Luminant

Illinois Power Generating Company
1500 Eastport Plaza Dr.
Collinsville, IL 62234

July 28, 2022

Illinois Environmental Protection Agency
DWPC – Permits MC #15
Attn: Part 845 Coal Combustion Residual Rule Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Coffeen Power Plant Ash Pond No. 1; IEPA ID # W1350150004-01

Dear Mr. LeCrone:

In accordance with 35 I.A.C. § 845.200, Illinois Power Generating Company (IPGC) is submitting a construction permit application for the Coffeen Power Plant Ash Pond No. 1 (IEPA ID # W1350150004-01). One hardcopy is provided with this submittal.

The permit application was prepared in accordance with 35 I.A.C. § 845.220 (a) and (d). This submittal includes the completed permit forms as required by § 845.210.

Sincerely,

Cynthia E. Vodopivec

Cynthia Vodopivec
SVP-Environmental Health and Safety

Enclosures

Form CCR 1	Illinois Environmental Protection Agency CCR Surface Impoundment Permit Application Form CCR 1 – General Provisions

Bureau of Water ID Number: W1350150004 **CCR Permit Number:** N/A **Facility Name:** Coffeen Power Plant	For IEPA Use Only

SECTION 1: FACILITY, OPERATOR, AND OWNER INFORMATION (35 Ill. Adm. Code 845.210(b))

Facility, Operator, and Owner Information

1.1	Facility Name		
	Illinois Power Generating Company - Coffeen Power Plant		
1.2	Illinois EPA CCR Permit Number (if applicable)		
	N/A		
1.3	Facility Contact Information		
	Name (first and last) Phil Morris	Title Senior Director - Environmental	Phone Number 618-343-7794
	Email address phil.morris@vistracorp.com		
1.4	Facility Mailing Address		
	Street or P.O. box 1500 Eastport Plaza Dr		
	City or town Collinsville	State IL	Zip Code 62234
1.5	Facility Location		
	Street, route number, or other specific identifier 134 CIPS Lane		
	County name Montgomery	County code (if known)	
	City or town Coffeen	State IL	Zip Code 62017
1.6	Name of Owner/Operator		
	Illinois Power Generating Company		

Facility, Operator, and Owner Info				
	1.7	Owner/Operator Contact Information		
		Name (first and last) Phil Morris	Title Senior Director - Environmental	Phone Number 618-343-7794
		Email address phil.morris@vistracorp.com		
	1.8	Owner/Operator Mailing Address		
		Street or P.O. box 1500 Eastport Plaza Dr		
		City or town Collinsville	State IL	Zip Code 62234

SECTION 2: LEGAL DESCRIPTION (35 Ill. Adm. Code 845.210(c))

Legal Description		
	2.1	Legal Description of the facility boundary
		See Attachment J.

SECTION 3: PUBLICLY ACCESSIBLE INTERNET SITE REQUIREMENTS (35 Ill. Adm. Code 845.810)

Internet Site					
	3.1	Web Address(es) to publicly accessible internet site(s) (CCR website)			
		www.luminant.com/illinois-ccr/			
	3.2	Is/are the website(s) titled “Illinois CCR Rule Compliance Data and Information”			
		☑	Yes	☐	No

SECTION 4: IMPOUNDMENT IDENTIFICATION

Impoundment Identification				
	4.1	List all the impoundment identification numbers for your facility and check the corresponding box to indicate that you have attached a written description for each impoundment.		
		W1350150004 - 01 (see Attachment J)	☑	Attached written description
			☐	Attached written description
			☐	Attached written description
			☐	Attached written description
			☐	Attached written description
			☐	Attached written description

		☐	Attached written description
		☐	Attached written description
		☐	Attached written description
		☐	Attached written description

SECTION 5: CHECKLIST AND CERTIFICATION STATEMENT

Checklist and Certification Statement

5.1 In Column 1 below, mark the sections of Form 1 that you have completed and are submitting with your application. For each section, specify in Column 2 any attachments that you are enclosing.

Column 1		Column 2	
Section 1: Facility, Operator, and Owner Information	☑	w/attachments	☐
Section 2: Legal Description	☑	w/attachments	☑
Section 3: Publicly Accessible Internet Site Requirement	☑	w/attachments	☐
Section 4: Impoundment Identification	☑	w/attachments	☑

5.2 **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision 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, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name (print or type first and last name) of Owner/Operator	Official Title
Cynthia Vodopivec	SVP - Environmental
Signature	**Date Signed**
Cynthia S. Vodopivec	7-18-2022

Form 2CC	Illinois Environmental Protection Agency CCR Surface Impoundment Permit Application Form CCR 2CC – Closure Construction

Bureau of Water ID Number: W1350150004 **CCR Permit Number:** N/A **Facility Name:** Coffeen Power Plant	For IEPA Use Only

SECTION 1: DESIGN AND CONSTRUCTION PLANS (35 Ill. Adm. Code 845.220)

Design and Construction Plans (Construction History)

1.1	CCR surface impoundment name.
	Ash Pond 1
1.2	Identification number of the CCR surface impoundment (if one has been assigned by the Agency).
	N/A
1.3	Describe the boundaries of the CCR surface impoundment (35 Ill. Adm. Code 845.210 (c)).
	Attachment J
1.4	State the purpose for which the CCR surface impoundment is being used.
	Attachment A
1.5	How long has the CCR surface impoundment been in operation?
	Attachment A
1.6	List the types of CCR that have been placed in the CCR surface impoundment.
	Attachment B

Design and Construction Plans (Continued)

1.7	List the name of the watershed within which the CCR surface impoundment is located.	
	Attachment A	
1.8	What is the size in acres of the watershed within which the CCR surface impoundment is located?	
	Attachment A	
1.9	Check the corresponding boxes to indicate that you have attached the following:	
	☑	A description of the physical and engineering properties of the foundation and abutment materials on which the CCR surface impoundment is constructed.
	☑	A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR surface impoundment.
	☑	A statement of the method of site preparation and construction of each zone of the CCR surface impoundment.
	☑	A statement of the approximate dates of construction of each successive stage of construction of the CCR surface impoundment.
	☑	Drawings satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(1)(F).
	☑	A description of the type, purpose, and location of existing instrumentation.
	☑	Area capacity curves for the CCR impoundment.
	☑	A description of each spillway and diversion design features and capacities and provide the calculations used in their determination.
	☑	The construction specifications and provisions for surveillance, maintenance, and repair of the CCR surface impoundment.
1.10.1	Is there any record or knowledge of structural instability of the CCR surface impoundment?	
	☐ Yes ☑ No	
1.10.2	If you answered yes to Item 1.10.1, provide detailed explanation of the structural instability.	

SECTION 2: NARRATIVE DESCRIPTION OF THE FACILITY (35 Ill. Adm. Code 845.220)

Narrative Description	2.1	List the types of CCR expected in the CCR surface impoundments.	
		Attachment B	
	2.2	Have you attached a chemical analysis of each type of expected CCR?	
		☑	Yes
	2.3	Estimate of the maximum capacity of the surface impoundment in gallons or cubic yards.	
		Attachment B	
	2.4	The rate at which CCR and non-CCR waste streams currently enter the CCR impoundment in gallons per day and dry tons.	
		Attachment B GPD	Attachment B dTn
	2.5	Estimate length of time the CCR surface impoundment will receive CCR and non-CCR waste streams.	
		Attachment B	
	2.6	Have you attached an on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment?	
		☑	Yes

SECTION 3: MAPS (35 Ill. Adm. Code 845.220)

Maps	3.1	Check the corresponding boxes to indicate that you have attached the following maps:	
		☑	A site location map on the most recent United Sates Geological Survey (USGS) quadrangle of the area from the 7 ½ minute series (topographic) or on another map whose scale clearly shows the information required in 35 Ill. Adm. Code 845.220(a)(3).
		☑	Site plans maps satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(4).

SECTION 4: ATTACHMENTS

Attachments	4.1	Check the corresponding boxes to indicate that you have attached the following:	
		☑	A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.
		☑	Plans and specifications fully describing the design, nature, function, and interrelationship of each individual component of the facility.
		☑	The signature and seal of a qualified professional engineer.
		☑	Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under 35 Ill. Adm. Code 845.240.

Attachments (Continued)		✓	A summary of the issues raised by the public during the public notification and public meetings.
		✓	A summary of any revisions, determinations, or other considerations made in response to those issues raised by the public during the public notification and public meetings.
		✓	A list of interested persons in attendance who would like to be added to the Agency's listserv for the facility.
		✓	Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in erosion control and environmental remediation.
		✓	Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in the operation of heavy equipment and excavation.
SECTION 5: GROUNDWATER MONITORING PROGRAM			
Groundwater Monitoring	5.1	Indicate that you have attached the following components of a new groundwater monitoring program or any modifications to an existing groundwater monitoring program by checking the corresponding boxes:	
		✓	A hydrogeologic site investigation meeting the requirements of 35 Ill. Adm. Code 845.620, if applicable.
		✓	Design and construction plans of a groundwater monitoring system meeting the requirements of 35 Ill. Adm. Code 845.630.
		✓	A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by 35 Ill. Adm. Code 845.640 and 845.650.
SECTION 6: CLOSURE (35 Ill. Adm. Code 845.220(d))			
Closure	6.1	What is the closure prioritization category under 35 Ill. Adm. Code 845.700(g), if applicable?	
		Attachment E	
	6.2	Indicate that you have attached the following by checking the corresponding boxes:	
		✓	The final closure plan, as specified in 35 Ill. Adm. Code 845.720(b), which includes the closure alternatives analysis required by 35 Ill. Adm. Code 845.710.
		✓	Proposed schedule to complete closure.
		✓	Post-closure care plan as specified in 35 Ill. Adm. Code 845.780(d).
SECTION 7: GROUNDWATER MODELING (35 Ill. Adm. Code 845.220(d)(3))			
Groundwater	7.1	Indicate that you have attached the following by checking the corresponding boxes:	
		✓	The results of groundwater contaminant transport modeling and calculations showing how the closure will achieve compliance with the applicable groundwater standards.
		✓	All modeling inputs and assumptions.
		✓	Description of the fate and transport of contaminants with the selected corrective action over time.

		☑	Capture zone modeling, if applicable.
		☑	Any necessary licenses and software needed to review and access both the model and the data contained within the model.

PERMIT APPLICATION

Part 845 Construction Permit Application for Ash Pond No. 1

Coffeen Power Plant

Submitted to:

Illinois Environmental Protection Agency

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Submitted by:

Illinois Power Resources Generating, LLC

1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Compiled by:

Golder Associates USA Inc.

701 Emerson Road, Suite 250
Creve Coeur, Missouri, 63141

21465046

July 28, 2022

Executive Summary

Introduction

Illinois Power Resources Generating, LLC (IPRG) owns and operates Ash Pond No. 1 (AP1) at the Coffeen Power Plant in Montgomery County, Illinois. AP1 is a coal combustion residuals (CCR) surface impoundment that was used to manage bottom ash produced at the Coffeen Power Plant from the time construction of AP1 was completed in 1964 until the power plant was retired in December 2019. Since the retirement of the Coffeen Power Plant, AP1 has no longer received CCR or any other waste stream. IPRG is submitting this Part 845 Construction Permit Application for AP1 to provide the Illinois Environmental Protection Agency (IEPA) with the information required under 35 Illinois Administrative Code (I.A.C.) 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (Part 845) for closure of AP1.

Pursuant to 35 I.A.C. § 845.700(c), AP1 has been designated as Category 5. Corrective action is expected at the Site. An evaluation of potential corrective measures and corrective actions has not yet been completed but will be conducted consistent with the requirements in 35 I.A.C. § 845.670.

Closure Method Selection

As required under 35 I.A.C. § 845.710, a closure alternatives analysis has been completed to identify the most appropriate closure method for AP1. The following closure alternatives were evaluated:

- closure by removal of CCR with disposal in both an on-site and off-site landfill
- hybrid closure with a final cover system constructed over CCR consolidated in the western portion of the impoundment

Based on the findings of the closure alternatives analysis, AP1 will be closed with a final cover system with CCR consolidated in the western portion of the impoundment (i.e., hybrid closure). All ash (CCR) in the eastern portion of the impoundment will be removed and relocated to the western portion of the impoundment, which will be closed in accordance with 35 I.A.C. § 845.750. Under this hybrid approach, approximately 58% of the current CCR footprint within the impoundment will be removed. The closed AP1 will contain approximately 436,000 cubic yards of CCR.

Closure Method Description

The closed AP1 facility will have final cover slopes of 7H:1V to approximate El. 664 feet transitioning to 20H:1V (5%) slopes above that elevation to accommodate moderate settlement and promote drainage. A berm will be constructed at the east end of the consolidated footprint for stability. The location of the berm has been selected to accommodate the estimated 436,000 CY of CCR and 21,500 CY of excavated subsoil to be contained within the consolidated footprint based on the grading plan presented. The general sequencing plan for closure of AP1 is as follows:

- Pump out ponded water [approximately 15.2 million gallons (MG)] from AP1 to the existing drainage to the north and through Outfall K20. Discharge will be managed in accordance with the NPDES permit for the site.
- A temporary water management system will be constructed within AP1, including ditches and sumps. The system will maintain AP1 in an unwatered state by collecting contact stormwater during closure construction.

Stormwater flow will be conveyed through Outfall K20 to the existing drainage to the north. Discharge will be managed in accordance with the NPDES permit for the site.

- Once the ponded water has been removed from AP1, the CCR in the consolidated footprint will be dewatered. All of the approximately 268,600 CY of CCR east of the consolidated footprint will be dewatered as needed to enable relocation. Free liquids in the CCR will be eliminated by removing liquid wastes or solidifying the remaining wastes. It is anticipated that after ponded water is removed approximately 14.1 MG of additional water removal will be required to dewater the CCR. The CCR will dewater to some degree by gravity, but dewatering by pumping from trenches and sumps is expected to be necessary. Liquid waste and water flowing to sumps will be managed in accordance with the NPDES permit for the site and discharged through Outfall K20.
- Any accumulated CCR within the riser structure and outlet pipes will be removed and the riser structure and outlet pipes will be decontaminated by pressure washing. Decontamination water will be routed through Outfall K20 and managed in accordance with the NPDES permit for the site. The riser structure will be demolished and disposed of in the consolidated footprint and the outlet pipes will be plugged and abandoned or removed and disposed.
- CCR will be removed from the berm footprint and relocated into the consolidated footprint. The berm will be constructed in north-south orientation at the east end of the consolidated footprint.
- All remaining CCR east of the berm will be collected and deposited west of the berm. The subsoils will be visually observed for signs of CCR. If soils with the presence of CCR are observed, they will be removed and deposited west of the berm. It is anticipated that up to 1 foot of subsoils may be removed; however, visual inspection will be conducted to confirm that all CCR in the eastern portion is removed. Decontamination of areas outside of the eastern portion of AP1 will not be required because there have been no releases of CCR from the eastern portion of AP1 and there is no containment system within AP1.
- Once all CCR is contained within the consolidated footprint and appropriate grades for closure have been achieved (with grading fill used as necessary), a final cover system will be installed in accordance with Part 845.750. The final cover system will consist of (from top to bottom):
  - 24-inch-thick final protective soil layer. The soil layer will include a 6-inch-thick topsoil layer that will be revegetated with grass species selected to reduce maintenance based on soil type. The underlying material will consist of locally available soils from the removed embankment containment berm compacted to between 80% and 95% of the standard Proctor maximum dry density for establishment of vegetation and protection of the underlying geomembrane. Final protective soil layer material is likely to be primarily low-plasticity silt or clay based on review of site geotechnical information.
  - Nonwoven geotextile cushioning layer.
  - 40-mil linear low-density polyethylene (LLDPE) geomembrane layer.
- All areas of the closure surface will be sloped at a minimum of 1% to positively drain to the exterior of AP1. Stormwater runoff from the AP1 closure area will be removed from the top of the final cover via the construction of a free-draining stormwater management system, including berms, channels, and let-down structures, that will convey stormwater to existing surface water bodies.

- Exterior slopes of the existing western, northern, and southern containment berms used to contain the consolidated AP1 footprint will be recontoured as necessary with additional soil, sourced from the existing berms that are no longer required, to achieve minimum 3H:1V side slopes for long-term stability.
- To prevent impoundment of water in the eastern end of the current AP1 footprint after CCR removal, existing earthen embankments not required for the consolidated footprint will be removed and a channel will be excavated to allow stormwater to flow through existing NPDES Outfall K20 into the existing drainage.
- Soil fill, sourced from existing berms no longer required to contain waste in the consolidated footprint or from the on-site soil borrow area southeast of AP1, will be used as fill in low areas of the existing AP1 base grade to provide at least one foot of soil cover above the top of the uppermost aquifer and establish the final ground surface.
- The final ground surface of the eastern part of AP1 will be sloped to drain at a minimum slope of 0.5% towards the channel excavated in the northeast corner, to allow post-closure, non-contact stormwater to gravity flow into the existing drainage.
- Vegetation will be established on the final surface of AP1. Stormwater best management practices (BMPs) such as erosion control blankets will be used as needed to reduce erosion during vegetation establishment.
- After vegetation is established, BMPs will be removed and closure construction will be considered complete.

Document Organization

IEPA Application Form CCR 1 and IEPA Application Form CCR 2CC precede this Executive Summary. A checklist identifying the required elements of the Part 845 Construction Permit Application and the location in this document where each element can be found follows this Executive Summary. Supplemental information required under Part 845 is organized in a set of appendices that follow the checklist:

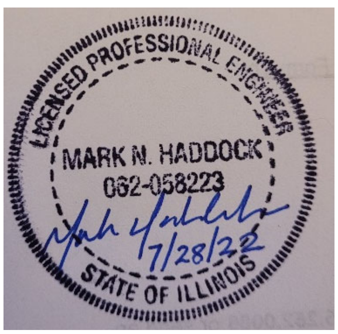
- Appendix A (History of Construction) provides general information about AP1 and describes its design and construction.
- Appendix B (Narrative Description) describes the types and generation rates of CCR managed in AP1.
- Appendix C (Map Package) includes a Site Location Map and a Site Plan Map depicting important site features and information.
- Appendix D (Hydrogeologic Site Characterization) describes hydrogeologic conditions in the vicinity of AP1.
- Appendix E (Closure Priority Categorization) identifies the closure priority category assigned to AP1.
- Appendix F (Groundwater Modeling) describes the results of groundwater modeling that has been conducted to assess the expected fate and transport of chemical constituents following closure of AP1 (a link to access the groundwater model files will be transmitted to the IEPA separately). Includes an Evaluation of Potential Exceedances of Groundwater Protection Standards, which summarizes the potential exceedances of groundwater protection standards that have been detected at AP1 and identifies the alternative sources that have caused them.
- Appendix G (Final Closure Plan) provides design information for closure of AP1, as well as the results of a closure alternatives analysis that has been conducted to determine the most effective approach for closure of AP1.

- Appendix H (Groundwater Monitoring Plan) describes the monitoring locations and procedures that will be used to assess groundwater quality after closure of AP1.
- Appendix I (Post-closure Care Plan) describes the procedures that will be followed to maintain the closed AP1 during the post-closure care period.
- Appendix J (Legal Description) provides the land description of the AP1 facility boundary.
- Appendix K (Public Meetings Information) provides the information pertaining to the public notification and public meetings required under Part 845.
- Appendix L (Contractor Training Certification) certifies that personnel used to construct, install, modify, or close AP1 will participate in required training programs.

Signature Page

Golder Associates USA Inc.

I, Mark Haddock, being a registered professional engineer in good standing in the State of Illinois, certify to the best of my knowledge that the information contained in this construction permit application has been prepared in accordance with recognized and generally accepted engineering practices.



Mark Haddock, PE
Principal

https://golderassociates.sharepoint.com/sites/145229/project files/6 deliverables/reports/02-ap1_permit_app/20220728_final/21465046-coffeen_ap1_permit_application_20220712.docx

Regulation	Requirement	Location in Permit Application
Section 845.220 - Construction Permits		
a)	All construction permit applications must contain the following information and documents.	
1)	Design and Construction Plans (Construction History)	Appendix A
A)	Identifying information	Appendix A
i)	The name and address of the person or persons owning or operating the CCR surface impoundment;	Appendix A
ii)	The name associated with the CCR surface impoundment;	Appendix A
iii)	The identification number of the CCR surface impoundment if one has been assigned by the Agency.	Appendix A
B)	A statement of the purpose for which the CCR surface impoundment is being used, how long the CCR surface impoundment has been in operation, and the types of CCR that have been placed in the CCR surface impoundment.	Appendix A
C)	The name and size in acres of the watershed within which the CCR surface impoundment is located.	Appendix A
D)	A description of the physical and engineering properties of the foundation and abutment materials on which the CCR surface impoundment is constructed.	Appendix A
E)	A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR surface impoundment; the method of site preparation and construction of each zone of the CCR surface impoundment; and the approximate dates of construction of each successive stage of construction of the CCR surface impoundment.	Appendix A
F)	At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR surface impoundment, detailed dimensional drawings of the CCR surface impoundment, including a plan view and cross-sections of the length and width of the CCR surface impoundment, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR surface impoundment due to malfunction or mis-operation.	Appendix A
G)	A description of the type, purpose, and location of existing instrumentation.	Appendix A
H)	Area-capacity curves for the CCR surface impoundment.	Appendix A
I)	A description of each spillway and diversion design features and capacities and calculations used in their determination.	Appendix A
J)	The construction specifications and provisions for surveillance, maintenance, and repair of the CCR surface impoundment.	Appendix A
K)	Any record or knowledge of structural instability of the CCR surface impoundment.	Appendix A
2)	Narrative Description of the Facility. The permit application must contain a written description of the facility with supporting documentation describing the procedures and plans that will be used at the facility to comply with the requirements of this Part. The descriptions must include, but are not limited to, the following information:	Appendix B, Appendix G
A)	The types of CCR expected in the CCR surface impoundment, including a chemical analysis of each type of expected CCR;	Appendix B
B)	An estimate of the maximum capacity of each surface impoundment in gallons or cubic yards;	Appendix B
C)	The rate at which CCR and non-CCR waste streams currently enter the CCR surface impoundment in gallons per day and dry tons;	Appendix B
D)	The estimated length of time the CCR surface impoundment will receive CCR and non-CCR waste streams; and	Appendix B
E)	An on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment.	Appendix B
3)	Site Location Map. All permit applications must contain a site location map on the most recent United States Geological Survey (USGS) quadrangle of the area from the 7½ minute series (topographic), or on such other map whose scale clearly shows the following information:	Appendix C
A)	The facility boundaries and all adjacent property, extending at least 1000 meters (3280 feet) beyond the boundary of the facility;	Appendix C
B)	All surface waters;	Appendix C
C)	The prevailing wind direction;	Appendix C
D)	The limits of all 100-year floodplains;	Appendix C
E)	All natural areas designated as a Dedicated Illinois Nature Preserve under the Illinois Natural Areas Preservation Act [525 ILCS 30];	Appendix C
F)	All historic and archaeological sites designated by the National Historic Preservation Act (16 USC 470 et seq.) and the Illinois Historic Sites Advisory Council Act [20 ILCS 3410]; and	Appendix C
G)	All areas identified as critical habitat under the Endangered Species Act of 1973 (16 USC 1531 et seq.) and the Illinois Endangered Species Protection Act [520 ILCS 10].	Appendix C
4)	Site Plan Map. The application must contain maps, including cross-sectional maps of the site boundaries, showing the location of the facility. The following information must be shown:	Appendix C
A)	The entire facility, including any proposed and all existing CCR surface impoundment locations;	Appendix C
B)	The boundaries, both above and below ground level, of the facility and all CCR surface impoundments or landfills containing CCR included in the facility;	Appendix C
C)	All existing and proposed groundwater monitoring wells; and	Appendix C
D)	All main service corridors, transportation routes, and access roads to the facility.	Appendix C
5)	A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.	Appendix G
6)	Plans and specifications fully describing the design, nature, function and interrelationship of each individual component of the facility.	Appendix A, Appendix G
7)	A new groundwater monitoring program or any modification to an existing groundwater monitoring program that includes but is not limited to the following information:	
A)	A hydrogeologic site investigation meeting the requirements of Section 845.620, if applicable;	Appendix D
B)	Design and construction plans of a groundwater monitoring system meeting the requirements of Section 845.630; and	Appendix H

Regulation	Requirement	Location in Permit Application
Section 845.220 - Construction Permits (Continued)		
C)	A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data, as required by Sections 845.640 and 845.650.	Appendix H
8)	The signature and seal of a qualified professional engineer	Executive Summary
9)	Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under Section 845.240, a summary of the issues raised by the public, a summary of any revisions, determinations, or other considerations made in response to those issues, and a list of interested persons in attendance who would like to be added to the Agency's listserv for the facility.	Appendix K
b)	New Construction. In addition to the requirements in subsection (a), all construction permit applications to build a new CCR surface impoundment, lateral expansion of a CCR surface impoundment, or retrofit of an existing CCR surface impoundment must also contain the following information and documents:	Not applicable - not new construction, lateral expansion, or retrofit
1)	Plans and specifications that demostrate the proposed CCR surface impoundment will meet the location standards in the following sections:	
A)	Section 845.300 (Placement Above the Uppermost Aquifer);	
B)	Section 845.310 (Wetlands);	
C)	Section 845.320 (Fault Areas);	
D)	Section 845.330 (Seismic Impact Zones); and	
E)	Section 845.340 (Unstable Areas and Floodplains).	
2)	Plans and specifications demonstrate the proposed CCR surface impoundment will meet the following design criteria:	
A)	The CCR surface impoundment will have a liner meeting the liner requirements of Section 845.400(b) or (c);	
B)	The CCR surface impoundment will have a leachate collection system meeting the requirements of Section 845.420; and	
C)	The CCR surface impoundment, if not incised, will be constructed with slope protection, as required by Section 845.430.	
3)	CCR fugitive dust control plan (see Section 845.500(b)).	
4)	Preliminary written closure plan (see Section 845.720(a)).	
5)	Initial written post-closure care plan, if applicable (see Section 845.780(d)).	
c)	Corrective Action Construction. In addition to the requirements in subsection (a), all construction permit applications that include any corrective action performed under Subpart F must also contain the following information and documents:	Not applicable - no corrective action included
1)	Corrective action plan (see Section 845.670);	
2)	Groundwater modeling, including:	
A)	The results of groundwater contaminant transport modeling and calculations showing how the closure will achieve compliance with the applicable groundwater standards;	
B)	All modeling inputs and assumptions;	
C)	Description of the fate and transport of contaminants, with the selected closure over time; and	
D)	Capture zone modeling, if applicable.	
3)	Any necessary licenses and software needed to review and access both the models and the data contained within the models required by subsection (c)(2);	
4)	Corrective action groundwater monitoring program, including identification of revisions to the groundwater monitoring system for corrective action; and	
5)	Any interim measures necessary to reduce the contaminants leaching from the CCR surface impoundment, and/or potential exposures to human or ecological receptors, including an analysis of the factors specified in Section 845.680(a)(3).	
d)	Closure Construction. In addition to the requirements in subsection (a), all construction permit applications for closure of the CCR surface impoundment under Subpart G must contain the following information and documents:	
1)	Closure prioritization category under Section 845.700(g), if applicable;	Appendix E
2)	Final closure plan, as specified in Section 845.720(b), which includes the closure alternatives analysis required by Section 845.710;	Appendix G
3)	Groundwater modeling, including:	Appendix F
A)	The results of groundwater contaminant transport modeling and calculations showing how the closure will achieve compliance with the applicable groundwater standards;	Appendix F
B)	All modeling inputs and assumptions;	Appendix F
C)	Description of the fate and transport of contaminants, with the selected closure over time;	Appendix F
D)	Capture zone modeling, if applicable; and	Not applicable
E)	Any necessary licenses and software needed to review and access both the model and the data contained within the model.	Provided separately if applicable
4)	Proposed schedule to complete closure; and	Appendix G
5)	Post-closure care plan as specified in Section 845.780(d), if applicable.	Appendix I
e)	*Owners or operators of CCR surface impoundments who submitted a closure plan to the agency before May 1, 2019, and who complete closure before July 30, 2021, shall not be required to obtain a construction permit for closure under subsection (d).* [415 ILCS 5/22.58(e)]	Not applicable - closure not completed before July 31, 2021
f)	A single construction permit application may be submitted for new construction, corrective action, and closure if the construction is related to the same multiphased project. The permit application for a project with multiple phases must contain all information required by subsections (a), (b), (c) and (d), as applicable.	Not applicable - not a multiphased project
g)	Duration of Construction Permits	
1)	For any construction permit that is not for the closure or retrofit of the CCR surface impoundment, the construction permit must be issued for fixed terms not to exceed 3 years.	Not applicable - permit application is for closure
2)	For any construction permit for the closure or retrofit of a CCR surface impoundment, the construction permit must be issued for an initial fixed term expiring within the timeframe approved by the Agency in the construction permit or five years, whichever is less. The Agency may renew a construction permit for closure or retrofit in two-year increments under Section 845.760(b).	Acknowledged

Regulation	Requirement	Location in Permit Application
Section 845.620 - Hydrogeologic Site Characterization		
a)	The owner or operator of the CCR surface impoundment must design and implement a hydrogeologic site characterization.	Appendix D
b)	The hydrogeologic site characterization must include, but is not limited to, the following:	
1)	Geologic well logs/boring logs;	Appendix D
2)	Climatic aspects of the site, including seasonal and temporal fluctuations in groundwater flow;	Appendix D
3)	Identification of nearby surface water bodies and drinking water intakes;	Appendix D
4)	Identification of nearby pumping wells and associated uses of the groundwater;	Appendix D
5)	Identification of nearby dedicated nature preserves;	Appendix D
6)	Geologic setting;	Appendix D
7)	Structural characteristics;	Appendix D
8)	Geologic cross-sections;	Appendix D
9)	Soil characteristics;	Appendix D
10)	Identification of confining layers;	Appendix D
11)	Identification of potential migration pathways;	Appendix D
12)	Groundwater quality data;	Appendix D
13)	Vertical and horizontal extent of the geologic layers to a minimum depth of 100 feet below land surface, including lithology and stratigraphy;	Appendix D
14)	A map displaying any known underground mines beneath a CCR surface impoundment;	Appendix D
15)	Chemical and physical properties of the geologic layers to a minimum depth of 100 feet below land surface;	Appendix D
16)	Hydraulic characteristics of the geologic layers identified as migration pathways and geologic layers that limit migration, including:	Appendix D
A)	Water table depth;	Appendix D
B)	Hydraulic conductivities;	Appendix D
C)	Effective and total porosities;	Appendix D
D)	Direction and velocity of groundwater flow; and	Appendix D
E)	Map of the potentiometric surface;	Appendix D
17)	Groundwater classification under 35 Ill. Adm. Code 620; and	Appendix D
18)	Any other information requested by the Agency that is relevant to the hydrogeologic site characterization.	Appendix D
Section 845.630 - Groundwater Monitoring Systems (excerpts providing requirements for the construction permit application)		
g)	The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this Section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in subsection (c)(1), the certification must document the basis supporting this determination. The certification must be submitted to the Agency with the appropriate permit application.	Appendix H
Section 845.640 - Groundwater Sampling and Analysis Requirements (excerpts providing requirements for the construction permit application)		
a)	The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of groundwater quality at the background and downgradient wells required by Section 845.630. The owner or operator of the CCR surface impoundment must develop a sampling and analysis program that includes procedures and techniques for:	Appendix H
b)	The groundwater monitoring program must include sampling and analysis methods that are appropriate for groundwater sampling and that accurately measure constituents and other monitoring parameters in groundwater samples.	Appendix H
1)	Sample collection;	Appendix H
2)	Sample preservation and shipment;	Appendix H
3)	Analytical procedures;	Appendix H
4)	Chain of custody control; and	Appendix H
5)	Quality assurance and quality control.	Appendix H
f)	Statistical Methods	Appendix H
1)	The owner or operator of the CCR surface impoundment must select one of the statistical methods specified in subsection (f)(1) to be used in evaluating groundwater monitoring data for each specified constituent. The statistical test chosen must be conducted separately for each constituent in each monitoring well.	Appendix H
2)	The owner or operator of the CCR surface impoundment must obtain a certification from a qualified professional engineer stating that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR surface impoundment. The certification must include a narrative description of the statistical method selected to evaluate the groundwater monitoring data. The certification must be submitted to the Agency with the appropriate permit application.	Appendix H
Section 845.710 - Closure Alternatives (excerpts providing requirements for the construction permit application)		
b)	Before selecting a closure method, the owner or operator of each CCR surface impoundment must complete a closure alternatives analysis. The closure alternatives analysis must examine the following for each closure alternative:	Appendix G
1)	The long- and short-term effectiveness and protectiveness of the closure method, including identification and analyses of the following factors:	Appendix G
A)	The magnitude of reduction of existing risks;	Appendix G
B)	The magnitude of residual risks in terms of likelihood of future releases of CCR;	Appendix G
C)	The the type and degree of long-term management required, including monitoring, operation, and maintenance;	Appendix G
D)	The short-term risks that might be posed to the community or the environment during implementation of such a closure, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminants;	Appendix G
E)	The time until closure and post-closure care or the completion of groundwater monitoring under Section 845.740(b) is completed;	Appendix G
F)	The potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, containment or changes in groundwater flow;	Appendix G
G)	The long-term reliability of the engineering and institutional controls, including an analysis of any off-site, nearby destabilizing activities; and	Appendix G
H)	Potential need for future corrective action of the closure alternative.	Appendix G

Regulation	Requirement	Location in Permit Application
Section 845.710 - Closure Alternatives (excerpts providing requirements for the construction permit application) (Continued)		
2)	The effectiveness of the closure method in controlling future releases based on analyses of the following factors:	Appendix G
A)	The extent to which containment practices will reduce further releases; and	Appendix G
B)	The extent to which treatment technologies may be used.	Appendix G
3)	The ease or difficulty of implementing a potential closure method based on analyses of the following types of factors:	Appendix G
A)	Degree of difficulty associated with constructing the technology;	Appendix G
B)	Expected operational reliability of the technologies;	Appendix G
C)	Need to coordinate with and obtain necessary approvals and permits from other agencies;	Appendix G
D)	Availability of necessary equipment and specialists; and	Appendix G
E)	Available capacity and location of needed treatment, storage, and disposal services.	Appendix G
4)	The degree to which the concerns of the residents living within communities where the CCR will be handled, transported and disposed are addressed by the closure method.	Appendix G
c)	In the closure alternative analysis, the owner or operator of the CCR surface impoundment must:	Appendix G
1)	Analyze complete removal of the CCR as one closure alternative, along with the modes for transporting the removed CCR, including by rail, barge, low-polluting trucks, or a combination of these transportation modes;	Appendix G
2)	Identify whether the facility has an onsite landfill with remaining capacity that can legally accept CCR, and, if not, whether constructing an onsite landfill is possible; and	Appendix G
3)	Include any other closure method in the alternatives analysis if requested by the Agency.	Appendix G
d)	The analysis for each alternative completed under this Section must:	Appendix G
1)	Meet or exceed a class 4 estimate under the AACE Classification Standard, incorporated by reference in Section 845.150, or a comparable classification practice as provided in the AACE Classification Standard;	Appendix G
2)	Contain the results of groundwater contaminant transport modeling and calculations showing how the closure alternative will achieve compliance with the applicable groundwater protection standards;	Appendix G
3)	Include a description of the fate and transport of contaminants with the closure alternative over time including consideration of seasonal variations; and	Appendix G
4)	Assess impacts to waters in the state.	Appendix G
e)	At least 30 days before submission of a construction permit application for closure, the owner or operator of the CCR surface impoundment must discuss the results of the closure alternatives analysis in a public meeting with interested and affected parties as required by Section 845.240.	Appendix K
f)	After completion of the public meeting under subsection (e), the owner or operator of a CCR surface impoundment must select a closure method and submit a final closure plan to the Agency under Section 845.720(b). All materials demonstrating completion of the closure alternatives analysis specified in this Section must be submitted with the final closure plan.	Appendix G
Section 845.720 - Closure Plan (excerpts providing requirements for the construction permit application)		
b)	Final Closure Plan	Appendix G
1)	The owner or operator of a CCR surface impoundment must submit to the Agency, as a part of a construction permit application for closure, a final closure plan. The plan must be submitted before the installation of a final cover system or removal of CCR from the surface impoundment for the purpose of closure.	Appendix G
3)	The final closure plan must identify the proposed selected closure method, and must include the information required in subsection (a)(1) and the closure alternatives analysis as specified in Section 845.710.	Appendix G
5)	The owner or operator of the CCR surface impoundment must obtain and submit with its construction permit application for closure a written certification from a qualified professional engineer that the final written closure plan meets the requirements of this Part.	Appendix G
Section 845.750 - Closure with a Final Cover System (excerpts providing requirements for the construction permit application)		
c)	Final Cover System. If a CCR surface impoundment is closed by leaving CCR in place, the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and, at a minimum, meets the requirements of this subsection (c). The final cover system must consist of a low permeability layer and a final protective layer. The design of the final cover system must be included in the preliminary and final written closure plans required by Section 845.720 and the construction permit application for closure submitted to the agency.	Appendix G
Section 845.780 - Post-Closure Care Requirements (excerpts providing requirements for the construction permit application)		
d)	Written Post-Closure Care Plan	Appendix I
1)	Content of the Plan. The owner or operator of a CCR surface impoundment must prepare a written post-closure care plan that includes, at a minimum, the information specified in this subsection (d)(1).	Appendix I
A)	A description of the monitoring and maintenance activities required in subsection (b) for the CCR surface impoundment and the frequency at which these activities will be performed;	Appendix I
B)	The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period; and	Appendix I
C)	A description of the planned uses of the property during the post- closure care period. Post-closure use of the property must not disturb the integrity of the final cover, liners, or any other component of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in this Part. Any other disturbance is allowed if the owner or operator of the CCR surface impoundment demonstrates that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, will not increase the potential threat to human health or the environment. The demonstration must be certified by a qualified professional engineer and must be submitted to the Agency.	Appendix I
4)	The owner or operator of the CCR surface impoundment must obtain a written certification from a qualified professional engineer that the initial, and any amendment of the, written post-closure care plan meets the requirements of this Section.	Appendix I

Table of Contents

APPENDIX A

History of Construction

October 2016

Illinois Power Generating Company
134 CIPS Lane
Coffeen, IL 62017

RE: History of Construction
USEPA Final CCR Rule, 40 CFR § 257.73(c)
Coffeen Power Station
Coffeen, Illinois

On behalf of Illinois Power Generating Company, AECOM has prepared the following history of construction for Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond at the Coffeen Power Station in accordance with 40 CFR § 257.73(c).

BACKGROUND

40 CFR § 257.73(c)(1) requires the owner or operator of an existing coal combustion residual (CCR) surface impoundment that either (1) has a height of five feet or more and a storage volume of 20 acre-feet or more, or (2) has a height of 20 feet or more to compile a history of construction by October 17, 2016 that contains, to the extent feasible, the information specified in 40 CFR § 257.73(c)(1)(i)–(xii).

The history of construction presented herein was compiled based on existing documentation, to the extent that it is reasonably and readily available (see 80 Fed. Reg. 21302, 21380 [April 17, 2015]), and AECOM's site experience. AECOM's document review included record drawings, geotechnical investigations, construction specifications, etc. for Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond at the Coffeen Power Station.

AECOM

HISTORY OF CONSTRUCTION

§ 257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

Owner: Illinois Power Generating Company

Address: 1500 Eastport Plaza Drive
Collinsville, IL 62234

CCR Units: Ash Pond No. 1
Ash Pond No. 2
GMF Pond, IDNR Dam ID No. IL50579
GMF Recycle Pond, IDNR Dam ID No. IL50578

Ash Pond No. 1 and Ash Pond No. 2 do not have a state assigned identification number.

§ 257.73(c)(1)(ii): The location of the CCR unit identified on the most recent USGS 7$^1/_2$ or 15 minute topographic quadrangle map or a topographic map of equivalent scale if a USGS map is not available.

The locations of Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond have been identified on an USGS 7-1/2 minute topographic quadrangle map in **Appendix A**.

§ 257.73(c)(1)(iii): A statement of the purpose for which the CCR unit is being used.

The following captures the purposes of the CCR units:

- Ash Pond No. 1 is being used to store and dispose of bottom ash and other-non-CCR waste and to clarify recycled process water for plant operations. Ash Pond No. 2 (inactive) was used to store and dispose of bottom ash and fly ash.
- The GMF Pond is being used to store and dispose of gypsum and to clarify recycled process water for plant operations.
- The GMF Recycle Pond was used to store and dispose of gypsum from the plant's scrubber operations prior to the in-service date of the GMF Pond in 2010. The GMF Recycle Pond currently only receives and stores clear process water from the GMF Pond.

Notice of intent to close Ash Pond No. 2 was provided in November, 2015.[1]

[1] This history of construction report was prepared on a facility-wide basis for CCR surface impoundments at the Coffeen Power Station. The inclusion of Ash Pond No. 2 in this history of construction report does not concede and should not be construed to concede that Ash Pond No. 2 is subject to the Design Criteria or all Operating Criteria in the CCR Rule.

§ 257.73(c)(1)(iv): The name and size in acres of the watershed where the CCR unit is located.

Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond are located in the Coffeen Lake Watershed with a 12-digit Hydrologic Unit Code (HUC) of 071402030304 and a drainage area of 11,695 acres (USGS, 2016).

§ 257.73(c)(1)(v): A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

The foundation and abutment materials of Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond consist of native fine-grained soils of wind-blown origin (loess), with some coarse-grained layers, underlain by glacial till. The physical properties of the fine-grained soils are described as low- to medium-plasticity silty clay, sandy lean clay, or lean clay with sand, often with trace amounts of gravel; or high plasticity fat clay, often with trace amounts of sand. The clay soils vary from soft to very stiff, moist to wet, and brown to gray. The physical properties of the coarse-grained soils are described as clayey sand, silty sand, or fine to coarse sand, with trace amounts of gravel. The sand is wet and varies from loose to dense and brown to gray. A thin layer of native silty or sandy lean clay is located immediately above the glacial till deposits. The clay is very soft to medium stiff, low to medium plasticity, wet, and orange brown to gray. The physical properties of the glacial till are described as lean clay, or silty to sandy lean clay, with trace amounts of fine gravel, hard, low plasticity, moist to wet, and brown to gray. An available summary of the engineering property typical ranges of the foundation and abutment materials is presented in **Table 1** below. The engineering properties are based on previous geotechnical explorations and laboratory testing.

Ash Pond No. 1 and Ash Pond No. 2 are enclosed impoundments with embankments and do not have abutments. The GMF Pond and GMF Recycle Pond were constructed as incised impoundments enclosed by embankments.

Table 1. Summary of Foundation and Abutment Material Engineering Properties

Material	**Unit Weight (pcf)**	**Effective (drained) Shear Strength Parameters**		**Total (undrained) Shear Strength Parameters**	**Post-Earthquake Shear Strength**
		Cohesion, c′ (psf)	Friction Angle, ϕ’ (deg)	S_u/p'	S_{ur}/p'
Foundation Clay (Under Embankment)	125	0	32	S_u/p' = 0.39-0.45, Min. S_u = 700 psf	Peak Undrained
Foundation Clay (Free Field)	125	0	30	S_u/p' = 0.24-0.28, Min. S_u = 450 psf	Peak Undrained
Soft Foundation Clay	125	0	30	S_u/p' = 0.22-0.28, Min. S_u = 275 psf	S_u/p' = 0.13-0.16, Min. S_{ur} = 200 psf
Glacial Till	135	0	40	S_u/p' = 0.45-0.64, Min. S_u = 700 psf	Peak Undrained

§ 257.73(c)(1)(vi): A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

Physical properties for the embankment construction materials for Ash Pond No. 1, Ash Pond No. 2, GMF Pond, and GMF Recycle Pond are described as silty clay, sandy lean clay, or lean clay with sand, with trace amounts of fine gravel. The fill is soft to very stiff in consistency, low to medium plasticity, moist to wet, and brown to gray. Trace amounts of organic material and ash are present. The embankment fill generally appears to be well-compacted. An available summary of the engineering properties of the embankment construction materials is presented in **Table 2** below. The engineering properties are based on previous geotechnical explorations and laboratory testing.

Table 2. Summary of Construction Material Engineering Properties for Embankments

Material	**Unit Weight (pcf)**	**Peak Drained Shear Strength**		**Peak Undrained Shear Strength**	**Post-Earthquake Shear Strength**
		Cohesion, c′ (psf)	Friction Angle, f ’ (deg)	S_u/p'	S_{ur}/p'
Embankment Fill	135	0	31	S_u/p' = 0.60, Min. S_u = 450 psf	Peak Undrained

The GMF Pond and GMF Recycle Pond contain liner systems. The liner system within the GMF Pond consists of a 60-mil textured high density polyethylene (HDPE) geomembrane underlain by a 3-foot thick layer of compacted clay. A typical cross section profile of the GMF Pond liner system is shown on drawing C-10206 (sh. 9) presented in **Appendix B**. An available summary of the engineering properties of the GMF Pond liner construction materials from Hanson (2008) is presented in **Table 3** below. The liner system within the GMF Recycle Pond consists of a 60-mil textured HDPE geomembrane underlain by smooth-drum rolled native soil. A typical cross section profile of the GMF Recycle Pond liner system is shown on drawing C-10206 (sh. 20) presented in **Appendix B**.

Table 3. Summary of Construction Material Engineering Properties for Liner

Material	**Unit Weight (pcf)**	**Effective (drained) Shear Strength Parameters**		**Total (undrained) Shear Strength Parameters**	
		c’ (psf)	**Φ’ (°)**	**c (psf)**	**Φ (°)**
Clay Liner	121.2	0	28.3	1950	0

The method of site preparation and construction of Ash Pond No. 1 and Ash Pond No. 2 is not reasonably and readily available. Site preparation and construction of the GMF Pond and GMF Recycle Pond were completed in accordance with the applicable construction specification (see § 257.73(c)(1)(xi) below).

The approximate dates of construction of each successive stage of construction of Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond are provided in **Table 4** below.

Table 4. Approximate dates of construction of each successive stage of construction.

Date	Event
1964	Construction of Ash Pond No. 1
1971	Construction of Ash Pond No. 2
1978-1979	Installation of internal embankment and new recycle intake structure in Ash Pond No. 1 and abandonment of existing outfall structure
1984-1985	Closure of Ash Pond No. 2 by installing a clay cover
2000	Installation of a sheet pile wall to facilitate construction of drainage flume along the northeast corner of the Ash Pond No. 1
2009	Installation of well dewatering system in Ash Pond No. 2
2008-2010	Construction of the GMF Pond and the GMF Recycle Pond

§ 257.73(c)(1)(vii): At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

Drawings that contain items pertaining to the requested information for Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond are listed in **Table 5** below. Items marked as "Not Available" are items not found during a review of the reasonably and readily available record documentation.

Table 5. List of drawings containing items pertaining to the information requested in § 257.73(c)(1)(vii).

	Ash Pond No. 1	Ash Pond No. 2	GMF Pond	GMF Recycle Pond
Dimensional plan view (all zones)	B-35, S-44, S-45	B-560, A1000 (sh. 1)	C-10206 (sh. 4, 9, 10)	C-10206 (sh. 4, 19)
Dimensional cross sections	B-35, S-47 to S-50	B-561	C-10206 (sh. 9)	C-10206 (sh. 20)
Foundation Improvements	Not Applicable	Not Applicable	C-10206 (sh. 10)	C-10206 (sh. 20)
Drainage Provisions	Not Applicable	A1000 (sh. 4)	C-10206 (sh. 15, 16, 20)	C-10206 (sh. 21)
Spillways and Outlets	S-8, S-49	W1008 (sh. 2)	C-10206 (sh. 20)	C-10206 (sh. 22)
Diversion Ditches	Not Applicable	A1000 (sh. 1)	Not Applicable	Not Applicable
Instrument Locations	Plate 2, Figure 2A	Figure 2B	Not Applicable	C-10206 (sh. 19)
Slope Protection	S-49	B-561	C-10206 (sh. 9)	C-10206 (sh. 20)
Normal Operating Pool Elevation	S-8, S-49	Not Applicable	C-10201-25	Not Available
Maximum Pool Elevation	S-8	Not Applicable	C-10201-25	Not Available
Approximate Maximum Depth of CCR in 2016	15 feet	28 feet	16 feet	12 feet

All drawings referenced in **Table 5** above can be found in **Appendix B** and **Appendix C**.

Based on the review of the drawings listed above, no natural or manmade features that could adversely affect operation of these CCR units due to malfunction or mis-operation were identified.

§ 257.73(c)(1)(viii): A description of the type, purpose, and location of existing instrumentation.

Existing instrumentation at Ash Pond No. 1 and Ash Pond No. 2 include vibrating-wire and open-standpipe piezometers. The purpose of the piezometers is to measure the phreatic surface within and around the impoundments. Two (2) open-standpipe piezometers (AP-P1 and AP-P2) were installed at Ash Pond No. 2 in 2009 and the locations are presented on Figure 2A in **Appendix C**. Two (2) open-standpipe piezometers (B-2 and B-4) were installed at Ash Pond No. 1 in 2010 and the locations are presented on Plate 2 in **Appendix C**. Twelve (12) open-standpipe and vibrating-wire piezometers were installed at Ash Pond No. 1 and Ash Pond No. 2 in 2015 and the locations are presented on Figure 2A in **Appendix C**.

The GMF Pond does not contain existing instrumentation. Existing instrumentation at the GMF Recycle Pond consists of one (1) ultrasonic level transmitter. The purpose of the ultrasonic level transmitter is to measure the water level within the GMF Recycle Pond. The location of the ultrasonic level transmitter is shown on drawing C-10206 (sh. 19) presented in **Appendix B**.

§ 257.73(c)(1)(ix): Area-capacity curves for the CCR unit.

Area-capacity curves for Ash Pond No. 2 and the GMF Recycle Pond are not reasonably and readily available. The area-capacity curves for Ash Pond No. 1 and the GMF Pond are presented in **Figures 1** and **2**, respectively, below. “Area-capacity curves”, as defined by 40 CFR § 257.53, “means graphic curves which readily show the reservoir water surface area, in acres, at different elevations from the bottom of the reservoir to the maximum water surface, and the capacity or volume, in acre-feet, of the water contained in the reservoir at various elevations.”

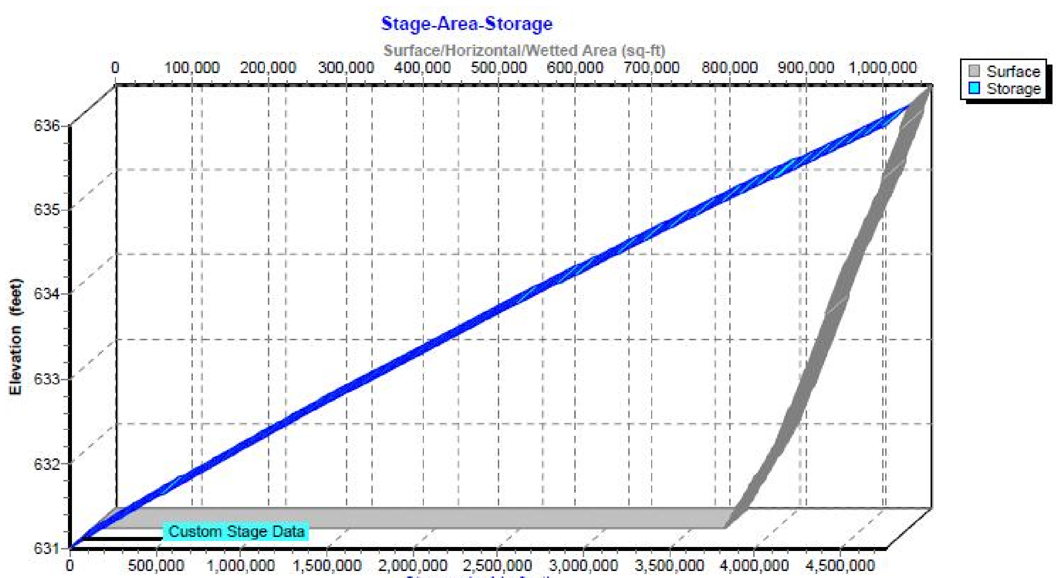


Figure 1. Area-capacity curve for Ash Pond No. 1

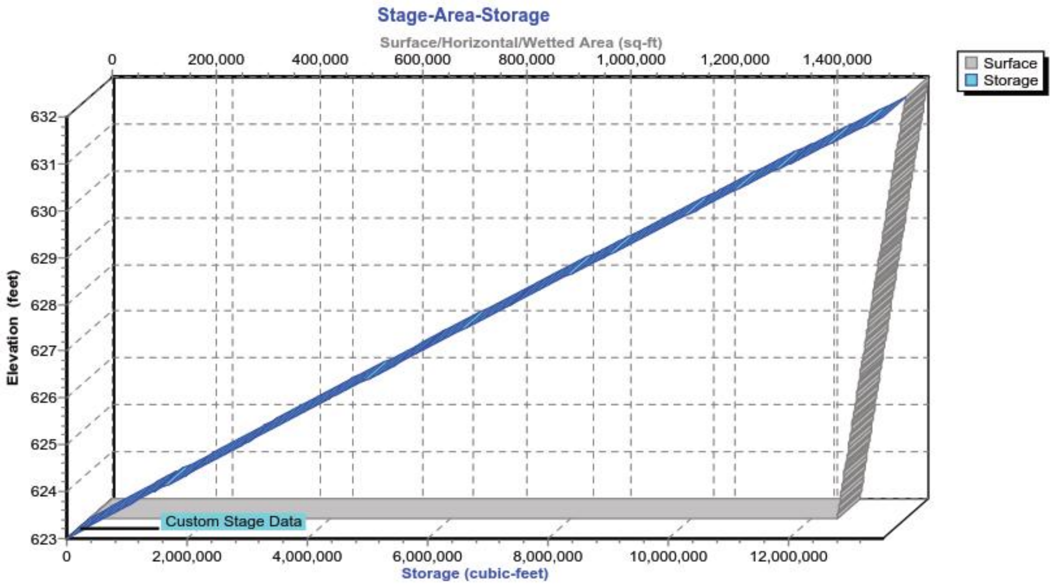


Figure 2. Area-capacity curve for GMF Pond

The area-capacity curves shown were taken from the pond modeling analysis. Actual pond capacity is limited to the approximate berm elevation listed in **Table 6** below. Any information above berm elevation should be disregarded.

§ 257.73(c)(1)(x): A description of each spillway and diversion design features and capacities and calculations used in their determination.

Ash Pond No. 1 contains a concrete intake structure that drains into a 48-inch diameter (dia.) steel pipe. The steel pipe leads to the recycle pump house. In 2016, the discharge capacity of Ash Pond No. 1 was evaluated using HydroCAD 10 software modeling a 1,000-year, 24-hour rainfall event. The results of the HydroCAD 10 analysis are presented below in **Table 6**.

Ash Pond No. 2 was closed in 1984-1985 by installing a clay cover. Non-contact stormwater is collected in ditches along the clay cover and drain off the pond cover via concrete-lined ditch outlets. CCR-contact stormwater collected within the pond is pumped into the GMF Pond via the well dewatering system at the discretion of plant personnel. The capacity of the diversion ditches and well pumps during a model rainfall event has not been evaluated.

The GMF Pond contains a 14-inch high-density polyethylene (HDPE) pipe culvert for normal flow and a weir-like spillway for high water flow. The GMF Pond also contains a 10-inch dia. HDPE siphon pipe used for dewatering. In 2016, the discharge capacity of the GMF Pond was evaluated using HydroCAD 10 software modeling a 1,000-year, 24-hour rainfall event. The results of the HydroCAD 10 analysis are presented below in **Table 6**.

The GMF Recycle Pond contains a decant structure that drains into two (2) 18-inch dia. HDPE pipes that lead to a pump house. The capacity of the decant structure during a model rainfall event has not been evaluated.

Table 6. Results of HydroCAD 10 analyses

	Ash Pond No. 1	GMF Pond
Approximate Minimum Berm Elevation[1] (ft)	635.0	631.0
Approximate Emergency Spillway Elevation[1] (ft)	Not Applicable	624.0
Starting Pool Elevation[1] (ft)	631.0	621.2
Peak Elevation[1] (ft)	632.0	623.8
Time to Peak (hr)	24.4	24.1
Surface Area (ac)	20.4	33.4
Storage[2] (ac-ft)	19.5	88.3

Note: 1. Elevations are based on NAVD88 datum
2. Storage given is from Starting Pool Elevation to Peak Elevation.

§ 257.73(c)(1)(xi): The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

The construction specifications for Ash Pond No. 1 and Ash Pond No. 2 are not reasonably and readily available. The construction specifications for the GMF Pond and the GMF Recycle Pond are located in *Project Specifications, Gypsum Stack and Recycle Pond Construction* presented in **Appendix D**.

The provisions for surveillance, maintenance, and repair of Ash Pond No. 1 are located in *Operation & Maintenance Manual for #1 Ash Pond* presented in **Appendix E**. The provisions for surveillance, maintenance, and repair of Ash Pond No. 2 are not reasonably and readily available. The provisions for surveillance, maintenance, and repair of the GMF Pond and the GMF Recycle Pond are located in *Operation and Maintenance Manual, Gypsum Management Facility* presented in **Appendix F**.

The operations and maintenance plans for the CCR units identified in this report are currently being revised by Illinois Power Generating Company.

§ 257.73(c)(1)(xii): Any record or knowledge of structural instability of the CCR unit.

In March, 2009, shallow sloughing was observed along the eastern embankment of Ash Pond No. 2. The sloughing was inspected by Hanson Professional Services Inc. A dewatering system was installed in Ash Pond No. 2 to lower the phreatic surface within the pond. In December, 2015, additional sloughing was observed on the embankment of Ash Pond No. 2 and on the embankment of Ash Pond No. 1. The sloughing was believed to be caused by recent heavy rains and was repaired. Photos of the 2015 sloughing repair are presented in **Appendix G**.

There is no record or knowledge of structural instability at the GMF Pond and the GMF Recycle Pond at Coffeen Power Station.

LIMITATIONS

The signature of AECOM's authorized representative on this document represents that to the best of AECOM's knowledge, information and belief in the exercise of its professional judgment, it is AECOM's professional opinion that the aforementioned information is accurate as of the date of such signature. Any recommendation, opinion or decisions by AECOM are made on the basis of AECOM's experience, qualifications and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data and that actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

Sincerely,

Claudia Prado

Claudia Prado	Victor Modeer, P.E., D.GE
Program Manager	Senior Project Manager

REFERENCES

Hanson Professional Services Inc. (2008), *Support Document for IDNR/OWR Permit Application, Coffeen Power Generating Station Gypsum Management Facility Montgomery County, Illinois*

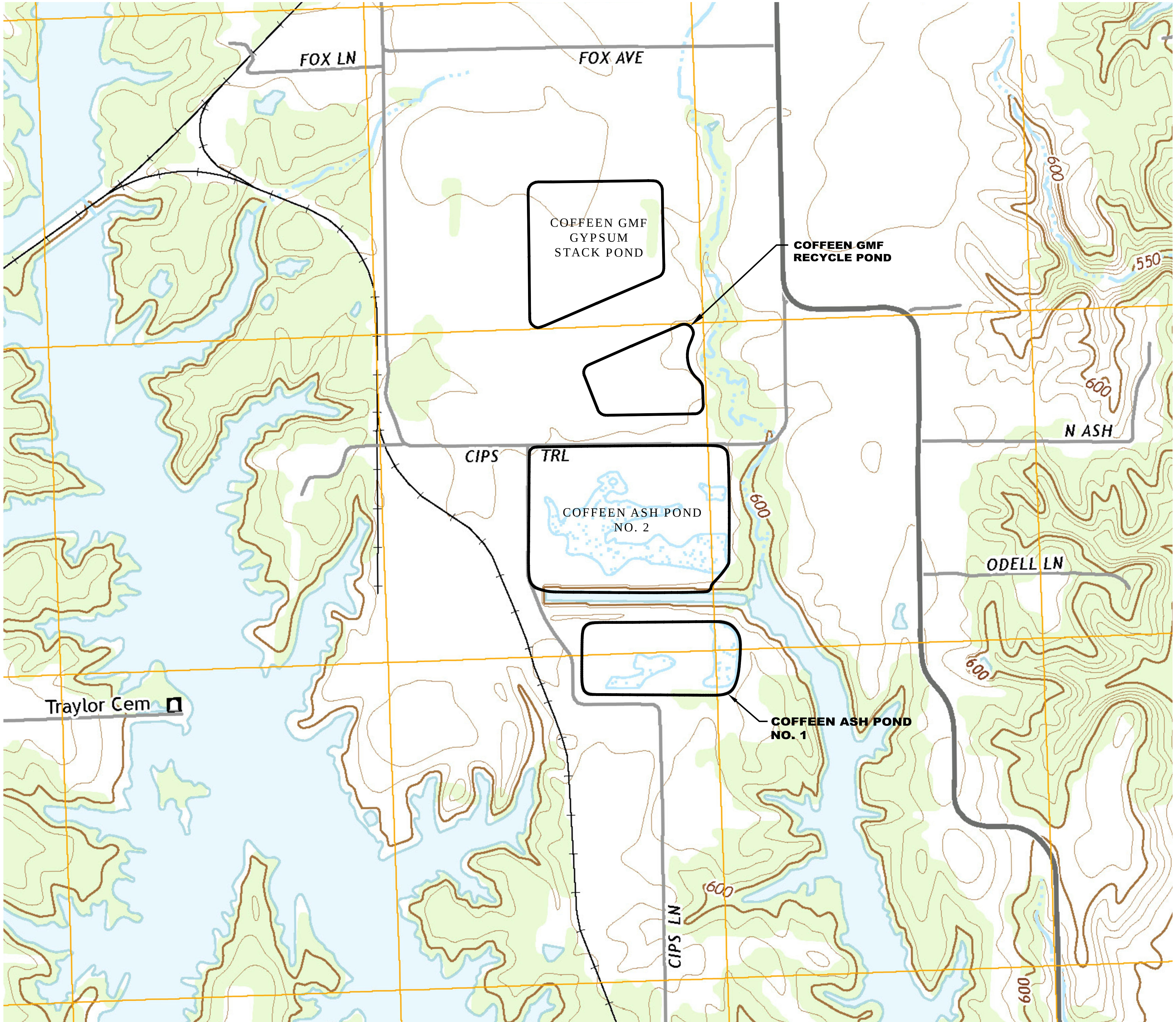
United States Environmental Protection Agency (USEPA). (2015). *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule.* 40 CFR Parts 257 and 261, 80 Fed. Reg. 21302, 21380 April 17, 2015.

United States Geological Survey (USGS). (2016). The National Map Viewer. http://viewer.nationalmap.gov/viewer/. USGS data first accessed in March of 2016.

APPENDICES

Appendix A: History of Construction Vicinity Map
Appendix B: Coffeen Power Station Drawings
Appendix C: Coffeen Power Station Boring and Piezometer Locations
Appendix D: Project Specifications, Gypsum Stack and Recycle Pond Construction (Hanson 2008)
Appendix E: Operation & Maintenance Manual for #1 Ash Pond
Appendix F: Operation and Maintenance Manual, Gypsum Management Facility Operation (2015)
Appendix G: Photos of 2015 Sloughing Repair

Appendix A: History of Construction Vicinity Map



LEGEND

CCR UNITS

SOURCE:
MAP PROVIDED FROM ELECTRONIC USGS DIGITAL RASTER GRAPHIC 7.5 MINUTE TOPOGRAPHIC MAP OF COFFEEN, ILLINOIS, REVISED 2015.

QUADRANGLE LOCATION

N

0 500 1000 1500
SCALE IN FEET

AECOM
1001 Highlands Plaza Drive, Suite 300
St. Louis, Mo. 63110
314 429-0100 (phone)
314-429-0462 (fax)

ILLINOIS POWER GENERATING COMPANY
134 CIPS Lane
Coffeen, IL 62017

HISTORY OF CONSTRUCTION

COFFEEN POWER STATION
COFFEEN, ILLINOIS

ISSUED FOR BIDDING — DATE BY

ISSUED FOR CONSTRUCTION — DATE BY

REVISIONS

NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60489731
DRAWN BY:	DJD
DESIGNED BY:	DJD
CHECKED BY:	MN
DATE CREATED:	2016-04-13
PLOT DATE:	
SCALE:	1" = 500'
ACAD VER:	2014

SHEET TITLE

HISTORY OF CONSTRUCTION VICINITY MAP

01

NANAK, MATT, 8/30/2016 10:52 AM

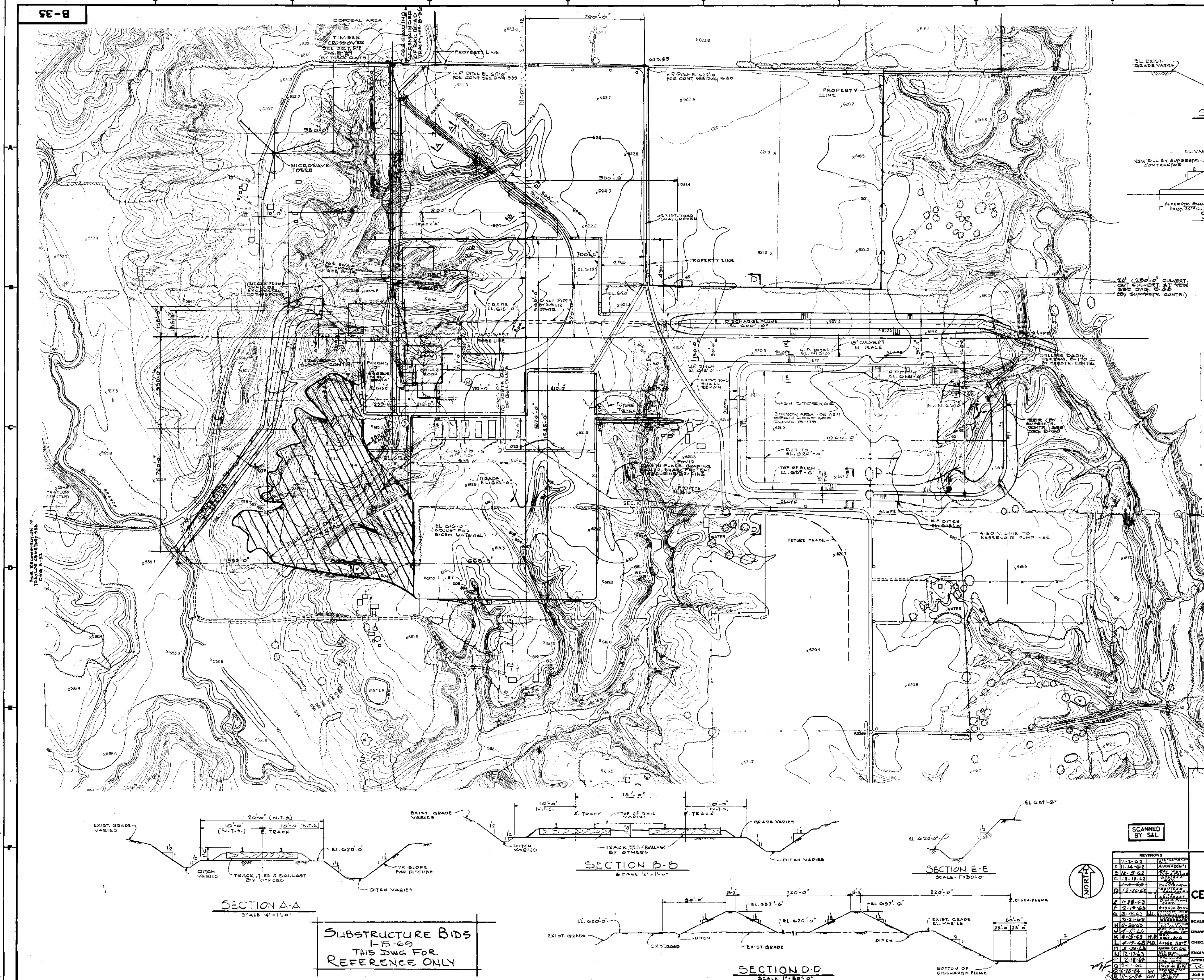
AECOM DRAWING PATH: P:\Projects\Geotech\60428794_DynegyCCR\13_Construction History\04 Technical Production\10_Coffeen\References\Vicinity Location Map References\Figures\C-01 History of Construction Vicinity Map (Coffeen)_ZJF.dwg

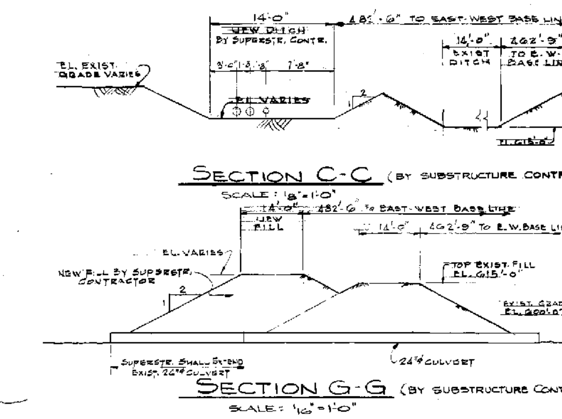
Appendix B: Coffeen Power Station Drawings

1. “Earthwork & Grading Plan”, Drawing No. B-35, Revision S, 8 September, 1995, Sargent & Lundy Engineers.
2. “Concrete Recycle Pump House – Intake Structure”, Drawing No. S-8, Revision 6, 23 February, 1996, Stearns-Roger Incorporated.
3. “Civil Layout & Grading Plan Sheet 4”, Drawing No. S-44, Revision 6, 23 February, 1996, Stearns-Roger Incorporated.
4. “Civil Layout & Grading Plan Sheet 5”, Drawing No. S-45, Revision 9, 23 February, 1996, Stearns-Roger Incorporated.
5. “Civil Miscellaneous Sections and Details, Sheet 2”, Drawing No. S-47, Revision 2, 23 February, 1996, Stearns-Roger Incorporated.
6. “Civil Ash Pond No 1 – Sections and Details”, Drawing No. S-48, Revision 2, 23 February, 1996, Stearns-Roger Incorporated.
7. “Civil Miscellaneous Sections and Details, Sheet 4”, Drawing No. S-49, Revision 4, 23 February, 1996, Stearns-Roger Incorporated.
8. “Civil Miscellaneous Sections and Details”, Drawing No. S-50, Revision 4, 23 February, 1996, Stearns-Roger Incorporated.
9. “Ash Storage Area, Plan”, Drawing No. B-560, Revision A, 9 February, 1971, Sargent & Lundy Engineers.
10. “Ash Storage Area, Sections & Details”, Drawing No. B-561, Revision A, 9 February, 1971, Sargent & Lundy Engineers.
11. “Overall Site Plan, Dewatering System, Ash Pond #2”, Drawing No. A1000 (sh. 1), Revision A, 12 October, 2009, Ameren Energy Resources Generating.
12. “Site Details, Dewatering System, Ash Pond #2”, Drawing No. A1000 (sh. 4), Revision A, 12 October, 2009, Ameren Energy Resources Generating.
13. “Proposed Site Plan, CCB Management Facility”, Drawing No. C-10206 (sh. 4), Revision 0, 5 January, 2011, Ameren Energy Generating.
14. “Groundwater Monitoring & Boring Plan, CCB Management Facility”, Drawing No. C-10206 (sh. 5), Revision 0, 5 January, 2011, Ameren Energy Generating.
15. “Anchor Trench and Liner System, CCB Management Facility”, Drawing No. C-10206 (sh. 9), Revision 0, 5 January, 2011, Ameren Energy Generating.
16. “Cell G1-Foundation Grade & Control Data, CCB Management Facility”, Drawing No. C-10206 (sh. 10), Revision 0, 5 January, 2011, Ameren Energy Generating.
17. “Cell G1-Process Water Recovery System, CCB Management Facility”, Drawing No. C-10206 (sh. 15), Revision 0, 5 January, 2011, Ameren Energy Generating.
18. “Cell G1-PWRS Drain Details, CCB Management Facility”, Drawing No. C-10206 (sh. 16), Revision 0, 5 January, 2011, Ameren Energy Generating.
19. “Recycle Pond Plan & Control Data, CCB Management Facility”, Drawing No. C-10206 (sh. 19), Revision 0, 5 January, 2011, Ameren Energy Generating.
20. “Recycle Pond – Process Water Transfer Channel Details, CCB Management Facility”, Drawing No. C-10206 (sh. 20), Revision 0, 5 January, 2011, Ameren Energy Generating.

Appendix B: Coffeen Power Station Drawings (continued)

21. "Recycle Pond–Process Water Decant Sections & Details, CCB Management Facility", Drawing No. C-10206 (sh. 21), Revision 0, 5 January, 2011, Ameren Energy Generating.
22. "Recycle Pond – Emergency Spillway Sections & Details, CCB Management Facility", Drawing No. C-10206 (sh. 22), Revision 0, 5 January, 2011, Ameren Energy Generating.
23. "Ash Pond #2, Drainage Modifications", Drawing No. W1008 (sh. 2), Ameren Energy Generating.





Notes

1. All work on these drawings shall be by Grading. Contractor in accordance with Job Spec. A-1813 unless otherwise noted
2. All slopes shall be 2:1 unless otherwise noted.

Reference Drawings

B-26	PRELIMINARY GRADING
B-32	RECONSTRUCTION OF TRAYLOR CEMETERY
B-36	TRACK LAYOUT
B-38	TRACK LAYOUT - SECTIONS & DETAILS
B-39	ROADWAY & DRAINAGE PLAN

SCANNED BY S&L

REVISIONS

	11-2-62		SITE PREPARATION BIDS
A	11-14-62		ADDENDUM #1
B	12-5-62		REV. ASH PIT & PLANT
C	12-18-62		REVISED REV.
	~~1-2-63~~		FOR CONSTRUCTION
D	12-26-62		REVISED CONTRACT / FOR CONTRACT
E	1-28-63		DISCH. FLUME ELEV.
F	2-19-63		SUBSTR. BIDS
G	3-14-63		[illegible]
	3-21-63		BACKWATER REFERENCE
H	5-26-63		[illegible]
J	4-8-63		REV. CULVERT [illegible]
K	4-15-63	H.R.	REV. SECT. A-A
L	4-19-63	M.D.	ADDED NOTE
M	5-20-63		ADDED CC & GG
N	12-17-63		ADD NEW SUBSTR. CONSTR.
P	2-18-64		REMOVED FILL NOTE
Q	5-17-66		FOR FIN. GRADE [illegible] BIDS
R	6-28-84	GN	[illegible]
R	11-16-84	GN	[illegible]
S	09-08-95		SCANNED BY S&L

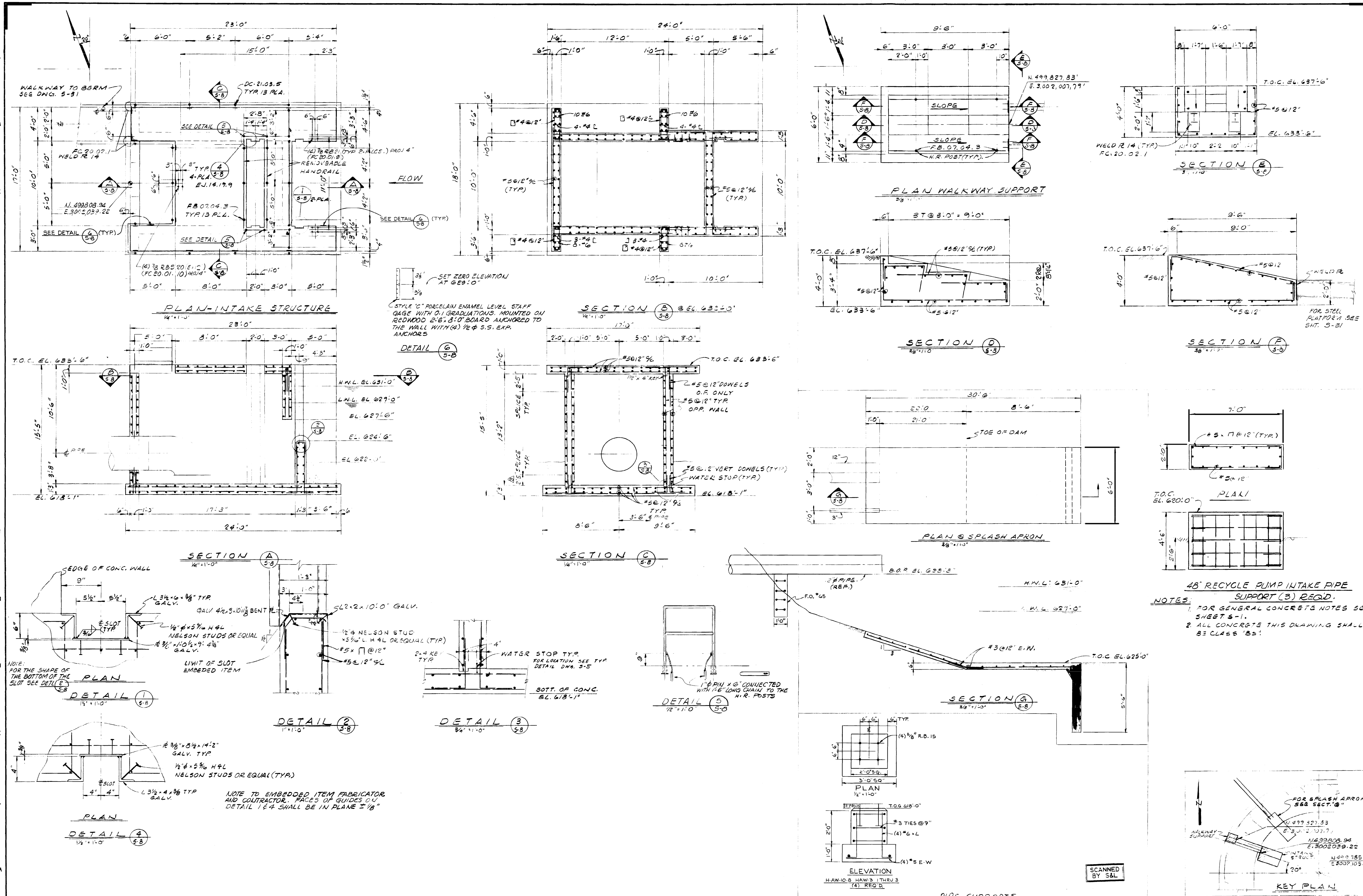
EARTHWORK & GRADING PLAN
UNIT I
COFFEEN POWER STATION
CENTRAL ILL. PUBLIC SERVICE CO.
COFFEEN, ILLINOIS

SCALE 1" = 200'-0" & AS NOTED
DRAWN CORTEZ 10-24-62
CHECKED J. COLLINS 12-28-62
ENGINEER W. Mellor 1-2-63
APPROVED R.N. Bergin 1-2-63

JOB NO.	JOB NO.	JOB NO.	JOB NO.
3094			

SARGENT & LUNDY
ENGINEERS
CHICAGO 3, ILLINOIS

DRAWING NO.
B-35



STATE OF ILLINOIS
VLADIMIR FOITIK
81-3493
STRUCTURAL ENGINEER

NO.	REVISIONS	DATE	BY	CH'D	APP'D
1	REVISED DET. 1, 2, 3 ADDED DET. 4 REVISED SECT. A B & G.	4/12/78	TOB		
2	REVISED ELEV. ADDED NOTE, DIMS. SECT. CALLOUT REINF. ADDED DETAIL "5" & "6" 48" RECYCLE PUMP INTAKE PIPE	5/31/78	TVT		
3	ADDED R.B. PROJ., B.O.P. EL. REVISED DIMS., PIPE SUPPORTS	9/2/78	TVT		
4	REMOVED PIPE SUPPORTS H4NWB-1 THRU 8	4/3/78	TVT		
5	FIELD REVISION	6-1-81	JFD		
6	SCANNED BY S&L	2 23 96			

NO.	REFERENCE DRAWINGS
S-31	STEEL MISC. STRUCT. & DETAILS
M-42	YARD PIPING PLOT PLAN
S-45	LAYOUT & GRADING PLAN
M-43	YARD PIPING, SECTIONS & DETAILS

PRINT RECORD					
DATE ISSUED	3/24/78	4/4/78	6/16/78	9/15/78	4/13/79
REVISION NO.	0	1	2	3	4
FOR	BID	BID	AFC	RAFC	RAFC
CUSTOMER	4	4	6	6	9
FIELD	—	—	2	2	2
INTRA CO.	7+15	7+15	AR	AR	AR
0201-200	6	6	8+15	8+15	8+15

ENG. RECORD		
DRAWN	TCB	3-78
CHECKED	CNJ	6/6/78
MECH. CK.	DW	6-6-78
STRUCT. CK.		6-6-78
ELECT. CK.		6-6-78
PIPING CK.	RAS	6-6-78
APPROVED	JRL	6-6-78
APPROVED		

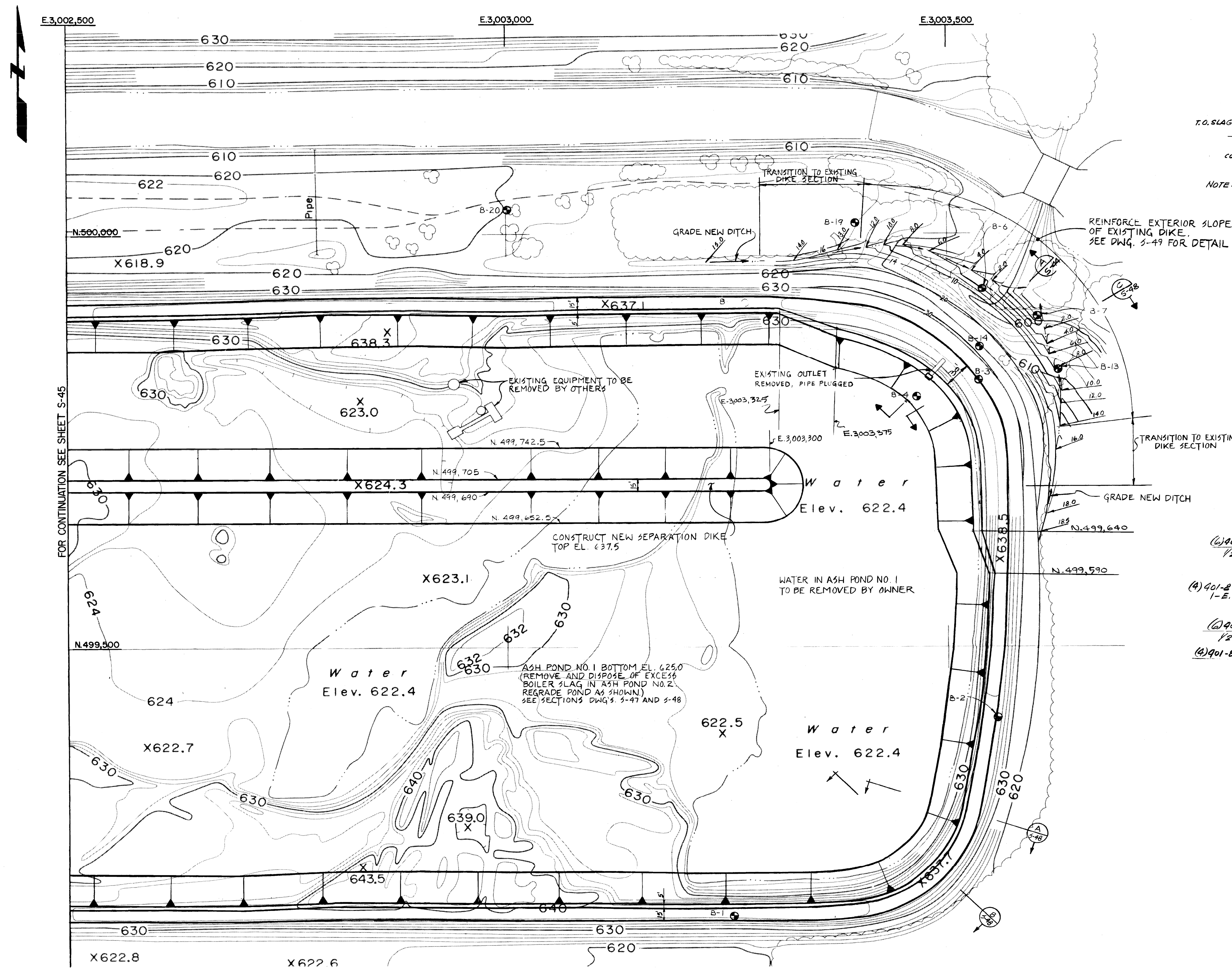
DRAWING STATUS ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION MEB	6-16-78
REVISED & APPROVED FOR CONSTRUCTION MEB REV. 5	4-13-79

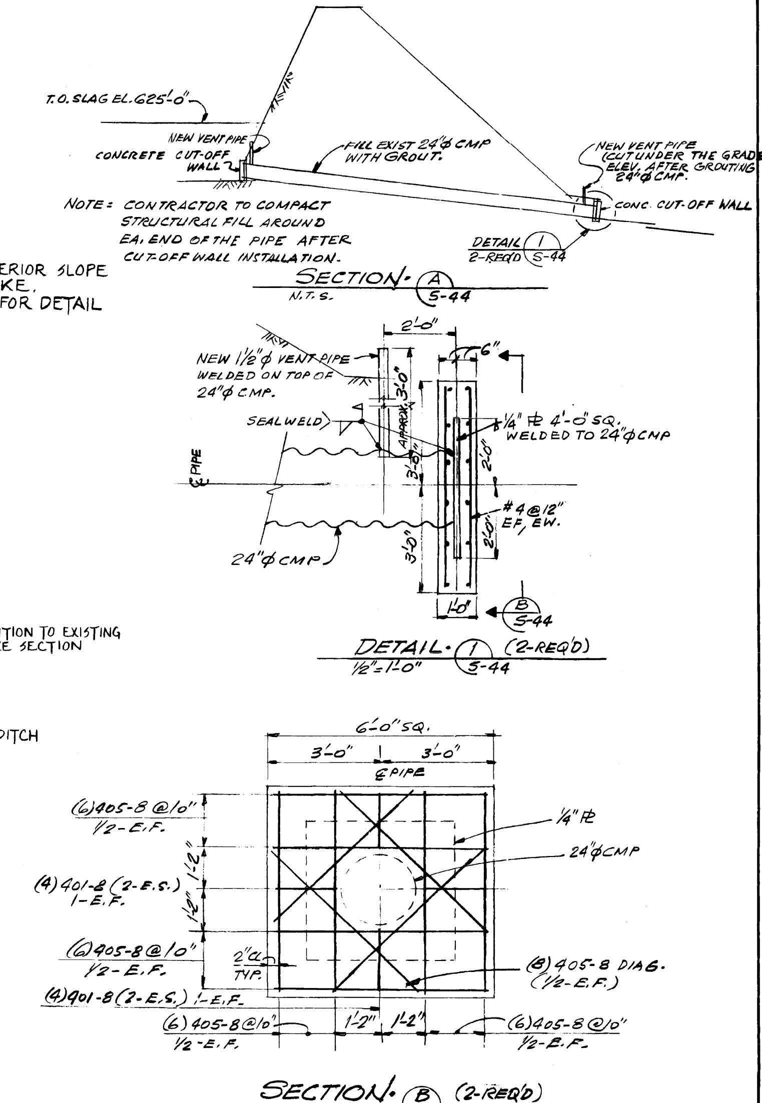
NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE &/OR REVISION NO.

CONCRETE
RECYCLE PUMP HOUSE - INTAKE STRUCTURE
& MISCELLANEOUS FOUNDATIONS

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE AS NOTED
Stearns-Roger INCORPORATED
ORDER NO. C-20000
DWG. NO. L-22886
0201
SHEET NO. S-8
REV. 6





NOTES:

1. FOR LEGEND SEE DWG S-40.
2. FOR ASH POND NO. 1 CROSS SECTIONS SEE DWGS S-47, S-48 & S-49.
3. FOR SITE PLAN SEE DWG S-40.

STATE OF ILLINOIS
6-9-78
VLADIMIR FOJTIK
81-3493
STRUCTURAL ENGINEER

SCANNED BY S&L

S.R. NO. Y2-4

NO.	REVISIONS	DATE	BY	CH'D	APP'D
1	GENERAL REVISIONS	4-11-78	W.S.B		
2	APPROVED FOR CONSTRUCTION	6/6/78	JKS		
3	REVISED NOTE	11/3/78	TVT		
4	ADD'D SECTION "A" & "B" AND DETAIL "1"	6.5.79			
5	RELOCATED N.E. CORNER EMBANKMENT, ASH POND #1	6/4/81	JJD		TWS
6	SCANNED BY S&L	2/23/96			
				CRA	

NO.	REFERENCE DRAWINGS

PRINT RECORD					
DATE ISSUED	3/24/78	4/14/78	6/9/78	12/1/78	6/8/79
REVISION NO.	0	1	2	3	4
FOR	BID	BID	CONST.	RAFC	RAFC
CUSTOMER	4	4	6	10	10
FIELD	–	–	2	2	2
INTRA CO.	7+1S	7+1S	AR	AR	AR
0201-200	6	6+1S	8+1S	8+1S	8+1S

ENG. RECORD		
DRAWN	WSB	1/31/78
CHECKED	JKS	6/6/78
MECH. CK.		6-8-78
STRUCT. CK.		6-8-78
ELECT. CK.		6-8-78
PIPING CK.	MEB	6/8/78
APPROVED		6-6-78
APPROVED		

DRAWING STATUS ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION MEB	6/9/78
REVISED & APPROVED FOR CONSTRUCTION MEB REV. 4	6-8-79
NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE &/OR REVISION NO.	

CIVIL
LAYOUT & GRADING PLAN SHEET 4

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE 1"=50'

Stearns-Roger INCORPORATED

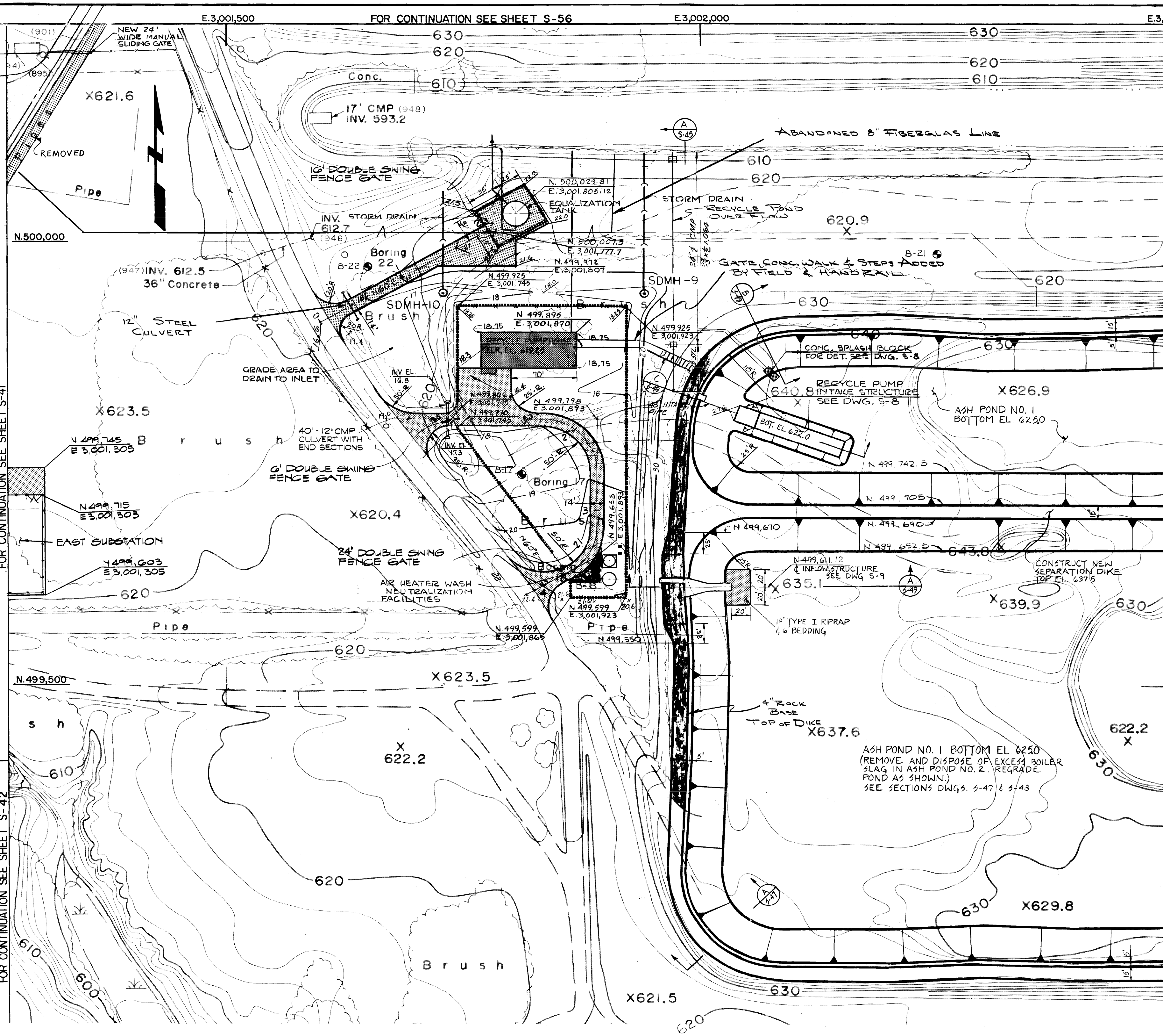
ORDER NO. C-20000

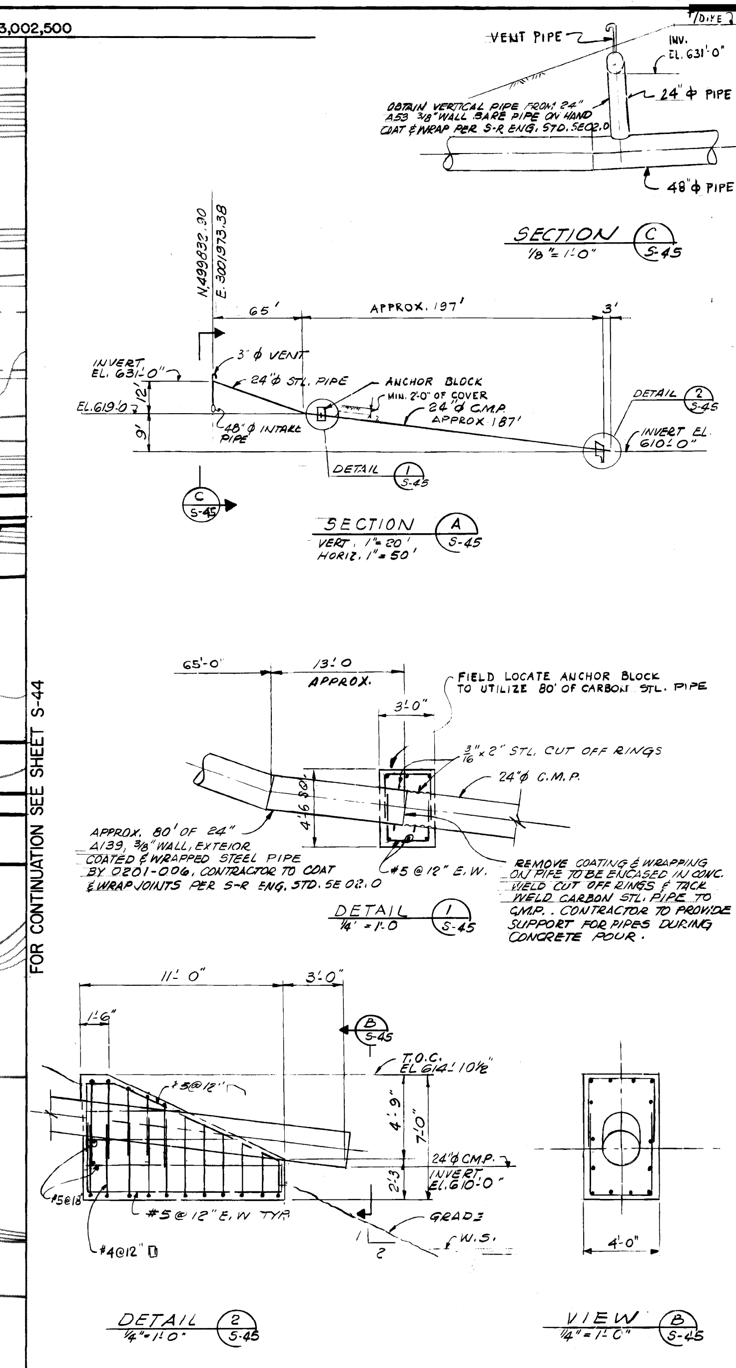
DWG. NO. L-22886

0201

SHEET NO. S-44

REV. 6





NOTES:

1. FOR ROAD PROFILE AND SECTIONS SEE DWG. S-53.
2. FOR LEGEND SEE DWG S-40
3. FOR ASH POND NO. 1 CROSS SECTIONS SEE DWGS S-47, S-48 & S-49.
4. FOR STORM DRAIN PROFILE AND MANHOLES SEE DWG S-52.
5. FOR SITE PLAN SEE DWG S-40
6. FOR FENCE DETAILS SEE DWG S-57

SCANNED BY S&L

S.R. NO. Y2-5

STATE OF ILLINOIS
6-9-78
VLADIMIR FOITIK
81-3493
STRUCTURAL ENGINEER

NO.	REVISIONS	DATE	BY	CH'D	APP'D
9	SCANNED BY S&L	2/23/96			
3	ADD. REF., GEN. REV., APPROVED FOR CONSTR.	6/6/78	JKS		
4	ADDED SUBSTATION AND REVISED GATE SIZES.	8/30/78	JKS		
5	REVISED COORDINATES TO AS BUILT	11/2/78	TVT	JKS	
6	ADDED OVERFLOW TO FLUME, SECT. A & B, DETL. 1 & 2	12/6/78	TVT		
7	REV. GRADING	9/7/79	SC		
8	ADDED 4" ROCK ON TOP OF DIKE, GATE, CONC. WALK & STEPS	6/3/81	JJD	CRA	TWS

NO.	REFERENCE DRAWINGS
M-51	RECYCLE PUMPHOUSE PIPING PL.
M-54	PIPING PLAN & SECTIONS
S-7	CONCRETE-RECYCLE PUMPHOUSE
S-19	NEUTRALIZATION FACILITIES

PRINT RECORD								
DATE ISSUED	3/24/78	4/14/78	5-19-78	6/9/78	9/19/78	11/7/78	12/8/78	
REVISION NO.	0	1	2	3	4	5	6	7
FOR	BID	BID	BID	CONST.	CONST.	RAFC	RAFC	
CUSTOMER	4	4	4	6	6	10	10	
FIELD	–	–	–	2	2	2	2	
INTRA CO.	7+15	7+15	7+15	AR	AR	AR	AR	
0201-200	6	6+15	6+15	8+15	8+15	8+15	8+15	

ENG. RECORD		
DRAWN	W.S.B	1-31-78
CHECKED	JKS	6/6/78
MECH. CK.	DW	6-8-78
STRUCT. CK.		6-8-78
ELECT. CK.		6-8-78
PIPING CK.	MEB	6/8/78
APPROVED		6-6-78
APPROVED		

DRAWING STATUS	
ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION MEB	6/9/78
REVISED & APPROVED FOR CONSTRUCTION MEB REV. 7	

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE &/OR REVISION NO.

CIVIL
LAYOUT & GRADING PLAN SHEET 5

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE 1" = 50'

Stearns-Roger INCORPORATED

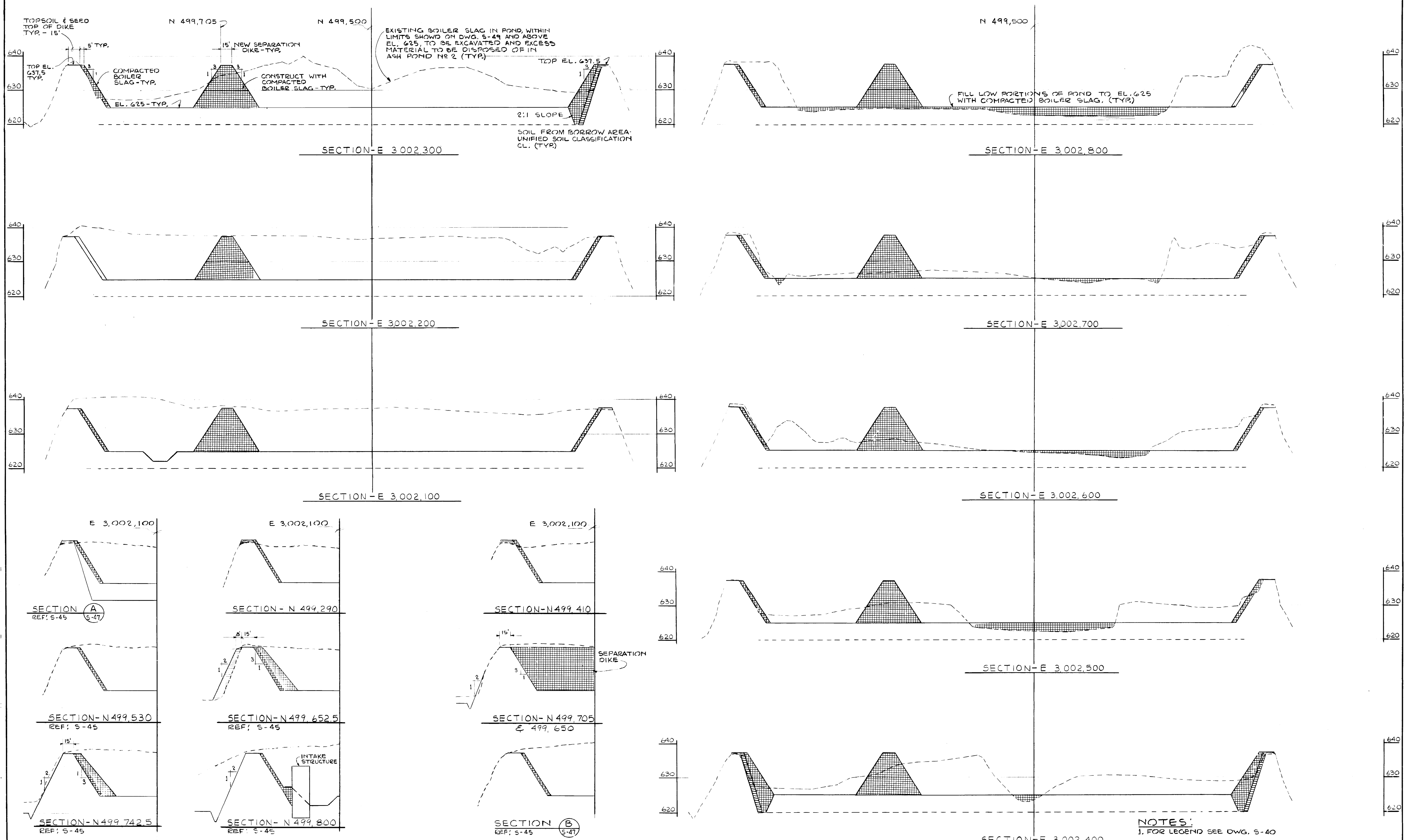
ORDER NO. C-20000

DWG. NO. L-22886

0201

SHEET NO. S-45

REV. 9



NOTES:
1. FOR LEGEND SEE DWG. S-40
2. FOR ASH POND № 1 PLANS SEE DWGS. S-44 AND S-45
3. FOR SITE PLAN SEE DWG. S-40

SCANNED BY S&L

SR NO Y2-7

STATE OF ILLINOIS
2-9-79
VLADIMIR FOITIK
81-3493
STRUCTURAL ENGINEER

NO.	REVISIONS	DATE	BY	CH'D	APP'D
1	APPROVED FOR CONSTRUCTION	6/6/78	JKS		
2	SCANNED BY S&L	2/23/96			

NO.	REFERENCE DRAWINGS

PRINT RECORD		
DATE ISSUED	3/26/78	6/9/78
REVISION NO.	0	1
FOR	BID	CONST.
CUSTOMER	4	6
FIELD	-	2
INTRA CO.	7+15	AR
0201-200	6	8+15

ENG. RECORD		
DRAWN	W.S.B.	2-23-78
CHECKED	JKS	6/6/78
MECH. CK.	DW	6-8-78
STRUCT. CK.		6-8-78
ELECT. CK.		6-8-78
PIPING CK.	MEB	6/8/78
APPROVED		6-6-78
APPROVED		

DRAWING STATUS ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION MEB	6/9/78
REVISED & APPROVED FOR CONSTRUCTION REV.	

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE &/OR REVISION NO.

CIVIL
MISCELLANEOUS SECTIONS AND DETAILS
SHEET 2

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE HOR'Z 1"=50' VERT 1"=10'

Stearns-Roger INCORPORATED

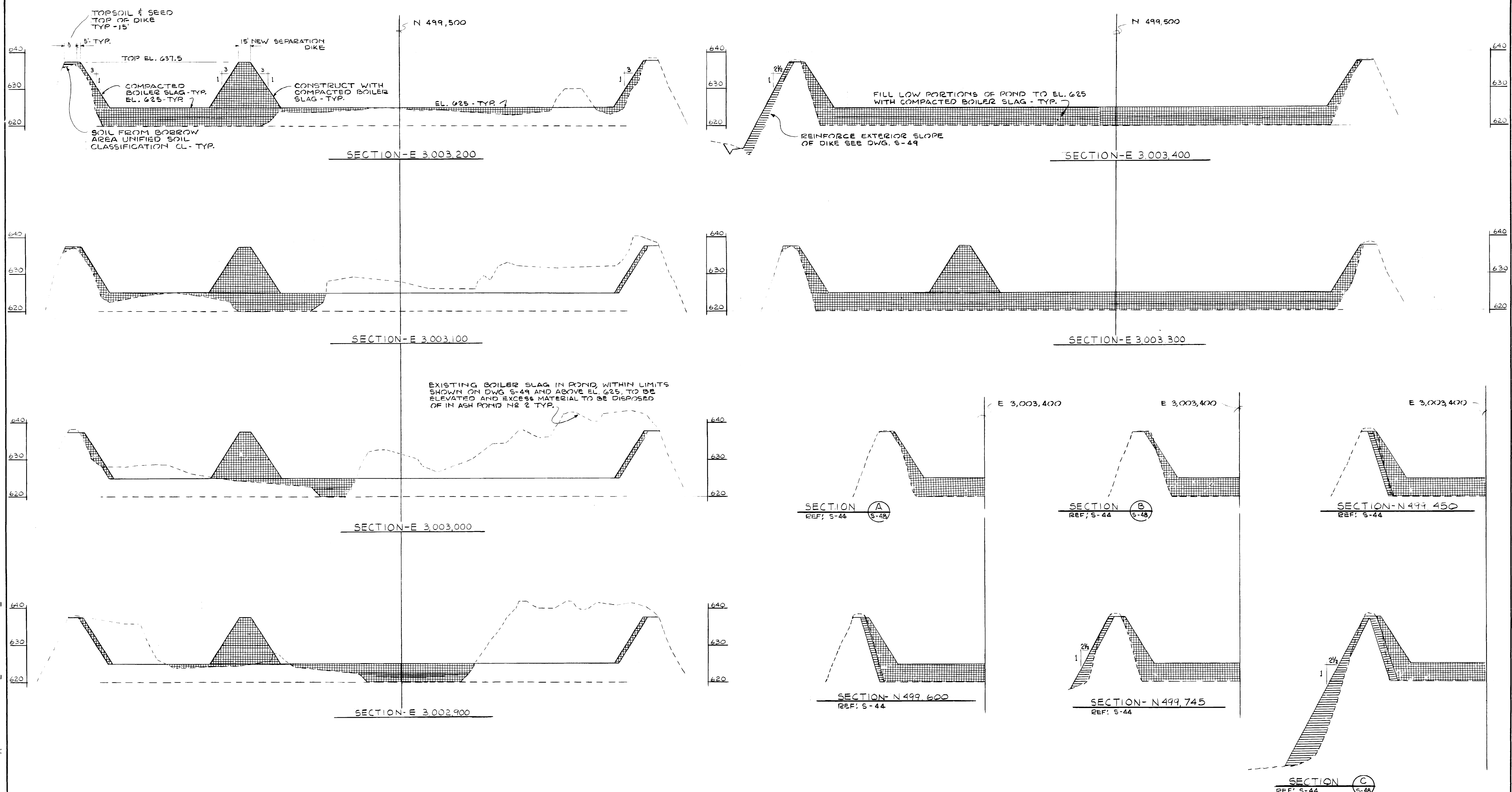
ORDER NO. C-20000

DWG. NO. L-22886

0201

SHEET NO. S-47

REV. 2



NOTES:

1. FOR LEGEND SEE DWG. S-40
2. FOR ASH POND Nº 1 PLANS SEE DWGS. S-44 AND S-45
3. FOR SITE PLAN SEE DWG. S-40

SCANNED BY S&L

SR NO Y2-8

NO.	REVISIONS	DATE	BY	CH'D	APP'D
1	APPROVED FOR CONSTRUCTION	6/6/78	JKS		
2	SCANNED BY S&L	2/23/96			

REFERENCE DRAWINGS

PRINT RECORD		
DATE ISSUED	3/24/78	6/6/78
REVISION NO.	0	1
FOR	BID	CONST.
CUSTOMER	4	6
FIELD	-	2
INTRA CO.	7+15	AR
0201-200	6	8+15

ENG. RECORD		
DRAWN	W.S.B.	2-23-78
CHECKED	JKS	6/6/78
MECH. CK.	DW	6-8-78
STRUCT. CK.		6-8-78
ELECT. CK.		6-8-78
PIPING CK.	McB	6/8/78
APPROVED		
APPROVED		

DRAWING STATUS	ISSUED	DATE
PRELIMINARY		
FOR COMMENTS AND/OR APPROVAL		
APPROVED FOR CONSTRUCTION	McB	6/9/78
REVISED & APPROVED FOR CONSTRUCTION	1 REV.	

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE &/OR REVISION NO.

CIVIL
ASH POND NO 1 - SECTIONS AND DETAILS

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE HORIZ 1" = 50' VEPT 1" = 10'

Stearns-Roger INCORPORATED

ORDER NO. C-20000

DWG. NO. L-22886

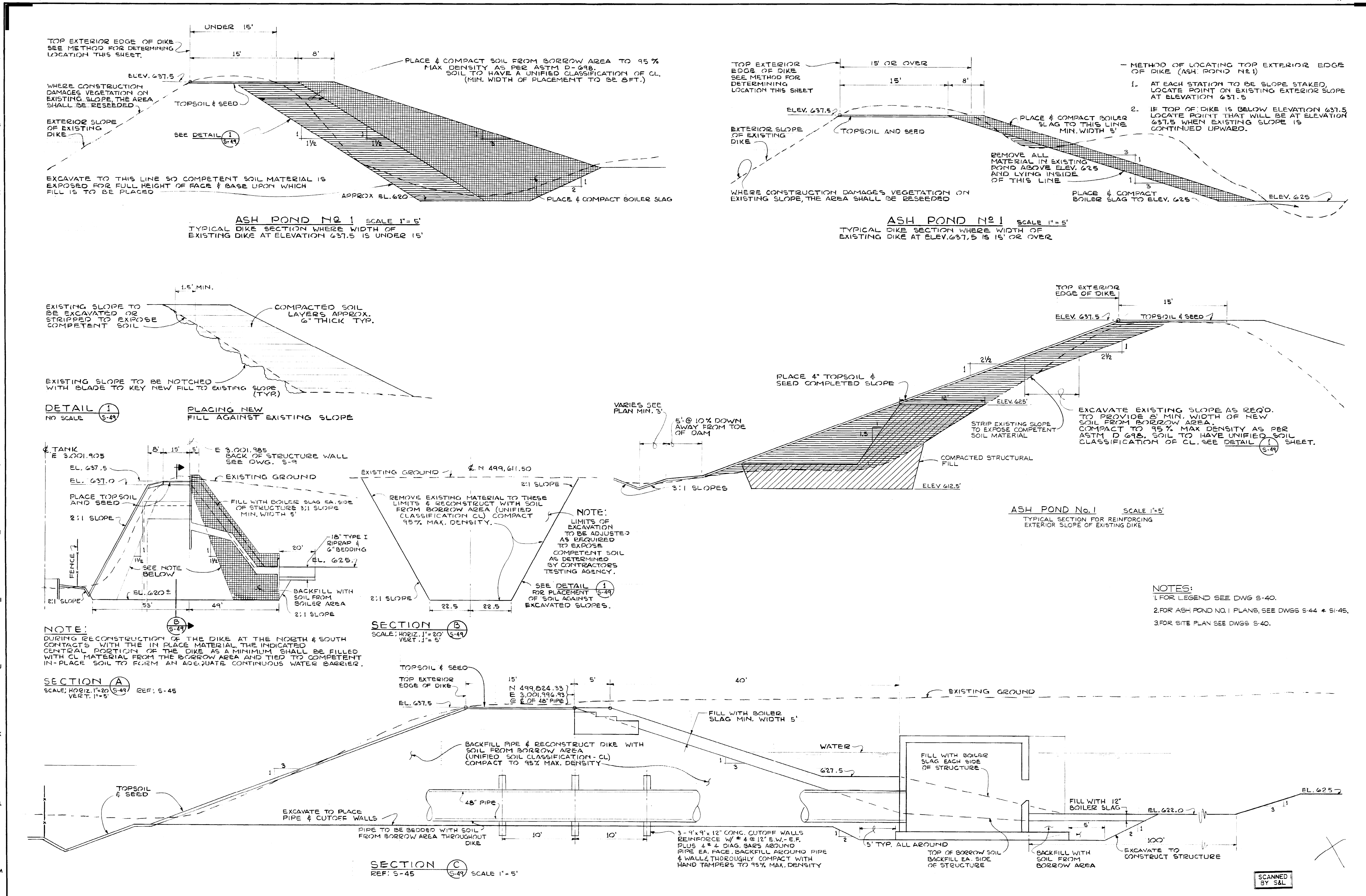
0201

SHEET NO. S-48

REV. 2

STATE OF ILLINOIS 6-9-78 VLADIMIR FOITIK 81-3493 STRUCTURAL ENGINEER

FORM 9127



SR NO Y2-9

STATE OF ILLINOIS
6-9-78
VLADIMIR FOITIK
81-3493
STRUCTURAL ENGINEER

NO.	REVISIONS	DATE	BY	CH'D	APP'D
1	GENERAL REVISIONS	4-11-78	W.S.B.		
2	NOTE CORRECTION, APPROVED FOR CONSTRUCTION.	6/6/78	JKS		
3	FIELD REVISION	6-2-81	JFD		
4	SCANNED BY S&L	2/23/96			

NO.	REFERENCE DRAWINGS

PRINT RECORD			
DATE ISSUED	3/24/78	4/14/78	6/6/78
REVISION NO.	0	1	2
FOR	BID	BID	CONST.
CUSTOMER	4	4	6
FIELD	–	-	2
INTRA CO.	7+15	7+15	AR
0201-200	6	6+15	8+15

ENG. RECORD		
DRAWN	TT	3/10/78
CHECKED	JKS	6/6/78
MECH. CK.		6-8-78
STRUCT. CK.		6-8-78
ELECT. CK.		6-8-78
PIPING CK.		6/6/78
APPROVED		
APPROVED		

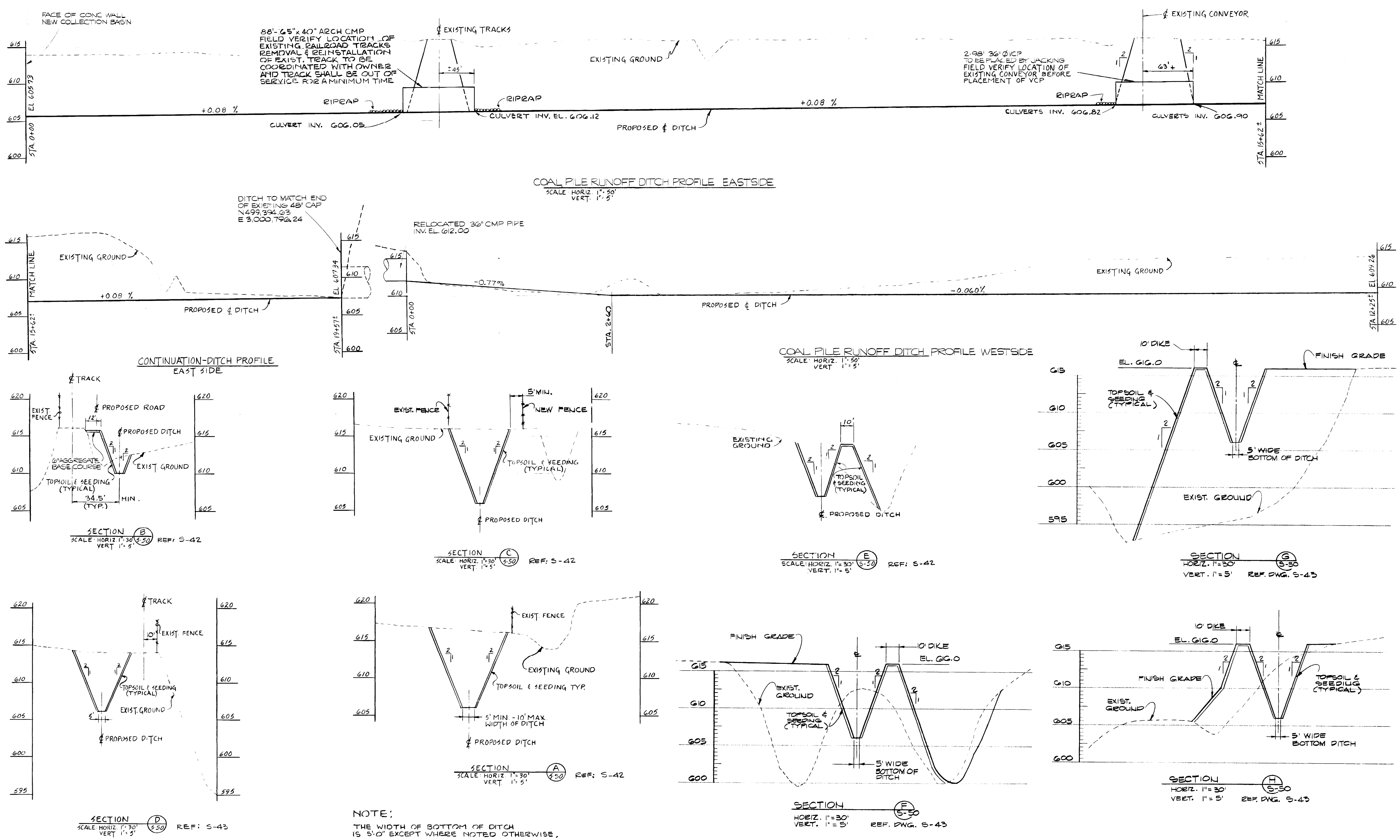
DRAWING STATUS	
ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION	6/10/78
REVISED & APPROVED FOR CONSTRUCTION 3 REV.	

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE &/OR REVISION NO.

CIVIL
MISCELLANEOUS SECTIONS & DETAILS SHEET 4

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE AS SHOWN
Stearns-Roger INCORPORATED
ORDER NO. C-20000
DWG. NO. L-22886
0201
SHEET NO. S-49
REV. 4



NOTES:
1. FOR DITCH PLAN SEE DWGS S-42 & S-43.
2. FOR SITE PLAN SEE DWG S-40.

SCANNED BY S&L

S R NO Y2-10

STATE OF ILLINOIS
6-9-78
VLADIMIR FOITIK
81-3493
STRUCTURAL ENGINEER

FORM 91977

NO.	REVISIONS	DATE	BY	CH'D	APP'D
1	GENERAL REVISIONS	4-10-78	W.S.B.		
2	APPROVED FOR CONSTRUCTION	6/6/78	JKS		
3	REVISED DITCH GRADE, ADDED NEW SECTIONS AND CHANGED PIPE LENGTH.	8/8/78		JKS	
4	SCANNED BY S&L	2/23/96			

REFERENCE DRAWINGS

PRINT RECORD				
DATE ISSUED	3/24/78	4/14/78	6/9/78	8/9/78
REVISION NO.	0	1	2	3
FOR	BID	BID	CONST.	CONST.
CUSTOMER	4	4	6	7
FIELD	-	-	2	2
INTRA CO.	7+1S	7+1S	AR	AR
0201-200	6	6+1S	5+1S	8+1S

ENG. RECORD		
DRAWN	TT	3/10/78
CHECKED	JKS	4/6/78
MECH. CK.	DW	6-8-78
STRUCT. CK.		6-8-78
ELECT. CK.		6-8-78
PIPING CK.	MEB	6/8/78
APPROVED		6-6-78
APPROVED		

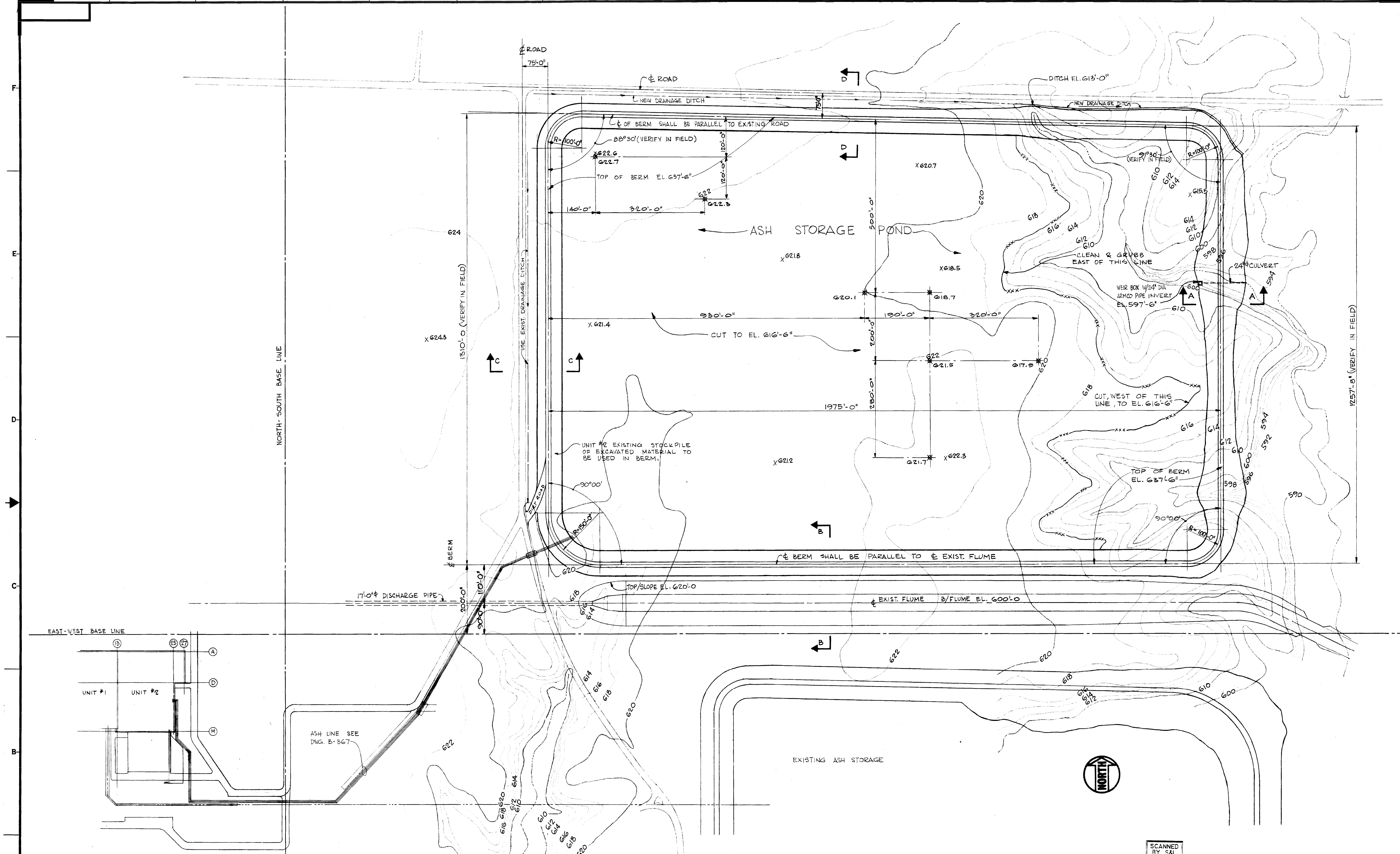
DRAWING STATUS ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION MEB	6/9/78
REVISED & APPROVED FOR CONSTRUCTION MEB REV. 3	8/9/78

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE &/OR REVISION NO.

CIVIL
MISCELLANEOUS SECTIONS & DETAILS SHEET

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE AS SHOWN
Stearns-Roger INCORPORATED
ORDER NO. C-20000
DWG. NO. L-22886
0201
SHEET NO. S-50
REV. 4



SCANNED BY S&L

NOTES	
1.	FOR GENERAL NOTES FOR ASH STORAGE POND CONTRACTOR SEE DWG. B-367
2.	ALL WORK ON THIS DWG. BY A.S.P.C. UNLESS NOTED
3.	☒ - INDICATES FIELD INFORMATION OF 12-13-70

REFERENCE DRAWINGS

Drawing Release Record

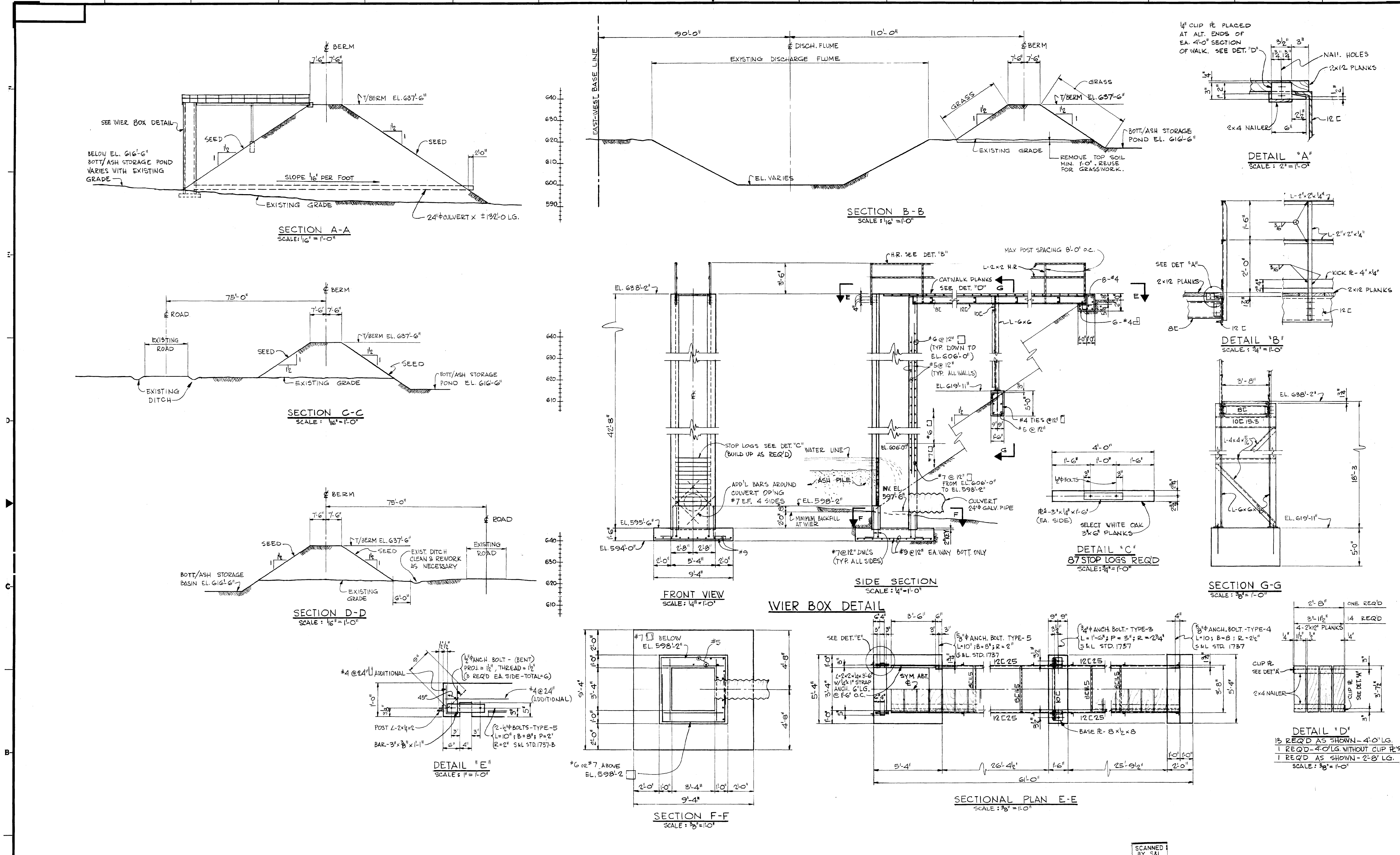
Rev	Date	Init	Description
	11-10-70	AMK	FOR A.S.P.C. BIDS
A	2-9-71	AK	FOR CONSTRUCT

ASH STORAGE AREA
PLAN UNIT 2
COFFEEN POWER STATION UNIT 2
CENTRAL ILL. PUBLIC SERVICE CO.
COFFEEN, ILLINOIS

SCALE 1" = 100'-0"
DRAWN GEO. S.P. 1-12-70
CHECKED A.M KAYES 1-20-71
ENGINEER E. P. Shires 1-21-71
APPROVED R. Bergh 2-2-71
JOB NO 3826

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO.
B-560



NOTES
1. FOR GENERAL NOTES FOR ASH STORAGE POND CONTRACTOR SEE DWG. B-367
2. ALL WORK ON THIS DWG. BY A.S.P.C.
3. ALL ANCHOR BOLTS SHALL BE GALVANIZED.

REFERENCE DRAWINGS	
B-560	ASH STORAGE AREA

Drawing Release Record

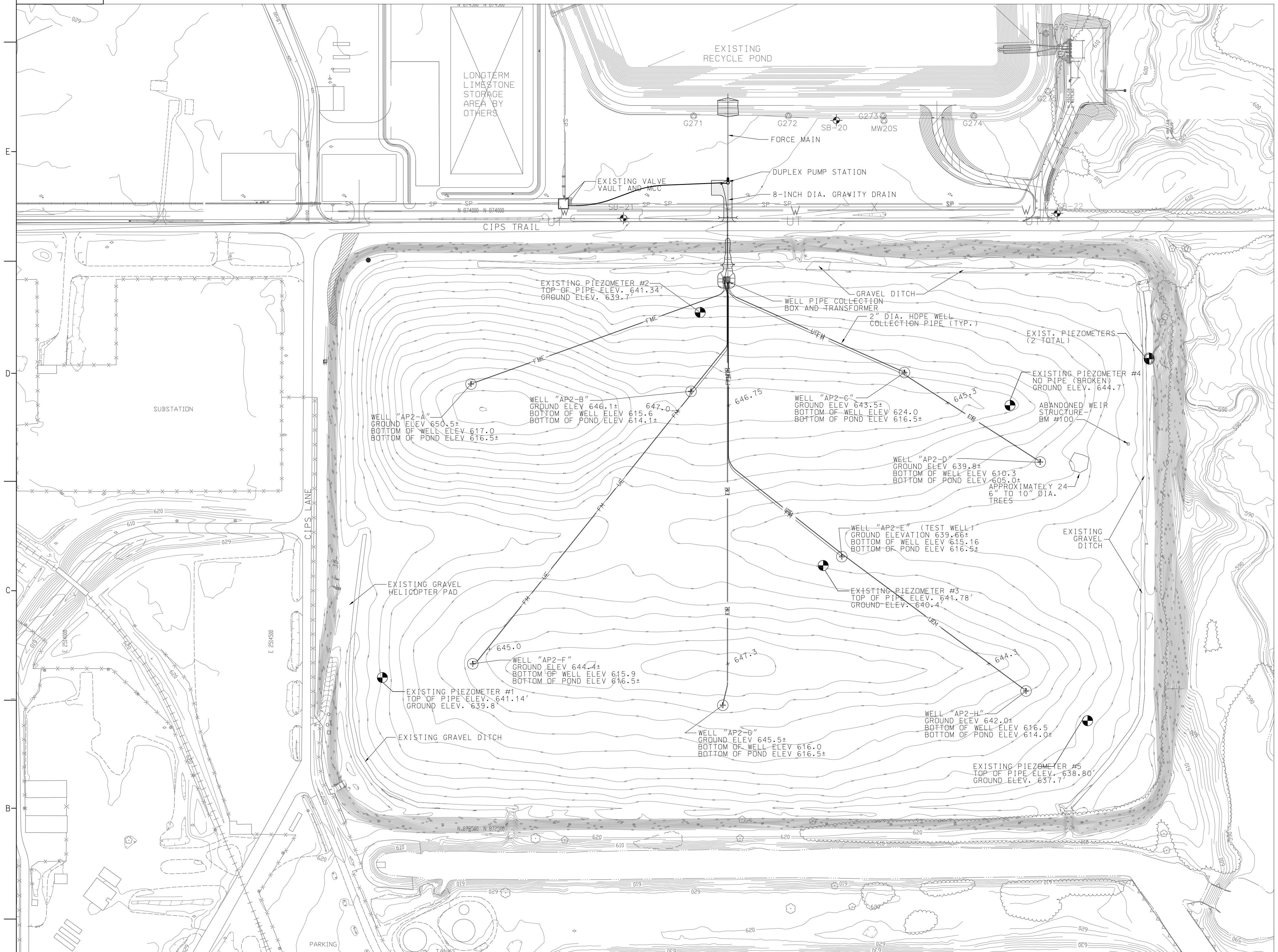
Rev	Date	Ind	Description
	11-10-70	AMK	
A	2-9-71	AK	

ASH STORAGE AREA
SECTIONS & DETAILS UNIT 2
COFFEEN POWER STATION UNIT 2
CENTRAL ILL. PUBLIC SERVICE CO.
COFFEEN, ILLINOIS

SCALE AS NOTED
DRAWN GEO.S.P. 1-27-70
CHECKED A.M.KAYES 1-20-71
ENGINEER E.L.Poline 1-21-71
APPROVED
JOB NO 3826

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. B-561



NOTES:

1. THE LOCATION, SIZE AND/OR TYPE OF MATERIAL OF EXISTING UNDERGROUND OR OVERHEAD UTILITIES AS MAY BE INDICATED ON THESE CONSTRUCTION PLANS IS NOT REPRESENTED AS BEING ACCURATE, SUFFICIENT OR COMPLETE. THE OWNER AND THE PROJECT ENGINEER HAVE NOT INDEPENDENTLY VERIFIED THIS INFORMATION AND DO NOT ASSUME ANY RESPONSIBILITY WHATSOEVER IN RESPECT TO THE ACCURACY, SUFFICIENCY OR COMPLETENESS OF THE INFORMATION AND GIVE NO EXPRESSED OR IMPLIED GUARANTEE THAT ANY CONDITIONS INDICATED ARE REPRESENTATIVE OF ACTUAL CONDITIONS TO BE ENCOUNTERED.

2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE ACTUAL LOCATION OF ALL SUCH FACILITIES, INCLUDING SERVICE CONNECTIONS TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES AND AGENCIES OF HIS CONSTRUCTION PLANS AND SHALL OBTAIN FROM EACH PARTY DETAILED INFORMATION AND ASSISTANCE RELATIVE TO THE LOCATION OF ALL UTILITIES AND THE SCHEDULE OF ANY REMOVALS AND ADJUSTMENTS REQUIRED OF THE UTILITY. THE CONTRACTOR SHALL CONTACT J.U.L.I.E. (1-800-892-0123 OR 811) TO ASSIST IN COMPLETING THIS RESPONSIBILITY.

3. THE CONTRACTOR SHALL PROTECT ANY FACILITIES TO THE SATISFACTION OF THE UTILITY OR OWNING-AGENCY WITH THE COST OF ANY REQUIRED PROTECTION TO BE INCIDENTAL TO THE CONTRACT. IN THE EVENT A UTILITY LINE OR SERVICE IS UNEXPECTEDLY ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND THE UTILITY COMPANY OR AGENCY OF JURISDICTION. ANY SUCH UTILITIES DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO SERVICE AT ONCE.

LEGEND

- ELECTRICAL SPLICE BOX
- TELEPHONE SPLICE BOX
- GUARDPOST
- EXISTING FENCE
- TREE AREA
- GRAVEL EDGE
- PAVED OUTLET EDGE
- FM — FORCE MAIN
- SS — SANITARY SEWER
- UE — UNDERGROUND ELECTRIC
- GRAVEL SURFACING
- PIEZOMETER
- IRON PIN

N

100' 50' 0 50' 100'
SCALE IN FEET

COORDINATE TABLE

STATE PLANE COORDINATES				DESCRIPTION	PLANT COORDINATES		
POINT	NORTH	EAST	ELEV.		NORTH	EAST	ELEV.
100	873,444.5	2,516,566.2	636.78'	BENCHMK: CHISELED "□" IN N.E. COR. OF WEIR BOX	3610.958	1357.406	616.31'
1	872,940.7900	2,513,222.5010	615.74'	CONTROL PT #1 BRASS MONUMENT NEAR N.W. ENTRANCE	3610.440	2430.490	623.44'
2	872,942.4450	2,514,295.5440	622.92'	CONTROL PT #2 BRASS MONUMENT NEAR EAST PKG AREA	4561.951	2430.945	N/A
3	873,893.9360	2,514,294.3340	624.63'	CONTROL PT #3 BRASS MONUMENT NEAR MAIN ENTRANCE			
5001	873,587.59	2,514,969.63	.	WELL AP2-A			
5002	873,569.87	2,515,503.76	.	WELL AP2-B			
5003	873,615.67	2,516,021.68	.	WELL AP2-C			
5004	873,398.41	2,516,351.29	.	WELL AP2-D			
5005	873,168.81	2,515,869.61	.	WELL AP2-E			
5006	872,908.89	2,514,973.83	.	WELL AP2-F			
5007	872,808.37	2,515,580.73	.	WELL AP2-G			
5008	872,842.91	2,516,316.70	.	WELL AP2-H			

NOTES

REFERENCE DRAWINGS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
A	10-12-09	W1314	SDB	MJW	SDB	SDB	MJW	–	-

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.

AS BUILT

SCALE –

LOC. NO. –

CLASS –

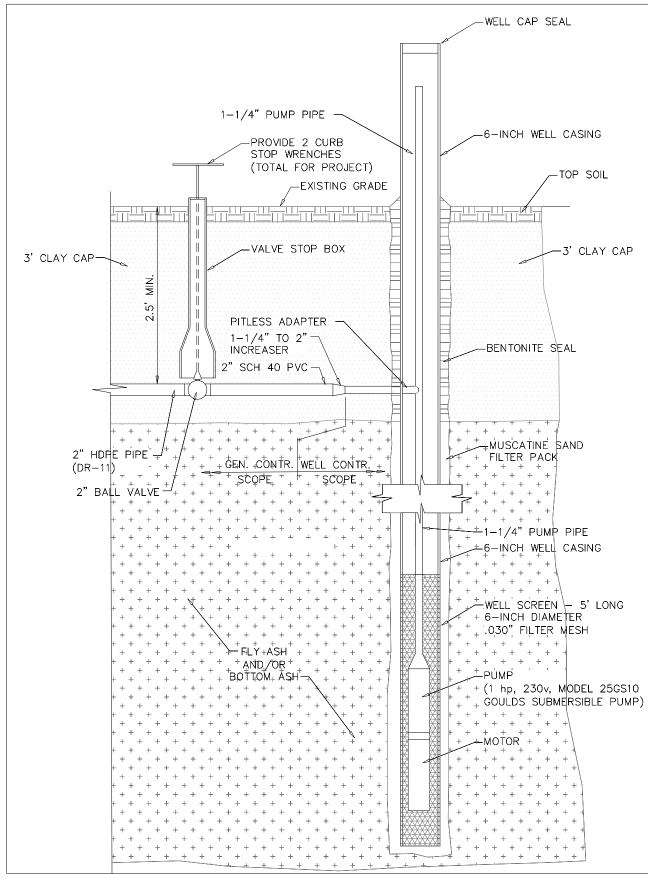
OVERALL SITE PLAN DEWATERING SYSTEM ASH POND #2 AMEREN COFFEEN POWER STATION

SITE: ASH POND #2

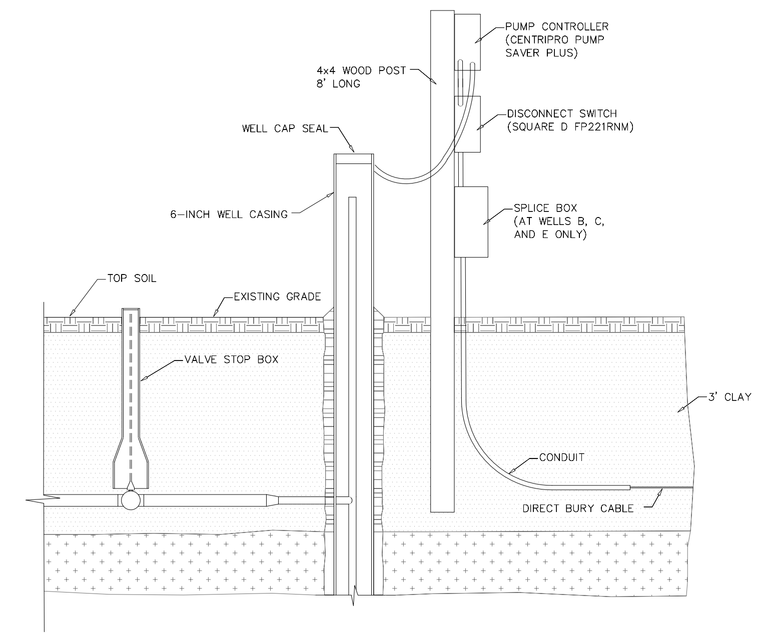
Ameren Energy Resources Generating

DRAWING NO.	REV.
A1000	0

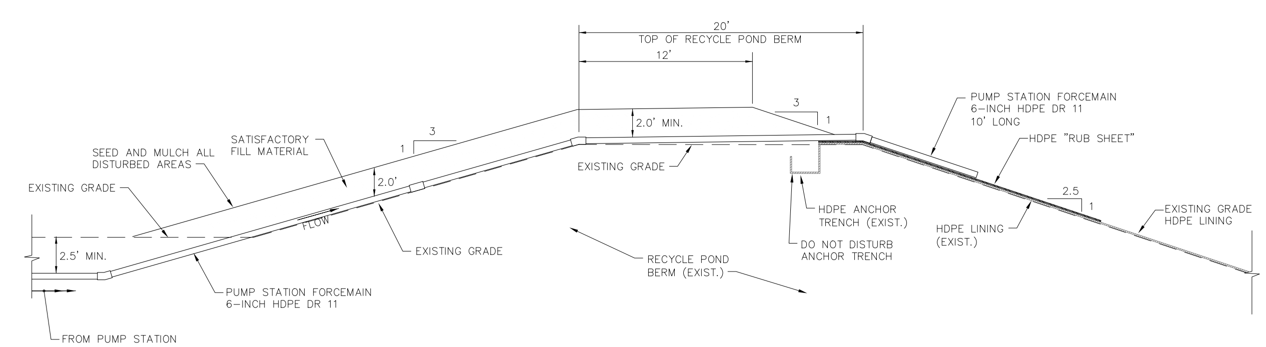
SHEET NO. 1 OF 5



1 WELL PUMP PIPING DETAIL
NOT TO SCALE



2 WELL PUMP CONTROLLER/DISCONNECT DETAIL
NOT TO SCALE



3 FORCE MAIN OUTLET DETAIL
NOT TO SCALE

N

10' 5' 0 5' 10'
SCALE IN FEET

NOTICE OF LIMITED RESPONSIBILITY

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AS BUILT

NOTES	REFERENCE DRAWINGS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
A	10-12-09	W1314	SDB	MJW	SDB	SDB	MJW	–	-

SCALE –
LOC. NO. –
CLASS –

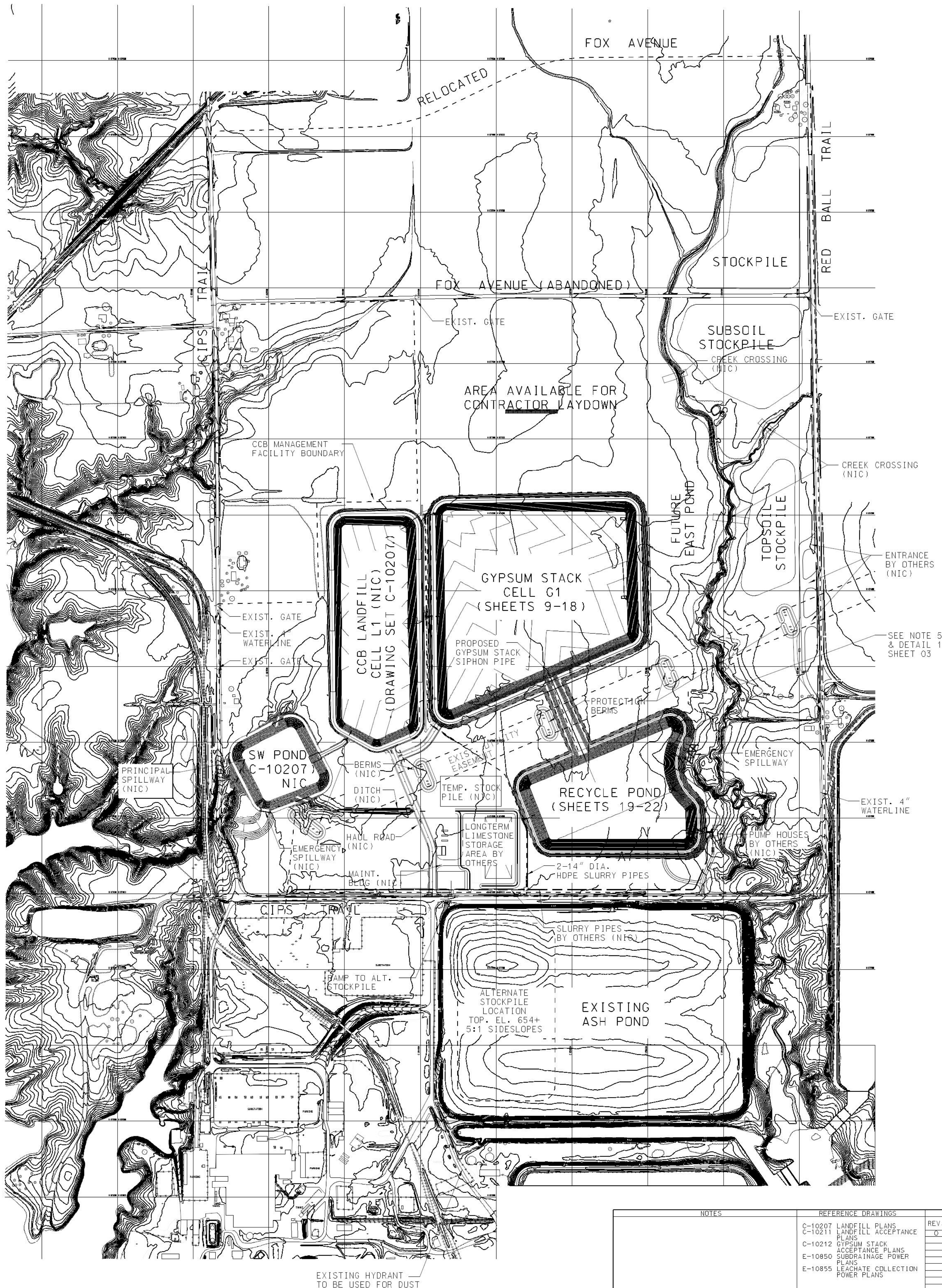
SITE DETAILS
DEWATERING SYSTEM
ASH POND #2
AMEREN COFFEEN POWER STATION

SITE: ASH POND #2

Ameren Energy Resources Generating

DRAWING NO. A1000 REV. 0

SHEET NO. 4 OF 5



STANDARD LEGEND

(ALL SYMBOLS MAY NOT BE USED ON EACH PLAN)

- ORIGINAL CONTOURS
- FENCELINE
- TRANSMISSION TOWERS
- OVERHEAD ELECTRIC
- WATER MAIN
- TELEPHONE LINE
- LIMITS OF VEGETATION
- GRAVEL ROAD
- RAILROAD
- CP-1000 CONTROL POINT - HORIZ. & VERT.
- A A′ GEOLOGICAL CROSS SECTION LINE
- LANDFILL CONTOURS
- SB-55 BORING
- GXXX PREVIOUSLY INSTALLED GROUNDWATER MONITORING WELL
- GXXX GROUNDWATER MONITORING WELL
- MW13S WELLS - NOT PART OF MONITORING PLAN

NOTES:

1. SEE NOTES ON SHEET 2 REGARDING THE RESPONSIBILITY FOR EXISTING UTILITIES.
2. (NIC) INDICATES SITE FEATURES WHICH ARE NOT PART OF THIS CONTRACT. THEY ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. HORIZONTAL AND VERTICAL CONTROL ARE BASED ON NAD 83, ILLINOIS STATE PLANE COORDINATE SYSTEM WEST ZONE, NAVD 88, US SURVEY FEET AND THE FOLLOWING PROJECT CONTROL POINTS WERE ESTABLISHED BY HANSON PROFESSIONAL SERVICES:

HORIZONTAL CONTROL

POINT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-1000	873998.37	2515334.17	620.81	#8 REBAR IN 6″ DIA. CONCRETE MONUMENT
CP-1001	873985.17	2513180.64	621.96	#8 REBAR IN 6″ DIA. CONCRETE MONUMENT
CP-1002	877937.14	2514533.34	623.15	#8 REBAR IN 6″ DIA. CONCRETE MONUMENT
CP-1003	877949.62	2516989.49	622.10	#8 REBAR IN 6″ DIA. CONCRETE MONUMENT

-N-

0′ 300′ 600′

SCALE: 1″ = 300′

NOTICE OF LIMITED RESPONSIBILITY

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NOTES

REFERENCE DRAWINGS

- C-10207 LANDFILL PLANS
- C-10211 LANDFILL ACCEPTANCE PLANS
- C-10212 GYPSUM STACK ACCEPTANCE PLANS
- E-10850 SUBDRAINAGE POWER PLANS
- E-10855 LEACHATE COLLECTION POWER PLANS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	-	-	SKB	MWR	-	-	MWR	ISSUED FOR RECORD DRAWING

SCALE: -

PROPOSED SITE PLAN

CCB MANAGEMENT FACILITY

SITE: COFFEEN

LOC. NO. -

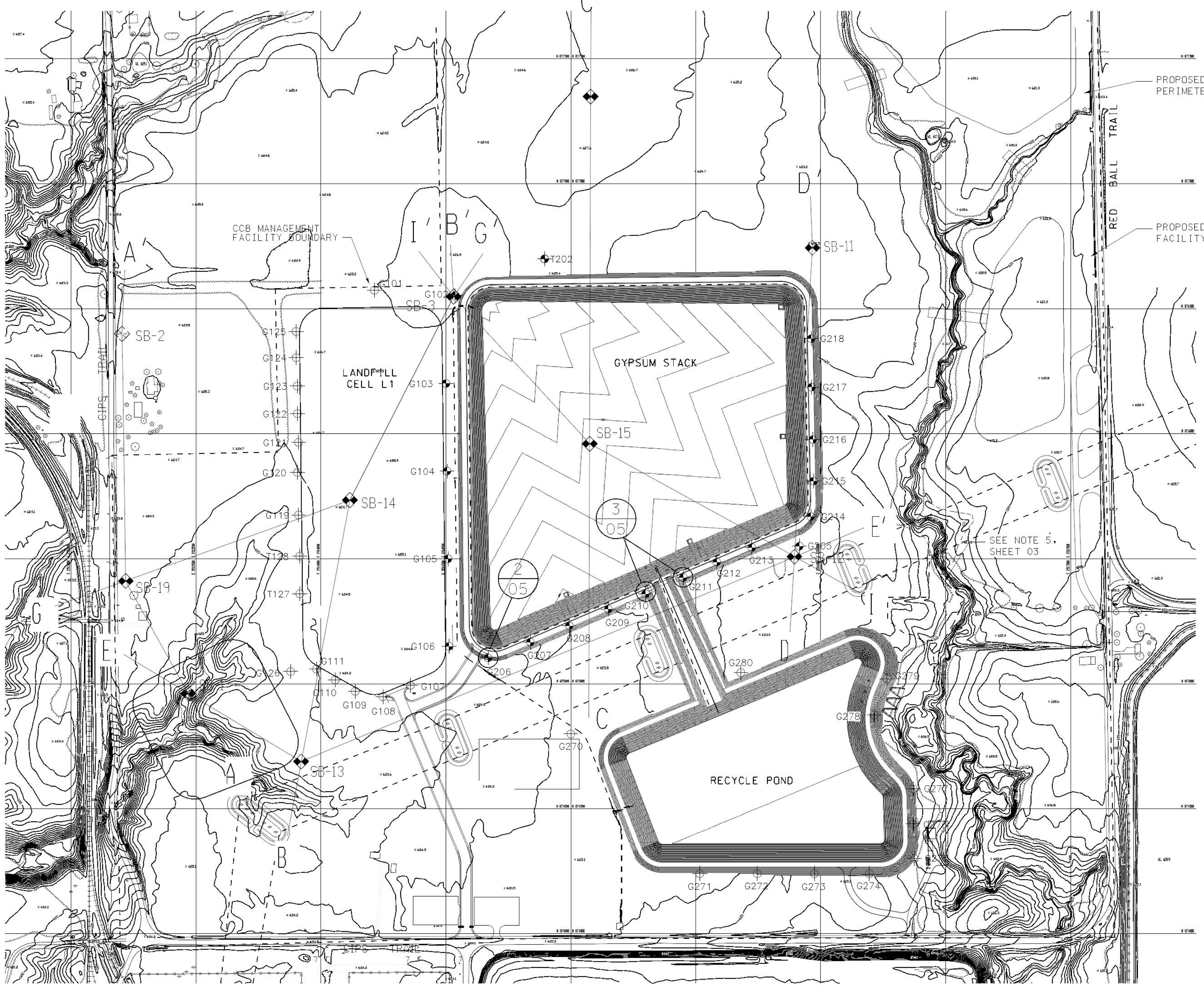
CLASS -

Ameren Energy Generating

DRAWING NO. C-10206

REV. 0

SHEET NO. 04



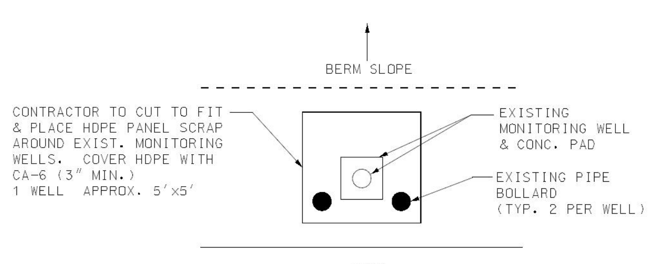
STANDARD LEGEND

(ALL SYMBOLS MAY NOT BE USED ON EACH PLAN)

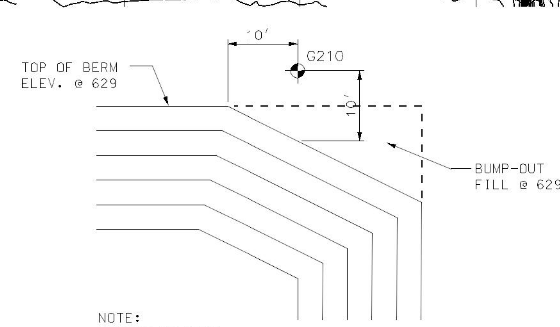
- ORIGINAL CONTOURS
- FENCELINE
- TRANSMISSION TOWERS
- OVERHEAD ELECTRIC
- WATER MAIN
- TELEPHONE LINE
- LIMITS OF VEGETATION
- GRAVEL ROAD
- RAILROAD
- CP-1000 CONTROL POINT - HORIZ. & VERT.
- A — A′ GEOLOGICAL CROSS SECTION LINE
- LANDFILL CONTOURS
- SB-55 BORING
- GXXX GYPSUM STACK GROUNDWATER MONITORING WELL
- GXXX OTHER MONITORING WELL

NOTES:

1. CONTOURS SHOWN IN GYPSUM STACK ARE TOP OF CLAY LINER.(NOTE: THE UPPER PORTION OF THE PROCESS WATER RECOVERY SYSTEM LINER WAS ELIMINATED AS PART OF THE CLEAN CLOSURE REVISION)
2. THE PROPERTY IS LOCATED IN SECTIONS 10 & 11, TOWNSHIP 7 NORTH, RANGE 3 WEST, 3RD P.M., MONTGOMERY COUNTY, ILLINOIS
3. THE DESIGN ELEMENTS INCLUDED IN THESE DRAWINGS WERE BASED UPON EXISTING AERIAL MAPPING AS OBTAINED FROM AMEREN.
4. ALL DISTURBED AREAS, INCLUDING THE CREST AND EXTERIOR FACE OF BOTH DAMS WILL BE SEEDED AND MULCHED WITH IDOT CLASS 1A SEED MIXTURE.
5. FILL MATERIAL FOR DAM EMBANKMENT WILL BE PLACED IN MAXIMUM UNCOMPACTED LIFTS OF 9-INCHES AND COMPACTED TO 95% OF THE STANDARD PROCTOR DENSITY.
6. SURFICIAL CONTOURS WERE DEVELOPED USING AERIAL PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHS TAKEN BY SURDEX.
7. CURRENT SURFACE TOPOGRAPHY MAY DIFFER FROM THAT SHOWN DUE TO ON GOING OPERATIONS AT THE SITE.
8. FOR CLARITY, NOT ALL EXISTING SITE FEATURES ARE SHOWN ON THIS DRAWING.

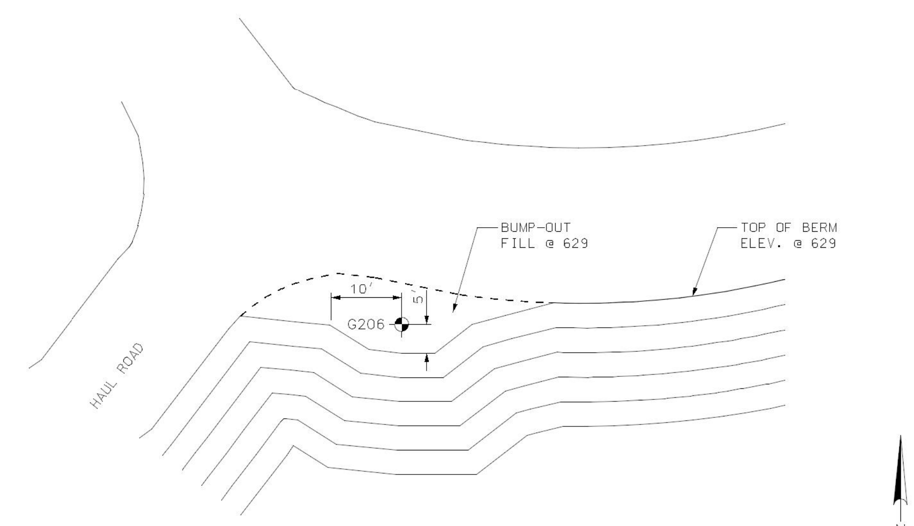


WEED CONTROL AT EXIST. SINGLE MONITORING WELLS
1/05



NOTE:
MIRROR AT G211

MONITORING WELL BUMP-OUT NEAR TRANSFER CHANNEL
3/05



MONITORING WELL BUMP-OUT AT HAUL ROAD
2/05

-N-

0′ 200′ 400′
SCALE: 1″ = 200′

NOTICE OF LIMITED RESPONSIBILITY
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NOTES	REFERENCE DRAWINGS
	C-10207 LANDFILL PLANS C-10211 LANDFILL ACCEPTANCE PLANS C-10212 GYPSUM STACK ACCEPTANCE PLANS E-10850 SUBDRAINAGE POWER PLANS E-10855 LEACHATE COLLECTION POWER PLANS

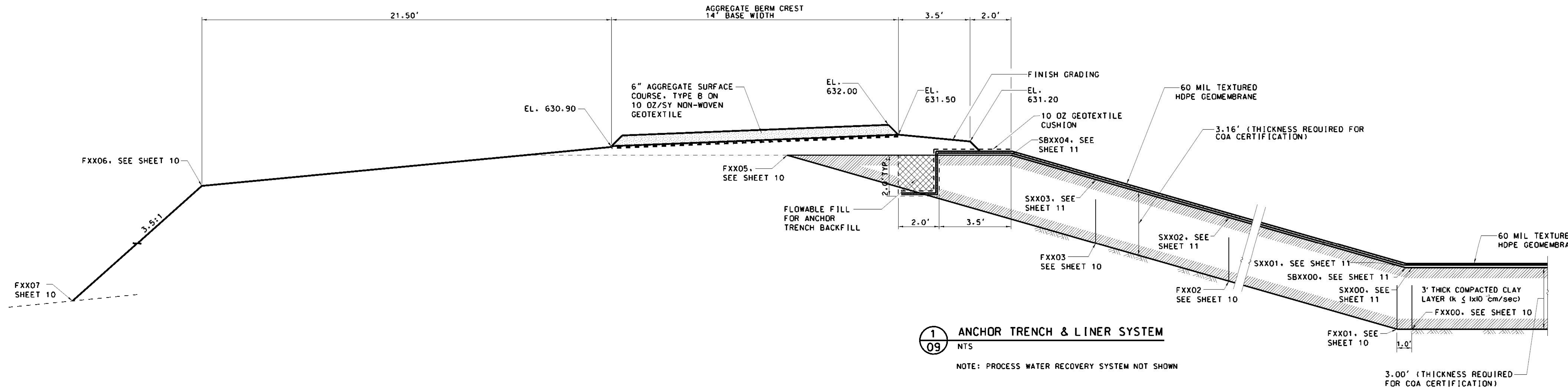
REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	–	–	SKB	MWR	–	–	MWR	ISSUED FOR RECORD DRAWING

SCALE –
LOC. NO. –
CLASS –

GROUNDWATER MONITORING & BORING PLAN
CCB MANAGEMENT FACILITY
SITE: COFFEEN

Ameren Energy Generating

DRAWING NO. C-10206
REV. 0
SHEET NO. 05



1/09 ANCHOR TRENCH & LINER SYSTEM
NTS

NOTE: PROCESS WATER RECOVERY SYSTEM NOT SHOWN

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NOTES

REFERENCE DRAWINGS
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- C-10212 GYPSUM STACK ACCEPTANCE PLANS
- E-10850 SUBDRAINAGE POWER PLANS
- E-10855 LEACHATE COLLECTION POWER PLANS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	–	–	SKB	MWR	–	–	MWR	ISSUED FOR RECORD DRAWING

SCALE

ANCHOR TRENCH AND LINER SYSTEM

CCB MANAGEMENT FACILITY

SITE: COFFEEN

LOC. NO.

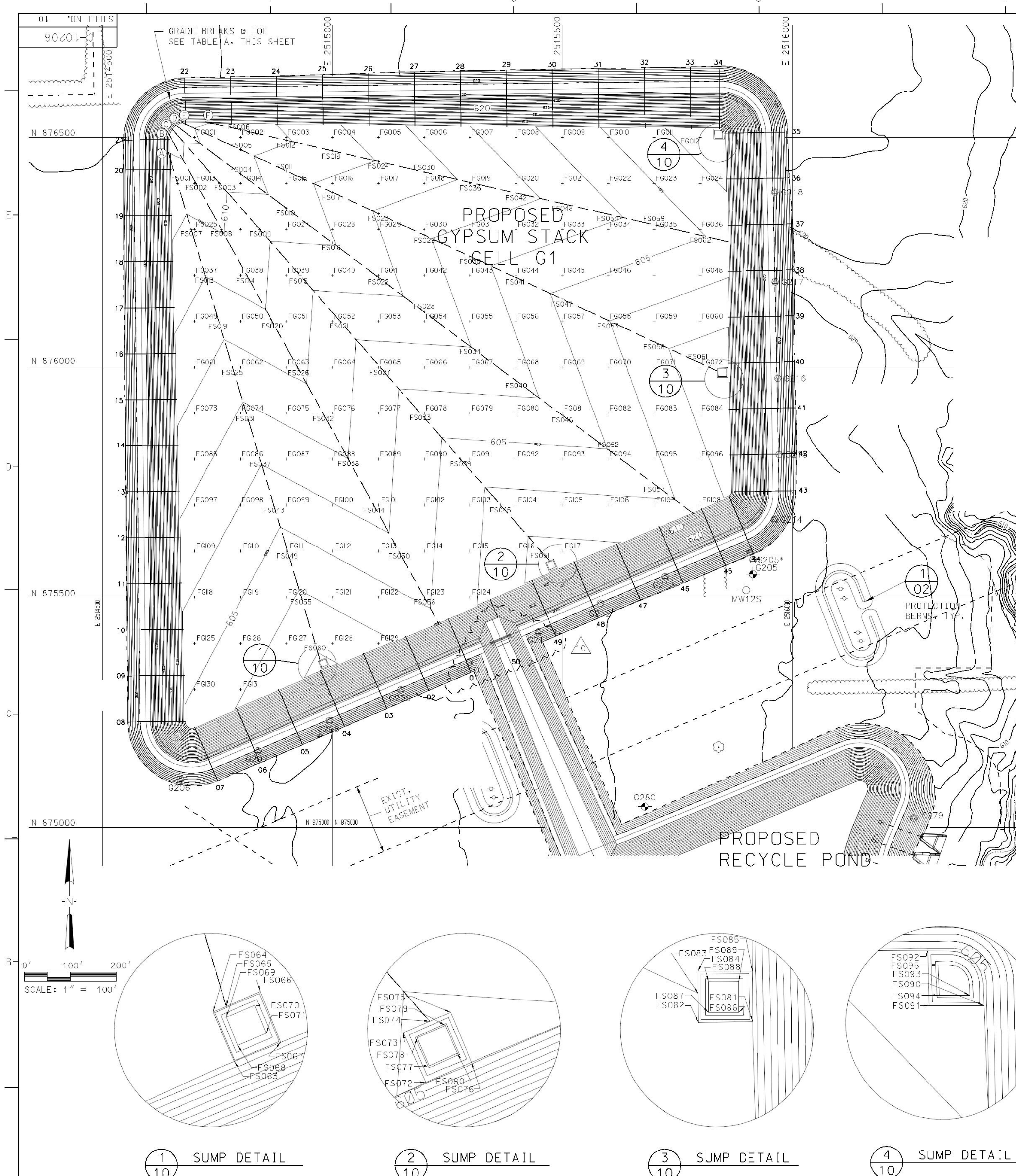
CLASS

Ameren Energy Generating

DRAWING NO. C-10206

REV. 0

SHEET NO. 09



POINT NUMBER	GRID COORDINATES NORTHING	EASTING	TOP OF FOUNDATION DESIGN	RECORD	POINT NUMBER	GRID COORDINATES NORTHING	EASTING	TOP OF FOUNDATION DESIGN	RECORD	POINT NUMBER	GRID COORDINATES NORTHING	EASTING	TOP OF FOUNDATION DESIGN	RECORD	POINT NUMBER	GRID COORDINATES NORTHING	EASTING	TOP OF FOUNDATION DESIGN	RECORD
F0100	875454.12	2515251.81	604.61	604.59	~~F2104~~	~~876494.47~~	~~2514593.36~~	~~626~~		F4202	875809.61	2515902.24	614.96	614.67	FG095	875800	2515700	604.12	604
F0101	875453.2	2515252.2	604.6	604.59	F2105	876494.41	2514588.27	630.5	630.43	F4203	875810.29	2515935.36	626	625.79	FG096	875800	2515800	603.19	603.02
F0102	875421.79	2515265.63	615.99	615.77	F2106	876494.11	2514562.01	630.5	630.35	~~F4204~~	~~875810.46~~	~~2515943.77~~	~~626~~		FG097	875700	2514700	606.86	606.7
F0103	875394.18	2515277.44	626	625.74	F2107	876493.93	2514546.26	626	626.36	F4205	875810.57	2515948.86	630.5	628.83	FG098	875700	2514800	605.99	605.98
~~F0104~~	~~875386.45~~	~~2515280.75~~	~~626~~		F2200	876528.45	2514679.88	611.16	611.13	F4206	875811.11	2515975.12	630.5	630.28	FG099	875700	2514900	605.48	605.38
F0105	875381.77	2515282.75	630.5	628.65	F2201	876529.45	2514679.87	611.17	611.15	F4207	875811.81	2516009.25	620.75	622.46	FG100	875700	2515000	605.96	605.83
F0106	875357.62	2515293.08	630.5	629.74	F2202	876553.87	2514679.6	619.3	619.08	F4300	875728.23	2515866.44	602.81	602.76	FG101	875700	2515100	606.28	606.12
F0107	875336.7	2515302.02	624	624.11	F2203	876573.96	2514679.37	626	625.9	F4301	875728.25	2515867.44	602.8	602.72	FG102	875700	2515200	605.28	605.08
F0200	875415.87	2515159.4	604.22	604.16	~~F2204~~	~~876582.37~~	~~2514679.28~~	~~626~~		F4302	875729.01	2515904.27	615.08	614.78	FG103	875700	2515300	604.29	604.16
F0201	875414.95	2515159.8	604.22	604.2	F2205	876587.46	2514679.22	630.5	630.4	F4303	875729.68	2515937.02	626	625.86	FG104	875700	2515400	603.66	603.61
F0202	875383.01	2515173.46	615.8	615.53	F2206	876613.72	2514678.92	630.5	630.27	~~F4304~~	~~875729.86~~	~~2515945.43~~	~~626~~		FG105	875700	2515500	603.72	603.55
F0203	875354.86	2515185.5	626	625.83	F2207	876628.68	2514678.76	626.23	625.94	F4305	875729.96	2515950.52	630.5	628.93	FG106	875700	2515600	603.79	603.64
~~F0204~~	~~875347.12~~	~~2515188.8~~	~~626~~		F2300	876528.15	2514779.89	610.69	610.57	F4306	875730.5	2515976.78	630.5	630.73	FG107	875700	2515700	603.86	603.59
F0205	875342.45	2515190.8	630.5	628.51	F2301	876529.15	2514779.88	610.69	610.63	F4307	875731.15	2516008.01	621.57	624.19	FG108	875700	2515800	603.53	603.36
F0206	875318.3	2515201.13	630.5	630.48	F2302	876554.17	2514779.6	619.03	618.76	F4400	875720.6	2515861.75	602.88	602.85	FG109	875600	2514700	606.39	606.27
F0207	875297.38	2515210.08	624	623.65	F2303	876575.08	2514779.36	626	625.77	F4401	875719.68	2515862.14	602.88	602.82	FG110	875600	2514800	605.51	605.38
F0300	875378.65	2515066.56	603.46	603.44	~~F2304~~	~~876583.5~~	~~2514779.27~~	~~626~~		F4402	875685.86	2515876.6	615.14	614.93	FG111	875600	2514900	604.64	604.4
F0301	875377.73	2515066.95	603.45	603.45	F2305	876588.58	2514779.21	630.5	630.55	F4403	875655.9	2515889.42	626	625.91	FG112	875600	2515000	605.08	605
F0302	875344.74	2515081.06	615.41	615.05	F2306	876614.84	2514778.92	630.5	630.42	~~F4404~~	~~875648.17~~	~~2515892.72~~	~~626~~		FG113	875600	2515100	605.55	605.46
F0303	875315.54	2515093.55	626	625.81	F2307	876630.92	2514778.74	625.91	625.95	F4405	875643.49	2515894.72	630.5	628.7	FG114	875600	2515200	605.22	605.16
~~F0304~~	~~875307.8~~	~~2515096.86~~	~~626~~		F2400	876527.15	2514879.91	609.99	609.88	F4406	875619.34	2515905.05	630.5	629.79	FG115	875600	2515300	604.23	604.14
F0305	875303.13	2515098.86	630.5	628.51	F2401	876528.15	2514879.9	609.98	609.95	F4407	875593.75	2515916	622.55	623.03	FG116	875600	2515400	603.23	603.11
F0306	875278.98	2515109.19	630.5	630.36	F2402	876554.23	2514879.6	618.68	618.31	F4500	875693	2515802.21	603.53	603.49	~~FG117~~	~~875600~~	~~2515500~~	~~600.48~~	
F0307	875258.06	2515118.13	624	623.16	F2403	876576.21	2514879.36	626	625.7	F4501	875692.08	2515802.6	603.53	603.49	FG118	875500	2514700	605.92	605.77
F0400	875341.18	2514973.82	602.79	602.61	~~F2404~~	~~876584.62~~	~~2514879.26~~	~~626~~		F4502	875659.17	2515816.68	615.47	615.25	FG119	875500	2514800	605.04	604.85
F0401	875340.26	2514974.22	602.78	602.68	F2405	876589.71	2514879.21	630.5	630.52	F4503	875630.11	2515829.11	626	625.79	FG120	875500	2514900	604.17	604.08
F0402	875306.35	2514988.72	615.08	614.81	F2406	876615.97	2514878.91	630.5	630.37	~~F4504~~	~~875622.37~~	~~2515832.42~~	~~626~~		FG121	875500	2515000	604.21	603.99
F0403	875276.22	2515001.61	626	625.66	F2407	876633.5	2514878.71	625.49	625.7	F4505	875617.7	2515834.42	630.5	628.55	FG122	875500	2515100	604.68	604.51
~~F0404~~	~~875268.48~~	~~2515004.91~~	~~626~~		F2500	876526.15	2514979.93	609.28	609.18	F4506	875593.55	2515844.74	630.5	629.96	FG123	875500	2515200	605.15	605.01
F0405	875263.8	2515006.91	630.5	628.61	F2501	876527.15	2514979.91	609.27	609.26	F4507	875568.59	2515855.42	622.75	622.56	FG124	875500	2515300	604.16	604.01
F0406	875239.66	2515017.24	630.5	630.61	F2502	876554.3	2514979.61	618.32	617.98	F4600	875654.05	2515710.11	603.41	603.25	FG125	875400	2514700	605.44	605.34
F0407	875218.74	2515026.19	624	623.18	F2503	876577.33	2514979.35	626	625.71	F4601	875653.13	2515710.5	603.4	603.37	FG126	875400	2514800	604.57	604.47
F0500	875300.25	2514882.57	603.37	603.34	~~F2504~~	~~876585.74~~	~~2514979.26~~	~~626~~		F4602	875620.08	2515724.64	615.36	615.28	FG127	875400	2514900	603.69	603.35
F0501	875299.33	2514882.96	603.37	603.36	F2505	876590.83	2514979.2	630.5	630.46	F4603	875590.79	2515737.16	626	625.73	FG128	875400	2515000	603.33	603.19
F0502	875266.22	2514897.12	615.37	615.06	F2506	876617.09	2514978.9	630.5	630.27	~~F4604~~	~~875583.05~~	~~2515740.47~~	~~626~~		FG129	875400	2515100	603.8	603.69
F0503	875236.9	2514909.66	626	625.89	F2507	876636.21	2514978.69	625.04	624.63	F4605	875578.38	2515742.47	630.5	628.83	FG130	875300	2514700	604.97	604.8
~~F0504~~	~~875229.16~~	~~2514912.97~~	~~626~~		F2600	876525.14	2515079.94	608.57	608.52	F4606	875554.23	2515752.8	630.5	629.97	FG131	875300	2514800	604.1	603.99
F0505	875224.48	2514914.97	630.5	628.61	F2601	876526.14	2515079.93	608.56	608.51	F4607	875530.52	2515762.94	623.13	622.95	FS001	876400	2514663.01	610.49	610.36
F0506	875200.34	2514925.3	630.5	630.46	F2602	876554.36	2515079.62	617.97	617.86	F4700	875615.94	2515617.64	602.97	602.76	FS002	876400	2514703.18	610.68	610.66
F0507	875179.42	2514934.24	624	623.47	F2603	876578.45	2515079.34	626	625.86	F4701	875615.02	2515618.04	602.96	602.83	FS003	876400	2514754.31	610.18	609.99
F0600	875259.25	2514791.34	603.98	603.65	~~F2604~~	~~876586.86~~	~~2515079.25~~	~~626~~		F4702	875581.36	2515632.43	615.16	614.78	FS004	876420.4	2514800	610.41	610.23
F0601	875258.34	2514791.73	603.97	603.78	F2605	876591.95	2515079.19	630.5	630.55	F4703	875551.47	2515645.22	626	625.61	FS005	876473.12	2514800	610.23	610.06
F0602	875226.07	2514805.53	615.67	615.35	F2606	876618.21	2515078.9	630.5	630.29	~~F4704~~	~~875543.73~~	~~2515648.53~~	~~626~~		FS006	876516.4	2514800	610.63	610.4
F0603	875197.57	2514817.72	626	625.69	F2607	876639.57	2515078.66	624.4	624.35	F4705	875539.05	2515650.53	630.5	628.42	FS007	876300	2514692.9	609.76	609.72
~~F0604~~	~~875189.84~~	~~2514821.02~~	~~626~~		F2700	876524.14	2515179.96	607.86	607.77	F4706	875514.91	2515660.85	630.5	630.14	FS008	876300	2514758.39	610.07	609.88
F0605	875185.16	2514823.02	630.5	628.68	F2701	876525.14	2515179.95	607.86	607.82	F4707	875492.87	2515670.28	623.65	623.52	FS009	876300	2514841.73	609.24	609.08
F0606	875161.01	2514833.35	630.5	630.36	F2702	876554.42	2515179.62	617.61	617.43	F4800	875577.83	2515525.18	602.53	602.23	FS010	876345.41	2514900	609.73	609.62
F0607	875140.1	2514842.3	624	623.5	F2703	876579.57	2515179.34	626	625.64	F4801	875576.91	2515525.57	602.52	602.35	FS011	876426.72	2514900	609.45	609.42
F0700	875218.28	2514700.1	604.58	604.47	~~F2704~~	~~876587.99~~	~~2515179.24~~	~~626~~		F4802	875542.65	2515540.23	614.94	614.58	FS012	876493.46	2514900	610.08	609.9
F0701	875217.36	2514700.5	604.58	604.56	F2705	876593.07	2515179.19	630.5	630.63	F4803	875512.15	2515553.27	626	625.6	FS013	876200	2514722.8	609.02	608.91
F0702	875185.92	2514713.94	615.97	615.95	F2706	876619.33	2515178.89	630.5	630.02	~~F4804~~	~~875504.41~~	~~2515556.58~~	~~626~~		FS014	876200	2514813.6	609.45	609.2
F0703	875158.25	2514725.77	626	625.8	F2707	876642.28	2515178.63	623.94	624.22	F4805	875499.73	2515558.58	630.5	628.47	FS015	876200	2514929.15	608.31	608.26
~~F0704~~	~~875150.52~~	~~2514729.08~~	~~626~~		F2800	876523.14	2515279.98	607.15	606.76	F4806	875475.59	2515568.91	630.5	630.22	FS016	876270.42	2515000	609.05	608.86
F0705	875145.84	2514731.08	630.5	628.78	F2801	876524.14	2515279.97	607.15	607	F4807	875454.67	2515577.85	624	623.97	FS017	876380.31	2515000	608.68	608.52
F0706	875121.69	2514741.41	630.5	629.98	F2802	876554.48	2515279.63	617.26	616.94	F4900	875537.59	2515433.63	602.86	602.71	FS018	876470.52	2515000	609.52	609.18
F0707	875100.85	2514750.32	624.02	623.43	F2803	876580.7	2515279.33	626	625.75	F4901	875536.67	2515434.02	602.85	602.75	FS019	876100	2514752.69	608.29	608.16
F0800	875230.26	2514680.99	604.81	605.14	~~F2804~~	~~876589.11~~	~~2515279.24~~	~~626~~		F4902	875502.84	2515448.49	615.12	614.76	FS020	876100	2514868.81	608.84	608.66
F0801	875230.24	2514679.99	604.82	605.16	F2805	876594.19	2515279.18	630.5	628.73	F4903	875472.82	2515461.33	626	625.66	FS021	876100	2515016.57	607.37	607.28
F0802	875229.85	2514646.05	616.13	616.1	F2806	876620.46	2515278.89	630.5	630.05	~~F4904~~	~~875465.09~~	~~2515464.64~~	~~626~~		FS022	876195.43	2515100	608.38	608.11
F0803	875229.51	2514616.64	626	625.95	F2807	876644.81	2515278.61	623.57	626.45	F4905	875460.41	2515466.64	630.5	628.48	FS023	876333.91	2515100	607.9	607.85
~~F0804~~	~~875229.41~~	~~2514608.02~~	~~626~~		F2900	876522.14	2515380	606.45	606.44	F4906	875436.26	2515476.96	630.5	630.14	FS024	876447.58	2515100	608.96	608.79
F0805	875229.35	2514602.93	630.5	628.67	F2901	876523.14	2515379.98	606.44	606.34	F4907	875415.35	2515485.91	624	624.34	FS025	876000	2514782.59	607.56	607.46
F0806	875229.05	2514576.67	630.5	629.81	F2902	876554.54	2515379.63	616.91	616.71	F5000	875495.86	2515342.72	603.73	603.67	FS026	876000	2514924.01	608.22	608.13
F0807	875228.79	2514554.86	624.27	625.38	F2903	876581.82	2515379.33	626	625.66	F5001	875494.94	2515343.11	603.73	603.67	FS027	876000	2515103.99	606.44	606.23
F0900	875330.23	2514678.33	605.3	605.21	~~F2904~~	~~876590.23~~	~~2515379.23~~	~~626~~		F5002	875462.31	2515357.06	615.55	615.47	FS028	876120.44	2515200	607.7	607.36
F0901	875330.22	2514677.33	605.31	605.28	F2905	876595.32	2515379.17	630.5	628.52	F5003	875433.5	2515369.38	626	618.46	FS029	876287.51	2515200	607.13	606.99
F0902	875329.83	2514644.14	616.38	616.19	F2906	876621.58	2515378.88	630.5	629.89	~~F5004~~	~~875425.77~~	~~2515372.69~~	~~626~~		FS030	876424.64	2515200	608.41	608.33
F0903	875329.5	2514615.27	626	625.92	F2907	876646.07	2515378.6	623.5	624.3	F5005	875421.09	2515374.69	630.5	622.63	FS031	875900	2514812.48	606.82	606.81
~~F0904~~	~~875329.4~~	~~2514606.86~~	~~626~~		F3000	876521.14	2515480.01	605.74	605.63	F5006	875396.94	2515385.02	630.5	N/A	FS032	875900	2514979.22	607.61	607.52
F0905	875329.34	2514601.77	630.5	628.81	F3001	876522.14	2515480	605.73	605.66	F5007	875376.03	2515393.97	624	N/A	FS033	875900	2515191.41	605.5	605.32
F0906	875329.04	2514575.51	630.5	630.03	F3002	876554.6	2515479.64	616.55	616.2	FG001	876500	2514700	611.07	610.81	FS034	876045.44	2515300	607.02	606.72
F0907	875328.79	2514554.04	624.37	625.39	F3003	876582.94	2515479.32	626	625.76	FG002	876500	2514800	610.48	610.33	FS035	876241.1	2515300	606.35	606.17
F1000	875430.21	2514675.68	605.8	605.67	~~F3004~~	~~876591.35~~	~~2515479.23~~	~~626~~		FG003	876500	2514900	610.03	609.85	FS036	876401.7	2515300	607.85	607.47
F1001	875430.2	2514674.68	605.81	605.79	F3005	876596.44	2515479.17	630.5	628.59	FG004	876500	2515000	609.32	609.26	FS037	875800	2514842.38	606.09	605.82
F1002	875429.82	2514642.24	616.62	616.28	F3006	876622.7	2515478.87	630.5	630.09	FG005	876500	2515100	608.6	608.42	FS038	875800	2515034.43	607	606.72
F1003	875429.49	2514614.11	626	625.96	F3007	876647.98	2515478.59	623.28	625.17	FG006	876500	2515200	607.89	607.73	FS039	875800	2515278.84	604.57	604.47
~~F1004~~	~~875429.4~~	~~2514605.7~~	~~626~~		F3100	876520.13	2515580.03	605.03	604.93	FG007	876500	2515300	607.17	607.08	FS040	875970.45	2515400	606.34	606.19
F1005	875429.34	2514600.61	630.5	628.68	F3101	876521.13	2515580.02	605.02	604.91	FG008	876500	2515400	606.46	606.35	FS041	876194.7	2515400	605.57	605.55
F1006	875429.03	2514574.35	630.5	630.06	F3102	876554.66	2515579.64	616.2	615.85	FG009	876500	2515500	605.74	605.48	FS042	876378.76	2515400	607.29	607.06
F1007	875428.79	2514553.21	624.46	625.71	F3103	876584.06	2515579.31	626	625.66	FG010	876500	2515600	605.03	604.97	FS043	875700	2514872.27	605.35	605.27
F1100	875530.18	2514673.04	606.3	606.07	~~F3104~~	~~876592.48~~	~~2515579.22~~	~~626~~		FG011	876500	2515700	604.31	603.94	FS044	875700	2515089.64	606.38	606.2
F1101	875530.17	2514672.04	606.3	606.24	F3105	876597.56	2515579.16	630.5	628.45	FG012	876500	2515800	603.6	603.35	FS045	875700	2515366.26	603.63	603.6
F1102	875529.8	2514640.34	616.87	616.78	F3106	876623.82	2515578.87	630.5	630.44	FG013	876400	2514700	610.67	610.6	FS046	875895.46	2515500	605.66	605.44
F1103	875529.49	2514612.95	626	626	F3107	876649.88	2515578.57	623.06	623.76	FG014	876400	2514800	610.21	609.99	FS047	876148.29	2515500	604.8	604.77
~~F1104~~	~~875529.39~~	~~2514604.54~~	~~626~~		F3200	876519.13	2515680.05	604.32	604.19	FG015	876400	2514900	609.54	609.34	FS048	876355.82	2515500	606.74	606.58
F1105	875529.33	2514599.45	630.5	628.96	F3201	876520.13	2515680.04	604.31	604.24	FG016	876400	2515000	608.86	608.63	FS049	875600	2514902.17	604.62	604.41
F1106	875529.03	2514573.19	630.5	630.11	F3202	876554.72	2515679.65	615.84	615.56	FG017	876400	2515100	608.52	608.41	FS050	875600	2515144.85	605.77	605.6
F1107	875528.78	2514552.36	624.55	625.51	F3203	876585.19	2515679.31	626	625.68	FG018	876400	2515200	608.16	608.08	FS051	875600	2515453.68	602.7	602.32
F1200	875630.16	2514670.39	606.79	606.77	~~F3204~~	~~876593.6~~	~~2515679.21~~	~~626~~		FG019	876400	2515300	607.83	607.47	FS052	875820.47	2515600	604.99	604.9
F1201	875630.15	2514669.39	606.8	606.72	F3205	876598.68	2515679.16	630.5	628.52	FG020	876400	2515400	607.15	606.92	FS053	876101.69	2515600	604.02	604.01
F1202	875629.79	2514638.44	617.12	617.05	F3206	876624.95	2515678.86	630.5	630.57	FG021	876400	2515500	606.43	606.28	FS054	876332.88	2515600	606.18	606.14
F1203	875629.48	2514611.79	626	625.76	F3207	876650.98	2515678.57	623.06	623.52	FG022	876400	2515600	605.72	605.59	FS055	875500	2514932.07	603.88	603.76
~~F1204~~	~~875629.38~~	~~2514603.38~~	~~626~~		F3300	876518.13	2515780.07	603.61	603.39	FG023	876400	2515700	605	604.93	FS056	875500	2515200.06	605.15	605.06
F1205	875629.32	2514598.29	630.5	628.67	F3301	876519.13	2515780.05	603.61	603.58	FG024	876400	2515800	604.29	604.12	FS057	875745.46	2515700	604.31	604.13
F1206	875629.02	2514572.03	630.5	630.17	F3302	876554.78	2515779.65	615.49	615.11	FG025	876300	2514700	609.79	609.66	FS058	876055.48	2515700	603.25	603.18
F1207	875628.78	2514551.51	624.64	626.02	F3303	876586.31	2515779.3	626	625.62	FG026	876300	2514800	609.66	609.51	FS059	876309.94	2515700	605.63	605.38
F1300	875730.14	2514667.75	607.29	607.22	~~F3304~~	~~876594.72~~	~~2515779.21~~	~~626~~		FG027	876300	2514900	609.28	609.22	FS060	875400	2514961.96	603.15	602.97
F1301	875730.12	2514666.75	607.3	607.18	F3305	876599.81	2515779.15	630.5	628.51	FG028	876300	2515000	608.95	608.76	FS061	876009.08	2515800	602.47	602.08
F1302	875729.77	2514636.53	617.37	617.28	F3306	876626.07	2515778.85	630.5	630.35	FG029	876300	2515100	608.02	607.92	FS062	876287	2515800	605.07	604.96
F1303	875729.47	2514610.63	626	625.75	F3307	876652.72	2515778.56	622.88	623.86	FG030	876300	2515200	607.24	607.06	FS063	875340.98	2514975.95	602.79	602.46
~~F1304~~	~~875729.38~~	~~2514602.22~~	~~626~~		F3401	876518.49	2515842.35	603.16	602.83	FG031	876300	2515300	606.9	606.73	FS064	875362.01	2514966.57	602.93	601.03
F1305	875729.32	2514597.14	630.5	628.77	F3402	876554.8	2515841.95	615.27	614.89	FG032	876300	2515400	606.56	606.32	FS065	875364.64	2514972.53	602.89	600.99
F1306	875729.01	2514570.87	630.5	630.24	F3403	876587.01	2515841.59	626	625.6	FG033	876300	2515500	606.22	606.15	FS066	875370.82	2514986.57	603.01	602.97
F1307	875728.78	2514550.79	624.76	625.95	~~F3404~~	~~876595.42~~	~~2515841.49~~	~~626~~		FG034	876300	2515600	605.87	605.81	FS067	875349.12	2514995.53	602.86	602.78
F1400	875830.11	2514665.1	607.78	607.74	F3405	876600.51	2515841.43	630.5	628.54	FG035	876300	2515700	605.53	605.4	FS068	875347.79	2514977.15	600.86	600.61
F1401	875830.1	2514664.1	607.79	607.78	F3406	876626.77	2515841.14	630.5	630.32	FG036	876300	2515800	604.98	604.76	FS069	875359.92	2514971.96	600.86	600.38
F1402	875829.76	2514634.63	617.61	617.39	F3407	876654.65	2515840.83	622.53	624.23	FG037	876200	2514700	609.22	609	FS070	875365.19	2514984.3	600.86	600.61
F1403	875829.47	2514609.48	626	625.83	F3501	876508.73	2515852.42	603.16	603.14	FG038	876200	2514800	609.39	609.24	FS071	875353.06	2514989.49	600.86	600.73
~~F1404~~	~~875829.37~~	~~2514601.06~~	~~626~~		F3502	876509.48	2515888.73	615.26	614.89	FG039	876200	2514900	608.6	608.36	FS072	875553.8	2515471.23	602.5	602.39
F1405	875829.31	2514595.98	630.5	628.94	F3503	876510.14	2515920.94	626	625.71	FG040	876200	2515000	608.35	608.25	FS073	875575.17	2515461.86	602.6	601.72
F1406	875829.01	2514569.72	630.5	629.96	~~F3504~~	~~876510.32~~	~~2515929.35~~	~~626~~		FG041	876200	2515100	608.36	608.31	FS074	875579.34	2515471.73	602.51	601.79
F1407	875828.78	2514549.96	624.86	626.73	F3505	876510.32	2515929.45	630.5	628.53	FG042	876200	2515200	607.43	607.14	FS075	875583.65	2515481.91	602.56	601.76
F1500	875930.09	2514662.46	608.28	608.17	F3506	876510.96	2515960.69	630.5	629.92	FG043	876200	2515300	606.49	606.35	FS076	875562.33	2515490.59	602.4	602.33
F1501	875930.08	2514661.46	608.29	608.2	F3507	876511.57	2515990.13	622.09	623.27	FG044	876200	2515400	605.62	605.55	FS077	875560.87	2515472.57	600.49	600.47
F1502	875929.74	2514632.73	617.86	617.54	F3600	876408.77	2515855.48	603.83	603.73	FG045	876200	2515500	605.28	605.25	FS078	875573	2515467.38	600.49	600.45
F1503	875929.46	2514608.32	626	625.7	F3601	876408.79	2515856.48	603.82	603.78	FG046	876200	2515600	604.94	604.89	FS079	875578.27	2515479.72	600.49	600.47
~~F1504~~	~~875929.36~~	~~2514599.9~~	~~626~~		F3602	876409.52	2515891.79	615.6	615.33	FG047	876200	2515700	604.6	604.42	FS080	875566.14	2515484.91	600.49	600.47
F1505	875929.3	2514594.82	630.5	630.41	F3603	876410.16	2515923	626	625.79	FG048	876200	2515800	604.26	604.24	FS081	875978.52	2515860.08	602.07	601.96
F1506	875929	2514568.56	630.5	630.08	~~F3604~~	~~876410.34~~	~~2515931.41~~	~~626~~		FG049	876100	2514700	608.75	608.51	FS082	875977.62	2515837.16	602.23	601.56
F1507	875928.77	2514549.09	624.94	626.86	F3605	876410.44	2515936.49	630.5	628.75	FG050	876100	2514800	608.51	608.33	FS083	875991.97	2515836.87	602.19	600.08
F1600	876030.06	2514659.81	608.77	608.71	F3606	876410.98	2515962.75	630.5	630.27	FG051	876100	2514900	608.53	608.4	FS084	875999.29	2515836.72	602.26	600.35
F1601	876030.05	2514658.81	608.78	608.7	F3607	876411.62	2515993.43	621.73	623.44	FG052	876100	2515000	607.54	607.39	FS085	875999.61	2515859.94	602.18	602.11
F1602	876029.73	2514630.83	618.11	617.77	F3700	876308.83	2515859.53	604.49	604.45	FG053	876100	2515100	607.43	607.24	FS086	875982.08	2515854.35	600.18	600.17
F1603	876029.45	2514607.16	626	625.84	F3701	876308.85	2515860.53	604.49	604.46	FG054	876100	2515200	607.49	607.42	FS087	875981.81	2515841.15	600.18	599.86
~~F1604~~	~~876029.36~~	~~2514598.75~~	~~626~~		F3702	876309.56	2515894.85	615.93	615.65	FG055	876100	2515300	606.83	606.64	FS088	875995.22	2515840.88	600.18	599.64
F1605	876029.3	2514593.66	630.5	630.44	F3703	876310.18	2515925.06	626	625.91	FG056	876100	2515400	605.9	605.77	FS089	875995.49	2515854.07	600.18	600.1
F1606	876028.99	2514567.4	630.5	629.92	~~F3704~~	~~876310.36~~	~~2515933.47~~	~~626~~		FG057	876100	2515500	604.96	604.78	FS090	876495.73	2515852.96	603.25	603.18
F1607	876028.77	2514548.23	625.02	627.3	F3705	876310.46	2515938.55	630.5	628.75	FG058	876100	2515600	604.03	603.99	FS091	876495.12	2515829.48	603.42	602.21
F1700	876130.04	2514657.16	609.27	609.26	F3706	876311	2515964.81	630.5	630.24	FG059	876100	2515700	603.66	603.62	FS092	876518.64	2515829.32	603.26	603.26
F1701	876130.03	2514656.16	609.28	609.28	F3707	876311.75	2516000.93	620.18	623.5	FG060	876100	2515800	603.32	603.19	FS093	876499.63	2515846.92	601.26	601.24
F1702	876129.71	2514628.93	618.36	618.07	F3800	876208.83	2515860.52	604.13	604	FG061	876000	2514700	608.28	608.08	FS094	876499.46	2515833.71	601.26	600.99
F1703	876129.45	2514606	626	625.82	F3801	876208.85	2515861.52	604.13	604.03	FG062	876000	2514800	607.64	607.45	FS095	876512.69	2515833.44	601.26	600.95
~~F1704~~	~~876129.35~~	~~2514597.59~~	~~626~~		F3802	876209.57	2515896.4	615.76	615.48	FG063	876000	2514900	608.11	608.03	~~FS096~~	~~875328.43~~	~~2514947.74~~	~~602.94~~	
F1705	876129.29	2514592.5	630.5	630.41	F3803	876210.21	2515927.12	626	625.75	FG064	876000	2515000	607.47	607.33	~~FS097~~	~~875362.73~~	~~2514932.41~~	~~603.23~~	
F1706	876128.99	2514566.24	630.5	630.04	~~F3804~~	~~876210.38~~	~~2515935.53~~	~~626~~		FG065	876000	2515100	606.48	606.23	~~FS098~~	~~875370.85~~	~~2514952.07~~	~~603.1~~	
F1707	876128.77	2514547.36	625.11	627.9	F3805	876210.48	2515940.62	630.5	628.42	FG066	876000	2515200	606.5	606.11	FS099	875336.67	2514966.08	602.82	602.8
F1800	876230.02	2514654.52	609.76	609.63	F3806	876211.03	2515966.87	630.5	630.69	FG067	876000	2515300	606.57	606.27	~~FS100~~	~~875335.51~~	~~2514949.05~~	~~600.94~~	
F1801	876230	2514653.52	609.77	609.74	F3807	876211.83	2516005.92	619.34	622.34	FG068	876000	2515400	606.24	606.14	~~FS101~~	~~875360.32~~	~~2514938.43~~	~~600.94~~	
F1802	876229.7	2514627.02	618.61	618.44	F3900	876108.8	2515859.78	603.2	602.96	FG069	876000	2515500	605.31	605.25	~~FS102~~	~~875365.16~~	~~2514949.8~~	~~600.94~~	
F1803	876229.44	2514604.84	626	625.93	F3901	876108.82	2515860.78	603.2	603.17	FG070	876000	2515600	604.37	604.24	~~FS103~~	~~875340.37~~	~~2514960.42~~	~~600.94~~	
~~F1804~~	~~876229.34~~	~~2514596.43~~	~~626~~		F3902	876109.57	2515897.06	615.29	615	FG071	876000	2515700	603.44	603.34	~~FS104~~	~~875566.07~~	~~2515499.26~~	~~602.39~~	
F1805	876229.28	2514591.34	630.5	630.42	F3903	876110.23	2515929.18	626	625.82	FG072	876000	2515800	602.5	602.11	~~FS105~~	~~875600.03~~	~~2515484.03~~	~~602.72~~	
F1806	876228.98	2514565.08	630.5	630.23	~~F3904~~	~~876110.4~~	~~2515937.59~~	~~626~~		FG073	875900	2514700	607.81	607.58	FS106	875608.67	2515503.74	602.82	602.5
F1807	876228.77	2514546.98	625.33	627.74	F3905	876110.51	2515942.68	630.5	628.71	FG074	875900	2514800	606.93	606.84	~~FS107~~	~~875573.76~~	~~2515517.93~~	~~602.48~~	
F1900	876329.99	2514651.87	610.26	610.16	F3906	876111.05	2515968.93	630.5	630.73	FG075	875900	2514900	607.24	607.14	~~FS108~~	~~875572.85~~	~~2515500.52~~	~~600.48~~	
F1901	876329.98	2514650.87	610.27	610.25	F3907	876111.77	2516004.09	620.45	622.09	FG076	875900	2515000	607.4	607.34	~~FS109~~	~~875597.67~~	~~2515489.91~~	~~600.48~~	
F1902	876329.68	2514625.12	618.85	618.65	F4000	876008.76	2515859.05	602.27	602.22	FG077	875900	2515100	606.41	606.25	~~FS110~~	~~875602.53~~	~~2515501.28~~	~~600.48~~	
F1903	876329.43	2514603.68	626	625.67	F4001	876008.78	2515860.05	602.26	602.25	FG078	875900	2515200	605.51	605.22	~~FS111~~	~~875577.71~~	~~2515511.89~~	~~600.48~~	
~~F1904~~	~~876329.34~~	~~2514595.27~~	~~626~~		F4002	876009.56	2515897.72	614.83	614.51	FG079	875900	2515300	605.58	605.49	~~FS112~~	~~875947.17~~	~~2515860.87~~	~~602.12~~	
F1905	876329.28	2514590.18	630.5	630.5	F4003	876010.25	2515931.24	626	625.98	FG080	875900	2515400	605.64	605.6	~~FS113~~	~~875945.68~~	~~2515823.16~~	~~602.47~~	
F1906	876328.97	2514563.92	630.5	630.29	~~F4004~~	~~876010.42~~	~~2515939.65~~	~~626~~		FG081	875900	2515500	605.65	605.46	~~FS114~~	~~875967.35~~	~~2515822.86~~	~~602.4~~	
F1907	876328.77	2514546.64	625.56	627.34	F4005	876010.53	2515944.74	630.5	628.86	FG082	875900	2515600	604.71	604.66	~~FS115~~	~~875967.42~~	~~2515860.26~~	~~602.05~~	
F2000	876429.97	2514649.23	610.76	610.71	F4006	876011.07	2515970.99	630.5	630.36	FG083	875900	2515700	603.78	603.68	~~FS116~~	~~875951.06~~	~~2515854.77~~	~~600.11~~	
F2001	876429.96	2514648.23	610.76	610.76	F4007	876011.75	2516004.22	621.01	622.2	FG084	875900	2515800	602.85	602.69	~~FS117~~	~~875950.5~~	~~2515827.79~~	~~600.11~~	
F2002	876429.67	2514623.22	619.1	618.89	F4100	875908.78	2515861.03	602.25	602.25	FG085	875800	2514700	607.33	607.13	~~FS118~~	~~875962.86~~	~~2515827.53~~	~~600.11~~	
F2003	876429.43	2514602.52	626	625.81	F4101	875908.8	2515862.02	602.24	602.07	FG086	875800	2514800	606.46	606.37	~~FS119~~	~~875963.41~~	~~2515854.52~~	~~600.11~~	
~~F2004~~	~~876429.33~~	~~2514594.11~~	~~626~~		F4102	875909.58	2515899.7	614.8	614.56	FG087	875800	2514900	606.36	606.13	~~FS120~~	~~876465.47~~	~~2515854.18~~	~~603.45~~	
F2005	876429.27	2514589.03	630.5	630.43	F4103	875910.27	2515933.3	626	625.91	FG088	875800	2515000	606.83	606.62	~~FS121~~	~~876464.14~~	~~2515816.67~~	~~603.72~~	
F2006	876428.97	2514562.76	630.5	630.27	~~F4104~~	~~875910.44~~	~~2515941.71~~	~~626~~		FG089	875800	2515100	606.34	606.27	~~FS122~~	~~876485.31~~	~~2515818.53~~	~~603.58~~	
F2007	876428.78	2514546.31	625.8	627.27	F4105	875910.55	2515946.8	630.5	628.85	FG090	875800	2515200	605.35	605.2	~~FS123~~	~~876485.54~~	~~2515853.37~~	~~603.31~~	
F2100	876495.09	2514647.04	611.25	611.15	F4106	875911.09	2515973.06	630.5	630.03	FG091	875800	2515300	604.58	604.44	~~FS124~~	~~876469.34~~	~~2515848.11~~	~~601.45~~	
F2101	876495.08	2514646.04	611.25	611.22	F4107	875911.81	2516008.23	620.45	622.2	FG092	875800	2515400	604.65	604.5	~~FS125~~	~~876468.78~~	~~2515821.13~~	~~601.45~~	
F2102	876494.8	2514621.83	619.31	619.09	F4200	875808.82	2515864.03	602.56	602.37	FG093	875800	2515500	604.72	604.48	~~FS126~~	~~876481.14~~	~~2515828.87~~	~~601.45~~	
F2103	876494.57	2514601.77	626	625.7	F4201	875808.84	2515865.03	602.55	602.44	FG094	875800	2515600	604.78	604.66	~~FS127~~	~~876481.69~~	~~2515847.86~~	~~601.45~~	

NOTE: SEE OTHER PLAN SHEETS FOR LEGEND

TYPICAL POINT NUMBER LOCATION

FB 00 — GRID POINT NUMBER — FOUNDATION GRADE (BREAK POINT)

FS 00 — GRID POINT NUMBER — FOUNDATION GRADE (SUMP GRADING)

FG 00 — GRID POINT NUMBER — FOUNDATION GRADE

F 00 00 — POINT NUMBER (SEE POINT NUMBERING DETAIL) — CONTROL LINE NUMBER — FOUNDATION GRADE

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 ...

NOTES

REFERENCE DRAWINGS
C-10207 LANDFILL PLANS
C-10211 LANDFILL ACCEPTANCE PLANS
C-10212 GYPSUM STACK ACCEPTANCE PLANS
E-10850 SUBDRAINAGE POWER PLANS
E-10855 LEACHATE COLLECTION POWER PLANS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFT	DRAFTING CHK'D	ENGR APPROVAL SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	-	-	SKB	MWR	-	-	MWR	ISSUED FOR RECORD DRAWING

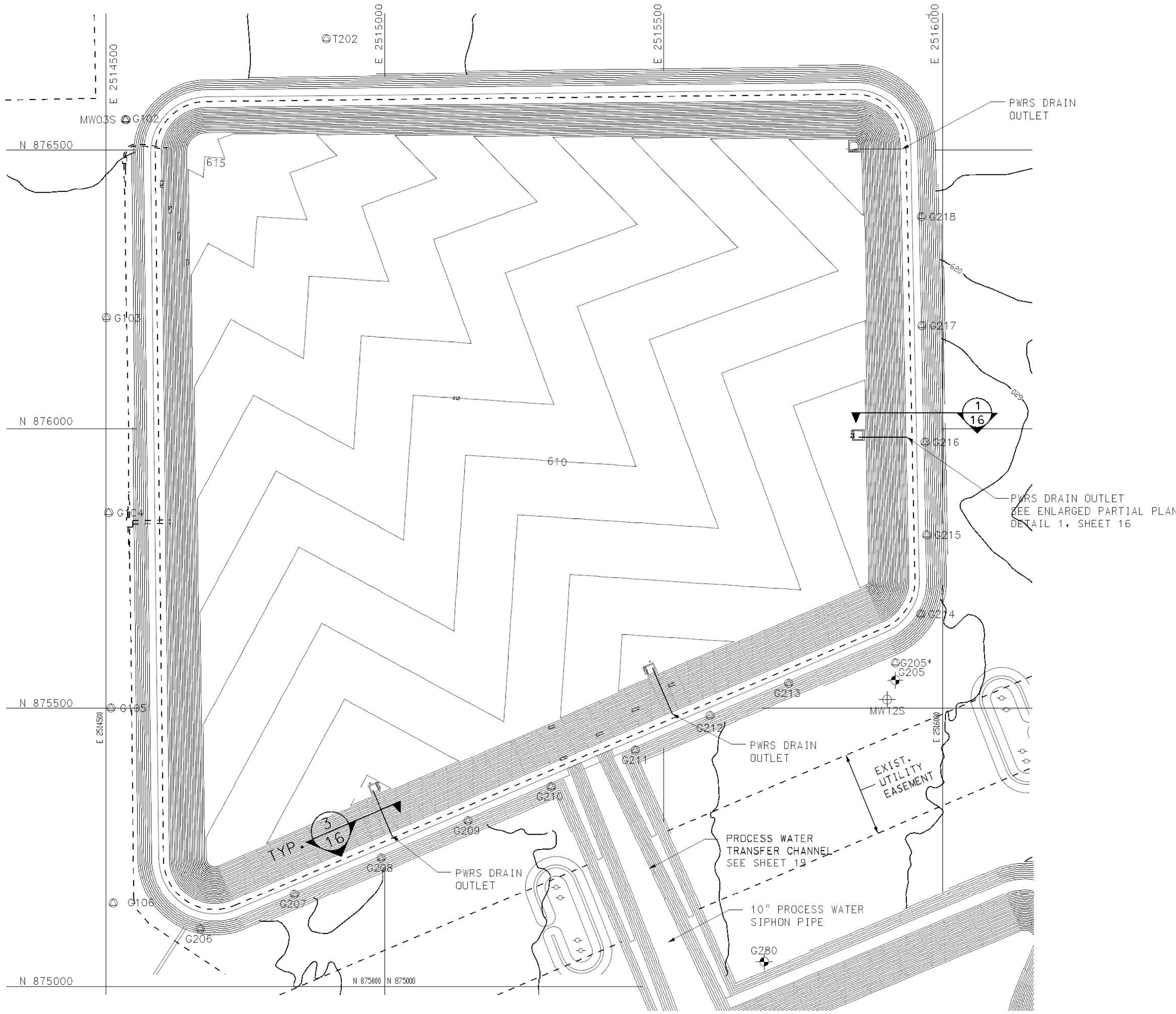
SCALE

CELL G1-FOUNDATION GRADE & CONTROL DATA

CCB MANAGEMENT FACILITY

SITE: COFFEEN

LOC. NO. | CLASS | Ameren Energy Generating | DRAWING NO. C-10206 | REV. 0 | SHEET NO. 10



-N-

0' 100' 200'

SCALE: 1" = 100'

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NOTES

REFERENCE DRAWINGS

C-10207 LANDFILL PLANS
C-10211 LANDFILL ACCEPTANCE PLANS
C-10212 GYPSUM STACK ACCEPTANCE PLANS
E-10850 SUBDRAINAGE POWER PLANS
E-10855 LEACHATE COLLECTION POWER PLANS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	-	-	SKB	MWR	-	-	MWR	ISSUED FOR RECORD DRAWING

SCALE

CELL G1-PROCESS WATER RECOVERY SYSTEM

CCB MANAGEMENT FACILITY

SITE: COFFEEN

LOC. NO.

CLASS

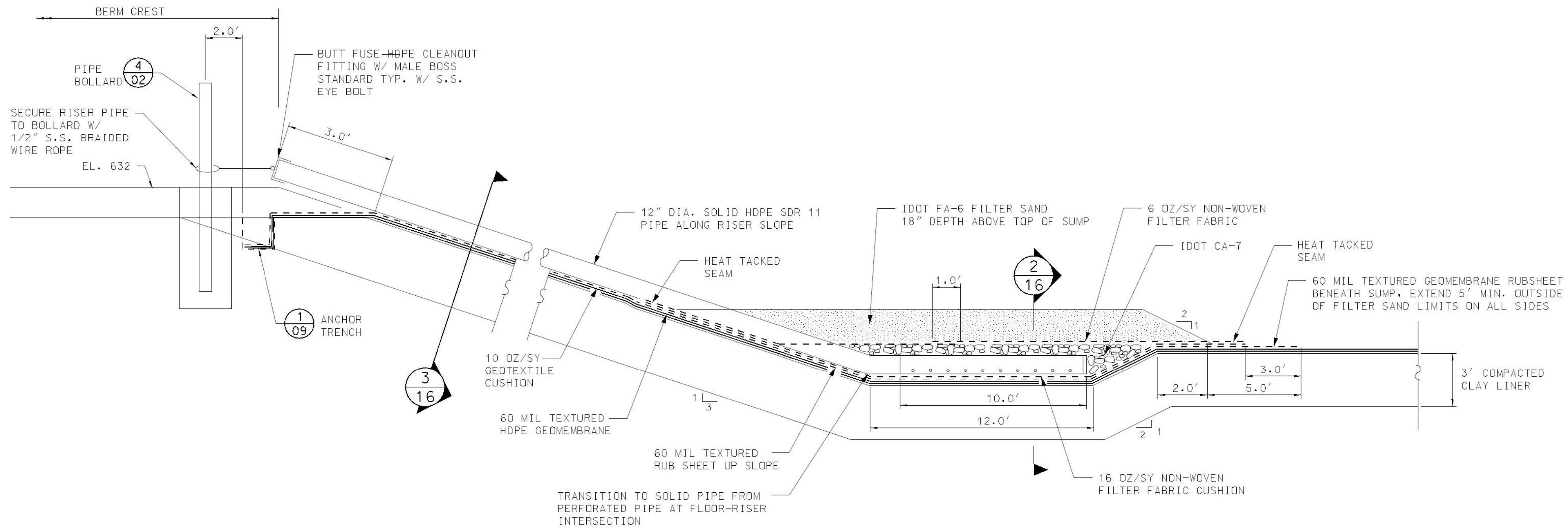
Ameren Energy Generating

DRAWING NO. C-10206

REV. 0

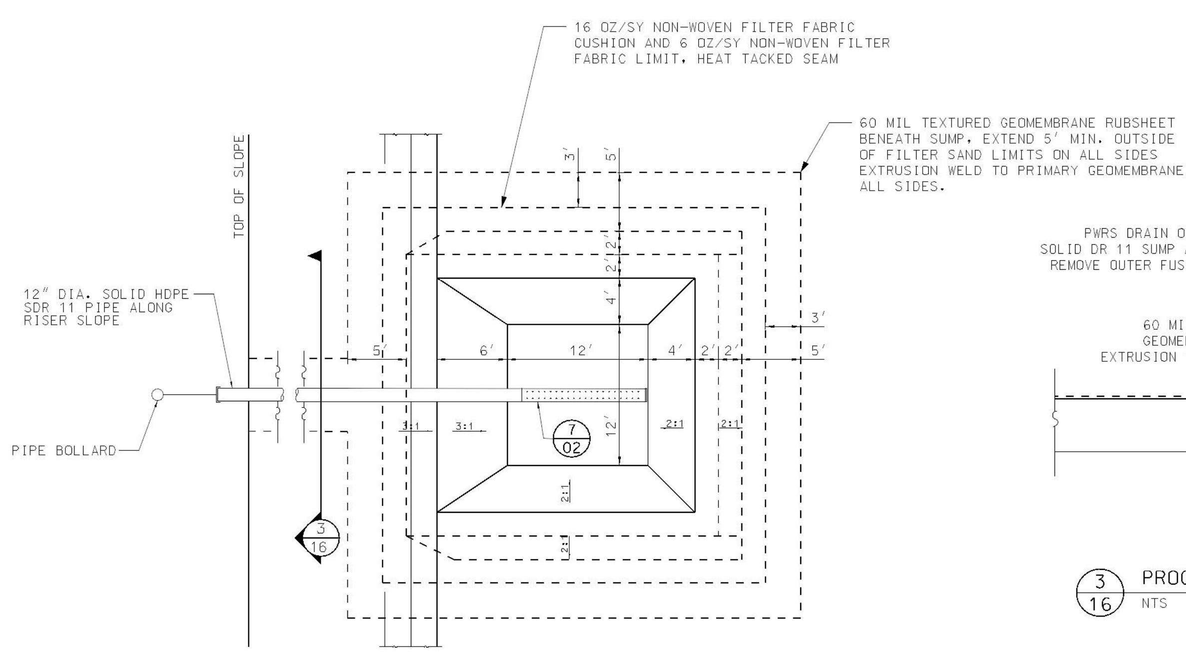
SHEET NO. 15

C-10206
SHEET NO. 15



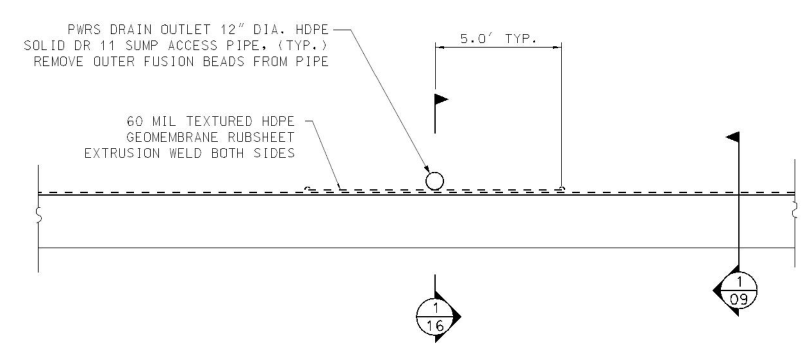
1/16 TYPICAL PROCESS WATER SUMP SECTION

NTS



2/16 PWRS SUMP PLAN

NTS



3/16 PROCESS WATER RECOVERY PIPE UP SIDESLOPE

NTS

NOTE:
ALL SIDE SLOPE PIPES TO BE SOLID WALL

NOTICE OF LIMITED RESPONSIBILITY

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NOTES

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C-10211 LANDFILL ACCEPTANCE PLANS
C-10212 GYPSUM STACK ACCEPTANCE PLANS
E-10850 SUBDRAINAGE POWER PLANS
E-10855 LEACHATE COLLECTION POWER PLANS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	–	–	SKB	MWR	–	–	MWR	ISSUED FOR RECORD DRAWING

SCALE
LOC. NO.
CLASS

CELL G1-PWRS DRAIN DETAILS

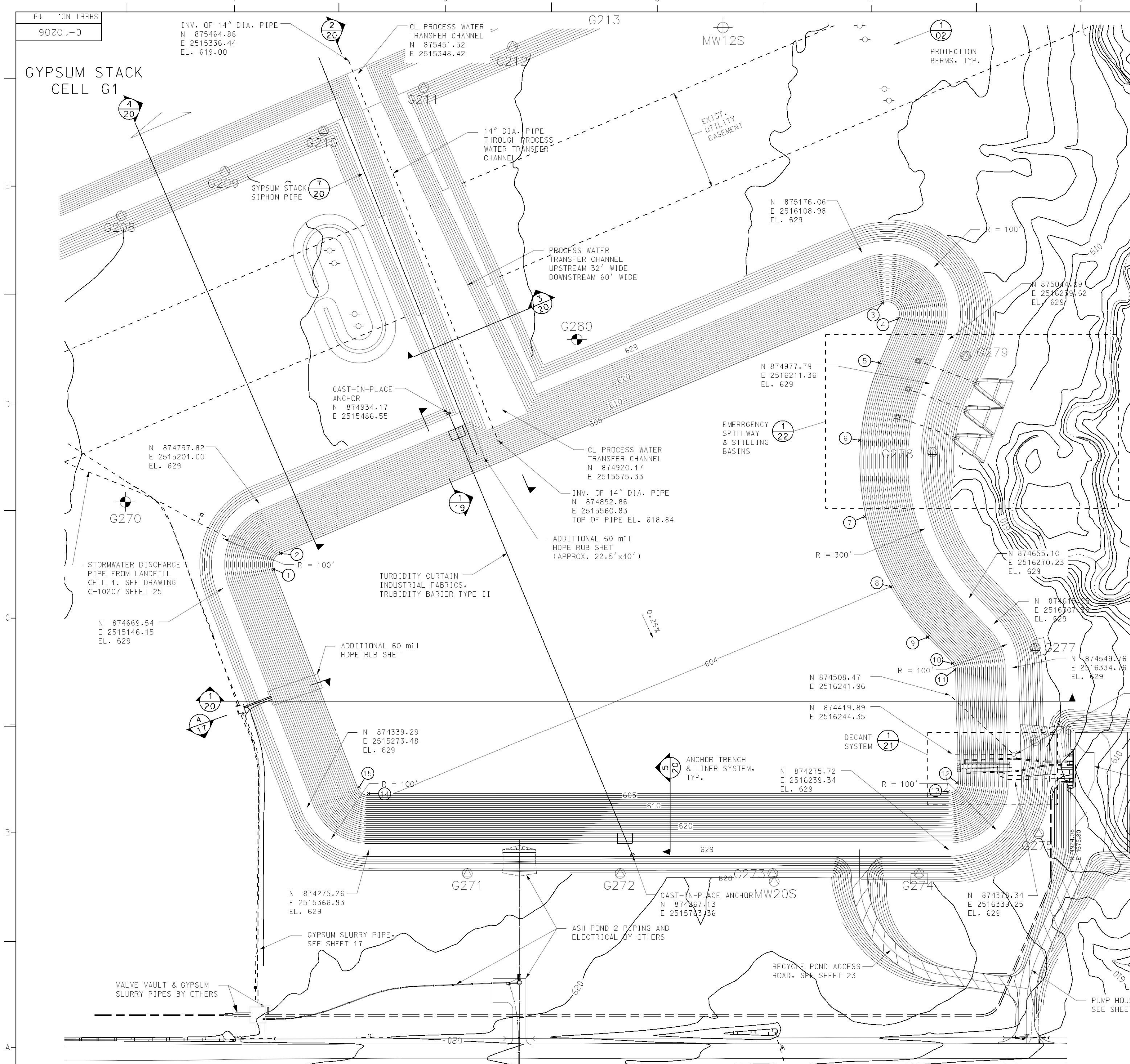
CCB MANAGEMENT FACILITY

SITE: COFFEEN

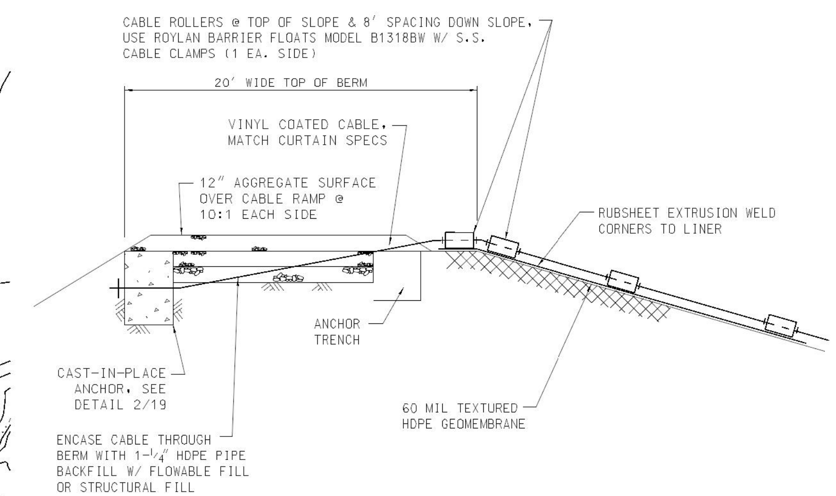
Ameren Energy Generating

DRAWING NO. C-10206 REV. 0

SHEET NO. 16

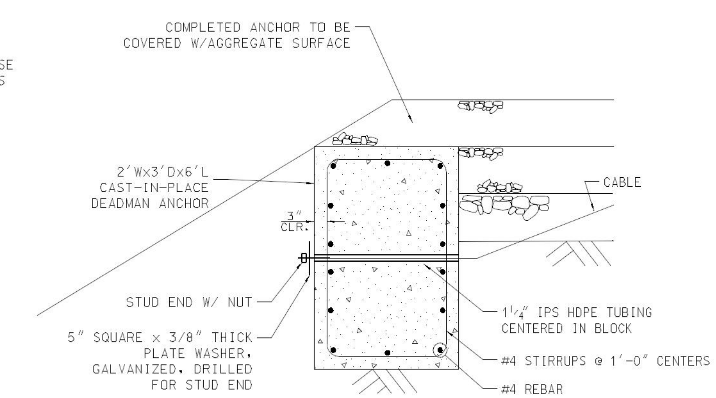


RECYCLE POND - INTERIOR TOE			
POINT	N	E	ELEV.
1	874706.97	2515227.14	605.24
2	874723.70	2515241.70	605.02
3	875095.89	2516132.29	605.05
4	875069.26	2516159.88	604.92
5	875005.90	2516132.91	604.95
6	874909.29	2516107.54	604.91
7	874811.81	2516106.37	604.65
8	874717.55	2516129.35	604.25
9	874633.41	2516175.61	604.17
10	874555.24	2516246.12	604.22
11	874549.81	2516248.01	604.07
12	874377.99	2516248.77	602.44
13	874365.11	2516237.06	604.00
14	874359.95	2515366.65	604.25
15	874372.65	2515351.72	604.49



1/19 TURBIDITY CURTAIN ANCHOR/CONNECTION
NTS

NOTE:
ALL CABLE CONNECTIONS SHALL BE 316 S.S.
WITH A STRENGTH RATING GREATER THAN CABLE.



2/19 CAST-IN-PLACE ANCHOR
NTS

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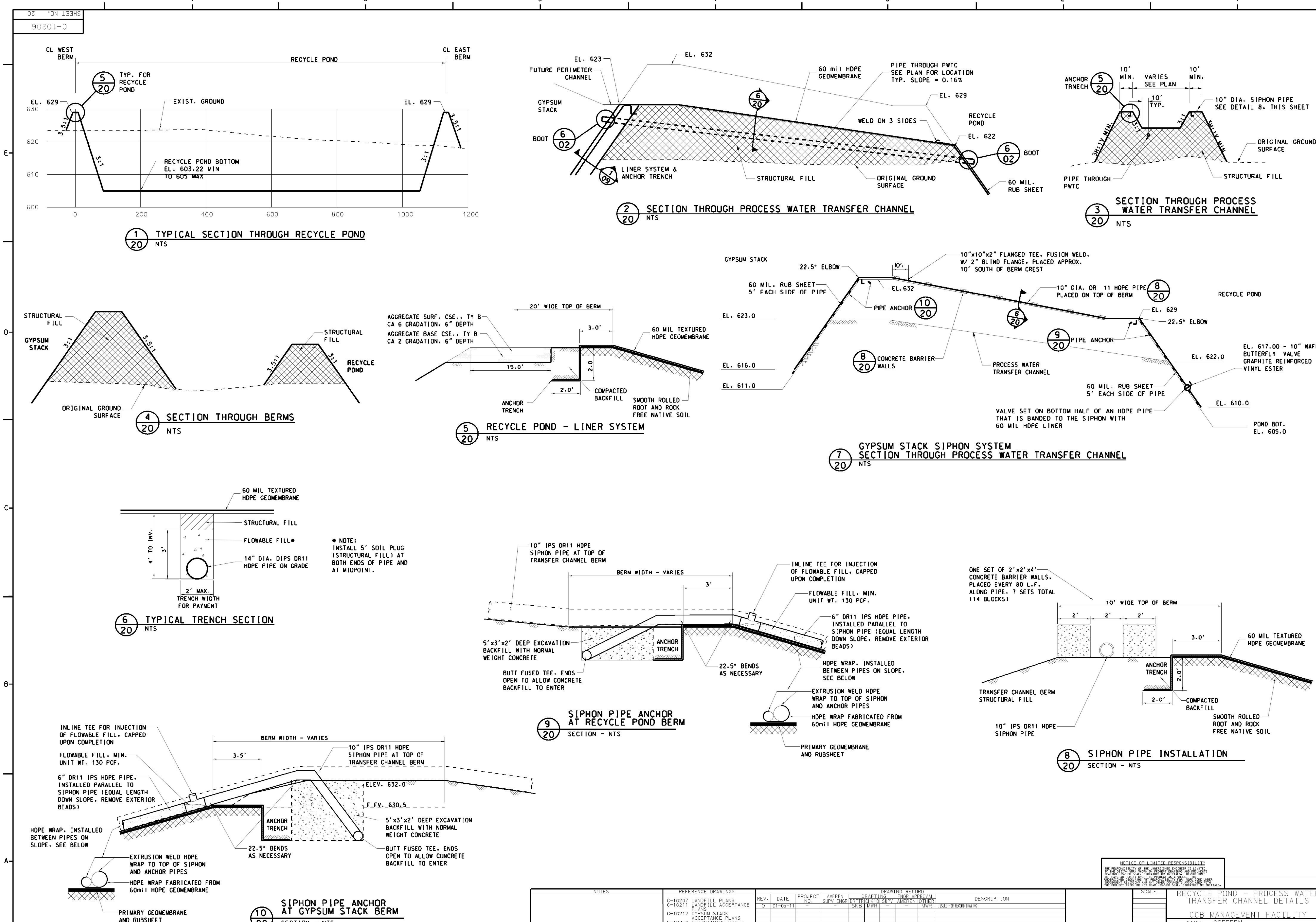
DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	-	-	SKB	MWR	-	-	MWR	ISSUED FOR RECORD DRAWING

SCALE
LOC. NO.
CLASS

RECYCLE POND PLAN & CONTROL DATA
CCB MANAGEMENT FACILITY
SITE: COFFEEN
Ameren Energy Generating
DRAWING NO. C-10206
REV. 0
SHEET NO. 19



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DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	-	-	SKB	MWR	-	-	MWR	ISSUED FOR RECORD DRAWING

SCALE

RECYCLE POND - PROCESS WATER TRANSFER CHANNEL DETAILS

CCB MANAGEMENT FACILITY

SITE: COFFEEN

LOC. NO.

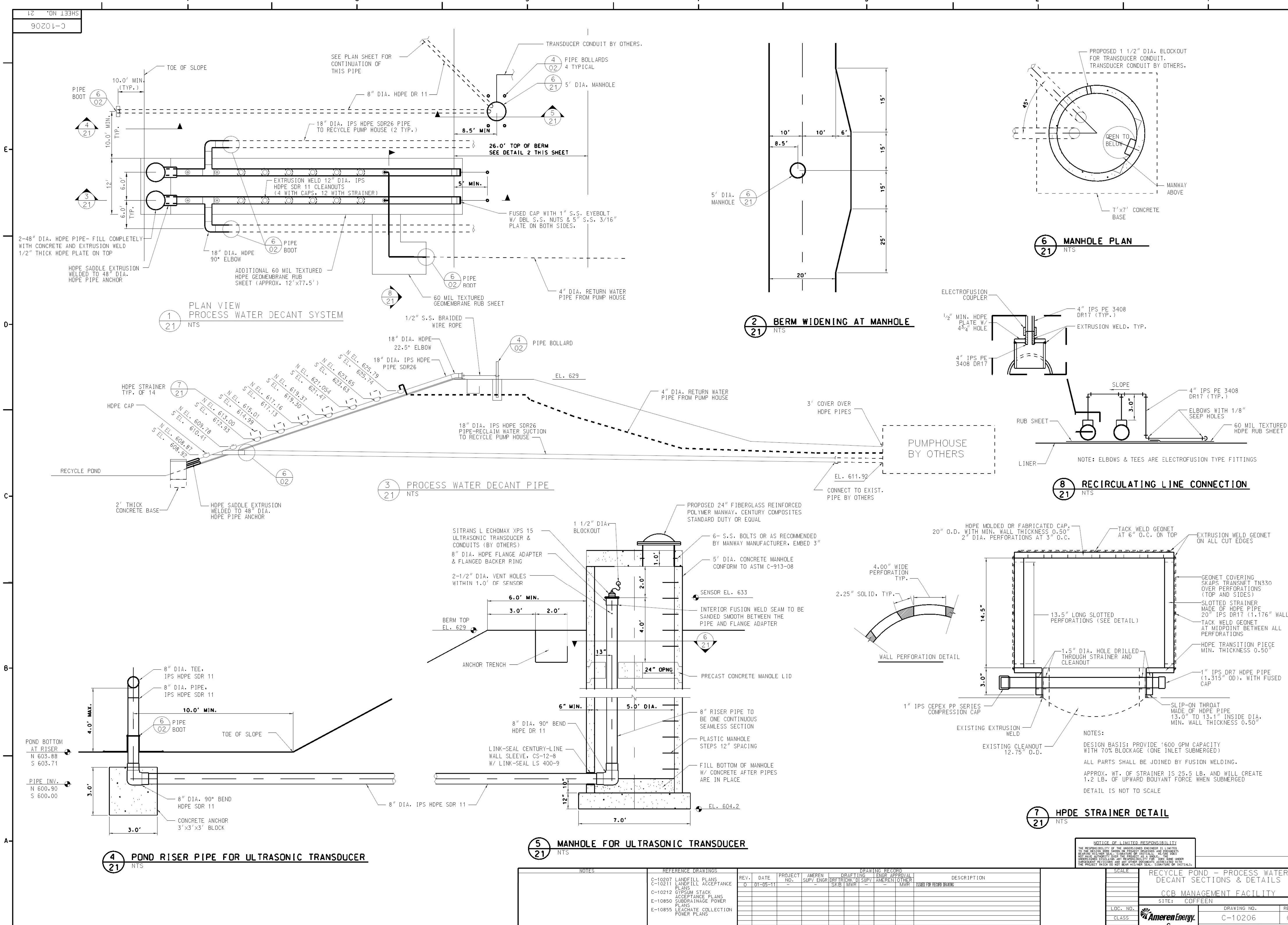
CLASS

Ameren Energy Generating

DRAWING NO. C-10206

REV. 0

SHEET NO. 20



PLAN VIEW
PROCESS WATER DECANT SYSTEM
1/21 NTS
TOE OF SLOPE
10.0' MIN. (TYP.)
PIPE BOOT 6/02
SEE PLAN SHEET FOR CONTINUATION OF THIS PIPE
8" DIA. HDPE DR 11
TRANSDUCER CONDUIT BY OTHERS.
4/02 PIPE BOLLARDS 4 TYPICAL
6/21 5' DIA. MANHOLE
18" DIA. IPS HDPE SDR26 PIPE TO RECYCLE PUMP HOUSE (2 TYP.)
8.5' MIN
26.0' TOP OF BERM SEE DETAIL 2 THIS SHEET
EXTRUSION WELD 12" DIA. IPS HDPE SDR 11 CLEANOUTS (4 WITH CAPS, 12 WITH STRAINER)
5' MIN.
FUSED CAP WITH 1" S.S. EYEBOLT W/ DBL S.S. NUTS & 5" S.S. 3/16" PLATE ON BOTH SIDES.
2-48" DIA. HDPE PIPE- FILL COMPLETELY WITH CONCRETE AND EXTRUSION WELD 1/2" THICK HDPE PLATE ON TOP
HDPE SADDLE EXTRUSION WELDED TO 48" DIA. HDPE PIPE ANCHOR
18" DIA. HDPE 90° ELBOW
ADDITIONAL 60 MIL TEXTURED HDPE GEOMEMBRANE RUB SHEET (APPROX. 12'x77.5')
60 MIL TEXTURED GEOMEMBRANE RUB SHEET
4" DIA. RETURN WATER PIPE FROM PUMP HOUSE
BERM WIDENING AT MANHOLE
2/21 NTS
10' 10' 6' 8.5' 15' 15' 15' 25' 20'
5' DIA. MANHOLE 6/21
PROPOSED 1 1/2" DIA. BLOCKOUT FOR TRANSDUCER CONDUIT. TRANSDUCER CONDUIT BY OTHERS.
45°
OPEN TO BELOW
MANWAY ABOVE
7'x7' CONCRETE BASE
MANHOLE PLAN
6/21 NTS
PROCESS WATER DECANT PIPE
3/21 NTS
1/2" S.S. BRAIDED WIRE ROPE
18" DIA. HDPE 22.5° ELBOW
18" DIA. IPS HDPE PIPE SDR26
4/02 PIPE BOLLARD
EL. 629
HDPE STRAINER TYP. OF 14 7/21
HDPE CAP
N EL. 625.79 S EL. 625.74
N EL. 623.65 S EL. 623.62
N EL. 621.054 S EL. 621.47
N EL. 619.37 S EL. 619.30
N EL. 617.16 S EL. 617.13
N EL. 615.01 S EL. 614.99
N EL. 613.00 S EL. 612.93
N EL. 609.78 S EL. 610.41
N EL. 608.87 S EL. 608.92
4" DIA. RETURN WATER PIPE FROM PUMP HOUSE
3' COVER OVER HDPE PIPES
18" DIA. IPS HDPE SDR26 PIPE-RECLAIM WATER SUCTION TO RECYCLE PUMP HOUSE
PUMPHOUSE BY OTHERS
EL. 611.92
CONNECT TO EXIST. PIPE BY OTHERS
RECYCLE POND
2' THICK CONCRETE BASE
HDPE SADDLE EXTRUSION WELDED TO 48" DIA. HDPE PIPE ANCHOR
ELECTROFUSION COUPLER
1/2" MIN. HDPE PLATE W/ 4 3/4" HOLE
4" IPS PE 3408 DR17 (TYP.)
EXTRUSION WELD, TYP.
4" IPS PE 3408 DR17
SLOPE
3.0'
4" IPS PE 3408 DR17 (TYP.)
ELBOWS WITH 1/8" SEEP HOLES
RUB SHEET
60 MIL TEXTURED HDPE RUB SHEET
LINER
NOTE: ELBOWS & TEES ARE ELECTROFUSION TYPE FITTINGS
RECIRCULATING LINE CONNECTION
8/21 NTS
SITRANS L ECHOMAX XPS 15 ULTRASONIC TRANSDUCER & CONDUITS (BY OTHERS)
8" DIA. HDPE FLANGE ADAPTER & FLANGED BACKER RING
2-1/2" DIA. VENT HOLES WITHIN 1.0' OF SENSOR
1 1/2" DIA. BLOCKOUT
PROPOSED 24" FIBERGLASS REINFORCED POLYMER MANWAY, CENTURY COMPOSITES STANDARD DUTY OR EQUAL
6- S.S. BOLTS OR AS RECOMMENDED BY MANWAY MANUFACTURER, EMBED 3"
5' DIA. CONCRETE MANHOLE CONFORM TO ASTM C-913-08
SENSOR EL. 633
INTERIOR FUSION WELD SEAM TO BE SANDED SMOOTH BETWEEN THE PIPE AND FLANGE ADAPTER
6.0' MIN. 3.0' 2.0'
BERM TOP EL. 629
ANCHOR TRENCH
13"
24" OPNG
PRECAST CONCRETE MANHOLE LID
6" MIN. 5.0' DIA.
8" RISER PIPE TO BE ONE CONTINUOUS SEAMLESS SECTION
8" DIA. 90° BEND HDPE DR 11
PLASTIC MANHOLE STEPS 12" SPACING
LINK-SEAL CENTURY-LINE WALL SLEEVE, CS-12-8 W/ LINK-SEAL LS 400-9
FILL BOTTOM OF MANHOLE W/ CONCRETE AFTER PIPES ARE IN PLACE
EL. 604.2
7.0'
MANHOLE FOR ULTRASONIC TRANSDUCER
5/21 NTS
8" DIA. TEE, IPS HDPE SDR 11
8" DIA. PIPE, IPS HDPE SDR 11
10.0' MIN.
4.0' MAX.
6/02 PIPE BOOT
TOE OF SLOPE
POND BOTTOM AT RISER N 603.88 S 603.71
PIPE INV. N 600.90 S 600.00
8" DIA. 90° BEND HDPE SDR 11
8" DIA. IPS HDPE SDR 11
CONCRETE ANCHOR 3'x3'x3' BLOCK
3.0'
POND RISER PIPE FOR ULTRASONIC TRANSDUCER
4/21 NTS
4.00" WIDE PERFORATION TYP.
2.25" SOLID, TYP.
WALL PERFORATION DETAIL
HDPE MOLDED OR FABRICATED CAP, 20" O.D. WITH MIN. WALL THICKNESS 0.50" 2" DIA. PERFORATIONS AT 3" O.C.
TACK WELD GEONET AT 6" O.C. ON TOP
EXTRUSION WELD GEONET ON ALL CUT EDGES
GEONET COVERING SKAPS TRANSNET TN330 OVER PERFORATIONS (TOP AND SIDES)
SLOTTED STRAINER MADE OF HDPE PIPE 20" IPS DR17 (1.176" WALL)
TACK WELD GEONET AT MIDPOINT BETWEEN ALL PERFORATIONS
13.5" LONG SLOTTED PERFORATIONS (SEE DETAIL)
14.5"
1.5" DIA. HOLE DRILLED THROUGH STRAINER AND CLEANOUT
HDPE TRANSITION PIECE MIN. THICKNESS 0.50"
1" IPS DR7 HDPE PIPE (1.315" OD), WITH FUSED CAP
1" IPS CEPEX PP SERIES COMPRESSION CAP
SLIP-ON THROAT MADE OF HDPE PIPE 20" IPS DR17 (1.176" WALL) 13.0" TO 13.1" INSIDE DIA. MIN. WALL THICKNESS 0.50"
EXISTING EXTRUSION WELD
EXISTING CLEANOUT 12.75" O.D.
NOTES:
DESIGN BASIS: PROVIDE 1600 GPM CAPACITY WITH 70% BLOCKAGE (ONE INLET SUBMERGED)
ALL PARTS SHALL BE JOINED BY FUSION WELDING.
APPROX. WT. OF STRAINER IS 25.5 LB. AND WILL CREATE 1.2 LB. OF UPWARD BOUYANT FORCE WHEN SUBMERGED
DETAIL IS NOT TO SCALE
HPDE STRAINER DETAIL
7/21 NTS
NOTICE OF LIMITED RESPONSIBILITY
REFERENCE DRAWINGS
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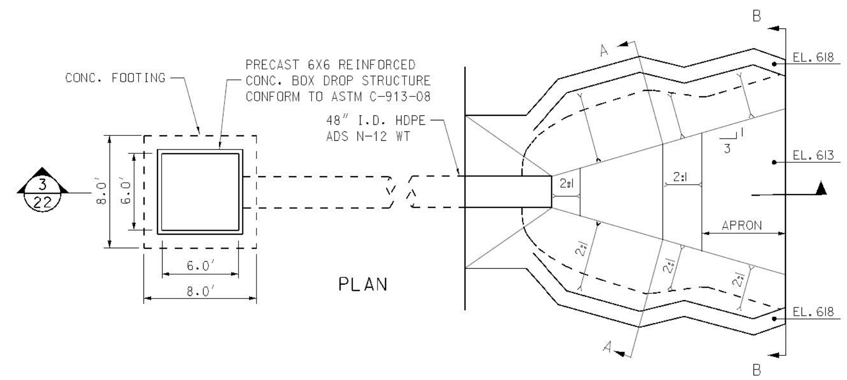
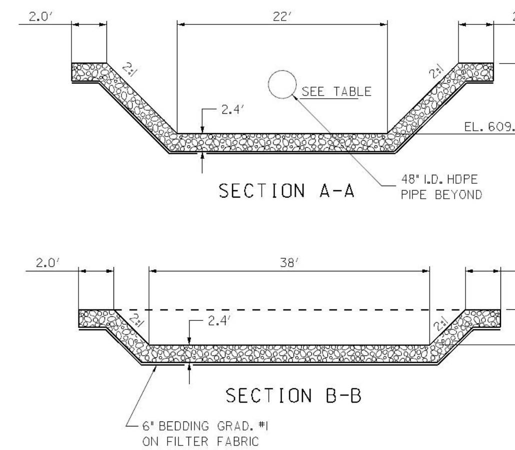
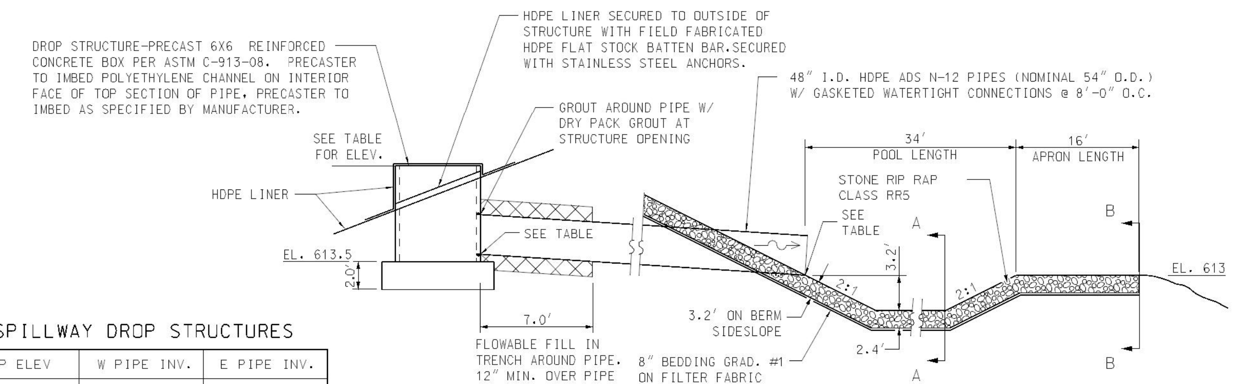
C-10212 GYPSUM STACK ACCEPTANCE PLANS
E-10850 SUBDRAINAGE POWER PLANS
E-10855 LEACHATE COLLECTION POWER PLANS
REV. 0 DATE 01-05-11 ISSUED FOR RECORD DRAWING
RECYCLE POND - PROCESS WATER DECANT SECTIONS & DETAILS
CCB MANAGEMENT FACILITY
SITE: COFFEEN
Ameren Energy Generating
DRAWING NO. C-10206 REV. 0
SHEET NO. 21

1/22 STILLING BASIN PLAN AT EMERGENCY SPILLWAY
NTS





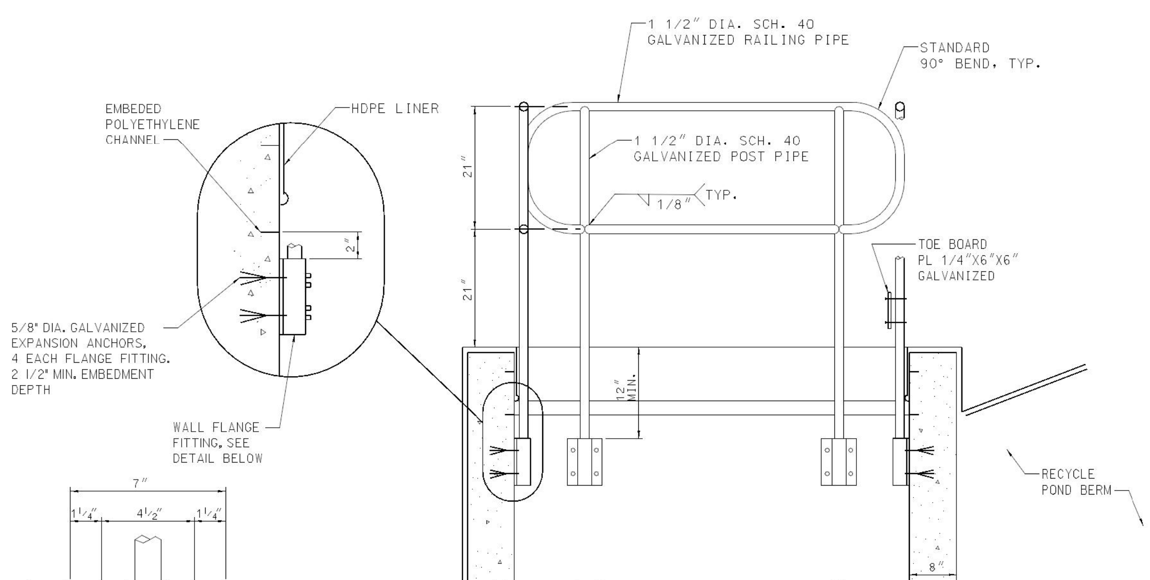
2/22 RIPRAP STILLING BASIN PLAN
NTS



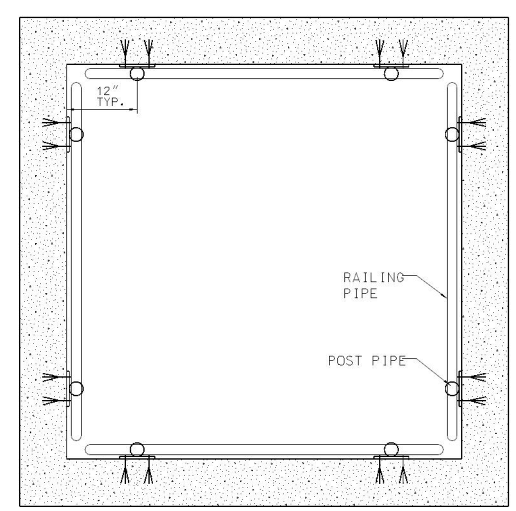
EMERGENCY SPILLWAY DROP STRUCTURES

STRUCTURE	TOP ELEV	W PIPE INV.	E PIPE INV.
NORTH	624.13	614.93	612.94
MIDDLE	624.15	614.95	613.00
SOUTH	624.11	614.03	613.06

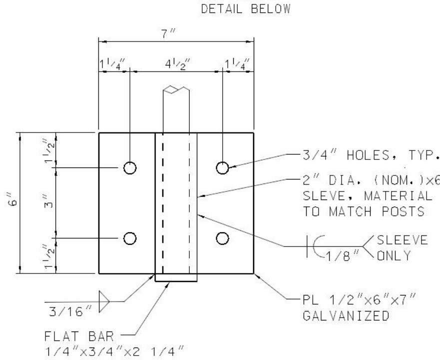
3/22 RIPRAP STILLING BASIN SECTION
NTS



4/22 DROP INLET HANDRAIL DETAIL
NTS



5/22 DROP INLET HANDRAIL PLAN
NTS



WALL FLANGE FITTING
NTS

HANDRAIL NOTES

GT-1 COPE ALL INTERSECTIONS OF RAILS AND POSTS, WELD JOINTS, AND GRIND SMOOTH TO A PLEASING APPEARANCE, TAKING CARE TO NOT REMOVE EXCESSIVE AMOUNT OF WELDED MATERIALS.

GT-2 BUTT WELD END-TO-END JOINTS, OR USE WELDING CONNECTIONS.

GT-3 CLEAN WELDED AREAS USING A WIRE BRUSH TO REMOVE SLAG AND LOOSE PARTICULATE. WIPE AWAY DUST WITH A CLEAN DRY RAG AND CLEAN THE WELDED SUFACE IN ACCORDANCE WITH SSPC-SP 1.

GT-4 TREAT ALL WELD ZONES WITH TWO COATS OF COLD GALVANIZING COMPOUND.

GT-5 COAT THE WELDED HANDRAIL ASSEMBLY PER THE FOLLOWING:
1 - 4 MIL COAT OF KRYLON INDUSTRIAL GALVANIZED METAL PRIMER
2 - 3 MIL COATS OF KRYLON INDUSTRIAL RUST TOUGH DTM ALKYD ENAMEL - COLOR: OHSA SAFETY YELLOW

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REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
0	01-05-11	-	-	SKB	MWR	-	-	MWR	ISSUED FOR RECORD DRAWING

SCALE

RECYCLE POND - EMERGENCY SPILLWAY SECTIONS & DETAILS

CCB MANAGEMENT FACILITY

SITE: COFFEEN

LOC. NO.
CLASS

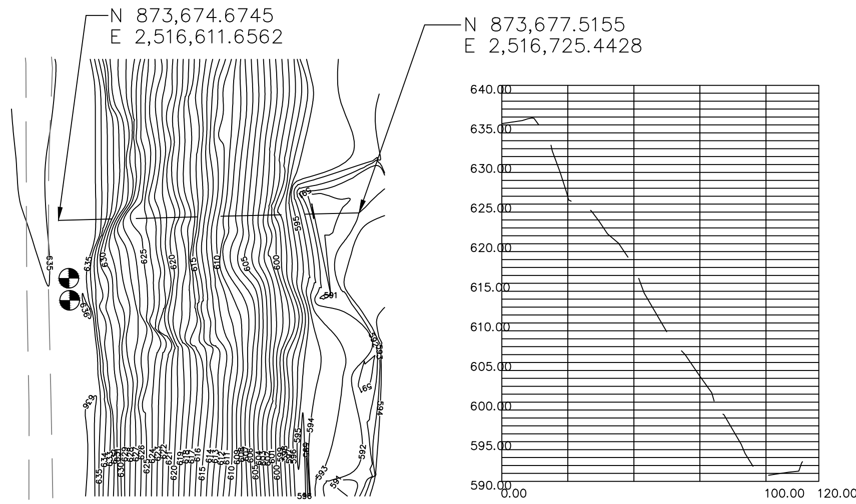
Ameren Energy Generating

DRAWING NO. C-10206 REV. 0

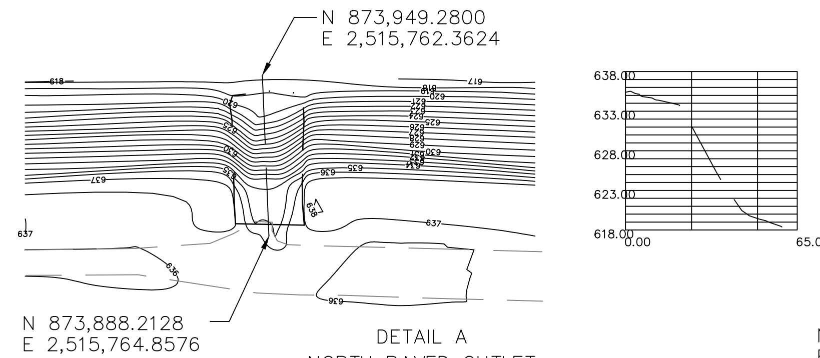
SHEET NO. 22

SHEET NO. ---

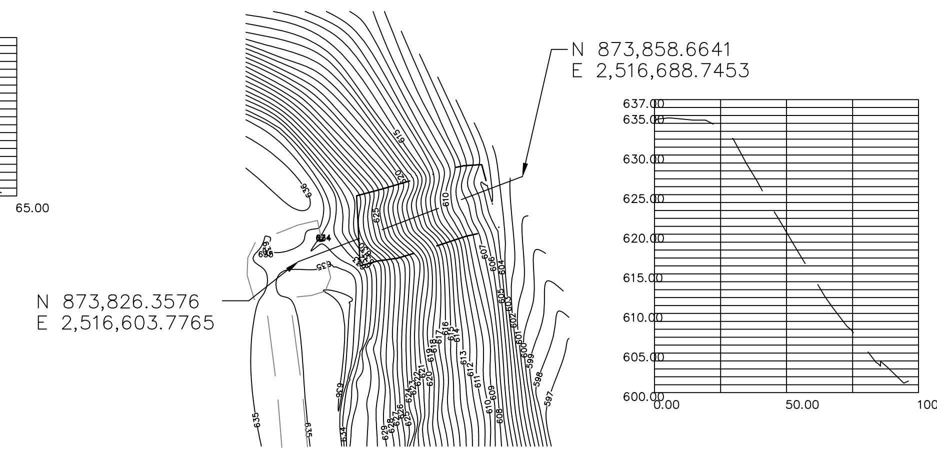
COFFEEN POWER STATION CLOSED ASH POND TOPO SURVEY



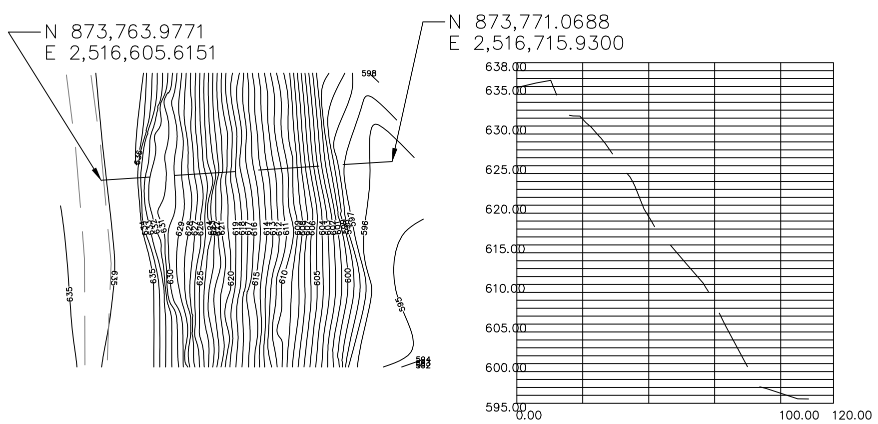
DETAIL G
EAST ERODED SLIDE AREA



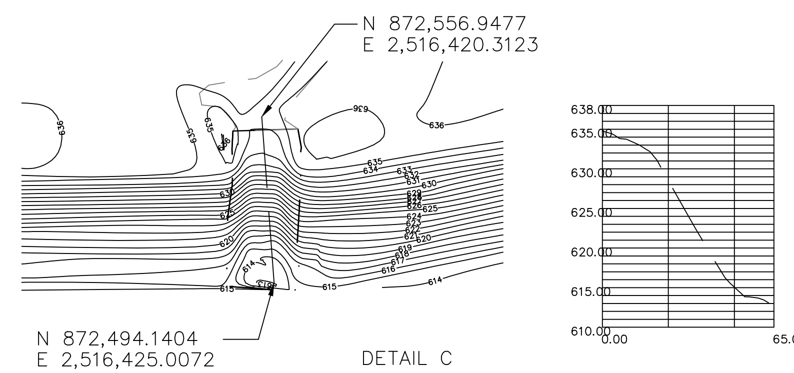
DETAIL A
NORTH PAVED OUTLET



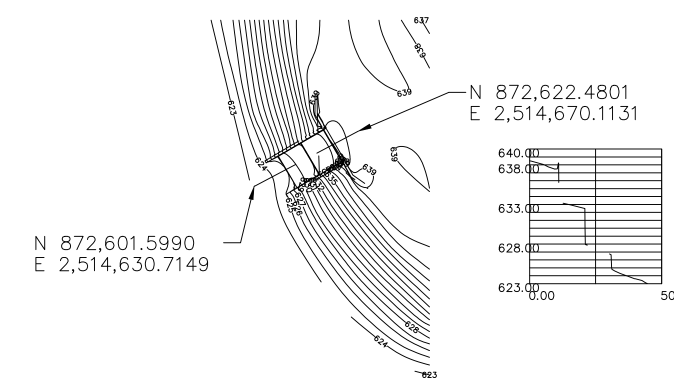
DETAIL B
NORTHEAST PAVED OUTLET



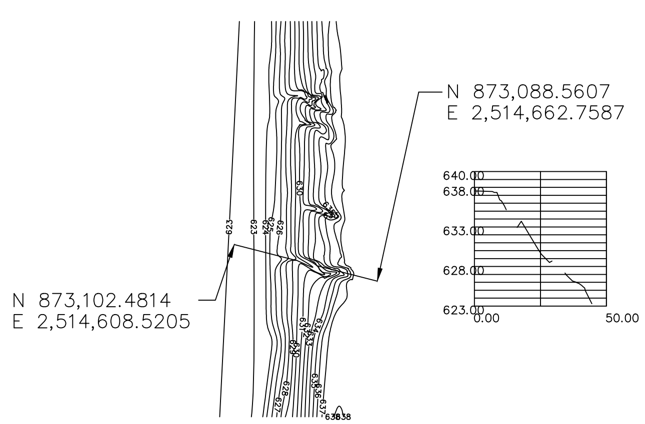
DETAIL H
NEW ERODED SLIDE AREA



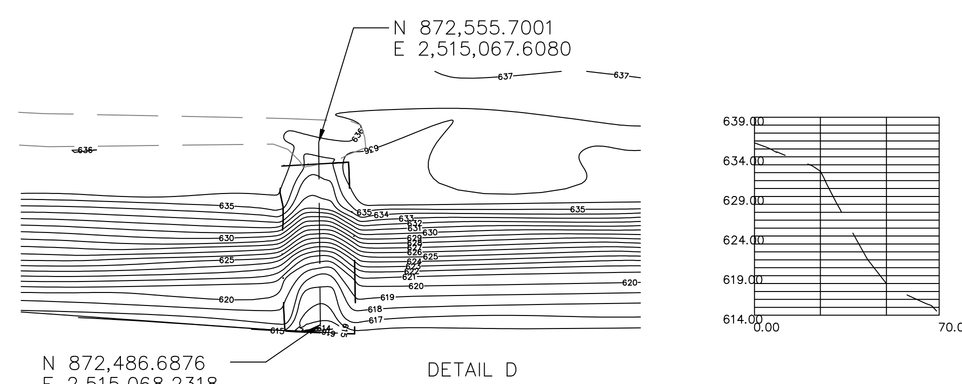
DETAIL C
SOUTHEAST PAVED OUTLET



DETAIL E**
CONCRETE DAM



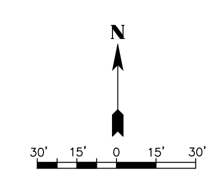
DETAIL F
WEST ERODED SLIDE AREA



DETAIL D
SOUTHWEST PAVED OUTLET

LEGEND

- GRAVEL DITCH EDGE
- PAVED OUTLET EDGE
- CROSS SECTION LINE
- PIEZOMETER



BASIS OF BEARINGS –
BEARINGS ARE BASED ON THE IL. STATE PLANE COORDINATE SYSTEM. NAD 1983 WEST ZONE.

McDonough–Whitlow, P.C.
Consulting Engineers & Land Surveyors
138 East Wood Street
Hillsboro, IL 62049
Phone: 217.532.9233
Fax: 217.532.6300
PROFESSIONAL DESIGN No. 184–002754

TONY HARD 2953 PROFESSIONAL LAND SURVEYOR STATE OF ILLINOIS HILLSBORO, ILLINOIS

(License Expires: 11/30/06)

THIS IS TO CERTIFY TO AMEREN ENERGEY THAT A TOPOGRAPHIC SURVEY SHOWN HEREON HAS BEEN PERFORMED BY ME OR UNDER MY SUPERVISION AND THIS PLAT IS A REPRESENTATION OF MY PROFESSIONAL OPINION OF SAID SURVEY.

ILLINOIS PROFESSIONAL LAND SURVEYOR NO. 035–2953 DATE

FIELD WORK FOR THIS SURVEY WAS COMPLETED ON MAY 28, 2009

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		–	–	–	–	–	–	–	–	–	–

AS BUILT

SCALE 1" = 30'

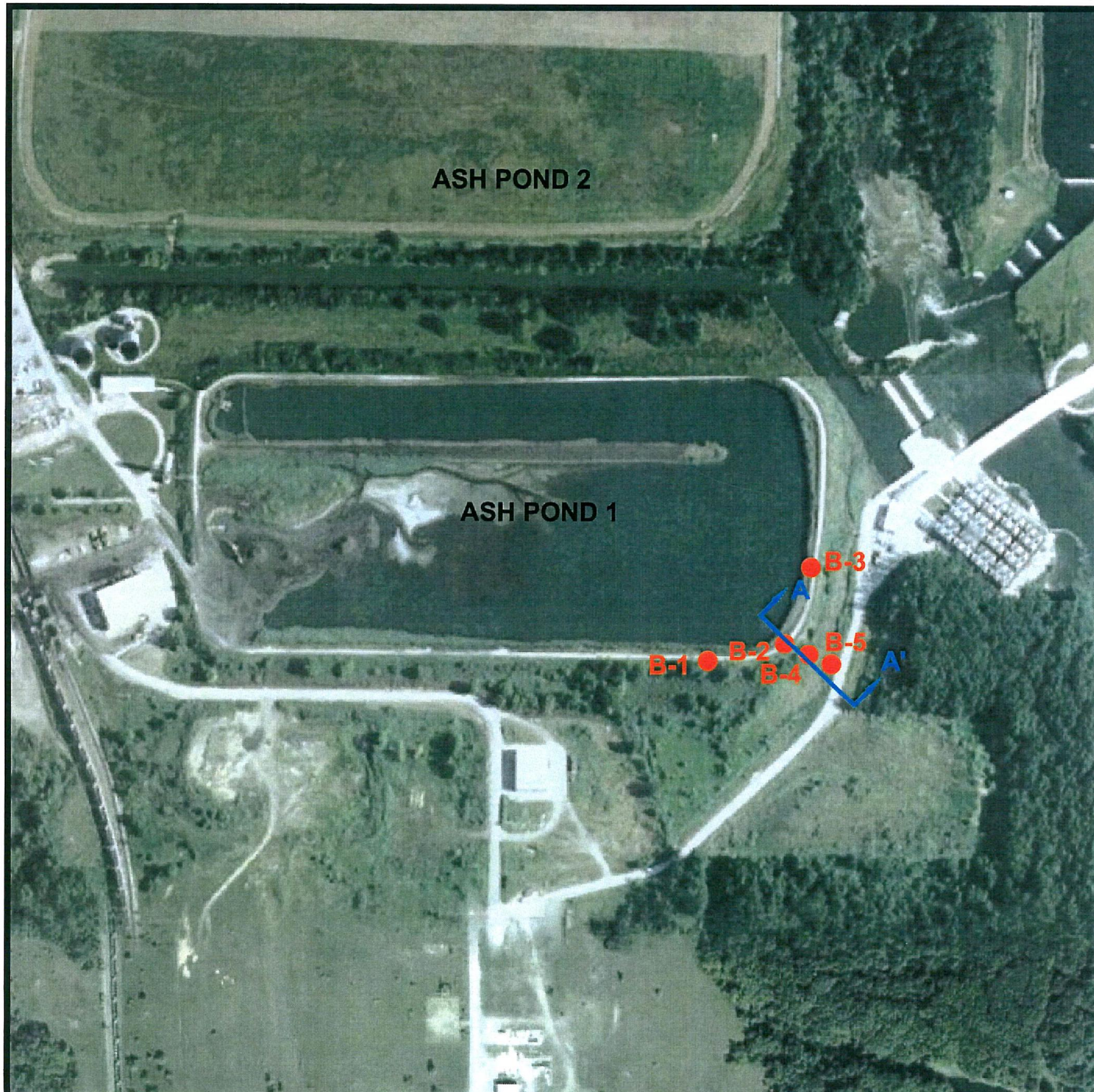
COFFEEN POWER STATION
ASH POND #2
DRAINAGE MODIFICATIONS

SITE: AMEREN CLOSED ASH POND

LOC. NO.		DRAWING NO.	REV.
–	AmerenEnergy Generating	W1008	--
CLASS –		SHEET NO. 2 OF 2	

AECOM

Appendix C: Coffeen Power Station Boring and Piezometer Locations



NOTES

1. Plan adapted from an aerial photograph courtesy of Google Earth.

LEGEND

- Boring Location
- Slope Stability Cross Section

0 200 400 800

SCALE IN FEET

N

Drawn By: SLC	Ck'd By: SL	App'vd By: DH
Date: 11-04-10	Date: 12/21/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Coffeen Power Station
Coffeen, Illinois

AERIAL PHOTOGRAPH OF SITE AND BORING LOCATIONS

Project Number J017150.01	PLATE 2

EXPLORATION METHOD
(B=BORING, C=CPT,
P=PIEZOMETER)

XXX-X###

ID NUMBER

STATION ABBREVIATION

SOURCE:
MAP PROVIDED BY GOOGLE EARTH PRO 2015

LEGEND

PIEZOMETER LOCATION

CCR UNIT BERM ALIGNMENT

0 200

APPROXIMATE SCALE FEET

N

Illinois Power Generating Company		PROJECT NO. 60440742
AECOM		
DRN. BY: djd October 2015 DSGN. BY: eg CHKD. BY: eg	Coffeen Ash Pond No.1 Piezometer Locations	FIG. NO. 2A

File: P:\PROJECTS\GEOTECH\60428794_DYNEGYCCR\04TASKS\00 PROGRAM TASKS\1.0 TASK 1 INITIAL UNIT ASSESSMENT\CCR FACT SHEETS\SITE MAPS\FIGURE 2A PIEZOMETER LOCATION PLAN (COFFEEN).DWG Last edited: NOV. 04, 15 @ 3:03 p.m. by: david_deguire

LEGEND

AECOM PIEZOMETER LOCATION

HISTORICAL PIEZOMETER LOCATION

CCR UNIT BERM ALIGNMENT

SOURCE:
MAP PROVIDED BY GOOGLE EARTH PRO 2015

0 200
APPROXIMATE SCALE FEET

N

Illinois Power Generating Company	PROJECT NO. 60440742
AECOM	
DRN. BY: djd October 2015 DSGN. BY: eg CHKD. BY: eg	Coffeen Ash Pond No.2 Piezometer Locations
FIG. NO.	2B

File: P:\PROJECTS\GEOTECH\60428794_DYNEGYCCR\04TASKS\00 PROGRAM TASKS\1.0 TASK 1 INITIAL UNIT ASSESSMENT\CCR FACT SHEETS\SITE MAPS\FIGURE 2A PIEZOMETER LOCATION PLAN (COFFEEN).DWG Last edited: NOV. 04, 15 @ 3:03 p.m. by: david_deguire

Appendix D: Project Specifications, Gypsum Stack and Recycle Pond Construction (Hanson 2008)

PROJECT SPECIFICATIONS
GYPSUM STACK AND RECYCLE POND CONSTRUCTION
GYPSUM MANAGEMENT FACILITY
COFFEEN POWER STATION
MONTGOMERY COUNTY, ILLINOIS

Prepared For:

AMEREN ENERGY GENERATING COMPANY

Prepared By:

HANSON PROFESSIONAL SERVICES INC.
1525 South Sixth Street
Springfield, Illinois 62703

January 2008

GYPSUM STACK AND RECYCLE POND CONSTRUCTION
GYPSUM MANAGEMENT FACILITY
COFFEEN POWER STATION
MONTGOMERY COUNTY, ILLINOIS

TABLE OF CONTENTS

PART 1. GENERAL

1.01 DESCRIPTION

A. This section pertains to the construction and maintenance of temporary erosion control systems to control erosion and sediment damage to adjacent properties and water resources, and the removal of erosion control devices when they are no longer required.

1.02 RELATED SECTIONS

The following sections contain items which are related to the work in this section:

02936 - Topsoil, Seeding, and Mulching.

1.03 REFERENCES

The following reference, or cited portions thereof, governs the work:

Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.

1.04 SUBMITTALS

A. Submittals shall follow the provisions of Section 01010.

B. Preconstruction Submittals: A storm water best management practices (BMP) plan shall be submitted that includes the following items:

1. Site drawing showing anticipated locations of structural erosion controls, areas of disturbed soils, and drainage patterns;
2. Inspection and record-keeping procedures; and
3. Maintenance procedures for erosion controls.

PART 2. PRODUCTS

2.01 EROSION CONTROL SYSTEMS

Materials for erosion control systems shall be in accordance with Article 280.02 of the IDOT Standard Specifications.

PART 3. EXECUTION

3.01 EXAMINATION

The site shall be examined to determine the extent of work required.

3.02 PRECONSTRUCTION JOBSITE INSPECTION

A. The person who shall be at the jobsite during construction and who shall be responsible for insuring that erosion control work is completed in a timely manner shall be identified at the preconstruction meeting.

B. A jobsite inspection shall be conducted with the Owner's Representative to review and designate the locations and types of erosion protection to be placed. The inspection shall be scheduled at the preconstruction conference and carried out on the job site before beginning any work that will disturb existing drainage or potentially create erodible conditions.

3.03 CONSTRUCTION

A. Temporary erosion control systems shall be constructed in accordance with IDOT Standard 280001 and Article 280.04 of the Standard Specifications and as directed by the Owner's Representative. Erosion control devices shall be in place and approved by the Owner's Representative prior to beginning other work.

B. Incorporate permanent erosion control features into the project at the earliest practicable time to minimize the need for temporary erosion controls.

3.04 MAINTENANCE

A. Temporary erosion control systems shall be maintained in accordance with Article 280.05 of the Standard Specifications, except that measurement and payment provisions shall not apply.

B. Temporary erosion control systems for unprotected disturbed areas shall be cleaned of trapped sediment and repaired immediately prior to project close out.

C. Temporary seeding shall be applied to all disturbed areas except the gypsum stack excavation and the future fill and topsoil stockpiles.

3.05 REMOVAL AND DISPOSAL

When the Owner's Representative deems that temporary erosion control systems are no longer needed, they shall be removed and properly disposed, and silt deposits shall be removed or regarded as directed by the Owner's Representative, and the area seeded. Non-biodegradable temporary erosion control materials shall be disposed of off site. Biodegradable erosion control devices may be disposed of in spoil areas designated by the Owner's Representative. All laws and regulations in disposing of the materials shall be obeyed.

END OF SECTION 01356

I:\05jobs\05s3004A\Gypsum Stacking\IDNR Dam Safety Permit Application\Specs\S01356_Storm Water Pollution Prevention Measures.doc

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to stripping of topsoil and vegetation from areas of the site that are to be excavated.

1.02 RELATED SECTIONS

No related sections.

PART 2. PRODUCTS

No products used.

PART 3. EXECUTION

3.01 EXAMINATION

The Contractor shall examine the site to determine the extent of work required.

3.02 SITE PREPARATION - STRIPPING

A. All vegetation and topsoil encountered within the Gypsum Stack grading limits shall be stripped. Topsoil shall be kept clean and free of all foreign material, and stored in separate stockpiles from vegetation and common excavations. Stockpiles shall be located as indicated on the drawings or as directed by the Owner's Representative.

B. Payment for stripping shall be based upon removal of 24 inches of topsoil in areas that require stripping.

3.03 DISPOSAL

All materials resulting from site preparation operations shall be stockpiled in the designated spoil area. Contractor shall obey all laws and regulations when disposing of the materials.

END OF SECTION 02100

I:\03jobs\03s5010\Gypsum Stack\Specs\Gypsum Mangement Facility\Pre-Final Specs\S02100_Site Preparation.doc

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to excavation, fill, and backfill required for foundation preparation, construction of low-permeability soil layer, anchor trench construction, miscellaneous site grading and berm construction.

1.02 RELATED SECTIONS

A. The following sections contain items which are related to the work in this section:

1. 01356 – Storm Water Pollution Prevention Measures
2. 02100 - Site Preparation
3. 02373 – Geotextiles
4. 02936 - Topsoil, Seeding, and Mulching

1.03 REFERENCES

The following references, or cited portions thereof, govern the work:

1. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007
2. Department of Sustainable Natural Resources, Soil Survey Standard Test Method, Unified Soil Classification System: Field Method (USCS).

1.04 MEASUREMENT AND PAYMENT

A. The Contractor shall be responsible for estimating the extent of excavation and fill required to complete the work, including, but not limited to, excavation to required elevations; loading, transporting, placing, and compacting low permeability soil; excavation and backfill of anchor trench; and miscellaneous site grading and berm construction. The Contractor shall include the dollar amount associated with all earthwork in his Lump Sum Bid amount.

B. Removal and replacement of unsuitable foundation material and subgrade stabilization measures directed by the Owner's Representative will be paid for on a time and material basis.

1.06 COORDINATION

Existing utilities or other plant facilities shall not be interrupted, except when permitted in writing by the Owner's Representative and then only after acceptable temporary services have been provided. A minimum 48-hour notice shall be provided prior to proceeding with an approved temporary interruption.

1.08 SUBMITTALS

A. Materials Handling Plan.

A materials handling plan shall be submitted for construction and protection of the low permeability soil liner. The plan shall describe the following:

1. Processing and placement of the low permeability soil type, model number, weight, and critical dimensions of equipment to be used for soil processing, compaction, scarification, and smooth rolling;
2. Method of protecting low permeability soil from changes in moisture content and freezing after placement.

B. Construction Access Ramp Layout.

Layout drawings shall be submitted showing alignment, profile, and typical section of the construction access ramps from the haul road into the bottom of the Gypsum Management Facility excavation. The minimum width of the ramp shall be 50 ft., and the longitudinal grade shall not exceed 8 percent.

PART 2. PRODUCTS

2.01 MATERIALS

A. Earth Fill Material

Earth Fill Material shall consist of a mixture of clay, silt, sand, and gravel-sized particles obtained from previously constructed subsoil stockpiles. These materials can be used separately or mixed as required for best results. When placed, Embankment Material shall have a USCS classification of SM, ML, or CL and shall be uniform. This material shall be free of ice, snow, organic matter, rubbish, and debris. Coarse-grained particles shall be well dispersed to prevent the development of segregated pockets or zones with insufficient fine material to fill the interstices.

B. Soil Liners

The Soil Liner for the Gypsum Management Facility is considered a Clay Liner, and shall be soil classification CL, CL-ML, or CH. The material shall be free of roots, debris, organic or frozen material, and shall have a maximum clod size no greater than the length of the compactor foot for the compaction equipment proposed by the Contractor. When compacted, the material shall have a hydraulic conductivity of less than 1×10^{-4} cm/sec.

C. Soil Stabilizers and Moisture Conditioning Agents

Additives to accelerate drying or to improve stability and workability of soil shall not be permitted unless approved in writing by the Owner's Representative.

2.02 EQUIPMENT

A. Compaction Equipment

1. Tamping foot rollers

Compaction equipment shall consist of tamping foot rollers which have a minimum weight of 40,000 pounds. At least one tamping foot shall be provided for each 110 square in. of drum surface. The length of each tamping foot, measured from the outside surface of the drum, shall be at least 1 in. longer than the loose lift thickness.

2. Steel-Wheeled Rollers

Equipment used to produce a smooth compacted surface shall be a smooth, non-vibratory steel wheeled roller weighing not less than 1,000 lb. per lineal ft.

B. Scarification Equipment

Discs, rotor tillers, or other equipment used to scarify the surface shall be capable of uniformly disturbing the upper 6 in. of surface to provide good bonding between lifts.

C. Mixing and Spreading Equipment

Discs, harrows, and motor graders or other similar equipment shall be available at the site for use in spreading, mixing, and drying Compacted Subsoil Stockpile Material.

PART 3. EXECUTION

3.01 PREPARATION

A. Control of Work

Benchmarks, monuments, and other reference points shall be maintained throughout the work area.

B. Utility Location

Before starting excavation, the location and extent of underground utilities in the work area shall be established.

3.02 EXCAVATION

A. General

Excavation consists of removal and redistribution of material encountered when establishing required grade and subgrade elevations. The Contractor shall be responsible for dewatering, protection, shoring, and disposal of excavated materials as necessary to complete the excavation.

B. Procedures

Excavation may be accomplished by any method and by use of any equipment that is suitable to the work, except that blasting will not be permitted. Based on previous construction experience at the site, it is recommended that excavation to the foundation grade be completed as far in advance of low permeability soil placement as possible to allow the foundation surface to dry and form a "crust" capable of sustaining compactive effort.

C. Overexcavation

All excavation shall be performed to the lines and grades indicated on the plans. Any overexcavation or excess excavation not requested by the Owner's Representative shall be at the expense of the Contractor.

D. Disposal of Excavated Materials

Contractor shall utilize excavated material as stockpile materials for future use as specified in paragraph E.

E. Stockpile Requirements

1. Excavated clay and silty clay materials are to be stockpiled in the short-term subsoil stockpile area.
2. Excess excavated materials are to be stockpile in the areas designated on the drawings.
3. Materials not suitable for use as fill or backfill shall be disposed of onsite in the locations specified by the Owner's Representative.
4. Spread fill material for use by others, topsoil, and low permeability soil are to be stockpiled in layers not to exceed 1 ft loose thickness.
5. Tops of stockpiles are to be graded to ensure positive drainage. Side slopes for stockpiles shall be no steeper than 3H:1V.
6. Perimeter ditches are to be excavated to intercept runoff flowing toward stockpile areas and to route it to outlet locations approved by the Owner's Representative.

3.03 SUBGRADE PREPARATION

A. Areas to receive fill shall be proof rolled under the observation of the Owner's Representative. Soft, loose, weak, or wet materials shall be removed and replaced with compacted fill or stabilized with geotechnical fabric or geogrid as directed by the Owner's Representative. Joints, fractures, and moisture seeps shall be repaired, and local sand deposits, if present at foundation grade, shall be removed and backfilled with compacted fill material as directed by the Owner's Representative.

B. The Owner's Representative may recommend additional drying time for soft, wet subgrade that has not been exposed long enough to permit "crust" formation. If approved by the Owner's Representative, the Contractor may install, at his own expense, geotechnical fabric or geogrid to stabilize the wet subgrade and expedite construction.

C. No fill shall be placed until the subgrade has been examined and approved.

3.04 GENERAL FILL

A. Placement

1. Unless otherwise indicated on the plans, all fill shall be composed of Earth Fill Material.
2. Fill materials used in embankment construction shall normally be placed in lanes parallel to the embankment axis and shall be placed in conformance with the lines, grades, and slopes as indicated on the plans. Placement of fill materials in lanes which are not parallel to the embankment will be allowed only where working room is too restricted for normal placement as determined by the Owner's Representative.
3. Fill shall be spread in approximately flat layers in such a manner as to obtain lifts of relatively uniform thickness without spaces between successively deposited loads. Segregation shall be prevented during placing and spreading. Hauling equipment shall be routed across the fill in such a way as to promote uniform compaction and to prevent the formation of ruts.
4. The maximum compacted thickness of each lift shall not exceed 8 in. where heavy compaction equipment will be used. The maximum compacted thickness shall not exceed 3 in. where power tampers or similar smaller equipment will be used. It may be necessary to reduce the thickness of lifts in order to obtain the required minimum density.
5. Where compacted earth fill is to be placed against existing slopes, each lift shall be keyed into existing slope by removing existing slope material in steps as each new lift is placed.
6. The surface of the fill shall be kept reasonably smooth. The fill surface shall be sloped transverse to the axis of the embankments to allow drainage. If the compacted surface is, in the opinion of the Owner's Representative, too smooth or too dry to bond properly with the

succeeding lift, it shall be roughened by scarifying, light discing, or other acceptable means, and it shall be sprinkled before the succeeding lift is placed thereon. If the surface becomes rutted or uneven subsequent to compaction, it shall be flattened and leveled before placing the next lift. This extra work shall be at the Contractor's expense.

7. Fill operations shall be suspended during periods of extended wet weather. Upon resuming operations, all fill materials that are excessively wet or soft shall be reprocessed in place or removed and stockpiled for reprocessing. The removal of soft material shall be carried to such depth as is necessary to expose firm materials. Fill shall not be placed on frozen surfaces.
8. When filling operations at any section will be suspended for any period in excess of 12 hours or in wet weather, the surface of the fill shall be rolled smooth to seal it against excessive absorption of moisture and to facilitate runoff. Prior to resuming fill placement and compaction, the fill surface shall be scarified and/or disced and moisture conditioned as required.
9. The Contractor will receive no additional compensation for any removal, reprocessing, stockpiling, recompaction, wasting, or similar operation related to suspensions or conditions due to weather or other causes unless caused by the Owner.
10. Earth fill access ramps shall not be constructed within the limits of the compacted embankments without prior approval. When such ramps are approved, they shall be constructed of low permeability soil (in-board of the perimeter berm) or compacted fill (out-board of the perimeter berm).

B. Compaction -

1. Fill materials shall be compacted to a dry density equal to or greater than the following:

   a. The Gypsum Management Facility: 95 percent of the maximum dry density obtained from the Standard Proctor Test, ASTM D698.

   In order to insure uniform coverage and to facilitate construction inspection and control, the compaction of each layer shall proceed in a systematic, orderly, and continuous manner. Rolling shall be parallel to the embankment axis, except where there is insufficient working room for such operations.

2. The moisture content of all earth fill materials shall be as uniform as practicable throughout each lift. Fill shall be compacted at a moisture content that is no more than 2 percent below and no more than 2 percent above optimum moisture content.
3. Moisture conditioning of fill materials shall be performed by discing, harrowing, plowing, blading, or other suitable means prior to excavation. Moisture conditioning where the fill is placed shall be limited to minor adjustments prior to compaction. Addition of moisture shall be by using a

pressure spray bar mounted in front of or to one side of a water tanker so that water will not collect in the tracks of the truck.

4. Compaction of fill materials shall not commence if the moisture content is not within the specified limits. Any materials that are placed but not compacted prior to drying out or becoming too wet shall be removed and replaced or reprocessed at the Contractor's expense.
5. No admixtures as drying agents or to improve the workability of the soil will be allowed.

3.05 SOIL LINERS

A. Sources

The Soil Liners for the Gypsum Management Facility shall be constructed from Soil Liner Material as described in paragraph 2.01(B) above.

B. Test Liner

A compacted low permeability soil test liner of the actual full scale liner shall be constructed in accordance with the following requirements:

1. Test liner will be constructed from the same soil material sources, to the same design specifications, and with similar equipment and procedures as are proposed for the full scale liner.
2. Test liner will be at least four times the width of the widest piece of equipment to be used.
3. Test liner will be no less than 100 ft long to allow equipment to reach normal operating speed before reaching a central 40-ft test area.
4. Test liner will be constructed with maximum 8-in. compacted lifts for a total liner thickness of 3 ft.
5. Test liner will be tested by the Owner's Testing Consultant as described below for each of the following physical properties:

    a. Multiple two-stage Boutwell permeameter tests will be used on the test liner to determine the hydraulic conductivity. The two-stage field hydraulic conductivity test is a falling head infiltration test conducted in a cased borehole, typically 4 in. in diameter. The test is cited in the U.S. EPA Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities, September 1993 (EPA/600/R-93/182).
    b. Undisturbed samples (Shelby tubes) will be tested in the laboratory for hydraulic conductivity to determine if there is a statistical correlation to the field testing results.
    c. Other engineering parameters including, but not limited to, particle size analysis, liquid limits, plasticity, water content, and in-place density that are needed to evaluate the full scale liner will be determined.

6. Additional test fills will be constructed for each new soil type or for each change in equipment or procedures.

C. Full Scale Liner Construction:

1. Full scale liner construction shall not be commenced until the results of the in-place compaction testing and Boutwell permeameter tests on the test liner confirm that the construction procedures and specified compaction requirements produce a in-situ hydraulic conductivities as specified in Section 2.01(B) above.
2. The liner shall be constructed according to the placement and compaction requirements for general fill, except the material shall be compacted to a density of no less than 95 percent of maximum dry density at a moisture content between 100 percent and 105 percent of optimum. The same compaction procedures, such as number of passes, speed, and compaction equipment used on construction of the test liner shall be used. Grade stakes shall not be driven into the clay liner.
3. The completed liner shall be smooth rolled to limit moisture loss and promote run-off of surface water. Moisture content shall be maintained within the specified range and erosion or other damage that occurs in the soil liner shall be repaired as directed by the Owner's Representative until the geosynthetic liner is placed.
4. Repair of any rutting or other damage caused by the installation of the geosynthetic liner will be paid for on a time and material basis.
5. Voids created in the clay barrier layer during construction (including, but not limited to, penetrations for test samples, and other penetrations necessary for construction) shall be repaired by removing material that does not meet the requirements for low permeability soil, placing low permeability soil backfill, granular or pelletized bentonite, or a mixture of bentonite and low permeability soil in lifts no thicker than 2 in. and tamping each lift with a steel rod. Each lift shall be tamped a minimum of 25 times altering the location of the rod within the void for each blow. Other ruts and depressions in the surface of the lifts shall be scarified, filled, and then compacted to grade.

3.06 CUSHION DIRT

Cushion Dirt to be placed beneath the upper High Density Polyethylene (HDPE) Geomembrane is to be placed to the specifications for General Fill in Section 3.04 above, except fill materials for Cushion Dirt shall be compacted to a dry density equal to or greater than 90 percent of the maximum dry density obtained from the Standard Proctor Test, ASTM D698.

3.07 ANCHOR TRENCH CONSTRUCTION

A. Gypsum Management Facility

1. A ledge at the bottom of the anchor trench elevation shall be excavated. Low permeability soil shall be placed and compacted on the ledge as shown on the anchor trench details in the plans.

2. The anchor trench shall be excavated to the depth and width shown on the anchor trench details. The front edge of the trench shall be rounded to eliminate any sharp corners that could cause excessive stress to the geosynthetic liners. Loose soil shall be removed or compacted into the floor of the trench.

3. Subsequent to Geosynthetic Clay Liner (GCL), Bottom HDPE Geomembrane and Geotextile Cushion installation, it shall be verified that the liners cover the entire trench floor, but do not extend up the back of the trench wall. After the liner installation in the trench has been inspected and approved by the Owner's Representative, the trench shall be backfilled with 1 ft. of low permeability soil. The backfill shall be deposited and compacted according to the requirements for general fill in such a manner as to prevent damage to the GCL and liner materials.

4. Subsequent to installation of separation geotextile on top of drainage layer, it shall be verified that the fabric extends across the top of the initial 1 ft layer of trench backfill, but does not extend up the back of the trench wall. After the fabric installation in the trench has been inspected and approved by the Owner's Representative, the trench shall be backfilled with 1 ft of low permeability soil. The backfill shall be deposited and compacted according to the requirements for general fill in such a manner as to prevent damage to the geotextile fabric.

5. Subsequent to installation of the upper HDPE Geomembrane, verify that the liner extends across the top of the initial 1 ft layer of trench backfill, but does not extend up the back of the trench wall. After the liner installation in the trench has been inspected and approved by the Owner's Representative, backfill the remainder of the trench to the top of the low permeability soil layer. Deposit and compact the backfill according to the requirements for general fill in such a manner as to prevent damage to the HDPE Geomembrane.

3.08 TESTING

A. Construction Quality Assurance (CQA) compaction and permeability tests will be made by the Owner's Testing Consultant during the progress of the work as indicated in Appendix 2. The Contractor shall cooperate with the Testing Consultant and allow such tests to be performed.

B. If tests indicate that an area of fill or low permeability soil liner does not meet the specified requirements, additional tests shall be performed to determine the extent of non-compliance. The Contractor shall moisture condition and recompact that area until a passing test result is obtained.

3.08 FINISH GRADING

All excavated and filled areas shall be fine graded and leveled to provide a smooth finish free of debris, foreign matter, objectionable stones, clods, lumps, pockets, or high spots, properly drained and true to indicated elevations. Finish grading shall be only near completion of work or when requested. Any portions of the berm damaged by construction shall be restored. The berm ditch shall be finished to design grade, and the ditch side slopes shaped and trimmed to provide a uniform ditch cross section.

3.09 CONSTRUCTION TOLERANCES

A. The foundation grade and finished earthwork grades shall be no more than 0.4 ft below and not above plan grade.

B. The minimum thickness of low permeability soil layer shall be 3 ft.

END OF SECTION 02200

I:\05jobs\05s3004A\Gypsum Stacking\IDNR Dam Safety Permit Application\Specs\S02200_Earthwork.doc

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to the placement of riprap for erosion control.

1.02 RELATED SECTIONS

The following section contains items which are related to the work in this section:

02200 - Earthwork

1.03 REFERENCES

Specified references or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

A. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.

1.04 SUBMITTALS

Product Data: Provide quarry name and material type prior to delivery.

PART 2. PRODUCTS

2.01 MATERIALS

A. Stone Riprap and Bedding materials according to Article 1005.01 of the Illinois Standard Specifications for Road and Bridge Construction.

B. Filter Fabric material for Stone Riprap according to Article 1080.03, with an AOS (Apparent Opening Size) as indicated on the plans.

C. Supplier shall be listed on the current IDOT Approved Aggregate Source List.

D. Gradation as indicated in the drawings. Quality shall be Class A.

PART 3. EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Stone Riprap and Bedding shall be installed in accordance with Section 281 of the Illinois Standard Specifications for Road and Bridge Construction for the placement of Stone Riprap. Measurement and payment provisions of Section 281 shall not apply.

B. Filter Fabric for Stone Riprap shall be installed in accordance with Section 282 of the Illinois Standard Specifications for Road and Bridge Construction.

C. The Owner's Representative shall be allowed to visually inspect Riprap for compliance with specifications prior to placement.

END OF SECTION 02275

PART 1. GENERAL

1.01 DESCRIPTION

A. Gypsum Management Facility

This section pertains to the following:

1. Furnishing and placing granular drainage materials for the drainage layer and leachate collection system.
2. Furnishing and placing coarse aggregate for encasement of the ring drain collection piping.
3. Furnishing and installing materials for roadbed construction related to the Gypsum Management Facility access roads and the McKinley Road relocation.
4. Recycle Pond Drain.

1.02 RELATED SECTIONS

The following sections contain items which are related to the work in this section:

1. 02300 - Earthwork
2. 02373 – Geotextiles
3. 02640 - HDPE Piping

1.03 REFERENCES

The following references, or cited portions thereof, govern the work:

1. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.
2. American Society for Testing and Materials (ASTM):

   a. ASTM D 75 (2003) Practice for Sampling Aggregates.
   b. ASTM D 422 (1963; R 2002) Test Method for Particle-Size Analysis of Soils.
   c. ASTM D 2434 (1968, R 2000) Test Method for Permeability of Granular Soils (Constant Head).
   d. ASTM D 3042 (2003) Test Method for Insoluble Residue in Carbonate Aggregates.
   e. ASTM C 1260 (2005) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).

3. American Geological Institute (AGI). Geoscience Handbook AGI Data Sheets, 4th Edition.

1.04 MEASUREMENT AND PAYMENT

The Contractor shall be responsible for estimating the extent of granular materials required to complete the work including, but not limited to, construction of drainage layer, encasement of leachate collection piping, and road-bed construction. The Contractor shall include the dollar amount associated with furnishing and placing all granular materials in his Lump Sum Bid amount.

1.05 COORDINATION

A. The geosynthetic liner shall be covered with granular materials as soon as practicable after a section of liner has been approved by the Owner's Representative.

1.06 SUBMITTALS

A. Product Data:

1. Aggregate source list: Submit a list of proposed aggregate sources.

2. Shipping Tickets: Submit shipping tickets for the granular materials delivered to the site. Shipping tickets shall be according to paragraph 1004.01f of the IDOT Standard Specifications.

B. Test Reports.

1. Submit results of grain size analysis (ASTM D422) and hydraulic conductivity testing (ASTM D2434) for gradations established by the Contractor that provide the specified hydraulic conductivity. Test results are required for each proposed source and gradation. Submit test results for each source demonstrating compliance with reactivity, soundness, and abrasion requirements specified herein.

C. Samples:

1. Submit one sample per source for each gradation proposed for use on the project. Samples shall be at least one pound and shall be obtained and shipped according to ASTM D75. Submit samples at least 15 days prior to starting construction of the drainage layer and coarse aggregate encasement for leachate piping.

1.07 STORAGE AND HANDLING

A. Storage and handling of granular materials shall be according to paragraph 1004.01e of the IDOT Standard Specifications.

1.01

PART 2. PRODUCTS

2.01 MATERIALS

A. General

1. Unless otherwise approved by the Owner's Representative, granular materials shall be obtained from sources listed on the current IDOT Approved Aggregate Source List (www.dot.il.gov\materials\approvedaggregatesources.pdf).
2. Coarse Granular materials shall be meet the Description of Gravel, as described in Section 1004.01(a)(1) of the IDOT Standard Specifications, and shwll be spherical to sub-discoidal, sub-rounded to well rounded particles as defined by AGI Data Sheet, 4th Edition, Sheet 8.4 – Comparison Charts for Estimating Roundness and Sphericity.
3. Granular materials shall experience no more than 15 percent carbonate loss per ASTM D3042.
4. Granular materials shall be free of deleterious material, and shall meet the Na_2SO_4 soundness and Los Angeles Abrasion Specifications for Class B quality aggregate per paragraph 1004.01 of the IDOT Standard Specifications.
5. All material shall pass the 2 in. sieve, and no greater than 5 percent shall be retained on the No. 200 sieve.
6. Granular materials shall be innocuous to alkali-silica reactivity, and shall exhibit internal expansions of less than 0.10 percent at 16 days after casting as determined by ASTM C 1260.

B. Gypsum Management Facility Granular Materials

1. Granular Materials for Drainage Layer

   Gradation for granular material for drainage layer shall be as required to provide a minimum hydraulic conductivity (ASTM D2434) of 1 x 10^{-3} cm/sec.

2. Coarse Aggregate around Ring Drain Collection Piping

   Coarse Aggregate used to encase the ring drain collection piping shall be IDOT Gradation CA 7 material as outlined in Article 1004.01 of the IDOT Standard Specifications for Road and Bridge Construction.

3. Filter Sand

   Filter Sand used for protective cover over the ring drain collection system shall be IDOT Gradation FA 1, Class B or better according to Article 1003 of the IDOT Standard Specifications for Road and Bridge Construction.

4. Aggregate Base Course, Type B

   Aggregate Base Course, Type B used for base material for all new access roads and shall be IDOT Gradation CA 2, in accordance with Section 1004.04 of the IDOT Standard Specifications for Road and Bridge Construction. The material shall originate from an IDOT approved source. The Na_2SO_4 soundness and Los Angeles Abrasion Specifications for Class B quality aggregate per paragraph 1004.01 of the IDOT Standard Specifications shall not apply.

5. Aggregate Surface Course, Type B

   Aggregate Surface Course, Type B used for surface material for all new access roads and the McKinley Road relocation shall be IDOT Gradation CA 6, in accordance with Section 1004.04 of the IDOT Standard Specifications for Road and Bridge Construction. The material shall originate from an IDOT approved source. The Na_2SO_4 soundness and Los Angeles Abrasion Specifications for Class B quality aggregate per paragraph 1004.01 of the IDOT Standard Specifications shall not apply.

2.02 EQUIPMENT

Equipment for spreading and compacting granular materials shall be low ground pressure equipment to prevent damage to the underlying geosynthetic liners.

PART 3. EXECUTION

3.01 PROTECTION OF GEOSYNTHETICS

A. Protection of the geosynthetic liners is critically important. Approved geosynthetic liner shall be covered by granular material as soon as practicable. Granular material shall be placed to a minimum thickness of 1 ft before any heavy equipment or loaded trucks are allowed on the lined area.

B. No equipment will be permitted directly on the geosynthetic liner.

C. Any damage to the geosynthetic liner system shall be repaired, as directed by the Owner's Representative, at the expense of the Contractor.

3.02 GRANULAR DRAINAGE LAYER (GYPSUM MANAGEMENT FACILITY)

A. Placement on Cell Floor

1. The granular material shall be back-dumped on the geotextile cushion fabric in a sequence of operations beginning at the perimeter of the liner on the cell floor.
2. Placement of material on the fabric shall be accomplished by spreading dumped material off of previously placed material with a bulldozer blade or endloader, in such a manner as to prevent tearing or shoving of the cloth. Dumping of material directly on the fabric will only be permitted to establish an initial working platform. No vehicles or construction equipment shall be allowed on the fabric prior to placement of the granular blanket to a minimum thickness of 1 ft.

B. Placement on Cell Side Slopes

1. Placement of granular material on cell side slopes shall be accomplished using methods and equipment similar to that specified for placement of material on cell floor.
2. The Contractor may place gypsum underlain with separation geotextile fabric to buttress the granular material on the slope:

   a. The Construction Quality Assurance (CQA) survey to certify thickness of drainage material shall be completed within the footprint of the gypsum stack before gypsum placement.

b. Separation geotextile fabric shall extend beyond the toe of gypsum buttress a sufficient distance to prevent contamination of the granular drainage layer. See Sections 02373 and 02320 for construction of separation geotextile fabric and gypsum, respectively.

3.04 COARSE AGGREGATE FOR ENCASEMENT OF RING DRAIN COLLECTION PIPING (GYPSUM MANAGEMENT FACILITY)

A. The geotextile filter fabric for encasement of leachate collection piping shall be placed on the approved cushion geotextile fabric according to Section 02373 – Geotextiles.

B. The coarse aggregate shall be placed on the encasement fabric to the width shown on the plans to the level of the bottom of the ring drain collection piping.

C. Course aggregate shall be placed and tamped along the pipe during pipe installation. The coarse aggregate shall be placed longitudinally along the pipe in lifts not to exceed 8 in. thick to a height of at least the center of the pipe. The aggregate shall be maintained at equal elevation on each side of the pipe, and the first lift of material shall be mechanically tamped to ensure that the space under the pipe is completely filled. The top of pipe shall not be covered until the CQA survey certifies leachate piping grade has been completed.

C. After the CQA survey has been completed, coarse aggregate material shall continue to be placed in lifts not to exceed 8 in. thick, as specified in the previous paragraph until the minimum cover height shown in the plans is attained.

D. The running of trucks or heavy equipment over leachate piping shall be avoided until there is at least a 12 in. cover of Filter Sand over the completed geotextile envelop. Temporary ramps no steeper than 10H:1V transverse to the piping shall be provided for temporary equipment crossings until the first lift of gypsum is placed.

3.03 ROADWAY CONSTRUCTION

A. Prepare the roadway subgrade as shown on the plans, in accordance with Section 02200 – Earthwork.

B. Furnish Geotechnical Fabric for Ground Stabilization in accordance with Section 02373 – Geotextiles.

C. Furnish Aggregate Base Course, Type B in accordance with Article 351 of the IDOT Standard Specifications for Road and Bridge Construction.

D. Furnish Aggregate Surface Course, Type B in accordance with Article 402 of the IDOT Standard Specifications for Road and Bridge Construction.

3.04 TESTING

A. CQA gradation and permeability tests will be made by the Owner's Testing Consultant during the progress of the work as indicated in Appendix 2. The Contractor shall cooperate with the Testing Consultant and allow such tests to be performed.

B. If tests indicate that an area of granular material or coarse aggregate does not meet the specified requirements, then the Contractor shall remove the material and replace it with suitable material.

3.05 FINISH GRADING

The granular drainage layer shall be fine graded to provide a smooth finish before a CQA survey of the completed portion of the drainage layer is requested. Ruts or erosion damage shall be repaired before placement of the separation geotextile fabric.

3.06 CONSTRUCTION TOLERANCES

The minimum thickness of drainage layer shall be 1 ft.

END OF SECTION 02315

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to furnishing and installing geotextile fabrics on prepared surfaces.

1.02 RELATED SECTIONS

The following sections contain items which are related to the work in this section:

1. 02300 - Earthwork
2. 02315 - Granular Materials
3. 02800 – HDPE Geomembrane

1.03 REFERENCES

The following references, or cited portions thereof, govern the work:

1. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.
2. American Society for Testing and Materials (ASTM):

    a. ASTM 3776 (1996; R 2002) Standard Test Method for Mass per Unit Area (Weight) of Fabric;
    b. ASTM D 3786 (2001) Test Method for Hydraulic Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method;
    c. ASTM D 4533 (2004) Test Method for Trapezoid Tearing Strength of Geotextiles;
    d. ASTM D 4632 (1991; R 2003) Test Method for Grab Breaking Load and Elongation of Geotextiles;
    e. ASTM D 4751 (2004) Test Method for Determining Apparent Opening Size of Geotextile;
    f. ASTM D 4833 (2000) Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products;
    g. ASTM D 4873 (2002) Guide for Identification, Storage, and Handling of Geosynthetic Rolls;
    h. ASTM D 4884 (1996; R 2003) Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles;
    i. ASTM D5261-92(2003) Standard Test Method for Measuring Mass per Unit Area of Geotextiles

j. ASTM D6241-04 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

1.04 MEASUREMENT AND PAYMENT

A. The Contractor shall be responsible for estimating the extent of geotextile fabric required to complete the work including fabric for laps, anchorage, repairs, and samples for Construction Quality Assurance (CQA) testing. The Contractor shall include the dollar amount associated with all geotextile construction in his Lump Sum Bid amount, except as specified in paragraph B.

B. Geotextile fabric for ground stabilization, when directed by the Owner's Representative, will be paid for on a time and materials basis.

C. No additional payment will be made for geotextile fabric for ground stabilization installed at the Contractor's discretion.

1.05 SUBMITTALS

A. Product Data

1. The manufacturer's list of guaranteed properties for each geotextile fabric or geogrid proposed for use on the project shall be submitted.
2. The manufacturer's installation guidelines shall be submitted.

B. Samples

Samples of geotextile fabrics shall be submitted for CQA prequalification testing. Sample size and sampling frequency are specified in Appendix 2.

C. Inventory

A copy of the roll inventory that identifies, as a minimum, manufacturer or supplier, product or style number, roll number, width, and length of roll as identified on the roll label shall be submitted.

1.06 STORAGE AND HANDLING

Geotextiles shall be stored and handled according to ASTM D4873.

PART 2. PRODUCTS

2.01 MATERIALS

A. Geotextile Fabric for Liner System

Geotextile fabrics for use in the cell liner system shall consist of non-woven filaments of polypropylene, polyester, or polyethylene. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Non-woven fabric may be needle-punched, heat-bonded, or a combination thereof. The filaments shall be dimensionally stable (i.e., filaments shall maintain their relative position with respect to each other) and resistant to delamination. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile. The filaments shall be free from any chemical treatment or coating that might significantly reduce porosity and permeability.

Fabric shall have the following physical properties:

Physical Properties[1]	**4 oz. (Separation)**	**6 oz. (PWRS)**	**16 oz. (CA Envelope)**
Mass/Unit Area (oz./yd^2) ASTM D5261	4.0	6.0	16.0
Grab Tensile Strength (lb.) ASTM D4632	115	160	380
Grab Elongation (%) ASTM D4632	50	50	50
Puncture Strength (lb.) ASTM D4833	65	85	240
Puncture (CBR) Strength (lb.) ASTM D6241	310	410	1025
Mullen Burst Strength (psi) ASTM D3786	210	280	750
Trapezoidal Tear Strength (lb.) ASTM D4533	50	60	150
Width (ft.)	15	15	15
Apparent Opening Size (AOS) Max. US Std. Sieve No. ASTM D4751	70	70	100
UV Resistance[2] (%) ASTM D4355	70	70	70
Roll Width (ft.)	15	15	15

Notes:

(1) All Values listed are Minimum Average Roll Values (MARV) unless otherwise noted, calculated as the typical minus two standard deviations..

(2) UV Resistance is a minimum value and not a MARV. Evaluation to be on 2.0 inch strip tensile specimens after 500 hours exposure.

A. Cushion Geotextile Fabric.

Cushion geotextile fabric shall consist of non-woven filaments of polypropylene, polyester, or polyethylene. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Non-woven fabric may be needle-punched, heat-bonded, or a combination thereof. The filaments shall be dimensionally stable (i.e., filaments shall maintain their relative position with respect to each other) and resistant to delamination. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile. The filaments shall be free from any chemical treatment or coating that might significantly reduce porosity and permeability.

Fabric shall have the following physical properties:

Physical Properties[1]	**10 oz. (Cushion)**
Mass per unit area (oz/yd^2) ASTM D5261	10
Grab Tensile Strength (lb.) ASTM D4632	230
Grab Tensile Elongation (%) ASTM D4632	50
Trapezoidal Tear Strength (lb.) ASTM D4533	95
Puncture (CBR) Strength (lb.) ASTM D6241	700
Puncture (CBR) Elongation (in.) ASTM D6241	1.5
UV Resistance[2] (%) ASTM D4355	70
Apparent Opening Size (Max.) (AOS) Sieve No. - ASTM D4751	---
Roll Width (ft.)	15

Notes:

(1) All Values listed are Minimum Average Roll Values (MARV) unless otherwise noted, calculated as the typical minus two standard deviations..

(2) UV Resistance is a minimum value and not a MARV. Evaluation to be on 2.0 inch strip tensile specimens after 500 hours exposure.

B. Geotechnical Fabric for Ground Stabilization

Geotechnical fabric for ground stabilization shall conform to Article 1080.02 of the IDOT Standard Specifications for Road and Bridge Construction.

C. Thread for Seams

High strength thread should be used such that seam test should conform to ASTM D4884. The thread shall meet the chemical, ultraviolet, and physical requirements of the geotextile, and the color shall be different from that of the geotextile.

D. Securing Devices

Pins, staples, and other devices that project through the geotextile fabric are not permitted for fabrics installed above the geomembrane. Sandbags, stone, or other appropriate means approved by the Owner's Representative shall be used to prevent movement of the geotextile.

2.02 EQUIPMENT

A. Equipment for spreading and compacting granular materials shall be low ground pressure equipment to prevent damage to the underlying geosynthetic liners.

PART 3. EXECUTION

3.01 SAMPLES FOR CQA TESTING

A. Geotextile fabric samples shall be obtained, identified and packaged from rolls designated by the Owner's Representative according to ASTM D4873.

B. Samples shall be 3 ft. wide by the full roll width.

3.02 BASE PREPARATION

A. Surface on which the geotextile will be placed shall be prepared to a relatively smooth surface condition, and shall be free from obstruction, debris, depressions, erosion features, or any irregularities that would prevent continuous, intimate contact of the geotextile with the entire surface. Rills, gullies, and ruts must be graded out of the surface before geotextile placement. Areas on which geotextile are to be placed shall be graded and/or dressed in accordance with Section 02200 – Earthwork and Section 02315 – Granular Drainage Materials. Immediately prior to placing the geotextile, the prepared base will be inspected by the Owner's Representative, and no material shall be placed thereon until that area has been approved.

B. Geotextile cushion fabric will be installed directly on the geosynthetic liner. Jointly inspect the liner with the Owner's Representative before commencing fabric installation each day. Notify the Owner's Representative promptly of any damage or defects observed in the liner as fabric installation progresses. Do not place fabric in the damaged or defective area until the liner has been repaired and approved by the Owner's Representative. Submit a daily inspection report identifying the area of fabric placement and certifying that there were no visible defects in the area of fabric placement.

C. Do not run heavy vehicle traffic directly on the geosynthetic liner or cushion geotextile. Use vehicles and equipment as specified in paragraph 2.02 to transport and deploy fabric on the liner. Operate the equipment with care, and place protective cover over the geomembrane, if necessary, to avoid damaging the liner. Route traffic and personnel over installed cushion fabric and use the installed fabric as a working platform to the greatest extent possible.

3.03 INSTALLATION

A. General Requirements:

1. Geotextile fabric shall be unrolled and laid out following these requirements to the greatest extent practical:

   a. Orient panels with the longest dimension parallel to the slope.
   b. Minimize the number of seams in corners and odd-shaped areas.
   c. Extend panels on slopes a minimum of 5 ft onto a horizontal surface.

   Geotextile panels shall be unrolled using methods that will not damage the fabric and will protect underlying surface from damage. While unrolling, the geotextile fabric shall be visually inspected for imperfections and faulty or suspect areas marked. Ballast shall be placed on fabric to prevent wind uplift. Expansion and contraction should be allowed for by leaving slack.

   Heavy vehicle traffic shall not be run directly on geotextile fabric. Fabric in areas of heavy traffic shall be protected with protective cover over the fabric.

2. Laps

   Individual panels of geotextile fabric shall be lapped according to manufacturer's instructions and as specified herein. Provide a minimum overlap of 3 in. unless otherwise specified herein or in the plans. Shingle overlaps so that water or other material cannot run down the slope between the two layers of fabric.

3. Field Seams

Continuously sew all laps on slopes steeper than 10H:1V. This requirement does not apply to the heavy geotextile fabric for envelopment of coarse aggregate around leachate piping.

4. Defects and Repairs

Examine the installed geotextile fabric for defects, holes discontinuous seams, puckered or separated laps, etc. Repair defective laps and seams. Patch holes and defects according to manufacturer's recommendations and as directed by the Owner's Representative. Do not cover suspect or patched areas until they have been inspected and approved by the Owner's Representative.

B. Geotextile Fabric for Separation

1. Use low ground pressure equipment to avoid rutting the granular material.
2. Horizontal seams (parallel to top of slope) will be permitted on cell side slopes to facilitate staged construction of the drainage layer on the side slope.
3. Extend separation geotextile fabric into and across the bottom of the anchor trench and complete backfill of the trench according to Section 02200.

C. Geotextile Fabric for Coarse Aggregate Envelope

1. Geotextile for coarse aggregate envelope will be installed directly on the cushion fabric. Remove any foreign materials from the cushion fabric within the footprint of the coarse aggregate leachate piping encasement before installing the geotextile envelope. Place sufficient width to completely envelop the coarse aggregate and provide a longitudinal lap of at least 6 in.
2. After the coarse aggregate encasement has been completed, according to Section 02315, wrap the geotextile around the mounded aggregate, and cover the lap with at least 6 in. of material before permitting vehicle or equipment on the fabric.
3. Any ballast material other than coarse aggregate, according to Section 02315, that is placed within the envelope will require removal during coarse aggregate construction.

D. Geotechnical Fabric for Ground Stabilization

1. Install Geotechnical Fabric for Ground Stabilization in accordance with Section 210 of the IDOT Standard Specifications for Road and Bridge Construction.

2. If approved by the Owner's Representative, the Contractor may, at his own expense, install geotextile or geogrid for ground stabilization outside the limits designated by the Owner's Representative.
3. Submit as-built drawings that clearly delineate limits and type of ground stabilization.

3.04 PROTECTION

A. Protect installed fabric until it is covered by at least 1 ft. of overlying material.

B. Any damage to the geotextile during its installation or during placement of overlying materials shall be replaced by the Contractor at no cost to the Owner. Unless otherwise noted, the work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 14 calendar days after placement of the geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage prior to and during the placement of overlying materials. Before placement of overlying materials, the Contractor shall demonstrate that the placement technique will not cause damage to the geotextile.

3.05 TESTING AND INSPECTION

A. Prequalification Testing

Geotextiles are subject to CQA testing by the Owner's Testing Consultant to verify conformance with the manufacturer's list of guaranteed properties according to Appendix 2. The Contractor shall provide samples as specified herein. If tests indicate nonconformance to the list of guaranteed properties, provide additional samples as directed by the Owner's Representative to determine the extent of the non-conformance. Any fabric that does not conform to the list of guaranteed properties shall be removed from the site.

B. Installed fabric shall be inspected by the Owner's Representative. No material shall be placed on the fabric, other than ballast, until the installation has been approved by the Owner's Representative. Ballast shall not obscure seams or significant length of unseamed laps. The Owner's Representative may require removal of ballast to inspect suspect areas.

C. If the Owner's Representative suspects that completed work has been damaged by construction methods that do not conform to the specifications, he may require removal of completed work to verify the integrity of the underlying materials. The Contractor shall bear the cost of removal and subsequent repair as directed by the Owner's Representative.

END OF SECTION 02373

PART 1. GENERAL

1.01 DESCRIPTION

A. This section covers furnishing and installation of a reinforced needlepunched Geosynthetic Clay Liner (GCL) at the Gypsum Management Facility and the CCB Management Facility.

B. The work includes furnishing all equipment and materials, providing all labor, supervision, administration and management necessary to perform the work as specified herein and as shown on the plans.

1.02 RELATED SECTIONS

None.

1.03 REFERENCES

The following references, or cited portions thereof, govern the work

1. American Society for Testing and Materials (ASTM):

   a. ASTM D 4632 (1991; R 2003), Standard Test Method for Grab Breaking Load and Elongation of Geotextiles;
   b. ASTM D 4643 (2000), Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method;
   c. ASTM D 5084 (2003), Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter;
   d. ASTM D 5261 (1992; R 2003), Test Method for Measuring Mass Per Unit Area of Geotextiles;
   e. ASTM D 5321 (2002), Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method;
   f. ASTM D 5887 (2004), Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter;
   g. ASTM D 5888 (1995; R 2002), Practice for Storage and Handling of Geosynthetic Clay Liners;
   h. ASTM D 5889 (1997; R 2003), Practice for Quality Control of Geosynthetic Clay Liners;

i. ASTM D 5890 (2002), Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners;

j. ASTM D 5891 (2002), Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

1.04 SUBMITTALS

A. With the bid, the Contractor shall furnish the following information:

1. Conceptual description of the proposed plan for placement of the GCL panels over the areas of installation.
2. GCL Manufacturer's Quality Control (MQC) Plan for documenting compliance with Sections 2.01 and 2.02 of these specifications.
3. GCL manufacturer's historical data for reinforced GCL of a) 10,000-hour creep shear testing per Section 2.01 D, and b) seam flow data at 2 psi confining pressure per Section 2.01 E.
4. A copy of GCL manufacturer's International Standards Organization (ISO) Quality Certificate of Registration.
5. Statement of experience from the proposed GCL supplier.
6. Statement of experience from the proposed GCL installer.

B. At the Owner Representative's or Owner's request, the Contractor shall furnish:

1. A representative sample of the GCLs.
2. A project reference list for the GCL(s) consisting of the principal details of at least ten projects totaling at least 10 million sq. ft (100,000 sq. meters) in size.

C. Upon shipment, the Contractor shall furnish:

1. The GCL manufacturer's Quality Assurance/Quality Control (QA/QC) certifications to verify that the materials supplied for the project are in accordance with the requirements of this specification.
2. Inventory of materials received.

D. As installation proceeds, the Contractor shall submit certificates of subgrade acceptance, signed by the Contractor and Construction Quality Assurance (CQA) Inspector (see Sections 1.06 and 3.03) for each area that is covered by the GCL.

E. Warranty

After construction, the contractor shall submit material and installation warranty certificates.

1.05 QUALIFICATIONS

A. GCL Manufacturer must have produced at least 10 million sq. ft. (1 million sq. meters) of GCL, with at least 8 million sq. ft. (800,000 sq. meters) installed.

B. The GCL Installer must either have installed at least 1 million sq. ft. (100,000 sq. meters) of GCL, **or** must provide to the Engineer satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the GCL will be installed in a competent, professional manner.

1.06 CONSTRUCTION QUALITY ASSURANCE (CQA)

A. The Owner shall provide a third-party inspector for CQA of the GCL installation. The inspector shall be an individual or company who is independent from the manufacturer and installer and who shall be responsible for monitoring and documenting activities, related to the CQA of the GCL throughout installation.

B. Testing of the GCL as necessary to support the CQA effort shall be performed by a third party laboratory retained by the Owner and independent from the GCL manufacturer and installer.

WARRANTY

The geomembrane material shall be warranted, on a pro-rata basis against manufacturer's defects for a period of five (5) years from the date of liner installation. The installation shall be warranted against defects in workmanship for a period of (1) year from the date of liner completion.

PART 2. PRODUCTS

2.01 MATERIALS

A. Acceptable products for the GCL are GCL Bentomat® SDN, as manufactured by CETCO, 1350 West Shure Drive, Arlington Heights, Illinois 60004 USA (847-392-5800), or an engineer-approved reinforced needlepunched GCL material equal to Bentomat SDN.

B. The delineation of areas to receive GCL shall be agreed by the Installer and the Engineer prior to installation.

C. The GCL and its components shall have the properties shown in the GCL Certified Properties table at the end of this section.

D. The reinforced GCL shall have 10,000 hour test data for large-scale constant-load (creep) shear testing for related products under hydrated conditions. The displacement shall be 0.13 in. (3.3 mm) or less at a constant shear load of 250 psf (12 kPa) and a normal load of 500 psf (24 kPa).

E. The reinforced GCL shall have seam test data from an independent laboratory showing that the seam flow with a grooved cut in one of the nonwoven geotextiles is less than 1 x 10^{-8} $m^3/m^2/s$ at 2 psi hydraulic pressure.

F. The minimum acceptable dimensions of full-size GCL panels shall be 150 ft. (45.7 m) in length. Short rolls [(those manufactured to a length greater than 70 ft. (21 meters) but less than a full-length roll)] may be supplied at a rate no greater than three (3) per truckload or three (3) rolls every 36,000 sq. ft. (3,500 sq. meters) of GCL, whichever is less.

G. A 6-inch (150 mm) overlap guideline shall be imprinted on both edges of the upper geotextile component of the GCL as a means for providing quality assurance of the overlap dimension. Lines shall be printed in easily visible, non-toxic ink.

2.02 PRODUCT QUALITY DOCUMENTATION

The GCL manufacturer shall provide the Contractor or other designated party with manufacturing QA/QC certifications for each shipment of GCL. The certifications shall be signed by a responsible party employed by the GCL manufacturer and shall include:

A. Certificates of analysis for the bentonite clay used in GCL production demonstrating compliance with the swell index and fluid loss parameters shown in the GCL Certified Properties tables.

B. Manufacturer's test data for finished GCL product(s) of bentonite mass/area, GCL tensile strength and GCL peel strength (reinforced only) demonstrating compliance with the index parameters shown in the GCL Certified Properties tables.

C. GCL lot and roll numbers supplied for the project (with corresponding shipping information).

2.03 PRODUCT LABELING

A. Prior to shipment, the GCL manufacturer shall label each roll, identifying:

1. Product identification information (Manufacturer's name and address, brand product code).
2. Lot number and roll number.
3. Roll length, width and weight.

2.04 PACKAGING

A. The GCL shall be wound around a rigid core whose diameter is sufficient to facilitate handling. The core is not necessarily intended to support the roll for lifting but should be sufficiently strong to prevent collapse during transit.

B. All rolls shall be labeled and bagged in packaging that is resistant to photodegradation by ultraviolet (UV) light.

2.05 ACCESSORY BENTONITE

A. The granular bentonite sealing clay used for overlap seaming, penetration sealing and repairs shall be made from the same natural sodium bentonite as used in the GCL and shall be as recommended by the GCL manufacturer. Seaming of GCLs shall be conducted in accordance with the manufacturer's guidelines for each particular GCL. Please refer to the installation guidelines for Bentomat /Claymax GCLs.

PART 3. EXECUTION

3.01 SHIPPING AND HANDLING

A. The rolls of GCL shall be packaged and shipped by appropriate means to prevent damage to the material and to facilitate off-loading.

B. The Installation Supervisor shall be present during delivery and unloading of the GCL. A visual inspection of each roll should be made during unloading to identify if any packaging has been damaged. Rolls with damaged packaging should be marked and set aside for further inspection. The packaging should be repaired prior to being placed in storage. The Installation Supervisor shall prepare and submit an inventory that includes lot and roll number for materials received.

C. The Installer is responsible for unloading the GCL. The Owner will make available equipment and operators employed at the site to assist with unloading. The Installer shall coordinate with the Owner to determine equipment availability and should contact the Manufacturer prior to shipment to ascertain the appropriateness of the proposed unloading methods and equipment.

3.02 STORAGE

A. Storage of the GCL rolls shall be the responsibility of the Installer. A dedicated storage area shall be provided by the Owner at the job site. Submit storage area requirements (size and preferred location) with bid documents.

B. Rolls should be stored in a manner that prevents sliding or rolling from the stacks and may be accomplished by the use of chock blocks. Rolls should be stacked at a height no higher than that at which the lifting apparatus can be safely handled (typically no higher than four).

C. All stored GCL materials and the accessory bentonite must be covered with a plastic sheet or tarpaulin until their installation.

D. The integrity and legibility of the labels shall be preserved during storage.

3.03 EARTHWORK

A. The low permeability soil layer upon which the GCL is installed shall be prepared and compacted prior to installation. The surface shall be smooth, firm, and unyielding, and free of:

1. Vegetation.
2. Construction debris.
3. Sticks.
4. Sharp rocks.
5. Void spaces.
6. Ice.
7. Abrupt elevation changes.
8. Standing water.
9. Cracks larger than 0.25 in. (6 mm) in width.
10. Any other foreign matter that could contact the GCL.

B. Immediately prior to GCL deployment, the low permeability soil layer shall be final-graded by the contractor to fill in all voids or cracks and then smooth-rolled to provide the best practicable surface for the GCL. At completion of this activity, no wheel ruts, footprints or other irregularities shall exist in the subgrade. Furthermore, all protrusions extending more than 0.5 in. (12 mm) from the surface shall either be removed, crushed or pushed into the surface with a smooth-drum compactor.

C. On a continuing basis, the project CQA inspector shall certify acceptance of the subgrade before GCL placement.

D. It shall be the Installer's responsibility thereafter to indicate to the Owner's Representative any change in the condition of the low permeability soil layer that could cause the subgrade to be out of compliance with any of the requirements listed in this Section. The Installation Supervisor shall certify in the daily report that no GCL was placed over visibly defective low permeability soil surface.

E. At the top of sloped areas of the job site, an anchor trench for the GCL shall be excavated by the contractor in accordance with the project plans. The trench shall be excavated and approved by the CQA Inspector prior to GCL placement. No loose soil shall be allowed at the bottom of the trench and no sharp corners or protrusions shall exist anywhere within the trench.

3.04 GCL PLACEMENT

A. GCL rolls shall be delivered to the working area of the site in their original packaging. Immediately prior to deployment, the packaging shall be carefully removed without damaging the GCL. The orientation of the GCL (i.e., which side faces up) shall be in accordance with the Owner Representative's recommendations.

B. Equipment which could damage the GCL, shall not be allowed to travel directly on it. If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.

C. Care must be taken to minimize the extent to which the GCL is dragged across the subgrade in order to avoid damage to the bottom surface of the GCL. A temporary geosynthetic subgrade covering commonly known as a slip sheet or rub sheet may be used to reduce friction damage during placement.

D. The GCL panels shall be placed parallel to the direction of the slope.

E. All GCL panels shall lie flat on the underlying surface, with no wrinkles or folds, especially at the exposed edges of the panels.

F. Only as much GCL shall be deployed as can be covered at the end of the working day with soil, a geomembrane, or a temporary waterproof tarpaulin. The GCL shall not be left uncovered overnight. If the GCL is hydrated when no confining stress is present, the Installer shall remove and replace the hydrated material as directed by the Owner Representative.

3.05 ANCHORAGE

A. As directed by the project drawings and specifications, the end of the GCL roll shall be placed in an anchor trench at the top of the slope. The front edge of the trench shall be rounded so as to eliminate any sharp corners. Loose soil shall be removed from the floor of the trench. The GCL shall cover the entire trench floor, but shall not extend up the rear trench wall.

3.06 SEAMING

A. The GCL seams shall be constructed by overlapping their adjacent edges according to the manufacturer's recommendations. Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.

B. The minimum dimension of the longitudinal overlap should be 6 in. (150 mm) for Bentomat SDN. If the GCL is manufactured with a grooved cut in the nonwoven geotextile that allows bentonite to freely extrude into the longitudinal overlap then no bentonite-enhanced seam is required for this overlap. If the GCL does not have a grooved cut in one of the nonwoven geotextiles in the longitudinal overlap, then bentonite-enhanced seams are required as described below.

C. End-of-roll overlapped seams shall be constructed with a minimum overlap of 24 in. (600 mm) for Bentomat SDN. Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone. End-of-roll overlapped seams for all reinforced GCL seams require bentonite-enhanced seams as described below.

D. Bentonite-enhanced seams shall be constructed between the overlapping adjacent panels as follows. The underlying edge of the longitudinal overlap is exposed and then a continuous bead of granular sodium bentonite is applied along a zone defined by the edge of the underlying panel and the 6-inch (150 mm) line. The granular bentonite shall be applied at a minimum application rate of one quarter pound per lineal ft. (0.4 kg/m). A similar bead of granular sodium bentonite is applied at the end-of-roll overlap.

3.07 DETAIL WORK

A. There shall be no penetrations through the GCL.

B. Cutting the GCL should be performed using a sharp utility knife. Frequent blade changes are recommended to avoid damage to the geotextile components of the GCL during the cutting process.

3.08 DAMAGE REPAIR

A. If the GCL is damaged (torn, punctured, perforated, etc.) during installation, it may be possible, if approved by the Owner's Representative, to repair it by cutting a patch to fit over the damaged area. The patch shall be obtained from a new GCL roll and shall be cut to size such that a minimum overlap of 12 in. (300 mm) is achieved around all of the damaged area. Granular bentonite or bentonite mastic shall be applied around the damaged area prior to placement of the patch. It may be desirable to use an adhesive to affix the patch in place so that it is not displaced during cover placement. Patching shall be observed and approved by the Owner's Representative.

GCL CERTIFIED PROPERTIES

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY $ft^2(m^2)$	REQUIRED VALUES
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area[2]	ASTM D 5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2) min
GCL Grab Strength[3]	ASTM D 6768	200,000 ft^2 (20,000 m^2)	30 lbs/in (53 N/cm) MARV
GCL Peel Strength[3]	ASTM D 6496	40,000 ft^2 (4,000 m^2)	2.5 lbs/in (4.4 N/cm) min
GCL Index Flux[4]	ASTM D 5887	Weekly	1 x 10^{-8} m^3/m^2/sec max
GCL Hydraulic Conductivity[4]	ASTM D 5887	Weekly	5 x 10^{-9} cm/sec max
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typ @ 200 psf

Notes

[1] Bentonite property tests performed at a bentonite processing facility before shipment the manufacturer's production facilities.

[2] Bentonite mass/area reported at 0 percent moisture content.

[3] All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. Upon request, tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips.

[4] Index flux and permeability testing with deaired distilled/deionized water at 80 psi (551kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of $5x10^{-9}$ cm/sec for typical GCL thickness. Actual flux values vary with field condition pressures. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.

[5] Peak values measured at 200 psf (10 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

END OF SECTION 02376

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to construction of the HDPE (High Density Polyethylene) Piping at the Gypsum Management Facility and the CCB Management Facility.

1.02 RELATED SECTIONS

None.

1.03 REFERENCES

The following references, or cited portions thereof, govern the work

A. American Society of Testing and Materials:

1. ASTM D 2683 (2004); Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
2. ASTM D 3261 (2003); Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
3. ASTM D 3350 (2005); Specification for Polyethylene Plastics Pipe and Fittings Materials.
4. ASTM F 412 (2001a); Terminology Relating to Plastic Piping System.
5. ASTM F 1055 (1998); Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
6. ASTM F 1056 (2004); Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.

1.04 SUBMITTALS

A. Qualifications

Submit qualifications of the Welding Supervisor who will be responsible for construction quality control of the pipe joining process.

B. Material Certifications

Submit manufacturer certifications that the pipe provided complies with the requirements herein.

C. Product Data

1. Submit product data and operating instructions for pipe joining equipment.
2. Submit pipe manufacturer's recommended procedures for storing, handling, and installing pipe and fittings.

1.05 QUALIFICATIONS

A. The Contractor or Subcontractor performing the work under this section shall have in his employ a Welding Supervisor who has completed a minimum of 1,000 ft of pipe joining work using the type of equipment proposed for use in this work. The Welding Supervisor shall be on site at all times during pipe line installation, and shall provide direct supervision over other employees.

1.06 WARRANTY

A. The pipe and fittings shall be warranted, on a pro-rata basis, against manufacturer's defects for a period of five (5) years from the date of pipe installation. The installation shall be warranted against defects in workmanship for a period of one (1) year from the date of completion of the leachate collection piping system.

PART 2. PRODUCTS

2.01 MATERIALS

A. Pipe

1. Pipe material shall be High Density Polyethylene (HDPE) PE 3408, according to ASTM F412, with a cell class designation of 345464C, according to ASTM D3350. Iron pipe size (IPS) and standard dimension ratio (SDR) shall be as indicated in the plans.
2. Size and spacing of holes in perforated pipe shall be as indicated in the plans.

B. Fittings

1. Fittings shall be made of the same material, and shall have a pressure rating no less than 160 psi. Butt fusion, socket, or electrofusion fittings, according to ASTM D3261, ASTM D2683, and ASTM F1055, respectively, are acceptable.

2.02 EQUIPMENT

A. Butt Fusion Machine

The butt fusion machine shall include the following features:

1. Facer with rotating planer block design.
2. Heater faces coated by the manufacturer to prevent molten plastic from adhering to the heater face.
3. Hydraulic-operated jaws suitable for use with the pipe sizes indicated in the plans.

B. Socket Fusion Equipment

Socket fusion heating tools and depth gauges shall be of the same manufacturer, unless they are all marked F1056, indicating compliance with ASTM F1056.

C. All equipment shall conform to any requirements specified in the pipe and socket manufacturer's installation instructions, and shall be approved by the Owner's Representative.

PART 3. EXECUTION

3.01 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. HDPE pipe and fittings shall be packaged and shipped by appropriate means to prevent damage to the material and to facilitate off-loading. The Owner will provide an on-site storage site. Storage site requirements (size and preferred location) shall be submitted with the bid documents.

B. Storage and handling shall be according to manufacturer's recommendations.

3.02 BASE PREPARATION

All HDPE piping shall be installed on a layer of coarse aggregate placed by the Contractor in accordance with the plans. The grade of the coarse aggregate base shall be verified before installing the piping.

3.03 INSTALLATION

All pipe and fittings shall be installed according to the manufacturer's recommendations. Removal of weld beads is not required. Contractor shall place coarse aggregate along the pipe to provide lateral stability. Welds shall not be obscured until they have been approved by the Owner's Representative, the top of pipe shall not be covered until the Construction Quality Assurance (CQA) survey has been completed to verify conformance with specified tolerances.

3.04 INSPECTIONS

A. The Owner's Representative shall shall be visually inspect pipe materials to verify that each pipe material is properly stamped (by the manufacturer) for ASTM acceptance before installation. Defective or damaged materials shall be removed from the site.

B. Each weld and connection shall be visually inspected by the Owner's Representative. Defective welds shall be repaired as directed by the Owner's Representative and according to manufacturer's recommendations. Welds and connections shall not be covered until they have been approved by the Owner's Representative.

3.05 TOLERANCES

A. HDPE piping shall be located within 0.5 ft. of plan location, and elevation shall be within 0.1 ft. of plan elevation with no adverse slopes.

END OF SECTION 02936

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes manufacturing, furnishing, and installing High Density Polyethylene (HDPE) Geomembranes for the Gypsum Management Facility and the Gypsum Management Facility Recycle Pond.

B. The work includes furnishing all equipment and materials and providing all labor, supervision, administration and management necessary to perform the work as shown on the plans.

1.02 RELATED SECTIONS

A. The following sections contain items which are related to the work in this section:

1. 02373 – Geotextiles
2. 02376 – Geosynthetic Clay Liner

1.03 REFERENCES

A. The following references, or cited portions thereof, govern the work:

1. American Society for Testing and Materials (ASTM):

a. D 638, Standard Test Method for Tensile Properties of Plastics.
b. D 751, Standard Test Methods for Coated Fabrics.
c. D 792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
d. D 1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
e. D 1204, Standard Test Method for Linear Dimensional Changes of Non Rigid Thermoplastic Sheeting or Film at Elevated Temperature.
f. D 1238, Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
g. D 1505, Standard Test Method for Density of Plastics by Density-Gradient Technique.
h. D 1603, Standard Test Method for Carbon Black in Olefin Plastics.
i. D 3895, Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis.
j. D 4218, Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.

k. D 4437, Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
l. D 4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
m. D 5199, Standard Test Method for Measuring Nominal Thickness of Smooth Geomembranes.
n. D 5397, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefins using Notched Constant Tensile Load Test.
o. D 5596, Standard Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds.
p. D 5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
q. D 5721, Practice for Air-Oven Aging of Polyolefin Geomembranes.
r. D 5820, Test Method for Air Testing.
s. D 5885, Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry.
t. D 5994, Standard Test Method for Measuring Nominal Thickness of Textured Geomembranes
u. D 6365, Standard Practice for the Nondestructive Testing of Geomembrane Seams using The Spark Test

2. Geosynthetic Research Institute (GRI):

a. GRI GM 6, Pressurized Air Channel Test for Dual Seamed Geomembranes
b. GRI GM 9, Cold Weather Seaming of Geomembranes
c. GRI GM 10, Specification for Stress Crack Resistance of HDPE Geomembrane Sheet
d. GRI GM 13, Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
e. GRI GM 14, Test Frequencies for Destructive SeamTesting

1.04 SUBMITTALS

A. Submit the following to the Engineer or Owner, for review and approval, within a reasonable time so as to expedite shipment or installation of the Geomembrane:

1. Documentation of manufacturer's qualifications as specified in subsection 1.05A of this Section.
2. Manufacturer's Quality Control program manual or descriptive documentation.
3. A material properties sheet, including at a minimum all properties specified in GRI GM 13, including test methods used.
4. Sample of the material.

5. Documentation of Installer's qualifications, as specified below and in subsection 1.05B of this Section.
    a. Submit a list of at least ten completed facilities. For each name and type of facility; its location; the date of installation; number of contact at the facility; type and thickness of geomembrane and; surface area of the installed geomembrane.
    b. Submit resumes or qualifications of the Installation Supervisor, Master Seamer and Technicians to be assigned to this project.
    c. Quality Control Program.
6. Example Material Warranty and Liner Installation Warranty complying with subsections 1.07 and 1.08 of this Section.
7. Resin Supplier's name, resin production plant identification, resin brand name and number, production date of the resin, resin Manufacturer's quality control certificates, and certification that the properties of the resin meet the requirements

B. Shop Drawings

1. Submit copies of shop drawings for engineer's approval within a reasonable time so as not to delay the start of geomembrane installation. Shop drawings shall show the proposed panel layout identifying seams and details. Seams should generally follow direction of the slope. Butt seams or roll-end seams should not occur on a slope unless approved by the Owner's Representative. Butt seams on a slope, if allowed, should be staggered.
2. Placement of geomembrane will not be allowed to proceed until Owner's Representative has received and approved the shop drawings.

C. Additional Submittals (In-Progress and at Completion)

1. Manufacturer's warranty (refer to subsection 1.08).
2. Geomembrane installation warranty (refer to subsection 1.09).
3. Daily written acceptance of subgrade surface (refer to subsection 3.01.C).
4. Low-temperature seaming procedures if applicable (refer to subsection 3.03.A)
5. Prequalification test seam samples (refer to subsection 3.05.A.6).
6. Field seam non-destructive test results (refer to subsection 3.05.B.1).
7. Field seam destructive test results (refer to subsection 3.05.C.6).
8. Daily field installation reports (refer to subsection 3.05.G).
9. Installation record drawing, as discussed in subsection 3.05.G).

1.05 QUALITY CONTOL

A. Manufacturer's Qualifications:

The manufacturer of geomembrane of the type specified or similar product shall have at least five years experience in the manufacture of such geomembrane. In addition, the geomembrane manufacturer shall have manufactured at least

10,000,000 sq. ft. of the specified type of geomembrane or similar product during the last five years.

B. Installer's Qualifications:

1 The Geomembrane Installer shall be the Manufacturer, approved Manufacturer's Installer or a contractor approved by the Owner's Representative to install the geomembrane.
2 The Geomembrane Installer shall have at least three years experience in the installation of the specified geomembrane or similar. The Geomembrane Installer shall have installed at least 10 projects involving a total of 5,000,000 sq. ft. of the specified type of geomembrane or similar during the last three years.
3 Installation shall be performed under the direction of a field Installation Supervisor who shall be responsible throughout the geomembrane installation, for geomembrane panel layout, seaming, patching, testing, repairs, and all other activities of the Geomembrane Installer. The Field Installation Supervisor shall have installed or supervised the installation and seaming of a minimum of 10 projects involving a total of 5,000,000 sq. ft. of geomembrane of the type specified or similar product.
4 Seaming shall be performed under the direction of a Master Seamer (who may also be the Field Installation Supervisor or Crew Foreman) who has seamed a minimum of 3,000,000 sq. ft. of geomembrane of the type specified or similar product, using the same type of seaming apparatus to be used in the current project. The Field Installation Supervisor and/or Master Seamer shall be present whenever seaming, patching, other welding operations, and testing is performed.
5 All seaming, patching, other welding operations, and testing shall be performed by qualified technicians employed by the Geomembrane Installer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Each roll of geomembrane delivered to the site shall be labeled by the manufacturer. The label shall be firmly affixed and shall clearly state the manufacturer's name, product identification, material thickness, roll number, roll dimensions and roll weight.
B. Geomembrane shall be protected from mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.
C. Rolls shall be stored away from high traffic areas. Continuously and uniformly support rolls on a smooth, level prepared surface.
D. Rolls shall not be stacked more than three high.

1.07 PROJECT CONDITIONS

Geomembrane shall not be installed in the presence of standing water, while precipitation is occurring, during excessive winds, or when material temperatures are outside the limits specified in Section 3.03.

1.08 MATERIAL WARRANTY

As required by specification, or as required in GRI GM 13 (attachment A)

1.09 GEOMEMBRANE INSTALLATION WARRANTY

The Geomembrane Installer shall guarantee the geomembrane installation against defects in the installation and workmanship for 1 year commencing with the date of final acceptance.

1.10 GEOMEMBRANE PRE-CONSTRUCTION MEETING

A. Geomembrane Pre-Construction Meeting shall be held at the site prior to installation of the geomembrane. At a minimum, the meeting shall be attended by the Geomembrane Installer, Owner, Owner's representative (Engineer and/or CQA Firm), and the General Contractor.

B. Topics for this meeting shall include:
   1. Responsibilities of each party.
   2. Lines of authority and communication. Resolution of any project document ambiguity.
   3. Methods for documenting, reporting and distributing documents and reports.
   4. Procedures for packaging and storing archive samples.
   5. Review of time schedule for all installation and testing.
   6. Review of panel layout and numbering systems for panels and seams including details for marking on geomembrane.
   7. Procedures and responsibilities for preparation and submission of as-built panel and seam drawings.
   8. Temperature and weather limitations. Installation procedures for adverse weather conditions. Defining acceptable subgrade, geomembrane, or ambient moisture and temperature conditions for working during liner installation.
   9. Subgrade conditions, dewatering responsibilities and subgrade maintenance plan.
   10. Deployment techniques including allowable subgrade for the geomembrane.
   11. Plan for controlling expansion/contraction and wrinkling of the geomembrane.
   12. Covering of the geomembrane and cover soil placement.
   13. Measurement and payment schedules.
   14. Health and safety.

C. The meeting shall be documented by the Owner's Representative and minutes shall be transmitted to all parties.

PART 2. PRODUCTS

2.01 SOURCE QUALITY CONTROL

Manufacturing Quality Control

A. The test methods and frequencies used by the manufacturer for quality control/quality assurance of the above geomembrane prior to delivery, shall be in accordance with GRI GM 13, or modified as required for project specific conditions.

B. The manufacturer's geomembrane quality control certifications, including results of quality control testing of the products, as specified in subsection 2.01.C of this Section, must be supplied to the Owner's Representative. The certification shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers and corresponding shipping information.

C. The Manufacturer will provide Certification that the geomembrane and welding rod supplied for the project have the same base resin and material properties.

2.02 GEOMEMBRANE

A. The geomembrane shall consist of new, first quality products designed and manufactured specifically for the purpose of this work which shall have been satisfactorily demonstrated by prior testing to be suitable and durable for such purposes. The geomembrane rolls shall be seamless, high density polyethylene (HDPE- Density >0.94g/cm) containing no plasticizers, fillers or extenders and shall be free of holes, blisters or contaminants, and leak free verified by 100% in line spark or equivalent testing. The geomembrane shall be supplied as a continuous sheet with no factory seams in rolls. The geomembrane will meet the property requirements as shown in Table A. (GRI GM 13)

B. Material shall be reviewed for conformance to the project specifications by the Owner's Representative

C. The geomembrane seams shall meet the property requirements as shown in Table 2, (Attachment B).

PART 3. EXECUTION

3.01 SUBGRADE PREPARATION

A. Geomembrane installed over geosynthetic clay liner (GCL).

The area of GCL to be covered with geomembrane shall be jointly inspected daily with the Owner's Representative before commencing geomembrane installation for the day, and the condition of the GCL shall be continuously observed as geomembrane installation progresses. Rocks, stones, sticks, sharp objects and debris of any kind shall be removed from the surface of the GCL. The Owner's Representative shall be notified of any discontinuities, premature hydration, or otherwise defective GCL. Geomembrane shall not be placed over suspect areas until they have been repaired to the satisfaction of the Owner's Representative. The Installation Supervisor shall certify daily in writing that the GCL surface was acceptable at the time of geomembrane installation.

B. Geomembrane installed over cushion dirt.

The area of cushion dirt to be covered with geomembrane shall be prepared in accordance with the Section 02200 – Earthwork. The surface shall be smooth and free of ruts and holes, rocks, stones, sticks, sharp objects and debris of any kind.

C. The Geomembrane installer shall provide daily written acceptance for the surface to be covered by the geomembrane in that day's operations. The surface shall be maintained in a manner, during geomembrane installation, to ensure subgrade suitability.

D. All subgrade damaged by construction equipment and deemed unsuitable by the Owner's Representative for geomembrane deployment shall be repaired prior to placement of the geomembrane. All repairs shall be reviewed by the Owner's Representative and approved by the Geomembrane Installer. This damage, repair, and the responsibilities of the contractor and Geomembrane Installer shall be defined in the preconstruction meeting.

3.02 GEOMEMBRANE PLACEMENT

A. No geomembrane shall be deployed until the applicable certifications and quality control certificates listed in subsection 1.04 of this Section are submitted to and approved by the Owner's Representative. Should geomembrane material be deployed prior to approval by the Owner's Representative it will be at the sole risk of the Geomembrane Installer and/or Contractor. If the material does not meet project specifications it shall be removed from the work area at no cost to the owner.

B. The geomembrane shall be installed to the limits shown on the project drawings and essentially as shown on approved panel layout drawings.

C. No geomembrane material shall be unrolled and deployed if the material temperatures are lower than 0 degrees C (32 degrees F). Temperature limitations should be defined in the preconstruction meeting. Typically, only the quantity of geomembrane that will be anchored and seamed together in one day should be deployed.

D. No vehicular traffic shall travel on the geomembrane other than an approved low ground pressure All Terrain Vehicle or equivalent.

E. Sand bags or equivalent ballast shall be used as necessary to temporarily hold the geomembrane material in position under the foreseeable and reasonably - expected wind conditions. Sand bag material shall be sufficiently close- knit to prevent soil fines from working through the bags and discharging on the geomembrane.

F. Geomembrane placement shall not be done if moisture prevents proper subgrade preparation, panel placement, or panel seaming. Moisture limitations should be defined in the preconstruction meeting.

G. Damaged panels or portions of the damaged panels which have been rejected shall be marked and their removal from the work area recorded.

H. The geomembrane shall not be allowed to "bridge over" voids or low areas in the subgrade. In these areas, the subgrade shall be prepared to allow the geomembrane to rest in intimate contact with the subgrade.

I. Wrinkles caused by panel placement or thermal expansion should be minimized in accordance with section 1.10 B. 11.

J. Considerations on Site Geometry: In general, seams shall be oriented parallel to the line of the maximum slope. In corners and odd shaped geometric locations, the total length of field seams shall be minimized. Seams shall not be located at low points in the subgrade.

K. Overlapping: The panels shall be overlapped prior to seaming to whatever extent is necessary to effect a good weld and allow for proper testing. In no case shall this overlap be less than 75mm (3 in.).

3.03 SEAMING PROCEDURES

A. Cold weather installations should follow guidelines as outlined in GRI GM9.

B. No geomembrane material shall be seamed when liner temperatures are less than 0 degrees C (32 degrees F).

C. No geomembrane material shall be seamed when the sheet temperature is above 75 degrees C (170 degrees F) as measured by an infrared thermometer or surface thermocouple.

D. Seaming shall primarily be performed using automatic fusion welding equipment and techniques. Extrusion welding shall be used where fusion welding is not possible such as at pipe penetrations, patches, repairs and short (less than a roll width) runs of seams.

E. Fishmouths or excessive wrinkles at the seam overlaps, shall be minimized and when necessary cut along the ridge of the wrinkles back into the panel so as to effect a flat overlap. The cut shall be terminated with a keyhole cut (nominal 10 mm (1/2 in) diameter hole) so as to minimize crack/tear propagation. The overlay shall subsequently be seamed. The key hole cut shall be patched with an oval or round patch of the same base geomembrane material extending a minimum of 150 mm (6 in.) beyond the cut in all directions.

3.04 PIPE AND STRUCTURE PENETRATION SEALING SYSTEM

A. Provide penetration sealing system as shown in the Project Drawings.

B. Penetrations shall be constructed from the base geomembrane material, flat stock, prefabricated boots and accessories as shown on the Project Drawings. The pre-fabricated or field fabricated assembly shall be field welded to the geomembrane as shown on the Project Drawings so as to prevent leakage. This assembly shall be tested as outlined in section 3.05.B. Alternatively, where field non destructive testing can not be performed, attachments will be field spark tested by standard holiday leak detectors in accordance with ASTM 6365 Spark testing should be done in areas where both air pressure testing and vacuum testing are not possible.

   1. Equipment for Spark testing shall be comprised of but not limited to: A

hand held holiday spark tester and conductive wand that generates a high voltage.

2. The testing activities shall be performed by the Geomembrane Installer by placing an electrically conductive tape or wire beneath the seam prior to welding. A trial seam containing a non welded segment shall be subject to a calibration test to ensure that such a defect (non welded segment) will be identified under the planned machine settings and procedures. Upon completion of the weld, enable the spark tester and hold approximately 25mm (1 in) above the weld moving slowly over the entire length of the weld in accordance with ASTM 6365. If there is no spark the weld is considered to be leak free.
3. A spark indicates a hole in the seam. The faulty area shall be located, repaired and retested by the Geomembrane Installer.
4. Care should be taken if flammable gases are present in the area to be tested.

3.05 FIELD QUALITY CONTROL

The Owner's Representative shall be notified prior to all pre qualification and production welding and testing, or as agreed upon in the pre construction meeting.

A. Prequalification Test Seams

1. Test seams shall be prepared and tested by the Geomembrane Installer to verify that seaming parameters (speed, temperature and pressure of welding equipment) are adequate.
2. Test seams shall be made by each welding technician and tested in accordance with ASTM D 4437 at the beginning of each seaming period. Test seaming shall be performed under the same conditions and with the same equipment and operator combination as production seaming. The test seam shall be approximately 3.3 meters (10 feet) long for fusion welding and 1 meter (3 feet) long for extrusion welding with the seam centered lengthwise. At a minimum, tests seams should be made by each technician 1 time every 4–6 hours; additional tests may be required with changes in environmental conditions.
3. Two 25 mm (1 in) wide specimens shall be die-cut by the Geomembrane Installer from each end of the test seam. These specimens shall be tested by the Geomembrane Installer using a field tensiometer testing both tracks for peel strength and also for shear strength. Each specimen shall fail in the parent material and not in the weld, "Film Tear Bond"(F.T.D. failure). Seam separation equal to or greater than 10% of the track width shall be considered a failing test.
4. The minimum acceptable seam strength values to be obtained for all specimens tested are listed in Subsection 3.05.C.4 of this Section. All four specimens shall pass for the test seam to be a passing seam.
5. If a test seam fails, an additional test seam shall be immediately conducted. If the additional test seam fails, the seaming apparatus shall be rejected and not used for production seaming until the deficiencies are

corrected and a successful test seam can be produced.

6. A sample from each test seam shall be labeled. The label shall indicate the date, geomembrane temperature, number of the seaming unit, technician performing the test seam and pass or fail description. The sample shall then be given to the Owner's Representative for archiving.

B. Field Seam Non-destructive Testing

1. All field seams shall be non-destructively tested by the Geomembrane Installer over the full seam length before the seams are covered. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of tester and outcome of all non-destructive testing shall be recorded and submitted to the Owner's Representative.
2. Testing should be done as the seaming work progresses, not at the completion of all field seaming. All defects found during testing shall be numbered and marked immediately after detection. All defects found should be repaired, retested and remarked to indicate acceptable completion of the repair.
3. Non-destructive testing shall be performed using vacuum box, air pressure or spark testing equipment.
4. Non-destructive tests shall be performed by experienced technicians familiar with the specified test methods. The Geomembrane Installer shall demonstrate to the Owner's Representative all test methods to verify the test procedures are valid.
5. Extrusion seams shall be vacuum box tested by the Geomembrane Installer in accordance with ASTM D 4437 and ASTM D 5641 with the following equipment and procedures:
    a. Equipment for testing extrusion seams shall be comprised of but not limited to: a vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the base, port hole or valve assembly and a vacuum gauge; a vacuum pump assembly equipped with a pressure controller and pipe connections; a rubber pressure/vacuum hose with fittings and connections; a plastic bucket; wide paint brush or mop; and a soapy solution.
    b. The vacuum pump shall be charged and the tank pressure adjusted to approximately 35 kPa (5 psig).
    c. The Geomembrane Installer shall create a leak tight seal between the gasket and geomembrane interface by wetting a strip of geomembrane approximately 0.3m (12 in) by 1.2m (48 in) (length and width of box) with a soapy solution, placing the box over the wetted area, and then compressing the box against the geomembrane. The Geomembrane Installer shall then close the bleed valve, open the vacuum valve, maintain initial pressure of approximately 35 kPa (5 psig) for approximately 5 seconds. The geomembrane should be continuously examined through the viewing window for the presence of soap bubbles, indicating a leak. If no bubbles appear after 5 seconds, the area shall be

considered leak free. The box shall be depressurized and moved over the next adjoining area with an appropriate overlap and the process repeated.

d. All areas where soap bubbles appear shall be marked, repaired and then retested.

e. At locations where seams cannot be non destructively tested, such as pipe penetrations, alternate nondestructive spark testing (as outlined in section 3.04.B) or equivalent should be substituted.

f. All seams that are vacuum tested shall be marked with the date tested, the name of the technician performing the test and the results of the test.

6. Double Fusion seams with an enclosed channel shall be air pressure tested by the Geomembrane Installer in accordance with ASTM D 5820 and ASTM D 4437 and the following equipment and procedures:

a. Equipment for testing double fusion seams shall be comprised of but not limited to: an air pump equipped with a pressure gauge capable of generating and sustaining a pressure of 210 kPa (30 psig), mounted on a cushion to protect the geomembrane; and a manometer equipped with a sharp hollow needle or other approved pressure feed device.

b. The Testing activities shall be performed by the Geomembrane Installer. Both ends of the seam to be tested shall be sealed and a needle or other approved pressure feed device inserted into the tunnel created by the double wedge fusion weld. The air pump shall be adjusted to a pressure of 210 kPa (30 psig), and the valve closed,. Allow 2 minutes for the injected air to come to equilibrium in the channel, and sustain pressure for 5 minutes. If pressure loss does not exceed 28 kPa (4 psig) after this five minute period the seam shall be considered leak tight. Release pressure from the opposite end verifying pressure drop on needle to ensure testing of the entire seam. The needle or other approved pressure feed device shall be removed and the feed hole sealed.

c. If loss of pressure exceeds 28 kPa (4 psig) during the testing period or pressure does not stabilize, the faulty area shall be located, repaired and retested by the Geomembrane Installer.

d. Results of the pressure testing shall be recorded on the liner at the seam tested and on a pressure testing record.

C. Destructive Field Seam Testing

1. One destructive test sample per 150 linear m (500 linear ft) seam length or another predetermined length in accordance with GRI GM 14 shall be taken by the Geomembrane Installer from a location specified by the Owner's Representative. The Geomembrane Installer shall not be informed in advance of the sample location. In order to obtain test results prior to completion of geomembrane installation, samples shall be cut by the Geomembrane Installer as directed by the Owner's Representative as seaming progresses.

2. All field samples shall be marked with their sample number and seam number. The sample number, date, time, location, and seam number shall be recorded. The Geomembrane Installer shall repair all holes in the geomembrane resulting from obtaining the seam samples. All patches shall be vacuum box tested or spark tested. If a patch cannot be permanently installed over the test location the same day of sample collection, a temporary patch shall be tack welded or hot air welded over the opening until a permanent patch can be affixed.
3. The destructive sample size shall be 300 mm (12 in) wide by 1 m (36 in) long with the seam centered lengthwise. The sample shall be cut into three equal sections and distributed as follows: one section given to the Owner's Representative as an archive sample; one section given to the Owner's Representative for laboratory testing as specified in paragraph 5 below; and one section retained by the Geomembrane Installer for field testing as specified in paragraph 4 below.
4. For field testing, the Geomembrane Installer shall cut 10 identical 25 mm (1 in) wide replicate specimens from his sample. The Geomembrane Installer shall test five specimens for seam shear strength and five for peel strength. Peel tests will be performed on both inside and outside weld tracks. To be acceptable, 4 of 5 test specimens must pass the stated criteria in section 2.02 with less than 10% separation. If 4 of 5 specimens pass, the sample qualifies for testing by the testing laboratory if required.
5. If independent seam testing is required by the specifications it shall be conducted in accordance with ASTM 5820 or ASTM D4437 or GRI GM 6.
6. Reports of the results of examinations and testing shall be prepared and submitted to the Owner's Representative.
7. For field seams, if a laboratory test fails, that shall be considered as an indicator of the possible inadequacy of the entire seamed length corresponding to the test sample. Additional destructive test portions shall then be taken by the Geomembrane Installer at locations indicated by the Engineer, typically 3 m (10 ft) on either side of the failed sample and laboratory seem tests shall be performed. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of non-adequate seams and all seams represented by the destructive test location shall be repaired with a cap-strip extrusion welded to all sides of the capped area. All cap-strip seams shall be non-destructively vacuum box tested until adequacy of the seams is achieved. Cap strip seams exceeding 50 M in length (150 FT) shall be destructively tested.

D. Identification of Defects

1. Panels and seams shall be inspected by the Installer and Owner's Representative during and after panel deployment to identify all defects, including holes, blisters, undispersed raw materials and signs of contamination by foreign matter.

E. Evaluation of Defects: Each suspect location on the liner (both in geomembrane seam and non-seam areas) shall be non-destructively tested using one of the methods described in Section 3.05.B. Each location which fails non-destructive testing shall be marked, numbered, measured and posted on the daily "installation" drawings and subsequently repaired.

1. If a destructive sample fails the field or laboratory test, the Geomembrane Installer shall repair the seam between the two nearest passed locations on both sides of the failed destructive sample location.
2. Defective seams, tears or holes shall be repaired by reseaming or applying a extrusion welded cap strip.
3. Reseaming may consist of either:
   a. Removing the defective weld area and rewelding the parent material using the original welding equipment; or
   b. Reseaming by extrusion welding along the overlap at the outside seam edge left by the fusion welding process.
4. Blisters, larger holes, and contamination by foreign matter shall be repaired by patches and/or extrusion weld beads as required. Each patch shall extend a minimum of 150 mm (6 in) beyond all edges of the defects.
5. All repairs shall be measured, located and recorded.

F. Verification of Repairs on Seams: Each repair shall be non-destructively tested using either vacuum box or spark testing methods. Tests which pass the non-destructive test shall be taken as an indication of a successful repair. Failed tests shall be reseamed and retested until a passing test results. The number, date, location, technician and test outcome of each patch shall be recorded.

G. Daily Field Installation Reports: At the beginning of each day's work, the Installer shall provide the Engineer with daily reports for all work accomplished on the previous work day. Reports shall include the following:
1. Total amount and location of geomembrane placed;
2. Total length and location of seams completed, name of technicians doing seaming and welding unit numbers;
3. Drawings of the previous day's installed geomembrane showing panel numbers, seam numbers and locations of non-destructive and destructive testing;
4. Results of pre-qualification test seams;
5. Results of non-destructive testing; and
6. Results of vacuum testing of repairs.

H. Destructive test results shall be reported prior to covering of liner or within 48 hours.

3.06 LINER ACCEPTANCE

A. Geomembrane liner will be accepted by the Owner's Representative when:

1. The entire installation is finished or an agreed upon subsection of the installation is finished;

2. All Installer's QC documentation is completed and submitted to the owner
3. Verification of the adequacy of all field seams and repairs and associated geomembrane testing is complete.

3.07 ANCHOR TRENCH

A. Construct as specified on the project drawings.

3.08 DISPOSAL OF SCRAP MATERIALS

A. On completion of installation, the Geomembrane Installer shall dispose of all trash and scrap material in a location approved by the Owner, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner. No scrap material shall be allowed to remain on the geomembrane surface.

PART 4. GRI GM13 SPECIFICATIONS

Geosynthetics Research Institute (GRI) Test Method GM13 – "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes", Revision 8, Dated July 10, 2006.

ATTACHMENT A:

Minimum Average Weld Properties for Smooth and Textured HDPE Geomembranes (English units)								
Property	**Test Method**	**30 mil**	**40 mil**	**50 mil**	**60 mil**	**80 mil**	**100 mil**	**120 mil**
Peel strength (fusion & extrusion) lb/in. Shear strength (fusion & extrusion) lb/in.	ASTM 4437 ASTM 4437	39 60	52 80	65 100	78 120	104 160	130 200	156 239

END OF SECTION 02800

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to seeding and placing mulch or erosion control blanket over seeded areas.

1.02 RELATED SECTIONS

A. Specified elsewhere:

1. 02200 - Earthwork

1.03 REFERENCES

The following reference or cited portions thereof, current at date of bidding documents unless otherwise specified, governs the work.

A. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.

1.04 SPECIFICATIONS

A. Work shall conform to the applicable requirements of Sections 250 and 251 of Standard Specifications for Road and Bridge Construction and to the requirements hereinafter specified.

B. Exceptions: All references in the IDOT specifications to methods of measurement and payment shall not apply.

1.05 WARRANTY

A. Warranty for one (1) year plus one growing season from date of substantial completion shall be provided.

PART 2. PRODUCTS

2.01 MATERIALS

A. Seed: Seed shall conform to Article 1081.04 of the IDOT Standard Specifications. The composition of the Ameren Energy Resources Generating hay seeding mix shall be as follows:

Seed Type	Pounds/Acre
Vernal Alfalfa	12
Wrangler Alfalfa	8
Medium Red Clover	6
Timothy	4

B. Mulch Material and Erosion Control Blanket: Mulch material shall conform to Article 1081.06 and the excelsior blanket/knitted straw mat shall conform to Article 1081.10 of the IDOT Standard Specifications.

