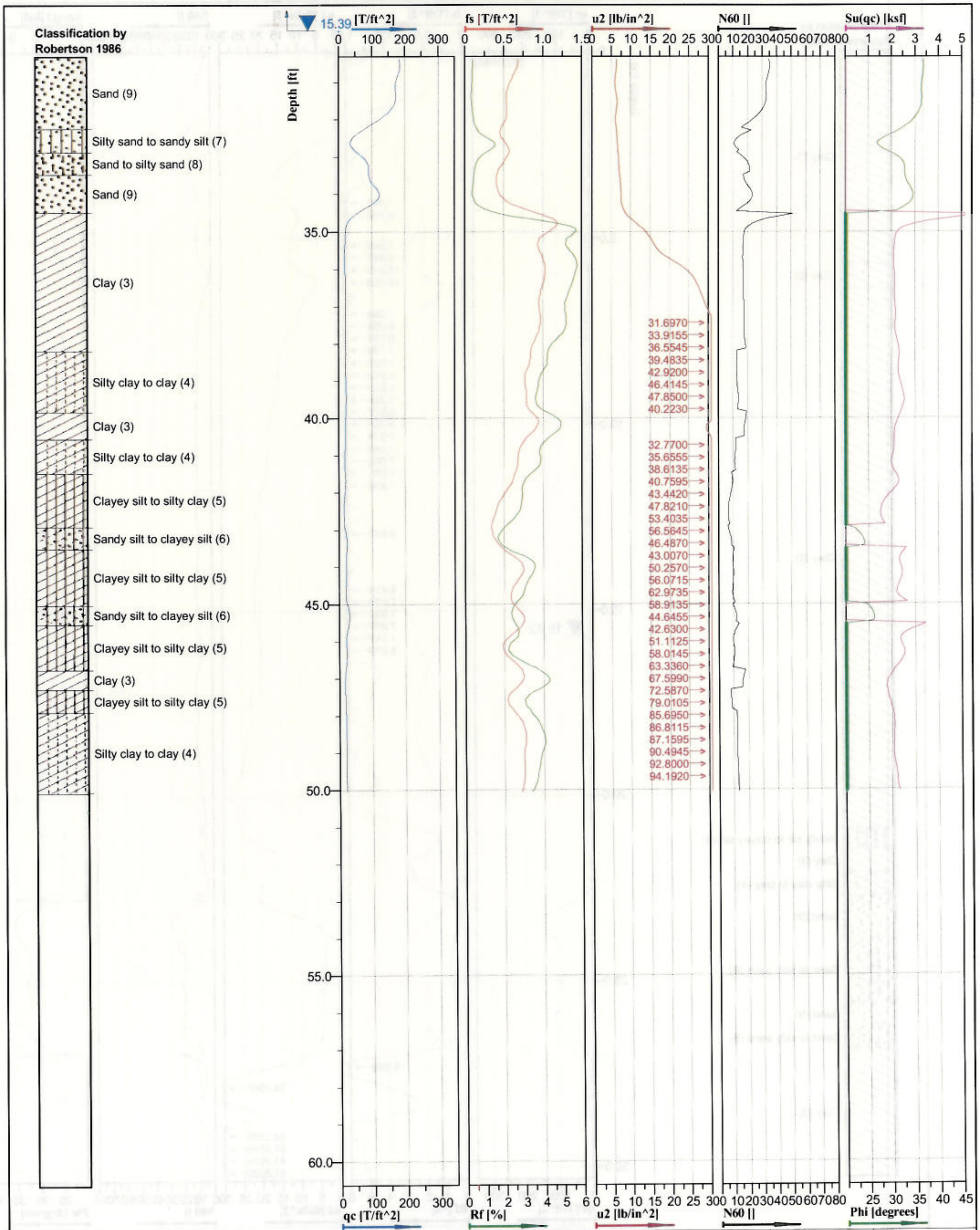
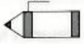
CONSULTING ENGINEERS

U2

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150





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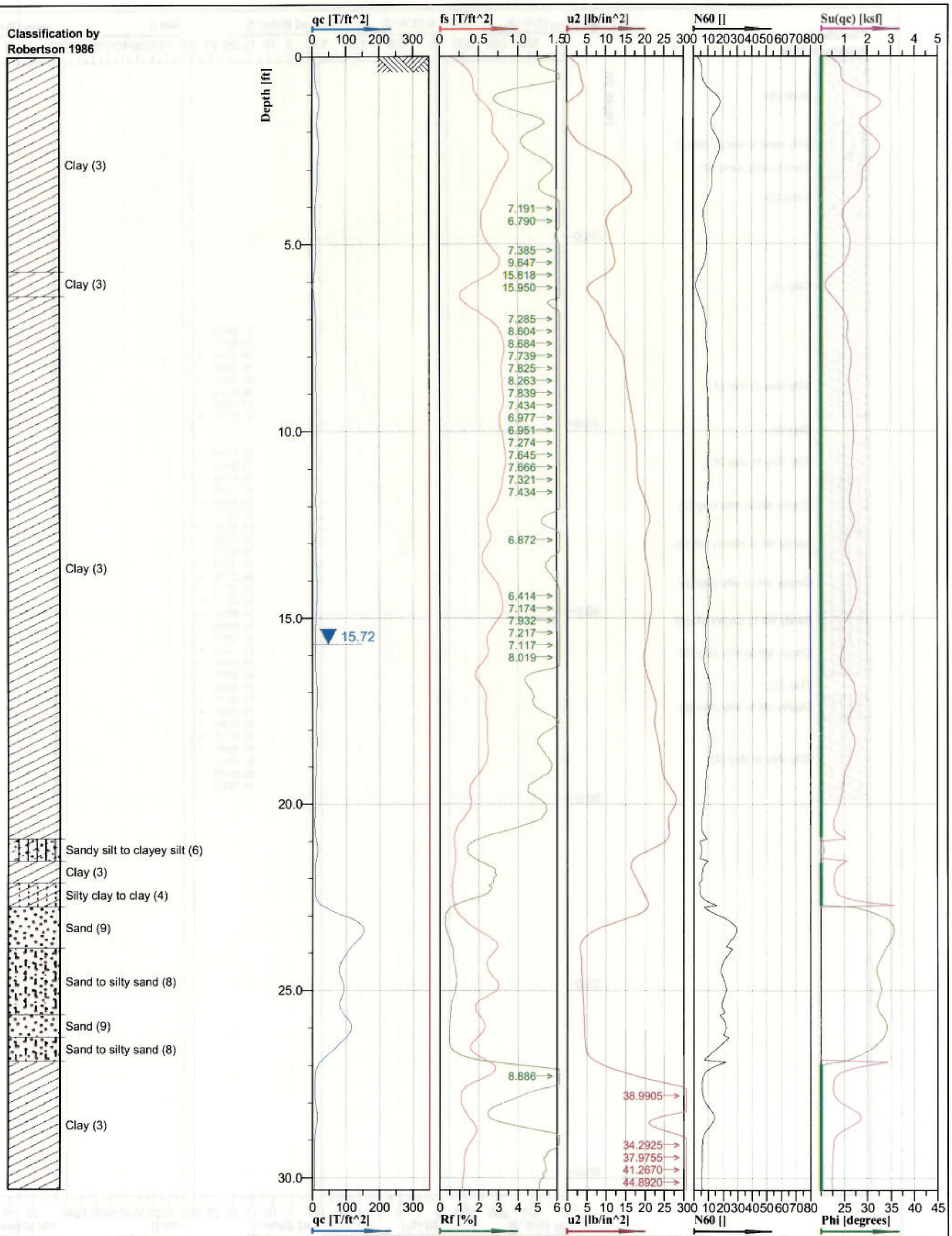
Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Ash Ponds	Position: X: 864861.25 ft, Y: 937323.69 ft	Ground level: 397.60	Test no: P-7
Project ID: 2010012488	Client: Ameren Missouri	Date: 11/2/2010	Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses		Page: 2/2	Fig: 3-7
		File: meramec b-1.cpd	



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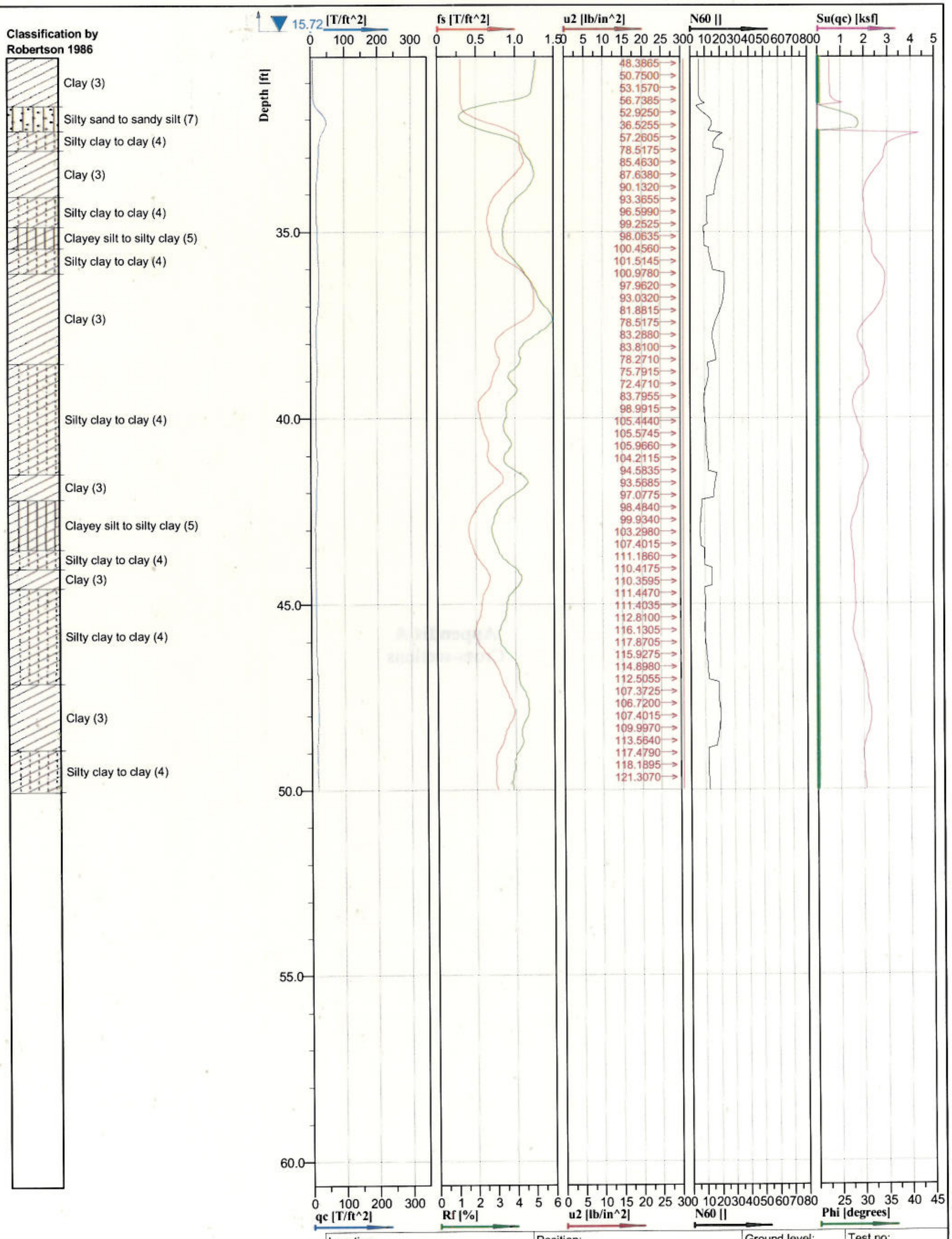
U2

Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Meramec Ash Ponds
Position: X: 864459.06 ft, Y: 936289.47 ft
Ground level: 398.00
Test no: P-8
Project ID: 2010012488
Client: Ameren Missouri
Date: 11/2/2010
Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses
Page: 1/2
Fig: 3-8
File: meramec b-2.cpd



Location: Meramec Ash Ponds	Position: X: 864459.06 ft, Y: 936289.47 ft	Ground level: 398.00	Test no: P-8
Project ID: 2010012488	Client: Ameren Missouri	Date: 11/2/2010	Scale: 1 : 42
Project: Ameren: Ash Pond Stability Analyses		Page: 2/2	Fig: 3-8
		File: meramec b-2.cpd	

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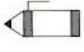
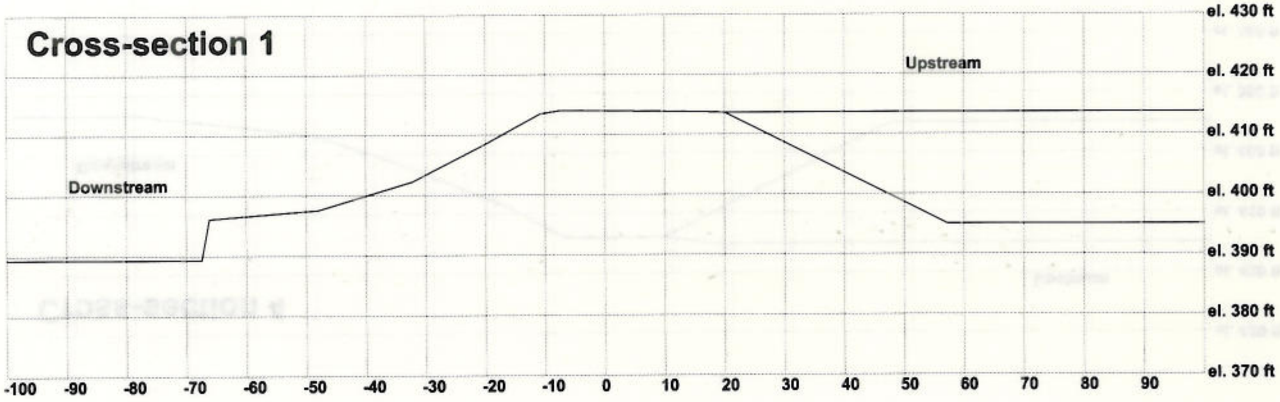


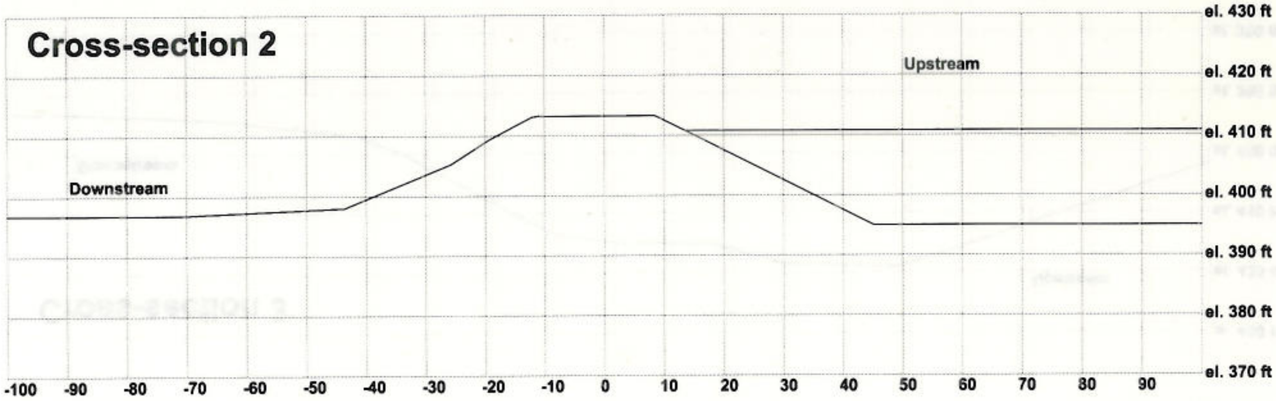
Cone No: 4274
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Appendix A

Cross-sections

Meramec Power Station


Cross-section 1


Cross-section 2

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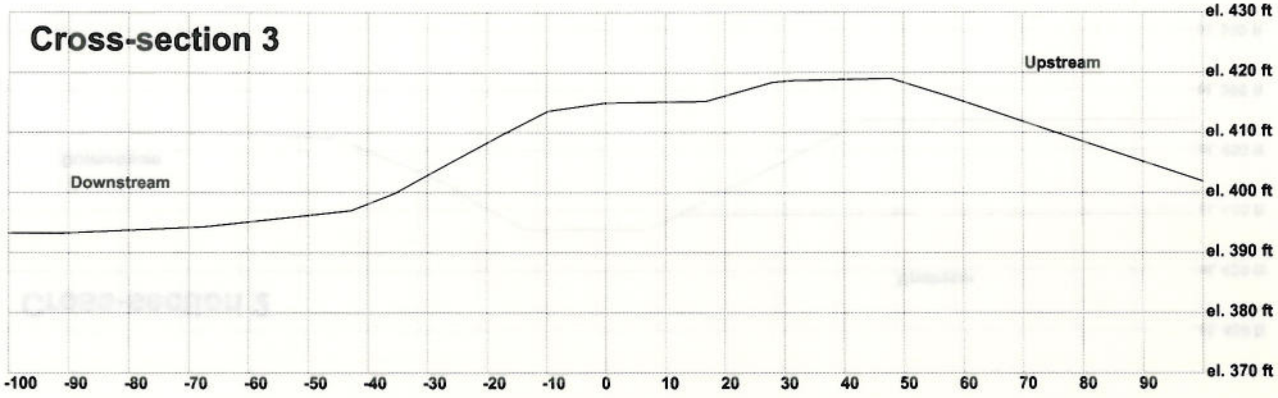
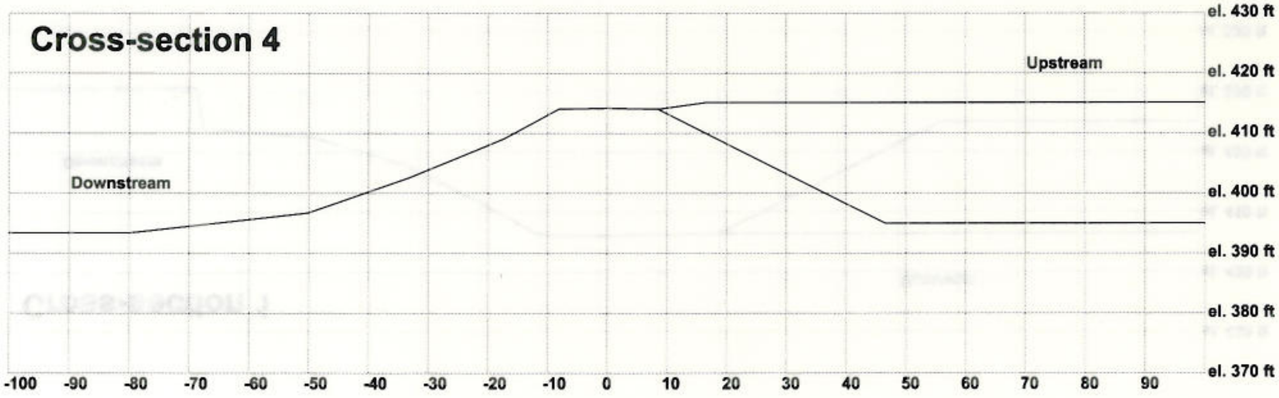
1055 Corporate Square Drive
St. Louis, Missouri 63132

Figure A-1

Meramec Power Station


Cross-section 3


Cross-section 4

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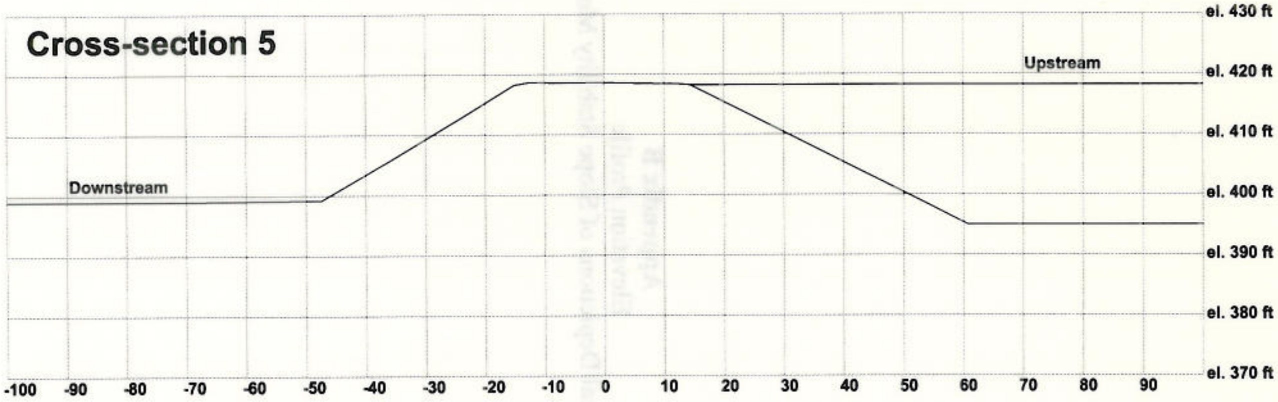
1055 Corporate Square Drive
St. Louis, Missouri 63132

Figure A-2

Meramec Power Station



Cross-section 5

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1055 Corporate Square Drive
St. Louis, Missouri 63132

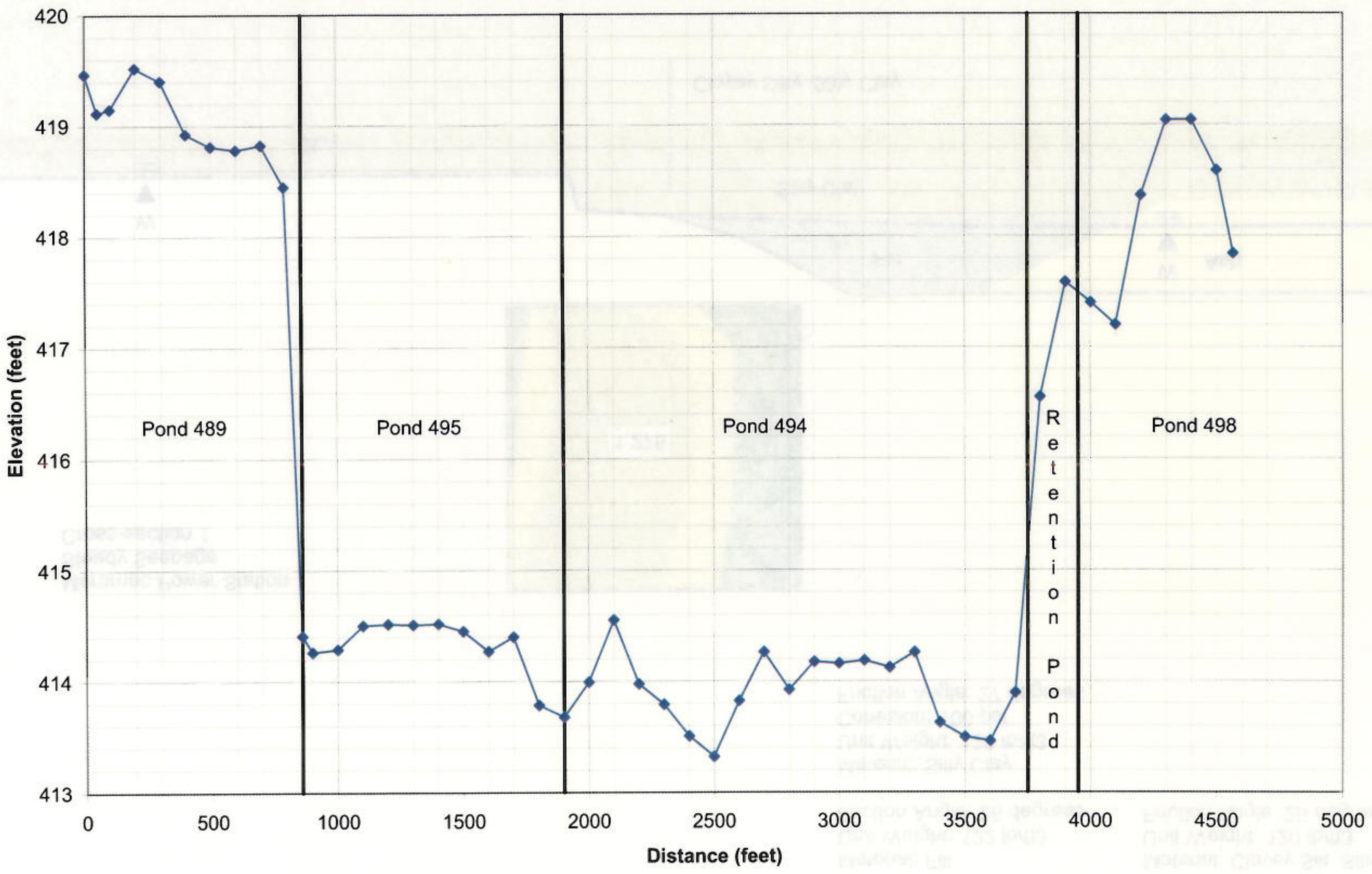
Figure A-3

Appendix B

Elevation Profile
Graphical Depictions of Slope Stability Models

Meramec Power Station

Elevation Profile



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-1

Material: Ash
Unit Weight: 110 lb/ft3
Friction Angle: 25 degrees

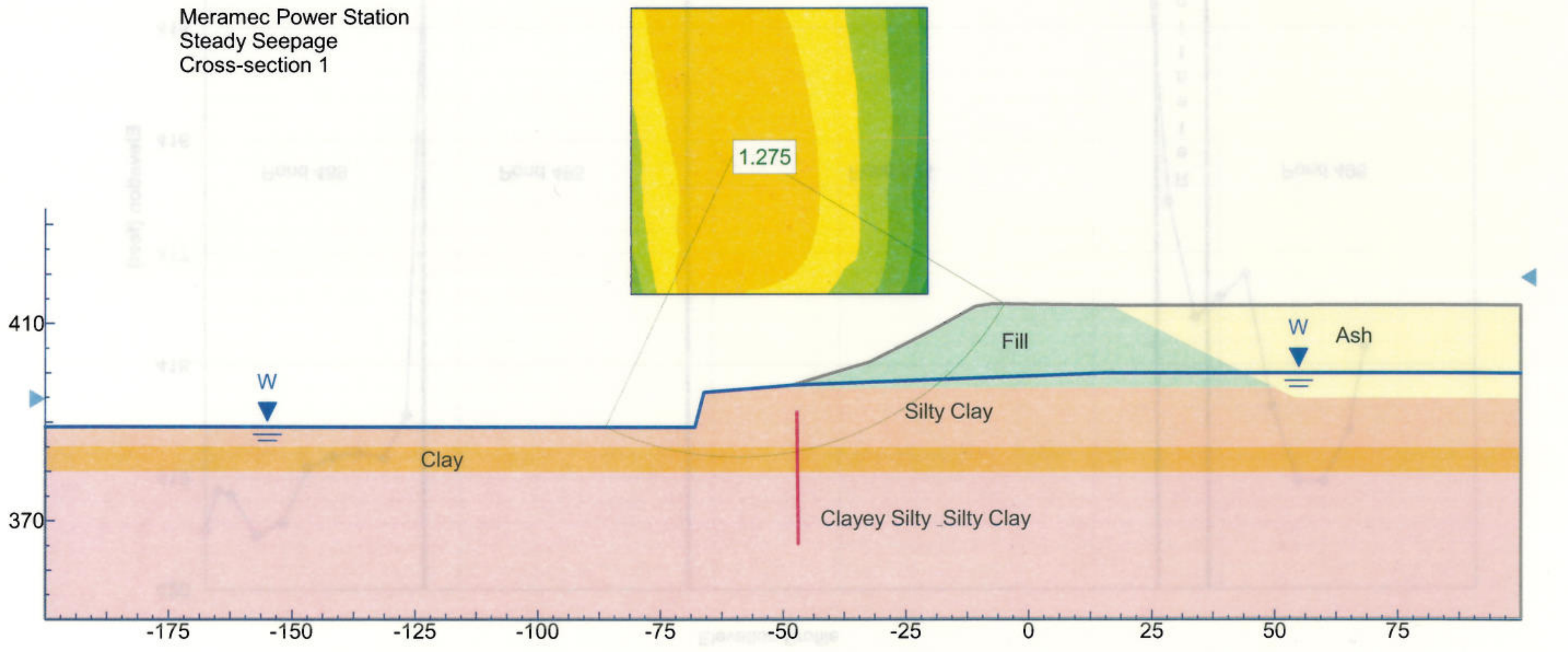
Material: Fill
Unit Weight: 122 lb/ft3
Friction Angle: 26 degrees

Material: Silty Clay
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees

Material: Clay
Unit Weight: 125 lb/ft3
Friction Angle: 26 degrees

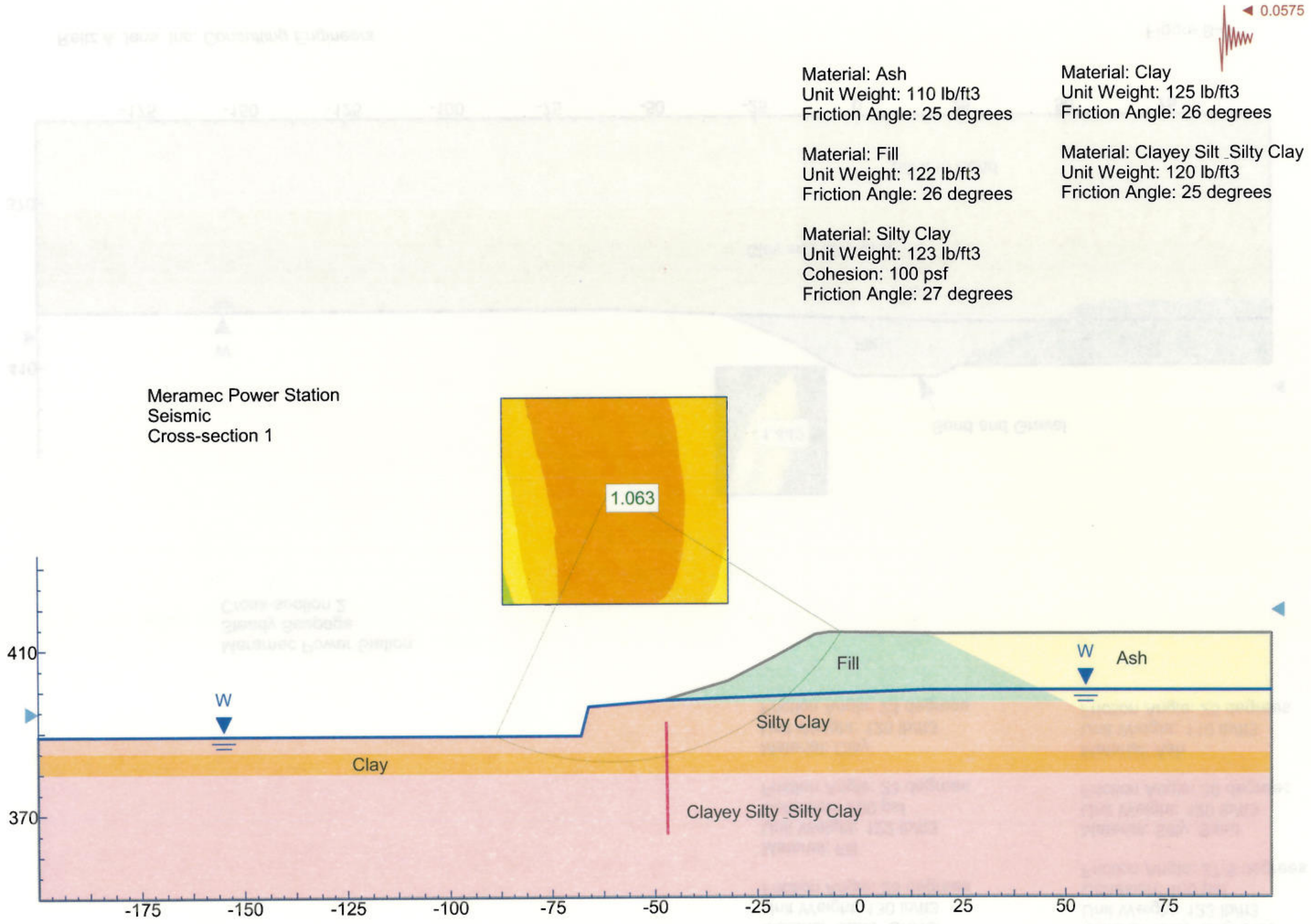
Material: Clayey Silt _Silty Clay
Unit Weight: 120 lb/ft3
Friction Angle: 25 degrees

Meramec Power Station
Steady Seepage
Cross-section 1



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-2



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-3

Material: Sand _Gravel
Unit Weight: 130 lb/ft3
Friction Angle: 28 degrees

Material: Fill
Unit Weight: 122 lb/ft3
Cohesion: 200 psf
Friction Angle: 23 degrees

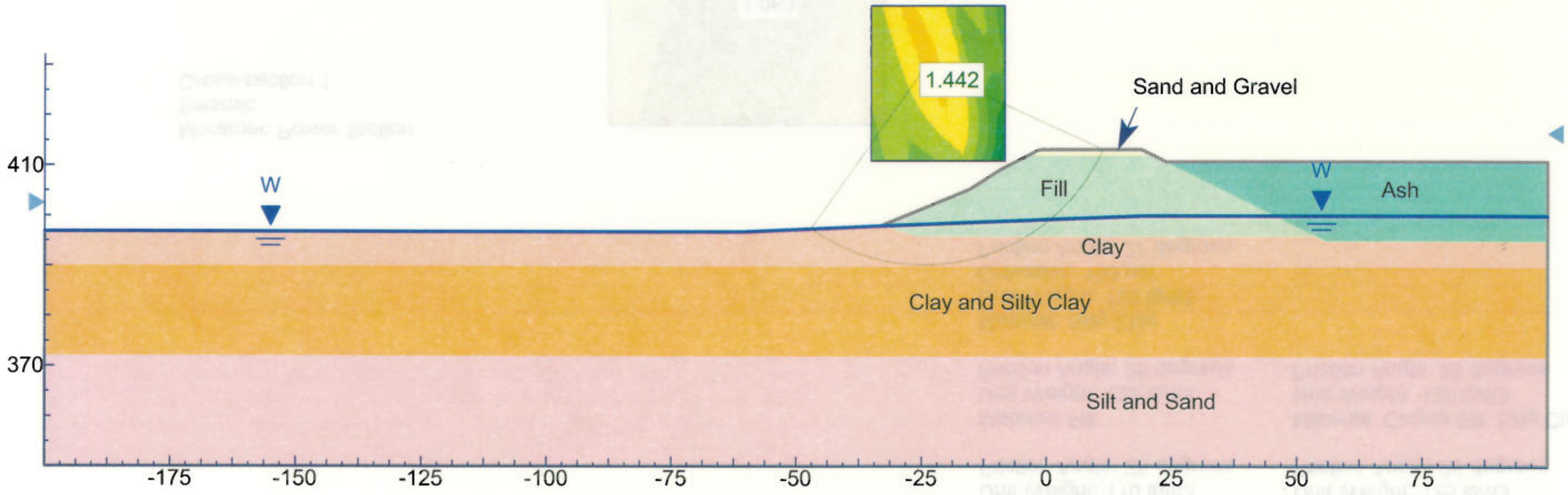
Material: Clay
Unit Weight: 125 lb/ft3
Friction Angle: 23 degrees

Material: Clay _Silty Clay
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27.5 degrees

Material: Silty _Sand
Unit Weight: 120 lb/ft3
Friction Angle: 30 degrees

Material: Ash
Unit Weight: 110 lb/ft3
Friction Angle: 25 degrees

Meramec Power Station
Steady Seepage
Cross-section 2



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-4

Material: Sand _Gravel
Unit Weight: 130 lb/ft3
Friction Angle: 28 degrees

Material: Fill
Unit Weight: 122 lb/ft3
Cohesion: 200 psf
Friction Angle: 23 degrees

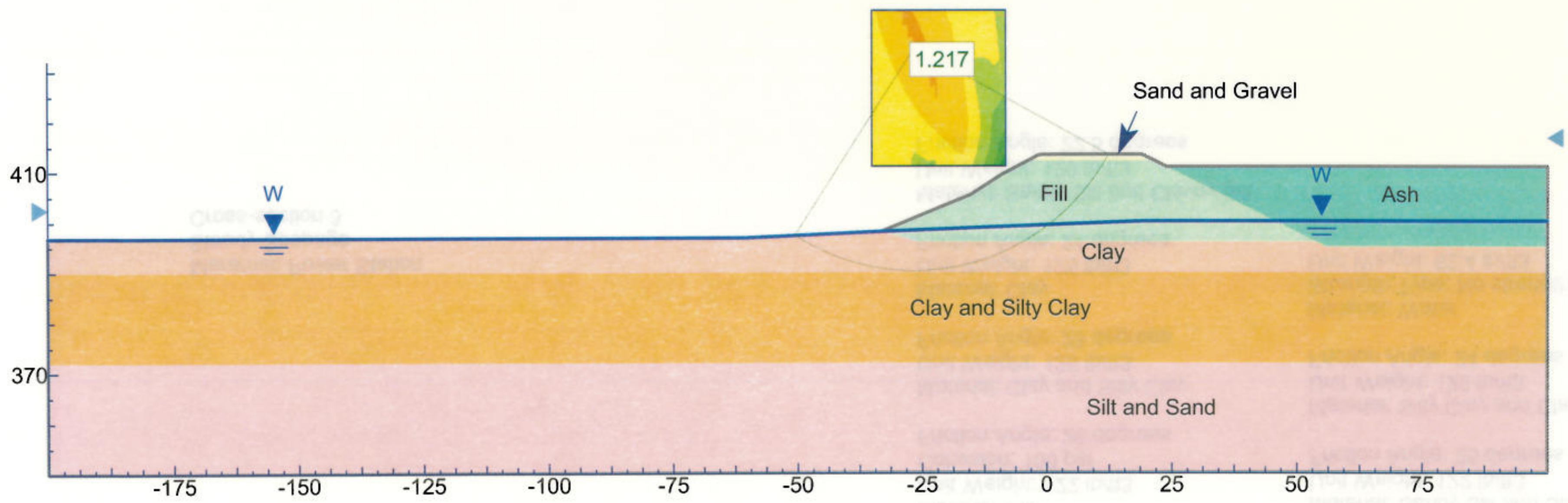
Material: Clay
Unit Weight: 125 lb/ft3
Friction Angle: 23 degrees

Material: Clay _Silty Clay
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27.5 degrees

Material: Silty _Sand
Unit Weight: 120 lb/ft3
Friction Angle: 30 degrees

Material: Ash
Unit Weight: 110 lb/ft3
Friction Angle: 25 degrees

Meramec Power Station
Seismic
Cross-section 2



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-5

Meramec Power Station
Steady Seepage
Cross-section 3

Material: Fill
Unit Weight: 122 lb/ft3
Cohesion: 100 psf
Friction Angle: 26 degrees

Material: Clay and Silty Clay
Unit Weight: 125 lb/ft3
Friction Angle: 23 degrees

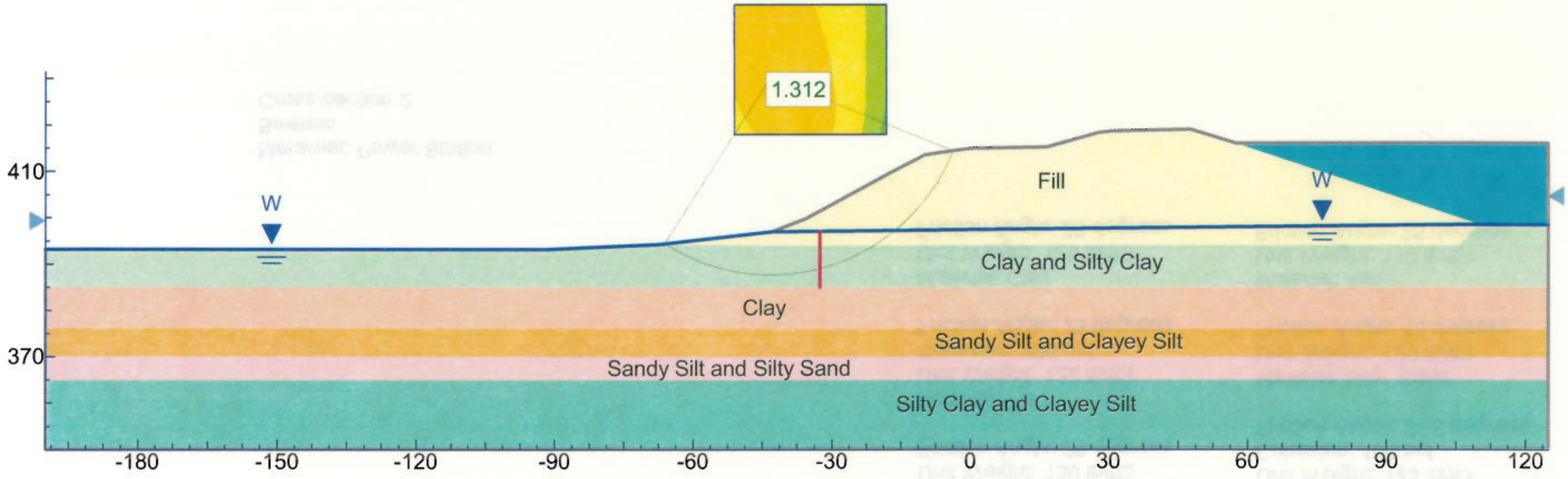
Material: Clay
Unit Weight: 125 lb/ft3
Friction Angle: 24 degrees

Material: Sandy Silt and Clayey Silt
Unit Weight: 120 lb/ft3
Friction Angle: 22.5 degrees

Material: Sandy Silt and Silty Sand
Unit Weight: 122 lb/ft3
Friction Angle: 25 degrees

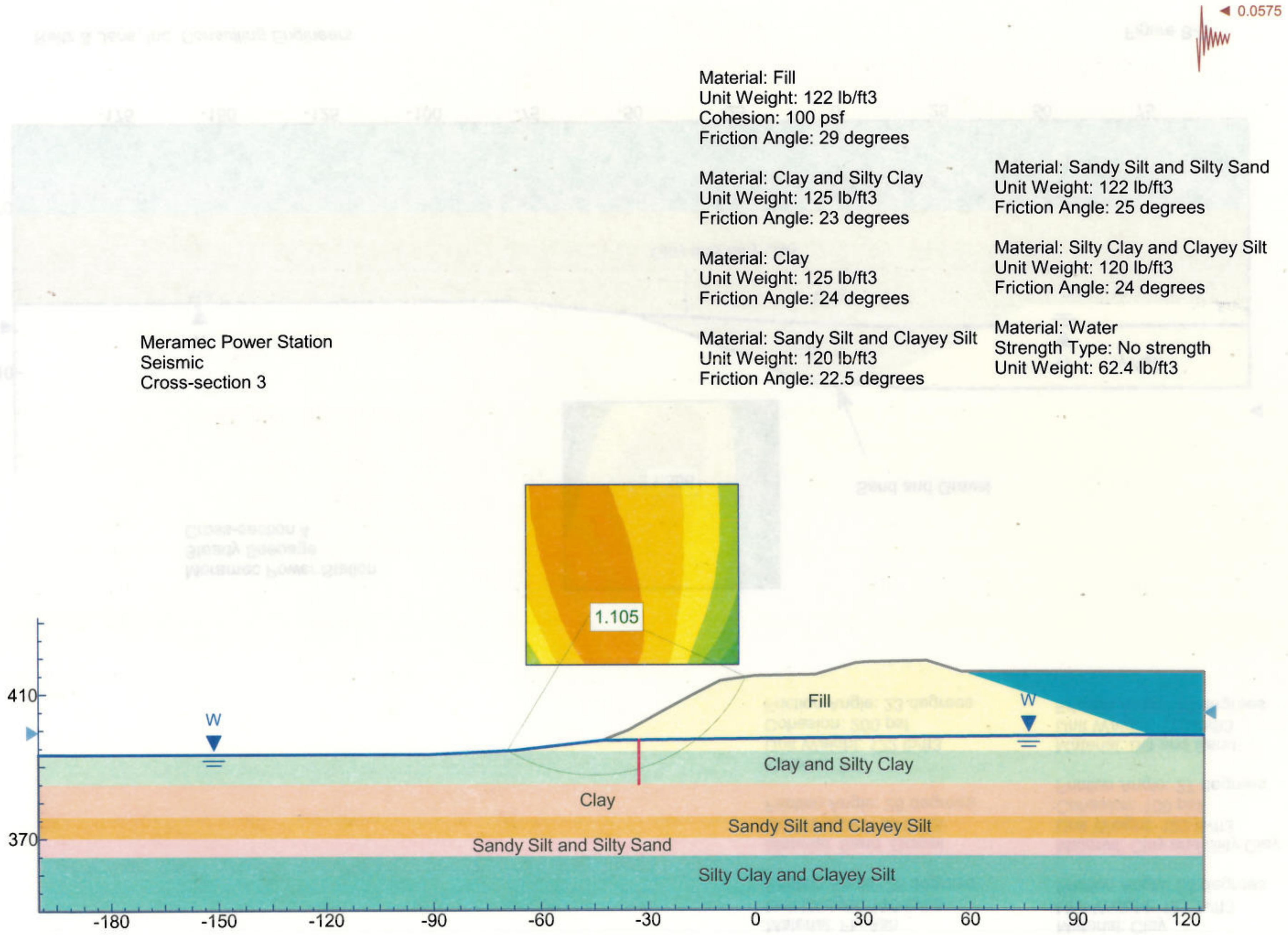
Material: Silty Clay and Clayey Silt
Unit Weight: 120 lb/ft3
Friction Angle: 24 degrees

Material: Water
Strength Type: No strength
Unit Weight: 62.4 lb/ft3



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-6



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-7

Material: Fly Ash
Unit Weight: 110 lb/ft3
Friction Angle: 25 degrees

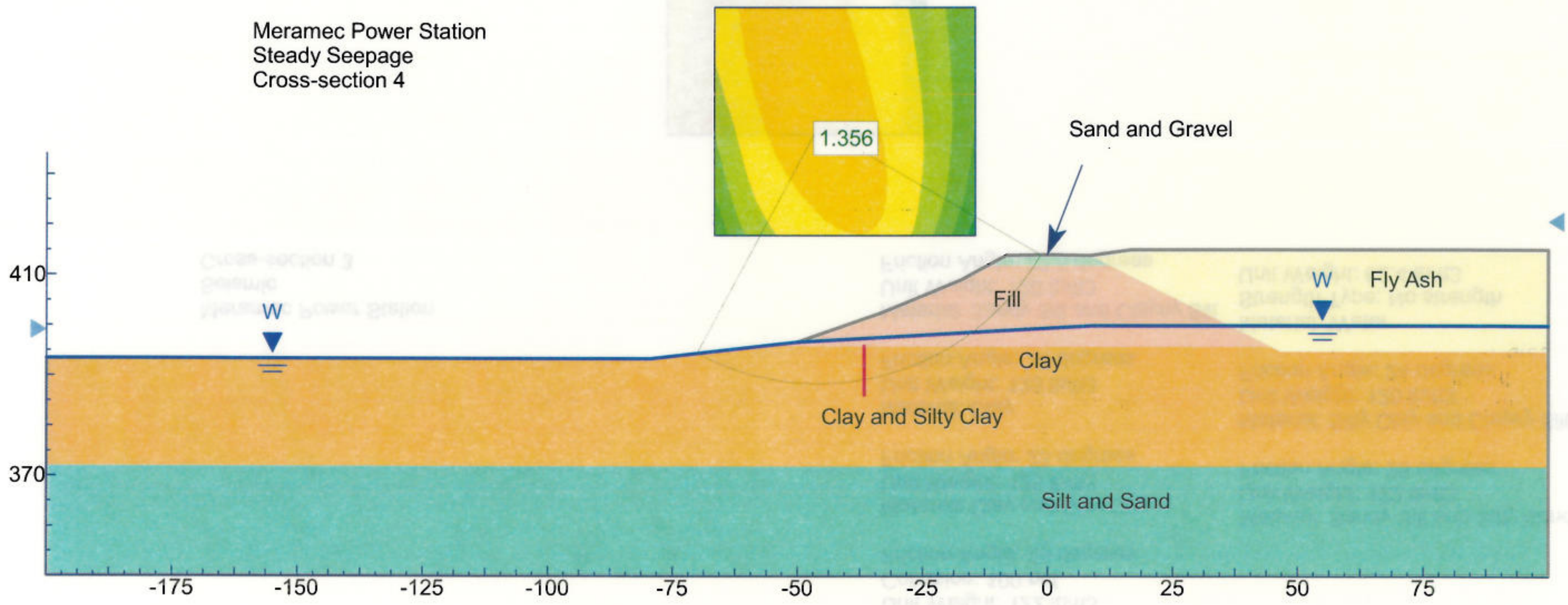
Material: Sand _Gravel
Unit Weight: 130 lb/ft3
Friction Angle: 28 degrees