C. Fertilizer and agricultural ground limestone will not be permitted.

PART 3. EXECUTION

3.01 CONSTRUCTION

A. Seed bed preparation and seeding methods shall conform to Section 250 of the IDOT Specifications. Seeding of areas disturbed by construction activities after September 30, 2008 may be deferred until Spring 2009.

B. Seed shall be applied to the perimeter berm ditch, to disturbed portions of the perimeter berm, and to all disturbed earth surfaces outside of the existing perimeter berm. IDOT seeding mixture 7 shall be used on stockpiles. IDOT seeding mixture 1A shall be used on the gypsum stack perimeter earthen berm, the recycle pond dam embankment and on slopes that are 4H:1V or steeper. The Ameren hay seed mix shall be used on slopes flatter that 4H:1V.

C. Application rates for IDOT seed mixtures shall be as specified in Section 250 of the IDOT Specifications. The application rate for the Ameren Energy Resources Generating's seed mix shall be as specified in the Ameren Energy Resources Generating's hay seeding mix.

D. Seeded areas shall be mulched in accordance with Article 251.03. The Contractor may use either Method 2 or Method 3.

3.02 MAINTENANCE OF COMPLETED WORK

A. All areas seeded by the Contractor shall be maintained by the Contractor during the period between completion of such work and final completion and acceptance of the Contractor's work by the Owner. This maintenance shall be such that the completed work, at time of acceptance, complies in all respects with the requirements herein specified.

B. The areas seeded will be required to germinate. If the seed does not germinate, the Contractor will be required to regrade and reseed at no additional cost.

END OF SECTION 02936

PART 1. GENERAL

1.01 WORK INCLUDES

A. The complete installation of the formwork for cast-in-place concrete, with shoring, bracing and anchorage, openings for other work, form accessories, form stripping.

1.02 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement.

B. Section 03300 - Cast-In-Place Concrete.

C. Section 03400 – Concrete Embedment Liner.

1.03 REFERENCES

A. ACI 347 - Recommended Practice For Concrete Formwork.

B. ACI 301 - Specifications For Structural Concrete For Buildings.

1.04 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347 and 301.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.08 COORDINATION

A. Coordinate this Section with other Sections of work which require attachment of components of formwork.

B. If formwork is placed which results in insufficient concrete cover over reinforcement, request instructions from Owner's Representative before proceeding.

PART 2. PRODUCTS

2.01 WOOD FORM MATERIALS

A. Softwood Plywood: 3/4 in. PS 1-83 "B-B" (concrete form) plywood, Class I, exterior grade or better, mill-oiled and edge sealed with each piece bearing legible inspection trademark.

B. Architectural Plywood: 3/4 in. PS 1-83 "B-B" plyform, Class I, with High Density smooth overlay, 1 surface, edge sealed with each piece bearing legible inspection trademark.

2.02 MANUFACTURERS - PREFABRICATED FORMS

A. Weyerhauser Concrete Form.

B. Georgia Pacific, G-P Exterior Soft Wood Plywood Product.

C. Plywood and Door Corporation's Finn-Form.

2.03 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.04 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, galvanized metal, adjustable length, 1 in. back break dimension, free of defects that could leave holes larger than 1 in. in concrete surface; Dayton-Sure Grip snap-in-form ties, as manufactured by Dayton Superior

Corp., Symons Ties as manufactured by Symons Corporation, Snap-Tys as manufactured by Richmond Corporation. Ties shall be removed after forms are removed, and holes filled with mortar that matches the adjacent surfaces.

B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture; by Magic Kote manufactured by Symons Manufacturing Co., Form Coat manufactured by Concrete Services Co., Formcel manufactured by Lambert Corp.

C. Corners: Chamfered, wood strip type; 3/4 x 3/4 in. size on all exterior corners, 3 x 3 in. size where shown on the drawings; maximum possible lengths.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

E. Concrete Embedment Liner, where required, shall be installed in accordance with Section 03400 – Concrete Embedment Liner.

PART 3. EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted, except for footings.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301. Metal forms shall be installed in strict accordance with manufacturer's directions and specifications.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members which are not indicated on drawings.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.08 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

B. Do not reuse wood formwork more than three times for concrete surfaces to be exposed to view. Do no patch formwork.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finished concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION 03100

PART 1. GENERAL

1.01 WORK INCLUDES

A. The complete installation of the reinforcing steel bars and accessories for cast-in-place concrete.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Formwork.

B. Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 318 - Building Code Requirements For Reinforced Concrete.

C. ACI SP-66 - American Concrete Institute - Detailing Manual.

D. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

E. CRSI - Concrete Reinforcing Steel Institute Manual of Practice.

1.04 SUBMITTALS

A. Submit under provisions of Section 01010.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, and bending and cutting schedules. Contract drawings shall not be reproduced as the basis for shop drawings.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI Manual of Standard Practice.

B. Submit certified copies of mill test report of reinforcement materials analysis.

1.06 COORDINATION

A. Coordinate with placement of formwork, formed openings and other work.

PART 2. PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars.

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage, annealed steel wire, epoxy coated when used with epoxy-coated reinforcement.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Standard Practice and ACI SP-66.

B. Splice reinforcement on at locations indicated on drawings. Indicate location of splices on shop drawings.

PART 3. EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Clean reinforcement of foreign particles or coatings.

B. Accommodate placement of formed openings.

C. Conform to ACI 318 code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

A. Contractor shall notify the Owner's Representative at least 24 hrs. in advance of concrete placement. Placement of reinforcing shall occur in such sequence that the Owner's Representative has sufficient time to inspect the correctness of the reinforcing within the placement area. The Owner's Representative retains the right to require necessary revisions be made before concrete is placed.

END OF SECTION 03200

PART 1. GENERAL

1.01 WORK INCLUDES

A. The complete installation of cast-in-place concrete structures, including joint sealants.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Formwork: Formwork and accessories.

B Section 03200 - Concrete Reinforcement.

C. Section 03400 – Concrete Embedment Liner

1.03 REFERENCES

A. ACI 301 – Structural Concrete for Buildings.

B. ACI 302 - Guide for Concrete Floor and Slab Construction.

C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 308 - Standard Practice for Curing Concrete.

G. ACI 318 - Building Code Requirements for Reinforced Concrete.

H. ASTM C31 - Concrete Test Specimens.

I. ASTM C33 - Concrete Aggregates.

J. ASTM C94 - Ready-Mixed Concrete.

K. ASTM C150 - Portland Cement.

L. ASTM C260 - Air Entraining Admixtures for Concrete.

M. ASTM C494 - Chemical Admixtures for Concrete.

1.04 SUBMITTALS

A. Product Data: Provide data on joint devices, attachment accessories, admixtures.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Acquire cement and aggregate from same source for all work.

C. Conform to ACI 305R when concreting during hot weather.

D. Conform to ACI 306R when concreting during cold weather.

1.06 COORDINATION

A. Coordinate this Section with other Sections which require embedment of components in cast-in-place concrete.

1.07 PRODUCT DATA

A. Submit proposed mix design to Owner's Representative for review prior to commencement of work. Identify source and provide material certificates for cement, fine and coarse aggregates. Provide recent laboratory gradation for fine and coarse aggregates and mix design information in accordance with ACI 301.

B. Submit Construction joint plan.

PART 2. PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland Type, Gray Color.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Potable.

2.02 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical: ASTM C494. Maximum 0.05% Chloride Ion Contents.

C. The use of calcium chloride in any concrete is not permitted.

2.03 ACCESSORIES

A. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

B. Curing Compound: Dress and Seal No. 18 by L&M Construction Chemicals, MB-429 by Master Builders, or Sikagard Cure/Hard by the Sika Corporation.

C. Epoxy Grouted Adhesive Anchors: Hilti, Red Head, Simpson, or Rawl.

2.04 CONCRETE MIX

A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.

B. Select proportions for normal weight concrete in accordance with ACI 301.

C. Provide normal weight concrete of the following characteristics:

1. Compressive strength at 28 days: 4,000 psi.

2. Slump: 4 in. - A tolerance of up to 1 in. above the maximum shall be allowed for one batch in any five consecutive batches tested.

3. Water/cement ratios: 0.4 (max).

D. Use accelerating admixtures in cold weather only when approved by Owner's Representative. Use of admixtures will not relax cold weather placement requirements.

E. Use set-retarding admixtures during hot weather only when approved by Owner's Representative.

F. Water-reducing admixtures may be used in all concrete except footings and in strict compliance with the manufacturer's directions.

G. Add air-entraining agent to concrete mix for air content of 6% (± 1%).

PART 3. EXECUTION

3.01 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.02 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify Owner's Representative minimum of 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, and embedded parts are not disturbed during concrete placement.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Place concrete continuously between predetermined expansion, control, and construction joints.

F. When air temperature is between 80°F and 90°F, reduce the mixing and delivery time specified in ASTM C94 from 1-1/2 hours to 75 minutes. When the air temperature is above 90°F, reduce the mixing and delivery time to 60 minutes.

G. Cold weather concreting. Comply with ACI 306 except as follows:

1. In freezing weather, provide suitable means for maintaining concrete temperature at a minimum of 70°F for three days, or 50°F for five days after placing.

2. Cooling of concrete to outside temperature: Not faster than 1° per hour for first day and 2° per hour thereafter until outside temperature is reached.

3. Maximum temperature of concrete produced with heated aggregated, heated water, or both, at any time during its production or transportation: 90°F.

4. Do not mix chemicals or other foreign materials in concrete to prevent freezing or to accelerate hardening of concrete, unless approved in writing by Owner's Representative.

H. Hot weather concreting. Comply with ACI 305R.

1. ACI recommendations shall be observed when any combination of high air temperature, low relative humidity and wind velocity tend to impair the quality of fresh or hardened concrete.

2. Retarding and water reducing admixtures shall be approved in writing for each concrete mix design prior to placement.

3.03 CONCRETE FINISHING

A. Provide exterior concrete formed surfaces to be left exposed with smooth rubbed finish in accord with ACI 301. All other formed surfaces shall have fins, projections and offsets removed.

B. Provide Class A tolerances to exterior concrete slabs according to ACI 301.

1. Broom finish all exterior slabs. Broom out all tool marks.

C. Pitch slabs to drain.

3.04 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete in accordance with ACI 308.

C. Cure and protect finished concrete slabs in accordance with ACI 308.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01010, paragraph 8.0.

B. Testing firm will take cylinders, perform slump and air entrainment tests in accordance with ACI 301.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed concrete mix design to Owner's Representative firm for review 14 days prior to commencement of Work.

E. Testing frequency shall be as specified in Section 01010, paragraph 8, except that one additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.06 PATCHING

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Owner's Representative and performed by the Contractor at no additional cost to the project.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Owner's Representative for each individual area.

END OF SECTION 03300

PART 1. GENERAL

1.01 WORK INCLUDES

A. Specifications and guidelines for manufacturing and installing high-density polyethylene embedment liners.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Formwork.

B. Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
2. D 1603 Test Method for Carbon Black in Olefin Plastics
3. D 5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
4. D 5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
5. D 6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
6. D 1204 Standard Test Method for Linear Dimensional Changes of Nongrid Thermoplastic Sheeting or Film at Elevated Temperature
7. D 696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
8. D 746 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
9. D 570 Standard Test Method for Water Absorption of Plastics
10. E 96 Standard Test Method for Water Vapor Transmission of Material

1.04 SUBMITTALS

A. All work for and in connection with the installation of the lining, field seaming and welding joints shall be completed in strict conformity with all applicable instructions and recommendations of the liner manufacturer.

B. Included with the shipment of liner, submit certified test reports that the liner and material are manufactured in accordance with standards specified herein.

1.05 QUALIFICATIONS

A. The HDPE liner specified in this section shall be furnished by a manufacturer who is fully experienced, reputable and qualified in the manufacturing of the materials. The manufacturer must at least 10 years of manufacturing experience.

B. Locking devices must be extruded to the sheet as a one step process.

C. Liner shall be GSE StudLiner as manufactured by GSE Lining Technology, Inc.

D. Liner shall be 8 feet in width.

E. Liner shall demonstrate a minimum pull-out strength of 14,000 psf.

1.06 COORDINATION

A. Coordinate with placement of formwork, formed openings and other work.

PART 2. PRODUCTS

2.01 ROLL DIMENSIONS

A. Embedment sheets shall be produced in rolls that are 8.0 ft (2.4 m) in width and a thickness range of 80 mils (2.0 mm) to 200 mils (5.0 mm) in thickness. Roll lengths vary according to thickness.

B. Locking studs of the same material as that of the liner shall be integrally extruded with the sheet. Stud spacing shall be on approximate 1.25 in (30 mm) centers, such that there are approximately 110 studs per square foot (1200 per square meter).

2.02 MATERIAL PROPERTIES

A. The material used in the embedment liner and in all welding strips shall be made from 97-98% virgin high density polyethylene and 1.5-3% carbon black or pigmentation for the purpose of an otherwise specified color.

B. Plasticizer shall not be added to the resin formulation.

C. Embedment sheet and welding strips shall be free of holes, pinholes, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.

D. The HDPE cap strips shall be made from HDPE, have good impact resistance and have an elongation sufficient to bridge up to 1/4 inch settling cracks.

E. Cap strips shall be approximately 4 inches wide or greater and shall be equivalent to that of the liner.

F. Material shall maintain a repairable state through it's lifecycle by methods approved and recommended by the manufacturer.

G. Embedment sheets shall have the following physical properties when tested in accordance with Table 1.

H. Raw resin shall have the following properties when tested in accordance with Table 2.

Table 1: Material Properties

Property	**Test Method**	**Nominal Value**				**Testing Frequency**
Thickness, mm (mil)	ASTM D 5199	2.00 (80)	3.00 (120)	4.00 (160)	5.00 (200)	Every 5th roll
Density, g/cm^3	ASTM D 1505	0.94	0.94	0.94	0.94	1/100,000 ft^2
Tensile Properties Strength@Yield, lb/in^2 (MPa) Elongation @ Break, %	ASTM D 6693 Type IV, Dumbell G.L.= 2.0in.	2,200 (14.5) 500	2,200 (14.5) 500	2,200 (14.5) 500	2,200 (14.5) 500	1/100,000 ft^2
Stud Pull-Out Strength[1], lb/ft^2 (kN/m^2)		>14,000 (669.89)	>14,000 (669.89)	>14,000 (669.89)	>14,000 (669.89)	1/ product
Carbon Black Content/ Pigment Content, % Black Liner Gray Liner	ASTM D 1603, mod. ASTM D 5630, mod.	2-3 1.5 – 2.5	2-3 1.5 – 2.5	2-3 1.5 – 2.5	2-3 1.5 – 2.5	1/100,000 ft^2
Carbon Black Dispersion[2]	ASTM D 5596	Note 2	Note 2	Note 2	Note 2	1/100,000 ft^2
Notched Constant Tensile Load, hours	ASTM D 5397	400	400	400	400	1/ formulation
Coefficient of Linear Thermal Expansion, per °C	ASTM D 696	1.20E-04	1.20E-04	1.20E-04	1.20E-04	1/ product
Low Temperature Brittleness, °C	ASTM D 746	-77	-77	-77	-77	1/ product
Dimensional Stability, % (each direction)	ASTM D 1204	$\pm$ 1.0	$\pm$ 1.0	$\pm$ 1.0	$\pm$ 1.0	1/ product
Water Absorption, %	ASTM D 570	0.1	0.1	0.1	0.1	1/ product
Water Vapor Transmission, ($g/m^2/day$)	ASTM E 96	<0.01	<0.01	<0.01	<0.01	1/ product

[1]Note: Concrete must have a compressive strength of at least 5,000 lb/in^2 (34,500 kPa).
[2]Note: Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view for category 3.

Table 2: Raw Material Properties

Property	Test Method	Value	Testing Frequency
Density, g/cm3	ASTM D 1505	0.932	1/ resin lot
Melt Flow, g/10 min	ASTM D 1238 (190/2.16)	$\leq$ 1.0	1/ resin lot
OIT, minutes	ASTM D 3895 (1atm/200°C)	100	1/ formulation

2.03 MATERIAL SUPPLY

A. Embedment sheets shall be supplied in roll form, sheets, pre-fabricated tubes or panels.

B. Cap strips shall be supplied in 4 inch widths or greater.

PART 3. EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Clean reinforcement of foreign particles or coatings.

B. Accommodate placement of formed openings.

C. Conform to ACI 318 code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

A. Contractor shall notify the Owner's Representative at least 24 hrs. in advance of concrete placement. Placement of the Concrete Embedment Liner shall occur in such sequence that the Owner's Representative has sufficient time to inspect the correctness of the placement within the concrete formwork area. The Owner's Representative retains the right to require necessary revisions be made before concrete is placed.

END OF SECTION 03200

AECOM

Appendix E: Operation & Maintenance Manual for #1 Ash Pond

Coffeen Power Station

Operational Procedure

x-xxx-xxxx--xxx

Operation & Maintenance Manual for #1 Ash Pond

(Bottom Ash Recycle Pond)

Effective Date: xx/xx/xxxx

Reason for Change: New Procedure

Approved By: ___________*x*___________ Date: xx/xx/xxxx

x
John Romang

Responsible Department: Coffeen Power Station, Technical Services Department

- ☐ This entire document shall be in the field during procedure performance.
- ☐ The following portions of this procedure shall be in the field during procedure performance: ________________________
- ☐ __________ from this procedure shall be in the field during procedure performance.
- ☐ No part of this procedure is required to be in the field during procedure performance.

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1.0 Purpose

1.1 This procedure is intended to ensure the safe and environmentally responsible operation and use of the #1 Ash Pond (Bottom Ash Recycle Pond) at the Coffeen Power Station. The primary purpose of the #1 Ash Pond is for the removal of bottom ash by settling and the recirculation of slag tank water. The pond is used to supply water to the Unit 1 and Unit 2 ash handling systems via the recycle pumps.

2.0 Scope

2.1 This procedure applies to all onsite personnel and the Dam Safety Group staff.

3.0 Responsibilities

3.1 Outside Unit Operator – Checks the pond level and screens once a shift. Operates the facilities as described in this Operational Procedure. Reports any conditions noted during routine activities to the Shift Supervisor and Chemistry Department. Writes job requests if a problem is identified.

3.2 Shift Supervisor (SS) - Calls the Chemistry Department when structural concerns or overflow conditions are reported. Make entries into the shift electronic log book (e-log) indicating the concern and actions taken.

3.3 Dam Safety Inspector - Conducts weekly detailed dam safety inspections and provides a report with findings and recommendations. Make entries in e-log indicating the concern and actions taken.

4.0 Historical Information

4.1 The #1 Ash Pond was initially constructed to be a mixed ash deposition pond and was put in service in the mid-1960's. It is located east of the Main Building. It is a 23 acre pond with a maximum outer berm height of 41.5 feet above ground surface level (approximately elevation 637.5'). The pond overflow was located on the north east corner of the pond and discharged into the flume.

4.2 The #1 Ash Pond was converted to act as a closed loop system in the late 1970's when the dewatering bins were installed. The mixed ash was removed and deposited into the #2 ash pond during the closure of #2 pond. The #1 Ash Pond berms were modified and an inner berms was added to the pond to aid in dropping out bottom ash solids. Exterior berm elevation is approximately 637.5 feet.

4.3 The #1 Ash Pond was equipped with an emergency overflow at the outlet structure. When the pond level reaches approximately 6.5 feet from the top of the berm, it will overflow into the flume. Overflow will be reported to the EPA. In 2011 there was an assessment of the overflow pipe which showed no obstructions or damage.

4.4 In 2006, the bottom ash system was modified to directly sluice bottom ash into the pond, bypassing the retired dewatering bins. Bottom Ash is removed from the pond via an outside contractor on an as needed (typically daily) basis.

5.0 Water Supply

All water inlets to the pond are located on the west side of the pond.

The ash sluice lines (from the valve house) discharge to the pond. These lines are used to convey ash from the slag handling system to the #1 Ash Pond. These lines are the southern most of the pond inlets. HPSW system is routed to the pond (valve house sparger valves, floor drains at Unit 1 cyclone level).

The Slag Tank Overflow sump pumps discharge into the pond at the concrete culvert located directly east of the of the lime/soda ash silo. Also in this area, a small stainless line extends thru the concrete. This is the discharge of the sludge pumps at the Waste Treatment System in the Recycle Pump House building.

The recycle pump flow control valves discharge to the pond through a line located at the northwest corner of the pond. Also in the vicinity of this line is the discharge pipe of the recycle pump house sump pumps.

Water from the Unit 1 and Unit 2 oil water separators are typically routed to the pond via the Slag Tank Overflow Pump (STOP) House sumps. Water entering these sumps are floor and roof drains in the plant and the yard area immediately to the north of the main building.

6.0 Operations Requirements

Pond Level - Plant personnel shall monitor the level of the #1 Ash Pond on a daily basis. Pond level is maintained at approximately 1.0’ to 1.5’ at the water level staff gauge located on the pond side of the screens. The staff gauge has elevation 629.0’ as the 0 elevation.

At 2.0' water level (elevation 631.0 feet), the pond overflows resulting in a sampling and analysis requirement for Total Suspended Solids and Oil and Grease with reporting of the results to the IEPA. If the pond is found at or above 2.0' on the pump side staff gauge, contact Chemistry immediately.

Water can be added to the pond from either the Unit 1 or Unit 2 Low Pressure Service Water (LPSW) headers via piping that discharges to the slag tank overflow trench.

Water can be drained from the pond via the water supply pipe to the dewatering bins. Opening this valve drains water from the recycle header which will remove water from the #1 Ash Pond.

Recycle Pump Intake Structure – Suction to the recycle pumps is supplied from the intake structure located at the west end of the north leg of the pond. This is the only water discharge point from the pond. Water level staff gauges are located upstream and downstream of the trash screens for determination of the screen differential. At 0.5' differential, the screens should be cleaned. Level sensors are also installed upstream and downstream of the screens. Digital displays of the upstream and downstream levels are located along the north side of the catwalk leading out to the screen enclosure. These level sensors will generate a high screen differential alarm in the Control Room DCS. Check screen differential (should clean screens at 6 inches differential.) When the screens become plugged, suction to the recycle pumps is reduced. Call shift supervisor to report if screens needs to be cleaned.

Oil Boom – Plant personnel shall monitor the oil boom that is provided upstream of the intake structure. Check condition of oil booms across pond, at discharge, and across pond inlet. Booms should be replaced when they become oil saturated or damaged. Also check that booms have not come unattached from one another. Write JR to change out booms or to reconnect booms when required.

Emergency Conditions – If a condition arises where there is a possibility of an embankment failure, then the following procedures will be followed:

1. Notify the Supervising Engineer Dam Safety immediately.

7.0 Dam Safety Requirements

7.1 Dam Safety Inspections - The plant's impoundment and flood prevention structures shall be inspected and maintained in a manner to ensure safe and environmentally responsible operations. A regular maintenance program shall be performed and shall consist of the following inspection items:

1. Earth embankments: Walk the crest, side slopes, and downstream toe of the dam concentrating on surface erosion, seepage, cracks, settlement, slumps, slides, and animal burrows. Frequency of inspection: Weekly.
2. Vegetation: Grass should be a thick vigorous growth to stabilize the earth embankment soils and prevent erosion form occurring. There should be NO trees on the earth embankment and none within a minimum of 20 feet of the embankment toe or other structures. Mowing frequency: Semiannually.
3. Well Readings: Record level of wells on the crest and toe of the berm. Frequency: Quarterly.
4. Special Inspections – Special inspections of the levees and ash pond berms shall be performed after earthquakes, floods, water level exceedance in the ponds, or heavy rainfall events. Inspection and report shall be equal to an annual inspection level of detail. Water level in the pond should be noted after a heavy rainfall. Dam Safety staff shall accompany plant personnel on special inspections. Frequency: As required.

8.0 Maintenance Log

8.1 Dam & Berm Inspector shall enter on e-log under the Dam Safety tab all weekly inspections, any usual occurrences, and maintenance performed.

9.0 Contact Numbers

Plant Environmental Supervisor: John Romang / 217-534-7629
Plant Dam & Berm Inspector: Vito Passariello/ 217-534-7664
Plant Control Room: 217-534-7668 / 217-534-7669
Supervising Engineer Dam Safety: Steve Bluemner / 314-554-6298
Dam Safety Staff Contact: Mike Wagstaff / 314-554-6296

10.0 References

Appendix F: Operation and Maintenance Manual, Gypsum Management FacilityOperation (2015)

Operation and Maintenance Manual
Coffeen Energy Center
Gypsum Management Facility
Montgomery County, Illinois

IDNR Permit # DS2014019
Dam Permit # IL50578 & IL50579

Prepared For:

ILLINOIS POWER GENERATING COMPANY
Coffeen Energy Center
134 CIPS Lane
Coffeen, Illinois 62017

Prepared By:

HANSON PROFESSIONAL SERVICES INC.
1525 South Sixth Street
Springfield, Illinois 62703

Amended By:

DYNEGY OPERATING COMPANY
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Original: February 2008
Amended: March 2015

OPERATION AND MAINTENANCE MANUAL
COFFEEN ENERGY CENTER
GYPSUM MANAGEMENT FACILITY
MONTGOMERY COUNTY, ILLINOIS

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SECTION 1.0
GENERAL

This operation and maintenance (O&M) manual outlines objectives, proposed policies, responsibilities, and procedures for Coffeen Energy Center personnel who are responsible for the management of the Coffeen Energy Center Gypsum Management Facility (GMF). The GMF incorporates two reservoirs, the Gypsum Pond and the Recycle Pond, for processing and storing gypsum.

1.1 REASONS FOR DEVELOPMENT AND DISSEMINATION OF THE O&M MANUAL

The State of Illinois Rivers, Lakes and Streams Act, (615 ILCS 5) Paragraph 23a includes the statement "The Department is authorized to carry out inspections of any dam within the State, and to establish standards and issue permits for the safe construction of new dams and the reconstruction, repair, operation and maintenance of all existing dams." (emphasis added).

Part 3702 of Section 17 of the Illinois Administrative Code, Chapter I entitled the "Construction and Maintenance of Dams" details the requirements to obtain a permit for the construction, operation, and maintenance of a dam. Section 3702.40 b) includes the following statements:

> "4) An applicant for a Class I or II dam shall submit an operational plan specifying the method and schedule for the operation of the dam and the routine operating procedures to keep the dam in good working order, including an emergency warning plan." and
>
> "5) As a condition of each permit, the dam owner shall submit a maintenance plan detailing the procedures and schedules to be followed to maintain the dam and its appurtenances in a reasonable state of repair."

Thus, it is a requirement of all dam owners who have dams which fall under the jurisdiction of the Illinois Department of Natural Resources Office of Water Resources (IDNR-OWR) to operate and maintain them safely.

As a dam owner, Illinois Power Generating Company (IPGC) Coffeen Energy Center is responsible for the safety of the public and for maintaining the structures at the facility for both safety and economy. The overall public interest is served by providing a document to serve as a basis for the safe and economical operation and maintenance of the dam during both emergency and day-to-day conditions.

1.2 GENERAL RESPONSIBILITIES CONCERNING DAMS

IPGC is responsible for the operation and maintenance of the Gypsum Pond Dam and the Recycle Pond Dam. These responsibilities include general maintenance (mowing, removing debris from decants, placing riprap where needed, etc.), operation, inspection and emergency action decisions.

SECTION 2.0
DEFINITIONS

Appurtenant Works - The structures or machinery auxiliary to dams which are built to operate and maintain dams; such as outlet works, spillways, gates, valves, channels, etc.

Boil - A stream of water discharging from the ground surface downstream of the dam carrying with it a volume of soil which is distributed around the hole formed by the discharging water.

Berm - A horizontal step or bench in the sloping profile of an embankment dam.

Breach - A break, gap, or opening (failure) in a dam which releases impoundment water.

Dam - A barrier built for impounding or diverting the flow of water.

Dike (Levee) - An embankment, usually applied to embankments or structures built to protect land from flooding.

Drain, Layer or Blanket - A layer of pervious material in a dam to facilitate the drainage of the embankment including such items as a toe drain, a weephole, and a chimney drain.

Drawdown - The resultant lowering of the water surface level due to the release of water from the impoundment.

Embankment - Fill material, usually rock or earth, placed with sloping sides.

Earthen Dam - Any dam constructed of excavated natural materials.

Emergency Action Plan - A predetermined plan of action to be taken to reduce the potential for property damage and loss of lives.

Failure - An incident resulting in the uncontrolled release of water from the dam.

Freeboard - The vertical distance between a stated water level and the top of the dam.

Gate or Valve - In general, a device in which a leaf or member is moved across the waterway to control or stop the flow.

Groin - The junction of the upstream or downstream face of the dam with the valley wall.

Maintenance - The upkeep, involving labor and materials, necessary for efficient operation of dams and their appurtenant works.

Operation - The administration, management, and performance needed to operate the dam and appurtenant works.

Operation and Maintenance Inspection - Inspections conducted by the dam operator. These inspections are frequent visual "Walk-around" inspections of the dam surface and appurtenant works.

Outlet - An opening through which water can freely discharge for a particular purpose from an impoundment.

Phreatic Surface - The upper surface of saturation in an embankment.

Piping - The progressive development of internal erosion by seepage, appearing downstream as a hole or seam, discharging water that contains soil particles.

Riprap - A layer of large stones, broken rock or precast blocks placed in a random fashion usually on the upstream slope of an embankment dam, on a reservoir shore, or on the sides of a channel as a protection against wave and ice action.

Silt/Sediment - Soil particles and debris in an impoundment.

Slump/Slide Area - A portion of earth embankment which moves downslope, sometimes suddenly, often with cracks developing.

Spillway System - A structure or structures over or through which flows are discharged. If the flow is controlled by gates, it is considered a controlled spillway. If the elevation of the spillway crest is the only control of the flows, it is considered an uncontrolled spillway.

Emergency Spillway - A spillway designed to operate very infrequently, only during exceptionally large floods, usually constructed of materials expected to erode slowly.

Principal Spillway - The main spillway which controls both normal and flood flows and is usually constructed of non-erodable materials.

Auxiliary Spillway - A spillway which works in conjunction with the principal spillway to control flood flows and is usually constructed of non-erodable materials.

Stilling Basin - A basin constructed to dissipate the energy of fast flowing water, such as from a spillway, and to protect the streambed from erosion.

Toe of Embankment - The junction of the face of the dam with the ground surface in the floodplain upstream or downstream of the dam.

SECTION 3.0
INFORMATION ABOUT THE DAMS

3.1 LOCATION

The Gypsum Pond Dam and Recycle Pond Dam are located in the NW 1/4 of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian in Montgomery County, Illinois. More specifically, the dams are located approximately 1.5 miles south of Coffeen, Illinois. A map showing the location of the dams is included in Appendix A.

3.2 DESCRIPTION OF DAM AND APPURTENANCES

The gypsum pond perimeter earthen dam, the gypsum pond "gypsum" dam, and the recycle pond dam will all be regulated in accordance with 17 Illinois Administrative Code (IAC) Part 3702, Construction and Maintenance of Dams. The gypsum pond perimeter earthen dam, which will be lined with a dual high density polyethylene (HDPE) geomembrane system, will have a maximum embankment height of 13 ft and a maximum impounding capacity of 442 acre-ft (measured at the top of earthen dam elevation 632 ft). There will be an additional 123 acre-ft of incised storage. The total volume of gypsum stored within the completed gypsum pond dams will be approximately 2,478 acre-ft.

The dam for the recycle pond, which will be lined with a 60 mil HDPE geomembrane, will have a maximum embankment height of 16 ft and a maximum impounding capacity of 243 acre-ft (measured at the top of dam elevation 629 ft). There will be an additional 99 acre-ft of incised storage.

The gypsum pond will be divided into two sub-cells for the containment of scrubber sludge (gypsum). Discharges to the site will switch back and forth between the two sub-cells so that one sub-cell can be dewatered and raised while the other is in use. There will be two fixed decant pipes constructed in the gypsum stack – one for each sub-cell - which will discharge to stilling wells located adjacent to the perimeter ditches. The control elevation on the decant pipes will be maintained 5.0 ft below the lowest point on the stack cell crest. The decant pipes will enable the cells to be dewatered after storm events so that a minimum of 5.0 ft of freeboard will be maintained in each cell. A minimum of 4.7 ft of freeboard is required above the decant inlet to contain the Probable Maximum Flood (PMF) storm event in addition to peak wind generated waves.

The gypsum pond dam perimeter ditches will be located on the interior sides of the earthen dam. Runoff from the stack will be conveyed through the ditches to a transfer channel which will discharge into the recycle pond. The ditches will be trapezoidal in shape with a 15 ft bottom width, a maximum depth of 9 ft and a longitudinal slope of 0.0005 ft/ft. Side slopes will be 3H:1V. During operation, the ditches will be monitored for erosion. If erosion of the designed ditch geometry occurs, a geogrid will be used for stabilization.

The transfer channel between the gypsum pond dam and the recycle pond have a trapezoidal cross-section with 3H:1V side slopes will be lined with HDPE. The 500 ft long transfer channel will transition from a 32-ft bottom width at an invert elevation of 623.0 ft at the upstream end to a 60-ft bottom width at an invert elevation of 622.0 ft at the downstream end. The transfer channel will be fitted with stop logs capable of raising the discharge control elevation to 625.0 ft. To prevent degradation of the HDPE liner due to flow velocities, the transfer channel and a portion of the recycle pond dam will incorporate an additional sacrificial layer of HDPE.

The emergency spillway for the recycle pond will consist of three 6 ft by 6 ft precast reinforced concrete risers (drop inlets) with a top elevation of 624 ft (5 ft below the top of the dam). The recycle pond's HDPE liner will attach to the exterior sides of each riser. A 4-ft diameter HDPE outlet conduit will be constructed at each riser with an upstream invert of 615.0 ft and a downstream invert of 613.0 ft. Assuming a normal pool elevation of 624 ft (control elevation of the risers), the emergency spillway has been designed to pass the 24-hour PMF storm event with adequate freeboard to prevent overtopping of the recycle pond crest by wind generated waves. The emergency spillway has been provided in the event of accident or catastrophic rainfall only. It is not expected to be activated during the life of the facility. As designed, all discharges from the system will be through the pump house located on the southeast corner of the recycle pond.

3.3 SIZE AND HAZARD CLASSIFICATION

If a worst case failure of the gypsum pond dam were to occur, and the entire volume of the stack is released easterly into Coffeen Lake, the Coffeen Lake reservoir has adequate freeboard to accept this additional volume without overtopping the dam during flood events up to and including the 60 percent PMF. However, the power plant and several residences could potentially be impacted if the gypsum stack dam were to fail in a westerly direction. Considering the regulatory criteria established in Part 3702, the gypsum stack perimeter earthen dam and the gypsum stack "gypsum" dam are classified as intermediate-size Class I (high hazard potential) dams.

A failure of the recycle pond dam would discharge water to Coffeen Lake but it is not anticipated to result in loss of life or any significant economic damage. Breach analyses indicate that a failure of the recycle pond dam during a PMF event would be expected to result in an increase in the Coffeen Lake water surface elevation of not more than ½ inch. Accordingly, the recycle pond dam is classified as a small-size Class III (low hazard potential) dam.

3.4 PURPOSE OF THE DAMS

The dams will be used to dewater, store and dispose of flue gas desulphurization sludge (gypsum) from the Coffeen Power Station (the Plant). Gypsum will be transported to the Gypsum Pond Dam in slurry form (approximately 20 percent solids) and allowed to settle. Clarified process water will then be decanted to the recycle pond and returned to the Plant for reuse via a pipeline.

3.5 PERTINENT DATA

Pertinent data about the dams, appurtenant works, and reservoirs are presented in Table 3-1 and Table 3-2.

Table 3-1 Pertinent Data for the Gypsum Pond Earthen Dam
(Based on the Construction of 2 Gypsum Cells)

Perimeter Ditches			**Transfer Channel**		
Bottom Width	15.00	feet	Bottom Width	32.00	feet
Top Width	73.50	feet	Top Width	86.00	feet
Depth	9.00	feet	Depth	9.00	feet
Outer Side Slope	3:1	H:V	Upstream Invert	623.00	feet
Inner Side Slope	3:1	H:V	Downstream Invert	622.00	feet
Upstream Invert	624.85	feet	Weir Elevation	625.00	feet
Downstream Invert	623.00	feet	Weir Length (at 2 ft height)	44.00	feet
Ditch slope	0.00050	ft/ft			
Bank Full Cross-sectional Area	378.00	sf	Dam		
Length of Each Ditch (Centerline)	3710.00	feet	Top of Dam Elevation	632	feet
Bank Full Volume of Each Ditch	32.19	acre-ft	Reservoir Surface Area	77.29	acres
Total Ditch length (Centerline)	7420.00	feet	Total Watershed Area	77.29	acres
Total Ditch Bank Full Volume	64.39	acre-ft	Dam Length	7720	feet
			Dam Height	13	feet

1.0 PMF Storm Event			**0.5 PMF Storm Event**		
Storm Duration	24	hours	Storm Duration	24	hours
Peak Outflow Discharge	1100.7	cfs	Peak Outflow Discharge	541.1	cfs
Total Discharge Volume	228.83	acre-ft	Total Discharge Volume	122.41	acre-ft
Peak WSEL in Perimeter Ditches	629.89	feet	Peak WSEL in Perimeter Ditches	628.23	feet
Freeboard over Max WSEL	2.11	feet	Freeboard over Max WSEL	3.77	feet
Wave Runup/Wind Setup	2.06	feet	Wave Runup/Wind Setup	2.06	feet
Adequate Freeboard?	**YES**		**Adequate Freeboard?**	**YES**	

100-yr Storm Event - Critical Duration			**100-yr Storm Event - 24 Hour Duration**		
Storm Duration	12	hours	Storm Duration	24	hours
Peak Outflow Discharge	92.6	cfs	Peak Outflow Discharge	62.9	cfs
Total Discharge Volume	50.91	acre-ft	Total Discharge Volume	57.01	acre-ft
Peak WSEL in Perimeter Ditches	626.07	feet	Peak WSEL in Perimeter Ditches	625.84	feet
Freeboard over Max WSEL	5.93	feet	Freeboard over Max WSEL	6.16	feet
Wave Runup/Wind Setup	2.06	feet	Wave Runup/Wind Setup	2.06	feet
Adequate Freeboard?	**YES**		**Adequate Freeboard?**	**YES**	

Note: The Critical Storm Duration is the duration of the rainfall event which produces the highest reservoir water surface elevation in the Gypsum Stack Perimeter Ditches for the given storm frequency. In each case, the starting normal pool elevation of the Recycle Pond is considered to be at elevation 624 ft.

Table 3-2 Pertinent Data for the Recycle Pond Dam
(Based on the Construction of 2 Gypsum Cells)

Dam		
Top of Dam Elevation	629	feet
Invert of Reservoir Elevation	605	feet
Reservoir Area at Invert	11.55	acres
Reservoir Area at Top of Dam	17.07	acres
Total Reservoir Volume	341.91	acre-ft
Volume at Elevation 624 ft	259.60	acre-ft
Total Watershed Area	94.36	acres
Dam Length	3600	feet
Dam Height	16	feet

3 Spillways- 6ft x 6ft inlet w/ 4ft dia outlet pipe		
Weir Length	22	feet
Weir Elevation	624.00	feet
Outlet Conduit Length	120	feet
Outlet Conduit Diameter (Inside)	48	inch
Upstream Invert	615	feet
Downstream Invert	614	feet
Outlet Conduit Slope	0.00833	

1.0 PMF Storm Event - Normal Pool at Elev. 624 ft		
Storm Duration	24	hours
Peak Inflow	1261.6	cfs
Peak Outflow	586.9	cfs
Peak Storage	315.47	acre-ft
Peak WSEL (HEC-HMS)	627.45	feet
Freeboard over Peak WSEL	1.55	feet
Wave Runup/Wind Setup	1.20	feet
Adequate Freeboard?	**YES**	

1.0 PMF Storm Event - Normal Pool at Elev. 609 ft		
Critical Storm Duration	24	hours
Peak Inflow	1261.6	cfs
Peak Outflow	289.7	cfs
Peak Storage	280.65	acre-ft
Peak WSEL (HEC-HMS)	625.34	feet
Freeboard over Peak WSEL	3.66	feet
Wave Runup/Wind Setup	1.20	feet
Water Released from Dam?	**YES**	

0.5 PMF Storm Event - Normal Pool at Elev. 624 ft		
Storm Duration	24	hours
Peak Inflow	608.4	cfs
Peak Outflow	413.6	cfs
Peak Storage	286.48	acre-ft
Peak WSEL (HEC-HMS)	625.69	feet
Freeboard over Peak WSEL	3.31	feet
Wave Runup/Wind Setup	1.20	feet
Adequate Freeboard?	**YES**	

0.5 PMF Storm Event - Normal Pool at Elev. 613 ft		
Critical Storm Duration	24	hours
Peak Inflow	608.4	cfs
Peak Outflow	0	cfs
Peak Storage	255.83	acre-ft
Peak WSEL (HEC-HMS)	623.75	feet
Freeboard over Peak WSEL	5.25	feet
Wave Runup/Wind Setup	1.20	feet
Water Released from Dam?	**NO**	

100-yr Storm Event - Normal Pool at Elev. 624 ft		
Critical Storm Duration	12	hours
Peak Inflow	113.2	cfs
Peak Outflow	95.8	cfs
Peak Storage	269.36	acre-ft
Peak WSEL (HEC-HMS)	624.63	feet
Freeboard over Peak WSEL	4.37	feet
Wave Runup/Wind Setup	1.20	feet
Adequate Freeboard?	**YES**	

100-yr Storm Event - Normal Pool at Elev. 619 ft		
Critical Storm Duration	24	hours
Peak Inflow	76.6	cfs
Peak Outflow	0	cfs
Peak Storage	258.48	acre-ft
Peak WSEL (HEC-HMS)	623.94	feet
Freeboard over Peak WSEL	5.06	feet
Wave Runup/Wind Setup	1.20	feet
Water Released from Dam?	**NO**	

Note: The above variation in normal pool elevations for the Recycle Pond is for the purpose of documenting the water surface elevation which must be maintained in the recycle pond in order to prevent the release of water from the GMF for the above described storm events.

SECTION 4.0
OPERATIONS ACTIVITIES

4.1 INTRODUCTION

The operations plan describes the proposed operation of the Coffeen Gypsum Management Facility (GMF) which includes the gypsum pond and the recycle pond.

4.2 SITE OPERATIONS AND PERSONNEL

4.2.1 Site Operations

The GMF will receive gypsum slurry 24 hours per day, seven days per week. Routine facility maintenance and construction activities will generally be conducted during day shift hours. The crest widths for both the gypsum stack earthen dam and the recycle pond dam are 20 ft. In addition, multi-directional ramps are being provided for both structures so that they are readily accessible by inspection, maintenance and gypsum recovery equipment.

The Plant is a restricted access location. Additional fencing around the perimeter of the active sedimentation cells of the gypsum stack and the recycle pond will be erected to prevent unauthorized access to the GMF, which is also under surveillance by security personnel.

4.2.2 Personnel

The proposed GMF will be owned and operated by Ameren Energy Generating Company (Ameren). Corporate offices are located in St. Louis, Missouri. Overall responsibility for the GMF operation lies with Ameren management personnel.

4.3 GYPSUM MANAGEMENT FACILITY STARTUP

The major components of the proposed GMF consist of:

- The gypsum stack dam/impoundment;
- The recycle pond;
- The earthen transfer channel that connects the two structures and through which process water will be decanted from the gypsum stack into the recycle pond; and
- The recycle pond decant and pumphouse through which process water will be returned to the Plant for reuse.

Both the recycle pond and the gypsum stack dam will be constructed before gypsum is placed within the gypsum stack dam/impoundment.

Upon startup, it is likely that the gypsum stack impoundment will have no more than a few feet of water in the bottom to prevent the high density polyethylene (HDPE) geomembrane from moving. The gypsum slurry (approximately 20 percent solids) will be pumped from the

Plant to the gypsum stack via piping. The piping will be HDPE with a suitable pressure rating for the intended hydraulic and static head. The HDPE pipe will discharge the slurry into the impoundment, and gypsum will settle by gravity.

It will take approximately 10 months before the gypsum stack impoundment is filled to elevation 623 ft, the point where process water may begin flowing into the recycle pond via the HDPE-lined earthen channel connecting the two structures. As soon as water begins to fill the recycle pond, it will be pumped back to the Plant for reuse.

4.4 WATER BALANCE

The capacity of the recycle pond has been designed to accommodate all precipitation runoff from the entire gypsum pond/recycle pond area during a 2-week complete maintenance outage at the Coffeen Power Station (the Plant) followed by a 12-week outage of one of the two units. The runoff and excess water accumulated during this time can be stored within the recycle pond without discharging. The design is based on the maximum 3.5 month precipitation that has occurred in the area since 1950. This occurred in April, May, June and half of July, 1957 and consisted of 28.83 inches of rainfall.

The water balance has been carried out for the expected life of the Site. During the first nine or ten months of operation, the water balance is positive, meaning that there is more water entering the gypsum stack/recycle pond system through process water and precipitation than is leaving the system through process water return and evaporation. However, there is 15 ft of freeboard between the pump discharge and the emergency spillway. With proper water-level management, the water surface will remain well below discharge elevation. After this initial startup period, the water balance is negative, meaning that other water sources will need to be continually added to the process water makeup stream to maintain the volume necessary for transport of the gypsum slurry.

The water balance is of particular concern since the entire system is designed to be a closed loop with no discharges. *(As previously noted, the recycle pond has been designed with an emergency spillway, but this is only to protect the structures in the event of an unforeseen accident or catastrophic rainfall event.)* Table 3.5-2 lists the maximum water surface elevation allowed in the recycle pond in order to prevent the discharge of water for the 100-year storm event and the 0.5 PMF storm event.

4.5 GYPSUM MANAGEMENT FACILITY OPERATION

4.5.1 Routine Operations

Gypsum slurry will initially be discharged at the southwestern corner of the gypsum pond impoundment. Settled gypsum will gradually create a plane of material sloping gently towards the north end of the impoundment. Depending on the slope of the settled gypsum, the discharge pipe may be moved to other corners of the impoundment to evenly distribute the material. Care must be taken during the initial filling period so to ensure that the sand layer covering the ring drains is not disturbed. If necessary, the sand may be armored with larger washed aggregate or the impoundment may be gradually filled with water to cover the sand prior to the discharge of gypsum slurry into the impoundment.

Once the gypsum plane reaches approximately elevation 627 ft (5 ft below the earthen dam crest), a track excavator or similar piece of equipment will be used to create the first gypsum berm and to form the perimeter ditch. Each gypsum berm will be approximately 10 ft in height and will effectively create a two-compartment impoundment within its perimeter. Gypsum for construction of the gypsum berm will be obtained from the settled material on the inside of the berm, creating an inner ditch. Gypsum slurry will then be discharged alternately into the inner ditch of each compartment. Gypsum will settle out into the inner ditch and clarified process water will flood the compartment to a depth of several feet. This water will be decanted to the perimeter ditch by way of an HDPE decant pipe which will discharge to a stilling well located at the toe of the gypsum stack.

As each compartment fills with settled gypsum, the discharge piping will be moved to the alternate compartment. The compartment, or sub-cell, that is not in service will be allowed to dewater and another gypsum berm will be constructed on top of the previous gypsum berm, effectively raising the gypsum stack another 10 ft. This alternating cycle of gypsum discharge, compartment dewatering and berm construction will continue. Gypsum will be deposited in the stack with an average dry density of approximately 74 lb/ft^{3}. Drawing No. C-10201-25 provides a visual description of this process.

4.5.2 Piezometer Installation and Monitoring

The side slopes of the gypsum pond will be constructed with 3:1 side slopes. After consolidation of the settled gypsum over time, the final slopes should approach 3.75:1. The stability of each gypsum pond slope is critically dependent on the location of the phreatic surface which is anticipated to develop within the stack. Ring drains are intended to lower the phreatic surface so that it is located an adequate distance from the surface of the slope in order to maintain slope stability. In order to monitor the phreatic surface within the stack, piezometers will be installed on each side of the gypsum pond. The piezometers will be installed every 15 vertical feet up the slope (45 horizontal feet based on 3:1 side slopes) and will extend to a depth of at least 15 feet below the anticipated phreatic water surface elevation as shown in Figure 4-1. At the time of installation, each piezometer will be labeled with the “critical elevation” corresponding to the anticipated phreatic surface elevation at that location. The anticipated phreatic surface elevation is the water surface elevation which was used in the slope stability analysis of the gypsum pond. The water level in each piezometer will be read and recorded on a monthly basis. If at any time a reading is recorded higher than “critical elevation” for that specific peizometer, the design engineer must be contacted immediately for evaluation of the reading. Any readings above the “critical elevation” may be indicative of improper ring drain function and/or slope instability which could lead to a failure of the gypsum stack. Therefore, it is critical that the piezometers are installed in accordance with the construction plans and specifications and monitored in accordance with this manual. It may be necessary to install additional subdrainage to maintain the phreatic surface at the desired level within the gypsum stack.

Figure 4-1 Anticipated Phreatic Surface in Gypsum Pond

Refer to figure at the end of the report text.

4.6 DAM INSPECTIONS

The inspection program includes two types of dam inspections. The first is regularly conducted by the dam operator and is referred to as an Operation and Maintenance Inspection. The second type of inspection, referred to as the Engineering Inspection, is conducted by a qualified engineer approved by IPGC. All engineering inspection reports must be signed and sealed by an Illinois Registered Professional Engineer.

The dam operator will perform monthly Operation and Maintenance Inspections of the gypsum pond perimeter earthen dam and the gypsum berms and side slopes during the operating life of the structure. During these inspections, the gypsum stack ditches and the transfer channel will also be examined for signs of erosion and liner degradation. The "operating life of the structure" will be considered to cease upon covering of the gypsum with an HDPE/soil cover. Engineering Inspections will be conducted on an annual basis during the operating life of the structure and will continue after covering of the gypsum pond until authorization to abandon the structure is received from IDNR/OWR.

4.6.1 Operation and Maintenance Inspection

Occasional "walk-around" inspections of the dams and appurtenant works are to be made by the dam operator. During these inspections, a checklist of items to be maintained and items to be observed should be recorded. Appendix A provides an example of the Operation and Maintenance Inspection Checklist to be utilized for these inspections. **If any of the following items are found to be unusual or are cause for concern, the Shift Supervisor should be notified and the Emergency Action Plan should be immediately consulted for guidance on an appropriate course of action.**

Frequency: Operation and maintenance inspections will be performed by the dam operator on a monthly basis and also during and after unusual events such as heavy rainfall or an earthquake.

Inspection Items: During each inspection the following items should be noted in particular.

1. Water Level - Maximum reservoir levels as a result of heavy rainfall should be recorded.

2. Earth Embankment - Walk the crest, side slopes and downstream toe of the dam concentrating on surface erosion, seepage, cracks, settlement, slumps, slides, and animal burrows. These are described as follows:

   - Surface Erosion - Removal of vegetative cover by water action or pedestrian or vehicle usage forming deep ruts or gullies.

   - Seepage - The passage of water through and/or underneath the earth embankment abutment and natural groundline or at the contact between the embankment and outlet works. It can be indicated by cattails or other wet environmental vegetation, erosion, channelization, or slumping on the embankment face.

- Cracks - Deep cracks usually indicate the movement of the dam and/or the foundation and can be in either the longitudinal (along the length of the dam) or transverse (across the dam) directions. Cracking can be an indicator of the beginning of slumps. Shallow cracks may develop during the summer when the surface soils of the embankment become severely dried and are usually of no concern in regard to the safety of the dam.

- Settlement - Settlement is indicated by depressions or low spots and can be signs of consolidation of the dam or foundation or the loss of material beneath the settlement area.

- Slumps/Slides - A slow or sudden movement of the earth embankment slope on either face toward the toe of the dam.

- If seepage indicates the presence of soil particles, or if deep cracks, settlement, slumps, or slides are noticed, a qualified engineer should be contacted immediately for consultation.

- Animal Burrows - Animal burrows result in a loss of earth embankment material and can provide seepage paths for water through the embankment.

3. Gypsum Embankment - Walk the crest, side slopes and downstream toe of the dam concentrating on surface erosion, seepage, cracks, settlement, slumps, slides and animal burrows. The descriptions for these are the same as for earth embankment.

4. Vegetation - Grass should be a thick vigorous growth to stabilize the earth embankment soils and prevent erosion from occurring. Note the height of the grass; if greater than 1 foot a mowing of the area should be scheduled before the next inspection. There should be NO trees on the earth embankment and NONE within a minimum of 20 feet of the embankment toes or other structures. The gypsum embankment will not be seeded and is not expected to have any vegetation.

5. Gypsum Stack piezometers should be inspected for any damage or loss of function. Damaged piezometers must be promptly repaired or replaced since their function is critical to ensuring stability of the gypsum stack.

6. The water level in each Gypsum Stack piezometer must be measured and recorded during each monthly inspection. If the water level in any piezometer is above the "critical elevation" as discussed in Section 4.5.2 of this plan, the Ameren Technical Services Superintendent should be notified and the **Emergency Action Plan should be immediately consulted for guidance on an appropriate course of action**.

7. Gypsum Pond LD/LCRS Drains - The change in location or amount of flows discharging from the Leak Detection/Leachate Collection Recovery System (LD/LCRS) should be recorded. If a significant change has occurred, a qualified engineer should be contacted for consultation.

8. Gypsum Stack Ring Drains - The change in location or amount of flows discharging from the Ring Drains should be recorded. If a significant change has occurred, a qualified engineer should be contacted for consultation.

9. Gypsum Stack Fixed Decant – Check the alignment and supports for the pipe. Record the amount of flows discharging from the pipe and any erosion or scour around the discharge point.

10. Gypsum Stack Perimeter Ditch – The perimeter ditch should have a consistent prismatic shape for the entire length. Inspect the perimeter ditch for evidence of erosion, sediment deposition and irregularity in channel geometry, especially in the vicinity of siphon, decant or ring drain outfall structures. If irregularities are noted, repairs should be scheduled and completed.

11. Drawdown Facilities - Check to make sure that the drawdown stop logs in the transfer ditch are undamaged, operating well and allowing for the free flow of water over them. Confirm during inspections the valves are opened and closed at least quarterly.

12. Transfer Channel - Check for any debris or other obstructions which may block or restrict the free flow of water. Check for any pools or undulation of the floor of the channel.

13. Recycle Pond Decant - Check for any debris or other obstructions around the Recycle Pond decant which may block or restrict the free flow of water. The emergency dewatering valve should be lubricated. If there is no return water in the pipe, the emergency dewatering valve should be exercised. Record the physical and operating conditions of the system.

14. Recycle Pond Drop Inlet Spillways - Check for any debris or other obstructions around the inlet crest and at the bottom of the drop inlet which may block or restrict the free flow of water. Check for the development of any rusty areas on the concrete, and seepage, cracking, breaking, or spalling of the concrete. Check for settlement or cracking of the crest. Check for any debris in the pipes which may restrict the flow of water. Check for any tears or leaks in the HDPE liner covering the concrete.

15. Recycle Pond Rip Rap Basin - Check for any debris or other obstructions in the riprap basin which may block or restrict the free flow of water. Check to make sure that the rip rap is remaining in a uniform position. Freeze/thaw action or flow over the rip rap may tend to lift or fracture, thus requiring replacement or leveling to maintain the necessary level of protection. NO trees or woody vegetation should be growing through the rip rap.

16. Fences - Check for damage, accumulated debris, operation of gates and locks, and adequacy of locations (this may change with time as people access the area or development occurs in the area).

17. Perimeter - Check the perimeter of the dams for a distance of at least 100 feet beyond the toe for signs of seepage or boils.

18. HDPE Liner – Wherever exposed, the HDPE Liner should be inspected for tears, gouges, protrusions under the liner and abrasion.

Records: A log book of activities occurring at the dam is to be kept current by the dam operator. The log book should be reviewed during the Engineering Inspection. This book should contain at the least the following documentation:

1. Completed operation and maintenance inspection checklists
2. Readings from all piezometers on the Gypsum Stack
3. Additional visual observations
4. A list of maintenance performed
5. A list of any unusual occurrences at the dam
6. Copies of the engineering inspection reports

4.6.2 Engineering Inspection

The engineering inspection is to be conducted by a qualified engineer approved by Ameren. The inspection will provide a thorough evaluation of the dam condition and appurtenances. Appendix B is an example of the inspection report form which is to be utilized for these inspections.

Frequency: The Gypsum Pond Dam is a Class I, High Hazard Potential dam and is to be inspected by an Illinois Registered Professional Engineer at least once per year. The Recycle Pond Dam is classified as a Class III, Low Hazard Potential dams and is to be inspected by an Illinois Registered Professional Engineer at least once every five years.

Inspection Items: The engineer will thoroughly inspect all of the items noted in Section 4.6.1 Operation and Maintenance Inspection.

Records: The Dam Inspection Report form from IDNR-OWR "Guidelines and Forms for Inspection of Illinois Dams" (a copy of which is included in Appendix B), will be completed by the inspecting engineer and will be signed and sealed by an Illinois Registered Professional Engineer. This report will document problem areas and deficiencies; recommend remedial actions for problem areas; and establish time requirements for dealing with the problems. The original report will be retained in Dynegy Operating Company (DOC) files, and a copy of the report will be submitted to the Illinois Department of Natural Resources, Office of Water Resources.

4.6.3 Review of Emergency Action Plan

The emergency action plan should be reviewed annually to assure that all contacts, addresses and telephone numbers are current. Changes in the adjacent land use should also be noted and may dictate the need for revisions to the plan. Changes to the plan should be made as appropriate but only with the concurrence of the Montgomery County Emergency Services and Disaster Agency and of the Illinois Department of Natural Resources, Office of Water Resources. Copies of any revisions should also be forwarded to all personnel and known emergency responders that possess previous versions the plan.

SECTION 5.0
MAINTENANCE ACTIVITIES

Timely repairs are a must after problem areas have been identified. The dam operator is to perform the work required to correct items noted in the operation and maintenance inspections and engineering inspections. Such items include repairing erosion of the gypsum slopes, mowing, seeding, tree and brush removal, replacing rip rap, repairing fences and locks, clearing debris, etc. The maintenance activities specified in the following sections are minimum requirements. NOTE: NO alterations or repairs to structural elements should be made without the assistance of the Ameren Chief Dam Safety Engineer and the concurrence of the Illinois Department of Natural Resources, Office of Water Resources.

Debris: Remove all trash, logs and other debris which may obstruct flow into the principal spillway pipes and drop inlets, or block passage from their discharge channels.

Rip Rap: Replenish rip rap as needed to provide adequate protection against erosion.

Vegetation Control

1. Maintain a good grass cover on the embankment by seeding, fertilizing and mulching areas which are refilled, barren, or thinly vegetated. Seeding mixtures used for maintenance reseeding shall result in a cover compatible with adjacent cover. The seeding mixture specified at the time of the dam's construction was IDOT Standard Specifications Class 1A (Salt Tolerant Lawn Mixture) as follows:

   <u>IDOT Class 1A Salt Tolerant Lawn Mixture</u>
   Bluegrass ....60 lb/acre
   Perennial Ryegrass ....20 lb/acre
   Dawsons Red Fescue.......20 lb/acre
   Scaldis Hard Fescue ....20 lb/acre
   Fults Salt Grass ....60 lb/acre

2. Grassed areas such as the embankment and the areas beyond the embankment toes for a distance of at least 20 feet should be mowed at least twice annually or at any time the height of the grass exceeds 1 foot.

3. All erosion areas will be filled and compacted, reseeded, fertilized and mulched to establish a thick erosion resistant cover.

4. Remove all trees and brush growing on the dam embankment to prevent development of a root system which could provide seepage paths. Herbicides utilized for tree and brush control are discussed in Appendix D.

5. Keep the riprap basin clear of weeds, brush, and trees.

6. Clear all brush and trees for a distance of approximately 20 feet beyond the toe of each dam.

Animal Damage: Fill rodent holes and other animal burrows with compacted clayey soil and reseed. If rodents become a nuisance, an effective rodent control program as approved by the Illinois Department of Natural Resources District Wildlife Biologist should be implemented.

Signs: All warning signs shall be maintained (repaired, painted, or replaced) as needed.

Gypsum Slopes: Erosion of the gypsum slopes will be evident with the presence of erosion rills. Erosion rills should be filled with additional gypsum material and graded to conform with the design slope.

Piezometers: All piezometers on the gypsum stack shall be inspected for signs of damage or displacement. Non-functioning piezometers shall immediately be replaced.

APPENDIX A
LOCATION MAP

APPENDIX B

OPERATION AND MAINTENANCE INSPECTION CHECKLIST

OPERATION AND MAINTENANCE INSPECTION CHECKLIST

Dam Name (circle one): Gypsum Pond Dam Recycle Pond Dam

Date: ___________________________ Time: __________________________

Name of Inspector: ____

Reservoir Elevation: _______________ feet

ITEM	NO	YES	IF YES
Record Piezometer Readings for Gypsum Stack. Are any readings above the critical level? (see section 4.5.2 of O&M Manual)			Contact Manager, Environment & Chemistry and notify Hanson Professional Services
Note the condition of the Piezometers on the Gypsum Stack. Any damage?			Contact Manager, Environment & Chemistry
Deep Surface Cracks			Contact Manager, Environment & Chemistry
Slump or Slide on the upstream or downstream face			Contact Manager, Environment & Chemistry
Erosion from runoff, wave action or traffic			Repair and stabilize
Embankment, abutment or spillway seepage			Contact Manager, Environment & Chemistry
Seepage or flows of muddy water			Contact Manager, Environment & Chemistry
Uneven settlement			Contact Manager, Environment & Chemistry
Trees, brush or burrow holes on the embankment or in the riprap basin			Remove trees and brush, fill holes
Transfer channel or Spillway pipes blocked			Clear immediately
Damage to stop logs			Repair or replace
Damage to HDPE Liner			Repair and schedule engineer inspection
Settlement or displacement of Gypsum Pond fixed decant pipes or outlets			Schedule engineer inspection
Discharge from Gypsum Pond LD/LCRS Drains?			Record discharge rate for each outlet (time to fill bucket)
Discharge from Gypsum Pond Ring Drains?			Record discharge rate for each outlet (time to fill bucket)
Gypsum Stack Perimeter Ditch erosion			Schedule repair
Problems with Recycle Pond spillways			Contact Manager, Environment & Chemistry
Problems with Recycle Pond decant			Contact Manager, Environment & Chemistry
Height of grass (inches)		inches	If more than 1 foot, schedule mowing
Damage to fencing, gates and locks or other access restriction measures			Contact Manager, Environment & Chemistry
Confirm drawdown facilities are opened and closed at least quarterly.			Contact Manager, Environment & Chemistry

Comments: ____

____

APPENDIX C
ENGINEERING INSPECTION FORMS

Dam Inspection Report

Name of Dam ______________________ Dam Identification Number ______________

Permit Number __________________ Class of Dam ______________________

Location NW 1/4 Section 11 Township 7N Range 3W 3rd P.M.

Owner ________________________ ________________________

Name Telephone Number (Day)

________________________ ________________________

Street Telephone Number (Night)

________________________ County Montgomery

City Zip Code

Type of Dam ____

Type of Spillway ____

Date(s) Inspected ____

Weather When Inspected ____

Temperature When Inspected ____

Pool Elevation When Inspected ____

Tailwater Elevation When Inspected ____

Inspection Personnel:

____

Name Title

____

Name Title

____

Name Title

____

Name Title

Professional Engineer's Seal

The Department of Natural Resources is requesting information that is necessary to accomplish the statutory purpose as outlined under the River, Lakes and Streams Act, 615 ILCS 5 (1994 State Bar Edition). Submittal of this information is REQUIRED. Failure to provide the required information could result in the initiation of non-compliance procedures as outlined in Section 702.160 of the "Rules for Construction and Maintenance of Dams". This form has been approved by the State Forms Management Center.

CONDITION CODES

EC	**-**	**Emergency Condition. A serious dam safety condition exists that needs immediate action. Emergency measures implemented as instructed by Chief Dam Safety Engineer; such as, pool draw down, work stoppage, plant stoppage.**
NE	**-**	**No evidence of a problem**
GC	**-**	**Good condition**
MM	**-**	**Item needing minor maintenance and/or repairs within the year, the safety or integrity of the item is not yet imperiled**
IM	**-**	**Item needing immediate maintenance to restore or ensure its safety or integrity. Remediation should be completed within 1 month.**
EC	**-**	**Emergency condition which if not immediately repaired or other appropriate measures taken could lead to failure of the dam**
OB	**-**	**Condition requires regular observation to ensure that the condition does not become worse**
NA	**-**	**Not applicable to this dam**
NI	**-**	**Not inspected - list the reason for non-inspection under deficiencies**
EC	**-**	**Emergency Condition. A serious dam safety condition exists that needs immediate action. Emergency measures implemented as instructed by Chief Dam Safety Engineer; such as, pool draw down, work stoppage, plant stoppage.**

GYPSUM STACK - EARTH EMBANKMENT

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Surface Cracks			
Vertical and Horizontal Alignment of Crest			
Unusual movement or Cracking at or Beyond Toe			
Sloughing or Erosion of Outer Embankment Slopes			
Upstream Face Slope Protection (HDPE Liner)			
Seepage			
Animal Damage			

GYPSUM STACK - EARTH EMBANKMENT

(Continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Vegetative Cover			

<u>GYPSUM STACK - GYPSUM EMBANKMENT</u>

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Surface Cracks			
Vertical and Horizontal Alignment of Crest			
Unusual movement or Cracking at or Beyond Toe			
Sloughing or Erosion of **Outside** Embankment Slopes			
Sloughing or Erosion of **Inside** Embankment Slopes			
Seepage			
Animal Damage			

GYPSUM STACK - GYPSUM EMBANKMENT

(Continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Condition of Piezometers on Gypsum Stack			
Piezometer Readings on Gypsum Stack Above Critical Level?			

GYPSUM STACK – PERIMETER DITCH

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Ditch Geometry (15 ft bottom width, 3:1 slopes, 8-9 ft depth)			
Concrete Apron at ring drain outlets			
Ring Drain Discharge Pipes			
Stilling Wells for Fixed Decants			

<u>TRANSFER CHANNEL - (between gypsum stack and recycle pond)</u>

☐ Drop Inlet Structure ☒ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Debris			
Side Slope Stability			
HPDE Liner			
HDPE Liner Welds			
Stop Logs			
Differential Settlement			

RECYCLE POND - EMBANKMENT

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Surface Cracks			
Vertical and Horizontal Alignment of Crest			
Unusual movement or Cracking at or Beyond Toe			
Sloughing or Erosion of Outer Embankment Slopes			
Upstream Face Slope Protection (HDPE Liner)			
Seepage			
Animal Damage			

RECYCLE POND - EMBANKMENT

(Continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Vegetative Cover			

<u>RECYCLE POND - PRINCIPAL SPILLWAY (Left, Looking Downstream)</u>

[X] Drop Inlet Structure   [ ] Overflow Spillway Structure   [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment of Structure Walls			
Construction Joints			
Differential Settlement			
Erosion, Spalling, Cavitation			
Joint Separation			
Seepage Around or into Conduit			
Surface Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Left, Looking Downstream)

(Continued)

[X] Drop Inlet Structure   [ ] Overflow Spillway Structure   [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Structural Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Center)

X Drop Inlet Structure ☐ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment of Structure Walls			
Construction Joints			
Differential Settlement			
Erosion, Spalling, Cavitation			
Joint Separation			
Seepage Around or into Conduit			
Surface Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Center)

(Continued)

X Drop Inlet Structure   ☐ Overflow Spillway Structure   ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Structural Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Right, Looking Downstream)

[X] Drop Inlet Structure [ ] Overflow Spillway Structure [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment of Structure Walls			
Construction Joints			
Differential Settlement			
Erosion, Spalling, Cavitation			
Joint Separation			
Seepage Around or into Conduit			
Surface Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Right, Looking Downstream)

(Continued)

[X] Drop Inlet Structure [ ] Overflow Spillway Structure [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Structural Cracks			

RECYCLE POND - ENERGY DISSIPATOR

X Principal Spillway ☐ Outlet Works Type: FHWA HEC-14, Riprap Basin

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Riprap			
Outlet Channel			
Debris			

RECYCLE POND - DECANT STRUCTURE

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment			
Connection to Bollard			
Debris in Inlets			
Condition of Pipe			
Condition of Liner Beneath Pipe			
Connection to Ballast			
Connection of Pipe Boot to Liner			

RECYCLE POND - DECANT STRUCTURE

(continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Seepage Around or into Conduit			

RECYCLE POND – WATER LEVEL GAGE STRUCTURE

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE

APPENDIX D
HERBICIDES

HERBICIDES

Site personnel should check with the Illinois Department of Natural Resources, Regional Fisheries Biologist and the Regional Wildlife Biologist before using any herbicide. Read the product label prior to use and follow the use directions and precautions accordingly.

On March 1, 1979 the U.S. Environmental Protection Agency (U.S.E.P.A.) halted the use of the herbicide 2, 4, 5-T in parks and recreation areas. The use of silvex (2, 4, 5-TP) around water has also been banned.

The Agronomy Department at the University of Illinois and the Aquatic Biology Section of the Department of Natural Resources, Office of Scientific Research and Analysis indicate that the herbicides containing the 2, 4-D or 2, 4-DP are legal for use in parks and recreation areas and effective for controlling brush and woody growth. Some examples of approved herbicides are:

1. Tordon RTU by DOW Chemical. (Can be obtained with blue dye.)
2. WEEDONE 170 by Union Carbide
3. WEEDONE, 2, 4-DP by Union Carbide
4. A 1% to 2% solution of ROUNDUP
5. Garlon by DOW Chemical
6. Banvel by Sandoz

Your distributor may carry brand name herbicides other than those listed above. Be certain that the product does not contain the ingredients 2, 4, 5-T or 2, 4, 5-TP. An example of an unacceptable product is ESTERON 2, 4, 5 by DOW Chemical.

APPENDIX E
CONSTRUCTION DRAWINGS

Appendix G: Photos of 2015 Sloughing Repairs

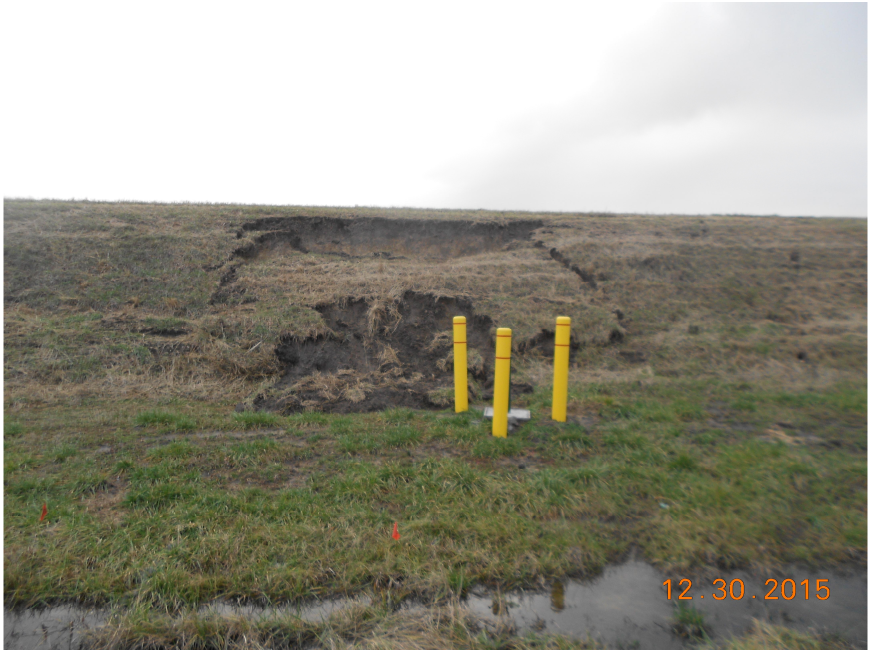

Figure G.1. Photo of 2015 sloughing prior to repairs.

Figure G.2. Photo of 2015 sloughing prior to repairs.

Figure G.3. Photo of 2015 sloughing area after repairs.

Figure G.4. Photo of 2015 sloughing area after repairs.

2021 USEPA CCR Rule Periodic Certification Report

Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois

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October 11, 2021

Illinois Power Generating Company
134 Cips Lane
Coffeen, Illinois 62017

Subject: USEPA CCR Rule and IEPA Part 845 Rule Applicability Cross-Reference
2021 USEPA CCR Rule Periodic Certification Report
Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois

At the request of Illinois Power Generating Company (IPGC), Geosyntec Consultants (Geosyntec) has prepared this letter to document how the attached 2021 United States Environmental Protection Agency (USEPA) CCR Rule Periodic Certification Report (Report) was prepared in accordance with both the Federal USEPA CCR Rule[1] and the state-specific Illinois Environmental Protection Agency (IEPA) Part 845 Rule[2]. Specific sections of the report and the applicable sections of the USEPA CCR Rule and Illinois Part 845 Rule are cross-referenced in **Table 1**. A certification from a Qualified Professional Engineer for each of the CCR Rule sections listed in **Table 1** is provided in Section 9 of the attached Report. This certification statement is also applicable to each section of the Part 845 Rule listed in **Table 1.**

Table 1 – USEPA CCR Rule and Illinois Part 845 Rule Cross-Reference

Report Section	USEPA CCR Rule		Illinois Part 845 Rule	
3	§257.73 (a)(2)	Hazard Potential Classification	845.440	Hazard Potential Classification Assessment[3]
4	§257.73 (c)(1)	History of Construction	845.220(a)	Design and Construction Plans (Construction History)
5	§257.73 (d)(1)	Structural Stability Assessment	845.450 (a) and (c)	Structural Stability Assessment
6	§257.73 (e)(1)	Safety Factor Assessment	845.460 (a-b)	Safety Factor Assessment
7	§257.82 (a)(1-3)	Adequacy of Inflow Design Control System Plan	845.510(a), (c)(1), (c)(3)	Hydrologic and Hydraulic Capacity Requirements / Inflow Design Flood Control System Plan
	§257.82 (b)	Discharge from CCR Unit	845.510(b)	Discharge from CCR Surface Impoundment

[1] United Stated Environmental Protection Agency, 2015. *40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule.*
[2] State of Illinois, Joint Committee on Administrative Rule, Administrative Code (2021). *Title 35: Environmental Protection, Subtitle G: Waste Disposal, Chapter I: Pollution Control Board, Subchapter j: Coal Combustion Waste Surface Impoundment, Part 845 Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments.*
[3] "Significant" and "High" hazard, per the CCR Rule[1], are equivalent to Class II and Class I hazard potential, respectively, per Part 845[2].

CLOSING

This letter has been prepared to demonstrate that the content and Qualified Professional Engineer Certification of the 2021 Periodic USEPA CCR Rule Certification Report fulfills the corresponding requirements of Part 845 of Illinois Administrative Code listed in **Table 1**.

Sincerely,

Lucas P. Carr, P.E.
Senior Engineer

John Seymour, P.E.
Senior Principal

2021 USEPA CCR RULE PERODIC CERTIFICATION REPORT §257.73(a)(2), (c), (d[1]), (e) and §257.82 ASH POND NO. 1

Coffeen Power Plant

Coffeen, Illinois

Submitted to

Illinois Power Generating Company

134 Cips Lane
Coffeen, Illinois 62017

Submitted by

Geosyntec consultants

engineers | scientists | innovators

1 McBride and Son Center Drive, Suite 202
Chesterfield, Missouri 63005

October 11, 2021

[1] Except for §257.73(d)(1)(vi).

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EXECUTIVE SUMMARY

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residuals (CCR) Rule [1] certification report (Periodic Certification Report) for Ash Pond No. 1 (AP1)[2] at the Coffeen Power Plant, also known as the Coffeen Power Station (COF), has been prepared in accordance with Rule 40, Code of Federal Regulations (CFR) §257. herein referred to as the "CCR Rule" [1]. The CCR Rule requires that initial certifications for existing CCR surface impoundment, completed in 2016 and subsequently posted on the Illinois Power Generating Company (IPGC) CCR Website ([2], [3], [4], [5], [6], [7]) be updated on a five-year basis.

The initial certification reports developed in 2016 and 2017 were independently reviewed by Geosyntec ([2], [8], [3], [4], [9], [5], [6], [7]). Additionally, field observations, interviews with plant staff, and evaluations were performed to compare conditions in 2021 at AP1 relative to the 2016 and 2017 initial certifications. These tasks determined that updates are not required for the Initial Hazard Potential Classification and Initial Safety Factor Assessment. However, due to changes at the site and technical review comments, updates were required and were performed for the:

- History of Construction Report,
- Initial Structural Stability Assessment,
- Initial Inflow Design Flood Control System Plan.

Geosyntec's evaluations of the initial certification reports and updated analyses identified that the AP1 meets all requirements for hazard potential classification, history of construction reporting, structural stability, safety factor assessment, and hydrologic and hydraulic control, with the exception of the structural integrity of hydraulic structures (§257.73(d)(1)(vi)), which was certified by others. **Table 1** provides a summary of the initial 2016 certifications and the updated 2021 periodic certifications.

[2] AP1 is also referred to as ID Number W1350150004-01, Ash Pond 1 by the Illinois Environmental Protection Agency (IEPA); CCR unit ID 101 by IPGC; and IL50722 by the National Inventory of Dams (NID) maintained by the Illinois Department of Natural Resources (IDNR). Within this document it is referred to as API.

Table 1 – Periodic Certification Summary

			2016 Initial Certification		2021 Periodic Certification	
Section	**CCR Rule Reference**	**Requirement Summary**	**Requirement Met?**	**Comments**	**Requirement Met?**	**Comments**
Hazard Potential Classification						
3	§257.73(a)(2)	Document hazard potential classification	Yes	Impoundment was determined to have a Significant hazard potential classification [2].	Yes	Updates were not determined to be necessary. Geosyntec recommends retaining the Significant hazard potential classification.
History of Construction						
4	§257.73(c)(1)	Compile a history of construction	Yes	A History of Construction report was prepared for Ash Pond No. 1 and Ash Pond No. 2, in addition to other CCR surface impoundments at COF [4].	Yes	A letter listing updates to the History of Construction Report is provided in **Attachment C**.
Structural Stability Assessment						
5	§257.73(d)(1)(i)	Stable foundations and abutments	Yes	Foundations was found to be stable. Abutments were not present [9].	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(ii)	Adequate slope protection	Yes	Slope protection was adequate [9].	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(iii)	Sufficiency of dike compaction	Yes	Dikes compaction was sufficient for expected ranges in loading conditions [9] .	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(iv)	Presence and condition of slope vegetation	Yes	Vegetation was present on interior and exterior slopes and was maintained [9].	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(v)(A) and (B)	Adequacy of spillway design and management	Yes	Spillways were adequately designed and constructed and were expected to adequately manage flow during 1,000-year flood [9].	Yes	Spillways were found to be adequately designed and constructed and are expected to adequately manger flow during the 1,00-year flood, after performing updated hydrologic and hydraulic analyses.
	§257.73(d)(1)(vi)	Structural integrity of hydraulic structures	No	Requirement could not be certified due to inability to complete a CCTV inspection of the recycle intake pipe due to high sustained pipe flows needed for plant operations. Inspection of this pipe was recommended as soon as feasible [9].	Periodic certification of §257.73(d)(1)(vi) was independently by Luminant in 2020 [10]	
	§257.73(d)(1)(vii)	Stability of downstream slopes inundated by water body.	Not Applicable	Inundation of exterior slopes were not expected. This requirement was not applicable [9] .	Yes	No changes were identified that may affect this requirement.
Safety Factor Assessment						
6	§257.73(e)(1)(i)	Maximum storage pool safety factor must be at least 1.50	Yes	Safety factors were calculated to be 1.50 and higher [9] .	Yes	No changes were identified that may affect this requirement.
	§257.73(e)(1)(ii)	Maximum surcharge pool safety factor must be at least 1.40	Yes	Safety factors were calculated to be 1.49 and higher [9].	Yes	No changes were identified that may affect this requirement.
	§257.73(e)(1)(iii)	Seismic safety factor must be at least 1.00	Yes	Safety factors were calculated to be 1.03 and higher [9].	Yes	No changes were identified that may affect this requirement.
	§257.73(e)(1)(iv)	For dike construction of soils that have susceptible to liquefaction, safety factor must be at least 1.20	Not Applicable	Dike soils were not susceptible to liquefaction. This requirement was not applicable [9].	Yes	No changes were identified that may affect this requirement.
Inflow Design Flood Control System Plan						
7	§257.82(a)(1), (2), (3)	Adequacy of inflow design control system plan.	Yes	Flood control system adequately managed inflow and peak discharge during the 1,000-year, 24-hour, Inflow Design Flood	Yes	The flood control system was found to adequately manage inflow and peak discharge during the 1,000-year, 24-hour Inflow Design Flood, after performing updated hydrologic and hydraulic analyses.
	§257.82(b)	Discharge from CCR Unit	Yes	Discharge from the CCR Unit into Waters of the United States were not expected during normal or 1,000-year, 24-hour Inflow Design Flood conditions [9].	Yes	Discharge from the CCR Unit into Waters of the United States were not expected during normal or 1,000-year, 24-hour Inflow Design Flood conditions, after performing updated hydrologic and hydraulic analyses.

SECTION 1

INTRODUCTION AND BACKGROUND

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residual (CCR) Rule [1] Certification Report was prepared by Geosyntec Consultants (Geosyntec) for Illinois Power Generating Company (IPGC) to document the re-certification of the Ash Pond No. 1 (AP1) at the Coffeen Power Plant (CPP), also known as the Coffeen Power Station (COF), located at 134 Cips Lane in Coffeen, Illinois, 62017. The location of CPP is provided in **Figure 1**, and a site plan showing the location of AP1, among other closed and open CCR units and non-CCR surface impoundments, is provided in **Figure 2**.

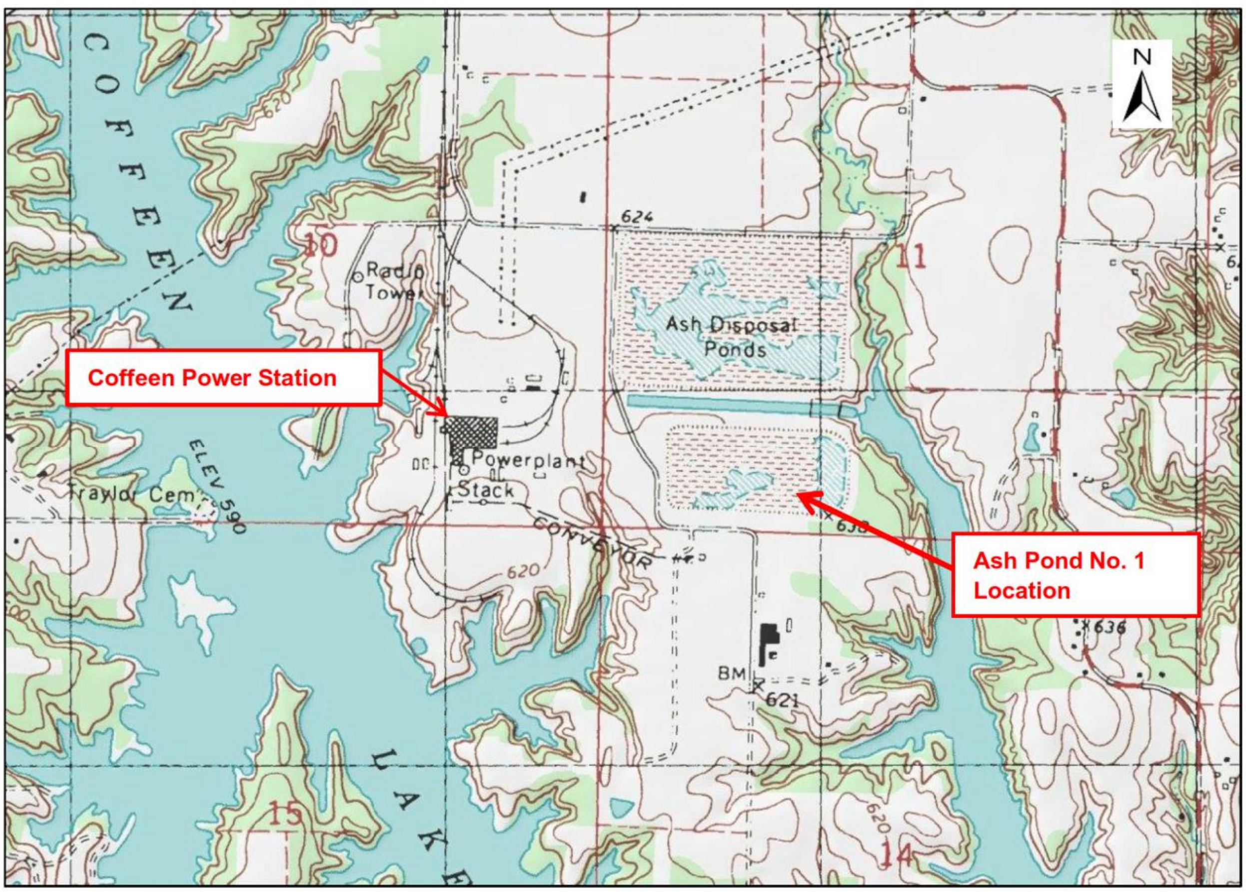


Figure 1 – Site Location Map (from AECOM, 2016)

Figure 2 – Site Plan (modified from AECOM, 2016)

1.1 AP1 Description

CPP was retired in 2019. Prior to retirement, three active CCR surface impoundments: the GMF Pond, the GMF Gypsum Recycle Pond, and AP1 and one CCR landfill were used for managing CCRs generated at CPP. AP1 has a Significant hazard potential, based on the initial hazard potential classification assessment performed by Stantec in 2016 in accordance with §257.73(a)(2) ([2], [9]).

AP1 formerly served as the primary wet impoundment basin for bottom ash produced at CPP. AP1 was utilized as a flow-through structure, where outflow was ultimately discharged to Coffeen

Lake, until approximately 1981, when the pond was modified by abandoning the penetrating discharge pipe in the northeast corner of the impoundment, adding a recycle intake structure in the northwest corner, removing some of the accumulated bottom ash, and regrading the remainder of the bottom ash to form a new impoundment flow.

When CPP was operational, outflow from AP1 flowed into the recycle intake structure (outlet pipe) and was transferred back to CPP for use as process water. An approximately 1,300-ft long interior dike creates an interior channel leading to the recycle intake structure. AP1 was operated as a closed-loop hydraulic system as outflow was transmitted back to CPP during normal operational conditions. Bottom ash was mechanically excavated from the southwest corner of AP1 for offsite beneficial use [9].

Sluiced bottom ash from CPP entered AP1 through three steel sluice pipes, which discharged along the western embankment, on the south side of the interior dike. Additional clear water inflow from CPP entered AP1 through two pipes, which discharged at a concrete structure approximately 120 feet north of the sluice pipes, and a 12-in. diameter iron pipe located at the northwest corner of the embankment. Outflow water was transmitted back to CPP via a concrete riser recycle intake structure and 48-in. diameter steel recycle intake pipe located at the northwest corner of AP1, which function as the primary outflow pipe for AP1. The pool level is controlled by a steel spillway gate, which allowed for pool levels ranging from El. 624.5 ft to 631.0 ft[3] However, a berm was constructed with bottom ash around the inlet to the spillway after plant closure in 2019 to provide freeze protection for the gate while still allowing overflow during higher pool levels. A secondary 24-in. diameter pipe, which starts as a corrugated metal pipe (CMP) and transitions to steel, is connected to the 48-in. diameter steel recycle intake pipe within the embankment, and was used to discharge excess flow into the process water flume during upset conditions and act as an overflow pipe., but the pipe did not transmit outflow during [9].

The surface area of AP1 is approximately 26.2 acres. The embankment portion of AP1 is comprised of a ring dike with a total length of approximately 4,350 ft and has a maximum height above exterior grade of 30 ft. The embankment was constructed as a homogenous earthen structure with well-compacted clayey fill. An approximately 570-ft long, Hoesch 2500k steel sheet pile wall, is located at the toe of the northeast corner of AP1, to separate the embankment from the plant process water flume. The process water flume was used to transmit plant cooling water back to Coffeen Lake over a series of weirs. The water level in the process water flume was surveyed to be approximately El. 600 ft in 2020, after plant closure [11]. The sheet pile wall was installed around 2000 and driven approximately 13 feet into the foundation soils and has a maximum exposed height of 13.8 feet, for a total pile length of approximately 27 ft. Downstream dike slopes, outside of the sheet pile wall area, range from approximately 1.4H:1V (horizontal to vertical) to 3H:1V and generally are covered in vegetation. Interior embankment slopes are partially covered in bottom ash, vegetation, or gravel and exhibit an approximately 2H:1V orientation. The

[3] Assumed to be the NGVD29 datum, based on the date of the design drawings, but all other elevations in this report are in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

embankment crest width varies from approximately 14 to 22 feet. An engineered liner system is not present beneath AP1 [9].

The normal maximum normal operating pool of AP1 was 631.0 ft when the plant was operational, as controlled by the recycle intake structure and emergency outflow pipes. The maximum normal operating pool may be different now due to the bottom ash berm placed around the recycle intake structure. The minimum crest elevation is 635.0 ft [9].

Initial certifications for AP1 for Hazard Potential Classification (§257.73(a)(2)), History of Construction (§257.73(c)), Structural Stability Assessment (§257.73(d)), Safety Factor Assessment (§257.73(e)(1)), and Inflow Design Flood Control System Plan (§257.82) were completed by Stantec and AECOM in 2016 and 2017 and subsequently posted to IPGC's CCR Website ([2], [3], [4], [5], [6], [7]). Additional documentation for the initial certifications included detailed operating record reports containing calculations and other information prepared for the hazard potential classification by Stantec [8] and for the structural stability assessment, safety factor assessment, and inflow design flood control system plan by AECOM [9]. These operating record reports were not posted to IPGC's CCR Website.

1.2 Report Objectives

The following objectives are associated with this report:

- Compare site conditions from 2015/2016 to site conditions in 2020/2021, and evaluate if updates are required to the:
    - §257.73(a)(2) Hazard Potential Classification [2];
    - §257.73(c) History of Construction [4];
    - §257.73(d) Structural Stability Assessment [5];
    - §257.73(e) Safety Factor Assessment [6], and/or
    - §257.82 Inflow Design Flood Control System Plan [7].
- Independently review the Hazard Potential Classification ([2], [8]), Structural Stability Assessment ([5], [9]), Safety Factor Assessment ([6], [9]), and Inflow Design Flood Control System Plan ([7], [9]) to evaluate whether updates are required based on technical considerations.
- The History of Construction report [4] was not independently reviewed for technical consideration, as this report contained historical information primarily developed prior to promulgation of the CCR Rule [1] for the CCR units at CPP, and did not include

calculations or other information used to certify performance and/or integrity of the impoundments under §257.73(a)(2)-(3), §257.73(c)-(e), or §257.82.

- Confirm that AP1 meets all of the requirements associated with §257.73(a)(2)-(3), (c), (d), (e), and §257.82, or, if AP1 does not meet any of the requirements, provide recommendations for compliance with that section of the CCR Rule [1].

SECTION 2

COMPARISION OF INITIAL AND PERIODIC SITE CONDITIONS

2.1 Overview

This section describes the comparison of conditions at AP1 between the start of the initial CCR certification program in 2015 and subsequent collection of periodic certification site data in 2020 and 2021.

2.2 Review of Annual Inspection Reports

Annual onsite inspections of AP1 were performed between 2016 and 2020 ([12], [13], [14], [15], [16]) and were certified by a licensed professional engineer in accordance with §257.83(b). Each inspection report stated the following information, relative to the previous inspection:

- A statement that no changes in geometry of the impounding structure were observed since the previous inspection;
- Information on maximum recorded instrumentation readings and water levels;
- Approximate volumes of impounded water and CCR at the time of inspection;
- A statement that no appearances of actual or potential structural weakness or other disruptive conditions were observed; and
- A statement that no other changes which may have affected the stability or operation of the impounding structure were observed.

In summary, the reports did not indicate any significant changes to AP1 between 2015 and 2020. No signs of instability, structural weakness, or changes which may have affected the operation or stability of the AP1 were noted in the inspection reports. The 2019 report [15] indicated that approximately 5 acre-feet (8,100 cubic yards) of CCR was removed from AP1 in 2019 for beneficial use, and the 2020 report noted that CPP had closed in 2019.

2.3 Review of Instrumentation Data

Eight piezometers, COF-P000, COF-P001, COF-P002, COF-P003, COF-P005, COF-P006, COF-P007, and COF-P008, are present at AP1 have been monitored monthly by CPP staff since August 29, 2015. Geosyntec reviewed the piezometer data collected through April 22, 2021 to evaluate if significant fluctuations, partially increases in phreatic levels, may have occurred between development of the initial structural stability and factor of safety certifications ([9], [5], [6]) and April 22, 2021. Available piezometer readings are plotted in **Attachment A**.

In summary, only minor changes in phreatic conditions were observed in the available piezometric data. Phreatic levels typically varied by one to five feet for most piezometers, with average levels remaining steady and not exhibiting any sustained trends of increase or decrease. These changes do not indicate significantly different phreatic levels than those utilized for the initial structural stability and factor of safety certifications ([9], [5], [6]).

2.4 Comparison of Initial to Periodic Surveys

The initial survey of AP1, conducted by Weaver Consultants (Weaver) in 2015 [17], was compared to the periodic survey of AP1, conducted by IngenAE, LLC (IngenAE) in 2020 [11], using AutoCAD Civil3D 2021 software. This comparison quantified changes in the volume of CCR placed within AP1 and considered volumetric changes above and below the starting water surface elevation (SWSE) used for the initial §257.82 inflow design flood control plan hydraulic analysis [7]. Potential changes to embankment geometry were also evaluated.

This comparison is presented in side-by-side views of each survey in **Drawing 1** and a plan view isopach map denoting changes in ground surface elevation in **Drawing 2**. A summary of the water elevations and changes in CCR volumes is provided in **Table 1**.

Table 2 – 2015 and 2020 Survey Comparison

Initial Surveyed Pool Elevation (ft)	629.9
Periodic Surveyed Pool Elevation (ft)	629.2
Initial §257.82 Starting Water Surface Elevation (SWSE) (ft)	631.0
Total Change in CCR Volume (CY)	+3,550
Change in CCR Volume Above SWSE (CY)	+2,877
Change in CCR Volume Below SWSE (CY)	+673

The comparison indicated that approximately 2,900 CY of CCR was placed in AP1 between 2015 and 2020 above the SWSE, thereby leading to a potential for the peak water surface elevation (PWSE) to increase slightly during the inflow design 1,000-year flood event. No significant changes to embankment geometry appeared to have occurred between the initial and periodic surveys, although changes in CCR disposal grades within the impoundment were noted, reportedly due to excavation of bottom ash for beneficial use.

2.5 Comparison of Initial to Periodic Aerial Photography

Initial aerial photographs of AP1 collected by Weaver in 2015 [17] were compared to periodic aerial photographs collected by IngenAE in 2020 [17] to visually evaluate if potential site changes (i.e., changes to the embankment, outlet structures, limits of CCR, other appurtenances) may have occurred. A comparison of the aerial photographs is provided in **Drawing 3**, and the following change was identified:

- The water level within the cooling water discharge channel leading to Coffeen Lake was observed to be lower (approximately El. 600 ft, as indicated by the 2020 survey [11]), likely due to closure of the CPP power plant and cessation of cooling water discharge.

2.6 Comparison of Initial to Periodic Site Visits

An initial site visit to AP1 was conducted by AECOM in 2015 and documented with a Site Visit Summary and corresponding photographs [18]. A periodic site visit was conducted by Geosyntec on May 28, 2021, with Mr. Lucas P. Carr, P.E. conducting the site visit. The site visit was intended to evaluate potential changes at the site since the initial certifications were prepared (i.e., modification to the embankment, outlet structures or other appurtenances, limits of CCR, maintenance programs, repairs), in addition to performing visual observations of AP1 to evaluate if the structural stability requirements (§257.73(d)) were still met. The site visit included walking the perimeter of AP1, visually observing conditions, recording field notes, and collecting photographs. The site visit is documented in a field observation form and photographic log provided in **Appendix A**. A summary of significant findings from the periodic site visit is provided below:

- Overall site maintenance appeared to have improved since 2015, with the exception of continued tree growth at the top of the sheet pile wall. Geosyntec recommended cutting the trees to IPGC staff as part of routine site maintenance activities.

- A berm of bottom ash was observed to have been installed around the inlet to the Recycle Intake Structure, reportedly to reduce freeze-thaw concerns.

- Seepage was observed at the east and south dikes of AP1. Geosyntec recommended to IPGC staff that the seepage be monitored during routine inspections.

- No signs of structural instability or erosion were observed during the site visit.

2.7 Interview with Power Plant Staff

An interview with Mr. John Romang of CPP was conducted by Mr. Lucas P. Carr, P.E. of Geosyntec on May 28, 2021. Mr. Romang had been employed, at the time of the interview, by CPP for approximately 20 years as the environmental and chemistry manager and supervisor. His responsibilities included general oversight and environmental compliance, including weekly impoundment inspections and identifying items requiring repair. The interview included a discussion of potential changes that may have occurred at AP1 since the development of the initial certifications ([2], [8], [3], [4], [9], [5], [6], [7]).

- Were any construction projects completed for AP1 between 2015 and 2021, and, if so, are design drawings and/or details available?

  - No construction projects were completed.

- Were there any changes to the purpose of AP1 between 2015 and 2017?

  - CPP was closed in October of 2019 and CCR placement stopped at that time.

  - Beneficial use contractors continued mining the AP1 for some time after closure, until CCR viable for beneficial use was no longer encountered.

- Were there any changes to the to the instrumentation program and/or physical instruments for AP1 between 2015 and 2021?

  - No known changes occurred.

- Were there any changes to spillways and/or diversion features for AP1 completed between 2015 and 2021?

  - The inlet to the Recycle Intake Structure was partially blocked with a berm of bottom ash in 2019, after plant closure, to provide freeze protection. Overflow into the Recycle Intake Structure will still occur at higher pool levels.

- Were there any changes to construction specifications, surveillance, maintenance, and repair procedures for AP1 between 2015 and 2021?

  - No known changes occurred.

- Were there any instances of dike and/or structural instability for AP1 between 2015 and 2021?

  - No known instance of dike and/or structural instability occurred.

SECTION 3

HAZARD POTENTIAL CLASSIFICATION - §257.73(A)(2)

3.1 Overview of Initial HPC

The Initial Hazard Potential Classification (Initial HPC) was prepared by Stantec Consulting Services, Inc. (Stantec) in 2016 ([2], [8]), following the requirements of §257.73(a)(2). The Initial HPC included the following information:

- Results of two breach analyses using HEC-HMC software [19], using pool levels estimated within AP1 during the Probable Maximum Precipitation (PMP) rainfall event, for breaches occurring at the northeast and northwest corners of AP1.
- Evaluating potential effects of flooding in multiple areas, including breach flood wave velocities, flood depths, and/or pool increases, for the following locations:
    - Coffeen Lake, including the eastern cove (east of AP1) and the main lake (west of AP1),
    - Coffeen Lake Dam,
    - Coffeen Power Plant, including the building and parking lots,
    - AP1 recycle pump house,
    - Coal yard maintenance buildings near AP1, and
    - Abandoned coal mining structures south of AP1.
- While a breach map is not included within the Initial HPC, it is included within the §257.73(a)(3) Initial Emergency Action Plan (Initial EmAP) [2].

The breach analysis concluded that a breach of AP1 would impact non-occupied CPP structures and lightly used access roads, where the populations at risk were considered transient and there would be no probable loss of life. Probable loss of life differentiates high hazard potential from significant hazard potential classification. The analysis found that a breach could impact several buildings with regular occupancy, but that the depth-velocity relationships of the breach wave did not constitute a probable loss of life. The Initial HPC concluded that neither breach would be likely to result in a probable loss of human life, although the breach could cause CCR to be released into the Coffeen Lake, thereby causing environmental damage. The Initial HPC therefore recommended a "Significant" hazard potential classification for AP1 [2].

3.2 Review of Initial HPC

Geosyntec performed a review of the Initial HPC ([2], [8]), in terms of technical approach, input parameters, and assessment of results. The review included the following tasks:

- Reviewing the rainfall depths utilized in the breach analysis for appropriateness,
- Reviewing the breach assessment inputs for appropriateness,
- Reviewing the selected HPC for appropriateness based on the results of the breach analysis, including flow velocities and depths,
- Reviewing the HPC vs. applicable requirements of the CCR Rule.

No significant technical issues were noted within the technical review; a detailed review (e.g., check) of the calculations was not performed.

3.3 Summary of Site Changes Affecting the Initial HPC

Geosyntec did not identify any changes at the stie that may affect the HPC. No new structures, infrastructure, frequently occupied facilities/areas, or waterways were present in the probable breach area indicated in the Initial EmAP [3]. Additionally, no significant changes to the topography in the probable breach were identified.

3.4 Periodic HPC

Geosyntec recommends retaining the “Significant” hazard potential classification for AP1, per §257.73(a)(2), based on the lack of site changes potentially affecting the Initial HPC occurring since the initial HPC was developed, as described in **Section 3.3**, and the lack of significant review comments, as described in **Section 3.2.** Updates to the Initial HPC reports ([2], [8]) are not recommended at this time.

SECTION 4

HISTORY OF CONSTRUCTION REPORT - §257.73(C)

4.1 Overview of Initial HoC

The Initial History of Construction report (Initial HoC) was prepared by AECOM in 2016 [4], following the requirements of §257.73(c), and included information on all CCR surface impoundments at CPP, including AP1, AP2, the GMF Pond, and the GMF Recycle Pond. The Initial HoC included the following information for each CCR surface impoundment:

- The name and address of the owner/operator,
- Location maps,
- Statements of purpose,
- The names and size of the surrounding watershed,
- A description of the foundation and abutment materials,
- A description of the dike materials,
- Approximate dates and stages of construction,
- Available design and engineering drawings,
- A summary of instrumentation,
- Area-capacity curves for AP1,
- Information on spillway structures,
- Construction specifications,
- Inspection and surveillance plans,
- Information on operational and maintenance procedures, and
- Information on past sloughs in the embankments for AP1.

4.2 Summary of Site Changes Affecting the Initial HoC

Several significant changes at the site were identified since development of the initial HoC and required updates to the HoC report. Each change is described below.

- A state identification number (ID) of W1350150004-01 was assigned to AP1 by the Illinois Environmental Protection Agency (IEPA).

- Electricity generation at the CPP ceased in 2019 and AP1 is no longer being used to actively store CCR generated by CPP as CCR is no longer being generated. Additionally, AP1 no longer receives regular process water inflows or outflows.

- A berm of bottom ash was constructed around the AP1 recycle intake structure.

- Revised area-curves and spillway design calculations for AP1 were prepared as part of the updated Periodic Inflow Design Flood Control System Plan, as described in **Section 6.3**.

A letter documenting changes to the HoC report is provided in **Attachment C**.

SECTION 5

STRUCTURAL STABILITY ASSESSMENT - §257.73(D)

5.1 Overview of Initial SSA

The Initial Structural Stability Assessment (Initial SSA) was prepared by AECOM in 2016 [9], following the requirements of §257.73(d)(1), and included the following evaluations:

- Stability of dike foundations, dike abutments, slope protection, dike compaction, and slope vegetation;
- Spillway stability including capacity, structural stability and integrity, including using closed-circuit television (CCTV) equipment to inspect the interior of the 24-in. diameter secondary overflow pipe;
- An evaluation of the effects of liquefaction in the foundation soils using a slope stability analysis considering post-cyclic softening in the foundation soils; and
- Downstream slope stability under sudden drawdown conditions for a downstream water body.

The Initial SSA concluded that AP1 met all structural stability requirements for §257.73(d)(1)(i)-(v) and (vii), but recommended inspection of the 48-in. diameter recycle intake pipe to verify that AP1 meets the stability and structural integrity criteria for hydraulic outfall structures, per §257.73(d)(1)(vi). An inspection of this spillway pipe was not performed in 2015 or 2016 due to high sustained flows in the pipe being critical for plant operations.

A periodic certification of the structural stability and structural integrity of hydraulic outfall structures (§257.73(d)(1)(vi)) was performed by Luminant in 2020 [10]. This certification independently determined that the criteria was met due to the condition of the spillway pipes and the soil types within the embankment. Therefore, the review and certification of §257.73(d)(1)(vi) was not included within the scope of this report.

The Initial SSA referenced the results of the Initial Structural Factor Assessment (Initial SFA) ([6], [9]), to demonstrate stability of the stability of foundations and abutments (§257.73(d)(1)(i)) and sufficiency of dike compaction (§257.73(d)(1)(iii)) portions of the SSA criteria. This included stating that slope stability analyses for slip surfaces passing through the foundation met or exceeded the criteria listed in §257.73(e)(1), for the stability of foundations and abutments. For the sufficiency of dike compaction, this included stating that slope stability analyses for slip surfaces passing through the dike also met or exceeded the §257.73(e)(1) criteria.

5.2 Review of Initial SSA

Geosyntec performed a review of the Initial SSA ([5], [9]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing photographs collected in 2015 and used to demonstrate compliance with §257.73(d)(1)(i)-(vii).
- Reviewing geotechnical calculations used to demonstrate the stability of foundations, per §257.73(d)(1)(i) and sufficiency of dike compaction, per §257.73(d)(1)(iii), in terms of supporting geotechnical investigation and testing data, input parameters, analysis methodology, selection of critical cross-sections, and loading conditions.
- Review of the methodology used to demonstrate that a downstream water body that could induce a sudden drawdown condition, per §257.73(d)(1)(vii), is not present.
- Reviewing the contents vs. the applicable CCR Rule requirements [1].

No significant technical issues were noted within the technical review of the Initial SSA. A detailed review (e.g., check) of the calculations was not performed.

5.3 Summary of Site Changes Affecting the Initial SSA

Several changes at the site that occurred after development of the Initial SSA were identified. These changes required updates to the Initial SSA and are described below:

- The Initial SSA utilized the results of the Initial Inflow Design Flood Control System Plan (IDF) to demonstrate compliance with the adequacy of spillway design and management (§257.73(d)(1)(v)(A)-(B)). The Initial IDF was subsequently updated to develop a Periodic IDF, based on site changes, as discussed in **Section 7**.

5.4 Periodic SSA

The Periodic IDF (**Section 7**) indicates that spillways are adequately designed and constructed to adequately manage flow during the 1,000-year flood, as the spillways can adequately manage flow during peak discharge from the 1,000-year storm event without overtopping of the embankments. Therefore, the requirements of §257.73(d)(1)(v)(A)-(B) are met for the Periodic SSA.

Certification of §257.73(d)(1)(vi) was independently performed by Luminant [10].

SECTION 6

SAFETY FACTOR ASSESSMENT - §257.73(E)(1)

6.1 Overview of Initial SFA

The Initial Safety Factor Assessment (Initial SFA) was prepared by AECOM in 2016 ([6], [9]), following the requirements of §257.73(e)(1). The Initial SFA included the following information:

- A geotechnical investigation program with in-situ and laboratory testing;
- An assessment of the potential for liquefaction in the dike and foundation soils;
- The development of five slope stability cross-sections for limit equilibrium stability analysis utilizing GeoStudio SLOPE/W software; and
- The analysis of each cross-section for maximum storage pool, maximum surcharge pool, and seismic loading conditions.
    - Liquefaction loading conditions were not evaluated as liquefaction-susceptible soil layers were not identified in the either the embankments or foundation soils.

The Initial SFA concluded that AP1 met all safety factor requirements, per §257.73(e), as all calculated safety factors were equal to or higher than the minimum required values.

6.2 Review of Initial SFA

Geosyntec performed a review of the Initial SFA ([6], [9]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing geotechnical calculations used to demonstrate the acceptable safety factors, per §257.73(e)(1), in terms of:
    - Completeness and adequacy of supporting geotechnical investigation and testing data;
    - Completeness and approach of liquefaction triggering assessments; and
    - Input parameters, analysis methodology, selection of critical cross-sections, and loading conditions utilized for slope stability analyses.
    - Phreatic conditions based on piezometric data collected between August 29, 2015 and April 22, 2021 as discussed in **Section 2.3**.

No significant technical issues were noted within the technical review. A detailed review (e.g., check) of the calculations was not performed.

6.3 Summary of Site Changes Affecting the Initial SFA

No changes since development of the Initial SFA were identified that would require updates to the Initial SFA ([6], [9]). For example, starting and peak water surface elevations from the updated Periodic IDF (**Section 7**) were both calculated to be less than level levels used within the slope stability analyses associated with the Initial SFA. Therefore, the water levels within the Initial SFA slope stability analyses are conservative and updates to the analyses were not recommended and were not performed.

SECTION 7

INFLOW DESIGN FLOOD CONROL SYSTEM PLAN - §257.82

7.1 Overview of Initial IDF

The Initial Inflow Design Flood Control System Plan (Initial IDF) was prepared by AECOM in 2016 ([7], [9]) following the requirements of §257.82. The Initial IDF included the following information:

- A hydraulic and hydrologic analysis, performed for the 1,000-year design flood event because of the hazard potential classification of “Significant”, which corresponded to 9.13 inches of rainfall over a 24-hour period.

- The Initial IDF utilized a HydroCAD Version 10 model to evaluate spillway flows and pool level increases during the design flood, with a SWSE of 631.0 ft.

The Initial IDF concluded that AP1 met the requirements of §257.82, as the peak water surface estimated by the HydroCAD model was El. 632.0 ft, relative to the minimum AP1 dike crest elevation of 635.0 ft. Therefore, overtopping was not expected. The Initial IDF also evaluated the potential for discharge from the CCR unit and determined that discharge from the unit was note expected, as AP1 does not discharge into waters of the United States and overtopping of the AP1 embankments was not expected during the 1,000-year inflow design flood.

7.2 Review of Initial IDF

Geosyntec performed a review of the Initial IDF ([7], [9]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing the return interval used vs. the hazard potential classification.

- Reviewing the rainfall depth and distribution for appropriateness.

- Performing a high-level review of the inputs to the hydrological modeling.

- Reviewing the hydrologic model parameters for spillway parameters, starting pool elevation, and storage vs. the reference data.

- Reviewing the overall Initial IDF vs. the applicable requirements of the CCR Rule [1].

Several comments were identified during review of the Initial IDF. The comments are described below:

- The Initial IDF utilized the National Resource Conservation Service (NRCS) Type II rainfall distribution type [20]. Geosyntec utilized the Huff 3rd Quartile distribution for areas less than 10 square miles [21] for the reasons listed below.
  - Huff 3rd Quartile distribution was identified to be a more appropriate representation of a 1,000-year, 24-hour storm event per the Illinois State Water Survey (ISWS) Circular 173 [22] which developed standardized rainfall distributions from compiled rainfall data at sites throughout Illinois.
  - Illinois Department of Natural Resources, Office of Water Resources (IDNR-OWR) [23] recommends use of the Huff Quartile distributions in Circular 173 when using frequency events to determine the spillway design flood inflow hydrograph, "*The suggested method to distribute this rainfall is described in the ISWS publication, Circular 173, "Time Distributions of Heavy Rainstorms in Illinois".*

7.3 Summary of Site Changes Affecting the Initial IDF

Several changes at the site that occurred after development of the Initial IDF were identified. These changes required updates to the Initial IDF and are described below:

- A bottom ash berm was constructed around the recycle outlet structure, thereby the outlet structure configuration utilized in the Initial IDF was no longer consistent with conditions observed in 2020.
- Approximately 2,900 CY of CCR were placed in AP1 above the SWSE utilized for the Initial IDF, thereby altering the stage-storage curve for AP1 relative to the Initial IDF. Process inflows to AP1 have ceased due to the closure of the CPP power plant, thereby the process inflow conditions utilized in the Initial IDF were no longer consistent with conditions observed in 2020.

7.4 Periodic IDF

Geosyntec revised the HydroCAD model associated with the Initial IDF to account for the revised rainfall distribution type, increase in SWSE, and additional CCR placement, as described in **Sections 7.2** and **7.3**. The following approach and input data were used for the revised analyses and are referenced in **Attachment D** as appropriate:

- Updated the time of concentration associated with Ash Pond No. 1 from 5 minutes to 6 minutes in accordance with TR-20 [24].

- Updated stage-storage curve for Ash Pond No. 1 based on the 2020 site survey [11].

  - A revised stage-volume curve for Ash Pond No. 1 was prepared based on measuring the storage volume of Ash Pond No. 1 at every one-foot increment of depth from an elevation just beneath the SWSE (630.0 ft) to the perimeter dike embankment crest elevation (636.0 ft). This analysis identified an overall increase of 539,887 cf (12 ac-ft) of storage volume at Ash Pond No. 1 from 2016 to 2021 relative to the SWSE used in the Initial IDF.

- Starting Water Surface Elevation

  - Based on information provided by site personnel, a bottom ash berm is located 30 inches below the top of the concrete outlet structure. A top of concrete elevation of 632.7 ft for the outlet structure was assumed based on the 2015 site survey [25]; therefore, a top of berm elevation of 630.2 ft was used for the bottom ash berm. For this analysis, the SWSE was updated from 631.0 ft to 630.2 ft to reflect the top elevation of the bottom ash berm as described by site personnel, and the lowest free discharge elevation was set at 632.7 ft based on the surveyed 24-inch riser elevation in 2015 [25]. The 2020 site survey showed a WSE of 629.17 ft; however, the top elevation of the bottom ash berm is higher than the surveyed WSE and was used as the SWSE to provide conservatism in the model.

- The rainfall distribution type was updated to the Huff 3rd Quartile for areas less than 10 square miles storm type provided by HydroCAD [26].

- The precipitation depth for the 1,000-yr, 24-hr design storm event was updated from 9.13 in. to 9.14 in. per NOAA Atlas 14 precipitation frequency estimates **Invalid source specified.**.

- The outlet structure for AP1 was updated as follows:

  - The discharge multiplier for the weir (i.e., top of the riser structure) was updated from 0 to 1.

  - The top of riser structure elevation was updated from 631.0 ft to 632.7 ft (i.e., top of concrete) per the 2015 site survey. The assumption that 100 percent of the flow is routed through the 24-inch circular horizontal orifice was maintained for conservatism in the model.

  - The length of 48-inch steel pipe was updated from 100 linear feet (LF) to 10 LF to account for a tee into the 24-inch cast iron pipe as described by site personnel. The pipe was assumed to be blocked beyond the tee as the CPP is no longer active and the recycle pump house downstream of the tee is no longer pumping water out of AP1. A slope of 0.17 ft/ft was maintained, and the outlet invert was updated from 607.0 ft to 622.3 ft based on the presumed tee elevation.

  - Added 92 LF of 24-inch cast iron pipe and 171 LF of 24-inch corrugated metal pipe based on an overflow assessment conducted in 2011. The inlet invert was set at 622.3 ft based on the approximate tee location, and the outlet invert was set at 600.0 ft per the 2020 site survey.

- All other input data and settings from the Initial IDF HydroCAD model were utilized, including, but not limited to software package and version, runoff method, analysis time span and analysis time step.

The results of the Updated IDF are summarized in **Table 4** and confirm that AP1 meets the requirements of §257.82(a)-(b), as the peak water surface elevation does not exceed the minimum perimeter dike crest elevation, as long as the SWSE is maintained ate El. 630.2 ft or lower. Based on the Periodic IDF analysis, the peak WSE is 631.4 ft, which is below the riser opening elevation of 632.7. Therefore, there is no discharge from AP1 during normal and inflow design flood conditions and discharge into Waters of the United States is not expected during either normal or inflow design flood conditions. Updated area-capacity curves and HydroCAD model output is provided in **Attachment D**.

Table 3 - Water Levels from Periodic IDF

	Ash Pond No. 1		
Analysis	**Starting Water Surface Elevation (ft)**	**Peak Water Surface Elevation (ft)**	**Minimum Dike Crest Elevation (ft)**
Initial IDF	631.0	632.0	636.0
Periodic IDF Update	630.2	631.4	636.0
Initial to Periodic Change[1]	-0.8	-0.6	0.0

Notes:
[1]Positive change indicates increase in the WSE relative to the Initial IDF; negative changes indicate decrease in the WSE, relative to the Initial IDF.

SECTION 8

CONCLUSIONS

AP1 at CPP was evaluated relative to the USPEPA CCR Rule periodic assessment requirements for:

- Hazard potential classification (§257.73(a)(2));
- History of Construction reporting (§257.73(d));
- Structural stability assessment (§257.73(d)), with the exception of §257.73(d)(1)(vi) that was independently certified by Luminant [10];
- Safety factor assessment (§257.73(e)); and
- Inflow design flood control system planning (§257.82).

Based on the evaluations presented herein, the referenced requirements are satisfied.

SECTION 9

CERTIFICATION STATEMENT

CCR Unit: Illinois Power Generating Company, Coffeen Power Plant, Ash Pond No. 1

I, Lucas P. Carr, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this 2021 USEPA CCR Rule Periodic Certification Report, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the periodic assessment of the hazard potential classification, history of construction report, structural stability, safety factors, and inflow design flood control system planning, dated October 2021, were conducted in accordance with the requirements of 40 CFR §257.73(a)(2), (c), (d), (e), and §257.82, with the exception of §257.73(d)(1)(vi)) that was independently certified by others.

Lucas P. Carr

10/11/2021

Date

LICENSED PROFESSIONAL ENGINEER
LUCAS PHILIP CARR
062066694
STATE OF ILLINOIS
Exp. 11/30/2021

SECTION 10

REFERENCES

[1] United States Environmental Protection Agency, 40 CFR Parts 257 and 261; Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, 2015.

[2] Stantec Consulting Services, Inc., "Initial Hazard Potential Classification Assessment, EPA Final CCR Rule, Ash Pond No. 1, Coffeen Power Station, Montgomery County, Illinois," Fenton, Mo, October 12, 2016.

[3] Stantec Consulting Services, Inc., "Illinois Power Generating Company, Coffeen Power Station, Montgomery County, Illinois, Emergency Action Plan (EAP)," Fenton, MO, April 13, 2017.

[4] AECOM, "History of Construction, USEPA Final CCR Rule, 40 CFR §257.73(c), Coffeen Power Station, Coffeen, Illinois," October 2016.

[5] AECOM, "CCR Rule Report: Initial Structural Stability Assessment for Ash Pond No. 1 at Coffeen Power Station," St. Louis, MO, October 2016.

[6] AECOM, "CCR Rule Report: Initial Safety Factor Assessment For Ash Pond No. 1 at Coffeen Power Station," St. Louis, MO, October 2016.

[7] AECOM, "CCR Rule Report: Initial Inflow Design Flood Control System Plan For Ash Pond No. 1 at Coffeen Power Station," St. Louis, MO, October 2016.

[8] Stantec Consulting Services, Inc., "Documentation of Initial Hazard Potential Classification Assessment, Ash Pond No. 1, Coffeen Power Station, Montgomery County, Illinois," October 12, 2016.

[9] AECOM, "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for Ash Pond No. 1 at Coffeen Power Station," St. Louis, MO, October 2016.

[10] V. Modeer, "Ash Pond No. 1 Structural Stability Assessment, Illinois Power Resrouces Generationg, LLC, Coffeen Power Station," Luminant, November 30, 2020.

[11] IngenAE, "Luminant, Illinois Power Generating Company, Coffeen Power Station, December 2020 Topography," February 26, 2021.

[12] J. Knutelski and J. Cambpbell, *Annual CCR Surface Impoundment Inspection (per 40 CFR 257.83(b)(2)), Coffeen Power Station, Ash Pond No. 1,* January 18, 2017.

[13] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Coffeen Power Station, Ash Pond No. 1,* February 7, 2018.

[14] J. Knutelski, *Inspection by a Qualified Professional Engineer, 40 CFR §257.73(b), Coffeen Power Station, Ash Pond No. 1,* December 28, 2018.

[15] J. Knutelski, *Annual Inspection by a Qualified Professional Engineer, 40 CFR §257.73(b), Coffeen Power Station, Ash Pond No. 1,* January 8, 2020.

[16] J. Knutelski, *Annual Inspection by a Qualified Professional Engineer, Coffeen Power Station, Ash Pond No. 1*, January 6, 2021.

[17] Weaver Consultants Group, "Dynegy, Collinsville, IL, 2015 - Coffeen Topography," December 1, 2015.

[18] AECOM, "CCR Unit Initial Site Visit Summary, Dynegy CCR Compliance Program, Coffeen Power Station - Ash Pond No. 1," June 18, 2015.

[19] US Army Corps of Engineers, "Hydrologic Modeling System (HEC-HMS), Version 4.0," Hydrologic Engineering Center, 2013.

[20] C. E. D. National Resources Conservation Service, "Urban Hydrology for Small Watersheds (TR-55)," United States Department of Agriculture, 1985.

[21] F. A. Huff and J. R. Angel, "Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois," State Water Survey Division, Department of Energy and Natural Resources, Champaign, Illinois, 1989.

[22] F. Huff, "Time Distributions of Heavy Rainstorms in Illinois," State Water Survey Division, Department of Energy and Natural Resources, Champaign, Illinois, 1990.

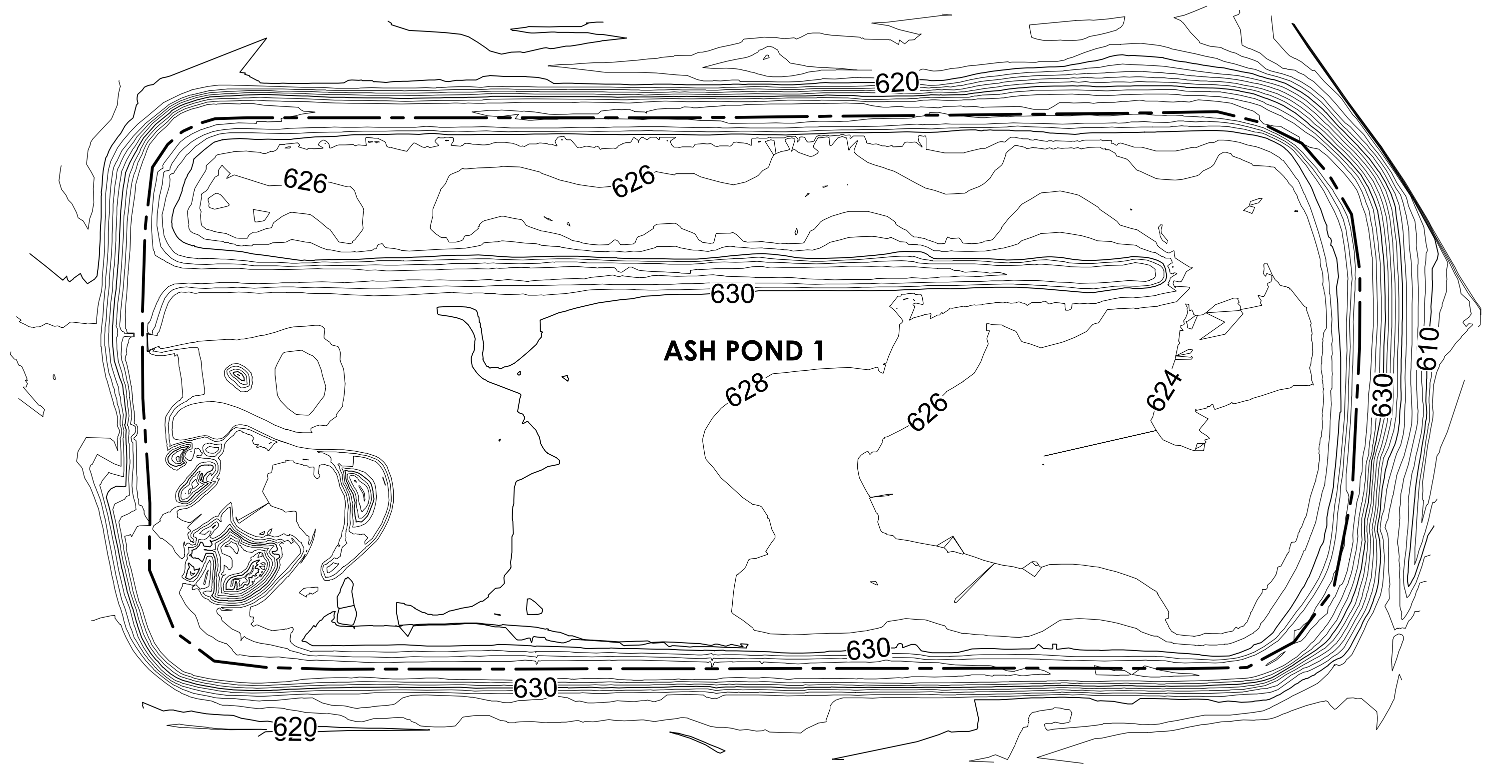
[23] Office of Natural Resources, "Procedural Guidelines for Preparation of Technical Data to be included in Applications for Permits for Construction and Maintenance of Dams," Department of Natural Resoruces, State of Illinois, Springfield, Illinois, Undated.

[24] U. N. R. C. Service, "WinTR-20 Project Formulation Hydrology, Verion 3.20".

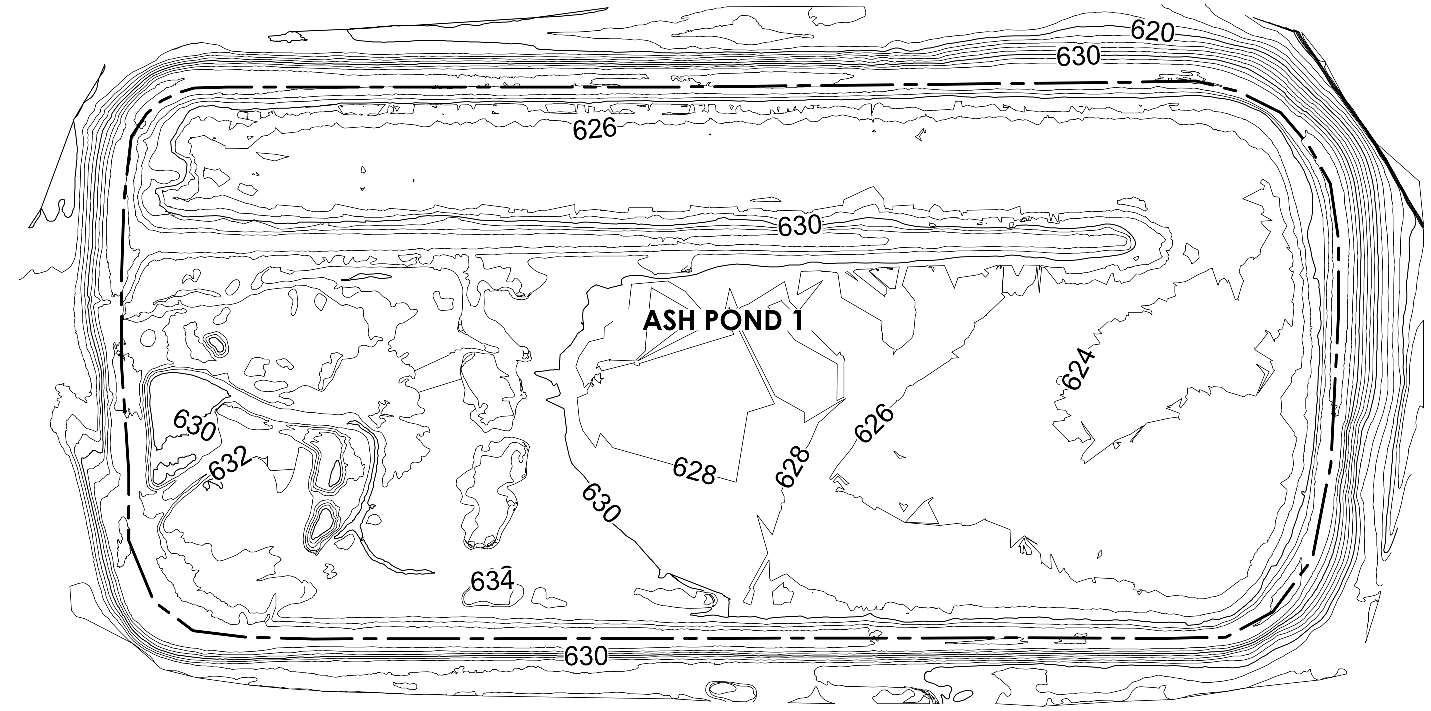
[25] Weaver Consultants Group, *Dynegy Collinsville, IL, 2015 - Coffeen Topography*, December, 2015.

[26] L. HydroCAD Software Solutions, "HydroCADTM Stormwater Modeling System, Version 10," Chocorua, New Hampshire, 2016.

DRAWINGS



INITIAL SURFEY
12-01-2015 TOPOGRAPHY



PERIODIC SURVEY
02-26-2021 TOPOGRAPHY

NOTES:

1. THE INITIAL SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "DYNEGY, COLLINSVILLE, ILLINOIS, 2015 - COFFEEN TOPOGRAPHY", PREPARED BY WEAVER CONSULTANTS GROUP, DATED DECEMBER 1, 2015.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "LUMINANT, ILLINOIS POWER GENERATING COMPANY, COFFEEN POWER STATION, DECEMBER 2020 TOPOGRAPHY", PREPARED BY INGENAE, DATED FEBRUARY 26, 2021.
3. ALL SURVEY DATA WAS COLLECTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND NORTH AMERICAN DATUM OF 1983 (NAD83) FOR VERTICAL AND HORIZONTAL COORDINATES, RESPECTIVELY.

0 250
SCALE IN FEET

INITIAL TO PERIODIC SURVEY COMPARISON
PLANT ASH POND 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

Geosyntec consultants

DRAWING 1

GLP8027.02 | JULY 2021

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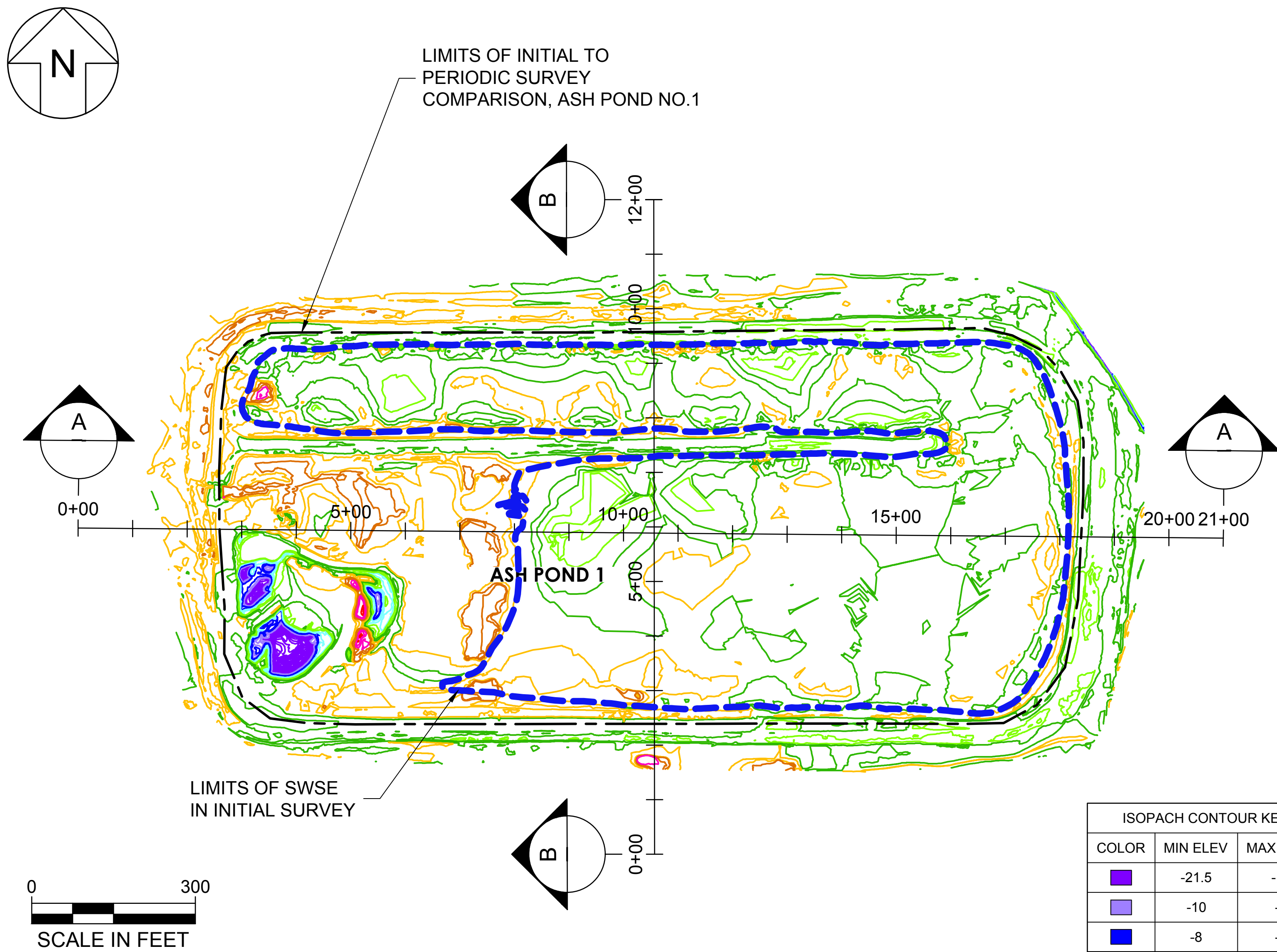

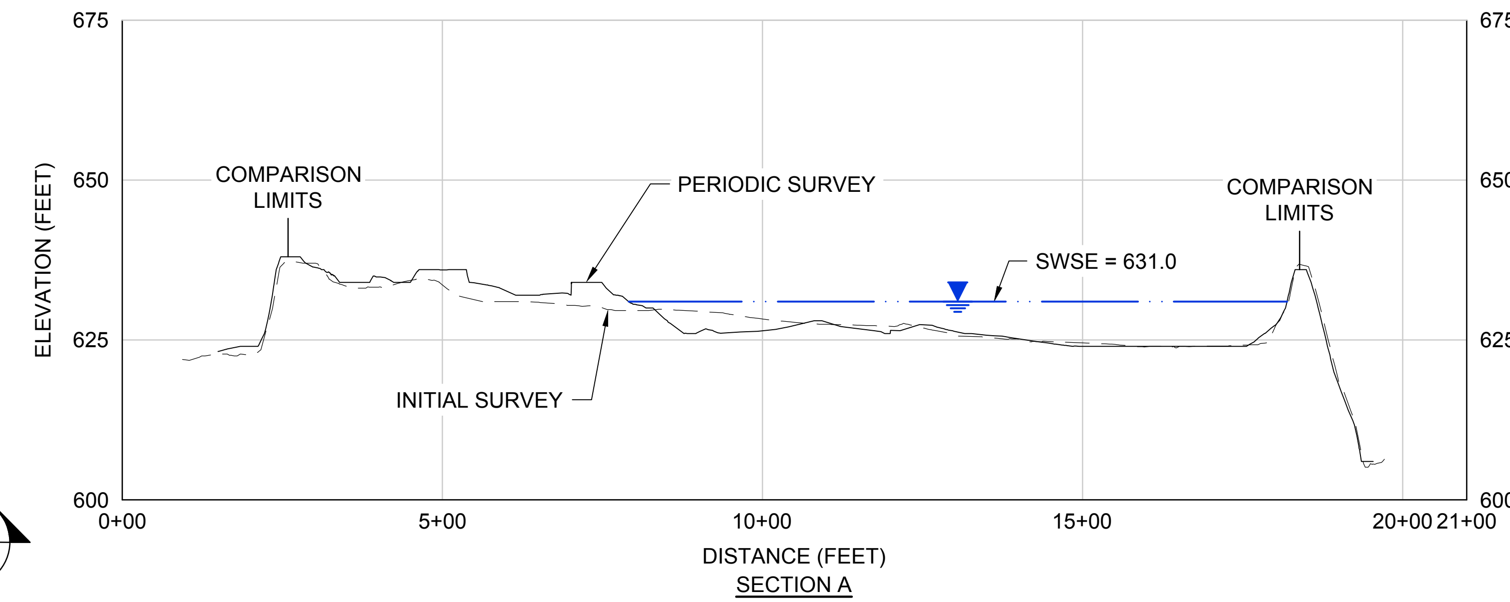

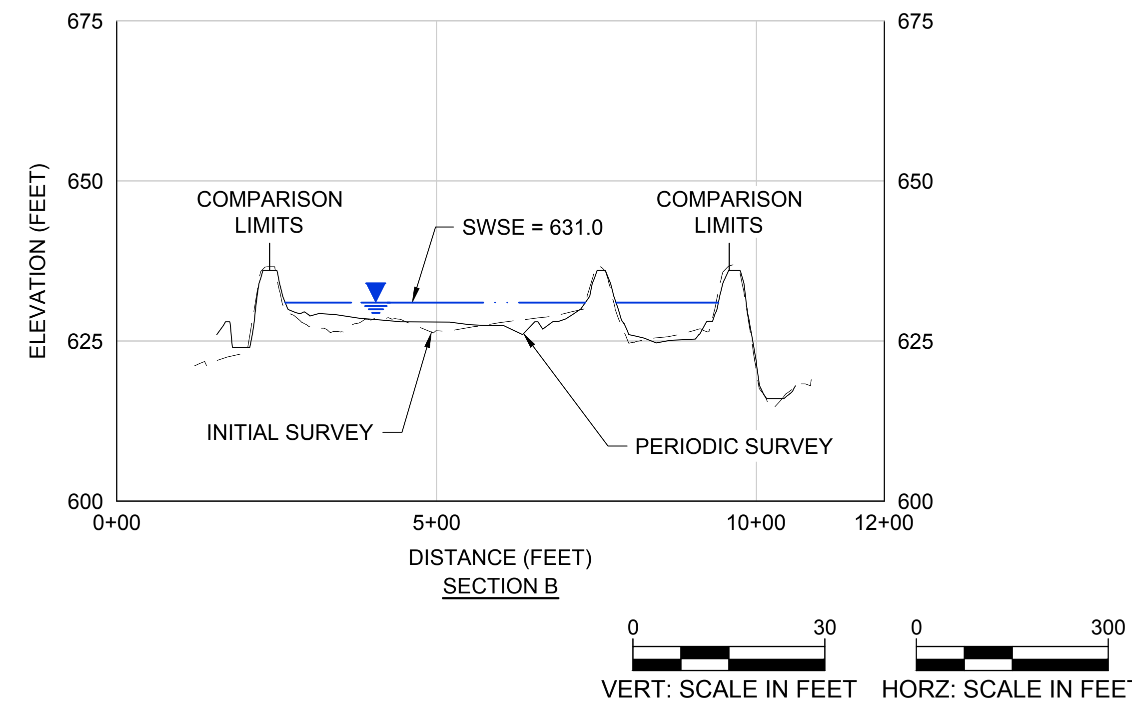

ISOPACH CONTOUR KEY		
COLOR	MIN ELEV	MAX ELEV
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	-10	-8
	-8	-6
	-6	-4
	-4	-2
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	0	2
	2	4
	4	6
	6	8

NOTES:

1. THE INITIAL SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "DYNEGY, COLLINSVILLE, ILLINOIS, 2015 - COFFEEN TOPOGRAPHY", PREPARED BY WEAVER CONSULTANTS GROUP, DATED DECEMBER 1, 2015.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "LUMINANT, ILLINOIS POWER GENERATING COMPANY, COFFEEN POWER STATION, DECEMBER 2020 TOPOGRAPHY", PREPARED BY INGENAE, DATED FEBRUARY 26, 2021.
3. ALL SURVEY DATA WAS COLLECTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND NORTH AMERICAN DATUM OF 1983 (NAD83) FOR VERTICAL AND HORIZONTAL COORDINATES, RESPECTIVELY.
4. THE MAXIMUM OPERATING POOL ELEVATION OF ASH POND NO. 1 IS EL. 631.0 FT, AS NOTED IN THE REPORT TITLED "CCR CERTIFICATION REPORT: INITIAL STRUCTURAL STABILITY ASSESSMENT, INITIAL SAFETY FACTOR ASSESSMENT, AND INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN FOR ASH POND NO. 1 AT COFFEEN POWER STATION", PREPARED BY AECOM, DATED OCTOBER, 2016.

INITIAL TO PERIODIC SURVEY COMPARISON SUMMARY			
SURFACE IMPOUNDMENT	CUT	FILL	NET (CU. YD.)
ASH POND 1	20,726	24,277	3,550 (FILL)
ABOVE SWSE	9,611	12,488	2,877 (FILL)
BELOW SWSE	11,118	11,789	673 (FILL)

SURVEY COMPARISION ISOPACH
ASH POND 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

Geosyntec consultants

DRAWING 2

GLP8027.02 | MAY 2021

INITIAL AERIAL
12-01-2015 IMAGERY

PERIODIC AERIAL
02-26-2021 IMAGERY

0 300
SCALE IN FEET

NOTES:

1. THE INITIAL IMAGERY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "DYNEGY, COLLINSVILLE, ILLINOIS, 2015 - COFFEEN TOPOGRAPHY", PREPARED BY WEAVER CONSULTANTS GROUP, DATED DECEMBER 1, 2015.
2. THE PERIODIC IMAGERY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "LUMINANT, ILLINOIS POWER GENERATING COMPANY, COFFEEN POWER STATION, DECEMBER 2020 TOPOGRAPHY", PREPARED BY INGENAE, DATED FEBRUARY 26, 2021.

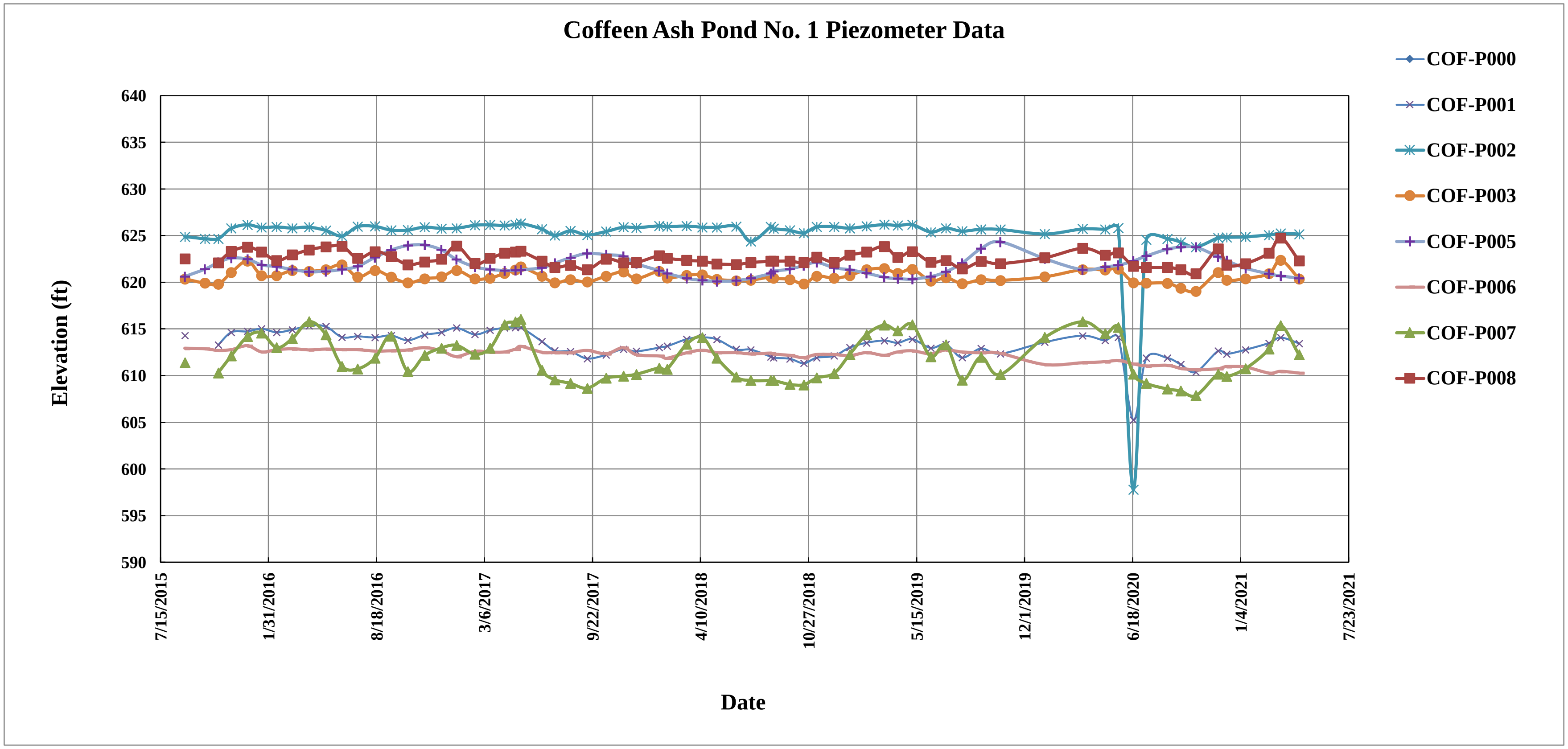
INITIAL TO PERIODIC AERIAL IMAGERY COMPARISON ASH POND 1 COFFEEN POWER PLANT COFFEEN, ILLINOIS		
Geosyntec consultants		DRAWING 3
GLP8027.02	MAY 2021	

P:\CADD\PROJECTS\VISTRA PONDS\COFFEEN\FIGURES\GLP802702F04 - Last Saved by: KHanavec on 5/19/21

ATTACHMENTS

Attachment A

AP1 Piezometer Data Plots



NOTES:

1. The average of preceding and following readings was applied in this graph for specific missed measurments on 5/2/2017, 8/18/2018 and 8/23/2018.
2. Piezometer data was taken from the spreadsheet titled "2021 Coffeen Piezo Measurements", provided by the Coffeen Power Station.

PIEZOMETER DATA PERIODIC CERTIFICATION, ASH POND NO.1 COFFEEN POWER PLANT COFFEEN, ILLINOIS		
Geosyntec consultants		Figure A-1
GLP8027	5/18/2021	

Attachment B

AP1 Site Visit Photolog

GEOSYNTEC CONSULTANTS **Photographic Record**	
Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 01 **Date:** 05/28/2021 **Direction Facing:** E **Comments:** Bottom ash berm installed around the recycle intake structure (primary spillway) inlet.	
Photo: 02 **Date:** 05/28/2021 **Direction Facing:** NW **Comments:** Recycle pipe penetration through the berm.	

GEOSYNTEC CONSULTANTS **Photographic Record**	
Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 03

Date: 05/28/2021

Direction Facing: Down

Comments: Interior of recycle intake structure.

Photo: 04

Date: 05/28/2021

Direction Facing: E

Comments: North AP1 embankment overview

GEOSYNTEC CONSULTANTS **Photographic Record**	
Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 05 **Date:** 05/28/2021 **Direction Facing:** E **Comments:** North interior slope of AP1. Slope coverings included bottom ash, gravel, and vegetation in some areas.	
Photo: 06 **Date:** 05/28/2021 **Direction Facing:** N **Comments:** Wet area at north embankment toe, as noted in previous site visit reports by others.	

GEOSYNTEC CONSULTANTS **Photographic Record**	
Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 07

Date: 05/28/2021

Direction Facing: NE

Comments: North embankment overview

Photo: 08

Date: 05/28/2021

Direction Facing: SE

Comments: North interior embankment overview

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 09	
Date: 05/28/2021	
Direction Facing: SE	
Comments: Northeast embankment exterior overview	

Photo: 10	
Date: 05/28/2021	
Direction Facing: E	
Comments: Crest of northeast embankment sheet pile wall. Note growth of small trees. Geosyntec recommended cutting of the trees as part of routine site maintenance.	

GEOSYNTEC CONSULTANTS
Photographic Record

Geosyntec consultants

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 11

Date: 05/28/2021

Direction Facing: S

Comments: East embankment toe overview. Some seepage was noted on the embankment face. Geosyntec recommended observing the seepage as part of routine inspections.

Photo: 12

Date: 05/28/2021

Direction Facing: W

Comments: Sheet pile wall overview at northeast embankment toe. Note tree growth. Geosyntec recommended cutting of the trees as part of routine site maintenance

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 13 **Date:** 05/28/2021 **Direction Facing:** S **Comments:** East embankment interior overview	
Photo: 14 **Date:** 05/28/2021 **Direction Facing:** SW **Comments:** Southeast Ash Pond 1 interior overview	

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 15 **Date:** 05/28/2021 **Direction Facing:** W **Comments:** South embankment exterior overview. The embankment toe is reportedly always wet in this area.	
Photo: 16 **Date:** 05/28/2021 **Direction Facing:** W **Comments:** South embankment interior overview.	

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 17 **Date:** 05/28/2021 **Direction Facing:** W **Comments:** South embankment exterior overview	
Photo: 18 **Date:** 05/28/2021 **Direction Facing:** SW **Comments:** Exterior toe of the south embankment. Note wet conditions, which are typical per previous site visit reports.	

GEOSYNTEC CONSULTANTS
Photographic Record

Geosyntec consultants

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 19

Date: 05/28/2021

Direction Facing: N

Comments: Exterior toe of the south embankment. Note wet conditions, which are typical per pervious site visit reports.

Photo: 20

Date: 05/28/2021

Direction Facing: NW

Comments: AP1 sluice line discharge location.

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 21
Date: 05/28/2021
Direction Facing: NW
Comments: Southwest embankment exterior overview

Photo: 22
Date: 05/28/2021
Direction Facing: NW
Comments: Sluice pipe penetrations through the embankment.

Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 23

Date: 05/28/2021

Direction Facing: Down

Comments: Culvert under the crest access road.

Photo: 24

Date: 05/28/2021

Direction Facing: N

Comments: West exterior embankment overview

GEOSYNTEC CONSULTANTS **Photographic Record**	
Site Owner: Illinois Power Generating Company	**Project Number:** GLP8027
CCR Unit: Ash Pond #1 (AP#1)	**Site:** Coffeen Power Plant

Photo: 25	
Date: 05/28/2021	
Direction Facing: SE	
Comments: Overview of sheet pile wall from AP2. Note l tree growth. Geosyntec recommended cutting trees as part of routine site maintenance.	

Attachment C

Periodic History of Construction Report Update Letter

Geosyntec consultants

1 McBride and Son Center Drive, Suite 202
Chesterfield, MO 63005
PH 636-812-0800
www.geosyntec.com

October 11, 2021

Illinois Power Generating Company
134 Cips Lane
Coffeen, Illinois 62017

Subject: Periodic History of Construction Report Update Letter
USEPA Final CCR Rule, 40 CFR §257.73(c)
Coffeen Power Plant
Coffeen Illinois

At the request of Illinois Power Resources Generation Company (IPRG), Geosyntec Consultants (Geosyntec) has prepared this Letter to documents updates to the Initial History of Construction (HoC) report for the Coffeen Power Plant (CPP), also known as the Coffeen Power Station (COF). The Initial HoC report was prepared by AECOM in October of 2016 [1] in accordance with 40 Code of Federal Regulations (CFR) §257.73(c) of the United States Environmental Protection Agency (USEPA) Coal Combustion Residuals Rule, known as the CCR Rule [2]. This letter also includes information required by Section 845.220(a)(1)(B) (Design and Construction Plans) of the state-specific Illinois Environmental Protection Agency (IEPA) Part 845 CCR Rule [3] that is not expressly required by §257.73(c).

BACKGROUND

The CCR Rule required that, by October 17, 2016, Initial HoC reports to be compiled for existing CCR surface impoundments with: (1) a height of five feet or more and a storage volume of 20 acre-feet or more, or (2) a height of 20 feet or more. The Initial HoC report was required to contain, to the extent feasible, the information specified in 40 CFR §257.73(c)(1)(i)-(xii). The Initial HoC report for CPP, which included four existing CCR surface impoundments, Ash Pond No. 1 (AP1), Ash Pond No. 2 (AP2), the GMF Gypsum Stack Pond (GMF GSP, also known as the GMF Pond), and the GMF Recycle Pond (GMF RP), was prepared and subsequently posted to IPGC's CCR Website prior to October 17, 2016.

The CCR Rule requires that Initial HoC to be updated if there is a significant change to any information complied in the Initial HoC report, as listed below:

§ 257.73(c)(2): If there is a significant change to any information complied under paragraph (c)(1) of this section, the owner or operator of the CCR unit must update the relevant information and place it in the facility's operating record as required by § 257.105(f)(9).

IPRG retained Geosyntec to review the Initial HoC report, review reasonably and readily available information for AP1, AP2, the GMF GSP, and the GMF RP generated since the Initial HoC report was prepared, and perform a site visit to CPP to evaluate if significant changes may have occurred since the Initial HoC report was prepared. This Letter contains the results of Geosyntec's evaluation and documents significant changes that have occurred at AP1, AP2, the GMF GSP, and the GMF RP, as they pertain the requirements of §257.73(c)(1)(i)-(xii).

UPDATES TO HISTORY OF CONSTRUCTION REPORT

Geosyntec's evaluation for the CPP AP1, AP2, GMF GSP, and GMF RP determined that no known significant changes requiring updates to the information in the Initial HoC report pertaining to §257.73(c)(1)(ii), (iv), (v), (vi), (vii), (xi), and (xii) of the CCR Rule had occurred since the Initial HoC report was developed.

However, Geosyntec's evaluation determined that significant changes at the CPP AP1, AP2, GMF GSP, and GMF RP, pertaining to §257.73(c)(1)(i), (iii), (viii), (ix), and (x) of the CCR Rule had occurred since the Initial HoC report had been developed. Additionally, information how long the CCR surface impoundments have been operating and the types of CCR in the surface impoundments, as required by Section 845.220(a)(1)(B) of the Part 845 Rule were not included in the Initial HoC report, as this information is not required by the CCR Rule. Each change and the subsequent updates to the Initial HoC report is described within this section.

Section 845.220(a)(1)(B): A statement of … how long the CCR surface impoundment has been in operation, and the types of CCR that have been placed in the surface impoundment.

<u>*Ash Pond No. 1*</u>

The AP1 was in operation from 1964 until CPP was retired in 2019 and received CCR for approximately 55 years. As of the date of this report, the AP1 has been present for approximately 57 years [4].

CCR placed in the AP1 included bottom ash [4].

<u>*Ash Pond No. 2*</u>

The AP2 was in operation from 1971 to 1984, for a total of approximately 13 years. The AP2 was closed in 1984-1985 by installing a clay cover and has not since been active or received CCR. As of the date of this report, AP2 has been present for approximately 50 years. [4].

CCR placed in the AP2 was used to store and dispose of fly ash and bottom ash [4].

GMF Gypsum Pond

The GMF GSP was in operation from 2010 until CPP was retired in 2019 and received CCR for approximately 9 years. As of the date of this report, the GMF GSP has been present for a total of approximately 11 years [4].

CCR placed in GMF GSP included gypsum [4].

GMF Recycle Pond

The GMF RP was in operation from 2010 until CPP was retired in 2019, for a total of 9 years [4]. As of the date of this report, the GMF RP has been present for approximately 11 years.

§ 257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

State identification numbers (IDs) for AP1, AP2, the GMF GSP, and the GMF RP have been assigned by the Illinois Environmental Protection Agency (IEPA). Each ID is listed in **Table 1**.

Table 1 – IEPA ID Numbers

CCR Surface Impoundment	State ID
Ash Pond No. 1 (AP1)	W1350150004-01
Ash Pond No. 2 (AP2)	W1350150004-02
GMF Gypsum Stack Pond (GMF GSP)	W1350150004-03
GMF Recycle Pond (GMF RP)	W1350150004-04

§ 257.73(c)(1)(iii): A statement of the purpose for which the CCR unit is being used.

AP2 was closed in 2020, in substantial compliance with the written closure plan posted to IPRG's CCR Website [5], and as documented by a certified Notification of Completion of Closures posted to DMG's CCR Website [6].

The CPP was retired in December of 2019, with the generation of electricity ceased at that time. Therefore, AP1, the GMF GSP, and the GMF RP are no longer being used to store and dispose of new CCR that is actively generated by CPP, as CCR generation as ceased. All three impoundments still contain CCR and liquids that was present at the time of plant retirement. The GMF RP also previously received dewatering discharge from AP2; this inflow was ceased after AP2 was closed in 202.

§ 257.73(c)(1)(viii): A description of the type, purpose, and location of existing instrumentation.

Instrumentation monitoring at AP2 is no longer required as the CCR surface impoundment was closed in accordance with §257.102 [6], and the instrumentation network was modified at that time. Therefore, the instrumentation locations shown in Appendix C of the Initial HoC report are no longer applicable to AP2.

§ 257.73(c)(1)(ix): Area-capacity curves for the CCR unit.

Updated area-capacity curves were prepared for AP1, the GMF GSP, and the GMF RP in 2021 and are provided in **Figures 1**, **2**, and **3**, respectively.

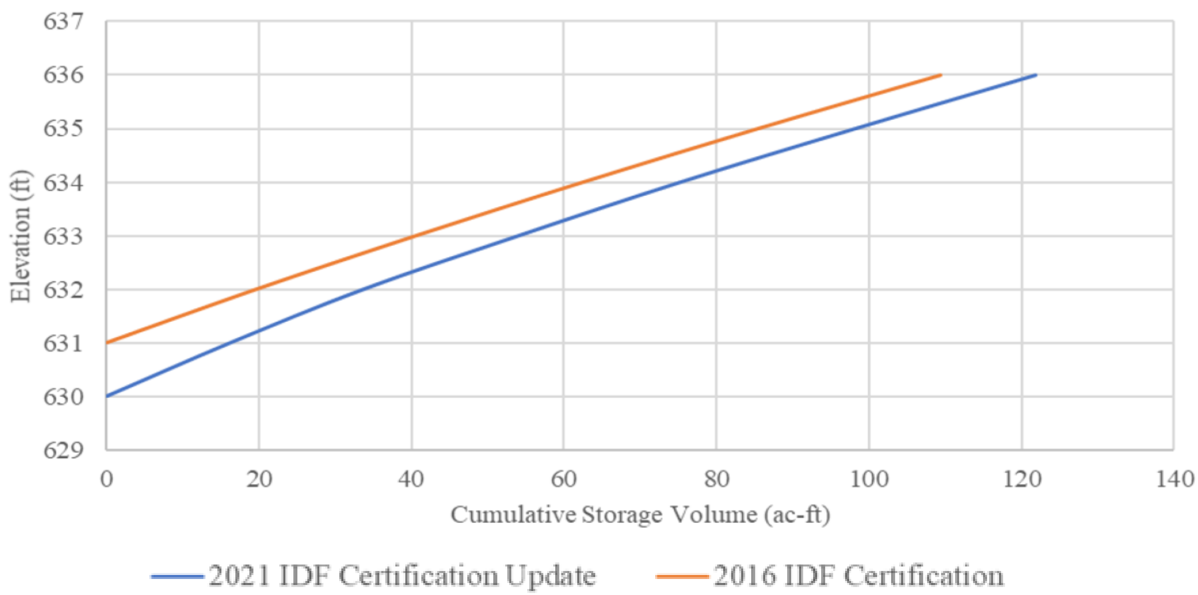


Figure 1 – Area-Capacity Curve for AP1

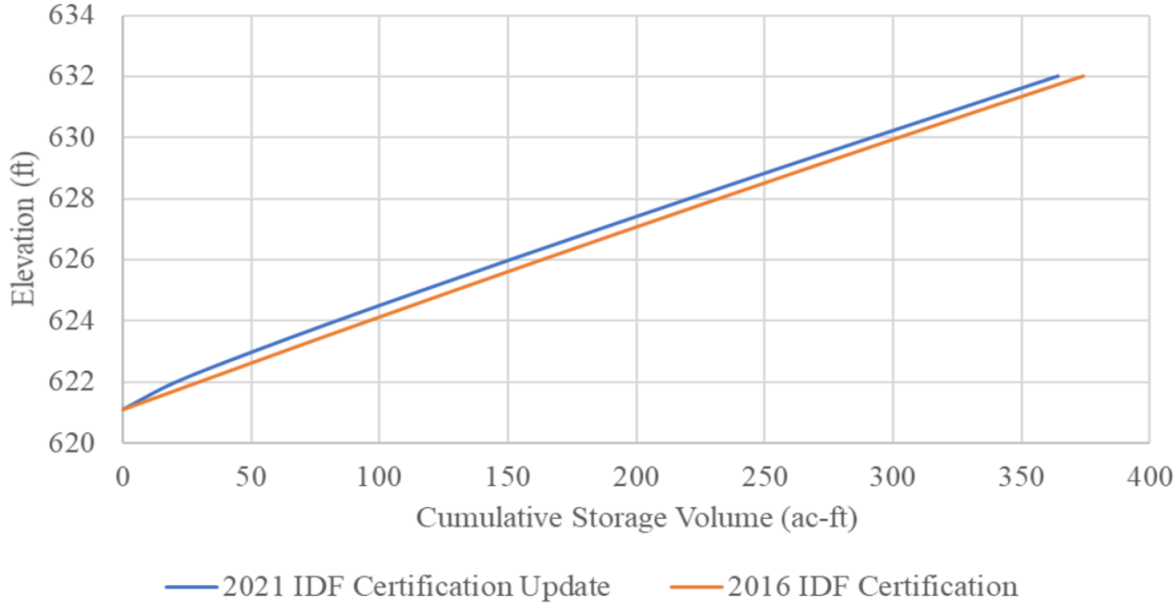


Figure 2 – Area-Capacity Curve for GMF GSP

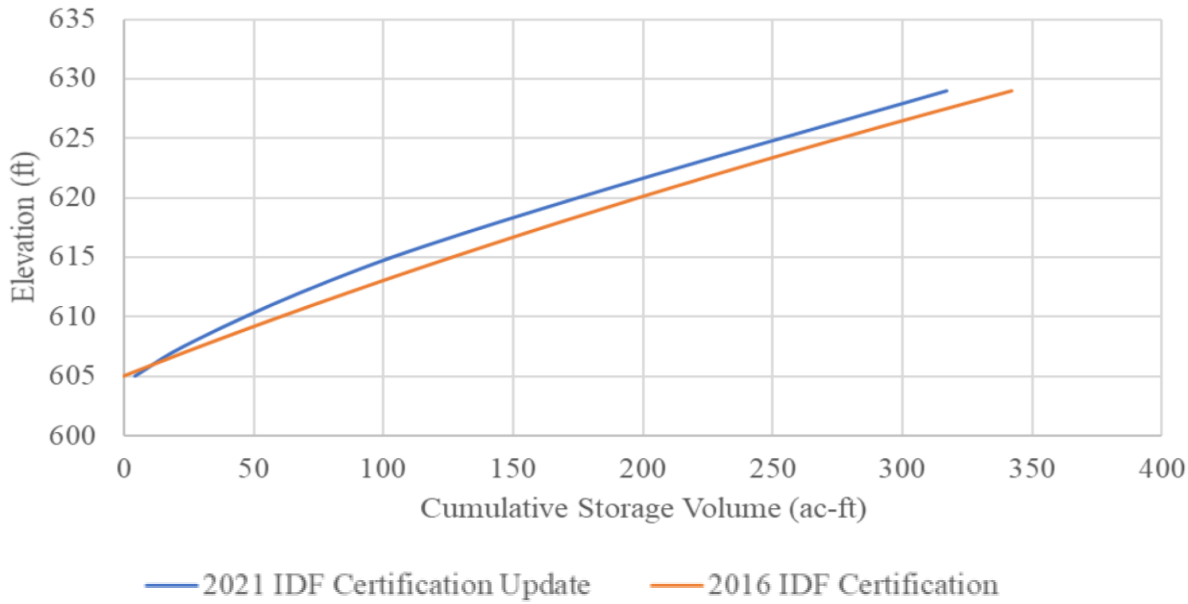


Figure 3 – Area-Capacity Curve for GMF RP

§ 257.73(c)(1)(x): A description of each spillway and diversion design features and capacities and calculations used in their determination.

The primary spillway structure for AP1 was modified in 2020 by constructing a berm of bottom ash around the entrance to the spillway, to reduce the potential for freezing around the spillway during post-CPP closure conditions, with a berm crest elevation of approximately 630 ft. Design drawings for the bottom ash berm are not reasonably or readily available.

The transfer channel between the GMF GSP and the GMF RP was modified in 2020 by constructing a geomembrane-lined berm, in order to allow the normal pool level of the GMF GSP to be increased. Design drawings for the berm are not reasonably or readily available. However, survey data [3] indicates the berm has an elevation of approximately 628 ft, a top width (perpendicular to the flow direction) of approximately 75 ft, a total length (parallel to the flow direction) of 25 ft, and side slopes of approximately 4 horizontal to 1 vertical.

Valves were installed on the intake pipes for the GMF RP after the CPP was closed and plant process water intake pumping was ceased. Design drawings for these valves are not reasonably or readily available.

Updated discharge capacity calculations for the existing spillways of AP1, the GMF GSP, and the GMF RP were prepared in 2021 using HydroCAD 10 modeling software. The calculations indicate that the AP1 and the GMF RP have sufficient storage capacity and will not overtop the embankments during the 1,000-year, 24-hour, storm event. The calculations also indicate that the GMF GSP has sufficient storage capacity and will not overtop the embankments during the Probable Maximum Precipitation (PMP), 24-hour storm event. The results of the calculations are provided in **Table 2**.

Table 2 – Results of Updated Discharge Capacity Calculations

	AP1	GMF GSP	GMF RP
Approximate Berm Minimum Elevation[1], ft	636.0	632.0	629.0
Approximate Emergency Spillway Elevation[1], ft	Not Present	Not Present	624.0
Starting Water Surface Elevation[1] (SWSE), ft	630.2	625.2	622.1
Peak Water Surface Elevation[1] (PWSE), ft	631.4	626.7	623.9
Time to Peak, hr	No Discharge	10.6	No Discharge
Surface Area[2], ac	18.1	34.8	16.1
Storage[3], ac-ft	19.5	52.9	29.0

Notes:
[1]Elevations are based on the NAVD88 datum
[2]Surface area is defined as the water surface area at the PWSE
[3]Storage is defined as the volume between the SWSE and PWSE

AP2 no longer retains free water as the CCR surface impoundments was closed in 2020 [6]. Therefore, the spillways are no longer present and the information regarding these structures, as presented in the Initial HoC report, is no longer applicable to AP2.

CLOSING

This letter has been prepared to document Geosyntec's evaluation of changes that have occurred at AP1, AP2, the GMF GSP, and the GMF RP since the Initial HoC was developed, based on reasonably and readily available information provided by IPRG, observed by Geosyntec during the site visit, or generated by Geosyntec as part of subsequent calculations.

Sincerely,

Lucas P. Carr, P.E.
Senior Engineer

John Seymour, P.E.
Senior Principal

REFERENCES

[1] AECOM, "History of Construction, USEPA Final CCR Rule, 40 CFR § 257.73(c), Coffeen Power Station, Coffeen, Illinois," October 2016.

[2] United Stated Environmental Protection Agency, "40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, 2015," 2015.

[3] Illinois Environmental Protection Agency, "35 Ill. Adm. Code Part 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments," Springfield, IL, 2021.

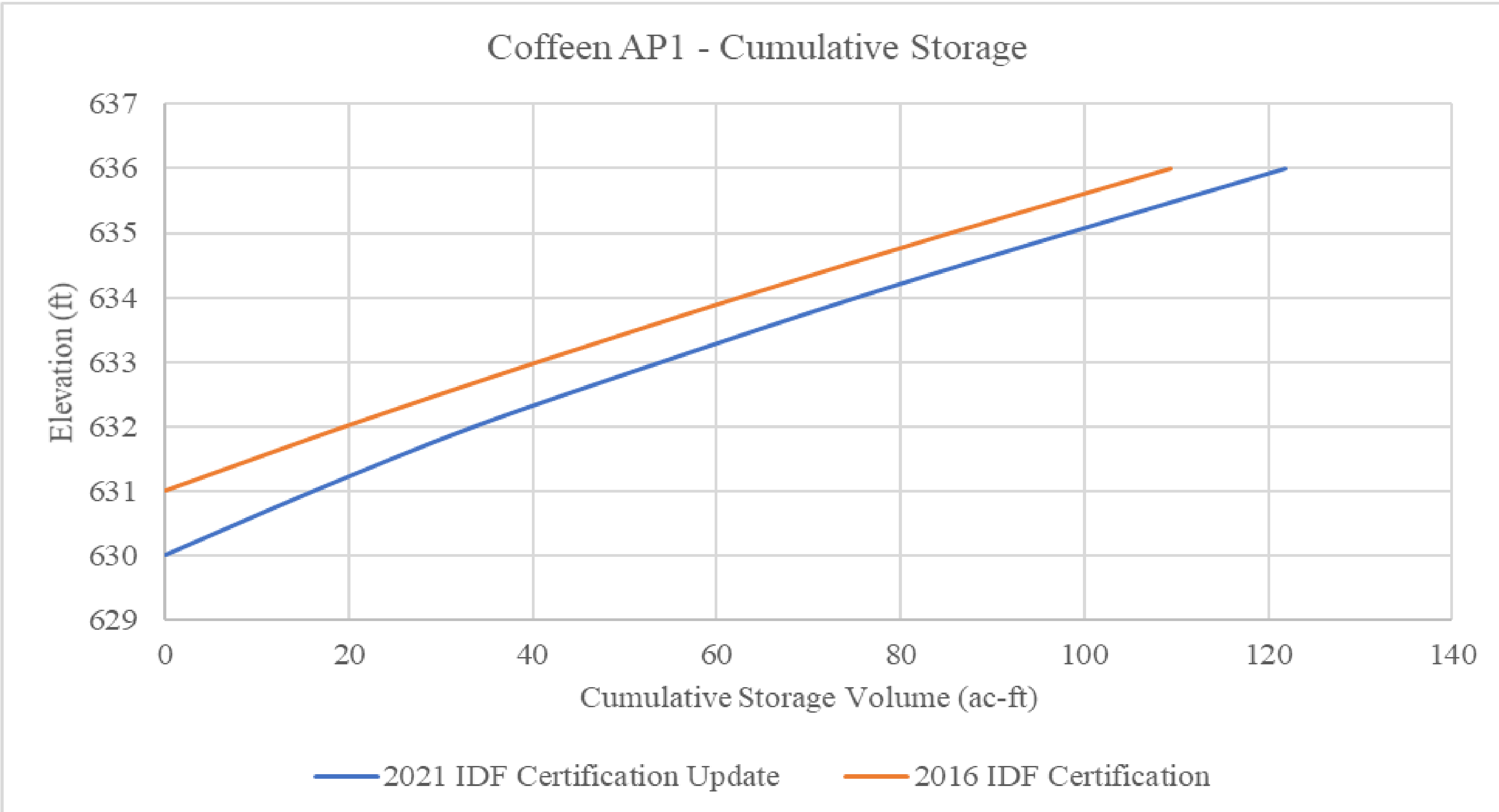
[4] AECOM, "History of Construction, USEPA Final CCR Rule, 40 CFR § 257.73(c), Hennepin Power Station, Hennepin, Illinois," October 2016.

[5] V. Modeer, "Closure Plan for Existing CCR Surface Impoundment, Coffeen Power Station, Illinois Power Generating Company, Ash Pond No. 2," October 17, 2016.

[6] D. Tickner, "Coffeen Power Station; Ash Pond No. 2; Notification of Completion of Closure," December 17, 2020.

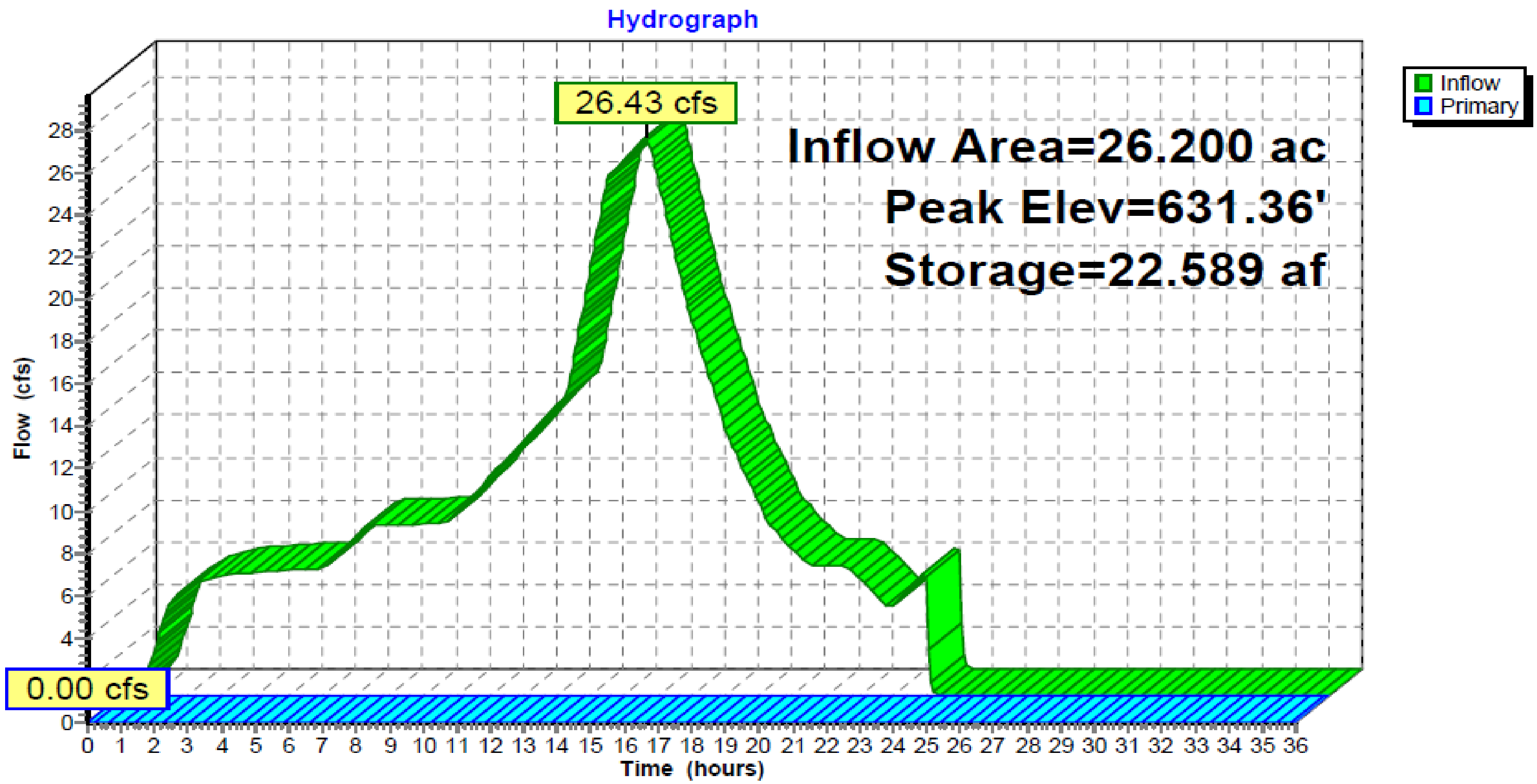
Attachment D

Periodic Inflow Design Flood Control System Plan Analyses

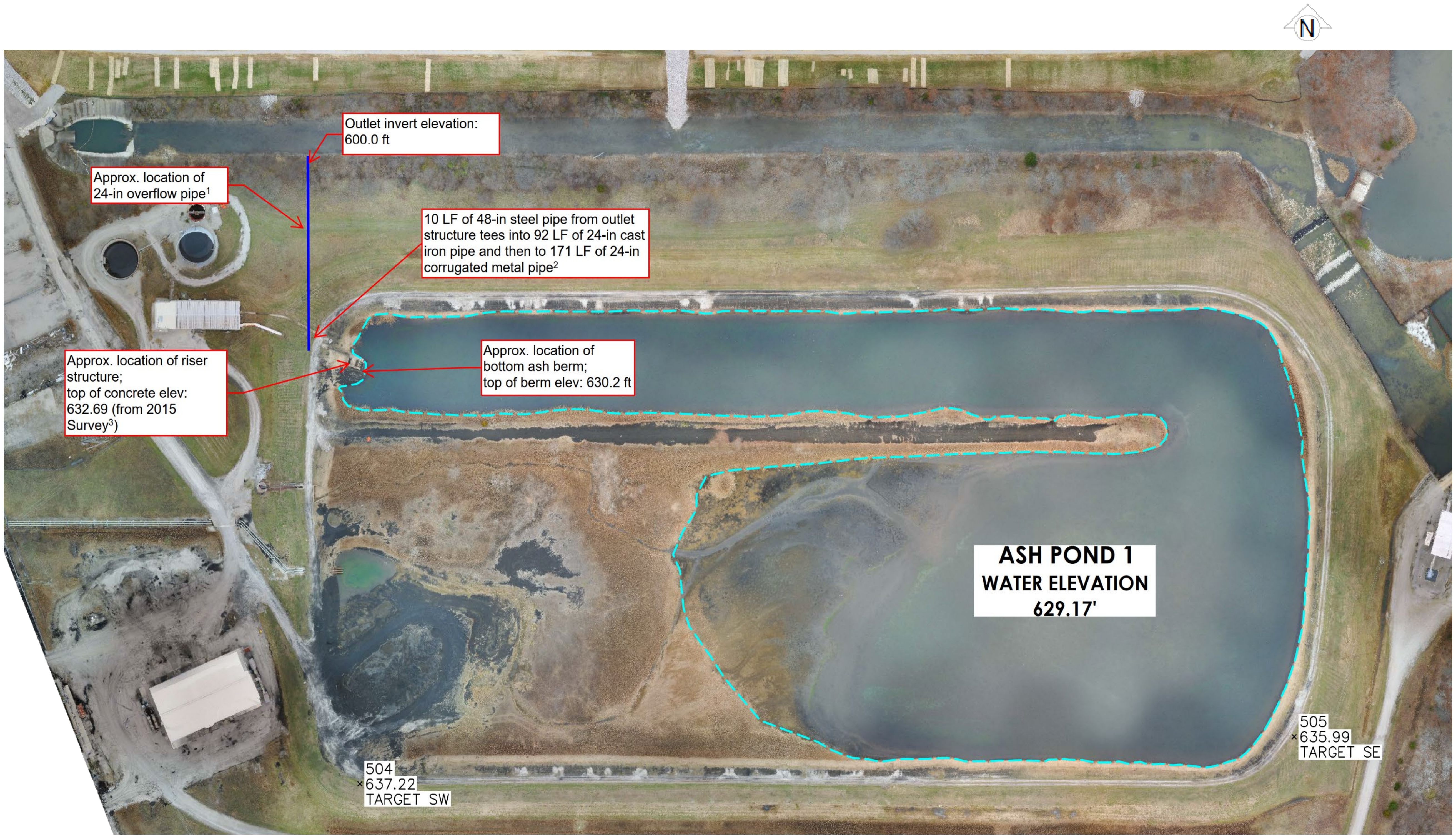


COFFEEN AP1 CUMULATIVE STORAGE PERIODIC CERTIFICATION COFFEEN POWER PLANT COFFEEN, ILLINOIS	
Geosyntec consultants	Figure D-1
GLP8027 | 9/10/2021	

Pond 2P: Ash Pond 1



AP1 IDF HYDROGRAPH PERIODIC CERTIFICATION COFFEEN POWER PLANT COFFEEN, ILLINOIS	
Geosyntec consultants	Figure D-2
GLP8027 9/10/2021	



[1]Outlet pipe configuration provided by site personnel on 29 June 2021
[2]Emergency Overflow Assessment (2011); see Figure D-4
[3]Weaver Consultants Group, "Dynegy, Collinsville, IL, 2015 - Coffeen Topography," December 1, 2015.

Figure based on IngenAE 2020 Site Topo

NOT TO SCALE

Coffeen Power Plant Ash Pond 1 Hydrologic Workmap	
Geosyntec consultants	Figure
GLP8027 / September 2021	D-3

BODINE
SERVICES OF EVANSVILLE LLC

3322 Tower Drive Newburgh, IN 47720 Phone 812 423-5106 Fax 812 422-1996

WORK FORM

DATE ________ SHEET NO. 1 of 1

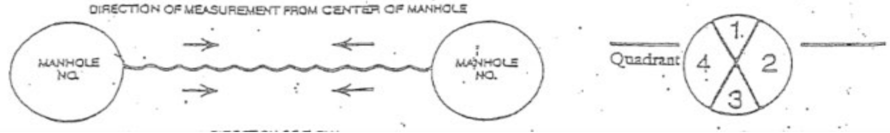
SECTION ON OR AREA emergency Overflow Line To River

FROM MANHOLE NO. Visual inspection TO MANHOLE NO. ________

DIRECTION River To Plant PIPE SIZE apx 24" PIPE TYPE Corrugated & cast pipe

Distance Reading	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Observations	Infiltration/ Inflow GPD	Recommended Correction Action	Photo No.
7 ft					Light buildup Bottom of pipe			
7 fT					Joint in pipe			
13 fT					Light buildup on Bottom of pipe			
27 fT					Joint in pipe			
48 fT					JOINT in pipe & Light build in bottom of pipe			
68 fT					" in pipe			
73 fT					Possible infiltration could be small Roots			
95 fT					Joint in pipe			
109 fT					small buildup in bottom & Joint in pipe			
130 fT					Joint in pipe & small buildup			
150 ft					Joint in pipe			
171 fT					end of Corrugated pipe			
					Light build up in pipe 171-263 fT			
263 ft					End Of Run			

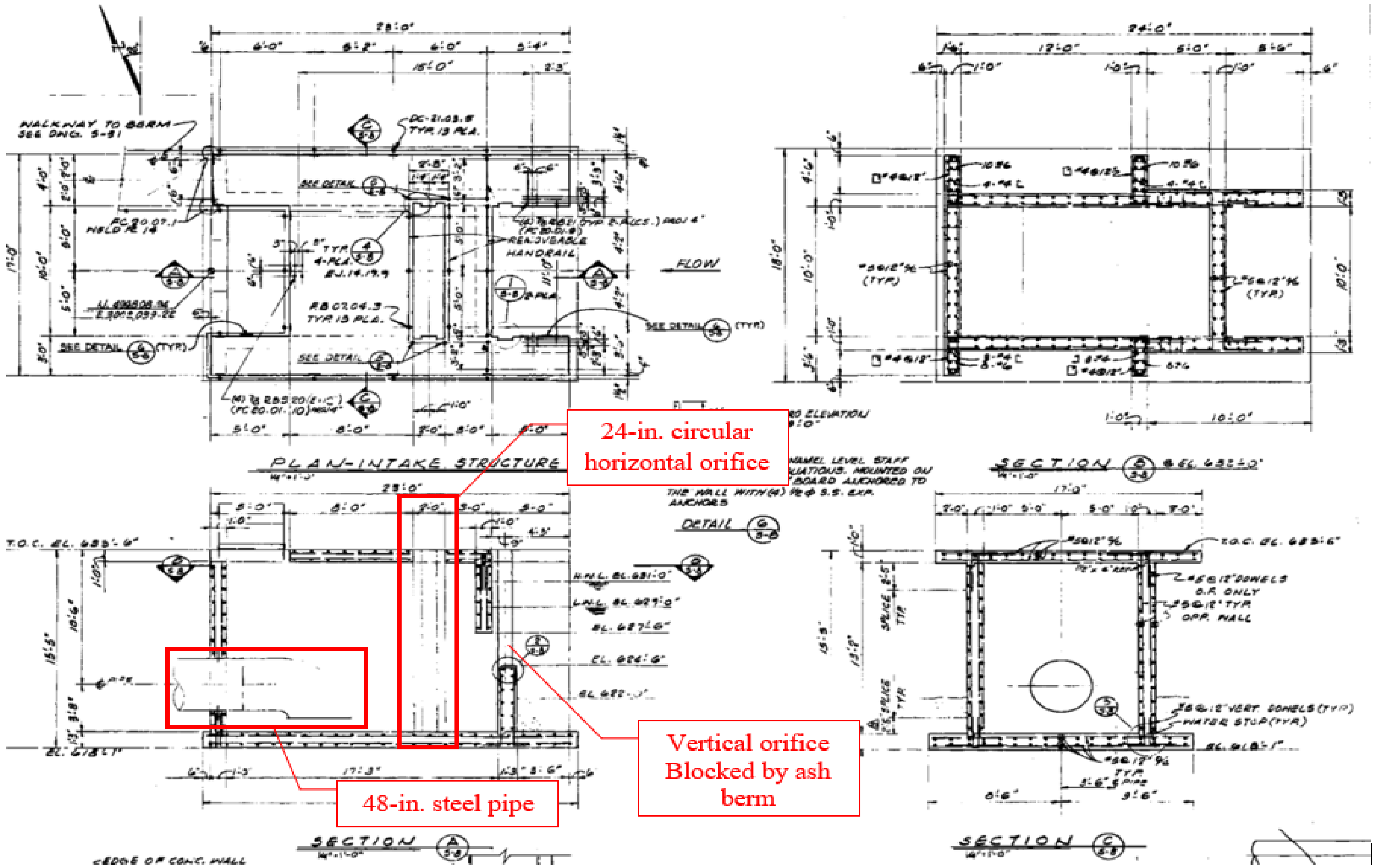
DIRECTION OF MEASUREMENT FROM CENTER OF MANHOLE



2011 EMERGENCY OVERFLOW ASSESSMENT (BY OTHERS)
PERIODIC CERTIFICATION
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

Geosyntec consultants

GLP8027	9/10/2021	Figure D-4



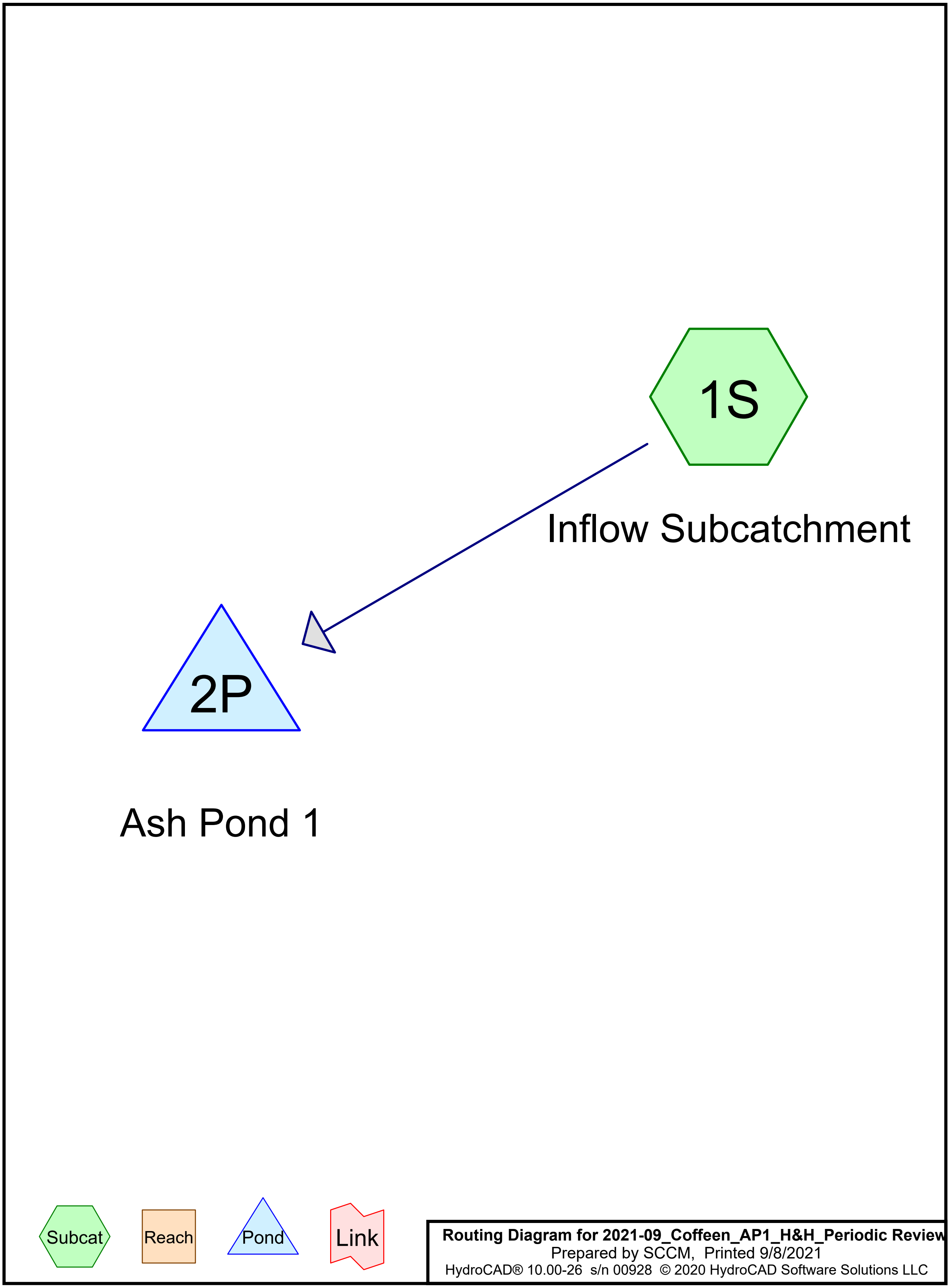
From Stearns-Roger, Inc., Drawing C-2000 - "Concrete Recycle Pump House - Intake Structure and Miscellaneous Foundations" (revised 13 April 1979)

ORIGINAL RISER STRUCTURE DESIGN DRAWING (BY OTHERS)
PERIODIC CERTIFICATION
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

Geosyntec consultants

GLP8027 | 9/10/2021

Figure D-5



Routing Diagram for 2021-09_Coffeen_AP1_H&H_Periodic Review
Prepared by SCCM, Printed 9/8/2021
HydroCAD® 10.00-26 s/n 00928 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
26.200	98	Water Surface and Ash (1S)
26.200	**98**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
26.200	Other	1S
26.200		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	26.200	26.200	Water Surface and Ash	1S
0.000	**0.000**	**0.000**	**0.000**	**26.200**	**26.200**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	614.50	600.00	171.0	0.0848	0.025	24.0	0.0	0.0
2	2P	622.30	614.50	92.0	0.0848	0.013	24.0	0.0	0.0
3	2P	624.00	622.30	10.0	0.1700	0.012	48.0	0.0	0.0

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Inflow Subcatchment Runoff Area=26.200 ac 100.00% Impervious Runoff Depth=8.93"
Tc=6.0 min CN=98 Runoff=26.43 cfs 19.502 af

Pond 2P: Ash Pond 1 Peak Elev=631.36' Storage=22.589 af Inflow=26.43 cfs 19.502 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 26.200 ac Runoff Volume = 19.502 af Average Runoff Depth = 8.93"
0.00% Pervious = 0.000 ac 100.00% Impervious = 26.200 ac

Summary for Subcatchment 1S: Inflow Subcatchment

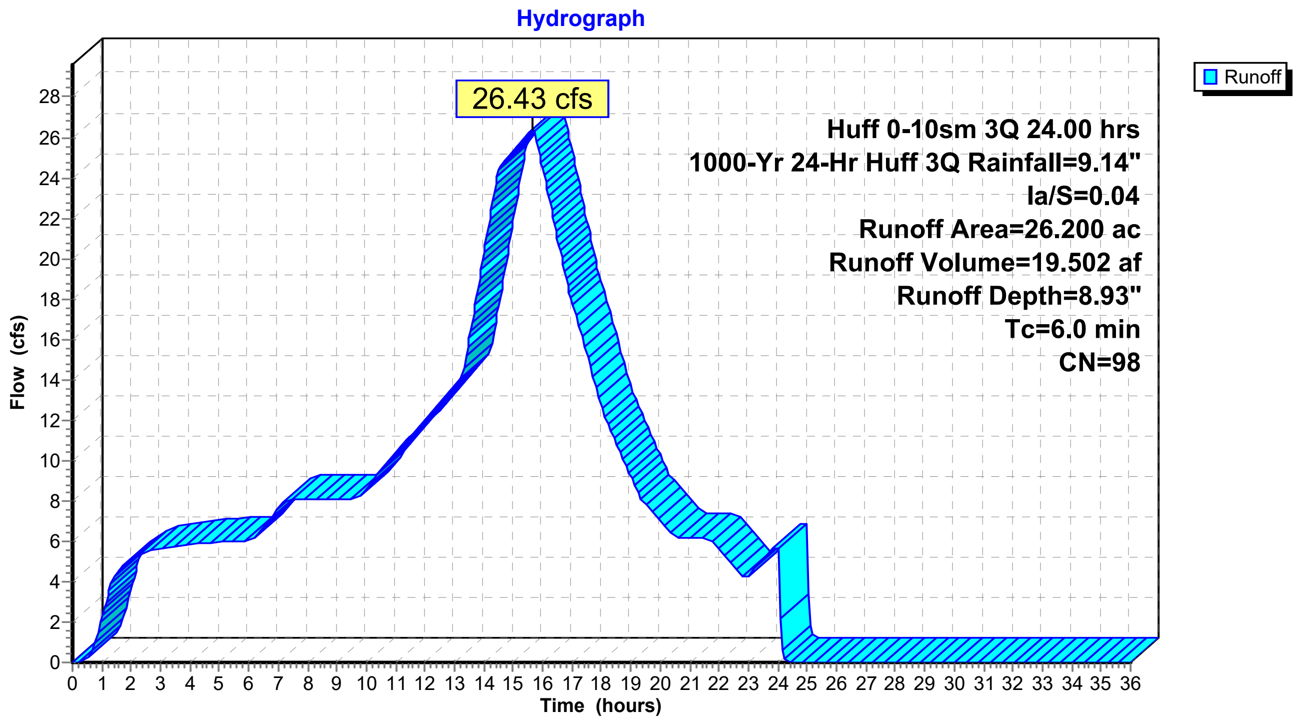
Runoff = 26.43 cfs @ 15.65 hrs, Volume= 19.502 af, Depth= 8.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Huff 0-10sm 3Q 24.00 hrs 1000-Yr 24-Hr Huff 3Q Rainfall=9.14", Ia/S=0.04

	Area (ac)	CN	Description
*	26.200	98	Water Surface and Ash
	26.200		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimal - Direct Entry into Impoundment**

Subcatchment 1S: Inflow Subcatchment



Summary for Pond 2P: Ash Pond 1

Inflow Area = 26.200 ac,100.00% Impervious, Inflow Depth = 8.93" for 1000-Yr 24-Hr Huff 3Q event
Inflow = 26.43 cfs @ 15.65 hrs, Volume= 19.502 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 630.19' Surf.Area= 0.000 ac Storage= 3.087 af
Peak Elev= 631.36' @ 24.40 hrs Surf.Area= 0.000 ac Storage= 22.589 af (19.502 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

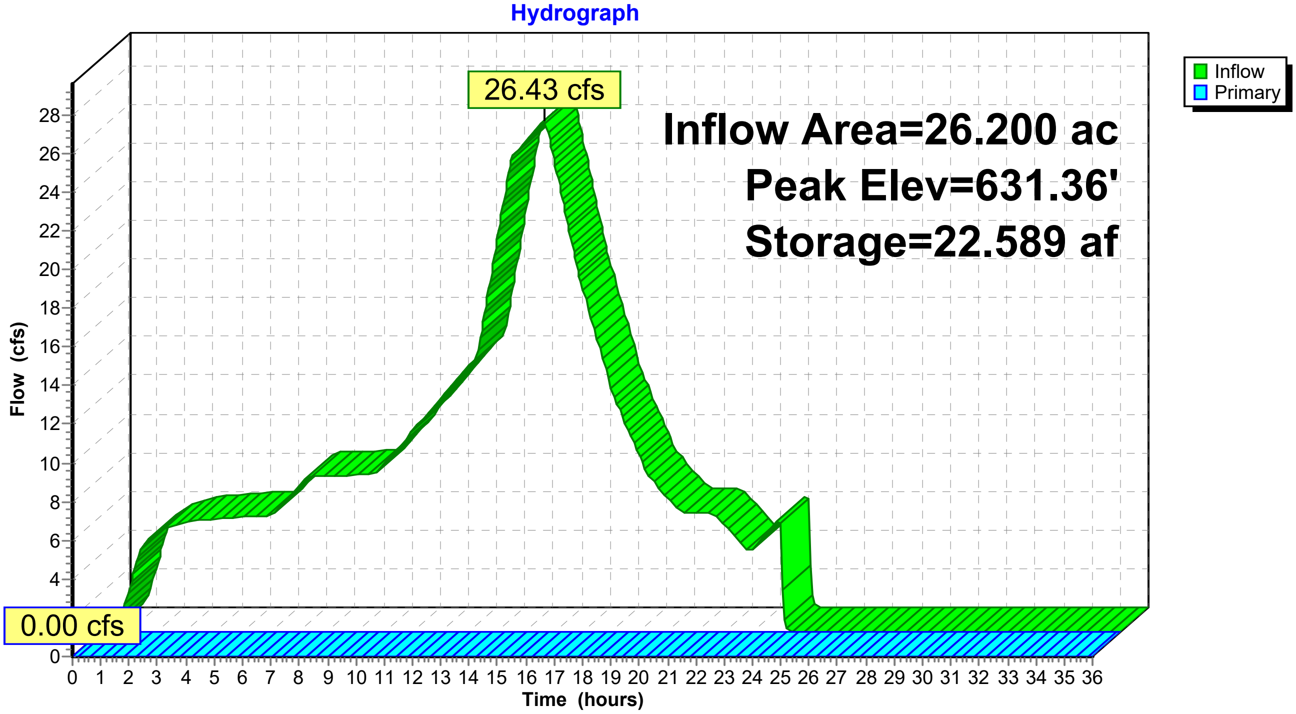
Volume	Invert	Avail.Storage	Storage Description
#1	630.00'	121.815 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
630.00	0.000
631.00	16.248
632.00	33.722
633.00	54.038
634.00	75.240
635.00	98.174
636.00	121.815

Device	Routing	Invert	Outlet Devices
#1	Primary	614.50'	**24.0" Round Culvert - 24" CMP** L= 171.0' Ke= 1.000 Inlet / Outlet Invert= 614.50' / 600.00' S= 0.0848 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Device 1	622.30'	**24.0" Round Culvert - 24" Cast Iron** L= 92.0' Ke= 1.000 Inlet / Outlet Invert= 622.30' / 614.50' S= 0.0848 '/' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 3.14 sf
#3	Device 2	624.00'	**48.0" Round Culvert - 48" Steel** L= 10.0' Ke= 1.000 Inlet / Outlet Invert= 624.00' / 622.30' S= 0.1700 '/' Cc= 0.900 n= 0.012 Steel, smooth, Flow Area= 12.57 sf
#4	Device 3	632.69'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=630.19' (Free Discharge)
└─**1=Culvert - 24" CMP** (Passes 0.00 cfs of 42.58 cfs potential flow)
  └─**2=Culvert - 24" Cast Iron** (Passes 0.00 cfs of 29.78 cfs potential flow)
    └─**3=Culvert - 48" Steel** (Passes 0.00 cfs of 92.89 cfs potential flow)
      └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Ash Pond 1



APPENDIX B

Narrative Description

APPENDIX B

Narrative Description of Ash Pond No. 1

Coffeen Power Plant

Submitted to:

Illinois Environmental Protection Agency

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Submitted by:

Illinois Power Resources Generating, LLC

1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Prepared by:

Golder Associates USA Inc.

701 Emerson Road, Suite 250
Creve Coeur, Missouri, 63141

21465046

July 28, 2022

Table of Contents

1.0 FACILITY INFORMATION

1.1 Coal Combustion Residuals Material Received

Ash Pond No. 1 (AP1) is a wet impoundment basin used to store bottom ash, a byproduct of power generation at the Coffeen Power Plant.

1.1.1 Chemical Analysis

Available information regarding chemical analysis of the bottom ash that is stored in AP1 is provided in Attachment 1.

1.2 Facility Capacity

The AP1 capacity was estimated as 470,000 cubic yards in the closure plan prepared in 2016 for compliance with 40 CFR 257.102. However, the Coffeen Power Plant was retired in December 2019, before AP1 could be filled to its capacity. The amount of coal combustion residuals (CCR) currently contained in AP1 was estimated by a volumetric analysis using Autodesk Civil 3D as approximately 436,000 cubic yards. No additional CCR will be placed in AP1.

1.3 Facility Operation

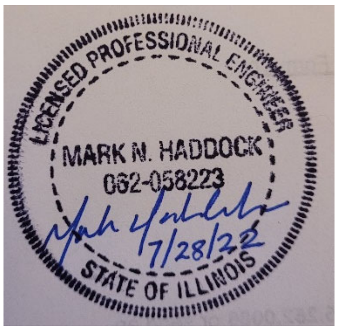
AP1 is no longer receiving CCR or other waste streams. AP1 received CCR from 1964 until the Coffeen Power Plant was retired in December 2019.

1.4 Transportation Plan

During operation, transport of CCR to AP1 was by pipeline. Figure 1 shows the main route that is used for vehicle travel between the Coffeen Power Plant and AP1. Figure 1 also shows the route that will be used to transport borrow materials from a soil stockpile to AP1 for closure and to transport soils excavated during closure to the soil stockpile. These routes are all on site.

Signature Page

Golder Associates USA Inc.



Mark Haddock, PE
Principal

https://golderassociates.sharepoint.com/sites/145229/project files/6 deliverables/reports/02-ap1_permit_app/appb-narr_desc/appb-ap1_narrative_description.docx

FIGURE 1

Transportation Plan

LEGEND

- ROUTE BETWEEN AP1 AND ON-SITE BORROW AREA
- TOPOGRAPHY/BATHYMETRY (2-FT CONTOUR INTERVAL)
- ASH POND NO. 1

KEY MAP

REFERENCES

1. AERIAL IMAGERY WITHIN PROJECT AREA: INGENAE, DECEMBER 2020.
2. AERIAL IMAGERY IN SURROUNDING AREAS: ESRI, VIVID, MAXAR.
3. WELLS, OUTFALLS, AND TOPOGRAPHY: INGENAE, DECEMBER 2020.
4. NPDES OUTFALL LOCATIONS: ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, 2021.

CLIENT
ILLINOIS POWER GENERATING COMPANY

PROJECT
COFFEEN POWER PLANT
ASH POND NO. 1

TITLE
SITE TRANSPORTATION PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-07-14
DESIGNED	MWD
PREPARED	KJC
REVIEWED	MWD
APPROVED	JJS

PROJECT NO.
21465046

FIGURE
1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

ATTACHMENT 1

Chemical Analysis

DYNEGY

Safety Data Sheet

Section 1
Identification of the Substance and of the Supplier

1.1 Product Identifier

Product Name/Identification:	ASTM Bottom Ash
Synonyms:	Ash; Ashes; Ash residues; Ashes, residues, bottom; Bottom ash; Bottom ash residues; Coal Fly Ash; Pozzolan; Waste solids.
Formula:	UVCB Substance

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advices Against

Relevant Identified Uses:	Component of wallboard, concrete, roofing material, bricks, cement kiln feed.
Uses Advised Against:	None known.

1.3 Details of the Supplier of the SDS

Manufacturer/Supplier:	Dynegy, Inc.
Street Address:	601 Travis Street, Suite 1400
City, State and Zip Code:	Houston, TX 77002
Customer Service Telephone:	800-633-4704

Section 2
Hazards Identification

2.1 Classification of the Substance

GHS Classification(s) according to OSHA Hazard Communication Standard (29 CFR 1910.1200):

- Eye Irritant, Category 2A
- STOT-SE, Category 3 (Respiratory Irritation)
- Carcinogen, Category 1A
- STOT-RE, Category 1 (Lungs)
- Toxic to Reproduction, Category 2

2.2 Label Elements

Labelling according to 29 CFR 1910.1200 Appendices A, B and C*	
Hazard Pictogram(s):	
Signal word:	**DANGER**
Hazard Statement(s):	*Causes serious eye irritation.* *May cause respiratory irritation.* *May cause damage to lungs after repeated/prolonged exposure via inhalation.* *May cause cancer of the lung.* *Suspected of damaging fertility or the unborn child.*
Precautionary Statement(s):	*Obtain special instructions before use.* *Do not handle until all safety precautions have been read and understood.* *Avoid breathing dust.* *Wash thoroughly after handling.* *Do not eat drink or smoke when using this product.* *Wear protective gloves/protective clothing/eye protection/face protection.* *Use outdoors or in a well-ventilated area.* *If exposed or concerned: Get medical advice/attention.* *Store in a secure area.* *Dispose of product in accordance with local/national regulations.*

** Fly ash and other coal combustion products (CCPs) are UVCB substances (unknown or variable composition or biological). Various CCPs, noted as ashes/ash residuals; Ashes, residues, bottom; Bottom ash; Bottom ash residues; Waste solids, ashes under TSCA are defined as: "The residuum from the burning of a combination of carbonaceous materials. The following elements may be present as oxides: aluminum, calcium, iron, magnesium, nickel, phosphorus, potassium, silicon, sulfur, titanium, and vanadium." Ashes including fly ash and fluidized bed combustion ash are identified by CAS number 68131-74-8. The exact composition of the ash is dependent on the fuel source and flue additives composed of many constituents. The classification of the final substance is dependent on the presence of specific identified oxides as well as other trace elements.*

2.3 Other Hazards

Listed Carcinogens:

-Respirable Crystalline Silica

IARC: [Yes] **NTP:** [Yes] **OSHA:** [Yes] **Other:** **(ACGIH)** [Yes]

Section 3
Composition/Information on Ingredients

Substance	*CAS No.*	*Percentage (%)*	*GHS Classification*
Crystalline Silica	*14808-60-7*	*20 - 40%*	*Repeat Dose STOT, Category 1* *Carcinogen, Category 1A*
Silica, crystalline respirable (RCS)	*14808-60-7*	*See Footnote 1*	*Repeat Dose STOT, Category 1* *Carcinogen. Category 1A*
Aluminosilicates[2]	*Various, see Footnote 2*	*10 - 60%*	*Single Exposure STOT, Category 3*
Calcium oxide (CaO)	*1305-78-8*	*10 - 30%*	*Skin Irritant, Category 2* *Eye Irritant, Category 1* *Single Exposure STOT, Category 3*
Iron oxide	*1309-37-1*	*1 - 10%*	*Not Classified*
Manganese dioxide (MnO_2)	*1313-13-9*	*<2%*	*Skin Irritant, Category 2* *Eye Irritant, Category 2B*
Magnesium oxide	*1309-48-4*	*2 - 10%*	*Not Classified*
Phosphorus pentoxide (P_2O_5)	*1314-56-3*	*≤2%*	*Skin Irritant, Category 2* *Eye Irritant, Category 2B*
Sodium oxide	*1313-59-3*	*1 - 10%*	*Not Classified*
Potassium oxide (K_2O)	*12136-45-7*	*≤1%*	*Skin Irritant Category 2* *Eye Irritant Category 2B*
Titanium dioxide (TiO_2)	*13463-67-7*	*<3%*	*Not Classified*

[1]*The percentage of respirable crystalline silica has not been determined. Therefore, a GHS classification of Carcinogen 1A has been assigned.*

[2]*Aluminosilicates (CAS# 1327-36-2) may be in the form of mullite (CAS# 1302-93-8); aluminosilicate glass; pozzolans (CAS# 71243-67-9); or calcium aluminosilicates such as tricalcium aluminate (C3A), or calcium sulfoaluminate (C4A3S). The form is dependent on the source of the coal and or the process used to create the CCP. Pulverized coal combustion would be more likely to create high levels of pozzolans. Aluminosilicates may have inclusions of calcium, titanium, iron, potassium, phosphorus, magnesium and other metal oxides.*

Section 4
First Aid Measures

4.1 Description of First Aid Measures

Inhalation:	If product is inhaled and irritation of the nose or coughing occurs, remove person to fresh air. Get medical advice/attention if respiratory symptoms persist.
Skin Contact:	If skin exposure occurs, wash with soap and water.
Eye Contact:	If product gets into the eye, rinse copiously with water for several minutes. Remove contact lenses, if present and easy to do. Seek medical attention/advice if irritation occurs or persists.
Ingestion:	No specific first aid measures are required.

4.2 Most Important Health Effects, Both Acute and Delayed

Acute Effects: Direct exposure may cause respiratory irritation, eye irritation and skin irritation. The product dust can dry and irritate the skin and cause dermatitis and can irritate eyes and skin through mechanical abrasion.

Chronic Effects: Chronic exposure may cause lung damage from repeated exposure. Prolonged inhalation of respirable crystalline silica above certain concentrations may cause lung diseases, including silicosis and lung cancer.

4.3 Indication of Any Immediate Medical Attention and Special Treatment Needed

Seek first aid or call a doctor or Poison Control Center if contact with eyes occurs and irritation remains after rinsing. Get medical advice if inhalation occurs and respiratory symptoms persist.

Section 5
Firefighting Measures

5.1 Extinguishing Media

Suitable Extinguishing Media:	Product is not flammable. Use extinguishing media appropriate for surrounding fire.
Unsuitable Extinguishing Media:	Not applicable, the product is not flammable.

5.2 Special Hazards Arising from the Substance or Mixture

Hazardous Combustion Products:	None known.

5.3 Advice for Firefighters

Special Protective Equipment and Precautions for Firefighters:	As with any fire, wear self-contained breathing apparatus (NIOSH approved or equivalent) and full protective gear.

Section 6
Accidental Release Measures

6.1 Personal Precautions, Protective Equipment and Emergency Procedures

Personal precautions/Protective Equipment:	See Section 8.2.2 Individual Protective Measures. For concentrations exceeding Occupational Exposure Levels (OELs), use a self-contained breathing apparatus (SCBA).
Emergency procedures:	Use scooping, water spraying/flushing/misting or ventilated vacuum cleaning systems to clean up spills. Do not use pressurized air.

6.2 Environmental Precautions

Environmental precautions:	Prevent contamination of drains or waterways and dispose according to local and national regulations.

6.3 Methods and Material for Containment and Cleaning Up

Methods and materials for containment and cleaning up:	Do not use brooms or compressed air to clean surfaces. Use dust collection vacuum and extraction systems. Large spills of dry product should be removed by a vacuum system. Dampened material should be removed by mechanical means and recycled or disposed of according to local and national regulations.

See Sections 8 and 13 for additional information on exposure controls and disposal.

Section 7
Handling and Storage

7.1 Precautions for Safe Handling

Practice good housekeeping. Use adequate exhaust ventilation, dust collection and/or water mist to maintain airborne dust concentrations below permissible exposure limits (note: respirable crystalline silica dust may be in the air without a visible dust cloud).

Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Maintain and test ventilation and dust collection equipment. In cases of insufficient ventilation, wear a NIOSH approved respirator for silica dust when handling or disposing dust from this product. Avoid contact with skin and eyes. Wash or vacuum clothing that has become dusty. Avoid eating, smoking, or drinking while handling the material.

7.2 Conditions for Safe Storage, Including any Incompatibilities

Minimize dust produced during loading and unloading.

Section 8
Exposure Controls/Personal Protection

8.1 Control Parameters

OCCUPATIONAL EXPOSURE LIMITS					
SUBSTANCE		**OSHA PEL TWA (mg/m^3)**	**NIOSH REL TWA (mg/m^3)**	**ACGIH TLV TWA (mg/m^3)**	**CA - OSHA PEL (mg/m^3)**
Calcium oxide		5	2	2	2
Particulates Not Otherwise Regulated	Total	15	15	10	10
	Respirable	5	5	3	5
Respirable Crystalline Silica	Respirable	0.05	0.05	0.025	0.05
Manganese dioxide (as manganese compounds)	Total	5 (Ceiling)	1 3 (STEL)	0.1	0.2
	Respirable	-	-	0.02	-

8.2 Exposure Controls

8.2.1 Engineering Controls

Provide ventilation to maintain the ambient workplace atmosphere below the occupational exposure limit(s). Use general and local exhaust ventilation and dust collection systems as necessary to minimize exposure.

8.2.2 Personal Protective Equipment (PPE)

Respiratory protection:	Wear a NIOSH approved particulate respirator if exposure to airborne particulates is unavoidable and where occupational exposure limits may be exceeded. If airborne exposures are anticipated to exceed applicable PELs or TLVs, a self-contained breathing apparatus or airline respirator is recommended.
Eye and face protection:	If eye contact is possible, wear protective glasses with side shields. Avoid contact lenses.
Hand and skin protection:	Wear gloves and protective clothing. Wash hands with soap and water after contact with material.

Section 9
Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Property: Value	Property: Value
Appearance (physical state, color, etc.): Fine tan/ gray particulate	**Upper/lower flammability or explosive limits:** Not applicable
Odor: Odorless[1]	**Vapor Pressure (Pa):** Not applicable
Odor threshold: Not applicable	**Vapor Density:** Not applicable
pH (25 °C) (in water): 8 - 11	**Specific gravity or relative density:** 2.2 – 2.9
Melting point/freezing point (°C): Not applicable	**Water Solubility:** Slight
Initial boiling point and boiling range (°C): Not applicable	**Partition coefficient: n-octane/water:** Not determined
Flash point (°C): Not determined	**Auto ignition temperature (°C):** Not applicable
Evaporation rate: Not applicable	**Decomposition temperature (°C):** Not determined
Flammability (solid, gas): Not combustible	**Viscosity:** Not applicable

[1] The use of urea or aqueous ammonia injected into the flue gas to reduce nitrogen oxides (NOx) emissions may result in the presence of ammonium sulfate or ammonium bisulfate in the ash at less than 0.1%. When ash containing these substances becomes wet under high pH (>9), free ammonia gas may be released resulting in objectionable/nuisance ammonia odor and potential exposure to ammonia gas especially in confined spaces.

Section 10
Stability and Reactivity

10.1 Reactivity:	The material is an inert, inorganic material primarily composed of elemental oxides.
10.2 Chemical stability:	The material is stable under normal use conditions.
10.3 Possibility of hazardous reactions:	The material is a relatively stable, inert material; however, when ash containing ammonia becomes wet under high pH (>9), free ammonia gas may be released resulting in an objectionable/nuisance ammonia odor and potential exposure to ammonia gas especially in confined spaces. Polymerization will not occur.
10.4 Conditions to avoid:	Product can become airborne in moderate winds. Dry material should be stored in silos. Materials stored out of doors should be covered or maintained in a damp condition.
10.5 Incompatible materials:	None known.
10. 6 Hazardous decomposition products:	None known.

Section 11
Toxicological Information

11.1 Information on Toxicological Effects

Endpoint	Data
Acute oral toxicity	LD50 > 2000 mg/kg
Acute dermal toxicity	LD50 > 2000 mg/kg
Acute inhalation toxicity	LD50 > 5.0 mg/L
Skin corrosion/irritation	Does not meet the classification criteria but may cause slight skin irritation. Product dust can dry the skin which can result in irritation.
Eye damage/irritation	Causes serious eye irritation. Positive scores for conjunctiva irritation and chemosis in 2/3 animals based on average of 24, 48 and 72-hour scores with irritation clearing within 21 days; no corneal or iritis effects observed.
Respiratory/skin sensitization	Not a respiratory or dermal sensitizer.
Germ cell mutagenicity	Not mutagenic in in-vitro and in-vivo assays with or without metabolic activation.
Carcinogenicity	Not available. Respirable crystalline silica has been identified as a carcinogen by OSHA, NTP, ACGIH and IARC.
Reproductive toxicity	No developmental toxicity was observed in available animal studies. Reproductive studies on CCPs showed either no reproductive effects, or some effects on male and female reproductive organs and parameters but without a clear dose response.
STOT-SE	CCPs when present as a nuisance dust may result in respiratory irritation.
STOT-RE	In a 180-day inhalation study with fly ash dust, no effects were observed at the highest dose tested. NOEC = 4.2 mg/m^3; it is not possible to assess the level at which toxicologically significant effects may occur. Repeated inhalation exposures to high levels of respirable crystalline silica may result in lung damage (i.e., silicosis).
Aspiration Hazard	Not applicable based product form.

Section 12
Ecological Information

12.1 Toxicity

Fly Ash (CAS# 68131-74-8)	
Toxicity to Fish	LC50 > 100 mg/L
Toxicity to Aquatic Invertebrates	Data indicates that the test substance is not toxic to *Daphnia magna* (EC50 undetermined)
Toxicity to Aquatic Algae and Plants	EC50 = 10 mg/L
Calcium oxide CAS# 1305-78-8	
Toxicity to Fish	LC50 = 50.6 mg/L The findings were closely related to the pH of the test solutions; therefore, pH is considered to be the main reason for the effects.
Toxicity to Aquatic Invertebrates	EC50 = 49.1 mg/L The findings were closely related to the pH of the test solutions; therefore, pH is considered to be the main reason for the effects.
Toxicity to Aquatic Algae and Plants	NOEC =48 mg/L @ 72 hours based on $Ca(OH)_2$ The initial pH of the test medium was not directly related to the biologically relevant effects. The formation of precipitates is likely the result of the reaction between CO_2 dissolved in the medium.

12.2 Persistence and Degradability

Not relevant for inorganic materials.

12.3 Bioaccumulative Potential

This material does not contain any compounds that would bioaccumulate up the food chain.

12.4 Mobility in Soil

No data available.

12.5 Results of PBT and vPvB Assessment

This material does not contain any compounds classified as “persistent, bioaccumulative or toxic” nor as “very persistent/very bioaccumulative”.

12.6 Other Adverse Effects

None known.

Section 13
Disposal Considerations

See Sections 7 and 8 above for safe handling and use, including appropriate industrial hygiene practices.

Dispose of all waste product and containers in accordance with federal, state and local regulations.

Section 14
Transport Information

Regulatory entity: U.S. DOT	Shipping Name:	Not Regulated
	Hazard Class:	Not Regulated
	ID Number:	Not Regulated
	Packing Group:	Not Regulated

Section 15
Regulatory Information

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Mixture

- TSCA Inventory Status

  All components are listed on the TSCA Inventory.

- California Proposition 65

  The following substances are known to the State of California to be carcinogens and/or reproductive toxicants:

  - Respirable crystalline silica
  - Titanium dioxide

- State Right-to-Know (RTK)

Component	CAS	MA[1,2]	NJ[3,4]	PA[5]	RI[6]
Ammonium bisulfate	7803-63-6	No	Yes	No	No
Ammonium sulfate	7783-20-2	Yes	No	Yes	No
Calcium oxide	1305-78-8	Yes	Yes	Yes	No
Iron oxide	1309-37-1	Yes	Yes	Yes	No
Magnesium oxide	1309-48-4	No	Yes	No	No
Phosphorus pentoxide (or phosphorus oxide)	1314-56-3	Yes	Yes	Yes	No
Potassium oxide	12136-45-7	No	Yes	No	No
Silica-crystalline (SiO_2), quartz	14808-60-7	Yes	Yes	Yes	No
Sodium oxide	1313-59-3	No	Yes	No	No
Titanium dioxide	13463-67-7	Yes	Yes	Yes	Yes

[1] Massachusetts Department of Public Health, no date
[2] 189th General Court of The Commonwealth of Massachusetts, no date
[3] New Jersey Department of Health and Senior Services, 2010a
[4] New Jersey Department of Health, 2010b
[5] Pennsylvania Code, 1986
[6] Rhode Island Department of Labor and Training, no date

Section 16
Other Information, Including Date of Preparation or Last Revision

16.1 Indication of Changes

Date of preparation or last revision: February 23, 2018

16.2 Abbreviations and Acronyms

- ACGIH: American Conference of Industrial Hygienists
- CA: California
- CAS: Chemical Abstract Services
- CCP: Coal Combustion Product
- CFR: Code of Federal Regulations
- EPA: Environmental Protection Agency
- GHS: Globally Harmonized System of Classification and Labelling
- IARC: International Agency for Research on Cancer
- LC50: Concentration resulting in the mortality of 50 % of an animal population
- LD50: Dose resulting in the mortality of 50 % of an animal population
- MA: Massachusetts
- NA: Not Applicable
- NJ: New Jersey
- NOEC: No observed effect concentration
- NIOSH: National Institute of Occupational Safety and Health
- NOx: Nitrogen oxides
- NTP: US National Toxicology Program
- OEL: Occupational Exposure Limit
- OSHA: Occupational Safety and Health Administration
- PA: Pennsylvania
- PBT: Persistent, Toxic and Bioaccumulative
- PEL: Permissible exposure limit
- PPE: Personal Protective Equipment
- REL: Recommended exposure limit
- RI: Rhode Island
- RCS: Respirable Crystalline Silica
- RTK: Right-to-Know
- SCBA: Self-contained breathing apparatus
- SDS: Safety Data Sheet
- STEL: Short-term exposure limit
- STOT-RE: Specific target organ toxicity-repeated exposure
- STOT-SE: Specific target organ toxicity-single exposure
- TLV: Threshold limit value
- TSCA: Toxic Substances Control Act
- TWA: Time-weighted average
- UEL: Upper explosive limit
- UVCB: Unknown or Variable Composition/Biological
- U.S.: United States
- U.S. DOT: United States of Department of Transportation

16.3 Other Hazards

Hazardous Materials Identification System (HMIS) Degree of hazard (0= low, 4 = extreme)							
Health:	2*	**Flammability:**	0	**Physical Hazards:**	0	**Personal protection:****	

** Chronic Health Effects*
****** *Appropriate personal protection is defined by the activity to be performed.*
See Section 8 for additional information.

DISCLAIMER:

This SDS has been prepared in accordance with the Hazard Communication Rule 29 CFR 1910.1200. Information herein is based on data considered to be accurate as of date prepared. No warranty or representation, express or implied, is made as to the accuracy or completeness of this data and safety information. No responsibility can be assumed for any damage or injury resulting from abnormal use, failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

WSP GOLDER

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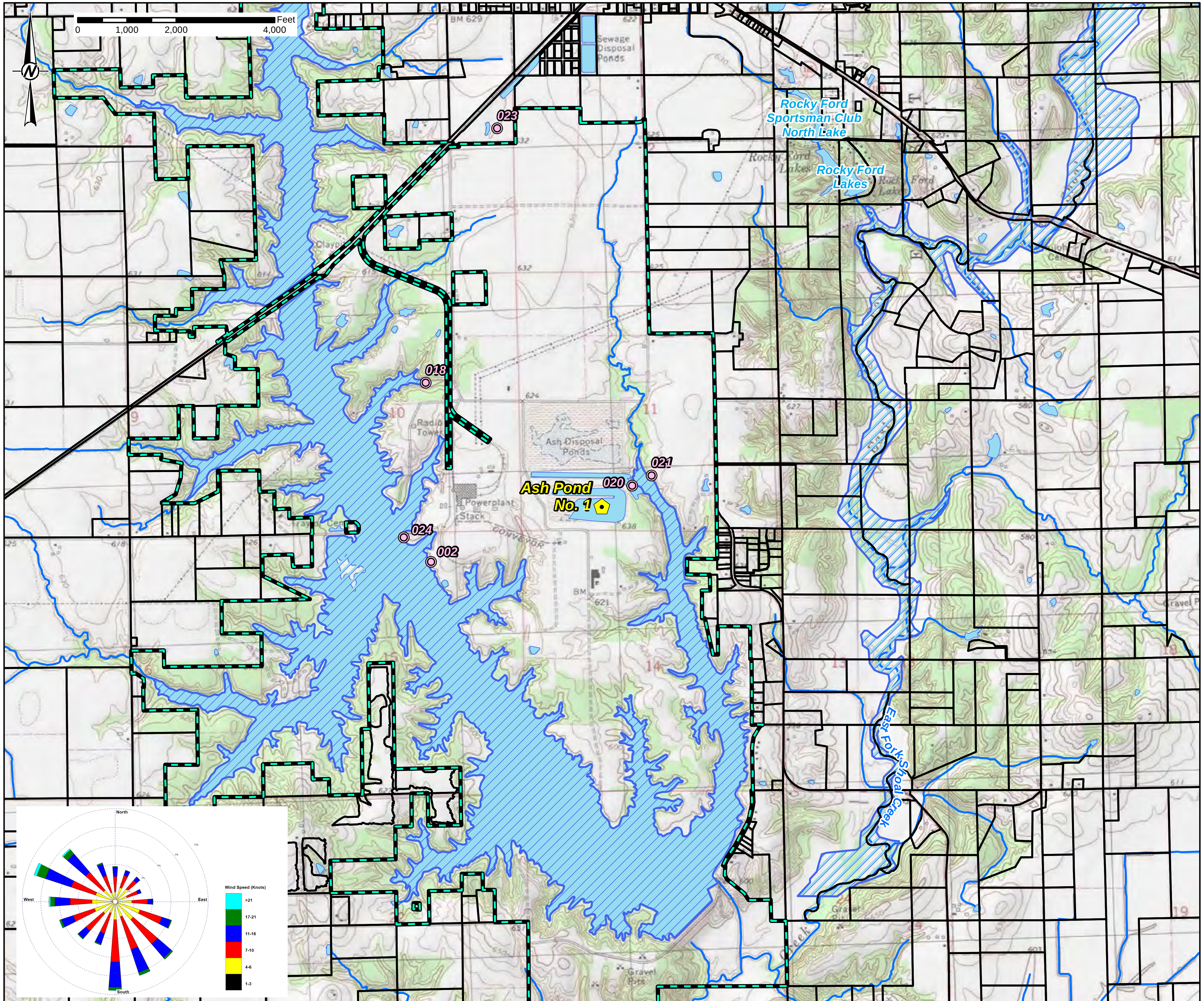
APPENDIX C

Map Package



LEGEND

- SITE LOCATION
- NPDES OUTFALL (PERMIT ILL0000108)
- SURFACE WATER - LINEAR FEATURE
- SURFACE WATER BODY
- FEMA 100-YEAR FLOODPLAIN (ZONE A)
- IPRG BOUNDARY
- NEIGHBORING PROPERTY BOUNDARIES

NOTES

1. A SEARCH OF THE ILLINOIS NATURAL AREAS INVENTORY (INAI) AND ILLINOIS NATURE PRESERVES COMMISSION (INPC) PROTECTED LANDS RETURNED NO PROTECTED AREAS WITHIN THE EXTENT OF THIS MAP.
2. THE IDNR NATURAL HERITAGE DATABASE THREATENED AND ENDANGERED SPECIES BY COUNTY LISTS 4 STATE THREATENED AND 7 STATE ENDANGERED SPECIES IN MONTGORMERY COUNTY, BUT NO SPATIAL DATA IS AVAILABLE. THE CLOSEST CRITICAL HABITAT PROTECTED BY THE NATIONAL ENDANGERED SPECIES ACT IS THAT OF THE INDIANA BAT, OVER 75 MILES SOUTHWEST OF THE SITE.
3. ACCORDING TO THE NATIONAL REGISTER OF HISTORIC PLACES, THERE ARE NO HISTORIC FEATURES WITHIN THE EXTENT OF THIS MAP.

REFERENCES

1. TOPOGRAPHIC BASEMAP: UNITED STATES GEOLOGICAL SURVEY 7.5-MINUTE TOPOGRAPHIC QUADRANGLES SHOWN: "COFFEEN, IL" AND "FILLMORE, IL".
2. FLOODPLAIN DATA: FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA). DIGITIZED FROM PANEL 1709920009A, EFFECTIVE ON JANUARY 9, 1981.
3. SURFACE WATER FEATURES: NATIONAL HYDROGRAPHY DATASET (NHD), USGS.
4. PREVAILING WIND DIRECTION GRAPHIC: ILLINOIS STATE CLIMATOLOGIST OFFICE. 1961-1990 ANNUAL AVERAGE WIND SPEEDS AND DIRECTIONS, AS MEASURED AT STATION #13994 - ST LOUIS/LAMBERT INT'L ARPT, MO.
5. NPDES PERMIT LOCATION: ILLINOIS ENVIRONMENTAL PROTECTION AGENCY.
6. PROPERTY BOUNDARIES: MONTGOMERY COUNTY GIS, JULY 2022.

CLIENT
ILLINOIS POWER GENERATING COMPANY

PROJECT
COFFEEN POWER PLANT
ASH POND NO. 1

TITLE
SITE LOCATION MAP

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-07-28
DESIGNED	MWD
PREPARED	KJC
REVIEWED	MWD
APPROVED	JJS

PROJECT NO. 21465046
FIGURE 1

LEGEND

- WELL
- NPDES OUTFALL (PERMIT ILL0000108)
- APPROXIMATE AREA OUTFALL PIPE
- ROUTE BETWEEN AP1 AND ON-SITE BORROW AREA
- TOPOGRAPHY/BATHYMETRY (2-FT CONTOUR INTERVAL)
- ASH POND NO. 1

REFERENCES

1. AERIAL IMAGERY WITHIN PROJECT AREA: INGENAE, DECEMBER 2020.
2. AERIAL IMAGERY IN SURROUNDING AREAS: ESRI, VIVID, MAXAR.
3. WELLS, OUTFALLS, AND TOPOGRAPHY: INGENAE, DECEMBER 2020.
4. NPDES OUTFALL LOCATIONS: ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, 2021.

CLIENT
ILLINOIS POWER GENERATING COMPANY

PROJECT
COFFEEN POWER PLANT
ASH POND NO. 1

TITLE
SITE PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-07-28
DESIGNED	MWD
PREPARED	KJC
REVIEWED	MWD
APPROVED	JJS

PROJECT NO. 21465046

FIGURE 2

APPENDIX D

Hydrogeologic Site Characterization

Intended for
Illinois Power Generating Company

Date
October 25, 2021

Project No.
1940100806-002

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL Bright ideas. Sustainable change.

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT COFFEEN POWER PLANT ASH POND NO. 1

Project Name	**Coffeen Power Plant Ash Pond No. 1**
Project No.	**1940100806-002**
Recipient	**Illinois Power Generating Company**
Document Type	**Hydrogeologic Site Characterization Report**
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TABLES (IN TEXT)

TABLES (ATTACHED)

FIGURES (IN TEXT)

FIGURES (ATTACHED)

APPENDICES

ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
§	Section
35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
AP1	Ash Pond No. 1
AP2	Ash Pond No. 2
bgs	below ground surface
CCR	coal combustion residuals
CCR Rule	40 C.F.R. § 257 Subpart D
cm/s	centimeters per second
CPP	Coffeen Power Plant
DA	deep aquifer
DCU	deep confining unit
ESRI	Environmental Systems Research Institute, Inc.
FEMA	Federal Emergency Management Agency
ft/day	feet per day
ft/ft	feet per foot
g	horizontal acceleration
GMF GSP	Gypsum Management Facility Gypsum Stack Pond
GMF RP	Gypsum Management Facility Recycle Pond
GMP	Groundwater Monitoring Plan
GMZ	Groundwater Management Zone
GWPS	Groundwater Protection Standard
Hanson	Hanson Professional Services, Inc.
HCR	Hydrogeologic Site Characterization Report
HDPE	high-density polyethylene
HELP	Hydrologic Evaluation of Landfill Performance
HUC	Hydrologic Unit Code
ID	identification
IDNR	Illinois Department of Nature Resources
IEPA	Illinois Environmental Protection Agency
ILWATER	Illinois Water and Related Wells
IPGC	Illinois Power Generating Company
ISAS	Illinois State Archaeological Survey
ISGS	Illinois State Geological Survey
LCU	lower confining unit
LF	Landfill
mg/L	milligrams per liter
msl	above mean sea level
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NID	National Inventory of Dams

NPDES	National Pollutant Discharge Elimination System
No.	number
NRT	Natural Resource Technology, Inc.
NRT/OBG	NRT, an OBG Company
Part 845	Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: 35 I.A.C. § 845
pcf	pounds per cubic foot
pCi/L	picoCuries per liter
PMP	potential migration pathways
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	Surface Impoundments
Site	Area near AP1
SSURGO	Soil Survey Geographic Database
SU	Standard Units
TDS	total dissolved solids
UCU	upper confining unit
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

EXECUTIVE SUMMARY

This Hydrogeologic Site Characterization Report (HCR) for the Coffeen Ash Pond Number (No.) 1 (AP1) expands upon the hydrogeology and groundwater quality data presented in previous hydrogeologic investigation reports prepared for the Coffeen Power Plant (CPP) (Natural Resource Technology [NRT], 2017; Hanson Professional Services, Inc. [Hanson], 2009; Hanson, 2016). This report has been assembled to satisfy the information and analysis requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845.620 as summarized in **Table ES-1**. The conceptual site model includes hydrogeologic and groundwater quality data specific to AP1, which has been collected from 2015 to 2021. AP1 is part of the CPP, which is two miles south of the city of Coffeen, Illinois and about eight miles southeast of the city of Hillsboro, Illinois.

The CPP operated as a coal-fired power plant from 1964 until November 2019 and has five coal combustion residuals (CCR) management units. The CCR unit that is the subject of this report is AP1 (Vistra Identification [ID] No. 101, Illinois Environmental Protection Agency [IEPA] ID No. W1350150004-01, and National Inventory of Dams [NID] No. IL50722). Coffeen AP1 is a 23-acre, unlined surface impoundment (SI) used to manage CCR and non-CCR waste streams at the CPP. Its total storage capacity is approximately 300 acre-feet.

CPP is located between the two lobes of Coffeen Lake (**Figure 1-1**), which was formed in 1963 by damming the McDavid Branch of the East Fork of Shoal Creek. Coffeen Lake encompasses approximately 1,100 acres and was created to provide a source of cooling water for the CPP. Coffeen Lake borders the CPP to the west, east, and south, and agricultural land is located to the north. Historically coal mines were operated at depth below the site. Mine shafts, processing facilities and historic coal storage was located south of AP1.

Unlithified material present above the bedrock in the vicinity of the CPP was categorized into hydrostratigraphic units for this HCR. In addition to the CCR, the hydrostratigraphic units occur in the following order (from surface downward) and include:

- **Upper Confining Unit (UCU):** Composed of the Roxana and Peoria Silts (Loess Unit) and the upper clayey portion of the Hagarstown member which are classified as silts to clayey silts and gravelly clay below the surficial soil. The UCU has been eroded east of AP1, near the Unnamed Tributary.
- **Uppermost Aquifer:** The uppermost aquifer is the Hagarstown Member which is classified as primarily sandy to gravelly silts and clays with thin beds of sands. Similar to the Loess Unit, the Hagarstown is absent in some locations near the Unnamed Tributary.
- **Lower Confining Unit (LCU):** Comprised of the Vandalia Member, Mulberry Grove Member, and Smithboro Member. These units include a sandy to silty till with thin, discontinuous sand lenses, a discontinuous and limited extent sandy silt which has infilled prior erosional features, and silty to clayey diamicton, respectively.
- **Deep Aquifer (DA):** Sand and sandy silt/clay units of the Yarmouth Soil, which include accretionary deposits of fine sediment and organic materials, typically less than five feet thick and discontinuous across the CPP.
- **Deep Confining Unit (DCU):** Comprised of the Banner Formation - generally clays, silts, and sands. The Lierle Clay Member is the upper layer of the Banner Formation which was encountered at the CPP.

Bedrock of the Bond Formation which consists of limestone and calcareous clays and shale, was not encountered in the borings advanced at the CPP.

Flow of groundwater from central portions of the CPP to Coffeen Lake or the Unnamed Tributary through the uppermost aquifer are the primary pathways for contaminant migration. Groundwater elevations are primarily controlled by surface topography, geologic unit topography, and water levels within Coffeen Lake and the Unnamed Tributary. A groundwater divide trending north-south is observed running through the approximate center of the CPP. Phreatic surfaces or water elevations within the SIs are generally consistent and have not been observed to fluctuate with groundwater elevations, indicating limited hydraulic connection with the SIs.

35 I.A.C. § 845 parameters were monitored in the uppermost aquifer monitoring wells at AP1 as part of the Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 and IEPA groundwater monitoring programs from 2015 to 2021. These data were supplemented with installation and sampling of additional wells installed in 2021. The results indicate the following parameters were detected at concentrations/measurements greater than (or less than for pH) the applicable 35 I.A.C. § 845.600 groundwater protection standards (GWPSs) and are considered potential exceedances:

- Arsenic in downgradient uppermost aquifer wells G302, G303, and G304/G307. Arsenic was also detected in upgradient uppermost aquifer well G306.
- Boron in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G311, and G313. Boron was also detected in upgradient uppermost aquifer well G306.
- Cadmium in downgradient uppermost aquifer well G304/G307.
- Chromium in downgradient uppermost aquifer well G304/G307.
- Cobalt in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, and G305; and in downgradient LCU well G314. Cobalt was also detected in upgradient uppermost aquifer well G306.
- Lead in downgradient uppermost aquifer wells G301, G302, G303, G304/G307 and G305; and in downgradient LCU well G316. Lead was also detected in upgradient uppermost aquifer well G306.
- Lithium in downgradient uppermost aquifer wells G303 and G304/G307.
- pH (lower limit) in downgradient uppermost aquifer wells G301 and G312.
- Radium 226 and 228 combined in downgradient LCU well G316.
- Sulfate in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G309, G310, G311, G312, G313, G315, and G317; in downgradient LCU wells G307D, G314, and G316; and in downgradient DA well G314D. Sulfate was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well G306.
- Total dissolved solids (TDS) in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G309, G310, G311, G312, G313, G315, and G317; in downgradient LCU wells G307D, G314, and G316; and in downgradient DA well G314D. Sulfate was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well G306.

Groundwater monitoring results were compared to the applicable 35 I.A.C. § 845.600 GWPSs to determine potential exceedances. Potential exceedances include results reported during the background groundwater monitoring or prior period that are greater than the GWPS. The results are considered potential exceedances because the results were compared directly to the standard and did not include an evaluation of background groundwater quality or utilize the statistical methodologies proposed in the groundwater monitoring plan (GMP) provided in the Operating Permit application. Exceedances will be determined following IEPA approval of the GMP.

TABLE ES-1. PART 845 REQUIREMENTS CHECKLIST
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Part 845 Reference	Individual Part 845 Components Reviewed for Completeness	Location of Information in HCR
845.620(b)	**The hydrogeologic site characterization shall include but not be limited to the following:**	
845.620(b)(1)	Geologic well logs/boring logs;	Table 3-1 Figure 3-1 Appendix C
845.620(b)(2)	Climatic aspects of the site, including seasonal and temporal fluctuations in groundwater flow;	Sections 3.2.4 & 3.3.1 Table 3-3 Figures 3-2 through 3-5
845.620(b)(3)	Identification of nearby surface water bodies and drinking water intakes;	Sections 3.3.2 & 5.2 Appendix B
845.620(b)(4)	Identification of nearby pumping wells and associated uses of the groundwater;	Section 5.1 Appendix B
845.620(b)(5)	Identification of nearby dedicated nature preserves;	Section 5.3 Appendix B
845.620(b)(6)	Geologic setting;	Sections 2.4 & 2.5 Figures 2-2 through 2-4
845.620(b)(7)	Structural characteristics;	Section 2.4.3 Figure 2-5
845.620(b)(8)	Geologic cross-sections;	Figure 2-7
845.620(b)(9)	Soil characteristics;	Section 2.3 Figure 2-2 Tables 2-1 & 2-4
845.620(b)(10)	Identification of confining layers;	Sections 3.2.1

TABLE ES-1. PART 845 REQUIREMENTS CHECKLIST
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Part 845 Reference	**Individual Part 845 Components Reviewed for Completeness**	**Location of Information in HCR**
845.620(b)(11)	Identification of potential migration pathways;	Section 3.2.1 & 3.2.3
845.620(b)(12)	Groundwater quality data;	Section 4.2 Table 4-1
845.620(b)(13)	Vertical and horizontal extent of the geologic layers to a minimum depth of 100 feet below land surface, including lithology and stratigraphy;	Section 2.8 Figures 2-7 & 2-8 Appendix C
845.620(b)(14)	A map displaying any known underground mines beneath a CCR surface impoundment;	Section 2.7 Appendix B
845.620(b)(15)	Chemical and physical properties of the geologic layers to a minimum depth of 100 feet below land surface;	Section 2.8 Tables 2-1, 2-2, & 2-4 Appendices D & F
845.620(b)(16)	Hydraulic characteristics of the geologic layers identified as migration pathways and geologic layers that limit migration, including:	Sections 3.2.4.1, 3.2.5, & 3.2.6 Tables 3-2 to 3-4 Appendices D & F
845.620(b)(16)(A)	water table depth;	Section 3.2.4 Figures 3-3 & 3-4 Appendix E
845.620(b)(16)(B)	hydraulic conductivities;	Sections 3.2.5 Tables 2-1 & 3-3 Appendices D & F
845.620(b)(16)(C)	effective and total porosities;	Section 2.5.1 Table 2-1

TABLE ES-1. PART 845 REQUIREMENTS CHECKLIST
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Part 845 Reference	Individual Part 845 Components Reviewed for Completeness	Location of Information in HCR
845.620(b)(16)(D)	direction and velocity of groundwater flow; and	Section 3.2.4 to 3.2.6 Tables 3-2 & 3-4 Figures 3-3 & 3-4
845.620(b)(16)(E)	map of the potentiometric surface;	Figures 3-3 & 3-4
845.620(b)(17)	Groundwater classification pursuant to 35 I.A.C. § 620; and	Section 3.2.7

[O: LDC 06/15/21, U: LDC 08/19/21; C: EJT 08/19/21; U:KLT 8/24/21, C: LDC 09/17/21]

Notes:
-- = reference to main regulation
35 I.A.C. § 620 = Title 35 of the Illinois Administrative Code, Part 620
HCR = Hydrogeologic Site Characterization Report

1. INTRODUCTION

1.1 Overview

In accordance with requirements of the Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: 35 I.A.C. § 845 (Part 845) (IEPA, 2021), Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this HCR on behalf of CPP (**Figure 1-1**), operated by Illinois Power Generating Company (IPGC). This report will apply specifically to the CCR Unit referred to as AP1. However, information gathered to evaluate other CCR units on site regarding geology, hydrogeology, and groundwater quality is included, where appropriate. AP1 is an unlined impoundment that covers an area of approximately 23 acres, has berms up to 41 feet above the surrounding land surface, and a volume of 300 acre-feet. This HCR includes Part 845 content requirements specific to 35 I.A.C. § 845.620(b) (Hydrogeologic Site Characterization) for AP1 at CPP.

1.2 Part 845 Description

Under Part 845 (IEPA, April 15, 2021), the IEPA has developed a rule of general applicability for CCR SIs at power generating facilities. Part 845 contains comprehensive rules for the design, construction, operation, corrective action, closure, and post closure care of SIs containing CCR. CCR is commonly referred to as coal ash, and CCR SIs are commonly referred to as coal ash ponds. This rule includes GWPSs applicable to each CCR SI at the waste boundary and requires each owner or operator to monitor groundwater. IEPA's rule includes a permitting program as well as all federal standards for CCR SIs promulgated by the United States Environmental Protection Agency (USEPA). In addition, the rules include procedures for public participation, closure alternatives analyses, and closure prioritization, and provides access to records via public website. The rules also include financial assurance requirements for CCR SIs.

1.3 Previous Investigations and Reports

Numerous hydrogeologic investigations have been performed concerning the CCR Units located at the CPP. The information presented in this HCR includes data collected in support of the monitoring well network established for development of the GMP and supplements comprehensive data collection and evaluations from prior hydrogeologic investigation reports (recent to oldest), including, but not limited to, the following:

- ***NRT, January 24, 2017. Hydrogeologic Site Characterization Report, Ash Pond 2, Coffeen Power Station, Coffeen, Illinois.***
  Summarizes the results of numerous hydrogeologic investigations that have been performed at the Site, including recent data collected to comply with 40 C.F.R. § 257 Subpart D (CCR Rule) as well as comprehensive data collection and evaluations from prior hydrogeologic investigation reports.
- ***NRT, January 24, 2017. Groundwater Management Zone Application, Coffeen Ash Pond No. 2, Coffeen Power Station, Coffeen, Illinois.***
  Establishes a three-dimensional Groundwater Management Zone (GMZ) containing groundwater being managed to mitigate a potential release of CCR constituents from Ash Pond No. 2 (AP2).
- ***NRT, January 24, 2017. Groundwater Monitoring Plan. Coffeen Power Station, Coffeen, Illinois.***

The plan describes the groundwater monitoring and reporting to be completed in support of the Closure Plan for AP2.

- ***NRT, January 24, 2017. Hydrostatic Modeling Report. Coffeen Power Station, Coffeen, Illinois.***
  Utilized the Hydrologic Evaluation of Landfill Performance (HELP) model to predict percolation from AP2 and to evaluate AP2 hydrostatic conditions in response to the proposed cover system as described in the Revised 30% Closure Design Package.
- ***NRT, January 24, 2017. Groundwater Modeling Report. Coffeen Power Station, Coffeen, Illinois.***
  Included simulations of the site hydrology, the extent of CCR leachate impacts on groundwater and the effect of pond closure on groundwater quality.
- ***Hanson, April 16, 2016. Corrective Action Plan.***
  A plan to remediate groundwater exceedances around AP2 and other units. Proposed plan includes reduction in leachate within AP2, enhanced cover system on AP2, and a GMZ.
- ***AECOM, April 2016. Revised 30% Closure Design Package for Coffeen Power Station Ash Pond No. 2.***
  A 30% design package for closure of AP2 including the design basis and summary in addition to preliminary construction costs and schedule.
- ***Hanson, April 2016. Uppermost Aquifer Considerations.***
  A discussion of the construction of the gypsum pond and relation to the uppermost aquifer in the vicinity of the site.
- ***Hanson, 2015. G153 Assessment.***
  Evaluation of manganese, sulfate, and TDS concentrations that were identified at concentrations greater than Class I Groundwater Standards at well G153, which concluded that elevated concentrations were also found upgradient of the Storm Water Runoff Pond and intrawell standards should be utilized.
- ***Hanson, July 2011. Hydrogeologic Report.***
  Supports permit applications for the Gypsum Management Facility Gypsum Stack Pond (GMF GSP) and Gypsum Management Facility Recycle Pond (GMF RP).

In conjunction with this report, a GMP is being prepared for AP1.

1.4 Site Location and Background

The CPP is located in Montgomery County, in central Illinois, within Section 11 Township 7 North and Range 7 East. The CPP is approximately two miles south of the city of Coffeen and about eight miles southeast of the city of Hillsboro, Illinois (**Figure 1-1**). AP1 is located between the two lobes of Coffeen Lake (identified as "Coffeen Lake" and "Unnamed Tributary" on **Figures 1-1 and 1-2**) to the west, east, and south, and is bordered by agricultural land to the north. The approximately 1,100-acre Coffeen Lake was built by damming the McDavid Branch of the East Fork of Shoal Creek in 1963 for use as an artificial cooling lake for the CPP. Historically, several coal mines were operated at depth in the vicinity of the CPP as well as a US Minerals processing facility located to the north. **Figure 1-2** is a site map showing the location of AP1 (Part 845 regulated CCR Unit and subject of this HCR), AP2, GMF RP, GMF GSP, and Landfill (LF). The area near AP1 will hereinafter be referred to as the Site.

1.5 Site History and CCR Units

The CPP was a coal-fired electrical generating plant that began operation in 1964. The plant initially burned bituminous coal from Illinois and CCR from the coal fired units was disposed of in AP1. AP2 was also utilized in the early 1970's and AP1 was reconstructed in 1978. Both of these units were used until the mid-1980's, beginning in 2010 CCR material was placed in the LF and GMF Units.

Ash Pond No. 1 (AP1): This SI (also known as the Bottom Ash/ Recycle Pond) is a reclaimed ash pond that was reconstructed utilizing the existing earthen berms with reinforcement, as provided by Water Pollution Control Permit 1978-EA-389 issued by the Agency on May 26, 1978. AP1 (existing unlined SI) covers an area of approximately 23 acres, has berms up to 41 feet above the surrounding land surface, and a volume of 300 acre-feet. It primarily received bottom ash and low volume wastes from floor drains in the main power block building. Several years ago, air heater wash and boiler chemical cleaning wastes were directed to AP1, but this practice was discontinued. The bottom ash was periodically removed for beneficial uses by a third-party contractor. Sluicing of waste to AP1 ceased prior to November 4, 2019.

Ash Pond No. 2 (AP2): AP2 is a closed (IEPA approved) SI with a surface area of approximately 60 acres and berms 47 feet higher than the surrounding land surface. AP2 was originally removed from service and capped in the mid 1980's. A clay and soil cap was placed on the surface of the pond with contouring and drainage provided to direct storm water to four engineered revetment down drain structures. Prior to capping, this pond was identified as Outfall 004 in the facility National Pollutant Discharge Elimination System (NPDES) operating permit, IL0000108. Additional closure activities include the construction of a geomembrane cover system that began in July 2019 and was completed on November 17, 2020. The construction was completed in accordance with the Closure and Post Closure Care Plan approved by the IEPA on January 30, 2018.

GMF Gypsum Stack Pond (GMF GSP): The 77-acre GMF GSP received blowdown from the air emission scrubbers and was put into operation in 2010. Construction of the GMF GSP was in accordance with Water Pollution Control Permit 2008-EA-4661 and features a composite 60-mil high-density polyethylene (HDPE) liner with 3 feet of recompacted soil with a hydraulic conductivity of 1×10^{-7} centimeters per second (cm/s) with internal piping and drains to collect contact water. Construction of the unit required excavation to approximately 603 feet and installation of a groundwater underdrain system to eliminate inward pressure on the liner prior to placement of CCR. The GMF GSP underdrain was actively pumped during construction but is no longer actively pumped. IPGC ceased receipt of waste to the GMF GSP prior to April 11, 2021.

GMF Recycle Pond (GMF RP): The 17-acre GMF RP received blowdown from the air emission scrubbers and was put into operation in 2010. Construction of the GMF RP was in accordance with Water Pollution Control Permit 2008-EA-4661 and features a composite 60-mil HDPE liner with 3 feet of recompacted soil with a hydraulic conductivity of 1×10^{-7} cm/s with internal piping and drains to collect contact water. Construction of the unit required excavation to approximately 601 feet and installation of a groundwater underdrain system to eliminate inward pressure on the liner prior to placement of CCR. The GMF RP underdrain is a passive, gravity drained system. IPGC ceased receipt of waste to the GMF RP prior to April 11, 2021.

Landfill (LF): Fly ash was managed in a permitted composite lined landfill constructed in 2010. The LF has an active groundwater underdrain system that is currently being pumped.

Additionally, the ash landfill leachate collection system is restricted by rule to no more than one foot of leachate on the composite liner. An IEPA groundwater monitoring program is in effect for the GMF (under Bureau of Water) and Ash Landfill (under Bureau of Land).

The approximate dates of construction of each successive stage of the CCR Units at the CPP are summarized in **Table A** below (AECOM, 2016).

Table A. History of Construction

Date	Event
1964	Construction of AP1 (formerly identified as the Bottom Ash Recycle Pond)
1971	Construction of AP2
1978-1979	Installation of internal embankment and new recycle intake structure in AP1 and abandonment of existing outfall structure
1984-1985	Closure of AP2 by installing a clay cover
2000	Installation of a sheet pile wall to facilitate construction of drainage flume along the northeast corner of AP1
2006	Bottom ash system modified in AP1
2008-2010	Construction of the GMF GSP and the GMF RP
2009	Installation of well dewatering system in AP2
2015	Notice of intent to close AP2
2015	Closure plans for AP1, AP2, GMF GSP, GMF RP, and LF submitted to IEPA
2018	IEPA approved Closure and Post-Closure Care Plan for AP2
2020	Completion of closure of AP2 with geomembrane cover system

2. REGIONAL AND LOCAL GEOLOGY

2.1 Topography

The CPP and embankments surrounding AP1 are located at an elevation of approximately 636 feet North American Vertical Datum of 1988 (NAVD88) with the surrounding areas having low topographic relief, generally at an elevation of around 615 to 620 feet NAVD88 (**Figure 2-1**). East and south of AP1, towards the Unnamed Tributary and Coffeen Lake, the elevation decreases to less than 590 feet NAVD88.

Topographic maps drawn prior to construction (1947) indicate the areas of the CPP were generally from 600 to 640 feet above mean sea level (msl), with elevations at AP1 generally from 600 to 620 feet msl (**Appendix A**). A minor drainage feature was present in the northeast corner of AP1 with an approximate base from 595 to 600 feet msl, although the extent appears to be limited.

2.2 Regional Geomorphology

The CPP is located in the central portion of the Springfield Plain of the Till Plains section, the largest physiographic division in Illinois, covering approximately four-fifths of the state. It is characterized by level to undulatory till plains with a few morainic ridges in a late youthful stage of erosion. The Springfield Plain includes the level to gently undulating portion of the Illinoian drift-sheet in central and south-central Illinois (Leighton et al., 1948; Zuehls et al., 1984). Distinguishing features include flatness and shallow drainage features. Moraines in this region are low and broad. Drainage systems are well developed, and the valleys tend to be shallow, broadly alluviated, and terraced (Leighton et al., 1948). Streams in the western portion of the Springfield Plain primarily flow westward, ultimately into the Mississippi River, while streams in the eastern portion flow eastward ultimately into the Wabash River.

2.3 Soils

Surficial soils at the CPP and vicinity are shown on **Figure 2-2** and based on Montgomery County soil survey data available in the Soil Survey Geographic Database (SSURGO) by the United States Department of Agriculture's Natural Resources Conservation Service provided by Environmental Systems Research Institute, Inc.'s (ESRI's) web hosted layer. Former soils underlying the CPP, not including the Fill and CCR within the limits of AP1 are identified as: Orthents (loamy, undulating) along the boundary, and in the immediate vicinity, of AP1; Ava silt loam (2 to 5 percent slopes), Bunkham silty clay loam (5 to 10 percent slopes, severely eroded), and Hickory silt loam (18 to 35 percent slopes) to the southeast between the unit and the Unnamed Tributary; and Cowden-Piasa silt loams, 0 to 2 percent slopes) near background monitoring well G281.

2.4 Regional Geology

2.4.1 Unlithified Deposits

Pleistocene deposits of unlithified glacial diamictons, lacustrine/alluvial deposits, and windblown loess overlie Pennsylvanian-age bedrock throughout central Illinois. The most extensive glacial deposits are those from the Illinoian Stage which cover much of the state and are present at the CPP. Windblown (aeolian) deposits, the Peoria and Roxana Silts, cover the glacial deposits over a majority of the state. These units are fine-grained deposits blown from river valleys by prevailing winds (Hansel and Johnson, 1996).

Surficial deposits, as reported and mapped on a regional scale by the Illinois State Geological Survey (ISGS), are the Vandalia Member (**Figure 2-3**), although the Hagarstown Member has been identified in the vicinity of the CPP. The general sequence of unlithified Quaternary deposits, depicted on **Figure 2-4**, from ground surface down is:

- **Loess Unit:** The loess unit is comprised of the Peoria and Roxana Silts. The Peoria Silt is generally classified and described as light yellow-tan to gray, fine sandy silt. The Roxana Silt is predominately silt-sized material but can be sandier in localized areas and the base of this unit is often colluvium of silt, and sand (Hansel and Johnson, 1996).
- **Glasford Formation:** Till members present in the surrounding area include (youngest to oldest): the Hagarstown Member, the Vandalia Member, the Mulberry Grove Member, and the Smithboro Member. The Hagarstown Member is bounded at the top by the Sangamon Soil. The Vandalia Member is described as a sandy till with thin lenticular bodies of silt, sand, and gravel. It is calcareous, except where weathered, generally gray, and moderately compact. The member consists of gravelly till, poorly sorted gravel, well sorted gravel, and sand. The Mulberry Grove Member is intermittent at the CPP and is described as a calcareous gray silt and fine sand containing some fossil mollusks. The Smithboro Member is described as a gray, compact, silty till. The Smithboro is bounded below by the Yarmouth Soil (Willman and Frey, 1970).
- **Banner Formation:** Composed primarily of glacial tills and intercalated outwash of sand, gravel, and silt. Members differentiated in western Illinois include the Yarmouth Soil and the Lierle Clay (Hanson, 2009).

2.4.2 Bedrock

Unlithified deposits at the CPP and surrounding areas, described in **Section 2.4.1**, are underlain by rocks belonging to the Pennsylvanian Bond Formation (Kolata, 2005). Detailed descriptions of the Pennsylvanian strata of Illinois were published by Willman et al. (1975). The Bond Formation includes all strata from the base of the Shoal Creek Limestone Member or the LaSalle Limestone Member to the top of the Millersville Limestone Member or the Livingstone Limestone Member. It is overlain by the Mattoon Formation and underlain by the Modesto Formation. It varies from less than 150 feet thick in eastern Illinois to over 300 feet thick in southeastern Illinois, averaging about 250 feet. The Bond Formation is characterized by a high percentage of limestone and calcareous clays and shales. The Bond and Modesto Formations of the McLeansboro Group also contain multiple thin (typically less than 2 feet) intermittent coal beds. The upper formation of the Kewanee Group is the Carbondale Formation which contains multiple coal beds, including the Herrin (No. 6) Coal, of varying thicknesses (up to 7 feet) (ISGS, 2020). It is bound by thick limestone members (up to 50 feet), the thickest and purest limestones in the Pennsylvanian System of Illinois. Gray shales constitute the greatest part of the formation, although thick channel sandstones are developed locally.

The elevation of the bedrock surface in the area ranges from 450 to 500 feet msl. The bedrock surface slopes gently towards the west into a minor bedrock valley that runs north-south (Herzog et al., 1994). Well logs indicate that the lithology of the uppermost bedrock is predominantly shale (Zeizel, 1959).

2.4.3 Structure

The major geologic structural features around Illinois are shown on **Figure 2-5**. There are no major structural features in Montgomery County. The nearest major structural feature to CPP is the Louden Anticline, which is north-south trending and located approximately 25 miles east of the CPP. Smaller-scale structural features within Montgomery County include the Hillsboro North and Hillsboro South Domes, which are located approximately 15 miles north of the CPP. The Crown Fault, which is a left-lateral fault, and the Girard Fault, which is a northeast dipping normal fault, are located approximately 31 miles northwest of the CPP.

Located south of the CPP in Bond County are the Ayers and Woburn Anticlines and the Greenville Dome. The Ayers Anticline is located approximately 10 miles south of the CPP and trends east-west. The Woburn Anticline is located approximately 10 miles southeast of the CPP and trends north-south. The Greenville Dome is located approximately 15 miles south of the CPP (Nelson, 1995). A review of the available data from the United States Geological Survey (USGS, 2010), ISGS, and other available structural information was completed by Haley & Aldrich, Inc., (2018) for the Location Restriction Demonstration to address the requirements of 40 C.F.R. § 257.62 (Fault Areas). The review found that the nearest known mapped fault is the Crown Fault referenced above, which is located approximately 31 miles northwest of the CPP, and the Centralia Fault zone, located approximately 35 miles southeast of the CPP. The timeframe of the most recent activity on these fault zones is unknown. There are no known active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of AP1 (**Figure 2-5**).

2.4.4 Seismic Setting

The nearest areas of present-day fault related, seismic activity are the Northern Illinois Seismic Source Zone, the Wabash Valley Fault Zone near southwestern Indiana, and the New Madrid Fault Zone along the Ohio and Mississippi River Valleys in southeastern Illinois. No recent earthquake epicenters are located in Montgomery County. A magnitude 3.80 earthquake occurred approximately 15 miles south of CPP in Bond County in 1981 and a magnitude 3.60 earthquake occurred approximately 20 miles southeast of CPP in Fayette County in 1990.

35 I.A.C. § 845.330 requires that existing and new CCR SIs and lateral expansions of existing SIs must not be located in seismic impact areas, unless owners or operators demonstrate that the SI is designed to resist the maximum horizontal acceleration (g) in lithified earth material. This requirement is identical to that in 40 C.F.R. § 257.63. The definition of a seismic impact zone is "areas having a 2 percent or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitation pull, will exceed 0.10 g in 50 years." Although AP1 is located within a seismic impact zone, it satisfies the demonstration requirements of 35 I.A.C. § 845.330. The AECOM report titled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Flow Design Control System Plan for the Ash Pond No. 1 at Coffeen Power Station", dated October 2016, includes engineering analysis, calculations, and findings that support the requirements of 40 C.F.R. § 257.63 (Haley & Aldrich, Inc., 2018), and, by extension, 35 I.A.C. § 845.330.

2.4.5 Mining Activities

Several coal mines, both strip and underground types, previously operated in Montgomery County, Illinois. A survey to identify historic mining activities was conducted for a 1,000-meter radius around the Site. Based on records obtained from ISGS, two mines were identified within a 1,000-meter radius of AP1. A map showing the extent of historic mines is provided in **Appendix B**.

In the southeast portion of the Site is the Hillsboro Mine (ISGS Mine No. 871), which was operated as a room and pillar panel mine. Operations began in 1964 under the Truax-Traer Coal Company. The mine was purchased by the Consolidation Coal Company in 1971 and production ceased in 1983. An approximately 5- to 7-foot-thick seam of Herrin Coal was mined at approximately 500 feet below ground surface (bgs) (ISGS, 2019). The mine showed indications of small-scale faulting, roof stability issues and floor heaving. AP1 directly overlies the Hillsboro Mine. Mine shafts, processing facilities and some historic coal storage associated with these historic mines was located south of AP1 (**Appendix B**).

To the north/northwest is the Clover Leaf No. 4 Mine (ISGS Mine No. 442), which was operated as a room and pillar panel mine. Operations began in 1906 under the Clover Leaf Mining Company. Production discontinued in 1924 under Clover Leaf Coal Company ownership. An approximately 6- to 8-foot-thick seam of Herrin Coal was mined at approximately 510 feet bgs (ISGS, 2019). AP1 does not overlie the Clover Leaf No. 4 Mine, nor does it fall within the buffer zone of the mine.

2.5 Site Geology

The Quaternary deposits in the vicinity of the CPP consist mainly of diamictons and interbedded outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations. The CPP geology summarized below is from a combination of the Coffeen Hydrogeologic Monitoring Plan (NRT, an OBG Company [NRT/OBG], 2017) and a field investigation performed in 2021 to collect additional data for the discussion of vertical and horizontal lithology, stratigraphy, chemical properties, and physical properties of geologic layers to a minimum of 100 feet bgs as specified in 35 I.A.C. § 845.620(b). Field investigation locations are shown on **Figure 2-6** and cross-sections are included in **Figure 2-7**. Soil boring logs and well construction logs are provided in **Appendix C**. Samples for geotechnical analysis were collected from interpreted geologic units and composited to obtain a representative sample of the entire geologic unit prior to submittal (**Table 2-1**). The unconsolidated deposits and bedrock which occur at the CPP include the following units (beginning at the ground surface):

- **Fill and CCR Unit:** CCR consisting of bottom ash and other non-CCR waste is present within AP1 and non-CCR fill material consisting of silty clay, sandy lean clay, or lean clay with sand, with trace amounts of fine gravel comprises the berms surrounding AP1.
- **Loess Unit**: Clays and silts, including undifferentiated Roxana Silt and Peoria Silt with thicknesses ranging from 1 to 16 feet, where present at the CPP.
- **Hagarstown Member**: The Hagarstown Member (consisting of gravelly clay till and sandy materials in contact with the Vandalia Member (also referred to as Hagarstown Beds) has been separated into two units for this discussion: the first unit, consisting of the gravelly clay till and the second unit consisting of sandy material overlying the Vandalia Member. The Upper Hagarstown Member is up to 6 feet thick, while the sandy portions, where present, are generally less than 3 feet thick, although thicknesses up to 7 feet have been observed north of the LF.
- **Vandalia Member**: Sandy, silt, or clay till that is generally greater than 15 feet thick.

- **Mulberry Grove Member**: Gray silt and sandy silt/clay unit found between the Vandalia Till and the Smithboro Till. Generally thin and not laterally continuous across the CPP.
- **Smithboro Member**: Thick, gray compacted silty clay diamicton.
- **Yarmouth Soil**: Sand and sandy silt/clay, which include accretionary deposits of fine sediment and organic materials, typically less than 5 feet thick and not laterally continuous.
- **Lierle Clay Member:** Clay and silt with some sand which is the upper portion of the Banner Formation. No borings advanced on site penetrated the full thickness of the Lierle Clay.

Soil boring logs and well construction logs are provided in **Appendix C**.

2.5.1 Fill and CCR

CCR (bottom ash) and other non-CCR wastes are present within AP1. CCR sample locations are shown on **Figure 2-6.** The elevation at the top of the fill layer estimated from the topographic surface (**Figure 2-1**) within the limits of AP1 is from approximately 629 to 637 feet NAVD88.

CCR thickness extends approximately 18 feet deep as measured in XPW02 and consists mostly of bottom ash (approximately 90 percent sand sized particles). Average ash thickness in AP1 is approximately 10 feet. AP1 overlies the Loess Unit described in **Section 2.5.2**; however, former drainage features in localized areas eroded through the loess and clay such that the ash fill may be in contact with the sandy portion of the Hagarstown Member (**Section 2.5.3**). The elevation of the bottom of ash is lowest in the eastern portion of the pond and extends to an elevation of approximately 595 to 600 feet (**Appendix A**).

The geotechnical testing results are summarized in **Table 2-1** and the geotechnical laboratory report is included in **Appendix D**. Geotechnical testing results from the CCR material encountered at XPW02 and composited for analysis indicated the following:

- Moisture content is 12.5 percent.
- Calculated porosity is 31.7 percent.
- Dry density is 110.8 pounds per cubic foot (pcf).
- Specific gravity is 2.60.
- Particle size distribution is 0 percent gravel, 90 percent sand, 10 percent fines.
- Vertical hydraulic conductivity was 8.8×10^{-5} cm/s.

Solids samples collected from XPW01 and XPW02 were also collected for chemical analysis. The results of solids samples collected from within AP1 are summarized in **Table 2-2.** Additionally, leachate wells XPW01 and XPW02 were sampled in 2021. The results of leachate samples collected from within AP1 are summarized in **Table 2-3**.

2.5.2 Loess Unit

The Loess Unit is the uppermost unlithified unit identified at the CPP. This unit is comprised of the combined Roxana and Peoria Silt and extends from beneath the topsoil, derived from the loess, to the top of the Hagarstown Member. The loess has been classified as silt or clayey silt, with minor amounts of sand. The Loess Unit is generally considered unsaturated, and the uppermost aquifer is recharged by precipitation that percolates through this unit.

The top of the Loess Unit was typically encountered from approximately 606 to 628 feet NAVD88. Loess Unit thickness ranges from 0 feet (absent) to 16 feet. Construction of the LF, GMF GSP, and GMF RP required the excavation and removal of this layer within the unit footprints. The Loess Unit is typically thickest to the north, and is absent near historic drainage features to the south.

During the 2021 investigation of AP1, the Loess Unit was typically encountered from 1 to 4 feet bgs, at elevations of approximately 605 to 625 feet NAVD88, and was generally 8 to 14 feet thick, where present near AP1. CCR borings XPW01 and XPW02 encountered the Loess Unit at approximately 13 and 18 feet bgs, at an elevation of approximately 619 feet NAVD88 at both locations. The Loess Unit was absent in borings G314, G314D, and G316, advanced along the eastern lobe of Coffeen Lake and located near the Unnamed Tributary.

The geotechnical testing results are summarized in **Table 2-1** and geotechnical laboratory report is included in **Appendix D**. Geotechnical testing results from the Loess Unit indicated the following:

- Average moisture content is 18.6 percent and ranges from 16.5 to 21.6 percent.
- Average calculated porosity is 31.2 percent and ranges from 29.8 to 33.5 percent.
- Average dry density is 109.9 pounds per cubic foot (pcf) and ranges from 105.0 to 115.7 pcf.
- Average specific gravity is 2.61 and ranges from 2.59 to 2.64.
- Particle size distribution is 0 percent gravel, 33 to 35 percent sand, and 65 to 67 percent fines (37 to 41 percent silt and 28 to 35 percent clay).

Soil samples collected from the Loess Unit were also submitted to an analytical laboratory for chemical analysis. The results of this chemical analysis are summarized in **Table 2-4**.

2.5.3 Hagarstown Member

The Hagarstown Member (also referred to as Hagarstown Beds) exhibits two units: the first unit consisting of the gravelly clay till and the second consisting of sandy material overlying the Vandalia Member. The clay till portion had varying thicknesses ranging from approximately 2 to 6 feet as observed adjacent to, south, and west of the Pond. This unit underlies 95 percent of AP1, and the clayey portion is up to 6 feet thick. The thickness of the sandy portion of the Hagarstown is generally 1 to 2 feet thick. The composition of the sandy portion of the Hagarstown unit varies across the CPP and has been classified as gravelly till, poorly sorted gravel, well sorted gravel, sand, and silty sand. Based on the historic topographic map (**Appendix A**), the Hagarstown Member is not present in former drainage features (*i.e.,* the northeast corner of AP1).

During construction of the LF, GMF GSP, and the GMF RP, the Loess Unit and the Hagarstown Member were excavated to facilitate construction and eliminate groundwater flow into excavations. The excavations were backfilled with structural fill and an underdrain system was installed to mitigate inward hydraulic pressure and potential liner uplift damage before the CCR units were filled. The LF underdrain system remains but is no longer actively pumped. The GMF GSP underdrain system has not been actively pumped since construction was completed. The GMF RP gravity underdrain remains in place.

Where present the sandy portion of the Hagarstown is generally 2 to 4 feet thick. The composition of the sandy portion of the Hagarstown unit varies across the CPP and has been classified as gravelly till, poorly sorted gravel, well sorted gravel, sand, and silty sand. The elevation of the top of the Hagarstown generally declines as the unit approaches Coffeen Lake or other topographic drainage features.

During the 2021 investigation, the sandy portion of the Hagarstown Member near AP1 was generally encountered from 9 to 34 feet bgs, at elevations of approximately 603 to 611 feet NAVD88, and was generally 1 to 5 feet thick, where present (**Figure 2-7**).

The geotechnical testing results are summarized in **Table 2-1** and the geotechnical laboratory report is included in **Appendix D**. Geotechnical testing results from the Hagarstown Member indicated the following:

- Average moisture content is 14.3 percent and ranges from 11.4 to 19.2 percent.
- Average calculated porosity is 24.6 percent and ranges from 24.2 to 25.1 percent.
- Average dry density is 125.1 pcf and ranges from 123.4 to 126.8 pcf.
- Average specific gravity is 2.64 and ranges from 2.59 to 2.68.
- Particle size distribution is 0 to 14 percent gravel, 28 to 79 percent sand, and 7 to 72 percent fines (7 to 52 percent silt and 0 to 26 percent clay).

Soil samples collected from the Hagarstown Member were also submitted to an analytical laboratory for chemical analysis. The results of this chemical analysis are summarized in **Table 2-4**.

2.5.4 Vandalia Member

The Vandalia (Till) Member is a sandy/silty till with thin, discontinuous lenses of silt, sand, and gravel. The Vandalia Member was encountered in all borings advanced at the CPP. The Vandalia Member typically ranged in thickness from 11.7 feet in the northern portion of the CPP, to 31.0 feet between the GMF GSP and the GMF RP. Similar to the observed top elevation of the Hagarstown Member, the top of the Vandalia Member declines in elevation near Coffeen Lake and topographic drainage features. This unit is relatively thick throughout the CPP, with an average thickness of over 15 feet (Hanson, 2009).

During the 2021 investigation, the Vandalia Member was encountered from 1.5 to 34 feet bgs, at elevations of approximately 598 to 608 feet NAVD88, where present.

The geotechnical testing results are summarized in **Table 2-1** and the geotechnical laboratory report is included in **Appendix D**. Geotechnical testing results from the Vandalia Member indicated the following:

- Average moisture content is 12.7 percent and ranges from 8.7 to 16.2 percent.
- Average calculated porosity is 23.3 percent and ranges from 18.9 to 27.6 percent.
- Average dry density is 122.2 pcf and ranges from 115.7 to 131.6 pcf.
- Average specific gravity is 2.59 and ranges from 2.56 to 2.61.
- Particle size distribution is 0 percent gravel, 26 to 44 percent sand, 56 to74 percent fines.

Soil samples collected from the Vandalia Member were also submitted to an analytical laboratory for chemical analysis. The results of this chemical analysis are summarized in **Table 2-4**.

2.5.5 Mulberry Grove Member

The Mulberry Grove (Silt) Member typically consists of a thin, lenticular unit of gray sandy silt (Willman et al., 1975). It represents the interval between the retreat of the glacier that deposited the Smithboro Member and the advance of the glacier that deposited the Vandalia Member. At the CPP, the Mulberry Grove Member is represented by pockets (generally less than 2 feet thick) of gray sandy silt. This unit was absent in many borings through the central portion of the CPP from south to north. Where sampled, the Mulberry Grove Member ranged in thickness from 0.5 to 4.9 feet near the GMF GSP (Hanson, 2009). During the 2021 investigation, the Mulberry Grove Silt was not encountered in the borings near AP1. These silts appear to be deposited in depressions found in the surface of the underlying Smithboro Member.

2.5.6 Smithboro Member

The Smithboro (Till) Member is described as a gray, compact, silty, clayey diamicton. The Smithboro Member ranges in thickness from 6.7 to 21.2 feet northwest of the landfill.

The geotechnical testing results are summarized in **Table 2-1** and the geotechnical laboratory report is included in **Appendix D**. Geotechnical testing results from the Smithboro Member indicated the following:

- Average moisture content is 15.5 percent and ranges from 15.0 to 16.6 percent.
- Calculated porosity of the G311D sample is 28.5 percent and 29 percent for G314D.
- Average dry density is 115.9 pcf and ranges from 114.2 to 118.8 pcf.
- Average specific gravity is 2.58 and ranges from 2.56 to 2.61.
- Particle size distribution of the samples collected from G311D and G314D is 0 percent gravel, 26-28 percent sand, 72-74 percent fines.

Soil samples collected from the Smithboro Member were also submitted to an analytical laboratory for chemical analysis. The results of this chemical analysis are summarized in **Table 2-4**.

2.5.7 Yarmouth Soil

The Yarmouth Soil is described as the weathered zone on the Kansan drift, but in some places, it consists of accretionary deposits of fine sediment and organic material that accumulated in poorly drained areas on the surface of the Kansan deposits. Historical borings in the northern portion of the CPP which encountered the Yarmouth were summarized previously by Hanson (2009) as ranging in thickness from 0 feet (absent) to 5.1 feet.

During the 2021 investigation, the Yarmouth Soil was encountered from 46 to 55 feet bgs, at an elevation from approximately 565 to 577 feet NAVD88, and was 1 to 3 feet thick, where present. The measured thickness was consistent with previous investigations.

The geotechnical testing results are summarized in **Table 2-1** and the geotechnical laboratory report is included in **Appendix D**. Geotechnical testing results from the Yarmouth Soil indicated the following:

- Moisture content of the G314D sample is 14.9 percent.

- No samples were analyzed for dry density. Therefore, average porosity was not calculated for the Yarmouth Soil. Based on material type encountered in the borings, the effective porosity is expected to range from 10 to 28 percent (Fetter, 2001).
- Specific gravity of the G314D sample is 2.61.
- Particle size distribution of the G314D sample is 0 percent gravel, 84 percent sand, 16 percent silt, and 0 percent clay.

Soil samples collected from the Yarmouth Soil were also submitted to an analytical laboratory for chemical analysis. The results of this chemical analysis are summarized in **Table 2-4**.

2.5.8 Lierle Clay Member/ Banner Formation

The Lierle Clay Member is the uppermost member of the Kansan Stage Banner Formation. It is described as an accretion-gley with clay, silt, and some sand. It was encountered by Hanson (2009) in all but a few borings on site. During the 2021 investigation, borings G307D, G311D, and G314D encountered the Lierle Clay at approximately 47 to 57 feet bgs, at approximate elevations from 564 to 575 feet NAVD88. No borings penetrated the full thickness of the Banner Formation near AP1.

The geotechnical testing results are summarized in **Table 2-1** and the geotechnical laboratory report is included in **Appendix D**. Geotechnical testing results from the Lierle Clay Member indicated the following:

- Average moisture content is 14 percent and ranges from 8.7 to 18.9 percent, typically decreasing with depth.
- Average calculated porosity is 27.6 percent and ranges from 19.2 to 33.2 percent.
- Average dry density is 118.8 pcf and ranges from 108.0 to 134.6 pcf.
- Average specific gravity is 2.64 and ranges from 2.58 to 2.73.
- Particle size distribution is 0 percent gravel, 16 to 24 percent sand, and 76 to 84 percent fines.

Soil samples collected from the Lierle Clay were also submitted to an analytical laboratory for chemical analysis. The results of this chemical analysis are summarized in **Table 2-4**.

2.5.9 Bedrock

Pennsylvanian-age Bond Formation bedrock was not encountered in any borings advanced at the CPP, so site-specific information is not available.

3. REGIONAL AND LOCAL HYDROGEOLOGY

3.1 Regional Hydrogeology

The water table conforms more or less to the topographic features of the land surface. Recharge occurs in the uplands and flows towards drainage features. Moderate thicknesses of unconsolidated materials fill shallow valleys or are present on the uplands bordering the main valleys. These materials contain thin and discontinuous deposits of sand and gravel. Potable water in Montgomery County is primarily serviced by the Hillsboro and Litchfield Water Departments. Surface water of Lake Glenn Shoals and Old Hillsboro Lake serves Hillsboro, Illinois, and the surrounding communities (*e.g.,* Coffeen) (Hillsboro, 2021). Groundwater for domestic and farm supplies is obtained locally in this area from wells drilled in sand and gravel, but in some places good water-yielding deposits are absent and water from the unconsolidated material is obtainable only with large-diameter dug wells (Selkregg et al., 1957).

3.2 Site Hydrogeology

Over 100 monitoring wells have been installed since 2006 to monitor groundwater conditions around the five CCR units at the CPP for both State and Federal programs. Two monitoring wells were installed in 2010 near AP1. From 2015 to 2017, five additional wells and piezometers were installed around AP1 to meet requirements of the CCR Rule. In 2021, thirteen additional wells were installed around AP1 to provide information to meet requirements of Part 845. A summary of the current monitoring well networks, and construction details, is included in **Table 3-1** and locations shown on **Figure 3-1**. This section discusses the recently (2021) collected information, focusing on the existing well network and monitoring wells installed after 2015 around AP1, as well as appropriate historical data from wells installed prior to 2015.

3.2.1 Hydrostratigraphic Units

Six hydrostratigraphic units have been identified at the CPP based on stratigraphic relationships and common hydrogeologic characteristics, and are summarized as follows:

- **CCR**: This unit is composed of CCR, consisting primarily of bottom ash. This also includes earthen fill deposits of predominantly silt and clay materials from on-site excavations that were used to construct berms and roads surrounding the various impoundments across the CPP.
- **UCU**: Consists of the Loess Unit and the upper clayey portion of the Hagarstown Member which has generally lower vertical permeability and generally greater than 60 percent fines (**Table 2-1**). This Unit was encountered across most of the CPP, with the exception of the eastern edges of AP1 near the Unnamed Tributary where the unit was eroded following deposition or locations where it has been excavated for construction.
- **Uppermost Aquifer**: This unit consists primarily of sand and sandy silts and clays at the base of the Hagarstown Member and, in some locations, the uppermost weathered sandy clay portion of the Vandalia Member. This unit is absent in several locations due to weathering and in others due to excavation during construction of the CCR Unit. The hydraulic characteristics of the Hagarstown Member indicate the unit has a moderate hydraulic conductivity.
- **LCU**: This unit is composed of the sandy clay till of the Vandalia Member, the silt of the Mulberry Grove Formation, and the compacted clay till of the Smithboro Member. The unit

underlies the uppermost aquifer and was encountered in all boring locations on the CPP. Results from laboratory tests completed for vertical hydraulic conductivity indicate the Vandalia Member has a very low vertical hydraulic conductivity.

- **DA**: This unit consists primarily of sandy silt and sands of the Yarmouth Soil, which are thin (less than 5 feet) and discontinuous across the CPP.
- **DCU**: This unit underlies the DA and is composed of the Banner Formation, of which the thick Lierle Clay is the first encountered unit. No boring penetrated the full thickness of this formation.

3.2.2 Uppermost Aquifer

The base of the Hagarstown Member is identified as the uppermost aquifer on Site. The sandy clay and sand of the uppermost aquifer is confined except where site excavations and ravines extend through the Loess Unit into the Hagarstown Member. The top of the uppermost aquifer was evaluated with respect to the location restrictions in 2018 (Haley & Aldrich, Inc., 2018) and provided in **Figure 3-2**. The top of the uppermost aquifer is separated from overlying CCR material by the low permeability Loess and Hagarstown Member Till (**Figure 2-7**). The base of the uppermost aquifer is the top of the LCU which is comprised of the low permeability Vandalia Member, Mulberry Grove Member, and Smithboro Till.

3.2.3 Potential Migration Pathways

Potential migration pathways (PMPs) were interpreted using the lithologic composition and hydrogeologic properties (hydraulic conductivity, hydraulic position with respect to the unit) of the screened materials. In addition to the physical properties, the analytical results from the baseline groundwater monitoring performed in wells screened in the confining units and DA were used to identify PMPs. The uppermost aquifer is the first occurrence of groundwater and therefore the PMPs identified are in geologic units located below the uppermost aquifer. Monitoring wells G307D, G311D, G314, and G316 are considered LCU PMP monitoring locations and G314D is considered a DA PMP monitoring location. Wells G307D, G311D, G314, and G316 evaluate the potential for migration of impacts through the LCU where the uppermost aquifer is absent.

3.2.4 Water Table Elevation and Groundwater Flow Direction

Porewater monitoring wells XPW01 and XPW02 were installed during the 2021 investigation to collect porewater samples and water elevations within AP1, and staff gauge XSG-01 was installed to monitor pond water levels in AP1. The phreatic surface in AP1 showed minimal variation, with elevations from approximately 629 to 630 feet NAVD88 (**Appendix E**).

No monitoring wells were installed in the UCU during 2021 investigation activities and no wells have historically been installed across solely the UCU because it is not present or is unsaturated in portions of the CPP.

During the 2021 Part 845 investigation, groundwater elevations in the uppermost aquifer ranged from approximately 591 to 625 feet NAVD88 across the CPP (**Appendix E**). Groundwater elevations were typically highest towards the northern extent of the CPP, near the GMF GSP and GMF RP, except monitoring well G307 south of AP1, which consistently had the highest groundwater elevation. Groundwater elevations were lowest near the Unnamed Tributary and east of AP1 towards Coffeen Lake. Groundwater elevations in the vicinity of AP1 were typically from 591 to 621 feet NAVD88, with the exception of G307 as noted above, which was typically around 624 feet NAVD88 (**Figures 3-3 and 3-4**). No seasonal variation has been observed in the uppermost aquifer monitoring wells, and any seasonal responses may be muted by the proximity and hydraulic connection to Coffeen Lake.

Overall groundwater flow within the uppermost aquifer is divided towards the two lobes of Coffeen Lake. The groundwater divide runs approximately through the center of the CPP, with groundwater east of the divide flowing east to southeast towards the Unnamed Tributary or the eastern lobe and groundwater west of the divide flowing west to southwest towards the western lobe. Groundwater flows north to northeast across AP1 (**Figures 3-3 and 3-4** and **Appendix E**) toward the former discharge structure and Unnamed Tributary. Although elevations vary seasonally, the groundwater flow direction in the uppermost aquifer is consistent and likely controlled by the proximity and hydraulic connection to Coffeen Lake.

Monitoring wells G206D, G275D, and G314D are screened across the DA. Groundwater elevation within the DA typically ranges from 567 to 590 feet NAVD88. G314D is nearest AP1 and typically has groundwater elevations ranging from about 567 to 573 feet NAVD88. Groundwater contour maps are not generated for the DA; however, groundwater flow within the DA is expected to generally follow subsurface topography for the unit.

3.2.4.1 Vertical Hydraulic Gradient

Vertical hydraulic gradients were calculated using available groundwater elevation data from March through July 2021, and from historic readings from 2017 to 2019, at nested well locations within the uppermost aquifer, LCU, and DA. Vertical hydraulic gradients for AP1 are presented in **Table 3-2**. Vertical hydraulic gradients for other nested well locations at the CPP are included in **Appendix E**. The results of the vertical hydraulic gradient calculations between hydrostratigraphic units are summarized below:

- Uppermost aquifer to Upper LCU (Vandalia Member)
  - In 2021, vertical gradients in well nest G405/T408, located north of AP2, were consistently downward, with an average vertical gradient of 0.03 feet per foot (ft/ft). From 2017 to 2020, vertical gradients in well nest G405/T408 varied between upward and downward, with an average (downward) vertical gradient of 0.04 ft/ft.
  - In 2021, vertical gradients in well nest G406/T409, located south of AP2 / northwest of AP1, were consistently upward, with an average vertical gradient of -0.18 ft/ft. From 2017 to 2020, vertical gradients in well nest G406/T409 varied between upward and downward, with an average (downward) vertical gradient of 0.02 ft/ft.
- Uppermost aquifer to Lower LCU (Smithboro Member)
  - During 2021, vertical gradients at well nest G307/G307D, located south of AP1, were downward, with an average vertical gradient of 0.05 ft/ft. In well nest G311/G311D gradients were consistently strongly downward, with an average vertical gradient of 0.93 ft/ft.
- Upper LCU (Vandalia Member) to Lower LCU (Smithboro Member)
  - In 2021, vertical gradients at well nest T408/G45D, located north of AP2, were consistently downward with an average vertical gradient of 0.20 ft/ft. The direction is consistent with measurements from 2017 to 2020 although less than the average downward gradient measured (2.02 ft/ft).

   - In 2021, vertical gradients at well nest T409/G46D, located near the southwest corner of AP2 / northwest of AP1, were downward with an average vertical gradient of 0.25 ft/ft. This direction is consistent with measurements from 2017 to 2020, although less than the average downward vertical gradient measured (1.28 ft/ft).

- LCU to DA
   - During 2021, vertical gradients in well nest G314/G314D, located east of AP1, were consistently strongly downward, with an average vertical gradient of 1.32 ft/ft.

Vertical hydraulic gradients indicate there is consistently downward migration of groundwater in most areas of the CPP, with the exception being northwest of AP1, where consistent upward gradients were measured between the upper LCU and UA in 2021.

3.2.4.2 Impact of Existing Ponds and Ash Saturation

Groundwater surface does not appear to be affected by water levels in AP1. Changes in pond elevations in 2021 are minimal, and do not result in, or vary with, corresponding changes in groundwater elevations. Comparisons of the base of ash elevations at XPW01 and XPW02 and the top of the uppermost aquifer elevations at nearby wells (G304, G307, and G307D) indicate that at least 8 to 10 feet of the UCU is present and limits hydraulic connection between the aquifer and the SI.

In the northeast corner of AP1, the historic land surface contours suggest CCR may have been placed at elevations as low as 595 to 600 feet, while nearby wells (G312, G313, G314) indicate the top of the uppermost aquifer ranges from 599 to 604 feet NAVD88.

3.2.4.3 Impact of Coffeen Lake on Groundwater Flow

Groundwater contour maps prepared from elevation data measured in monitoring wells indicate groundwater elevations can be variable, but flow directions are generally consistent. Groundwater generally flows from the center of the CPP west towards Coffeen Lake, and east towards the Unnamed Tributary, the eastern lobe of Coffeen Lake, and the discharge flume, resulting in a groundwater divide (high) running through the middle of the CPP.

Construction of the LF, GMF GSP, and GMF RP required removal of the Hagarstown Member, in effect removing the aquifer beneath the footprint of these units (Hanson, 2016). It is uncertain whether these constructed units significantly limit lateral groundwater flow, either by creating no flow zones or by capturing groundwater via their dewatering (NRT, 2017).

3.2.5 Hydraulic Conductivities

3.2.5.1 Field Hydraulic Conductivities

Field hydraulic conductivity tests were performed by Hanson in 2021 as part of characterization efforts to complete Part 845 requirements. Individual field hydraulic conductivity test results conducted at the AP1 are summarized in **Table 3-3** and the field hydraulic conductivity data is included in **Appendix F**. The results of the tests are summarized as follows:

- **Uppermost aquifer:** Hydraulic conductivities near AP1 ranged from 2.6×10^{-4} to 9.1×10^{-3} cm/s. Tests had a geometric mean of 2.0×10^{-3} cm/s. This is generally consistent with, although higher than, tests conducted prior to 2017 as part of CCR Rule characterization efforts that indicated hydraulic conductivities varied from 1.7×10^{-5} to 2.1×10^{-3} cm/s with a geometric mean of 2.9×10^{-4} cm/s (NRT, 2017).

- **LCU:** Hydraulic conductivities ranged from 1.2×10^{-4} to 2.3×10^{-3} cm/s. Tests had a geometric mean of 5.0×10^{-4} cm/s. Monitoring wells with the highest hydraulic conductivities were located near the GMF RP and wells with the lowest hydraulic conductivities were located near AP1. Prior to 2017, field hydraulic conductivity tests completed in the LCU for monitoring well and temporary piezometers (G45D, G46D, T408, and T409) indicate horizontal conductivities from 4.0×10^{-8} to 3.4×10^{-5} cm/s. The elevated hydraulic conductivity values (10^{-4} to 10^{-3} cm/s) in LCU wells are likely not representative of the primary LCU lithology, but instead reflect the isolated and discontinuous sandy lenses in which the wells are screened (NRT, 2017).
- **DA:** Geometric mean hydraulic conductivity at DA well G314D, near AP1, was 8.7×10^{-5} cm/s and was slightly lower than tests completed in the northern portion of the CPP in 2009 that resulted in hydraulic conductivity values ranging from 1.3×10^{-4} to 1.7×10^{-3} cm/s, with a geometric mean of 4.4×10^{-4} cm/s (NRT, 2017).
- No monitoring wells are screened only within the DCU, and no field hydraulic conductivity tests were conducted for the DCU.

3.2.5.2 Laboratory Hydraulic Conductivities

Falling head permeability tests (ASTM D5084 Method F) were performed in the laboratory on nine samples collected primarily from CCR and confining units at the CPP during the 2021 investigations. Samples collected from locations near AP1 are shown on **Figure 2-6** The geotechnical laboratory report is provided in **Appendix D**. The results are summarized in **Table 2-1** and discussed below.

- **CCR:** One geotechnical sample of CCR (ash) was collected at XPW02 and the vertical hydraulic conductivity is 8.8×10^{-5} cm/s.
- **UCU:**
  - Vertical hydraulic conductivities of samples collected from G307D and G311D near AP1 are 4.8×10^{-8} and 2.9×10^{-8} cm/s, respectively. These values are consistent with historically reported values.
  - Geotechnical tests conducted prior to 2017 indicated UCU vertical hydraulic conductivity values ranging from 1.3×10^{-8} to 5.0×10^{-7} cm/s, with a geometric mean of 1.0×10^{-7} cm/s (NRT, 2017).
- **Uppermost Aquifer:** One geotechnical sample of uppermost aquifer material was collected from G275D, near the GMF RP, with a vertical hydraulic conductivity of 1.6×10^{-4} cm/s. No uppermost aquifer samples collected near AP1 were analyzed for vertical hydraulic conductivity.
- **LCU:**
  - Three samples collected from G307D, G311D, and G314D, near AP1, have vertical hydraulic conductivities ranging from 5.5×10^{-8} to 3.7×10^{-7} cm/s, with a geometric mean of 1.8×10^{-7} cm/s. Vertical hydraulic conductivities from 2021 are consistent with those observed historically.

  - Intermittently present within the LCU is the Mulberry Grove Member. Historic vertical hydraulic conductivities of the Mulberry Grove Member were measured as 1.6×10^{-6} and 1.9×10^{-6} cm/s.
  - Historic laboratory tests reported LCU hydraulic conductivity values ranging from 6.8×10^{-9} to 4.5×10^{-6} cm/s, with a geometric mean of 3.0×10^{-8} cm/s (NRT, 2017).
- **DA:** No laboratory vertical hydraulic conductivity tests were completed during 2021 on DA materials.
- **DCU**: No laboratory vertical hydraulic conductivity tests were completed during 2021 on DCU materials. Historic vertical hydraulic conductivity tests were performed on samples collected north and west of the GMF GSP. Vertical hydraulic conductivities of 6.8×10^{-9} and 4.5×10^{-6} cm/s were reported (NRT, 2017).

3.2.6 Horizontal Groundwater Gradients and Flow Velocity

Horizontal gradient and flow velocities are calculated using the flow path from G308 to G301. Horizontal gradients range from 0.004 to 0.005 ft/ft, equating to a minimum flow velocity of 0.19 feet/day (ft/day) and a maximum flow velocity of 0.24 ft/day. Average calculated flow velocity across AP1 is 0.22 ft/day (**Table 3-4**).

Horizontal gradient and flow velocities were also calculated using the flow path from G315 to G312. Horizontal gradients are from 0.009 to 0.012 ft/ft, equating to a minimum flow velocity of 0.71 ft/day and a maximum flow velocity of 0.95 ft/day. Average calculated flow velocity across AP1 is 0.91 ft/day (**Table 3-4**).

3.2.7 Groundwater Classification

Per 35 I.A.C. § 620.210, groundwater within the uppermost aquifer at AP1 meets the definition of a Class I - Potable Resource Groundwater based on the following criteria:

- Groundwater in the uppermost aquifer is located 10 feet or more below the land surface and
- Within a geologic material which is capable of a hydraulic conductivity of 1×10^{-4} cm/s or greater using a slug test (**Table 3-3**).

3.3 Surface Water Hydrology

3.3.1 Climate

Average climatic data was obtained from the National Oceanic and Atmospheric Administration National Centers for Environmental Information Climate Data Online. The data was recorded between 2001 and May 2021 from Hillsboro, Illinois, which is located approximately eight miles northwest of CPP. The data includes monthly maximum and monthly minimum daily temperatures (degrees Fahrenheit [°F]) and average rainfall for each month calculated from daily values collected over the 20-year period. The data is summarized in **Table B** below.

Table B: Average Monthly Temperature Extremes and Precipitation for Hillsboro, IL

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Maximum Temperature (°F)	38.4	42.8	54.8	67.2	77.2	86.1	88.4	86.0	82.3	69.5	54.2	44.9	66.3
Minimum Temperature (°F)	22.3	24.5	34.9	44.3	55.4	64.2	67.2	64.7	58.6	46.6	34.5	28.3	45.8
Precipitation (inches)	1.94	2.14	2.78	5.72	4.18	4.64	3.71	3.37	2.77	3.29	2.88	2.95	40.4
https://www.ncei.noaa.gov/orders/cdo/2651630.csv													

3.3.2 Surface Waters

The primary surface water body in the area, Coffeen Lake, is comprised of two lobes (identified as "Coffeen Lake" and "Unnamed Tributary" on **Figure 1-2**). The main body of Coffeen Lake is immediately adjacent to CPP on the west and south and the Unnamed Tributary borders CPP to the east.

In 1963, a 75-foot-high earthen dam was built across the McDavid Branch of East Fork Shoal Creek, creating Coffeen Lake for use as an artificial cooling lake for CPP. Coffeen Lake covers approximately 1,100 acres. The lake is part of the Shoal Creek Watershed (Hydrologic Unit Code [HUC] 07140203), which encompasses approximately 916 square miles. The average depth of Coffeen Lake is approximately 19 feet and the maximum depth is approximately 59 feet (Illinois Department of Nature Resources [IDNR], 2014). The average elevation of Coffeen Lake is approximately 591 feet NAVD88.

A USGS stream gage (USGS 05593900) for East Fork Shoal Creek near Coffeen, Illinois (latitude 39.1347 degrees north, longitude 89.3525 degrees west) is located approximately 6.5 miles northeast (upstream) of CPP. The gage datum elevation is 574.76 feet National Geodetic Vertical Datum of 1929 (NGVD29) (574.39 feet NAVD88). Daily gage heights for the period of January 1, 2018 through March 30, 2021 are shown below in **Figure A** (USGS, 2021). The gage height of approximately 2 feet, representing approximate baseflow, occurs at an elevation of about 576.39 feet NAVD88.

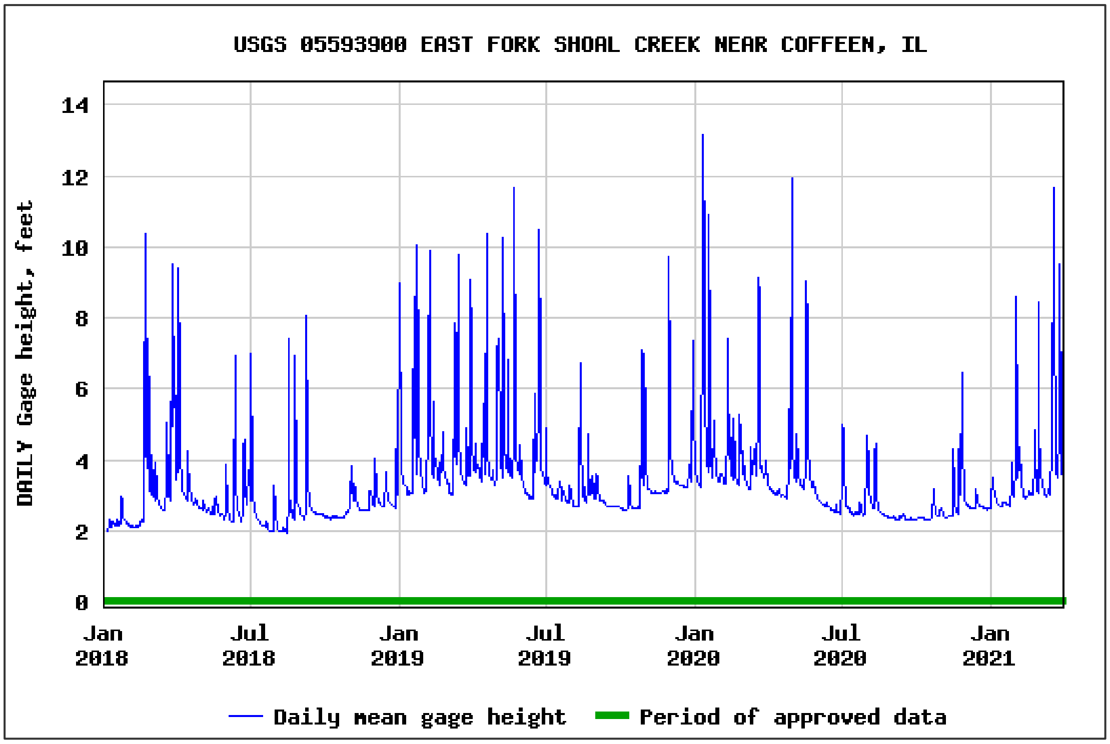

Figure A. Daily Gage Height of East Fork Shoal Creek (USGS 05593900)

Historically, Coffeen Lake received water discharge from both CPP and the Hillsboro Mine in additional to natural precipitation and drainage from East Fork Shoal Creek. At present, Coffeen Lake receives discharge from CPP under NPDES Permit No. IL 0000108. Additionally, an emergency spillway, located at the northeast corner of the GMF RP, discharges to the Unnamed Tributary, east of the CPP.

4. GROUNDWATER QUALITY

4.1 Summary of Groundwater Monitoring Activities

In 2015, additional well installation and groundwater sampling was initiated to meet the requirements of 40 C.F.R. § 257. Groundwater samples were collected, and totals analyses were completed for Appendix III and Appendix IV parameters. In 2021, additional wells were installed to comply with Part 845; wells were sampled for the parameters listed in 35 I.A.C. § 845.600. A review and summary of data from both the 40 C.F.R. § 257 and Part 845 monitoring programs is included in the evaluation of groundwater quality at the Site.

4.1.1 40 C.F.R. § 257 Program Monitoring and Well Network

The 40 C.F.R. § 257 monitoring well network consists of six monitoring wells screened in the uppermost aquifer, including two background monitoring wells (G281 and G306) and four compliance wells (G301, G302, G303, and G307). Monitoring well G304, originally in the 40 C.F.R. § 257 monitoring well network, was abandoned and replaced by G307. The boring logs, well construction forms, and other related monitoring well forms for the 40 C.F.R. § 257 monitoring well network are included in **Appendix C** of this HCR. The well locations are shown on **Figure 3-1**.

40 C.F.R. § 257 monitoring well network groundwater samples are collected and analyzed for the laboratory parameters from Appendix III and Appendix IV of 40 C.F.R. § 257 as summarized in **Table C** below.

Table C. 40 C.F.R. § 257 Groundwater Monitoring Program Parameters

Field Parameters [1]			
Groundwater Elevation	pH		
Appendix III Parameters (Total, except TDS)			
Boron	Chloride	Sulfate	
Calcium	TDS	Fluoride	
Appendix IV Parameters (Total)			
Antimony	Beryllium	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Chromium	Lithium	Thallium
Radium 226 and 228 combined			

[1] Dissolved oxygen, temperature, specific conductance, and oxidation/reduction potential, and turbidity were recorded during sample collection.

4.1.2 Part 845 Well Installation and Groundwater Monitoring

In 2021, thirteen additional monitoring wells (G307D, G308, G309, G310, G311, G311D, G312, G313, G314, G314D, G315, G316, and G317), two CCR source sample collection points (XPW01 and XPW02), and three staff gauges (SG02, SG03, and XSG01) were installed around Coffeen AP1 to assess the vertical and horizontal lithology, stratigraphy, chemical properties, and physical properties of geologic layers to a minimum of 100 feet bgs as specified in 35 I.A.C. § 845.620(b). The boring logs, well construction forms, and other related monitoring well forms for the monitoring well network are included in **Appendix C** of this HCR.

Prospective Part 845 monitoring wells were sampled for eight rounds from February to August 2021 and the results were assessed for selection of the AP1 Part 845 monitoring well network presented in the GMP. Samples were collected from the new monitoring points and analyzed for 35 I.A.C. § 845.600 parameters summarized in **Table D** below. Part 845 groundwater monitoring results are discussed below in **Section 4.2**.

Table D. Part 845 Groundwater Monitoring Program Parameters

Field Parameters [1]			
pH	Groundwater Elevation	Turbidity	
Metals (Total)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (Total)			
Fluoride	Sulfate	Chloride	TDS
Other (Total)			
Radium 226 and 228 combined			

[1] Dissolved oxygen, temperature, specific conductance, and oxidation/reduction potential were recorded during sample collection.

4.2 Groundwater Monitoring Results and Analysis

Groundwater data collected from the AP1 40 C.F.R. § 257 network monitoring wells from 2015 to 2021 were supplemented with sampling of additional locations in 2021 and evaluated with respect to standards included in 35 I.A.C. § 845.600(a)(1). This data set was selected because it includes parameters (total metals) consistent with the parameter list in 35 I.A.C. § 845.600(a)(1). Based on this data set there were no concentrations of antimony, barium, calcium, chloride, fluoride, mercury, molybdenum, selenium, or thallium greater than the GWPSs. Results indicate that the parameters discussed in the following sections were detected at concentrations greater than the applicable 35 I.A.C. § 845.600(a)(1) standards and are considered potential exceedances[1]. A summary of groundwater analytical data is provided in **Table 4-1**. Field parameters are included in **Table 4-2** and groundwater elevations are provided in **Appendix E**.

4.2.1 Arsenic

Arsenic was detected at concentrations greater than the GWPS (0.01 milligrams per liter [mg/L]) in three downgradient uppermost aquifer wells (G302, G303, and G304/G307). Arsenic was also detected at concentrations greater than the GWPS in background uppermost aquifer well (G306).

[1] Potential exceedances include results reported during the eight rounds of baseline groundwater monitoring that are greater than the applicable 35 I.A.C. § 845.600(a)(1) standards. The results are considered potential exceedances because they were compared directly to the standard and did not include an evaluation of background groundwater quality or apply the statistical methodologies proposed in the Groundwater Monitoring Plan (GMP). For simplicity, "GWPS" will be used hereafter in discussing potential exceedances. Exceedances will be determined following IEPA approval of the GMP.

Arsenic concentrations in these downgradient uppermost aquifer wells ranged from non-detect (at a reporting limit of 0.001 mg/L) to 0.041 mg/L. Arsenic concentrations in the background uppermost aquifer well noted above ranged from non-detect to 0.02 mg/L. Arsenic was not detected during 2021 groundwater monitoring events.

No LCU or DA monitoring wells had concentrations greater than the arsenic GWPS.

4.2.2 Boron

Boron is a primary indicator parameter for CCR leachate impacts on groundwater quality. Boron has been detected consistently at concentrations greater than the GWPS (2 mg/L) at eight downgradient uppermost aquifer wells (G301, G302, G303, G304/G307, G305, G308, G311, and G313) and infrequently at two downgradient uppermost aquifer wells (G309 and G312). Boron was also frequently detected at concentrations greater than the GWPS at background uppermost aquifer monitoring well G306. Boron concentrations observed at the downgradient uppermost aquifer wells listed above ranged from 0.28 to 3.5 mg/L, excluding one event at G309 where the boron concentration was 7.5 mg/L. Boron concentrations in the background uppermost aquifer well ranged from 2.3 to 3.5 mg/L.

No LCU or DA monitoring wells had concentrations greater than the boron GWPS.

4.2.3 Cadmium

Cadmium was detected at concentrations greater than the GWPS (0.005 mg/L) during two events in one downgradient uppermost aquifer well (G304/G307). Cadmium concentrations in G304/G307 ranged from non-detect (at a reporting limit of 0.001 mg/L) to 0.027 mg/L. Cadmium was not detected at concentrations greater than the GWPS during 2021.

No LCU or DA monitoring wells had concentrations greater than the cadmium GWPS.

4.2.4 Chromium

Chromium was detected at concentrations greater than the GWPS (0.1 mg/L) during one event in May 2017 in one downgradient uppermost aquifer well (G304/G307). Chromium concentration in G304/G307 ranged from non-detect (at a reporting limit of 0.004 mg/L) to 0.11 mg/L.

No LCU or DA monitoring wells had concentrations greater than the chromium GWPS.

4.2.5 Cobalt

Cobalt has been frequently detected at concentrations greater than the GWPS (0.006 mg/L) at one downgradient uppermost aquifer well (G304/G307) and occasionally at four downgradient uppermost aquifer wells (G301, G302, G303, and G305). Cobalt has also been detected at concentrations greater than the GWPS often at one background uppermost aquifer well (G306). Cobalt concentrations of the downgradient wells listed above ranged from non-detect (at a reporting limit of 0.002 mg/L) to 0.034 mg/L. Cobalt concentrations in the background well noted above ranged from non-detect to 0.02 mg/L.

Cobalt has been frequently detected at concentrations greater than the GWPS (0.006 mg/L) at one downgradient LCU well (G314). Cobalt concentrations at G314 range from non-detect (at a reporting limit of 0.002 mg/L) to 0.011 mg/L.

No DA monitoring wells had concentrations greater than the cobalt GWPS.

4.2.6 Lead

Lead has been detected at concentrations greater than the GWPS (0.0075 mg/L) often at one downgradient uppermost aquifer well (G304/G307) and occasionally at three downgradient uppermost aquifer wells (G301, G302, and G305). Lead has also been detected at concentrations greater than the GWPS often at one background uppermost aquifer well (G306). Lead concentrations in these downgradient uppermost aquifer wells ranged from non-detect (at a reporting limit of 0.001 mg/L) to 0.068 mg/L. Lead concentrations in the background uppermost aquifer well noted above ranged from non-detect to 0.028 mg/L.

Lead was detected at concentrations greater than the GWPS in downgradient LCU well G316 during the July 2021 event. Concentrations at G316 ranged from non-detect (at a reporting limit of 0.001 mg/L) to 0.014 mg/L.

No DA monitoring wells had concentrations greater than the lead GWPS.

4.2.7 Lithium

Lithium has been detected consistently at concentrations greater than the GWPS (0.04 mg/L) at one downgradient uppermost aquifer well (G303) and once at one downgradient uppermost aquifer well (G304/G307). Lithium concentrations observed at the downgradient wells listed above ranged from 0.01 to 0.1 mg/L.

No LCU or DA monitoring wells had concentrations greater than the lithium GWPS.

4.2.8 pH

Intermittently, pH has been detected at measurements less than the lower GWPS (6.5 Standard Units [SU]) in two downgradient uppermost aquifer wells (G301 and G312). Measurements of pH have ranged from 6.3 to 7.1 SU at these wells.

None of the uppermost aquifer wells had measurements greater than the upper pH GWPS.

No LCU or DA monitoring wells had measurements less than the lower pH GWPS or greater than the upper pH GWPS.

4.2.9 Radium 226 and 228 Combined

Radium 226 and 228 combined was detected at concentrations greater than the GWPS (5 picoCuries per liter [pCi/L]) in downgradient LCU well G316 during one event in May 2021. Radium 226 and 228 combined concentrations at G316 range from 0.196 to 17.5 mg/L.

No uppermost aquifer wells had concentrations greater than the radium 226 and 228 combined GWPS.

No DA monitoring wells had concentrations greater than the radium 226 and 228 combined GWPS.

4.2.10 Sulfate

Sulfate is also a primary indicator parameter of CCR leachate impacts on groundwater quality. Sulfate was consistently detected at concentrations greater than the GWPS (400 mg/L) in twelve downgradient uppermost aquifer wells (G301, G302, G303, G304/G307, G308, G309, G310, G311, G312, G313, G315, and G317) and intermittently in one downgradient uppermost aquifer well (G305). Sulfate was also detected at concentrations greater than the GWPS during one event in May 2017 at background uppermost aquifer monitoring well G306. Sulfate concentrations of the downgradient uppermost aquifer wells listed above ranged from 260 to 1,300 mg/L. Sulfate concentrations at background uppermost aquifer well G306 ranged from 5.9 to 700 mg/L.

Sulfate was frequently detected at concentrations greater than the GWPS at three downgradient LCU wells (G307D, G314, and G316). Sulfate concentrations of the downgradient LCU wells ranged from 330 to 2,400 mg/L.

Sulfate was often detected at concentrations greater than the GWPS at downgradient DA well G314D. Sulfate concentrations at G314D range from 820 to 1,100 mg/L.

4.2.11 Total Dissolved Solids

TDS was consistently detected at concentrations greater than the GWPS (1,200 mg/L) in ten downgradient uppermost aquifer wells (G303, G304/G307, G308, G309, G310, G311, G312, G313, G315, and G317) and intermittently in three downgradient uppermost aquifer wells (G301, G302, and G305). TDS concentrations of these downgradient uppermost aquifer wells ranged from 780 to 2,000 mg/L.

TDS was consistently detected at concentrations greater than the GWPS at one downgradient LCU well (G314) and frequently detected at concentrations greater than the GWPS at two downgradient LCU wells (G307D and G316). TDS concentrations of the downgradient LCU wells ranged from 1,100 to 4,000 mg/L.

TDS was occasionally detected at concentrations greater than the GWPS at downgradient DA well G314D. TDS concentrations at G314D ranged from 1,600 to 2,400 mg/L.

5. EVALUATION OF POTENTIAL RECEPTORS

5.1 Water Well Survey

A water well survey was conducted for a 1,000-meter radius around. Based on State of Illinois records obtained from the ISGS Illinois Water and Related Wells (ILWATER) Map[1] there are twelve water wells located within 1,000 meters of AP1. These included four monitoring wells and eight farm/domestic wells. A map of wells in the vicinity of AP1 is presented in **Appendix B**.

5.2 Surface Water

A search was performed utilizing the United States Fish and Wildlife Service (USFWS) Wetlands Mapper[2] and the USGS National Map [3] for surface water bodies within 1,000 meters of AP1. The predominant surface water body in the region is Coffeen Lake and associated tributaries. Coffeen Lake consists of two lobes which are located approximately 1,300 feet west, 3,700 feet south, and 150 feet east and downgradient from AP1. A USGS stream gage (USGS 05593900) for the East Fork Shoal River near Coffeen, Illinois is located 6.5 miles north and east (upstream) of CPP.

Additional surface waters indicated in the USFWS Wetland Mapper and USGS National Map include several man-made freshwater ponds ranging from 0.2 to 4.8 and two emergent wetlands, one 0.2 acres and northeast and one 1.6 acres and east of AP1. A map of wetlands and surface waters in the vicinity of AP1 is presented in **Appendix B**.

The USGS National Map places CPP within the Shoal Creek watershed (HUC 07140203), which is part of the Middle Kaskaskia River Watershed.

A Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for Montgomery County, Illinois (Map No. 170992 0009 A, effective: January 9, 1981) is available in **Appendix G**. AP1 does not occur within the special flood hazard zones identified on the 1981 FEMA map. The flood hazard areas shown on the map are defined as those areas subject to inundation by the 1 percent annual chance flood (*i.e.,* 100-year flood), also known as the base flood, that has a 1 percent chance of being equaled or exceeded in any given year.

5.3 Nature Preserves, Historic Sites, Endangered/Threatened Species

A comprehensive search of the IDNR Natural Heritage Database[4] for natural areas and protected areas within 1,000 meters of the AP1 was performed. No natural or protected areas within the IDNR database were identified within 1,000 meters of the AP1. A list of sites identified at the county level is found in **Appendix B**.

The IDNR Natural Heritage Database Threatened and Endangered Species by County[5] lists eleven threatened and endangered species as located within Montgomery County, including

[1] ISGS ILWATER Map: https://prairieresearch.maps.arcgis.com/apps/webappviewer/index.html?id=e06b64ae0c814ef3a4e43a191cb57f87
[2] USFWS Wetlands Mapper: https://www.fws.gov/wetlands/data/mapper.html
[3] USGS National Map: https://apps.nationalmap.gov/viewer/
[4] IDNR Natural Heritage Database: https://www2.illinois.gov/dnr/conservation/NaturalHeritage/Pages/NaturalHeritageDatabase.aspx
[5] Illinois Threatened and Endangered Species by County: https://www2.illinois.gov/dnr/ESPB/Documents/ET_by_County.pdf

six endangered and five threatened species. Habitats for endangered or threatened species are identified at the county level only.

Additionally, a search of the IDNR Historic Preservation Division[6] database for historic sites in the vicinity of the Site yielded six results at the county level located within Montgomery County. Four of these sites were identified from the Illinois Natural Areas Inventory and two were identified from the Illinois Nature Preserves list. None of these sites fall within 1,000 meters of AP1. The Illinois State Archaeological Survey (ISAS)[7] databases that do not require credentials to access were also searched and yielded no results within 1,000 meters of AP1.

[6] IDNR Historic Preservation Division: https://www2.illinois.gov/dnrhistoric/Pages/default.aspx

[7] ISAS: https://www.isas.illinois.edu/

6. CONCLUSIONS

Based on extensive site investigation and monitoring, AP1 has been characterized and a detailed site conceptual model has been developed. Results of these hydrogeologic studies were summarized and updated to include geologic, hydrogeologic, and groundwater quality data collected with a focus on AP1 (Part 845 regulated CCR Unit and subject of this HCR).

Results of these hydrogeologic studies were reintroduced in this HCR and updated to include geologic, hydrogeologic, and groundwater quality data collected with a focus on AP1 (Part 845 regulated CCR Unit and subject of this HCR). The data were summarized and evaluated for changes in groundwater conditions since the previous investigations; available groundwater quality data for AP1 collected from 2015 to present was compared to the Part 845 Standards.

The results of the hydrogeologic and groundwater quality evaluation are:

- There are eight principal unlithified units above the bedrock in the vicinity of AP1, these include the following in descending order:
  - **CCR**: CCR consisting of fly ash and bottom ash is present within AP1 and non-CCR fill material consisting of silt, clay, and sand comprises the berms surrounding AP1.
  - **Loess Unit**: Clays and silts, including undifferentiated Roxana Silt and Peoria Silt with thicknesses ranging from 1 to 16 feet, where present.
  - **Hagarstown Member**: The Hagarstown Member (consisting of gravelly clay till and sandy materials in contact with the Vandalia Member (also referred to as Hagarstown Beds) which has been subdivided into two units: the first unit consists of the gravelly clay till, and the second unit consists of sandy material overlying the Vandalia Member. The Upper Hagarstown Member is up to 6 feet thick, while the sandy portions, where present, are generally less than 3 feet thick.
  - **Vandalia Member**: Sandy, silt till, or clay till that is generally greater than 15 feet thick.
  - **Mulberry Grove Member**: Gray silt and sandy silt/clay unit found between the Vandalia Till and the Smithboro Till. Generally thin and not laterally continuous across the Site.
  - **Smithboro Member**: Thick, gray compacted silty clay diamicton.
  - **Yarmouth Soil**: Sand and sandy silt/clay, which include accretionary deposits of fine sediment and organic materials, typically less than 5 feet thick and not laterally continuous.
  - **Lierle Clay Member**: Clay and silt with some sand which is the upper portion of the Banner Formation. No borings advanced on site penetrated the full thickness of the Lierle Clay.
  - **Bedrock:** Was not encountered in any deep borings advanced at AP1.
- Unlithified materials, described above, in the vicinity of the CPP were categorized into hydrostratigraphic units for this HCR. In addition to the CCR Unit, the hydrostratigraphic units occur in the following order (from surface downward) and include:

- **UCU**: Composed of the Loess Unit and clayey portions of the Hagarstown Formation which are classified as silts to clayey silts and gravelly clay below the surficial soil. The UCU has been eroded east of AP1, near the Unnamed Tributary.
- **Uppermost Aquifer:** The uppermost aquifer is the Hagarstown Member which is classified as primarily sandy to gravelly silts and clays with thin beds of sands. Similar to the Loess Unit, the Hagarstown is also absent in some locations near the Unnamed Tributary.
- **LCU:** Comprised of the Vandalia Member, Mulberry Grove Member, and Smithboro Member. These units include a sandy to silty till with thin, discontinuous sand lenses, a discontinuous and limited extent sandy silt which has infilled prior erosional features, and silty to clayey diamicton, respectively.
- **DA:** Sand and sandy silt/clay units of the Yarmouth Soil, which include accretionary deposits of fine sediment and organic materials, typically less than 5 feet thick and discontinuous across the Site.
- **DCU:** Comprised of the Banner Formation, generally consists of clays, silts, and sands. The Lierle Clay Member is the upper layer of the Banner Formation which was encountered at the Site.

- The elevations of water within AP1 are greater than the surrounding areas; however, approximately 8 to 10 feet of UCU is present beneath AP1 and water elevation within AP1 does not vary coincidentally with surrounding groundwater elevations. Based on historic topographic maps, ash may have been placed as low as 595 to 600 feet NAVD88 in the northeast corner of AP1. Groundwater elevations may be above the base of ash in this area.
- Groundwater flow within the uppermost aquifer is divided towards the two lobes of Coffeen Lake. The groundwater divide runs approximately through the center of the CPP property, with groundwater east of the divide flowing east to southeast towards the Unnamed Tributary or the eastern lobe and groundwater west of the divide flowing west to southwest towards the western lobe. Groundwater flows north to northeast across AP1.
- Vertical gradients measured near the site indicate downward flow from the uppermost aquifer to the LCU and DA. The LCU in locations without the uppermost aquifer and the DA have been identified as PMPs due to the presence of downward gradients and also the relatively higher hydraulic conductivities measured in the DA.
- Historically coal mines were operated at depth below the Site. Mine shafts, processing facilities and historic coal storage associated with these mines were located south of AP1.
- As determined by the detailed geologic information provided for AP1, and the hydrogeologic and groundwater quality data, groundwater within the uppermost aquifer at the AP1 is classified as Class I - Potable Resource Groundwater.
- Potential exceedances of 35 I.A.C. § 845.600 GWPSs were detected in monitoring wells downgradient of AP1 in the various hydrostratigraphic units as follows:
  - Arsenic in downgradient uppermost aquifer wells G302, G303, and G304/G307. Arsenic was also detected in upgradient uppermost aquifer well G306.

- Boron in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G311, and G313. Boron was also detected in upgradient uppermost aquifer well G306.
- Cadmium in downgradient uppermost aquifer well G304/G307.
- Chromium in downgradient uppermost aquifer well G304/G307.
- Cobalt in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, and G305; and in downgradient LCU well G314. Cobalt was also detected in upgradient uppermost aquifer well G306.
- Lead in downgradient uppermost aquifer wells G301, G302, G303, G304/G307 and G305; and in downgradient LCU well G316. Lead was also detected in upgradient uppermost aquifer well G306.
- Lithium in downgradient uppermost aquifer wells G303 and G304/G307.
- pH (lower limit) in downgradient uppermost aquifer wells G301 and G312.
- Radium 226 and 228 combined in downgradient LCU well G316.
- Sulfate in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G309, G310, G311, G312, G313, G315, and G317; in downgradient LCU wells G307D, G314, and G316; and in downgradient DA well G314D. Sulfate was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well G306.
- TDS in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G309, G310, G311, G312, G313, G315, and G317; in downgradient LCU wells G307D, G314, and G316; and in downgradient DA well G314D. Sulfate was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well G306.

Groundwater results are considered potential exceedances because they were compared directly to the standard and did not include an evaluation of background groundwater quality or apply the statistical methodologies proposed in the GMP.

This HCR satisfies Part 845 content requirements specific to 35 I.A.C. § 845.620(b) (Hydrogeologic Site Characterization) for AP1 at the CPP.

7. REFERENCES

AECOM, 2016. *History of Construction. Coffeen Power Station, Coffeen, Illinois*. Illinois Power Generating Company. October 2016.

Fetter, C.W., 2001. *Applied Hydrogeology*. 4th Edition, Prentice Hall, Upper Saddle River, p. 79.

Haley & Aldrich, Inc., October 1, 2018. *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*.

Hansel, A.K., and W.H. Johnson, 1996. *Wedron and Mason Groups: Lithostratigraphic Reclassification of Deposits of the Wisconsin Episode, Lake Michigan Lobe Area*. Illinois State Geological Survey, Bulletin 104, 116 p.

Hanson Professional Services, Inc. (Hanson), 2009. *Section 3: Hydrogeologic Investigation. Initial Facility Report*. Hanson Professional Services, Inc. August 2009.

Hanson Professional Services, Inc. (Hanson), 2016. 40 CFR 257.60 *Uppermost Aquifer Considerations, Gypsum Pond*, Illinois Power Holdings LLC, Coffeen Energy Center, Montgomery County, Illinois, April 2016.

Herzog, B.L., B.J. Stiff, C.A. Chenoweth, K.L. Warner, J.B. Sieverling, and C. Avery, 1994. *Buried Bedrock Surface of Illinois*. Illinois State Geological Survey map, scale 1:500,000.

Hillsboro, 2021. *Consumer Confidence Report*. Hillsboro Water Department. Accessed from URL: https://hillsboroillinois.net/water-department/

Illinois Department of Natural Resources (IDNR), 2014. *Coffeen Lake State Fish and Wildlife Area*. Illinois Office of Communication and Information, IOCI 0625-14. Accessed from URL: https://www2.illinois.gov/dnr/publications/Documents/00000068.pdf

Illinois Department of Natural Resources (IDNR) Natural Heritage Database, 2020. *Illinois Threatened and Endangered Species by County as of December 2020*. Accessed from URL: https://www2.illinois.gov/dnr/ESPB/Documents/ET%20List%20Review%20and%20Revision/Illinois%20Threatened%20and%20Endangered%20Species%20by%20County.pdf

Illinois Department of Natural Resources (IDNR), 2021. *Natural Heritage Database, Natural and Protected Areas*. Accessed from URL: https://www2.illinois.gov/dnr/conservation/NaturalHeritage/Pages/NaturalHeritageDatabase.aspx

Illinois Department of Natural Resources (IDNR), 2021*. Historic Preservation Division, Database for Historic Sites*. Accessed from URL: https://www2.illinois.gov/dnrhistoric/Pages/default.aspx

Illinois Environmental Protection Agency (IEPA), 2021. *In the Matter of: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Title 35 Illinois Administration Code 845, Addendum*. April 15, 2021.

Illinois State Archaeological Survey (ISAS), 2021. Public database. Accessed from URL: https://www.isas.illinois.edu/

Illinois State Geological Survey (ISGS), 2019. *Directory of Coal Mines in Illinois, Christian County*. Accessed from URL: https://wikiimage.isgs.illinois.edu/ilmines/webfiles/mines-series/mines-directories/pdf-files/mines-directory-christian.pdf. August 2019.

Illinois State Geological Survey (ISGS), 2020. *ILSTRAT: The Online Handbook of Illinois Stratigraphy*. Accessed from URL: https://ilstratwiki.web.illinois.edu/wiki/Main_Page.

Illinois State Geological Survey (ISGS), 2021. *Illinois Water & Related Wells Map (ILWATER)*. Accessed from URL: https://prairie-research.maps.arcgis.com/apps/webappviewer/index.html?id=e06b64ae0c814ef3a4e43a191cb57f87

Kolata, D.R., 2005. *Bedrock Geology of Illinois*. Illinois State Geological Survey map, scale 1:500,000.

Leighton, M.M., George E. Ekblaw, and Leland Horberg, 1948. *Physiographic Divisions of Illinois.* The Journal of Geology, vol. 56, no. 1, pp. 16-33.

Natural Resource Technology, Inc. (NRT), 2017. *Hydrogeologic Site Characterization Report. Ash Pond 2, Coffeen Power Station, Coffeen, Illinois*. Illinois Power Generating Company. January 24, 2017.

Natural Resource Technology, Inc., an OBG Company (NRT/OBG), 2017. *Hydrogeologic Monitoring Plan. Coffeen Ash Pond No. 1 – CCR Unit ID 101, Coffeen Ash Pond No. 2 – CCR Unit ID 102, Coffeen GMF Gypsum Stack Pond – CCR Unit ID 103, Coffeen GMF Recycle Pond – CCR Unit ID 104, Coffeen Landfill – CCR Unit ID 105. Coffeen Power Station, Coffeen, Illinois*. Illinois Power Generating Company. October 17, 2017.

Nelson, W. John, 1995. *Structural Features in Illinois*. Illinois State Geological Survey, Bulletin 100, 144 p.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. *Groundwater Monitoring Plan. Coffeen Power Plant, Ash Pond No. 1, Coffeen, Illinois*. Illinois Power Generating Company. October 25, 2021.

Selkregg, L.F., Wayne A. Pryor, and John Kempton, 1957. *Groundwater Geology in South-Central Illinois*. Illinois State Geological Survey and Illinois State Water Survey. Circ. 225, 1957, 92 p.

United States Fish and Wildlife Service (USFWS), 2021. *Wetlands Mapper*. Accessed 2021 from URL: https://www.fws.gov/wetlands/data/mapper.html

United States Geological Survey (USGS), 2010. *Data Release for the 2014 National Seismic Hazard Model for the Conterminous U.S*. December 17, 2019. Accessed from URL: https://www.sciencebase.gov/catalog/item/5db9be62e4b06957974eb5ca

United States Geological Survey (USGS), 2021. *National Water Information System data available on the World Wide Web (Peak Streamflow for Illinois, USGS 05593900, East Fork Shoal Creek Near Coffeen, IL)*. Accessed July 2, 2021 at URL: https://waterdata.usgs.gov/nwis/dv?cb_00060=on&cb_00065=on&format=gif_default&site_no=05593900&referred_module=sw&period=&begin_date=2018-01-01&end_date=2021-03-30

United States Geological Survey (USGS), 2021. *National Map*. Accessed from URL: https://apps.nationalmap.gov/viewer/

Willman, H.B., and J.C. Frye, 1970. *Pleistocene Stratigraphy of Illinois.* Illinois State Geological Survey, Bulletin 94, 204 p.

Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon, 1975*. Handbook of Illinois Stratigraphy.* Illinois State Geological Survey, Bulletin 95, 261 p.

Zeizel, A.J., 1959. *Geologic Report on the Ground-Water Geology at Fillmore, Sections 23 and 26, T8N., R2W., Montgomery County*. Illinois State Geological Survey, Open File Report.

Zuehls, E.E., K.K. Fitzgerald, and C.A. Peters, 1984. *Hydrology of Area 28, Eastern Region, Interior Coal Province, Illinois.* United State Geological Survey, Water Resources Investigations, Open File Report, 67 p.

TABLES

TABLE 2-1. GEOTECHNICAL DATA SUMMARY

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample ID	Field Location ID	Top of Sample (ft bgs)	Bottom of Sample (ft bgs)	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Calculated Porosity [1] (%)	Vertical Hydraulic Conductivity (cm/s)	LL	PL	PI	USCS	Gravel (%)	Sand (%)	Fines (%)
Loess Unit															
G307D/Comp 1	G307D	4	12.8	19.4	107.5	2.59	33.5	--	33	16	17	CL	0	33	67
G307D, ST5	G307D	8	10	21.6	105.0	--	--	4.8E-08	--	--	--	CL/CH	--	--	--
G311D/Comp 1	G311D	4	22 **	16.5	115.7	2.64	29.8	--	31	13	18	CL	0	35	65
G311D, ST4	G311D	6	8	19.0	107.5	--	--	2.9E-08	--	--	--	CL	--	--	--
G314D/Comp 1	G314D	4.2	17	16.5	113.6	2.61	30.2	--	29	14	15	CL	0	34	66
Hagarstown Member															
G307D/Comp 2	G307D	12.8	14	19.2	--	2.59	--	--	NP	NP	NP	SW	14	79	7
G311D/Comp 2	G311D	12	14	11.4	126.8	2.68	24.2	--	18	13	5	SM	0	65	35
G314D/Comp 2	G314D	17.3	21.6	12.2	123.4	2.64	25.1	--	29	14	15	CL	0	28	72
Vandalia Member															
G307D/Comp 3	G307D	18	34.9	8.7	131.6	2.60	18.9	--	19	13	6	SP-SM	0	44	56
G311D/Comp 3	G311D	18 **	42	11.4	124.8	2.61	23.4	--	30	15	15	CL	0	28	72
G311D, ST14	G311D	28	30	16.2	116.7	--	--	5.5E-08	--	--	--	CL	--	--	--
G314D/Comp 3	G314D	21.8	45.5	14.6	115.7	2.56	27.6	--	31	15	16	CL	0	26	74
Smithboro Member															
G307D/Comp 4	G307D	40	54	15.6	115.7	2.61	29.0	--	30	15	15	CL	0	28	72
G307D, ST22	G307D	42	44	15.0	118.8	--	--	3.7E-07	--	--	--	CL	--	--	--
G311D/Comp 4	G311D	44	52	15.5	114.2	2.56	28.5	--	30	16	14	CL	0	26	74
G314D, ST18	G314D	37	39	16.6	115.0	--	--	3.0E-07	--	--	--	CL	--	--	--
Yarmouth Soil															
G314D/Comp 4	G314D	46	47	14.9	--	2.61	--	--	--	--	--	SP-SM	0	84	16
Lierle Clay															
G307D/Comp 5	G307D	54	60	8.7	134.6	2.67	19.2	--	47	18	29	CL	0	20	80
G311D/Comp 5	G311D	52	60	18.9	108.0	2.59	33.2	--	37	17	20	CL	0	19	81
G314D/Comp 5	G314D	47.8	52	17.5	109.6	2.58	31.9	--	43	18	25	CL	0	24	76
G314D/Comp 6	G314D	52.2	62.9	13.6	120.2	2.64	27.0	--	37	18	19	CL	0	19	81
Banner Formation															
G314D/Comp 7	G314D	73.9	82.5	14.0	120.3	2.64	27.0	--	29	19	10	CL	0	16	84
G314D/Comp 8	G314D	93.5	100.3	8.5	123.6	2.73	27.4	--	35	19	16	CL	0	16	84

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TABLE 2-1. GEOTECHNICAL DATA SUMMARY
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample ID	Field Location ID	Top of Sample (ft bgs)	Bottom of Sample (ft bgs)	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Calculated Porosity [1] (%)	Vertical Hydraulic Conductivity (cm/s)	LL	PL	PI	USCS	Gravel (%)	Sand (%)	Fines (%)
CCR															
XPW02 Bulk	XPW02	0	17.7	12.5	110.8	2.60	31.7	8.8E-05	--	--	--	Bottom Ash	0	90	10

[O:KLT, QC: FPO][U: FPO, QC:KLT 8/9/21][U:KLT 8/13/21, C:EDP 8/30/21]

Notes:
[1] Porosity calculated as relationship of bulk density (p_b) to particle density (p_d) (n = 100[1- (p_b/p_d)])
-- = not analyzed
% = Percent
** = not all sampled in the noted interval were included in this composite sample
bgs = below ground surface
cm/s = centimeters per second
ft = foot/feet
LL = Liquid limit
NP = Non Plastic
pcf = pounds per cubic foot
PI = Plasticity Index
PL = Plastic Limit

USCS = Unified Soil Classification System
CH = Fat Clay
CL = Lean Clay
ML = Silt
SC = Clayey Sand
SM = Silty Sand
SP-SM = Poorly Graded-Sand with Silt

TABLE 2-2. ASH ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Depth (ft BGS)	Sample Date	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Chloride (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Fluoride (mg/kg)	Lead (mg/kg)	Lithium (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Selenium (mg/kg)	Sulfate (mg/kg)	Thallium (mg/kg)
XPW01	0-8	02/08/2021	<2.7	6.9	710	1.9	110	0.96	<10	41	4.8	<2.5	4.7	18	<0.18	7	7.5	450	<0.91
XPW02	0-8	02/08/2021	<2.8	<0.93	850	1.6	70	<0.93	<10	24	4.3	<2.5	1.3	20	<0.19	2.5	<0.93	85	<0.93

Notes:
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method.
BGS = below ground surface
ft = feet
mg/kg = milligrams per kilogram

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TABLE 2-3. POREWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)
XPW01	03/30/2021	<0.003	0.002	0.043	<0.001	2.4	<0.001	280	13	<0.004	<0.002	0.791	<0.001	0.037	<0.0002	0.082	8.0	0	<0.001	820	<0.001
XPW01	04/22/2021	<0.003	0.0011	0.035	<0.001	2.4	<0.001	270	17	<0.004	<0.002	0.396	<0.001	0.039	<0.0002	0.078	7.8	0.0477	<0.001	860	<0.001
XPW01	05/05/2021	<0.003	0.0017	0.033	<0.001	2.5	<0.001	290	17	<0.004	<0.002	0.77	<0.001	0.032	<0.0002	0.078	8.0	0.169	<0.001	850	<0.001
XPW01	05/18/2021	<0.003	0.0017	0.032	<0.001	2.5	<0.001	270	15	<0.004	<0.002	0.846	<0.001	0.035	<0.0002	0.079	8.0	0.447	<0.001	820	<0.001
XPW01	06/14/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.21	--	--	--
XPW01	06/28/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.15	--	--	--
XPW01	07/27/2021	<0.003	0.0014	0.031	<0.001	2.9	<0.001	250	13	<0.004	<0.002	0.799	<0.001	0.038	<0.0002	0.062	8.1	--	<0.001	740	<0.001
XPW02	03/30/2021	<0.003	0.0034	0.11	<0.001	2.4	<0.001	210	17	<0.004	<0.002	0.551	<0.001	0.057	<0.0002	0.024	7.9	0.0969	0.0013	570	<0.001
XPW02	04/22/2021	<0.003	0.0017	0.089	<0.001	2.2	<0.001	220	17	<0.004	<0.002	<0.25	<0.001	0.06	<0.0002	0.024	8.0	0.203	<0.001	620	<0.001
XPW02	05/05/2021	<0.003	0.0035	0.11	<0.001	2.4	<0.001	230	17	<0.004	<0.002	0.56	<0.001	0.059	<0.0002	0.02	7.9	0.0971	<0.001	610	<0.001
XPW02	05/19/2021	<0.003	0.0023	0.089	<0.001	2.4	<0.001	220	1.5	<0.004	<0.002	<0.25	<0.001	0.066	<0.0002	0.016	8.1	0.387	<0.001	650	<0.001
XPW02	06/14/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.593	--	--	--
XPW02	06/28/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.29	--	--	--
XPW02	07/27/2021	<0.003	0.002	0.083	<0.001	2.4	<0.001	210	14	<0.004	<0.002	0.643	<0.001	0.061	<0.0002	0.025	8.2	--	<0.001	600	<0.001

Notes:
Field readings are reported with as many significant figures as provided by analytical laboratory.
-- = data not available
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method.
mg/L = milligrams per liter
pCi/L = picocuries per liter
SU = standard units

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TABLE 2-4. SOIL ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Geologic Unit	Sample Depth (ft BGS)	Sample Date	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron (mg/kg)	Cadmium (mg/kg)	Chloride (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Fluoride (mg/kg)	Lead (mg/kg)	Lithium (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Selenium (mg/kg)	Sulfate (mg/kg)	Thallium (mg/kg)
G307D	Loess Unit/Hagarstown Member	4-12.8	02/09/2021	<2.6	7.5	150	<0.86	<8.6	1.2	<10	9.5	25	3.1	15	<4.3	<0.17	1.3	<0.86	220	<0.86
G307D	Hagarstown Member	12.8-14	02/09/2021	<2	1.7	10	<0.66	<6.6	<0.66	19	3.8	1.4	<2.5	3.3	<3.3	<0.13	<0.66	<0.66	170	<0.66
G307D	Vandalia Till Member	18-34.9	02/09/2021	<2.6	2.9	20	<0.87	<8.7	<0.87	<10	8.5	4.5	<2.5	5.9	10	<0.17	<0.87	<0.87	30	<0.87
G307D	Smithboro Till Member	40-54	02/09/2021	<2.8	5.7	93	<0.93	<9.3	<0.93	<10	10	7.1	4.2	7.7	7.1	<0.19	1.4	<0.93	<10	<0.93
G307D	Lierle Clay	54-60	02/09/2021	<2.4	4.2	110	<0.79	<7.9	<0.79	<10	8.5	6	6.8	7.2	6.8	<0.16	<0.79	<0.79	<10	<0.79
G311D	Loess Unit/Hagarstown Member/Vandlia Till Member	4-22	02/05/2021	<3	3.2	57	<1	<10	<1	<1	10	3.1	<0.25	8.1	<5	<0.2	<1	<1	2.3	<1
G311D	Hagarstown Member	12-14	02/05/2021	<3.2	3.5	44	<1.1	<11	<1.1	<1	8	4	<0.25	5.4	6.4	<0.21	1.2	<1.1	<1	<1.1
G311D	Vandalia Till Member	18-42	02/05/2021	<3	2.8	69	<1	<10	<1	<1	10	5	<0.25	6.9	8.4	<0.2	1.2	<1	<1	<1
G311D	Smithboro Till Member	44-52	02/05/2021	<2.8	3.2	90	<0.95	<9.5	<0.95	<1	12	5.9	<0.25	8.7	10	<0.19	1.3	<0.95	<1	<0.95
G314D	Soil/Vandalia Till Member	4.2-17	02/10/2021	<2.8	1.3	63	<0.93	<9.3	<0.93	<10	8.7	<1.9	<2.5	5.5	<4.6	<0.19	<0.93	<0.93	76	<0.93
G314D	Vandalia Till Member	17.3-21.6	02/11/2021	<3	2.7	27	<1	<10	<1	<10	9.9	5.2	<2.5	7.3	9.1	<0.2	1.2	<1	210	<1
G314D	Vandalia Till Member/Smithboro Till Member	21.8-45.5	02/11/2021	<2.4	3.8	140	<0.8	<8	<0.8	<10	25	10	3.1	11	28	<0.16	<0.8	0.98	<10	<0.8

Notes:
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method.
BGS = below ground surface
ft = foot or feet
mg/kg = milligrams per kilogram

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TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G045D	LCU	08/17/2016	623.81	623.81	Top of PVC	620.94	31.88	41.52	589.06	579.42	41.92	578.90	9.6	2	39.064349	-89.396281
G046D	LCU	08/19/2017	625.24	625.24	Top of PVC	621.91	41.61	51.26	580.30	570.65	51.65	569.90	9.7	2	39.060305	-89.398524
G101	UA	02/02/2010	--	627.60	Top of Disk	625.27	15.68	20.32	609.59	604.95	20.89	603.40	4.6	2	39.071386	-89.400107
G102	UA	04/28/2006	--	629.04	Top of Disk	626.18	12.02	16.78	614.16	609.40	17.15	609.00	4.8	2	39.071387	-89.398991
G103	UA	02/15/2010	--	633.80	Top of Disk	627.94	15.88	20.67	612.06	607.27	21.09	606.90	4.8	2	39.070412	-89.399107
G104	UA	02/15/2010	--	632.94	Top of Disk	627.96	14.91	19.61	613.05	608.35	20.08	605.80	4.7	2	39.069451	-89.399104
G105	UA	02/16/2010	--	632.08	Top of Disk	626.86	16.11	20.90	610.75	605.96	21.37	604.40	4.8	2	39.068491	-89.3991
G106	UA	02/16/2010	--	631.15	Top of Disk	625.96	14.37	18.96	611.59	607.00	19.44	605.50	4.6	2	39.06753	-89.399097
G107	UA	02/17/2010	630.22	630.22	Top of Disk	628.20	13.87	18.50	614.33	609.70	19.00	607.50	4.6	2	39.067106	-89.399646
G108	UA	02/12/2010	--	630.22	Top of Disk	625.58	16.82	21.50	608.76	604.08	22.00	603.60	4.7	2	39.066984	-89.400035
G109	UA	02/11/2010	--	629.76	Top of Disk	624.79	15.39	19.93	609.40	604.86	20.50	604.30	4.5	2	39.067045	-89.400423
G110	UA	02/11/2010	--	629.65	Top of Disk	624.81	15.05	19.59	609.76	605.22	20.16	604.70	4.5	2	39.067172	-89.400704
G111	UA	02/11/2010	--	629.90	Top of Disk	625.28	14.61	19.15	610.67	606.13	19.72	605.60	4.5	2	39.067292	-89.40097
G119	UA	02/09/2010	--	631.55	Top of Disk	626.57	17.29	21.83	609.28	604.74	22.38	604.20	4.5	2	39.068986	-89.401213
G120	UA	02/08/2010	--	631.87	Top of Disk	627.21	15.10	19.62	612.11	607.59	20.21	605.10	4.5	2	39.069479	-89.401214
G121	UA	02/04/2010	--	632.83	Top of Disk	627.94	16.79	21.47	611.15	606.47	21.95	603.80	4.7	2	39.069781	-89.401216
G122	UA	02/04/2010	--	632.69	Top of Disk	628.05	16.51	21.05	611.54	607.00	21.66	606.20	4.5	2	39.070098	-89.401218
G123	UA	02/04/2010	--	632.96	Top of Disk	628.12	20.94	25.46	607.18	602.66	26.07	602.10	4.5	2	39.070399	-89.401219
G124	UA	02/03/2010	--	633.39	Top of Disk	628.70	15.98	20.51	612.72	608.19	21.06	606.70	4.5	2	39.070715	-89.40122
G125	UA	02/03/2010	--	633.51	Top of Disk	628.85	17.03	21.56	611.82	607.29	22.04	606.80	4.5	2	39.071003	-89.401221
G126	UA	02/10/2010	--	625.39	Top of Disk	622.96	12.89	17.43	610.07	605.53	18.00	605.00	4.5	2	39.067304	-89.401274
G151	UA	12/19/2011	--	625.93	Top of Disk	622.82	15.34	19.84	607.48	602.98	20.46	602.40	4.5	2	39.0672	-89.40159
G152	UA	12/20/2011	--	626.52	Top of Disk	623.06	13.59	18.09	609.47	604.97	18.57	604.50	4.5	2	39.066275	-89.401289

TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G153	UA	12/15/2011	626.35	626.40	Top of Disk	623.23	15.90	20.34	607.33	602.89	20.80	602.50	4.4	2	39.065857	-89.402567
G154	UA	12/16/2011	--	626.35	Top of Disk	623.52	14.26	18.76	609.26	604.76	19.10	603.50	4.5	2	39.067089	-89.403574
G155	UA	12/19/2011	--	625.86	Top of Disk	622.89	15.09	19.58	607.80	603.31	23.23	599.70	4.5	2	39.067493	-89.402659
G200	UA	02/25/2008	--	625.94	Top of Disk	623.27	12.19	16.98	611.08	606.29	17.36	605.30	4.8	2	39.075139	-89.395009
G201	UA	02/25/2008	627.15	627.15	Top of Riser	624.19	13.01	17.80	611.18	606.39	18.15	606.00	4.8	2	39.075141	-89.397829
G205	UA	02/21/2008	--	624.34	Top of Disk	622.10	10.04	14.53	612.06	607.57	15.07	606.10	4.5	2	39.068596	-89.394147
G206	UA	10/14/2010	--	632.82	Top of Disk	630.53	17.51	21.92	613.02	608.61	22.42	606.50	4.4	2	39.067399	-89.398548
G206D	DA	01/25/2021	634.14	634.14	Top of PVC	631.41	49.20	59.00	582.21	572.41	59.39	571.41	9.8	2	39.067428	-89.398493
G207	UA	10/08/2010	--	633.21	Top of Disk	630.61	18.24	22.77	612.37	607.84	23.30	606.60	4.5	2	39.067568	-89.397952
G208	UA	10/07/2010	--	633.16	Top of Disk	630.57	17.53	22.06	613.04	608.51	22.60	606.60	4.5	2	39.067743	-89.397402
G209	UA	10/07/2010	--	632.91	Top of Disk	630.57	17.74	22.28	612.83	608.29	22.81	606.60	4.5	2	39.067923	-89.39685
G210	UA	10/06/2010	--	632.99	Top of Disk	630.48	19.39	23.93	611.09	606.55	24.46	605.50	4.5	2	39.068088	-89.396322
G211	UA	10/11/2010	--	632.64	Top of Disk	630.31	17.34	21.88	612.97	608.43	22.41	606.30	4.5	2	39.068263	-89.395792
G212	UA	10/11/2010	--	632.89	Top of Disk	630.59	16.74	21.29	613.85	609.30	21.81	606.60	4.6	2	39.06843	-89.395318
G213	UA	10/12/2010	--	632.81	Top of Disk	630.34	16.75	21.29	613.59	609.05	21.82	606.30	4.5	2	39.068585	-89.394822
G214	UA	10/14/2010	--	632.85	Top of Disk	630.39	17.75	22.14	612.64	608.25	22.65	606.40	4.4	2	39.068919	-89.393982
G215	UA	10/13/2010	--	633.06	Top of Disk	630.48	19.41	23.80	611.07	606.68	24.31	606.20	4.4	2	39.069309	-89.39394
G216	UA	10/13/2010	--	632.76	Top of Disk	630.28	20.04	24.42	610.24	605.86	24.93	604.30	4.4	2	39.069765	-89.393946
G217	UA	10/12/2010	--	633.10	Top of Disk	630.67	20.49	24.88	610.18	605.79	25.38	604.70	4.4	2	39.07034	-89.393959
G218	UA	10/12/2010	--	633.11	Top of Disk	630.64	20.33	24.77	610.31	605.87	25.27	604.60	4.4	2	39.070876	-89.393956
G270	UA	02/26/2008	--	625.86	Top of Disk	623.73	13.13	17.92	610.60	605.81	18.27	605.50	4.8	2	39.066564	-89.397403
G271	UA	09/10/2009	--	625.57	Top of Disk	622.89	9.96	14.31	612.93	608.58	14.79	606.90	4.4	2	39.065007	-89.395587
G272	UA	09/10/2009	--	623.81	Top of Disk	620.72	9.11	13.98	611.61	606.74	14.32	606.40	4.9	2	39.064989	-89.394785

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TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G273	UA	09/10/2009	--	623.02	Top of Disk	620.17	9.08	14.56	611.09	605.61	15.10	604.20	5.5	2	39.064985	-89.393973
G274	UA	09/16/2009	--	624.04	Top of Disk	621.67	12.90	17.67	608.77	604.00	18.06	603.60	4.8	2	39.064991	-89.393198
G275	UA	09/16/2009	--	618.26	Top of Disk	616.14	8.22	12.62	607.92	603.52	13.19	603.00	4.4	2	39.065151	-89.392561
G275D	DA	01/14/2021	620.31	620.31	Top of PVC	617.52	49.76	59.55	567.76	557.97	59.89	517.80	9.8	2	39.065121	-89.392595
G276	UA	09/16/2009	--	632.00	Top of Disk	629.14	22.41	27.22	606.73	601.92	27.65	601.10	4.8	2	39.065534	-89.392617
G277	UA	09/14/2009	--	623.08	Top of Disk	620.79	14.29	18.77	606.50	602.02	19.24	600.80	4.5	2	39.065927	-89.392572
G278	UA	09/11/2009	631.19	631.17	Top of Disk	628.85	18.93	23.70	609.92	605.15	24.06	604.80	4.8	2	39.066737	-89.393161
G279	UA	09/10/2009	--	632.04	Top of Disk	629.19	22.40	26.79	606.79	602.40	27.30	601.20	4.4	2	39.067156	-89.392998
G280	UA	02/26/2008	625.35	625.35	Top of Riser	623.11	12.79	17.63	610.32	605.48	17.98	605.10	4.8	2	39.067216	-89.394992
G281	UA	09/08/2015	--	626.36	Top of Disk	623.82	15.51	20.16	608.31	603.66	20.30	603.50	4.7	2	39.065405	-89.399322
G283	LCU	01/14/2021	610.75	610.75	Top of PVC	608.30	8.39	18.17	599.91	590.13	18.36	589.90	9.8	2	39.064645	-89.392119
G284	UA	02/03/2021	618.42	618.42	Top of PVC	615.33	8.08	12.85	607.25	602.48	13.23	601.30	4.8	2	39.065487	-89.390631
G285	LCU	01/25/2021	613.52	613.52	Top of PVC	610.54	13.68	23.45	596.86	587.09	23.83	584.50	9.8	2	39.066513	-89.391474
G286	UA	01/18/2021	613.13	613.13	Top of PVC	609.97	3.37	8.16	606.60	601.81	8.50	600.00	4.8	2	39.067277	-89.391883
G287	UA	01/20/2021	617.45	617.45	Top of PVC	614.34	5.43	10.25	608.91	604.09	10.59	602.50	4.8	2	39.068297	-89.392388
G288	UA	01/19/2021	620.07	620.07	Top of PVC	617.08	7.59	12.26	609.49	604.82	12.75	603.10	4.7	2	39.067834	-89.390082
G301	UA	09/04/2015	--	622.65	Top of Disk	620.88	11.31	15.96	608.96	604.31	16.21	604.10	4.7	2	39.05951	-89.395415
G302	UA	09/04/2015	--	620.04	Top of Disk	618.52	13.21	17.86	604.74	600.09	18.39	599.60	4.7	2	39.059544	-89.393192
G303	UA	08/26/2010	--	622.02	Top of Disk	619.33	10.00	20.00	609.07	599.07	20.40	598.70	10	2	39.057144	-89.391721
G304	UA	08/26/2010	--	626.72	Top of Disk	623.32	10.00	20.00	613.32	603.32	20.40	602.90	10	2	39.057205	-89.395663
G305	UA	05/03/2016	625.67	625.67	Top of PVC	623.23	13.44	18.27	609.10	604.27	18.50	604.10	4.8	2	39.056558	-89.396798
G306	UA	05/03/2016	625.91	625.91	Top of PVC	623.57	13.07	17.68	609.77	605.16	17.90	604.80	4.6	2	39.056494	-89.393556
G307	UA	07/27/2016	624.60	624.60	Top of PVC	624.73	12.96	17.80	609.12	604.28	18.22	603.90	4.8	2	39.057214	-89.395545

TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G307D	LCU	01/19/2021	624.88	624.88	Top of PVC	622.51	48.98	58.75	573.53	563.76	59.60	562.50	9.8	2	39.05721	-89.39552
G308	UA	01/18/2021	624.59	624.59	Top of PVC	621.59	10.10	14.89	611.49	606.70	15.24	605.80	4.8	2	39.057379	-89.397134
G309	UA	01/21/2021	625.88	625.88	Top of PVC	622.77	12.97	17.75	609.80	605.02	18.10	604.70	4.8	2	39.058508	-89.397243
G310	UA	02/09/2021	622.87	622.87	Top of PVC	619.89	10.24	15.03	609.65	604.86	15.38	604.00	4.8	2	39.059532	-89.396907
G311	UA	01/13/2021	621.04	621.04	Top of PVC	618.32	9.27	14.04	609.05	604.28	14.40	603.90	4.8	2	39.059513	-89.394363
G311D	LCU	01/12/2021	621.24	621.24	Top of PVC	618.39	50.16	60.10	568.23	558.29	60.58	557.80	9.9	2	39.059513	-89.394312
G312	UA	01/15/2021	619.78	619.78	Top of PVC	616.92	9.79	14.58	607.13	602.34	14.93	601.70	4.8	2	39.059558	-89.391983
G313	UA	02/05/2021	614.30	614.30	Top of PVC	611.51	6.30	11.11	605.21	600.40	11.46	599.50	4.8	2	39.058773	-89.391124
G314	LCU	02/05/2021	613.88	613.88	Top of PVC	611.11	14.56	19.58	596.55	591.53	20.02	591.10	5	2	39.05782	-89.390964
G314D	DA	02/04/2021	613.70	613.70	Top of PVC	610.87	39.34	49.11	571.53	561.76	49.47	510.60	9.8	2	39.057852	-89.390958
G315	UA	01/14/2021	623.52	623.52	Top of PVC	620.94	9.69	14.48	611.25	606.46	14.85	605.00	4.8	2	39.057165	-89.393667
G316	LCU	02/26/2021	602.59	602.59	Top of PVC	599.64	10.02	14.82	589.62	584.82	15.16	583.90	4.8	2	39.057847	-89.389698
G317	UA	02/12/2021	641.93	641.93	Top of PVC	638.85	30.14	34.93	608.71	603.92	35.28	602.90	4.8	2	39.056727	-89.390148
G401	UA	09/14/2015	--	625.57	Top of Disk	623.03	14.36	18.79	608.67	604.24	19.29	603.70	4.4	2	39.060259	-89.395295
G402	UA	08/27/2010	--	613.37	Top of Disk	610.36	10.00	20.00	600.36	590.36	20.40	590.00	10	2	39.060207	-89.391712
G403	UA	09/11/2015	--	626.47	Top of Disk	623.81	13.11	17.78	610.70	606.03	18.15	605.70	4.7	2	39.063167	-89.398779
G404	UA	05/01/2007	--	615.67	Top of Disk	613.57	6.42	11.17	607.15	602.40	11.62	601.60	4.8	2	39.064329	-89.392493
G405	UA	05/01/2007	--	623.63	Top of Disk	621.40	9.01	13.76	612.39	607.64	14.21	607.20	4.8	2	39.064345	-89.396234
G406	UA	08/19/2016	625.36	625.36	Top of PVC	621.86	13.56	18.37	608.30	603.49	18.75	603.10	4.8	2	39.060309	-89.398508
G407	UA	08/16/2016	621.32	621.32	Top of PVC	618.35	13.78	18.61	604.57	599.74	19.04	598.40	4.8	2	39.061574	-89.402004
G410	UA	02/23/2018	--	619.79	Top of Disk	617.21	8.89	13.68	608.32	603.53	14.09	603.10	4.8	2	39.061572	-89.403763
G411	UA	02/22/2018	--	623.25	Top of Disk	620.49	11.21	16.07	609.28	604.42	16.47	604.00	4.9	2	39.063979	-89.404033
MW01D	DA	05/03/2006	609.02	609.02	Top of PVC	607.08	33.29	38.05	573.79	569.03	38.41	567.10	4.8	2	39.067068	-89.402747

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TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW02S	UA	05/05/2006	627.12	627.12	Top of PVC	624.16	10.34	15.12	613.82	609.04	15.51	608.70	4.8	2	39.071017	-89.403648
MW02D	LCU	05/05/2006	626.99	626.99	Top of PVC	624.14	22.03	26.83	602.11	597.31	27.22	596.90	4.8	2	39.071031	-89.403649
MW03D	DA	04/27/2006	629.01	629.01	Top of PVC	625.86	52.29	57.06	573.57	568.80	57.40	567.90	4.8	2	39.071386	-89.398976
MW04S	UA	05/11/2006	625.89	625.89	Top of PVC	622.63	9.83	14.26	612.80	608.37	14.77	607.90	4.4	2	39.075356	-89.399232
MW05S	UA	05/17/2006	625.95	625.95	Top of PVC	622.65	12.66	17.41	609.99	605.24	17.71	604.90	4.8	2	39.075866	-89.40333
MW05D	DA	05/17/2006	625.91	625.91	Top of PVC	622.65	45.57	50.33	577.08	572.32	50.72	568.70	4.8	2	39.075863	-89.403313
MW06S	UA	05/04/2006	626.15	626.15	Top of PVC	623.37	11.04	15.62	612.33	607.75	16.08	607.30	4.6	2	39.078189	-89.403644
MW07S	UA	05/09/2006	627.60	627.60	Top of PVC	624.90	9.91	13.79	614.99	611.11	14.39	610.50	3.9	2	39.0786	-89.399383
MW08S	UA	05/10/2006	628.01	628.01	Top of PVC	625.09	11.51	16.00	613.58	609.09	16.60	608.00	4.5	2	39.080234	-89.399079
MW09S	UA	05/03/2006	627.62	627.62	Top of PVC	624.70	11.21	15.62	613.49	609.08	16.20	608.50	4.4	2	39.079954	-89.394899
MW09D	LCU	05/03/2006	627.61	627.61	Top of PVC	624.68	45.81	50.57	578.87	574.11	51.00	570.70	4.8	2	39.07994	-89.394899
MW10S	UA	05/02/2006	624.45	624.45	Top of PVC	621.43	11.28	15.76	610.15	605.67	16.30	605.10	4.5	2	39.07601	-89.394068
MW10D	LCU	05/01/2006	624.47	624.47	Top of PVC	621.33	41.74	46.57	579.59	574.76	47.02	572.60	4.8	2	39.075995	-89.39407
MW11S	UA	04/28/2006	625.27	625.27	Top of PVC	622.04	8.89	13.63	613.15	608.41	14.08	608.00	4.7	2	39.071888	-89.393913
MW11D	LCU	04/28/2006	625.52	625.52	Top of PVC	622.19	28.31	33.04	593.88	589.15	33.50	585.90	4.7	2	39.071888	-89.393894
MW12S	UA	05/10/2006	625.31	625.31	Top of PVC	622.24	10.61	15.18	611.63	607.06	15.61	606.60	4.6	2	39.068514	-89.394199
MW12D	DA	05/10/2006	625.21	625.21	Top of PVC	622.24	42.46	46.99	579.78	575.25	47.47	572.20	4.5	2	39.068501	-89.394199
MW13S	UA	05/09/2006	625.96	625.96	Top of PVC	622.80	11.43	16.23	611.37	606.57	16.62	606.20	4.8	2	39.066297	-89.40118
MW13D	DA	05/09/2006	625.86	625.86	Top of PVC	622.85	49.81	54.60	573.04	568.25	55.00	567.90	4.8	2	39.066293	-89.401163
MW14S	UA	05/02/2006	626.88	626.88	Top of PVC	624.62	12.26	17.02	612.36	607.60	17.38	607.20	4.8	2	39.069153	-89.400442
MW15S	UA	04/25/2006	626.66	626.66	Top of PVC	623.83	14.41	19.16	609.42	604.67	19.62	604.20	4.8	2	39.069772	-89.397088
MW15D	LCU	04/25/2006	626.44	626.44	Top of PVC	623.83	33.68	38.45	590.15	585.38	38.80	585.00	4.8	2	39.06977	-89.397073
MW16S	UA	04/25/2006	629.47	629.47	Top of PVC	626.32	14.59	19.41	611.73	606.91	19.76	606.40	4.8	2	39.073571	-89.397006

TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW16D	DA	04/25/2006	629.38	629.38	Top of PVC	626.37	45.90	50.34	580.47	576.03	50.78	575.40	4.4	2	39.073571	-89.397036
MW17S	UA	05/04/2006	630.56	630.56	Top of PVC	627.28	14.02	23.56	613.26	603.72	24.11	603.20	9.5	2	39.07715	-89.396978
MW17D	DA	05/04/2006	630.29	630.29	Top of PVC	627.47	48.82	53.32	578.65	574.15	53.87	573.60	4.5	2	39.077151	-89.396958
MW18S	UA	05/11/2006	628.66	628.66	Top of PVC	625.69	11.31	15.79	614.38	609.90	16.40	609.30	4.5	2	39.077033	-89.401698
MW20S	UA	05/01/2007	622.90	622.90	Top of PVC	620.26	8.41	13.22	611.85	607.04	13.67	604.30	4.8	2	39.064968	-89.394322
R104	UA	10/08/2010	--	632.84	Top of Disk	629.03	14.59	19.32	614.44	609.71	19.85	609.20	4.7	2	39.069474	-89.399109
R201	UA	10/08/2010	--	626.34	Top of Disk	624.02	14.59	19.32	609.43	604.70	19.85	604.20	4.7	2	39.075142	-89.397855
R205	UA	03/20/2017	--	624.52	Top of Disk	621.91	11.32	16.01	610.59	605.90	16.42	605.50	4.7	2	39.068593	-89.394164
T127	UA	02/10/2010	--	630.96	Top of Disk	625.53	17.53	22.07	608.00	603.46	22.64	602.90	4.5	2	39.068119	-89.40121
T128	UA	02/09/2010	631.03	630.93	Top of Disk	626.27	16.53	21.04	609.74	605.23	21.64	602.20	4.5	2	39.068532	-89.401211
T202	UA	10/15/2010	--	628.63	Top of Disk	626.22	12.27	16.65	613.95	609.57	17.21	608.20	4.4	2	39.071776	-89.397705
T408	LCU	08/17/2016	624.08	624.08	Top of PVC	621.09	20.66	25.49	600.43	595.60	25.92	595.20	4.8	2	39.064353	-89.396307
T409	LCU	08/19/2016	625.01	625.01	Top of PVC	621.85	21.79	26.59	600.06	595.26	26.99	594.90	4.8	2	39.0603	-89.398538
TA31	UA	10/28/2014	626.55	626.55	Top of PVC	623.89	15.09	19.57	608.80	604.32	20.19	603.70	4.5	2	39.071368	-89.401366
TA32	UA	10/27/2014	621.42	621.42	Top of PVC	618.93	11.31	15.68	607.62	603.25	16.47	602.50	4.4	2	39.074093	-89.402223
TA33	UA	06/02/2015	625.27	625.27	Top of PVC	622.51	12.23	16.89	610.28	605.62	17.44	605.10	4.7	2	39.071556	-89.403506
TA34	UA	06/03/2015	626.52	626.52	Top of PVC	624.10	10.92	15.41	613.18	608.69	16.10	608.00	4.5	2	39.069631	-89.402759
TR32	UA	07/02/2021	621.68	621.68	Top of PVC	619.28	11.00	15.68	608.28	603.60	16.17	603.11	4.68	2	39.074064	-89.397758
XPW01	CCR	01/14/2021	634.57	634.57	Top of PVC	631.85	8.21	12.98	623.64	618.87	13.36	617.90	4.8	2	39.057878	-89.396196
XPW02	CCR	02/08/2021	639.69	639.69	Top of PVC	636.64	8.05	17.85	628.59	618.79	18.20	618.40	9.8	2	39.058828	-89.395267
XSG-01	CCR	--	635.52	635.52	staff gauge	635.52	--	--	--	--	--	--	--	--	39.059128	-89.396727
SG-02	SW	--	--	605.87	Top of Prot Casing	605.87	--	--	--	--	--	--	--	--	39.059695	-89.391429
SG-03	SW	--	--	594.94	Top of Prot Casing	594.94	--	--	--	--	--	--	--	--	39.059092	-89.390342

TABLE 3-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
SG-04	SW	--	--	599.52	Top of Prot Casing	599.52	--	--	--	--	--	--	--	--	39.064146	-89.390504

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
-- = data not available
BGS = below ground surface
CCR = Coal Combustion Residual
DA = deep aquifer
ft = foot or feet
HSU = Hydrostratigraphic Unit
LCU = lower confining unit
PVC = polyvinyl chloride
SW = surface water
UA = uppermost aquifer
generated 10/05/2021, 2:17:49 PM CDT

TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Date	G405 Groundwater Elevation (ft NAVD88)	T408 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	LCU (upper)				
2/4/2017	618.47	619.46	-0.99	12.00	-0.08	up
5/13/2017	618.74	619.00	-0.26	12.00	-0.02	up
7/8/2017	618.54	619.12	-0.58	12.00	-0.05	up
10/21/2017	614.47	614.81	-0.34	12.00	-0.03	up
5/8/2018	618.94	615.82	3.12	12.00	0.26	down
8/2/2018	617.55	614.45	3.10	12.00	0.26	down
10/23/2018	616.40	616.30	0.10	12.00	0.01	down
1/15/2019	616.81	617.01	-0.20	12.00	-0.02	up
8/5/2019	617.72	617.15	0.57	12.00	0.05	down
1/20/2020	619.28	619.13	0.15	12.00	0.01	down
8/10/2020	617.62	617.38	0.24	12.00	0.02	down
1/20/2021	617.12	616.85	0.27	12.00	0.02	down
4/20/2021	617.13	616.65	0.48	12.00	0.04	down
7/26/2021	617.37	617.21	0.16	12.00	0.01	down
			Middle of screen elevation G405D			610.0
			Middle of screen elevation T408			598.0

Date	G406 Groundwater Elevation (ft NAVD88)	T409 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	LCU (upper)				
2/4/2017	617.52	615.93	1.59	8.23	0.19	down
5/13/2017	616.20	616.75	-0.55	8.23	-0.07	up
7/8/2017	616.29	617.05	-0.76	8.23	-0.09	up
10/21/2017	611.27	612.16	-0.89	8.23	-0.11	up
5/8/2018	615.47	616.02	-0.55	8.23	-0.07	up
8/2/2018	615.75	615.25	0.50	8.23	0.06	down
10/23/2018	614.11	613.96	0.15	8.23	0.02	down
1/15/2019	615.36	614.78	0.58	8.23	0.07	down
8/5/2019	616.50	615.10	1.40	8.23	0.17	down
1/20/2020	617.48	617.16	0.32	8.23	0.04	down
8/10/2020	615.54	615.43	0.11	8.23	0.01	down
1/20/2021	612.97	614.41	-1.44	8.23	-0.17	up
4/20/2021	613.78	615.33	-1.55	8.23	-0.19	up
7/26/2021	614.20	615.72	-1.52	8.23	-0.18	up
			Middle of screen elevation G406			605.9
			Middle of screen elevation T409			597.7

TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Date	T408 Groundwater Elevation (ft NAVD88)	G45D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	LCU (upper)	LCU (lower)				
2/4/2017	619.46	587.71	31.75	13.78	2.30	down
5/13/2017	619.00	586.19	32.81	13.78	2.38	down
7/8/2017	619.12	586.29	32.83	13.78	2.38	down
10/21/2017	614.81	584.69	30.12	13.78	2.19	down
5/8/2018	615.82	587.56	28.26	13.78	2.05	down
8/2/2018	614.45	585.81	28.64	13.78	2.08	down
10/23/2018	616.30	584.60	31.70	13.78	2.30	down
1/15/2019	617.01	586.96	30.05	13.78	2.18	down
8/5/2019	617.15	588.04	29.11	13.78	2.11	down
8/10/2020	617.38	614.21	3.17	13.78	0.23	down
1/20/2021	616.85	614.60	2.25	13.78	0.16	down
4/20/2021	616.65	614.32	2.33	13.78	0.17	down
7/26/2021	617.21	613.58	3.63	13.78	0.26	down
			Middle of screen elevation T408			598.0
			Middle of screen elevation G45D			584.2

Date	T409 Groundwater Elevation (ft NAVD88)	G46D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	LCU (upper)	LCU (lower)				
2/4/2017	615.93	586.06	29.87	22.19	1.35	down
5/13/2017	616.75	584.87	31.88	22.19	1.44	down
7/8/2017	617.05	585.22	31.83	22.19	1.43	down
5/8/2018	616.02	585.86	30.16	22.19	1.36	down
8/2/2018	615.25	583.95	31.30	22.19	1.41	down
10/23/2018	613.96	582.05	31.91	22.19	1.44	down
1/15/2019	614.78	583.17	31.61	22.19	1.42	down
8/5/2019	615.10	583.68	31.42	22.19	1.42	down
8/10/2020	615.43	609.00	6.43	22.19	0.29	down
1/20/2021	614.41	610.49	3.92	22.19	0.18	down
4/20/2021	615.33	611.06	4.27	22.19	0.19	down
7/26/2021	615.72	607.21	8.51	22.19	0.38	down
			Middle of screen elevation T409			597.7
			Middle of screen elevation G46D			575.5

TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Date	G307 Groundwater Elevation (ft NAVD88)	G307D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	LCU (lower)				
4/20/2021	624.50	622.48	2.02	38.06	0.05	down
5/17/2021	624.45	622.44	2.01	38.06	0.05	down
7/12/2021	624.45	622.59	1.86	38.06	0.05	down
			Middle of screen elevation G307			606.7
			Middle of screen elevation G307D			568.6

Date	G311 Groundwater Elevation (ft NAVD88)	G311D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	LCU (lower)				
3/29/2021	616.54	575.42	41.12	43.41	0.95	down
4/22/2021	613.68	575.74	37.94	43.41	0.87	down
5/3/2021	614.01	573.09	40.92	43.41	0.94	down
5/17/2021	613.86	572.40	41.46	43.41	0.96	down
6/9/2021	613.13	573.85	39.28	43.41	0.90	down
6/15/2021	612.78	575.25	37.53	43.41	0.86	down
6/23/2021	612.45	571.74	40.71	43.41	0.94	down
7/12/2021	613.75	571.63	42.12	43.41	0.97	down
7/26/2021	613.05	569.74	43.31	43.41	1.00	down
			Middle of screen elevation G311			606.7
			Middle of screen elevation G311D			563.3

TABLE 3-2. VERTICAL HYDRAULIC GRADIENTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Date	G314 Groundwater Elevation (ft NAVD88)	G314D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	LCU (upper)	DA (PMP)				
3/29/2021	596.40	572.75	23.65	29.76	0.79	down
4/20/2021	603.16	571.76	31.40	27.40	1.15	down
5/3/2021	604.66	568.77	35.89	27.40	1.31	down
5/17/2021	605.61	566.84	38.77	27.40	1.42	down
6/9/2021	607.54	567.45	40.09	27.40	1.46	down
6/14/2021	608.16	568.60	39.56	27.40	1.44	down
6/23/2021	605.19	566.77	38.42	27.40	1.40	down
7/12/2021	605.32	566.88	38.44	27.40	1.40	down
7/26/2021	606.66	566.65	40.01	27.40	1.46	down
			Middle of screen elevation G314			594.0
			Middle of screen elevation G314D			566.6

[O: KLT 6/4/21, C:YMD 6/7/21; U:KLT 8/25/21, C:EDP 8/31/21]

Notes:

[1] Distance change was calculated using the midpoint of the piezometer screen and water table surface. If the water table surface was above the top of the monitoring well screen, then distance change was calculated using the midpoint of both screens.