Material: Fill
Unit Weight: 122 lb/ft3
Cohesion: 200 psf
Friction Angle: 23 degrees

Material: Clay
Unit Weight: 125 lb/ft3
Friction Angle: 23 degrees

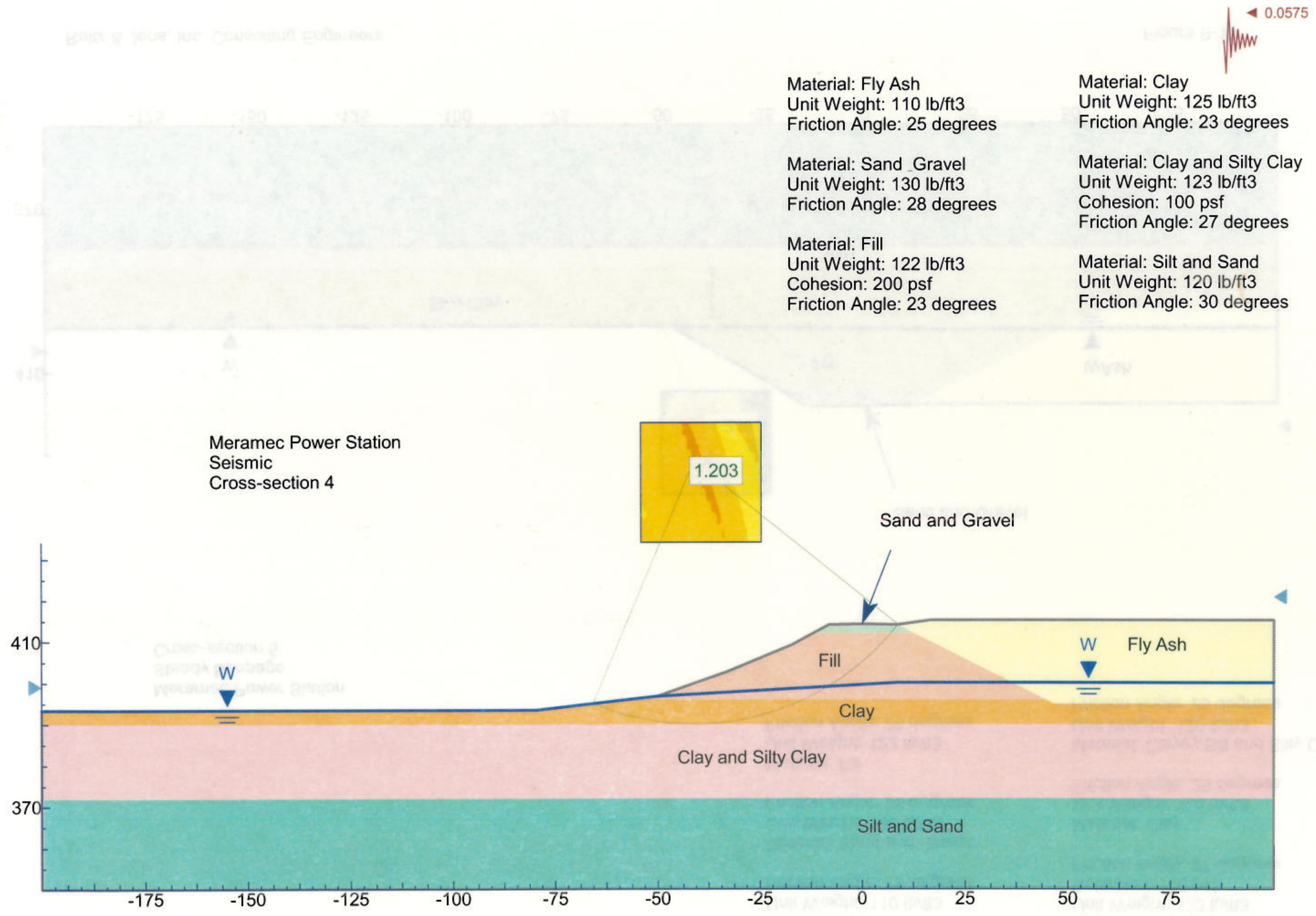
Material: Clay and Silty Clay
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees

Material: Silt and Sand
Unit Weight: 120 lb/ft3
Friction Angle: 30 degrees



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-8



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-9

Material: Ash
Unit Weight: 110 lb/ft3
Friction Angle: 25 degrees

Material: Sand and Gravel
Unit Weight: 130 lb/ft3
Friction Angle: 28 degrees

Material: Fill
Unit Weight: 122 lb/ft3
Friction Angle: 26 degrees

Material: Silty Clay
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees

Material: Clay
Unit Weight: 125 lb/ft3
Friction Angle: 26 degrees

Material: Clayey Silt and Silty Clay
Unit Weight: 120 lb/ft3
Friction Angle: 25 degrees

Meramec Power Station
Steady Seepage
Cross-section 5

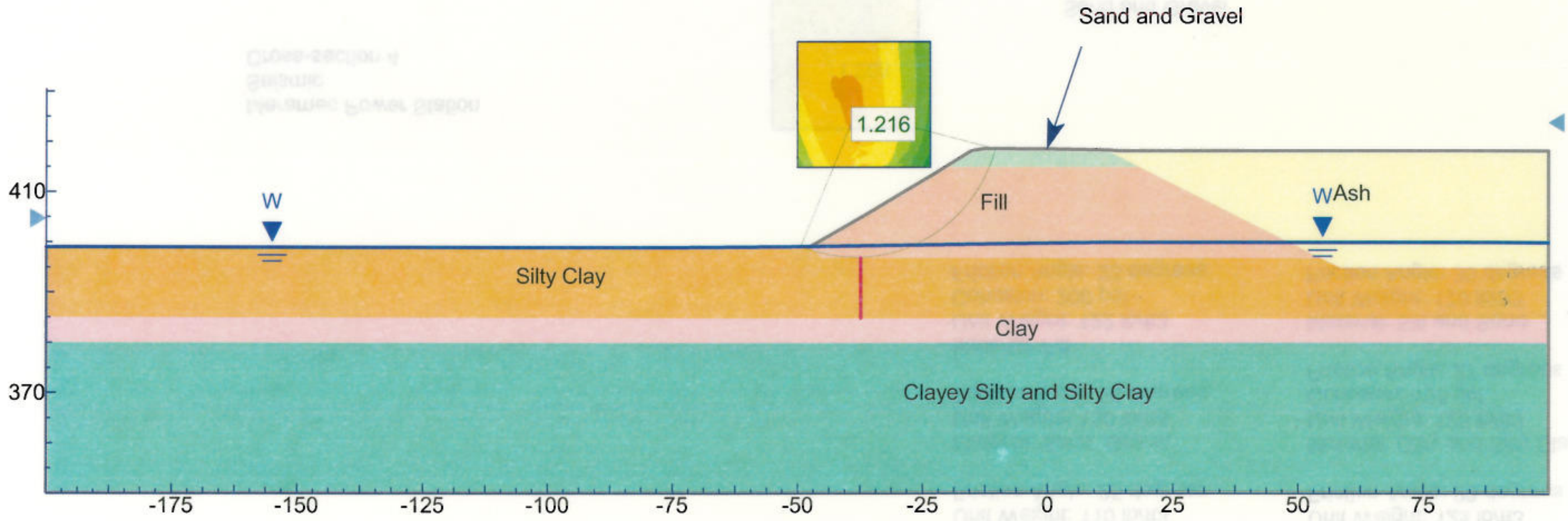
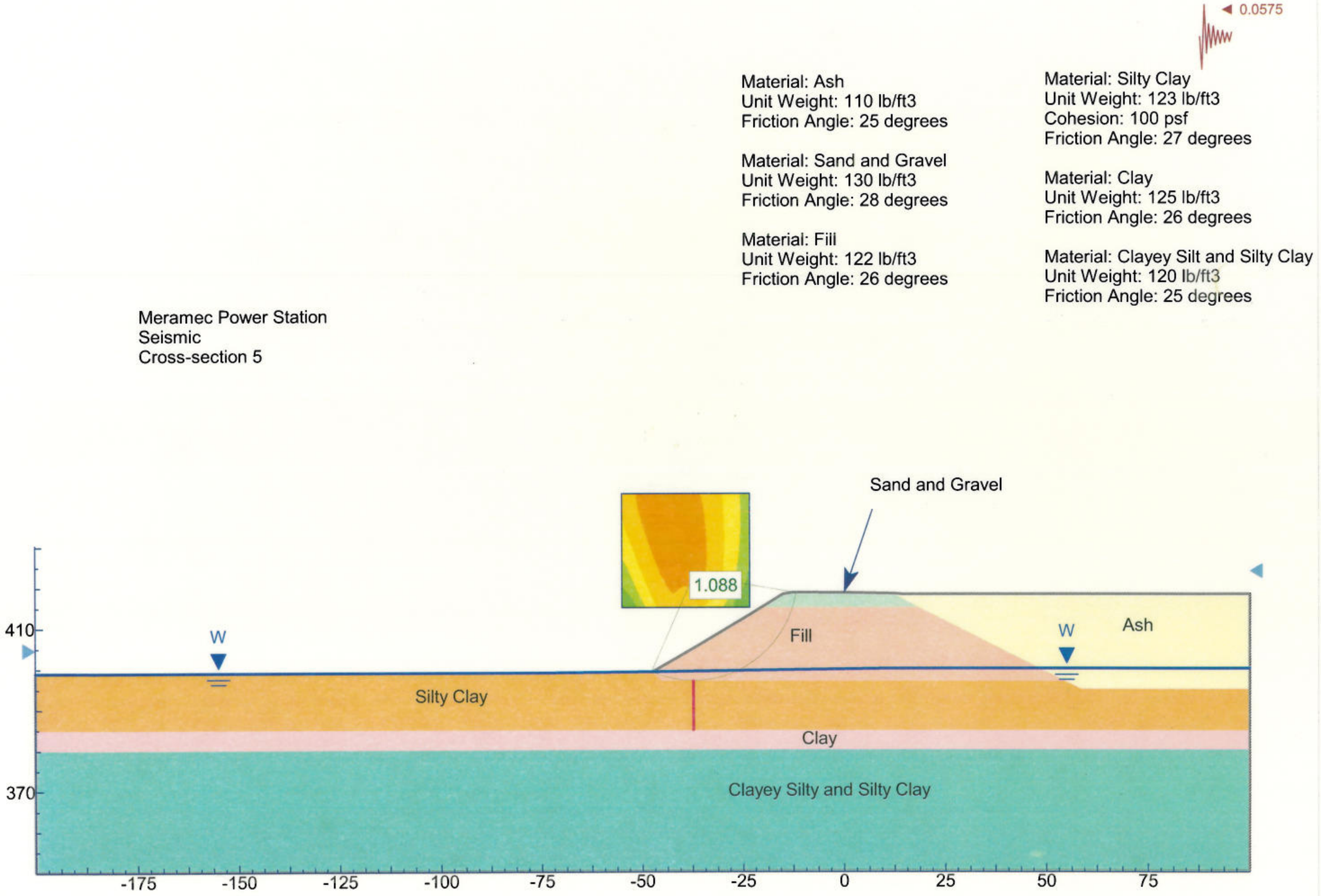


Figure B-10



Reitz & Jens, Inc. *Consulting Engineers*

Figure B-11

APPENDIX A

DOC 1.11 PRELIMINARY SKETCHES

SEE DRAWING 8020-Y-122626 FOR CROSS SECTION 6

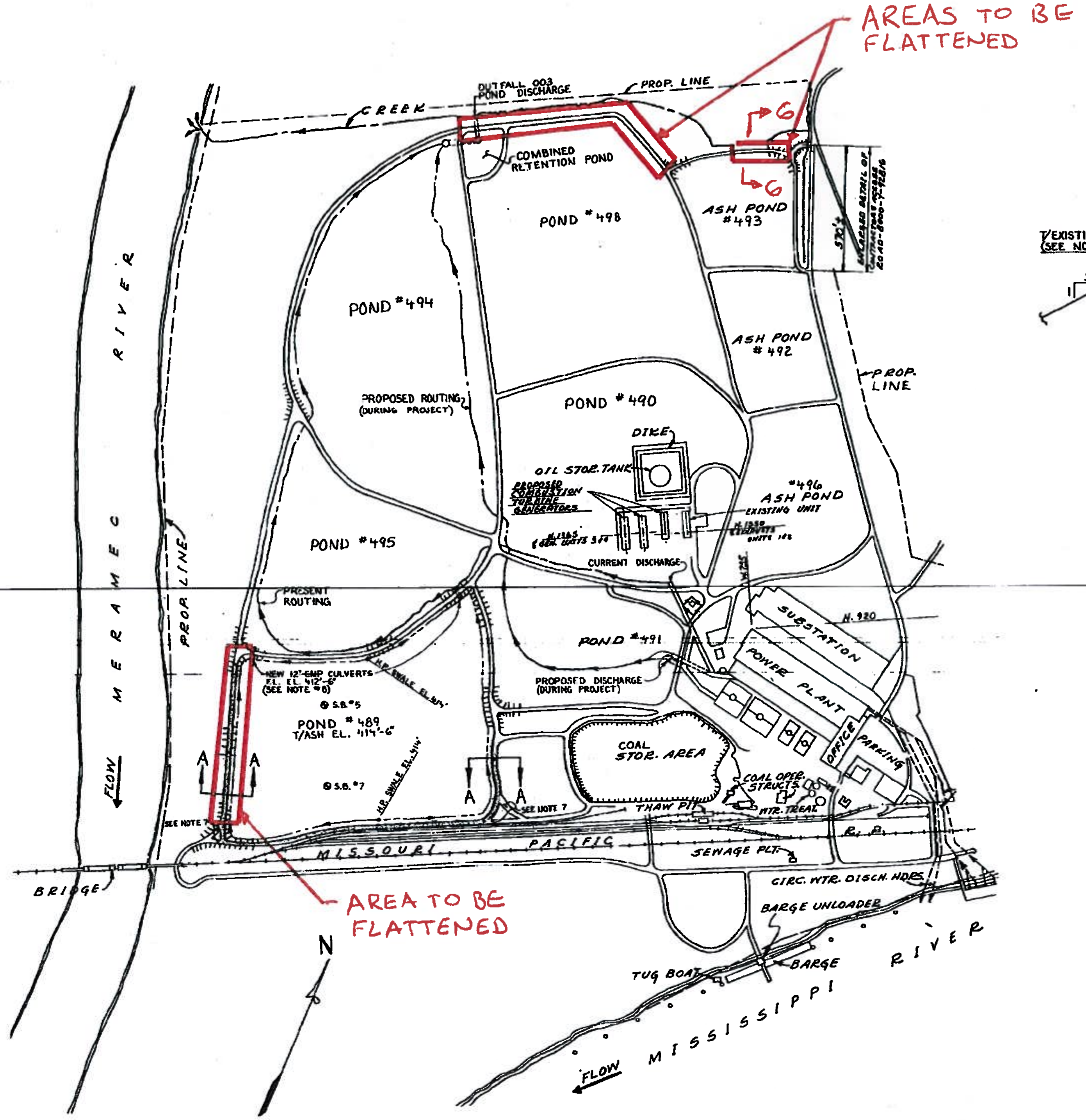
Elevation Profile Survey Limits
Locations of Cross-sections and Borings

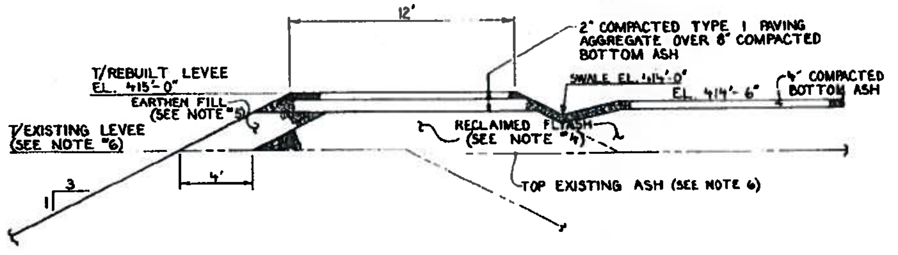
REITZ & JENS, INC.
CONSULTING ENGINEERS

Figure 1

REVISIONS
REV 0 FIRST ISSUE

8020-Y-122626





SECTION A-A
LEVEE RENOVATION

NOTES:

1) DEPRESSED SECTIONS OF POND #489 LEVEES SHALL FIRST BE RESTORED TO THEIR ORIGINAL TOP-OF-LEVEE ELEVATION 416', AS SHOWN IN SECTION A-A.

2) FLYASH SHALL BE RECLAIMED FROM POND #495 BY APPROPRIATE METHODS. FLYASH SHALL BE DRYED, PLACED AND COMPACTED IN POND #489, TO AN EL. OF 414'-6".

3) METHODS OF DRYING (IE. MOISTURE REDUCTION) SHALL BE RESTRICTED SUCH THAT ANY RESULTING RUNOFF BE KEPT WITHIN EXISTING ASH POND LIMITS AND BE ROUTED TO THE EXISTING PERMITTED DISCHARGE.

4) RECLAIMED FLYASH SHALL BE PLACED IN LOOSE LIFTS NOT TO EXCEED 8-12 INCHES, AND IMMEDIATELY COMPACTED AT OPTIMUM MOISTURE CONTENT BY MEANS OF A VIBRATORY ROLLER. SEE SPECIFICATION FOR COMPACTION REQUIREMENT. (SEE ALSO NOTE #9)

5) EARTHEN MATERIAL REQUIRED FOR EROSION PROTECTION AND CONTAINMENT SHALL CONFORM TO CL, CH, ML, OR MH SOIL CLASSIFICATIONS AS GIVEN BY ASTM DESIGNATION D-2487. THIS MATERIAL SHALL BE COMPACTED WITH A SHEEPS-FOOT TYPE COMPACTOR. SEE SPECIFICATION FOR COMPACTION REQUIREMENT. (SEE ALSO NOTE #9)

6) SEE TOPOGRAPHIC MAP DRAWING 8020-W-22627 FOR EXISTING ELEVATIONS.

7) REBUILD ACCESS ROADS TO RENOVATED LEVEE TO PROVIDE SMOOTH TRANSITIONS FOR SMALL VEHICLES.

8) TWO NEW CULVERTS WILL BE INSTALLED AS SHOWN TO PROVIDE STORMWATER DRAINAGE FROM POND #489 INTO POND #495.

9) COMPACTION SPECIFICATIONS SHOULD YIELD PERMEABILITIES WITHIN THE REPAIRED LEVEE AS FOLLOWS:
CLAY FILL – LESS THAN 10^{-7} CM/SEC.
FLYASH – LESS THAN 10^{-6} CM/SEC.

10) SURVEY MONUMENT #2 SHALL BE RAISED TO ELEVATION 415'-0"±2". SEE DRAWING 8020-W-122627 FOR LOCATION.

11) S.B. #5/7 – SOIL BORINGS (SEE U.E. SPEC. EC-2392, APPENDIX E)

12) RENOVATED LEVEE SHOWN THUS ▨

13) ALL WORK SHALL BE DONE IN ACCORDANCE WITH U.E. SPECIFICATION EC-2392.

REFERENCE DRAWING:
TOPOGRAPHIC MAP _______________ 8020-W-122627

8020-Y-122626

NOTICE OF LIMITED RESPONSIBILITY

THOMAS LEE
E-18247

DRAWN 5/6/91 SCOTT HELD	**PROPERTY PLAN** **ASH RETENTION PONDS**	
CHKD. P.Q.		
SUPV. 5-7-91		
APPD 5-7-91 R. Kinzer	LOCATION 001005	**MERAMEC PLANT**	CLASS 02010
UNION ELECTRIC COMPANY ST. LOUIS, MO.	**8020-Y-122626**	REV. 0

SCANNED HYBRID DRAWING

APPENDIX A

DOC 1.12 REITZ & JENS REVISED STABILITY REPORT, MARCH 29, 2011

REITZ & JENS, INC.
CONSULTING ENGINEERS

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st. louis, mo 63132
phone: 314.993.4132
fax: 314.993.4177
www.reitzjens.com

MEMORANDUM

To: Gene Campbell, E.I.T.

From: Jeff Bertel, P.E.

Subject: Meramec Plant Stability Analysis
Date: March 29, 2011

Attached are graphical depictions and summaries of slope stability analysis for four (4) cross-sections at the Meramec Plant. Ameren Missouri plans to place fill on the downstream slope in these locations with MoDOT Type 4 Rip Rap Ditch Liner so that the slope steepness is flattened to 3 horizontal (H) to 1 vertical (V). The attached cross-section 3 represent the slopes adjacent to Pond 489, cross-sections 1 and 5 represent the slopes adjacent to the Retention Pond and cross-section 6 represent the slopes adjacent to Pond 493.

The factors of safety for stability of the slopes as a result of the proposed modification are summarized in the following table. A factor of safety is presented for the short-term, long-term and seismic load cases.

	Factor of Safety			
Cross-section	**Short-term**	**Long-term**	**Seismic***	**Existing Long-term**
3 (Pond 489)	1.61	1.56	1.30	1.3
1 (Retention Pond)	2.07	1.76	1.48	1.3
5 (Retention Pond)	2.06	2.10	1.72	1.2
6 (Pond 493)	1.31	1.46	1.22	1.1

*Based on required design acceleration per MDNR 10 CSR 22-3

The factors of safety at the improved Cross-sections 3, 1 and 5 exceed those required by MDNR. For Cross-section 6 the factor of safety for the short-term condition is marginal. The soil profile for Cross-section 6 is a conservative estimate based on existing borings in the general proximity. Cross-sections 1 and 6 were analyzed with the new rock fill extending down to the flow line of the creek.

At locations where the creek meanders away from the toe of the existing embankment, the slope stability analysis show that a minimum of 10 feet should be maintained from the toe of the new rip rap fill and the top of the creek bank. This assumes that the creek has a depth of 8 feet from the top of the creek bank. We recommend for locations where the projection of the 3 (H) to 1 (V) final slope intersects the creek above the flowline (as shown on the attached sketch), the creek bank must be rip-rapped to avoid undermining the new slope.