[2] Vertical gradients between ±0.0015 are considered flat, and typically have less than 0.02 foot difference in groundwater elevation between wells.

- - = no data collected on date / no vertical gradient calculated
DA = deep aquifer
dh = head change
dl = distance change
ft = foot/feet
LCU (lower) = lower confining unit (Smithboro)
LCU (upper) = lower confining unit (Vandalia)
NAVD88 = North American Vertical Datum of 1988
PMP = potential migration pathway
UA = uppermost aquifer

TABLE 3-3. FIELD HYDRAULIC CONDUCTIVITIES
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well ID	Gradient Position	Bottom of Screen Elevation (ft NAVD88)	Screen Length [1] (ft)	Field Identified Screened Material	Slug Type	Analysis Method	Falling Head (Slug In) Hydraulic Conductivity (cm/s)	Rising Head (Slug Out) Hydraulic Conductivity (cm/s)	Minimum Hydraulic Conductivity (cm/s)	Maximum Hydraulic Conductivity (cm/s)	Hydraulic Conductivity Geometric Mean (cm/s)
Uppermost Aquifer											
G301	D	604.31	4.65	(ML)s	solid	Kansas Geological Survey	1.1E-03	1.2E-03	2.6E-04	9.1E-03	2.0E-03
G303	D	599.07	10	CL	solid	Kansas Geological Survey	2.8E-04	2.6E-04			
G308	D	606.70	4.79	s(ML), s(CL), (CL)s	solid	Kansas Geological Survey	5.5E-03	1.6E-03			
G309	D	605.02	4.78	SP, s(CL), (ML)s	solid	Kansas Geological Survey	9.1E-03	8.8E-04			
G310	D	604.86	4.79	SM, s(ML)	solid	Kansas Geological Survey	7.5E-03	5.9E-03			
G311	D	604.28	4.77	s(ML), s(CL)	solid	Bouwer-Rice	1.5E-03	- -			
G312	D	602.34	4.79	s(ML), s(CL)	solid	Kansas Geological Survey	1.1E-03	1.1E-03			
G313	D	600.40	4.81	SP, s(ML), (CL)s	solid	Kansas Geological Survey	2.7E-03	3.5E-03			
G315	D	606.46	4.79	s(CL)	solid	Kansas Geological Survey	6.6E-03	5.8E-03			
Lower Confining Unit											
G307D	D	563.76	9.77	(CL)s	solid	Kansas Geological Survey	3.2E-04	1.2E-04	1.2E-04	2.3E-03	5.0E-04
G311D	D	558.29	9.94	CL	solid	Kansas Geological Survey	3.8E-04	2.1E-04			
G316	D	584.82	4.80	SP, s(ML), (CL)s	solid	Kansas Geological Survey	2.3E-03	2.3E-03			
Deep Aquifer (PMP)											
G314D	D	561.76	9.77	SP, s(CL)	solid	Bouwer-Rice	3.3E-04	2.3E-05	2.3E-05	3.3E-04	8.7E-05

[O: KLT 07/09/21; C:EDP 8/31/21]

Notes:
1. All wells are constructed from 2 inch PVC with 0.01 inch slotted screens.
- - = Test not analyzed/performed
cm/s = centimeters per second
D = downgradient
ft = foot/feet
NAVD88 = North American Vertical Datum of 1988
PMP= potential migration pathway
PVC = polyvinyl chloride

USCS = Unified Soil Classification System
CL = Lean Clay
s(CL) = Sandy Lean Clay
(CL)s = Lean Clay with Sand
s(ML) = Sandy Silt
(ML)s = Silt with Sand
SP = Poorly-Graded Sand

TABLE 3-4. HORIZONTAL HYDRAULIC GRADIENTS AND GROUNDWATER FLOW VELOCITIES
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

$\mathbf{V = K\,i\ /\ n_e}$

V = Groundwater Velocity
K = Hydraulic Conductivity [1]
i = hydraulic gradient
n_e = Effective Porosity [2]

Across Ash Pond No. 1 (G308 to G301)

Distance between Wells (ft): 920
Hydraulic Conductivity (ft/day): 6.80
Effective Porosity (%): 14 Assumes: Silt and Clay

Date	G308 Elevation (ft NAVD88)	G301 Elevation (ft NAVD88)	Change in Elevation (ft)	Horizontal Gradient (ft/ft)	Velocity (ft/day)
4/20/21-4/21/21	620.15	616.05	4.10	0.004	0.22
5/3/2021	620.04	616.12	3.92	0.004	0.21
5/17/2021	619.93	615.99	3.94	0.004	0.22
6/9/2021	619.17	615.63	3.54	0.004	0.19
6/23/2021	618.54	615.02	3.52	0.004	0.19
7/12/2021	620.22	615.79	4.43	0.005	0.24
7/26/2021	619.68	615.31	4.37	0.005	0.24
			Average	0.004	0.22

Across Ash Pond No. 1 (G315 to G312)

Distance between Wells (ft): 995
Hydraulic Conductivity (ft/day): 10.48
Effective Porosity (%): 14 Assumes: Silt and Clay

Date	G315 Elevation (ft NAVD88)	G312 Elevation (ft NAVD88)	Change in Elevation (ft)	Horizontal Gradient (ft/ft)	Velocity (ft/day)
3/29/2021	621.24	612.19	9.05	0.009	0.71
4/20/2021	621.05	609.11	11.94	0.012	0.93
5/3/2021	621.13	609.47	11.66	0.012	0.91
5/17/2021	621.14	609.27	11.87	0.012	0.93
6/9/2021	620.24	608.31	11.93	0.012	0.93
6/15/2021	619.70	607.64	12.06	0.012	0.94
6/23/2021	619.17	606.99	12.18	0.012	0.95
7/12/2021	620.91	608.70	12.21	0.012	0.95
7/26/2021	620.42	608.56	11.86	0.012	0.93
			Average	0.012	0.91

[O:KLT 9/16/21, C: LDC 09/17/21]

RAMBOLL

TABLE 3-4. HORIZONTAL HYDRAULIC GRADIENTS AND GROUNDWATER FLOW VELOCITIES

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Notes:

[1] Hydraulic conductivity values used above are average of the individual wells used in each velocity calculation as derived from slug tests completed in February and March 2021 by Ramboll.

[2] Effective porosity used in these calculations was derived from an average between estimated values of 0.20 for silt materials, 0.267 for gravel, 0.07 for clay, and 0.28 for sand from *Morris, D.A. and A.I. Johnson, 1967. Summary of hydrologic and physical properties of rock and soil materials as analyzed by the Hydrologic Laboratory of the U.S. Geological Survey, U.S. Geological Survey Water-Supply Paper 1839-D, 42p. and Heath, R.C., 1983. Basic ground-water hydrology, U.S. Geological Survey Water-Supply Paper 2220, 86p.* Effective porosity may be as high as maximum total porosity (50%) calculated in Table 2-1.

-- = not calculated

% = percent

ft = foot/feet

ft/day = feet per day

ft/ft = feet per foot

NAVD88 = North American Vertical Datum of 1988

NI = not installed

NM = not measured

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G281	11/20/2015	<0.003	0.0043	0.14	<0.001	<0.01	<0.001	150	74	0.011	0.0056	0.349	0.0063	0.013	<0.0002	0.0015	7.0	1.12	<0.001	300	<0.001	820
G281	02/11/2016	<0.003	<0.001	0.067	<0.001	0.01	<0.001	120	55	<0.004	<0.002	0.411	<0.001	<0.01	<0.0002	<0.001	7.1	0.622	<0.001	340	<0.001	740
G281	05/10/2016	<0.003	<0.001	0.072	<0.001	<0.01	<0.001	130	72	<0.004	<0.002	0.405	<0.001	<0.01	<0.0002	<0.001	7.0	0.218	<0.001	370	<0.001	740
G281	08/01/2016	<0.003	<0.001	0.078	<0.001	0.012	<0.001	140	70	<0.004	<0.002	0.368	0.0011	<0.01	<0.0002	<0.001	7.0	1.49	<0.001	310	<0.001	780
G281	11/16/2016	<0.003	0.001	0.081	<0.001	0.022	<0.001	110	68	<0.004	<0.002	0.263	0.0013	<0.01	<0.0002	<0.001	6.9	0.94	<0.001	310	<0.001	840
G281	02/10/2017	<0.003	<0.001	0.08	<0.001	<0.01	<0.001	120	67	<0.004	<0.002	0.27	<0.001	<0.01	<0.0002	<0.001	6.7	1.63	<0.001	310	<0.001	840
G281	05/16/2017	<0.003	<0.001	0.081	<0.001	<0.01	<0.001	130	68	<0.004	<0.002	0.308	<0.001	<0.01	<0.0002	<0.001	6.9	0.437	<0.001	330	<0.001	840
G281	07/12/2017	<0.003	0.001	0.087	<0.001	<0.01	<0.001	130	75	<0.004	<0.002	0.273	0.0013	<0.01	<0.0002	<0.001	7.0	0.36	<0.001	300	<0.001	760
G281	10/25/2017	--	--	--	--	0.012	--	110	64	--	--	0.351	--	--	--	--	7.0	--	--	300	--	800
G281	05/11/2018	<0.003	<0.001	0.081	<0.001	<0.01	<0.001	120	69	<0.004	0.0023	0.268	0.0017	<0.01	<0.0002	<0.001	7.1	--	<0.001	310	<0.001	840
G281	05/30/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.742	--	--	--	--
G281	08/03/2018	--	0.0029	0.1	--	0.013	<0.001	130	66	0.0059	0.0036	0.364	0.003	<0.01	--	<0.001	7.0	1.05	--	280	--	840
G281	01/23/2019	<0.003	<0.001	0.072	<0.001	0.013	<0.001	130	85	<0.004	<0.002	0.299	<0.001	<0.01	<0.0002	<0.001	7.0	0.333	<0.001	380	<0.001	880
G281	08/13/2019	--	0.0015	0.091	<0.001	<0.01	<0.001	140	72	0.0048	<0.002	0.546	0.0016	0.014	--	<0.001	6.9	0.879	<0.001	310	--	900
G281	01/24/2020	<0.003	<0.001	0.07	<0.001	0.011	<0.001	140	75	<0.004	<0.002	0.317	<0.001	<0.02	<0.0002	<0.001	7.3	0	<0.001	300	<0.001	880
G281	08/12/2020	--	<0.001	0.057	<0.001	0.037	<0.001	130	81	<0.004	<0.002	0.324	<0.001	<0.02	<0.0002	<0.001	6.9	0.304	<0.001	260	--	700
G281	01/29/2021	<0.003	<0.001	0.064	<0.001	<0.01	<0.001	130	100	<0.004	<0.002	0.314	<0.001	<0.02	<0.0002	<0.001	7.1	0.397	<0.001	260	<0.001	870
G281	03/31/2021	<0.003	<0.001	0.066	<0.001	0.11	<0.001	130	90	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	7.0	0.159	<0.001	280	<0.001	830
G281	04/21/2021	<0.003	<0.001	0.061	<0.001	<0.01	<0.001	130	120	<0.004	<0.002	0.317	<0.001	<0.02	<0.0002	<0.001	6.9	0.0358	<0.001	250	<0.001	1000
G281	05/05/2021	<0.003	<0.001	0.065	<0.001	0.015	<0.001	130	86	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	7.1	0	<0.001	260	<0.001	820
G281	05/17/2021	<0.003	0.0018	0.086	<0.001	0.043	<0.001	130	85	0.0049	0.0026	0.362	0.002	<0.02	<0.0002	<0.001	7.1	0.199	<0.001	280	<0.001	870
G281	06/14/2021	<0.003	<0.001	0.06	<0.001	<0.01	<0.001	140	76	<0.004	<0.002	0.379	<0.001	<0.02	<0.0002	<0.001	7.1	1.22	<0.001	260	<0.001	930

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G281	06/28/2021	<0.003	<0.001	0.062	<0.001	0.036	<0.001	130	86	<0.004	<0.002	0.277	<0.001	<0.02	<0.0002	<0.001	7.2	0.106	<0.001	280	<0.001	830
G281	07/12/2021	<0.003	<0.001	0.061	<0.001	<0.01	<0.001	130	73	<0.004	<0.002	0.334	<0.001	<0.02	<0.0002	<0.001	7.2	0.601	<0.001	260	<0.001	910
G281	07/27/2021	<0.003	<0.001	0.061	<0.001	<0.01	<0.001	120	73	<0.004	<0.002	0.352	<0.001	<0.02	<0.0002	<0.001	7.1	--	<0.001	270	0.001	880
G301	11/20/2015	<0.003	0.0026	0.079	<0.001	2.3	<0.001	140	33	0.0071	0.0053	0.31	0.0038	0.015	<0.0002	<0.001	6.9	1.07	<0.001	700	<0.001	1200
G301	02/23/2016	<0.003	<0.001	0.041	<0.001	2.4	<0.001	140	25	0.0045	0.0028	0.324	0.0011	<0.01	<0.0002	<0.001	6.6	0.399	<0.001	740	<0.001	1000
G301	05/20/2016	<0.003	<0.001	0.031	<0.001	2.6	<0.001	130	24	<0.004	0.0028	0.404	<0.001	<0.01	<0.0002	<0.001	6.4	0.202	<0.001	710	<0.001	1100
G301	08/15/2016	<0.003	<0.001	0.032	<0.001	2.9	<0.001	140	24	<0.004	0.0022	0.296	<0.001	0.011	<0.0002	<0.001	6.8	1.03	<0.001	740	<0.001	1200
G301	11/17/2016	<0.003	<0.001	0.036	<0.001	2.4	0.0011	120	25	<0.004	0.0024	<0.25	0.0017	<0.01	<0.0002	<0.001	6.9	0.604	<0.001	800	<0.001	1400
G301	02/16/2017	<0.003	0.0017	0.063	<0.001	2.4	<0.001	150	23	0.0064	0.0044	<0.25	0.0028	0.01	<0.0002	<0.001	7.0	0.994	<0.001	790	<0.001	1200
G301	05/17/2017	<0.003	<0.001	0.029	<0.001	2.1	<0.001	120	21	<0.004	0.0022	<0.25	0.0013	<0.01	<0.0002	<0.001	7.1	2.16	<0.001	650	<0.001	1100
G301	07/12/2017	<0.003	0.0021	0.058	<0.001	2.3	<0.001	120	23	0.0075	0.0031	<0.25	0.0038	0.011	0.001	<0.001	6.8	0.674	<0.001	760	<0.001	1100
G301	10/26/2017	--	--	--	--	2.3	--	110	22	--	--	0.28	--	--	--	--	6.8	--	--	680	--	1100
G301	05/11/2018	<0.003	0.0016	0.06	<0.001	2.1	<0.001	130	22	0.0081	0.0042	0.302	0.0047	0.011	<0.0002	<0.001	6.9	--	<0.001	810	<0.001	1200
G301	05/30/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.54	--	--	--	--
G301	08/03/2018	--	0.0035	0.084	--	2.4	<0.001	150	20	0.014	0.0051	0.31	0.0058	0.012	--	<0.001	6.9	1.28	--	860	--	1200
G301	01/23/2019	<0.003	0.0045	0.11	<0.001	2.1	<0.001	170	21	0.017	0.0084	0.272	0.0086	<0.01	<0.0002	<0.001	7.0	0.943	<0.001	850	<0.001	1500
G301	08/19/2019	--	<0.001	0.02	<0.001	2	<0.001	110	12	<0.004	<0.002	0.351	<0.001	0.014	--	<0.001	6.9	1.6	<0.001	570	--	950
G301	01/23/2020	<0.003	0.0012	0.034	<0.001	2.1	<0.001	160	16	0.0044	0.0032	<0.25	0.0015	<0.02	<0.0002	<0.001	6.7	0.391	<0.001	820	<0.001	1400
G301	08/11/2020	--	<0.001	0.016	<0.001	2.1	<0.001	150	14	<0.004	<0.002	0.263	<0.001	<0.02	--	<0.001	6.6	0.781	<0.001	750	--	1200
G301	01/27/2021	<0.003	<0.001	0.017	<0.001	2	<0.001	160	17	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.6	1.02	<0.001	650	<0.001	1300
G302	11/20/2015	<0.003	0.0098	0.067	<0.001	2	<0.001	180	22	0.0044	0.004	0.267	0.0024	0.032	<0.0002	0.002	6.9	0.672	<0.001	480	<0.001	1200
G302	02/23/2016	<0.003	0.0014	0.029	<0.001	2.1	<0.001	170	21	<0.004	0.0022	0.288	<0.001	0.018	<0.0002	0.0015	6.8	0.532	<0.001	530	<0.001	1000

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G302	05/20/2016	<0.003	0.0018	0.024	<0.001	2.5	<0.001	140	12	<0.004	<0.002	0.39	<0.001	0.013	<0.0002	0.0014	6.8	0.681	<0.001	440	<0.001	1000
G302	08/15/2016	<0.003	0.0015	0.028	<0.001	1.9	<0.001	130	9.7	<0.004	0.002	0.304	0.0011	0.022	0.00052	<0.001	7.0	0.876	<0.001	360	<0.001	910
G302	11/17/2016	<0.003	0.0035	0.037	<0.001	1.9	<0.001	140	14	<0.004	0.0025	<0.25	<0.001	0.023	<0.0002	0.0011	7.1	0.309	<0.001	450	<0.001	1100
G302	02/16/2017	<0.003	0.0036	0.03	<0.001	1.4	<0.001	160	14	<0.004	<0.002	0.29	<0.001	0.026	<0.0002	0.001	7.1	0.976	<0.001	430	<0.001	1100
G302	05/17/2017	<0.003	<0.001	0.02	<0.001	1.1	<0.001	130	6.5	<0.004	0.0024	<0.25	<0.001	0.013	<0.0002	<0.001	7.0	0.848	<0.001	330	<0.001	820
G302	07/12/2017	<0.003	0.0072	0.06	<0.001	2	<0.001	160	14	0.0075	0.0045	0.388	0.0035	0.031	<0.0002	0.0019	7.0	1.55	<0.001	460	<0.001	1000
G302	10/26/2017	--	--	--	--	1.1	--	180	8.3	--	--	0.319	--	--	--	--	7.1	--	--	320	--	840
G302	05/11/2018	<0.003	0.0053	0.039	<0.001	2.1	<0.001	170	17	<0.004	0.0034	0.329	0.0018	0.022	<0.0002	0.0024	7.1	--	<0.001	510	<0.001	1100
G302	05/30/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.76	--	--	--	--
G302	08/03/2018	--	0.0051	0.054	--	2.3	<0.001	180	17	0.0074	0.0046	0.3	0.0041	0.02	--	0.0016	7.0	0.458	--	500	--	1200
G302	01/23/2019	<0.003	0.013	0.095	<0.001	1.9	<0.001	210	20	0.019	0.0084	0.267	0.011	0.028	<0.0002	0.0029	7.0	1.29	0.0011	500	<0.001	1400
G302	08/19/2019	--	<0.001	0.028	<0.001	1.8	<0.001	120	5.9	<0.004	0.0056	0.381	<0.001	0.02	--	<0.001	7.0	1.89	<0.001	280	--	800
G302	01/23/2020	<0.003	0.0038	0.045	<0.001	1.7	<0.001	150	14	0.0073	0.0028	<0.25	0.003	0.023	<0.0002	0.0012	7.1	0.0859	<0.001	350	<0.001	960
G302	08/11/2020	--	0.001	0.022	<0.001	1.2	<0.001	140	5.9	<0.004	<0.002	0.28	<0.001	<0.02	--	<0.001	6.9	0.652	<0.001	260	--	780
G302	01/27/2021	<0.003	<0.001	0.027	<0.001	1.2	<0.001	180	22	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.6	0.129	<0.001	430	<0.001	1100
G303	11/20/2015	<0.003	0.013	0.046	<0.001	1.5	<0.001	170	32	0.01	0.0065	<0.25	0.0053	0.062	<0.0002	0.0033	6.9	0.631	<0.001	860	<0.001	1700
G303	02/23/2016	<0.003	0.0023	0.014	<0.001	2.5	<0.001	170	32	<0.004	<0.002	0.329	<0.001	0.031	<0.0002	0.0017	7.0	0.472	<0.001	700	<0.001	1400
G303	05/20/2016	<0.003	0.0039	0.016	<0.001	2.4	<0.001	160	29	<0.004	0.0028	0.342	<0.001	0.024	<0.0002	0.0019	6.9	0.432	<0.001	700	<0.001	1400
G303	08/15/2016	<0.003	0.0074	0.016	<0.001	1.8	<0.001	170	30	<0.004	0.0041	0.257	<0.001	0.076	0.0009	0.0019	6.9	0.65	<0.001	830	<0.001	1600
G303	11/17/2016	<0.003	0.0065	0.016	<0.001	1.6	<0.001	180	30	<0.004	0.0032	<0.25	<0.001	0.064	<0.0002	0.0024	6.9	0.421	<0.001	870	<0.001	1900
G303	02/19/2017	<0.003	0.018	0.016	<0.001	1.7	<0.001	170	28	<0.004	0.0027	0.3	<0.001	0.066	<0.0002	0.0024	6.9	1.62	<0.001	860	<0.001	1700
G303	05/17/2017	<0.003	0.0092	0.017	<0.001	1.4	<0.001	210	28	<0.004	0.0033	0.277	<0.001	0.06	0.00067	0.0027	7.1	0.659	<0.001	780	<0.001	1900

RAMBOLL

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G303	07/13/2017	<0.003	0.008	0.016	<0.001	1.7	<0.001	170	31	<0.004	0.0053	0.277	<0.001	0.051	<0.0002	0.0018	7.0	1.68	<0.001	860	<0.001	1500
G303	10/26/2017	--	--	--	--	2.5	--	130	28	--	--	0.311	--	--	--	--	7.0	--	--	600	--	1300
G303	05/14/2018	<0.003	0.0064	0.018	<0.001	1.5	<0.001	170	30	<0.004	0.0032	0.279	<0.001	0.05	<0.0002	0.0024	7.0	--	<0.001	780	<0.001	1500
G303	05/30/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.2	--	--	--	--
G303	08/03/2018	--	0.0044	0.019	--	1.6	<0.001	200	28	<0.004	0.0031	0.275	<0.001	0.041	--	0.002	7.0	0.216	--	780	--	1600
G303	01/23/2019	<0.003	0.0031	0.015	<0.001	1.8	<0.001	190	30	<0.004	<0.002	0.3	<0.001	0.033	<0.0002	0.0022	7.0	0.884	<0.001	760	<0.001	1800
G303	08/19/2019	--	0.0036	0.016	<0.001	1.8	<0.001	190	32	<0.004	0.0024	0.334	<0.001	0.058	--	0.0021	7.0	1.14	<0.001	730	--	1700
G303	01/23/2020	<0.003	0.0012	0.015	<0.001	2.3	<0.001	160	29	<0.004	<0.002	0.256	<0.001	0.028	<0.0002	0.0016	7.0	0.6	<0.001	690	<0.001	1200
G303	08/11/2020	--	0.0041	0.033	<0.001	1.7	<0.001	210	24	0.0043	0.0056	0.294	0.0037	0.041	--	0.0023	6.9	1.37	<0.001	790	--	1700
G303	01/26/2021	<0.003	<0.001	0.013	<0.001	2	<0.001	170	32	<0.004	<0.002	<0.25	<0.001	0.033	<0.0002	0.0016	6.8	0.355	<0.001	730	<0.001	1600
G304	11/20/2015	<0.003	0.0078	0.06	<0.001	2.3	<0.001	170	27	0.0065	0.014	0.354	0.0035	0.014	<0.0002	0.0023	7.1	1.93	<0.001	1000	<0.001	1500
G304	02/23/2016	<0.003	0.0016	0.029	<0.001	2.4	<0.001	220	27	<0.004	0.0033	0.414	0.0012	0.012	0.00023	0.0012	7.1	0.611	<0.001	1100	<0.001	1400
G304	05/20/2016	<0.003	0.0023	0.032	<0.001	2.6	<0.001	200	27	0.0049	0.0047	0.476	0.0017	<0.01	<0.0002	0.0017	7.1	0.22	<0.001	1000	<0.001	1300
G305	05/19/2016	<0.003	0.0071	0.093	<0.001	2.6	<0.001	180	27	0.026	0.0088	0.531	0.023	0.02	<0.0002	0.0024	7.1	0.723	<0.001	890	<0.001	1300
G305	07/01/2016	<0.003	<0.001	0.043	<0.001	2.5	<0.001	190	28	0.0057	<0.002	0.424	0.0028	0.014	<0.0002	0.0013	7.2	0.767	<0.001	900	<0.001	1500
G305	08/16/2016	<0.003	<0.001	0.035	<0.001	2.4	<0.001	150	27	<0.004	<0.002	0.425	0.0016	0.014	<0.0002	<0.001	7.3	1.26	<0.001	930	<0.001	1400
G305	09/29/2016	<0.003	<0.001	0.036	<0.001	2.7	<0.001	190	30	<0.004	<0.002	0.503	0.0011	<0.01	<0.0002	<0.001	6.9	0.691	<0.001	890	<0.001	1400
G305	11/17/2016	<0.003	0.0013	0.039	<0.001	1.8	<0.001	100	60	<0.004	<0.002	0.546	0.003	<0.01	<0.0002	0.0035	7.1	0.344	<0.001	710	<0.001	1400
G306	05/19/2016	<0.003	0.0041	0.088	<0.001	2.3	<0.001	130	14	0.012	0.0064	0.426	0.0049	0.011	<0.0002	0.0019	6.7	0.778	<0.001	350	<0.001	720
G306	07/01/2016	<0.003	<0.001	0.061	<0.001	2.7	<0.001	130	8.9	<0.004	0.0043	0.344	<0.001	<0.01	<0.0002	0.0016	6.5	0.545	<0.001	330	<0.001	720
G306	08/16/2016	<0.003	<0.001	0.062	<0.001	2.4	<0.001	110	7.2	<0.004	0.0025	0.308	<0.001	<0.01	<0.0002	0.0012	6.9	0.885	<0.001	320	<0.001	680
G306	09/29/2016	<0.003	<0.001	0.059	<0.001	2.6	<0.001	120	6.8	<0.004	0.0025	0.326	<0.001	<0.01	<0.0002	<0.001	6.6	0.818	0.0011	320	<0.001	660

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G306	11/16/2016	<0.003	<0.001	0.076	<0.001	2.7	<0.001	120	6.6	<0.004	<0.002	<0.25	<0.001	<0.01	<0.0002	0.0018	7.0	0.143	<0.001	330	<0.001	820
G306	02/19/2017	<0.003	<0.001	0.059	<0.001	2.7	<0.001	130	6.2	<0.004	<0.002	0.263	<0.001	<0.01	<0.0002	0.0017	7.0	0.864	<0.001	5.9	<0.001	820
G306	05/17/2017	<0.003	<0.001	0.066	<0.001	2.5	<0.001	150	5.5	<0.004	<0.002	0.304	<0.001	<0.01	<0.0002	0.0016	7.1	1.39	<0.001	700	<0.001	800
G306	07/13/2017	<0.003	<0.001	0.085	<0.001	2.9	<0.001	130	8.3	<0.004	<0.002	0.326	<0.001	<0.01	<0.0002	0.0019	7.0	0.76	<0.001	340	<0.001	720
G306	10/27/2017	--	--	--	--	3.1	--	120	4.7	--	--	0.332	--	--	--	--	6.9	--	--	350	--	720
G306	05/14/2018	<0.003	<0.001	0.06	<0.001	2.8	<0.001	130	3.9	<0.004	<0.002	0.319	<0.001	0.01	<0.0002	0.0013	6.9	--	<0.001	320	<0.001	720
G306	05/30/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.31	--	--	--	--
G306	08/03/2018	--	0.0093	0.17	--	2.7	<0.001	160	3.7	0.035	0.0094	0.313	0.012	0.02	--	0.0026	7.0	0.454	--	290	--	820
G306	01/23/2019	<0.003	0.02	0.28	0.0013	2.4	<0.001	170	4.1	0.071	0.02	0.269	0.028	0.036	<0.0002	0.0037	7.0	2.61	0.0028	250	<0.001	900
G306	08/19/2019	--	0.0025	0.088	<0.001	2.5	<0.001	160	4.4	0.013	0.0024	0.413	0.0031	0.015	--	0.0016	7.0	0.533	<0.001	260	--	780
G306	01/21/2020	<0.003	0.006	0.089	<0.001	3.5	<0.001	150	2.5	0.019	0.0062	<0.25	0.0067	<0.02	<0.0002	0.0015	7.0	0.576	0.0016	260	<0.001	830
G306	08/11/2020	--	<0.001	0.039	<0.001	2.6	<0.001	140	1.5	<0.004	<0.002	<0.25	<0.001	<0.02	--	<0.001	6.9	0.145	<0.001	250	--	700
G306	01/26/2021	<0.003	<0.001	0.03	<0.001	2.4	<0.001	110	2.1	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.8	0.876	0.0012	240	<0.001	700
G306	03/29/2021	<0.003	<0.001	0.039	<0.001	2.5	<0.001	120	1.6	0.0042	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.7	0.351	0.0012	260	<0.001	690
G306	04/21/2021	<0.003	<0.001	0.04	<0.001	2.6	<0.001	130	2	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.8	0.173	0.0012	240	<0.001	830
G306	05/05/2021	<0.003	<0.001	0.039	<0.001	2.9	<0.001	130	<1	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0011	6.8	0.0696	0.0015	240	<0.001	670
G306	05/18/2021	<0.003	0.0011	0.04	<0.001	2.9	<0.001	140	1.1	<0.004	<0.002	0.382	<0.001	<0.02	<0.0002	<0.001	6.9	0.115	<0.001	250	<0.001	680
G306	06/15/2021	<0.003	0.001	0.035	<0.001	3.2	<0.001	140	1.5	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.8	0.0641	<0.001	250	<0.001	670
G306	06/28/2021	<0.003	<0.001	0.042	<0.001	2.5	<0.001	140	2.4	<0.004	<0.002	0.321	<0.001	<0.02	<0.0002	<0.001	7.0	1.28	<0.001	210	<0.001	700
G306	07/14/2021	<0.003	<0.001	0.03	<0.001	2.9	<0.001	110	<1	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.8	0.186	<0.001	230	<0.001	730
G306	07/27/2021	<0.003	<0.001	0.033	<0.001	3.1	<0.001	110	<1	<0.004	<0.002	<0.25	<0.001	<0.02	0.0013	<0.001	6.8	--	<0.001	220	<0.001	650
G307	08/16/2016	<0.003	<0.001	0.031	<0.001	2.1	<0.001	210	26	<0.004	0.0029	0.37	<0.001	0.012	0.00042	0.0013	7.0	0.588	<0.001	1000	<0.001	1500

RAMBOLL

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G307	09/29/2016	<0.003	<0.001	0.029	<0.001	2.2	<0.001	250	26	<0.004	0.0034	0.416	<0.001	<0.01	<0.0002	0.0011	6.9	0.767	<0.001	1000	<0.001	1300
G307	11/16/2016	<0.003	<0.001	0.034	<0.001	2.1	<0.001	190	24	<0.004	0.0038	0.263	0.0012	0.011	<0.0002	0.0019	6.9	0.529	<0.001	1000	<0.001	1600
G307	02/19/2017	<0.003	<0.001	0.033	<0.001	2	<0.001	200	22	<0.004	0.0039	0.323	<0.001	0.011	<0.0002	0.0013	7.0	1.88	<0.001	1100	<0.001	1500
G307	05/17/2017	<0.003	0.041	0.38	0.0029	1.8	0.0013	400	19	0.11	0.034	0.364	0.068	0.1	<0.0002	0.0054	7.2	0.907	0.0038	940	<0.001	1500
G307	07/13/2017	<0.003	0.012	0.13	<0.001	2.2	0.0011	220	21	0.031	0.012	0.495	0.02	0.028	<0.0002	0.0024	7.0	0.676	0.0014	1300	<0.001	1300
G307	10/27/2017	--	--	--	--	2.1	--	230	18	--	--	0.411	--	--	--	--	7.0	--	--	980	--	1400
G307	05/14/2018	<0.003	0.0037	0.071	<0.001	2.2	0.0015	220	17	0.013	0.0059	0.389	0.007	0.02	<0.0002	0.0021	7.0	--	<0.001	1100	<0.001	1400
G307	05/30/2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.813	--	--	--	--
G307	08/03/2018	--	0.0064	0.1	--	2	0.0034	270	17	0.025	0.0078	0.391	0.013	0.02	--	0.0022	7.0	0.0687	--	1100	--	1500
G307	08/19/2019	--	0.0049	0.11	<0.001	2.1	0.027	280	18	0.025	0.0072	1.37	0.01	0.03	--	0.002	7.0	1.06	0.0012	1100	--	1600
G307	02/26/2020	<0.003	<0.001	0.033	<0.001	2.1	0.009	250	18	0.004	0.0031	0.264	0.0014	<0.02	<0.0002	0.0014	7.0	0.885	<0.001	1000	<0.001	1500
G307	05/06/2020	--	--	--	--	--	--	--	--	--	0.0026	--	--	--	--	--	7.3	--	--	--	--	--
G307	08/11/2020	--	<0.001	0.021	<0.001	2.1	<0.001	230	15	<0.004	0.0024	0.414	<0.001	<0.02	--	0.0013	7.3	0.593	<0.001	910	--	1200
G307	01/27/2021	<0.003	<0.001	0.02	<0.001	1.9	<0.001	200	14	<0.004	0.0024	<0.25	<0.001	<0.02	<0.0002	0.0012	7.4	0.616	<0.001	850	<0.001	1400
G307D	03/29/2021	<0.003	0.001	0.044	<0.001	1.4	<0.001	170	34	<0.004	<0.002	0.435	<0.001	<0.02	<0.0002	0.012	7.3	0.454	<0.001	820	<0.001	1400
G307D	04/21/2021	<0.003	<0.001	0.04	<0.001	1.4	<0.001	180	--	<0.004	<0.002	--	<0.001	<0.02	<0.0002	0.012	7.2	0.568	<0.001	--	<0.001	--
G307D	05/04/2021	<0.003	0.0012	0.037	<0.001	1.4	<0.001	180	29	<0.004	<0.002	0.612	<0.001	<0.02	<0.0002	0.011	7.3	0.213	<0.001	850	<0.001	1300
G307D	05/18/2021	<0.003	0.002	0.035	<0.001	1.4	<0.001	180	28	<0.004	<0.002	0.652	<0.001	<0.02	<0.0002	0.011	7.3	0.139	<0.001	840	<0.001	1500
G307D	06/15/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.138	--	--	--	--
G307D	06/28/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.733	--	--	--	--
G307D	07/27/2021	<0.003	<0.001	0.032	<0.001	1.7	<0.001	160	22	<0.004	<0.002	0.716	<0.001	<0.02	0.00031	0.0082	7.2	--	<0.001	790	<0.001	1400
G308	03/29/2021	<0.003	<0.001	0.024	<0.001	2.4	<0.001	210	17	<0.004	<0.002	0.621	<0.001	<0.02	<0.0002	0.0014	7.3	0.213	<0.001	1100	<0.001	1900

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G308	04/21/2021	<0.003	<0.001	0.022	<0.001	2.5	<0.001	210	19	<0.004	<0.002	0.616	<0.001	<0.02	<0.0002	0.0013	7.2	0.607	<0.001	1100	<0.001	2000
G308	05/05/2021	<0.003	<0.001	0.023	<0.001	2.8	<0.001	220	19	<0.004	<0.002	<2.5	<0.001	<0.02	<0.0002	0.0015	7.2	0.00738	0.0011	1200	<0.001	1800
G308	05/17/2021	<0.003	<0.001	0.021	<0.001	2.5	<0.001	220	20	<0.004	<0.002	0.647	<0.001	<0.02	<0.0002	0.0014	7.2	0	<0.001	1200	<0.001	1900
G308	06/14/2021	<0.003	<0.001	0.022	<0.001	2.4	<0.001	230	18	<0.004	<0.002	0.48	<0.001	<0.02	<0.0002	0.0014	7.2	0.369	<0.001	1100	<0.001	1900
G308	06/28/2021	<0.003	<0.001	0.025	<0.001	2.5	<0.001	220	18	<0.004	<0.002	0.481	<0.001	<0.02	<0.0002	0.0014	7.2	0.121	<0.001	1100	<0.001	1800
G308	07/14/2021	<0.003	<0.001	0.021	<0.001	2.6	<0.001	210	17	<0.004	<0.002	0.689	<0.001	<0.02	<0.0002	0.0014	7.3	0.0838	<0.001	1100	<0.001	1900
G308	07/27/2021	<0.003	<0.001	0.022	<0.001	2.7	<0.001	190	17	<0.004	<0.002	0.71	<0.001	<0.02	0.00022	<0.001	7.3	--	<0.001	1100	<0.001	1900
G309	03/29/2021	<0.003	0.0019	0.036	<0.001	1.8	<0.001	180	17	0.0045	<0.002	0.369	0.0012	<0.02	<0.0002	0.0021	7.2	0.0737	<0.001	840	<0.001	1300
G309	04/21/2021	<0.003	<0.001	0.023	<0.001	1.8	<0.001	180	19	<0.004	<0.002	0.532	<0.001	<0.02	<0.0002	0.002	7.2	0.0702	<0.001	740	<0.001	1400
G309	05/05/2021	<0.003	0.0012	0.023	<0.001	1.9	<0.001	180	19	<0.004	<0.002	0.408	<0.001	<0.02	<0.0002	0.0019	7.2	0.222	<0.001	770	<0.001	1400
G309	05/17/2021	<0.003	0.0013	0.023	<0.001	7.5	<0.001	190	21	<0.004	<0.002	0.438	<0.001	<0.02	<0.0002	0.0017	7.3	0.36	<0.001	840	<0.001	1300
G309	06/14/2021	<0.003	0.0011	0.021	<0.001	1.9	<0.001	190	19	<0.004	<0.002	0.468	<0.001	<0.02	<0.0002	0.0015	7.2	0	<0.001	790	<0.001	1400
G309	06/28/2021	<0.003	<0.001	0.022	<0.001	1.9	<0.001	190	19	<0.004	<0.002	0.387	<0.001	<0.02	<0.0002	0.0014	7.3	1.2	<0.001	780	<0.001	1300
G309	07/13/2021	<0.003	<0.001	0.023	<0.001	2.5	<0.001	180	19	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	7.4	0.62	<0.001	800	<0.001	1400
G309	07/27/2021	<0.003	<0.001	0.022	<0.001	2	<0.001	170	18	<0.004	<0.002	0.484	<0.001	<0.02	<0.0002	<0.001	7.3	--	<0.001	740	<0.001	1400
G310	03/29/2021	<0.003	<0.001	0.016	<0.001	1.6	<0.001	170	20	<0.004	<0.002	0.252	<0.001	<0.02	<0.0002	<0.001	7.1	0.642	<0.001	910	<0.001	1400
G310	04/22/2021	<0.003	<0.001	0.022	<0.001	1.7	<0.001	190	22	<0.004	<0.002	0.295	<0.001	<0.02	<0.0002	<0.001	7.0	0	<0.001	2300	<0.001	1500
G310	05/04/2021	<0.003	<0.001	0.019	<0.001	1.8	<0.001	190	20	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	7.2	0.0501	<0.001	870	<0.001	1600
G310	05/19/2021	<0.003	<0.001	0.016	<0.001	1.7	<0.001	180	22	<0.004	<0.002	0.31	<0.001	<0.02	<0.0002	<0.001	7.2	2.25	<0.001	860	<0.001	1500
G310	06/15/2021	<0.003	<0.001	0.018	<0.001	2	<0.001	200	21	<0.004	<0.002	0.29	<0.001	<0.02	<0.0002	<0.001	7.2	0	<0.001	860	<0.001	1500
G310	06/28/2021	<0.003	<0.001	0.018	<0.001	1.8	<0.001	190	21	<0.004	<0.002	0.286	<0.001	<0.02	<0.0002	<0.001	7.1	0.83	<0.001	820	<0.001	1500
G310	07/13/2021	<0.003	<0.001	0.018	<0.001	2	<0.001	180	24	<0.004	<0.002	0.331	<0.001	<0.02	<0.0002	<0.001	7.2	0.298	<0.001	420	<0.001	1600

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G310	07/28/2021	<0.003	<0.001	0.017	<0.001	1.8	<0.001	190	21	<0.004	<0.002	0.394	<0.001	<0.02	<0.0002	<0.001	7.2	--	<0.001	880	<0.001	1600
G311	03/30/2021	<0.003	<0.001	0.038	<0.001	2.3	<0.001	210	22	<0.004	0.0033	0.356	0.001	<0.02	<0.0002	<0.001	6.7	0.0742	<0.001	770	<0.001	1500
G311	04/22/2021	<0.003	<0.001	0.031	<0.001	2.3	<0.001	210	31	<0.004	0.0029	0.345	<0.001	<0.02	<0.0002	<0.001	6.8	0.245	<0.001	820	<0.001	1500
G311	05/04/2021	<0.003	<0.001	0.029	<0.001	2.3	<0.001	200	22	<0.004	0.0027	<0.25	<0.001	<0.02	<0.0002	<0.001	7.0	0.108	<0.001	820	<0.001	1600
G311	05/19/2021	<0.003	<0.001	0.031	<0.001	2.4	<0.001	210	24	<0.004	0.0032	0.282	<0.001	<0.02	<0.0002	<0.001	6.9	0.147	<0.001	840	<0.001	1500
G311	06/15/2021	<0.003	0.0011	0.03	<0.001	2.9	<0.001	240	22	<0.004	0.0031	0.36	<0.001	<0.02	<0.0002	<0.001	6.9	0.727	<0.001	820	<0.001	1600
G311	06/29/2021	<0.003	<0.001	0.027	<0.001	2.5	<0.001	220	25	<0.004	0.003	0.371	<0.001	0.02	<0.0002	<0.001	7.0	1.12	<0.001	810	<0.001	1500
G311	07/14/2021	<0.003	<0.001	0.026	<0.001	2.6	<0.001	200	24	<0.004	0.0026	0.436	<0.001	<0.02	<0.0002	<0.001	6.9	0.179	<0.001	860	<0.001	1600
G311	07/27/2021	<0.003	<0.001	0.029	<0.001	2.5	<0.001	210	23	<0.004	0.0028	0.422	<0.001	<0.02	<0.0002	<0.001	7.1	--	<0.001	750	<0.001	1600
G311D	03/30/2021	<0.003	0.0018	0.22	<0.001	0.32	<0.001	98	12	<0.004	0.0022	0.537	<0.001	<0.02	<0.0002	0.013	7.1	0.838	0.0012	140	<0.001	490
G311D	04/22/2021	<0.003	0.0023	0.23	<0.001	0.28	<0.001	110	8.7	<0.004	0.002	0.518	<0.001	<0.02	<0.0002	0.011	7.0	0.512	<0.001	120	<0.001	580
G311D	05/04/2021	<0.003	0.0026	0.24	<0.001	0.3	<0.001	110	8.9	<0.004	0.002	0.393	<0.001	<0.02	<0.0002	0.011	7.2	0.149	<0.001	120	<0.001	580
G311D	05/19/2021	<0.003	0.0035	0.22	<0.001	0.29	<0.001	110	15	<0.004	0.0021	0.531	<0.001	<0.02	<0.0002	0.01	7.2	0.433	<0.001	120	<0.001	550
G311D	06/15/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.01	--	--	--	--
G311D	06/29/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.24	--	--	--	--
G311D	07/28/2021	<0.003	0.0054	0.25	<0.001	0.26	<0.001	110	<1	<0.004	<0.002	0.701	<0.001	<0.02	<0.0002	0.01	7.2	--	<0.001	77	<0.001	590
G312	03/30/2021	<0.003	<0.001	0.023	<0.001	1.5	<0.001	190	20	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.5	0.0336	<0.001	600	<0.001	1300
G312	04/22/2021	<0.003	<0.001	0.025	<0.001	1.6	<0.001	200	20	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	<0.001	6.4	0.0769	<0.001	650	<0.001	1400
G312	05/04/2021	<0.003	0.0012	0.03	<0.001	1.7	<0.001	210	25	<0.004	0.0029	<0.25	<0.001	<0.02	<0.0002	0.0013	6.5	0.435	<0.001	920	<0.001	1600
G312	05/19/2021	<0.003	<0.001	0.025	<0.001	1.4	<0.001	190	26	<0.004	0.0025	<0.25	<0.001	<0.02	<0.0002	<0.001	6.4	0.825	<0.001	1000	<0.001	1700
G312	06/15/2021	<0.003	<0.001	0.026	<0.001	1.6	<0.001	220	26	<0.004	0.003	<0.25	<0.001	<0.02	<0.0002	<0.001	6.5	0.937	<0.001	920	<0.001	1800
G312	06/29/2021	<0.003	<0.001	0.029	<0.001	1.8	<0.001	210	27	<0.004	0.0039	<0.25	<0.001	0.021	<0.0002	<0.001	6.5	0.498	<0.001	890	<0.001	1600

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G312	07/13/2021	<0.003	<0.001	0.028	<0.001	2.2	<0.001	200	26	<0.004	0.0036	<0.25	<0.001	<0.02	<0.0002	<0.001	6.3	1.12	<0.001	930	<0.001	1900
G312	07/27/2021	<0.003	<0.001	0.023	<0.001	3.5	<0.001	240	22	<0.004	0.0032	0.253	<0.001	0.021	<0.0002	<0.001	6.5	--	<0.001	800	<0.001	1800
G313	03/30/2021	<0.003	<0.001	0.025	<0.001	3.3	<0.001	200	23	<0.004	<0.002	0.276	<0.001	0.02	<0.0002	0.0014	6.9	0.685	<0.001	970	<0.001	1600
G313	04/22/2021	<0.003	<0.001	0.021	<0.001	3.4	<0.001	210	25	<0.004	<0.002	0.272	<0.001	<0.02	<0.0002	0.0013	6.8	0.623	<0.001	750	<0.001	1600
G313	05/04/2021	<0.003	<0.001	0.023	<0.001	3.5	<0.001	200	26	<0.004	<0.002	0.267	<0.001	<0.02	<0.0002	0.0012	7.0	0.188	<0.001	790	<0.001	1600
G313	05/18/2021	<0.003	0.0014	0.023	<0.001	3.3	<0.001	210	25	<0.004	0.0024	0.332	<0.001	<0.02	<0.0002	0.0011	7.0	0.666	<0.001	780	<0.001	1600
G313	06/14/2021	<0.003	<0.001	0.022	<0.001	3.3	<0.001	220	26	<0.004	0.0022	0.251	<0.001	0.021	<0.0002	0.0012	7.1	0.65	<0.001	770	<0.001	1700
G313	06/28/2021	<0.003	<0.001	0.02	<0.001	3.5	<0.001	200	24	<0.004	<0.002	0.276	<0.001	0.037	<0.0002	0.0012	7.0	0.828	<0.001	750	<0.001	1600
G313	07/13/2021	<0.003	<0.001	0.02	<0.001	3.4	<0.001	200	24	<0.004	<0.002	0.336	<0.001	0.033	<0.0002	0.0012	6.9	0	<0.001	690	<0.001	1800
G313	07/27/2021	<0.003	<0.001	0.019	<0.001	3.5	<0.001	200	<250	<0.004	<0.002	0.351	<0.001	0.022	<0.0002	0.0012	6.9	--	<0.001	710	<0.001	1600
G314	03/30/2021	<0.003	<0.001	0.035	<0.001	0.24	<0.001	570	36	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.016	6.8	1.36	0.0015	2000	<0.001	3400
G314	04/21/2021	<0.003	<0.001	0.026	<0.001	0.16	<0.001	640	35	<0.004	0.0037	<0.25	<0.001	<0.02	<0.0002	0.01	6.6	2.01	<0.001	2100	<0.001	3700
G314	05/04/2021	<0.003	<0.001	0.026	<0.001	0.22	<0.001	660	34	<0.004	0.0047	<0.25	0.0025	<0.02	<0.0002	0.01	7.1	0.32	<0.001	2100	<0.001	3600
G314	05/17/2021	<0.003	<0.001	0.021	<0.001	0.42	<0.001	630	37	<0.004	0.006	<0.25	<0.001	<0.02	<0.0002	0.0089	6.6	0.976	0.0043	2200	<0.001	3600
G314	06/14/2021	<0.003	0.0011	0.021	<0.001	0.15	<0.001	660	100	<0.004	0.0088	<0.25	<0.001	<0.02	<0.0002	0.0081	6.6	0.482	<0.001	830	<0.001	1900
G314	06/28/2021	<0.003	<0.001	0.021	<0.001	0.12	<0.001	620	36	0.0096	0.0095	<0.25	<0.001	<0.02	<0.0002	0.0058	6.6	1.8	<0.001	2000	<0.001	3700
G314	07/13/2021	<0.003	<0.001	0.022	<0.001	0.14	<0.001	620	30	<0.004	0.011	<0.25	<0.001	<0.02	<0.0002	0.0048	6.7	0.604	<0.001	2000	<0.001	4000
G314	07/27/2021	<0.003	<0.001	0.02	<0.001	0.23	<0.001	630	33	<0.004	0.01	<0.25	<0.001	<0.02	<0.0002	0.0043	6.6	--	<0.001	2400	<0.001	3800
G314D	03/30/2021	<0.003	0.0014	0.049	<0.001	0.18	<0.001	110	170	<0.004	<0.002	1.06	<0.001	0.025	<0.0002	0.026	7.3	2.51	<0.001	1100	<0.001	2400
G314D	04/21/2021	<0.003	0.001	0.048	<0.001	0.17	<0.001	130	180	<0.004	<0.002	0.996	<0.001	0.022	<0.004	0.02	7.2	1.4	<0.001	1000	<0.001	2400
G314D	05/04/2021	<0.003	<0.001	0.045	<0.001	0.18	<0.001	130	--	<0.004	<0.002	--	<0.001	0.022	<0.0002	0.02	7.2	2.82	<0.001	--	<0.001	--
G314D	05/19/2021	<0.003	<0.001	0.052	<0.001	0.16	<0.001	140	130	<0.004	<0.002	0.84	0.0014	<0.02	<0.0002	0.014	7.2	4.09	<0.001	820	<0.001	1800

RAMBOLL

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G314D	06/28/2021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.56	--	--	--	--
G314D	07/28/2021	<0.003	<0.001	0.046	<0.001	0.14	<0.001	160	93	<0.004	<0.002	0.659	<0.001	<0.02	<0.0002	0.0095	7.2	--	<0.001	670	<0.001	1600
G315	03/30/2021	<0.003	<0.001	0.028	<0.001	1.2	<0.001	190	1.9	<0.004	<0.002	0.261	<0.001	<0.02	<0.0002	<0.001	6.9	0.622	<0.001	1100	<0.001	1500
G315	04/22/2021	<0.003	<0.001	0.026	<0.001	1.2	<0.001	200	64	<0.004	<0.002	0.344	<0.001	<0.02	<0.0002	<0.001	6.8	0.0124	<0.001	880	<0.001	1600
G315	05/05/2021	<0.003	<0.001	0.024	<0.001	1.3	<0.001	190	19	<0.004	<0.002	0.253	<0.001	<0.02	<0.0002	<0.001	6.8	0.0233	<0.001	900	<0.001	1500
G315	05/18/2021	<0.003	<0.001	0.024	<0.001	1.2	<0.001	190	20	<0.004	<0.002	0.25	<0.001	<0.02	<0.0002	<0.001	6.9	0.45	<0.001	880	<0.001	1500
G315	06/15/2021	<0.003	<0.001	0.025	<0.001	1.3	<0.001	210	19	<0.004	<0.002	0.307	<0.001	<0.02	<0.0002	<0.001	6.9	1.27	<0.001	870	<0.001	1500
G315	06/29/2021	<0.003	<0.001	0.023	<0.001	1.3	<0.001	190	19	<0.004	<0.002	0.395	<0.001	<0.02	<0.0002	<0.001	7.0	0.528	<0.001	930	<0.001	1400
G315	07/14/2021	<0.003	<0.001	0.028	<0.001	1.3	<0.001	190	17	<0.004	<0.002	0.316	<0.001	<0.02	<0.0002	<0.001	6.8	0.864	<0.001	860	<0.001	1700
G315	07/28/2021	<0.003	<0.001	0.023	<0.001	1.3	<0.001	190	18	<0.004	<0.002	0.394	<0.001	<0.02	<0.0002	<0.001	6.7	--	<0.001	850	<0.001	1600
G316	03/30/2021	<0.003	0.0073	0.063	<0.001	0.35	<0.001	200	25	<0.004	0.0035	<0.25	<0.001	<0.02	<0.0002	0.0036	7.0	0.479	<0.001	840	<0.001	1600
G316	04/22/2021	<0.003	0.0063	0.064	<0.001	0.37	<0.001	200	52	<0.004	0.0034	<0.25	<0.001	<0.02	<0.0002	0.0036	7.0	0.622	<0.001	770	<0.001	1100
G316	05/05/2021	<0.003	0.007	0.063	<0.001	0.35	<0.001	210	26	<0.004	0.0034	<0.25	0.014	<0.02	<0.0002	0.0037	6.9	0.884	<0.001	740	<0.001	1600
G316	05/17/2021	<0.003	0.0071	0.059	<0.001	0.55	<0.001	200	28	<0.004	0.0035	0.28	<0.001	<0.02	<0.0002	0.0037	7.1	17.5	<0.001	760	<0.001	1700
G316	06/14/2021	<0.003	0.0073	0.062	<0.001	0.42	<0.001	210	23	<0.004	0.003	<0.25	<0.001	<0.02	<0.0002	0.004	7.1	0.75	<0.001	750	<0.001	1700
G316	06/28/2021	<0.003	0.0077	0.065	<0.001	0.46	<0.001	190	22	<0.004	0.003	0.273	<0.001	<0.02	<0.0002	0.0041	7.1	0.196	<0.001	330	<0.001	1600
G316	07/13/2021	<0.003	0.0085	0.069	<0.001	0.49	<0.001	190	25	<0.004	0.0032	0.305	<0.001	<0.02	<0.0002	0.0043	7.0	0.705	<0.001	680	<0.001	1600
G316	07/27/2021	<0.003	0.0077	0.062	<0.001	0.52	<0.001	190	30	<0.004	0.0029	0.296	<0.001	<0.02	<0.0002	0.0042	7.0	--	<0.001	660	<0.001	1600
G317	03/30/2021	<0.003	0.001	0.049	<0.001	0.034	<0.001	210	16	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0049	6.5	3.01	0.0011	780	<0.001	1500
G317	04/22/2021	<0.003	<0.001	0.058	<0.001	0.021	<0.001	230	18	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.004	6.5	1.26	<0.001	910	<0.001	1600
G317	05/05/2021	<0.003	0.0011	0.04	<0.001	0.019	<0.001	280	14	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0034	6.6	1.1	<0.001	1000	<0.001	1800
G317	05/18/2021	<0.003	<0.001	0.038	<0.001	0.034	<0.001	260	15	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0028	6.6	1.08	<0.001	980	<0.001	1800

RAMBOLL

TABLE 4-1. GROUNDWATER ANALYTICAL RESULTS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Location	Sample Date	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Boron, total (mg/L)	Cadmium, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	pH (field) (SU)	Radium 226 and 228 combined (pCi/L)	Selenium, total (mg/L)	Sulfate, total (mg/L)	Thallium, total (mg/L)	Total Dissolved Solids (mg/L)
35 I.A.C. 845.600	Lower	0	0	0	0	0	0	--	0	0	0	0	0	0	0	0	6.5	0	0	0	0	0
	Upper	0.006	0.010	2.0	0.004	2	0.005	--	200	0.1	0.006	4.0	0.0075	0.04	0.002	0.1	9.0	5	0.05	400	0.002	1200
G317	06/15/2021	<0.003	0.0013	0.039	<0.001	0.034	<0.001	260	14	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0025	6.6	1.05	<0.001	900	<0.001	1600
G317	06/28/2021	<0.003	<0.001	0.034	<0.001	0.024	<0.001	230	12	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0026	6.7	0.863	<0.001	950	<0.001	1900
G317	07/13/2021	<0.003	0.0014	0.021	<0.001	0.019	<0.001	310	14	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0027	6.6	1.33	<0.001	1100	<0.001	2000
G317	07/28/2021	<0.003	<0.001	0.023	<0.001	0.045	<0.001	290	2.8	<0.004	<0.002	<0.25	<0.001	<0.02	<0.0002	0.0023	6.5	--	<0.001	1000	<0.001	1800

Notes:
Detected at concentration greater than the GWPS
-- = data not available
GWPS = Groundwater protection standard
mg/L = milligrams per liter
pCi/L = picocuries per liter
SU = standard units
< = concentration is less than the concentration shown, which corresponds to the reporting limit for the method. Estimated concentrations below the reporting limit and associated qualifiers are not provided since they are not utilized in statistics to determine exceedances above Part 845 standards.
35 I.A.C. 845.600 = Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (field) (SU)	Specific Conductance (micromhos/cm)	Temperature (deg. C)	Turbidity (NTU)
G281	11/20/2015	0	-18	7.0	1310	16.8	375
G281	02/11/2016	2.40	171	7.1	1330	8.0	12
G281	05/10/2016	0	40	7.0	1350	15.5	--
G281	08/01/2016	0	56	7.0	1405	16.7	19.4
G281	11/16/2016	0	58	6.9	1305	13.6	16
G281	02/10/2017	0	65	6.7	1200	14.5	23.5
G281	05/16/2017	0	63	6.9	1230	15.4	19.8
G281	07/12/2017	0	62	7.0	1295	16.5	11.3
G281	10/25/2017	0	75	7.0	877	13.0	26.4
G281	05/11/2018	0	45	7.1	1430	14.3	11.4
G281	08/03/2018	0	62	7.0	1182	16.1	20.4
G281	01/23/2019	0	65	7.0	1190	11.9	20
G281	08/13/2019	0	65	6.9	1090	17.4	12
G281	01/24/2020	6.60	151	7.3	739.1	9.7	7.83
G281	08/12/2020	0.66	129	6.9	1322	21.5	1.8
G281	01/29/2021	2.20	110	7.1	1121	9.4	29.4
G281	03/31/2021	1.40	257	7.0	1356	11.1	14.1
G281	04/21/2021	2.20	41.7	6.9	1311	12.0	2.14
G281	05/05/2021	1.50	189	7.1	1340	14.0	14.9
G281	05/17/2021	0.14	181	7.1	1359	15.0	2.06
G281	06/14/2021	1.10	54.1	7.1	1357	20.8	66.5
G281	06/28/2021	1.80	26.1	7.2	1311	20.7	11.4
G281	07/12/2021	1.60	210	7.2	1096	19.9	13.3
G281	07/27/2021	0.85	72.7	7.1	1319	20.4	18.9
G301	11/20/2015	0	-37	6.9	1630	16.5	270
G301	02/23/2016	0	127	6.6	1640	11.3	26
G301	05/20/2016	0	136	6.4	1660	15.7	74
G301	08/15/2016	0	125	6.8	1720	18.3	32
G301	11/17/2016	0	109	6.9	1560	14.4	40.8
G301	02/16/2017	0	122	7.0	1500	15.8	63
G301	05/17/2017	0	103	7.1	1590	15.4	67.9
G301	07/12/2017	0	121	6.8	1490	17.2	27.4
G301	10/26/2017	0	96	6.8	1500	13.0	34.1
G301	05/11/2018	0	98	6.9	1680	13.7	50.5
G301	08/03/2018	0	109	6.9	1615	15.6	41.8
G301	01/23/2019	0	112	7.0	1590	12.0	41
G301	08/19/2019	0	101	6.9	1520	17.4	39.8
G301	01/23/2020	1.40	147	6.7	1661	8.6	104
G301	08/11/2020	0.30	-102	6.6	1682	21.1	0.45
G301	01/27/2021	0.76	50.6	6.6	1710	9.1	6.08
G302	11/20/2015	0	-120	6.9	1850	16.4	145
G302	02/23/2016	0	27	6.8	1730	11.6	--
G302	05/20/2016	0	-118	6.8	1930	15.9	34
G302	08/15/2016	1.13	95	7.0	1490	17.7	56
G302	11/17/2016	1.08	71	7.1	1280	15.1	60.8
G302	02/16/2017	0	71	7.1	1262	15.3	78.1

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (field) (SU)	Specific Conductance (micromhos/cm)	Temperature (deg. C)	Turbidity (NTU)
G302	05/17/2017	0	70	7.0	1160	15.5	80.7
G302	07/12/2017	0	112	7.0	1260	17.1	46.6
G302	10/26/2017	0	78	7.1	1420	13.3	54.2
G302	05/11/2018	0	87	7.1	1470	15.0	46.2
G302	08/03/2018	0	93	7.0	1465	15.2	50.4
G302	01/23/2019	0	94	7.0	1407	12.2	53
G302	08/19/2019	0	87	7.0	1505	17.0	60.1
G302	01/23/2020	4.10	44.7	7.1	1462	9.2	258
G302	08/11/2020	2.30	5.6	6.9	1339	20.1	11.1
G302	01/27/2021	2.40	63	6.6	1525	9.8	5.05
G303	11/20/2015	0	-29	6.9	2260	16.4	348
G303	02/23/2016	0.81	121	7.0	2110	11.0	--
G303	05/20/2016	0.61	-77	6.9	2270	20.2	7.6
G303	08/15/2016	0.07	-2	6.9	2480	17.9	7.8
G303	11/17/2016	0.20	-2	6.9	2260	15.0	9.8
G303	02/19/2017	0	-31	6.9	2009	16.0	12.9
G303	05/17/2017	0	-26	7.1	1850	15.7	13.8
G303	07/13/2017	0	59	7.0	1870	17.4	15.7
G303	10/26/2017	0	-3	7.0	2230	13.3	26.1
G303	05/14/2018	0	-1	7.0	2200	13.4	7.5
G303	08/03/2018	0	-60	7.0	1877	15.3	44.1
G303	01/23/2019	0	-69	7.0	1869	11.5	30.1
G303	08/19/2019	0	-59	7.0	1903	17.3	39.7
G303	01/23/2020	2.30	33.8	7.0	2102	9.4	3.71
G303	08/11/2020	1.50	-69.9	6.9	2254	19.9	95.6
G303	01/26/2021	0.48	55.5	6.8	2205	8.9	1.2
G304	11/20/2015	0	19	7.1	1970	16.8	209
G304	02/23/2016	0	132	7.1	1960	12.1	14
G304	05/20/2016	0	15	7.1	1990	18.6	50
G305	05/19/2016	0	-29	7.1	1990	18.1	832
G305	07/01/2016	0	108	7.2	1960	24.4	0
G305	08/16/2016	0	161	7.3	2060	19.6	2.3
G305	09/29/2016	0	27	6.9	2000	18.5	0
G305	11/17/2016	0	169	7.1	1830	14.4	3.8
G306	05/19/2016	0	-21	6.7	1250	16.6	1000
G306	07/01/2016	0	139	6.5	1230	20.8	--
G306	08/16/2016	0	225	6.9	1250	17.6	4
G306	09/29/2016	0	178	6.6	1230	18.1	--
G306	11/16/2016	0	205	7.0	1144	13.7	1.3
G306	02/19/2017	0	122	7.0	1290	14.8	74
G306	05/17/2017	0	109	7.1	1190	15.8	66.9
G306	07/13/2017	0	122	7.0	1017	17.3	12.2
G306	10/27/2017	0	210	6.9	1210	13.9	4.2
G306	05/14/2018	0	200	6.9	1140	15.6	0.3
G306	08/03/2018	0	92	7.0	1205	15.1	27.4
G306	01/23/2019	0	95	7.0	1032	11.2	33

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (field) (SU)	Specific Conductance (micromhos/cm)	Temperature (deg. C)	Turbidity (NTU)
G306	08/19/2019	0	99	7.0	1178	16.8	33.1
G306	01/21/2020	5.50	212	7.0	1079	9.9	835
G306	08/11/2020	0.90	132	6.9	1173	18.7	1.3
G306	01/26/2021	2.80	115	6.8	1012	10.4	0
G306	03/29/2021	4.70	227	6.7	1097	14.5	59.3
G306	04/21/2021	3.00	102	6.8	1053	12.5	8.96
G306	05/05/2021	2.00	132	6.8	1053	14.7	25.6
G306	05/18/2021	1.40	149	6.9	1102	14.0	21.6
G306	06/15/2021	1.10	156	6.8	1087	17.0	29.3
G306	06/28/2021	1.90	149	7.0	1148	23.4	9.97
G306	07/14/2021	1.20	134	6.8	1065	18.6	17.5
G306	07/27/2021	1.00	114	6.8	1002	19.6	2.78
G307	08/16/2016	0	167	7.0	2010	19.0	--
G307	09/29/2016	0	-7	6.9	1950	18.8	--
G307	11/16/2016	0	174	6.9	2130	15.8	--
G307	02/19/2017	0	162	7.0	2305	16.5	7.9
G307	05/17/2017	0	140	7.2	2540	15.7	6.6
G307	07/13/2017	0	170	7.0	1940	17.9	9.2
G307	10/27/2017	0	175	7.0	2050	13.4	0
G307	05/14/2018	0	105	7.0	1850	16.0	9.4
G307	08/03/2018	0	161	7.0	1460	16.1	92.6
G307	08/19/2019	0	155	7.0	1495	17.1	1000
G307	02/26/2020	0.50	128	7.0	1885	10.4	45.2
G307	05/06/2020	1.00	87.6	7.3	1914	14.4	18
G307	08/11/2020	0.70	50.1	7.3	1828	19.0	0.41
G307	01/27/2021	0.83	65.7	7.4	1711	5.7	0.59
G307D	03/29/2021	1.20	186	7.3	1958	14.4	16.4
G307D	04/21/2021	1.20	-15.1	7.2	1856	14.0	16.7
G307D	05/04/2021	2.70	-2.9	7.3	1739	14.0	19.7
G307D	05/18/2021	0.17	-50.3	7.3	1840	15.3	10.2
G307D	07/27/2021	2.20	-62.4	7.2	1554	24.1	2.37
G308	03/29/2021	0.63	213	7.3	2389	13.5	15.5
G308	04/21/2021	0.87	32.1	7.2	2221	11.6	0.99
G308	05/05/2021	0.51	103	7.2	2131	13.6	0
G308	05/17/2021	0.47	42.7	7.2	2258	13.9	0
G308	06/14/2021	0.25	-8.3	7.2	2207	19.0	0.72
G308	06/28/2021	0.36	26.1	7.2	9092	20.3	0.8
G308	07/14/2021	0.40	118	7.3	2092	17.3	0.06
G308	07/27/2021	0.30	37.2	7.3	1141	22.6	1.14
G309	03/29/2021	0.71	206	7.2	1709	14.8	84.3
G309	04/21/2021	1.10	61.7	7.2	1582	13.8	10.9
G309	05/05/2021	1.00	93.6	7.2	1770	14.7	19.4
G309	05/17/2021	0.36	26.6	7.3	1664	16.0	28.8
G309	06/14/2021	0.51	-28.6	7.2	1371	21.2	2.4
G309	06/28/2021	0.49	-48.6	7.3	1491	21.4	1.11
G309	07/13/2021	0.80	-35.9	7.4	1565	16.5	21.7

RAMBOLL

TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (field) (SU)	Specific Conductance (micromhos/cm)	Temperature (deg. C)	Turbidity (NTU)
G309	07/27/2021	0.44	-55.2	7.3	1729	20.0	2.22
G310	03/29/2021	0.84	214	7.1	1800	14.0	4.55
G310	04/22/2021	0.40	102	7.0	1889	13.2	1.22
G310	05/04/2021	0.79	153	7.2	1952	12.9	0.47
G310	05/19/2021	0.29	100	7.2	1934	14.9	1.22
G310	06/15/2021	0.25	181	7.2	1930	15.8	2.67
G310	06/28/2021	0.37	44.5	7.1	1853	17.3	0.61
G310	07/13/2021	0.36	65.5	7.2	1929	18.8	0.74
G310	07/28/2021	0.35	51.3	7.2	1970	18.9	0.13
G311	03/30/2021	1.30	330	6.7	1854	13.3	54.4
G311	04/22/2021	0.78	208	6.8	1986	13.1	21.1
G311	05/04/2021	0.60	165	7.0	2052	13.2	54.9
G311	05/19/2021	0.31	101	6.9	2039	15.7	47.2
G311	06/15/2021	0.24	91.6	6.9	2040	17.8	42.8
G311	06/29/2021	1.00	91.5	7.0	1558	21.4	34.3
G311	07/14/2021	0.60	204	6.9	2037	15.8	4.13
G311	07/27/2021	2.80	33	7.1	2117	19.9	41.5
G311D	03/30/2021	3.40	65.8	7.1	883	17.8	56.9
G311D	04/22/2021	3.40	106	7.0	897.6	15.0	3.2
G311D	05/04/2021	2.30	101	7.2	953.1	14.8	8.15
G311D	05/19/2021	2.70	-52.9	7.2	979	17.0	0.93
G311D	07/28/2021	1.60	-170	7.2	1080	19.6	1.28
G312	03/30/2021	2.40	421	6.5	1471	12.4	0.12
G312	04/22/2021	0.78	114	6.4	1645	13.0	3.42
G312	05/04/2021	1.00	136	6.5	1788	13.0	6.97
G312	05/19/2021	0.31	142	6.4	1725	15.8	1.15
G312	06/15/2021	0.29	130	6.5	1761	17.2	3.63
G312	06/29/2021	1.60	138	6.5	1954	21.2	3.39
G312	07/13/2021	0.61	112	6.3	1460	19.5	3.39
G312	07/27/2021	0.42	85.5	6.5	1846	18.2	0
G313	03/30/2021	0.64	243	6.9	2611	12.8	58
G313	04/22/2021	0.74	97.7	6.8	1558	12.1	14.3
G313	05/04/2021	0.16	81.4	7.0	2115	13.3	48.9
G313	05/18/2021	0.29	38.5	7.0	2132	15.2	28.1
G313	06/14/2021	0.22	17.7	7.1	2132	20.7	27
G313	06/28/2021	1.10	46.3	7.0	2104	23.9	6.74
G313	07/13/2021	0.40	17.8	6.9	2099	21.7	5.27
G313	07/27/2021	0.30	13.8	6.9	1605	22.4	1.16
G314	03/30/2021	3.40	177	6.8	3921	14.0	19.4
G314	04/21/2021	0.95	96.8	6.6	3977	11.7	1.58
G314	05/04/2021	4.70	82.1	7.1	3303	14.9	21.1
G314	05/17/2021	0.32	64.9	6.6	3877	14.7	0.75
G314	06/14/2021	0.46	41.1	6.6	3551	17.6	6.91
G314	06/28/2021	0.90	-14	6.6	3553	20.1	42.1
G314	07/13/2021	1.70	-17.9	6.7	4012	16.9	1.36
G314	07/27/2021	0.34	-39.1	6.6	4091	20.0	0.36

RAMBOLL

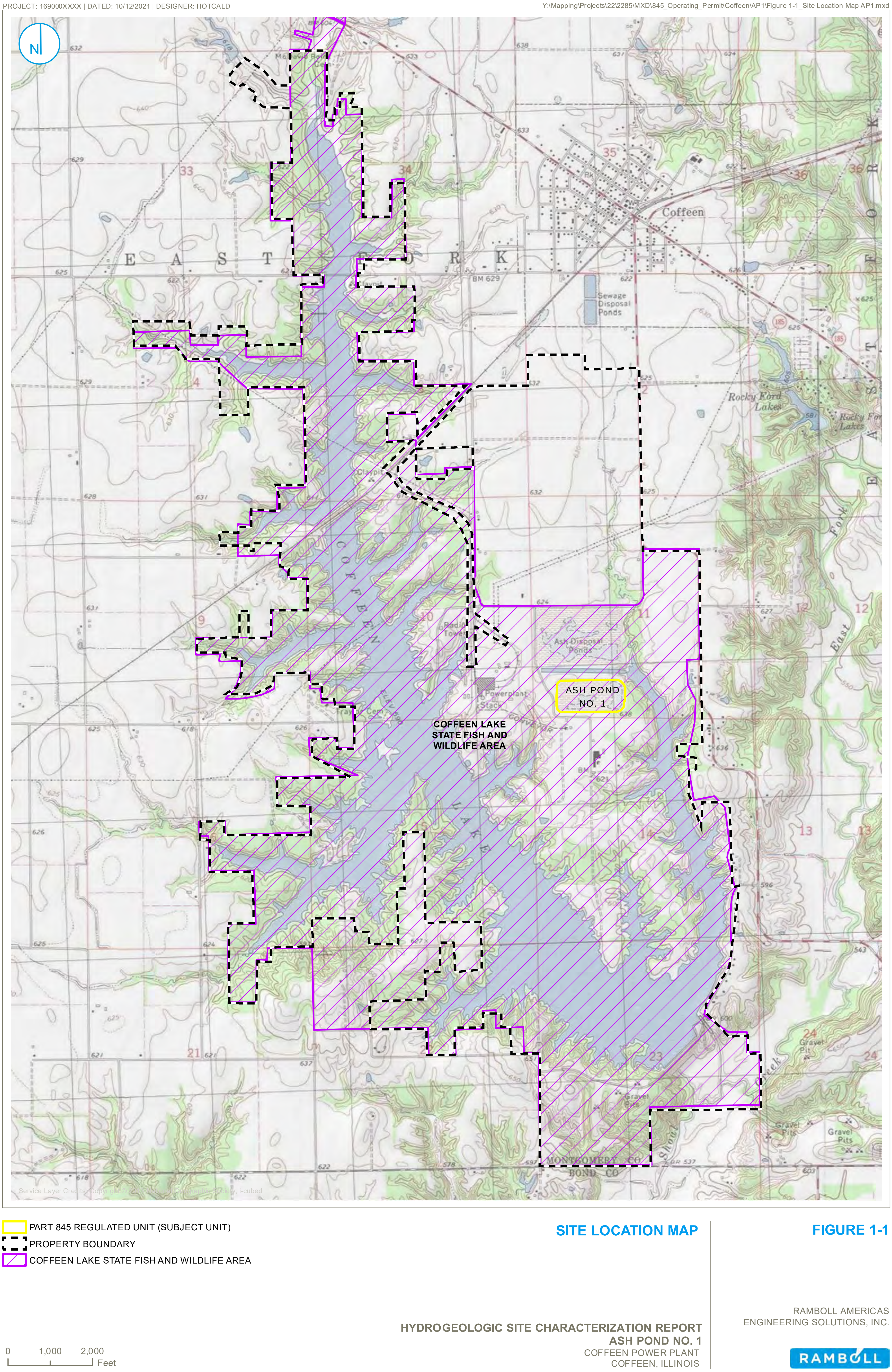
TABLE 4-2. GROUNDWATER FIELD PARAMETERS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (field) (SU)	Specific Conductance (micromhos/cm)	Temperature (deg. C)	Turbidity (NTU)
G314D	03/30/2021	0.60	-21.8	7.3	3751	15.9	15.9
G314D	04/21/2021	0.76	62.7	7.2	3428	13.0	12.1
G314D	05/04/2021	0.89	77.7	7.2	3110	14.4	1.52
G314D	05/19/2021	0.90	130	7.2	2761	15.4	42.4
G314D	07/28/2021	5.40	94.8	7.2	2522	20.8	1.74
G315	03/30/2021	0.92	192	6.9	2014	13.9	6.47
G315	04/22/2021	1.40	108	6.8	1682	12.7	2.66
G315	05/05/2021	0.59	157	6.8	1940	14.7	0.03
G315	05/18/2021	0.36	156	6.9	1936	14.1	1.56
G315	06/15/2021	0.20	135	6.9	1926	17.6	3.33
G315	06/29/2021	2.60	162	7.0	1933	19.8	5.01
G315	07/14/2021	0.35	18.8	6.8	1898	17.6	20.5
G315	07/28/2021	0.25	45.1	6.7	1881	17.8	0.24
G316	03/30/2021	0.36	-81.7	7.0	2351	11.5	28.9
G316	04/22/2021	0.63	-80.3	7.0	1626	10.6	11.8
G316	05/05/2021	0.37	-71.1	6.9	2170	12.5	2.01
G316	05/17/2021	0.26	-99.4	7.1	2202	14.4	2
G316	06/14/2021	0.21	-107	7.1	2171	17.7	8.05
G316	06/28/2021	0.80	-112	7.1	1790	18.0	27.7
G316	07/13/2021	0.56	-108	7.0	2208	19.6	4.92
G316	07/27/2021	0.27	-114	7.0	1987	18.6	1.11
G317	03/30/2021	4.70	94.2	6.5	1981	14.4	1.09
G317	04/22/2021	3.60	114	6.5	2011	13.3	0.26
G317	05/05/2021	3.50	104	6.5	2280	21.0	0.16
G317	05/18/2021	2.80	89.7	6.6	2209	15.1	1.83
G317	06/15/2021	4.70	103	6.6	2069	17.0	6.82
G317	06/28/2021	5.30	180	6.7	2127	17.2	10.2
G317	07/13/2021	5.60	116	6.6	2031	17.9	134
G317	07/28/2021	6.70	150	6.5	1616	16.4	9.41

Notes:
Field readings are reported with as many significant figures as provided by analytical laboratory.
-- = data not available
cm = centimeter
deg. C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
NTU = nephelometric turbidity units
SU = standard units

generated 10/22/2021, 11:51:40 AM CDT

FIGURES

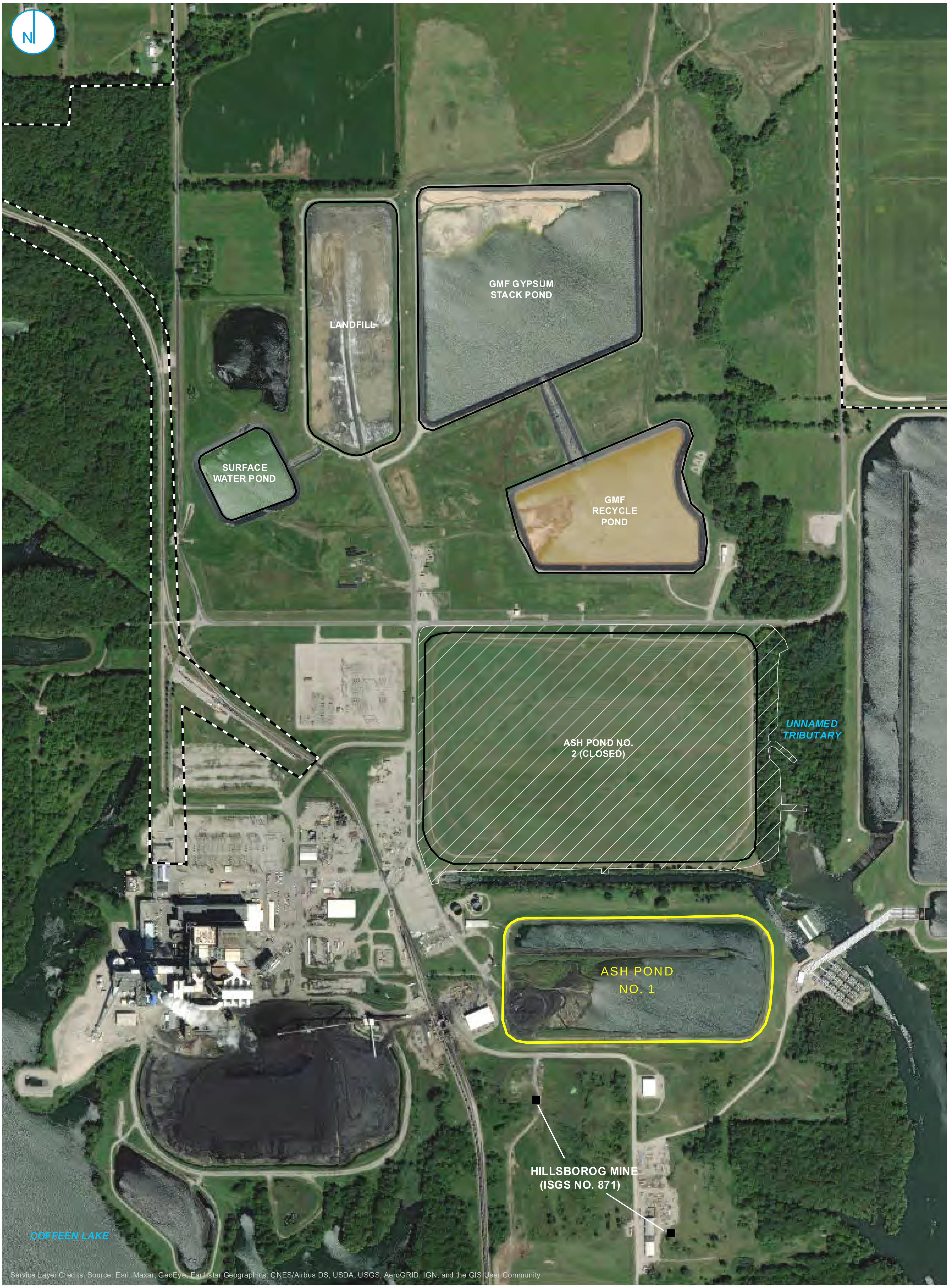


SITE LOCATION MAP

FIGURE 1-1

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.



- COAL MINE SHAFT
- PART 845 REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

0 275 550 Feet

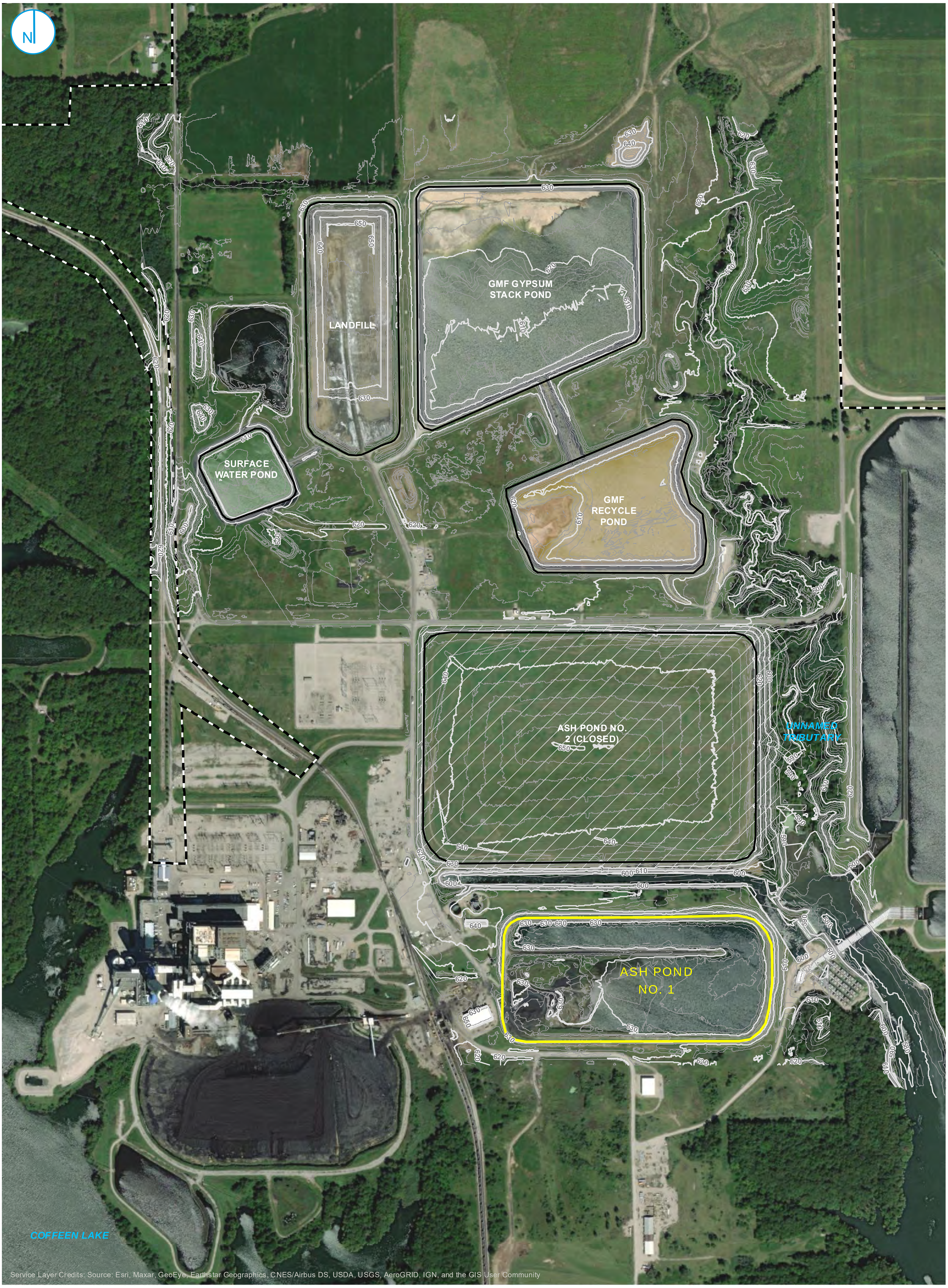
SITE MAP

FIGURE 1-2

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO.1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



10-FT ELEVATION CONTOUR
2-FT ELEVATION CONTOUR
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

NOTE
ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988

SOURCE
INGENAE SURVEY, 2021

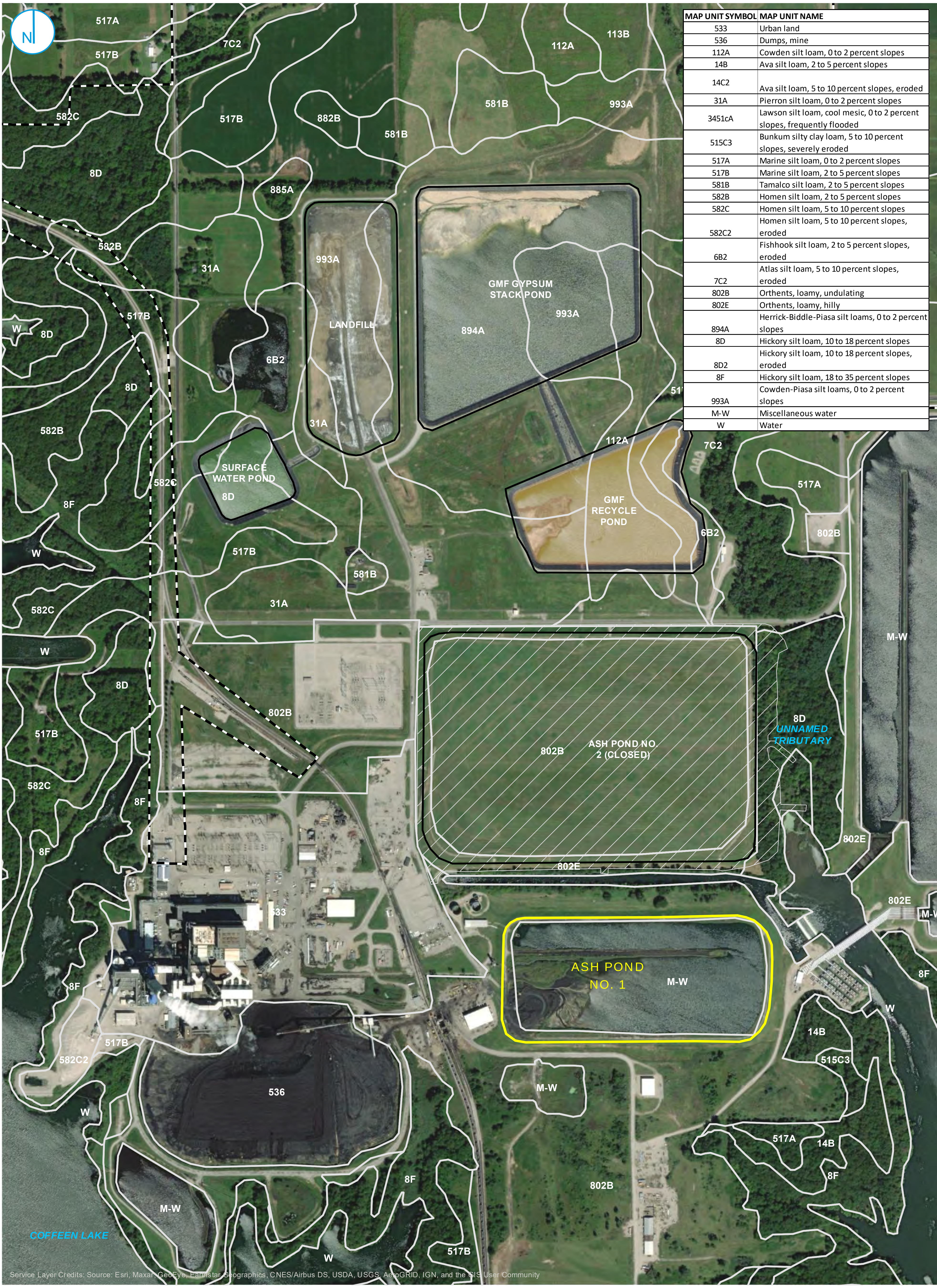
SITE TOPOGRAPHIC MAP

FIGURE 2-1

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL



MAP UNIT SYMBOL	MAP UNIT NAME
533	Urban land
536	Dumps, mine
112A	Cowden silt loam, 0 to 2 percent slopes
14B	Ava silt loam, 2 to 5 percent slopes
14C2	Ava silt loam, 5 to 10 percent slopes, eroded
31A	Pierron silt loam, 0 to 2 percent slopes
3451cA	Lawson silt loam, cool mesic, 0 to 2 percent slopes, frequently flooded
515C3	Bunkum silty clay loam, 5 to 10 percent slopes, severely eroded
517A	Marine silt loam, 0 to 2 percent slopes
517B	Marine silt loam, 2 to 5 percent slopes
581B	Tamalco silt loam, 2 to 5 percent slopes
582B	Homen silt loam, 2 to 5 percent slopes
582C	Homen silt loam, 5 to 10 percent slopes
582C2	Homen silt loam, 5 to 10 percent slopes, eroded
6B2	Fishhook silt loam, 2 to 5 percent slopes, eroded
7C2	Atlas silt loam, 5 to 10 percent slopes, eroded
802B	Orthents, loamy, undulating
802E	Orthents, loamy, hilly
894A	Herrick-Biddle-Piasa silt loams, 0 to 2 percent slopes
8D	Hickory silt loam, 10 to 18 percent slopes
8D2	Hickory silt loam, 10 to 18 percent slopes, eroded
8F	Hickory silt loam, 18 to 35 percent slopes
993A	Cowden-Piasa silt loams, 0 to 2 percent slopes
M-W	Miscellaneous water
W	Water

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY
NRCS SOIL SURVEY MAP UNIT BOUNDARY

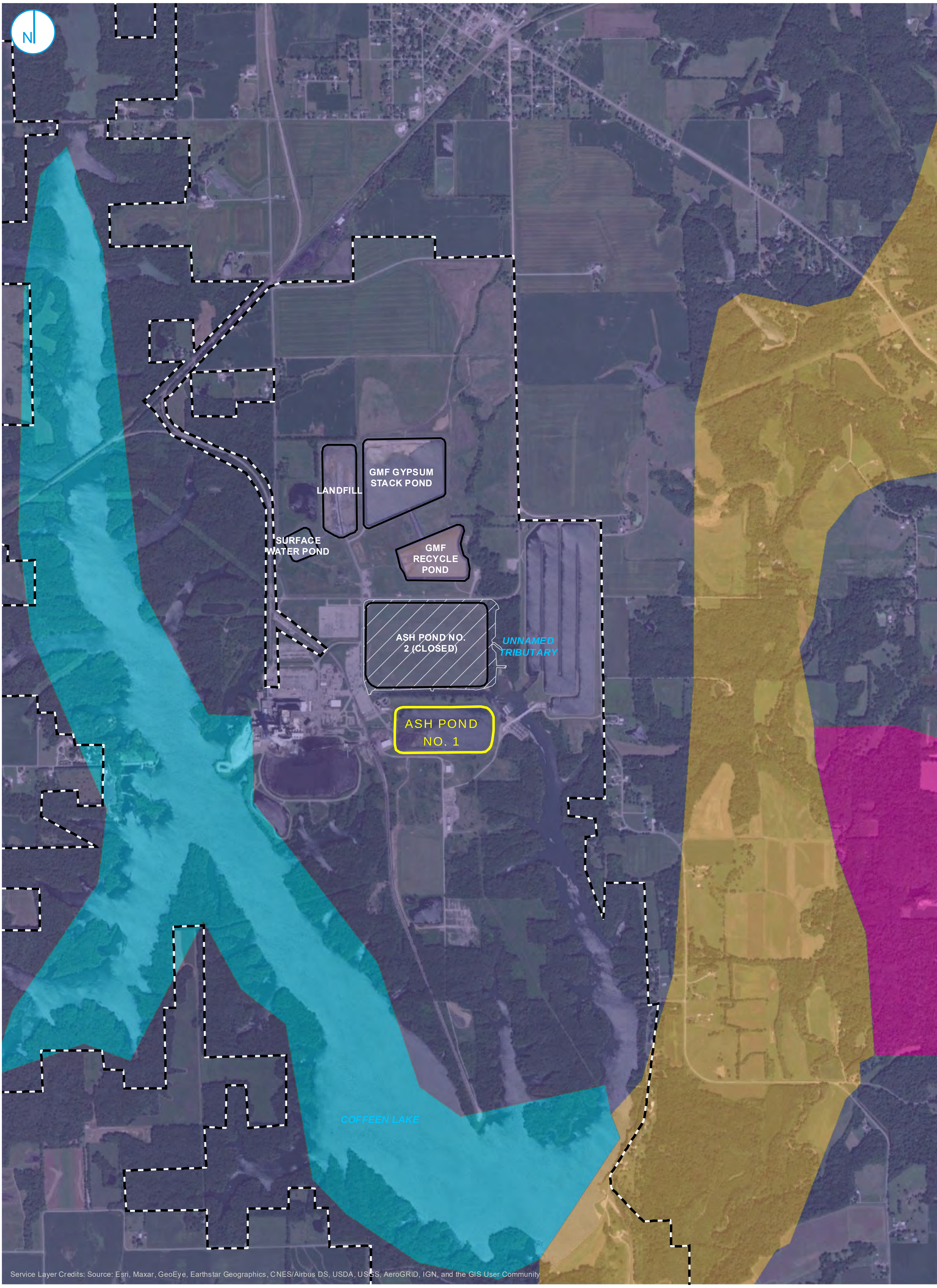
0 275 550 Feet

SOIL SURVEY MAP

FIGURE 2-2

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.



PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY
CAHOKIA ALLUVIUM (INCLUDES ALLUVIAL FAN FACIES)
HAGARSTOWN MEMBER
VANDALIA TILL MEMBER
WATER

0 750 1,500 Feet

SOURCE
ILLINOIS STATE GEOLOGICAL SURVEY (ISGS)

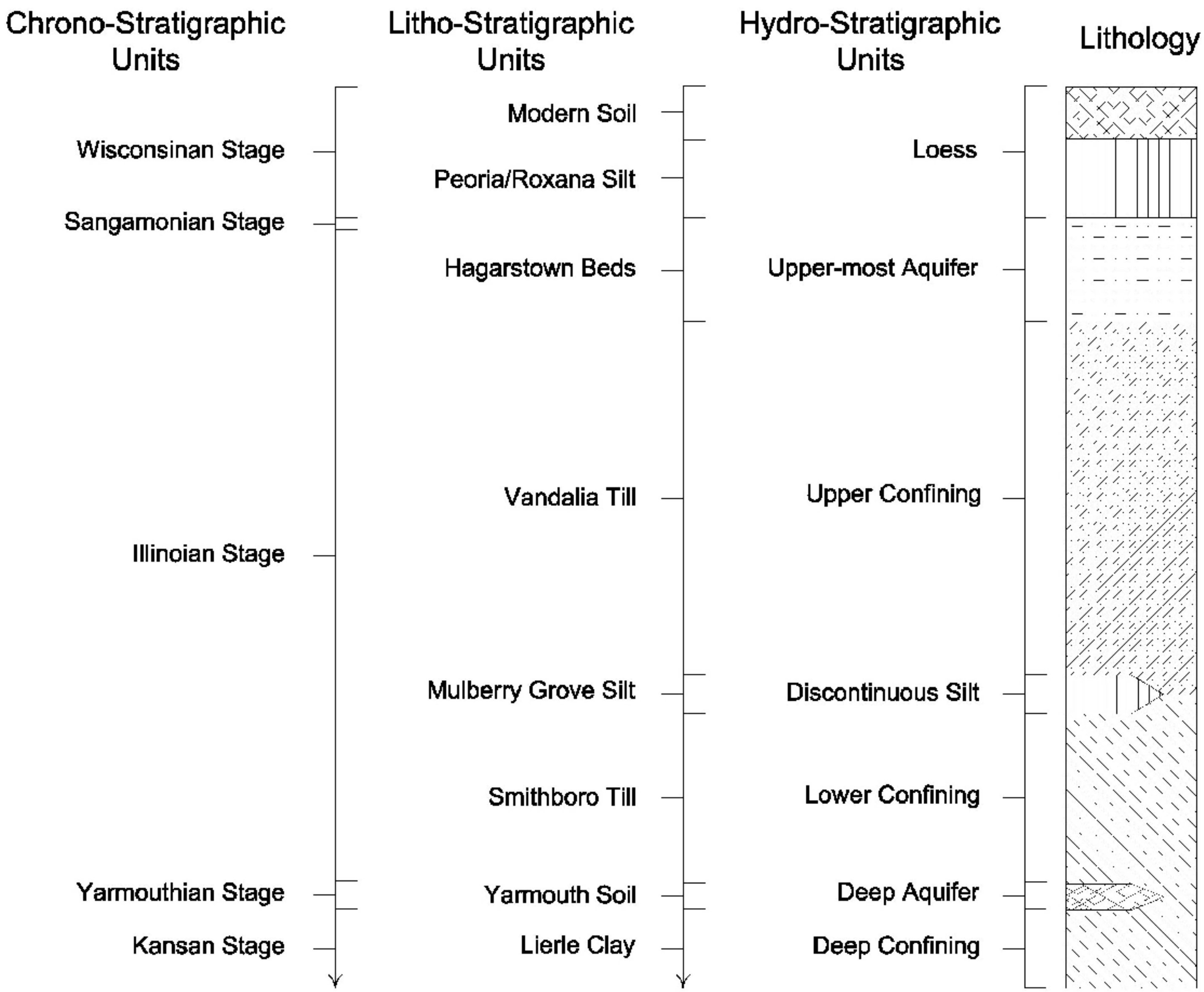
SURFICIAL GEOLOGIC DEPOSITS

FIGURE 2-3

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



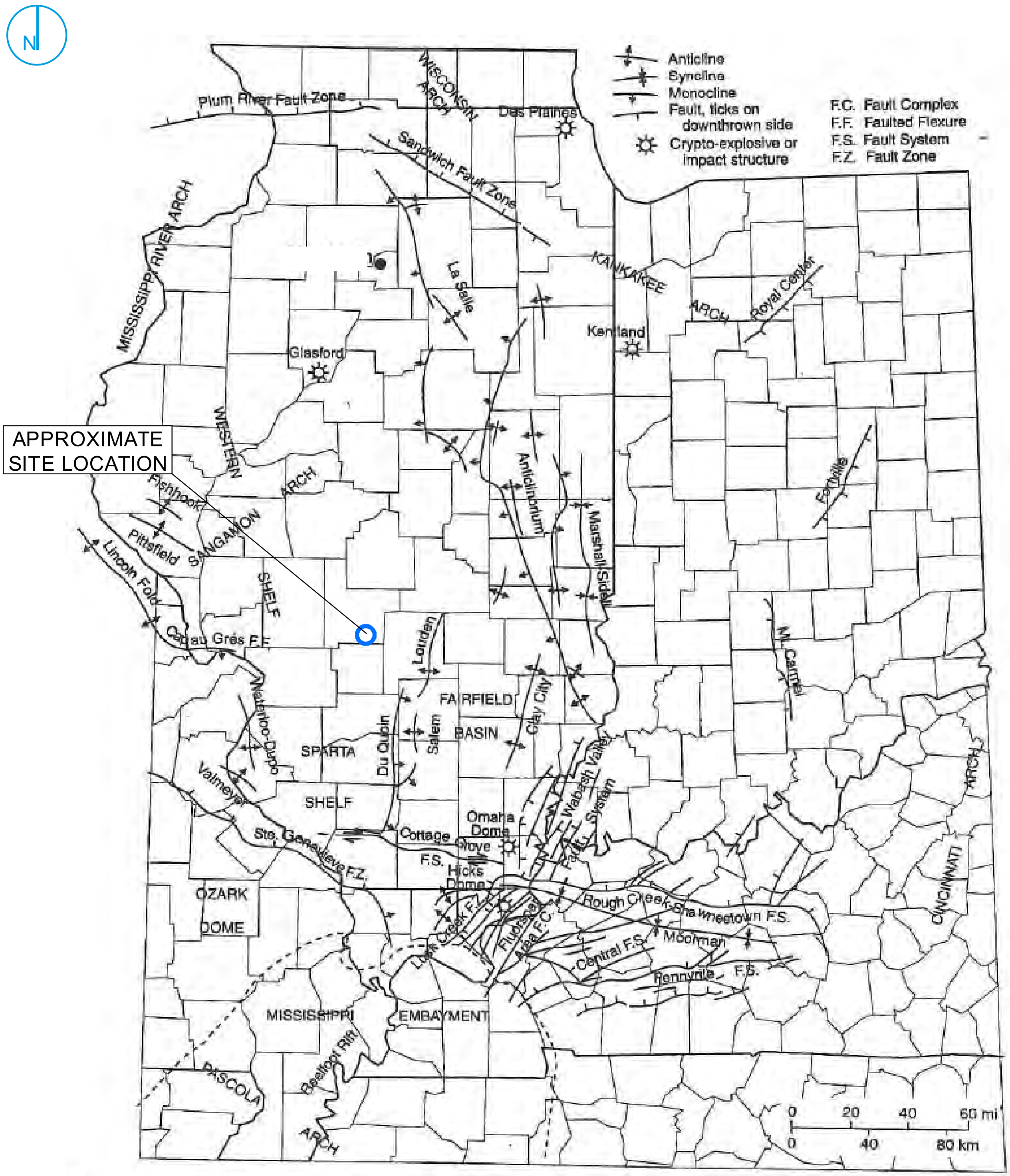
Service Layer Credits:

GENERALIZED STRATIGRAPHIC COLUMN

FIGURE 2-4

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.



SOURCE NOTE: MODIFIED FROM "NELSON, W.J. 1995, STRUCTURAL FEATURES IN ILLINOIS, ILLINOIS STATE GEOLOGICAL SURVEY, BULLETIN 100, CHAMPAIGN, ILLINOIS."

Service Layer Credits:

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Coffeen\AP1\Figure 2-5_Major Structural Features of Illinois AP1.mxd

PROJECT: 169000XXXX | DATED: 10/12/2021 | DESIGNER: HOTCALD

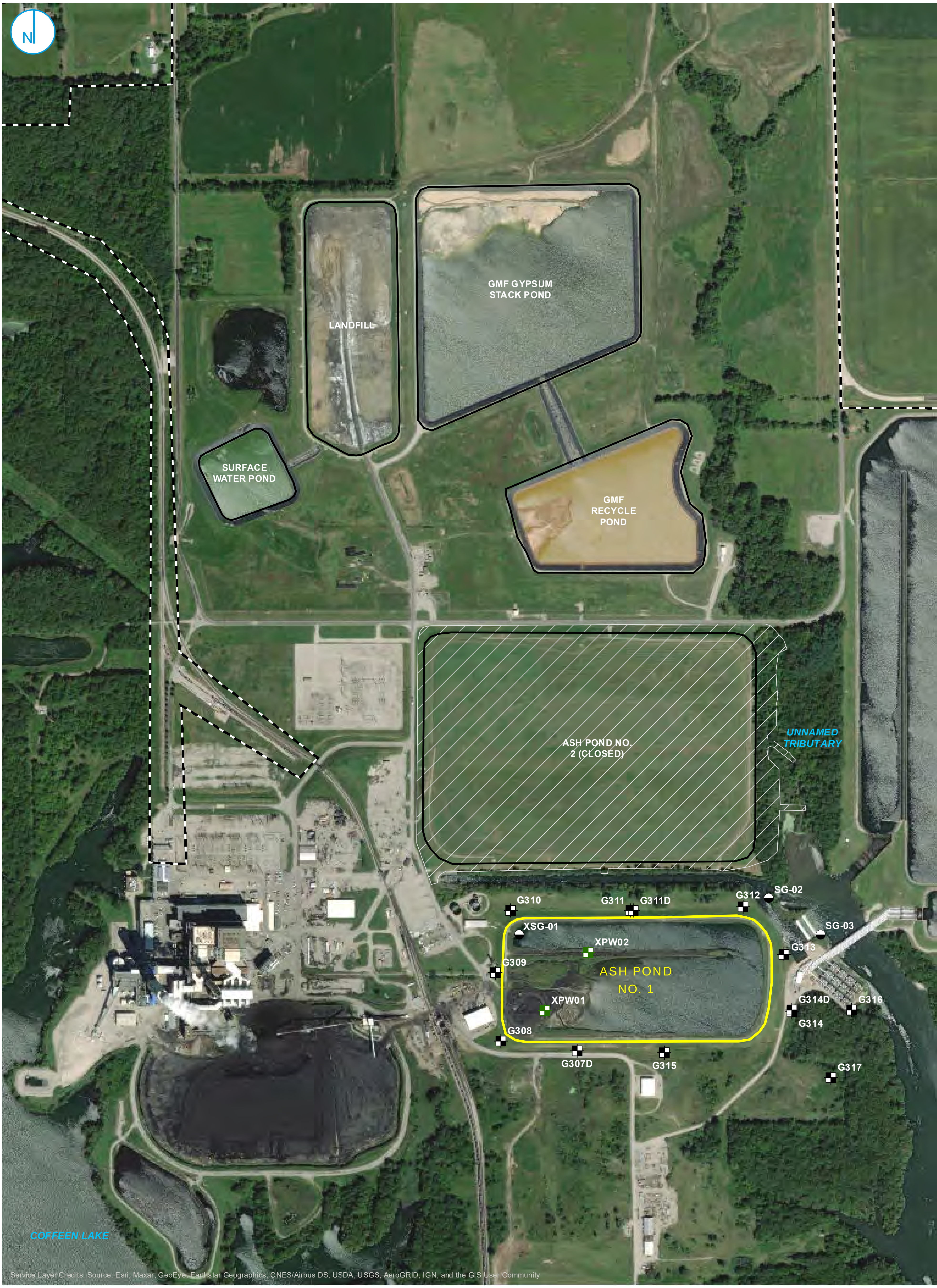
MAJOR STRUCTURAL FEATURES OF ILLINOIS

FIGURE 2-5

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

FIELD INVESTIGATION LOCATION MAP

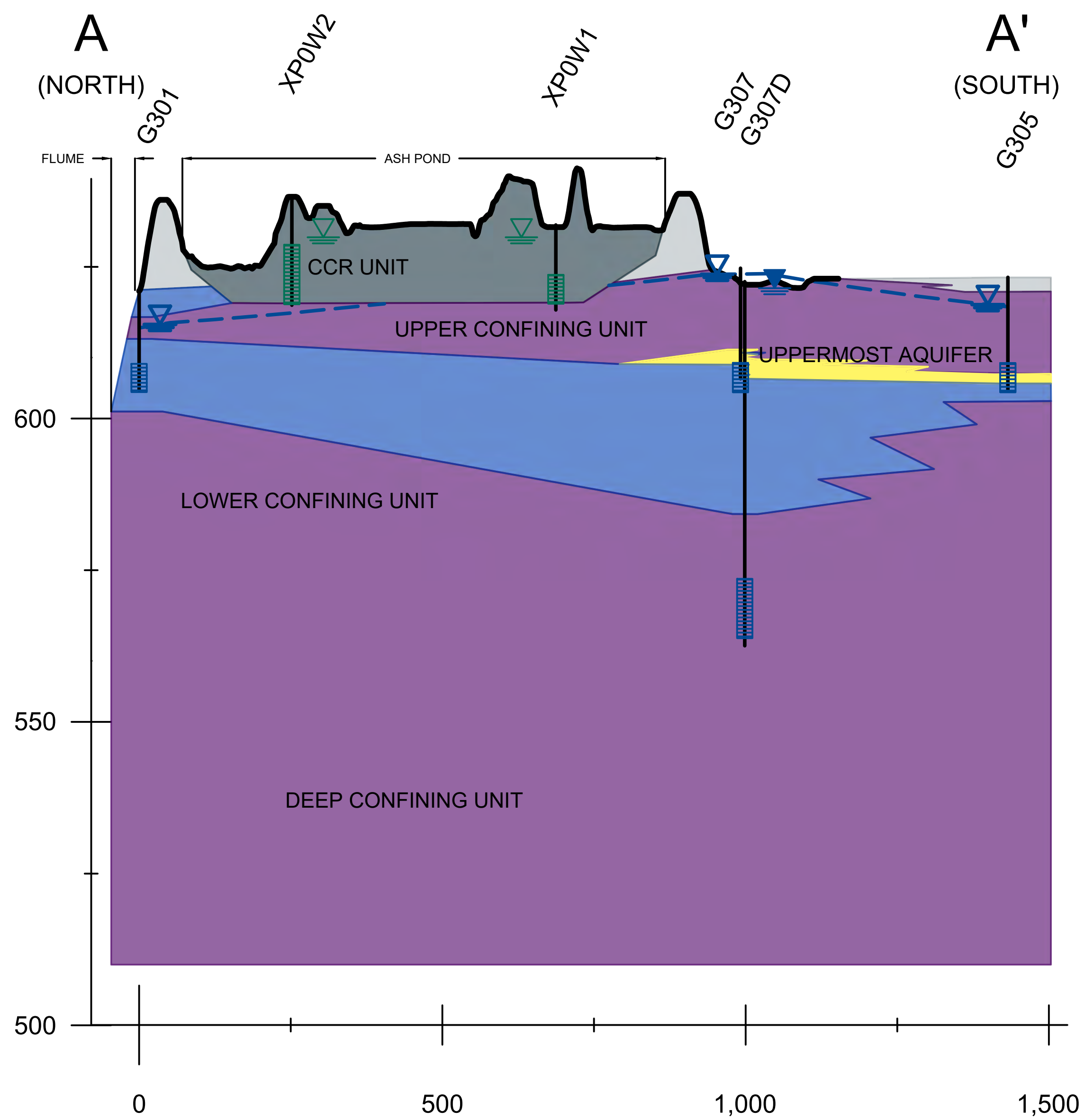
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

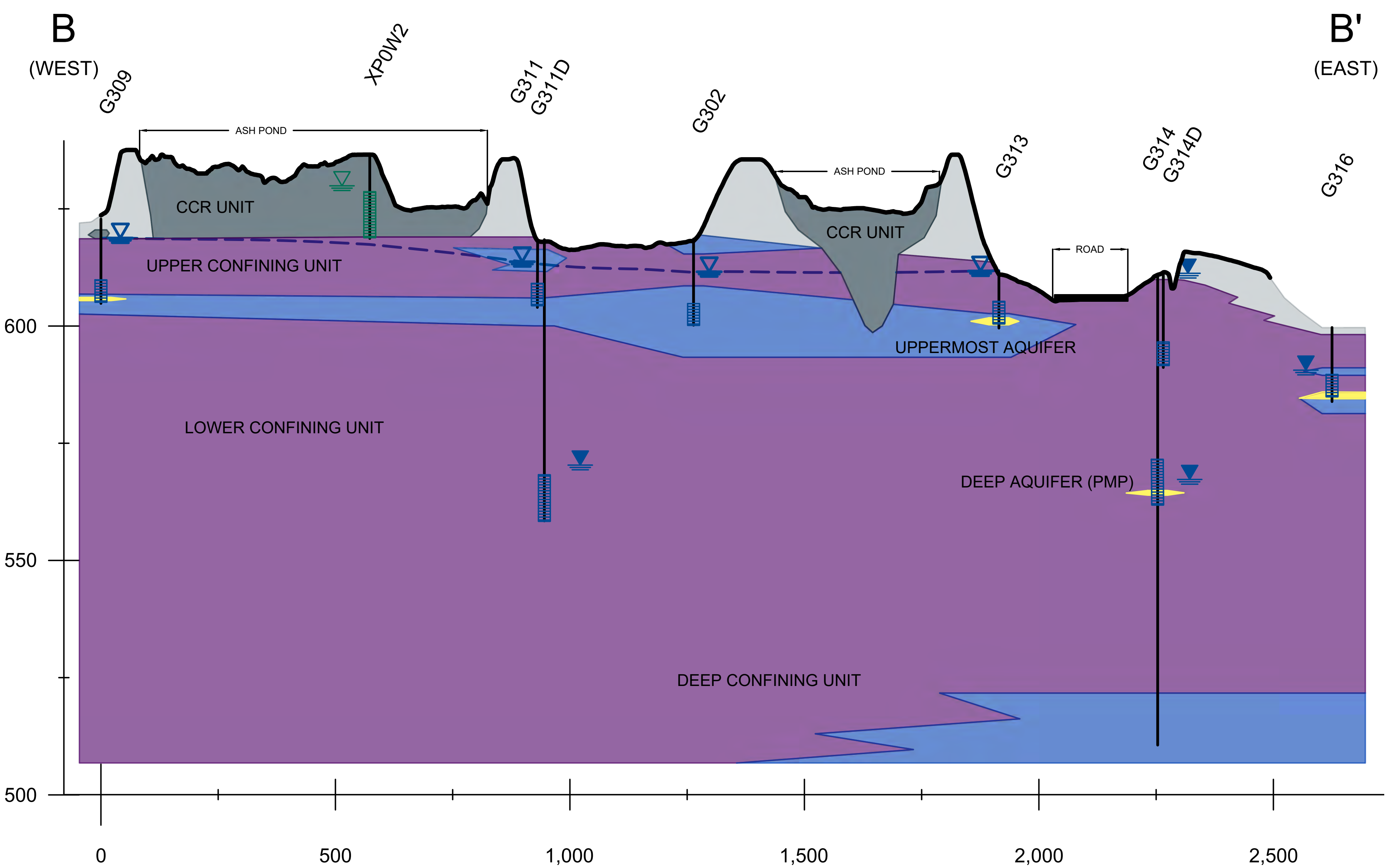
FIGURE 2-6

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

NOTES

1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 10X.
4. Groundwater elevations measured on July 26, 2021.





LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- FILL
- CLAY (CL/CH)
- SILT (ML)
- SAND (SP/SM/SW)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPERMOST AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- BEDROCK GROUNDWATER / OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)

30'

0

300'

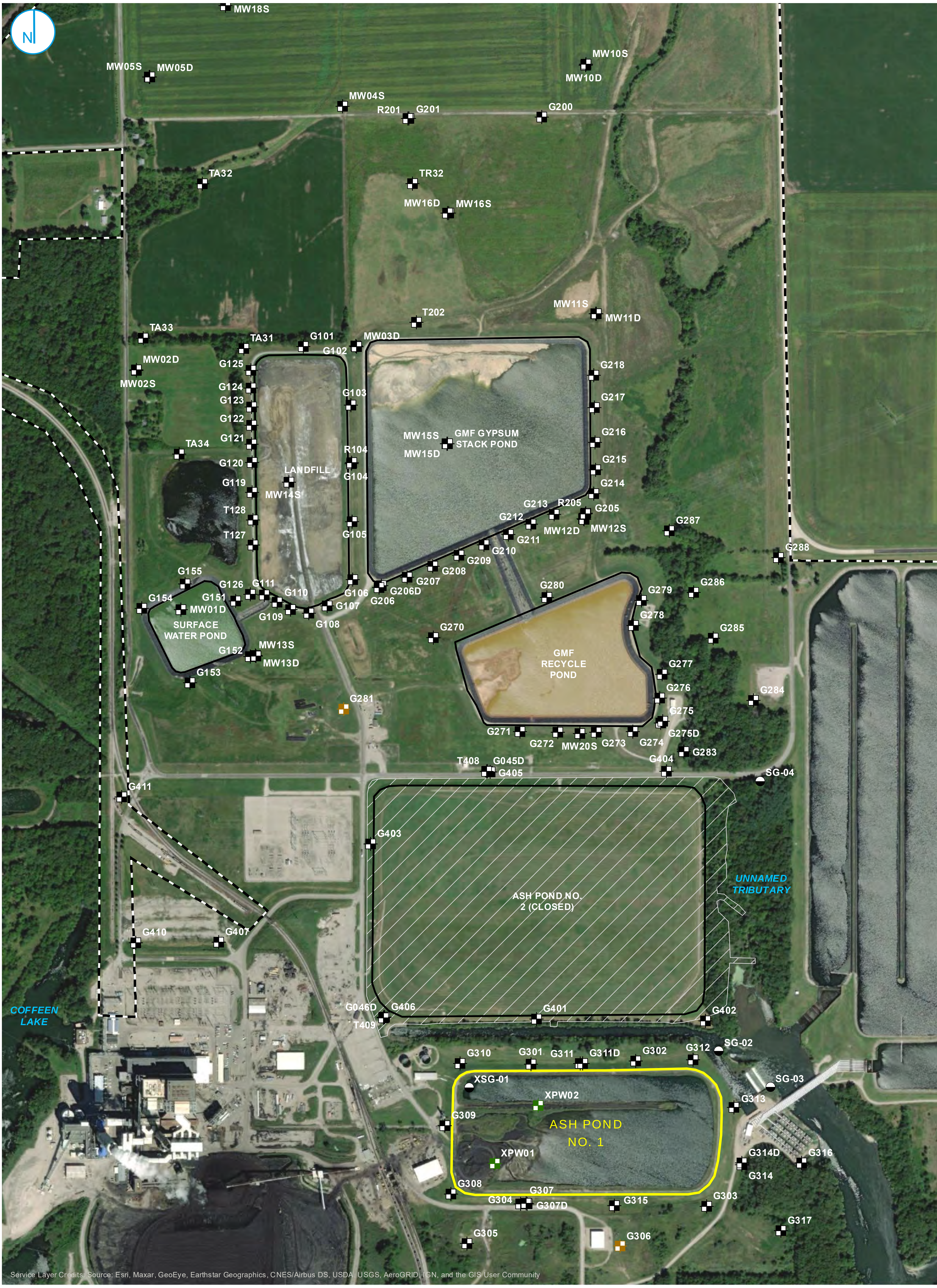
GEOLOGIC CROSS SECTIONS
A-A' & B-B'

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 2-7

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550
Feet

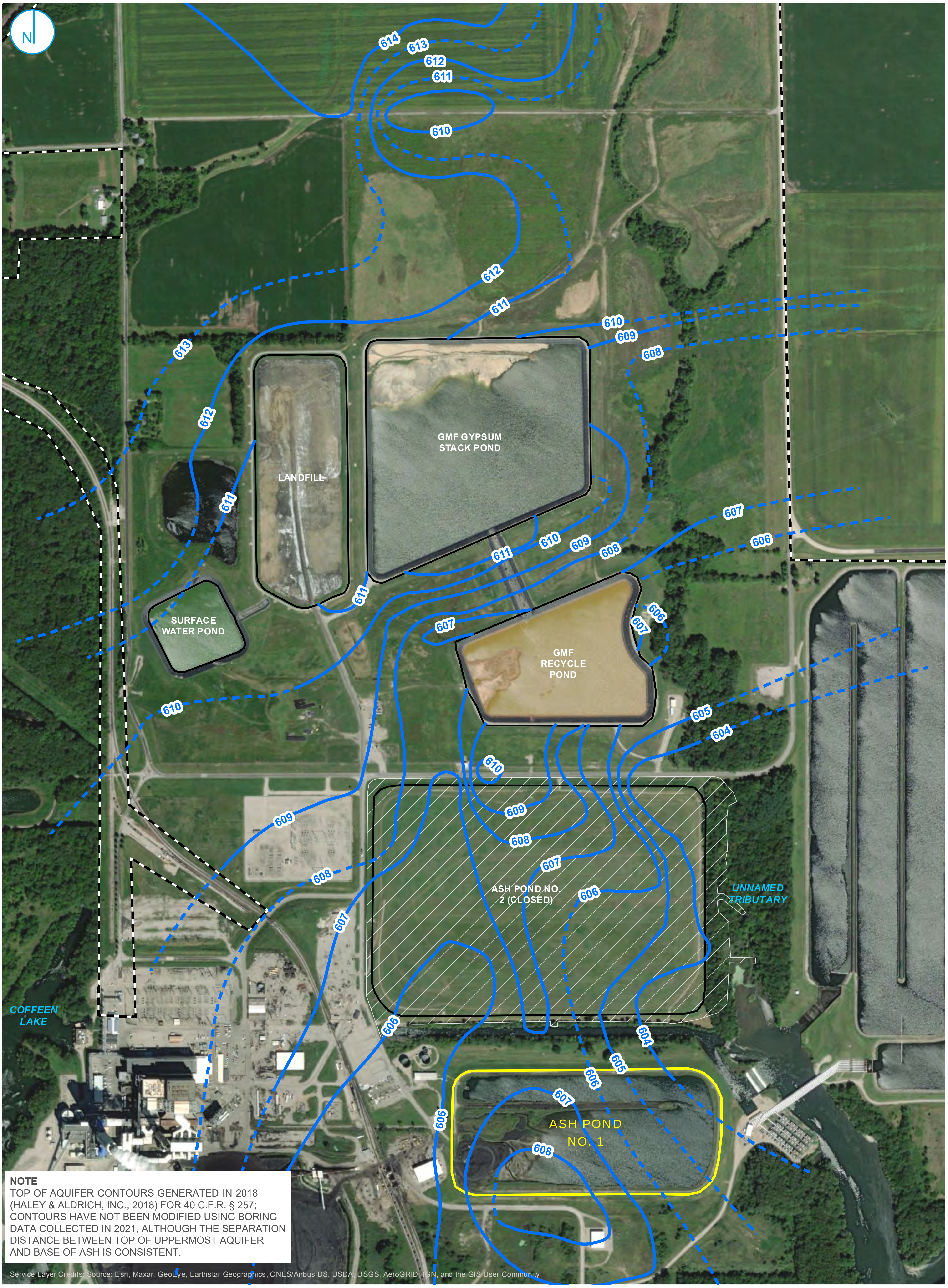
MONITORING WELL LOCATION MAP

FIGURE 3-1

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



HAGARSTOWN MEMBER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)
INFERRED HAGARSTOWN MEMBER ELEVATION CONTOUR
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

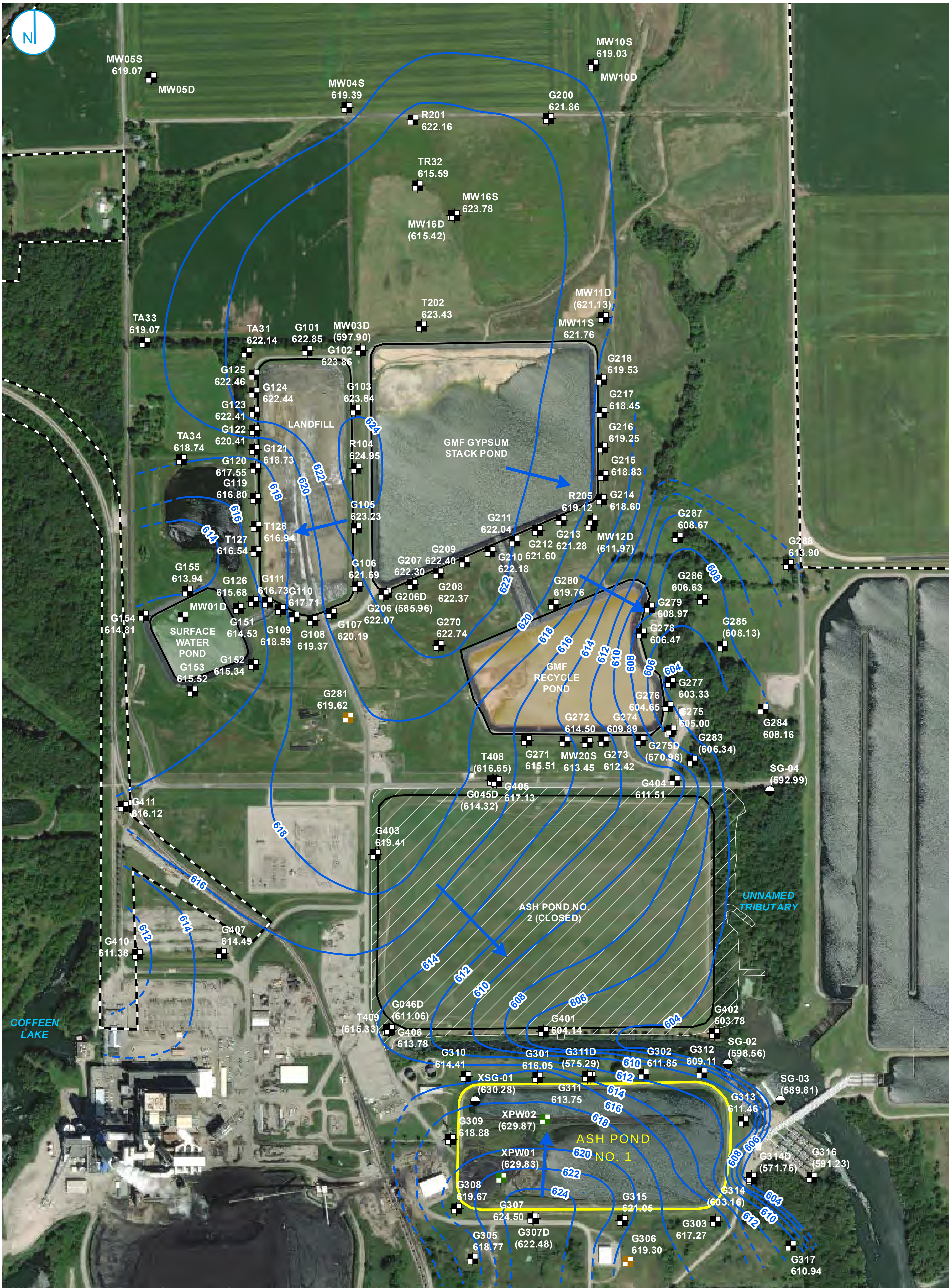
TOP OF UPPERMOST AQUIFER

FIGURE 3-2

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 275 550 Feet

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

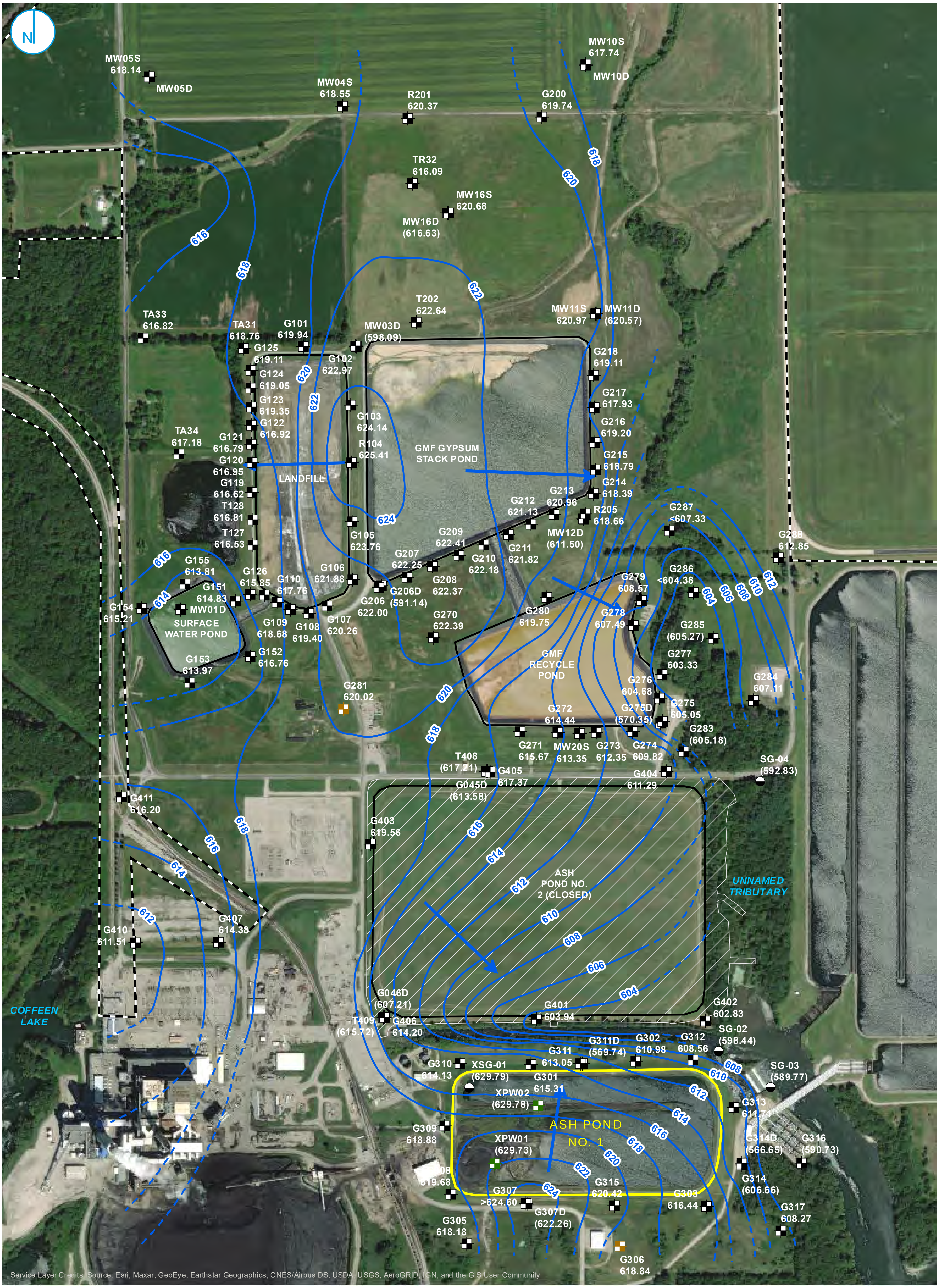
UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS
APRIL 20, 2021

FIGURE 3-3

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 275 550 Feet

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS
JULY 26, 2021

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 3-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

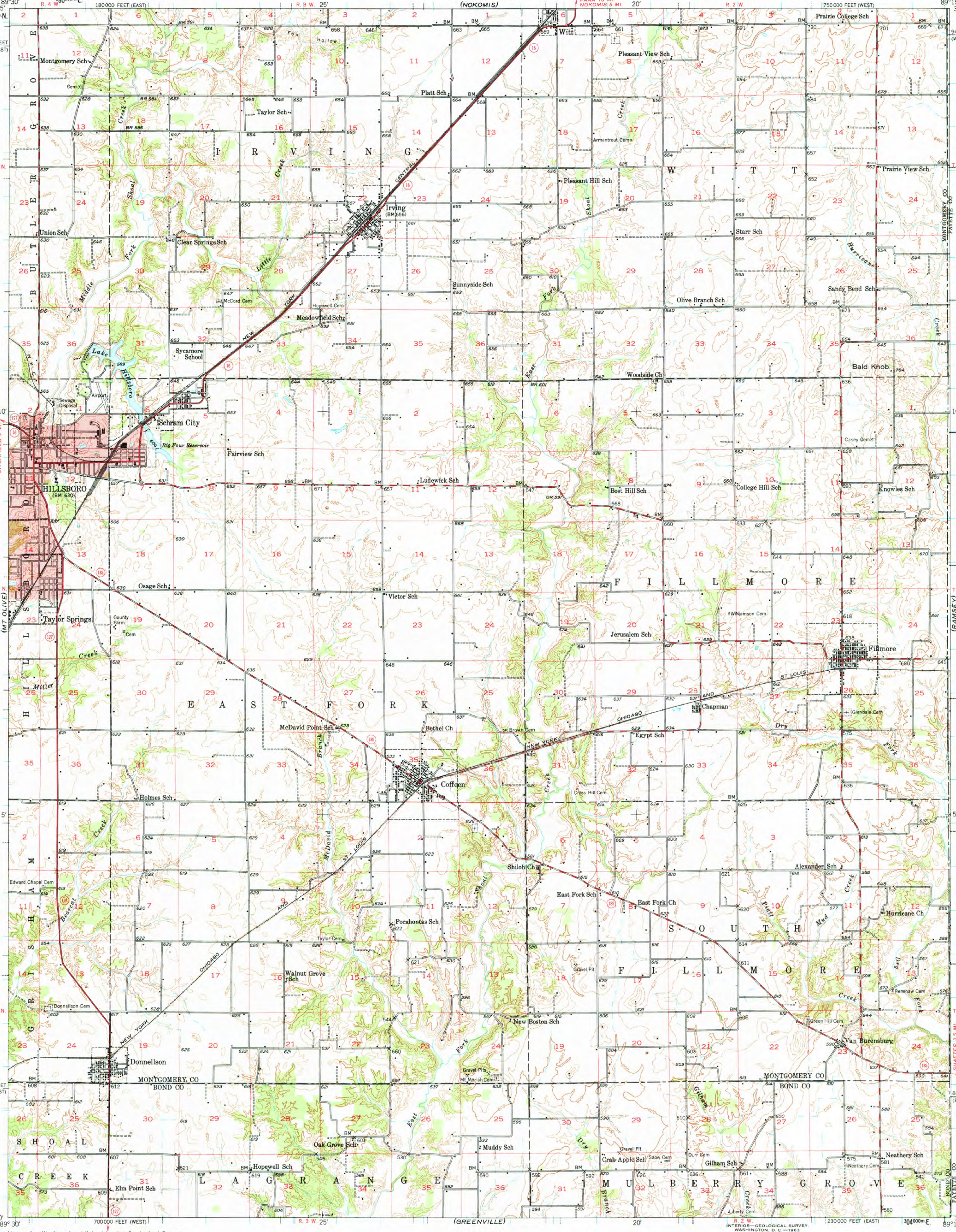
APPENDICES

APPENDIX A
HISTORIC TOPOGRAPHIC MAPS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
GEOLOGICAL SURVEY DIVISION
URBANA, ILLINOIS

HILLSBORO QUADRANGLE
ILLINOIS
15 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey
Control by USGS and USC&GS
Culture and drainage in part compiled from aerial photographs taken 1938
Topography by plane-table methods 1947
Polyconic projection. 1927 North American datum
10,000-foot grids based on Illinois coordinate system, east and west zones
Red tint indicates area in which only landmark buildings are shown
1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue

APPROXIMATE MEAN DECLINATION, 1947

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT HALF-INTERVAL CONTOURS
DATUM IS MEAN SEA LEVEL

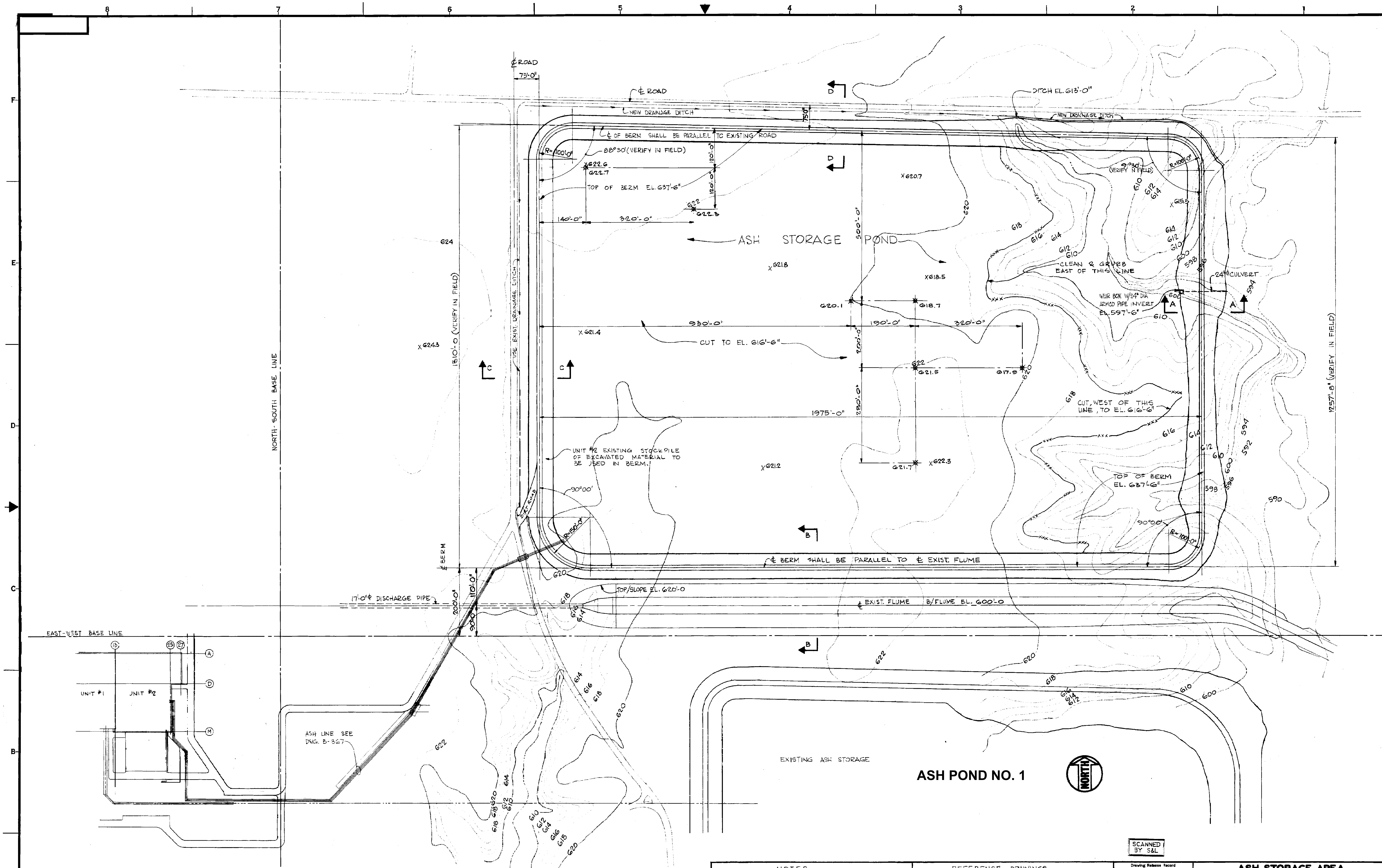
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON 25, D. C.
AND BY THE STATE GEOLOGICAL SURVEY, URBANA, ILLINOIS
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION 1963
Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
State Route

QUADRANGLE LOCATION

HILLSBORO, ILL.
N3900—W8915/15

1947



SCANNED BY S&L

NOTES	
1.	FOR GENERAL NOTES FOR ASH STORAGE POND CONTRACTOR SEE DWG. B-367
2.	ALL WORK ON THIS DWG. BY A.S.P.C. UNLESS NOTED
3.	☒ - INDICATES FIELD INFORMATION OF 12-13-70

REFERENCE DRAWINGS

Drawing Release Record

Rev	Date	Init	Description
	1-10-70	AHK	FOR A.S.P.C. BIDS
A	2-9-71	AK	FOR CONSTRUC-

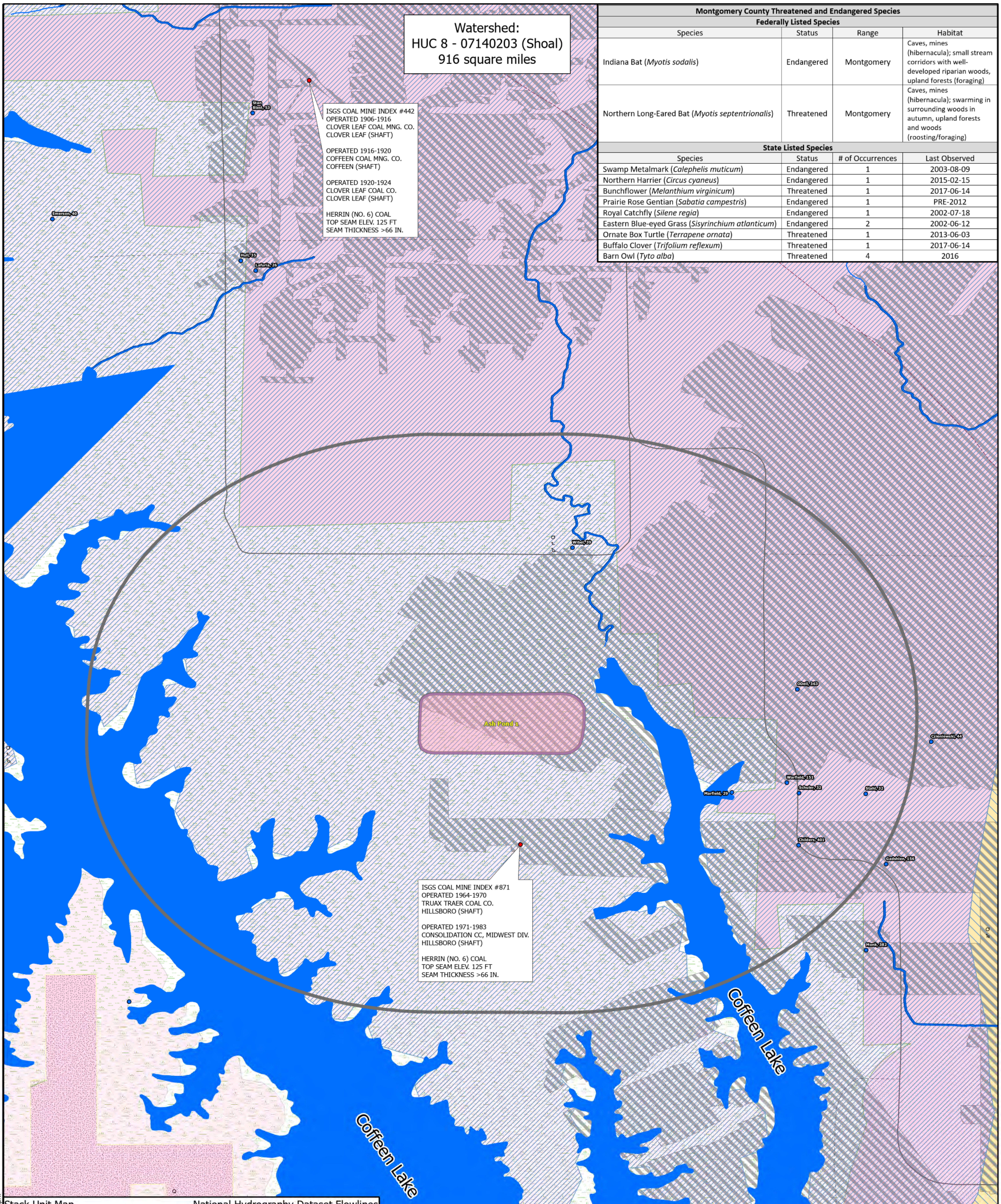
ASH STORAGE AREA
PLAN UNIT 2
COFFEEN POWER STATION UNIT 2
CENTRAL ILL. PUBLIC SERVICE CO.
COFFEEN, ILLINOIS

SCALE 1" = 100'-0"
DRAWN GEO. S.P. 1-12-70
CHECKED A.M KAYES 1-20-71
ENGINEER E. P[illegible] 1-21-71
APPROVED [illegible] 2-2-71
JOB NO 3826

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. **B-560**

APPENDIX B
INFORMATION PERTINENT TO 35 I.A.C. § 845.220(a)(3)



Montgomery County Threatened and Endangered Species

Federally Listed Species

Species	Status	Range	Habitat
Indiana Bat (*Myotis sodalis*)	Endangered	Montgomery	Caves, mines (hibernacula); small stream corridors with well-developed riparian woods, upland forests (foraging)
Northern Long-Eared Bat (*Myotis septentrionalis*)	Threatened	Montgomery	Caves, mines (hibernacula); swarming in surrounding woods in autumn, upland forests and woods (roosting/foraging)

State Listed Species

Species	Status	# of Occurrences	Last Observed
Swamp Metalmark (*Calephelis muticum*)	Endangered	1	2003-08-09
Northern Harrier (*Circus cyaneus*)	Endangered	1	2015-02-15
Bunchflower (*Melanthium virginicum*)	Threatened	1	2017-06-14
Prairie Rose Gentian (*Sabatia campestris*)	Endangered	1	PRE-2012
Royal Catchfly (*Silene regia*)	Endangered	1	2002-07-18
Eastern Blue-eyed Grass (*Sisyrinchium atlanticum*)	Endangered	2	2002-06-12
Ornate Box Turtle (*Terrapene ornata*)	Threatened	1	2013-06-03
Buffalo Clover (*Trifolium reflexum*)	Threatened	1	2017-06-14
Barn Owl (*Tyto alba*)	Threatened	4	2016

Stack Unit Map
- (A or a*) Cahokia Alluvium
- (P,Q,R,p*,q* or r*) Glasford Formation
- Bedrock Topography

IDOT Roadways
- Interstate
- Freeway and Expressway
- Other Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Local Road or Street
- Cities

Ponds
- Ash Pond 1
- 1000m Pond Buffer

Sand Units
- Alluvium/Coluvium [surficial sand]
- Formation Sands [subsurface sand]

National Hydrography Dataset Flowlines
- Perennial
- Intermittent
- Ephemeral

National Wetlands Inventory
- Lake
- Riverine

Managed Lands
- State Trust Land, Protected Biodiversity Area
- Coffeen Lake State Fish and Wildlife Area

Underground Coal Mines
- Underground
- Abandoned Coal Mine Shafts

Completed Quadrangle Mine Outlines
- Final
- Not Final

Water Wells*
- Water Wells*

*(ISGS Water Well locations are provided by the original well driller to the nearest quarter, quarter section, and may not accurately represent the actual location of the well)

Illinois Natural Heritage Database

Illinois Natural Areas Inventory (INAI) sites

INAI Name	INAI Number	Categories
Shoal Creek Barrens	0752	I, II
Gillespie Railroad Prairie	1337	II, III
Irving Railroad Prairie	0751	I
Roberts Cemetery Savanna	0750	I, II, III

INAI Category Descriptions:
Cat. I = High quality natural community and natural community restorations
Cat. II = Specific suitable habitat for state-listed species or state-listed species relocations
Cat. III = State dedicated Nature Preserves, Land and Water Reserves, & Natural Heritage Landmarks

Illinois Nature Preserves

INPC Protected Areas	INPC Number	Distance from Site
Roberts Cemetery Savanna Nature Preserve	NP152	17 miles NW
Gillespie Prairie Land and Water Reserve	LWR012	22 miles W

Land Protection Programs:
LWR = Land and Water Reserve
NHL = Natural Heritage Landmark
NP = Nature Preserve

0 300 600 1,200 1,800 2,400 3,000 3,600 US Feet

1 inch = 1,200 US feet

N

No public water supply wells or intakes in mapped area.

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HANSON
Hanson Professional Services Inc.

Ash Pond 1

Work Plan Desktop Evaluation
Coffeen Power Station
Coffeen, Montgomery Co., Illinois

Job Number: 20E0111A

Sheet 1

WATER WELL SURVEY

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
clay	0	29
Total Depth		**29**

Casing: 36" CONCRETE from 1' to 29'

Water from clay at 0' to 0'.

Owner Address: East St Louis, IL

Location source: Location from permit

Permit Date:

Permit #:

COMPANY Bekemeyer, Gust

FARM Marfield, Mac

DATE DRILLED September 15, 1970

NO.

ELEVATION 0

COUNTY NO. 01717

LOCATION NE NW NE

LATITUDE 39.055977

LONGITUDE -89.386252

COUNTY Montgomery

API 121350171700

14 - 7N - 3W

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
clay	0	25
sand	25	32
Total Depth		**32**

Casing: 36" CONCRETE from 1' to 32'

Size hole below casing: 36"

Water from sand at 0' to 0'.

Driller's Log filed

Owner Address: Granite City, IL

Location source: Location from permit

Permit Date: **Permit #:**

COMPANY Bekemeyer, Gust

FARM Schuler, Paul

DATE DRILLED February 4, 1971 **NO.**

ELEVATION 0 **COUNTY NO.** 01726

LOCATION NW NE NE

LATITUDE 39.055952 **LONGITUDE** -89.383929

COUNTY Montgomery **API 121350172600** **14 - 7N - 3W**

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
clay	0	32
Total Depth		**32**

Casing: 30" CONCRETE from 0' to 33'

Water from clay at 0' to 0'.

Owner Address: Coffeen, IL

Location source: Location from permit

Permit Date: **Permit #:** 28886

COMPANY Bekemeyer, Gust

FARM Hueitt, Bill

DATE DRILLED May 5, 1974 **NO.**

ELEVATION 0 **COUNTY NO.** 21824

LOCATION NE NE NE

LATITUDE 39.055928 **LONGITUDE** -89.381606

COUNTY Montgomery **API 121352182400** **14 - 7N - 3W**

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
clay	0	32
Total Depth		**32**

Casing: 30" CONCRETE from 0' to 33'

Water from clay at 0' to 0'.

Owner Address: Coffeen, IL

Location source: Location from permit

Permit Date:

Permit #: 28887

COMPANY Bekemeyer, Gust

FARM Stahl, Louis

DATE DRILLED May 5, 1974

NO.

ELEVATION 0

COUNTY NO. 21825

LOCATION NE NE NE

LATITUDE 39.055928 **LONGITUDE** -89.381606

COUNTY Montgomery **API 121352182500** **14 - 7N - 3W**

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
tan clay	0	37
gray clay	37	106
limestone	106	110
gray shale	110	136
sandstone	136	151
Total Depth		**151**

Casing: 5" VALLEY STEEL from -1' to 112'

Size hole below casing: 4.75"

Water from sandstone at 136' to 151'.
Static level 47' below casing top which is 1' above GL
Pumping level 92' when pumping at 5 gpm for 2 hours

Driller's Log filed

Owner Address: R.R. #1 Coffeen, IL
Location source: Location from permit

Permit Date: April 28, 1977 **Permit #:** 59626

COMPANY Courson, Richard C.
FARM Warfield, William
DATE DRILLED May 10, 1977 **NO.** 1
ELEVATION 630GL **COUNTY NO.** 22214
LOCATION 200'N line, 1100'E line of NE
LATITUDE 39.056309 **LONGITUDE** -89.384343
COUNTY Montgomery API 121352221400 14 - 7N - 3W

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
brown top soil	0	1
yellow clay	1	8
yellow clay & sand	8	18
yellow gravel & sand	18	30
yellow sand & gravel	30	39
Total Depth		**39**

Casing: 36" CONCRETE from -1' to 39'
" from 0' to 0'

Grout: CONCRETE from 0 to 10.

Grout: GRAVEL from 10 to 39.

Size hole below casing: 0"

Water from at 22' to 39'.
Permanent pump installed at 38'
on December 1, 1981, with a capacity of 10 gpm

Owner Address: 109 Laredo Ave. St. Louis, MO
Location source: Location from permit

Permit Date: November 13, 1981 **Permit #:** 102105

COMPANY Kohnen, Clarence
FARM Wibel, William
DATE DRILLED November 30, 1981 **NO.**
ELEVATION 0 **COUNTY NO.** 22832
LOCATION 115'S line, 102'W line of SE SE NW
LATITUDE 39.064493 **LONGITUDE** -89.391801
COUNTY Montgomery API 121352283200 11 - 7N - 3W

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
brown sandy clay	0	7
orangish brown clay sandy & pebble hard	7	9
brown clay very sandy & pebble hard	9	40
gray clay very sandy & pebble hard	40	43
greenish gray clay tacky	43	50
brn sandy clay pebble hard & cobblestone	50	72
gray clay sandy pebble hard	72	85
brown clay tacky stiff	85	101
grn-gry shale w/f strk dk red/brn rock	101	107
gray shale sandy (H)	107	115
gray sandstone clean tight	115	117
gray shale very sandy	117	135
gray sandstone clean cemented (H)	135	157
gray shale sticky	157	177
gray shale very soft (cavey)	177	180
gray shale sticky little sandy	180	187
lime gray & dull gray (H-M)	187	196
gray & black shale sandy firm	196	201
gray shale sandy & sticky	201	263
gray & dk gry shale w/f pieces brn lime	263	274
gray & lt gray shale & sticky	274	288
gray sandstone loose (dirty)	288	290
gray sandstone w/streak of gry sandstone	290	297
gray sandstone clean loose semi loose	297	301

Permit Date: June 21, 1996 **Permit #:**

COMPANY Kohnen, Clarence
FARM O'Dell, Kenneth & Chong
DATE DRILLED August 6, 1996 **NO.**
ELEVATION 0 **COUNTY NO.** 23802
LOCATION NW SE SE
LATITUDE 39.05958 **LONGITUDE** -89.383966
COUNTY **Montgomery** **API** **121352380200** **11 - 7N - 3W**

gray shale very sandy	301	307
gray sandstone clean loose fine cuttings	307	315
gray sandstone w/streak of gray shale	315	317
gray sandstone clean semi loose	317	325
gray sandstone clean loose water bearing	325	363
Total Depth		**363**

Casing: 6" PVC SDR 21 from 0' to 116'
4.5" PVC SDR 17 from 102' to 362'
4.5" SLOTTED @ 321'-322'& from 342' to 362'

Grout: BENTONITE SLRY from 0 to 116.

Water from light gray sandstone at 322' to 362'.
Static level 300' below casing top which is 1' above GL
Pumping level 362' when pumping at 15 gpm for 0 hours

Remarks: TDS 800,shale trap @ 116'-302'-322'-330'

Owner Address: 169 O'Dell Lane Coffeen, IL
Location source: Location from permit

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
brown clay firm sticky	0	15
brown clay sandy & pebble firm	15	27
brn gvl coarse clean loose water bearing	27	29
gray clay hard sandy & pebble	29	65
greenish brown clay sandy firm	65	82
brown shale very sandy S-M	82	84
gray-brown sandstone clean-dirty	84	93
brown shale soft & sandy	93	99
gray & brown shale in layers soft	99	123
gry brn sandstone loose clean wtr bearin	123	153
gray shale sandy	153	178
dark gray shale	178	197
gray & dull gray & dark gray lime	197	204
dark gray & black shale	204	208
gray shale	208	218
coal	218	219
lt gray shale w/pieces brown lime & coal	219	240
shale & gray sandstone in fine sheets	240	250
gray shale sandy & sticky	250	257
gry sandy & sticky shale w/strk brn lime	257	262
dark gray & black shale sticky	262	267
gry-lt gry shale sticky w/fine strk lime	267	281
gray sandstone clean semi loose	281	300
gray shale sticky (M) chips	300	302

Permit Date: May 15, 1996 **Permit #:**

COMPANY Kohnen, Clarence
FARM Childers, Joe
DATE DRILLED August 5, 1996 **NO.**
ELEVATION 0 **COUNTY NO.** 23803
LOCATION SW NE NE
LATITUDE 39.054141 **LONGITUDE** -89.383921
COUNTY Montgomery API 121352380300 14 - 7N - 3W

gray sandstone loose clean	302	306
gray sandy shale chips & sticky chips	306	324
gray sandstone loose clean w/pieces lime	324	398
off white lime H & tan soft	398	399
dark gray shale sticky chips	399	401
Total Depth		**401**

Casing: 6" PVC SDR 21 from -1' to 86'
4.5" PV SDR 17 from 41' to 401'
4.5" SLOTTED from 361' to 401'

Grout: BENTONITE SLRY from 0 to 86.

Water from gry-lt gry sandstone at 341' to 398'.
Static level 295' below casing top which is 0' above GL
Pumping level 401' when pumping at 10 gpm for 0 hours

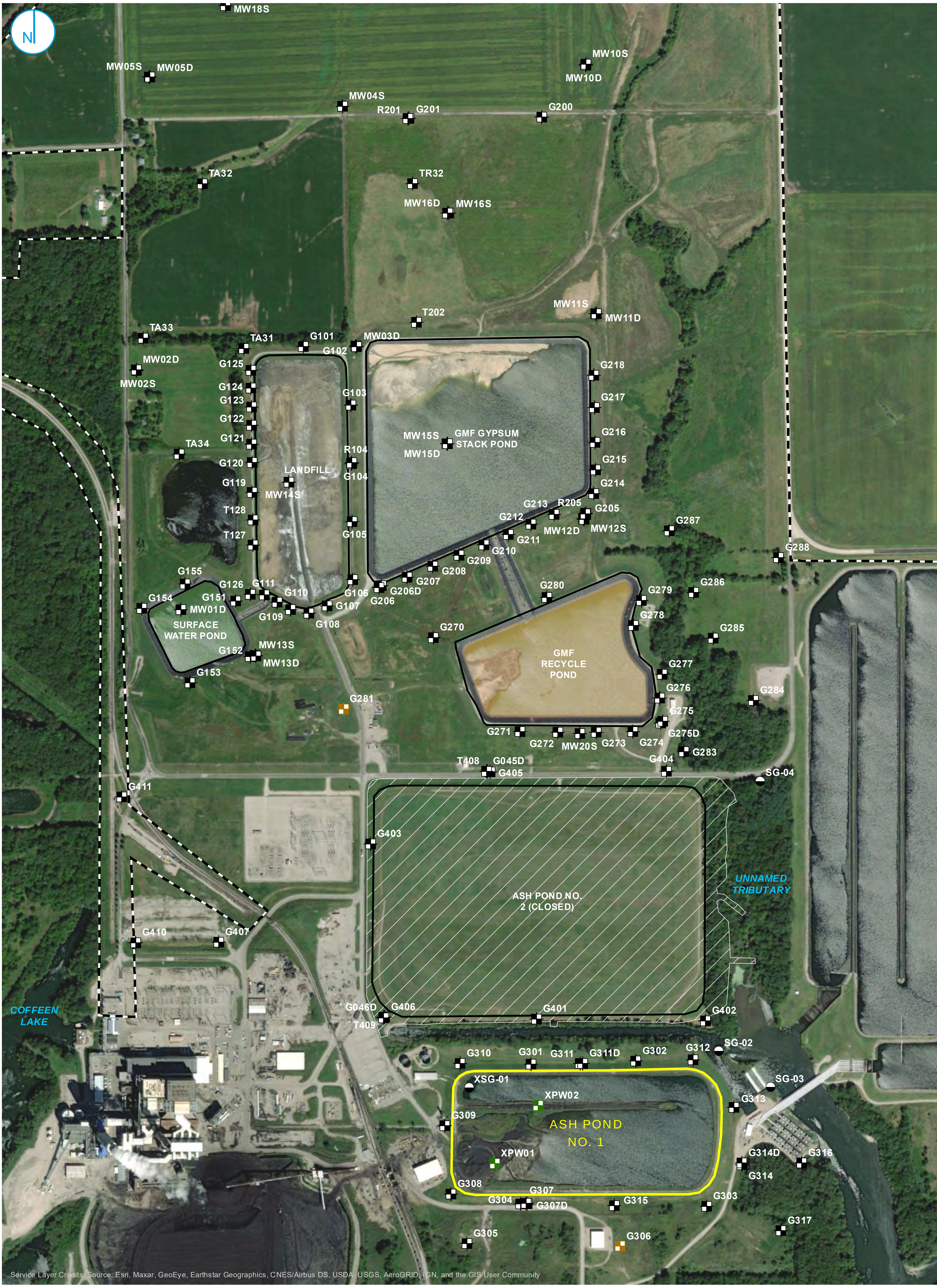
Remarks: TDS 550, shale trap @ 86' & 341' & 339'

Owner Address: 261 Lvndale Northlake, IL
Add'l loc. info: Subdivision: Holtz Claw

Location source: Location from permit

APPENDIX C
BORING AND WELL CONSTRUCTION LOGS

BORING AND WELL LOCATIONS MAP



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550
Feet

MONITORING WELL LOCATION MAP

FIGURE C1

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

BORING LOGS

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/17/2016
WEATHER: Cloudy, rain, (hi-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G405D
Well ID: G45D
Surface Elev: 620.94 ft. MSL
Completion: 42.00 ft. BGS
Station: 873,998.03N
2,515,322.23E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	0/60 *0%*	BD					0–2.3	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)		
							2.3–5.0	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY		
	0/60 *0%*	BD					5.0–5.9	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand		
							5.9–6.5	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND		
							6.5–8.0	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel		
							8.0–10.7	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel		
	0/48 *0%*	BD					10.7–11.3	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
							11.3–11.9	Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel		
							11.9–12.6	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
							12.6–13.2	Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel		
							13.2–13.8	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
							13.8–14.5	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel		
1A	24/24 *100%*	SS	*6-23 37-44* N=60	11		*1.50*				
2A	23/24 *96%*	SS	*14-32 41-45* N=73	7		*4.50*	14.5–18.0	Dark gray (10YR4/1), moist, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.		
3A	14/17 *82%*	SS	*16-47 50/5"*	7		*4.50*	18.0–20.0	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16 (▼), 18, 20. Elevation scale: 620, 618, 616, 614, 612, 610, 608, 606, 604, 602.

NOTE(S): G45D installed in boring.
Boring was blind drilled to 14.0 feet bgs. Blind drill lithologies from boring G405.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/17/2016
WEATHER: Cloudy, rain, (hi-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G405D
Well ID: G45D
Surface Elev: 620.94 ft. MSL
Completion: 42.00 ft. BGS
Station: 873,998.03N
2,515,322.23E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
	19/24 *79%*	SS	*15-36 32-36* N=68			
4A				8		*4.50*
5A	19/24 *79%*	SS	*10-18 30-33* N=48	8		*4.50*
6A	11/24 *46%*	SS	*22-42 34-36* N=76	8		*4.50*
7A	11/24 *46%*	SS	*28-26 23-26* N=49	11		*4.50*
8A	23/24 *96%*	SS	*7-11 16-25* N=27	10		*4.50*
9A	17/24 *71%*	SS	*7-14 12-12* N=26	16		
9B				14		
9C				9		
10A	24/24 *100%*	SS	*2-5 8-13* N=13	15		*3.25*
11-1	22/24 *92%*	SH				
11-2				15		
11-3						
11-4						
12A	24/24 *100%*	SS	*2-5 8-10* N=13	16		*2.00*
13A	22/24 *92%*	SS	*2-5 7-8* N=12	16		*2.00*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	
	Dark gray (10YR4/1), moist, dense, fine- to coarse-grained SAND.	600
22	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	598
24		596
26	Dark gray (10YR4/1) with 5% light brownish gray (10YR6/2) mottles, dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	594
28	Dark gray (10YR4/1) with 5% light brownish gray (10YR6/2) and dark greenish gray (10YR4/2) mottles, dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	592
30	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	
	Dark gray (10YR4/1), dry, very stiff, SILT with some very fine-grained SAND.	590
	Very dark gray (10YR3/1), moist, very stiff, CLAY with few silt and little medium-grained sand.	
32	Very dark gray (10YR3/1), moist, very stiff, CLAY with little silt and little medium-grained sand.	588
34		586
36	Very dark gray (10YR3/1), moist, very stiff, CLAY with little silt, little medium-grained sand, and trace small gravel.	584
38	Very dark gray (10YR3/1) with 5% black (10YR2/1) mottles, moist, very stiff, CLAY with little silt, little medium-grained sand, and trace small gravel.	582
40		

Borehole Detail | Remarks

NOTE(S): G45D installed in boring.
Boring was blind drilled to 14.0 feet bgs. Blind drill lithologies from boring G405.

FIELD BORING LOG

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/17/2016
WEATHER: Cloudy, rain, (hi-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

HANSON

BOREHOLE ID: G405D
Well ID: G45D
Surface Elev: 620.94 ft. MSL
Completion: 42.00 ft. BGS
Station: 873,998.03N
2,515,322.23E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
14A	23/24 *96%*	SS	*1-3* *7-7* N=10	16		*3.50*		Very dark gray (10YR3/1) with 5% black (10YR2/1) mottles, moist, very stiff, CLAY with little silt, little medium-grained sand, and trace small gravel. *[Continued from previous page]*		580	
							42	**End of Boring = 42.0 ft. BGS**			

NOTE(S): G45D installed in boring.
Boring was blind drilled to 14.0 feet bgs. Blind drill lithologies from boring G405.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/1/2007
Finish: 5/1/2007
WEATHER: Partly sunny, warm

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" Hollow stem auger with split spoon sampler
FIELD STAFF: Driller: A. Rachford
Helper: M. Brown
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB21 Formerly MW21S
Well ID: G405
Surface Elev: 620.90 ft. MSL
Completion: 14.21 ft. BGS
Station: 873,996.79N 2,515,335.70E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 1.28 - 05/10/2007
▼ =
▽ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL
							0–2.3	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)	620
1A	19/24 79%	SS		43		0.78 B	2		
1B				26		1.94 B			
2A	12/12 100%	SS		27		2.52 BSh	2.3–5.0	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	618
3A	24/24 100%	SS		24		3.92 BSh	4		
3B				24		2.33 BSh	5.0–5.9	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand	616
							5.9–6.5	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND	
4A	24/24 100%	SS		20		2.33 BSh	6.5–8	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	614
5A	24/24 100%	SS		24		1.55 BSh	8–10.7	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel	612
	24/24 100%	SS					10.7–11.3	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	610
6A				19			11.3–11.9	Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel	
6B				18					
7A	24/24 100%	SS		9		7.42 BSh	11.9–12.5	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	
							12.5–13.1	Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel	608
							13.1–13.7	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	
							13.7–14.2	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel	

End of Boring = 14.2 ft. BGS

Borehole Detail

Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.	**CONTRACTOR:** Bulldog Drilling, Inc.		
Site: Coffeen Power Station - Ash Pond 2	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G406D	
Location: 134 CIPS Lane, Coffeen, IL 62017	**Drilling Method:** 4 1/4" Hollow Stem Auger	**Well ID:** G46D	
Project: 16E0080		**Surface Elev:** 621.91 ft. MSL	
DATES: Start: 8/19/2016	**FIELD STAFF: Driller:** J. Dittmaier	**Completion:** 52.00 ft. BGS	
Finish: 8/19/2016	**Helper:** M. Hill	**Station:** 872,519.70N	
WEATHER: Sunny, (mid-70s)	**Eng/Geo:** K. Theesfeld	2,514,697.78E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	18/24 *75%*	SS	*4-3 4-6* N=7	11		*1.50*
1B				15		*3.00*
2A	12/24 *50%*	SS	*4-6 3-3* N=9	12		*2.50*
2B				18		*2.00*
3A	3/24 *13%*	SS	*3-3 4-7* N=7	24		
4A	20/24 *83%*	SS	*2-3 4-5* N=7	21		*1.25*
5A	19/24 *79%*	SS	*1-3 4-6* N=7	18		*1.75*
6A	23/24 *96%*	SS	*2-2 4-5* N=6	18		*2.50*
7A	21/24 *88%*	SS	*1-3 4-5* N=7	16		*1.00*
8A	23/24 *96%*	SS	*1-2 2-2* N=4	18		*0.75*
8B				17		*0.75*
9A	22/24 *92%*	SS	*4-13 27-23* N=40	8		
9B				8		
10A	17/24 *71%*	SS	*13-31 33-42* N=64	7		*4.50*

Columns: Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale (ft. MSL): 620, 618, 616, 614, 612, 610, 608, 606, 604, 602

Lithologic Description:

- Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.
- Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.
- Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.
- Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.
- Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.
- Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.
- Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.
- Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.
- Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.
- Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.
- Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.
- Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.
- Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL
11-1	3/3 *100%*	SH						Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*	
	8/24 *33%*	DS					22		600
12-1									
13-1									
13-2	24/24 *100%*	DS							
13-3							24		598
13-4									
14A				19				Pale brown (10YR6/3), wet, loose, fine-grained SAND.	
14B	21/21 *100%*	SS	*7-30* *32-20* N=62	7				Pale brown (10YR6/3), wet, loose, fine-grained SAND and small GRAVEL.	
14C				8		*4.50*		Gray (10YR5/1), dry, hard, SILT with some clay, trace fine- to coarse-grained sand and trace small gravel.	
							26		596
15A	12/24 *50%*	SS	*15-16* *10-11* N=26	10		*4.50*		Dark gray (10YR4/1), dry, hard, CLAY with some silt, trace fine- to coarse-grained sand and trace small gravel.	
							28		594
16A	17/24 *71%*	SS	*2-5* *7-11* N=12	16		*3.00*	30	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	592
17A	17/24 *71%*	SS	*2-5* *7-12* N=12	15		*2.50*			
							32	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small to large gravel.	590
18A	12/24 *50%*	SS	*3-7* *12-20* N=19	17		*2.50*		Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	
							34		588
19A	23/24 *96%*	SS	*4-4* *6-9* N=10	25		*1.00*		Dark gray (10YR4/1) with 5% very dark gray (10YR3/1) and brown (10YR5/3) mottles, moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	
							36	Gray (10YR5/1) with 5% very dark gray (10YR3/1) and brown (10YR5/3) mottles, moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	586
20A	22/24 *92%*	SS	*2-2* *5-7* N=7	17		*1.00*			
							38	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	584
21A	24/24 *100%*	SS	*2-3* *4-6* N=7	17		*1.00*	40		582

Borehole Detail | Remarks

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING							
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
22A	24/24 *100%*	SS	*1-3 5-6* N=8	17		*1.50*	42	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*	580	
23-1 23-2 23-3 23-4	24/24 *100%*	SH		16			44		578	
24A	24/24 *100%*	SS	*3-4 6-7* N=10	17		*1.50*	46		576	
25A	24/24 *100%*	SS	*2-2 5-7* N=7	18		*1.25*	48		574	
26A	24/24 *100%*	SS	*2-5 6-8* N=11	17		*1.75*	50		572	
27A	23/24 *96%*	SS	*2-3 9-12* N=12	15		*3.50*	52		570	

End of Boring = 52.0 ft. BGS

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/2/2010
Finish: 2/2/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Suzanna Simpson

BOREHOLE ID: G101
Well ID: G101
Surface Elev: 625.27 ft. MSL
Completion: 21.92 ft. BGS
Station: 876,551.76N
2,514,214.31E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.50 - While drilling
▼ = 12.38 - Upon Completion
▽ = 7.31 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								TOPSOIL - Brown (10YR5/3), moist, soft, silty CLAY with slight trace sand and gravel, roots.			
1A	18/24 *75%*	SS	*1-1 2-3* N=3	24				Dark grayish brown (10YR4/2), moist, soft, silty CLAY with slight trace sand, trace roots.		624	
							2	Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/4) mottles, moist, medium, silty CLAY, slight trace roots.			
2A	18/24 *75%*	SS	*1-3 3-5* N=6	30				Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/4) mottles, moist, medium, silty CLAY, slight trace roots.		622	
3A	19/24 *79%*	SS	*2-3 4-4* N=7	26			4	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY, slight trace roots.		620	
4A	19/24 *79%*	SS	*1-3 4-3* N=7	21			6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.		618	
							▽				
5A	22/24 *92%*	SS	*1-3 3-4* N=6	23			8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		616	
6A	20/24 *83%*	SS	*1-2 2-3* N=4	24			10	Gray (10YR6/1) with 35% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.		614	
							12 ▼				
7A	22/24 *92%*	SS	*1-2 3-2* N=5	17				Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, very moist, medium, silty, sandy CLAY with trace gravel.		612	
8A 8B	14/24 *58%*	SS	*1-2 5-8* N=7	15 13			14	Brown (10YR5/3), very moist, medium, silty, clayey, very fine- to coarse-grained SAND with slight trace gravel.			
							▼ 16	Brown (10YR5/3), very moist, loose, silty, very fine- to coarse-grained SAND with slight trace gravel.		610	
9A	16/24 *67%*	SS	*2-5 15-25* N=20	16				Brown (10YR5/3), very moist, medium dense, silty, very fine- to coarse-grained SAND with slight trace gravel.		608	
10A 10B	17/24 *71%*	SS	*19-20 22-18* N=42	14 8			18	Brown (10YR5/3), very moist, dense, silty, very fine- to coarse-grained SAND with slight trace gravel.		606	
							20				

NOTE(S): G101 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G101	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G101	
Project: 05S3004A		**Surface Elev:** 625.27 ft. MSL	
DATES: Start: 2/2/2010	**FIELD STAFF: Driller:** T. List	**Completion:** 21.92 ft. BGS	
Finish: 2/2/2010	**Helper:** M. Herbst/S. Hamby	**Station:** 876,551.76N	
WEATHER: Overcast, cold (lo-30's)	**Eng/Geo:** S. Suzanna Simpson	2,514,214.31E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.50 - While drilling
▼ = 12.38 - Upon Completion
▽ = 7.31 - 3/1/2010

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	16/23 *70%*	SS	*2-16* *42-60/5"* N=58	8				Brown (10YR5/3), slightly moist, hard, clayey SILT with slight trace sand and gravel.			
								Dark gray (10YR4/1), slightly moist, hard, clayey SILT with slight trace sand and slight trace gravel.		604	

End of Boring = 21.9 ft. BGS

NOTE(S): G101 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/28/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-650 Track Drill
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03a
Well ID: G102 (MW3S)
Surface Elev: 625.70 ft. MSL
Completion: 17.15 ft. BGS
Station: 876,554.77N
2,514,531.48E

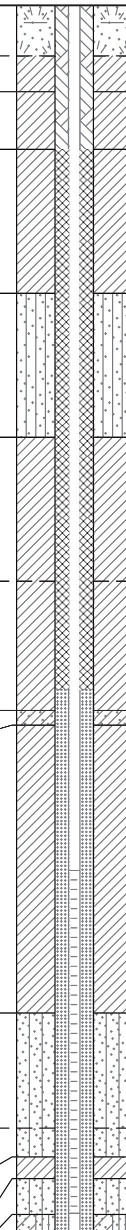
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	20/24 *83%*	SS	*2-2 4-6* N=6	17		2.07 SP
1B				20		
1C				26		3.30 B
2A	17/24 *71%*	SS	*2-3 4-5* N=7	25		3.05 B
3A	20/24 *83%*	SS	*2-3 3-5* N=6	16		1.96 B
4A	24/24 *100%*	SS	*4-3 5-6* N=8	21		2.27 B
5A	21/24 *88%*	SS	*1-3 3-4* N=6	20		2.18 B
5B				19		
6A	18/24 *75%*	SS	*1-2 2-4* N=4	24		0.87 B
7A	23/24 *96%*	SH	*3-2 2-4* N=4	19		
7B	16/24 *67%*	SS		12		
8A	23/24 *96%*	SS	*3-12 29-50* N=41	13		
8B				13		
8C				12		
9A	12/12 *100%*	SS	*8-82*	10		6.98 B

Depth ft. BGS	Lithologic Description
	Very dark grayish brown (10YR3/2), lean CLAY
	Grayish brown (10YR5/2), lean CLAY, trace sand
	Yellowish brown (10YR5/6), lean CLAY, trace sand
2	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, lean CLAY, trace sand
4	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, sandy SILT, trace gravel
6	Yellowish brown (10YR5/6) with 50% gray (N5/1) mottles, lean CLAY, trace sand and gravel
8	Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel
	Dark gray (10YR4/1), sandy CLAY, trace gravel
10	Gray (10YR6/1) with 50% yellowish brown (10YR5/8) mottles, lean CLAY, little sand, trace gravel
14	Yellowish brown (10YR5/8), silty, fine SAND, little medium sand, trace gravel, wet
	Yellowish brown (10YR5/8), silty, fine SAND, little clay, wet
16	Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel
	Yellowish brown (10YR5/6), silty SAND, trace gravel, wet
	Yellowish brown (10YR5/4), clayey SILT, trace sand and gravel

End of Boring = 17.15 ft. BGS



Elevation ft. MSL
624
622
620
618
616
614
612
610

Remarks

NOTE(S): G102 (MW03S) installed in blind-drilled borehole within 10 ft of SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	20/24 83%	SS	2-2 4-6 N=6	17		2.07 SP		Very dark grayish brown (10YR3/2), lean CLAY		
1B				20				Grayish brown (10YR5/2), lean CLAY, trace sand		
1C				26		3.30 B	2	Yellowish brown (10YR5/6), lean CLAY, trace sand	624	
2A	17/24 71%	SS	2-3 4-5 N=7	25		3.05 B	4	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, lean CLAY, trace sand	622	
3A	20/24 83%	SS	2-3 3-5 N=6	16		1.96 B	6	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, sandy SILT, trace gravel	620	
4A	24/24 100%	SS	4-3 5-6 N=8	21		2.27 B	8	Yellowish brown (10YR5/6) with 50% gray (N5/1) mottles, lean CLAY, trace sand and gravel	618	
5A	21/24 88%	SS	1-3 3-4 N=6	20		2.18 B		Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel		
5B				19			10	Dark gray (10YR4/1), sandy CLAY, trace gravel	616	
6A	18/24 75%	SS	1-2 2-4 N=4	24		0.87 B	12	Gray (10YR6/1) with 50% yellowish brown (10YR5/8) mottles, lean CLAY, little sand, trace gravel	614	Shelby tube taken from shallow well borehole at indicated depth.
7A	23/24 96%	SH		19						
7B	16/24 67%	SS	3-2 2-4 N=4	12			14		612	
8A	23/24 96%	SS	3-12 29-50 N=41	13				Yellowish brown (10YR5/8), silty, fine SAND, little medium sand, trace gravel, wet		
8B				13				Yellowish brown (10YR5/8), silty, fine SAND, little clay, wet	610	
8C				12			16	Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel		
9A	14/24 58%	SS	8-82 85-72 N=167	10		6.98 B		Yellowish brown (10YR5/6), silty SAND, trace gravel, wet		
9B				13		6.18 BSh	18	Yellowish brown (10YR5/4), clayey SILT, trace sand and gravel	608	
10A	18/24 75%	SS	6-21 32-49 N=53	8		11.95 Sh	20	Gray (10YR5/1), sandy SILT, trace gravel	606	

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	19/24 *79%*	SS	*3-20 35-29* N=55	10		5.36 *Sh*	20–22	Gray (10YR5/1), sandy SILT, trace gravel *[Continued from previous page]*	604	Wood fragments
12A	20/24 *83%*	SS	*15-25 89-69* N=114	8		13.00 *Sh*	22–24		602	
13A	23/24 *96%*	SS	*14-19 24-22* N=43	9			24–25.3			
13B				13		6.98 *BSh*	25.3–26	Yellowish brown (10YR5/4), lean CLAY, trace sand and gravel	600	
14A	24/24 *100%*	SS	*19-21 26-32* N=47	15		7.01 *BSh*	26–27.8	Gray (10YR4/1), clayey SILT, trace sand and gravel	598	
15A	21/24 *88%*	SS	*10-25 25-23* N=50	12			27.8–29.5	Light gray (10YR6/1), SILT, trace sand		
15B				13		8.53 *BSh*	29.5–36	Gray (10YR4/1), lean CLAY, trace sand and gravel	596	
16A	24/24 *100%*	SS	*7-12 19-30* N=31	13		9.16 *BSh*			594	
17A				14		6.59 *B*				
17B	24/24 *100%*	SS	*29-35 39-42* N=74	14		3.49 *Sh*			592	
18A	23/24 *96%*	SS	*6-8 11-17* N=19	13		7.21 *BSh*			590	
19A	24/24 *100%*	SS	*19-21 31-31* N=52	13		6.98 *BSh*	36–38	Gray (10YR4/1), clayey SILT, trace sand and gravel	588	
20A	24/24 *100%*	SS	*6-10 15-24* N=25	14		6.76 *BSh*	38–40	Gray (10YR4/1), lean CLAY, trace sand and gravel	586	

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
21A	19/24 *79%*	SS	*4-10 16-23* N=26	13		8.04 *BSh*		Gray (10YR4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*		
							42		584	
22A	21/24 *88%*	SS	*19-27 28-32* N=55	13		7.56 *BSh*	44	Gray (10YR4/1), clayey SILT, trace sand and gravel	582	
23A	23/24 *96%*	SS	*4-9 14-18* N=23	14		6.98 *BSh*	46		580	
24A	24/24 *100%*	SS	*20-26 30-33* N=56	14		6.59 *BSh*			578	
							48			
25A	24/24 *100%*	SS	*6-10 13-12* N=23	20		3.30 *BSh*	50	Gray (10YR4/1), lean CLAY, trace sand and gravel	576	
26A	24/24 *100%*	SS	*4-7 6-7* N=13	22		2.91 *BSh*	52		574	
27A	24/24 *100%*	SS	*7-18 37-85* N=55	16		4.05 *BSh*		Gray (10Y4/1), silty, fine to medium SAND, wet	572	
27B				13			54	Gray (10YR4/1), silty, fine SAND, trace clay, wet		
28A	23/24 *96%*	SS	*15-34 34-19* N=68	11		3.22 *SP*	▽		570	
28B				13		5.82 *B*	56	Very dark gray (10YR3/1), lean CLAY, trace sand and gravel		
29A	24/24 *100%*	SS	*19-22 28-18* N=50	20		4.36 *BSh*	58		568	

End of Boring = 58.0 ft. BGS

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/15/2010
Finish: 2/15/2010
WEATHER: Cold, snowy (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G103
Well ID: G103
Surface Elev: 627.94 ft. MSL
Completion: 18.03 ft. BGS
Station: 876,199.48N
2,514,501.19E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 16.99 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	20/24 *83%*	SS	*5-4 5-7* N=9	16			0–4.8	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.		
2A	16/24 *67%*	SS	*3-4 6-7* N=10	25						
3A	17/24 *71%*	SS	*3-5 7-8* N=12	21			4.8–6	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.		
4A	16/24 *67%*	SS	*2-3 5-6* N=8	24			6–8.3	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.		
5A	24/24 *100%*	SS	*3-4 4-4* N=8	22			8.3–10	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
6A	20/24 *83%*	SS	*1-1 3-3* N=4	23			10–16.4	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, soft, medium, silty CLAY with trace sand and slight trace gravel.		
7A	22/24 *92%*	SS	*1-2 2-4* N=4	26						
8A	20/24 *83%*	SS	*1-2 3-3* N=5	22						
9A	22/24 *92%*	SS	*1-10 21-33* N=31	14			16.4–16.8	Brown (10YR5/3) with 15% gray (10YR6/1) mottles, very moist, medium dense, silty, very fine- to medium-grained SAND.		
9B				10			16.8–18	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.		

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18. Elevation scale (ft. MSL): 626, 624, 622, 620, 618, 616, 614, 612, 610.

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/15/2010
Finish: 2/15/2010
WEATHER: Overcast, cold, windy (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Suzanna Simpson

BOREHOLE ID: G104
Well ID: G104
Surface Elev: 627.96 ft. MSL
Completion: 20.00 ft. BGS
Station: 875,849.26N
2,514,504.98E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 15.40 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	16/24 *67%*	SS	*9-11 12-14* N=23	16		
2A	20/24 *83%*	SS	*3-5 9-12* N=14	21		
3A	19/24 *79%*	SS	*3-6 8-9* N=14	21		
4A	17/24 *71%*	SS	*2-3 4-7* N=7	25		
5A	22/24 *92%*	SS	*1-2 5-8* N=7	24		
6A	18/24 *75%*	SS	*1-2 3-5* N=5	21		
7A	23/24 *96%*	SS	*woh-2 3-4* N=5	23		
8A	22/24 *92%*	SS	*1-3 3-3* N=6	24		
9A				16		
9B	17/24 *71%*	SS	*woh-6 27-40* N=33	13		
10A	22/24 *92%*	SS	*10-24 44-66* N=68	7		

Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks

- 0–4.5: FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with slight trace sand and gravel.
- 4.5–6.4: Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.
- 6.4–12: Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.
- 12–14.6: Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.
- 14.6–16: Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel. (▽ 15.40)
- 16–16.6: Gray (10YR6/1), moist, very soft, clayey, very fine- to coarse-grained SAND with trace gravel.
- 16.6–18.2: Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.
- 18.2–20: Gray (10YR4/1), slightly moist, hard, clayey SILT with sand and gravel.

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT:	AEG Coffeen Power Station	**CONTRACTOR:**	Layne-Western Co		
Site:	CCB Management Facility	**Rig mfg/model:**	CME-750 ATV Drill	**BOREHOLE ID:**	G105
Location:	Coffeen, Illinois	**Drilling Method:**	4¼" HSA w/SS samplers	**Well ID:**	G105
Project:				**Surface Elev:**	626.86 ft. MSL
DATES: Start:	2/16/2010	**FIELD STAFF: Driller:**	T. List	**Completion:**	19.83 ft. BGS
Finish:	2/16/2010	**Helper:**	M. Herbst/S. Hamby	**Station:**	875,499.70N
WEATHER:	Sunny, cold, windy (mid-20's)	**Eng/Geo:**	S. Simpson		2,514,509.15E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

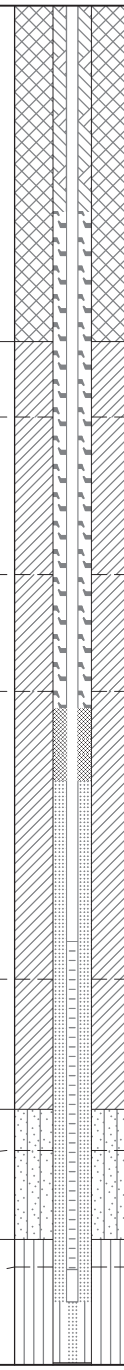
WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 16.08 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	18/24 *75%*	SS	*4-4 4-7* N=8	20		
2A	19/24 *79%*	SS	*2-4 6-10* N=10	19		
3A	19/24 *79%*	SS	*2-4 5-6* N=9	29		
4A	20/24 *83%*	SS	*1-4 4-5* N=8	29		
5A	22/24 *92%*	SS	*1-3 3-3* N=6	20		
6A	24/24 *100%*	SS	*1-2 3-4* N=5	25		
7A	24/24 *100%*	SS	*1-2 3-5* N=5	22		
8A	19/24 *79%*	SS	*1-2 2-2* N=4	18		
9A	18/24 *75%*	SS	*1-2 8-10* N=10	18		
9B				14		
10A	19/22 *86%*	SS	*11-40 53-60/4"* N=93	7		

Depth ft. BGS	Lithologic Description
0 – ~4.9	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel.
~4.9 – ~6	Grayish brown (10YR5/2) with 40% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY, slight trace roots.
~6 – ~8.3	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.
~8.3 – 10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.
10 – ~14.2	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
~14.2 – ~16.1	Gray (10YR6/1) with 15% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and gravel.
~16.1 – ~16.7	Gray (10YR5/1), very moist to wet, loose, silty, fine- to coarse-grained SAND with slight trace gravel.
~16.7 – 18	Brown (10YR5/3), very moist to wet, loose, silty, very fine- to coarse-grained SAND with slight trace gravel.
18 – ~18.6	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.
~18.6 – 19.8	Gray (10YR4/1), slightly moist, hard, clayey SILT with sand and gravel.

Depth ticks: 2, 4, 6, 8, 10, 12, 14, ▽ 16, 18

Borehole Detail



Elevation ft. MSL: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

Remarks

End of Boring = 19.8 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/16/2010
Finish: 2/16/2010
WEATHER: Overcast, cold, windy (mid-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Suzanna Simpson

BOREHOLE ID: G106
Well ID: G106
Surface Elev: 625.96 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,149.76N
2,514,512.79E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 12.62 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	17/24 *71%*	SS	*7-8 13-16* N=21	18		
2A	16/24 *67%*	SS	*2-4 5-7* N=9	16		
3A	17/24 *71%*	SS	*2-4 6-7* N=10	21		
4A	20/24 *83%*	SS	*2-3 5-6* N=8	24		
5A	22/24 *92%*	SS	*1-3 3-5* N=6	21		
6A	22/24 *92%*	SS	*1-2 4-4* N=6	24		
7A	23/24 *96%*	SS	*1-3 4-4* N=7	22		
8A	19/24 *79%*	SS	*1-4 7-7* N=11	20		
8B				14		
9A	23/24 *96%*	SS	*7-15 22-22* N=37	8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–4.7	FILL - Brown (10YR5/3) with 15% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	624, 622	
4.7–6	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.	620	
6–8.4	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with slight trace sand.	618	
8.4–12.3	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	616, 614	
12.3–14.5	Yellowish brown (10YR5/6) with 10% gray (10YR6/1) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	612	
14.5–15	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand.		
15–15.6	Brown (10YR5/3), moist, medium dense, clayey, very fine- to medium-grained SAND with slight trace gravel.		
15.6–16.8	Yellowish brown (10YR5/6) with 5% gray (10YR6/1) mottles, moist, medium, clayey SILT with trace sand and gravel.	610	
16.8–17.4	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.		
17.4–18	Gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.	608	

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/17/2010
Finish: 2/17/2010
WEATHER: Overcast, cold, windy (mid-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G107
Well ID: G107
Surface Elev: 627.11 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,994.33N
2,514,358.25E

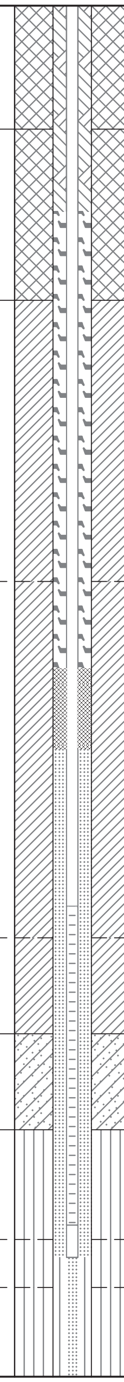
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.80 - While drilling
▼ = 11.56 - Upon Completion
▽ = 10.40 - 3/1/2010

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) / *Failure Type*
	0/18 *0%*	BD				
1A	5/6 *83%*	SS	*3*	12		
2A	14/24 *58%*	SS	*3-3 6-8* N=9	17		
3A	16/24 *67%*	SS	*3-5 5-7* N=10	20		
4A	18/24 *75%*	SS	*2-3 6-7* N=9	27		
5A	22/24 *92%*	SS	*2-3 4-5* N=7	18		
6A	22/24 *92%*	SS	*1-3 3-4* N=6	23		
7A	24/24 *100%*	SS	*1-2 3-4* N=5	27		
8A	2/24 *8%*	SS	*1-3 2-3* N=5	23		
9A	20/24 *83%*	SS	*woh-3 8-12* N=11	22		
9B				10		
10A	20/24 *83%*	SS	*8-25 26-58* N=51	11		

Depth ft. BGS	Lithologic Description
0 – 2	GRAVEL FILL
2 – 4	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace sand and slight and gravel.
4 – 8	Grayish brown (10YR5/2) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.
8 – 14	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
14	Gray (10YR6/1) with 35% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
16	Brown (10YR5/3), very moist to wet, very loose, clayey, very fine- to coarse-grained SAND.
16 – 18	Brown (10YR5/3), slightly moist, stiff, clayey SILT with trace sand and gravel.
18	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.
18 – 20	Gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.

Borehole Detail



Elevation ft. MSL: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

Remarks

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G108	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G108	
Project:		**Surface Elev:** 625.58 ft. MSL	
DATES: Start: 2/12/2010	**FIELD STAFF: Driller:** T. List	**Completion:** 20.00 ft. BGS	
Finish: 2/12/2010	**Helper:** M. Herbst/S. Hamby	**Station:** 874,948.81N	
WEATHER: Overcast, cold ~25F	**Eng/Geo:** D. Lamb	2,514,248.25E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.50 - While drilling
▼ = 19.00 - Upon completion
▽ = 8.93 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	23/24 *96%*	SS	*24-25 13-13* N=38	16			0–2	FILL - Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with slight trace gravel.	624	
2A	13/24 *54%*	SS	*4-5 8-11* N=13	26			2–4.5	FILL - Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	622	
3A	20/24 *83%*	SS	*2-2 5-7* N=7	28			4.5–6.8	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/8) and 5% very dark brown (10YR2/2) mottles, moist, medium, clayey SILT with trace sand and slight trace gravel.	620	
4A	24/24 *100%*	SS	*2-3 5-6* N=8	18			6.8–11.7	Gray (10YR5/1) with 10% brownish yellow (10YR6/8) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	618	
5A	23/24 *96%*	SS	*1-2 3-4* N=5	20			▽ 8.93		616	
6A	24/24 *100%*	SS	*1-3 3-5* N=6	19			11.7–12.7	Grayish brown (10YR5/2) with brownish yellow (10YR6/8) mottles, moist, soft, sandy CLAY with trace gravel.	614	
7A	19/24 *79%*	SS	*1-1 1-2* N=2	19			12.7–13.9	Brownish yellow (10YR6/8), very moist, soft, sandy CLAY with trace gravel.	612	
							13.9–14.5	Brownish yellow (10YR6/8), very moist, soft, sandy SILT with trace gravel.		
8A	23/24 *96%*	SS	*2-4 7-10* N=11	19			▼ 14.5–15	Brownish yellow (10YR6/6), wet, medium, SILT.		
8B				13			15–18	Light yellowish brown (10YR6/4) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, clayey SILT with trace sand and gravel.	610	
9A	22/24 *92%*	SS	*10-24 25-10* N=49	11					608	
9B				8			18–18.5	Gray (10YR5/1), slightly moist, hard, SILT with gravel.		
10A	24/24 *100%*	SS	*10-25 40-40* N=65	10			▼ 18.5–19	Gray (10YR5/1), wet, hard, SILT with sand and gravel.		
							19–20	Gray (10YR5/1), very moist, hard, SILT with gravel.	606	

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/11/2010
Finish: 2/11/2010
WEATHER: Sunny, cold ~32F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G109
Well ID: G109
Surface Elev: 624.79 ft. MSL
Completion: 18.00 ft. BGS
Station: 874,970.10N
2,514,137.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.20 - While drilling
▼ = 11.50 - Upon completion
▽ = 8.85 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*6-7 7-8* N=14	22		
2A	19/24 *79%*	SS	*3-5 5-6* N=10	27		
3A	20/24 *83%*	SS	*2-5 6-8* N=11	24		
4A	24/24 *100%*	SS	*2-4 5-6* N=9	19		
5A	22/24 *92%*	SS	*2-3 4-5* N=7	20		
6A	24/24 *100%*	SS	*1-3 3-4* N=6	19		
7A	23/24 *96%*	SS	*1-1 2-2* N=3	19		
8A	22/24 *92%*	SS	*8-15 15-21* N=30	14		
9A	24/24 *100%*	SS	*12-29 44-45* N=73	7		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–2	FILL - Grayish brown (10YR5/2) with 40% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace gravel.	624, 622	
4	Light yellowish brown (10YR6/4) with 50% brownish yellow (10YR6/8) mottles, moist, medium, silty CLAY, slight trace roots.	620	
6–8	Light brownish gray (10YR6/2) with 10% brownish yellow (10YR6/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel.	618	
10	Light brownish gray (10YR6/2) with 10% brownish yellow (10YR6/6) and 2% very dark gray (10YR3/1) mottles, moist, medium, silty CLAY with slight trace sand and gravel.	616, 614	
12	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, moist, medium, sandy CLAY with slight trace gravel.	612	
14	Brownish yellow (10YR6/6), wet, dense, silty SAND with trace gravel.	610	
16	Brownish yellow (10YR6/8), wet, dense, SAND with trace gravel.	608	
18	Grayish brown (10YR5/2), slightly moist, hard, gravelly SILT with sand.		

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/11/2010
Finish: 2/11/2010
WEATHER: Sunny, cold 10-20F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: .

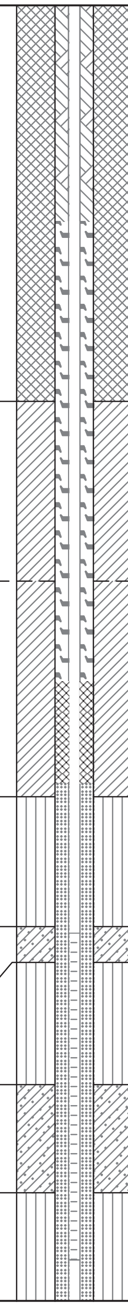
BOREHOLE ID: G110
Well ID: G110
Surface Elev: 624.81 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,015.42N
2,514,057.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.00 - While drilling
▼ =
▽ = 9.50 - 3/1/2010

Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / RQD	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type
1A	24/24 100%	SS	8-6 6-8 N=12	17		
2A	14/24 58%	SS	2-4 5-7 N=9	25		
3A	22/24 92%	SS	1-4 5-9 N=9	22		
4A	24/24 100%	SS	3-6 8-9 N=14	18		
5A	24/24 100%	SS	1-3 4-6 N=7	21		
6A	24/24 100%	SS	2-4 4-6 N=8	21		
7A	24/24 100%	SS	1-2 3-3 N=5	22		
8A	19/24 79%	SS	1-2 2-1 N=4	24		
9A	24/24 100%	SS	7-26 49-60 N=75	6		

Depth ft. BGS	Lithologic Description
0 – 5.5	FILL - Yellowish brown (10YR5/6) with 20% light brownish gray (10YR6/2) mottles, moist, stiff, silty CLAY with slight trace sand.
5.5 – 8	Grayish brown (10YR5/2) with 20% yellowish brown (10YR5/6) and 5% very dark brown (10YR2/2) mottles, moist, medium, silty CLAY.
8 – 11	Grayish brown (10YR5/2) with 20% yellowish brown (10YR5/6) and 5% very dark brown (10YR2/2) mottles, moist, medium, silty CLAY with slight trace sand and gravel.
11 – 12.8	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, moist, medium, clayey SILT with trace sand and gravel.
12.8 – 13.3	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, very moist, medium, sandy CLAY with trace gravel.
13.3 – 15	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, moist, soft, clayey SILT with trace sand and slight trace gravel.
15 – 16.5	Gray (10YR6/1) with 30% brownish yellow (10YR6/8) mottles, wet, soft, sandy CLAY.
16.5 – 18	Grayish brown (10YR5/2), slightly moist, hard, clayey SILT with trace sand and gravel.



Elevation ft. MSL: 624, 622, 620, 618, 616, 614, 612, 610, 608

Remarks

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/10/2010
Finish: 2/11/2010
WEATHER: Sunny, breezy ~25F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G111
Well ID: G111
Surface Elev: 625.28 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,058.70N
2,513,981.72E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.50 - While drilling
▼ =
▽ = 10.50 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*7-7 6-9* N=13	18		
2A	13/24 *54%*	SS	*3-5 7-8* N=12	20		
3A	18/24 *75%*	SS	*2-4 6-8* N=10	20		
4A	16/24 *67%*	SS	*4-12 20-17* N=32	18		
5A	22/24 *92%*	SS	*2-3 4-5* N=7	21		
6A	24/24 *100%*	SS	*2-3 6-6* N=9	23		
7A	24/24 *100%*	SS	*1-4 5-6* N=9	20		
8A	24/24 *100%*	SS	*1-2 2-2* N=4	17		
9A	18/18 *100%*	SS	*12-50 66* N=116	7		
	0/6 *0%*	BD				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–5.8	FILL - Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.	624, 622, 620	
5.8–7.5	Grayish brown (10YR5/2) with 20% yellowish brown (10YR5/6) and 5% dark brown (10YR3/3) mottles, moist, medium, clayey SILT with slight trace sand, slight trace roots.	618	
7.5–10	Grayish brown (10YR5/2) with 5% yellowish brown (10YR5/6) mottles, moist, medium, clayey SILT with trace sand.	616	
10–13.5	Grayish brown (10YR5/2) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand.	614, 612	
13.5–14.5	Grayish brown (10YR5/2) with 30% yellowish brown (10YR5/8) mottles, moist, stiff, clayey SILT with trace sand and gravel.		
14.5–16	Yellowish brown (10YR5/8), wet, soft, clayey SAND with trace gravel.	610	
16–18	Grayish brown (10YR5/2) with 20% brownish yellow (10YR6/6) mottles, slightly moist, hard, clayey SILT with gravel.	608	

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/9/2010
Finish: 2/9/2010
WEATHER: Cold, snow, windy (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G119
Well ID: G119
Surface Elev: 626.57 ft. MSL
Completion: 20.10 ft. BGS
Station: 875,675.04N
2,513,907.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 11.26 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	16/24 *67%*	SS	*3-2 3-3* N=5	21		
2A	16/24 *67%*	SS	*2-4 5-5* N=9	20		
3A	10/24 *42%*	SS	*2-5 5-6* N=10	25		
4A	17/24 *71%*	SS	*2-5 4-5* N=9	18		
5A	20/24 *83%*	SS	*2-3 4-5* N=7	19		
6A	19/24 *79%*	SS	*1-3 4-6* N=7	21		
7A	20/24 *83%*	SS	*1-3 3-5* N=6	20		
8A	18/24 *75%*	SS	*1-2 2-2* N=4	18		
9A	22/24 *92%*	SS	*3-9 13-16* N=22	13		
9B				12		
10A	17/24 *71%*	SS	*6-25 33-39* N=58	8		

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
0–6	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		626, 624, 622	
6–10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand.		620, 618	
10–12.5	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		616	▽
12.5–14.2	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and gravel.		614	
14.2–16	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, sandy CLAY with slight trace gravel.		612	
16–16.6	Brown (10YR5/3), moist, medium, silty CLAY with trace sand and slight trace gravel.		610	
16.6–17.3	Brown (10YR5/3), moist, medium dense, silty, very fine-grained SAND.			
17.3–18.2	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.			
18.2–20.1	Dark gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.		608	

End of Boring = 20.1 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/8/2010
Finish: 2/8/2010
WEATHER: Cold, snow, windy (mid-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Suzanna Simpson

BOREHOLE ID: G120
Well ID: G120
Surface Elev: 627.21 ft. MSL
Completion: 20.00 ft. BGS
Station: 875,854.43N
2,513,905.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 13.85 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	20/24 *83%*	SS	*3-3 4-5* N=7	16		
2A	19/24 *79%*	SS	*3-4 7-9* N=11	20		
3A	16/24 *67%*	SS	*2-3 4-5* N=7	26		
4A	17/24 *71%*	SS	*3-5 6-6* N=11	24		
5A	14/24 *58%*	SS	*2-4 4-6* N=8	22		
6A	22/24 *92%*	SS	*1-3 3-4* N=6	23		
7A	22/24 *92%*	SS	*1-2 3-5* N=5	21		
8A	19/24 *79%*	SS	*woh-2 3-3* N=5	25		
9A	24/24 *100%*	SS	*woh-3 12-21* N=15	21		
9B				10		
10A	24/24 *100%*	SS	*13-36 46-70* N=82	7		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0 – ~4.9	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	626, 624	
~4.9 – ~6.5	Gray (10YR5/1) with15% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.	622	
~6.5 – 8	Gray (10YR5/1) with15% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel, slight trace roots.	620	
8 – 10	Gray (10YR5/1) with15% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand.	618	
10 – ~12.7	Gray (10YR5/1) with brownish yellow (10YR6/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	616	
~12.7 – ~16.2	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel. (▽ at ~13.85)	614, 612	
~16.2 – ~16.9	Brown (10YR5/3), very moist, soft, clayey SAND with slight trace gravel.		
~16.9 – ~18.2	Brown (10YR5/3), slightly moist, stiff, clayey SILT with trace sand and slight trace gravel.	610	
~18.2 – 20	Dark gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.	608	

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/4/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G121
Well ID: G121
Surface Elev: 627.94 ft. MSL
Completion: 22.00 ft. BGS
Station: 875,964.59N
2,513,904.35E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 14.44 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*4-4 7-8* N=11	15		
2A	20/24 *83%*	SS	*3-5 8-12* N=13	16		
3A	18/24 *75%*	SS	*1-4 5-6* N=9	27		
4A	18/24 *75%*	SS	*2-3 5-6* N=8	25		
5A	18/24 *75%*	SS	*2-2 3-4* N=5	24		
6A	13/24 *54%*	SS	*2-2 4-4* N=6	23		
7A	19/24 *79%*	SS	*woh-2 3-4* N=5	23		
8A	18/24 *75%*	SS	*1-2 2-2* N=4	23		
9A	23/24 *96%*	SS	*woh-woh 1-2*	21		
10A	22/24 *92%*	SS	*4-12 26-30* N=38	8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0 – ~5.7	FILL - Brown (10YR4/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.	
~5.7 – ~7.3	Dark yellowish brown (10YR4/4), moist, medium, silty CLAY with slight trace sand.	
~7.3 – ~8.2	Gray (10YR5/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, medium, clayey SILT with trace sand.	
~8.2 – 12	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.	
12 – ~16.2	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	
~16.2 – ~18.2	Brown, (10YR5/3), very moist, very soft, clayey SAND with slight trace gravel.	
~18.2 – 20	Brown (10YR5/3), slightly moist, hard, very silty CLAY with trace sand and gravel.	

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. Elevation scale: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608. Remarks: (none)

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/4/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G121
Well ID: G121
Surface Elev: 627.94 ft. MSL
Completion: 22.00 ft. BGS
Station: 875,964.59N
2,513,904.35E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 14.44 - 3/1/2010

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*13-23* *31-48* N=54	7				Dark gray (10YR4/1), slightly moist, hard, clayey SILT with sand and gravel.			
							22			606	

End of Boring = 22.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G122	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G122	
Project:		**Surface Elev:** 628.05 ft. MSL	
DATES: Start: 2/4/2010	**FIELD STAFF: Driller:** T. List	**Completion:** 20.00 ft. BGS	
Finish: 2/4/2010	**Helper:** M. Herbst/S. Hamby	**Station:** 876,080.14N	
WEATHER: Overcast, cold (lo-30's)	**Eng/Geo:** D. Lamb	2,513,902.82E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 17.00 - While drilling
▼ =
▽ = 12.84 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	23/24 *96%*	SS	*5-5 6-11* N=11	16		
2A	20/24 *83%*	SS	*3-3 5-5* N=8	22		
3A	20/24 *83%*	SS	*3-4 5-6* N=9	25		
4A	19/24 *79%*	SS	*1-5 5-6* N=10	29		
5A	20/24 *83%*	SS	*1-3 3-3* N=6	21		
6A	19/24 *79%*	SS	*1-2 3-3* N=5	22		
7A	16/24 *67%*	SS	*1-2 3-4* N=5	21		
8A	19/24 *79%*	SS	*1-1 2-2* N=3	21		
9A	20/24 *83%*	SS	*1-1 4-16* N=5	14		
10A	24/24 *100%*	SS	*10-38 51-58* N=89	6		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–4.8	FILL - Grayish brown (10YR5/2) with 15% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	626, 624	
4.8–7.5	Dark yellowish brown (10YR4/4), moist, medium, silty CLAY.	622	
7.5–9.5	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY.	620	
9.5–11.7	Grayish brown (10YR5/2), moist, medium, clayey SILT with sand.	618	
11.7–12.5	Yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace gravel.	616	
12.5–13.7	Gray (10YR5/1), moist, medium, clayey SILT with fine sand.		
13.7–14.7	Brown (10YR4/3), moist, medium, silty CLAY with trace gravel.	614	
14.7–15.5	Grayish brown (10YR5/2), moist, soft, sandy SILT.		
15.5–17.0	Yellowish brown (10YR5/4) with 40% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with slight trace sand.	612	
17.0–18.8	Dark yellowish brown (10YR4/6), wet, medium dense, silty SAND.	610	
18.8–19.3	Brownish yellow (10YR6/6), slightly moist, hard, clayey SILT with trace sand and gravel.		
19.3–20	Gray (10YR5/1), slightly moist, hard, clayey SILT with gravel.		

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/3/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G123
Well ID: G123
Surface Elev: 628.12 ft. MSL
Completion: 24.00 ft. BGS
Station: 876,189.60N
2,513,901.46E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.50 - While drilling
▼ =
▽ = 15.98 - 3/1/2010

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*6-8 9-11* N=17	16		
2A	19/24 *79%*	SS	*4-5 6-7* N=11	18		
3A	17/24 *71%*	SS	*2-3 5-6* N=8	24		
4A	18/24 *75%*	SS	*1-3 5-8* N=8	24		
5A	20/24 *83%*	SS	*2-3 4-5* N=7	18		
6A	19/24 *79%*	SS	*1-2 3-5* N=5	21		
7A	23/24 *96%*	SS	*1-3 4-4* N=7	19		
8A	22/24 *92%*	SS	*1-2 3-3* N=5	17		
9A	22/24 *92%*	SS	*1-1 2-2* N=3	19		
10A	12/24 *50%*	SS	*3-3 3-4* N=6	16		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–5.2	FILL - Grayish brown (10YR5/2) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	628	
5.2–6.4	Dark grayish brown (10YR4/2) with 20% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand, slight trace roots.		
6.4–8	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.		
8–12	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
12–13.5	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with sand and slight trace gravel.		
13.5–15	Dark yellowish brown (10YR3/6) with dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with trace gravel.		
15–16.5	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, sandy SILT.		
16.5–18	Dark yellowish brown (10YR4/6), wet, soft, clayey SAND.		
18–20	Yellowish brown (10YR5/6), wet, medium, sandy SILT with trace gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. Elevation scale: 628, 626, 624, 622, 620, 618, 616, 614, 612, 610.

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/3/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G123
Well ID: G123
Surface Elev: 628.12 ft. MSL
Completion: 24.00 ft. BGS
Station: 876,189.60N
2,513,901.46E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.50 - While drilling
▼ =
▽ = 15.98 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	20/24 *83%*	SS	*6-12 12-12* N=24	11				Yellowish brown (10YR5/6), wet, medium, sandy SILT with trace gravel. *[Continued from previous page]*		608	
							22	Gray (10YR5/1), moist, very stiff, clayey SILT with trace gravel.		606	
12A	19/24 *79%*	SS	*3-8 13-9* N=21	9				Dark gray (10YR4/1), moist, very stiff, sandy SILT with trace clay and gravel.			
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/3/2010
Finish: 2/3/2010
WEATHER: Sunny, cold (mid-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G124
Well ID: G124
Surface Elev: 628.70 ft. MSL
Completion: 20.00 ft. BGS
Station: 876,304.85N
2,513,900.34E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 10.99 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*6-4 5-6* N=9	17		
2A	22/24 *92%*	SS	*4-5 7-8* N=12	21		
3A	19/24 *79%*	SS	*2-4 6-7* N=10	25		
4A	13/24 *54%*	SS	*3-3 6-6* N=9	28		
5A	20/24 *83%*	SS	*1-3 5-6* N=8	21		
6A	17/24 *71%*	SS	*1-3 3-4* N=6	22		
7A	18/24 *75%*	SS	*1-3 3-4* N=6	23		
8A	20/24 *83%*	SS	*woh-woh 2-3*	28		
8B				22		
9A	19/24 *79%*	SS	*1-2 3-3* N=5	22		
9B				17		
10A	20/24 *83%*	SS	*4-10 17-23* N=27	12		

Depth ft. BGS	Lithologic Description
0 – ~5.2	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.
~5.2 – 6	Dark grayish brown (10YR4/2) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY.
6 – 8	Dark grayish brown (10YR4/2) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, slight trace roots.
8 – 10	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel.
10 – 15	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
15 – ~16.3	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, very soft, silty CLAY with trace sand and slight trace gravel.
~16.3 – ~17.3	Gray (10YR6/1) with 5% yellowish brown (10YR5/6) mottles, moist, medium, sandy CLAY with slight trace gravel.
~17.3 – ~18.3	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, sandy CLAY with slight trace gravel.
~18.3 – ~19	Yellowish brown (10YR5/4), moist, medium, clayey SILT with trace sand and slight trace gravel.
~19 – ~19.7	Yellowish brown (10YR5/4), slightly moist, stiff, clayey SILT with trace sand and slight trace gravel.
~19.7 – 20	Gray (10YR5/1), slightly moist, stiff, clayey SILT with trace sand and slight trace gravel.

End of Boring = 20.0 ft. BGS

Elevation ft. MSL: 628, 626, 624, 622, 620, 618, 616, 614, 612, 610

Borehole Detail | Remarks

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/2/2010
Finish: 2/3/2010
WEATHER: Sunny, cold (mid-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Suzanna Simpson

BOREHOLE ID: G125
Well ID: G125
Surface Elev: 628.85 ft. MSL
Completion: 20.13 ft. BGS
Station: 876,409.47N
2,513,899.12E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 17.00 - While drilling
▼ = Dry - Upon completion
▽ = 8.58 - 3/1/2010

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	18/24 *75%*	ss	*5-6 7-9* N=13	17		
2A	16/24 *67%*	ss	*3-4 6-9* N=10	17		
3A	20/24 *83%*	ss	*2-5 5-7* N=10	25		
4A	19/24 *79%*	ss	*2-4 5-5* N=9	23		
5A	14/24 *58%*	ss	*3-4 4-6* N=8	25		
6A	18/24 *75%*	ss	*2-3 3-5* N=6	22		
7A	20/24 *83%*	ss	*3-4 3-4* N=7	23		
8A	24/24 *100%*	ss	*3-3 3-3* N=6	23		
9A	24/24 *100%*	ss	*woh-1 2-1* N=3	25		
9B				18		
10A				22		
	19/24 *79%*	ss	*woh-1 7-19* N=8			
10B				11		

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.			
	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel, slight trace roots.			
	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel, slight trace roots.			
	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.			
	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.			
	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.			
	Brown (10YR5/3), very moist, very soft, clayey SAND with slight trace gravel.			
	Brown (10YR5/3), slightly moist, medium, clayey SILT with trace sand and slight trace gravel.			

End of Boring = 20.1 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/10/2010
Finish: 2/10/2010
WEATHER: Partly cloudy, wind 10 mph, ~25F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G126
Well ID: G126
Surface Elev: 622.96 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,062.44N
2,513,895.37E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.20 - While drilling
▼ = 13.00 - Upon completion
▽ = 8.82 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*9-7 12-10* N=19	15		
2A	19/24 *79%*	SS	*2-4 6-9* N=10	26		
3A	22/24 *92%*	SS	*2-4 5-7* N=9	20		
4A	24/24 *100%*	SS	*2-3 4-5* N=7	22		
5A	24/24 *100%*	SS	*1-3 4-5* N=7	22		
6A	22/24 *92%*	SS	*1-3 4-5* N=7	18		
7A	20/24 *83%*	SS	*1-2 3-4* N=5	19		
8A	24/24 *100%*	SS	*4-15 12-29* N=27	20		
9A	23/24 *96%*	SS	*29-39 39-29* N=78	8		

Depth ft. BGS	Lithologic Description
0 – 1.5	FILL - Dark yellowish brown (10YR4/6), moist, very stiff, sandy CLAY with silt and trace gravel.
1.5 – 2.3	Light grayish brown (10YR6/2), slightly moist, stiff, silty CLAY.
2.3 – 5.2	Light grayish brown (10YR6/2) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, slight trace roots.
5.2 – 9.2	Dark brown (10YR3/3) with 10% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY.
9.2 – 11.5	Light grayish brown (10YR6/2) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
11.5 – 13.2	Grayish brown (10YR5/2) with dark yellowish brown (10YR4/6) mottles, moist, medium, clayey SILT with sand and slight trace gravel.
13.2 – 14.8	Gray (10YR6/1). very moist, medium, sandy CLAY with trace gravel.
14.8 – 15.8	Yellowish brown (10YR5/8) with 40% dark yellowish brown (10YR4/6) mottles, slightly moist, very stiff, clayey SILT with trace gravel.
15.8 – 16.4	Brownish yellow (10YR6/8), moist, very stiff, sandy SILT with gravel.
16.4 – 18	Grayish brown (10YR5/2), moist, hard, sandy SILT with gravel.

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18. Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606. Borehole Detail. Remarks.

End of Boring = 18.0 ft. BGS

NOTE(S): G126 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/19/2011
Finish: 12/19/2011
WEATHER: Cloudy, rain (mid-60's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G151
Well ID: G151
Surface Elev: 622.82 ft. MSL
Completion: 20.46 ft. BGS
Station: 875,023.67N
2,513,805.93E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 11.50 - Upon completion
▽ = 7.79 - 12/21/2011

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	21/24 *88%*	SS	*2-3 4-5* N=7			
2A	19/24 *79%*	SS	*2-3 6-9* N=9			
3A	19/24 *79%*	SS	*2-4 6-8* N=10			
4A	19/24 *79%*	SS	*15-15 18-11* N=33			
5A	18/24 *75%*	SS	*1-3 4-4* N=7			
6A	16/24 *67%*	SS	*3-3 4-6* N=7			
7A	22/24 *92%*	SS	*9-9 10-9* N=19			
8A	19/24 *79%*	SS	*15-15 35-70* N=50			
9A	4/4 *100%*	SS	*50/4"*			
10A	10/23 *43%*	SS	*12-18 70-99/5"* N=88			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–2	FILL - Light yellowish brown (10YR6/4), silty CLAY with some sand and gravel.	622
2–4	FILL - Brown (10YR5/3), silty CLAY with some sand and slight trace gravel.	620
4–4.5	FILL - Brown (10YR5/3), silty CLAY with some sand and slight trace gravel.	
4.5–8	Brown (10YR5/3) with 30% gray (10YR6/1) mottles, clayey SILT with trace sand and slight trace gravel.	618, 616
8–10	Brown (10YR5/3) with 30% gray (10YR6/1) mottles, silty CLAY with sand and gravel.	614
10–14	Light gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, sandy CLAY with some silt and slight trace gravel.	612, 610
14–14.6	Light brown (10YR5/3) silty SAND with slight trace gravel.	
14.6–15.8	Light gray (10YR6/1), silty SAND with slight trace gravel.	608
15.8–16.3	Light brown (10YR6/4), silty SAND with some gravel.	
16.3–20.5	Dark gray (10YR5/1), very silty CLAY with sand and trace gravel.	606, 604

Borehole Detail | Remarks

End of Boring = 20.5 ft. BGS

NOTE(S): G151 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/20/2011
Finish: 12/20/2011
WEATHER: Cloudy, (mid-40's), rainy later.

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G152
Well ID: G152
Surface Elev: 623.06 ft. MSL
Completion: 18.57 ft. BGS
Station: 874,687.53N
2,513,894.46E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.50 - While drilling
▼ = 3.05 - Upon completion
▽ = 17.00 - 12/21/2011

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	12/24 *50%*	SS	*2-2 2-3* N=4			
2A, 2B	22/24 *92%*	SS	*2-4 9-7* N=13			
3A, 3B	15/24 *63%*	SS	*3-4 5-6* N=9			
5A	19/24 *79%*	SS	*10-10 12-10* N=22			
5B	20/24 *83%*	SS	*2-4 6-7* N=10			
6A	21/24 *88%*	SS	*2-3 5-7* N=8			
7A	20/24 *83%*	SS	*5-7 9-10* N=16			
8A, 8B	21/24 *88%*	SS	*3-4 7-11* N=11			
9A	23/24 *96%*	SS	*14-35 60-70* N=95			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–0.6	Dark brown (10YR4/2), silty CLAY with trace sand and slight trace gravel.		
0.6–2.5	Light yellowish brown (10YR6/4), silty CLAY with trace sand and slight trace gravel.	622	
2.5–4	Gray (10YR6/1), silty CLAY with trace sand and slight trace gravel.	620	
4–5	Gray (10YR6/1) and 25% brown (10YR5/6) mottles, silty CLAY with trace sand and slight trace gravel.	618	
5–9.3	Gray (10YR5/1), clayey SILT silty CLAY with sand and slight trace gravel.	616	
9.3–10	Gray (10YR5/1) with 25% brown (10YR5/6) mottles, silty CLAY with trace sand and slight trace gravel.	614	
10–12.7	Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, silty CLAY with trace sand and slight trace gravel.	612	
12.7–14	Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND with some silt and slight trace gravel.	610	
14–14.5	Yellowish brown (10YR5/6) with 20% gray (10YR6/1), mottles, clayey SAND with some silt and slight trace gravel.		
14.5–15.2	Yellowish brown (10YR5/6), silty SAND.	608	
15.2–16	Yellowish brown (10YR5/6), silty SAND with slight trace gravel.		
16–16.6	Dark grayish brown (10YR4/2), very silty CLAY with sand and trace gravel.		
16.6–18.6	Grayish brown (10YR5/2) silty CLAY with sand and trace gravel.	606	

End of Boring = 18.6 ft. BGS

NOTE(S): G152 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/15/2011
Finish: 12/15/2011
WEATHER: Cloudy, windy, (mid-high 30's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G153
Well ID: G153
Surface Elev: 623.30 ft. MSL
Completion: 20.76 ft. BGS
Station: 874,532.71N
2,513,532.68E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 15.70 - Upon completion
▽ = 17.55 - 12/21/2011

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	16/24 *67%*	SS				
1B	17/24 *71%*	SS	*woh-3* *4-6* N=7			
2A, 3A	18/24 *75%*	SS	*3-4* *5-5* N=9			
4A	21/24 *88%*	SS	*4-5* *6-8* N=11			
5A	20/24 *83%*	SS	*1-4* *4-5* N=8			
6A	20/24 *83%*	SS	*1-4* *4-6* N=8			
7A	23/24 *96%*	SS	*7-6* *6-15* N=12			
8A	19/24 *79%*	SS	*15-23* *37-50* N=60			
9A	9/12 *75%*	SS	*50-99*			
10A	20/24 *83%*	SS	*23-50* *58-109* N=108			
11A	6/7 *86%*	SS	*75-99/1"*			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	FILL - Light yellowish brown (10YR6/4), silty CLAY with sand and slight trace gravel.	
	FILL - Gray (10YR6/1), silty CLAY with sand and slight trace gravel.	622, 620
4	Gray (10YR6/1) with 50% brownish yellow (10YR6/8) mottles, silty CLAY with trace sand.	
	Gray (10YR5/1), silty CLAY with trace sand.	618, 616
	Gray (10YR6/1), silty CLAY with sand and slight trace gravel.	614
10	Gray (10YR6/1), silty CLAY with sand and slight trace gravel.	
	Gray (10YR6/1) with 50% brownish yellow (10YR6/8) mottles, silty CLAY with sand and slight trace gravel.	612
12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) mottles, clayey SAND with trace silt.	610
14	Yellowish brown (10YR5/8), silty SAND with slight trace gravel.	608
	Brownish yellow (10YR6/8), silty CLAY with sand and trace gravel.	606
	Dark gray (10YR4/1), silty CLAY with sand and trace gravel.	604

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Borehole Detail | Remarks

End of Boring = 20.8 ft. BGS

NOTE(S): G153 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/16/2011
Finish: 12/16/2011
WEATHER: Ptly. cloudy (mid-30's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G154
Well ID: G154
Surface Elev: 623.52 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,978.38N
2,513,243.10E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.45 - While drilling
▼ =
▽ = 11.10 - 12/21/2011

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	14/24 *58%*	SS	*3-4 4-5* N=8			
2A	10/24 *42%*	SS	*woh-1 4-5* N=5			
3A	14/24 *58%*	SS	*2-4 6-7* N=10			
4A	21/24 *88%*	SS	*6-8 10-10* N=18			
5A	16/24 *67%*	SS	*1-4 6-8* N=10			
6A	13/24 *54%*	SS	*1-4 6-8* N=10			
7A, 7B	20/24 *83%*	SS	*4-6 8-12* N=14			
8A, 8B, 8C	23/24 *96%*	SS	*4-18 30-37* N=48			
9A	21/24 *88%*	SS	*40-75 86-84* N=161			
10A	20/24 *83%*	SS	*28-28 30-34* N=58			

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
0 - 2	FILL - Light yellowish brown (10YR6/4), silty CLAY with trace sand and slight trace gravel.		622	
2 - 4	Brownish yellow (10YR6/6) with 25% gray (10YR6/1) mottles, silty CLAY with trace sand.		620	
4 - 6	Gray (10YR5/1) with 25% yellowish brown (10YR5/4) mottles, silty CLAY with trace sand.		618	
6 - 12	Gray (10YR6/1) with 25% brownish yellow (10YR6/6) mottles, silty CLAY with trace sand and slight trace gravel.		616, 614, 612	
12 - 12.8	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) mottles, silty CLAY with trace sand and slight trace gravel.			
12.8 - 14	Gray (10YR6/1), silty CLAY with trace sand and slight trace gravel.		610	
14 - 14.7	Gray (10YR6/1), clayey SAND with trace silt.			
14.7 - 15.2	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, silty SAND with slight trace gravel.			
15.2 - 16	Dark yellowish brown (10YR4/4), silty CLAY with sand and trace gravel.		608	
16 - 17.8	Brown (10YR4/3), silty CLAY with sand and trace gravel.		606	
17.8 - 20	Dark gray (10YR4/1), silty CLAY with sand and trace gravel.		604	

End of Boring = 20.0 ft. BGS

NOTE(S): G154 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/19/2011
Finish: 12/19/2011
WEATHER: Cloudy, rainy, (mid-40's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G155
Well ID: G155
Surface Elev: 622.89 ft. MSL
Completion: 20.23 ft. BGS
Station: 875,127.65N
2,513,501.75E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.30 - While drilling
▼ = 12.90 - Upon completion
▽ = 7.90 - 12/21/2011

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	20/24 *83%*	SS	*4-6 8-6* N=14			
2A	20/24 *83%*	SS	*2-4 6-7* N=10			
3A	17/24 *71%*	SS	*2-4 5-8* N=9			
4A	24/24 *100%*	SS	*6-7 11-11* N=18			
5A	22/24 *92%*	SS	*woh-3 6-6* N=9			
6A	17/24 *71%*	SS	*2-4 6-6* N=10			
7A	24/24 *100%*	SS	*6-8 10-12* N=18			
8A	23/24 *96%*	SS	*woh-woh 4-15*			
8B, 9A	16/16 *100%*	SS	*15-50 99/4"*			
10A	15/17 *88%*	SS	*24-68 99/5"*			

Depth ft. BGS	Lithologic Description
0	FILL - Yellow (10YR7/6), silty CLAY with trace sand and slight trace gravel.
	FILL - Brown (10YR5/3), silty CLAY with sand and trace gravel.
	FILL - Brown (10YR5/3), silty CLAY with trace sand and slight trace gravel.
2	FILL - Brownish yellow (10YR6/6), silty CLAY with trace sand and slight trace gravel.
	FILL - Dark grayish brown (10YR4/2), silty CLAY with trace sand and slight trace gravel.
4	Gray (10YR5/1), silty CLAY with trace sand and slight trace gravel.
6	Brownish yellow (10YR6/6) with 10% gray (10YR6/1) mottles, silty CLAY with trace sand and slight trace gravel.
8	Dark gray (10YR4/1) with10% brown (10YR4/3) mottles, silty CLAY with trace sand and slight trace gravel.
10	Dark yellowish brown (10YR4/6) with 30% grayish brown (10YR5/2) mottles,silty CLAY with trace sand and slight trace gravel.
12	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, clayey SAND with trace silt.
14	Yellowish brown (10YR6/4), clayey SAND with trace silt.
	Yellowish brown (10YR5/6), silty SAND with slight trace gravel.
16	Yellowish brown (10YR5/6), silty SAND with slight trace gravel.
	Light brownish gray (10YR6/2), silty CLAY with sand and trace gravel.
18	Light gray (10YR6/2), silty CLAY with sand and trace gravel.
20	

Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606, 604

Borehole Detail | Remarks

End of Boring = 20.2 ft. BGS

NOTE(S): G155 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/25/2008
Finish: 2/25/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-650 Track Drill
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: .

BOREHOLE ID: G200
Well ID: G200
Surface Elev: 624.20 ft. MSL
Completion: 18.00 ft. BGS
Station: 877,930.59N
2,515,649.96E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.50 - While drilling
▼ = 2.75 - 3/12/08
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
	24/24 *100%*	SS	*3-2 3-3* N=5			
1A				31		1.36 B
2A				26		1.94 BSh
	19/24 *79%*	SS	*3-3 6-6* N=9			
2B				26		2.33 Sh
3A	19/24 *79%*	SS	*3-3 4-5* N=7	26		1.59 B
3B				23		1.55 B
4A	22/24 *92%*	SS	*5-5 5-5* N=10	29		0.31 B
5A	20/24 *83%*	SS	*2-2 3-5* N=5	25		1.09 B
	22/24 *92%*	SS	*1-3 2-3* N=5			
6A				22		1.01
	24/24 *100%*	SS	*3-3 5-6* N=8			
7A				15		0.50 B
7B				18		
8A				24		0.27 B
	19/24 *79%*	SS	*0-3 5-8* N=8			
8B				17		
9A				13		
	24/24 *100%*	SS	*8-15 30-50* N=45			
9B				8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Very dark grayish brown (10YR3/2), moist, firm, friable, clayey SILT	624
2	Dark gray (10YR4/1) with 5% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY	622
	Dark gray (10YR4/1) with 70% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	
4	Dark gray (10YR4/1) with 70% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand	620
	Very dark gray (10YR3/1), moist, firm, silty CLAY, slight trace sand	
6	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace coarse sand	618
8	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, sand and slight trace gravel	616
10		614
12	Yellowish brown (10YR5/8), moist, soft, sandy CLAY	612
	Gray (10YR5/1), wet, soft, fine- to coarse-grained SAND	
14	Gray (10YR5/1), wet, soft, silty CLAY, trace sand and gravel	610
	Yellowish brown (10YR5/4), wet, soft, fine- to coarse-grained SAND, trace gravel	
16		608
	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel	
18	**End of Boring = 18.0 ft. BGS**	

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/25/2008
Finish: 2/25/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-650 Track Drill
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: .

BOREHOLE ID: G201
Well ID: G201
Surface Elev: 623.90 ft. MSL
Completion: 18.15 ft. BGS
Station: 877,924.94N
2,514,849.47E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.20 - While drilling
▼ = 2.17 - 3/12/08
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	22/24 *92%*	SS	*3-3 2-3* N=5	23				Very dark grayish brown (10YR3/2), moist, soft, friable, clayey SILT, slight trace sand and gravel			
1B				33		1.16	2	Dark brown (10YR3/3), moist, soft, silty CLAY		622	
2A	22/24 *92%*	SS	*2-3 5-6* N=8	26		2.33 BSh	4	Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel		620	
3A	20/24 *83%*	SS	*2-4 5-5* N=9	15		1.94 B	6	Gray (10YR5/1) with 5% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY, sand and trace gravel		618	
4A	24/24 *100%*	SS	*7-7 7-6* N=14	19		1.24 B	8	Gray (10YR5/1), moist, firm, sandy CLAY, trace silt and slight trace gravel		616	
5A	24/24 *100%*	SS	*1-2 3-3* N=5	23		1.16 B	10	Yellowish brown (10YR5/8) with 10% gray (10YR5/1) mottles, moist, firm, sandy CLAY, trace gravel		614	
6A	23/24 *96%*	SS	*0-1 1-2* N=2	20			12	Yellowish brown (10YR5/8), wet, soft, silty SAND, trace gravel		612	
								Yellowish brown (10YR5/8), moist, firm, clayey SILT			
7A	20/24 *83%*	SS	*3-6 6-12* N=12	22		2.72 BSh	14	Greenish gray (5GY6/1), moist, firm, interbedded clayey SILT and SILT		610	
8A	24/24 *100%*	SS	*4-7 7-10* N=14	23		1.59 Sh					
8B				19			16	Yellowish brown (10YR5/8), wet, soft, fine- to coarse-grained SAND, slight trace gravel		608	
9A				15				Yellowish brown (10YR5/8), wet, firm, very fine- to fine-grained silty SAND			
9B	24/24 *100%*	SS	*7-12 25-30* N=37	20				Gray (10YR5/1), wet, soft, SILT			
9C				11				Gray (10YR5/1), wet, soft, fine- to coarse-grained SAND, slight trace gravel			
							18	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel		606	

End of Boring = 18.15 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/21/2008
Finish: 2/21/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-650 Track Drill
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: .

BOREHOLE ID: G205
Well ID: G205
Surface Elev: 622.15 ft. MSL
Completion: 16.00 ft. BGS
Station: 875,550.19N
2,515,914.87E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.10 - While drilling
▼ = 5.06 - 3/12/08
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	24/24 *100%*	SS	*4-3 4-4* N=7	22		
1B				30		1.67 Sh
2A	19/24 *79%*	SS	*3-5 6-5* N=11	24		1.86 B
3A	20/24 *83%*	SS	*2-2 5-5* N=7	19		1.55 B
4A	19/24 *79%*	SS	*5-6 7-8* N=13	20		1.12 B
5A	16/24 *67%*	SS	*2-2 3-5* N=5	20		0.62 BSh
6A	22/24 *92%*	SS	*1-2 3-3* N=5	17		0.62 BSh
6B				17		
7A				25		
7B	23/24 *96%*	SS	*3-3 5-6* N=8	17		1.36 BSh
8A				15		
8B	17/24 *71%*	SS	*5-19 26-35* N=45	10		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	Very dark grayish brown (10YR3/2), moist, firm, clayey SILT	622
	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand	
2	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY, slight trace sand	620
4		618
6	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand, slight trace gravel	616
8	Yellowish brown (10YR5/6), moist, firm, silty CLAY with sand, trace gravel	614
10		612
	Yellowish brown (10YR5/6), moist, soft, sandy SILT, slight trace gravel	
12	Yellowish brown (10YR 5/4), moist, soft, silty SAND, trace gravel	610
14	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel	608
16		

Borehole Detail | Remarks

End of Boring = 16.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/14/2010
Finish: 10/14/2010
WEATHER: Sunny, warm, breezy (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G206
Well ID: G206
Surface Elev: 630.54 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,103.91N
2,514,669.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 22.00 - While drilling
▼ = 21.54 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	12/24 *50%*	SS	*2-2 3-2* N=5	18		
2A	20/24 *83%*	SS	*2-2 3-5* N=5	16		
3A	20/24 *83%*	SS	*4-9 6-8* N=15	19		
4A	19/24 *79%*	SS	*2-4 5-6* N=9	20		
5A	17/24 *71%*	SS	*2-3 4-5* N=7	30		
6A	22/24 *92%*	SS	*2-3 4-6* N=7	19		
7A	23/24 *96%*	SS	*1-2 3-4* N=5	23		
8A	22/24 *92%*	SS	*1-1 3-3* N=4	22		
9A	24/24 *100%*	SS	*1-1 2-2* N=3	21		
10A	24/24 *100%*	SS	*woh-woh 1-5*	25		

Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks

Depth: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

FILL - Grayish brown (10YR5/2), moist, firm, silty CLAY with trace sand and gravel.

FILL - Dark gray (10YR4/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.

Very dark gray (10YR3/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.

Dark grayish brown (10YR4/2) with 35% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.

Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand and gravel.

Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.

Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.

Dark yellowish brown (10YR4/6) with 30% gray (10YR5/1) mottles, moist, soft, silty CLAY with trace sand and gravel.

Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.

Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, silty CLAY with trace sand and gravel.

Gray (10YR5/1), moist, very soft, very fine- to fine-grained sandy CLAY with trace gravel.

Gray (10YR5/1), moist, firm, very fine- to fine-grained

NOTE(S): G206 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G206	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G206	
Project: 05S3004A		**Surface Elev:** 630.54 ft. MSL	
DATES: Start: 10/14/2010	**FIELD STAFF: Driller:** D. Mahurin	**Completion:** 24.00 ft. BGS	
Finish: 10/14/2010	**Helper:** J. Litsch/D. Smail	**Station:** 875,103.91N	
WEATHER: Sunny, warm, breezy (lo-70's)	**Eng/Geo:** .	2,514,669.16E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 22.00 - While drilling
▼ = 21.54 - Upon completion
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								sandy CLAY with trace gravel.			
11A	22/24 *92%*	SS	*19-6 13-19* N=19	13				Dark yellowish brown (10YR4/6), wet dense, silty, fine- to coarse-grained SAND with trace gravel.		610	
								Dark yellowish brown (10YR4/6), moist, hard, clayey SILT with sand and gravel.			
11B				16			22	Grayish brown (10YR5/2), moist, dense, silty, very fine- to fine-grained SAND.			
12A	20/24 *83%*	SS	*11-20 19-13* N=39	10				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
12B				10				Dark gray (10YR4/1), wet, dense, silty, fine- to coarse-grained SAND with gravel.			
							24	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			

End of Boring = 24.0 ft. BGS

NOTE(S): G206 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/8/2010
Finish: 10/8/2010
WEATHER: Sunny, mild

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: G207
Well ID: G207
Surface Elev: 630.61 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,166.36N
2,514,837.94E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	23/24 *96%*	ss	*6-5 5-8* N=10	15		
2A	24/24 *100%*	ss	*4-4 7-8* N=11	15		
3A	23/24 *96%*	ss	*3-6 7-9* N=13	17		
4A	24/24 *100%*	ss	*3-4 6-7* N=10	16		
5A	24/24 *100%*	ss	*2-2 3-4* N=5	22		
5B				24		
6A	22/24 *92%*	ss	*2-2 2-5* N=4	27		
7A	24/24 *100%*	ss	*2-2 2-3* N=4	27		
8A	24/24 *100%*	ss	*woh-1 2-3* N=3	25		
9A	23/24 *96%*	ss	*woh-2 2-3* N=4	22		
10A	24/24 *100%*	ss	*woh-woh 2-3*	19		

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

Lithologic Description

- FILL - Yellowish brown (10YR5/6) with 10% gray (10YR6/1) and 5% black (10YR2/1) mottles, slightly moist, hard, silty CLAY with trace sand and slight trace gravel.
- FILL - Gray (10YR5/1) with 20% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY with sand and trace gravel.
- FILL - Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, moist, hard, silty CLAY with sand and trace gravel.
- FILL - Dark yellowish brown (10YR4/4), moist, hard, silty CLAY with slight trace sand and gravel.
- FILL - Gray (10YR5/1) with 20% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY with slight trace sand and gravel.
- Yellowish brown (10YR5/6) with 25% gray (10YR5/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.
- Gray (10YR5/1) with 15% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.
- Gray (10YR5/1) with 40% yellowish brown (10YR5/8) mottles, very moist, firm, silty CLAY with slight trace sand and gravel.
- Yellowish brown (10YR5/8) with 30% gray (10YR6/1) mottles, very moist, soft, silty CLAY with trace sand and gravel.
- Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, very moist, soft, silty CLAY with sand and slight trace gravel.
- Yellowish brown (10YR5/6) with 25% gray (10YR6/1) mottles, very moist, very soft, sandy, silty CLAY with trace gravel.
- Yellowish brown (10YR5/6) with 30% gray (10YR6/1) mottles, very moist, very soft, sandy CLAY with silt and trace gravel.

Borehole Detail | Remarks

NOTE(S): G207 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/8/2010
Finish: 10/8/2010
WEATHER: Sunny, mild

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: G207
Well ID: G207
Surface Elev: 630.61 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,166.36N
2,514,837.94E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	22/24 *92%*	SS	*woh-1* *2-2* N=3	18				Yellowish brown (10YR5/6) with 30% gray (10YR6/1) mottles, very moist, very soft, sandy CLAY with silt and trace gravel. *[Continued from previous page]*		610	
							22	Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, very moist to wet, loose, silty, very fine- to fine-grained SAND with slight trace gravel.			
12A	24/24 *100%*	SS	*10-24* *26-30* N=50					Gray (10YR5/1), slightly moist, hard, very silty CLAY with trace sand and slight trace gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G207 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/7/2010
Finish: 10/7/2010
WEATHER: Sunny, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G208
Well ID: G208
Surface Elev: 630.57 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,231.46N
2,514,993.57E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.92 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	19/24 *79%*	SS	*4-3 3-5* N=6	23		
2A	24/24 *100%*	SS	*2-3 4-6* N=7	14		
3A	24/24 *100%*	SS	*2-4 4-7* N=8	21		
4A	24/24 *100%*	SS	*2-4 6-8* N=10	17		
5A	20/24 *83%*	SS	*2-2 4-5* N=6	24		
6A	23/24 *96%*	SS	*1-2 4-4* N=6	26		
7A	19/24 *79%*	SS	*1-2 2-3* N=4	23		
8A	22/24 *92%*	SS	*1-1 2-3* N=3	24		
9A	24/24 *100%*	SS	*1-1 2-3* N=3	24		
9B				20		
10A	22/24 *92%*	SS	*woh-woh 1-2*	20		
10B				17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–2	FILL - Brown (10YR4/3) with 5% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	630
2–8.6	FILL - Brown (10YR4/3) with 15% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	628, 626, 624, 622
8.6–9.1	Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand and gravel, trace roots.	
9.1–10	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.	
10–12	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.	620
12–16	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand, trace roots.	618, 616
16–17.3	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel, trace roots.	614
17.3–18.9	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, very moist, soft, silty, very fine- to fine-grained sandy CLAY with trace gravel.	612
18.9–20	Dark yellowish brown (10YR4/6) with 15% gray (10YR5/1) mottles, very moist to wet, soft, clayey, very fine- to medium-grained SAND with trace gravel.	

NOTE(S): G208 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/7/2010
Finish: 10/7/2010
WEATHER: Sunny, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G208
Well ID: G208
Surface Elev: 630.57 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,231.46N
2,514,993.57E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.92 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										610	
11A	20/24 *83%*	SS	*woh-2* *5-12* N=7	13				Yellowish brown (10YR5/4), moist, firm, very silty CLAY with sand and gravel.			
							22				
12A	24/24 *100%*	SS	*6-11* *18-24* N=29	9				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
							▼ 24				

End of Boring = 24.0 ft. BGS

NOTE(S): G208 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/7/2010
Finish: 10/7/2010
WEATHER: Sunny, cool (lo-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G209
Well ID: G209
Surface Elev: 630.57 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,298.23N
2,515,149.56E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 22.40 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	24/24 *100%*	SS	*4-4 4-6* N=8	21		
2A	24/24 *100%*	SS	*3-4 6-6* N=10	13		
3A	24/24 *100%*	SS	*2-3 6-8* N=9	19		
4A	22/24 *92%*	SS	*2-3 6-8* N=9	17		
5A	18/24 *75%*	SS	*2-3 3-5* N=6	20		
6A	24/24 *100%*	SS	*1-2 2-5* N=4	26		
7A	22/24 *92%*	SS	*1-3 4-4* N=7	22		
8A	24/24 *100%*	SS	*woh-1 2-3* N=3	25		
9A	19/24 *79%*	SS	*woh-1 2-3* N=3	24		
10A	14/24 *58%*	SS	*woh-2 3-3* N=5	20		

Depth ft. BGS	Lithologic Description
0 – 7.6	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
7.6 – 8.1	Grayish brown (10YR5/2), moist, firm, clayey SILT with trace sand and gravel.
8.1 – 12.3	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.
12.3 – 14.0	Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.
14.0 – 20+	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

Borehole Detail | Remarks

NOTE(S): G209 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/7/2010
Finish: 10/7/2010
WEATHER: Sunny, cool (lo-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G209
Well ID: G209
Surface Elev: 630.57 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,298.23N
2,515,149.56E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 22.40 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	1/24 *4%*	SS	*woh-1 1-1* N=2	21				Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel. *[Continued from previous page]*		610	
12A	20/24 *83%*	SS	*9-16 17-26* N=33	7			22	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G209 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/6/2010
Finish: 10/6/2010
WEATHER: Sunny, warm (mid-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G210
Well ID: G210
Surface Elev: 630.48 ft. MSL
Completion: 25.00 ft. BGS
Station: 875,359.71N
2,515,298.97E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.90 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	20/24 *83%*	SS	*4-3 5-6* N=8	16		
2A	24/24 *100%*	SS	*3-4 7-7* N=11	15		
3A	24/24 *100%*	SS	*3-5 10-9* N=15	19		
4A	24/24 *100%*	SS	*3-6 9-11* N=15	17		
5A	24/24 *100%*	SS	*3-4 5-7* N=9	15		
6A	22/24 *92%*	SS	*2-2 4-6* N=6	26		
7A	19/24 *79%*	SS	*1-3 3-5* N=6	23		
8A	24/24 *100%*	SS	*2-2 2-4* N=4	26		
9A	24/24 *100%*	SS	*1-1 2-3* N=3	24		
10A	20/24 *83%*	SS	*1-1 2-2* N=3	24		
10B				31		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–6.3	FILL - Brown (10YR4/3) with 20% dark gray (N5/1) mottles, moist, firm, silty CLAY with trace sand and gravel.	630, 628, 626
6.3–7.6	FILL - Dark grayish brown (10YR4/2), slightly moist, firm, clayey SILT with trace sand and gravel.	624
7.6–8	Gray (10YR5/1) with 10% dark grayish brown (10YR4/2) mottles, moist, firm, silty CLAY with trace sand.	
8–9.4	Dark gray (10YR4/1), moist, firm, silty CLAY with trace sand, trace roots.	622
9.4–10	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand.	
10–12.6	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	620
12.6–14	Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist to very moist, firm, silty CLAY with sand.	618
14–16	Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.	616
16–19	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.	614, 612
19–20	Gray (N6/1), very moist, very soft, silty, very fine- to fine-grained sandy CLAY with trace gravel.	

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 ▼

Borehole Detail | Remarks

NOTE(S): G210 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/6/2010
Finish: 10/6/2010
WEATHER: Sunny, warm (mid-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G210
Well ID: G210
Surface Elev: 630.48 ft. MSL
Completion: 25.00 ft. BGS
Station: 875,359.71N
2,515,298.97E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.90 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	14/24 *58%*	ss	*woh-5* *6-18* N=11	12				Yellowish brown (10YR5/4), moist, medium dense, silty, fine- to coarse-grained SAND with trace gravel.		610	
								Gray (N6/1), moist, medium dense, silty, very fine - to fine-grained SAND.			
							22	Yellowish brown (10YR5/4), slightly moist, hard, clayey SILT with sand and gravel.			
12A	19/24 *79%*	ss	*7-18* *26-36* N=44	14				Brown (10YR5/3), very moist, dense, very fine- to fine-grained sandy SILT with trace gravel.		608	
13A	10/12 *83%*	ss	*27-50/6"*	9			24	Gray (N5/1), slightly moist, hard, very silty CLAY with sand and gravel.		606	

End of Boring = 25.0 ft. BGS

NOTE(S): G210 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/11/2010
Finish: 10/11/2010
WEATHER: Sunny, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G211
Well ID: G211
Surface Elev: 630.31 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,424.49N
2,515,449.06E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 20.60 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	20/24 *83%*	SS	*5-3 4-5* N=7	23		
2A	20/24 *83%*	SS	*3-5 5-8* N=10	17		
3A	24/24 *100%*	SS	*2-3 5-7* N=8	24		
4A	24/24 *100%*	SS	*3-5 7-9* N=12	29		
5A	24/24 *100%*	SS	*2-2 3-5* N=5	31		
6A	17/24 *71%*	SS	*1-2 4-4* N=6	19		
7A	24/24 *100%*	SS	*1-2 2-4* N=4	22		
8A	24/24 *100%*	SS	*1-1 3-2* N=4	28		
9A	22/24 *92%*	SS	*1-1 1-2* N=2	19		
10A	19/24 *79%*	SS	*1-4 5-11* N=9	13		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–3.5	FILL - Brown (10YR4/3) with 20% dark gray (10YR4/1) mottles, moist, firm, silty CLAY with trace sand and gravel.	630, 628	
3.5–7.8	FILL - Dark gray (10YR4/1) with 20% brown (10YR4/3) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	626, 624	
7.8–10	Dark gray (10YR4/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY, slight trace roots.	622	
10–12	Dark gray (10YR4/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	620	
12–16.6	Dark gray (10YR4/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	618, 616, 614	
16.6–18.4	Dark yellowish brown (10YR4/6) with 30% gray (10YR5/1) mottles, very moist, soft, very fine- to fine-grained sandy CLAY with trace gravel.	612	
18.4–20	Dark yellowish brown (10YR4/4) with 15% grayish brown (10YR5/2) mottles, moist, firm, clayey SILT with sand and gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, ▼ 20

NOTE(S): G211 installed in borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/11/2010
Finish: 10/11/2010
WEATHER: Sunny, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

HANSON

BOREHOLE ID: G211
Well ID: G211
Surface Elev: 630.31 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,424.49N
2,515,449.06E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 20.60 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	18/24 *75%*	SS	*7-17 23-21* N=40	10			▼	Grayish brown (10YR5/2), slightly moist, hard, very silty CLAY with sand and gravel.		610	
12A	24/24 *100%*	SS	*4-14 15-17* N=29	13			22	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G211 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/11/2010
Finish: 10/11/2010
WEATHER: Sunny, warm (lo-80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G212
Well ID: G212
Surface Elev: 630.59 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,486.50N
2,515,583.03E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 19.00 - While drilling
▼ = 20.72 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	24/24 *100%*	SS	*4-3 3-6* N=6	17			0–1.7	FILL - Brown (10YR4/3), slightly moist, firm, silty CLAY with trace sand and gravel.	630	
2A	24/24 *100%*	SS	*2-3 4-5* N=7	21			1.7–3.5	FILL - Dark gray (10YR4/1) with 20% brown (10YR4/3) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	628	
3A	24/24 *100%*	SS	*2-5 6-7* N=11	13			3.5–8.2	FILL - Brown (10YR4/3) with 15% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	626	
4A	24/24 *100%*	SS	*2-5 7-10* N=12	15					624	
5A	24/24 *100%*	SS	*2-2 4-7* N=6	29			8.2–10	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY, slight trace roots.	622	
6A	18/24 *75%*	SS	*2-3 4-6* N=7	23			10–12	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	620	
7A	17/24 *71%*	SS	*1-2 2-2* N=4	25			12–18	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	618	
8A	24/24 *100%*	SS	*woh-1 2-3* N=3	27					616	
9A	22/24 *92%*	SS	*1-1 2-2* N=3	25					614	
10A	24/24 *100%*	SS	*woh-woh 1-2*	19			18–19.5 ▼	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, very moist, very soft, silty, very fine- to fine-grained sandy CLAY with trace gravel.	612	
10B				22			19.5–20	Gray (10YR5/1), loose, wet, silty, very fine- to		

NOTE(S): G212 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/11/2010
Finish: 10/11/2010
WEATHER: Sunny, warm (lo-80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G212
Well ID: G212
Surface Elev: 630.59 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,486.50N
2,515,583.03E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 19.00 - While drilling
▼ = 20.72 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								medium-grained SAND.			
11A	7/24 *29%*	SS	*1-6 10-22* N=16	19			▼	Brown (10YR5/3), moist, medium dense, SILT with trace sand and gravel.		610	
							22	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			
12A	20/24 *83%*	SS	*5-21 18-27* N=39	12						608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G212 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, mild (mid-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G213
Well ID: G213
Surface Elev: 630.34 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,544.37N
2,515,723.51E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.92 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	23/24 *96%*	SS	*4-3 4-5* N=7	15		
2A	22/24 *92%*	SS	*2-4 6-8* N=10	21		
3A	22/24 *92%*	SS	*2-4 7-8* N=11	17		
4A	22/24 *92%*	SS	*2-4 4-8* N=8	16		
5A	20/24 *83%*	SS	*1-3 6-6* N=9	12		
6A	20/24 *83%*	SS	*2-2 5-7* N=7	24		
7A	20/24 *83%*	SS	*2-3 3-5* N=6	19		
8A	22/24 *92%*	SS	*1-2 2-3* N=4	24		
9A	24/24 *100%*	SS	*woh-1 2-2* N=3	24		
10A	18/24 *75%*	SS	*woh-woh 1-2*	24		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–10.3	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, silty CLAY with trace sand and gravel.	630–620	
10.3–11.3	Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.		
11.3–12.2	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT, trace roots.		
12.2–14	Dark gray (10YR4/1) with 3% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.		
14–16.8	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.		
16.8–17.8	Gray (10YR5/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.		
17.8–18.8	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, very fine- to fine-grained sandy CLAY with trace gravel.		
18.8–20	Dark yellowish brown (10YR4/6), very moist, soft, sandy CLAY with trace gravel.		

NOTE(S): G213 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, mild (mid-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G213
Well ID: G213
Surface Elev: 630.34 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,544.37N
2,515,723.51E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.92 - Upon completion
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										610	
11A	18/24 *75%*	SS	*1-1 1-2* N=2	18				Dark yellowish brown (10YR4/6), moist, soft, clayey, very fine- to coarse-grained SAND with trace gravel.			
								Dark yellowish brown (10YR4/6), moist, firm, very silty CLAY with sand and gravel.			
							22			608	
12A	22/24 *92%*	SS	*10-13 18-22* N=31	11				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			
							24				

End of Boring = 24.0 ft. BGS

NOTE(S): G213 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/14/2010
Finish: 10/14/2010
WEATHER: Sunny, cool (lo-40's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G214
Well ID: G214
Surface Elev: 630.39 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,668.02N
2,515,960.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	24/24 *100%*	ss	*6-7 7-9* N=14	15		
2A	24/24 *100%*	ss	*3-3 6-5* N=9	22		
3A	24/24 *100%*	ss	*3-4 6-8* N=10	18		
4A	24/24 *100%*	ss	*3-4 7-10* N=11	17		
5A	24/24 *100%*	ss	*3-2 4-5* N=6	19		
6A	24/24 *100%*	ss	*2-3 4-7* N=7	24		
7A	24/24 *100%*	ss	*2-3 4-6* N=7	22		
7B				16		
8A	24/24 *100%*	ss	*woh-2 3-4* N=5	22		
9A	22/24 *92%*	ss	*1-2 2-3* N=4	21		
10A	22/24 *92%*	ss	*woh-2 2-2* N=4	15		
10B				21		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–3.1	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	630, 628	
3.1–4	FILL - Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.		
4–8.4	FILL - Brown (10YR4/3) with 10% dark yellowish brown (10YR4/6) and 5% dark gray (10YR4/1) mottles, moist, firm, silty CLAY with trace sand and gravel.	626, 624, 622	
8.4–10.5	Grayish brown (10YR5/2) with 15% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand and gravel.	620	
10.5–12.2	Brown (10YR4/3) with 15% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.		
12.2–13	Gray (10YR6/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY.	618	
13–16	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	616	
16–16.9	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	614	
16.9–19.4	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	612	
19.4–20	Gray (10YR5/1), wet, loose, silty, very fine- to medium-grained SAND with trace gravel and clayey seams.		

NOTE(S): G214 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G214	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G214	
Project: 05S3004A		**Surface Elev:** 630.39 ft. MSL	
DATES: Start: 10/14/2010	**FIELD STAFF: Driller:** D. Mahurin	**Completion:** 24.00 ft. BGS	
Finish: 10/14/2010	**Helper:** J. Litsch/D. Smail	**Station:** 875,668.02N	
WEATHER: Sunny, cool (lo-40's)	**Eng/Geo:** .	2,515,960.84E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Gray (10YR5/1), wet, loose, silty, very fine- to medium-grained SAND with trace gravel and clayey seams. *[Continued from previous page]*		610	
11A	20/24 *83%*	SS	*woh-woh 3-12*	24							
11B				14				Dark yellowish brown (10YR4/6), moist, firm, very silty CLAY with trace sand and gravel.			
							22				
										608	
12A	24/24 *100%*	SS	*12-28 32-28* N=60	7				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with trace sand and gravel.			
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G214 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/13/2010
Finish: 10/13/2010
WEATHER: Sunny, warm, windy (hi-60's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G215
Well ID: G215
Surface Elev: 630.48 ft. MSL
Completion: 24.31 ft. BGS
Station: 875,810.19N
2,515,971.55E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
= Dry - While drilling
= Dry - Upon completion
= 22.52 - 10/14/10

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	23/24 *96%*	SS	*5-3 3-5* N=6	18		
2A	19/24 *79%*	SS	*3-3 5-6* N=8	17		
3A	20/24 *83%*	SS	*2-3 7-7* N=10	13		
4A	23/24 *96%*	SS	*3-6 6-7* N=12	16		
4B				27		
5A	20/24 *83%*	SS	*3-3 3-5* N=6	20		
6A	13/24 *54%*	SS	*2-2 3-5* N=5	24		
7A	19/24 *79%*	SS	*2-3 4-6* N=7	17		
8A	20/24 *83%*	SS	*2-3 4-5* N=7	19		
9A	22/24 *92%*	SS	*1-3 3-4* N=6	19		
10A	24/24 *100%*	SS	*woh-1 2-2* N=3	17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–6	FILL - Brown (10YR4/3) with 30% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	
6–7.5	FILL - Dark grayish brown (10YR4/2), moist, firm, silty CLAY with trace sand and gravel.	
7.5–8.4	FILL - Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	
8.4–9	Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand, trace roots.	
9–12	Dark gray (10YR4/1) with 30% dark yellowish brown (10YR4/6) moist, firm, silty CLAY with trace sand.	
12–13.3	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.	
13.3–15	Dark gray (10YR4/1), moist, firm, clayey SILT with trace sand.	
15–18.6	Dark gray (10YR4/1) with 30% Dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	
18.6–20	Dark gray (10YR4/1) with 30% Dark yellowish brown (10YR4/6) mottles, moist, soft, sandy CLAY with trace gravel.	

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

Borehole Detail | Remarks

NOTE(S): G215 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/13/2010
Finish: 10/13/2010
WEATHER: Sunny, warm, windy (hi-60's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G215
Well ID: G215
Surface Elev: 630.48 ft. MSL
Completion: 24.31 ft. BGS
Station: 875,810.19N
2,515,971.55E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ = 22.52 - 10/14/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark yellowish brown (10YR4/6), moist, medium dense, clayey SILT with sand and trace gravel.		610	
11A	20/24 *83%*	SS	*2-4 4-4* N=8	17				Yellowish brown (10YR5/6), moist, medium dense, silty, very fine- to fine-grained SAND.			
							22	Dark yellowish brown (10YR4/6) with 30% dark gray (10YR4/1) mottles, moist, firm, sandy CLAY with trace gravel.			
12A	24/24 *100%*	SS	*7-11 17-19* N=28	11			▽	Grayish brown (10YR5/2), slightly moist, very firm, very silty CLAY with sand and gravel.		608	
12B	0/4 *0%*	BD		9			24	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			

End of Boring = 24.3 ft. BGS

NOTE(S): G215 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/13/2010
Finish: 10/13/2010
WEATHER: Partly cloudy, mild, windy (lo-60's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G216
Well ID: G216
Surface Elev: 630.28 ft. MSL
Completion: 26.00 ft. BGS
Station: 875,976.05N
2,515,968.53E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 21.00 - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) / % Recovery	Type	TESTING: Blows / 6 in / N - Value / RQD	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) / Qp (tsf) / Failure Type
1A	24/24 100%	SS	3-2 2-4 N=4	22		
2A	19/24 79%	SS	2-2 5-4 N=7	28		
3A	24/24 100%	SS	2-2 4-5 N=6	19		
4A	22/24 92%	SS	3-4 6-6 N=10	19		
5A	20/24 83%	SS	2-3 3-6 N=6	18		
6A	18/24 75%	SS	2-3 3-4 N=6	17		
7A	16/24 67%	SS	1-2 3-4 N=5	20		
8A	22/24 92%	SS	2-2 5-5 N=7	20		
9A	23/24 96%	SS	woh-2 3-3 N=5	18		
10A	24/24 100%	SS	woh-woh 1-2	17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0 – ~5.1	FILL - Brown (10YR4/3) with 20% dark gray (10YR4/6) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	630 – 628 – 626	
~5.1 – ~6.4	FILL - Dark gray (10YR4/1) with 15% brown (10YR4/3) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand and gravel.	624	
~6.4 – ~8.4	FILL - Dark grayish brown (10YR4/2) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	622	
~8.4 – 12	Dark gray (10YR4/1) with 40% gray (10YR6/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.	620	
12 – ~14.2	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	618	
~14.2 – ~15.4	Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand.	616	
~15.4 – ~18.3	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	614	
~18.3 – ~19.3	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, sandy CLAY with trace gravel.	612	
~19.3 – 20	Dark yellowish brown (10YR4/6) and 40% gray		

NOTE(S): G216 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/13/2010
Finish: 10/13/2010
WEATHER: Partly cloudy, mild, windy (lo-60's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G216
Well ID: G216
Surface Elev: 630.28 ft. MSL
Completion: 26.00 ft. BGS
Station: 875,976.05N
2,515,968.53E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 21.00 - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								(10YR5/1) mottles, moist, soft, sandy CLAY with trace gravel. *[Continued from previous page]*		610	
11A	20/24 *83%*	SS	*2-9 9-7* N=18	14			▼	Light brownish gray (10YR6/2), wet, medium dense, very fine- to fine-grained sandy SILT with trace gravel.			
							22	Yellowish brown (10YR5/6), wet, medium dense, silty, very fine-to medium-grained SAND.			
								Gray (10YR5/1), very moist, medium dense, very fine- to fine-grained sandy SILT.		608	
12A 12B	22/24 *92%*	SS	*5-10 21-25* N=31	19 16				Gray (10YR5/1), wet, medium dense, very fine- to fine-grained sandy SILT.			
							24	Dark gray (10YR4/1), wet, dense, silty, fine- to coarse-grained SAND with gravel.		606	
13A	20/24 *83%*	SS	*14-25 27-27* N=52	9			26	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			

End of Boring = 26.0 ft. BGS

NOTE(S): G216 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Sunny, warm (lo-80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G217
Well ID: G217
Surface Elev: 630.67 ft. MSL
Completion: 26.00 ft. BGS
Station: 876,185.57N
2,515,963.02E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.00 - While drilling
▼ = 24.82 - Upon completion
▽ = 23.98 - 10/13/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	20/24 *83%*	SS	*5-2 3-4* N=5	21		
2A	19/24 *79%*	SS	*2-3 5-6* N=8	28		
3A	19/24 *79%*	SS	*2-3 6-7* N=9	14		
4A	23/24 *96%*	SS	*5-6 7-8* N=13	15		
5A	20/24 *83%*	SS	*3-5 7-6* N=12	13		
6A	19/24 *79%*	SS	*3-3 4-5* N=7	27		
7A	18/24 *75%*	SS	*3-4 6-8* N=10	28		
8A	20/24 *83%*	SS	*2-4 6-8* N=10	16		
9A	19/24 *79%*	SS	*2-3 4-5* N=7	26		
10A	19/24 *79%*	SS	*1-2 2-3* N=4	18		

Depth ft. BGS	Lithologic Description
0–4.4	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
4.4–6	FILL - Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
6–7.2	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
7.2–9.4	FILL - Dark grayish brown (10YR4/2) with 5% dark yellowish brown (10YR4/6) slightly moist, firm, clayey SILT with trace sand and gravel.
9.4–10.2	FILL - Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand and gravel.
10.2–10.8	Dark gray (10YR4/1), moist, firm, silty CLAY with trace sand and gravel.
10.8–12	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.
12–14	Dark grayish brown (10YR4/2) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY trace sand, trace roots.
14–16	Dark gray (10YR4/1), moist, firm, silty CLAY with trace sand and gravel.
16–17.4	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
17.4–20	Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

Borehole Detail | Remarks

NOTE(S): G217 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G217	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G217	
Project: 05S3004A		**Surface Elev:** 630.67 ft. MSL	
DATES: Start: 10/12/2010	**FIELD STAFF: Driller:** D. Mahurin	**Completion:** 26.00 ft. BGS	
Finish: 10/12/2010	**Helper:** J. Litsch/D. Smail	**Station:** 876,185.57N	
WEATHER: Sunny, warm (lo-80's)	**Eng/Geo:** .	2,515,963.02E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.00 - While drilling
▼ = 24.82 - Upon completion
▽ = 23.98 - 10/13/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	22/24 *92%*	SS	*woh-woh 1-2*	18				Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel. *[Continued from previous page]*	610	
							22	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.		
12A	10/24 *42%*	SS	*4-6 7-10* N=13	13				Yellowish brown (10 YR5/4), wet, medium dense, silty, very fine- to coarse-grained SAND with trace gravel.	608	
13A	22/24 *92%*	SS	*8-18 17-17* N=35	12			24	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.	606	
							26	**End of Boring = 26.0 ft. BGS**		

NOTE(S): G217 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G218
Well ID: G218
Surface Elev: 630.64 ft. MSL
Completion: 26.00 ft. BGS
Station: 876,380.92N
2,515,962.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 24.00 - While drilling
▼ = 24.76 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	18/24 *75%*	SS	*4-1 2-1* N=3	20		
2A	22/24 *92%*	SS	*2-2 3-5* N=5	20		
3A	19/24 *79%*	SS	*2-3 4-8* N=7	17		
4A	22/24 *92%*	SS	*2-5 6-8* N=11	14		
5A	20/24 *83%*	SS	*3-4 8-7* N=12	17		
6A	19/24 *79%*	SS	*2-2 3-5* N=5	19		
6B				25		
7A	22/24 *92%*	SS	*2-3 5-7* N=8	22		
8A	18/24 *75%*	SS	*2-3 4-5* N=7	19		
9A	24/24 *100%*	SS	*2-2 2-4* N=4	19		
10A	24/24 *100%*	SS	*1-2 2-3* N=4	18		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–2.4	FILL - Brown (10YR4/3) with 15% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	630	
2.4–6.2	FILL - Dark gray (10YR4/1) with 30% brown (10YR4/3) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	628, 626	
6.2–9.4	FILL - Brown (10YR5/3) with 10% dark gray (10YR4/1) mottles, slightly moist, firm, clayey SILT with trace sand and gravel.	624, 622	
9.4–10.6	Dark grayish brown (10YR4/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.	620	
10.6–13.2	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, slight trace roots.	618	
13.2–15.3	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.	616	
15.3–20	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	614, 612	

NOTE(S): G218 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: .

BOREHOLE ID: G218
Well ID: G218
Surface Elev: 630.64 ft. MSL
Completion: 26.00 ft. BGS
Station: 876,380.92N
2,515,962.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 24.00 - While drilling
▼ = 24.76 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										610	
11A	22/24 *92%*	SS	*woh-woh woh-woh*	16				Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, very soft, clayey, very fine- to coarse-grained SAND with trace gravel.			
							22				
12A	24/24 *100%*	SS	*1-1 1-3* N=2	10				Yellowish brown, wet, loose, silty, very fine- to coarse-grained SAND with trace gravel.		608	
12B				16				Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.			
							▼ 24	Gray (10YR5/1), wet, loose, silty, very fine- to coarse-grained SAND with trace gravel.			
13A	24/24 *100%*	SS	*1-5 9-13* N=14	20			▼			606	
13B				17				Dark gray (10YR4/1), slightly moist, very firm, very silty CLAY with sand and gravel.			
							26	**End of Boring = 26.0 ft. BGS**			

NOTE(S): G218 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/26/2008
Finish: 2/26/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-650 Track Drill
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: .

BOREHOLE ID: G270
Well ID: G270
Surface Elev: 622.92 ft. MSL
Completion: 18.27 ft. BGS
Station: 874,801.92N
2,514,996.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 5.62 - 3/12/08
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
	20/24 *83%*	SS	*2-2 2-4* N=4			
1A				24		
2A	19/24 *79%*	SS	*3-4 5-9* N=9	22		2.33 B
2B				20		5.04 Sh
3A	20/24 *83%*	SS	*14-5 7-8* N=12	17		2.52 Sh
4A	24/24 *100%*	SS	*8-6 7-5* N=13	21		1.24 BSh
4B				21		1.20 B
5A	22/24 *92%*	SS	*2-3 4-4* N=7	21		1.36 B
6A	24/24 *100%*	SS	*1-2 2-3* N=4	21		0.74 BSh
6B				24		0.78 B
7A	17/24 *71%*	SS	*2-2 2-3* N=4	21		
8A				20		
8B	19/24 *79%*	SS	*1-3 5-6* N=8	17		4.46 Sh
9A	24/24 *100%*	SS	*6-8 30-35* N=38	20		
9B				8		

Depth ft. BGS	Lithologic Description
	Dark grayish brown (10YR4/2), moist, firm, clayey SILT
	Dark grayish brown (10YR4/2), moist, firm, silty CLAY
2	Dark grayish brown (10YR4/2) with 5% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand
	Gray (10YR5/1) with 70% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand and gravel
4	Dark gray (10YR4/1) with 5% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel
6–8	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel
10	Gray (10YR5/1) with 60% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel
	Gray (10YR5/1), moist, soft, sandy CLAY
12	Gray (10YR5/1), moist, soft, sandy CLAY, trace gravel
14	Gray (10YR5/1), moist, soft, fine- to coarse-grained SAND, trace gravel
	Dark yellowish brown (10YR4/4), moist, soft, sandy CLAY
	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand and gravel
16	Yellowish brown (10YR5/4), wet, soft, fine to coarse SAND
18	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel

Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606

Borehole Detail | Remarks

End of Boring = 18.27 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/9/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G271
Well ID: G271
Surface Elev: 622.89 ft. MSL
Completion: 16.00 ft. BGS
Station: 874,239.38N
2,515,517.12E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 12.50 - 9/21/09
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	20/24 *83%*	SS	*2-5 5-6* N=10	27		
2A	24/24 *100%*	SS	*2-6 5-5* N=11	23		
3A	23/24 *96%*	SS	*4-5 4-5* N=9	18		
4A	24/24 *100%*	SS	*2-4 4-5* N=8	17		
5A	24/24 *100%*	SS	*2-4 4-6* N=8	20		
6A	24/24 *100%*	SS	*2-4 4-5* N=8	22		
6B				20		
7A				20		
7B	20/24 *83%*	SS	*2-2 3-7* N=5	19		
8A	24/24 *100%*	SS	*10-19 30-33* N=49	7		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	FILL - Yellowish brown (10YR5/4), moist, firm, silty CLAY with trace sand.	
	Grayish brown (10YR5/2), dry, friable, clayey SILT.	622
2	Yellowish brown (10YR5/6) with 10% gray (10YR6/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	620
4	Gray (10YR6/1), moist, firm, very silty CLAY with slight trace sand.	618
6–8	Gray (10YR5/1) with 30% brownish yellow (10YR6/6) mottles, moist, firm, silty CLAY with sand and trace gravel.	616, 614
	Very dark gray (10YR3/1), organic-rich (PEAT), silty CLAY and trace sand.	
10	Brownish yellow (10YR6/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with sand and trace gravel.	612
12	Gray (10YR6/1) with 20% brownish yellow (10YR6/8) mottles, very moist, soft, sandy CLAY with silt and slight trace gravel.	
	Brownish yellow (10YR6/6), very moist to wet, soft, sandy CLAY with silt and slight trace gravel.	610
14	Gray (10YR6/1), wet, loose, very fine to medium SAND with silt.	
	Gray (10YR5/1), slightly moist, hard, very silty CLAY with sand and gravel.	608
16		

End of Boring = 16.0 ft. BGS

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G272
Well ID: G272
Surface Elev: 620.72 ft. MSL
Completion: 14.32 ft. BGS
Station: 874,234.83N
2,515,744.99E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.00 - While drilling
▼ = 9.49 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	20/24 *83%*	SS	*3-2 3-4* N=5	18			0–1.8	FILL - Brownish yellow (10YR6/6) with 30% gray (10YR5/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	620	
2A	24/24 *100%*	SS	*4-5 6-7* N=11	25			1.8–5.4	Brownish yellow (10YR6/6) with 20% brownish yellow (10YR6/8) and 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	618	
3A	23/24 *96%*	SS	*2-4 4-6* N=8	18					616	
3B				17			5.4–8.4	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with sand and trace gravel.	614	
4A	24/24 *100%*	SS	*3-4 4-4* N=8	20						
5A	23/24 *96%*	SS	*2-3 3-5* N=6	21			8.4–10.3	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, moist, soft, silty CLAY with sand and slight trace gravel.	612	
6A	22/24 *92%*	SS	*2-3 3-3* N=6	23			10.3–11.7	Gray (10YR6/1) with 30% brownish yellow (10YR6/6) mottles, very moist, soft, silty CLAY with sand and slight trace gravel.	610	
							11.7–13.0	Gray (10YR6/1), very moist, loose, SILT and very fine sand.	608	
7A	18/24 *75%*	SS	*2-9 15-21* N=24	14			13.0–13.5	Gray (10YR6/1), wet, loose, SILT and very fine sand.		
7B				10			13.5–14.3	Yellowish brown (10YR5/6), moist, hard, very silty CLAY with sand and trace gravel.		

End of Boring = 14.3 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G273
Well ID: G273
Surface Elev: 620.17 ft. MSL
Completion: 16.00 ft. BGS
Station: 874,235.24N
2,515,975.49E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.50 - While drilling
▼ = 9.89 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	16/24 *67%*	SS	*3-3 3-3* N=6	24			0–2	FILL -Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with slight trace sand.	620	
2A	24/24 *100%*	SS	*3-4 5-7* N=9	28			2–4.4	FILL - Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	618	
3A				18					616	
3B	24/24 *100%*	SS	*3-5 6-8* N=11	25			4.4–5.8	Brownish yellow (10YR6/8) with 40% gray (10YR5/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.		
4A				19			5.8–6.8	Gray (10YR6/1) with 10% brownish yellow(10YR6/6) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	614	
4B	24/24 *100%*	SS	*3-5 5-6* N=10	16			6.8–9.2	Gray (10YR5/1), moist, firm, silty CLAY with sand and trace gravel.	612	
5A	23/24 *96%*	SS	*2-4 5-4* N=9	19			9.2–10	Yellowish brown (10YR5/8) with 30% gray (10YR6/1) mottles, moist, soft, sandy CLAY with silty and slight trace gravel.		
5B				21			10–12.2	Brownish yellow (10YR6/8) with 10% gray (10YR6/1) mottles, very moist, soft, sandy CLAY with silt and slight trace gravel.	610	
6A	24/24 *100%*	SS	*1-2 3-4* N=5	19						
7A	24/24 *100%*	SS	*4-8 17-24* N=25	11			12.2–13.5	Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.	608	
7B				11			13.5–14	Light yellowish brown (10YR6/4), wet, loose, very fine- to very coarse-grained SAND with trace silt.		
							14–14.4	Light yellowish brown (10YR6/4), wet, dense, sandy, silty CLAY.	606	
8A	22/24 *92%*	SS	*9-22 22-23* N=44	8			14.4–16	Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.		

End of Boring = 16.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G274
Well ID: G274
Surface Elev: 621.67 ft. MSL
Completion: 18.06 ft. BGS
Station: 874,239.25N
2,516,195.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 13.12 - 9/21/09
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	20/24 *83%*	SS	*2-3 3-4* N=6	17			0–5.6	FILL - Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.		
2A	24/24 *100%*	SS	*4-6 7-9* N=13	25						
3A	24/24 *100%*	SS	*3-4 6-9* N=10	26						
3B				21			5.6–8.5	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with slight trace sand and gravel.		
4A	16/24 *67%*	SS	*3-6 6-8* N=12	24						
5A	24/24 *100%*	SS	*2-4 4-6* N=8	20			8.5–10.4	Dark gray (10YR4/1) with 15% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.		
6A	22/24 *92%*	SS	*1-3 4-6* N=7	19			10.4–15.3	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and trace gravel.		
7A	23/24 *96%*	SS	*1-2 4-4* N=6	21			▼ 13.12			
8A	22/24 *92%*	SS	*1-3 3-6* N=6	17			15.3–16.0	Yellowish brown (10YR5/8), very moist, soft, silty CLAY with sand and trace gravel.		
							▼ 16.0–17.0	Brownish yellow (10YR6/6), wet, loose, very fine- to very coarse-grained SAND.		
9A	14/24 *58%*	SS	*wor-4 9-11* N=13	13			17.0–17.7	Brownish yellow (10YR6/6), moist, firm, very silty CLAY with sand and gravel.		
9B				13			17.7–18.1	Gray (10YR6/1), moist, hard, very silty CLAY with sand and gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18. Elevation scale: 620, 618, 616, 614, 612, 610, 608, 606, 604.

End of Boring = 18.1 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G275
Well ID: G275
Surface Elev: 616.14 ft. MSL
Completion: 13.19 ft. BGS
Station: 874,298.94N
2,516,375.86E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.90 - While drilling
▼ = 10.25 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	22/24 *92%*	SS	*2-4 4-6* N=8	22		
2A	18/24 *75%*	SS	*3-6 7-7* N=13	19		
3A	24/24 *100%*	SS	*2-4 4-5* N=8	22		
4A	24/24 *100%*	SS	*2-3 4-6* N=7	17		
5A	24/24 *100%*	SS	*1-2 3-3* N=5	18		
5B				21		
6A				16		
6B	20/24 *83%*	SS	*woh-4 5-2* N=9	13		
6C				15		
7A	12/12 *100%*	SS	*10-35*	8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–2.2	FILL - Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	616–614
2.2–4.3	Dark gray (10YR4/1) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	
4.3–6.5	Gray (10YR6/1), moist, soft, silty CLAY with sand and slight trace gravel.	
6.5–9.4	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and slight trace gravel.	
9.4–10.7	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, very moist, soft, silty CLAY with sand and trace gravel.	
10.7–11.6	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, very moist, very soft, silty CLAY with sand and trace gravel.	
11.6–12.2	Gray (10YR6/1), wet, loose, very fine- to very coarse-grained SAND with trace gravel.	
12.2–13.2	Yellowish brown (10YR5/6), moist, hard, very silty CLAY with sand and gravel.	

Borehole Detail | Remarks

End of Boring = 13.2 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, mild (70'S)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G276
Well ID: G276
Surface Elev: 629.14 ft. MSL
Completion: 28.00 ft. BGS
Station: 874,438.60N
2,516,358.83E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 25.55 - 9/21/09
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	17/24 *71%*	SS	*5-8 9-10* N=17	10		
2A	19/24 *79%*	SS	*7-7 10-14* N=17	15		
3A	11/24 *46%*	SS	*5-10 14-27* N=24	14		
4A	24/24 *100%*	SS	*5-9 10-14* N=19	8		
4B				5		
5A	17/24 *71%*	SS	*4-4 8-19* N=12	22		
6A	17/24 *71%*	SS	*4-5 8-14* N=13	14		
7A	16/24 *67%*	SS	*6-7 2-4* N=9	20		
8A	20/24 *83%*	SS	*2-4 6-6* N=10	21		
9A	22/24 *92%*	SS	*1-4 5-7* N=9	17		
9B				13		
10A	23/24 *96%*	SS	*2-3 8-12* N=11	20		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–6	FILL - Yellowish brown (10YR5/4) with 20% gray (10YR5/1) mottles, moist, hard, silty CLAY with trace sand and slight trace gravel.	628, 626, 624	Rock fragment in split spoon shoe
6–7	FILL - Yellowish brown (10YR5/4) with 20% gray (10YR5/1) mottles, slightly moist, hard, silty CLAY with trace sand and slight trace gravel.		
7–8.3	FILL - Yellowish brown (10YR5/4) with 10% gray (10YR5/1) mottles, slightly moist, hard, friable, clayey SILT with sand and trace gravel.	622	
8.3–13	FILL - Yellowish brown (10YR5/4) with 25% gray (10YR5/1) mottles, slightly moist, firm, silty CLAY with slight trace sand and gravel.	620, 618	
13–16.8	Gray (10YR6/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	616, 614	
16.8–18.4	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, sandy CLAY with silt and slight trace gravel.	612	
18.4–20	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and slight trace gravel.	610	

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, mild (70'S)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G276
Well ID: G276
Surface Elev: 629.14 ft. MSL
Completion: 28.00 ft. BGS
Station: 874,438.60N
2,516,358.83E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 25.55 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
11A	24/24 *100%*	SS	*1-3 5-7* N=8	21		
12A	24/24 *100%*	SS	*1-4 6-7* N=10	16		
13A	24/24 *100%*	SS	*2-3 4-6* N=7	16		
14A	24/24 *100%*	SS	*1-5 15-29* N=20	16		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
20–23	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and slight trace gravel. *[Continued from previous page]*	608
23–24.2	Yellowish brown (10YR5/8), moist, firm, silty CLAY with sand and slight trace gravel.	606
24.2–25.2	Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, very moist, soft, silty CLAY with sand and trace gravel.	604
25.2–26	Gray (10YR6/1), very moist, loose, very fine- to fine-grained, SAND	
26–26.5	Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, very moist, soft, silty CLAY with sand and trace gravel.	
26.5–27	Gray (10YR6/1), very moist, firm, clayey SILT with trace very fine-grained sand.	602
27–27.5	Gray (10YR6/1) with 40% yellowish brown (10YR5/4) mottles, moist, hard, very silty CLAY with sand and trace gravel.	
27.5–28	Yellowish brown (10YR5/4), moist, hard, very silty CLAY with sand and trace gravel.	

End of Boring = 28.0 ft. BGS

Depth scale: 22, 24, 26, 28. Water level ▼ at approximately 25.55 ft.

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/14/2009
Finish: 9/14/2009
WEATHER: Sunny, mild (70'S)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G277
Well ID: G277
Surface Elev: 620.79 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,581.80N
2,516,370.51E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.40 - While drilling
▼ = 18.23 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) / Failure Type
1A	23/24 *96%*	SS	*2-2 4-6* N=6	21		
2A	24/24 *100%*	SS	*2-4 6-7* N=10	22		
2B				16		
3A				11		
3B	17/24 *71%*	SS	*4-7 9-11* N=16	22		
4A	18/24 *75%*	SS	*4-8 8-6* N=16	13		
5A	19/24 *79%*	SS	*3-7 8-9* N=15	12		
6A	22/24 *92%*	SS	*3-9 9-10* N=18	14		
6B				16		
7A	18/24 *75%*	SS	*3-5 7-9* N=12	17		
8A	22/24 *92%*	SS	*2-5 5-8* N=10	12		
9A	22/24 *92%*	SS	*1-2 3-3* N=5	14		
10A				11		
10B	23/24 *96%*	SS	*1-3 19-47* N=22	9		
10						

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–1.6	FILL - Yellowish brown (10YR5/4) with 10% yellowish brown (10YR5/8) mottles, very moist, soft, silty CLAY with slight trace sand and gravel.	620
1.6–3.1	FILL - Yellowish brown (10YR5/4) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	618
3.1–4	Yellowish brown (10YR5/4) with 20% gray (10YR5/1) and 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand.	
4	Light brownish gray (10YR6/2), dry, friable, clayey SILT.	616
4–7.3	Light brownish gray (10YR6/2) with 25% yellowish brown (10YR5/8) mottles, moist, firm, clayey SILT with slight trace sand.	614
7.3–8.2	Gray (10YR6/1) with 50% very dark grayish brown (10YR3/2) mottles, moist, hard, clayey SILT with slight trace sand and gravel.	
8.2–10.8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, hard, very silty CLAY with sand and slight trace gravel.	612, 610
10.8–15.4	Yellowish brown (10YR5/8) with 30% gray (10YR6/1) mottles, moist, hard, silty CLAY with sand and trace gravel.	608, 606
15.4–16.1	Gray (10YR6/1), moist, slightly dense, silty, very fine- to very coarse-grained SAND.	
16.1–16.6	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.	604
16.6–17.6	Gray (10YR6/1) with 20% brownish yellow (10YR6/6) mottles, wet, very soft, silty, very fine- to fine-grained SAND with trace gravel.	
17.6–18.6	Gray (10YR6/1) with 30% grayish brown (10YR5/2) mottles, moist, soft, sandy CLAY with slight trace gravel.	
18.6–20	Brownish yellow (10YR6/6) with 25% gray (10YR6/1) mottles, moist, hard, very silty CLAY with sand and trace gravel.	602

Borehole Detail | Remarks

End of Boring = 20.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/11/2009
Finish: 9/11/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G278
Well ID: G278
Surface Elev: 628.85 ft. MSL
Completion: 24.06 ft. BGS
Station: 874,875.37N
2,516,200.66E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.98 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	16/24 *67%*	SS	*3-4 6-7* N=10	19			0–13.6	FILL - Yellowish brown (10YR5/4) with 15% yellowish brown(10YR5/8) mottles, moist, hard, silty CLAY with trace sand and slight trace gravel.	628	
2A	24/24 *100%*	SS	*4-7 8-11* N=15	21					626	
3A	22/24 *92%*	SS	*9-10 9-35* N=19	10					624	Rock fragment in split spoon shoe
4A	4/24 *17%*	SS	*20-7 10-8* N=17						622	Rock fragment in split spoon shoe
5A	14/24 *58%*	SS	*11-6 8-8* N=14	15					620	Rock fragment in split spoon shoe
6A	20/24 *83%*	SS	*6-4 8-9* N=12	26					618	
7A	24/24 *100%*	SS	*2-4 8-11* N=12	18			13.6–14.1	Gray (10YR6/1) with 30% brownish yellow (10YR6/6) mottles, moist, firm, clayey SILT with slight trace sand.	616	
8A	20/24 *83%*	SS	*4-7 10-11* N=17	12			14.1–15.1	Very dark gray (10YR3/1), moist, firm, clayey SILT with slight trace sand and trace roots.	614	
8B				22			15.1–16.6	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.		
9A	22/24 *92%*	SS	*4-6 6-9* N=12	17			16.6–19.3	Gray (10YR6/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.	612	
10A	20/24 *83%*	SS	*2-4 5-8* N=9	21			19.3–20	Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with sand and trace gravel.	610	

NOTE(S):

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/11/2009
Finish: 9/11/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: G278
Well ID: G278
Surface Elev: 628.85 ft. MSL
Completion: 24.06 ft. BGS
Station: 874,875.37N
2,516,200.66E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.98 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	18/24 *75%*	SS	*2-4* *7-7* N=11	19				Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with sand and trace gravel. *[Continued from previous page]*		608	
11B							22	Yellowish brown (10YR5/6), very moist, soft, silty, very fine- to medium-grained SAND.			
12A	20/24 *83%*	SS	*1-5* *10-18* N=15	16				Yellowish brown (10YR5/4), moist, hard, very silty CLAY with sand and trace gravel.		606	
12B				10			▼ 24				

End of Boring = 24.1 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G279
Well ID: G279
Surface Elev: 629.19 ft. MSL
Completion: 28.00 ft. BGS
Station: 875,028.06N
2,516,245.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.60 - While drilling
▼ = 24.68 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	24/24 *100%*	SS	*3-3 5-6* N=8	18		
2A	24/24 *100%*	SS	*5-9 10-11* N=19	14		
3A	24/24 *100%*	SS	*5-9 9-10* N=18	17		
4A	24/24 *100%*	SS	*4-5 7-6* N=12	21		
5A	24/24 *100%*	SS	*3-3 5-7* N=8	19		
6A	24/24 *100%*	SS	*3-4 6-9* N=10	17		
7A	23/24 *96%*	SS	*2-5 5-6* N=10	23		
8A	24/24 *100%*	SS	*2-3 7-6* N=10	23		
9A	18/24 *75%*	SS	*4-7 8-9* N=15	25		
10A	24/24 *100%*	SS	*3-6 7-10* N=13	17		

Depth ft. BGS	Lithologic Description
0 – 3.5	FILL - Brown (10YR4/3) with 30% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with sand and trace gravel.
3.5 – 14	FILL - dark gray (10YR4/1) with 10% brownish yellow (10YR6/6) mottles, moist, hard, silty CLAY with sand and trace gravel.
14 – 15.3	Brownish yellow (10YR6/8) with 30% gray (10YR5/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.
15.3 – 18.4	Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.
18.4 – 20	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 628, 626, 624, 622, 620, 618, 616, 614, 612, 610

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G279
Well ID: G279
Surface Elev: 629.19 ft. MSL
Completion: 28.00 ft. BGS
Station: 875,028.06N
2,516,245.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.60 - While drilling
▼ = 24.68 - 9/21/09
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	23/24 *96%*	SS	*2-4 5-7* N=9	18			20–22	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel. *[Continued from previous page]*	608	
12A	19/24 *79%*	SS	*4-9 8-9* N=17	13			22–23.6	Yellowish brown (10YR5/8), moist, firm, clayey SILT and very fine-grained SAND with slight trace gravel.	606	
12B				12			23.6–26.6	Light brownish gray (10YR6/2), wet, loose, very fine- to coarse-grained SAND.	604	
13A	17/24 *71%*	SS	*1-5 5-7* N=10	18						
14A				16			26.6–27.1	Brownish yellow (10YR6/6), moist, hard, very silty CLAY with sand and trace gravel.		
14B	24/24 *100%*	SS	*10-10 18-18* N=28	14			27.1–28	Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.	602	

End of Boring = 28.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/26/2008
Finish: 2/26/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-650 Track Drill
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: .

BOREHOLE ID: G280
Well ID: G280
Surface Elev: 622.95 ft. MSL
Completion: 17.98 ft. BGS
Station: 875,045.11N
2,515,679.48E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.60 - While drilling
▼ = 4.34 - 3/12/08
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	24/24 *100%*	SS	*5-3 4-4* N=7	23		
1B				26		2.33 B
2A	24/24 *100%*	SS	*3-4 4-6* N=8	30		1.28 BSh
2B				25		
3A	19/24 *79%*	SS	*3-4 6-6* N=10	14		3.10 Sh
4A	22/24 *92%*	SS	*9-11 10-8* N=21	18		1.67 BSh
5A	19/24 *79%*	SS	*2-2 4-4* N=6	20		1.47 B
5B				21		1.28 B
6A	22/24 *92%*	SS	*2-3 3-3* N=6	20		
7A	23/24 *96%*	SS	*3-14 23-21* N=37	13		
8A	23/24 *96%*	SS	*12-17 24-26* N=41	9		
8B				15		
9A	24/24 *100%*	SS	*11-27 54-43* N=81	26		
9B				7		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–1.1	Dark grayish brown (10YR4/2), moist, firm, clayey SILT	622
1.1–2	Brown (10YR4/3) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	
2–2.6	Dark yellowish brown (10YR4/4), moist, firm, silty CLAY	620
2.6–4.8	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	618
4.8–7	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand	616
7–8	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel	
8–10.8	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, sand, trace gravel	614
10.8–12.4	Yellowish brown (10YR5/8) with 20% light gray (10YR6/1) mottles, moist, soft, sandy CLAY	612
12.4–13	Yellowish brown (10YR5/8), moist, soft, fine to coarse SAND, trace gravel	610
13–13.6	Yellowish brown (10YR5/8), moist, firm, sandy CLAY, trace gravel	
13.6–15.6	Yellowish brown (10YR5/4), moist, firm, clayey SILT, trace sand and gravel	608
15.6–16.8	Yellowish brown (10YR5/4), wet, soft, fine- to coarse-grained SAND, trace gravel	
16.8–17.98	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel	606

End of Boring = 17.98 ft. BGS

Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/8/2015
Finish: 9/8/2015
WEATHER: Sunny, hi 70's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G281
Well ID: G281
Surface Elev: 623.82 ft. MSL
Completion: 20.29 ft. BGS
Station: 2,514,455.48N
874,375.37E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	17/24 71%	SS	15-10 7-6 N=17	14				Light gray (10YR7/2), dry, very stiff, SILT with little clay and trace gravel.		
								Yellowish brown (10YR5/4) with 5% dark brown (10YR3/3) mottles, dry, very stiff, SILT with few clay and trace gravel.	622	
2A	19/24 79%	SS	2-4 5-5 N=9	25		1.50	2	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with few clay.	620	
3A	22/24 92%	SS	2-2 3-4 N=5	23		0.40	4	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) mottles, moist, medium, CLAY with some silt and trace fine-grained sand and small gravel.	618	
4A	24/24 100%	SS	5-5 6-6 N=11	19		1.20	6	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, CLAY with some silt and trace fine-grained sand and small gravel.	616	
5A	20/24 83%	SS	2-2 3-4 N=5	21		1.40	8	Yellowish brown (10YR5/4) with 30% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with some clay and trace very fine- to fine-grained sand and small gravel.	614	
6A	22/24 92%	SS	2-2 3-3 N=5	18		0.50	10	Dark yellowish brown (01YR4/6) with 30% yellowish brown (10YR5/4) mottles, moist, soft, SILT with few clay and little fine- to coarse-grained sand and small gravel, trace wood fragments.	612	
7A	17/24 71%	SS	3-4 5-5 N=9	19		0.30	12	Dark yellowish brown (01YR4/6) with 15% yellowish brown (10YR5/4) mottles, moist, soft, SILT with few clay and very fine- to fine-grained sand and trace small gravel.	610	
	19/24 79%	SS	3-11 21-28 N=32				▼ 14	Dark yellowish brown (10YR4/4), wet, dense, very fine- to fine-grained SAND with some silt, few clay and trace small gravel.	608	
	24/24 100%	SS	21-36 39-50 N=75				16	Dark yellowish brown (10YR4/4), wet, dense, very fine- to fine-grained SAND with few silt, little clay and trace small gravel.	606	
8A				7		4.50	18	Yellowish brown (10YR5/6) with 5% strong brown (7.5YR5/6) mottles, moist, hard, SILT with few clay and little fine-grained sand and small gravel.		
	11/24 46%	SS	16-9 30-50 N=39					Dark grayish brown (10YR4/2) with 5% strong brown (7.5YR5/6) mottles, moist, hard, SILT with few clay and little fine-grained sand and small gravel.	604	
	0/3 0%	BD					20			

End of boring = 20.29 feet

NOTE(S): G281 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/4/2015
Finish: 9/4/2015
WEATHER: Sunny, hi 70's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")

FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G301
Well ID: G301
Surface Elev: 620.27 ft. MSL
Completion: 16.21 ft. BGS
Station: 2,515,582.97N
872,234.82E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - During Drilling
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	19/24 *79%*	SS	*4-4 3-5* N=7	18		*1.80*	0–1.5	Brown (10YR4/3), moist, stiff, SILT with few clay, trace organics.	620	
							1.5–2	Brown (10YR5/3) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with few clay, trace organics.		
2A	22/24 *92%*	SS	*2-4 4-6* N=8	26		*2.40*	2–4.2	Brown (10YR5/3) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with few clay, trace very fine- to medium-grained sand.	618	
3A	21/24 *88%*	SS	*2-2 3-4* N=5	22		*1.30*	4.2–6	Brown (10YR5/3) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt and trace very fine- to medium-grained sand.	616	
4A	24/24 *100%*	SS	*6-4 6-6* N=10	19		*1.10*	6–7.8	Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, medium to stiff, CLAY with some silt and little very fine- to coarse-grained sand and small gravel.	614	
5A	21/24 *88%*	SS	*1-2 3-4* N=5	21			7.8–9.2	Brown (10YR5/3) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with some clay and little very fine- to coarse-grained sand and small gravel.	612	
6A	24/24 *100%*	SS	*3-2 3-3* N=5	19		*0.80*	9.2–12	Brown (10YR5/3) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with some clay and little very fine- to coarse-grained sand and small gravel.	610	
7A	24/24 *100%*	SS	*2-4 6-21* N=10	13		*1.60*	12–14.5 (▼ 12)	Yellowish brown (10YR5/6) with 10% grayish brown (10YR5/2) and 5% yellowish brown (10YR5/4) mottles, wet, stiff, SILT with few clay and little fine- to coarse-grained sand and small gravel.	608	
8A	21/24 *88%*	SS	*20-27 50* N=77	7		*4.50*	14.5–16.21	Grayish brown (10YR5/2) with 5% brown (10YR5/3) mottles, dry, hard, SILT with few clay, very fine- to coarse-grained sand and small gravel.	606	
	0/3 *0%*	BD								

End of boring = 16.21 feet

NOTE(S): G301 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/3/2015
Finish: 9/4/2015
WEATHER: Sunny, hi 70's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")

FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G302
Well ID: G302
Surface Elev: 617.95 ft. MSL
Completion: 18.39 ft. BGS
Station: 2,516,214.19N
872,252.95E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - During Drilling
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	23/24 *96%*	SS	*5-5 5-6* N=10	17		*1.50*	0–1.7	Yellowish brown (10YR5/6) to dark yellowish brown (10YR4/6), moist, hard, SILT with some clay and trace fine-grained sand and small gravel.		
2A	20/24 *83%*	SS	*2-3 4-4* N=7	27		*2.60*	2	Very dark brown (10YR3/1), moist, hard, SILT with some clay and trace fine-grained sand and small gravel.	616	
							4	Dark grayish brown (10YR4/2) with very dark gray (10YR3/1) mottles, moist, stiff, CLAY with some silt and trace sand.	614	
3A	21/24 *88%*	SS	*1-2 3-4* N=5	26		*1.80*		Brown (10YR5/3) with dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with some silt and trace sand.		
4A	24/24 *100%*	SS	*4-7 8-8* N=15	18		*1.60*	6		612	
5A	24/24 *100%*	SS	*2-3 5-5* N=8	17		*1.80*	8	Brown (10YR5/3) with dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with some silt and few very fine- to fine-grained sand.	610	
6A	18/24 *75%*	SS	*2-2 4-5* N=6	19			10	Brown (10YR4/3) with dark yellowish brown (10YR4/6) mottles, moist, stiff, SILT with some clay and few sand.	608	
							12	Dark gray (10YR4/1), moist, stiff, SILT with some clay and few sand.	606	
								Yellowish brown (10YR5/8) with reddish brown (5YR4/4) inclusions, moist, stiff, SILT with some clay and few sand.		
7A	24/24 *100%*	SS	*7-7 8-8* N=15	16		*1.70*		Dark gray (10YR4/1), moist, stiff, SILT with some clay, few sand and trace small gravel.		
8A				18		*0.80*	▼ 14		604	
8B	22/24 *92%*	SS	*2-5 25-32* N=30	12		*4.50*		Grayish brown (10YR5/2), wet, hard, SILT with little clay and very fine-grained sand and trace small gravel.		
							16	Brown (10YR5/3), wet, hard, SILT with little clay and very fine-grained sand and trace small gravel.	602	
9A	24/24 *100%*	SS	*7-24 48-38* N=72	8		*4.50*		Brown (10YR5/3) grading to yellowish brown (10YR5/4), moist, hard, SILT with some clay, few small gravel.		
	0/5 *0%*	BD					18		600	

End of boring = 18.39 feet

NOTE(S): G302 installed in borehole.

Surface Elevation: 619.10

Datum msl

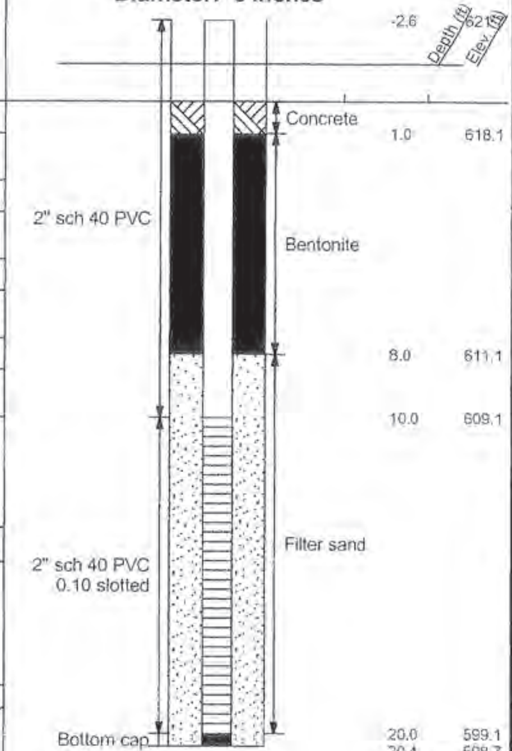
Completion Date: 8/26/10

Northing: 871382.45

Easting: 2516641.06

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: brown, silty clay		1-2-3	SS1
	Medium stiff, grayish-brown, silty CLAY with lignite - CL		1-3-3	SS2
5			1-3-4	SS3
	Soft, brown, silty CLAY - CL		2-3-3	SS4
10	Stiff to hard, brown to grayish-brown, silty CLAY - CL (TILL)			
15			27-44 -50/1"	SS5
			44-50/2"	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 9 FEET ∇

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM __ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RBS
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

Renamed G303

LOG OF BORING: APW-3

Project No. J017150.01

LOG OF BORING 2002 WL J017150.01-COFFEEN.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 623.46

Datum: msl

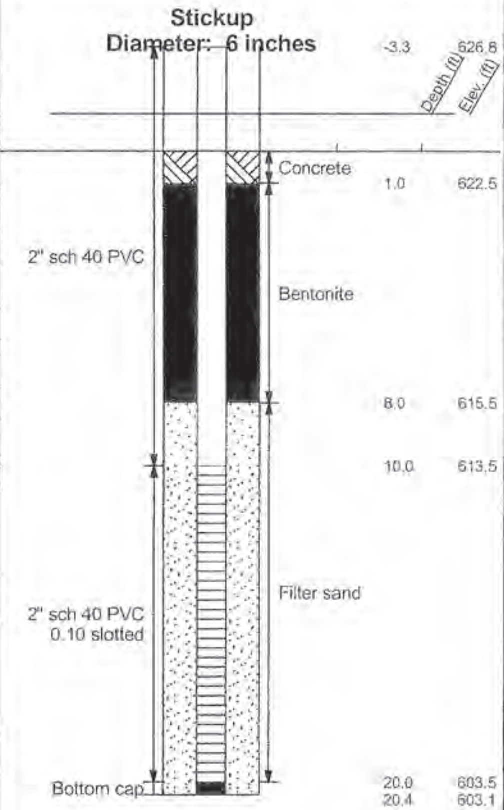
Completion Date: 8/26/10

Northing: 871397.48

Easting: 2515520.23

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium stiff, grayish-brown, silty CLAY - CL			
1			0-1-1	SS1
3.5			1-2-5	SS2
6			1-3-4	SS3
8.5			1-2-3	SS4
14	Medium to fine SAND - SP		1-2-1	SS5
15	Hard, gray, silty CLAY - CL (TILL)			
18.5			14-47	SS6
20	Boring terminated at 20 feet.			

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 14 FEET ∇

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM __ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RJS
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

Renamed G304

LOG OF BORING: APW-4

Project No. J017150.01

LOG OF BORING 2002 WL J017150.01 - COFFEEN.GPJ GTINC 0638301.GPJ 12/13/10

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Power Station
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/3/2016
Finish: 5/3/2016
WEATHER: Cloudy, breezy, warm, lo 60s

CONTRACTOR: Ramsey Geotechnical Engineering LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: G305
Well ID: G305
Surface Elev: 622.54 ft. MSL
Completion: 18.45 ft. BGS
Station: 2,515,199.36N
871,156.33E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 14, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 3.00 - During Drilling
▼ =
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	14/24 *58%*	SS	*2-2 5-7* N=7	12			0–0.8	FILL - Grayish brown (10YR5/2), moist, soft, silty CLAY with few small to coarse sand and few small to large gravel.	622	
							0.8–2.4	FILL - Black (10YR2/1), moist, loose, silty, fine- to coarse-grained SAND with little coal fragments.		
2A	17/24 *71%*	SS	*6-7 7-6* N=14	19			2.4–4	Gray (10YR6/1) and light yellowish brown (10YR6/4), moist, very stiff, SILT with little clay.	620	
3A	18/24 *75%*	SS	*3-3 6-4* N=9	28			4–6	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with trace very fine-grained sand.	618	
4A	16/24 *67%*	SS	*6-6 7-8* N=13	24			6–8	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace very fine- to coarse-grained sand.	616	
5A	23/24 *96%*	SS	*1-3 5-6* N=8	21			8–10.6	Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with few fine- to coarse-grained sand and trace small gravel.	614	
6A	21/24 *88%*	SS	*3-4 6-6* N=10	21			10.6–12	Gray (10YR5/1) with 35% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with few fine- to coarse-grained sand and trace small gravel.	612	
7A	24/24 *100%*	SS	*8-8 9-9* N=17	18			12–14	Yellowish brown (10YR5/8) with 15% gray (10YR5/1) mottles, moist, very stiff, silty CLAY with few fine- to coarse-grained sand and trace small gravel.	610	
	19/24 *79%*	SS	*3-3 4-4* N=7				14–15.3	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with little fine- to coarse-grained sand and trace small gravel.	608	
8A				18			15.3–16.1	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with some fine- to coarse-grained sand and trace small gravel.		
9A	22/24 *92%*	SS	*1-3 7-14* N=10	19			16.1–17.5	Brown (10YR5/3), wet, loose, very silty, very fine- to coarse-grained SAND with trace small gravel.	606	
9B	0/5 *0%*	BD		15			17.5–18.45	Brown (10YR5/3) with 40% yellowish brown (10YR5/8) mottles, moist, very stiff, SILT with little clay and trace fine- to coarse-grained sand.		

End of boring = 18.45 feet

NOTE(S): G305 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Power Station
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/3/2016
Finish: 5/3/2016
WEATHER: Sunny, calm, warm, lo 60s

CONTRACTOR: Ramsey Geotechnical Engineering LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4 ¼" HSA, split spoon sampler

FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: G306
Well ID: G306
Surface Elev: 622.84 ft. MSL
Completion: 18.00 ft. BGS
Station: 2,516,120.41N
871,140.98E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 14, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 5.50 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	12/24 *50%*	SS	*1-3 3-4* N=6	14			0–2	Very dark brown (10YR2/2), moist, medium, SILT with little clay and few very fine- to medium-grained sand, roots, trace coal fragments.	622	
2A	24/24 *100%*	SS	*5-4 5-4* N=9	21			2	Dark gray (10YR4/1) with 5% dark yellowish brown (10YR3/6) mottles, moist, stiff, SILT with little clay and trace very fine- to medium-grained sand.	620	
2B				19			–4	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT with little clay and trace very fine-grained sand.		
3A	22/24 *92%*	SS	*2-2 3-3* N=5	30			4–8	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT with some clay and trace very fine-grained sand.	618	
4A	20/24 *83%*	SS	*3-4 6-6* N=10	26					616	
5A	24/24 *100%*	SS	*2-2 3-3* N=5	23			8–12	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with trace very fine- to coarse-grained sand.	614	
6A	22/24 *92%*	SS	*1-2 3-4* N=5	20					612	
7A	20/24 *83%*	SS	*5-6 6-6* N=12	21			12–14	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with few very fine- to coarse-grained sand.	610	
8A	20/24 *83%*	SS	*2-2 8-14* N=10	15			14	Yellowish brown (10YR5/6), wet, soft, very fine- to coarse-grained sandy CLAY with little silt.	608	
8B				12			–16	Yellowish brown (10YR5/6), wet, medium dense, silty, very fine- to medium-grained SAND with trace coarse-grained sand.		
9A	23/24 *96%*	SS	*14-17 28-50/5"* N=45	10			16	Yellowish brown (10YR5/6), moist, dense, fine- to coarse-grained SAND with little silt, little very fine-grained sand, and trace small gravel.	606	
9B				13			–18	Brown (10YR5/3) with 20% dark yellowish brown (10YR4/6) mottles, moist, hard, SILT with little clay, few very fine- to coarse-grained sand, and trace small gravel.		

End of boring = 18.0 feet

NOTE(S): G306 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Power Station Ash Pond 1
Location: Coffeen, Illinois
Project: 16E0108
DATES: Start: 07/26/2016
Finish: 07/27/2016
WEATHER: Overcast, warm & humid (mid-80s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME 55LC Track Drill
Drilling Method: 4¼" Hollow Stem Auger w/Continuous Split Spoon
FIELD STAFF: Driller: J. Gates
Helper: C. Clines
Eng/Geo: R. Hasenyager

BOREHOLE ID: G307
Well ID: G307
Surface Elev: 622.08 ft. MSL
Completion: 18.22 ft. BGS
Station: 871,398.55N
2,515,553.26E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - during drilling
▼ = -1.76 - 7/27/2016 @ 07:30
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	18/24 *75%*	SS	*1-3 3-2* N=6	22		
2A	22/24 *92%*	SS	*2-1 3-3* N=4	28		
3A	24/24 *100%*	SS	*1-2 3-4* N=5	26		
4A	24/24 *100%*	SS	*1-3 3-3* N=6	18		
5A	24/24 *100%*	SS	*3-3 4-5* N=7	19		
6A	24/24 *100%*	SS	*3-3 4-5* N=7	20		
7A	24/24 *100%*	SS	*woh-2 5-13* N=7	20		
7B				11		
8A	24/24 *100%*	SS	*12-9 6-9* N=15	20		
9A	18/18 *100%*	SS	*8-30 50* N=80	8		
	0/9 *0%*	BD				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0 – 0.9	Brown (10YR5/3), moist, stiff, SILT with few clay, trace sand, gravel and roots.	
0.9 – 3.1	Gray (10YR5/1), moist, soft, CLAY, with some silt, trace sand, gravel and roots.	620
3.1 – 6	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, CLAY with some silt, trace sand, gravel and roots.	618, 616
6 – 11.7	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, medium CLAY,with some silt, few very fine- to medium-grained sand, and trace gravel.	614, 612
11.7 – 12	Gray (10YR5/1), moist, medium, CLAY with little silt and very fine to very coarse sand, trace gravel.	610
12 – 13.4	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, soft, CLAY with some silt, trace sand and gravel.	
13.4 – 14.5	Gray (10YR6/1), wet, medium dense, very fine- to very coarse-grained SAND with few silt and trace clay.	608
14.5 – 16	Yellow brown (10YR5/6), wet. medium dense, very fine- to very coarse-grained SAND, with little silt and trace gravel.	
16 – 16.8	Yellowish brown (10YR5/8), moist, hard, SILT with some clay, little very fine- to very coarse-grained sand and trace gravel.	606
16.8 – 18.2	Gray (10YR5/1), moist, hard, SILT with some clay, little very fine- to very coarse-grained sand and trace gravel.	604

End of boring = 18.2 feet

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/14/2015
Finish: 9/14/2015
WEATHER: Sunny, hi 60's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: R. Hasenyager

BOREHOLE ID: G401
Well ID: G401
Surface Elev: 623.03 ft. MSL
Completion: 19.30 ft. BGS
Station: 2,515,614.84N
872,510.57E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	16/24 *67%*	SS	*2-2 3-7* N=5	17		
2A	21/24 *88%*	SS	*8-11 8-9* N=19	17		*1.80*
2B				25		
3A	23/24 *96%*	SS	*3-4 7-8* N=11	23		*2.50*
4A	24/24 *100%*	SS	*8-9 12-14* N=21	21		*3.30*
4B				19		*2.80*
5A	24/24 *100%*	SS	*2-3 4-5* N=7	21		*1.30*
6A	24/24 *100%*	SS	*2-4 5-6* N=9	17		*2.50*
7A	24/24 *100%*	SS	*9-7 8-9* N=15	21		*1.40*
8A	24/24 *100%*	SS	*2-3 2-4* N=5	17		*1.30*
8B				19		
9A	20/24 *83%*	SS	*5-4 5-10* N=9	21		
9B				16		
10A	12/16 *75%*	SS	*23-41 50/4"*	6		*4.50*

Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation scale: 622, 620, 618, 616, 614, 612, 610, 608, 606, 604

- Dark grayish brown (10YR4/2), moist, soft, CLAY with little silt and trace very fine- to fine-grained sand - FILL.
- Yellowish brown (10YR5/6) moist, medium, CLAY with some silt and trace very fine- to coarse-grained sand - FILL.
- Dark gray (10YR4/1), moist, stiff, SILT with little clay and trace very fine-grained sand.
- Yellowish brown (10YR5/6), moist, stiff, CLAY with some silt and trace very fine- to fine-grained sand.
- Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with some silt and trace very fine- to fine-grained sand.
- Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, stiff, SILT and very fine-grained SAND with trace clay.
- Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with some silt and trace very fine- to fine-grained sand.
- Gray (10YR6/1), moist soft, CLAY with very fine- to fine-grained sand and little silt.
- Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND with trace silt.
- Yellowish brown (10YR5/6), wet medium, SILT with some very fine-grained sand and little clay.
- Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND with trace silt.
- Gray (10YR5/1), moist, very hard, SILT with few clay and little very fine- to very coarse sand.

End of boring = 19.3 feet

NOTE(S): G401 installed in borehole.

Surface Elevation: 610.56

Datum: msl

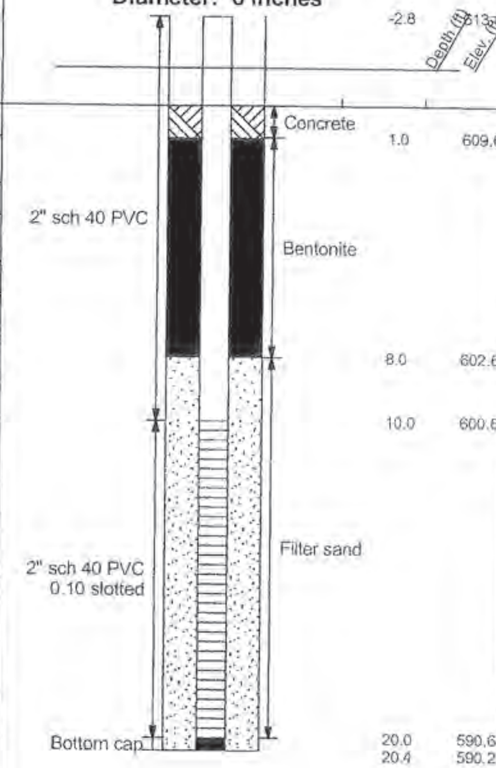
Completion Date: 8/27/10

Northing: 872502.26

Easting: 2516632.59

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium stiff, brown, silty CLAY - CL			
			6-3-3	SS1
			1-2-4	SS2
5	Medium stiff, gray, silty CLAY, trace sand - CL			
	▽		1-2-5	SS3
	Hard to stiff, brown to gray, silty CLAY, trace sand seams - CL (TILL)			
10			9-22-28	SS4
15			1-6-12	SS5
20			3-4-9	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01- COFFEEN.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 7 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM __ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RRB
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC

FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

Renamed G402

LOG OF BORING: APW-2

Project No. J017150.01

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/11/2015
Finish: 9/11/2015
WEATHER: Raining, hi 60's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G403
Well ID: G403
Surface Elev: 623.81 ft. MSL
Completion: 18.15 ft. BGS
Station: 2,514,616.63N
873,561.34E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

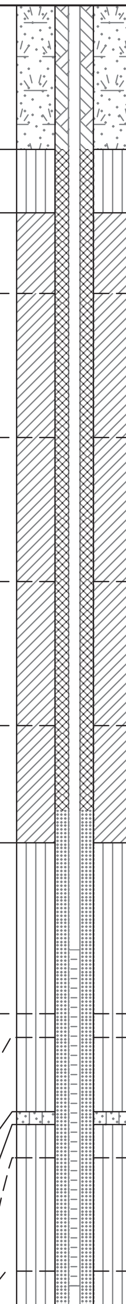
WATER LEVEL INFORMATION:
▼ = 15.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	19/24 *79%*	SS	*2-2 2-2* N=4	25		*0.80*
2A	22/24 *92%*	SS	*2-2 3-4* N=5	29		
2B				26		*1.50*
3A	8/24 *33%*	SS	*2-3 4-4* N=7	25		*1.50*
4A	21/24 *88%*	SS	*8-7 8-7* N=15	20		*1.30*
5A	20/24 *83%*	SS	*2-2 3-3* N=5	22		*0.70*
6A	24/24 *100%*	SS	*2-2 3-4* N=5	23		*1.40*
7A	21/24 *88%*	SS	*5-5 6-5* N=11	20		*0.90*
8A	24/24 *100%*	SS	*3-2 3-6* N=5	17		
9A	19/24 *79%*	SS	*8-12 21-25* N=33	8		*4.50*
	0/2 *0%*	BD				

Depth ft. BGS	Lithologic Description
0–2	Very dark brown (10YR2/2) grading to dark grayish brown (10YR4/2), moist, medium, SILT with some clay, trace roots and grass.
2–2.9	Very dark brown (10YR2/2) grading to dark grayish brown (10YR4/2), moist , stiff, SILT with some clay, trace wood.
2.9–4	Yellowish brown (10YR5/4) with 10% very dark brown (10YR2/2) mottles, moist, stiff, CLAY with little silt, trace very fine-grained sand seams (<1/16" thick).
4–6	Yellowish brown (10YR5/4), moist, stiff, CLAY with little silt and trace very fine-grained sand.
6–8	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) and 5% very dark grayish brown (10YR3/2) mottles, moist, stiff, CLAY with little silt and trace very fine-grained sand.
8–10	Grayish brown (10YR5/2) with 5% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with little silt and trace very fine-grained sand.
10–11.7	Grayish brown (10YR5/2) with 30% yellowish brown (10YR5/6) mottles, moist, very stiff, CLAY with little silt, few very fine- to medium-grained sand, and trace gravel.
11.7–14	Grayish brown (10YR5/3) with 45% yellowish brown (10YR5/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with some clay, few very fine- to coarse-grained sand, and trace gravel.
14–14.9	Grayish brown (10YR5/3) with 40% yellowish brown (10YR5/6) mottles, moist, medium, SILT with little clay, few very fine- to coarse-grained sand, and trace gravel.
14.9–15.8	Yellowish brown (10YR5/6) with 30% grayish brown (10YR5/2) mottles, moist, medium, SILT with little clay, few very fine- to coarse-grained sand, and trace gravel.
15.8–16.5	Yellowish brown (10YR5/6), wet, loose, SAND with some clay and few silt.
16.5–17.4	Yellowish brown (10YR5/6) with 30% grayish brown (10YR5/2) mottles, moist, stiff, SILT with few clay, very fine- to coarse-grained sand, and gravel.
17.4–18	Yellowish brown (10YR5/6), moist, very stiff, SILT with some clay and few sand and gravel.
18–18.15	Very dark grayish brown (10YR3/2), dry, hard, SILT with little clay and few very fine- to coarse-grained sand and gravel.

End of boring = 18.15 feet

Borehole Detail



Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606

Remarks

NOTE(S): G403 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.	**CONTRACTOR:** Reynolds Drilling Corp.	**BOREHOLE ID:** SB22 Formerly MW22S
Site: Coffeen Energy Center	**Rig mfg/model:** CME-550 ATV Drill	**Well ID:** G404
Location: Coffeen, Illinois	**Drilling Method:** 4¼" Hollow stem auger with split spoon sampler	**Surface Elev:** 613.10 ft. MSL
Project: 15E0030		**Completion:** 12.00 ft. BGS
DATES: Start: 5/1/2007	**FIELD STAFF: Driller:** A. Rachford	**Station:** 873,999.77N
Finish: 5/1/2007	**Helper:** M. Brown	2,516,397.85E
WEATHER: Partly sunny, warm	**Eng/Geo:** R. Hasenyager	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 2.07 - 05/10/2007
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	19/24 *79%*	SS		26		0.85 B	0–1.8	Black (10YR2/1), moist, firm, clayey SILT (TOPSOIL)	612	
1B				26						
2A	19/24 *79%*	SS		16		2.47 B	1.8–5.0	Gray (10YR5/1) with 35% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with sand and trace gravel	610	
3A	18/24 *75%*	SS		19		2.18 B	5.0–6.1	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	608	
3B				18		2.33 B				
4A	24/24 *100%*	SS		23		0.58 B	6.1–6.8	Yellowish brown (10YR5/8), moist, soft, sandy CLAY with slight trace gravel		
4B				18			6.8–8.1	Yellowish brown (10YR5/8), very moist to wet, very soft, clayey, very fine- to medium-grained SAND with trace gravel	606	
5A	23/24 *96%*	SS		10			8.1–9.6	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, hard, clayey SILT with sand and trace gravel	604	
5B				19			9.6–11.1	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND with coarse-grained sand and slight trace gravel		
6A	19/24 *79%*	SS		19			11.1–12	Dark yellowish brown (10YR4/6) with 40% yellowish brown (10YR5/8) mottles, moist, very hard, very silty CLAY with sand and gravel	602	
6B				11			12			

End of Boring = 12.0 ft. BGS

NOTE(S):

FIELD BORING LOG

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/1/2007
Finish: 5/1/2007
WEATHER: Partly sunny, warm

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" Hollow stem auger with split spoon sampler
FIELD STAFF: Driller: A. Rachford
Helper: M. Brown
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB21 Formerly MW21S
Well ID: G405
Surface Elev: 620.90 ft. MSL
Completion: 14.21 ft. BGS
Station: 873,996.79N
2,515,335.70E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

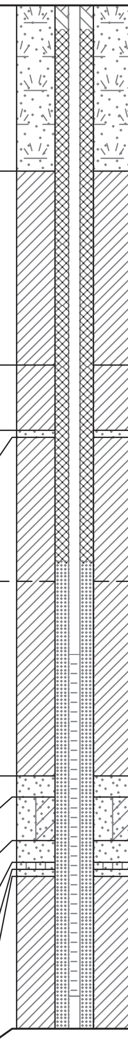
WATER LEVEL INFORMATION:
▼ = 1.28 - 05/10/2007
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	19/24 *79%*	SS		43		0.78 B
1B				26		1.94 B
2A	12/12 *100%*	SS		27		2.52 BSh
3A	24/24 *100%*	SS		24		3.92 BSh
3B				24		2.33 BSh
4A	24/24 *100%*	SS		20		2.33 BSh
5A	24/24 *100%*	SS		24		1.55 BSh
6A	24/24 *100%*	SS		19		
6B				18		
7A	24/24 *100%*	SS		9		7.42 BSh

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–2.3	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)	620	
2.3–5.0	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	618	
5.0–5.9	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand	616	
5.9–6.6	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND		
6.6–8	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	614	
8–10.7	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel	612	
10.7–11.3	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	610	
11.3–11.9	Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel		
11.9–12.6	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
12.6–13.2	Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel	608	
13.2–13.8	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
13.8–14.2	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel		

End of Boring = 14.2 ft. BGS

Borehole Detail



NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger
FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406
Well ID: G406
Surface Elev: 621.86 ft. MSL
Completion: 18.75 ft. BGS
Station: 872,521.34N
2,514,702.38E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.			
							2	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.		620	
								Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.			
							4	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.		618	
								Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.			
							6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.		616	
							8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.		614	
							10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		612	
							12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		610	
							14	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.		608	
							16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.		606	
								Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.			
							18	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.		604	

End of Boring = 18.75 ft. BGS

NOTE(S): G406 installed in boring.
Boring was blind drilled adjacent to G406D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	18/24 *75%*	SS	*4-3 4-6* N=7	11		*1.50*
1B				15		*3.00*
2A	12/24 *50%*	SS	*4-6 3-3* N=9	12		*2.50*
2B				18		*2.00*
3A	3/24 *13%*	SS	*3-3 4-7* N=7	24		
4A	20/24 *83%*	SS	*2-3 4-5* N=7	21		*1.25*
5A	19/24 *79%*	SS	*1-3 4-6* N=7	18		*1.75*
6A	23/24 *96%*	SS	*2-2 4-5* N=6	18		*2.50*
7A	21/24 *88%*	SS	*1-3 4-5* N=7	16		*1.00*
8A	23/24 *96%*	SS	*1-2 2-2* N=4	18		*0.75*
8B				17		*0.75*
9A	22/24 *92%*	SS	*4-13 27-23* N=40	8		
9B				8		
10A	17/24 *71%*	SS	*13-31 33-42* N=64	7		*4.50*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.		
2	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.	620	
	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.		
4	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.	618	
	Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.		
6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.	616	
8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.	614	
10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.	612	
12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.	610	
14	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.	608	
16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.	606	
	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.		
18	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.	604	
20		602	

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
11-1	3/3 *100%*	SH				
	8/24 *33%*	DS				
12-1						
13-1						
13-2	24/24 *100%*	DS				
13-3						
13-4						
14A				19		
14B	21/21 *100%*	SS	*7-30 32-20* N=62	7		
14C				8		*4.50*
15A	12/24 *50%*	SS	*15-16 10-11* N=26	10		*4.50*
16A	17/24 *71%*	SS	*2-5 7-11* N=12	16		*3.00*
17A	17/24 *71%*	SS	*2-5 7-12* N=12	15		*2.50*
18A	12/24 *50%*	SS	*3-7 12-20* N=19	17		*2.50*
19A	23/24 *96%*	SS	*4-4 6-9* N=10	25		*1.00*
20A	22/24 *92%*	SS	*2-2 5-7* N=7	17		*1.00*
21A	24/24 *100%*	SS	*2-3 4-6* N=7	17		*1.00*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
22	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*	600
24		598
	Pale brown (10YR6/3), wet, loose, fine-grained SAND.	
	Pale brown (10YR6/3), wet, loose, fine-grained SAND and small GRAVEL.	
	Gray (10YR5/1), dry, hard, SILT with some clay, trace fine- to coarse-grained sand and trace small gravel.	
26	Dark gray (10YR4/1), dry, hard, CLAY with some silt, trace fine- to coarse-grained sand and trace small gravel.	596
28	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	594
30		592
32	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small to large gravel.	590
	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	
34	Dark gray (10YR4/1) with 5% very dark gray (10YR3/1) and brown (10YR5/3) mottles, moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	588
36	Gray (10YR5/1) with 5% very dark gray (10YR3/1) and brown (10YR5/3) mottles, moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	586
38	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	584
40		582

Borehole Detail | Remarks

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
22A	24/24 *100%*	SS	*1-3* *5-6* N=8	17		*1.50*	42	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*		580	
23-1 23-2 23-3 23-4	24/24 *100%*	SH		16			44			578	
24A	24/24 *100%*	SS	*3-4* *6-7* N=10	17		*1.50*	46			576	
25A	24/24 *100%*	SS	*2-2* *5-7* N=7	18		*1.25*	48			574	
26A	24/24 *100%*	SS	*2-5* *6-8* N=11	17		*1.75*	50			572	
27A	23/24 *96%*	SS	*2-3* *9-12* N=12	15		*3.50*	52			570	

End of Boring = 52.0 ft. BGS

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/16/2016
WEATHER: Rain, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger
FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G407
Well ID: G407
Surface Elev: 618.35 ft. MSL
Completion: 20.00 ft. BGS
Station: 2,513,705.87N
2,513,705.87E

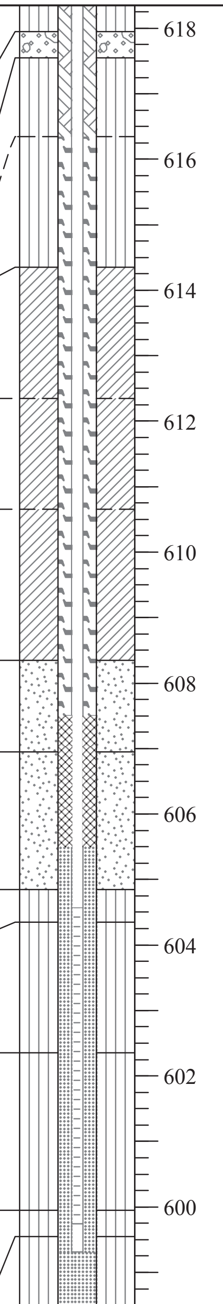
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 10, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description
1A	12/24 *50%*	SS	*4-3 3-3* N=6	14		*3.50*	0–1	Very dark gray (10YR3/1), wet, medium, SILT with some organics. [Fill]
							1–2	Gray (10YR6/1), wet, loose, SAND with some gravel and little clay. [Fill]
2A	20/24 *83%*	SS	*2-2 4-4* N=6	18		*1.50*	2–3	Yellowish brown (10YR5/6) with 5% dark yellowish brown (10YR3/6) mottles, moist, very stiff, SILT with some clay and trace very fine- to fine-grained sand.
							3–4	Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with some clay, little fine- to coarse-grained sand, and trace small gravel.
3A	23/24 *96%*	SS	*1-2 3-4* N=5	19		*1.75*	4–6	Brown (10YR5/3) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt, trace fine-grained sand and trace small gravel.
4A	24/24 *100%*	SS	*1-3 3-5* N=6	19		*1.50*	6–7.7	Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt, little fine- to coarse-grained sand and trace small gravel.
5A	21/24 *88%*	SS	*1-2 4-4* N=6	19		*0.50*	7.7–10	Yellowish brown (10YR5/6) with 25% brown (10YR5/3) mottles, moist, medium, CLAY with few silt, few fine-grained sand, and trace small gravel.
6A	22/24 *92%*	SS	*1-2 2-1* N=4	17			10–11.4	Yellowish brown (10YR5/8) with 5% gray (10YR5/1) mottles, moist, very loose, fine-grained SAND with some clay and trace small gravel.
7A	24/24 *100%*	SS	*7-29 33-17* N=62	8			11.4–13.5	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very dense, fine-grained SAND
							13.5–14	Brown (10YR5/3), moist, hard, SILT with some clay and little fine- to coarse-grained sand.
8A	24/24 *100%*	SS	*3-7 12-17* N=19	12		*4.50*	14–16	Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6) and 5% black (10YR2/1) mottles, SILT with some clay and little fine- to coarse-grained sand.
9A	24/24 *100%*	SS	*4-9 14-20* N=23	13		*4.00*	16–18.4	Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6), 5% dark gray (10YR4/1) and 5% black (10YR2/1) mottles, moist, hard, SILT with little fine- to coarse-grained sand and trace small gravel.
10A	24/24 *100%*	SS	*2-8 14-19* N=22	14		*4.50*	18.4–19.5	Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6), 5% dark gray (10YR4/1) and 5% black (10YR2/1) mottles, wet, stiff, SILT with little fine- to coarse-grained sand and little small gravel.
							19.5–20	Dark grayish brown (10YR4/2) with 10% dark yellowish brown (10YR3/6) mottles, moist, hard, CLAY with some silt, little fine- to coarse-grained sand and trace small gravel.

End of Boring = 20.0 ft. BGS

Borehole Detail / Elevation ft. MSL / Remarks



NOTE(S): G407 installed in boring.

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FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-01
Well ID: MW1D
Surface Elev: 607 ft. MSL
Completion: 40 ft. BGS
Station: 874,972.6N
2,513,478.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 34.00 - While drilling
▼ =
▽ = 36.28 - MW01D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	16/24 *67%*	SS	*1-1 1-2* N=2	22		0.78 *B*		Very dark gray (10YR3/1), clayey SILT, trace sand		606	
2A	20/24 *83%*	SS	*2-3 5-5* N=8	13		3.71 *BSh*	2	Light gray (10YR7/1) with 40% yellowish brown (10YR5/8) mottles, clayey SILT, trace sand and gravel		604	
3A	22/24 *92%*	SS	*2-2 3-6* N=5	14		2.62 *BSh*	4	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand and gravel		602	
4A	23/24 *96%*	SS	*8-12 19-19* N=31	13		3.30 *BSh*	6	Yellowish brown (10YR5/6) with 20% black (10YR2/1) mottles, clayey SILT, little sand and gravel		600	
5A	24/24 *100%*	SS	*4-9 13-19* N=22	13		4.80 *BSh*	8			598	
6A	22/24 *92%*	SS	*3-6 12-15* N=18	12		8.73 *B*	10	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, clayey SILT, trace sand and gravel		596	
7A	24/24 *100%*	SS	*14-19 23-30* N=42	12		7.86 *B*	12			594	
8A	24/24 *100%*	SS	*4-8 12-14* N=20	13		7.56 *B*	14	Dark gray (N4/1) with 25% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand and gravel		592	
9A	24/24 *100%*	SS	*16-16 20-21* N=36	14		7.01 *B*	16			590	
10A	24/24 *100%*	SS	*3-5 8-11* N=13	14		5.24 *B*	18	Dark gray (N4/1), clayey SILT, trace sand and gravel		588	
							20				

NOTE(S): MW01D installed in SB-01.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-01
Well ID: MW1D
Surface Elev: 607 ft. MSL
Completion: 40 ft. BGS
Station: 874,972.6N
2,513,478.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 34.00 - While drilling
▼ =
▽ = 36.28 - MW01D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) / *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SH		15		3.69 *B*	22	Dark gray (N4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*	586	Shelby tube taken from shallow well borehole at indicated depth.
12A	24/24 *100%*	SS	*10-11 12-16* N=23	14		5.24 *B*	24		584	
13A	6/24 *25%*	SH		14		3.69 *B*	26		582	Shelby tube taken from shallow well borehole at indicated depth.
14A	24/24 *100%*	SS	*10-12 18-18* N=30	15		4.27 *B*	28		580	
15A	24/24 *100%*	SS	*5-9 11-16* N=20	14		4.27 *B*	30		578	
16A	24/24 *100%*	SS	*5-8 10-12* N=18	17		2.72 *BSh*	32		576	
17A	24/24 *100%*	SS	*8-14 14-16* N=28	14		5.62 *B*	▼ 34		574	
18A	23/24 *96%*	SS	*8-28 40-65* N=68	14				Gray (N4/1), silty, fine to medium SAND, little coarse sand, trace gravel, wet	572	
19A				13			▽ 36			
19B	24/24 *100%*	SS	*24-14 17-16* N=31	19		5.43 *B*	38	Very dark gray (10YR3/1), silty CLAY	570	
20A	24/24 *100%*	SS	*3-5 6-10* N=11	24		3.50 *BSh*	40	Dark gray (N4/1) with 30% dark yellowish brown (10YR4/6) mottles, silty CLAY **End of Boring = 40.0 ft. BGS**	568	

NOTE(S): MW01D installed in SB-01.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02b
Well ID: MW2D
Surface Elev: 624 ft. MSL
Completion: 27 ft. BGS
Station: 876,414.0N
2,513,209.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) % Recovery	Type	TESTING: Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0	Dark grayish brown (10YR4/2), clayey SILT, trace sand		624	
								Gray (10YR6/1), clayey SILT, trace sand			
								Yellowish brown (10YR5/4) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand			
							2	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, lean CLAY, trace sand		622	
							4	Yellowish brown (10YR5/8) with 40% gray (10YR6/1)mottles, lean CLAY, trace sand		620	
							6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		618	
							8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		616	
							10			614	
								Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND, trace gravel			
							12	Gray (10YR6/1) with 30% white (10YR8/1) mottles, sandy CLAY, trace gravel		612	
								Yellowish brown (10YR5/4), silty, fine SAND, little medium sand, wet			
							14	Pale brown (10YR6/3), silty, fine SAND, trace gravel, wet		610	
							16			608	
							18	Dark gray (10YR4/1), clayey SILT, little sand and gravel		606	
							20				

NOTE(S): MW02D installed in blind-drilled borehole within 10 ft of SB-02.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02b
Well ID: MW2D
Surface Elev: 624 ft. MSL
Completion: 27 ft. BGS
Station: 876,414.0N
2,513,209.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										604	
							22	Brown (10YR5/3), clayey SILT, little sand, trace gravel		602	
							24			600	
							26	Blueish gray (5B5/1), with 30% dark yellowish brown (10YR4/6) mottles, lean CLAY, trace coal		598	

End of Boring = 27.22 ft. BGS
See SB-02 for sample & testing details

NOTE(S): MW02D installed in blind-drilled borehole within 10 ft of SB-02.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*3-3 4-5* N=7	23		
1B				18		1.96 *B*
1C				29		1.94 *B*
2A	24/24 *100%*	SS	*3-4 4-6* N=8	25		2.89 *B*
3A	24/24 *100%*	SS	*3-5 5-7* N=10	20		2.91 *B*
4A	24/24 *100%*	SS	*10-8 8-10* N=16	17		2.91 *B*
5A	24/24 *100%*	SS	*3-3 4-5* N=7	19		1.94 *B*
6A	24/24 *100%*	SS	*2-3 6-5* N=9	18		2.13 *B*
6B				17		
7A	24/24 *100%*	SS	*4-4 7-10* N=11	14		2.06 *B*
7B				17		
8A	24/24 *100%*	SS	*15-23 33-68* N=56	10		
9A	10/10 *100%*	SS	*48-62/4"*	10		3.92 *Sh*
10A	12/12 *100%*	SS	*15-45*	9		8.07 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0	Dark grayish brown (10YR4/2), clayey SILT, trace sand	624	
	Gray (10YR6/1), clayey SILT, trace sand		
	Yellowish brown (10YR5/4) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand		
2	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, lean CLAY, trace sand	622	
4	Yellowish brown (10YR5/8) with 40% gray (10YR6/1)mottles, lean CLAY, trace sand	620	
6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, little sand	618	
8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand	616	
10		614	
	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND, trace gravel		
12	Gray (10YR6/1) with 30% white (10YR8/1) mottles, sandy CLAY, trace gravel	612	
	Yellowish brown (10YR5/4), silty, fine SAND, little medium sand, wet		
14	Pale brown (10YR6/3), silty, fine SAND, trace gravel, wet	610	
16		608	
18	Dark gray (10YR4/1), clayey SILT, little sand and gravel	606	
20			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							20			604	
11A				9							
	36/60 *60%*	CS					22	Brown (10YR5/3), clayey SILT, little sand, trace gravel		602	
11B				11			24			600	
12A				21			26	Blueish gray (5B5/1), with 30% dark yellowish brown (10YR4/6) mottles, lean CLAY, trace coal		598	
	60/60 *100%*	CS					28			596	
12B				23			30			594	
	60/60 *100%*	CS					32			592	
13A				14			34	Very dark gray (10Y3/1), lean CLAY, trace sand and gravel		590	
							36			588	
	60/60 *100%*	CS					38			586	
14A				14			40				

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										584	
	60/60 *100%*	CS					42			582	
15A				14			44			580	
								Very dark gray (10Y3/1), lean CLAY, trace sand and gravel *[Continued from previous page]*			
							46			578	
	60/60 *100%*	CS					48			576	
16A				13			50				

End of Boring = 50.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02a
Well ID: MW2S
Surface Elev: 624 ft. MSL
Completion: 16 ft. BGS
Station: 876,408.9N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) % Recovery	Type	TESTING: Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark grayish brown (10YR4/2), clayey SILT, trace sand		624	
								Gray (10YR6/1), clayey SILT, trace sand			
								Yellowish brown (10YR5/4) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand			
							2	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, lean CLAY, trace sand		622	
							4	Yellowish brown (10YR5/8) with 40% gray (10YR6/1)mottles, lean CLAY, trace sand		620	
							6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		618	
							8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		616	
							10	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND, trace gravel		614	
							12	Gray (10YR6/1) with 30% white (10YR8/1) mottles, sandy CLAY, trace gravel		612	
								Yellowish brown (10YR5/4), silty, fine SAND, little medium sand, wet			
							14	Pale brown (10YR6/3), silty, fine SAND, trace gravel, wet		610	

End of Boring = 15.51 ft. BGS
See SB-02 for sample & testing details

NOTE(S): MW02S installed in blind-drilled borehole within 10 ft of SB-02.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							0	Dark grayish brown (10YR4/2), clayey SILT, trace sand	624	
1A	24/24 *100%*	SS	*3-3 4-5* N=7	23				Gray (10YR6/1), clayey SILT, trace sand		
1B				18		1.96 *B*		Yellowish brown (10YR5/4) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand		
1C				29		1.94 *B*	2		622	
2A	24/24 *100%*	SS	*3-4 4-6* N=8	25		2.89 *B*		Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, lean CLAY, trace sand		
3A	24/24 *100%*	SS	*3-5 5-7* N=10	20		2.91 *B*	4	Yellowish brown (10YR5/8) with 40% gray (10YR6/1)mottles, lean CLAY, trace sand	620	
4A	24/24 *100%*	SS	*10-8 8-10* N=16	17		2.91 *B*	6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, little sand	618	
5A	24/24 *100%*	SS	*3-3 4-5* N=7	19		1.94 *B*	8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand	616	
6A				18		2.13 *B*	10		614	
6B	24/24 *100%*	SS	*2-3 6-5* N=9	17				Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND, trace gravel		
							12	Gray (10YR6/1) with 30% white (10YR8/1) mottles, sandy CLAY, trace gravel	612	
7A	24/24 *100%*	SS	*4-4 7-10* N=11	14		2.06 *B*				
7B				17				Yellowish brown (10YR5/4), silty, fine SAND, little medium sand, wet		
8A	24/24 *100%*	SS	*15-23 33-68* N=56	10			14		610	
9A	10/10 *100%*	SS	*48-62/4"*	10		3.92 *Sh*	16	Pale brown (10YR6/3), silty, fine SAND, trace gravel, wet	608	
10A	12/12 *100%*	SS	*15-45*	9		8.07 *BSh*	18	Dark gray (10YR4/1), clayey SILT, little sand and gravel	606	
							20			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
									604	
11A				9						
	36/60 *60%*	CS					22	Brown (10YR5/3), clayey SILT, little sand, trace gravel	602	
11B				11			24		600	
12A				21			26		598	
	60/60 *100%*	CS					28	Blueish gray (5B5/1), with 30% dark yellowish brown (10YR4/6) mottles, lean CLAY, trace coal	596	
12B				23			30		594	
	60/60 *100%*	CS					32		592	
13A				14			34	Very dark gray (10Y3/1), lean CLAY, trace sand and gravel	590	
							36		588	
	60/60 *100%*	CS					38		586	
14A				14			40			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										584	
	60/60 *100%*	CS					42			582	
15A				14			44			580	
								Very dark gray (10Y3/1), lean CLAY, trace sand and gravel *[Continued from previous page]*			
							46			578	
	60/60 *100%*	CS					48			576	
16A				13			50				

End of Boring = 50.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*2-2 4-6* N=6	17		2.07 *SP*
1B				20		
1C				26		3.30 *B*
2A	17/24 *71%*	SS	*2-3 4-5* N=7	25		3.05 *B*
3A	20/24 *83%*	SS	*2-3 3-5* N=6	16		1.96 *B*
4A	24/24 *100%*	SS	*4-3 5-6* N=8	21		2.27 *B*
5A	21/24 *88%*	SS	*1-3 3-4* N=6	20		2.18 *B*
5B				19		
6A	18/24 *75%*	SS	*1-2 2-4* N=4	24		0.87 *B*
7A	23/24 *96%*	SH		19		
7B	16/24 *67%*	SS	*3-2 2-4* N=4	12		
8A	23/24 *96%*	SS	*3-12 29-50* N=41	13		
8B				13		
8C				12		
9A	14/24 *58%*	SS	*8-82 85-72* N=167	10		6.98 *B*
9B				13		6.18 *BSh*
10A	18/24 *75%*	SS	*6-21 32-49* N=53	8		11.95 *Sh*

Lithologic Description	Remarks
Very dark grayish brown (10YR3/2), lean CLAY	
Grayish brown (10YR5/2), lean CLAY, trace sand	
Yellowish brown (10YR5/6), lean CLAY, trace sand	
Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, lean CLAY, trace sand	
Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, sandy SILT, trace gravel	
Yellowish brown (10YR5/6) with 50% gray (N5/1) mottles, lean CLAY, trace sand and gravel	
Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel	
Dark gray (10YR4/1), sandy CLAY, trace gravel	
Gray (10YR6/1) with 50% yellowish brown (10YR5/8) mottles, lean CLAY, little sand, trace gravel	Shelby tube taken from shallow well borehole at indicated depth.
Yellowish brown (10YR5/8), silty, fine SAND, little medium sand, trace gravel, wet	
Yellowish brown (10YR5/8), silty, fine SAND, little clay, wet	
Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel	
Yellowish brown (10YR5/6), silty SAND, trace gravel, wet	
Yellowish brown (10YR5/4), clayey SILT, trace sand and gravel	
Gray (10YR5/1), sandy SILT, trace gravel	

Depth ft. BGS	Elevation ft. MSL
2	624
4	622
6	620
8	618
10	616
12	614
14	612
16	610
18	608
20	606

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	19/24 *79%*	SS	*3-20 35-29* N=55	10		5.36 *Sh*	20–22	Gray (10YR5/1), sandy SILT, trace gravel *[Continued from previous page]*	604	Wood fragments
12A	20/24 *83%*	SS	*15-25 89-69* N=114	8		13.00 *Sh*	22–24		602	
13A	23/24 *96%*	SS	*14-19 24-22* N=43	9			24–25.3			
13B				13		6.98 *BSh*	25.3–26	Yellowish brown (10YR5/4), lean CLAY, trace sand and gravel	600	
14A	24/24 *100%*	SS	*19-21 26-32* N=47	15		7.01 *BSh*	26–27.8	Gray (10YR4/1), clayey SILT, trace sand and gravel	598	
15A	21/24 *88%*	SS	*10-25 25-23* N=50	12			27.8–29.5	Light gray (10YR6/1), SILT, trace sand		
15B				13		8.53 *BSh*	29.5–36	Gray (10YR4/1), lean CLAY, trace sand and gravel	596	
16A	24/24 *100%*	SS	*7-12 19-30* N=31	13		9.16 *BSh*			594	
17A	24/24 *100%*	SS	*29-35 39-42* N=74	14		6.59 *B*				
17B				14		3.49 *Sh*			592	
18A	23/24 *96%*	SS	*6-8 11-17* N=19	13		7.21 *BSh*			590	
19A	24/24 *100%*	SS	*19-21 31-31* N=52	13		6.98 *BSh*	36–38	Gray (10YR4/1), clayey SILT, trace sand and gravel	588	
20A	24/24 *100%*	SS	*6-10 15-24* N=25	14		6.76 *BSh*	38–40	Gray (10YR4/1), lean CLAY, trace sand and gravel	586	

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
21A	19/24 *79%*	SS	*4-10 16-23* N=26	13		8.04 *BSh*
22A	21/24 *88%*	SS	*19-27 28-32* N=55	13		7.56 *BSh*
23A	23/24 *96%*	SS	*4-9 14-18* N=23	14		6.98 *BSh*
24A	24/24 *100%*	SS	*20-26 30-33* N=56	14		6.59 *BSh*
25A	24/24 *100%*	SS	*6-10 13-12* N=23	20		3.30 *BSh*
26A	24/24 *100%*	SS	*4-7 6-7* N=13	22		2.91 *BSh*
27A	24/24 *100%*	SS	*7-18 37-85* N=55	16		4.05 *BSh*
27B				13		
28A	23/24 *96%*	SS	*15-34 34-19* N=68	11		3.22 *SP*
28B				13		5.82 *B*
29A	24/24 *100%*	SS	*19-22 28-18* N=50	20		4.36 *BSh*

Depth ft. BGS	Lithologic Description
40 – 42	Gray (10YR4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*
42 – 48	Gray (10YR4/1), clayey SILT, trace sand and gravel
48 – 53.3	Gray (10YR4/1), lean CLAY, trace sand and gravel
53.3 – 54	Gray (10Y4/1), silty, fine to medium SAND, wet
54 – 55.6	Gray (10YR4/1), silty, fine SAND, trace clay, wet
55.6 – 58	Very dark gray (10YR3/1), lean CLAY, trace sand and gravel

Depth scale (ft. BGS): 42, 44, 46, 48, 50, 52, 54, 56, 58

Elevation (ft. MSL): 584, 582, 580, 578, 576, 574, 572, 570, 568

Borehole Detail | Remarks

End of Boring = 58.0 ft. BGS

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04a
Well ID: MW4S
Surface Elev: 622 ft. MSL
Completion: 15 ft. BGS
Station: 877,999.7N
2,514,450.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–0.8	Very dark gray (10YR3/1), clayey SILT, trace sand		622	
							0.8–2	Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/6) mottles, lean CLAY			
							2–4	Yellowish brown (10YR5/8) with 50% grayish brown (10YR5/2) mottles, lean CLAY		620	
							4–6	Dark gray (10YR4/1), clayey SILT, trace sand		618	
							6–8	Gray (10YR5/1), lean CLAY, trace sand and gravel		616	
							8–10.6	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, sandy SILT		614, 612	
							10.6–12.4	Very dark gray (10YR3/1) with 35% gray (10YR6/1) mottles, clayey SILT, wet		610	
							12.4–13.3	Yellowish brown (10YR5/6), clayey SAND, trace gravel			
							13.3–14	Light gray (10YR7/1) with 20% brown (10YR5/3) mottles, clayey SILT, trace sand and gravel			
							14–14.6	Yellowish brown (10YR5/8), silty, fine to medium SAND, trace coarse sand, wet		608	
							14.6–14.77	Gray (10YR4/1), sandy SILT, trace gravel			

End of Boring = 14.77 ft. BGS
See SB-04 for sample & testing details

NOTE(S): MW04S installed in blind-drilled borehole within 10 ft of SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04
Well ID: n/a
Surface Elev: 622 ft. MSL
Completion: 55 ft. BGS
Station: 878,000.0N
2,514,445.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	21/24 *88%*	SS	*1-2* *2-4* N=4	24		1.09 *B*
1B				29		
2A	18/24 *75%*	SS	*2-4* *5-6* N=9	27		2.72 *BSh*
3A	16/24 *67%*	SS	*2-3* *4-6* N=7	23		1.71 *B*
4A	24/24 *100%*	SS	*4-5* *5-7* N=10	20		1.40 *BSP*
5A	24/24 *100%*	SS	*1-2* *2-2* N=4	23		0.70 *B*
6A	24/24 *100%*	SS	*0-1* *2-3* N=3	24		0.31 *BSh*
6B				28		
7A	22/24 *92%*	SS	*0-1* *3-7* N=4	20		0.08 *B*
7B				16		
7C				12		
8A	23/24 *96%*	SS	*4-9* *22-35* N=31	14		4.36 *SP*
8B				11		
9A	24/24 *100%*	SS	*27-38* *54-50* N=92	7		
10A	24/24 *100%*	SS	*24-29* *39-34* N=68	9		2.18 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Very dark gray (10YR3/1), clayey SILT, trace sand	622
2	Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/6) mottles, lean CLAY	620
4	Yellowish brown (10YR5/8) with 50% grayish brown (10YR5/2) mottles, lean CLAY	618
6	Dark gray (10YR4/1), clayey SILT, trace sand	616
8	Gray (10YR5/1), lean CLAY, trace sand and gravel	614
10	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, sandy SILT	612
12	Very dark gray (10YR3/1) with 35% gray (10YR6/1) mottles, clayey SILT, wet	610
	Yellowish brown (10YR5/6), clayey SAND, trace gravel	
14	Light gray (10YR7/1) with 20% brown (10YR5/3) mottles, clayey SILT, trace sand and gravel	608
	Yellowish brown (10YR5/8), silty, fine to medium SAND, trace coarse sand, wet	
16		606
18	Gray (10YR4/1), sandy SILT, trace gravel	604
20		

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04
Well ID: n/a
Surface Elev: 622 ft. MSL
Completion: 55 ft. BGS
Station: 878,000.0N
2,514,445.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										602	
							22			600	
	60/60 *100%*	CS									
							24				
11A				7						598	
							26			596	
	60/60 *100%*	CS									
							28			594	
12A				7							
							30	Gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*		592	
							32			590	
	60/60 *100%*	CS									
							34				
13A				8						588	
							36			586	
	60/60 *100%*	CS									
							38			584	
14A				13							
							40				

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04
Well ID: n/a
Surface Elev: 622 ft. MSL
Completion: 55 ft. BGS
Station: 878,000.0N
2,514,445.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										582	
	60/60 *100%*	CS					42			580	
15A				13			44	Gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*		578	
							46			576	
	60/60 *100%*	CS					48			574	
16A				14				Greenish gray (10BG5/1) with 20% dark yellowish brown (10YR4/6) mottles, lean CLAY, trace sand			
16B				21			50			572	
	60/60 *100%*	CS					52			570	
17A				24			54			568	

End of Boring = 55.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING Blows / 6 in *N - Value* **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	19/24 *79%*	SS	*0-2 3-4* N=5	29			0–0.6	Dark grayish brown (10YR4/2), clayey SILT, trace sand	622	
1B				28			0.6–3.2	Gray (10YR5/1 with 50% yellowish brown (10YR5/6) mottles, clayey SILT	620	
2A	22/24 *92%*	SS	*2-5 5-7* N=10	27		2.47 *BSh*	3.2–4	Very dark brown (10YR2/2) with 20% dark gray (10YR4/1) mottles, clayey SILT, trace sand		
2B				22		2.13 *B*	4–6	Dark gray (10YR4/1) with 30% light gray (10YR7/1) mottles, lean CLAY	618	
3A	24/24 *100%*	SS	*2-2 3-6* N=5	21		2.33 *BSP*				
4A	24/24 *100%*	SS	*7-6 6-8* N=12	21		1.90 *BSh*	6–8	Gray (10YR6/1), lean CLAY, trace sand	616	
5A	18/24 *75%*	SS	*1-3 4-5* N=7	22		1.78 *B*	8–10	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand	614	
6A				16			10–10.6	Yellowish brown (10YR5/6), clayey SAND, trace gravel, wet	612	
6B	20/24 *83%*	SS	*0-1 3-4* N=4	22		0.70 *BSh*	10.6–12	Yellowish brown (10YR5/6) with 50% gray 10YR5/1) mottles, sandy CLAY		
7A	24/24 *100%*	SS	*3-6 17-20* N=23	19			12–12.7	Gray 10YR6/1), clayey, fine to medium SAND, trace gravel, wet	610	
7B				16			12.7–14	Brownish yellow (10YR6/6), silty, fine SAND, trace medium sand		
8A	20/24 *83%*	SS	*4-16 25-25* N=41	20			14–15.3	Yellowish brown (10YR5/6), silty, fine SAND, wet	608	
8B				11			15.3–16.6	Brown (10YR5/3), silty SAND and GRAVEL, wet	606	
9A	24/24 *100%*	SS	*14-18 38-62* N=56	12			16.6–20	Dark gray (10YR4/1), sandy SILT, trace clay and gravel	604	
9B				8						
10A	18/24 *75%*	SS	*14-39 77* N=116	9		3.27 *Sh*				

Borehole Detail

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel *[Continued from previous page]*		602	
	60/60 *100%*	CS					22	Dark gray (10YR4/1), silty, fine SAND, trace medium sand		600	
11A				7							
11B				7			24			598	
	60/60 *100%*	CS					26			596	
12A				7			28			594	
	60/60 *100%*	CS					30	Dark gray (10YR4/1), sandy SILT, trace clay and gravel		592	
13A				8			32			590	
							34			588	
							36			586	
14A	48/60 *80%*	CS		7				Gray (10YR6/1), fine to medium SAND			
							38	Dark gray (10YR4/1), sandy SILT, trace clay and gravel		584	
14B				14			40				

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

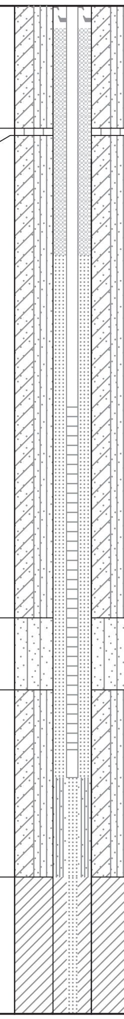
BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel *[Continued from previous page]*	582	
	60/60 *100%*	CS					42	Gray (10YR4/1), clayey SILT, trace sand	580	
15A				16			44	Dark gray (10YR4/1), sandy SILT, trace clay and gravel	578	
	60/60 *100%*	CS					46		576	
16A				14			48	Gray(10YR4/1), silty, fine to medium SAND, trace organics and coal	574	
16B				20						
17A	24/24 *100%*	SS	*7-10* *15-16* N=25	12			50 ▽	Dark gray (10YR4/1), sandy SILT, trace clay and gravel	572	
18A	24/24 *100%*	SS	*17-18* *19-21* N=37	22			52	Greenish gray (5G5/1) with 40% yellowish brown (10YR5/6)mottles, lean CLAY	570	
							54	**End of Boring = 54.0 ft. BGS**		

Borehole Detail



NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/17/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05a
Well ID: MW5S
Surface Elev: 623 ft. MSL
Completion: 18 ft. BGS
Station: 878,175.6N
2,513,285.5E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark grayish brown (10YR4/2), clayey SILT, trace sand		622	
							2	Gray (10YR5/1 with 50% yellowish brown (10YR5/6) mottles, clayey SILT		620	
							4	Very dark brown (10YR2/2) with 20% dark gray (10YR4/1) mottles, clayey SILT, trace sand			
								Dark gray (10YR4/1) with 30% light gray (10YR7/1) mottles, lean CLAY		618	
							6	Gray (10YR6/1), lean CLAY, trace sand		616	
							8	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		614	
							10	Yellowish brown (10YR5/6), clayey SAND, trace gravel, wet			
								Yellowish brown (10YR5/6) with 50% gray 10YR5/1) mottles, sandy CLAY		612	
							12	Gray 10YR6/1), clayey, fine to medium SAND, trace gravel, wet		610	
								Brownish yellow (10YR6/6), silty, fine SAND, trace medium sand			
							14	Yellowish brown (10YR5/6), silty, fine SAND, wet		608	
							16	Brown (10YR5/3), silty SAND and GRAVEL, wet		606	
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel			

End of Boring = 17.71 ft. BGS
See SB-05 for sample & testing details

NOTE(S): MW05S installed in blind-drilled borehole within 10 ft of SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	19/24 *79%*	SS	*0-2 3-4* N=5	29		
1B				28		
2A	22/24 *92%*	SS	*2-5 5-7* N=10	27		2.47 *BSh*
2B				22		2.13 *B*
3A	24/24 *100%*	SS	*2-2 3-6* N=5	21		2.33 *BSP*
4A	24/24 *100%*	SS	*7-6 6-8* N=12	21		1.90 *BSh*
5A	18/24 *75%*	SS	*1-3 4-5* N=7	22		1.78 *B*
6A	20/24 *83%*	SS	*0-1 3-4* N=4	16		
6B				22		0.70 *BSh*
7A	24/24 *100%*	SS	*3-6 17-20* N=23	19		
7B				16		
8A	20/24 *83%*	SS	*4-16 25-25* N=41	20		
8B				11		
9A	24/24 *100%*	SS	*14-18 38-62* N=56	12		
9B				8		
10A	18/24 *75%*	SS	*14-39 77* N=116	9		3.27 *Sh*

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606, 604

Lithologic Description	Borehole Detail	Remarks
Dark grayish brown (10YR4/2), clayey SILT, trace sand		
Gray (10YR5/1 with 50% yellowish brown (10YR5/6) mottles, clayey SILT		
Very dark brown (10YR2/2) with 20% dark gray (10YR4/1) mottles, clayey SILT, trace sand		
Dark gray (10YR4/1) with 30% light gray (10YR7/1) mottles, lean CLAY		
Gray (10YR6/1), lean CLAY, trace sand		
Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		
Yellowish brown (10YR5/6), clayey SAND, trace gravel, wet		
Yellowish brown (10YR5/6) with 50% gray 10YR5/1) mottles, sandy CLAY		
Gray 10YR6/1), clayey, fine to medium SAND, trace gravel, wet		
Brownish yellow (10YR6/6), silty, fine SAND, trace medium sand		
Yellowish brown (10YR5/6), silty, fine SAND, wet		
Brown (10YR5/3), silty SAND and GRAVEL, wet		
Dark gray (10YR4/1), sandy SILT, trace clay and gravel		

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel *[Continued from previous page]*		602	
							22				
11A	60/60 *100%*	CS		7				Dark gray (10YR4/1), silty, fine SAND, trace medium sand		600	
							24				
11B				7						598	
							26			596	
	60/60 *100%*	CS					28			594	
12A				7							
							30	Dark gray (10YR4/1), sandy SILT, trace clay and gravel		592	
							32				
	60/60 *100%*	CS								590	
							34				
13A				8						588	
							36			586	
14A	48/60 *80%*	CS		7				Gray (10YR6/1), fine to medium SAND			
							38				
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel		584	
14B				14							
							40				

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel *[Continued from previous page]*		582	
	60/60 *100%*	CS					42	Gray (10YR4/1), clayey SILT, trace sand		580	
15A				16			44			578	
							46	Dark gray (10YR4/1), sandy SILT, trace clay and gravel		576	
	60/60 *100%*	CS					48				
16A				14				Gray(10YR4/1), silty, fine to medium SAND, trace organics and coal		574	
16B				20			50 ▽				
17A	24/24 *100%*	SS	*7-10* *15-16* N=25	12				Dark gray (10YR4/1), sandy SILT, trace clay and gravel		572	
18A	24/24 *100%*	SS	*17-18* *19-21* N=37	22			52 – 54	Greenish gray (5G5/1) with 40% yellowish brown (10YR5/6)mottles, lean CLAY		570	

End of Boring = 54.0 ft. BGS

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-06a
Well ID: MW6S
Surface Elev: 623 ft. MSL
Completion: 16 ft. BGS
Station: 879,021.2N
2,513,189.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark grayish brown (10YR4/2), clayey SILT, trace sand			
								Light brownish gray (10YR6/2) with 20% yellowish brown (10YR5/8) mottles, clayey SILT, trace sand		622	
							2	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		620	
							4	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand		618	
							▼ 6			616	
							8	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, clayey, fine SAND		614	
							▼	Yellowish brown (10YR5/6), silty, fine SAND, trace clay, wet			
							10	Dark yellowish brown (10YR4/6), silty, fine SAND, wet		612	
							12	Brownish yellow (10YR6/6), silty, fine to medium SAND, little coarse sand, trace gravel, wet		610	
								Yellowish brown (10YR5/4), sandy SILT, trace gravel, wet			
							14	Brown (10YR5/3), silty, fine SAND, little medium sand, trace gravel, wet			
								Gray (N5/1), clayey SILT, little sand, trace gravel		608	
							16	Dark gray (N4/1), clayey SILT, trace sand and gravel			

End of Boring = 16.08 ft. BGS
See SB-06 for sample & testing details

NOTE(S): MW06S installed in blind-drilled borehole within 10 ft of SB-06.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-06
Well ID: n/a
Surface Elev: 623 ft. MSL
Completion: 60 ft. BGS
Station: 879,015.0N
2,513,190.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*2-3 3-5* N=6	25		1.22 *SP*
1B				28		1.96 *B*
2A	24/24 *100%*	SS	*2-4 5-6* N=9	27		1.94 *BSh*
2B				19		2.52 *BSh*
3A	24/24 *100%*	SS	*1-3 4* N=7	21		1.36 *B*
4A	24/24 *100%*	SS	*4-6 6* N=12	17		1.78 *B*
5A	22/24 *92%*	SS	*1-2 3-3* N=5	18		0.85 *BSh*
5B				17		0.81 *None*
5C				21		0.31 *None*
6A	20/24 *83%*	SS	*0-1 2-4* N=3	25		
7A	24/24 *100%*	SS	*2-4 7-8* N=11	15		
7B				12		1.48 *BSh*
8B	22/24 *92%*	SS	*11-33 57-35* N=90	8		7.18 *Sh*
9A	22/24 *92%*	SS	*30-39 46-55* N=85	9		11.35 *Sh*
8A				11		
10A	24/24 *100%*	SS	*4-23 50-51* N=73	7		11.64 *Sh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	Dark grayish brown (10YR4/2), clayey SILT, trace sand	
	Light brownish gray (10YR6/2) with 20% yellowish brown (10YR5/8) mottles, clayey SILT, trace sand	622
2	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand	620
4	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand	618, 616
6 ▼		
8	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, clayey, fine SAND	614
▼	Yellowish brown (10YR5/6), silty, fine SAND, trace clay, wet	
10	Dark yellowish brown (10YR4/6), silty, fine SAND, wet	612
12	Brownish yellow (10YR6/6), silty, fine to medium SAND, little coarse sand, trace gravel, wet	610
	Yellowish brown (10YR5/4), sandy SILT, trace gravel, wet	
14	Brown (10YR5/3), silty, fine SAND, little medium sand, trace gravel, wet	
	Gray (N5/1), clayey SILT, little sand, trace gravel	608
16	Dark gray (N4/1), clayey SILT, trace sand and gravel	606
18		604
20		

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-06
Well ID: n/a
Surface Elev: 623 ft. MSL
Completion: 60 ft. BGS
Station: 879,015.0N
2,513,190.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	20/24 *83%*	SS	*6-16 33-58* N=49	11		3.49 *BSh*	22	Dark gray (N4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*	602	
12A	20/24 *83%*	SS	*45-56 54-50/3"* N=110	9		11.64 *Sh*	24		600	
13A	12/24 *50%*	SS	*26-78*	12		2.84 *Sh*	26		598	
14A	8/24 *33%*	SS	*52-48/2"*	9		5.43 *BSh*	28		596	
15A	24/24 *100%*	SS	*10-24 30-40* N=54	13		4.95 *BSh*	30		594	
16A	21/24 *88%*	SS	*10-16 37-38* N=53	8		10.91 *BSh*	32		592	
17A	17/24 *71%*	SS	*36-47 61/5"*	9			34		590	
18A	22/24 *92%*	SS	*11-36 45-60* N=81	9		10.04 *Sh*	36		588	
19A	22/24 *92%*	SS	*40-35 34-29* N=69	10		9.60 *Sh*			586	
19B				13		8.92 *B*	38	Very dark greenish gray (10Y3/1), lean CLAY, trace sand		
20A	24/24 *100%*	SS	*3-8 12-15* N=20	14		8.53 *BSh*	40		584	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-06
Well ID: n/a
Surface Elev: 623 ft. MSL
Completion: 60 ft. BGS
Station: 879,015.0N
2,513,190.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) / *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
21A	23/24 *96%*	SS	*3-5 8-12* N=13	15		4.27 *B*	42	Very dark greenish gray (10Y3/1), lean CLAY, trace sand and gravel		582	
22A	22/24 *92%*	SS	*6-6 7-8* N=13	14		3.49 *B*	44			580	
23A	24/24 *100%*	SS	*5-7 9-12* N=16	16		2.72 *B*	46			578	
24A	24/24 *100%*	SS	*4-8 10-11* N=18	15		4.07 *B*	48			576	
25A	24/24 *100%*	SS	*5-6 9-13* N=15	15		3.10 *B*	50			574	
26A	24/24 *100%*	SS	*5-6 8-12* N=14	22		1.94 *B*	52			572	
27A	24/24 *100%*	SS	*5-6 8-8* N=14	23		2.13 *B*	54	Dark greenish gray (10BG4/1), lean CLAY		570	
28A	24/24 *100%*	SS	*3-5 6-8* N=11	24		2.33 *BSh*	56			568	
29A	24/24 *100%*	SS	*12-10 12-14* N=22	24		3.30 *BSh*	58	Greenish gray (5G4/1) with 10% dark yellowish brown (10YR3/4) mottles, lean CLAY, trace sand		566	
30A	24/24 *100%*	SS	*5-8 12-13* N=20	27		2.13 *BSh*	60	Dark greenish gray (10G4/1), lean CLAY, trace sand. **End of Boring = 60.0 ft. BGS**		564	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07a
Well ID: MW7S
Surface Elev: 625 ft. MSL
Completion: 14 ft. BGS
Station: 879,181.1N
2,514,397.5E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0 – 0.7	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.		624	
							0.7 – 2	Dark gray (10YR4/1), moist, soft, silty CLAY with trace and and trace gravel.			
							2 – 4	Gray (10YR5/1) with 20% yellowish brown mottles, moist, soft, silty CLAY with trace sand and trace gravel.		622	
							4 – 4.7	Black (10YR2/1), very moist, soft, clayey SILT.		620	
							4.7 – 5.3	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist soft, silty CLAY with trace sand and trace gravel.			
							5.3 – 6.2	Black (10YR2/1), moist, soft, silty CLAY with trace sand and trace gravel.		618	
							6.2 – 9.4	Dark gray (10YR4/1), very moist, soft, silty CLAY with some sand and trace gravel.		616	
							9.4 – 10.8	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and gravel.		614	
							10.8 – 12	Yellowish brown (10YR5/8) wet, very soft, clayey, very fine- to fine-grained, SAND with trace gravel.			
							12 – 12.5	Yellowish brown (10YR5/8) wet, soft, clayey, very fine- to fine-grained, SAND with trace gravel.		612	
							12.5 – 14.39	Gray (10YR4/1), moist, very hard, sandy, clayey SILT with gravel.			

End of Boring = 14.39 ft. BGS
See SB-07 for sample & testing details

NOTE(S): MW07S installed in blind-drilled borehole within 10 ft of SB-07.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/8/2006
WEATHER: Partly cloudy, mild (mid-70s)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,180.0N
2,514,390.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	18/24 *75%*	SS	*1-1 1-1* N=2	23		2.40 *B*
1B				24		
2A	24/24 *100%*	SS	*0-0 1-1* N=1	26		2.33 *B*
3A	24/24 *100%*	SS	*0-1 1-2* N=2	25		4.33 *BSh*
3B				25		2.52 *BSh*
3C				22		3.05 *B*
4A	24/24 *100%*	SS	*0-1 1-2* N=2	22		1.75 *B*
5A	24/24 *100%*	SS	*0-0 1-1* N=1	22		1.24 *B*
6A	24/24 *100%*	SS	*0-0 0-1* N=0	24		0.54 *B*
6B				20		1.65 *B*
7A	24/24 *100%*	SS	*0-0 1-2* N=1	24		
7B				13		2.89 *B*
8A	24/24 *100%*	SS	*2-5 7-9* N=12	8		5.04 *BSh*
9A	24/24 *100%*	SS	*3-6 6-8* N=12	9		9.27 *BSh*
10A	24/24 *100%*	SS	*3-6 8-11* N=14	9		11.13 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–0.7	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.	624	
0.7–2	Dark gray (10YR4/1), moist, soft, silty CLAY with trace and and trace gravel.		
2–4	Gray (10YR5/1) with 20% yellowish brown mottles, moist, soft, silty CLAY with trace sand and trace gravel.	622	
4–4.7	Black (10YR2/1), very moist, soft, clayey SILT.	620	
4.7–5.3	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist soft, silty CLAY with trace sand and trace gravel.		
5.3–6.2	Black (10YR2/1), moist, soft, silty CLAY with trace sand and trace gravel.		
6.2–9.4	Dark gray (10YR4/1), very moist, soft, silty CLAY with some sand and trace gravel.	618, 616	
9.4–10.8	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and gravel.	614	
10.8–12	Yellowish brown (10YR5/8) wet, very soft, clayey, very fine- to fine-grained, SAND with trace gravel.		
12–12.5	Yellowish brown (10YR5/8) wet, soft, clayey, very fine- to fine-grained, SAND with trace gravel.	612	
12.5–20	Gray (10YR4/1), moist, very hard, sandy, clayey SILT with gravel.	610, 608, 606	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/8/2006
WEATHER: Partly cloudy, mild (mid-70s)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,180.0N
2,514,390.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A				8				Gray (10YR4/1), moist, very hard, sandy, clayey SILT with gravel. *[Continued from previous page]*	604	
11B	35/48 *73%*	CS		14			22	Gray (10YR6/1), wet, loose, fine- to medium-grained SAND.	602	
							24		600	
	50/60 *83%*	CS					26		598	
12A				7			28	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.	596	
13A				6			30		594	
	56/60 *93%*	CS					32	Gray (10YR5/1), wet, loose, medium- to very coarse-grained SAND and GRAVEL.		
13B				6					592	
13C				8				Gray (10YR5/1), wet, dense, very fine- to fine-grained SAND.		
							34	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.	590	
	60/60 *100%*	CS					36		588	
14A				14			38	Gray (10YR5/1), moist, firm, sandy, clayey SILT with gravel.	586	
							40			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/8/2006
WEATHER: Partly cloudy, mild (mid-70s)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,180.0N
2,514,390.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
15A	60/60 *100%*	CS		14			40–49	Gray (10YR5/1), moist, firm, sandy, clayey SILT with gravel. *[Continued from previous page]*		584, 582, 580, 578, 576	
	60/60 *100%*	CS									
16A				15							
							49–51.2	Dark greenish gray (10BG4/1), moist, soft, silty CLAY with trace sand and trace gravel.		574	
17A	60/60 *100%*	CS		24			51.2–51.5	Very dark gray (10YR3/1), moist firm, clayey SILT.			
17B							51.5–54	Dark greenish gray (10BG4/1), moist, soft, silty CLAY with trace sand and trace gravel.		572	

Depth scale: 42, 44, 46, 48, 50, 52, 54

End of Boring = 54.0 ft BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

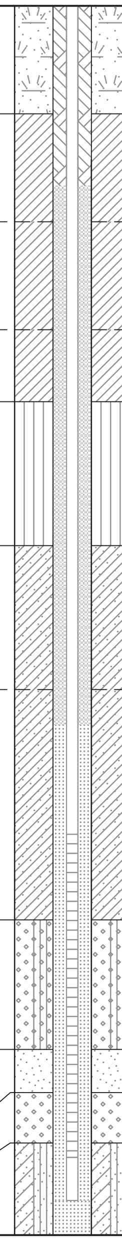
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-08a
Well ID: MW8S
Surface Elev: 625 ft. MSL
Completion: 17 ft. BGS
Station: 879,776.6N
2,514,478.8E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.		624	
							2	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		622	
							4	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.			
							▼	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		620	
							6	Gray (10YR5/1), moist, soft, clayey SILTwith little sand and trace gravel.		618	
							8	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.		616	
							10, 12	Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.		614	
							▼ 14	Gray (10YR5/1), wet, soft, very silty, very fine- to coarse-grained SAND.		612	
								Light gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, wet, very dense, very fine- to fine-grained SAND.		610	
								Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, wet, dense, fine- to very coarse-grained SAND.			
							16	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		608	



End of Boring = 17.08 ft. BGS
See SB-08 for sample & testing details

NOTE(S): MW08S installed in blind-drilled borehole within 10 ft of SB-08.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-08
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 59 ft. BGS
Station: 879,770.0N
2,514,480.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
	24/24 *100%*	SS	*1-1* *1* N=2			
	24/24 *100%*	SS	*1-1* *1* N=2			
2A				25		1.59 *B*
3A	24/24 *100%*	SS	*1-1* *1* N=2	20		1.86 *B*
3B				21		1.20 *B*
	24/24 *100%*	SS	*0-1* *1* N=2			
4A				25		1.01 *None*
	24/24 *100%*	SS	*0-1* *1* N=2			
5A				21		
6A	24/24 *100%*	SS	*0-1* *1* N=2	21		0.70 *BSh*
6B				31		
7A	20/24 *83%*	SS	*0-1* *3* N=4	13		
7B				15		
8A	23/24 *96%*	SS	*7-11* *16* N=27	9		5.45 *Sh*
8B				8		
	24/30 *80%*	CS				
9A				5		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.	624
2	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	622
4	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	
	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	620
6	Gray (10YR5/1), moist, soft, clayey SILTwith little sand and trace gravel.	618
8	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.	616
10	Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.	614
12	Gray (10YR5/1), wet, soft, very silty, very fine- to coarse-grained SAND.	612
14	Light gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, wet, very dense, very fine- to fine-grained SAND.	610
	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, wet, dense, fine- to very coarse-grained SAND.	
16	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	608
18		606
20		

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-08
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 59 ft. BGS
Station: 879,770.0N
2,514,480.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
10A	60/60 *100%*	CS		7		
11A	36/60 *60%*	CS		10		
12A	60/60 *100%*	CS		6		
13A	60/60 *100%*	CS		7		

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
20–40	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*			

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

Elevation scale: 604, 602, 600, 598, 596, 594, 592, 590, 588, 586

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-08
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 59 ft. BGS
Station: 879,770.0N
2,514,480.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	60/60 *100%*	CS						Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	584	
14A				14			42	Greenish gray (10BG5/1) with 10% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with little sand and trace gravel		
14B				11				Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	582	
15A				12			44	Dark yellowish brown (10YR4/4), moist, firm, clayey SILT with some sand and trace gravel.	580	
15B	60/60 *100%*	CS		15			46	Gray (10YR4/1), moist, hard, clayey, sandy SILT with trace gravel.	578	
15C				13			48	Gray (10YR4/1) with 50% very dark grayish brown (10YR3/2), moist, firm, silty CLAY with sand and trace gravel.	576	
16A	60/60 *100%*	CS		14			50, 52	Gray (10YR4/1), moist, hard, clayey, sandy SILT with trace gravel.	574, 572	
16B				19			54	Greenish gray (10BG4/1), moist, soft, silty CLAY with little sand and sl. trace gravel.	570	
17A	60/60 *100%*	CS		24			56, 58	Yellowish brown (10YR5/6) with 20% Greenish gray (10BG4/1) mottles, moist, soft, silty CLAY with little sand and sl. trace gravel.	568	
17B				19						

End of Boring = 58.5 ft.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL
1A	22/24 *92%*	SS	*0-1 1-1* N=2	24		1.65 *B*	0–1	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.	624
2A	20/24 *83%*	SS	*1-2 1-1* N=3	27		2.06 *B*	1–4.9	Yellowish brown (10YR5/6), moist, soft, silty CLAY with little sand.	622, 620
3A	24/24 *100%*	SS	*1-1 1-1* N=2	24		1.65 *B*	4.9–7.5	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	618
4A	24/24 *100%*	SS	*1-1 1-2* N=2	23		1.57 *B*	7.5–9	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with sand.	616
5A	24/24 *100%*	SS	*0-1 1-1* N=2	27		1.85 *B*	9–11.5	Yellowish brown (10YR5/6) with 10% Gray (10YR5/1) mottles, moist, soft, silty CLAY with sand.	614
6A	24/24 *100%*	SS	*0-0 0-0* N=0	22		1.44 *B*			
7A	24/24 *100%*	SS	*0-0 1-2* N=1	21		0.93 *BSh*	11.5–12.5	Yellowish brown (10YR5/8), very moist, soft, sandy CLAY with trace gravel.	
7B				18		0.97 *BSh*	12.5–13.6	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist to very moist, clayey SILT with sand and trace gravel.	612
7C				15			13.6–14.2	Gray (10YR5/1), wet, soft, clayey very fine- to fine-grained SAND.	
8A	24/24 *100%*	SS	*1-3 6-6* N=9	18			14.2–14.8	Gray (10YR5/1), wet, loose, fine- to very coarse-grained SAND with trace gravel.	610
8B				18			14.8–15.7	Gray (10YR5/1), wet, dense, silty very fine- to fine-grained SAND.	
9A	24/24 *100%*	SS	*7-13 19-25* N=32	8		7.86 *Sh*	15.7–20	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	608, 606
	12/12 *100%*	CS							

Borehole Detail

Remarks

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										604	
11A	60/60 *100%*	CS		2			22			602	
							24			600	
12A	49/60 *82%*	CS		3			26			598	2" Sand stringer
							28	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		596	
							30			594	
13A	60/60 *100%*	CS		3			32			592	
							34			590	
14A	60/60 *100%*	CS		10			36	Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist, very hard, clayey SILT with little sand and occasional dry, silt stringers (<1").		588	
14B				11			38	Gray (10YR5/1), moist, very hard, clayey SILT with little sand and trace gravel.		586	
							40	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.			DRILLER NOTE: Appears more plastic

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

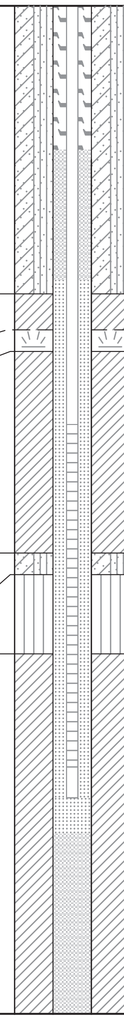
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft³)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description
	60/60 *100%*	CS					40–44	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*
15A				12				
							44–44.5	Very dark grayish brown (10YR3/2), moist, hard, silty CLAY with trace sand and trace organic matter.
							44.5–45	Very dark grayish brown (10YR3/2), moist, firm, PEAT.
19	60/60 *100%*	CS		22			45–47.6	Dark greenish gray (10BG4/1), moist, firm, silty CLAY with little sand and trace gravel.
							47.6–48.2	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.
16A				17			48.2–49	Dark gray (10YR3/1), moist, hard, clayey SILT.
17A	60/60 *100%*	CS					49–54	Dark greenish gray (10BG4/1), moist, firm, silty CLAY with little sand and trace gravel.

Depth ft. BGS: 42, 44, 46, 48, 50, 52 ▽, 54

Borehole Detail | Elevation ft. MSL: 584, 582, 580, 578, 576, 574, 572 | Remarks



End of Boring = 54.0 ft.

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09a
Well ID: MW9S
Surface Elev: 625 ft. MSL
Completion: 16 ft. BGS
Station: 879,684.9N
2,515,666.2E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.		624	
							1–4.9	Yellowish brown (10YR5/6), moist, soft, silty CLAY with little sand.		622, 620	
							4.9–7.5 (▼ at 5.23)	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		618	
							7.5–9	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with sand.		616	
							9–11.5	Yellowish brown (10YR5/6) with 10% Gray (10YR5/1) mottles, moist, soft, silty CLAY with sand.		614	
							11.5–12.5	Yellowish brown (10YR5/8), very moist, soft, sandy CLAY with trace gravel.			
							12.5–13.6	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist to very moist, clayey SILT with sand and trace gravel.		612	
							13.6–14 (▼ at 14)	Gray (10YR5/1), wet, soft, clayey very fine- to fine-grained SAND.			
							14–14.6	Gray (10YR5/1), wet, loose, fine- to very coarse-grained SAND with trace gravel.		610	
							14.6–15.7	Gray (10YR5/1), wet, dense, silty very fine- to fine-grained SAND.			
							15.7–16.2	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.			

End of Boring = 16.20 ft. BGS
See SB-09 for sample & testing details

NOTE(S): MW09S installed in blind-drilled borehole within 10 ft of SB-09.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*0-1 1-1* N=2	24		1.65 *B*
2A	20/24 *83%*	SS	*1-2 1-1* N=3	27		2.06 *B*
3A	24/24 *100%*	SS	*1-1 1-1* N=2	24		1.65 *B*
4A	24/24 *100%*	SS	*1-1 1-2* N=2	23		1.57 *B*
5A	24/24 *100%*	SS	*0-1 1-1* N=2	27		1.85 *B*
6A	24/24 *100%*	SS	*0-0 0-0* N=0	22		1.44 *B*
7A	24/24 *100%*	SS	*0-0 1-2* N=1	21		0.93 *BSh*
7B				18		0.97 *BSh*
7C				15		
8A	24/24 *100%*	SS	*1-3 6-6* N=9	18		
8B				18		
9A	24/24 *100%*	SS	*7-13 19-25* N=32	8		7.86 *Sh*
	12/12 *100%*	CS				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.	624
2	Yellowish brown (10YR5/6), moist, soft, silty CLAY with little sand.	622
4 – 6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	620, 618
8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with sand.	616
10	Yellowish brown (10YR5/6) with 10% Gray (10YR5/1) mottles, moist, soft, silty CLAY with sand.	614
12	Yellowish brown (10YR5/8), very moist, soft, sandy CLAY with trace gravel.	
	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist to very moist, clayey SILT with sand and trace gravel.	612
14	Gray (10YR5/1), wet, soft, clayey very fine- to fine-grained SAND.	
	Gray (10YR5/1), wet, loose, fine- to very coarse-grained SAND with trace gravel.	610
	Gray (10YR5/1), wet, dense, silty very fine- to fine-grained SAND.	
16 – 20	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	608, 606

Borehole Detail | Remarks

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) / *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	60/60 *100%*	CS		2			20–25	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		
12A	49/60 *82%*	CS		3			25–30			2" Sand stringer
13A	60/60 *100%*	CS		3			30–35.5			
14A	60/60 *100%*	CS		10			35.5–37	Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist, very hard, clayey SILT with little sand and occasional dry, silt stringers (<1").		
14B				11			37–39	Gray (10YR5/1), moist, very hard, clayey SILT with little sand and trace gravel.		
							39–40	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		DRILLER NOTE: Appears more plastic

Depth scale (ft. BGS): 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation scale (ft. MSL): 604, 602, 600, 598, 596, 594, 592, 590, 588, 586

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL
15A	60/60 *100%*	CS		12			41–44	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	584–581
19	60/60 *100%*	CS		22			44–44.5	Very dark grayish brown (10YR3/2), moist, hard, silty CLAY with trace sand and trace organic matter.	581–580.5
							44.5–45	Very dark grayish brown (10YR3/2), moist, firm, PEAT.	
							45–47.6	Dark greenish gray (10BG4/1), moist, firm, silty CLAY with little sand and trace gravel.	
16A				17			47.6–48.1	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	
							48.1–49	Dark gray (10YR3/1), moist, hard, clayey SILT.	
17A	60/60 *100%*	CS					49–54 (▽ 52.46)	Dark greenish gray (10BG4/1), moist, firm, silty CLAY with little sand and trace gravel.	576–571

End of Boring = 54.0 ft.

Remarks:

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	17/24 *71%*	SS	*1-1* *1-1* N=2	23		2.33 *B*	0–1	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.	620	
							1–2	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		
2A	24/24 *100%*	SS	*1-1* *2-2* N=3	25		2.47 *BSh*	2–5.9	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	618	
3A	24/24 *100%*	SS	*1-2* *1-2* N=3	24		2.33 *B*			616	
4A	24/24 *100%*	SS	*1-1* *1-1* N=2	23		1.55 *B*	5.9–6.6	Gray (10YR5/1), moist, soft, clayey, very fine- to fine-grained SAND.		
4B							6.6–10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand and trace gravel.	614	
5A	17/24 *71%*	SS	*1-1* *1-2* N=2	23		2.06 *B*			612	
6A	24/24 *100%*	SS	*0-1* *1-1* N=2	17		1.16 *B*	10–13	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, clayey, very fine- to medium-grained SAND with trace gravel.	610	
7A	23/24 *96%*	SS	*1-1* *3-3* N=4	17		2.84 *B*	13–14.5	Grayish brown (10YR5/2), wet, loose, very fine- to medium-grained SAND with trace coarse- to very coarse-grained sand.	608	
7B				18						
8A	24/24 *100%*	SS	*3-5* *9-9* N=14	10		7.64 *BSP*	14.5–15	Yellowish brown (10YR5/6), moist, firm, silty CLAY with little sand and trace gravel.	606	
10A	12/33 *36%*	CS		16			15–20	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	604, 602	

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							22–27	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	600–594	
11A				12						
	56/60 *93%*	CS								2" Gravel stringer
							27–27.6	Dark grayish brown (10YR4/2), very moist, soft, PEAT.		
11B				13						
11C				196						
	60/60 *100%*	CS					27.6–40	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.	594–581	
12A				13						
	60/60 *100%*	CS								
13A				12						

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
14A	60/60 *100%*	CS		14				Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	580	
14B				23			42	Greenish gray (5G5/1), moist, firm, silty CLAY with little sand and sl. trace gravel.	578	1" Gravel stringer
15A				13			44	Greenish gray (5G5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with little sand and sl. trace gravel.	576	
	60/60 *100%*	CS					46			
15B				25			▽ 48	Greenish gray (5G5/1), moist, firm, silty CLAY with little sand and sl. trace gravel.	574	

End of Boring = 48.75 ft.

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/2/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10a
Well ID: MW10S
Surface Elev: 621 ft. MSL
Completion: 16 ft. BGS
Station: 878,250.5N
2,515,914.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.		621–620	
							1–2	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		620	
							2–6 (▼ 4.91)	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		618, 616	
							6–6.7	Gray (10YR5/1), moist, soft, clayey, very fine- to fine-grained SAND.			
							6.7–10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand and trace gravel.		614, 612	
							10–13 (▼ 11.80)	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, clayey, very fine- to medium-grained SAND with trace gravel.		610	
							13–14.5	Grayish brown (10YR5/2), wet, loose, very fine- to medium-grained SAND with trace coarse- to very coarse-grained sand.		608	
							14.5–15	Yellowish brown (10YR5/6), moist, firm, silty CLAY with little sand and trace gravel.			
							15–16.3	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		606	

End of Boring = 16.30 ft. BGS
See SB-10 for sample & testing details

NOTE(S): MW10S installed in blind-drilled borehole within 10 ft of SB-10.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	17/24 *71%*	SS	*1-1 1-1* N=2	23		2.33 *B*
2A	24/24 *100%*	SS	*1-1 2-2* N=3	25		2.47 *BSh*
3A	24/24 *100%*	SS	*1-2 1-2* N=3	24		2.33 *B*
4A	24/24 *100%*	SS	*1-1 1-1* N=2	23		1.55 *B*
4B						
5A	17/24 *71%*	SS	*1-1 1-2* N=2	23		2.06 *B*
6A	24/24 *100%*	SS	*0-1 1-1* N=2	17		1.16 *B*
7A	23/24 *96%*	SS	*1-1 3-3* N=4	17		2.84 *B*
7B				18		
8A	24/24 *100%*	SS	*3-5 9-9* N=14	10		7.64 *BSP*
10A	12/33 *36%*	CS		16		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–1	Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.	620
1–2	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	
2–5.9	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	618, 616
5.9–6.6	Gray (10YR5/1), moist, soft, clayey, very fine- to fine-grained SAND.	
6.6–10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand and trace gravel.	614, 612
10–13	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, clayey, very fine- to medium-grained SAND with trace gravel.	610
13–14.5	Grayish brown (10YR5/2), wet, loose, very fine- to medium-grained SAND with trace coarse- to very coarse-grained sand.	608
14.5–15	Yellowish brown (10YR5/6), moist, firm, silty CLAY with little sand and trace gravel.	
15–20	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	606, 604, 602

Remarks:

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							21–27	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	600–594	
11A				12						
	56/60 *93%*	CS								2" Gravel stringer
							26.7–27.3	Dark grayish brown (10YR4/2), very moist, soft, PEAT.		
11B				13						
11C				196						
	60/60 *100%*	CS					27.3–40	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.	594–581	
12A				13						
	60/60 *100%*	CS								
13A				12						

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation scale: 600, 598, 596, 594, 592, 590, 588, 586, 584, 582

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
14A	60/60 *100%*	CS		14				Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		580	
14B				23			42	Greenish gray (5G5/1), moist, firm, silty CLAY with little sand and sl. trace gravel.		578	1" Gravel stringer
15A	60/60 *100%*	CS		13			44	Greenish gray (5G5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with little sand and sl. trace gravel.		576	
15B				25			46 ▽ 48	Greenish gray (5G5/1), moist, firm, silty CLAY with little sand and sl. trace gravel.		574	

End of Boring = 48.75 ft.

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11
Well ID: MW11D
Surface Elev: 622 ft. MSL
Completion: 36 ft. BGS
Station: 876,749.6N
2,515,976.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	24/24 *100%*	SS	*3-3 4-4* N=7	16				Very dark grey (10YR3/1), moist, soft, clayey SILT.		
1B				34		1.09 *B*		Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist , soft, silty CLAY.		
							2		620	
2A	24/24 *100%*	SS	*4-7 14-21* N=21	27		2.13 *BSh*		Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist , soft, silty CLAY.		
							4		618	
3A	24/24 *100%*	SS	*4-6 7-8* N=13	24		2.27 *BSh*		Gray (10YR5/1), moist, soft, clayey SILT.		
3B				19		2.33 *B*	6		616	
4A	24/24 *100%*	SS	*7-8 13-14* N=21	21		2.13 *None*		Gray (10YR4/1), moist, firm, silty CLAY with little sand and trace gravel.		
							8		614	
5A	24/24 *100%*	SS	*3-4 4-4* N=8	20		1.55 *Sh*				
							10		612	
6A	24/24 *100%*	SS	*3-2 2-3* N=4	19		0.78 *BSh*				
6B				18			12	Gray (10YR4/1), wet, soft, sandy CLAY.	610	
7A	24/24 *100%*	SS	*3-6 14-21* N=20	16				Yellowish brown (10YR5/6) with 50% gray (10YR5/1) mottles, wet, soft, sandy CLAY with trace gravel.		
7B				9		5.45 *BSP*	14	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.	608	
8A	11/12 *92%*	SS	*41-61/5"*	7				Gray (10YR5/1), moist, hard, silty CLAY with little sand and trace gravel.		
								Light gray (10YR7/1) with 10% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY with little sand and trace gravel.		
							16		606	
9A	48/54 *89%*	CS		8			18	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	604	
							20		602	DRILLER NOTE: sampler recovered wet.

NOTE(S): MW11D installed in SB-11.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11
Well ID: MW11D
Surface Elev: 622 ft. MSL
Completion: 36 ft. BGS
Station: 876,749.6N
2,515,976.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
										DRILLER NOTE: soft drilling 20.5' to 21.0'
	54/60 *90%*	CS					22	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	600	
10A				6						Wet, gravelly zone from 22.4' to 22.8'
							24		598	
							26		596	
11A	58/60 *97%*	CS		8						
							28		594	
							30	Gray (10YR5/1), wet, loose, clayey, very fine- to medium-grained SAND with little coarse-grained sand and trace gravel.	592	
12A	32/60 *53%*	CS		9			32		590	
							34	Gray (10YR6/1) with occasional black (10YR2/1) varves, dry, dense, SILT with trace sand.	588	
12B				9						
	22/22 *100%*	SS	*7-19* *41-50/4"* N=60							
13B				14		4.85 *BSh*	36	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	586	

End of Boring = 36.33 ft.

NOTE(S): MW11D installed in SB-11.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/28/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11a
Well ID: MW11S
Surface Elev: 622 ft. MSL
Completion: 14 ft. BGS
Station: 876,749.4N
2,515,971.2E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1.1	Very dark grey (10YR3/1), moist, soft, clayey SILT.			
							1.1–2	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist , soft, silty CLAY.		620	
							2–4.2	Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist , soft, silty CLAY.		618	
							4.2–4.7	Gray (10YR5/1), moist, soft, clayey SILT.			
							4.7–11.7	Gray (10YR4/1), moist, firm, silty CLAY with little sand and trace gravel.		616, 614, 612	
							11.7–12	Gray (10YR4/1), wet, soft, sandy CLAY.		610	
							12–13	Yellowish brown (10YR5/6) with 50% gray (10YR5/1) mottles, wet, soft, sandy CLAY with trace gravel.			
							13–14	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.		608	

End of Boring = 14.08 ft. BGS
See SB-11 for sample & testing details

NOTE(S): MW11S installed in blind-drilled borehole within 10 ft of SB-11.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11
Well ID: MW11D
Surface Elev: 622 ft. MSL
Completion: 36 ft. BGS
Station: 876,749.6N
2,515,976.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*3-3 4-4* N=7	16		
1B				34		1.09 *B*
2A	24/24 *100%*	SS	*4-7 14-21* N=21	27		2.13 *BSh*
3A	24/24 *100%*	SS	*4-6 7-8* N=13	24		2.27 *BSh*
3B				19		2.33 *B*
4A	24/24 *100%*	SS	*7-8 13-14* N=21	21		2.13 *None*
5A	24/24 *100%*	SS	*3-4 4-4* N=8	20		1.55 *Sh*
6A	24/24 *100%*	SS	*3-2 2-3* N=4	19		0.78 *BSh*
6B				18		
7A	24/24 *100%*	SS	*3-6 14-21* N=20	16		
7B				9		5.45 *BSP*
8A	11/12 *92%*	SS	*41-61/5"*	7		
9A	48/54 *89%*	CS		8		

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 620, 618, 616, 614, 612, 610, 608, 606, 604, 602

Lithologic Description

- Very dark grey (10YR3/1), moist, soft, clayey SILT.
- Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist , soft, silty CLAY.
- Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist , soft, silty CLAY.
- Gray (10YR5/1), moist, soft, clayey SILT.
- Gray (10YR4/1), moist, firm, silty CLAY with little sand and trace gravel.
- Gray (10YR4/1), wet, soft, sandy CLAY.
- Yellowish brown (10YR5/6) with 50% gray (10YR5/1) mottles, wet, soft, sandy CLAY with trace gravel.
- Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.
- Gray (10YR5/1), moist, hard, silty CLAY with little sand and trace gravel.
- Light gray (10YR7/1) with 10% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY with little sand and trace gravel.
- Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.

Remarks: DRILLER NOTE: sampler recovered wet.

NOTE(S): MW11D installed in SB-11.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11
Well ID: MW11D
Surface Elev: 622 ft. MSL
Completion: 36 ft. BGS
Station: 876,749.6N
2,515,976.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

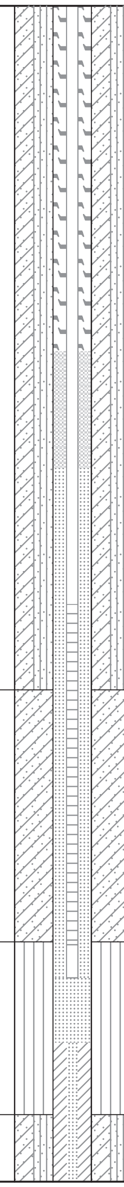
WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
	54/60 *90%*	CS				
10A				6		
11A	58/60 *97%*	CS		8		
12A	32/60 *53%*	CS		9		
12B				9		
	22/22 *100%*	SS	*7-19* *41-50/4"* N=60			
13B				14		4.85 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
~20.5 – 29.5	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	22 – 600; 24 – 598; 26 – 596; 28 – 594
~29.5 – 33	Gray (10YR5/1), wet, loose, clayey, very fine- to medium-grained SAND with little coarse-grained sand and trace gravel.	30 – 592; 32 – 590
~33 – 35.4	Gray (10YR6/1) with occasional black (10YR2/1) varves, dry, dense, SILT with trace sand.	34 – 588
~35.4 – 36.33	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	36 – 586

End of Boring = 36.33 ft.

Borehole Detail



Remarks:

DRILLER NOTE: soft drilling 20.5' to 21.0'

Wet, gravelly zone from 22.4' to 22.8'

NOTE(S): MW11D installed in SB-11.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Testing Service Corporation		
Site: CCB Management Facility	**Rig mfg/model:** CME-650 Track Rig	**BOREHOLE ID:** SB-12	
Location: Coffeen, Illinois	**Drilling Method:** 3¼" HSA w/SS & CME samplers	**Well ID:** MW12D	
Project: 05S3004A		**Surface Elev:** 622 ft. MSL	
DATES: Start: 5/10/2006	**FIELD STAFF: Driller:** B. Williamson	**Completion:** 50 ft. BGS	
Finish: 5/10/2006	**Helper:** R. Keedy	**Station:** 875,515.1N	
WEATHER: Foggy to partly sunny, mild (hi-60's)	**Eng/Geo:** R. Hasenyager	2,515,900.6E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24"/24	SS	*2-3 4-5* N=7	22		1.27 *Sh*
1B				27		2.33 *B*
2A	19"/24	SS	*2-4 5-7* N=9	24		2.91 *B*
3A	20"/24	SS	*2-2 3-4* N=5	21		2.13 *B*
4A	24/24 *100%*	SS	*4-5 5-6* N=10	21		1.36 *BSh*
5A	24"/24	SS	*1-2 2-5* N=4	20		1.47 *BSh*
6A	20"/24	SS	*0-1 3-3* N=4	21		0.62 *B*
7A	21"/24	SS	*2-2 3-5* N=5	22		0.19 *B*
7B				22		
7C				15		3.71 *B*
8A	24"/24	SS	*4-13 18-29* N=31	9		5.15 *BSh*
9A	24"/24	SS	*26-32 46-50* N=78	9		6.59 *Sh*
10A	24"/24	SS	*21-31 63-71* N=94	11		6.39 *Sh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Very dark gray (10YR3/1), clayey SILT, trace sand	622
	Dark gray (10YR4/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY	
2	Yellowish brown (10YR5/8) with 40% grayish brown (10YR5/2) mottles, lean CLAY	620
4	Gray (10YR5/1), lean CLAY, trace sand and gravel	618
6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand	616
8	Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand and gravel	614
10	Yellowish brown (10YR 5/8) with 25% gray (10YR6/1) mottles, clayey SAND, trace gravel	612
12	Gray (10YR6/1), clayey SAND, trace gravel, wet	610
	Dark yellowish brown (10YR4/6), clayey SAND, trace gravel, wet	
14	Light yellowish brown (10YR6/4) with 30% brownish yellow (10YR6/6) mottles, clayey SILT, trace sand and gravel	608
16	Dark greenish gray (N4/1), clayey SILT, trace sand and gravel	606
18		604
20		

Borehole Detail | Remarks

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N
2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	60/60 *100%*	CS		6			22–25	Dark greenish gray (N4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*		600, 598	
12A	60/60 *100%*	CS		7			25–30	Dark greenish gray (N4/1), sandy SILT, trace gravel		596, 594, 592	
13A	60/60 *100%*	CS		13			30–35			590, 588	
14A	60/60 *100%*	CS		16			35–40	Very dark gray (N3/1), clayey SILT, trace sand and gravel		586, 584	

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40. Elevation scale: 602, 600, 598, 596, 594, 592, 590, 588, 586, 584.

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N 2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
15A	60/60 *100%*	CS		14			42, 44	Very dark gray (N3/1), clayey SILT, trace sand and gravel *[Continued from previous page]*		582, 580, 578	
								Very dark gray (N3/1), PEAT			
16A	60/60 *100%*	CS		45			46, ▽, 48, 50	Gray (N5/1) with 30% yellowish brown (10YR5/6) mottles, lean CLAY		576, 574	

End of Boring = 50.0 ft. BGS

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12a
Well ID: MW12S
Surface Elev: 622 ft. MSL
Completion: 16 ft. BGS
Station: 875,520.1N
2,515,900.5E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Very dark gray (10YR3/1), clayey SILT, trace sand		622	
								Dark gray (10YR4/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY			
							2	Yellowish brown (10YR5/8) with 40% grayish brown (10YR5/2) mottles, lean CLAY		620	
							4	Gray (10YR5/1), lean CLAY, trace sand and gravel		618	
							6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		616	
							8	Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand and gravel		614	
							10	Yellowish brown (10YR 5/8) with 25% gray (10YR6/1) mottles, clayey SAND, trace gravel		612	
							12	Gray (10YR6/1), clayey SAND, trace gravel, wet		610	
								Dark yellowish brown (10YR4/6), clayey SAND, trace gravel, wet			
							14	Light yellowish brown (10YR6/4) with 30% brownish yellow (10YR6/6) mottles, clayey SILT, trace sand and gravel		608	
								Dark greenish gray (N4/1), clayey SILT, trace sand and gravel			

End of Boring = 15.61 ft. BGS
See SB-12 for sample & testing details

NOTE(S): MW12S installed in blind-drilled borehole within 10 ft of SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N
2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24"/24	SS	*2-3 4-5* N=7	22		1.27 *Sh*
1B				27		2.33 *B*
2A	19"/24	SS	*2-4 5-7* N=9	24		2.91 *B*
3A	20"/24	SS	*2-2 3-4* N=5	21		2.13 *B*
4A	24/24 *100%*	SS	*4-5 5-6* N=10	21		1.36 *BSh*
5A	24"/24	SS	*1-2 2-5* N=4	20		1.47 *BSh*
6A	20"/24	SS	*0-1 3-3* N=4	21		0.62 *B*
7A	21"/24	SS	*2-2 3-5* N=5	22		0.19 *B*
7B				22		
7C				15		3.71 *B*
8A	24"/24	SS	*4-13 18-29* N=31	9		5.15 *BSh*
9A	24"/24	SS	*26-32 46-50* N=78	9		6.59 *Sh*
10A	24"/24	SS	*21-31 63-71* N=94	11		6.39 *Sh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	Very dark gray (10YR3/1), clayey SILT, trace sand	622	
	Dark gray (10YR4/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY		
2	Yellowish brown (10YR5/8) with 40% grayish brown (10YR5/2) mottles, lean CLAY	620	
4	Gray (10YR5/1), lean CLAY, trace sand and gravel	618	
6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand	616	
8	Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand and gravel	614	
10	Yellowish brown (10YR 5/8) with 25% gray (10YR6/1) mottles, clayey SAND, trace gravel	612	
12	Gray (10YR6/1), clayey SAND, trace gravel, wet	610	
	Dark yellowish brown (10YR4/6), clayey SAND, trace gravel, wet		
14	Light yellowish brown (10YR6/4) with 30% brownish yellow (10YR6/6) mottles, clayey SILT, trace sand and gravel	608	
16	Dark greenish gray (N4/1), clayey SILT, trace sand and gravel	606	
18		604	
20			

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N
2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	60/60 *100%*	CS		6			20–25	Dark greenish gray (N4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*	602–597	
12A	60/60 *100%*	CS		7			25–30	Dark greenish gray (N4/1), sandy SILT, trace gravel	597–592	
13A	60/60 *100%*	CS		13			30–35		592–587	
14A	60/60 *100%*	CS		16			35–40	Very dark gray (N3/1), clayey SILT, trace sand and gravel	587–582	

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation scale: 602, 600, 598, 596, 594, 592, 590, 588, 586, 584

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N
2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
15A	60/60 *100%*	CS		14			41–45	Very dark gray (N3/1), clayey SILT, trace sand and gravel *[Continued from previous page]*			
							45–45.5	Very dark gray (N3/1), PEAT			
16A	60/60 *100%*	CS		45			45.5–50 (▽ 46.9)	Gray (N5/1) with 30% yellowish brown (10YR5/6) mottles, lean CLAY			

Depth scale: 42, 44, 46, 48, 50. Elevation scale: 582, 580, 578, 576, 574.

End of Boring = 50.0 ft. BGS

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*4-5 4-4* N=9	21		
1B				15		
1C				28		2.13 *B*
2A	21/24 *88%*	SS	*3-4 5-8* N=9	25		2.13 *BSh*
3A	24/24 *100%*	SS	*4-5 6-8* N=11	22		2.84 *Sh*
3B				21		2.91 *BSh*
4A	24/24 *100%*	SS	*9-12 10-10* N=22	23		2.33 *B*
5A	24/24 *100%*	SS	*3-4 6-7* N=10	21		2.72 *Sh*
6A	19/24 *79%*	SS	*1-3 6-8* N=9	23		1.94 *Sh*
7A	21/24 *88%*	SS	*6-8 10-12* N=18	18		1.94 *Sh*
7B				13		1.55 *BSh*
8A	22/24 *92%*	SS	*7-21 29-30* N=50	11		
8B				9		
9A	23/24 *96%*	SS	*25-28 28-45* N=56	9		9.16 *Sh*
10A	24/24 *100%*	SS	*18-27 31-36* N=58	8		12.00 *Sh*

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	Grayish brown (10YR5/2), clayey SILT, trace sand			
	Light gray (10YR7/2), clayey SILT, trace sand			
	Light brownish gray (10YR6/2) with 15%yellowish brown (10YR5/6) mottles, lean CLAY, trace sand			
	Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand			
	Dark gray (10YR4/1), lean CLAY, trace sand and gravel			
	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand and gravel			
	Yellowish brown (10YR5/6), silty SAND, trace gravel, wet			
	Yellowish brown (10YR5/8) with 30% light brownish gray (10YR6/2) mottles, sandy SILT, trace gravel			
	Dark gray (10YR4/1), sandy SILT, trace gravel			

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elevation scale (ft. MSL): 622, 620, 618, 616, 614, 612, 610, 608, 606, 604

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Testing Service Corporation		
Site: CCB Management Facility	**Rig mfg/model:** CME-650 Track Rig	**BOREHOLE ID:** SB-13	
Location: Coffeen, Illinois	**Drilling Method:** 3¼" HSA w/SS sampler & 4¼" HSA overdrill	**Well ID:** MW13D	
Project: 05S3004A		**Surface Elev:**	623 ft. MSL
DATES: Start: 5/9/2006	**FIELD STAFF: Driller:** B. Williamson	**Completion:**	55 ft. BGS
Finish: 5/9/2006	**Helper:** R. Keedy	**Station:**	874,694.3N
WEATHER: Overcast, mild (mid-60's)	**Eng/Geo:** R. Hasenyager		2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										602	
	60/60 *100%*	CS					22			600	
11A				13			24			598	
							26			596	
	60/60 *100%*	CS					28	Dark gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*		594	
12A							30			592	
	60/60 *100%*	CS					32			590	
13A				15			34			588	
							36			586	
	60/60 *100%*	CS					38	Dark gray (10YR4/1), lean CLAY, trace sand and gravel		584	
14A				15			40				

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	60/60 *100%*	CS					42			582, 580	
15A				15			44			578	
	60/60 *100%*	CS					46–48	Dark gray (10YR4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*		576, 574	
16A				15			50			572	
17A	60/60 *100%*	CS		14			52	Gray (10YR4/1), silty, fine to medium SAND, wet			
17B				20				Gray (10YR4/1), sandy SILT		570	
17C				14							
17D				22			54	Dark greenish gray (5GY4/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY		568	

End of Boring = 55.0 ft. BGS

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13a
Well ID: MW13S
Surface Elev: 623 ft. MSL
Completion: 17 ft. BGS
Station: 874,695.7N
2,513,925.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▽ = 6.76 - MW13S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Grayish brown (10YR5/2), clayey SILT, trace sand		622	
								Light gray (10YR7/2), clayey SILT, trace sand			
							2	Light brownish gray (10YR6/2) with 15%yellowish brown (10YR5/6) mottles, lean CLAY, trace sand			
							4	Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		620, 618	
							6	Dark gray (10YR4/1), lean CLAY, trace sand and gravel			
							▽, 8, 10, ▼ 12	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand and gravel		616, 614, 612	
							14	Yellowish brown (10YR5/6), silty SAND, trace gravel, wet		610, 608	
								Yellowish brown (10YR5/8) with 30% light brownish gray (10YR6/2) mottles, sandy SILT, trace gravel			
							16	Dark gray (10YR4/1), sandy SILT, trace gravel			

End of Boring = 16.62 ft. BGS
See SB-13 for sample & testing details

NOTE(S): MW13S installed in blind-drilled borehole within 10 ft of SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*4-5 4-4* N=9	21		
1B				15		
1C				28		2.13 *B*
2A	21/24 *88%*	SS	*3-4 5-8* N=9	25		2.13 *BSh*
3A	24/24 *100%*	SS	*4-5 6-8* N=11	22		2.84 *Sh*
3B				21		2.91 *BSh*
4A	24/24 *100%*	SS	*9-12 10-10* N=22	23		2.33 *B*
5A	24/24 *100%*	SS	*3-4 6-7* N=10	21		2.72 *Sh*
6A	19/24 *79%*	SS	*1-3 6-8* N=9	23		1.94 *Sh*
7A	21/24 *88%*	SS	*6-8 10-12* N=18	18		1.94 *Sh*
7B				13		1.55 *BSh*
8A	22/24 *92%*	SS	*7-21 29-30* N=50	11		
8B				9		
9A	23/24 *96%*	SS	*25-28 28-45* N=56	9		9.16 *Sh*
10A	24/24 *100%*	SS	*18-27 31-36* N=58	8		12.00 *Sh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Grayish brown (10YR5/2), clayey SILT, trace sand	622
	Light gray (10YR7/2), clayey SILT, trace sand	
2	Light brownish gray (10YR6/2) with 15%yellowish brown (10YR5/6) mottles, lean CLAY, trace sand	620
4	Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand	618
6	Dark gray (10YR4/1), lean CLAY, trace sand and gravel	616
8 ▼		614
10	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand and gravel	612
12 ▼		610
14	Yellowish brown (10YR5/6), silty SAND, trace gravel, wet	608
16	Yellowish brown (10YR5/8) with 30% light brownish gray (10YR6/2) mottles, sandy SILT, trace gravel	606
18	Dark gray (10YR4/1), sandy SILT, trace gravel	604
20		

Borehole Detail | Remarks

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										602	
	60/60 *100%*	CS					22			600	
11A				13			24			598	
							26			596	
	60/60 *100%*	CS					28	Dark gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*		594	
12A							30			592	
	60/60 *100%*	CS					32			590	
13A				15			34			588	
							36			586	
	60/60 *100%*	CS					38	Dark gray (10YR4/1), lean CLAY, trace sand and gravel		584	
14A				15			40				

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	60/60 *100%*	CS					42		582	
15A				15			44		580	
	60/60 *100%*	CS					46	Dark gray (10YR4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*	578	
16A				15			48		576	
							50		574	
17A	60/60 *100%*	CS		14			52	Gray (10YR4/1), silty, fine to medium SAND, wet	572	
17B				20				Gray (10YR4/1), sandy SILT	570	
17C				14			54	Dark greenish gray (5GY4/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY		
17D				22					568	

End of Boring = 55.0 ft. BGS

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/2/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

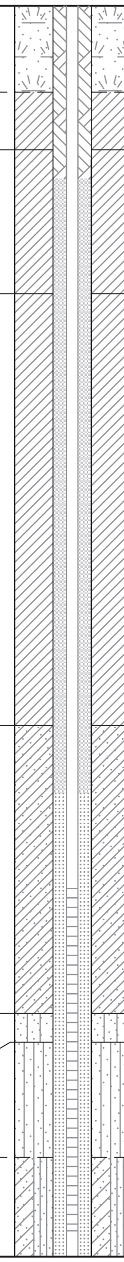
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: Sb-14a
Well ID: MW14S
Surface Elev: 625 ft. MSL
Completion: 17 ft. BGS
Station: 875,737.8N
2,514,125.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1.2	Grayish brown (10YR5/2), clayey SILT, trace sand		624	
							1.2–2	Gray (10YR6/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand			
							2–4	Light gray (10YR7/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand		622	
							4–10	Light gray (10YR7/1) with 15% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand		620, 618, 616	
							10–14	Yellowish brown (10YR5/8) with 50% light gray (10YR7/1) mottles, sandy CLAY		614, 612	
							14–14.6	Yellowish brown (10YR5/6), silty, fine SAND, trace medium sand and gravel, wet		610	
							14.6–16	Yellowish brown (10YR5/6), sandy SILT, trace gravel			
							16–17.38	Yellowsh brown (10YR5/6) with 40% gray (10YR6/1) mottles, sandy SILT, trace gravel		608	



End of Boring = 17.38 ft. BGS
See SB-14 for sample & testing details

NOTE(S): MW14S installed in blind-drilled borehole within 10 ft of SB-14.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-14
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 60 ft. BGS
Station: 875,740.0N
2,514,130.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	23/24 *96%*	SS	*2-3 2-3* N=5	16		
1B				26		2.33 *B*
2A	24/24 *100%*	SS	*3-4 5-7* N=9	23		3.10 *B*
3A	23/24 *96%*	SS	*3-3 5-5* N=8	19		2.33 *B*
4A	24/24 *100%*	SS	*5-6 5-7* N=11	23		2.68 *BSh*
5A	24/24 *100%*	SS	*2-2 3-4* N=5	26		1.83 *B*
6A	19/24 *79%*	SS	*2-2 3-5* N=5	17		2.18 *B*
7A	20/24 *83%*	SS	*2-3 3-3* N=6	22		1.16 *B*
8A	24/24 *100%*	SS	*5-14 14-20* N=28	16		1.36 *B*
8B				11		5.77 *BSh*
9A	12/24 *50%*	SS	*57-65*	10		
10A	24/24 *100%*	SS	*6-8 16-18* N=24	12		5.04 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Grayish brown (10YR5/2), clayey SILT, trace sand	624
2	Gray (10YR6/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand	
4	Light gray (10YR7/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand	622
6, 8, 10	Light gray (10YR7/1) with 15% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand	620, 618, 616
12, 14	Yellowish brown (10YR5/8) with 50% light gray (10YR7/1) mottles, sandy CLAY	614, 612
	Yellowish brown (10YR5/6), silty, fine SAND, trace medium sand and gravel, wet	
16	Yellowish brown (10YR5/6), sandy SILT, trace gravel	610
18	Yellowsh brown (10YR5/6) with 40% gray (10YR6/1) mottles, sandy SILT, trace gravel	608
20	Dark gray (10YR4/1), clayey SILT, trace sand and gravel	606

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-14
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 60 ft. BGS
Station: 875,740.0N
2,514,130.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*2-7 13-30* N=20	13		9.70 *B*	22	Dark gray (10YR4/1), clayey SILT, trace sand and gravel *[Continued from previous page]* (to 34 ft.)		604	
12A	24/24 *100%*	SS	*26-40 36-40* N=76	9		13.09 *BSP*	24			602	
13A	24/24 *100%*	SS	*8-18 28-34* N=46	9		8.73 *BSP*	26			600	
14A	22/24 *92%*	SS	*20-18 24-30* N=42	9		7.42 *BSP*	28			598	
15A	19/24 *79%*	SS	*8-27 33-67* N=60	9			30			596	
16A	24/24 *100%*	SS	*8-25 27-33* N=52	10		9.60 *BSh*	32			594	
17A	20/24 *83%*	SS	*11-15 20-24* N=35	14		6.80 *B*	34			592	
18A	24/24 *100%*	SS	*3-4 7-9* N=11	16		3.88 *B*	36	Dark gray (N4/1), lean CLAY, trace sand and gravel (34 to 40 ft.)		590	
19A	24/24 *100%*	SS	*8-12 13-15* N=25	16		6.18 *B*	38			588	
20A	24/24 *100%*	SS	*3-7 10-13* N=17	14		3.10 *B*	40			586	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-14
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 60 ft. BGS
Station: 875,740.0N
2,514,130.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
21A	23/24 *96%*	SS	*3-6 8-13* N=14	15		4.80 *B*
22A	24/24 *100%*	SS	*13-15 16-18* N=31	14		5.62 *B*
23A	24/24 *100%*	SS	*4-8 11-13* N=19	15		4.65 *B*
24A	24/24 *100%*	SS	*18-18 20-20* N=38	15		4.65 *B*
25A	24/24 *100%*	SS	*4-7 9-11* N=16	19		2.13 *BSh*
26A	22/24 *92%*	SS	*3-5 6-8* N=11	22		3.30 *BSh*
27A	24/24 *100%*	SS	*3-5 5-7* N=10	25		2.89 *BSh*
28A	21/24 *88%* 0/24 *0%*	SS SH	*4-6 7-8* N=13	22		3.71 *BSh*
29A	14/24 *58%*	SS	*0-0 0-0* N=0	22		3.09 *BSh*
30A	22/24 *92%*	SS	*5-6 8-12* N=14	19		4.46 *BSh*

Depth ft. BGS	Lithologic Description
to 48	Dark gray (N4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*
48	Dark gray (N4/1), clayey SILT, trace sand and gravel
	Gray (N4/1), wet, loose, fine- to medium-grained SAND
50	Dark gray (N4/1), clayey SILT, trace sand and gravel
	Greenish gray (5BG5/1), lean CLAY
52	Greenish gray (5BG5/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY
54	Greenish gray (5BG5/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY
56	Greenish gray (5BG5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY
58	Yellowish brown (10YR4/6) with 10% greenish gray (5BG5/1) mottles, lean CLAY
60	**End of Boring = 60.0 ft. BGS**

Depth scale: 42, 44, 46, 48, 50, 52, 54, 56, 58, 60
Elevation ft. MSL: 584, 582, 580, 578, 576, 574, 572, 570, 568, 566

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15b
Well ID: MW15D
Surface Elev: 624 ft. MSL
Completion: 39 ft. BGS
Station: 875,970.5N
2,515,080.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark brown (10YR3/3), clayey SILT			
								Dark grayish brown (10YR3/2), clayey SILT, trace sand			
							2	Grayish brown (10YR5/2), with 50% very dark gray (10YR3/1) mottles, lean CLAY, trace sand		622	
								Gray (10YR6/1), lean CLAY, trace sand			
							4			620	
								Yellowish brown (10YR5/6) with 40% gray (10YR6/1) mottles, lean CLAY, trace sand			
							6			618	
								Gray (10YR6/1), lean CLAY, trace sand			
							8			616	
							10			614	
								Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand, trace gravel			
							12			612	
								Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, silty, fine to medium SAND, trace coarse sand and gravel, wet			
							14			610	
								Pale brown (10YR6/3), clayey SILT, little sand, trace gravel			
							16	Yellowish brown (10YR5/4), silty, fine to coarse SAND, wet		608	
								Yellowish brown (10YR5/4) silty fine SAND, wet			
								Gray (10YR6/1), sandy SILT, trace medium to coarse sand and trace gravel		606	
							18				
								Dark gray (10YR4/1), clayey SILT, little sand, trace gravel			
							20			604	

NOTE(S): MW15D installed in blind-drilled borehole within 10 ft of SB-15.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15b
Well ID: MW15D
Surface Elev: 624 ft. MSL
Completion: 39 ft. BGS
Station: 875,970.5N
2,515,080.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							22 – 36	Dark gray (10YR4/1), clayey SILT, little sand, trace gravel *[Continued from previous page]*		602, 600, 598, 596, 594, 592, 590, 588	
							36 – 38	Dark gray (10YR4/1), silty, fine to medium SAND, trace coarse sand and gravel, wet		586	
							38 – 38.8	Very dark gray (10YR3/1), clayey SILT, little sand, trace gravel			

End of Boring = 38.80 ft. BGS
See SB-15 for sample & testing details

NOTE(S): MW15D installed in blind-drilled borehole within 10 ft of SB-15.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*2-2 3-4* N=5	19		
1B				27		1.94 *B*
2A	24/24 *100%*	SS	*2-2 4-6* N=6	25		3.10 *B*
3A	20/24 *83%*	SS	*2-3 3-5* N=6	29		2.10 *B*
4A	24/24 *100%*	SS	*4-6 5-5* N=11	24		1.75 *B*
5A	22/24 *92%*	SS	*1-2 3-4* N=5	26		1.55 *B*
6A	22/24 *92%*	SS	*2-3 3-4* N=6	22		1.85 *B*
	19/24 *79%*	SH				
7A	24/24 *100%*	SS	*4-4 5-5* N=9	23		1.22 *B*
7B				17		
8A	21/24 *88%*	SS	*2-6 15-19* N=21	11		3.22 *BSP*
9A	24/24 *100%*	SS	*18-29 40-50* N=69	20		
9B				21		
9C				9		
10A	17/24 *71%*	SS	*11-43 59/5"*	7		7.42 *B*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	Dark brown (10YR3/3), clayey SILT		
	Dark grayish brown (10YR3/2), clayey SILT, trace sand		
2	Grayish brown (10YR5/2), with 50% very dark gray (10YR3/1) mottles, lean CLAY, trace sand	622	
	Gray (10YR6/1), lean CLAY, trace sand		
4		620	
	Yellowish brown (10YR5/6) with 40% gray (10YR6/1) mottles, lean CLAY, trace sand		
6		618	
	Gray (10YR6/1), lean CLAY, trace sand		
8		616	
10		614	
	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand, trace gravel		
12		612	Shelby tube taken from shallow well borehole at indicated depth.
	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, silty, fine to medium SAND, trace coarse sand and gravel, wet		
14		610	
	Pale brown (10YR6/3), clayey SILT, little sand, trace gravel		
16		608	
	Yellowish brown (10YR5/4), silty, fine to coarse SAND, wet		
	Yellowish brown (10YR5/4) silty fine SAND, wet		
	Gray (10YR6/1), sandy SILT, trace medium to coarse sand and trace gravel		
18		606	
	Dark gray (10YR4/1), clayey SILT, little sand, trace gravel		
20		604	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
11A	14/24 *58%*	SS	*14-55 45/2"*	8		
12A	8/24 *33%*	SS	*100/8"*	8		6.76 *SP*
13A	23/24 *96%*	SS	*12-28 43-57/5"* N=71	5		
14A	8/24 *33%*	SS	*59-41/2"*	6		7.95 *BSh*
15A	16/24 *67%*	SS	*11-26 74/4"*	12		4.74 *BSh*
16A	12/24 *50%*	SS	*39-61*	7		
17A	10/24 *42%*	SS	*49-51/4"*	9		5.43 *B*
18A	11/24 *46%*	SS	*100-95*	11		
19A	8/24 *33%*	SS	*61-39/2"*	10		
20A	24/24 *100%*	SS	*21-41 21-24* N=62	12		16.00 *None*
20B				13		9.38

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
20–36	Dark gray (10YR4/1), clayey SILT, little sand, trace gravel *[Continued from previous page]*			
36–38	Dark gray (10YR4/1), silty, fine to medium SAND, trace coarse sand and gravel, wet			
38–39.3	Very dark gray (10YR3/1), clayey SILT, little sand, trace gravel			
39.3–40	Very dark gray (10YR3/1) with 20% dark grayish brown (10YR4/2) mottles, clayey SILT, trace sand and gravel			

Depth scale (ft. BGS): 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation scale (ft. MSL): 602, 600, 598, 596, 594, 592, 590, 588, 586, 584

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
						BSh				
21A	22/24 *92%*	SS	*3-7 11-18* N=18	19		6.11 *BSh*	40–42	Dark gray (10YR4/1), clayey SILT, trace sand and gravel	582	
22A	24/24 *100%*	SS	*4-7 8-10* N=15	23		4.46 *B*	42–44.4	Dark greenish gray (5GY4/1) with 30% dark gray (N4/1) mottles, lean CLAY, trace sand	580	
23A				21						
	24/24 *100%*	SS	*3-6 6-10* N=12				44.4–52	Dark gray (N4/1), lean CLAY, trace sand and gravel	578	
23B				16		3.69 *B*				
24A	24/24 *100%*	SS	*10-12 10-15* N=22	16		4.58 *B*			576	
25A	24/24 *100%*	SS	*2-4 7-9* N=11	16		4.65 *B*			574	
26A	19/24 *79%*	SS	*3-5 7-13* N=12	21		3.88 *B*			572	
27A	24/24 *100%*	SS	*8-10 8-13* N=18	25		3.49 *BSh*	52–54	Dark yellowish brown (10YR3/4) with 50% dark grayish brown (10YR4/2) mottles, lean CLAY, trace sand and gravel	570	
28A	24/24 *100%*	SS	*4-5 8-12* N=13	22		3.49 *BSh*	54–58	Greenish gray (10YR5/1) with 20% dark yellowish brown (10YR4/4) mottles, lean CLAY, trace sand and gravel	568	
29A	24/24 *100%*	SS	*5-9 15-18* N=24	20					566	
30A	24/24 *100%*	SS	*8-9 14-18* N=23	18		5.82 *BSh*	58–60	Olive (5Y4/3) with 15% greenish gray (10GY5/1) mottles, lean CLAY, trace sand and gravel	564	

Depth scale: 42, 44, 46, 48, 50, 52, 54, 56, 58, 60

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
31A	24/24 *100%*	SS	*4-7 13-15* N=20	18		5.42 *BSh*
32A	24/24 *100%*	SS	*10-15 11-16* N=26	20		4.74 *BSh*
33A	24/24 *100%*	SS	*6-10 11-13* N=21	16		6.98 *BSh*
34A	24/24 *100%*	SS	*11-14 18-31* N=32	18		6.98 *BSh*
35A	23/24 *96%*	SS	*9-18 27-40* N=45	15		11.95 *BSh*
36A	24/24 *100%*	SS	*4-12 18-24* N=30	16		7.15 *BSh*
37A	24/24 *100%*	SS	*17-29 36-47* N=65	17		8.24 *BSh*
38A	20/24 *83%*	SS	*12-18 23-28* N=41	17		6.59 *BSh*
39A	9/24 *38%*	SS	*29-39 48-66* N=87	16		
40A	24/24 *100%*	SS	*5-9 13-18* N=22	18		6.21 *B*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
60–64	Olive (5Y4/3) with 15% greenish gray (10GY5/1) mottles, lean CLAY, trace sand and gravel *[Continued from previous page]*		
64–66	Greenish gray (10Y5), lean CLAY, trace sand and gravel		
66–80	Dark yellowish brown (10YR4/4), lean CLAY, trace sand and gravel		

Depth scale (ft. BGS): 62, 64, 66, 68, 70, 72, 74, 76, 78, 80
Elevation scale (ft. MSL): 562, 560, 558, 556, 554, 552, 550, 548, 546, 544

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
41A	24/24 *100%*	SS	*6-8 13-16* N=21	17		5.82 *B*	82	Dark yellowish brown (10YR4/4), lean CLAY, trace sand and gravel *[Continued from previous page]*		542	
42A	24/24 *100%*	SS	*18-28 25-25* N=53	18		5.82 *BSh*	84			540	

End of Boring = 84.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/25/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15a
Well ID: MW15S
Surface Elev: 624 ft. MSL
Completion: 20 ft. BGS
Station: 875,971.1N
2,515,076.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark brown (10YR3/3), clayey SILT			
								Dark grayish brown (10YR3/2), clayey SILT, trace sand			
							2	Grayish brown (10YR5/2), with 50% very dark gray (10YR3/1) mottles, lean CLAY, trace sand		622	
								Gray (10YR6/1), lean CLAY, trace sand			
							4			620	
							▼ ▽	Yellowish brown (10YR5/6) with 40% gray (10YR6/1) mottles, lean CLAY, trace sand			
							6			618	
								Gray (10YR6/1), lean CLAY, trace sand			
							8			616	
							10			614	
								Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand, trace gravel			
							12			612	
							▼				
								Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, silty, fine to medium SAND, trace coarse sand and gravel, wet		610	
							14				
								Pale brown (10YR6/3), clayey SILT, little sand, trace gravel			
							16	Yellowish brown (10YR5/4), silty, fine to coarse SAND, wet		608	
								Yellowish brown (10YR5/4) silty fine SAND, wet			
								Gray (10YR6/1), sandy SILT, trace medium to coarse sand and trace gravel		606	
							18				
								Dark gray (10YR4/1), clayey SILT, little sand, trace gravel			

See SB-15 for sample & testing details
End of Boring = 19.62 ft. BGS

NOTE(S): MW15S installed in blind-drilled borehole within 10 ft of SB-15.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								Dark brown (10YR3/3), clayey SILT		
1A	24/24 *100%*	SS	*2-2 3-4* N=5	19				Dark grayish brown (10YR3/2), clayey SILT, trace sand		
1B				27		1.94 *B*	2	Grayish brown (10YR5/2), with 50% very dark gray (10YR3/1) mottles, lean CLAY, trace sand	622	
2A	24/24 *100%*	SS	*2-2 4-6* N=6	25		3.10 *B*		Gray (10YR6/1), lean CLAY, trace sand		
							4		620	
3A	20/24 *83%*	SS	*2-3 3-5* N=6	29		2.10 *B*		Yellowish brown (10YR5/6) with 40% gray (10YR6/1) mottles, lean CLAY, trace sand		
							6		618	
4A	24/24 *100%*	SS	*4-6 5-5* N=11	24		1.75 *B*		Gray (10YR6/1), lean CLAY, trace sand		
							8		616	
5A	22/24 *92%*	SS	*1-2 3-4* N=5	26		1.55 *B*				
							10		614	
6A	22/24 *92%*	SS	*2-3 3-4* N=6	22		1.85 *B*		Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand, trace gravel		
	19/24 *79%*	SH					12		612	Shelby tube taken from shallow well borehole at indicated depth.
7A	24/24 *100%*	SS	*4-4 5-5* N=9	23		1.22 *B*		Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, silty, fine to medium SAND, trace coarse sand and gravel, wet		
7B				17			14		610	
8A	21/24 *88%*	SS	*2-6 15-19* N=21	11		3.22 *BSP*		Pale brown (10YR6/3), clayey SILT, little sand, trace gravel		
							16		608	
9A				20				Yellowish brown (10YR5/4), silty, fine to coarse SAND, wet		
	24/24 *100%*	SS	*18-29 40-50* N=69					Yellowish brown (10YR5/4) silty fine SAND, wet		
9B				21				Gray (10YR6/1), sandy SILT, trace medium to coarse sand and trace gravel		
9C				9			18		606	
10A	17/24 *71%*	SS	*11-43 59/5"*	7		7.42 *B*		Dark gray (10YR4/1), clayey SILT, little sand, trace gravel		
							20		604	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
11A	14/24 *58%*	SS	*14-55 45/2"*	8		
12A	8/24 *33%*	SS	*100/8"*	8		6.76 *SP*
13A	23/24 *96%*	SS	*12-28 43-57/5"* N=71	5		
14A	8/24 *33%*	SS	*59-41/2"*	6		7.95 *BSh*
15A	16/24 *67%*	SS	*11-26 74/4"*	12		4.74 *BSh*
16A	12/24 *50%*	SS	*39-61*	7		
17A	10/24 *42%*	SS	*49-51/4"*	9		5.43 *B*
18A	11/24 *46%*	SS	*100-95*	11		
19A	8/24 *33%*	SS	*61-39/2"*	10		
20A	24/24 *100%*	SS	*21-41 21-24* N=62	12		16.00 *None*
20B				13		9.38

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
to 36	Dark gray (10YR4/1), clayey SILT, little sand, trace gravel *[Continued from previous page]*			
36–38	Dark gray (10YR4/1), silty, fine to medium SAND, trace coarse sand and gravel, wet			
38–~39.3	Very dark gray (10YR3/1), clayey SILT, little sand, trace gravel			
~39.3–40	Very dark gray (10YR3/1) with 20% dark grayish brown (10YR4/2) mottles, clayey SILT, trace sand and gravel			

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation scale: 602, 600, 598, 596, 594, 592, 590, 588, 586, 584

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*
						BSh
21A	22/24 *92%*	SS	*3-7 11-18* N=18	19		6.11 *BSh*
22A	24/24 *100%*	SS	*4-7 8-10* N=15	23		4.46 *B*
23A				21		
	24/24 *100%*	SS	*3-6 6-10* N=12			
23B				16		3.69 *B*
24A	24/24 *100%*	SS	*10-12 10-15* N=22	16		4.58 *B*
25A	24/24 *100%*	SS	*2-4 7-9* N=11	16		4.65 *B*
26A	19/24 *79%*	SS	*3-5 7-13* N=12	21		3.88 *B*
27A	24/24 *100%*	SS	*8-10 8-13* N=18	25		3.49 *BSh*
28A	24/24 *100%*	SS	*4-5 8-12* N=13	22		3.49 *BSh*
29A	24/24 *100%*	SS	*5-9 15-18* N=24	20		
30A	24/24 *100%*	SS	*8-9 14-18* N=23	18		5.82 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
40–42	Dark gray (10YR4/1), clayey SILT, trace sand and gravel	582	
42–44.4	Dark greenish gray (5GY4/1) with 30% dark gray (N4/1) mottles, lean CLAY, trace sand	580	
44.4–52	Dark gray (N4/1), lean CLAY, trace sand and gravel	578, 576, 574, 572	
52–54	Dark yellowish brown (10YR3/4) with 50% dark grayish brown (10YR4/2) mottles, lean CLAY, trace sand and gravel	570	
54–58	Greenish gray (10YR5/1) with 20% dark yellowish brown (10YR4/4) mottles, lean CLAY, trace sand and gravel	568, 566	
58–60	Olive (5Y4/3) with 15% greenish gray (10GY5/1) mottles, lean CLAY, trace sand and gravel	564	

Depth scale: 42, 44, 46, 48, 50, 52, 54, 56, 58, 60

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
31A	24/24 *100%*	SS	*4-7 13-15* N=20	18		5.42 *BSh*
32A	24/24 *100%*	SS	*10-15 11-16* N=26	20		4.74 *BSh*
33A	24/24 *100%*	SS	*6-10 11-13* N=21	16		6.98 *BSh*
34A	24/24 *100%*	SS	*11-14 18-31* N=32	18		6.98 *BSh*
35A	23/24 *96%*	SS	*9-18 27-40* N=45	15		11.95 *BSh*
36A	24/24 *100%*	SS	*4-12 18-24* N=30	16		7.15 *BSh*
37A	24/24 *100%*	SS	*17-29 36-47* N=65	17		8.24 *BSh*
38A	20/24 *83%*	SS	*12-18 23-28* N=41	17		6.59 *BSh*
39A	9/24 *38%*	SS	*29-39 48-66* N=87	16		
40A	24/24 *100%*	SS	*5-9 13-18* N=22	18		6.21 *B*

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
62	Olive (5Y4/3) with 15% greenish gray (10GY5/1) mottles, lean CLAY, trace sand and gravel *[Continued from previous page]*		562	
64 – 66	Greenish gray (10Y5), lean CLAY, trace sand and gravel		560, 558	
66 – 80	Dark yellowish brown (10YR4/4), lean CLAY, trace sand and gravel		556, 554, 552, 550, 548, 546, 544	

Depth scale: 62, 64, 66, 68, 70, 72, 74, 76, 78, 80

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
41A	24/24 *100%*	SS	*6-8 13-16* N=21	17		5.82 *B*	82	Dark yellowish brown (10YR4/4), lean CLAY, trace sand and gravel *[Continued from previous page]*		542	
42A	24/24 *100%*	SS	*18-28 25-25* N=53	18		5.82 *BSh*	84			540	

End of Boring = 84.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16b
Well ID: MW16D
Surface Elev: 626 ft. MSL
Completion: 51 ft. BGS
Station: 877,354.9N
2,515,079.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0	Black (10YR2/1), sl. moist, firm, clayey SILT with trace sand and trace gravel.		626	
							2	Brown (10YR4/3), sl. moist, firm, silty CLAY with trace sand.		624	
							4	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very soft, very silty CLAY with trace sand.		622	
							6	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, very silty CLAY with trace sand.		620	
							8–12	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with some sand and trace gravel.		618–614	
								Dark yellowish brown (10YR4/6), wet, sl. dense, silty, very fine- to fine-grained SAND.			
							14	Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with sand and trace gravel.		612	
								Dark yellowish brown (10YR4/6), wet, loose, silty, very fine- to fine-grained SAND.			
								Dark yellowish brown (10YR4/6), wet, soft, silty CLAY with sand and trace gravel.			
							16	Yellowish brown (10YR5/6), wet, loose, very fine- to very coarse-grained SAND.		610	
								Gray (10YR5/1), wet, loose, fine- to medium-grained SAND.			
							18	Gray (10YR5/1), moist, hard, clayey SILT with sand and trace gravel.		608	
								Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.			
							20	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.			

NOTE(S): MW16D installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-16b
Well ID: MW16D
Surface Elev: 626 ft. MSL
Completion: 51 ft. BGS
Station: 877,354.9N
2,515,079.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										606	
							22			604	
							24			602	
							26			600	
							28			598	
							30	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		596	
							32			594	
							34			592	
							36			590	
							38			588	
							40				

NOTE(S): MW16D installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-16b
Well ID: MW16D
Surface Elev: 626 ft. MSL
Completion: 51 ft. BGS
Station: 877,354.9N
2,515,079.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Gray (10YR5/1) with 50% black (10YR2/1) varves, very moist, soft SILT.		586	
							42	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.		584	
							44, 46, 48	Very dark greenish gray (10Y3/1), moist, hard, silty CLAY with sand and trace gravel.		582, 580, 578	
							50	Very dark bluish gray (5BG3/1), moist, firm, silty CLAY with trace sand and trace gravel.		576	

End of Boring = 51.00 ft. BGS
See SB-16 for sample & testing details

NOTE(S): MW16D installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING Blows / 6 in *N - Value* **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	21/24 *88%*	SS	*4-4 6-7* N=10	22		
1B				29		2.13 *B*
2A	24/24 *100%*	SS	*4-6 7-9* N=13	25		2.13 *B*
3A	20/24 *83%*	SS	*3-4 5-7* N=9	21		2.33 *B*
4A	24/24 *100%*	SS	*2-3 4-6* N=7	25		2.13 *B*
5A	24/24 *100%*	SS	*3-4 5-5* N=9	24		2.33 *B*
6A	24/24 *100%* / 24/24 *100%*	SS / SH	*2-4 4-5* N=8	24		1.75 *B*
7A	24/24 *100%*	SS	*4-7 7-7* N=14	22		1.94 *BSh*
7B				18		
8A	21/24 *88%*	SS	*1-2 2-4* N=4	20		
9A	18/24 *75%*	SS	*4-3 4-10* N=7	14		
9B				15		
10A				10		
10B	20/24 *83%*	SS	*27-54 59-59* N=113	17		

Depth ft. BGS / Lithologic Description / Elevation ft. MSL / Remarks (depth scale 0–20 ft; elevation 626–608 ft. MSL)

- Black (10YR2/1), sl. moist, firm, clayey SILT with trace sand and trace gravel.
- Brown (10YR4/3), sl. moist, firm, silty CLAY with trace sand.
- Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very soft, very silty CLAY with trace sand.
- Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, very silty CLAY with trace sand.
- Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with some sand and trace gravel.
  - Remarks: Shelby tube taken from shallow well borehole at indicated depth.
- Dark yellowish brown (10YR4/6), wet, sl. dense, silty, very fine- to fine-grained SAND.
- Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with sand and trace gravel.
- Dark yellowish brown (10YR4/6), wet, loose, silty, very fine- to fine-grained SAND.
- Dark yellowish brown (10YR4/6), wet, soft, silty CLAY with sand and trace gravel.
- Yellowish brown (10YR5/6), wet, loose, very fine- to very coarse-grained SAND.
- Gray (10YR5/1), wet, loose, fine- to medium-grained SAND.
- Gray (10YR5/1), moist, hard, clayey SILT with sand and trace gravel.
- Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.
- Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	10/24 *42%*	SS	*10-96*	8					606	
							22		604	
12A	14/24 *58%*	SS	*84-132*	10		3.10 *BSh*				
							24		602	
13A	20/24 *83%*	SS	*41-68* *82* N=150	10		7.56 *B*				
							26		600	
14A	12/24 *50%*	SS	*58-119*	10		9.89 *B*				Dusky red (7.5YR3/4) staining.
							28		598	
15A	24/24 *100%*	SS	*30-48* *70-71* N=118	9		5.62 *B*				
							30	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	596	
16A	24/24 *100%*	SS	*50-54* *68-93* N=122	9						
							32		594	
17A	35/36 *97%*	CS		17						
							34		592	
							36		590	
18A	60/60 *100%*	CS		10			38		588	
							40			Wood fragments.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
									586	
19A				19				Gray (10YR5/1) with 50% black (10YR2/1) varves, very moist, soft SILT.		
	60/60 *100%*	CS					42	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.	584	
							44		582	
19B				11						
							46	Very dark greenish gray (10Y3/1), moist, hard, silty CLAY with sand and trace gravel.	580	
20A	60/60 *100%*	CS		13						
							48		578	
	24/24 *100%*	SS	*6-14* *18-22* N=32				50		576	
21A				19		1.94 *B*	▽			
							52	Very dark bluish gray (5BG3/1), moist, firm, silty CLAY with trace sand and trace gravel.	574	Possible rock at end of auger.
	0/48 *0%*	CS								
							54		572	
	24/24 *100%*	SS	*2-7* *7-15* N=14				56		570	
22A				21		3.71 *BSh*		Greenish gray (5G6/1) with 40% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with sl. trace sand.		
	24/24 *100%*	SS	*4-8* *11-13* N=19				58		568	
23A				26		2.13 *BSh*				
	0/12 *0%*	BD					60			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*
	0/48 *0%*	RC				
26A	24/24 *100%*	SS	*32-34 42-51* N=76	25		2.72 *BSh*
	0/24 *0%*	RC				
	24/24 *100%*	SS	*15-21 21-21* N=42			
28A				18		2.72 *BSh*
29A	24/24 *100%*	SS	*14-17 21-25* N=38	20		2.91 *BSh*
30A	24/24 *100%*	SS	*12-21 34-35* N=55	18		5.04 *BSh*
31A	24/24 *100%*	SS	*16-21 27-35* N=48	16		8.15 *BSh*
32A	60/60 *100%*	CS		19		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
to 62.7	Greenish gray (5G6/1) with 40% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with sl. trace sand. *[Continued from previous page]*	566–563.3	
62.7–70	Yellowish brown (10YR5/6) with 20% greenish gray (5G6/1) mottles, moist, hard, silty CLAY with trace sand and trace coal fragments.	563.3–556	
70–80	Yellowish brown (10YR5/6) with zones of gray (10YR4/1) mottles, moist, hard, clayey SILT with some sand and trace gravel.	556–546	70' to 79.5' - possible oxidation rinds.

Depth scale: 62, 64, 66, 68, 70, 72, 74, 76, 78, 80. Elevation scale: 566, 564, 562, 560, 558, 556, 554, 552, 550, 548.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Reynolds Drilling Corp.		
Site: CCB Management Facility	**Rig mfg/model:** CME-850 Track Rig	**BOREHOLE ID:** SB-16	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS & CME samplers	**Well ID:** n/a	
Project: 05S3004A		**Surface Elev:**	626 ft. MSL
DATES: Start: 4/21/2006	**FIELD STAFF: Driller:** K. Doetzel	**Completion:**	92 ft. BGS
Finish: 4/25/2006	**Helper:** S. McCartney	**Station:**	877,355.0N
WEATHER: Overcast, cool (mid-40's)	**Eng/Geo:** R. Hasenyager		2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							80–82.4	Yellowish brown (10YR5/6) with zones of gray (10YR4/1) mottles, moist, hard, clayey SILT with some sand and trace gravel. *[Continued from previous page]*	546–544	
33A	60/60 *100%*	CS		16			82.4–86.5	Yellow brown (10YR5/6), very moist, very soft, clayey, very fine-grained SAND and SILT.	544–540	
	0/60 *0%*	CS					86.5–90.5	Yellowish brown (10YR5/6), moist, hard, silty CLAY with sand and trace gravel.	540–536	Possible rock at end of auger.
35A	24/24 *100%*	SS	*9* *11-16* N=20			2.72 *BSh*	90.5–92	Dark gray (10YR3/1), moist, firm, silty CLAY with sand and trace gravel.		

End of Boring = 92.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/25/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16a
Well ID: MW16S
Surface Elev: 626 ft. MSL
Completion: 20 ft. BGS
Station: 877,355.1N
2,515,088.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Black (10YR2/1), sl. moist, firm, clayey SILT with trace sand and trace gravel.			
							2	Brown (10YR4/3), sl. moist, firm, silty CLAY with trace sand.		624	
							4	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very soft, very silty CLAY with trace sand.		622	
							6	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, very silty CLAY with trace sand.		620	
							8, 10, 12	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with some sand and trace gravel.		618, 616, 614	
								Dark yellowish brown (10YR4/6), wet, sl. dense, silty, very fine- to fine-grained SAND.			
							14	Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with sand and trace gravel.		612	
								Dark yellowish brown (10YR4/6), wet, loose, silty, very fine- to fine-grained SAND.			
								Dark yellowish brown (10YR4/6), wet, soft, silty CLAY with sand and trace gravel.			
							16	Yellowish brown (10YR5/6), wet, loose, very fine- to very coarse-grained SAND.		610	
								Gray (10YR5/1), wet, loose, fine- to medium-grained SAND.			
							18	Gray (10YR5/1), moist, hard, clayey SILT with sand and trace gravel.		608	
								Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.			
								Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.			

End of Boring = 19.90 ft. BGS
See SB-16 for sample & testing details

NOTE(S): MW16S installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	21/24 *88%*	SS	*4-4 6-7* N=10	22			0	Black (10YR2/1), sl. moist, firm, clayey SILT with trace sand and trace gravel.	626	
1B				29		2.13 *B*		Brown (10YR4/3), sl. moist, firm, silty CLAY with trace sand.		
2A	24/24 *100%*	SS	*4-6 7-9* N=13	25		2.13 *B*	2	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very soft, very silty CLAY with trace sand.	624	
3A	20/24 *83%*	SS	*3-4 5-7* N=9	21		2.33 *B*	4		622	
4A	24/24 *100%*	SS	*2-3 4-6* N=7	25		2.13 *B*	6	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, very silty CLAY with trace sand.	620	
5A	24/24 *100%*	SS	*3-4 5-5* N=9	24		2.33 *B*	8	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with some sand and trace gravel.	618	
6A	24/24 *100%* 24/24 *100%*	SS SH	*2-4 4-5* N=8	24		1.75 *B*	10		616	Shelby tube taken from shallow well borehole at indicated depth.
7A	24/24 *100%*	SS	*4-7 7-7* N=14	22		1.94 *BSh*	12		614	
7B				18				Dark yellowish brown (10YR4/6), wet, sl. dense, silty, very fine- to fine-grained SAND.		
							14	Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with sand and trace gravel.	612	
								Dark yellowish brown (10YR4/6), wet, loose, silty, very fine- to fine-grained SAND.		
8A	21/24 *88%*	SS	*1-2 2-4* N=4	20				Dark yellowish brown (10YR4/6), wet, soft, silty CLAY with sand and trace gravel.		
9A	18/24 *75%*	SS	*4-3 4-10* N=7	14			16	Yellowish brown (10YR5/6), wet, loose, very fine- to very coarse-grained SAND.	610	
								Gray (10YR5/1), wet, loose, fine- to medium-grained SAND.		
9B				15			18	Gray (10YR5/1), moist, hard, clayey SILT with sand and trace gravel.	608	
10A	20/24 *83%*	SS	*27-54 59-59* N=113	10				Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.		
10B				17				Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.		
							20			

Water level symbols: ▼ at approx. 5.7 ft; ▼ at approx. 12.8 ft.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	10/24 *42%*	SS	*10-96*	8					606	
12A	14/24 *58%*	SS	*84-132*	10		3.10 *BSh*	22		604	
13A	20/24 *83%*	SS	*41-68 82* N=150	10		7.56 *B*	24		602	
14A	12/24 *50%*	SS	*58-119*	10		9.89 *B*	26		600	Dusky red (7.5YR3/4) staining.
15A	24/24 *100%*	SS	*30-48 70-71* N=118	9		5.62 *B*	28		598	
16A	24/24 *100%*	SS	*50-54 68-93* N=122	9			30	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	596	
17A	35/36 *97%*	CS		17			32		594	
							34		592	
18A	60/60 *100%*	CS		10			36		590	
							38		588	
							40			Wood fragments.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
									586	
19A	60/60 *100%*	CS		19			40.5–41.1	Gray (10YR5/1) with 50% black (10YR2/1) varves, very moist, soft SILT.		
							41.1–42.7	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.	584	
19B				11			42.7–50	Very dark greenish gray (10Y3/1), moist, hard, silty CLAY with sand and trace gravel.	582, 580, 578	
20A	60/60 *100%*	CS		13						
21A	24/24 *100%*	SS	*6-14* *18-22* N=32	19		1.94 *B*	50–55	Very dark bluish gray (5BG3/1), moist, firm, silty CLAY with trace sand and trace gravel.	576, 574, 572	Possible rock at end of auger.
	0/48 *0%*	CS					▽ 51.37			
22A	24/24 *100%*	SS	*2-7* *7-15* N=14	21		3.71 *BSh*	55–60	Greenish gray (5G6/1) with 40% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with sl. trace sand.	570, 568	
	24/24 *100%*	SS	*4-8* *11-13* N=19							
23A	0/12 *0%*	BD		26		2.13 *BSh*	60			

Depth scale: 42, 44, 46, 48, 50, 52, 54, 56, 58, 60

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
	0/48 *0%*	RC				
26A	24/24 *100%*	SS	*32-34 42-51* N=76	25		2.72 *BSh*
	0/24 *0%*	RC				
	24/24 *100%*	SS	*15-21 21-21* N=42			
28A				18		2.72 *BSh*
	24/24 *100%*	SS	*14-17 21-25* N=38			
29A				20		2.91 *BSh*
	24/24 *100%*	SS	*12-21 34-35* N=55			
30A				18		5.04 *BSh*
	24/24 *100%*	SS	*16-21 27-35* N=48			
31A				16		8.15 *BSh*
	60/60 *100%*	CS				
32A				19		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
to 62.7	Greenish gray (5G6/1) with 40% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with sl. trace sand. *[Continued from previous page]*		
62.7–70	Yellowish brown (10YR5/6) with 20% greenish gray (5G6/1) mottles, moist, hard, silty CLAY with trace sand and trace coal fragments.		
70–80	Yellowish brown (10YR5/6) with zones of gray (10YR4/1) mottles, moist, hard, clayey SILT with some sand and trace gravel.		70' to 79.5' - possible oxidation rinds.

Depth scale (ft. BGS): 62, 64, 66, 68, 70, 72, 74, 76, 78, 80
Elevation scale (ft. MSL): 566, 564, 562, 560, 558, 556, 554, 552, 550, 548

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	60/60 *100%*	CS					80–82.4	Yellowish brown (10YR5/6) with zones of gray (10YR4/1) mottles, moist, hard, clayey SILT with some sand and trace gravel. *[Continued from previous page]*	546–544	
33A				16			82.4–86.5	Yellow brown (10YR5/6), very moist, very soft, clayey, very fine-grained SAND and SILT.	544–540	
	0/60 *0%*	CS					86.5–90.5	Yellowish brown (10YR5/6), moist, hard, silty CLAY with sand and trace gravel.	540–536	Possible rock at end of auger.
35A	24/24 *100%*	SS	*9* *11-16* N=20			2.72 *BSh*	90.5–92	Dark gray (10YR3/1), moist, firm, silty CLAY with sand and trace gravel.	536–534	

End of Boring = 92.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								Dark grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.		
1A	20/24 *83%*	SS	*1-1 1-1* N=2	29				Yellowish brown (10YR5/8), moist, soft, silty CLAY.	626	
2A	24/24 *100%*	SS	*1-1 2-2* N=3	26		1.71 *None*	2	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with little sand and trace gravel.	624	
3A	24/24 *100%*	SS	*1-1 1-3* N=2	16		2.62 *BSh*	4	Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.	622	
4A	24/24 *100%*	SS	*1-2 2-3* N=4	18		2.33 *B*	6	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.	620	
5A	24/24 *100%*	SS	*1-1 2-3* N=3	18			8		618	
							10	Yellowish brown (10YR5/6), moist, soft, very sandy, clayey SILT.		
6A	24/24 *100%*	SS	*1-1 1-1* N=2	21		0.58 *B*		Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, very moist, soft, very sandy, clayey SILT.	616	
6B				18				Moderate yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND.		
7A	24/24 *100%*	SS	*1-1 3-7* N=4	21			12	Yellowish brown (10YR5/6), wet, dense, silty, very fine- to fine-grained SAND.	614	
7B				19				Yellowish brown (10YR5/6), very moist, dense, silty, very fine-grained SAND.		
8A				15			14	Yellowish brown (10YR5/6) wet, dense, fine- to medium-grained SAND.		
	24/24 *100%*	SS	*2-5 5-7* N=10					Moderate yellowish brown (10YR5/4), wet, dense, SILT and very fine-grained SAND.	612	
8B				13				Yellowish brown (10YR5/6), moist, clayey SILT and very fine-grained SAND with trace gravel.		
8C				13			16			
9A	24/24 *100%*	SS	*0-6 6-6* N=12	17				Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND.	610	
							18	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.		
10A	24/24 *100%*	SS	*0-2 2-3* N=4	19				Yellowish brown (10YR5/6), wet, sl. dense, SILT with some very fine-grained SAND.	608	
10B				23			20	Gray (10YR5/1), wet, sl. dense, SILT with some very		

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								fine-grained SAND.		
11A	12/24 *50%*	SS	*0-1* *1-2* N=2	21			22	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.	606	
12A	24/24 *100%*	SS	*2-2* *5-7* N=7	18				Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.	604	
12B				9		4.65 *BSh*	24			
13A	25/60 *42%*	CS					26, 28		602, 600, 598	
14A	60/60 *100%*	CS		9			30, 32, 34	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	596, 594	
15A	60/60 *100%*	CS		16			36	Gray (10YR5/1), wet, dense, very fine- to fine-grained SAND.	592, 590	
15B				8			38, 40	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	588	

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
	48/60 *80%*	CS				
16A				14		
16B				8		
	60/60 *100%*	CS				
17A				13		
	60/60 *100%*	CS				
18A				22		
18B				16		
18C				11		

Depth ft. BGS	Lithologic Description
40.0–51.5	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*
51.5–52.1	Dark bluish gray (10BG4/1), moist, hard, silty CLAY with little sand.
52.1–52.7	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.
52.7–53.3	Gray (10YR5/1), moist, firm, silty, very fine-grained to fine-grained SAND.
53.3–53.87	Dark bluish gray (10BG4/1), moist, hard, silty CLAY with little sand.

End of Boring = 53.87 ft.

Depth scale (ft. BGS): 42, 44, 46, 48, 50, 52
Elevation scale (ft. MSL): 586, 584, 582, 580, 578, 576, 574

Borehole Detail | Remarks

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17a
Well ID: MW17S
Surface Elev: 627 ft. MSL
Completion: 24 ft. BGS
Station: 878,658.5N
2,515,084.8E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.			
								Yellowish brown (10YR5/8), moist, soft, silty CLAY.		626	
							2	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with little sand and trace gravel.		624	
							4	Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.		622	
							6				
							▼	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.		620	
							8			618	
							10	Yellowish brown (10YR5/6), moist, soft, very sandy, clayey SILT.			
							▼	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, very moist, soft, very sandy, clayey SILT.		616	
							12	Moderate yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND.			
								Yellowish brown (10YR5/6), wet, dense, silty, very fine- to fine-grained SAND.		614	
								Yellowish brown (10YR5/6), very moist, dense, silty, very fine-grained SAND.			
							14	Yellowish brown (10YR5/6) wet, dense, fine- to medium-grained SAND.			
								Moderate yellowish brown (10YR5/4), wet, dense, SILT and very fine-grained SAND.		612	
								Yellowish brown (10YR5/6), moist, clayey SILT and very fine-grained SAND with trace gravel.			
							16	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND.		610	
							18	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.			
								Yellowish brown (10YR5/6), wet, sl. dense, SILT with some very fine-grained SAND.		608	
							20	Gray (10YR5/1), wet, sl. dense, SILT with some very			

NOTE(S): MW17S installed in blind-drilled borehole within 10 ft of SB-17.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17a
Well ID: MW17S
Surface Elev: 627 ft. MSL
Completion: 24 ft. BGS
Station: 878,658.5N
2,515,084.8E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								fine-grained SAND.			
							22	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.		606	
								Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.		604	
							24	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.			

End of Boring = 24.11 ft. BGS
See SB-17 for sample & testing details

NOTE(S): MW17S installed in blind-drilled borehole within 10 ft of SB-17.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								Dark grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.		
1A	20/24 *83%*	SS	*1-1* *1-1* N=2	29				Yellowish brown (10YR5/8), moist, soft, silty CLAY.	626	
2A	24/24 *100%*	SS	*1-1* *2-2* N=3	26		1.71 *None*	2	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with little sand and trace gravel.	624	
3A	24/24 *100%*	SS	*1-1* *1-3* N=2	16		2.62 *BSh*	4	Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.	622	
4A	24/24 *100%*	SS	*1-2* *2-3* N=4	18		2.33 *B*	6	▼ Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.	620	
5A	24/24 *100%*	SS	*1-1* *2-3* N=3	18			8	Yellowish brown (10YR5/6), moist, soft, very sandy, clayey SILT.	618	
6A	24/24 *100%*	SS	*1-1* *1-1* N=2	21		0.58 *B*	10	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, very moist, soft, very sandy, clayey SILT. ▼	616	
6B				18				Moderate yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND.		
7A	24/24 *100%*	SS	*1-1* *3-7* N=4	21			12	Yellowish brown (10YR5/6), wet, dense, silty, very fine- to fine-grained SAND.	614	
7B				19				Yellowish brown (10YR5/6), very moist, dense, silty, very fine-grained SAND.		
8A	24/24 *100%*	SS	*2-5* *5-7* N=10	15			14	Yellowish brown (10YR5/6) wet, dense, fine- to medium-grained SAND.		
8B				13				Moderate yellowish brown (10YR5/4), wet, dense, SILT and very fine-grained SAND.	612	
8C				13				Yellowish brown (10YR5/6), moist, clayey SILT and very fine-grained SAND with trace gravel.		
9A	24/24 *100%*	SS	*0-6* *6-6* N=12	17			16	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND.	610	
							18	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.		
10A	24/24 *100%*	SS	*0-2* *2-3* N=4	19				Yellowish brown (10YR5/6), wet, sl. dense, SILT with some very fine-grained SAND.	608	
10B				23			20	Gray (10YR5/1), wet, sl. dense, SILT with some very		

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								fine-grained SAND.		
11A	12/24 *50%*	SS	*0-1 1-2* N=2	21			22	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.	606	
12A	24/24 *100%*	SS	*2-2 5-7* N=7	18				Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.	604	
12B				9		4.65 *BSh*	24		602	
13A	25/60 *42%*	CS					26, 28		600, 598	
14A	60/60 *100%*	CS		9			30, 32, 34	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	596, 594, 592	
15A	60/60 *100%*	CS		16			36	Gray (10YR5/1), wet, dense, very fine- to fine-grained SAND.	590	
15B				8			38, 40	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	588	

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	48/60 *80%*	CS							586	
							42			
16A				14						
16B				8					584	
							44			
									582	
	60/60 *100%*	CS					46	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		
									580	
17A				13			48			
									578	
							50			
	60/60 *100%*	CS							576	
18A				22				Dark bluish gray (10BG4/1), moist, hard, silty CLAY with little sand.		
18B				16			52	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		
18C				11				Gray (10YR5/1), moist, firm, silty, very fine-grained to fine-grained SAND.	574	
								Dark bluish gray (10BG4/1), moist, hard, silty CLAY with little sand.		

End of Boring = 53.87 ft.

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-18a
Well ID: MW18S
Surface Elev: 626 ft. MSL
Completion: 16 ft. BGS
Station: 878,604.7N
2,513,745.2E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–0.6	Dark grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.			
							0.6–2	Yellowish brown (10YR5/6) with 50% gray (10YR4/1) mottles, moist, silty CLAY with little sand.		624	
							2–4	Yellowish brown (10YR5/6) with 10% gray (10YR4/1) mottles, moist, silty CLAY with little sand.		622	
							4–11.2 (▼ 6.87)	Gray (10YR4/1)with 10% Yellowish brown (10YR5/6) mottles, moist, silty CLAY with little sand.		620, 618, 616	
							11.2–12.4 (▼ 12.20)	Light gray (10YR6/1) moist, soft, clayey, very fine- to fine-grained SAND.		614	
							12.4–13	Light gray (10YR6/1) moist, soft, silty, very fine- to fine-grained SAND.			
							13–14	Yellowish brown (10YR5/6), very moist, soft, silty, very fine- to fine-grained, SAND with trace gravel.		612	
							14–14.6	Yellowish brown (10YR5/6), wet, loose, fine- to medium-grained SAND.			
							14.6–15.1	Yellowish brown (10YR5/6), very moist, soft, sandy (very fine- to fine-grained) SILT.			
							15.1–16.4	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		610	

End of Boring = 16.40 ft. BGS
See SB-18 for sample & testing details

NOTE(S): MW18S installed in blind-drilled borehole within 10 ft of SB-18.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-18
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 54 ft. BGS
Station: 878,605.0N
2,513,750.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL
							0	Dark grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.	626
1A	18/24 *75%*	SS	*0-1 1-1* N=2	24		1.31 *BSh*		Yellowish brown (10YR5/6) with 50% gray (10YR4/1) mottles, moist, silty CLAY with little sand.	624
2A	24/24 *100%*	SS	*1-2 2-2* N=4	28		1.78 *Sh*	2	Yellowish brown (10YR5/6) with 10% gray (10YR4/1) mottles, moist, silty CLAY with little sand.	622
3A	24/24 *100%*	SS	*1-2 2-2* N=4	23		1.32 *BSh*	4	Gray (10YR4/1)with 10% Yellowish brown (10YR5/6) mottles, moist, silty CLAY with little sand.	620
4A	24/24 *100%*	SS	*1-1 1-2* N=2	24		1.09 *B*	6		618
5A	24/24 *100%*	SS	*1-1 1-2* N=2	28		0.54 *BSh*	8		616
6A	24/24 *100%*	SS	*0-0 1-2* N=1	21		0.39 *B*	10	Light gray (10YR6/1) moist, soft, clayey, very fine- to fine-grained SAND.	614
7A	24/24 *100%*	SS	*3-5 9-15* N=14	17			12	Light gray (10YR6/1) moist, soft, silty, very fine- to fine-grained SAND.	
7B				15				Yellowish brown (10YR5/6), very moist, soft, silty, very fine- to fine-grained, SAND with trace gravel.	612
8A	24/24 *100%*	SS	*8-9 9-10* N=18	14			14	Yellowish brown (10YR5/6), wet, loose, fine- to medium-grained SAND.	
8B				11				Yellowish brown (10YR5/6), very moist, soft, sandy (very fine- to fine-grained) SILT.	610
8C				9			16		
9A	24/36 *67%*	CS					18	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	608
							20		606

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-18
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 54 ft. BGS
Station: 878,605.0N
2,513,750.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
10A	60/60 *100%*	CS					22, 24			604, 602	
11A	60/60 *100%*	CS		5			26, 28	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		600, 598	
12A	60/60 *100%*	CS		11			30, 32, 34			596, 594, 592	Coal fragment seam
13A	60/60 *100%*	CS		10			36	Gray (10YR5/1), moist, dense, SILT.		590, 588	
13B				12			38, 40	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		586	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-18
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 54 ft. BGS
Station: 878,605.0N
2,513,750.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	60/60 *100%*	CS					42		584	Appears more clayey
14A				13			44		582	
	60/60 *100%*	CS					46	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	580	
15A				13			48		578	
							50		576	
16A	60/60 *100%*	CS		13			52		574	
16B				22			54	Greenish gray (10BG5/1), moist, firm, silty CLAY with little sand and trace gravel.	572	

End of Boring = 54.0 ft.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: Ash Pond Investigation
Location: Coffeen, IL
Project: 05S3004B
DATES: Start: 5/1/2007
Finish: 5/1/2007
WEATHER: Partly sunny, warm

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" Hollow stem auger with split spoon sampler
FIELD STAFF: Driller: A. Rachford
Helper: M. Brown
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB20
Well ID: MW20S
Surface Elev: 620.30 ft. MSL
Completion: 16.00 ft. BGS
Station: 874,226.44N
2,515,867.87E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 4.28 - 05/10/2007
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	12/24 *50%*	SS						Black (10YR2/1), moist, firm, clayey SILT with slight trace sand (TOPSOIL)	620	
1A				24.9						
1B				19.9			2	Gray (10YR6/1),moist, form, clayey SILT with roots and slight trace sand	618	
2A	23/24 *96%*	SS		28.9		2.33 BSh	4	Gray (10YR5/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	616	
3A	13/24 *54%*	SS		17.2			6	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand	614	
4A	24/24 *100%*	SS		20.5		2.52 B		Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel		
4B				20.6		2.33 B	8	Gray (10YR6/1), moist, firm, silty CLAY with trace sand and slight trace gravel	612	
5A	24/24 *100%*	SS		23.1		1.63 B		Yellowish brown (10YR5/8) with 10% gray (10YR6/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel		
5B				24.0		1.07 B	10	Yellowish brown (10YR5/8), very moist, soft, sandy CLAY with some silt	610	
6A	24/24 *100%*	SS		16.4						
6B				19.1		0.39 B		Yellowish brown (10YR5/8), very moist, soft, clayey, very fine- to medium-grained SAND		
6C				17.5			12	Gray (10YR6/1), wet, loose, very fine- to medium-grained SAND with trace coarse-grained sand	608	
7A	13/16 *81%*	SS		19.1				Brown (10YR5/3), moist, very hard, very silty CLAY with sand and gravel		
7B				11.7		1.75 BSh				
							14	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel	606	
8A	22/24 *92%*	SS		9.0		4.80 BSh	16			

End of Boring = 16.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/8/2010
Finish: 10/8/2010
WEATHER: Sunny, mild

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA (blind drill)
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: R104
Well ID: R104
Surface Elev: 629.03 ft. MSL
Completion: 19.85 ft. BGS
Station: 875,857.80N
2,514,503.41E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–4.5	FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with slight trace sand and gravel.		628, 626	
							4.5–6.4	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.		624	
							6.4–12	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.		622, 620, 618	
							12–14.6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.		616	
							14.6–16	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.		614	
							16–16.6	Gray (10YR6/1), moist, very soft, clayey, very fine- to coarse-grained SAND with trace gravel.			
							16.6–18.2	Brown (10YR5/3), slightly moist, hard, very silty CLAY with trace sand and gravel.		612	
							18.2–19.85	Gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		610	

End of Boring = 19.85 ft. BGS

NOTE(S): R104 blind drilled in borehole approximately 8 ft. north of G104. Lithology taken from G104.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G104	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G104	
Project: 05S3004A		**Surface Elev:** 627.96 ft. MSL	
DATES: Start: 2/15/2010	**FIELD STAFF: Driller:** T. List	**Completion:** 20.00 ft. BGS	
Finish: 2/15/2010	**Helper:** M. Herbst/S. Hamby	**Station:** 875,849.26N	
WEATHER: Overcast, cold, windy (lo-20's)	**Eng/Geo:** S. Suzanna Simpson	2,514,504.98E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
∇ = 15.40 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	16/24 *67%*	SS	*9-11 12-14* N=23	16			0–4.5	FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with slight trace sand and gravel.		
2A	20/24 *83%*	SS	*3-5 9-12* N=14	21						
3A	19/24 *79%*	SS	*3-6 8-9* N=14	21			4.5–6.4	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.		
4A	17/24 *71%*	SS	*2-3 4-7* N=7	25			6.4–12	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.		
5A	22/24 *92%*	SS	*1-2 5-8* N=7	24						
6A	18/24 *75%*	SS	*1-2 3-5* N=5	21						
7A	23/24 *96%*	SS	*woh-2 3-4* N=5	23			12–14.6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.		
8A	22/24 *92%*	SS	*1-3 3-3* N=6	24			14.6–16	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.		
9A				16			16–16.6	Gray (10YR6/1), moist, very soft, clayey, very fine- to coarse-grained SAND with trace gravel.		
9B	17/24 *71%*	SS	*woh-6 27-40* N=33	13			16.6–18.2	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.		
10A	22/24 *92%*	SS	*10-24 44-66* N=68	7			18.2–20	Gray (10YR4/1), slightly moist, hard, clayey SILT with sand and gravel.		

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale (ft. MSL): 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/15/2010
Finish: 10/15/2010
WEATHER: Sunny (mid-50's)

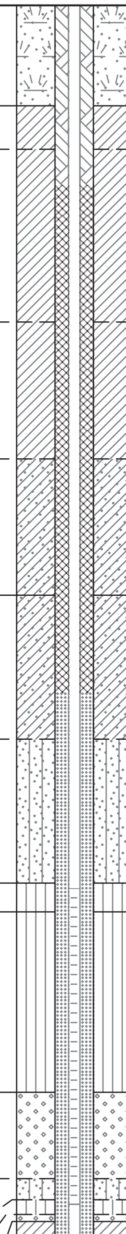
CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: R201
Well ID: R201
Surface Elev: 624.02 ft. MSL
Completion: 17.22 ft. BGS
Station: 877,925.26N
2,514,841.96E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Very dark grayish brown (10YR3/2), moist, soft, friable, clayey SILT, slight trace sand and gravel			
							2	Dark brown (10YR3/3), moist, soft, silty CLAY		622	
							4	Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel		620	
							6	Gray (10YR5/1) with 5% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY, sand and trace gravel		618	
							8	Gray (10YR5/1), moist, firm, sandy CLAY, trace silt and slight trace gravel		616	
							10	Yellowish brown (10YR5/8) with 10% gray (10YR5/1) mottles, moist, firm, sandy CLAY, trace gravel		614	
							12	Yellowish brown (10YR5/8), wet, soft, silty SAND, trace gravel		612	
								Yellowish brown (10YR5/8), moist, firm, clayey SILT			
							14	Greenish gray (5GY6/1), moist, firm, interbedded clayey SILT and SILT		610	
							16	Yellowish brown (10YR5/8), wet, soft, fine- to coarse-grained SAND, slight trace gravel		608	
								Yellowish brown (10YR5/8), wet, firm, very fine- to fine-grained silty SAND			
								Gray (10YR5/1), wet, soft, SILT			
								Gray (10YR5/1), wet, soft, fine- to coarse-grained SAND, slight trace gravel			
								Gray (10YR5/1), moist, hard, very silty CLAY, trace sand and gravel			



End of Boring = 17.22 ft. BGS

NOTE(S): R201 blind drilled in borehole approximately 8 ft. west of G201. Lithology taken from G201.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Power Station - Gypsum Mgmt Facility
Location: Coffeen, IL
Project: 15E0161A
DATES: Start: 3/20/2017
Finish: 3/20/2017
WEATHER: Sunny, mild, (mid-60s)

CONTRACTOR: Bulldog Drilling
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: J. Gates
Helper: C. Clines
Eng/Geo: R. Hasenyager

BOREHOLE ID: R205
Well ID: R205
Surface Elev: 621.91 ft. MSL
Completion: 16.42 ft. BGS
Station: 875,548.77N
2,515,910.12E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - Upon Completion
▼ = 2.50 - 3/21/2017
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Very dark grayish brown (10YR3/2), moist, firm, clayey SILT			
							2	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand		620	
							4	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY, slight trace sand		618	
							6	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand, slight trace gravel		616	
							8			614	
							10	Yellowish brown (10YR5/6), moist, firm, silty CLAY with sand, trace gravel		612	
							12	Yellowish brown (10YR5/6), moist, soft, sandy SILT, slight trace gravel		610	
							14	Yellowish brown (10YR 5/4), moist, soft, silty SAND, trace gravel		608	
							16	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel		606	

End of Boring = 16.42 ft. BGS

NOTE(S): R205 installed in blind drilled boring approximately 5 ft. west of G205. Lithologies from boring G205.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/21/2008
Finish: 2/21/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-650 Track Drill
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: .

BOREHOLE ID: G205
Well ID: G205
Surface Elev: 622.15 ft. MSL
Completion: 16.00 ft. BGS
Station: 875,550.19N
2,515,914.87E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.10 - While drilling
▼ = 5.06 - 3/12/08
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	24/24 *100%*	SS	*4-3 4-4* N=7	22		
1B				30		1.67 Sh
2A	19/24 *79%*	SS	*3-5 6-5* N=11	24		1.86 B
3A	20/24 *83%*	SS	*2-2 5-5* N=7	19		1.55 B
4A	19/24 *79%*	SS	*5-6 7-8* N=13	20		1.12 B
5A	16/24 *67%*	SS	*2-2 3-5* N=5	20		0.62 BSh
6A	22/24 *92%*	SS	*1-2 3-3* N=5	17		0.62 BSh
6B				17		
7A				25		
7B	23/24 *96%*	SS	*3-3 5-6* N=8	17		1.36 BSh
8A				15		
8B	17/24 *71%*	SS	*5-19 26-35* N=45	10		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Very dark grayish brown (10YR3/2), moist, firm, clayey SILT	622
2	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand	620
4	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY, slight trace sand	618
6	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand, slight trace gravel	616
8	Yellowish brown (10YR5/6), moist, firm, silty CLAY with sand, trace gravel	614
10		612
	Yellowish brown (10YR5/6), moist, soft, sandy SILT, slight trace gravel	
12		610
	Yellowish brown (10YR 5/4), moist, soft, silty SAND, trace gravel	
14		608
	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel	
16		

Borehole Detail | Remarks

End of Boring = 16.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/10/2010
Finish: 2/10/2010
WEATHER: Overcast, wind 15mph, ~10-20F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: .

BOREHOLE ID: T127
Well ID: T127
Surface Elev: 625.53 ft. MSL
Completion: 19.80 ft. BGS
Station: 875,359.21N
2,513,911.02E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.30 - While drilling
▼ = 18.00 - Upon completion
▽ = 11.26 - 3/1/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1	24/24 *100%*	SS	*8-5 5-8* N=10			
2	10/24 *42%*	SS	*5-6 7-11* N=13			
3	20/24 *83%*	SS	*1-4 5-7* N=9			
4	24/24 *100%*	SS	*2-4 5-6* N=9			
5	24/24 *100%*	SS	*2-4 5-6* N=9			
6	24/24 *100%*	SS	*3-3 5-7* N=8			
7	24/24 *100%*	SS	*1-2 3-3* N=5			
8	24/24 *100%*	SS	*1-1 2-1* N=3			
9	24/24 *100%*	SS	*8-12 28-30* N=40			
10	22/22 *100%*	SS	*8-44 65-60/4"* N=109			

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
2, 4	FILL - yellowish brown (10YR5/6) with 20% grayish brown (10YR5/2) mottles, moist, stiff, silty CLAY with trace sand and gravel.		624, 622	
6	Dark yellowish brown (10YR4/6) with 30% brownish yellow (10YR6/6) and 10% very dark gray (10YR3/1) mottles, moist, medium, clayey SILT with trace sand.		620	
8	Grayish brown (10YR5/2) with 20% dark yellowish brown (10YR4/6) mottles, moist, medium, clayey SILT with sand.		618	
10	Grayish brown (10YR5/2) with 20% dark yellowish brown (10YR4/6) and 5% very dark brown (10YR2/2) mottles, moist, medium, clayey SILT with sand and slight trace gravel.		616, 614	
12	Dark yellowish brown (10YR4/6) with 5% light brownish gray (10YR6/2) mottles, moist, medium, sandy SILT with gravel.			
14	Light brownish gray (10YR6/2) with 30% yellowish brown (10YR5/6) mottles, very moist, medium, clayey SAND with silt.		612	
16	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, wet, very loose, silty SAND trace with gravel.		610	
18	Brownish yellow (10YR6/8), wet, medium dense, silty SAND with gravel.		608	
	Grayish brown (10YR5/2), slightly moist, hard, clayey SILT with sand and gravel.		606	

End of Boring = 19.8 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/9/2010
Finish: 2/9/2010
WEATHER: Cold, windy, snow (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: T128
Well ID: T128
Surface Elev: 626.27 ft. MSL
Completion: 22.00 ft. BGS
Station: 875,509.70N
2,513,909.45E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.84 - While drilling
▼ =
▽ = 12.35 - 3/1/10

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	12/24 *50%*	SS	*37-17 15-18* N=32	14		
2A	7/24 *29%*	SS	*4-7 7-13* N=14			
3A	12/24 *50%*	SS	*3-4 6-8* N=10	26		
4A	19/24 *79%*	SS	*2-4 5-7* N=9	24		
5A	22/24 *92%*	SS	*1-3 4-5* N=7	20		
6A	22/24 *92%*	SS	*1-3 5-5* N=8	20		
7A	22/24 *92%*	SS	*2-3 4-5* N=7	19		
8A	20/24 *83%*	SS	*2-2 3-3* N=5	18		
9A	22/24 *92%*	SS	*woh-1 8-7* N=9	19		
9B				18		
10A						
10B	18/24 *75%*	SS	*3-10 13-11* N=23	17		

Lithologic Description (Depth ft. BGS / Elevation ft. MSL)

Depth ft. BGS	Lithologic Description
0–0.7	FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, hard (frozen), silty CLAY with trace sand and slight trace gravel.
0.7–2	FILL - Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, hard (frozen), silty CLAY with slight trace sand and gravel.
2–4.3	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.
4.3–6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.
6–13	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.
13–16.2	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
16.2–16.8	Brown (10YR5/3), moist, soft, clayey SAND with slight trace gravel.
16.8–17.4	Gray (10YR6/1), wet, loose, silty, very fine- to coarse-grained SAND.
17.4–18.7	Brown (10YR5/3), wet, loose, silty, very fine- to fine-grained SAND.
18.7–20	Brown (10YR5/3), slightly moist, very stiff, clayey SILT with trace sand and gravel.

Depth ticks: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 ft. BGS; Elevation ticks: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608 ft. MSL. Borehole Detail; Remarks.

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/9/2010
Finish: 2/9/2010
WEATHER: Cold, windy, snow (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: T128
Well ID: T128
Surface Elev: 626.27 ft. MSL
Completion: 22.00 ft. BGS
Station: 875,509.70N
2,513,909.45E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.84 - While drilling
▼ =
▽ = 12.35 - 3/1/10

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										606	
11A	24/24 *100%*	SS	*8-16 18-25* N=34	16				Dark gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.			
							22				

End of Boring = 22.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/15/2010
Finish: 10/15/2010
WEATHER: Sunny (mid-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: T202
Well ID: T202
Surface Elev: 626.22 ft. MSL
Completion: 18.00 ft. BGS
Station: 876,699.42N
2,514,895.01E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 15.42 - Upon completion
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	23/24 *96%*	SS	*6-4 5-7* N=9	27		
2A	24/24 *100%*	SS	*3-4 6-6* N=10	25		
2B				26		
3A	22/24 *92%*	SS	*2-4 5-6* N=9	22		
4A	23/24 *96%*	SS	*1-2 3-3* N=5	21		
5A	23/24 *96%*	SS	*1-1 3-2* N=4	22		
6A	24/24 *100%*	SS	*woh-1 3-3* N=4	23		
6B				21		
7A	24/24 *100%*	SS	*1-2 1-2* N=3	21		
7B				25		
8A	24/24 *100%*	SS	*woh-2 1-8* N=3	17		
9A	24/24 *100%*	SS	*6-15 20-24* N=35	9		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–0.6	FILL - Yellowish brown (10YR5/6), slightly moist, hard, silty CLAY with trace sand and gravel.	626
0.6–3.2	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, hard, silty CLAY with slight trace sand and gravel.	624
3.2–6.2	Yellowish brown (10YR5/8) with 35% gray (10YR5/1) and 15% very dark brown (10YR2/2) mottles, moist, hard, silty CLAY with trace sand and slight trace gravel.	622
6.2–10	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.	620, 618
10–11	Gray (10YR6/1) with 15% yellowish brown (10YR5/8) mottles, very moist, soft, silty CLAY with sand and slight trace gravel.	616
11–13.3	Yellowish brown (10YR5/8) with 10% gray (10YR6/1) mottles, very moist, firm, silty CLAY with sand and trace gravel.	614
13.3–14.4	Gray (10YR6/1) with 10% brownish yellow (10YR6/6) mottles, very moist, soft, sandy CLAY with silt and slight trace gravel.	612
14.4–15.8	Gray (10YR5/1), wet, loose, very fine- to medium-grained SAND with trace gravel. (▼ 15.42)	
15.8–18	Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.	610

End of Boring = 18.0 ft. BGS

NOTE(S): T202 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/17/2016
Finish: 8/17/2016
WEATHER: Hazy, (low-80s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T408
Well ID: T408
Surface Elev: 621.09 ft. MSL
Completion: 25.92 ft. BGS
Station: 2,515,314.91N
2,515,314.91E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/60 *0%*	BD					0–2.3	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)		620	
							2.3–5	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY		618	
	0/60 *0%*	BD					5–5.9	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand		616	
							5.9–6	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND			
							6–8	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel		614	
	0/60 *0%*	BD					8–10.7	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel		612	
								Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		610	
								Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel			
								Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND			
								Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel		608	
								Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND			
							14	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel			
4A	22/24 *92%*	SS	*8-16* *33-35* N=49			*4.50*	16	Dark gray (10YR4/1), moist, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.		606, 604	
	0/36 *0%*	BD					18–20	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.		602	

NOTE(S): T408 installed in boring.
Boring was blind drilled to 26.0 feet bgs. Blind drill lithologies from boring G405 and G405D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/17/2016
Finish: 8/17/2016
WEATHER: Hazy, (low-80s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T408
Well ID: T408
Surface Elev: 621.09 ft. MSL
Completion: 25.92 ft. BGS
Station: 2,515,314.91N
2,515,314.91E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/36 *0%*	BD						Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.			
								Dark gray (10YR4/1), moist, dense, fine- to coarse-grained SAND.		600	
							22				
7-1								Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.		598	
7-2	20/24 *83%*	DS					24				
7-3											
7-4										596	
	0/12 *0%*	BD									

End of Boring = 25.92 ft. BGS

NOTE(S): T408 installed in boring.
Boring was blind drilled to 26.0 feet bgs. Blind drill lithologies from boring G405 and G405D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Cloudy, (70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T409
Well ID: T409
Surface Elev: 621.85 ft. MSL
Completion: 26.99 ft. BGS
Station: 2,514,693.89N
2,514,693.89E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.			
	0/60 *0%*	BD					2	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.		620	
								Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.			
							4	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.		618	
								Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.			
	0/60 *0%*	BD					6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.		616	
							8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.		614	
							10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		612	
	0/60 *0%*	BD					12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		610	
							14	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.		608	
							16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.		606	
								Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.			
	0/60 *0%*	BD					18	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.		604	
							20			602	

NOTE(S): T409 installed in boring.
Boring was blind drilled to 27.0 feet bgs. Blind drill lithologies from boring G406D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Cloudy, (70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger
FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T409
Well ID: T409
Surface Elev: 621.85 ft. MSL
Completion: 26.99 ft. BGS
Station: 2,514,693.89N
2,514,693.89E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/36 *0%*	BD					22	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*		600	
6-1 6-2 6-3 6-4	0/24 *0%*	DS					24	Pale brown (10YR6/3), wet, loose, fine-grained SAND.		598	
								Pale brown (10YR6/3), wet, loose, fine-grained SAND and small GRAVEL.			
								Gray (10YR5/1), dry, hard, SILT with some clay, trace fine- to coarse-grained sand and trace small gravel.			
	0/24 *0%*	BD					26	Dark gray (10YR4/1), dry, hard, CLAY with some silt, trace fine- to coarse-grained sand and trace small gravel.		596	

End of Boring = 26.99 ft. BGS

NOTE(S): T409 installed in boring.
Boring was blind drilled to 27.0 feet bgs. Blind drill lithologies from boring G406D.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Holdings
Site: Coffeen Power Station
Location: Coffeen, Montgomery County, Illinois
Project: 14E0078
DATES: Start: 10/28/2014
Finish: 10/28/2014
WEATHER: Overcast, mild - mid 50's

CONTRACTOR: Ramsey
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4¼" Hollow Stem Auger with Split spoon
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: R. Hasenyager

BOREHOLE ID: TA31
Well ID: TA31
Surface Elev: 623.89 ft. MSL
Completion: 20.19 ft. BGS
Station: 876,542.25N
2,513,856.77E

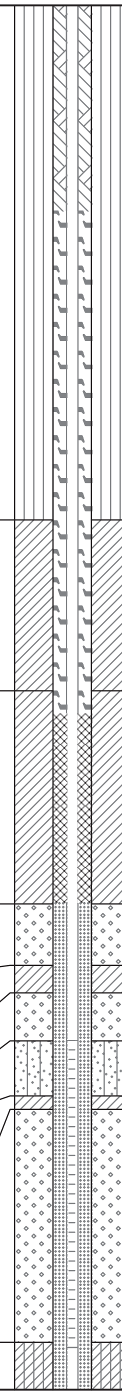
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.11 - 10/30/2014
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1	24/24 *100%*	SS	*1-2 2-2* N=4	26		
2	22/24 *92%*	SS	*2-3 3-4* N=6	28		1.44 B
3	23/24 *96%*	SS	*2-3 4-4* N=7	20		1.71 Sh
4	24/24 *100%*	SS	*6-7 6-6* N=13	22		1.55 Sh
5	22/24 *92%*	SS	*2-2 2-4* N=4	22		1.55 Sh
6	24/24 *100%*	SS	*2-1 3-2* N=4	20		0.93 B
7A	24/24 *100%*	SS	*2-3 3-3* N=6	19		
7B				22		
8A	24/24 *100%*	SS	*4-5 8-7* N=13	12		
8B				13		
9	22/24 *92%*	SS	*5-4 4-4* N=8	18		
10	16/24 *67%*	SS	*2-4 3-5* N=7	12		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
2		622
4	Yellowish brown (10YR5/4), moist, soft, SILT with little clay and trace very fine sand. Brown (10YR4/3), moist, soft, SILT with little clay and trace very fine sand.	620
6		618
8 ▼	Gray (10YR5/1) with 20% yellowish brown (10YR5/8) mottles, moist, soft, CLAY with few silt and trace very fine to fine sand.	616
10		614
12	Brownish yellow (10YR6/6) with 20% gray (10YR6/1) mottles, moist, soft, CLAY with few silt and little very fine to fine sand and trace small gravel.	612
14	Brownish yellow (10YR6/6), wet, slightly dense, SAND (very fine to coarse) with little sand and silt and trace clay and small gravel.	610
	Brownish yellow (10YR6/6), moist, soft, CLAY with few silt and trace very fine to fine sand and small gravel.	
	Brownish yellow (10YR6/6) wet, loose, SAND (very fine to very coarse) and trace small gravel.	
16	Brownish yellow (10YR6/6) very moist, soft, SAND (very fine to medium) with few clay and silt.	608
	Yellowish brown (10YR5/8), moist, soft, CLAY with few silt and trace sand (very fine to very coarse) and small gravel.	
18	Yellowish brown (10YR5/8), wet, loose, very fine to very coarse SAND.	606
20	Gray (10YR5/1), moist, hard, CLAY with few silt and (very fine to very coarse) sand and small gravel.	604

Borehole Detail



Remarks

End of Boring at 20.19 ft.

NOTE(S): Monitoring well TA31 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Holdings
Site: Coffeen Power Station
Location: Coffeen, Montgomery County, Illinois
Project: 14E0078
DATES: Start: 10/27/2014
Finish: 10/27/2014
WEATHER: Partly sunny, mild - mid 70's

CONTRACTOR: Ramsey
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4¼" Hollow Stem Auger with Split spoon
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: R. Hasenyager

BOREHOLE ID: TA32
Well ID: TA32
Surface Elev: 618.93 ft. MSL
Completion: 16.47 ft. BGS
Station: 877,532.57N
2,513,605.19E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.05 - 10/30/2014
▼ =
▽ =

SAMPLE			TESTING							
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1	18/24 *75%*	SS	*2-1 2-3* N=3	21			0–3.1	Dark yellowish brown (10YR4/4), moist, soft, clayey SILT with trace sand (very fine).	618	
	21/24 *88%*	SS	*2-1 1-1* N=2						616	
2				28			3.1–4.8	Black (10YR2/1), moist, soft, clayey SILT with trace sand (very fine).		
3A				24						
3B	14/24 *58%*	SS	*1-1 3-3* N=4	22		1.15 Sh	4.8–7.2	Very dark gray (10YR3/1), moist, soft, CLAY with little silt and trace sand (very fine to fine).	614	
4	20/24 *83%*	SS	*4-5 4-7* N=9	22		0.96 B	7.2–8.6	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, medium, CLAY with little silt and trace sand (very fine to very coarse) and gravel (small).	612	
5	21/24 *88%*	SS	*4-7 12-22* N=19	9		8.45 Sh	8.6–13.0	Yellowish brown (10YR5/8) with 30% Gray (10YR5/1) mottles, slightly moist, very hard, CLAY with silt and little sand (very fine to very coarse) trace gravel (small).	610	
6	21/24 *88%*	SS	*6-16 27-42* N=43	8		10.47 Sh			608	
7	12/24 *50%*	SS	*36-55 50/4"*	6			13.0–13.5	Yellowish brown (10YR5/8), slightly moist, loose, SAND (very fine to very coarse) and few gravel (small to medium).	606	
							13.5–14.4 ▼ 14	Gray (10YR5/1), slightly moist, very hard, CLAY with silt and few gravel (small to medium).		
							14.4–14.9	Gray (10YR5/1), moist, dense, SAND (very fine to coarse).		
8	16/24 *67%*	SS	*16-35 69* N=104	8			14.9–16.47	Gray (10YR5/1), slightly moist, very hard, CLAY with silt and few gravel (small to medium).	604	

End of Boring at 16.47 ft.

NOTE(S): Monitoring well TA32 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/2/2015
Finish: 6/2/2015
WEATHER: Sunny, calm, hi-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, blind drill
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA33b
Well ID: TA33
Surface Elev: 622.51 ft. MSL
Completion: 17.44 ft. BGS
Station: 876,605.45N
2,513,248.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - during drilling
▼ = 7.00 - 6/16/15
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–0.6	Yellowish brown (10YR5/4), moist, stiff, clayey SILT, trace very fine-grained sand, roots.		622	
							0.6–2.6	Light brownish gray (10YR6/2) with 35% yellowish brown (10YR5/6) mottles, moist, stiff to very stiff, clayey SILT, trace very fine- to fine-grained sand.		620	
							2.6–4.5	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, clayey SILT, little fine- to medium-grained sand, trace coarse-grained sand.		618	
							4.5–7.8	Gray (10YR5/1) with 5-10% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY, little fine- to medium-grained sand, trace coarse-grained sand.		616	
							7.8–8.7	Dark yellowish brown (10YR4/6) with 3% gray (10YR6/1) mottles, moist, very stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.		614	
							8.7–10.4	Gray (10YR6/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.		612	
							10.4–11.9	Gray (10YR6/1) moist, medium, fine- to coarse-grained sandy CLAY, little silt, trace small to large gravel.			
							11.9–13.6	Brown (10YR5/3) with 5% dark yellowish brown (10YR4/6) mottles, slightly moist, very stiff, very fine- to fine-grained sandy SILT, trace medium- to coarse-grained sand, trace small to large gravel, friable.		610	
							13.6–14.3	Dark yellowish brown (10YR4/6), very moist, dense, silty,very fine- to medium-grained SAND.		608	
							14.3–17.44	Brown (10YR5/3), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.		606	

End of boring = 17.44 feet

NOTE(S): TA33 installed in bore hole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/2/2015
Finish: 6/2/2015
WEATHER: Sunny, calm, hi-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA33a
Well ID: n/a
Surface Elev: 622.5 ft. MSL
Completion: 30.0 ft. BGS
Station: 876,610.00N
2,513,248.00E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.80 - during drilling
▼ =
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL
1A	21/24 *88%*	SS	*2-3 5-5* N=8				0–0.3	Yellowish brown (10YR5/4), moist, stiff, clayey SILT, trace very fine-grained sand, roots.	622
							0.3–2.6	Light brownish gray (10YR6/2) with 35% yellowish brown (10YR5/6) mottles, moist, stiff to very stiff, clayey SILT, trace very fine- to fine-grained sand.	620
2A	20/24 *83%*	SS	*3-4 4-5* N=8				2.6–4.5	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, clayey SILT, little fine- to medium-grained sand, trace coarse-grained sand.	618
3A	23/24 *96%*	SS	*5-6 6-9* N=12				4.5–7.8	Gray (10YR5/1) with 5-10% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY, little fine- to medium-grained sand, trace coarse-grained sand.	616
4A	24/24 *100%*	SS	*10-10 10-10* N=20						
							7.8–8.7	Dark yellowish brown (10YR4/6) with 3% gray (10YR6/1) mottles, moist, very stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.	614
5A	21/24 *88%*	SS	*2-4 6-6* N=10				8.7–10.4	Gray (10YR6/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.	612
6A	24/24 *100%*	SS	*0-3 4-8* N=7				10.4–11.9	Gray (10YR6/1) moist, medium, fine- to coarse-grained sandy CLAY, little silt, trace small to large gravel.	
7A	24/24 *100%*	SS	*15-27 32-41* N=59				11.9–13.6	Brown (10YR5/3) with 5% dark yellowish brown (10YR4/6) mottles, slightly moist, very stiff, very fine- to fine-grained sandy SILT, trace medium- to coarse-grained sand, trace small to large gravel, friable.	610
7B							13.6–14.3	Dark yellowish brown (10YR4/6), very moist, dense, silty,very fine- to medium-grained SAND.	
8A	20/24 *83%*	SS	*5-12 18-22* N=30				14.3–18.0	Brown (10YR5/3), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.	608
9A	16/24 *67%*	SS	*23-44 50/5"*						606
10A	22/24 *92%*	SS	*12-12 22-25* N=34				18.0–20	Dark gray (10YR4/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small to large gravel.	604

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

NOTE(S): Borehole sealed with high-solids bentonite grout.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/2/2015
Finish: 6/2/2015
WEATHER: Sunny, calm, hi-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA33a
Well ID: n/a
Surface Elev: 622.5 ft. MSL
Completion: 30.0 ft. BGS
Station: 876,610.00N
2,513,248.00E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.80 - during drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*11-17* *25-32* N=42						602	
12A	23/24 *96%*	SS	*17-23* *35-44* N=58				22		600	
13A	21/24 *88%*	SS	*26-30* *30-37* N=60				24	Dark gray (10YR4/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small to large gravel. *[Continued from previous page]*	598	
14A	18/24 *75%*	SS	*19-35* *47-50* N=82				26		596	
15A	24/24 *100%*	SS	*18-27* *34-35* N=61				28		594	
							30	**End of boring = 30.0 feet**		

NOTE(S): Borehole sealed with high-solids bentonite grout.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/3/2015
Finish: 6/3/2015
WEATHER: Mostly cloudy, windy, mid-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA34
Well ID: TA34
Surface Elev: 624.10 ft. MSL
Completion: 16.10 ft. BGS
Station: 875,906.10N
2,513,466.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.00 - during drilling
▼ = 8.10 - 6/16/15
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	21/24 *88%*	SS	*3-3 3-3* N=6				0	Gray (10YR5/1) with 10% dark yellowish brown (10YR3/6) mottles, moist, stiff, SILT, some clay, trace very fine-grained, roots.	624	
								Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, very stiff, silty CLAY, trace fine-grained sand.		
2A	17/24 *71%*	SS	*2-2 4-6* N=6				2	Light grayish brown (10YR6/2) with 15% yellowish brown (10YR5/6) mottles, slightly moist, very stiff, silty CLAY, trace fine-grained sand.	622	
3A	22/24 *92%*	SS	*3-3 3-4* N=6				4	Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, little fine-grained sand, trace medium- to coarse-grained sand.	620	
4A	24/24 *100%*	SS	*3-4 6-7* N=10				6		618	
5A	24/24 *100%*	SS	*2-2 5-5* N=7				8 ▼	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, little fine-grained sand, trace medium- to coarse-grained sand, trace small gravel.	616	
6A	22/24 *92%*	SS	*3-3 4-5* N=7				10		614	
7A	21/24 *88%*	SS	*3-3 4-5* N=7				12 ▼	Dark yellowish brown (10YR4/6) with 15% light gray (10YR7/1) mottles, very moist, very soft, fine- to medium-grained sandy CLAY, trace coarse-grained sand.	612	
7B								Gray (10YR6/1), very moist, loose, clayey, silty, fine- to medium-grained SAND, trace coarse grained sand.		
8A	24/24 *100%*	SS	*18-28 25-32* N=53				14	Brown (10YR5/3), very moist, very dense, silty,fine- to coarse-grained SAND and small to large GRAVEL.	610	
								Yellowish brown (10YR5/6), slightly moist, hard, clayey SILT, little fine- to coarse-grained sand, trace small gravel.		
8B								Gray (10YR6/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.		
8C							16	Dark gray (10YR4/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.	608	

End of boring = 16.1 feet

NOTE(S): TA34 installed in bore hole.

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: ______ Well #: TR32

Site Name: Coffeen Power Station Borehole #: TR32

State Plane Coordinate: X 2,513,605.0 Y 877,523.7 (or) Latitude: 39° 4' 2663.000" Longitude: 89° 24' 8.070"

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Ramsey Geotechnical Engineering, LLC Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 7/2/2019 Date Finished: 7/2/2019

Report Form Completed By: Rhonald W. Hasenyager Date: 7/3/2019

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Gravity

Setting Time: 30 min.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

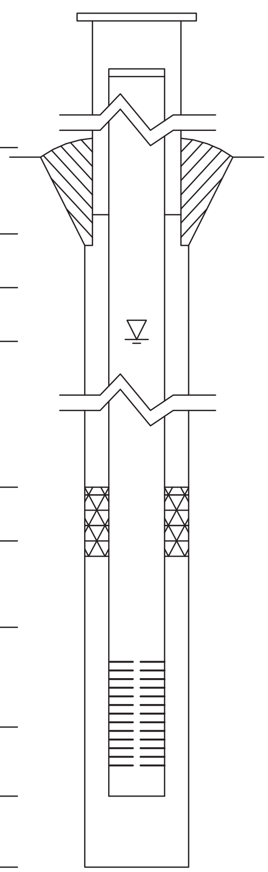
Type of Sand Pack: Quartz Sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.97	-2.69	Top of Protective Casing
621.68	-2.40	Top of Riser Pipe
619.28	0.00	Ground Surface
616.28	3.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
609.77	9.51	Top of Sand Pack
608.28	11.00	Top of Screen
603.60	15.68	Bottom of Screen
603.11	16.17	Bottom of Well
603.11	16.17	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.40
Bottom of Screen to End Cap	(feet)	0.49
Screen Length (1st slot to last slot)	(feet)	4.68
Total Length of Casing	(feet)	18.57
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/28/2021
Finish: 2/3/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G275D
Well ID: G275
Surface Elev: 617.52 ft. MSL
Completion: 99.70 ft. BGS
Station: 874,285.30N
2,516,366.50E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 10.90 - During Drilling
▽ =
▽ =

Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) / Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	21/24 88%	SS	3-4 5-10 N=9				0–1.8	Dark yellowish brown (10YR4/4), moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel, trace roots. [FILL]	616	
2A	22/24 92%	SS	3-4 6-9 N=10				2–4	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	614	
3A	19/24 79%	SS	2-4 6-8 N=10				4–6.5	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	612	
4A	23/24 96%	SS	2-5 5-6 N=10				6.5–9.5	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) and 5% yellowish red (5YR4/6) mottles, moist, very stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	610	
5A	24/24 100%	SS	2-3 5-6 N=8							
5B							9.5–10	Dark yellowish brown (10YR3/6), moist, stiff, SILT, with some very fine- to medium-grained sand, few clay and small gravel.	608	
6A	24/24 100%	SS	0-1 2-2 N=3				10–10.9	Gray (10YR6/1) with 10% dark yellowish brown (10YR3/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, few small gravel.		
6B							10.9–13	Dark yellowish brown (10YR3/6), wet, loose, SILT, with some very fine- to fine-grained sand, few clay and small gravel.	606	
7A	18/24 75%	SH					13–14	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, few clay and small gravel.	604	
8A	14/14 100%	SS	26-43 50/2"				14–16.4	Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, few clay and small gravel.	602	
9A	24/24 100%	SS	5-12 18-22 N=30				16.4–20	Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some clay and very fine- to fine-grained sand, few small gravel.	600	
10A	24/24 100%	SS	4-11 13-20 N=24						598	

NOTE(S): G275 installed in adjacent blind drill borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/28/2021
Finish: 2/3/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G275D
Well ID: G275
Surface Elev: 617.52 ft. MSL
Completion: 99.70 ft. BGS
Station: 874,285.30N
2,516,366.50E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
$\underline{\nabla}$ = 10.90 - During Drilling
$\underline{\nabla}$ =
$\underline{\nabla}$ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
11A	24/24 *100%*	SS	*3-9 13-22* N=22			
12A	24/24 *100%*	SS	*7-14 20-24* N=34			
13A	24/24 *100%*	SS	*6-11 15-21* N=26			
14A	18/24 *75%*	SS	*4-8 12-10* N=20			
15A	24/24 *100%*	SS	*5-7 13-17* N=20			
16A	23/24 *96%*	SS	*4-7 12-16* N=19			
17A	2/24 *8%*	SS	*4-10 13-17* N=23			
18A	21/24 *88%*	SH				
19A	24/24 *100%*	SS	*3-6 10-14* N=16			
20A	4/24 *17%*	SS	*3-8 11-17* N=19			

Depth ft. BGS: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation ft. MSL: 596, 594, 592, 590, 588, 586, 584, 582, 580, 578

Lithologic Description

Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some clay and very fine- to fine-grained sand, few small gravel.
[Continued from previous page]

22 ft: Dark gray (10YR4/1) with frequent dark yellowish brown (10YR3/6) oxidation along fractures, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel.

Remarks

Vertical fractures with oxidation from 22 to 24 ft, no oxidation below 24 ft.

Occasional thin SILT and SAND lenses from 25.3 to 25.8 ft.

Trace wood fragments below 28 ft.

NOTE(S): G275 installed in adjacent blind drill borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/28/2021
Finish: 2/3/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G275D
Well ID: G275
Surface Elev: 617.52 ft. MSL
Completion: 99.70 ft. BGS
Station: 874,285.30N
2,516,366.50E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 10.90 - During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type
21A	24/24 *100%*	SS	*4-8 11-15* N=19			
22A	24/24 *100%*	SS	*7-8 11-17* N=19			
23A	24/24 *100%*	SS	*5-8 13-40* N=21			
24A	23/24 *96%*	SS	*22-45 35-23* N=80			
25A	24/24 *100%*	SS	*7-9 14-21* N=23			
26A	24/24 *100%*	SS	*3-8 15-15* N=23			
27A	17/24 *71%*	SS	*12-27 13-15* N=40			
28A	24/24 *100%*	SS	*4-9 11-13* N=20			
29A	24/24 *100%*	SS	*5-9 13-12* N=22			
30A	24/24 *100%*	SS	*3-4 7-14* N=11			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
to ~45.5	Dark gray (10YR4/1) with frequent dark yellowish brown (10YR3/6) oxidation along fractures, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel. *[Continued from previous page]*	576, 574	0.5" lignite fragment seam at 42.8 ft.
~45.5–48.3	Dark gray (10YR4/1), moist, hard, SILT, with some to little clay and very fine- to fine-grained sand, few small to medium gravel.	572, 570	
~48.3–49.2	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel.		
~49.2–50.8	Very dark gray (10YR3/1), moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel, trace wood fragments.	568	
~50.8–51.2	Dark gray (10YR3/1), moist, SILT, with some very fine-grained sand seams.		Methane deposit encountered at approx. 51 ft.
~51.2–52.0	Dark gray (10YR4/1) with 15% dark grayish brown (10YR4/2) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand, small gravel and wood fragments.	566	
~52.0–53.8	Gray (10YR5/1), moist, dense, very fine- to medium-grained SAND, with some silt, trace small gravel.	564	
~53.8–57.2	Very dark grayish brown (10YR3/2), moist, hard, lean CLAY, with some silt, trace very fine-grained sand and organics.	562	
~57.2–58.6	Very dark grayish brown (10YR3/2) with 10% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, trace very fine-grained sand and organics.	560	
~58.6–59.2	Very dark grayish brown (10YR3/2), wet, SAND, with some silt.		
~59.2–60	Gray (GLEY15/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel.	558	

Depth scale: 42, 44, 46, 48, 50, 52, 54, 56, 58, 60

NOTE(S): G275 installed in adjacent blind drill borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Roberts		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:** CME-75 Track Rig	**BOREHOLE ID:** G275D	
Location: Coffeen, Illinois	**Drilling Method:** 4.25" HSA w/SS sampler	**Well ID:** G275	
Project: 20E0111A		**Surface Elev:** 617.52 ft. MSL	
DATES: Start: 1/28/2021	**FIELD STAFF: Driller:** Matt	**Completion:** 99.70 ft. BGS	
Finish: 2/3/2021	**Helper:** Corey	**Station:** 874,285.30N	
WEATHER: Clear, cold (20s)	**Eng/Geo:** C. Colin Winter	2,516,366.50E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 10.90 - During Drilling
▽ =
▼ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
31A	24/24 100%	SS	0-4 5-7 N=9					Gray (GLEY15/) with 30% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel.	556	
							62			
32A	24/24 100%	SS	4-6 8-11 N=14						554	
33A	24/24 100%	SH					64	Greenish gray (GLEY15/1) with 15% very dark gray (10YR3/1) mottles, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel.	552	
							66			
34A	24/24 100%	SS	5-10 22-41 N=32						550	
							68			
35A	24/24 100%	SS	12-24 33-45 N=57						548	
							70	Yellowish brown (10YR5/4) with occasional thin greenish gray (GLEY15/1) seams, moist, hard, lean CLAY, with some silt, few small gravel, trace very fine-grained sand.		Trace medium gravel at 70 ft.
36A	23/24 96%	SS	6-14 25-30 N=39						546	
							72			
37A	24/24 100%	SS	8-18 24-32 N=42						544	
							74			
38A	24/24 100%	SS	7-16 25-29 N=41						542	
							76	Yellowish brown (10YR5/4) with 15% gray (10YR6/1) mottles, moist, hard, lean CLAY, with some silt, few small gravel, trace very fine-grained sand.		
39A	24/24 100%	SS	7-15 20-21 N=35						540	
							78			
	19/24 79%	SS	3-5 7-10 N=12					Greenish gray (GLEY15/1) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very	538	
40A							80			

NOTE(S): G275 installed in adjacent blind drill borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/28/2021
Finish: 2/3/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G275D
Well ID: G275
Surface Elev: 617.52 ft. MSL
Completion: 99.70 ft. BGS
Station: 874,285.30N
2,516,366.50E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 10.90 - During Drilling
▽ =
▽ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
41A	22/24 92%	SS	1-5 7-11 N=12					fine-grained sand. Greenish gray (GLEY15/1) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand. [Continued from previous page]		
							82	Very dark gray (10YR3/1), moist, stiff, lean CLAY, with some silt, trace very fine-grained sand.	536	
42A	24/24 100%	SS	4-14 19-20 N=33					Greenish gray (GLEY15/1) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand.	534	
43A	8/24 33%	SS	6-20 22-23 N=42				84	Greenish gray (GLEY15/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	532	
44A	24/24 100%	SS	7-8 16-17 N=24				86	Greenish gray (GLEY15/1) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	530	
							88	Brown (10YR4/3) with 5% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, trace very fine-grained sand and small gravel.		
45A	24/24 100%	SS	5-13 16-21 N=29						528	
46A	24/24 100%	SS	4-8 15-9 N=23				90	Brown (10YR4/3) with 5% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, few small gravel, trace very fine-grained sand, medium gravel and black (10YR2/1) organics.	526	
47A							92	Brown (10YR4/3) with 5% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, few small gravel and wood fragments, trace very fine-grained sand, medium gravel and black (10YR2/1) organics.		
47B	24/24 100%	SS	5-6 8-10 N=14					Very dark grayish brown (10YR3/2), moist, stiff, fat CLAY, with some silt.	524	
48A	24/24 100%	SS	2-4 7-8 N=11				94	Dark grayish brown (10YR4/2), moist, stiff, fat CLAY, with some silt.	522	
49A	24/24 100%	SS	2-6 7-11 N=13				96		520	
							98	Greenish gray (GLEY15/1) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little to trace very fine-grained sand, trace small gravel.		
50A	18/20 90%	SS	3-15 28-50/2" N=43					Greenish gray (GLEY15/1) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt and very	518	

NOTE(S): G275 installed in adjacent blind drill borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Roberts		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:** CME-75 Track Rig	**BOREHOLE ID:** G275D	
Location: Coffeen, Illinois	**Drilling Method:** 4.25" HSA w/SS sampler	**Well ID:** G275	
Project: 20E0111A		**Surface Elev:** 617.52 ft. MSL	
DATES: Start: 1/28/2021	**FIELD STAFF: Driller:** Matt	**Completion:** 99.70 ft. BGS	
Finish: 2/3/2021	**Helper:** Corey	**Station:** 874,285.30N	
WEATHER: Clear, cold (20s)	**Eng/Geo:** C. Colin Winter	2,516,366.50E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
= 10.90 - During Drilling
=
=

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								fine-grained sand, trace small gravel.			
								End of boring = 99.7 feet			

NOTE(S): G275 installed in adjacent blind drill borehole.

Identified as G206D

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/25/2021
Finish: 1/25/2021
WEATHER: Rain, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G282D
Well ID: 282D
Surface Elev: ft. MSL
Completion: 60.00 ft. BGS
Station: N
E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 18.80 - During Drilling
▼ = 55.90 - During Drilling
▼ =

SAMPLE: Number	Recov / Total (in) % Recovery	Type	TESTING: Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–0.7	Gray (10YR6/1), wet, loose, GRAVEL, with some sand. [FILL]			
1A	15/24 63%	SS	3-3 3-4 N=6				0.7–2	Brown (10YR5/3), moist, stiff, lean CLAY, with some silt, trace very fine- to fine-grained sand. [FILL]			
2A	17/24 71%	SS	3-4 4-5 N=8				2–4.9	Yellowish brown (10YR5/4) with 10% gray (10YR6/1) mottles, moist, stiff, lean CLAY, with some silt, trace very fine- to fine-grained sand and small gravel. [FILL]			
3A	22/24 92%	SS	2-3 5-6 N=8				4.9–6.5	Grayish brown (10YR5/2), moist, stiff, lean CLAY, with some silt, trace small gravel.			
4A	20/24 83%	SS	3-4 4-5 N=8				6.5–8	Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/4) mottles, moist, stiff, lean CLAY, with some silt, trace small gravel.			
5A	22/24 92%	SS	2-3 5-7 N=8				8–10.3	Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/4) and 5% gray (10YR5/1) mottles, moist, stiff, lean CLAY, with some silt, trace small gravel.			
6A	20/24 83%	SS	3-4 4-7 N=8				10.3–12.4	Grayish brown (10YR5/2) with 20% yellowish brown (10YR5/4) and 5% gray (10YR5/1) mottles, moist, stiff, lean CLAY, with some silt, trace small gravel.			
7A	20/24 83%	SS	2-3 4-5 N=7				12.4–14.5	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.			
							14.5–14.8	Dark gray (10YR4/1), moist, stiff, lean CLAY, with some silt.			
8A	20/24 83%	SS	1-2 3-4 N=5				14.8–16.5	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.			
9A	21/24 88%	SS	1-2 2-3 N=4				16.5–18.8	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.			
10A											
10B	24/24 100%	SS	0-1 1-0 N=2				18.8–20 ▽	Yellowish brown (10YR5/6) with 10% gray (10YR6/1) mottles, wet, very loose, SILT, with some very fine- to fine-grained sand, few small gravel, trace clay.			

NOTE(S): G282D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/25/2021
Finish: 1/25/2021
WEATHER: Rain, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G282D
Well ID: 282D
Surface Elev: ft. MSL
Completion: 60.00 ft. BGS
Station: N
E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
= 18.80 - During Drilling
= 55.90 - During Drilling
=

Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type
11A	24/24 100%	SS	3-7 11-16 N=18			
12A	24/24 100%	SS	7-12 17-24 N=29			
13A	24/24 100%	SS	9-15 22-22 N=37			
14A	22/24 92%	SS	8-17 16-22 N=33			
15A	21/24 88%	SS	5-11 15-19 N=26			
16A	22/22 100%	SS	5-25 33-50/4" N=58			
17A	22/24 92%	SS	7-10 15-20 N=25			
18A	24/24 100%	SS	4-8 10-16 N=18			
19A	24/24 100%	SS	5-8 13-15 N=21			
20A	21/24 88%	SS	2-4 8-11 N=12			

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	Yellowish brown (10YR5/4) with 20% yellowish brown (10YR5/6) and 5% yellowish red (5YR4/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, little clay, few small gravel.			
22	Yellowish brown (10YR5/4), wet, fine- to medium-grained SAND.			
	Yellowish brown (10YR5/4) with 20% yellowish brown (10YR5/6) and 5% yellowish red (5YR4/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, little clay, few small gravel, trace medium gravel.			
24				
26				
	Dark gray (10YR4/1), moist, hard, SILT, with some very fine- to fine-grained sand, little clay, few small gravel, trace medium gravel.			
28				
30	Dark gray (10YR4/1), moist, SAND, little silt and clay.			
	Dark gray (10YR4/1), moist, hard, SILT, with some very fine- to fine-grained sand, little clay, few small gravel, trace medium gravel.			
32				
34				
36	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, little small gravel.			
38				
40				

NOTE(S): G282D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/25/2021
Finish: 1/25/2021
WEATHER: Rain, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G282D
Well ID: 282D
Surface Elev: ft. MSL
Completion: 60.00 ft. BGS
Station: N
E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 18.80 - During Drilling
▼ = 55.90 - During Drilling
▼ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
21A	24/24 100%	SS	4-8 11-14 N=19							
22A	22/24 92%	SS	3-7 8-12 N=15				42			
23A	24/24 100%	SS	3-6 9-13 N=15				44			Trace wood fragments below 45.7 ft.
24A	24/24 100%	SS	4-6 9-12 N=15				46	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, little small gravel. *[Continued from previous page]*		
25A	24/24 100%	SS	4-6 12-13 N=18				48			0.5" gravel seam at 48.5 ft.
26A	24/24 100%	SS	2-7 9-13 N=16				50			
27A	24/24 100%	SS	4-7 11-14 N=18				52			
28A / 28B	24/24 100%	SS	6-12 9-18 N=21				54	Light yellowish brown (10YR6/5), moist, very fine- to medium-grained SAND, with some silt, little small to medium gravel.		
							▼ 56	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, little small gravel, trace wood fragments.		
29A	24/24 100%	SS	6-10 11-11 N=21					Light yellowish brown (10YR6/5), wet, medium dense, very fine- to coarse-grained SAND, little small gravel, few silt.		
30A	24/24 100%	SS	4-5 8-9 N=13				58	Dark gray (10YR4/1) with 5% dark yellowish brown (10YR3/6) mottles, moist, stiff, lean CLAY, with some silt.		
							60			

NOTE(S): G282D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Roberts		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:** CME-75 Track Rig	**BOREHOLE ID:** G282D	
Location: Coffeen, Illinois	**Drilling Method:** 4.25" HSA w/SS sampler	**Well ID:** 282D	
Project: 20E0111A		**Surface Elev:**	ft. MSL
DATES: Start: 1/25/2021	**FIELD STAFF: Driller:** Matt	**Completion:**	60.00 ft. BGS
Finish: 1/25/2021	**Helper:** Corey	**Station:**	N
WEATHER: Rain, cold (30s)	**Eng/Geo:** C. Colin Winter		E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 18.80 - During Drilling
▼ = 55.90 - During Drilling
▼ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								End of boring = 60.0 feet			

NOTE(S): G282D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/18/2021
Finish: 1/18/2021
WEATHER: Overcast, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G283
Well ID: G283
Surface Elev: 608.30 ft. MSL
Completion: 18.00 ft. BGS
Station: 874,113.00N
2,516,503.00E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 14.00 - During Drilling
▽ =
▼ =

SAMPLE Number	Recov / Total (in) / *% Recovery*	Type	*Blows / 6 in* / N - Value / **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A / 1B	19/24 *79%*	SS	*1-2 4-3* N=6			
2A	23/24 *96%*	SS	*8-15 24-31* N=39			
3A	20/23 *87%*	SS	*5-27 35-50/5"* N=62			
4A	18/18 *100%*	SS	*15-31 50/5.5"*			
5A	19/22 *86%*	SS	*9-29 38-50/4"* N=67			
6A	21/24 *88%*	SS	*12-24 25-30* N=49			
7A	24/24 *100%*	SS	*14-22 32-38* N=54			
8A	22/24 *92%*	SS	*6-17 12-12* N=29			
9A / 9B	24/24 *100%*	SS	*0-8 16-19* N=24			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–0.9	Very dark grayish brown (10YR3/2), moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace roots.	608	
0.9–2	Yellowish brown (10YR5/4), moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, few small gravel.		
2–4	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, little small gravel, trace clay.	606	
4–6.3	Yellowish brown (10YR5/6) with 30% gray (10YR6/1) mottles and frequent yellowish red (5YR4/6) oxidation along fracture faces, moist, hard SILT, with some very fine- to fine-grained sand, little small gravel, trace clay.	604	
6.3–8	Gray (10YR5/1), moist, hard, SILT, with some very fine- to fine-grained sand, little small gravel, trace clay.	602	
8–10	Gray (10YR5/1), moist, hard, SILT, with some to little very fine- to fine-grained sand, little small gravel, trace clay.	600	
10–14	Gray (10YR5/1), moist, hard, SILT, with some to little very fine- to fine-grained sand, little to few small gravel, trace clay.	598, 596	0.5" very fine-grained SAND seam at 13.6 ft.
14 ▽ –16.8	Dark gray (10YR4/1), wet, medium dense, very fine- to medium-grained SAND, with some silt, few small gravel, occasional thin clayey seams.	594, 592	
16.8–18	Gray (10YR5/1), moist, very stiff, SILT, with some to ltitle very fine-grained sand.		

End of boring = 18.0 feet

NOTE(S): G283 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/20/2021
Finish: 1/20/2021
WEATHER: Clear, cool (40s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G284
Well ID: G284
Surface Elev: 615.33 ft. MSL
Completion: 14.00 ft. BGS
Station: 874,423.60N
2,516,922.90E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 11.60 - During Drilling
▼ =
▼ =

SAMPLE: Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / RQD	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) / Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	18/24 75%	SS	0-2 2-5 N=4				0–1.2	Very dark gray (10YR3/1), moist, very stiff, lean CLAY, some silt, few roots.	614	
							1.2–2.2	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, trace very fine-grained sand.		
2A	22/24 92%	SS	1-2 3-4 N=5				2.2–4.6	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand.	612	
3A	20/24 83%	SS	0-3 4-4 N=7				4.6–6	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) moist, very stiff, lean CLAY, with some very fine-grained sand and silt, few small gravel.	610	
4A	22/24 92%	SS	2-3 4-6 N=7				6–8.9	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) moist, very stiff, lean CLAY, with some very fine-grained sand and silt, few small gravel.	608	
5A / 5B	24/24 100%	SS	2-3 4-4 N=7				8.9–10	Yellowish brown (10YR5/4), moist, loose, SILT, with some very fine- to fine-grained sand, few clay and small gravel.	606	
6A	20/24 83%	SS	1-2 3-3 N=5				10–11.6	Yellowish brown (10YR5/4) with 20% yellowish brown (10YR5/6) mottles, moist, loose, SILT, with some very fine- to fine-grained sand, few clay and small gravel.	604	
7A							11.6–11.8	Yellowish brown (10YR5/4), wet, SAND, with some silt.		
							11.8–12.7	Yellowish brown (10YR5/4) with 20% yellowish brown (10YR5/6) mottles, wet, loose, SILT, with few very fine- to medium-grained sand, little clay, few small gravel.		
	23/24 96%	SS	7-22 27-48 N=49				12.7–14	Light yellowish brown (10YR6/4) with 10% yellowish brown (10YR5/6) mottles, moist, hard, SILT, trace very fine-grained sand.	602	

End of boring = 14.0 feet

NOTE(S): G284 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/19/2021
Finish: 1/19/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G285
Well ID: G285
Surface Elev: 610.54 ft. MSL
Completion: 26.00 ft. BGS
Station: 874,795.00N
2,516,680.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = Dry During Drilling
▽ =
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	20/24 *83%*	SS	*0-2 3-3* N=5				0–2	Yellowish brown (10YR5/4), moist, stiff, lean CLAY, with some silt, few fine-grained sand.	610	
2A	18/24 *75%*	SS	*1-3 4-6* N=7				2–4.3	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, few very fine-grained sand, trace small gravel.	608	
3A	22/24 *92%*	SS	*2-5 8-9* N=13				4.3–5.2	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, very stiff, lean CLAY, with some silt, few very fine-grained sand, trace small gravel.	606	
							5.2–6.3	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, hard, lean CLAY, with some silt, few very fine-grained sand and small gravel.		
4A	22/24 *92%*	SS	*3-8 12-15* N=20				6.3–10	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, hard, lean CLAY, with some silt, few very fine-grained sand and small gravel.	604	
5A	21/24 *88%*	SS	*4-11 16-18* N=27						602	
6A	23/24 *96%*	SS	*3-8 13-17* N=21				10–14.5	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, hard, lean CLAY, with some silt, few very fine-grained sand and small gravel.	600	
7A	23/24 *96%*	SS	*4-9 12-17* N=21						598	
8A	23/24 *96%*	SS	*5-14 21-33* N=35				14.5–16	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles and 15% dark reddish brown (5YR3/4) oxidation along vertical fracture, hard, lean CLAY, with some silt, few very fine-grained sand and small gravel.	596	
9A	23/24 *96%*	SS	*5-7 10-15* N=17				16–20	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine-grained sand and small gravel.	594	
10A	4/24 *17%*	SS	*4-6 12-14* N=18						592	Sampler pushing gravel in Run 10.

NOTE(S): G285 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/19/2021
Finish: 1/19/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G285
Well ID: G285
Surface Elev: 610.54 ft. MSL
Completion: 26.00 ft. BGS
Station: 874,795.00N
2,516,680.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = Dry During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*4-7 9-11* N=16					Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine-grained sand and small gravel. *[Continued from previous page]*		590	
12A	3/24 *13%*	SS	*4-7 8-13* N=15				22			588	Sampler pushing gravel in Run 12.
13A	23/24 *96%*	SS	*3-5 7-11* N=12				24			586	
							26	**End of boring = 26.0 feet**			

NOTE(S): G285 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/19/2021
Finish: 1/19/2021
WEATHER: Clear, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G286
Well ID: G286
Surface Elev: 609.97 ft. MSL
Completion: 10.00 ft. BGS
Station: 875,072.20N
2,516,561.80E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 6.40 - During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	24/24 *100%*	SS	*0-0 2-2* N=2				0–2	Dark grayish brown (10YR4/2), moist, medium stiff, SILT, with some clay, trace very fine-grained sand and small gravel.			
2A, 2B	19/24 *79%*	SS	*0-2 5-7* N=7				2–3	Brown (10YR5/3), moist, stiff, SILT, with some clay, few very fine- to fine-grained sand, trace small gravel.		608	
							3–4.3	Grayish brown (10YR5/2), moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.		606	
3A	19/24 *79%*	SS	*4-7 5-4* N=12				4.3–6.4	Dark grayish brown (10YR4/2) with 20% grayish brown (10YR5/2) mottles, moist, very stiff, lean CLAY, with some very fine- to medium-grained sand, little silt, few small gravel.		604	
4A, 4B	20/24 *83%*	SS	*2-3 3-4* N=6				6.4–7.4 (▽ 6.40)	Gray (10YR5/1) with 10% dark yellowish brown (10YR3/6) mottles, wet, loose, SAND, with some silt and small to medium gravel, trace clay.			
5A	20/24 *83%*	SS	*2-5 7-15* N=12				7.4–10	Gray (10YR5/1), moist, hard, SILT, with some very fine- to fine-grained sand, few small gravel.		602 / 600	

End of boring = 10.0 feet

NOTE(S): G286 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/18/2021
Finish: 1/18/2021
WEATHER: Overcast, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G287
Well ID: G287
Surface Elev: 614.34 ft. MSL
Completion: 11.80 ft. BGS
Station: 875,442.80N
2,516,415.50E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
= 6.90 - During Drilling
=
=

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	12/24 *50%*	SS	*0-1* *2-3* N=3				0–2	Gray (10YR5/1), moist, stiff, lean CLAY, with some silt, trace roots.	614	
2A	20/24 *83%*	SS	*1-2* *4-6* N=6				2–4	Gray (10YR6/1), moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.	612	
3A	20/24 *83%*	SS	*3-4* *5-9* N=9				4–6.9	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small to medium gravel.	610, 608	
4A, 4B	23/24 *96%*	SS	*2-3* *3-4* N=6				6.9–9.6	Yellowish brown (10YR5/6) with 20% gray (10YR5/1), wet, loose, SAND, with some silt, few small gravel, trace clay.	606	
5A, 5B	20/24 *83%*	SS	*2-3* *7-8* N=10				9.6–10.4	Gray (10YR6/1) with 30% yellowish brown (10YR5/6), moist, stiff, SILT, with little very fine- to fine-grained sand, few clay and small gravel.	604	
6A	17/22 *77%*	SS	*3-7* *15-50/4"* N=22				10.4–11.8	Gray (10YR6/1) with 40% yellowish brown (10YR5/6), moist, stiff, SILT, with some very fine- to fine-grained sand, few clay and little small gravel.		

End of boring = 11.8 feet

NOTE(S): G287 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/21/2021
Finish: 1/21/2021
WEATHER: Clear, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G288
Well ID: G288
Surface Elev: 617.08 ft. MSL
Completion: 14.00 ft. BGS
Station: 875,279.60N
2,517,071.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 11.20 - During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	18/24 75%	SS	1-2 2-3 N=4				0–3.3	Brown (10YR4/3), moist, medium stiff, SILT, with some clay, trace roots.		
2A, 2B	20/24 83%	SS	1-1 2-3 N=3				3.3–5.0	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace small gravel.		
3A	20/24 83%	SS	2-3 4-4 N=7				5.0–6.6	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.		
4A	24/24 100%	SS	1-2 4-4 N=6				6.6–10.2	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.		
5A	24/24 100%	SS	0-2 2-3 N=4							
6A	21/24 88%	SS	1-2 3-5 N=5				10.2–11.2	Light yellowish brown (10YR6/4), moist, stiff, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.		
6B							11.2–12.5	Gray (10YR6/1), wet, medium stiff, SILT, with some very fine- to fine-grained sand, few small to medium gravel, occasional thin sand seams.		
7A	22/24 92%	SS	5-12 19-19 N=31				12.5–14	Gray (10YR6/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, few clay, trace small gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14. Elevation scale: 616, 614, 612, 610, 608, 606, 604.

End of boring = 14.0 feet

NOTE(S): G288 installed in borehole.

Identified as SB289

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/26/2021
Finish: 1/27/2021
WEATHER: Overcast, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G289
Well ID: n/a
Surface Elev: ft. MSL
Completion: 60.0 ft. BGS
Station: N
E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 18.60 - During Drilling
▼ = 8.00 - 1/27/2021 8am
▼ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	17/24 71%	SS	2-2 4-4 N=6				0–2.3	Brown (10YR4/3) with 10% gray (10YR6/1) and 10% yellowish brown (10YR5/6) mottles, moist, stiff, SILT, with some clay, trace very fine- to fine-grained sand.			
2A	19/24 79%	SS	3-5 6-8 N=11				2.3–5.5	Dark gray (10YR4/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.			
3A	19/24 79%	SS	3-4 4-10 N=8								
4A	21/24 88%	SS	2-2 4-6 N=6				5.5–7.0	Dark gray (10YR4/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.			
							7.0–7.3	Dark gray (10YR4/1), SILT, with some clay.			
5A	18/24 75%	SH					7.3–10 (▼ 8)	Dark gray (10YR4/1) with 20% yellowish brown (10YR5/6) and 5% very pale brown (10YR7/3) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.			
6A	22/24 92%	SS	3-4 4-6 N=8				10–11.2	Dark grayish brown (10YR4/3), moist, stiff, lean CLAY, with some silt.			
6B							11.2–12.3	Gray (10YR6/1) with 20% dark grayish brown (10YR4/2) and 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.			
7A	19/24 79%	SS	3-4 6-6 N=10				12.3–14	Gray (10YR6/1) with 30% dark yellowish brown (10YR4/6) and 20% dark grayish brown (10YR4/2) mottles, moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.			
8A	22/24 92%	SS	3-4 5-6 N=9				14–16	Very dark gray (10YR3/1), moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.			
9A	24/24 100%	SS	2-3 4-4 N=7				16–18.6	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium stiff, lean CLAY, with some silt and very fine- to fine-grained sand, few small gravel.			
10A	24/24 100%	SS	2-2 1-2 N=3				18.6–19.3 (▽ 18.6)	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist to wet, SILT, with some very fine- to fine-grained sand and clay, few small gravel.			
10B							19.3–20	Strong brown (7.5YR5/8), moist to wet, SILT, with some very			

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/26/2021
Finish: 1/27/2021
WEATHER: Overcast, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G289
Well ID: n/a
Surface Elev: ft. MSL
Completion: 60.0 ft. BGS
Station: N
E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 18.60 - During Drilling
▼ = 8.00 - 1/27/2021 8am
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								fine- to fine-grained sand and clay, few small gravel.			
11A	22/24 *92%*	SS	*2-2 4-7* N=6					Strong brown (7.5YR5/8) with 20% gray (10YR6/1) mottles, moist to wet, SILT, with some very fine- to fine-grained sand and clay, few small gravel.			1" wet, fine- to coarse-grained SAND, with little small gravel.
							22	Gray (10YR6/1), moist, hard, SILT, with some very fine- to fine-grained sand, little clay, few small gravel.			
12A	21/24 *88%*	SS	*6-20 17-26* N=37					Gray (10YR6/1), wet, SILT, with some sand, little small to medium gravel.			
								Gray (10YR6/1), moist, hard, SILT, with some very fine- to fine-grained sand, little clay, few small gravel.			
13A							24	Gray (10YR6/1), wet, loose, very fine- to medium-grained SAND, with some silt, little small to medium gravel.			
13B	23/24 *96%*	SS	*4-23 32-41* N=55								
							26				
14A	22/24 *92%*	SS	*23-25 24-27* N=49								Trace large gravel from 27 to 28 ft.
							28				
15A	23/23 *100%*	SS	*14-22 32-50/5"* N=54					Gray (10YR6/1), moist, hard, SILT, with some very fine- to fine-grained sand, little clay, few small gravel.			
							30				
16A	14/17 *82%*	SS	*4-6 50/5"*								Trace large gravel from 31 to 31.5 ft.
							32				
17A	11/11 *100%*	SS	*27-50/5"*								
							34				
18A	19/24 *79%*	SS	*20-17 15-19* N=32								
							36				
19A	24/24 *100%*	SS	*7-14 16-16* N=30					Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine- to fine- grained sand, few small gravel.			
							38				
20A	24/24 *100%*	SS	*7-12 15-18* N=27								
							40				

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/26/2021
Finish: 1/27/2021
WEATHER: Overcast, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G289
Well ID: n/a
Surface Elev: ft. MSL
Completion: 60.0 ft. BGS
Station: N
E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 18.60 - During Drilling
▼ = 8.00 - 1/27/2021 8am
▼ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
21A	24/24 *100%*	SH									
22A	24/24 *100%*	SS	*5-13 20-22* N=33				42	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, few very fine- to fine- grained sand, few small gravel. *[Continued from previous page]*			Trace wood fragments below 42 ft.
23A	22/24 *92%*	SS	*3-7 11-14* N=18				44				
24A	24/24 *100%*	SS	*4-9 10-14* N=19				46				
25A	23/24 *96%*	SS	*2-5 7-10* N=12				48				
26A	24/24 *100%*	SS	*4-10 12-18* N=22				50				
27A	24/24 *100%*	SS	*5-9 11-15* N=20				52				
28A	24/24 *100%*	SS	*3-5 7-8* N=12				54	Gray (10YR5/1) with 15% dark brown (10YR3/6) mottles, moist, stiff, lean CLAY, with some silt.			
29A	24/24 *100%*	SS	*3-5 9-9* N=14				56	Gray (10YR5/1) with 20% dark brown (10YR3/6) and 10% dark gray (10YR4/1) mottles, moist, stiff, lean CLAY, with some silt.			
30A	24/24 *100%*	SS	*0-4 8-9* N=12				58				Few fine- to medium-grained sand below 59 ft.
							60				

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Roberts		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:** GeoProbe 8040DT	**BOREHOLE ID:** G289	
Location: Coffeen, Illinois	**Drilling Method:** 4.25" HSA w/SS sampler	**Well ID:** n/a	
Project: 20E0111A		**Surface Elev:**	ft. MSL
DATES: Start: 1/26/2021	**FIELD STAFF: Driller:** Matt	**Completion:**	60.0 ft. BGS
Finish: 1/27/2021	**Helper:** Corey	**Station:**	N
WEATHER: Overcast, cold (30s)	**Eng/Geo:** C. Colin Winter		E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 18.60 - During Drilling
▼ = 8.00 - 1/27/2021 8am
▼ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								End of boring = 60.0 feet			

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/9/2021
Finish: 2/9/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G307D
Well ID: G307D
Surface Elev: 622.51 ft. MSL
Completion: 60.00 ft. BGS
Station: 871,397.20N
2,515,560.30E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 12.80 - During Drilling
▽ =
▽ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type
1A	18/24 75%	SS	3-2 1-2 N=3			
2A	16/24 67%	SS	2-3 5-6 N=8			
3A	24/24 100%	SS	2-3 4-5 N=7			
4A	24/24 100%	SS	3-4 6-7 N=10			
5A	24/24 100%	SH				
6A	24/24 100%	SS	1-2 4-4 N=6			
7A, 7B	20/24 83%	SS	4-7 3-8 N=10			
8A	21/24 88%	SS	0-6 10-13 N=16			
9A	11/11 100%	SS	29-50/5"			
10A	7/9 78%	SS	45-50/3"			

Depth ft. BGS	Lithologic Description
0–3.5	Greenish gray (GLEY15/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace roots and very fine-grained sand.
3.5–4.3	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand.
4.3–6	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) and 10% very dark grayish brown (10YR3/2) mottles, moist, stiff, lean CLAY, with some silt, few very fine-grained sand.
6–10	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.
10–11.7	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.
11.7–12	Gray (10YR5/1), wet, medium stiff, SILT, with some very fine- to fine-grained sand, little clay, trace small gravel.
12–12.8	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.
12.8–15	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND, with some silt, few small to medium gravel.
15–15.7	Yellowish brown (10YR4/6), moist, hard, SILT, with some very fine- to medium-grained sand, few clay and small gravel.
15.7–16	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND, with some silt, few small to medium gravel.
16–20	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, few clay and small gravel, trace medium gravel.

Borehole Detail | Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606, 604 | Remarks

NOTE(S): G307D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/9/2021
Finish: 2/9/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G307D
Well ID: G307D
Surface Elev: 622.51 ft. MSL
Completion: 60.00 ft. BGS
Station: 871,397.20N
2,515,560.30E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 12.80 - During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	8/8 *100%*	SS	*35-50/2"*						602	Little sand below 20 ft.
12A	8/9 *89%*	SS	*30-50/3"*				22		600	
13A	17/17 *100%*	SS	*23-39 50/5"*				24		598	
14A	9/9 *100%*	SS	*38-50/3"*				26		596	
15A	23/23 *100%*	SS	*31-44 34-50/5"* N=78				28	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, few clay and small gravel, trace medium gravel. *[Continued from previous page]*	594	1" dark gray (10YR4/1), fine- to medium-grained sand, with some silt, little small gravel.
16A	15/15 *100%*	SS	*3-44 50/3"*				30		592	
17A	10/10 *100%*	SS	*34-50/4"*				32		590	
18A	11/11 *100%*	SS	*31-50/5"*				34		588	
19A	17/17 *100%*	SS	*28-44 50/5"*				36		586	
20A	24/24 *100%*	SS	*14-19 13-24* N=32				38	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, little to few very fine- to fine-grained sand, few small gravel.	584	
							40			

NOTE(S): G307D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/9/2021
Finish: 2/9/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G307D
Well ID: G307D
Surface Elev: 622.51 ft. MSL
Completion: 60.00 ft. BGS
Station: 871,397.20N
2,515,560.30E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 12.80 - During Drilling
▽ =
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
										Trace medium gravel below 40 ft.
21A	24/24 *100%*	SS	*7-8 12-15* N=20						582	
22A	20/24 *83%*	SH					42		580	
23A	24/24 *100%*	SS	*6-8 10-12* N=18				44		578	
24A	24/24 *100%*	SS	*5-6 10-12* N=16				46	Dark gray (10YR4/1), moist, hard, lean CLAY, with some silt, little to few very fine- to fine-grained sand, few small gravel. *[Continued from previous page]*	576	
25A	24/24 *100%*	SS	*3-6 11-11* N=17				48		574	Trace wood fragments below 48.5 ft.
26A	24/24 *100%*	SS	*3-7 9-10* N=16				50		572	
27A	16/24 *67%*	SS	*4-7 11-9* N=18				52		570	Gravel plugged shoe in Run 27. Large lignite fragment at 52.4 ft.
28A	24/24 *100%*	SS	*3-6 10-9* N=16				54	Greenish gray (GLEY15/1) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace small gravel.	568	
29A	24/24 *100%*	SS	*4-6 8-12* N=14				56	Yellowish brown (10YR5/6) with 30% greenish gray (GLEY15/1) and 5% very dark grayish brown (10YR3/2) mottles, moist, stiff, lean CLAY, with some silt, trace small gravel.	566	
30A	24/24 *100%*	SS	*2-5 8-10* N=13				58	Yellowish brown (10YR5/6) with 20% greenish gray (GLEY15/1) and 5% very dark grayish brown (10YR3/2) mottles, moist, stiff, lean CLAY, with some silt, trace small gravel.	564	
							60			Large wood fragment

NOTE(S): G307D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/9/2021
Finish: 2/9/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G307D
Well ID: G307D
Surface Elev: 622.51 ft. MSL
Completion: 60.00 ft. BGS
Station: 871,397.20N
2,515,560.30E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 12.80 - During Drilling
▼ =
▼ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								End of boring = 60.0 feet			at 59.8 ft.

NOTE(S): G307D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/13/2021
Finish: 1/13/2021
WEATHER: Clear, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G308
Well ID: G308
Surface Elev: 621.59 ft. MSL
Completion: 15.80 ft. BGS
Station: 871,454.70N
2,515,101.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 13.00 - During Drilling
▼ =
▼ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	16/24 *67%*	SS	*2-2 2-3* N=4				0–2	Grayish brown (10YR5/2), moist, stiff, lean CLAY, with some silt, trace roots.		620	
2A	19/24 *79%*	SS	*0-2 3-5* N=5				2–4.5	Brown (10YR5/3) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace roots.		618	
3A	17/24 *71%*	SS	*2-4 5-6* N=9				4.5–7.8	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.		616	
4A	23/24 *96%*	SS	*1-4 5-6* N=9							614	
5A	22/24 *92%*	SS	*2-4 6-7* N=10				7.8–10	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, trace very fine-grained sand and small to medium gravel.		612	
6A	21/24 *88%*	SS	*2-3 4-5* N=7				10–13	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, stiff to very stiff, lean CLAY, with some silt, little to trace very fine-grained sand, trace small to medium gravel.		610	
7A	24/24 *100%*	SS	*2-3 4-6* N=7				13–14.7 ▽	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, wet, stiff, lean CLAY, with some very fine- to fine-grained sand, little silt, trace small gravel.		608	
8A	19/22 *86%*	SS	*4-12 33-50/4"* N=45				14.7–15.8	Light yellowish brown (10YR6/4) wet, hard, SILT, with some very fine-grained sand, few clay and small to medium gravel.		606	

End of boring = 15.8 feet

NOTE(S): G308 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/12/2021
Finish: 1/12/2021
WEATHER: Clear, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G309
Well ID: G309
Surface Elev: 622.77 ft. MSL
Completion: 18.00 ft. BGS
Station: 871,865.80N
2,515,067.10E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 16.00 - During Drilling
▽ =
▼ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	13/24 54%	SS	2-4 3-3 N=7				0–2.3	Brown (10YR4/3), moist, very stiff, lean CLAY, with some silt, few to little sand, trace gravel and ash. [FILL]	622	
2A	8/24 33%	SS	3-2 2-1 N=4				2.3–4.2	Black (10YR2/1), moist, very loose, ASH. [FILL]	620	
	17/24 71%	SS	3-2 2-4 N=4				4.2–6	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, stiff, lean CLAY, with some silt.	618	
3A	23/24 96%	SS	2-3 3-3 N=6				6–10.8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	616, 614	
4A / 5A	23/24 96%	SS	2-3 4-5 N=7							
6A	22/24 92%	SS	1-2 3-5 N=5				10.8–12	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	612	
7A	21/24 88%	SS	2-3 6-5 N=9				12–14.3	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	610	
8A	13/24 54%	SS	2-2 3-4 N=5				14.3–16	Light yellowish brown (10YR6/4) with 10% yellowish brown (10YR5/6) mottles, moist, medium stiff, lean CLAY, with some fine-grained sand, little small gravel, trace medium to large gravel.	608	Gravel plugged shoe in Run 8.
9A	8/24 33%	SS	5-12 24-22 N=36				16–16.7	Pale brown (10YR6/3), wet, hard, SILT, little very fine-grained sand, few clay and small to medium gravel.		
							16.7–17.4	Brownish yellow (10YR6/6), wet, loose, very fine- to fine-grained SAND, trace clay and small to medium gravel.	606	
							17.4–18	Pale brown (10YR6/3), wet, hard, SILT, little very fine-grained sand, few clay and small to medium gravel.		Sampler shoe lost in hole at 18 ft.

End of boring = 18.0 feet

NOTE(S): G309 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/15/2021
Finish: 1/15/2021
WEATHER: Clear, light snow, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G310
Well ID: G310
Surface Elev: 619.89 ft. MSL
Completion: 15.90 ft. BGS
Station: 872,239.40N
2,515,159.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 14.20 - During Drilling
▽ =
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A, 1B	21/24 *88%*	SS	*2-7 4-6* N=11				0–0.8	Dark gray (10YR4/1), moist, very stiff, lean CLAY, with some silt, trace roots.		
							0.8–2	Gray (10YR6/1) with 15% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT, few clay, trace roots.	618	
2A	18/24 *75%*	SS	*2-4 4-6* N=8				2–4.4	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt.	616	
3A	23/24 *96%*	SS	*2-3 4-5* N=7				4.4–6.3	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt.	614	
4A	24/24 *100%*	SS	*2-3 5-6* N=8				6.3–9	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand and small gravel.	612	
5A	24/24 *100%*	SS	*2-3 4-5* N=7				9–11	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, few small gravel, trace very fine- to fine-grained sand.	610	
6A	24/24 *100%*	SS	*2-3 4-4* N=7				11–14.2	Gray (10YR5/1), moist, medium stiff, SILT, with some clay, little very fine- to fine-grained sand, few small gravel.	608	
7A	24/24 *100%*	SS	*0-1 2-2* N=3				▽ 14		606	
8A	17/23 *74%*	SS	*8-16 26-50/5"* N=42				14.2–15.9	Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, wet, hard, SILT, with some very fine-grained sand, few small gravel, trace clay. Yellowish brown (10YR5/6), wet, SAND, some silt, few gravel. Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, wet, hard, SILT, with some very fine-grained sand, few small gravel, trace clay. Yellowish brown (10YR5/6), wet, SAND, some silt, few gravel seam from 15.3 to 15.5 ft. Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, wet, hard, SILT, with some very fine-grained sand, few small gravel, trace clay.	604	

End of boring = 15.9 feet

NOTE(S): G310 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/5/2021
Finish: 2/5/2021
WEATHER: Clear, cold (20s)

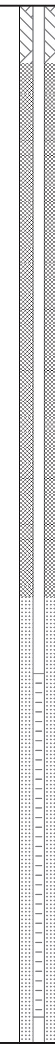
CONTRACTOR: Roberts
Rig mfg/model:
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G311
Well ID: G311
Surface Elev: 618.32 ft. MSL
Completion: 14.40 ft. BGS
Station: 872,238.70N
2,515,881.80E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							2			618	
							4			616	
							6			614	
							8			612	
							10			610	
							12			608	
							14			606	
										604	



NOTE(S): G311 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/5/2021
Finish: 2/5/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 3.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G311D
Well ID: G311D
Surface Elev: 618.39 ft. MSL
Completion: 60.00 ft. BGS
Station: 872,238.70N
2,515,881.80E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
= 11.20 - During Drilling
=
=

SAMPLE Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	13/24 *54%*	SS	*0-4* *4-4* N=8				0–2	Yellowish brown (10YR5/6), moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	618	
2A	24/24 *100%*	SS	*3-4* *5-6* N=9				2–3.6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) and 5% very dark grayish brown (10YR3/2) mottles, moist, stiff, lean CLAY, with some silt, trace very fine- to fine-grained sand, and small gravel.	616	
3A	24/24 *100%*	SS	*2-4* *5-7* N=9				3.6–6.5	Very dark grayish brown (10YR3/2) with 10% gray (10YR5/1) mottles, moist, stiff, lean CLAY, with some silt, trace very fine- to fine-grained sand, and small gravel.	614	
4A	24/24 *100%*	SH					6.5–11.2	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, few small gravel.	612	
5A	18/24 *75%*	SS	*1-2* *4-5* N=6						610	
6A	24/24 *100%*	SS	*1-3* *3-4* N=6				11.2–12	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist to wet, medium stiff, lean CLAY, with some very fine- to fine-grained sand, little silt, few small gravel.	608	
7A	24/24 *100%*	SS	*2-6* *12-13* N=18				12–12.9	Yellowish brown (10YR5/6), moist to wet, medium stiff, lean CLAY, with some very fine- to fine-grained sand, little silt, few small gravel.	606	
							12.9–14	Gray (10YR5/1), moist to wet, medium stiff, SILT, with some very fine- to fine-grained sand, few clay, trace small gravel.		1" wet, SAND at 13.5 ft.
8A	24/24 *100%*	SS	*2-6* *12-13* N=18				14–18.4	Yellowish brown (10YR5/6), moist, hard, SILT, with some clay, some to little sand, few small gravel.	604	
9A	24/24 *100%*	SS	*6-15* *18-22* N=33						602	Vertical fracture with very fine- to fine-grained sand from 16.9 to 18 ft.
10A	24/24 *100%*	SS	*6-13* *16-22* N=29				18.4–20	Dark grayish brown (10YR4/2) with frequent yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	600	

NOTE(S): G311D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/5/2021
Finish: 2/5/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 3.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G311D
Well ID: G311D
Surface Elev: 618.39 ft. MSL
Completion: 60.00 ft. BGS
Station: 872,238.70N
2,515,881.80E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
= 11.20 - During Drilling
=
=

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*5-15 20-26* N=35						598	
12A	12/24 *50%*	SS	*2-3 14-17* N=17				22		596	No oxidation below 22 ft.
13A	24/24 *100%*	SS	*6-11 14-20* N=25				24		594	Trace medium gravel below 24 ft.
14A	24/24 *100%*	SS	*4-8 11-16* N=19				26		592	
15A	24/24 *100%*	SH					28		590	
16A	24/24 *100%*	SS	*0-3 5-8* N=8				30	Dark gray (10YR4/1) with frequent yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	588	
17A	24/24 *100%*	SS	*2-4 6-8* N=10				32		586	
18A	24/24 *100%*	SS	*2-5 7-7* N=12				34		584	Gravel plugged shoe in Run 18. Trace large gravel from 35 to 36 ft.
19A	13/24 *54%*	SS	*2-7 8-11* N=15				36		582	Trace lignite and wood fragments below 36 ft.
20A	24/24 *100%*	SS	*2-6 10-8* N=16				38		580	
							40			

NOTE(S): G311D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/5/2021
Finish: 2/5/2021
WEATHER: Clear, cold (20s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 3.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G311D
Well ID: G311D
Surface Elev: 618.39 ft. MSL
Completion: 60.00 ft. BGS
Station: 872,238.70N
2,515,881.80E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 11.20 - During Drilling
▽ =
▼ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
21A	16/24 *67%*	SS	*3-3* *6-8* N=9					Dark gray (10YR4/1) with frequent yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel. *[Continued from previous page]*	578	
22A							42	Greenish gray (GLEY15/1) with 20% dark reddish brown (10YR3/2) mottles, moist, medium stiff, lean CLAY, with some silt.	576	
22B	24/24 *100%*	SS	*3-4* *7-8* N=11							
23A	24/24 *100%*	SS	*1-3* *5-7* N=8				44		574	
24A	20/24 *83%*	SS	*3-4* *10-8* N=14				46		572	
25A	24/24 *100%*	SS	*3-5* *8-13* N=13				48	Dark grayish brown (10YR4/1) with frequent yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small to large gravel.	570	
26A	24/24 *100%*	SS	*2-5* *10-12* N=15				50		568	
	24/24 *100%*	SS	*2-6* *10-14* N=16				52		566	
27A										
28A	24/24 *100%*	SS	*4-7* *7-11* N=14				54	Dark gray (10YR4/1) with 20% greenish gray (GLEY15/1) and 5% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	564	Trace small gravel below 54.3 ft.
29A	24/24 *100%*	SS	*2-5* *9-11* N=14				56	Greenish gray (GLEY16/1) with 40% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	562	0.5" small to medium GRAVEL.
30A	24/24 *100%*	SS	*3-7* *10-13* N=17				58	Yellowish brown (10YR5/6) with 30% greenish gray (GLEY16/1) mottles, moist, very stiff, lean CLAY, with some silt, trace very fine-grained sand and small gravel.	560	
							60			

NOTE(S): G311D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Roberts		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:** CME-75 Track Rig	**BOREHOLE ID:** G311D	
Location: Coffeen, Illinois	**Drilling Method:** 3.25" HSA w/SS sampler	**Well ID:** G311D	
Project: 20E0111A		**Surface Elev:**	618.39 ft. MSL
DATES: Start: 2/5/2021	**FIELD STAFF: Driller:** Matt	**Completion:**	60.00 ft. BGS
Finish: 2/5/2021	**Helper:** Corey	**Station:**	872,238.70N
WEATHER: Clear, cold (20s)	**Eng/Geo:** C. Colin Winter		2,515,881.80E

TOPOGRAPHIC MAP INFORMATION:

Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:

= 11.20 - During Drilling
=
=

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								End of boring = 60.0 feet			

NOTE(S): G311D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/4/2021
Finish: 2/4/2021
WEATHER: Rain, cold (30s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G312
Well ID: G312
Surface Elev: 616.92 ft. MSL
Completion: 15.25 ft. BGS
Station: 872,260.90N
2,516,557.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 12.70 - During Drilling
▼ =
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	14/24 *58%*	SS	*0-2 3-2* N=5				0–1.8	Brown (10YR5/3) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.	616	
2A	17/24 *71%*	SS	*2-1 2-2* N=3				2	Yellowish brown (10YR5/6), moist, stiff to very stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.	614	
3A	18/24 *75%*	SS	*1-3 5-6* N=8				4	Yellowish brown (10YR5/6) with 10% very dark grayish brown (10YR3/2) mottles, moist, stiff to very stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, trace small gravel.	612	
4A	17/24 *71%*	SS	*2-3 3-4* N=6				6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	610	
5A	20/24 *83%*	SS	*2-4 5-7* N=9				8	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) and 5% very dark grayish brown (10YR3/2) mottles, moist, very stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	608	
6A	20/24 *83%*	SS	*1-3 4-4* N=7				10	Gray (10YR5/1), moist, soft SILT, some clay, trace roots. Gray (10YR5/1) with 20% yellowish brown (10YR5/6) and 5% very dark grayish brown (10YR3/2) mottles, moist, very stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	606	
							12	Yellowish brown (10YR5/6) with 15% gray (10YR5/1) mottles, moist, very stiff, lean CLAY, with some silt and very fine- to fine-grained sand.		
7A 7B	24/24 *100%*	SS	*0-3 2-5* N=5				▽	Gray (10YR6/1) with 15% yellowish brown (10YR5/6), moist, very stiff, lean CLAY, with some silt and very fine- to fine-grained sand. Gray (10YR5/1), wet, loose, SILT, with some very fine- to fine-grained sand, few clay, trace small gravel.	604	
8A 8B	15/15 *100%*	SS	*4-17 50/3"*				14	Yellowish brown (10YR5/6) with 5% very dark grayish brown (10YR3/2), wet, loose, SILT, with some very fine- to fine-grained sand, few clay and small gravel. Yellowish brown (10YR5/6) with 5% very dark grayish brown (10YR3/2) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, few clay and small gravel.	602	

End of boring = 15.25 feet

NOTE(S): G312 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/14/2021
Finish: 1/14/2021
WEATHER: Overcast, cool (40s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G313
Well ID: G313
Surface Elev: 611.51 ft. MSL
Completion: 12.00 ft. BGS
Station: 871,976.80N
2,516,803.70E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 9.80 - During Drilling
▽ =
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A, 1B	17/24 *71%*	SS	*0-2 3-3* N=5				0–1.2	Dark yellowish brown (10YR4/4), wet, stiff, lean CLAY, with some silt, few roots, trace small gravel.		
							1.2–2	Gray (10YR6/1) with 15% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT, with little clay, few roots.	610	
2A	13/24 *54%*	SS	*0-2 2-3* N=4				2–4.7	Dark gray (10YR4/1) with 5% black (10YR2/1) mottles, moist, stiff, lean CLAY, with some silt.	608	
3A	19/24 *79%*	SS	*2-3 5-5* N=8				4.7–6	Dark gray (10YR4/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine- to fine-grained sand and small gravel.	606	
4A	22/24 *92%*	SS	*2-3 4-5* N=7				6–8.9	Very dark gray (10YR3/1), moist, stiff, lean CLAY, with some silt, little very fine- to fine-grained sand and small gravel.	604	
5A	22/24 *92%*	SS	*2-5 9-12* N=14				8.9–9.8 ▽	Yellowish brown (10YR5/6) with 10% very dark gray (10YR3/1) mottles, moist, stiff SILT, with some very fine- to fine-grained sand and clay, few small gravel.	602	
6A	21/24 *88%*	SS	*9-12 21-22* N=33				9.8–11.3	Yellowish brown (10YR5/4), wet, medium dense, very fine- to medium-grained SAND, with some silt, few small gravel.		
6B							11.3–12	Dark grayish brown (10YR4/2) with 10% yellowish brown (10YR5/6) mottles, moist, hard, SILT, with some very fine- to fine-grained sand, few clay and small gravel, trace medium gravel.	600	

End of boring = 12.0 feet

NOTE(S): G313 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Holcomb Foundation Engineering Co.		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:**	**BOREHOLE ID:** G314	
Location: Coffeen, Illinois	**Drilling Method:** 4.25" HSA w/SS sampler	**Well ID:** G314	
Project: 20E0111A		**Surface Elev:**	611.11 ft. MSL
DATES: Start: 2/26/2021	**FIELD STAFF: Driller:** Steve	**Completion:**	20.05 ft. BGS
Finish: 2/26/2021	**Helper:** Jeff	**Station:**	871,630.20N
WEATHER: Clear, mild (40s)	**Eng/Geo:** C. Colin Winter		2,516,852.10E

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							2			610	
							4			608	
							6			606	
							8			604	
							10			602	
							12			600	
							14			598	
							16			596	
							18			594	
							20			592	

NOTE(S): G314 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT:	Illinois Power Generating Co.	**CONTRACTOR:**	Holcomb Foundation Engineering Co.		
Site:	Coffeen Part 845 Groundwater	**Rig mfg/model:**		**BOREHOLE ID:**	G314
Location:	Coffeen, Illinois	**Drilling Method:**	4.25" HSA w/SS sampler	**Well ID:**	G314
Project:	20E0111A			**Surface Elev:**	611.11 ft. MSL
DATES: Start:	2/26/2021	**FIELD STAFF: Driller:**	Steve	**Completion:**	20.05 ft. BGS
Finish:	2/26/2021	**Helper:**	Jeff	**Station:**	871,630.20N
WEATHER:	Clear, mild (40s)	**Eng/Geo:**	C. Colin Winter		2,516,852.10E

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks

NOTE(S): G314 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/10/2021
Finish: 2/12/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G314D
Well ID: G314D
Surface Elev: 610.87 ft. MSL
Completion: 100.30 ft. BGS
Station: 871,642.00N
2,516,853.90E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
∇ = During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type
1A	4/24 *17%*	SS	*13-7 4-5* N=11			
	1/24 *4%*	SS	*3-4 5-5* N=9			
3A	24/24 *100%*	SS	*1-3 4-5* N=7			
4A	24/24 *100%*	SS	*2-5 15-17* N=20			
5A	24/24 *100%*	SS	*4-10 12-16* N=22			
6A	24/24 *100%*	SS	*4-5 14-18* N=19			
7A	24/24 *100%*	SS	*3-11 14-18* N=25			
8A	24/24 *100%*	SS	*3-9 13-18* N=22			
9A	24/24 *100%*	SS	*1-7 9-13* N=16			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–1	Moist, dense, small to large GRAVEL. [FILL]	610	
1–6.8	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, few very fine- to fine-grained sand, trace small gravel.	608, 606	
6.8–9.4	Yellowish brown (10YR5/6) with occasional yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.	604, 602	
9.4–16.9	Yellowish brown (10YR5/6) with 10% very dark grayish brown (10YR3/2) mottles and occasional yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.	600, 598, 596	1" wet, SAND, with some silt at 11.6 ft.
16.9–18	Yellowish brown (10YR5/6) with 10% very dark grayish brown (10YR3/2) and 10% dark yellowish brown (10YR4/6) mottles and occasional yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.	594	
18–20	Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/6) mottles and occasional yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.	592	

NOTE(S): G314D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: **Start:** 2/10/2021
Finish: 2/12/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: **Driller:** Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G314D
Well ID: G314D
Surface Elev: 610.87 ft. MSL
Completion: 100.30 ft. BGS
Station: 871,642.00N
2,516,853.90E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type
10A	24/24 *100%*	SS	*1-5* *10-13* N=15			
11A	24/24 *100%*	SS	*1-6* *9-12* N=15			
12A	24/24 *100%*	SS	*4-7* *10-13* N=17			
13A	24/24 *100%*	SS	*3-7* *10-13* N=17			
14A	24/24 *100%*	SS	*4-6* *10-10* N=16			
15A	24/24 *100%*	SS	*3-9* *10-12* N=19			
16A	24/24 *100%*	SS	*2-3* *7-8* N=10			
17A	24/24 *100%*	SS	*2-4* *7-9* N=11			
18A	21/24 *88%*	SH				
			2-5			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
20–24.3	Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/6) and 5% dark yellowish brown (10YR4/6) mottles and occasional yellowish red (5YR4/6) oxidation along fractures, moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel. *[Continued from previous page]*	590, 588	1" wet, SAND, with some silt at 20 ft. Frequent oxidation below 21.7 ft.
24.3–34.8	Dark grayish brown (10YR4/2), moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel.	586, 584, 582, 580, 578	1 ft vertical fracture with yellowish red (5YR4/6) oxidation at 28.3 ft. Trace roots below 34 ft.
34.8–35.5	Gray (GLEY15/), moist, stiff, lean CLAY, with some silt.	576	
35.5–40	Dark grayish brown (10YR4/2), moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel and roots.	574, 572	

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

NOTE(S): G314D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/10/2021
Finish: 2/12/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G314D
Well ID: G314D
Surface Elev: 610.87 ft. MSL
Completion: 100.30 ft. BGS
Station: 871,642.00N
2,516,853.90E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = During Drilling
▽ =
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
19A	24/24 *100%*	SS	*7-12* N=12					Dark grayish brown (10YR4/2), moist, hard, lean CLAY, with some silt and very fine- to fine-grained sand, trace small gravel and roots. *[Continued from previous page]*	570	Trace medium gravel below 41.3 ft.
20A	24/24 *100%*	SS	*4-8 10-14* N=18				42		568	
21A	24/24 *100%*	SS	*3-9 13-16* N=22				44		566	
22A	24/24 *100%*	SS	*12-31 14-11* N=45				46	Gray (10YR5/1), wet, dense, SAND, with some silt, few small gravel.	564	
22B										
23A	24/24 *100%*	SS	*3-4 6-9* N=10				48	Gray (GLEY15/) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand.	562	1" SILT, with some sand at 48.2 ft.
24A	24/24 *100%*	SS	*5-11 14-17* N=25				50		560	
25A	24/24 *100%*	SS	*4-6 11-15* N=17				52	Yellowish brown (10YR5/6) with 20% gray (GLEY15/) mottles, moist, stiff, lean CLAY, with some silt, trace very fine-grained sand.	558	
26A	20/24 *83%*	SS	*4-5 18-30* N=23				54		556	
27A	20/24 *83%*	SS	*9-22 33-33* N=55				56	Yellowish brown (10YR5/6), moist, hard, lean CLAY, with some silt, little very fine- to fine-grained sand and small gravel.	554	
							58	Yellowish brown (10YR5/6) with 20% gray (GLEY15/) mottles, moist, hard, lean CLAY, with some silt, little very fine- to fine-grained sand and small gravel.		
28A	24/24 *100%*	SS	*7-19 29-43*				60	Yellowish brown (10YR5/6) with 10% gray (GLEY15/) and 5% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, little very fine- to fine-grained sand and small gravel.	552	

NOTE(S): G314D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/10/2021
Finish: 2/12/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G314D
Well ID: G314D
Surface Elev: 610.87 ft. MSL
Completion: 100.30 ft. BGS
Station: 871,642.00N
2,516,853.90E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
$\underline{\nabla}$ = During Drilling
$\underline{\nabla}$ =
$\underline{\nabla}$ =

Sample Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type
			N=48			
29A	20/24 *83%*	SS	*13-20 30-38* N=50			
30A	24/24 *100%*	SS	*8-15 30-34* N=45			
31A	24/24 *100%*	SS	*5-17 28-29* N=45			
32A	24/24 *100%*	SS	*7-18 29-43* N=47			
33A	24/24 *100%*	SS	*5-14 32-26* N=46			
34A	24/24 *100%*	SS	*8-17 26-38* N=43			
35A	24/24 *100%*	SS	*5-12 24-24* N=36			
36A	24/24 *100%*	SS	*14-24 20-33* N=44			
37A	24/24 *100%*	SS	*6-14 17-31* N=31			

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
to 68	Yellowish brown (10YR5/6) with 10% gray (GLEY15/) and 5% dark yellowish brown (10YR4/6) mottles, moist, hard, lean CLAY, with some silt, little very fine- to fine-grained sand and small gravel. *[Continued from previous page]*			
68–70	Yellowish brown (10YR5/6) with 10% gray (GLEY15/), 5% dark yellowish brown (10YR4/6) and 5% very dark grayish brown (10YR3/2) mottles, moist, hard, lean CLAY, with some silt, little very fine- to fine-grained sand and small gravel.			
70–72	Dark grayish brown (10YR4/2) with 5% gray (GLEY15/), 5% yellowish brown (10YR5/6), and 5% light gray (10YR7/1) mottles, moist, hard, lean CLAY, with some silt, little sand and gravel.			
72–74	Yellowish brown (10YR5/6) with 5% gray (GLEY15/), 5% dark grayish brown (10YR4/2), and 5% light gray (10YR7/1) mottles.			
74–77	Dark grayish brown (10YR4/2) with 5% gray (GLEY15/), 5% yellowish brown (10YR5/6), and 5% light gray (10YR7/1) mottles.			
77–78	Dark grayish brown (10YR5/2) with 20% reddish brown (5YR4/4) and 5% light gray (10YR7/1) mottles, moist, hard, lean CLAY, with some silt, trace very fine- to fine-grained sand and small gravel.			
78–80	Dark gray (10YR4/1) with 5% light gray (10YR7/1) mottles, moist, hard, lean CLAY, with some silt, trace very fine- to fine-grained sand and small gravel.			

Depth scale: 62, 64, 66, 68, 70, 72, 74, 76, 78, 80
Elevation scale: 550, 548, 546, 544, 542, 540, 538, 536, 534, 532

NOTE(S): G314D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/10/2021
Finish: 2/12/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G314D
Well ID: G314D
Surface Elev: 610.87 ft. MSL
Completion: 100.30 ft. BGS
Station: 871,642.00N
2,516,853.90E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = During Drilling
▽ =
▼ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
38A	24/24 100%	SS	7-17 21-29 N=38				82	Dark gray (10YR4/1) with 5% light gray (10YR7/1) mottles, moist, hard, lean CLAY, with some silt, trace very fine- to fine-grained sand and small gravel. *[Continued from previous page]*	530, 528	Trace roots at 82 ft.
39A	24/24 100%	SS	8-24 26-27 N=50				84	Very dark gray (10YR3/1), moist, hard, lean CLAY, with some silt.	526	
40A	24/24 100%	SS	5-9 10-13 N=19				86	Dark gray (10YR4/1) with 5% black (10YR2/1) mottles, moist, hard, lean CLAY, with some silt.	524	
41A	24/24 100%	SS	6-10 25-33 N=35				88	Dark greenish gray (GLEY14/1) with 5% yellowish brown (10YR5/6) mottles, moist, hard, lean CLAY, with some silt.	522	Few very fine- to fine-grained sand below 88 ft.
42A	11/11 100%	SS	3-50/5"				90	Light reddish brown (2.5YR6/3) with 10% gray (GLEY15/), dry, hard, SILT, with few clay and very fine-grained sand.	520	
43A	5/5 100%	SS	50/5"				92		518	
44A	5/5 100%	SS	50/5"				94		516	
45A	8/8 100%	SS	49-50/2"				96	Light reddish brown (2.5YR6/3) with 10% gray (GLEY15/) and 5% dark yellowish brown (10YR4/6) mottles, dry, hard, SILT, with few clay and very fine-grained sand.	514	
46A	11/11 100%	SS	25-50/5"				98, 100		512	

NOTE(S): G314D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Roberts		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:** CME-75 Track Rig	**BOREHOLE ID:** G314D	
Location: Coffeen, Illinois	**Drilling Method:** 4.25" HSA w/SS sampler	**Well ID:** G314D	
Project: 20E0111A		**Surface Elev:**	610.87 ft. MSL
DATES: Start: 2/10/2021	**FIELD STAFF: Driller:** Matt	**Completion:**	100.30 ft. BGS
Finish: 2/12/2021	**Helper:** Corey	**Station:**	871,642.00N
WEATHER: Overcast, very cold (10s)	**Eng/Geo:** C. Colin Winter		2,516,853.90E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = During Drilling
▽ =
▼ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
47A	3/3 *100%*	SS	*50/3"*					**End of boring = 100.3 feet**			

NOTE(S): G314D installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/13/2021
Finish: 1/13/2021
WEATHER: Overcast, cool (40s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G315
Well ID: G315
Surface Elev: 620.94 ft. MSL
Completion: 15.90 ft. BGS
Station: 871,385.00N
2,516,086.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 13.00 - During Drilling
▼ =
▼ =

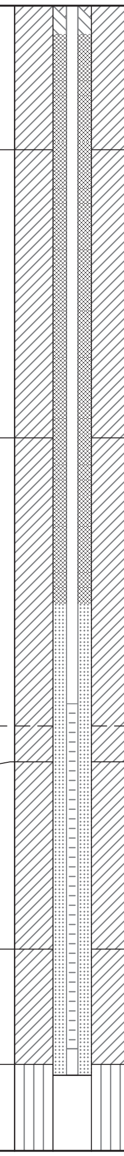
SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	15/24 *63%*	SS	*0-2 3-2* N=5			
2A	9/24 *38%*	SS	*1-1 2-2* N=3			
3A	22/24 *92%*	SS	*2-3 3-5* N=6			
4A	24/24 *100%*	SS	*1-2 2-4* N=4			
5A	23/24 *96%*	SS	*2-2 3-4* N=5			
6A	19/24 *79%*	SS	*0-2 4-5* N=6			
7A, 7B	24/24 *100%*	SS	*1-2 3-3* N=5			
8A	21/23 *91%*	SS	*8-16 32-50/5"* N=48			

Lithologic Description	Remarks
Light gray (10YR7/1) with 20% brown (10YR4/3) mottles, moist, stiff, lean CLAY, with some silt, few roots.	
Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, with some silt.	
Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, with some silt, few to trace small gravel.	
Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, lean CLAY, with some silt, few to trace small gravel.	Gray (10YR6/1), SILT seam.
Gray (10YR5/1) with 30% yellowish brown (10YR6/1) mottles, lean CLAY, with some silt, few to trace small gravel.	
Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, wet, medium stiff, lean CLAY, with some very fine- to fine-grained sand, little silt, few small to medium gravel.	Gravel plugged shoe in Run 8.
Yellowish brown (10YR5/6), wet, very stiff, SILT, with some very fine- to fine-grained sand, little small to medium gravel, few clay.	

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14

Elevation ft. MSL: 620, 618, 616, 614, 612, 610, 608, 606

Borehole Detail



End of boring = 15.9 feet

NOTE(S): G315 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.	**CONTRACTOR:** Roberts		
Site: Coffeen Part 845 Groundwater	**Rig mfg/model:** GeoProbe 8040DT	**BOREHOLE ID:** G316	
Location: Coffeen, Illinois	**Drilling Method:** 4.25" HSA w/SS sampler	**Well ID:** G316	
Project: 20E0111A		**Surface Elev:**	599.64 ft. MSL
DATES: Start: 1/14/2021	**FIELD STAFF: Driller:** Matt	**Completion:**	15.75 ft. BGS
Finish: 1/14/2021	**Helper:** Corey	**Station:**	871,643.10N
WEATHER: Overcast, cold (30s)	**Eng/Geo:** C. Colin Winter		2,517,211.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 8.60 - During Drilling
▼ = 13.80 - During Drilling
▼ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	15/24 *63%*	SS	*10-9 5-4* N=14				0–1.5	Brown (10YR5/3), moist, medium dense, small to large GRAVEL, with some clay and fine to coarse grained sand. [FILL]		598	
2A	10/24 *42%*	SS	*1-3 4-6* N=7				1.5–4	Gray (10YR5/1), moist, hard, lean CLAY, with some silt, few small gravel and very fine- to fine-grained sand.		596	
3A	14/24 *58%*	SS	*2-2 3-3* N=5				4–6.4	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, few small gravel and very fine- to fine-grained sand.		594	
4A	10/24 *42%*	SS	*0-1 1-2* N=2				6.4–8.6	Gray (10YR5/1) with 30% black (10YR2/1) mottles, moist, stiff, lean CLAY, with some silt, few very fine-grained sand, organics and wood fragments.		592	
5A											
5B	22/24 *92%*	SS	*1-1 1-2* N=2				8.6–10.2	Very dark gray (10YR3/1), wet, medium stiff to stiff, SILT, with some clay and very fine- to fine-grained sand.		590	
6A	20/24 *83%*	SS	*1-2 4-7* N=6				10.2–12.3	Brown (10YR4/3), moist, very stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, few small gravel.		588	
7A	22/24 *92%*	SS	*0-2 3-3* N=5				12.3–13.8	Dark gray (10YR4/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium stiff to stiff, lean CLAY, with some silt, little very fine- to fine-grained sand, few small gravel.		586	
8A	21/17 *124%*	SS	*2-2 26-50/3"* N=28				13.8–15.2	Brown (10YR4/3), wet, loose, very fine- to fine-grained SAND, with some silt, trace clay.			
8B							15.2–15.75	Yellowish brown (10YR5/6), moist, hard, SILT, with some very fine- to fine-grained sand, trace small gravel.		584	

End of boring = 15.75 feet

NOTE(S): G316 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/13/2021
Finish: 1/14/2021
WEATHER: Overcast, cold (30s to 40s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G317
Well ID: G317
Surface Elev: 638.85 ft. MSL
Completion: 36.00 ft. BGS
Station: 871,234.20N
2,517,087.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 34.00 - During Drilling
▼ =
▼ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type
1A	17/24 71%	SS	2-2 5-3 N=7			
2A	12/24 50%	SS	3-5 4-4 N=9			
3A	15/24 63%	SS	1-2 3-4 N=5			
4A	11/24 46%	SS	3-5 5-4 N=10			
5A	12/24 50%	SS	3-4 4-4 N=8			
6A	4/24 17%	SS	2-2 3-4 N=5			
7A, 7B	14/24 58%	SS	1-3 4-3 N=7			
8A	20/24 83%	SS	2-2 3-4 N=5			
9A	17/24 71%	SS	1-2 3-4 N=5			
10A	16/24 67%	SS	0-2 5-5 N=7			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–5.2	Light yellowish brown (10YR6/4) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, little fine-grained sand and small to medium gravel, trace to no roots.	638, 636, 634	
5.2–7.5	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, lean CLAY, with some silt, few fine-grained sand and small gravel.	632	
7.5–9	Brownish yellow (10YR6/8) with 20% gray (10YR6/1) mottles, moist, stiff, SILT, with little fine-grained sand and small gravel.	630	
9–13.4	Gray (10YR5/1) with 30% very dark gray (20YR3/1) mottles, moist, very stiff, lean CLAY, with some silt, trace lignite fragments and organics.	628, 626	Wood fragment plugged shoe in Run 6. Gravel plugged shoe in Run 7.
13.4–14.2	Gray (10YR5/1) with 10% yellowish brown (10YR5/4) mottles, moist, stiff, SILT, with some fine-grained sand, little small gravel.		
14.2–16.5	Gray (10YR5/1) with 10% yellowish brown (10YR5/4) and 10% very dark gray (10YR3/1) mottles, moist, very stiff, lean CLAY, with some silt, few fine-grained sand and small gravel.	624	
16.5–20	Gray (10YR5/1) with 10% very dark gray (10YR3/1) mottles, moist, medium stiff, lean CLAY, with some silt, little small gravel, trace lignite fragments and organics.	622, 620	Thin wood fragment seam at 19.4 ft.

NOTE(S): G317 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 1/13/2021
Finish: 1/14/2021
WEATHER: Overcast, cold (30s to 40s)

CONTRACTOR: Roberts
Rig mfg/model: GeoProbe 8040DT
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: G317
Well ID: G317
Surface Elev: 638.85 ft. MSL
Completion: 36.00 ft. BGS
Station: 871,234.20N
2,517,087.40E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 34.00 - During Drilling
▽ =
▼ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	16/24 *67%*	SS	*3-5 6-11* N=11					Gray (10YR5/1) with 10% very dark gray (10YR3/1) mottles, moist, medium stiff, lean CLAY, with some silt, little small gravel, trace lignite fragments and organics. *[Continued from previous page]*		618	
								Gray (10YR5/1) moist, SILT, with some clay.			
12A	21/24 *88%*	SS	*4-4 7-9* N=11				22	Gray (10YR5/1) with 10% very dark gray (10YR3/1) mottles, moist, medium stiff to very stiff, lean CLAY, with some silt, little small gravel, few wood fragments and organics.		616	
13A	18/24 *75%*	SS	*3-5 7-11* N=12				24			614	
14A	20/24 *83%*	SS	*2-5 7-9* N=12				26	Yellowish brown (10YR5/6) with 20% gray (10YR6/1) mottles, moist, very stiff, lean CLAY, with some silt, few to no fine-grained sand, trace to no small gravel.		612	
15A	19/24 *79%*	SS	*2-4 6-8* N=10				28			610	
16A	24/24 *100%*	SS	*1-5 7-9* N=12				30	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, very stiff, lean CLAY, with some silt, few to no fine-grained sand, trace to no small gravel.		608	
17A	24/24 *100%*	SS	*2-4 6-7* N=10				32	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) and 10% black (10YR2/1) mottles, moist, very stiff, lean CLAY, with some silt, few to no fine-grained sand, trace to no small gravel.		606	
18A							▽ 34	Yellowish brown (10YR5/4) with 10% gray (10YR6/1) mottles, wet, loose, very fine- to fine-grained SAND, with some clay, little silt, few small gravel.			Sampler full in Run 18.
18B	24/24 *100%*	SS	*0-1 14-34* N=15					Yellowish brown (10YR5/6) with 10% gray (10YR6/1) mottles, moist, very stiff, SILT, with some very fine- to fine-grained sand, little small to medium gravel, trace clay.		604	
							36	**End of boring = 36.0 feet**			

NOTE(S): G317 installed in borehole.

FIELD BORING LOG

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/8/2021
Finish: 2/8/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler

FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

HANSON

BOREHOLE ID: XPW01
Well ID: XPW01
Surface Elev: 631.85 ft. MSL
Completion: 14.00 ft. BGS
Station: 871,638.70N
2,515,366.30E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 5.00 - Approx. During Drilling
▼ =
▼ =

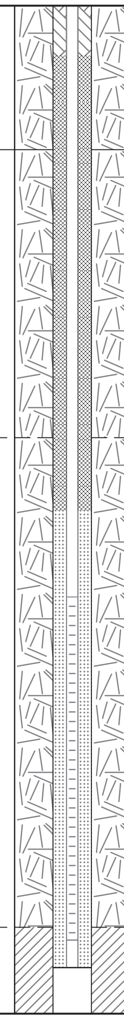
SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	19/24 *79%*	SS	*11-20 21-13* N=41			
2A	24/24 *100%*	SS	*3-6 8-6* N=14			
3A	0/24 *0%*	SH				
4A	24/24 *100%*	SS	*1-5 7-8* N=12			
5A	19/24 *79%*	SS	*1-1 1-6* N=2			
6A	15/24 *63%*	SS	*4-5 4-4* N=9			
7A / 7B	18/24 *75%*	SS	*1-3 5-6* N=8			

Depth ft. BGS	Lithologic Description
0 – 2	Black (10YR2/1), moist, BOTTOM ASH, fine- to coarse-grained, cohesionless. [FILL]
2 – 6	Black (10YR2/1), moist, BOTTOM ASH, very fine- to fine-grained, cohesive. [FILL]
6 – 12.8	Black (10YR2/1), wet, BOTTOM ASH, fine- to coarse-grained. [FILL]
12.8 – 14	Gray (10YR5/1) with 20% yellowish brown (10YR5/6), moist, stiff, lean CLAY, some silt, trace very fine grained sand.

End of boring = 14.0 feet

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14

Borehole Detail



Elevation ft. MSL: 630, 628, 626, 624, 622, 620, 618

Remarks

NOTE(S): XPW01 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Part 845 Groundwater
Location: Coffeen, Illinois
Project: 20E0111A
DATES: Start: 2/8/2021
Finish: 2/8/2021
WEATHER: Overcast, very cold (10s)

CONTRACTOR: Roberts
Rig mfg/model: CME-75 Track Rig
Drilling Method: 4.25" HSA w/SS sampler
FIELD STAFF: Driller: Matt
Helper: Corey
Eng/Geo: C. Colin Winter

BOREHOLE ID: XPW02
Well ID: XPW02
Surface Elev: 636.64 ft. MSL
Completion: 18.00 ft. BGS
Station: 871,987.10N
2,515,627.30E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork Township
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▽ = 6.00 - During Drilling
▼ =
▼ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Water Content (%)	Dry Density (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	19/24 *79%*	SS	*5-5 10-15* N=15				0–6	Black (10YR2/1), moist, BOTTOM ASH, fine- to coarse-grained, cohesionless. [FILL]		
2A	21/24 *88%*	SS	*5-14 17-18* N=31							
3A	24/24 *100%*	SS	*4-13 15-14* N=28							
	24/24 *100%*	SS	*4-9 13-15* N=22				6–17.7	Black (10YR2/1), wet, BOTTOM ASH, fine- to coarse-grained, cohesionless. [FILL]		
5A	22/24 *92%*	SS	*3-4 7-12* N=11							
6A	23/24 *96%*	SS	*1-9 14-14* N=23							
7A	24/24 *100%*	SS	*5-7 7-7* N=14							
8A	21/24 *88%*	SS	*4-4 5-4* N=9							
9A 9B	24/24 *100%*	SS	*0-1 1-2* N=2				17.7–18	Dark gray (10YR4/1), moist, very soft, SILT, some clay.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation scale: 636, 634, 632, 630, 628, 626, 624, 622, 620

End of boring = 18.0 feet

NOTE(S): XPW02 installed in borehole.

WELL CONSTRUCTION LOGS

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G45D

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G405D

State Plane Coordinate: X 2,515,322.2 Y 873,998.0 (or) Latitude: 39 3! 51.657Ä Longitude: -89 23! 46.612Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

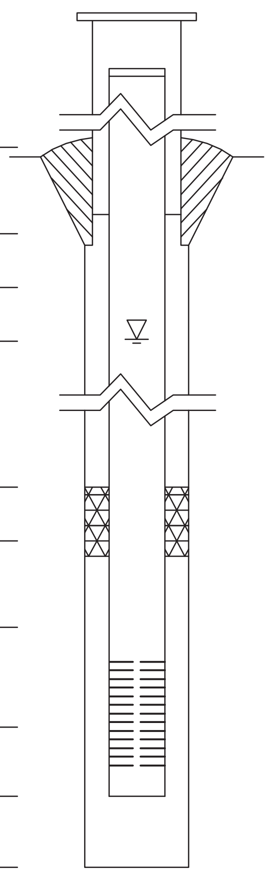
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/16/2016 Date Finished: 8/17/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS



	Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
	624.16	-3.22	Top of Protective Casing
	623.81	-2.87	Top of Riser Pipe
Type of Surface Seal: Concrete	620.94	0.00	Ground Surface
Type of Annular Sealant: High-solids bentonite	618.94	2.00	Top of Annular Sealant
Installation Method: Tremie			
Setting Time: >24 hours			Static Water Level (After Completion)
Type of Bentonite Seal -- Granular (circled) / Pellet / Slurry (choose one)			
Installation Method: Gravity	590.59	30.35	Top of Seal
Setting Time: 38 minutes	589.62	31.32	Top of Sand Pack
Type of Sand Pack: Quartz Sand			
Grain Size: 10-20 (sieve size)	589.06	31.88	Top of Screen
Installation Method: Gravity			
	579.42	41.52	Bottom of Screen
Type of Backfill Material: n/a (if applicable)	579.02	41.92	Bottom of Well
Installation Method:	578.94	42.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	34.75
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	9.64
Total Length of Casing	(feet)	44.79
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G46D

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G406D

State Plane Coordinate: X 2,514,697.8 Y 872,519.7 (or) Latitude: 39 3! 37.098Ä Longitude: -89 23! 54.687Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/19/2016 Date Finished: 8/19/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >12 hours

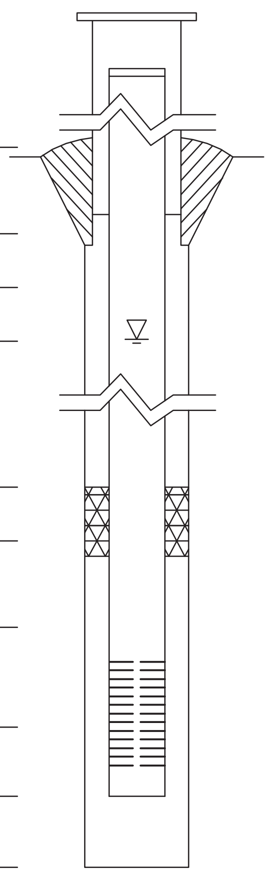
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.53	-3.62	Top of Protective Casing
625.24	-3.33	Top of Riser Pipe
621.91	0.00	Ground Surface
619.91	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
582.34	39.57	Top of Seal
581.21	40.70	Top of Sand Pack
580.30	41.61	Top of Screen
570.65	51.26	Bottom of Screen
570.26	51.65	Bottom of Well
569.91	52.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	44.94
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	9.65
Total Length of Casing	(feet)	54.98
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: G101

Site Name: CCB Management Facility Borehole #: G101

State Plane Coordinate: X 2,514,214.3 Y 876,551.8 (or) Latitude: 39 4! 17.000Ä Longitude: -89 24! 0.400Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 2/2/2010 Date Finished: 2/2/2010

Report Form Completed By: Suzanna Simpson Date: 2/4/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 20 min

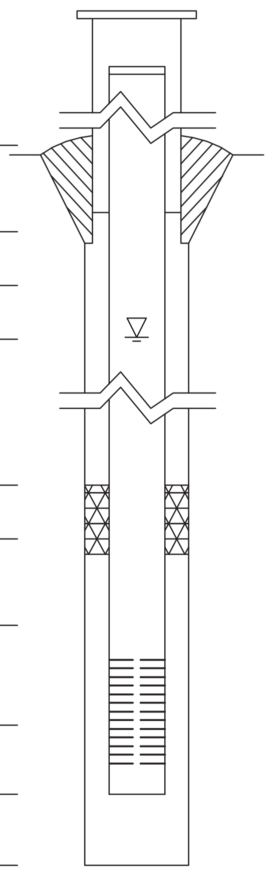
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.89	-2.62	Top of Protective Casing
627.60	-2.33	Top of Riser Pipe
625.27	0.00	Ground Surface
622.27	3.00	Top of Annular Sealant
617.96	7.31	Static Water Level (After Completion) 3/1/2010
614.27	11.00	Top of Seal
612.14	13.13	Top of Sand Pack
609.59	15.68	Top of Screen
604.95	20.32	Bottom of Screen
604.38	20.89	Bottom of Well
603.35	21.92	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.01
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.64
Total Length of Casing	(feet)	23.22
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G102 (MW3S)

Site Name: CCB Management Facility Borehole #: SB-03a

State Plane Coordinate: X 2,514,531.5 Y 876,554.8 (or) Latitude: ______ Longitude: ______

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 4/28/2006 Date Finished: 4/28/2006

Report Form Completed By: Rhonald W. Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

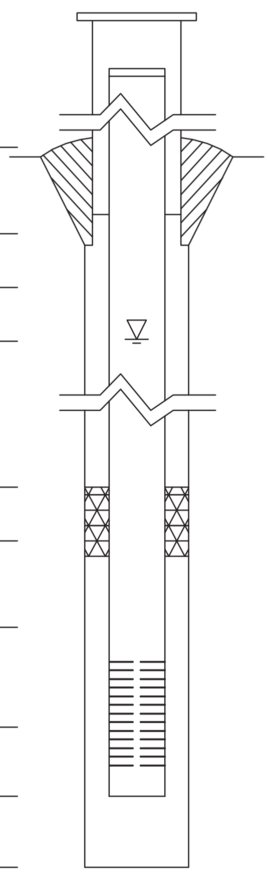
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.45	-3.75	Top of Protective Casing
628.96	-3.26	Top of Riser Pipe
625.70	0.00	Ground Surface
623.70	2.00	Top of Annular Sealant
618.67	7.03	Static Water Level (After Completion) 6/1/2006
623.70	2.00	Top of Seal
616.20	9.50	Top of Sand Pack
613.68	12.02	Top of Screen
608.92	16.78	Bottom of Screen
608.55	17.15	Bottom of Well
608.55	17.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.28
Bottom of Screen to End Cap	(feet)	0.37
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	20.41
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G103

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G103

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,501.2 Y 876,199.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/15/2010 Date Finished: 2/15/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 8 min

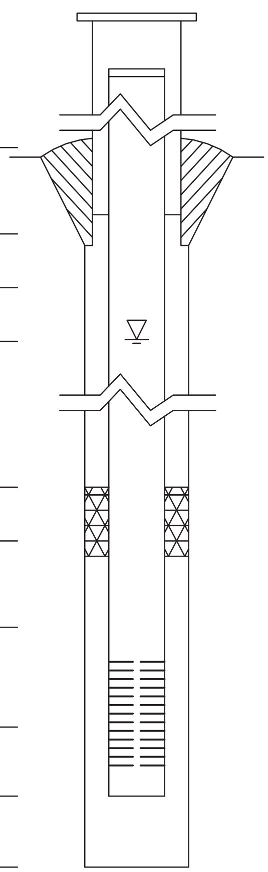
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
634.07	-3.08	Top of Protective Casing
633.80	-2.81	Top of Riser Pipe
630.99	0.00	Ground Surface
624.93	6.06	Top of Annular Sealant
614.00	16.99	Static Water Level (After Completion) 3/1/2010
618.51	12.48	Top of Seal
617.35	13.64	Top of Sand Pack
615.11	15.88	Top of Screen
610.32	20.67	Bottom of Screen
609.90	21.09	Bottom of Well
609.90	21.09	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.69
Bottom of Screen to End Cap	(feet)	0.42
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	23.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G104

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G104

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,505.0 Y 875,849.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/15/2010 Date Finished: 2/15/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- **Granular** Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

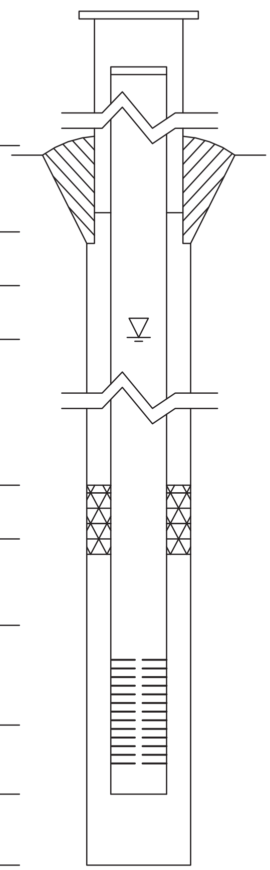
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.29	-3.17	Top of Protective Casing
632.94	-2.82	Top of Riser Pipe
630.12	0.00	Ground Surface
624.92	5.20	Top of Annular Sealant
614.72	15.40	Static Water Level (After Completion) 3/1/2010
619.17	10.95	Top of Seal
617.42	12.70	Top of Sand Pack
615.21	14.91	Top of Screen
610.51	19.61	Bottom of Screen
610.04	20.08	Bottom of Well
607.92	22.20	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.73
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.70
Total Length of Casing	(feet)	22.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location: 134 CIPS Trail (Address - Lot Number), Coffeen (City), Montgomery (County)

   General Description: Township 7 (N)(~~S~~) Range 3 (~~E~~)(W) Section 10

   SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well: Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

Filled with (cement or other materials)	Bentonite grout	from 0.5	to 20.0 ft.
Kind of plug	Random soil	from 0	to 0.5 ft.
Filled with		from	to ft.
Kind of plug		from	to ft.
Filled with		from	to ft.
Kind of plug		from	to ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

Name: Rhonald W. Hasenyager, L.P.G.
Complete License Number: 196-000246

Address: Hanson Professional Services Inc., 1525 S. 6th St.
City: Springfield
State/ZIP: IL 62703

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G105

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G105

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,509.2 Y 875,499.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/16/2010 Date Finished: 2/16/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

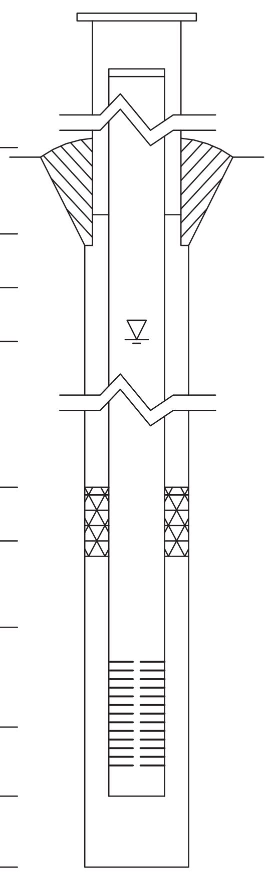
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.40	-3.14	Top of Protective Casing
632.08	-2.82	Top of Riser Pipe
629.26	0.00	Ground Surface
623.80	5.46	Top of Annular Sealant
613.18	16.08	Static Water Level (After Completion) 3/1/2010
616.55	12.71	Top of Seal
615.50	13.76	Top of Sand Pack
613.15	16.11	Top of Screen
608.36	20.90	Bottom of Screen
607.89	21.37	Bottom of Well
606.80	22.46	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.93
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	24.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G106

Site Name: CCB Management Facility Borehole #: G106

State Plane Coordinate: X 2,514,512.8 Y 875,149.8 (or) Latitude: 39 4! 3.100Ä Longitude: -89 23! 56.800Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

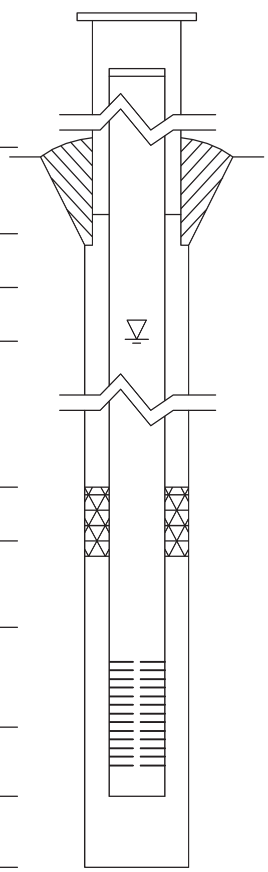
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 2/16/2010 Date Finished: 2/16/2010

Report Form Completed By: Suzanna Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.45	-3.06	Top of Protective Casing
631.15	-2.76	Top of Riser Pipe
628.39	0.00	Ground Surface
622.94	5.45	Top of Annular Sealant
615.77	12.62	Static Water Level (After Completion) 3/1/2010
617.44	10.95	Top of Seal
616.10	12.29	Top of Sand Pack
614.02	14.37	Top of Screen
609.43	18.96	Bottom of Screen
608.95	19.44	Bottom of Well
607.94	20.45	Bottom of Borehole

* Referenced to a National Geodetic Datum

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.13
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.69
Total Length of Casing	(feet)	22.30
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G107

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G107

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,358.3 Y 874,994.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/17/2010 Date Finished: 2/17/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 8 min

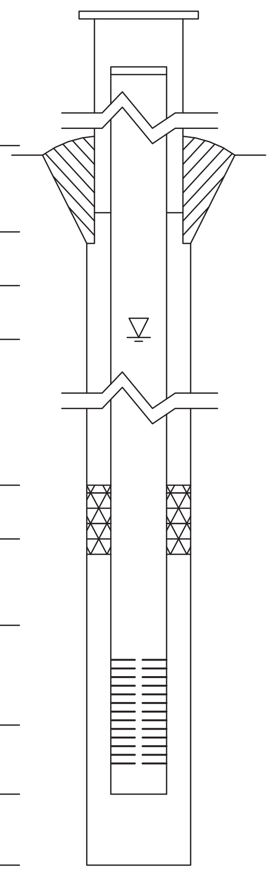
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.60	-2.81	Top of Protective Casing
630.23	-2.44	Top of Riser Pipe
627.79	0.00	Ground Surface
624.08	3.71	Top of Annular Sealant
617.39	10.40	Static Water Level (After Completion) 3/1/2010
617.41	10.38	Top of Seal
616.24	11.55	Top of Sand Pack
613.92	13.87	Top of Screen
609.29	18.50	Bottom of Screen
608.82	18.97	Bottom of Well
607.08	20.71	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.31
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.63
Total Length of Casing	(feet)	21.41
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G108

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G108

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,248.3 Y 874,948.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/12/2010 Date Finished: 2/12/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular selected]

Installation Method: Granular

Setting Time: 10 min

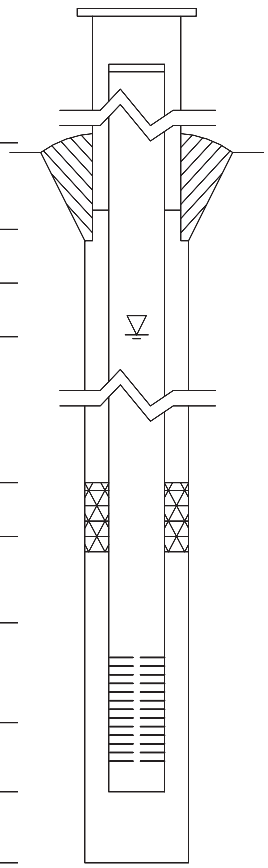
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.52	-3.02	Top of Protective Casing
630.22	-2.72	Top of Riser Pipe
627.50	0.00	Ground Surface
622.50	5.00	Top of Annular Sealant
618.57	8.93	Static Water Level (After Completion) 3/1/2010
614.00	13.50	Top of Seal
612.80	14.70	Top of Sand Pack
610.68	16.82	Top of Screen
606.00	21.50	Bottom of Screen
605.50	22.00	Bottom of Well
605.50	22.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.54
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.68
Total Length of Casing	(feet)	24.72
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G109

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G109

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,137.8 Y 874,970.1 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/11/2010 Date Finished: 2/11/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular circled]

Installation Method: Granular

Setting Time: 10 min

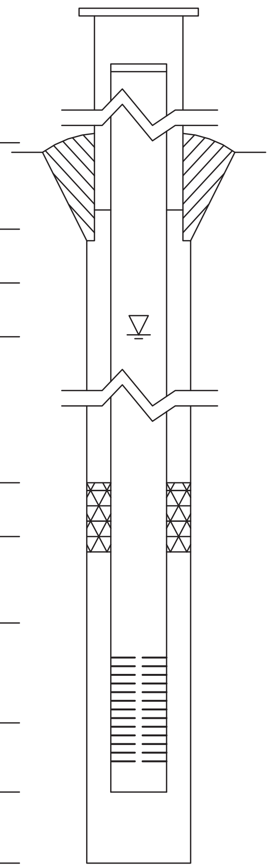
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.08	-2.88	Top of Protective Casing
629.76	-2.56	Top of Riser Pipe
627.20	0.00	Ground Surface
621.70	5.50	Top of Annular Sealant
618.35	8.85	Static Water Level (After Completion) 3/1/2010
614.90	12.30	Top of Seal
614.60	12.60	Top of Sand Pack
611.81	15.39	Top of Screen
607.27	19.93	Bottom of Screen
606.70	20.50	Bottom of Well
606.70	20.50	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.95
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	23.06
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G110

Site Name: CCB Management Facility Borehole #: G110

State Plane Coordinate: X 2,514,057.7 Y 875,015.4 (or) Latitude: 39 4! 1.800Ä Longitude: -89 24! 2.500Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

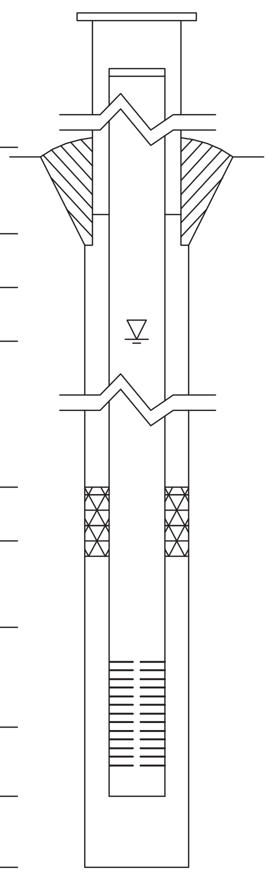
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: ______ Date Started: 2/11/2010 Date Finished: 2/11/2010

Report Form Completed By: ______ Date: 2/19/2010

ANNULAR SPACE DETAILS



	Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
	629.96	-2.94	Top of Protective Casing
	629.65	-2.63	Top of Riser Pipe
Type of Surface Seal: Concrete	627.02	0.00	Ground Surface
Type of Annular Sealant: High-solids bentonite	621.86	5.16	Top of Annular Sealant
Installation Method: Tremie			
Setting Time: >24 hr.	617.52	9.50	Static Water Level (After Completion) 3/1/2010
Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular circled]			
Installation Method: Granular	615.46	11.56	Top of Seal
Setting Time: 10 min	614.06	12.96	Top of Sand Pack
Type of Sand Pack: Quartz sand			
Grain Size: 10/20 (sieve size)	611.97	15.05	Top of Screen
Installation Method: Gravity	607.43	19.59	Bottom of Screen
Type of Backfill Material: n/a (if applicable)	606.86	20.16	Bottom of Well
Installation Method: n/a	606.86	20.16	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.68
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	22.79
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G111

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G111

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,981.7 Y 875,058.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/10/2010 Date Finished: 2/11/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

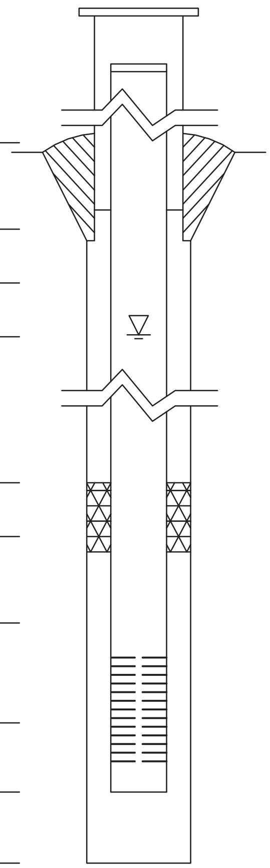
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.19	-2.95	Top of Protective Casing
629.90	-2.66	Top of Riser Pipe
627.24	0.00	Ground Surface
622.52	4.72	Top of Annular Sealant
616.74	10.50	Static Water Level (After Completion) 3/1/2010
616.41	10.83	Top of Seal
614.52	12.72	Top of Sand Pack
612.63	14.61	Top of Screen
608.09	19.15	Bottom of Screen
607.52	19.72	Bottom of Well
607.52	19.72	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.27
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	22.38
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G119

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G119

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,907.7 Y 875,675.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/9/2010 Date Finished: 2/9/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- **Granular** Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

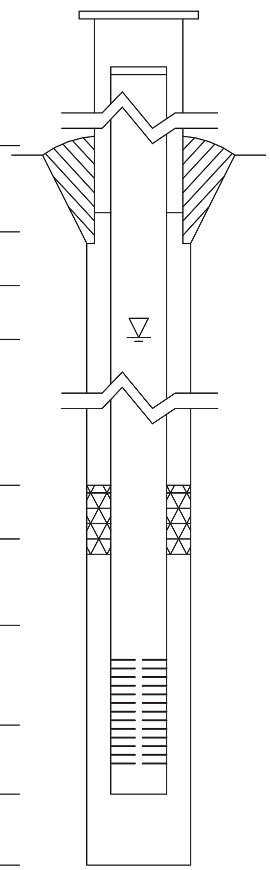
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.85	-3.00	Top of Protective Casing
631.55	-2.70	Top of Riser Pipe
628.85	0.00	Ground Surface
623.57	5.28	Top of Annular Sealant
617.59	11.26	Static Water Level (After Completion) 3/1/2010
614.87	13.98	Top of Seal
613.57	15.28	Top of Sand Pack
611.56	17.29	Top of Screen
607.02	21.83	Bottom of Screen
606.47	22.38	Bottom of Well
606.47	22.38	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.99
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	25.08
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: **Steel**
Riser Pipe Above W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Screen	SS304	SS316	PTFE	**PVC**	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G120

Site Name: CCB Management Facility Borehole #: G120

State Plane Coordinate: X 2,513,905.8 Y 875,854.4 (or) Latitude: 39 4! 10.100Ä Longitude: -89 24! 4.400Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 2/8/2010 Date Finished: 2/8/2010

Report Form Completed By: Suzanna Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 8 min

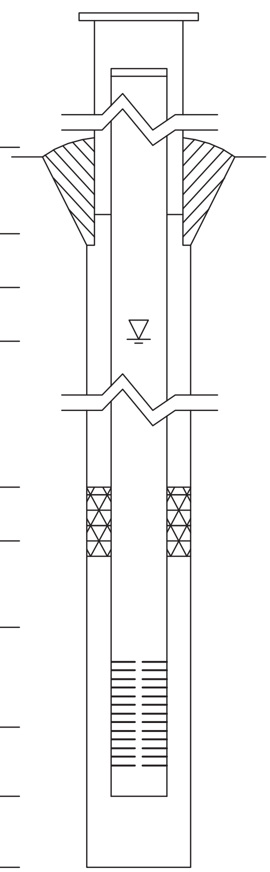
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.18	-2.88	Top of Protective Casing
631.87	-2.57	Top of Riser Pipe
629.30	0.00	Ground Surface
624.22	5.08	Top of Annular Sealant
615.45	13.85	Static Water Level (After Completion) 3/1/2010
618.14	11.16	Top of Seal
616.22	13.08	Top of Sand Pack
614.20	15.10	Top of Screen
609.68	19.62	Bottom of Screen
609.09	20.21	Bottom of Well
607.22	22.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.67
Bottom of Screen to End Cap	(feet)	0.59
Screen Length (1st slot to last slot)	(feet)	4.52
Total Length of Casing	(feet)	22.78
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ________ County: Montgomery Well #: G121

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G121

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,904.4 Y 875,964.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/4/2010 Date Finished: 2/4/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 7 min

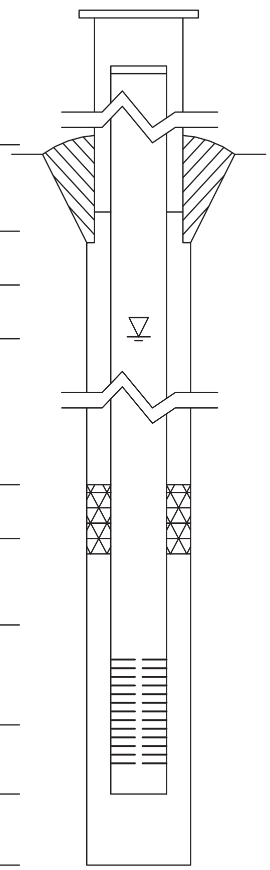
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.14	-3.57	Top of Protective Casing
632.83	-3.26	Top of Riser Pipe
629.57	0.00	Ground Surface
624.41	5.16	Top of Annular Sealant
615.13	14.44	Static Water Level (After Completion) 3/1/2010
616.81	12.76	Top of Seal
615.49	14.08	Top of Sand Pack
612.78	16.79	Top of Screen
608.10	21.47	Bottom of Screen
607.62	21.95	Bottom of Well
605.41	24.16	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.05
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.68
Total Length of Casing	(feet)	25.21
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G122

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G122

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,902.8 Y 876,080.1 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

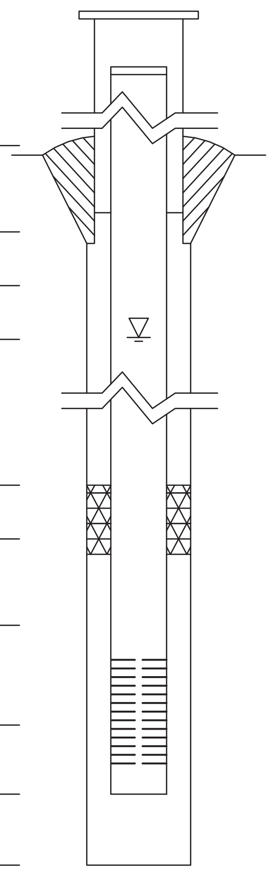
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/4/2010 Date Finished: 2/4/2010

Report Form Completed By: Diane M. Lamb Date: 2/9/2010

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.98	-3.12	Top of Protective Casing
632.69	-2.83	Top of Riser Pipe
629.86	0.00	Ground Surface
625.01	4.85	Top of Annular Sealant
617.02	12.84	Static Water Level (After Completion) 3/1/2010
617.01	12.85	Top of Seal
615.41	14.45	Top of Sand Pack
613.35	16.51	Top of Screen
608.81	21.05	Bottom of Screen
608.20	21.66	Bottom of Well
608.01	21.85	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.34
Bottom of Screen to End Cap	(feet)	0.61
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	24.49
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G123

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G123

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,901.5 Y 876,189.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/3/2010 Date Finished: 2/4/2010

Report Form Completed By: Diane M. Lamb Date: 2/9/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

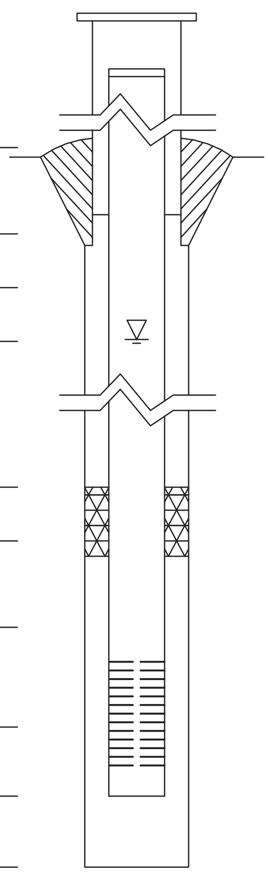
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.29	-3.16	Top of Protective Casing
632.96	-2.83	Top of Riser Pipe
630.13	0.00	Ground Surface
625.06	5.07	Top of Annular Sealant
614.15	15.98	Static Water Level (After Completion) 3/1/2010
612.31	17.82	Top of Seal
611.14	18.99	Top of Sand Pack
609.19	20.94	Top of Screen
604.67	25.46	Bottom of Screen
604.06	26.07	Bottom of Well
604.06	26.07	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	23.77
Bottom of Screen to End Cap	(feet)	0.61
Screen Length (1st slot to last slot)	(feet)	4.52
Total Length of Casing	(feet)	28.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G124

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G124

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,900.3 Y 876,304.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

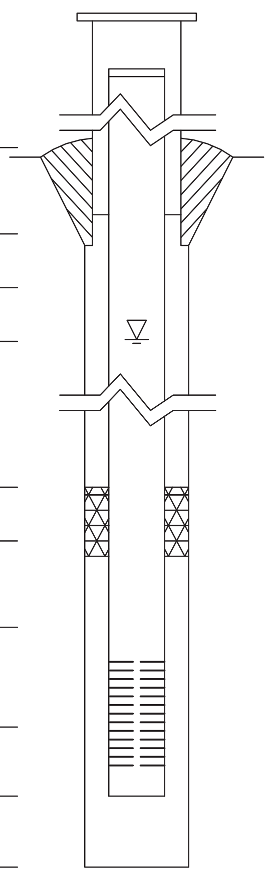
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/3/2010 Date Finished: 2/3/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/5/2010

ANNULAR SPACE DETAILS



	Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
	633.70	-3.28	Top of Protective Casing
	633.39	-2.97	Top of Riser Pipe
Type of Surface Seal: Concrete	630.42	0.00	Ground Surface
Type of Annular Sealant: High-solids bentonite	625.45	4.97	Top of Annular Sealant
Installation Method: Tremie			
Setting Time: >24 hr.	619.43	10.99	Static Water Level (After Completion) 3/1/2010
Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)			
Installation Method: Gravity	618.34	12.08	Top of Seal
Setting Time: 10 min	616.50	13.92	Top of Sand Pack
Type of Sand Pack: Quartz sand			
Grain Size: 10/20 (sieve size)	614.44	15.98	Top of Screen
Installation Method: Gravity	609.91	20.51	Bottom of Screen
Type of Backfill Material: Quartz sand (if applicable)	609.36	21.06	Bottom of Well
Installation Method: Gravity	608.45	21.97	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.95
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	24.03
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency **Well Completion Report**

Site #: ______ County: Montgomery Well #: G125

Site Name: CCB Management Facility Borehole #: G125

State Plane Coordinate: X 2,513,899.1 Y 876,409.5 (or) Latitude: 39 4! 15.600Ä Longitude: -89 24! 4.400Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 2/2/2010 Date Finished: 2/3/2010

Report Form Completed By: Suzanna Simpson Date: 2/5/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

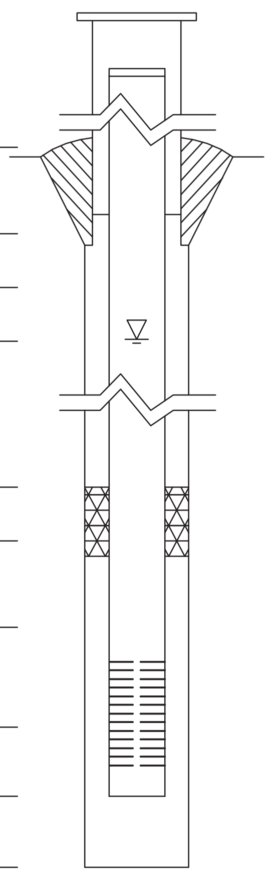
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.82	-3.14	Top of Protective Casing
633.51	-2.83	Top of Riser Pipe
630.68	0.00	Ground Surface
625.77	4.91	Top of Annular Sealant
622.10	8.58	Static Water Level (After Completion) 3/1/2010
617.15	13.53	Top of Seal
615.95	14.73	Top of Sand Pack
613.65	17.03	Top of Screen
609.12	21.56	Bottom of Screen
608.64	22.04	Bottom of Well
608.64	22.04	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.86
Bottom of Screen to End Cap	(feet)	0.58
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	24.97
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G126

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G126

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,895.4 Y 875,062.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/10/2010 Date Finished: 2/10/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

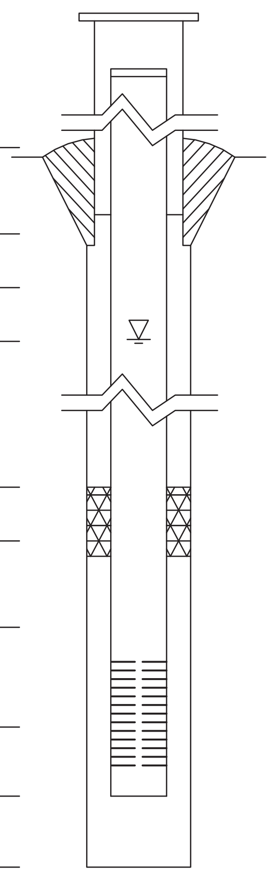
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.69	-2.73	Top of Protective Casing
625.39	-2.43	Top of Riser Pipe
622.96	0.00	Ground Surface
619.96	3.00	Top of Annular Sealant
614.14	8.82	Static Water Level (After Completion) 3/1/2010
613.96	9.00	Top of Seal
612.86	10.10	Top of Sand Pack
610.07	12.89	Top of Screen
605.53	17.43	Bottom of Screen
604.96	18.00	Bottom of Well
604.96	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.32
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	20.43
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G151

Site Name: CCB Management Facility Borehole #: G151

State Plane Coordinate: X 2,513,805.9 Y 875,023.7 (or) Latitude: ______ Longitude: ______

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/19/2011 Date Finished: 12/19/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (selected) / Pellet / Slurry (choose one)

Installation Method: Gravity

Setting Time: 24 min

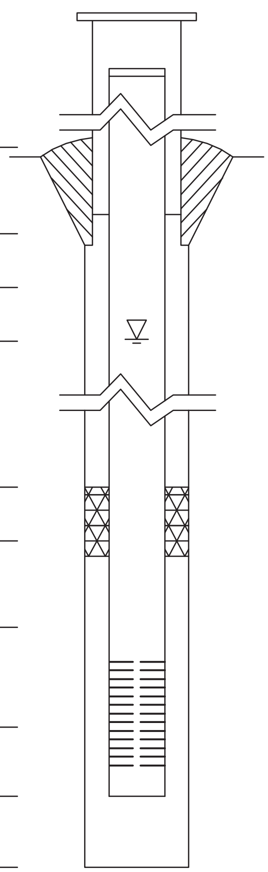
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.24	-3.42	Top of Protective Casing
625.93	-3.11	Top of Riser Pipe
622.82	0.00	Ground Surface
620.49	2.33	Top of Annular Sealant
615.03	7.79	Static Water Level (After Completion) 12/21/2011
611.82	11.00	Top of Seal
609.07	13.75	Top of Sand Pack
607.48	15.34	Top of Screen
602.98	19.84	Bottom of Screen
602.36	20.46	Bottom of Well
602.36	20.46	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.45
Bottom of Screen to End Cap	(feet)	0.62
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	23.57
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: (selected)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G152

Site Name: CCB Management Facility Borehole #: G152

State Plane Coordinate: X 2,513,894.5 Y 874,687.5 (or) Latitude: ______ Longitude: ______

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/20/2011 Date Finished: 12/20/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Seal extended to near surface

Installation Method: ______

Setting Time: ______

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

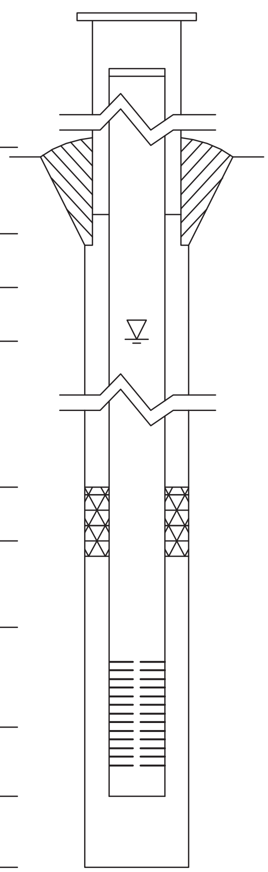
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.67	-3.61	Top of Protective Casing
626.52	-3.46	Top of Riser Pipe
623.06	0.00	Ground Surface
621.06	2.00	Top of Annular Sealant
606.06	17.00	Static Water Level (After Completion) 12/21/2011
621.06	2.00	Top of Seal
611.56	11.50	Top of Sand Pack
609.47	13.59	Top of Screen
604.97	18.09	Bottom of Screen
604.49	18.57	Bottom of Well
604.49	18.57	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.05
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	22.03
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G153

Site Name: CCB Management Facility Borehole #: G153

State Plane Coordinate: X 2,513,532.7 Y 874,532.7 (or) Latitude: ______ Longitude: ______

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/15/2011 Date Finished: 12/15/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

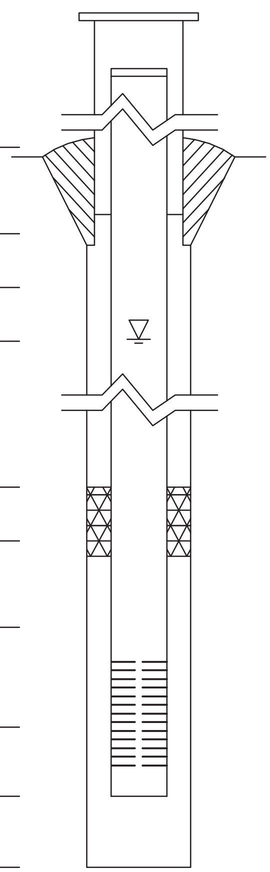
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.59	-3.29	Top of Protective Casing
626.35	-3.05	Top of Riser Pipe
623.30	0.00	Ground Surface
622.63	0.67	Top of Annular Sealant
605.75	17.55	Static Water Level (After Completion) 12/21/2011
610.30	13.00	Top of Seal
608.30	15.00	Top of Sand Pack
607.40	15.90	Top of Screen
602.96	20.34	Bottom of Screen
602.54	20.76	Bottom of Well
602.54	20.76	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.95
Bottom of Screen to End Cap	(feet)	0.42
Screen Length (1st slot to last slot)	(feet)	4.44
Total Length of Casing	(feet)	23.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G154

Site Name: CCB Management Facility Borehole #: G154

State Plane Coordinate: X 2,513,243.1 Y 874,978.4 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/16/2011 Date Finished: 12/16/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 24 min

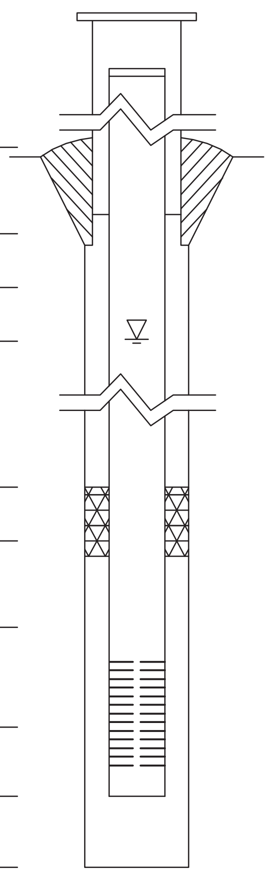
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.55	-3.03	Top of Protective Casing
626.35	-2.83	Top of Riser Pipe
623.52	0.00	Ground Surface
622.44	1.08	Top of Annular Sealant
612.42	11.10	Static Water Level (After Completion) 12/21/2011
613.02	10.50	Top of Seal
610.02	13.50	Top of Sand Pack
609.26	14.26	Top of Screen
604.76	18.76	Bottom of Screen
604.42	19.10	Bottom of Well
603.52	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.09
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	21.93
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G155

Site Name: CCB Management Facility Borehole #: G155

State Plane Coordinate: X 2,513,501.8 Y 875,127.7 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/19/2011 Date Finished: 12/19/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: 27 min

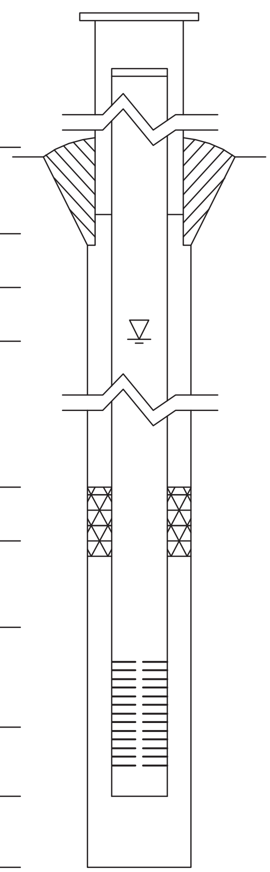
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.07	-3.18	Top of Protective Casing
625.86	-2.97	Top of Riser Pipe
622.89	0.00	Ground Surface
621.39	1.50	Top of Annular Sealant
614.99	7.90	Static Water Level (After Completion) 12/21/2011
611.89	11.00	Top of Seal
609.14	13.75	Top of Sand Pack
607.80	15.09	Top of Screen
603.31	19.58	Bottom of Screen
602.66	20.23	Bottom of Well
602.66	20.23	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.28
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	23.20
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G200

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G200

~~State-~~ Plant ~~Plane~~ Coordinate: X 877,930.6 Y 2,515,650.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/25/2008 Date Finished: 2/25/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

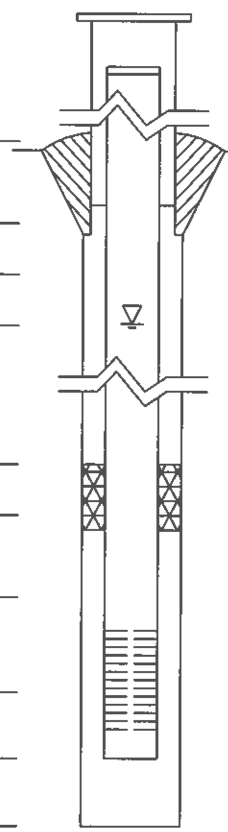
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Formation Sand (if applicable)

Installation Method: Slough



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.54	-2.34	Top of Protective Casing
625.94	-1.74	Top of Riser Pipe
624.20	0.00	Ground Surface
620.70	3.50	Top of Annular Sealant
621.45	2.75	Static Water Level (After Completion) 3/12/2008
620.70	3.50	Top of Seal
614.20	10.00	Top of Sand Pack
612.01	12.19	Top of Screen
607.22	16.98	Bottom of Screen
606.84	17.36	Bottom of Well
606.20	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.93
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	19.10
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G201

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G201

~~State Plane~~ Plant Coordinate: X 877,924.9 Y 2,514,849.5 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/25/2008 Date Finished: 2/25/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

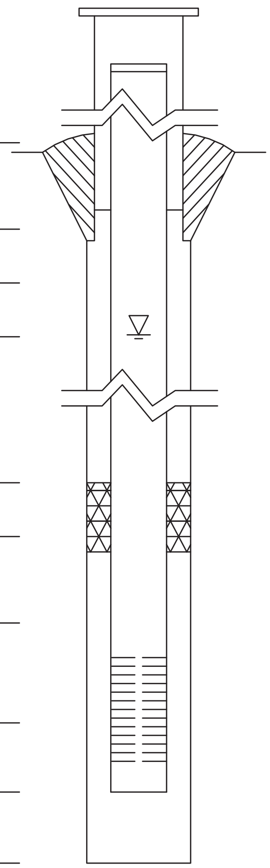
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.66	-3.76	Top of Protective Casing
627.12	-3.22	Top of Riser Pipe
623.90	0.00	Ground Surface
620.60	3.30	Top of Annular Sealant
621.73	2.17	Static Water Level (After Completion) 3/12/2008
620.60	3.30	Top of Seal
611.80	12.10	Top of Sand Pack
610.89	13.01	Top of Screen
606.10	17.80	Bottom of Screen
605.75	18.15	Bottom of Well
605.75	18.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.23
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	21.37
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location 134 CIPS Trail (Address - Lot Number) Coffeen (City) Montgomery (County)

General Description Township 7 (N)~~(S)~~ Range 3 ~~(E)~~(W) Section 10

SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

Filled with Bentonite grout (cement or other materials) from 0.5 to 20.0 ft.

Kind of plug Random soil from 0 to 0.5 ft.

Filled with ____ from ____ to ____ ft.

Kind of plug ____ from ____ to ____ ft.

Filled with ____ from ____ to ____ ft.

Kind of plug ____ from ____ to ____ ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

Rhonald W. Hasenyager, L.P.G. (Name) 196-000246 (Complete License Number)

Hanson Professional Services Inc., 1525 S. 6th St. (Address) Springfield (City) IL 62703 (State/ZIP)

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G205

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G205

~~State- Plane~~ Plant Coordinate: X 875,550.2 Y 2,515,914.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

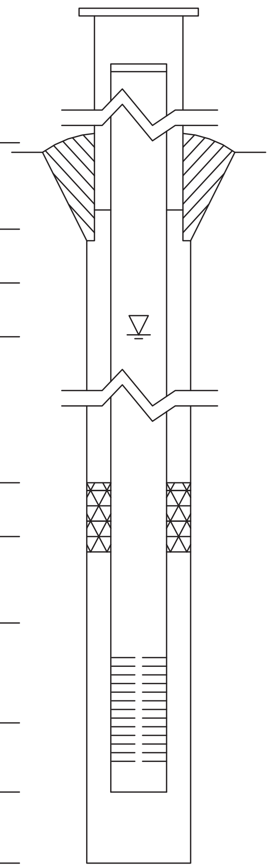
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/21/2008 Date Finished: 2/21/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Formation Sand (if applicable)

Installation Method: Slough

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.87	-2.72	Top of Protective Casing
624.45	-2.30	Top of Riser Pipe
622.15	0.00	Ground Surface
619.95	2.20	Top of Annular Sealant
617.09	5.06	Static Water Level (After Completion) 3/12/2008
619.95	2.20	Top of Seal
613.35	8.80	Top of Sand Pack
612.11	10.04	Top of Screen
607.62	14.53	Bottom of Screen
607.08	15.07	Bottom of Well
606.15	16.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.34
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	17.37
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. **Ownership (Name of Controlling Party)** Coffeen Power Station - GMF (G205)

2. **Well Location** 134 CIPS Lane — Coffeen — Montgomery
   Address - Lot Number — **City** — **County**

   General Description **Township** 7 **(N)(~~S~~)** **Range** 3 **(~~E~~)(W)** **Section** 11

   SW **Quarter of the** NE **Quarter of the** NW **Quarter**

3. **Year Drilled** 2008

4. **Drilling Permit Number (and date, if known)** n/a

5. **Type of Well** **Bored** ____ **Drilled** ✓ **Other** ____

6. **Total Depth** 16 **Diameter (inches)** 8

7. **Formation clear of obstruction** ✓ **Yes** ____ **No**

8. **DETAILS OF PLUGGING** *(riser pipe and screen pulled and annulus was grouted)*

   Filled with Bentonite grout **from** 0 **to** 16.0 **ft.**
   (cement or other materials)

   Kind of plug ____ **from** ____ **to** ____ **ft.**

   Filled with ____ **from** ____ **to** ____ **ft.**

   Kind of plug ____ **from** ____ **to** ____ **ft.**

   Filled with ____ **from** ____ **to** ____ **ft.**

   Kind of plug ____ **from** ____ **to** ____ **ft.**

9. **CASING RECORD** **Upper 2 feet of casing removed** ✓ **Yes** ____ **No**

10. **Date well was sealed** **Month** March **Day** 20 **Year** 2017.

11. **Licensed water well driller or other person approved by the Department performing well sealing.**

Rhonald W. Hasenyager, L.P.G. — 196-000246
Name — **Complete License Number**

Hanson Professional Services Inc., 1525 S. 6th St. — Springfield — IL 62703
Address — **City** — **State/ZIP**

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. **IL 482-0631**

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G206

Site Name: CCB Management Facility Borehole #: G206

State Plane Coordinate: X 2,514,669.2 Y 875,103.9 (or) Latitude: 39 4! 2.600Ä Longitude: -89 23! 54.800Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 10/14/2010 Date Finished: 10/14/2010

Report Form Completed By: Suzanna Simpson Date: 10/15/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: 15 min

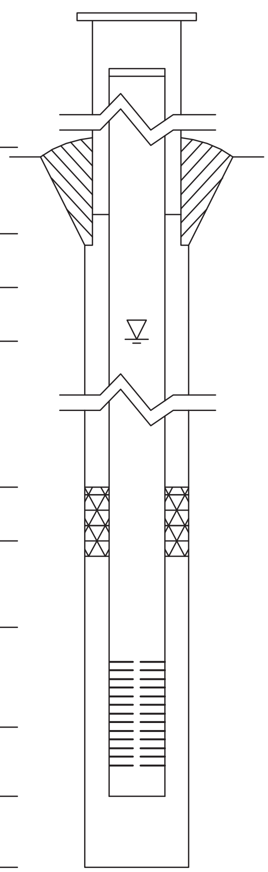
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.07	-2.53	Top of Protective Casing
632.82	-2.28	Top of Riser Pipe
630.54	0.00	Ground Surface
627.84	2.70	Top of Annular Sealant
611.96	18.58	Static Water Level (After Completion) 11/15/2010
616.24	14.30	Top of Seal
615.04	15.50	Top of Sand Pack
613.03	17.51	Top of Screen
608.62	21.92	Bottom of Screen
608.12	22.42	Bottom of Well
606.54	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.79
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.41
Total Length of Casing	(feet)	24.70
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G207

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G207

State Plane Coordinate: X 2,514,837.9 Y 875,166.4 (or) Latitude: 39 ° 4 ' 3.2 " Longitude: -89 ° 23 ' 52.6 "

Surveyed By: Jeffrey D. Emrick | IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co | Driller: D. Mahurin

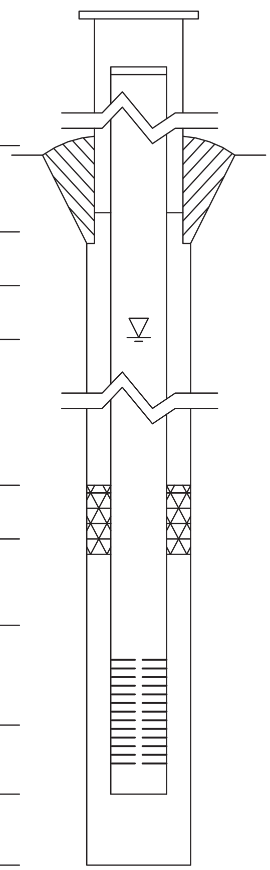
Consulting Firm: Hanson Professional Services Inc. | Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger | Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson | Date Started: 10/8/2010 Date Finished: 10/8/2010

Report Form Completed By: Suzanna L. Simpson | Date: 10/8/2010

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.37	-2.76	Top of Protective Casing
633.21	-2.60	Top of Riser Pipe
630.61	0.00	Ground Surface
628.61	2.00	Top of Annular Sealant
612.86	17.75	Static Water Level (After Completion) 11/15/2010
614.76	15.85	Top of Seal
613.63	16.98	Top of Sand Pack
612.37	18.24	Top of Screen
607.84	22.77	Bottom of Screen
607.31	23.30	Bottom of Well
606.61	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.84
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	25.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G208

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G208

State Plane Coordinate: X 2,514,993.6 Y 875,231.5 (or) Latitude: 39 ° 4 ' 3.9 " Longitude: -89 ° 23 ' 50.6 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/7/2010 Date Finished: 10/7/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/8/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 9 min

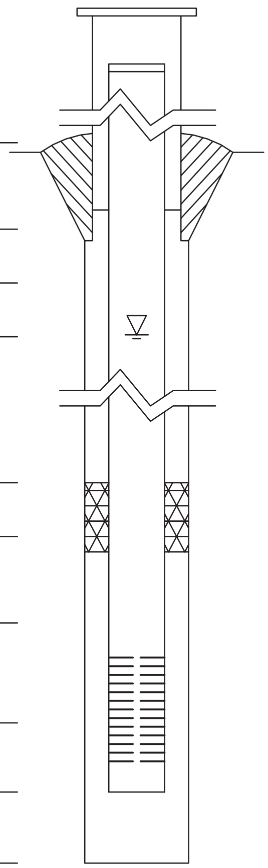
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.43	-2.86	Top of Protective Casing
633.16	-2.59	Top of Riser Pipe
630.57	0.00	Ground Surface
627.77	2.80	Top of Annular Sealant
614.76	15.81	Static Water Level (After Completion) 11/15/2010
616.07	14.50	Top of Seal
613.90	16.67	Top of Sand Pack
613.04	17.53	Top of Screen
608.51	22.06	Bottom of Screen
607.97	22.60	Bottom of Well
606.57	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.12
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	25.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G209

Site Name: CCB Management Facility Borehole #: G209

State Plane Coordinate: X 2,515,149.6 Y 875,298.2 (or) Latitude: 39 4! 4.500Ä Longitude: -89 23! 48.700Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 10/7/2010 Date Finished: 10/7/2010

Report Form Completed By: Suzanna Simpson Date: 10/8/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — selected: Granular

Installation Method: Gravity

Setting Time: 15 min

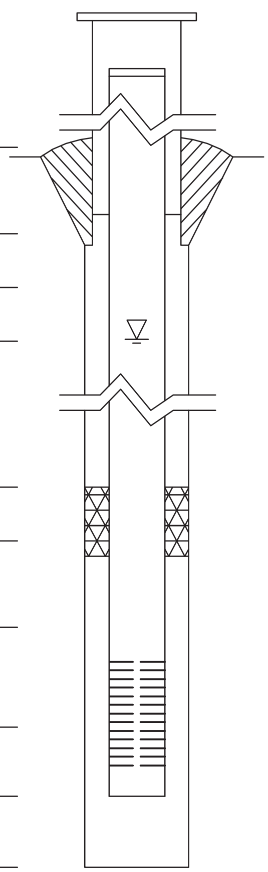
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.16	-2.59	Top of Protective Casing
632.91	-2.34	Top of Riser Pipe
630.57	0.00	Ground Surface
627.57	3.00	Top of Annular Sealant
615.52	15.05	Static Water Level (After Completion) 11/15/2010
616.07	14.50	Top of Seal
614.67	15.90	Top of Sand Pack
612.83	17.74	Top of Screen
608.29	22.28	Bottom of Screen
607.76	22.81	Bottom of Well
606.57	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.08
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	25.15
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: County: Montgomery Well #: G210

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G210

State Plane Coordinate: X 2,515,299.0 Y 875,359.7 (or) Latitude: 39 ° 4 ' 5.1 " Longitude: -89 ° 23 ' 46.8 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/6/2010 Date Finished: 10/6/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/8/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 hrs

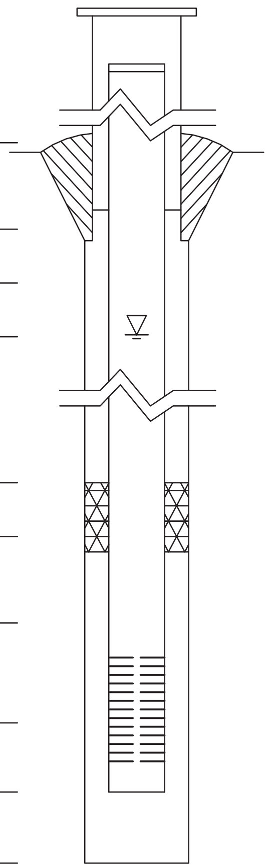
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.17	-2.69	Top of Protective Casing
632.99	-2.51	Top of Riser Pipe
630.48	0.00	Ground Surface
627.48	3.00	Top of Annular Sealant
615.38	15.10	Static Water Level (After Completion) 11/15/2010
614.03	16.45	Top of Seal
612.98	17.50	Top of Sand Pack
611.09	19.39	Top of Screen
606.55	23.93	Bottom of Screen
606.02	24.46	Bottom of Well
605.48	25.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	21.90
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	26.97
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G211

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G211

State Plane Coordinate: X 2,515,449.1 Y 875,424.5 (or) Latitude: 39 ° 4 ' 5.7 " Longitude: -89 ° 23 ' 44.9 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/11/2010 Date Finished: 10/11/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/15/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

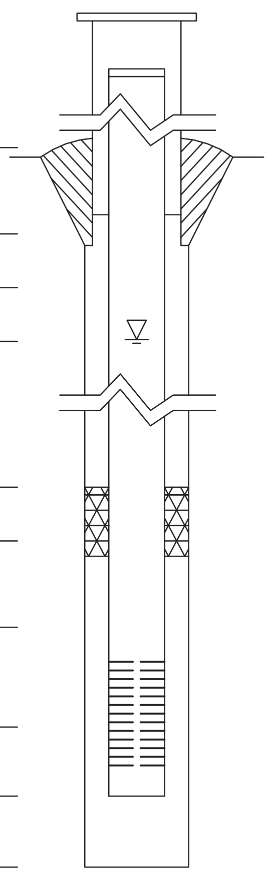
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.83	-2.52	Top of Protective Casing
632.64	-2.33	Top of Riser Pipe
630.31	0.00	Ground Surface
627.31	3.00	Top of Annular Sealant
616.17	14.14	Static Water Level (After Completion) 11/15/2010
616.01	14.30	Top of Seal
614.91	15.40	Top of Sand Pack
612.97	17.34	Top of Screen
608.43	21.88	Bottom of Screen
607.90	22.41	Bottom of Well
606.31	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.67
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	24.74
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G212

Site Name: CCB Management Facility Borehole #: G212

State Plane Coordinate: X 2,515,583.0 Y 875,486.5 (or) Latitude: 39 4! 6.300Ä Longitude: -89 23! 43.100Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 10/11/2010 Date Finished: 10/11/2010

Report Form Completed By: Suzanna Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 17 min

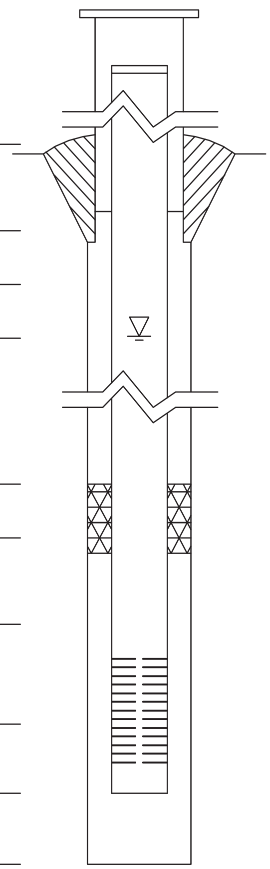
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.12	-2.53	Top of Protective Casing
632.89	-2.30	Top of Riser Pipe
630.59	0.00	Ground Surface
627.59	3.00	Top of Annular Sealant
616.10	14.49	Static Water Level (After Completion) 11/15/2010
616.89	13.70	Top of Seal
615.79	14.80	Top of Sand Pack
613.85	16.74	Top of Screen
609.30	21.29	Bottom of Screen
608.78	21.81	Bottom of Well
606.59	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.04
Bottom of Screen to End Cap	(feet)	0.52
Screen Length (1st slot to last slot)	(feet)	4.55
Total Length of Casing	(feet)	24.11
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 　　County: Montgomery　　Well #: G213

Site Name: AEG Coffeen Power Station CCB Management Facility　　Borehole #: G213

State Plane Coordinate: X 2,515,723.5 Y 875,544.4 (or) Latitude: 39 ° 4 ' 6.9 " Longitude: -89 ° 23 ' 41.4 "

Surveyed By: Jeffrey D. Emrick　　IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co　　Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc.　　Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger　　Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson　　Date Started: 10/12/2010　　Date Finished: 10/12/2010

Report Form Completed By: Suzanna L. Simpson　　Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular　Pellet　Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

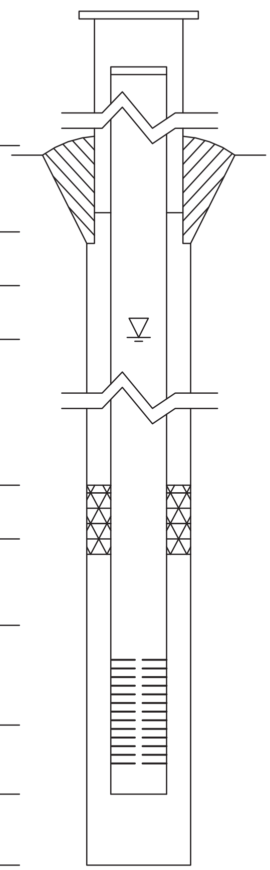
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.08	-2.74	Top of Protective Casing
632.81	-2.47	Top of Riser Pipe
630.34	0.00	Ground Surface
627.64	2.70	Top of Annular Sealant
615.01	15.33	Static Water Level (After Completion) 11/15/2010
616.54	13.80	Top of Seal
615.34	15.00	Top of Sand Pack
613.59	16.75	Top of Screen
609.05	21.29	Bottom of Screen
608.52	21.82	Bottom of Well
606.34	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.22
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	24.29
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G214

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G214

State Plane Coordinate: X 2,515,960.8 Y 875,668.0 (or) Latitude: 39 ° 4 ' 8.1 " Longitude: -89 ° 23 ' 38.3 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/14/2010 Date Finished: 10/14/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 14 min

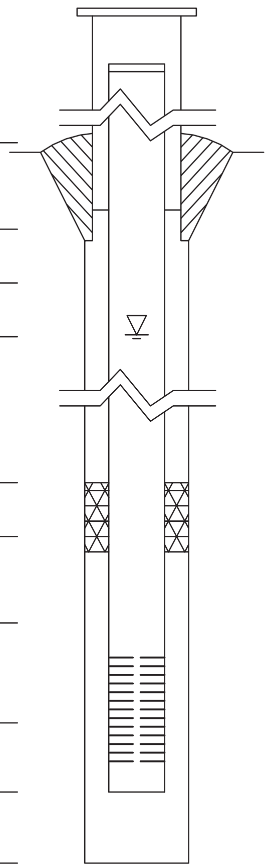
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.08	-2.69	Top of Protective Casing
632.85	-2.46	Top of Riser Pipe
630.39	0.00	Ground Surface
626.99	3.40	Top of Annular Sealant
609.48	20.91	Static Water Level (After Completion) 11/15/2010
615.39	15.00	Top of Seal
614.34	16.05	Top of Sand Pack
612.64	17.75	Top of Screen
608.25	22.14	Bottom of Screen
607.74	22.65	Bottom of Well
606.39	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.21
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	25.11
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G215

Site Name: CCB Management Facility Borehole #: G215

State Plane Coordinate: X 2,515,971.6 Y 875,810.2 (or) Latitude: 39 4! 9.500Ä Longitude: -89 23! 38.200Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 10/13/2010 Date Finished: 10/13/2010

Report Form Completed By: Suzanna Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — selected: Granular

Installation Method: Gravity

Setting Time: 20 min

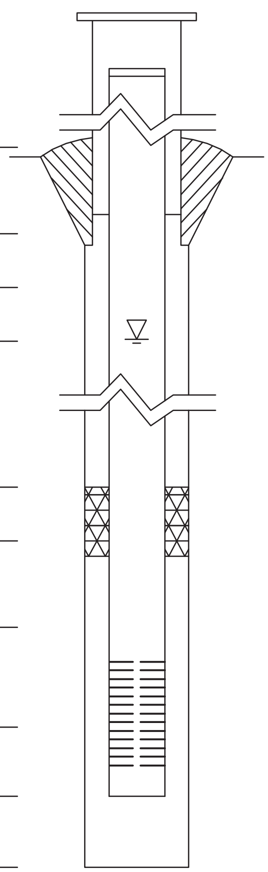
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.30	-2.82	Top of Protective Casing
633.06	-2.58	Top of Riser Pipe
630.48	0.00	Ground Surface
627.58	2.90	Top of Annular Sealant
607.64	22.84	Static Water Level (After Completion) 11/15/2010
614.08	16.40	Top of Seal
612.98	17.50	Top of Sand Pack
611.07	19.41	Top of Screen
606.68	23.80	Bottom of Screen
606.17	24.31	Bottom of Well
606.17	24.31	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	21.99
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	26.89
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G216

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G216

State Plane Coordinate: X 2,515,968.5 Y 875,976.1 (or) Latitude: 39 ° 4 ' 11.2 " Longitude: -89 ° 23 ' 38.2 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/13/2010 Date Finished: 10/13/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular circled]

Installation Method: Gravity

Setting Time: 15 min

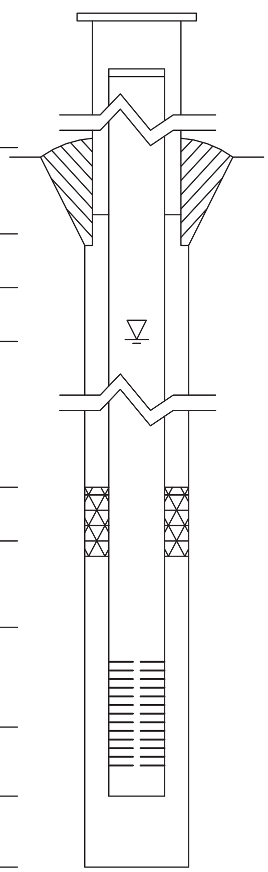
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.02	-2.74	Top of Protective Casing
632.76	-2.48	Top of Riser Pipe
630.28	0.00	Ground Surface
627.78	2.50	Top of Annular Sealant
607.52	22.76	Static Water Level (After Completion) 11/15/2010
613.28	17.00	Top of Seal
612.08	18.20	Top of Sand Pack
610.24	20.04	Top of Screen
605.86	24.42	Bottom of Screen
605.35	24.93	Bottom of Well
604.28	26.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	22.52
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.38
Total Length of Casing	(feet)	27.41
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G217

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G217

State Plane Coordinate: X 2,515,963.0 Y 876,185.6 (or) Latitude: 39 ° 4 ' 13.2 " Longitude: -89 ° 23 ' 38.3 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/12/2010 Date Finished: 10/12/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 11 min

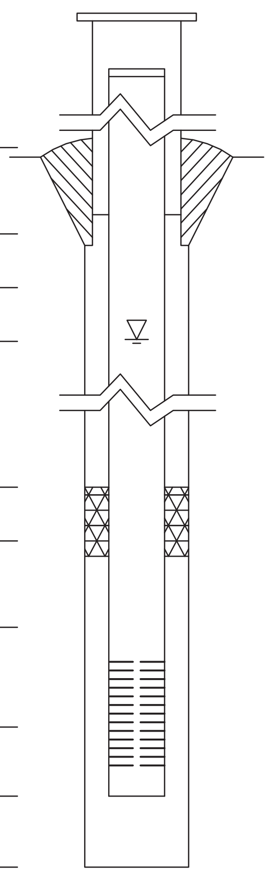
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.34	-2.67	Top of Protective Casing
633.10	-2.43	Top of Riser Pipe
630.67	0.00	Ground Surface
628.27	2.40	Top of Annular Sealant
609.28	21.39	Static Water Level (After Completion) 11/15/2010
612.82	17.85	Top of Seal
611.82	18.85	Top of Sand Pack
610.18	20.49	Top of Screen
605.79	24.88	Bottom of Screen
605.29	25.38	Bottom of Well
604.67	26.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	22.92
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	27.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency **Well Completion Report**

Site #: ______ County: Montgomery Well #: G218

Site Name: CCB Management Facility Borehole #: G218

State Plane Coordinate: X 2,515,962.2 Y 876,380.9 (or) Latitude: 39 4! 15.200Ä Longitude: -89 23! 38.200Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna Simpson Date Started: 10/12/2010 Date Finished: 10/12/2010

Report Form Completed By: Suzanna Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 17 min

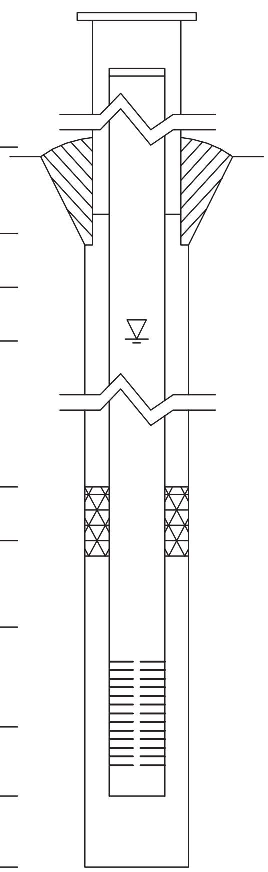
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.34	-2.70	Top of Protective Casing
633.11	-2.47	Top of Riser Pipe
630.64	0.00	Ground Surface
627.14	3.50	Top of Annular Sealant
609.89	20.75	Static Water Level (After Completion) 11/15/2010
613.14	17.50	Top of Seal
612.14	18.50	Top of Sand Pack
610.31	20.33	Top of Screen
605.87	24.77	Bottom of Screen
605.37	25.27	Bottom of Well
604.64	26.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	22.80
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.44
Total Length of Casing	(feet)	27.74
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G270

Site Name: CCB Management Facility Borehole #: G270

State Plane Coordinate: X 2,514,996.8 Y 874,801.9 (or) Latitude: 39 3! 59.600Ä Longitude: -89 23! 50.700Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna Simpson Date Started: 2/26/2008 Date Finished: 2/26/2008

Report Form Completed By: Suzanna Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: >24 hr.

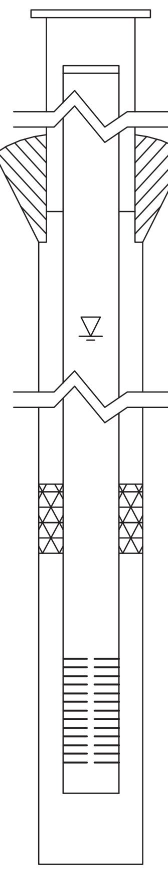
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.41	-3.49	Top of Protective Casing
625.97	-3.05	Top of Riser Pipe
622.92	0.00	Ground Surface
619.92	3.00	Top of Annular Sealant
617.30	5.62	Static Water Level (After Completion) 3/12/2008
619.92	3.00	Top of Seal
610.92	12.00	Top of Sand Pack
609.79	13.13	Top of Screen
605.00	17.92	Bottom of Screen
604.65	18.27	Bottom of Well
604.65	18.27	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.18
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	21.32
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G271

Site Name: CCB Management Facility Borehole #: G271

State Plane Coordinate: X 2,515,517.1 Y 874,239.4 (or) Latitude: 39 3! 54.000Ä Longitude: -89 23! 44.100Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/9/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

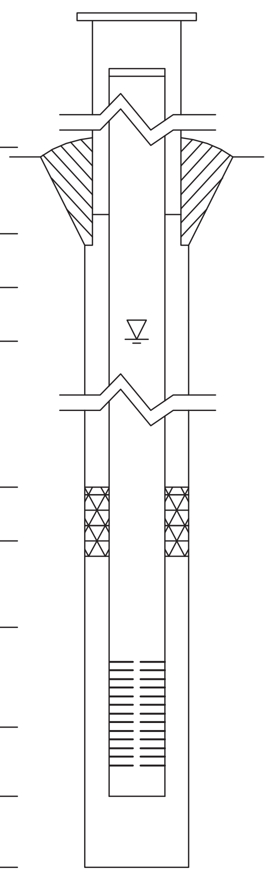
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.88	-2.99	Top of Protective Casing
625.57	-2.68	Top of Riser Pipe
622.89	0.00	Ground Surface
619.89	3.00	Top of Annular Sealant
610.39	12.50	Static Water Level (After Completion) 9/21/2009
616.16	6.73	Top of Seal
613.87	9.02	Top of Sand Pack
612.93	9.96	Top of Screen
608.58	14.31	Bottom of Screen
608.10	14.79	Bottom of Well
606.89	16.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.64
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.35
Total Length of Casing	(feet)	17.47
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G272

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G272

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,515,745.0 Y 874,234.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

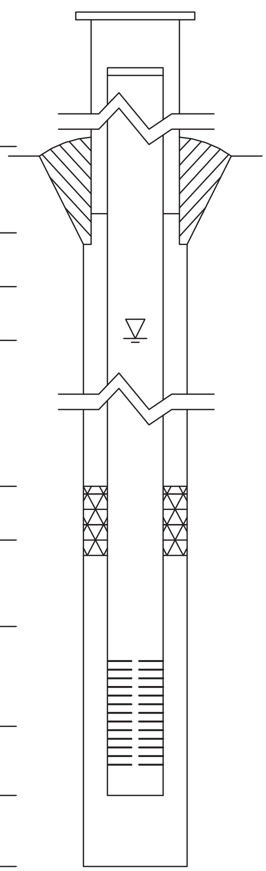
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/10/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.11	-3.39	Top of Protective Casing
623.81	-3.09	Top of Riser Pipe
620.72	0.00	Ground Surface
617.72	3.00	Top of Annular Sealant
611.23	9.49	Static Water Level (After Completion) 9/21/2009
614.55	6.17	Top of Seal
612.74	7.98	Top of Sand Pack
611.61	9.11	Top of Screen
606.74	13.98	Bottom of Screen
606.40	14.32	Bottom of Well
606.40	14.32	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.20
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.87
Total Length of Casing	(feet)	17.41
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency **Well Completion Report**

Site #: ______ County: Montgomery Well #: G273

Site Name: CCB Management Facility Borehole #: G273

State Plane Coordinate: X 2,515,975.5 Y 874,235.2 (or) Latitude: 39 3! 53.900Ä Longitude: -89 23! 38.300Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

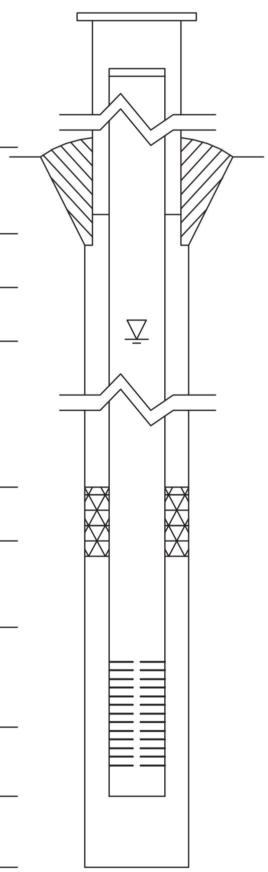
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/10/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.33	-3.16	Top of Protective Casing
623.02	-2.85	Top of Riser Pipe
620.17	0.00	Ground Surface
617.17	3.00	Top of Annular Sealant
610.28	9.89	Static Water Level (After Completion) 9/21/2009
614.07	6.10	Top of Seal
612.45	7.72	Top of Sand Pack
611.09	9.08	Top of Screen
605.61	14.56	Bottom of Screen
605.07	15.10	Bottom of Well
604.17	16.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.93
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	5.48
Total Length of Casing	(feet)	17.95
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G274

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G274

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,516,195.6 Y 874,239.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

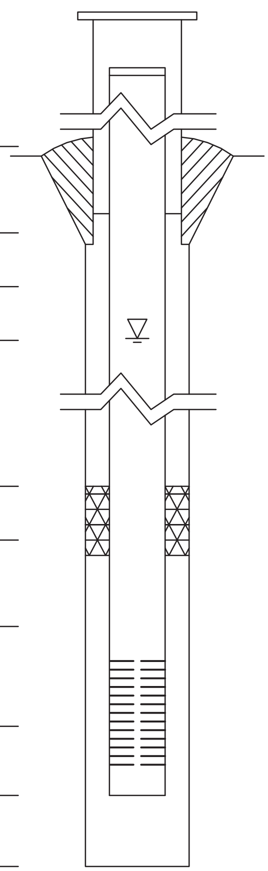
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/16/2009 Date Finished: 9/16/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.32	-2.65	Top of Protective Casing
624.04	-2.37	Top of Riser Pipe
621.67	0.00	Ground Surface
618.67	3.00	Top of Annular Sealant
608.55	13.12	Static Water Level (After Completion) 9/21/2009
611.93	9.74	Top of Seal
610.15	11.52	Top of Sand Pack
608.77	12.90	Top of Screen
604.00	17.67	Bottom of Screen
603.61	18.06	Bottom of Well
603.61	18.06	Bottom of Borehole

* Referenced to a National Geodetic Datum

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.27
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	20.43
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G275

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G275

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,516,375.9 Y 874,298.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/16/2009 Date Finished: 9/16/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

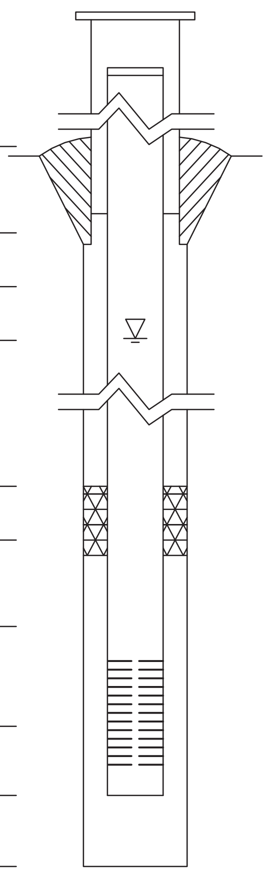
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
618.53	-2.39	Top of Protective Casing
618.26	-2.12	Top of Riser Pipe
616.14	0.00	Ground Surface
613.14	3.00	Top of Annular Sealant
605.89	10.25	Static Water Level (After Completion) 9/21/2009
610.42	5.72	Top of Seal
609.16	6.98	Top of Sand Pack
607.92	8.22	Top of Screen
603.52	12.62	Bottom of Screen
602.95	13.19	Bottom of Well
602.95	13.19	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	10.34
Bottom of Screen to End Cap	(feet)	0.52
Screen Length (1st slot to last slot)	(feet)	4.45
Total Length of Casing	(feet)	15.31
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G276

Site Name: CCB Management Facility Borehole #: G276

State Plane Coordinate: X 2,516,358.8 Y 874,438.6 (or) Latitude: 39 3! 55.900Ä Longitude: -89 23! 33.400Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/16/2009 Date Finished: 9/16/2009

Report Form Completed By: Suzanna Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

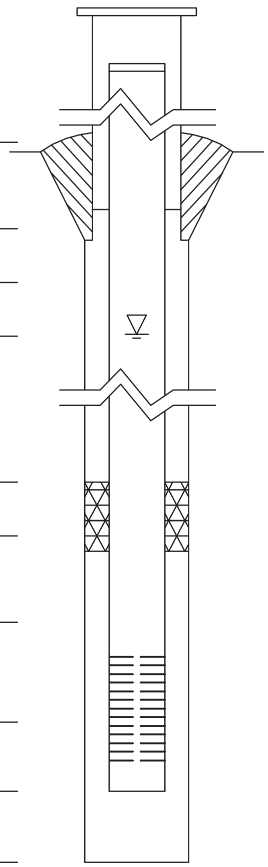
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.40	-3.26	Top of Protective Casing
632.00	-2.86	Top of Riser Pipe
629.14	0.00	Ground Surface
626.14	3.00	Top of Annular Sealant
603.59	25.55	Static Water Level (After Completion) 9/21/2009
610.06	19.08	Top of Seal
608.11	21.03	Top of Sand Pack
606.73	22.41	Top of Screen
601.92	27.22	Bottom of Screen
601.49	27.65	Bottom of Well
601.14	28.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	25.27
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.81
Total Length of Casing	(feet)	30.51
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G277

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G277

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,516,370.5 Y 874,581.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/14/2009 Date Finished: 9/14/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min

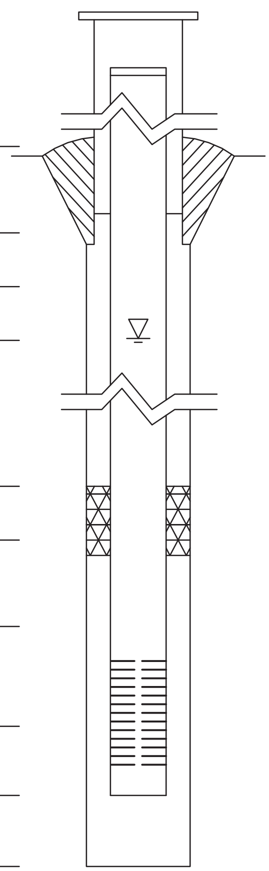
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.35	-2.56	Top of Protective Casing
623.08	-2.29	Top of Riser Pipe
620.79	0.00	Ground Surface
617.79	3.00	Top of Annular Sealant
602.56	18.23	Static Water Level (After Completion) 9/21/2009
608.00	12.79	Top of Seal
607.00	13.79	Top of Sand Pack
606.50	14.29	Top of Screen
602.02	18.77	Bottom of Screen
601.55	19.24	Bottom of Well
600.79	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.58
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	21.53
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G278

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G278

~~State-~~ ~~Plane~~ Plant Coordinate: X 2,516,200.7 Y 874,875.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/11/2009 Date Finished: 9/11/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 22 min

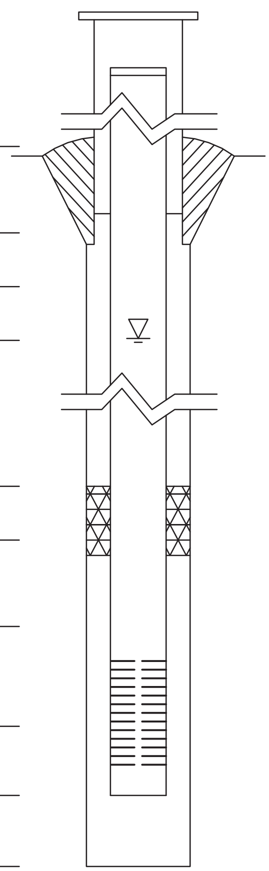
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.49	-2.64	Top of Protective Casing
631.17	-2.32	Top of Riser Pipe
628.85	0.00	Ground Surface
625.85	3.00	Top of Annular Sealant
604.87	23.98	Static Water Level (After Completion) 9/21/2009
613.74	15.11	Top of Seal
611.90	16.95	Top of Sand Pack
609.92	18.93	Top of Screen
605.15	23.70	Bottom of Screen
604.79	24.06	Bottom of Well
604.79	24.06	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	21.25
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	26.38
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: G279

Site Name: CCB Management Facility Borehole #: G279

State Plane Coordinate: X 2,516,245.6 Y 875,028.1 (or) Latitude: 39 4! 1.800Ä Longitude: -89 23! 34.800Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/10/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min

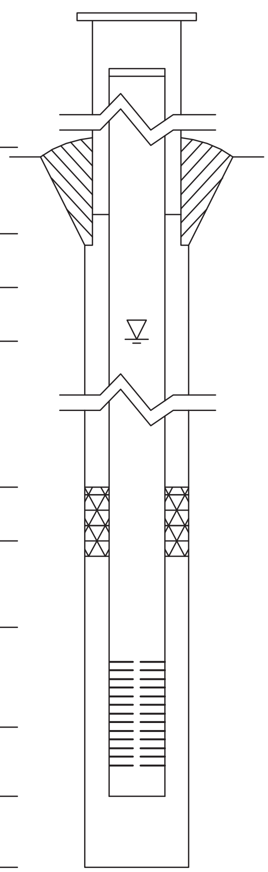
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz Sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.33	-3.14	Top of Protective Casing
632.04	-2.85	Top of Riser Pipe
629.19	0.00	Ground Surface
626.19	3.00	Top of Annular Sealant
601.66	27.53	Static Water Level (After Completion) 9/21/2009
610.45	18.74	Top of Seal
608.77	20.42	Top of Sand Pack
606.79	22.40	Top of Screen
602.40	26.79	Bottom of Screen
~~604.51~~	~~24.68~~ $\boxed{27.3}$	Bottom of Well
601.19	28.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	25.25
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	30.17
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G280

Site Name: CCB Management Facility Borehole #: G280

State Plane Coordinate: X 2,515,679.5 Y 875,045.1 (or) Latitude: 39 4! 2.000Ä Longitude: -89 23! 42.000Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna Simpson Date Started: 2/26/2008 Date Finished: 2/26/2008

Report Form Completed By: Suzanna Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

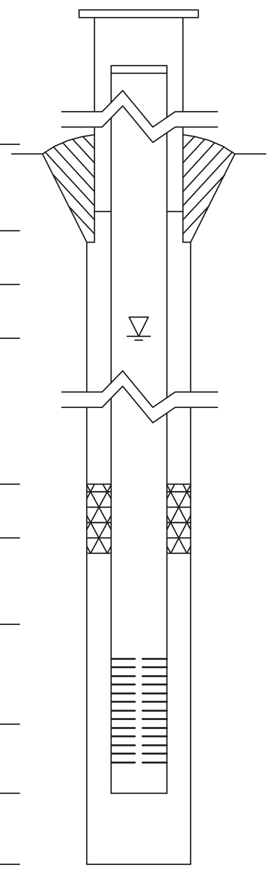
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.79	-2.84	Top of Protective Casing
625.30	-2.35	Top of Riser Pipe
622.95	0.00	Ground Surface
620.85	2.10	Top of Annular Sealant
618.61	4.34	Static Water Level (After Completion) 3/12/2008
620.85	2.10	Top of Seal
611.75	11.20	Top of Sand Pack
610.16	12.79	Top of Screen
605.32	17.63	Bottom of Screen
604.97	17.98	Bottom of Well
604.97	17.98	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.14
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.84
Total Length of Casing	(feet)	20.33
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G281

Site Name: Natural Resource Technology, Inc. Coffeen Energy Center Borehole #: G281

State Plane Coordinate: X 874,375.4 Y 2,514,455.5 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Geotechnical Engineering, LLC Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/8/2015 Date Finished: 9/8/2015

Report Form Completed By: Suzanna L. Keim Date: 10/6/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

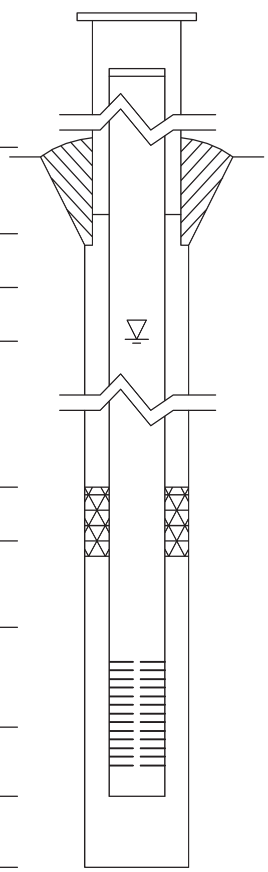
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ____



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.64	-2.82	Top of Protective Casing
626.36	-2.54	Top of Riser Pipe
623.82	0.00	Ground Surface
622.82	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
612.59	11.23	Top of Seal
610.37	13.45	Top of Sand Pack
608.31	15.51	Top of Screen
603.66	20.16	Bottom of Screen
603.53	20.29	Bottom of Well
603.53	20.29	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.80
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.65
Total Length of Casing	(feet)	22.83
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G301

Site Name: Natural Resource Technology, Inc. Coffeen Energy Center Borehole #: G301

State Plane Coordinate: X 872,234.8 Y 2,515,583.0 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Geotechnical Engineering, LLC Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/4/2015 Date Finished: 9/4/2015

Report Form Completed By: Suzanna L. Keim Date: 10/6/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: 25 minutes

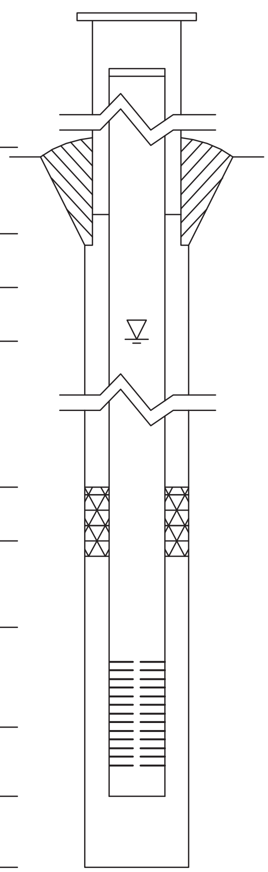
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
622.98	-2.71	Top of Protective Casing
622.65	-2.38	Top of Riser Pipe
620.27	0.00	Ground Surface
618.20	2.07	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
612.75	7.52	Top of Sand Pack
608.96	11.31	Top of Screen
604.31	15.96	Bottom of Screen
604.06	16.21	Bottom of Well
604.06	16.21	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.56
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.65
Total Length of Casing	(feet)	18.59
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G302

Site Name: Natural Resource Technology, Inc. Coffeen Energy Center Borehole #: G302

State Plane Coordinate: X 872,253.0 Y 2,516,214.2 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Geotechnical Engineering, LLC Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/3/2015 Date Finished: 9/4/2015

Report Form Completed By: Suzanna L. Keim Date: 10/7/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

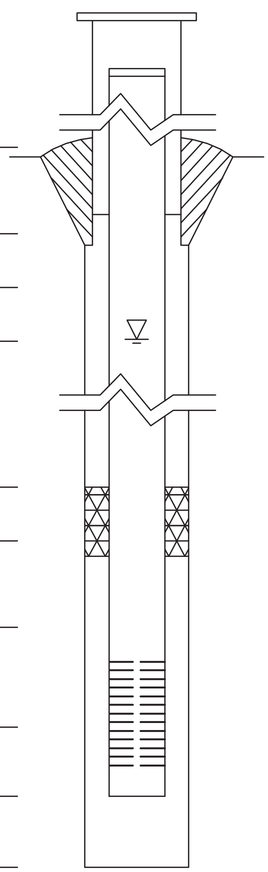
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
620.34	-2.39	Top of Protective Casing
620.04	-2.09	Top of Riser Pipe
617.95	0.00	Ground Surface
615.95	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
607.78	10.17	Top of Seal
605.88	12.07	Top of Sand Pack
604.74	13.21	Top of Screen
600.09	17.86	Bottom of Screen
599.56	18.39	Bottom of Well
599.56	18.39	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.30
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.65
Total Length of Casing	(feet)	20.48
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Surface Elevation: 619.10

Datum msl

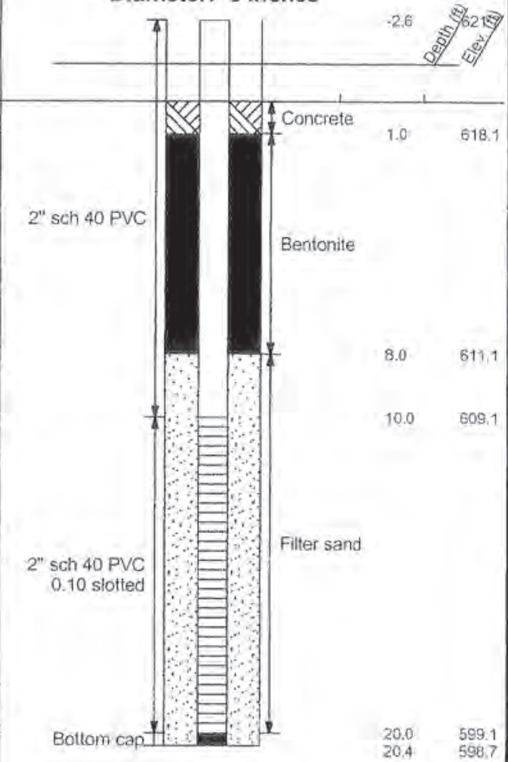
Completion Date: 8/26/10

Northing: 871382.45

Easting: 2516641.06

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	FILL: brown, silty clay	1-2-3	SS1
3	Medium stiff, grayish-brown, silty CLAY with lignite - CL	1-3-3	SS2
5		1-3-4	SS3
9	Soft, brown, silty CLAY - CL	2-3-3	SS4
10	Stiff to hard, brown to grayish-brown, silty CLAY - CL (TILL)		
14		27-44 -50/1"	SS5
19		44-50/2"	SS6
20	Boring terminated at 20 feet.		

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 9 FEET ∇

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM __ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RBF
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

Renamed G303

LOG OF BORING: APW-3

Project No. J017150.01

Surface Elevation: 623.46

Datum: msl

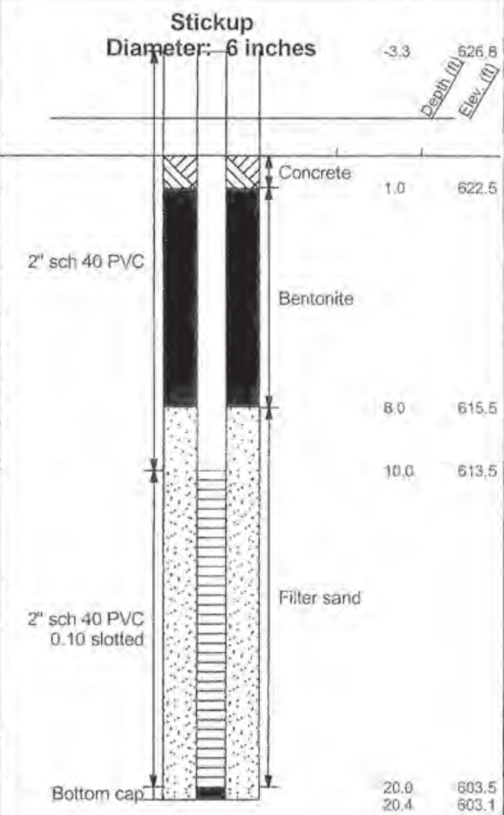
Completion Date: 8/26/10

Northing: 871397.48

Easting: 2515520.23

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium stiff, grayish-brown, silty CLAY - CL			
			0-1-1	SS1
			1-2-5	SS2
5			1-3-4	SS3
10			1-2-3	SS4
14	Medium to fine SAND - SP	▽		
15	Hard, gray, silty CLAY - CL (TILL)		1-2-1	SS5
			14-47	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 14 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM __ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RJS
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

Renamed G304

LOG OF BORING: APW-4

Project No. J017150.01

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location 134 CIPS Trail (Address - Lot Number) Coffeen (City) Montgomery (County)

General Description Township 7 (N)~~(S)~~ Range 3 ~~(E)~~(W) Section 10

SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

Filled with Bentonite grout (cement or other materials) from 0.5 to 20.0 ft.

Kind of plug Random soil from 0 to 0.5 ft.

Filled with ____ from ____ to ____ ft.

Kind of plug ____ from ____ to ____ ft.

Filled with ____ from ____ to ____ ft.

Kind of plug ____ from ____ to ____ ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

Name: Rhonald W. Hasenyager, L.P.G.
Complete License Number: 196-000246

Address: Hanson Professional Services Inc., 1525 S. 6th St.
City: Springfield
State/ZIP: IL 62703

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G305

Site Name: Coffeen Power Station Borehole #: G305

State Plane Coordinate: X 871,156.3 Y 2,515,199.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Geotechnical Engineering LLC Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Suzanna L. Keim Date Started: 5/3/2016 Date Finished: 5/3/2016

Report Form Completed By: Suzanna L. Keim Date: 5/19/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

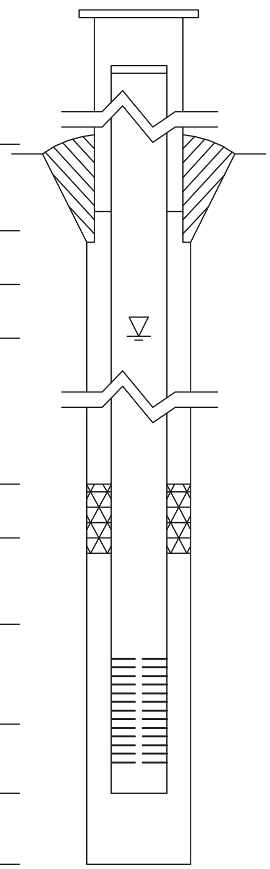
Type of Sand Pack: Quartz Sand

Grain Size: 10-40 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.88	-3.34	Top of Protective Casing
625.55	-3.01	Top of Riser Pipe
622.54	0.00	Ground Surface
621.54	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
611.04	11.50	Top of Sand Pack
609.10	13.44	Top of Screen
604.27	18.27	Bottom of Screen
604.09	18.45	Bottom of Well
604.09	18.45	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.45
Bottom of Screen to End Cap	(feet)	0.18
Screen Length (1st slot to last slot)	(feet)	4.83
Total Length of Casing	(feet)	21.46
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G306

Site Name: Coffeen Power Station Borehole #: G306

State Plane Coordinate: X 871,141.0 Y 2,516,120.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Geotechnical Engineering LLC Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Suzanna L. Keim Date Started: 5/3/2016 Date Finished: 5/3/2016

Report Form Completed By: Suzanna L. Keim Date: 5/19/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

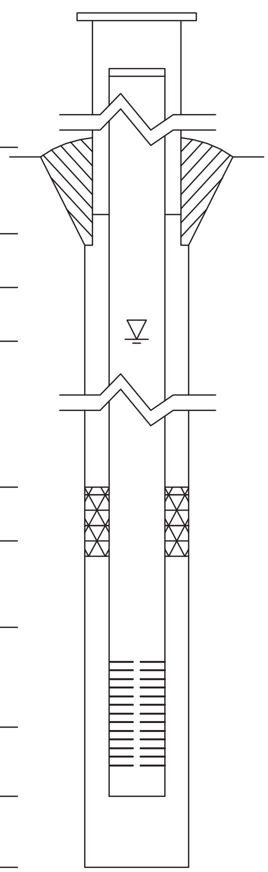
Type of Sand Pack: Quartz Sand

Grain Size: 10-40 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.12	-3.28	Top of Protective Casing
625.72	-2.88	Top of Riser Pipe
622.84	0.00	Ground Surface
621.84	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
611.24	11.60	Top of Sand Pack
609.77	13.07	Top of Screen
605.16	17.68	Bottom of Screen
604.98	17.86	Bottom of Well
604.84	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.95
Bottom of Screen to End Cap	(feet)	0.18
Screen Length (1st slot to last slot)	(feet)	4.61
Total Length of Casing	(feet)	20.74
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G307

Site Name: Coffeen Power Station Ash Pond 1 Borehole #: G307

State Plane Coordinate: X 2,515,553.3 Y 871,398.6 (or) Latitude: ______ Longitude: ______

Surveyed By: ______ IL Registration #: ______

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Gates

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 7/26/2016 Date Finished: 7/27/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 7/28/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: 18 hrs.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

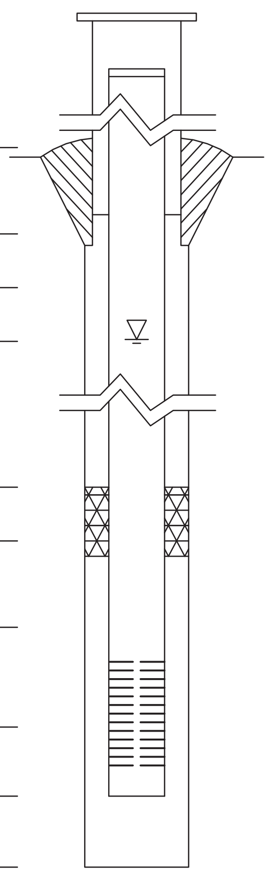
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: none (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.72	-2.64	Top of Protective Casing
624.47	-2.39	Top of Riser Pipe
622.08	0.00	Ground Surface
620.08	2.00	Top of Annular Sealant
623.84	-1.76	Static Water Level (After Completion) 7/27/2016
n/a	n/a	Top of Seal
610.10	11.98	Top of Sand Pack
609.12	12.96	Top of Screen
604.28	17.80	Bottom of Screen
603.86	18.22	Bottom of Well
603.86	18.22	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.37
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.84
Total Length of Casing	(feet)	20.61
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____________ County: Montgomery Well #: G401

Site Name: Natural Resource Technology, Inc. Coffeen Energy Center Borehole #: G401

State Plane Coordinate: X 872,510.6 Y 2,515,614.8 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Geotechnical Engineering, LLC Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 9/14/2015 Date Finished: 9/14/2015

Report Form Completed By: Suzanna L. Keim Date: 10/7/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

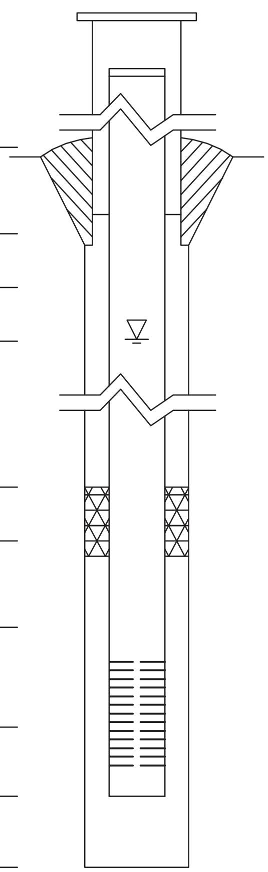
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ____________



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.84	-2.81	Top of Protective Casing
625.57	-2.54	Top of Riser Pipe
623.03	0.00	Ground Surface
621.33	1.70	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
610.12	12.91	Top of Sand Pack
608.67	14.36	Top of Screen
604.24	18.79	Bottom of Screen
603.74	19.29	Bottom of Well
603.73	19.30	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.70
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.63
Total Length of Casing	(feet)	21.83
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Surface Elevation: 610.56

Datum msl

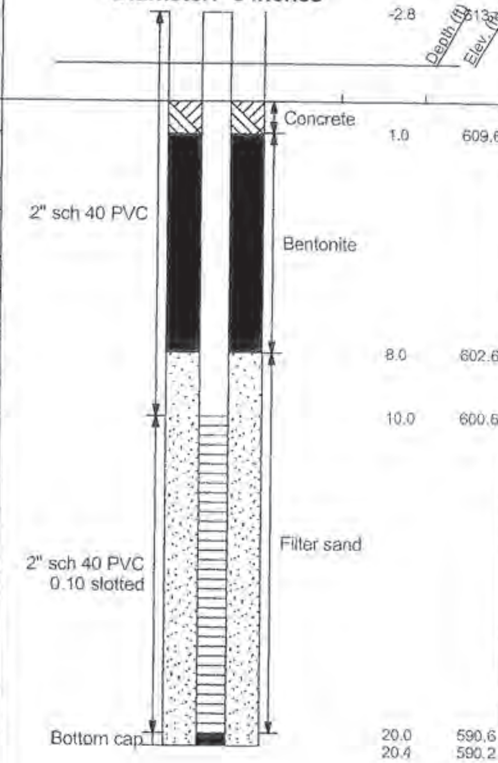
Completion Date: 8/27/10

Northing: 872502.26

Easting: 2516632.59

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium stiff, brown, silty CLAY - CL		6-3-3	SS1
			1-2-4	SS2
5	Medium stiff, gray, silty CLAY, trace sand - CL ▽		1-2-5	SS3
	Hard to stiff, brown to gray, silty CLAY, trace sand seams - CL (TILL)		9-22-28	SS4
10				
15			1-6-12	SS5
			3-4-9	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01- COFFEEN.GPJ GTINC 0838301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 7 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM __ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RR8
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

Renamed G402

LOG OF BORING: APW-2

Project No. J017150.01

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G403

Site Name: Natural Resource Technology, Inc. Coffeen Energy Center Borehole #: G403

State Plane Coordinate: X 873,561.3 Y 2,514,616.6 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Geotechnical Engineering, LLC Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/11/2015 Date Finished: 9/11/2015

Report Form Completed By: Suzanna L. Keim Date: 10/7/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

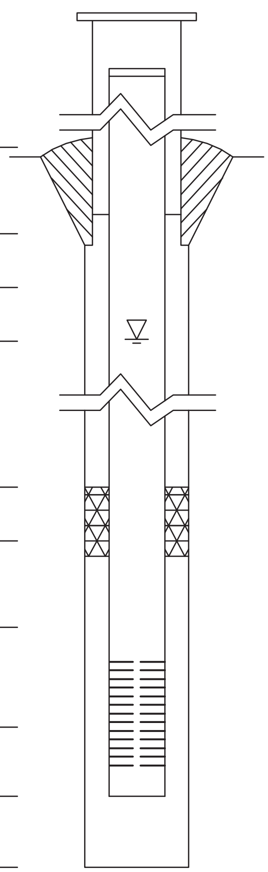
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.72	-2.91	Top of Protective Casing
626.47	-2.66	Top of Riser Pipe
623.81	0.00	Ground Surface
621.81	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
612.64	11.17	Top of Sand Pack
610.70	13.11	Top of Screen
606.03	17.78	Bottom of Screen
605.66	18.15	Bottom of Well
605.66	18.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.77
Bottom of Screen to End Cap	(feet)	0.37
Screen Length (1st slot to last slot)	(feet)	4.67
Total Length of Casing	(feet)	20.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G404
Formerly MW22S

Site Name: Coffeen Energy Center Borehole #: SB22

State Plane Coordinate: X 2,516,397.9 Y 873,999.8 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: A. Rachford

Consulting Firm: Hanson Professional Services Inc. Geologist: , LPG #

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 5/1/2007 Date Finished: 5/1/2007

Report Form Completed By: Rhonald W. Hasenyager Date: 5/2/2007

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

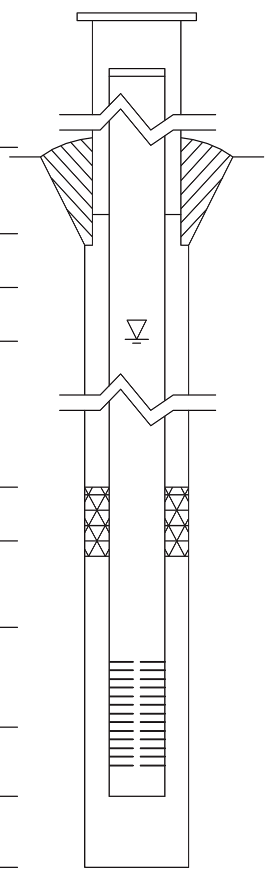
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: gravity

Type of Backfill Material: Formation sand (if applicable)

Installation Method: slough



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
616.02	-2.92	Top of Protective Casing
615.77	-2.67	Top of Riser Pipe
613.10	0.00	Ground Surface
613.10	0.00	Top of Annular Sealant
611.03	2.07	Static Water Level (After Completion) 5/10/2007
n/a	n/a	Top of Seal
608.05	5.05	Top of Sand Pack
606.68	6.42	Top of Screen
601.93	11.17	Bottom of Screen
601.48	11.62	Bottom of Well
601.10	12.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	9.09
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	14.29
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G405
Formerly MW21S

Site Name: Coffeen Energy Center Borehole #: SB21

State Plane Coordinate: X 2,515,335.7 Y 873,996.8 (or) Latitude: ______ Longitude: ______

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: A. Rachford

Consulting Firm: Hanson Professional Services Inc. Geologist: , LPG #

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 5/1/2007 Date Finished: 5/1/2007

Report Form Completed By: Rhonald W. Hasenyager Date: 5/2/2007

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

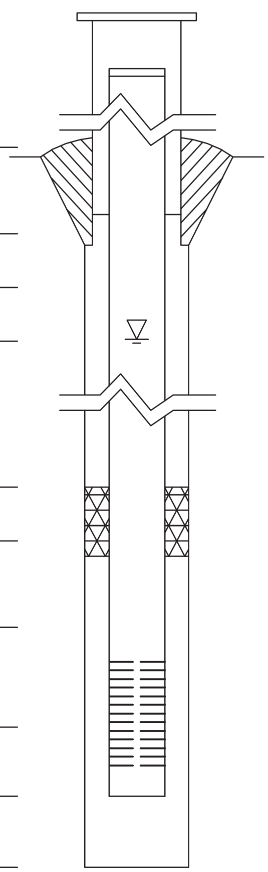
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: gravity

Type of Backfill Material: ______ (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.04	-3.14	Top of Protective Casing
623.78	-2.88	Top of Riser Pipe
620.90	0.00	Ground Surface
620.90	0.00	Top of Annular Sealant
619.67	1.23	Static Water Level (After Completion) 5/10/2007
n/a	n/a	Top of Seal
613.19	7.71	Top of Sand Pack
611.89	9.01	Top of Screen
607.14	13.76	Bottom of Screen
606.69	14.21	Bottom of Well
606.69	14.21	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.89
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	17.09
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G406

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G406

State Plane Coordinate: X 2,514,702.4 Y 872,521.3 (or) Latitude: 39 3! 37.114Ä Longitude: -89 23! 54.628Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/19/2016 Date Finished: 8/19/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

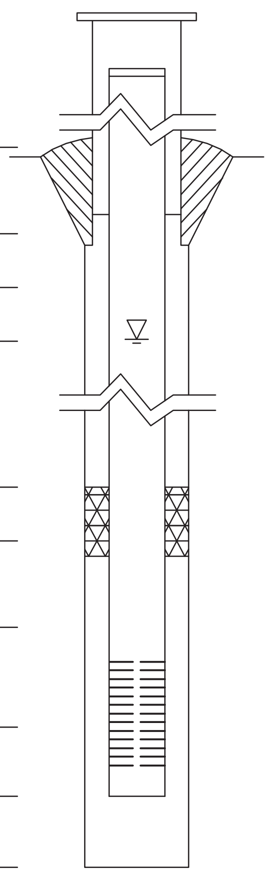
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.70	-3.84	Top of Protective Casing
625.36	-3.50	Top of Riser Pipe
621.86	0.00	Ground Surface
619.86	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
610.74	11.12	Top of Seal
609.65	12.21	Top of Sand Pack
608.30	13.56	Top of Screen
603.49	18.37	Bottom of Screen
603.11	18.75	Bottom of Well
603.11	18.75	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.06
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.81
Total Length of Casing	(feet)	22.25
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G407

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G407

State Plane Coordinate: X 2,513,705.9 Y 872,973.4 (or) Latitude: 39 3! 41.665Ä Longitude: -89 24! 7.213Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/16/2016 Date Finished: 8/16/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — selected: Granular

Installation Method: Gravity

Setting Time: 15 minutes

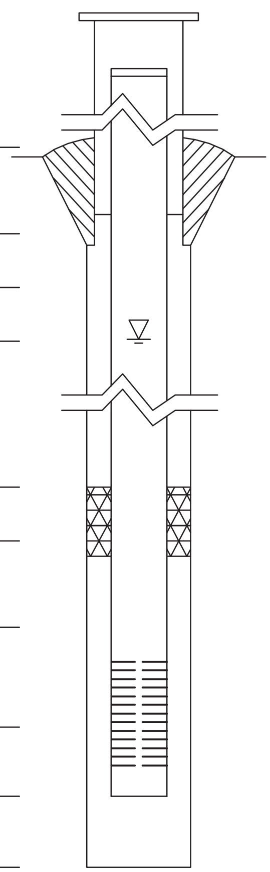
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz Sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.70	-3.35	Top of Protective Casing
621.32	-2.97	Top of Riser Pipe
618.35	0.00	Ground Surface
616.35	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
607.50	10.85	Top of Seal
605.50	12.85	Top of Sand Pack
604.57	13.78	Top of Screen
599.74	18.61	Bottom of Screen
599.31	19.04	Bottom of Well
598.35	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.75
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.83
Total Length of Casing	(feet)	22.01
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G410

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G410

State Plane Coordinate: X 2,513,206.3 Y 872,968.5 (or) Latitude: 39Ä 3! 41.658 Longitude: -89Ä 24! 13.546

Surveyed By: Matthew H. Schrader IL Registration #: 035-003487

Drilling Contractor: Bulldog Drilling, Inc. Driller: C. Dutton

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 2/23/2018 Date Finished: 2/23/2018

Report Form Completed By: Suzanna L. Keim Date: 2/26/2018

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: ____

Installation Method: ____

Setting Time: ____

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hours

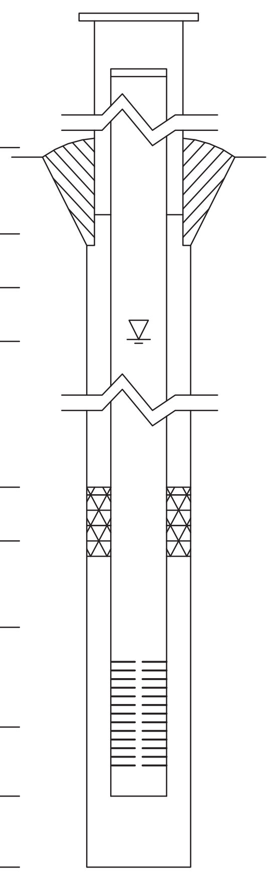
Type of Sand Pack: Filter Sand

Grain Size: 20/40 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
620.18	-2.97	Top of Protective Casing
619.79	-2.58	Top of Riser Pipe
617.21	0.00	Ground Surface
	n/a	Top of Annular Sealant
612.39	4.82	Static Water Level (After Completion) 3/1/2018
616.71	0.50	Top of Seal
609.81	7.40	Top of Sand Pack
608.32	8.89	Top of Screen
603.53	13.68	Bottom of Screen
603.12	14.09	Bottom of Well
603.12	14.09	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.47
Bottom of Screen to End Cap	(feet)	0.41
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	16.67
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G411

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G411

State Plane Coordinate: X 2,513,122.4 Y 873,844.8 (or) Latitude: 39Ä 3! 50.326 Longitude: -89Ä 24! 14.517

Surveyed By: Matthew H. Schrader IL Registration #: 035-003487

Drilling Contractor: Bulldog Drilling, Inc. Driller: C. Dutton

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 2/22/2018 Date Finished: 2/22/2018

Report Form Completed By: Suzanna L. Keim Date: 2/26/2018

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: ______

Installation Method: ______

Setting Time: ______

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hours

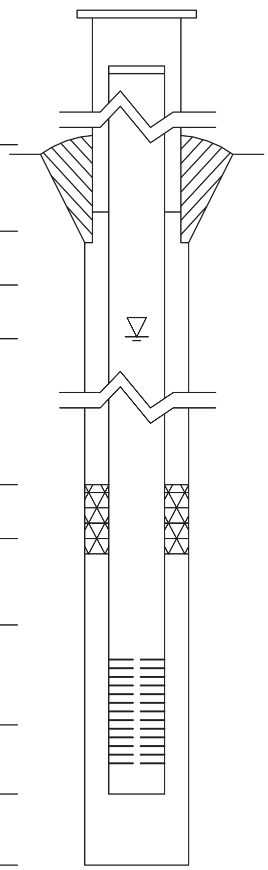
Type of Sand Pack: Filter Sand

Grain Size: 20/40 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.60	-3.11	Top of Protective Casing
623.25	-2.76	Top of Riser Pipe
620.49	0.00	Ground Surface
	n/a	Top of Annular Sealant
617.84	2.65	Static Water Level (After Completion) 3/1/2018
619.99	0.50	Top of Seal
610.42	10.07	Top of Sand Pack
609.28	11.21	Top of Screen
604.42	16.07	Bottom of Screen
604.02	16.47	Bottom of Well
604.02	16.47	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.97
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.86
Total Length of Casing	(feet)	19.23
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW1D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-01

State Plane Coordinate: X 874,972.6 Y 2,513,478.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/3/2006 Date Finished: 5/3/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 21 min.

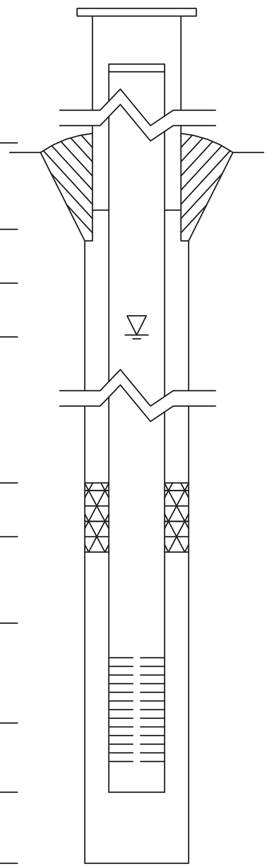
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
609.29	-1.89	Top of Protective Casing
609.01	-1.61	Top of Riser Pipe
607.40	0.00	Ground Surface
604.80	2.60	Top of Annular Sealant
571.12	36.28	Static Water Level (After Completion) 6/1/2006
578.90	28.50	Top of Seal
575.82	31.58	Top of Sand Pack
574.11	33.29	Top of Screen
569.35	38.05	Bottom of Screen
568.99	38.41	Bottom of Well
567.40	40.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	35.17
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	40.29
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location 134 CIPS Trail — Coffeen — Montgomery
   Address - Lot Number — City — County

   General Description Township 7 (N)(~~S~~) Range 3 (~~E~~)(W) Section 10

   SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

   Filled with Bentonite grout from 0.5 to 20.0 ft.
   (cement or other materials)

   Kind of plug Random soil from 0 to 0.5 ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

Rhonald W. Hasenyager, L.P.G. — 196-000246
Name — Complete License Number

Hanson Professional Services Inc., 1525 S. 6th St. — Springfield — IL 62703
Address — City — State/ZIP

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW2D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-02b

State Plane Coordinate: X 876,414.0 Y 2,513,209.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/5/2006 Date Finished: 5/5/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 20 min.

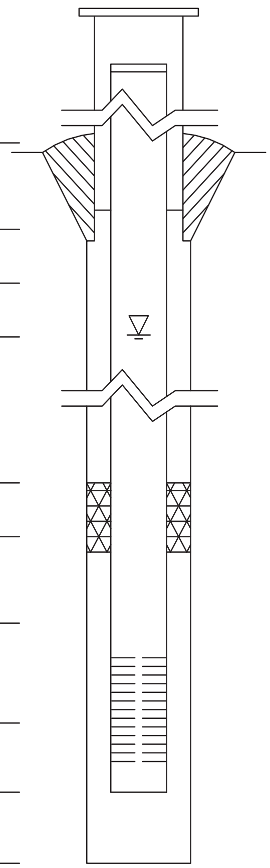
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Re-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.52	-3.42	Top of Protective Casing
627.07	-2.97	Top of Riser Pipe
624.10	0.00	Ground Surface
621.00	3.10	Top of Annular Sealant
616.74	7.36	Static Water Level (After Completion) 6/1/2006
606.00	18.10	Top of Seal
603.92	20.18	Top of Sand Pack
602.07	22.03	Top of Screen
597.27	26.83	Bottom of Screen
596.88	27.22	Bottom of Well
596.88	27.22	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	25.00
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.80
Total Length of Casing	(feet)	30.19
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location 134 CIPS Trail | Coffeen | Montgomery
   Address - Lot Number | City | County

   General Description Township 7 (N)~~(S)~~ Range 3 ~~(E)~~(W) Section 10

   SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

   Filled with Bentonite grout from 0.5 to 20.0 ft.
   (cement or other materials)

   Kind of plug Random soil from 0 to 0.5 ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

Rhonald W. Hasenyager, L.P.G.
Name

196-000246
Complete License Number

Hanson Professional Services Inc., 1525 S. 6th St.
Address

Springfield
City

IL 62703
State/ZIP

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW2S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-02a

State Plane Coordinate: X 876,408.9 Y 2,513,210.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/5/2006 Date Finished: 5/5/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular / Pellet / Slurry (choose one): Granular

Installation Method: Gravity

Setting Time: +24 hr.

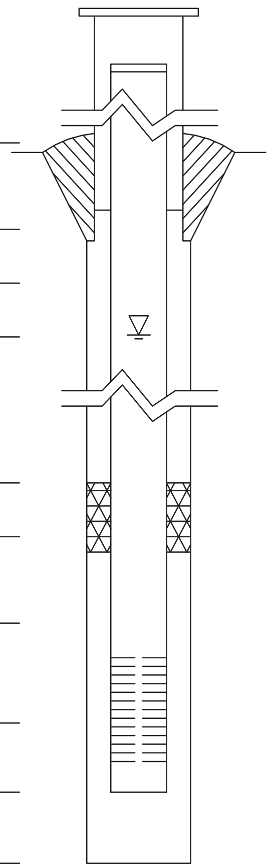
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.55	-3.45	Top of Protective Casing
627.07	-2.97	Top of Riser Pipe
624.10	0.00	Ground Surface
619.72	4.38	Top of Annular Sealant
616.68	7.42	Static Water Level (After Completion) 6/1/2006
619.72	4.38	Top of Seal
614.60	9.50	Top of Sand Pack
613.76	10.34	Top of Screen
608.98	15.12	Bottom of Screen
608.59	15.51	Bottom of Well
608.59	15.51	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.31
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.78
Total Length of Casing	(feet)	18.48
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

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1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location 134 CIPS Trail — Coffeen — Montgomery
   Address - Lot Number — City — County

   General Description Township 7 (N)(~~S~~) Range 3 (~~E~~)(W) Section 10

   SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

   Filled with Bentonite grout from 0.5 to 20.0 ft.
   (cement or other materials)

   Kind of plug Random soil from 0 to 0.5 ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

    Rhonald W. Hasenyager, L.P.G. — 196-000246
    Name — Complete License Number

    Hanson Professional Services Inc., 1525 S. 6th St. — Springfield — IL 62703
    Address — City — State/ZIP

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW3D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-03

State Plane Coordinate: X 876,554.5 Y 2,514,535.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 4/27/2006 Date Finished: 4/27/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 min.

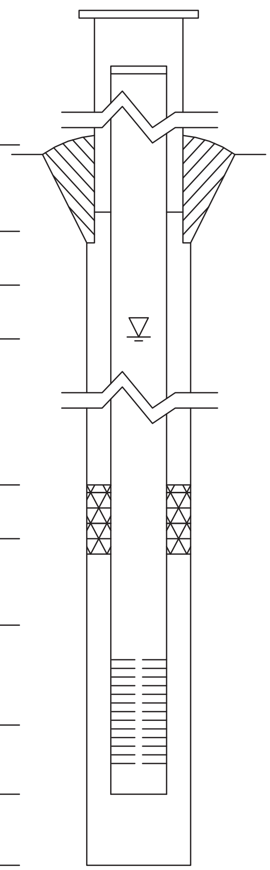
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Cuttings (if applicable)

Installation Method: Over-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.37	-3.67	Top of Protective Casing
628.94	-3.24	Top of Riser Pipe
625.70	0.00	Ground Surface
623.00	2.70	Top of Annular Sealant
570.30	55.40	Static Water Level (After Completion) 6/1/2006
576.70	49.00	Top of Seal
575.60	50.10	Top of Sand Pack
573.41	52.29	Top of Screen
568.64	57.06	Bottom of Screen
568.30	57.40	Bottom of Well
567.70	58.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	55.51
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	60.64
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW4S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-04a

State Plane Coordinate: X 877,999.7 Y 2,514,450.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/11/2006 Date Finished: 5/11/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

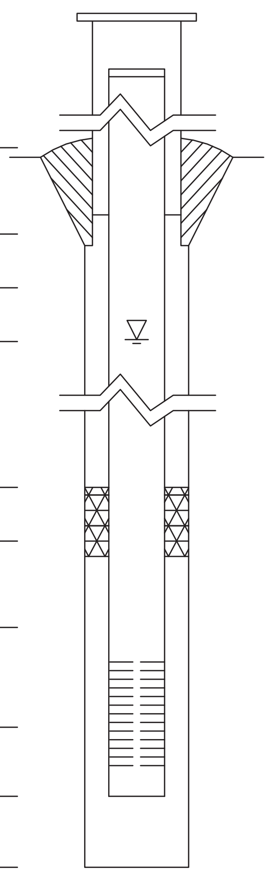
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.07	-3.67	Top of Protective Casing
625.60	-3.20	Top of Riser Pipe
622.40	0.00	Ground Surface
619.57	2.83	Top of Annular Sealant
616.73	5.67	Static Water Level (After Completion) 6/1/2006
619.57	2.83	Top of Seal
614.15	8.25	Top of Sand Pack
612.57	9.83	Top of Screen
608.14	14.26	Bottom of Screen
607.63	14.77	Bottom of Well
607.63	14.77	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.25
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.43
Total Length of Casing	(feet)	19.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW5D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-05

State Plane Coordinate: X 878,174.8 Y 2,513,290.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/12/2006 Date Finished: 5/17/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — **Granular**

Installation Method: Gravity

Setting Time: 18 min.

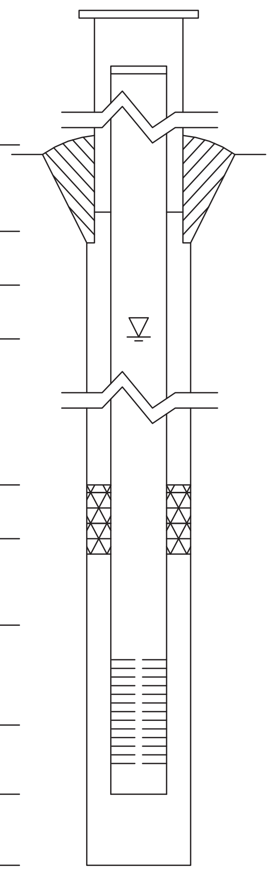
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.21	-3.61	Top of Protective Casing
625.78	-3.18	Top of Riser Pipe
622.60	0.00	Ground Surface
620.77	1.83	Top of Annular Sealant
572.16	50.44	Static Water Level (After Completion) 6/1/2006
582.29	40.31	Top of Seal
579.14	43.46	Top of Sand Pack
577.03	45.57	Top of Screen
572.27	50.33	Bottom of Screen
571.88	50.72	Bottom of Well
568.60	54.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	48.74
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	53.89
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW5S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-05a

State Plane Coordinate: X 878,175.6 Y 2,513,285.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/17/2006 Date Finished: 5/17/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

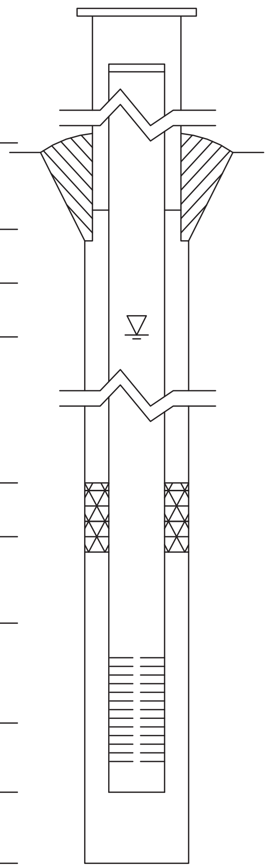
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Cuttings (if applicable)

Installation Method: Over-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.14	-3.54	Top of Protective Casing
625.73	-3.13	Top of Riser Pipe
622.60	0.00	Ground Surface
620.49	2.11	Top of Annular Sealant
615.86	6.74	Static Water Level (After Completion) 6/1/2006
620.49	2.11	Top of Seal
611.06	11.54	Top of Sand Pack
609.94	12.66	Top of Screen
605.19	17.41	Bottom of Screen
604.89	17.71	Bottom of Well
604.89	17.71	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.69
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	20.84
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: MW6S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-06a

State Plane Coordinate: X 879,021.2 Y 2,513,189.4 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/4/2006 Date Finished: 5/4/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

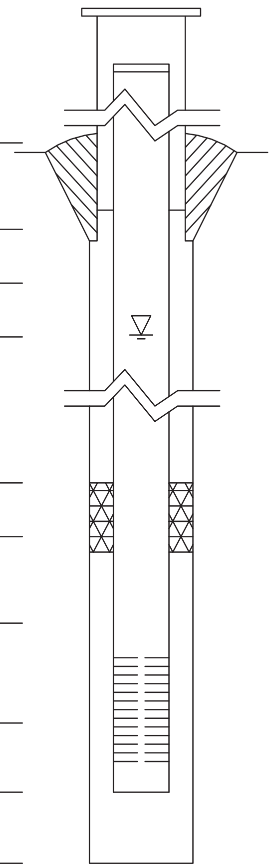
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.67	-3.57	Top of Protective Casing
626.21	-3.11	Top of Riser Pipe
623.10	0.00	Ground Surface
620.10	3.00	Top of Annular Sealant
616.89	6.21	Static Water Level (After Completion) 6/1/2006
620.10	3.00	Top of Seal
613.34	9.76	Top of Sand Pack
612.06	11.04	Top of Screen
607.48	15.62	Bottom of Screen
607.02	16.08	Bottom of Well
607.02	16.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.15
Bottom of Screen to End Cap	(feet)	0.46
Screen Length (1st slot to last slot)	(feet)	4.58
Total Length of Casing	(feet)	19.19
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW7S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-07a

State Plane Coordinate: X 879,181.1 Y 2,514,397.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: P. McIntire

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Rhonald W Hasenyager Date Started: 5/9/2006 Date Finished: 5/9/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — selected: Granular

Installation Method: Gravity

Setting Time: +24 hr.