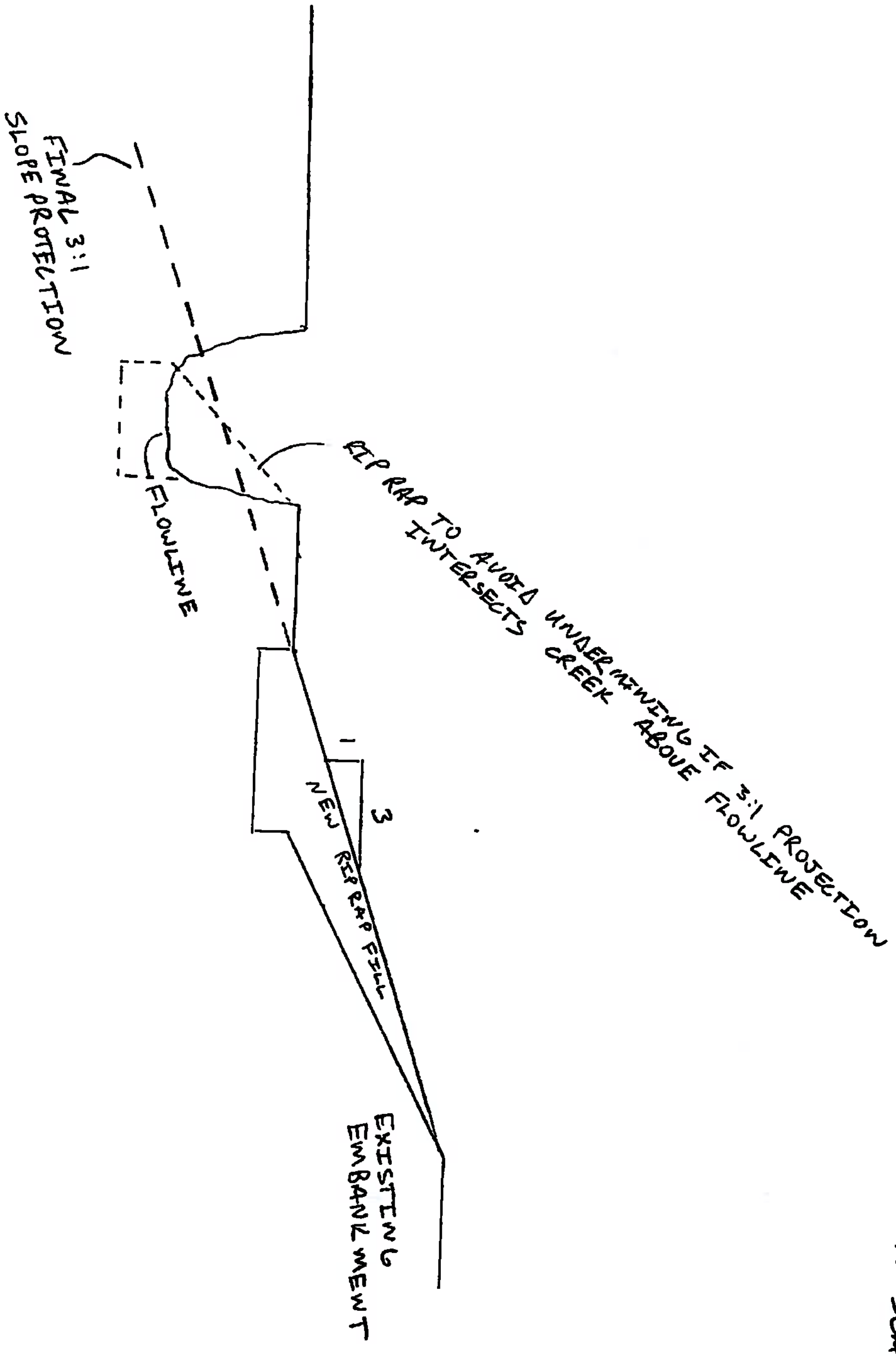
The following bulleted list contains a few items you should consider when proceeding with this project:

- New rip rap fill should be keyed in at the toe, especially when placed as fill within the creek; generally the depth of the key is dependent on the hydraulic shear stress

- MoDOT requires bedding material consisting of crushed stone or gravel beneath Type 4 Rock Ditch Liner, in our experience the rip rap is more susceptible to erosion when placed directly on geotextile
- A minimum thickness of 4 feet of rip rap should be specified. In some locations the existing slopes may become more shallow near the toe, and if rip rap is only placed at a 3 (H) to 1 (V) may lead to thin layer of rip rap. It may be necessary to increase the thickness of the rip rap based on the calculated hydraulic shear stresses
- Changes to the impounded water level can have a significant impact on the stability of the slopes and should be evaluated if changes are anticipated

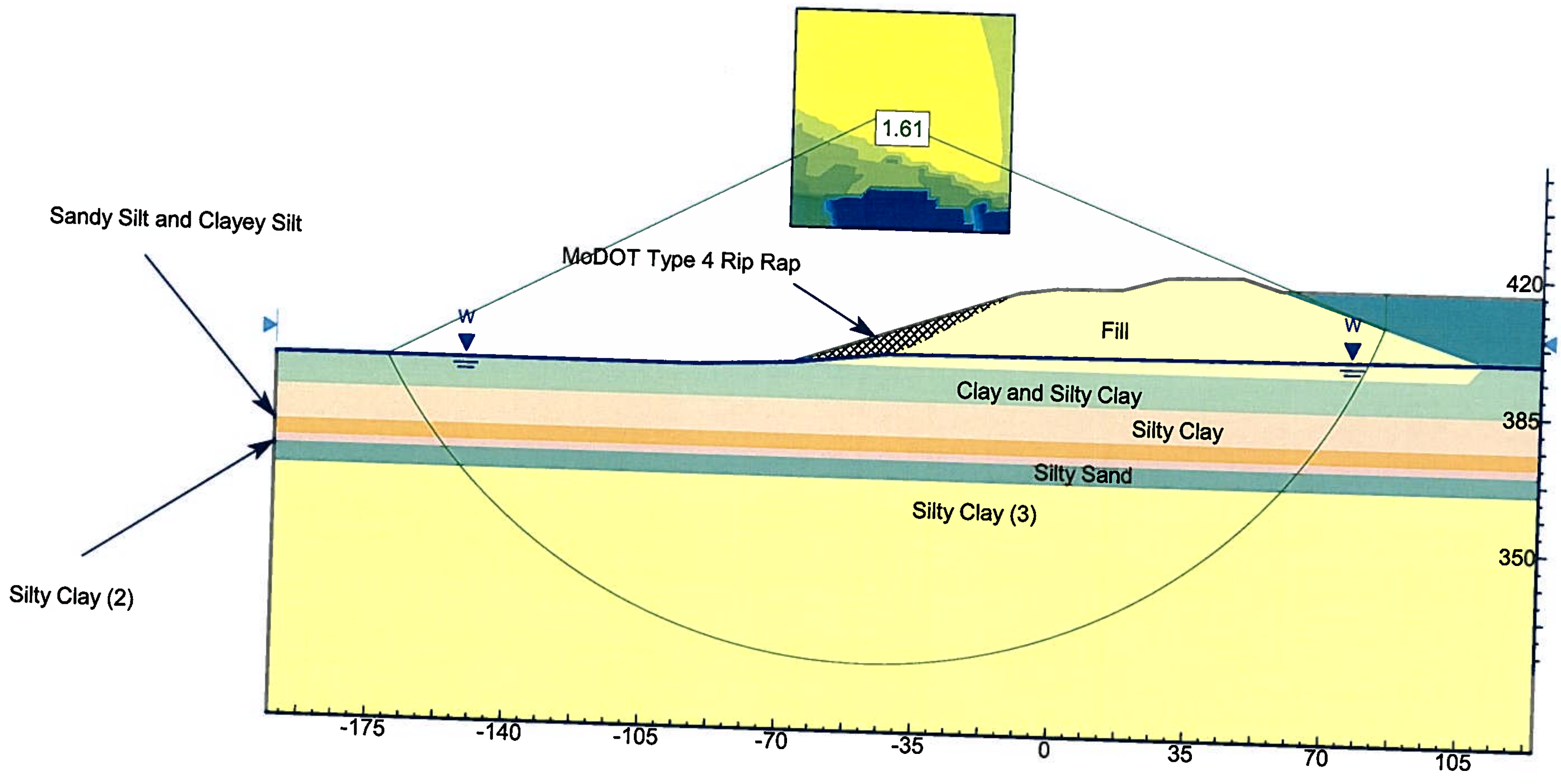
REITZ & JENS, INC.
CONSULTING ENGINEERS

PROJECT MERAMEC PLANT ASH POND
SUBJECT SLOPE STABILITY: NEW RIPRAP FILL
DATE 3-31-2011 BY JDB Proj. Number ______ SHEET ___ OF ___



NOT TO SCALE

Ameren Missouri
Meramec Plant
Cross-Section 3
Undrained Loading



Slide Analysis Information

Document Name

File Name: xsec 3 meramec rip rap.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Fill
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 1500 psf
Water Surface: Water Table
Custom Hu value: 0

Material: Clay and Silty Clay
Strength Type: Undrained
Unit Weight: 120 lb/ft3
Cohesion Type: Constant
Cohesion: 500 psf

Water Surface: Water Table
Custom Hu value: 0

Material: Silty Clay
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 750 psf
Water Surface: Water Table
Custom Hu value: 0

Material: Sandy Silt and Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 22.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay (2)
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 1000 psf
Water Surface: Water Table
Custom Hu value: 0

Material: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Water
Strength Type: No strength
Unit Weight: 62.4 lb/ft3

Material: Silty Clay (3)
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 750 psf
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

57.560	416.000
110.060	398.500
125.000	398.500

Material Boundary

-67.450	394.300
-43.000	394.000
105.928	394.000
110.060	398.500

Material Boundary

-200.000	385.000
125.000	385.000

Material Boundary

-200.000	376.000
125.000	376.000

Material Boundary

-200.000	370.000
125.000	370.000

Material Boundary

-200.000	365.000
125.000	365.000

Material Boundary

-67.450	394.300
-42.800	397.000
-35.600	399.800
-26.500	404.760
-17.100	409.800
-9.700	413.550

Material Boundary

-200.000	372.000
125.000	372.000

External Boundary

-6.700	414.000
-9.700	413.550
-67.450	394.300
-91.700	393.200
-200.000	393.200
-200.000	385.000
-200.000	376.000
-200.000	372.000
-200.000	370.000
-200.000	365.000
-200.000	300.000
125.000	300.000
125.000	365.000
125.000	370.000
125.000	372.000
125.000	376.000
125.000	385.000

125.000	394.000
125.000	398.500
125.000	416.000
57.560	416.000
47.820	419.000
30.670	418.620
27.870	418.330
16.780	415.190
0.000	414.910

Water Table

-200.000	393.200
-91.700	393.200
-67.450	394.300
-42.800	397.000
110.060	398.500
125.000	398.500

Search Grid

-69.000	429.000
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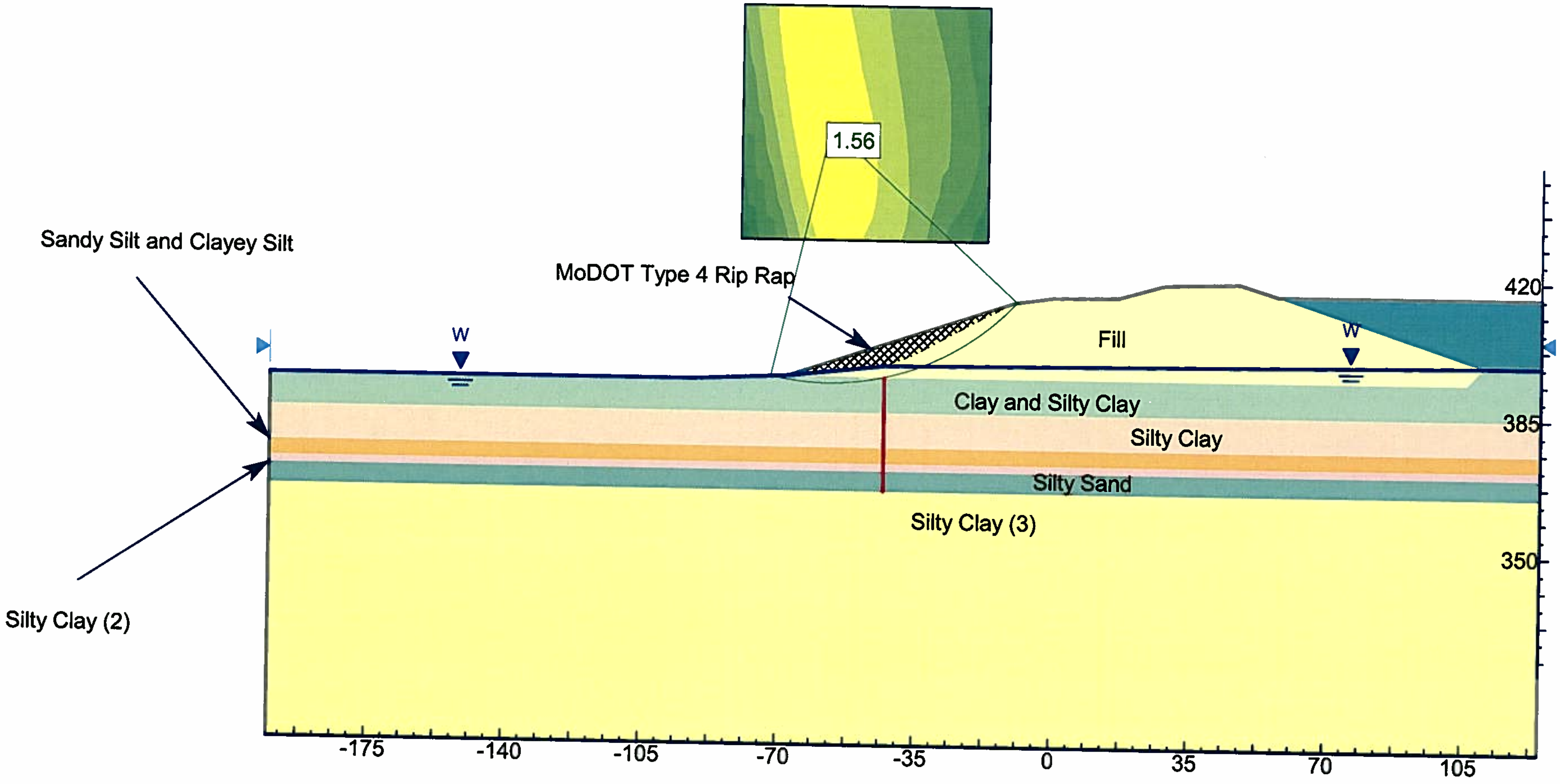
-13.000	485.000
-69.000	485.000

Ameren Missouri
Meramec Plant
Cross-Section 3
Long-term Analysis



Slide Analysis Information

Document Name

File Name: xsec 3 meramec rip rap longterm.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clay and Silty Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Silty Clay
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 22 degrees
Water Surface: None

Material: Sandy Silt and Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 22.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 22.5 degrees
Water Surface: None

Material: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Water
Strength Type: No strength
Unit Weight: 62.4 lb/ft3

Material: Silty Clay (3)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: None

List of All Coordinates

Material Boundary

57.560	416.000
110.060	398.500
125.000	398.500

Material Boundary

-67.450	394.300
-43.000	394.000
105.928	394.000
110.060	398.500

Material Boundary

-200.000	385.000
125.000	385.000

Material Boundary

-200.000	376.000
125.000	376.000

Material Boundary

-200.000	370.000
125.000	370.000

Material Boundary

-200.000	365.000
125.000	365.000

Material Boundary

-67.450	394.300
-42.800	397.000
-35.600	399.800
-26.500	404.760
-17.100	409.800
-9.700	413.550

Material Boundary

-200.000	372.000
125.000	372.000

External Boundary

-6.700	414.000
-9.700	413.550
-67.450	394.300
-91.700	393.200
-200.000	393.200
-200.000	385.000
-200.000	376.000
-200.000	372.000
-200.000	370.000
-200.000	365.000
-200.000	300.000
125.000	300.000
125.000	365.000
125.000	370.000
125.000	372.000
125.000	376.000
125.000	385.000
125.000	394.000
125.000	398.500
125.000	416.000
57.560	416.000
47.820	419.000

30.670	418.620
27.870	418.330
16.780	415.190
0.000	414.910

Water Table

-200.000	393.200
-91.700	393.200
-67.450	394.300
-42.800	397.000
110.060	398.500
125.000	398.500

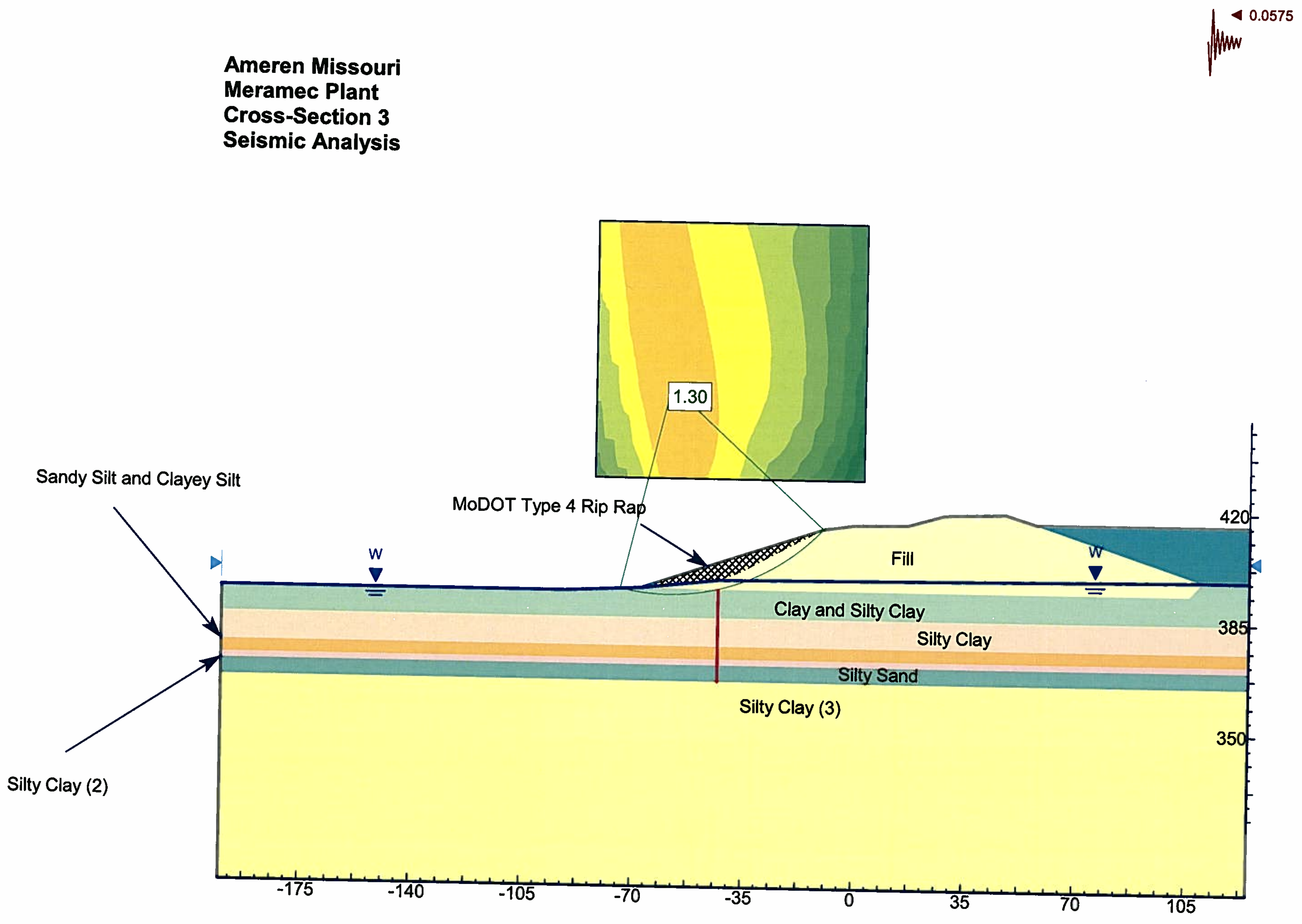
Focus/Block Search Line

-43.000	365.000
-43.000	394.000

Search Grid

-80.000	429.000
-17.000	429.000
-17.000	489.000
-80.000	489.000

Ameren Missouri
Meramec Plant
Cross-Section 3
Seismic Analysis



Slide Analysis Information

Document Name

File Name: xsec 3 meramec rip rap longterm seis.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0575

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clay and Silty Clay
Strength Type: Mohr-Coulomb

Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Silty Clay
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 22 degrees
Water Surface: None

Material: Sandy Silt and Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 22.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 22.5 degrees
Water Surface: None

Material: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Water
Strength Type: No strength
Unit Weight: 62.4 lb/ft3

Material: Silty Clay (3)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: None

List of All Coordinates

Material Boundary

57.560	416.000
110.060	398.500
125.000	398.500

Material Boundary

-67.450	394.300
-43.000	394.000
105.928	394.000
110.060	398.500

Material Boundary

-200.000	385.000
125.000	385.000

Material Boundary

-200.000	376.000
125.000	376.000

Material Boundary

-200.000	370.000
125.000	370.000

Material Boundary

-200.000	365.000
125.000	365.000

Material Boundary

-67.450	394.300
-42.800	397.000
-35.600	399.800
-26.500	404.760
-17.100	409.800
-9.700	413.550

Material Boundary

-200.000	372.000
125.000	372.000

External Boundary

-6.700	414.000
-9.700	413.550
-67.450	394.300
-91.700	393.200
-200.000	393.200
-200.000	385.000
-200.000	376.000
-200.000	372.000
-200.000	370.000
-200.000	365.000
-200.000	300.000
125.000	300.000
125.000	365.000
125.000	370.000
125.000	372.000
125.000	376.000
125.000	385.000
125.000	394.000

125.000	398.500
125.000	416.000
57.560	416.000
47.820	419.000
30.670	418.620
27.870	418.330
16.780	415.190
0.000	414.910

Water Table

-200.000	393.200
-91.700	393.200
-67.450	394.300
-42.800	397.000
110.060	398.500
125.000	398.500

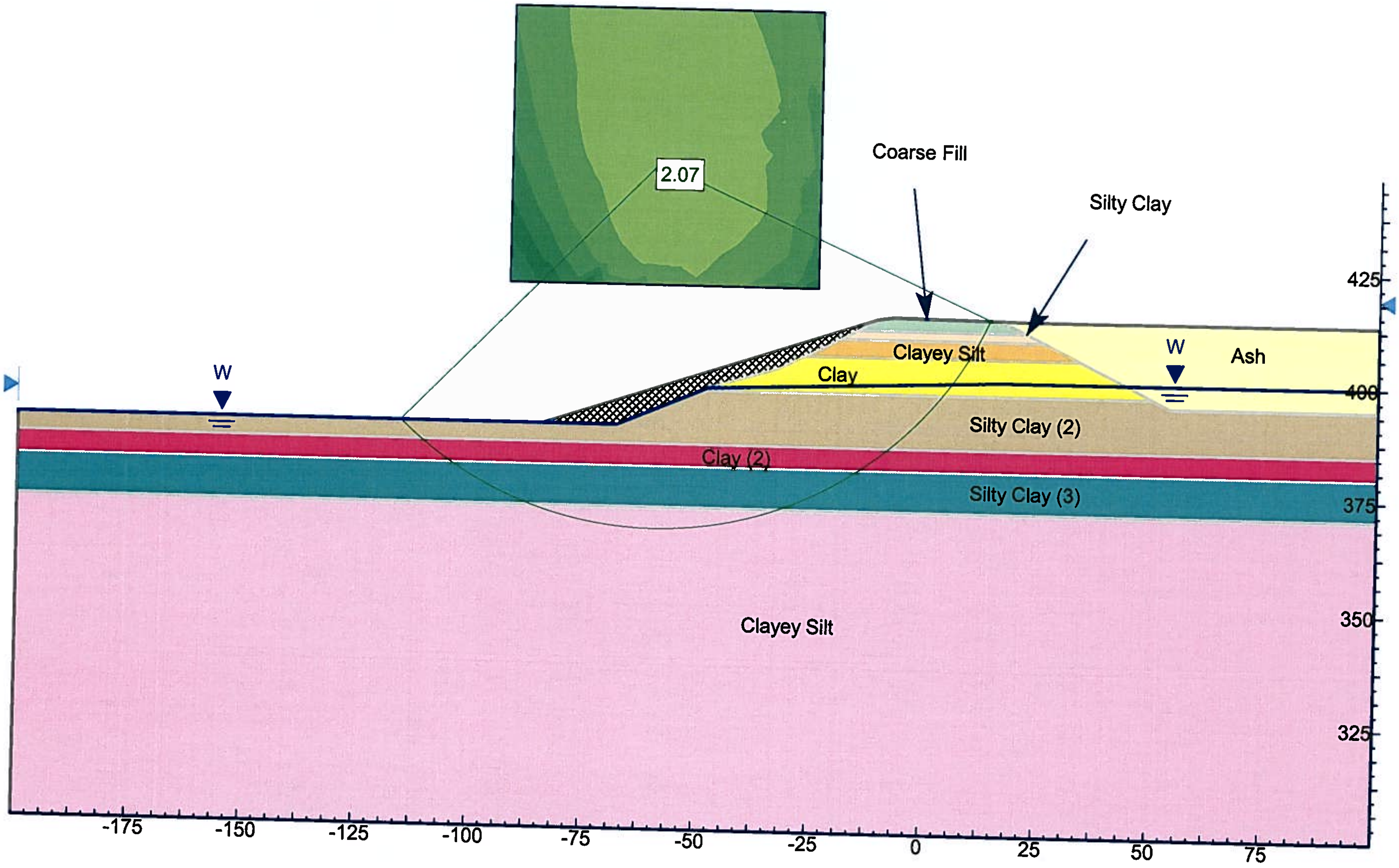
Focus/Block Search Line

-43.000	365.000
-43.000	394.000

Search Grid

-82.269	429.000
2.731	429.000
2.731	510.000
-82.269	510.000

Ameren Missouri
Meramec Plant
Cross-section 1
Undrained Loading



Slide Analysis Information

Document Name

File Name: xsec 1 meramec rip rap.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Ash
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 1500 psf
Water Surface: Water Table
Custom Hu value: 1

Material: Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Undrained
Unit Weight: 123 lb/ft3
Cohesion Type: Constant
Cohesion: 1000 psf
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay (2)
Strength Type: Undrained
Unit Weight: 123 lb/ft3
Cohesion Type: Constant
Cohesion: 750 psf
Water Surface: Water Table
Custom Hu value: 1

Material: Clay (2)
Strength Type: Undrained
Unit Weight: 123 lb/ft3
Cohesion Type: Constant
Cohesion: 1250 psf
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay (3)
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 1000 psf
Water Surface: Water Table
Custom Hu value: 1

Material: Clayey Silt (2)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table

Custom Hu value: 1

Material: MoDOT Type 4
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

16.700	413.700
22.094	411.003
26.109	408.996
34.092	405.004
45.089	399.505
50.100	397.000
54.100	395.000
100.000	395.000

Material Boundary

-49.308	397.000
50.100	397.000

Material Boundary

-200.000	385.000
100.000	385.000

Material Boundary

-200.000	380.000
100.000	380.000

Material Boundary

-48.000	397.560
-41.501	399.505
-32.300	402.260
-26.822	405.004
-20.300	408.270
-18.965	408.996
-15.272	411.003
-10.770	413.450

Material Boundary

-84.120	389.000
-68.000	389.000
-49.308	397.000
-48.000	397.560

Material Boundary

-15.272	411.003
22.094	411.003

Material Boundary

-18.965	408.996

26.109	408.996

Material Boundary

-26.822	405.004
34.092	405.004

Material Boundary

-200.000	371.000
100.000	371.000

External Boundary

-7.240	414.000
-10.770	413.450
-84.120	389.000
-200.000	389.000
-200.000	385.000
-200.000	380.000
-200.000	371.000
-200.000	300.000
100.000	300.000
100.000	371.000
100.000	380.000
100.000	385.000
100.000	395.000
100.000	413.650
68.380	413.650
20.700	413.600
16.700	413.700
0.000	413.900

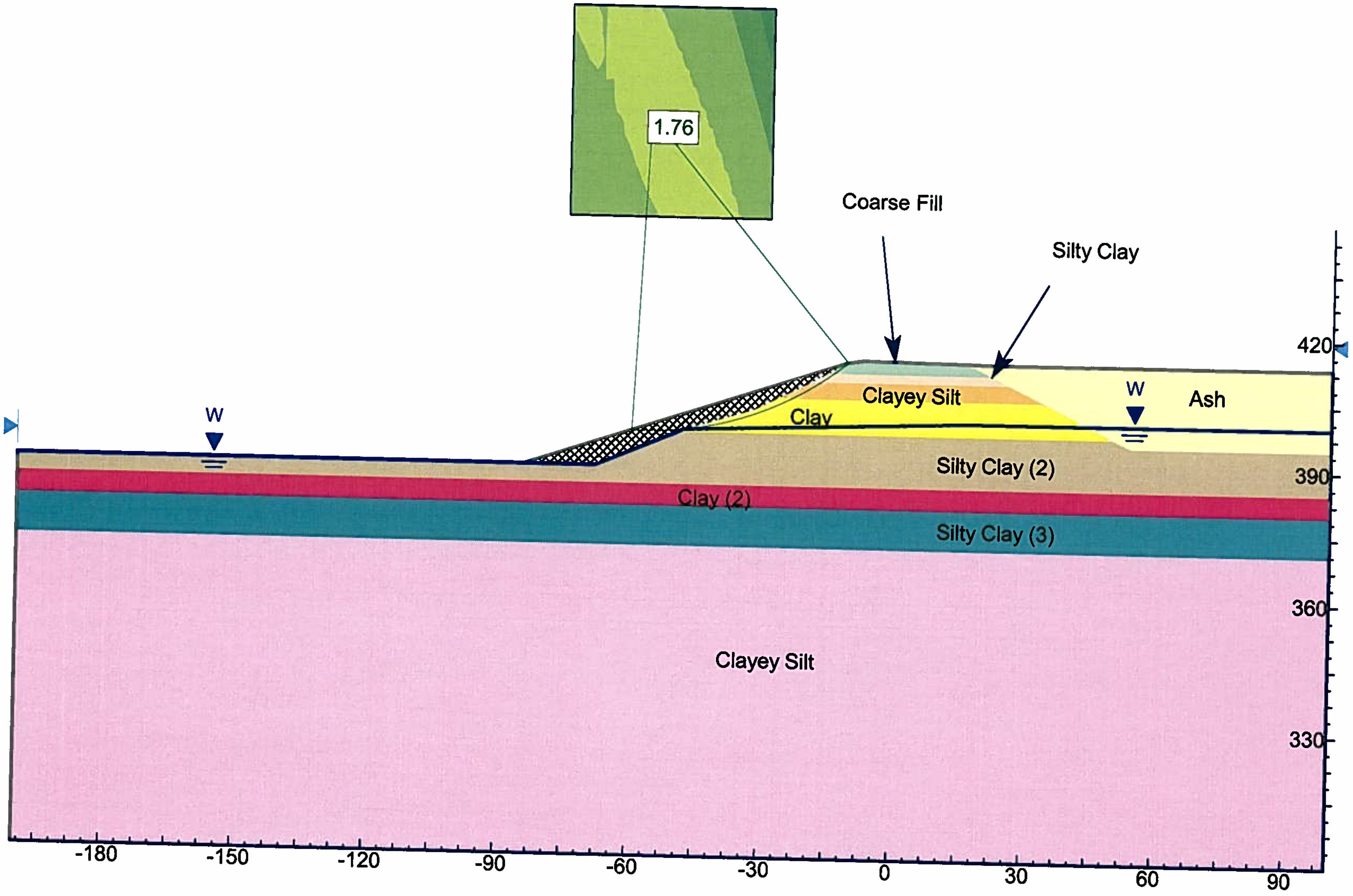
Water Table

-200.000	389.000
-68.000	389.000
-49.308	397.000
-48.000	397.560
16.700	400.000
44.100	400.000
100.000	400.000

Search Grid

-92.000	420.000
-24.000	420.000
-24.000	481.000
-92.000	481.000

Ameren Missouri
Meramec Plant
Cross-section 1
Long-term Analysis



Slide Analysis Information

Document Name

File Name: xsec 1 meramec rip rap long term.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Ash

Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Fill

Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 27 degrees
Water Surface: None

Material: Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees
Water Surface: None

Material: Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (3)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clayey Silt (2)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3

Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

16.700	413.700
22.094	411.003
26.109	408.996
34.092	405.004
45.089	399.505
50.100	397.000
54.100	395.000
100.000	395.000

Material Boundary

-49.308	397.000
50.100	397.000

Material Boundary

-200.000	385.000
100.000	385.000

Material Boundary

-200.000	380.000
100.000	380.000

Material Boundary

-48.000	397.560
-41.501	399.505
-32.300	402.260
-26.822	405.004
-20.300	408.270
-18.965	408.996
-15.272	411.003
-10.770	413.450

Material Boundary

-84.120	389.000
-68.000	389.000
-49.308	397.000
-48.000	397.560

Material Boundary

-15.272	411.003
22.094	411.003

Material Boundary

-18.965	408.996
26.109	408.996

Material Boundary

-26.822	405.004
34.092	405.004

Material Boundary

-200.000	371.000
100.000	371.000

External Boundary

-7.240	414.000
-10.770	413.450
-84.120	389.000
-200.000	389.000
-200.000	385.000
-200.000	380.000
-200.000	371.000
-200.000	300.000
100.000	300.000
100.000	371.000
100.000	380.000
100.000	385.000
100.000	395.000
100.000	413.650
68.380	413.650
20.700	413.600
16.700	413.700
0.000	413.900

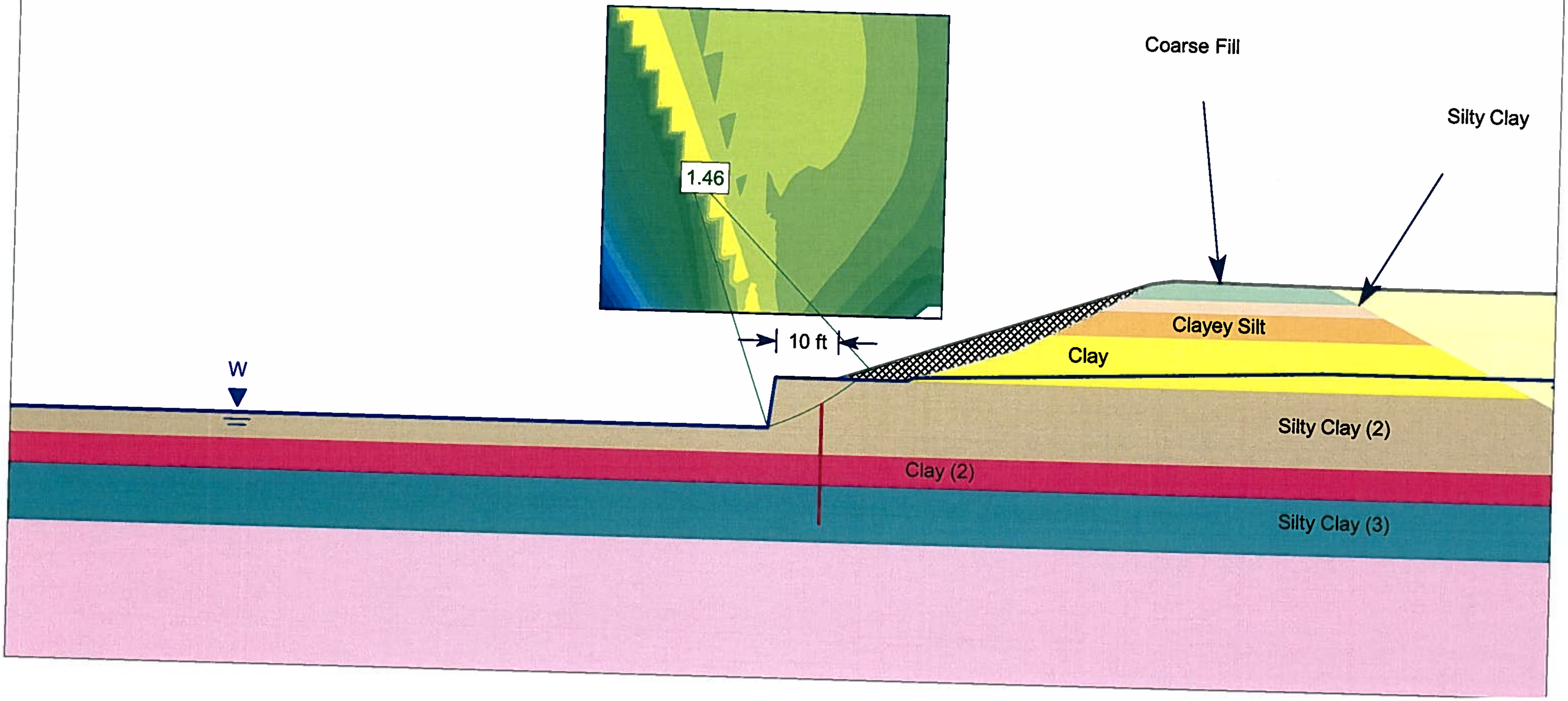
Water Table

-200.000	389.000
-68.000	389.000
-49.308	397.000
-48.000	397.560
16.700	400.000
44.100	400.000
100.000	400.000

Search Grid

-74.833	446.000
-28.833	446.000
-28.833	494.000
-74.833	494.000

Ameren Missouri
Meramec Plant
Cross-section 1 (with bench)
Long-term Analysis



Slide Analysis Information

Document Name

File Name: xsec 1 meramec rip rap long term bench.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Ash
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 27 degrees
Water Surface: None

Material: Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees
Water Surface: None

Material: Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (3)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clayey Silt (2)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3

Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

16.700	413.700
22.094	411.003
26.109	408.996
34.092	405.004
45.089	399.505
50.100	397.000
54.100	395.000
100.000	395.000

Material Boundary

-49.308	397.000
50.100	397.000

Material Boundary

-200.000	385.000
100.000	385.000

Material Boundary

-200.000	380.000
100.000	380.000

Material Boundary

-48.000	397.560
-41.501	399.505
-32.300	402.260
-26.822	405.004
-20.300	408.270
-18.965	408.996
-15.272	411.003
-10.770	413.450

Material Boundary

-60.120	397.000
-49.308	397.000
-48.000	397.560

Material Boundary

-15.272	411.003
22.094	411.003

Material Boundary

-18.965	408.996
26.109	408.996

Material Boundary

-26.822	405.004
34.092	405.004

Material Boundary

-200.000	371.000
100.000	371.000

External Boundary

-7.240	414.000
-10.770	413.450
-60.120	397.000
-70.000	397.000
-71.000	389.000
-84.120	389.000
-200.000	389.000
-200.000	385.000
-200.000	380.000
-200.000	371.000
-200.000	300.000
100.000	300.000
100.000	371.000
100.000	380.000
100.000	385.000
100.000	395.000
100.000	413.650
68.380	413.650
20.700	413.600
16.700	413.700
0.000	413.900

Water Table

-200.000	389.000
-71.000	389.000
-70.000	397.000
-60.120	397.000
-49.308	397.000
-48.000	397.560
16.700	400.000
44.100	400.000
100.000	400.000

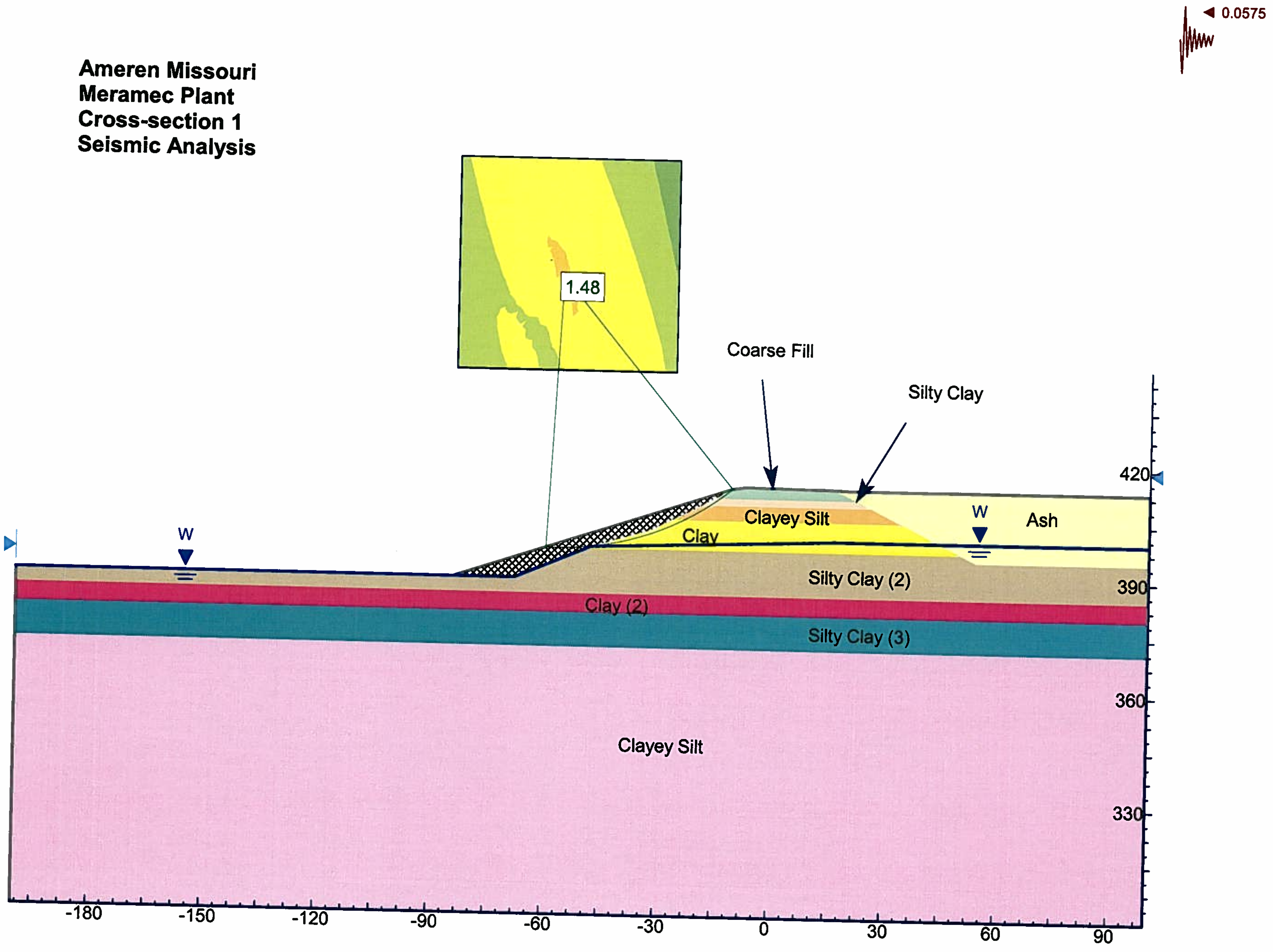
Focus/Block Search Line

-62.533	373.983
-62.533	392.983

Search Grid

-98.000	407.000
-44.000	407.000
-44.000	455.000
-98.000	455.000

Ameren Missouri
Meramec Plant
Cross-section 1
Seismic Analysis



Slide Analysis Information

Document Name

File Name: xsec 1 meramec rip rap long term seis.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0575

Material Properties

Material: Ash
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Fill

Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

<u>Material: Silty Clay</u>
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 27 degrees
Water Surface: None

<u>Material: Clayey Silt</u>
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

<u>Material: Clay</u>
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

<u>Material: Silty Clay (2)</u>
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees
Water Surface: None

<u>Material: Clay (2)</u>
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

<u>Material: Silty Clay (3)</u>
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

<u>Material: Clayey Silt (2)</u>
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

16.700	413.700
22.094	411.003
26.109	408.996
34.092	405.004
45.089	399.505
50.100	397.000
54.100	395.000
100.000	395.000

Material Boundary

-49.308	397.000
50.100	397.000

Material Boundary

-200.000	385.000
100.000	385.000

Material Boundary

-200.000	380.000
100.000	380.000

Material Boundary

-48.000	397.560
-41.501	399.505
-32.300	402.260
-26.822	405.004
-20.300	408.270
-18.965	408.996
-15.272	411.003
-10.770	413.450

Material Boundary

-84.120	389.000
-68.000	389.000
-49.308	397.000
-48.000	397.560

Material Boundary

-15.272	411.003
22.094	411.003

Material Boundary

-18.965	408.996
26.109	408.996

Material Boundary

-26.822	405.004
34.092	405.004

Material Boundary

-200.000	371.000
100.000	371.000

External Boundary

-7.240	414.000
-10.770	413.450
-84.120	389.000
-200.000	389.000
-200.000	385.000
-200.000	380.000
-200.000	371.000
-200.000	300.000
100.000	300.000
100.000	371.000
100.000	380.000
100.000	385.000
100.000	395.000
100.000	413.650
68.380	413.650
20.700	413.600
16.700	413.700
0.000	413.900

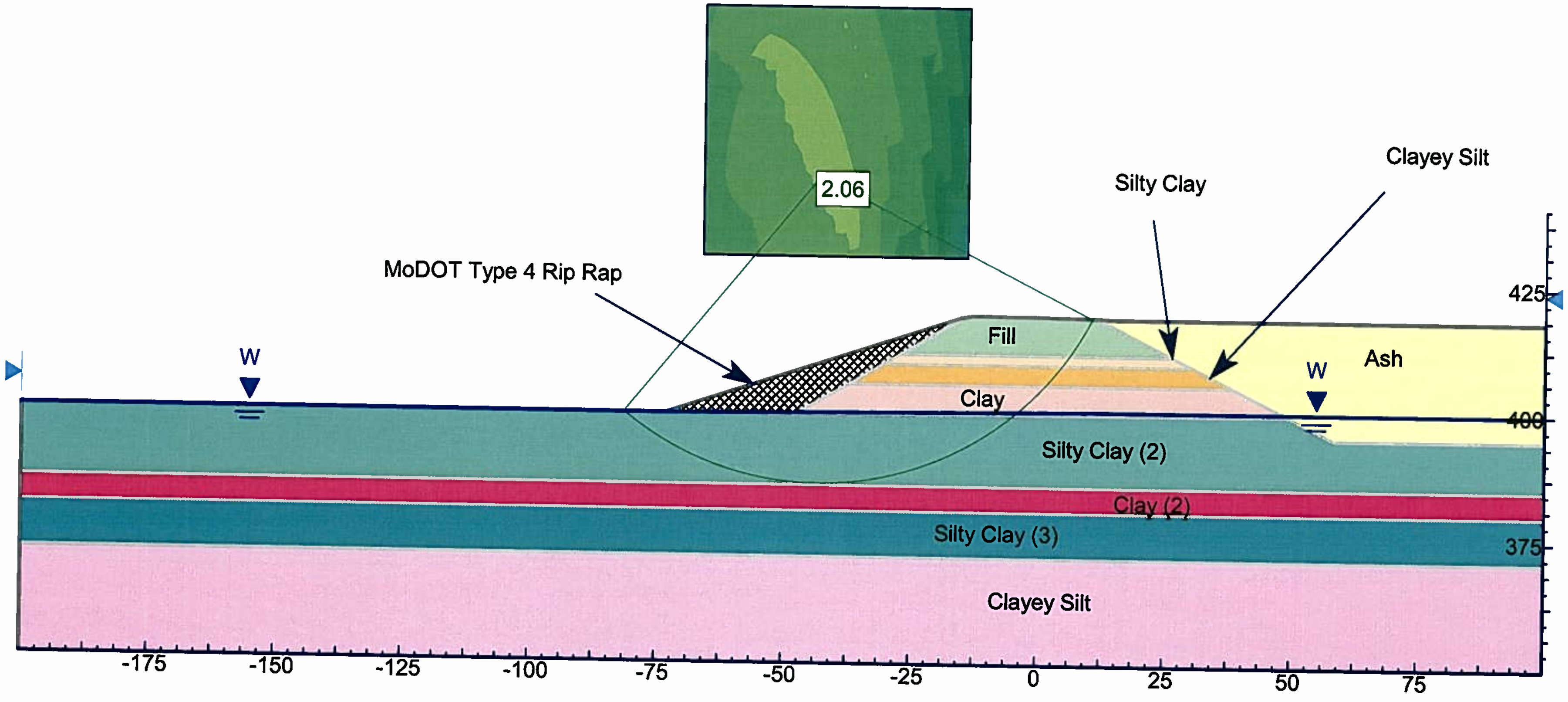
Water Table

-200.000	389.000
-68.000	389.000
-49.308	397.000
-48.000	397.560
16.700	400.000
44.100	400.000
100.000	400.000

Search Grid

-84.000	444.000
-26.000	444.000
-26.000	500.000
-84.000	500.000

Ameren Missouri
Meramec Plant
Cross-section 5
Undrained Loading



Slide Analysis Information

Document Name

File Name: xsec 5 meramec undrained.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Ash
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 1750 psf
Water Surface: None

Material: Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 100 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Undrained
Unit Weight: 123 lb/ft3
Cohesion Type: Constant
Cohesion: 1000 psf
Water Surface: None

Material: Silty Clay (2)
Strength Type: Undrained
Unit Weight: 123 lb/ft3
Cohesion Type: Constant
Cohesion: 750 psf
Water Surface: None

Material: Clay (2)
Strength Type: Undrained
Unit Weight: 123 lb/ft3
Cohesion Type: Constant
Cohesion: 1250 psf
Water Surface: None

Material: Silty Clay (3)
Strength Type: Undrained
Unit Weight: 122 lb/ft3
Cohesion Type: Constant
Cohesion: 1000 psf
Water Surface: None

Material: Clayey Silt (2)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4 Rip Rap
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3

Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

11.851	418.383
18.460	415.000
26.441	411.009
30.405	409.028
38.424	405.018
49.561	399.449
54.460	397.000
58.460	395.000
100.000	395.000

Material Boundary

-200.000	385.000
100.000	385.000

Material Boundary

-200.000	380.000
100.000	380.000

Material Boundary

-72.920	398.980
-47.420	399.200
-37.250	405.018
-36.250	405.590
-30.463	409.028
-29.500	409.600
-27.111	411.009
-23.110	413.370
-20.447	415.000
-15.170	418.230