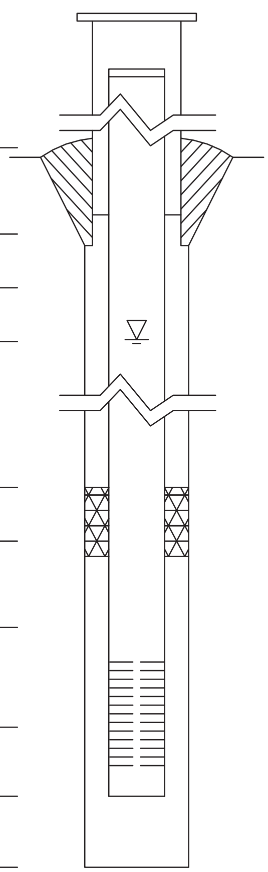
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.71	-3.21	Top of Protective Casing
627.56	-3.06	Top of Riser Pipe
624.50	0.00	Ground Surface
621.70	2.80	Top of Annular Sealant
619.60	4.90	Static Water Level (After Completion) 6/1/2006
621.70	2.80	Top of Seal
616.23	8.27	Top of Sand Pack
614.59	9.91	Top of Screen
610.71	13.79	Bottom of Screen
610.11	14.39	Bottom of Well
610.11	14.39	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.37
Bottom of Screen to End Cap	(feet)	0.60
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	17.45
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (selected)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW8S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-08a

State Plane Coordinate: X 879,776.6 Y 2,514,478.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/10/2006 Date Finished: 5/10/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

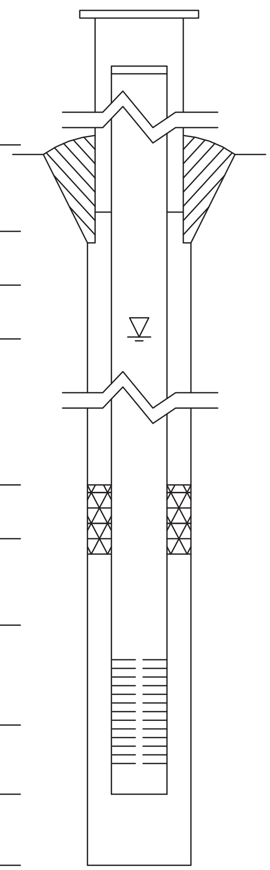
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
628.26	-3.56	Top of Protective Casing
627.92	-3.22	Top of Riser Pipe
624.70	0.00	Ground Surface
622.20	2.50	Top of Annular Sealant
619.37	5.33	Static Water Level (After Completion) 6/1/2006
622.20	2.50	Top of Seal
614.72	9.98	Top of Sand Pack
613.19	11.51	Top of Screen
608.70	16.00	Bottom of Screen
608.10	16.60	Bottom of Well
607.62	17.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.73
Bottom of Screen to End Cap	(feet)	0.60
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	19.82
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW9D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-09

State Plane Coordinate: X 879,679.7 Y 2,515,666.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/3/2006 Date Finished: 5/3/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min.

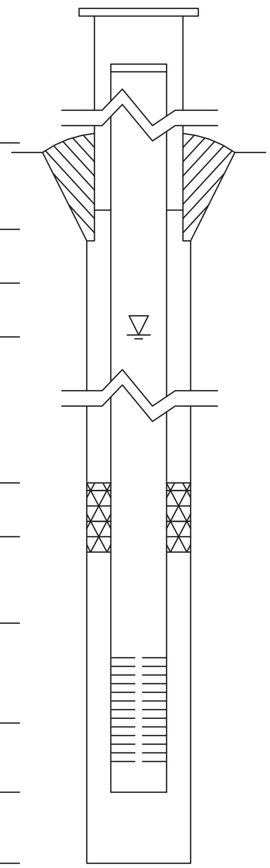
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.84	-3.24	Top of Protective Casing
627.52	-2.92	Top of Riser Pipe
624.60	0.00	Ground Surface
621.70	2.90	Top of Annular Sealant
572.14	52.46	Static Water Level (After Completion) 6/1/2006
582.60	42.00	Top of Seal
580.80	43.80	Top of Sand Pack
578.79	45.81	Top of Screen
574.03	50.57	Bottom of Screen
573.60	51.00	Bottom of Well
570.60	54.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	52.25
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	57.44
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW9S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-09a

State Plane Coordinate: X 879,684.9 Y 2,515,666.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/3/2006 Date Finished: 5/3/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

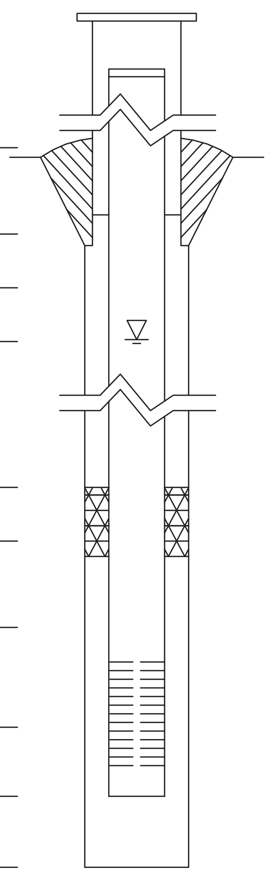
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.84	-3.24	Top of Protective Casing
627.51	-2.91	Top of Riser Pipe
624.60	0.00	Ground Surface
621.35	3.25	Top of Annular Sealant
619.37	5.23	Static Water Level (After Completion) 6/1/2006
621.35	3.25	Top of Seal
615.49	9.11	Top of Sand Pack
613.39	11.21	Top of Screen
608.98	15.62	Bottom of Screen
608.40	16.20	Bottom of Well
608.40	16.20	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.12
Bottom of Screen to End Cap	(feet)	0.58
Screen Length (1st slot to last slot)	(feet)	4.41
Total Length of Casing	(feet)	19.11
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW10D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-10

State Plane Coordinate: X 878,245.1 Y 2,515,914.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/1/2006 Date Finished: 5/1/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Tremie

Setting Time: 22 min.

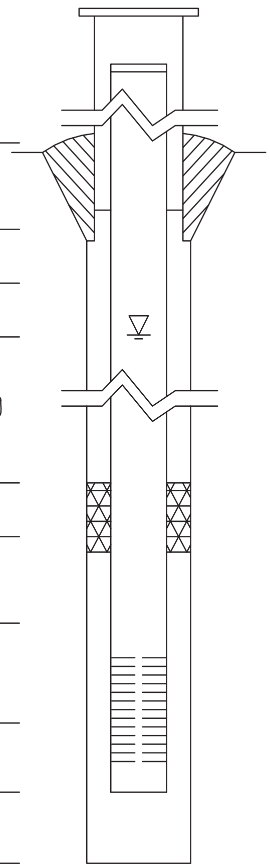
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.72	-3.52	Top of Protective Casing
624.42	-3.22	Top of Riser Pipe
621.20	0.00	Ground Surface
619.77	1.43	Top of Annular Sealant
573.72	47.48	Static Water Level (After Completion) 6/1/2006
619.77	1.43	Top of Seal
581.65	39.55	Top of Sand Pack
579.46	41.74	Top of Screen
574.63	46.57	Bottom of Screen
574.18	47.02	Bottom of Well
572.45	48.75	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	45.06
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.73
Total Length of Casing	(feet)	50.24
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: MW10S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-10a

State Plane Coordinate: X 878,250.5 Y 2,515,914.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

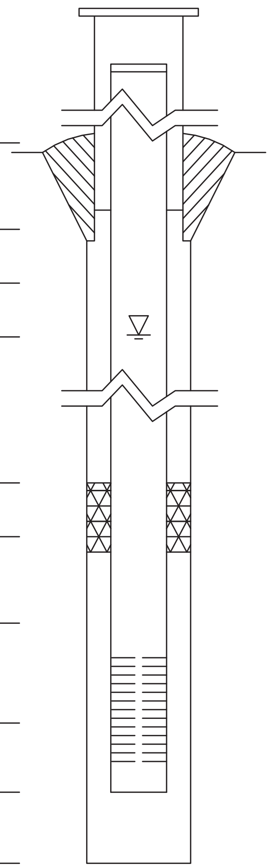
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/2/2006 Date Finished: 5/2/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.55	-3.35	Top of Protective Casing
624.24	-3.04	Top of Riser Pipe
621.20	0.00	Ground Surface
618.83	2.37	Top of Annular Sealant
616.29	4.91	Static Water Level (After Completion) 6/1/2006
618.83	2.37	Top of Seal
611.90	9.30	Top of Sand Pack
609.92	11.28	Top of Screen
605.44	15.76	Bottom of Screen
604.90	16.30	Bottom of Well
604.90	16.30	Bottom of Borehole

* Referenced to a National Geodetic Datum

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.32
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	19.34
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW11D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-11

State Plane Coordinate: X 876,749.6 Y 2,515,976.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/27/2006 Date Finished: 4/28/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular circled]

Installation Method: Gravity

Setting Time: 18 min.

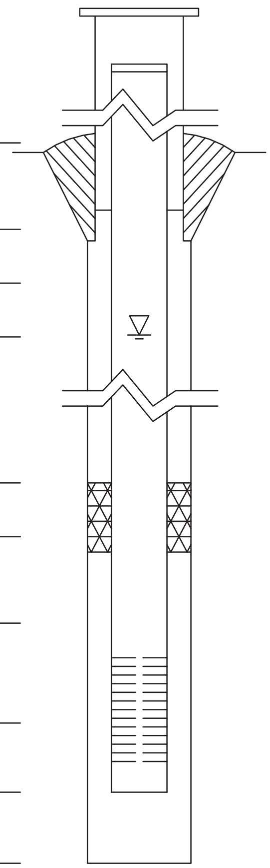
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.70	-3.70	Top of Protective Casing
625.36	-3.36	Top of Riser Pipe
622.00	0.00	Ground Surface
618.89	3.11	Top of Annular Sealant
615.97	6.03	Static Water Level (After Completion) 6/1/2006
597.20	24.80	Top of Seal
595.59	26.41	Top of Sand Pack
593.69	28.31	Top of Screen
588.96	33.04	Bottom of Screen
588.50	33.50	Bottom of Well
585.67	36.33	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	31.67
Bottom of Screen to End Cap	(feet)	0.46
Screen Length (1st slot to last slot)	(feet)	4.73
Total Length of Casing	(feet)	36.86
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW11S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-11a

State Plane Coordinate: X 876,749.4 Y 2,515,971.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/28/2006 Date Finished: 4/28/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 26 min.

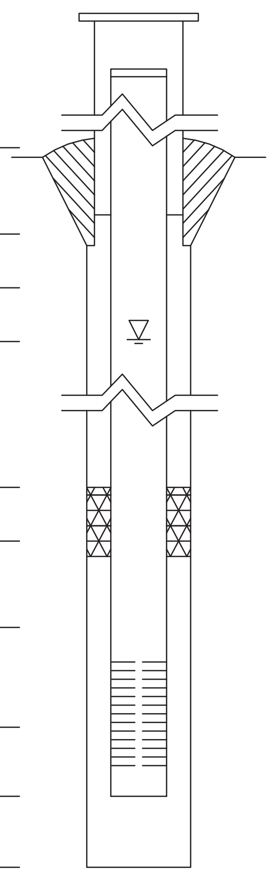
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.47	-3.47	Top of Protective Casing
625.16	-3.16	Top of Riser Pipe
622.00	0.00	Ground Surface
620.00	2.00	Top of Annular Sealant
616.58	5.42	Static Water Level (After Completion) 6/1/2006
620.00	2.00	Top of Seal
615.25	6.75	Top of Sand Pack
613.11	8.89	Top of Screen
608.37	13.63	Bottom of Screen
607.92	14.08	Bottom of Well
607.92	14.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.04
Bottom of Screen to End Cap	(feet)	0.46
Screen Length (1st slot to last slot)	(feet)	4.74
Total Length of Casing	(feet)	17.24
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW12D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-12

State Plane Coordinate: X 875,515.1 Y 2,515,900.6 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/10/2006 Date Finished: 5/10/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

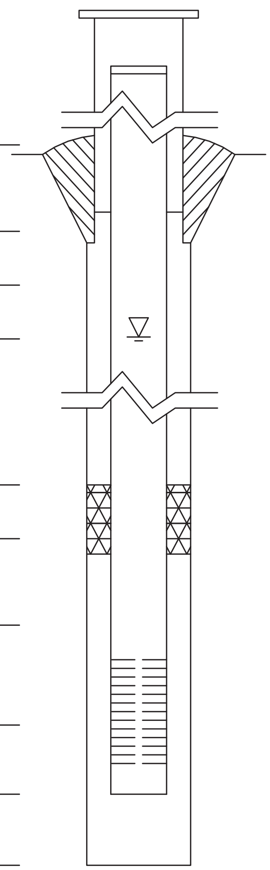
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Over-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.49	-3.29	Top of Protective Casing
625.03	-2.83	Top of Riser Pipe
622.20	0.00	Ground Surface
619.43	2.77	Top of Annular Sealant
575.30	46.90	Static Water Level (After Completion) 6/1/2006
585.50	36.70	Top of Seal
581.69	40.51	Top of Sand Pack
579.74	42.46	Top of Screen
575.21	46.99	Bottom of Screen
574.73	47.47	Bottom of Well
572.20	50.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	45.29
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	50.30
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW12S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-12a

State Plane Coordinate: X 875,520.1 Y 2,515,900.5 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/10/2006 Date Finished: 5/10/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min.

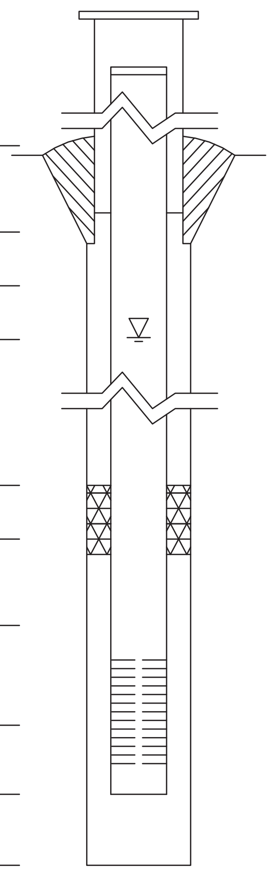
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.58	-3.38	Top of Protective Casing
625.10	-2.90	Top of Riser Pipe
622.20	0.00	Ground Surface
619.20	3.00	Top of Annular Sealant
615.44	6.76	Static Water Level (After Completion) 6/1/2006
619.20	3.00	Top of Seal
613.95	8.25	Top of Sand Pack
611.59	10.61	Top of Screen
607.02	15.18	Bottom of Screen
606.59	15.61	Bottom of Well
606.59	15.61	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.51
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.57
Total Length of Casing	(feet)	18.51
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW13D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-13

State Plane Coordinate: X 874,694.3 Y 2,513,929.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/9/2006 Date Finished: 5/9/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

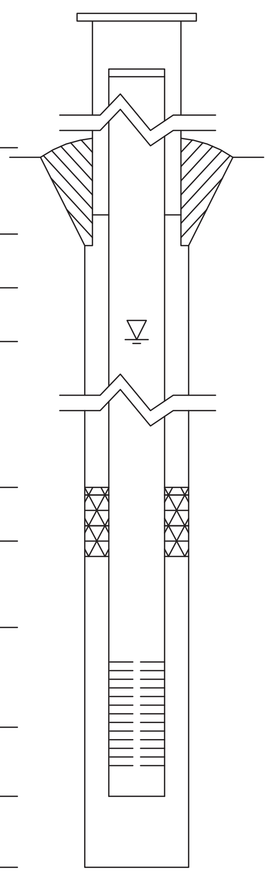
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.33	-3.63	Top of Protective Casing
625.87	-3.17	Top of Riser Pipe
622.70	0.00	Ground Surface
619.64	3.06	Top of Annular Sealant
566.67	56.03	Static Water Level (After Completion) 6/1/2006
577.48	45.22	Top of Seal
574.76	47.94	Top of Sand Pack
572.89	49.81	Top of Screen
568.10	54.60	Bottom of Screen
567.70	55.00	Bottom of Well
567.70	55.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	52.98
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	58.17
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: MW13S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-13a

State Plane Coordinate: X 874,695.7 Y 2,513,925.3 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/9/2006 Date Finished: 5/9/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 21 min.

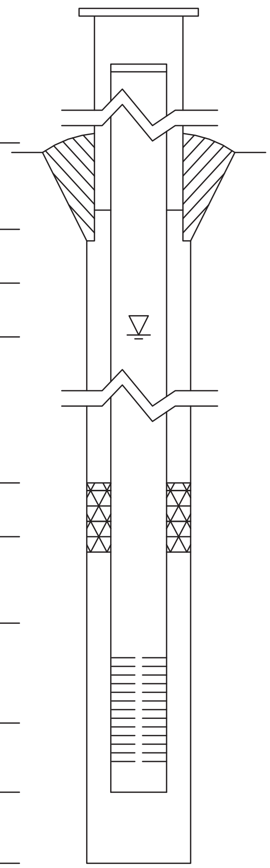
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.42	-3.72	Top of Protective Casing
625.92	-3.22	Top of Riser Pipe
622.70	0.00	Ground Surface
619.35	3.35	Top of Annular Sealant
614.46	8.24	Static Water Level (After Completion) 6/1/2006
619.35	3.35	Top of Seal
612.65	10.05	Top of Sand Pack
611.27	11.43	Top of Screen
606.47	16.23	Bottom of Screen
606.08	16.62	Bottom of Well
606.08	16.62	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.65
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.80
Total Length of Casing	(feet)	19.84
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW14S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: Sb-14a

State Plane Coordinate: X 875,737.8 Y 2,514,125.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/2/2006 Date Finished: 5/2/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 23 min.

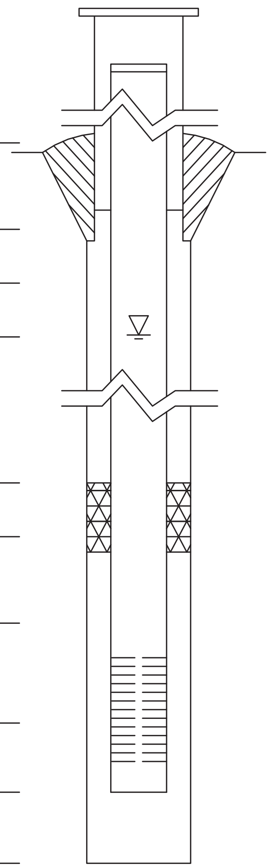
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.23	-2.63	Top of Protective Casing
626.82	-2.22	Top of Riser Pipe
624.60	0.00	Ground Surface
622.20	2.40	Top of Annular Sealant
620.11	4.49	Static Water Level (After Completion) 6/1/2006
622.20	2.40	Top of Seal
613.67	10.93	Top of Sand Pack
612.34	12.26	Top of Screen
607.58	17.02	Bottom of Screen
607.22	17.38	Bottom of Well
607.22	17.38	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.48
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	19.60
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY | **RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT**

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. **Ownership (Name of Controlling Party)** AEG Coffeen Power Station (G104)

2. **Well Location** 134 CIPS Trail — Coffeen — Montgomery
   Address - Lot Number **City** **County**

   General Description **Township** 7 **(N)(~~S~~)** **Range** 3 **(~~E~~)(W)** **Section** 10

   SE **Quarter of the** NE **Quarter of the** NE **Quarter**

3. **Year Drilled** 2010

4. **Drilling Permit Number (and date, if known)** n/a

5. **Type of Well** **Bored** ___ **Drilled** ✓ **Other** ___

6. **Total Depth** 20.0 ft. **Diameter (inches)** 2

7. **Formation clear of obstruction** ✓ **Yes** ___ **No**

8. **DETAILS OF PLUGGING**

   Filled with Bentonite grout **from** 0.5 **to** 20.0 **ft.**
   (cement or other materials)

   Kind of plug Random soil **from** 0 **to** 0.5 **ft.**

   Filled with ___ **from** ___ **to** ___ **ft.**

   Kind of plug ___ **from** ___ **to** ___ **ft.**

   Filled with ___ **from** ___ **to** ___ **ft.**

   Kind of plug ___ **from** ___ **to** ___ **ft.**

9. **CASING RECORD** **Upper 2 feet of casing removed** ✓ **Yes** ___ **No**

10. **Date well was sealed** **Month** October **Day** 8 **Year** 2010.

11. **Licensed water well driller or other person approved by the Department performing well sealing.**

Rhonald W. Hasenyager, L.P.G. — 196-000246
Name — **Complete License Number**

Hanson Professional Services Inc., 1525 S. 6th St. — Springfield — IL 62703
Address — **City** — **State/ZIP**

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW15D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-15b

State Plane Coordinate: X 875,970.5 Y 2,515,080.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/24/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

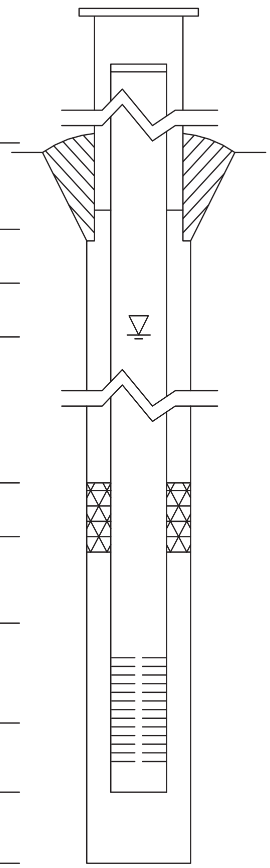
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Re-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.93	-3.13	Top of Protective Casing
626.45	-2.65	Top of Riser Pipe
623.80	0.00	Ground Surface
620.55	3.25	Top of Annular Sealant
618.56	5.24	Static Water Level (After Completion) 6/1/2006
594.80	29.00	Top of Seal
591.80	32.00	Top of Sand Pack
590.12	33.68	Top of Screen
585.35	38.45	Bottom of Screen
585.00	38.80	Bottom of Well
585.00	38.80	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	36.32
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	41.45
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

Sealing Form for MW15D - Original Mislabelled as MW15S

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location 134 CIPS Trail | Coffeen | Montgomery
   Address - Lot Number | City | County

   General Description Township 7 (N)(~~S~~) Range 3 (~~E~~)(W) Section 10

   SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

   Filled with Bentonite grout from 0.5 to 20.0 ft.
   (cement or other materials)

   Kind of plug Random soil from 0 to 0.5 ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

    Rhonald W. Hasenyager, L.P.G. | 196-000246
    Name | Complete License Number

    Hanson Professional Services Inc., 1525 S. 6th St. | Springfield | IL 62703
    Address | City | State/ZIP

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW15S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-15a

State Plane Coordinate: X 875,971.1 Y 2,515,076.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/25/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 20 min.

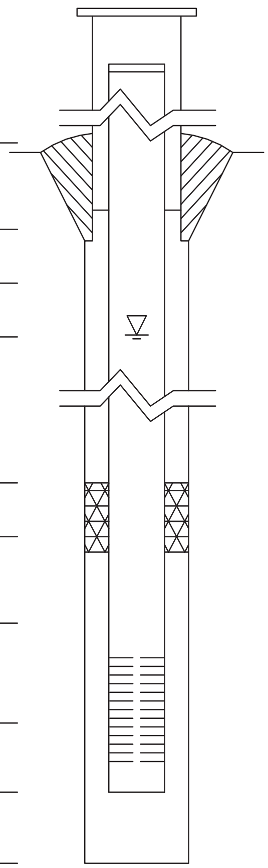
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.06	-3.26	Top of Protective Casing
626.60	-2.80	Top of Riser Pipe
623.80	0.00	Ground Surface
623.30	0.50	Top of Annular Sealant
618.81	4.99	Static Water Level (After Completion) 6/1/2006
614.30	9.50	Top of Seal
611.60	12.20	Top of Sand Pack
609.39	14.41	Top of Screen
604.64	19.16	Bottom of Screen
604.18	19.62	Bottom of Well
604.18	19.62	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.28
Bottom of Screen to End Cap	(feet)	19.62
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	41.67
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

4/2000

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
525 W. JEFFERSON ST.
SPRINGFIELD, IL 62761

WATER WELL SEALING FORM

TYPE OR PRESS FIRMLY

RETURN ALL COPIES TO IDPH OR LOCAL HEALTH DEPARTMENT

This form shall be submitted to this Department or the local health department not more than 30 days after a water well, boring or monitoring well is sealed. Such wells are to be sealed not more than 30 days after they are abandoned in accordance with the sealing requirements in the Water Well Construction Code. THE LOCAL HEALTH DEPARTMENT OR REGIONAL PUBLIC HEALTH DEPARTMENT MUST BE NOTIFIED AT LEAST 48 HOURS PRIOR TO SEALING.

1. Ownership (Name of Controlling Party) AEG Coffeen Power Station (G104)

2. Well Location 134 CIPS Trail — Coffeen — Montgomery
   Address - Lot Number — City — County

   General Description Township 7 (N)(~~S~~) Range 3 (~~E~~)(W) Section 10

   SE Quarter of the NE Quarter of the NE Quarter

3. Year Drilled 2010

4. Drilling Permit Number (and date, if known) n/a

5. Type of Well Bored ____ Drilled ✓ Other ____

6. Total Depth 20.0 ft. Diameter (inches) 2

7. Formation clear of obstruction ✓ Yes ____ No

8. DETAILS OF PLUGGING

   Filled with Bentonite grout from 0.5 to 20.0 ft.
   (cement or other materials)

   Kind of plug Random soil from 0 to 0.5 ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

   Filled with ____ from ____ to ____ ft.

   Kind of plug ____ from ____ to ____ ft.

9. CASING RECORD Upper 2 feet of casing removed ✓ Yes ____ No

10. Date well was sealed Month October Day 8 Year 2010.

11. Licensed water well driller or other person approved by the Department performing well sealing.

Rhonald W. Hasenyager, L.P.G. — 196-000246
Name — Complete License Number

Hanson Professional Services Inc., 1525 S. 6th St. — Springfield — IL 62703
Address — City — State/ZIP

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Public Act 85-0863. Disclosure of this information is mandatory. This form has been approved by the Forms Management Center. IL 482-0631

Printed by Authority of the State of Illinois
P.O. #530379 9.6M 4/00

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW16D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-16b

State Plane Coordinate: X 877,354.9 Y 2,515,079.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Rhonald W Hasenyager Date Started: 4/21/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

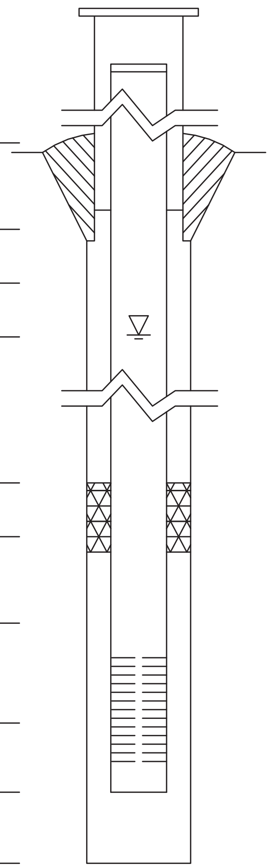
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Re-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.68	-3.58	Top of Protective Casing
629.33	-3.23	Top of Riser Pipe
626.10	0.00	Ground Surface
623.77	2.33	Top of Annular Sealant
574.73	51.37	Static Water Level (After Completion) 6/1/2006
584.65	41.45	Top of Seal
582.65	43.45	Top of Sand Pack
580.20	45.90	Top of Screen
575.76	50.34	Bottom of Screen
575.32	50.78	Bottom of Well
575.10	51.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	48.83
Bottom of Screen to End Cap	(feet)	0.44
Screen Length (1st slot to last slot)	(feet)	4.74
Total Length of Casing	(feet)	54.01
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW16S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-16a

State Plane Coordinate: X 877,355.1 Y 2,515,088.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Rhonald W Hasenyager Date Started: 4/25/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 17 min.

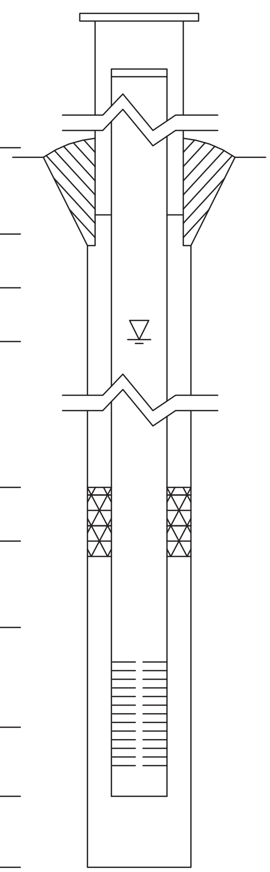
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.62	-3.52	Top of Protective Casing
629.28	-3.18	Top of Riser Pipe
626.10	0.00	Ground Surface
624.66	1.44	Top of Annular Sealant
620.36	5.74	Static Water Level (After Completion) 6/1/2006
624.66	1.44	Top of Seal
612.40	13.70	Top of Sand Pack
611.51	14.59	Top of Screen
606.69	19.41	Bottom of Screen
606.34	19.76	Bottom of Well
606.20	19.90	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.74
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.82
Total Length of Casing	(feet)	22.94
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW17D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-17

State Plane Coordinate: X 878,659.0 Y 2,515,090.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/4/2006 Date Finished: 5/4/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

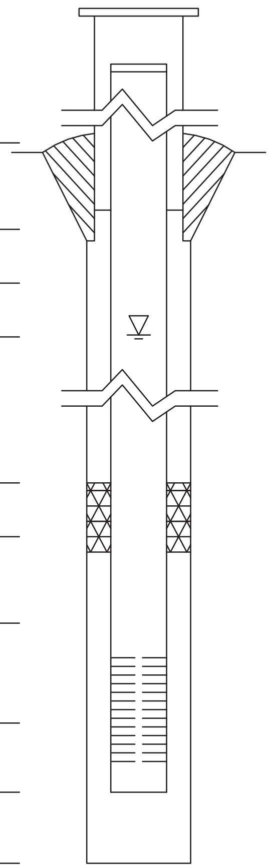
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.62	-3.52	Top of Protective Casing
630.29	-3.19	Top of Riser Pipe
627.10	0.00	Ground Surface
624.92	2.18	Top of Annular Sealant
572.65	54.45	Static Water Level (After Completion) 6/1/2006
581.55	45.55	Top of Seal
580.25	46.85	Top of Sand Pack
578.28	48.82	Top of Screen
573.78	53.32	Bottom of Screen
573.23	53.87	Bottom of Well
573.23	53.87	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	52.01
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	57.06
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW17S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-17a

State Plane Coordinate: X 878,658.5 Y 2,515,084.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/4/2006 Date Finished: 5/4/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 22 min.

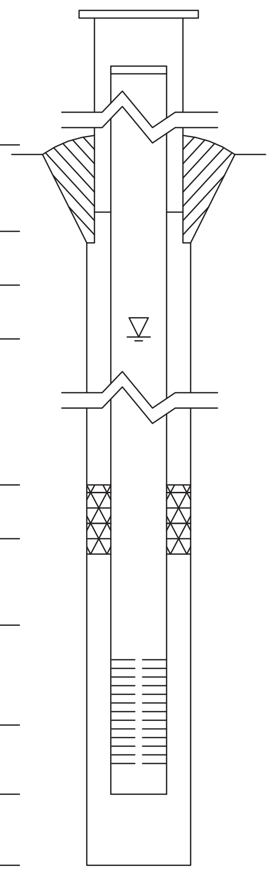
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.68	-3.58	Top of Protective Casing
630.34	-3.24	Top of Riser Pipe
627.10	0.00	Ground Surface
626.40	0.70	Top of Annular Sealant
620.21	6.89	Static Water Level (After Completion) 6/1/2006
617.33	9.77	Top of Seal
614.80	12.30	Top of Sand Pack
613.08	14.02	Top of Screen
603.54	23.56	Bottom of Screen
602.99	24.11	Bottom of Well
602.99	24.11	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.26
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	9.54
Total Length of Casing	(feet)	27.35
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW18S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-18a

State Plane Coordinate: X 878,604.7 Y 2,513,745.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/11/2006 Date Finished: 5/11/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 min.

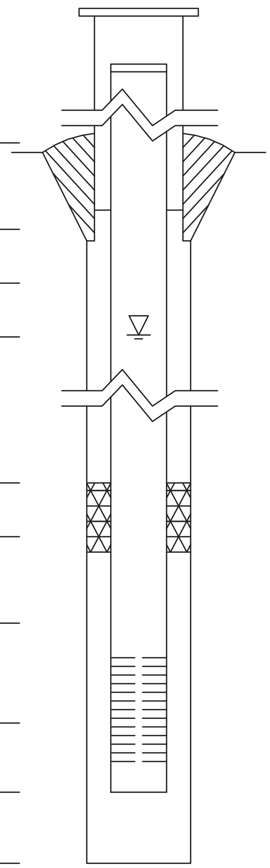
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.02	-3.42	Top of Protective Casing
628.71	-3.11	Top of Riser Pipe
625.60	0.00	Ground Surface
622.13	3.47	Top of Annular Sealant
618.73	6.87	Static Water Level (After Completion) 6/1/2006
622.13	3.47	Top of Seal
615.79	9.81	Top of Sand Pack
614.29	11.31	Top of Screen
609.81	15.79	Bottom of Screen
609.20	16.40	Bottom of Well
609.20	16.40	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.42
Bottom of Screen to End Cap	(feet)	0.61
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	19.51
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW20S

Site Name: Ash Pond Investigation Borehole #: SB20

State Plane Coordinate: X 2,515,867.9 Y 874,226.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: A. Rachford

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 5/1/2007 Date Finished: 5/1/2007

Report Form Completed By: Rhonald W. Hasenyager Date: 5/2/2007

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

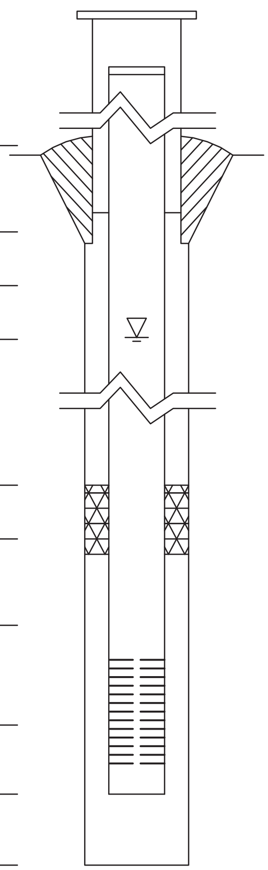
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: gravity

Type of Backfill Material: ______ (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.26	-2.96	Top of Protective Casing
623.00	-2.70	Top of Riser Pipe
620.30	0.00	Ground Surface
620.30	0.00	Top of Annular Sealant
616.02	4.28	Static Water Level (After Completion) 5/10/2007
n/a	n/a	Top of Seal
613.05	7.25	Top of Sand Pack
611.89	8.41	Top of Screen
607.08	13.22	Bottom of Screen
606.63	13.67	Bottom of Well
604.30	16.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.11
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.81
Total Length of Casing	(feet)	16.37
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: R104

Site Name: CCB Management Facility Borehole #: R104

State Plane Coordinate: X 2,514,503.4 Y 875,857.8 (or) Latitude: 39 4! 10.000Ä Longitude: -89 23! 56.800Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Rhonald W. Hasenyager Date Started: 10/8/2010 Date Finished: 10/8/2010

Report Form Completed By: Suzanna Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

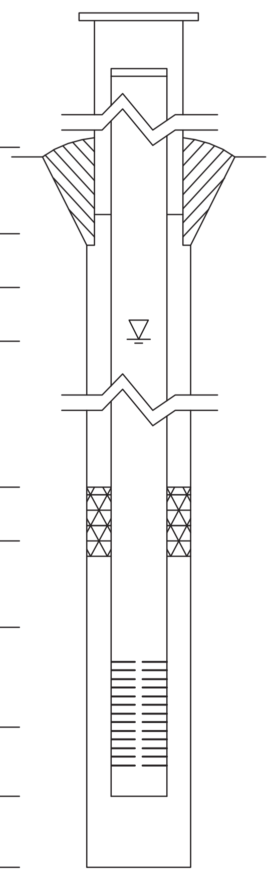
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.02	-2.99	Top of Protective Casing
631.84	-2.81	Top of Riser Pipe
629.03	0.00	Ground Surface
627.03	2.00	Top of Annular Sealant
612.85	16.18	Static Water Level (After Completion) 11/15/2010
617.03	12.00	Top of Seal
616.01	13.02	Top of Sand Pack
614.44	14.59	Top of Screen
609.71	19.32	Bottom of Screen
609.18	19.85	Bottom of Well
609.18	19.85	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.60
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	22.66
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: R201

Site Name: CCB Management Facility Borehole #: R201

State Plane Coordinate: X 2,514,842.0 Y 877,925.3 (or) Latitude: 39 4! 30.500Ä Longitude: -89 23! 52.300Ä

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Rhonald W. Hasenyager Date Started: 10/15/2010 Date Finished: 10/15/2010

Report Form Completed By: Suzanna Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 48 min

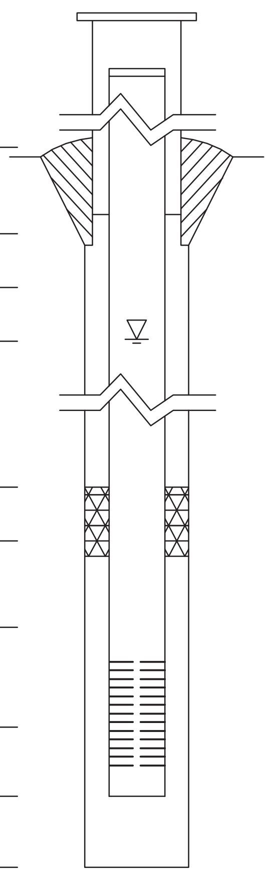
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.51	-2.49	Top of Protective Casing
626.34	-2.32	Top of Riser Pipe
624.02	0.00	Ground Surface
621.52	2.50	Top of Annular Sealant
618.70	5.32	Static Water Level (After Completion) 11/15/2010
614.47	9.55	Top of Seal
612.90	11.12	Top of Sand Pack
611.75	12.27	Top of Screen
607.36	16.66	Bottom of Screen
606.80	17.22	Bottom of Well
606.80	17.22	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.59
Bottom of Screen to End Cap	(feet)	0.56
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	19.54
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ________ County: Montgomery Well #: R205

Site Name: Coffeen Power Station - Gypsum Mgmt Facility Borehole #: R205

State Plane Coordinate: X 2,515,910.1 Y 875,548.8 (or) Latitude: 39 4! 6.935À Longitude: -89 23! 38.991À

Surveyed By: Gary C. Rogers IL Registration #: 035-02957

Drilling Contractor: Bulldog Drilling Driller: J. Gates

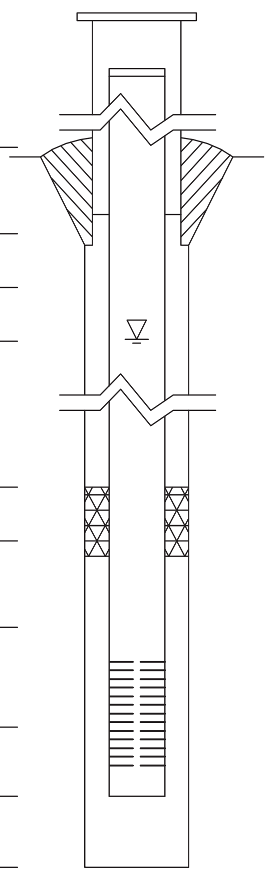
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): ________

Logged By: Rhonald W. Hasenyager Date Started: 3/20/2017 Date Finished: 3/20/2017

Report Form Completed By: Suzanna L. Keim Date: 3/27/2017

ANNULAR SPACE DETAILS



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.94	-3.03	Top of Protective Casing
624.52	-2.61	Top of Riser Pipe
621.91	0.00	Ground Surface
619.91	2.00	Top of Annular Sealant
619.41	2.50	Static Water Level (After Completion) 3/21/2017
614.26	7.65	Top of Seal
611.99	9.92	Top of Sand Pack
610.59	11.32	Top of Screen
605.90	16.01	Bottom of Screen
605.49	16.42	Bottom of Well
605.49	16.42	Bottom of Borehole

* Referenced to a National Geodetic Datum

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 95 minutes

Type of Sand Pack: Quartz sand

Grain Size: #0 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.93
Bottom of Screen to End Cap	(feet)	0.41
Screen Length (1st slot to last slot)	(feet)	4.69
Total Length of Casing	(feet)	19.03
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: T127

Site Name: CCB Management Facility Borehole #: T127

State Plane Coordinate: X 2,513,911.0 Y 875,359.2 (or) Latitude: 39 4! 5.200Ä Longitude: -89 24! 4.400Ä

Surveyed By: ______ IL Registration #: ______

Drilling Contractor: Layne-Western Co Driller: T. List

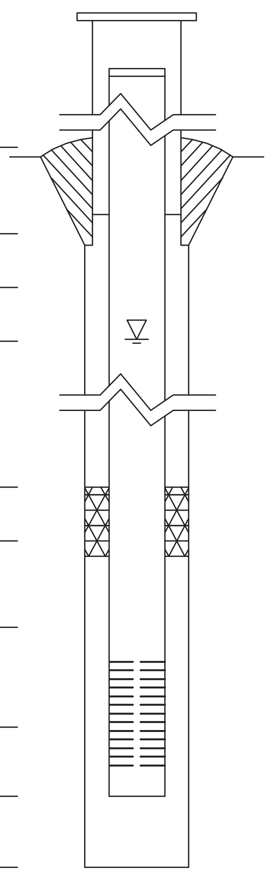
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: ______ Date Started: 2/10/2010 Date Finished: 2/10/2010

Report Form Completed By: ______ Date: 2/19/2010

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.29	-3.22	Top of Protective Casing
630.96	-2.89	Top of Riser Pipe
628.07	0.00	Ground Surface
622.43	5.64	Top of Annular Sealant
616.81	11.26	Static Water Level (After Completion) 3/1/2010
613.43	14.64	Top of Seal
612.32	15.75	Top of Sand Pack
610.54	17.53	Top of Screen
606.00	22.07	Bottom of Screen
605.43	22.64	Bottom of Well
605.43	22.64	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.42
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	25.53
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: T128

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: T128

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,909.5 Y 875,509.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: ______ IL Registration #: ______

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/9/2010 Date Finished: 2/9/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

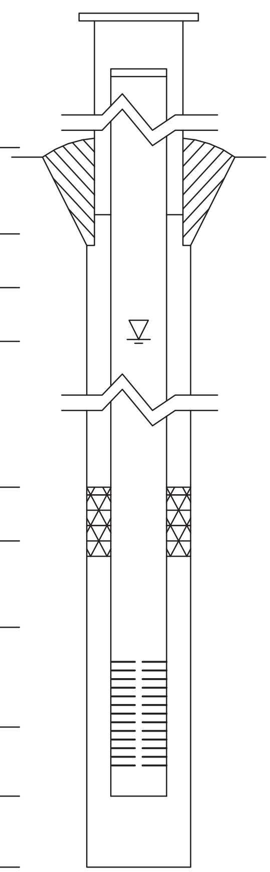
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.23	-2.79	Top of Protective Casing
630.93	-2.49	Top of Riser Pipe
628.44	0.00	Ground Surface
623.38	5.06	Top of Annular Sealant
616.09	12.35	Static Water Level (After Completion) 3/1/2010
615.53	12.91	Top of Seal
614.13	14.31	Top of Sand Pack
611.91	16.53	Top of Screen
607.40	21.04	Bottom of Screen
606.80	21.64	Bottom of Well
604.38	24.06	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.02
Bottom of Screen to End Cap	(feet)	0.60
Screen Length (1st slot to last slot)	(feet)	4.51
Total Length of Casing	(feet)	25.13
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: T202

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: T202

State Plane Coordinate: X 2,514,895.0 Y 876,699.4 (or) Latitude: 39 ° 4 ' 18.4 " Longitude: -89 ° 23 ' 51.7 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/15/2010 Date Finished: 10/15/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

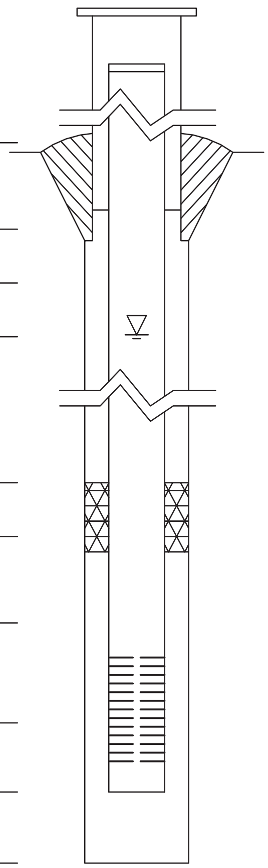
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
628.79	-2.57	Top of Protective Casing
628.63	-2.41	Top of Riser Pipe
626.22	0.00	Ground Surface
623.42	2.80	Top of Annular Sealant
613.72	12.50	Static Water Level (After Completion) 11/15/2010
616.50	9.72	Top of Seal
615.27	10.95	Top of Sand Pack
613.95	12.27	Top of Screen
609.57	16.65	Bottom of Screen
609.01	17.21	Bottom of Well
608.22	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.68
Bottom of Screen to End Cap	(feet)	0.56
Screen Length (1st slot to last slot)	(feet)	4.38
Total Length of Casing	(feet)	19.62
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: T408

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: T408

State Plane Coordinate: X 2,515,314.9 Y 873,999.4 (or) Latitude: 39 3! 51.671Ä Longitude: -89 23! 46.704Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/17/2016 Date Finished: 8/17/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

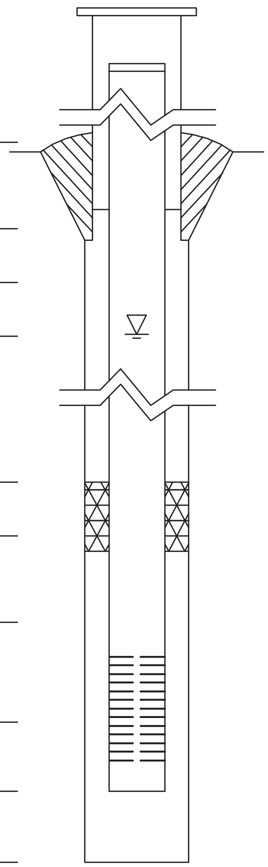
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: ____ (if applicable)

Installation Method: ____



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.44	-3.35	Top of Protective Casing
624.08	-2.99	Top of Riser Pipe
621.09	0.00	Ground Surface
619.09	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
602.99	18.10	Top of Seal
602.04	19.05	Top of Sand Pack
600.43	20.66	Top of Screen
595.60	25.49	Bottom of Screen
595.17	25.92	Bottom of Well
595.17	25.92	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	23.65
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.83
Total Length of Casing	(feet)	28.91
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ________ County: Montgomery Well #: T409

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: T409

State Plane Coordinate: X 2,514,693.9 Y 872,517.8 (or) Latitude: 39 3! 37.079Ä Longitude: -89 23! 54.736Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/19/2016 Date Finished: 8/19/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

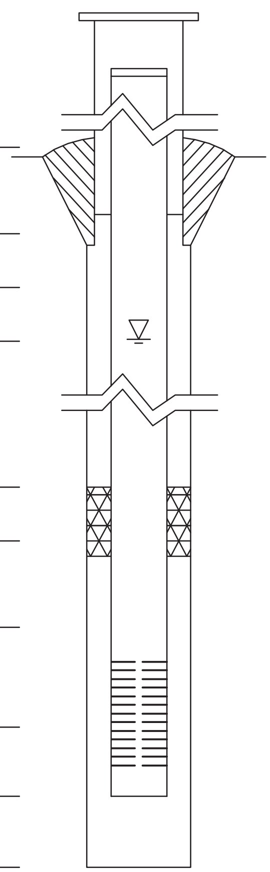
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: ________ (if applicable)

Installation Method: ________



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.35	-3.50	Top of Protective Casing
625.01	-3.16	Top of Riser Pipe
621.85	0.00	Ground Surface
619.85	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
602.65	19.20	Top of Seal
601.30	20.55	Top of Sand Pack
600.06	21.79	Top of Screen
595.26	26.59	Bottom of Screen
594.86	26.99	Bottom of Well
594.86	26.99	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	24.95
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.80
Total Length of Casing	(feet)	30.15
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: ______ Well #: TA31

Site Name: Coffeen Power Station Borehole #: TA31

State Plane Coordinate: X 2,513,856.8 Y 876,542.2 (or) Latitude: 39 4! 16.930Ä Longitude: 89 24! 4.920Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 10/28/2014 Date Finished: 10/28/2014

Report Form Completed By: Rhonald W. Hasenyager Date: 11/5/2014

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: tremie

Setting Time: 45 min.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 min.

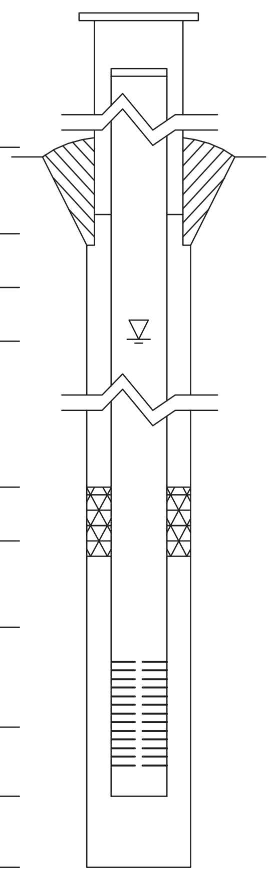
Type of Sand Pack: Quartz Sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity & Surge

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.90	-3.01	Top of Protective Casing
626.55	-2.66	Top of Riser Pipe
623.89	0.00	Ground Surface
620.89	3.00	Top of Annular Sealant
615.78	8.11	Static Water Level (After Completion) 10/30/2014
613.56	10.33	Top of Seal
610.81	13.08	Top of Sand Pack
608.80	15.09	Top of Screen
604.32	19.57	Bottom of Screen
603.70	20.19	Bottom of Well
603.70	20.19	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.82
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	22.85
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: ______ Well #: TA32

Site Name: Coffeen Power Station Borehole #: TA32

State Plane Coordinate: X 2,513,605.2 Y 877,532.6 (or) Latitude: 39 4! 26.730Ä Longitude: 89 24! 8.000Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 10/27/2014 Date Finished: 10/27/2014

Report Form Completed By: Rhonald W. Hasenyager Date: 11/5/2014

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: tremie

Setting Time: 30 min.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 35 min.

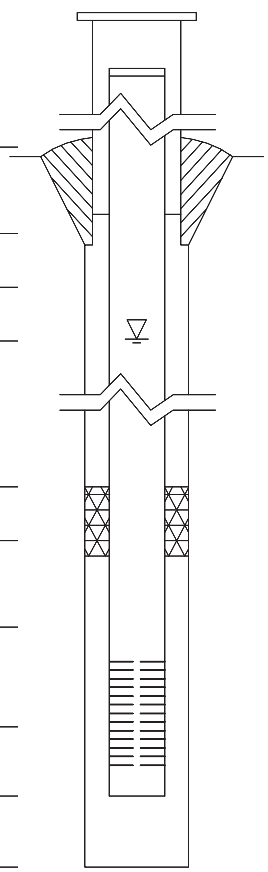
Type of Sand Pack: Quartz Sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.76	-2.83	Top of Protective Casing
621.42	-2.49	Top of Riser Pipe
618.93	0.00	Ground Surface
616.03	2.90	Top of Annular Sealant
604.88	14.05	Static Water Level (After Completion) 10/30/2014
611.09	7.84	Top of Seal
609.18	9.75	Top of Sand Pack
607.62	11.31	Top of Screen
603.25	15.68	Bottom of Screen
602.46	16.47	Bottom of Well
602.46	16.47	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.94
Bottom of Screen to End Cap	(feet)	0.65
Screen Length (1st slot to last slot)	(feet)	4.37
Total Length of Casing	(feet)	18.96
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: TA33

Site Name: Coffeen Well Sealing & Assmt Well Install Borehole #: TA33b

State Plane Coordinate: X 2,513,248.7 Y 876,605.4 (or) Latitude: 39 4! 17.500Ä Longitude: 89 24! 12.700Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): None

Logged By: Suzanna L. Keim Date Started: 6/2/2015 Date Finished: 6/2/2015

Report Form Completed By: Suzanna L. Keim Date: 6/4/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >48 hrs.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

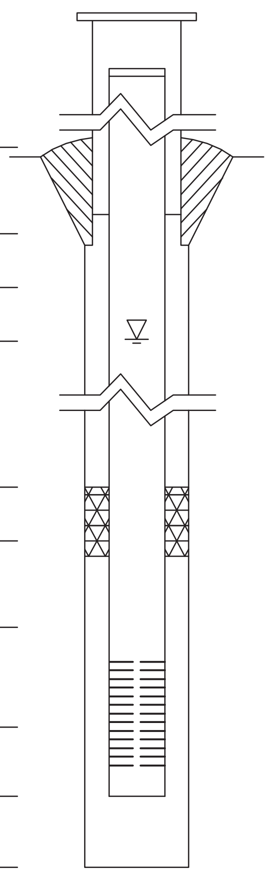
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.05	-2.54	Top of Protective Casing
625.27	-2.76	Top of Riser Pipe
622.51	0.00	Ground Surface
620.51	2.00	Top of Annular Sealant
615.51	7.00	Static Water Level (After Completion) 6/16/2015
614.51	8.00	Top of Seal
612.11	10.40	Top of Sand Pack
610.28	12.23	Top of Screen
605.62	16.89	Bottom of Screen
605.07	17.44	Bottom of Well
605.07	17.44	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.5
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.99
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.66
Total Length of Casing	(feet)	20.20
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ________ County: Montgomery Well #: TA34

Site Name: Coffeen Well Sealing & Assmt Well Install Borehole #: TA34

State Plane Coordinate: X 2,513,466.7 Y 875,906.1 (or) Latitude: 39 4! 10.500Ä Longitude: 89 24! 10.000Ä

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): None

Logged By: Suzanna L. Keim Date Started: 6/3/2015 Date Finished: 6/3/2015

Report Form Completed By: Suzanna L. Keim Date: 6/4/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: 1 hour

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

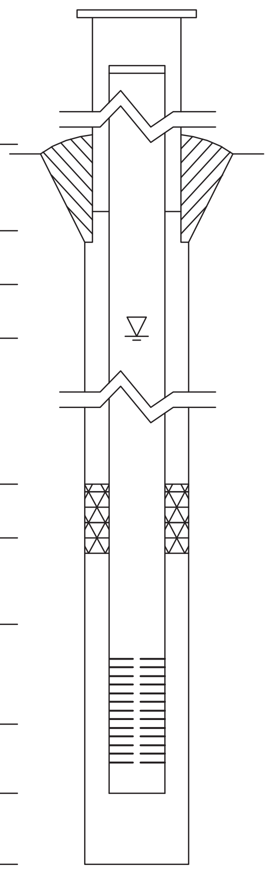
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ________



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.77	-2.67	Top of Protective Casing
626.52	-2.42	Top of Riser Pipe
624.10	0.00	Ground Surface
623.10	1.00	Top of Annular Sealant
616.00	8.10	Static Water Level (After Completion) 6/16/2015
n/a	n/a	Top of Seal
615.10	9.00	Top of Sand Pack
613.18	10.92	Top of Screen
608.69	15.41	Bottom of Screen
608.00	16.10	Bottom of Well
608.00	16.10	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.5
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.34
Bottom of Screen to End Cap	(feet)	0.69
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	18.52
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: ______ Well #: TR32

Site Name: Coffeen Power Station Borehole #: TR32

State Plane Coordinate: X 2,513,605.0 Y 877,523.7 (or) Latitude: 39° 4' 2663.000" Longitude: 89° 24' 8.070"

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Ramsey Geotechnical Engineering, LLC Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 7/2/2019 Date Finished: 7/2/2019

Report Form Completed By: Rhonald W. Hasenyager Date: 7/3/2019

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Gravity

Setting Time: 30 min.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

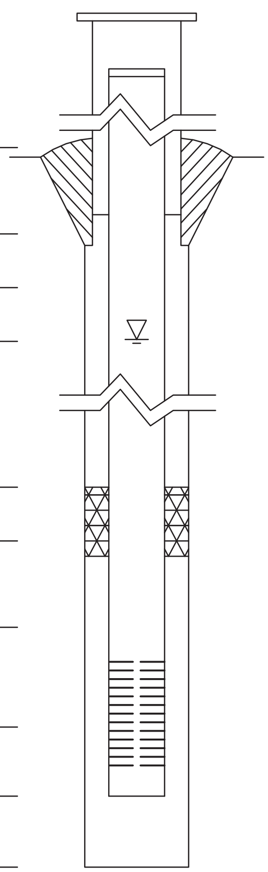
Type of Sand Pack: Quartz Sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.97	-2.69	Top of Protective Casing
621.68	-2.40	Top of Riser Pipe
619.28	0.00	Ground Surface
616.28	3.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
609.77	9.51	Top of Sand Pack
608.28	11.00	Top of Screen
603.60	15.68	Bottom of Screen
603.11	16.17	Bottom of Well
603.11	16.17	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.40
Bottom of Screen to End Cap	(feet)	0.49
Screen Length (1st slot to last slot)	(feet)	4.68
Total Length of Casing	(feet)	18.57
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G307D

Site Name: Coffeen Part 845 Groundwater Borehole #: G307D

State Plane Coordinate: X 2,515,560.3 Y 871,397.2 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

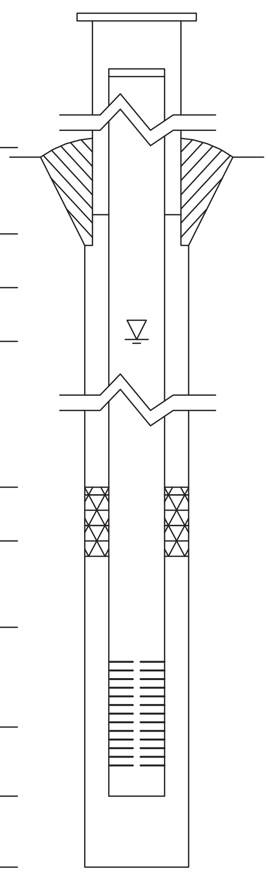
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/9/2021 Date Finished: 2/9/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.29	-2.78	Top of Protective Casing
624.88	-2.37	Top of Riser Pipe
622.51	0.00	Ground Surface
621.51	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
575.51	47.00	Top of Seal
574.51	48.00	Top of Sand Pack
573.53	48.98	Top of Screen
563.76	58.75	Bottom of Screen
562.91	59.60	Bottom of Well
562.51	60.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	51.85
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	9.77
Total Length of Casing	(feet)	61.97
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G308

Site Name: Coffeen Part 845 Groundwater Borehole #: G308

State Plane Coordinate: X 2,515,101.4 Y 871,454.7 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/13/2021 Date Finished: 1/13/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

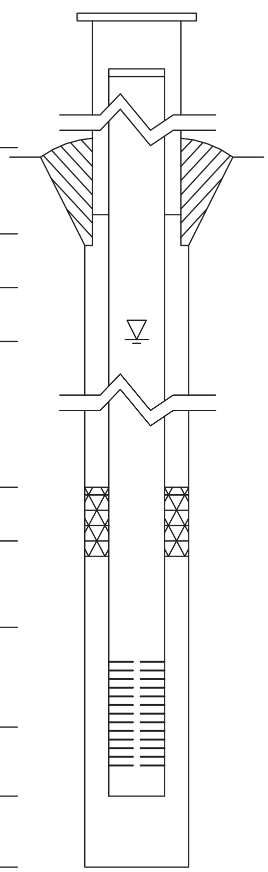
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.96	-3.37	Top of Protective Casing
624.59	-3.00	Top of Riser Pipe
621.59	0.00	Ground Surface
621.39	0.20	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
612.59	9.00	Top of Sand Pack
611.49	10.10	Top of Screen
606.70	14.89	Bottom of Screen
606.35	15.24	Bottom of Well
605.79	15.80	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.10
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	18.24
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G309

Site Name: Coffeen Part 845 Groundwater Borehole #: G309

State Plane Coordinate: X 2,515,067.1 Y 871,865.8 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/12/2021 Date Finished: 1/12/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

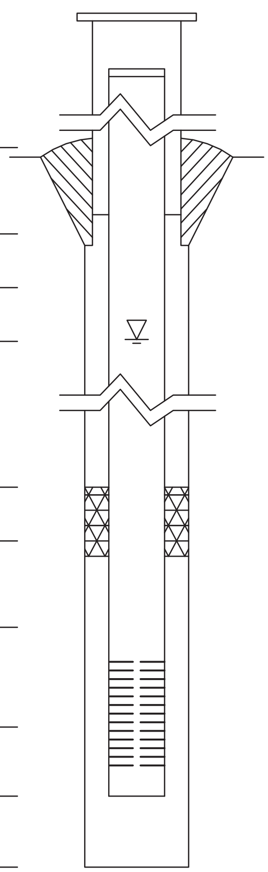
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.20	-3.43	Top of Protective Casing
625.88	-3.11	Top of Riser Pipe
622.77	0.00	Ground Surface
622.27	0.50	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
610.77	12.00	Top of Sand Pack
609.80	12.97	Top of Screen
605.02	17.75	Bottom of Screen
604.67	18.10	Bottom of Well
604.67	18.10	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.08
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.78
Total Length of Casing	(feet)	21.21
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G310

Site Name: Coffeen Part 845 Groundwater Borehole #: G310

State Plane Coordinate: X 2,515,159.4 Y 872,239.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/15/2021 Date Finished: 1/15/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

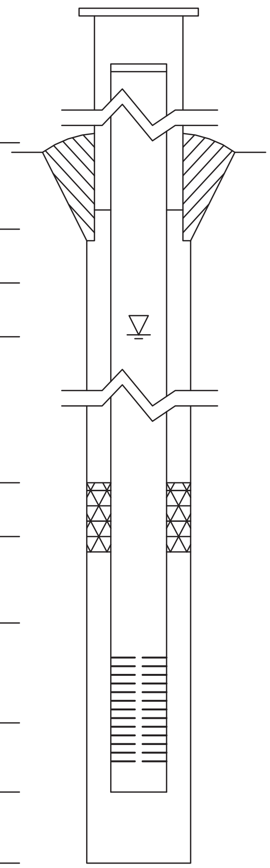
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.32	-3.43	Top of Protective Casing
622.87	-2.98	Top of Riser Pipe
619.89	0.00	Ground Surface
619.39	0.50	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
610.69	9.20	Top of Sand Pack
609.65	10.24	Top of Screen
604.86	15.03	Bottom of Screen
604.51	15.38	Bottom of Well
603.99	15.90	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.22
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	18.36
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: G311

Site Name: Coffeen Part 845 Groundwater Borehole #: G311

State Plane Coordinate: X 2,515,881.8 Y 872,238.7 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

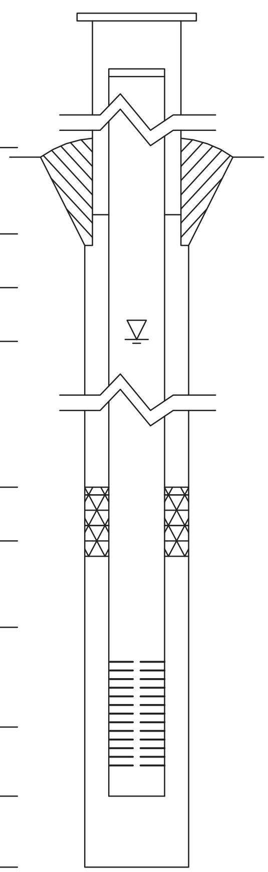
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/5/2021 Date Finished: 2/5/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.55	-3.23	Top of Protective Casing
621.04	-2.72	Top of Riser Pipe
618.32	0.00	Ground Surface
617.52	0.80	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
610.12	8.20	Top of Sand Pack
609.05	9.27	Top of Screen
604.28	14.04	Bottom of Screen
603.92	14.40	Bottom of Well
603.92	14.40	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.99
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	17.12
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G311D

Site Name: Coffeen Part 845 Groundwater Borehole #: G311D

State Plane Coordinate: X 2,515,881.8 Y 872,238.7 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/5/2021 Date Finished: 2/5/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: 1 hour

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

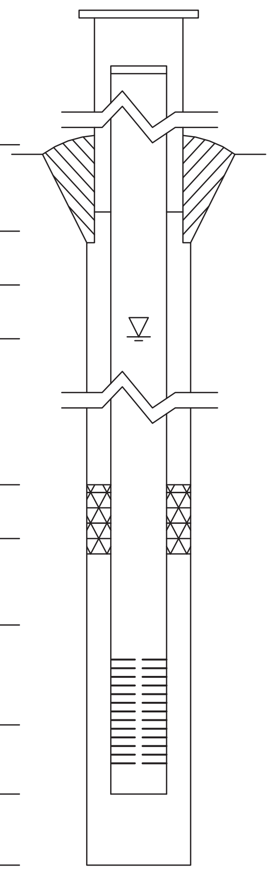
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Tremie

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.75	-3.36	Top of Protective Casing
621.24	-2.85	Top of Riser Pipe
618.39	0.00	Ground Surface
617.09	1.30	Top of Annular Sealant
		Static Water Level (After Completion)
572.39	46.00	Top of Seal
569.39	49.00	Top of Sand Pack
568.23	50.16	Top of Screen
558.29	60.10	Bottom of Screen
557.81	60.58	Bottom of Well
557.81	60.58	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	6.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	53.01
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	9.94
Total Length of Casing	(feet)	63.43
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G312

Site Name: Coffeen Part 845 Groundwater Borehole #: G312

State Plane Coordinate: X 2,516,557.4 Y 872,260.9 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/4/2021 Date Finished: 2/4/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

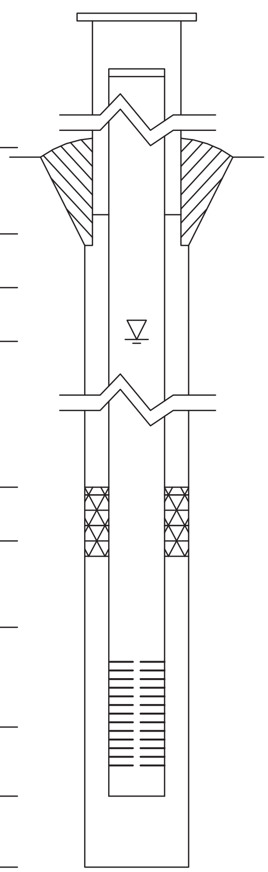
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
620.11	-3.19	Top of Protective Casing
619.78	-2.86	Top of Riser Pipe
616.92	0.00	Ground Surface
615.92	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
608.92	8.00	Top of Sand Pack
607.13	9.79	Top of Screen
602.34	14.58	Bottom of Screen
601.99	14.93	Bottom of Well
601.67	15.25	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.65
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	17.79
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G313

Site Name: Coffeen Part 845 Groundwater Borehole #: G313

State Plane Coordinate: X 2,516,803.7 Y 871,976.8 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/14/2021 Date Finished: 1/14/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

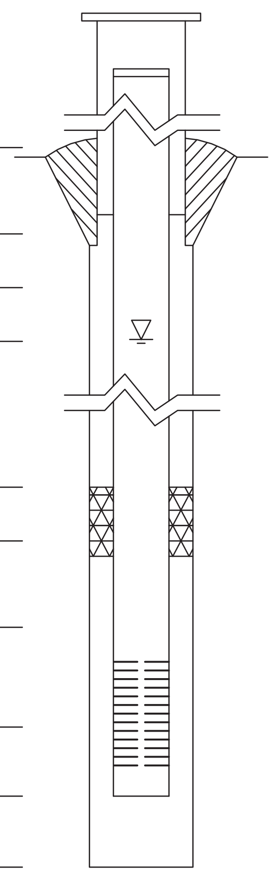
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
614.62	-3.11	Top of Protective Casing
614.30	-2.79	Top of Riser Pipe
611.51	0.00	Ground Surface
611.11	0.40	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
606.51	5.00	Top of Sand Pack
605.21	6.30	Top of Screen
600.40	11.11	Bottom of Screen
600.05	11.46	Bottom of Well
599.51	12.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	9.09
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.81
Total Length of Casing	(feet)	14.25
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G314

Site Name: Coffeen Part 845 Groundwater Borehole #: G314

State Plane Coordinate: X 2,516,852.1 Y 871,630.2 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Holcomb Foundation Engineering Co. Driller: Steve

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/26/2021 Date Finished: 2/26/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: 1 hour

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

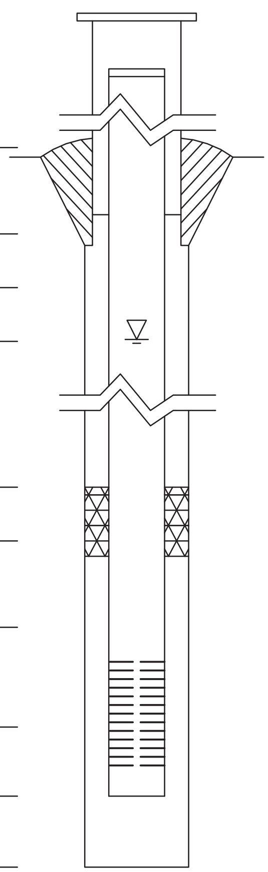
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
614.28	-3.17	Top of Protective Casing
613.88	-2.77	Top of Riser Pipe
611.11	0.00	Ground Surface
609.11	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
597.61	13.50	Top of Sand Pack
596.55	14.56	Top of Screen
591.53	19.58	Bottom of Screen
591.09	20.02	Bottom of Well
591.06	20.05	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.30
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	5.02
Total Length of Casing	(feet)	22.79
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G314D

Site Name: Coffeen Part 845 Groundwater Borehole #: G314D

State Plane Coordinate: X 2,516,853.9 Y 871,642.0 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

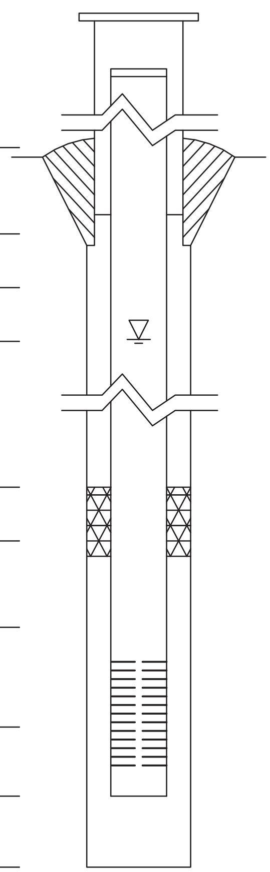
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/10/2021 Date Finished: 2/12/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular (selected) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
614.10	-3.23	Top of Protective Casing
613.70	-2.83	Top of Riser Pipe
610.87	0.00	Ground Surface
608.87	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
574.07	36.80	Top of Seal
572.97	37.90	Top of Sand Pack
571.53	39.34	Top of Screen
561.76	49.11	Bottom of Screen
561.40	49.47	Bottom of Well
510.57	100.30	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	42.17
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	9.77
Total Length of Casing	(feet)	52.30
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (selected)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G315

Site Name: Coffeen Part 845 Groundwater Borehole #: G315

State Plane Coordinate: X 2,516,086.6 Y 871,385.0 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/13/2021 Date Finished: 1/13/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

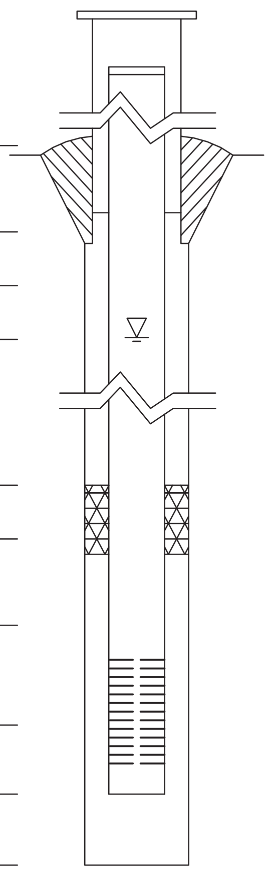
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.89	-2.95	Top of Protective Casing
623.52	-2.58	Top of Riser Pipe
620.94	0.00	Ground Surface
620.54	0.40	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
612.64	8.30	Top of Sand Pack
611.25	9.69	Top of Screen
606.46	14.48	Bottom of Screen
606.09	14.85	Bottom of Well
605.04	15.90	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.27
Bottom of Screen to End Cap	(feet)	0.37
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	17.43
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G316

Site Name: Coffeen Part 845 Groundwater Borehole #: G316

State Plane Coordinate: X 2,517,211.6 Y 871,643.1 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/14/2021 Date Finished: 1/14/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method:

Setting Time:

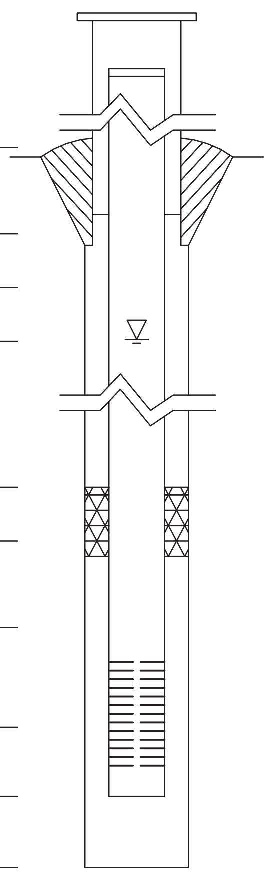
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method:



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
603.06	-3.42	Top of Protective Casing
602.59	-2.95	Top of Riser Pipe
599.64	0.00	Ground Surface
598.84	0.80	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
590.64	9.00	Top of Sand Pack
589.62	10.02	Top of Screen
584.82	14.82	Bottom of Screen
584.48	15.16	Bottom of Well
583.89	15.75	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.97
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.80
Total Length of Casing	(feet)	18.11
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G317

Site Name: Coffeen Part 845 Groundwater Borehole #: G317

State Plane Coordinate: X 2,517,087.4 Y 871,234.2 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

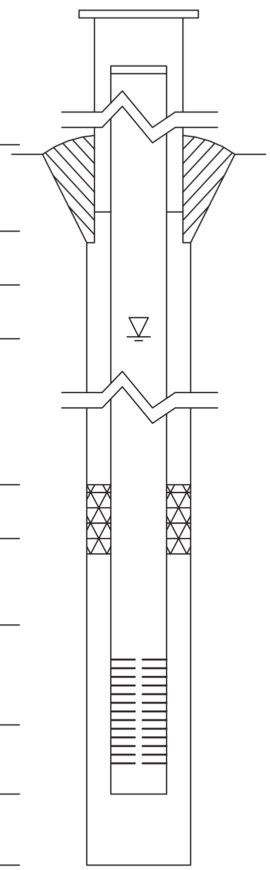
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/13/2021 Date Finished: 1/14/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 24 hours

Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
642.26	-3.41	Top of Protective Casing
641.93	-3.08	Top of Riser Pipe
638.85	0.00	Ground Surface
638.05	0.80	Top of Annular Sealant
		Static Water Level (After Completion)
612.55	26.30	Top of Seal
609.75	29.10	Top of Sand Pack
608.71	30.14	Top of Screen
603.92	34.93	Bottom of Screen
603.57	35.28	Bottom of Well
602.85	36.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	33.22
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	38.36
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: XPW01

Site Name: Coffeen Part 845 Groundwater Borehole #: XPW01

State Plane Coordinate: X 2,515,366.3 Y 871,638.7 (or) Latitude: ______ ______ ______ Longitude: ______ ______ ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/8/2021 Date Finished: 2/8/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

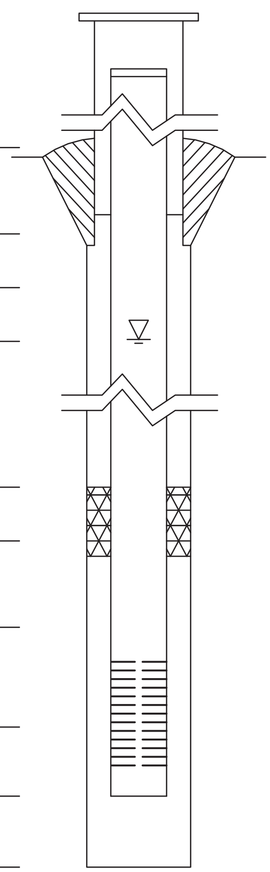
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
634.92	-3.07	Top of Protective Casing
634.57	-2.72	Top of Riser Pipe
631.85	0.00	Ground Surface
631.15	0.70	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
624.85	7.00	Top of Sand Pack
623.64	8.21	Top of Screen
618.87	12.98	Bottom of Screen
618.49	13.36	Bottom of Well
617.85	14.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	10.93
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	16.08
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: XPW02

Site Name: Coffeen Part 845 Groundwater Borehole #: XPW02

State Plane Coordinate: X 2,515,627.3 Y 871,987.1 (or) Latitude: ______ Longitude: ______

Surveyed By: Kyle J. Nolan IL Registration #: 035-003919

Drilling Contractor: Roberts Env. Drilling Inc. Driller: Matt

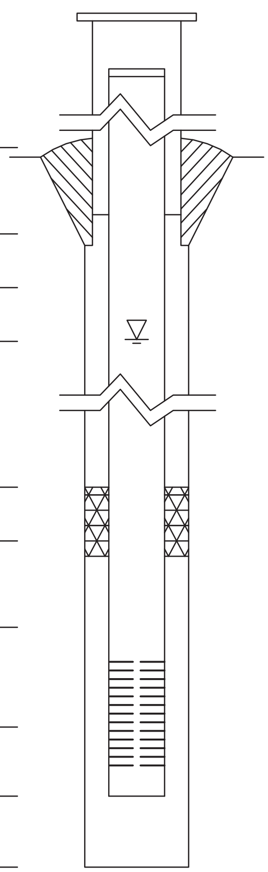
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 2/8/2021 Date Finished: 2/8/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

ANNULAR SPACE DETAILS



	Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
	640.02	-3.38	Top of Protective Casing
	639.69	-3.05	Top of Riser Pipe
Type of Surface Seal: Concrete	636.64	0.00	Ground Surface
Type of Annular Sealant: Bentonite chips	636.04	0.60	Top of Annular Sealant
Installation Method: Gravity			
Setting Time: >24 hours			Static Water Level (After Completion)
Type of Bentonite Seal -- Granular Pellet Slurry (choose one)			
Installation Method:	n/a	n/a	Top of Seal
Setting Time:	629.64	7.00	Top of Sand Pack
Type of Sand Pack: Quartz sand			
Grain Size: 10-20 (sieve size)	628.59	8.05	Top of Screen
Installation Method: Gravity			
	618.79	17.85	Bottom of Screen
Type of Backfill Material: N/A (if applicable)	618.44	18.20	Bottom of Well
Installation Method:	618.44	18.20	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.10
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	9.80
Total Length of Casing	(feet)	21.25
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Deqi t pn Wi CpUti Nlime AUtmhLmpti v Sli LT

h leeg t Nrdmpti PlrtUm

Site #: ________ County: Montgomery Well #: G275D

Site Name: Coffeen Part 845 Groundwater Borehole #: G275D

State Plane Coordinate: X 2,516,366.5 Y 874,285.3 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Michael J. Graminski IL Registration #: 035-003919

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/28/2021 Date Finished: 2/3/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

vaasIvPcAvgWRWyvDIc

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

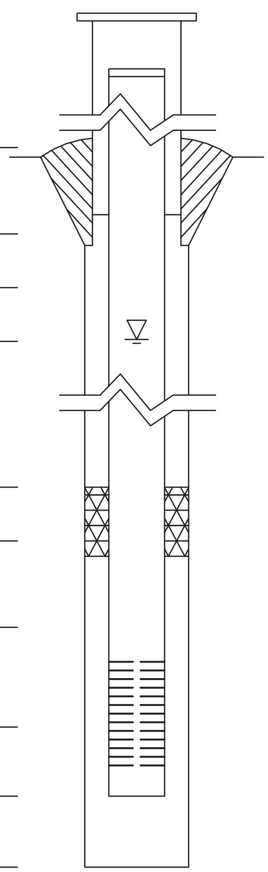
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ________



Wel Compti n (MSL)*	Rlr mEn (BGS)	(0.01 ft.)
620.69	-3.17	Top of Protective Casing
620.31	-2.79	Top of Riser Pipe
617.52	0.00	Ground Surface
617.02	0.50	Top of Annular Sealant
		Static Water Level (After Completion)
572.02	45.50	Top of Seal
571.02	46.50	Top of Sand Pack
567.76	49.76	Top of Screen
557.97	59.55	Bottom of Screen
557.63	59.89	Bottom of Well
517.82	99.70	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	52.55
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	9.79
Total Length of Casing	(feet)	62.68
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Depi t pn Wi CpUt i Nli me AUt mLmpt i v Sli LT   h lœg t Nr d mpt i Pl r t Um

Site #: ______ County: Montgomery Well #: G206D

Site Name: Coffeen Part 845 Groundwater Borehole #: G282D

State Plane Coordinate: X 2,514,684.6 Y 875,111.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Michael J. Graminski IL Registration #: 035-003919

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/25/2021 Date Finished: 1/25/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

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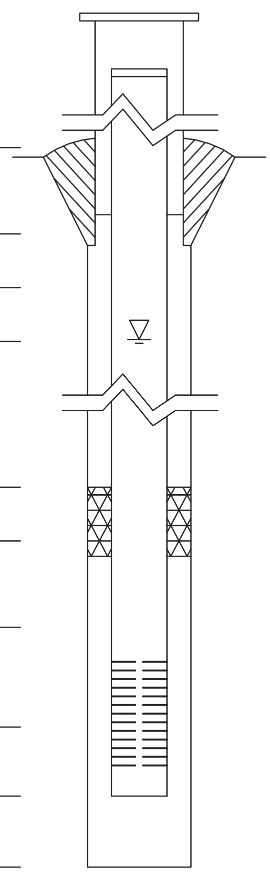

Wel Compt i n (MSL)*	Rl r mEn (BGS)	(0.01 ft.)
634.35	-2.94	Top of Protective Casing
634.14	-2.73	Top of Riser Pipe
631.41	0.00	Ground Surface
631.11	0.30	Top of Annular Sealant
		Static Water Level (After Completion)
585.81	45.60	Top of Seal
583.41	48.00	Top of Sand Pack
582.21	49.20	Top of Screen
572.41	59.00	Bottom of Screen
572.02	59.39	Bottom of Well
571.41	60.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 hours

Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	51.93
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	9.77
Total Length of Casing	(feet)	62.09
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Depi t pn Wi CplLti i Nlime AUtmhLmpti v Sli LT　　　h lægt Nrdmpti PlrtUm

Site #: ______ County: Montgomery Well #: G283

Site Name: Coffeen Part 845 Groundwater Borehole #: G283

State Plane Coordinate: X 2,516,503.0 Y 874,113.0 (or) Latitude: ______ Longitude: ______

Surveyed By: Michael J. Graminski IL Registration #: 035-003919

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/18/2021 Date Finished: 1/18/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

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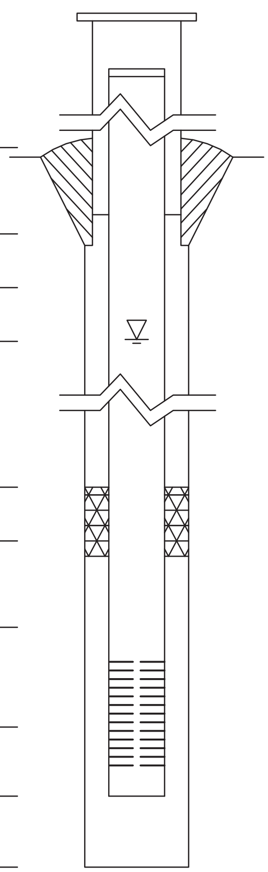

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

Wel Comptin (MSL)*	Rlrm En (BGS)	(0.01 ft.)
611.07	-2.77	Top of Protective Casing
610.75	-2.45	Top of Riser Pipe
608.30	0.00	Ground Surface
607.70	0.60	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
600.80	7.50	Top of Sand Pack
599.91	8.39	Top of Screen
590.13	18.17	Bottom of Screen
589.94	18.36	Bottom of Well
589.94	18.36	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	10.84
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	9.78
Total Length of Casing	(feet)	21.00
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Deqpi tpnWiCpUt i Nlime AUtmhLmpti v Sli LT **h lægt Nrdmpti Plrt Um**

Site #: ______ County: Montgomery Well #: G284

Site Name: Coffeen Part 845 Groundwater Borehole #: G284

State Plane Coordinate: X 2,516,922.9 Y 874,423.6 (or) Latitude: ______ Longitude: ______

Surveyed By: Michael J. Graminski IL Registration #: 035-003919

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/20/2021 Date Finished: 1/20/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

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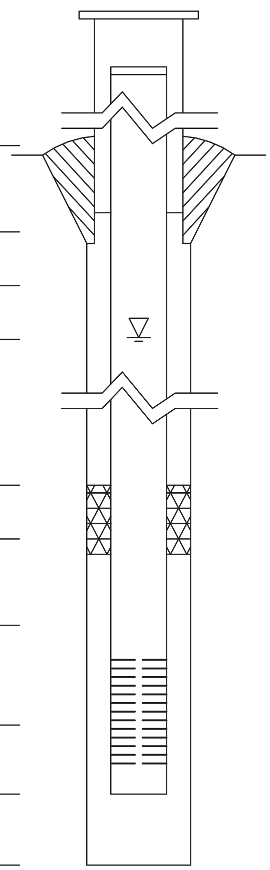

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

Wel Compt i n (MSL)*	Rl r mEn (BGS)	(0.01 ft.)
618.66	-3.33	Top of Protective Casing
618.42	-3.09	Top of Riser Pipe
615.33	0.00	Ground Surface
614.33	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
608.33	7.00	Top of Sand Pack
607.25	8.08	Top of Screen
602.48	12.85	Bottom of Screen
602.10	13.23	Bottom of Well
601.33	14.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.17
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	16.32
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Dœpi tpn Wi CpUt i Nli me AUt mhLnpt i v Sli LT — **h lœgt Nrdmpti Plrt Um**

Site #: ______ County: Montgomery Well #: G285

Site Name: Coffeen Part 845 Groundwater Borehole #: G285

State Plane Coordinate: X 2,516,680.4 Y 874,795.0 (or) Latitude: ______ Longitude: ______

Surveyed By: Michael J. Graminski IL Registration #: 035-002901

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/19/2021 Date Finished: 1/19/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

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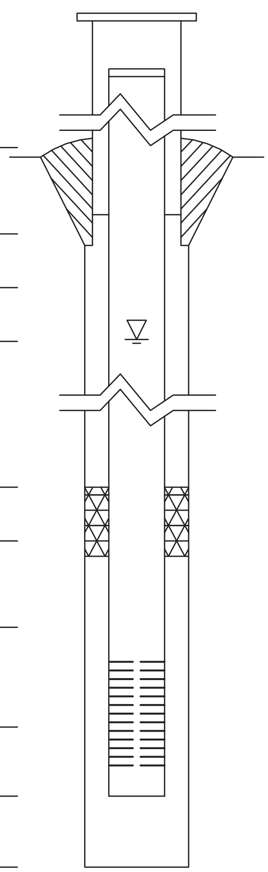

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

Wel Compt i n Rl r mEn (0.01 ft.)

(MSL)*	(BGS)	
613.90	-3.36	Top of Protective Casing
613.52	-2.98	Top of Riser Pipe
610.54	0.00	Ground Surface
610.24	0.30	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
598.24	12.30	Top of Sand Pack
596.86	13.68	Top of Screen
587.09	23.45	Bottom of Screen
586.71	23.83	Bottom of Well
584.54	26.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.66
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	9.77
Total Length of Casing	(feet)	26.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Dœpi tpm Wi CpUi Nli me AUt mLmpti v Sli LT — h lœgtNrdmpti PlrtUm

Site #: ______ County: Montgomery Well #: G286

Site Name: Coffeen Part 845 Groundwater Borehole #: G286

State Plane Coordinate: X 2,516,561.8 Y 875,072.2 (or) Latitude: ______ Longitude: ______

Surveyed By: Michael J. Graminski IL Registration #: 035-002901

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/19/2021 Date Finished: 1/19/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

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Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

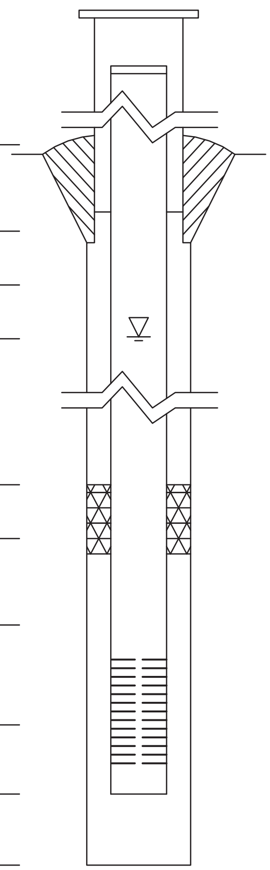
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Wel Compti n (MSL)*	Rlrm En (BGS)	(0.01 ft.)
613.57	-3.60	Top of Protective Casing
613.13	-3.16	Top of Riser Pipe
609.97	0.00	Ground Surface
609.47	0.50	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
607.27	2.70	Top of Sand Pack
606.60	3.37	Top of Screen
601.81	8.16	Bottom of Screen
601.47	8.50	Bottom of Well
599.97	10.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	6.53
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	11.66
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Depitpn Wi CplUti NlimeAUtmhLmpti v Sli LT **h leegt Nrdmpti PlrtUm**

Site #: ______ County: Montgomery Well #: G287

Site Name: Coffeen Part 845 Groundwater Borehole #: G287

State Plane Coordinate: X 2,516,415.5 Y 875,442.8 (or) Latitude: ______ Longitude: ______

Surveyed By: Michael J. Graminski IL Registration #: 035-002901

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/18/2021 Date Finished: 1/18/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

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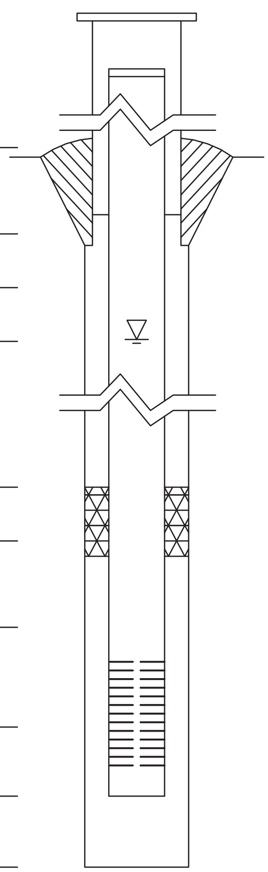
Wel Comptin Rlrm En (0.01 ft.)

(MSL)*	(BGS)	
617.88	-3.54	Top of Protective Casing
617.45	-3.11	Top of Riser Pipe
614.34	0.00	Ground Surface
613.74	0.60	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
609.84	4.50	Top of Sand Pack
608.91	5.43	Top of Screen
604.09	10.25	Bottom of Screen
603.75	10.59	Bottom of Well
602.54	11.80	Bottom of Borehole

* Referenced to a National Geodetic Datum



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	8.54
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.82
Total Length of Casing	(feet)	13.70
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Deepi t pn Wi CpUi i Nl i me AUt mLnpt i v Sli LT　　h lœg t Nrd npti Plrt Um

Site #: ______ County: Montgomery Well #: G288

Site Name: Coffeen Part 845 Groundwater Borehole #: G288

State Plane Coordinate: X 2,517,071.4 Y 875,279.6 (or) Latitude: ______ Longitude: ______

Surveyed By: Michael J. Graminski IL Registration #: 035-002901

Drilling Contractor: Roberts Driller: Matt

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): None

Logged By: Colin Winter Date Started: 1/21/2021 Date Finished: 1/21/2021

Report Form Completed By: Colin Winter Date: 5/3/2021

v a a s I v P c Av g WRWy v DI c

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

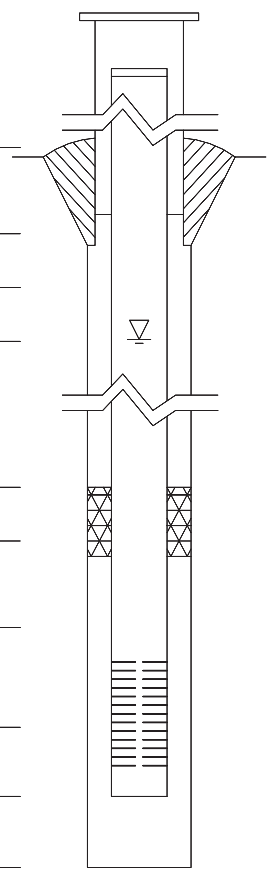
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: N/A (if applicable)

Installation Method: ______



Wel Cmpt i n (MSL)*	Rl r m En (BGS) (0.01 ft.)	
620.37	-3.29	Top of Protective Casing
620.07	-2.99	Top of Riser Pipe
617.08	0.00	Ground Surface
616.78	0.30	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
611.08	6.00	Top of Sand Pack
609.49	7.59	Top of Screen
604.82	12.26	Bottom of Screen
604.33	12.75	Bottom of Well
603.08	14.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	10.58
Bottom of Screen to End Cap	(feet)	0.49
Screen Length (1st slot to last slot)	(feet)	4.67
Total Length of Casing	(feet)	15.74
Screen Slot Size **	(inches)	0.010

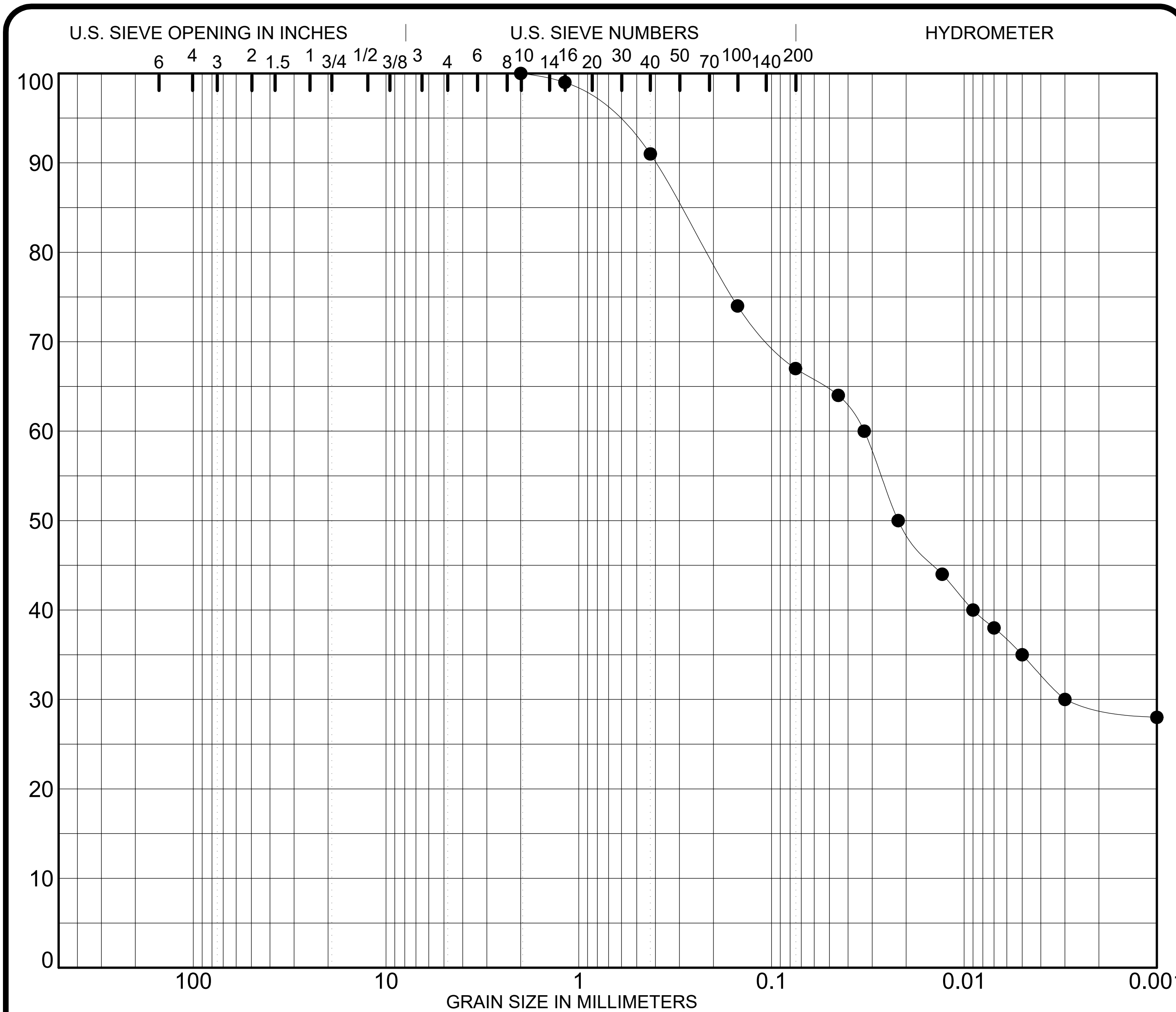
**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

APPENDIX D
GEOTECHNICAL LABORATORY REPORTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
G307D/Comp1	3/8	100.0	Sandy Lean Clay
	#4	100.0	
	#8	100.0	
	#10	100.0	%GRAVEL: 0; %SAND: 33; %SILT: 38; %CLAY: 29
NOTES:	# 16	99.0	
Specific Gravity - 2.59	# 30		
	# 40	91.0	MC%: 19.4; γdry (pcf): 107.5; LL: 33; PL: 16; PI: 17
	# 50		
	# 80		
	# 100	74.0	Density/Moisture Relationship: Standard
	# 200	67.0	Max PCF: ; Opt. WC%:

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

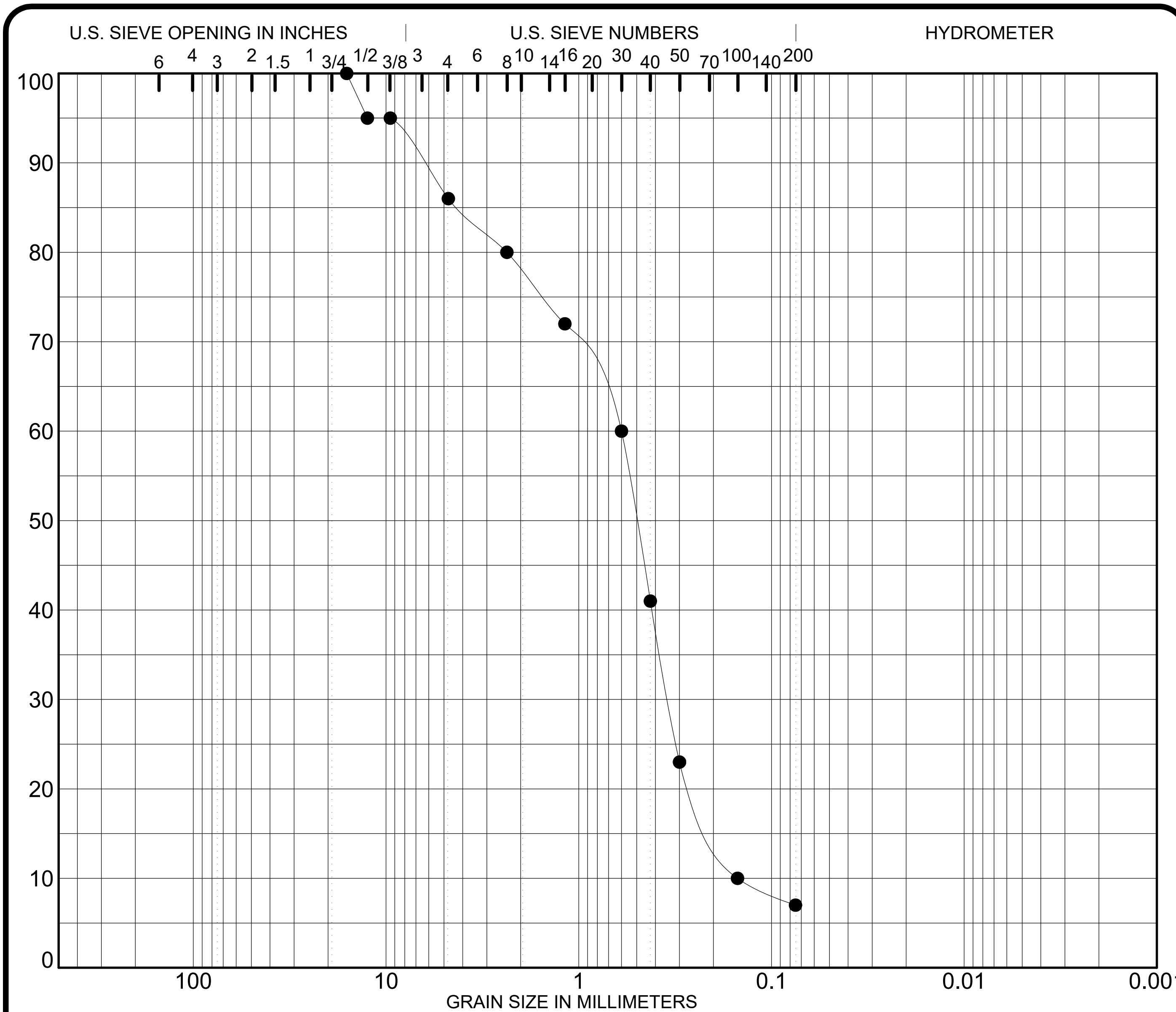
DATE March 23, 2021

G307D/Comp1

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G307D/Comp2	3/8	95.0	Fine to Coarse Sand, with silt				
	#4	86.0					
	#8	80.0					
	#10		%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	72.0	14	79	7		
Specific Gravity - 2.59	# 30	60.0					
	# 40	41.0	MC%	γdry (pcf)	LL	PL	PI
	# 50	23.0	19.2		NP	NP	NP
	# 80						
	# 100	10.0	Density/Moisture Relationship: Standard				
	# 200	7.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

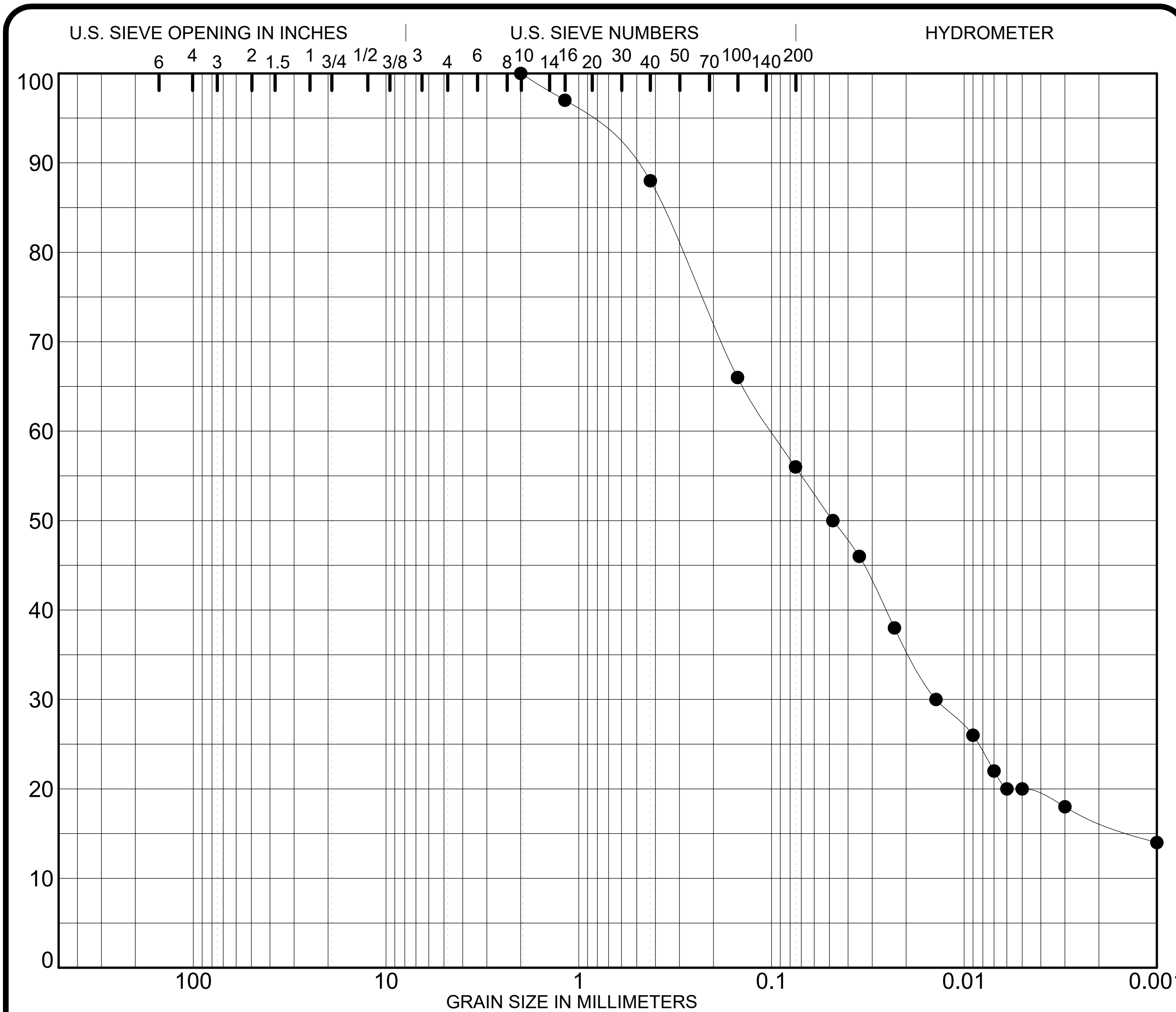
JOB NO. **21-056**
DATE March 18, 2021

G307D/Comp2

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
G307D/Comp3	3/8	100.0	Sandy Silt
	#4	100.0	
	#8	100.0	
	#10	100.0	%GRAVEL: 0; %SAND: 44; %SILT: 40; %CLAY: 16
NOTES:	# 16	97.0	
Specific Gravity - 2.60	# 30		
	# 40	88.0	MC%: 8.7; γdry (pcf): 131.6; LL: 19; PL: 13; PI: 6
	# 50		
	# 80		
	# 100	66.0	Density/Moisture Relationship: Standard
	# 200	56.0	Max PCF: ; Opt. WC%:

%GRAVEL	%SAND	%SILT	%CLAY
0	44	40	16

MC%	γdry (pcf)	LL	PL	PI
8.7	131.6	19	13	6

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

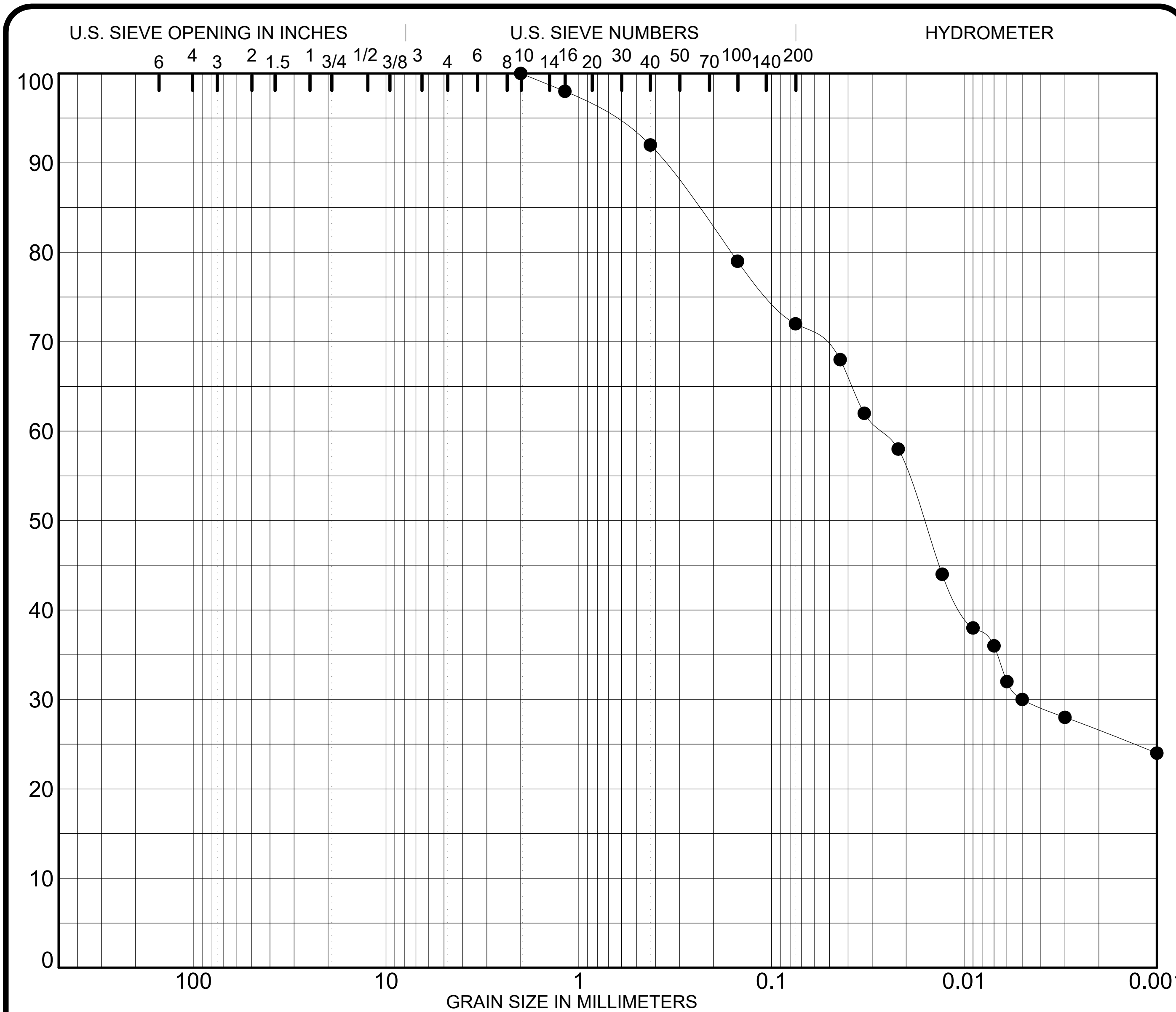
DATE March 23, 2021

G307D/Comp3

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G307D/Comp4	3/8	100.0	Lean Clay, with sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	98.0	0	28	46	26	
Specific Gravity - 2.61	# 30						
	# 40	92.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		15.6	115.7	30	15	15
	# 80						
	# 100	79.0	Density/Moisture Relationship: Standard				
	# 200	72.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

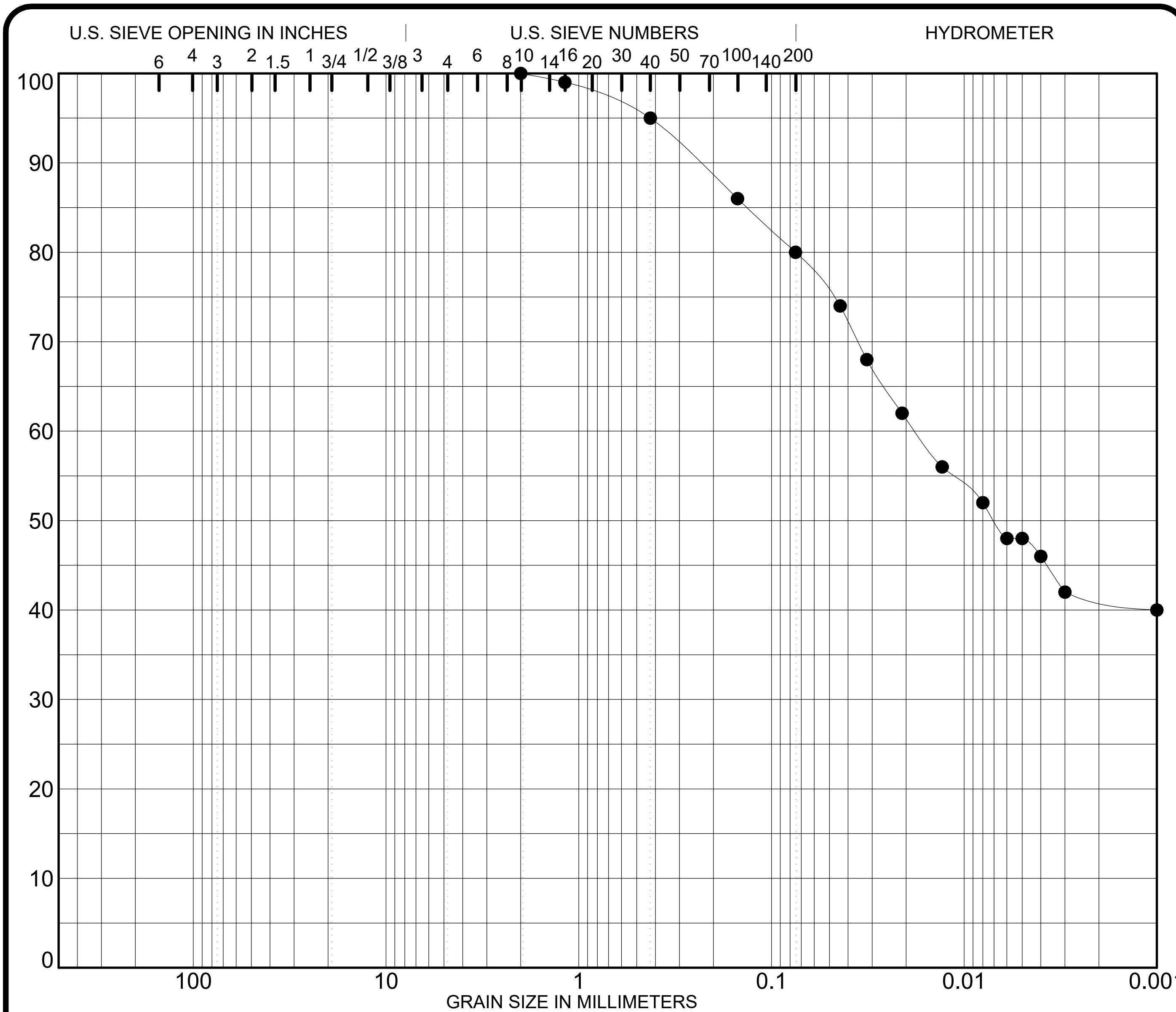
DATE March 24, 2021

G307D/Comp4

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G307D/Comp5	3/8	100.0	Lean Clay, with sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	99.0	0	20	39	41	
Specific Gravity - 2.67	# 30						
	# 40	95.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		8.7	134.6	47	18	29
	# 80						
	# 100	86.0	Density/Moisture Relationship: Standard				
	# 200	80.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

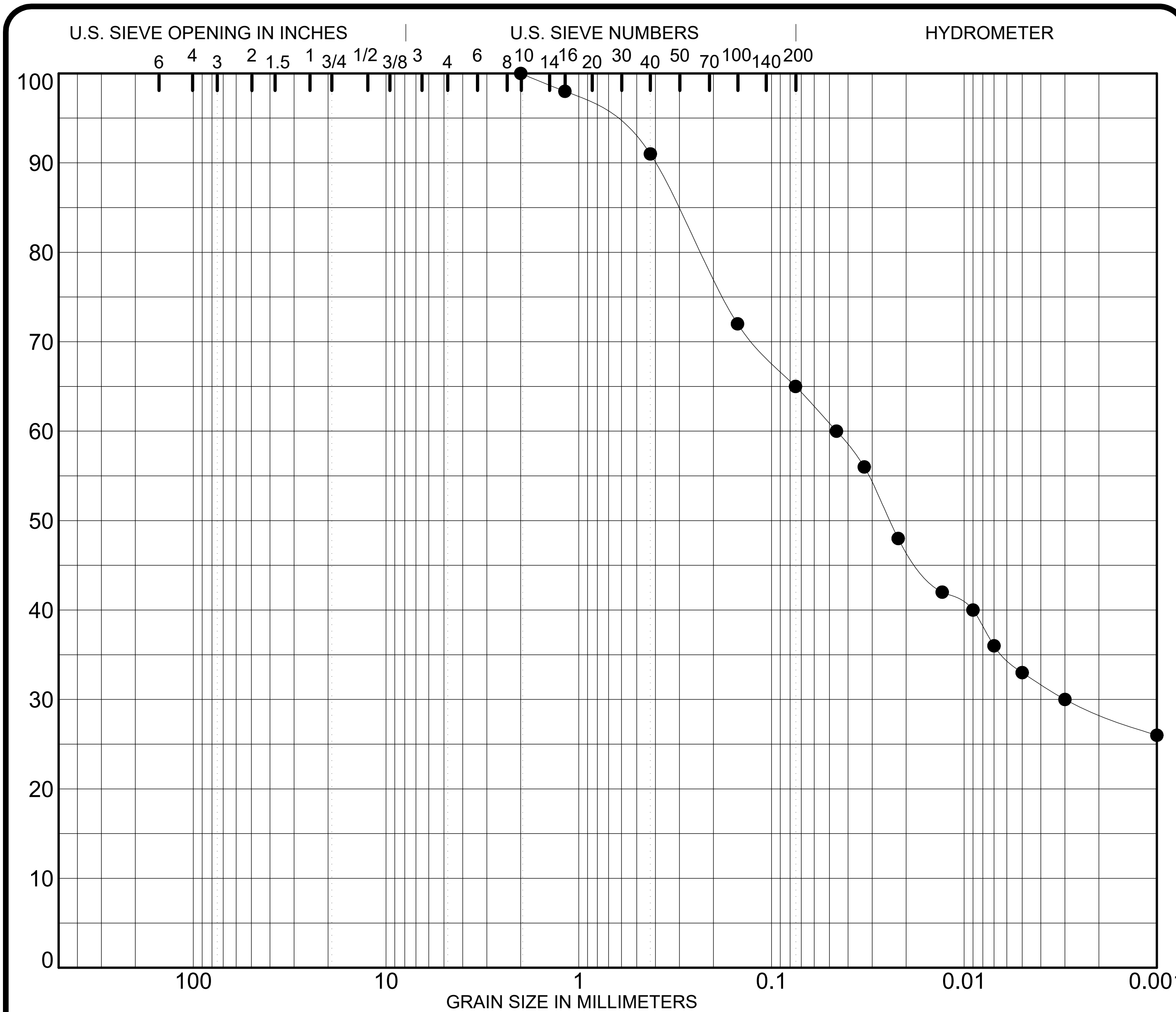
JOB NO. **21-056**
DATE March 24, 2021

G307D/Comp5

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION			
G311D/Comp1	3/8	100.0	Sandy Lean Clay			
	#4	100.0				
	#8	100.0				
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY
NOTES:	# 16	98.0	0	35	37	28
Specific Gravity - 2.64	# 30					

SIEVE	% PASS	MC%	γdry (pcf)	LL	PL	PI
# 40	91.0					
# 50		16.5	115.7	31	13	18
# 80						
# 100	72.0	Density/Moisture Relationship: Standard				
# 200	65.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

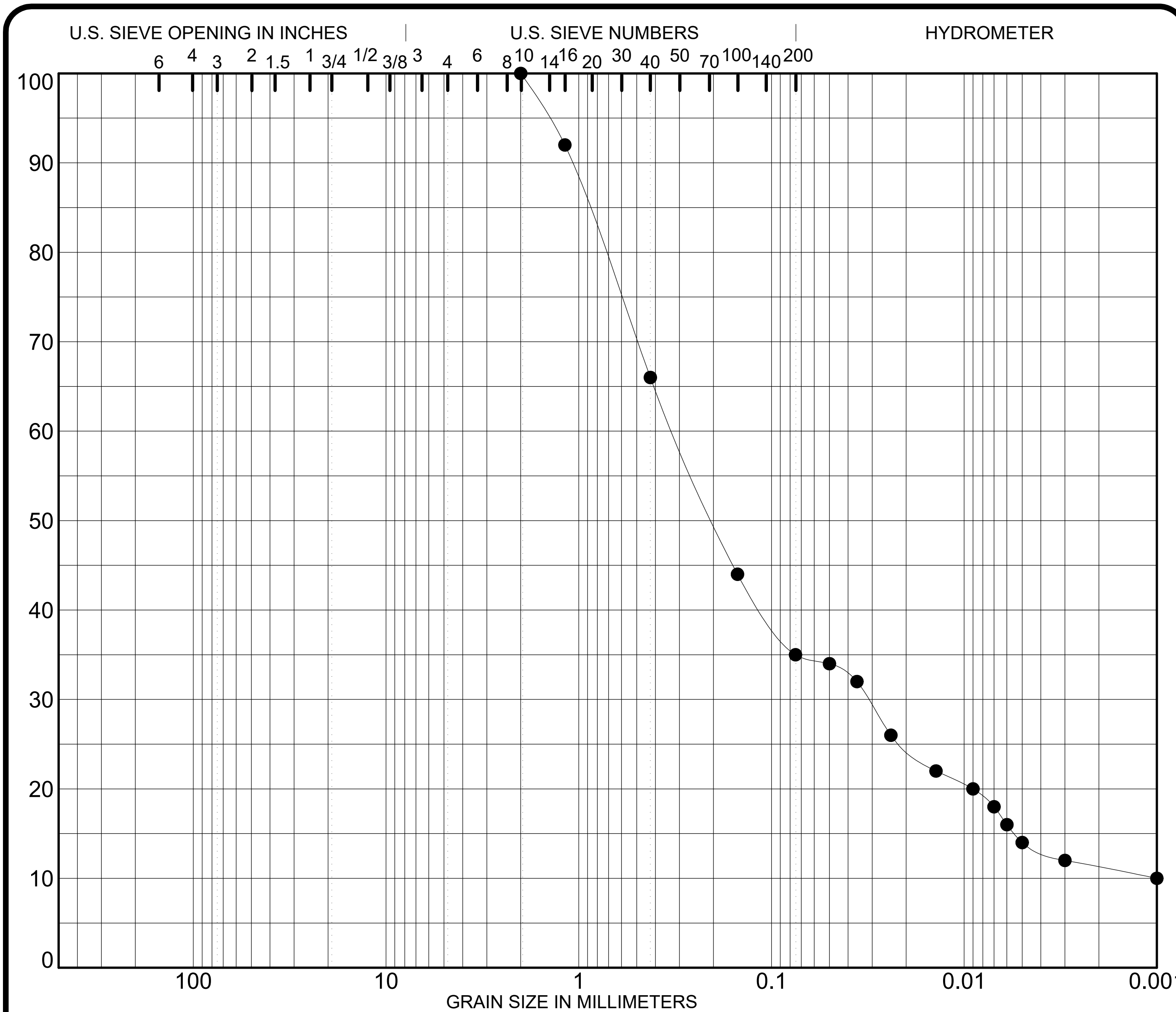
DATE March 24, 2021

G311D/Comp1

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G311D/Comp2	3/8	100.0	Silty Fine to Medium Sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND		%SILT	%CLAY
NOTES:	# 16	92.0	0	65		24	11
Specific Gravity - 2.68	# 30						
	# 40	66.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		11.4	126.8	18	13	5
	# 80						
	# 100	44.0	Density/Moisture Relationship: Standard				
	# 200	35.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

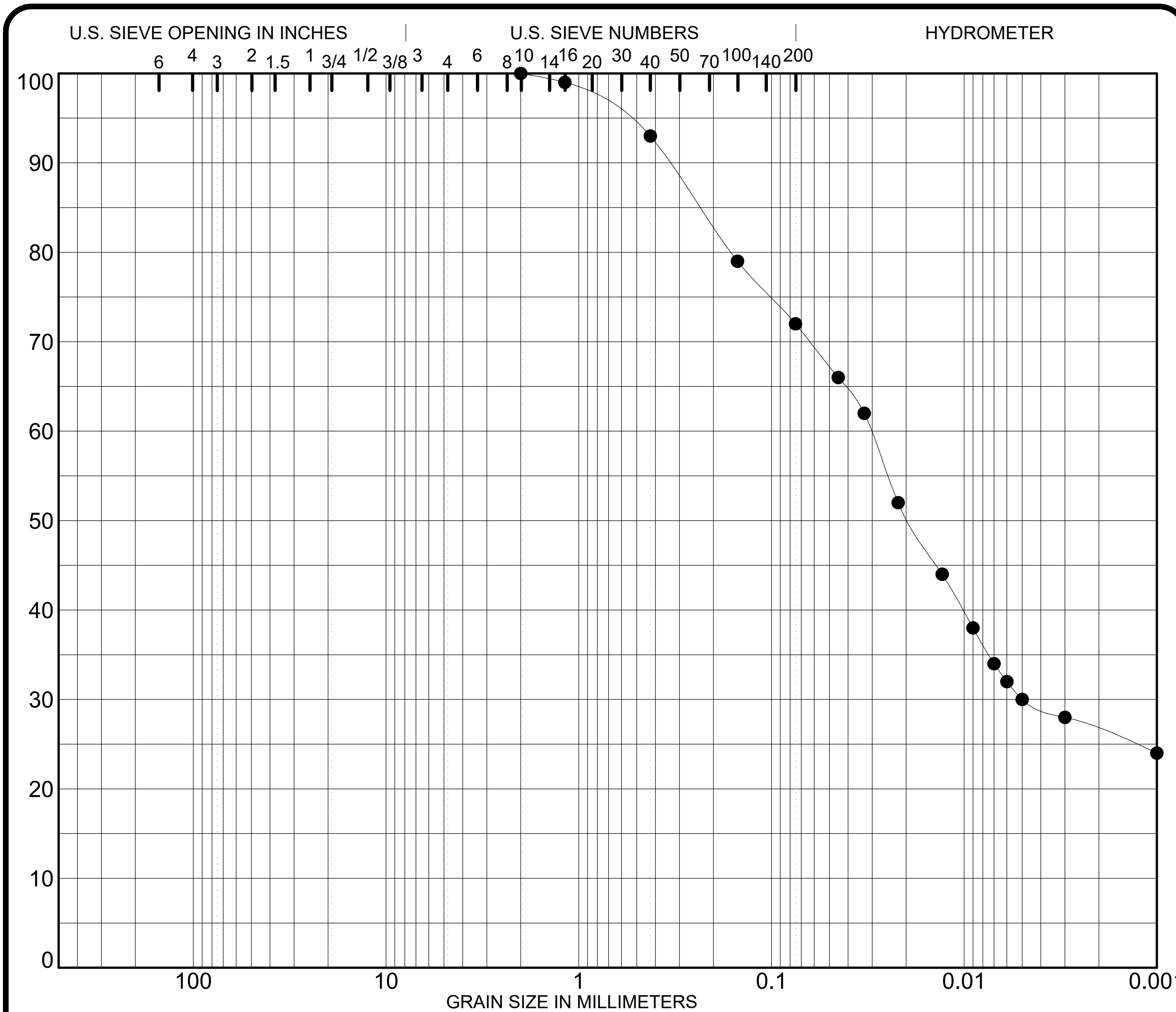
DATE April 8, 2021

G311D/Comp2

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

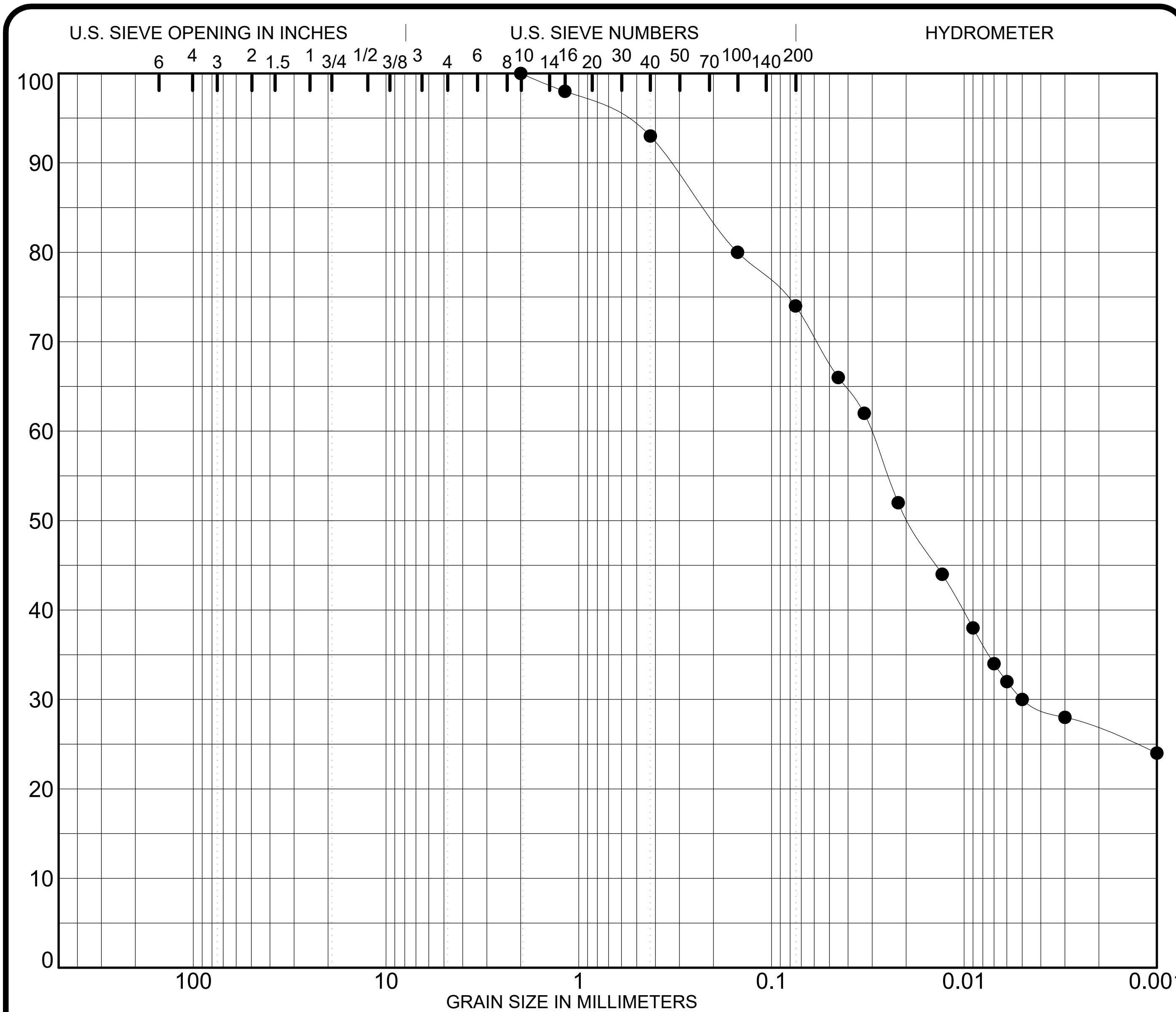
SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G311D/Comp3	3/8	100.0	Lean Clay, with sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	99.0	0	28	46	26	
Specific Gravity - 2.61	# 30						
	# 40	93.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		11.4	124.8	30	15	15
	# 80						
	# 100	79.0	Density/Moisture Relationship: Standard				
	# 200	72.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**
DATE March 24, 2021

G311D/Comp3

SOIL DATA SHEET
Ramsey Geotechnical Engineering
Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
G311D/Comp4	3/8	100.0	Lean Clay, with sand
	#4	100.0	
	#8	100.0	
	#10	100.0	
NOTES:	# 16	98.0	
Specific Gravity - 2.56	# 30		
	# 40	93.0	
	# 50		
	# 80		
	# 100	80.0	
	# 200	74.0	

%GRAVEL	%SAND	%SILT	%CLAY
0	26	48	26

MC%	γdry (pcf)	LL	PL	PI
15.5	114.2	30	16	14

Density/Moisture Relationship: Standard

Max PCF		Opt. WC%	

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

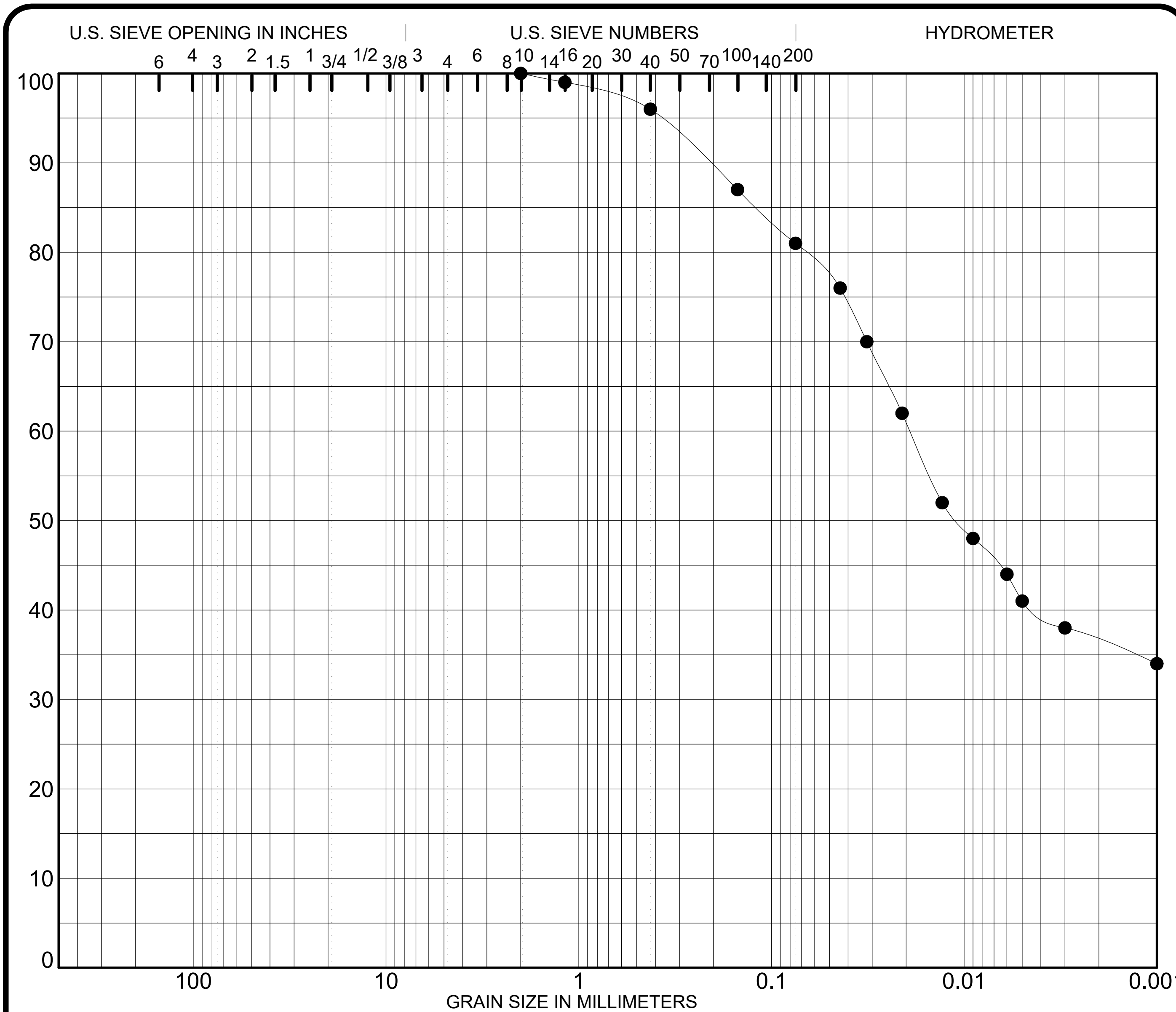
DATE March 24, 2021

G311D/Comp4

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G311D/Comp5	3/8	100.0	Lean Clay, with sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	99.0	0	19	45	36	
Specific Gravity - 2.59	# 30						
	# 40	96.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		18.9	108.0	37	17	20
	# 80						
	# 100	87.0	Density/Moisture Relationship: Standard				
	# 200	81.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

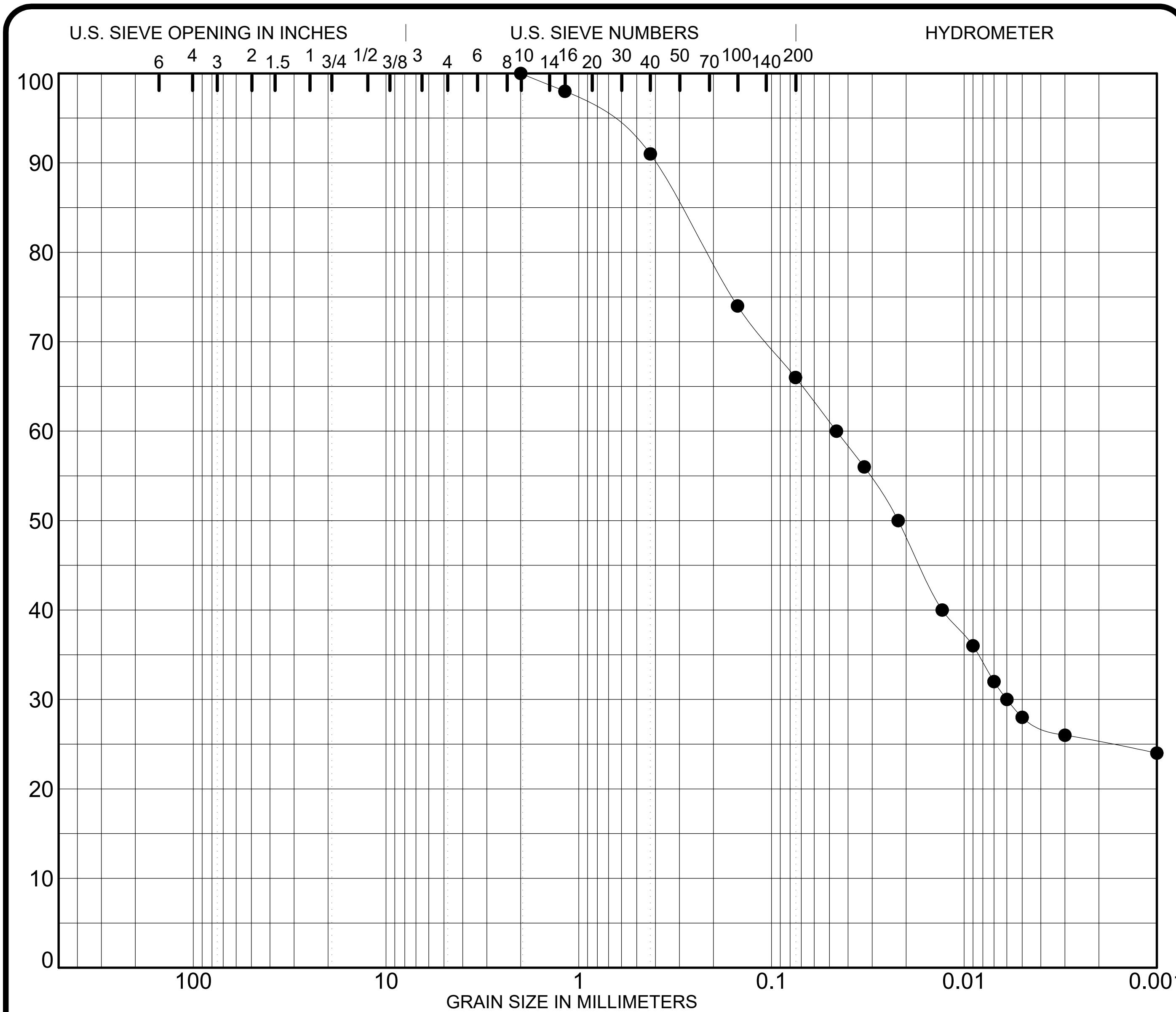
DATE March 24, 2021

G311D/Comp5

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
G314D/Comp1	3/8	100.0	Sandy Lean Clay
	#4	100.0	
	#8	100.0	
	#10	100.0	
NOTES:	# 16	98.0	
Specific Gravity - 2.61	# 30		
	# 40	91.0	
	# 50		
	# 80		
	# 100	74.0	
	# 200	66.0	

%GRAVEL	%SAND	%SILT	%CLAY
0	34	41	35

MC%	γdry (pcf)	LL	PL	PI
16.5	113.6	29	14	15

Density/Moisture Relationship: Standard

Max PCF		Opt. WC%	

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

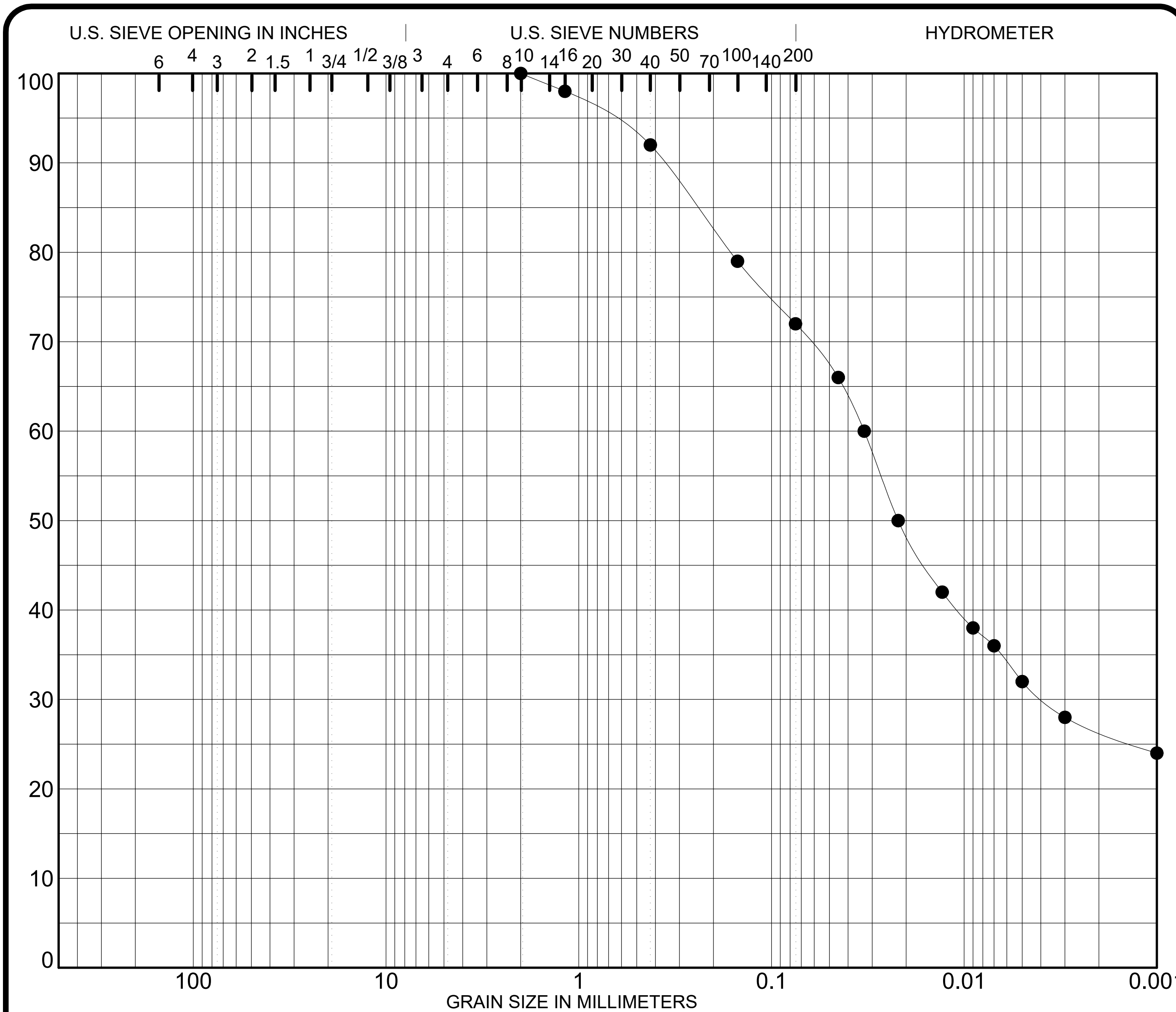
DATE March 24, 2021

G314D/Comp1

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
G314D/Comp2	3/8	100.0	Lean Clay, with sand
	#4	100.0	
	#8	100.0	
	#10	100.0	
NOTES:	# 16	98.0	
Specific Gravity - 2.64	# 30		
	# 40	92.0	
	# 50		
	# 80		
	# 100	79.0	
	# 200	72.0	

%GRAVEL	%SAND	%SILT	%CLAY
0	28	52	26

MC%	γdry (pcf)	LL	PL	PI
12.2	123.4	29	14	15

Density/Moisture Relationship: Standard

Max PCF		Opt. WC%	

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

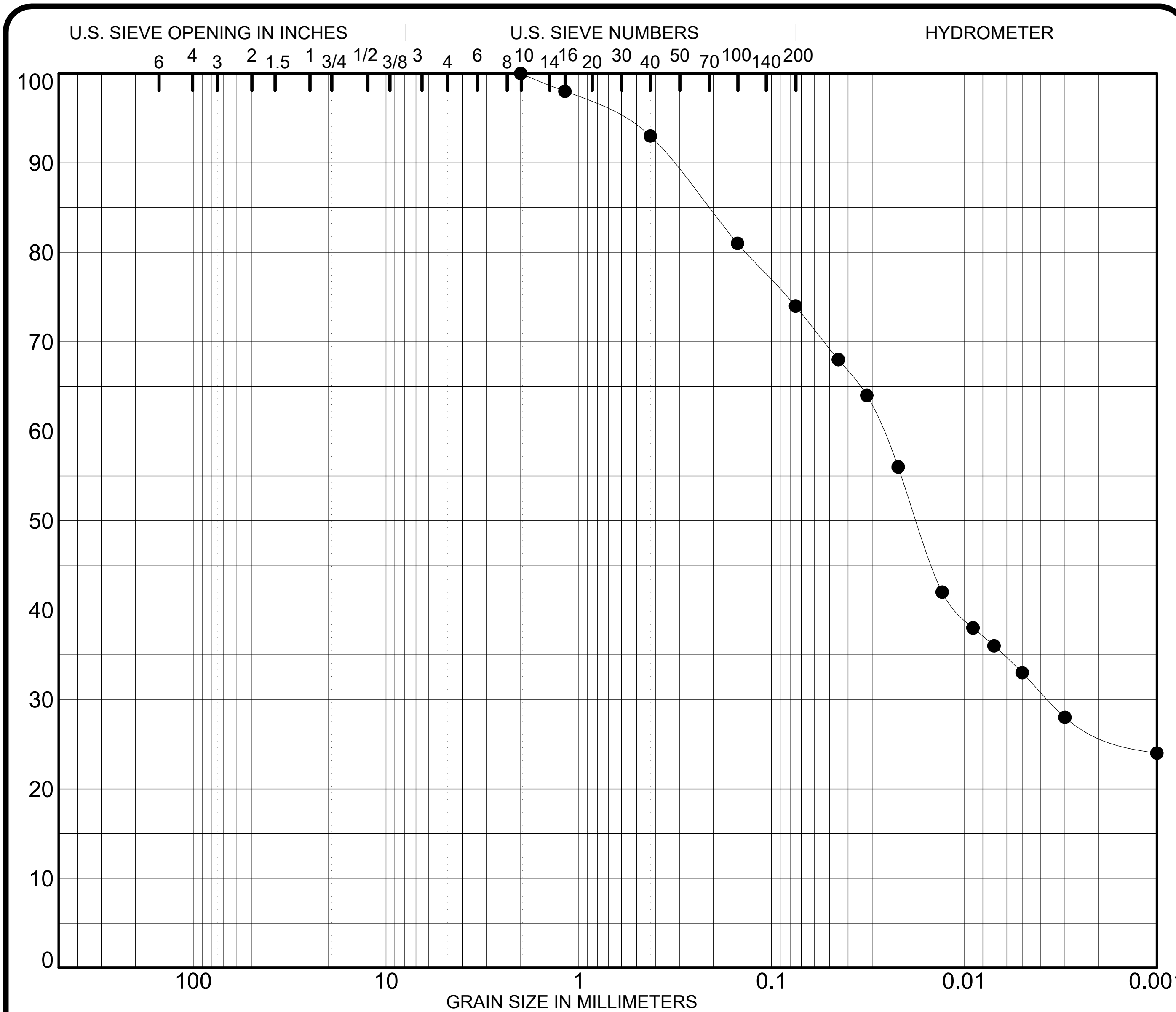
DATE March 24, 2021

G314D/Comp2

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G314D/Comp3	3/8	100.0	Lean Clay, with sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	98.0	0	26	48	26	
Specific Gravity - 2.56	# 30						
	# 40	93.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		14.6	115.7	31	15	16
	# 80						
	# 100	81.0	Density/Moisture Relationship: Standard				
	# 200	74.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

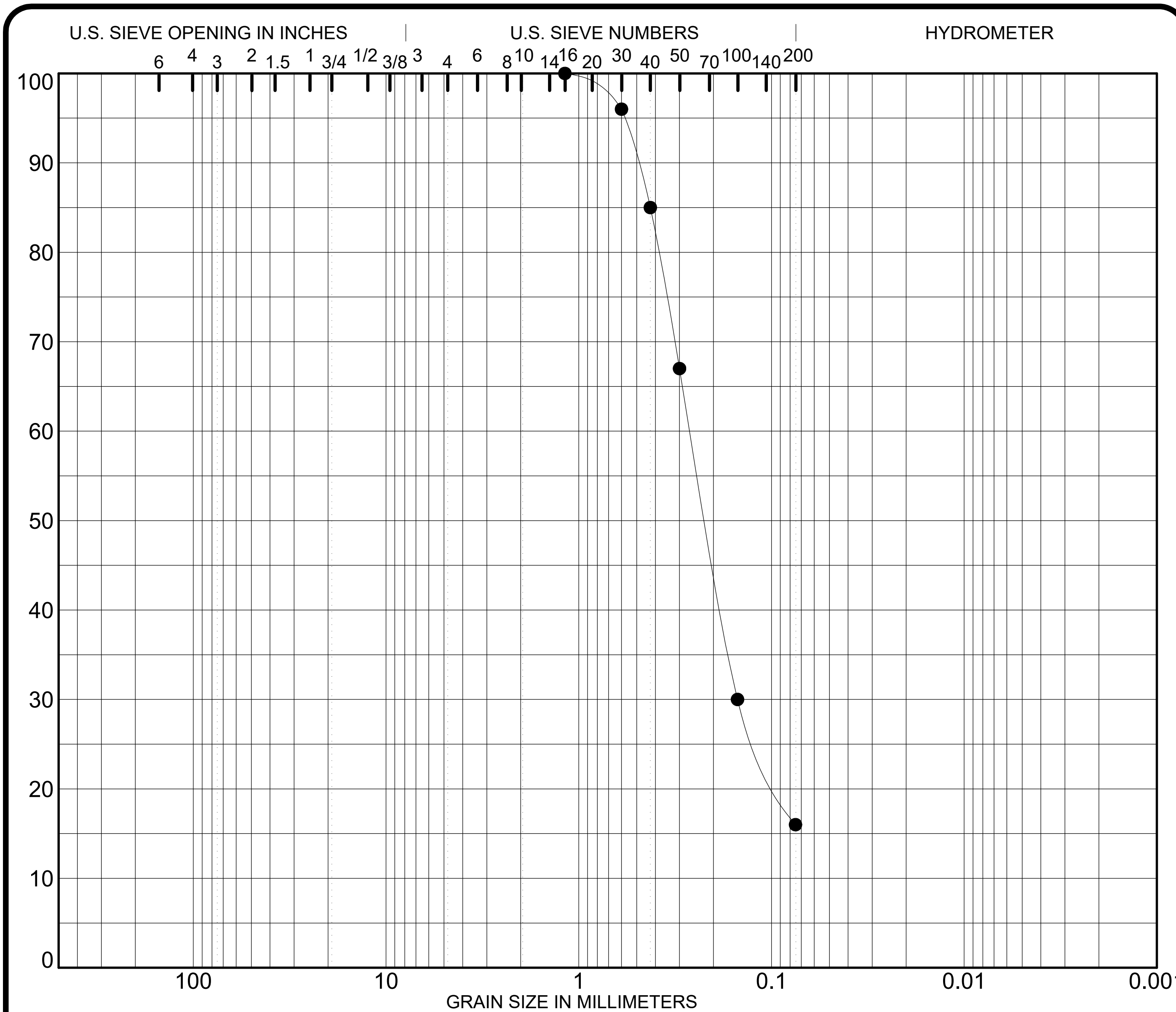
DATE March 24, 2021

G314D/Comp3

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

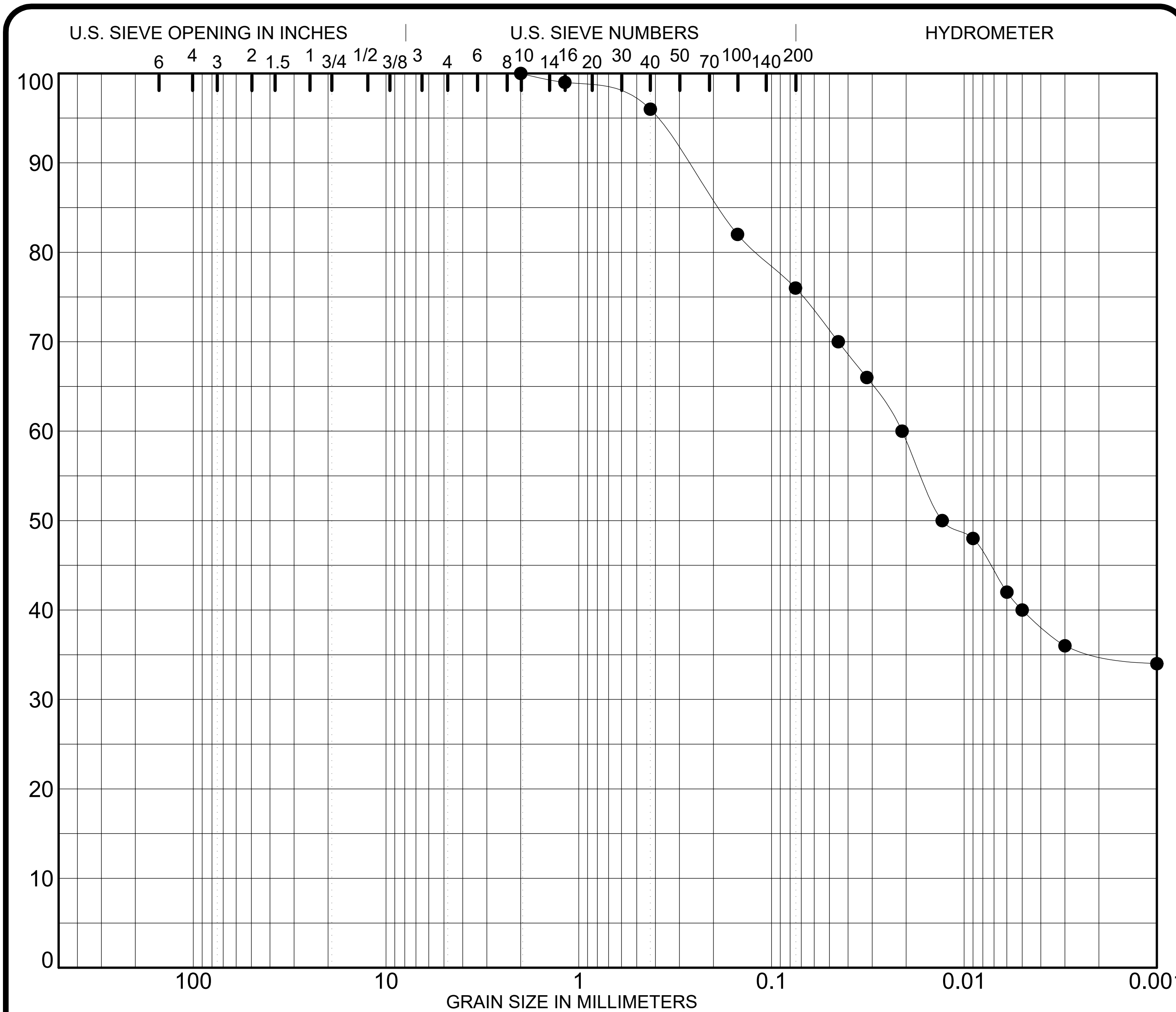
SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G314D/Comp4	3/8	100.0	Fine to Medium Sand, with silt				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	100.0	0	84	16		
Specific Gravity - 2.61	# 30	96.0					
	# 40	85.0	MC%	γdry (pcf)	LL	PL	PI
	# 50	67.0	14.9				
	# 80						
	# 100	30.0	Density/Moisture Relationship: Standard				
	# 200	16.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**
JOB NO. **21-056**
DATE April 8, 2021

G314D/Comp4

SOIL DATA SHEET

Ramsey Geotechnical Engineering
Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G314D/Comp5	3/8	100.0	Lean Clay, with sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	99.0	0	24	43	33	
Specific Gravity - 2.58	# 30						
	# 40	96.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		17.5	109.6	43	18	25
	# 80						
	# 100	82.0	Density/Moisture Relationship: Standard				
	# 200	76.0	Max PCF		Opt. WC%		

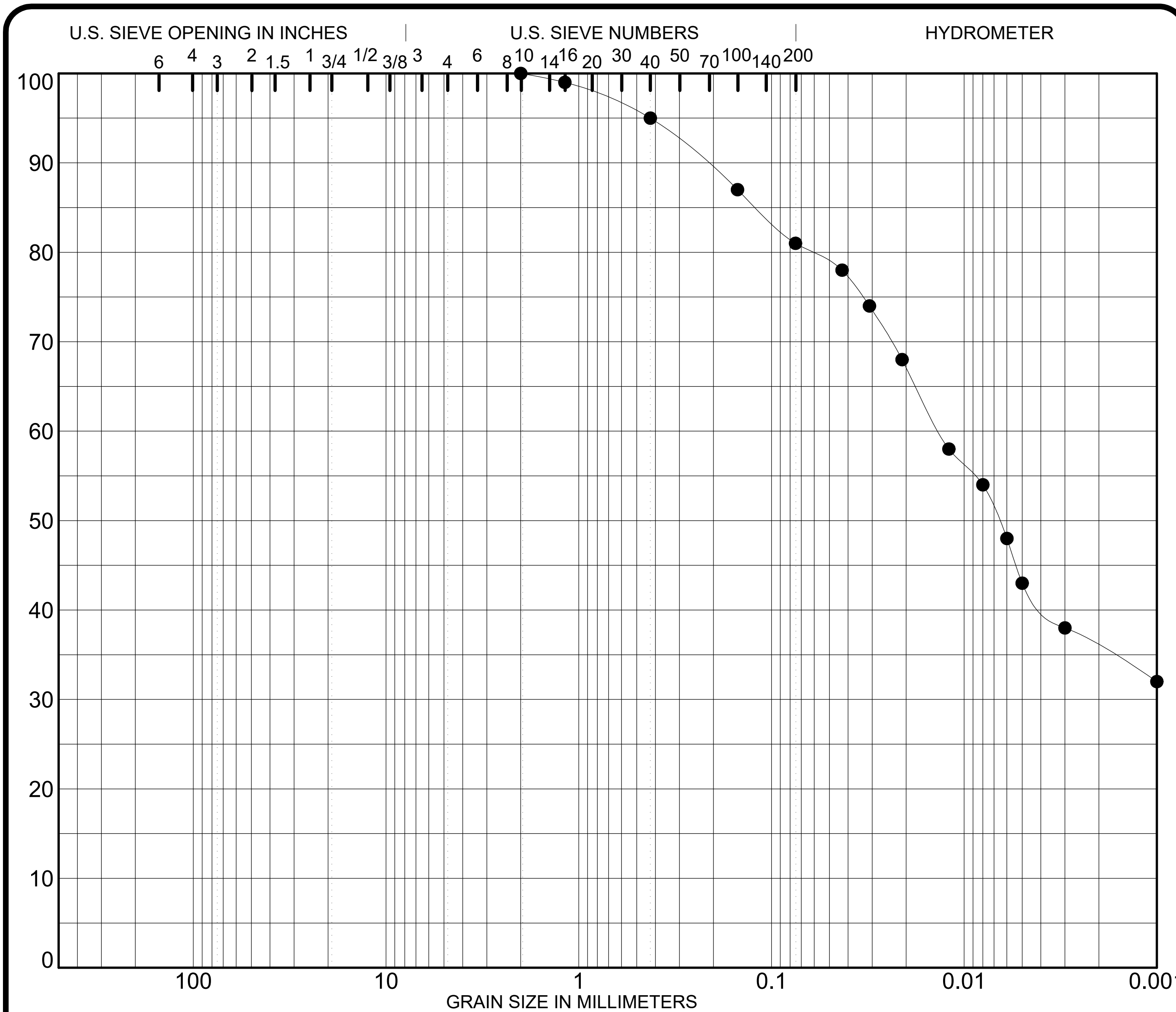
PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**
DATE March 30, 2021

G314D/Comp5

SOIL DATA SHEET

Ramsey Geotechnical Engineering
Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION				
G314D/Comp6	3/8	100.0	Lean Clay, with sand				
	#4	100.0					
	#8	100.0					
	#10	100.0	%GRAVEL	%SAND	%SILT	%CLAY	
NOTES:	# 16	99.0	0	19	46	35	
Specific Gravity - 2.64	# 30						
	# 40	95.0	MC%	γdry (pcf)	LL	PL	PI
	# 50		13.6	120.2	37	18	19
	# 80						
	# 100	87.0	Density/Moisture Relationship: Standard				
	# 200	81.0	Max PCF		Opt. WC%		

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

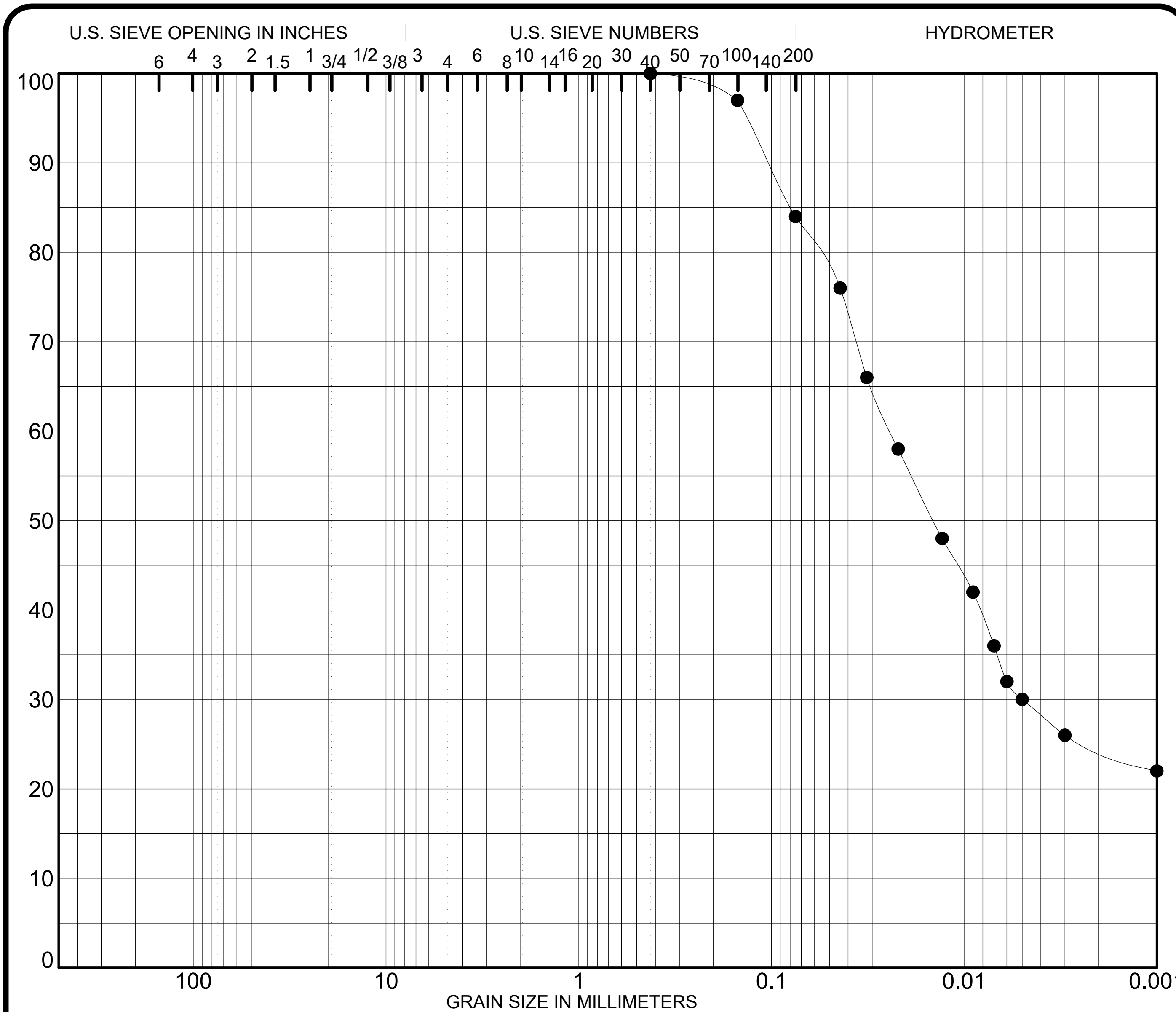
JOB NO. **21-056**
DATE March 30, 2021

G314D/Comp6

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
G314D/Comp7	3/8	100.0	Lean Clay, with sand
	#4	100.0	
	#8	100.0	
	#10	100.0	%GRAVEL: 0; %SAND: 16; %SILT: 60; %CLAY: 24
NOTES:	# 16	100.0	
Specific Gravity - 2.64	# 30	100.0	
	# 40	100.0	MC%: 14.0; γdry (pcf): 120.3; LL: 29; PL: 19; PI: 10
	# 50		
	# 80		
	# 100	97.0	Density/Moisture Relationship: Standard
	# 200	84.0	Max PCF: ; Opt. WC%:

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

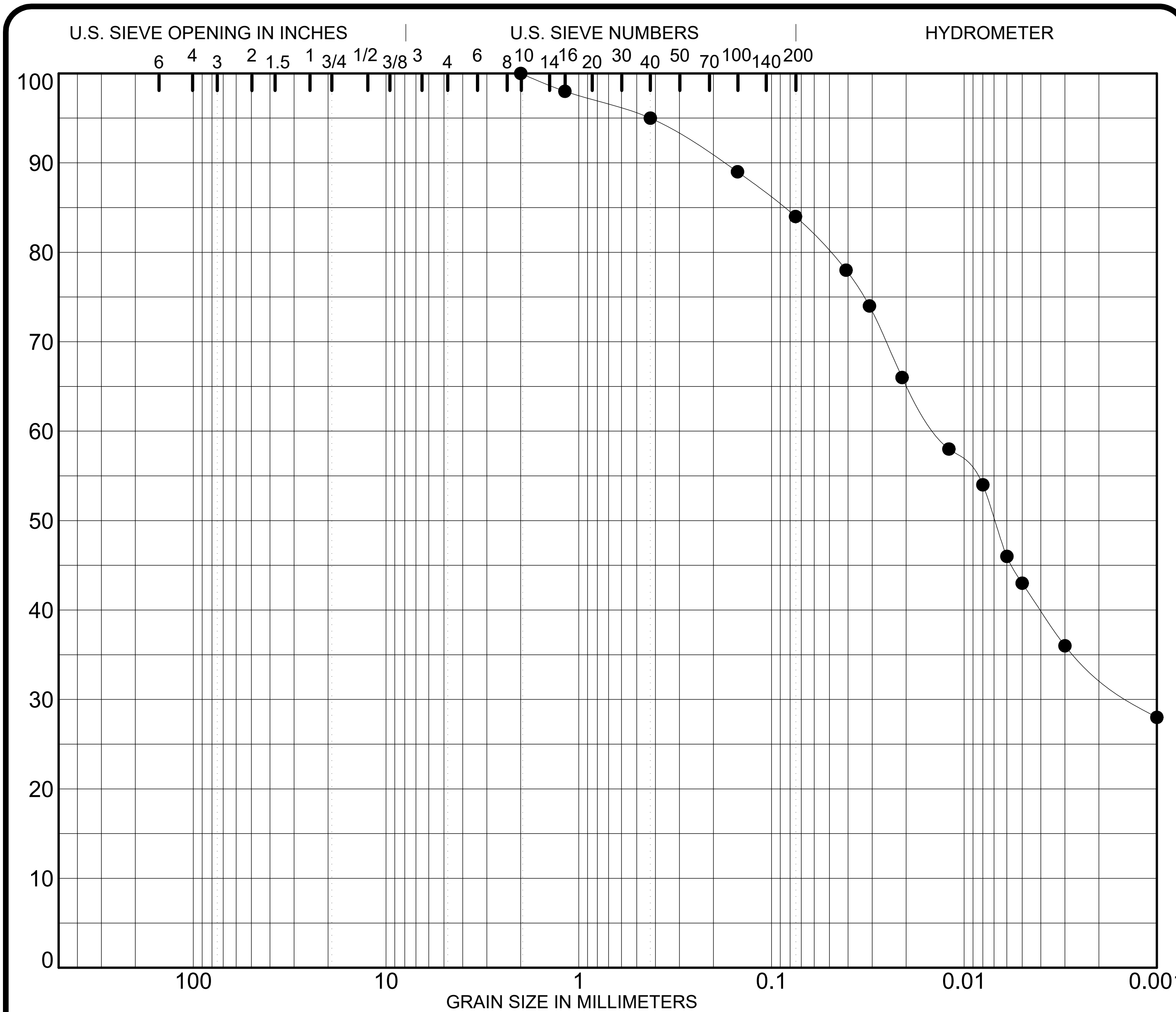
DATE March 30, 2021

G314D/Comp7

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
G314D/Comp8	3/8	100.0	Lean Clay, with sand
	#4	100.0	
	#8	100.0	
	#10	100.0	%GRAVEL: 0; %SAND: 16; %SILT: 52; %CLAY: 32
NOTES:	# 16	98.0	
Specific Gravity - 2.73	# 30		
	# 40	95.0	MC%: 8.5; γdry (pcf): 123.6; LL: 35; PL: 19; PI: 16
	# 50		
	# 80		
	# 100	89.0	Density/Moisture Relationship: Standard
	# 200	84.0	Max PCF; Opt. WC%

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

DATE March 30, 2021

G314D/Comp8

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701

GEOTECHNOLOGY INC
FROM THE GROUND UP

Via email: dramsey@ramgeoeng.com

April 5, 2021 J037264.01.6003

Mr. Douglas P. Ramsey, P.E.
Ramsey Geotechnical Engineering
1701 W. Market Street
Bloomington, Illinois 61701

Re: Coffeen Power Station
Ash Pond 1
Montgomery County, Illinois

Dear Mr. Ramsey:

Included in this report are the test results from five Shelby tubes and one bulk sample of bottom ash received in our laboratory on March 15, 2021. The samples were tested in general accordance with the test method listed below.

Test to Determine	Method of Test
Water (Moisture) Content of Soils	ASTM D2216
Description and Identification of Soils (Visual-Manual)	ASTM D2488
Hydraulic Conductivity of Soil Using Flexible Wall Permeameter	ASTM D5084
Density (Unit Weight) of Soil Specimens	ASTM D7263

We trust this is the information you require. Please contact the undersigned if you have any questions regarding this report.

Respectfully submitted,

GEOTECHNOLOGY, INC.

Janet M. May
Illinois Laboratory Manager

JMM/LPH:jmm

Attachment: Test Result Summary
Hydraulic Conductivity Test Data Sheets
Proctor Curve (Provided by Ramsey)
Shelby Tube Logs
Testing Assignment Sheets

J037264.01.6003

TEST RESULT SUMMARY

Coffeen Power Station
Ash Pond 1
Montgomery County, Illinois

			ASTM D2216	ASTM D7263	ASTM D5084	
Boring Number	Sample Number	Depth, feet	Moisture Content, %	Dry Unit Weight, pcf	Hydraulic Conductivity, cm/sec	Range of Hydraulic Gradient
G307D	ST-5	8.0-10.0	21.6	105.0	4.8×10^{-8}	1.3 - 12.9
G307D	ST-22	42.0-44.0	15.0	118.8	3.7×10^{-7}	5.5 - 20.7
G311D	ST-4	6.0-8.0	19.7	107.5	2.9×10^{-8}	11.9 - 22.7
G311D	ST-14	26.0-28.0	16.2	116.7	5.5×10^{-8}	1.4 - 1.5
G314D	ST-18	34.0-36.0	16.6	115.0	3.0×10^{-7}	0.9 - 6.7

Sample Number/ Material	Optimum Moisture Content, %	Maximum Dry Unit Weight, pcf	Percent Compact	Moisture Content, %	Dry Unit Weight, pcf	Hydraulic Conductivity, cm/sec	Range of Hydraulic Gradient
LSN-3782/ Bottom Ash	11.0	123.0	90.0	12.5	110.8	8.8×10^{-5}	0.4 - 2.3

			ASTM D2488
Boring Number	Sample Number	Depth, feet	Material Description
G307D	ST-5	8.0-10.0	Gray and yellow-brown, LEAN to FAT CLAY, some sand, trace gravel – CL/CH
G307D	ST-22	42.0-44.0	Very dark gray-brown, LEAN CLAY with SAND, some gravel – CL
G311D	ST-4	6.0-8.0	Gray-brown, LEAN CLAY with SAND, trace gravel – CL
G311D	ST-14	26.0-28.0	Very dark gray-brown, LEAN CLAY, some sand, gravel – CL
G314D	ST-18	34.0-36.0	Very dark gray, LEAN CLAY, trace sand, gravel – CL

Notes and abbreviations:
% - Percent
cm/sec - Centimeters per second
pcf - Pounds per cubic foot

HYDRAULIC CONDUCTIVITY TEST DATA
(ASTM D 5084)

JOB NO.:	J037264.01.6002		
BORING NO.:	G307D		
SAMPLE NO.:	ST-5; LSN-3786		
DEPTH (Feet):	8.0-10.0		

Initial Unit Weight		**Unit Weight as Tested**	
WET UNIT WEIGHT, pcf:	127.7	WET UNIT WEIGHT, pcf:	127.4
DRY UNIT WEIGHT, pcf:	105.0	DRY UNIT WEIGHT, pcf:	104.0

	Initial	As Tested**		Initial	As Tested
LENGTH, in.:	4.779	4.793	LENGTH, cm:	12.139	12.174
DIAMETER, in.:	2.876	2.887	DIAMETER, cm	7.305	7.333
WET WT., gms.:	1040.57	1049.12			
AREA, sq.in.:	6.496	6.546	AREA, sq cm:	41.912	42.233

INITIAL MOISTURE CONTENT		FINAL MOISTURE CONTENT	
WET WT SPLE+TARE	1311.89	WET WT SPLE+TARE	1319.74
DRY WT SPLE+TARE	1126.94	DRY WT SPLE+TARE	1126.94
TARE WEIGHT	271.38	TARE WEIGHT	271.38
% MOISTURE	21.6	% MOISTURE	22.5

B VALUE (before Permeation): 95% Cell / Back Pressure, psi: 75 / 70

HEAD (PSI)	DATE (YR,MO,DY)	TIME (HR,MN,SC)	TEMP °C	ELAPSED MINUTES	BOTTOM BURETTE	TOP BURETTE	Q (CC)	K CM/SEC	HYDRAULIC GRADIENT	HYDRAULIC HEAD	HEAD LOSS,%	k (in/sec)
0.0	16-Mar-21	05:05 PM	20.8	0	5.82	22.52			1.38	16.70		
0.0	17-Mar-21	08:23 AM	21.1	918	5.93	22.35	0.11	4.6E-08	1.35	16.42	1.68	1.8E-08
0.0	17-Mar-21	01:42 PM	21.9	319	5.98	22.30	0.05	4.8E-08	1.34	16.32	0.61	1.9E-08
2.0	17-Mar-21	02:20 PM	21.9	0	6.10	22.29			12.92	156.79		
2.0	17-Mar-21	05:23 PM	21.9	183	6.41	21.97	0.31	5.5E-08	12.86	156.16	0.40	2.2E-08
2.0	18-Mar-21	08:23 AM	21.1	900	7.81	20.71	1.40	4.8E-08	12.65	153.50	1.70	1.9E-08

Average Temp. = 21.5

AVERAGE K = 5.0E-08 **AVERAGE K = 2.0E-08**

Corrected K for 20°C = 4.8E-08 **Corrected K for 20°C = 1.9E-08**

** Measurements at end of test

HYDRAULIC CONDUCTIVITY TEST DATA
(ASTM D 5084, Method F)

JOB NO.: J037264.01.6002
BORING NO.: G307D
SAMPLE NO.: ST-22; LSN-3787
DEPTH (Feet): 42-44

Initial Unit Weight	
WET UNIT WEIGHT, pcf:	136.6
DRY UNIT WEIGHT, pcf:	118.8

Unit Weight as Tested	
WET UNIT WEIGHT, pcf:	136.3
DRY UNIT WEIGHT, pcf:	117.9

	Initial	As Tested**		Initial	As Tested
LENGTH, in.:	4.653	4.660	LENGTH, cm:	11.819	11.836
DIAMETER, in.:	2.875	2.884	DIAMETER, cm:	7.303	7.325
WET WT., gms.:	1083.49	1089.51	AREA, sq cm:	41.883	42.145
AREA, sq.in.:	6.492	6.533			

INITIAL MOISTURE CONTENT		FINAL MOISTURE CONTENT	
WET WT SPLE+TARE	1360.70	WET WT SPLE+TARE	1366.19
DRY WT SPLE+TARE	1219.23	DRY WT SPLE+TARE	1219.23
TARE WEIGHT	277.21	TARE WEIGHT	277.21
% MOISTURE	15.0	% MOISTURE	15.6

B VALUE (before Permeation): 97%   Cell / Back Pressure, psi: 45 / 40

	M_1	M_2		
Manometer Constants	0.0302	1.0410	Sample Constant (L/A)	0.2808

DATE (YR,MO,DY)	TIME (HR,MN,SC)	TEMP ºC	ELAPSED MINUTES	PIPET READING	ANNULUS READING	γ SPECIFIC GRAVITY	C TEST CONSTANT	T TRIAL CONSTANT	K CM/SEC	HYDRAULIC GRADIENT	HYDRAULIC HEAD	k (in/sec)
17-Mar-21	09:03 AM	22.1	0	19.29	0.72	12.570	0.000674	0.0561		19.72	233.42	
17-Mar-21	09:13 AM	22.1	10	14.78	0.92	12.570	0.000674	0.0751	4.6E-07	14.72	174.22	1.8E-07
17-Mar-21	09:35 AM	22.1	22	10.37	0.61	12.570	0.000674	0.1067	3.2E-07	10.36	122.68	1.3E-07
17-Mar-21	10:40 AM	21.8	65	5.90	0.77	12.570	0.000674	0.2029	4.1E-07	5.45	64.48	1.6E-07
17-Mar-21	02:55 PM	21.5	0	20.15	0.66	12.570	0.000674	0.0534		20.70	244.99	
17-Mar-21	03:13 PM	21.5	18	13.93	0.92	12.570	0.000674	0.0800	4.3E-07	13.82	163.54	1.7E-07
17-Mar-21	04:33 PM	21.9	80	8.13	1.18	12.570	0.000674	0.1498	2.9E-07	7.38	87.36	1.1E-07

Average Temp. = 21.9

AVERAGE K = 3.8E-07   **AVERAGE K = 1.5E-07**

Corrected K for 20ºC = 3.7E-07   **Corrected K for 20ºC = 1.4E-07**

** Measurements at end of test

HYDRAULIC CONDUCTIVITY TEST DATA

(ASTM D 5084, Method F)

JOB NO.:	J037264.01.6002		
BORING NO.:	G311D		
SAMPLE NO.:	ST-4; LSN-3788		
DEPTH (Feet):	6.0-8.0		

Initial Unit Weight		Unit Weight as Tested	
WET UNIT WEIGHT, pcf:	128.7	WET UNIT WEIGHT, pcf:	129.3
DRY UNIT WEIGHT, pcf:	107.5	DRY UNIT WEIGHT, pcf:	107.3

	Initial	As Tested**		Initial	As Tested
LENGTH, in.:	4.444	4.447	LENGTH, cm:	11.288	11.295
DIAMETER, in.:	2.879	2.881	DIAMETER, cm:	7.313	7.318
WET WT., gms.:	977.08	983.97	AREA, sq cm:	41.999	42.058
AREA, sq.in.:	6.510	6.519			

INITIAL MOISTURE CONTENT		FINAL MOISTURE CONTENT	
WET WT SPLE+TARE	1271.15	WET WT SPLE+TARE	1277.34
DRY WT SPLE+TARE	1110.30	DRY WT SPLE+TARE	1110.30
TARE WEIGHT	294.07	TARE WEIGHT	294.07
% MOISTURE	19.7	% MOISTURE	20.5

B VALUE (before Permeation): 97% Cell / Back Pressure, psi: 45 / 40

	M_1	M_2		
Manometer Constants	0.0302	1.0410	Sample Constant (L/A)	0.2686

DATE (YR,MO,DY)	TIME (HR,MN,SC)	TEMP ºC	ELAPSED MINUTES	PIPET READING	ANNULUS READING	γ SPECIFIC GRAVITY	C TEST CONSTANT	T TRIAL CONSTANT	K CM/SEC	HYDRAULIC GRADIENT	HYDRAULIC HEAD	k (in/sec)
22-Mar-21	08:47 AM	19.5	0	21.23	0.88	12.570	0.000645	0.0512		22.65	255.80	
22-Mar-21	09:04 AM	19.7	17	20.25	0.91	12.570	0.000645	0.0538	3.4E-08	21.52	243.10	1.3E-08
22-Mar-21	09:30 AM	19.8	26	19.07	0.96	12.570	0.000645	0.0575	2.9E-08	20.15	227.64	1.1E-08
22-Mar-21	10:12 AM	19.8	42	17.48	1.03	12.570	0.000645	0.0633	2.7E-08	18.31	206.78	1.1E-08
22-Mar-21	10:57 AM	20.0	45	16.03	1.10	12.570	0.000645	0.0697	2.5E-08	16.61	187.67	1.0E-08
22-Mar-21	12:10 PM	20.4	73	13.98	1.17	12.570	0.000645	0.0813	2.7E-08	14.26	161.02	1.1E-08
22-Mar-21	01:36 PM	20.5	86	11.93	1.26	12.570	0.000645	0.0976	2.8E-08	11.87	134.12	1.1E-08

Average Temp. = 19.9

AVERAGE K =	**2.8E-08**	**AVERAGE K =**	**1.1E-08**
Corrected K for 20ºC =	**2.9E-08**	**Corrected K for 20ºC =**	**1.1E-08**

** Measurements at end of test

HYDRAULIC CONDUCTIVITY TEST DATA
(ASTM D 5084)

		Initial Unit Weight		**Unit Weight as Tested**	
JOB NO.:	J037264.01.6002	WET UNIT WEIGHT, pcf:	135.6	WET UNIT WEIGHT, pcf:	136.2
BORING NO.:	G311D	DRY UNIT WEIGHT, pcf:	116.7	DRY UNIT WEIGHT, pcf:	117.1
SAMPLE NO.:	ST-14; LSN-3789				
DEPTH (Feet):	26.0-28.0				

	Initial	As Tested**		Initial	As Tested	INITIAL MOISTURE CONTENT		FINAL MOISTURE CONTENT	
LENGTH, in.:	5.010	4.991	LENGTH, cm:	12.725	12.677	WET WT SPLE+TARE	1428.49	WET WT SPLE+TARE	1429.87
DIAMETER, in.:	2.873	2.874	DIAMETER, cm	7.297	7.300	DRY WT SPLE+TARE	1267.73	DRY WT SPLE+TARE	1267.73
WET WT., gms.:	1155.90	1157.76				TARE WEIGHT	272.59	TARE WEIGHT	272.59
AREA, sq.in.:	6.483	6.487	AREA, sq cm:	41.824	41.853	**% MOISTURE**	16.2	% MOISTURE	16.3

B VALUE (before Permeation): 98%   Cell / Back Pressure, psi: 55 / 50

HEAD (PSI)	**DATE (YR,MO,DY)**	**TIME (HR,MN,SC)**	**TEMP °C**	**ELAPSED MINUTES**	**BOTTOM BURETTE**	**TOP BURETTE**	**Q (CC)**	**K CM/SEC**	**HYDRAULIC GRADIENT**	**HYDRAULIC HEAD**	**HEAD LOSS,%**	k (in/sec)
0.0	21-Mar-21	08:42 AM	17.6	0	3.40	22.15			1.47	18.75		
0.0	21-Mar-21	12:52 PM	19.0	250	3.45	22.11	0.05	5.1E-08	1.47	18.66	0.48	2.0E-08
0.0	22-Mar-21	08:10 AM	19.0	1158	3.67	21.90	0.22	5.3E-08	1.43	18.23	2.30	2.1E-08
0.0	22-Mar-21	01:50 PM	20.3	340	3.72	21.83	0.05	5.1E-08	1.42	18.11	0.66	2.0E-08
0.0	23-Mar-21	07:01 AM	20.3	1031	3.90	21.58	0.18	6.2E-08	1.39	17.68	2.37	2.4E-08

Average Temp. = 19.2

AVERAGE K = 5.4E-08   **AVERAGE K = 2.1E-08**

Corrected K for 20°C = 5.5E-08   **Corrected K for 20°C = 2.2E-08**

** Measurements at end of test

HYDRAULIC CONDUCTIVITY TEST DATA
(ASTM D 5084)

		Initial Unit Weight		Unit Weight as Tested	
JOB NO.:	J037264.01.6002	WET UNIT WEIGHT, pcf:	134.1	WET UNIT WEIGHT, pcf:	134.3
BORING NO.:	G314D	DRY UNIT WEIGHT, pcf:	115.0	DRY UNIT WEIGHT, pcf:	114.7
SAMPLE NO.:	ST-18; LSN-3790				
DEPTH (Feet):	34.0-36.0				

	Initial	As Tested**		Initial	As Tested	INITIAL MOISTURE CONTENT		FINAL MOISTURE CONTENT	
LENGTH, in.:	5.097	5.105	LENGTH, cm:	12.946	12.967	WET WT SPLE+TARE	1467.69	WET WT SPLE+TARE	1471.60
DIAMETER, in.:	2.876	2.878	DIAMETER, cm	7.305	7.310	DRY WT SPLE+TARE	1301.35	DRY WT SPLE+TARE	1301.35
WET WT., gms.:	1165.92	1170.56				TARE WEIGHT	301.77	TARE WEIGHT	301.77
AREA, sq.in.:	6.496	6.505	AREA, sq cm:	41.912	41.970	**% MOISTURE**	16.6	% MOISTURE	17.0

B VALUE (before Permeation): 98% Cell / Back Pressure, psi: 44 / 40

HEAD (PSI)	DATE (YR,MO,DY)	TIME (HR,MN,SC)	TEMP °C	ELAPSED MINUTES	BOTTOM BURETTE	TOP BURETTE	Q (CC)	K CM/SEC	HYDRAULIC GRADIENT	HYDRAULIC HEAD	HEAD LOSS,%	k (in/sec)
0.0	19-Mar-21	10:12 AM	19.4	0	6.03	22.64			1.28	16.61		
0.0	21-Mar-21	11:16 AM	19.0	2944	8.13	20.01	2.10	3.1E-07	0.92	11.88	28.48	1.2E-07
1.0	21-Mar-21	11:41 AM	19.1	0	8.35	19.94			6.33	81.89		
1.0	21-Mar-21	12:51 PM	19.4	70	8.73	19.65	0.38	3.2E-07	6.27	81.22	0.82	1.2E-07
1.0	22-Mar-21	08:11 AM	19.2	1160	13.80	14.76	5.07	3.0E-07	5.50	71.26	12.26	1.2E-07
1.0	22-Mar-21	08:28 AM	19.2	0	7.48	23.29			6.65	86.11		
1.0	22-Mar-21	11:59 AM	20.3	211	8.40	22.33	0.92	2.8E-07	6.51	84.23	2.18	1.1E-07
1.0	22-Mar-21	01:51 PM	20.7	112	8.83	21.83	0.43	2.7E-07	6.43	83.30	1.10	1.1E-07

Average Temp. = 19.5

AVERAGE K = 3.0E-07 **AVERAGE K = 1.2E-07**

Corrected K for 20ºC = 3.0E-07 **Corrected K for 20ºC = 1.2E-07**

** Measurements at end of test

HYDRAULIC CONDUCTIVITY TEST DATA

(ASTM D 5084)

					Initial Unit Weight		Unit Weight as Tested	
JOB NO.:	J037264.01.6002	ASTM D698 Results			WET UNIT WEIGHT, pcf:	124.6	WET UNIT WEIGHT, pcf:	132.0
PROJECT:	Coffeen Ash Pond 1	Maximum Dry Unit Weight, pcf:		123.0	DRY UNIT WEIGHT, pcf:	110.8	DRY UNIT WEIGHT, pcf:	110.8
SAMPLE NO.:	LSN-3782	Optimum Water Content, %		11.0	**Percent Compact:**	**90.0%**		
MATERIAL:	Bottom Ash							

	Initial	As Tested**		Initial	As Tested	INITIAL MOISTURE CONTENT		FINAL MOISTURE CONTENT	
LENGTH, in.:	2.869	2.848	LENGTH, cm:	7.287	7.234	WET WT SPLE+TARE	896.23	WET WT SPLE+TARE	932.52
DIAMETER, in.:	2.884	2.895	DIAMETER, cm	7.325	7.353	DRY WT SPLE+TARE	828.37	DRY WT SPLE+TARE	828.37
WET WT., gms.:	612.77	649.36				TARE WEIGHT	283.46	TARE WEIGHT	283.46
AREA, sq.in.:	6.533	6.582	AREA, sq cm:	42.145	42.467	**% MOISTURE**	12.5	% MOISTURE	19.1

B VALUE (before Permeation): 95% Cell / Back Pressure, psi: 83 / 80 **Percent Wet of Optimum: 1.5**

HEAD (PSI)	DATE (YR,MO,DY)	TIME (HR,MN,SC)	TEMP ºC	ELAPSED MINUTES	BOTTOM BURETTE	TOP BURETTE	Q (CC)	K CM/SEC	HYDRAULIC GRADIENT	HYDRAULIC HEAD	HEAD LOSS,%	k (in/sec)
0.0	30-Mar-21	04:49 PM	22.3	0	6.41	23.00			2.28	16.59		
0.0	30-Mar-21	04:51 PM	22.3	2	7.40	22.00	0.99	9.5E-05	2.00	14.60	12.00	3.7E-05
0.0	30-Mar-21	04:53 PM	22.3	2	8.21	21.10	0.81	9.3E-05	1.77	12.89	11.71	3.7E-05
0.0	30-Mar-21	04:57 PM	22.4	4	9.60	19.70	1.39	9.1E-05	1.39	10.10	21.64	3.6E-05
0.0	30-Mar-21	05:05 PM	22.4	8	11.59	17.74	1.99	9.2E-05	0.84	6.15	39.11	3.6E-05
0.0	30-Mar-21	05:16 PM	22.5	11	13.10	16.20	1.51	9.3E-05	0.43	3.10	49.59	3.7E-05

Average Temp. = 22.4

AVERAGE K = 9.3E-05
Corrected K for 20ºC = 8.8E-05

AVERAGE K = 3.7E-05
Corrected K for 20ºC = 3.5E-05

** Measurements at end of test

GEOTECHNOLOGY INC
FROM THE GROUND UP

LABORATORY LOG OF TUBE SAMPLE

Project No.: V037264.01.6002 Project Name.: Coffeen LSN-3786 Date Opened: 3/15/2021 By: JMM

Boring No.: G307D Sample No.: SH-5 Depth (ft): 8 to 10

Type [X] Std. "Shelby" [ ] Other: ______

Tube Dimensions: Outside Diameter (in): 3 Recovery (in): 22

Tube Condition:	Dented	End(s) not sealed	Other:

Sample Condition	Good	Fair	Poor	Disturbed
	✓			

Remarks: ______

Tube Scale (in)	Sample Use (Test Type)	Soil Identification and Processing Remarks (Draw lines to indicate top and botton of soil's surface and where sample was taken. Identify cut lines with: "Cut" "Date: m/d/y" "Your Initials")
0.0		Gray and yellow-brown, LEAN TO FAT CLAY some sand, trace gravel - CL/CH
2.0		
4.0		
6.0		Qp=2.75 tsf
8.0		
10.0	'K'	
12.0		
14.0		
16.0		Qp=2.0 tsf
18.0		
20.0		
22.0		
24.0		

Ave. Height (in.): ______ Ave. Diameter (in.): ______ Specimen Wt. (gms): ______

Natural Moisture Content				
Tare Number	Wet Mass + Tare (g)	Dry Mass+ Tare (g)	Tare Mass (g)	Water Content (%)

Wet Unit Weight: ______ pcf Dry Unit Weight ______ pcf

Tested By: ______ Calculated By: ______ Checked By: ______
Date: ______ Date: ______ Date: ______

GEOTECHNOLOGY FROM THE GROUND UP

LABORATORY LOG OF TUBE SAMPLE

Project No.: J037264.01.6002 Project Name.: Coffeen LSN-3787 Date Opened: 3/16/2021 By: JMM

Boring No.: G307D Sample No.: SH-22 Depth (ft): 42 to 44

Type [X] Std. "Shelby" [ ] Other: ______

Tube Dimensions: Outside Diameter (in): 3 Recovery (in): 18

Tube Condition:	Dented	End(s) not sealed	Other:

Sample Condition	Good	Fair	Poor	Disturbed

Remarks: ______

Tube Scale (in)	Sample Use (Test Type)	Soil Identification and Processing Remarks (Draw lines to indicate top and botton of soil's surface and where sample was taken. Identify cut lines with: "Cut" "Date: m/d/y" "Your Initials")
0.0		Top, 2-3" Clayey SAND, standing water, fall-in? Mud rotary?
2.0		very dark gray-brown, LEAN CLAY with SAND, some gravel - CL
4.0		
6.0		Qp=3.25tsf
8.0	'K'	
10.0		
12.0		
14.0		Qp=3.75tsf
16.0		
18.0		
20.0		
22.0		
24.0		

Ave. Height (in.): ______ Ave. Diameter (in.): ______ Specimen Wt. (gms): ______

Natural Moisture Content				
Tare Number	Wet Mass + Tare (g)	Dry Mass+ Tare (g)	Tare Mass (g)	Water Content (%)

Wet Unit Weight: ______ pcf Dry Unit Weight ______ pcf

Tested By: ______ Calculated By: ______ Checked By: ______
Date: ______ Date: ______ Date: ______

GEOTECHNOLOGY INC FROM THE GROUND UP

LABORATORY LOG OF TUBE SAMPLE

Project No.: V037264.01.6002 Project Name.: Coffeen LSN-3788 Date Opened: 3/18/2021 By: JMM

Boring No.: G311D Sample No.: SH-4 Depth (ft): 6 to 8

Type [X] Std. "Shelby" [ ] Other: ______

Tube Dimensions: Outside Diameter (in): 3 Recovery (in): 24

Tube Condition:	Dented	End(s) not sealed	Other:

Sample Condition	Good	Fair	Poor	Disturbed
	✓			

Remarks: ______

Tube Scale (in)	Sample Use (Test Type)	Soil Identification and Processing Remarks (Draw lines to indicate top and botton of soil's surface and where sample was taken. Identify cut lines with: "Cut" "Date: m/d/y" "Your Initials")
0.0		Gray-brown, LEAN CLAY with SAND trace gravel – CL
2.0		
4.0		
6.0		Qp = 2.0 tsf
8.0		
10.0	'K'	
12.0		
14.0		
16.0		Qp = 2.0 tsf
18.0		
20.0		
22.0		
24.0		

Ave. Height (in.): ______ Ave. Diameter (in.): ______ Specimen Wt. (gms): ______

Natural Moisture Content				
Tare Number	Wet Mass + Tare (g)	Dry Mass+ Tare (g)	Tare Mass (g)	Water Content (%)

Wet Unit Weight: ______ pcf Dry Unit Weight ______ pcf

Tested By: ______ Calculated By: ______ Checked By: ______
Date: ______ Date: ______ Date: ______

GEOTECHNOLOGY INC
FROM THE GROUND UP

LABORATORY LOG OF TUBE SAMPLE

Project No.: J037264.01.6002 Project Name.: Coffeen LSN-3789 Date Opened: 3/18/2021 By: JMM

Boring No.: G 311D Sample No.: SH-14 Depth (ft): 26 to 28

Type [X] Std. "Shelby" [ ] Other: ______

Tube Dimensions: Outside Diameter (in): 3 Recovery (in): 24

Tube Condition:	Dented	End(s) not sealed	Other:

Sample Condition	Good	Fair	Poor	Disturbed
	✓			

Remarks: ______

Tube Scale (in)	Sample Use (Test Type)	Soil Identification and Processing Remarks (Draw lines to indicate top and botton of soil's surface and where sample was taken. Identify cut lines with: "Cut" "Date: m/d/y" "Your Initials")
0.0		Very darkgray-brown, LEAN CLAY, some sand, gravel - CL
2.0		
4.0		
6.0		Qp = 2.75tsf
8.0		
10.0	'K'	
12.0		
14.0		
16.0		Qp = 2.25tsf
18.0		
20.0		
22.0		
24.0		

Ave. Height (in.): ______ Ave. Diameter (in.): ______ Specimen Wt. (gms): ______

Natural Moisture Content				
Tare Number	Wet Mass + Tare (g)	Dry Mass+ Tare (g)	Tare Mass (g)	Water Content (%)

Wet Unit Weight: ______ pcf Dry Unit Weight ______ pcf

Tested By: ______ Calculated By: ______ Checked By: ______
Date: ______ Date: ______ Date: ______

GEOTECHNOLOGY INC
FROM THE GROUND UP

LABORATORY LOG OF TUBE SAMPLE

Project No.: J037264.01.6002 Project Name.: Coffeen LSN-3790 Date Opened: 3/18/2021 By: JMM

Boring No.: G314D Sample No.: SH-18 Depth (ft): 34 to 36

Type [X] Std. "Shelby" [ ] Other: ____

Tube Dimensions: Outside Diameter (in): 3 Recovery (in): ≈20

Tube Condition:	Dented	End(s) not sealed	Other:

Sample Condition	Good	Fair	Poor	Disturbed
	✓			

Remarks: Bottom tube bent, then wouldn't extrude; Tube Cut ≈10" from bottom

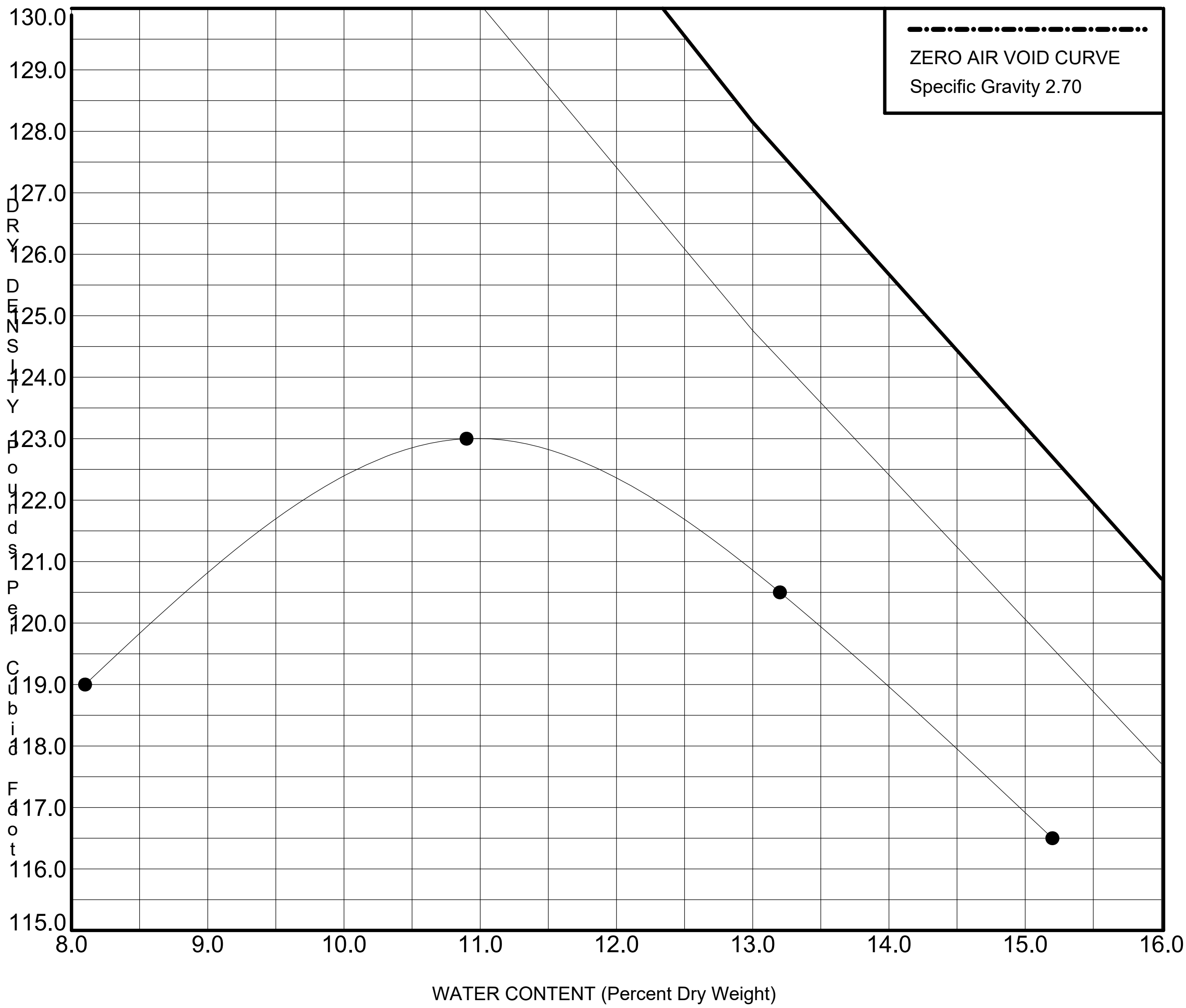
Tube Scale (in)	Sample Use (Test Type)	Soil Identification and Processing Remarks (Draw lines to indicate top and botton of soil's surface and where sample was taken. Identify cut lines with: "Cut" "Date: m/d/y" "Your Initials")
0.0		Very dark gray, Lean CLAY, trace sand, gravel - CL
2.0		Qp = 3.0 tsf
4.0		
6.0	K	
8.0		
10.0		
12.0		
14.0		≈2" Clayey Sand Seam
16.0		
18.0		
20.0		
22.0		
24.0		

Ave. Height (in.): ____ Ave. Diameter (in.): ____ Specimen Wt. (gms): ____

Natural Moisture Content				
Tare Number	Wet Mass + Tare (g)	Dry Mass+ Tare (g)	Tare Mass (g)	Water Content (%)

Wet Unit Weight: ____ pcf Dry Unit Weight ____ pcf

Tested By: ____ Calculated By: ____ Checked By: ____
Date: ____ Date: ____ Date: ____



SPECIMEN IDENTIFICATION	CLASSIFICATION
XPW02 Bulk	Bottom Ash

MOISTURE/DENSITY RELATIONSHIP	
x	Standard ASTM D698/AASHTO T99
	Modified ASTM D1557/AASHTO T180
Maximum Dry Density (PCF)	**123.0**
Optimum Water Content (%)	**11.0**

NOTES :

PROJECT **Coffeen Ash Pond 1** JOB NO. **21-056**

LOCATION **Montgomery County, Illinois** DATE **March 18, 2021**

XPW02 Bulk

MOISTURE-DENSITY RELATIONSHIP

Ramsey Geotechnical Engineering

Bloomington, IL 61701

21.056

Coffeen Fly Ash

Hanson Professional Services Inc.

Subcontract Agreement: RGE2014

Task Order No. 20E0111A/2000A

SCHEDULE OF LABORATORY TESTING

	Routine Testing [1]											Complex Testing [1]																Analytical Testing [1]						
Sample ID	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matter	
G307D																																		
3A																																		
4A																																		
5A																																		
6A																																		
7A																																		
Comp1				x	x			x			x			x																				
ST5																					x													
7B																																		
Comp2				x	x			x			x			x																				
10A																																		
11A																																		
12A																																		
13A																																		
14A																																		
15A																																		
16A																																		
17A																																		
18A																																		
Comp3				x	x			x			x			x																				
21A																																		
22A																																		
23A																																		
24A																																		
25A																																		
26A																																		
27A																																		
Comp4				x	x			x			x			x																				
ST22																					x													

Note 1: All testing to be in accordance with *Laboratory Testing Specifications*.

See Task Order or Attachment for any special instructions regarding scheduled testing.

SCHEDULE OF LABORATORY TESTING																																	
	Routine Testing											Complex Testing																Analytical Testing					
Sample ID	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matter
G307D																																	
28A																																	
29A																																	
30A																																	
Comp5				x	x			x			x			x																			
G311D																																	
3A																																	
4A																																	
5A																																	
6A																																	
11A																																	
Comp1				x	x			x			x			x																			
ST4																					x												
7A																																	
Comp2				x	x			x			x			x																			
10A																																	
11A																																	
12A																																	
13A																																	
14A																																	
15A																																	
16A																																	
17A																																	
18A																																	
19A																																	
20A																																	
21A																																	
Comp3				x	x			x			x			x																			
ST14																					x												

SCHEDULE OF LABORATORY TESTING

Sample ID	Routine Testing											Complex Testing																Analytical Testing						
	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matte	
G311D																																		
23A																																		
24A																																		
25A																																		
26A																																		
Comp4				x	x			x			x			x																				
27A																																		
28A																																		
29A																																		
30A																																		
Comp5				x	x			x			x			x																				
G314D																																		
3A																																		
4A																																		
5A																																		
6A																																		
7A																																		
8A																																		
Comp1				x	x			x			x			x																				
9A																																		
10A																																		
Comp2				x	x			x			x			x																				

SCHEDULE OF LABORATORY TESTING

Sample ID	Routine Testing											Complex Testing																Analytical Testing					
	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matter
G314D																																	
11A																																	
12A																																	
13A																																	
14A																																	
15A																																	
16A																																	
17A																																	
19A																																	
20A																																	
21A																																	
Comp3				x	x			x			x			x																			
ST18																					x												
22A																																	
Comp4				x	x			x			x			x																			
23A																																	
24A																																	
Comp5				x	x			x			x			x																			
25A																																	
26A																																	
27A																																	
28A																																	
29A																																	
Comp6				x	x			x			x			x																			
35A																																	
36A																																	
37A																																	
38A																																	
Comp7				x	x			x			x			x																			

SCHEDULE OF LABORATORY TESTING

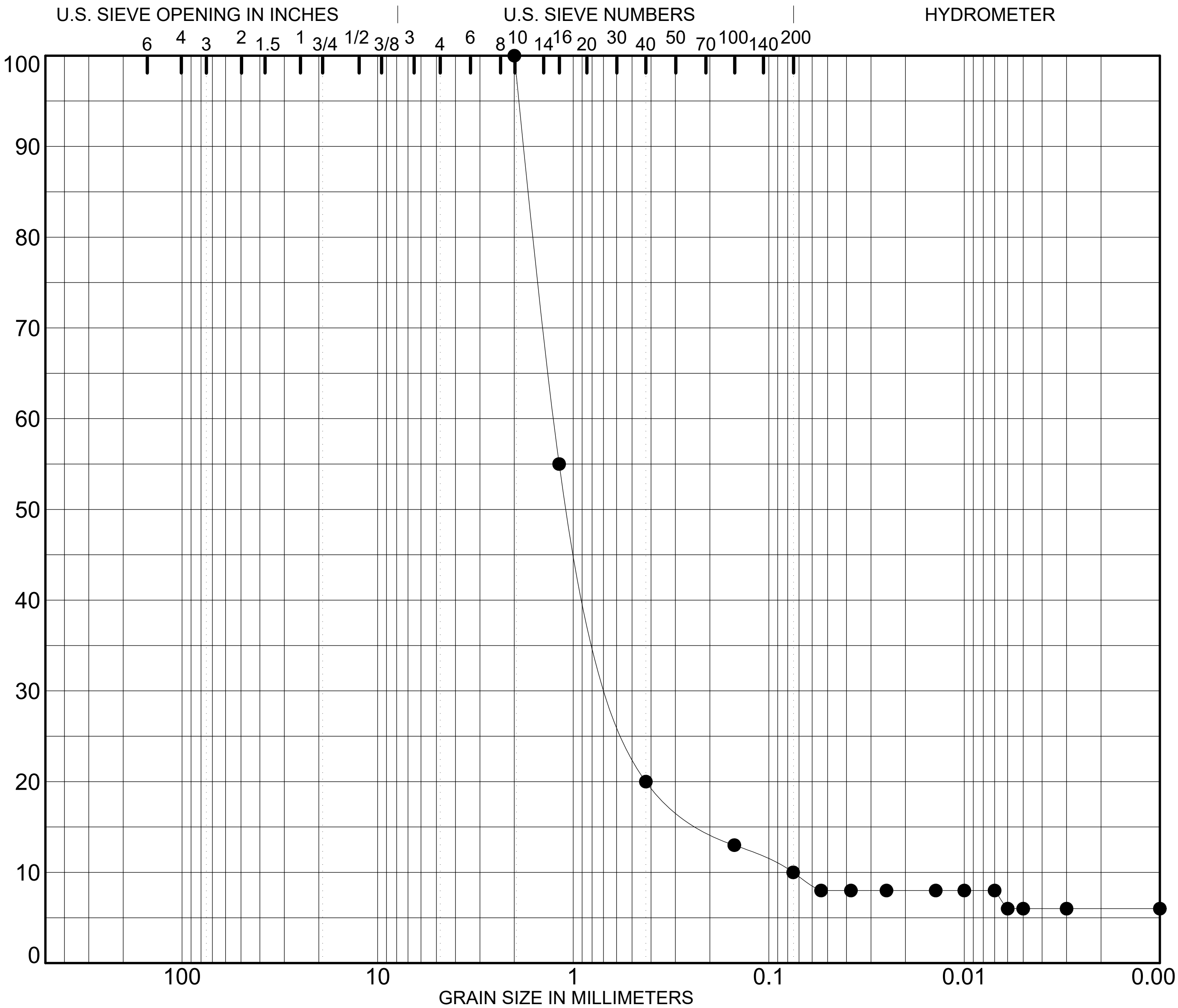
	Routine Testing											Complex Testing																Analytical Testing						
Sample ID	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matter	
G314D																																		
44A																																		
45A																																		
46A																																		
47A																																		
Comp8				x	x			x			x			x																				
XPW01																																		
1A																																		
2A																																		
3A																																		
4A																																		
Comp1				x	x			x			x			x																				
ST3																					x													
5A																																		
6A																																		
7A																																		
Comp2				x	x			x			x			x																				
XPW02																																		
1A																																		
2A																																		
3A																																		
4A																																		
Comp1				x	x			x			x			x																				
5A																																		
6A																																		
7A																																		
8A																																		
9A																																		
Comp2				x	x			x			x			x																				

NO RECOVERY

– NO SAMPLE

FLY ASH BUCKET SAMPLE

X REMOLDED



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SPECIMEN IDENTIFICATION	SIEVE	% PASS	CLASSIFICATION
XPW02 Bulk	3/8	100.0	Bottom Ash
	#4	100.0	
	#8	100.0	
	#10	100.0	%GRAVEL: 0; %SAND: 90; %SILT: ; %CLAY:
NOTES:	# 16	55.0	
Specific Gravity - 2.60	# 30		
	# 40	20.0	MC%: ; γdry (pcf): ; LL: ; PL: ; PI:
	# 50		
	# 80		
	# 100	13.0	Density/Moisture Relationship: Standard
	# 200	10.0	Max PCF: 123.0; Opt. WC%: 11.0

PROJECT **Coffeen Ash Pond 1 - Montgomery County, Illinois**

JOB NO. **21-056**

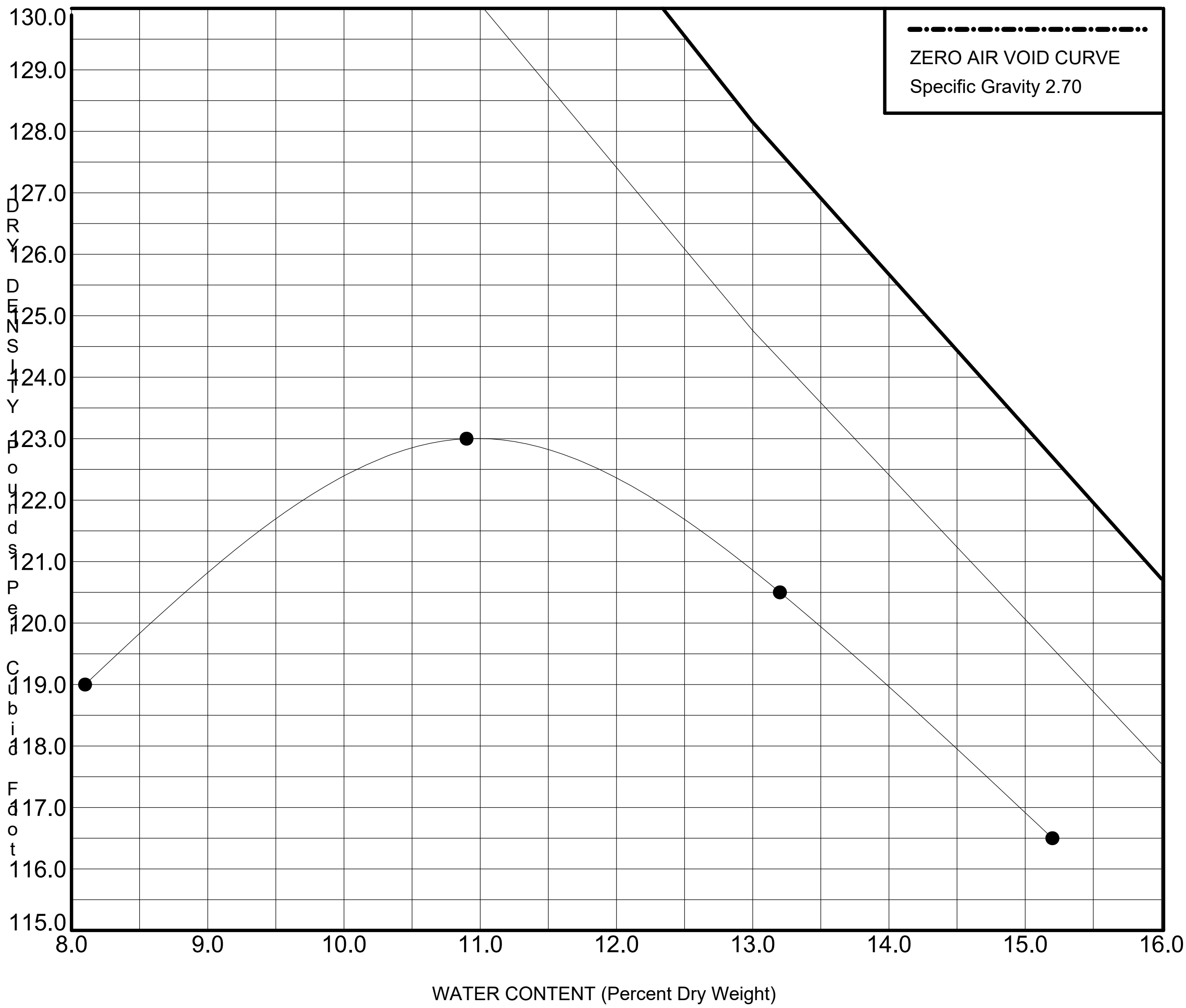
DATE March 18, 2021

XPW02 Bulk

SOIL DATA SHEET

Ramsey Geotechnical Engineering

Bloomington, IL 61701



SPECIMEN IDENTIFICATION	CLASSIFICATION
XPW02 Bulk	Bottom Ash

MOISTURE/DENSITY RELATIONSHIP		
x	Standard ASTM D698/AASHTO T99	
	Modified ASTM D1557/AASHTO T180	
Maximum Dry Density (PCF)		**123.0**
Optimum Water Content (%)		**11.0**

NOTES :

PROJECT **Coffeen Ash Pond 1** JOB NO. **21-056**

LOCATION **Montgomery County, Illinois** DATE **March 18, 2021**

XPW02 Bulk

MOISTURE-DENSITY RELATIONSHIP

Ramsey Geotechnical Engineering

Bloomington, IL 61701

Hanson Professional Services Inc.

Subcontract Agreement: RGE2014
Task Order No. 20E0111A/2000A

SCHEDULE OF LABORATORY TESTING

	QC: KLT 7/21/21	QC: KLT 7/21/21	Routine Testing [1]											Complex Testing [1]																Analytical Testing [1]						
Sample ID	Top Depth (Info taken from boring logs by Ramboll)	Bottom Depth (Info taken from boring logs by Ramboll)	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matte	
G307D																																				
3A	4	6																																		
4A	6	8																																		
5A	8	10																																		
6A	10	12																																		
7A	12	12.8																																		
Comp1	4	12.8				x	x			x			x			x																				
ST5	8	10																					x													
7B	12.8	14																																		
Comp2	12.8	14				x	x			x			x			x																				
10A	*18*	*20*																																		
11A	20	22																																		
12A	22	24																																		
13A	24	26																																		
14A	26	28																																		
15A	28	30																																		
16A	*30*	*32*																																		
17A	32	34																																		
18A	34	34.9																																		
Comp3	18	34.9				x	x			x			x			x																				
21A	40	42																																		
22A	*42*	*44*																																		
23A	44	46																																		
24A	46	48																																		
25A	48	50																																		
26A	50	52																																		
27A	52	54																																		
Comp4	40	54				x	x			x			x			x																				
ST22	**42**	**44**																					x													

Note 1: All testing to be in accordance with *Laboratory Testing Specifications* .

See Task Order or Attachment for any special instructions regarding scheduled testing.

SCHEDULE OF LABORATORY TESTING

	QC: KLT 7/21/21	QC: KLT 7/21/21	Routine Testing											Complex Testing																Analytical Testing						
Sample ID	Top Depth (Info taken from boring logs by Ramboll)	Bottom Depth (Info taken from boring logs by Ramboll)	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matte	
G307D																																				
28A	54	56																																		
29A	56	58																																		
30A	58	60																																		
Comp5	54	60				x	x			x			x			x																				
G311D																																				
3A	4	6																																		
4A	6	8																																		
5A	8	10																																		
6A	10	12																																		
11A	20	22																																		
Comp1	*4*	*22*				x	x			x			x			x																				
ST4	6	8																					x													
7A	12	14																																		
Comp2	12	14				x	x			x			x			x																				
10A	18	20																																		
11A	20	22																																		
12A	22	24																																		
13A	24	26																																		
14A	26	28																																		
15A	28	30																																		
16A	30	32																																		
17A	32	34																																		
18A	*34*	*36*																																		
19A	36	38																																		
20A	38	40																																		
21A	40	42																																		
Comp3	18	42				x	x			x			x			x																				
ST14	28	30																					x													

SCHEDULE OF LABORATORY TESTING

	QC: KLT 7/21/21	QC: KLT 7/21/21	Routine Testing											Complex Testing																Analytical Testing						
Sample ID	Top Depth (Info taken from boring logs by Ramboll)	Bottom Depth (Info taken from boring logs by Ramboll)	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matte	
G311D																																				
23A	44	46																																		
24A	46	48																																		
25A	48	50																																		
26A	*50*	*52*																																		
Comp4	44	52				x	x			x			x			x																				
27A	52	54																																		
28A	54	56																																		
29A	56	58																																		
30A	58	60																																		
Comp5	52	60				x	x			x			x			x																				
G314D																																				
3A	*4.2*	*6.2*																																		
4A	*6.4*	*8.5*																																		
5A	*8.7*	*11.6*																																		
6A	*11.8*	*12.8*																																		
7A	13	15																																		
8A	15.5	17																																		
Comp1	4.2	17				x	x			x			x			x																				
9A	*17.3*	*19.3*																																		
10A	19.6	21.6																																		
Comp2	17.3	21.6				x	x			x			x			x																				

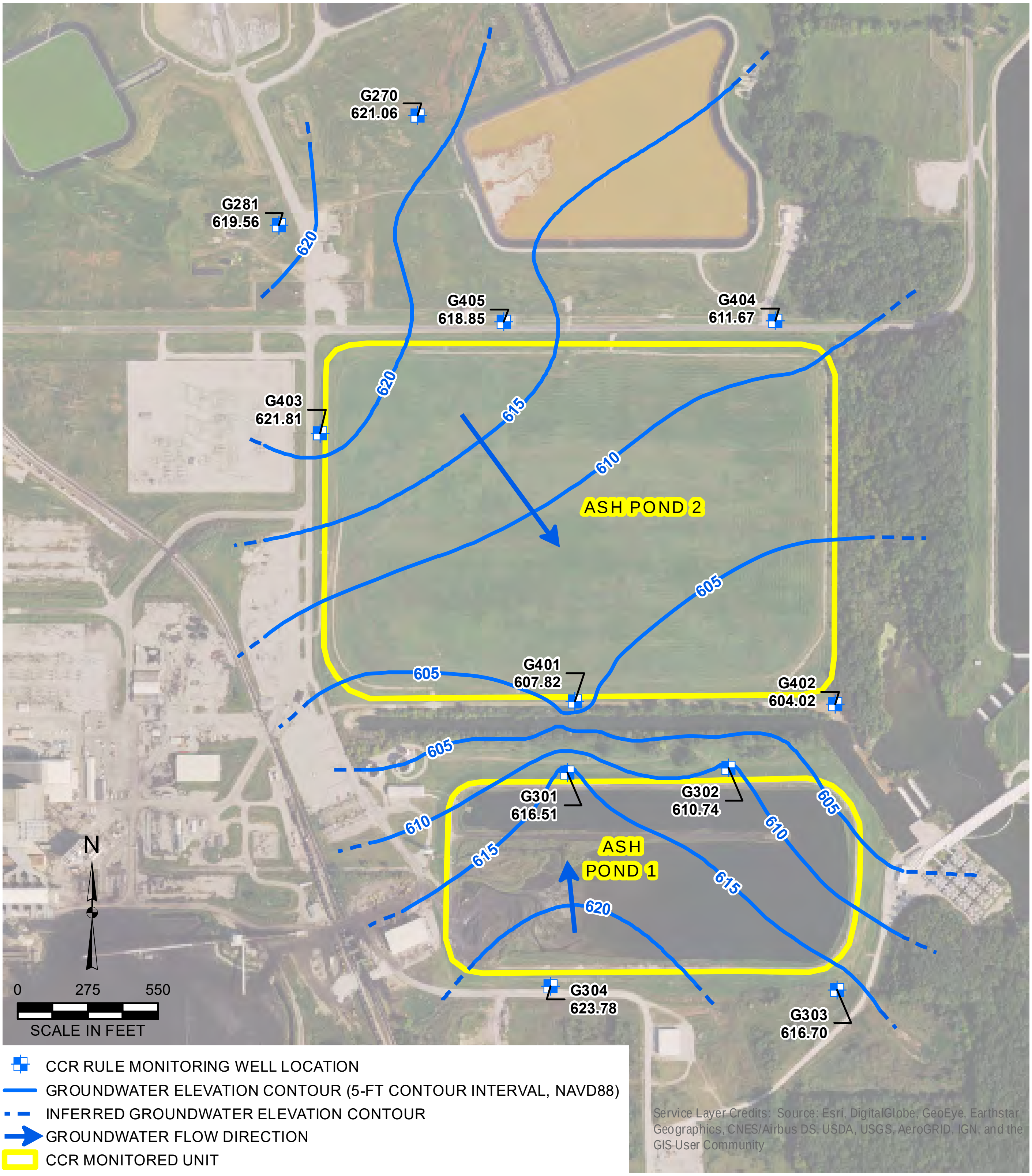
SCHEDULE OF LABORATORY TESTING																																				
	QC: KLT 7/21/21	QC: KLT 7/21/21	Routine Testing											Complex Testing																Analytical Testing						
Sample ID	Top Depth (Info taken from boring logs by Ramboll)	Bottom Depth (Info taken from boring logs by Ramboll)	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matte	
G314D																																				
11A	21.8	23.8																																		
12A	23.9	25.9																																		
13A	26.1	28.1																																		
14A	28.3	30.3																																		
15A	30.4	32.4																																		
16A	32.6	34.6																																		
17A	34.8	36.8																																		
19A	39.1	41.1																																		
20A	41.3	43.3																																		
21A	43.5	45.5																																		
Comp3	21.8	45.5				x	x			x			x			x																				
ST18	37	39																							x												
22A	46	47																																		
Comp4	46	47				x	x			x			x			x																				
23A	47.8	49.8																																		
24A	50	52																																		
Comp5	47.8	52				x	x			x			x			x																				
25A	52.2	54.2																																		
26A	54.4	56.4																																		
27A	56.5	58.5																																		
28A	58.7	60.7																																		
29A	60.9	62.9																																		
Comp6	52.2	62.9				x	x			x			x			x																				
35A	73.9	75.9																																		
36A	76.1	78.1																																		
37A	78.3	80.3																																		
38A	80.5	82.5																																		
Comp7	73.9	82.5				x	x			x			x			x																				

SCHEDULE OF LABORATORY TESTING

	QC: KLT 7/21/21	QC: KLT 7/21/21	Routine Testing											Complex Testing																Analytical Testing						
Sample ID	Top Depth (Info taken from boring logs by Ramboll)	Bottom Depth (Info taken from boring logs by Ramboll)	Rimac Comp Strength	Visual-Manual Classification	Unified Classification	Moisture Content	Liquid / Plastic Limits	Particle Size < #200	Particle Size - Sieves	Particle Size - Sieves + Hyd	Standard Compaction	Modified Compaction	Bulk Density	Unconfined Comp Strength	Consolidation Test	Specific Gravity	UU Triaxial Comp Strength	CU Traxail Comp Strength	CD Direct Shear Strength	Swell Test for Soil	Collapse Test for Soil	Permeability Granular Soil	Hyd Conduct Cohesive Soil	Shrinkafe Factor	Soil Resistivity	IBR and IBV of Soils	CBR Test	Elastic Moduli - Rock	Uniaxial Comp Str - Rock	Corrosivity	pH	Chloride	Sulfate	Total Organic Content	Moisture, Ash & Organ Matte	
G314D																																				
44A	93.5	93.9																																		
45A	95.7	96.4																																		
46A	97.9	98.8																																		
47A	100	100.3																																		
Comp8	93.5	100.3				x	x			x			x			x																				
XPW01																																				
1A	0	2																																		
2A	2	4																																		
3A	4	6																																		
4A	6	8																																		
Comp1	0	8				x	x			x			x			x																				
ST3	4	6																					x													
5A	8	10																																		
6A	10	12																																		
7A	12	12.8																																		
Comp2	8	12.8				x	x			x			x			x																				
XPW02																																				
1A	0	2																																		
2A	2	4																																		
3A	4	6																																		
4A	6	8																																		
Comp1	0	8				x	x			x			x			x																				
5A	8	10																																		
6A	10	12																																		
7A	12	14																																		
8A	14	16																																		
9A	16	17.7																																		
Comp2	8	17.7				x	x			x			x			x																				

APPENDIX E
GROUNDWATER CONTOUR MAPS AND ELEVATIONS

GROUNDWATER CONTOUR MAPS



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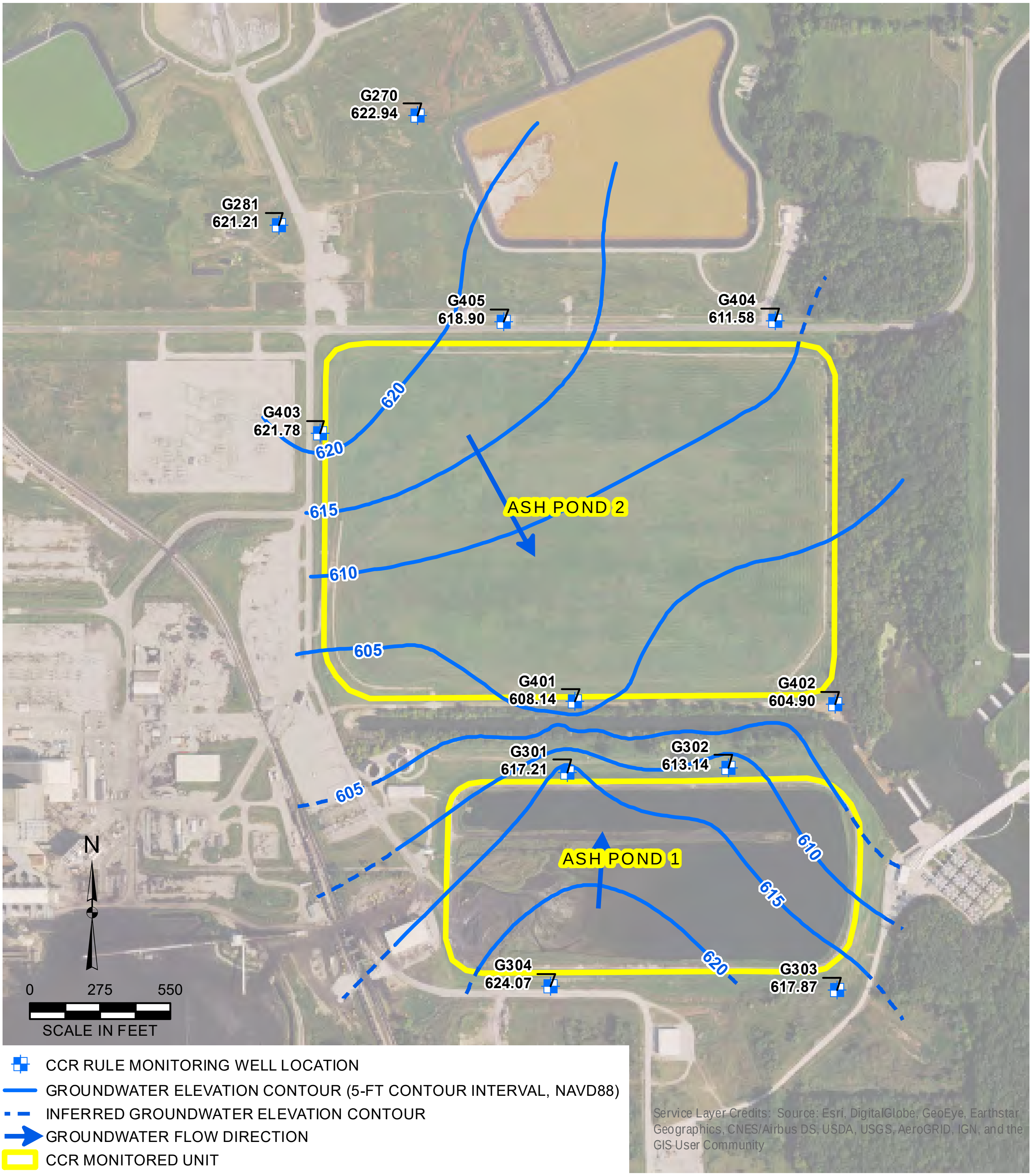
DRAWN BY/DATE: SDS 1/23/17 REVIEWED BY/DATE: TBN 1/25/17 APPROVED BY/DATE: JJW 2/7/17	**COFFEEN ASH POND NO. 1 (UNIT ID: 101) AND COFFEEN ASH POND NO. 2 (UNIT ID: 102) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 1: NOVEMBER 16, 2015** DYNEGY CCR RULE GROUNDWATER MONITORING COFFEEN POWER STATION COFFEEN, ILLINOIS	PROJECT NO: 2285 FIGURE NO: 1 Natural Resource Technology AN OBG COMPANY



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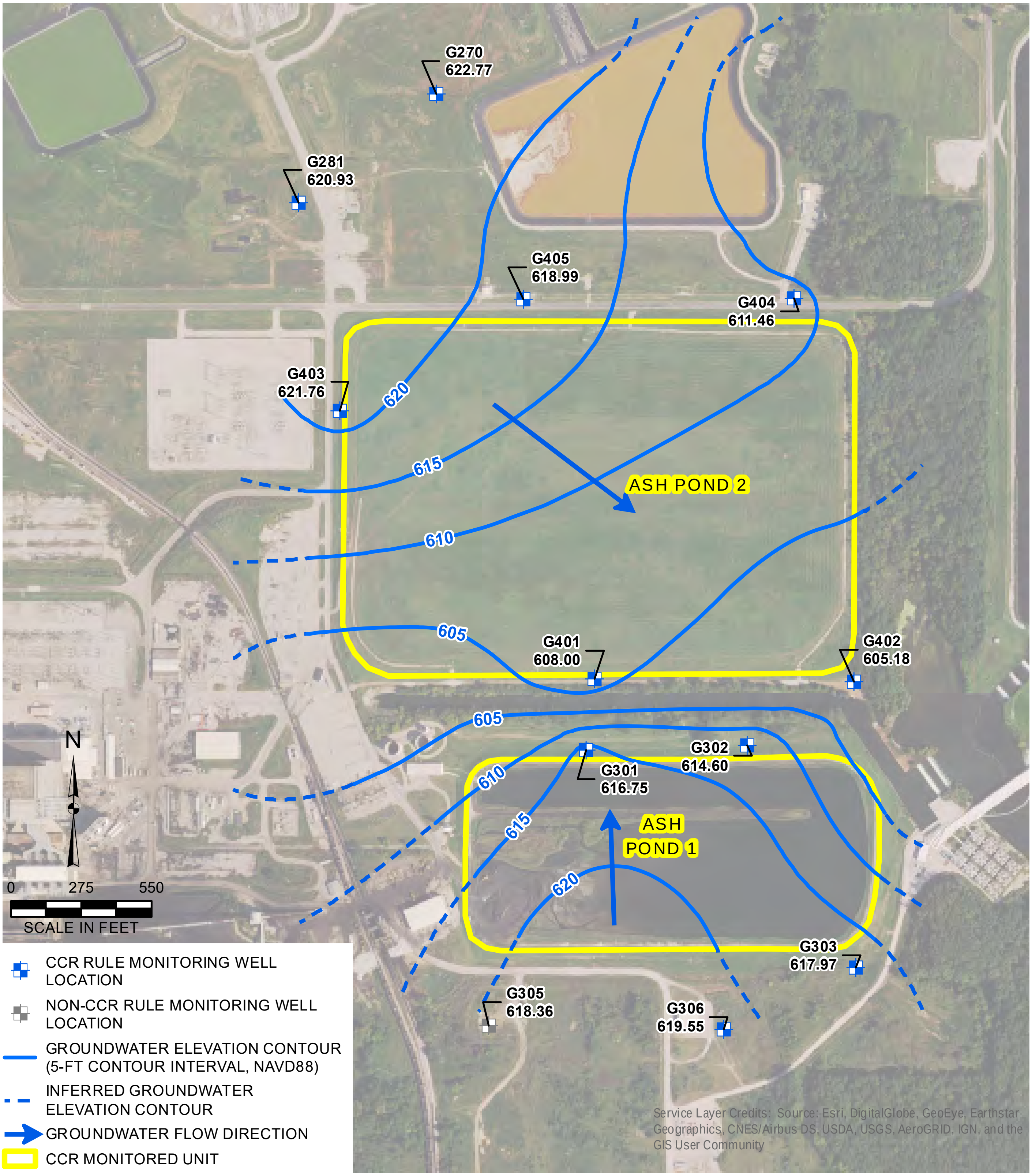
DRAWN BY/DATE: SDS 1/23/17 REVIEWED BY/DATE: TBN 1/25/17 APPROVED BY/DATE: JJW 2/8/17	**COFFEEN ASH POND NO. 1 (UNIT ID: 101) AND COFFEEN ASH POND NO. 2 (UNIT ID: 102) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 2: FEBRUARY 8, 2016** DYNEGY CCR RULE GROUNDWATER MONITORING COFFEEN POWER STATION COFFEEN, ILLINOIS	PROJECT NO: 2285 FIGURE NO: 1 Natural Resource Technology AN OBG COMPANY



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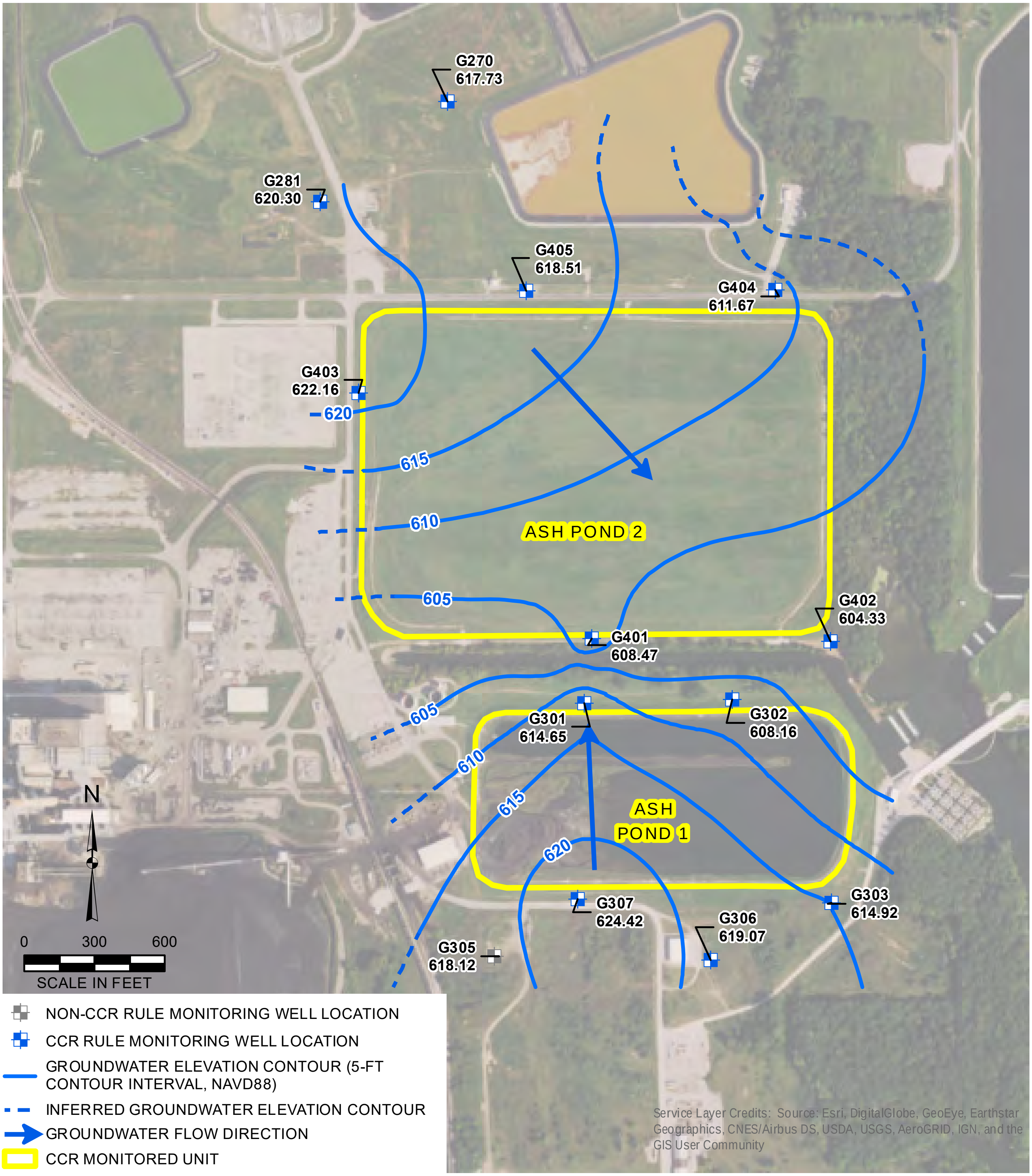
DRAWN BY/DATE: SDS 1/23/17 REVIEWED BY/DATE: TBN 1/25/17 APPROVED BY/DATE: JJW 2/8/17	**COFFEEN ASH POND NO. 1 (UNIT ID: 101) AND COFFEEN ASH POND NO. 2 (UNIT ID: 102) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 3: MAY 9, 2016** DYNEGY CCR RULE GROUNDWATER MONITORING COFFEEN POWER STATION COFFEEN, ILLINOIS	PROJECT NO: 2285 FIGURE NO: 1 Natural Resource Technology AN OBG COMPANY



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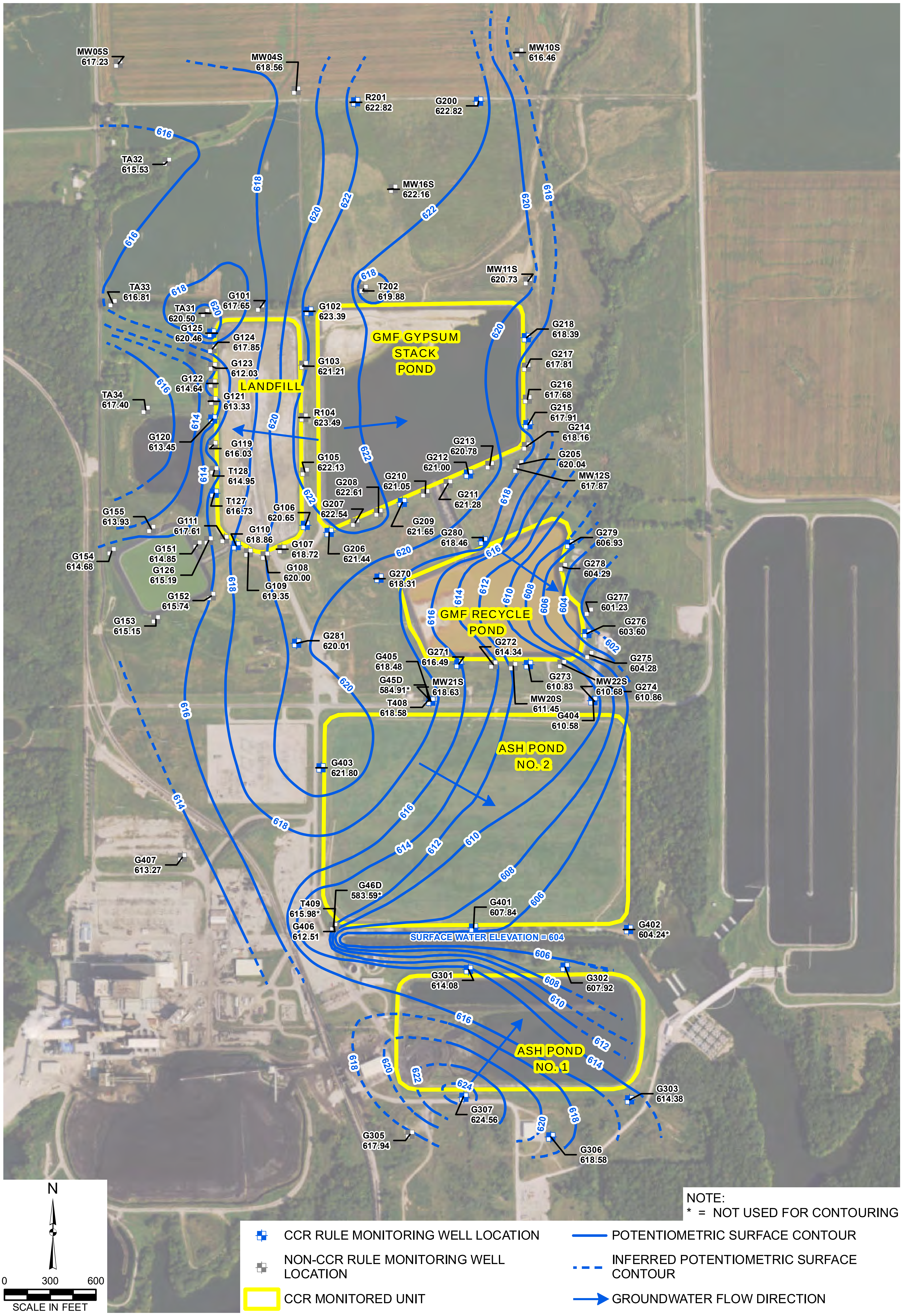
DRAWN BY/DATE: SDS 1/23/17 REVIEWED BY/DATE: ANS 1/25/17 APPROVED BY/DATE: JJW 2/8/17	**COFFEEN ASH POND NO. 1 (UNIT ID: 101) AND COFFEEN ASH POND NO. 2 (UNIT ID: 102) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP ROUND 4: JULY 25, 2016** DYNEGY CCR RULE GROUNDWATER MONITORING COFFEEN POWER STATION COFFEEN, ILLINOIS	PROJECT NO: 2285 FIGURE NO: 1 Natural Resource Technology AN OBG COMPANY



NOTE:
* = NOT USED FOR CONTOURING

CCR RULE MONITORING WELL LOCATION

NON-CCR RULE MONITORING WELL LOCATION

CCR MONITORED UNIT

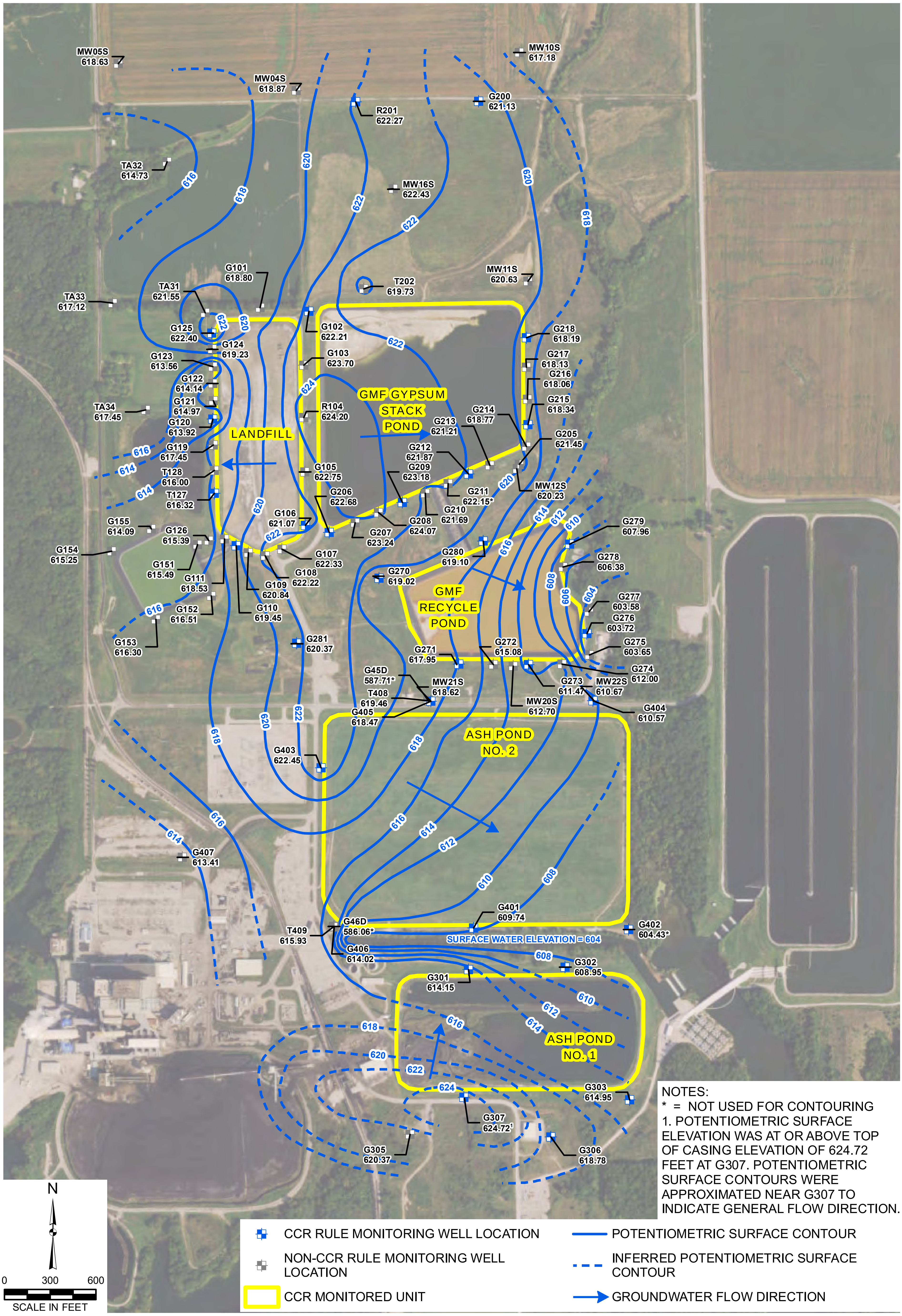
POTENTIOMETRIC SURFACE CONTOUR

INFERRED POTENTIOMETRIC SURFACE CONTOUR

GROUNDWATER FLOW DIRECTION

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_05\R5_Coffeen_GW_Contours.mxd Author: stolzsd; Date/Time: 9/1/2017, 4:50:27 PM

DRAWN BY/DATE: SDS 3/3/17 REVIEWED BY/DATE: TBN 3/3/17 APPROVED BY/DATE: JJW 8/30/17	**COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP** **ROUND 5: NOVEMBER 12, 2016** DYNEGY CCR RULE GROUNDWATER MONITORING COFFEEN POWER STATION COFFEEN, ILLINOIS	PROJECT NO: 2285 FIGURE NO: 1 Natural Resource Technology AN OBG COMPANY



NOTES:
* = NOT USED FOR CONTOURING
1. POTENTIOMETRIC SURFACE ELEVATION WAS AT OR ABOVE TOP OF CASING ELEVATION OF 624.72 FEET AT G307. POTENTIOMETRIC SURFACE CONTOURS WERE APPROXIMATED NEAR G307 TO INDICATE GENERAL FLOW DIRECTION.

CCR RULE MONITORING WELL LOCATION
NON-CCR RULE MONITORING WELL LOCATION
CCR MONITORED UNIT
POTENTIOMETRIC SURFACE CONTOUR
INFERRED POTENTIOMETRIC SURFACE CONTOUR
GROUNDWATER FLOW DIRECTION

DRAWN BY/DATE: SDS 4/14/17
REVIEWED BY/DATE: TBN 4/14/17
APPROVED BY/DATE: JJW 8/30/17

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP
ROUND 6: FEBRUARY 4, 2017
DYNEGY CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

PROJECT NO: 2285
FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY

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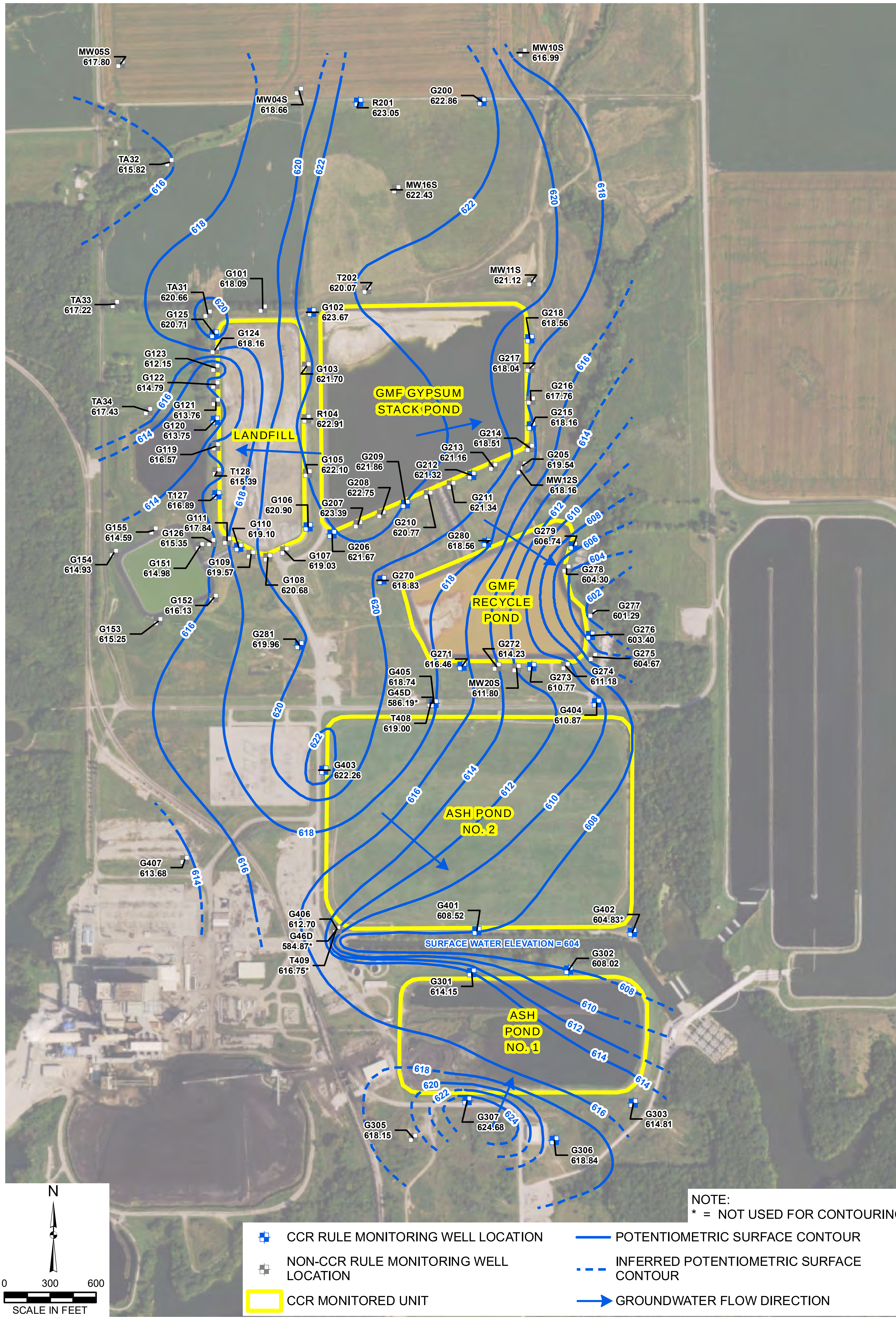


NOTE:
* = NOT USED FOR CONTOURING

CCR RULE MONITORING WELL LOCATION

NON-CCR RULE MONITORING WELL LOCATION

CCR MONITORED UNIT

POTENTIOMETRIC SURFACE CONTOUR

INFERRED POTENTIOMETRIC SURFACE CONTOUR

GROUNDWATER FLOW DIRECTION

DRAWN BY/DATE: SDS 7/12/17
REVIEWED BY/DATE: TBN 7/12/17
APPROVED BY/DATE: JJW 8/30/17

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP

ROUND 7: MAY 13, 2017

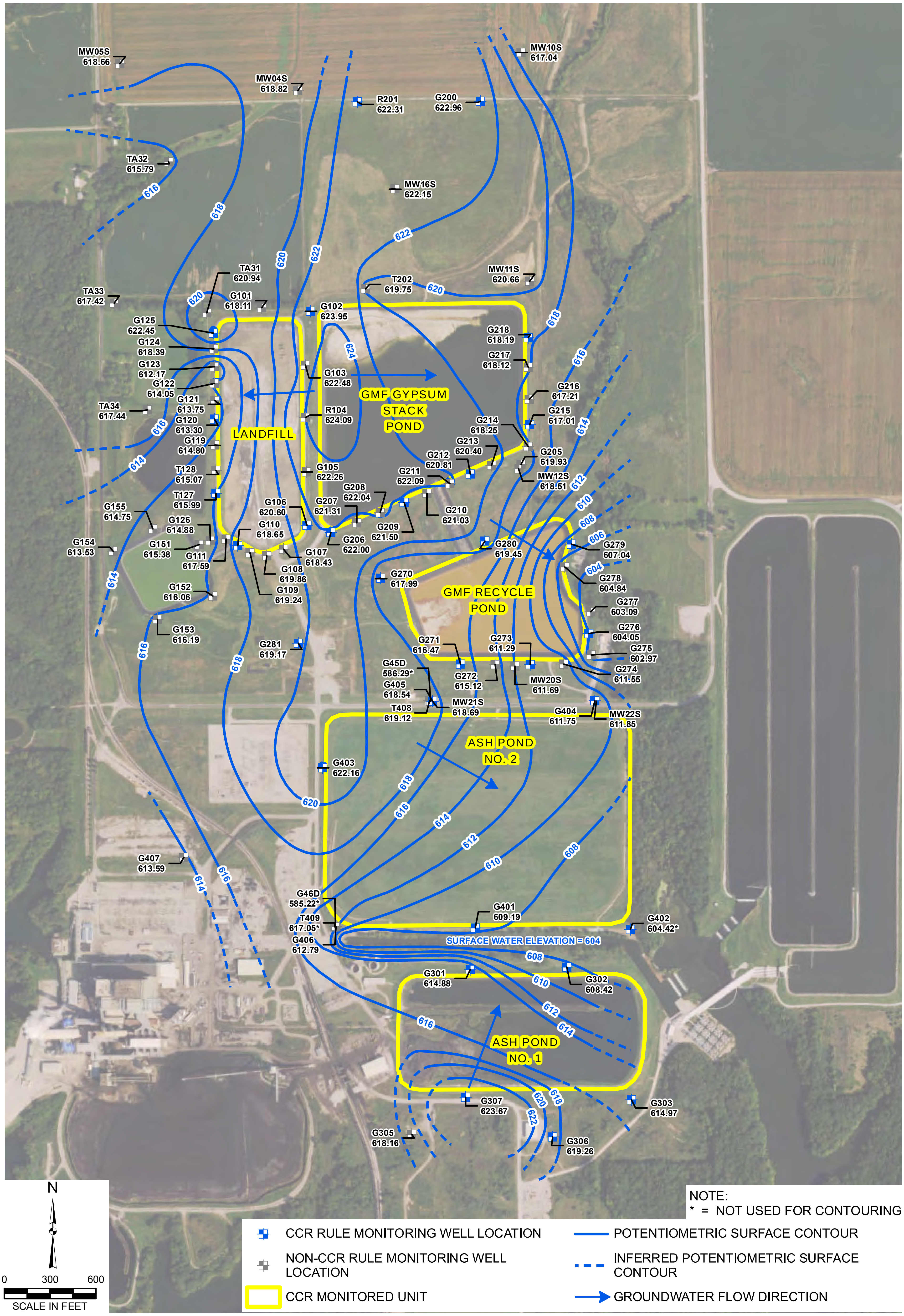
DYNEGY CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_07\R7_Coffeen_GW_Contours.mxd Author: stolzsd; Date/Time: 9/1/2017, 4:57:33 PM



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REVIEWED BY/DATE: TBN 8/10/17
APPROVED BY/DATE: JJW 8/30/17

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105) UPPERMOST AQUIFER UNIT GROUNDWATER ELEVATION CONTOUR MAP

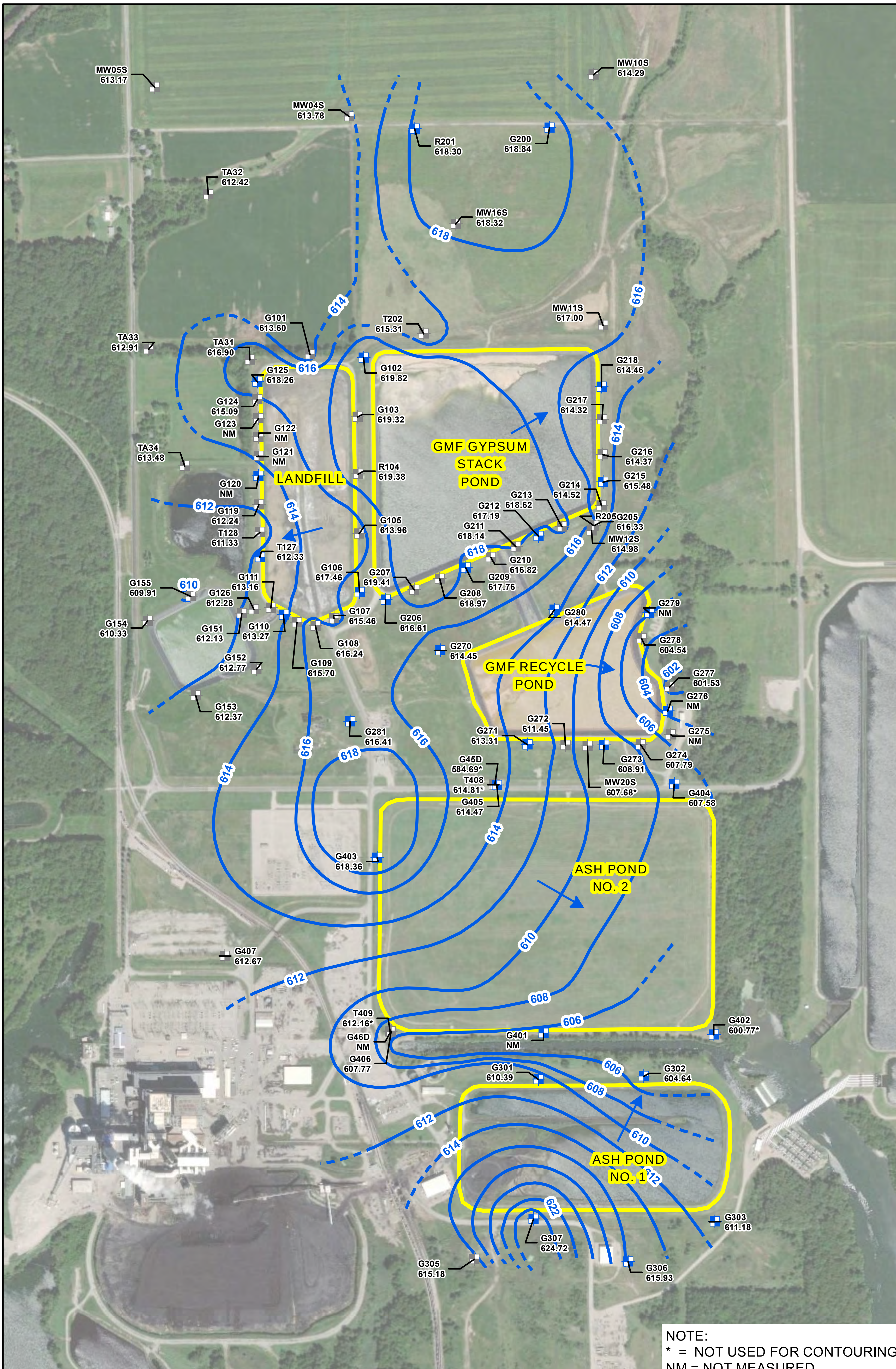
ROUND 8: JULY 8, 2017

DYNEGY CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

PROJECT NO: 2285

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



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LEGEND

- CCR RULE MONITORING WELL LOCATION
- NON-CCR RULE MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105)
GROUNDWATER ELEVATION CONTOUR MAP
OCTOBER 21, 2017

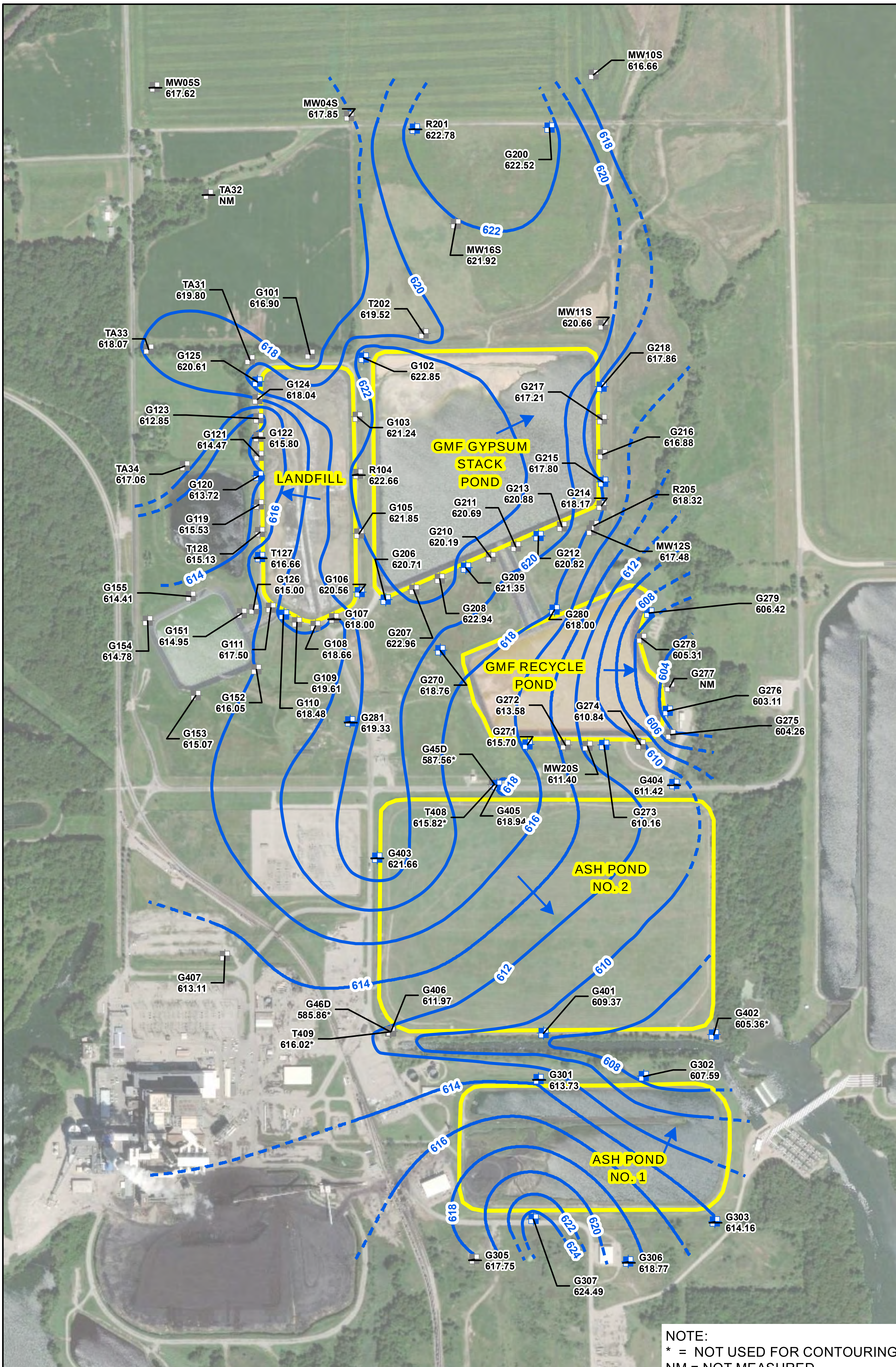
CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

0 150 300 600
Feet

N

FILE_NO. 70099
DATE 8/1/2018

O'BRIEN & GERE ENGINEERS, INC.



LEGEND

- CCR RULE MONITORING WELL LOCATION
- NON-CCR RULE MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 8, 2018

CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

0 150 300 600
Feet

N

FILE_NO. 70099
DATE 8/1/2018

O'BRIEN & GERE ENGINEERS, INC.

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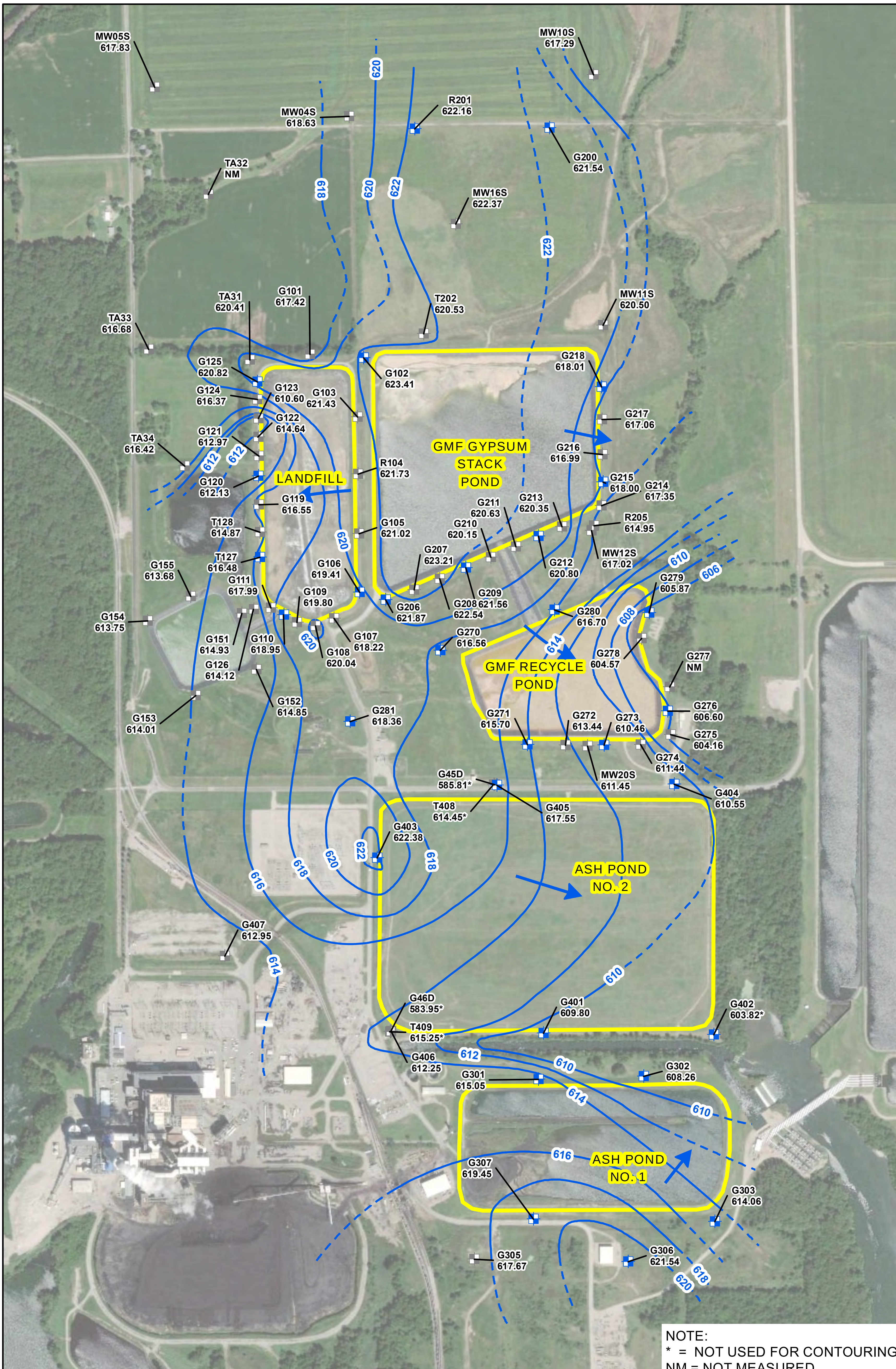

CCR RULE MONITORING WELL LOCATION

NON-CCR RULE MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105)
GROUNDWATER ELEVATION CONTOUR MAP
AUGUST 2, 2018

CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

0 150 300 600
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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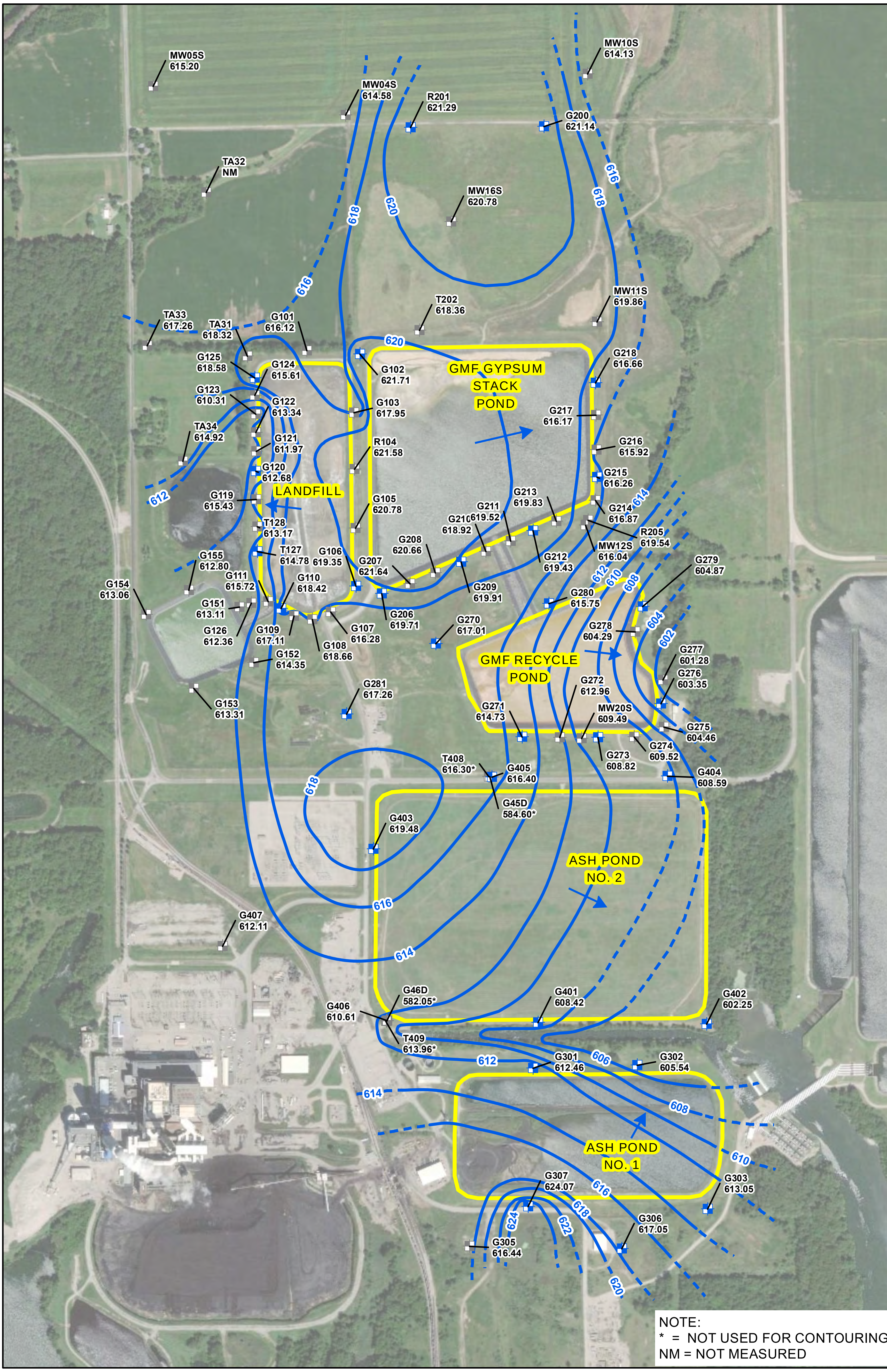

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LEGEND

- CCR RULE MONITORING WELL LOCATION
- NON-CCR RULE MONITORING WELL LOCATION
- GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- CCR MONITORED UNIT

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105)
GROUNDWATER ELEVATION CONTOUR MAP
OCTOBER 23, 2018

CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

N

0 150 300 600
Feet

O'BRIEN & GERE ENGINEERS, INC.

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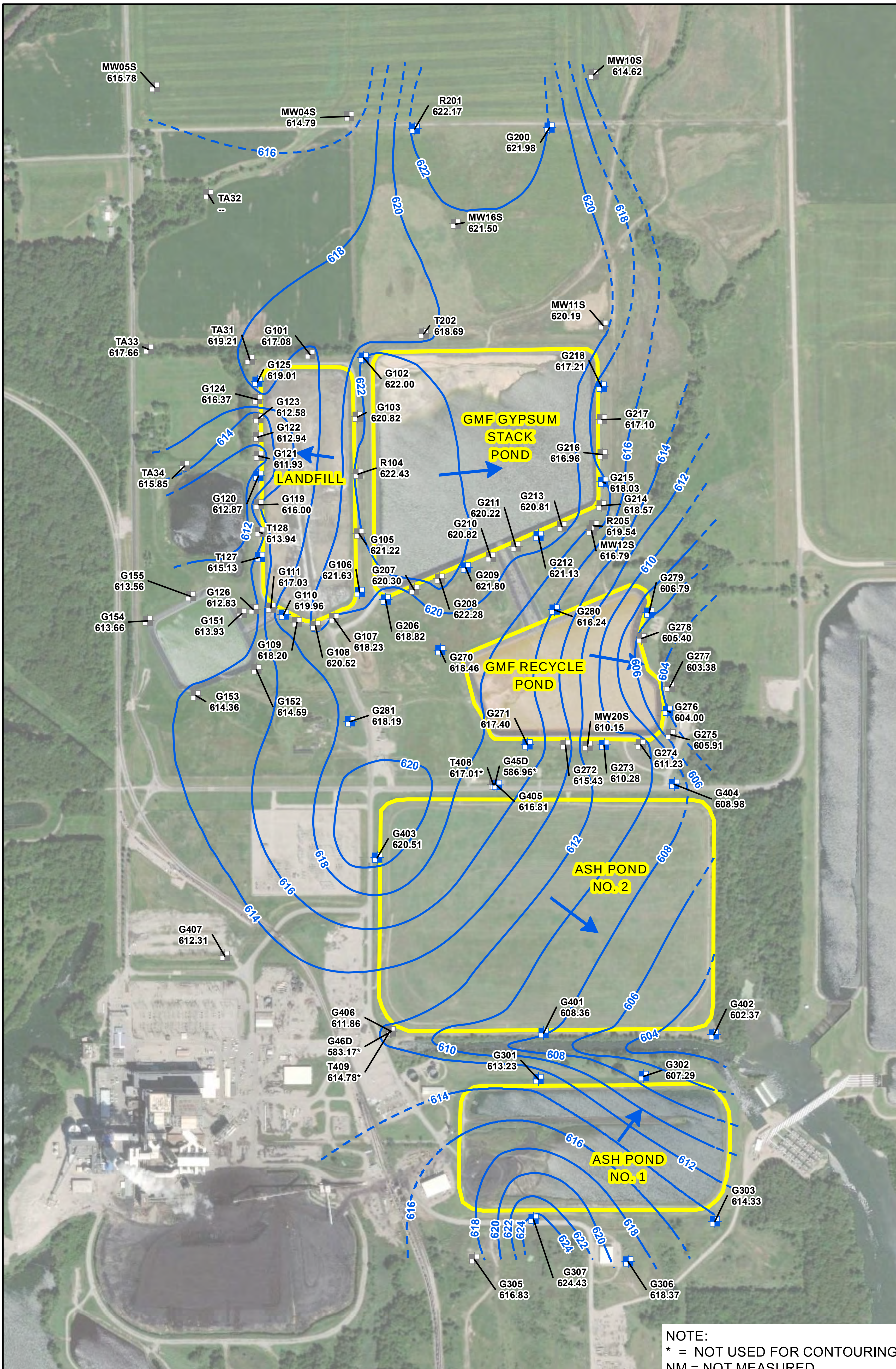

CCR RULE MONITORING WELL LOCATION

NON-CCR RULE MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105)
GROUNDWATER ELEVATION CONTOUR MAP
JANUARY 15, 2019

CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

0 150 300 600
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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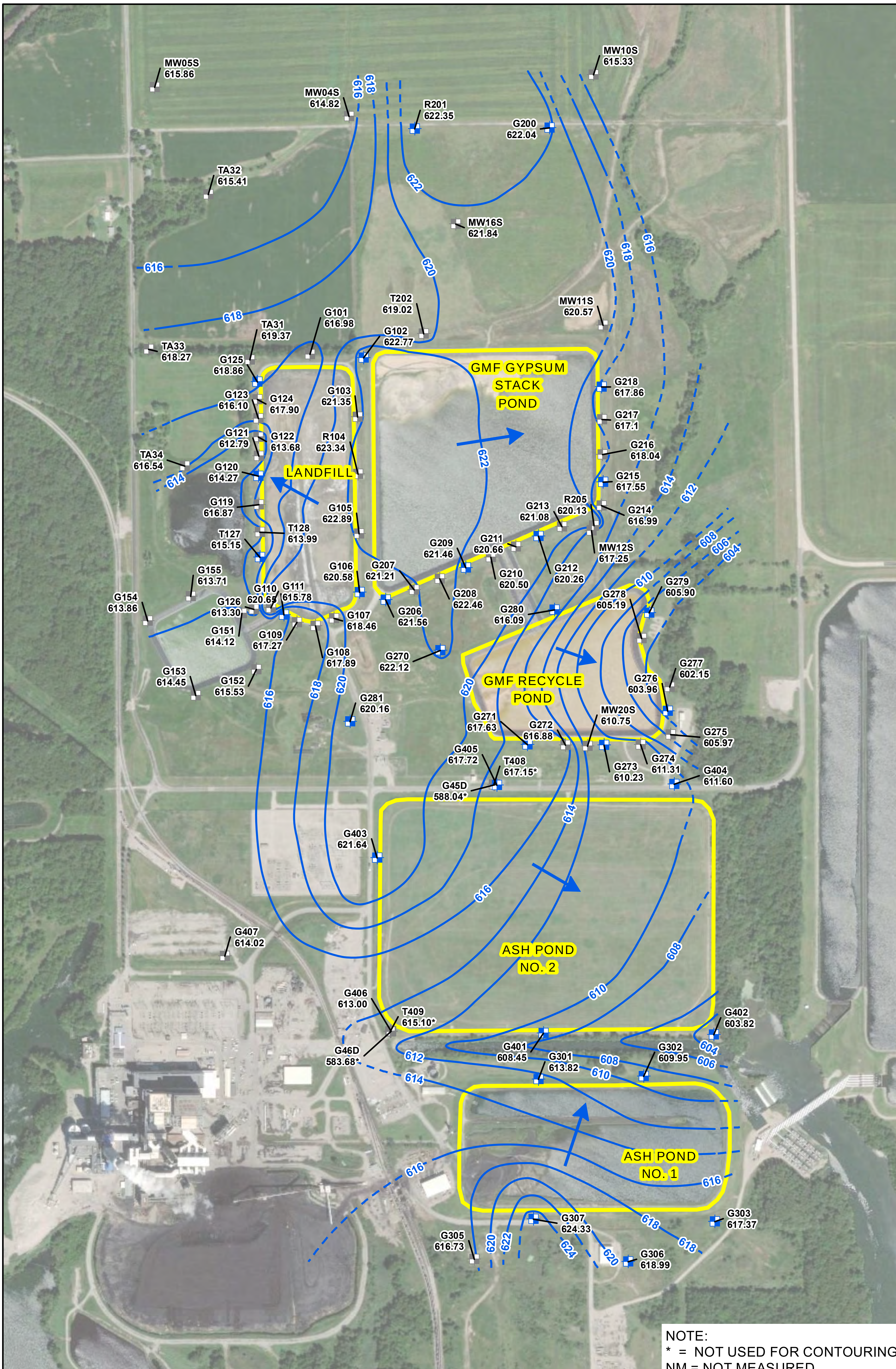

NOTE:
* = NOT USED FOR CONTOURING
NM = NOT MEASURED

CCR RULE MONITORING WELL LOCATION

NON-CCR RULE MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

CCR MONITORED UNIT

COFFEEN ASH POND NO. 1 (UNIT ID: 101), COFFEEN ASH POND NO. 2 (UNIT ID: 102), COFFEEN GMF GYPSUM STACK POND (UNIT ID: 103), COFFEEN GMF RECYCLE POND (UNIT ID: 104) AND COFFEEN LANDFILL (UNIT ID: 105)
GROUNDWATER ELEVATION CONTOUR MAP
AUGUST 5, 2019

CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

N

0 150 300 600
Feet

O'BRIEN & GERE ENGINEERS, INC.

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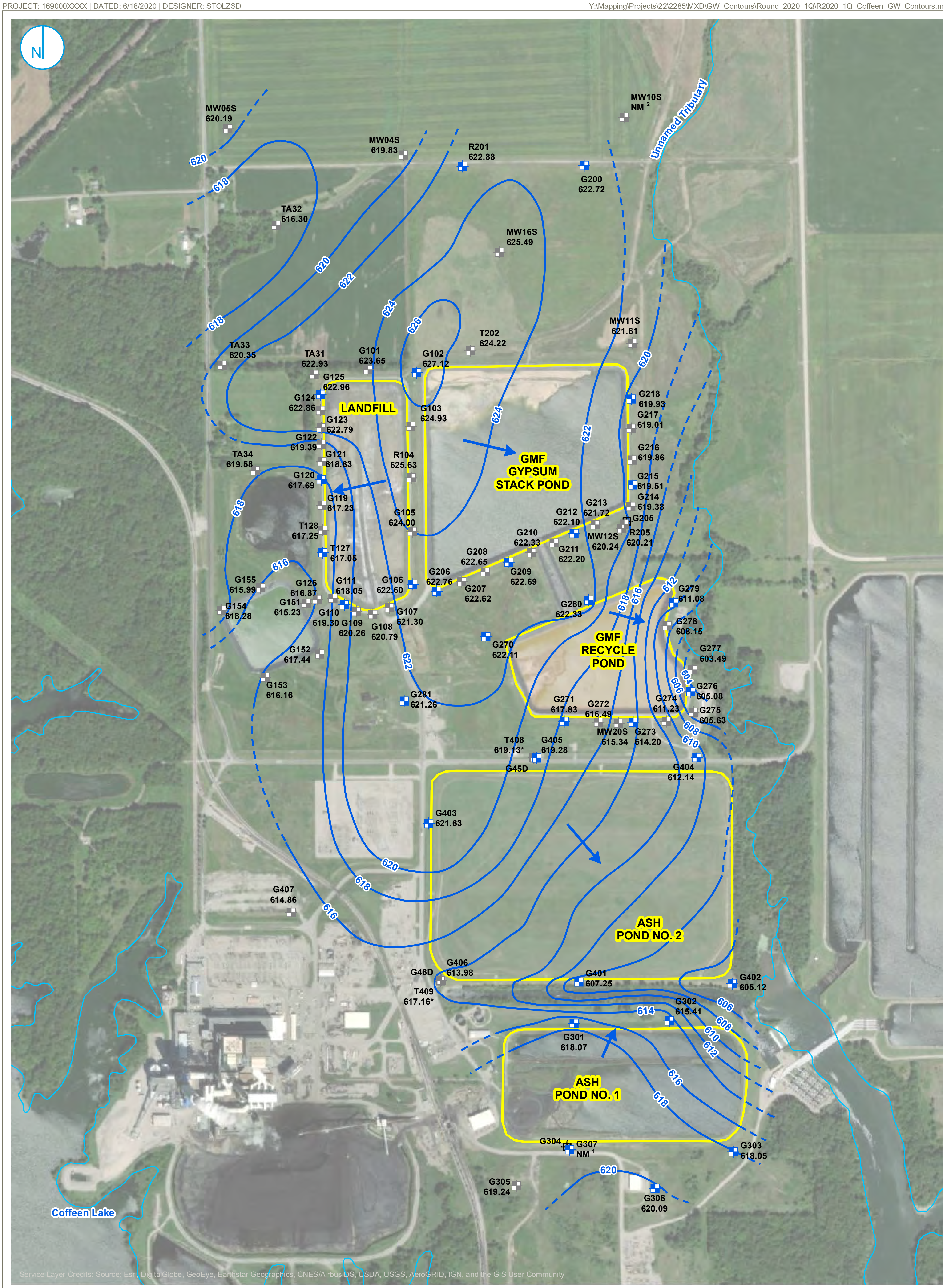

CCR RULE MONITORING WELL LOCATION
NON-CCR RULE MONITORING WELL LOCATION
ABANDONED MONITORING WELL
GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

CCR UNIT BOUNDARY
SURFACE WATER FEATURE

NOTE:
* = NOT USED FOR CONTOURING
NM = NOT MEASURED
[1] G307 WAS FROZEN DURING THE JANUARY 20, 2020 SAMPLING EVENT AND WATER LEVEL COULD NOT BE COLLECTED.
[2] MW10S WAS DAMAGED PRIOR TO THE JANUARY 20, 2020 SAMPLING EVENT AND WATER LEVEL COULD NOT BE COLLECTED.

0 300 600
Feet

GROUNDWATER ELEVATION CONTOUR MAP
JANUARY 20, 2020

CCR RULE GROUNDWATER MONITORING
COFFEEN POWER STATION
COFFEEN, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

TABLE E-1. GROUNDWATER ELEVATIONS

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G045D	11/12/2016	584.91
G045D	02/04/2017	587.71
G045D	05/13/2017	586.19
G045D	07/08/2017	586.29
G045D	10/21/2017	584.69
G045D	05/08/2018	587.56
G045D	08/02/2018	585.81
G045D	10/23/2018	584.60
G045D	01/15/2019	586.96
G045D	08/05/2019	588.04
G045D	08/10/2020	614.21
G045D	01/20/2021	614.60
G045D	04/20/2021	614.32
G045D	07/26/2021	613.58
G045D	08/16/2021	613.83
G046D	11/12/2016	583.59
G046D	02/04/2017	586.06
G046D	05/13/2017	584.87
G046D	07/08/2017	585.22
G046D	05/08/2018	585.86
G046D	08/02/2018	583.95
G046D	10/23/2018	582.05
G046D	01/15/2019	583.17
G046D	08/05/2019	583.68
G046D	08/10/2020	609.00
G046D	01/20/2021	610.49
G046D	04/20/2021	611.06
G046D	07/26/2021	607.21
G046D	08/16/2021	608.17
G101	01/20/2015	614.48
G101	04/08/2015	618.87
G101	07/23/2015	618.53
G101	10/06/2015	617.15
G101	11/16/2015	612.95
G101	02/08/2016	618.46
G101	05/09/2016	618.89
G101	07/25/2016	618.44
G101	11/12/2016	617.65
G101	02/04/2017	618.80
G101	05/13/2017	618.09
G101	07/08/2017	618.11
G101	10/21/2017	613.60
G101	05/08/2018	616.90
G101	08/02/2018	617.42
G101	10/23/2018	616.12
G101	01/15/2019	617.08

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G101	08/05/2019	616.98
G101	01/20/2020	623.65
G101	08/10/2020	616.70
G101	10/15/2020	613.61
G101	01/20/2021	617.20
G101	01/28/2021	617.80
G101	04/20/2021	622.85
G101	07/26/2021	619.94
G101	08/16/2021	619.95
G102	01/20/2015	619.18
G102	04/08/2015	622.06
G102	10/06/2015	622.02
G102	11/16/2015	618.96
G102	02/08/2016	624.04
G102	05/09/2016	625.34
G102	07/25/2016	623.92
G102	11/12/2016	623.39
G102	02/04/2017	622.21
G102	05/13/2017	623.67
G102	07/08/2017	623.95
G102	10/21/2017	619.82
G102	01/26/2018	621.79
G102	05/08/2018	622.85
G102	08/02/2018	623.41
G102	10/23/2018	621.71
G102	01/15/2019	622.00
G102	08/05/2019	622.77
G102	01/20/2020	627.12
G102	08/10/2020	621.72
G102	10/15/2020	618.94
G102	01/20/2021	619.79
G102	01/26/2021	621.71
G102	04/20/2021	623.86
G102	05/03/2021	624.28
G102	05/17/2021	623.83
G102	06/09/2021	623.09
G102	06/23/2021	621.22
G102	07/12/2021	622.92
G102	07/26/2021	622.97
G102	08/16/2021	622.69
G103	01/20/2015	620.82
G103	04/08/2015	622.58
G103	07/23/2015	621.70
G103	10/06/2015	620.69
G103	02/08/2016	621.68
G103	05/09/2016	623.26

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G103	07/25/2016	622.88
G103	11/12/2016	621.21
G103	02/04/2017	623.70
G103	05/13/2017	621.70
G103	07/08/2017	622.48
G103	10/21/2017	619.32
G103	05/08/2018	621.24
G103	08/02/2018	621.43
G103	10/23/2018	617.95
G103	01/15/2019	620.82
G103	08/05/2019	621.35
G103	01/20/2020	624.93
G103	08/10/2020	622.45
G103	10/15/2020	618.91
G103	01/20/2021	621.01
G103	01/28/2021	621.38
G103	04/20/2021	623.84
G103	07/26/2021	624.14
G103	08/16/2021	624.29
G105	01/20/2015	621.95
G105	04/08/2015	623.73
G105	07/23/2015	622.72
G105	10/06/2015	621.65
G105	02/08/2016	623.03
G105	05/09/2016	623.60
G105	07/25/2016	622.08
G105	11/12/2016	622.13
G105	02/04/2017	622.75
G105	05/13/2017	622.10
G105	07/08/2017	622.26
G105	10/21/2017	613.96
G105	05/08/2018	621.85
G105	08/02/2018	621.02
G105	10/23/2018	620.78
G105	01/15/2019	621.22
G105	08/05/2019	622.89
G105	01/20/2020	624.00
G105	08/10/2020	623.11
G105	10/15/2020	620.10
G105	01/20/2021	622.21
G105	01/28/2021	622.33
G105	04/20/2021	623.23
G105	07/26/2021	623.76
G105	08/16/2021	623.70
G106	01/20/2015	620.45
G106	04/08/2015	622.19

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TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G106	07/23/2015	621.43
G106	10/06/2015	620.50
G106	11/16/2015	619.32
G106	02/08/2016	621.55
G106	05/09/2016	622.11
G106	07/25/2016	620.62
G106	11/12/2016	620.65
G106	02/04/2017	621.07
G106	05/13/2017	620.90
G106	07/08/2017	620.60
G106	10/21/2017	617.46
G106	05/08/2018	620.56
G106	08/02/2018	619.41
G106	10/23/2018	619.35
G106	01/15/2019	621.63
G106	08/05/2019	620.58
G106	01/20/2020	622.60
G106	08/10/2020	620.48
G106	10/14/2020	618.19
G106	01/20/2021	620.90
G106	01/26/2021	620.90
G106	04/20/2021	621.69
G106	06/29/2021	621.95
G106	07/26/2021	621.88
G106	08/16/2021	621.90
G107	01/20/2015	619.23
G107	04/08/2015	620.85
G107	07/23/2015	620.15
G107	10/06/2015	619.10
G107	02/08/2016	620.26
G107	05/09/2016	620.78
G107	07/25/2016	618.37
G107	11/12/2016	618.72
G107	02/04/2017	622.33
G107	05/13/2017	619.03
G107	07/08/2017	618.43
G107	10/21/2017	615.46
G107	05/08/2018	618.00
G107	08/02/2018	618.22
G107	10/23/2018	616.28
G107	01/15/2019	618.23
G107	08/05/2019	618.46
G107	01/20/2020	621.30
G107	08/10/2020	618.68
G107	10/14/2020	616.56
G107	01/20/2021	619.58

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G107	01/28/2021	619.74
G107	04/20/2021	620.19
G107	07/26/2021	620.26
G107	08/16/2021	620.39
G108	01/19/2015	618.42
G108	04/08/2015	620.31
G108	07/24/2015	621.22
G108	10/07/2015	618.92
G108	02/08/2016	619.53
G108	05/09/2016	620.15
G108	07/25/2016	619.78
G108	11/12/2016	620.46
G108	02/04/2017	622.22
G108	05/13/2017	620.68
G108	07/08/2017	619.86
G108	10/21/2017	616.24
G108	05/08/2018	618.66
G108	08/02/2018	620.04
G108	10/23/2018	618.66
G108	01/15/2019	620.52
G108	08/05/2019	617.89
G108	01/20/2020	620.79
G108	08/10/2020	617.86
G108	10/14/2020	616.02
G108	01/20/2021	618.72
G108	01/28/2021	618.82
G108	04/20/2021	619.37
G108	07/26/2021	619.40
G108	08/16/2021	619.66
G109	01/19/2015	617.78
G109	04/08/2015	619.71
G109	07/24/2015	620.41
G109	10/06/2015	618.12
G109	02/08/2016	618.94
G109	05/09/2016	619.56
G109	07/25/2016	619.11
G109	11/12/2016	619.35
G109	02/04/2017	620.84
G109	05/13/2017	619.57
G109	07/08/2017	619.24
G109	10/21/2017	615.70
G109	05/08/2018	619.61
G109	08/02/2018	619.80
G109	10/23/2018	617.11
G109	01/15/2019	618.20
G109	08/05/2019	617.27

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TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G109	01/20/2020	620.26
G109	08/10/2020	617.16
G109	10/14/2020	615.52
G109	01/20/2021	617.91
G109	01/28/2021	618.58
G109	04/20/2021	618.59
G109	07/26/2021	618.68
G109	08/16/2021	618.96
G110	01/19/2015	616.76
G110	04/08/2015	618.60
G110	07/24/2015	619.55
G110	10/07/2015	617.70
G110	11/16/2015	616.55
G110	02/08/2016	617.88
G110	05/09/2016	618.53
G110	07/25/2016	617.64
G110	11/12/2016	618.86
G110	02/04/2017	619.45
G110	05/13/2017	619.10
G110	07/08/2017	618.65
G110	10/21/2017	613.27
G110	01/26/2018	616.74
G110	05/08/2018	618.48
G110	08/02/2018	618.95
G110	10/23/2018	618.42
G110	01/15/2019	619.96
G110	08/05/2019	620.65
G110	01/20/2020	619.30
G110	08/10/2020	616.14
G110	10/14/2020	614.90
G110	01/20/2021	616.81
G110	01/28/2021	616.81
G110	04/20/2021	617.71
G110	07/26/2021	617.76
G110	08/16/2021	617.97
G111	01/19/2015	615.93
G111	04/08/2015	617.48
G111	07/24/2015	618.03
G111	10/07/2015	616.79
G111	02/08/2016	616.92
G111	05/09/2016	617.52
G111	07/25/2016	617.35
G111	11/12/2016	617.61
G111	02/04/2017	618.53
G111	05/13/2017	617.84
G111	07/08/2017	617.59

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G111	10/21/2017	613.16
G111	05/08/2018	617.50
G111	08/02/2018	617.99
G111	10/23/2018	615.72
G111	01/15/2019	617.03
G111	08/05/2019	615.78
G111	01/20/2020	618.05
G111	08/10/2020	615.59
G111	10/14/2020	614.40
G111	01/20/2021	615.84
G111	01/28/2021	616.67
G111	04/20/2021	616.73
G111	07/26/2021	616.84
G111	08/16/2021	618.10
G119	01/19/2015	615.64
G119	04/08/2015	615.86
G119	07/23/2015	616.55
G119	10/06/2015	615.31
G119	02/08/2016	615.83
G119	05/09/2016	615.87
G119	07/25/2016	614.73
G119	11/12/2016	616.03
G119	02/04/2017	617.45
G119	05/13/2017	616.57
G119	07/08/2017	614.80
G119	10/21/2017	612.24
G119	05/08/2018	615.53
G119	08/02/2018	616.55
G119	10/23/2018	615.43
G119	01/15/2019	616.00
G119	08/05/2019	616.87
G119	01/20/2020	617.23
G119	08/10/2020	616.02
G119	10/13/2020	615.16
G119	01/20/2021	616.09
G119	01/28/2021	616.14
G119	04/20/2021	616.80
G119	07/26/2021	616.62
G119	08/16/2021	616.75
G120	01/19/2015	612.75
G120	04/08/2015	613.43
G120	07/23/2015	613.47
G120	10/06/2015	612.94
G120	11/16/2015	612.37
G120	02/08/2016	613.06
G120	05/09/2016	613.37

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G120	07/25/2016	612.87
G120	11/12/2016	613.45
G120	02/04/2017	613.92
G120	05/13/2017	613.75
G120	07/08/2017	613.30
G120	01/26/2018	612.69
G120	05/08/2018	613.72
G120	08/02/2018	612.13
G120	10/23/2018	612.68
G120	01/15/2019	612.87
G120	05/03/2019	618.15
G120	08/05/2019	614.27
G120	01/20/2020	617.69
G120	05/05/2020	618.23
G120	08/10/2020	615.22
G120	10/13/2020	614.39
G120	01/20/2021	615.80
G120	01/27/2021	615.80
G120	04/20/2021	617.55
G120	07/26/2021	616.95
G120	08/16/2021	617.19
G121	01/19/2015	613.63
G121	04/08/2015	614.63
G121	07/23/2015	614.09
G121	10/06/2015	613.31
G121	02/08/2016	614.10
G121	05/09/2016	614.81
G121	07/25/2016	613.62
G121	11/12/2016	613.33
G121	02/04/2017	614.97
G121	05/13/2017	613.76
G121	07/08/2017	613.75
G121	05/08/2018	614.47
G121	08/02/2018	612.97
G121	10/23/2018	611.97
G121	01/15/2019	611.93
G121	08/05/2019	612.79
G121	01/20/2020	618.63
G121	08/10/2020	615.02
G121	10/13/2020	613.69
G121	01/20/2021	615.44
G121	01/27/2021	616.14
G121	04/20/2021	618.73
G121	07/26/2021	616.79
G121	08/16/2021	617.27
G122	01/19/2015	610.79

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G122	04/08/2015	615.94
G122	07/23/2015	615.26
G122	10/06/2015	614.39
G122	02/08/2016	615.52
G122	05/09/2016	616.84
G122	07/25/2016	614.06
G122	11/12/2016	614.64
G122	02/04/2017	614.14
G122	05/13/2017	614.79
G122	07/08/2017	614.05
G122	05/08/2018	615.80
G122	08/02/2018	614.64
G122	10/23/2018	613.34
G122	01/15/2019	612.94
G122	08/05/2019	613.68
G122	01/20/2020	619.39
G122	08/10/2020	613.48
G122	10/13/2020	611.41
G122	01/20/2021	613.99
G122	01/27/2021	614.08
G122	04/20/2021	620.41
G122	07/26/2021	616.92
G122	08/16/2021	617.28
G123	01/19/2015	610.84
G123	04/08/2015	612.41
G123	07/23/2015	612.76
G123	10/06/2015	611.89
G123	02/08/2016	611.74
G123	05/09/2016	611.73
G123	07/25/2016	611.91
G123	11/12/2016	612.03
G123	02/04/2017	613.56
G123	05/13/2017	612.15
G123	07/08/2017	612.17
G123	05/08/2018	612.85
G123	08/02/2018	610.60
G123	10/23/2018	610.31
G123	01/15/2019	612.58
G123	08/05/2019	616.10
G123	01/20/2020	622.79
G123	08/10/2020	615.96
G123	10/14/2020	613.01
G123	01/20/2021	615.92
G123	01/27/2021	616.24
G123	04/20/2021	622.41
G123	07/26/2021	619.35

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G123	08/16/2021	617.73
G124	01/19/2015	615.27
G124	04/08/2015	617.85
G124	07/23/2015	618.25
G124	10/06/2015	617.27
G124	02/08/2016	616.47
G124	05/09/2016	616.81
G124	07/25/2016	618.27
G124	11/12/2016	617.85
G124	02/04/2017	619.23
G124	05/13/2017	618.16
G124	07/08/2017	618.39
G124	10/21/2017	615.09
G124	05/08/2018	618.04
G124	08/02/2018	616.37
G124	10/23/2018	615.61
G124	01/15/2019	616.37
G124	08/05/2019	617.90
G124	01/20/2020	622.86
G124	08/10/2020	615.53
G124	10/14/2020	612.59
G124	01/20/2021	615.96
G124	01/27/2021	616.10
G124	04/20/2021	622.44
G124	07/26/2021	619.05
G124	08/16/2021	619.43
G125	01/19/2015	617.83
G125	04/08/2015	620.45
G125	07/23/2015	620.71
G125	10/06/2015	619.66
G125	11/16/2015	614.60
G125	02/08/2016	619.95
G125	05/09/2016	620.22
G125	07/25/2016	621.53
G125	11/12/2016	620.46
G125	02/04/2017	622.40
G125	05/13/2017	620.71
G125	07/08/2017	622.45
G125	10/21/2017	618.26
G125	01/26/2018	613.88
G125	05/08/2018	620.61
G125	08/02/2018	620.82
G125	10/23/2018	618.58
G125	01/15/2019	619.01
G125	08/05/2019	618.86
G125	01/20/2020	622.96

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G125	05/05/2020	623.39
G125	08/10/2020	615.38
G125	10/14/2020	612.46
G125	01/20/2021	615.66
G125	01/27/2021	615.66
G125	04/20/2021	622.46
G125	07/26/2021	619.11
G125	08/16/2021	619.49
G126	01/20/2015	615.22
G126	04/08/2015	616.45
G126	07/23/2015	616.34
G126	10/07/2015	614.13
G126	02/08/2016	616.12
G126	05/09/2016	616.58
G126	07/25/2016	614.82
G126	11/12/2016	615.19
G126	02/04/2017	615.39
G126	05/13/2017	615.35
G126	07/08/2017	614.88
G126	10/21/2017	612.28
G126	05/08/2018	615.00
G126	08/02/2018	614.12
G126	10/23/2018	612.36
G126	01/15/2019	612.83
G126	08/05/2019	613.30
G126	01/20/2020	616.87
G126	08/10/2020	614.91
G126	10/14/2020	613.97
G126	01/20/2021	614.95
G126	01/29/2021	615.98
G126	04/20/2021	615.68
G126	07/26/2021	615.85
G126	08/16/2021	616.05
G151	07/23/2015	615.43
G151	10/06/2015	614.86
G151	11/12/2016	614.85
G151	02/04/2017	615.49
G151	05/13/2017	614.98
G151	07/08/2017	615.38
G151	10/21/2017	612.13
G151	05/08/2018	614.95
G151	08/02/2018	614.93
G151	10/23/2018	613.11
G151	01/15/2019	613.93
G151	08/05/2019	614.12
G151	01/20/2020	615.23

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G151	08/10/2020	614.11
G151	10/13/2020	613.39
G151	01/20/2021	613.86
G151	02/01/2021	615.07
G151	04/20/2021	614.53
G151	07/26/2021	614.83
G151	08/16/2021	615.06
G152	07/23/2015	616.47
G152	10/06/2015	614.06
G152	11/12/2016	615.74
G152	02/04/2017	616.51
G152	05/13/2017	616.13
G152	07/08/2017	616.06
G152	10/21/2017	612.77
G152	05/08/2018	616.05
G152	08/02/2018	614.85
G152	10/23/2018	614.35
G152	01/15/2019	614.59
G152	08/05/2019	615.53
G152	01/20/2020	617.44
G152	08/10/2020	614.46
G152	10/13/2020	613.13
G152	01/20/2021	614.87
G152	02/01/2021	613.13
G152	04/20/2021	615.34
G152	07/26/2021	616.76
G152	08/16/2021	615.30
G153	07/23/2015	615.93
G153	10/06/2015	614.45
G153	11/12/2016	615.15
G153	02/04/2017	616.30
G153	05/13/2017	615.25
G153	07/08/2017	616.19
G153	10/21/2017	612.37
G153	05/08/2018	615.07
G153	08/02/2018	614.01
G153	10/23/2018	613.31
G153	01/15/2019	614.36
G153	08/05/2019	614.45
G153	01/20/2020	616.16
G153	08/10/2020	613.72
G153	10/13/2020	612.16
G153	01/20/2021	612.66
G153	02/01/2021	613.18
G153	04/20/2021	615.52
G153	07/26/2021	613.97

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G153	08/16/2021	614.19
G154	07/23/2015	614.85
G154	10/06/2015	612.24
G154	11/12/2016	614.68
G154	02/04/2017	615.25
G154	05/13/2017	614.93
G154	07/08/2017	613.53
G154	10/21/2017	610.33
G154	05/08/2018	614.78
G154	08/02/2018	613.75
G154	10/23/2018	613.06
G154	01/15/2019	613.66
G154	08/05/2019	613.86
G154	01/20/2020	618.28
G154	08/10/2020	612.57
G154	10/13/2020	610.84
G154	01/20/2021	612.41
G154	02/01/2021	617.01
G154	04/20/2021	614.81
G154	07/26/2021	615.21
G154	08/16/2021	615.45
G155	07/23/2015	614.45
G155	10/06/2015	613.51
G155	11/12/2016	613.93
G155	02/04/2017	614.09
G155	05/13/2017	614.59
G155	07/08/2017	614.75
G155	10/21/2017	609.91
G155	05/08/2018	614.41
G155	08/02/2018	613.68
G155	10/23/2018	612.80
G155	01/15/2019	613.56
G155	08/05/2019	613.71
G155	01/20/2020	615.99
G155	08/10/2020	613.09
G155	10/13/2020	612.10
G155	01/20/2021	612.72
G155	02/01/2021	614.59
G155	04/20/2021	613.94
G155	07/26/2021	613.81
G155	08/16/2021	614.01
G200	10/05/2015	621.05
G200	11/16/2015	621.66
G200	02/08/2016	623.29
G200	05/09/2016	622.52
G200	07/25/2016	622.82

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G200	11/12/2016	622.82
G200	02/04/2017	621.13
G200	05/13/2017	622.86
G200	07/08/2017	622.96
G200	10/21/2017	618.84
G200	01/25/2018	620.39
G200	05/08/2018	622.52
G200	08/02/2018	621.54
G200	10/23/2018	621.14
G200	01/15/2019	621.98
G200	08/05/2019	622.04
G200	01/20/2020	622.72
G200	08/10/2020	618.16
G200	10/13/2020	615.63
G200	01/20/2021	619.63
G200	01/29/2021	619.63
G200	03/29/2021	623.27
G200	04/20/2021	621.86
G200	04/21/2021	622.19
G200	05/03/2021	622.69
G200	05/06/2021	623.36
G200	05/17/2021	622.10
G200	06/09/2021	620.84
G200	06/23/2021	619.38
G200	07/12/2021	620.52
G200	07/26/2021	619.74
G200	07/28/2021	619.56
G200	08/16/2021	619.88
G205	02/08/2016	620.10
G205	05/09/2016	620.48
G205	07/25/2016	619.81
G205	11/12/2016	620.04
G205	02/04/2017	621.45
G205	05/13/2017	619.54
G205	07/08/2017	619.93
G205	10/21/2017	616.33
G206	10/07/2015	620.69
G206	11/16/2015	619.27
G206	02/08/2016	621.92
G206	05/09/2016	622.30
G206	06/27/2016	620.51
G206	07/25/2016	621.71
G206	11/12/2016	621.44
G206	02/04/2017	622.68
G206	05/13/2017	621.67
G206	07/08/2017	622.00

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G206	10/21/2017	616.61
G206	05/08/2018	620.71
G206	08/02/2018	621.87
G206	10/23/2018	619.71
G206	01/15/2019	618.82
G206	08/05/2019	621.56
G206	01/20/2020	622.76
G206	05/05/2020	623.02
G206	08/10/2020	619.92
G206	10/13/2020	617.84
G206	01/20/2021	621.50
G206	01/27/2021	621.50
G206	04/20/2021	622.07
G206	05/03/2021	622.60
G206	05/17/2021	622.31
G206	06/09/2021	621.71
G206	06/23/2021	620.54
G206	07/12/2021	622.39
G206	07/26/2021	622.00
G206	08/16/2021	622.08
G206D	03/29/2021	583.94
G206D	03/30/2021	584.34
G206D	04/20/2021	585.96
G206D	04/22/2021	584.64
G206D	05/03/2021	587.42
G206D	05/05/2021	586.96
G206D	05/17/2021	587.81
G206D	05/18/2021	587.82
G206D	06/09/2021	584.19
G206D	06/23/2021	589.66
G206D	07/12/2021	590.72
G206D	07/26/2021	591.14
G206D	07/27/2021	591.15
G206D	08/16/2021	592.00
G207	10/07/2015	620.72
G207	02/08/2016	622.18
G207	05/09/2016	622.56
G207	07/25/2016	622.06
G207	11/12/2016	622.54
G207	02/04/2017	623.24
G207	05/13/2017	623.39
G207	07/08/2017	621.31
G207	10/21/2017	619.41
G207	05/08/2018	622.96
G207	08/02/2018	623.21
G207	10/23/2018	621.64

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G207	01/15/2019	620.30
G207	08/05/2019	621.21
G207	01/20/2020	622.62
G207	08/10/2020	619.71
G207	10/13/2020	617.71
G207	01/20/2021	621.85
G207	01/28/2021	621.86
G207	04/20/2021	622.30
G207	07/26/2021	622.25
G207	08/16/2021	622.36
G208	10/07/2015	620.62
G208	02/08/2016	622.19
G208	05/09/2016	622.63
G208	07/25/2016	622.20
G208	11/12/2016	622.61
G208	02/04/2017	624.07
G208	05/13/2017	622.75
G208	07/08/2017	622.04
G208	10/21/2017	618.97
G208	05/08/2018	622.94
G208	08/02/2018	622.54
G208	10/23/2018	620.66
G208	01/15/2019	622.28
G208	08/05/2019	622.46
G208	01/20/2020	622.65
G208	08/10/2020	619.56
G208	10/13/2020	617.65
G208	01/20/2021	622.09
G208	01/27/2021	622.13
G208	04/20/2021	622.37
G208	07/26/2021	622.37
G208	08/16/2021	622.50
G209	10/07/2015	620.56
G209	11/16/2015	620.06
G209	02/08/2016	622.26
G209	05/09/2016	622.74
G209	07/25/2016	621.52
G209	11/12/2016	621.65
G209	02/04/2017	623.18
G209	05/13/2017	621.86
G209	07/08/2017	621.50
G209	10/21/2017	617.76
G209	01/25/2018	619.95
G209	05/08/2018	621.35
G209	08/02/2018	621.56
G209	10/23/2018	619.91

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G209	01/15/2019	621.80
G209	05/03/2019	623.09
G209	08/05/2019	621.46
G209	01/20/2020	622.69
G209	05/05/2020	622.96
G209	08/10/2020	619.59
G209	10/13/2020	617.69
G209	01/20/2021	621.94
G209	01/27/2021	621.94
G209	04/20/2021	622.40
G209	05/03/2021	622.82
G209	05/17/2021	622.51
G209	06/09/2021	622.03
G209	06/23/2021	620.89
G209	07/12/2021	622.08
G209	07/26/2021	622.41
G209	08/16/2021	622.56
G210	10/07/2015	619.83
G210	02/08/2016	621.72
G210	05/09/2016	622.50
G210	07/25/2016	620.94
G210	11/12/2016	621.05
G210	02/04/2017	621.69
G210	05/13/2017	620.77
G210	07/08/2017	621.03
G210	10/21/2017	616.82
G210	05/08/2018	620.19
G210	08/02/2018	620.15
G210	10/23/2018	618.92
G210	01/15/2019	620.82
G210	08/05/2019	620.50
G210	01/20/2020	622.33
G210	08/10/2020	619.97
G210	10/13/2020	618.00
G210	01/20/2021	620.58
G210	01/27/2021	620.40
G210	04/20/2021	622.18
G210	07/26/2021	622.18
G210	08/16/2021	622.28
G211	10/07/2015	619.00
G211	02/08/2016	622.08
G211	05/09/2016	622.45
G211	07/25/2016	621.81
G211	11/12/2016	621.28
G211	02/04/2017	622.15
G211	05/13/2017	621.34

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G211	07/08/2017	622.09
G211	10/21/2017	618.14
G211	05/08/2018	620.69
G211	08/02/2018	620.63
G211	10/23/2018	619.52
G211	01/15/2019	620.22
G211	08/05/2019	620.66
G211	01/20/2020	622.20
G211	08/10/2020	619.83
G211	10/13/2020	617.77
G211	01/20/2021	620.22
G211	01/27/2021	620.50
G211	04/20/2021	622.04
G211	07/26/2021	621.82
G211	08/16/2021	621.91
G212	10/07/2015	620.76
G212	11/16/2015	618.54
G212	02/08/2016	621.99
G212	05/09/2016	622.04
G212	07/25/2016	620.89
G212	11/12/2016	621.00
G212	02/04/2017	621.87
G212	05/13/2017	621.32
G212	07/08/2017	620.81
G212	10/21/2017	617.19
G212	05/08/2018	620.82
G212	08/02/2018	620.80
G212	10/23/2018	619.43
G212	01/15/2019	621.13
G212	08/05/2019	620.26
G212	01/20/2020	622.10
G212	08/10/2020	619.14
G212	10/13/2020	616.90
G212	01/20/2021	620.08
G212	01/26/2021	620.08
G212	04/20/2021	621.60
G212	05/03/2021	622.12
G212	05/17/2021	621.74
G212	06/09/2021	621.19
G212	06/23/2021	619.96
G212	06/29/2021	620.08
G212	07/12/2021	620.55
G212	07/26/2021	621.13
G212	08/16/2021	621.41
G213	10/07/2015	620.21
G213	02/08/2016	621.20

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G213	05/09/2016	621.69
G213	07/25/2016	620.36
G213	11/12/2016	620.78
G213	02/04/2017	621.21
G213	05/13/2017	621.16
G213	07/08/2017	620.40
G213	10/21/2017	618.62
G213	05/08/2018	620.88
G213	08/02/2018	620.35
G213	10/23/2018	619.83
G213	01/15/2019	620.81
G213	08/05/2019	621.08
G213	01/20/2020	621.72
G213	08/10/2020	618.66
G213	10/13/2020	616.56
G213	01/20/2021	619.61
G213	01/27/2021	619.97
G213	04/20/2021	621.28
G213	07/26/2021	620.96
G213	08/16/2021	621.20
G214	10/07/2015	617.56
G214	02/08/2016	618.11
G214	05/09/2016	619.39
G214	07/25/2016	617.75
G214	11/12/2016	618.16
G214	02/04/2017	618.77
G214	05/13/2017	618.51
G214	07/08/2017	618.25
G214	10/21/2017	614.52
G214	05/08/2018	618.17
G214	08/02/2018	617.35
G214	10/23/2018	616.87
G214	01/15/2019	618.57
G214	08/05/2019	616.99
G214	01/20/2020	619.38
G214	08/10/2020	616.32
G214	10/13/2020	614.47
G214	01/20/2021	616.45
G214	01/27/2021	616.64
G214	04/20/2021	618.60
G214	07/26/2021	618.39
G214	08/16/2021	618.55
G215	10/07/2015	616.56
G215	11/16/2015	616.38
G215	02/08/2016	618.31
G215	05/09/2016	619.45

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G215	07/25/2016	617.10
G215	11/12/2016	617.91
G215	02/04/2017	618.34
G215	05/13/2017	618.16
G215	07/08/2017	617.01
G215	10/21/2017	615.48
G215	05/08/2018	617.80
G215	08/02/2018	618.00
G215	10/23/2018	616.26
G215	01/15/2019	618.03
G215	08/05/2019	617.55
G215	01/20/2020	619.51
G215	08/10/2020	617.11
G215	10/14/2020	618.58
G215	01/20/2021	617.19
G215	01/26/2021	617.19
G215	04/20/2021	618.83
G215	05/03/2021	619.20
G215	05/17/2021	619.10
G215	06/09/2021	618.65
G215	06/23/2021	617.45
G215	06/29/2021	617.72
G215	07/12/2021	618.24
G215	07/26/2021	618.79
G215	08/16/2021	618.91
G216	10/07/2015	616.66
G216	02/08/2016	618.74
G216	05/09/2016	619.81
G216	07/25/2016	617.68
G216	11/12/2016	617.68
G216	02/04/2017	618.06
G216	05/13/2017	617.76
G216	07/08/2017	617.21
G216	10/21/2017	614.37
G216	05/08/2018	616.88
G216	08/02/2018	616.99
G216	10/23/2018	615.92
G216	01/15/2019	616.96
G216	08/05/2019	618.04
G216	01/20/2020	619.86
G216	08/10/2020	617.54
G216	10/14/2020	615.85
G216	01/20/2021	617.65
G216	01/28/2021	617.48
G216	04/20/2021	619.25
G216	07/26/2021	619.20

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G216	08/16/2021	619.30
G217	10/07/2015	616.71
G217	02/08/2016	618.25
G217	05/09/2016	619.13
G217	07/25/2016	617.81
G217	11/12/2016	617.81
G217	02/04/2017	618.13
G217	05/13/2017	618.04
G217	07/08/2017	618.12
G217	10/21/2017	614.32
G217	05/08/2018	617.21
G217	08/02/2018	617.06
G217	10/23/2018	616.17
G217	01/15/2019	617.10
G217	08/05/2019	617.10
G217	01/20/2020	619.01
G217	08/10/2020	616.20
G217	10/14/2020	614.57
G217	01/20/2021	616.74
G217	01/28/2021	616.84
G217	04/20/2021	618.45
G217	07/26/2021	617.93
G217	08/16/2021	618.04
G218	10/07/2015	616.93
G218	11/16/2015	617.11
G218	02/08/2016	619.05
G218	05/09/2016	620.10
G218	07/25/2016	618.01
G218	11/12/2016	618.39
G218	02/04/2017	618.19
G218	05/13/2017	618.56
G218	07/08/2017	618.19
G218	10/21/2017	614.46
G218	01/26/2018	616.46
G218	05/08/2018	617.87
G218	08/02/2018	618.01
G218	10/23/2018	616.66
G218	01/15/2019	617.21
G218	08/05/2019	617.86
G218	01/20/2020	619.93
G218	08/10/2020	617.42
G218	10/14/2020	615.65
G218	01/20/2021	617.53
G218	01/26/2021	617.53
G218	04/20/2021	619.53
G218	05/03/2021	619.90

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G218	05/17/2021	619.72
G218	06/09/2021	619.32
G218	06/23/2021	617.87
G218	07/12/2021	618.60
G218	07/26/2021	619.11
G218	08/16/2021	619.33
G270	10/05/2015	616.07
G270	11/16/2015	621.06
G270	02/08/2016	622.94
G270	05/09/2016	622.77
G270	07/25/2016	617.73
G270	11/12/2016	618.31
G270	02/04/2017	619.02
G270	05/13/2017	618.83
G270	07/08/2017	617.99
G270	10/21/2017	614.45
G270	05/08/2018	618.76
G270	08/02/2018	616.56
G270	10/23/2018	617.01
G270	01/15/2019	618.46
G270	08/05/2019	622.12
G270	01/20/2020	622.11
G270	08/10/2020	618.11
G270	10/14/2020	616.17
G270	01/20/2021	622.51
G270	01/21/2021	622.57
G270	03/29/2021	623.38
G270	03/30/2021	623.44
G270	04/20/2021	622.74
G270	04/21/2021	622.85
G270	05/03/2021	623.08
G270	05/06/2021	623.27
G270	05/17/2021	622.87
G270	05/19/2021	623.30
G270	06/09/2021	621.75
G270	06/15/2021	620.09
G270	06/23/2021	619.06
G270	06/29/2021	621.69
G270	07/12/2021	622.56
G270	07/26/2021	622.39
G270	07/27/2021	622.30
G270	08/16/2021	622.54
G271	10/08/2015	614.12
G271	11/16/2015	613.77
G271	02/08/2016	615.87
G271	05/09/2016	616.05

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G271	07/25/2016	616.62
G271	11/12/2016	616.49
G271	02/04/2017	617.95
G271	05/13/2017	616.46
G271	07/08/2017	616.47
G271	07/17/2017	616.47
G271	10/21/2017	613.31
G271	05/08/2018	615.70
G271	08/02/2018	615.70
G271	10/23/2018	614.73
G271	01/15/2019	617.40
G271	08/05/2019	617.63
G271	01/20/2020	617.83
G271	08/10/2020	614.18
G271	08/13/2020	614.18
G271	10/14/2020	612.90
G271	01/20/2021	613.91
G271	02/01/2021	613.91
G271	04/20/2021	615.51
G271	05/03/2021	615.96
G271	05/17/2021	615.78
G271	06/09/2021	615.52
G271	06/23/2021	615.02
G271	07/12/2021	615.57
G271	07/26/2021	615.67
G271	08/16/2021	615.78
G272	10/08/2015	612.56
G272	02/08/2016	614.93
G272	05/09/2016	614.96
G272	07/25/2016	614.79
G272	11/12/2016	614.34
G272	02/04/2017	615.08
G272	05/13/2017	614.23
G272	07/08/2017	615.12
G272	10/21/2017	611.45
G272	05/08/2018	613.58
G272	08/02/2018	613.44
G272	10/23/2018	612.96
G272	01/15/2019	615.43
G272	08/05/2019	616.88
G272	01/20/2020	616.49
G272	08/10/2020	613.19
G272	10/14/2020	611.89
G272	01/20/2021	613.01
G272	02/01/2021	616.48
G272	04/20/2021	614.50

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G272	07/26/2021	614.44
G272	08/16/2021	614.47
G273	10/08/2015	610.41
G273	11/16/2015	611.82
G273	02/08/2016	613.26
G273	05/09/2016	612.83
G273	07/25/2016	611.27
G273	11/12/2016	610.83
G273	02/04/2017	611.47
G273	05/13/2017	610.77
G273	07/08/2017	611.29
G273	07/17/2017	611.29
G273	10/21/2017	608.91
G273	05/08/2018	610.16
G273	08/02/2018	610.46
G273	10/23/2018	608.82
G273	01/15/2019	610.28
G273	08/05/2019	610.23
G273	01/20/2020	614.20
G273	08/10/2020	611.52
G273	08/13/2020	611.52
G273	10/14/2020	610.31
G273	01/20/2021	611.52
G273	02/01/2021	611.52
G273	04/20/2021	612.42
G273	05/03/2021	612.90
G273	05/17/2021	612.63
G273	06/09/2021	612.24
G273	06/23/2021	611.79
G273	07/12/2021	612.22
G273	07/26/2021	612.35
G273	08/16/2021	613.52
G274	10/08/2015	610.06
G274	02/08/2016	610.22
G274	05/09/2016	609.97
G274	07/25/2016	611.06
G274	11/12/2016	610.86
G274	02/04/2017	612.00
G274	05/13/2017	611.18
G274	07/08/2017	611.55
G274	10/21/2017	607.79
G274	05/08/2018	610.84
G274	08/02/2018	611.44
G274	10/23/2018	609.52
G274	01/15/2019	611.23
G274	08/05/2019	611.31

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G274	01/20/2020	611.23
G274	08/10/2020	609.29
G274	10/14/2020	608.49
G274	01/20/2021	610.36
G274	02/01/2021	611.18
G274	04/20/2021	609.89
G274	07/26/2021	609.82
G274	08/16/2021	609.88
G275	02/08/2016	604.71
G275	05/09/2016	604.76
G275	07/25/2016	603.17
G275	11/12/2016	604.28
G275	02/04/2017	603.65
G275	05/13/2017	604.67
G275	07/08/2017	602.97
G275	05/08/2018	604.26
G275	08/02/2018	604.16
G275	10/23/2018	604.46
G275	01/15/2019	605.91
G275	08/05/2019	605.97
G275	01/20/2020	605.63
G275	08/10/2020	604.95
G275	01/20/2021	605.02
G275	04/20/2021	605.00
G275	07/13/2021	605.63
G275	07/26/2021	605.05
G275	08/16/2021	605.09
G275D	03/30/2021	570.32
G275D	04/20/2021	570.98
G275D	04/22/2021	568.33
G275D	05/03/2021	569.75
G275D	05/05/2021	570.26
G275D	05/17/2021	568.67
G275D	05/18/2021	569.00
G275D	06/09/2021	570.31
G275D	06/23/2021	569.71
G275D	07/12/2021	570.43
G275D	07/26/2021	570.35
G275D	07/28/2021	570.68
G275D	08/16/2021	571.48
G276	11/16/2015	603.25
G276	02/08/2016	603.71
G276	05/09/2016	604.71
G276	07/25/2016	604.92
G276	11/12/2016	603.60
G276	02/04/2017	603.72

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G276	05/13/2017	603.40
G276	07/08/2017	604.05
G276	07/18/2017	604.05
G276	05/08/2018	603.11
G276	08/02/2018	606.60
G276	10/23/2018	603.35
G276	01/15/2019	604.00
G276	08/05/2019	603.96
G276	01/20/2020	605.08
G276	08/10/2020	604.63
G276	08/12/2020	604.63
G276	10/14/2020	603.59
G276	01/20/2021	603.71
G276	04/20/2021	604.65
G276	05/03/2021	604.71
G276	05/17/2021	604.88
G276	06/09/2021	604.93
G276	06/23/2021	604.53
G276	06/28/2021	604.58
G276	07/12/2021	604.55
G276	07/26/2021	604.68
G276	08/16/2021	604.73
G277	02/08/2016	602.98
G277	05/09/2016	603.79
G277	07/25/2016	602.08
G277	11/12/2016	601.23
G277	02/04/2017	603.58
G277	05/13/2017	601.29
G277	07/08/2017	603.09
G277	10/21/2017	601.53
G277	10/23/2018	601.28
G277	01/15/2019	603.38
G277	08/05/2019	602.15
G277	01/20/2020	603.49
G277	08/10/2020	603.29
G277	04/20/2021	603.33
G277	07/26/2021	603.33
G278	02/08/2016	606.56
G278	05/09/2016	607.00
G278	07/25/2016	604.57
G278	11/12/2016	604.29
G278	02/04/2017	606.38
G278	05/13/2017	604.30
G278	07/08/2017	604.84
G278	10/21/2017	604.54
G278	05/08/2018	605.31

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G278	08/02/2018	604.57
G278	10/23/2018	604.29
G278	01/15/2019	605.40
G278	08/05/2019	605.19
G278	01/20/2020	608.15
G278	08/10/2020	606.83
G278	10/14/2020	605.55
G278	01/20/2021	605.18
G278	04/20/2021	606.47
G278	07/26/2021	607.49
G278	08/16/2021	607.62
G279	10/08/2015	608.14
G279	11/16/2015	607.80
G279	02/08/2016	609.16
G279	05/09/2016	610.17
G279	07/25/2016	606.94
G279	11/12/2016	606.93
G279	02/04/2017	607.96
G279	05/13/2017	606.74
G279	07/08/2017	607.04
G279	07/18/2017	607.04
G279	05/08/2018	606.42
G279	08/02/2018	605.87
G279	10/23/2018	604.87
G279	01/15/2019	606.79
G279	08/05/2019	605.90
G279	01/20/2020	611.08
G279	08/10/2020	607.17
G279	08/12/2020	607.17
G279	10/14/2020	605.54
G279	01/20/2021	607.07
G279	01/28/2021	607.07
G279	04/20/2021	608.97
G279	05/03/2021	609.38
G279	05/17/2021	609.22
G279	06/09/2021	599.69
G279	06/23/2021	607.74
G279	07/12/2021	608.18
G279	07/26/2021	608.57
G279	08/16/2021	608.95
G280	10/08/2015	614.54
G280	11/16/2015	618.45
G280	02/08/2016	621.37
G280	05/09/2016	621.94
G280	07/25/2016	618.21
G280	11/12/2016	618.46

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G280	02/04/2017	619.10
G280	05/13/2017	618.56
G280	07/08/2017	619.45
G280	07/18/2017	619.45
G280	10/21/2017	614.47
G280	05/08/2018	618.00
G280	08/02/2018	616.70
G280	10/23/2018	615.75
G280	01/15/2019	616.24
G280	08/05/2019	616.09
G280	01/20/2020	622.33
G280	08/10/2020	619.50
G280	08/11/2020	619.50
G280	10/14/2020	617.45
G280	01/20/2021	618.20
G280	01/28/2021	618.70
G280	03/29/2021	620.61
G280	03/30/2021	621.22
G280	04/20/2021	619.76
G280	04/22/2021	620.13
G280	05/03/2021	620.21
G280	05/06/2021	620.89
G280	05/17/2021	619.98
G280	05/19/2021	620.72
G280	06/09/2021	619.75
G280	06/23/2021	618.93
G280	06/28/2021	619.02
G280	07/12/2021	619.26
G280	07/13/2021	619.50
G280	07/26/2021	619.75
G280	07/27/2021	619.66
G280	08/16/2021	620.00
G281	11/16/2015	619.56
G281	02/08/2016	621.21
G281	05/09/2016	620.93
G281	07/25/2016	620.30
G281	11/12/2016	620.01
G281	02/04/2017	620.37
G281	05/13/2017	619.96
G281	07/08/2017	619.17
G281	10/21/2017	616.41
G281	05/08/2018	619.33
G281	08/02/2018	618.36
G281	10/23/2018	617.26
G281	01/15/2019	618.19
G281	08/05/2019	620.16

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G281	01/20/2020	621.26
G281	08/10/2020	619.26
G281	01/20/2021	619.36
G281	01/29/2021	619.36
G281	03/29/2021	621.68
G281	03/31/2021	621.29
G281	04/20/2021	619.62
G281	04/21/2021	619.77
G281	05/03/2021	620.60
G281	05/05/2021	620.85
G281	05/17/2021	620.13
G281	06/09/2021	619.65
G281	06/14/2021	619.46
G281	06/23/2021	618.71
G281	06/28/2021	619.77
G281	07/12/2021	620.23
G281	07/26/2021	620.02
G281	07/27/2021	619.92
G281	08/16/2021	619.81
G283	03/29/2021	607.80
G283	03/31/2021	607.34
G283	04/20/2021	606.34
G283	04/22/2021	606.09
G283	05/03/2021	606.81
G283	05/06/2021	606.79
G283	05/17/2021	606.30
G283	05/18/2021	606.54
G283	06/09/2021	605.13
G283	06/15/2021	604.95
G283	06/23/2021	604.56
G283	06/29/2021	605.29
G283	07/12/2021	605.50
G283	07/13/2021	605.82
G283	07/26/2021	605.18
G283	07/27/2021	605.08
G283	08/16/2021	605.12
G284	03/29/2021	611.14
G284	03/30/2021	610.95
G284	04/20/2021	608.16
G284	04/21/2021	607.65
G284	05/03/2021	609.33
G284	05/06/2021	610.72
G284	05/17/2021	608.16
G284	05/18/2021	609.49
G284	06/09/2021	607.07
G284	06/14/2021	606.95

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G284	06/23/2021	606.17
G284	06/28/2021	608.02
G284	07/12/2021	607.68
G284	07/13/2021	607.69
G284	07/26/2021	607.11
G284	07/27/2021	606.95
G284	08/16/2021	606.98
G285	03/29/2021	608.62
G285	03/30/2021	608.81
G285	04/20/2021	608.13
G285	04/22/2021	603.79
G285	05/03/2021	606.99
G285	05/06/2021	607.57
G285	05/17/2021	607.47
G285	05/18/2021	607.51
G285	06/09/2021	607.39
G285	06/15/2021	607.08
G285	06/23/2021	604.33
G285	06/28/2021	604.93
G285	07/12/2021	604.80
G285	07/13/2021	604.92
G285	07/26/2021	605.27
G285	07/27/2021	605.37
G285	08/16/2021	606.28
G286	03/29/2021	609.08
G286	03/31/2021	608.22
G286	04/20/2021	606.63
G286	04/22/2021	606.15
G286	05/03/2021	606.97
G286	05/06/2021	608.56
G286	05/17/2021	606.44
G286	05/18/2021	606.57
G286	06/09/2021	604.68
G286	06/15/2021	602.98
G286	07/12/2021	605.90
G286	07/13/2021	606.00
G287	03/29/2021	610.22
G287	04/20/2021	608.67
G287	04/22/2021	608.03
G287	05/03/2021	609.28
G287	05/06/2021	610.29
G287	05/17/2021	608.41
G287	05/18/2021	609.32
G287	06/09/2021	607.59
G287	06/14/2021	617.45
G287	07/12/2021	610.83

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G287	07/13/2021	607.78
G287	08/16/2021	607.76
G288	03/29/2021	616.32
G288	03/30/2021	615.89
G288	04/20/2021	613.90
G288	04/21/2021	613.56
G288	05/03/2021	614.51
G288	05/06/2021	616.00
G288	05/17/2021	613.87
G288	05/18/2021	616.15
G288	06/09/2021	612.90
G288	06/15/2021	612.47
G288	06/23/2021	611.90
G288	06/28/2021	612.91
G288	07/12/2021	613.59
G288	07/13/2021	615.11
G288	07/26/2021	612.85
G288	07/27/2021	612.75
G288	08/16/2021	612.98
G301	11/16/2015	616.51
G301	02/08/2016	617.21
G301	05/09/2016	616.75
G301	07/25/2016	614.65
G301	11/12/2016	614.08
G301	02/04/2017	614.15
G301	05/13/2017	614.15
G301	07/08/2017	614.88
G301	10/21/2017	610.39
G301	05/08/2018	613.73
G301	08/02/2018	615.05
G301	10/23/2018	612.46
G301	01/15/2019	613.23
G301	08/05/2019	613.82
G301	01/20/2020	618.07
G301	08/10/2020	615.16
G301	01/20/2021	616.03
G301	01/27/2021	616.03
G301	04/20/2021	616.05
G301	05/03/2021	616.12
G301	05/17/2021	615.99
G301	06/09/2021	615.63
G301	06/23/2021	615.02
G301	07/12/2021	615.79
G301	07/26/2021	615.31
G301	08/16/2021	615.45
G302	11/16/2015	610.74

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G302	02/08/2016	613.14
G302	05/09/2016	614.60
G302	07/25/2016	608.16
G302	11/12/2016	607.92
G302	02/04/2017	608.95
G302	05/13/2017	608.02
G302	07/08/2017	608.42
G302	10/21/2017	604.64
G302	05/08/2018	607.59
G302	08/02/2018	608.26
G302	10/23/2018	605.54
G302	01/15/2019	607.29
G302	08/05/2019	609.95
G302	01/20/2020	615.41
G302	08/10/2020	608.05
G302	01/20/2021	609.99
G302	01/27/2021	609.99
G302	04/20/2021	611.85
G302	05/03/2021	612.07
G302	05/17/2021	612.06
G302	06/09/2021	610.29
G302	06/23/2021	608.79
G302	07/12/2021	611.79
G302	07/26/2021	610.98
G302	08/16/2021	611.77
G303	11/16/2015	616.70
G303	02/08/2016	617.87
G303	05/09/2016	617.97
G303	07/25/2016	614.92
G303	11/12/2016	614.38
G303	02/04/2017	614.95
G303	05/13/2017	614.81
G303	07/08/2017	614.97
G303	10/21/2017	611.18
G303	05/08/2018	614.16
G303	08/02/2018	614.06
G303	10/23/2018	613.05
G303	01/15/2019	614.33
G303	08/05/2019	617.37
G303	01/20/2020	618.05
G303	08/10/2020	615.16
G303	01/20/2021	616.17
G303	01/26/2021	616.17
G303	04/20/2021	617.27
G303	05/03/2021	618.02
G303	05/17/2021	617.37

RAMBOLL

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G303	06/09/2021	616.52
G303	06/23/2021	614.92
G303	07/12/2021	617.15
G303	07/26/2021	616.44
G303	08/16/2021	616.58
G304	11/16/2015	623.78
G304	02/08/2016	624.07
G304	05/09/2016	623.91
G304	07/25/2016	626.72
G305	05/09/2016	618.48
G305	07/01/2016	616.28
G305	07/25/2016	618.24
G305	09/29/2016	617.33
G305	11/12/2016	618.06
G305	02/04/2017	620.49
G305	05/13/2017	618.27
G305	07/08/2017	618.28
G305	10/21/2017	615.30
G305	05/08/2018	617.87
G305	08/02/2018	617.79
G305	10/23/2018	616.56
G305	01/15/2019	616.95
G305	08/05/2019	616.85
G305	01/20/2020	619.36
G305	08/10/2020	617.02
G305	01/20/2021	618.63
G305	04/20/2021	618.77
G305	05/03/2021	619.11
G305	05/17/2021	618.90
G305	06/09/2021	618.04
G305	06/23/2021	616.94
G305	07/12/2021	618.55
G305	07/26/2021	618.18
G305	08/16/2021	618.31
G306	05/09/2016	619.74
G306	07/01/2016	615.11
G306	07/25/2016	619.26
G306	09/29/2016	617.64
G306	11/12/2016	618.77
G306	02/04/2017	618.97
G306	05/13/2017	619.03
G306	07/08/2017	619.45
G306	10/21/2017	616.12
G306	05/08/2018	618.96
G306	08/02/2018	621.73
G306	10/23/2018	617.24

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G306	01/15/2019	618.56
G306	08/05/2019	619.18
G306	01/20/2020	620.28
G306	08/10/2020	617.26
G306	01/20/2021	619.17
G306	01/26/2021	618.98
G306	03/29/2021	620.42
G306	04/20/2021	619.30
G306	04/21/2021	619.53
G306	05/03/2021	619.96
G306	05/05/2021	620.27
G306	05/17/2021	619.44
G306	05/18/2021	619.56
G306	06/09/2021	618.04
G306	06/15/2021	617.29
G306	06/23/2021	616.32
G306	06/28/2021	618.31
G306	07/12/2021	620.59
G306	07/14/2021	620.17
G306	07/26/2021	618.84
G306	07/27/2021	618.70
G306	08/16/2021	618.92
G307	07/25/2016	624.30
G307	09/29/2016	623.85
G307	11/12/2016	624.44
G307	02/04/2017	624.60
G307	05/13/2017	624.56
G307	07/08/2017	623.55
G307	10/21/2017	624.60
G307	05/08/2018	624.37
G307	08/02/2018	619.33
G307	10/23/2018	623.95
G307	01/15/2019	624.31
G307	08/05/2019	624.21
G307	05/06/2020	624.72
G307	08/10/2020	624.36
G307	01/20/2021	624.10
G307	01/27/2021	624.10
G307	04/20/2021	624.50
G307	05/17/2021	624.45
G307	07/12/2021	624.45
G307	08/16/2021	624.46
G307D	03/29/2021	622.43
G307D	04/20/2021	622.48
G307D	04/21/2021	622.46
G307D	05/03/2021	622.47

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G307D	05/04/2021	622.44
G307D	05/17/2021	622.44
G307D	05/18/2021	622.46
G307D	06/09/2021	622.43
G307D	06/15/2021	622.42
G307D	06/23/2021	622.42
G307D	07/12/2021	622.59
G307D	07/26/2021	622.26
G307D	07/27/2021	622.51
G307D	08/16/2021	621.49
G308	03/29/2021	621.03
G308	04/20/2021	619.67
G308	04/21/2021	620.15
G308	05/03/2021	620.04
G308	05/05/2021	621.01
G308	05/17/2021	619.93
G308	06/09/2021	619.17
G308	06/14/2021	619.06
G308	06/23/2021	618.54
G308	06/28/2021	620.44
G308	07/12/2021	620.22
G308	07/14/2021	620.67
G308	07/26/2021	619.68
G308	07/27/2021	619.44
G308	08/16/2021	619.45
G309	03/29/2021	621.09
G309	04/20/2021	618.88
G309	04/21/2021	618.88
G309	04/22/2021	618.88
G309	05/03/2021	619.04
G309	05/05/2021	619.84
G309	05/17/2021	618.83
G309	06/09/2021	618.43
G309	06/14/2021	618.25
G309	06/23/2021	617.89
G309	06/28/2021	618.95
G309	07/12/2021	619.31
G309	07/13/2021	620.17
G309	07/26/2021	618.88
G309	07/27/2021	618.78
G309	08/16/2021	618.91
G310	03/29/2021	617.27
G310	04/20/2021	614.41
G310	04/22/2021	614.40
G310	05/03/2021	614.61
G310	05/04/2021	615.01

RAMBOLL

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G310	05/17/2021	614.47
G310	05/19/2021	616.01
G310	06/09/2021	613.83
G310	06/15/2021	613.54
G310	06/23/2021	613.20
G310	06/28/2021	614.15
G310	07/12/2021	614.81
G310	07/13/2021	615.88
G310	07/26/2021	614.13
G310	07/28/2021	614.00
G310	08/16/2021	614.29
G311	03/29/2021	616.54
G311	03/30/2021	616.21
G311	04/20/2021	613.75
G311	04/22/2021	613.68
G311	05/03/2021	614.01
G311	05/04/2021	615.13
G311	05/17/2021	613.86
G311	05/19/2021	615.78
G311	06/09/2021	613.13
G311	06/15/2021	612.78
G311	06/23/2021	612.45
G311	06/29/2021	613.31
G311	07/12/2021	613.75
G311	07/14/2021	615.37
G311	07/26/2021	613.05
G311	07/27/2021	612.94
G311	08/16/2021	613.30
G311D	03/29/2021	575.42
G311D	03/30/2021	575.73
G311D	04/20/2021	575.29
G311D	04/22/2021	575.74
G311D	05/03/2021	573.09
G311D	05/04/2021	573.23
G311D	05/17/2021	572.40
G311D	05/19/2021	572.91
G311D	06/09/2021	573.85
G311D	06/15/2021	575.25
G311D	06/23/2021	571.74
G311D	07/12/2021	571.63
G311D	07/26/2021	569.74
G311D	07/28/2021	569.98
G311D	08/16/2021	570.34
G312	03/29/2021	612.19
G312	03/30/2021	611.97
G312	04/20/2021	609.11

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G312	04/22/2021	608.97
G312	05/03/2021	609.47
G312	05/04/2021	610.07
G312	05/17/2021	609.27
G312	05/19/2021	610.89
G312	06/09/2021	608.31
G312	06/15/2021	607.64
G312	06/23/2021	606.99
G312	06/29/2021	608.07
G312	07/12/2021	608.70
G312	07/13/2021	610.23
G312	07/26/2021	608.56
G312	07/27/2021	608.47
G312	08/16/2021	609.09
G313	03/29/2021	611.78
G313	03/30/2021	611.75
G313	04/20/2021	611.46
G313	04/22/2021	611.41
G313	05/03/2021	611.68
G313	05/04/2021	611.66
G313	05/17/2021	611.62
G313	05/18/2021	611.66
G313	06/09/2021	611.57
G313	06/14/2021	611.55
G313	06/23/2021	611.29
G313	06/28/2021	611.58
G313	07/12/2021	611.70
G313	07/13/2021	611.81
G313	07/26/2021	611.71
G313	07/27/2021	611.73
G313	08/16/2021	611.90
G314	03/29/2021	596.40
G314	03/30/2021	597.11
G314	04/20/2021	603.16
G314	04/21/2021	603.48
G314	05/03/2021	604.66
G314	05/04/2021	604.64
G314	05/17/2021	605.61
G314	06/09/2021	607.54
G314	06/14/2021	608.16
G314	06/23/2021	605.19
G314	06/28/2021	606.45
G314	07/12/2021	605.32
G314	07/13/2021	605.60
G314	07/26/2021	606.66
G314	07/27/2021	606.84

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G314	08/16/2021	608.60
G314D	03/29/2021	572.75
G314D	03/30/2021	573.05
G314D	04/20/2021	571.76
G314D	04/21/2021	571.95
G314D	05/03/2021	568.77
G314D	05/04/2021	568.95
G314D	05/17/2021	566.84
G314D	05/19/2021	566.84
G314D	06/09/2021	567.45
G314D	06/14/2021	568.60
G314D	06/23/2021	566.77
G314D	07/12/2021	566.88
G314D	07/26/2021	566.65
G314D	07/28/2021	566.75
G314D	08/16/2021	567.28
G315	03/29/2021	621.24
G315	03/30/2021	621.20
G315	04/20/2021	621.05
G315	04/22/2021	621.12
G315	05/03/2021	621.13
G315	05/05/2021	621.25
G315	05/17/2021	621.14
G315	05/18/2021	621.34
G315	06/09/2021	620.24
G315	06/15/2021	619.70
G315	06/23/2021	619.17
G315	06/29/2021	621.04
G315	07/12/2021	620.91
G315	07/14/2021	621.13
G315	07/26/2021	620.42
G315	07/28/2021	620.44
G315	08/16/2021	620.29
G316	03/29/2021	591.63
G316	03/30/2021	591.55
G316	04/20/2021	591.23
G316	04/22/2021	591.31
G316	05/03/2021	591.39
G316	05/05/2021	591.63
G316	05/17/2021	591.28
G316	06/09/2021	581.54
G316	06/14/2021	590.61
G316	06/23/2021	590.06
G316	06/28/2021	591.40
G316	07/12/2021	591.16
G316	07/13/2021	591.50

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G316	07/26/2021	590.73
G316	07/27/2021	590.68
G316	08/16/2021	590.59
G317	03/29/2021	610.40
G317	03/30/2021	610.89
G317	04/20/2021	610.94
G317	04/22/2021	610.84
G317	05/03/2021	611.75
G317	05/05/2021	611.15
G317	05/17/2021	611.65
G317	05/18/2021	611.57
G317	06/09/2021	610.59
G317	06/15/2021	609.63
G317	06/23/2021	606.57
G317	06/28/2021	608.25
G317	07/12/2021	607.93
G317	07/13/2021	607.92
G317	07/26/2021	608.27
G317	07/28/2021	608.11
G317	08/16/2021	608.46
G401	11/16/2015	607.82
G401	02/08/2016	608.14
G401	05/09/2016	608.00
G401	07/25/2016	608.47
G401	11/12/2016	607.84
G401	02/04/2017	609.74
G401	05/13/2017	608.52
G401	07/08/2017	609.19
G401	05/08/2018	609.37
G401	08/02/2018	609.80
G401	10/23/2018	608.42
G401	01/15/2019	608.36
G401	08/05/2019	608.45
G401	01/20/2020	607.25
G401	05/06/2020	607.02
G401	08/10/2020	606.77
G401	01/29/2021	604.22
G401	04/20/2021	604.14
G401	07/26/2021	603.94
G401	08/16/2021	604.04
G402	11/16/2015	604.02
G402	02/08/2016	604.90
G402	05/09/2016	605.18
G402	07/25/2016	604.33
G402	11/12/2016	604.24
G402	02/04/2017	604.43

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G402	05/13/2017	604.83
G402	07/08/2017	604.42
G402	10/21/2017	600.77
G402	05/08/2018	605.36
G402	08/02/2018	603.82
G402	10/23/2018	602.25
G402	01/15/2019	602.37
G402	08/05/2019	603.82
G402	01/20/2020	605.12
G402	08/10/2020	602.09
G402	01/20/2021	603.01
G402	01/28/2021	603.01
G402	04/20/2021	603.78
G402	07/26/2021	602.83
G402	08/16/2021	603.29
G403	11/16/2015	621.81
G403	02/08/2016	621.78
G403	05/09/2016	621.76
G403	07/25/2016	622.16
G403	11/12/2016	621.80
G403	02/04/2017	622.45
G403	05/13/2017	622.26
G403	07/08/2017	622.16
G403	10/21/2017	618.36
G403	05/08/2018	621.66
G403	08/02/2018	622.38
G403	10/23/2018	619.48
G403	01/15/2019	620.51
G403	08/05/2019	621.64
G403	01/20/2020	621.63
G403	08/10/2020	621.14
G403	01/20/2021	619.88
G403	01/21/2021	619.88
G403	04/20/2021	619.41
G403	07/26/2021	619.56
G403	08/16/2021	619.27
G404	11/16/2015	611.67
G404	02/08/2016	611.58
G404	05/09/2016	611.46
G404	07/25/2016	611.67
G404	11/12/2016	610.58
G404	02/04/2017	610.57
G404	05/13/2017	610.87
G404	07/08/2017	611.75
G404	10/21/2017	607.58
G404	05/08/2018	611.42

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G404	08/02/2018	610.55
G404	10/23/2018	608.59
G404	01/15/2019	608.98
G404	08/05/2019	611.60
G404	01/20/2020	612.14
G404	08/10/2020	610.37
G404	01/20/2021	611.63
G404	01/21/2021	611.63
G404	04/20/2021	611.51
G404	07/26/2021	611.29
G404	08/16/2021	610.95
G405	11/16/2015	618.85
G405	02/08/2016	618.90
G405	05/09/2016	618.99
G405	07/25/2016	618.51
G405	11/12/2016	618.48
G405	02/04/2017	618.47
G405	05/13/2017	618.74
G405	07/08/2017	618.54
G405	10/21/2017	614.47
G405	05/08/2018	618.94
G405	08/02/2018	617.55
G405	10/23/2018	616.40
G405	01/15/2019	616.81
G405	08/05/2019	617.72
G405	01/20/2020	619.28
G405	08/10/2020	617.62
G405	01/20/2021	617.12
G405	01/21/2021	617.12
G405	04/20/2021	617.13
G405	07/26/2021	617.37
G405	08/16/2021	617.28
G406	11/12/2016	616.01
G406	02/04/2017	617.52
G406	05/13/2017	616.20
G406	07/08/2017	616.29
G406	10/21/2017	611.27
G406	05/08/2018	615.47
G406	08/02/2018	615.75
G406	10/23/2018	614.11
G406	01/15/2019	615.36
G406	08/05/2019	616.50
G406	01/20/2020	617.48
G406	08/10/2020	615.54
G406	01/20/2021	612.97
G406	04/20/2021	613.78

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
G406	07/26/2021	614.20
G406	08/16/2021	613.82
G407	11/12/2016	613.27
G407	02/04/2017	613.41
G407	05/13/2017	613.68
G407	07/08/2017	613.59
G407	10/21/2017	612.67
G407	05/08/2018	613.11
G407	08/02/2018	612.95
G407	10/23/2018	612.11
G407	01/15/2019	612.31
G407	08/05/2019	614.02
G407	01/20/2020	614.86
G407	08/10/2020	613.74
G407	01/20/2021	614.70
G407	04/20/2021	614.49
G407	07/26/2021	614.38
G407	08/16/2021	614.41
G410	10/23/2018	610.41
G410	01/15/2019	610.91
G410	08/05/2019	611.75
G410	01/20/2020	612.70
G410	08/10/2020	610.88
G410	01/20/2021	610.91
G410	04/20/2021	611.38
G410	07/26/2021	611.51
G410	08/16/2021	611.29
G411	10/23/2018	613.20
G411	01/15/2019	613.82
G411	08/05/2019	614.25
G411	01/20/2020	617.53
G411	08/10/2020	615.51
G411	01/20/2021	615.91
G411	04/20/2021	616.12
G411	07/26/2021	616.20
G411	08/16/2021	616.03
MW03D	04/20/2021	597.90
MW03D	05/03/2021	598.18
MW03D	05/17/2021	598.06
MW03D	06/09/2021	598.13
MW03D	06/23/2021	598.09
MW03D	07/12/2021	598.12
MW03D	07/26/2021	598.09
MW03D	08/16/2021	598.10
MW04S	02/08/2016	621.62
MW04S	05/09/2016	620.45

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
MW04S	07/25/2016	618.84
MW04S	11/12/2016	618.66
MW04S	02/04/2017	618.97
MW04S	05/13/2017	618.76
MW04S	07/08/2017	618.92
MW04S	10/21/2017	613.88
MW04S	05/08/2018	617.95
MW04S	08/02/2018	618.73
MW04S	10/23/2018	614.68
MW04S	01/15/2019	614.89
MW04S	08/05/2019	614.92
MW04S	01/20/2020	619.93
MW04S	08/10/2020	617.74
MW04S	01/20/2021	620.63
MW04S	04/20/2021	619.39
MW04S	07/26/2021	618.55
MW04S	08/16/2021	618.50
MW05S	02/08/2016	620.92
MW05S	05/09/2016	620.53
MW05S	07/25/2016	618.20
MW05S	11/12/2016	617.38
MW05S	02/04/2017	618.78
MW05S	05/13/2017	617.95
MW05S	07/08/2017	618.81
MW05S	10/21/2017	613.32
MW05S	05/08/2018	617.77
MW05S	08/02/2018	617.98
MW05S	10/23/2018	615.35
MW05S	01/15/2019	615.93
MW05S	08/05/2019	616.01
MW05S	01/20/2020	620.34
MW05S	08/10/2020	617.09
MW05S	01/20/2021	618.33
MW05S	04/20/2021	619.07
MW05S	07/26/2021	618.14
MW05S	08/16/2021	617.84
MW10S	02/08/2016	620.43
MW10S	05/09/2016	619.47
MW10S	07/25/2016	617.69
MW10S	11/12/2016	616.69
MW10S	02/04/2017	617.41
MW10S	05/13/2017	617.22
MW10S	07/08/2017	617.27
MW10S	10/21/2017	614.52
MW10S	05/08/2018	616.89
MW10S	08/02/2018	617.52

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
MW10S	10/23/2018	614.36
MW10S	01/15/2019	614.85
MW10S	08/05/2019	615.56
MW10S	08/10/2020	617.11
MW10S	01/20/2021	619.48
MW10S	04/20/2021	619.03
MW10S	07/26/2021	617.74
MW10S	08/16/2021	617.35
MW11S	02/08/2016	621.30
MW11S	05/09/2016	622.19
MW11S	07/25/2016	620.99
MW11S	11/12/2016	620.92
MW11S	02/04/2017	620.82
MW11S	05/13/2017	621.31
MW11S	07/08/2017	620.85
MW11S	10/21/2017	617.19
MW11S	05/08/2018	620.85
MW11S	08/02/2018	620.69
MW11S	10/23/2018	620.05
MW11S	01/15/2019	620.38
MW11S	08/05/2019	620.76
MW11S	01/20/2020	621.80
MW11S	08/10/2020	618.12
MW11S	01/20/2021	619.64
MW11S	04/20/2021	621.76
MW11S	05/03/2021	622.01
MW11S	05/17/2021	621.94
MW11S	06/09/2021	621.45
MW11S	06/23/2021	618.83
MW11S	07/12/2021	620.54
MW11S	07/26/2021	620.97
MW11S	08/16/2021	621.49
MW11D	04/20/2021	621.13
MW11D	05/03/2021	621.36
MW11D	05/17/2021	621.27
MW11D	06/09/2021	620.96
MW11D	06/23/2021	618.72
MW11D	07/12/2021	619.88
MW11D	07/26/2021	620.57
MW11D	08/16/2021	621.01
MW12S	02/08/2016	620.37
MW12S	05/09/2016	620.48
MW12S	07/25/2016	618.53
MW12S	11/12/2016	617.97
MW12S	02/04/2017	620.33
MW12S	05/13/2017	618.26

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
MW12S	07/08/2017	618.61
MW12S	10/21/2017	615.08
MW12S	05/08/2018	617.58
MW12S	08/02/2018	617.12
MW12S	10/23/2018	616.14
MW12S	01/15/2019	616.89
MW12S	08/05/2019	617.35
MW12S	01/20/2020	620.34
MW12S	08/10/2020	615.69
MW12S	01/20/2021	611.42
MW12S	04/20/2021	618.96
MW12S	05/03/2021	619.66
MW12S	05/17/2021	619.23
MW12S	06/09/2021	618.20
MW12S	06/23/2021	616.52
MW12S	07/12/2021	619.35
MW12S	07/26/2021	618.43
MW12S	08/16/2021	618.79
MW12D	04/20/2021	611.97
MW12D	05/03/2021	611.87
MW12D	05/17/2021	611.95
MW12D	06/09/2021	611.87
MW12D	06/23/2021	611.79
MW12D	07/12/2021	611.55
MW12D	07/26/2021	611.50
MW12D	08/16/2021	611.51
MW16S	02/08/2016	625.29
MW16S	05/09/2016	624.54
MW16S	07/25/2016	622.13
MW16S	11/12/2016	622.26
MW16S	02/04/2017	622.53
MW16S	05/13/2017	622.53
MW16S	07/08/2017	622.25
MW16S	10/21/2017	618.42
MW16S	05/08/2018	622.02
MW16S	08/02/2018	622.47
MW16S	10/23/2018	620.88
MW16S	01/15/2019	621.60
MW16S	08/05/2019	621.94
MW16S	01/20/2020	625.59
MW16S	08/10/2020	618.52
MW16S	01/20/2021	618.34
MW16S	04/20/2021	623.78
MW16S	05/03/2021	624.58
MW16S	05/17/2021	623.87
MW16S	06/09/2021	622.57

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
MW16S	06/23/2021	620.48
MW16S	07/12/2021	620.58
MW16S	07/26/2021	620.68
MW16S	08/16/2021	620.65
MW16D	04/20/2021	615.42
MW16D	05/03/2021	615.92
MW16D	05/17/2021	616.36
MW16D	06/09/2021	616.87
MW16D	06/23/2021	616.90
MW16D	07/12/2021	616.76
MW16D	07/26/2021	616.63
MW16D	08/16/2021	616.35
MW20S	02/08/2016	614.36
MW20S	05/09/2016	614.09
MW20S	07/25/2016	611.61
MW20S	11/12/2016	611.51
MW20S	02/04/2017	612.76
MW20S	05/13/2017	611.86
MW20S	07/08/2017	611.75
MW20S	10/21/2017	607.74
MW20S	05/08/2018	611.46
MW20S	08/02/2018	611.51
MW20S	10/23/2018	609.55
MW20S	01/15/2019	610.21
MW20S	08/05/2019	610.81
MW20S	01/20/2020	615.40
MW20S	08/10/2020	612.37
MW20S	01/20/2021	612.27
MW20S	04/20/2021	613.45
MW20S	07/26/2021	613.35
MW20S	08/16/2021	612.31
R104	01/20/2015	623.03
R104	04/08/2015	624.77
R104	10/06/2015	621.69
R104	11/16/2015	621.34
R104	02/08/2016	624.11
R104	05/09/2016	624.89
R104	07/25/2016	623.65
R104	11/12/2016	623.49
R104	02/04/2017	624.20
R104	05/13/2017	622.91
R104	07/08/2017	624.09
R104	10/21/2017	619.38
R104	05/08/2018	622.66
R104	08/02/2018	621.73
R104	10/23/2018	621.58

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
R104	01/15/2019	622.43
R104	08/05/2019	623.34
R104	01/20/2020	625.63
R104	08/10/2020	624.56
R104	10/15/2020	621.10
R104	01/20/2021	623.31
R104	01/28/2021	620.57
R104	04/20/2021	624.95
R104	07/26/2021	625.41
R104	08/16/2021	625.92
R201	10/05/2015	619.94
R201	11/16/2015	622.44
R201	02/08/2016	623.40
R201	05/09/2016	622.81
R201	07/25/2016	622.36
R201	11/12/2016	622.82
R201	02/04/2017	622.27
R201	05/13/2017	623.05
R201	07/08/2017	622.31
R201	10/21/2017	618.30
R201	01/25/2018	622.00
R201	05/08/2018	622.78
R201	08/02/2018	622.16
R201	10/23/2018	621.29
R201	01/15/2019	622.17
R201	08/05/2019	622.35
R201	01/20/2020	622.88
R201	08/10/2020	618.89
R201	10/13/2020	616.57
R201	01/20/2021	620.52
R201	01/29/2021	620.52
R201	03/29/2021	623.52
R201	04/20/2021	622.16
R201	04/21/2021	622.59
R201	05/03/2021	622.91
R201	05/06/2021	623.40
R201	05/17/2021	622.68
R201	06/09/2021	621.12
R201	06/14/2021	620.63
R201	06/23/2021	619.92
R201	06/29/2021	621.16
R201	07/12/2021	621.34
R201	07/13/2021	621.36
R201	07/26/2021	620.37
R201	07/28/2021	620.16
R201	08/16/2021	620.61

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
R205	05/08/2018	618.32
R205	08/02/2018	614.95
R205	10/23/2018	618.85
R205	01/15/2019	619.54
R205	08/05/2019	620.13
R205	01/20/2020	620.21
R205	08/10/2020	615.92
R205	10/14/2020	613.87
R205	01/20/2021	617.80
R205	01/28/2021	618.45
R205	04/20/2021	619.12
R205	07/26/2021	618.66
R205	08/16/2021	618.99
T127	01/19/2015	615.65
T127	04/08/2015	616.04
T127	07/23/2015	616.04
T127	10/06/2015	615.66
T127	11/16/2015	615.91
T127	02/08/2016	616.04
T127	05/09/2016	616.15
T127	07/25/2016	615.96
T127	11/12/2016	616.73
T127	02/04/2017	616.32
T127	05/13/2017	616.89
T127	07/08/2017	615.99
T127	10/21/2017	612.33
T127	01/27/2018	611.06
T127	05/08/2018	616.66
T127	08/02/2018	616.48
T127	10/23/2018	614.78
T127	01/15/2019	615.13
T127	05/03/2019	617.26
T127	08/05/2019	615.15
T127	01/20/2020	617.05
T127	05/05/2020	617.02
T127	08/10/2020	615.90
T127	10/14/2020	615.08
T127	01/20/2021	615.89
T127	01/29/2021	615.89
T127	04/20/2021	616.54
T127	06/29/2021	616.72
T127	07/26/2021	616.53
T127	08/16/2021	616.65
T128	01/19/2015	614.73
T128	04/08/2015	614.89
T128	07/23/2015	615.40

RAMBOLL

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
T128	10/06/2015	614.67
T128	02/08/2016	614.90
T128	05/09/2016	615.01
T128	07/25/2016	614.75
T128	11/12/2016	614.95
T128	02/04/2017	616.00
T128	05/13/2017	615.39
T128	07/08/2017	615.07
T128	10/21/2017	611.33
T128	05/08/2018	615.13
T128	08/02/2018	614.87
T128	10/23/2018	613.17
T128	01/15/2019	613.94
T128	08/05/2019	613.99
T128	01/20/2020	617.25
T128	08/10/2020	616.15
T128	10/14/2020	615.36
T128	01/20/2021	616.20
T128	01/28/2021	616.33
T128	04/20/2021	616.94
T128	07/26/2021	616.81
T128	08/16/2021	616.93
T202	02/08/2016	622.82
T202	05/09/2016	623.66
T202	07/25/2016	619.49
T202	11/12/2016	619.88
T202	02/04/2017	619.73
T202	05/13/2017	620.07
T202	07/08/2017	619.75
T202	10/21/2017	615.31
T202	05/08/2018	619.52
T202	08/02/2018	620.53
T202	10/23/2018	618.36
T202	01/15/2019	618.69
T202	08/05/2019	619.02
T202	01/20/2020	624.22
T202	08/10/2020	620.39
T202	01/20/2021	620.08
T202	04/20/2021	623.43
T202	07/26/2021	622.64
T202	08/16/2021	622.69
T408	11/12/2016	618.58
T408	02/04/2017	619.46
T408	05/13/2017	619.00
T408	07/08/2017	619.12
T408	10/21/2017	614.81

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
T408	05/08/2018	615.82
T408	08/02/2018	614.45
T408	10/23/2018	616.30
T408	01/15/2019	617.01
T408	08/05/2019	617.15
T408	01/20/2020	619.13
T408	08/10/2020	617.38
T408	01/20/2021	616.85
T408	04/20/2021	616.65
T408	07/26/2021	617.21
T408	08/16/2021	617.22
T409	11/12/2016	615.98
T409	02/04/2017	615.93
T409	05/13/2017	616.75
T409	07/08/2017	617.05
T409	10/21/2017	612.16
T409	05/08/2018	616.02
T409	08/02/2018	615.25
T409	10/23/2018	613.96
T409	01/15/2019	614.78
T409	08/05/2019	615.10
T409	01/20/2020	617.16
T409	08/10/2020	615.43
T409	01/20/2021	614.41
T409	04/20/2021	615.33
T409	07/26/2021	615.72
T409	08/16/2021	615.42
TA31	02/08/2016	621.56
TA31	05/09/2016	621.32
TA31	07/25/2016	620.63
TA31	11/12/2016	620.50
TA31	02/04/2017	621.55
TA31	05/13/2017	620.66
TA31	07/08/2017	620.94
TA31	10/21/2017	616.90
TA31	05/08/2018	619.80
TA31	08/02/2018	620.41
TA31	10/23/2018	618.32
TA31	01/15/2019	619.21
TA31	08/05/2019	619.37
TA31	01/20/2020	622.93
TA31	08/10/2020	614.89
TA31	01/20/2021	615.79
TA31	04/20/2021	622.14
TA31	07/26/2021	618.76
TA31	08/16/2021	619.17

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
TA32	02/08/2016	615.46
TA32	05/09/2016	616.02
TA32	07/25/2016	615.61
TA32	11/12/2016	615.53
TA32	02/04/2017	614.73
TA32	05/13/2017	615.82
TA32	07/08/2017	615.79
TA32	10/21/2017	612.42
TA32	08/05/2019	615.41
TA32	01/20/2020	616.30
TA33	02/08/2016	619.67
TA33	05/09/2016	619.75
TA33	07/25/2016	616.91
TA33	11/12/2016	616.81
TA33	02/04/2017	617.12
TA33	05/13/2017	617.22
TA33	07/08/2017	617.42
TA33	10/21/2017	612.91
TA33	05/08/2018	618.07
TA33	08/02/2018	616.68
TA33	10/23/2018	617.26
TA33	01/15/2019	617.66
TA33	08/05/2019	618.27
TA33	01/20/2020	620.35
TA33	08/10/2020	614.10
TA33	01/20/2021	614.34
TA33	04/20/2021	619.07
TA33	07/26/2021	616.82
TA33	08/16/2021	616.86
TA34	02/08/2016	619.29
TA34	05/09/2016	619.35
TA34	07/25/2016	617.37
TA34	11/12/2016	617.40
TA34	02/04/2017	617.45
TA34	05/13/2017	617.43
TA34	07/08/2017	617.44
TA34	10/21/2017	613.48
TA34	05/08/2018	617.06
TA34	08/02/2018	616.42
TA34	10/23/2018	614.92
TA34	01/15/2019	615.85
TA34	08/05/2019	616.54
TA34	01/20/2020	619.58
TA34	08/10/2020	615.68
TA34	01/20/2021	616.16
TA34	04/20/2021	618.74

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
TA34	07/26/2021	617.18
TA34	08/16/2021	617.42
TR32	08/05/2019	615.67
TR32	01/20/2020	616.56
TR32	08/10/2020	614.92
TR32	01/20/2021	614.50
TR32	04/20/2021	615.59
TR32	07/26/2021	616.09
TR32	08/16/2021	616.18
XPW01	03/29/2021	630.23
XPW01	03/30/2021	630.19
XPW01	04/20/2021	629.83
XPW01	04/22/2021	629.84
XPW01	05/03/2021	629.83
XPW01	05/05/2021	630.00
XPW01	05/17/2021	629.85
XPW01	05/18/2021	630.11
XPW01	06/09/2021	629.67
XPW01	06/14/2021	629.57
XPW01	06/23/2021	629.27
XPW01	07/12/2021	629.90
XPW01	07/26/2021	629.73
XPW01	07/27/2021	629.65
XPW01	08/16/2021	629.87
XPW02	03/29/2021	630.19
XPW02	03/30/2021	630.17
XPW02	04/20/2021	629.87
XPW02	04/22/2021	629.88
XPW02	05/03/2021	629.87
XPW02	05/05/2021	629.98
XPW02	05/17/2021	629.86
XPW02	05/19/2021	630.00
XPW02	06/09/2021	629.72
XPW02	06/14/2021	629.64
XPW02	06/23/2021	629.37
XPW02	07/12/2021	629.71
XPW02	07/26/2021	629.78
XPW02	07/27/2021	629.72
XPW02	08/16/2021	629.91
XSG-01	03/29/2021	630.06
XSG-01	04/20/2021	630.28
XSG-01	05/03/2021	629.86
XSG-01	05/17/2021	629.88
XSG-01	06/09/2021	629.74
XSG-01	06/23/2021	629.38
XSG-01	07/12/2021	629.71

TABLE E-1. GROUNDWATER ELEVATIONS
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Sample Location	Sample Date	Groundwater Elevation (ft NAVD88)
XSG-01	07/26/2021	629.79
XSG-01	08/16/2021	629.92
SG-02	03/29/2021	598.75
SG-02	04/20/2021	598.56
SG-02	05/03/2021	598.74
SG-02	05/17/2021	598.56
SG-02	06/09/2021	598.37
SG-02	06/23/2021	598.34
SG-02	07/12/2021	598.75
SG-02	07/26/2021	598.44
SG-02	08/16/2021	598.39
SG-03	04/20/2021	589.81
SG-03	05/03/2021	589.84
SG-03	05/17/2021	589.84
SG-03	06/09/2021	589.65
SG-03	06/23/2021	589.51
SG-03	07/12/2021	589.97
SG-03	07/26/2021	589.77
SG-03	08/16/2021	589.70
SG-04	04/20/2021	592.99
SG-04	05/03/2021	592.93
SG-04	05/17/2021	593.00
SG-04	06/09/2021	592.82
SG-04	06/23/2021	592.72
SG-04	07/12/2021	591.94
SG-04	07/26/2021	592.83
SG-04	08/16/2021	593.01

Notes:
ft NAVD88 = feet relative to the North American Vertical Datum 1988, GEOID 12A
generated 10/12/2021, 9:26:51 AM CDT

ADDITIONAL VERTICAL HYDRAULIC GRADIENTS

VERTICAL HYDRAULIC GRADIENTS

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

COFFEEN POWER PLANT

GYPSUM MANAGEMENT FACILITY GYPSUM STACK POND

COFFEEN, ILLINOIS

Date	G206 Groundwater Elevation (ft NAVD88)	G206D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	DA (PMP)				
3/29/2021	--	583.94	--	--	--	--
4/20/2021	622.07	585.96	36.11	33.51	1.08	down
5/3/2021	622.60	587.42	35.18	33.51	1.05	down
5/17/2021	622.31	587.81	34.50	33.51	1.03	down
6/9/2021	621.71	584.19	37.52	33.51	1.12	down
6/23/2021	620.54	589.66	30.88	33.51	0.92	down
7/12/2021	622.39	590.72	31.67	33.51	0.95	down
7/26/2021	622.00	591.14	30.86	33.51	0.92	down
			Middle of screen elevation G206			610.8
			Middle of screen elevation G206D			577.3

[O: KLT 6/4/21, C:YMD 6/7/21][U:KLT 8/25/21, C:EDP 8/31/21]

Notes:

[1] Distance change was calculated using the midpoint of the piezometer screen and water table surface. If the water table surface was above the top of the monitoring well screen, then distance change was calculated using the midpoint of both screens.

[2] Vertical gradients between ±0.0015 are considered flat, and typically have less than 0.02 foot difference in groundwater elevation between wells.

-- = no data collected on date / no vertical gradient calculated

DA = deep aquifer

dh = head change

dl = distance change

ft = foot/feet

NAVD88 = North American Vertical Datum of 1988

PMP = potential migration pathway

UA = uppermost aquifer

VERTICAL HYDRAULIC GRADIENTS

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

COFFEEN POWER PLANT

GYPSUM MANAGEMENT FACILITY RECYCLE POND

COFFEEN, ILLINOIS

Date	G405 Groundwater Elevation (ft NAVD88)	T408 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	LCU (upper)				
2/4/2017	618.47	619.46	-0.99	12.00	-0.08	up
5/13/2017	618.74	619.00	-0.26	12.00	-0.02	up
7/8/2017	618.54	619.12	-0.58	12.00	-0.05	up
10/21/2017	614.47	614.81	-0.34	12.00	-0.03	up
5/8/2018	618.94	615.82	3.12	12.00	0.26	down
8/2/2018	617.55	614.45	3.10	12.00	0.26	down
10/23/2018	616.40	616.30	0.10	12.00	0.01	down
1/15/2019	616.81	617.01	-0.20	12.00	-0.02	up
8/5/2019	617.72	617.15	0.57	12.00	0.05	down
1/20/2020	619.28	619.13	0.15	12.00	0.01	down
8/10/2020	617.62	617.38	0.24	12.00	0.02	down
1/20/2021	617.12	616.85	0.27	12.00	0.02	down
4/20/2021	617.13	616.65	0.48	12.00	0.04	down
7/26/2021	617.37	617.21	0.16	12.00	0.01	down
			Middle of screen elevation G405D			610.0
			Middle of screen elevation T408			598.0

Date	G275 Groundwater Elevation (ft NAVD88)	G275D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UA	DA (PMP)				
4/20/21-4/21/20	605.00	568.33	36.67	42.14	0.87	down
7/12/21-7/13/21	605.63	570.43	35.20	42.77	0.82	down
7/26/2021	605.05	570.35	34.70	42.18	0.82	down
			Middle of screen elevation G275			605.7
			Middle of screen elevation G275D			562.9

VERTICAL HYDRAULIC GRADIENTS

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

COFFEEN POWER PLANT

GYPSUM MANAGEMENT FACILITY RECYCLE POND

COFFEEN, ILLINOIS

Date	T408 Groundwater Elevation (ft NAVD88)	G45D Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	LCU (upper)	LCU (lower)				
2/4/2017	619.46	587.71	31.75	13.78	2.30	down
5/13/2017	619.00	586.19	32.81	13.78	2.38	down
7/8/2017	619.12	586.29	32.83	13.78	2.38	down
10/21/2017	614.81	584.69	30.12	13.78	2.19	down
5/8/2018	615.82	587.56	28.26	13.78	2.05	down
8/2/2018	614.45	585.81	28.64	13.78	2.08	down
10/23/2018	616.30	584.60	31.70	13.78	2.30	down
1/15/2019	617.01	586.96	30.05	13.78	2.18	down
8/5/2019	617.15	588.04	29.11	13.78	2.11	down
8/10/2020	617.38	614.21	3.17	13.78	0.23	down
1/20/2021	616.85	614.60	2.25	13.78	0.16	down
4/20/2021	616.65	614.32	2.33	13.78	0.17	down
7/26/2021	617.21	613.58	3.63	13.78	0.26	down
			Middle of screen elevation T408			598.0
			Middle of screen elevation G45D			584.2

[O: KLT 6/4/21, C:YMD 6/7/21][U:KLT 8/25/21, C:EDP 8/31/21]

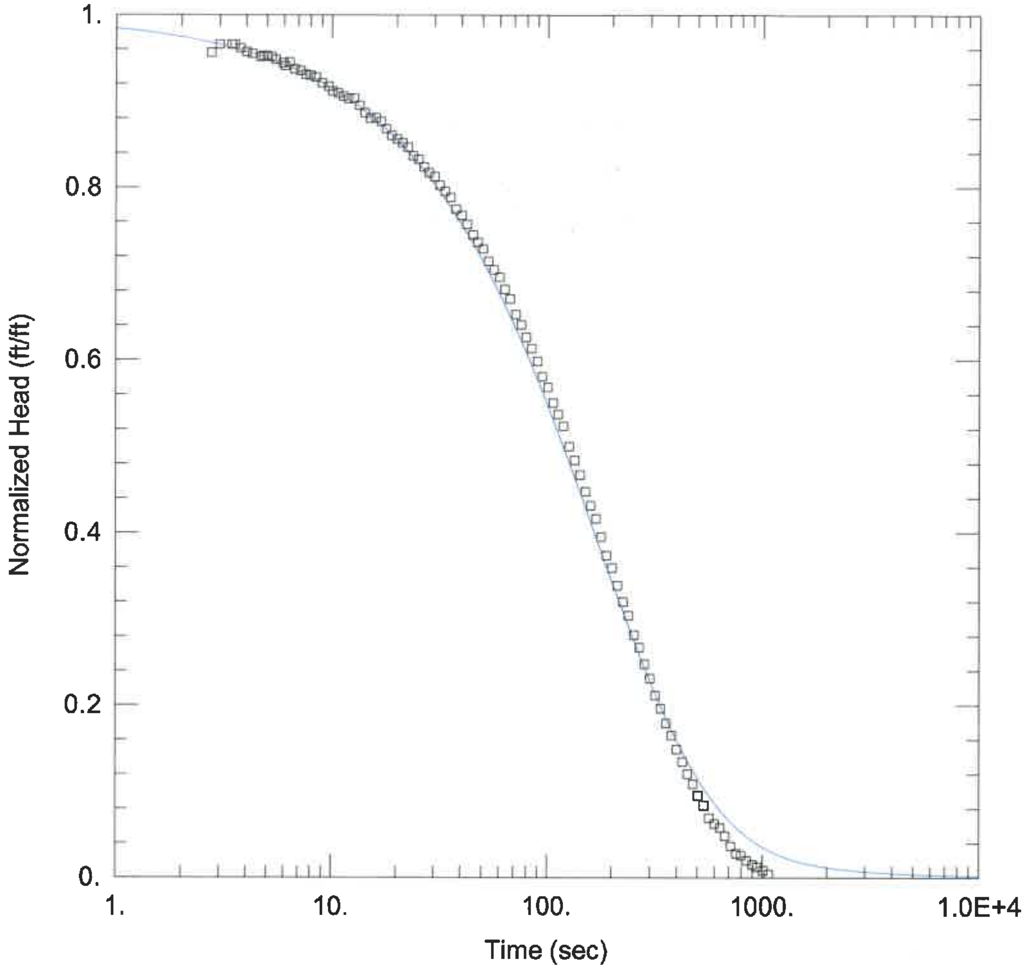
Notes:

[1] Distance change was calculated using the midpoint of the piezometer screen and water table surface. If the water table surface was above the top of the monitoring well screen, then distance change was calculated using the midpoint of both screens.

[2] Vertical gradients between ±0.0015 are considered flat, and typically have less than 0.02 foot difference in groundwater elevation between wells.

-- = no data collected on date / no vertical gradient calculated
DA = deep aquifer
dh = head change
dl = distance change
ft = foot/feet
LCU (lower) = lower confining unit (Smithboro)
LCU (upper) = lower confining unit (Vandalia)
NAVD88 = North American Vertical Datum of 1988
PMP = potential migration pathway
UA = uppermost aquifer

HYDRAULIC CONDUCTIVITY TEST DATA



G301 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G301-fh.aqt
Date: 06/03/21 Time: 15:37:26

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G301
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 2.5 ft

WELL DATA (G301)

Initial Displacement: 1.78 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.79 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

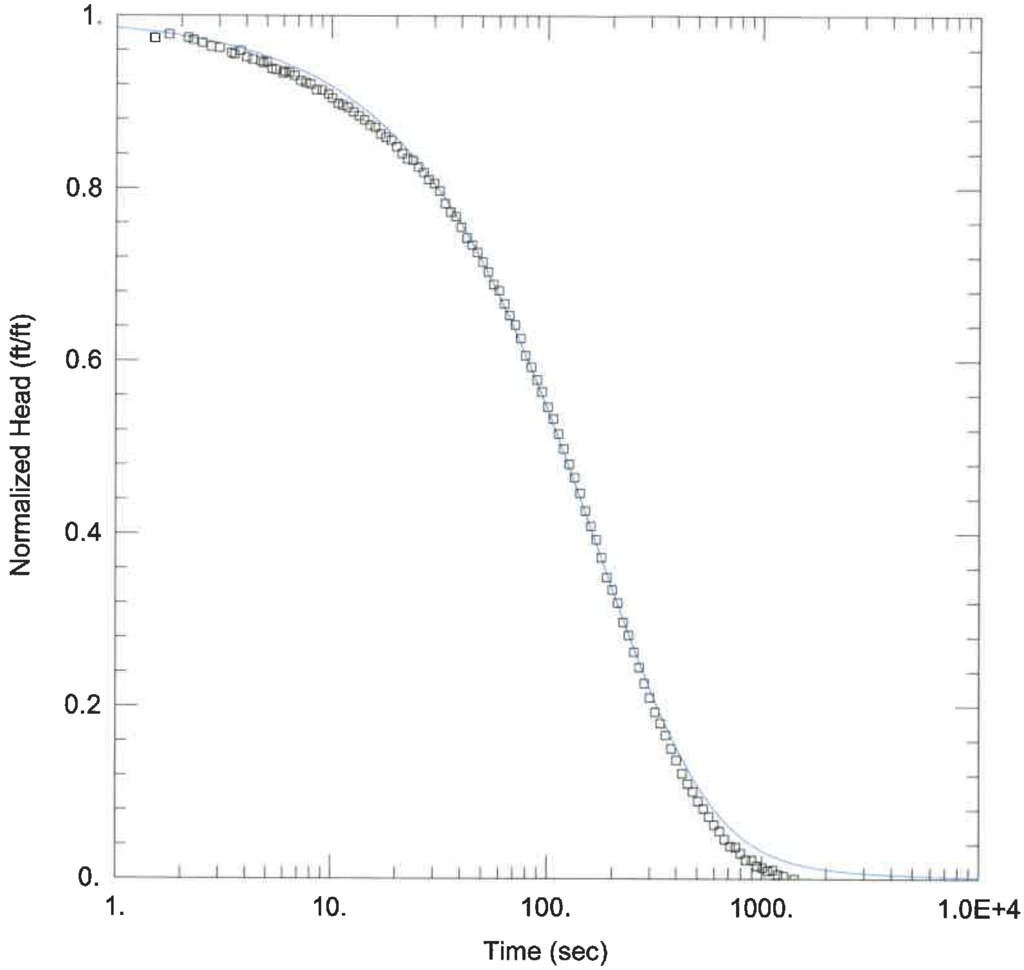
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0011 cm/sec
Kz/Kr = 1.

Ss = 0.00093 ft^{-1}



G301 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G301-rh.aqt
Date: 06/03/21 Time: 15:37:28

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G301
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 2.5 ft

WELL DATA (G301)

Initial Displacement: 1.86 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.79 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

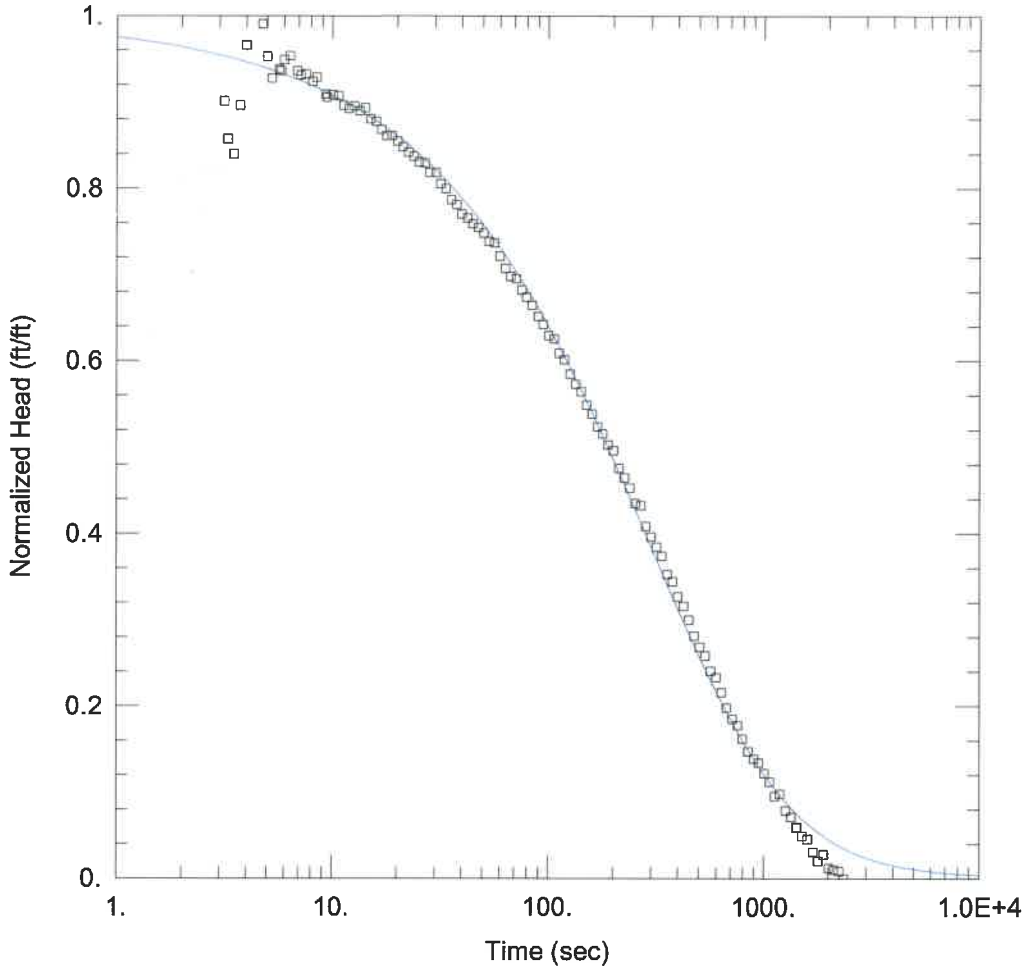
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0012 cm/sec
Kz/Kr = 1.

Ss = 0.00051 ft^{-1}



G303 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G303-fh.aqt
Date: 06/03/21 Time: 15:37:29

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G303
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 5. ft

WELL DATA (G303)

Initial Displacement: 1.08 ft
Total Well Penetration Depth: 17.45 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 17.85 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

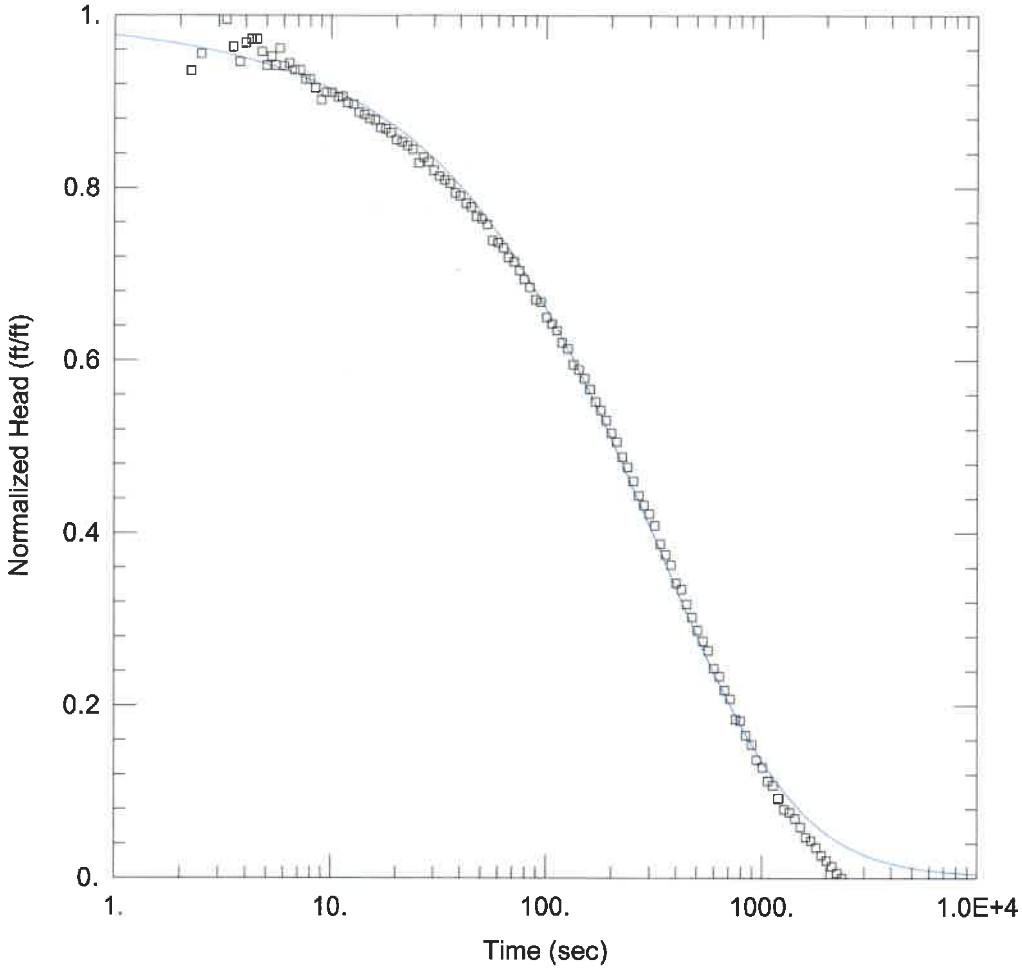
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00028 cm/sec
Kz/Kr = 1.

Ss = 0.011 ft^{-1}



G303 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G303-rh.aqt
Date: 06/03/21 Time: 15:37:31

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G303
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 5. ft

WELL DATA (G303)

Initial Displacement: 7.78 ft
Total Well Penetration Depth: 17.45 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 17.85 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

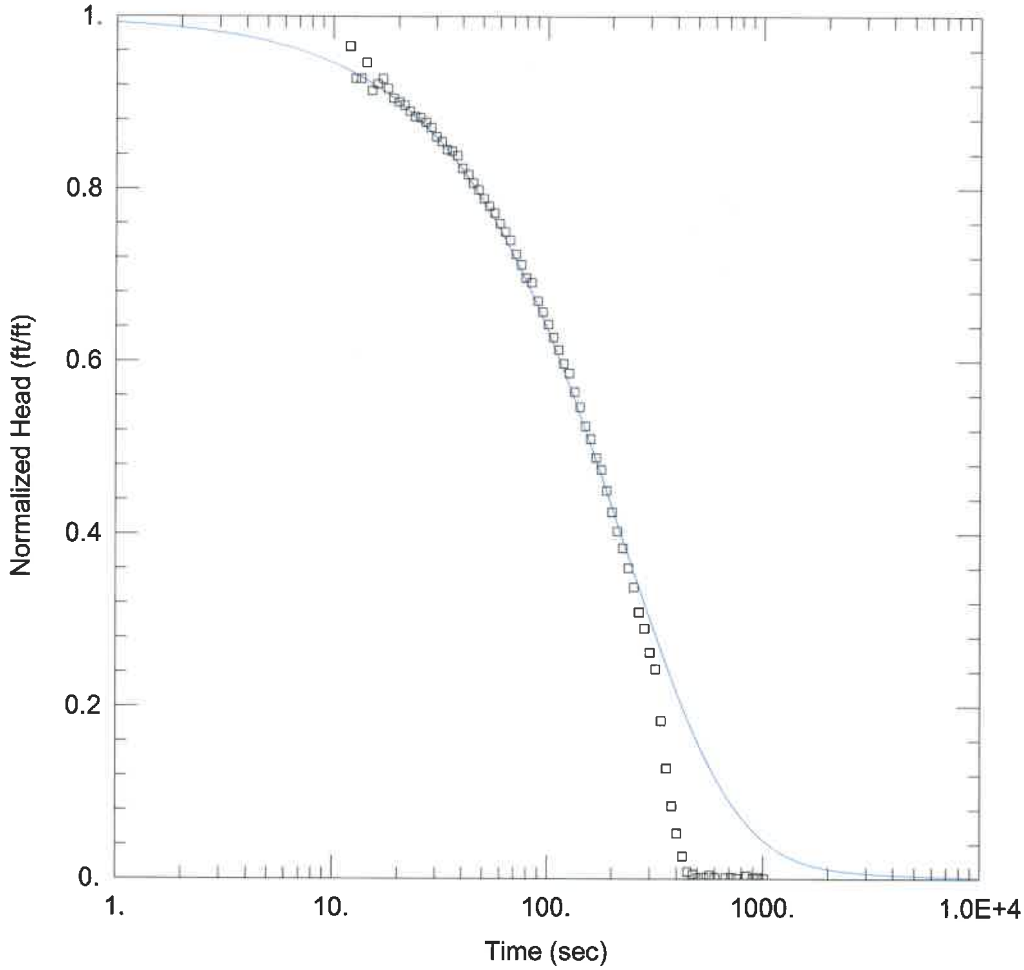
SOLUTION

Aquifer Model: Confined

Kr = 0.00026 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.01 ft^{-1}



G307D FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G307D-fh.aqt
Date: 06/03/21 Time: 15:37:32

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G307D
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 10. ft

WELL DATA (G307D)

Initial Displacement: 1.65 ft
Total Well Penetration Depth: 58.72 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 59.57 ft
Screen Length: 9.77 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

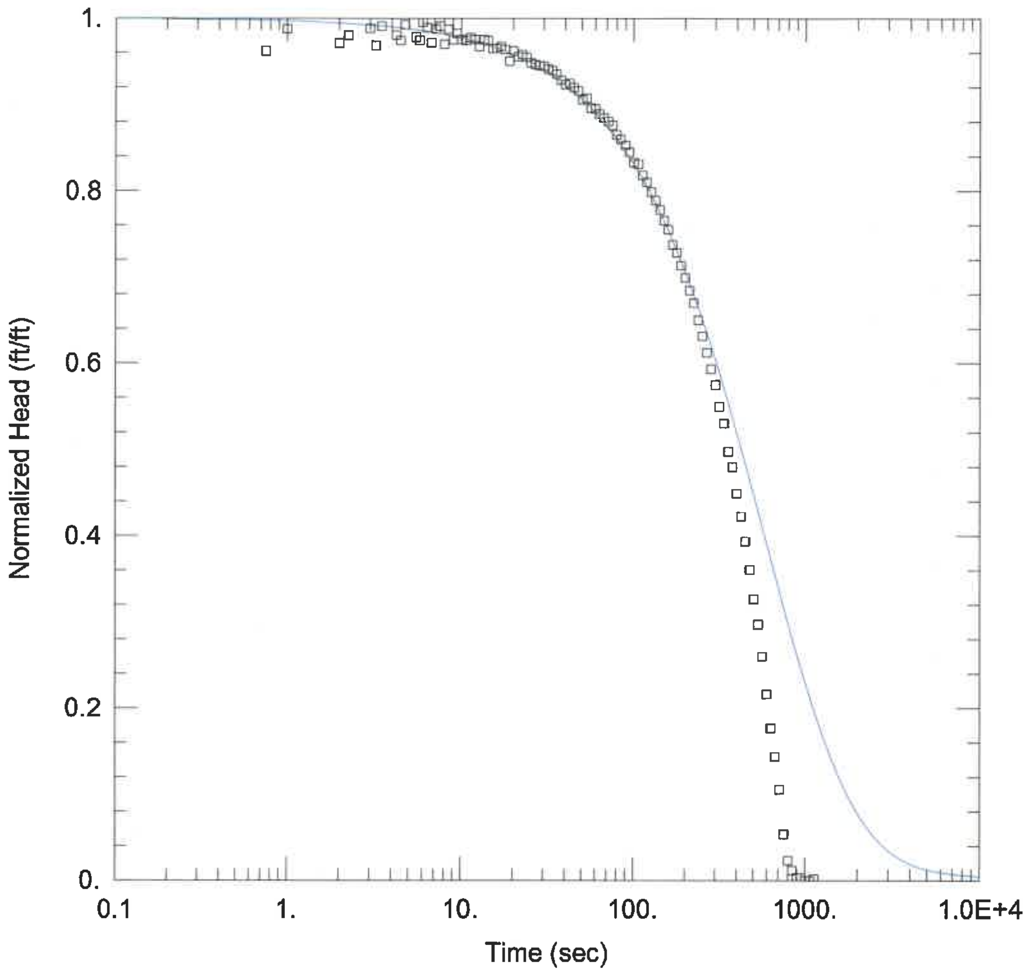
SOLUTION

Aquifer Model: Confined

Kr = 0.00032 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 1.0E-6 ft^{-1}



G307D RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G307D-rh.aqt
Date: 06/04/21 Time: 08:21:32

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G307D
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 10. ft

WELL DATA (G307D)

Initial Displacement: 1.55 ft
Total Well Penetration Depth: 58.72 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 59.57 ft
Screen Length: 9.77 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

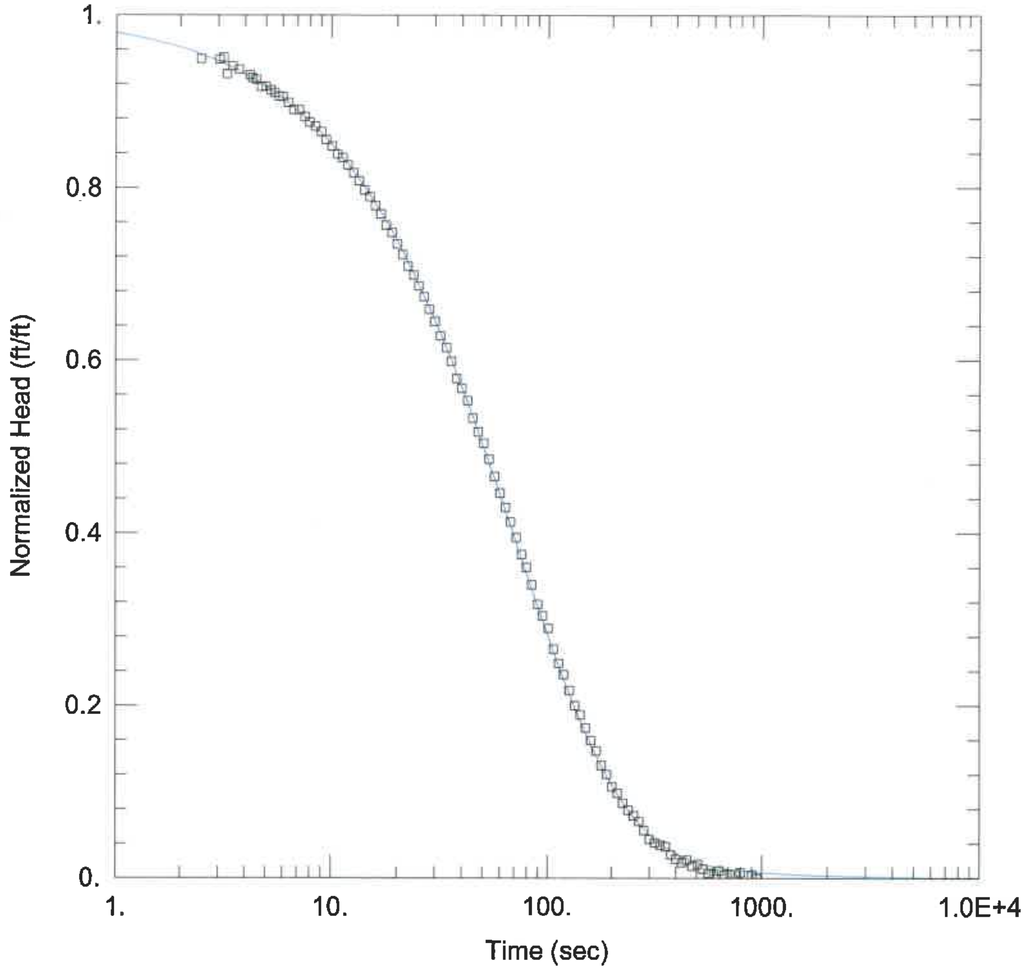
SOLUTION

Aquifer Model: Confined

Kr = 0.00012 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 1.0E-6 ft^{-1}



G308 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G308-fh.aqt
Date: 06/03/21 Time: 15:37:35

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G308
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 1.7 ft

WELL DATA (G308)

Initial Displacement: 1.73 ft
Total Well Penetration Depth: 13.97 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.29 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

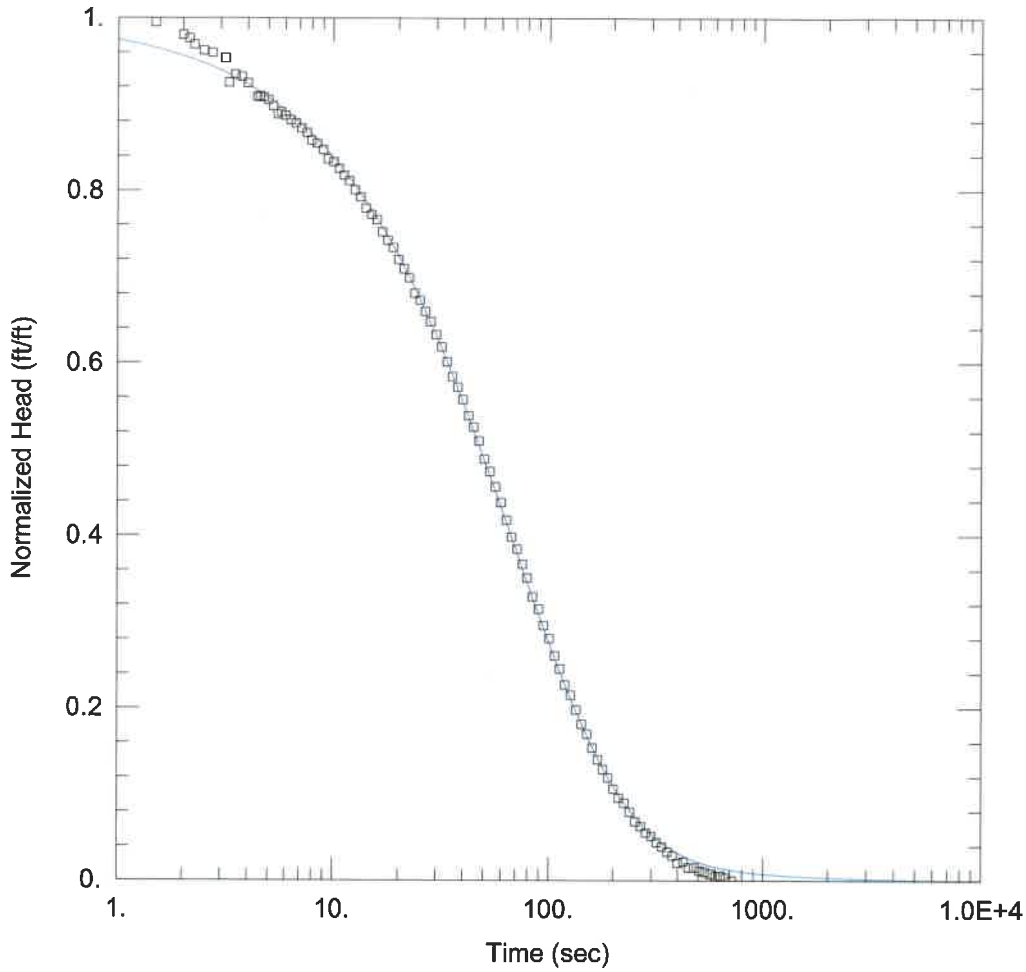
SOLUTION

Aquifer Model: Confined

Kr = 0.0055 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.0001 ft^{-1}



G308 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G308-rh.aqt
Date: 06/03/21 Time: 15:37:37

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G308
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 5. ft

WELL DATA (G308)

Initial Displacement: 11.9 ft
Total Well Penetration Depth: 13.97 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.29 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

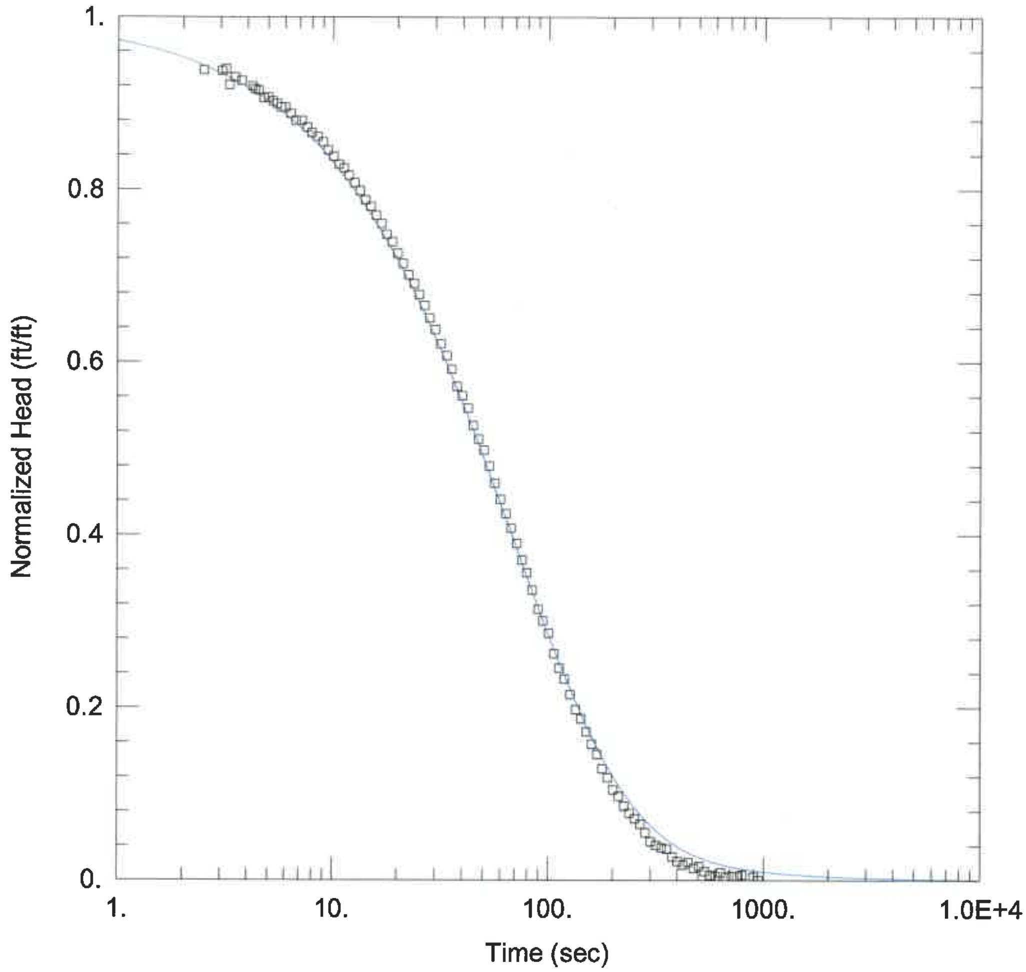
SOLUTION

Aquifer Model: Confined

Kr = 0.0016 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.0001 ft^{-1}



G309 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G309-fh.aqt
Date: 06/03/21 Time: 15:37:38

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G309
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 0.7 ft

WELL DATA (G309)

Initial Displacement: 1.75 ft
Total Well Penetration Depth: 14.38 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.73 ft
Screen Length: 4.78 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

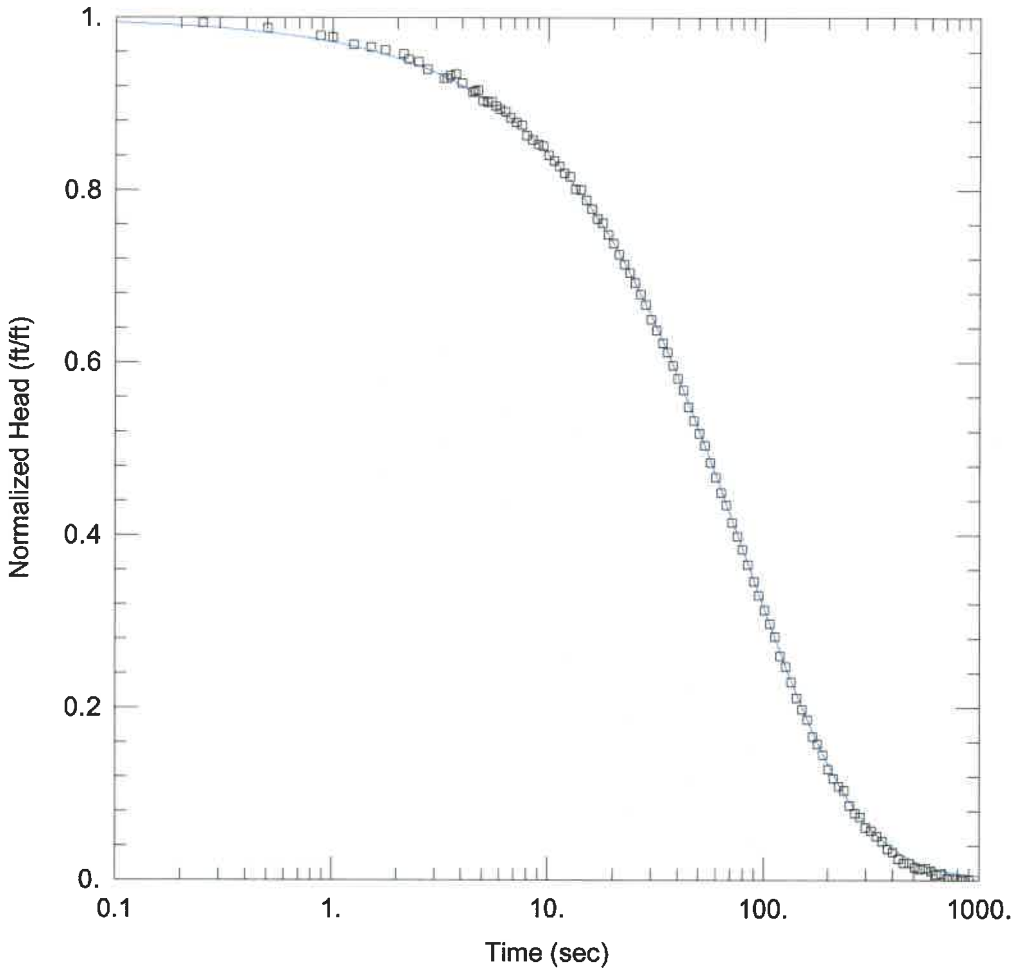
SOLUTION

Aquifer Model: Confined

Kr = 0.0091 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.0025 ft^{-1}



G309 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G309-rh.aqt
Date: 06/04/21 Time: 08:22:05

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G309
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 14.73 ft

WELL DATA (G309)

Initial Displacement: 1.575 ft
Total Well Penetration Depth: 14.38 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.73 ft
Screen Length: 4.78 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

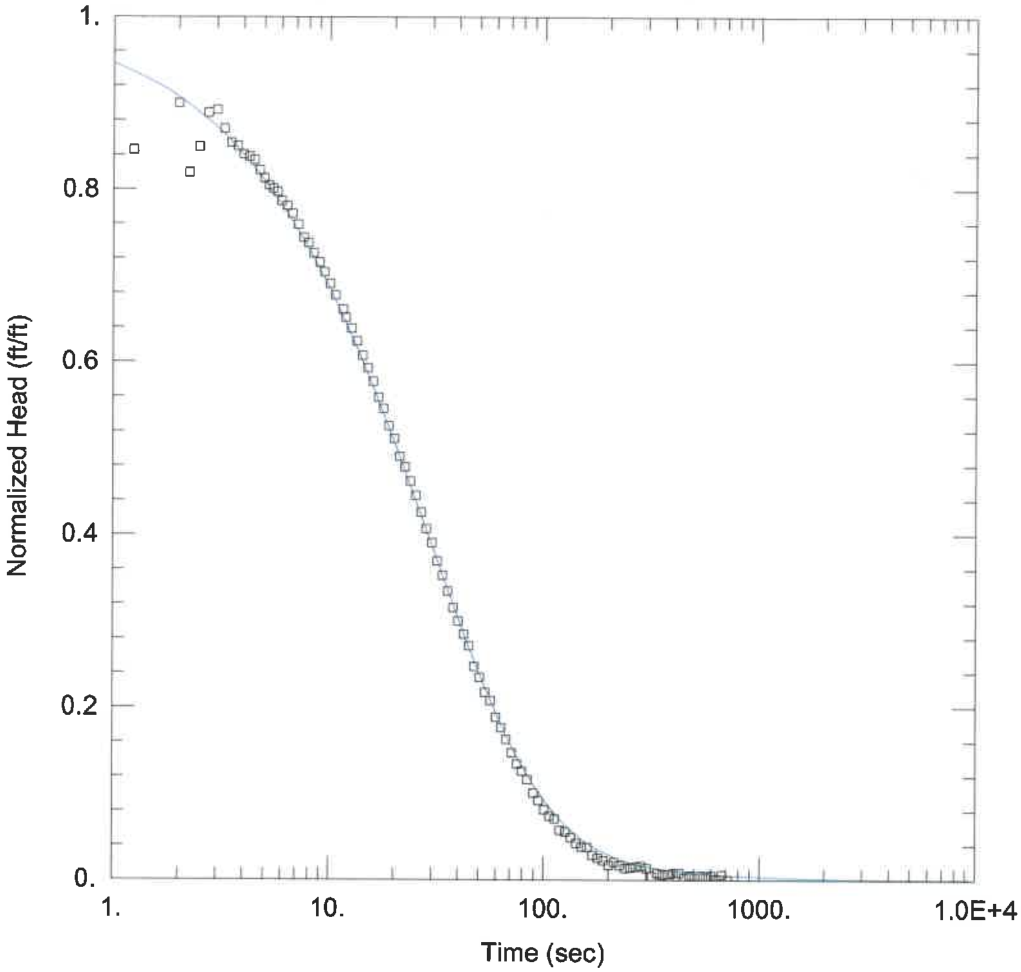
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00088 cm/sec
Kz/Kr = 1.

Ss = 0.00035 ft^{-1}



G310 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G310-fh.aqt
Date: 06/03/21 Time: 15:37:42

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G310
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 2. ft

WELL DATA (G310)

Initial Displacement: 1.61 ft
Total Well Penetration Depth: 10.53 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.88 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

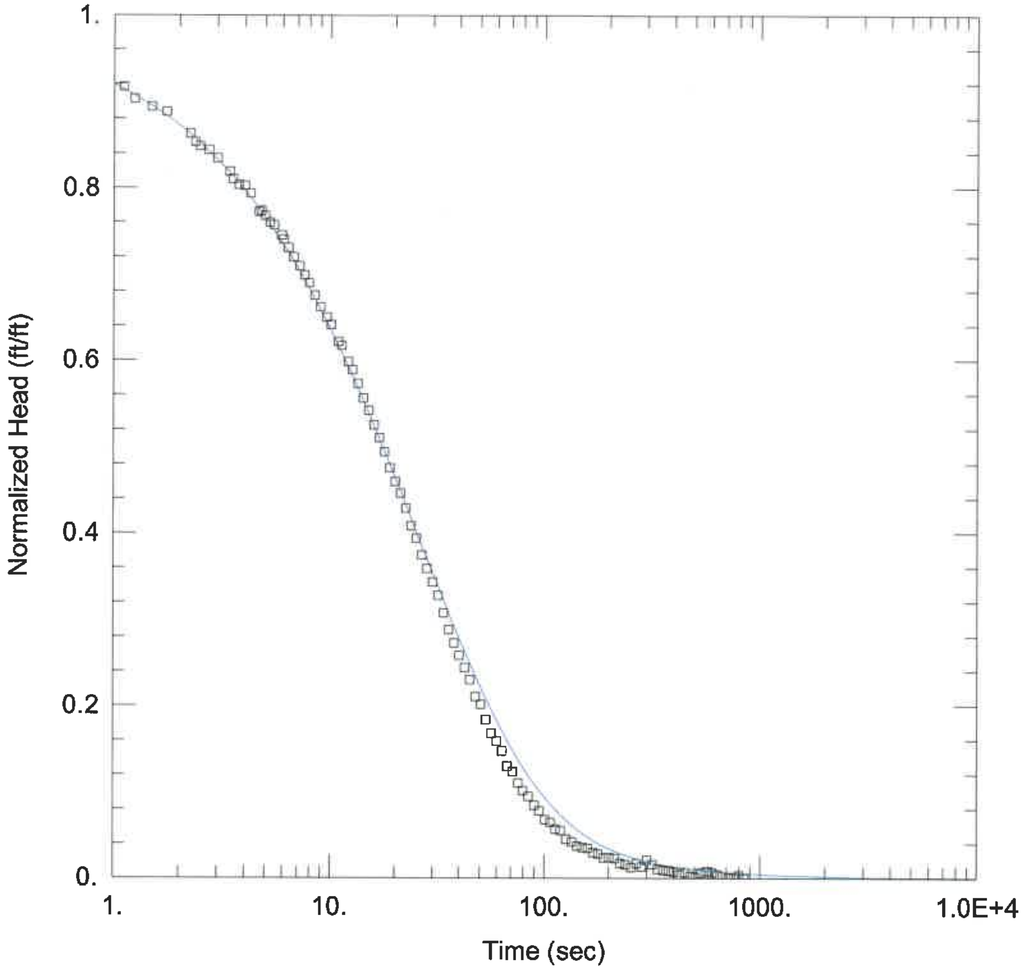
SOLUTION

Aquifer Model: Confined

Kr = 0.0075 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.0005 ft^{-1}



G310 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G310-rh.aqt
Date: 06/03/21 Time: 15:37:43

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G310
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 2. ft

WELL DATA (G310)

Initial Displacement: 1.67 ft
Total Well Penetration Depth: 10.53 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.88 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

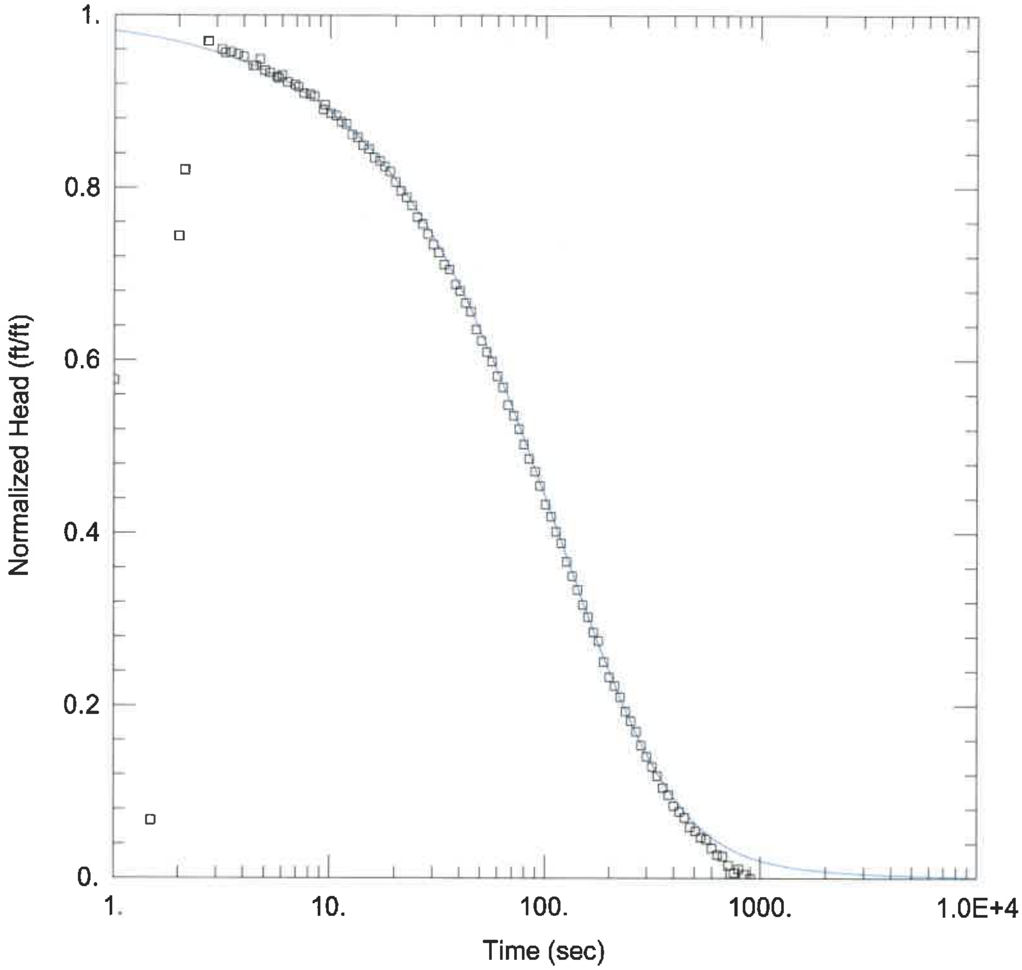
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

K_r = 0.0059 cm/sec
K_z/K_r = 1.

S_s = 0.006 ft^{-1}



G311D FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G311D-fh.aqt
Date: 06/03/21 Time: 15:38:30

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G311D
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 10. ft

WELL DATA (G311D)

Initial Displacement: 1.625 ft
Total Well Penetration Depth: 10.21 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.69 ft
Screen Length: 9.94 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

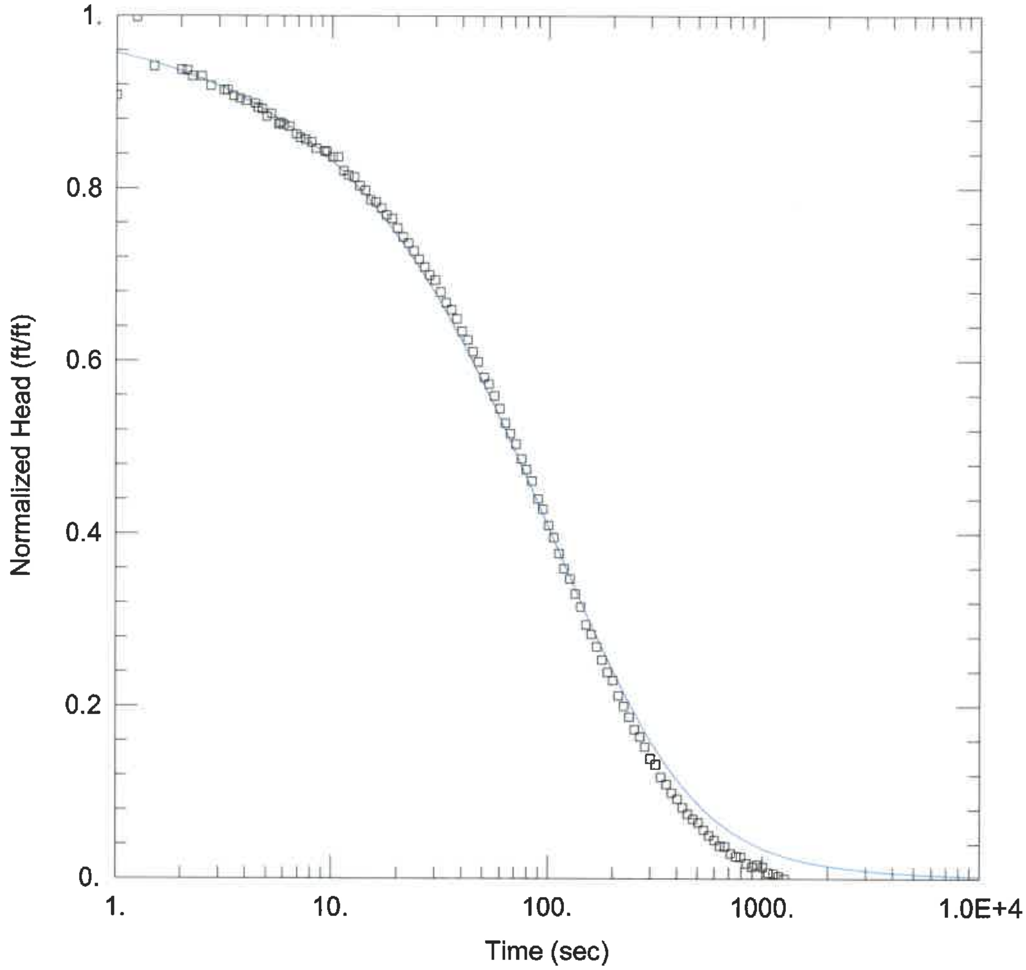
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.00038 cm/sec
Kz/Kr = 1.

Ss = 4.7E-5 ft^{-1}



G311D RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G311D-rh.aqt
Date: 06/03/21 Time: 15:38:31

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G311D
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 10. ft

WELL DATA (G311D)

Initial Displacement: 1.72 ft
Total Well Penetration Depth: 10.21 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.69 ft
Screen Length: 9.94 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

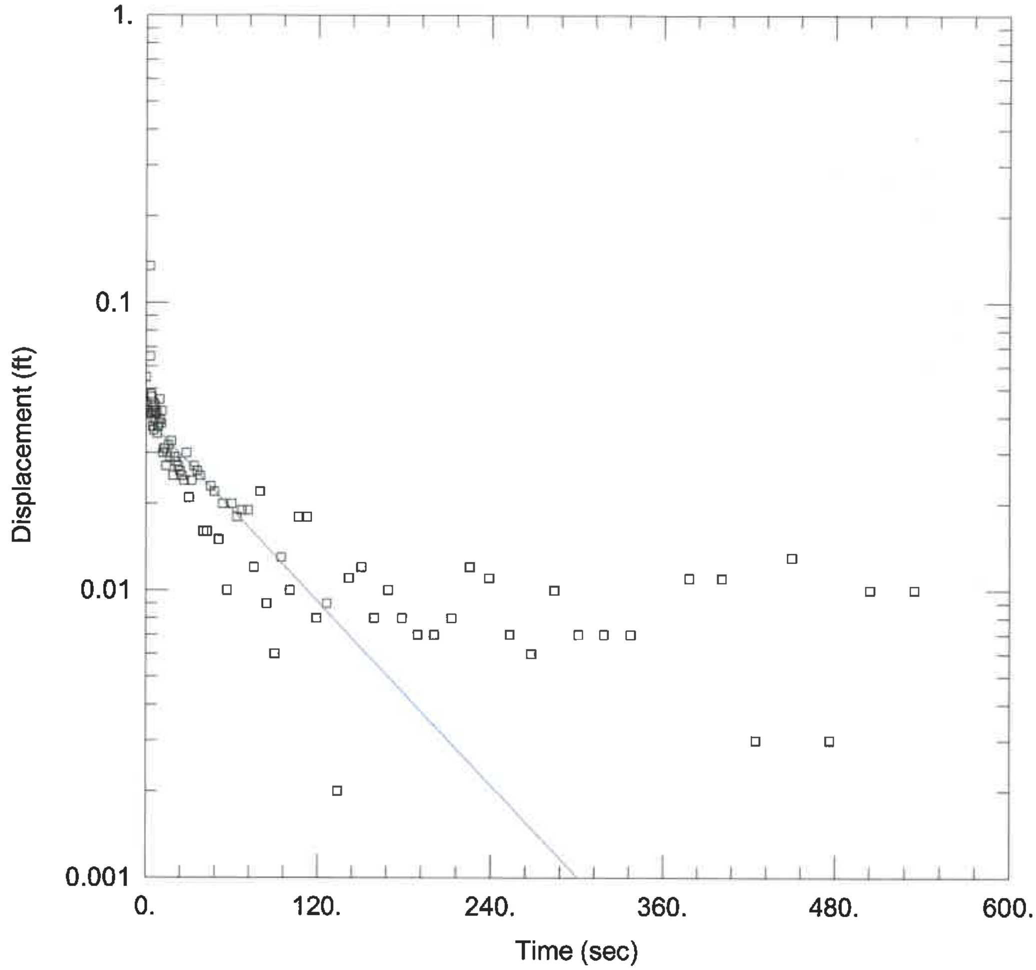
SOLUTION

Aquifer Model: Confined

Kr = 0.00021 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.0027 ft^{-1}



G311 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G311-fh.aqt
Date: 06/03/21 Time: 15:38:33

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G311
Test Date: 3/10/2021

AQUIFER DATA

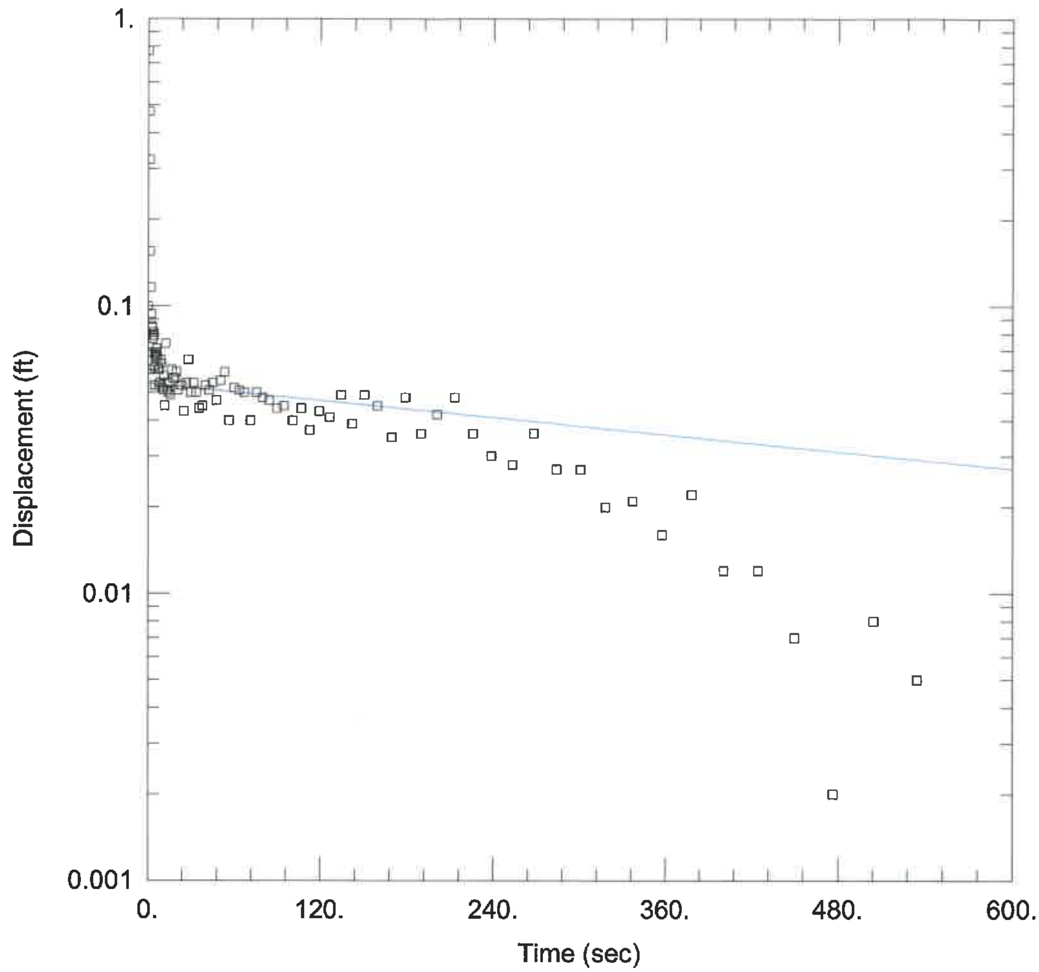
Saturated Thickness: 3. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G311)

Initial Displacement: 0.055 ft
Total Well Penetration Depth: 10.32 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 10.68 ft
Screen Length: 4.77 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0015 cm/sec
y0 = 0.04 ft



G311 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G311-rh.aqt
Date: 06/03/21 Time: 15:38:35

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G311
Test Date: 3/10/2021

AQUIFER DATA

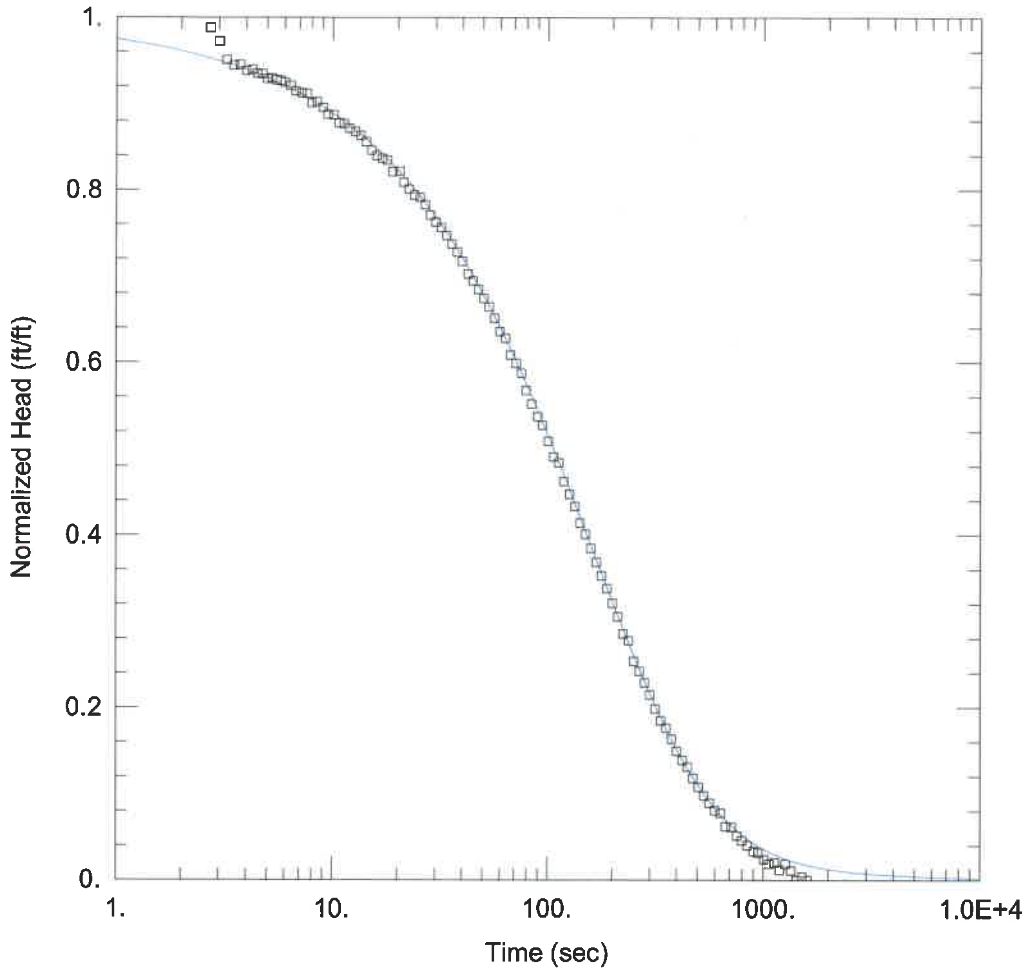
Saturated Thickness: 3. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G311)

Initial Displacement: 0.1 ft
Total Well Penetration Depth: 10.32 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 10.68 ft
Screen Length: 4.77 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.00014 cm/sec
y0 = 0.054 ft



G312 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G312-fh.aqt
Date: 06/03/21 Time: 15:38:36

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G312
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 2.3 ft

WELL DATA (G312)

Initial Displacement: 1.29 ft
Total Well Penetration Depth: 7.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.15 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

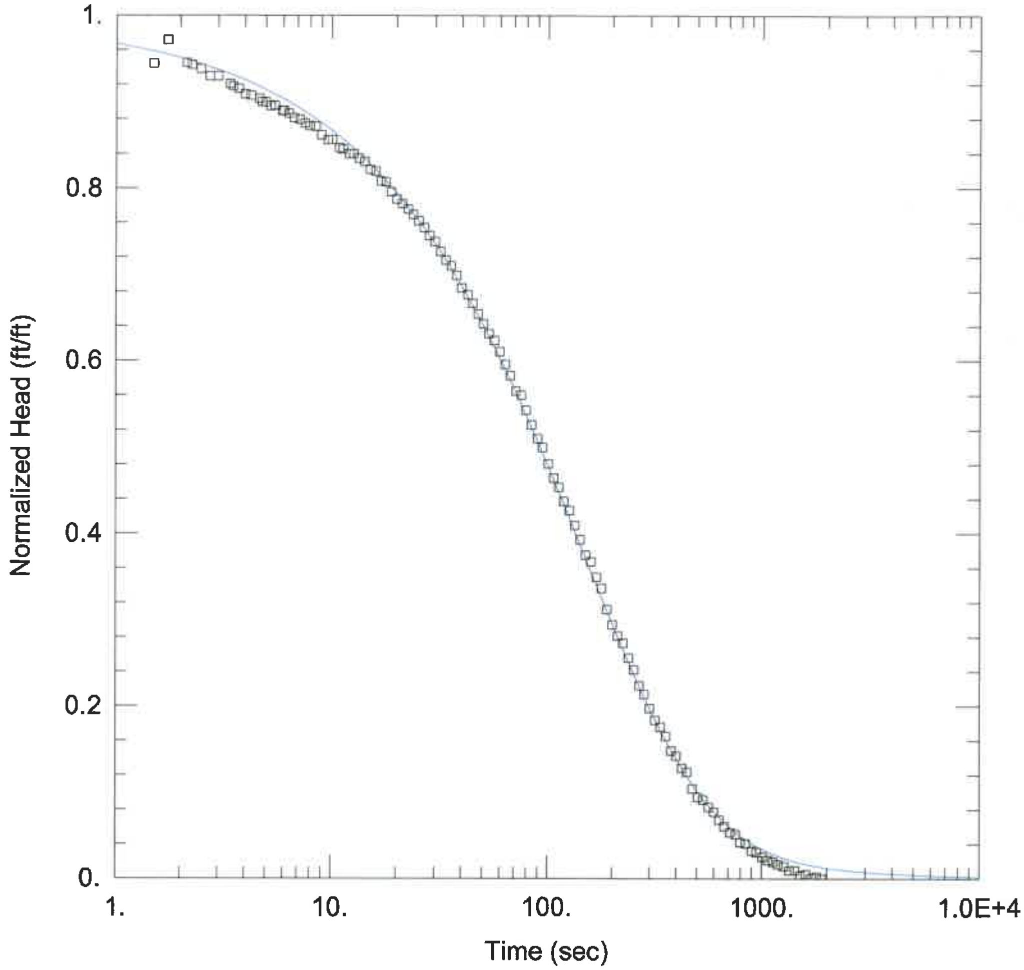
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0011 cm/sec
Kz/Kr = 1.

Ss = 0.0066 ft^{-1}



G312 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G312-rh.aqt
Date: 06/03/21 Time: 15:38:38

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G312
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 2.3 ft

WELL DATA (G312)

Initial Displacement: 1.4 ft
Total Well Penetration Depth: 7.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.15 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

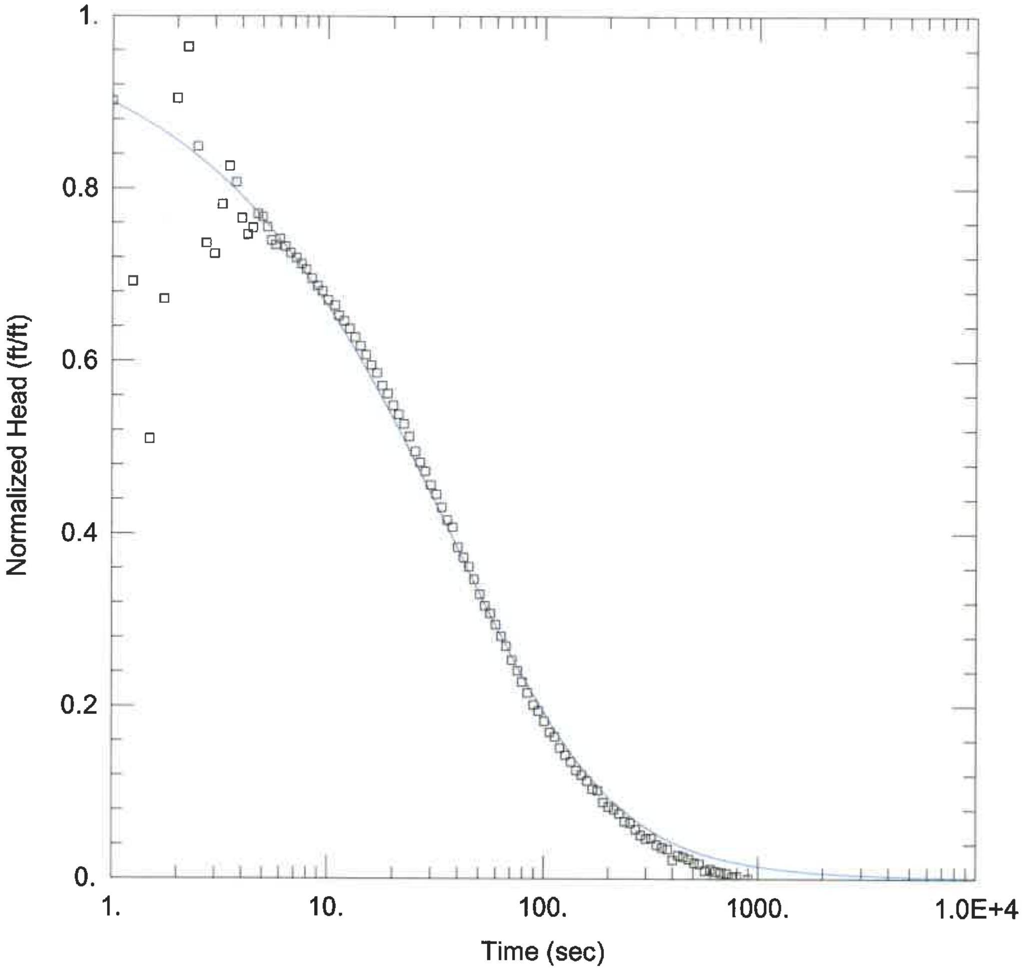
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0011 cm/sec
Kz/Kr = 1.

Ss = 0.013 ft^{-1}



G313 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G313-fh.aqt
Date: 06/03/21 Time: 15:38:40

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G313
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 1.5 ft

WELL DATA (G313)

Initial Displacement: 1.7 ft
Total Well Penetration Depth: 10.9 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.25 ft
Screen Length: 4.81 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

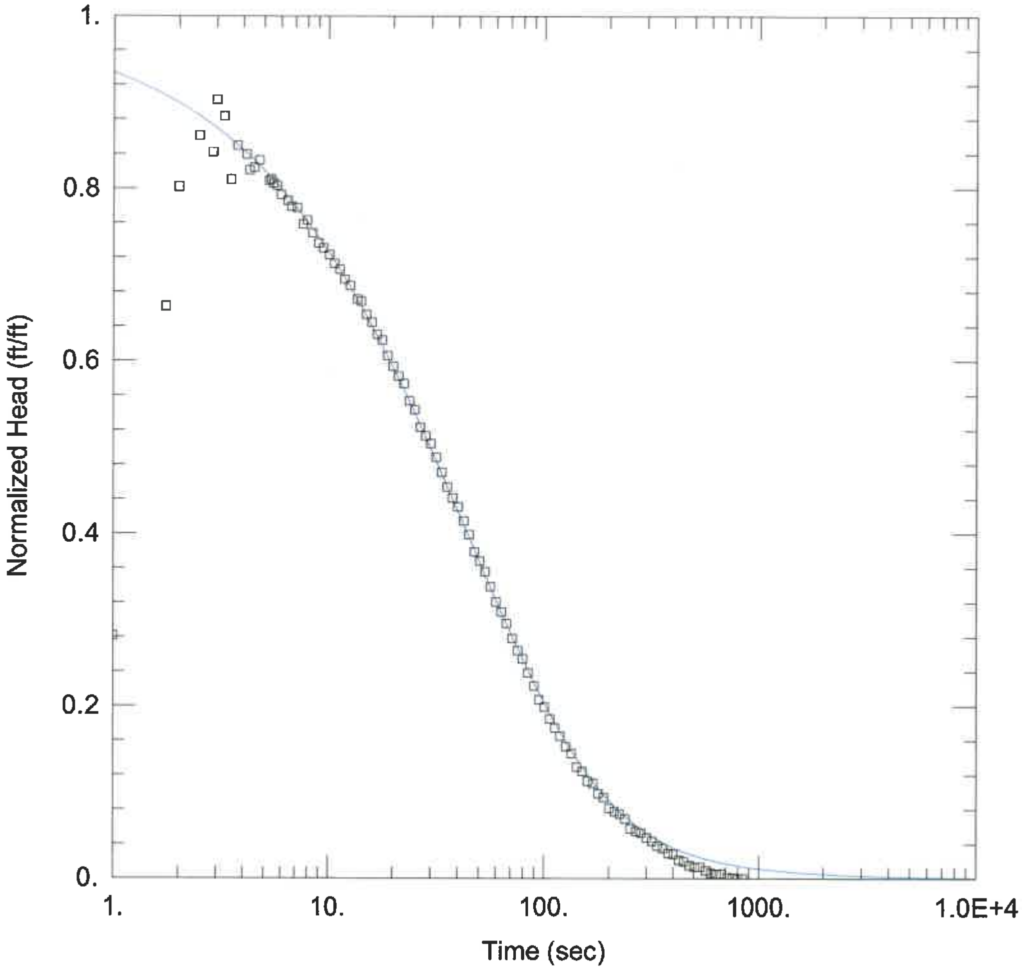
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0027 cm/sec
Kz/Kr = 1.

Ss = 0.07 ft^{-1}



G313 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G313-rh.aqt
Date: 06/03/21 Time: 15:38:41

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G313
Test Date: 3/10/2021

AQUIFER DATA

Saturated Thickness: 1.5 ft

WELL DATA (G313)

Initial Displacement: 1.65 ft
Total Well Penetration Depth: 10.9 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.25 ft
Screen Length: 4.81 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

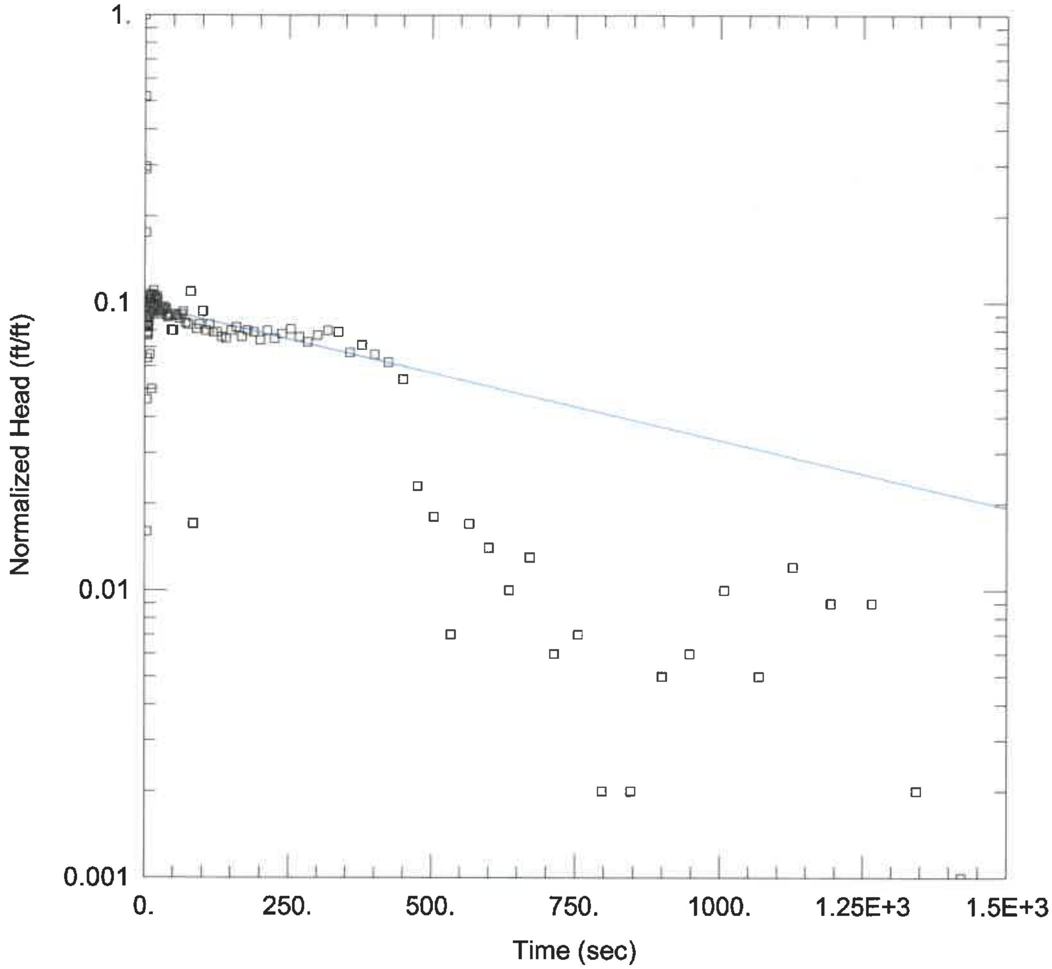
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0035 cm/sec
Kz/Kr = 1.

Ss = 0.015 ft^{-1}



G314D FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G314D-fh.aqt
Date: 06/03/21 Time: 15:38:43

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G314D
Test Date: 3/10/2021

AQUIFER DATA

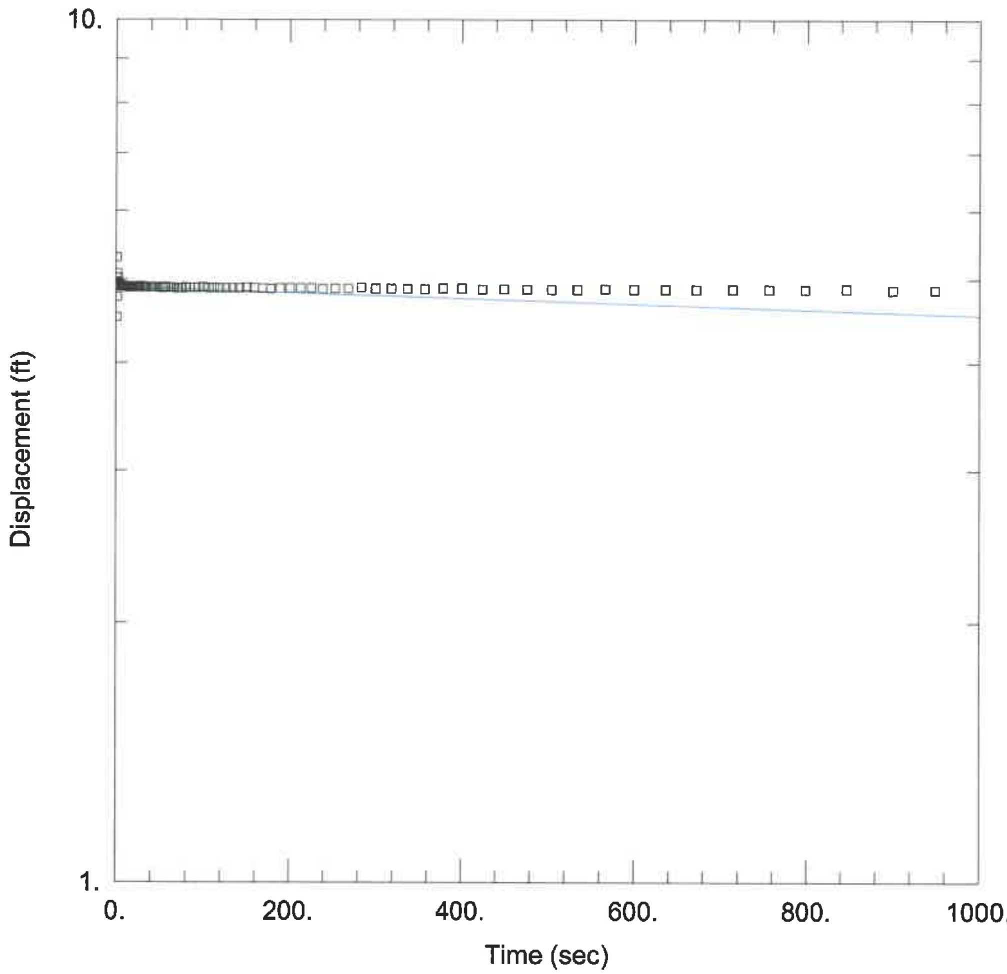
Saturated Thickness: 1. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G314D)

Initial Displacement: 1. ft
Total Well Penetration Depth: 9.77 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 9.77 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.00033 cm/sec
y0 = 0.098 ft



G314D RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G314D-rh.aqt
Date: 06/03/21 Time: 15:38:45

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G314D
Test Date: 3/10/2021

AQUIFER DATA

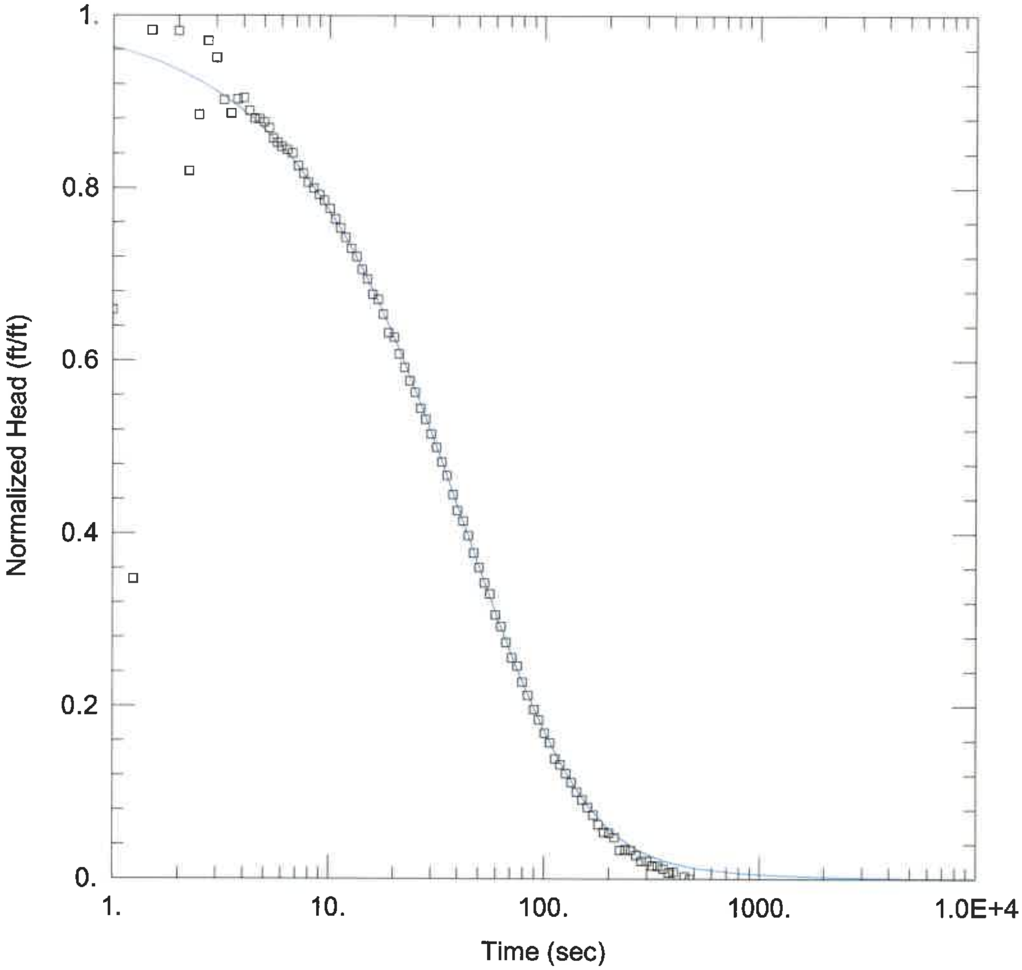
Saturated Thickness: 1. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G314D)

Initial Displacement: 4.95 ft
Total Well Penetration Depth: 9.77 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.3 ft
Screen Length: 9.77 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 2.3E-5 cm/sec
y0 = 4.9 ft



G315 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G315-fh.aqt
Date: 06/03/21 Time: 15:38:46

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G315
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 1.6 ft

WELL DATA (G315)

Initial Displacement: 1.35 ft
Total Well Penetration Depth: 14.77 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12.56 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

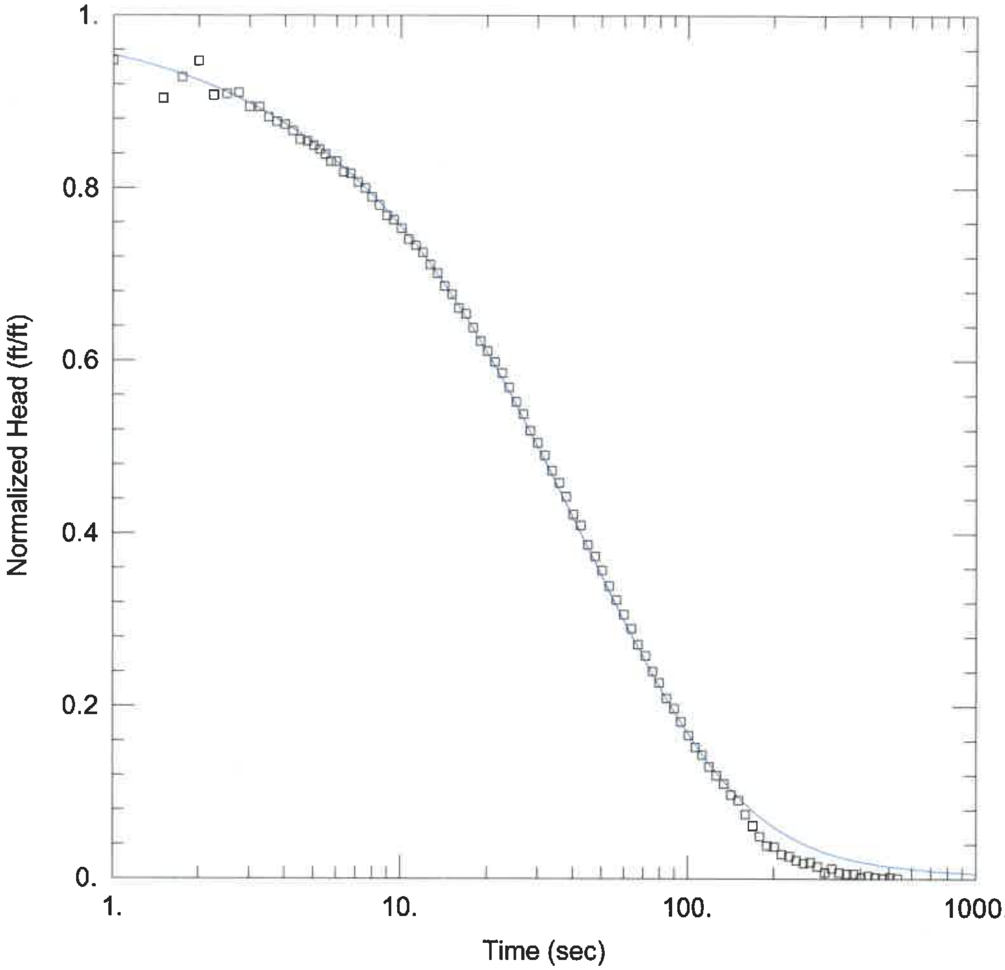
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0066 cm/sec
Kz/Kr = 1.

Ss = 0.0007 ft^{-1}



G315 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G315-rh.aqt
Date: 06/03/21 Time: 16:40:34

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G315
Test Date: 3/12/2021

AQUIFER DATA

Saturated Thickness: 1.6 ft

WELL DATA (G315)

Initial Displacement: 1.77 ft
Total Well Penetration Depth: 14.77 ft
Casing Radius: 0.08333 ft

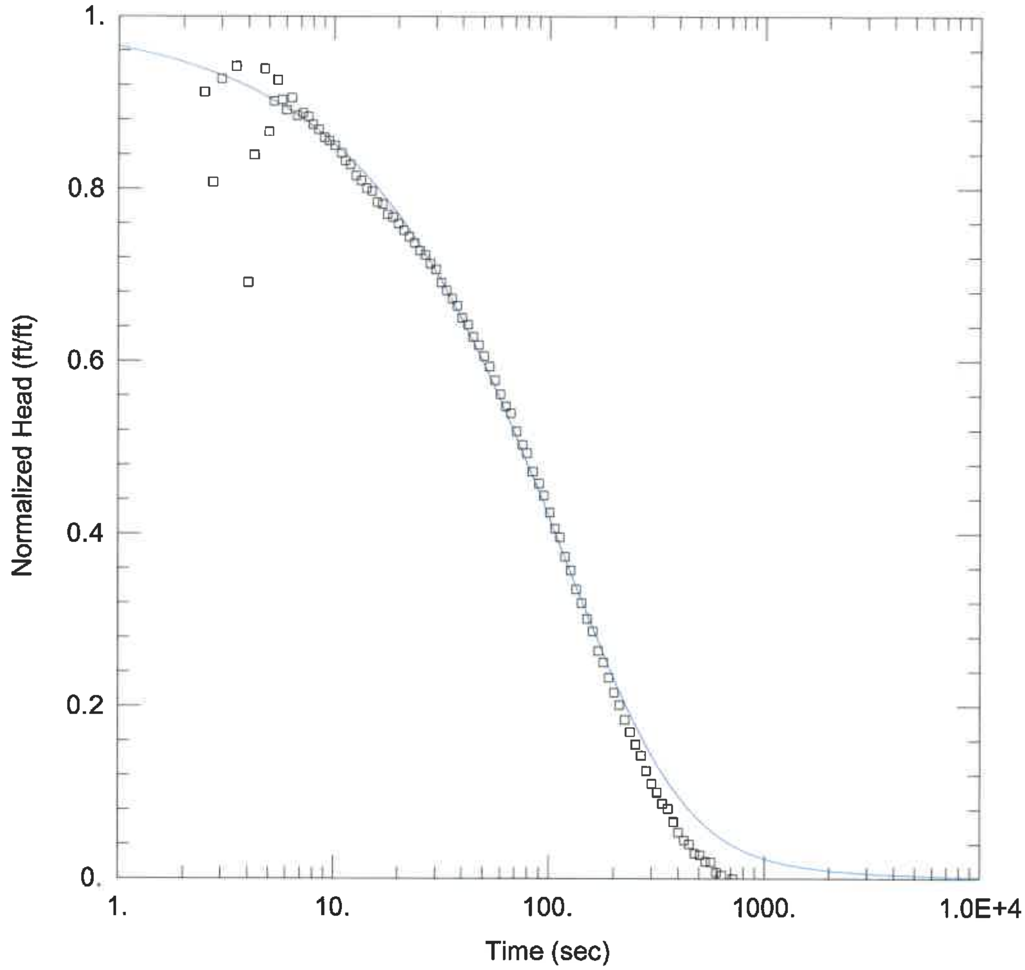
Static Water Column Height: 12.56 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0058 cm/sec
Kz/Kr = 1.

Ss = 0.003 ft^{-1}



G316 FALLING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G316-fh.aqt
Date: 06/03/21 Time: 15:38:50

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G316
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 1.4 ft

WELL DATA (G316)

Initial Displacement: 1.51 ft
Total Well Penetration Depth: 6.69 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 4.08 ft
Screen Length: 4.8 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

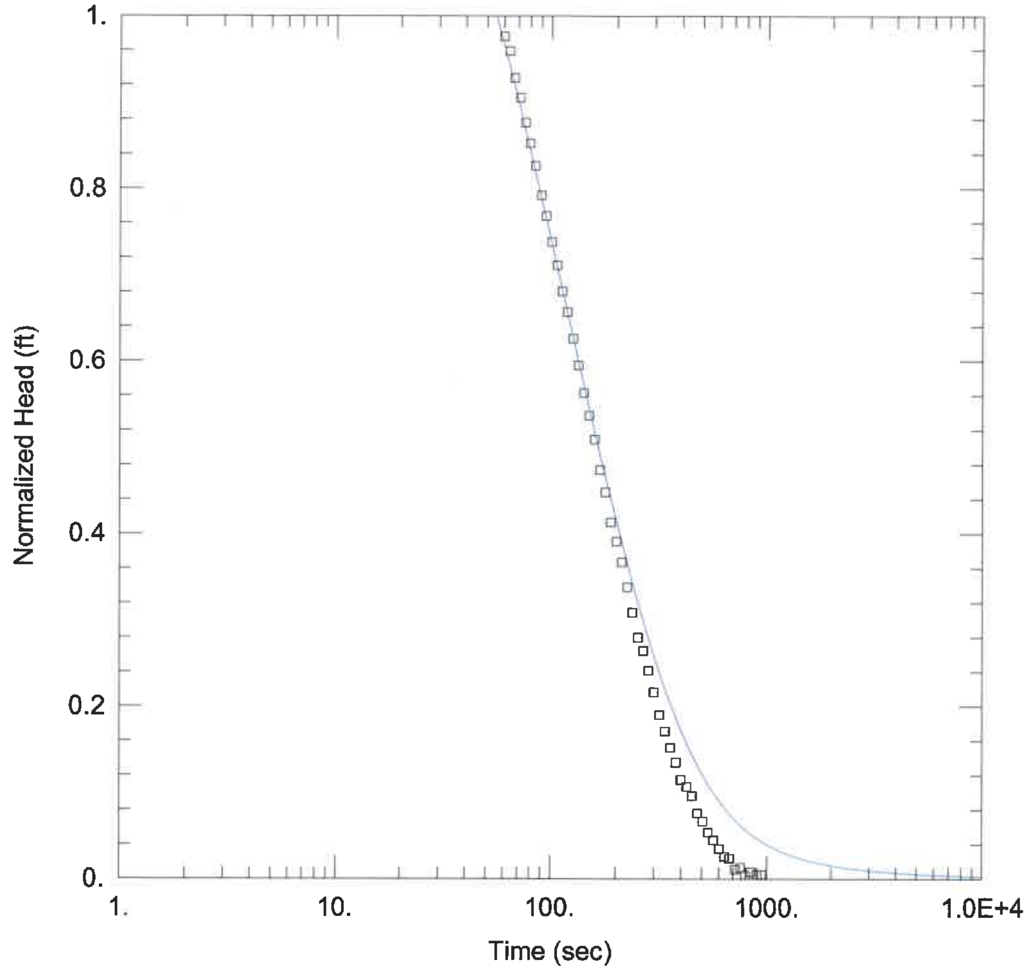
SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0023 cm/sec
Kz/Kr = 1.

Ss = 0.02 ft^{-1}



G316 RISING HEAD TEST

Data Set: I:\20jobs\20E0111A\Admin\13-Calculations\Slug Tests\Coffeen\G316-rh.aqt
Date: 06/03/21 Time: 15:38:51

PROJECT INFORMATION

Client: Coffeen Power Station
Project: 20E0111A
Location: Coffeen, IL
Test Well: G316
Test Date: 3/11/2021

AQUIFER DATA

Saturated Thickness: 1.4 ft

WELL DATA (G316)

Initial Displacement: 1.62 ft
Total Well Penetration Depth: 6.69 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 4.08 ft
Screen Length: 4.8 ft
Well Radius: 0.08333 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 0.0023 cm/sec
Kz/Kr = 1.

Ss = 0.0085 ft^{-1}

ADDITIONAL FIELD HYDRAULIC CONDUCTIVITIES

FIELD HYDRAULIC CONDUCTIVITIES
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
GMF GYPSUM STACK POND
COFFEEN, ILLINOIS

Well ID	Gradient Position	Bottom of Screen Elevation (ft NAVD88)	Screen Length [1] (ft)	Field Identified Screened Material	Slug Type	Analysis Method	Falling Head (Slug In) Hydraulic Conductivity (cm/s)	Rising Head (Slug Out) Hydraulic Conductivity (cm/s)	Minimum Hydraulic Conductivity (cm/s)	Maximum Hydraulic Conductivity (cm/s)	Hydraulic Conductivity Geometric Mean (cm/s)
Uppermost Aquifer											
G206	D	608.61	4.41	SM, s(CL), CL	solid	Kansas Geological Survey	5.0E-04	4.9E-04	2.5E-04	4.0E-03	1.4E-03
G209	D	608.29	4.54	CL	solid	Kansas Geological Survey	- -	2.5E-04			
G212	D	609.30	4.55	SM, s(CL), CL	solid	Kansas Geological Survey	2.1E-03	1.8E-03			
G215	D	606.68	4.39	SM, s(CL), ML	solid	Kansas Geological Survey	4.0E-03	3.5E-03			
G218	D	605.87	4.44	SM, SC, CL	solid	Kansas Geological Survey	2.6E-03	2.4E-03			

[O: KLT, C:EDP 8/31/21]

Notes:
1. All wells are constructed from 2 inch PVC with 0.01 inch slotted screens.
- - = Test not analyzed/performed
cm/s = centimeters per second
D = downgradient
ft = foot/feet
NAVD88 = North American Vertical Datum of 1988
PVC = polyvinyl chloride

USCS = Unified Soil Classification System
CL = Lean Clay
s(CL) = Sandy Lean Clay
ML = Silt
SC = Clayey Sand
SM = Silty Sand

FIELD HYDRAULIC CONDUCTIVITIES
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
COFFEEN POWER PLANT
GMF RECYCLE POND
COFFEEN, ILLINOIS

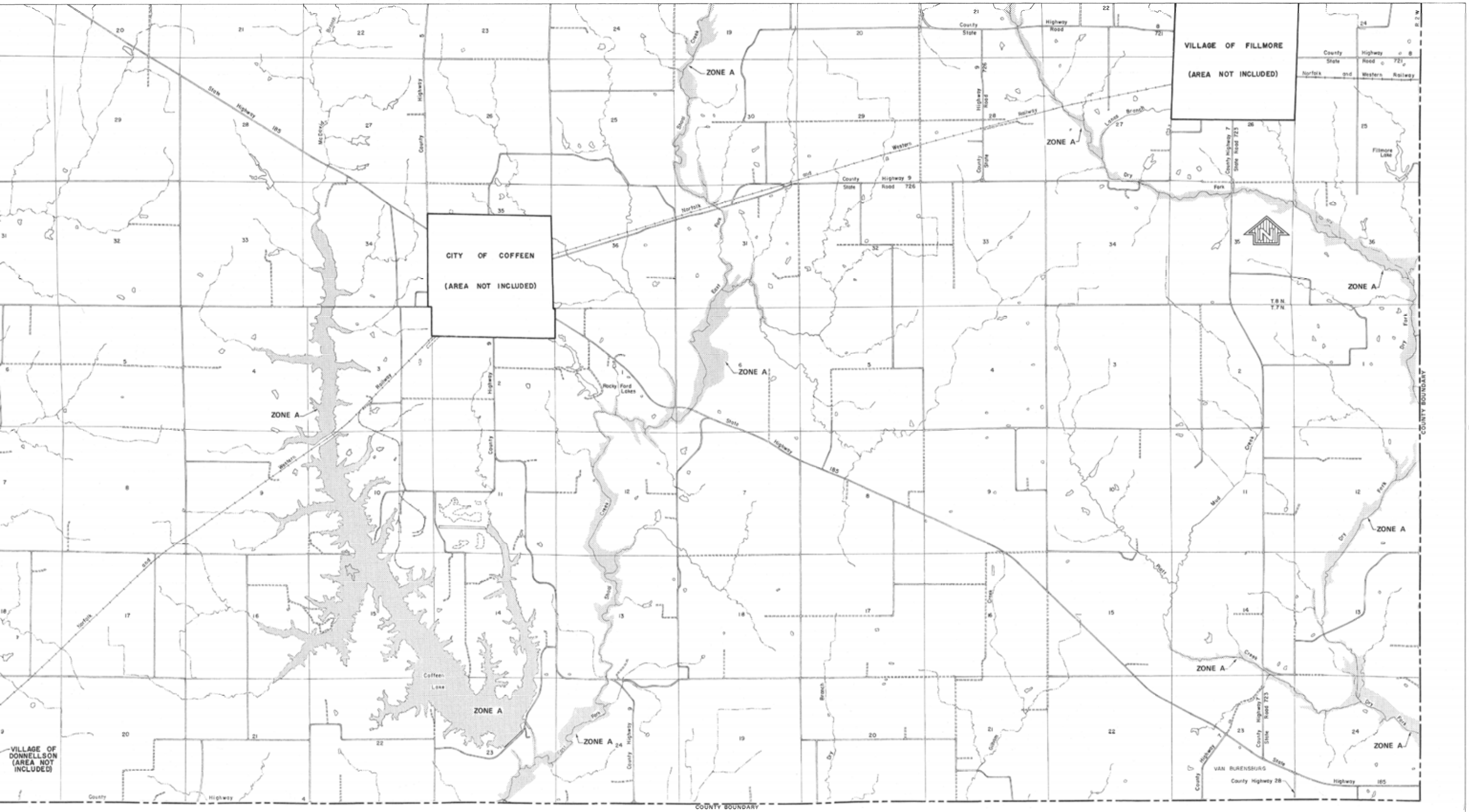
Well ID	Gradient Position	Bottom of Screen Elevation (ft NAVD88)	Screen Length [1] (ft)	Field Identified Screened Material	Slug Type	Analysis Method	Falling Head (Slug In) Hydraulic Conductivity (cm/s)	Rising Head (Slug Out) Hydraulic Conductivity (cm/s)	Minimum Hydraulic Conductivity (cm/s)	Maximum Hydraulic Conductivity (cm/s)	Hydraulic Conductivity Geometric Mean (cm/s)
Uppermost Aquifer											
G272	D	606.74	4.87	SP to ML, (CL)s	solid	Kansas Geological Survey	1.7E-03	- -	7.8E-04	1.7E-03	1.1E-03
G284	D	602.48	4.77	ML	solid	Kansas Geological Survey	1.2E-03	7.8E-04			
G286	D	601.81	4.79	SP, ML, CL	solid	Kansas Geological Survey	1.2E-03	- -			
G287	D	604.09	4.82	SP, ML, CL	solid	Kansas Geological Survey	1.1E-03	1.1E-03			
Lower Confining Unit (PMP)											
G283	D	590.13	9.78	SP, ML	solid	Kansas Geological Survey	4.2E-03	4.5E-03	2.7E-04	4.5E-03	1.2E-03
G285	D	587.09	9.77	CL	solid	Bouwer-Rice	2.7E-04	4.3E-04			

[O: KLT, C:EDP 8/31/21]

Notes:
1. All wells are constructed from 2 inch PVC with 0.01 inch slotted screens.
- - = Test not analyzed/performed
cm/s = centimeters per second
D = downgradient
ft = foot/feet
NAVD88 = North American Vertical Datum of 1988
PVC = polyvinyl chloride
PMP = potential migration pathway

USCS = Unified Soil Classification System
CL = Lean Clay
(CL)s = Lean Clay with Sand
ML = Silt
SP = Poorly-Graded Sand

APPENDIX G
FEMA FLOOD HAZARD MAP



KEY TO SY

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Illinois State **WATER** Survey (1895)

This map illustrates stream reaches at risk for potential flooding that were not designated as Special Flood Hazard Areas (SFHAs) and were not shown on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps as of July 1, 2007. Also shown are areas of Risk Class A (high), B (medium), and C (low) adopted by FEMA Region 5. Streams lacking a SFHA designation and draining more than one square mile in a Risk Class A area or draining more than 10 square miles in a Risk Class B or C area are shown with red lines.

A table associated with this map lists streams with unmapped potential flood risk, their names, and the number of miles not within a Special Flood Hazard Area.

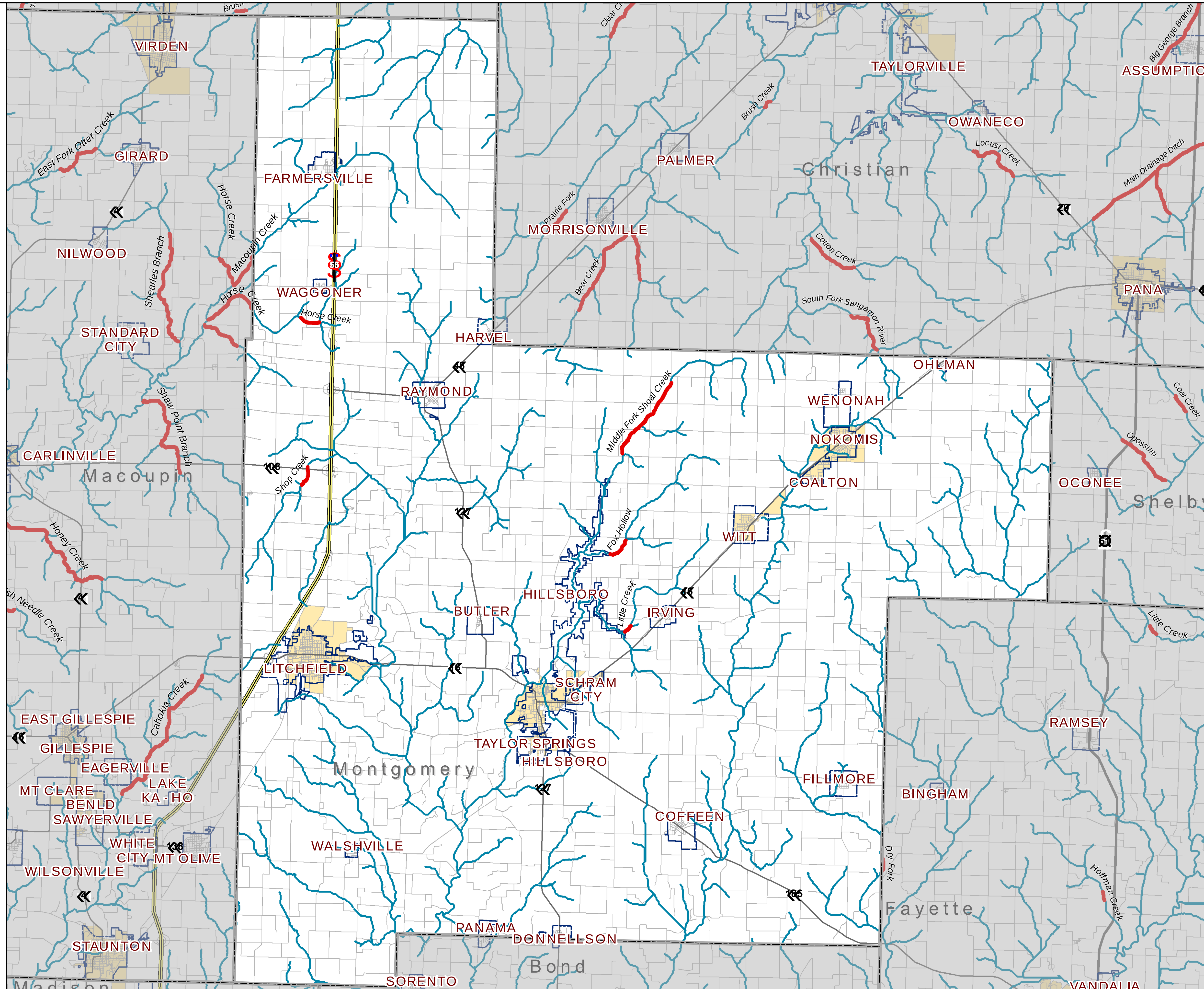
0 0.5 1 2 3 4 5
Miles

Legend

- Streams without SFHAs
- Streams
- Municipal Boundaries
- County Boundaries
- Interstate Hwy
- US Highways
- State Routes
- Roads

Risk Classes

- A - High Risk
- B - Medium Risk
- C - Low Risk



Streams Classified by Risk: Montgomery County, Illinois

APPENDIX E

Closure Priority Categorization

Phil Morris
Illinois Power Generating Company
Luminant
1500 Eastport Plaza Drive
Collinsville, IL 62234

May 19, 2021

Mr. Darin LeCrone, P.E.
Manager, Industrial Unit
Bureau of Water, Division of Water Pollution Control, Permits Section
Illinois Environmental Protection Agency
1021 North Grand Avenue, East
Springfield, IL 62794-9276

Re: CCR Surface Impoundment Category Designation and Justification for Illinois Power Generating Company

Dear Mr. LeCrone:

Pursuant to 35 I.A.C. 845.700(c), Illinois Power Generating Company submits the information necessary to categorize the CCR surface impoundments located at the Newton Power Plant and the now retired Coffeen Power Plant. The following parameters were used in assessing and justifying each assigned category.

- Category 1 – *Impacts to existing potable water supply well or impacts to groundwater quality within the setback of an existing potable water supply well.*
    - This review includes an assessment of potable water wells within 2,500 feet of CCR surface impoundments to determine whether any potential impacts are occurring within the setback zone of any community water supply well established under the Illinois Groundwater Protection Act.
    - This information was developed during the Part 845 rulemaking and is summarized in Attachment 1, Table 2: Impacts to Potable Water Supply.
- Category 2 – *Imminent threat to human health or the environment or have been designated by IEPA under (g)(5)*
    - The surface impoundments at Newton and Coffeen Power Plants do not pose an imminent threat to human health or the environment. There are no known conditions at or around the facility where someone or something may be exposed to contaminant concentrations reasonably expected to cause harm
- Category 3 – *Located in areas of environmental justice ("EJ") concern*
    - EJ areas were evaluated using the EJ mapping link from IEPA's webpage located at https://www2.illinois.gov/epa/topics/environmental-justice. Per the IEPA mapping tool, the EJ Status thresholds were determined as twice the state averages for Minority and Low Income consistent with 35 IAC 845.700(g)(6).
    - An EJ map denoting the facilities with impoundments is located in Attachment 2.

- Category 4-7
    - Category 4 - Inactive CCR surface impoundments that have an exceedance of the groundwater protection standards in Section 845.600
    - Category 5 - Existing CCR surface impoundments that have exceedances of the groundwater protection standards in Section 845.600
    - Category 6 - Inactive CCR surface impoundments that are in compliance with the groundwater protection standards in Section 845.600.
    - Category 7 – Existing CCR surface impoundments that are in compliance with the groundwater protection standards in Section 845.600

Based on the information above, category designations have been assigned. The category designations for each CCR impoundment are shown in Attachment 1, Table 1: Category Designations.

If you have any questions regarding this submittal, please contact Phil Morris at 618-343-7794 or phil.morris@vistracorp.com.

Sincerely,

Phil Morris
Senior Environmental Director

Attachments

Attachment 1

Table 1: Category Designation

Facility	Pond Description	Classifications	Potable Water Supply Impacts (Category 1)	Human Health or Environment Threat (Category 2)	Located within Environmental Justice Areas[1] (Category 3)	Standards Exceedances[2] (Categories 4,5,6,7)	Impoundment Category 845.700(g)
Coffeen	Ash Pond 1	Inactive	No	No	No	Yes	5
	GMF Pond	Inactive	No	No	No	Yes	5
	GMF Recycle Pond	Inactive	No	No	No	Yes	5
Newton	Primary Ash Pond	Existing	No	No	No	Yes	5

[1] See Attachment 2 Environmental Justice Area Map

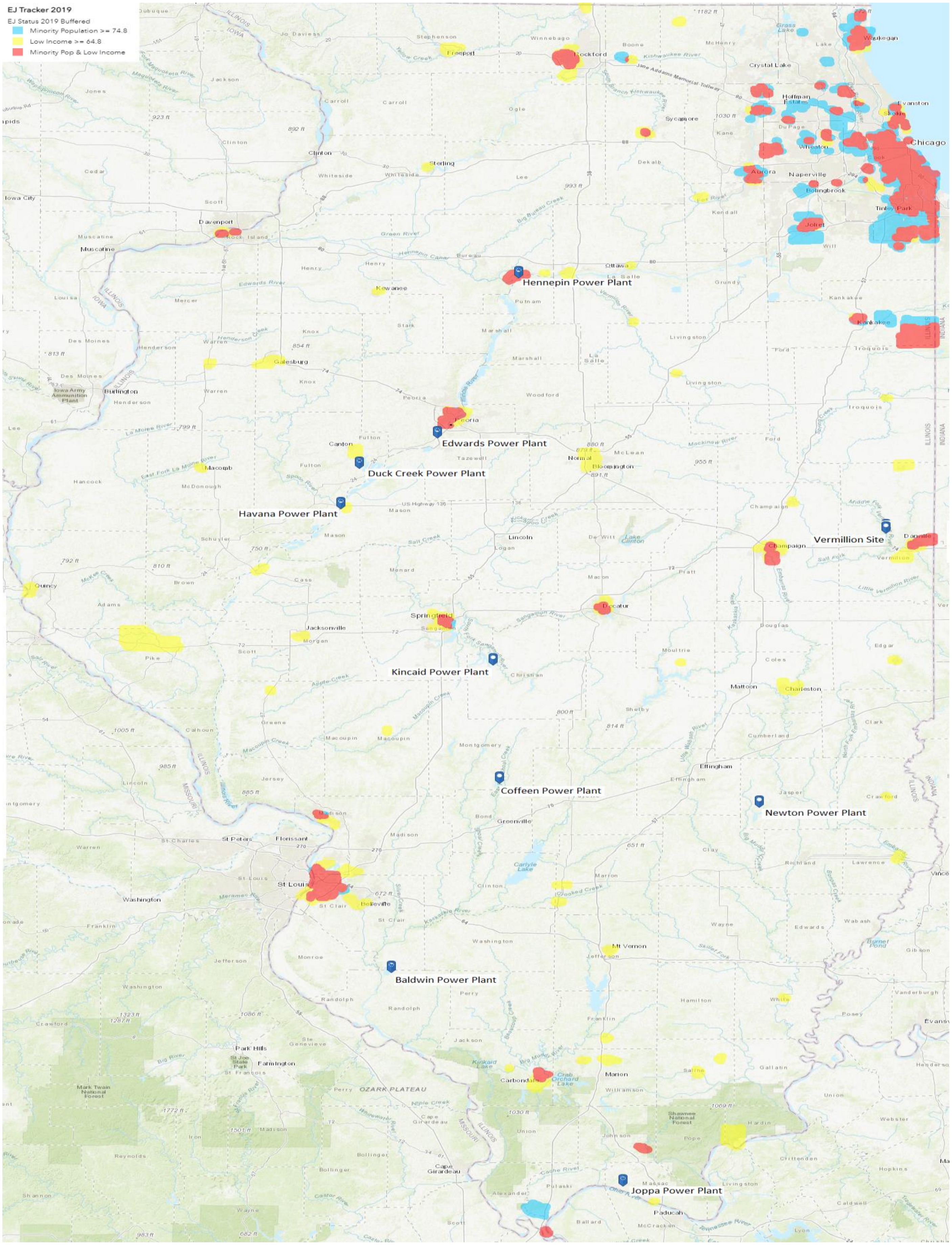
[2] Ground water analyses for purposes of categories 4-7, assumptions have been made based on current groundwater data. However, since sampling and analysis is ongoing and subject to IEPA review and approval, IPGC reserves the right to update its category designations for Categories 4-7.

Table 2: Impacts to Potable Water Supply[1]

Site Name	Private and Semi-Private Wells	Non-Community Water Supply (CWS) Wells	Non-CWS Surface Water Intakes	Community Water Supply Wells	CWS Surface Water Intakes
Coffeen	**Present, but not at risk** Thirty-four (34) water wells were identified; however, they are unlikely to be at risk because of their hydrogeologic location relative to the power plant, they are abandoned, or they do not appear to be used for potable purposes. None of the off-site wells are located in a downgradient direction.	**Present, but not at risk** Three (3) non-CWS wells were identified; however, they are unlikely to be at risk because of their hydrogeologic location relative to the power plant and/or their inactive status.	Absent	Absent	Absent
Newton	**Present, but not at risk** Twenty-four (24) water wells were identified; however, they are unlikely to be at risk because of their hydrogeologic location relative to the power plant, they are abandoned, and/or they are unlikely to be present based on the mapped location. None of the offsite wells are located in a downgradient direction.	Absent	Absent	Absent	Absent

[1] Ramboll, WELL/WATER SUPPLY SURVEY AND EVALUATION COAL-FIRED POWER PLANTS IN ILLINOIS (September 24, 2020), filed with the Illinois Pollution Control Board in R2020-019.

Attachment 2: EJ Mapping Denoting Facilities with Impoundments



APPENDIX F

Groundwater Modeling

Intended for
Illinois Power Generating Company

Date
July 28, 2022

Project No.
1940101010-008

GROUNDWATER MODELING REPORT

ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

Bright ideas. Sustainable change.

GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT ASH POND NO. 1

Project name	**Coffeen Power Plant Ash Pond No. 1**
Project no.	**1940101010-008**
Recipient	**Illinois Power Generating Company**
Document type	**Groundwater Model Report**
Revision	**FINAL**
Date	**July 28, 2022**

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https://ramboll.com

Saskia Noorduijn, PhD
Consultant

Brian G. Hennings, PG
Senior Managing Hydrogeologist

CONTENTS

TABLES (IN TEXT)

TABLES (ATTACHED)

FIGURES (IN TEXT)

FIGURES (ATTACHED)

APPENDICES

ACRONYMS AND ABBREVIATIONS

§	Section
35 I.A.C.	Title 35 of the Illinois Administrative Code
AP1	Ash Pond No. 1
AP2	Ash Pond No. 2
bgs	below ground surface
CBR	closure by removal
CCR	coal combustion residual(s)
CIP	closure in place
cm/s	centimeter per second
CPP	Coffeen Power Plant
CSM	conceptual site model
DA	deep aquifer
DCU	deep confining unit
DEM	Digital Elevation Model
ft^2	square feet
ft/d	feet per day
ft/ft	feet per foot
Geosyntec	Geosyntec Consultants, Inc.
GHB	general head boundary conditions
GMF GSP	Gypsum Management Facility Gypsum Stack Pond
GMF RP	Gypsum Management Facility Recycle Pond
GMP	Groundwater Monitoring Plan
GMR	Groundwater Modeling Report
GWPS	groundwater protection standard(s)
Hanson	Hanson Professional Services, Inc.
HCR	Hydrogeologic Site Characterization Report
HDPE	high density polyethylene
HELP	Hydrologic Evaluation of Landfill Performance
HFB	horizontal flow barrier
HUC	Hydrologic Unit Code
ID	identification
IEPA	Illinois Environmental Protection Agency
IPGC	Illinois Power Generating Company - IPGC
ISGS	Illinois State Geological Survey
K_D	linear isotherm
K_{eff}	effective hydraulic conductivity
K_F	Freundlich isotherm
K_L	Langmuir isotherm
Kd	distribution coefficient
Kh/Kv	anisotropy ratio
LCU	lower confining unit
LF	Landfill
L/kg	liters per kilogram
m	meter
mg/L	milligrams per liter

mil	one thousandth of an inch
mL/g	milliliters per gram
NAVD88	North American Vertical Datum of 1988
NID	National Inventory of Dams
No.	number
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resources Technology, Inc.
Part 845	35 I.A.C. § 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments
R2	correlation coefficient
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	surface impoundment(s)
SSR	sum of squared residuals
TDS	total dissolved solids
TR	transient model
TVD	total-variation-diminishing
UA	uppermost aquifer
UCU	upper confining unit
USDA/NRCS	United States Department of Agriculture/Natural Resources Conservation Service
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

EXECUTIVE SUMMARY

Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Groundwater Modeling Report (GMR) on behalf of the Coffeen Power Plant (CPP), operated by Illinois Power Generating Company - IPGC (IPGC), in accordance with requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (Part 845) (Illinois Environmental Protection Agency [IEPA], 2021). This document presents the results of predictive groundwater modeling simulations for proposed closure scenarios for the coal combustion residuals (CCR) management unit Ash Pond Number (No.) 1 (AP1 [(Vistra Identification [ID] No. 101, IEPA ID No. W1350150004-01, and National Inventory of Dams [NID] No. IL50722]). AP1 is a 23-acre, unlined surface impoundment (SI) used to manage CCR and non-CCR waste streams at the CPP. Its total storage capacity is approximately 300 acre-feet.

The CPP is located in Montgomery County, in central Illinois between the two lobes of Coffeen Lake (**Figure 1-1**), which was formed in 1963 by damming the McDavid Branch of the East Fork of Shoal Creek. Coffeen Lake encompasses approximately 1,100 acres and was created to provide a source of cooling water for the CPP. Coffeen Lake borders the CPP to the west, east, and south, and agricultural land is located to the north. Historically coal mines were operated at depth below the site. Mine shafts, processing facilities, and historic coal storage were located on the southern extent of the CPP, south of AP1. The CPP operated as a coal-fired power plant from 1964 until November 2019 and has five CCR management units, with AP1 being the subject of this GMR. Unlithified material present above the bedrock in the vicinity of the CPP was categorized into hydrostratigraphic units as part of the 2021 Hydrogeologic Site Characterization Reports (HCR; Ramboll, 2021a). In addition to the CCR, the hydrostratigraphic units occur in the following order (from ground surface downward) and include:

- **Upper Confining Unit (UCU):** Consists of the Loess Unit and the upper clayey portion of the Hagarstown Member which has generally lower vertical permeability. The UCU has been eroded east of AP1, near the Unnamed Tributary.
- **Uppermost Aquifer (UA):** The UA is the sandy portion of the Hagarstown Member which is classified as primarily sandy to gravelly silts and clays with thin beds of sands. Similar to the Loess Unit, the Hagarstown is absent in some locations near the Unnamed Tributary.
- **Lower Confining Unit (LCU):** Comprised of the Vandalia Member, Mulberry Grove Member, and Smithboro Member. These units include a sandy to silty till with thin, discontinuous sand lenses, a discontinuous and limited extent sandy silt which has infilled prior erosional features, and silty to clayey diamicton, respectively.
- **Deep Aquifer (DA):** Sand and sandy silt/clay units of the Yarmouth Soil, which include accretionary deposits of fine sediment and organic materials, typically less than five feet thick and discontinuous across the CPP.
- **Deep Confining Unit (DCU):** Comprised of the Banner Formation and generally clays, silts, and sands. The Lierle Clay Member is the upper layer of the Banner Formation which was encountered at the CPP.

Flow of groundwater from central portions of the CPP to Coffeen Lake or the Unnamed Tributary through the UA are the primary pathways for contaminant migration. Groundwater elevations are primarily controlled by surface topography, geologic unit topography, and water levels within Coffeen Lake and the Unnamed Tributary. A groundwater divide trending north-south is observed running through the approximate center of the CPP. Phreatic surfaces or water elevations within the SI are generally consistent and have not been observed to fluctuate with groundwater elevations, indicating limited hydraulic connection with the SI.

The conceptual site model (CSM) for modeling the groundwater at the CPP is as follows:

- Most hydrostratigraphic layers are laterally continuous across the area. The flat to gently rolling uplands are dissected by deeply incised streams (into the materials of the UCU, UA, and LCU) that are tributaries to river systems in the area. Coffeen Lake was created by damming one of these tributary streams for use by the CPP.
- The UA is separated from the bottom of the AP1 by a minimum of 10 feet of low-permeability glacial till that comprises the UCU. Erosion caused by incised streams has occurred along the northeast corner of AP1 which likely results in ash being in contact with the UA.
- Surface recharge and groundwater migrate vertically through the low permeability sediments of the UCU. Groundwater migrates horizontally through the higher permeability sediments of the UA.
- Groundwater elevations and lake elevations indicates groundwater flows into Coffeen Lake from the UA.
- AP1 is constructed such that the earthen berm and base are in contact with the UCU with exception of limited areas in the northeast of the SI where the UCU and UA have been eroded and the berm and base are in contact with the LCU.
- The stage within AP1 is managed with minimal (less than 3 feet) variability throughout the year.

A review and summary of data collected from 2015 through 2021 for parameters with groundwater protection standards (GWPS) listed in 35 I.A.C. § 845.600 is provided in the HCR (Ramboll, 2021a). Concentration results presented in the HCR and summarized in the History of Potential Exceedances (Ramboll, 2021b) are considered potential exceedances because the methodology used to determine them is proposed in the Statistical Analysis Plan (Appendix A to the Groundwater Monitoring Plant [GMP], Ramboll 2021c), which has not been reviewed or approved by IEPA at the time of submittal of the Part 845 operating permit application. The following constituents with potential exceedances of the GWPS listed in 35 I.A.C. § 845.600 were identified: boron, cobalt, pH, sulfate, and total dissolved solids (TDS) (Ramboll, 2021b) at AP1.

A Technical Memorandum (**Attachment A**) was prepared by Geosyntec Consultants, Inc. (Geosyntec, 2022a), *Evaluation of Potential Groundwater Protection Standard Exceedances, Coffeen Ash Pond No.1, Coffeen Illinois*, to further evaluate potential GWPS exceedances. The results of the evaluation demonstrated that the potential GWPS exceedances of cobalt in well G314 and pH in well G312 are not related to AP1 based on several lines of evidence presented in the Technical Memorandum.

Statistically significant correlations between sulfate concentrations and concentrations of TDS identified as potential exceedances of the GWPS indicate sulfate is an acceptable surrogate for TDS in the groundwater model. Concentrations of TDS are expected to change along with model predicted sulfate concentrations. A potential exceedance of boron was observed at one monitoring well, G313, which also has potential exceedances of both sulfate and TDS. Similar source and behavior in the groundwater system would be expected among boron, sulfate, and TDS at UA monitoring well G313, and boron concentrations are expected to change along with model predicted sulfate concentrations.

It was assumed that sulfate would not significantly sorb or chemically react with aquifer solids (distribution coefficient [Kd] was set to 0 milliliters per gram [mL/g]) which is a conservative estimate for predicting contaminant transport times in the model. Boron, sulfate, and TDS transport is likely to be affected by both chemical and physical attenuation mechanisms (*i.e.,* adsorption and/or precipitation reactions as well as dilution and dispersion).

All available hydrological information were used to construct a CSM and numerical model of the CPP. A steady state, 5-layer numerical model, based on a previous groundwater model of the area, was constructed to characterize the long-term groundwater flow conditions at the site. The hydrostratigraphic units included in the model were the UCU, UA, and LCU. The DA and DCU were not included in the model. Calibration of the model focused on simulating mean groundwater elevations for 95 wells at the site by modifying hydraulic parameters for the different hydrostratigraphic units, alongside river and general head boundary conductance. The calibrated model represents a reasonable match to the observed head and sulfate concentration data.

The calibrated model was used to predict the sulfate concentration for two closure scenarios using information provided in the Final Closure Plan for AP1 (Golder Associates [Golder], 2022a) including:

- **Scenario 1:** closure in place (CIP) including removal of CCR from the eastern portion of AP1, consolidation into the western portion of AP1, and construction of a cover system over the remaining CCR, and;
- **Scenario 2:** closure by removal (CBR) including removal of all CCR and regrading of the removal area.

Prior to the simulation of these scenarios, a dewatering simulation was included, which simulated the removal of free liquids from AP1 prior to the implementation of the two closure scenarios.

Scenario 1 (CIP) was predicted to reduce total flux in and out of the Fill Unit (CCR) by approximately 99.9%, when simulated post-construction heads in the groundwater monitoring wells are predicted to stabilize. Additionally, the base of consolidated CCR was compared to the simulated steady-state groundwater elevations which indicate between 3.2 and 10 feet of separation will be present between the base of CCR and groundwater.

Differences exist in the timeframes to reach the GWPS for most monitoring wells between CIP and CBR. In general, the simulated groundwater concentrations in the monitoring wells within the UA will achieve the GWPS in 15 years and 18 years respectively for the CIP and CBR closure scenarios, with the exception of well G301 in the CIP scenario. The predicted delayed reduction in concentration at well G301, 59 years to reach the GWPS, is a result of the well being located along the flow path of the residual sulfate concentrations released into native geologic materials prior to closure. Reduced percolation rates through the consolidation area at the northwest corner of AP1 in the CIP scenario means that the residual sulfate concentrations in this limited area require a longer time period to migrate through native geologic materials.

1. INTRODUCTION

1.1 Overview

In accordance with the requirements of Part 845 (IEPA, 2021), Ramboll has prepared this GMR on behalf of the CPP, operated by IPGC. This report will apply specifically to the CCR unit referred to as AP1 (**Figure 1-1**). However, information gathered to evaluate other CCR units at the CPP regarding geology, hydrogeology, and groundwater quality is included, where appropriate. AP1 is a 23-acre, unlined SI used to manage CCR and non-CCR waste streams at the CPP. Its total storage capacity is approximately 300 acre-feet. This GMR presents and evaluates the results of predictive groundwater modeling simulations for two proposed closure scenarios, including CCR consolidation and CIP, and CBR scenarios summarized below.

- **Scenario 1:** CIP including removal of CCR from the eastern portion of AP1, consolidation into the western portion of AP1, and construction of a cover system over the remaining CCR.
- **Scenario 2:** CBR including removal of all CCR and regrading of the removal area.

1.2 Previous Groundwater Modeling Reports

Several reports containing groundwater modeling have been completed at the CPP. The information presented in this GMR includes data collected in support of the previous groundwater models as well as data collected as part of a 2021 field investigation to support development of a HCR (Ramboll, 2021a). The HCR was provided as an attachment to the initial operating permit application required by 35 I.A.C. § 845.230. Previous groundwater modeling reports completed for the various CCR units located at the CPP include, but are not limited to, the following (recent to oldest):

- ***Natural Resources Technology, Inc. (NRT), January 24, 2017. Hydrostatic Modeling Report. Coffeen Power Station, Coffeen, Illinois.***
  Utilized the Hydrologic Evaluation of Landfill Performance (HELP) model to predict percolation from Ash Pond No. 2 (AP2) and evaluate AP2 hydrostatic conditions in response to the proposed cover system as described in the Revised 30% Closure Design Package.
- ***NRT, January 24, 2017. Groundwater Modeling Report. Coffeen Power Station, Coffeen, Illinois.***
  Included simulations of the site hydrology, the extent of CCR leachate impacts on groundwater, and the effect of pond closure on groundwater quality.

1.3 Site Location and Background

The CPP is located in Montgomery County, in central Illinois, within Section 11 Township 7 North and Range 7 East (**Figure 1-1**). The CPP is approximately two miles south of the city of Coffeen and about eight miles southeast of the city of Hillsboro, Illinois. AP1 is located between the two lobes of Coffeen Lake (identified as "Coffeen Lake" and "Unnamed Tributary" on **Figure 1-1** and **Figure 1-2**) to the west, east, and south, and is bordered by agricultural land to the north. The approximately 1,100-acre Coffeen Lake was built by damming the McDavid Branch of the East Fork of Shoal Creek in 1963 for use as an artificial cooling lake for the CPP. Historically, several coal mines were operated at depth in the vicinity of the CPP as well as the US Minerals processing facility located to the north. **Figure 1-2** is a site map showing the location of AP1 (Part 845 regulated CCR unit and subject of this GMR), AP2, Gypsum Management Facility Recycle Pond

(GMF RP), Gypsum Management Facility Gypsum Stack Pond (GMF GSP), and Landfill (LF). A surface water pond southwest of the LF collects overflow from the LF, this feature does not contain CCR. The area near AP1 will hereinafter be referred to as the Site.

1.4 Site History and CCR Units

The CPP was a coal-fired electrical generating plant that began operation in 1964. The plant initially burned bituminous coal from Illinois and CCR from the coal fired units was disposed of in AP1. AP2 was also utilized in the early 1970's and AP1 was reconstructed in 1978. Both of these units were used until the mid-1980's. Beginning in 2010, CCR material was placed in the LF and GMF units (*i.e.,* GMF RP and GMF GSP). All approximate dates of construction of each successive stage of the CCR units at the CPP are included in the groundwater model and described here.

AP1: This SI (also known as the Bottom Ash/Recycle Pond) is a reclaimed ash pond that was reconstructed utilizing the existing earthen berms with reinforcement, as provided by Water Pollution Control Permit 1978-EA-389 issued by the IEPA on May 26, 1978. AP1 (existing unlined SI) covers an area of approximately 23 acres, has berms up to 41 feet above the surrounding land surface, and a volume of 300 acre-feet. It primarily received bottom ash and low volume wastes from floor drains in the main power block building. Several years ago, air heater wash and boiler chemical cleaning wastes were directed to AP1, but this practice was discontinued. The bottom ash was periodically removed for beneficial uses by a third-party contractor. Sluicing of waste to AP1 ceased prior to November 4, 2019.

AP2: AP2 is a closed (IEPA approved) SI with a surface area of approximately 60 acres and berms 47 feet higher than the surrounding land surface. AP2 was originally removed from service and capped in the mid 1980's. A clay and soil cap was placed on the surface of the pond with contouring and drainage provided to direct storm water to four engineered revetment down drain structures. Prior to capping, this pond was identified as Outfall 004 in the facility National Pollutant Discharge Elimination System (NPDES) operating permit, IL0000108. Additional closure activities include the construction of a geomembrane cover system that began in July 2019 and was completed on November 17, 2020. The construction was completed in accordance with the Closure and Post Closure Care Plan approved by the IEPA on January 30, 2018.

GMF GSP: The 77-acre GMF GSP received blowdown from the air emission scrubbers and was put into operation in 2010. Construction of the GMF GSP was in accordance with Water Pollution Control Permit 2008-EA-4661 and features a composite 60- one thousandth of an inch (mil) high-density polyethylene (HDPE) liner with 3 feet of recompacted soil with a hydraulic conductivity of 1 x 10^{-7} centimeters per second (cm/s) with internal piping and drains to collect contact water. Construction of the unit required excavation to approximately 603 feet North American Vertical Datum of 1988 (NAVD88), removal of the sands and silts of the UA prior to construction of the liner, and installation of a groundwater underdrain system to eliminate inward pressure on the liner prior to placement of CCR. The GMF GSP underdrain was actively pumped during construction but is no longer actively pumped. IPGC ceased receipt of waste to the GMF GSP prior to April 11, 2021.

GMF RP: The 17-acre GMF RP received blowdown from the air emission scrubbers and was put into operation in 2010. Construction of the GMF RP was in accordance with Water Pollution Control Permit 2008-EA-4661 and features a composite 60-mil HDPE liner with 3 feet of recompacted soil with a hydraulic conductivity of 1 x 10^{-7} cm/s with internal piping and drains to collect contact water. Construction of the unit required excavation to approximately 601 feet

NAVD88, removal of the sands and silts of the UA prior to construction of the liner, and installation of a groundwater underdrain system to eliminate inward pressure on the liner prior to placement of CCR. The GMF RP underdrain is a passive, gravity drained system. IPGC ceased receipt of waste to the GMF RP prior to April 11, 2021.

LF: Fly ash was managed in a permitted composite lined landfill constructed in 2010. The LF has an active groundwater underdrain system that is currently being pumped. Additionally, the ash landfill leachate collection system is restricted by rule to no more than one foot of leachate on the composite liner. An IEPA groundwater monitoring program is in effect for the GMF GSP and GMF RP (under Bureau of Water), and LF (under Bureau of Land).

2. SITE GEOLOGY AND HYDROGEOLOGY

2.1 Stratigraphy

The geology and hydrogeology of AP1 are described in detail in the HCR (Ramboll, 2021a) and summarized below.

The unlithified stratigraphy within and immediately surrounding AP1 consists of the following in descending order: fill material and CCR; clays and silts (Loess Unit); gravelly clay till and sandy materials, absent in some locations (Hagarstown Member); a weathered till zone and sandy, silt, or clay till (Vandalia Member); silt and sandy silt/clay unit (Mulberry Grove Member); silty clay diamicton (Smithboro Member); sand and sandy silt/clay, absent in some locations (Yarmouth Soil); and clay and silt with some sand (Lierle Clay Member). The unlithified units overlay Pennsylvanian-age limestone, sandstone, and minor coal beds (Bond Formation). The Bond Formation bedrock was not encountered in any borings advanced at the CPP, so site-specific information is not available.

CCR consisting of bottom ash and other non-CCR waste is present within AP1 at a thickness of up to 18 feet, as estimated from borings advanced within AP1, and an average thickness of 10 feet. However, CCR materials may be thicker near former drainage features in localized areas eroded through the loess and clay (Ramboll, 2021a). One such former drainage feature is located in the northeast corner of AP1 and ash fill may be in contact with the sandy portion of the Hagarstown Member similar to features observed at AP2. Non-CCR fill material consisting of silty clay, sandy lean clay, or lean clay with sand, with trace amounts of fine gravel comprises the berms surrounding AP1.

The Loess Unit is the uppermost unlithified unit identified at the CPP. This unit is comprised of the combined Roxana and Peoria Silt and extends from beneath the topsoil, derived from the loess, to the top of the Hagarstown Member. The loess has been classified as silt or clayey silt, with minor amounts of sand. The Loess Unit ranges in thickness from 0 feet (absent) to 16 feet, and was generally 8 to 14 feet thick, where present near AP1. The Loess Unit is generally considered unsaturated, and the UA is recharged by precipitation that percolates through this unit.

The Hagarstown Member (also referred to as Hagarstown Beds) exhibits two units: the first unit consisting of the gravelly clay till and the second consisting of sandy material overlying the Vandalia Member. The clay till portion had varying thicknesses ranging from approximately 2 to 6 feet as observed adjacent to AP1 (Ramboll, 2021a). The sandy portion of the Hagarstown, where present, was typically encountered between 9 and 34 feet below ground surface (bgs) near AP1, and is generally 1 to 5 feet thick, although thicknesses up to 7 feet have been observed north of the LF (Ramboll, 2021d; Ramboll, 2021e). The composition of the sandy portion of the Hagarstown unit varies across the CPP and has been classified as gravelly till, poorly sorted gravel, well sorted gravel, sand, and silty sand. Based on historic topography, the Hagarstown Member is not present in former drainage features present along the banks of Coffeen Lake and the Unnamed Tributary. During construction of the LF, GMF GSP, and the GMF RP, the Loess Unit and portions of the Hagarstown Member were excavated to facilitate construction.

The Vandalia (*i.e.,* till) Member is a sandy/silty till with thin, discontinuous lenses of silt, sand, and gravel. The Vandalia Member was encountered between 1.5 and 34 feet bgs in all borings advanced at the CPP. The Vandalia Member typically ranged in thickness from 11.7 feet in the northern portion of the CPP, to 31.0 feet between the GMF GSP and the GMF RP. Similar to the observed top elevation of the Hagarstown Member, the top of the Vandalia Member declines in elevation near Coffeen Lake and topographic drainage features. This unit is relatively thick throughout the CPP, with an average thickness of over 15 feet (Hanson Professional Services, Inc. [Hanson], 2009).

The Mulberry Grove (*i.e.,* silt) Member typically consists of a thin, lenticular unit of gray sandy silt (Willman et al., 1975). It represents the interval between the retreat of the glacier that deposited the Smithboro Member and the advance of the glacier that deposited the Vandalia Member. At the CPP, the Mulberry Grove Member is represented by gray sandy silt layers deposited in depressions found in the surface of the underlying Smithboro Member. This unit was absent in many borings through the central portion of the CPP from south to north, and is generally less than 2 feet thick, but was measured at up to 4.9 feet thick near the GMF GSP (Hanson, 2009).

The Smithboro (*i.e.,* till) Member is described as a gray, compact, silty, clayey diamicton that ranges in thickness from 6.7 to 21.2 feet northwest of the LF.

The Yarmouth Soil is described as the weathered zone on the Kansan drift, but in some places, it consists of accretionary deposits of fine sediment and organic material that accumulated in poorly drained areas on the surface of the Kansan deposits. Historical borings in the northern portion of the CPP which encountered the Yarmouth were summarized previously by Hanson (2009) as ranging in thickness from 0 feet (absent) to 5.1 feet.

The Lierle Clay Member is the uppermost member of the Kansan Stage Banner Formation. It is described as an accretion gley with clay, silt, and some sand. It was encountered by Hanson (2009) in all but a few borings on site. During the 2021 investigation, the top of the Lierle Clay was observed between 54 and 57 feet bgs. No borings advanced at the CPP penetrated the full thickness of the Banner Formation.

Pennsylvanian-age Bond Formation bedrock was not encountered in any borings advanced at the CPP, so site-specific information is not available.

2.2 Hydrogeology

Regionally, the water table conforms to the topographic features of the land surface. Recharge occurs in the uplands and flows towards drainage features. Moderate thicknesses of unconsolidated materials fill shallow valleys or are present on the uplands bordering the main valleys. These materials contain thin and discontinuous deposits of sand and gravel.

2.2.1 Groundwater Flow

Monitoring well locations are illustrated in **Figure 2-1**. Monitoring well locations and construction details are summarized in **Table 2-1**. Overall groundwater flow within the UA is divided towards the two lobes of Coffeen Lake. Groundwater generally flows from the center of the CPP west towards Coffeen Lake, and east towards the Unnamed Tributary, the eastern lobe of Coffeen Lake, and the discharge flume, resulting in a groundwater divide (high) running through the middle of the CPP (**Figure 2-2** and **Figure 2-3**). Groundwater flows north to northeast across AP1 toward the former discharge structure and Unnamed Tributary. Although elevations vary seasonally, the groundwater flow direction in the UA is consistent and likely controlled by the proximity and hydraulic connection to Coffeen Lake.

2.2.2 Hydraulic Properties

Over 100 monitoring wells have been installed since 2006 to monitor groundwater conditions around the five CCR units at the CPP for both State and Federal groundwater compliance programs. Six hydrostratigraphic units were described in detail in the HCR (Ramboll, 2021a) and are summarized as follows:

- **CCR**: This unit is composed of CCR, consisting primarily of bottom ash. This also includes earthen fill deposits of predominantly silt and clay materials from on-site excavations that were used to construct berms and roads surrounding the various impoundments across the CPP. Laboratory testing of one CCR (ash) sample from AP1 had a vertical hydraulic conductivity of 8.8 x 10^{-5} cm/s.
- **UCU**: Consists of the Loess Unit and the upper clayey portion of the Hagarstown Member which has generally lower vertical permeability and generally greater than 60 percent fines (Ramboll, 2021a). This unit was encountered across most of the CPP, with the exception of the eastern edges of AP1 near the Unnamed Tributary where the unit was eroded following deposition or locations where it has been excavated for construction. Vertical hydraulic conductivities based on laboratory testing ranged from 1.3 x 10^{-8} to 5.0 x 10^{-7} cm/s.
- **UA** This unit consists primarily of sand and sandy silts and clays at the base of the Hagarstown Member and, in some locations, the uppermost weathered sandy clay portion of the Vandalia Member. This unit is absent in several locations due to weathering and in others due to excavation during construction of CCR Units. Field hydraulic conductivity tests indicated hydraulic conductivities ranged from 1.7 x 10^{-5} to 9.1 x 10^{-3} cm/s near AP1. Laboratory testing of one UA sample, collected near the GMF RP, had a vertical hydraulic conductivity of 1.6 x 10^{-4} cm/s (Ramboll, 2021a).
- **LCU**: This unit is composed of the sandy clay till of the Vandalia Member, the silt of the Mulberry Grove Formation, and the compacted clay till of the Smithboro Member. The unit underlies the UA and was encountered in all boring locations on the CPP. Results from laboratory tests completed for vertical hydraulic conductivity indicate the Vandalia Member has a very low vertical hydraulic conductivity. Field hydraulic conductivity tests indicated hydraulic conductivities from 4.0 x 10^{-8} to 3.4 x 10^{-5} cm/s; however, these likely reflect the isolated and discontinuous sandy lenses. Vertical hydraulic conductivities based on laboratory testing were from 1.3 x 10^{-8} to 5.0 x 10^{-7} cm/s.
- **DA**: This unit consists primarily of sandy silt and sands of the Yarmouth Soil, which are thin (less than 5 feet) and discontinuous across the CPP. Field hydraulic conductivity tests indicated hydraulic conductivities from 8.7 x 10^{-5} to 1.7 x 10^{-3} cm/s within the DA.
- **DCU**: This unit underlies the DA and is composed of the Banner Formation, of which the thick Lierle Clay is the first encountered unit. No boring penetrated the full thickness of this formation.

2.2.3 Groundwater Elevation Data

During the 2021 Part 845 investigation, groundwater elevations in the UA ranged from approximately 591 to 625 feet NAVD88 across the CPP. Groundwater elevations were typically highest towards the northern extent of the CPP, near the GMF GSP and GMF RP, except monitoring well G307 south of AP1, which consistently had the highest groundwater elevation. Groundwater elevations were lowest near the Unnamed Tributary and east of AP1 towards Coffeen Lake. Groundwater elevations in the vicinity of AP1 were typically from 591 to 621 feet NAVD88, with the exception of G307 as noted above, which was typically around 624 feet NAVD88 (**Figure 2-2** and **Figure 2-3**).

No seasonal variation has been observed in the UA monitoring wells, and any seasonal responses may be muted by the proximity and hydraulic connection to Coffeen Lake.

2.2.4 Mining Activity

Several coal mines, both strip and underground types, previously operated in Montgomery County, Illinois. Three mines - the Hillsboro Mine (Illinois State Geological Survey [ISGS] Mine No. 871), the Clover Leaf No. 4 Mine (ISGS Mine No. 442), and the Clover Leaf No. 1 Mine (ISGS Mine No. 3001) – were operated as room and pillar mines in the vicinity of the site beginning as early as 1889. The mines extracted coal from the Herrin (No. 6) Coal at depths of approximately 500 to 535 feet bgs (ISGS, 2019). All nearby mining operations ceased in 1983.

The Hillsboro Mine showed indications of small-scale faulting, roof stability issues, and floor heaving. Mine shafts, processing facilities, and some historic coal storage associated with these historic mines were located south of AP1. AP1 directly overlies the Hillsboro Mine. AP1 is outside of the buffer zone of the Clover Leaf No. 4 and Clover Leaf No. 1 mines (Ramboll, 2021a).

3. GROUNDWATER QUALITY

3.1 Groundwater Classification

Per 35 I.A.C. § 620.210, groundwater within the UA at AP1 meets the definition of Class I - Potable Resource Groundwater based on the following criteria:

- Groundwater in the UA is located 10 feet or more below the land surface and
- Within a geologic material which is capable of a hydraulic conductivity of 1 x 10^{-4} cm/s or greater using a slug test.

Field hydraulic conductivity tests performed in the UA near AP1 in 2021 had a geometric mean of 2.0 x 10^{-3} cm/s (Ramboll, 2021a). Based on this information, groundwater is classified as Class I – Potable Resource Groundwater.

However, background (upgradient) groundwater originates from areas southwest of AP1 that have historically been used for coal storage and present a potential alternate source for groundwater impacts.

3.2 Potential Groundwater Exceedances

A review and summary of data collected from 2015 through 2021 for parameters with GWPSs listed in 35 I.A.C. § 845.600 is provided in the HCR (Ramboll, 2021a). Concentration results presented in the HCR were compared directly to 35 I.A.C. § 845.600 GWPSs to determine potential exceedances. The results are considered potential exceedances because the results were compared directly to the standard and did not include an evaluation of background groundwater quality or utilize the statistical methodologies proposed in the GMP (Ramboll, 2021c) attached to the operating permit application.

Groundwater concentrations from 2015 to 2021 are summarized in the History of Potential Exceedances (Ramboll, 2021b) (attached to the operating permit application) and are considered potential exceedances because the methodology used to determine them is proposed in the Statistical Analysis Plan (Appendix A to the GMP, Ramboll 2021c), which has not been reviewed or approved by IEPA at the time of submittal of the Part 845 operating permit application.

The History of Potential Exceedances attached to the operating permit application summarizes all potential groundwater exceedances following the proposed Statistical Analysis Plan. The following potential exceedances were identified:

- Boron – determined at well G313.
- Cobalt - determined at well G314.
- pH (lower limit) - determined at well G312.
- Sulfate - determined at wells G301, G303, G304/G307, G305, G307D, G308, G309, G310, G311, G312, G313, G314, G314D, G315, and G317.
- TDS - determined at wells G303, G304/G307, G305, G307D, G308, G309, G310, G311, G312, G313, G314, G315, and G317.

A Technical Memorandum (**Attachment A**) was prepared by Geosyntec Consultants, Inc. (Geosyntec, 2022a), *Evaluation of Potential Groundwater Protection Standard Exceedances, Coffeen Ash Pond No.1, Coffeen Illinois*, to further evaluate potential GWPS exceedances. The results of the evaluation demonstrated that the potential GWPS exceedances of cobalt in well G314 and pH in well G312 are not related to AP1 based on several lines of evidence presented in the Technical Memorandum. Since potential GWPS exceedances for cobalt and pH are not related to AP1, these parameters will not be discussed further in this GMR.

4. GROUNDWATER MODEL

4.1 Overview

Data collected at the Site from 2015 to the 2021 field investigation were used to update an existing groundwater model of the CPP (NRT, 2017b). The updated model was then used to evaluate the results of predictive groundwater modeling simulations for two proposed closure scenarios, including CCR consolidation and CIP, and CBR. The modeling results are summarized and evaluated in this GMR. The associated model files are included as **Appendix B**.

4.2 Description of Existing Model

The NRT (2017b) contaminant fate and transport model simulated boron and was performed to support closure of AP2 using MODFLOW and MT3DMS. AP1, GMF GSP, GMF RP, and LF were present within the previous model domain.

The NRT (2017b) modeling consisted of the following:

- Steady-state MODFLOW model was developed to represent site conditions for 2016. This model was calibrated to a set of groundwater elevation data collected during November 2016.
- The hydraulic properties from the steady-state model were used in the calibration of the transient MODFLOW and MT3DMS models which simulated groundwater flow and transport at the AP2 from 1970 to 2017. Boron concentrations collected in August 2016 were used to calibrate the transport model.
- Predictive simulations to estimate future boron concentrations for a baseline (no action) and capping closure scenario for AP2 were completed. Closure action was modeled over a period of 1,500 years, beginning in January 2018.
- Predicted boron concentrations were simulated to reach compliance for CIP at AP2 after 101 years (NRT, 2017b). These modeling results were part of the closure plan approved by IEPA on January 30, 2018.

4.3 Conceptual Model

The HCR (Ramboll, 2021a) forms the foundation of the AP1 hydrogeological setting. The AP1 overlies the recharge area for the underlying transmissive geologic media, which are composed of unlithified deposits.

4.3.1 Hydrogeology

As discussed in **Section 2.2**, groundwater flow in the UA at the CPP is divided towards the two lobes of Coffeen Lake. The loess of the UCU and sands of the UA are hydraulically connected. The groundwater flow in the silts and clays of the UCU and LCU are expected to be primarily vertical. The Hagarstown member is where the majority of the horizontal migration is expected to occur. The hydrogeological CSM consists of the following layers:

- Hagarstown Loess Unit (*i.e.,* UCU) – Loess Unit and the upper clayey portion of the Hagarstown Member.
- Hagarstown Member (*i.e.,* UA) – sand and sandy silts and clays at the base of the Hagarstown Member and, in some locations, the uppermost weathered sandy clay portion of the Vandalia Member.

- Vandalia Member/Mulberry Grove Member (*i.e.,* LCU) – unweathered sandy clay till and discontinuous silts.
- Smithboro Till (*i.e.,* LCU) – compacted clay till of the Smithboro Member.

The hydrostratigraphic units included in the model were the UCU, UA, and LCU. The DA and DCU were not included in the model, which includes consistency with the original model (NRT, 2017b). No potential GWPS exceedances have been observed in the DA. This, coupled with the limited groundwater data available for the DA and DCU, meant that these layers were not included in the model. Therefore, the Smithboro Till (*i.e.,* LCU) represents the lower boundary of the CSM.

Surfaces for each of the three major geological units (Loess Unit, Hagarstown Member, Vandalia/Mulberry Grove Member and Smithboro Till Member) were taken from the NRT model (2017b). The NRT model (2017b) used available information from well logs to interpolate the top and base of the UA.

4.3.2 Extent and Boundaries

The United States Geological Survey (USGS) National Map places the CPP within the East Fork Shoal Creek watershed subbasin (Hydrologic Unit Code [HUC] 071402030303).

The CPP CSM extent is bounded by a hydrological catchment (watershed) divide to the east based on watershed data from USGS. Along the north, south, and east, the model boundary has been placed along known waterbodies as much as possible. As such, it is assumed groundwater inflow from adjacent watersheds is negligible through both the UA and LCU.

The Coffeen Lake water levels are managed an average elevation 591.0 feet NAVD88. Coffeen Lake and Unnamed Tributary are the receiving body of water for surface water in the area encompassed by the CSM.

Infiltration of precipitation to the groundwater table is applied as recharge at the site. Groundwater in the UCU migrates downward into the Hagarstown Formation. As discussed in **Section 2.2.1**, the Hagarstown Formation is considered the UA for groundwater adjacent to AP1.

4.3.3 Ash Pond No. 1

AP1 is constructed such that the earthen berm and base are in contact with the UCU with exception of limited areas in the northeast of the SI where the UCU and UA have been eroded and the berm and base of CCR are in contact with the LCU. Findings from the HCR (Ramboll, 2021a) indicate that AP1 does influence the UA flow system, where there is a component of radial flow from AP1. However, this radial flow system appears to be centered around the southwest corner of AP1 resulting in a northerly and easterly component of groundwater flow within the UA.

Sulfate was selected for transport modeling. Sulfate is commonly used as an indicator parameter for contaminant transport modeling for CCR because: (i) it is commonly present in coal ash leachate; and (ii) it is mobile and typically not very reactive but conservative (*i.e.*, low rates of sorption or degradation) in groundwater.

4.5 Model Approach

4.5.1 Potential Groundwater Exceedances

A comparison of observed TDS concentrations to sulfate (**Figure A** below) indicates a statistically significant correlation between these parameters in UA wells where these potential exceedances were observed. Observed concentrations were transformed into Log10 concentrations for evaluation. The correlation coefficient (R^2) and p values (indicator of statistical significance) are also provided on **Figure A**. Higher R^2 values (*i.e.,* closer to 1) indicate stronger correlation between parameters. A correlation is considered statistically significant when the p value is lower than 0.05. The correlation has a p value less than the target of 0.05, indicating the correlation is statistically significant. The statistically significant correlation associated with sulfate concentrations indicate sulfate is an acceptable surrogate for TDS in the groundwater model, and concentrations of this parameter are expected to change along with model predicted sulfate concentrations.

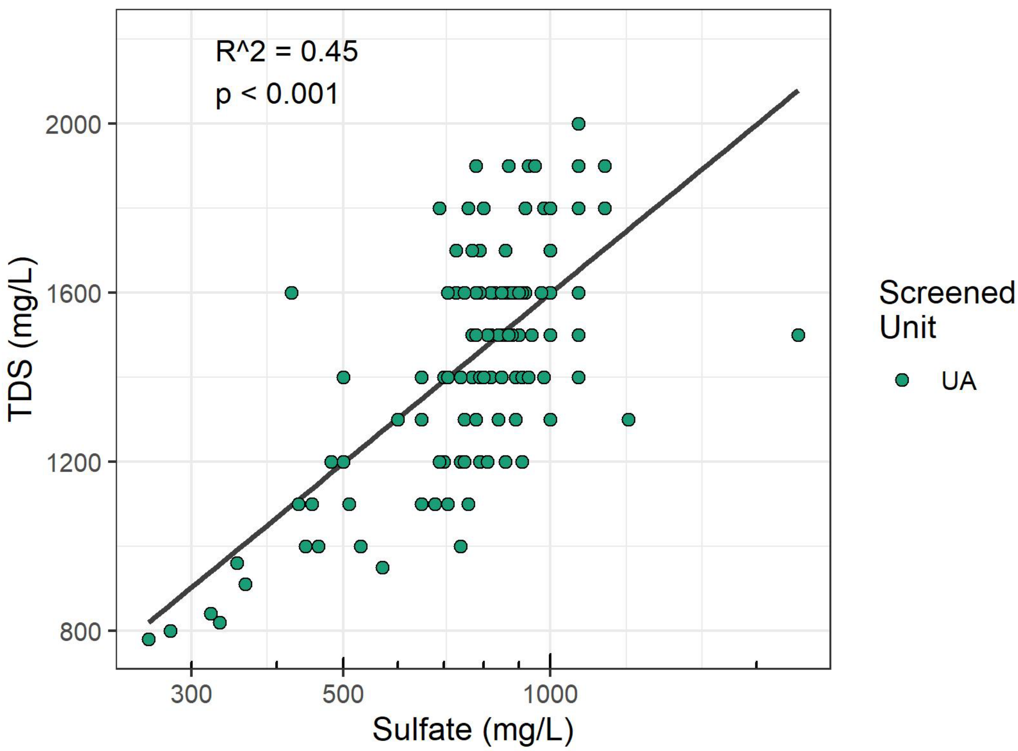

Figure A. Sulfate Correlation with TDS in UA Wells

A potential exceedance of boron was also observed at one monitoring well, G313, in the vicinity of AP1, based on the History of Potential Exceedances (Ramboll, 2021b). Correlations between sulfate and boron for the same AP1 UA wells did not indicate a statistically significant correlation between these constituents. However, UA monitoring well G313 has potential exceedances of both sulfate and TDS along with the potential exceedance of boron (**Section 3.2**). Boron, like sulfate, is a common indicator parameter used for contaminant transport modeling of CCR; and boron is less likely than other constituents to be present in background groundwater from natural or other anthropogenic sources. The only significant source of boron is AP1. With potential exceedances of boron, sulfate, and TDS present in the same well (G313) and having the same source (AP1), boron concentrations are expected to change along with model predicted sulfate concentrations.

4.5.2 Summary of Modeling Activities

A three-dimensional groundwater flow model was calibrated to represent the conceptual flow system described above. Prediction simulations were performed to evaluate the effects of closure (source control) measures (CCR consolidation and CIP and CBR scenarios) for the CCR units on groundwater quality following initial corrective action measures, which includes removal of free liquids (dewatering). **Figure 4-1** illustrates the calibration and predictive modeling timelines.

Three model codes were used to simulate groundwater flow and contaminant transport:

- Groundwater flow was modeled in three dimensions using MODFLOW 2005.
- Contaminant transport was modeled in three dimensions using MT3DMS.
- Percolation (recharge) was modeled using the results of HELP model.

Modeling steps are a summarized below:

- A steady state model was created in MODFLOW 2005 and used to simulate the mean groundwater flow conditions at the site. The model was calibrated to match mean groundwater elevations observed between 2015 to 2021 (**Table 4-1**).
- Transient flow models based off of the calibrated steady state model were used to simulate groundwater flow and transport for 42 years using MODFLOW 2005 and MT3DMS to simulate changes in site conditions through time and match currently observed concentrations of sulfate in groundwater (**Table 4-1**).
- Prediction simulations began with a 2-year dewatering period simulated in MODFLOW 2005 and MT3DMS where heads were reduced within the CCR unit and concentrations were removed from CCR removal areas.
- Prediction simulations resumed for CIP and CBR following the 2-year dewatering period using the results of HELP modeling as input values for recharge rates in the construction areas.
- The prediction simulations were run using MODFLOW 2005 and MT3DMS to estimate the time for sulfate concentrations to meet the GWPS in the compliance wells and to evaluate the differences between the two closure scenarios.

5. MODEL SETUP AND CALIBRATION

5.1 Model Descriptions

For the construction and calibration of the numerical groundwater flow model for the site, Ramboll selected the model code MODFLOW, a publicly-available groundwater flow simulation program developed by the USGS (McDonald and Harbaugh, 1988). MODFLOW is thoroughly documented, widely used by consultants, government agencies and researchers, and is consistently accepted in regulatory and litigation proceedings. MODFLOW uses a finite difference approximation to solve a three-dimensional head distribution in a transient, multi-layer, heterogeneous, anisotropic, variable-gradient, variable-thickness, confined or unconfined flow system—given user-supplied inputs of hydraulic conductivity, aquifer/layer thickness, recharge, wells, and boundary conditions. The program also calculates water balance at wells, rivers, and drains.

MODFLOW was developed by USGS (McDonald and Harbaugh, 1988) and has been updated several times since. Major assumptions of the code are: (i) groundwater flow is governed by Darcy’s law; (ii) the formation behaves as a continuous porous medium; (iii) flow is not affected by chemical, temperature, or density gradients; and (iv) hydraulic properties are constant within a grid cell. Other assumptions concerning the finite difference equation can be found in McDonald and Harbaugh (1988). MODFLOW 2005 was used for these simulations with Groundwater Vistas 7 software for model pre- and post- processing tasks (Environmental Simulations, Inc., 2017).

MT3DMS (Zheng and Wang, 1998) is an update of MT3D. It calculates concentration distribution for a single dissolved solute as a function of time and space. Concentration is distributed over a three-dimensional, non-uniform, transient flow field. Solute mass may be input at discrete points (wells, drains, river nodes, constant head cells), or distributed evenly or unevenly over the land surface (recharge).

MT3DMS accounts for advection, dispersion, diffusion, first-order decay, and sorption. Sorption can be calculated using linear, Freundlich, or Langmuir isotherms. First-order decay terms may be differentiated for the adsorbed and dissolved phases.

The program uses the standard finite difference method, the particle-tracking-based Eulerian-Lagrangian methods and the higher-order finite-volume total-variation-diminishing (TVD) method for the solution schemes. The finite difference solution has numerical dispersion for low-dispersivity transport scenarios but conserves good mass balance. The particle-tracking method avoids numerical dispersion but was not accurate in conserving mass. The TVD solution is not subject to significant numerical distribution and adequately conserves mass, but is numerically intensive, particularly for long-term models such as developed for this model. The finite difference solution was used for this simulation.

Major assumptions of MT3DMS are: (i) changes in the concentration field do not affect the flow field; (ii) changes in the concentration of one solute do not affect the concentration of another solute; (iii) chemical and hydraulic properties are constant within a grid cell; and (iv) sorption is instantaneous and fully reversible, while decay is not reversible.

The HELP model was developed by the United States Environmental Protection Agency (USEPA). HELP is a one-dimensional hydrologic model of water movement across, into, through, and out of a landfill or soil column based on precipitation, evapotranspiration, runoff, and the geometry and hydrogeologic properties of a layered soil and waste profile. For this modeling, results of the HELP model, HELP Version 4.0 (Tolaymat and Krause, 2020) completed for the groundwater model were used to estimate the hydraulic flux from closure construction.

5.2 Flow and Transport Model Setup

The 2017 flow and transport models were retained and revised as appropriate to perform simulations for the AP1.

The modeled area was approximately 10,000 feet by 15,025 feet (150,250,000 square feet [ft^2]) centered on the CPP (**Figure 5-1**). The model boundaries along the northern and eastern edges of the model were selected to maintain sufficient distance from the CPP to reduce boundary interference with model calculations, while not extending too far past the extent of available calibration data. The eastern edge of the model also approximates topographic highs, surface water divides, and watershed boundaries.

The steady state MODFLOW model was calibrated to mean groundwater elevation collected from 2015 to 2021 as presented in **Table 4-1**. MT3DMS was run on the transient flow model and model-simulated concentrations were calibrated to observed sulfate concentration values at the monitoring wells from January 2015 to July 2021 as presented in **Table 4-1**. Multiple iterations of MODFLOW and MT3DMS calibration were performed to achieve an acceptable match to observed flow and transport data. For AP1, the calibrated flow and transport models were used in predictive modeling to evaluate the CIP and CBR closure scenarios. Prior to simulation of CIP and CBR, a dewatering phase, which simulated the removal of free liquid from the CCR material in the AP1 was completed. Closure scenarios were simulated by removing saturated ash cells from removal areas and using HELP modeled recharge values to simulate changes proposed in the closure scenarios.

5.2.1 Grid and Boundary Conditions

A five-layer, 326 x 211 node grid was established with a variable grid spacing between 25 and 100 feet (**Figures 5-2 through 5-6**), with a total number of 284,575 active cells.

The main body of Coffeen Lake is immediately adjacent to CPP on the west and south and the Unnamed Tributary borders CPP to the east. These surface water features form the southern, eastern, and western boundaries of the model. The northern boundary of the model domain is a general head boundary. Vertically, the model domain extends from the top of the saturated zone to the base of the Smithboro Member. The thick clays of the Banner Formation are relatively impermeable compared to the overlying unconsolidated sediments and provides a base for the model.

The northern boundaries for layers 3, 4, and 5 are general head boundaries placed to simulate flow in the sandier soils of the Hagarstown Member, Vandalia/Mulberry Grove Member and Smithboro Till composing the UA (layer 3), and LCU (layer 4 and 5). The northern boundary represents the regional flow conditions within these units. The eastern edge is no-flow boundary in all model layers.

Coffeen Lake is represented as a constant head boundary based on an average surface water elevation of 591.0 feet NAVD88. The constant head boundary was simulated with an elevation equal to 591.0 feet. The lake is in hydraulic connection with multiple layers within the model.

The bottom of the model was also a no-flow boundary. The top of the model was a time-dependent specified flux boundary, with specified flux rates equal to the recharge rate. A specified mass flux boundary was used to simulate downward percolation of solute mass from the AP1. This boundary condition assigns a specified concentration to recharge water entering the cells within AP1, and the resulting concentration in the AP1 cells is a function of the relative rate and concentration of recharge water (water percolating from the impoundment) compared to the rate and concentration of other water entering the node.

5.2.2 Flow Model Input Values and Sensitivity

Evaluation of monitoring well data for the CPP has not identified statistically significant seasonal trends in groundwater flow or quality which could affect model applicability for prediction of transport. The MODFLOW model was calibrated to mean groundwater elevations from 2015 to 2021. Multiple iterations of MODFLOW calibration were performed to achieve an acceptable match to observed flow data.

Sensitivity analysis was conducted by changing input values and observing changes in the sum of squared residuals (SSR). Horizontal conductivity, vertical conductivity, and river and general head conductance terms were all varied by one order of magnitude (*i.e.*, between one-tenth and ten times) of the calibrated values. Recharge terms were varied between one-half and two times calibrated values. River stage was obtained from the 10 meter (m) Digital Elevation Model (DEM) from the United States Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS) National Geospatial Center of Excellence (USDA/NRCS, 2022). The vertical error of the 10 m DEM is 0.82 m (2.7 feet); therefore, the stream stage was varied by adding and subtracting 2.7 feet. Where appropriate, drain stage was modified based on the DEM error. Where this was inappropriate, drain stage increased and decreased by 2 feet. General head boundary head terms were varied between 90 and 110 percent of calibrated values. The HFB was varied by increasing the hydraulic conductivity by a factor of 100 and 1,000. When the calibrated model was tested, the SSR was 351. Sensitivity test results were categorized into negligible, low, moderate, moderately high, and high sensitivity based on the change in the SSR as summarized in the notes in **Table 5-1**.

5.2.2.1 Layer Top/Bottom

The top of the saturated zone was used as the top of the model. The elevations for the base of each hydrostratigraphic layer were obtained from the NRT model (2017b) and were imported as grid data into MODFLOW. The upper Loess Unit of the Hagarstown Member (UCU) was divided into two layers to accommodate the explicit inclusion of the CCR in AP1 and AP2. The sand and silts of the Hagarstown Member which form the UA were represented using a single layer. The LCU was represented by two layers, the upper LCU (layer 4) represents the unweathered Vandalia/Mulberry Grove Member and the lower LCU (layer 5) represents the Smithboro Member.

The UCU layer was split into two layers (layers 1 and 2) to simulate the construction of AP1 and AP2. Within AP1 and AP2, layer 1 represents ash fill and layer 2 represents the UCU present below the ash and above the UA. Outside of AP1 and AP2, both layers 1 and 2 represent the UCU. Layer 3 represents the UA and the LCU is present in layers 4 and 5. **Figures 5-7 through 5-11** show the bottom elevations of the five model layers. The resulting model layers represent the distribution and change in thickness of each water-bearing unit across the model domain. **Table A** below provides elevation and thickness information for the model layers and hydrostratigraphic units used in the model.

Table A. Flow Model Layer Descriptions

Layer	Hydrostratigraphic Unit Name	Hydrostratigraphic Unit Used to Determine Layer Thickness	Top Elevation [1]	Bottom Elevation [1]	Thickness (feet)
			Mean (Minimum – Maximum)		
1&2	UCU and CCR	Loess Unit of Hagarstown Member and CCR	640 (-)	607.73 (604.0-614.15)	27.1 (26.0-29.85)
3	UA	Hagarstown Member	607.73 (604.0-614.15)	600.9 (580.0-612.0)	5.2 (2.0-34.0)
4	LCU	Vandalia/Mulberry Grove Member	600.9 (580.0-612.0)	588.5 (578.0-594.0)	18.83 (2.0-30.0)
5	LCU	Base of Coffeen Lake	588.5 (578.0-594.0)	540.0 (-)	48.4 (38.0-51.1)

Notes:
[1] Elevation is measured in feet, referenced to NAVD88.

5.2.2.2 Hydraulic Conductivity

Hydraulic conductivity values and sensitivity results are summarized in **Table 5-1.** The spatial distribution of the hydraulic conductivities within the UCU, UA and LCU were considered homogenous. **Figures 5-12 through 5-16** show the spatial distribution of the hydraulic conductivity zones, AP1 and other units on site for each of the five model layers. Construction of the GMF units removed the sands and silts of the UA prior to construction of the liner, therefore the UA is absent beneath these units and liner hydraulic properties are assigned. Conductivity zones that did not have representative site data (*i.e.,* zones 19 and 21, representing the cells above the river cells and the disturbed sediments between the LF and GMF GSP, respectively) were determined through model calibration.

Where available, hydraulic conductivity values were derived from field measured or laboratory tested values reported in the HCR (Ramboll, 2021a) (**Section 2.2.2**). No horizontal anisotropy was assumed. Vertical anisotropy was applied to conductivity zones to simulate preferential flow in the horizontal direction in these materials, and are presented as anisotropy ratio (Kh/Kv) in **Table 5-1**.

The model was highly sensitive to changes in horizontal and vertical hydraulic conductivity in zones 1 (UCU), 2 (UA), and 3 (LCU - unweathered Vandalia), and moderately sensitive to changes in horizontal and vertical hydraulic conductivity in zones 10 (CCR fill-AP1) and 19 (UCU-fill). The model exhibited a negligible to low sensitivity in the remaining zones for both horizontal and vertical conductivity.

5.2.2.3 Recharge

Recharge rates were determined through calibration of the model to observed groundwater elevations. For the calibration model, recharge was applied to the uppermost active layer and the rates varied based on different units, namely the AP1, AP2, GMF GSP, GMF RP, LF, Surface Water Pond, and Cooling Pond. Model inputs are summarized in **Table 5-1**. The distribution of recharge is shown in **Figure 5-17**. Changes in operational history, such as the addition of AP1 to the site in 1977 and the GMF units in 2010 as illustrated in **Figures 5-18 through 5-21,** have been incorporated into the transient model simulation (**Table 5-2**). See **Section 5.2.3.1** for additional discussion of time discretization.

The model had a high sensitivity to changes in recharge in zones 1 (UCU) and 7 (CCR fill - AP1). The model had negligible to low sensitivity to changes in recharge in the remaining zones, with the exception of zone 6 (CCR fill - AP2), where the sensitivity was moderate.

5.2.2.1 Storage and Specific Yield

The flow calibration model did not use these terms because it was run at steady state. For the transport model, which was run as a transient simulation, no field data defining these terms were available so published values were used consistent with Fetter (1988). Specific yield was set to equal effective porosity values described in **Section 5.2.3.5**. The spatial distribution of the storage and specific yield zones were consistent with those of the hydraulic conductivity zones. The sensitivity of these parameters was tested by evaluating their effect on the transport model as described in **Section 5.2.3.6**.

5.2.2.2 River Parameters

Five river reaches were included in the model as head dependent flux boundaries that required inputs for elevation of the surface water, bottom of the stream, width, bed thickness, and bed hydraulic conductivity (**Table 5-1**). The five river reaches were the Unnamed Tributary east of the CPP (reach 0 and reach 5), the Unnamed Tributary west of the CPP (reach 1), ponded surface water west of the LF (reach 2), and the condenser cooling water discharge flume (reach 3). The river and drain information is summarized in **Table B** below.

Table B. River and Drain Information

Name	Boundary Type	Length (feet)	Slope (ft/ft)
Unnamed Tributary East	River	8959.0	-0.0031
Unnamed Tributary East – downstream reach	River	1438.3	-0.0026
Unnamed Tributary West	River	3436.5	-0.0098
Ponded Surface Water West	River	-	-
Condenser Cooling Flume	River	-	-
Active Landfill Underdrain	Drain	2147.0	-
Gravity Drain Recycle Pond	Drain	2181.8	-
North Drain	Drain	3032.0	-

Notes:
ft/ft = feet per foot

In the absence of river geometry information, the DEM was used to estimate stream stage at the upstream and downstream limits of the Unnamed Tributary east of the CPP and the Unnamed Tributary west of the CPP. The surface water stages for the ponded surface water west of the LF and the Condenser Cooling Flume were constant (not sloped) and were also obtained from the DEM. For both Unnamed Tributaries (east and west), the slope of the river was then linearly interpolated along the reaches, providing an estimation of stream stage along the length of each reach for each model grid cell though which the river flows. Bed thickness was set at 2 foot and river width was set at 10 feet. The river bottom is set 3 feet below the stage for both the

Unnamed Tributaries. The downstream reach (reach 5) of the Unnamed Tributary is located in layer 5 of the model adjacent to the SI unit AP2, this layer represents the LCU-Smithboro till and has a low hydraulic conductivity. To increase connectivity of the tributary to the overlying layers, the hydraulic conductivity of the streambed was modified during calibration.

The Condenser Cooling flume stage is maintained at 604.0 feet and the ponded surface water west of the LF was maintained at 617.5 feet, and bed thicknesses for these reaches were set to 1 foot. The width of the Cooling Flume (approximately 52 feet) and ponded surface water west of the LF are larger than the grid cell dimensions (25 feet by 25 feet); therefore, the conductance term for both were based on the area of the cells which coincide with the flume and ponded water.

The model had low to moderate sensitivity to changes in river stage. The model had low to moderately high sensitivity to changes in river conductance, with the exceptions of reach 0 (Unnamed Tributary East) and reach 3 (Condenser Cooling Flume) which had high sensitivity.

5.2.2.3 Drain Parameters

The LF has an active underdrain, which is actively pumped to prevent more than 1-foot of groundwater head above the liner. This was estimated to be 603.5 feet. The GMF RP has a passive drain beneath the liner which discharges water towards the Unnamed Tributary east of the unit. This was estimated to be 600.5 feet. Both the active LF drain and passive GMF RP drain were placed in layer 4 (LCU) below the low hydraulic conductivity zones which represent the base of the lined units. A surface water drain in the north of the model was also included; the placement of this northern drain was determined using google earth imagery. The Northern drain appears to be a man-made feature and no hydrological data are available as to its flow conditions. Therefore, its implementation in the model as a drain makes the fewest assumptions of its interaction with the aquifer. This surface water drain is located in layer 1 and has an elevation of 622.0 feet.

The model had low sensitivity to changes in drain stage. The model had negligible to moderate sensitivity to changes in drain conductance, with the exception of reach 0 (Active LF Underdrain) where the model had moderately high sensitivity to changes in drain conductance.

5.2.2.4 GMF Unit Parameters

All GMF units (GMF GSP, GMF RP, and LF) have a similar liner construction (**Table C** below); they were all implemented into the model using horizontal flow barrier (HFB) package to represent the liner system on the sides of the units. The bottom of the liner is implemented by assigning the liner system hydraulic conductance to model layer 3 within the footprint of the pond. The base elevation of layer 3 within the footprint of the GMF units simulates the base elevation of the liner. The thickness of model layer 3 within the footprint of the pond was set to three feet. Removal of the sands and silts below the GMF units (as described in **Sections 1.4** and **2.1**) means that the liner is in direct contact with the Vandalia Member. The groundwater flow dynamics beneath/around the Ash Landfill and GMF Units is affected by several factors, including: removal of the Hagarstown Member from beneath the Units; presence of the construction dewatering systems around the units; and the lateral variability of lithology within the Hagarstown Member (Hanson, 2016). Drains discussed above were used to represent the underdrains associated with the GMF units. The hydraulic properties within the GMF units were set to represent the CCR.

Estimates of the hydraulic properties of each of the components within the liner system were derived using values from the HELP model; see **Section 5-1** for more information about HELP. For flow perpendicular to the layer orientation, as is the case in the liner where the hydraulic gradient is vertical for the base and horizontal for the sides of the pond, the harmonic mean was used to obtain the effective hydraulic conductivity (K_{eff}) (Fetter, 1988). The harmonic mean was determined by:

$$K_{eff} = \frac{\sum b}{\sum \frac{b}{K}}$$

where b is the layer thickness and K is the horizontal hydraulic conductivity.

HFB input parameters are presented in **Table 5-1**. The model had low to moderate sensitivity to changes in the hydraulic conductivity in the HFB.

Table C. Liner System Properties From Top to Bottom for the GMF GSP, GMF RP, and LF

Liner Component	Thickness (feet)	Hydraulic Conductivity (cm/s)	Hydraulic Conductivity (ft/d)
HDPE geomembrane (60 mil)	0.06	2.0×10^{-13}	5.7×10^{-10}
Recompacted Soil	3.0	1.0×10^{-7}	2.8×10^{-4}
Vertical Harmonic Mean of liner system	**NA**	**NA**	***2.89×10^{-8}***

* Estimated based on available information
ft/d = feet per day
NA = not applicable

5.2.2.5 General Head Boundary

General head boundary conditions (GHB) were used along the northern boundary of the model for layer 3 through 5 (**Figures 5-4 through 5-6**). The GHB at the northern limit of the model represents groundwater entering the model domain from upgradient areas. The GHB is present in layers 3 through 5 and was used to simulate groundwater flow into the model via the UA and LCU. The groundwater levels used for the northern boundary of the model in layers 3 through 5 were estimated using the Dupuit equation for steady state flow in an unconfined aquifer with recharge.

The DEM of the site provided estimates of the surface water levels for Coffeen Lake on the west of the model (591 feet), and Rocky Ford Sportsman Club North Lake (604 feet) on the east of the model domain (refer to **Figure 5-1**). The calibrated ambient recharge to the UCU was used in the calculation of the groundwater level distribution at the northern boundary. The hydraulic conductivity value used in the Dupuit equation was estimated during model calibration.

This GHB was only applied to cells along the northern boundary where the base of the cell was below the calculated groundwater head for a given distance from the constant head boundaries, the head was determined by the Dupuit equation. Cell conductance was then calculated using the cells' saturated thickness and cell width, and hydraulic conductivity were based on cell hydraulic conductivities and adjusted if appropriate during calibration.

The GHB elevation for northern boundary in the UA was established during calibration (**Table 5-1**). The distance to the GHB head was set to 1, and the GHB conductivity was calculated using the cell width, cell thickness, and calibrated hydraulic conductivity from the model.

The sensitivity to changes in specified head was low to moderate, with the exception of reach 3 (Northern Model Boundary in LCU Layer 4) where the model sensitivity was high. The flow calibration model had a negligible sensitivity to changes in conductance.

5.2.3 Transport Model

MT3DMS input values are listed in **Table 5-2** and described below. Sensitivity of the transport model is summarized in **Table 5-3**.

Groundwater transport was calibrated to groundwater sulfate concentration ranges at each well as measured from the monitoring wells between 2015 (where available) and 2021. The transport model calibration targets are summarized in **Table 4-1**.

Sensitivity analysis was conducted by changing input values and observing percent change in sulfate concentration at each well from the calibrated model sulfate concentration. Effective porosity was varied by decreasing and increasing calibrated model values by 0.05. Storage values were multiplied and divided by a factor of 10, and specific yield by a factor of 2. The dispersivity values in the calibrated model were increased by a factor of 5 and 10. The sensitivity of the transport model to changes in the liner conductance was also investigated by increasing and decreasing the hydraulic conductivity of the liner by one order of magnitude (*i.e.*, between one-tenth and ten times).

The transport model had a negligible to moderate sensitivity to changes in storage and specific yield (**Table 5-3**) as discussed in **Section 5.2.3.6**. The transport model ranged from negligible to moderate sensitivity to effective porosity and dispersivity as discussed in **Sections 5.2.3.5** and **5.2.3.7**, respectively. The sensitivity to the liner conductivity was negligible to low as discussed in **Section 5.2.3.2**.

5.2.3.1 Time Discretization and Stress Periods

The evolution of the CPP required changes to the hydraulic properties within the model; this is not possible in a single model where hydraulic properties as assumed to remain constant. As a result, the changes in the site (*e.g.,* inclusion of the GMF units) are simulated in three consecutive numerical models, as summarized in **Table D** below. The simulation length was revised from the existing model to extend to the current time (2022).

Table D. Transient Model Setup and Time Discretization

Date	Model	Stress Period	Operational Change	Previous model
Pre-1970	Steady-State	NA	No CCR units present	Not applicable
1970-2010	Transient (TR-1)	1:1970-1985	AP2 only	Steady State Pre-1970 flow
		2:1985-2010	AP2 and AP1 in operation	
2010-2018	Transient (TR-2)	1:2010-2018.	AP1, GMF GSP and GMF RP in operation.	TR-1 as initial flow and concentrations

2018-2022	Transient (TR-3)	1:2018-2022	Modification to lined units GMF GSP and GMF RP, AP2 capped	TR-2 as initial flow and concentrations

Notes:
TR = transient model

5.2.3.2 GMF Units

Groundwater chemistry data from wells G215 (located adjacent to the GMF GSP), and wells G275 and G279 (located adjacent to the GMF RP), indicate an increase in sulfate concentrations post 2018 when compared with sulfate concentrations in adjacent wells. Sulfate concentrations in G215 have experienced further increases since 2021. Sulfate concentrations around the GMF RP tend to be higher than those around the GMF GSP, with elevated sulfate concentrations observed since 2015 (the earliest sampling date). Elevated sulfate concentrations along the southern boundary of the GMF RP are associated with historic groundwater impacts from AP2. However, wells G275 and G279 are located along the eastern boundary of the pond and have elevated sulfate concentrations. To simulate observed sulfate concentrations at these isolated wells (GMF GSP well G215, and GMF RP wells G275 and G279), the hydraulic conductivity of the liner (simulated using HFB) was increased to allow sulfate migration from the CCR unit in the transient model TR-3, as shown in **Figure B** below and **Table D** above.

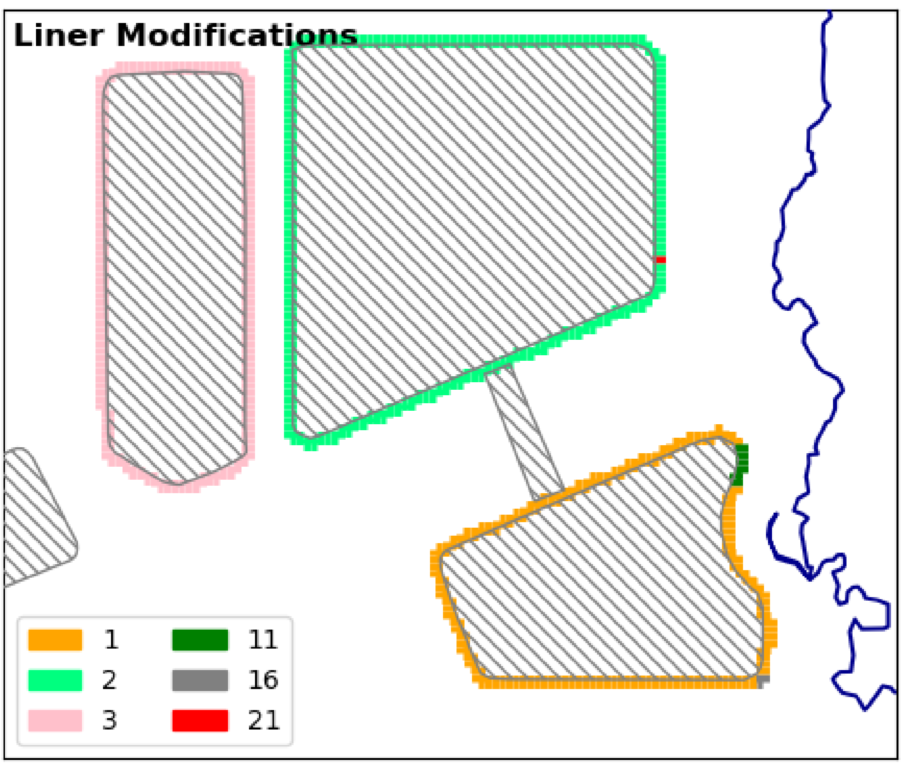

Figure B. Liner Modification Zones

As part of the transport calibration process, the hydraulic conductivity of HFB reaches 11, 16, and 21 were modified to simulate the observed rises in sulfate. The changes are summarized in **Table 5-2**. Model sensitivity near the GMF ponds is discussed in the Groundwater Modeling

Report, *GMF Gypsum Stack Pond and GMF Recycle Pond, Coffeen Power Plant, Coffeen Illinois* (Ramboll, 2022).

The monitoring wells associated with AP1 show negligible to low sensitivity to changes in the GMF liner conductivity (**Table 5-3**). AP1 Is located approximately 2,500 foot south of the GMF SIs, any changes in groundwater flow and transport will be minimal in proximity to AP1.

5.2.3.3 Initial Concentration

No initial concentrations were placed in the steady state flow calibration model. The flow model was run as transient and concentration was added to the model through recharge starting at the same time as the transient flow simulation. Modeling was performed for a sufficient period (42 years) to allow modeled concentrations in the primary transport layer (*i.e.,* UA) to reach recently observed levels.

Modeling was performed over three numerical models which mirror the operational developments at the CPP. **Table 5-2** provides an overview of how the source concentrations and recharge rates change through time.

5.2.3.4 Source Concentration

Five sources in the form of vertical percolation (recharge) and constant concentration cells were simulated in the CCR material for calibration (**Table 5-2**) (in chronological order): (i) percolation through CCR in AP2 (1970-2022), (ii) percolation through CCR in AP1 (1978-2022), (iii) percolation through CCR in GMF RP (2010-2022), (iv) percolation through CCR in GMF GSP (2010-2022), and (v) percolation through CCR in GMF LF (2010-2022). All five sources were simulated by assigning concentration to the recharge input. The CCR sources were also simulated with constant concentration cells placed where CCR was present (**Figures 5-18 through 5-21**) to simulate saturated CCR conditions. From the model perspective, this means that when the simulated water level is above the base of these cells, water that passes through the cell will take on the assigned concentration. All source concentrations were calibrated in the transport model to the sulfate concentration data collected from November 2015 to August 2021. The source concentrations applied to the recharge zones and saturated ash cells immediately below the recharge zones have the same concentration values. **Table 4-1** indicates that the background sulfate concentrations (identified with a "B" for background in the "CCR unit" column) at CPP show considerable variability across the site, from 11 mg/L (G286) to 770.0 mg/L (G288). No background sulfate concentration was applied to recharge beyond the source areas in the model.

Because these are the sources of concentration in the model, the model will be highly sensitive to changes in the input values. For that reason, sensitivity testing was not completed for the source values.

5.2.3.5 Effective Porosity

Effective porosity for each modeled hydraulic conductivity zones were based on the NRT model (2017b), data from the HCR (Ramboll, 2021a), and literature values (Fetter, 2001) and are presented in **Table 5-2**.

The model had a negligible to moderate sensitivity to changes in porosity values (**Table 5-3**). The greatest sensitivity for porosity was moderate for the high porosity sensitivity test at monitoring locations G305, G306, and G317. Moderate sensitivity at monitoring well G317 was also observed for the low porosity sensitivity test.

5.2.3.6 Storage and Specific Yield

The transport model had a negligible to low sensitivity to changes in storage and specific yield, with the exception of sensitivity at monitoring wells G306, G307, and G317, where sensitivity was moderate (**Table 5-3**).

5.2.3.7 Dispersivity and Diffusion

Physical attenuation (dilution and dispersion) of contaminants is simulated in MT3DMS. Dispersion in porous media refers to the spreading of contaminants over a greater region than would be predicted solely from the average groundwater velocity vectors (Anderson, 1979; Anderson, 1984). Dispersion is caused by both mechanical dispersion, a result of deviations of actual velocity at a microscale from the average groundwater velocity, and molecular diffusion driven by concentration gradients. Molecular diffusion is generally secondary and negligible compared to the effects of mechanical dispersion and only becomes important when groundwater velocity is very low. The sum of mechanical dispersion and molecular diffusion is termed hydrodynamic dispersion, or simply dispersion (Zheng and Wang, 1998).

Longitudinal dispersivity was 10 feet in the UA and 1 foot in the UCU and LCU, with transverse and vertical dispersion coefficients assuming a ratio of 1/10 and 1/100.

The model had a negligible to moderate sensitivity to changes in dispersivity values (**Table 5-3**). The greatest sensitivity for dispersivity was moderate for the highest dispersivity sensitivity test at monitoring well locations G313, G314, G316, and G317. Sensitivity was also moderate for the lower dispersivity sensitivity test at monitoring well locations G313 and G317.

5.2.3.8 Retardation and Decay

It was assumed that sulfate would not significantly sorb or chemically react with aquifer solids (Kd was set to 0 mL/g) which is a conservative estimate for estimating contaminant transport times. Boron, sulfate, and TDS transport is likely to be affected by both chemical and physical attenuation mechanisms (*i.e.,* adsorption and/or precipitation reactions as well as dilution and dispersion). Batch adsorption testing was conducted to generate site specific partition coefficient results for boron and sulfate (Geosyntec, 2022b; **Appendix C**) for locations G311 and G313. Results of the testing are summarized below:

- Boron: The Freundlich isotherm (K_F) fit the data best for G313/SB306 and G313/SB313, yielding K_F values of 0.65 liters per kilogram (L/kg) and 2.03 L/kg, respectively. Though slightly higher at G313/SB313, these values are comparable to boron partition coefficients reported in literature, which range from 0.19 to 1.3 L/kg depending on pH conditions and the amount of sorbent present (EPRI, 2005; Strenge & Peterson, 1989). No partition coefficient was calculated for G311.
- Sulfate: The G311 partition coefficient for sulfate ranged from -624 L/kg for the Langmuir isotherm (K_L) to 10.11 L/kg for the linear isotherm (K_D), but the best-fitting Freundlich isotherm yielded a low K_F value of 9.2×10^{-12} L/kg. None of the isotherms showed a high goodness-of-fit (*i.e.,* R^2) for either G313/SB306 or G313/SB313, with the highest correlation being 0.05, and were associated with erroneously high (1,700 L/kg) and low (-690 L/kg) partition coefficients. An accurate sulfate partition coefficient could therefore not be calculated from any of the data. These results are consistent with the findings of Strenge and Peterson

(1989), who found that partition coefficients for sulfate are 0.0 L/kg, regardless of pH conditions and the amount of sorbent present.

The results from site samples are variable with poor goodness of fit which supports modeling sulfate without retardation. The potential exceedances identified in groundwater (boron, sulfate, and TDS) are affected by natural attenuation processes in multiple ways and to varying degrees. Further assessment of these processes and how they may be applied as a potential groundwater remedy will be completed as part of future remedy selection evaluations, as necessary. For the purposes of this GMR, and as mentioned at the beginning of this section, no retardation was applied to sulfate transport in the model (*i.e.*, Kd was set to 0 mL/g). Sensitivity tests were not run for retardation.

5.3 Flow and Transport Model Assumptions and Limitations

Simplifying assumptions were made while developing this model:

- Leading up to 2022, the groundwater flow system cannot be simulated as steady state.
- Natural recharge is constant over the long term.
- Fluctuations in lake stage do not affect groundwater flow and transport over the long term.
- Hydraulic conductivity is consistent within hydrostratigraphic units.
- The approximate base of ash surface in the AP1, GMF GSP, GMF RP, and LF were developed with Golder using soil borings and historic topographic maps.
- Source concentrations are assumed to remain constant over time.
- Sulfate is not adsorbed and does not decay and mixing and dispersion are the only attenuation mechanisms.

The model is limited by the data used for calibration, which adequately define the local groundwater flow system and the source and extent of the plume. Since data used for calibration are located near the units on site, model predictions of transport distant spatially and temporally from the calibrated conditions at the CCR units will not be as reliable as predictions closer to the CCR units and concentrations observed in 2021.

5.4 Calibration Flow Model

The groundwater model was manually calibrated to best approximate the mean groundwater elevations in 95 wells at the site. The mean elevations used for calibration and locations of wells within the flow model are summarized in **Table 4-1** Well locations are shown in **Figure 2-1**. This involved modifying the hydraulic conductivities of the different hydrostratigraphic units, recharge rate, and conductance of the drains, rivers, and general head boundaries within the model to minimize the difference between the mean observed groundwater elevation and simulated groundwater elevation. Where possible, the range of the parameter values used during calibration were based on observed values (*i.e.,* for the range in hydraulic conductivity estimates from the HCR). Where this was not possible, such as for the drain and general head boundary conductance, the range of parameter values were based on other site information or inferred from knowledge from similar sites. Where data were limited, the parameter values were less constrained during calibration (*e.g.,* parameter values had wider ranges). The SSR was used as a metric to identify the optimal values for the different parameters.

5.5 Calibration Flow and Transport Model Results

Results of the MODFLOW modeling are presented below. The model files accompany this report (**Appendix B**). **Table 5-1** shows the calibrated hydraulic conductivity for the different units shown in **Figures 5-12 through 5-16**.

Groundwater model calibration results are presented in **Figure 5-22** and **Figure 5-23**, which shows the observed and simulated groundwater elevations and the observed groundwater elevations versus residuals. The near-linear relationship between observed and simulated values presented on **Figure 5-22** indicates that the model adequately represents the calibration dataset. The root mean squared error of the groundwater elevation across all wells was 1.92 feet. The mass balance error for the flow model was 0.00 percent and the ratio of the residual standard deviation to the range of heads was 9.0 percent, which is below the desired target value of 10 percent. Another flow model calibration goal is that residuals are evenly distributed such that there is no bias affecting modeled flow. The observed heads are plotted versus the simulated heads in **Figure 5-23** and simulated values are evenly distributed above and below observed values. The residual mean was also near zero with a value of 0.10 feet, indicating a small bias towards underestimating the groundwater elevations in the calibrated model; this is also illustrated in the observed versus residuals plot in **Figure 5-23**.

The simulated groundwater elevations within the UA (layer 3) for the entire site are shown in **Figure 5-24**. **Figure 5-25** shows the simulated groundwater elevations in proximity to AP1. In general, the model is able to simulate the groundwater flow patterns for the UA (**Figure 2-2** and **Figure 2-3**) at AP1 as interpreted from the site well data for April and July 2021, respectively. The simulated groundwater flow pattern also captures the radial flow pattern centered on the southwest area of AP1. Fourteen wells provided calibration targets for the simulated groundwater level around AP1. The simulated groundwater levels for five of these wells are within 1 foot; six wells are within 2 feet. G303 and G312 are underestimated by 2.14 feet and 3.06 feet respectively, and G309 is overestimated by 2.24 feet.

The range of observed sulfate concentrations for transport calibration locations are summarized in **Table 4-1**. The goals of the transport model calibration were to have predicted concentrations fall within the range of observed concentrations, and to have predicted concentrations above and below the GWPS for sulfate (400 mg/L) match observed concentrations above or below the standard at each well. One or both of these goals were achieved at all of the transport calibration location wells, except G317, where concentrations were underpredicted (**Figure 5-26**). Deviations from the observed ranges are discussed below.

The model underpredicts concentrations at G305 and G317. The observed sulfate concentrations range from 710 to 930 mg/L and 780 to 1100 mg/L for G305 and G317, respectively. The predicted concentrations are 424.8 mg/L and 146.8 mg/L for G305 and G317, respectively. G305 is located south of AP1 (**Figure 2-1**) in close proximity to the mine entrance discussed in **Section 2.2.4** and shown in **Figure 1-2**. The disturbance associated with the former mining activity may be associated with the elevated sulfate concentrations in this well. G317 is located southeast of AP1, downgradient of G303 (whose predicted sulfate concentration is within the observed range). Groundwater flow in this area is predominantly towards Coffeen Lake (west to east). There is aerial and topographic evidence supporting the presence of a soil pile related to the mining activities in the area west (upgradient) of G317 (see **Section 2.2.4**). One soil boring completed through the soil pile documents the presence of coal in the boring log, indicating the soil pile may be another source of sulfate. This soil pile may potentially leach sulfate into the groundwater thereby increasing the sulfate concentration at G317 above that which would be attributed to AP1 alone.

The remaining calibration locations had predicted concentrations that fall within the range of observed concentrations and/or have predicted concentrations above and below the GWPS for sulfate (400 mg/L) matching observed concentrations above or below the standard at each well. In other words, there was a very good match between predicted and observed sulfate concentrations relative to wells with concentrations above and below the GWPS. The transport model has achieved a very good calibration using a sulfate source concentration of 1,000 mg/L, even though some wells have observed concentrations that are greater than the source concentration used. The distribution of sulfate concentrations in the calibrated model are presented on **Figure 5-27**.

6. PREDICTIVE SIMULATIONS

6.1 Overview and Prediction Model Development

Prediction simulations were performed to evaluate the effects of closure (source control measures) for AP1 on groundwater quality. The prediction simulations evaluated changes in groundwater sulfate concentrations from Scenario 1: CIP (removal of CCR from the eastern portion of AP1 and consolidation into the western portion of the AP1) and Scenario 2: CBR (removal of all CCR material from AP1). As discussed in **Section 5.2.3.7** physical attenuation (dilution and dispersion) of contaminants in groundwater is simulated in MT3DMS, which captures the physical process of natural attenuation as part of corrective actions for both closure scenarios simulated. No retardation was applied to sulfate transport in the model (*i.e.,* Kd was set to 0 mL/g) as discussed in **Section 5.2.3.8**.

Closure scenarios were simulated by initially removing free liquids from the CCR material over the course of 2 years by placing drain cells within AP1 with an elevation of 618 feet and applying zero recharge to simulate dewatering of the CCR units.

HELP-calculated percolation rates, based on removal and final soil backfill grading designs provided in the Final Closure Plans for AP1 (Golder, 2022a), GMF GSP (Golder, 2022b), and GMF RP (Golder, 2022c), were applied for the different closure scenarios. HELP modeling input and output values are summarized in **Table 6-1** and described in detail below.

The CIP and CBR scenarios were simulated for a 100-year period. The following simplifying assumptions were made during the simulations:

- Removal of free liquids from CCR takes place prior to the CIP and CBR closure scenarios. Drain cells were placed within the units to simulate the removal of free water within the ponds; and recharge was set to zero.
- In the CIP and CBR closure scenarios, HELP-calculated average annual percolation rates were developed from a 30-year HELP model run. This 30-year HELP-calculated percolation rate remained constant over duration of the closure scenario prediction model runs following CCR dewatering period.
- Changes in recharge resulting from removal of free liquids (decrease calibration model recharge rates to zero) and CCR fill removal/final soil backfill grading (recharge rates are based on HELP-calculated average annual percolation rates) have an instantaneous effect on recharge and percolation through surface materials.
- Sulfate source concentrations were assumed to be negligible (0 mg/L) in CCR removal areas in both the CIP and CBR scenarios. The spatial distribution of CCR concentrations within the consolidation area for the CIP scenario were maintained from the initial transport simulation.
- Cap construction in CIP scenario was assumed to be completed with a cover system consisting of the following (listed from ground surface down): a vegetative cover (6 inches thick), rooting zone (18 inches thick), a 200-mil geocomposite drainage layer and a 40-mil linear HDPE geomembrane.
- The start of each closure prediction simulation was initiated at the end of the calibration model period of 42 years plus 2 years to complete removal of free liquids. For example, the

simulation of Scenario 1: CIP begins at 44 years (42 years for calibration plus 2 years). The prediction modeling timeline for each scenario is illustrated in **Figure 4-1**.

- CCR consolidation/removal areas were assumed to be graded and include proper drainage controls to remove excess water from the surface using the design drawings provided (Golder, 2022a).
- The CIP scenario includes the placement of a stormwater pond within the removal area. The outflow elevation of this stormwater pond is 625 feet, which will discharge into Coffeen Lake adjacent to the AP2. This is represented as a drain in the model whose elevation is equal to the stormwater pond outflow elevation.
- Local fill materials applied to the prediction models have similar hydraulic properties as the UCU materials used in the transport calibration models. However, the local fill materials were assumed to have reduced vertical anisotropy ratios, approaching isotropic, due to reworking of the material as it is placed as backfill (Kh/Kv decreased from measured values of 10 to 1 for reworked material).

6.2 HELP Model Setup and Results

HELP (Version 4.0; Tolaymat and Krause, 2020) was used to estimate percolation through AP1 in areas of CCR removal with soil backfill, and areas of CCR consolidation with final cover system. HELP input and output files are included electronically and attached to this report.

HELP input data and results are provided in **Table 6-1**. All scenarios were modeled for a period of 30 years. Climatic inputs were synthetically generated using default equations developed for Belleville Scott Air Force Base in Belleville, Illinois (the closest weather station included in the HELP database). Precipitation, temperature, and solar radiation was simulated based on the latitude of CPP. Thickness of soil backfill and soil runoff input parameters were developed for the ash fill removal scenarios using data provided in the Final Closure Plans for AP1 (Golder, 2022a), GMF GSP (Golder, 2022b), and GMF RP (Golder, 2022c).

HELP model results (**Table 6-1**) indicated 7.85 inches of percolation per year for AP1 CCR removal and soil backfill area in the CIP scenario and 0.00027 inches of percolation per year through the CCR and final cover system for the CIP scenario. Results indicated 7.85 inches and 6.28 inches of percolation per year for AP1 eastern and western CCR removal and soil backfill area in the CBR scenario, respectively. The differences in HELP model runs for each area included the following parameters: area, soil backfill thickness, slopes, and soil runoff slope length; all other HELP model input parameters were the same for each simulated area. HELP input data and results are provided in **Appendix B.**

Two additional HELP model simulations were completed to support the *Proposed Alternative Final Protective Layer Equivalency Demonstration*, (Geosyntec, 2022c) which is an appendix to the Construction Permit Application to which this report is also attached. Results of these two HELP simulations were not incorporated in the MODFLOW simulations for closure. Simulation inputs and output results are presented in **Appendix D**.

6.3 Simulation of Closure Scenarios

The calibrated model was used to evaluate the effectiveness of the two closure scenarios by defining CCR removal and consolidation areas, reducing head to simulate removal of free liquids, removing source concentrations from the removal areas, adding drain cells and removing recharge to simulate stormwater management within the removal areas, and applying reduced recharge in the CCR consolidation areas to simulate the effects of the cover system on flow and transport. Removal of source inputs from the ash removal areas was simulated by reducing the sulfate concentrations associated with recharge in the areas to 0 mg/L and removing constant concentration cells.

Each prediction scenario was simulated as a continuation of the AP1 dewatering simulation which followed the transient calibrated model. The prediction model input values are summarized in **Table 6-2,** and the modifications to the recharge zones and drain placement for the CIP scenario are illustrated in **Figure 6-1**. **Figure 6-2** illustrates the CCR removal area for the CBR at the AP1. The two closure scenarios are discussed in this report based on predicted changes in sulfate concentrations as described below and results are presented in **Figure 6-3 to Figure 6-6**.

6.3.1 Closure in Place Model Results

The design for Scenario 1: CIP includes an initial 2-year dewatering period to remove free liquids followed by CCR removal from AP1, consolidation in the western area of AP1, and construction of a cover system over the remaining CCR (**Figure 6-1**). Stormwater drainage will be present within the eastern area of AP1 with an outflow elevation of 625 feet.

Predicted concentrations start to decline at all monitoring wells with observations above the GWPS for sulfate (400 mg/L) once closure actions are initiated within the prediction model. These declines occur first in the eastern area where CCR is removed and saturated ash cells (constant concentration cells) are reduced in the area of the highest modeled source concentrations. Following removal of CCR in the eastern area, sulfate concentrations are no longer entering the model domain from recharge or from saturated ash cells (constant concentration cells). Dewatering also reduces the head within AP1. These low heads are maintained following completion of closure by the drain cells that simulate storm water management designs within the removal area to the east, and by the greatly reduced infiltration rates (recharge) that result from placement of the cover system over the consolidated CCR in the western end of AP1. As a result of the reduced heads and recharge, downward percolation of solute mass from AP1 is reduced, which decreases the sulfate concentration entering the model domain.

The predictive model indicates that most wells will reach the GWPS (400 mg/L) in under 14.8 years following closure, with one exception. **Figure 6-3** and **Figure 6-4** show the extent of the plume in the UA after 14.8 years and the maximum extent of the plume in the model after 14.8 years, respectively. The predicted delayed reduction in concentration at well G301, 58.8 years, is a result of the well's location along the flow path of the residual sulfate concentrations released into native geologic materials prior to closure. All UA groundwater monitoring wells are below the GWPS within 58.8 years (**Figure 6-5** and **Figure 6-6**). The residual sulfate plume in the UA from the calibrated model remains in close proximity to AP1 as it recedes over time. The predicted footprint of the sulfate plume in the UA after 58.8 years shown in **Figure 6-5** is considerably reduced from that at the end of the transient model simulation (**Figure 5-27**).

The predicted delayed reduction in concentration at well G301 is a result of the well's location along the flow path of the residual sulfate concentrations released into native geologic materials prior to closure. Reduced percolation rates through the consolidation area within AP1 in the CIP scenario means that the residual sulfate concentrations require a longer time period to migrate through native geologic materials.

Evaluations of post-construction water flux through the consolidated and covered Fill Unit (CCR) were completed using data obtained from the Scenario 1 (CIP) prediction model when simulated post-construction heads in the groundwater monitoring wells are predicted to stabilize (once heads stabilized in the model, the post-construction movement of water in and out of the Fill Unit [CCR] were compared to pre-construction conditions). The pre-construction (calibration model) and post-construction Scenario 1 (CIP) prediction model simulated water flux values are summarized in **Appendix E** and discussed below. Data export files used for flux evaluations are found along with model files in **Appendix B**.

Scenario 1 (CIP) was predicted to reduce total flux in and out of the Fill Unit (CCR) by approximately 99.9%, when simulated post-construction heads in the groundwater monitoring wells are predicted to stabilize (approximate hydraulic steady state) as illustrated in **Figure 6-7**. **Figure 6-8** is a plot showing the changes in flux reduction (shown as negative percentage) over time starting from implementation of Scenario 1 (CIP) through approximate hydraulic steady state conditions. Following implementation of Scenario 1 (CIP), influx into the CCR unit decreases rapidly as illustrated in **Figure 6-8**. Following removal of free-liquids, the consolidated CCR is no longer in contact with groundwater. Thus, the modeling indicates consolidation and closure with the proposed cover system result in 99.9% reduction in outflux after 10 days (**Figure 6-8**). The outflux from the CCR unit remains relatively constant throughout the CIP simulation.

Further, the base of consolidated CCR was compared to the simulated steady-state groundwater elevations which indicate between 3.2 and 10 feet of separation will be present between the base of CCR and groundwater (**Figure 6-9**).

6.3.2 Closure by Removal Model Results

The design for Scenario 2: CBR includes an initial 2-year dewatering period followed by CCR removal from AP1 (**Figure 6-2**). Stormwater drainage is present within AP1 with an outflow elevation of 625 feet.

For most wells, predicted concentrations for CBR start to decline at monitoring wells with observations above the standard GWPS for sulfate (400 mg/L) once the closure actions are initiated within the prediction model. The concentration of sulfate in some wells (most notably G315, G307 and G308) show short term fluctuations (less than 5 years) following the removal of concentration during the dewatering phase, such that sulfate concentrations decline and are followed by a short rise before the impacts of the CBR are clearly observed. The general decline in sulfate concentration occur as the CCR is removed from AP1 and saturated ash cells (constant concentration cells) are removed. Following removal of CCR, sulfate concentrations are no longer entering the model domain from recharge or from saturated ash cells (constant concentration cells); all source concentrations are removed. Dewatering through removal of free liquids also reduces the head within AP1. These low heads are maintained following completion of closure by the drain cells that simulate storm water management designs within AP1. The removal of the CCR sources leads to the gradual reduction the residual sulfate concentrations released into native geologic materials prior to closure. All monitoring wells with observations above the standard GWPS for sulfate (400 mg/L) are predicted to be below the GWPS 18.1 years after closure implementation (**Figure 6-3**).

The sulfate plume in the CBR prediction model differs from that in the CIP prediction model. Higher recharge rates are present in the western portion of the pond because there is no cover system. The relatively higher recharge rates maintain components of the radial flow pattern described in **Section 2.2** at AP1. However, the stormwater drainage within the pond does constrain the groundwater elevation beneath AP1. As a result of the radial flow pattern, the prediction model indicates that a portion of the historic plume will remain along the western edge of AP1 as the plume recedes over time. The maximum extent of the plume at 14.8 years is illustrated in **Figure 6-4**. The maximum extent of the plume remains in close proximity to AP1 and is no longer present above the GWPS (400 mg/L) at 58.8 years as illustrated in **Figure 6-6**.

7. CONCLUSIONS

This GMR has been prepared to evaluate how proposed CIP and CBR scenarios will achieve compliance with the applicable groundwater standards at the CPP for AP1. An existing groundwater model was updated to include data collected from the recent 2021 field investigations and used to predict the impacts of the closure scenarios on groundwater quality at the CPP. Statistically significant correlations between sulfate concentrations and concentrations of TDS identified as potential exceedances of the GWPS indicate sulfate is an acceptable surrogate for TDS in the groundwater model. Concentrations of TDS are expected to change along with model predicted sulfate concentrations. A potential exceedance of boron was observed at one monitoring well, G313, which also has potential exceedances of both sulfate and TDS. Similar source and behavior in the groundwater system would be expected among boron, sulfate, and TDS at UA monitoring well G313, and boron concentrations are expected to change along with model predicted sulfate concentrations. It was assumed that sulfate would not significantly sorb or chemically react with aquifer solids (Kd was set to 0 mL/g) which is a conservative estimate for predicting contaminant transport times in the model. The MODFLOW and MT3DMS models were used to evaluate two scenarios using information provided in the Final Closure Plan for AP1 (Golder, 2022a):

- **Scenario 1:** CIP including removal of CCR from the eastern portion of AP1, consolidation into the western portion of AP1, and construction of a cover system over the remaining CCR.
- **Scenario 2:** CBR including removal of all CCR and regrading of the removal area.

Scenario 1 (CIP) was predicted to reduce total flux in and out of the Fill Unit (CCR) by approximately 99.9%, when simulated post-construction heads in the groundwater monitoring wells are predicted to stabilize. Additionally, the base of consolidated CCR was compared to the simulated steady-state groundwater elevations which indicate between 3.2 and 10 feet of separation will be present between the base of CCR and groundwater.

Differences exist in the timeframes to reach the GWPS for most monitoring wells between CIP and CBR. In general, the simulated groundwater concentrations in the monitoring wells within the UA will achieve the GWPS in 15 years and 18 years respectively for the CIP and CBR closure scenarios, with the exception of well G301 in the CIP scenario. The predicted delayed reduction in concentration at well G301, 59 years to reach the GWPS, is a result of the well's location along the flow path of the residual sulfate concentrations released into native geologic materials prior to closure. Reduced percolation rates through the consolidation area at the northwest corner of AP1 in the CIP scenario means that the residual sulfate concentrations in this limited area require a longer time period to migrate through native geologic materials.

8. REFERENCES

Anderson, M.P. 1979. *Using models to simulate the movement of contaminants through groundwater flow systems*. CRC Critical Rev. Environ. Control., 9(2), p. 97-156.

Anderson, M.P. 1984. *Movement of contaminants in groundwater: groundwater transport -- advection and dispersion*. Groundwater Contamination. National Academy Press, Washington, D.C. p. 37-45.

Environmental Simulations, Inc., 2017. *Groundwater Vistas 7 Software*.

Electric Power Research Institute (EPRI), 2005. *Chemical constituents in coal combustion product leachate: boron. Final Report 1005258.*

EPRI, 2005. *Chemical constituents in coal combustion product leachate: boron*. Final Report 1005258.

Fetter, C.W., 1988. *Applied Hydrogeology*. Merrill Publishing Company, Columbus, Ohio.

Fetter, C.W., 2001. *Applied Hydrogeology*. 4th Edition, Prentice Hall, Upper Saddle River, p. 79.

Geosyntec Consultants, Inc. (Geosyntec), 2022a. *Technical Memorandum: Evaluation of Potential GWPS Exceedances, Coffeen Ash Pond 1, Coffeen Power Plant*.

Geosyntec Consultants, Inc. (Geosyntec), 2022b. *Technical Memorandum: Evaluation of Partition Coefficient Results, Coffeen Ash Pond No. 1, CCR Unit 101, Coffeen Power Plant, Coffeen Illinois*.

Geosyntec Consultants, Inc. (Geosyntec), 2022c. *Technical Memorandum: Proposed Alternative Final Protective Layer Equivalency Demonstration, Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois*.

Golder Associates (Golder), 2022a. *Final Closure Plan for Ash Pond No. 1*, attached to the Construction Permit Application to which this report is also attached, July 2022.

Golder Associates (Golder), 2022b. *Final Closure Plan for the Gypsum Management Facility Gypsum Stack Pond, Coffeen Power Plant, Coffeen, Illinois*, July 2022.

Golder Associates (Golder), 2022c. *Final Closure Plan for the Gypsum Management Facility Recycle Pond, Coffeen Power Plant, Coffeen*, July 2022.

Haley & Aldrich, Inc., October 1, 2018. *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*.

Hanson Professional Services, Inc. (Hanson), 2009. *Section 3: Hydrogeologic Investigation. Initial Facility Report*. Hanson Professional Services, Inc. August 2009.

Hanson Professional Services, Inc. (Hanson), 2016. 40 CFR 257.60 *Uppermost Aquifer Considerations, Gypsum Pond*, Illinois Power Holdings LLC, Coffeen Energy Center, Montgomery County, Illinois, April 2016.

Illinois Environmental Protection Agency (IEPA), 2021. *In the Matter of: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Title 35 Illinois Administration Code 845, Addendum*. April 15, 2021.

Illinois State Geological Survey (ISGS), 2019. *Directory of Coal Mines in Illinois, Christian County*. Accessed from URL: https://wikiimage.isgs.illinois.edu/ilmines/webfiles/mines-series/mines-directories/pdf-files/mines-directory-christian.pdf. August 2019.

McDonald, M.G., and A.W. Harbaugh, 1988. *A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model: Techniques of Water-Resources Investigations, Techniques of Water-Resources of the United States Geological Survey*. Book 6, Chapter A1.

Natural Resource Technology, Inc. (NRT), 2017a. *Hydrogeologic Site Characterization Report. Ash Pond 2, Coffeen Power Station, Coffeen, Illinois*. Illinois Power Generating Company. January 24, 2017.

Natural Resource Technology, Inc. (NRT), 2017b. *Groundwater Model Report. Ash Pond 2, Coffeen Power Station, Coffeen, Illinois*. Illinois Power Generating Company. January 24, 2017.

Nelson, W. John, 1995. *Structural Features in Illinois*. Illinois State Geological Survey, Bulletin 100, 144 p.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021a. *Hydrogeologic Site Characterization Report, Ash Pond No. 1, Coffeen, Illinois*. Illinois Power Generating Company. October 25, 2021.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021b. *History of Potential Exceedances, Ash Pond No. 1, Coffeen, Illinois*. Illinois Power Generating Company. October 25, 2021.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021c. *Groundwater Monitoring Plan. Coffeen Power Plant, Ash Pond No. 1, Coffeen, Illinois*. Illinois Power Generating Company. October 25, 2021.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021d. *Hydrogeologic Site Characterization Report, GMF Recycle Pond, Coffeen, Illinois*. Illinois Power Generating Company. October 25, 2021.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021e. *Hydrogeologic Site Characterization Report, GMF Gypsum Stack Pond, Coffeen, Illinois*. Illinois Power Generating Company. October 25, 2021.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2022. *Groundwater Modeling Report, GMF Gypsum Stack Pond and GMF Recycle Pond, Coffeen Power Plant, Coffeen Illinois*.

Strenge, D. and Peterson, S. 1989. *Chemical Data Bases for the Multimedia Environmental Pollutant Assessment System (MEPAS) (No. PNL-7145)*. Pacific Northwest Lab., Richland, WA (USA).

Tolaymat, T. and Krause, M, 2020. *Hydrologic Evaluation of Landfill Performance: HELP 4.0 User Manual*. United States Environmental Protection Agency, Washington, DC, EPA/600/B 20/219.

United States Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS), 2022. National Geospatial Center of Excellence, Digital Elevation Model.

United States Geological Survey (USGS), 2021. *National Map*. Accessed from URL: https://apps.nationalmap.gov/viewer/

Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon, 1975. *Handbook of Illinois Stratigraphy.* Illinois State Geological Survey, Bulletin 95, 261 p.

Zheng, Z., and P.P. Wang, 1998. MT3DMS, a Modular Three-Dimensional Multispecies Transport Model, Model documentation and user's guide prepared by the University of Alabama Hydrogeology Group for the US Army Corps of Engineers.

TABLES

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (feet)	Measuring Point Elevation (feet)	Measuring Point Description	Ground Elevation (feet)	Screen Top Depth (feet bgs)	Screen Bottom Depth (feet bgs)	Screen Top Elevation (feet)	Screen Bottom Elevation (feet)	Well Depth (feet bgs)	Bottom of Boring Elevation (feet)	Screen Length (feet)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G045D	LCU	08/17/2016	623.81	623.81	Top of PVC	620.94	31.88	41.52	589.06	579.42	41.92	578.90	9.6	2	39.064349	-89.396281
G046D	LCU	08/19/2017	625.24	625.24	Top of PVC	621.91	41.61	51.26	580.30	570.65	51.65	569.90	9.7	2	39.060305	-89.398524
G101	UA	02/02/2010	--	627.60	Top of Disk	625.27	15.68	20.32	609.59	604.95	20.89	603.40	4.6	2	39.071386	-89.400107
G102	UA	04/28/2006	--	629.04	Top of Disk	626.18	12.02	16.78	614.16	609.40	17.15	609.00	4.8	2	39.071387	-89.398991
G103	UA	02/15/2010	--	633.80	Top of Disk	627.94	15.88	20.67	612.06	607.27	21.09	606.90	4.8	2	39.070412	-89.399107
G104	UA	02/15/2010	--	632.94	Top of Disk	627.96	14.91	19.61	613.05	608.35	20.08	605.80	4.7	2	39.069451	-89.399104
G105	UA	02/16/2010	--	632.08	Top of Disk	626.86	16.11	20.90	610.75	605.96	21.37	604.40	4.8	2	39.068491	-89.3991
G106	UA	02/16/2010	--	631.15	Top of Disk	625.96	14.37	18.96	611.59	607.00	19.44	605.50	4.6	2	39.06753	-89.399097
G107	UA	02/17/2010	630.22	630.22	Top of Disk	628.20	13.87	18.50	614.33	609.70	19.00	607.50	4.6	2	39.067106	-89.399646
G108	UA	02/12/2010	--	630.22	Top of Disk	625.58	16.82	21.50	608.76	604.08	22.00	603.60	4.7	2	39.066984	-89.400035
G109	UA	02/11/2010	--	629.76	Top of Disk	624.79	15.39	19.93	609.40	604.86	20.50	604.30	4.5	2	39.067045	-89.400423
G110	UA	02/11/2010	--	629.65	Top of Disk	624.81	15.05	19.59	609.76	605.22	20.16	604.70	4.5	2	39.067172	-89.400704
G111	UA	02/11/2010	--	629.90	Top of Disk	625.28	14.61	19.15	610.67	606.13	19.72	605.60	4.5	2	39.067292	-89.40097
G119	UA	02/09/2010	--	631.55	Top of Disk	626.57	17.29	21.83	609.28	604.74	22.38	604.20	4.5	2	39.068986	-89.401213
G120	UA	02/08/2010	--	631.87	Top of Disk	627.21	15.10	19.62	612.11	607.59	20.21	605.10	4.5	2	39.069479	-89.401214
G121	UA	02/04/2010	--	632.83	Top of Disk	627.94	16.79	21.47	611.15	606.47	21.95	603.80	4.7	2	39.069781	-89.401216
G122	UA	02/04/2010	--	632.69	Top of Disk	628.05	16.51	21.05	611.54	607.00	21.66	606.20	4.5	2	39.070098	-89.401218
G123	UA	02/04/2010	--	632.96	Top of Disk	628.12	20.94	25.46	607.18	602.66	26.07	602.10	4.5	2	39.070399	-89.401219
G124	UA	02/03/2010	--	633.39	Top of Disk	628.70	15.98	20.51	612.72	608.19	21.06	606.70	4.5	2	39.070715	-89.40122
G125	UA	02/03/2010	--	633.51	Top of Disk	628.85	17.03	21.56	611.82	607.29	22.04	606.80	4.5	2	39.071003	-89.401221
G126	UA	02/10/2010	--	625.39	Top of Disk	622.96	12.89	17.43	610.07	605.53	18.00	605.00	4.5	2	39.067304	-89.401274
G151	UA	12/19/2011	--	625.93	Top of Disk	622.82	15.34	19.84	607.48	602.98	20.46	602.40	4.5	2	39.0672	-89.40159
G152	UA	12/20/2011	--	626.52	Top of Disk	623.06	13.59	18.09	609.47	604.97	18.57	604.50	4.5	2	39.066275	-89.401289
G153	UA	12/15/2011	626.35	626.40	Top of Disk	623.23	15.90	20.34	607.33	602.89	20.80	602.50	4.4	2	39.065857	-89.402567
G154	UA	12/16/2011	--	626.35	Top of Disk	623.52	14.26	18.76	609.26	604.76	19.10	603.50	4.5	2	39.067089	-89.403574
G155	UA	12/19/2011	--	625.86	Top of Disk	622.89	15.09	19.58	607.80	603.31	23.23	599.70	4.5	2	39.067493	-89.402659
G200	UA	02/25/2008	--	625.94	Top of Disk	623.27	12.19	16.98	611.08	606.29	17.36	605.30	4.8	2	39.075139	-89.395009
G201	UA	02/25/2008	627.15	627.15	Top of Riser	624.19	13.01	17.80	611.18	606.39	18.15	606.00	4.8	2	39.075141	-89.397829
G205	UA	02/21/2008	--	624.34	Top of Disk	622.10	10.04	14.53	612.06	607.57	15.07	606.10	4.5	2	39.068596	-89.394147
G206	UA	10/14/2010	--	632.82	Top of Disk	630.53	17.51	21.92	613.02	608.61	22.42	606.50	4.4	2	39.067399	-89.398548
G206D	DA	01/25/2021	634.14	634.14	Top of PVC	631.41	49.20	59.00	582.21	572.41	59.39	571.41	9.8	2	39.067428	-89.398493
G207	UA	10/08/2010	--	633.21	Top of Disk	630.61	18.24	22.77	612.37	607.84	23.30	606.60	4.5	2	39.067568	-89.397952
G208	UA	10/07/2010	--	633.16	Top of Disk	630.57	17.53	22.06	613.04	608.51	22.60	606.60	4.5	2	39.067743	-89.397402
G209	UA	10/07/2010	--	632.91	Top of Disk	630.57	17.74	22.28	612.83	608.29	22.81	606.60	4.5	2	39.067923	-89.39685
G210	UA	10/06/2010	--	632.99	Top of Disk	630.48	19.39	23.93	611.09	606.55	24.46	605.50	4.5	2	39.068088	-89.396322
G211	UA	10/11/2010	--	632.64	Top of Disk	630.31	17.34	21.88	612.97	608.43	22.41	606.30	4.5	2	39.068263	-89.395792
G212	UA	10/11/2010	--	632.89	Top of Disk	630.59	16.74	21.29	613.85	609.30	21.81	606.60	4.6	2	39.06843	-89.395318
G213	UA	10/12/2010	--	632.81	Top of Disk	630.34	16.75	21.29	613.59	609.05	21.82	606.30	4.5	2	39.068585	-89.394822
G214	UA	10/14/2010	--	632.85	Top of Disk	630.39	17.75	22.14	612.64	608.25	22.65	606.40	4.4	2	39.068919	-89.393982
G215	UA	10/13/2010	--	633.06	Top of Disk	630.48	19.41	23.80	611.07	606.68	24.31	606.20	4.4	2	39.069309	-89.39394

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS

GROUNDWATER MODELING REPORT

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (feet)	Measuring Point Elevation (feet)	Measuring Point Description	Ground Elevation (feet)	Screen Top Depth (feet bgs)	Screen Bottom Depth (feet bgs)	Screen Top Elevation (feet)	Screen Bottom Elevation (feet)	Well Depth (feet bgs)	Bottom of Boring Elevation (feet)	Screen Length (feet)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G216	UA	10/13/2010	--	632.76	Top of Disk	630.28	20.04	24.42	610.24	605.86	24.93	604.30	4.4	2	39.069765	-89.393946
G217	UA	10/12/2010	--	633.10	Top of Disk	630.67	20.49	24.88	610.18	605.79	25.38	604.70	4.4	2	39.07034	-89.393959
G218	UA	10/12/2010	--	633.11	Top of Disk	630.64	20.33	24.77	610.31	605.87	25.27	604.60	4.4	2	39.070876	-89.393956
G270	UA	02/26/2008	--	625.86	Top of Disk	623.73	13.13	17.92	610.60	605.81	18.27	605.50	4.8	2	39.066564	-89.397403
G271	UA	09/10/2009	--	625.57	Top of Disk	622.89	9.96	14.31	612.93	608.58	14.79	606.90	4.4	2	39.065007	-89.395587
G272	UA	09/10/2009	--	623.81	Top of Disk	620.72	9.11	13.98	611.61	606.74	14.32	606.40	4.9	2	39.064989	-89.394785
G273	UA	09/10/2009	--	623.02	Top of Disk	620.17	9.08	14.56	611.09	605.61	15.10	604.20	5.5	2	39.064985	-89.393973
G274	UA	09/16/2009	--	624.04	Top of Disk	621.67	12.90	17.67	608.77	604.00	18.06	603.60	4.8	2	39.064991	-89.393198
G275	UA	09/16/2009	--	618.26	Top of Disk	616.14	8.22	12.62	607.92	603.52	13.19	603.00	4.4	2	39.065151	-89.392561
G275D	DA	01/14/2021	620.31	620.31	Top of PVC	617.52	49.76	59.55	567.76	557.97	59.89	517.80	9.8	2	39.065121	-89.392595
G276	UA	09/16/2009	--	632.00	Top of Disk	629.14	22.41	27.22	606.73	601.92	27.65	601.10	4.8	2	39.065534	-89.392617
G277	UA	09/14/2009	--	623.08	Top of Disk	620.79	14.29	18.77	606.50	602.02	19.24	600.80	4.5	2	39.065927	-89.392572
G278	UA	09/11/2009	631.19	631.17	Top of Disk	628.85	18.93	23.70	609.92	605.15	24.06	604.80	4.8	2	39.066737	-89.393161
G279	UA	09/10/2009	--	632.04	Top of Disk	629.19	22.40	26.79	606.79	602.40	27.30	601.20	4.4	2	39.067156	-89.392998
G280	UA	02/26/2008	625.35	625.35	Top of Riser	623.11	12.79	17.63	610.32	605.48	17.98	605.10	4.8	2	39.067216	-89.394992
G281	UA	09/08/2015	--	626.36	Top of Disk	623.82	15.51	20.16	608.31	603.66	20.30	603.50	4.7	2	39.065405	-89.399322
G283	LCU	01/14/2021	610.75	610.75	Top of PVC	608.30	8.39	18.17	599.91	590.13	18.36	589.90	9.8	2	39.064645	-89.392119
G284	UA	02/03/2021	618.42	618.42	Top of PVC	615.33	8.08	12.85	607.25	602.48	13.23	601.30	4.8	2	39.065487	-89.390631
G285	LCU	01/25/2021	613.52	613.52	Top of PVC	610.54	13.68	23.45	596.86	587.09	23.83	584.50	9.8	2	39.066513	-89.391474
G286	UA	01/18/2021	613.13	613.13	Top of PVC	609.97	3.37	8.16	606.60	601.81	8.50	600.00	4.8	2	39.067277	-89.391883
G287	UA	01/20/2021	617.45	617.45	Top of PVC	614.34	5.43	10.25	608.91	604.09	10.59	602.50	4.8	2	39.068297	-89.392388
G288	UA	01/19/2021	620.07	620.07	Top of PVC	617.08	7.59	12.26	609.49	604.82	12.75	603.10	4.7	2	39.067834	-89.390082
G301	UA	09/04/2015	--	622.65	Top of Disk	620.88	11.31	15.96	608.96	604.31	16.21	604.10	4.7	2	39.05951	-89.395415
G302	UA	09/04/2015	--	620.04	Top of Disk	618.52	13.21	17.86	604.74	600.09	18.39	599.60	4.7	2	39.059544	-89.393192
G303	UA	08/26/2010	--	622.02	Top of Disk	619.33	10.00	20.00	609.07	599.07	20.40	598.70	10	2	39.057144	-89.391721
G304	UA	08/26/2010	--	626.72	Top of Disk	623.32	10.00	20.00	613.32	603.32	20.40	602.90	10	2	39.057205	-89.395663
G305	UA	05/03/2016	625.67	625.67	Top of PVC	623.23	13.44	18.27	609.10	604.27	18.50	604.10	4.8	2	39.056558	-89.396798
G306	UA	05/03/2016	625.91	625.91	Top of PVC	623.57	13.07	17.68	609.77	605.16	17.90	604.80	4.6	2	39.056494	-89.393556
G307	UA	07/27/2016	624.60	624.60	Top of PVC	624.73	12.96	17.80	609.12	604.28	18.22	603.90	4.8	2	39.057214	-89.395545
G307D	LCU	01/19/2021	624.88	624.88	Top of PVC	622.51	48.98	58.75	573.53	563.76	59.60	562.50	9.8	2	39.05721	-89.39552
G308	UA	01/18/2021	624.59	624.59	Top of PVC	621.59	10.10	14.89	611.49	606.70	15.24	605.80	4.8	2	39.057379	-89.397134
G309	UA	01/21/2021	625.88	625.88	Top of PVC	622.77	12.97	17.75	609.80	605.02	18.10	604.70	4.8	2	39.058508	-89.397243
G310	UA	02/09/2021	622.87	622.87	Top of PVC	619.89	10.24	15.03	609.65	604.86	15.38	604.00	4.8	2	39.059532	-89.396907
G311	UA	01/13/2021	621.04	621.04	Top of PVC	618.32	9.27	14.04	609.05	604.28	14.40	603.90	4.8	2	39.059513	-89.394363
G311D	LCU	01/12/2021	621.24	621.24	Top of PVC	618.39	50.16	60.10	568.23	558.29	60.58	557.80	9.9	2	39.059513	-89.394312
G312	UA	01/15/2021	619.78	619.78	Top of PVC	616.92	9.79	14.58	607.13	602.34	14.93	601.70	4.8	2	39.059558	-89.391983
G313	UA	02/05/2021	614.30	614.30	Top of PVC	611.51	6.30	11.11	605.21	600.40	11.46	599.50	4.8	2	39.058773	-89.391124
G314	LCU	02/05/2021	613.88	613.88	Top of PVC	611.11	14.56	19.58	596.55	591.53	20.02	591.10	5	2	39.05782	-89.390964
G314D	DA	02/04/2021	613.70	613.70	Top of PVC	610.87	39.34	49.11	571.53	561.76	49.47	510.60	9.8	2	39.057852	-89.390958
G315	UA	01/14/2021	623.52	623.52	Top of PVC	620.94	9.69	14.48	611.25	606.46	14.85	605.00	4.8	2	39.057165	-89.393667

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS

GROUNDWATER MODELING REPORT

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (feet)	Measuring Point Elevation (feet)	Measuring Point Description	Ground Elevation (feet)	Screen Top Depth (feet bgs)	Screen Bottom Depth (feet bgs)	Screen Top Elevation (feet)	Screen Bottom Elevation (feet)	Well Depth (feet bgs)	Bottom of Boring Elevation (feet)	Screen Length (feet)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G316	LCU	02/26/2021	602.59	602.59	Top of PVC	599.64	10.02	14.82	589.62	584.82	15.16	583.90	4.8	2	39.057847	-89.389698
G317	UA	02/12/2021	641.93	641.93	Top of PVC	638.85	30.14	34.93	608.71	603.92	35.28	602.90	4.8	2	39.056727	-89.390148
G401	UA	09/14/2015	--	625.57	Top of Disk	623.03	14.36	18.79	608.67	604.24	19.29	603.70	4.4	2	39.060259	-89.395295
G402	UA	08/27/2010	--	613.37	Top of Disk	610.36	10.00	20.00	600.36	590.36	20.40	590.00	10	2	39.060207	-89.391712
G403	UA	09/11/2015	--	626.47	Top of Disk	623.81	13.11	17.78	610.70	606.03	18.15	605.70	4.7	2	39.063167	-89.398779
G404	UA	05/01/2007	--	615.67	Top of Disk	613.57	6.42	11.17	607.15	602.40	11.62	601.60	4.8	2	39.064329	-89.392493
G405	UA	05/01/2007	--	623.63	Top of Disk	621.40	9.01	13.76	612.39	607.64	14.21	607.20	4.8	2	39.064345	-89.396234
G406	UA	08/19/2016	625.36	625.36	Top of PVC	621.86	13.56	18.37	608.30	603.49	18.75	603.10	4.8	2	39.060309	-89.398508
G407	UA	08/16/2016	621.32	621.32	Top of PVC	618.35	13.78	18.61	604.57	599.74	19.04	598.40	4.8	2	39.061574	-89.402004
G410	UA	02/23/2018	--	619.79	Top of Disk	617.21	8.89	13.68	608.32	603.53	14.09	603.10	4.8	2	39.061572	-89.403763
G411	UA	02/22/2018	--	623.25	Top of Disk	620.49	11.21	16.07	609.28	604.42	16.47	604.00	4.9	2	39.063979	-89.404033
MW01D	DA	05/03/2006	609.02	609.02	Top of PVC	607.08	33.29	38.05	573.79	569.03	38.41	567.10	4.8	2	39.067068	-89.402747
MW02S	UA	05/05/2006	627.12	627.12	Top of PVC	624.16	10.34	15.12	613.82	609.04	15.51	608.70	4.8	2	39.071017	-89.403648
MW02D	LCU	05/05/2006	626.99	626.99	Top of PVC	624.14	22.03	26.83	602.11	597.31	27.22	596.90	4.8	2	39.071031	-89.403649
MW03D	DA	04/27/2006	629.01	629.01	Top of PVC	625.86	52.29	57.06	573.57	568.80	57.40	567.90	4.8	2	39.071386	-89.398976
MW04S	UA	05/11/2006	625.89	625.89	Top of PVC	622.63	9.83	14.26	612.80	608.37	14.77	607.90	4.4	2	39.075356	-89.399232
MW05S	UA	05/17/2006	625.95	625.95	Top of PVC	622.65	12.66	17.41	609.99	605.24	17.71	604.90	4.8	2	39.075866	-89.40333
MW05D	DA	05/17/2006	625.91	625.91	Top of PVC	622.65	45.57	50.33	577.08	572.32	50.72	568.70	4.8	2	39.075863	-89.403313
MW06S	UA	05/04/2006	626.15	626.15	Top of PVC	623.37	11.04	15.62	612.33	607.75	16.08	607.30	4.6	2	39.078189	-89.403644
MW07S	UA	05/09/2006	627.60	627.60	Top of PVC	624.90	9.91	13.79	614.99	611.11	14.39	610.50	3.9	2	39.0786	-89.399383
MW08S	UA	05/10/2006	628.01	628.01	Top of PVC	625.09	11.51	16.00	613.58	609.09	16.60	608.00	4.5	2	39.080234	-89.399079
MW09S	UA	05/03/2006	627.62	627.62	Top of PVC	624.70	11.21	15.62	613.49	609.08	16.20	608.50	4.4	2	39.079954	-89.394899
MW09D	LCU	05/03/2006	627.61	627.61	Top of PVC	624.68	45.81	50.57	578.87	574.11	51.00	570.70	4.8	2	39.07994	-89.394899
MW10S	UA	05/02/2006	624.45	624.45	Top of PVC	621.43	11.28	15.76	610.15	605.67	16.30	605.10	4.5	2	39.07601	-89.394068
MW10D	LCU	05/01/2006	624.47	624.47	Top of PVC	621.33	41.74	46.57	579.59	574.76	47.02	572.60	4.8	2	39.075995	-89.39407
MW11S	UA	04/28/2006	625.27	625.27	Top of PVC	622.04	8.89	13.63	613.15	608.41	14.08	608.00	4.7	2	39.071888	-89.393913
MW11D	LCU	04/28/2006	625.52	625.52	Top of PVC	622.19	28.31	33.04	593.88	589.15	33.50	585.90	4.7	2	39.071888	-89.393894
MW12S	UA	05/10/2006	625.31	625.31	Top of PVC	622.24	10.61	15.18	611.63	607.06	15.61	606.60	4.6	2	39.068514	-89.394199
MW12D	DA	05/10/2006	625.21	625.21	Top of PVC	622.24	42.46	46.99	579.78	575.25	47.47	572.20	4.5	2	39.068501	-89.394199
MW13S	UA	05/09/2006	625.96	625.96	Top of PVC	622.80	11.43	16.23	611.37	606.57	16.62	606.20	4.8	2	39.066297	-89.40118
MW13D	DA	05/09/2006	625.86	625.86	Top of PVC	622.85	49.81	54.60	573.04	568.25	55.00	567.90	4.8	2	39.066293	-89.401163
MW14S	UA	05/02/2006	626.88	626.88	Top of PVC	624.62	12.26	17.02	612.36	607.60	17.38	607.20	4.8	2	39.069153	-89.400442
MW15S	UA	04/25/2006	626.66	626.66	Top of PVC	623.83	14.41	19.16	609.42	604.67	19.62	604.20	4.8	2	39.069772	-89.397088
MW15D	LCU	04/25/2006	626.44	626.44	Top of PVC	623.83	33.68	38.45	590.15	585.38	38.80	585.00	4.8	2	39.06977	-89.397073
MW16S	UA	04/25/2006	629.47	629.47	Top of PVC	626.32	14.59	19.41	611.73	606.91	19.76	606.40	4.8	2	39.073571	-89.397006
MW16D	DA	04/25/2006	629.38	629.38	Top of PVC	626.37	45.90	50.34	580.47	576.03	50.78	575.40	4.4	2	39.073571	-89.397036
MW17S	UA	05/04/2006	630.56	630.56	Top of PVC	627.28	14.02	23.56	613.26	603.72	24.11	603.20	9.5	2	39.07715	-89.396978
MW17D	DA	05/04/2006	630.29	630.29	Top of PVC	627.47	48.82	53.32	578.65	574.15	53.87	573.60	4.5	2	39.077151	-89.396958
MW18S	UA	05/11/2006	628.66	628.66	Top of PVC	625.69	11.31	15.79	614.38	609.90	16.40	609.30	4.5	2	39.077033	-89.401698
MW20S	UA	05/01/2007	622.90	622.90	Top of PVC	620.26	8.41	13.22	611.85	607.04	13.67	604.30	4.8	2	39.064968	-89.394322

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (feet)	Measuring Point Elevation (feet)	Measuring Point Description	Ground Elevation (feet)	Screen Top Depth (feet bgs)	Screen Bottom Depth (feet bgs)	Screen Top Elevation (feet)	Screen Bottom Elevation (feet)	Well Depth (feet bgs)	Bottom of Boring Elevation (feet)	Screen Length (feet)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
R104	UA	10/08/2010	--	632.84	Top of Disk	629.03	14.59	19.32	614.44	609.71	19.85	609.20	4.7	2	39.069474	-89.399109
R201	UA	10/08/2010	--	626.34	Top of Disk	624.02	14.59	19.32	609.43	604.70	19.85	604.20	4.7	2	39.075142	-89.397855
R205	UA	03/20/2017	--	624.52	Top of Disk	621.91	11.32	16.01	610.59	605.90	16.42	605.50	4.7	2	39.068593	-89.394164
T127	UA	02/10/2010	--	630.96	Top of Disk	625.53	17.53	22.07	608.00	603.46	22.64	602.90	4.5	2	39.068119	-89.40121
T128	UA	02/09/2010	631.03	630.93	Top of Disk	626.27	16.53	21.04	609.74	605.23	21.64	602.20	4.5	2	39.068532	-89.401211
T202	UA	10/15/2010	--	628.63	Top of Disk	626.22	12.27	16.65	613.95	609.57	17.21	608.20	4.4	2	39.071776	-89.397705
T408	LCU	08/17/2016	624.08	624.08	Top of PVC	621.09	20.66	25.49	600.43	595.60	25.92	595.20	4.8	2	39.064353	-89.396307
T409	LCU	08/19/2016	625.01	625.01	Top of PVC	621.85	21.79	26.59	600.06	595.26	26.99	594.90	4.8	2	39.0603	-89.398538
TA31	UA	10/28/2014	626.55	626.55	Top of PVC	623.89	15.09	19.57	608.80	604.32	20.19	603.70	4.5	2	39.071368	-89.401366
TA32	UA	10/27/2014	621.42	621.42	Top of PVC	618.93	11.31	15.68	607.62	603.25	16.47	602.50	4.4	2	39.074093	-89.402223
TA33	UA	06/02/2015	625.27	625.27	Top of PVC	622.51	12.23	16.89	610.28	605.62	17.44	605.10	4.7	2	39.071556	-89.403506
TA34	UA	06/03/2015	626.52	626.52	Top of PVC	624.10	10.92	15.41	613.18	608.69	16.10	608.00	4.5	2	39.069631	-89.402759
TR32	UA	07/02/2021	621.68	621.68	Top of PVC	619.28	11.00	15.68	608.28	603.60	16.17	603.11	4.68	2	39.074064	-89.397758
X201	S	--	--	618.47	--	--	--	--	--	--	--	--	--	--	39.065278	-89.3925
SG-02	SW	--	--	605.87	Top of Prot Casing	605.87	--	--	--	--	--	--	--	--	39.059695	-89.391429
SG-03	SW	--	--	594.94	Top of Prot Casing	594.94	--	--	--	--	--	--	--	--	39.059092	-89.390342
SG-04	SW	--	--	599.52	Top of Prot Casing	599.52	--	--	--	--	--	--	--	--	39.064146	-89.390504

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
-- = data not available
bgs = below ground surface
DA = deep aquifer
ft = foot or feet
HSU = hydrostratigraphic Unit
LCU = lower confining unit
PVC = polyvinyl chloride
S = source water
SW = surface water
UA = uppermost aquifer
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TABLE 4-1. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS

GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

					Flow Targets								Transport Targets							
Well Name	Easting	Northing	HSU	CCR Unit	Number of Samples	mean GWL[1] (feet)	std GWL[1] (feet)	min GWL[1] (feet)	max GWL[1] (feet)	Earliest Sample Date	Latest Sample Date	Flow Calibration Wells	Number of Samples	mean Sulfate (mg/L)	std Sulfate (mg/L)	min Sulfate (mg/L)	max Sulfate (mg/L)	Earliest Sample Date	Latest Sample Date	Transport Calibraiton Well
G101	2514214.26	876551.76	UA	LF	20	617.989	2.504194166	612.95	623.65	15/01/2019	16/11/2015	Yes	-	-	-	-	-	-	-	-
G102	2514531.1	876554.8	UA	GSP	25	622.8612	1.751842649	618.96	627.12	15/01/2019	16/11/2015	Yes	19	90.6	29.7	49	140	04/08/2015	01/26/2021	Yes
G103	2514501.17	876199.41	UA	GSP	19	622.0884211	1.754825927	617.95	624.93	15/01/2019	11/12/2016	Yes	3	66.3	11.2	54	76	04/08/2015	10/06/2015	Yes
G105	2514509.06	875499.78	UA	GSP	19	622.0884211	2.178504235	613.96	624	15/01/2019	11/12/2016	Yes	3	116.7	11.5	110	130	04/08/2015	10/06/2015	Yes
G106	2514512.87	875149.77	UA	GSP	20	620.763	1.194844628	617.46	622.6	15/01/2019	16/11/2015	Yes	19	66.1	23.3	36	140	04/08/2015	01/26/2021	Yes
G107	2514358.3	874994.03	UA	LF	19	619.1036842	1.658802147	615.46	622.33	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G108	2514248.22	874948.67	UA	LF	19	619.4994737	1.31911786	616.24	622.22	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G109	2514137.87	874969.96	UA	LF	19	618.7294737	1.25543031	615.7	620.84	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G110	2514057.7	875015.54	UA	LF	20	618.104	1.590105591	613.27	620.65	15/01/2019	16/11/2015	Yes	-	-	-	-	-	-	-	-
G111	2513981.81	875058.61	UA	LF	19	616.9310526	1.267626368	613.16	618.53	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G119	2513907.62	875675	UA	LF	19	615.9689474	1.16332328	612.24	617.45	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G120	2513905.82	875854.56	UA	LF	19	614.3242105	1.834418817	612.13	617.69	15/01/2019	16/11/2015	Yes	-	-	-	-	-	-	-	-
G121	2513904.33	875964.54	UA	LF	18	614.6861111	2.034979806	611.93	618.73	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G122	2513902.79	876080	UA	LF	18	615.3283333	2.095957594	612.94	620.41	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G123	2513901.58	876189.62	UA	LF	18	614.5494444	3.842648401	610.31	622.79	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G124	2513900.33	876304.71	UA	LF	19	617.8857895	2.128430083	615.09	622.86	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G125	2513899.16	876409.6	UA	LF	20	619.676	2.365809976	614.6	622.96	15/01/2019	16/11/2015	Yes	-	-	-	-	-	-	-	-
G126	2513895.46	875062.25	UA	LF	19	614.87	1.340053896	612.28	616.87	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G151	2513806.06	875023.62	UA	LF	16	614.468125	0.894980214	612.13	615.49	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G152	2513894.35	874687.44	UA	SW	16	615.421875	1.122949799	612.77	617.44	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G153	2513532.77	874532.15	UA	SW	16	614.5425	1.204416871	612.37	616.3	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G154	2513243.08	874978.46	UA	SW	16	614.16	1.731546515	610.33	618.28	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G155	2513501.64	875127.78	UA	SW	16	613.686875	1.278998143	609.91	615.99	15/01/2019	11/12/2016	Yes	-	-	-	-	-	-	-	-
G200	2515650.03	877930.9	UA	B	26	621.4965385	1.461968378	618.16	623.29	15/01/2019	16/11/2015	Yes	25	101.2	8.3	87	120	01/20/2015	07/28/2021	-
G205	2515915	875549.93	UA	GSP	8	619.71	1.482912193	616.33	621.45	02/04/2017	11/12/2016	Yes	-	-	-	-	-	-	-	-
G206	2514669.15	875103.38	UA	GSP	25	621.286	1.444036588	616.61	622.76	15/01/2019	16/11/2015	Yes	20	119.4	24.7	32	150	01/21/2015	01/27/2021	Yes
G207	2514837.85	875166.36	UA	GSP	19	621.9526316	1.135658605	619.41	623.39	15/01/2019	11/12/2016	Yes	4	44.5	30.1	16	72	01/21/2015	10/07/2015	Yes
G208	2514993.46	875231.42	UA	GSP	19	622.0989474	1.175154339	618.97	624.07	15/01/2019	11/12/2016	Yes	4	53.5	37.7	33	110	01/21/2015	10/07/2015	Yes
G209	2515149.64	875298.3	UA	GSP	25	621.6212	1.211081885	617.76	623.18	15/01/2019	16/11/2015	Yes	20	248.8	51.6	95	310	01/21/2015	01/27/2021	Yes
G210	2515299.04	875359.67	UA	GSP	19	620.8747368	1.372254303	616.82	622.5	15/01/2019	11/12/2016	Yes	4	90.3	6.5	84	99	01/21/2015	10/07/2015	Yes
G211	2515448.98	875424.68	UA	GSP	19	621.1094737	1.148145721	618.14	622.45	15/01/2019	11/12/2016	Yes	4	79.8	5.4	74	87	01/21/2015	10/07/2015	Yes
G212	2515583.04	875486.65	UA	GSP	25	620.7644	1.197814259	617.19	622.12	15/01/2019	16/11/2015	Yes	20	55.9	4.2	49	66	01/21/2015	01/26/2021	Yes
G213	2515723.38	875544.3	UA	GSP	19	620.6210526	0.889262458	618.62	621.72	15/01/2019	11/12/2016	Yes	4	53.3	3.3	50	57	01/21/2015	10/07/2015	Yes
G214	2515960.85	875667.97	UA	GSP	19	617.8473684	1.193332598	614.52	619.39	15/01/2019	11/12/2016	Yes	4	71.3	3.9	68	76	01/21/2015	10/07/2015	Yes
G215	2515971.56	875810.11	UA	GSP	25	617.9504	1.033285537	615.48	619.51	15/01/2019	16/11/2015	Yes	21	167.1	109.9	100	490	01/21/2015	06/29/2021	Yes
G216	2515968.45	875976.18	UA	GSP	19	617.8368421	1.365349172	614.37	619.86	15/01/2019	11/12/2016	Yes	4	217.5	9.6	210	230	01/21/2015	10/07/2015	Yes
G217	2515962.98	876185.57	UA	GSP	19	617.5063158	1.127668246	614.32	619.13	15/01/2019	11/12/2016	Yes	4	132.5	5.0	130	140	01/21/2015	10/07/2015	Yes
G218	2515962.17	876380.8	UA	GSP	25	618.3172	1.25211328	614.46	620.1	01/15/2019	11/16/2015	Yes	20	135.8	34.0	94	220	01/21/2015	01/26/2021	Yes
G270	2514996.81	874802.01	UA	RP	26	620.3503846	2.547542315	614.45	623.38	01/15/2019	11/16/2015	Yes	21	69.8	25.8	49	140	01/20/2015	03/30/2021	Yes
G271	2515517.24	874239.3	UA	RP	25	615.7952	1.212807075	613.31	617.95	01/15/2019	11/16/2015	Yes	6	455.0	89.6	340	610	08/10/2018	02/01/2021	Yes
G272	2515745.01	874234.68	UA	RP	19	614.3836842	1.271854335	611.45	616.88	01/15/2019	12/11/2016	Yes	4	332.5	45.7	270	380	01/21/2015	10/08/2015	Yes

RAMBOLL

TABLE 4-1. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS

GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

					Flow Targets								Transport Targets							
Well Name	Easting	Northing	HSU	CCR Unit	Number of Samples	mean GWL[1] (feet)	std GWL[1] (feet)	min GWL[1] (feet)	max GWL[1] (feet)	Earliest Sample Date	Latest Sample Date	Flow Calibration Wells	Number of Samples	mean Sulfate (mg/L)	std Sulfate (mg/L)	min Sulfate (mg/L)	max Sulfate (mg/L)	Earliest Sample Date	Latest Sample Date	Transport Calibraiton Well
G273	2515975.58	874235.18	UA	RP	25	611.5884	1.339299195	608.82	614.2	01/15/2019	11/16/2015	Yes	20	475.0	89.5	360	690	01/21/2015	02/01/2021	Yes
G274	2516195.61	874239.23	UA	RP	19	610.4968421	1.009549144	607.79	612	01/15/2019	12/11/2016	Yes	4	322.5	53.2	260	390	01/21/2015	10/08/2015	Yes
G275	2516375.98	874299.05	UA	RP	19	604.7021053	0.833210517	602.97	605.97	01/15/2019	12/11/2016	Yes	3	780.0	147.3	650	940	01/21/2015	07/23/2015	Yes
G276	2516358.89	874438.41	UA	RP	24	604.3108333	0.781508667	603.11	606.6	01/15/2019	11/16/2015	Yes	19	223.6	59.6	19	310	01/21/2015	06/28/2021	Yes
G277	2516370.45	874581.65	UA	RP	15	602.6546667	0.949126415	601.23	603.79	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
G278	2516200.7	874875.24	UA	RP	19	605.7357895	1.268819731	604.29	608.15	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
G279	2516245.69	875028.24	UA	RP	24	607.4420833	2.205378759	599.69	611.08	01/15/2019	11/16/2015	Yes	20	569.0	336.3	170	1600	01/21/2015	01/28/2021	Yes
G280	2515679.35	875045.28	UA	RP	26	618.8873077	1.884508546	614.47	622.33	01/15/2019	11/16/2015	Yes	27	78.1	12.2	52	94	01/21/2015	07/27/2021	Yes
G281	2514455.52	874375.28	UA	B	27	619.6537037	1.162395233	616.41	621.68	01/15/2019	11/16/2015	Yes	24	296.3	34.2	250	380	11/20/2015	07/27/2021	-
G283	2516503.05	874115.82	LCU	AP2	9	605.86	1.027898341	604.56	607.8	03/29/2021	08/16/2021	Yes	8	242.5	7.1	230	250	03/31/2021	07/27/2021	Yes
G284	2516922.93	874426.1	UA	B	9	607.9777778	1.492646792	606.17	611.14	03/29/2021	08/16/2021	Yes	8	69.5	10.8	60	95	03/30/2021	07/27/2021	-
G285	2516680.39	874797.74	LCU	B	9	606.5866667	1.509014579	604.33	608.62	03/29/2021	08/16/2021	Yes	8	570.0	40.0	490	620	03/30/2021	07/27/2021	-
G286	2516561.89	875075	UA	B	6	606.6166667	1.448346183	604.68	609.08	03/29/2021	12/07/2021	Yes	8	13.5	2.1	11	16	03/31/2021	07/27/2021	-
G287	2516415.34	875445.28	UA	B	7	608.9657143	1.217249045	607.59	610.83	03/29/2021	08/16/2021	Yes	8	44.4	2.7	41	50	03/29/2021	07/27/2021	-
G288	2517071.51	875282.23	UA	B	9	613.6466667	1.259801572	611.9	616.32	03/29/2021	08/16/2021	Yes	8	200.5	302.5	29	770	03/30/2021	07/27/2021	-
G301	2515583.06	872237.64	UA	AP1	25	615.0272	1.602722995	610.39	618.07	01/15/2019	11/16/2015	Yes	16	742.5	79.8	570	860	11/20/2015	01/27/2021	Yes
G302	2516214.19	872255.38	UA	AP1	25	609.8508	2.621329052	604.64	615.41	01/15/2019	11/16/2015	Yes	16	414.4	86.0	260	530	11/20/2015	01/27/2021	Yes
G303	2516639.34	871384.83	UA	AP1	25	615.7748	1.750197894	611.18	618.05	01/15/2019	11/16/2015	Yes	16	770.0	76.2	600	870	11/20/2015	01/26/2021	Yes
G304	2515519.76	871397.53	UA	AP1	2	623.99	0.113137085	623.91	624.07	08/02/2016	09/05/2016	Yes	3	1033.3	57.7	1000	1100	11/20/2015	05/20/2016	-
G305	2515199.45	871159.15	UA	AP1	23	618.0413043	1.084004798	615.3	620.49	01/15/2019	12/11/2016	Yes	5	864.0	87.6	710	930	05/19/2016	11/17/2016	Yes
G306	2516120.28	871143.66	UA	AP1	26	618.9373077	1.290400117	616.12	621.73	01/15/2019	12/11/2016	Yes	24	284.0	113.3	5.9	700	05/19/2016	07/27/2021	Yes
G307	2515553.24	871401.09	UA	AP1	17	624.0317647	1.239890294	619.33	624.6	01/15/2019	12/11/2016	Yes	13	1029.2	113.1	850	1300	08/16/2016	01/27/2021	Yes
G308	2515101.51	871457.36	UA	AP1	11	619.7218182	0.671190259	618.54	621.03	03/29/2021	08/16/2021	Yes	8	1125.0	46.3	1100	1200	03/29/2021	07/27/2021	Yes
G309	2515067.07	871868.3	UA	AP1	11	618.9445455	0.814350829	617.89	621.09	03/29/2021	08/16/2021	Yes	8	787.5	38.8	740	840	03/29/2021	07/27/2021	Yes
G310	2515159.33	872242.06	UA	AP1	11	614.4509091	1.049528032	613.2	617.27	03/29/2021	08/16/2021	Yes	8	990.0	552.5	420	2300	03/29/2021	07/28/2021	Yes
G311	2515881.77	872241.27	UA	AP1	11	613.6636364	1.07212194	612.45	616.54	03/29/2021	08/16/2021	Yes	8	811.3	35.6	750	860	03/30/2021	07/27/2021	Yes
G312	2516557.45	872263.4	UA	AP1	11	608.9363636	1.307511168	606.99	612.19	03/29/2021	08/16/2021	Yes	8	838.8	143.6	600	1000	03/30/2021	07/27/2021	Yes
G314	2516852.2	871632.87	UA	AP1	10	605.13	3.49532386	596.4	608.6	03/29/2021	08/16/2021	Yes	8	1953.8	473.9	830	2400	03/30/2021	07/27/2021	Yes
G315	2516086.68	871387.77	UA	AP1	10	620.529	0.69468538	619.17	621.24	03/29/2021	08/16/2021	Yes	8	908.8	81.1	850	1100	03/30/2021	07/28/2021	Yes
G316	2517211.619	871645.77	UA	AP1	10	590.022	3.016792999	581.54	591.63	03/29/2021	08/16/2021	-	8	691.3	156.1	330	840	03/30/2021	07/27/2021	Yes
G317	2517087.319	871236.76	UA	AP1	10	609.619	1.740890258	606.57	611.75	03/29/2021	08/16/2021	-	8	952.5	93.6	780	1100	03/30/2021	07/28/2021	Yes
G401	2515614.82	872510.72	UA	AP2	18	607.6811111	1.846264556	603.94	609.8	01/15/2019	11/16/2015	Yes	-	-	-	-	-	-	-	-
G402	2516632.39	872500.43	UA	AP2	20	603.743	1.213286533	600.77	605.36	01/15/2019	11/16/2015	Yes	-	-	-	-	-	-	-	-
G403	2514616.58	873561.48	UA	AP2	20	621.055	1.263622612	618.36	622.45	01/15/2019	11/16/2015	Yes	-	-	-	-	-	-	-	-
G404	2516397.84	873999.83	UA	AP2	20	610.838	1.183783408	607.58	612.14	01/15/2019	11/16/2015	Yes	-	-	-	-	-	-	-	-
G405	2515335.58	873996.63	UA	AP2	20	617.8585	1.158348529	614.47	619.28	01/15/2019	11/16/2015	Yes	-	-	-	-	-	-	-	-
G406	2514702.32	872521.21	UA	AP2	16	615.141875	1.675395351	611.27	617.52	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
G407	2513705.74	872973.57	UA	B	16	613.60625	0.84114109	612.11	614.86	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
MW04S	2514450.47	877999.78	UA	B	19	618.2110526	2.142835335	613.88	621.62	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
MW05S	2513285.52	878175.73	UA	B	19	617.8810526	1.843543975	613.32	620.92	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
MW10S	2515914.48	878250.4	UA	B	18	617.255	1.690963004	614.36	620.43	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-

TABLE 4-1. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS

GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

					Flow Targets								Transport Targets							
Well Name	Easting	Northing	HSU	CCR Unit	Number of Samples	mean GWL[1] (feet)	std GWL[1] (feet)	min GWL[1] (feet)	max GWL[1] (feet)	Earliest Sample Date	Latest Sample Date	Flow Calibration Wells	Number of Samples	mean Sulfate (mg/L)	std Sulfate (mg/L)	min Sulfate (mg/L)	max Sulfate (mg/L)	Earliest Sample Date	Latest Sample Date	Transport Calibraiton Well
MW11S	2515971.24	876749.49	UA	GSP	24	620.7020833	1.218373753	617.19	622.19	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
MW12S	2515900.49	875519.94	UA	GSP	24	617.9708333	2.049907562	611.42	620.48	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
MW16S	2515087.93	877355.01	UA	B	24	622.0208333	2.003932908	618.34	625.59	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
MW20S	2515876.54	874228.14	UA	B	19	612.0194737	1.76501959	607.74	615.4	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
R104	2514503.48	875857.78	UA	B	20	623.479	1.640654234	619.38	625.92	01/15/2019	11/16/2015	Yes	7	74.4	2.2	72	77	04/08/2015	08/03/2016	-
R201	2514842.05	877925.14	UA	B	26	621.8242308	1.348306117	618.3	623.52	01/15/2019	11/16/2015	Yes	28	211.0	55.8	89	370	01/20/2015	07/28/2021	-
T127	2513911.13	875359.24	UA	B	20	615.954	1.042297058	612.33	617.05	01/15/2019	11/16/2015	Yes	-	-	-	-	-	-	-	-
T128	2513909.58	875509.65	UA	B	19	615.1989474	1.45420805	611.33	617.25	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
T202	2514895.01	876699.56	UA	GSP	19	620.5410526	2.211231167	615.31	624.22	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
T408	2515314.82	873999.37	UA	B	16	617.25875	1.507615667	614.45	619.46	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
T409	2514693.83	872517.86	UA	B	16	615.403125	1.232908316	612.16	617.16	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
TA31	2513856.87	876542.19	UA	B	19	619.7289474	2.10867756	614.89	622.93	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
TA32	2513605.22	877532.63	UA	B	10	615.309	1.097172629	612.42	616.3	01/20/2020	12/11/2016	Yes	-	-	-	-	-	-	-	-
TA33	2513248.73	876605.56	UA	B	19	617.2257895	1.90237663	612.91	620.35	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-
TA34	2513466.7	875906.23	UA	B	19	617.0926316	1.535020239	613.48	619.58	01/15/2019	12/11/2016	Yes	-	-	-	-	-	-	-	-

Notes:

[O: SLN 04/20/22; C: EGP 4/29/22]

[1] GWL = Groundwater Elevation
AP1 = Ash Pond No. 1
AP2 = Ash Pond No. 2
B = Background
GSP = Gypsum Management Facility Gypsum Stack Pond
LF = Landfill
max=maximum
mg/l = milligrams per liter
min=minimum
RP = Gypsum Management Facility Recycle Pond
std=standard deviation from the mean

HSU = Hydrostratigraphic Unit
CCR = coal combustion residuals
UA = uppermost aquifer
LCU = lower confining unit

RAMBOLL

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Zone	Hydrostratigraphic Unit	Materials	ft/d	cm/s	Kh/Kv	Value Source	Sensitivity[1]
Horizontal Hydraulic Conductivity			**Calibration Model**				
1	UCU	loess and clay	0.51	1.80E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	High
2	UA	sand and sandy silt	4.04	1.43E-03	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	High
3	LCU (unweathered Vandalia)	sand clay till	0.83	2.93E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	High
4	LCU (Smithboro Formation)	sand clay till	0.0014	4.94E-07	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Low
5	SW Pond	NA	2.89E-09	1.02E-12	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
6	LF-CCR	CCR	13.6	4.80E-03	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
7	GSP-CCR	CCR	13.6	4.80E-03	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
8	RP-CCR	CCR	13.6	4.80E-03	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
9	AP2	CCR	13.6	4.80E-03	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
10	AP1	CCR	13.6	4.80E-03	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Moderate
11	Cooling Pond	clay and silt	0.51	1.80E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Low
12	GSP-RP connector	lined channel within UCU	0.51	1.80E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
13	AP2 -berm	loess and clay	0.51	1.80E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
14	AP1-berm	loess and clay	0.51	1.80E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
15	Pond (west)	loess and clay	0.51	1.80E-04	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
16	GSP-liner	liner	2.89E-08	1.02E-11	NA	Harmonic mean of liner layers	Negligible
17	RP-liner	liner	2.89E-08	1.02E-11	NA	Harmonic mean of liner layers	Negligible
18	LF-liner	liner	2.89E-08	1.02E-11	NA	Harmonic mean of liner layers	Negligible
19	UCU- fill (drain/river)	NA	10	3.53E-03	NA	Calibrated - Conductivity Value to Allow Groundwater Flow from UCU to River and Drain Boundary Conditions	Moderate
21	LF-GSP shared embankment	reworked silts and clays	0.01	3.53E-06	NA	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
Vertical Hydraulic Conductivity			**Calibration Model**				
1	UCU	loess and clay	0.0510	1.80E-05	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	High
2	UA	sand and sandy silt	0.4040	1.43E-04	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	High
3	LCU (unweathered Vandalia)	sand clay till	0.0830	2.93E-05	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	High
4	LCU (Smithboro Formation)	sand clay till	0.0001	4.94E-08	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Low
5	SW Pond	lined	2.89E-09	1.02E-12	1	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
6	LF-CCR	CCR	0.2500	8.82E-05	54	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
7	GSP-CCR	CCR	0.2500	8.82E-05	54	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
8	RP-CCR	CCR	0.2500	8.82E-05	54	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
9	AP2	CCR	0.2500	8.82E-05	54	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
10	AP1	CCR	0.2500	8.82E-05	54	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Moderate
11	Cooling Pond	clay and silt	0.0510	1.80E-05	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Low
12	GSP-RP connector	lined channel within UCU	0.0510	1.80E-05	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
13	AP2 -berm	loess and clay	0.0510	1.80E-05	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
14	AP1-berm	loess and clay	0.0510	1.80E-05	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
15	Pond (west)	loess and clay	0.0510	1.80E-05	10	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
16	GSP-liner	liner	2.89E-08	1.02E-11	1	Harmonic mean of liner layers	Negligible
17	RP-liner	liner	2.89E-08	1.02E-11	1	Harmonic mean of liner layers	Negligible
18	LF-liner	liner	2.89E-08	1.02E-11	1	Harmonic mean of liner layers	Negligible
19	UCU- fill (drain/river)	NA	10.0000	3.53E-03	1	Calibrated - Conductivity Value to Allow Groundwater Flow from UCU to River and Drain Boundary Conditions	Moderate

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Zone	Hydrostratigraphic Unit	Materials	ft/d	cm/s	Kh/Kv	Value Source	Sensitivity[1]
Vertical Hydraulic Conductivity (Continued)			**Calibration Model**				
21	LF-GSP shared embankment	reworked silts and clays	0.0100	3.53E-06	1	Calibrated - Within Range of Field Test Results (Ramboll, 2021a)	Negligible
Zone	**Hydrostratigraphic Unit**	**Materials**	**ft/d**	**in/yr**	**Kh/Kv**	**Value Source**	**Sensitivity[1]**
Recharge			**Calibration Model**				
1	UCU	clay and silt	0.00055	2.41	NA	Calibrated	High
2	SW Pond	clay and silt	1.50E-08	6.57E-05	NA	Calibrated	Negligible
3	LF	CCR	8.00E-08	3.50E-04	NA	Calibrated	Negligible
4	GSP	CCR	8.00E-08	3.50E-04	NA	Calibrated	Negligible
5	RP	CCR	8.00E-08	3.50E-04	NA	Calibrated	Negligible
6	AP2	CCR	0.0005	2.19	NA	Calibrated	Moderate
7	AP1	CCR	0.0024	10.51	NA	Calibrated	High
8	Cooling pond	clay and silt	1.40E-05	0.06	NA	Calibrated	Negligible
9	GSP-RP connector	clay and silt	0.00055	2.41	NA	Calibrated	Low
10	AP2-Berm	clay and silt	0.00055	2.41	NA	Calibrated	Negligible
11	AP1-Berm	clay and silt	0.00055	2.41	NA	Calibrated	Negligible
12	Pond (west)	clay and silt	5.50E-04	2.41	NA	Calibrated	Negligible
Storage							
1	UCU	loess and clay	*Not used in steady-state calibration model*				
2	UA	sand and sandy silt					
3	LCU (unweathered Vandalia)	sand clay till					
4	LCU (Smithboro Formation)	sand clay till					
5	SW Pond	lined					
6	LF-CCR	CCR					
7	GSP-CCR	CCR					
8	RP-CCR	CCR					
9	AP2	CCR					
10	AP1	CCR					
11	Cooling Pond	clay and silt					
12	GSP-RP connector	lined channel within UCU					
13	AP2 -berm	loess and clay					
14	AP1-berm	loess and clay					
15	Pond (west)	loess and clay					
16	GSP-liner	liner					
17	RP-liner	liner					
18	LF-liner	liner					
19	UCU- fill (drain/river)	NA					
21	LF-GSP shared embankment	reworked silts and clays					

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

River Parameters							
	Relative Location	**River Width (feet)**	**River depth (feet)**	**Bed Thickness (feet)**	**Hydraulic Conductivity (ft/d)**	**Head (feet)**	**River Boundary Conductance (ft^2/d)**
Reach 0	Unnamed Tributary East Coffeen Lake	10	3	2	4.00E-02	594.7-621.84	0.08-20.4
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	Moderate	High
Reach 5	Unnamed Tributary East Coffeen Lake - downstream in layer 5	10	3	2	4.00E-01	591.0-594.7	1.5-109.2
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	Moderate	Low
Reach 1	Unnamed Tributary West Coffeen Lake	10	3	2	4.80E-02	591.0-622.45	0.04-12.3
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	Low	Moderately High
Reach 2	Pond (west)	cell dimensions	3	1	3.20E-03	617.50	4.0
Sensitivity[1]	NA	- - -		- - -		Low	Low
Reach 3	Condenser Cooling Flume	cell dimensions	4	1	5.00	604.00	5.00
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	Moderate	High
Value Source	NA	Calibrated	Calibrated	Calibrated	Calibrated	Estimated based on DEM	Calibrated
Drain Parameters							
	Name	**Drain Width (feet)**	**Drain depth (feet)**	**Bed Thickness (feet)**	**Hydraulic Conductivity (ft/d)**	**Stage (feet)**	**Drain Conductance (ft^2/d)**
Reach 0	Active LF Underdrain	2	2	1.5	2.40E-02	603.5	6.6e-5-0.47
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	Low	Moderately High
Reach 1	Gravity Driven GRP Drain	cell dimensions	2	1.5	2.50E-02	600.5	9.7e-5-0.51
Sensitivity[1]		- - -	- - -	- - -	- - -	Low	Moderate
Reach 2	Northern Drain	cell dimensions	2	1.5	2.00E+00	622	5.1-135.46
Sensitivity[1]		- - -	- - -	- - -	- - -	Low	Negligible
Value Source	NA	Calibrated	Calibrated	Calibrated	Calibrated	Estimated based on DEM	Calibrated
General Head Parameters							
	Relative Location	**Width of General Head Boundary Cell (feet)**	**Distance to General Head Boundary Head (feet)**	**Saturated Thickness of Cell (feet)**	**Hydraulic Conductivity (ft/d)**	**Head (feet)**	**General Head Boundary Conductance (ft^2/d)**
Reach 2	Northern Model Boundary in UA	*variable*	1	variable	4.54	591-610.66	1.4-7032.9
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	Moderate	Negligible
Reach 3	Northern Model Boundary in LCU ayer 4	*variable*	1	variable	0.83	591-610.66	166-1812.6
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	High	Negligible
Reach 4	Northern Model Boundary in LCU ayer 5	*variable*	1	variable	0.0014	591-610.66	1.61-6.0
Sensitivity[1]	NA	- - -	- - -	- - -	- - -	Low	Negligible
Value Source	NA	Calibrated	Calibrated	Calibrated	Calibrated	Estimated based on Groundwater Elevation Targets in UA around the GSP/GRP/LF	Calibrated

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Hydraulic Flow Boundary Parameters					
	Relative Location	**Width of HFB (feet)[2]**	**Hydraulic Conductivity (feet)**		
Reach 1	GSP	1	2.89E-08		
Sensitivity[1]	NA	- - -	Low		
Reach 2	RP	1	2.89E-08		
Sensitivity[1]	NA	- - -	Moderate		
Reach 3	LF	1	2.89E-08		
Sensitivity[1]	NA	- - -	Low		
Value Source	NA	Calibrated	Harmonic mean of construction material		

Notes:
[O: SLN 04/01/22; C: EGP 4/29/22]

[1] Sensitivity Explanation:
Negligible - SSR changed by less than 1%
Low - SSR change between 1% and 10%
Moderate - SSR change between 10% and 50%
Moderately High - SSR change between 50% and 100%
High - SSR change greater than 100%

[2] Liner thickness accounted for in harmonic mean calculation
SSR = sum of squared residuals
- - - = not tested
AP1 = Ash Pond No. 1
AP2 = Ash Pond No. 2
CCR = coal combustion residuals
cm/s = centimeters per second
ft/d = feet per day
ft^2/day = feet squared per day
GSP = Gypsum Management Facility Gypsum Stack Pond
in/yr = inches per year
Kh/Kv = anisotropy ratio
LF = Landfill
NA = not applicable
RP = Gypsum Management Facility Recycle Pond
SW = Surface Water

Hydrostratigraphic Unit
UCU = upper confining unit
UA = uppermost aquifer
LCU = lower confining unit

TABLE 5-2. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Zone	Hydrostratigraphic Unit	Materials	Calibration Model									
			Recharge (ft/d)				Sulfate Concentration (mg/L)				Value Source	Sensitivity
Initial Concentration												
Entire Domain	NA	NA	0.00055				0				NA	- - -
Source Concentration (recharge and constant concentration cells)												
			Pre-GMF		**Post-GMF**		**Pre-GMF**		**Post-GMF**			
	Model Name and Stress Period		**TR1 - STP 1**	**TR1 - STP 2**	**TR2 - STP 1**	**TR3 - STP 1**	**TR1 - STP 1**	**TR1 - STP 2**	**TR2 - STP 1**	**TR3 - STP 1**		
	Time Period		**1970-1984**	**1985-2009**	**2010-2017**	**2018-2022**	**1970-1984**	**1985-2009**	**2010-2017**	**2018-2022**		
6	AP2	CCR	0.0005	0.0005	0.0005	0.00027	1,600	1,600	1,600	0	Leachate sulfate concentrations	- - -
13	AP2 Northwest seep area	-	0.002	0.002	0.002	0.00055	1,600	1,600	1,600	0	Based on previous model	- - -
14	AP2 East and Southwest seep area	-	0.01	0.01	0.01	0.00055	300	300	300	0	Based on previous model	- - -
13	AP2 closure structures	-									Based on previous model	- - -
7	AP1	CCR	0.00055	0.00240	0.00240	0.00240	0	1,000	1,000	1,000	Calibrated	- - -
5	RP	CCR	NA	NA	8.00E-08	8.00E-08	NA	NA	15,000	15,000	Leachate sulfate concentrations	- - -
4	GSP	CCR	NA	NA	8.00E-08	8.00E-08	NA	NA	11,000	11,000	Leachate sulfate concentrations	- - -
3	LF	CCR	NA	NA	8.00E-08	8.00E-08	NA	NA	7,500	7,500	Leachate sulfate concentrations	- - -
GMF Units liner modification (HFB)												
		Well Data	**Hydraulic Conductivity (ft/d)**									
			Pre-GMF		**Post-GMF**							
	Model Name and Stress Period		**TR1 - STP 1**	**TR1 - STP 2**	**TR2 - STP 1**	**TR3 - STP 1**						
	Time Period		**1970-1984**	**1985-2009**	**2010-2017**	**2018-2022**						
1	RP		NA	NA	2.89E-08	2.89E-08					Harmonic Mean	see Table 5-3
11	RP-northeast	G279	NA	NA	2.89E-08	3.00E-04					Calibrated	see Table 5-3
16	RP-southeast	G275	NA	NA	2.89E-08	6.54E-04					Calibrated	see Table 5-3
2	GSP		NA	NA	2.89E-08	2.89E-08					Harmonic Mean	see Table 5-3
21	GSP-east	G215	NA	NA	2.89E-08	6.00E-04					Calibrated	see Table 5-3
3	LF		NA	NA	2.89E-08	2.89E-08					Harmonic Mean	see Table 5-3
Storage, Specific Yield and Effective Porosity				**Calibration Model**								
Zone	**Hydrostratigraphic Unit**	**Materials**	**Storage**	**Specific Yield**	**Effective Porosity**						**Value Source**	**Sensitivity**
1	UCU	loess and clay	0.0034	0.35	0.35						Ramboll (2021a) HCR	see Table 5-3
2	UA	sand and sany silt	0.0034	0.16	0.16						Ramboll (2021a) HCR	see Table 5-3
3	LCU (unweathered Vandalia)	sand clay till	0.0034	0.19	0.19						Ramboll (2021a) HCR	see Table 5-3
4	LCU (Smithboro Formation)	sand clay till	0.0034	0.28	0.28						Ramboll (2021a) HCR	see Table 5-3
5	SW Pond	NA	0.0034	0.35	0.35						Ramboll (2021a) HCR	see Table 5-3
6	LF-CCR	CCR	0.0034	0.19	0.19			NA			Ramboll (2021a) HCR	see Table 5-3
7	GSP-CCR	CCR	0.0034	0.19	0.19						Ramboll (2021a) HCR	see Table 5-3
8	RP-CCR	CCR	0.0034	0.19	0.19						Ramboll (2021a) HCR	see Table 5-3
9	AP2	CCR	0.0034	0.19	0.19						Ramboll (2021a) HCR	see Table 5-3
10	AP1	CCR	0.0034	0.19	0.19						Ramboll (2021a) HCR	see Table 5-3
11	Cooling Pond	clay and silt	0.0034	0.35	0.35						Ramboll (2021a) HCR	see Table 5-3
12	GSP-RP connector	lined channel within UCU	0.0034	0.35	0.35						Ramboll (2021a) HCR	see Table 5-3
13	AP2 -berm	loess and clay	0.0034	0.35	0.35						Ramboll (2021a) HCR	see Table 5-3

TABLE 5-2. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Storage, Specific Yield and Effective Porosity				**Calibration Model**				
Zone	**Hydrostratigraphic Unit**	**Materials**	**Storage**	**Specific Yield**	**Effective Porosity**		**Value Source**	**Sensitivity**
14	AP1-berm	loess and clay	0.0034	0.35	0.35		Ramboll (2021a) HCR	see Table 5-3
15	Pond (west)	loess and clay	0.0034	0.35	0.35		Ramboll (2021a) HCR	see Table 5-3
16	GSP-liner	liner	0.0034	0.16	0.16	NA	Ramboll (2021a) HCR	see Table 5-3
17	RP-liner	liner	0.0034	0.16	0.16		Ramboll (2021a) HCR	see Table 5-3
18	LF-liner	liner	0.0034	0.16	0.16		Ramboll (2021a) HCR	see Table 5-3
19	UCU- fill (drain/river)	NA	0.0034	0.5	0.5		Calibrated	see Table 5-3
21	LF-GSP shared embankment	reworked silts and clays	0.0034	0.16	0.16		Calibrated	see Table 5-3
Dispersivity								
Applicable Region	**Hydrostratigraphic Unit**	**Materials**	**Longitudinal (feet)**	**Transverse (feet)**	**Vertical (feet)**		**Value Source**	**Sensitivity**
1	UCU	loess and clay	1	0.1	0.01		calibrated	see Table 5-3
2	UA	sand and sany silt	10	1	0.1	NA	calibrated	see Table 5-3
3	LCU (unweathered Vandalia)	sand clay till	1	0.1	0.01		calibrated	see Table 5-3
4	LCU (Smithboro Formation)	sand clay till	1	0.1	0.01		calibrated	see Table 5-3

[O: SLN 04/01/22; C: EGP 04/29/22]

Notes:
- - - = not tested
AP1 = Ash Pond No. 1
AP2 = Ash Pond No. 2
CCR = coal combustion residuals
ft/d = feet per day
GMF = Gypsum Management Facility
GSP = Gypsum Management Facility Gypsum Stack Pond
LF = Landfill
mg/L = milligrams per liter
NA = not applicable
RP = Gypsum Management Facility Recycle Pond
SS = Steady State model
STP = Stress Period
SW = Surface Water
TR = Transient model

Hydrostratigraphic Unit
UCU = upper confining unit
UA = uppermost aquifer
LCU = lower confining unit

TABLE 5-3. TRANSPORT MODEL INPUT SENSITIVITY (CALIBRATION)
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

			Storage and Specific Yield				Effective Porosity			
Well ID	**SI**	**Calibration on Sulfate Concentration (mg/L)**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**
G301	AP1	961.2	961.3	Negligible	958.1	Negligible	964.1	Negligible	954.2	Negligible
G302	AP1	954.3	951.2	Negligible	937.3	Low	954.8	Negligible	950.7	Negligible
G303	AP1	626.7	613.2	Low	572.0	Low	643.3	Low	598.3	Low
G305	AP1	426.0	408.8	Low	442.1	Low	451.3	Low	379.3	Moderate
G306	AP1	427.0	371.0	Moderate	400.9	Low	463.5	Low	375.8	Moderate
G307	AP1	779.7	762.4	Low	911.7	Moderate	786.0	Negligible	768.6	Low
G308	AP1	880.0	868.7	Low	813.0	Low	883.2	Negligible	872.2	Negligible
G309	AP1	922.0	901.3	Low	867.1	Low	924.2	Negligible	916.0	Negligible
G310	AP1	921.9	925.6	Negligible	916.5	Negligible	926.7	Negligible	915.6	Negligible
G311	AP1	966.6	965.5	Negligible	956.7	Low	967.0	Negligible	964.8	Negligible
G312	AP1	934.7	940.5	Negligible	924.4	Low	936.7	Negligible	933.5	Negligible
G313	AP1	908.8	908.3	Negligible	903.2	Negligible	909.3	Negligible	907.0	Negligible
G314	AP1	848.0	845.7	Negligible	838.1	Low	850.8	Negligible	841.8	Negligible
G315	AP1	786.7	737.7	Low	791.7	Negligible	789.6	Negligible	776.3	Low
G316	AP1	507.5	509.6	Negligible	494.8	Low	532.8	Low	469.7	Low
G317	AP1	146.9	149.8	Low	116.4	Moderate	202.9	Moderate	93.4	Moderate
			S*0.1 Sy*0.5		S*10 Sy*2		Porosity-0.05		Porosity+0.05	

TABLE 5-3. TRANSPORT MODEL INPUT SENSITIVITY (CALIBRATION)
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

		Dispersivity				HFB (GMF GSP and GMF RP Liner)			
Well ID	**SI**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**	**Sulfate Concentration (mg/L)**	**Sensitivity [1]**
G301	AP1	931.7	Low	909.6	Low	959.2	Negligible	937.3	Low
G302	AP1	914.3	Low	887.2	Low	953.4	Negligible	956.9	Negligible
G303	AP1	620.4	Negligible	589.4	Low	626.1	Negligible	622.1	Negligible
G305	AP1	415.1	Low	387.9	Low	425.8	Negligible	425.0	Negligible
G306	AP1	420.1	Low	390.5	Low	426.9	Negligible	426.2	Negligible
G307	AP1	756.7	Low	720.4	Low	779.6	Negligible	779.1	Negligible
G308	AP1	843.3	Low	800.4	Low	879.4	Negligible	879.2	Negligible
G309	AP1	892.9	Low	858.2	Low	922.8	Negligible	916.7	Negligible
G310	AP1	882.3	Low	853.6	Low	922.3	Negligible	915.6	Negligible
G311	AP1	943.7	Low	926.1	Low	965.1	Negligible	963.6	Negligible
G312	AP1	900.6	Low	869.2	Low	934.9	Negligible	933.7	Negligible
G313	AP1	774.1	Moderate	693.3	Moderate	908.4	Negligible	908.6	Negligible
G314	AP1	799.7	Low	756.2	Moderate	848.5	Negligible	848.5	Negligible
G315	AP1	764.9	Low	722.5	Low	785.7	Negligible	786.4	Negligible
G316	AP1	461.4	Low	426.2	Moderate	507.4	Negligible	507.5	Negligible
G317	AP1	123.6	Moderate	124.2	Moderate	146.9	Negligible	146.9	Negligible
		Disp*5		Disp*10		HFB*0.1		HFB*10	

Notes:

[O: SLN 04/10/22; C: EGP 5/5/22]

[1] Sensitivity Explanation:
Negligible = concentration changed by less than 1%
Low = concentration change between 1% and 10%
Moderate = concentration change between 10% and 50%
Moderately High = concentration change between 50% and 100%
High = concentration change greater than 100%
[2] sensitivity test used transient transport
AP1 = Ash Pond No. 1
AP2 = Ash Pond No. 2
Disp = dispersivity
GSP = Gypsum Management Facility Gypsum Stack Pond
HFB = Horizontal Flow Boundary
ID = identification
mg/L = milligrams per liter
RP = Gypsum Management Facility Recycle Pond
S = storativity
Sy = specific yield

TABLE 6-1. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Closure Scenario Number (Drainage Length)	Ash Pond 1 - CIP Consolidation and Cover System Area	Ash Pond 1 - CIP Removal Area (1 foot) - CBR East Side (1 foot)	Ash Pond 1 - CBR West Side (3 feet)	Notes
Input Parameter				
Climate-General				
City	Coffeen, Illinois	Coffeen, Illinois	Coffeen, Illinois	Nearby city to the Site within HELP database
Latitude	39.06	39.06	39.06	Site latitude
Evaporative Zone Depth	18	12	18	Estimated based on geographic location (Illinois) and uppermost soil type (Tolaymat, T. and Krause, M., 2020)
Maximum Leaf Area Index	4.5	4.5	4.5	Maximum for geographic location (Illinois) (Tolaymat, T. and Krause, M., 2020)
Growing Season Period, Average Wind Speed, and Quarterly Relative Humidity	Belleville Scott Air Force Base Belleville, Illinois	Belleville Scott Air Force Base Belleville, Illinois	Belleville Scott Air Force Base Belleville, Illinois	Nearby city to the Coffeen Power Plant within HELP database
Number of Years for Synthetic Data Generation	30	30	30	
Temperature, Evapotranspiration, and Precipitation	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 39.06/-89.39	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 39.06/-89.39	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 39.06/-89.39	
Soils-General				
% where runoff possible	100	100	100	
Area (acres)	10	13	10	CBR - Removal Area based on HCR (Ramboll, 2021); CIP - Consolidation and Cover System Area based on construction drawing for Ash Pond No. 1; CIP -Removal Area equals the difference
Specify Initial Moisture Content	No	No	No	
Surface Water/Snow	Model Calculated	Model Calculated	Model Calculated	
Soils-Layers				
1	Vegetative Soil Layer (HELP Final Cover Soil [topmost layer])	Protective Cover Layer (HELP Final Cover Soil [topmost layer])	Protective Cover Layer (HELP Final Cover Soil [topmost layer])	Layers details for CBR, CIP, and Landfill areas based on grading plans, construction drawings, and cover system design for Ash Pond No. 1
2	Protective Soil Layer (HELP Vertical Percolation Layer)	--	--	
3	Nonwoven Geotextile (HELP Custom Layer)	--	--	
4	Geomembrane Liner	--	--	
5	Unsaturated CCR Material (HELP Waste)	--	--	
6	HELP Vertical Percolation Layer	--	--	
7	--	--	--	

TABLE 6-1. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Closure Scenario Number (Drainage Length)	Ash Pond 1 - CIP Consolidation and Cover System Area	Ash Pond 1 - CIP Removal Area (1 foot) - CBR East Side (1 foot)	Ash Pond 1 - CBR West Side (3 feet)	Notes
Soil Parameters--Layer 1				
Type	1	1	1	Vertical Percolation Layer (Cover Soil)
Thickness (in)	6	12	36	For CBR and CIP removal areas, layer 1 thickness is the average thickness of unsaturated backfill material placed after removal
Texture	12	14	14	Defaults used
Description	Silty Clay Loam	Silty Clay	Silty Clay	
Saturated Hydraulic Conductivity (cm/s)	4.20E-05	2.50E-05	2.50E-05	Defaults used
Soil Parameters--Layer 2				
Type	1	--	--	Vertical Percolation Layer
Thickness (in)	18	--	--	design thickness
Texture	14	--	--	Defaults used
Description	Silty Clay	--	--	
Saturated Hydraulic Conductivity (cm/s)	2.50E-05	--	--	Defaults used
Soil Parameters--Layer 3				
Type	2	--	--	Lateral Drainage Layer
Thickness (in)	0.11	--	--	design thickness
Texture	123	--	--	Defaults used
Description	10 oz Nonwoven Geotextile	--	--	
Saturated Hydraulic Conductivity (cm/s)	3.00E-01	--	--	Defaults used
Soil Parameters--Layer 4				
Type	4	--	--	Flexible Membrane Liner
Thickness (in)	0.04	--	--	design thickness
Texture	36	--	--	Defaults used
Description	LDPE Membrane	--	--	
Saturated Hydraulic Conductivity (cm/s)	4.00E -13	--	--	Defaults used
Soil Parameters--Layer 5				
Type	1	--	--	Vertical Percolation Layer (Waste)
Thickness (in)	360	--	--	design thickness
Texture	84	--	--	Defaults used
Description	High-Density Electric Plant Coal Bottom Ash	--	--	
Saturated Hydraulic Conductivity (cm/s)	8.80E-05	--	--	defaults used

TABLE 6-1. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Closure Scenario Number (Drainage Length)	Ash Pond 1 - CIP Consolidation and Cover System Area	Ash Pond 1 - CIP Removal Area (1 foot) - CBR East Side (1 foot)	Ash Pond 1 - CBR West Side (3 feet)	Notes
Soil Parameters--Layer 6				
Type	1	--	--	Background Silty Clay (Ash Pond No. 1)
Thickness (in)	60	--	--	Background clay thickness (Ash Pond No. 1)
Texture	43	--	--	Custom (Ash Pond No. 1) Defaults used (GSP and Landfill)
Description	Loess Unit Silty Clay	--	--	
Saturated Hydraulic Conductivity (cm/s)	3.85E-06	--	--	Average for Loess Unit (Ash Pond No. 1)
Soil Parameters--Layer 7				
Type	--	--	--	Drainage Liner
Thickness (in)	--	--	--	design thickness
Texture	--	--	--	Defaults used
Description	--	--	--	
Saturated Hydraulic Conductivity (cm/s)	--	--	--	Defaults used
Soils--Runoff				
Runoff Curve Number	85.9	88.6	89.2	HELP-computed curve number
Slope	5.00%	0.50%	0.50%	Estimated from construction design drawings
Length (ft)	350	1,000	350	estimated maximum flow path
Vegetation	fair	fair	fair	fair indicating fair stand of grass on surface of soil backfill
Execution Parameters				
Years	30	30	30	
Report Daily	No	No	No	
Report Monthly	No	No	No	
Report Annual	Yes	Yes	Yes	
Output Parameter				
Unsaturated Percolation Rate (in/yr)	**0.00090**	**7.85**	**6.28**	

Notes:
% = percent
CBR = closure by removal
CIP = closure in place
cm/s = centimeters per second
ft = feet
HCR = Hydrogeologic Site Characterization Report
HELP = Hydrologic Evaluation of Landfill Performance
in = inches
in/yr = inches per year
Lat = latitude
Long = longitude

References:
Tolaymat, T. and Krause, M, 2020. Hydrologic Evaluation of Landfill Performance: HELP 4.0 User Manual . United States Environmental Protection Agency, Washington, DC, EPA/600/B 20/219
Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. Hydrogeologic Site Characterization Report. AP1, GMF GSP, Coffeen Power Plant. Coffeen, Illinois.