Material Boundary

-27.111	411.009
26.441	411.009

Material Boundary

-30.463	409.028
30.405	409.028

Material Boundary

-37.250	405.018
38.424	405.018

Material Boundary

-47.420	399.200
49.561	399.449

Material Boundary

-200.000	371.000

100.000	371.000

External Boundary

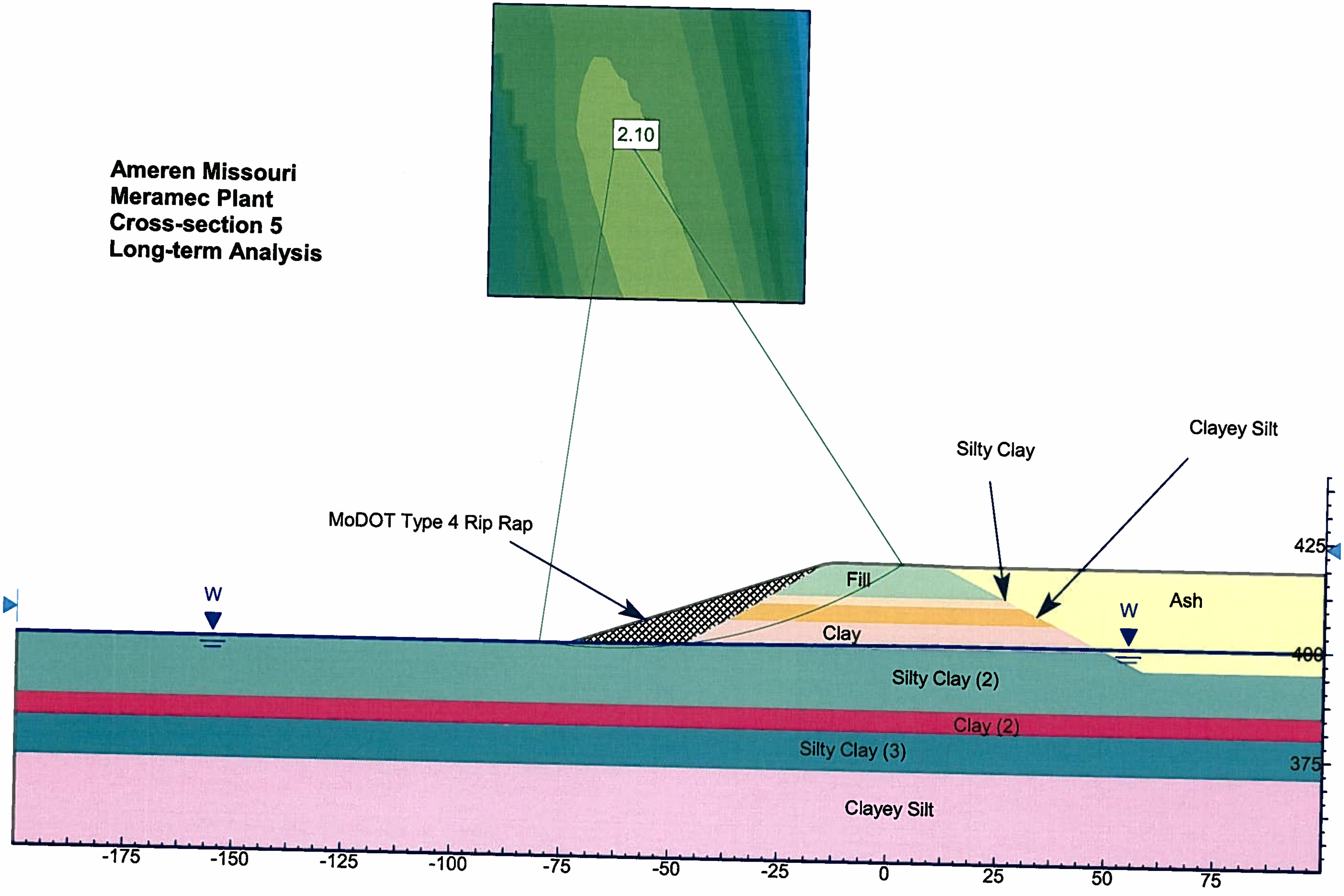
-12.840	418.630
-15.170	418.230
-72.920	398.980
-73.260	398.980
-200.000	398.980
-200.000	385.000
-200.000	380.000
-200.000	371.000
-200.000	350.000
100.000	350.000
100.000	371.000
100.000	380.000
100.000	385.000
100.000	395.000
100.000	418.230
14.300	418.230
12.000	418.380
11.851	418.383
0.000	418.590

Water Table

-200.000	398.980
-73.260	398.980
-72.920	398.980
11.851	400.000
100.000	400.000

Search Grid

-66.000	430.000
-14.000	430.000
-14.000	479.000
-66.000	479.000



Ameren Missouri
Meramec Plant
Cross-section 5
Long-term Analysis

Slide Analysis Information

Document Name

File Name: xsec 5 meramec longterm.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Ash
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees
Water Surface: None

Material: Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (3)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clayey Silt (2)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4 Rip Rap
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3

Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

11.851	418.383
18.460	415.000
26.441	411.009
30.405	409.028
38.424	405.018
49.561	399.449
54.460	397.000
58.460	395.000
100.000	395.000

Material Boundary

-200.000	385.000
100.000	385.000

Material Boundary

-200.000	380.000
100.000	380.000

Material Boundary

-72.920	398.980
-47.420	399.200
-37.250	405.018
-36.250	405.590
-30.463	409.028
-29.500	409.600
-27.111	411.009
-23.110	413.370
-20.447	415.000
-15.170	418.230

Material Boundary

-27.111	411.009
26.441	411.009

Material Boundary

-30.463	409.028
30.405	409.028

Material Boundary

-37.250	405.018
38.424	405.018

Material Boundary

-47.420	399.200
49.561	399.449

Material Boundary

-200.000	371.000

100.000	371.000

External Boundary

-12.840	418.630
-15.170	418.230
-72.920	398.980
-73.260	398.980
-200.000	398.980
-200.000	385.000
-200.000	380.000
-200.000	371.000
-200.000	350.000
100.000	350.000
100.000	371.000
100.000	380.000
100.000	385.000
100.000	395.000
100.000	418.230
14.300	418.230
12.000	418.380
11.851	418.383
0.000	418.590

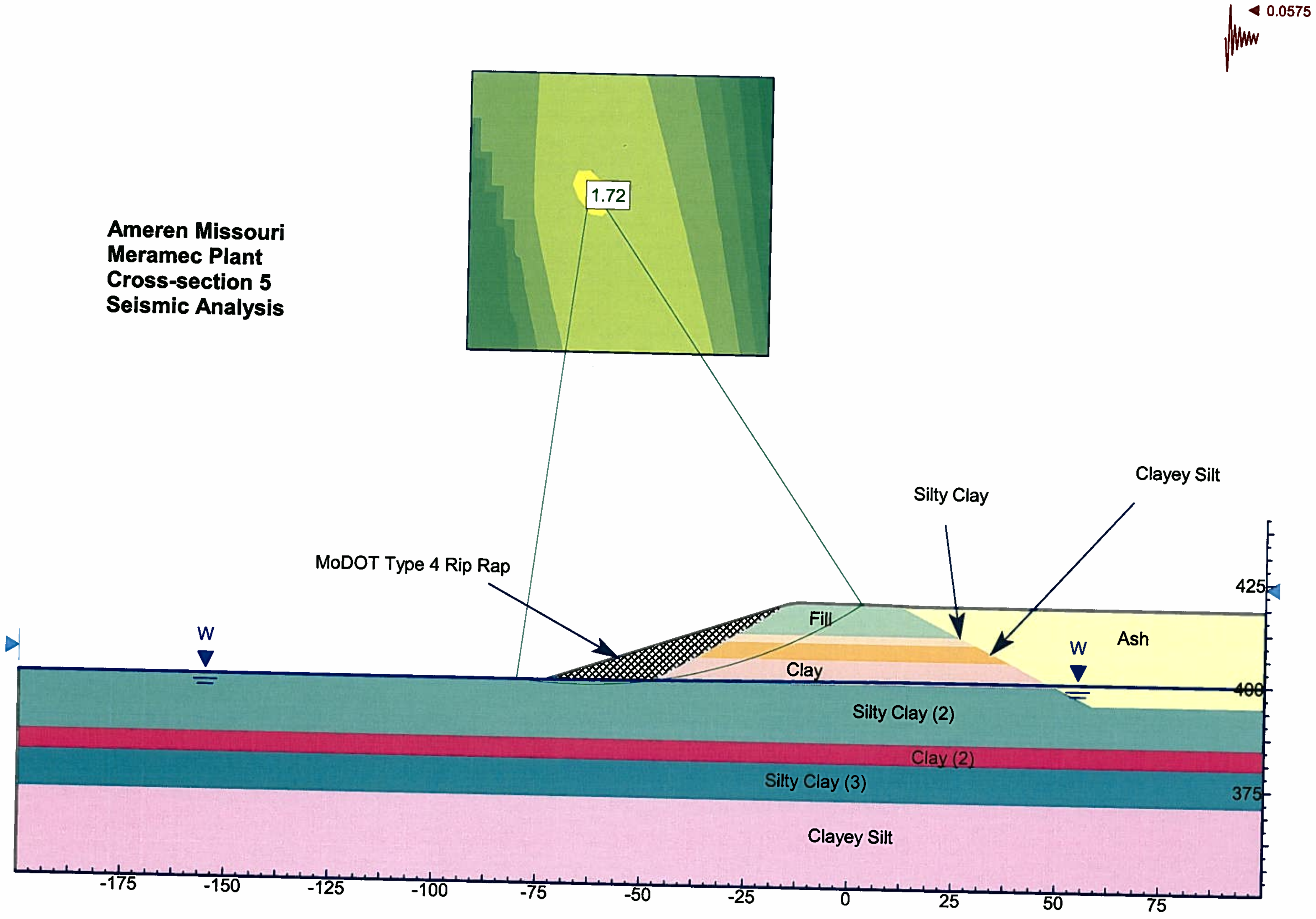
Water Table

-200.000	398.980
-73.260	398.980
-72.920	398.980
11.851	400.000
100.000	400.000

Search Grid

-93.474	478.000
-21.000	478.000
-21.000	545.000
-93.474	545.000

**Ameren Missouri
Meramec Plant
Cross-section 5
Seismic Analysis**



Slide Analysis Information

Document Name

File Name: xsec 5 meramec longterm seismic.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0575

Material Properties

Material: Ash
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Fill

Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Clay
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 1 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clayey Silt
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 100 psf
Friction Angle: 27 degrees
Water Surface: None

Material: Clay (2)
Strength Type: Mohr-Coulomb
Unit Weight: 123 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Silty Clay (3)
Strength Type: Mohr-Coulomb
Unit Weight: 122 lb/ft3
Cohesion: 0 psf
Friction Angle: 26 degrees
Water Surface: None

Material: Clayey Silt (2)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4 Rip Rap
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

11.851	418.383
18.460	415.000
26.441	411.009
30.405	409.028
38.424	405.018
49.561	399.449
54.460	397.000
58.460	395.000
100.000	395.000

Material Boundary

-200.000	385.000
100.000	385.000

Material Boundary

-200.000	380.000
100.000	380.000

Material Boundary

-72.920	398.980
-47.420	399.200
-37.250	405.018
-36.250	405.590
-30.463	409.028
-29.500	409.600
-27.111	411.009
-23.110	413.370
-20.447	415.000
-15.170	418.230

Material Boundary

-27.111	411.009
26.441	411.009

Material Boundary

-30.463	409.028
30.405	409.028

Material Boundary

-37.250	405.018
38.424	405.018

Material Boundary

-47.420	399.200
49.561	399.449

Material Boundary

-200.000	371.000
100.000	371.000

External Boundary

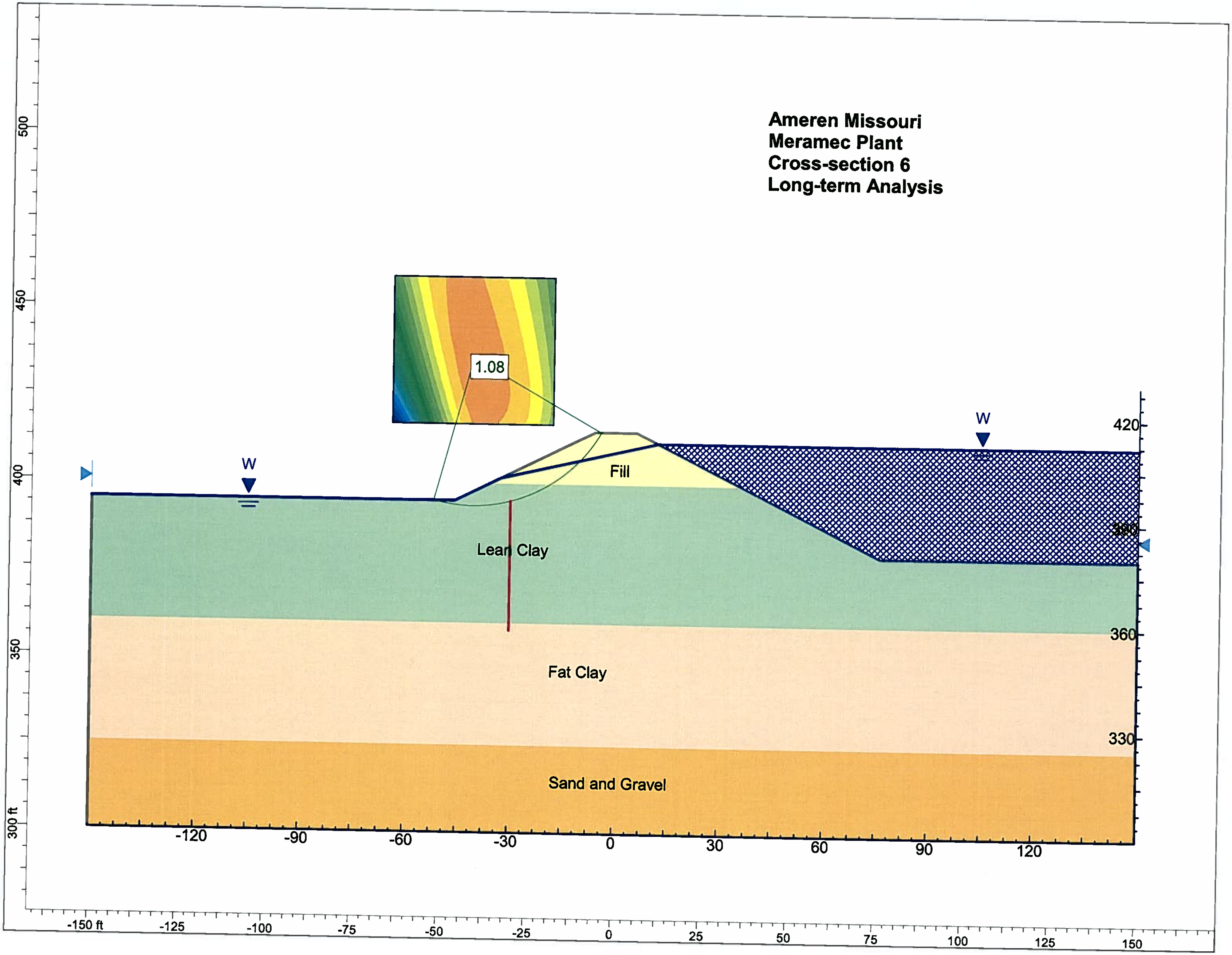
-12.840	418.630
-15.170	418.230
-72.920	398.980
-73.260	398.980
-200.000	398.980
-200.000	385.000
-200.000	380.000
-200.000	371.000
-200.000	350.000
100.000	350.000
100.000	371.000
100.000	380.000
100.000	385.000
100.000	395.000
100.000	418.230
14.300	418.230
12.000	418.380
11.851	418.383
0.000	418.590

Water Table

-200.000	398.980
-73.260	398.980
-72.920	398.980
11.851	400.000
100.000	400.000

Search Grid

-93.474	478.000
-21.000	478.000
-21.000	545.000
-93.474	545.000


Ameren Missouri
Meramec Plant
Cross-section 6
Long-term Analysis
1.08
W
W
Fill
Lean Clay
Fat Clay
Sand and Gravel
420
380
360
330
-120
-90
-60
-30
0
30
60
90
120
500
450
400
350
300 ft
-150 ft
-125
-100
-75
-50
-25
0
25
50
75
100
125
150

Slide Analysis Information

Document Name

File Name: no rip rap xsec 6 longterm.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: None

Material: Lean Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Fat Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Sand & Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 27 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

-150.000	360.000
150.000	360.000

Material Boundary

-150.000	325.000
150.000	325.000

Material Boundary

-66.000	395.000
-46.000	395.000
-45.950	395.025

Material Boundary

-36.000	400.000
36.000	400.000

External Boundary

-150.000	300.000
150.000	300.000
150.000	325.000
150.000	360.000
150.000	380.000
76.000	380.000
46.000	395.000
36.000	400.000
10.000	413.000
6.000	415.000
-6.000	415.000
-10.000	413.000
-36.000	400.000
-45.950	395.025
-66.000	395.000
-150.000	395.000
-150.000	360.000
-150.000	325.000

Water Table

-150.000	395.000

-46.000	395.000
-32.817	401.591
12.000	412.000
150.000	412.000

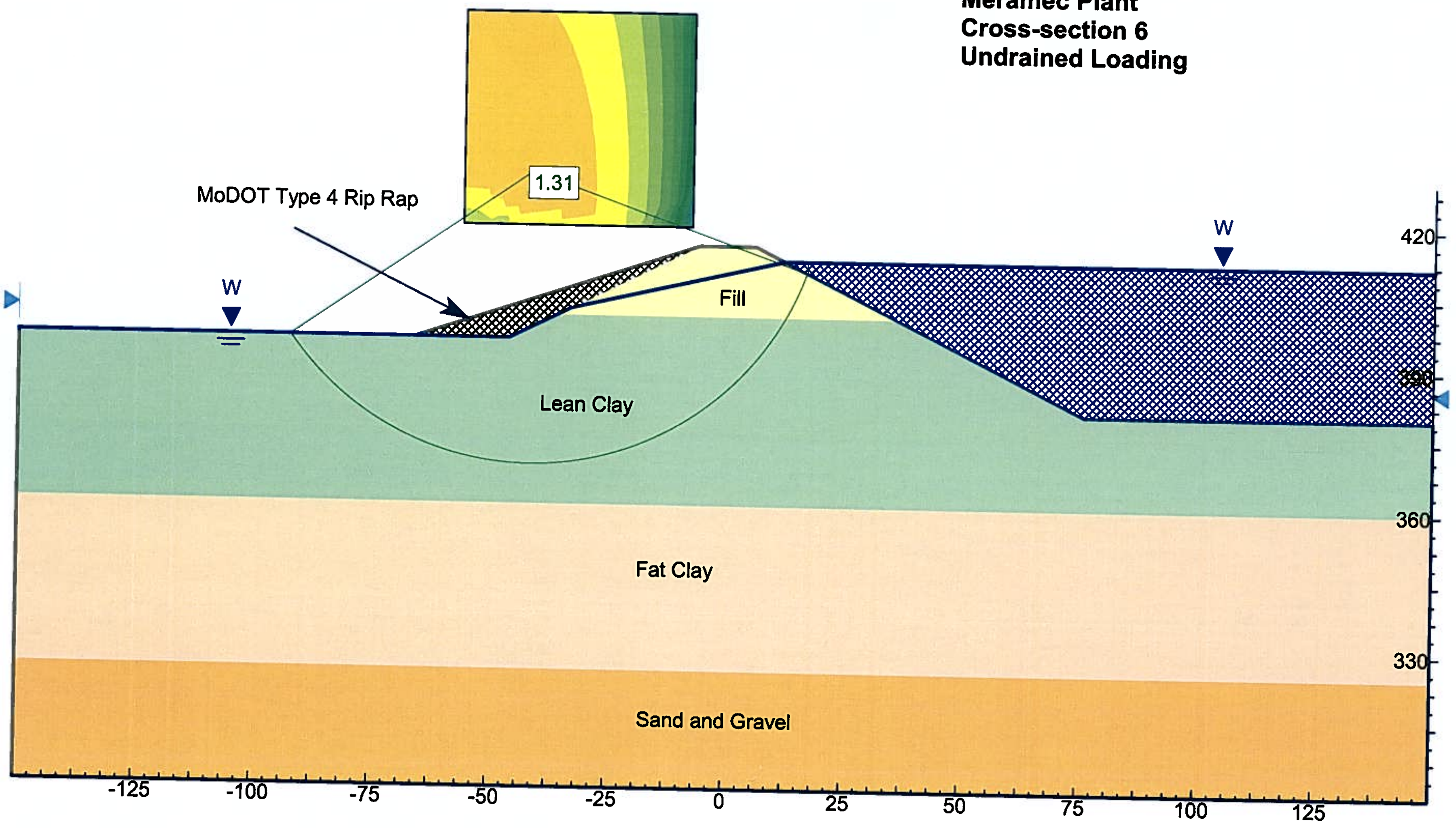
Focus/Block Search Line

-30.000	358.000
-30.000	395.000

Search Grid

-64.000	417.000
-18.000	417.000
-18.000	459.000
-64.000	459.000

Ameren Missouri
Meramec Plant
Cross-section 6
Undrained Loading



Slide Analysis Information

Document Name

File Name: xsec 6 undrained.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Fill
Strength Type: Undrained
Unit Weight: 120 lb/ft3
Cohesion Type: Constant
Cohesion: 500 psf
Water Surface: None

Material: Lean Clay
Strength Type: Undrained
Unit Weight: 120 lb/ft3
Cohesion Type: Constant
Cohesion: 500 psf
Water Surface: None

Material: Fat Clay
Strength Type: Undrained
Unit Weight: 120 lb/ft3
Cohesion Type: Constant
Cohesion: 750 psf
Water Surface: None

Material: Sand & Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 27 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4 Rip Rap
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

-150.000	360.000
150.000	360.000

Material Boundary

-150.000	325.000
150.000	325.000

Material Boundary

-66.000	395.000
-46.000	395.000
-36.000	400.000
-10.000	413.000
-6.000	415.000

Material Boundary

-36.000	400.000
36.000	400.000

External Boundary

-150.000	300.000
150.000	300.000
150.000	325.000
150.000	360.000
150.000	380.000
76.000	380.000
46.000	395.000
36.000	400.000
10.000	413.000
6.000	415.000
-6.000	415.000

-66.000	395.000
-150.000	395.000
-150.000	360.000
-150.000	325.000

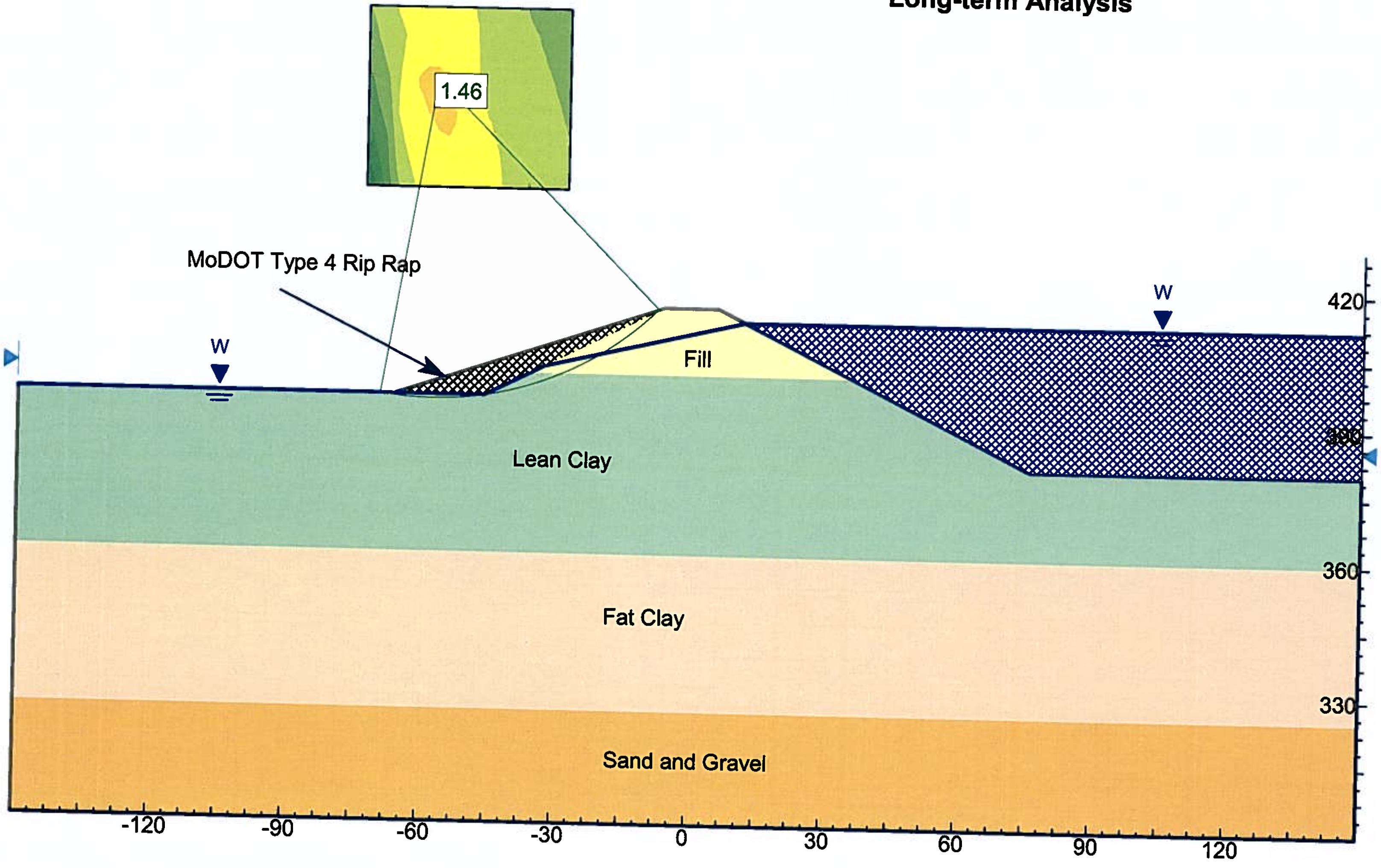
Water Table

-150.000	395.000
-46.000	395.000
-32.817	401.591
12.000	412.000
150.000	412.000

Search Grid

-56.000	419.000
-7.507	419.000
-7.507	464.000
-56.000	464.000

Ameren Missouri
Meramec Plant
Cross-section 6
Long-term Analysis



Slide Analysis Information

Document Name

File Name: xsec 6 longterm.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: None