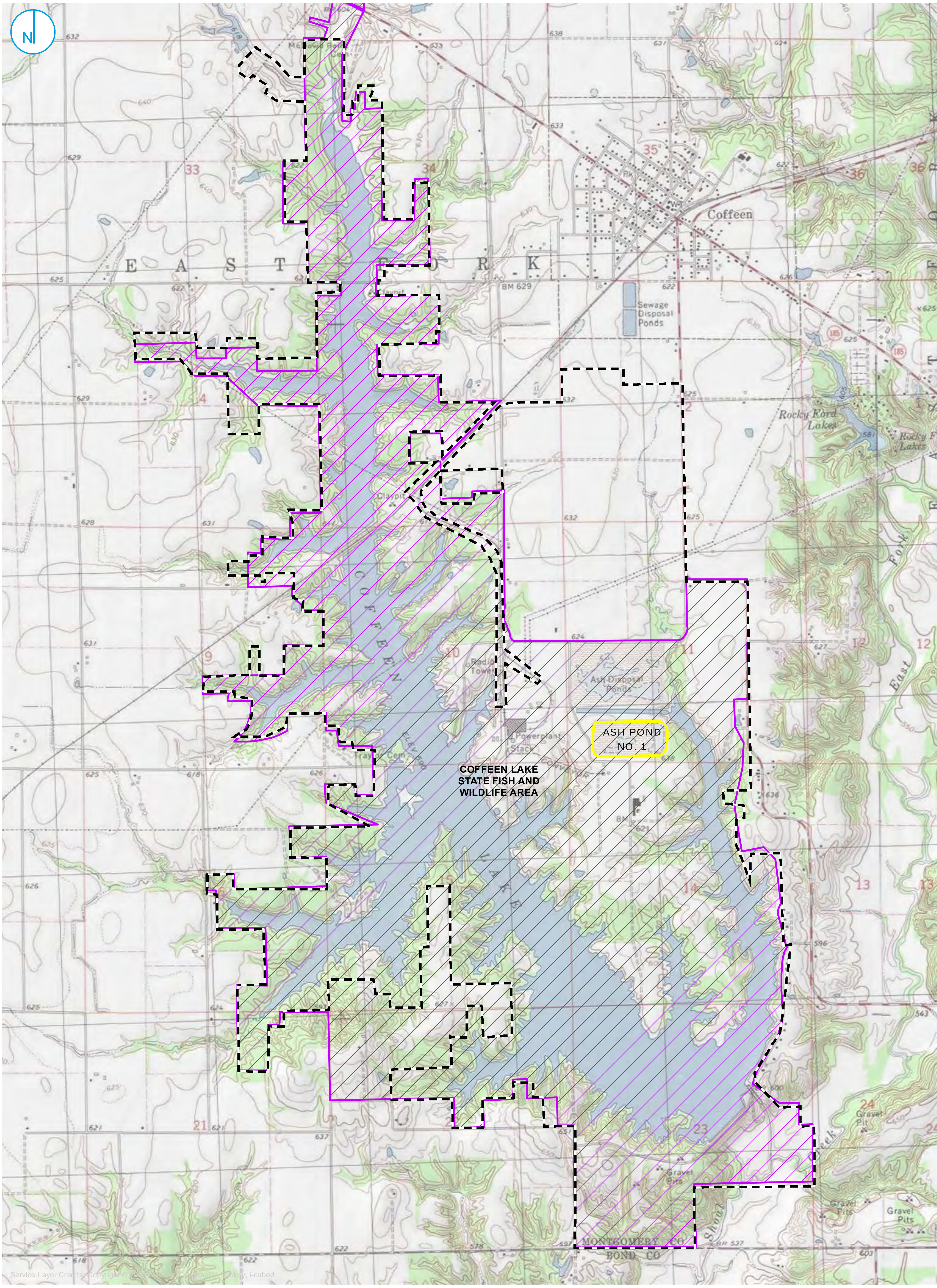
TABLE 6-2. PREDICTION MODEL INPUT VALUES
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Hydrostratigraphic Unit/Recharge Area	Notes	Recharge Zone	Sulfate Concentration (mg/L)	Recharge (ft/day)	Recharge (inches/yr)	Constant Concentration Layer	Constant Concentration (mg/L)
Scenario 1: CIP							
AP1 - removal area east	FILL	7	0	1.8E-03	7.85	2&3	130.0
AP1 - consolidation area west	CCR	16	1,000	6.26E-08	2.74E-04	- - -	- - -
Scenario 2: CBR							
AP1 - removal area east	FILL	7	0	1.8E-03	7.85	- - -	- - -
AP1 - removal area west	FILL	16	0	1.4E-03	6.28	- - -	- - -

[O: SLN 04/01/22; C: EGP 04/29/22]

Notes:
- - - = not included
AP1 = Ash Pond No. 1
CCR = coal combustion residuals
ft/day = feet per day
inches/yr = inches per year
mg/L = milligrams per liter

FIGURES



PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY
COFFEEN LAKE STATE FISH AND WILDLIFE AREA

0 1,000 2,000 Feet

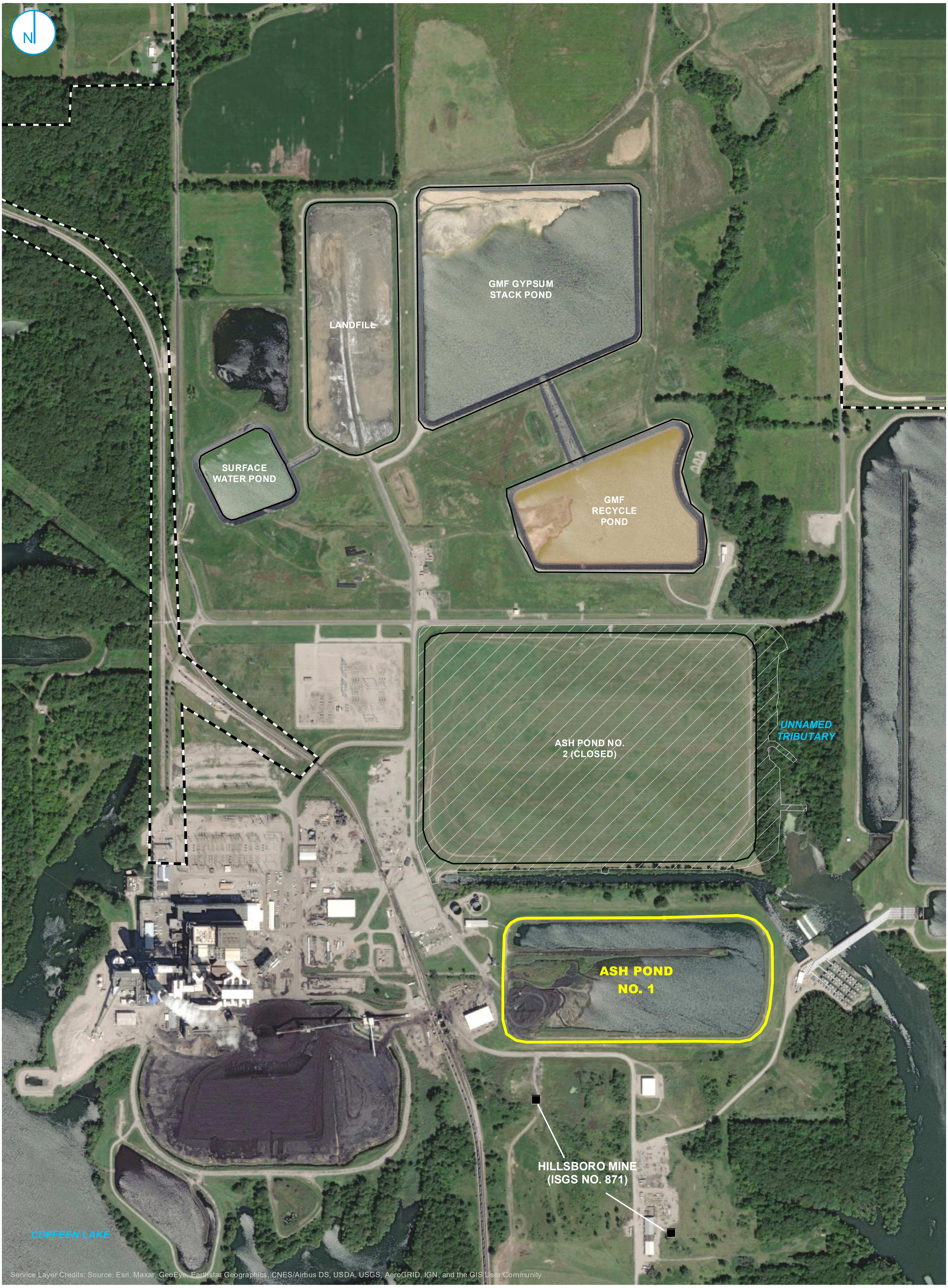
SITE LOCATION MAP

FIGURE 1-1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL



COAL MINE SHAFT
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

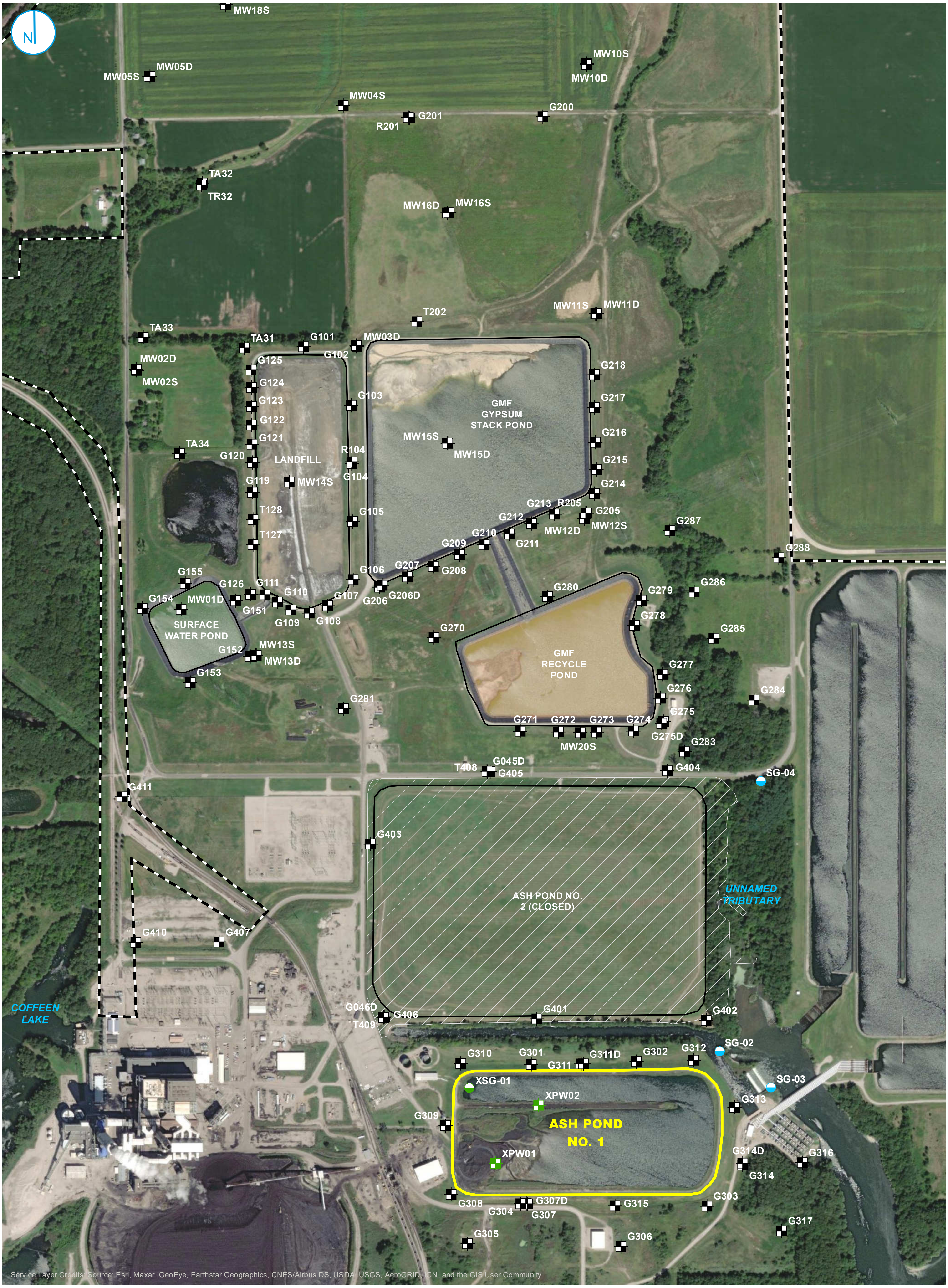
SITE MAP

FIGURE 1-2

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



MONITORING WELL
PORE WATER WELL
STAFF GAGE, RIVER
STAFF GAGE, CCR UNIT
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

MONITORING WELL LOCATION MAP

FIGURE 2-1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 275 550 Feet

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

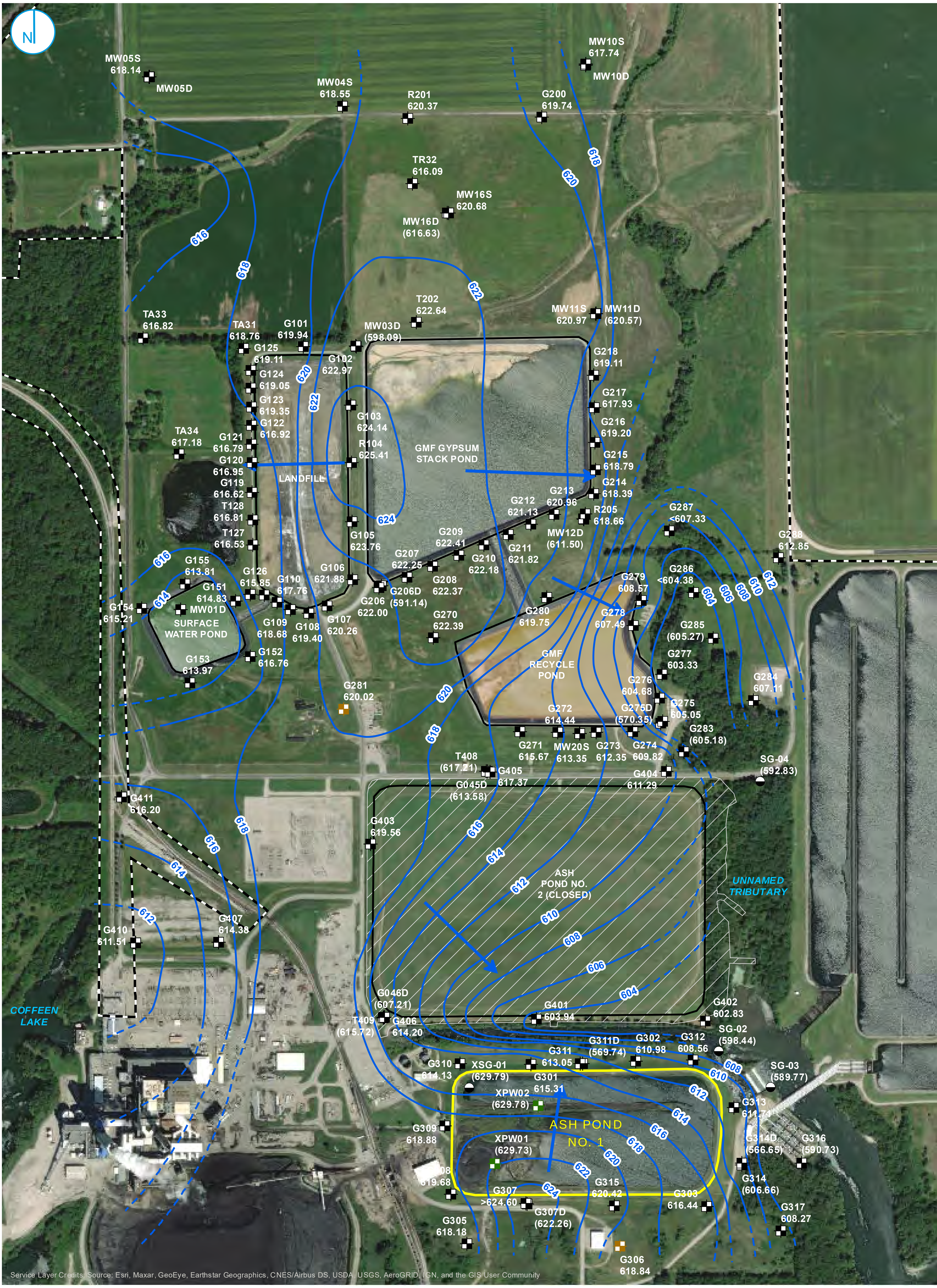
UPPERMOST AQUIFER POTENTIOMETRIC SURFACE MAP APRIL 20, 2021

FIGURE 2-2

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
SOURCE SAMPLE LOCATION
STAFF GAGE
GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 275 550 Feet

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

UPPERMOST AQUIFER POTENTIOMETRIC SURFACE MAP JULY 26, 2021

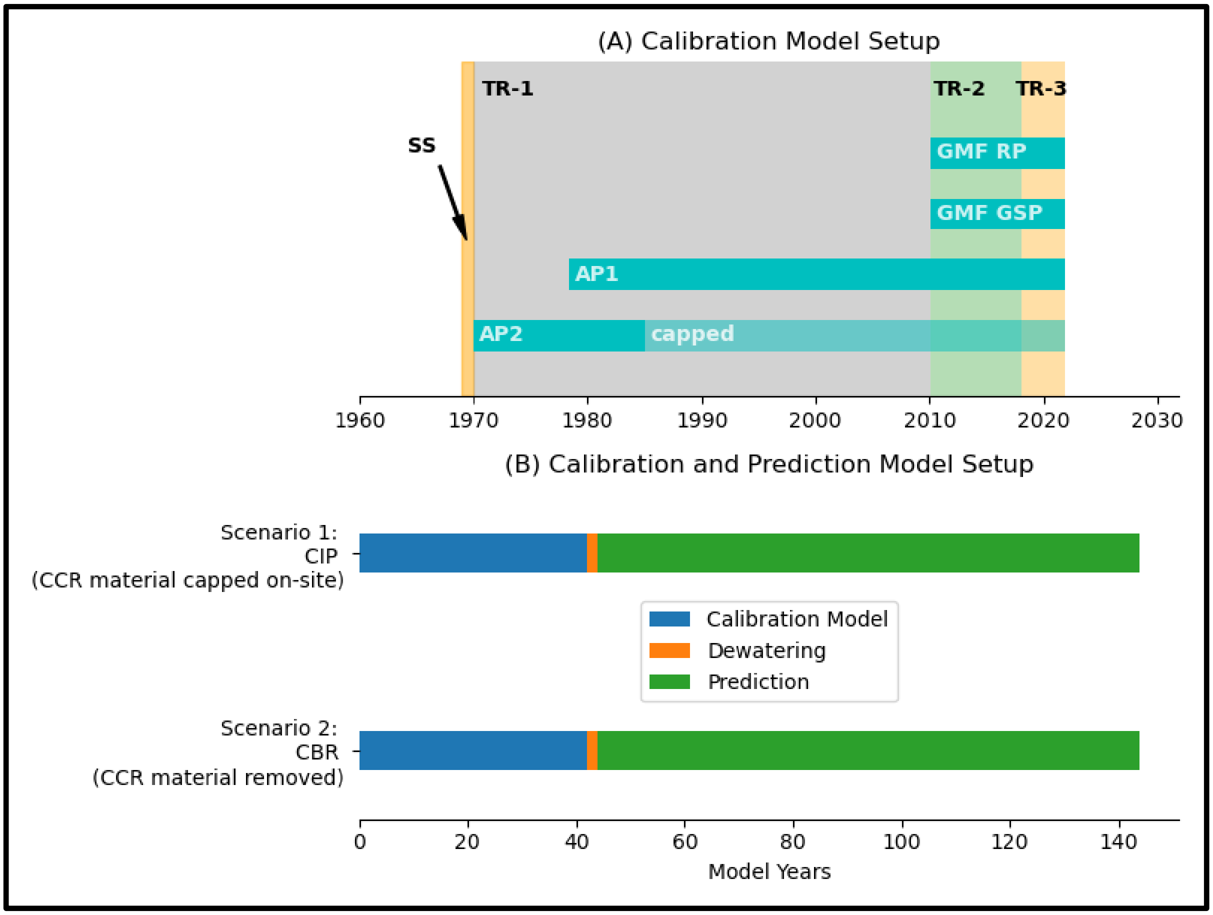
GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 2-3

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

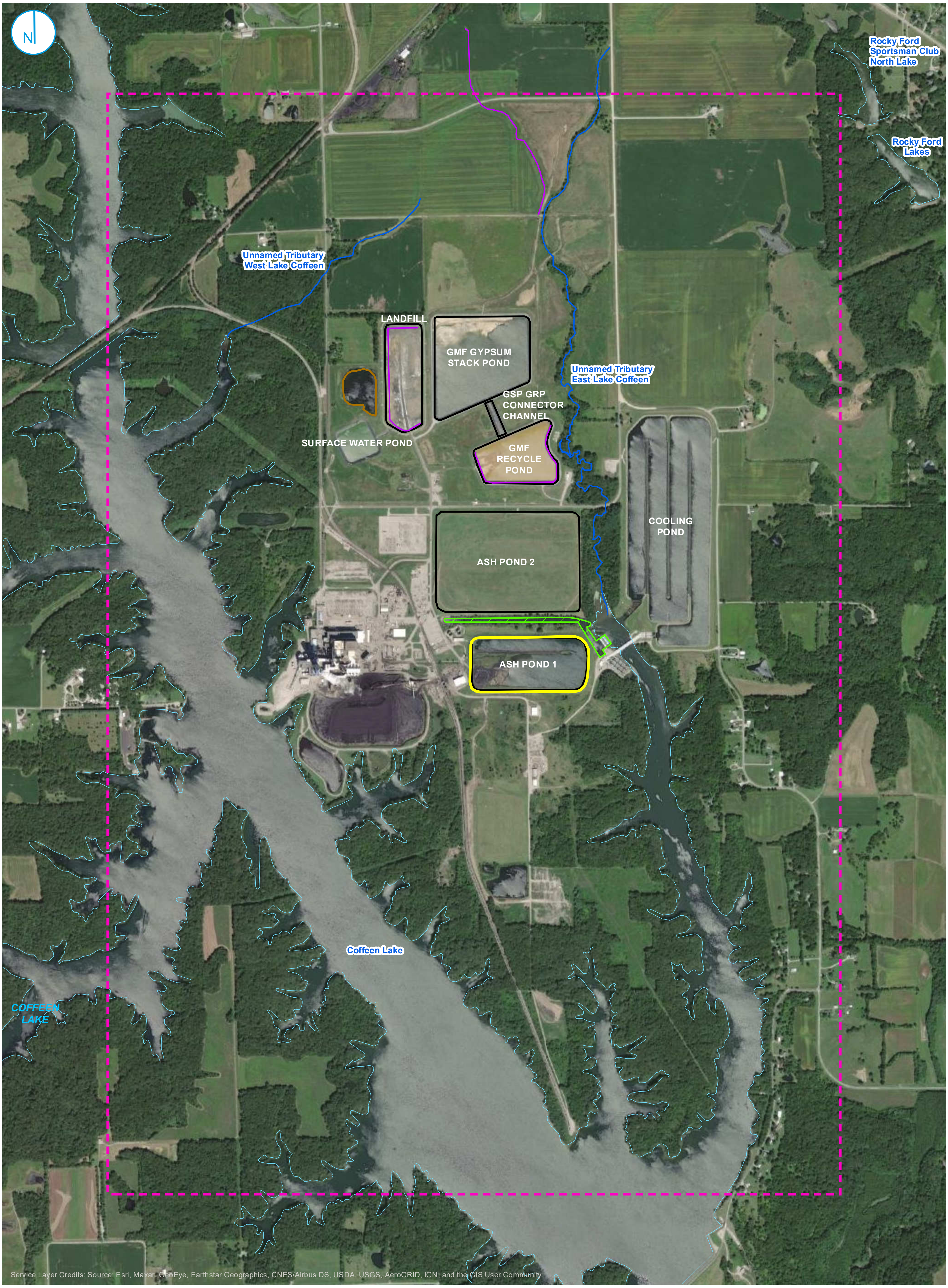
RAMBOLL

FIGURE 4-1



CALIBRATION AND PREDICTIVE TIMELINE
(SS = STEADY STATE MODEL AND TR = TRANSIENT MODEL)

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS



DRAIN
STREAM
LAKE
COOLING CONDENSER FLUME
SI UNIT
POND
MODEL GRID
PART 845 REGULATED UNIT (SUBJECT UNIT)

0 625 1,250 Feet

MODEL AREA MAP

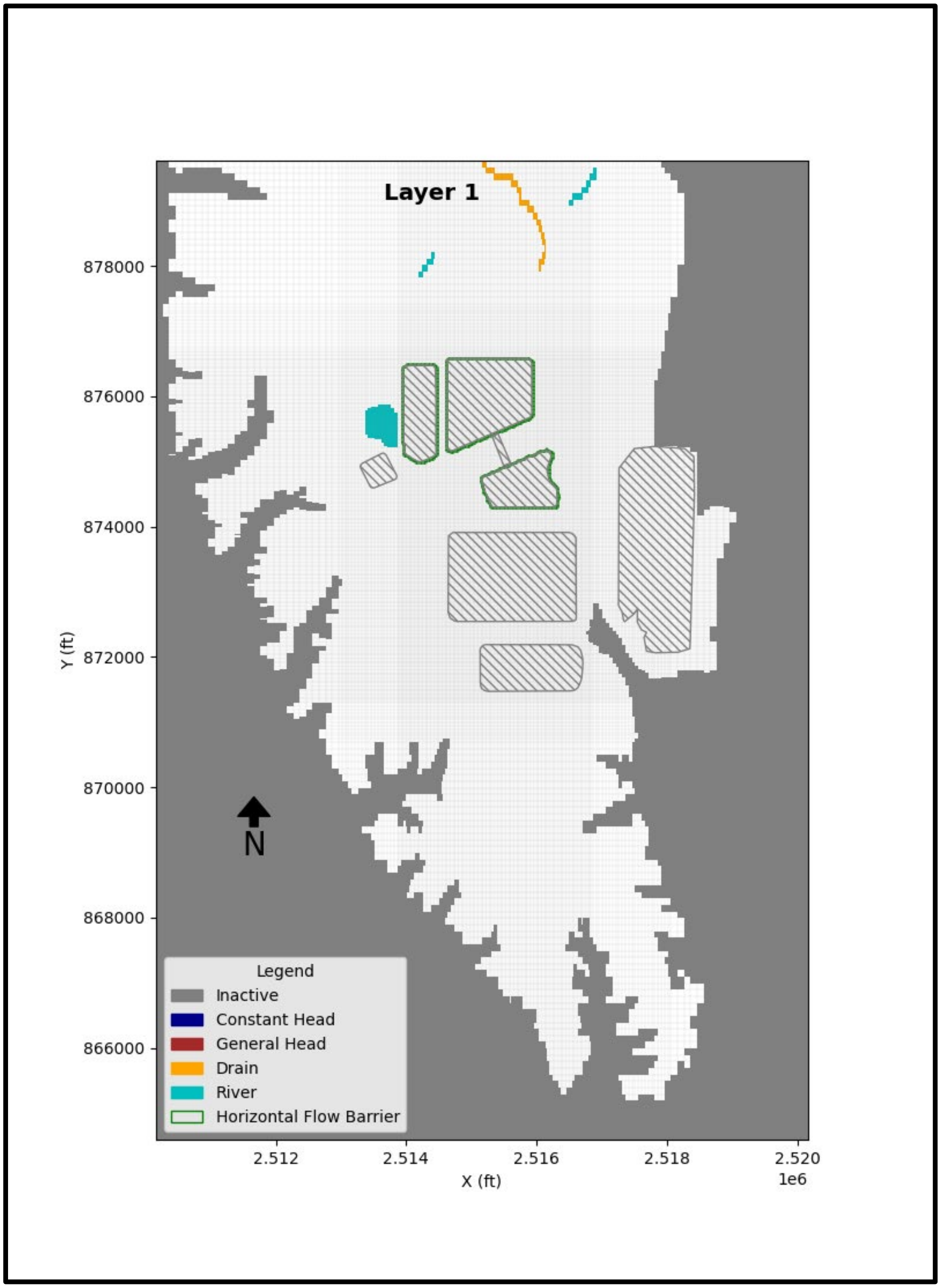
FIGURE 5-1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

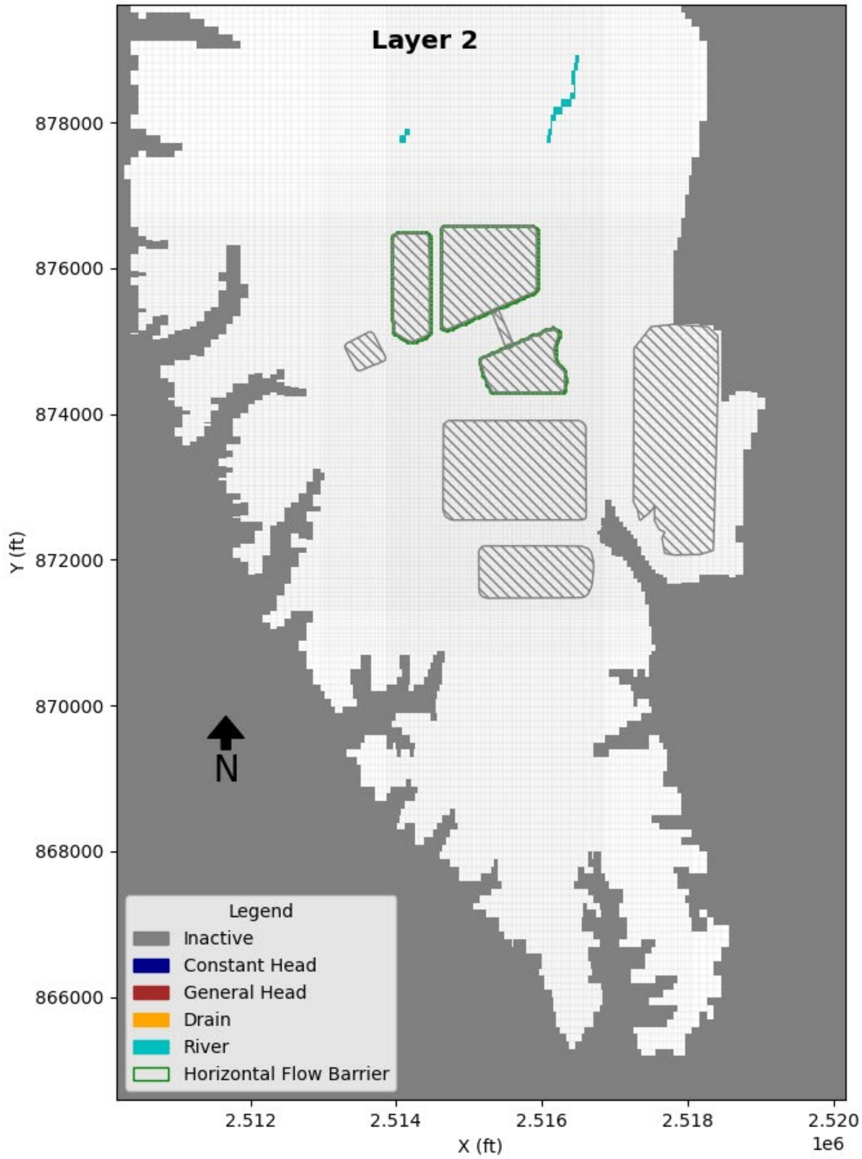
FIGURE 5-2



BOUNDARY CONDITIONS FOR LAYER 1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

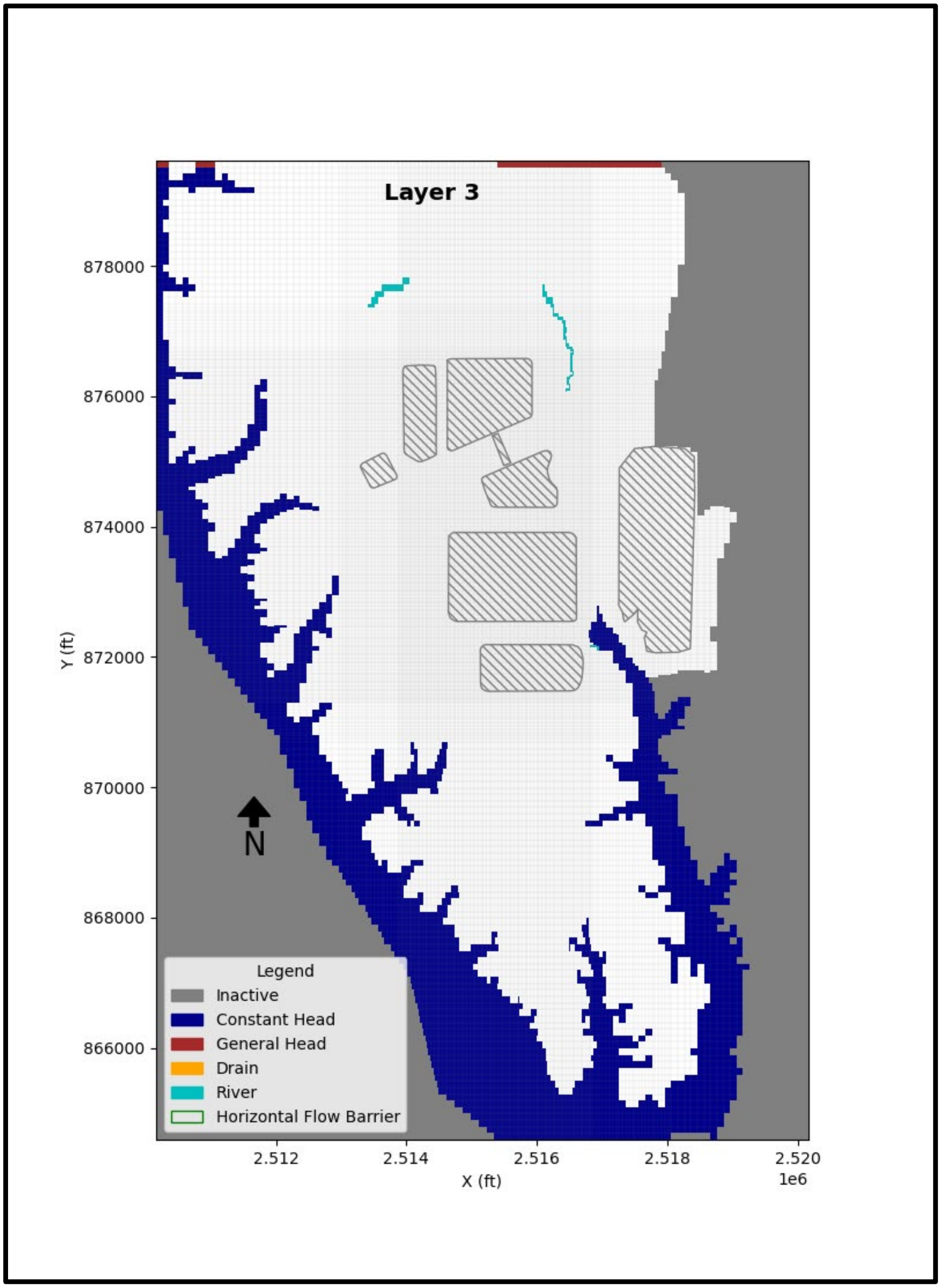
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 2

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

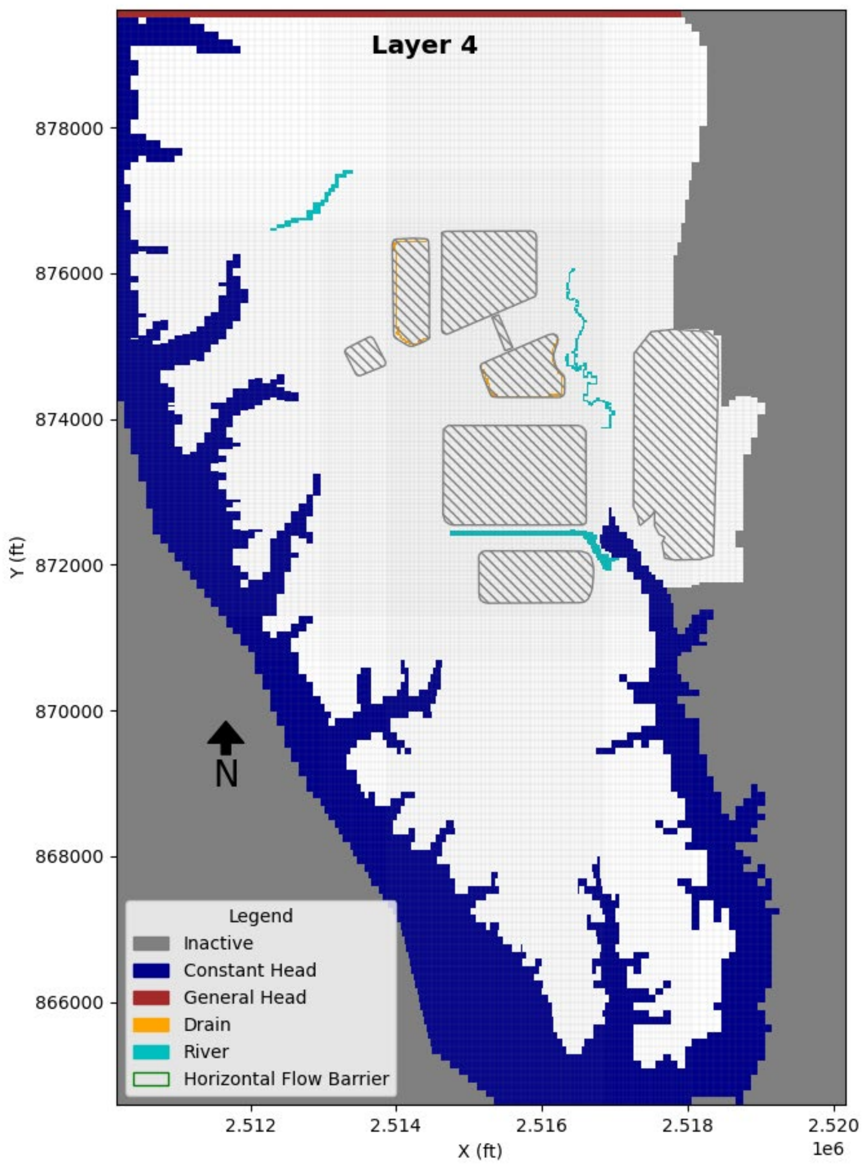
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 3

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

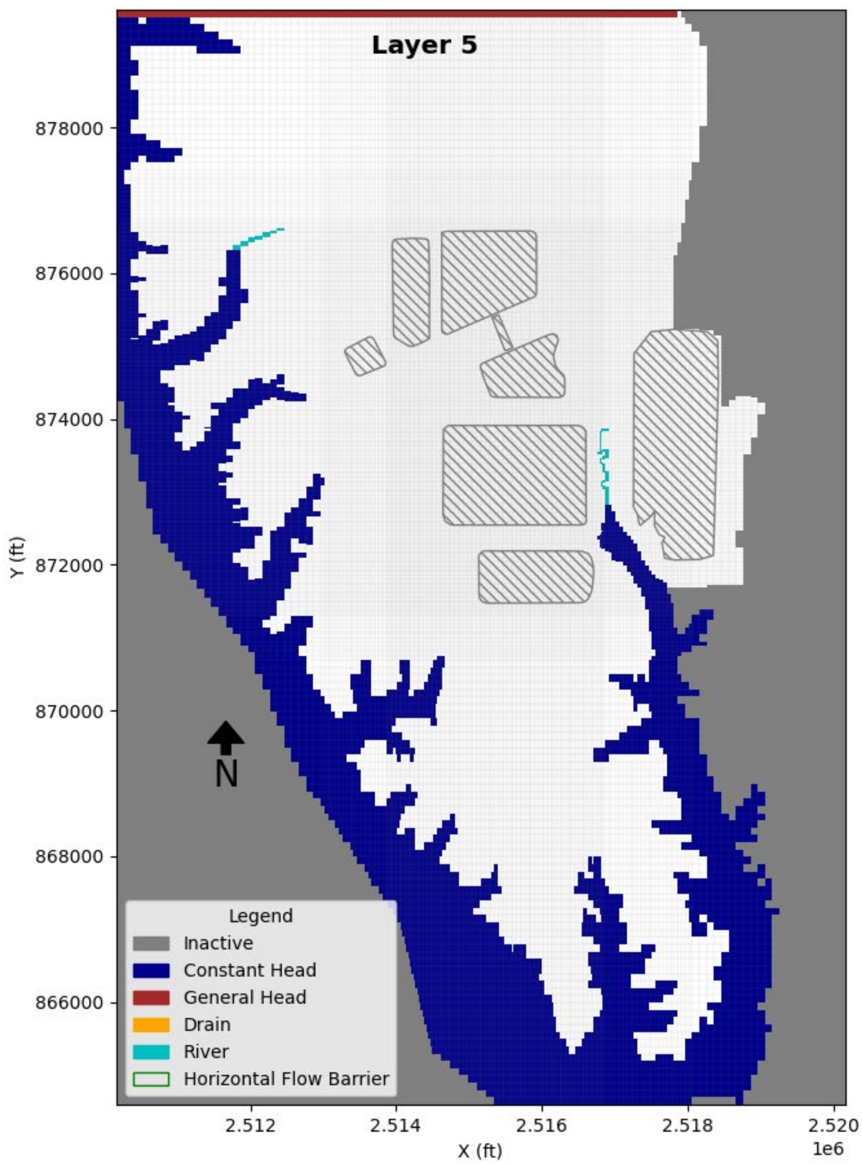


BOUNDARY CONDITIONS FOR LAYER 4

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

FIGURE 5-6

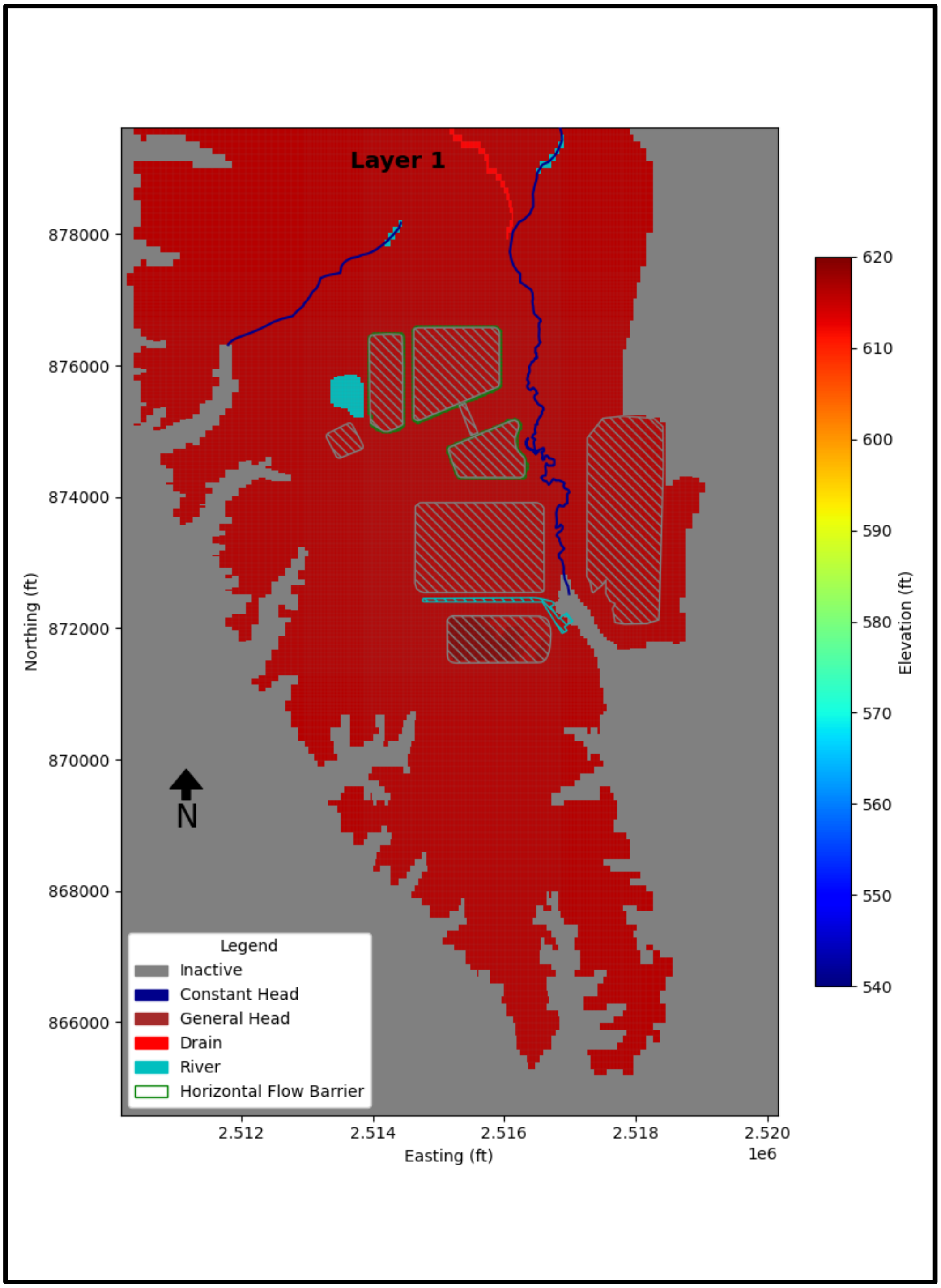


BOUNDARY CONDITIONS FOR LAYER 5

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

FIGURE 5-7

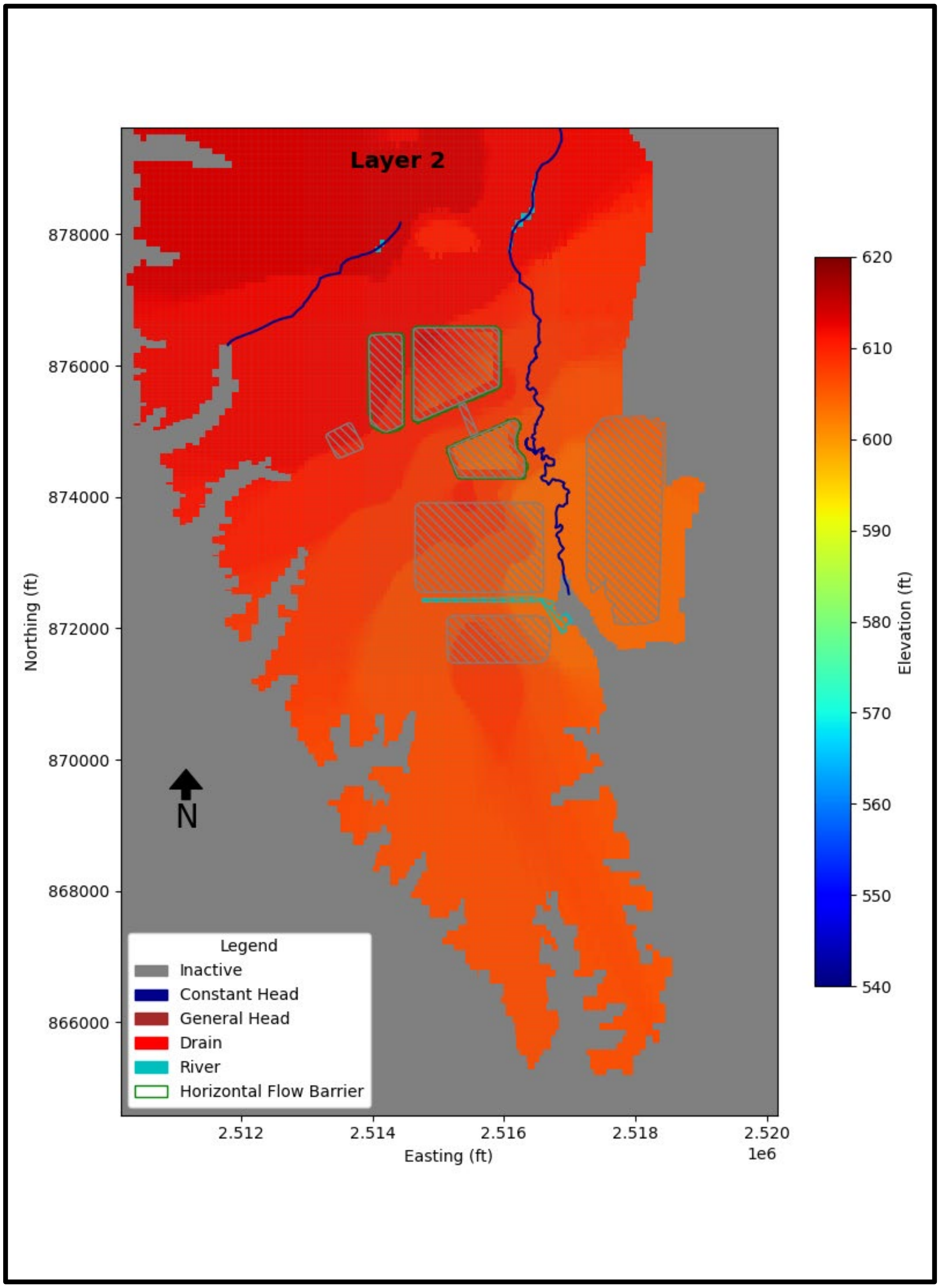


BASE OF MODEL FOR LAYER 1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

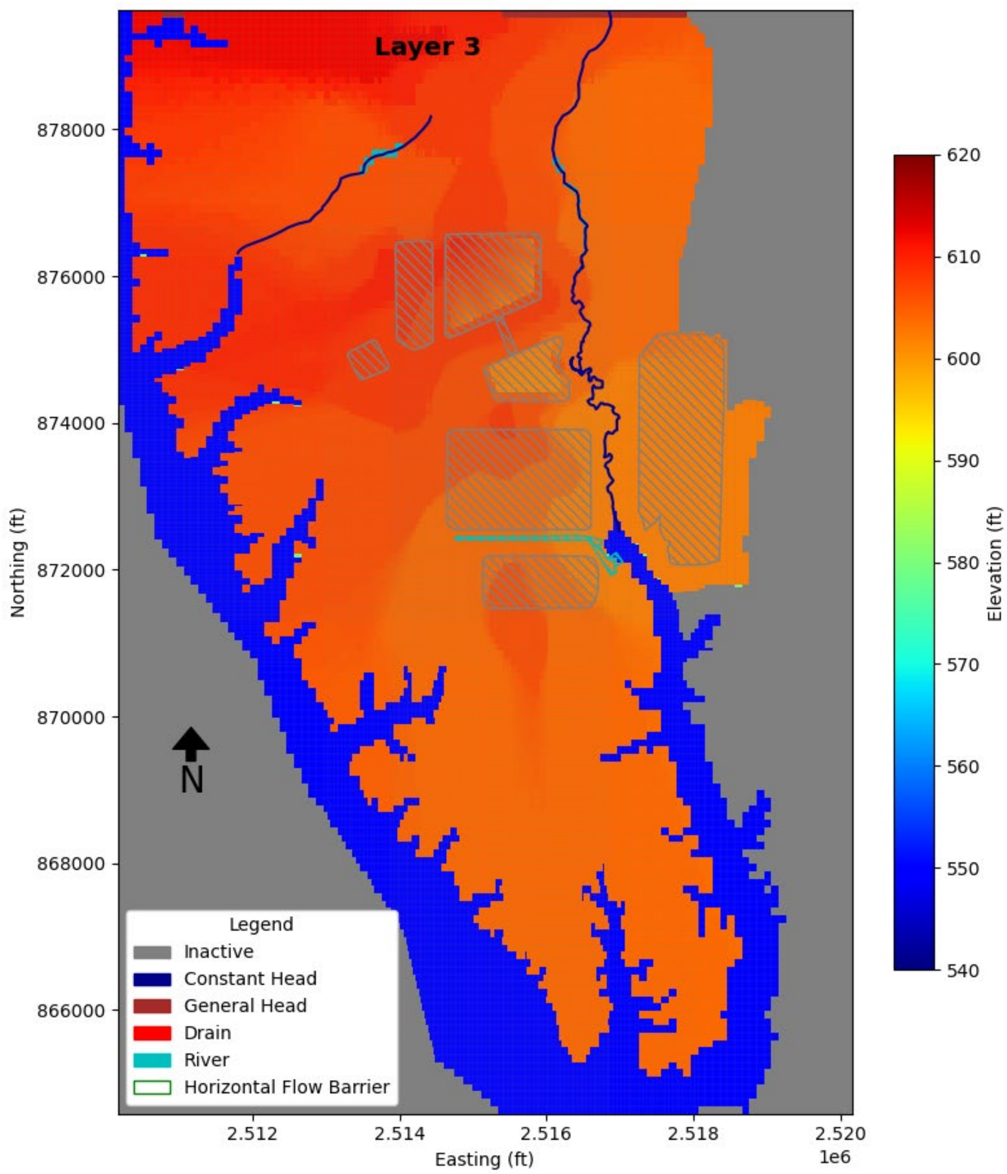
FIGURE 5-8



BASE OF MODEL FOR LAYER 2

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

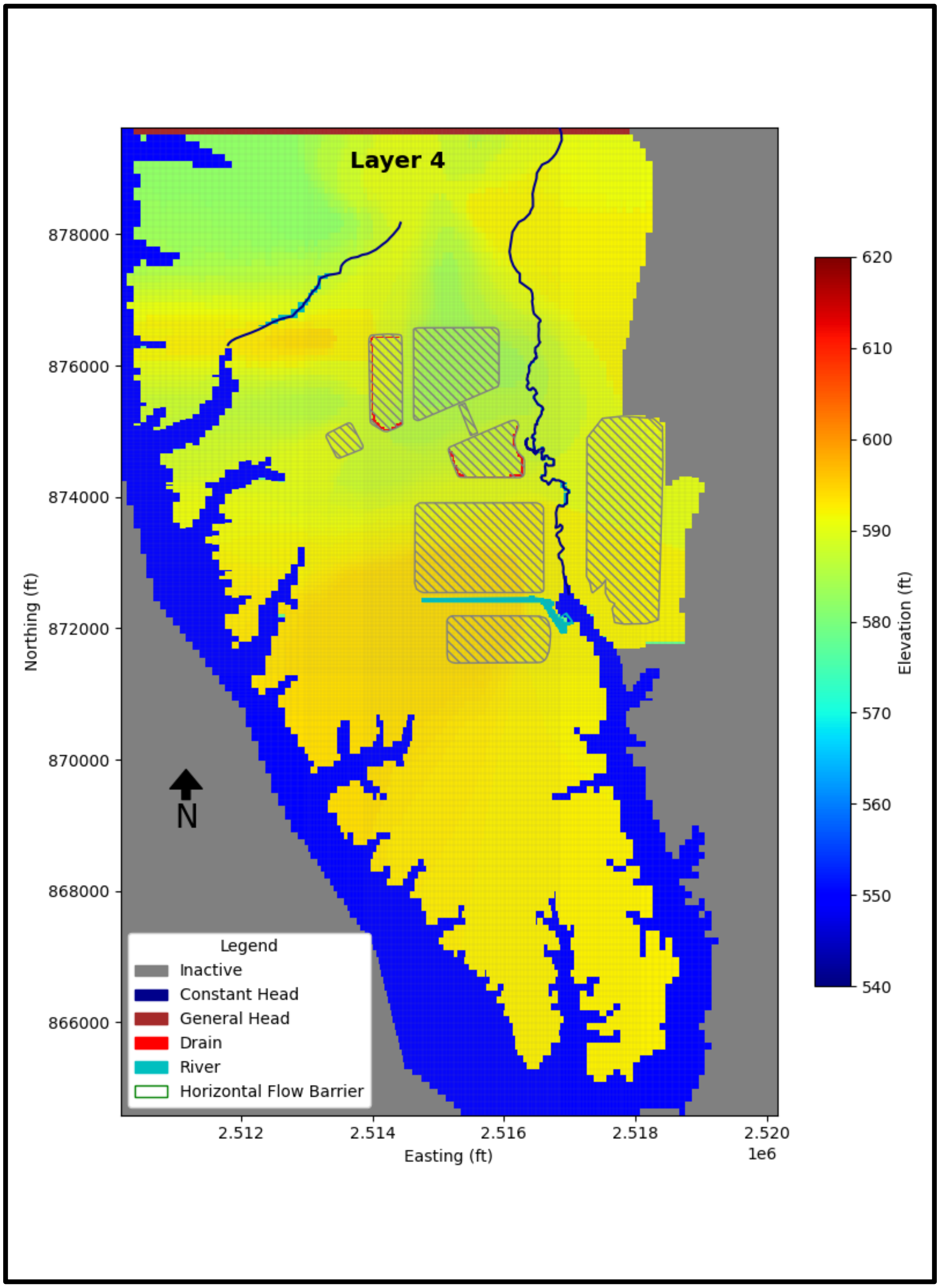
RAMBOLL



BASE OF MODEL FOR LAYER 3

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

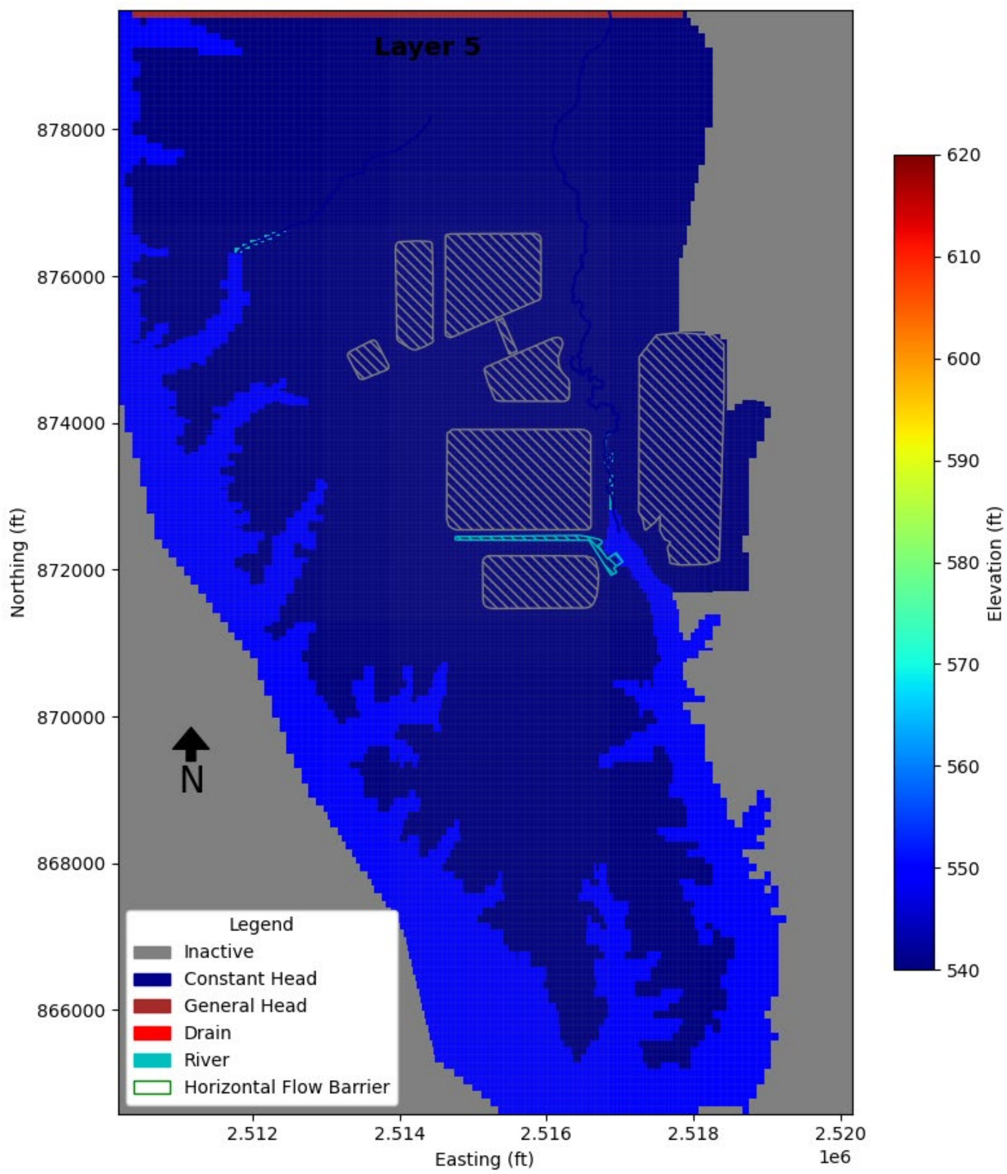


BASE OF MODEL FOR LAYER 4

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

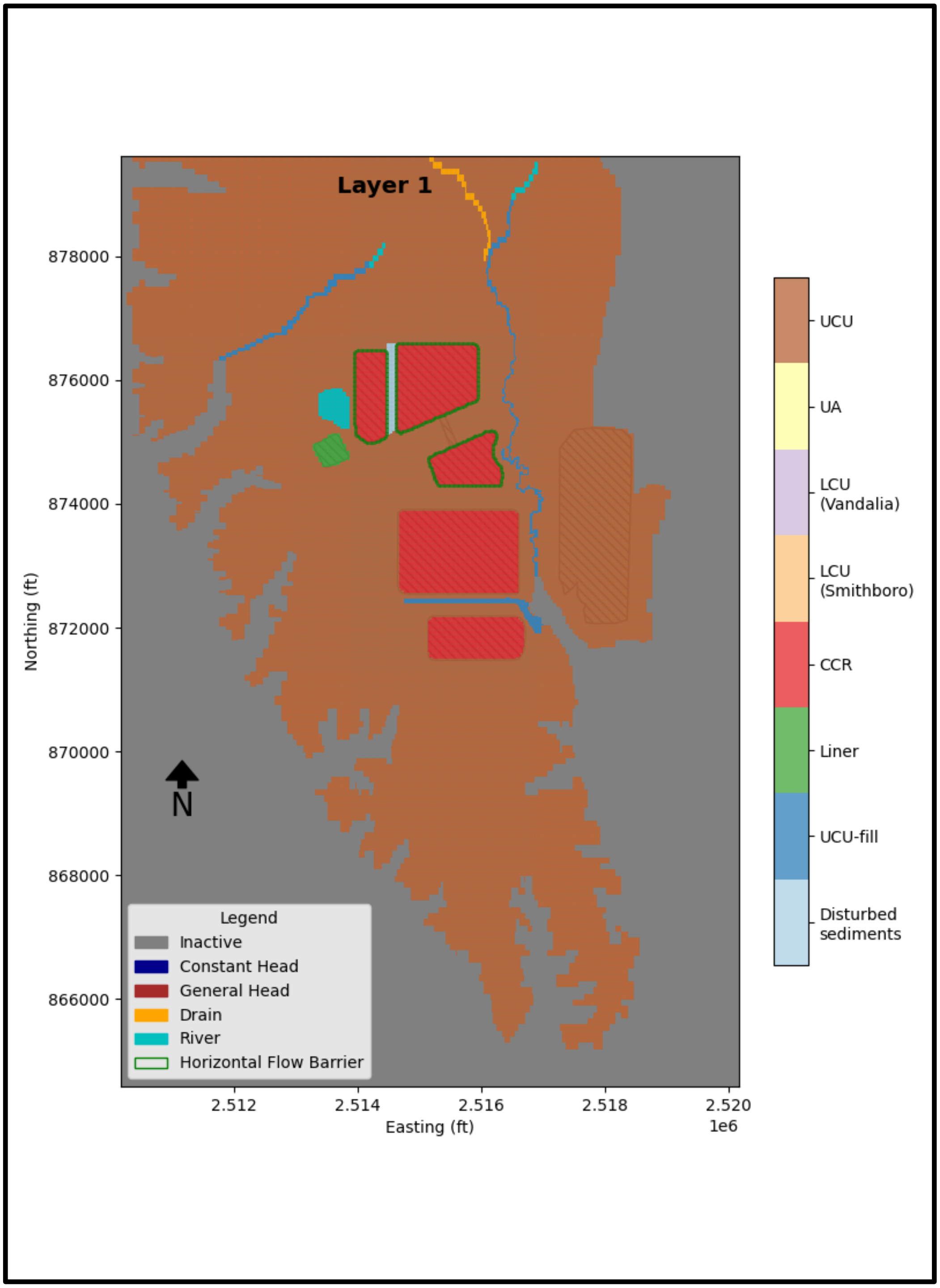
FIGURE 5-11



BASE OF MODEL FOR LAYER 5

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

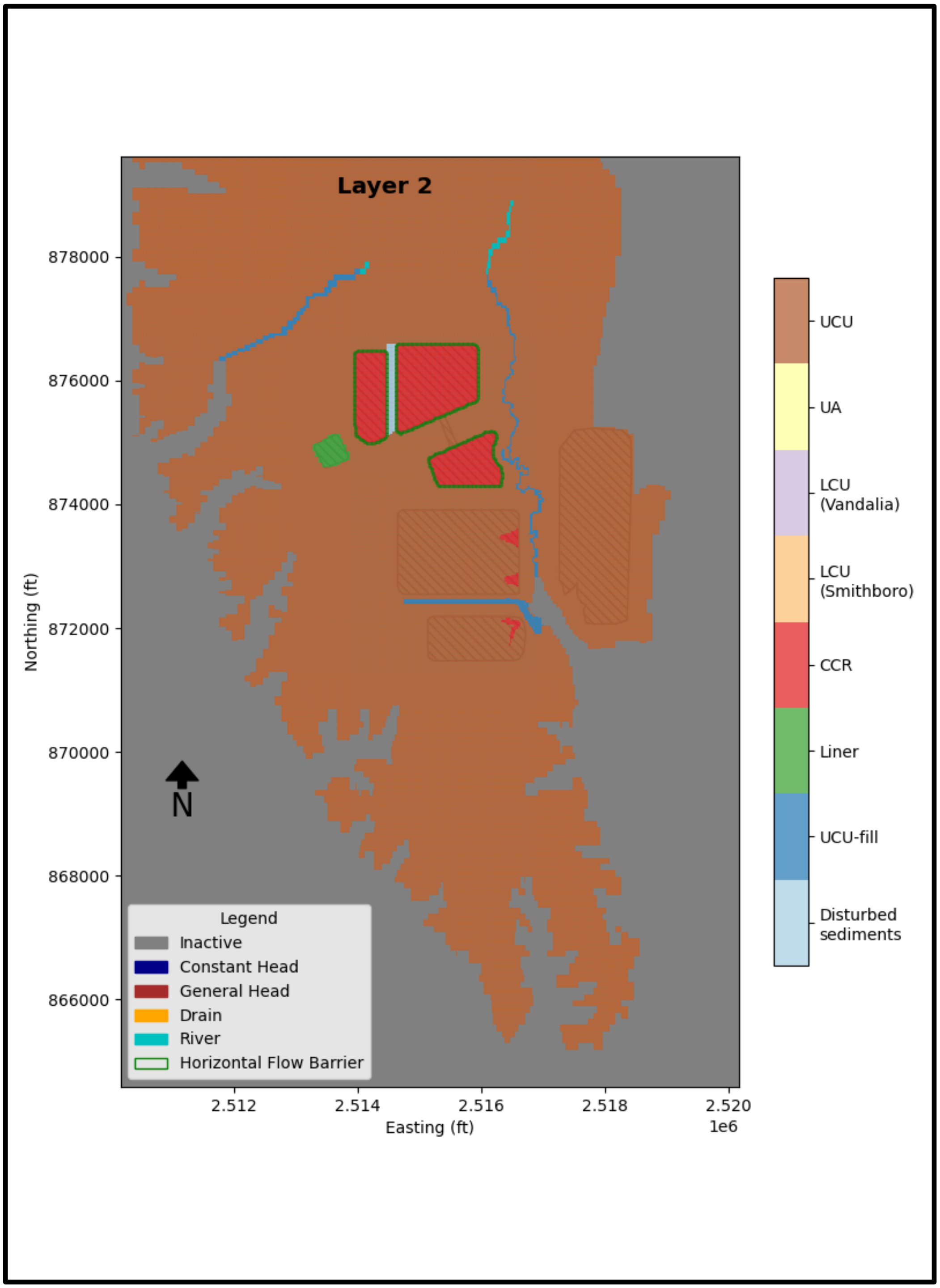
RAMBOLL



HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

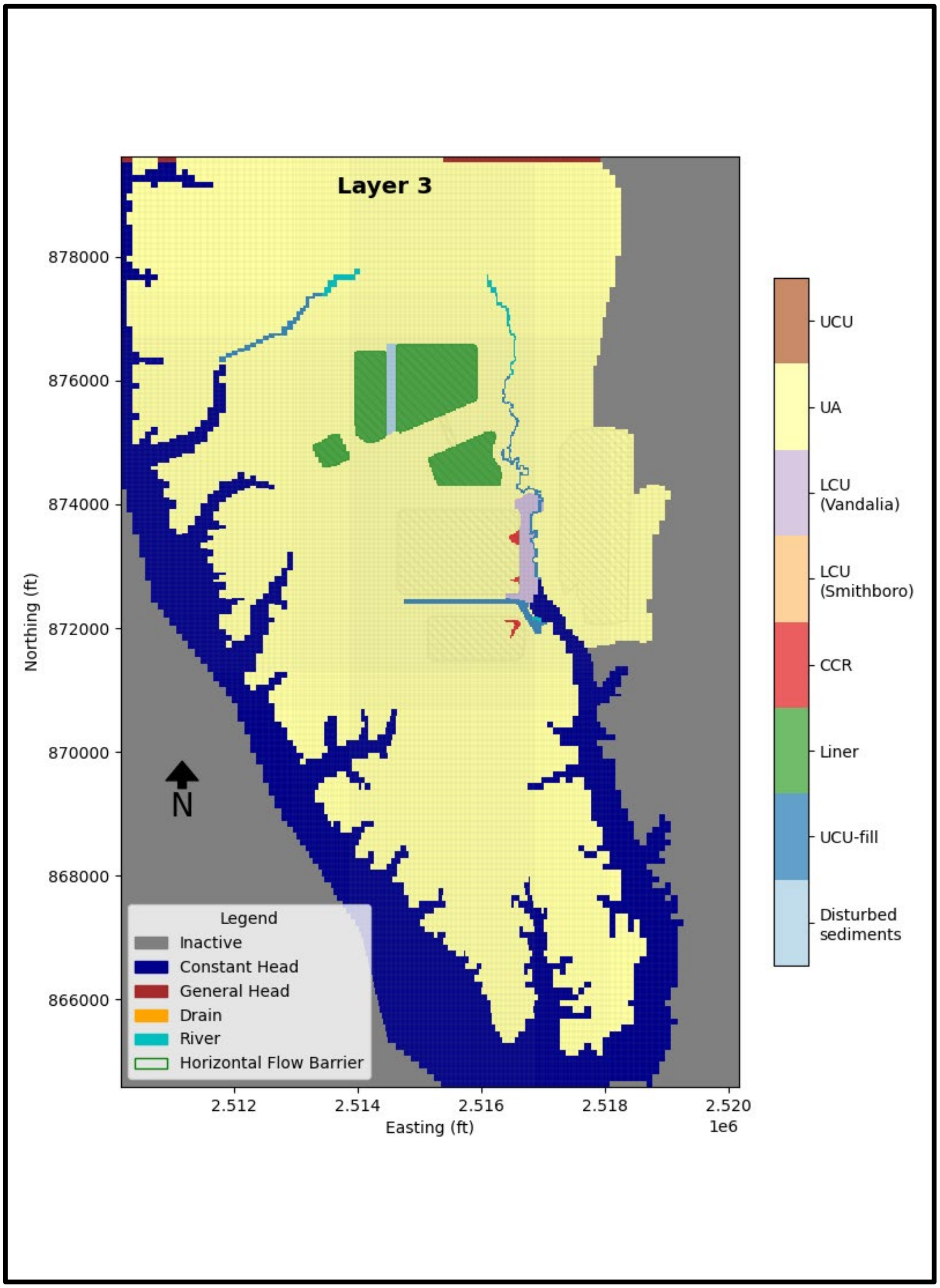
RAMBOLL



HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 2

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

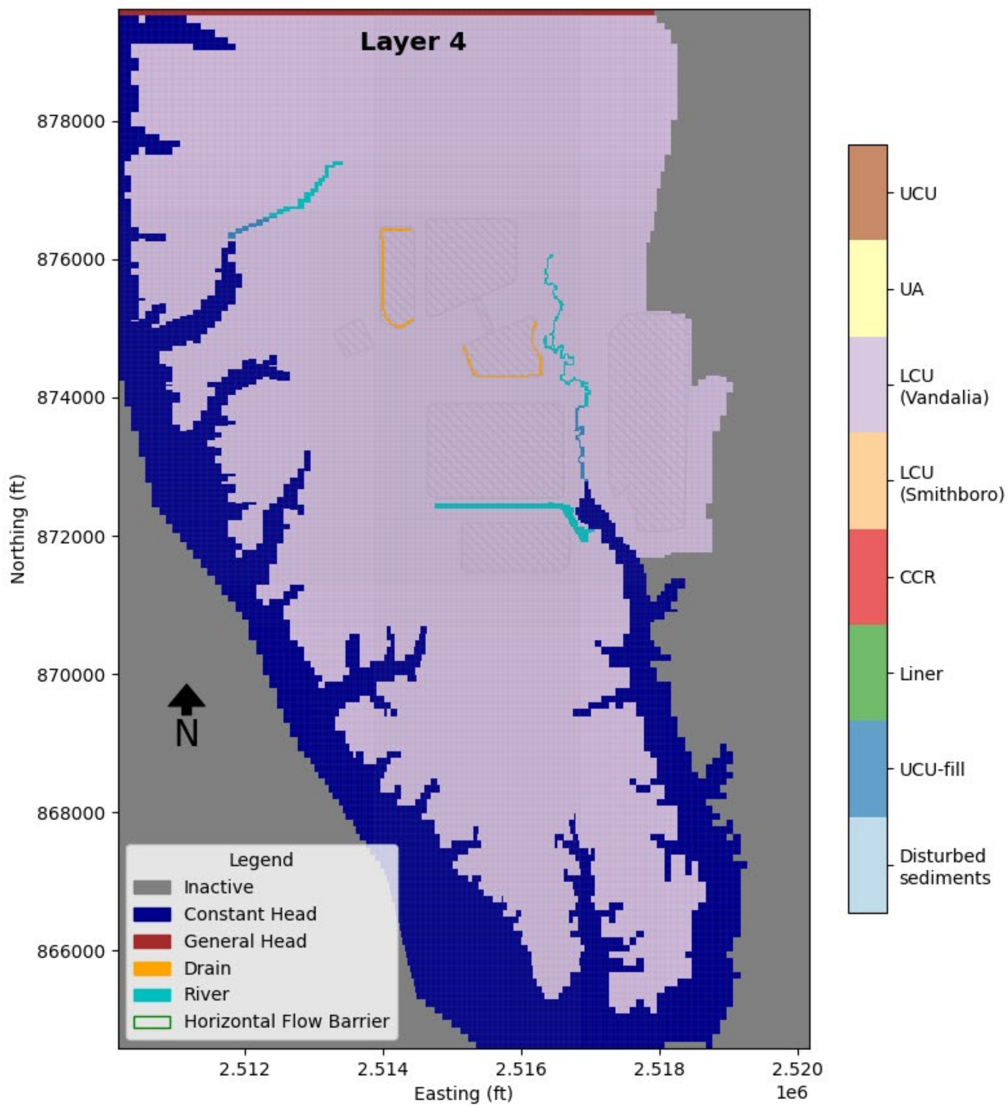


HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 3

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

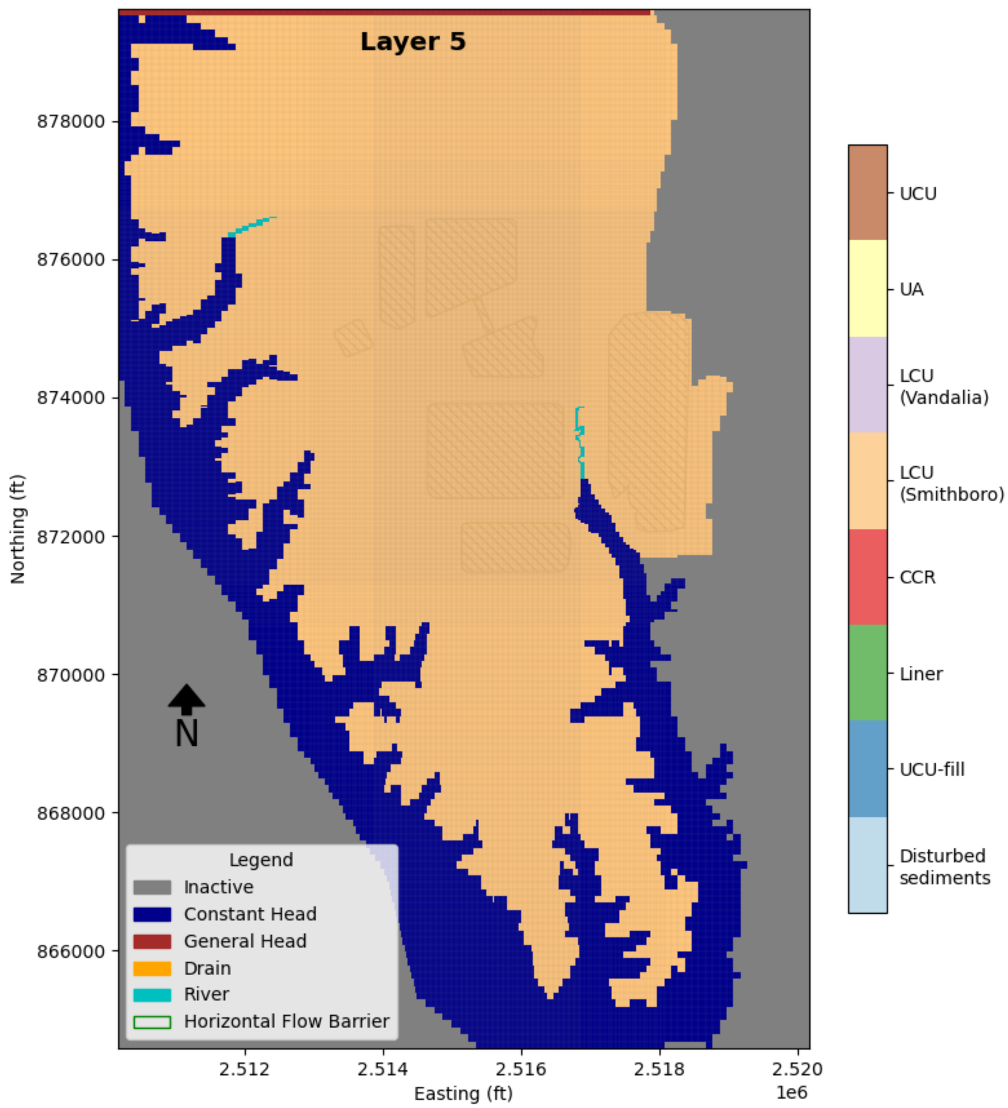
FIGURE 5-15



HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 4

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

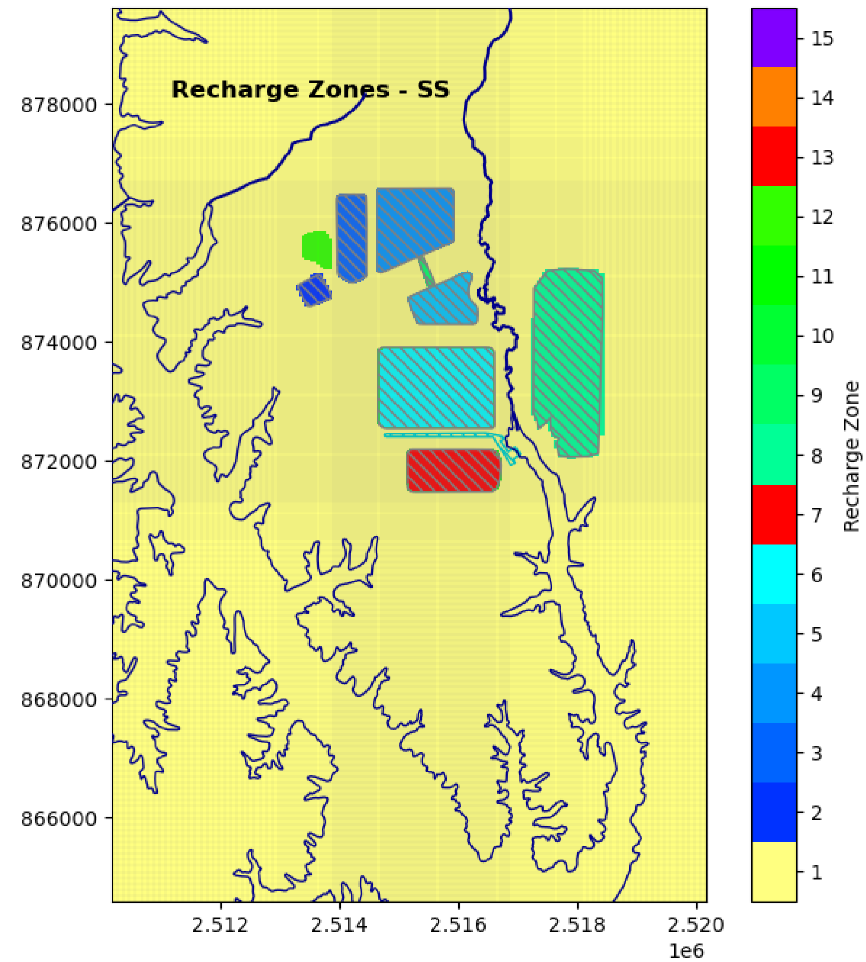
RAMBOLL



HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 5

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

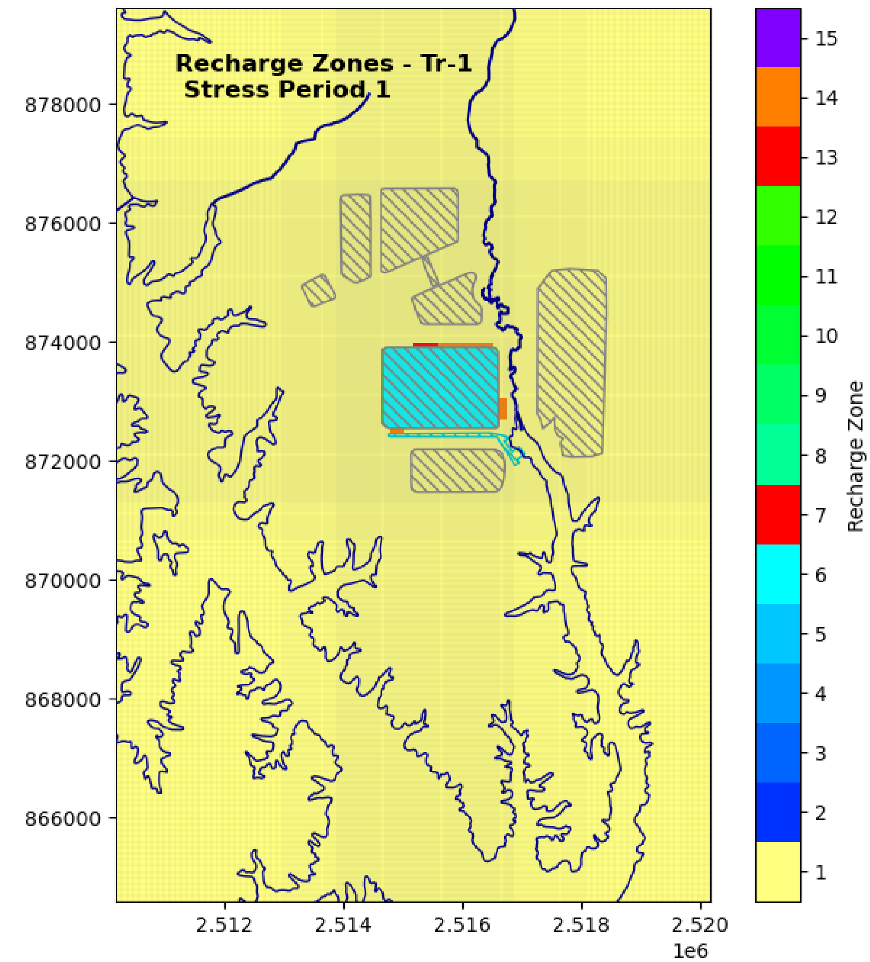
FIGURE 5-17



MODEL RECHARGE DISTRIBUTION STEADY STATE (SS) MODEL

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

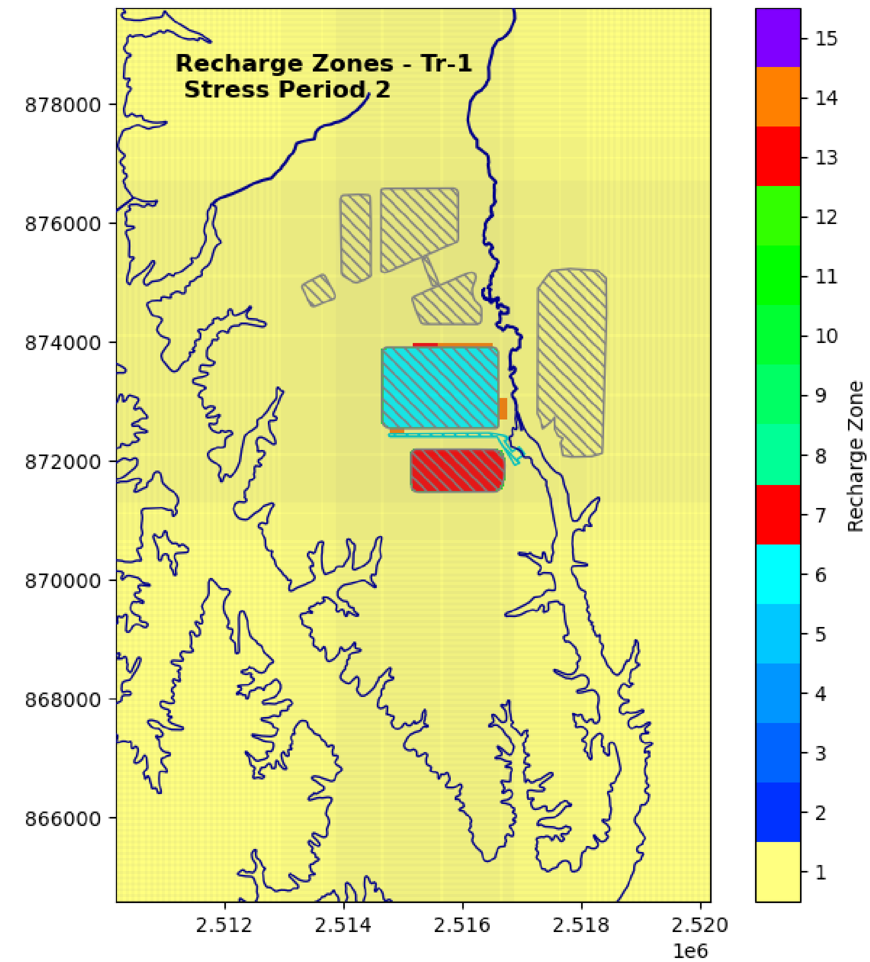
RAMBOLL



MODEL RECHARGE DISTRIBUTION FOR THE TRANSIENT (TR) MODEL TR-1
STRESS PERIOD 1

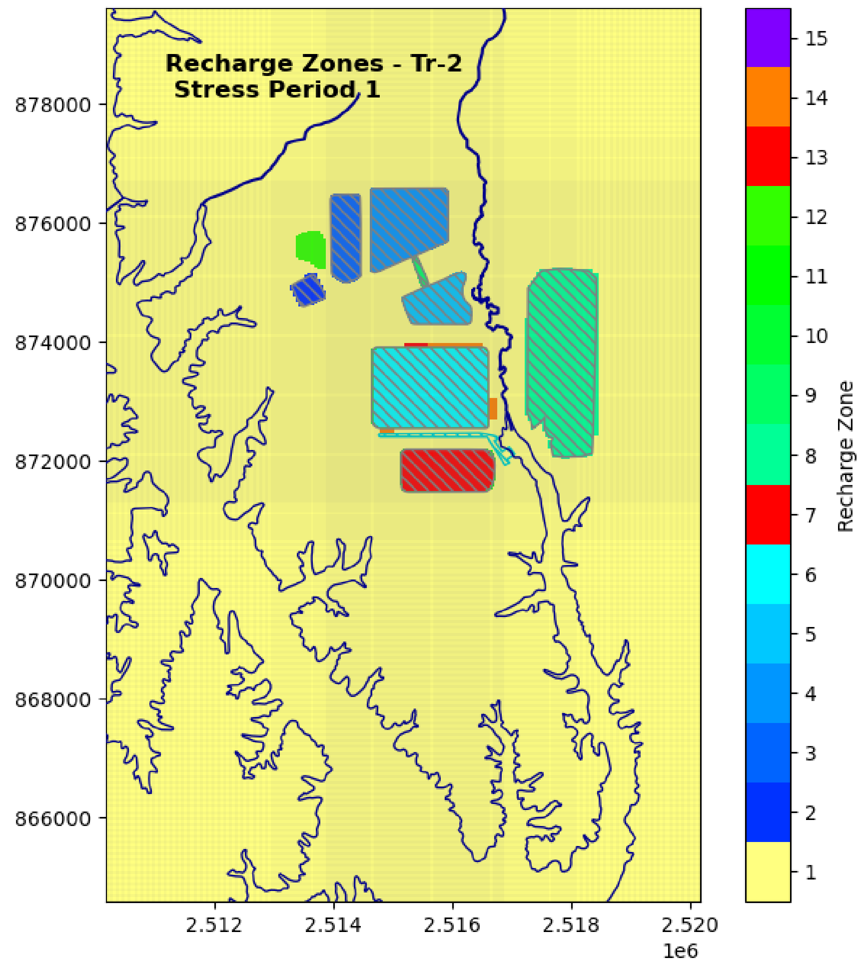
GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL



MODEL RECHARGE DISTRIBUTION FOR THE TRANSIENT (TR) MODEL TR-1
STRESS PERIOD 2

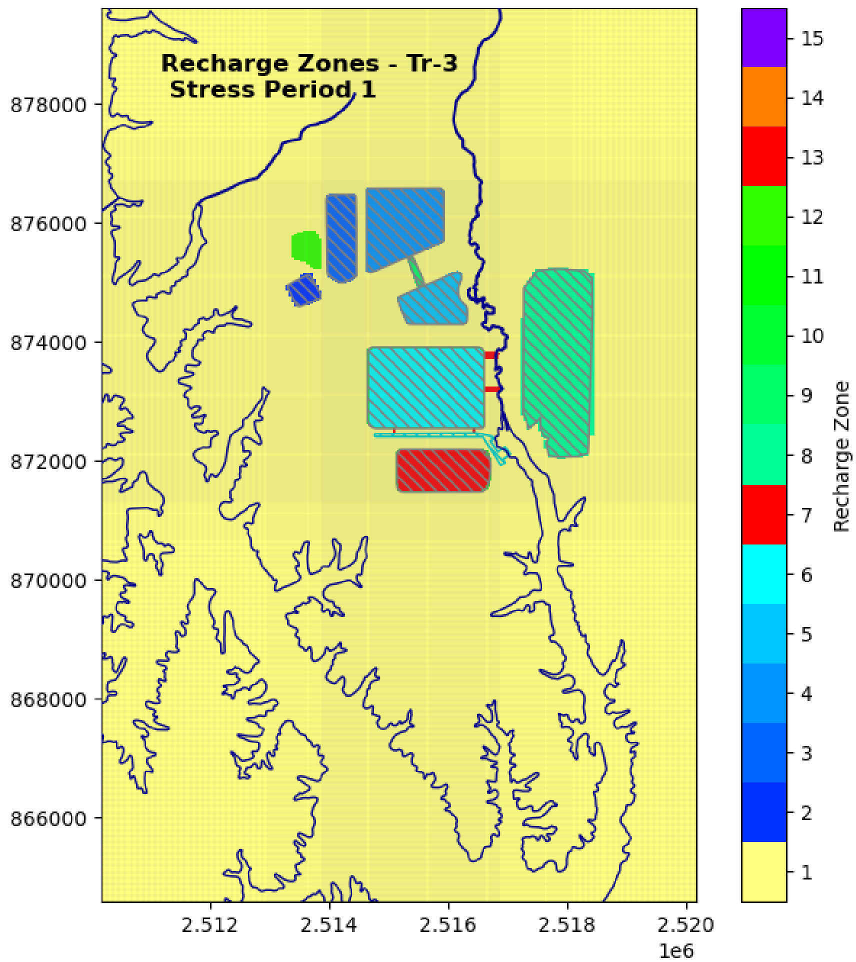
GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS



MODEL RECHARGE DISTRIBUTION FOR THE TRANSIENT (TR) MODEL TR-2
STRESS PERIOD 1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

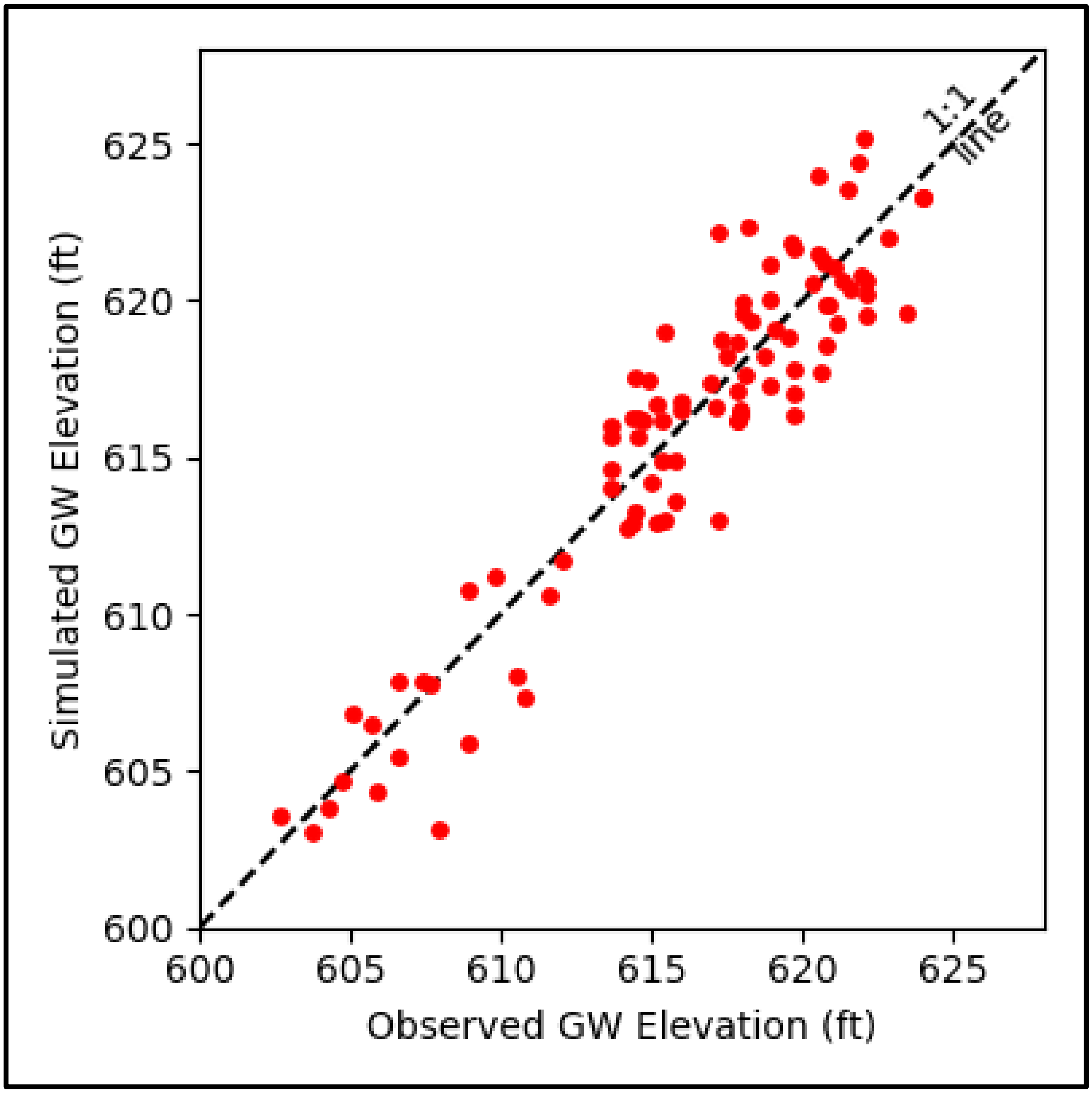
RAMBOLL



MODEL RECHARGE DISTRIBUTION FOR THE TRANSIENT (TR) MODEL TR-3
STRESS PERIOD 1

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

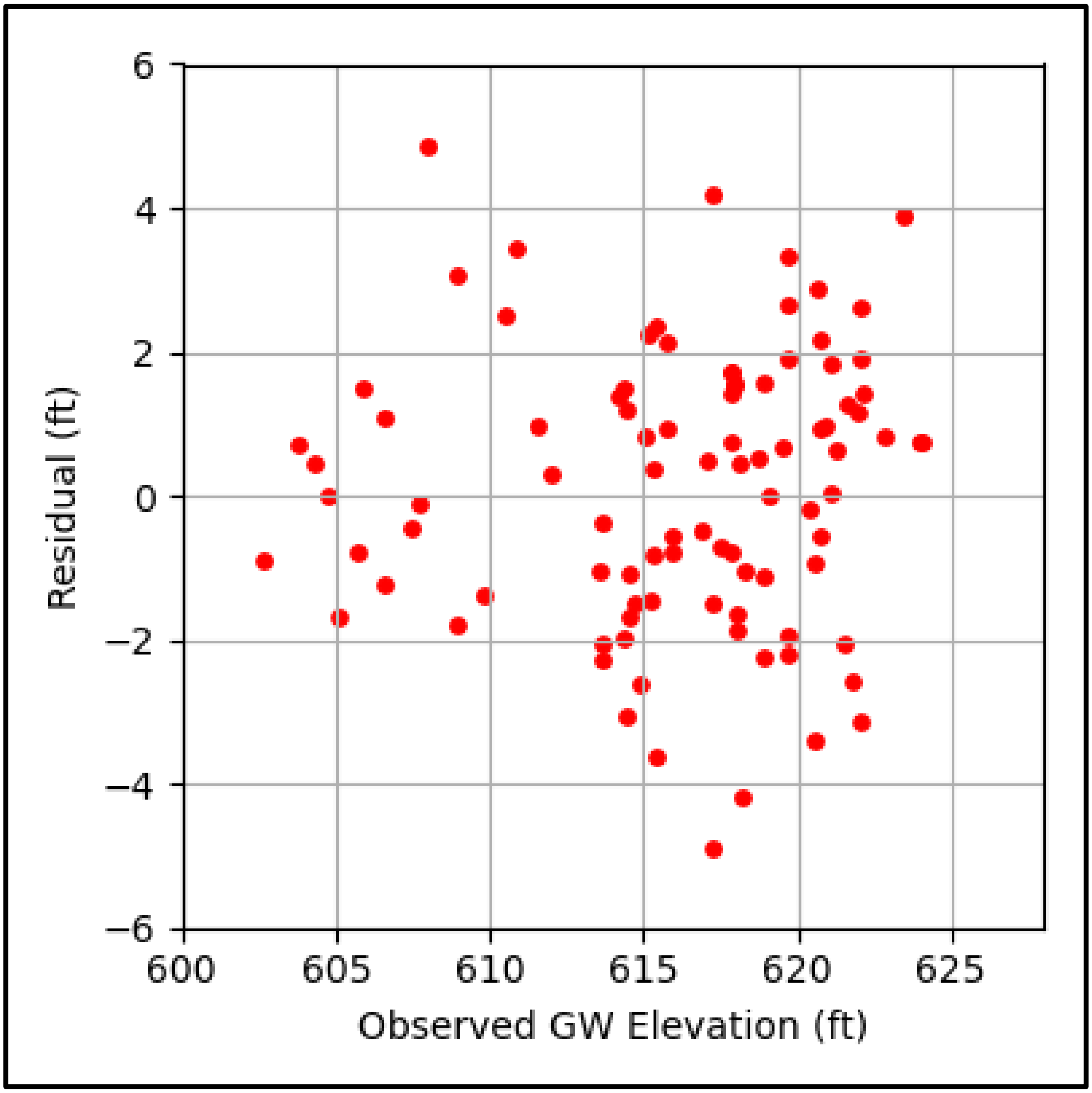


OBSERVED VERSUS SIMULATED STEADY STATE GROUNDWATER LEVELS FROM THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

FIGURE 5-23

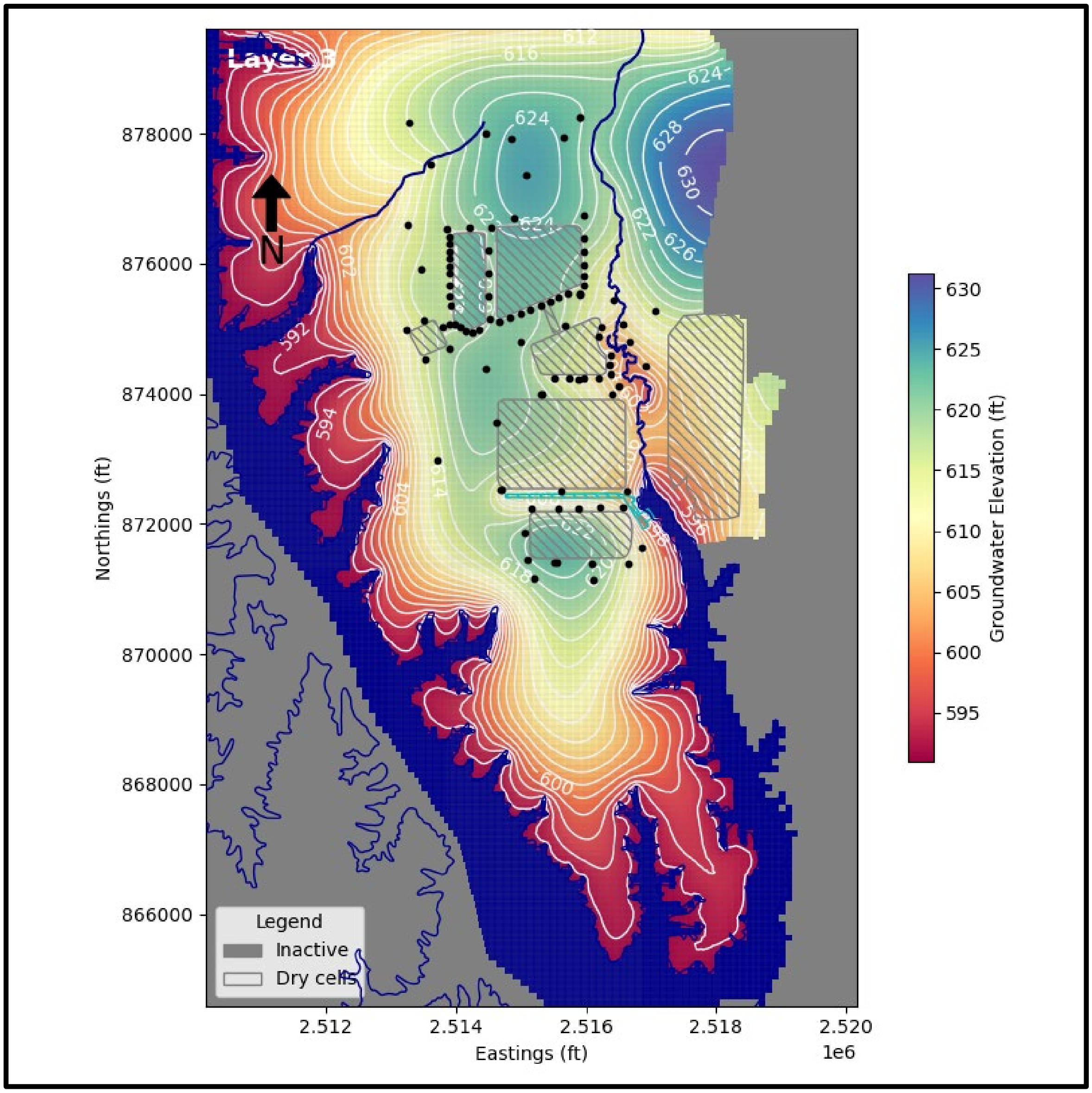


SIMULATED GROUNDWATER LEVEL RESIDUALS FROM THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

FIGURE 5-24

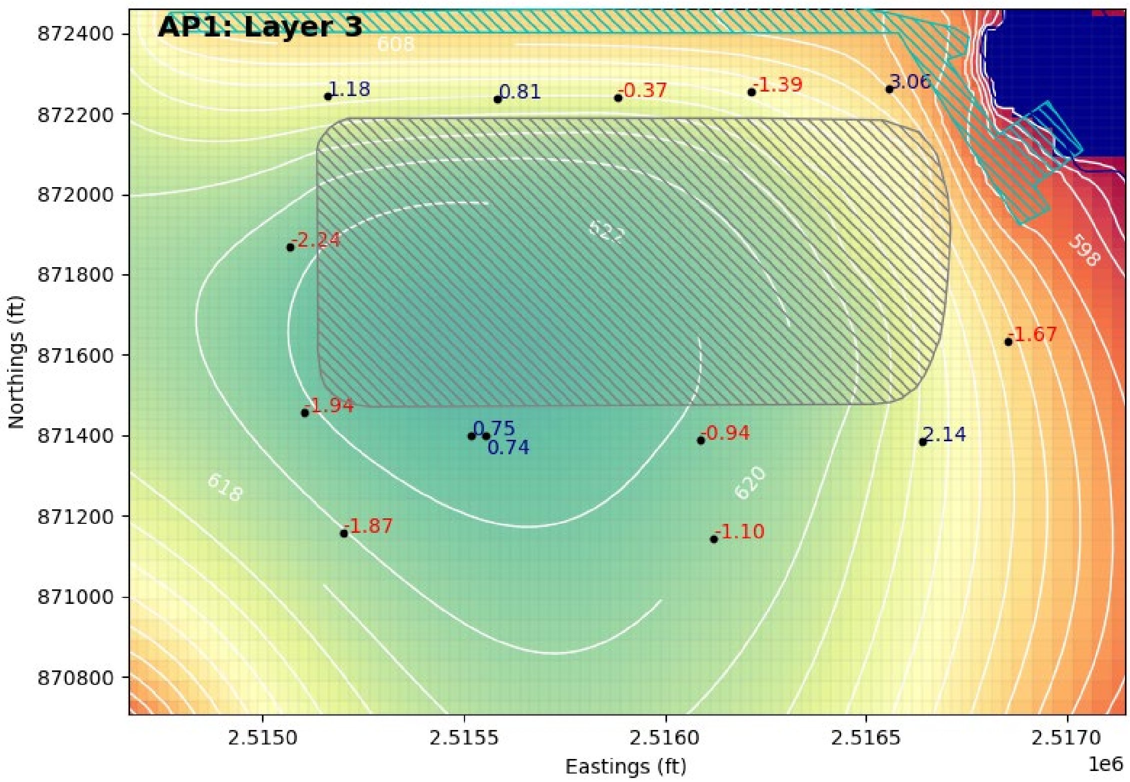


SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM UA (LAYER 3) FROM THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

FIGURE 5-25

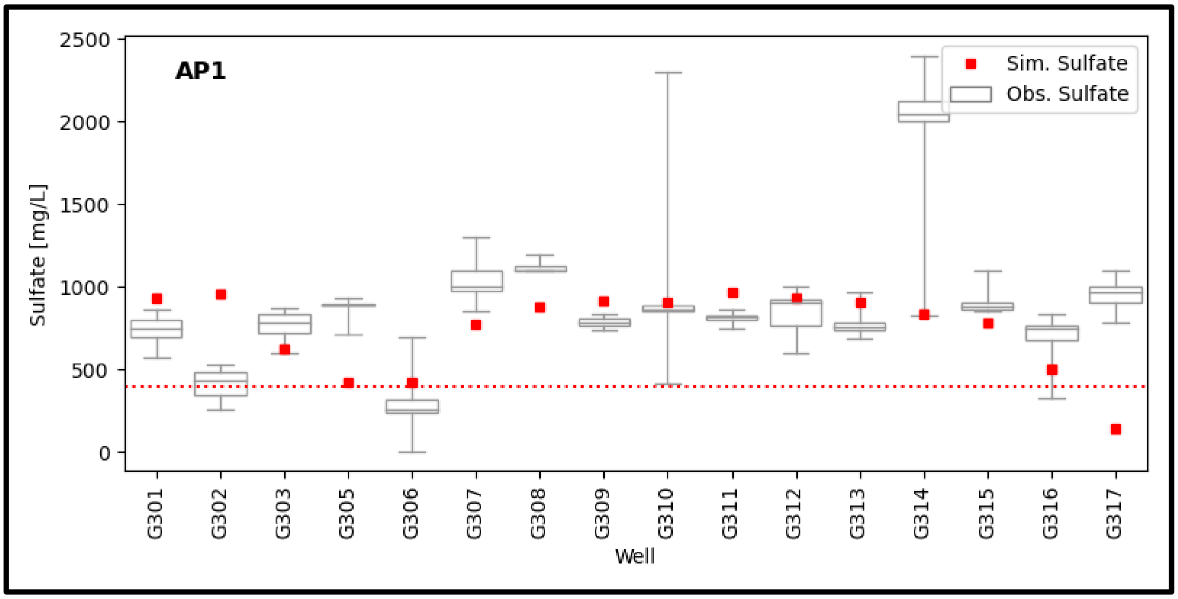


SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS IN PROXIMITY TO AP1
FROM UA (LAYER 3) FROM THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

FIGURE 5-26

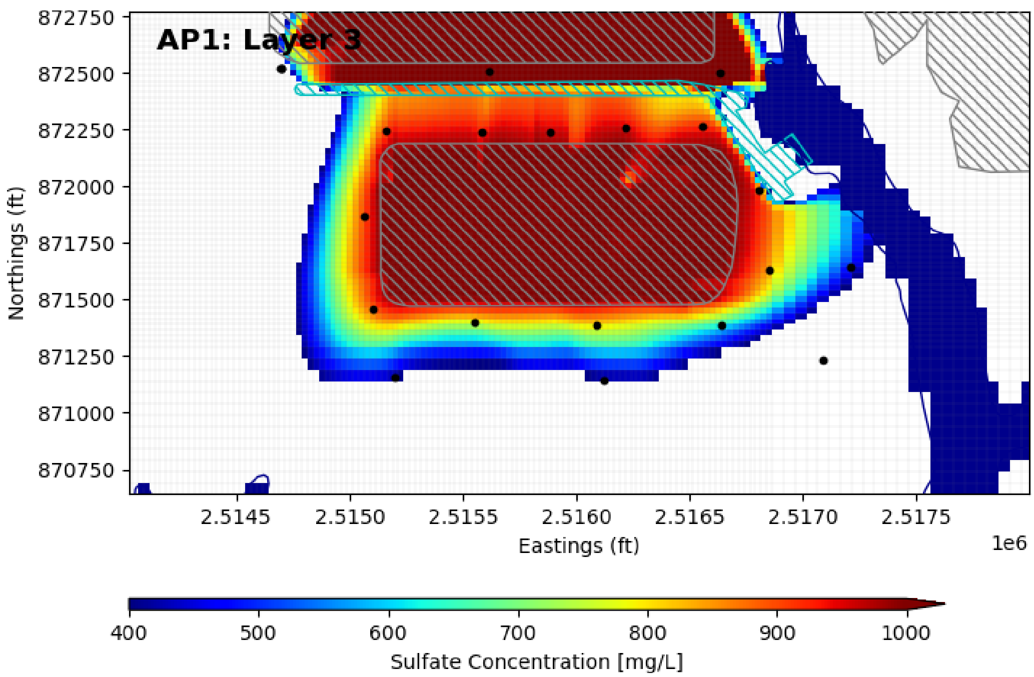


OBSERVED VERSUS SIMULATED SULFATE CONCENTRATIONS (mg/L)

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

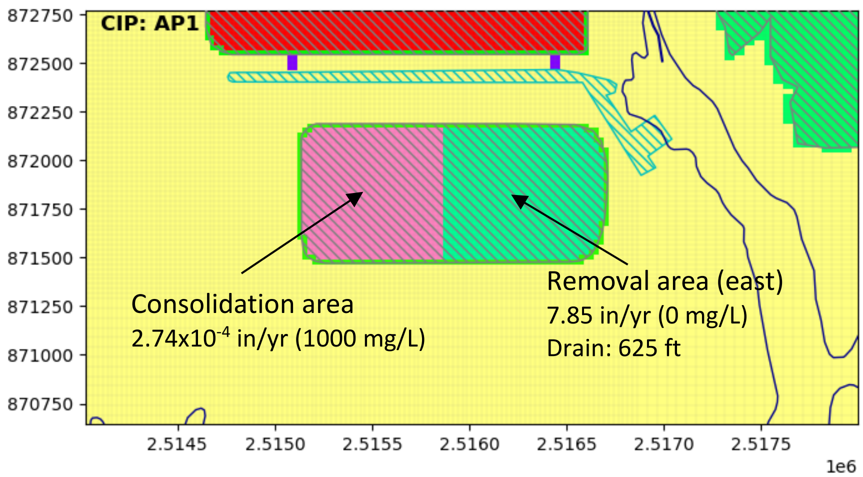
FIGURE 5-27



SIMULATED SULFATE PLUME IN THE UA FROM THE TRANSIENT MODEL

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

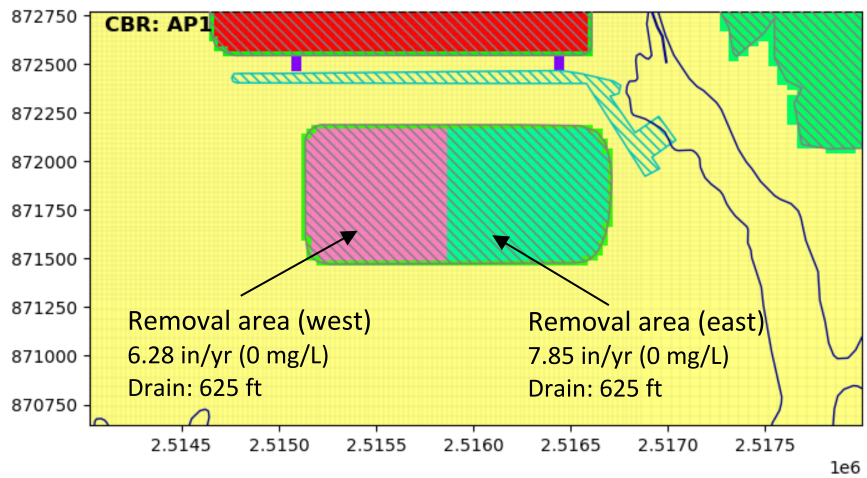
RAMBOLL



CIP RECHARGE AND STORMWATER POND MODIFICATIONS

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

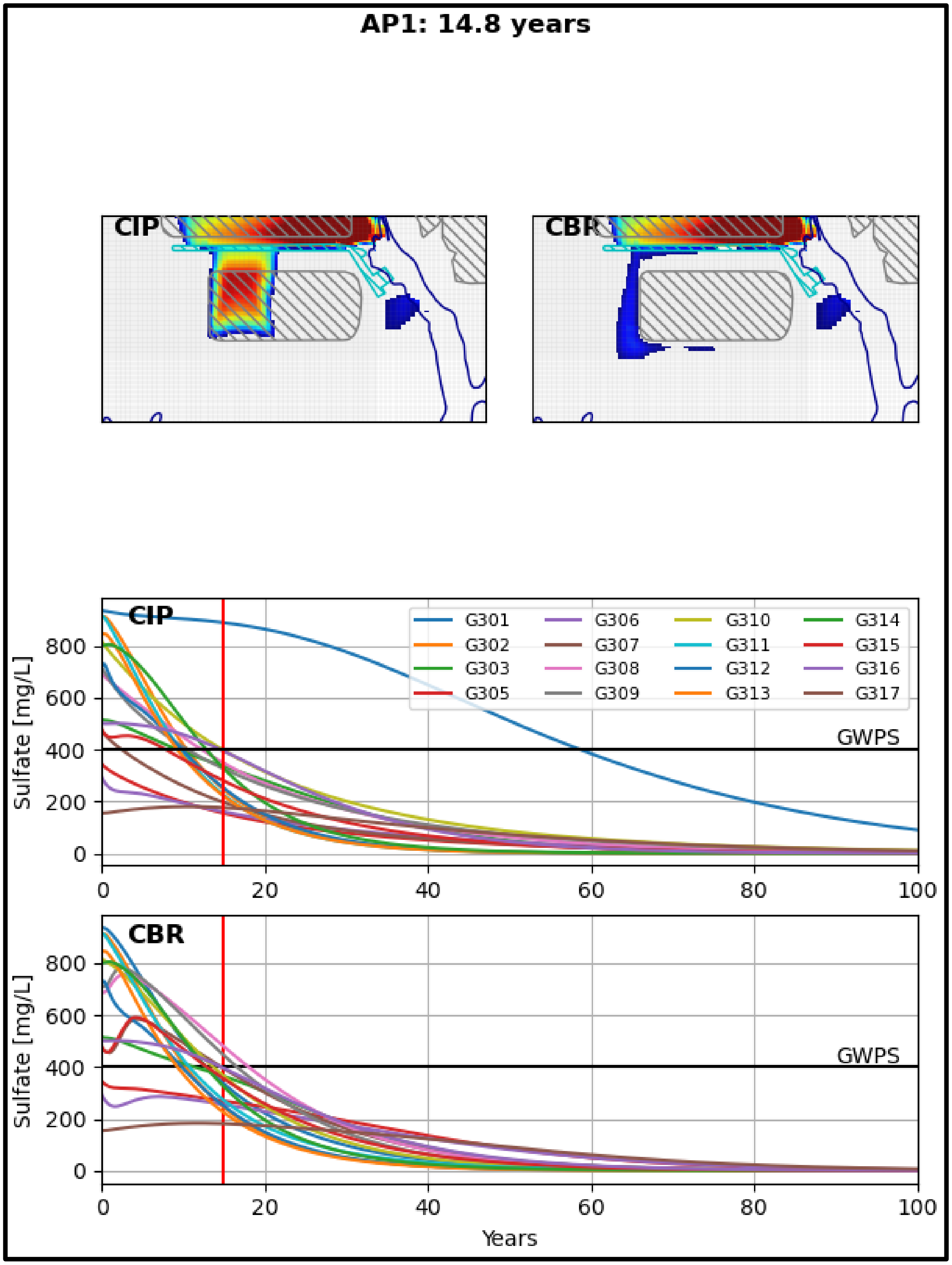
RAMBOLL



CBR RECHARGE AND STORMWATER POND MODIFICATIONS

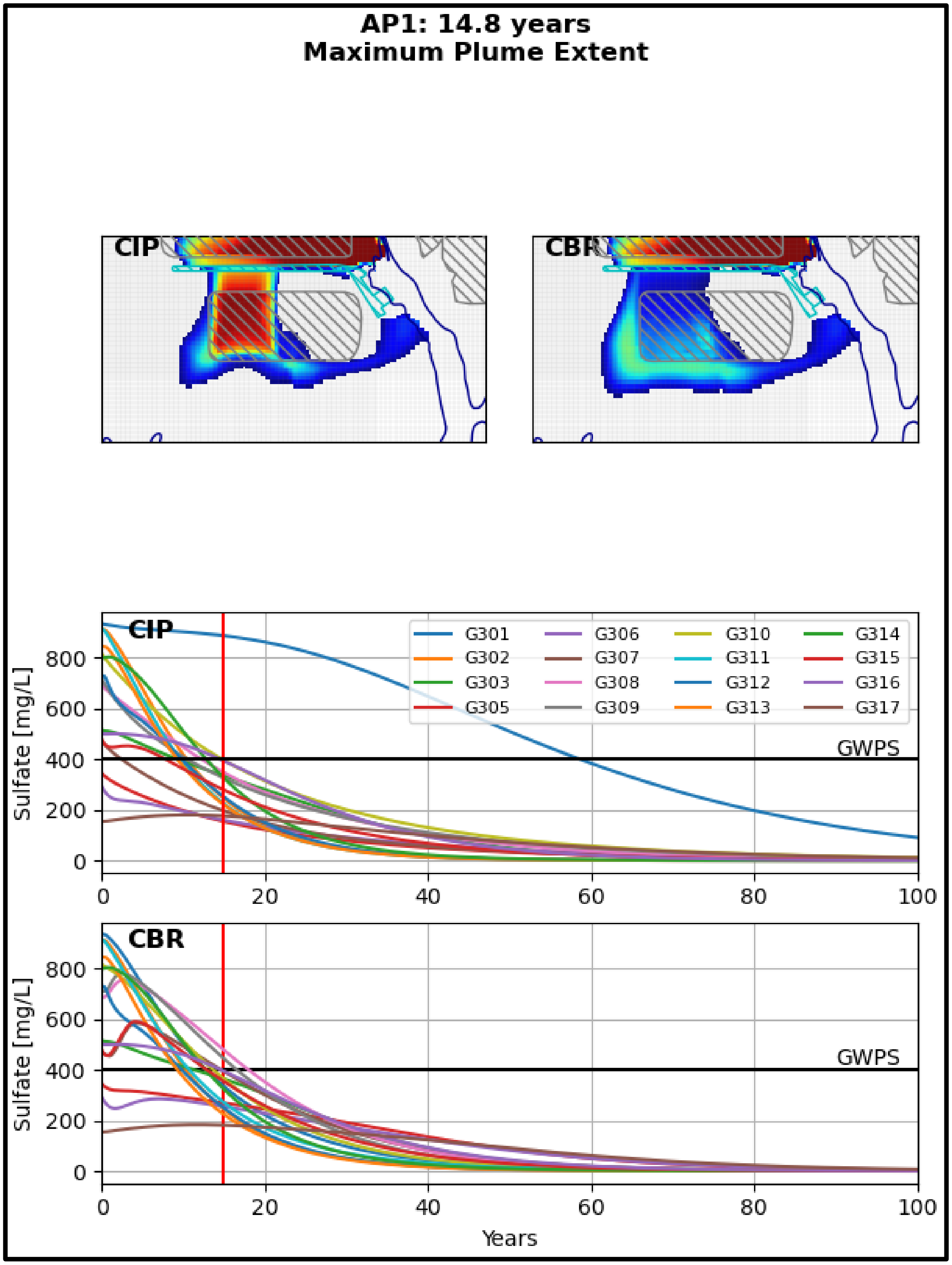
GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL



SIMULATED SULFATE PLUME OF THE UA FOR THE CIP AND CBR SCENARIOS AFTER 14.8 YEARS

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

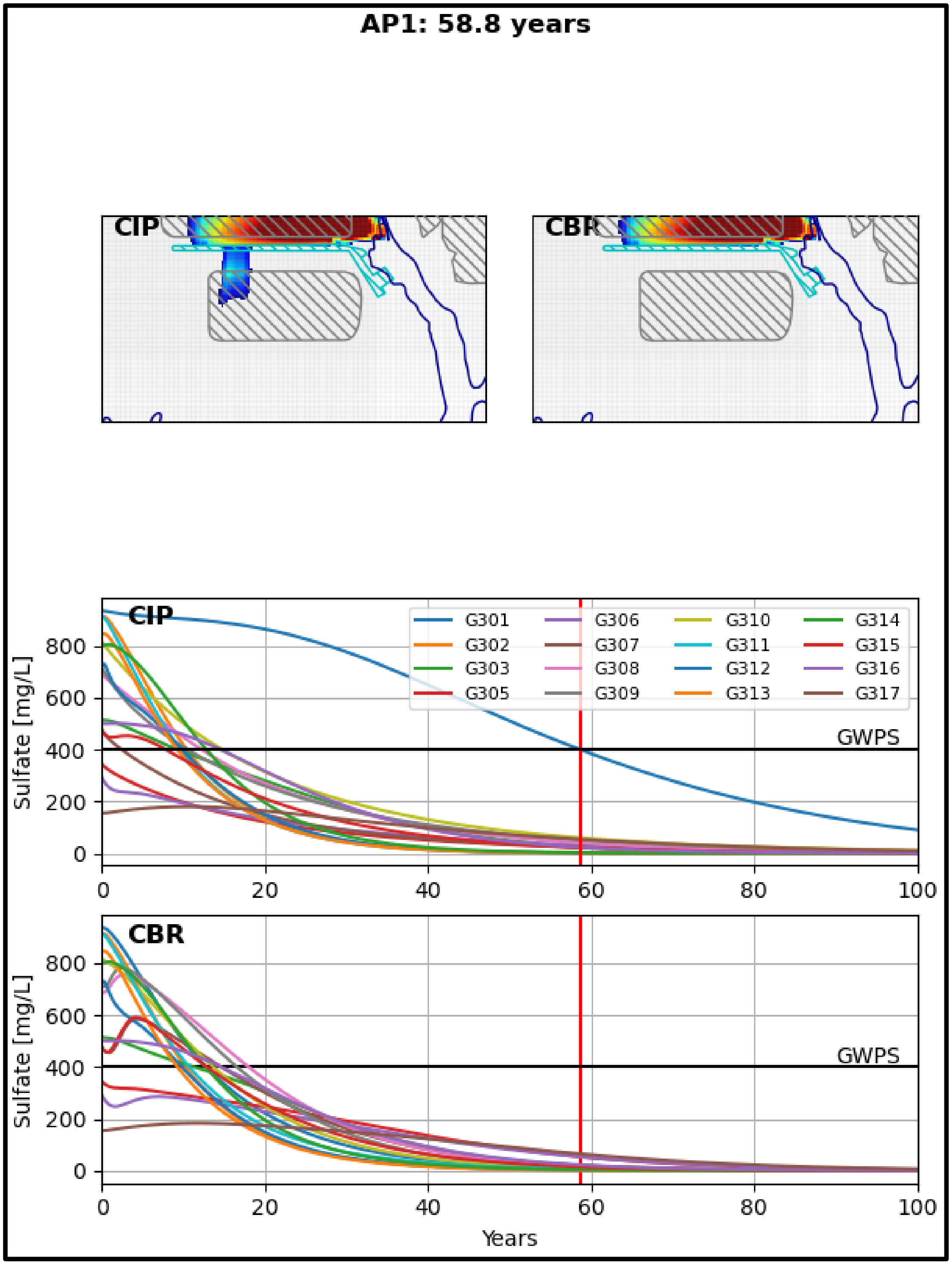


SIMULATED MAXIMUM EXTENT OF THE SULFATE PLUME FOR THE CIP AND CBR SCENARIOS AFTER 14.8 YEARS

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

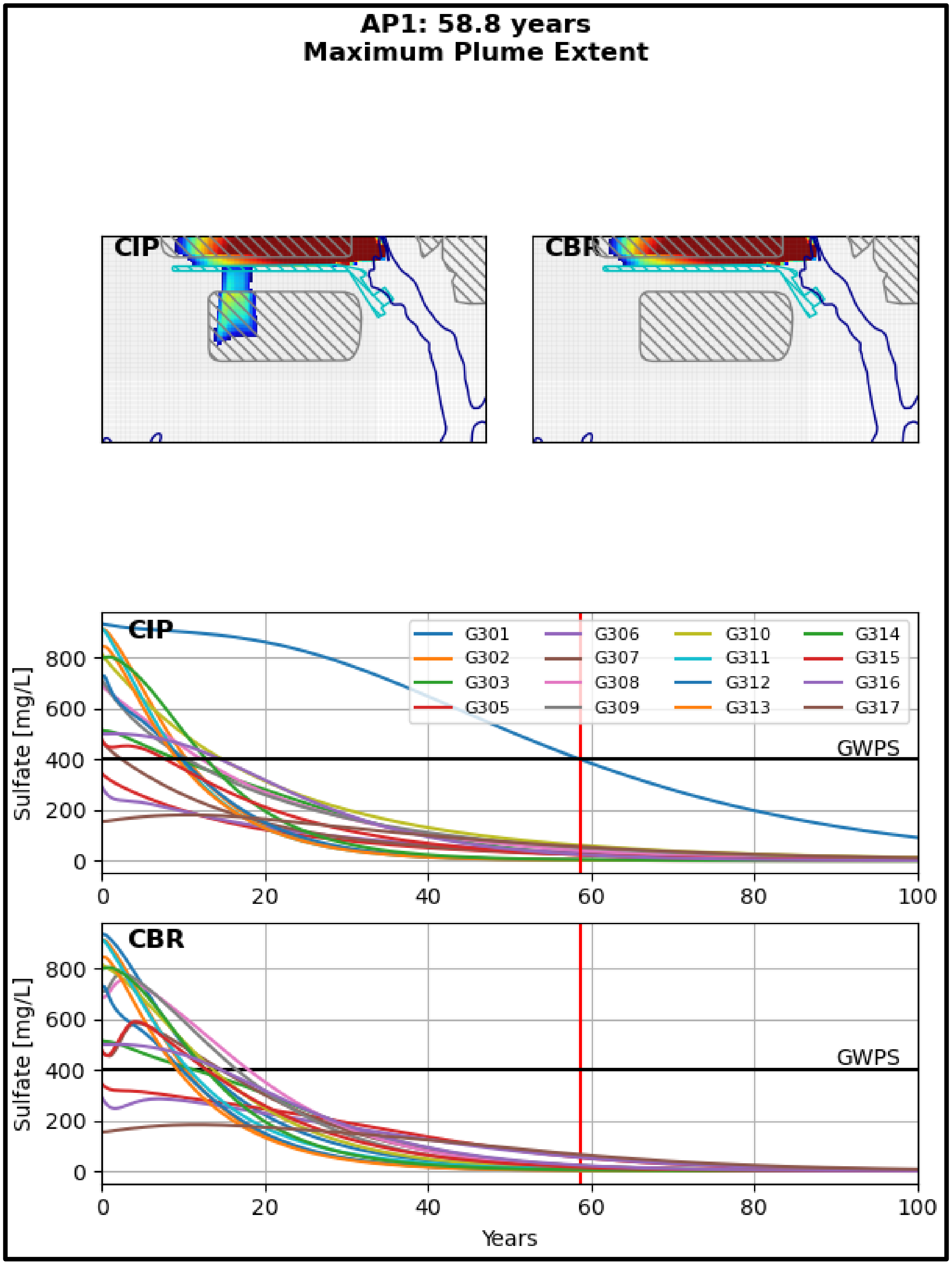
FIGURE 6-5



SIMULATED SULFATE PLUME OF THE UA FOR THE CIP AND CBR SCENARIOS AFTER 58.8 YEARS

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

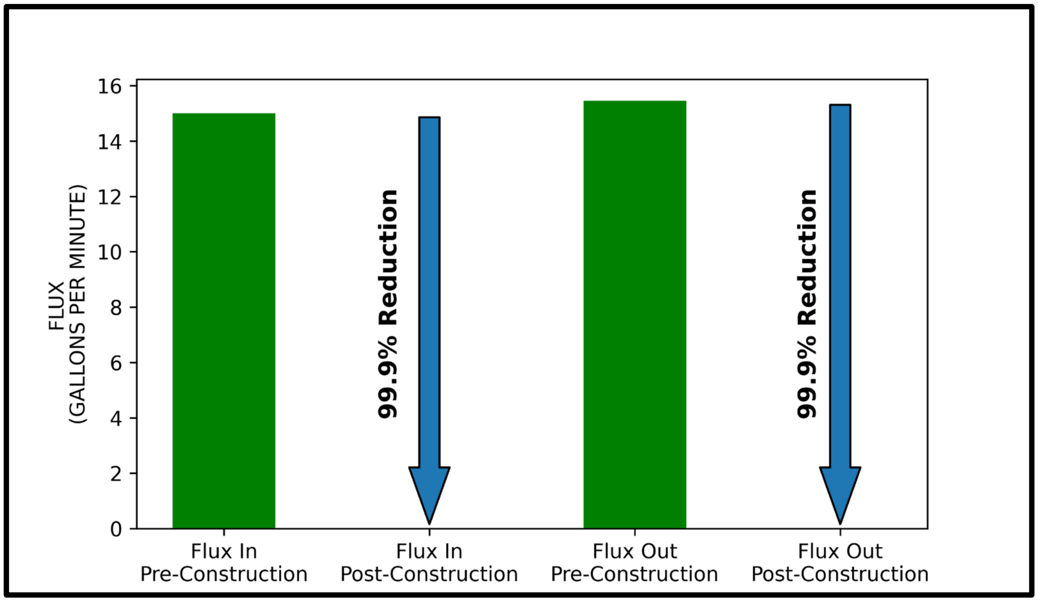
RAMBOLL



SIMULATED MAXIMUM EXTENT OF THE SULFATE PLUME FOR THE CIP AND CBR SCENARIOS AFTER 58.8 YEARS

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

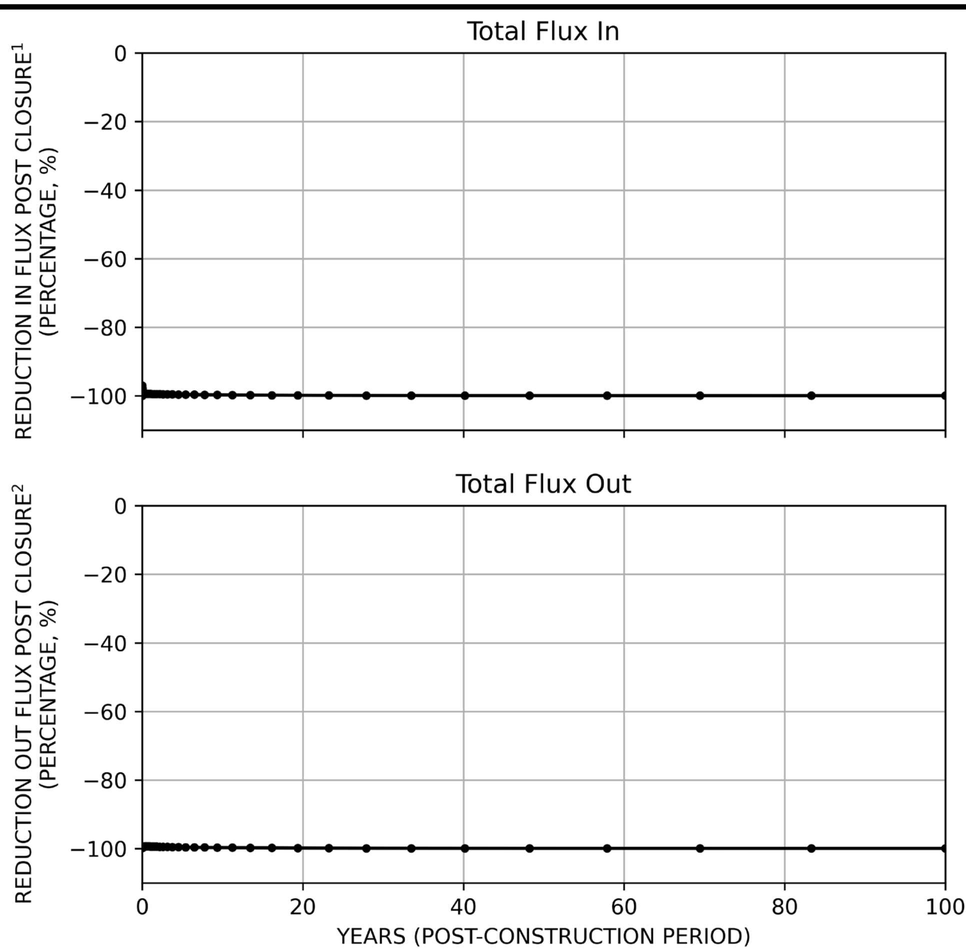
RAMBOLL



SCENARIO 1 (CIP) –
HYDRAULIC STEADY STATE REDUCTIONS IN TOTAL FLUX IN AND OUT OF FILL UNIT (CCR)

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL



[1] Reduction in flux in compared to flux in at the end of the calibration model (model period of 42 years). Reduction in flux in are expressed as negative percentages to illustrate decreases in flux over time.

[2] Reduction in flux out compared to flux out at the end of the calibration model (model period of 42 years). Reduction in flux out are expressed as negative percentages to illustrate decreases in flux over time.

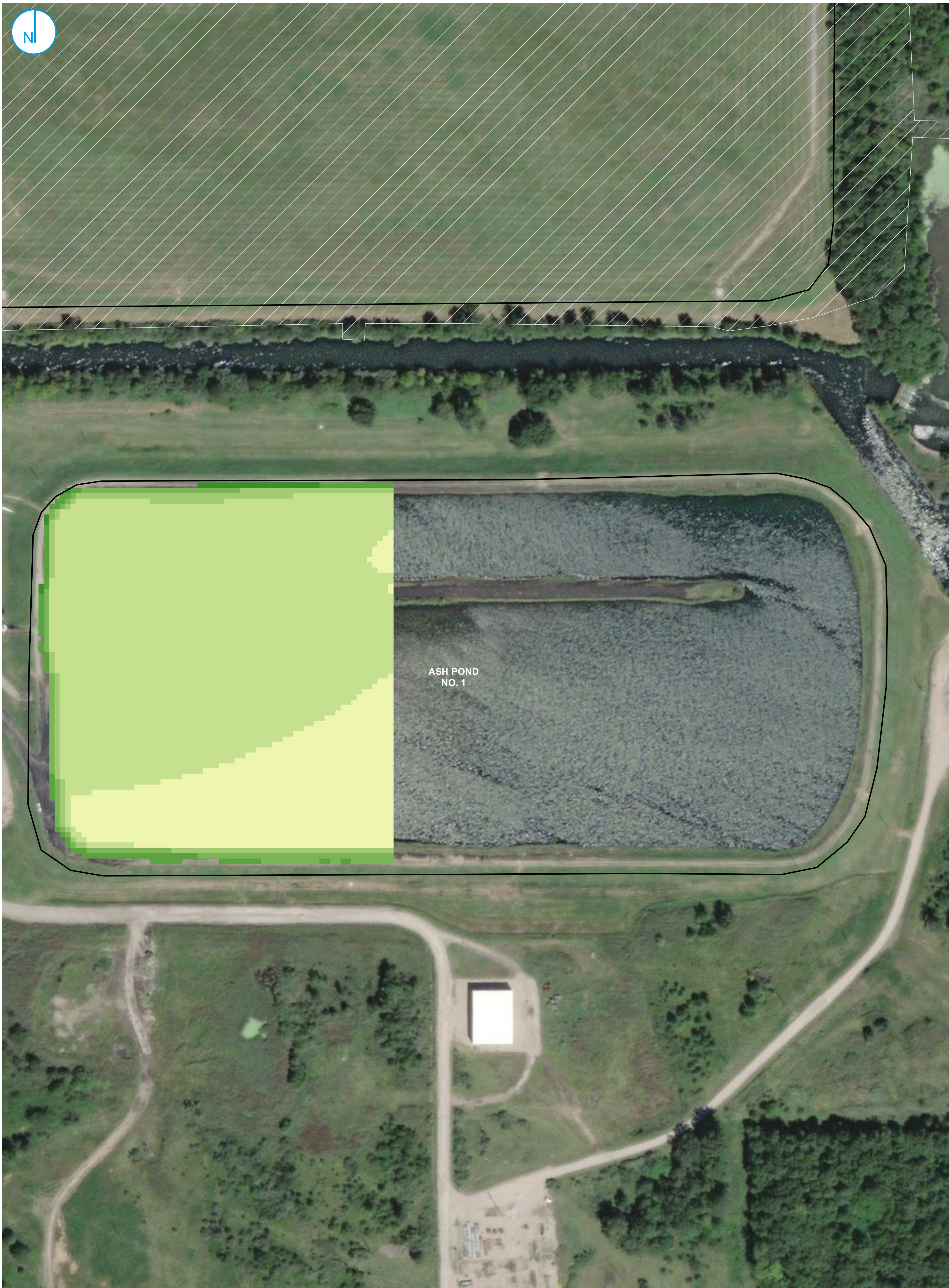
SCENARIO 1 (CIP) –
REDUCTIONS IN TOTAL FLUX IN AND OUT OF FILL UNIT (CCR)

GROUNDWATER MODELING REPORT
ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL

PROJECT: 169000XXXX | DATED: 7/1/2022 | DESIGNER: galarnmc

Y:\Mapping\Projects\22\2285\MXD\IntersectingGW_2022\COF AP1 BOA Saturation CIP.mxd



SITE FEATURE

LIMITS OF FINAL COVER

DIFFERENCE BETWEEN BOTTOM OF CCR AND SIMULATED GROUNDWATER SURFACE*
(FEET, POSITIVE VALUES INDICATE SEPARATION)

0 - 5
5.1 - 10
10.1 - 15
15.1 - 20
20.1 - 25
25.1 - 30

0 87.5 175 Feet

*GROUNDWATER SURFACE BASED ON SIMULATED CLOSURE IN PLACE SCENARIO AT HYDRAULIC STABILIZATION.

POTENTIAL ASH SATURATION SIMULATED CLOSURE IN PLACE GROUNDWATER SURFACE

COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 6-9

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

APPENDICES

APPENDIX A
EVALUATION OF POTENTIAL GWPS EXCEEDANCES

EVALUATION OF POTENTIAL GROUNDWATER PROTECTION STANDARD EXCEEDANCES

Coffeen Ash Pond No. 1
Coffeen, Illinois

Prepared for

Illinois Power Generating Company

Submitted by

Geosyntec consultants

engineers | scientists | innovators

1 McBride and Son Center Dr Suite 202
Chesterfield, Missouri 63005

July 5, 2022

GLP8029

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

AP1	Ash Pond No. 1
AP2	Ash Pond No. 2
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CPP	Coffeen Power Plant
DA	Deep Aquifer
DCU	Deep Confining Unit
IPGC	Illinois Power Generation Company
LCU	Lower Confining Unit
mg/L	Milligram per Liter
NID	National Inventory of Dams
ORP	Oxidation-Reduction Potential
QC	Quality Control
SI	Saturation Index
SU	Standard Units
TDS	Total Dissolved Solids
UA	Uppermost Aquifer
UCU	Upper Confining Unit
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

SECTION 1

INTRODUCTION

The Illinois Power Generation Company (IPGC) currently operates the Coffeen Power Plant (CPP) and its associated ash ponds. In October 2021, the IPGC submitted an Operating Permit application for the coal combustion residual (CCR) Unit referred to as the Ash Pond Number (No.) 1 (AP1), Vistra identification (ID) No. 101, IEPA ID No. W1350150004-01, and National Inventory of Dams (NID) No. IL50722 (Burns & McDonnell, 2021). The Operating Permit was prepared to comply with Part 845 "Standards of the Disposal of Coal Combustion Residuals in Surface Impoundments (Part 845), which was promulgated by the Illinois Pollution Control Board on April 21, 2021. Ramboll Americas Engineer Solutions, Inc. (Ramboll) identified potential groundwater protection standard (GWPS) exceedances for multiple constituents in groundwater samples collected from monitoring wells in the vicinity of AP1, as presented in the Operating Permit Application. This report was developed to further evaluate the potential GWPS exceedances identified.

SECTION 2

BACKGROUND

A brief description of the site location, AP1 design, geology, and groundwater assessment activities to date are described below.

2.1 Site Location and Description

The CPP, operated by the IPGC is located in Montgomery County, Illinois approximately two miles south of the City of Coffeen in Section 11, Township 7 North, and Range 7 East. The CPP is located between the two lobes of Coffeen Lake to the west, east, and south, and is bordered by agricultural land to the north. The CPP operated as a coal-fired power plant from 1964 to November 2019 and has five CCR management units. The approximately 1,100-acre Coffeen Lake was built by damming the McDavid Branch of the East Fork of Shoal Creek in 1963 for use as an artificial cooling lake for the CPP. Historically, coal mines were operated at depth in the vicinity of the CPP as well as a US Minerals processing facility located to the north. Mine shafts, processing facilities, and coal storage associated with these historical operations were located south of AP1.

2.2 Ash Pond 1 Design

Coffeen AP1 is a 23-acre, unlined surface impoundment used to manage CCR and non-CCR waste streams at the CPP. The location of AP1 relative to the proposed monitoring well network is displayed on Figure 2-1 of the Groundwater Monitoring Plan Report (Ramboll, 2021a) and is provided herein as **Appendix A**. AP1 (also known as the Bottom Ash/Recycle Pond) is a reclaimed ash pond that was constructed utilizing the existing earthen berms with reinforcement. AP1 is an unlined surface impoundment which covers an area of approximately 23 acres, has berms up to 41 feet above the surrounding land surface, and a capacity of 300 acre-feet. It primarily received bottom ash and low volume wastes from floor drains in the main power block building. Several years ago, air heater wash and boiler chemical cleaning wastes were directed to AP1, but this practice was discontinued. The bottom ash is periodically removed from AP1 for beneficial uses by a third-party contractor. Sluicing of waste to AP1 ceased prior to November 4, 2019.

2.3 Geology and Hydrogeology

The AP1 geologic and hydrogeologic setting summarized below is excerpted from the Hydrogeologic Site Characterization Report (HCR) for AP1 (Ramboll, 2021b).

There are five principal layers of unlithified material present below AP1 and above bedrock which are categorized into hydrostratigraphic units listed below (from the surface downward) based on stratigraphic relationships and hydrogeologic characteristics:

- **Upper Confining Unit (UCU):** Composed of the Roxana and Peoria Silts (Loess Unit) and the upper clayey portion of the Hagarstown member which are classified as silts-clayey silts and gravelly clay below the surficial soil. The UCU has been eroded east of AP1, near the Unnamed Tributary.

- **Uppermost Aquifer (UA):** The uppermost aquifer is the Hagarstown Member which is classified as primarily sandy-gravelly silts and clays with thin beds of sands. Similar to the Loess Unit, the Hagarstown is absent in some locations near the Unnamed Tributary.

- **Lower Confining Unit (LCU):** Comprised of the Vandalia Member, Mulberry Grove Member, and Smithboro Member. These units include a sandy-silty till with thin, discontinuous sand lenses, a discontinuous and limited extent sandy silt which has infilled prior erosional features, and silty-clayey diamicton, respectively. This unit has been identified as a potential migration pathway (PMP) because downward vertical gradients indicate that there is the potential for impacts to migrate within this unit.

- **Deep Aquifer (DA):** Comprised of sand and sandy silt/clay units of the Yarmouth Soil, which include accretionary deposits of fine sediment and organic materials, typically less than five feet thick and discontinuous across the CPP. This unit is also identified as a PMP, because it is the first permeable unit below the uppermost aquifer.

- **Deep Confining Unit (DCU):** Comprised of the Banner Formation, generally consisting of clays, silts, and sands. The Lierle Clay Member is the upper layer of the Banner Formation which was encountered at the Site.

Bedrock is comprised of the Bond Formation, which consists of limestone and calcareous clays and shale. Bedrock was not encountered in the borings advanced to date at CPP.

Flow of groundwater from central portions of the CPP to Coffeen Lake or the Unnamed Tributary through the UA are the primary pathways for contaminant migration. The LCU and DA underlying the UA have been identified as PMPs. Groundwater elevations are primarily controlled by surface topography, geologic unit topography, and water levels within Coffeen Lake and the Unnamed Tributary. A groundwater divide trending north-south is observed running through the approximate center of the CPP (Figure 1-3 of Ramboll [2021a], provided as **Appendix B**). Phreatic surfaces or water elevations within the surface impoundments are generally consistent and have not been observed to fluctuate with groundwater elevations, indicating limited hydraulic connection with the surface impoundments.

2.4 Groundwater and AP1 Monitoring

The proposed Part 845 monitoring well network for AP1 was established in the Groundwater Monitoring Plan (Ramboll, 2021a). The proposed monitoring well network consists of sixteen (16) monitoring wells, which are installed in the UA, LCU, DA, and temporary water-level only surface water staff gages. Two of the installed wells are background monitoring wells (G281 and G306) and the remaining fourteen are compliance monitoring wells. Both background wells and most compliance wells are screened within the UA. G307D, G314, and G316 are screened within the LCU, and G314D is screened within the DA. Well locations are shown on **Appendix A**.

SECTION 3
POTENTIAL GROUNDWATER PROTECTION STANDARD EXCEEDANCE REVIEW

An evaluation of the history of potential GWPS exceedances was completed for the Operating Permit application in October 2021 (Burns & McDonnell, 2021). Groundwater concentrations from 2015 to 2021 were evaluated for potential exceedances in accordance with the Statistical Analysis Plan proposed in the Operating Permit application. Potential exceedances are summarized below:

- Boron at monitoring well G313: The boron statistical result at G313 is 3.5 milligrams per liter (mg/L), which exceeds the Part 845 GWPS (3.2 mg/L).

- Cobalt at monitoring well G314: The cobalt statistical result at G314 is 0.00959 mg/L which exceeds the Part 845 GWPS (0.006 mg/L).

- pH (field) at monitoring well G312: The pH statistical result at G312 is 6.4 standard units (SU), which is below the lower limit of the Part 845 GWPS (6.5/9.0 SU).

- Sulfate at monitoring wells G301, G303, G304, G305, G307, G307D, G308, G309, G310, G311, G312, G313, G314, G314D, G315, and G317: The sulfate statistical results ranged from 464 to 1100 mg/L and individually exceed their relevant Part 845 GWPS (400 to 700 mg/L) for the identified wells.

- Total dissolved solids (TDS) at monitoring wells G303, G304, G305, G307, G307D, G308, G309, G310, G311, G312, G313, G314, G315, and G317: The TDS statistical results ranged from 1210 to 1900 mg/L which exceed the Part 845 GWPS (1200 mg/L).

A review of groundwater, porewater, soil, and ash data indicates that the potential exceedances of cobalt at G314 and pH at G312 are not related to AP1, as documented in Section 4. An evaluation of alternative sources of the boron, sulfate, and TDS potential exceedances was not completed at this time.

SECTION 4
LINES OF EVIDENCE

A review of groundwater, porewater, soil, and ash data indicates that the potential GWPS exceedances of cobalt at G314 and the pH value at G312 are not related to AP1, as supported by the lines of evidence (LOE) below:

1. AP1 porewater samples do not contain detectable concentrations of cobalt.
2. Cobalt concentrations in ash samples collected from AP1 are comparable to or lower than cobalt concentrations in soil samples near AP1.
3. Monitoring well G314 has experienced significant changes in oxidation-reduction (redox) conditions since well installation occurred, which may impact cobalt behavior in groundwater.
4. AP1 porewater is slightly basic and would not result in low pH measurements at monitoring well G312.
5. pH values within the proposed monitoring well network are strongly correlated with saturation indices of carbonate minerals in soil near AP1.

4.1 LOE #1: AP1 porewater samples do not contain detectable concentrations of cobalt

Of the three AP1 porewater sampling locations analyzed for cobalt (AP1d, XPW01, and XPW02), none have ever contained cobalt concentrations above the method detection limit of 0.002 mg/L; therefore, cobalt concentrations detected at G314 cannot be derived from a mixing scenario between groundwater and AP1 porewater. In contrast, both background monitoring wells have at times contained cobalt concentrations within the range observed at G314. This indicates that aqueous cobalt is naturally present in groundwater at CPP at variable concentrations.

Figure 1 displays cobalt concentrations over time for G314, background wells G306 and G281, and porewater samples from AP1. Cobalt concentrations at G314 display an increasing trend, but this trend is punctuated by a concentration decrease in the most recent sampling event. The highest values at G314 are comparable to or lower than select results observed at background well G306, suggesting there is variability within the aquifer.

4.2 LOE #2: Cobalt concentrations in ash samples collected from AP1 are comparable to or lower than cobalt concentrations in soil samples near AP1

Soil samples were collected in May 2021 and September 2021 adjacent to select existing monitoring wells and analyzed for total metals. Cobalt concentrations in soil are displayed in **Table 1** along with total cobalt concentrations in ash material collected from AP1. Cobalt concentrations in ash from AP1 (4.3 – 4.8 mg/kg) fall within the range of cobalt concentrations observed in CPP soil (4.0 – 10 mg/kg). Cobalt concentrations in soil are highest at Ash Pond No.2 (AP2) background monitoring well G270, which is in a background location relative to AP1 (**Appendix B**). **Table 1** indicates variability in cobalt concentrations detected in soil across the CPP. Three sample locations (two background locations and one compliance location) contained greater cobalt concentrations than ash samples, indicating that naturally occurring cobalt exists in solid phase across the CPP at equivalent or greater concentrations than within AP1 itself.

4.3 LOE #3: Monitoring well G314 has experienced significant changes in oxidation-reduction (redox) conditions since well installation occurred, which may impact cobalt behavior in groundwater

Groundwater oxidation-reduction potential (ORP) was measured as a field parameter during the sample collection process at monitoring wells in the proposed network. ORP is a measure of the redox conditions of water which, along with other parameters like pH, temperature, and chemical composition, govern the stability of minerals comprising groundwater aquifer solids. ORP values over time at recently installed compliance monitoring wells are displayed on **Figure 2**. ORP values for recently installed wells display a decreasing trend, indicating a shift from highly oxic to near reducing conditions. This decreasing trend is hypothesized to be attributable to stabilization of the new wells following the potential introduction of drilling water involved in the well installation process. Such a change in geochemical conditions can influence the stability of redox-sensitive mineral phases such as iron and manganese oxides. Significantly, decreases in ORP are commonly correlated with dissolution of iron and manganese bearing minerals, leading to the release of ions associated with these mineral phases.

Cobalt is known to undergo isomorphic substitution for iron in crystalline iron minerals such as iron oxides, iron sulfides, and iron carbonates due to the similar ionic radii of approximately 1.56 angstroms (Å) for iron vs. 1.52 Å for cobalt (Clementi and Raimondi, 1963; Krupka and Serne, 2002; Hitzman et al., 2017). Soil samples around AP1 were collected and submitted for mineralogical analysis via X-ray diffraction (XRD) to determine the mineralogical composition of the natural aquifer material. XRD results are shown in **Table 2**. **Table 2** indicates that the majority component of site soils consists of geochemically inert minerals quartz and feldspar (microcline and albite). No iron oxides or iron sulfides were detected in XRD analysis, but iron-bearing carbonate mineral ankerite ($Ca,Fe(CO_3)_2$) was detected at a maximum abundance of 7.7 wt.%.

An Eh-pH diagram displaying the thermodynamic stability of iron phases was generated using the average composition of G314 groundwater (**Figure 3**). Geochemical conditions during initial sampling events favored thermodynamic stability of the ferric (Fe^{3+}) iron hydroxide mineral $Fe(OH)_3$; however, no iron hydroxide or oxide minerals were present in XRD results above the detection limit of 0.5%. **Figure 3** indicates G314 groundwater conditions have shifted in recent sampling events, favoring the formation of ferrous (Fe^{2+}) carbonate mineral siderite ($FeCO_3$). The modeled shift of thermodynamic stability away from iron hydroxide and oxide minerals and towards iron carbonates would result in the release of iron and isomorphically substituted cobalt into groundwater through mineral dissolution reactions.

While siderite was not detected in the XRD results, iron-bearing carbonate mineral ankerite was detected at abundances of up to 7.7 wt.%. Ankerite exists in nature as a solid-solution mineral without a fixed mineral formula. As a result, accurate thermodynamic information is not available for modeling purposes and ankerite was consequently not included in the thermodynamic database used to generate **Figure 3**. It is likely that ankerite thermodynamic stability is favored over siderite stability at G314 and the ankerite detected in XRD analyses is a product of the formation of carbonate minerals in an iron-rich environment.

Naturally occurring cobalt is known to substitute for iron in iron-bearing minerals. Thermodynamic modeling indicates that a recent trend in redox conditions has resulted in a mineral stability shift from iron hydroxides and oxides towards iron carbonates. The presence of ankerite, an iron-bearing carbonate mineral, has been confirmed across the site. The modeled dissolution of iron hydroxide and oxide minerals may have resulted in isomorphically substituted cobalt being released from the crystal structure of these minerals and entering groundwater. The presence of observed iron carbonate minerals in soil samples supports the occurrence of this mineralogical shift.

4.4 LOE #4: AP1 porewater is slightly basic and would not result in low pH measurements at monitoring well G312

Groundwater pH conditions were measured as a field parameter during the sample collection process at monitoring wells within the proposed monitoring well network. A time series plot of field pH measurements at G312, background wells G281 and G306, and AP1 porewater monitoring locations XPW-01 and XPW-02 is provided as **Figure 4**. Groundwater at monitoring well G312 contains pH levels below the calculated lower GWPS for pH of 6.5 SU. Low pH values at G312 cannot be attributed to AP1, because AP1 porewater samples are consistently slightly basic (pH values range from 7.78-8.08). Physical mixing of AP1 porewater with G312 groundwater would result in an increase in pH at G312. In contrast, pH values at background well G306 were occasionally measured at 6.5 SU, which is within the range of measurements observed at G312. Therefore, low pH conditions at G312 are attributable to natural variability within the aquifer.

4.5 LOE #5: pH values within the proposed monitoring well network are strongly correlated with saturation indices of carbonate minerals in soil near AP1

As mentioned in Section 4.3, composite soil samples from various locations surrounding AP1 were collected and submitted for mineral identification analysis via XRD (**Table 2**). Soil surrounding AP1 contains variable abundances of carbonate minerals such as calcite, dolomite, and ankerite, with the total abundance of carbonates at each location ranging an order of magnitude from 2.7-27.5 wt.%. Carbonate minerals in nature function as pH buffers, capable of neutralizing acidity through reaction with carbonate (CO_3) (Drever, 1988). pH levels at individual wells may be significantly influenced by the presence and abundance of carbonate minerals comprising localized sections of the aquifer unit. Although soil samples were not collected for all wells of interest, carbonate saturation indices (SIs) provide a method to assess the role of carbonate minerals in soil buffering capacity in the absence of XRD results.

United States Geologic Survey (USGS) software package PHREEQC was used to calculate SIs of carbonate minerals at G312 and background wells G281 and G306 based on groundwater compositions. A mineral's SI is an expression of its thermodynamic equilibrium state relative to a liquid (groundwater). If the calculated SI for a mineral is negative, then that mineral is undersaturated relative to groundwater and is thermodynamically favored to dissolve. If the calculated SI for a mineral is positive, then that mineral is supersaturated relative to groundwater and is thermodynamically favored to precipitate. If a mineral's SI is approximately 0 (+\- 0.2), then the mineral is in thermodynamic equilibrium with groundwater. SIs for calcite ($CaCO_3$) and dolomite ($Ca,Mg(CO_3)_2$) were plotted against pH for individual samples (**Figure 5**). **Figure 5** demonstrates a strong positive correlation between pH and carbonate SI. pH values tend to be lower in groundwater that is undersaturated with respect to carbonate minerals. This relationship is expected – monitoring wells which favor carbonate dissolution are likely to contain less carbonate in the solid phase. Absence of carbonate in localized portions of the aquifer results in the inability of these locations to buffer low pH groundwater. According to **Figure 5**, background wells G281 and G306 are near equilibrium or supersaturated with respect to carbonate minerals and are likely to have these minerals present and stable. These wells would then have greater capability to buffer acidic water and retain near-neutral pH values. G312 was not sampled for mineralogy, although **Figure 5** demonstrates that groundwater from this well is undersaturated with respect to carbonate minerals, suggesting that large abundances of carbonate are not likely to be present in aquifer solids at this location.

XRD analyses indicate carbonate mineral abundances around AP1 vary up to an order of magnitude (**Table 2**). Evaluation of carbonate SIs reveals that a strong correlation exists between carbonate SIs and pH. G312 is undersaturated with respect to calcite and dolomite; therefore, these minerals are likely not present as pH buffers, resulting in lower groundwater pH values where acid neutralizing minerals are not available.

SECTION 5

CONCLUSIONS

Based on these five LOEs, it has been demonstrated that AP1 is not the source of the potential cobalt and pH exceedances identified.

1. AP1 porewater samples do not contain detectable concentrations of cobalt, whereas cobalt concentrations in background well G306 occasionally exceed the relevant GWPS.

2. Cobalt concentrations in ash samples collected from AP1 are comparable to or lower than cobalt concentrations in soil samples from downgradient and background monitoring wells.

3. Monitoring well G314 has experienced significant changes in oxidation-reduction (redox) conditions since well installation occurred, which may cause destabilization of iron-bearing minerals capable of hosting cobalt ions in their crystal structure.

4. AP1 porewater is slightly basic and would not result in low pH measurements at monitoring well G312.

5. pH values within the proposed monitoring well network are strongly correlated with saturation indices of carbonate minerals which are detected at variable abundances across soil near AP1.

SECTION 6

REFERENCES

Burns & McDonnell. 2021. Initial Operating Permit – Coffeen Ash Pond No. 1. October.

Clementi, E., and Raimdoni, D. L. 1963. Atomic screening constants from SCF functions. *J. Chem. Phys.,* 38, 2686.

Drever, J. 1988. *The Geochemistry of Natural Waters*. Englewood Cliffs, N.J: Prentice Hall.

Hitzman, M.W., Bookstrom, A.A., Slack, J.F., and Zientek, M.L., 2017. Cobalt – Styles of Deposits and the Search for Primary Deposits. USGS Open File Report 2017-1155.

Krupka, K.M. and Serne, R.J., 2002. Geochemical Factors Affecting the Behavior of Antimony, Cobalt, Europium, Technetium, and Uranium in Vadose Sediments. Pacific Northwest National Lab, PNNL-14126. December.

Ramboll. 2021a. Groundwater Monitoring Plan, Ash Pond No.1, Coffeen Power Plant, Coffeen, Illinois. October.

Ramboll. 2021b. Hydrogeologic Site Characterization Report, Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois. October.

TABLES

Table 1: Cobalt Concentrations in Soil and Ash
Coffeen Power Plant - Ash Pond No. 1

Sample Location	Description	Sample Depth (feet)	Cobalt (mg/kg)
G270	Background	16-20	10
G306	Background	14-16	6.0
G311	Compliance	14-15	4.0
G313	Compliance	8-9	7.0
G316	Compliance	13-16	4.0
XPW01	Ash Pond 1	NA	4.8
XPW02	Ash Pond 1	NA	4.3

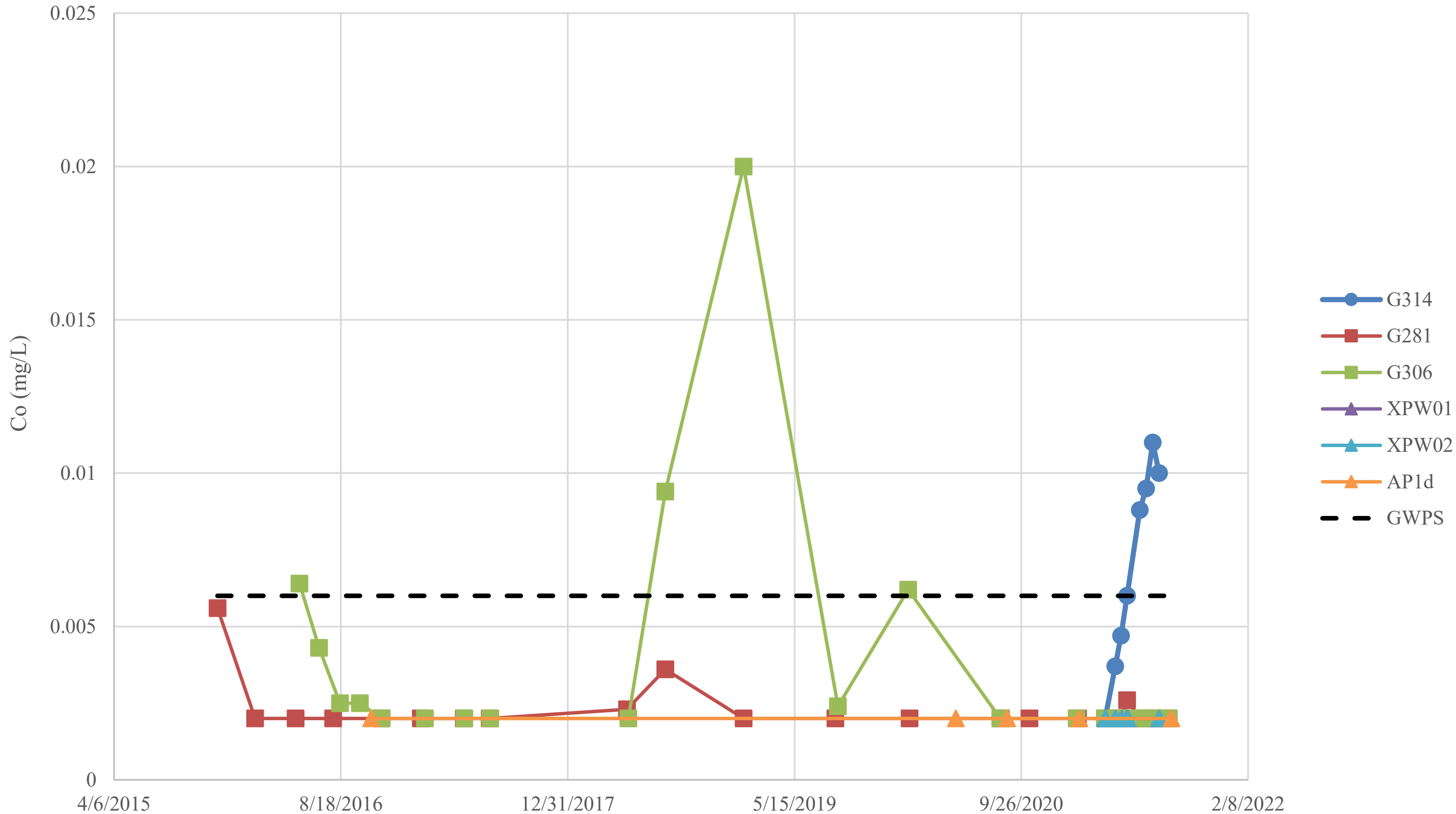
Notes:
Soil samples were composite samples collected over the indicated depth range

Table 2: Summary of X-ray Diffraction Results *Geosyntec Consultants, Inc.*
Coffeen Power Plant - Ash Pond No. 1

Sample ID	**SB-306**	**SB-311**	**SB-313**	**SB-316**
Sample Depth (ft.) / **Mineral**	14-16	14-15	8-9	13-16
Quartz	70.9	58.9	51.3	67.6
Microcline	8.5	7.4	7.6	9.8
Albite	9.6	8.6	7.9	9.6
Chlorite	1.8	1.7	1.1	1.7
Diopside	3.1	3.8	4.6	1.3
Muscovite	-	-	-	7.3
Carbonate Minerals				
Calcite	0.5	2.5	4.1	-
Dolomite	3.5	12.1	15.7	1.9
Ankerite	2.1	5	7.7	0.8
Carbonate Total	*6.1*	*19.6*	*27.5*	*2.7*

Notes:
Results presented in units of weight %
 - : Mineral was not detected in sample
Weight % quantities have been normalized to a sum of 100% to remove reporting of amorphous material
Carbonate total consists of calcite, dolomite, and ankerite

FIGURES



Notes: Data displayed for compliance well G314, background wells G281 and G306, and pore water samples XPW01, XPW02, and AP1d. The calculated Groundwater Protection Standard (GWPS) is indicated by the dashed line. Samples which did not contain cobalt concentrations above the method detection limit of 0.002 mg/L are displayed on the figure as having a detected concentration of 0.002 mg/L.

Aqueous Cobalt Time Series

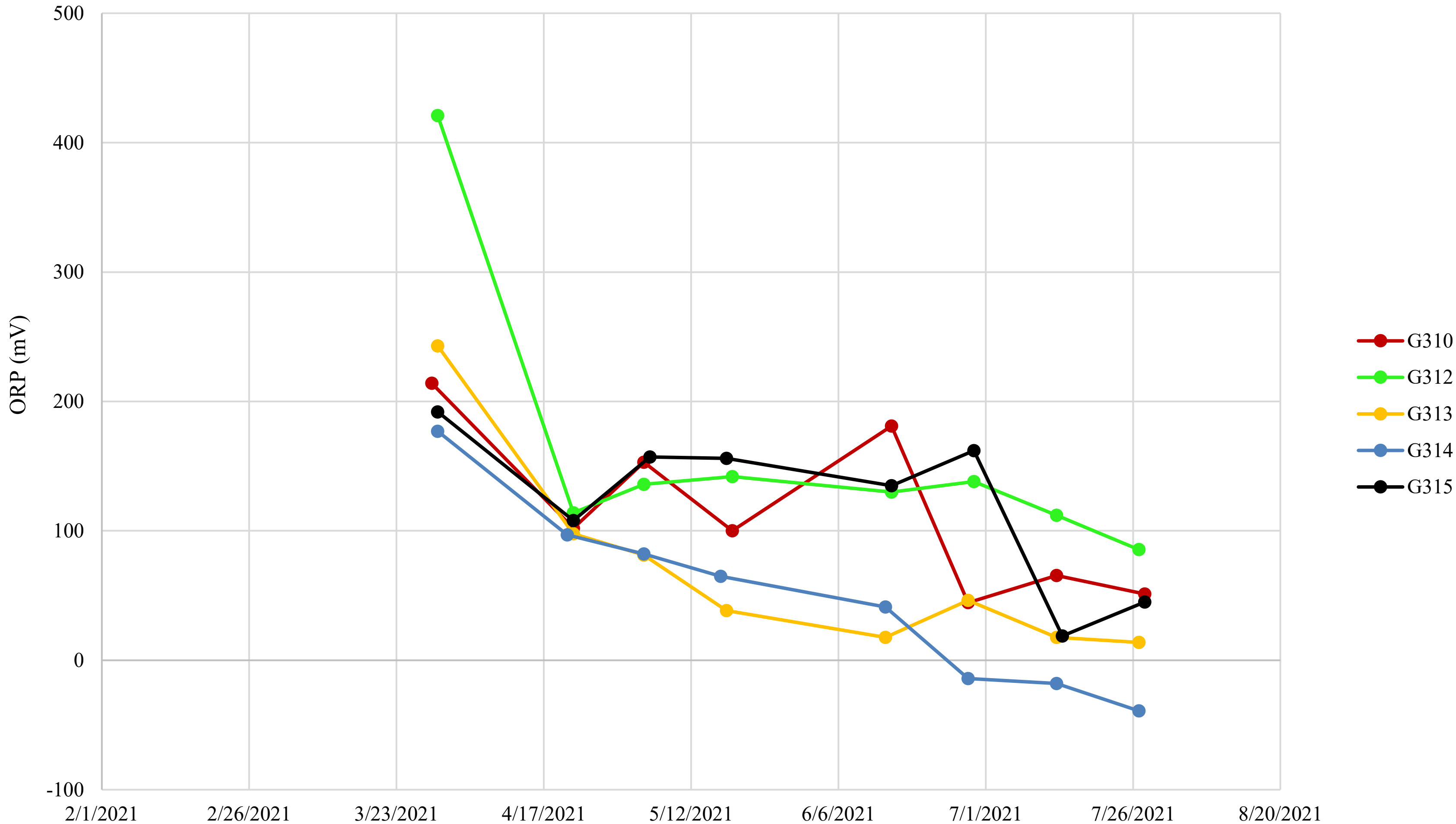
Coffeen Power Plant

Geosyntec consultants

Columbus, OH

April 2022

Figure 1



Notes: Groundwater monitoring began at all wells displayed in March 2021. Positive ORP values are considered indicative of oxic environments, and negative ORP values are considered indicative of anoxic environments.

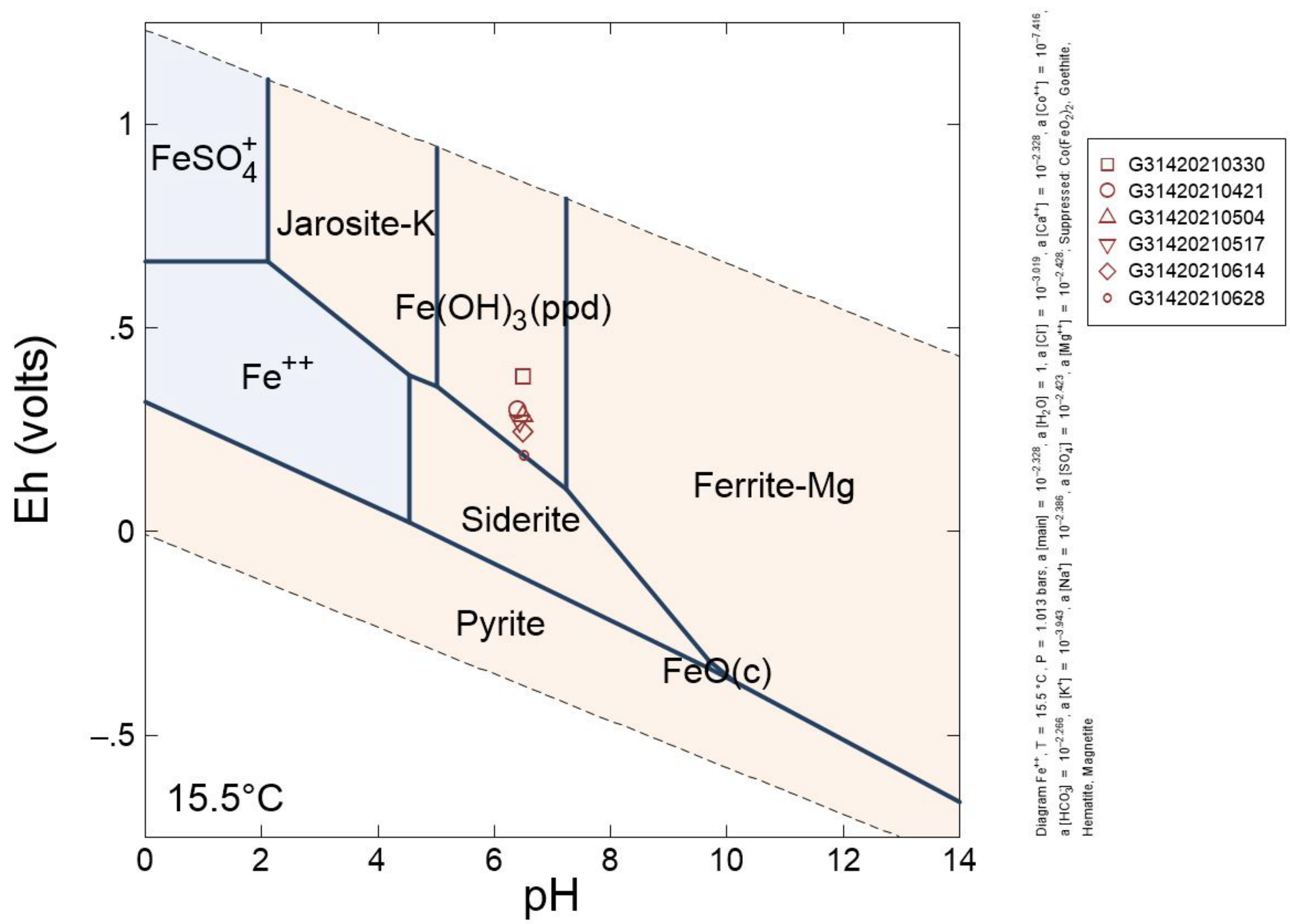
Oxidation-Reduction Potential (ORP) Time Series – Recently Installed Wells
Coffeen Power Plant

Geosyntec consultants

Figure 2

Columbus, OH

April 2022



Notes: The average groundwater composition of compliance monitoring well G314 was used to establish baseline conditions for the diagram. Eh and pH values for sampling dates at G314 are shown on the diagram. Fe-oxide phases hematite, goethite, and magnetite were suppressed to reflect detected mineralogy from XRD analysis.

G314 Eh-pH Diagram - Iron

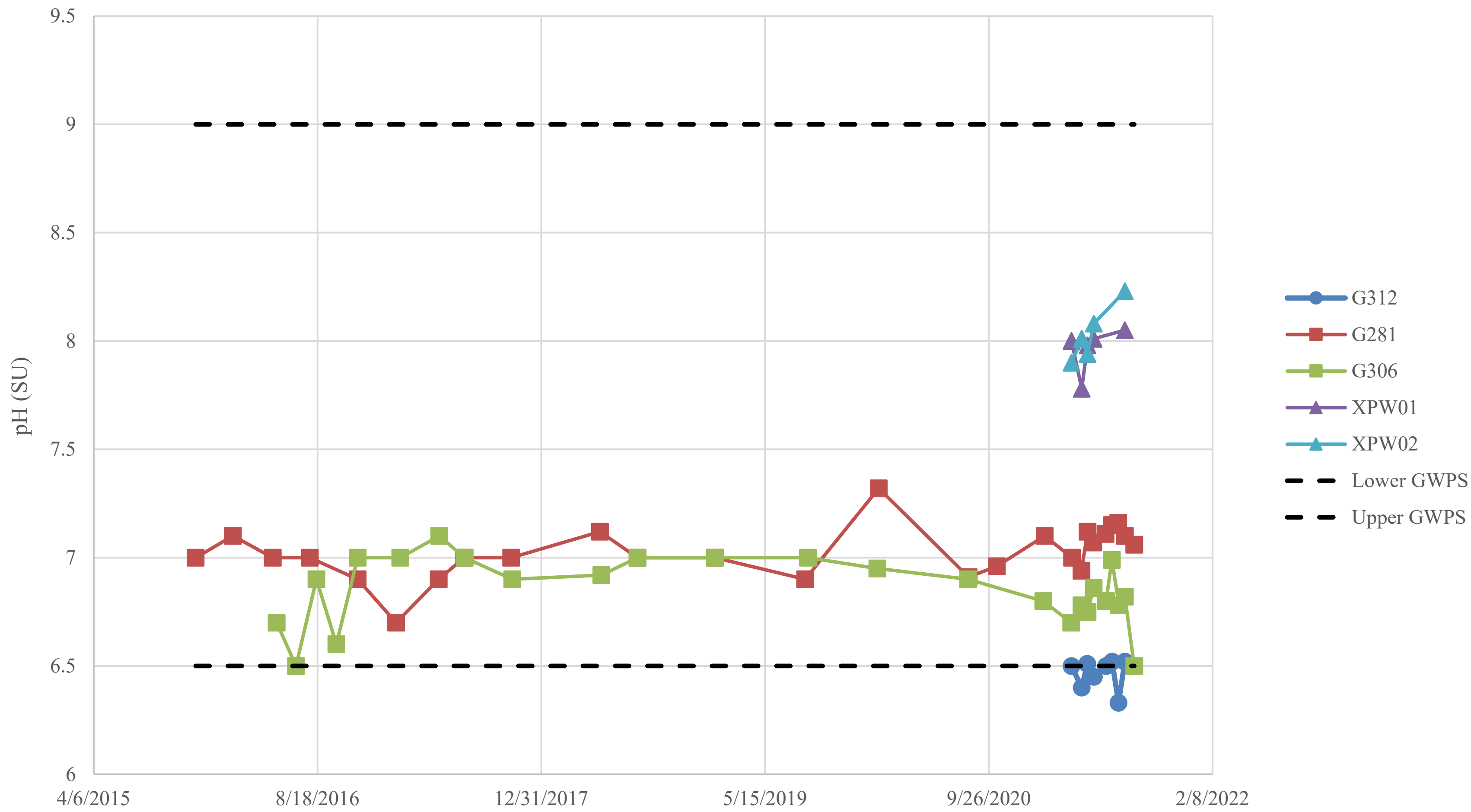
Coffeen Power Plant

Geosyntec consultants

Figure 3

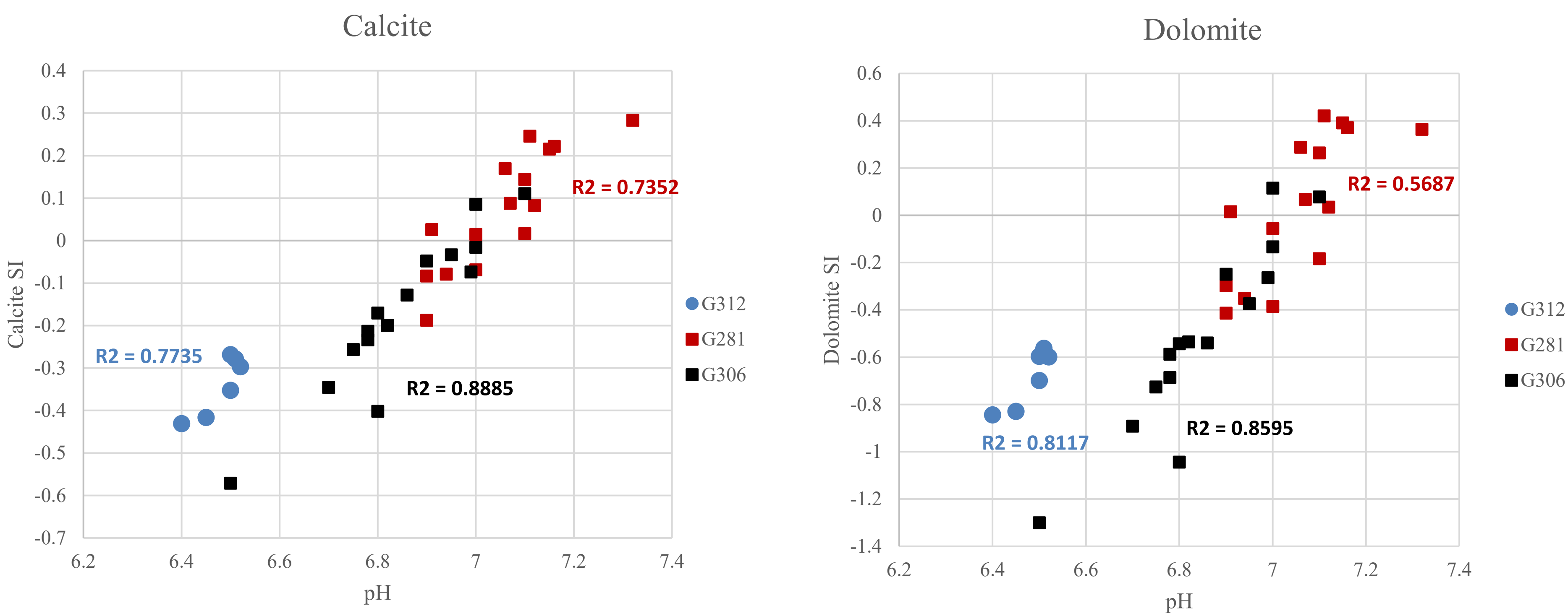
Columbus, Ohio

April 2022



Notes: Data displayed for compliance well G312, background wells G281 and G306, and pore water samples XPW01 and XPW02. The calculated GWPS for the upper and lower pH values are indicated by dashed lines.

pH Time Series Coffeen Power Plant		
Geosyntec consultants		Figure 4
Columbus, OH	April 2022	



Notes: Saturation indices (SIs) were calculated using PHREEQC based on groundwater composition and geochemical characteristics. R^2 values for linear trendlines for each individual well are displayed.

pH vs. Carbonate Saturation Indices

Coffeen Power Plant

Geosyntec consultants

Figure 5

Columbus, OH | April 2022

APPENDIX A

Figure 2-1: Proposed 845 Groundwater Monitoring Well Network. From Groundwater Monitoring Plan, Ash Pond No. 1, Coffeen Power Plant

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Coffeen\AP1\GMP\Figure 2-1_Proposed Monitoring Well Network.mxd

PROJECT: 169000XXXX | DATED: 10/12/2021 | DESIGNER: HOTCALD

COMPLIANCE WELL
BACKGROUND WELL
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 200 400 Feet

PROPOSED 845 GROUNDWATER MONITORING WELL NETWORK

GROUNDWATER MONITORING PLAN
ASH POND NO.1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

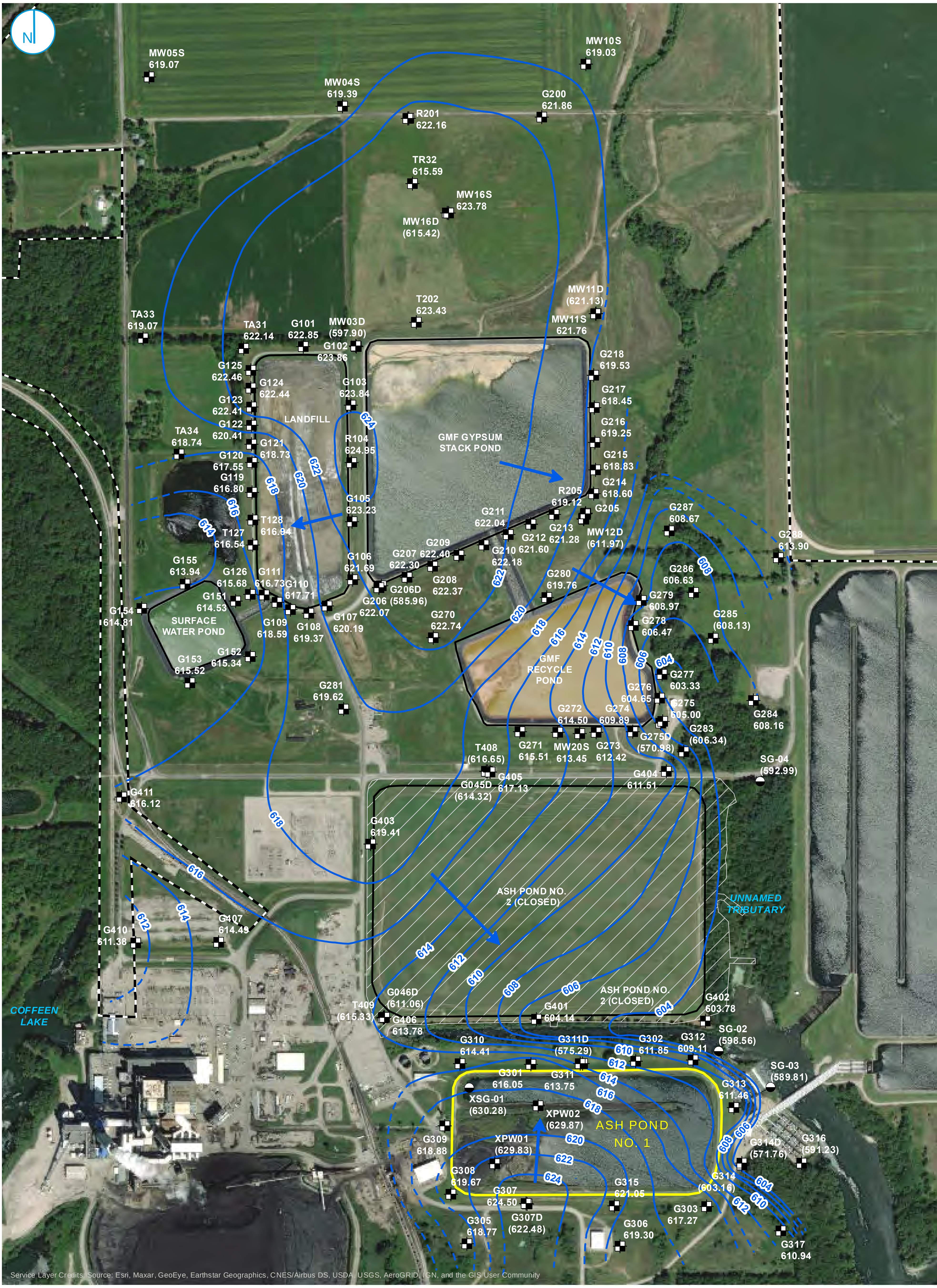
FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDIX B

Figure 1-3: Uppermost Aquifer Groundwater Elevation Contours, April 20, 2021. From Groundwater Monitoring Plan, Ash Pond No. 1, Coffeen Power Plant



MONITORING WELL

STAFF GAGE

PART 845 REGULATED UNIT (SUBJECT UNIT)

SITE FEATURE

LIMITS OF FINAL COVER

PROPERTY BOUNDARY

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 275 550 Feet

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS APRIL 20, 2021

FIGURE 1-3

GROUNDWATER MONITORING PLAN
ASH POND NO.1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDIX B
MODFLOW, MT3DMS, HELP MODEL, AND FLUX EVALUATION DATA EXPORT FILES (ELECTRONIC ONLY)

APPENDIX C
EVALUATION OF PARTITION COEFFICIENT RESULTS

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www.geosyntec.com

Memorandum

Date: July 5, 2022

To: David Mitchell, Stu Cravens, Vic Modeer
Illinois Power Generating Company

Copies to: Brian Hennings - Ramboll

From: Allison Kreinberg, Ryan Fimmen – Geosyntec Consultants, Inc.

Subject: Evaluation of Partition Coefficient Results – Coffeen Ash Pond No. 1
CCR Unit 101, Coffeen Power Plant, Coffeen, Illinois

INTRODUCTION

The Illinois Power Generation Company (IPGC) currently operates the Coffeen Power Plant (CPP) and its associated ash ponds located in Coffeen, Illinois. Ash Pond Number (No.) 1 (AP1) (Vistra identification (ID) No. 101; Illinois Environmental Protection Agency [IEPA] ID No. W1350150004-01; National Inventory of Dams [NID] No. IL50722) is a 23-acre, unlined SI used to manage CCR (bottom ash) and non-CCR waste streams at the CPP in accordance with the plant's Water Pollution Control Permit 1978-EA-389 issued by the Agency on May 26, 1978. Geosyntec Consultants (Geosyntec) is assisting IPGC with Part 845 compliance at the Site.

IPGC is currently preparing a Construction Permit application for AP1 as required under Section 845.220. As part of the Construction Permit application, groundwater modeling is being completed for known potential exceedances of groundwater protection standards (GWPS) identified in the Operating Permit (Burns & McDonnell, 2021). In the Operating Permit (October 2021), Burns & McDonnell identified potential GWPS exceedances for several compounds potentially associated with AP1, including boron, cobalt, pH (field), sulfate, and total dissolved solids (TDS). An evaluation of potential exceedances of applicable GWPS found that both cobalt and pH potential exceedances are not related to AP1 (Geosyntec, 2022). Batch adsorption testing was conducted for boron and sulfate to generate site-specific partition coefficients. This technical memorandum summarizes the results of the batch adsorption testing and calculation of partition coefficients.

BATCH ATTENUATION TESTING

In 2021, Geosyntec conducted a field investigation at AP1 which included completion of four (4) soil/rock borings ranging in depth from 13 to 18 feet below ground surface. As part of that investigation, soil and groundwater samples were submitted to SiREM Laboratories (Guelph, ON) for batch solid/liquid partitioning testing. A summary of the soil samples used for the batch testing is provided in **Table 1**.

Two groundwater samples (G311 and G313) and three soil samples (SB-306, SB-311, and SB-313) were used for batch attenuation testing at five (5) soil:solution ratios (**Table 1**), each ran in duplicate. For each treatment, 0.1 L of groundwater was brought into contact with varying amounts of soil (0.004 to 0.2 kg, depending on the ratio) and equilibrated over a seven-day period. Each microcosm was amended (i.e., spiked) with sodium sulfate (Na_2SO_4), and the microcosms with G313 groundwater were also amended with boric acid (H_3BO_3), to achieve a target concentration of sulfate and boron, respectively (**Table 2**). The G311 microcosm was not amended with boric acid because potential boron exceedances were not identified in the vicinity of G311. G313 groundwater was combined with aquifer solids both adjacent to downgradient location G311 and background location G306 to understand how partitioning behavior may be affected by position relative to AP1.

An initial sample of the stock solution for each experimental design was collected on Day 0, and a control sample (i.e., only amended G311 or G313 groundwater with no aquifer solids) was collected on Day 7 after tumbling in polypropylene bottleware to evaluate any loss to interactions with the bottleware or ambient conditions. Duplicates were constructed for each microcosm, including the control samples. After seven days of contact time, an aliquot of the free liquid was collected and filtered through a 0.45 micron (µm) filter prior to analysis for dissolved concentrations of sulfate and/or boron. The oxidation/reduction potential (redox) and pH were measured for each batch test at the beginning and end of the contact period and in the control samples.

Data obtained from the tests (**Tables 3** and **4**) were used to construct isotherms for boron and sulfate; 5-point isotherms were constructed by averaging duplicate results for each soil:solution ratio. Mathematical fitting was used to calculate the attenuation distribution coefficients (K_d), assuming linear adsorption. The linear adsorption equation was used:

$$q_e = K_d \times C_e \qquad \text{Eq. 1}$$

where q_e is the mass of constituent adsorbed to the solid phase at equilibrium, C_e is the remaining aqueous constituent concentration at equilibrium, and K_d is the linear sorption coefficient (reported in liters per kilogram [L/kg]). Some of the data showed a deviation from a linear trend, and so were also fitted using non-linear isotherms. The non-linear Langmuir isotherm was used:

$$q_e = \frac{q_m K_L C_e}{1 + K_L C_e} \quad \text{Eq. 2}$$

where q_m is the inverse of the slope and K_L is the Langmuir distribution coefficient. The adsorption data were linearized according to:

$$\frac{C_e}{q_e} = \frac{1}{(K_L \times q_m)} + \frac{C_e}{q_m} \quad \text{Eq. 3}$$

A common non-linear Freundlich equation was also used:

$$q_e = K_F (C_e)^{1/n} \quad \text{Eq. 4}$$

where q_e is the mass of constituent adsorbed to the solid phase at equilibrium, C_e is the remaining aqueous constituent concentration at equilibrium, K_F is the Freundlich distribution coefficient, and $1/n$ is a non-linearity constant. The adsorption data were plotted as log-transformed values to perform the non-linear isotherm fitting using the linearized Freundlich equation:

$$log(q_e) = \log(K_F) + (1/n)\log(C_e) \quad \text{Eq. 5}$$

The calculated linear, Langmuir, and Freundlich distribution coefficients (K_d, K_L, and K_F, respectively) and $1/n$ values are shown in **Tables 5** and **6**.

SUMMARY OF RESULTS

The partition coefficient values for G311 and G313 (denoted below as G313/SB-306 when combined with SB-306 geologic material and G313/SB-313 when combined with the SB-313 geologic material) are presented in **Tables 5** and **6**, respectively. Figures which show the linear, Langmuir, and Freundlich isotherms for boron and sulfate are provided in **Appendix A**.

A boron partition coefficient was not calculated for G311, since the microcosm was not amended with boric acid because potential boron exceedances were not identified in the vicinity. The Freundlich isotherm fit the data best for G313/SB-306 and G313/SB-313, yielding K_F values of 0.65 L/kg and 2.03 L/kg, respectively. Though slightly higher at G313/SB-313, these values are comparable to boron partition coefficients reported in the literature, which range from 0.19 to 1.3 L/kg depending on pH conditions and the amount of sorbent present (EPRI, 2005; Strenge & Peterson, 1989).

The G311 partition coefficient for sulfate ranged from -624 L/kg for the Langmuir isotherm to 10.11 L/kg for the linear isotherm, but the best-fitting Freundlich isotherm yielded a low K_F value of 9.2×10^{-12} L/kg. None of the isotherms showed a high goodness-of-fit (i.e., R^2) for either G313/SB-306 or G313/SB-313, with the highest correlation being 0.51, and were associated with erroneously high (1700 L/kg) and low (-690 L/kg) partition coefficients. An accurate sulfate partition coefficient could therefore not be calculated from any of the data. These results are consistent with the findings of Strenge and Peterson (1989), who found that partition coefficients for sulfate are 0.0 L/kg, regardless of pH conditions and the amount of sorbent present.

REFERENCES

EPRI, 2005. *Chemical constituents in coal combustion product leachate: boron. Final Report 1005258.*

Burns & McDonnell. 2021. Initial Operating Permit Coffeen GMF Recycle Pond. October

Strenge, D. and Peterson, S. 1989. Chemical Data Bases for the Multimedia Environmental Pollutant Assessment System (MEPAS) (No. PNL-7145). Pacific Northwest National Laboratory, Richland, WA (USA).

Geosyntec. 2022. Evaluation of Potential Groundwater Protection Standard Exceedances. Coffeen Ash Pond No. 1. Coffeen, Illinois. May

TABLES

Table 1 - Batch Attenuation Testing Data Summary
Coffeen AP1

Groundwater Sample ID	Soil Sample ID	Soil: Water Ratio
G311	SB-311 (14-15 ft bgs)	2:1.4
		1:1.3
		1:5.7
		1:11.3
		1:27.8
G313	SB-306 (14-16 ft bgs)	2:1.5
		1:1.3
		1:6.0
		1:11.7
		1:28.8
G313	SB-313 (8-9 ft bgs)	2:1.5
		1:1.3
		1:6.0
		1:11.7
		1:28.8

Notes:

ft bgs = feet below ground surface

Table 2 - Microcosm Amendment and Target Concentrations
Coffeen AP1

Groundwater Sample ID	Soil Sample ID	Compound	Amendment	Target Concentration (mg/L)
G311	SB-311 (14-15 ft bgs)	Boron	--	--
		Sulfate	2.76 g of Na_2SO_4	1500
G313	SB-306 (14-16 ft bgs)	Boron	19.73 mL of a 2 g/L H_3BO_3	5
		Sulfate	1.98 g of Na_2SO_4	1500
G313	SB-313 (8-9 ft bgs)	Boron	19.73 mL of a 2 g/L H_3BO_3	5
		Sulfate	1.98 g of Na_2SO_4	1500

Notes:
ft bgs - feet below ground surface
mg/L - milligrams per liter
Na_2SO_4 - sodium sulfate
H_3BO_3 - boric acid

Table 3 - Batch Attenuation Testing Results, G311
Coffeen AP1

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Date	Day	Replicate	Dissolved Sulfate	pH	ORP
						mg/L	**SU**	**mV**
G311	--	Groundwater Only Control	25-Jan-22	0	G311-1a	1,589	6.83	-62
					G311-2a	1,826	6.88	-66
					Average Concentration (mg/L)	**1,708**	**6.86**	**-64**
			1-Feb-22	7	G311-1	1,617	6.85	42
					G311-2	1,478	6.85	38
					Average Concentration (mg/L)	**1,548**	**6.85**	**40**
	G311 SB-311 Geologic Material	2:1 Soil:Water Ratio	25-Jan-22	0				
			1-Feb-22	7	SB-311:G311 2:1-1	1,321	6.92	50
					SB-311:G311 2:1-2	1,302	6.86	100
					Average Concentration (mg/L)	**1,311**	**6.89**	**75**
		1:1 Soil:Water Ratio	25-Jan-22	0				
			1-Feb-22	7	SB-311:G311 1:1-1	1,727	6.92	51
					SB-311:G311 1:1-2	860	6.88	24
					Average Concentration (mg/L)	**1,294**	**6.90**	**38**
		1:5 Soil:Water Ratio	25-Jan-22	0				
			1-Feb-22	7	SB-311:G311 1:5-1	1,326	6.87	93
					SB-311:G311 1:5-2	1,516	6.88	56
					Average Concentration (mg/L)	**1,421**	**6.88**	**75**
		1:10 Soil:Water Ratio	25-Jan-22	0				
			1-Feb-22	7	SB-311:G311 1:10-1	1,570	6.89	27
					SB-311:G311 1:10-2	1,551	6.86	133
					Average Concentration (mg/L)	**1,560**	**6.88**	**80**
		1:20 Soil:Water Ratio	25-Jan-22	0				
			1-Feb-22	7	SB-311:G311 1:20-1	1,511	6.88	88
					SB-311:G311 1:20-2	1,588	6.86	39
					Average Concentration (mg/L)	**1,550**	**6.87**	**64**

Notes:

mg/L - milligrams per liter
mV - millivolts
SU - Standard Units
ORP - oxidation/reduction potential

Table 4 - Batch Attenuation Testing Results, G313
Coffeen AP1

Groundwater Sample ID	Geologic Material Sample ID	Treatment	Date	Day	Replicate	Dissolved Boron	Dissolved Sulfate	pH	ORP
						mg/L	mg/L	SU	mV
G313	--	Groundwater Only Control	25-Jan-22	0	G313-1a	6.5	1,372	6.98	-60
					G313-2a	6.7	1,473	6.98	-21
					Average Concentration (mg/L)	**6.6**	**1,423**	**6.98**	**-41**
			1-Feb-22	7	G313-1	6.3	1,158	6.98	113
					G313-2	6.2	1,058	6.97	40
					Average Concentration (mg/L)	**6.2**	**1,108**	**6.98**	**77**
	G313 SB-306 Geologic Material	2:1 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-306:G313 2:1-1	4.5	884	6.95	46
					SB-306:G313 2:1-2	4.7	779	6.95	44
					Average Concentration (mg/L)	**4.6**	**831**	**6.95**	**45**
		1:1 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-306:G313 1:1-1	5.3	1,049	6.94	75
					SB-306:G313 1:1-2	5.3	976	6.93	44
					Average Concentration (mg/L)	**5.3**	**1,012**	**6.94**	**60**
		1:5 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-306:G313 1:5-1	5.8	243	6.95	80
					SB-306:G313 1:5-2	6.1	1,005	6.96	-5
					Average Concentration (mg/L)	**5.9**	**624**	**6.96**	**38**
		1:10 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-306:G313 1:10-1	6.1	958	6.96	203
					SB-306:G313 1:10-2	6.1	832	6.97	90
					Average Concentration (mg/L)	**6.1**	**895**	**6.97**	**147**
		1:20 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-306:G313 1:20-1	6.0	881	6.96	39
					SB-306:G313 1:20-2	6.0	1,409	6.94	81
					Average Concentration (mg/L)	**6.0**	**1,145**	**6.95**	**60**
	G313 SB-313 Geologic Material	2:1 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-313:G313 2:1-1	4.3	852	6.96	164
					SB-313:G313 2:1-2	4.6	900	6.93	143
					Average Concentration (mg/L)	**4.5**	**876**	**6.95**	**154**
		1:1 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-313:G313 1:1-1	4.9	482	6.99	78
					SB-313:G313 1:1-2	5.0	1,000	6.95	39
					Average Concentration (mg/L)	**4.9**	**741**	**6.97**	**59**
		1:5 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-313:G313 1:5-1	6.0	1,227	6.96	23
					SB-313:G313 1:5-2	6.2	837	6.97	25
					Average Concentration (mg/L)	**6.1**	**1,032**	**6.97**	**24**
		1:10 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-313:G313 1:10-1	6.0	1,459	6.97	63
					SB-313:G313 1:10-2	5.8	2,105	6.98	85
					Average Concentration (mg/L)	**5.9**	**1,782**	**6.98**	**74**
		1:20 Soil:Water Ratio	25-Jan-22	0					
			1-Feb-22	7	SB-313:G313 1:20-1	5.8	1,000	6.96	125
					SB-313:G313 1:20-2	6.0	1,043	6.97	47
					Average Concentration (mg/L)	**5.9**	**1,022**	**6.97**	**86**

Notes:

mg/L - milligrams per liter
mV - millivolts
SU - Standard Units
ORP - oxidation/reduction potential

Table 5 - Partition Coefficient Results, G311
Coffeen AP1

Analyte	Isotherm	Variable	Value
Sulfate	Linear	R^2	0.61
		K_D (L/kg)	10.11
	Langmuir	R^2	0.65
		q_m (mg/g)	-0.10
		K_L (L/kg)	-6.24E+02
	Freundlich	R^2	0.78
		1/n	10.27
		K_F (L/kg)	9.20E-12

Notes:

K_D - linear partition coefficient

K_L - Langmuir partition coefficient

K_F - Freundlich partition coefficient

q_m - inverse of the slope of the linearized Langmuir isotherm

n - non-linearity constant of the Freundlich isotherm

Table 6 - Partition Coefficient Results, G313
Coffeen AP1

Materials	Analyte	Isotherm	Variable	Value
G313/SB-306	Boron	Linear	R^2	0.37
			K_D (L/kg)	6.13
		Langmuir	R^2	0.76
			q_m (mg/g)	0.00
			K_L (L/kg)	-1.51E+05
		Freundlich	R^2	0.64
			1/n	6.65
			K_F (L/kg)	6.50E-01
	Sulfate	Linear	R^2	0.05
			K_D (L/kg)	3.97
		Langmuir	R^2	0.01
			q_m (mg/g)	2.20
			K_L (L/kg)	1.19E+03
		Freundlich	R^2	0.00
			1/n	-0.06
			K_F (L/kg)	1.70E+03
G313/SB-313	Boron	Linear	R^2	0.24
			K_D (L/kg)	5.68
		Langmuir	R^2	0.50
			q_m (mg/g)	0.00
			K_L (L/kg)	-1.43E+05
		Freundlich	R^2	0.46
			1/n	5.25
			K_F (L/kg)	2.03E+00
	Sulfate	Linear	R^2	0.21
			K_D (L/kg)	-6.50
		Langmuir	R^2	0.51
			q_m (mg/g)	-0.66
			K_L (L/kg)	-6.91E+02
		Freundlich	R^2	--
			1/n	--
			K_F (L/kg)	--

Notes:

The Freundlich isotherm was not calculated for G313/SB-313 because the data were not conducive to log transformation

K_D - linear partition coefficient

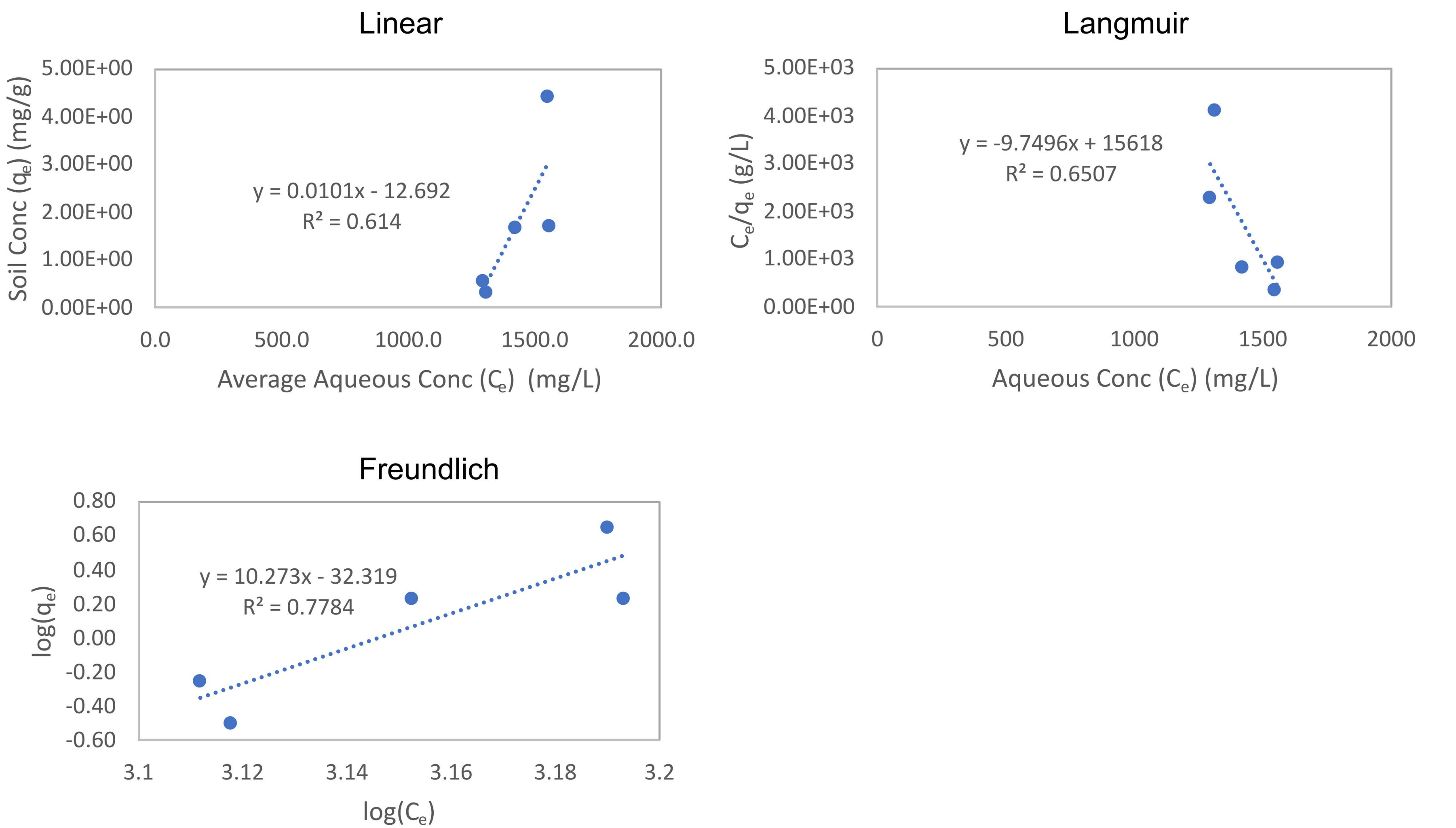
K_L - Langmuir partition coefficient

K_F - Freundlich partition coefficient

q_m - inverse of the slope of the linearized Langmuir isotherm

n - non-linearity constant of the Freundlich isotherm

APPENDIX A
BATCH TESTING ISOTHERM PLOTS



Notes:

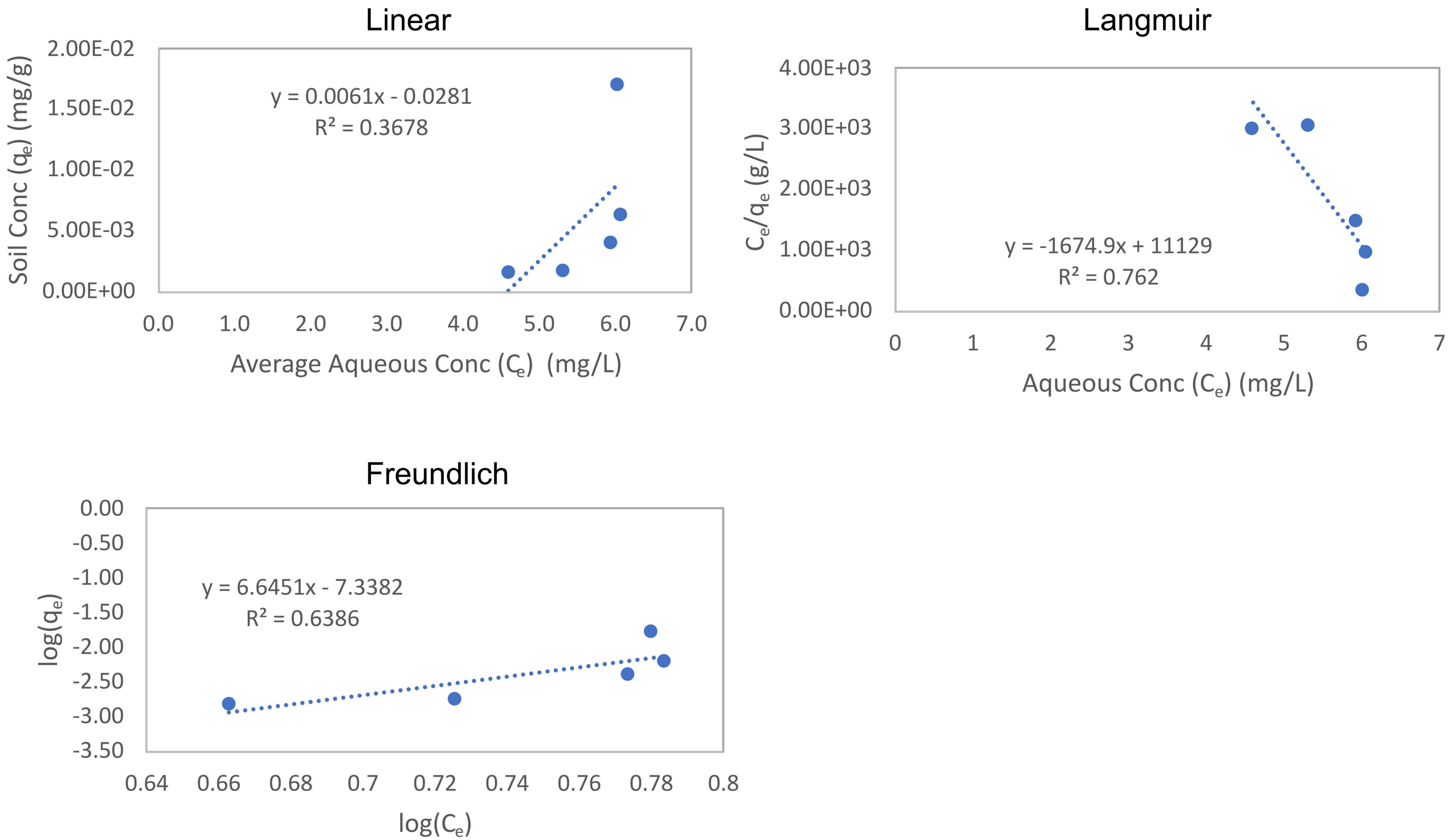
q_e - mass of constituent adsorbed to the solid phase
C_e - remaining aqueous constituent concentration
mg/L - milligrams per liter
mg/g - milligrams per gram
g/L - grams per liter

G311 Sulfate Partitioning Coefficients
Coffeen Power Plant AP-1
Coffeen, Illinois

Geosyntec consultants

Columbus, OH | May 2022

Figure 1



Notes:

q_e - mass of constituent adsorbed to the solid phase
C_e - remaining aqueous constituent concentration
mg/L - milligrams per liter
mg/g - milligrams per gram
g/L - grams per liter

G313/SB-306 Boron Partitioning Coefficients
Coffeen Power Plant AP-1
Coffeen, Illinois

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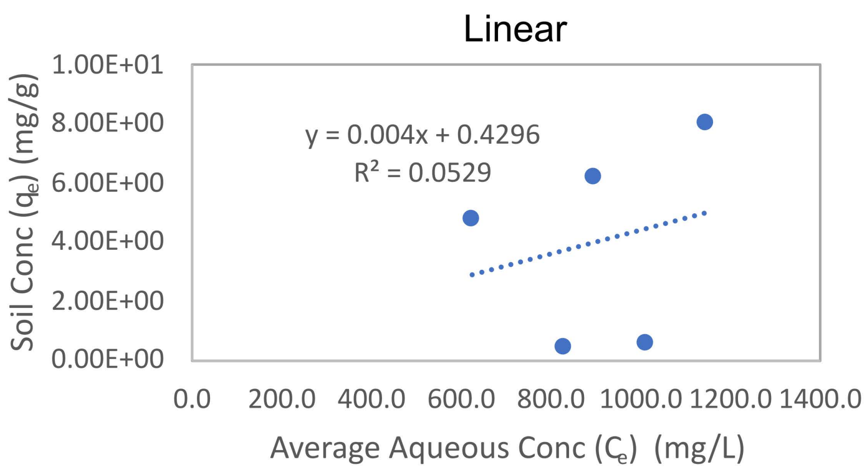
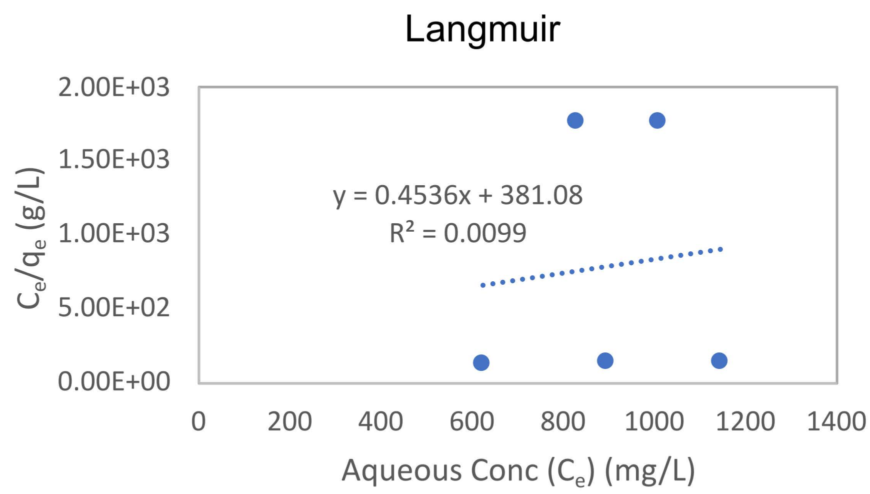
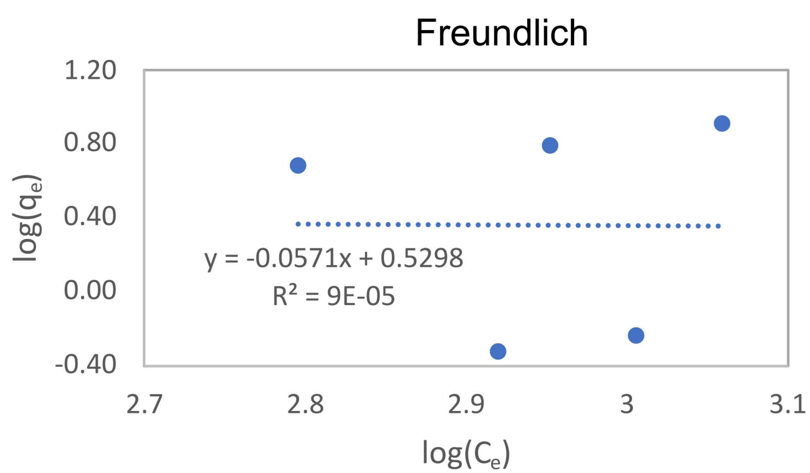
Figure **2**







Notes:

q_e - mass of constituent adsorbed to the solid phase
C_e - remaining aqueous constituent concentration
mg/L - milligrams per liter
mg/g - milligrams per gram
g/L - grams per liter

G313/SB-306 Sulfate Partitioning Coefficients
Coffeen Power Plant AP-1
Coffeen, Illinois

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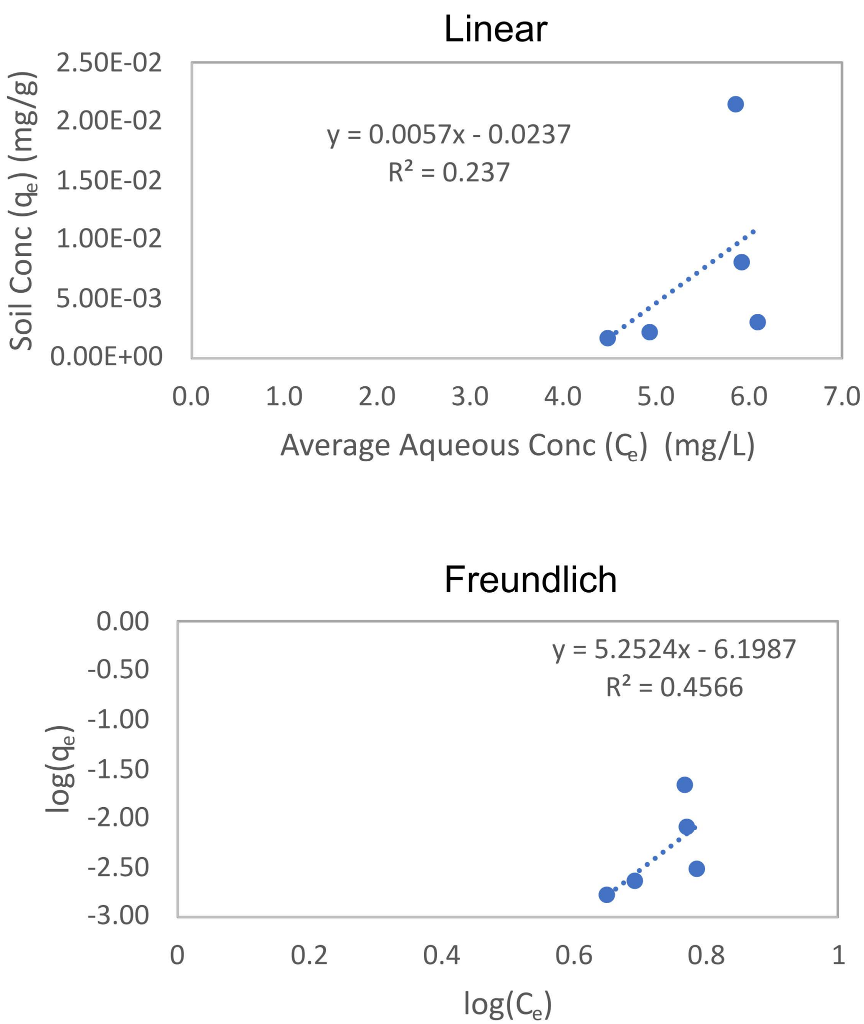
Figure **3**



Notes:

q_e - mass of constituent adsorbed to the solid phase
C_e - remaining aqueous constituent concentration
mg/L - milligrams per liter
mg/g - milligrams per gram
g/L - grams per liter

G313/SB-313 Boron Partitioning Coefficients
Coffeen Power Plant AP-1
Coffeen, Illinois

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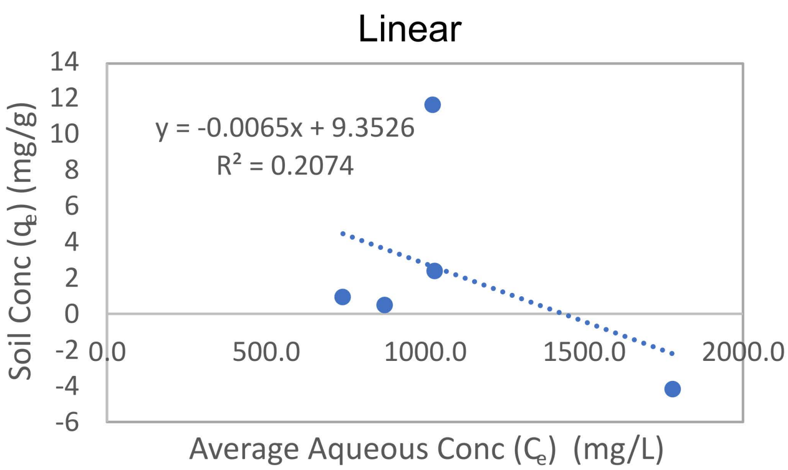
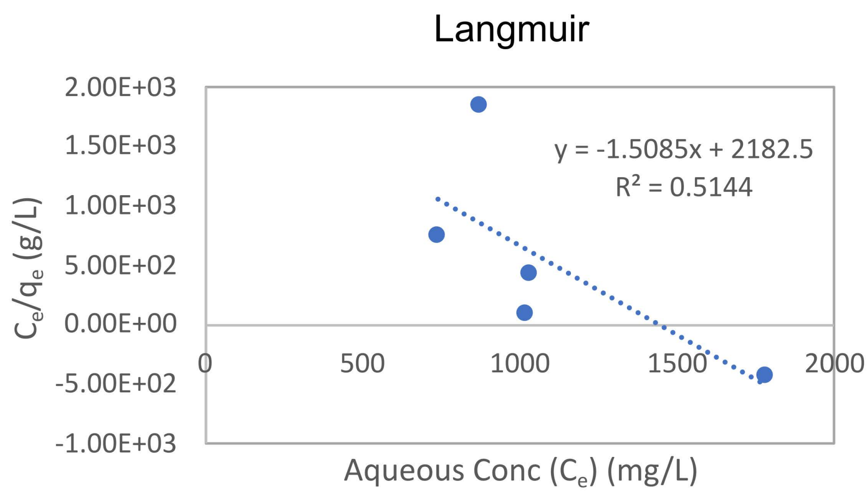
Figure **4**





Notes:

The Freundlich isotherm was not calculated because the data were not conducive to log transformation.

q_e - mass of constituent adsorbed to the solid phase
C_e - remaining aqueous constituent concentration
mg/L - milligrams per liter
mg/g - milligrams per gram
g/L - grams per liter

G313/SB-313 Sulfate Partitioning Coefficients
Coffeen Power Plant AP-1
Coffeen, Illinois

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Figure 5

APPENDIX D
HELP MODEL OUTPUT FILES

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: COF AP1 CIP **Simulated On:** 6/23/2022 13:38

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
SiCL - Silty Clay Loam
Material Texture Number 12

Thickness	=	6	inches
Porosity	=	0.471	vol/vol
Field Capacity	=	0.342	vol/vol
Wilting Point	=	0.21	vol/vol
Initial Soil Water Content	=	0.2544	vol/vol
Effective Sat. Hyd. Conductivity	=	4.20E-05	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer
SiC - Silty Clay
Material Texture Number 14

Thickness	=	18	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.3554	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
10 oz Nonwoven Geotextile
Material Texture Number 123

Thickness	=	0.11	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.5445	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-01	cm/sec
Slope	=	5	%
Drainage Length	=	350	ft

Layer 4

Type 4 - Flexible Membrane Liner
LDPE Membrane
Material Texture Number 36

Thickness	=	0.04	inches
Effective Sat. Hyd. Conductivity	=	4.00E-13	cm/sec
FML Pinhole Density	=	1	Holes/Acre
FML Installation Defects	=	1	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 1 - Vertical Percolation Layer (Waste)
High Density Electric Plant Coal Bottom Ash
Material Texture Number 84

Thickness	=	360	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.0762	vol/vol
Effective Sat. Hyd. Conductivity	=	8.80E-05	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer
Loess Unit Silty Clay
Material Texture Number 43

Thickness	=	60	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.371	vol/vol
Effective Sat. Hyd. Conductivity	=	3.85E-08	cm/sec
Slope	=	0	%
Drainage Length	=	0	ft

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	87.9	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	10.37	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.654	inches
Upper Limit of Evaporative Storage	=	8.574	inches

Lower Limit of Evaporative Storage	=	4.272	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	57.664	inches
Total Initial Water	=	57.752	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 CIP
Simulated on: 6/23/2022 13:40

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	1,504,439.0	100.00
Runoff	5.219	[2.734]	196,475.1	13.06
Evapotranspiration	30.032	[3.266]	1,130,503.8	75.14
Subprofile1				
Lateral drainage collected from Layer 3	4.5549	[1.2488]	171,460.7	11.40
Percolation/leakage through Layer 4	0.195970	[0.082153]	7,376.9	0.49
Average Head on Top of Layer 4	4.4608	[1.8873]	---	---
Subprofile2				
Percolation/leakage through Layer 6	0.000911	[0.001146]	34.3	0.00
Water storage				
Change in water storage	0.1585	[1.4776]	5,965.1	0.40

* Note: Average inches are converted to volume based on the user-specified area.

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: COF AP1 CBR E 1ft Simulated On: 18/04/2022 12:42

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SiC - Silty Clay
Material Texture Number 14

Thickness	=	12	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.2751	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	88.6	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	14.28	acres
Evaporative Zone Depth	=	12	inches
Initial Water in Evaporative Zone	=	3.302	inches
Upper Limit of Evaporative Storage	=	5.748	inches
Lower Limit of Evaporative Storage	=	3.012	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	3.302	inches
Total Initial Water	=	3.39	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days

Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 CBR E 1ft
Simulated on: 18/04/2022 12:43

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	2,071,686.5	100.00
Runoff	4.098	[2.566]	212,424.0	10.25
Evapotranspiration	28.031	[2.833]	1,453,011.5	70.14
Subprofile1				
Percolation/leakage through Layer 1	7.845754	[2.291827]	406,695.7	19.63
Water storage				
Change in water storage	-0.0086	[0.9272]	-444.6	-0.02

* Note: Average inches are converted to volume based on the user-specified area.

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: COF AP1 CBR W 3ft   Simulated On: 18/04/2022 17:19

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SiC - Silty Clay
Material Texture Number 14

Thickness	=	36	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.3502	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	89.2	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	10.38	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.826	inches
Upper Limit of Evaporative Storage	=	8.622	inches
Lower Limit of Evaporative Storage	=	4.518	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	12.606	inches
Total Initial Water	=	12.694	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days

Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 CBR W 3ft
Simulated on: 18/04/2022 17:20

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	1,505,889.7	100.00
Runoff	4.277	[2.541]	161,157.5	10.70
Evapotranspiration	29.447	[3.212]	1,109,534.9	73.68
Subprofile1				
Percolation/leakage through Layer 1	6.278209	[2.388206]	236,559.2	15.71
Water storage				
Change in water storage	-0.0361	[1.2459]	-1,361.9	-0.09

* Note: Average inches are converted to volume based on the user-specified area.

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: COF AP1 CIP Default **Simulated On:** 6/21/2022 16:04

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	6	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.154	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer
SiC - Silty Clay
Material Texture Number 14

Thickness	=	30	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.3698	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
10 oz Nonwoven Geotextile
Material Texture Number 123

Thickness	=	0.11	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.6794	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-01	cm/sec
Slope	=	5	%
Drainage Length	=	350	ft

Layer 4

Type 4 - Flexible Membrane Liner
LDPE Membrane
Material Texture Number 36

Thickness	=	0.04	inches
Effective Sat. Hyd. Conductivity	=	4.00E-13	cm/sec
FML Pinhole Density	=	1	Holes/Acre
FML Installation Defects	=	1	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 1 - Vertical Percolation Layer (Waste)
High Density Electric Plant Coal Bottom Ash
Material Texture Number 84

Thickness	=	360	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.0762	vol/vol
Effective Sat. Hyd. Conductivity	=	8.80E-05	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer
Loess Unit Silty Clay
Material Texture Number 43

Thickness	=	60	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.371	vol/vol
Effective Sat. Hyd. Conductivity	=	3.85E-08	cm/sec
Slope	=	0	%
Drainage Length	=	0	ft

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	85.9	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	10.37	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.059	inches
Upper Limit of Evaporative Storage	=	8.136	inches

Lower Limit of Evaporative Storage	=	3.828	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	61.794	inches
Total Initial Water	=	61.882	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 CIP
Simulated on: 6/21/2022 16:05

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	1,504,439.0	100.00
Runoff	4.089	[2.542]	153,905.0	10.23
Evapotranspiration	30.058	[3.318]	1,131,459.1	75.21
Subprofile1				
Lateral drainage collected from Layer 3	5.5133	[1.5623]	207,537.5	13.80
Percolation/leakage through Layer 4	0.344465	[0.16843]	12,966.7	0.86
Average Head on Top of Layer 4	7.8378	[3.8306]	---	---
Subprofile2				
Percolation/leakage through Layer 6	0.049311	[0.128508]	1,856.2	0.12
Water storage				
Change in water storage	0.2572	[1.781]	9,681.1	0.64

* Note: Average inches are converted to volume based on the user-specified area.

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: COF AP1 Default Earth   Simulated On: 27/06/2022 18:16

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	6	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.1542	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer
SiC - Silty Clay
Material Texture Number 14

Thickness	=	30	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.436	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Layer 3
Type 3 - Barrier Soil Liner
Liner Soil (High)
Material Texture Number 16

Thickness	=	36	inches
Porosity	=	0.427	vol/vol
Field Capacity	=	0.418	vol/vol
Wilting Point	=	0.367	vol/vol
Initial Soil Water Content	=	0.427	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-07	cm/sec

Layer 4
Type 1 - Vertical Percolation Layer (Waste)
High Density Electric Plant Coal Bottom Ash

Material Texture Number 84

Thickness	=	360	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.0805	vol/vol
Effective Sat. Hyd. Conductivity	=	8.80E-05	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Loess Unit Silty Clay

Material Texture Number 43

Thickness	=	60	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.371	vol/vol
Effective Sat. Hyd. Conductivity	=	3.85E-08	cm/sec
Slope	=	0	%
Drainage Length	=	0	ft

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	85.9	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	10.37	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.382	inches
Upper Limit of Evaporative Storage	=	8.136	inches
Lower Limit of Evaporative Storage	=	3.828	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	80.625	inches
Total Initial Water	=	80.713	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	

Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 Default Earth
Simulated on: 27/06/2022 18:17

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	1,504,439.0	100.00
Runoff	6.862	[3.483]	258,316.2	17.17
Evapotranspiration	31.176	[3.425]	1,173,551.9	78.01
Subprofile1				
Percolation/leakage through Layer 3	1.992946	[0.073666]	75,020.7	4.99
Average Head on Top of Layer 3	21.7496	[2.1124]	---	---
Subprofile2				
Percolation/leakage through Layer 5	1.698973	[0.713508]	63,954.6	4.25
Water storage				
Change in water storage	0.2289	[1.8082]	8,616.3	0.57

* Note: Average inches are converted to volume based on the user-specified area.

APPENDIX E
FLUX EVALUATION DATA

Appendix E. Flux Evaluation Data
GROUNDWATER MODELING REPORT
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Calibration Model					
Model	**Model Period (years)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	
Calibration Model	42	Fill Unit (CCR)	2888.39	15.00	
Model	**Model Period (years)**	**HSU**	**Total Flux Out[1] (ft^3/d)**	**Total Flux Out (gpm)**	
Calibration Model	42	Fill Unit (CCR)	-2975.75	-15.46	
Scenario 1: CIP (CCR removal from the northwest areas of the Ash Pond, consolidation to the northeast, central and southern areas of the Ash Pond, and construction of a cover system over the remaining CCR)					
Prediction Model	**Construction Period (years)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	**Reduction in Flux In Post Closure[2] (Percentage, %)**
CIP	56	Fill Unit (CCR)	2.20	0.01	99.92%
Prediction Model	**Construction Period (years)**	**HSU**	**Total Flux Out[1] (ft^3/d)**	**Total Flux Out (gpm)**	**Reduction in Flux Out Post Closure[2] (Percentage, %)**
CIP	56	Fill Unit (CCR)	-2.21	-0.01	99.93%

[O: SLN 6/25/22; C: BGH 6/29/22]

Notes:
1. Total flux in and out source data provided in flux calculation data files included in Appendix B.
2. Reduction in flux as compared to flux at the end of calibration model (model period of 42 years).
CCR = coal combustion residuals
CIP = Closure In Place
HSU = Hydrostratigraphic Unit
% = percentage
ft^3/d = cubic feet per day
gpm = gallons per minute

APPENDIX G

Final Closure Plan

REPORT

Final Closure Plan for Ash Pond No. 1

Coffeen Power Plant

Submitted to:

Illinois Power Resources Generating, LLC

1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Compiled by:

Golder Associates USA Inc.

701 Emerson Road, Suite 250, Creve Coeur, Missouri 63141

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21465046

July 28, 2022

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TABLES

ATTACHMENTS

1.0 INTRODUCTION

This Final Closure Plan has been prepared to address certain requirements of Illinois Administrative Code Title 35, Part 845, Standards for the Disposal of Coal Combustion Residuals (CCR) in Surface Impoundments (Part 845) for Illinois Power Resources Generating, LLC's (IPRG's) Ash Pond No. 1 (AP1) at the Coffeen Power Plant near Coffeen, Illinois. Specifically, this document addresses requirements pertaining to the development of a Final Closure Plan for AP1. AP1 has identification codes as follow:

- IPRG ID Number: CCR Unit ID 101
- IEPA ID Number: W1350150004-01
- IDNR Dam ID Number: IL50722

1.1 Proposed Selected Closure Method

Part 845.720 (b)(3): The final closure plan must identify the proposed selected closure method, and must include the information required in subsection (a)(1) and the closure alternatives analysis specified in Section 845.710.

IPRG evaluated closure with a final cover system (hereafter referred to as closure-in-place or CIP) (Section 845.750) and closure-by-removal of CCR (CBR) (Section 845.740). An analysis of these closure alternatives is summarized in Attachment 1. Based on the Closure Alternatives Analysis, a hybrid closure with a final cover system has been identified as the most appropriate closure method. All ash (CCR) in the eastern portion of the impoundment will be removed and relocated to the western portion of the impoundment, which will be closed in accordance with Section 845.750. Under this hybrid approach, approximately 58% of the current CCR footprint within the impoundment will be removed. The final cover system will physically isolate the CCR in AP1 from contact with surface water and the atmosphere and minimize the potential for release of CCR. The final cover system has been designed to minimize the post-closure infiltration of liquids into the waste.

During the closure process, IPRG will continue to assess off-Site CCR beneficial use opportunities. Ash consolidation and closure in place in combination with offsite beneficial use may result in a smaller footprint for purposes of our ultimate cap design along with a reduced construction schedule.

2.0 FINAL CLOSURE PLAN

2.1 Narrative Closure Description

Part 845.720(a)(1)(A): A narrative description of how the CCR surface impoundment will be closed in accordance with this Part.

Closure grades and details are shown in the Drawings included as Attachment 2. The closure-in-place concept for AP1 was developed to reduce the waste footprint at closure and to achieve 10 feet of vertical separation between the top of the uppermost aquifer and the CCR material. The closed facility will have final cover slopes of 7H:1V to approximate El. 664 feet transitioning to 20H:1V (5%) slopes above that elevation to accommodate moderate settlement and promote drainage. A berm will be constructed at the east end of the consolidated footprint for stability. The location of the berm has been selected to accommodate the estimated 436,000 CY of CCR and 21,500 CY of excavated subsoil to be contained within the consolidated footprint based on the grading plan presented. The general sequencing plan for the closure-in-place method is as follows:

- Pump out ponded water [approximately 15.2 million gallons (MG)] from AP1 to the existing drainage to the north and through Outfall K20. Discharge will be managed in accordance with the NPDES permit for the site.

- A temporary water management system will be constructed within AP1, including ditches and sumps. The system will maintain AP1 in an unwatered state by collecting contact stormwater during closure construction. Stormwater flow will be conveyed through Outfall K20 to the existing drainage to the north. Discharge will be managed in accordance with the NPDES permit for the site.
- Once the ponded water has been removed from AP1, the CCR in the consolidated footprint will be dewatered. All of the approximately 268,600 CY of CCR east of the consolidated footprint will be dewatered as needed to enable relocation. Free liquids in the CCR will be eliminated by removing liquid wastes or solidifying the remaining wastes. It is anticipated that after ponded water is removed approximately 14.1 MG of additional water removal will be required to dewater the CCR. The CCR will dewater to some degree by gravity, but dewatering by pumping from trenches and sumps is expected to be necessary. Liquid waste and water flowing to sumps will be managed in accordance with the NPDES permit for the site and discharged through Outfall K20.
- Any accumulated CCR within the riser structure and outlet pipes will be removed and the riser structure and outlet pipes will be decontaminated by pressure washing. Decontamination water will be routed through Outfall K20 and managed in accordance with the NPDES permit for the site. The riser structure will be demolished and disposed of in the consolidated footprint and the outlet pipes will be plugged and abandoned or removed and disposed.
- CCR will be removed from the berm footprint and relocated into the consolidated footprint. The berm will be constructed in north-south orientation at the east end of the consolidated footprint.
- All remaining CCR east of the berm will be collected and deposited west of the berm. It is anticipated that up to 1 foot of subsoil beneath the CCR may also be removed. The subsoils will be visually observed for signs of CCR. If subsoils with CCR staining are observed, they will be removed and deposited west of the berm.
- Once all CCR is contained within the consolidated footprint and appropriate grades for closure have been achieved (with grading fill used as necessary), a final cover system will be installed in accordance with Part 845.750. The final cover system will consist of (from top to bottom):
  - 24-inch-thick final protective soil layer. The soil layer will include a 6-inch-thick topsoil layer that will be revegetated with grass species selected to reduce maintenance based on soil type. The underlying material will consist of locally available soils from the removed embankment containment berm compacted to between 80% and 95% of the standard Proctor maximum dry density for establishment of vegetation and protection of the underlying geomembrane. Final protective soil layer material is likely to be primarily low-plasticity silt or clay based on review of site geotechnical information.
  - Nonwoven geotextile cushioning layer.
  - 40-mil linear low-density polyethylene (LLDPE) geomembrane layer.
- All areas of the closure surface will be sloped at a minimum of 1% to positively drain to the exterior of AP1. Stormwater runoff from the AP1 closure area will be removed from the top of the final cover via the construction of a free-draining stormwater management system, including berms, channels, and let-down structures, that will convey stormwater to existing surface water bodies.

- Exterior slopes of the existing western, northern, and southern containment berms used to contain the consolidated AP1 footprint will be recontoured as necessary with additional soil, sourced from the existing berms that are no longer required, to achieve minimum 3H:1V side slopes for long-term stability.
- To prevent impoundment of water in the eastern end of the current AP1 footprint after CCR removal, existing earthen embankments not required for the consolidated footprint will be removed and a channel will be excavated to allow stormwater to flow through existing NPDES Outfall K20 into the existing drainage.
- Soil fill, sourced from existing berms no longer required to contain waste in the consolidated footprint or from the on-site soil borrow area southeast of AP1, will be used as fill in low areas of the existing AP1 base grade to provide at least one foot of soil cover above the top of the uppermost aquifer and establish the final ground surface.
- The final ground surface of the eastern part of AP1 will be sloped to drain at a minimum slope of 0.5% towards the channel excavated in the northeast corner, in order to allow post-closure, non-contact stormwater to gravity flow into the existing drainage.
- Vegetation will be established on the final surface of AP1. Stormwater best management practices (BMPs) such as erosion control blankets will be used as needed to reduce erosion during vegetation establishment.
- After vegetation is established, BMPs will be removed and closure construction will be considered complete.

2.2 Decontamination of CCR Surface Impoundment

Part 845.720(a)(1)(B): If closure of the CCR surface impoundment will be accomplished through removal of CCR from the CCR surface impoundment, a description of the procedures to remove the CCR and decontaminate the CCR surface impoundment in accordance with Section 845.740.

After all CCR east of the berm has been relocated to within the closure footprint, the subsoils will be visually observed for signs of CCR. If soils with the presence of CCR are observed, they will be removed and deposited west of the berm. It is anticipated that up to 1 foot of subsoils may be removed; however, visual inspection will be conducted to confirm that all CCR in the eastern portion is removed. Decontamination of areas outside of the eastern portion of AP1 will not be required because there have been no releases of CCR from the eastern portion of AP1 and there is no containment system within AP1.

2.3 Final Cover System Performance Standards

Part 845.720(a)(1)(C): If closure of the CCR surface impoundment will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with Section 845.750, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in Section 845.750.

The final cover system is described in Section 2.1 and shown in the Drawings (Attachment 2). Documentation in support of the final cover system achieving the performance standards of Section 845.750 is provided in Section 4.7.

2.4 Maximum CCR Inventory Estimate

Part 845.720(a)(1)(D): An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR surface impoundment.

Based on Golder's comparison (using Autodesk Civil 3D) between the existing conditions (December 2020 survey by IngenAE) and the approximate base of ash grades developed from the 1963 earthwork and grading plans, the estimated volume of CCR in AP1 is approximately 436,000 CY. No additional CCR will be placed in AP1 before it is closed.

2.5 Largest Surface Area Estimate

Part 845.720(a)(1)(E): An estimate of the largest area of the CCR surface impoundment ever requiring a final cover (see Section 845.750), at any time during the CCR surface impoundment's active life.

In the Closure Plan developed for compliance with the United States Environmental Protection Agency's (USEPA's) CCR Rule (40 CFR 257, Subpart D), the largest area of AP1 ever requiring a final cover system was estimated to be approximately 26 acres. This area represents the entire footprint of AP1. The area of the closure footprint requiring a final cover system under this Final Closure Plan is approximately 10.4 acres.

2.6 Closure Completion Schedule

Part 845.720(a)(1)(F): A schedule for completing all activities necessary to satisfy the closure criteria in this Section, including an estimate of the year in which all closure activities for the CCR surface impoundment will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR surface impoundment, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR surface impoundment closure. When preparing the preliminary written closure plan, if the owner or operator of a CCR surface impoundment estimates that the time required to complete closure will exceed the timeframes specified in Section 845.760(a), the preliminary written closure plan must include the site-specific information, factors and considerations that would support any time extension sought under Section 845.760(b).

Table 1: Closure Completion Milestone Schedule

Milestone	Timeframe (Preliminary Estimates)
Final Closure Plan Submittal	August 2022
Final Design and Bid Process ▪ Complete final design of the closure and select a construction contractor Agency Coordination, Approvals, and Permitting ▪ Obtain state permits, as needed, for dewatering, water discharge, land disturbance, and dam modifications	8 to 12 months after Final Closure Plan Approval
Dewater and Stabilize CCR ▪ Complete contractor mobilization, installation of stormwater BMPs, and unwatering of AP1 ▪ Pump water from AP1	5 to 7 months after issuance of necessary permits, design completion, and bid award

Milestone	Timeframe (Preliminary Estimates)
▪ Dewater and stabilize AP1	
Consolidate Waste Footprint ▪ Demolish existing outlet structures ▪ Construct north-south berm ▪ Relocate CCR east of berm to closure footprint	4 to 6 months after dewatering and CCR stabilization
Installation of Final Cover System ▪ Prepare top of CCR for cover system installation ▪ Regrade exterior embankments to 3H:1V ▪ Install geomembrane ▪ Install nonwoven geotextile ▪ Place final protective soil	5 to 7 months after CCR relocation to closure footprint
Site Restoration ▪ Place fill over top of aquifer ▪ Place stormwater conveyance tack-on berms and letdown structures ▪ Excavate drainage channels ▪ Seed and stabilize AP1	3 to 4 months after the final cover system is complete
Timeframe to Complete Closure	Prior to April 2026

3.0 AMENDMENT OF THE FINAL CLOSURE PLAN

Part 845.720(b)(4): If a final written closure plan revision is necessary after closure activities have started for a CCR surface impoundment, the owner or operator must submit a request to modify the construction permit within 60 days following the triggering event.

IPRG will submit a written request to modify the construction permit within 60 days of a triggering event.

4.0 CLOSURE WITH A FINAL COVER SYSTEM

4.1 Minimization of Post-Closure Infiltration and Releases

Part 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

1) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere.

The proposed CIP design will control, minimize, or eliminate as much as feasible "post-closure infiltration of liquids" and releases of CCR, leachate, or contaminated runoff as interpreted by Illinois EPA in the Part 845 rulemaking. The final cover system will consist of (from top to bottom) the following:

- a 2-foot-thick final protective layer consisting of locally available soils compacted to between 80% and 95% of the standard Proctor maximum dry density. The uppermost 6 inches of the final protective layer will be tracked in place with a density suitable for establishment of vegetation. Soils are likely to consist primarily of low-plasticity silt or clay based on a review of site geotechnical information.
- Nonwoven geotextile cushioning layer.
- 40-mil LLDPE geomembrane.

The use of HDPE geomembrane was considered, but LLDPE geomembrane was selected because it can be installed more easily in a wider range of cold-temperature conditions. This final cover system is compliant with the Part 845 requirements, as described in Section 4.7, and will minimize the post-closure infiltration of liquids into the waste. After closure, the CCR stored in the facility will be completely covered by the final cover system, physically isolating it from contact with surface water and the atmosphere and minimizing the potential for release of CCR. This is supported by groundwater modeling, as presented in Appendix G to the Part 845 Construction Permit Application for AP1.

- The closure design will result in a reduction of infiltration into AP1 by 99.9% compared to pre-closure conditions as shown in the Groundwater Modelling Report. The Groundwater Modelling Report shows that the closure design will result in a reduction of hydraulic flux out of AP1 by 99.9% compared to pre-closure conditions. Due to the reduction in the hydraulic flux out of AP1, the mass flux out of AP1 will also be controlled or minimized as much as feasible as a result of closure design.

4.2 Preclusion of Future Impoundment

Part 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

2) Preclude the probability of future impoundment of water, sediment, or slurry.

The final cover system will be crowned with 7H:1V and 20H:1V slopes to direct surface water away from the facility. Beyond the final cover system, channels will direct surface water away from AP1 to existing site drainages.

4.3 Provisions for Preventing Instability, Sloughing and Movement

Part 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

3) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period.

An assessment of AP1 structural stability was completed as part of compliance with USEPA's CCR Rule (AECOM 2016). This assessment concluded that AP1 meets stability factor of safety requirements and does not pose a significant risk of instability.

A new earthen berm is provided in the closure design to enhance stability along the eastern end of the closure footprint. Slope stability calculations are included in Attachment 3 to demonstrate that factors of safety for static and seismic stability after closure are acceptable. The slope stability calculations also considered veneer stability to verify that the final cover system will not be susceptible to instability, sloughing, or movement during the closure and post-closure care period.

4.4 Minimize the Need for Future Maintenance

Part 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

4) Minimize the need for further maintenance of the CCR surface impoundment

The 5% to 14.3% design closure slopes are sufficient to adequately shed water from the facility but are flat enough to limit erosion of the final protective layer. Stormwater conveyance tack-on berms, which are sloped at 1%, direct stormwater on the final cover to a series of riprap-lined stormwater let-down structures. Minor maintenance of the final cover system (potentially including filling of low areas, reseeding, fertilizing, etcetera) will likely be necessary for several years after completion of final cover system construction, as described in the Post-closure Care Plan (Appendix J to the Part 845 Construction Permit Application for AP1). The need for long-term future maintenance is expected to be minimal after installation of the final cover system has been completed and vegetation has been established.

The channels designed to convey surface water runoff away from the closed facility have been sized to accommodate the 25-year, 24-hour storm event. The design calculations are provided in Attachment 4.

4.5 Be Completed in the Shortest Amount of Time

Part 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

5) Be completed in the shortest amount of time consistent with recognized and generally accepted engineering practices.

The CIP method will require significantly less material handling compared with a CBR approach. Both approaches require the removal of liquid wastes, but the CIP method will require relocation of less than 65% of the CCR present in AP1. This reduced material handling volume means that the CIP construction can be completed in approximately 25 to 36 months, compared with 36 to 56 months, or possibly more, for CBR.

4.6 Drainage and Stabilization

Part 845.750(b): Drainage and Stabilization of CCR Surface Impoundments. The owner or operator of a CCR surface impoundment or any lateral expansion of a CCR surface impoundment must meet the requirements of this subsection (b) before installing the final cover system required by subsection (c).

1) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.

2) Remaining wastes must be stabilized sufficiently to support the final cover system.

Approximately 15.2 million gallons of water will be pumped from AP1 as the initial step for facility closure. After removal of the ponded water, the CCR will still be unsuitable for supporting heavy construction traffic over much of the footprint. Careful planning will be required to safely work on the wet CCR within AP1. The planned CCR removal and relocation will rely on a series of trenches or other engineering measures to remove liquid wastes or solidify the remaining wastes. Trenches will shorten drainage routes to facilitate gravity removal of liquid wastes in the CCR in the vicinity of each trench and direct the liquid wastes to sumps. Other engineering measures may be considered to facilitate removal of liquid wastes. Sumps will be used to collect liquid wastes, which will be managed in accordance with the NPDES permit for the site. Using the process described or other engineering measures for removal of liquid wastes or solidification of the remaining wastes, the CCR remaining in place will be stabilized sufficiently to support the final cover system.

4.7 Final Cover System

Part 845.750(c): Final Cover System. If a CCR surface impoundment is closed by leaving CCR in place, the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and, at a minimum, meets the requirements of this subsection (c). The final cover system must consist of a low permeability layer and a final protective layer. The design of the final cover system must be included in the preliminary and final written closure plans required by Section 845.720 and the construction permit application for closure submitted to the Agency.

4.7.1 Low-Permeability Layer

Part 845.750(c)(1) Standards for the Low Permeability Layer. The low permeability layer must have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present, or a hydraulic conductivity no greater than 1 x 10^{-7} cm/sec, whichever is less. The low permeability layer must be constructed in accordance with the standards in either subsection (c)(1)(A) or (c)(1)(B), unless the owner or operator demonstrates that another low permeability layer construction technique or material provides equivalent or superior performance to the requirements of either subsection (c)(1)(A) or (c)(1)(B) and is approved by the Agency.

A) A compacted earth layer constructed in accordance with the following standards:

i) The minimum allowable thickness must be 0.91 meter (three feet); and

ii) The layer must be compacted to achieve a hydraulic conductivity of 1 x 10^{-7} cm/sec or less and minimize void spaces.

B) A geomembrane constructed in accordance with the following standards:

i) The geosynthetic membrane must have a minimum thickness of 40 mil (0.04 inches) and, in terms of hydraulic flux, must be equivalent or superior to a three-foot layer of soil with a hydraulic conductivity of 1 x 10^{-7} cm/sec;

ii) The geomembrane must have strength to withstand the normal stresses imposed by the waste stabilization process; and

iii) The geomembrane must be placed over a prepared base free from sharp objects and other materials that may cause damage.

The final cover system will include a 40-mil LLDPE geomembrane placed on a prepared subgrade of CCR (see the Drawings in Attachment 2). The prepared subgrade will be free of sharp objects prior to geomembrane installation. The geomembrane material will conform with the specifications of Geosynthetic Institute GRI-GM17 "Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes" and will be installed per GRI-GM19a "Seam Strength and Related Properties of Thermally Bonded Homogeneous Polyolefin Geomembranes/Barriers" so that the material itself and the seams between panels will withstand the expected normal and tensile stress conditions. Furthermore, a 40-mil LLDPE geomembrane manufactured and installed to these specifications is widely accepted to be equivalent or superior to a 3-foot-thick layer of soil with a hydraulic conductivity of 1 x 10^{-7} cm/sec.

4.7.2 Final Protective Layer

Part 845.750(c)(2): Standards for the Final Protective Layer. The final protective layer must meet the following requirements, unless the owner or operator demonstrates that another final protective layer construction technique or material provides equivalent or superior performance to the requirements of this subsection (c)(2) and is approved by the Agency.

A) Cover the entire low permeability layer;

B) Be at least three feet thick, be sufficient to protect the low permeability layer from freezing, and minimize root penetration of the low permeability layer;

C) Consist of soil material capable of supporting vegetation;

D) Be placed as soon as possible after placement of the low permeability layer; and

E) Be covered with vegetation to minimize wind and water erosion.

A 2-foot-thick final protective layer will be installed for the final cover system, immediately overlaying the nonwoven geotextile cushioning layer and covering the entire low-permeability layer (see the Drawings in Attachment 2). The final protective layer will comprise locally available soils compacted to between 80% and 95% of the standard Proctor maximum dry density. The uppermost 6 inches of the final protective layer will be tracked in place to a density suitable for establishment of vegetation. This soil is expected to consist primarily of low-plasticity silt or clay based on a review of site geotechnical information. This soil is capable of supporting vegetation, will be placed as soon as possible after placement of the low-permeability layer, and will be covered with vegetation to limit wind and water erosion.

4.8 Final Cover System Settling

Part 845.750(c)(3): The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

The closure slopes are designed at a minimum slope of 5% to accommodate settlement while still maintaining positive drainage off the facility. Additional discussion on this subject is provided in Section 4.4.

4.9 Use of CCR in Closure

Part 845.750(d): This subsection specifies the allowable uses of CCR in the closure of CCR surface impoundments closing under Section 845.700. Notwithstanding the prohibition on further placement in Section

845.700, CCR may be placed in these surface impoundments, but only for purposes of grading and contouring in the design and construction of the final cover system, if:

1) *The CCR placed was generated at the facility and is located at the facility at the time closure was initiated;*

2) *CCR is placed entirely above the elevation of CCR in the surface impoundment, following dewatering and stabilization (see subsection (b));*

3) *The CCR is placed entirely within the perimeter berms of the CCR surface impoundment; and*

4) *The final cover system is constructed with either:*

    A) *A slope not steeper than 5% grade after allowance for settlement; or*

    B) *At a steeper grade, if the Agency determines that the steeper slope is necessary, based on conditions at the site, to facilitate run-off and minimize erosion, and that side slopes are evaluated for erosion potential based on a stability analysis to evaluate possible erosion potential. The stability analysis, at a minimum, must evaluate the site geology; characterize soil shear strength; construct a slope stability model; establish groundwater and seepage conditions, if any; select loading conditions; locate critical failure surface; and iterate until minimum factor of safety is achieved.*

AP1 is not closing under Section 845.700. Following dewatering of AP1, CCR currently located within AP1 (which was generated at Coffeen Power Plant) will be relocated to within the closure footprint. Closure of AP1 will comply with the requirements of Subsection 845.750(d) in the event ash from a unit other than AP1 is utilized.

Slope stability calculations are included in Attachment 3 to demonstrate that factors of safety for static and seismic stability after closure are acceptable. The slope stability calculations also considered veneer stability to verify that the final cover system will not be susceptible to instability, sloughing, or movement during the closure and post-closure care period.

5.0 CERTIFICATION

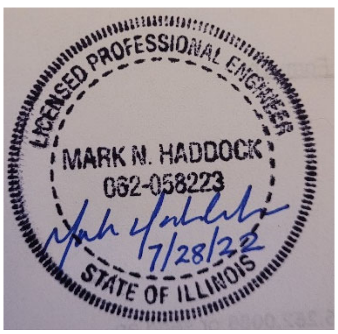
Part 845.750(c)(4): The owner or operator of the CCR surface impoundment must obtain and submit with its construction permit application for closure a written certification from a qualified professional engineer that the design of the final cover system meets the requirements of this Section.

The undersigned qualified professional engineer registered in Illinois certifies that the design of the final cover system meets the requirements of Section 845.750.

Signature Page

Golder Associates USA Inc.

I, Mark Haddock, being a registered professional engineer in good standing in the State of Illinois, certify to the best of my knowledge that this Final Closure Plan meets the requirements of Illinois Administrative Code Title 35, Part 845.



Mark Haddock
Principal

6.0 REFERENCES

AECOM. 2016. CCR Certification Report: AP1, At Coffeen Power Station. October.

ATTACHMENT 1

Closure Alternatives Analysis

Closure Alternatives Analysis for Ash Pond No. 1 at the Coffeen Power Plant Coffeen, Illinois

July 28, 2022

GRADIENT

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Abbreviations

AACE	Association for the Advancement of Cost Engineering
AP1	Ash Pond No. 1
BMP	Best Management Practice
CAA	Closure Alternatives Analysis
CBR	Closure-by-Removal
CCR	Coal Combustion Residual
CFR	Code of Federal Regulation
CIP	Closure-in-Place
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CY	Cubic Yard
DA	Deep Aquifer
DCU	Deep Confining Unit
EJ	Environmental Justice
FEMA	Federal Emergency Management Agency
GHG	Greenhouse Gas
GWPS	Groundwater Protection Standard
HUC	Hydrologic Unit Code
IAC	Illinois Administrative Code
ID	Identification
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Survey
IPGC	Illinois Power Generating Company
LCU	Lower Confining Unit
LLDPE	Linear Low-Density Polyethylene
N_2O	Nitrous Oxide
NID	National Inventory of Dams
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
PM	Particulate Matter
SFWA	State Fish and Wildlife Area
TMDL	Total Maximum Daily Load
TVA	Tennessee Valley Authority
UA	Uppermost Aquifer
UCU	Upper Confining Unit
US DOT	United States Department of Transportation
US FWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
WPC Permit	Water Pollution Control Construction and Operating Permit

Summary of Findings

Title 35, Part 845 of the Illinois Administrative Code (IAC; IEPA, 2021a) requires the development of a Closure Alternatives Analysis (CAA) prior to undertaking closure activities at certain surface impoundments containing coal combustion residuals (CCRs) in the state of Illinois. Pursuant to requirements under IAC Section 845.710, this report presents a CAA for Ash Pond No. 1 (AP1) located on Illinois Power Generating Company's (IPGC) Coffeen Power Plant property near the City of Coffeen, Illinois. The goal of a CAA is to holistically evaluate potential closure scenarios with respect to a wide range of factors, including the efficiency, reliability, and ease of implementation of the closure scenario; its potential positive and negative short- and long-term impacts on human health and the environment; and its ability to address concerns raised by residents (IAC Part 845; IEPA, 2021a). Gradient evaluated two specific closure scenarios for AP1: Closure-in-Place (CIP) with CCR excavation and consolidation and Closure-by-Removal (CBR) with a combination of on-Site and off-Site disposal. The CIP scenario entails excavating CCR and consolidating it into the western portion of AP1 and capping it with a new cover system consisting of, from bottom to top, a geomembrane layer, a geotextile cushion if needed, and 24 inches of low-permeability soil with a vegetated surface. The CBR scenario entails excavating all of the CCR from AP1 and transporting a portion of the material to an on-Site landfill and the remainder of the material to an off-Site landfill for disposal. Even though capping the entire AP1 (without any excavation or consolidation) would be an acceptable closure approach based on IAC Section 845.710 (IEPA, 2021a), it was not evaluated in this CAA. IPGC will also continue to evaluate potential opportunities for beneficial reuse of CCR excavated from AP1 as an alternative to disposal.

IAC Section 845.710(c)(2) requires CAAs to "[i]dentify whether the facility has an onsite landfill with remaining capacity that can legally accept CCR, and, if not, whether constructing an onsite landfill is possible" (IEPA, 2021a). There is an existing on-Site landfill at the Coffeen Power Plant Site with some capacity to accept CCR, but it does not have enough capacity to contain all of the material that would be removed from AP1. Furthermore, due to the planned redevelopment of the Site as a utility-scale solar energy generation and battery energy storage facility, there is not sufficient space available to expand the existing landfill.

Table S.1 summarizes the expected impacts of the CIP and CBR closure scenarios with regard to each of the factors specified under IAC Section 845.710 (IEPA, 2021a). Based on this evaluation and the additional details provided in Section 2 of this report, CIP has been identified as the most appropriate closure scenario for AP1. Key benefits of the CIP scenario relative to the CBR scenario include reduced impacts to workers, community members, and the environment during construction (*e.g.*, fewer construction-related accidents, lower energy demands, less air pollution and greenhouse gas [GHG] emissions, and less traffic-related impacts).

Table S.1 Comparison of Proposed Closure Scenarios

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR**
Closure Alternative Descriptions (Section 2.1, IAC Section 845.710(c))	CCR in AP1 would excavated and relocated into the western portion of AP1 and then capped in place with a new cover system consisting of, from bottom to top, a geomembrane layer, a geotextile cushion if needed, and 24 inches of low-permeability soil with a vegetated surface. During the closure process, we will continue to assess off-Site CCR beneficial use opportunities. Ash consolidation and closure in place in combination with off-Site beneficial use may result in a smaller footprint for purposes of our ultimate cap design along with a reduced construction schedule.	All CCR would be excavated from AP1. Some of the CCR would be transported *via* truck to an on-Site landfill for disposal, and the remainder would be transported *via* truck to an off-Site landfill for disposal. The on-Site landfill does not have capacity for all of the CCR, nor can it be expanded due to future redevelopment plans. Expansion of the off-Site landfill may be necessary in order to accept all of the CCR and related materials from AP1. This scenario meets the requirements of IAC Section 845.710(c)(2) (IEPA, 2021a), which requires an assessment be included in the CAA of whether the Site has an on-Site landfill with available capacity or whether an on-Site landfill can be constructed.
Type and Degree of Long-Term Management, Including Monitoring, Operation, and Maintenance (Section 2.2.3, IAC Section 845.710(b)(1)(C))	Monitoring would be performed for 30 years post-closure or until GWPSs are achieved, whichever is longer. Additionally, the final cover system for AP1 would undergo 30 years of annual inspections, mowing, and maintenance.	Monitoring would be performed for 3 years post-closure or until GWPSs are achieved, whichever is longer.
Magnitude of Reduction of Existing Risks (Section 2.2.1, IAC Sections 845.710(b)(1)(A) and 845.710(b)(1)(F))	There are no current unacceptable risks to any human or ecological receptors associated with AP1. Because there are no current risks, and dissolved constituent concentrations would be expected to decline post-closure, no risks to human or ecological receptors would be expected post-closure.	There are no current unacceptable risks to any human or ecological receptors associated with AP1. Because there are no current risks, and dissolved constituent concentrations would be expected to decline post-closure, no risks to human or ecological receptors would be expected post-closure.
Likelihood of Future Releases of CCR (Section 2.2.2, IAC Sections 845.710(b)(1)(B) and 845.710(b)(1)(F))	During closure, there would be minimal risk of dike failure occurring at AP1 (*e.g.*, due to flooding or seismic activity) and minimal risk of dike overtopping during flood conditions. Post-closure, the risks of overtopping and dike failure would be even smaller than they are currently, due to the installation of a protective soil cover and new stormwater control structures. Dikes, final cover, and stormwater control features have been designed to withstand earthquakes and storm events.	During closure, there would be minimal risk of dike failure occurring at AP1 (due to, *e.g.*, flooding or seismic activity) and minimal risk of dike overtopping during flood conditions. Following excavation, there would be no risk of CCR releases due to dike failure. Changing geochemical conditions during an extended excavation can be a mechanism that results in the mobilization and increased transport in groundwater for some constituents.
Worker Risks (Section 2.2.4.1, IAC Sections 845.710(b)(1)(D) and 845.710(b)(1)(F))	An estimated 0.0019 worker fatalities and 0.29 worker injuries would be expected to occur due to on-Site activities under this closure scenario. An additional 0.0018 worker fatalities and 0.14 worker injuries would be expected to occur off-Site due to vehicle accidents during hauling, labor and equipment mobilization and demobilization, and material deliveries. In total, 0.0037 worker fatalities and 0.43 worker injuries would be expected under this closure scenario. Overall, risks to workers would likely be higher under the CBR scenario and lower under the CIP scenario.	An estimated 0.0021 worker fatalities and 0.32 worker injuries would be expected to occur due to on-Site activities under this closure scenario. An additional 0.0044 worker fatalities and 0.30 worker injuries would be expected to occur off-Site due to vehicle accidents during hauling, labor and equipment mobilization and demobilization, and material deliveries. In total, 0.0065 worker fatalities and 0.62 worker injuries would be expected under this closure scenario. Overall, risks to workers would likely be higher under the CBR scenario and lower under the CIP scenario.
Community Risks (Section 2.2.4.2, IAC Sections 845.710(b)(1)(D) and 845.710(b)(1)(F))		
▪ *Off-Site Impacts on Nearby Residents and EJ Communities*	Off-Site impacts on nearby residents (including accidents, traffic, noise, and air pollution) would be less under this closure scenario than under the CBR scenario because it would require less off-Site vehicle and equipment travel miles than the CBR scenario. In total, an estimated 0.0014 fatalities and 0.073 injuries would be expected to occur among community members due to off-Site activities under this scenario. No off-Site transport of CCR and/or borrow soil is required under this closure scenario. No impacts to nearby EJ communities are anticipated under this closure scenario.	Off-Site impacts on nearby residents would be greater under the CBR closure scenario than under the CIP scenario because it would require significantly more off-Site vehicle and equipment travel miles. In total, an estimated 0.0074 fatalities and 0.27 injuries would be expected to occur among community members due to off-Site activities under this scenario. With regard to traffic impacts, a haul truck would be likely to pass a location near the Site every 19 minutes on average during working hours for approximately 691 workdays over 20-30 months under this closure scenario. No impacts to nearby EJ communities are anticipated under this closure scenario.
▪ *Impacts on Scenic, Historical, and Recreational Value*	Due to (*e.g.*) noise and visual disturbances, construction activities may have short-term negative impacts on the recreational use of the Coffeen Lake State Fish and Wildlife Area. Because the expected duration of construction activities is shorter under this closure scenario compared to the CBR scenario, short-term impacts on the scenic and recreational value of natural areas near the Site would be less under this closure scenario than under the CBR scenario. There are no historical sites in the vicinity of the impoundment, the on-Site landfill, or the on-Site borrow soil location. Thus, no impacts on historical sites would be expected under any closure scenario.	Due to (*e.g.*) noise and visual disturbances, construction activities may have short-term negative impacts on the recreational use of the Coffeen Lake State Fish and Wildlife Area. Because the expected duration of construction activities is longer under the CBR scenario than under the CIP scenario, short-term impacts on the scenic and recreational value of natural areas near the Site would be greater under the CBR scenario than under the CIP scenario. There are no historical sites in the vicinity of the impoundment or the on-Site landfill. Thus, no impacts on historical sites would be expected under any closure scenario.

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR**
Environmental Risks (Section 2.2.4.3, IAC Sections 845.710(b)(1)(D) and 845.710(b)(1)(F))		
▪ *Impacts on Greenhouse Gas Emissions and Energy Consumption*	Total energy demands and GHG emissions would be smaller under this closure scenario than under the CBR scenario, because the total equipment and vehicle mileages required under this closure scenario would be smaller than those required under the CBR scenario. The CIP scenario would have an additional, unquantified carbon footprint due to the need to manufacture geomembranes for use in the final cover system. At the grid scale, construction of a solar facility at the Site would put energy back on the grid and reduce reliance on non-renewable energy sources.	Total energy demands and GHG emissions would be greater under the CBR closure scenario than under the CIP scenario, because the total equipment and vehicle mileages required under this closure scenario would be greater than those required under the CIP scenario. If expansion of the off-Site landfill becomes necessary in order to accept all of the CCR and related materials from AP1, then the CBR scenario would have an additional, unquantified carbon footprint due to the need to manufacture geomembranes for use in the expanded landfill liner. At the grid scale, construction of a solar facility at the Site would put energy back on the grid and reduce reliance on non-renewable energy sources.
▪ *Impacts on Natural Resources and Habitat*	Construction may have short-term negative impacts on species located near AP1, the on-Site borrow soil location, the on-Site landfill, and the off-Site landfill. Construction may also cause a long-term shift in the habitat type atop portions of the impoundment. Short-term impacts on natural resources and habitat would be smaller under the CIP scenario than under the CBR scenario, because the overall duration of construction is shorter under the former scenario.	Construction may have short-term negative impacts on species located near AP1, the on-Site borrow soil location, the on-Site landfill, and the off-Site landfill. Construction may also cause a long-term shift in the habitat type atop portions of the impoundment. Short-term impacts on natural resources and habitat would be greater under the CBR scenario than under the CIP scenario, because the overall duration of construction is longer under the former scenario.
Time Until Groundwater Protection Standards Are Achieved (Section 2.2.5, IAC Sections 845.710(b)(1)(E) and 845.710(d)(2 and 3))	Groundwater modeling was performed to evaluate future groundwater quality in the vicinity of AP1 under each of the proposed closure scenarios (Ramboll, 2022). The groundwater modeling demonstrated that the groundwater concentrations in the monitoring wells within the UA will achieve GWPSs in 15 years with the exception of well G301 (Ramboll, 2022). The decline in post-closure groundwater concentrations at well G301 will be slower than at other locations because the well is located along the flow path of constituents that were released into the native geologic materials prior to closure. Because there will be reduced percolation of precipitation through the consolidation area within AP1 for the CIP scenario as a result of the cap, the time for concentrations to attenuate to levels below the GWPSs at well G301 is longer for the CIP scenario than for the CBR scenario.	Groundwater modeling was performed to evaluate future groundwater quality in the vicinity of AP1 under each of the proposed closure scenarios (Ramboll, 2022). The groundwater modeling demonstrated that the groundwater concentrations in the monitoring wells within the UA will achieve GWPSs in 18 years (Ramboll, 2022). Additionally, changing geochemical conditions during an extended excavation can be a mechanism that results in the mobilization and increased transport in groundwater for some constituents. This may result in GWPS exceedance durations in excess of the model predictions.
Long-Term Reliability of the Engineering and Institutional Controls (Section 2.2.7; IAC Section 845.710(b)(1)(G))	CIP would be expected to be a reliable closure alternative over the long term.	CBR would be expected to be a reliable closure alternative over the long term.
Potential Need for Future Corrective Action (Section 2.2.8; IAC Section 845.710(b)(1)(H))	Corrective action is expected at the Site. An evaluation of potential corrective measures and corrective actions has not yet been completed, but will be conducted consistent with the requirements in IAC Section 845.660 and IAC Section 845.670.	Corrective action is expected at the Site. An evaluation of potential corrective measures and corrective actions has not yet been completed, but will be conducted consistent with the requirements in IAC Section 845.660 and IAC Section 845.670.
Effectiveness of the Alternative in Controlling Future Releases (Section 2.3; IAC Section 845.710(b)(2)(A and B))	There are no current or future risks to any human or ecological receptors associated with AP1. During closure, there would be minimal risk of dike failure occurring and minimal risk of dike overtopping during flood conditions. Post-closure, the risks of overtopping and dike failure would be even smaller than they are currently, due to the installation of a protective soil cover and new stormwater control structures. Dikes, final cover, and stormwater control features have been designed to withstand earthquakes and storm events.	There are no current or future risks to any human or ecological receptors associated with AP1. During closure, there would be minimal risk of dike failure occurring and minimal risk of dike overtopping during flood conditions. Following excavation, there would be no risk of CCR releases due to dike failure.

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR**
Ease or Difficulty of Implementing the Alternative (Section 2.4, IAC Section 845.710(b)(3))		
▪ *Degree of Difficulty Associated with Construction*	CIP is a reliable and standard method for managing and closing waste impoundments. Dewatering saturated CCR to construct a stabilized final cover system subgrade may present challenges during closure; however, these challenges are common to most CCR surface impoundment closures and are commonly addressed *via* surface water management and dewatering techniques.	Relative to CIP, CBR poses additional implementation difficulties due to higher earthwork volumes, higher dewatering volumes, and longer construction schedules. Hauling to an off-Site landfill would be required under the CBR scenario. Because the CCR would be hauled on public roads, it would require haul trucks with a smaller capacity (16.5 cubic yards *versus* 34 cubic yards) and would also need to be dewatered to a greater extent than would be necessary under the CIP scenario. Off-Site landfilling would additionally require the development of a disposal plan and could raise issues related to the co-disposal of CCR and other non-hazardous wastes. The off-Site landfill may also need to be expanded to receive all of the CCR generated during excavation.
▪ *Expected Operational Reliability*	Operational reliability would be expected under all closure scenarios.	Operational reliability would be expected under all closure scenarios.
▪ *Need for Permits and Approvals*	Permits required under all closure scenarios would include a modification to the existing NPDES permit; a construction permit from the IDNR Dam Safety Program to allow the embankment and spillways of AP1 to be modified as part of closure; a construction stormwater permit through IEPA; and a joint water pollution control construction and operating permit (WPC permit).	Permits required under all closure scenarios would include a modification to the existing NPDES permit; a construction permit from the IDNR Dam Safety Program to allow the embankment and spillways of AP1 to be modified as part of closure; a construction stormwater permit through IEPA; and a joint water pollution control construction and operating permit (WPC permit). Additional permits and approvals may be required under this scenario if the off-Site landfill must be expanded to receive all of the CCR from AP1.
▪ *Availability of Equipment and Specialists*	CIP and CBR rely on common construction equipment and materials and typically do not require the use of specialists. However, global supply chains have been disrupted due to the COVID-19 pandemic, resulting in shortages in the availability of construction equipment and parts. There may be delays in construction under all scenarios if supply chain resilience does not improve by the time of construction. Due to smaller earthwork volumes and a lesser need for construction equipment under the CIP scenario than under the CBR scenario, shortages may cause fewer challenges under the CIP scenario than under the CBR scenario.	CIP and CBR rely on common construction equipment and materials and typically do not require the use of specialists. However, global supply chains have been disrupted due to the COVID-19 pandemic, resulting in shortages in the availability of construction equipment and parts. There may be delays in construction under all scenarios if supply chain resilience does not improve by the time of construction. Due to higher earthwork volumes and a greater need for construction equipment under the CBR scenario than under the CIP scenario, shortages may cause greater challenges under the CBR scenario than under the CIP scenario.
▪ *Available Capacity and Location of Treatment, Storage, and Disposal Services*	Under the CIP scenario, all of the CCR currently within AP1 would be stored within the existing footprint of the impoundment. Treatment would consist of unwatering AP1 at the start of construction, performing limited dewatering to stabilize the CCR subgrade, and managing stormwater inflow. Water from unwatering and dewatering of AP1 would be discharged in accordance with the NPDES permit for the facility.	Under the CBR scenario, CCR currently within AP1 would be placed in the on-Site landfill until the on-Site landfill reaches capacity. The remaining CCR in AP1 would be hauled to the off-Site landfill. The capacity remaining at the chosen off-Site landfill in Litchfield, Illinois, would be sufficient to receive all of the CCR in AP1 that is not placed in the on-Site landfill. However, due to the relatively short period over which CCR would be received at the off-Site landfill, vertical and/or lateral expansions may become necessary. Additionally, the landfill operators may need to develop a disposal plan to account for the increased volume of material that would be received and the unique CCR waste characteristics. If expansion of the chosen off-Site landfill were found to be impractical or infeasible, then an alternative landfill located farther from the Site would need to be identified. A likely alternative to the Litchfield-Hillsboro Landfill is the Five Oaks Landfill in Taylorville, Illinois. Water from unwatering and dewatering of AP1 would be discharged in accordance with the NPDES permit for the facility.

Evaluation Factor (Report Section; IAC Part 845 Section)	**Closure Scenario**	
	CIP	**CBR**
Impact of Alternative on Waters of the State (Section 2.5, IAC Section 845.710(d)(4))	No current or future exceedances of any screening benchmarks for surface water would be expected under any closure scenario.	No current or future exceedances of any screening benchmarks for surface water would be expected under any closure scenario.
Potential Modes of Transportation Associated with CBR (Section 2.1; IAC Section 845.710(c)(1)	This factor is not relevant for CIP.	IAC Section 845.710(c)(1) requires CBR alternatives to consider multiple methods for transporting CCR off-Site, including rail, barge, and trucks. Golder evaluated the feasibility of transporting CCR to the off-Site landfill *via* rail or barge and found that neither option is viable at this Site. Truck transport has been identified as the preferred option for transport of CCR to the off-Site landfill. The local availability and use of natural gas-powered trucks, or other low-polluting trucks, will be evaluated prior to the start of construction.
Concerns of Residents Associated with Alternatives (Section 2.6, IAC Section 845.710(b)(4))	Despite the preference for CBR that has been expressed by nonprofits representing community interests near the Site, CIP would effectively address residents' concerns regarding potential impacts to groundwater and surface water quality at the Site. Relative to CBR, CIP also presents fewer risks to nearby residents in the form of accidents, traffic, noise, and air pollution. A public meeting was held on June 14, 2022, pursuant to requirements under IAC Section 845.710(e). Questions raised by attendees were addressed at the meeting; subsequently, a written summary of the questions and responses was prepared.	Nonprofits representing community interests near the Site have expressed a preference for CBR over CIP. However, the CBR scenario has several disadvantages with regard to potential community concerns. Relative to CIP, the CBR scenario presents greater risks to nearby residents in the form of accidents, traffic, noise, and air pollution. A public meeting was held on June 14, 2022, pursuant to requirements under IAC Section 845.710(e). Questions raised by attendees were addressed at the meeting; subsequently, a written summary of the questions and responses was prepared.

Notes:

AP1 = Ash Pond No. 1; CAA = Closure Alternatives Analysis; CBR = Closure-by-Removal; CCR = Coal Combustion Residual; CIP = Closure-in-Place; EJ = Environmental Justice; GHG = Greenhouse Gas; GWPS = Groundwater Protection Standard; IAC = Illinois Administrative Code; IDNR = Illinois Department of Natural Resources; IEPA = Illinois Environmental Protection Agency; NPDES = National Pollutant Discharge Elimination System; UA = Upper Aquifer.

1 Introduction

1.1 Site Description and History

1.1.1 Site Location and History

Illinois Power Generating Company's (IPGC) Coffeen Power Plant is an electric power generating facility with coal-fired units located approximately two miles south of the city of Coffeen, Illinois, between two lobes of Coffeen Lake. Historically, three room and pillar coal mines operated within the boundaries of the Site. From north to south, they are the Clover Leaf No. 1 Mine, which operated from 1889 to 1901; the Clover Leaf No. 4 Mine, which operated from 1906 to 1924; and the Hillsboro Mine, which operated from 1964 to 1983 (Ramboll, 2021a; ISGS and University of Illinois at Urbana-Champaign, 2011). The Coffeen Power Plant began operating in 1964 and was retired in November 2019 (Ramboll, 2021a).

1.1.2 CCR Impoundment

The Coffeen Power Plant produced and stored coal combustion residuals (CCRs) as a part of its historical operations. Ash Pond No. 1 (AP1; Vistra identification [ID] No. CCR Unit 101, Illinois Environmental Protection Agency [IEPA] ID No. W1350150004-01, and National Inventory of Dams [NID] ID No. IL50722) is the subject of this report.

AP1 (Figure 1.1) is a 26.2-acre unlined surface impoundment constructed in 1964 for the management of bottom ash and other non-CCR waste generated historically by the facility (Ramboll, 2021a). It began operating in 1964 and stopped receiving sluiced ash in November 2019 (Ramboll, 2021a; AECOM, 2016a).

Initially, AP1 received CCR from the coal-fired units of the power plant, operating as a flow-through structure with outflow discharging to Coffeen Lake. AP1 primarily received bottom ash as well as low volume wastes *via* floor drains in the main power building. Later, AP1 was modified to recycle water on-Site. Reconstruction occurred from approximately 1979 to 1981 to abandon the discharge pipe to Coffeen Lake, add a recycle intake structure, and redirect flow through AP1 such that the outflow was returned to the Coffeen Power Plant for reuse as process water (Appendix B). Bottom ash was also removed for beneficial reuse from AP1 by third-party contractors (Ramboll, 2021a; Appendix B).

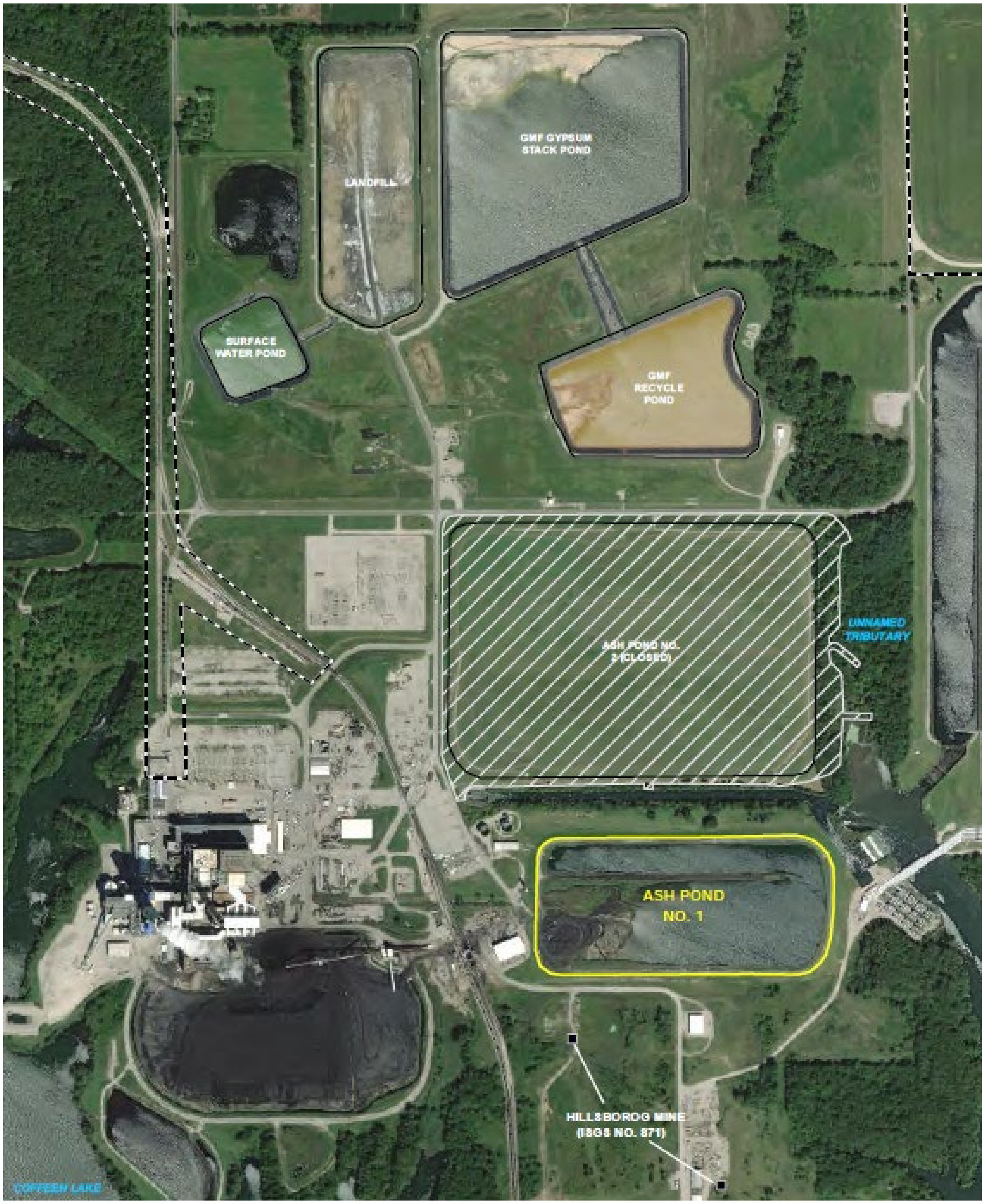

Figure 1.1 Site Location Map. GMF = Gypsum Management Facility. Adapted from Ramboll (2021a).

1.1.3 Surface Water Hydrology

Coffeen Lake has two lobes that border the Coffeen Power Plant on the west, south, and part of the eastern Site boundary. East of the Site, the Unnamed Tributary flows south into the eastern lobe of Coffeen Lake. The facility is permitted to discharge to Coffeen Lake under National Pollutant Discharge Elimination System (NPDES) Permit No. IL 0000108 (Ramboll, 2021a). The northeast corner of AP1 is located approximately 160 feet west of Coffeen Lake within the Shoal Creek Watershed (Hydrologic Unit Code [HUC] 07140203; Ramboll, 2021a). The Unnamed Tributary flows south into Coffeen Lake approximately 760 feet northeast of AP1, and the East Fork of Shoal Creek is located approximately 4,300 feet east of AP1. Within 1,000 meters of AP1, there are several unnamed freshwater ponds and two freshwater emergent wetlands (Figure 1.2; Ramboll, 2021a). The ponds range in size from 0.2 acres to 4.8 acres. The emergent wetlands are 0.4 acre in size, located south of AP1, and 1.6 acres, located northeast of AP1 where the Unnamed Tributary enters Coffeen Lake (Figure 1.2).

The 1,100-acre Coffeen Lake was built by damming the McDavid Branch of the East Fork of Shoal Creek to aid with cooling for the facility (Ramboll, 2021a). The IEPA classifies Coffeen Lake as a General Use Water (IL EPA, 2007): it is designated for aquatic life and use in primary contact recreation; however, it is not designated for use in food processing or as a public water supply. Coffeen Lake (Assessment Unit ID IL_ROG) is listed on the 2018 Illinois Section 303(d) List as being impaired for fish consumption due to mercury (IEPA, 2019a; US EPA, 2022). In addition, US EPA approved in 2007 a Total Maximum Daily Load (TMDL) for phosphorus to address aesthetic quality impairments in Coffeen Lake due to excess algae and total suspended solids (IEPA, 2007).

Surface water samples were collected from six locations in Coffeen Lake in the vicinity of AP1 in August 2021 (Geosyntec Consultants, 2021). These data are summarized in Gradient's Human Health and Ecological Risk Assessment for the Site, which is provided as Appendix A of this report.

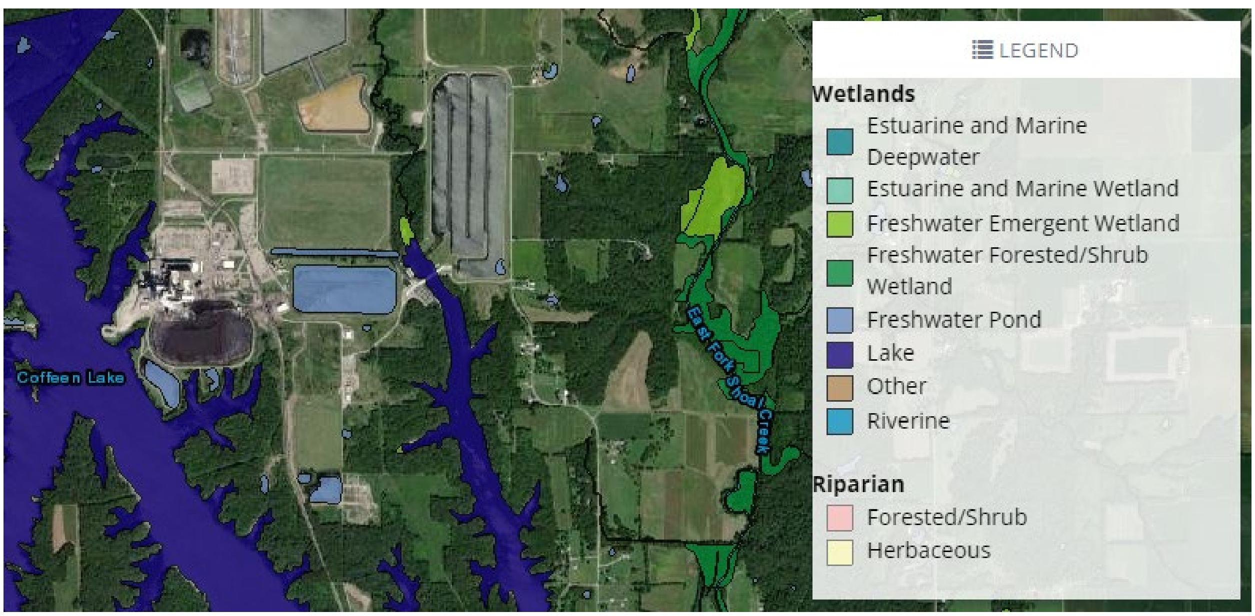

Figure 1.2 Wetlands and Surface Water Bodies in the Vicinity of the Coffeen Power Plant Ash Pond No. 1. Adapted from US FWS (2021).

1.1.4 Hydrogeology

The geology underlying the Site in the vicinity of AP1 consists of five distinct hydrostratigraphic units (Ramboll, 2021a):

- Upper Confining Unit (UCU): The UCU underlies AP1. It consists of a Loess Unit and the upper portion of the Hagarstown Member, which has low permeability clays and silts with generally greater than 60% fines. The UCU was encountered across most of the Coffeen Power

Plant except for the eastern edge of AP1 where soils were excavated during construction of the pond.

- Uppermost Aquifer (UA): The UA is comprised of moderately permeable sands, silty sand, and clayey gravel of the Hagarstown Member and, in some portions of the Site, the Vandalia Member. The UA unit is missing in several locations due to both excavation and weathering.
- Lower Confining Unit (LCU): The LCU underlies the UA. It consists of three low hydraulic conductivity soils: the sandy clay till of the Vandalia Member, the silt of the Mulberry Grove Formation, and the compacted clay till of the Smithboro Member.
- Deep Aquifer (DA): The DA is a thin (generally less than 5-foot thick), discontinuous unit composed of sands and silty sands.
- Deep Confining Unit (DCU): The DCU underlies the DA. It consists of the Lierle Clay of the Banner Formation and acts as an aquitard due to its low hydraulic conductivity (Ramboll, 2021a).

Groundwater near AP1 flows north to northeast toward a former discharge structure and the Unnamed Tributary (Ramboll, 2021a). The "Hydrogeologic Site Characterization Report" prepared by Ramboll as part of the operating permit for AP1 includes an evaluation of groundwater data collected from AP1 monitoring wells between 2015 and 2021 (Ramboll, 2021a).

1.1.5 Site Vicinity

The Coffeen Power Plant property is bordered by Coffeen Lake to the west and south, by the Unnamed Tributary and Coffeen Lake to the east, and by agricultural land to the north (Ramboll, 2021a, Figure 1.1). Coal mining operations occurred in the vicinity of AP1 from 1906 until 1983. AP1 partially overlies the former Hillsboro Mine (Illinois State Geological Survey [ISGS] Mine No. 871), which operated from 1964 until 1983. The Clover Leaf No. 4 Mine (ISGS Mine No. 442) was located north to northwest of AP1 and operated from 1906 until 1924 (Ramboll, 2021a).

Although the area surrounding the Coffeen Power Plant is predominantly agricultural, Coffeen Lake and the surrounding land are used for recreational activities. Since 1986, Coffeen Lake State Fish and Wildlife Area (SFWA) has been open to the public under a lease and management agreement between the Illinois Department of Natural Resources (IDNR) and Ameren Energy Generating Company (IDNR, 1999). To the north of the Coffeen Power Plant, there are walking and hiking trails and bank fishing. Coffeen Lake also entertains fishing and picnicking on the western shore. Based on a review of the IDNR Historic Preservation Division database and the Illinois State Archaeological Survey database, there are no historic sites located within 1,000 meters of AP1 (Ramboll, 2021a).

1.2 IAC Part 845 Regulatory Review and Requirements

Title 35, Part 845 of the Illinois Administrative Code (IAC; IEPA, 2021a) requires the development of a Closure Alternatives Analysis (CAA) prior to undertaking closure activities at certain CCR-containing surface impoundments in the state of Illinois. Section 2 of this report presents a CAA for AP1 pursuant to requirements under IAC Section 845.710. The goal of a CAA is to holistically evaluate each potential closure scenario with respect to a wide range of factors, including the efficiency, reliability, and ease of implementation of the closure scenario; its potential positive and negative short- and long-term impacts on human health and the environment; and its ability to address concerns raised by residents (IEPA, 2021a). A CAA is a decision-making tool that is designed to aid in the selection of an optimal closure alternative for the impoundments at a site.

2 Closure Alternatives Analysis

2.1 Closure Alternative Descriptions (IAC Section 845.710(c))

This section of the report presents a CAA for AP1 pursuant to requirements under IAC Section 845.710 (IEPA, 2021a). The two closure scenarios evaluated in this CAA are Closure-in-Place (CIP) and Closure-by-Removal (CBR). Under the CIP scenario, the CCR would remain in place and AP1 would be capped with a new cover system. Under the CBR scenario, some of the CCR would be excavated from the impoundment and hauled to an on-Site landfill and the remainder of the CCR would be excavated from the impoundment and hauled to an off-Site landfill. IPGC will also continue to evaluate potential opportunities for beneficial reuse of CCR excavated from AP1 as an alternative to disposal.

IAC Section 845.710(c)(2) requires CAAs to, "[i]dentify whether the facility has an onsite landfill with remaining capacity that can legally accept CCR, and, if not, whether constructing an onsite landfill is possible" (IEPA, 2021a). There is an existing on-Site landfill at the Coffeen Power Plant Site with some capacity to accept CCR, but it does not have enough capacity to contain all of material that would be removed from AP1. Furthermore, due to the planned redevelopment of the Site as a utility-scale solar energy generation and battery energy storage facility, there is not sufficient space available to expand the existing landfill.

Sections 2.1.1 and 2.1.2 provide detailed descriptions of the CIP and CBR closure scenarios. These scenarios are based on closure documents and analyses provided to Gradient by Golder, which are attached to this report as Appendix B.

2.1.1 Closure-in-Place

Under the CIP scenario, CCR would be excavated and relocated into the western portion of AP1 and then capped in place with a final cover system. This scenario includes the following work elements (Golder Associates USA Inc., 2022; Appendix B):

- Unwatering and dewatering of the impoundment *via* pumping and the construction of drilled sumps, engineered trenches, and/or horizontal wells. The CCR will dewater to some degree by gravity. Water will be pumped to the existing drainage to the north of AP1 and managed in accordance with the NPDES permit for the facility.
- Decontamination and demolition/disposal of the riser structure and outlet pipes. The riser structure will be disposed of in the consolidated footprint, and the outlet pipes will be plugged and abandoned or removed and disposed of. Decontamination water will be managed in accordance with the NPDES permit for the facility.
- Excavation of CCR and up to 1 foot of underlying soil from the eastern portion of AP1 and consolidating it into the western portion of AP1. The excavation and consolidation of CCR will result in CCR being separated from underlying groundwater during the simulated post-closure conditions by at least 3.2 feet (Ramboll, 2022).
- Construction of a berm oriented north-south on the east end of the consolidated footprint.

- Construction of an alternative cover system consisting of a 40-mil linear low-density polyethylene (LLDPE) geomembrane layer, a nonwoven geotextile cushion, and 24 inches of protective soil cover suitable for supporting vegetative growth. An alternative cover performance demonstration has been submitted to IEPA for approval pursuant to Section 845.750(c)(2) (Geosyntec Consultants, 2022).
- Construction of a free-draining stormwater management system, including berms, channels, and letdown structures, that will convey stormwater from the consolidated closure area to existing surface water bodies.
- Removal of existing earthen embankments not required for the consolidated footprint and excavation of a channel to allow stormwater to flow off-Site in accordance with the NPDES permit for the facility.
- Filling the low areas east of the consolidated footprint using soil sourced from existing berms that are no longer required or from the on-Site soil borrow area southeast of AP1 to provide at least 1 foot of soil cover above the top of the UA and establish the final ground surface.
- Long-term (post-closure) monitoring and maintenance, including at least 30 years of groundwater monitoring at the impoundment, or until such time as groundwater protection standards (GWPSs) are achieved. Additionally, 30 years of post-closure care would be undertaken for the final cover system, including annual cap inspections, mowing, and maintenance.

This CIP plan meets all closure requirements of IAC Part 845.750 (IEPA, 2021a). Key closure elements that address the Part 845 closure requirements are summarized below. Further details are provided in the Closure Plan (Golder Associates USA Inc., 2022).

- An alternative cover system would be installed over the CCR that remains in AP1. The cover, consisting of a 40-mil LLDPE geomembrane low-permeability layer, a geotextile cushion if needed, and 24 inches of soil, would minimize vertical infiltration of precipitation into the basin [Part 845.750(a)(1)] (Geosyntec Consultants, 2022).
- The final cover system would be gently sloped to direct surface water away from the impoundment. Beyond the final cover system, channels would direct surface water away from AP1 to existing Site drainages [Part 845.750(a)(2)].
- Impounded water would be removed from AP1 and managed in accordance with the NPDES permit for the facility [845.750(b)(1) and 845.750(b)(2)].
- Free liquids in the CCR would be eliminated by removing liquid wastes or solidifying the remaining wastes. Engineered trenches would facilitate gravity drainage of liquid wastes in the CCR and direct the liquid wastes to sumps. Other engineering measures, such as drilled sumps and/or horizontal wells, may also be considered to facilitate removal of liquid wastes and stabilization of wastes. Liquid wastes will be managed in accordance with the NPDES permit for the Site [845.750(b)(1) and 845.750(b)(2)].
- The proposed CIP design will control, minimize, or eliminate as much as feasible post-closure infiltration of liquids and releases of CCR, leachate, or contaminated runoff as interpreted by IEPA in the Part 845 rulemaking. Specifically, CIP will result in a reduction of infiltration into AP1 by 99.2% compared to pre-closure conditions (Ramboll, 2022). Additionally, CIP will result in a reduction of hydraulic flux out of AP1 by 99.9% compared to pre-closure conditions (Ramboll, 2022). Due to the reduction in the hydraulic flux out of AP1, the mass flux out of AP1 will also be controlled or minimized as much as feasible as a result of CIP.

Furthermore, during the closure process, we will continue to assess off-Site CCR beneficial use opportunities. Ash consolidation and CIP in combination with off-Site beneficial use may result in a smaller footprint for purposes of our ultimate cap design along with a reduced construction schedule.

Under this scenario, approximately 305,000 cubic yards (CY) of CCR and subsoil would be relocated to the western portion of AP1 (an assumed travel distance of 2,000 feet; Appendix B). Construction of the final cover system for the impoundment and contouring east of the consolidated footprint would require an additional 109,000 CY of clean soil, which would be sourced from existing berms, and if needed, elsewhere on Site (an assumed travel distance of 2,000 feet; Appendix B). Borrow soil would be hauled on Site using trucks with an assumed capacity of 34 CY.

Under the CIP scenario, the overall expected duration of construction and earthwork activities (including closure of the impoundment and Site restoration) is approximately 17 to 24 months (1.4 to 2.0 years; Golder Associates USA Inc., 2022). The total expected number of on-Site workdays is 503 (Appendix B). The CIP scenario will meet the required closure schedule (*i.e.*, closure completed by October 2028) defined in IAC Section 845.700(d)(2)(C)(ii) (IEPA, 2021a). Key parameters for the CIP scenario are shown in Table 2.1.

Table 2.1 Key Parameters for the Closure-in-Place Scenario

Parameter	
Surface Area of AP1	26.2 acres
Surface Area of Final Cover System	10.4 acres
Hauled Volume of CCR and Subsoil to be Relocated	305,000 CY
Average Travel Distance for Relocation of CCR	2,000 feet
Hauled Volume of Borrow Soil	109,000 CY
Average Distance to On-Site Borrow Soil Location	2,000 feet
Duration of Construction Activities	503 days
Labor Hours	
Total On-Site Labor	25,100 hours
Total Off-Site Labor	3,980 hours
30% Contingency	8,720 hours
Total Labor Hours:	37,800 hours
Vehicle and Equipment Travel Miles	
Vehicles On-Site	8,850 miles
Equipment On-Site	37,700 miles
On-Site Haul Trucks (Unloaded + Loaded)	9,210 miles
Labor Mobilization	211,000 miles
Equipment Mobilization (Unloaded + Loaded)	43,100 miles
Off-Site Haul Trucks (Unloaded + Loaded)	0 miles
Material Deliveries (Unloaded + Loaded)	13,900 miles
Total On-Site Vehicle and Equipment Travel Miles:	55,800 miles
Total Off-Site Vehicle and Equipment Travel Miles:	268,000 miles
Total Vehicle and Equipment Travel Miles:	324,000 miles

Notes:
AP1 = Ash Pond No. 1; CCR = Coal Combustion Residual; CY = Cubic Yards.
Hauled volumes of CCR and soil are 5% greater than "in-place" volumes.
Due to rounding, totals may not match the sum of the values.
Source: Appendix B.

2.1.2 Closure-by-Removal

Under the CBR scenario, CCR would be excavated from AP1 and approximately 63% of the CCR would be transported to the on-Site landfill for disposal, and the remainder would be transported to an off-Site landfill for disposal. The on-Site landfill would be located approximately 1 mile north of AP1 along Site roads (Appendix B).

Evaluation of landfill capacity and permitted use must be taken into consideration for each landfill considered for off-Site disposal. For example, a municipal landfill is often designed and permitted to accept waste from the local community at a specific rate. The landfill owner relies on this information to determine the remaining life of a landfill and determine when it will be necessary to expand or close the landfill. Due to the lengthy permitting and construction process, a landfill would need to continue accepting current waste streams and ash for a significant period of time to be a viable option, assuming the landfill owner and state approve. Furthermore, given the volume of ash that would need to be transported, it is important to evaluate impacts to communities that will be affected by the increase in truck traffic to and from the landfill. The nearest operating landfill to meet these criteria is Republic Services' Litchfield-Hillsboro Landfill in Litchfield, Illinois, which is located approximately 18 miles from the Site (Appendix B). CCR would be hauled to the off-Site landfill using haul trucks with a capacity of 16.5 CY, a smaller capacity than that of the haul trucks that would haul CCR to the on-Site landfill (34 CY) due to restrictions placed on the size of trucks that can be used on public roadways. As is described below in Section 2.4.5, it is possible that the Litchfield-Hillsboro Landfill would have to be expanded in order to accept all of the material excavated from AP1.

IAC Section 845.710(c)(1) requires CBR alternatives to consider multiple methods for transporting CCR off-Site, including rail, barge, and trucks. Golder evaluated the feasibility of transporting CCR to the off-Site landfill *via* rail or barge and found that neither option is viable at this Site (Appendix B). Transporting CCR by rail would require the construction of a new rail loading terminal on-Site and the construction of a new rail unloading terminal near the off-Site landfill. The construction of new rail terminals would require coordination with the railroad and additional permitting, which could negatively impact the project schedule. Trucks would still be needed to haul CCR to and from the terminals, and additional CCR exposures could occur during the loading and unloading of CCR into trucks and rail cars. Moreover, because there is no direct rail route from the Site to the off-Site landfill, the transport of CCR to the off-Site landfill would require 25 miles of rail transport on tracks owned by three separate rail lines.

The Coffeen Power Plant is not located near a navigable waterway, thus transportation of CCR by barge is not feasible. For these reasons, truck transport has been identified as the preferred option for transport of CCR to the off-Site landfill. Transport *via* truck would not require the construction of additional loading or unloading infrastructure and would not result in project delays due to permitting and coordination with other parties. The existing travel routes from the Site to the off-Site landfill are suitable for CCR transport *via* truck (Appendix B). The local availability and use of natural gas-powered trucks, or other low-polluting trucks, will be evaluated prior to the start of construction.

This scenario includes the following work elements (Appendix B):

- Unwatering and dewatering of the impoundment *via* pumping and passive dewatering methods. The CCR will dewater to some degree by gravity. Pumping from trenches and sumps is also expected to be necessary. Water would be pumped to the existing drainage to the north of AP1 and managed in accordance with the NPDES permit for the facility.
- Construction of temporary stormwater control structures, including ditches and sumps, to maintain AP1 in an unwatered state and convey runoff away from the impoundment.
- Excavation of approximately 311,000 CY of CCR from the impoundment and transport of these materials to the on-Site landfill.
- Excavation of the remaining CCR and up to 1 foot of subsoil (approximately 184,000 CY) from the impoundment, and transport of these materials to the off-Site landfill. Subsoils with CCR staining would be excavated with the CCR.
- Decontamination and demolition/disposal of the riser structure and outlet pipes. The riser structure will be disposed of in the offsite landfill, and the outlet pipes will be plugged and abandoned or removed and disposed. Decontamination water will be managed in accordance with the NPDES permit for the facility.
- Removal of earthen embankments and excavation of a channel to allow stormwater to flow off-Site in accordance with the NPDES permit for the facility.
- Filling the low areas east of the consolidated footprint using soil sourced from existing berms to provide at least 1 foot of soil cover above the top of the UA and establish the final ground surface.
- Site restoration, including the placement of 6 inches of topsoil along the side slopes and bottom of AP1 and revegetation with native grasses.

- Monitoring for 3 years post-closure or until such time as GWPSs are achieved, whichever is longer.

Under this scenario, soil for backfilling of the impoundment and Site restoration would be sourced from existing berms, and if needed, elsewhere on Site (an assumed average travel distance of approximately 2,000 feet; Appendix B). In total, 40,500 CY of clean borrow soil would be required under this scenario. A haul truck capacity of 34 CY is assumed for the on-Site transport of borrow soil (Appendix B).

The on-Site landfill currently has approximately 375,500 CY of available capacity. Thus, the on-Site landfill does not have sufficient capacity to receive all of the CCR from AP1 that is slated for disposal under this scenario. Expansion of the landfill is not viable due to the planned redevelopment of the Site as a utility-scale solar energy generation and battery energy storage facility. This scenario meets the requirements of IAC Section 845.710(c)(2) (IEPA, 2021a), which requires an assessment be included in the CAA of whether the Site has an on-Site landfill with available capacity or whether an on-Site landfill can be constructed.

Under the CBR scenario, the overall expected duration of construction and earthwork activities (including closure of the impoundment and Site restoration) is approximately 20 to 30 months (1.7 to 2.5 years). The total expected number of on-Site workdays is 691 (Appendix B). The CBR scenario will meet the required closure schedule (*i.e.*, closure completed by October 2028) defined in IAC Section 845.700(d)(2)(C)(ii) (IEPA, 2021a). Key parameters for the CBR scenario are shown in Table 2.2.

Table 2.2 Key Parameters for the Closure-by-Removal Scenario

Parameter	Value
Surface Area of AP1	26.2 acres
Distance from AP1 to the On-Site Landfill	1 mile
Distance to the Off-Site Landfill	18 miles
Distance from AP1 to the On-Site Borrow Location	2,000 feet
Hauled Volume of CCR to On-Site Landfill	311,000 CY
Hauled Volume of CCR and Subsoil to Off-Site Landfill	184,000 CY
Hauled Volume of Borrow Soil	40,500 CY
Duration of Construction Activities	691 days
Labor Hours	
Total On-Site Labor	27,800 hours
Total Off-Site Labor	20,800 hours
30% Contingency	14,600 hours
Total Labor Hours:	63,100 hours
Vehicle and Equipment Travel Miles	
Vehicles On-Site	13,700 miles
Equipment On-Site	72,500 miles
On-Site Haul Trucks (Unloaded + Loaded)	19,200 miles
Labor Mobilization	387,000 miles
Equipment Mobilization (Unloaded + Loaded)	59,200 miles
Off-Site Haul Trucks (Unloaded + Loaded)	400,000 miles
Material Deliveries (Unloaded + Loaded)	7,000 miles
Total On-Site Vehicle and Equipment Travel:	105,000 miles
Total Off-Site Vehicle and Equipment Travel:	853,000 miles
Total Vehicle and Equipment Travel:	958,000 miles

Notes:
AP1 = Ash Pond No. 1; CCR = Coal Combustion Residual; CY = Cubic Yard.
Due to rounding, totals may not match the sum of the values.
Hauled volumes of CCR and soil are 5% greater than "in-place" volumes.
Source: Appendix B.

2.2 Long- and Short-Term Effectiveness of the Closure Alternative (IAC Section 845.710(b)(1))

2.2.1 Magnitude of Reduction of Existing Risks (IAC Section 845.710(b)(1)(A))

This section of the report addresses the potential risks to human and ecological receptors due to exposure to CCR-associated constituents in groundwater or surface water. Gradient has performed a Human Health and Ecological Risk Assessment for the Site (Appendix A of this report), which provides a detailed evaluation of the magnitude of existing risks to human and ecological receptors associated with AP1. This report concluded that there are no current unacceptable risks to any human or ecological receptors associated with AP1. Because there are no current risks to any human or ecological receptors, and dissolved constituent concentrations would be expected to decline post-closure, no post-closure risks would be expected under any closure scenario. Thus, there would be no current risk or future risk under any closure scenario, and the magnitude of reduction of existing risks would be the same under every closure scenario.

2.2.2 Likelihood of Future Releases of CCR (IAC Section 845.710(b)(1)(B))

This section of the report quantifies the risk of future releases of CCR that may occur during dike failure and storm-related events.

Storm-Related Releases and Dike Failure During Flood Conditions

Based on the effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for the Site, AP1 is not located within the 100-year flood zone for Coffeen Lake and the Unnamed Tributary (FEMA, 1981). Engineering analyses show that the risk of overtopping occurring during flood conditions is also minimal under current conditions. Specifically, AECOM evaluated the risk of flood overtopping occurring at AP1 and found that the impoundment can adequately manage flow during peak discharge from even a 1,000-year storm event, thus preventing overtopping (AECOM, 2016b,c). Additionally, engineering analyses show that the AP1 dikes are expected to remain stable under static, seismic, and flood conditions (AECOM, 2016b,c). Prior to closure (*i.e.*, under current conditions), the risk of dike failure occurring during floods or other storm-related events is therefore minimal. Post-closure, the risks of overtopping and dike failure occurring due to floods or other storm-related events would be even smaller than they are currently. Under the CIP scenario, a new cover system would be installed, which would include 24 inches of soil and a geomembrane liner, as well as new stormwater control structures. Relative to current conditions, this cover system would provide increased protection against berm and surface erosion, groundwater infiltration, and other adverse effects that could potentially trigger a dike slope failure event. Under the CBR scenario, all of the CCR in AP1 would be excavated and relocated, eliminating the risk of a CCR release occurring post-closure. In summary, there is minimal current or future risk of sudden CCR releases occurring under any closure scenario either during or following closure.

Dike Failure Due to Seismicity

Sites in Illinois may be subject to seismic risks arising from the Wabash Valley Seismic Zone and the New Madrid Seismic Zone (IEMA, 2020). The Coffeen Power Plant property lies within a seismic impact zone (Ramboll, 2021a; Haley & Aldrich, Inc., 2018a). However, all structural components of AP1 have been designed to resist the maximum horizontal acceleration in lithified earth material for the Site. AP1 therefore meets the seismic safety requirements of 40 Code of Federal Regulations (CFR) Section 257.63(a) and IAC Section 845.330, and the overall risk of dike failure due to seismicity is expected to be low (Ramboll, 2021a; Haley & Aldrich, Inc., 2018a). Additionally, AP1 does not lie within 200 feet of an active fault or fault damage zone at which displacement has occurred within the current geological epoch (*i.e.*, within the last ~11,650 years; Haley & Aldrich, Inc., 2018b). The nearest known faults are the Crown Fault, which is located about 31 miles northwest of AP1, and the Centralia Fault zone, which is located about 35 miles southeast of AP1. These faults do not have known recent activity (Haley & Aldrich, Inc., 2018b); however, a magnitude 3.8 earthquake occurred approximately 15 miles south of AP1 in 1981, and a magnitude 3.6 earthquake occurred approximately 20 miles southeast of AP1 in 1990 (Ramboll, 2021a). Having met the seismic safety requirements, the risk of dike failure occurring during or following closure activities due to seismic activity is low at AP1.

2.2.3 Type and Degree of Long-Term Management, Including Monitoring, Operation, and Maintenance (IAC Section 845.710(b)(1)(C))

The long-term operation and management plans for AP1 and the on-Site landfill under each closure scenario are described in Section 2.1 (Closure Alternatives Descriptions). In summary, under the CIP scenario, AP1 would undergo monitoring for 30 years post-closure, or until such time as GWPSs are achieved. The post-closure care plan for the CIP scenario would additionally include annual inspections, mowing, and maintenance of the final cover system. Under the CBR scenario, AP1 would undergo monitoring for 3 years post-closure, or until such time as GWPSs are achieved.

2.2.4 Short-Term Risks to the Community or the Environment During Implementation of Closure (IAC Section 845.710(b)(1)(D))

2.2.4.1 Worker Risks

Best practices would be employed during construction in order to ensure worker safety and comply with all relevant regulations, permit requirements, and safety plans. However, it is impossible to completely eliminate the risk of accidents occurring during construction activities, both on- and off-Site. On-Site accidents include injuries and deaths arising from the use of heavy equipment and/or earthmoving operations during construction activities. Off-Site accidents include injuries and deaths due to vehicle accidents during labor and equipment mobilization/demobilization, material deliveries, and the hauling of borrow soil and CCR.

As shown in Tables 2.1 through 2.3, Golder estimates that the CIP scenario would require 25,100 on-Site labor hours and the CBR scenario would require approximately 27,800 on-Site labor hours (Appendix B). The US Bureau of Labor Statistics (US DOL, 2020a,b) provides an estimate of the hourly fatality and injury rates for construction workers. Based on the accident rates reported by US Bureau of Labor Statistics and the on-Site labor hours reported in Appendix B, we estimate that approximately 0.29 worker injuries and 0.0019 worker fatalities would occur on-Site under the CIP scenario; approximately 0.32 worker injuries and 0.0021 worker fatalities would occur on-Site under the CBR scenario (Table 2.4). The rate of on-Site worker accidents is therefore expected to be higher under the CBR scenario and lower under the CIP scenario.

Table 2.3 Expected Number of On-Site Worker Accidents Under Each Closure Scenario

Closure Scenario	Injuries	Fatalities
CIP	0.29	0.0019
CBR	0.32	0.0021

Notes:
CBR = Closure-by-Removal; CIP = Closure-in-Place.

Off-Site, a greater number of haul truck miles, labor and equipment mobilization/demobilization miles, and material delivery miles would be required under the CBR scenario than would be required under the CIP scenario (Tables 2.1 through 2.3). For example, under the CBR scenario, 400,000 haul truck miles would be required to haul CCR from the Site, and under the CIP scenario, off-Site hauling is not required (Appendix B). The United States Department of Transportation (US DOT, 2020) provides estimates of the expected number of fatalities and injuries "per vehicle mile driven" for drivers and passengers of large trucks and passenger vehicles. Table 2.5 shows the expected number of off-Site accidents under each closure scenario due to all categories of off-Site vehicle usage. For these calculations, it was assumed that labor mobilization/demobilization would rely on passenger vehicles (cars or light trucks, including pickups, vans, and sport utility vehicles) and that hauling, equipment mobilization/demobilization, and material deliveries would rely on large trucks. Based on US DOT's accident statistics and the mileage estimates in Appendix B, an estimated 0.14 worker injuries and 0.0018 worker fatalities would be expected to occur due to off-Site activities under the CIP scenario; and an estimated 0.30 worker injuries and 0.0044 worker fatalities would be expected to occur due to off-Site activities under the CBR scenario.

Table 2.4 Expected Number of Off-Site Worker Accidents Under Each Closure Scenario

Off-Site Vehicle Use Category	CIP		CBR	
	Injuries	Fatalities	Injuries	Fatalities
Hauling	0	0	0.051	0.0012
Labor Mobilization/Demobilization	0.13	0.0017	0.24	0.0030
Equipment Mobilization/Demobilization	0.0055	0.00013	0.0076	0.00017
Material Deliveries	0.0018	0.000040	0.00090	0.000020
Total:	0.14	0.0018	0.30	0.0044

Notes:
CBR = Closure-by-Removal; CIP = Closure-in-Place.

Overall, taking into account accidents occurring both on- and off-Site, 0.43 worker injuries and 0.0037 worker fatalities would be expected under the CIP scenario, and 0.62 worker injuries and 0.0065 worker fatalities would be expected under the CBR scenario. Thus, overall risks to workers would be higher under the CBR scenario and lower under the CIP scenario.

In summary, risks to workers due to accidents would be expected to be greater under the CBR scenario than under the CIP scenario. Differences in worker risks between the two scenarios would largely be driven by off-Site activities.

2.2.4.2 Community Risks

Accidents

Vehicle accidents that occur off-Site can result in injuries or fatalities among community members, as well as workers. Based on the accident statistics reported by US DOT (2020) and the off-Site travel mileages reported in Appendix B, off-Site vehicle accidents could result in an estimated 0.073 injuries and 0.0014 fatalities among community members (*i.e.*, people involved in haul truck accidents that are neither haul truck drivers nor passengers, including pedestrians, drivers of other vehicles, *etc.*) under the CIP scenario (Table 2.6). Under the CBR scenario, off-Site vehicle accidents could result in an estimated 0.27 community injuries and 0.0074 community fatalities.

Table 2.5 Expected Number of Community Accidents Under Each Closure Scenario

Off-Site Vehicle Use Category	CIP		CBR	
	Injuries	Fatalities	Injuries	Fatalities
Hauling	0	0	0.15	0.0053
Labor Mobilization/Demobilization	0.052	0.00067	0.10	0.0012
Equipment Mobilization/Demobilization	0.016	0.00057	0.022	0.00079
Material Deliveries	0.0051	0.00018	0.0026	0.000093
Total:	0.073	0.0014	0.27	0.0074

Notes:
CBR = Closure-by-Removal; CIP = Closure-in-Place.

Traffic

Haul routes would be expected to use major arterial roads and highways wherever possible, which would reduce the incidence of traffic. However, the heavy use of local roads for construction operations may result in traffic near the Site and the off-Site landfill. Traffic could potentially cause travel delays on local roads and damage to local roadways.

Traffic may increase temporarily around the Site under all closure scenarios due to the daily arrival and departure of the workforce, equipment mobilization/demobilization, and material deliveries. However, these impacts would be expected to largely occur at the beginning or end of each workday (during the arrival/departure of the workforce), at the beginning or end of the construction period (during equipment mobilization/demobilization), and at specific times throughout the construction period (during material deliveries). These impacts would therefore likely be less disruptive to community members than the constant and steady movement of haul trucks to and from the Site due to CCR hauling. Under the CBR scenario, hauling-related construction activities would be expected to take approximately 691 workdays and require approximately 11,200 truckloads (Appendix B). Assuming 10-hour working days, a haul truck would need to pass a given location near the Site once every 19 minutes on average over 20 to 30 months under this closure scenario. Under the CIP scenario, off-Site hauling is not required.

Noise

Construction generates a great deal of noise, both in the vicinity of the Site and along haul routes. In a closure impact analysis performed by the Tennessee Valley Authority (TVA, 2015), the authors found that "[T]ypical noise levels from construction equipment used for closure are expected to be 85 dBA or less when measured at 50 ft. These types of noise levels would diminish with distance…at a rate of approximately 6 dBA per each doubling of distance and therefore would be expected to attenuate to the recommended EPA noise guideline of 55 dBA at 1,500 ft." Because there are no residences or businesses within 1,500 feet of any of the construction areas on the Site (the impoundment, the on-Site landfill, and the borrow soil location), we do not anticipate that any residences or businesses would be adversely impacted by noise pollution at the Site under any closure scenario. However, recreators and wildlife in the Coffeen Lake SFWA, which lies within 1,500 feet of AP1, could be temporarily impacted by construction noise under both scenarios. The duration of noise impacts in the vicinity of AP1 would be greater under the CBR scenario than under the CIP scenario, because the expected duration of construction is longer (17 to 24 months under the CIP scenario *vs.* 20 to 30 months under the CBR scenario).

In addition to impacts in the immediate vicinity of planned construction areas at the Site, local roads near the Site and the off-Site landfill (CBR scenario only) may also experience noise pollution due to high volumes of truck traffic. As described above (Traffic), the construction schedule for the CBR scenario requires haul trucks to pass by a given location every 19 minutes on average for 10 hours each workday for approximately 20 to 30 months. Dump trucks generate significant noise pollution, with noise levels of approximately 88 decibels or higher expected within a 50-foot radius of the truck (Exponent, 2018). This noise level is similar to the noise level of a gas-powered lawnmower or leaf blower (CDC, 2019). Decibel levels above 80 can damage hearing after 2 hours of exposure (CDC, 2019).

In addition to haul truck impacts, noise pollution may also arise from the daily arrival and departure of the workforce, equipment mobilization/demobilization, and material deliveries. These impacts would be expected to largely occur at the beginning or end of each workday (during the arrival/departure of the workforce), at the beginning or end of the construction period (during equipment mobilization/demobilization), and at specific times throughout the construction period (during material deliveries). These impacts would therefore likely be less disruptive to community members than the constant and steady movement of haul trucks to and from the Site. In summary, noise impacts are likely to be greater under the CBR scenario than under the CIP scenario due to the need for off-Site hauling.

Air Quality

Construction can adversely impact air quality. Air pollution can occur both on-Site and off-Site (*e.g.*, along haul routes), potentially impacting workers as well as community members. With regard to construction activities, two categories of air pollution are of particular concern: equipment emissions and fugitive dust. The equipment emissions of greatest concern are those found in diesel exhaust. Most construction equipment is diesel-powered, including the dump trucks that would be used to haul material to and from the Site. Diesel exhaust contains numerous air pollutants, including nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO), and volatile organic compounds (VOCs; Hesterberg *et al*., 2009; Mauderly and Garshick, 2009). Fugitive dust, another major air pollutant at construction sites, is generated by earthmoving operations and other soil- and CCR-handling activities. Along haul routes, an additional source of fugitive dust is road dust along unpaved dirt roads. Careful planning and the use of Best Management Practices (BMPs) such as wet suppression are used to minimize and control fugitive dust during construction activities; however, it is not possible to prevent dust generation entirely.

On-Site, emissions would be higher under the CBR scenario than under the CIP scenario, due to the greater amount of on-Site vehicle and equipment travel miles required under this scenario (55,800 total on-Site travel miles under the CIP scenario *vs.* 105,000 total on-Site travel miles under the CBR scenario; Tables 2.1 and 2.2). Off-Site, emissions would similarly be higher under the CBR scenario than under the CIP scenario due to the greater amount of off-Site vehicle and equipment travel miles required under the CBR scenario (268,000 total off-Site travel miles under the CIP scenario *vs.* 853,000 total off-Site travel miles under the CBR scenario).

Environmental Justice

The State of Illinois defines environmental justice (EJ) communities to be those communities with a minority population above twice the state average and/or a total population below twice the state poverty rate (IEPA, 2019b).

As shown in a map of EJ communities throughout the state (IEPA, 2019b), the outer perimeter of the 1-mile buffer zone for the nearest EJ community lies approximately 10 miles south of the Site near Greenville (Figure 2.1). As described above (Noise), significant noise impacts due to construction are expected to be limited to potential receptors located within 1,500 feet (0.28 miles) of the Site. Similarly, the air quality impacts of construction are expected to be limited to potential receptors located within 1,000 feet (0.19 miles) of the Site (CARB, 2005; BAAQMD, 2017). Along heavily trafficked roadways, air quality impacts are expected to be limited to potential receptors located within 600 feet of the roadway (0.11 miles; US EPA, 2014). The EJ community near Greenville is therefore unlikely to be directly impacted by on-Site air emissions, noise pollution, or other negative impacts arising at the Site. However, they may be impacted by off-Site impacts, including labor and equipment mobilization/demobilization, and material deliveries. Off-Site impacts due to labor and equipment mobilization/demobilization and material deliveries would be expected to be diffuse (*i.e.,* to span a wide range of transport routes originating over a wide area). Additionally, these impacts would be expected to largely occur at the beginning or end of each workday (during the arrival/departure of the workforce), at the beginning or end of the construction period (during equipment mobilization/demobilization), and at specific times throughout the construction period (during material deliveries).

Off-Site hauling of CCR and excavated subsoil is evaluated in this report. Under the CBR scenario, EJ communities located along the haul route to the off-Site landfill or near the off-Site landfill itself may be negatively impacted throughout the excavation period by the air pollution, noise, traffic, and accidents generated by CCR-hauling activities. A review of the Illinois map of EJ communities reveals that the off-Site landfill is not located within the 1-mile buffer zone of an EJ community. Additionally, based on the two major haul routes suggested by Google Maps (Google, LLC, 2022), transport of CCR to the landfill will not require hauling CCR through the buffer zone of an EJ community (Figure 2.1).

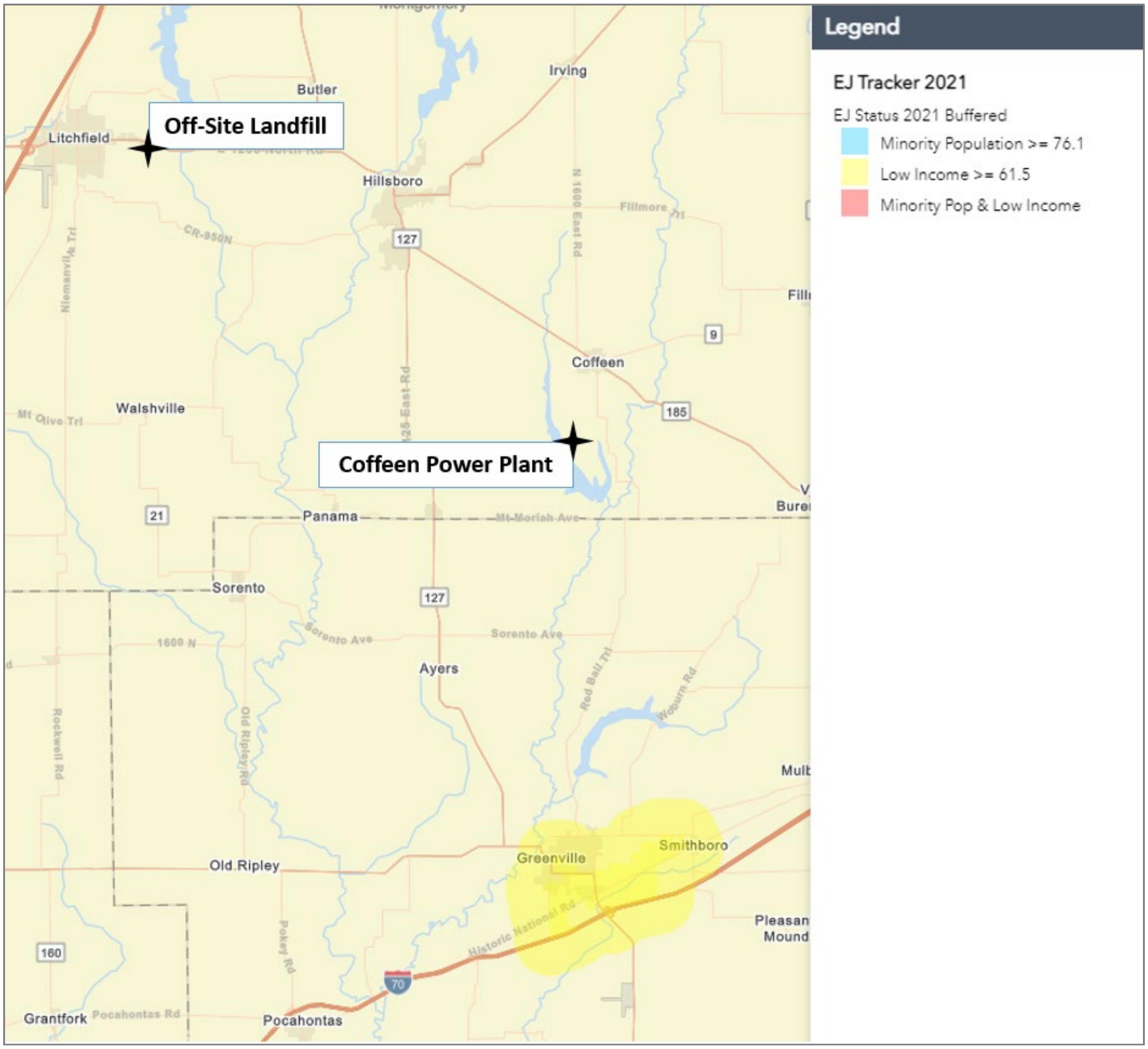

Figure 2.1 Environmental Justice Communities in the Vicinity of the Site and the Off-Site Landfill. EJ = Environmental Justice. Adapted from IEPA (2019b).

Scenic, Historical, and Recreational Value

During construction activities, negative impacts on scenic and recreational value may occur within the Coffeen Lake SFWA. Noise impacts were described above. In addition, construction activities at AP1 may be visible to recreators using these scenic and recreational areas, potentially interfering with enjoyment of the view. Negative impacts would not be expected to occur within any scenic or recreational areas located further away from the Site. The expected duration of construction activities is longer under the CBR scenario than under the CIP scenario (17 to 24 months under the CIP scenario *vs.* 20 to 30 months under the CBR scenario). It is therefore anticipated that short-term impacts on the scenic and recreational value of natural areas near the Site would be greater under the CBR scenario than under the CIP scenario.

Based on a review of the IDNR Historic Preservation Division database and the Illinois State Archaeological Survey database, there are no historic sites located within 1,000 meters of AP1 or the on-Site landfill (Ramboll, 2021a).

2.2.4.3 Environmental Risks

Greenhouse Gas Emissions

In addition to the air pollutants listed above in Section 2.2.4.2, construction equipment emits greenhouse gases (GHGs), including carbon dioxide (CO_2) and possibly nitrous oxide (N_2O). The potential impact of each closure scenario on GHG emissions is proportional to the potential impact of each closure scenario on other emissions from construction vehicles and equipment, as described above in Section 2.2.4.2. In summary, GHG emissions from construction equipment and vehicles would be greater under the CBR scenario than under the CIP scenario, because the total on-Site and off-Site vehicle and equipment travel miles required under the CBR scenario (958,000 total vehicle and equipment travel miles) are greater than the total required under the CIP scenario (324,000 total vehicle and equipment travel miles; Tables 2.1 and 2.2).

We did not quantify the carbon footprint of the approximately 10.4 acres of a 40-mil LLDPE geomembrane liner required for the final AP1 cover system under the CIP scenario. The carbon footprint of this geomembrane (*i.e.*, the fossil fuel emissions required to manufacture it) is an additional source of GHG emissions at the Site under the CIP scenario. The potential expansion of the off-Site landfill under the CBR scenario would have an additional, unquantified carbon footprint due to the manufacture of geomembranes used in the expanded landfill liners.

Energy Consumption

Energy consumption at a construction site is synonymous with fossil fuel consumption, because the energy to power construction vehicles and equipment comes from the burning of fossil fuels. Fossil fuel demands considered in this analysis include the burning of diesel fuel during construction activities and the carbon footprint of manufacturing geomembrane textiles. Because GHG emission impacts and energy consumption impacts both arise from the same sources at construction sites, the trends discussed above with respect to GHG emissions also apply to the evaluation of energy demands. Specifically, the energy demands of construction equipment and vehicles would be greater under the CBR scenario than under the CIP scenario. We did not quantify the energy demands of the geomembranes required for the construction of the final cover system under the CIP scenario or, potentially, the geomembranes required for expansion of the off-Site landfill under the CBR scenario.

The Coffeen Power Plant Site is slated for redevelopment as a utility-scale solar power generating facility and battery energy storage facility. At the grid scale, solar generation would add energy back onto the grid and reduce reliance on non-renewable energy sources.

Natural Resources and Habitat

During closure, major construction activities such as the excavation of the impoundment, the excavation of the borrow area, and, potentially, the expansion of the off-Site landfill may require the destruction of some existing habitat atop portions of these construction areas, resulting in negative impacts to natural resources and habitat within the footprint of these areas. Construction may also have indirect negative impacts on the natural resources and habitat in the immediate vicinity of these locations by causing alarm-and-escape behavior in nearby wildlife (*e.g.*, due to noise disturbances). Finally, although erosion prevention and sediment control measures will be undertaken under all closure scenarios, it is possible that limited negative short-term impacts could occur to sensitive aquatic and wetland species in Coffeen Lake and other wetlands or surface water bodies located adjacent to AP1 (see Section 1.1.3) due to sediment runoff during construction. Short-term impacts on natural resources and habitat would be greater under the CBR scenario than under the CIP scenario, because the overall duration of construction would be longer under the CBR scenario than under the CIP scenario (17 to 24 months under the CIP scenario *vs.* 20 to 30 months under the CBR scenario).

In addition to the short-term negative habitat impacts caused by construction activities, closure may also result in long-term shifts in the habitat types overlying the major construction locations associated with closure. This assessment does not make any value judgments regarding the relative value of the habitat types currently overlying these locations and the habitat types that could potentially overlie these locations post-closure under the various closure scenarios. For example, we did not attempt to determine whether the conversion of open water to grassland within the footprint of AP1 would constitute a positive or negative long-term change with regard to factors such as biodiversity, ecosystem services, or the preferences of recreators/sightseers.

According to the IDNR Natural Heritage Database and the United States Fish and Wildlife Service (US FWS) Environmental Conservation Online System, there are four state threatened species, five state endangered species, one federally threatened species, and one federally endangered species within Montgomery County (Ramboll, 2021a). To our knowledge, however, no threatened or endangered species have been identified at the Site. Based on the information that is currently available, we do not expect construction activities to have negative impacts on any threatened or endangered species.

2.2.5 Time Until Groundwater Protection Standards Are Achieved (IAC Sections 845.710(b)(1)(E) and 845.710(d)(2 and 3))

The time horizon over which GWPSs would be exceeded at the Site is immaterial from a risk perspective because there is no unacceptable risk associated with exceedances of a GWPS at the Site (see Section 2.2.1). Nonetheless, pursuant to requirements under IAC Section 845.710, this section of the text describes the time required to achieve GWPSs at the Site.

As described in Section 1.1.4 (Hydrogeology), water and CCR-related constituents from AP1 may migrate vertically downward until they reach the UA. Groundwater flows eastward toward the Unnamed Tributary and Coffeen Lake. The Unnamed Tributary and Coffeen Lake serve as regional sinks for shallow groundwater discharge, and shallow groundwater migration beneath or beyond the tributary or the lake is unlikely (Ramboll, 2021b,c). Groundwater flow within the UA is mostly in the horizontal direction because the UA is underlain by the low-permeability LCU (Ramboll, 2021b,c).

At the Coffeen Power Plant Site, no seasonal variation in groundwater levels has been observed. Surface water elevations in Coffeen Lake similarly do not fluctuate significantly over time, since the lake elevation is controlled by a dam. As a result, groundwater flow directions at the Site are not generally affected by seasonal variabilities (Ramboll, 2021b,c).

Groundwater modeling was performed to evaluate future groundwater quality in the vicinity of AP1 under each of the proposed closure alternatives (Ramboll, 2022). The modeling demonstrated that groundwater concentrations in the monitoring wells within the UA will achieve the GWPSs in 15 years for the CIP scenario, with the exception of well G301, and 18 years for the CBR scenario (Ramboll, 2022). The decline in post-closure groundwater concentrations at well G301 will be slower than at other locations because the well is located along the flow path of constituents that were released into the native geologic materials prior to closure. Because there will be reduced percolation of precipitation through the consolidation area within AP1 for the CIP scenario as a result of the cap, the time for concentrations to attenuate to levels below the GWPSs at well G301 is longer for the CIP scenario than for the CBR scenario. The model predicts that GWPSs at well G301 will be achieved in approximately 59 years under the CIP scenario (Ramboll, 2022).

Additionally, changing geochemical conditions during an extended excavation associated with the CBR off-Site and CBR on-Site scenarios can be a mechanism that results in the mobilization and increased transport in groundwater for some constituents. This may result in GWPS exceedance durations in excess of the model predictions for the CBR off-Site and CBR on-Site scenarios.

2.2.6 Potential for Exposure of Humans and Environmental Receptors to Remaining Wastes, Considering the Potential Threat to Human Health and the Environment Associated with Excavation, Transportation, Re-disposal, Containment, or Changes in Groundwater Flow (IAC Section 845.710(b)(1)(F))

Section 2.2.1 evaluates potential risks to human and ecological receptors arising from the leaching of CCR-associated constituents into groundwater during closure activities and following closure of AP1. Section 2.2.2 evaluates the potential for CCR releases to occur due to dike failure or overtopping during floods or other storm-related events. In summary, there is no current or future risk to any human or ecological receptors associated with AP1. Additionally, there is minimal current or future risk of overtopping occurring at the embankments due to flood conditions at the Site. Dike failure due to, *e.g.*, seismic activity and storm-related events is also exceedingly unlikely.

Section 2.2.4 evaluates several potential risks to human health and the environment during closure activities, including risks of accidents occurring among workers; risks to nearby residents and EJ communities related to accidents, traffic, noise, and air pollution; and risks to natural resources and wildlife. The findings from this section of the text are summarized in Table S.1 (Summary of Findings).

2.2.7 Long-Term Reliability of the Engineering and Institutional Controls (IAC Section 845.710(b)(1)(G))

Post-closure, there is minimal risk of engineering or institutional failures leading to sudden releases of CCR from the impoundment under the CIP scenario. There is no post-closure risk of engineering or institutional failures under the CBR scenario (see Section 2.2.2 above). Additionally, there are no current or future unacceptable risks to any human or ecological receptors under any closure scenario (see Section 2.2.1 above). Moreover, reliable engineering and institutional controls (*e.g.*, a bottom liner, a leachate management system, and groundwater monitoring) would be implemented at the on-Site and off-Site landfills under the CBR scenario. All of the evaluated closure scenarios are therefore reliable with respect to long-term engineering and institutional controls.

2.2.8 Potential Need for Future Corrective Action Associated with the Closure (IAC Section 845.710(b)(1)(H))

Corrective action is expected at the Site. An evaluation of potential corrective measures and corrective actions has not yet been completed, but will be conducted consistent with the requirements in IAC Section 845.660 and IAC Section 845.670.

2.3 Effectiveness of the Closure Alternative in Controlling Future Releases (IAC Section 845.710(b)(2))

2.3.1 Extent to Which Containment Practices Will Reduce Further Releases (IAC Section 845.710(b)(2)(A))

The CCR in AP1 currently poses no unacceptable risks to human health or the environment (Section 2.2.1). Because current conditions do not present a risk to human health or the environment, and dissolved constituent concentrations would be expected to decline post-closure, there would also be no unacceptable risks to human health or the environment following closure, regardless of the closure scenario.

Section 2.2.2 discussed the potential for dike failure or overtopping to occur during or following closure activities, resulting in a sudden release of CCR. That analysis showed that there is minimal risk of sudden CCR releases occurring during or following closure under any closure scenario.

2.3.2 Extent to Which Treatment Technologies May Be Used (IAC Section 845.710(b)(2)(B))

Under all three closure scenarios, water generated during the dewatering and unwatering of the impoundment would be treated if necessary prior to disposal. Following treatment, water from unwatering and dewatering would be discharged in accordance with the NPDES permit for the facility.

2.4 Ease or Difficulty of Implementing Closure Alternative (IAC Section 845.710(b)(3))

2.4.1 Degree of Difficulty Associated with Constructing the Closure Alternative

CIP using a final cover system is a reliable and standard method for managing and closing impoundments that relies on common construction activities. Dewatering saturated CCR to construct a stabilized final cover system subgrade can present challenges during closure; however, these challenges are common to most CCR surface impoundment closures and are commonly addressed *via* surface water management and dewatering techniques.

Excavation and landfilling of CCR is also a reliable and standard method for closing impoundments. However, relative to CIP, CBR poses additional implementation difficulties due to higher earthwork volumes, higher dewatering volumes, and longer construction schedules. Additionally, because the CBR scenario would involve hauling CCR off-Site (*i.e.*, intrastate travel), a higher level of dewatering would be required under this scenario compared to the CIP scenario. As described in Section 2.2.4.2 (Community Risks), off-Site hauling may also have detrimental community impacts due to an increased incidence of vehicle accidents, traffic-related impacts, noise, and air pollution.

In addition to off-Site hauling, off-Site landfilling under the CBR scenario may pose particular challenges. A disposal plan would need to be developed between IPGC and the owner/operator of the third-party landfill in order to outline acceptable waste conditions upon delivery, daily waste production rates, and the expected duration of the project. Off-Site landfilling may additionally raise issues related to the co-disposal of CCR and other non-hazardous wastes. Finally, the construction schedule for excavation may be negatively impacted if, during the course of closure, it is determined that the off-Site landfill must be expanded in order to receive all of the materials excavated from AP1.

2.4.2 Expected Operational Reliability of the Closure Alternative

There is no post-closure risk of operational failures leading to sudden releases of CCR from the impoundment under the two CBR scenarios. There is minimal post-closure risk of sudden CCR releases occurring under the CIP scenario, because: (i) the final cover system will be constructed and maintained in accordance with all relevant state and federal safety regulations, and (ii) the dikes, final cover, and stormwater control features have all been designed to withstand earthquakes and storm events (see Section 2.2.2 above). Moreover, appropriate operational controls are expected to be implemented at the on-Site and off-Site landfills under the CBR scenario. As such, operational reliability would be expected under all closure scenarios.

2.4.3 Need to Coordinate with and Obtain Necessary Approvals and Permits from Other Agencies

Permits and approvals would be needed under all closure scenarios. Components of the three closure scenarios that would be expected to require a permit include:

- A modification to the existing NPDES permit through IEPA to allow the disposal of water generated from unwatering and dewatering operations to Coffeen Lake *via* the existing NPDES-permitted outfall for the Site;
- A construction permit from the IDNR, Office of Water Resources, Dam Safety Program to allow the embankment and spillways of AP1 to be modified as part of closure;
- A construction stormwater permit through IEPA, including construction stormwater controls and other BMPs such as silt fences and other measures; and
- A joint water pollution control construction and operating permit (WPC permit).

As discussed below in Section 2.4.5, under the CBR scenario, it may similarly be necessary to expand the off-Site landfill. Additional permitting may be required under this scenario for transport of the CCR and to expand the off-Site landfill. It may also be necessary to modify the operating plan for the off-Site landfill in order to accommodate the increased rate of filling of the landfill and the likely need for additional equipment and personnel to manage the receipt and disposal of the CCR.

2.4.4 Availability of Necessary Equipment and Specialists

CIP and CBR are reliable and standard methods for managing waste that rely on common construction equipment and materials and typically do not require the use of specialists, outside of typical construction labor and equipment operators. However, global supply chains have been disrupted due to the COVID-19 pandemic, resulting in shortages in the availability of construction equipment and parts. There may be some shortages in construction equipment under all scenarios, if supply chain resilience does not improve by the time of construction. Alternatively, extended downtime may be required for equipment repairs and maintenance. A national shortage of truck drivers has also developed during the COVID-19 pandemic. Due to higher earthwork volumes and a longer construction schedule under the CBR scenario than under the CIP scenario, shortages in construction equipment may cause greater challenges under this scenario than under the CIP scenario. The current shortage of truck drivers may be particularly impactful under the CBR scenario, due to the large volume of CCR to be hauled from the Site. If sufficient trucks and truck drivers are not available, the construction schedule at the impoundment may lengthen based on hauling-related delays.

The availability of critical materials such as metal, wood, and electronic chips has also been impacted by the COVID-19 pandemic. However, soil materials and geomembrane liner materials have generally been available during 2021 and early 2022 for landfill development and closure projects.

2.4.5 Available Capacity and Location of Needed Treatment, Storage, and Disposal Services

Under the CIP scenario, all of the CCR currently within AP1 would be stored within the existing footprint of AP1. Treatment would consist of unwatering AP1 at the start of construction, performing limited dewatering to stabilize the CCR subgrade, and managing stormwater inflow. Water from unwatering and dewatering of AP1 would be discharged in accordance with the NPDES permit for the facility. Under the CBR scenario, water treatment would similarly consist of unwatering and dewatering AP1 at the start of construction and discharging water from unwatering/dewatering in accordance with the NPDES permit for the facility. Due to the need for dewatering prior to CCR hauling, a higher volume of water would be expected to be generated during dewatering under the CBR scenario than under the CIP scenario.

For the CBR scenario, 495,000 CY of CCR and subsoil would be excavated from AP1 and require disposal. The existing landfill on the Coffeen Power Plant property does not have sufficient capacity to receive all of the CCR that is currently slated for landfilling under the CBR scenario. For the CBR scenario 311,000 CY of CCR would be excavated from AP1 and placed in the on-Site landfill, and the remaining 184,000 CY of CCR and subsoil would require disposal off-Site. According to the IEPA "Landfill Disposal Capacity Report" for 2020 (IEPA, 2021b), the closest nearby third-party landfill with the ability to receive and dispose of CCR from the Site is the Hillsboro-Litchfield Landfill in Litchfield, Illinois. This facility has 1,540,000 CY of remaining capacity in its current permitted footprint. It receives 83,000 CY of waste annually, and is located 18 miles from the Site by road. The Litchfield-Hillsboro Landfill therefore has sufficient capacity to receive CCR from AP1. However, closure of AP1 would increase the annual waste receipt rate at the off-Site landfill. Due to the short time frame over which CCR would be received at the landfill, vertical and/or lateral expansions may become necessary. Additionally, the landfill operators may need to develop a disposal plan to account for the increased volume of material that would be received and the unique CCR waste characteristics. Elements of this disposal plan might include increasing daily operational capacity and procedures, expediting planned airspace construction, and potentially expediting landfill expansion.

If expansion of the Litchfield-Hillsboro Landfill is impractical or infeasible, then an alternative landfill located farther from the Site would need to be identified. A likely alternative to the Litchfield-Hillsboro Landfill is the Five Oaks Landfill in Taylorville, Illinois. It has 7,050,000 CY of remaining capacity in its current permitted footprint, receives 250,000 CY of waste annually, and is located 44 miles from the Site (IEPA, 2021b).

2.5 Impact of Closure Alternative on Waters of the State (IAC Section 845.710(d)(4))

As demonstrated in Gradient's Human Health and Ecological Risk Assessment (Appendix A), both modeled and measured surface water concentrations in Coffeen Lake are all below relevant human health and ecological screening benchmarks.

Surface water concentrations of CCR-associated constituents would be expected to decline over time under all closure scenarios. Thus, no current or future exceedances of any human health or ecological screening benchmarks would be anticipated under any closure scenario.

The lined landfills that would receive the CCR excavated from the impoundment under the CBR and scenario would be managed to ensure that no surface water impacts would occur in the vicinity of the landfill. In summary, no impacts on any waters of the state would be expected under any closure scenario.

2.6 Concerns of Residents Associated with Closure Alternatives (IAC Section 845.710(b)(4))

Several nonprofits representing community interests near the Site have raised concerns regarding the potential impacts of the coal ash impoundments at this Site on groundwater and surface water quality, including Earthjustice, the Prairie Rivers Network, and the Sierra Club (Earthjustice *et al*., 2018; Sierra Club, 2014; Sierra Club and CIHCA, 2014). These parties generally prefer CBR to CIP, citing fears that allowing CCR to remain in place "allows the widespread groundwater contamination to continue indefinitely" (Earthjustice *et al*., 2018, p. 24). However, it is not the case that closing AP1 *via* CIP rather than CBR would result in undue risks to groundwater and surface water post-closure. As described in Sections 2.2.1 and 2.2.2, no current or future unacceptable risks to human or ecological receptors are associated with AP1 under any scenario. There is also minimal risk of future CCR releases occurring under any scenario. Furthermore, groundwater modeling conducted at the Site demonstrated that the groundwater concentrations in the monitoring wells within the UA will achieve GWPSs in 15 years for both the CIP and CBR scenarios, with the exception of well G301 (Section 2.2.5; Ramboll, 2022). Both closure scenarios are therefore responsive to residents' concerns regarding impacts to groundwater and surface water quality.

The CIP scenario has several advantages over the CBR scenario with regard to likely community concerns. Notably, the CIP scenario presents fewer risks to workers and nearby residents during construction in the form of accidents, traffic-related impacts, noise, and air pollution (Section 2.2.4 above). Closure would also be achieved more rapidly under the CIP scenario than under the CBR scenario, due to the shorter duration of construction activities.

A public meeting was held on June 14, 2022, pursuant to requirements under IAC Section 845.710(e). Questions raised by attendees were addressed at the meeting; subsequently, a written summary of the questions and responses was prepared.

2.7 Class 4 Estimate (IAC Section 845.710(d)(1))

Analyses in the Final Closure Plan were prepared consistent with Class 4 estimates based on the Association for the Advancement of Cost Engineering (AACE) Classification Standard (or a comparable classification practice as provided in the AACE Classification Standard), as required by IAC Section 845.710 (IEPA, 2021a).

2.8 Summary

Table S.1 (Summary of Findings) summarizes the expected impacts of the CIP and CBR closure scenarios with regard to each of the factors specified under IAC Section 845.710 (IEPA, 2021a). Based on this evaluation and the details provided in Section 2 above, CIP has been identified as the most appropriate closure scenario for AP1. Key benefits of the CIP scenario relative to the CBR scenario include greatly reduced impacts to workers, community members, and the environment due to construction activities (*e.g.*, fewer constructed-related accidents, lower energy demands, less air pollution and GHG emissions, less traffic-related impacts, and potentially lower impacts to EJ communities).

References

AECOM. 2016a. "Letter Report re: History of Construction, USEPA Final CCR Rule, 40 CFR § 257.73(c), Coffeen Power Station, Coffeen, Illinois." Report to Illinois Power Resources Generating, LLC. 185p., October

AECOM. 2016b. "CCR Rule Report: Initial Structural Stability Assessment for Ash Pond No. 1 at Coffeen Power Station." Report to Illinois Power Generating Co. 8p., October.

AECOM. 2016c. "CCR Rule Report: Initial Safety Factor Assessment for Ash Pond No. 1 at Coffeen Power Station." Report to Illinois Power Generating Co. 5p., October.

Bay Area Air Quality Management District (BAAQMD). 2017. "California Environmental Quality Act Air Quality Guidelines." 224p., May.

California Air Resources Board (CARB). 2005. "Air Quality and Land Use Handbook: A Community Health Perspective." 109p., April.

Centers for Disease Control and Prevention (CDC). 2019. "What noises cause hearing loss?" National Center for Environmental Health (NCEH), October 7. Accessed on April 30, 2021 at https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html.

Earthjustice; Prairie Rivers Network; Environmental Integrity Project (EIP); Sierra Club. 2018. "Cap and Run: Toxic Coal Ash Left Behind by Big Polluters Threatens Illinois Water." 45p.

Exponent. 2018. "Community Impact Analysis of Ash Basin Closure Options at the Allen Steam Station." Report to Duke Energy Carolinas, LLC. 210p., November 15.

Federal Emergency Management Agency (FEMA). 1981. "Flood Hazard Boundary Map, Montgomery County, Illinois Unincorporated Area (Panel 9 of 9)." National Flood Insurance Program (NFIP). January 9.

Geosyntec Consultants. 2021. "Draft Surface Water Analytical Results, Coffeen Site." 2p., August 3.

Geosyntec Consultants. 2022. "Technical Memorandum to V. Modeer (Vistra) re: Proposed Alternative Final Protective Layer Equivalency Demonstration, Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois (Final Draft)." 33p., July 11."

Golder Associates USA Inc. 2022. "Final Closure Plan for Ash Pond No. 1, Coffeen Power Plant." Report to Illinois Power Resources Generating, LLC.

Google LLC. 2022. "Google Maps." Accessed on Date of map or deliverable issue at https://www.google.com/maps.

Haley & Aldrich, Inc. 2018a. "Location Restriction Demonstration - Seismic Impact Zone, Coffeen Power Station Ash Pond No. 1, Coffeen, Illinois [Seismic impact zone certification]." 2p., October 16.

Haley & Aldrich, Inc. 2018b. "Location Restriction Demonstration - Fault Areas, Coffeen Power Station Ash Pond No. 1, Coffeen, Illinois [Fault area certification]." 2p., October 16.

Hesterberg, TW; Valberg, PA; Long, CM; Bunn, WB III; Lapin, C. 2009. "Laboratory studies of diesel exhaust health effects: Implications for near-roadway exposures." *EM Mag*. (August):12-16. Accessed on March 05, 2014 at http://pubs.awma.org/gsearch/em/2009/8/hesterberg.pdf.

Illinois Dept. of Natural Resources (IDNR). 1999. "Coffeen Lake State Fish & Wildlife Area." 2p., November.

Illinois Emergency Management Agency (IEMA). 2020. "Earthquake preparedness." Accessed on September 7, 2021 at https://www2.illinois.gov/iema/Preparedness/Pages/Earthquake.aspx.

Illinois Environmental Protection Agency (IEPA). 2007. "Greenville Old Lake and Coffeen Lake Watersheds." IEPA/BOW/07-014, 155p., August.

Illinois Environmental Protection Agency (IEPA). 2019a. "Appendix A-1. Illinois' 2018 303(d) List and Prioritization." In *Illinois Integrated Water Quality Report and Section 303(d) List, 2018 (Final as submitted to US EPA Region V on February 22, 2021)*. 40p., May 20. Accessed on October 21, 2021 at https://www2.illinois.gov/epa/topics/water-quality/watershed-management/tmdls/Documents/Appendix%20A-1_303d_by_priority_FINAL_5-20-19.pdf.

Illinois Environmental Protection Agency (IEPA). 2019b. "Illinois EPA Environmental Justice (EJ) Start." Accessed on April 30, 2021 at https://illinois-epa.maps.arcgis.com/apps/webappviewer/index.html?id=f154845da68a4a3f837cd3b880b0233c.

Illinois Environmental Protection Agency (IEPA). 2021a. "Standards for the disposal of coal combustion residuals in surface impoundments." Accessed on October 4, 2021 at https://www.ilga.gov/commission/jcar/admincode/035/03500845sections.html.

Illinois Environmental Protection Agency (IEPA). 2021b. "Illinois Landfill Disposal Capacity Report." 11p., August. Accessed on October 4, 2021 at https://www2.illinois.gov/epa/topics/waste-management/landfills/landfill-capacity/Documents/landfill-capacity-report-2021.pdf.

Illinois State Geological Survey (ISGS); University of Illinois at Urbana-Champaign. 2011. "Directory of Coal Mines in Illinois 7.5-Minute Quadrangle Series, Coffeen Quadrangle, Montgomery & Bond Counties." Report to Illinois Mine Subsidence Insurance Fund. 20p.

Mauderly, JL; Garshick, E. 2009. "Diesel exhaust." In *Environmental Toxicants: Human Exposures and Their Health Effects (Third Edition)*. (Ed.: Lippmann, M), John Wiley & Sons, Inc., Hoboken, NJ. p551-631.

Ramboll. 2021a. "Hydrogeologic Site Characterization Report, Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois (Final)." Report to Illinois Power Generating Co. 700p., October 25.

Ramboll. 2021b. "Hydrogeologic Site Characterization Report, GMF Gypsum Stack Pond, Coffeen Power Plant, Coffeen, Illinois (Final)." Report to Illinois Power Generating Co. 666p., October 25.

Ramboll. 2021c. "Hydrogeologic Site Characterization Report, GMF Recycle Pond, Coffeen Power Plant, Coffeen, Illinois (Final)." Report to Illinois Power Generating Co. 676p., October 25.

Ramboll. 2022. "Groundwater Modeling Report, Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois." Report to Illinois Power Generating Co.

Sierra Club. 2014. "Dangerous Waters: America's Coal Ash Crisis." 43p.

Sierra Club; Central Illinois Healthy Community Alliance (CIHCA). 2014. "Dynegy's Toxic Assets: Legacy Coal Pollution in the Heartland." 17p.

Tennessee Valley Authority (TVA). 2015. "Draft Ash Impoundment Closure Environmental Impact Statement. Part I - Programmatic NEPA Review." 164p., December.

US Dept. of Labor (US DOL). 2020a. "Fatal occupational injuries, total hours worked, and rates of fatal occupational injuries by selected worker characteristics, occupations, and industries, civilian workers, 2019." Bureau of Labor Statistics, December. Accessed on October 5, 2021 at https://www.bls.gov/iif/oshwc/cfoi/cfoi_rates_2019hb.xlsx.

US Dept. of Labor. 2020b. "Table R100. Incidence rates for nonfatal occupational injuries and illnesses involving days away from work per 10,000 full-time workers by occupation and selected events or exposures leading to injury or illness, private industry, 2019." Bureau of Labor Statistics, October. Accessed on October 5, 2021 at https://www.bls.gov/iif/oshwc/osh/case/cd_r100_2019.xlsx.

US Dept. of Transportation (US DOT). 2020. "Large Truck and Bus Crash Facts 2018." Federal Motor Carrier Safety Administration, Analysis Division, FMCSA-RRA-19-018, 118p., September.

US EPA, 2014. "Near Roadway Air Pollution and Health: Frequently Asked Questions." Office of Transportation and Air Quality, EPA-420-F-14-044. 9p., August.

US EPA. 2022. "Coffeen, Illinois, Watershed: Rocky Fork Lakes-East Fork Shoal Creek (071402030305)." Accessed on March 29, 2022 at https://mywaterway.epa.gov/community/coffeen/overview.

US Fish & Wildlife Service (US FWS). 2021. "Wetlands Mapper." National Wetlands Inventory, November 30. Accessed on January 31, 2022 at https://www.fws.gov/wetlands/data/mapper.html.

Appendix A

Human Health and Ecological Risk Assessment

Human Health and Ecological Risk Assessment
Ash Pond 1
Coffeen Power Plant
Coffeen, Illinois

July 28, 2022

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Abbreviations

ADI	Acceptable Daily Intake
AP1	Ash Pond 1
BCF	Bioconcentration Factor
BCG	Biota Concentration Guide
CAA	Closure Alternatives Assessment
CPP	Coffeen Power Plant
CCR	Coal Combustion Residuals
CEM	Conceptual Exposure Model
COI	Constituent of Interest
COPC	Constituent of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DA	Deep Aquifer
DCU	Deep Confining Unit
ESV	Ecological Screening Value
GMF	Gypsum Management Facility
GWPS	Groundwater Protection Standards
GWQS	Groundwater Quality Standards
HTC	Human Threshold Criteria
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
ILWATER	Illinois Water and Related Wells
IPGC	Illinois Power Generating Company
ISGS	Illinois State Geological Survey
LCU	Lower Confining Unit
MCL	Maximum Contaminant Level
NRWQC	National Recommended Water Quality Criteria
ORNL RAIS	Oak Ridge National Laboratory Risk Assessment Information System
PRG	Preliminary Remediation Goal
RfD	Reference Dose
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SI	Surface Impoundment
SWQC	Surface Water Quality Criteria
UA	Uppermost Aquifer
UCU	Upper Confining Unit
US DOE	United States Department of Energy
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

1 Introduction

Illinois Power Generating Company's (IPGC) Coffeen Power Plant (CPP, or "the Site") is an electric power generating facility with coal-fired units located approximately two miles south of the City of Coffeen, Illinois. The CPP operated as a coal-fired power plant from 1964 until November 2019 and has five coal combustion residuals (CCR) management units (Ramboll, 2021). The CCR unit that is the subject of this report is Ash Pond 1 (AP1) (Vistra Identification No. 101, Illinois Environmental Protection Agency [IEPA] ID No. W1350150004-01, and National Inventory of Dams No. IL50722). AP1 is a 23-acre, unlined surface impoundment (SI) that was used to manage CCR and non-CCR waste streams at the CPP (Ramboll, 2021).

This report presents the results of an evaluation that characterizes potential risk to human and ecological receptors that may be exposed to CCR constituents in environmental media originating from AP1. This risk evaluation was performed to support the Closure Alternatives Assessment for AP1 in accordance with requirements in Title 35 Part 845 of the Illinois Administrative Code (IEPA, 2021a). Human and ecological risks were evaluated for Site-specific constituents of interest (COIs). The conceptual site model (CSM) assumed that Site-related COIs in groundwater may migrate to the adjacent Coffeen Lake and affect surface water and sediment in the vicinity of the Site.

Consistent with United States Environmental Protection Agency (US EPA) guidance (US EPA, 1989), this report used a tiered approach to evaluate potential risks, which included the following steps:

1. Identify complete exposure pathways and develop a conceptual exposure model (CEM).
2. Identify Site-related COIs: Constituents detected in groundwater were considered COIs if their maximum detected concentration over the period from 2015 to 2021 exceeded a groundwater protection standard (GWPS) identified in Part 845.600 (IEPA, 2021a), or a relevant surface water quality standard (IEPA, 2019; US EPA Region IV, 2018).
3. Perform screening-level risk analysis: Compare maximum measured or modeled COI concentrations in surface water and sediment to conservative, health-protective benchmarks to determine constituents of potential concern (COPCs).
4. Perform refined risk analysis: If COPCs are identified, perform a refined analysis to evaluate potential risks associated with the COPCs.
5. Formulate risk conclusions and discuss any associated uncertainties.

This assessment relies on a conservative (*i.e.*, health-protective) approach and is consistent with the risk approaches outlined in US EPA guidance. Specifically, we considered evaluation criteria detailed in IEPA guidance documents (*e.g.*, IEPA, 2013, 2019), incorporating principles and assumptions consistent with the Federal CCR Rule (US EPA, 2015a) and US EPA's "Human and Ecological Risk Assessment of Coal Combustion Residuals" (US EPA, 2014).

US EPA has established acceptable risk metrics. Risks above these US EPA-defined metrics are termed potentially "unacceptable risks." Based on the evaluation presented in this report, no unacceptable risks to human or ecological receptors resulting from CCR exposures associated with AP1 were identified. This means that the risks from the site are likely indistinguishable from normal background risks. Specific risk assessment results include the following:

- No completed exposure pathways were identified for any groundwater receptors; consequently, no risks were identified relating to the use of groundwater.
- No unacceptable risks were identified for recreators boating in Coffeen Lake adjacent to the Site.
- No unacceptable risks were identified for recreators exposed to sediment in Coffeen Lake adjacent to the Site.
- No unacceptable risks were identified for anglers consuming locally caught fish.
- No unacceptable risks were identified for ecological receptors exposed to surface water or sediment.
- No bioaccumulative ecological risks were identified.

It should be noted that this evaluation incorporates a number of conservative assumptions that tend to overestimate exposure and risk. Moreover, it should be noted that because current conditions do not present a risk to human health or the environment, there will also be no unacceptable risk to human health or the environment for future conditions when AP1 is closed. For all future closure scenarios, potential releases of CCR-related constituents will decline over time and, consequently, potential exposures to CCR-related constituents in the environment will also decline.

2 Site Overview

2.1 Site Description

The CPP is located in Montgomery County, Illinois, approximately 2 miles south of the City of Coffeen and about 8 miles southeast of the City of Hillsboro, Illinois. Five CCR units are present on the CPP property, including AP1, Ash Pond 2, Gypsum Management Facility (GMF) Recycle Pond, GMF Gypsum Stack Pond, and the Landfill (Ramboll, 2021). AP1, the subject of this report, was constructed in 1964; it is an unlined SI that covers an area of approximately 23 acres (Ramboll, 2021). Sluicing of waste to AP1 ceased prior to November 2019 (Ramboll, 2021). The CPP is bordered by Coffeen Lake to the west, east, and south, and is bordered by agricultural land to the north. An unnamed tributary, located east of AP1, flows south into Coffeen Lake (Figure 2.1) (Ramboll, 2021). Coffeen Lake (approximately 1,100-acres) was formed in 1963 for use as an artificial cooling lake for the CPP, by damming the McDavid Branch of the East Fork of Shoal Creek (Ramboll, 2021).

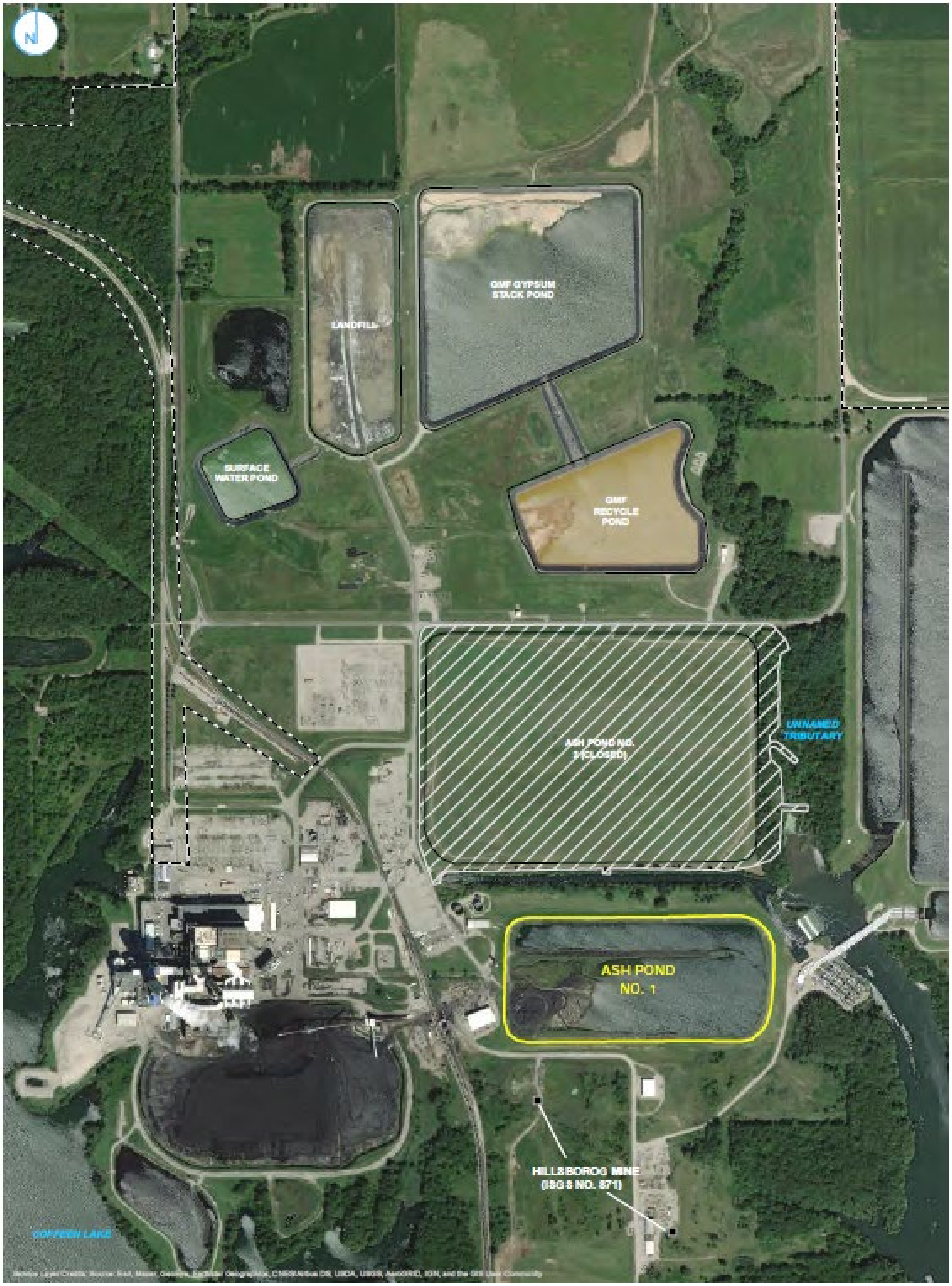


Figure 2.1 Site Location Map. Source: Ramboll (2021).

2.2 Geology/Hydrogeology

The geology underlying the CPP Site in the vicinity of AP1 primarily consists of unlithified deposits (Ramboll, 2021). The unlithified deposits were categorized into the following hydrostratigraphic units (moving downward from the ground surface): the Upper Confining Unit (UCU), which is composed of Roxana and Peoria Silts (Loess Unit); the Uppermost Aquifer (UA), which is primarily composed of sandy to gravelly silts and clays of the Hagarstown Member; the Lower Confining Unit (LCU), which is composed of the Vandalia Member, the Mulberry Grove Member, and the Smithboro Member; the Deep Aquifer (DA), which is composed of sand and sandy silts/clays of the Yarmouth Soil; and the Deep Confining Unit (DCU), which is composed of clays, silts, and sands of the Banner Formation (Ramboll, 2021).

The Hagarstown Member is separated into two units: a gravelly clay till unit on top of a sandy unit (Ramboll, 2021). The sandy unit at the base of the Hagarstown Member was identified as the UA. However, in some locations, the uppermost weathered sandy clay portion of the underlying Vandalia Member was also identified as the UA (Ramboll, 2021). The UA (*i.e.*, sandy portion of the Hagarstown Member) is generally less than 3 feet (ft) thick, but it is absent at several locations (Ramboll, 2021). The top of the UA is separated from overlying CCR materials by the low permeability Loess (*i.e.*, the UCU) and the gravelly clay till portions of the Hagarstown Member. The bottom of the UA is separated from the DA by low-permeability tills of the LCU (Ramboll, 2021). Near AP1, the UA has moderate permeability with a geometric mean horizontal hydraulic conductivity of 2×10^{-3} cm/s (Ramboll, 2021).

Groundwater within the UA flows generally from the south towards the north and northeast across AP1 and ultimately flows into a drainage ditch and the eastern branch of Coffeen Lake (Ramboll, 2021). Horizontal hydraulic gradients calculated for the UA range from 0.004 to 0.012 ft/ft, which correspond to a groundwater flow velocity ranging from 0.19 ft/day to 0.95 ft/day (Ramboll, 2021).

2.3 Conceptual Site Model

A CSM describes sources of contamination, the hydrogeological units, and the physical processes that control the transport of water and solutes. In this case, the CSM describes how groundwater underlying AP1 migrates and interacts with surface water and sediment in the adjacent Coffeen Lake. The CSM was developed using available hydrogeologic data specific to AP1, including information on groundwater flow and surface water characteristics (Ramboll, 2021).

CCR-related constituents may migrate vertically downward through the UCU from AP1 into the underlying groundwater of the UA. Once in groundwater, CCR-related constituents may migrate in a north/northeasterly direction, consistent with the direction of groundwater flow, into a drainage ditch and the eastern branch of Coffeen Lake (Ramboll, 2021). Groundwater flow within the UA is mostly in the horizontal direction because the UA is underlain by the LCU, which is a low-permeability till unit inhibiting vertical flow of groundwater. Groundwater near AP1 may mix with surface water in the eastern branch of Coffeen Lake, and dissolved constituents in groundwater may partition between the sediments and surface water in Coffeen Lake.

2.4 Groundwater Monitoring

A total of 17 wells have been used to monitor the groundwater quality near and downgradient of AP1. Of these, 13 wells are screened in the UA, 3 wells are screened in the LCU, and 1 well is screened in the DA (Table 2.1). The analyses presented in this report relied on all available data from the 17 wells collected between 2015 and 2021, which is the period subsequent to the promulgation of the Federal CCR Rule. Groundwater samples were analyzed for a suite of total metals, specified in Illinois CCR Rule Part 845.600 (IEPA, 2021a).[1] A summary of the groundwater data used in this risk evaluation is presented in Table 2.2. The AP1 well locations used in this risk evaluation are shown in Figure 2.2. The use of groundwater data in this risk evaluation does not imply that detected constituents are associated with AP1 or that they have been identified as potential groundwater exceedances.

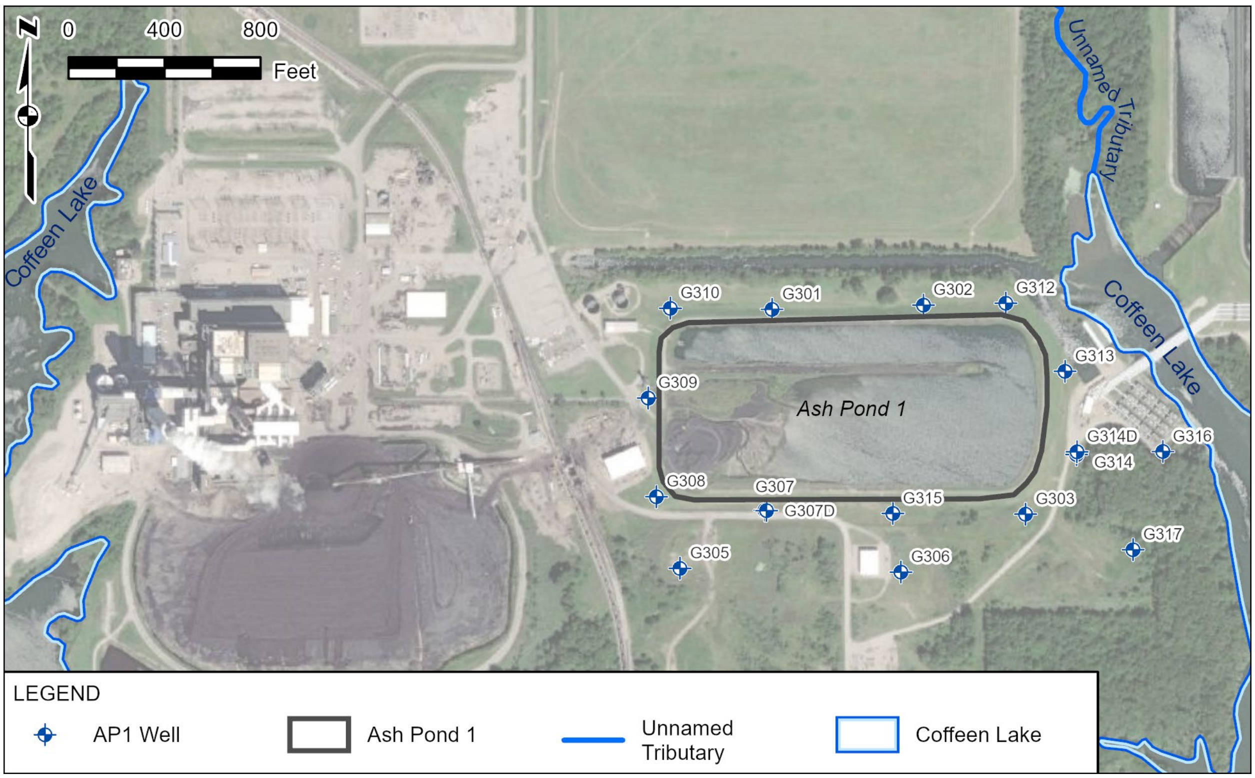


Figure 2.2 Monitoring Well Locations. Source: Ramboll (2021, Figure 3-1). AP1 = Ash Pond 1.

[1] Samples were analyzed for a longer list of inorganic constituents and general water quality parameters (chloride, fluoride, sulfate, and total dissolved solids), but these constituents were not evaluated in the risk evaluation.

Table 2.1 Groundwater Monitoring Wells Related to Coffeen Ash Pond 1

Well	Hydrogeologic Unit	Date Constructed	Screen Top Depth (ft bgs)	Screen Bottom Depth (ft bgs)	Well Depth (ft bgs)
G301	UA	9/4/2015	11.31	15.96	16.21
G302	UA	9/4/2015	13.21	17.86	18.39
G303	UA	8/26/2010	10.00	20.00	20.40
G305	UA	5/3/2016	13.44	18.27	18.50
G306	UA	5/3/2016	13.07	17.68	17.90
G307	UA	7/27/2016	12.96	17.80	18.22
G307D	LCU	1/19/2021	48.98	58.75	59.60
G308	UA	1/18/2021	10.10	14.89	15.24
G309	UA	1/21/2021	12.97	17.75	18.10
G310	UA	2/9/2021	10.24	15.03	15.38
G312	UA	1/15/2021	9.79	14.58	14.93
G313	UA	2/5/2021	6.30	11.11	11.46
G314	LCU	2/5/2021	14.56	19.58	20.02
G314D	DA	2/4/2021	39.34	49.11	49.47
G315	UA	1/14/2021	9.69	14.48	14.85
G316	LCU	2/26/2021	10.02	14.82	15.16
G317	UA	2/12/2021	30.14	34.93	35.28

Notes:
Source: Ramboll (2021).
bgs = Below Ground Surface; DA = Deep Aquifer; ft = Feet; LCU = Lower Confining Unit; UA = Uppermost Aquifer.

Table 2.2 Groundwater Data Summary

Constituent	Samples with Constituent Detected	Samples Analyzed	Minimum Detected Value	Maximum Detected Value	Maximum Laboratory Detection Limit
Total Metals (mg/L)					
Antimony	0	152	ND	ND	0.0030
Arsenic	72	172	0.0010	0.041	0.0010
Barium	172	172	0.013	0.38	0.0010
Beryllium	2	167	0.0013	0.0029	0.0010
Boron	177	177	0.019	7.5	0.20
Cadmium	8	172	0.0011	0.027	0.0010
Chromium	31	172	0.0040	0.11	0.0040
Cobalt	81	173	0.0020	0.034	0.0020
Lead	41	172	0.0010	0.068	0.0010
Lithium	62	172	0.010	0.10	0.020
Mercury	8	152	0.00022	0.0013	0.0040
Molybdenum	111	172	0.0010	0.026	0.0010
Selenium	15	167	0.0011	0.0043	0.0010
Thallium	0	152	ND	ND	0.0010
Radionuclides (pCi/L)					
Radium-226+228	163	163	0	18	5.0
Other (mg/L)					
Chloride	171	175	1.1	180	250
Fluoride	121	175	0.25	1.4	2.5
Sulfate	175	175	5.9	2,400	500
Total Dissolved Solids	175	175	640	4,000	26

Notes:
Source: Ramboll (2021).
ND = Not Detected; pCi/L = PicoCuries Per Liter.

2.5 Surface Water Monitoring

Geosyntec collected a total of six surface water samples from Coffeen Lake in the vicinity of AP1 in August 2021 (Geosyntec, 2021). The sample locations are shown in Figure 2.3, and the sampling results are summarized in Table 2.3.

Figure 2.3 Surface Water Sampling Locations. Source: Geosyntec (2021).

Table 2.3 Surface Water Data Summary

Constituent	Samples with Constituent Detected	Samples Analyzed	Minimum Detected Value	Maximum Detected Value	Maximum Laboratory Detection Limit
Total Metals (mg/L)					
Boron	5	5	0.086	0.33	0.05
Calcium	5	5	21	53	0.2
Cobalt	0	5	0	0	0.005
Iron	5	5	0.23	0.38	0.2
Lithium	0	5	0	0	0.01
Magnesium	5	5	10	16	0.1
Manganese	5	5	0.03	0.2	0.01
Potassium	5	5	2.5	4.9	0.5
Sodium	5	5	11	19	1
Other (mg/L)					
Chloride	5	5	7.2	11	0.4
Phosphorus	5	5	0.095	0.24	0.15
Sulfate	5	5	31	110	2
Total Dissolved Solids	5	5	120	240	10

Notes:
Source: Geosyntec (2021).
Surface water was analyzed for both total and dissolved metals; only the total metals are reported here because they generally have higher concentrations than dissolved metals. The only exception was iron, which had a maximum dissolved concentration 1.8 times higher than the maximum total concentration. However, iron was not measured in groundwater and, therefore, was not identified as a COI.

3 Risk Evaluation

3.1 Risk Evaluation Process

A risk evaluation was conducted to determine whether constituents present in groundwater underlying and downgradient of AP1 have the potential to pose adverse health effects to human and ecological receptors. The risk evaluation is consistent with the principles of risk assessment established by US EPA and has considered evaluation criteria detailed in Illinois guidance documents (*e.g.*, IEPA, 2013, 2019).

The general risk evaluation approach is summarized in Figure 3.1 and discussed below.

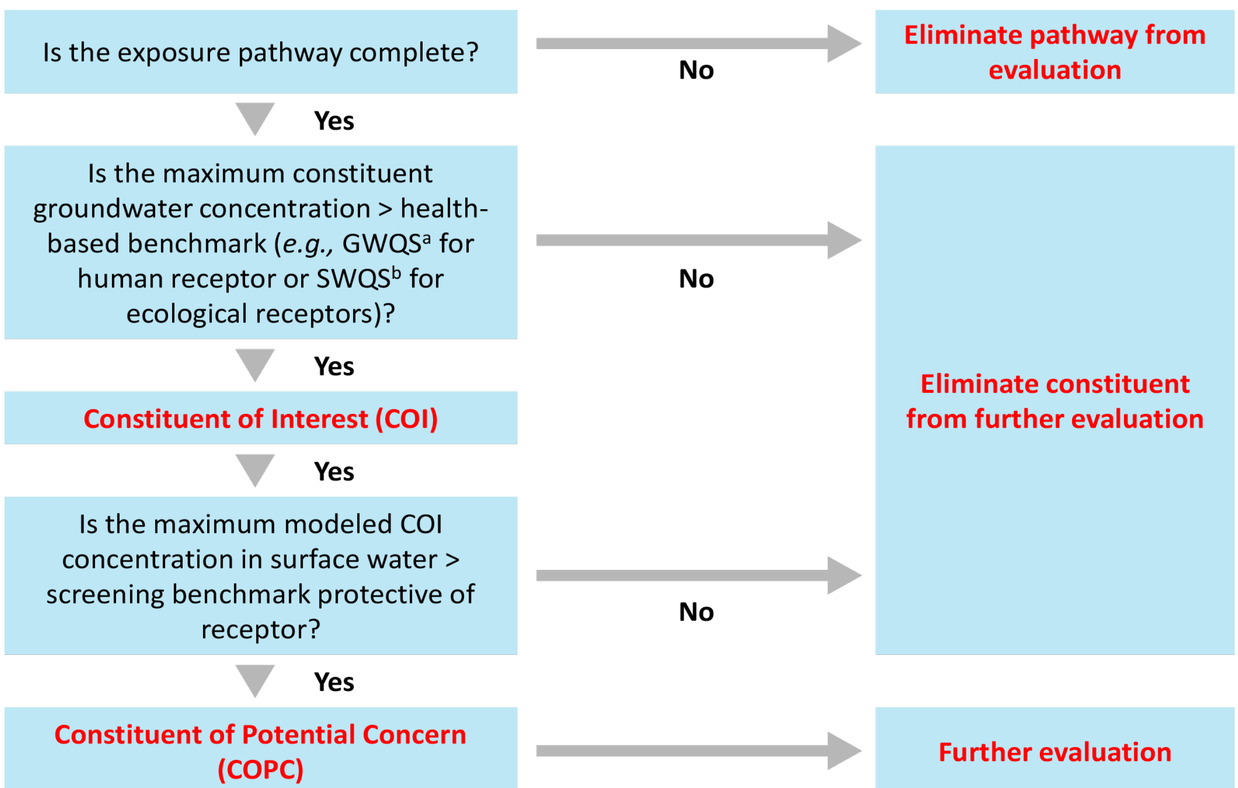


Figure 3.1 Overview of Risk Evaluation Methodology. GWQS = Groundwater Quality Standard; IEPA = Illinois Environmental Protection Agency; SWQS = Surface Water Quality Standard. (a) The IEPA Part 845 GWPS were used to identify COIs. (b) IEPA SWQS protective of chronic exposures to aquatic organisms were used to identify ecological COIs. In the absence of a SWQS, US EPA Region IV ecological screening values were used.

The first step in the risk evaluation was to develop the CEMs and identify complete exposure pathways. All potential receptors and exposure pathways based on groundwater use and surface water use in the vicinity of the Site were considered. Exposure pathways that are incomplete were excluded from the evaluation.

Groundwater data were used to identify COIs. COIs were identified as constituents with maximum concentrations in groundwater in excess of groundwater quality standards (GWQS)[2] for human receptors and surface water quality standards (SWQS) for ecological receptors. Based on the CSM (Section 2.3), some groundwater underlying AP1 has the potential to interact with surface water in Coffeen Lake. Therefore, potential AP1-related constituents in groundwater may potentially flow toward and flow into surface water in Coffeen Lake.

Surface water samples have been collected from Coffeen Lake adjacent to the Site; however, sediment samples have not been collected from the lake. Gradient modeled the potential migration of COIs from groundwater to surface water and sediment to evaluate potential risks to receptors (see Section 3.3.3).

Gradient modeled the COI concentrations in surface water and sediment based on the groundwater data from the AP1-related wells. The measured and modeled COI concentrations in surface water and sediment were compared to conservative, generic risk-based screening benchmarks for human health and ecological receptors. These generic screening benchmarks rely on default assumptions with limited consideration of site-specific characteristics. Human health benchmarks are receptor-specific values calculated for each pathway and environmental medium that are designed to be protective of human health. Ecological benchmarks are medium-specific values designed to be protective of all potential ecological receptors exposed to surface water. Ecological and human health screening benchmarks are inherently conservative because they are intended to screen out chemicals that are of no concern with a high level of confidence. Therefore, a measured or modeled COI concentration exceeding a screening benchmark does not indicate an unacceptable risk, but only that further risk evaluation is warranted. COIs with maximum concentrations exceeding a conservative screening benchmark are identified as COPCs requiring further evaluation.

As described in more detail below, this evaluation relied on the screening assessment to demonstrate that constituents present in groundwater underlying AP1 do not pose an unacceptable human health or ecological risk. That is, after the screening step, no COPCs were identified and further assessment was not warranted.

3.2 Human and Ecological Conceptual Exposure Models

A CEM provides an overview of the receptors and exposure pathways requiring risk evaluation. The CEM describes the source of the contamination, the mechanism that may lead to a release of contamination, the environmental media to which a receptor may be exposed, the route of exposure (exposure pathway), and the types of receptors that may be exposed to these environmental media.

3.2.1 Human Conceptual Exposure Model

The human CEM for the Site depicts the relationships between the off-Site environmental media potentially impacted by constituents in groundwater and human receptors that could be exposed to these media. Figure 3.2 presents a human CEM for the Site. It considers a human receptor who could be exposed to COIs hypothetically released from AP1 into groundwater, surface water, sediment, and fish. The following human receptors and exposure pathways were evaluated for inclusion in the Site-specific CEM.

[2] As discussed further in Section 3.3.2, GWQS are protective of human health and not necessarily of ecological receptors. While ecological receptors are not exposed to groundwater, groundwater can potentially enter into the adjacent surface water and impact ecological receptors. Therefore, two sets of COIs were identified: one for humans and another for ecological receptors.

- Residents – exposure to groundwater/surface water as drinking water;
- Residents – exposure to groundwater/surface water used for irrigation;
- Recreators in the lake adjacent to the Site:
  - Boaters – exposure to surface water and sediment while boating;
  - Swimmers – exposure to surface water and sediment while swimming;
  - Anglers – exposure to surface water and sediment and consumption of locally caught fish.

All of these exposure pathways were considered to be complete, except for residential exposure to groundwater or surface water used for drinking water or irrigation, and swimming. Section 3.2.1.1 explains why the residential drinking water and irrigation pathways are incomplete, and Section 3.2.1.2 provides additional description of the recreational exposures. While a recreator's potential exposure to surface water in Coffeen Lake was evaluated, swimming is prohibited in Coffeen Lake and thus was not evaluated (IDNR, 2014).

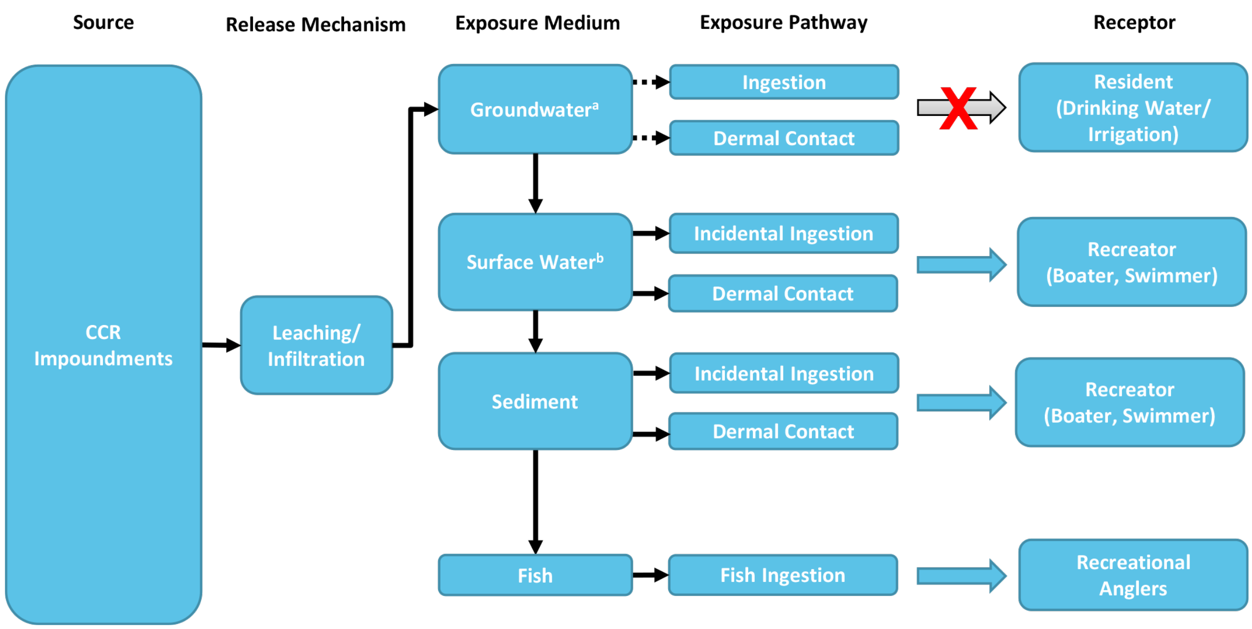


Figure 3.2 Human Conceptual Exposure Model. CCR = Coal Combustion Residuals. Dashed line/Red X = Incomplete or insignificant exposure pathway. (a) Groundwater in the vicinity of the Site is not used as a drinking water or irrigation source. (b) Surface water is not used as a drinking water source.

3.2.1.1 Groundwater or Surface Water as a Drinking Water/Irrigation Source

Using groundwater as a source of drinking water and/or irrigation water is not a complete exposure pathway for CCR-related constituents originating from AP1. Specifically, there are no users of shallow groundwater from the UA in the vicinity of AP1; thus, no receptors can be exposed to any CCR-related constituents in groundwater originating from AP1.

Relying on state databases, Ramboll completed a water well survey in 2021 (Ramboll, 2021). A total of 12 water wells were identified within a 1,000-meter radius of the AP1 boundary during a comprehensive search of the Illinois State Geological Survey's (ISGS) Illinois Water and Related Wells (ILWATER) Map (Ramboll, 2021). These included four monitoring wells and eight farm/domestic wells (Ramboll, 2021) (Figure 3.3). There is no information available about the current use of these wells. However, site-specific groundwater flow conditions support the conclusion that none of the eight farm/domestic wells are or can ever be affected by potential CCR-related constituents originating from AP1.

- **There is no off-Site migration of CCR-related constituents in groundwater**. Groundwater from the UA flows north/northeast before flowing into the eastern branch of Coffeen Lake (Ramboll, 2021). Seven of the eight farm/domestic wells within a 1,000 m radius of AP1 are located on the east/southeast side of Coffeen Lake's eastern branch and the unnamed tributary, *i.e.*, the opposite side of the lake from AP1. These surface water bodies are hydraulic boundaries that prevent shallow groundwater from flowing past or underneath them. Furthermore, the surface waters are regional "sinks", meaning that groundwater flows into the surface water bodies both from the east and the west, but cannot flow past. Thus, because the eastern branch of Coffeen Lake and the unnamed tributary separate the farm/domestic wells from AP1 (Figure 3.3), there is no plausible mechanism by which the wells could be impacted by any potential constituents in groundwater associated with the AP1. There is one domestic/farm well located north of AP1 (Well ID 32 on Figure 3.3), side-gradient to AP1 and on the west side of the unnamed tributary. It is likely that this well is not in use and no longer in existence. The well, which was installed in 1981, is located near the former location of several prior residents (Figure 3.4). However, the property in this area has been purchased by IPGC and no residents are currently living or using groundwater in the area.
- **Coffeen Lake is not used as a public water supply.** Coffeen Lake is a cooling water pond owned and maintained by IPGC, and IPGC restricts the use of the lake as a source of drinking water. Therefore, the human exposure pathway of surface water ingestion (as potable water) adjacent to AP1 is not a complete pathway and was not evaluated further.
- **AP1 has a limited hydraulic connection to underlying groundwater.** The LCU underlying the UA forms a hydraulic barrier between AP1 and deeper groundwater resources. Due to the very low hydraulic conductivity of the LCU, downward migration of shallow groundwater is expected to be limited. Therefore, the likelihood of AP1-related impacts to deep groundwater is minimal.

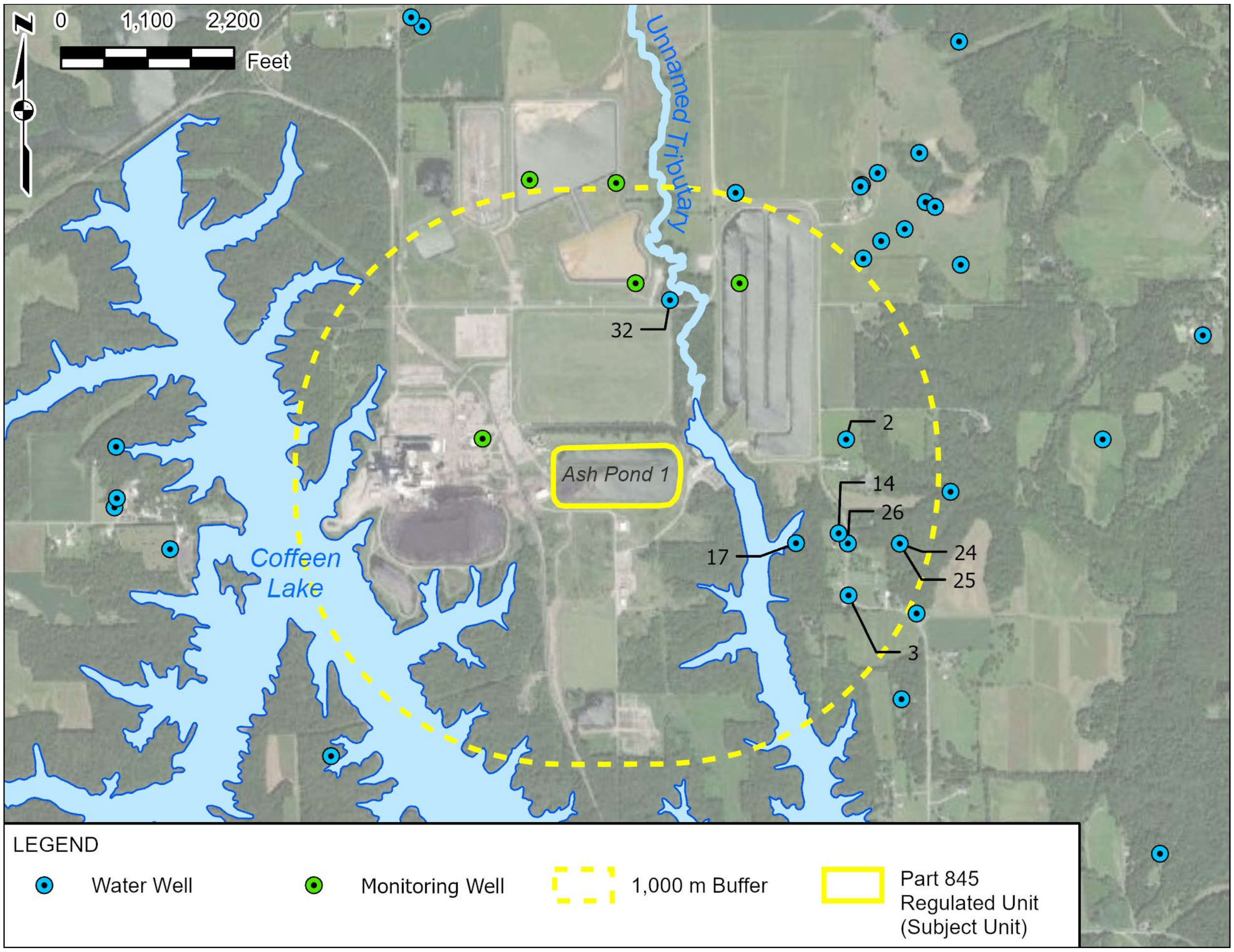


Figure 3.3 Water Wells Within 1,000 Meters of AP1. Source: Ramboll (2021).

Figure 3.4 Historic Property Use In the Vicinity of Well 32. (a) 1998; (b) 2005; (c) 2009. Sources: USGS (1998a,b, 2005a,b); USDA (2009a,b).

3.2.1.2 Recreational Exposures

Coffeen Lake is located adjacent to the Site and is owned by IPGC. Property along the lake has been leased to IDNR for use as a State Fish and Wildlife Area (Ramboll, 2021), and the lake is used for recreational fishing (IDNR, 2022). Recreational exposure to surface water and sediment may occur during activities such as boating or fishing in the lake. Recreational anglers may also consume locally caught fish from Coffeen Lake. Swimming does not occur in Coffeen Lake because it is owned by IPGC and used as a cooling reservoir (IDNR, 2022).

3.2.2 Ecological Conceptual Exposure Model

The ecological CEM for the Site depicts the relationships between off-Site environmental media (surface water and sediment) potentially impacted by COIs in groundwater and ecological receptors that may be exposed to these media. The ecological risk evaluation considered both direct toxicity and secondary toxicity *via* bioaccumulation. Figure 3.5 presents the ecological CEM for the Site. The following ecological receptor groups and exposure pathways were considered:

- **Ecological Receptors Exposed to Surface Water:**
  - Aquatic plants, amphibians, reptiles, and fish.
- **Ecological Receptors Exposed to Sediment:**
  - Benthic invertebrates (*e.g.*, insects, crayfish, and mussels).
- **Ecological Receptors Exposed to Bioaccumulative COIs:**
  - Higher trophic-level wildlife (avian and mammalian) *via* direct exposures (surface water and sediment exposure) and secondary exposures through the consumption of prey (*e.g.*, plants, invertebrates, small mammals, and fish).

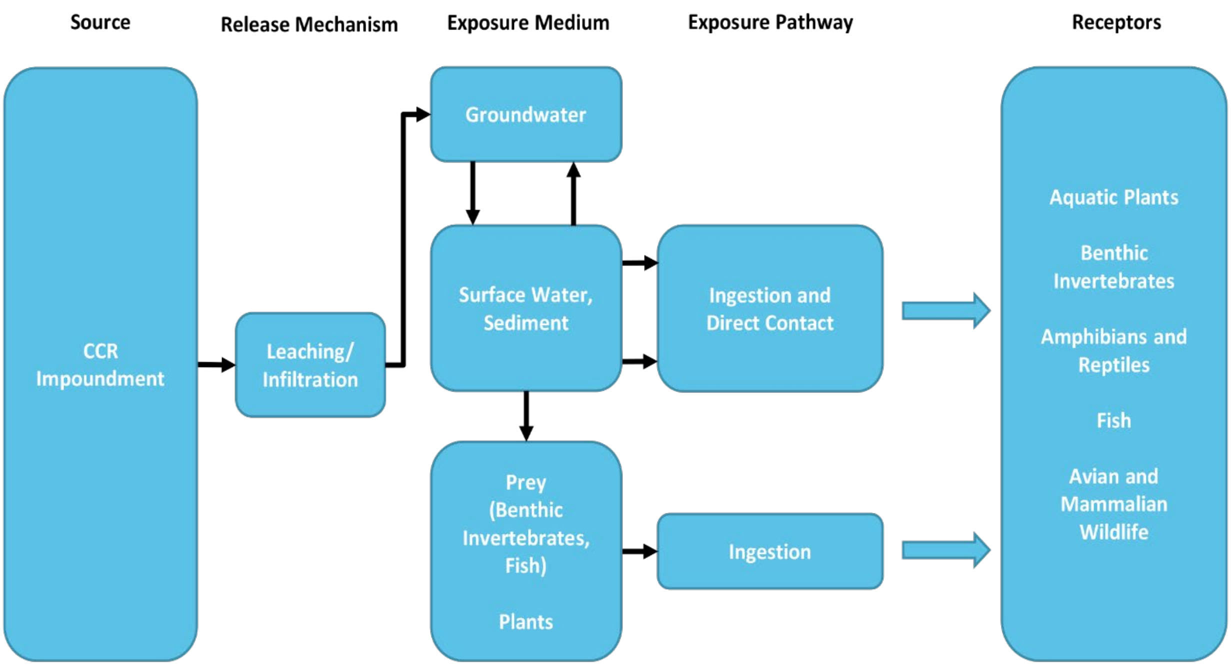


Figure 3.5 Ecological Conceptual Exposure Model. CCR = Coal Combustion Residuals.

3.3 Identification of Constituents of Interest

Risks were evaluated for COIs. A constituent was considered a COI if the maximum detected constituent concentration in groundwater exceeded a health-based benchmark. According to US EPA risk assessment guidance (US EPA, 1989), this screening step is designed to reduce the number of constituents carried through the risk evaluation that are anticipated to have a minimal contribution to the overall risk. Identified COIs are the constituents that are most likely to pose a risk concern in the surface water adjacent to the Site.

3.3.1 Human Health Constituents of Interest

For the human health risk evaluation, COIs were conservatively identified as constituents with maximum concentrations in groundwater above the GWPS listed in the Illinois CCR Rule Part 845.600 (IEPA, 2021a). Gradient used the maximum detected concentrations from groundwater samples collected from all of the AP1-associated wells, regardless of hydrostratigraphic unit. The use of groundwater data in this risk evaluation does not imply that detected constituents are associated with AP1 or that they have been identified as potential groundwater exceedances. Using this approach, eight COIs (arsenic, boron, cadmium, chromium, cobalt, lead, lithium, and radium-226+228) were identified for the human health risk evaluation *via* the surface water pathway (Table 3.1).

The water quality parameters that exceeded the GWPS included sulfate and total dissolved solids; however, these constituents were not included in the risk evaluation because the GWPS are based on aesthetic quality. The US EPA secondary maximum contaminant levels (MCLs) for sulfate and total dissolved solids are based on aesthetic quality. The secondary MCL for sulfate (250 mg/L) is based on salty taste (US EPA, 2021a). The secondary MCL for total dissolved solids (500 mg/L) is based on hardness, deposits, colored water, staining, and salty taste (US EPA, 2021a). Given that these parameters are not likely to pose a human health risk concern in the event of exposure, they were not considered to be human health COIs.

Table 3.1 Human Health Constituents of Interest

Constituent[a]	Maximum Concentration	GWPS[b]	Human Health COI[c]
Total Metals (mg/L)			
Antimony	ND	0.0060	No
Arsenic	0.041	0.010	Yes
Barium	0.38	2.0	No
Beryllium	0.0029	0.0040	No
Boron	7.5	2.0	Yes
Cadmium	0.027	0.0050	Yes
Chromium	0.11	0.10	Yes
Cobalt	0.034	0.0060	Yes
Lead	0.068	0.0075	Yes
Lithium	0.10	0.040	Yes
Mercury	0.0013	0.0020	No
Molybdenum	0.026	0.10	No
Selenium	0.0043	0.050	No
Thallium	ND	0.0020	No
Radionuclides (pCi/L)			
Radium-226+228	18	5.0	Yes
Other (mg/L)			
Chloride	180	200	No
Fluoride	1.4	4.0	No
Sulfate	2,400	400	No[d]
Total Dissolved Solids	4,000	1,200	No[d]

Notes:
COI = Constituent of Interest; GWPS = Groundwater Protection Standard; MCL = Maximum Contaminant Level; pCi/L = PicoCuries Per Liter.
Shaded = Compound identified as a COI.
(a) The constituents are those listed in the Illinois Part 845.600 GWPS (IEPA, 2021a).
(b) The Illinois Part 845.600 GWPS (IEPA, 2021a) were used to identify COIs.
(c) COIs are constituents for which the maximum concentration exceeds the groundwater standard.
(d) This constituent is not likely to pose a human health risk concern due to the absence of studies regarding toxicity to human health. Therefore, this constituent is not considered a COI.

3.3.2 Ecological Constituents of Interest

The Illinois GWPS, as defined in IEPA's guidance, were developed to protect human health, but not necessarily ecological receptors. While ecological receptors are not exposed to groundwater, groundwater can potentially migrate into the adjacent surface water and impact ecological receptors. Therefore, to identify ecological COIs, the maximum concentrations of constituents detected in groundwater were compared to ecological surface water benchmarks protective of aquatic life.

The surface water screening benchmarks for freshwater organisms were obtained from the following hierarchy of sources:

- IEPA (2019) SWQC. IEPA SWQC are health-protective benchmarks for aquatic life exposed to surface water on a long-term basis (*i.e.*, chronic exposure). The SWQC for several metals are hardness-dependent (cadmium, chromium, copper, lead, manganese, nickel, and zinc). Screening benchmarks for these constituents were calculated assuming US EPA's default hardness of 100 mg/L (US EPA, 2022).[3]
- US EPA Region IV (2018) surface water Ecological Screening Values (ESVs) for hazardous waste sites.

Benchmarks from the United States Department of Energy's (US DOE) guidance document ("A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota") were used for radium (US DOE, 2019). US DOE (2019) presents benchmarks for radium-226 and radium-228 (4 and 3 picoCuries per liter [pCi/L], respectively). Given that radium concentrations are expressed as total radium (radium-226+228, *i.e.*, the sum of radium-226 and radium-228), Gradient used the lower of the two benchmarks (3 pCi/L for radium-228) to evaluate total radium concentrations.

Consistent with the human health risk evaluation, Gradient used the maximum detected concentrations from groundwater samples collected from all of the AP1-associated wells (regardless of hydrostratigraphic unit) without considering spatial or temporal representativeness for ecological receptor exposures. The use of the maximum constituent concentrations in this evaluation is designed to conservatively identify COIs that warrant further investigation. Cadmium, cobalt, lead, mercury, and radium-226+228 were identified as COIs for ecological receptors (Table 3.2).

[3] Hardness data are not available for Coffeen Lake adjacent to the Site; therefore, the US EPA (2022) default hardness of 100 mg/L was used. Use of a higher hardness value would result in less stringent screening values; thus, use of the US EPA default hardness is conservative.

Table 3.2 Ecological Constituents of Interest

Constituent[a]	Maximum Groundwater Concentration	Ecological Benchmark[b]	Basis	Ecological COI[c]
Total Metals (mg/L)				
Antimony	ND	0.19	US EPA R4 ESV	No
Arsenic	0.041	0.19	IEPA SWQC	No
Barium	0.38	5.0	IEPA SWQC	No
Beryllium	0.0029	0.064	US EPA R4 ESV	No
Boron	7.5	7.6	IEPA SWQC	No
Cadmium	0.027	0.0011	IEPA SWQC	Yes
Chromium	0.11	0.21	IEPA SWQC	No
Cobalt	0.034	0.019	US EPA R4 ESV	Yes
Lead	0.068	0.020	IEPA SWQC	Yes
Lithium	0.10	0.44	US EPA R4 ESV	No
Mercury	0.0013	0.0011	IEPA SWQC	Yes
Molybdenum	0.026	7.2	US EPA R4 ESV	No
Selenium	0.0043	1.0	IEPA SWQC	No
Thallium	ND	0.0060	US EPA R4 ESV	No
Radionuclides (pCi/L)				
Radium-226 + 228	18	3.0	US DOE	Yes
Other (mg/L)				
Chloride	180	500	IEPA SWQC	No
Fluoride	1.4	4.0	IEPA SWQC	No
Sulfate	2,400	NA	NA	No
Total Dissolved Solids	4,000	NA	NA	No

Notes:
AP1 = Ash Pond 1; COI = Constituent of Interest; ESV = Ecological Screening Value; GWPS = Groundwater Protection Standards; IEPA = Illinois Environmental Protection Agency; NA = Not Available; ND = Nondetect; pCi/L = picoCuries Per Liter; SWQC = Surface Water Quality Criteria; US DOE = United States Department of Energy; US EPA R4 = US Environmental Protection Agency Region IV.
Shaded = Compound identified as a COI.
(a) The constituents are those listed in the Illinois Part 845.600 GWPS (IEPA, 2021a).
(b) Ecological benchmarks are from the hierarchy of sources discussed in Section 3.3.2: IEPA SWQC (IEPA, 2019); US EPA Region IV "Ecological Risk Assessment Supplemental Guidance" (US EPA Region IV, 2018); and US DOE's guidance document, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (US DOE, 2019).
(c) Constituents with maximum detected concentrations exceeding a benchmark protective of surface water exposure are considered ecological COIs.

3.3.3 Surface Water and Sediment Modeling

Surface water sampling has been conducted in Coffeen Lake adjacent to the Site. To estimate the potential contribution to surface water (and sediment) from groundwater specifically associated with AP1, Gradient modeled concentrations in Coffeen Lake surface water and sediment from groundwater flow into the lake for the detected human and ecological COIs. This is because the constituents detected in groundwater above an ecological- or health-based benchmark are most likely to pose a risk concern in the adjacent surface water. Gradient modeled human health and ecological COI concentrations in the surface water and sediment using a mass balance calculation based on the surface water and groundwater mixing. The model assumes a well-mixed groundwater-surface water location. The maximum detected concentrations in groundwater (regardless of well location) from 2015 to 2021 were conservatively used to model COI concentrations in surface water and sediment. The groundwater data were measured as total metals. Use of the total metals concentration for these COIs may overestimate surface water concentrations because dissolved concentrations, which are lower than total concentrations, represent the mobile fractions of constituents that could likely flow into and mix with surface water.

This modeling approach does not account for geochemical transformations that may occur during groundwater mixing with surface water. Gradient assumed that predicted surface water concentrations were influenced only by the physical mixing of groundwater as it enters the surface water, and were not further influenced by the geochemical reactions in the water and sediment, such as precipitation. In addition, the model only predicts surface water and sediment concentrations as a result of the potential migration of COI concentrations in AP1-related groundwater and does not account for background concentrations in surface water or sediment.

For this evaluation, Gradient adapted a simplified and conservative form of US EPA's indirect exposure assessment methodology (US EPA, 1998) that was used in US EPA's coal combustion waste risk assessment (US EPA, 2014). The model is a mass balance calculation based on surface water and groundwater mixing and the concept that the dissolved and sorbed concentrations can be related through an equilibrium partitioning coefficient (K_d). The model assumes a well-mixed groundwater-surface water location, with partitioning among total suspended solids, dissolved water column, sediment pore water, and solid sediments.

Sorption to soil and sediment is highly dependent on the surrounding geochemical conditions. To be conservative, we ignored the natural attenuation capacity of soil and sediment and estimated the surface water concentration based only on the physical mixing of groundwater and surface water (*i.e.*, dilution) at the point of entry of groundwater to the surface water.

The aquifer and surface water properties used to estimate the volume of groundwater flowing into Coffeen Lake and surface water concentrations are presented in Table 3.3. The COI concentrations in sediment were modeled using the COI-specific sediment-to-water partitioning coefficients and the sediment properties presented in Table 3.4. In the absence of Site-specific information for Coffeen Lake, Gradient used default assumptions (*e.g.*, depth of the upper benthic layer and bed sediment porosity) to model sediment concentrations. The modeled surface water and sediment concentrations are presented in Table 3.5. These modeled concentrations reflect conservative contributions from groundwater flow. A description of the modeling and the detailed results are presented in Appendix A.

Table 3.3 Groundwater and Surface Water Properties Used in Modeling

Parameter	Unit	Values	Notes/Source
Groundwater			
COI Concentration	mg/L	Constituent-specific	Maximum detected concentration in groundwater
Cross Section Area for the UA[a]	m^2	613	The average thickness of the UA (*i.e.*, 3 ft or 0.9144 m) multiplied by the potential length of AP1 affected groundwater intersecting Coffeen Lake (*i.e.*, about 670 m) (Ramboll, 2021)
Hydraulic Gradient	m/m	0.0080	The average hydraulic gradient for the UA (Ramboll, 2021)
Hydraulic Conductivity of the UA	cm/s	0.0020	The geometric mean horizontal hydraulic conductivity measured for the UA (Ramboll, 2021)
Surface Water			
Surface Water Flow Rate in the Eastern Branch of Coffeen Lake	L/yr	8.0×10^{10}	There are no flow records available for the eastern branch of Coffeen Lake. The flow rate was assumed to be the same (*i.e.*, 90 cfs) as estimated for the unnamed tributary that flows from north to south into the eastern branch of Coffeen Lake (Golder Associates Inc., 2020).
Total Suspended Solids	mg/L	3.2	Average Coffeen Lake concentration (Hanson Professional Services, Inc., 2020 222-4807)
Depth of the Water Column	m	5.7	Mean depth of Coffeen Lake (Austen *et al*., 1993)
Suspended Sediment to Water Partition Coefficient	mg/L	Constituent-specific	Values based on US EPA (2014)

Notes:

AP1 = Ash Pond 1; cfs = Cubic Feet Per Second; COI = Constituent of Interest; ft = Feet; L/yr = Liter Per Year; UA = Uppermost Aquifer; US EPA = United States Environmental Protection Agency.