Material: Lean Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Fat Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Sand & Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 27 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4 Rip Rap
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

-150.000	360.000
150.000	360.000

Material Boundary

-150.000	325.000
150.000	325.000

Material Boundary

-66.000	395.000
-46.000	395.000
-36.000	400.000
-10.000	413.000
-6.000	415.000

Material Boundary

-36.000	400.000
36.000	400.000

External Boundary

-150.000	300.000
150.000	300.000
150.000	325.000
150.000	360.000
150.000	380.000
76.000	380.000
46.000	395.000
36.000	400.000
10.000	413.000
6.000	415.000
-6.000	415.000

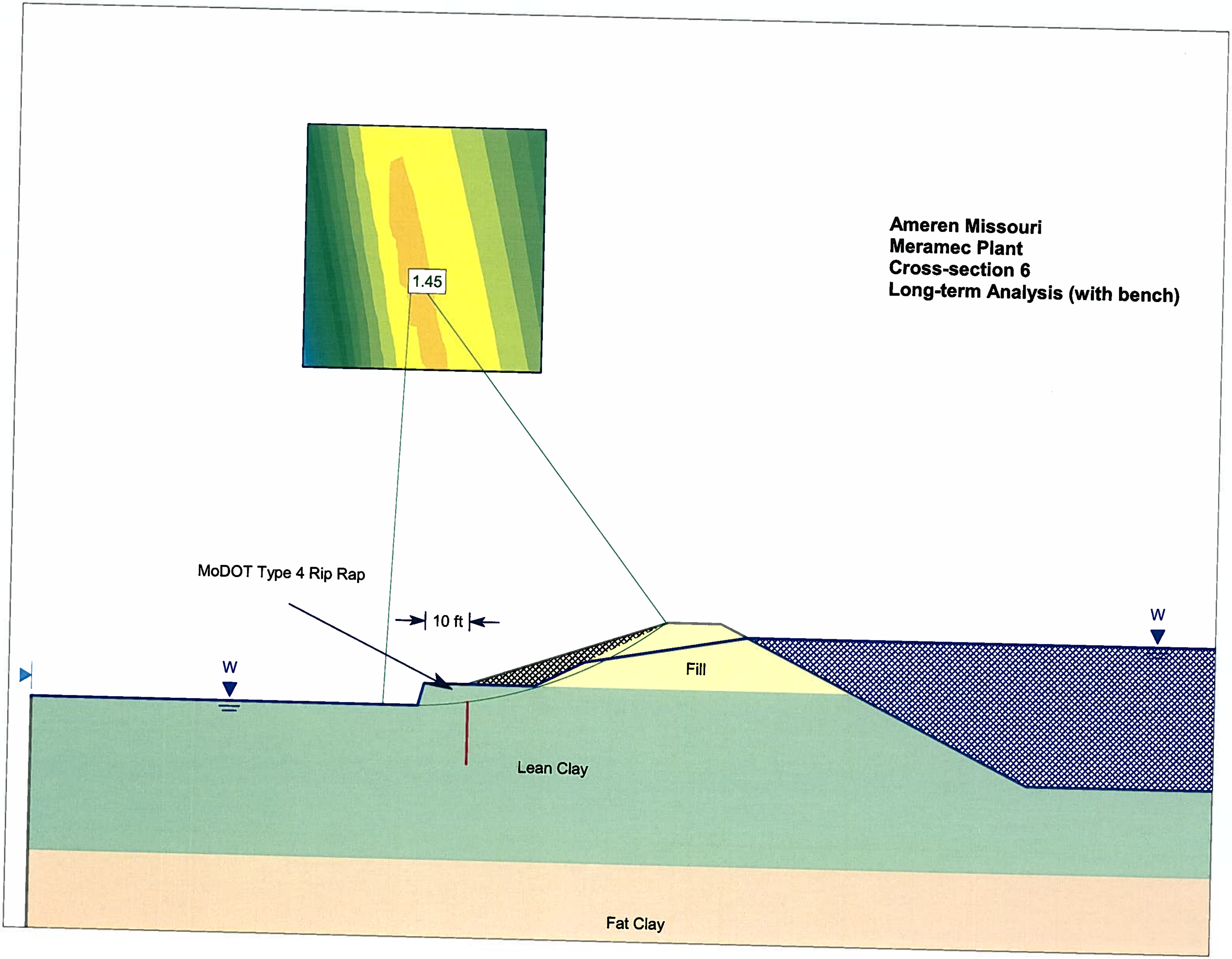
-66.000	395.000
-150.000	395.000
-150.000	360.000
-150.000	325.000

Water Table

-150.000	395.000
-46.000	395.000
-32.817	401.591
12.000	412.000
150.000	412.000

Search Grid

-73.000	441.000
-28.000	441.000
-28.000	481.000
-73.000	481.000



Ameren Missouri
Meramec Plant
Cross-section 6
Long-term Analysis (with bench)

Slide Analysis Information

Document Name

File Name: xsec 6 longterm bench.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 0

Material: Lean Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees

Water Surface: Water Table
Custom Hu value: 0

Material: Fat Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: Water Table
Custom Hu value: 0

Material: Sand & Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 27 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4 Rip Rap
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

-150.000	360.000
150.000	360.000

Material Boundary

-150.000	325.000
150.000	325.000

Material Boundary

-51.000	400.000
-36.000	400.000
-10.000	413.000
-6.000	415.000

Material Boundary

-36.000	400.000
36.000	400.000

External Boundary

-150.000	300.000
150.000	300.000
150.000	325.000
150.000	360.000
150.000	380.000
76.000	380.000
46.000	395.000
36.000	400.000
10.000	413.000

6.000	415.000
-6.000	415.000
-51.000	400.000
-61.000	400.000
-62.371	395.000
-150.000	395.000
-150.000	360.000
-150.000	325.000

Water Table

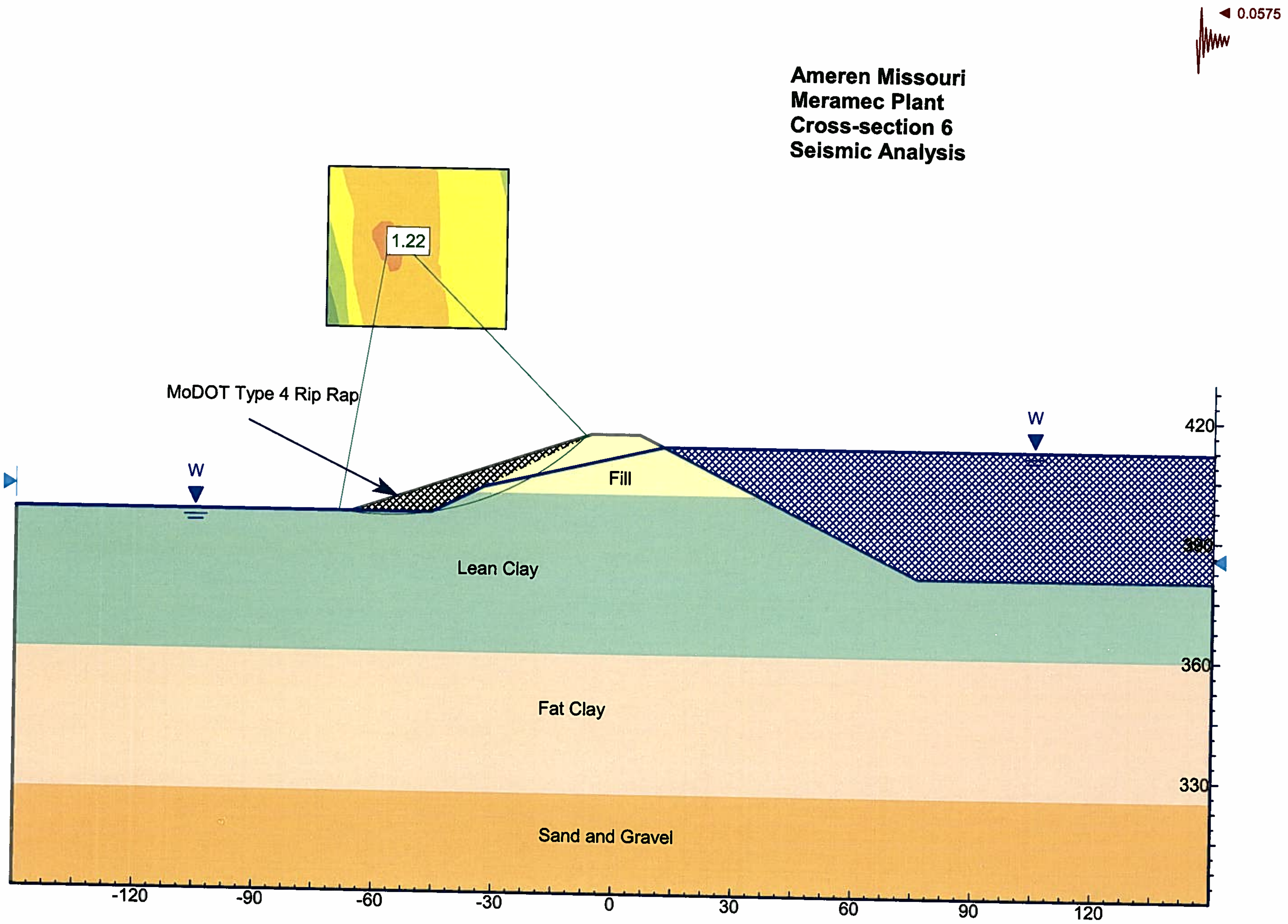
-150.000	395.000
-62.371	395.000
-61.000	400.000
-51.000	400.000
-36.000	400.000
-24.763	405.619
12.000	412.000
150.000	412.000

Focus/Block Search Line

-51.000	382.000
-51.000	396.000

Search Grid

-90.000	471.000
-36.000	471.000
-36.000	526.000
-90.000	526.000



Ameren Missouri
Meramec Plant
Cross-section 6
Seismic Analysis

Slide Analysis Information

Document Name

File Name: xsec 6 longterm seismic.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
GLE/Morgenstern-Price with interslice force function: Half Sine
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.0575

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: None

Material: Lean Clay
Strength Type: Mohr-Coulomb

Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Fat Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Sand & Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1 psf
Friction Angle: 27 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: MoDOT Type 4 Rip Rap
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 1 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

List of All Coordinates

Material Boundary

-150.000	360.000
150.000	360.000

Material Boundary

-150.000	325.000
150.000	325.000

Material Boundary

-66.000	395.000
-46.000	395.000
-36.000	400.000
-10.000	413.000
-6.000	415.000

Material Boundary

-36.000	400.000
36.000	400.000

External Boundary

-150.000	300.000
150.000	300.000
150.000	325.000
150.000	360.000
150.000	380.000
76.000	380.000
46.000	395.000

36.000	400.000
10.000	413.000
6.000	415.000
-6.000	415.000
-66.000	395.000
-150.000	395.000
-150.000	360.000
-150.000	325.000

Water Table

-150.000	395.000
-46.000	395.000
-32.817	401.591
12.000	412.000
150.000	412.000

Search Grid

-73.000	441.000
-28.000	441.000
-28.000	481.000
-73.000	481.000

APPENDIX B

UNIT 1 (POND 3) FIELD OBSERVATION CHECKLIST

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name:	**Meramec**	**Date:**	**September 29, 2010**
Unit Name:	**New Fly Ash Pond**	**Operator's Name:**	**AmerenUE**
Unit I.D.:	**498**	**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** X
	Inspector's Name:	Jeffrey Crabtree, PE and James Filson, PE	

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

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	418		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	plans		20. Decant Pipes:	■	■
4. Open channel spillway elevation (operator records)?		X	Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	423		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	Plans		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):	■	■
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		N/A	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		N/A	At isolated points on embankment slopes?	X	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
#3	Information on plans and plans have been requested through AmerenUE Legal Group
#10	Noted as part of normal maintenance
#12	Clear of debris
#17	Cleared areas and scarps are from maintenance of eroded areas from runoff
#21	NW area between Bottom Ash and 498 Pond – Isolated area noted in Maintenance report and being monitored
#23	Floodwater - Mississippi River and backwater conditions on the Meramec River

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit MO-0000361 **INSPECTOR**

Date 05/19/2000 to 05/18/2005
Impoundment Name Meramec Power Plant

Impoundment Company AmerenUE
EPA Region Region 7

State Agency State of Missouri
(Field Office) Address Department of Natural Resources
Name of Impoundment New Fly Ash Pond

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

New X **Update** ☐

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

IMPOUNDMENT FUNCTION: Storage – Fly Ash

Nearest Downstream Town Name: Kimmswick

Distance from the impoundment: 2.8 miles

Location:

Latitude	38	Degrees	24	Minutes	25.16	Seconds	**N**
Longitude	90	Degrees	20	Minutes	26.97	Seconds	**W**

State Missouri **County** St. Louis

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

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.

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

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

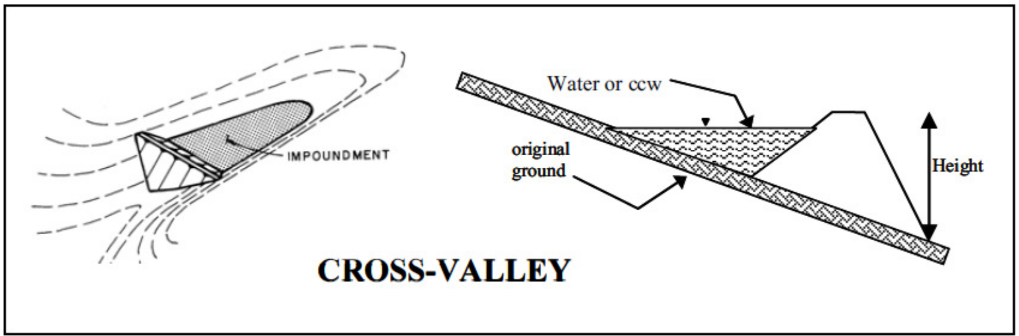
☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

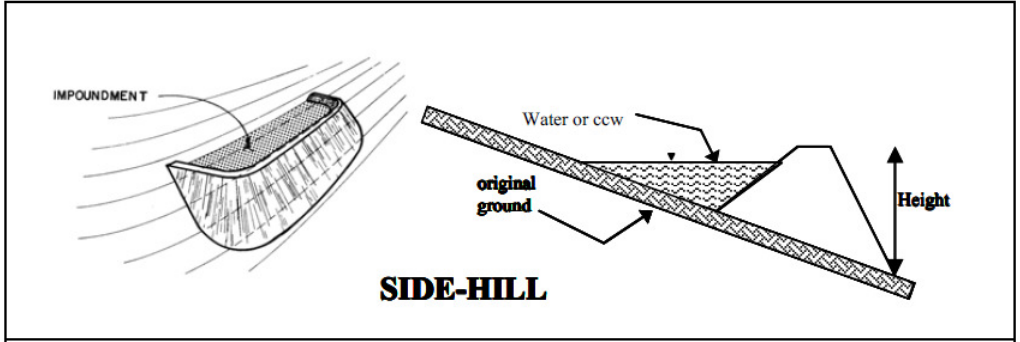
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

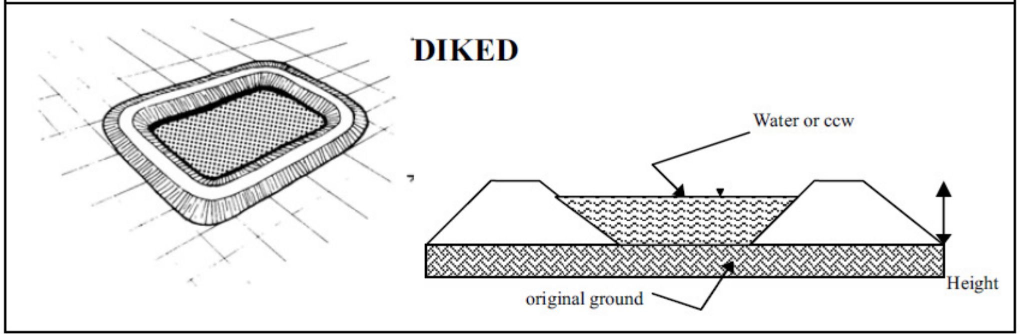
Early assessment is determined to be low based on site assessment only. Visual assessment of unit was conducted and small isolated seep area noted and AmerenUE has been monitoring this location as noted in their annual inspection report. Units and site in good conditions. AmerenUE has a dam safety group which oversees the unit and conducts weekly inspections.

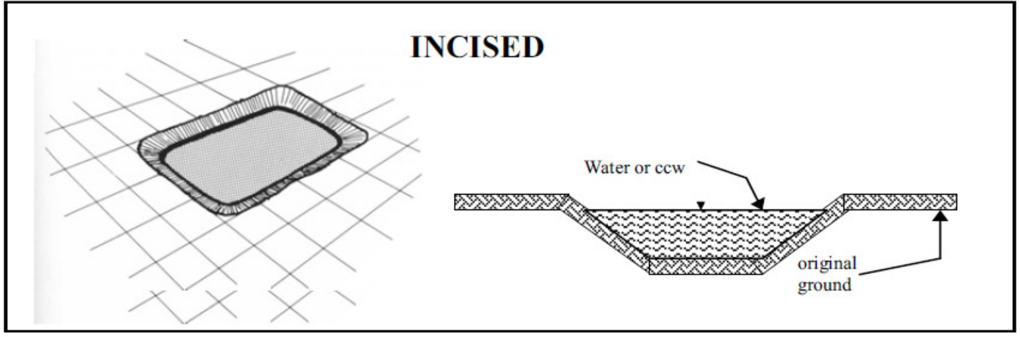
The new fly ash pond is located in the middle of the site and incised. The embankment is more than 100 yards away from this unit. The unit was built within the old fly ash area and is lined. The potential is low for failure at this unit.

CONFIGURATION:









☐ Cross-Valley ☐ Side-Hill X Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft) 25

Embankment Material Ash with liner (in interior of dam)

Pool Area (ac) 13.5 ac

Liner Has Liner

Current Freeboard (ft)

Liner Permeability

TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

☐ Rectangular

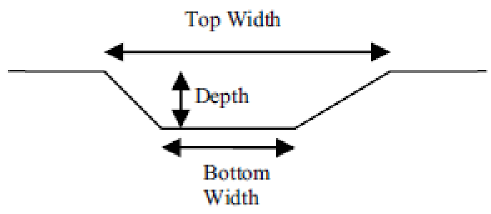
☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)

TRAPEZOIDAL



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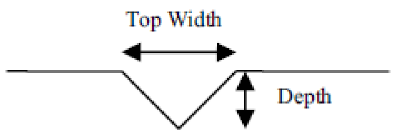

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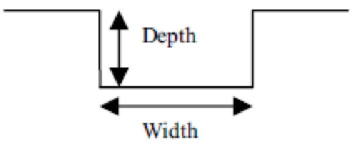
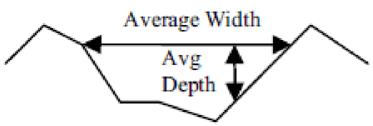
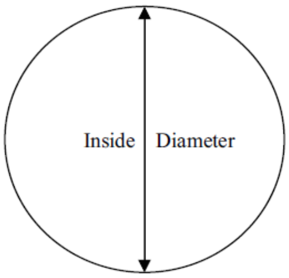


IRREGULAR



X **Outlet**

24" inside diameter



Material

☐ corrugated metal

☐ welded steel

☐ concrete

X plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	X	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

	Yes	**No**
Has there ever been a failure at this site?	☐	X

If So When?

If So Please Describe :

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

If So Please Describe :

Minor seepage noted during the site assessment and AmerenUE is currently monitoring.

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

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

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

Interior Unit – 498 see detail map. Unknown ; Plans requested through AmerenUE

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

Plans will assist in determining the dam foundation and have been requested and waiting for clearance through AmerenUE Legal.

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

No – minor erosion noted during assessment.

APPENDIX B

UNIT 2 (POND 2) FIELD OBSERVATION CHECKLIST

Site Name:	**Meramec**	**Date:**	**September 29, 2010**
Unit Name:	**Old Fly Ash Pond**	**Operator's Name:**	**AmerenUE**
Unit I.D.:	**489**	**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** X
	Inspector's Name:	Jeffrey Crabtree, PE and James Filson, PE	

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

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	416.5		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	plans		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?		X	Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	420.2		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	Plans		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		N/A	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		N/A	At isolated points on embankment slopes?	X	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?	X		24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
#3	Information on plans and plans have been requested through AmerenUE Legal Group
#12	Clear of debris
#17	Cleared areas and scarps are from maintenance of eroded areas from runoff
#21	NW area between Bottom Ash and 498 Pond – Isolated area noted in Maintenance report and being monitored
#23	Floodwater - Mississippi River and backwater conditions on the Meramec River

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit MO-0000361 **INSPECTOR**

Date 05/19/2000 to 05/18/2005
Impoundment Name Meramec Power Plant

Impoundment Company AmerenUE
EPA Region Region 7

State Agency State of Missouri
(Field Office) Address Department of Natural Resources
Name of Impoundment Old Fly Ash Pond

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

New X **Update** ☐

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

IMPOUNDMENT FUNCTION: Storage – Fly Ash

Nearest Downstream Town Name: Kimmswick

Distance from the impoundment: 2.8 miles

Location:

Latitude	38	Degrees	23	Minutes	59.43	Seconds	**N**
Longitude	90	Degrees	20	Minutes	31.67	Seconds	**W**

State Missouri **County** St. Louis

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

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.

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

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

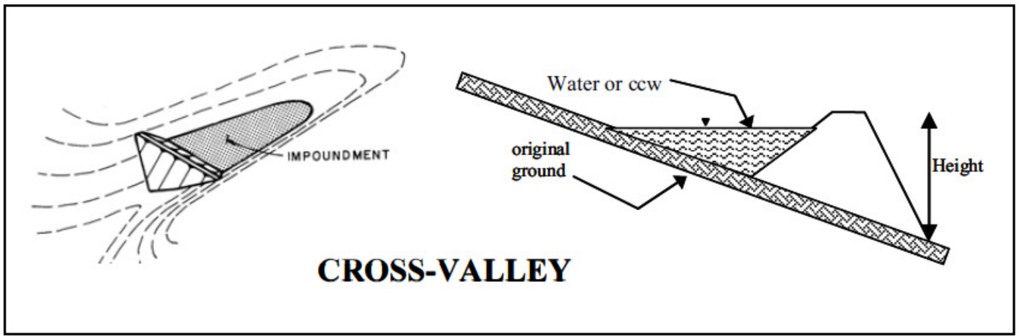
☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

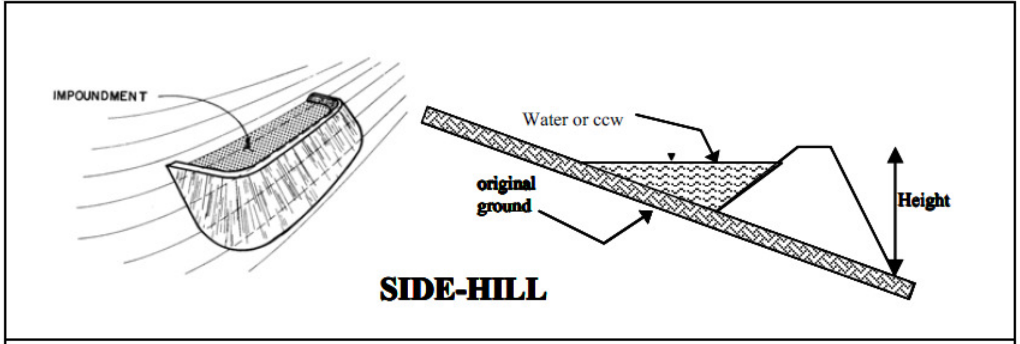
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

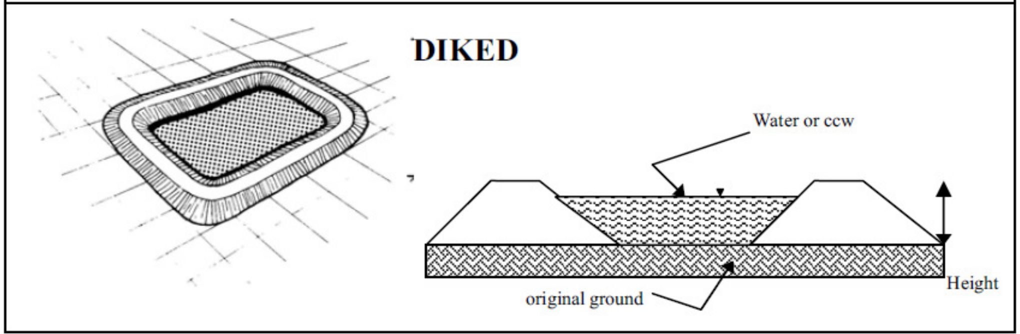
Early assessment is determined to be low based on site assessment only. Visual assessment of unit was conducted and small isolated seep area noted and AmerenUE has been monitoring this location as noted in their annual inspection report. Units and site in good conditions. AmerenUE has a dam safety group which oversees the unit and conducts weekly inspections.

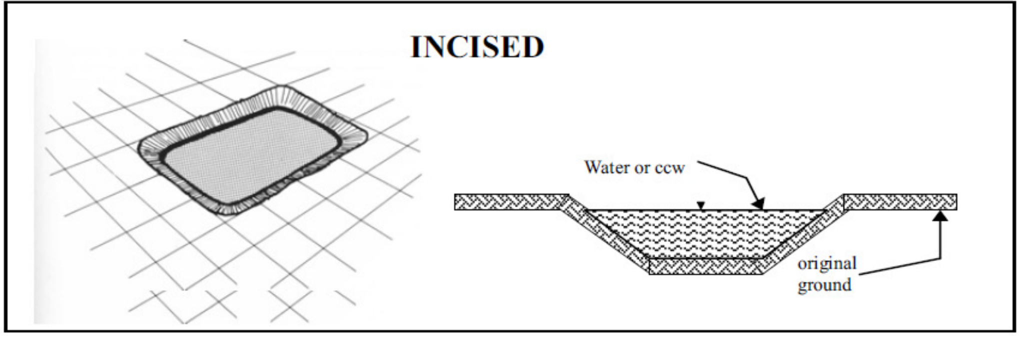
The old fly ash pond is located along the SE area of the embankments and has three sides incised. The one side which is adjacent to the embankment is approximately 75-100 yards away from this unit. The unit is lined.

CONFIGURATION:









☐ Cross-Valley ☐ Side-Hill X Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	25' (24.7')	**Embankment Material**	Ash with liner (in interior of dam)
17.6	13.5 ac	**Liner**	Has Liner
Current Freeboard (ft)	3.7'	**Liner Permeability**	

TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

☐ Rectangular

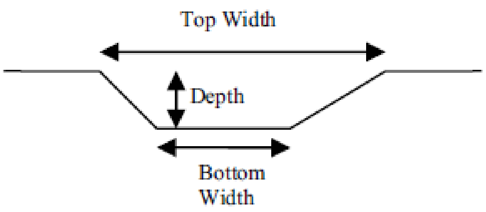
☐ Irregular

depth (ft)

average bottom width (ft)

top width (ft)

TRAPEZOIDAL



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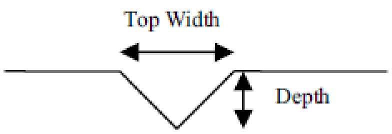

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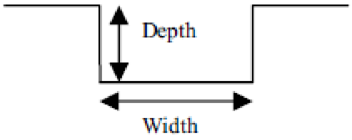
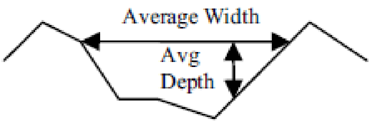
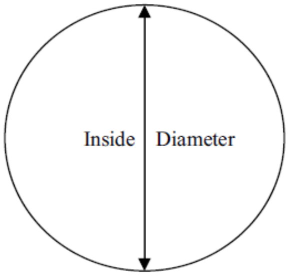


IRREGULAR



X **Outlet**

36” inside diameter



Material

☐ corrugated metal

☐ welded steel

☐ concrete

X plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	X	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

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

If So Please Describe :

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

If So Please Describe :

Minor seepage noted during the site assessment and AmerenUE is currently monitoring.

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

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

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

Unknown; Plans requested through AmerenUE

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

Plans will assist in determining the dam foundation and have been requested and waiting for clearance through AmerenUE Legal.

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

No – minor erosion noted during assessment.

APPENDIX B

UNIT 3 (POND 4, 5 & 6) FIELD OBSERVATION CHECKLIST

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name:	**Meramec**	**Date:**	**September 29, 2010**
Unit Name:	**Bottom Ash Pond**	**Operator's Name:**	**AmerenUE**
Unit I.D.:	**Bottom Ash**	**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** X
	Inspector's Name:	Jeffrey Crabtree, PE and James Filson, PE	

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

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	408		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	plans		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?		X	Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	417.4		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	Plans		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		N/A	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		N/A	At isolated points on embankment slopes?	X	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
#2 #3	Information on plans and plans have been requested through AmerenUE Legal Group
#12	Clear of debris
#21	SW quad of Bottom Ash Pond – Isolated area noted in Maintenance report and being monitored
#23	Floodwater - backwater conditions on the Meramec River

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit MO-0000361 **INSPECTOR**

Date 05/19/2000 to 05/18/2005
Impoundment Name Meramec Power Plant

Impoundment Company AmerenUE
EPA Region Region 7

State Agency State of Missouri
(Field Office) Address Department of Natural Resources
Name of Impoundment Bottom Ash Pond

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

New X **Update** ☐

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

IMPOUNDMENT FUNCTION: Storage – Bottom Ash

Nearest Downstream Town Name: Kimmswick

Distance from the impoundment: 2.8 miles

Location:

Latitude	38	Degrees	24	Minutes	30.56	Seconds	**N**
Longitude	90	Degrees	20	Minutes	20.56	Seconds	**W**

State Missouri **County** St. Louis

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

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.

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

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

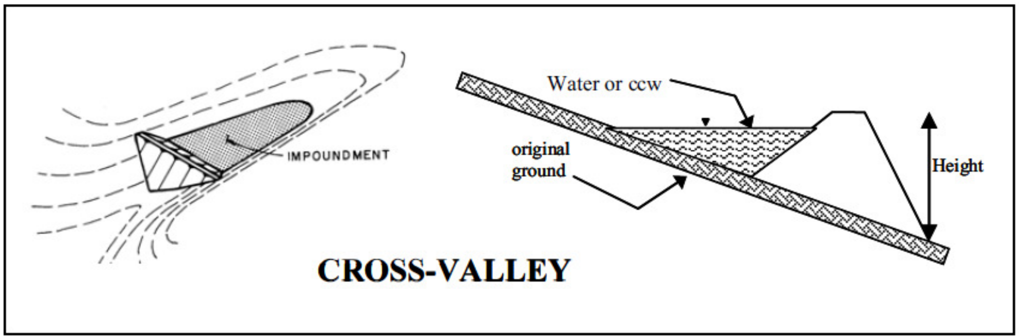
☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

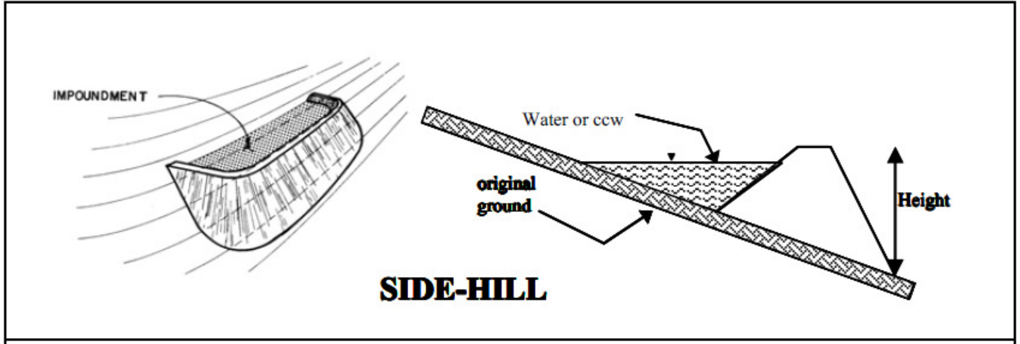
Early assessment is determined to be low based on site assessment only. Visual assessment of unit was conducted and small isolated seep area noted and AmerenUE has been monitoring this location as noted in their annual inspection report. Units and site in good conditions. AmerenUE has a dam safety group which oversees the unit and conducts weekly inspections.

The bottom ash pond is located NW corner of the embankment and has three sides that are incised. The fourth side is part of the embankment. The seep location is in the SW corner of the unit and is a little wet, no running water. A stability analysis is being conducted and will be completed by the end of the year, we have requested a copy for this site assessment.

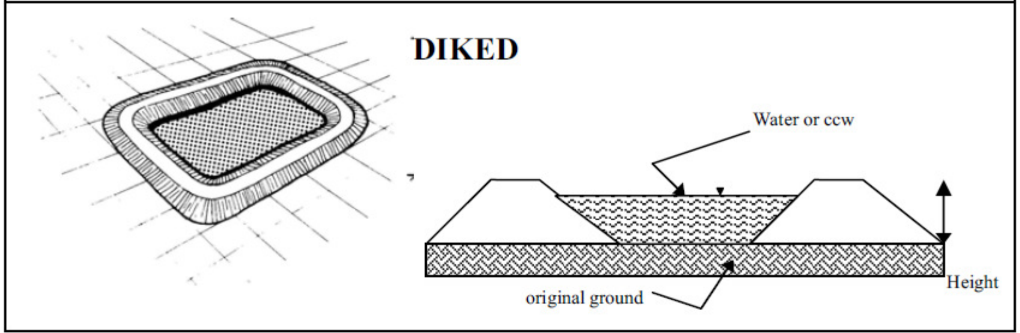
CONFIGURATION:



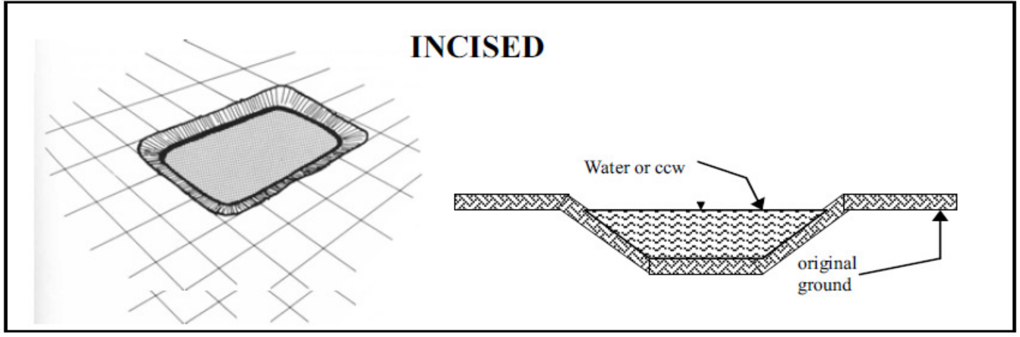
CROSS-VALLEY



SIDE-HILL



DIKED



INCISED

☐ Cross-Valley ☐ Side-Hill X Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft) 25’ (24.7’) **Embankment Material** Noted on Plans – Silty Clay / Clay

Pool Area (ac) 14 ac **Liner**

Current Freeboard (ft) 9.4’ **Liner Permeability**

TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

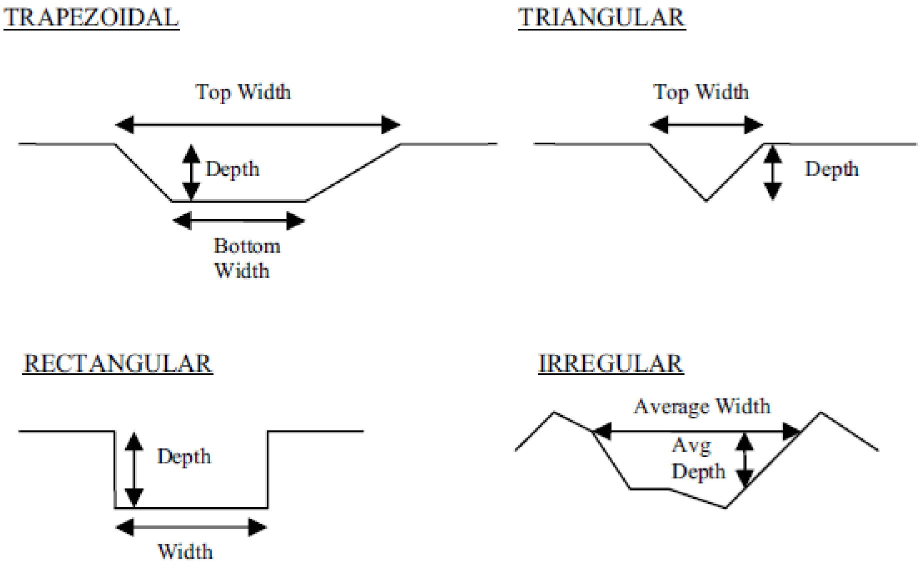
☐ Rectangular

☐ Irregular

depth (ft)

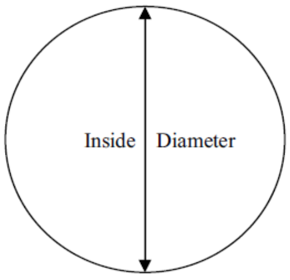
average bottom width (ft)

top width (ft)



X **Outlet**

18" inside diameter



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

X other (specify): Carbon Steel

	Yes	No
Is water flowing through the outlet?	X	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

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

If So When?

If So Please Describe :

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

If So Please Describe :

Minor seepage noted during the site assessment and AmerenUE is currently monitoring.

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

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

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

Unknown; Plans requested through AmerenUE

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

Plans will assist in determining the dam foundation and have been requested and waiting for clearance through AmerenUE Legal.

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

No –

APPENDIX B

UNIT 4 (POND 1) FIELD OBSERVATION CHECKLIST

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name:	**Meramec**	**Date:**	**September 29, 2010**
Unit Name:	**Retention Pond**	**Operator's Name:**	**AmerenUE**
Unit I.D.:	**Retention**	**Hazard Potential Classification:**	**High** ☐ **Significant** ☐ **Low** X
		Inspector's Name:	Jeffrey Crabtree, PE and James Filson, PE

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

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	405		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	plans		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?		X	Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	414		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	Plans		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		N/A	From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		N/A	At isolated points on embankment slopes?	X	
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

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

Issue #	Comments
#2 #3	Information on plans and plans have been requested through AmerenUE Legal Group
#12	Clear of debris
#21	NW corner – Isolated area noted in Maintenance report and being monitored
#23	Floodwater - backwater conditions on the Meramec River

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit MO-0000361 **INSPECTOR**

Date 05/19/2000 to 05/18/2005

Impoundment Name Meramec Power Plant

Impoundment Company AmerenUE

EPA Region Region 7

State Agency State of Missouri

(Field Office) Address Department of Natural Resources

Name of Impoundment Retention Pond

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

New X **Update** ☐

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

IMPOUNDMENT FUNCTION: Storage – Bottom Ash

Nearest Downstream Town Name: Kimmswick

Distance from the impoundment: 2.8 miles

Location:

Latitude	38	Degrees	24	Minutes	27.68	Seconds	**N**
Longitude	90	Degrees	20	Minutes	35.46	Seconds	**W**

State Missouri **County** St. Louis

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

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.

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DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

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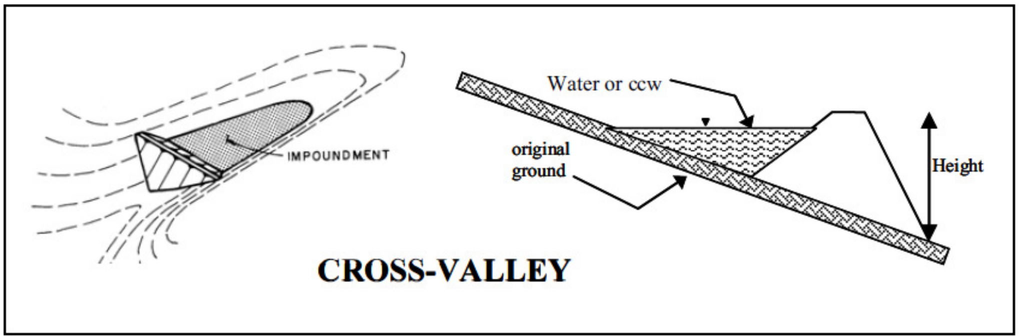
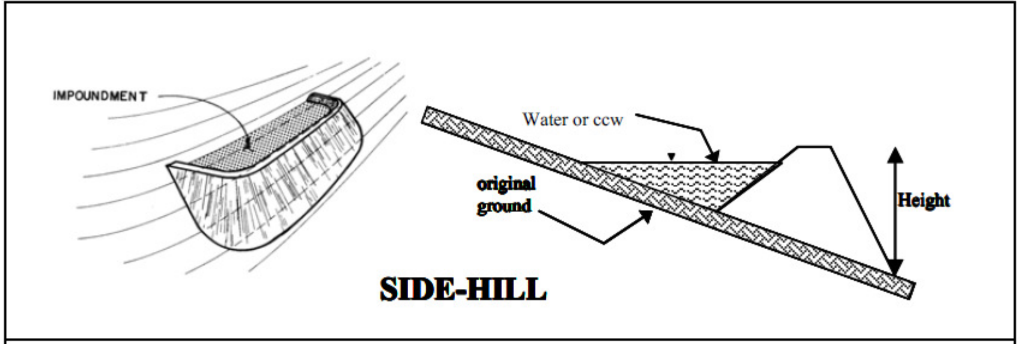
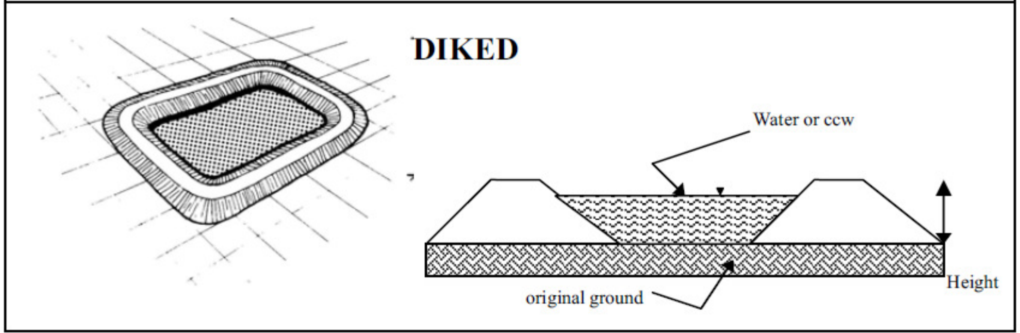
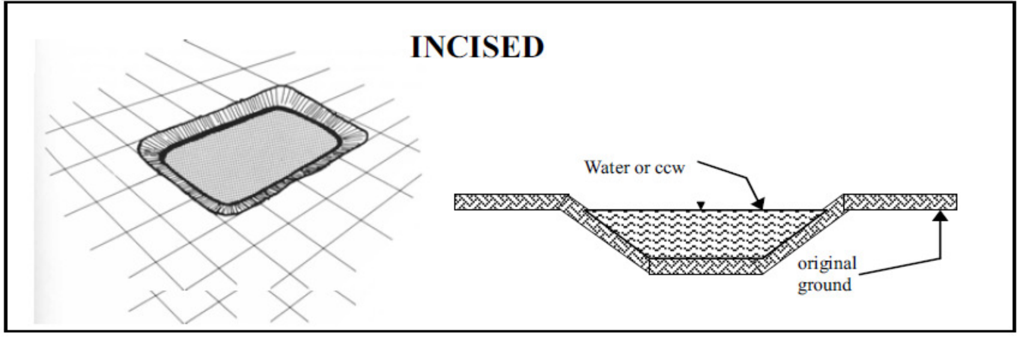
The retention pond is located west of the embankment and has all sides incised. The edge of the retention pond, shortest distance to the embankment is approximately 75 yards. The side slopes are vertical timber board built within the fly ash pond area.

CONFIGURATION:









☐ Cross-Valley ☐ Side-Hill ☐ Diked

☐ Incised (form completion optional) X Combination Incised/Diked

Embankment Height (ft)	25' (24.7')	**Embankment Material**	Noted on Plans – Vertical wooden boards
Pool Area (ac)	0.7 ac	**Liner**	
Current Freeboard (ft)	9'	**Liner Permeability**	

TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

☐ Rectangular

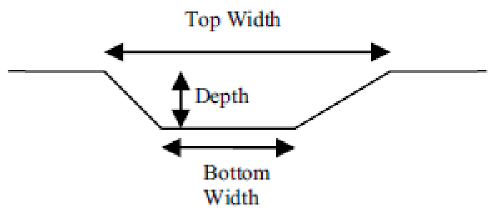
☐ Irregular

depth (ft)

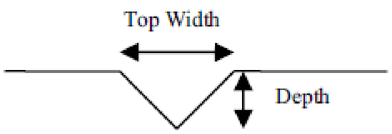
average bottom width (ft)

top width (ft)

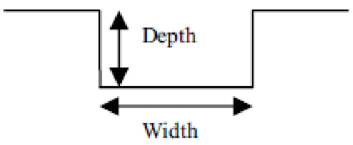
TRAPEZOIDAL



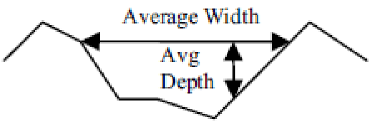
TRIANGULAR



RECTANGULAR

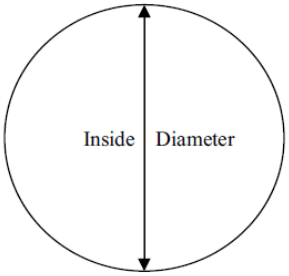


IRREGULAR



X **Outlet**

24" inside diameter



Material

☐ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

X other (specify): Carbon Steel

	Yes	No
Is water flowing through the outlet?	X	☐

☐ **No Outlet**

☐ **Other Type of Outlet** (specify):

	Yes	**No**
Has there ever been a failure at this site?	☐	X

If So When?

If So Please Describe :

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

If So Please Describe :

Minor seepage noted during the site assessment and AmerenUE is currently monitoring.

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

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

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

Unknown; Plans requested through AmerenUE

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

Plans will assist in determining the dam foundation and have been requested and waiting for clearance through AmerenUE Legal.

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

No –

APPENDIX C

REFERENCES

REFERENCES

Dent, J. and Heineman, J. 2010. Meramec Ash Impoundment: Weekly Inspection Checksheets. AmerenUE.

Campbell, G. and Frerking, M. 2009. Meramec Ash Impoundment: 2008 Annual Inspection Checksheets. AmerenUE.

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Haddock, M. and Lemon, M. 2008. AmerenUE Meramec Plan Ash Pond #494 Drilling and Piezometer Installation. Golder Associates Inc., St. Charles, MO.

United States Army Corps of Engineers (USACE). 2004. “Upper Mississippi River System Flow Frequency Study.” January 2004.