(a) Cross-sectional area represents the area through which groundwater flows from the UA into Coffeen Lake (*i.e.*, the groundwater flow area that intersects with Coffeen Lake).

Table 3.4 Sediment Properties Used in Modeling

Parameter	Unit	Value	Notes/Source
Sediment			
Depth of Upper Benthic Layer	m	0.03	Default (US EPA, 2014)
Depth of Water Body	m	5.73	Sum of depth of water column (5.7 m, depth of Coffeen Lake) (Austen *et al*., 1993) and depth of upper benthic layer (0.03 m) (US EPA, 2014)
Bed Sediment Particle Concentration	g/cm^3	1	Default (US EPA, 2014)
Bed Sediment Porosity	-	0.6	Default (US EPA, 2014)
TSS Mass Per Unit Area	kg/m^2	0.0342	Depth of water column × TSS × conversion factors (10^{-6} kg/mg and 1,000 L/m^3)
Sediment Mass Per Unit Area	kg/m^2	30	Depth of upper benthic layer × bed sediment particulate concentration × conversion factors (0.001 kg/g, 10^6 cm^3/m^3)
Sediment to Water Partition Coefficients	mg/L	Constituent-specific	Values based on US EPA (2014)

Notes:

TSS = Total Suspended Solids; US EPA = United States Environmental Protection Agency.

Table 3.5 Surface Water and Sediment Modeling Results

COI	Groundwater Concentration (mg/L or pCi/L)	Mass Discharge Rate (mg/yr or pCi/yr)	Total Water Column Concentration (mg/L or pCi/L)	Concentration Sorbed to Bottom Sediments (mg/kg or pCi/kg)
Total Metals				
Arsenic	0.041	1.3E+05	1.6E-06	3.8E-04
Boron	7.5	2.3E+07	2.9E-04	1.7E-03
Cadmium	0.027	8.4E+04	1.0E-06	1.4E-03
Chromium	0.11	3.4E+05	4.3E-06	1.9E-01
Cobalt	0.034	1.1E+05	1.3E-06	1.2E-03
Lead	0.068	2.1E+05	2.6E-06	2.6E-02
Lithium	0.10	3.1E+05	3.9E-06	(a)
Mercury	0.0013	4.0E+03	5.0E-08	1.8E-03
Radionuclides				
Radium-226 + 228	18	5.4E+07	6.8E-04	4.8E+00

Notes:
COI = Constituent of Concern; K_d = Equilibrium Partition Coefficient; pCi/L = PicoCuries Per Liter; pCi/kg = PicoCuries Per Kilogram.
(a) Lithium does not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

3.4 Human Health Risk Evaluation

The section below presents the results of the human health risk evaluation for recreators (boaters and anglers) in Coffeen Lake adjacent to the Site. Risks were assessed using the maximum measured or modeled COIs in surface water.

3.4.1 Recreators Exposed to Surface Water

Screening Exposures: Recreators could be exposed to surface water *via* incidental ingestion and dermal contact while boating. In addition, anglers could consume fish caught in Coffeen Lake. The maximum measured or modeled COI concentrations in surface water were used as conservative upper-end estimates of the COI concentrations to which a recreator might be exposed directly (incidental ingestion of COIs in surface water while boating) and indirectly (consumption of locally caught fish exposed to COIs in surface water).

Screening Benchmarks: Illinois surface water criteria (IEPA, 2019), known as human threshold criteria (HTC), are based on incidental exposure through contact or ingestion of small volumes of water while swimming or during other recreational activities, as well as the consumption of fish. The HTC values were calculated from the following equation (IEPA, 2019):

$$\mathrm{HTC} = \frac{\mathrm{ADI}}{\mathrm{W} + (\mathrm{F} \times \mathrm{BCF})}$$

where:

HTC	=	Human health protection criterion in milligrams per liter (mg/L)
ADI	=	Acceptable daily intake (mg/day)
W	=	Water consumption rate (L/day)
F	=	Fish consumption rate (kg/day)
BCF	=	Bioconcentration factor (L/kg-tissue)

Illinois defines the acceptable daily intake (ADI) as the "maximum amount of a substance which, if ingested daily for a lifetime, results in no adverse effects to humans" (IEPA, 2019). US EPA defines its chronic reference dose (RfD) as an "estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a chronic duration (up to a lifetime) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (US EPA, 2011a). Illinois lists methods to derive an ADI from the primary literature (IEPA, 2019). In accordance with Illinois guidance, Gradient derived an ADI by multiplying the MCL by the default water ingestion rate of 2 L/day (IEPA, 2019). In the absence of an MCL, Gradient applied the RfD used by US EPA to derive its Regional Screening Levels (RSLs) (US EPA, 2021b) as a conservative estimate of the ADI. The RfDs are given in mg/kg-day, while the ADIs are given in mg/day; thus, Gradient multiplied the RfD by a standard body weight of 70 kg to obtain the ADI in mg/day. The calculation of the HTC values is shown in Appendix B, Table B.1.

Gradient used bioconcentration factors (BCFs) from a hierarchy of sources. The primary BCFs were those that US EPA used to calculate the National Recommended Water Quality Criteria (NRWQC) for human health (US EPA, 2002). Other sources included BCFs used in the US EPA coal combustion ash risk assessment (US EPA, 2014) and BCFs reported by Oak Ridge National Laboratory's Risk Assessment Information System (ORNL RAIS) (ORNL, 2020).[4] Lithium did not have a BCF value available from any authoritative source; therefore, the water quality criterion for lithium was calculated assuming a BCF of 1. This is a conservative assumption, as lithium does not readily bioaccumulate in the aquatic environment (ECHA, 2020).

Illinois recommends a fish consumption rate of 0.020 kg/day (20 g/day) for an adult weighing 70 kg (IEPA, 2019). Illinois recommends a water consumption rate of 0.01 L/day for "incidental exposure through contact or ingestion of small volumes of water while swimming or during other recreational activities" (IEPA, 2019). Appendix B, Table B.1 presents the calculated HTC for fish consumption and water ingestion, and for fish consumption only.

The HTC for fish consumption for radium-226+228 was calculated as follows:

$$\mathrm{HTC} = \frac{\mathrm{TCR}}{(\mathrm{SF} \times \mathrm{BAF} \times \mathrm{F})}$$

where:

HTC	=	Human health protection criterion in picoCuries per liter (pCi/L)
TCR	=	Target cancer risk (1×10^{-5})
SF	=	Food ingestion slope factor (risk/pCi)
BAF	=	Bioaccumulation factor (L/kg-tissue)
F	=	Fish consumption rate (kg/day)

[4] Although recommended by US EPA (2015c), US EPA EpiSuite 4.1 (US EPA, 2019) was not used as a source of BCFs because inorganic compounds are outside the estimation domain of the program.

The food ingestion slope factor (lifetime excess total cancer risk per unit exposure, in risk/pCi) used to calculate the HTC was the highest value of those for radium-226 (Ra-226), radium-228 (Ra-228), and "Ra-228+D" (US EPA, 2001). According to US EPA (2001), "+D" indicates that "the risks from associated short-lived radioactive decay products (*i.e.,* those decay products with radioactive half-lives less than or equal to 6 months) are also included."

Screening Risk Evaluation: The maximum modeled and measured COI concentrations in surface water were compared to the calculated Illinois HTC values (Table 3.6). All surface water concentrations were below their respective benchmarks. The HTC values are protective of recreational exposure *via* water and/or fish ingestion and do not account for dermal exposures to COIs in surface water while boating. However, given that the measured and modeled COI surface water concentrations are orders of magnitude below an HTC protective of water and/or fish ingestion, dermal exposures to COIs are not expected to be a risk concern. Moreover, the dermal uptake of metals is considered to be minimal and only a small proportion of ingestion exposures. Thus, none of the COIs evaluated would be expected to pose an unacceptable risk to recreators exposed to surface water while boating or anglers consuming fish caught in Coffeen Lake.

Table 3.6 Risk Evaluation for Recreators Exposed to Surface Water

COI	Maximum Surface Water Concentration		HTC for Water and Fish	HTC for Water Only	HTC for Fish Only	COPC	
	Modeled	Measured[a]				Based on Modeled Concentrations	Based on Measured Concentrations
Total Metals (mg/L)							
Arsenic	1.6E-06	NA	0.022	2.0	0.023	No	NA
Boron	2.9E-04	0.33	467	1,400	700	No	No
Cadmium	1.0E-06	NA	0.0018	1.0	0.0019	No	NA
Chromium	4.3E-06	NA	0.61	20	0.63	No	NA
Cobalt	1.3E-06	ND	0.0035	2.1	0.0035	No	No
Lead	2.6E-06	NA	0.015	0.015	0.015	No	NA
Lithium	3.9E-06	ND	4.7	14	7.0	No	No
Radionuclides (pCi/L)							
Radium-226+228	6.8E-04	NA	1,000	1,000	87,413	No	NA

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; HTC = Human Threshold Criteria; NA = Not Applicable; ND = Not Detected; pCi/L = PicoCuries Per Liter.
(a) Measured concentrations are listed only for the constituents identified as COIs. Measured surface water concentrations may be different from modeled concentrations because measured data include the effects of background and other industrial sources. Modeled concentrations only represent the potential effect on surface water quality resulting from the measured groundwater concentrations. COIs with no measured surface water data were listed as NA.

3.4.2 Recreators Exposed to Sediment

Recreational exposure to sediment may occur during boating activity in Coffeen Lake; exposure to sediment may occur through incidental ingestion and dermal contact.

Screening Exposures: COIs in impacted groundwater flowing into the river can sorb to sediments. In the absence of sediment data, sediment concentrations were modeled using maximum detected groundwater concentrations.

Screening Benchmarks: There are no established recreator RSLs that are protective of recreational exposures to sediment (US EPA, 2021c). Therefore, benchmarks that are protective of recreational exposures to sediment *via* incidental ingestion and dermal contact were calculated using US EPA's RSL guidance (US EPA, 2021c). These benchmarks were calculated using the recommended assumptions (*i.e.*, oral bioavailability, body weights, and averaging time) and toxicity reference values (*i.e.*, RfD and cancer slope factor [CSF]), with the following changes: Recreators were assumed to be exposed to sediment while recreating 60 days per year (or two weekend days per week for 30 weeks per year, from April to October). The exposure duration was assumed for a child 6 years of age and an adult 20 years of age, per US EPA guidance (Stalcup, 2014). The daily recommended residential soil ingestion rates of 200 mg/day for a child and 100 mg/day for an adult are based on an all-day exposure to residential soils (Stalcup, 2014; US EPA, 2011b). Since recreational exposures to sediment are assumed to occur for less than 4 hours per day, one-third of the daily residential soil ingestion (67 mg/day for a child and 33 mg/day for an adult) was used as a conservative assumption. For dermal exposures, recreators were assumed to be exposed to sediment on their lower legs and feet (1,026 cm^2 for the child and 3,026 cm^2 for the adult, based on the age-weighted surface areas reported in US EPA, 2011b). While other body parts may be exposed to sediment, the contact time will likely be very short, as the sediment would wash off in the surface water. Gradient used US EPA's recommended adherence factor of 0.2 mg/cm^2 based on child exposure to wet soil (US EPA, 2004; Stalcup, 2014), which was used in the US EPA RSL User's Guide for a child recreator exposed to soil or sediment (US EPA, 2021c). The sediment screening benchmarks were calculated based on a target hazard quotient of 1, or a target cancer risk of 1×10^{-5}. Appendix B, Table B.2 presents the calculation of screening benchmarks protective of recreational exposures to sediment. A recreator sediment screening benchmark for radium-226+228 was based on soil Preliminary Remediation Goals (PRGs) calculated for radium-226 and radium-228 using US EPA's PRG calculator (US EPA, 2020). The lower of the two values was used as the recreator sediment screening benchmark for radium-226+228 (Appendix B, Table B.3).

Screening Risk Evaluation: The modeled sediment concentrations were well below the recreational sediment screening benchmarks (Table 3.7). Therefore, exposure to sediment is not expected to pose an unacceptable risk to recreators while boating.

Table 3.7 Risk Evaluation for Recreators Exposed to Sediment

COI	Modeled Sediment Concentration (mg/kg)	Recreator Sediment Screening Benchmark (mg/kg)	COPC
Total Metals (mg/kg)			
Arsenic	3.8E-04	6.8E+01	No
Boron	1.7E-03	2.7E+05	No
Cadmium	1.4E-03	1.2E+02	No
Chromium	1.9E-01	2.1E+06	No
Cobalt	1.2E-03	4.1E+02	No
Lead	2.6E-02	4.0E+02	No
Lithium	(a)	2.7E+03	NA
Radionuclides (pCi/kg)			
Radium-226+228	4.8E+00	7.9E+03	No

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; K_d = Equilibrium Partition Coefficient; mg/kg = Milligram Per Kilogram; NA = Not Applicable; pCi/kg = PicoCuries Per Kilogram.
(a) Lithium does not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

3.5 Ecological Risk Evaluation

Based on the ecological CEM (Figure 3.4), ecological receptors could be exposed to surface water and dietary items (*i.e.*, prey and plants) potentially impacted by identified COIs (*i.e.*, cadmium, cobalt, lead, mercury, and radium-226+228).

3.5.1 Ecological Receptors Exposed to Surface Water

Screening Exposures: The ecological evaluation considered aquatic communities in Coffeen Lake potentially impacted by identified ecological COIs. Measured and modeled surface water concentrations were compared to risk-based ecological screening benchmarks.

Screening Benchmarks: Surface water screening benchmarks protective of aquatic life were obtained from the following hierarchy of sources:

- IEPA SWQC (IEPA, 2019), regulatory standards that are intended to protect aquatic life exposed to surface water on a long-term basis (*i.e.*, chronic exposure). For cadmium, the surface water benchmark is hardness-dependent and calculated using a default hardness of 100 mg/L (US EPA, 2022)[5];
- US EPA Region IV (2018) surface water ESVs for hazardous waste sites; and
- US DOE benchmarks from the guidance document, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (US DOE, 2019).

[5] Conservatisms associated with using a default hardness value are discussed in Section 3.6.

Risk Evaluation: The maximum measured and modeled COI concentrations in surface water were compared to the benchmarks protective of aquatic life (Table 3.8). The measured and modeled surface water concentrations for the COIs were below their respective benchmarks. Thus, none of the COIs evaluated are expected to pose an unacceptable risk to aquatic life in Coffeen Lake.

Table 3.8 Risk Evaluation for Ecological Receptors Exposed to Surface Water

COI	Maximum Surface Water Concentration		Ecological Freshwater Benchmark	Basis	COPC	
	Modeled	Measured[a]			Based on Modeled Concentrations	Based on Measured Concentrations
Total Metals (mg/L)						
Cadmium	1.0E-06	NA	0.0011	IEPA SWQC	No	NA
Cobalt	1.3E-06	ND	0.019	US EPA R4 ESV	No	No
Lead	2.6E-06	NA	0.020	IEPA SWQC	No	NA
Mercury	5.0E-08	NA	0.0011	IEPA SWQC	No	NA
Radionuclides (pCi/L)						
Radium-226+228	6.8E-04	NA	3.0	US DOE	No	NA

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; ESV = Ecological Screening Value; IEPA = Illinois Environmental Protection Agency; NA = Not Applicable; ND = Nondetect; pCi/L = PicoCuries Per Liter; SWQC = Surface Water Quality Criteria; US DOE = United States Department of Energy; US EPA = United States Environmental Protection Agency.
(a) COIs with no measured surface water data were listed as NA.

3.5.2 Ecological Receptors Exposed to Sediment

Screening Exposures: COIs in impacted groundwater discharging into Coffeen Lake can sorb to sediments *via* chemical partitioning. In the absence of sediment data, sediment concentrations were modeled using maximum detected groundwater concentrations. Therefore, the modeled COI sediment concentrations reflect the potential maximum Site-related sediment concentration from groundwater discharge.

Screening Benchmarks: Sediment screening benchmarks were obtained from US EPA Region IV (2018). The majority of the sediment ESVs are based on threshold effect concentrations from MacDonald *et al.* (2000), which provide consensus values that identify concentrations below which harmful effects on sediment-dwelling organisms are unlikely to be observed. In the absence of an ESV for radium-226+228, a sediment screening value of 90,000 pCi/kg was used, based on the biota concentration guide (BCG) for radium-228 (US DOE, 2019).[6] Chloride and fluoride are not expected to sorb to sediment; therefore, risk to ecological receptors exposed to sediment was not evaluated for these constituents. The benchmarks used in this evaluation are listed in Table 3.9.

Screening Risk Results: The maximum modeled COI sediment concentrations were below their respective sediment screening benchmarks (Table 3.9). The modeled sediment concentrations attributed to potential contributions from Site groundwater for all COIs were less than or equal to 1% of the sediment screening benchmark. Therefore, the modeled sediment concentrations attributed to potential contributions from Site

[6] US DOE (2019) reported the biota concentration guide (BCG) for sediment as 90 pCi/g for Ra-228 and 100 pCi/g for Ra-226; the lower of the two values was used for Ra-226+228, and converted to pCi/kg.

groundwater are not expected to significantly contribute to ecological exposures in Coffeen Lake adjacent to the Site.

Table 3.9 Risk Evaluation for Ecological Receptors Exposed to Sediment

COI	Modeled Sediment Concentration	ESV[a]	COPC	% of Benchmark
Total Metals (mg/kg)				
Cadmium	1.4E-03	0.99	No	0.14%
Cobalt	1.2E-03	50	No	0.0024%
Lead	2.6E-02	35.8	No	0.073%
Mercury	1.8E-03	0.18	No	1%
Radionuclides (pCi/kg)				
Radium-226 + 228	4.8E+00	90,000[b]	No	0.0053%

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; ESV = Ecological Screening Value; pCi/kg = PicoCuries Per Kilogram; US DOE = United States Department of Energy; US EPA = United States Environmental Protection Agency.
(a) ESV from US EPA Region IV (2018).
(b) ESV from US DOE (2019); value converted from 90 pCi/g to 90,000 pCi/kg.

3.5.3 Ecological Receptors Exposed to Bioaccumulative Constituents of Interest

Screening Exposures: COIs with bioaccumulative properties can impact higher-trophic-level wildlife exposed to these COIs *via* direct exposures (surface water and sediment exposure) and secondary exposures through the consumption of dietary items (*e.g.*, plants, invertebrates, small mammals, and fish).

Screening Benchmark: US EPA Region IV (2018) and IEPA SWQC (IEPA, 2019) guidance were used to identify constituents with potential bioaccumulative effects.

Risk Evaluation: With the exception of mercury, the ecological COIs (*i.e.*, cadmium, cobalt, lead, and radium-226+228) were not identified as having potential bioaccumulative effects. Therefore, these COIs are not considered to pose an ecological risk *via* bioaccumulation. IEPA (2019) identifies mercury as the only metal with bioaccumulative properties. US EPA Region IV (2018) also identifies mercury (including methyl mercury) as having potential bioaccumulative effects.[7]

The modeled mercury concentration in surface water (5.1×10^{-9} mg/L) was below the mercury surface water ESV for wildlife (1.3×10^{-6} mg/L), and the modeled mercury concentration in sediment (1.9×10^{-4} mg/kg) was below the sediment ESV for wildlife (0.18 mg/kg) (US EPA Region IV, 2018). Both the modeled surface water and sediment concentrations were below benchmarks protective of receptors accounting for bioaccumulative properties. Therefore, in addition to not posing an ecological risk from direct toxicity, mercury does not pose a risk from bioaccumulation exposures.

[7] US EPA Region IV (2018) identifies selenium as having potential bioaccumulative effects. Although selenium was detected in groundwater, it was not considered an ecological COI.

3.6 Uncertainties and Conservatisms

A number of uncertainties and their potential impact on the risk evaluation are discussed below. Wherever possible, conservative assumptions were used in an effort to minimize uncertainties and overestimate rather than underestimate risks.

Exposure Estimates:

- The risk evaluation included the Illinois Part 845.600 constituents detected in groundwater samples (above GWPS) collected from wells associated with AP1. However, it is possible that not all of the detected constituents are related specifically to AP1.
- The human health and ecological risk characterizations were based on the maximum measured or modeled COI concentrations, rather than on averages. Thus, the variability in exposure concentrations was not considered. Assuming continuous exposure to the maximum concentration overestimates human and ecological exposures, given that receptors are mobile and concentrations change over time. For example, US EPA guidance states that risks should be estimated using average exposure concentrations as represented by the 95% upper confidence limit on the mean (US EPA, 1992). Given that exposure estimates based on the maximum concentrations did not exceed risk benchmarks, Gradient has greater confidence that there is no risk concern.
- Only constituents detected in groundwater were used to identify COIs and model COI concentrations in surface water and sediment. For the constituents that were not detected in AP1 groundwater, the detection limits were below the Illinois Part 845.600 GWPS and thus do not require further evaluation.
- COI concentrations in surface water were modeled using the maximum detected total COI concentrations in groundwater. Modeling surface water concentrations using total metal concentrations may overestimate surface water concentrations because dissolved concentrations, which are lower than total concentrations, represent the mobile fractions of constituents that could likely flow into and mix with surface water.
- The COIs identified in this evaluation also occur naturally in the environment. Contributions to exposure from natural or other non-AP1-related sources were not considered in the evaluation of modeled concentrations; only exposure contributions potentially attributable to Site groundwater mixing with surface water were evaluated. While not quantified, exposures from potential AP1-related groundwater contributions are likely to represent only a small fraction of the overall human and ecological exposure to COIs that also have natural or non-AP1-related sources.
- Screening benchmarks for human health were developed using exposure inputs based on US EPA's recommended values for reasonable maximum exposure (RME) assessments (Stalcup, 2014). RME is defined as "the highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures" (US EPA, 2004). US EPA states the "intent of the RME is to estimate a conservative exposure case (*i.e.*, well above the average case) that is still within the range of possible exposures" (US EPA, 1989). US EPA also notes this high-end exposure "is the highest dose estimated to be experienced by some individuals, commonly stated as approximately equal to the 90th percentile exposure category for individuals" (US EPA, 2015b). Thus, most individuals will have lower exposures than those presented in this risk assessment.

Toxicity Benchmarks:

- Screening-level ecological benchmarks were compiled from IEPA and US EPA guidance and designed to be protective of the majority of Site conditions, leaving the option for Site-specific refinement. In some cases, these benchmarks may not be representative of the Site-specific conditions or receptors found at the Site, or may not accurately reflect concentration-response relationships encountered at the Site. For example, the ecological benchmark for cadmium is hardness-dependent. However, hardness data are not available for Coffeen Lake; therefore, Gradient relied on US EPA's default hardness of 100 mg/L. Use of a higher hardness value would increase the cadmium SWQC because benchmarks become less stringent with higher levels of hardness. Regardless of the hardness, the maximum modeled cadmium concentration is orders of magnitude below the SWQC.
- In addition, for the ecological evaluation, Gradient conservatively assumed all constituents to be 100% bioavailable. Modeled COI concentrations in surface water are considered total COI concentrations. In addition, the measured surface water data used in this report represent total concentrations. US EPA recommends using dissolved metals as a measure of exposure to ecological receptors because it represents the bioavailable fraction of metal in water (US EPA, 1993). Therefore, the modeled surface water COI concentrations may be an overestimation of exposure concentrations to ecological receptors.
- In general, it is important to appreciate that the human health toxicity factors used in this risk evaluation are developed to account for uncertainties, such that safe exposure levels used as benchmarks are often many times lower (even orders of magnitude lower) than the levels that cause effects which have been observed in human or animal studies. For example, toxicity factors incorporate a 10-fold safety factor to protect sensitive subpopulations. This means that a risk exceedance does not necessarily equate to actual harm.

4 Summary and Conclusions

A screening-level risk evaluation was performed for potential Site-related constituents in groundwater at the CPP in Coffeen, Illinois. The CSM developed for the Site indicates that groundwater beneath AP1 flows into Coffeen Lake adjacent to the Site and may potentially impact surface water and sediment.

CEMs were developed for human and ecological receptors. The complete exposure pathways for humans include recreators (boaters) in Coffeen Lake who are exposed to surface water and sediment, and anglers who consume locally caught fish. Based on the local hydrogeology, residential exposure to groundwater used for drinking water or irrigation is not a complete pathway and was not evaluated. The complete exposure pathways for ecological receptors include aquatic life (including aquatic and marsh plants, amphibians, reptiles, and fish) exposed to surface water; benthic invertebrates exposed to sediment; and avian and mammalian wildlife exposed to bioaccumulative COIs in surface water, sediment, and dietary items.

Groundwater data collected from 2015 to 2021 were used to estimate exposures. Surface water data collected from Coffeen Lake in 2021 were also evaluated. For groundwater constituents retained as COIs, surface water and sediment concentrations were modeled using the maximum detected groundwater concentration. Surface water and sediment exposure estimates were screened against benchmarks protective of human health and ecological receptors for this risk evaluation.

US EPA has established acceptable risk metrics. Risks above these US EPA-defined metrics are termed potentially "unacceptable risks." Based on the evaluation presented in this report, no unacceptable risks to human or ecological receptors resulting from CCR exposures associated with AP1 were identified. This means that the risks from the site are likely indistinguishable from normal background risks. Specific risk assessment results include the following:

- For recreators exposed to surface water, all COIs were below the conservative risk-based screening benchmarks. Therefore, none of the COIs evaluated in surface water are expected to pose an unacceptable risk to recreators in Coffeen Lake adjacent to the Site.
- For recreators exposed to sediment *via* incidental ingestion and dermal contact, the modeled sediment concentrations were below health-protective sediment benchmarks. Therefore, the modeled sediment concentrations are not expected to pose an unacceptable risk to recreators exposed to sediment in Coffeen Lake adjacent to the Site.
- For anglers consuming locally caught fish, the modeled concentrations of all COIs in surface water (as well as the measured data) were below conservative benchmarks protective of fish consumption. Therefore, none of the COIs evaluated are expected to pose an unacceptable risk to recreators consuming fish caught in Coffeen Lake.
- Ecological receptors exposed to surface water include aquatic and marsh plants, amphibians, reptiles, and fish. The risk evaluation showed that none of the modeled or measured COIs in surface water exceeded protective screening benchmarks. Ecological receptors exposed to sediment include benthic invertebrates. The modeled sediment COIs did not exceed the conservative screening benchmarks; therefore, none of the COIs evaluated in sediment are expected to pose an unacceptable risk to ecological receptors.

- Ecological receptors were also evaluated for exposure to bioaccumulative COIs. This evaluation considered higher-trophic-level wildlife with direct exposure to surface water and sediment and secondary exposure through the consumption of dietary items (*e.g.*, plants, invertebrates, small mammals, and fish). Mercury was the only ecological COI identified as having potential bioaccumulative effects. However, the modeled concentrations did not exceed benchmarks protective of bioaccumulative effects. Therefore, mercury is not considered to pose an ecological risk *via* bioaccumulation. Overall, this evaluation demonstrated that none of the COIs evaluated are expected to pose an unacceptable risk to ecological receptors.

It should be noted that this evaluation incorporates a number of conservative assumptions that tend to overestimate exposure and risk. The risk evaluation was based on the maximum detected COI concentration for each constituent; however, US EPA guidance states that risks should be based on a representative average concentration such as the 95% upper confidence limit on the mean. Thus, using the maximum concentration tends to overestimate exposure. Although the COIs identified in this evaluation also occur naturally in the environment, the contributions to exposure from natural background sources and nearby industry were not considered; thus, CCR-related exposures were likely overestimated. In addition, exposure estimates assumed 100% metal bioavailability, which likely results in overestimates of exposure and risks. Further, exposure estimates were based on inputs to evaluate the "reasonable maximum exposure"; thus, most individuals will have lower exposures than those estimated in this risk assessment.

Finally, it should be noted that because current conditions do not present a risk to human health or the environment, there will also be no unacceptable risk to human health or the environment for future conditions when AP1 is closed. For all future closure scenarios, potential releases of CCR-related constituents will decline over time and, consequently, potential exposures to CCR-related constituents in the environment will also decline.

References

Austen, DJ; Peterson, JT; Newman, B; Sobaski, ST; Bayley, PB. [Illinois Natural History Survey]. 1993. "Compendium of 143 Illinois Lakes: Bathymetry, Physico-chemical Features, and Habitats. Volume 2 - Lakes in Regions 4 and 5 (Final)." Report to Illinois Dept. of Conservation, Division of Fisheries, Center for Aquatic Ecology. Aquatic Ecology Technical Report 93/9 (2); F-69-R(4-6) 273p., June.

European Chemicals Agency (ECHA). 2020. "REACH dossier for lithium (CAS No. 7439-93-2)." Accessed at https://echa.europa.eu/registration-dossier/-/registered-dossier/14178.

Geosyntec Consultants. 2021. "Draft Surface Water Analytical Results, Coffeen Site." August 3. 2p.

Golder Associates Inc. 2020. "Construction Completion Report, Unnamed Tributary Relocation at the Illinois Power Generating Company Coffeen Site." Report to Illinois Power Generating Co., 161p., November.

Hanson Professional Services Inc. 2020. "Antidegradation Assessment for Discharge of Gypsum Management Facility Waters to Coffeen Lake, Coffeen Power Plant, Illinois Power Generating Company, NPDES Permit No. IL000108." Report to Illinois Power Generating Co., Collinsville, IL. 37p., July 20.

Illinois Dept. of Natural Resources (IDNR). 2014. Coffeen Lake State Fish and Wildlife Area.

Illinois Dept. of Natural Resources (IDNR). 2022. "Coffeen Lake profile." Accessed at https://www.ifishillinois.org/profiles/waterbody.php?waternum=00600.

Illinois Environmental Protection Agency (IEPA). 2013. "Title 35: Environmental Protection, Subtitle F: Public Water Supplies, Chapter I: Pollution Control Board, Part 620: Ground Water Quality." Accessed at https://www.ilga.gov/commission/jcar/admincode/035/035006200D04200R.html.

Illinois Environmental Protection Agency (IEPA). 2019. "Title 35: Environmental Protection, Subtitle C: Water Pollution, Chapter I: Pollution Control Board, Part 302: Water Quality Standards." Accessed at https://www.epa.gov/sites/production/files/2019-11/documents/ilwqs-title35-part302.pdf.

Illinois Environmental Protection Agency (IEPA). 2021. "Standards for the disposal of coal combustion residuals in surface impoundments." Accessed at https://www.ilga.gov/commission/jcar/admincode/035/03500845sections.html.

MacDonald, DD; Ingersoll, CG; Berger, TA. 2000. "Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems." *Arch. Environ. Contam. Toxicol.* 39:20-31. doi: 10.1007/s002440010075.

Oak Ridge National Laboratory (ORNL). 2020. "Risk Assessment Information System (RAIS) Toxicity Values and Physical Parameters Search." Accessed at https://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem.

Ramboll. 2021. "Hydrogeologic Site Characterization Report, Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois (Final)." Report to Illinois Power Generating Co. 700p., October 25.

Stalcup, D. 2014. Memorandum to Superfund National Policy Managers, Regions 1-10 re: Human Health Evaluation Manual, Supplemental Guidance: Update of standard default exposure factors. US EPA, Office of Solid Waste and Emergency Response (OSWER), OSWER Directive 9200.1-120, February 6. Accessed at https://www.epa.gov/sites/production/files/2015-11/documents/oswer_directive_9200.1-120_exposurefactors_corrected2.pdf.

US Dept. of Agriculture (USDA). 2009a. "Aerial imagery of the Coffeen, IL area [Northeast]." National Agricultural Imagery Program. Accessed on March 29, 2022 at https://earthexplorer.usgs.gov/.

US Dept. of Agriculture (USDA). 2009b. "Aerial imagery of the Coffeen, IL area [Southeast]." National Agricultural Imagery Program. Accessed on March 29, 2022 at https://earthexplorer.usgs.gov/.

US Dept. of Energy (US DOE). 2019. "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota." DOE-STD-1153-2019. Accessed at https://www.standards.doe.gov/standards-documents/1100/1153-astd-2019/@@images/file.

US EPA. 1989. "Risk Assessment Guidance for Superfund (RAGS). Volume I: Human Health Evaluation Manual (Part A) (Interim final)." Office of Emergency and Remedial Response, NTIS PB90-155581, EPA-540/1-89-002, December.

US EPA. 1992. "Risk Assessment Guidance for Superfund: Supplemental Guidance to RAGS: Calculating the Concentration Term." Office of Emergency and Remedial Response, OSWER Directive 9285.7-08I, NTIS PB92-963373, May.

US EPA. 1993. Memorandum to US EPA Directors and Regions re: Office of Water policy and technical guidance on interpretation and implementation of aquatic life metals criteria. Office of Water, EPA-822-F93-009, October 1.

US EPA. 1998. "Methodology for assessing health risks associated with multiple pathways of exposure to combustor emissions." National Center for Environmental Assessment (NCEA), EPA 600/R-98/137, December. Accessed at http://www.epa.gov/nceawww1/combust.htm.

US EPA. 2001. "Radionuclide Table: Radionuclide Carcinogenicity – Slope Factors (Federal Guidance Report No. 13 Morbidity Risk Coefficients, in Units of Picocuries)." Health Effects Assessment Summary Tables (HEAST) 72p. Accessed at https://www.epa.gov/radiation/radionuclide-table-radionuclide-carcinogenicity-slope-factors.

US EPA. 2002. "National Recommended Water Quality Criteria [NRWQC]: 2002. Human Health Criteria Calculation Matrix." Office of Water, EPA-822-R-02-012, November.

US EPA. 2004. "Risk Assessment Guidance for Superfund (RAGS). Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) (Final)." Office of Superfund Remediation and Technology Innovation, EPA/540/R/99/005, OSWER 9285.7-02EP; PB99-963312, July. Accessed at http://www.epa.gov/oswer/riskassessment/ragse/pdf/part_e_final_revision_10-03-07.pdf.

US EPA. 2011a. "IRIS Glossary." August 31. Accessed at https://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&glossaryName=IRIS%20Glossary#formTop.

US EPA. 2011b. "Exposure Factors Handbook: 2011 Edition." Office of Research and Development, US EPA, National Center for Environmental Assessment (NCEA) EPA/600/R-090/052F. September. Accessed at https://www.epa.gov/expobox/about-exposure-factors-handbook.

US EPA. 2014. "Human and Ecological Risk Assessment of Coal Combustion Residuals (Final)." Office of Solid Waste and Emergency Response (OSWER), Office of Resource Conservation and Recovery, December. Accessed at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-RCRA-2009-0640-11993.

US EPA. 2015a. "Hazardous and solid waste management system; Disposal of coal combustion residuals from electric utilities (Final rule)." *Fed. Reg.* 80(74):21302-21501, 40 CFR 257, 40 CFR 261, April 17.

US EPA. 2015b. "Conducting a Human Health Risk Assessment." October 14. Accessed at http://www2.epa.gov/risk/conducting-human-health-risk-assessment#tab-4.

US EPA. 2015c. "Human Health Ambient Water Quality Criteria: 2015 Update." Office of Water, EPA 820-F-15-001. June.

US EPA. 2019. "EPI Suite™ - Estimation Program Interface." March 12. Accessed at https://www.epa.gov/tsca-screening-tools/epi-suitetm-estimation-program-interface.

US EPA. 2020. "Preliminary Remediation Goals for Radionuclides (PRG): PRG Calculator." Accessed at https://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search. July 24.

US EPA. 2021a. "Secondary drinking water standards: Guidance for nuisance chemicals." January 7. Accessed at https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals.

US EPA. 2021b. Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1). November. 11p. Accessed at https://semspub.epa.gov/work/HQ/401635.pdf.

US EPA. 2021c. "Regional Screening Levels (RSLs) - User's Guide." 82p. Accessed at https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide. November.

US EPA. 2022. "National Recommended Water Quality Criteria - Aquatic Life Criteria Table." Accessed at https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. January 6.

US EPA Region IV. 2018. "Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update)." Superfund Division, Scientific Support Section. March. Accessed at https://www.epa.gov/sites/production/files/2018-03/documents/era_regional_supplemental_guidance_report-march-2018_update.pdf.

US Geological Survey (USGS). 1998a. "Aerial imagery of the Coffeen, IL area [Northeast]." Accessed on March 29, 2022 at https://earthexplorer.usgs.gov/.

US Geological Survey (USGS). 1998b. "Aerial imagery of the Coffeen, IL area [Southeast]." Accessed on March 29, 2022 at https://earthexplorer.usgs.gov/.

US Geological Survey (USGS). 2005a. "Aerial imagery of the Coffeen, IL area [Northeast]." Accessed on March 29, 2022 at https://earthexplorer.usgs.gov/.

US Geological Survey (USGS). 2005b. "Aerial imagery of the Coffeen, IL area [Southeast]." Accessed on March 29, 2022 at https://earthexplorer.usgs.gov/.

Appendix A

Surface Water and Sediment Modeling

Gradient modeled concentrations in Coffeen Lake surface water and sediment based on available groundwater data. First, Gradient estimated the flow rate of constituents of interest (COIs) that may flow into Coffeen Lake *via* groundwater. Then, Gradient adapted United States Environmental Protection Agency's (US EPA's) indirect exposure assessment methodology (US EPA, 1998) in order to model surface water and sediment water concentrations in Coffeen Lake.

Model Overview

Groundwater flow into Coffeen Lake is represented by a one-dimensional steady-state model. In this model, the groundwater plume migrates horizontally in the Uppermost Aquifer (UA) before flowing into the eastern branch of Coffeen Lake. The groundwater flow entering the lake is the flow going through a cross-sectional area with a length equal to the length of the lake adjacent to Ash Pond 1 (AP1) with potential CCR-related impacts and a height equal to the average saturated thickness of the UA. It was assumed that groundwater flowing through the UA may flow into the eastern branch of Coffeen Lake.

Groundwater flow into Coffeen Lake mixes with the surface water in the lake. The COIs entering the lake *via* groundwater can dissolve into the water column, sorb to suspended sediments, or sorb to benthic sediments. Using US EPA's indirect exposure assessment methodology (US EPA, 1998), the model evaluates the surface water and sediment concentrations at a location downstream of the groundwater discharge, assuming a well-mixed water column.

Groundwater Discharge Rate

The groundwater discharge rate was evaluated using conservative assumptions. Gradient conservatively assumed that the groundwater concentrations were uniformly equal to the maximum detected concentration for each individual COI. Gradient ignored adsorption by subsurface soil and assumed that groundwater flowing through the shallow aquifers was discharged into the lake.

For each groundwater unit, the groundwater flow rate into the lake was derived using Darcy's Law:

$$Q = K \times i \times A$$

where:

Q	=	Groundwater flow rate (m^3/s)
K	=	Hydraulic conductivity (m/s)
i	=	Hydraulic gradient (m/m)
A	=	Cross-sectional area (m^2)

For each COI, the mass discharge rate into the lake was then calculated by:

$$m_c = C_c \times Q \times CF$$

where:

m_c	=	Mass discharge rate of the COI (mg/year)
C_c	=	Maximum groundwater concentration of the COI (mg/L)
Q	=	Groundwater flow rate (m^3/s)
CF	=	Conversion factors: 1,000 L/m^3; 31,557,600 s/year

The values of the aquifer parameters used for these calculations are provided in Table A.1. The calculated mass discharge rates were then used as inputs for the surface water and sediment partitioning model.

The cross-sectional area for the UA was 613 m^2. The length of the lake through which groundwater flows was estimated to be approximately 670 m. The height of the UA was approximately 0.91 m (Ramboll, 2021).

The hydraulic gradient was 0.008 m/m, based on the average horizontal hydraulic gradient determined for the UA (Ramboll, 2021).

The hydraulic conductivity was 0.002 cm/s, based on the geometric mean horizontal hydraulic conductivity measured for the UA (Ramboll, 2021).

Surface Water and Sediment Concentration

Groundwater flowing into the lake will be diluted in the surface water flow. Constituents transported by groundwater into the surface water migrate into the water column and the bed sediments. The surface water model Gradient used to estimate the surface water and sediment concentrations is a steady-state model described in US EPA's indirect exposure assessment methodology (US EPA, 1998), and also used in US EPA's "Human and Ecological Risk Assessment of Coal Combustion Residuals" (US EPA, 2014). This model describes the partitioning of constituents between surface water, suspended sediments, and benthic sediments based on equilibrium partition coefficients. It estimates the concentrations of constituents in surface water, suspended sediments, and benthic sediments at steady-state equilibrium at a theoretical location downstream of the discharge point after complete mixing of the water column. In the analysis, Gradient used the partitioning coefficients given in Table J-1 of the US EPA CCR Risk Assessment for all COIs (US EPA, 2014). These coefficients are presented in Table A.2.

To be conservative, Gradient assumed that the constituents were not affected by dissipation or degradation once they entered the water body. The total water body concentration of the COI was calculated as (US EPA, 1998):

$$C_{wtot} = \frac{m_c}{V_f \times f_{water}}$$

where:

C_{wtot}	=	Total water body concentration of the constituent (mg/L)
m_c	=	Mass discharge rate of the COI (mg/year)
V_f	=	Water body annual flow (L/year)
f_{water}	=	Fraction of COI in the water column (unitless)

There are no flow records available for the eastern branch of Coffeen Lake. The flow rate was assumed to be the same as that estimated for the unnamed tributary (*i.e.*, 90 cfs) (Golder Associates Inc., 2020), which flows from north to south into the eastern branch of the lake. The surface water parameters are presented in Table A.3.

The fraction of COI in the water column was calculated for each COI using the sediment/water and suspended solids/water partition coefficients (US EPA, 2014, Table J-1). The fraction of COI in the water column is defined as (US EPA, 2014):

$$f_{water} = \frac{(1 + [K_{dsw} \times TSS \times 0.000001]) \times \frac{d_w}{d_z}}{\left([1 + (K_{dsw} \times TSS \times 0.000001)] \times \frac{d_w}{d_z}\right) + ([bsp + K_{dbs} \times bsc] \times \frac{d_b}{d_z})}$$

where:

f_{water}	=	Fraction of COI in the water column (unitless)
K_{dsw}	=	Suspended sediment-water partition coefficient (mL/g)
K_{dbs}	=	Sediment-water partition coefficient (mL/g)
TSS	=	Total suspended solids in the surface water body (mg/L), set equal to the average Coffeen Lake concentration of 3.2 mg/L (Hanson Professional Services, Inc., 2020 222-4807)
0.000001	=	Units conversion factor
d_w	=	Depth of the water column (m). The depth of the water column was estimated as 5.7 m (Austen *et al*., 1993).
d_b	=	Depth of the upper benthic layer (m), set equal to 0.03 m (US EPA, 2014)
$d_z = d_w + d_b$	=	Depth of the water body (m) = 5.73 m
bsp	=	Bed sediment porosity (unitless), set equal to 0.6 (US EPA, 2014)
bsc	=	Bed sediment particle concentration (g/cm^3), set equal to 1.0 g/cm^3 (US EPA, 2014)

The fraction of COIs dissolved in the water column (f_d) is calculated as (US EPA 2014):

$$f_d = \frac{1}{1 + K_{dsw} \times TSS \times 0.000001}$$

The values of the fraction of COIs in the water column and other calculated parameters are presented in Table A.4.

The total water column concentration (C_{wcTot}) of the COIs, comprising both the dissolved and suspended sediment phases, is then calculated as (US EPA, 2014):

$$C_{wcTot} = C_{wtot} \times f_{water} \times \frac{d_z}{d_w}$$

Finally, the dissolved water column concentration (C_{dw}) for the COIs is calculated as (US EPA, 2014):

$$C_{dw} = f_d \times C_{wcTot}$$

The dissolved water column concentration was then used to calculate the concentration of COIs sorbed to suspended solids in the water column (US EPA, 1998):

$$C_{sw} = C_{dw} \times K_{dsw}$$

where:

C_{sw}	=	Concentration sorbed to suspended solids (mg/kg)

C_{dw} = Concentration dissolved in the water column (mg/L)
K_{dsw} = Suspended solids/water partition coefficient (mL/g)

In the same way, using the total water body concentration and the fraction of COIs in the benthic sediments, the model derives the total concentration in benthic sediments (US EPA, 2014, Table J-1-12):

$$C_{bstot} = f_{benth} \times C_{wtot} \times \frac{d_z}{d_b}$$

where:

C_{bstot} = Total concentration in bed sediment (mg/L or g/m^3)
C_{wtot} = Total water body concentration of the constituent (mg/L)
f_{benth} = Fraction of constituent in benthic sediments (unitless)
d_b = Depth of the upper benthic layer (m)
$d_z = d_w + d_b$ = Depth of the water body (m)

This value can be used to calculate dry weight sediment concentration as follows:

$$C_{sed-dw} = \frac{C_{bstot}}{bsc}$$

where:

C_{sed-dw} = Dry weight sediment concentration (mg/kg)
C_{bstot} = Total sediment concentration (mg/L)
bsc = Bed sediment bulk density (default value of 1 g/cm^3 from US EPA, 2014)

The total sediment concentration is composed of the concentration dissolved in the bed sediment pore water (equal to the concentration dissolved in the water column) and the concentration sorbed to benthic sediments (US EPA, 1998).

The concentration sorbed to benthic sediments was calculated from (US EPA, 1998):

$$C_{sb} = C_{dbs} \times K_{dbs}$$

where:

C_{sb} = Concentration sorbed to bottom sediments (mg/kg)
C_{dbs} = Concentration dissolved in the sediment pore water (mg/L)
K_{dbs} = Sediments/water partition coefficient (mL/kg)

For each COI, the modeled total water column concentration, the modeled dry weight sediment concentration, and the modeled concentration sorbed to sediment are presented in Table A.5.

Table A.1 Parameters Used to Estimate Groundwater Discharge to Surface Water

Groundwater Unit	Parameter	Name	Value	Unit
Uppermost Aquifer	A	Cross-Sectional Area	613	m^2
Uppermost Aquifer	i	Hydraulic Gradient	0.008	m/m
Uppermost Aquifer	K	Hydraulic Conductivity	0.002	cm/s

Note:
Source: Hydraulic gradient and hydraulic conductivity values from Ramboll (2021).

Table A.2 Partition Coefficients

Constituent	Sediment-Water, Mean, K_{dbs}		Suspended Sediment-Water, Mean, K_{dsw}	
	Value ($\log_{10}$) (mL/g)	Value (mL/g)	Value ($\log_{10}$) (mL/g)	Value (mL/g)
Metals				
Arsenic	2.4	2.51E+02	3.9	7.94E+03
Boron	0.8	6.31E+00	3.9	7.94E+03
Cadmium	3.3	2.00E+03	4.9	7.94E+04
Chromium	4.9	7.94E+04	5.1	1.26E+05
Cobalt	3.1	1.26E+03	4.8	6.31E+04
Lead	4.6	3.98E+04	5.7	5.01E+05
Lithium	-	-	-	-
Mercury	4.9	7.94E+04	5.3	2.00E+05
Radionuclides				
Radium-226+228	-	7.40E+03	-	7.40E+03
Other				
Sulfate	-	-	-	-

Notes:
Source: US EPA (2014).
Lithium and sulfate do not readily sorb to soils and sediments. Consequently, sediment concentrations were not modeled for these constituents (K_d was assumed to be 0).

Table A.3 Surface Water Parameters

Parameter	Name	Value	Unit
TSS	Total Suspended Solids	6	mg/L
V_{fx}	Surface Water Flow Rate	8.04×10^{10}	L/yr
d_b	Depth of Upper Benthic Layer (default)	0.03	m
d_w	Depth of Water Column	5.70	m
d_z	Depth of Water Body	5.73	m
bsc	Bed Sediment Bulk Density (default)	1	g/cm^3
bsp	Bed Sediment Porosity (default)	0.6	-
M_{TSS}	TSS Mass Per Unit Area[a]	0.0342	kg/m^2
M_S	Sediment Mass Per Unit Area[b]	30	kg/m^2

Notes:
Source of default values: US EPA (2014).
(a) Determined by multiplying total suspended solids, TSS by the depth of water column, d_w.
(b) Determined by multiplying depth of upper benthic layer, d_b, with sediment bed particle concentration of 1 g/cc.

Table A.4 Calculated Parameters

COI	Fraction of Constituent in the Water Column f_{water}	Fraction of Constituent in the Benthic Sediments $f_{benthic}$	Fraction of Constituent Dissolved in the Water Column $f_{dissolved}$
Arsenic	0.442	0.558	0.955
Boron	0.9665	0.0335	0.9545
Cadmium	0.1232	0.8768	0.6772
Chromium	0.0042	0.9958	0.5697
Cobalt	0.172	0.828	0.725
Lead	0.019	0.981	0.250
Lithium	0.997	0.003	
Mercury	0.005	0.995	0.455
Radionuclides			
Radium-226+228	0.026	0.974	0.957

Note:
COI = Constituent of Interest.

Table A.5 Surface Water and Sediment Modeling Results

COI	Groundwater Concentration (mg/L or pCi/L)	Mass Discharge Rate (mg/year or pCi/year)	Total Water Column Concentration (mg/L or pCi/L)	Concentration Sorbed to Bottom Sediments (mg/kg or pCi/kg)
Total Metals				
Arsenic	4.1E-02	1.3E+05	1.6E-06	3.8E-04
Boron	7.5E+00	2.3E+07	2.9E-04	1.8E-03
Cadmium	2.7E-02	8.4E+04	1.0E-06	1.4E-03
Chromium	1.1E-01	3.4E+05	4.3E-06	1.9E-01
Cobalt	3.4E-02	1.1E+05	1.3E-06	1.2E-03
Lead	6.8E-02	2.1E+05	2.6E-06	2.6E-02
Lithium	1.0E-01	3.1E+05	3.9E-06	(a)
Mercury	1.3E-03	4.0E+03	5.0E-08	1.8E-03
Radionuclides				
Radium-226+228	1.8E+01	5.4E+07	6.8E-04	4.8E+00
Other				
Sulfate	2.4E+03	7.4E+09	9.3E-02	(a)

Notes:
pCi/kg = PicoCuries Per Kilogram; pCi/L = PicoCuries Per Liter.
(a) Lithium, chloride, and sulfate do not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

Appendix A References

Austen, DJ; Peterson, JT; Newman, B; Sobaski, ST; Bayley, PB. [Illinois Natural History Survey]. 1993. "Compendium of 143 Illinois Lakes: Bathymetry, Physico-chemical Features, and Habitats. Volume 2 - Lakes in Regions 4 and 5 (Final)." Report to Illinois Dept. of Conservation, Division of Fisheries, Center for Aquatic Ecology. Aquatic Ecology Technical Report 93/9 (2); F-69-R(4-6) 273p., June.

Golder Associates Inc. 2020. "Construction Completion Report, Unnamed Tributary Relocation at the Illinois Power Generating Company Coffeen Site." Report to Illinois Power Generating Co., 161p., November.

Hanson Professional Services Inc. 2020. "Antidegradation Assessment for Discharge of Gypsum Management Facility Waters to Coffeen Lake, Coffeen Power Plant, Illinois Power Generating Company, NPDES Permit No. IL000108." Report to Illinois Power Generating Co., Collinsville, IL. 37p., July 20.

Ramboll. 2021. "Hydrogeologic Site Characterization Report, Ash Pond No. 1, Coffeen Power Plant, Coffeen, Illinois (Final)." Report to Illinois Power Generating Co. 700p., October 25.

US EPA. 1998. "Methodology for assessing health risks associated with multiple pathways of exposure to combustor emissions." National Center for Environmental Assessment (NCEA), EPA 600/R-98/137, December. Accessed at http://www.epa.gov/nceawww1/combust.htm.

US EPA. 2014. "Human and Ecological Risk Assessment of Coal Combustion Residuals (Final)." Office of Solid Waste and Emergency Response (OSWER), Office of Resource Conservation and Recovery, December. Accessed at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-RCRA-2009-0640-11993.

Appendix B

Screening Benchmarks

Table B.1 Calculated Water Quality Standards Protective of Incidental Ingestion and Fish Consumption

Human Health COI	BCF[a] (L/kg-tissue)	Basis	MCL (mg/L)	RfD (mg/kg-day)	ADI[b] (mg/day)	Human Threshold Criteria Water & Fish (mg/L)	Human Threshold Criteria Water Only (mg/L)	Human Threshold Criteria Fish Only (mg/L)
Arsenic	44	NRWQC (2002)	0.010	0.00030	0.020	0.022	2.0	0.023
Boron	1	(c)	NC	0.20	14	467	1,400	700
Cadmium	270	US EPA, 2014	0.0050	0.00050	0.010	0.0018	1.0	0.0019
Chromium	16	NRWQC (2002)	0.10	1.5	0.20	0.61	20	0.63
Cobalt	300	ORNL (2020)	NC	0.00030	0.021	0.0035	2.1	0.0035
Lead	46	US EPA (2014)	0.015	NC	0.030	0.015	0.015	0.015
Lithium	1	(c)	NC	0.002	0.14	4.7	14	7.0
Human Health COI	**BAF (L/kg-tissue) SW-Fish**	**BAF (L/kg-tissue) Basis**	**MCL (pCi/L)**	**ADI (pCi/day)**	**Food Ingestion Slope Factor[d] (risk/pCi)**	**Human Threshold Criteria Water & Fish (pCi/L)**	**Human Threshold Criteria Water Only (pCi/L)**	**Human Threshold Criteria Fish Only (pCi/L)**
Radium-226+228	4.0	ORNL (2020)	5	10	1.43E-09	1,000	1,000	87,413

Notes:

ADI = Acceptable Daily Intake; BAF = Bioaccumulation Factor; BCF = Bioconcentration Factor; MCL = Maximum Contaminant Level; NC = No Criterion Available; NRWQC = National Recommended Water Quality Criteria; ORNL = Oak Ridge National Laboratory; pCi = picocurie; Ra = Radium; RAIS = Risk Assessment Information System; RfD = Reference Dose; US EPA = United States Environmental Protection Agency.

(a) BCFs from the following hierarchy of sources:

NRWQC (US EPA, 2002). National Recommended Water Quality Criteria: 2002. Human Health Criteria Calculation Matrix.

US EPA (2014). Human and Ecological Risk Assessment of Coal Combustion Residuals.

ORNL RAIS (ORNL, 2020). Risk Assessment Information System (RAIS) Toxicity Values and Chemical Parameters.

(b) ADI based on the MCL is calculated as the MCL (mg/L) multiplied by a water ingestion rate of 2 L/day. In the absence of an MCL, the ADI was calculated as the RfD (mg/kg-day) multiplied by the body weight (70 kg).

(c) BCF of 1 was used as a conservative assumption, due to lack of published BCF.

(d) Food ingestion slope factors for Ra-226+D and Ra-228+D were compared and the higher factor (Ra-228+D) was selected. The "+D" indicates that the risks from "associated short-lived radioactive decay products are also included" (US EPA, 2001).

Equations from IEPA (2019):

Consumption of Water and Fish

$$HTC = \frac{ADI}{W + (F \times BCF)}$$

Incidental Consumption of Water Only

$$HTC = \frac{ADI}{W}$$

Consumption of Fish Only

$$HTC = \frac{ADI}{F \times BCF}$$

Where:

Human Threshold Criteria (HTC)	Chemical-specific	mg/L
Acceptable Daily Intake (ADI)	Chemical-specific	mg/day
Fish Consumption Rate (F)	0.02	kg/day
Bioconcentration Factor (BCF)/ Bioaccumulation Factor (BAF)	Chemical-specific	L/kg-tissue
Water Consumption Rate (W)	0.01	L/day
Body Weight	70	kg
Target Cancer Risk (TCR)	1.0E-05	

Radium-226+228

$$HTC = \frac{TCR}{(SF \times BAF \times F)}$$

Table B.2 Recreator Exposure to Sediment

COI	Relative Bioavailability (unitless)	Dermal Absorption Fraction (unitless)	Cancer: TRV: CSF $(mg/kg\text{-}day)^{-1}$	Cancer: TRV: Dermal CSF $(mg/kg\text{-}day)^{-1}$	Cancer: Child + Adult: Incidental Ingestion SL (mg/kg)	Cancer: Child + Adult: Dermal Contact SL (mg/kg)	Cancer SL (mg/kg)	Non-Cancer: TRV: RfD (mg/kg-day)	Non-Cancer: TRV: Dermal RfD (mg/kg-day)	Non-Cancer: Child: Incidental Ingestion SL (mg/kg)	Non-Cancer: Child: Dermal Contact SL (mg/kg)	Non-Cancer: Adult: Incidental Ingestion SL (mg/kg)	Non-Cancer: Adult: Dermal Contact SL (mg/kg)	Non-Cancer SL (mg/kg): Child	Non-Cancer SL (mg/kg): Adult	Recreator RSL Sediment (mg/kg)	Basis[a]
Total Metals																	
Arsenic	1	3.0E-02	1.5E+00	1.5E+00	8.1E+01	4.1E+02	6.8E+01	3.0E-04	3.0E-04	4.1E+02	4.4E+03	4.4E+03	8.0E+03	3.8E+02	2.8E+03	6.8E+01	c
Boron	1	NA	NC	NC	NC	NC	NC	2.0E-01	2.0E-01	2.7E+05	NA	2.9E+06	NA	2.7E+05	2.9E+06	2.7E+05	nc
Cadmium	1	1.0E-03	NC	NC	NC	NC	NC	1.0E-04	2.5E-06	1.4E+02	1.1E+03	1.5E+03	2.0E+03	1.2E+02	8.5E+02	1.22E+02	nc
Chromium	1	NA	NC	NC	NC	NC	NC	1.5E+00	2.0E-02	2.1E+06	NA	2.2E+07	NA	2.1E+06	2.2E+07	2.1E+06	nc
Cobalt	1	NA	NC	NC	NC	NC	NC	3.0E-04	3.0E-04	4.1E+02	NA	4.4E+03	NA	4.1E+02	4.4E+03	4.1E+02	nc
Lead	1	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	4.0E+02	L
Lithium	1	NA	NC	NC	NC	NC	NC	2.0E-03	2.0E-03	2.7E+03	NA	2.9E+04	NA	2.7E+03	2.9E+04	2.7E+03	nc
Radionuclides																**Total Soil PRG (pCi/kg)**	
Radium-226+228																7.9E+03	

Notes:

ABS = Dermal Absorption Fraction; COI = Constituent of Interest; CSF = Cancer Slope Factor; NC = No Criterion Available; pCi = PicoCurie; PRG = Preliminary Remediation Goal; RfD = Reference Dose; RSL = Regional Screening Level; SL = Screening Level; TRV = Toxicity Reference Value; US EPA = United States Environmental Protection Agency.

(a) Screening benchmark defined as the lower of the Screening Levels for cancer and non-cancer. The basis of the benchmark presented as c = based on cancer endpoint, nc = based on non-cancer endpoint, or L = based on blood lead levels.

Equations for Screening Benchmark and Screening Levels:

$$\text{Screening Benchmark} = \frac{1}{\frac{1}{SL_{ing}} + \frac{1}{SL_{derm}}}$$

$$\text{Non-cancer } SL_{ing} = \frac{THQ * RfD}{Intake} \qquad \text{Cancer } SL_{ing} = \frac{TR}{Intake * CSF}$$

$$\text{Non-cancer } SL_{derm} = \frac{THQ * RfD}{Intake * ABS} \qquad \text{Cancer } SL_{derm} = \frac{TR}{Intake * ABS * CSF}$$

Where:

Target Risk (TR)	1E-05	
Target Hazard Quotient (THQ)	1	
Reference Dose (RfD)	Chemical-specific	mg/kg-day
Dermal Absorption Fraction (ABS)	Chemical-specific	
Cancer Slope Factor (CSF)	Chemical-specific	mg/kg
Incidental Ingestions Screening Level (SL_{ing})	Chemical-specific	mg/kg
Dermal Contact Screening Level (SL_{derm})	Chemical-specific	mg/kg

Sediment – Ingestion (Chemical)

Intake Factor (IF) = $\frac{IR \times EF \times ED \times CF}{BW \times AT}$ =		Non-Cancer: Child	Non-Cancer: Adult	Cancer: Child	Cancer: Adult	Basis
		7.3E-07	6.8E-08	6.3E-08	2.0E-08	
IR	Ingestion Rate (mg/day)	67	33	67	33	One-third of US EPA residential soil ingestion rate (Professional Judgment)
EF	Sediment Exposure Frequency (days/year)	60	60	60	60	2 days/week between April and October when air temperature > 70°F (Professional Judgment)
ED	Exposure Duration (years)	6	20	6	20	Default value for Resident (US EPA, 2021b)
CF	Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	
BW	Body Weight (kg)	15	80	15	80	Default value for Resident (US EPA, 2021b)
AT	Averaging Time (days)	2,190	7,300	25,550	25,550	Default value for Resident (US EPA, 2021b)

Sediment – Dermal Contact (Chemical)

Intake Factor (IF) = $\frac{SA \times AF \times EF \times ED \times CF}{BW \times AT}$ =		Non-Cancer: Child	Non-Cancer: Adult	Cancer: Child	Cancer: Adult	Basis
		2.2E-06	1.2E-06	1.9E-07	3.6E-07	
SA	Surface Area Exposed to Sediment (cm^2/day)	1,026	3,026	1,026	3,026	Age weighted SA for lower legs and feet (US EPA, 2011b)
AF	Sediment Skin Adherence Factor (mg/cm^2)	0.2	0.2	0.2	0.2	Age weighted AF for children exposed to sediment (US EPA, 2011b)
EF	Sediment Exposure Frequency (days/year)	60	60	60	60	2 days/week between April and October when air temperature > 70°F (Professional Judgment)
ED	Exposure Duration (years)	6	20	6	20	Default value for Resident (US EPA, 2021b)
CF	Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	
BW	Body Weight (kg)	15	80	15	80	Default value for Resident (US EPA, 2021b)
AT	Averaging Time (days)	2,190	7,300	25,550	25,550	Default value for Resident (US EPA, 2021b)

Table B.3.1 Recreator PRGs for Soil, input values

Variable	Recreator Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	16.8653
B (PEF Dispersion Constant)	18.7762	18.7848
City (Climate Zone)	Default	Chicago, IL (7)
C (PEF Dispersion Constant)	216.108	215.0624
Cover layer thickness for GSF (gamma shielding factor) cm	0 cm	0 cm
$CF_{rec\text{-}fowl}$ (fowl contaminated fraction) unitless	1	1
$CF_{rec\text{-}game}$ (game contaminated fraction) unitless	1	1
ED_{rec} (exposure duration - recreator) yr		26
EF_{rec} (exposure frequency - recreator) day/yr		60
$f_{p\text{-}fowl}$ (fowl on-site fraction) unitless	1	1
$f_{p\text{-}game}$ (land game on-site fraction) unitless	1	1
$f_{s\text{-}fowl}$ (fraction of year fowl is on site) unitless	1	1
$f_{s\text{-}game}$ (fraction of year land game is on site) unitless	1	1
$MLF_{pasture}$ (pasture plant mass loading factor) unitless	0.25	0.25
t_{rec} (time - recreator) yr		26
TR (target risk) unitless	0.000001	0.000001
F(x) (function dependent on U_m/U_t) unitless	0.194	0.182
PEF (particulate emission factor) m^3/kg	1,359,344,438	1,560,521,177
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	98.431
A_s (acres)	0.5	0.5
Site area for ACF (area correction factor) m^2	1,000,000 m^2	1,000 m^2
ED_{rec} (exposure duration - recreator) yr		26
$ED_{rec\text{-}a}$ (exposure duration - recreator adult) yr		20
$ED_{resc\text{-}c}$ (exposure duration - recreator child) yr		6
EF_{rec} (exposure frequency - recreator) day/yr		60
$EF_{rec\text{-}a}$ (exposure frequency - recreator adult) day/yr		60
$EF_{rec\text{-}c}$ (exposure frequency - recreator child) day/yr		60
ET_{rec} (exposure time - recreator) hr/day		8
$ET_{rec\text{-}a}$ (exposure time - recreator) hr/day		8
$ET_{rec\text{-}c}$ (exposure time - recreator) hr/day		8
$IFA_{rec\text{-}adj}$ (age-adjusted inhalation rate - recreator) m^3		9,200
$IFS_{rec\text{-}adj}$ (age-adjusted soil intake rate - recreator) mg		63,720
$IRA_{rec\text{-}a}$ (inhalation rate - recreator adult) m^3/day	20	20
$IRA_{rec\text{-}c}$ (inhalation rate - recreator child) m^3/day	10	10
$IRS_{rec\text{-}a}$ (soil intake rate - recreator adult) mg/day	100	33
$IRS_{rec\text{-}c}$ (soil intake rate - recreator child) mg/day	200	67
t_{rec} (time - recreator) yr		26
TR (target risk) unitless	0.000001	0.000001
U_m (mean annual wind speed) m/s	4.69	4.65
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

Notes:

IL = Illinois; PRG = Preliminary Remediation Goal; yr = year.

Table B.3.2 Recreator PRGs for Soil, Ra-226

Isotope	ICRP Lung Absorption Type	Soil Ingestion Slope Factor (risk/pCi)	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)	1,000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Particulate Emission Factor (m^3/kg)	Dry Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-dry soil)	Beef Transfer Factor (pCi/kg per pCi/d)	Poultry Transfer Factor (pCi/kg per pCi/d)	Ingestion PRG TR=1.0E-06 (pCi/g)	Inhalation PRG TR=1.0E-06 (pCi/g)	External Exposure PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (mg/kg)	Total PRG TR=1.0E-06 (pCi/kg)
Ra-226	S	6.77E-10	2.82E-08	2.50E-08	5.14E-10	4.33E-04	1.60E+03	6.85E-01	1.00E+00	1.56E+09	1.95E-02	1.70E-03	-	2.32E+01	6.02E+03	4.10E+01	1.48E+01	1.50E-05	1.48E+04

Notes:

d = Day; ICRP = International Commission on Radiological Protection; Ra = Radium; S = Slow; pCi = Picocurie; PRG = Preliminary Remediation Goal; TR = Target Risk; yr = Year.

Table B.3.3 Recreator PRGs for Soil, Ra-228

Isotope	ICRP Lung Absorption Type	Soil Ingestion Slope Factor (risk/pCi)	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)	1,000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Particulate Emission Factor (m^3/kg)	Dry Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-dry soil)	Beef Transfer Factor (pCi/kg per pCi/d)	Poultry Transfer Factor (pCi/kg per pCi/d)	Ingestion PRG TR=1.0E-06 (pCi/g)	Inhalation PRG TR=1.0E-06 (pCi/g)	External Exposure PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (mg/kg)	Total PRG TR=1.0E-06 (pCi/kg)
Ra-228	S	1.98E-09	4.37E-08	3.43E-11	1.42E-09	1.21E-01	5.75E+00	1.00E+00	1.00E+00	1.56E+09	1.95E-02	1.70E-03	-	7.93E+00	3.89E+03	2.04E+04	7.91E+00	2.90E-08	7.91E+03

Notes:

d = Day; ICRP = International Commission on Radiological Protection; Ra= Radium; S = Slow; pCi = Picocurie; PRG = Preliminary Remediation Goal; TR = Target Risk; yr = Year.

Appendix B

Supporting Information for the Closure Alternatives Analysis – Ash Pond No. 1 at the Coffeen Power Plant

TECHNICAL MEMORANDUM

DATE July 28, 2022 **Reference No.** 21465046

TO Victor Modeer
Illinois Power Generating Company, LLC

CC David Mitchell (Illinois Power Generating Company, LLC)

FROM Michael Dreyer **EMAIL michael_dreyer@golder.com**

SUPPORTING INFORMATION FOR CLOSURE ALTERNATIVES ANALYSIS – ASH POND NO. 1 AT COFFEEN POWER STATION

Golder Associates USA Inc. (Golder), a Member of WSP, has prepared this technical memorandum for Illinois Power Generating Company, LLC (IPGC) to support the Closure Alternatives Analysis for Ash Pond No. 1 (AP1) at Coffeen Power Station. The Closure Alternatives Analysis is being completed in accordance with Illinois Administrative Code Title 35, Part 845, Standards for the Disposal of Coal Combustion Residuals (CCR) in Surface Impoundments (Part 845), by Gradient. With this technical memorandum, Golder summarizes the design basis and references used in developing the closure concepts evaluated by the Closure Alternatives Analysis.

Golder reviewed several documents related to the design, construction, and operation of AP1. Notable documents included the History of Construction (AECOM 2016a), the AP1 CCR Certification Report (AECOM 2016b), and the 2021 Periodic Certification Report for Ash Pond No. 1 (Geosyntec 2021).

1.0 INTRODUCTION AND BACKGROUND

1.1 Operational History

AP1 was constructed in 1964 and operated until the Coffeen Power Station was retired in 2019. AP1 formerly served as the primary wet impoundment basin for bottom ash produced at Coffeen Power Station and has a surface area of approximately 26.2 acres. Base grade elevations range from approximately El. 594 feet (North American Vertical Datum of 1988) to El. 620 feet. AP1 was used as a flow-through structure, where outflow was ultimately discharged to Coffeen Lake, until approximately 1979 to 1981, when AP1 was modified to facilitate recycling of water on site. The modifications included abandoning the penetrating discharge pipe in the northeast corner of the impoundment, adding a recycle intake structure in the northwest corner, removing some of the accumulated ash, flattening the interior embankment slopes using boiler slag, and regrading the remainder of the bottom ash to form a new impoundment flow.

After the facility modifications, when Coffeen Power Station was operational, outflow from AP1 flowed into the recycle intake structure (outlet pipe) and was transferred back to Coffeen Power Station for use as process water. An approximately 1,300-foot long interior dike creates an internal channel leading to the recycle intake structure. AP1 was operated as a closed-loop hydraulic system as outflow was transmitted back to Coffeen Power Station during normal operational conditions. Bottom ash was mechanically excavated from the southwest corner of AP1 for offsite beneficial use.

Sluiced bottom ash from Coffeen Power Station entered AP1 through three steel sluice pipes, which discharged along the western embankment, on the south side of the interior dike. Additional clear water inflow from Coffeen Power Station entered AP1 through two pipes, which discharged at a concrete structure approximately 120 feet north of the sluice pipes, and a 12-in. diameter ductile iron pipe located at the northwest corner of the embankment. Outflow water was transmitted back to Coffeen Power Station via a concrete riser recycle intake structure and 48-in. diameter steel recycle intake pipe located at the northwest corner of AP1, which functioned as the primary outflow pipe for AP1. The pool level was controlled by a steel spillway gate, which allowed for pool levels ranging from El. 624.5 ft to 631.0 feet. However, a berm was constructed with bottom ash around the inlet to the spillway after plant closure in 2019 to provide freeze protection for the gate while still allowing overflow during higher pool levels. A secondary 24-inch diameter pipe, which starts as a corrugated metal pipe (CMP) and transitions to steel, is connected to the 48-inch diameter steel recycle intake pipe within the embankment and was used to discharge excess flow into the process water flume during upset conditions and act as an overflow pipe (See Sheet 5, Drawing No. S-45 from AECOM 2016a).

The embankment portion of AP1 is comprised of a ring dike with a total length of approximately 4,350 ft and has a maximum height above exterior grade of 30 feet. The embankment was constructed as a homogenous earthen structure with well-compacted clayey fill. An approximately 570-foot long Hoesch 2500k steel sheet pile wall is located at the toe of the northeast corner of AP1, to separate the embankment from the plant process water flume. The process water flume was used to transmit plant cooling water back to Coffeen Lake over a series of weirs. The water level in the process water flume was surveyed to be approximately El. 600 feet in 2020, after plant closure. The sheet pile wall was installed around 2000 and driven approximately 13 feet into the foundation soils and has a maximum exposed height of 13.8 feet, for a total pile length of approximately 27 ft. Downstream dike slopes, outside of the sheet pile wall area, range from approximately 1.3H:1V (horizontal to vertical) along the southern embankment to 3H:1V and generally are covered in vegetation. Interior embankment slopes were originally constructed at 1.5H:1V out of clayey fill. Additional boiler slag material was added to the interior slopes in 1981 to flatten them to approximately 3H:1V. The embankment crest width varies from approximately 14 to 22 feet. An engineered liner system is not present beneath AP1.

The normal maximum operating water level of AP1 was El. 631.0 ft when the plant was operational, as controlled by the recycle intake structure and emergency outflow pipes. The maximum normal operating water level may be different now due to the bottom ash berm placed around the recycle intake structure. The minimum crest elevation is 635.0 ft.

1.2 Existing AP1 Liner System Information

Based on the evaluation of design drawings and available construction records, AP1 was not constructed with a liner that meets the design criteria in 40 CFR 257.71(a)(1)(i), (ii), or (iii), respectively, for a compacted soil liner, a composite liner, or an alternative composite liner. Permeability requirements were not specified for the native soils. Native soils in the area of AP1 generally consist of clay and wind-blown origin (loess), with some coarse-grained layers. The clay encountered in borings conducted in the vicinity of AP1 are generally classified as low- to medium-plasticity silty clay, sandy lean clay, or lean clay with sand (CL) often with trace amounts of gravel; or high plasticity fat clay (CH), often with trace amounts of sand. The CL and CH soils are soft to very stiff, moist to wet, and brown to gray. The coarse-grained soils encountered in the borings were classified as clayey sand (SC), silty sand (SM), or fine to coarse sand (SP), with trace amounts of gravel, loose to dense, wet, and brown to gray (AECOM, 2016b).

1.3 Type and Volume of Materials

Based on Golder's comparison (using Autodesk Civil 3D) of the existing conditions (December 2020 survey by IngenAE) and the approximate base of ash grades developed from the 1963 earthwork and grading plans, approximately 436,000 cubic yards (CY) of bottom ash are present in AP1.

Minimal information on the specific bottom ash material produced at Coffeen Power Station is available. Because the material was sluiced, the particle-size distribution of the bottom ash in AP1 is expected to be variable, becoming finer with increased distance from the deposition locations. Laboratory gradation testing was performed on two bottom ash samples collected from AP1 in 2016 at depths of 1 ft and 6 ft below ground surface (bgs). The gradation of the samples ranged from 0-2% gravel-sized particles, 88-93% sand-sized particles, and 7-10% silt and clay-sized particles (AECOM 2016b). For comparison, We Energies (2013) reports a similar gradation for bottom ash produced at Pleasant Prairie Power Plant, but with less sand-sized particles (77%) and greater amount of gravel-sized particles (10%) and silt and clay-sized particles (13%). Additionally, We Energies (2013) indicates a measured hydraulic conductivity of 4.9×10^{-3} cm/s for bottom ash produced at Pleasant Prairie Power Plant.

1.4 Water Levels

At the time of the December 2020 survey by IngenAE, the water level in AP1 was El. 629.2 feet. Although the water level would be expected to respond to wet or dry climate conditions, this water level is likely typical. Based on this water level, approximately 89% (388,000 CY) of the ash in AP1 is below the water level. Ash below the water level can be considered saturated. The ash above the water level forms a plateau at the southeast side of AP1 with the highest point at approximately El. 641.5 feet. Based on Golder's site observations and past history of beneficial use operations at AP1, ash above the water level is likely moist, but not saturated, and is capable of supporting light equipment traffic.

Ramboll has provided a surface corresponding to the top of the uppermost aquifer unit. Based on a comparison of this surface and the approximate base of ash grades, the base of ash appears to be below the top of the uppermost aquifer in the northeastern portion of AP1.

2.0 CLOSURE-BY-REMOVAL INFORMATION

Section 845.710(c)(1) requires the evaluation of complete removal of CCR and Section 845(d)(2) requires Closure Alternatives Analysis to identify if the Power Plant has a landfill that can accept the CCR or if constructing an on-Site landfill is feasible. Additionally, Section 845.710(c)(1) requires the evaluation of multiple modes of transportation of CCR, including rail, barge, and truck. This section includes evaluation of on-Site landfill options, potential off-Site landfills, and potential methods for transporting CCR to off-Site landfills.

2.1 Evaluation of On-Site CCR Landfill Options

There is an existing CCR landfill at the Coffeen Site, which currently has capacity for up to approximately 375,500 CY of additional material. 79,000 CY of material from the Gypsum Management Facility (GMF) Recycle Pond (RP) are planned for disposal in the on-Site landfill, which leaves approximately 296,000 CY of capacity for additional material from AP1. Therefore, the on-Site landfill does not currently have the capacity to contain all the CCR and subsoil that would be excavated from AP1 under the closure by removal scenario. However, under closure by removal, material will be disposed of in the on-Site landfill until it reaches capacity, after which material will be hauled off-Site for disposal.

Due to planned future land use of the surrounding property dedicated to renewable power generation, the landfill also cannot be expanded to sufficiently increase its capacity. Neither expansion of the existing on-site landfill nor construction of a new on-site landfill is a viable alternative at this site.

2.2 Potential Off-Site CCR Receiving Landfills

Potential off-Site landfills suitable for disposing of the approximately 140,000 CY of CCR and 35,500 CY of subsoil within AP1 that are beyond the capacity of the on-Site landfill, were evaluated using IEPA's online Illinois Disposal Capacity Report. The closest landfills to the site, by road miles, were determined to be Republic Services' Litchfield-Hillsboro Landfill (a.k.a. Litchfield Landfill) in Litchfield, Illinois and Waste Management's Five Oaks Recycling and Disposal Facility (a.k.a. Five Oaks Landfill) in Taylorville, Illinois.

The Litchfield Landfill is the preferred landfill due to its location being closer to the Coffeen Power Plant (17.9 vs. 43.5 one-way miles, respectively), thereby resulting in reduced hauling mileage. Both landfills have sufficient remaining capacity to receive the approximately 175,500 CY of CCR and subsoil, although the landfills have not yet been contacted, as of the date of this report, to confirm that they would be willing to accept the CCR. Information on both landfills is provided in Table 1 below.

Table 1: Off-Site Landfill Information

Landfill Name	Owner	Location	One-Way Distance from Site by Road (Miles)	2020 Five-Year Average Disposal Volume (in-place CY)	2020 Remaining Capacity Reported (in-place CY)
Litchfield Landfill	Republic Services	Litchfield, IL	17.9	82,620	1,535,189
Five Oaks Landfill	Waste Management	Taylorville, IL	43.5	249,664	7,051,864

2.3 Potential Off-Site CCR Transportation Methods

Section 845.710(c)(1) requires Closure-by-Removal to consider multiple methods for transporting removed CCR, including using rail, barge, and trucks. An evaluation of each method is included within this section.

2.3.1 Transportation by Rail

The Coffeen Power Plant currently has a rail spur on-Site that was historically used to receive coal shipments, which were unloaded via an unloading terminal. The terminal is not currently suitable for the loading of CCR into rail cars as it was designed and constructed for unloading, rather than loading. Additionally, the terminal was partially decommissioned by removing associated transformers and disconnecting the electrical supply after the Coffeen Power Plant was closed in 2019. In order for CCR to be hauled by rail from the Coffeen Power Plant, a new loading terminal would need to be constructed, thereby increasing the project schedule due to the need to complete design, permitting, and construction.

While the Lichfield Landfill is located within approximately 2.3 miles of an existing rail line, an existing terminal suitable for the unloading of CCR is not present. A rail unloading terminal would need to be constructed, which would increase the project schedule due to the need to coordinate with the railroad, complete design and permitting, and construct the terminal. CCR would still need to be hauled by truck from the new off-Site unloading terminal to the landfill, resulting in additional CCR handling and exposure to the surrounding environment. The Five Oaks Landfill has a rail spur on-site.

Furthermore, a direct rail route from the Coffeen Power Plant to either landfill does not exist. Hauling CCR to the Lichfield or Five Oaks Landfills would involve approximately 25 and 63 miles, respectively, of hauling by rail on tracks owned by three separate rail lines (Norfolk Southern Ry. Co., BNSF Ry. Co., and Illinois & Midland R.R. Inc.). The ability of CCR to be hauled over multiple lines and transferred from line to line is currently unknown.

Therefore, transporting CCR by rail is unlikely to be a viable option for AP1 at the Coffeen Power Plant, due to the need to design, permit, and construct additional loading and unloading infrastructure, resulting in corresponding project schedule delays, and the distance and number of rail lines which the CCR would need to be transported over.

2.3.2 Transportation by Barge

The Coffeen Power Plant is not located near a navigable waterway and, therefore, transportation of CCR by barge is not feasible.

2.3.3 Transportation by Truck

The Coffeen Power Plant is located approximately 2.9 miles from Illinois Route 185 (IL-185), which is suitable for receiving truck hauling traffic. Red Ball Trail links the Coffeen Power Plant to IL-185 and routinely receives truck traffic associated with adjacent industrial facilities and the Coffeen Power Plant. Potential travel routes between the Coffeen Power Plant and Litchfield and Five Oaks Landfills have been assumed for cost estimate purposes, although actual travel routes may vary.

Transporting CCR by truck will not require the construction of additional loading or unloading infrastructure at either the receiving landfill or the Coffeen Power Plant. CCR would be loaded into trucks using heavy equipment at AP1. CCR will then be unloaded at the receiving landfill by the truck directly. Since no construction is required, project delays related to coordination with other entities, design, and permitting are unlikely to occur. Therefore, transporting CCR by truck is a viable option for AP1 at the Coffee Power Plant.

3.0 CLOSURE DESCRIPTION NARRATIVES

Section 845.720(a)(1)(A) requires narrative description of CCR impoundment closures to be prepared. Narrative descriptions have been prepared for both closure-in-place and closure-by-removal and are included in this section.

3.1 AP1 Closure-in-Place

The closure-in-place concept for AP1 was developed to reduce the waste footprint at closure and to achieve 10 feet of vertical separation between the top of aquifer and the ash material. The proposed closure-in-place option would have final cover slopes of 7H:1V to approximate El. 664 feet transitioning to 20H:1V (5%) slopes above that elevation to accommodate moderate settlement and promote drainage. A berm will be constructed at the east end of the consolidated footprint for stability. The location of the berm has been selected to accommodate the estimated 436,000 CY of ash and 21,500 CY of excavated subsoil to be contained within the consolidated footprint based on the grading plan presented. The general sequencing plan for the closure-in-place option is as follows:

- Pump out ponded water [approximately 15.2 million gallons (MG)] from AP1 through Outfall K20 to the existing drainage to the north where it will be managed in accordance with the NPDES permit for the site.
- A temporary water management system will be constructed within AP1, including ditches and sumps. The system will maintain AP1 in an unwatered state by collecting contact stormwater during closure construction. Stormwater flow will be conveyed through Outfall K20 to the existing drainage to the north where it will be managed in accordance with the NPDES permit for the site.
- Once the ponded water has been removed from AP1, the ash in the consolidated footprint will be dewatered. Approximately 268,600 CY of ash east of the consolidated footprint will be dewatered as needed to enable relocation. It is anticipated that approximately 14.1 MG of water removal will be required to dewater the ash. The ash will dewater to some degree by gravity, but dewatering by pumping from trenches and sumps is expected to be necessary. Liquid waste and water flowing to sumps will be managed in accordance with the NPDES permit for the site and discharged through Outfall K20.
- Any accumulated ash within the riser structure and outlet pipes will be removed and the riser structure and outlet pipes will be decontaminated by pressure washing. Decontamination water will be routed through Outfall K20 and managed in accordance with the NPDES permit for the Site. The riser structure will be demolished and disposed of in the consolidated footprint and the outlet pipes will be plugged and abandoned or removed and disposed of.
- Ash will be removed from the berm footprint and relocated into the consolidated footprint. The berm will be constructed in north-south orientation at the east end of the consolidated footprint.
- The remaining ash east of the berm will be collected and deposited west of the berm. It is anticipated that up to 1 foot of subsoil beneath the ash may also be removed. The subsoils will be visually observed for signs of CCR. If subsoils with signs of CCR are observed, they will be removed and deposited west of the berm (for the purposes of conceptual design, assume 1 foot, or approximately 21,500 CY, will need to be removed).
- Compacted fill, composed of locally available soils, would be placed only as needed to achieve final cover subgrade. The compacted fill is anticipated to be compacted to a minimum of 95% of the standard Proctor maximum dry density to reduce settlement.
- Construction of an alternate final cover system, consisting of (from top to bottom):
  - 24-inch final protective soil layer. The soil layer would include a 6-inch-thick topsoil layer and be revegetated with grass species selected to reduce maintenance based on soil type. This layer will consist of locally available soils from the removed embankment containment berm compacted to between 80% and 95% of the standard Proctor maximum dry density for establishment of vegetation and protection of the underlying geomembrane. Protective soil layer material is likely to be primarily low-plasticity silt or clay based on review of site geotechnical information.
  - Nonwoven geotextile cushioning layer.
  - 40-mil linear low-density polyethylene (LLDPE) geomembrane layer.

- All areas of the cover system will be sloped at a minimum of 1% to positively drain to the exterior of AP1. Stormwater runoff from the AP1 closure area will be removed from the top of the final cover via the construction of a free-draining stormwater management system, including berms, channels, and letdown structures, that will convey stormwater to existing surface water bodies.
- Exterior slopes of the existing western, northern, and southern containment berms used to contain the consolidated AP1 footprint will be recontoured as necessary with additional soil, sourced from the existing berms that are no longer required, to achieve minimum 3H:1V side slopes for long-term stability.
- To prevent impoundment of water in the eastern end of the current AP1 footprint after ash removal, existing earthen embankments not required for the consolidated footprint will be removed and a channel will be excavated to allow stormwater to flow through existing NPDES Outfall K20 into the existing drainage.
- Soil fill, sourced from existing berms no longer required to contain waste in the consolidated footprint or from the on-Site soil borrow area southeast of AP1, will be used as fill in low areas of the existing AP1 base grade to provide at least one foot of soil cover above the top of the uppermost aquifer and establish the final ground surface.
- The final ground surface of the eastern part of AP1 will be sloped to drain a minimum of 0.5% towards the channel excavated in the northeast corner, in order to allow post-closure, non-contact stormwater to gravity flow into the existing drainage.
- Vegetation will be established on the final surface of AP1. Stormwater best management practices (BMPs) such as erosion control blankets will be used, as needed to reduce erosion during vegetation establishment.
- After vegetation is established, BMPs will be removed, and closure construction will be considered complete.

3.2 AP1 Closure by Removal

A narrative description of closure-by-removal activities associated with AP1 include:

- Pump out ponded water (approximately 15.2 MG) from AP1 through Outfall K20 to the existing drainage to the north where it will be managed in accordance with the NPDES permit for the site.
- A temporary water management system will be constructed within AP1, including ditches and sumps. The system will maintain AP1 in an unwatered state by collecting contact stormwater during closure construction. Stormwater flow will be conveyed through Outfall K20 to the existing drainage to the north where it will be managed in accordance with the NPDES permit for the site.
- Once the ponded water has been removed from AP1, the ash will be dewatered to enable relocation. Approximately 388,000 CY of ash is located below the current water level in AP1 and it is anticipated that approximately 20.3 MG of water removal will be required to dewater the ash. The ash will dewater to some degree by gravity, but dewatering by pumping from trenches and sumps is expected to be necessary. Liquid waste and water flowing to sumps will be managed in accordance with the NPDES permit for the site and discharged through Outfall K20.
- Ash will be removed from AP1 using mass mechanical excavation techniques.

- Approximately 296,000 CY of ash will be hauled by truck from AP1 to the on-Site CCR Landfill until the on-site CCR Landfill reaches capacity.
- The remaining ash (approximately 140,000 CY) will be loaded into over-the-road dump trucks and hauled to the off-Site receiving landfill.
- It is anticipated that up to 1 foot of subsoil (35,500 CY) beneath the ash may also be removed. The subsoils will be visually observed for signs of CCR. If subsoils with signs of CCR are observed, they will be loaded into over-the-road dump trucks and hauled to the off-Site receiving landfill.
- Any accumulated ash within the riser structure and outlet pipes will be removed and the riser structure and outlet pipes will be decontaminated by pressure washing. Decontamination water will be routed through Outfall K20 and managed in accordance with the NPDES permit for the Site. The removed ash will also be disposed of in the off-Site receiving landfill. The riser structure will be demolished and disposed of in the off-Site receiving landfill and the outlet pipes will be plugged and abandoned or removed and disposed.
- To prevent impoundment of water in the decontaminated AP1, existing earthen embankments will be removed and a channel will be excavated to allow stormwater to flow through existing NPDES Outfall K20 into the existing drainage.
- Protective cover soil, sourced from existing berms no longer required to contain CCR, will be used as fill in low areas of the existing AP1 base grade to provide at least one foot of soil cover above the top of the uppermost aquifer and establish the final ground surface.
- The final ground surface of AP1 will be sloped to drain a minimum of 0.5% towards the channel excavated in the northeast corner, in order to allow post-closure, non-contact stormwater to gravity flow into the existing drainage.
- Vegetation will be established on the final surface of AP1. Stormwater best management practices (BMPs) such as erosion control blankets will be used, as needed to reduce erosion during vegetation establishment.
- After vegetation is established, BMPs will be removed, and closure construction will be considered complete.

4.0 CONSTRUCTION SCHEDULES

Section 845.720(a)(1)(F) requires a schedule including all activities necessary to complete closure to be prepared. Schedules have been prepared for both closure-in-place and closure-by-removal and are included within this section. Schedules were prepared using estimates of task durations based on Golder's experience, typical weather conditions at the site, and expected construction rates relative to estimated construction quantities.

4.1 AP1 Closure-in-Place

The proposed closure completion schedule for closure-in-place is provided in Table 2.

Table 2: Construction Schedule - AP1 Closure-in-Place

Milestone	Timeframe (Preliminary Estimates)
Agency Coordination, Approvals, and Permitting	8 to 12 months after Final Closure Plan Approval

Milestone	Timeframe (Preliminary Estimates)
■ Obtain state permits, as needed, for dewatering, water discharge, land disturbance, and dam modifications	
Final Design and Bid Process ■ Complete final design of the closure and select a construction contractor	8 to 14 months after Agency Coordination, Approvals, and Permitting
Dewater and Stabilize CCR, Install Final Cover System ■ Complete contractor mobilization, installation of stormwater BMPs, and unwatering of AP1 ■ Abandon outlet structures, stabilize AP1, and complete grading ■ Install the final cover system and stormwater conveyances ■ Winter weather delays are assumed between November and March of each construction year	13 to 18 months after necessary permits are issued
Site Restoration ■ Seed and stabilize AP1 ■ Complete contractor demobilization	2 to 3 months after the final cover system is complete
Timeframe to Complete Closure	31 to 47 months

4.2 AP1 Closure-by-Removal

The proposed closure completion schedule for closure-by-removal is provided in Table 3.

Table 3: Construction Schedule - AP1 Closure-by-Removal

Milestone	Timeframe (Preliminary Estimates)
Agency Coordination, Approvals, and Permitting ■ Obtain state permits, as needed, for dewatering, water discharge, land disturbance, and dam modifications	8 to 12 months after Final Closure Plan Approval
Final Design and Bid Process	8 to 14 months after Agency Coordination, Approvals, and Permitting

Milestone	Timeframe (Preliminary Estimates)
■ Complete final design of the closure and select a construction contractor	
Dewater and Excavate CCR, Decontaminate CCR Unit ■ Complete contractor mobilization, installation of stormwater BMPs, and unwatering of AP1 ■ Complete mass excavation of CCR and decontamination of AP1 ■ Winter weather delays are assumed between November and March of each construction year	16 to 24 months after necessary permits are issued
Backfill with Clean Soil ■ Regrade AP1 base grade and fill above low areas to provide at least one foot above top of uppermost aquifer. Slope to drain.	2 to 3 months after decontamination is complete
Site Restoration ■ Seed and stabilize AP1 ■ Complete contractor demobilization	2 to 3 months after backfill is complete
Timeframe to Complete Closure	36 to 56 months

5.0 MATERIAL, QUANTITY, LABOR, AND MILEAGE ESTIMATES

Section 845.720(d)(1) requires that a cost estimate be prepared in accordance with the Class 4 standards of the Association for the Advancement of Cost Engineering (AACE). Estimates for both closure-in-place and closure-by-removal were prepared in accordance with the AACE Class 4 standards.

In addition to construction quantity estimates, Golder has also prepared estimates of construction labor hours, equipment usage, haul truck mileage, daily labor mobilization vehicle mileage, material delivery mileage, and on-Site vehicle mobilization mileage.

Estimates were prepared using the following approach:

- Major construction components and line items were identified, in accordance with the narrative closure description
- Construction quantities were estimated based on volume estimates, area estimates, and proposed construction schedules

- Soil fill requirements beyond what is available on-Site was assumed to come from off-Site borrow sources located within 2 miles of the site, as limited borrow soil is expected to be available at the Coffeen Power Plant, due to planned future land use of the surrounding property dedicated to renewable power generation
- For line items where RS Means was available, the corresponding RS Means crew size, equipment description, and daily output were used to estimate the total number of man-hours and equipment hours. For line items where RS Means data was unavailable, the crew size, equipment description, and daily output were estimated based on Golder's experience.
- Daily labor mobilization miles were estimated assuming an average one-way commute of 35 miles for each individual working on-Site. The number of working days were estimated from the construction schedules.
- Estimates of haul truck mileage were based on the assumed round-trip haul distance and dump truck size. All dump trucks were assumed to be filled to capacity.
- Estimates of material delivery miles were prepared based on Golder's experience

The detailed estimates for closure-in-place are provided in Tables 4 and 5, respectively.

The detailed estimates for closure-by-removal are provided in Tables 6 and 7, respectively.

6.0 REFERENCES

AACE International. 2020. Recommended Practice 18R-97: Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries. 2020.

AECOM. 2016a. History of Construction, USEPA Final CCR Rule, 40 CFR 257.73(c), Coffeen Power Station. October. Available online: https://www.luminant.com/ccr/?wpdf_download_file=L25hcy9jb250ZW50L2xpdmUvbHVtaW5hbnQzL2RvY3VtZW50cy9jY3IvSWxsaW5vaXMvQ29mZmVlbi8yMDE2L0hpc3Rvcnkgb2YgQ29uc3RydWN0aW9uLnBkZg%3D%3D

AECOM. 2016b. CCR Certification Report: Ash Pond No. 1, At Coffeen Power Station. October.

Geosyntec. 2021. 2021 USEPA CCR Rule Periodic Certification Report; Ash Pond No. 1, Coffeen Power Plant. October.

Illinois Environmental Protection Agency. 2021a. 35 Ill. Adm. Code Part 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments. Springfield, IL, 2021.

Illinois Environmental Protection Agency. 2021b. Illinois Landfill Disposal Capacity Report. August 2021.

RS Means. 2022. Heavy Construction Costs with RS Means Data. Gordian, 2022.

United States Environmental Protection Agency. 2015. 40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, 2015.

We Energies. 2013. Coal Combustion Products Utilization Handbook. Third Edition. Available online: https://www.we-energies.com/environment/pdf/ccp_handbook.pdf.

APPENDIX A

Tables

AACE Class 4 Estimate
Coffeen Power Station
Closure-in-Place of Ash Pond No. 1

Item No.	Item Description	Quantity	Unit	Crew	Daily Output	Labor Hours	Equipment Hours	Notes/Assumptions/Reference
	Pre-Construction							
1	Mobilization and Demobilization (10% of Construction Subtotal)	1	LS					Typical Industry Value
	Pre-Construction Subtotal							
	Site Preparation							
2	Mow Vegetation in limits of disturbance	87	MSF	B84	22	32	32	RS Means 320190191660: Mowing, mowing brush, light density, tractor with rotary mower
3	Construction Soil Erosion & Sediment Controls (Silt Fence)	5000	LF	B62	650	185	62	RS Means 312514161000: Synthetic erosion control, silt fence, install and remove, 3' high
4	Construction Facilities	17	MO - in use	-	-	-	-	
	Office Trailer	17	MO - in use	-	-	-	-	RS Means 015213200350: Office trailer, furnished, rent per month, 32' x 8', excl. hookups
	Storage Trailers (x2)	17	MO - in use	-	-	-	-	RS Means 015213201350: Storage boxes, rent per month, 40' x 8'
	Portable Toilet (x2)	17	MO - in use	-	-	-	-	RS Means 015433406410: Rent toilet portable chemical, incl. hourly oper. cost
5	Dust Control	120	Day	B59	0.5	1,920	1,920	RS Means 312323202510: Hauling, heavy, dust control, includes loading
6	Haul Road Maintenance	55	Day	B86A	1	440	440	RS Means 312323202600: Hauling, haul road maintenance, includes loading
	Site Preparation Subtotal					***2,580***	***2,450***	
	Dewatering, Unwatering, and Stormwater Management							
7	Unwatering of AP1 ponded water	147	Day	Dewater	4	293	73	RS Means 312319200650: Dewatering, pumping 8 hours, attended 2 hours per day, 4" dischage pump used for 8 hours, includes 20 LF of suction hose and 100 LF of discharge hose
8	Dewatering and Stormwater Management for AP2	356	Day	Dewater	4	712	178	RS Means 312319200650: Dewatering, pumping 8 hours, attended 2 hours per day, 4" dischage pump used for 8 hours, includes 20 LF of suction hose and 100 LF of discharge hose
9	Dewatering Sumps Installation	4	EA	Sump Install	4	16	8	Unit Rate, Crew, and Daily Output based on experience. Materials include 24" corrugated HDPE pipe with geotextile wrapping, and 1 CY of gravel backfill
	Dewatering, Unwatering, and Stormwater Management Subtotal					***1,020***	***260***	
	Ash Pond No. 1 Closure							
10	Removal and Abandonment of Riser and Outlet Structure	-	LS	-	-	155	24	
	Demolition of Steel Walkway	800	SF	B21C	500	90	13	RS Means 024116330200: Bridge demolition, pedestrian, steel, 50' to 160' long, 8' to 10' wide
	Demolition of Outlet Structure	20	LF	B69	300	3	1	RS Means 024113430100: Selective demolition, box culvert, precast, 8' x 6' x 3' to 8' x 8' x 8', excludes excavation
	Plugging of Outlet Pipe	2	CY	C14A	18	22	2	RS Means 033053401040: Structural concrete, in place, column (4000 psi), square, up to 3% reinforcing by area, 36" x 36", including forms (4 uses), Grade 60 rebar, concrete (portland cement Type I), placement and finishing included
	Cleaning of Pipe Interior	1	LS	2 Clab	1	16	-	Unit Rate, Crew, and Daily Output based on experience.
	Grouting of Pipe	79	CY	Grout/Concrete	80	24	8	Unit Rate, Crew, and Daily Output based on experience.
11	Relocation of Ash Material and Contaminated Subgrade	290200	CY - in place	-	-	8,374	6,778	
	Excavation and Loading of Material	304710	CY - as excavated	B14A	3230	1,132	755	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	304710	CY - as excavated	B34G	680	3,585	3,585	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	304710	CY - as excavated	B10B	1000	3,657	2,438	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
12	Excavation and Placement of Embankment Fill	28000	CY - in place	-	-	937	740	
	Excavation and Loading of Material	29400	CY - as excavated	B14A	3230	109	73	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	29400	CY - as excavated	B34G	680	346	346	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	29400	CY - as excavated	B10B	1000	353	235	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
	Compaction of Material	28000	CY - in place	B10F	2600	129	86	RS Means 312323235100: Compaction; Riding, vibrating roller, 12" lifts, 4 passes (RSMeans Crew is B10Y; altered to B10F based on experience)
13	Excavation and Stockpiling of Excess Cut Material	24320	CY - in place	-	-	395	363	
	Excavation and Loading of Material	25536	CY - as excavated	B14A	3230	95	63	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling and Dumping of Material	25536	CY - as excavated	B34G	680	300	300	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
14	Excavation and Placement of Fill over Top of Aquifer	9600	CY - in place	-	-	321	255	
	Excavation and Loading of Material	10080	CY - as excavated	B14A	3230	37	25	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	10080	CY - as excavated	B34G	680	119	119	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	10080	CY - as excavated	B10B	1000	121	81	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
	Compaction of Material	9600	CY - in place	B10F	2600	44	30	RS Means 312323235100: Compaction; Riding, vibrating roller, 12" lifts, 4 passes (RSMeans Crew is B10Y; altered to B10F based on experience)
15	Geomembrane	450900	SF - in place	B63B	1600	9,018	2,255	RS Means 310519531200: Pond and reservoir liners, membrane lining systems HDPE, 100,000 S.F. or more, 60 mil thick, per S.F. (multiplied unit rate by 0.5 based on experience)
16	Geotextile	450900	SF - in place	2 Clab	22500	321	-	RS Means 313219161550: Geotextile soil stabilization; non-woven 120 lb. tensile strength (multiplied unit rate by 4 to account for heavier geotextile based on experience)
17	Anchor Trench Installation	2400	LF	-	-	71	47	
	Excavation of Material	374	CY - as excavated	B11C	150	40	20	RS Means 312316130050: Excavating, Trench or continuous footing, common earth with no sheeting or dewatering included, 1' to 4' deep, 3/8 C.Y. excavator
	Backfilling Material	374	CY - as excavated	B10R	400	11	7	RS Means 312316133020: Backfill trench, F.E. Loader, wheel mtd., 1 C.Y. bucket, minimal haul
	Compaction of Material	356	CY - in place	A1D	140	20	20	RS Means 312323237040: Compaction, walk behind, vibrating plate 18" wide, 6" lifts, 4 passes
18	Excavation and Placement of Exterior Embankment 3:1 Fill	7100	CY - in place	-	-	238	188	
	Excavation and Loading of Material	7455	CY - as excavated	B14A	3230	28	18	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	7455	CY - as excavated	B34G	680	88	88	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	7455	CY - as excavated	B10B	1000	89	60	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
	Compaction of Material	7100	CY - in place	B10F	2600	33	22	RS Means 312323235100: Compaction; Riding, vibrating roller, 12" lifts, 4 passes (RSMeans Crew is B10Y; altered to B10F based on experience)
19	Placement of Protective Cover Soil	33400	CY - in place	-	-	985	795	
	Excavation and Loading of Material	35070	CY - as excavated	B14A	5000	84	56	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	35070	CY - as excavated	B34G	680	413	413	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	35070	CY - as excavated	B10B	1000	421	281	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
	Finish Grading of Material	49851	SY	B10W	8900	67	45	RS Means 312216103300: Fine grading, Finish grading slopes, gentle. Crew altered to reflect likely equipment to be used based on experience
20	Placement of Stormwater Tack-on Berms	1880	LF	-	-	34	28	
	Excavation and Loading of Material	1204	CY - as excavated	B14A	5000	3	2	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	1204	CY - as excavated	B34G	680	14	14	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	1204	CY - as excavated	B10B	1000	14	10	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
	Finish Grading of Material	2298	SY	B10W	8900	3	2	RS Means 312216103300: Fine grading, Finish grading slopes, gentle. Crew altered to reflect likely equipment to be used based on experience
	Ash Pond No. 1 Closure Subtotal					***20,850***	***11,470***	
	Site Restoration							
21	Riprap Stormwater Letdown Structures	2000	SF - in place	-	-	236	34	
	Geotextile	2000	SF - in place	2 Clab	22500	1	-	RS Means 313219161550: Geotextile soil stabilization; non-woven 120 lb. tensile strength (multiplied unit rate by 4 to account for heavier geotextile based on experience)
	Riprap	2000	SF - in place	B13	477	235	34	RS Means 313713100200: Riprap and rock lining, random, broken stone, machine placed for slope protection, 18" minimum thickness, not grouted
22	Erosion Control Blanket	37600	SF - in place	ECB	22500	40	13	RS Means 312514160100. Rolled erosion control mats and blankets, plastic netting, stapled, 2" x 1" mesh, 20 mil.
23	Straw Wattle Ditch Checks	2500	LF - in place	A2	1000	60	20	RS Means 312514160705: Compost or mulch filter sock, 9" diameter
24	Seed, Mulch, and Maintain Vegetated Surfaces	34	AC	-	-	310	310	
	Lime	1498	MSF	B66	700	17	17	RS Means 329113234250: Soil preparation, structural soil mixing, spread soil conditioners, ground limestone, 1#/S.Y., tractor spreader
	Fertilizer	1498	MSF	B66	700	17	17	RS Means 329113234150: Soil preparation, tructural soil mixing, spread soil conditioners, fertilizer, 0.2#/S.Y., tractor spreader
	Seed	1498	MSF	B66	52	231	231	RS Means 329219142300: Seeding athletic fields, seeding fescue, tall, 5.5 lb. per M.S.F., tractor spreader
	Mulch	1498	MSF	B65	530	45	45	RS Means 329113160350: Mulching, Hay, 1" deep, power mulcher, large
	Site Restoration Subtotal					***650***	***380***	
	Engineering & Construction Support Tasks and Contingency							
25	Final Closure Design and Bid Support (5% of Construction Subtotal)	1	LS	-	-	-	-	Typical Industry Value
26	Engineering Support and CQA During Construction (10% of Construction Subtotal)	398	Day	Eng	1	3,981	1,592	Unit Rate, Crew, and Output based on experience.
	Engineering & Construction Support Tasks Subtotal					***3,980***	***1,590***	
Construction Subtotal						**25,100**	**14,600**	
Project Subtotal						**29,100**	**16,200**	
30% Contingency						**8,700**	**4,900**	
ENGINEER'S ESTIMATE OF TOTAL CONSTRUCTION AND ENGINEERING HOURS						**37,800**	**21,100**	

Notes and Assumptions:

1. LS = Lump Sum, AC = Acre, LF = Linear Foot, EA = Each, SY = Square Yard, MO = Month, YR = Year, CY = Cubic Yard, MSF = Thousand Square Feet
2. Where possible, costs were developed using RS Means 2022 Heavy Construction Costs
3. 2022 RS Means unit rates include overhead and profit and refer to standard union labor in Effingham, IL.
4. Subtotal and total costs have been rounded to the nearest $1,000. Subtotal and total hours have been rounded to the nearest 100.
5. Earthwork quantities assume that the excavation and placement of fill within construction limits will be balanced so that no off-Site fill will be required to reach the final contours. The final elevations may need to be adjusted during final design to achieve balanced quantities.

Coffeen Power Station
Closure-in-Place of Ash Pond No. 1

Crew	Labor	Daily Labor Hours	Equipment	Daily Equipment Hours	Project Total Labor Hours	Project Total Equipment Hours
B84	Operator x1	8	Rotary Mower/Tractor	8	32	32
B62	Laborer x2 Operator x1	24	Loader, Skid Steer, 30 H.P.	8	185	62
B59	Truck Driver x1	8	Truck Tractor, 220 H.P. Water Tank Trailer, 5000 Gal	8	1920	1920
B86A	Operator x1	8	Grader, 30,000 lbs	8	440	440
B14A	Operator x1 Laborer x0.5	12	Hyd. Excavator, 4.5 CY	8	1488	992
B34G	Truck Driver x1	8	Dump Truck, Off Hwy, 54 ton	8	4865	4865
B10B	Operator x1 Laborer x0.5	12	Dozer, 200 H.P.	8	4655	3105
B21C	Labor Foreman x1 Laborer x4 Operator (crane) x1 Operator (oiler) x1	56	Cutting Torches x2 Sets of Gases x2 Lattice Boom Crane, 90 ton	8	90	13
B69	Labor Foreman x1 Laborer x3 Operator (crane) x1 Operator (oiler) x1	48	Hyd. Crane, 80 ton	8	3	1
C14A	Carpenter Foreman x1 Carpenters x16 Rodmen x4 Laborers x2 Cement Finisher x1 Operator (medium) x1	200	Gas Engine Vibrator Concrete Pump (small)	16	22	2
B63B	Labor Foreman x1 Laborer x2 Operator (light) x1	32	Loader, Skid Steer, 78 H.P.	8	9018	2255
2 Clab	Laborer x2	16	None	0	338	0
B13	Labor Foreman x1 Laborer x4 Operator (crane) x1 Operator (oiler) x1	56	Hyd. Crane, 25 ton	8	235	34
A2	Laborer x2 Truck Driver x1	24	Flatbed Truck, Gas, 1.5 ton	8	60	20
B66	Operator (light) x1	8	Loader-Backhoe, 40 H.P.	8	265	265
B65	Laborer x1 Truck Driver (light) x1	16	Power Mulcher (large) Flatbed Truck, Gas, 1.5 ton	16	45	45
B11C	Laborer x1 Operator (medium) x1	16	Backhoe Loader, 48 H.P.	8	40	20
B10R	Operator (medium) x1 Laborer x0.5	12	F.E. Loader, W.M., 1 CY	8	11	7
ECB	Laborer x3	24	Tractor	8	40	13
Dewater	Laborer x1	8	8" Diesel Pump	2	1005	251
Sump Install	Laborer x1 Operator x1	16	Hyd. Excavator, 4.5 CY	8	16	8
Grout/Concrete	Laborer x2 Truck Driver x1	24	Concrete Truck	8	24	8
Eng	Engineering Staff x1.2	10	Side by Side x1	4	3981	1592
A1D	Laborer x1	8	Vibrating Plate, Gas, 18"	8	20	20
B10F	Operator (medium) x1 Laborer x0.5	12	Tandem Roller, 10 ton	8	206	138
B10W	Operator (medium) x1 Laborer x0.5	12	Dozer, 105 H.P.	8	70	47
PROJECT TOTAL					**29074**	**16155**

Notes and Assumptions:
1. Crew names in itallics were created by Golder based on experience and are not from RS Means.

Item	Quantity	Assumptions
Labor Total Hours	29,074	Per projected total in cost estimate
Duration of Onsite Construction - Days	503	Per Construction Schedule
Average Daily Crew Size	6	10 hour days
Labor Mobilization Miles	211,174	Average of 70 miles round trip per day
Vehicle Miles On-Site	8,849	1 mile round trip from gate to parking 5 miles per day for CQA tech and Construction Supervisor 10% Contingency for Site visitors (client and engineering support)
Equipment Mobilization Miles - Unloaded	21,548	Average of 300 miles one way for equipment hauling Average 1 load of equipment per working week
Equipment Mobilization Miles - Loaded	21,548	Average of 300 miles one way for equipment hauling Average 1 load of equipment per working week
Total Equipment Miles On-Site	37,710	Average of 4 of 6 crew members running equipment Assume 15 miles per piece of equipment (based on 15 minute round trip path across AP1 10 miles per day used for water truck 5 miles per day for grader
On-Site Haul Truck Miles - Unloaded	4,606	34 CY Haul Truck 4000 ft cycle
On-Site Haul Truck Miles - Loaded	4,606	34 CY Haul Truck 4000 ft cycle
Off-Site Haul Truck Miles - Unloaded	-	16.5 CY Dump Truck 4 mile cycle
Off-Site Haul Truck Miles - Loaded	-	16.5 CY Dump Truck 4 mile cycle
Material Delivery Miles - Unloaded	6,925	Same geosynthetic material source, trailer quantities, and roll sizes as Coffeen AP2 project assumed 45 extra trips for seed, fertilizer, lime, mulch, ECBs, straw wattles, and concrete
Material Delivery Miles - Loaded	6,925	Same geosynthetic material source, trailer quantities, and roll sizes as Coffeen AP2 project assumed 45 extra trips for seed, fertilizer, lime, mulch, ECBs, straw wattles, and concrete

AACE Class 4 Estimate
Coffeen Power Station
Closure-by-Removal of Ash Pond No. 1

Item No.	Item Description	Quantity	Unit	Crew	Daily Output	Labor Hours	Equipment Hours	Notes/Assumptions/Reference
	Pre-Construction							
1	Mobilization and Demobilization (10% of Construction Subtotal)	1	LS					Typical Industry Value
	Pre-Construction Subtotal							
	Site Preparation							
2	Mow Vegetation in limits of disturbance	87	MSF	B84	22	32	32	RS Means 320190191660: Mowing, mowing brush, light density, tractor with rotary mower
3	Construction Soil Erosion & Sediment Controls (Silt Fence)	10000	LF	B62	650	369	123	RS Means 312514161000: Synthetic erosion control, silt fence, install and remove, 3' high
4	Construction Facilities	23	MO - in use	-	-	-	-	
	Office Trailer	23	MO - in use	-	-	-	-	RS Means 015213200350: Office trailer, furnished, rent per month, 32' x 8', excl. hookups
	Storage Trailers (x2)	23	MO - in use	-	-	-	-	RS Means 015213201350: Storage boxes, rent per month, 40' x 8'
	Portable Toilet (x2)	23	MO - in use	-	-	-	-	RS Means 015433406410: Rent toilet portable chemical, incl. hourly oper. cost
5	Dust Control	478	Day	B59	0.5	7,648	7,648	RS Means 312323202510: Hauling, heavy, dust control, includes loading
6	Haul Road Maintenance	478	Day	B86A	1	3,824	3,824	RS Means 312323202600: Hauling, haul road maintenance, includes loading
	Site Preparation Subtotal					***11,870***	***11,630***	
	Dewatering, Unwatering, and Stormwater Management							
7	Unwatering, Dewatering, and Stormwater Management for AP1	147	Day	Dewater	4	293	73	RS Means 312319200650: Dewatering, pumping 8 hours, attended 2 hours per day, 4" dischage pump used for 8 hours, includes 20 LF of suction hose and 100 LF of discharge hose
8	Dewatering and Stormwater Management for AP2	544	Day	Dewater	4	1,088	272	RS Means 312319200650: Dewatering, pumping 8 hours, attended 2 hours per day, 4" dischage pump used for 8 hours, includes 20 LF of suction hose and 100 LF of discharge hose
9	Dewatering Sumps Installation	4	EA	Sump Install	4	16	8	Unit Rate, Crew, and Daily Output based on experience. Materials include 24" corrugated HDPE pipe with geotextile wrapping, and 1 CY of gravel backfill
	Dewatering, Unwatering, and Stormwater Management Subtotal					***1,400***	***350***	
	Ash Pond No. 1 Closure							
10	Removal and Abandonment of Riser and Outlet Structure	-	LS	-	-	155	24	
	Demolition of Steel Walkway	800	SF	B21C	500	90	13	RS Means 024116330200: Bridge demolition, pedestrian, steel, 50' to 160' long, 8' to 10' wide
	Demolition of Outlet Structure	20	LF	B69	300	3	1	RS Means 024113430100: Selective demolition, box culvert, precast, 8' x 6' x 3' to 8' x 8' x 8', excludes excavation
	Plugging of Outlet Pipe	2	CY	C14A	18	22	2	RS Means 033053401040: Structural concrete, in place, column (4000 psi), square, up to 3% reinforcing by area, 36" x 36", including forms (4 uses), Grade 60 rebar, concrete (portland cement Type I), placement and finishing included
	Cleaning of Pipe Interior	1	LS	2 Clab	1	16	-	Unit Rate, Crew, and Daily Output based on experience.
	Grouting of Pipe	79	CY	Grout/Concrete	80	24	8	Unit Rate, Crew, and Daily Output based on experience.
11	Relocation of Ash Material to On-Site CCR Landfill	296000	CY - in place	-	-	10,979	9,350	
	Excavation and Loading of Material	310800	CY - as excavated	B14A	3230	1,155	770	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	310800	CY - as excavated	B34G	408	6,094	6,094	RS Means 312323206050: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off road, 15 min wait/ld/uld., 5 MPH, cycle 2 mile
	Spreading of Material	310800	CY - as excavated	B10B	1000	3,730	2,486	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
12	Disposal of Remaining Ash Material/Contaminated Subsoil at Off-Site Landfill	175500	CY - in place	-	-	16,754	15,936	
	Excavation and Loading of Material	184275	CY - as excavated	B14A	3230	685	456	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	184275	CY - as excavated	B34C	99	14,891	14,891	RS Means 312323203284: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 16.5 C.Y. truck, 20 min wait/ld/uld., 40 MPH, cycle 40 miles
	Finish Grading of Excavation Surface	122700	SY	B32C	5000	1,178	589	RS Means 312216101020: Fine grading, loam or topsoil fine grade for large area, 15,000 S.Y. or more
	Landfill Tipping Fee	189540	Ton	-	-	-	-	Unit Rate based on actual tipping fee from Republic Services Litchfield Landfill (nearest landfill to Site). Unit Rate subject to increase upon Landfill's soil classification.
13	Excavation and Placement of Fill over Top of Aquifer	9600	CY - in place	-	-	321	255	
	Excavation and Loading of Material	10080	CY - as excavated	B14A	3230	37	25	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling of Material	10080	CY - as excavated	B34G	680	119	119	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	10080	CY - as excavated	B10B	1000	121	81	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
	Compaction of Material	9600	CY - in place	B10F	2600	44	30	RS Means 312323235100: Compaction; Riding, vibrating roller, 12" lifts, 4 passes (RSMeans Crew is B10Y; altered to B10F based on experience)
14	Excavation and Stockpiling of Excess Cut Material	29000	CY - in place	-	-	836	677	
	Excavation and Loading of Material	30450	CY - as excavated	B14A	3230	113	75	RS Means 312316435400: Excavating, large volume projects; excavation with truck loading; excavator, 4.5 CY bucket, 95% fill factor (assume 5% shrinkage factor from ground to in-place)
	Hauling and Dumping of Material	30450	CY - as excavated	B34G	680	358	358	RS Means 312323206020: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off road, 15 min wait/ld/uld., 5 MPH, cycle 4000 feet
	Spreading of Material	30450	CY - as excavated	B10B	1000	365	244	RS Means 312323170020: Fill, dumped material, spread, by dozer, excludes compaction
	Ash Pond No. 1 Closure Subtotal					***29,050***	***26,240***	
	Site Restoration							
15	Erosion Control Blanket	37600	SF - in place	ECB	22500	40	13	RS Means 312514160100. Rolled erosion control mats and blankets, plastic netting, stapled, 2" x 1" mesh, 20 mil.
16	Straw Wattle Ditch Checks	2500	LF - in place	A2	1000	60	20	RS Means 312514160705: Compost or mulch filter sock, 9" diameter
17	Seed, Mulch, and Maintain Vegetated Surfaces	28	AC	-	-	253	253	
	Lime	1224	MSF	B66	700	14	14	RS Means 329113234250: Soil preparation, structural soil mixing, spread soil conditioners, ground limestone, 1#/S.Y., tractor spreader
	Fertilizer	1224	MSF	B66	700	14	14	RS Means 329113234150: Soil preparation, tructural soil mixing, spread soil conditioners, fertilizer, 0.2#/S.Y., tractor spreader
	Seed	1224	MSF	B66	52	188	188	RS Means 329219142300: Seeding athletic fields, seeding fescue, tall, 5.5 lb. per M.S.F., tractor spreader
	Mulch	1224	MSF	B65	530	37	37	RS Means 329113160350: Mulching, Hay, 1" deep, power mulcher, large
	Site Restoration Subtotal					***350***	***290***	
	Engineering & Construction Support Tasks and Contingency							
18	Final Closure Design and Bid Support (1.5% of Construction Subtotal)	1	LS	-	-	-	-	Typical Industry Value
19	Engineering Support and CQA During Construction (4% of Construction Subtotal)	586	Day	Eng	1	5,859	2,344	Unit Rate, Crew, and Output based on experience.
	Engineering & Construction Support Tasks Subtotal					***5,860***	***2,340***	
Construction Subtotal						**42,700**	**38,500**	
Project Subtotal						**48,600**	**40,800**	
30% Contingency						**14,600**	**12,200**	
ENGINEER'S ESTIMATE OF TOTAL CONSTRUCTION AND ENGINEERING HOURS						**63,200**	**53,000**	

Notes and Assumptions:
1. LS = Lump Sum, AC = Acre, LF = Linear Foot, EA = Each, SY = Square Yard, MO = Month, YR = Year, CY = Cubic Yard, MSF = Thousand Square Feet
2. Where possible, costs were developed using RS Means 2022 Heavy Construction Costs
3. 2022 RS Means unit rates include overhead and profit and refer to standard union labor in Effingham, IL.
4. Subtotal and total costs have been rounded to the nearest $1,000. Subtotal and total hours have been rounded to the nearest 100.
5. Earthwork quantities assume that the excavation and placement of fill within construction limits will be balanced so that no off-Site fill will be required to reach the final contours. The final elevations may need to be adjusted during final design to achieve balanced quantities.

Coffeen Power Station
Closure-by-Removal of Ash Pond No. 1

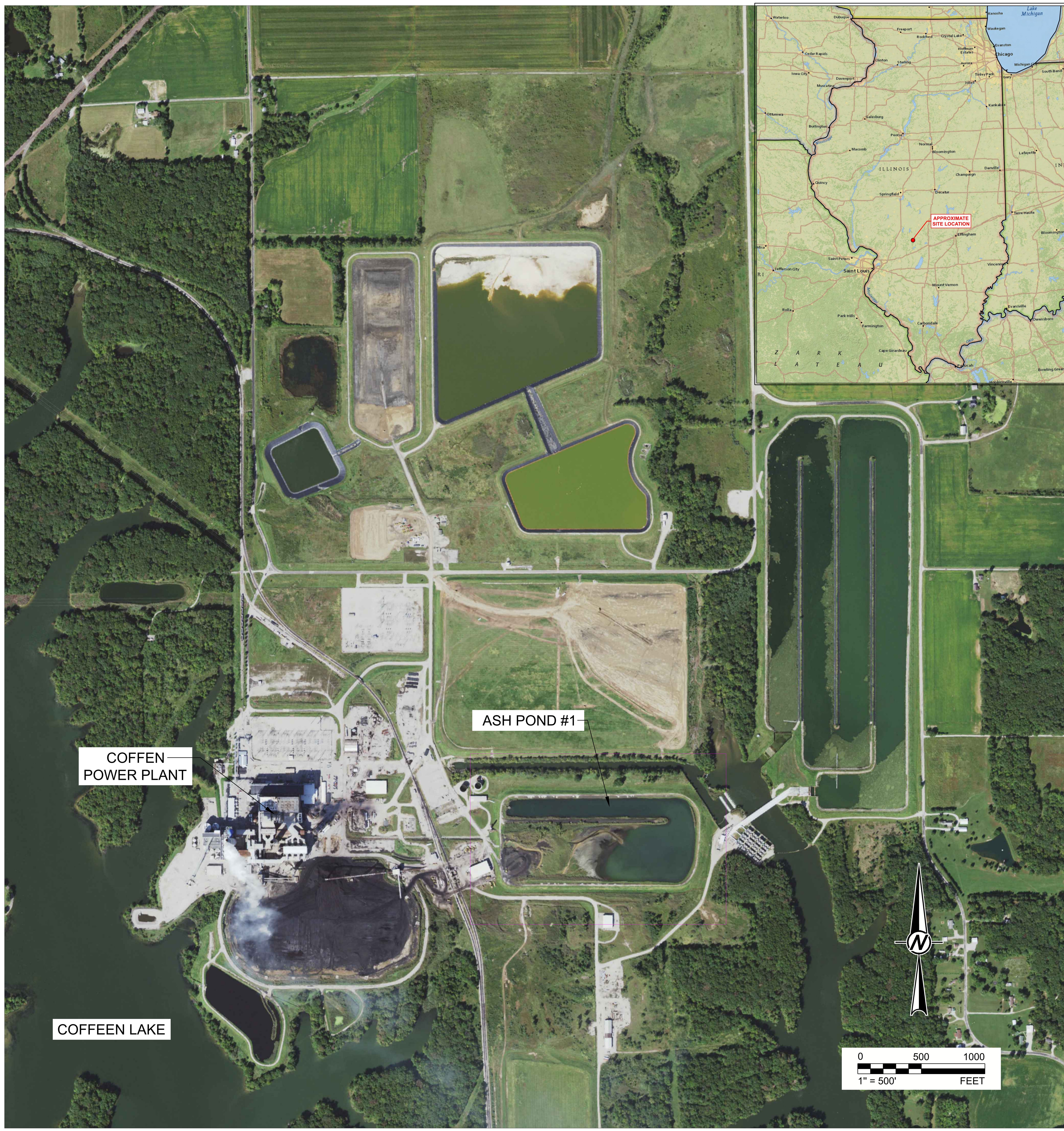
Crew	Labor	Daily Labor Hours	Equipment	Daily Equipment Hours	Project Total: Labor Hours	Project Total: Equipment Hours
B84	Operator x1	8	Rotary Mower/Tractor	8	32	32
B62	Laborer x2 Operator x1	24	Loader, Skid Steer, 30 H.P.	8	369	123
B59	Truck Driver x1	8	Truck Tractor, 220 H.P. Water Tank Trailer, 5000 Gal	8	7648	7648
B86A	Operator x1	8	Grader, 30,000 lbs	8	3824	3824
B14A	Operator x1 Laborer x0.5	12	Hyd. Excavator, 4.5 CY	8	1990	1326
B34G	Truck Driver x1	8	Dump Truck, Off Hwy, 54 ton	8	6571	6571
B10B	Operator x1 Laborer x0.5	12	Dozer, 200 H.P.	8	4216	2811
B21C	Labor Foreman x1 Laborer x4 Operator (crane) x1 Operator (oiler) x1	56	Cutting Torches x2 Sets of Gases x2 Lattice Boom Crane, 90 ton	8	90	13
B69	Labor Foreman x1 Laborer x3 Operator (crane) x1 Operator (oiler) x1	48	Hyd. Crane, 80 ton	8	3	1
C14A	Carpenter Foreman x1 Carpenters x16 Rodmen x4 Laborers x2 Cement Finisher x1 Operator (medium) x1	200	Gas Engine Vibrator Concrete Pump (small)	16	22	2
2 Clab	Laborer x2	16	None	0	16	0
A2	Laborer x2 Truck Driver x1	24	Flatbed Truck, Gas, 1.5 ton	8	60	20
B66	Operator (light) x1	8	Loader-Backhoe, 40 H.P.	8	216	216
B65	Laborer x1 Truck Driver (light) x1	16	Power Mulcher (large) Flatbed Truck, Gas, 1.5 ton	16	37	37
B32C	Labor Foreman x1 Laborer x2 Operator (medium) x3	48	Grader, 30,000 lbs Tandem Roller, 10 ton Dozer, 200 H.P.	24	1178	589
ECB	Laborer x3	24	Tractor	8	40	13
Dewater	Laborer x1	8	8" Diesel Pump	2	1381	345
Sump Install	Laborer x1 Operator x1	16	Hyd. Excavator, 4.5 CY	8	16	8
Grout/Concrete	Laborer x2 Truck Driver x1	24	Concrete Truck	8	24	8
Eng	Engineering Staff x1.2	10	Side by Side x1	4	5859	2344
B10F	Operator (medium) x1 Laborer x0.5	12	Tandem Roller, 10 ton	8	44	30
B34C	Truck Driver (heavy) x1	8	Truck Tractor, 6x4, 380 H.P. Dump Trailer, 16.5 CY	8	14891	14891
PROJECT TOTAL					**48527**	**40852**

Notes and Assumptions:
1. Crew names in itallics were created by Golder based on experience and are not from RS Means.

Item	Quantity	Assumptions
Labor Total Hours	48,527	Per projected total in cost estimate
Duration of Onsite Construction - Days	691	Per Construction Schedule
Average Daily Crew Size	8	10 hour days
Labor Mobilization Miles	386,744	Average of 70 miles round trip per day
Vehicle Miles On-Site	13,674	1 mile round trip from gate to parking 5 miles per day for CQA tech and Construction Supervisor 10% Contingency for Site visitors (client and engineering support)
Equipment Mobilization Miles - Unloaded	29,598	Average of 300 miles one way for equipment hauling Average 1 load of equipment per working week
Equipment Mobilization Miles - Loaded	29,598	Average of 300 miles one way for equipment hauling Average 1 load of equipment per working week
Total Equipment Miles On-Site	72,514	Average of 6 of 8 crew members running equipment Assume 15 miles per piece of equipment (based on 15 minute round trip path across AP1 10 miles per day used for water truck 5 miles per day for grader
On-Site Haul Truck Miles - Unloaded	9,593	34 CY Haul Truck 2 mile cycle to on-Site CCR Landfill
On-Site Haul Truck Miles - Loaded	9,593	34 CY Haul Truck 2 mile cycle to on-Site CCR Landfill
Off-Site Haul Truck Miles - Unloaded	199,911	16.5 CY Dump Truck 36 mile cycle to off-Site Landfill
Off-Site Haul Truck Miles - Loaded	199,911	16.5 CY Dump Truck 36 mile cycle to off-Site Landfill
Material Delivery Miles - Unloaded	3,500	35 extra trips for seed, fertilizer, lime, mulch, ECBs, straw wattles, and concrete
Material Delivery Miles - Loaded	3,500	35 extra trips for seed, fertilizer, lime, mulch, ECBs, straw wattles, and concrete

ATTACHMENT 2

Drawings



ILLINOIS POWER RESOURCES GENERATING, LLC
COFFEEN POWER PLANT
ASH POND NO. 1 CONSTRUCTION PERMIT APPLICATION

PREPARED BY:

GOLDER ASSOCIATES INC.
701 EMERSON ROAD, SUITE 250
CREVE COEUR, MISSOURI 63141

DRAWING LIST		
NUMBER	TITLE	REVISION
1	TITLE SHEET	A
2	EXISTING CONDITIONS	A
3	ASH REGRADING AND CONTAINMENT PLAN	A
4	FINAL COVER AND STORMWATER PLAN	A
5	CROSS SECTIONS	A
6	DETAILS	A

REFERENCE(S)

1. AERIAL IMAGERY OBTAINED FROM UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) NATIONAL AGRICULTURAL IMAGERY PROGRAM. IMAGERY CAPTURED 7/13/2019.

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2022-07-28	ISSUED FOR PERMIT APPLICATION	ETF	ETF	MWD	MNH

SEAL

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC
COFFEEN POWER PLANT

CONSULTANT
wsp GOLDER

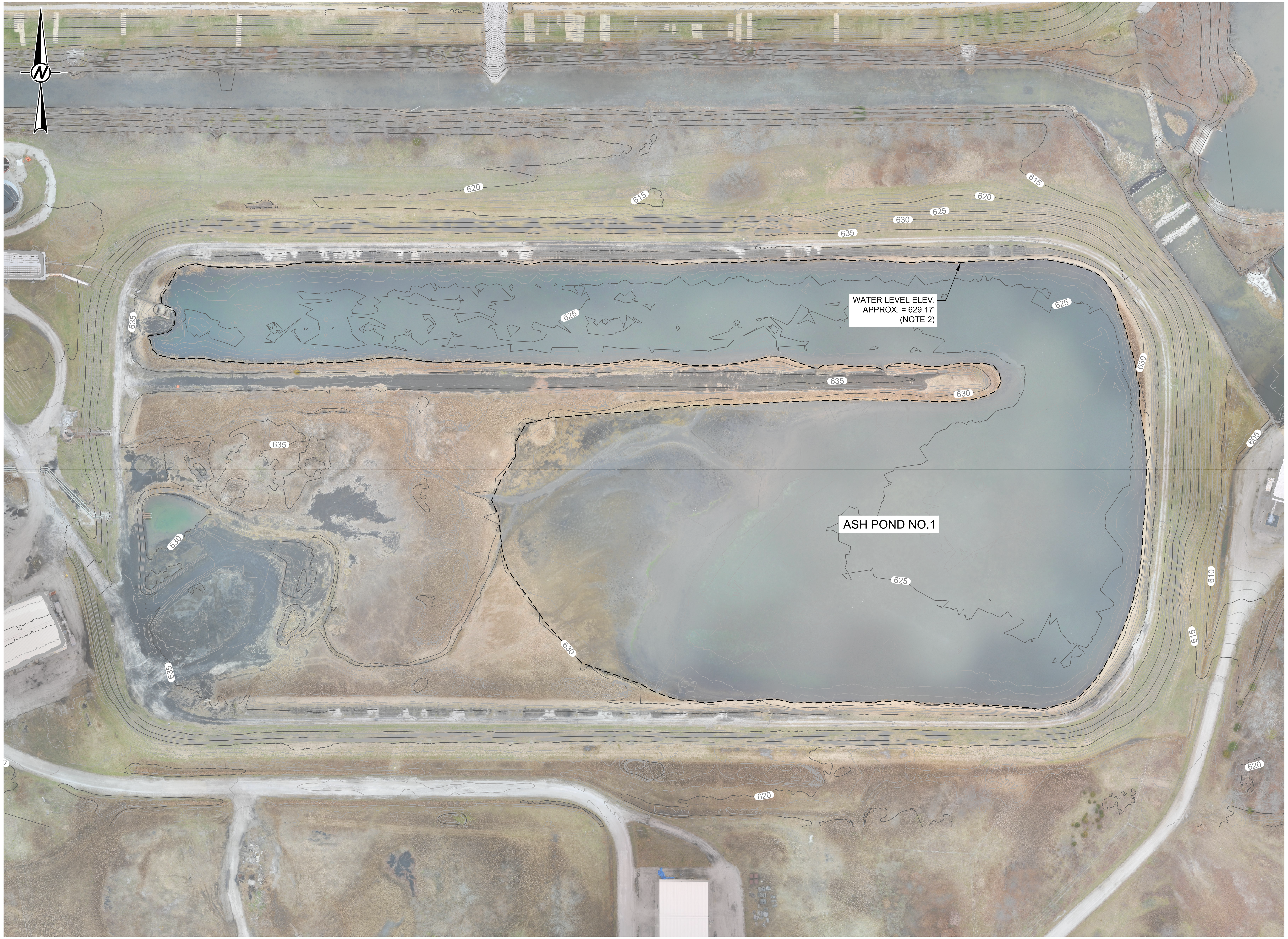
GOLDER ASSOCIATES USA INC.
701 EMERSON ROAD
SUITE 250
CREVE COEUR, MO 63141
[+1] (314) 984 8800

PROJECT
ASH POND NO. 1 CONSTRUCTION PERMIT APPLICATION

TITLE
TITLE SHEET

PROJECT NO. 21465046 | REV. A | DRAWING 1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



LEGEND

600 — EXISTING GROUND CONTOURS (SEE NOTE 1)

- - - - WATER LEVEL (SEE NOTE 2)

NOTE(S)

1. EXISTING CONTOURS ARE A COMPOSITE OF AN AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/3/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 12/3/2020 & 12/4/2020.
2. WATER LEVEL LINE FROM SURVEY COMPLETED BY INGENAE DATED MARCH 24, 2021.

REFERENCE(S)

1. AERIAL IMAGERY OBTAINED FROM AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/3/2020.

0 100 200

1" = 100' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2022-07-28	ISSUED FOR PERMIT APPLICATION	ETF	ETF	MWD	MNH

SEAL

LICENSED PROFESSIONAL ENGINEER
MARK N. HADDOCK
062-058223
7/28/22
STATE OF ILLINOIS

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC
COFFEEN POWER PLANT

CONSULTANT

GOLDER

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SUITE 250
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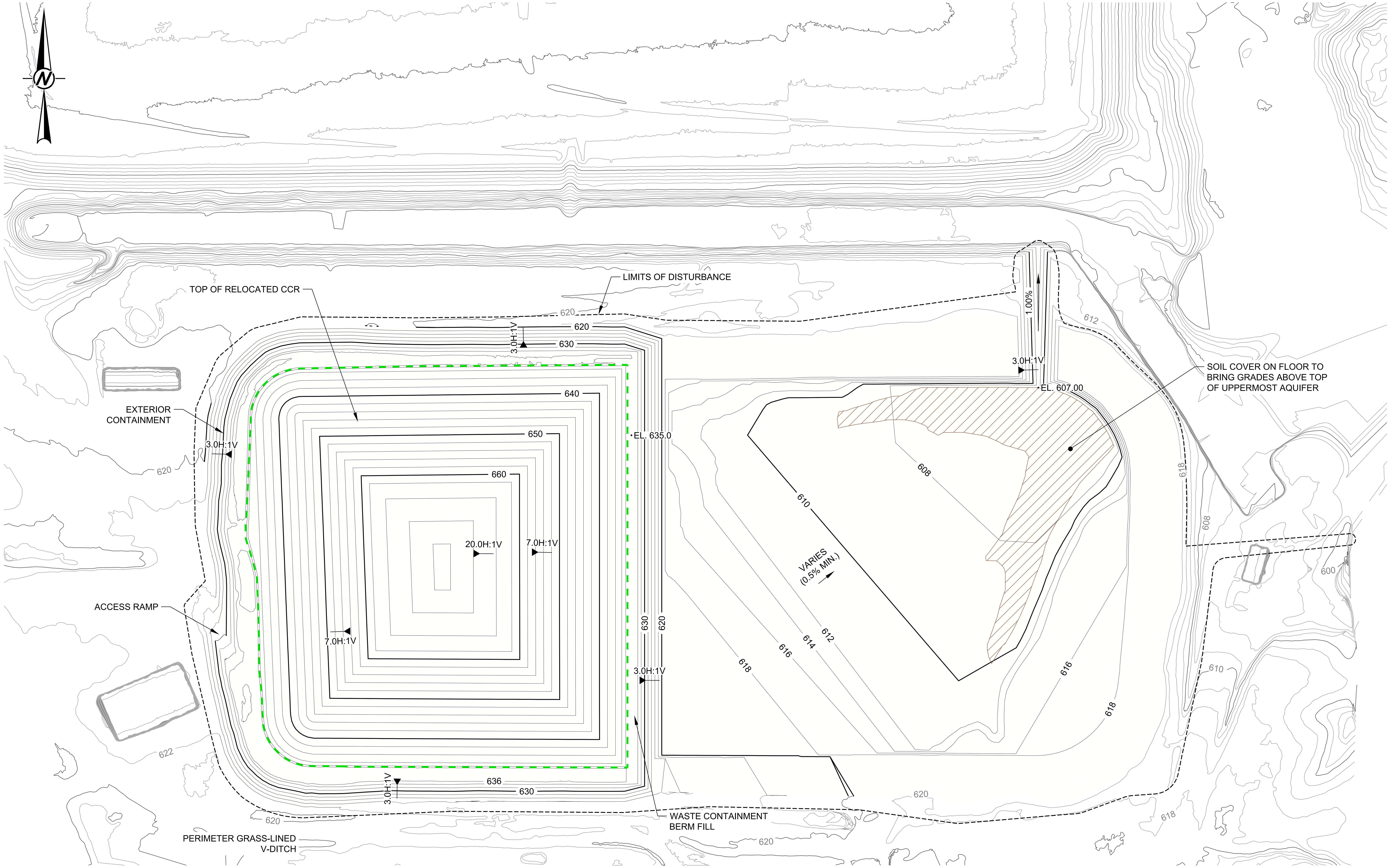
[+1] (314) 984 8800

PROJECT
ASH POND NO. 1 CONSTRUCTION PERMIT APPLICATION

TITLE
EXISTING CONDITIONS

PROJECT NO. 21465046 | REV. A | 2 of 6 | DRAWING 2



LEGEND

- 600 — AP1 CLOSURE IN PLACE GRADES (SEE NOTES 1 AND 2)
- 600 — EXISTING GROUND CONTOURS (SEE NOTE 3)
- LIMITS OF RELOCATED CCR WASTE
- PROPOSED STORMWATER FLOW PATH
- LIMITS OF DISTURBANCE

NOTE(S)

1. THE CLOSURE-IN-PLACE CONCEPT FOR ASH POND NO. 1 (AP1) INVOLVES REMOVAL OF PONDED WATER, CONSTRUCTION OF A CCR WASTE CONTAINMENT BERM, REMOVAL AND RELOCATION OF CCR WASTE AND 1 FT (MAX.) OF SUBSOIL EAST OF THE BERM TO WITHIN THE CONSOLIDATED FOOTPRINT, PLACEMENT OF SOIL COVER ON PORTIONS OF THE AP1 FLOOR EAST OF THE BERM, AND FINAL COVER CONSTRUCTION OVER THE CONSOLIDATED FOOTPRINT.
2. AP1 CLOSURE IN PLACE GRADES INCLUDE RELOCATED CCR WASTE, WASTE CONTAINMENT BERM, SOIL COVER OVER THE TOP OF THE UPPERMOST AQUIFER, AND PERIMETER GRADING AROUND AP1 EXTERIOR SIDE SLOPES.
3. EXISTING CONTOURS ARE A COMPOSITE OF AN AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/3/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 12/3/2020 & 12/4/2020.

0 100 200
1" = 100' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2022-07-28	ISSUED FOR PERMIT APPLICATION	ETF	ETF	MWD	MNH

SEAL

LICENSED PROFESSIONAL ENGINEER
MARK N. HADDOCK
062-058223
7/28/22
STATE OF ILLINOIS

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC
COFEEN POWER PLANT

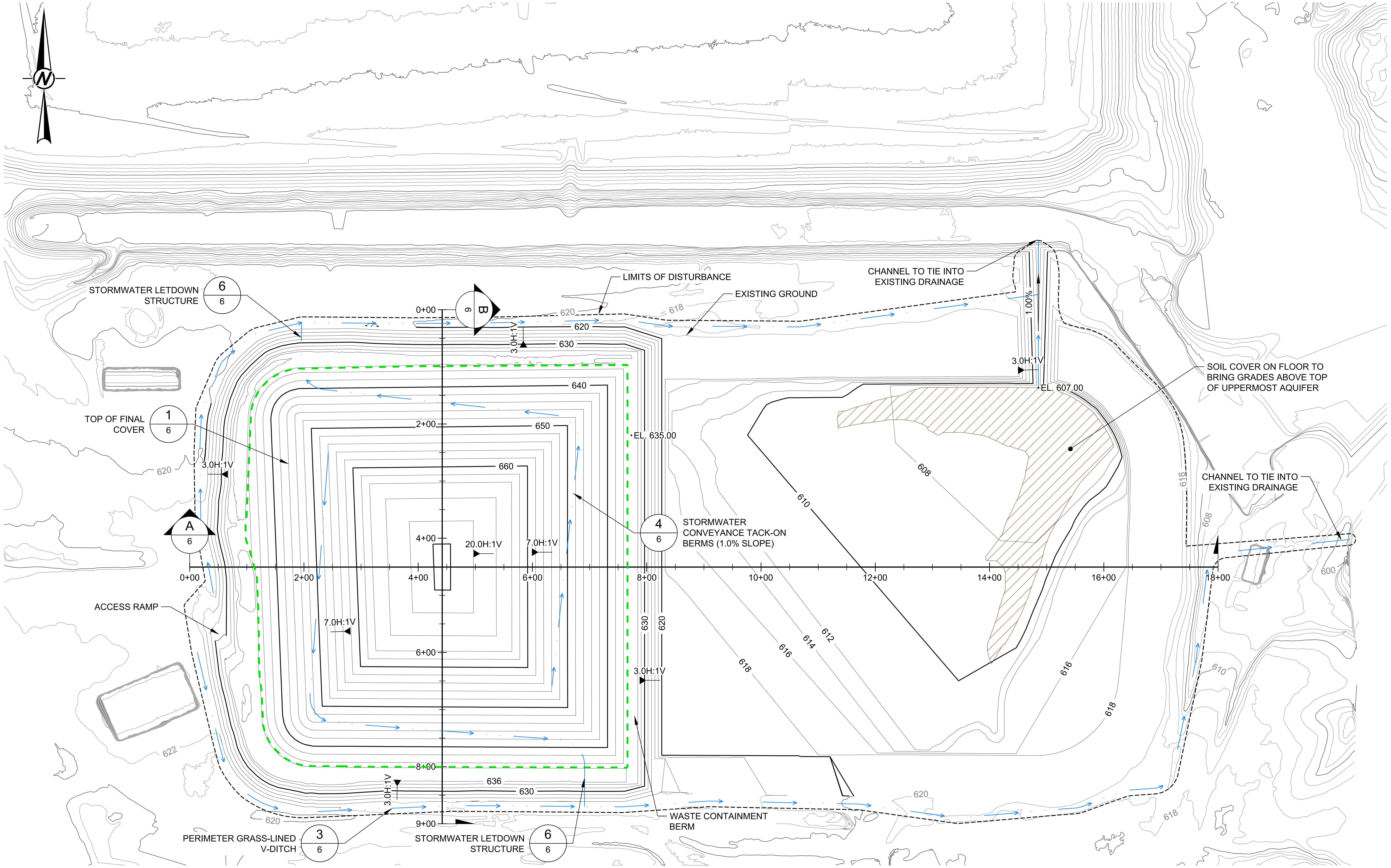
CONSULTANT
WSP GOLDER

GOLDER ASSOCIATES USA INC.
701 EMERSON ROAD
SUITE 250
CREVE COEUR, MO 63141
[+1] (314) 984 8800

PROJECT
ASH POND NO. 1 CONSTRUCTION PERMIT APPLICATION

TITLE
ASH REGRADING AND CONTAINMENT PLAN

PROJECT NO. 21465046 | REV. A | 3 of 6 | DRAWING 3



0 100 200

1" = 100' FEET

LEGEND

- 600 — FINAL CLOSURE IN PLACE GRADES (SEE NOTES 1 AND 2)
- 600 — EXISTING GROUND CONTOURS (SEE NOTE 3)
- LIMIT OF RELOCATED CCR WASTE
- PROPOSED STORMWATER FLOW PATH
- LIMITS OF DISTURBANCE

NOTE(S)

1. THE CLOSURE-IN-PLACE CONCEPT FOR ASH POND NO. 1 (AP1) INVOLVES REMOVAL OF PONDED WATER, CONSTRUCTION OF A CCR STRUCTURAL WASTE CONTAINMENT BERM, REMOVAL AND RELOCATION OF ASH AND 1 FT (MAX.) OF SUBSOIL EAST OF THE BERM TO WITHIN THE CONSOLIDATED FOOTPRINT, PLACEMENT OF SOIL COVER ON PORTIONS OF AP1 FLOOR EAST OF THE BERM, AND FINAL COVER CONSTRUCTION.
2. FINAL GRADES INCLUDE FINAL COVER, WASTE CONTAINMENT BERM, SOIL COVER OVER TOP OF UPPERMOST AQUIFER, AND PERIMETER GRADING AROUND AP1 EXTERIOR SIDE SLOPES.
3. EXISTING CONTOURS ARE A COMPOSITE OF AN AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/3/2020, TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 12/3/2020 & 12/4/2020.
4. THE PROPOSED STORMWATER DRAINAGE CONCEPT IS TO SHED WATER INTO EXISTING DRAINAGE CHANNELS NORTH AND EAST OF THE FACILITY. STORMWATER COLLECTED WITHIN AP1 WILL BE DIRECTED INTO AN OPEN CHANNEL THAT BREACHES THE CONSTRUCTED BERM TO CONNECT TO THE EXISTING DRAINAGE.

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2022-07-28	ISSUED FOR PERMIT APPLICATION	ETF	ETF	MWD	MNH

SEAL

LICENSED PROFESSIONAL ENGINEER MARK N. HADDOCK 062-058223 STATE OF ILLINOIS 7/28/22

CLIENT

ILLINOIS POWER RESOURCES GENERATING, LLC
COFFEEN POWER PLANT

CONSULTANT

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PROJECT

ASH POND NO. 1 CONSTRUCTION PERMIT APPLICATION

TITLE

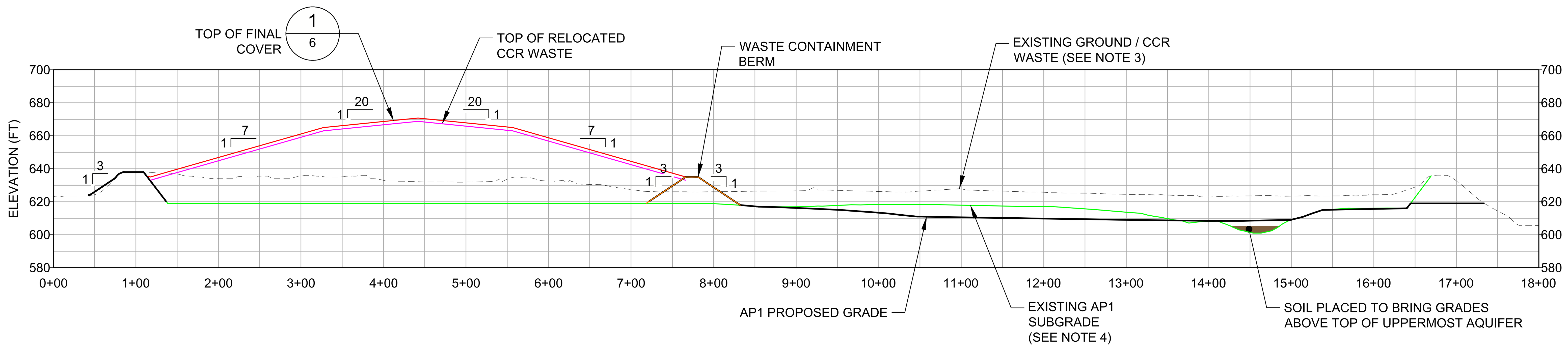
FINAL COVER AND STORMWATER PLAN

PROJECT NO. 21465046 | REV. A | 4 of 6 | DRAWING 4

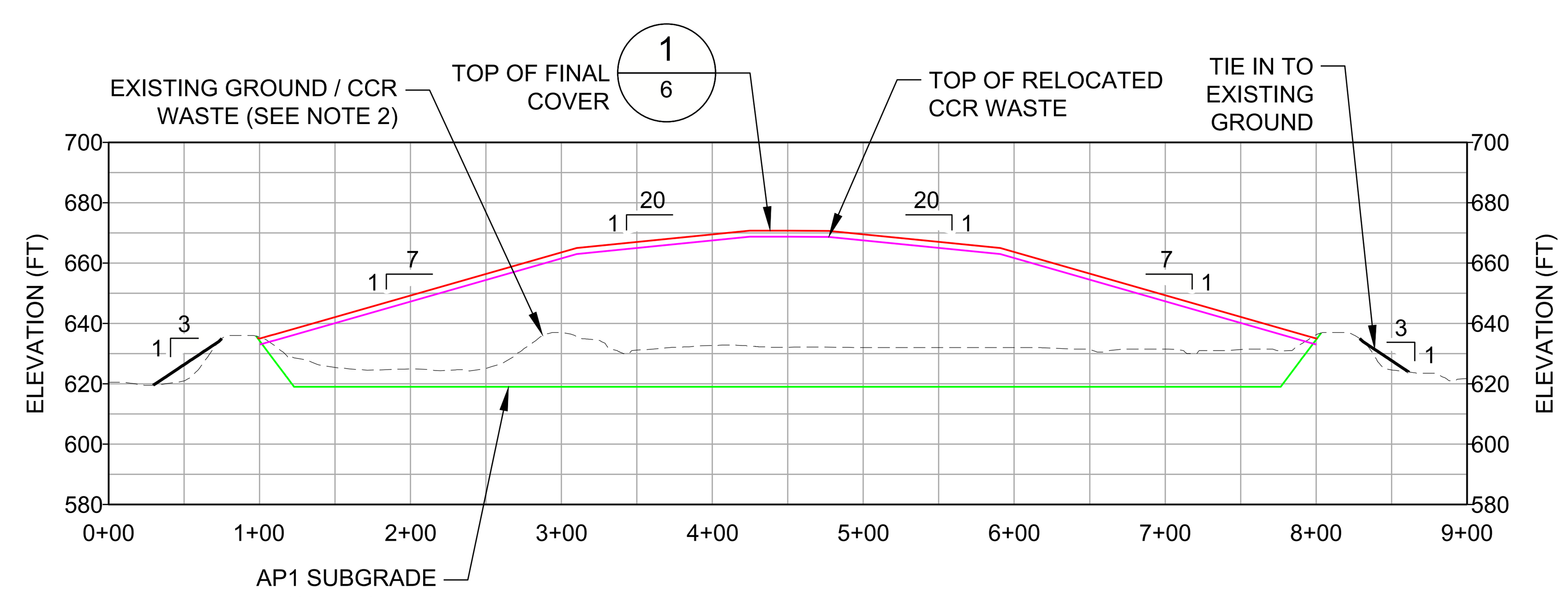
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

NOTE(S)

1. THE CLOSURE-IN-PLACE CONCEPT FOR ASH POND NO.1 (AP1) INVOLVES REMOVAL OF PONDED WATER, CONSTRUCTION OF A WASTE CONTAINMENT BERM, REMOVAL AND RELOCATION OF CCR WASTE AND 1 FT (MAX.) OF SUBSOIL EAST OF THE BERM TO WITHIN THE CONSOLIDATED FOOTPRINT, PLACEMENT OF SOIL COVER ON PORTIONS OF AP1 FLOOR EAST OF THE BERM, AND FINAL COVER CONSTRUCTION OVER THE CONSOLIDATED FOOTPRINT.
2. AP1 BASE OF ASH GRADES WERE DEVELOPED FROM THE 1963 EARTHWORK AND GRADING PLANS.
3. EXISTING CONTOURS ARE A COMPOSITE OF AN AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/3/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 12/3/2020 & 12/4/2020.



SCALE 1" = 100'
VERT. SCALE X2
A
6
SECTION A



SCALE 1" = 100'
VERT. SCALE X2
B
6
SECTION B

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2022-07-28	ISSUED FOR PERMIT APPLICATION	ETF	ETF	MWD	MNH

SEAL

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC
COFFEEN POWER PLANT

CONSULTANT
WSP GOLDER

GOLDER ASSOCIATES USA INC.
701 EMERSON ROAD
SUITE 250
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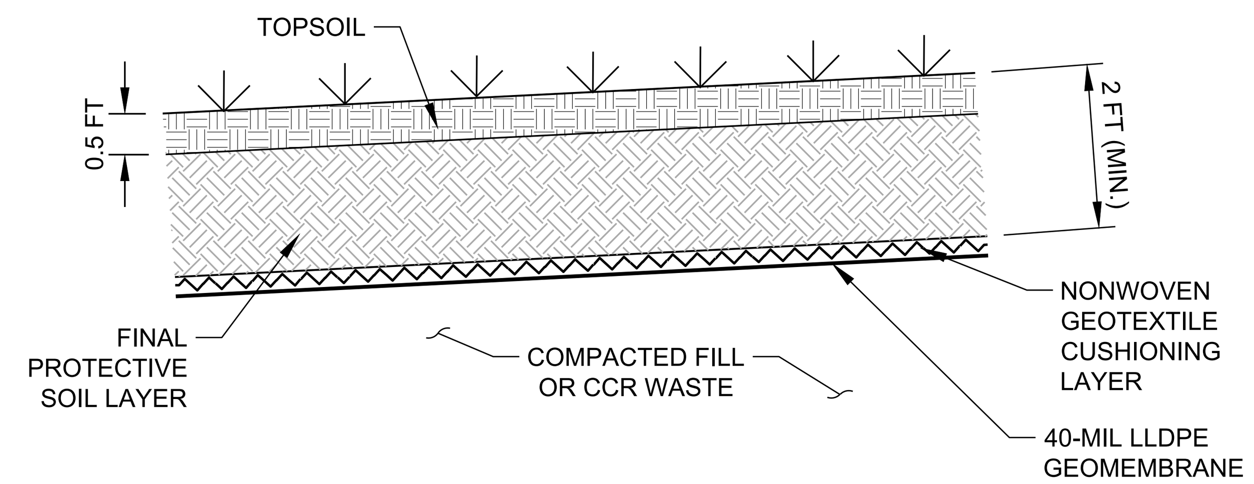
[+1] (314) 984 8800

PROJECT
ASH POND NO. 1 CONSTRUCTION PERMIT APPLICATION

TITLE
CROSS SECTIONS

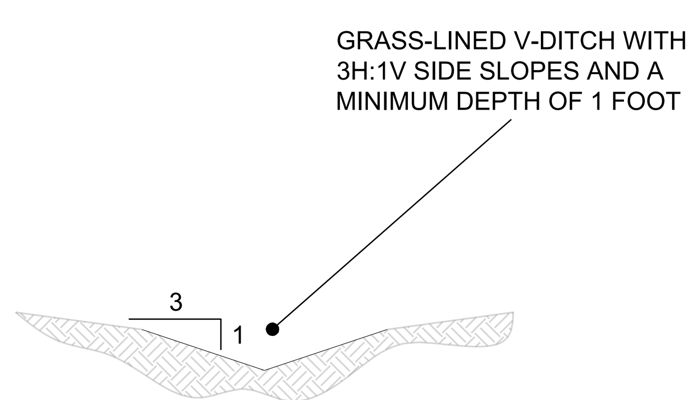
PROJECT NO. 21465046
REV. A
5 of 6
DRAWING 5

NOTE(S)
1. RR3 AND RR4 ARE ROCK MATERIALS DEFINED BY ILLINOIS DEPARTMENT OF TRANSPORTATION (IDOT).
2. PERIMETER CHANNEL SHOULD BE MIRRORED WHERE FLOW IS IN THE OPPOSITE DIRECTION.

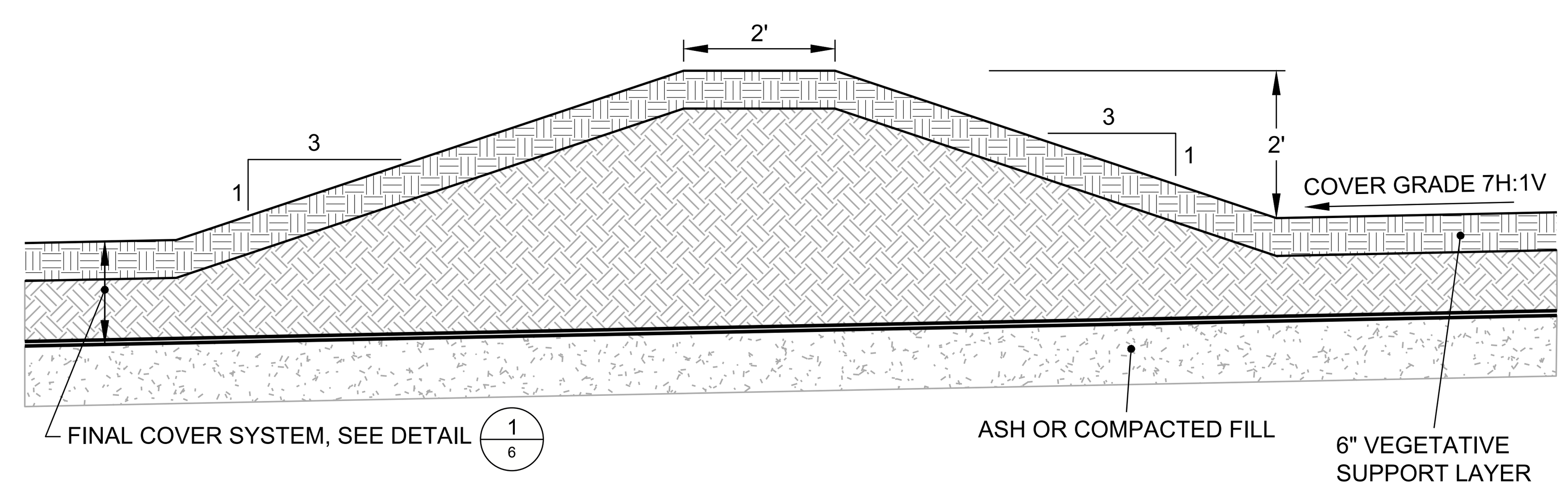


SCALE N.T.S. 1/6 FINAL COVER DETAIL

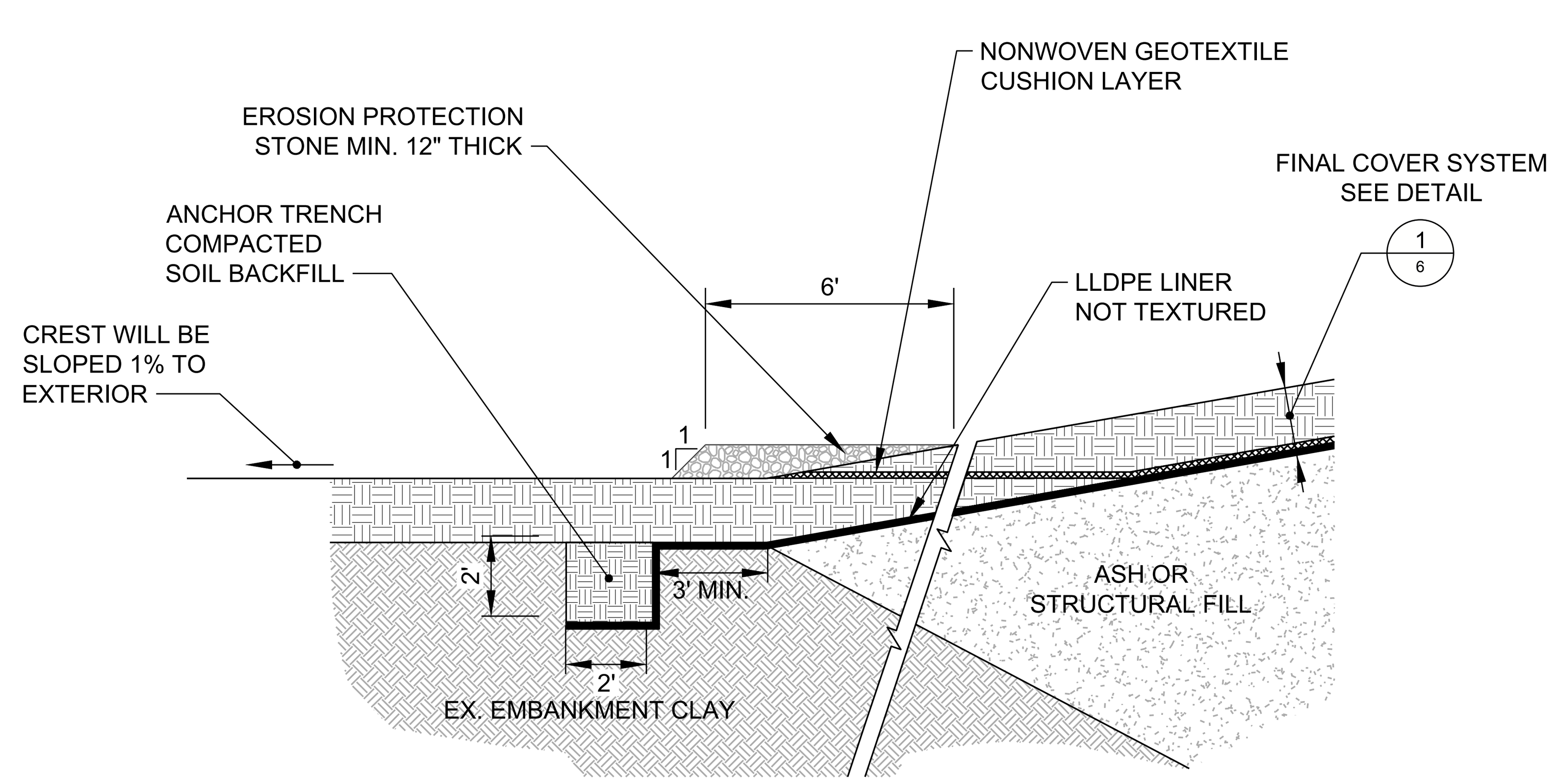
NOTE
THE FINAL PROTECTIVE SOIL LAYER WILL BE COMPOSED OF LOCALLY AVAILABLE SOILS COMPACTED TO BETWEEN 80% AND 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY FOR ESTABLISHMENT OF VEGETATION AND PROTECTION OF THE GEOSYNTHETICS.



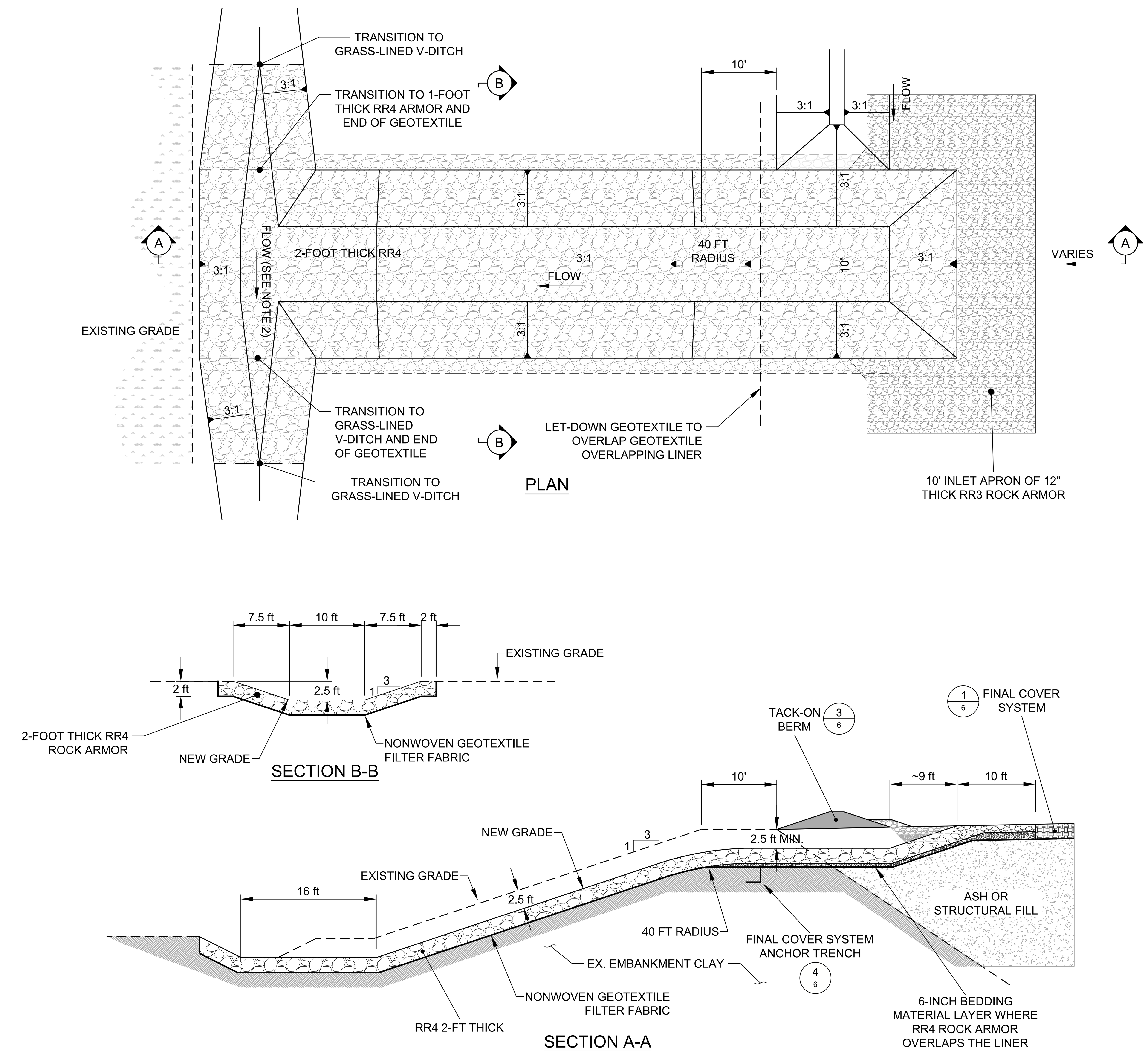
2/6 GRASS-LINED V-DITCH (TYP)



3/6 TACK-ON BERM DETAIL (TYP)



4/6 ANCHOR TRENCH DETAIL
NTS



5/6 LET-DOWN STRUCTURE DETAIL (TYP)

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2022-07-28	ISSUED FOR PERMIT APPLICATION	ETF	ETF	MWD	MNH

SEAL
LICENSED PROFESSIONAL ENGINEER MARK N. HADDOCK 062-058223 STATE OF ILLINOIS 7/28/22

CLIENT
ILLINOIS POWER RESOURCES GENERATING, LLC
COFFEEN POWER PLANT

CONSULTANT
WSP GOLDER
GOLDER ASSOCIATES USA INC.
701 EMERSON ROAD
SUITE 250
CREVE COEUR, MO 63141
[+1] (314) 984 8800

PROJECT
ASH POND NO. 1 CONSTRUCTION PERMIT APPLICATION

TITLE
DETAILS

PROJECT NO. 21465046 REV. A 6 of 6 DRAWING 6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

Path: C:\Users\EVForney\Golder Associates\21465046.Vistra Coffeen Part 845 Apps IL - 5 Technical Work\DRAFTING\PRODUCTION\ | File Name: CE-PROD-AP1-CIP-DETAILS.dwg | Last Edited By: evforney Date: 2022-07-11 Time:12:08:48 PM | Printed By: EVForney Date: 2022-07-12 Time:9:25:15 AM

ATTACHMENT 3

Slope Stability Calculations

CALCULATION

DATE May 12, 2022	**Project No.** 21465046
PREPARED BY: Elizabeth Hanna	
CHECKED BY Michael Dreyer	
REVIEWED BY: Jacob Sauer	**CLIENT NAME: Illinois Power Resources Generating, LLC**

SLOPE STABILITY ANALYSIS – ASH POND NO. 1

1.0 OBJECTIVE

Evaluate slope stability for Ash Pond No. 1 (AP1) closure design in terms of global stability and veneer stability for the final cover system and containment berm.

2.0 METHODOLOGY

Limit-equilibrium slope stability analyses were performed using Spencer's method of slices (Spencer 1967) in Slide2, a two-dimensional slope stability modeling software platform (Rocscience Inc. 2022). Spencer's method of slices considers both moment and force equilibrium. It is common geotechnical practice to analyze the stability of embankment slopes using limit-equilibrium methods.

2.1 Target Factors of Safety

The following target factors of safety are based on the values presented in Illinois Administrative Code Title 35, Subsection 845.460(a), as pertinent to AP1 following closure:

- Target minimum factor of safety under static long-term conditions = 1.5
- Target minimum factor of safety under seismic loading conditions = 1.0

The locally available soils that will be used for closure construction have relatively high silt and clay contents. Therefore, they are not expected to be susceptible to liquefaction.

3.0 SLOPE STABILITY ANALYSIS

3.1 Geometry

A typical cross-section through the containment berm along the east end of the closure footprint was selected for the slope stability analysis. This is identified as the critical cross-section for slope stability following closure of AP1.

The containment berm is designed with 3H-to-1V slopes and a crest width of 25 feet. The final cover system will be sloped at 7H:1V. The base of the final cover system is designed to meet the upstream edge of the containment berm crest and terminate with a 3H-to-1V slope to the crest. The final cover system will consist of the following components (from top to bottom):

- 2 feet of protective soil cover, anticipated to consist primarily of locally available low-plasticity silt or clay
- Nonwoven geotextile cushioning layer
- 40-mil textured LLDPE geomembrane

Downstream of the containment berm, the closure grades represent soil fill (locally available low-plasticity silt or clay) over the top of native soils. Previous stability analyses (AECOM 2016) determined that AP1 is underlain by a native clay layer, a relatively thin layer (approximately 3 feet) of soft native clay, and till. For simplification of the model geometry, the final cover system is represented as a layer having a thickness of 2 feet.

For slope stability analysis, the phreatic surface is modeled along the top of the native clay layer. Within the closure footprint, the CCR will be dewatered. Downstream of the containment berm, elevated groundwater is expected to present as surface water that will be managed in a stormwater channel, resulting in phreatic levels near the ground surface.

3.2 Approach and Input Parameters

The slope stability analysis uses the following approach and input parameters:

- Circular and non-circular slip surfaces are evaluated. Analysis of non-circular slip surfaces enables evaluation of veneer stability for the final cover system.
- Earthquake (seismic) loading conditions are simulated using a pseudo-static approach. Pseudo-static stability analyses apply a constant horizontal force to the system to represent the forces generated during an earthquake event, with the magnitude of the applied force typically related to the peak ground acceleration (PGA) of a specific earthquake hazard risk. A pseudo-static limit equilibrium analysis was conducted to evaluate the stability of the slope under a seismic load for the earthquake hazard representing a 2% probability of exceedance in 50 years (equaling 0.212g; i.e. a return period of 2475 years) based on the United States Geological Survey (USGS) Hazard Maps. As recommended by Hynes-Griffin and Franklin (1984), a horizontal force of ½ of the maximum PGA (EPA 1995) was used in the analysis (0.106g). In addition, the shear strength properties of the materials were reduced by 20% per the method’s requirements.
- Material properties of soils are selected based on previous stability calculations (AECOM 2016). Cohesion is neglected for conservatism.
- For conservatism, undrained strengths are applied for the ash. A vertical stress ratio (ratio of undrained strength to initial vertical effective stress) of 0.40 is used, consistent with values used in the previous stability analyses (AECOM 2016).
- Strength parameters for the geosynthetic interfaces included in the final cover system associated with the closed AP1 are evaluated from laboratory testing data published by Koerner and Narejo (2005) and summarized in Table 1.

Table 1: Characteristic Geosynthetic Interface Strengths (Koerner and Narejo 2005)

Interface	Peak Friction Angle	Peak Adhesion
Textured geomembrane against cohesive soil	18 degrees	209 psf
Textured geomembrane against granular soil	28 degrees	0 psf
NWNP geotextile against cohesive soil	30 degrees	104 psf
NWNP geotextile against textured geomembrane	25 degrees	167 psf

- The lowest geosynthetic interface strength parameters in the final cover system from Table 1 are selected for analysis. Adhesion is conservatively neglected for all geosynthetic interfaces.

A summary of material properties used in the slope stability analysis is presented in Table 2.

Table 2: Material Properties

Material	Unit Weight	Friction Angle	Cohesion or Adhesion	Vertical Stress Ratio
Embankment	135	31	0	N/A
Ash	112	N/A	N/A	0.40
Protective Cover	120	25	0	N/A
Native Clay	125	32	0	N/A
Soft Native Clay	125	30	0	N/A
Till	135	40	0	N/A

3.3 Results and Conclusions

The factor of safety for slope stability under static loading conditions is calculated as 1.8, as shown in Figure 1. The critical slip surface is surficial on the downstream face of the containment berm. The factor of safety for global stability under seismic loading conditions is calculated as 1.1, as shown in Figure 2. As with the static analysis, the critical slip surface is surficial on the downstream face of the containment berm.

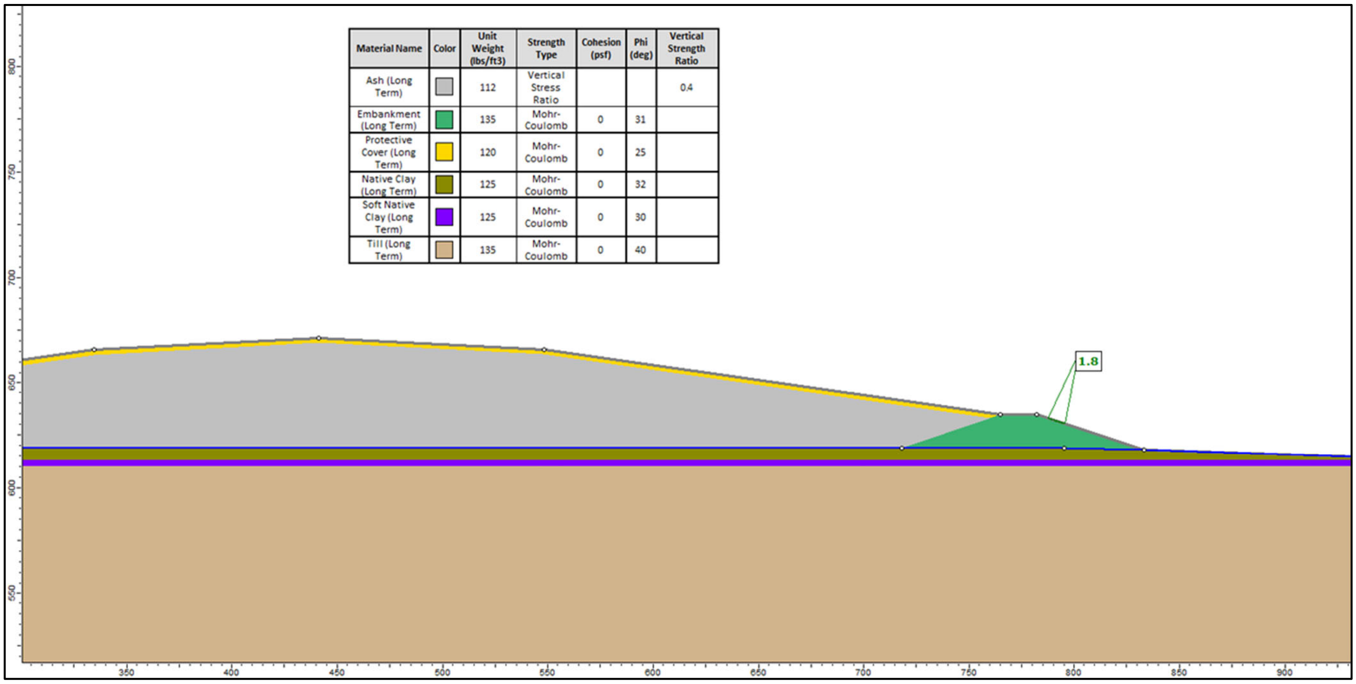


Figure 1: Analysis Result - Static Loading

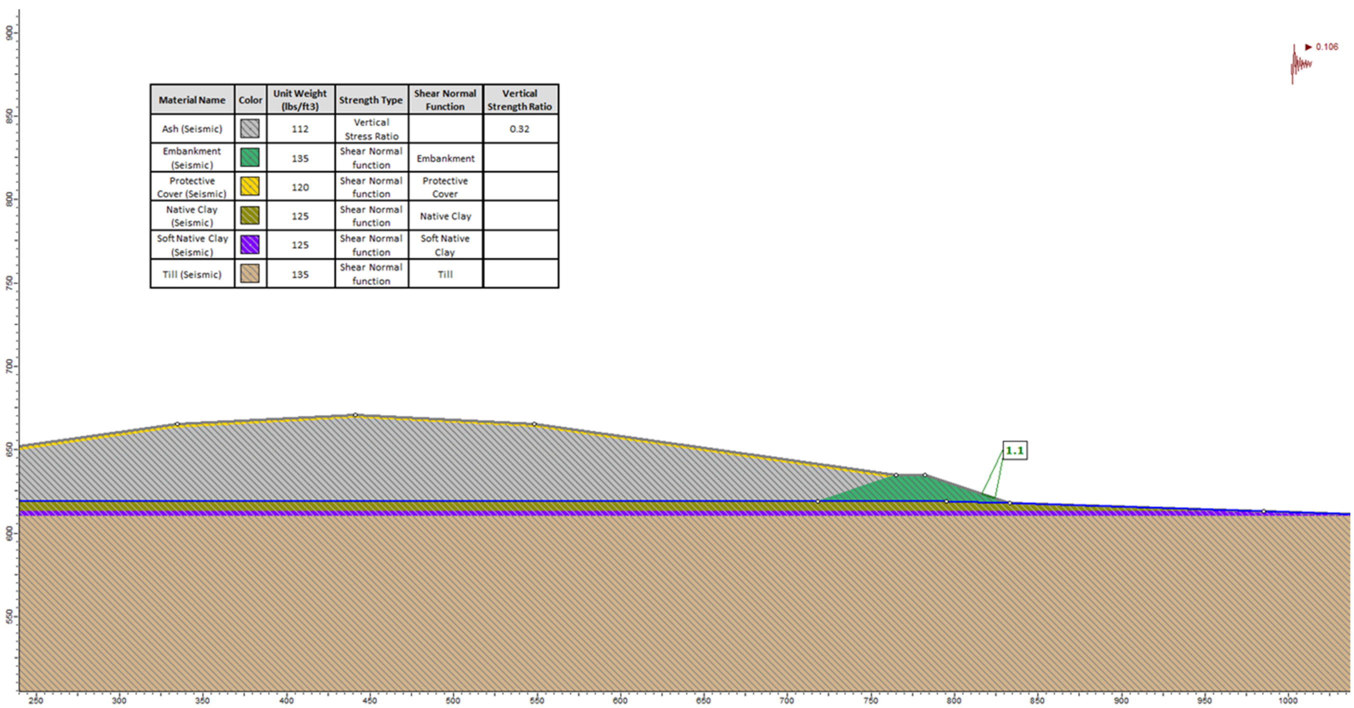


Figure 2: Analysis Result - Seismic Loading

Based on the factors of safety computed using the methods and assumptions described, the closed AP1 is expected to remain stable with an acceptable safety margin for global and veneer stability. A factor of safety greater that 1.5 was computed for static loading conditions. A factor of safety greater than 1.0 was computed for seismic loading conditions.

4.0 REFERENCES

AECOM 2016. Geotechnical Report Coffeen Power Station AP1. October 2016.

RocScience Inc. 2022. Slide2 Version 9.022. Build date: April 20, 2022.

Koerner, G.R. and Narejo, D. 2005. Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces. GRI Report #30, 2005.

Mesri, G. 1989. A Reevaluation of $S_{u(mob)} = 0.22\sigma'_p$ Using Laboratory Shear Tests. Canadian Geotechnical Journal, No. 26, pp. 162-164.

Spencer, E. 1967. A Method of Analysis of the Stability of Embankments Assuming Parallel Inter-Slice Forces. Geotechnique, Vol. XVII, No. 1, pp. 11-26.

United States Geological Survey (USGS). 2014. Unified Hazard Tool. Available online: https://earthquake.usgs.gov/hazards/interactive/index.php (accessed May 11, 2022).

ATTACHMENT 4

Hydrologic Calculations

CALCULATION

DATE	May 10, 2022	**PREPARED BY**	Gustavo Guerrero, EIT
PROJECT NO.	21465046	**CHECKED BY**	DVS
CLIENT NAME	Illinois Power Resource Generating, LLC	**REVIEWED BY**	MWD

HYDROLOGY CALCULATIONS FOR CLOSURE OF ASH POND NO. 1 AT THE COFFEEN POWER PLANT

1.0 OBJECTIVE

Evaluate the hydrology (routing of stormwater runoff) after closure of Ash Pond No. 1 (AP1) at the Coffeen Power Plant. These calculations were performed to support the closure plan by determining the minimum channel dimensions.

2.0 METHODOLOGY

The areas contributing to AP1 were delineated in AutoCAD, as shown on Figure 1. The ground conditions were used to estimate a lag time using NRCS methodology (NRCS 1986). The calculations for the hydrologic parameters are included in Tables 1 and 2. The hydrologic parameters were used to model the stormwater runoff reporting to proposed channel to the north and east of the closed pond during the 25-year, 24-hour design storm event using HEC-HMS software (USACE 2021). The channels were analyzed using Manning's equation to evaluate the steady-state hydraulics.

3.0 INPUTS AND ASSUMPTIONS

Information and assumptions regarding input parameters used in the analyses include the following:

- A curve number of 58 was used to be consistent with the closed condition of Meadow and hydrologic soil group B (NRCS 1986) based on a review of the Web Soil Survey in the vicinity of AP1 (NRCS 2021).
- The design storm (25-year, 24-hour) depth from NOAA Atlas 14 (NOAA 2006) is 5.33 inches.
- Lag time was estimated using NRCS TR-55 methodology.
- Manning's number used for channel design was 0.030 for capacity and 0.035 for depth assuming a grass-lined channel.

4.0 RESULTS AND CONCLUSIONS

The HEC-HMS model results provide the estimated peak flow from the 25-year, 24-hour design storm to discharge points of interest:

- The peak flow rate at the proposed stormwater channel for AP1 is estimated as 32.2 cubic feet per second (cfs). This peak flow rate accounts for the AP1 and AP1N basins
- The peak flow rate at the proposed stormwater channel for AP1S basin is estimated as 10.0 cfs.

The output from the HEC-HMS model is shown in Table 3.

The channels were designed with dimensions as indicated in Table 4. Freeboard is shown to be at least 1 foot and at least one-half of the velocity head. The calculations indicate that the channels should function as designed.

5.0 REFERENCES

National Oceanic and Atmospheric Administration (NOAA). 2006. Precipitation-Frequency Atlas of the United States, Volume 2 Version 3.0.

Natural Resources Conservation Service (NRCS). 1986. Urban Hydrology for Small Watersheds. 2nd edition Technical Release 55). June.

Natural Resources Conservation Service (NRCS). 2021. Web Soil Survey. Available online: http://websoilsurvey.sc.egov.usda.gov/. Accessed September 22, 2021.

United States Army Corps of Engineers (USACE). 2021. Hydrologic Modeling System (HEC-HMS), Version 4.9.0. Release date: Jan 21, 2022.

TABLES

Table 1: Subbasin Summary Table

Illinois Power Resource Generating, LLC
Gypsum Management Facility Ponds
Project Number: 21465046

Date:	5/10/22
By:	GMG
Chkd:	DVS
Apprvd:	MWD

Design Storm **25 -Year Reccurence Interval**

Storm Duration (hours)	2-Year Depth (inches)	25 -Year Depth (inches)	Storm Distribution
24	3.14	5.33	II

Subbasin ID	Subbasin Area (ft^2)	Subbasin Area (acres)	Subbasin Area (sq mile)	CN = 58 Meadow HSG B (acres)	CN = 99 Open Water or Impervious (acres)	Composite SCS Curve No.	$S = \frac{1000}{CN} - 10$	Unit Runoff Q (in)	Runoff Volume (ac-ft)	Runoff Volume (ft^3)
AP-1	823,691	18.9	0.0295	18.91	0.00	CN = 58	7.24	1.35	2.13	92,984
AP-1N	389,796	8.9	0.0140	8.95	0.0	CN = 58	7.24	1.35	1.01	44,003
AP-1S	315,526	7.2	0.0113	7.24	0.0	CN = 58	7.24	1.35	0.82	35,619
		0.00	0.0000							
		0.00	0.0000							
		0.00	0.0000							
Total:	1,529,013	35.1	0.05						3.96	172,605

TABLE 2
BASIN TIME OF CONCENTRATION CALCULATIONS

Table 2: Basin Time of Concentration Calculations
Illinois Power Resource Generating, LLC
Gypsum Management Facility Ponds
Project Number: 21465046

Date:	5/10/22
By:	GMG
Chkd:	DVS
Apprvd:	MWD

Subbasin ID	Subbasin Area (sq mile)	Composite Curve Number	Total Lag (0.6*Tc) (min)	Total Travel Time (min)	Flow Segment 1: Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)
Ash Pond	0.0295	58	14.5	24.1	Sheet	100	0.046	G	Bermuda Grass		15.9
AP-1N	0.0140	58	8.1	13.5	Sheet	100.0	0.080	G	Bermuda Grass		12.7
AP-1S	0.0113	58	8.0	13.3	Sheet	100.0	0.084	G	Bermuda Grass		12.5

Subbasin ID	Flow Segment 2: Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)
Ash Pond	Shallow	285	0.157	U	Unpaved		0.7
AP-1N	Shallow	265.0	0.123	U	Unpaved		0.8
AP-1S	Shallow	275.0	0.114	U	Unpaved		0.8

Subbasin ID	Flow Segment 3: Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)
Ash Pond	Shallow	745	0.016	U	Unpaved		6.1
AP-1N	Channel	1900	0.006	G	Grass-lined	0.55	14.6
AP-1S	Channel	2540	0.010	G	Grass-lined	0.45	16.9

Subbasin ID	Flow Segment 3: Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)
Ash Pond	Channel	240	0.008	G	Grass-lined	0.70	1.3
AP-1N							
AP-1S							

TABLE 3
FLOW RESULTS FROM HEC-HMS

Illinois Power Resource Generating, LLC
Gypsum Management Facility Ponds
Project Number: 21465046

Date:	5/10/22
By:	GMG
Chkd:	DVS
Apprvd:	MWD

HEC-HMS Basin Model:	GMF
HEC-HMS Met. Model:	25-yr, 24-hr
HEC-HMS Control Specs:	48-hr, 6-min

Hydrologic Element	Drainage Area (sq mile)	Peak Discharge (cfs)	Time of Peak	Total Volume (ac-ft)
Ash Pond	0.030	20.4	02May2050, 00:12	1.35
Ash Pond North	0.014	12.3	02May2050, 00:00	1.35
Ash Pond South	0.011	10	02May2050, 00:00	1.35
Ash Pond South-Sink	0.011	10	02May2050, 00:00	1.35
Ash Pond + North-Sink	0.044	32.2	02May2050, 00:06	1.35

Table 4
Channel Hydraulic Calculations

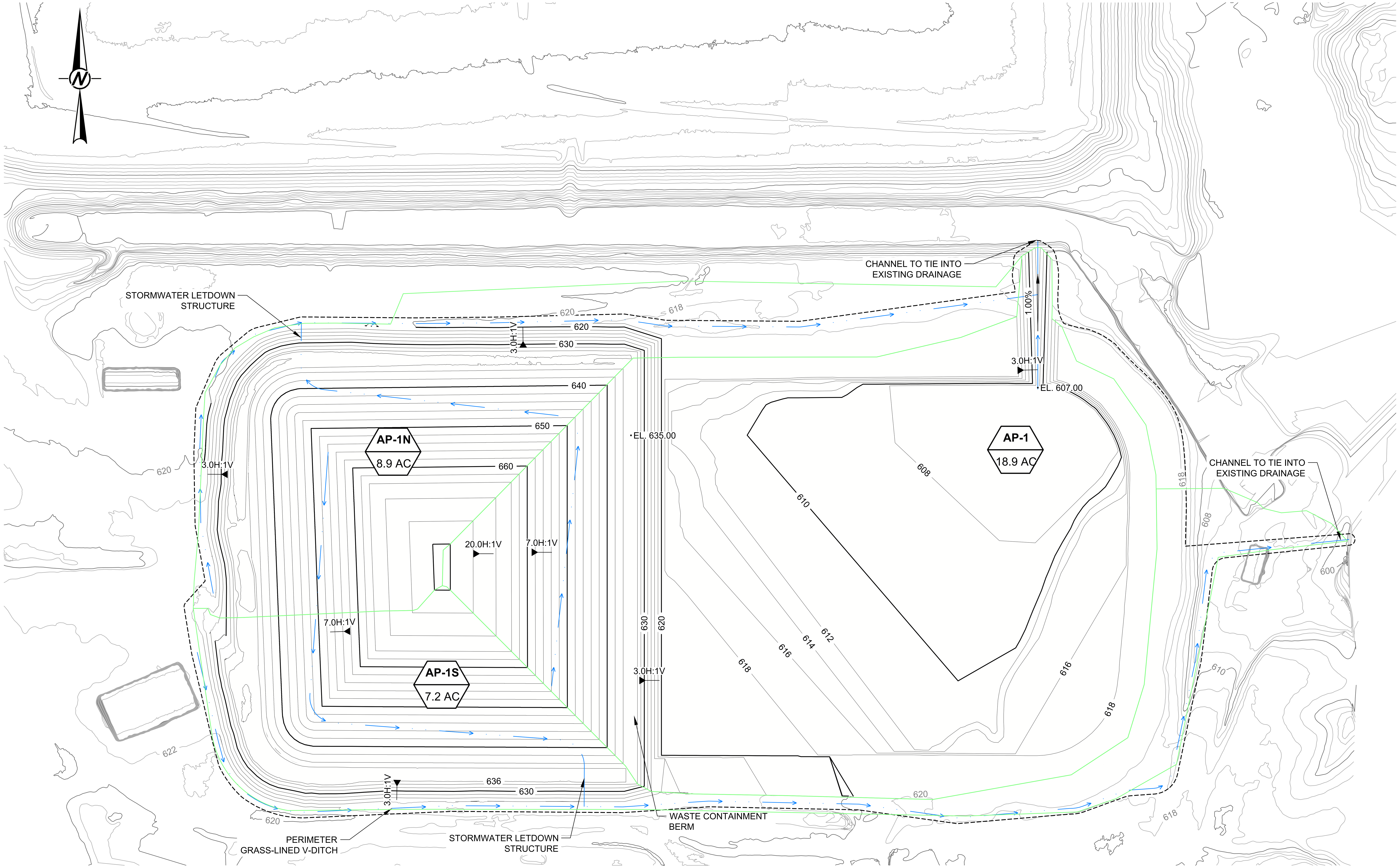
Illinois Power Resource Generating, LLC
Gypsum Management Facility Ponds
PROJECT NO.: **21465046**

Date:	5/10/22
By:	GMG
Chkd:	DVS
Apprvd:	MWD

Date:	5/10/22
By:	GMG
Chkd:	DVS
Apprvd:	MJG

			Channel Design Geometry						Channel Roughness Parameters				Hydraulic Calculations							Channel Evaluations	
Reach Designation	Q25 from HEC-HMS (cfs)	HEC HMS Element ID for Q	Approximate Channel Length (ft)	Bed Slope (ft/ft)	Left Side Slope (H:1V)	Right Side Slope (H:1V)	Bottom Width (ft)	Minimum Channel Depth (ft)	Design Channel Lining		Mannings 'n' for Capacity (Depth Calculation)	Mannings 'n' for Stability (Velocity Calculation)	Maximum Velocity (ft/sec)	Maximum Normal Flow Depth (ft)	Froude Number	Normal Depth Shear Stress (lb/ft^2)	Stream Power (W/m^2)	Top Width of Flow (ft)	Top Width of Channel (ft)	Available Freeboard (ft)	
AP-1N Channel	12.3	Ash Pond North	1900	0.006	3.0	3.0	0	2.5	G	Grass-lined	0.035	0.030	2.7	1.32	0.59	0.47	18.26	7.9	15.0	1.2	
AP-1S Channel	10.0	Ash Pond South	2540	0.010	3.0	3.0	0	2.5	G	Grass-lined	0.035	0.030	3.1	1.10	0.76	0.69	31.32	6.6	15.0	1.4	
Ash Pond Channel	32.2	Ash Pond + North-Sink	240	0.008	3.0	3.0	0	12.0	G	Grass-lined	0.035	0.030	3.9	1.76	0.75	0.92	51.53	10.6	72.0	10.2	

FIGURE



LEGEND

600	FINAL CLOSURE IN PLACE GRADES (SEE NOTES 1 AND 2)
600	EXISTING GROUND CONTOURS (SEE NOTE 3)
	PROPOSED STORMWATER FLOW PATH
	LIMITS OF DISTURBANCE
	BASIN DELINEATION
AP-1	BASIN ID
X.X AC	BASIN ACREAGE

NOTE(S)

1. FINAL GRADES INCLUDE FINAL COVER, WASTE CONTAINMENT BERM, SOIL COVER OVER TOP OF UPPERMOST AQUIFER, AND PERIMETER GRADING AROUND AP1 EXTERIOR SIDE SLOPES.
2. EXISTING CONTOURS ARE A COMPOSITE OF AN AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/3/2020, TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 12/3/2020 & 12/4/2020.
3. THE PROPOSED STORMWATER DRAINAGE CONCEPT IS TO SHED WATER INTO EXISTING DRAINAGE CHANNELS NORTH AND EAST OF THE FACILITY. STORMWATER COLLECTED WITHIN AP1 WILL BE DIRECTED INTO AN OPEN CHANNEL THAT BREACHES THE CONSTRUCTED BERM TO CONNECT TO THE EXISTING DRAINAGE.

0 100 200
1" = 100' FEET

Path: C:\Users\EVForney\Golder Associates\21465046 Vistra Coffeen Part 845 Apps IL - 5 Technical Work\DRAFTING\PRODUCTION | File Name: CE-PROD-AP1-STRM-FIGURE.dwg

WSP GOLDER

COFFEEN POWER PLANT ASH POND NO. 1
SURFACE WATER DRAINAGE BASINS

FIGURE 1

ATTACHMENT 5

Final Protective Layer Demonstration

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Technical Memorandum

Date:	July 25, 2022
To:	Victor Modeer, P.E., DGE, Vistra on behalf of Illinois Power Resources Generating, LLC
Copies to:	Phil Morris, Rhys Fuller, Vistra on behalf of Illinois Power Resources Generating, LLC
From:	John Seymour, P.E., Geosyntec Consultants (Geosyntec) Lucas Carr, P.E., Geosyntec
Subject:	Proposed Alternative Final Protective Layer Equivalency Demonstration Ash Pond No. 1, Coffeen Power Plant Coffeen, Illinois Geosyntec Project: GLP8025

PROPOSAL

An alternative final protective layer is proposed by Illinois Power Resources Generating, LLC (IPRG) for the Ash Pond No. 1 (AP1) surface impoundment that will be closed-in-place at the Coffeen Power Plant (CPP). The closure will be in accordance with Illinois Administrative Code (IAC) Part 845 Rule [1] (Part 845). Overall, the proposal will meet the requirements of Section 845.750 c) 2).

This Technical Memorandum presents a demonstration that a 2-foot-thick alternative final protective layer consisting of an 18-inch-thick soil layer and a 6-inch layer of topsoil provide equivalent or superior performance to the default protective layer set forth in Section 845.750 c) 2). The alternative final protective layer works in combination with an underlying low permeability (geomembrane) layer in place of the default three-foot thick, low permeability compacted earth layer required by Section 845.750 c) 1) A). In addition, a cushion layer consisting of a geotextile is placed on top of the geomembrane prior to installation of the final protective layer. The combination of the above materials comprises the final "alternative final cover system".

A discussion of how the closure, including the proposed alternative final cover system discussed herein, meets the performance standards is contained in the Closure Plan [2], which includes the Closure Alternatives Assessment required by Section 845.710.

REQUIREMENTS OF SECTION 845

Section 845.750 provides requirements for both the final protective layer and underlying low permeability layer. They work in tandem to provide protection of groundwater and surface exposure conditions. A principal intention of the low permeability layer is to reduce the infiltration of liquid through the final cover system and into the CCR waste mass during post-closure conditions, in accordance with Section 845.720 (a), which states in part:

> *The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will*:
>
> *1) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate or contaminated run-off to the ground or surface waters or to the atmosphere;*

Specific default requirements for the final cover system are included in Section 845.750(c), which requires the final cover system to have either: 1) a three-foot thick soil low permeability compacted earth layer overlain by a three-foot-thick final protective layer (final protective layer), or 2) a geomembrane low permeability layer with a three-foot-thick final protective layer.

The specific Section 845.750 (c) (2) design requirements for the final protective layer are as follows (emphasis added):

> *Standards for the Final Protective Layer: The final protective layer must meet the following requirements,* ***unless the owner or operator demonstrates that another final protective layer construction technique or material provides equivalent or superior performance to the requirements of this subsection (c)(2****) and is approved by the Agency.*

Therefore, Section 845.750 (c) (2) specifically allows the use of an alternate final protective layer as long as it provides an equivalent or superior performance to the default standards set forth in Section 845.750(c)(2), which are as follows:

> *A) Cover the entire low permeability layer;*
>
> *B) Be at least three feet thick, be sufficient to protect the low permeability layer from freezing, and minimize root penetration of the low permeability layer;*
>
> *C) Consist of soil material capable of supporting vegetation;*
>
> *D) Be placed as soon as possible after placement of the low permeability layer; and*
>
> *E) Be covered with vegetation to minimize wind and water erosion.*

The alternate design is only requesting an alternate to Section 845.740(c)(2)(B) related to the thickness of the of the final protective layer.

PROPOSED FINAL COVER SYSTEM SUMMARY

The proposed final cover systems will include:

- A low permeability layer consisting of a linear low-density polyethylene (LLDPE) geomembrane that is at least 40-mil in thickness, placed on a smooth CCR subgrade;
- A geotextile cushion; and
- A final protective layer consisting of 18 inches of protective cover soil with a 6-inch layer of topsoil capable of supporting vegetation.

The final protective layer will meet all Section 845.750(c)(2) criteria, will not need any supplemental engineering measures, and will be designed by a qualified professional engineer licensed in Illinois.

The concepts of the alternative cover system are illustrated on **Figure 1**.

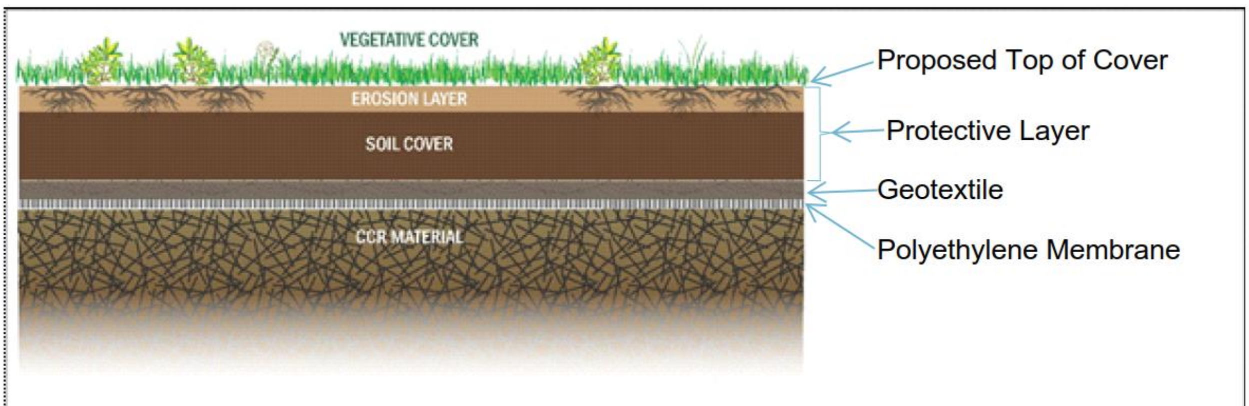

Figure 1: Proposed Alternative Final Cover System

DEMONSTRATION

The proposed alternate final protective layer will address the five requirements of Section 845.750 (c)(2)(A) to (E), as described in this section.

Section 845.750(c)(2)(A) Cover the entire low permeability layer

The final protective layer will horizontally cover the entire low-permeability layer, as indicated in the drawings in Attachment 2 of the Closure Plan [2].

Therefore, the use of the two-foot-thick final protective layer will meet the minimum requirements of Section 845 750(c)(2)(A) because it will completely cover the low-permeability layer.

Section 845.750(c)(2)(B) Be sufficient to protect the low permeability layer from freezing, and minimize root penetration of the low permeability layer

The existing Part 845, which has the same requirements as Part 814 (closure rule for landfills), requires a three-foot-thick final protective layer to protect the underlying low permeability layer from freeze-thaw effects and root penetration. However, when a geomembrane is used as the low permeability layer it does not need these protections since it is not subject to the same impacts (i.e., causing an increase in hydraulic conductivity) as a compacted earth layer as discussed in more detail below.

A geomembrane low permeability layer will be used for the CPP AP1. Geomembranes have the following characteristics:

- Geomembranes do not have pores that can contain water and are therefore not susceptible to freeze-thaw damage that may reduce their performance as a low permeability layer and/or lead to degradation of the geomembrane.
    - In fact, geomembrane panel strength and stiffness both increase with decreasing temperatures ([3], [4]). In 1996, the United States Bureau of Reclamation [5] (USBR) performed testing of both geomembrane panels and seams subjected to up to 500 freeze-thaw cycles, in both constrained and unconstrained conditions, with temperature cycles as severe as +30º C to -20º C.
    - The testing showed no changes in the strength of the geomembrane panels or seams. The USBR concluded that *"…there is simply "no change" in tensile behavior of geomembrane sheets or their seams after freeze-thaw cycling"*.
    - In 2013, the Geosynthetic Institute, upon reviewing the results of the USBR and other studies, concluded that *"the essential question often raised in this regard, i.e.,*

> *"will freeze-thaw conditions affect geomembrane sheets or their seam behavior," is answered with a resounding "NO""* [6].

- Geomembranes are not susceptible to grass plant root penetration because the geomembranes do not provide organic nutrients to plant roots and do not have pores or other areas where roots can enter the geomembrane.
  - Consequently, geomembranes are not a hospitable material that would either encourage root penetration or allow root penetration. Additionally, the geomembrane will be covered with a or geocomposite drainage layer with a geotextile filter on top, which will provide an additional barrier to root penetration.

U.S. EPA research [7] states that *"…a typical minimum thickness of the cover soil is 0.45 to 0.6 m…" (18 to 24 inches) thick "… for cover systems with hydraulic barriers"* (low permeability layer). This is particularly appropriate when using a geomembrane low permeability which is not susceptible to any impact from freezing. U.S. EPA research also states that cover thickness design for root penetration into the low permeability layer is only a concern for compacted clay layers or geosynthetic clay barriers. This is when using an appropriate design of cover vegetation.

Therefore, the use of the two-foot-thick final protective layer will provide equivalent or superior performance to the requirements of Section 845.750 (c) (2) (B) when coupled with a geotextile cushion and a geomembrane low permeability layer, as geomembranes are not susceptible to freeze-thaw damage or root penetration as compared to a low permeability compacted earth layer.

Section 845.750(c)(2)(C) Consist of soil material capable of supporting vegetation.

The uppermost six inches of the final protective layer will consist of topsoil that is capable of supporting vegetation, which is the same requirement as the default (three-foot thick) final protective layer. This is also consistent with the Federal CCR Rule, which requires a six-inch-thick "erosion" (topsoil) layer. Research [7] and Geosyntec's experience indicate topsoil layers are designed to have shallow-rooted grasses and most shallow-rooted grasses do not typically penetrate more than six inches into the subsurface. Shallow-rooted grasses will be specified based on recommendations from specialists at nurseries in the location of CPP and Illinois Department of Transportation guidelines. The topsoil layer will be fertilized and/or amended, as necessary, on a site-specific basis based on agronomical soil testing, to provide a growing medium for the vegetation that provides the required levels of nutrients and water storage during drought conditions.

Grass species will also be selected on a site-specific basis to minimize long-term vegetation maintenance, based on the climatic conditions at each site and the soil types. Vegetation will be established by applying seed and mulch and watering to establish the vegetation. Temporary erosion control measures will also be used during vegetation establishment to protect the topsoil layer from erosion. These measures may include erosion control blankets (ECBs), silt fences, hydroseeding, and/or other methods. The Post-Closure Care Plan includes the commitment to maintain the vegetation of the surface for the closed CPP AP1 within the Construction Permit Application [8].

The 18-inches of the protective layer below the topsoil will consist of a soil type suitable for retaining moisture to provide additional support for vegetation during times of drought, and to support any grass species with roots that exceed six inches. Such soil types may include sandy clay loam, silty loam, silts, silty clays, lean clays, sandy clays, and/or sandy silts.

Therefore, the use of the two-foot-thick protective layer will meet the requirements of Section 845.750(c)(2)(C), as the final protective layer will utilize soil capable of supporting vegetation.

Section 845.750(c)(2)(D) Be placed as soon as possible after placement of the low permeability layer

The CPP AP1 Closure Plan (Section 4.7.2 [2]) states that the geotextile and cover soil "…will be placed as soon as possible after placement of the low-permeability layer."

The use of a two-foot-thick protective layer will allow the final protective layer to be placed on top of the low permeability layer and vegetation to be established on top of the final protective layer sooner than if a three-foot thick final protective layer is used. This is due to the 33% reduction in earthwork volumes associated with the thinner 2-ft-thick final protective layer.

Therefore, the use of the two-foot-thick final protective layer will exceed the minimum requirements of Section 845.750(c)(2)(D), by allowing the protective layer to be installed sooner than when using a three-foot-thick protective layer.

Section 845.750(c)(2)(E) Be covered with vegetation to minimize wind and water erosion.

The protective layer will be covered with vegetation to limit with wind and water erosion, as noted in the discussion regarding Section 4.7.2 of the Closure Plan [2]. Additionally, the following design and engineering features, construction techniques, and maintenance procedures will be used to reduce the potential for wind and water erosion under both long-term conditions and during vegetation establishment.

- Design and Engineering Features
    - Final cover system slopes will be installed at relatively gentle grades (e.g., typically 5% to 14%). The use of gentle grades will reduce water runoff velocities and

therefore reduce the potential for water erosion of the final cover soils.

- A stormwater management system consisting of back-on berms and letdown structures is included in the drawings within the Closure Plan [2] and will be designed to collect stormwater in a controlled manner and route it off the final cover system which will minimize infiltration into the CCR waste mass. The stormwater management system will minimize the overland flow distance between stormwater channels. Channels will be lined with an appropriate material, based on estimated stormwater velocities, to limit water erosion.

- Construction Techniques
  - The final protective layer is typically the most susceptible to wind and water erosion in the period between the placement of the protective layer and the establishment of vegetation. To reduce the potential for both wind and water erosion during this time, the following approaches will be utilized:
    - Temporary erosion and sediment controls (ESCs) will be installed to reduce the potential for erosion, such as erosion control blankets (ECBs), silt socks (e.g., straw wattles), silt fences, and other methods. These ESCs will be regularly inspected and maintained until vegetation is established.
    - The entire surface of the final protective layer will be stabilized during seeding and until vegetation is established. Coverings may consist of straw mulch, hydroseeding binder, ECBs, or engineering growing media.
    - The final protective layer will be regularly inspected and maintained during vegetation establishment. Any areas that become eroded by wind and water will be repaired until vegetation is established to a suitable level over the surface of the final cover.
- Maintenance Procedures
  - During the post-closure care period, vegetation established on the final protective cover layer will be regularly maintained using a written and IEPA-approved maintenance program. The program will consist of regular mowing and inspections. Any bare areas or areas of erosion will be repaired by seeding and stabilizing the area, and observing the area until vegetation becomes re-established.
  - The final cover slopes will be relatively gentle (5% to 14%); these slopes experience less erosion in general, especially less than typical landfill covers sloped at predominately 25 to 33%. Typically, after three to five years, it is Geosyntec's

experience that the cover vegetation becomes fully stabilized and experiences less erosion.

In conclusion, the use of the two-foot-thick final protective layer will exceed the minimum requirements of Section 845 750 c) 2) E), using a robust program to support the establishment of protective vegetation, prevent and address any erosion that may occur during vegetation establishment, and monitor and maintain the vegetation during post-closure conditions.

ADDITIONAL CONSIDERATIONS

Infiltration Analysis

The use of the proposed two-foot-thick final protective layer, when coupled with a geomembrane low permeability layer, will also meet the criteria contained within Section 845.750 (a) (1). Section 845.750 (a) (1) provides the following requirement:

> *Section 845.750(a)(1) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;*

Section 845.750(a)(1) is an important overall measure of the effectiveness of the final cover system because it requires control of post-closure infiltration of liquids through the final cover and into the waste and releases of CCR.

An infiltration analysis was performed to by Ramboll, within the CPP AP1 Construction Permit Application [8], to estimate post-closure liquid infiltration rates through both the default and the proposed alternate final cover systems at the CPP AP1. The infiltration analysis used the Hydrologic Evaluation of Landfill Performance (HELP) software promulgated by the USEPA [9]. The HELP model estimates the infiltration rates from the top of the cover, through the final protective layer and through the low permeability layer (either a geomembrane or the three-foot thick compacted earth layer). The results are included in **Appendix A**. The resulting estimated infiltration rates are provided in **Table 1**.

Table 1 – CPP AP1 Final Cover Systems for Infiltration Analysis

Description	Low Permeability Layer[1]	Final Protective Layer	Infiltration Rate[2]
Proposed Alternative Final Cover System	40-mil Linear Low-Density Polyethylene (LLDPE) Geomembrane	2 ft of cover material, including, from bottom to top, a 10 oz nonwoven geotextile, 1.5 ft of silty clay and 0.5 ft of sandy clay loam	0.20 in/yr
Default Cover with Geomembrane Barrier	40-mil LLDPE Geomembrane	3 ft of cover material, including, from bottom to top, a 10 oz nonwoven geotextile, 2.5 ft of silty clay and 0.5 ft of sandy clay loam	0.34 in/yr
Default Cover with Compacted Earth Layer	3-ft thick compacted earth layer (1×10^{-7} cm/sec)	3 ft of cover material, including, from bottom to top, 2.5 ft of silty clay and 0.5 ft of sandy clay loam	1.99 in/yr

The CPP AP1 analysis indicated that the performance of the proposed alternative final cover system with a geomembrane and a two-foot-thick final protective cover exceeds the performance offered by the default final cover system utilizing a geomembrane with the default three-foot-thick protective layer and cushion layer, with the infiltration rate reduced by a factor of 1.7.

Furthermore, the proposed alternate final cover system performance exceeds the performance of a final cover system using a three-foot-thick compacted earthen low permeability layer and a three-foot-thick final protective layer (a total cover thickness of six feet) by reducing infiltration by a factor of 10.

---

[1] All HELP run versions used a pinhole density of 1 hole per acre, installation defects of 1 hole/acre, and construction quality as “good”.
[2] Infiltration is out the bottom of the low permeability layer.

Environmental and Societal Benefits

The use of the proposed two-foot-thick final protective layer will provide the following additional environmental and societal benefits, relative to the default three-foot-thick final protective layer:

- The final cover system earthwork quantities will be reduced by 33%. This will result in a corresponding 33% reduction in the amount of onsite soil fill that needs to be excavated, hauled to the construction location, and placed. This provides multiple benefits, such as:
    - Reduced disruption to onsite areas caused by the excavation of fill materials and corresponding disturbance to the natural environment.
    - Reduced haul truck traffic on site access roadways, thereby reducing, air pollution, and carbon emissions.
    - Reduced earthwork effort during installation of the final cover system, thereby reducing air pollution and carbon emissions.
- Construction of the alternate final cover system can be completed faster than the default final cover, providing multiple benefits, such as:
    - Initiation of the reduction of infiltration at a sooner date than with the default final cover system.
    - Ceasing construction-related impacts to offsite residents (e.g., air pollution, carbon emissions) at a sooner date than otherwise possible.

SUMMARY

The proposed alternate final protective layer will:

- Provide equivalent or superior performance to the requirements of Section 845.750 (c)(2).
- Have a geotextile cushion layer, which is not required by Section 845.750, over the geomembrane that adds physical protection for the geomembrane.
- Have a lower infiltration rate than the infiltration through the default soil final cover system.
- Meet or exceed the same criteria for long term performance and all other requirements of Section 845.750(c)(2).
- Provide other benefits by reducing the amount of final cover earthwork by 33% for the CPP AP1.

REFERENCES

[1] Illinois Environmental Protection Agency, "35 Ill. Adm. Code Part 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments," Springfield, IL, 2021.

[2] Golder Associates USA Inc., "Final Closure Plan for Ash Pond No. 1, Coffeen Power Plant," Creve Coeur, MO, 2022.

[3] A. L. Rollin, J. Lafleur, M. Marcotte, O. Dascal and Z. Akber, "Selection Criteria for the Use of Geomembranes in Dams and Dykes in Northern Climate," in *Proceedings of the International Conference on Geomembranes*, Denver, Colorado, 1945.

[4] D. E. Thorton and P. Blackall, "Report EPA-3-76-13: Field Evaluation of Plastic Film Liners for Petroleum Storage Areas in the Mackenzie Delta," Canadian Environmental Protection Service, 1976.

[5] A. I. Comer and Y. G. Hsuan, "Report R-96-03: Freeze-Thaw Cycling and Cold Temperature Effects on Geomembrane Sheets and Seams," U.S. Bureau of Reclamation, 1996.

[6] Y. G. Hsuan, R. M. Koerner and A. I. Comer, "GSI White Paper #28: Cold Temperature and Freeze-Thaw Cycling Behavior of Geomembranes and their Seams," Geosynthetic Institute, Folsom, Pennsylvania, 2013.

[7] United States Environmental Protection Agency, "(Draft) Technical Guidance For RCRA/CERCLA Final Covers," Office of Solid Waste and Emergency Response, Washington D.C., 2004.

[8] Golder Associates USA Inc., "Final Closure Plan for Ash Pond No. 1, Coffeen Power Plant," Creve Coeur, Missouri, 2022.

[9] T. Tolaymat and M. Krause, "Hydrologic Evaluation of Landfill Performance: HELP 4.0 User Manual," United States Environmental Protection Agency, Washington, DC, 2020.

APPENDIX A: HELP MODEL OUTPUT

A-1: CPP AP1- 2-FT FINAL PROTECTIVE COVER SOIL

A-2: CPP AP1-3-FT FINAL PROTECTIVE COVER SOIL

A-3: CPP AP1-3-FT COMPACTED EARTH LAYER, 3-FT FINAL PROTECTIVE COVER SOIL

APPENDIX A-1

CPP AP1- 2-FT FINAL PROTECTIVE COVER SOIL

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: COF AP1 CIP **Simulated On:** 6/23/2022 13:38

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SiCL - Silty Clay Loam
Material Texture Number 12

Thickness	=	6	inches
Porosity	=	0.471	vol/vol
Field Capacity	=	0.342	vol/vol
Wilting Point	=	0.21	vol/vol
Initial Soil Water Content	=	0.2544	vol/vol
Effective Sat. Hyd. Conductivity	=	4.20E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer
SiC - Silty Clay
Material Texture Number 14

Thickness	=	18	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.3554	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
10 oz Nonwoven Geotextile
Material Texture Number 123

Thickness	=	0.11	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.5445	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-01	cm/sec
Slope	=	5	%
Drainage Length	=	350	ft

Layer 4

Type 4 - Flexible Membrane Liner
LDPE Membrane
Material Texture Number 36

Thickness	=	0.04	inches
Effective Sat. Hyd. Conductivity	=	4.00E-13	cm/sec
FML Pinhole Density	=	1	Holes/Acre
FML Installation Defects	=	1	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 1 - Vertical Percolation Layer (Waste)
High Density Electric Plant Coal Bottom Ash
Material Texture Number 84

Thickness	=	360	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.0762	vol/vol
Effective Sat. Hyd. Conductivity	=	8.80E-05	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer
Loess Unit Silty Clay
Material Texture Number 43

Thickness	=	60	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.371	vol/vol
Effective Sat. Hyd. Conductivity	=	3.85E-08	cm/sec
Slope	=	0	%
Drainage Length	=	0	ft

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	87.9	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	10.37	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.654	inches
Upper Limit of Evaporative Storage	=	8.574	inches

Lower Limit of Evaporative Storage	=	4.272	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	57.664	inches
Total Initial Water	=	57.752	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 CIP
Simulated on: 6/23/2022 13:40

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	1,504,439.0	100.00
Runoff	5.219	[2.734]	196,475.1	13.06
Evapotranspiration	30.032	[3.266]	1,130,503.8	75.14
Subprofile1				
Lateral drainage collected from Layer 3	4.5549	[1.2488]	171,460.7	11.40
Percolation/leakage through Layer 4	0.195970	[0.082153]	7,376.9	0.49
Average Head on Top of Layer 4	4.4608	[1.8873]	---	---
Subprofile2				
Percolation/leakage through Layer 6	0.000911	[0.001146]	34.3	0.00
Water storage				
Change in water storage	0.1585	[1.4776]	5,965.1	0.40

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: COF AP1 CIP
Simulated on: 6/23/2022 13:41

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.44	129,392.6
Runoff	2.900	109,168.0
Subprofile1		
Drainage collected from Layer 3	0.0280	1,055.5
Percolation/leakage through Layer 4	0.002887	108.7
Average head on Layer 4	24.1098	---
Maximum head on Layer 4	35.9865	---
Location of maximum head in Layer 3	88.14 (feet from drain)	
Subprofile2		
Percolation/leakage through Layer 6	0.000012	0.4398
Other Parameters		
Snow water	6.8181	256,654.5
Maximum vegetation soil water	0.4763 (vol/vol)	
Minimum vegetation soil water	0.2373 (vol/vol)	

Final Water Storage in Landfill Profile at End of Simulation Period

Title: COF AP1 CIP
Simulated on: 6/23/2022 13:41
Simulation period: 30 years

	Final Water Storage	
Layer	(inches)	(vol/vol)
1	1.4460	0.2410
2	5.5269	0.3070
3	0.0012	0.0106
4	0.0000	0.0000
5	29.7308	0.0826
6	25.8010	0.4300
Snow water	0.0000	---

APPENDIX A-2

CPP AP1- 3-FT FINAL PROTECTIVE COVER SOIL

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: COF AP1 CIP Default **Simulated On:** 6/21/2022 16:04

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	6	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.154	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer
SiC - Silty Clay
Material Texture Number 14

Thickness	=	30	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.3698	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
10 oz Nonwoven Geotextile
Material Texture Number 123

Thickness	=	0.11	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.6794	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-01	cm/sec
Slope	=	5	%
Drainage Length	=	350	ft

Layer 4

Type 4 - Flexible Membrane Liner
LDPE Membrane
Material Texture Number 36

Thickness	=	0.04	inches
Effective Sat. Hyd. Conductivity	=	4.00E-13	cm/sec
FML Pinhole Density	=	1	Holes/Acre
FML Installation Defects	=	1	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 1 - Vertical Percolation Layer (Waste)
High Density Electric Plant Coal Bottom Ash
Material Texture Number 84

Thickness	=	360	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.0762	vol/vol
Effective Sat. Hyd. Conductivity	=	8.80E-05	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer
Loess Unit Silty Clay
Material Texture Number 43

Thickness	=	60	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.371	vol/vol
Effective Sat. Hyd. Conductivity	=	3.85E-08	cm/sec
Slope	=	0	%
Drainage Length	=	0	ft

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	85.9	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	10.37	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.059	inches
Upper Limit of Evaporative Storage	=	8.136	inches

Lower Limit of Evaporative Storage	=	3.828	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	61.794	inches
Total Initial Water	=	61.882	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 CIP
Simulated on: 6/21/2022 16:05

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	1,504,439.0	100.00
Runoff	4.089	[2.542]	153,905.0	10.23
Evapotranspiration	30.058	[3.318]	1,131,459.1	75.21
Subprofile1				
Lateral drainage collected from Layer 3	5.5133	[1.5623]	207,537.5	13.80
Percolation/leakage through Layer 4	0.344465	[0.16843]	12,966.7	0.86
Average Head on Top of Layer 4	7.8378	[3.8306]	---	---
Subprofile2				
Percolation/leakage through Layer 6	0.049311	[0.128508]	1,856.2	0.12
Water storage				
Change in water storage	0.2572	[1.781]	9,681.1	0.64

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: COF AP1 CIP
Simulated on: 6/21/2022 16:05

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.44	129,392.6
Runoff	2.884	108,544.0
Subprofile1		
Drainage collected from Layer 3	0.0302	1,135.8
Percolation/leakage through Layer 4	0.004436	167.0
Average head on Layer 4	36.1098	---
Maximum head on Layer 4	50.2352	---
Location of maximum head in Layer 3	105.93	(feet from drain)
Subprofile2		
Percolation/leakage through Layer 6	0.002634	99.2
Other Parameters		
Snow water	6.8181	256,654.5
Maximum vegetation soil water	0.4520	(vol/vol)
Minimum vegetation soil water	0.2127	(vol/vol)

Final Water Storage in Landfill Profile at End of Simulation Period

Title: COF AP1 CIP
Simulated on: 6/21/2022 16:05
Simulation period: 30 years

	Final Water Storage	
Layer	(inches)	(vol/vol)
1	1.0066	0.1678
2	10.0334	0.3344
3	0.0012	0.0105
4	0.0000	0.0000
5	29.8926	0.0830
6	28.6633	0.4777
Snow water	0.0000	---

APPENDIX A-3

CPP AP1-3-FT COMPACTED EARTH LAYER, 3-FT FINAL PROTECTIVE COVER SOIL

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title:	COF AP1 CIP Default Earth	**Simulated On:**	6/21/2022 16:12

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SCL - Sandy Clay Loam
Material Texture Number 10

Thickness	=	6	inches
Porosity	=	0.398	vol/vol
Field Capacity	=	0.244	vol/vol
Wilting Point	=	0.136	vol/vol
Initial Soil Water Content	=	0.154	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-04	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer
SiC - Silty Clay
Material Texture Number 14

Thickness	=	30	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.4338	vol/vol
Effective Sat. Hyd. Conductivity	=	2.50E-05	cm/sec

Layer 3
Type 3 - Barrier Soil Liner
Liner Soil (High)
Material Texture Number 16

Thickness	=	36	inches
Porosity	=	0.427	vol/vol
Field Capacity	=	0.418	vol/vol
Wilting Point	=	0.367	vol/vol
Initial Soil Water Content	=	0.427	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-07	cm/sec

Layer 4
Type 1 - Vertical Percolation Layer (Waste)
High Density Electric Plant Coal Bottom Ash

Material Texture Number 84

Thickness	=	360	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.0804	vol/vol
Effective Sat. Hyd. Conductivity	=	8.80E-05	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Loess Unit Silty Clay

Material Texture Number 43

Thickness	=	60	inches
Porosity	=	0.479	vol/vol
Field Capacity	=	0.371	vol/vol
Wilting Point	=	0.251	vol/vol
Initial Soil Water Content	=	0.371	vol/vol
Effective Sat. Hyd. Conductivity	=	3.85E-08	cm/sec
Slope	=	0	%
Drainage Length	=	0	ft

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	85.9	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	10.37	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	5.314	inches
Upper Limit of Evaporative Storage	=	8.136	inches
Lower Limit of Evaporative Storage	=	3.828	inches
Initial Snow Water	=	0.088108	inches
Initial Water in Layer Materials	=	80.511	inches
Total Initial Water	=	80.599	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	39.06	Degrees
Maximum Leaf Area Index	=	4.5	

Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	302	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Coffeen, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.353618	2.511085	2.81508	3.241374	3.956664	4.312863
4.375035	2.656228	3.284204	3.675466	3.677412	3.106835

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
37.3	37.1	50	61.9	69.7	80.6
84.2	81	72.2	62.4	48.1	38

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 39.06/-89.39

Average Annual Totals Summary

Title: COF AP1 CIP
Simulated on: 6/21/2022 16:13

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	39.97	[4.83]	1,504,439.0	100.00
Runoff	6.861	[3.483]	258,261.6	17.17
Evapotranspiration	31.175	[3.425]	1,173,536.2	78.00
Subprofile1				
Percolation/leakage through Layer 3	1.992460	[0.074169]	75,002.4	4.99
Average Head on Top of Layer 3	21.7355	[2.127]	---	---
Subprofile2				
Percolation/leakage through Layer 5	1.697175	[0.714281]	63,886.9	4.25
Water storage				
Change in water storage	0.2326	[1.8115]	8,754.2	0.58

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: COF AP1 CIP
Simulated on: 6/21/2022 16:13

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.44	129,392.6
Runoff	2.981	112,222.0
Subprofile1		
Percolation/leakage through Layer 3	0.006803	256.1
Average head on Layer 3	35.9998	
Subprofile2		
Percolation/leakage through Layer 5	0.009683	364.5
Other Parameters		
Snow water	6.8181	256,654.5
Maximum vegetation soil water	0.4520 (vol/vol)	
Minimum vegetation soil water	0.2127 (vol/vol)	

Final Water Storage in Landfill Profile at End of Simulation Period

Title: COF AP1 CIP
Simulated on: 6/21/2022 16:13
Simulation period: 30 years

	Final Water Storage	
Layer	(inches)	(vol/vol)
1	1.0172	0.1695
2	11.1255	0.3709
3	15.3720	0.4270
4	31.3211	0.0870
5	28.7397	0.4790
Snow water	0.0000	---

golder.com

APPENDIX H

Groundwater Monitoring Plan

Intended for
Illinois Power Generating Company

Date
October 25, 2021

Project No.
1940100806-002

GROUNDWATER MONITORING PLAN

ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL Bright ideas. Sustainable change.

GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT ASH POND NO. 1

Project Name	**Coffeen Power Plant Ash Pond No. 1**
Project No.	**1940100806-002**
Recipient	**Illinois Power Generating Company**
Document Type	**Groundwater Monitoring Plan**
Revision	**FINAL**
Date	**October 25, 2021**

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Senior Hydrogeologist

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Hydrogeologist

LICENSED PROFESSIONAL CERTIFICATIONS

35 I.A.C. § 845.630 Groundwater Monitoring Systems (PE)

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Illinois, certify that the groundwater monitoring system described in this document (Groundwater Monitoring Plan, Coffeen Power Plant Ash Pond No. 1), has been designed and constructed to meet the requirements of 35 I.A.C. § 845.630. The monitoring system was developed based on information included in the Hydrogeologic Site Characterization Report (Ramboll 2021; included in the Operating Permit to which this Groundwater Monitoring Plan is attached).

Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
Date: October 25, 2021

35 I.A.C. § 845.630 Groundwater Monitoring Systems (PG)

I, Brian G. Hennings, a qualified professional geologist in good standing in the State of Illinois, certify that the groundwater monitoring system described in this document (Groundwater Monitoring Plan, Coffeen Power Plant Ash Pond No. 1), has been designed and constructed to meet the requirements of 35 I.A.C. § 845.630. The monitoring system was developed based on information included in the Hydrogeologic Site Characterization Report (Ramboll 2021; included in the Operating Permit to which this Groundwater Monitoring Plan is attached).

Brian G. Hennings
Professional Geologist
196.001482
Illinois
Date: October 25, 2021

CONTENTS

TABLES (IN TEXT)

TABLES (ATTACHED)

FIGURES (ATTACHED)

APPENDICES

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
AP1	Ash Pond No. 1
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	coal combustion residuals
cm/s	centimeters per second
CPP	Coffeen Power Plant
DA	deep aquifer
DCU	deep confining unit
GMP	Groundwater Monitoring Plan
GWPS	Groundwater Protection Standard
HCR	Hydrogeologic Site Characterization Report
ID	identification
IEPA	Illinois Environmental Protection Agency
IPGC	Illinois Power Generating Company
LCU	lower confining unit
mg/L	milligrams per liter
NID	National Inventory of Dams
NA	not applicable
No.	number
NRT/OBG	Natural Resources Technology, an OBG Company
Part 845	Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845
PMP	potential migration pathway
QA/QC	quality assurance/quality control
Ramboll	Ramboll Americas Engineering Solutions, Inc.
RL	reporting limit
SI	surface impoundment
TDS	total dissolved solids
UA	uppermost aquifer
UCU	upper confining unit
USEPA	United States Environmental Protection Agency
WLO	water level only

1. INTRODUCTION

1.1 Overview

In accordance with requirements of the Standards for the Disposal of Coal Combustion Residuals (CCR) in Surface Impoundments (SIs): Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845 (Part 845) (Illinois Environmental Protection Agency [IEPA], April 15, 2021), Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Groundwater Monitoring Plan (GMP) on behalf of Coffeen Power Plant (CPP), operated by Illinois Power Generating Company (IPGC). This report will apply specifically to the CCR Unit referred to as the Ash Pond Number (No.) 1 (AP1), Vistra identification (ID) No. 101, IEPA ID No. W1350150004-01, and National Inventory of Dams (NID) No. IL50722. This GMP includes Part 845 content requirements specific to 35 I.A.C. § 845.630 (Groundwater Monitoring System), 35 I.A.C. § 845.640 (Groundwater Sampling and Analysis), and 35 I.A.C. § 845.650 (Groundwater Monitoring Program) for AP1 at the CPP.

A checklist which identifies the specific requirements of 35 I.A.C. § 845.630, 35 I.A.C. § 845.640, and 35 I.A.C. § 845.650 is included in **Table 1-1**. The table provides references to sections, tables, and figures included in this document to locate the information that meets specific requirements of 35 I.A.C. § 845.630, 35 I.A.C. § 845.640, and 35 I.A.C. § 845.650.

1.2 Site Location and Background

The CPP is located approximately two miles south of the city of Coffeen, Illinois and approximately eight miles southeast of the city of Hillsboro, Illinois (**Figure 1-1**). AP1 is located in Montgomery County, in central Illinois, within Section 11, Township 7 North, and Range 7 East. The CPP is located between the two lobes of Coffeen Lake to the west, east, and south, and is bordered by agricultural land to the north. The CPP operated as a coal-fired power plant from 1964 to November 2019 and has five CCR management units. The approximately 1,100-acre Coffeen Lake was built by damming the McDavid Branch of the East Fork of Shoal Creek in 1963 for use as an artificial cooling lake for the CPP. Historically coal mines were operated at depth in the vicinity of the CPP as well as a US Minerals processing facility located to the north. Mine shafts, processing facilities, and historic coal storage associated with these historic operations were located south of AP1. IPGC ceased receipt of waste to AP1 prior to April 11, 2021.

Coffeen AP1 (**Figure 1-2**) is a 23-acre, unlined SI used to manage CCR (bottom ash) and non-CCR waste streams at the CPP. Its total storage capacity is approximately 300 acre-feet. AP1 (also known as the Bottom Ash/Recycle Pond) is a reclaimed ash pond that was constructed utilizing the existing earthen berms with reinforcement, as provided by Water Pollution Control Permit 1978-EA-389 issued by the Agency on May 26, 1978. AP1 (existing unlined SI) covers an area of approximately 23-acres, has berms up to 41 feet above the surrounding land surface, and a capacity of 300-acre-foot. Several years ago, air heater wash and boiler chemical cleaning wastes were directed to AP1, but this practice was discontinued. The bottom ash is periodically removed from AP1 for beneficial uses by a third-party contractor. Sluicing of waste to API ceased prior to November 4, 2019.

1.3 Conceptual Model

Significant site investigation has been completed at the CPP to characterize the geology, hydrogeology, and groundwater quality. Based on extensive investigation and monitoring, the

CPP has been well characterized and detailed in the Hydrogeologic Site Characterization Report (HCR [Ramboll, 2021]; included in the Operating Permit to which this Plan is attached). A site conceptual model has been developed and is discussed below.

In addition to the CCR present at AP1, there are five principal layers of unlithified material present above the bedrock, which are categorized into hydrostratigraphic units below (from surface downward) based on stratigraphic relationships and common hydrogeologic characteristics.

- **Upper Confining Unit (UCU):** Composed of the Roxana and Peoria Silts (Loess Unit) and the upper clayey portion of the Hagarstown member which are classified as silts to clayey silts and gravelly clay below the surficial soil. The UCU has been eroded east of AP1, near the Unnamed Tributary.
- **Uppermost Aquifer:** The uppermost aquifer is the Hagarstown Member which is classified as primarily sandy to gravelly silts and clays with thin beds of sands. Similar to the Loess Unit, the Hagarstown is absent in some locations near the Unnamed Tributary.
- **Lower Confining Unit (LCU):** Comprised of the Vandalia Member, Mulberry Grove Member, and Smithboro Member. These units include a sandy to silty till with thin, discontinuous sand lenses, a discontinuous and limited extent sandy silt which has infilled prior erosional features, and silty to clayey diamicton, respectively. This unit has been identified as a potential migration pathway (PMP) because downward vertical gradients indicate that there is the potential for impacts to migrate within this unit.
- **Deep Aquifer (DA):** Sand and sandy silt/clay units of the Yarmouth Soil, which include accretionary deposits of fine sediment and organic materials, typically less than five feet thick and discontinuous across the CPP. This unit is also identified as a PMP, because it is the first permeable unit below the uppermost aquifer.
- **Deep Confining Unit (DCU):** Comprised of the Banner Formation, generally consists of clays, silts, and sands. The Lierle Clay Member is the upper layer of the Banner Formation which was encountered at the Site.

Bedrock of the Bond Formation, which consists of limestone and calcareous clays and shale, was not encountered in the borings advanced on CPP.

Flow of groundwater from central portions of the CPP to Coffeen Lake or the Unnamed Tributary through the uppermost aquifer are the primary pathways for contaminant migration. The LCU and DA underlying the uppermost aquifer have been identified as PMPs. Groundwater elevations are primarily controlled by surface topography, geologic unit topography, and water levels within Coffeen Lake and the Unnamed Tributary. A groundwater divide trending north-south is observed running through the approximate center of the CPP (**Figure 1-3**). Phreatic surfaces or water elevations within the SIs are generally consistent and have not been observed to fluctuate with groundwater elevations indicating limited hydraulic connection with the SIs.

Part 845 parameters were monitored in uppermost aquifer monitoring wells at AP1 as part of the Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 monitoring program beginning in 2015. These data were supplemented with sampling of additional locations in 2021. The results indicate that the following parameters were detected at concentrations greater than the applicable 35 I.A.C. § 845.600 groundwater protection standards (GWPSs) and are considered potential exceedances:

- Arsenic in downgradient uppermost aquifer wells G302, G303, and G304/G307. Arsenic was also detected in upgradient uppermost aquifer well G306.

- Boron in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G311, and G313. Boron was also detected in upgradient uppermost aquifer well G306.
- Cadmium in downgradient uppermost aquifer well G304/G307.
- Chromium in downgradient uppermost aquifer well G304/G307.
- Cobalt in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, and G305; and in downgradient LCU well G314. Cobalt was also detected in upgradient uppermost aquifer well G306.
- Lead in downgradient uppermost aquifer wells G301, G302, G303, G304/G307 and G305; and in downgradient LCU well G316. Lead was also detected in upgradient uppermost aquifer well G306.
- Lithium in downgradient uppermost aquifer wells G303 and G304/G307.
- pH (lower limit) in downgradient uppermost aquifer wells G301 and G312.
- Radium 226 and 228 combined in downgradient LCU well G316.
- Sulfate in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G309, G310, G311, G312, G313, G315, and G317; in downgradient LCU wells G307D, G314, and G316; and in downgradient DA well G314D. Sulfate was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well G306.
- Total dissolved solids (TDS) in downgradient uppermost aquifer wells G301, G302, G303, G304/G307, G305, G308, G309, G310, G311, G312, G313, G315, and G317; in downgradient LCU wells G307D, G314, and G316; and in downgradient DA well G314D. Sulfate was also detected at concentrations greater than the GWPS in upgradient uppermost aquifer well G306.

Concentration results for the above parameters were compared directly to 35 I.A.C. § 845.600 GWPS, without an evaluation of background concentrations. Evaluation of background groundwater quality has been completed as part of this GMP, and compliance with Part 845 will be determined following the first round of groundwater sampling. The first round of groundwater sampling for compliance will be completed the quarter following issuance of the Operating Permit and in accordance with this GMP.

2. GROUNDWATER MONITORING SYSTEMS

2.1 Existing Monitoring Well Network and Analysis

This GMP is being provided to propose a groundwater monitoring network and monitoring program specific to AP1 that will comply with Part 845. Monitoring networks and programs that apply to other units are not discussed in this GMP. Those programs will continue to be performed as specified in IEPA approvals. Any future modifications will be proposed and submitted to IEPA for approval in a separate document. The remaining discussion in this document will include only these networks and monitoring programs that are applicable and specific to the AP1, specifically the 40 C.F.R. § 257 network and the proposed Part 845 monitoring network.

2.1.1 40 C.F.R. § 257 Monitoring Program

The 40 C.F.R. § 257 well network for AP1 consists of six monitoring wells installed nearby or adjacent to AP1 within the uppermost aquifer. The AP1 40 C.F.R. § 257 well network consists of two background monitoring wells (G281 and G306) and four compliance monitoring wells (G301, G302, G303, and G307). The boring logs, well construction forms, and other related monitoring well forms are available in the Operating Records as required by 40 C.F.R. § 257.91 for each monitored CCR Unit or CCR Multi-Unit, and are included in Appendix C of the HCR (included in the Operating Permit to which this Plan is attached).

Assessment monitoring in accordance with 40 C.F.R. § 257.95 was initiated on April 9, 2018. Details on the procedures and techniques used to fulfill the groundwater sampling and analysis program requirements are found in the Sampling and Analysis Plan for AP1 (Natural Resource Technology, an OBG Company [NRT/OBG], 2017).

Groundwater samples are collected semiannually and analyzed for the laboratory and field parameters from Appendix III and Appendix IV of 40 C.F.R. § 257, summarized in **Table A** below.

Table A. 40 C.F.R. § 257 Groundwater Monitoring Program Parameters

Field Parameters[1]			
Groundwater Elevation	pH		
Appendix III Parameters (Total, except TDS)			
Boron	Chloride	Sulfate	
Calcium	Fluoride	TDS	
Appendix IV Parameters (Total)			
Antimony	Cadmium	Lithium	Selenium
Arsenic	Chromium	Mercury	Thallium
Barium	Cobalt	Molybdenum	Radium 226 and 228 combined
Beryllium	Lead		

[1]Dissolved oxygen, temperature, specific conductance, oxidation/reduction potential, and turbidity are recorded during sample collection.

Results and analysis of groundwater sampling are reported annually by January 31 of the following year and made available on the CCR public website as required by 40 C.F.R. § 257.

2.1.2 Part 845 Well Installation and Monitoring

In 2021, 13 additional monitoring wells (G307D, G308, G309, G310, G311, G311D, G312, G313, G314, G314D, G315, G316, and G317) were installed along the perimeter of AP1 to assess the vertical and horizontal lithology, stratigraphy, chemical properties, and physical properties of geologic layers to a minimum of 100 feet below ground surface (bgs) as specified in 35 I.A.C. § 845.620(b). Additionally, two leachate monitoring wells (XPW01 and XPW02) were installed within the AP1 unit to characterize the CCR materials.

Prospective Part 845 monitoring wells were sampled for eight rounds from March to August 2021 and the results were assessed for selection of the AP1 Part 845 monitoring well network. Groundwater samples were collected and analyzed for 35 I.A.C. § 845.600 parameters as summarized in **Table B** below.

Table B. Part 845 Groundwater Monitoring Program Parameters

Field Parameters[1]			
Groundwater Elevation	pH	Turbidity	
Metals (Total)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (Total, except TDS)			
Fluoride	Sulfate	Chloride	TDS
Other (Total)			
Radium 226 and 228 combined			

[1] Dissolved oxygen, temperature, specific conductance, and oxidation/reduction potential were recorded during sample collection.

Data and results from the Part 845 background monitoring were included in the water quality discussion included in the HCR (included in the Operating Permit to which this Plan is attached). The data collected from background locations during the Part 845 monitoring were used to evaluate and calculate background concentrations for AP1. The evaluation and discussion are included in **Section 3.2** of this report.

Data collected from the 40 C.F.R. § 257 monitoring network from 2015 to 2021, and from the Part 845 background monitoring were used for selection of the Part 845 monitoring well network proposed in **Section 2.2**.

2.2 Proposed Part 845 Monitoring Well Network

The groundwater monitoring network proposed in this plan will include 12 monitoring wells screened in the uppermost aquifer (G281, G301, G302, G303, G305, G306, G307, G308, G310, G312, G313, and G315), three monitoring wells screened in the LCU (G307D, G314, and G316), one well screened in the DA (G314D), and three temporary water level only surface water staff gages (SG-02, SG-03, and XSG-01). The proposed network is summarized in **Table C** below and displayed on **Figure 2-1.** Sixteen wells (two background and 14 compliance) will be used to monitor groundwater concentrations within the hydrostratigraphic units.

The groundwater samples collected from the 16 wells will be used to monitor and evaluate groundwater quality and demonstrate compliance with the groundwater quality standards listed in 35 I.A.C. § 845.600(a). The proposed monitoring wells will yield groundwater samples that represent the quality of downgradient groundwater at the CCR boundary (as required in 35 I.A.C. § 845.630(a)(2)). Monitoring well depths and construction details are listed in **Table 2-1** and summarized in **Table C** below.

Table C. Proposed Part 845 Monitoring Well Network

Well ID	Monitored Unit	Well Screen Interval (feet bgs)	Well Type[1]
G281	UA	15.5 - 20.2	Background
G301	UA	11.3 - 16.0	Compliance
G302	UA	13.2 - 17.9	Compliance
G303	UA	10.0 - 20.0	Compliance
G305	UA	13.4 - 18.3	Compliance
G306	UA	13.1 - 17.7	Background
G307	UA	13.0 - 17.8	Compliance
G307D	LCU	49.0 – 58.8	Compliance
G308	UA	10.1 - 14.9	Compliance
G310	UA	10.2 - 15.0	Compliance
G312	UA	9.8 - 14.6	Compliance
G313	UA	6.3 - 11.1	Compliance
G314	LCU	14.6 - 19.6	Compliance
G314D	DA	39.3 – 49.1	Compliance
G315	UA	9.7 - 14.5	Compliance
G316	LCU	10.0 - 14.8	Compliance
XSG-01[2, 3]	CCR	NA	WLO
SG-02[2, 3]	Surface Water	NA	WLO
SG-03[2, 3]	Surface Water	NA	WLO

[1] Well type refers to the role of the well in the monitoring network.
[2] Surface water level measuring points.
[3] Location is temporary pending implementation of impoundment closure per an approved Construction Permit Application.
NA = Not Applicable
UA = uppermost aquifer
WLO = water level only

2.3 Well Abandonment

No wells are currently proposed for abandonment.

3. APPLICABLE GROUNDWATER QUALITY STANDARDS

3.1 Groundwater Classification

Groundwater within the uppermost aquifer at AP1 meets the definition of Class I – Potable Resource Groundwater (35 I.A.C. § 620.210), based on the following criteria:

- The groundwater is located more than 10 feet bgs; and
- Field hydraulic conductivity tests performed in the uppermost aquifer resulted in an overall (geometric mean) horizontal hydraulic conductivity of 2.0×10^{-3} centimeters per second (cm/s), exceeding the 1×10^{-4} cm/s criterion.

3.2 Statistical Evaluation of Background Groundwater Data

A Statistical Analysis Plan (**Appendix A**) has been developed to describe procedures that will be used to establish background conditions and implement compliance monitoring as necessary and required by 35 I.A.C. § 845.640 and 35 I.A.C. § 845.650. The Statistical Analysis Plan was prepared in accordance with the requirements of 35 I.A.C. § 845.640(f), with reference to the acceptable statistical procedures provided in United States Environmental Protection Agency's (USEPA) *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (*Unified Guidance,* March 2009), and is intended to provide a logical process and framework for conducting the statistical analysis of the data obtained during groundwater monitoring.

In accordance with 35 I.A.C. § 845.640(f)(1), the statistical method chosen for analysis of background groundwater quality was either the tolerance interval or the prediction interval procedure for each constituent listed in 35 I.A.C. § 845.600(a)(1) at this CCR unit per 35 I.A.C. § 845.640(f)(1)(C). A comparison of the statistical background concentrations and groundwater quality standards listed in 35 I.A.C. § 845.600(a)(1) and the resulting GWPSs are summarized in **Table 3-1**.

3.3 Applicable Groundwater Protection Standards

The applicable GWPS will be established in accordance with 35 I.A.C. § 845.600(a) (greater of the background concentration or numerical limit specified in 35 I.A.C. § 845.600(a)(1)). The results of the statistical analysis of background groundwater data (**Table 3-1**) indicate that most background concentrations in the uppermost aquifer and PMP are less than the groundwater quality standards listed in 35 I.A.C. § 845.600(a)(1). Therefore, for these parameters, the groundwater quality standards listed in 35 I.A.C. § 845.600(a)(1) will be applied to the results from the proposed groundwater monitoring network. The only exception being boron, where the background concentration is greater than the 35 I.A.C. § 845.600(a)(1) standard (3.2 milligrams per liter [mg/L] versus 2 mg/L). In this instance, the GWPS will be the background concentration.

Under most circumstances, the GWPS will be compared to the lower confidence limit for the observed concentrations for each constituent in each compliance well. Exceptions are when there are high percentages (greater than 50 percent) of non-detects in compliance well data, for which a future mean (for 50 to 70 percent non-detects) or median (for greater than 70 percent non-detects) will be compared to the GWPS. Consistent with the *Unified Guidance*, the same general statistical method of confidence interval testing against a fixed GWPS is recommended in compliance and corrective action programs. Confidence intervals provide a flexible and statistically accurate method to test how a parameter estimated from a single sample compares to a fixed numerical limit. Confidence intervals explicitly account for variation and uncertainty in the sample data used to construct them.

Evaluation of the applicable standards will occur in conjunction with the analysis of groundwater quality results. Background calculations and the resulting concentrations may be updated as appropriate, in accordance with the Statistical Analysis Plan included in **Appendix A.**

4. GROUNDWATER MONITORING PLAN

The groundwater monitoring plan will monitor and evaluate groundwater quality to demonstrate compliance with the groundwater quality standards included in 40 C.F.R. § 257.94(e), 40 C.F.R. § 257.95(h), and 35 I.A.C. § 845.600(a). The groundwater monitoring program will include sampling and analysis procedures that are consistent and that provide an accurate representation of groundwater quality at the background and compliance wells as required by 35 I.A.C. § 845.630. As discussed in **Section 2**, two monitoring programs specific to AP1 exist: the 40 C.F.R. § 257 monitoring program and the proposed Part 845 monitoring program. These networks will continue to be monitored until USEPA approves Part 845. It is expected that upon USEPA approval of Part 845, the 40 C.F.R. § 257 monitoring program and reporting will be eliminated, and the proposed Part 845 monitoring and reporting included in this Plan will continue until requirements of Part 845 have been achieved.

4.1 Monitoring Networks and Parameters

4.1.1 40 C.F.R. § 257 Groundwater Monitoring

The existing 40 C.F.R. § 257 monitoring program was discussed in detail in **Section 2.1.1**. Six wells (two background and four compliance) are sampled for Appendix III and Appendix IV parameters on a semi-annual frequency. No changes are proposed to this monitoring network. Well locations and parameters will continue to be monitored and reported as required by 40 C.F.R. § 257 until USEPA approves Part 845.

4.1.2 Part 845 Groundwater Monitoring

The proposed Part 845 Monitoring Network will consist of two background monitoring wells (G281 and G306), 14 compliance monitoring wells (G301, G302, G303, G305, G307, G307D, G308, G310, G312, G313, G314, G314D, G315, and G316), and three temporary water level only surface water staff gages (SG-02, SG-03, and XSG-01) to monitor potential impacts from AP1 (**Figure 2-1**). These monitoring wells are screened within the uppermost aquifer (G281, G301, G302, G303, G305, G306, G307, G308, G310, G312, G313, G315,), the LCU (G307D, G314, and G316), and DA (G314D) along the perimeter of AP1. Groundwater samples will be collected and analyzed for the laboratory and field parameters in **Table D** below.

Table D. Part 845 Groundwater Monitoring Program Parameters

Field Parameters[1]			
Groundwater Elevation	pH	Turbidity	
Metals (Total)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (Total, except TDS)			
Fluoride	Sulfate	Chloride	TDS
Other (Total)			
Radium 226 and 228 combined			

[1] Dissolved oxygen, temperature, specific conductance, and oxidation/reduction potential will be recorded during sample collection.

All parameters listed above were sampled a minimum of eight times by October 18, 2021 to establish background groundwater quality in accordance with 35 I.A.C. § 845.650 (b)(1)(A). Discussion of background groundwater quality is included in **Section 3.2**.

4.2 Sampling Schedule

Groundwater sampling for the Part 845 monitoring well network will initially be performed quarterly according to the following schedule:

Table E. Part 845 Sampling Schedule

Frequency	**Duration**
Monthly (groundwater elevations only)	Begins: the quarter following approval of this plan and issuance of the Operating Permit.
	Ends: Following the 30-year post closure care period and following IEPA approval of documentation that groundwater concentrations are below standards in 35 I.A.C. § 845.600 and concentrations exceeding background are not increasing and meet requirements in 35 I.A.C. § 845.780 (c)(2)(B)(i) and (ii).
Quarterly (groundwater quality)	Begins: the quarter following approval of this plan and issuance of the Operating Permit.
	Ends: Following the 30-year post closure care period and following IEPA approval of documentation that groundwater concentrations are below standards in 35 I.A.C. § 845.600 and concentrations exceeding background are not increasing and meet requirements in 35 I.A.C. § 845.780 (c)(2)(B)(i) and (ii), or upon IEPA approval of an alternate schedule as allowed by 35 I.A.C. § 845.650(b)(4).
Semi-annual (groundwater quality)	Begins: Following 5 years of quarterly groundwater monitoring and IEPA approval of a demonstration that groundwater concentrations are below standards in 35 I.A.C. § 845.600 and not exhibiting statistically-significant increasing trends, monitoring effectiveness is not compromised by a semi-annual schedule, and sufficient data has been collected to characterize groundwater.
	Ends: Following detection of a statistically-significant increasing trend in groundwater concentrations or an exceedance of the standards in 35 I.A.C. § 845.600 (quarterly monitoring shall be resumed in these circumstances), or following the 30-year post closure care period and following IEPA approval of documentation that groundwater concentrations

	are below standards in 35 I.A.C. § 845.600 and concentrations exceeding background are not increasing and meet requirements in 35 I.A.C. § 845.780 (c)(2)(B)(i) and (ii).

4.3 Groundwater Sample Collection

Groundwater sampling procedures have been developed and the collection of groundwater samples is being implemented to meet the requirements of 35 I.A.C. § 845.640. In addition to groundwater well samples, quality assurance samples will be collected as described in **Section 4.5** (**Table 4-1**).

4.4 Laboratory Analysis

Laboratory analysis will be performed consistent with the requirements of 35 I.A.C. § 845.640(j) by a state-certified laboratory using methods approved by IEPA and USEPA. Laboratory methods may be modified based on laboratory equipment availability or procedures, but the Reporting Limit (RL) for all parameters analyzed, regardless of method, will be lower than the applicable groundwater quality standard. RLs for the applicable parameters are summarized in **Table 4-2**. Concentrations lower than the RL will be reported as less than the RL.

4.5 Quality Assurance Program

Consistent with the requirements of 35 I.A.C. § 845.640(a)(5), the sampling and analysis program includes procedures and techniques for quality assurance/quality control (QA/QC). Additional quality assurance samples to be collected will include the following:

- Field duplicates will be collected at a frequency of one per group of ten or fewer investigative water samples.
- One equipment blank sample will be collected and analyzed for each day of sampling. If dedicated sampling equipment is used, then equipment blank samples will not be collected.
- The duplicate and equipment blank quality assurance samples will be supplemented by the laboratory QA/QC program, which typically includes:
  - Regular generation of instrument calibration curves to assure instrument reliability
  - Laboratory control samples and/or quality control check standards that have been spiked, and analyses to monitor the performance of the analytical method
  - Matrix spike/matrix spike duplicate analyses to determine percent recoveries and relative percent differences for each of the parameters detected
  - Analysis of replicate samples to check the precision of the instrumentation and/or methodology employed for all analytical methods
  - Analysis of method blanks to assure that the system is free of contamination

Water quality meters used to measure pH and turbidity will be calibrated according to manufacturer's specifications. At a minimum, it is recommended that calibration of pH occur daily prior to sampling and checked for accuracy at the end of each day. Unusual or suspect pH measurements during sampling events will be flagged, evaluated, and additional calibration may be performed throughout the sampling events. Turbidity meters will be checked daily, prior to and following sampling. Unusual measurements or erratic meter performance will be flagged and evaluated for overall effects on the data prior to reporting.

4.6 Groundwater Monitoring System Maintenance Plan

Consistent with the requirements of 35 I.A.C. § 845.630(e)(2), maintenance will be performed as needed to assure that the monitoring wells provide representative groundwater samples. Monitoring wells will be inspected during each groundwater sampling event; inspections will consist of the following:

- Visual inspection, clearing of vegetation, replacement of markers, and painting of protective casings as needed to assure that monitoring wells are clearly marked and accessible
- Visual inspection and repair or replacement of well aprons as needed to assure that they are intact, drain water away from the well, and have not heaved
- Visual inspection and repair or replacement of protective casings as needed to assure that they are undamaged, and that locks are present and functional
- Checks to assure that well caps are intact and vented, unless in flood-prone areas in which case caps will not be vented
- Annual measurement of monitoring well depths to determine the degree of siltation within the wells. Wells will be redeveloped as needed to remove siltation from the screened interval if it impedes flow of water into the well
- Checks to assure that wells are clear of internal obstructions, and flow freely

If maintenance of a monitoring well cannot address an identified deficiency, a replacement well will be installed.

4.7 Statistical Analysis

Statistical analysis will be consistent with procedures listed in 35 I.A.C. § 845.640(f). A Statistical Analysis Plan, provided in **Appendix A**, has been developed to summarize the statistical procedures that will be used to evaluate the groundwater results.

4.8 Data Reporting

Data reporting for the 40 C.F.R. § 257 monitoring program will be consistent with recordkeeping, notification, and internet posting requirements described in 40 C.F.R. § 257.105 through 257.107.

Groundwater monitoring and analysis completed in accordance with the Part 845 monitoring under an approved monitoring program will be reported to IEPA within 60 days after completion of sampling and the data placed in the facility's operating record as required by 35 I.A.C. § 845.610(b)(3)(D). Within 14 days of posting to the operating record, information will be posted to the publicly accessible internet site "Illinois CCR Rule Compliance Data and Information" as required by 35 I.A.C. § 845.810(d). Information will also be submitted to IEPA annually by January 31 as required by 35 I.A.C. § 845.550, for data collected the preceding year. The report will include the status of the groundwater monitoring and any required corrective action plan for AP1 in addition to other requirements detailed in 35 I.A.C. § 845.610(e).

4.9 Compliance with Applicable On-site Groundwater Protection Standards

In accordance with 35 I.A.C. § 845.600(a)(1), the groundwater protection standard at the waste boundary will be the higher of either the 35 I.A.C. § 845.600 standard or the concentration determined by background groundwater monitoring.

As provided in 35 I.A.C. § 845.780(c)(2), at the end of the 30-year post-closure care period, groundwater monitoring will continue to be conducted in post-closure care until the groundwater results show the concentrations are:

- Below the GWPS in 35 I.A.C. § 845.600; and
- Not increasing for those constituents over background, using the statistical procedures and performance standards in 35 I.A.C. § 845.640(f) and (g), provided that:
  - Concentrations have been reduced to the maximum extent feasible; and
  - Concentrations are protective of human health and the environment.

Following detection of an exceedance of the GWPS, an Alternate Source Demonstration (ASD) will be evaluated as described in **Section 4.10**.

4.10 Alternate Source Demonstrations

As allowed in 35 I.A.C. § 845.650(e), following detection of an exceedance of the GWPS, an ASD will be evaluated and, if completed, submitted to IEPA within 60 days. The ASD will provide lines of evidence that a source other than AP1 caused the contamination and AP1 did not contribute to the contamination, or that the exceedance of the GWPS resulted from error in sampling, analysis, statistical evaluation, natural variation in groundwater quality, or a change in the potentiometric surface and groundwater flow direction.

The ASD will include information and analysis that supports the conclusions and a certification of accuracy by a qualified professional engineer. Once the ASD is approved by IEPA, the Part 845 groundwater monitoring will continue as defined in **Section 4.1.2**.

If an ASD is not completed and submitted, or IEPA does not approve the ASD, a notification of the exceedance will be provided to IEPA and placed in the operating record. Additional actions will also be completed as required by 35 I.A.C § 845.650(d)(1) through (3), including initiation of an assessment of corrective measures under 35 I.A.C § 845.660. As allowed in 35 I.A.C § 845.650(e)(7) a petition for review of IEPA's non-concurrence under 35 I.A.C. § 105 may also be filed.

4.11 Assessment of Corrective Measures and Corrective Action

As described in 35 I.A.C. § 845.660, if the ASD summarized in **Section 4.10** has not been approved by IEPA, an assessment of corrective measures will be initiated within 90 days of the detection of a result exceeding 35 I.A.C. § 845.600 standards (*i.e.,* receipt of laboratory data). The assessment of corrective measures will include at least the following (35 I.A.C. § 845.660 (c)):

- The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
- The time required to begin and complete the corrective action plan; and
- The institutional requirements, such as State or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the corrective action plan.

Within one year of completing the assessment of corrective measures, a corrective action plan will be developed to identify the selected remedy in accordance with 35 I.A.C. § 845.670. If closure of the CCR Unit is required, a closure alternatives analysis will be completed as specified in 35 I.A.C. § 845.710. The analysis and selected alternative will be submitted to IEPA in a Closure Plan as specified by 35 I.A.C. § 845.720. Groundwater monitoring proposed in this Addendum will continue as specified until the post closure care period has expired and IEPA has approved termination of post-closure care.

5. REFERENCES

Illinois Environmental Protection Agency, 2021. *Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845*, April 15, 2021.

Natural Resource Technology, An OBG Company (NRT/OBG), 2017. *Sampling and Analysis Plan, Coffeen Ash Pond No. 1, Coffeen Power Station, Coffeen, Illinois, Project No. 2285, Revision 0, October 17, 2017.*

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. *Hydrogeologic Site Characterization Report. Coffeen Ash Pond No. 1, Coffeen Power Plant*. *Coffeen, Illinois.*

United States Environmental Protection Agency (USEPA), March 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance*. Office of Resource Conservation and Recovery, Program Implementation and Information Division, United States Environmental Protection Agency, Washington D.C. EPA/530/R-09/007.

TABLES

TABLE 1-1. PART 845 REQUIREMENTS CHECKLIST

GROUNDWATER MONITORING PLAN

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Part 845 Reference	Part 845 Components	Location of Information in GMP
845.630	**Groundwater Monitoring Systems**	
845.630(a)(2)	Potential contaminant pathways must be monitored.	Sections 2.2 & 4.1.2
845.630(a) 845.630(b) 845.630(c)	At least two upgradient wells and four downgradient wells (min. 1 and 3, but requires additional documentation)	Sections 2.2 & 4.1.2 Table 2-1 Figure 2-1
845.630(a) 845.630(b) 845.630(c)	Downgradient Well Density	Figure 2-1
845.630(a)(2)	Downgradient wells at waste boundary	Figure 2-1
845.640	**Groundwater Sampling and Analysis Requirements**	
845.640(a)	Consistent sampling and analysis procedures	Section 4 Tables 4-1 & 4-2
845.640(b)	Methods are appropriate	Section 4 Tables 4-1 & 4-2
845.640(c)	Groundwater elevations must be measured in each well prior to purging, each time groundwater is sampled.	Section 4.3
845.640 (d)(e)(f)(g)(h)	Establishment of background and application of statistical methods	Sections 3.2 & 4.7 Appendix A
845.640(i)	Analyze total recoverable metals	Section 4.1.2
845.640(j)	Analyze groundwater samples using a certified laboratory	Section 4.4

TABLE 1-1. PART 845 REQUIREMENTS CHECKLIST

GROUNDWATER MONITORING PLAN

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Part 845 Reference	Part 845 Components	Location of Information in GMP
845.650	**Groundwater Monitoring Program**	
845.650(a)	Must include monitoring for all constituents with a groundwater protection standard in Section 845.600(a), calcium, and turbidity	Section 4.1.2
845.650(b)(c)	Groundwater Monitoring Frequency	Sections 4.1.2 & 4.2
845.650(d)(e)	Exceedances of the groundwater protection standard	Sections 4.9, 4.10 & 4.11
845.650(b)(2) and (3)	Staff gauge/ piezometer to monitor head in impoundment	Sections 2.2 & 4.1.2 Figure 2-1 (XSG-01)
NA	Staff gauge/ piezometer to monitor head of neighboring surface water body	Sections 2.2 & 4.1.2 Figure 2-1 (SG-02 & SG-03)

[O: CJC 09/01/21; C: SSW 09/15/21]

Notes:

GMP = Groundwater Monitoring Plan

NA = Not Applicable

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	Type	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
G281	B	UA	09/08/2015	--	626.36	Top of Disk	623.82	15.51	20.16	608.31	603.66	20.30	603.50	4.7	2	39.065405	-89.399322
G301	C	UA	09/04/2015	--	622.65	Top of Disk	620.88	11.31	15.96	608.96	604.31	16.21	604.10	4.7	2	39.05951	-89.395415
G302	C	UA	09/04/2015	--	620.04	Top of Disk	618.52	13.21	17.86	604.74	600.09	18.39	599.60	4.7	2	39.059544	-89.393192
G303	C	UA	08/26/2010	--	622.02	Top of Disk	619.33	10.00	20.00	609.07	599.07	20.40	598.70	10	2	39.057144	-89.391721
G305	C	UA	05/03/2016	625.67	625.67	Top of PVC	623.23	13.44	18.27	609.10	604.27	18.50	604.10	4.8	2	39.056558	-89.396798
G306	B	UA	05/03/2016	625.91	625.91	Top of PVC	623.57	13.07	17.68	609.77	605.16	17.90	604.80	4.6	2	39.056494	-89.393556
G307	C	UA	07/27/2016	624.60	624.60	Top of PVC	624.73	12.96	17.80	609.12	604.28	18.22	603.90	4.8	2	39.057214	-89.395545
G307D	C	LCU	01/19/2021	624.88	624.88	Top of PVC	622.51	48.98	58.75	573.53	563.76	59.60	562.50	9.8	2	39.05721	-89.39552
G308	C	UA	01/18/2021	624.59	624.59	Top of PVC	621.59	10.10	14.89	611.49	606.70	15.24	605.80	4.8	2	39.057379	-89.397134
G310	C	UA	02/09/2021	622.87	622.87	Top of PVC	619.89	10.24	15.03	609.65	604.86	15.38	604.00	4.8	2	39.059532	-89.396907
G312	C	UA	01/15/2021	619.78	619.78	Top of PVC	616.92	9.79	14.58	607.13	602.34	14.93	601.70	4.8	2	39.059558	-89.391983
G313	C	UA	02/05/2021	614.30	614.30	Top of PVC	611.51	6.30	11.11	605.21	600.40	11.46	599.50	4.8	2	39.058773	-89.391124
G314	C	LCU	02/05/2021	613.88	613.88	Top of PVC	611.11	14.56	19.58	596.55	591.53	20.02	591.10	5	2	39.05782	-89.390964
G314D	C	DA	02/04/2021	613.70	613.70	Top of PVC	610.87	39.34	49.11	571.53	561.76	49.47	510.60	9.8	2	39.057852	-89.390958
G315	C	UA	01/14/2021	623.52	623.52	Top of PVC	620.94	9.69	14.48	611.25	606.46	14.85	605.00	4.8	2	39.057165	-89.393667
G316	C	LCU	02/26/2021	602.59	602.59	Top of PVC	599.64	10.02	14.82	589.62	584.82	15.16	583.90	4.8	2	39.057847	-89.389698
XSG-01	WLO	CCR	--	635.52	635.52	staff gauge	635.52	--	--	--	--	--	--	--	--	39.059128	-89.396727
SG-02	WLO	SW	--	--	605.87	Top of Prot Casing	605.87	--	--	--	--	--	--	--	--	39.059695	-89.391429
SG-03	WLO	SW	--	--	594.94	Top of Prot Casing	594.94	--	--	--	--	--	--	--	--	39.059092	-89.390342

RAMBOLL

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Well Number	Type	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
Type refers to the role of the well in the monitoring network: background (B), compliance (C), or water level measurements only (WLO)
WLO wells are temporary pending implementation of impoundment closure per an approved Construction Permit application
-- = data not available
BGS = below ground surface
CCR = Coal Combustion Residual
DA = deep aquifer
ft = foot or feet
HSU = Hydrostratigraphic Unit
LCU = lower confining unit
PVC = polyvinyl chloride
SW = surface water
UA = uppermost aquifer
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RAMBOLL

TABLE 3-1. BACKGROUND GROUNDWATER QUALITY AND STANDARDS
GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Parameter	Background Concentration	845 Limit	Groundwater Protection Standard	Unit
Antimony, total	0.003	0.006	0.006	mg/L
Arsenic, total	0.0043	0.010	0.010	mg/L
Barium, total	0.12	2.0	2.0	mg/L
Beryllium, total	0.001	0.004	0.004	mg/L
Boron, total	3.2	2	3.2	mg/L
Cadmium, total	0.001	0.005	0.005	mg/L
Chloride, total	120	200	200	mg/L
Chromium, total	0.011	0.1	0.1	mg/L
Cobalt, total	0.0056	0.006	0.006	mg/L
Fluoride, total	0.411	4.0	4.0	mg/L
Lead, total	0.0063	0.0075	0.0075	mg/L
Lithium, total	0.013	0.04	0.04	mg/L
Mercury, total	0.0013	0.002	0.002	mg/L
Molybdenum, total	0.0015	0.1	0.1	mg/L
pH (field)	7.3 / 6.6	9.0 / 6.5	9.0 / 6.5	SU
Radium 226 and 228 combined	1.6	5	5	pCi/L
Selenium, total	0.0015	0.05	0.05	mg/L
Sulfate, total	367	400	400	mg/L
Thallium, total	0.001	0.002	0.002	mg/L
Total Dissolved Solids	1010	1200	1200	mg/L

Notes:
For pH, the values presented are the upper / lower limits
Groundwater protection standards for calcium and turbidity do not apply per 35 I.A.C. § 845.600(b)
mg/L = milligrams per liter
SU = standard units
pCi/L = picocuries per liter

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TABLE 4-1. SAMPLING AND ANALYSIS SUMMARY
GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT
ASH POND NO. 1
COFFEEN, ILLINOIS

Parameter	Analytical Method [1]	Number of Samples	Field Duplicates [2]	Field Blanks [3]	Equipment Blanks [3]	MS/MSD [4]	Total	Container Type	Minimum Volume [5]	Preservation (Cool to 4 °C for all samples)	Sample Hold Time from Collection Date
Metals											
Metals [6]	6020, Li - EPA 200.7	16	2	0	0	1	19	plastic	600 mL	HNO_3 to pH<2	6 months
Mercury	7470A or 6020	16	2	0	0	1	19	plastic	400 mL	HNO_3 to pH<2	28 days
Inorganic Parameters											
Fluoride	9214 or EPA 300	16	2	0	0	1	19	plastic	300 mL	Cool to 4 °C	28 days
Chloride	9251 or EPA 300	16	2	0	0	1	19	plastic	100 mL	Cool to 4 °C	28 days
Sulfate	9036 or EPA 300	16	2	0	0	1	19	plastic	50 mL	Cool to 4 °C	28 days
Total Dissolved Solids	SM 2540 C	16	2	0	0	1	19	plastic	200 mL	Cool to 4 °C	7 days
Radium											
Radium 226	9315 or EPA 903	16	0	0	0	0	16	plastic	1000 mL	HNO_3 to pH<2	6 months
Radium 228	9320 or EPA 904	16	0	0	0	0	16	plastic	1000 mL	HNO_3 to pH<2	6 months
Field Parameters											
pH	SM 4500-H+ B	16	NA	NA	NA	NA	16	flow-through cell	NA	none	immediately
Dissolved Oxygen [8]	SM 4500-O/405.1	16	NA	NA	NA	NA	16	flow-through cell	NA	none	immediately
Temperature [8]	SM 2550	16	NA	NA	NA	NA	16	flow-through cell	NA	none	immediately
Oxidation/Reduction Potential [8]	SM 2580 B	16	NA	NA	NA	NA	16	flow-through cell	NA	none	immediately
Specific Conductance [8]	SM 2510 B	16	NA	NA	NA	NA	16	flow-through cell	NA	none	immediately
Turbidity [7]	SM 2130 B	16	NA	NA	NA	NA	16	flow-through cell or hand-held turbidity meter	NA	none	immediately

[O: CJC 09/01/21; C: SSW 09/15/21]

Notes:
[1] Analytical method numbers are from SW-846 unless otherwise indicated. Analytical methods may be updated with more recent versions as appropriate.
[2] Field duplicates will be collected at a frequency of one per group of 10 or fewer investigative water samples. Field duplicates will not be collected for radium analysis.
[3] Field blanks will be collected at the discretion of the project manager; Equipment blanks will be collected at a rate of 1 per sampling event if non-dedicated equipment is used.
[4] Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples will be collected at a frequency of one per group of 20 or fewer investigative water samples per CCR unit/multi-unit. Additional volume to be determined by laboratory.
[5] Sample volume is estimated and will be determined by the laboratory.
[6] Metals = antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, lead, lithium, molybdenum, selenium, thallium. Metals may be analyzed via ICP/ ICP-MS USEPA methods 6010 or 6020 depending on laboratory instrument availability
[7] If turbidity exceeds 10 NTUs, a duplicate sample filtered through a .45 micron filter may be collected for metals analysis in addition to the unfiltered sample. Both samples would be submitted for analysis.
[8] Parameter collected for quality assurance and quality control for field sampling purposes only; not required to be collected or reported under Part 845; collection of parameter may be discontinued without notification.
< = less than
°C = degrees Celsius
HNO_3 = nitric acid
mL = milliliter
NA = not applicable
NTU = nephelometric turbidity unit

TABLE 4-2. DETECTION AND REPORTING LIMITS FOR PART 845 PARAMETERS

GROUNDWATER MONITORING PLAN

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Constituent	CAS	Unit	Analytical Methods [1]	USEPA MCL [2]	35 I.A.C. § 845.600	RL [4, 5]	MDL [5]
Metals							
Antimony	7440-36-0	mg/L	6020	0.006	0.006	0.003	0.00036
Arsenic	7440-38-2	mg/L	6020	0.01	0.01	0.001	0.00013
Barium	7440-39-3	mg/L	6020	2	2	0.001	0.00028
Beryllium	7440-41-7	mg/L	6020	0.004	0.004	0.001	0.000017
Boron	7440-42-8	mg/L	6020	NS	2	0.01	0.0023
Cadmium	7440-43-9	mg/L	6020	0.005	0.005	0.001	0.000042
Calcium	7440-70-2	mg/L	6020	NS	NS	0.15	0.15
Chromium	7440-47-3	mg/L	6020	0.1	0.1	0.004	0.00027
Cobalt	7440-48-4	mg/L	6020	0.006	0.006	0.002	0.000017
Lead	7439-92-1	mg/L	6020	0.015	0.0075	0.001	0.000025
Lithium	7439-93-2	mg/L	6020 or EPA 200.7	0.04	0.04	0.02	0.0001
Mercury	7439-97-6	mg/L	6020 or 7470A	0.002	0.002	0.0002	0.000078
Molybdenum	7439-98-7	mg/L	6020	0.1	0.1	0.001	0.000063
Selenium	7782-49-2	mg/L	6020	0.05	0.05	0.001	0.00032
Thallium	7440-28-0	mg/L	6020	0.002	0.002	0.001	0.000062
Inorganics							
Fluoride	7681	mg/L	9214 or EPA 300	4	4	0.25	0.065
Chloride	16887-00-6	mg/L	9251 or EPA 300	250 [3]	200	1	0.15
Sulfate	18785-72-3	mg/L	9036 or EPA 300	250 [3]	400	1	0.24
Total Dissolved Solids	10052	mg/L	SM 2540C	500 [3]	1200	17	--
Other							
Radium 226 and 228 combined	7440-14-4	pCi/L	9315/9320 or EPA 903/904	5	5	-- [6]	-- [7]

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TABLE 4-2. DETECTION AND REPORTING LIMITS FOR PART 845 PARAMETERS

GROUNDWATER MONITORING PLAN

COFFEEN POWER PLANT

ASH POND NO. 1

COFFEEN, ILLINOIS

Constituent	CAS	Unit	Analytical Methods [1]	USEPA MCL [2]	35 I.A.C. § 845.600	RL [4, 5]	MDL [5]
Field							
pH	NA	SU	SM 4500-H+ B	NS	6.5-9.0	NA	NA
Oxidation/Reduction Potential	NA	mV	SM 2580 B	NS	NS	NA	NA
Dissolved Oxygen	NA	mg/L	SM 4500-O/405.1	NS	NS	NA	NA
Temperature	NA	°C	SM 2550	NS	NS	NA	NA
Specific Conductivity	NA	μS/cm	SM 2510 B	NS	NS	NA	NA
Turbidity	NA	NTU	SM 2130 B	NS	NS	NA	NA

[O: CJC 09/01/21; C: SSW 09/15/21]

Notes:

[1] Analytical method numbers are from SW-846 unless otherwise indicated. Metals will be analyzed via Method 6020 or 6010 depending on laboratory equipment availability. Selected method will ensure reporting limits (RL) are below Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.600 groundwater protection standards.

[2] USEPA MCL = United States Environmental Protection Agency Maximum Contaminant Level.

[3] USEPA SMCL = United States Environmental Protection Agency Secondary Maximum Contaminant Level.

[4] RLs will be less than the 35 I.A.C. § 845.600 groundwater protection standards.

[5] RLs and method detection limits (MDL) will vary depending on the laboratory performing the work.

[6] All radium results will be reported (values may be positive or negative) and will include uncertainty and the calculated MDC.

[7] Laboratories calculate a minimum detectable concentration (MDC) based on the sample.

°C = degrees Celsius

μS/cm = microSiemens per centimeter

CAS = Chemical Abstract Number

MDL = Method detection limit as established by the laboratory

mg/L = milligrams per liter

mV = millivolts

NS = No standard

NTU = nephelometric turbidity unit

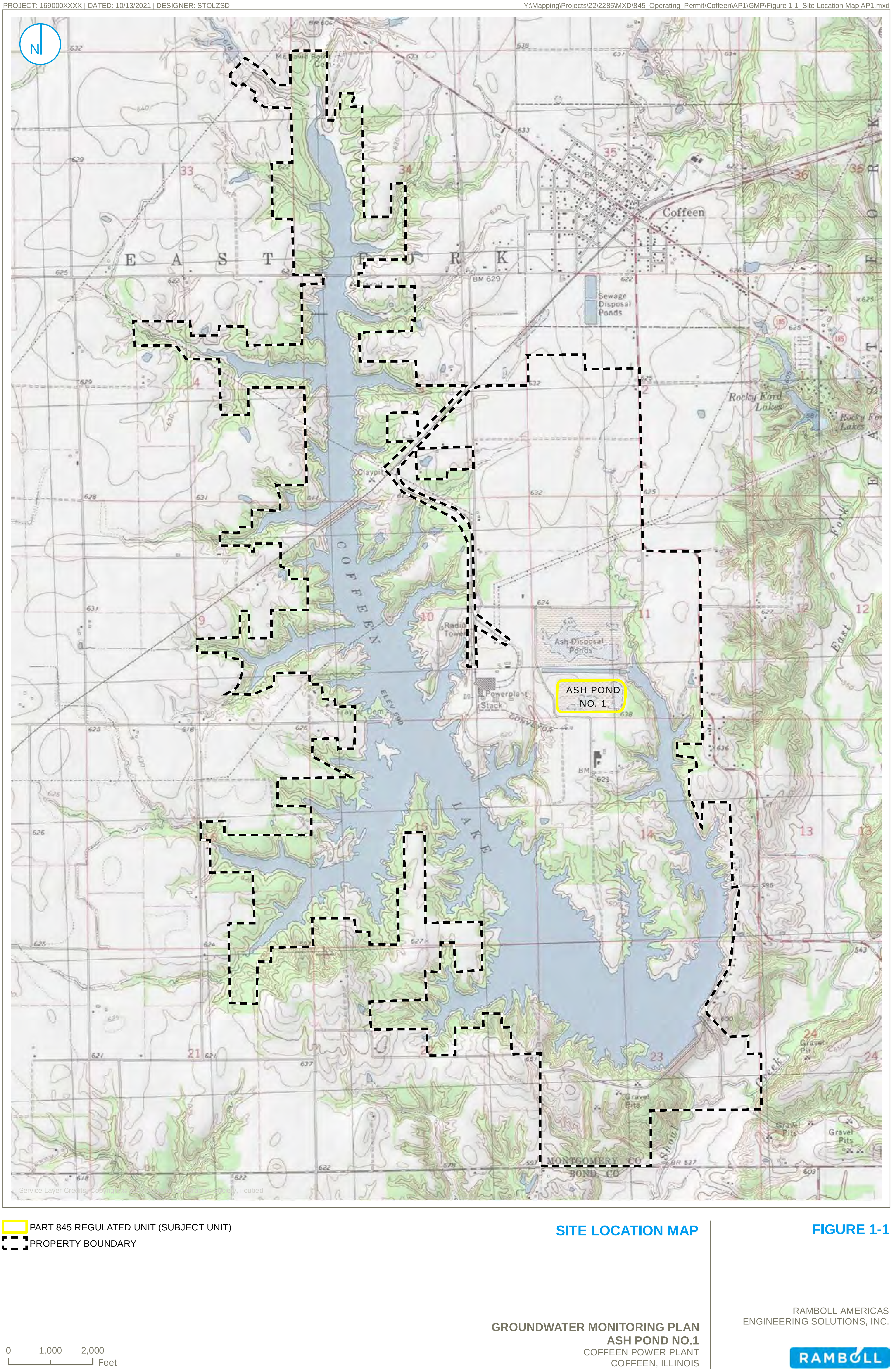
pCi/L = picoCuries per liter

RL = Reporting limit as established by the laboratory

SM = Standard Methods for the Examination of Water and Wastewater

SU = standard units

FIGURES



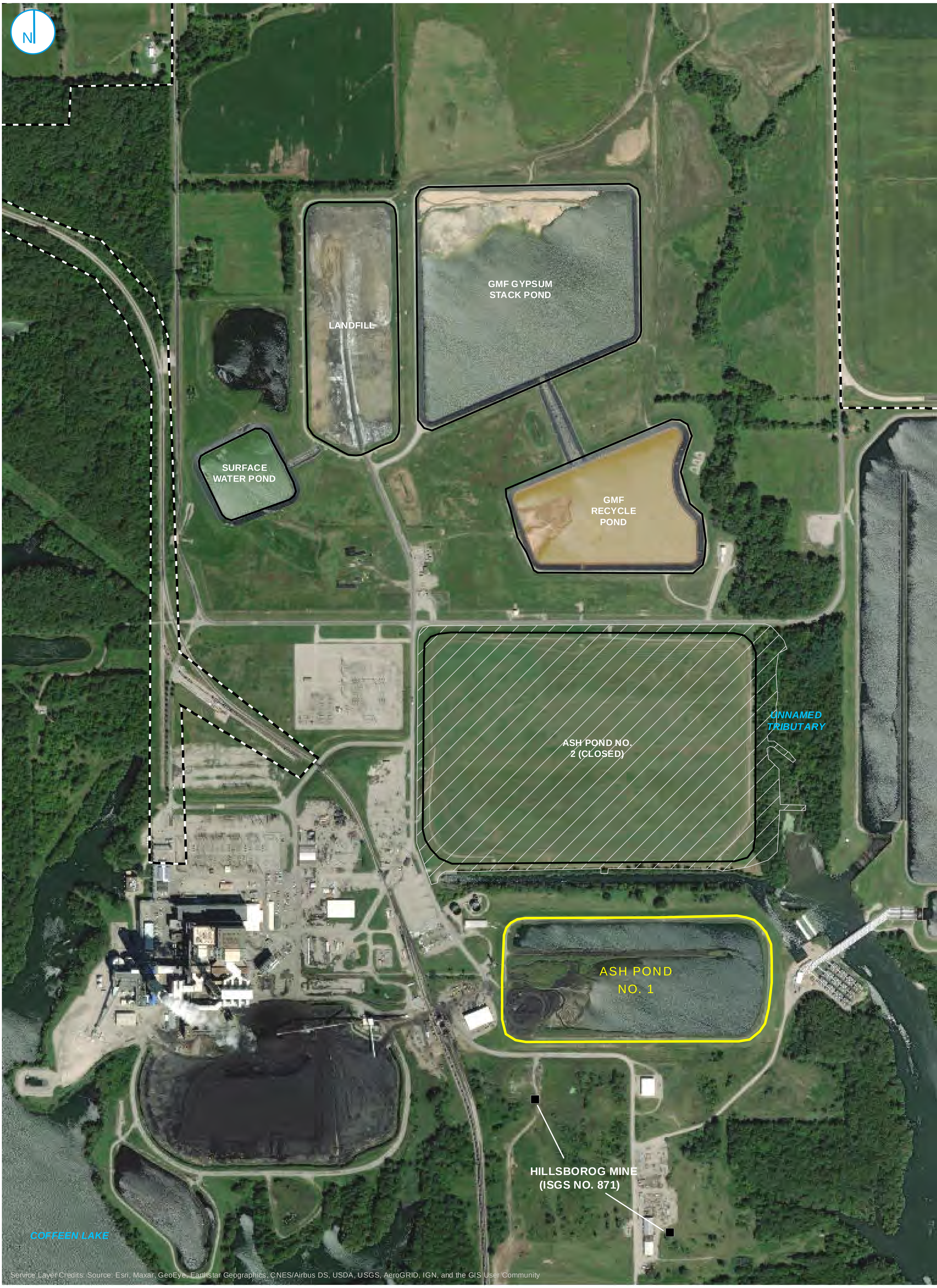
SITE LOCATION MAP

FIGURE 1-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

GROUNDWATER MONITORING PLAN
ASH POND NO.1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL



COAL MINE SHAFT
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

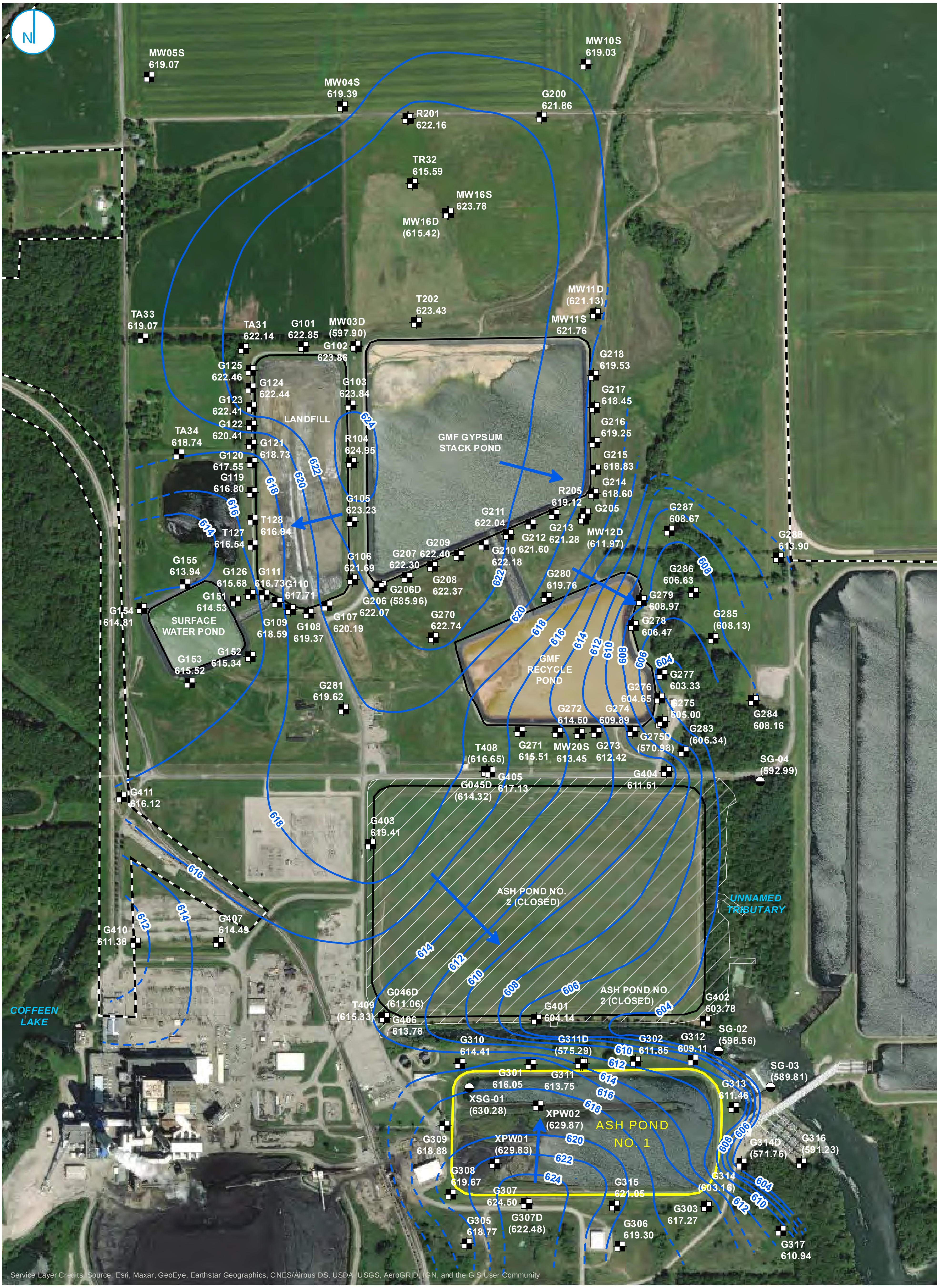
SITE MAP

FIGURE 1-2

GROUNDWATER MONITORING PLAN
ASH POND NO.1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL



MONITORING WELL
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 275 550
Feet

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.

UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS APRIL 20, 2021

FIGURE 1-3

GROUNDWATER MONITORING PLAN
ASH POND NO.1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
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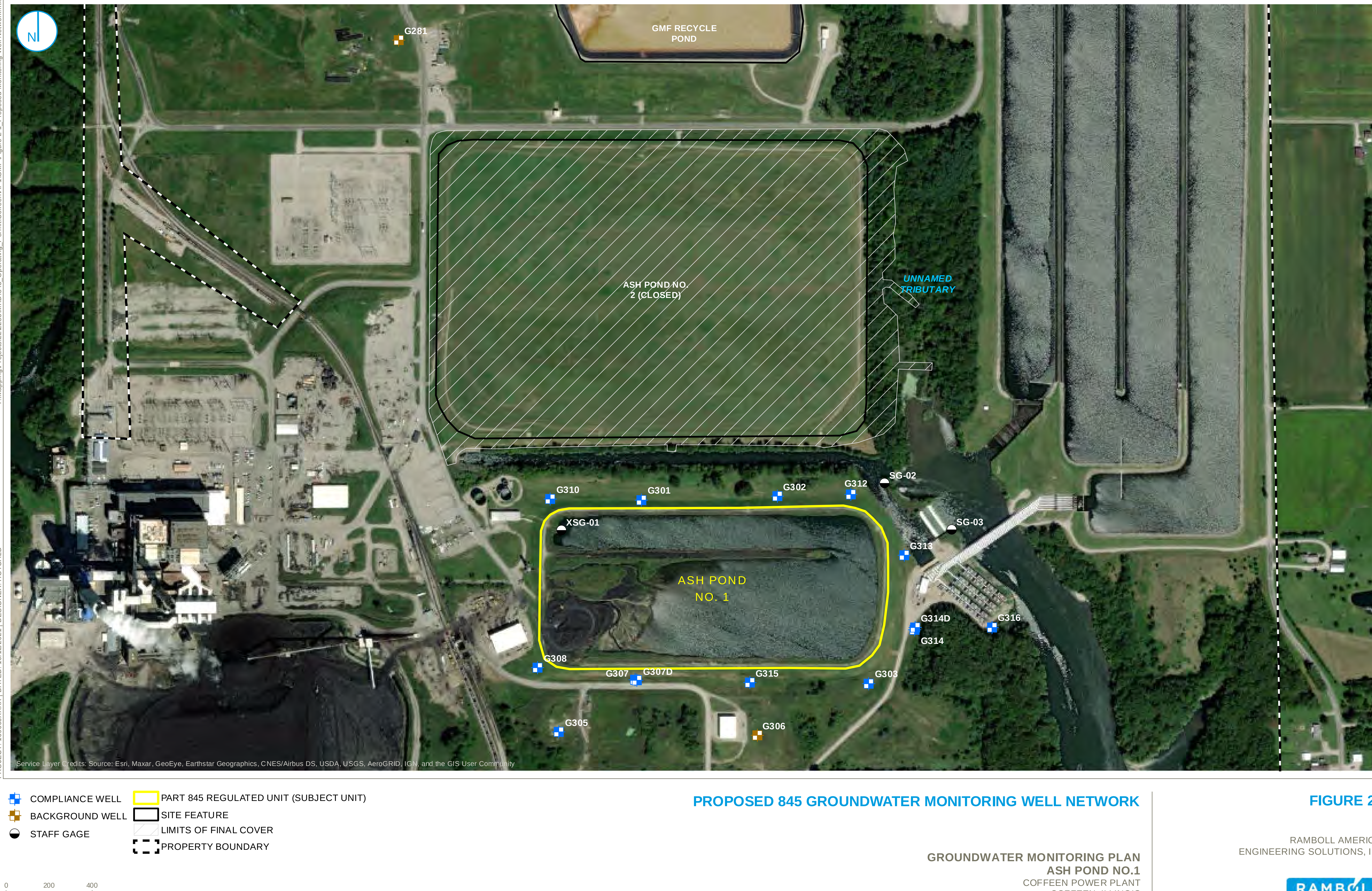

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Coffeen\AP1\GMP\Figure 2-1_Proposed Monitoring Well Network.mxd

PROJECT: 169000XXXX | DATED: 10/12/2021 | DESIGNER: HOTCALD

COMPLIANCE WELL
BACKGROUND WELL
STAGE GAGE

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

PROPOSED 845 GROUNDWATER MONITORING WELL NETWORK

GROUNDWATER MONITORING PLAN
ASH POND NO.1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

APPENDIX A
STATISTICAL ANALYSIS PLAN

Prepared for
Illinois Power Generating Company

Date
October 25, 2021

Project No.
1940100806-002

STATISTICAL ANALYSIS PLAN

ASH POND NO. 1
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL Bright ideas. Sustainable change.

STATISTICAL ANALYSIS PLAN
COFFEEN POWER PLANT ASH POND NO. 1

Project Name	**Coffeen Power Plant Ash Pond No. 1**
Project No.	**1940100806-002**
Recipient	**Illinois Power Generating Company**
Document Type	**Statistical Analysis Plan**
Version	**FINAL**
Date	**October 25, 2021**

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Brian G. Hennings, PG
Senior Managing Hydrogeologist

Eric J. Tlachac, PE
Senior Managing Engineer

Rachel A. Banoff, EIT
Project Statistician

LICENSED PROFESSIONAL CERTIFICATIONS

This certification is based on the description of the statistical methods selected to evaluate groundwater as presented in the following Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 1. The procedures described in the plan will be used to establish background conditions and implement compliance monitoring as necessary and required by 35 I.A.C. § 845.640 and 35 I.A.C. § 845.650. The Statistical Analysis Plan was prepared in accordance with the requirements of 35 I.A.C. § 845.640(f), with reference to the acceptable statistical procedures provided in the United States Environmental Protection Agency (USEPA)'s *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (*Unified Guidance,* March 2009), and is intended to provide a logical process and framework for conducting the statistical analysis of the data obtained during groundwater monitoring. In accordance with 35 I.A.C. § 845.640(f)(1), the statistical method chosen for analysis of background groundwater quality will be either the tolerance interval or the prediction interval procedure for each constituent listed in 35 I.A.C. § 845.600(a)(1) at this CCR unit per 35 I.A.C. § 845.640(f)(1)(C). Groundwater Protection Standards (GWPS) will be established in accordance with 35 I.A.C. § 845.600(a) (greater of the background concentration or numerical limit specified in 35 I.A.C. § 845.600(a)(1)). The GWPS will be compared to the lower confidence limit for the observed concentrations for each constituent in each compliance well. Consistent with the *Unified Guidance*, the same general statistical method of confidence interval testing against a fixed GWPS is recommended in compliance and corrective action programs. Confidence intervals provide a flexible and statistically accurate method to test how a parameter estimated from a single sample compares to a fixed numerical limit. Confidence intervals explicitly account for variation and uncertainty in the sample data used to construct them.

Description of the statistical methods chosen for analysis of groundwater monitoring data and application of these methods for determining exceedances of the GWPS identified in 35 I.A.C. § 845.600(a) is provided in this Statistical Analysis Plan.

35 I.A.C. § 845.640 Statistical Analysis (PE)

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Illinois, certify that the statistical methods summarized above and described in this document (Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 1) are appropriate for evaluating the groundwater monitoring data collected as described in the attached document and are in substantial compliance with 35 I.A.C. § 845.640.

Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
Date: October 25, 2021

LICENSED PROFESSIONAL ENGINEER
ERIC J. TLACHAC
062-063091
STATE OF ILLINOIS

35 I.A.C. § 845.640 Statistical Analysis (PG)

I, Brian G. Hennings, a qualified professional geologist in good standing in the State of Illinois, certify that the statistical methods described in this document (Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 1) are appropriate for evaluating the groundwater monitoring data collected as described in the attached document and are in substantial compliance with 35 I.A.C. § *845.640.*

Brian G. Hennings
Professional Geologist
196.001482
Illinois
Date: October 25, 2021

LICENSED PROFESSIONAL GEOLOGIST
BRIAN G. HENNINGS
196.001482
ILLINOIS

35 I.A.C. § 845.640 Statistical Analysis

I, Rachel A. Banoff, a qualified professional, certify that the statistical methods described in this document (Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 1), are appropriate for evaluating the groundwater monitoring data collected as described in the attached document and are in substantial compliance with 35 I.A.C. § *845.640.*

Rachel A. Banoff, EIT
Project Statistician
Date: October 25, 2021

CONTENTS

TABLES (IN TEXT)

ACRONYMS AND ABBREVIATIONS

§	Section
35 I.A.C.	Title 35 of the Illinois Administrative Code
ANOVA	analysis of variance
CCR	coal combustion residuals
COC	constituents of concern
GWPS	groundwater protection standard
IEPA	Illinois Environmental Protection Agency
LCL	lower confidence limit
LTL	lower tolerance limit
MSE	mean squared error
P	probability
Part 845	Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
ROS	regression on order statistics
SI	surface impoundment
SSI	statistically significant increase
SWFPR	site-wide false positive rate
Unified Guidance	*Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009)
UPL	upper prediction limit
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit

1. INTRODUCTION

In April 2021, the Illinois Environmental Protection Agency (IEPA) issued a final rule for the regulation and management of Coal Combustion Residuals (CCR) in surface impoundments (SIs) under the Standards for the Disposal of CCR in Surface Impoundments: Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845 (Part 845). Facilities regulated under Part 845 are required to develop and sample a groundwater monitoring well network to evaluate whether impounded CCR materials are impacting downgradient groundwater quality. The groundwater quality evaluation must include selection and certification by a qualified professional engineer of the statistical procedures to be used. The procedures described in the evaluation will be used to establish background conditions and implement compliance and corrective action monitoring as necessary and required by 35 I.A.C. § 845.640 and 35 I.A.C. § 845.650. This Statistical Analysis Plan was prepared in accordance with the requirements of 35 I.A.C. § 845.640(f), with reference to the acceptable statistical procedures provided in United States Environmental Protection Agency's (USEPA's) *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (*Unified Guidance*) (March 2009).

This Statistical Analysis Plan does not include procedures for groundwater sample collection and analysis, as these activities are conducted in accordance with the Sampling and Analysis Plan prepared for each CCR unit in accordance with 35 I.A.C. § 845.640. This Statistical Analysis Plan will be used as the primary reference for evaluating groundwater quality during operation and post-closure care.

1.1 Statistical Analysis Objectives

This Statistical Analysis Plan is intended to provide a logical process and framework for conducting the statistical analyses of data obtained during groundwater monitoring conducted in accordance with the Sampling and Analysis Plan for each CCR unit. The Statistical Analysis Plan will enable a qualified professional engineer to certify that the selected statistical methods are appropriate for evaluating the groundwater monitoring data for the applicable CCR unit(s).

1.2 Statistical Analysis Plan Approach

The main sections of this Statistical Analysis Plan should be viewed as a "generic" outline of statistical methods utilized for each CCR unit and constituent required to be monitored. The statistical analysis of the groundwater monitoring data, however, will be conducted on an individual-constituent or well basis, and may involve the use of appropriate statistical procedures depending on multiple factors such as detection frequency and normality distributions.

The CCR Rule outlines two phases of groundwater monitoring:

- Background Monitoring in accordance with 35 I.A.C. § 845.650(b)(1)
- Compliance Monitoring in accordance with 35 I.A.C. § 845.650

Each phase of the groundwater monitoring program requires specific statistical procedures to accomplish the intended purpose. During the background monitoring phase, background groundwater quality will be established utilizing upgradient and background wells and downgradient groundwater quality data will be collected to facilitate statistics in subsequent phases. Compliance Monitoring is then initiated through the evaluation of the downgradient groundwater monitoring data for exceedances of the groundwater protection standard (GWPS) established by Part 845 (concentration specified in 35 I.A.C. § 845.600 or an IEPA-approved background concentration). The developed statistical analysis plan will be implemented for each monitoring phase and in accordance with the statistical procedures.

2. BACKGROUND MONITORING AND DATA PREPARATION

The background and compliance monitoring wells were sampled and analyzed for constituents, as listed in Part 845 (antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, pH, radium 226 and 228 combined, selenium, sulfate, thallium, total dissolved solids, and turbidity), during the baseline phase of the groundwater monitoring program.

The background monitoring well(s) were placed upgradient of the CCR unit, or at an alternative background location, where they are not affected by potential leakage from the CCR unit. Compliance monitoring wells were placed at the waste boundary of the CCR unit, along the same groundwater flow path. As 35 I.A.C. § 845.630(a) specifies, the location of these wells ensures that background accurately represents the quality of unaffected groundwater, while compliance wells accurately represent groundwater quality at the waste boundary and monitor all potential contaminant pathways.

As required by 35 I.A.C. § 845.650(a)(1), eight sampling events were completed within 180 days of April 21, 2021. As outlined, groundwater sampling procedures included sampling of the background and compliance wells using low-flow sampling methods, collection of one field quality control sample per event, and groundwater samples were not field filtered before laboratory analysis of total recoverable metals.

Following completion of the eight sampling events, background groundwater quality was established for Part 845 constituents. Groundwater monitoring will be conducted quarterly for at least the first five years. In accordance with 35 I.A.C. § 845.650(b)(4), after the first five years, a request to reduce the monitoring frequency to semiannual may be submitted to IEPA if all of the following can be demonstrated:

- Groundwater monitoring effectiveness will not be compromised by the reduced frequency
- Sufficient data has been collected to characterize groundwater
- Monitoring to date does not show any statistically significant increasing trends
- The concentrations of monitored constituents at the compliance monitoring wells are below the applicable GWPSs established in 35 I.A.C. § 845.600

The following subsections outline the statistical tests and procedures (methods) that will be utilized to evaluate data collected for each constituent in both background and compliance wells for Background and Compliance Monitoring. When necessary and contingent upon equivalent statistical power, an alternative test not included in this Statistical Analysis Plan may be chosen due to site-specific data requirements.

2.1 Sample Independence

Independence of sample results is a major assumption for most statistical analyses. To ensure physical independence of groundwater sampling results, the minimum time between sampling events must be longer than the time required for groundwater to move through the monitoring well. The sampling schedules for both the baseline and compliance monitoring periods are specified in 35 I.A.C. § 845.650(b) and may conflict with the statistical assumption of independence of sample results.

2.2 Non-Detect Data Processing

The reporting limit (RL) will be used as the lower level for the reporting of non-detected groundwater quality data. For all summary statistics (box plots, timeseries, etc.), the RL will be substituted for concentrations reported below the RL, including non-detects. With professional judgement, analytical results between the RL and the method detection limit, *i.e.,* estimated values, typically identified with a "J" flag, may be utilized if provided by the laboratory.

For all statistical test procedures:

- If the frequency of non-detect data are less than or equal to 15 percent, half of the RL will be substituted for these data
- If the non-detect frequency is between 15 percent and 50 percent, either the Kaplan-Meier or robust regression on order statistics (ROS) will be used to estimate the mean and standard deviation adjusted for the presence of left-censored values
- If the non-detect frequency is greater than 50 percent, a non-parametric test will be used
- If only one background result is detected that value will be used as the non-parametric upper prediction limit (UPL)

2.3 Testing for Normality

Many statistical analyses assume that sample data are normally distributed (parametric). However, environmental data are frequently not normally distributed (nonparametric). 35 I.A.C. § 845.640(g) requires the knowledge of the background data distribution for comparison to compliance results. The *Unified Guidance* document recommends the Shapiro-Wilk normality test for sample sizes of 50 or less, and the Shapiro-Francia normality test for sample sizes greater than 50.

When possible, transformation of datasets to achieve normal distributions is preferred.

2.4 Testing for Outliers

Part 845 constituents will be screened for the existence of outliers using a method described by the *Unified Guidance*. Outliers are extreme data points that may represent an anomaly or erroneous data point. To test for outliers, one or more of the following outlier tests will be utilized:

- Dixon's test, for well-constituent pairs with less than 25 samples, assumes normally distributed data.
- Rosner's test, for well-constituent pairs with more than 20 samples, assumes normally distributed data.
- Grubb's test for well-constituent pairs with seven or more samples, assumes normally distributed data.
- Time series, box-whisker plots, and probability plots provide visual tools to identify potential outliers, and evaluation of seasonal, spatial, or temporal variability for both normally and non-normally distributed data.

Data quality control, groundwater geochemistry, and sampling procedures will be evaluated as potential sources of error leading to an outlier result. The outlier tests cannot be used alone to determine whether a value is a true outlier that should be excluded from future statistical analysis. Corroborating evidence needed to exclude values includes a discrete data reporting or analytical error, or potential laboratory bias. Absent corroborating evidence, the flagged values are considered true, but extreme, values in the data set. Professional judgement will be used to exclude extreme outliers from further statistical analyses. Outliers will be retained in the database.

With professional judgement, a confirmatory sample may be collected to allow for the distinction between an outlier and a true representation of groundwater quality at the monitoring point. If re-sampling is conducted, this sample will be collected within 90 days following outlier identification. If the confirmatory sample indicates the original result as an outlier, it will be reported as such.

2.5 Trend Analysis

Statistical analyses supporting the lack of trend are a fundamental step to confirm the assumption that groundwater quality values are stationary or constant over time at a CCR unit. These analyses allow for evaluation of variation in the background and compliance data for each constituent over time. A statistically significant increasing trend in background data could indicate an existing release from the CCR unit or alternate source, requiring further investigation. In addition, statistically significant trending background data can result in increased standard deviation and, therefore, greater prediction or control limits. Consequently, the increased prediction or control limit will have less power or ability to identify a release from the CCR unit.

A linear regression, coupled with a t-test for slope significance at a 95 percent confidence level (0.05 significance level), may be used on datasets for each constituent with few non-detects and a normally distributed variance of the mean to evaluate time trends. The Theil-Sen trend line, coupled with the Mann-Kendall test for slope significance at a 95 percent confidence level (0.05 significance level), will be used for datasets with frequent non-detects or non-normal variance. Similarly, trend analyses could also be used on compliance data to evaluate a possible release from the CCR unit.

2.6 Spatial Variation

Spatial trends and/or variation between background wells could indicate an existing release from a CCR unit. If the spatial variability is not due to an existing release, intrawell comparisons in compliance wells may be used to account for spatial variability and monitor for a future release. However, the CCR unit being monitored was placed into service prior to the start of groundwater monitoring and it is unknown whether a previous release has occurred. Accordingly, intrawell comparisons in compliance wells cannot be used to determine the occurrence of a future release. Interwell comparisons between compliance wells and background wells will be used.

2.7 Temporal Variation

Time series plots can be used to identify temporal dependence. Potentially significant temporal components of variability can be identified by graphing single constituent data from multiple wells together on a time series plot. With temporal dependence, the time series plot as a pattern of parallel traces, in which the individual wells will tend to rise and fall together across the sequence of sampling dates. Time series plots can be helpful by plotting multiple constituents over time for the same well, or averaging values for each constituent across wells on each sampling event and then plotting the averages over time. In either case, the plots can signify whether the general concentration pattern over time is simultaneously observed for different constituents. If so, it may indicate that a group of constituents is highly correlated in groundwater or that the same artifacts of sampling and/or lab analysis impacted the results of several monitoring parameters.

Hydrologic factors such as drought, recharge patterns or regular (*e.g.,* seasonal) water table fluctuations may be responsible for the temporal variation. In these cases, it may be useful to test for the presence of a significant temporal effect by first constructing a parallel time series plot and then running a formal one-way analysis of variance (ANOVA) ($\alpha = 0.05$) for temporal effects. A one-way ANOVA for temporal effects considers multiple well data sets for individual sampling events or seasons as the relevant statistical factor. If event-specific analytical differences or seasonality appear to be an important temporal factor, the one-way ANOVA for temporal effects can be used to formally identify seasonality, parallel trends, or changes in lab performance that affect other temporal effects. The one-way ANOVA for temporal effects assumes that the data groups are normally distributed with constant variance. It is also assumed that for each of a series of background wells, measurements are collected at each well on sampling events or dates common to all the wells. Results of the ANOVA can also be used to create temporally stationary residuals, where the temporal effect has been 'subtracted from' the original measurements. These stationary residuals may be used to replace the original data in subsequent statistical testing.

If the data cannot be normalized, a similar test for a temporal or seasonal effect can be performed using the Kruskal-Wallis test ($\alpha = 0.05$). Each sampling event should be treated as a separate 'well,' while each well is treated as a separate 'sampling event.' In this case, no residuals can be computed since the Kruskal-Wallis test employs ranks of the data rather than the measurements themselves.

Where both spatial and temporal variation occur, two-way ANOVA can be considered where both well location and sampling event/season are treated as statistical factors. This procedure is described in Davis (1994).

2.8 Updating Background

Updating the background dataset periodically by adding recent results to an existing background dataset can improve the statistical power and accuracy of the statistical analysis, especially for non-parametric prediction intervals. The *Unified Guidance* recommends updating statistical limits (background) when at least four to eight new measurements (every 1 to 2 years under a quarterly monitoring program), are available for comparison to historical data. Professional judgement will be used to evaluate whether any background data appear to be affected by a release and need to be excluded from a background update. A t-test for equal means (if normal data distribution) or appropriate non-parametric test (if non-normal data distribution) such as a Mann-Whitney (or Wilcoxon) rank-sum or box-whisker plots, will be conducted to evaluate whether the two groups of background sample populations are statistically different prior to updating any background datasets. A 0.05 significance level will be utilized when evaluating the two populations, with the null hypothesis that they are equivalent. In addition, time series graphs or other trend evaluation statistics will be conducted on the new background dataset to verify the absence of a release or changing groundwater quality. If the tests indicate that there are no statistical differences between the two background populations, the new data will be combined with the existing dataset. If the two populations are found to be different, the data will be reviewed to evaluate the cause of the difference. If the differences appear to be caused by a release (if the new data are significantly higher, or lower for pH), then the previous background dataset may continue to be used. Furthermore, verified outliers will not be added to an existing background dataset. In accordance with the *Unified Guidance*, continual background updates will not be conducted due to the lack of sufficient samples for a statistical comparison.

3. COMPLIANCE MONITORING

Compliance monitoring is designed to monitor groundwater for evidence of a release by comparing Part 845 constituents in compliance wells to both background concentrations and the GWPS. Compliance Monitoring will begin the 1st quarter following approval of this Groundwater Monitoring Plan and issuance of the Operating Permit. The selected Compliance Monitoring statistical method used to compare compliance groundwater quality data for each constituent to the GWPS will provide for adequate statistical power, error levels and individual test false positive rates, and be appropriate for the distribution and detection frequency of the background dataset. Statistical power is the ability of a statistical test to detect a true exceedance.

In accordance with 35 I.A.C. § 845.610(b)(3)(D), compliance monitoring statistical analyses will be completed and submitted to IEPA within 60 days after completion of sampling.

3.1 GWPS Establishment and Exceedance Determination

In accordance with 35 I.A.C. § 845.600(a), the GWPS will be the constituent concentrations specified in 35 I.A.C. § 845.600(a)(1) except for when the background concentration is greater, or no concentration is specified (*i.e.,* for calcium and turbidity), in which case the GWPS will be the background concentration. The GWPS based on background concentration will be calculated using a parametric upper tolerance limit (UTL), a parametric UPL for a future mean, or a non-parametric UPL for a future median.

Statistical calculations that will be utilized in Compliance Monitoring procedures are summarized in **Table A** below and listed in **Sections 3.1.1** through **3.1.7**. Depending on the distribution of the data and the percentage of non-detects, it may be more appropriate to use a parametric model over a non-parametric model. As necessary, other techniques as mentioned in the *Unified Guidance* and/or new methods will be implemented.

Table A. Statistical Calculations Used in Compliance Monitoring Procedures

Compliance Monitoring						
Significant Trend?	Background Data			Compliance Data		
	Percent Non-Detects	Distribution	GWPS Determination	Percent Non-Detects	Distribution	Method to Determine Exceedance
No	0 ≤ 50	Normal	35 I.A.C § 845.600(a)(1) constituent concentration or The Upper Tolerance Limit	≤75	Normal	Parametric Lower Confidence Limit around a Normal Mean
				≤75	Log-Normal	Parametric Lower Confidence Limit around a Lognormal Geometric Mean
				NA	Non-Normal	Non-Parametric Lower Confidence Limit around a Median
				>75	Unknown/ Cannot be determined	
	50 ≤ 70	Normal	The Upper Prediction Limit for a Future Mean	NA	NA	Future mean
	>70	Non-Normal	Upper Prediction Limit for a Future Median	NA	NA	Future median
	100	Non-Normal	Double Quantification Rule	NA	NA	Individual Retesting Values
Yes	0 ≤ 50	Normal	UCL of Confidence Band around Linear Regression	≤75	Residuals after subtracting trend are normal, equal variance	Lower Limit from Confidence Band around Linear Regression
	50 ≤ 100	Non-Normal	UCL of Confidence Band around Thiel-Sen trend line	≤75	Residuals not normal	Lower Limit from Confidence Band around Thiel-Sen

3.1.1 The Upper Tolerance Limit

The UTL will be used to calculate the GWPS when pooled background data are normally distributed, with a non-detect frequency of 50 percent or less. When non-detect frequency is 15 percent or less, half the RL will be substituted for non-detects. The *Unified Guidance* recommends 95 percent confidence level and 95 percent coverage (95/95 tolerance interval).

- When non-detect frequency is 15 percent or less, half the RL will be substituted for non-detects (simple substitution), and the normal mean and standard deviation will be calculated.

- The Kaplan-Meier or the ROS method will be used when the detection frequency is between 15 percent and 50 percent. The Kaplan-Meier method assesses the linearity of a censored probability plot to determine whether the background sample can be approximately normalized. If so, then the Kaplan-Meier method will be used to compute estimates of the mean and standard deviation adjusted for the presence of left-censored values. The Kaplan-Meier or ROS estimate of the mean and standard deviation will be substituted for the sample mean and standard deviation.
- If background normality cannot be achieved, non-parametric UTLs will not be calculated until a minimum of 60 background samples have been collected (to achieve 95 percent coverage).

The parametric UTL on a future mean will be calculated from the background dataset as follows:

$$UTL = \overline{x} + \kappa\,(n, \gamma, \alpha - 1) \cdot s$$

$\overline{x}$ = background sample mean

s = background sample standard deviation

$\kappa\,(n, \gamma, \alpha - 1)$ = one-sided normal tolerance factor based on the chosen coverage (γ) and confidence level (α -1) and the size of the background dataset (n). Values are tabulated in Table 17-3 in Appendix D of the *Unified Guidance*. If exact values are not provided, then κ values can be estimated by linear interpolation.

If the UTL is constructed on the logarithms of original observations to achieve normality, where $\overline{y}$ and s_y are the log-mean and log-standard deviation, the limit will be exponentiated for back-transformation to the concentration scale as follows:

$$UTL = \exp\left[\overline{y} + \kappa\,(n, \gamma, \alpha - 1) \cdot s_y\right]$$

$\overline{y}$ = background sample log-mean

s_y = background sample log-standard deviation

When the GWPS is based on the 35 I.A.C. § 845.600(a)(1) constituent concentrations or a UTL derived from the background dataset, an exceedance in compliance wells relative to the GWPS will be evaluated using confidence intervals. A confidence interval defines the upper and lower bound of the true mean of a constituent concentration in groundwater within a specified confidence range.

- Non-detects in compliance data will be handled similarly to upgradient analyses, with half the RL substituted for non-detects when the frequency is 15 percent or less.
- The Kaplan-Meier, or the ROS method, will be used when the detection frequency is between 15 percent and 50 percent to compute estimates of the mean and standard deviation adjusted for the presence of left-censored values. These estimates will then be substituted for the sample mean and standard deviation.

Once the GWPS is established for background data using the UTL, either parametric or non-parametric confidence intervals will be computed for each constituent in compliance wells to identify GWPS exceedances.

3.1.2 Parametric Confidence Intervals around a Mean

If compliance data are approximately normal, one-sided parametric confidence intervals around a sample mean will be constructed for each constituent and well pair. The lower confidence limit (LCL) will be calculated as:

$$LCL_{1-\alpha} = \overline{x} - t_{1-\alpha,n-1} \cdot \frac{s}{\sqrt{n}}$$

$\overline{x}$ = compliance sample mean

s = compliance sample standard deviation

n = compliance sample size

$t_{1-\alpha,n-1}$ = obtained from a Student's t-table with (n–1) degrees of freedom (Table 16-1 in Appendix D of the *Unified Guidance*)

The chosen t value will aim to achieve both a low false-positive rate, and high statistical power. Minimum ɑ values are tabulated in Table 22-2 of Appendix D of the *Unified Guidance*. The selected minimum ɑ value, from which the t value will be derived, will have at least 80 percent power (1-β = 0.8) when the underlying mean concentration is twice the GWPS.

If compliance data are distributed lognormally, the LCL will be computed around the lognormal geometric mean as:

$$LCL_{1-\alpha} = \exp\left(\overline{y} - t_{1-\alpha,n-1} \cdot \frac{s_y}{\sqrt{n}}\right)$$

$\overline{y}$ = compliance sample log-mean

s_y = compliance sample log-standard deviation

3.1.3 Non-Parametric Confidence Intervals around a Median

Non-parametric confidence intervals around the median will be computed if the compliance data contain greater than 50 percent non-detects or are not normally distributed. The mathematical algorithm used to construct non-parametric confidence intervals is based on the probability (*P*) that any randomly selected measurement in a sample of n concentration measurements will be less than an unknown *P* x 100th percentile of interest (where *P* is between 0 and 1). Then the probability that the measurement will exceed the *P* x 100th percentile is (1–*P*). The number of sample values falling below the *P* x 100th percentile out of a set of n should follow a binomial distribution with parameters n and success probability *P*, where 'success' is defined as the event that a sample measurement is below the *P* x 100th percentile. The probability that the interval formed by a given pair of order statistics will contain the percentile of interest will then be determined by a cumulative binomial distribution *Bin(x;n,p)*, representing the probability of *x* or fewer successes occurring in *n* trials with success probability p. *P* will be set to 0.50 for an interval around the median.

The sample size n will be ordered from least to greatest. Given *P* = 0.50, candidate interval endpoints will be chosen by ordered data values with ranks close to the product of (n+1) x 0.50. If the result of (n+1) x 0.50 is a fraction (for even-numbered sample sizes), the rank values immediately above and below will be selected as possible candidate endpoints. If the result of (n+1) x 0.50 is an integer (for odd-numbered sample sizes), one will be added to and subtracted from the result to get the upper and lower candidate endpoints. The ranks of the endpoints will be denoted L* and U*. For a one-sided LCL, the confidence level associated with endpoint L* will be computed as:

$$1 - \alpha = Bin(L^* - 1; n, 0.50) = \sum_{x=L^*}^{n} \binom{n}{x} \left(\frac{1}{2}\right)^n$$

If the candidate endpoint(s) do not achieve the desired confidence level, new candidate endpoints (L*–1) and (U*+1) and achieved confidence levels will be calculated. If one candidate endpoint equals the data minimum or maximum, only the rank of the other endpoint will be changed. Achievable confidence levels are tabulated using these equations in Table 21-11 in Appendix D of the *Unified Guidance*.

Both parametric and non-parametric confidence limits will then be compared to the GWPS. The CCR unit is considered to be in compliance if the LCL is equal to or lower than the GWPS for all detected constituents at all compliance monitoring wells. A GWPS exceedance is determined if the LCL exceeds the GWPS.

3.1.4 The Upper Prediction Limit for a Future Mean

The parametric UPL for a future mean will be used to calculate the GWPS if the pooled background data contain 50 to 70 percent non-detects and normality can be achieved. The Kaplan-Meier or ROS methods will be used to estimate the mean and standard deviation. The non-parametric UPL for a future median will be calculated as the GWPS if background samples cannot be normalized or contain greater than 70 percent non-detects. The parametric UPL for a future mean will be calculated from the background dataset at follows:

$$UPL_{1-\alpha} = \overline{x} + \kappa s$$

$\overline{x}$ = background sample mean

s = background standard deviation

κ = multiplier based on the order (p) of the future mean to be predicted, the number of compliance wells to be tested (w), the background sample size (n) the number (c) of constituents of concern (COCs), the "1-of-m" retesting scheme, and the evaluation schedule (annual, semi-annual, quarterly). Values are tabulated in 19-5 to 19-9 in Appendix D of the *Unified Guidance*.

The mean of order p will be computed for each well and compared against the UPL. For any compliance point mean that exceeds the limit, p additional resamples may be collected at that well for a 1-of-2 retesting scheme. Resample means will then be compared to the UPL. A GWPS exceedance has been deemed to occur at a compliance well when the initial mean and all resample means exceed the UPL.

3.1.5 The Non-Parametric Upper Prediction Limit for a Future Median

The non-parametric UPL for a future median will be used to calculate the GWPS if the pooled background data contain greater than 70 percent non-detects and normality cannot be achieved. Non-parametric methods assume that the data does not have an underlying distribution. To calculate the non-parametric UPL on a future value, the target per-constituent false positive rate (α_{const}) will be determined as follows:

$$\alpha_{const} = 1 - (1 - \alpha)^{1/c}$$

α = the site-wide false positive rate (SWFPR) of 0.10 recommended by the *Unified Guidance*

c = the number of monitoring constituents

The number of yearly statistical evaluation (nE) will be multiplied by the number of compliance wells (w) to determine the look-up table entry, w*. The background sample size (n) and w* will be used to select an achievable per-constituent false positive rate value in Table 19-24 of Appendix D in the *Unified Guidance*. The chosen achievable per-constituent false positive rate value will determine the type of non-parametric prediction limit (maximum or 2nd highest value in background) and a retesting scheme for a future median. The background data will be sorted in ascending order, and the upper prediction limit will be set to the appropriate order statistic previously determined by the achievable per-constituent false positive rate value in Table 19-24. If all constituent measurements in a background sample are non-detect, the Double Quantification rule will be used. The use of the Double Quantification rule in Compliance Monitoring will only be applicable if the RL is above the 35 I.A.C. § 845.600(a)(1) constituent concentration or a constituent concentration is not specified in § 845.600(a)(1). This scenario is highly unlikely. The constituent will also be removed from calculations identifying the target false positive rate.

Two initial measurements per compliance well will be collected. If both do not exceed the upper prediction limit, a third initial measurement will not be collected since the median of order 3 will also not exceed the limit. If both exceed the prediction limit, a third initial measurement will not be collected since the median will also exceed the limit. If one initial measurement is above and one below the limit, a third initial observation may be collected to determine the position of the median relative to the UPL. Up to three resamples will be collected in order to assess the resample median. In all cases, if two or more of the compliance point observations are non-detect, the median will be set equal to the RL. The median value for each compliance well will be compared to the UPL. For the 1-of-2 retesting scheme, if any compliance point median exceeds the limit, up to three additional resamples will may be collected from that well. The resample median will be computed and compared to the UPL. A GWPS exceedance has been deemed to occur at a compliance well when either the initial median, or both the initial median and resample median exceed the UPL.

If the concentrations of detected constituents are below the established GWPS, Compliance Monitoring will continue.

3.1.6 Parametric Linear Regression and Confidence Band

If the t-test detects a significant trend in the parametric linear regression line using either background or compliance data for a particular constituent, confidence bands accounting for trends will be constructed to account for the trend-induced variation. If this is not accounted for, a wider confidence interval will inevitably be calculated for a given confidence level and sample size (n). A wider confidence interval will result in less statistical power, or ability to demonstrate an exceedance or return to compliance. When a linear trend line has been estimated, a series of confidence intervals is estimated at each point along the trend. This creates a simultaneous confidence band that follows the trend line. As the underlying population mean increases or decreases, the confidence band does also to reflect this change at that point in time.

Linear regression will be used when background or compliance data are approximately normally distributed, with a constant sample variance around the mean, and the frequency of non-detects is low. The linear regression of concentration against sampling date (time) will be computed as follows:

$$\hat{b} = \sum_{i=1}^{n} (t_i - \overline{t}) \cdot x_i / (n-1) \cdot s_t^2$$

x_i = i^{th} concentration value and

t_i = i^{th} sampling date

$\overline{t}$ = sampling mean date

s_t^2 = variance of the sampling dates

This estimate leads to the following regression equation:

$$\hat{x} = \overline{x} + \hat{b} \cdot (\mathrm{t} - \overline{t})$$

$\overline{x}$ = mean concentration level

$\hat{x}$ = estimated mean concentration at time t

The regression residuals will also be computed at each sampling event to ensure uniformity and lack of significant skewness. Regression residuals will be computed at each sampling event as follows:

$$r_i = x_i - \hat{x}_i$$

The estimated variance around the regression line, or mean squared error (MSE) will be computed as follows:

$$s_e^2 = \frac{1}{n-2} \sum_{i=1}^{n} r_i^2$$

The confidence intervals around a linear regression trend line given confidence level (1-ɑ) and a point in time (t_0), will be computed as follows:

$$LCL_{1-\alpha} = \hat{x}_0 - \sqrt{2 s_e^2 \cdot F_{1-2\alpha,2,\mathrm{n}-1} \cdot \left[\frac{1}{n} + \frac{\left(t_0 - \overline{t}\right)^2}{(n-1) \cdot s_t^2} \right]}$$

$$UCL_{1-\alpha} = \hat{x}_0 - \sqrt{2 s_e^2 \cdot F_{1-2\alpha,2,\mathrm{n}-2} \cdot \left[\frac{1}{n} + \frac{\left(t_0 - \overline{t}\right)^2}{(n-1) \cdot s_t^2} \right]}$$

$\hat{x}_0$ = estimated mean concentration from the regression equation at time t_0

$F_{1-2\alpha,2,\mathrm{n}-2}$ = upper $(1\text{-}2\alpha)^{th}$ percentage point from an F-distribution with 2 and (n-2) degrees of freedom

For background data, the UCL around the linear regression line will be used as the GWPS for the trending constituent. For compliance data, confidence bands around the linear regression line will be compared to the GWPS. The CCR unit is considered to be in compliance if the LCL is equal to or lower than the GWPS for all detected constituents at all compliance wells. A GWPS exceedance is determined when the LCL based on the trend line first exceeds the GWPS.

3.1.7 Non-Parametric Thiel-Sen Trend Line and Confidence Band

If the Mann-Kendall test detects a significant trend in the non-parametric Thiel-Sen line using either background or compliance data for a particular constituent, confidence bands accounting for trends will be constructed to account for the trend-induced variation. The Thiel-Sen trend line will be used as a non-parametric alternative to linear regression when trend residuals cannot be normalized or if there are a higher percentage of non-detects in either background or compliance data. The Thiel-Sen trend line estimates the median concentration over time by combining the median pairwise slope with the median concentration value and the median sample date. To compute the Thiel-Sen line, the data will first be ordered by sampling event x1, x2, xn. All possible distinct pairs of measurements (x_i, x_j) for j > i will be considered and the simple pairwise slope estimate will be computed for each pair as follows:

$$m_{ij} = (x_j - x_i)/(j - i)$$

With a sample size of n, there will be a total of N = n(n-1)/2 pairwise estimates (m_{ij}). If a given observation is a non-detect, half the RL will be substituted. The N pairwise slope estimates (m_{ij}) will be ordered from least to greatest (renamed m(1), m(2),..m(N)). The Thiel-Sen estimate of slope (Q) will be calculated as the median value of the list depending on whether N is even or odd as follows:

$$Q = \begin{cases} m_{([N+1]/2)} \; if\ N\ is\ odd \\ (m_{(N/2)} + m_{([N+2]/2)})/2 \; if\ N\ is\ even \end{cases}$$

The sample concentration magnitude will be ordered from least to greatest, x(1), x(2), to x(n) and the median concentration will be calculated as follows:

$$\tilde{x} = \begin{cases} x_{([n+1]/2)} \; if\ n\ is\ odd \\ (x_{(n/2)} + x_{([n+2]/2)})/2 \; if\ n\ is\ even \end{cases}$$

The median sampling date ($\tilde{t}$) with ordered times (t(1), t(2), to t(n)) will also be determined in this way. The Thiel-Sen trend line will then be computed for an estimate at any time (t) of the expected median concentration (x) as follows:

$$x = \tilde{x} + Q \cdot (\mathrm{t} - \tilde{t}) = (\tilde{x} - Q \cdot \tilde{t}) + Q \cdot \mathrm{t}$$

To construct a confidence band around the Thiel-Sen line, sample pairs (ti, xi) will be formed with a sample date (ti) and the concentration measurement from that date (xi). Bootstrap samples (B) will be formed by repeatedly sampling n pairs at random with replacement from the original sample pairs. This will be repeated 500 times. For each bootstrap sample, a Thiel-Sen trend line will be constructed using the equation above. A series of equally spaced time points (tj) will be identified along the range of sampling dates represented in the original sample, j =1 to m. The Thiel-Sen trend line associated with each bootstrap replicate will be used to compute an estimated concentration ($\hat{x}_j^B$). An LCL will be constructed for the lower α^{th} percentile $\hat{x}_j^{[\alpha]}$ from the distribution of estimated concentrations at each time point (tj). For a UCL, compute the upper $(1-\alpha)^{th}$ percentile, $\hat{x}_j^{[1-\alpha]}$ at each time point (tj).

For background data, the UCL around the Thiel-Sen trend line will be used as the GWPS for the trending constituent. For compliance data, confidence bands around the Thiel-Sen trend line will be compared to the GWPS. The CCR unit is considered to be in compliance if the LCL is equal to or lower than the GWPS for all detected constituents at all compliance wells. A GWPS exceedance is confirmed when the LCL based on the trend line first exceeds the GWPS.

3.2 Determination of Statistically Significant Increases over Background

In accordance with 35 I.A.C. §§ 845.610(b)(3)(B) and 845.640(h), individual monitoring event concentrations for each constituent detected in the compliance monitoring wells during compliance monitoring sampling events will be compared to the background concentration as determined by the methods described above. An exceedance of the background concentration for any constituent measured at any compliance monitoring well, or constituent detection if not detected in the background samples, constitutes a Statistically Significant Increase (SSI). An exception to this method is pH, where two-sided (upper and lower) tolerance limits are established from the distribution of the background groundwater quality data. An exceedance of either the UTL or lower tolerance limit (LTL) would constitute an SSI for pH.

4. REFERENCES

Davis, C.B., 1994. *Environmental Regulatory Statistics.* In GP Patil & CR Rao (Eds.) *Handbook of Statistics, Volume 12: Environmental Statistics*, Chapter 26. New York: Elsevier Science B.V.

United States Environmental Protection Agency (USEPA), 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance*. EPA 530-R-09-007. March 2009.

APPENDIX I

Post-closure Care Plan

POST-CLOSURE PLAN FOR EXISTING CCR SURFACE IMPOUNDMENT 40 C.F.R. § 257.104 and 35 I.A.C. 845.780
REV 0 – 10/30/2021

SITE INFORMATION

Site Name / Address	Coffeen Power Plant / 134 Cips Lane, Coffeen, IL 61207		
Owner Name / Address	Illinois Power Generating Company / 6555 Sierra Drive Irving, Texas 75039		
CCR Unit	Ash Pond No. 1	Closure Method and Final Cover Type	Close In-Place Clayey Soil Cover with Vegetation

POST-CLOSURE PLAN DESCRIPTION

40 C.F.R. § 257.104(c)(1) and 35 I.A.C. 845.780(c)(1) – Length of post-closure care period.	Post-closure care will be conducted for a period of 30 years as required by 40 C.F.R. § 257.104(c)(1) and 35 I.A.C. 845.780(c)(1), except as provided by 40 C.F.R. § 257.104(c)(2) and 35 I.A.C. 845.780(c)(2).
40 C.F.R. § 257.104(c)(2) and 35 I.A.C. 845.780(c)(2) – Circumstances extending the post closure care period.	If at the end of the post-closure care period the CCR unit is operating under assessment monitoring in accordance with §257.95, the post-closure care as described in this plan will continue until returning to detection monitoring in accordance with §257.95. Under 35 I.A.C. 845.780(c)(2), the post-closure care period will be extended until groundwater monitoring data demonstrate that concentrations are below the groundwater protection standards in Section 845.600 and are not increasing for those constituents over background, using the statistical procedures and performance standards in Section 845.640(f) and (g), provided that concentrations have been reduced to the maximum extent feasible and concentrations are protective of human health and the environment.
40 C.F.R. § 257.104(d)(1)(i) and 35 I.A.C. 845.780(d)(1)(A) – A description of the monitoring and maintenance activities required in 40 C.F.R. § 257.104(b) and 35 I.A.C. 845.780(b), and the frequency at which these activities will be performed, to maintain the integrity and effectiveness of the final cover system, maintain the groundwater monitoring system and monitor the groundwater.	Pursuant to § 257.104(b)(1) and 35 I.A.C. 845.780(b)(1), throughout the post-closure care period, periodic visual observations of the final cover system and stormwater management system will be performed at least annually for evidence of settlement, subsidence, erosion, or other damage that may adversely affect the integrity and effectiveness of the final cover system. When practical, visual observations of the final cover will be made concurrent with groundwater monitoring activities. Noted evidence of damage, such as rills, surface cracks and settlement, will be repaired to maintain the integrity and effectiveness of the final cover system. Vegetation will be established and maintained on the final cover system, including storm drainage areas, where appropriate, to provide long-term erosion control. Established vegetation and the slope design of the final cover system will prevent potential erosion and damage that may be caused by run-on and run-off.

	Repair activities may include, but are not limited to, replacing and compacting soil cover, repairing drainage channels that have been eroded, filling in depressions with soil, regrading, and reseeding areas of failed vegetation, as necessary. Pursuant to § 257.104(b)(3) and 35 I.A.C. 845.780(b)(3), the groundwater monitoring system will be maintained, and groundwater will be monitored as required by 40 C.F.R. § 257.90 through 40 C.F.R. § 257.98 and 35 I.A.C. 845.600 through 35 I.A.C. 845.680. Monitoring wells will be inspected during each groundwater sampling event. Monitoring wells and associated instrumentation will be maintained so that they perform to the design specifications throughout the life of the monitoring program. Groundwater monitoring frequency will be at least quarterly, except as provided in 40 C.F.R. § 257.94(d), 257.94(c), and 35 I.A.C. 845.650(b)(4).
40 C.F.R. § 257.104(d)(1)(ii) and 35 I.A.C. 845.780(d)(1)(B) – The name, address, telephone number and email address of the person or office to contact about the facility during the post-closure care period.	Illinois Power Generating Company 6555 Sierra Drive Irving, Texas 75039 800.633.4704 ccr@dynegy.com
40 C.F.R. § 257.104(d)(1)(iii) and 35 I.A.C. 845.780(d)(1)(C) – A description of the planned uses of the property during the post-closure period.	The CCR unit is located at a closed electric generation facility. Planned uses of the property during the post-closure period are currently unknown, except for post-closure care of the CCR unit. Post-closure use of the property will not disturb the integrity of the final cover system or other components of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements of 40 C.F.R. Part § 257, Subpart D and 35 I.A.C. Part 845. Any other disturbance will be conducted following a demonstration that it will not increase the potential threat to human health or the environment, as required by 40 C.F.R. § 257.104(d)(1)(iii) and 35 I.A.C. 845.780 (d)(1)(C). The demonstration will be certified by a qualified professional engineer and submitted to the Illinois Environmental Protection Agency (IEPA). Per 40 C.F.R. § 257.104(d)(1)(iii) notification shall be provided to the State Director that the demonstration has been placed in the operating record and on the owners or operator's publicly accessible internet site. Following closure of the CCR unit, a notation on the deed to the property, or some other instrument that is normally examined during title search, will be recorded in accordance with 40 C.F.R. § 257.102(i) and 35 I.A.C. 845.760(h). The notation will notify potential purchasers of the property that the land has been used as a CCR unit and its use is restricted under the post-closure care requirements in 40 C.F.R. § 257.104(d)(1)(iii) and 35 I.A.C. 845.780(d)(1)(C) or groundwater monitoring requirements per 35 I.A.C. 845.740(b). Within 30 days of recording the deed notation, a notification stating that the notation has been recorded will be submitted to the IEPA and placed in the facility's operating record per 35 I.A.C. 845.760(h)(3). The notification will be placed on the owner or operator's publicly accessible CCR Web site in accordance with 40 C.F.R. § 257.107 (i)(9) and 35 I.A.C. 845.810(e) and placed in the facility's operating record as required by 35 I.A.C. 845.800(d)(26) and §257.105(i)(9).

40 C.F.R. § 257.104(d)(3) and 35 I.A.C. 845.780(d)(3) – Amendments to the initial or subsequent written post-closure plan.	Pursuant to 40 C.F.R. § 257.104(d), the initial post closure care plan for the Coffeen Ash Pond No. 1 was prepared on October 17, 2016. That plan is being amended pursuant to 40 C.F.R. § 257.104(d)(3)(i). This plan also serves as the initial post-closure care plan, prepared in accordance with 35 I.A.C. 845.780(d). Pursuant to § 257.104(d)(3) and 35 I.A.C. 845.780(d)(3), an operating permit modification application to amend the initial or any subsequent written post-closure care plan developed under 35 I.A.C. 845.780 (d)(1) and § 257.104(d)(1) will be submitted to IEPA. The written post-closure care plan will be amended whenever there is a change in the operation of the CCR surface impoundment that would substantially affect the written post-closure care plan in effect; or unanticipated events necessitate a revision of the written post-closure care plan, after post-closure activities have started. The written post-closure care plan will be amended at least 60 days before a planned change in the operation of the facility or CCR surface impoundment, or within 60 days after an unanticipated event requires the need to revise the existing plan. If the plan is revised after post-closure activities have started, a request to modify the operating permit, including an amended written post-closure care plan, will be submitted to the IEPA within 30 days following the triggering event.
40 C.F.R. § 257.104(d)(4) and 35 I.A.C. 845.780(d)(4) – Qualified professional engineering certification.	Certification by a qualified professional engineer will be appended to this plan and any amendment of this plan.
35 I.A.C. 845.780(e) – Termination of post-closure care.	Upon completion of the post-closure period, a request to terminate post-closure care will be submitted to the IEPA. The request will include a certification by a qualified professional engineer verifying that post-closure care has been completed in accordance with the post-closure care plan specified in 35 I.A.C. 845.780(d) and the requirements of 35 I.A.C. 845.780.
40 C.F.R. § 257.104(e) and 35 I.A.C. 845.780(f) – Notification of completion of the post-closure care period.	A notification of completion of post-closure care will be prepared and placed in the facility’s operating record within 30 days after IEPA approval of the request to terminate post-closure care. The notification will be placed in the facility's operating record in accordance with 35 I.A.C. 845.800(d)(31) and § 257.105(i)(13). The notification will be placed on the owner or operator's publicly accessible CCR Internet site in accordance with the requirements of § 257.107(i)(13) and 35 I.A.C. 845.810(e). The IEPA will be notified when the notification has been placed in the operating record and on the owner or operator's publicly accessible Internet site in accordance with the requirements of § 257.106(i)(13).

Certification Statement 40 C.F.R. § 257.104 (d)(4) and 35 I.A.C. 845.780(d)(4) – Amended/Initial Written Post Closure Plan for a CCR Surface Impoundment

CCR Unit: Illinois Power Generating Company; Coffeen Power Plant; Ash Pond No.1

I, John R. Hesemann, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the information contained in the amended/initial written post closure plan, dated October 30, 2021, meets the requirements of 40 C.F.R. § 257.104 and 35 I.A.C. 845.780.

John R. Hesemann

Printed Name

9/27/2021

Date

JOHN ROBERT HESEMANN
062-058523
LICENSED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

John R. Hesemann

Exp.: 11/30/2021

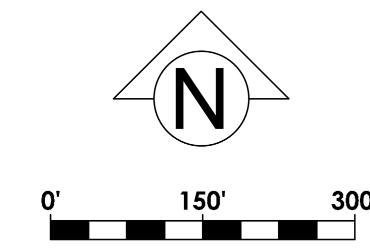
APPENDIX J

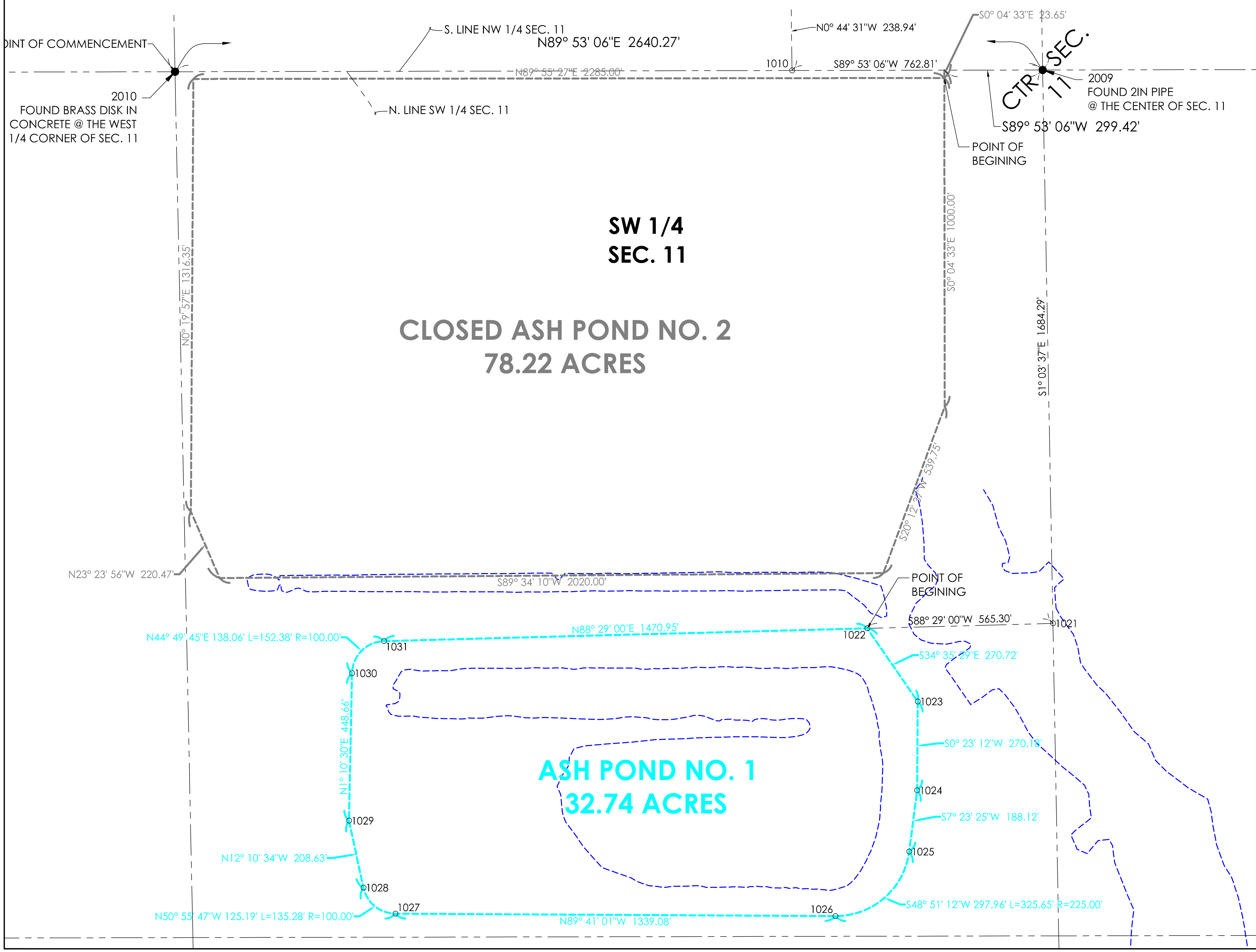
Legal Description

CONTROL MONUMENTATION				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
2008	876619.65	2517127.46	623.84	FOUND IRON PIN @ NORTH 1/4 CORNER OF SEC. 11
2009	873984.91	2517176.22	614.30	FOUND 2IN PIPE @ THE CENTER OF SEC. 11
2010	873979.62	2514535.96	623.85	FOUND BRASS DISK IN CONCRETE @ THE WEST 1/4 CORNER OF SEC. 11
2016	876592.86	2514482.10	626.44	FOUND IRON PIN @ NW CORNER OF SEC. 11

Luminant

ILLINOIS POWER GENERATING COMPANY
COFFEEN POWER PLANT





LEGEND

- SECTION LINE
- RESTRICTED USE BOUNDARY
- FACILITY BOUNDARY
- FOUND SURVEY MARKER AS NOTED

SURVEY NOTE:
THIS DRAWING AND THE INFORMATION SHOWN HERE ON WAS OBTAINED FROM DATA COLLECTED FROM A FIELD SURVEY MADE BY INGENAE, LLC BETWEEN FEBRUARY 12 THROUGH JULY 20, 2021. SURVEY COORDINATES, BEARINGS & DISTANCES ARE REFERENCED TO ILLINOIS WEST 1202 STATE PLANE COORDINATE SYSTEM NAD 1983.

CCR FACILITY BOUNDARY CORNERS		
Point #	Northing	Easting
1021	872300.91	2517207.39
1022	872285.95	2516642.29
1023	872063.09	2516795.99
1024	871792.92	2516794.16
1025	871606.36	2516769.97
1026	871410.31	2516545.59
1027	871417.70	2515206.53
1028	871496.61	2515109.33
1029	871700.55	2515065.33
1030	872149.11	2515074.53
1031	872247.02	2515171.86

Land Description of the Coffeen Power Plant
AP 1 Facility Boundary
32.74 Acres

Part of the Southwest Quarter of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian, Montgomery County, Illinois being more particularly described as follows:

Commencing at the Brass Plug in concrete found at the West Quarter Corner of Section 11, from which bears an Iron Pin at the Northwest corner of Section 11 North 1 degree 10 minutes 50 seconds West a distance of 2613.80 feet; thence from said commencement point at the West Quarter Corner of Section 11, North 89 degrees 53 minutes 06 seconds East, along the South line of the Northwest Quarter of Section 11, being the same as the North line of the Southwest Quarter of section 11 a distance of 2640.27 feet to the 2 inch Iron Pipe at the Center of Section 11, from which bears an Iron Pin at the North Quarter Corner of Section 11 North 1 degree 03 minutes 37 seconds West a distance of 2635.19 feet; thence from said 2 inch Iron Pipe at the Center of Section 11 South 1 degrees 03 minutes 37 seconds East a distance of 1684.29 feet; thence South 88 degrees 29 minutes 00 seconds West a distance of 565.30 feet to the Point of Beginning of the Tract described herein; thence South 34 degrees 35 minutes 29 seconds East a distance of 270.72 feet; thence South 0 degrees 23 minutes 12 seconds West a distance of 270.18 feet; thence South 7 degrees 23 minutes 25 seconds West a distance of 188.12 feet; thence along a curve to the right having a radius of 225.00 feet a curve length of 325.65 feet a chord bearing South 48 degrees 51 minutes 12 seconds West a chord distance of 297.96 feet; thence North 89 degrees 41 minutes 01 seconds West a distance of 1339.08 feet; thence along a curve to the right having a radius of 100.00 feet a curve length of 135.28 feet a chord bearing North 50 degrees 55 minutes 47 seconds West a chord distance of 125.19 feet; thence North 12 degrees 10 minutes 34 seconds West a distance of 208.63 feet; thence North 1 degrees 10 minutes 30 seconds East a distance of 448.66 feet; thence along a curve to the right having a radius of 100.00 feet a curve length of 152.38 feet a chord bearing North 44 degrees 49 minutes 45 seconds East a chord distance of 138.06 feet; thence North 88 degrees 29 minutes 00 seconds East a distance of 1470.95 feet to the Point of Beginning and containing 32.74 Acres.

IngenAE
502 Earth City Plaza, Suite 120
Earth City, MO 63045
www.ingenae.com

Submissions / Revisions:	Date:
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Luminant

Project Name & Location:

COFFEEN
POWER PLANT

134 CIPS Lane
Coffeen, IL 62017

Drawing Name:
CCR FACILITY BOUNDARY EXHIBIT

Date: 9/21/2021	Project No.
Type: SITE	Drawing No. 3
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

CONTROL MONUMENTATION				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
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Luminant

ILLINOIS POWER GENERATING COMPANY
COFFEEN POWER PLANT

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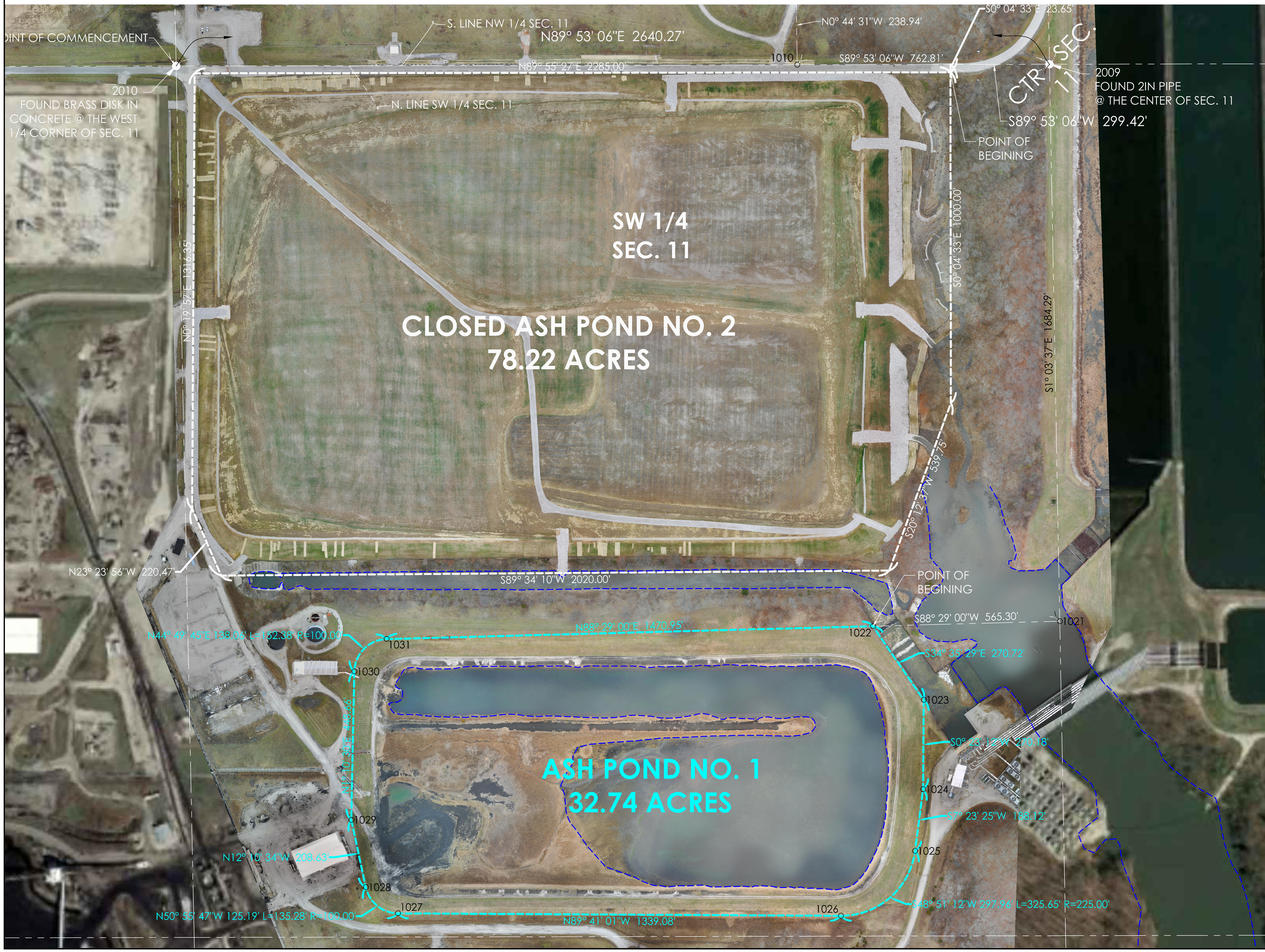
0' 150' 300'



LEGEND
- SECTION LINE
- RESTRICTED USE BOUNDARY
- FACILITY BOUNDARY
- ● FOUND SURVEY MARKER AS NOTED

SURVEY NOTE:
THIS DRAWING AND THE INFORMATION SHOWN HERE ON WAS OBTAINED FROM DATA COLLECTED FROM A FIELD SURVEY MADE BY INGENAE, LLC BETWEEN FEBRUARY 12 THROUGH JULY 20, 2021. SURVEY COORDINATES, BEARINGS & DISTANCES ARE REFERENCED TO ILLINOIS WEST 1202 STATE PLANE COORDINATE SYSTEM NAD 1983.

CCR FACILITY BOUNDARY CORNERS		
Point #	Northing	Easting
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1027	871417.70	2515206.53
1028	871496.61	2515109.33
1029	871700.55	2515065.33
1030	872149.11	2515074.53
1031	872247.02	2515171.86

IngenAE
502 Earth City Plaza, Suite 120
Earth City, MO 63045
www.ingenae.com

Submissions / Revisions:	Date:
1	
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7	
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12	
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Luminant

Project Name & Location:

COFFEEN
POWER PLANT

134 CIPS Lane
Coffeen, IL 62017

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Copying, Printing, Software and other processes required to produce these prints can stretch or shrink the actual paper or layout. Therefore, scaling of this drawing may be inaccurate. Contact IngenAE with any need for additional dimensions or clarifications.

Drawing Name:
CCR FACILITY BOUNDARY EXHIBIT

Date: 9/21/2021	Project No.
Type: SITE	Drawing No. 4
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

APPENDIX K

Public Meetings Information

Dianna Tickner
Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234

July 27, 2022

Illinois Environmental Protection Agency
DWPC – Permits MC # 15
ATTN: Part 845 Coal Combustion Residual Rule Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: 35 IAC 845.220(a)(9) Certification Statement
Coffeen Power Plant; Ash Pond No. 1, GMF Gypsum Stack Pond, and GMF Recycle Pond (IEPA ID # W1350150004-01,03,04)

Dear Mr. Darin LeCrone:

For the above-refenced CCR surface impoundments and in accordance with 35 IAC 845.220(a)(9), Illinois Power Generating Company certifies that the public notification and public meetings required under 35 IAC 845.240 were completed. Please find enclosed both the public meeting summary and listserv.

Sincerely,
Illinois Power Generating Company

Dianna Tickner

Dianna Tickner
Director, Decommissioning

Coffeen Public Meeting Summary, June 14, 2022

On May 13, 2022, Illinois Power Generating Company (IPGC) made available to the public its plans to close Ash Pond No. 1 (AP1), Gypsum Management Facility (GMF) Gypsum Stack Pond (GSP); and GMF Recycle Pond (RP) located at the Coffeen Power Plant. On Tuesday, June 14, 2022, IPGC held in-person public meetings at 3:00 pm and 5:30 pm at the Coffeen Public School to present its decision-making process. A comparison of projected groundwater impacts for the alternatives presented, and an objective comparison of the pros and cons of each alternative were presented at these meetings. During the question-and-answer portion of the meeting, the public asked questions relating to the proposed closure which the company addressed. As required by Section 845.240(g), this document provides a general summary of the issues or comments raised by the public relating to the closure, a summary of the company's responses to those issues or comments, and a summary of any revisions or changes made to the proposed closure action as a result of issues and comments raised by the public.

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
1.	Closure-by-Removal with On-Site Disposal	The existing Coffeen Power Plant landfill has capacity for the Gypsum Recycle Pond and an estimated 63% of material in AP1. There is not enough space to expand the current on-site landfill due to planned redevelopment for solar generation and battery storage. Disposal of any additional material would have to be managed offsite for closure by removal.	
2.	Closure-in-Place for AP1 and GMF GSP	Closure in place includes consolidating the CCR to reduce the total footprint. Ash in AP1 will be consolidated to the west side. The gypsum in the GMF GSP will be consolidated to the north side. The composite cap components used for final cover system include an LLDPE geomembrane liner, cover soil, vegetation, and stormwater control features. For AP1, the cover system will extend horizontally past the limits of waste to minimize infiltration of precipitation into the	

		unit. The cover system on GMF GSP will overlap the liner beneath the unit. Free liquids will be removed from the ash and non-contact stormwater will be discharged in accordance with the NPDES permit. If necessary, to meet permit limits, the liquids will be pre-treated.	
3.	Closure Permitting	The question was raised as to whom selects the closure method. Part 845 stipulates that Plant owner proposes to the agency the most appropriate closure method. The public has additional opportunities to provide input and IEPA must approve the selected method.	
4.	Groundwater	A question was asked as to why only sulfate was discussed during the presentation. What about other contaminants, for example cobalt? Sulfate is a primary indicator of potential CCR impacts to groundwater and was identified as a potential exceedance of the groundwater protection standard (GWPS) at more monitoring wells than other contaminants; therefore, sulfate was used in the groundwater model as a surrogate for all potential contaminants. Statistically significant correlations between sulfate concentrations and concentrations of boron and TDS (the other two constituents identified as potential exceedances of the GWPS) indicate sulfate is an acceptable surrogate for these parameters. Identified potential exceedances of the GWPS are expected to behave similar to sulfate following closure.	As indicated during the meeting, cobalt has not been identified as a potential exceedance of the GWPS for AP1, the GMF GSP, or GMF RP. Boron, sulfate, and total dissolved solids were identified as potential exceedances of the GWPS at one or more of these CCR units. Sulfate being detected in more monitoring wells than other potential exceedances is also an indication that sulfate has the largest plume and will take longer to achieve the GWPS than the other potential contaminants, making the model predictions conservative for other potential contaminants.

5.	Risk Assessment	An ecological and human health risk assessment was performed to evaluate potential risks associated environmental exposure to CCR related constituents. This assessment determined that there are no current or future unacceptable risks for aquatic or benthic organisms in Coffeen Lake or for recreators (e.g., anglers, boaters, etc.) on the lake.	The Risk Assessment follows USEPA and IEPA recommended guidance using conservative (health-protective) assumptions based on a conceptual site model (CSM). The CSM provides a basis for understanding the site conditions and exposure pathways for receptors that may be exposed to site-related constituents. Exposure pathways refer to the way that people or animals may come in contact with a constituent. They are generally referred to as either complete or incomplete. The necessary components for a complete exposure pathway consist of: • A source and mechanism of constituent release from the source; • Retention or transport of the constituent through the environmental medium; • A point of contact between the receptor and the environmental medium; and • A route of exposure for the potential receptor at the contact point. US EPA has established acceptable risk metrics. Risks above these US EPA defined metrics are termed potentially "unacceptable risks". This assessment evaluated potential risks to human and ecological receptors that may be exposed to groundwater or surface water near the site. These receptors include recreators on Coffeen Lake (e.g., boaters and swimmers), anglers on Coffeen Lake that consume locally caught fish, and ecological receptors in the lake and lake sediments. No unacceptable risks were identified for any receptor, which means that the calculated risks from the site are likely indistinguishable from normal background risks.

6.	Future Land Use –	IPGC intends to install a solar facility capable of approximately 44 MW at the Coffeen Power Plant. The property is being assessed to identify potential suitable locations for installation of solar panels. The Coal-to-Solar regulation has deadlines for installation, and we anticipate ash pond closure construction may be completed along concurrent timelines. Work will be contracted following standard procedures. IPGC intends to operate an energy storage unit (battery) at the Coffeen Site. The battery containers include HVAC systems to protect the batteries and minimize risk of fires. A vendor for the batteries has not yet been selected. Operation of the storage units will be done in accordance with county, state, and federal environmental and safety regulations. The Coffeen Power Plant will continue to maintain a contract with local emergency response services.	
7.	Existing Structures	There are no current plans for demolition of the existing plant structures.	Access to the site will continue to be restricted.
8.	Worker Safety	All current and future work will be performed in accordance with the Safety and Health Plan as required by 35 IAC 845.530.	

		CCR does not include volatile organic compounds capable of generating vapors, therefore, dust is the only airborne concern. In accordance with the Fugitive Dust Plan, provided to IEPA dust control methods, including spreading water on surface of ash, will be used during construction.	
9.	Beneficial Reuse	Beneficial reuse continues to be evaluated. The primary beneficial reuse of fly ash is in cement.	
10.	Meeting Notice	An attendee questioned the address provided for the meeting at the Coffeen school.	Upon further review the address provided for the meeting was correct. The address given is the address provided on the school website. https://www.hillsboroschools.net/Domain/11
11.	Off-site monitoring	An attendee questioned whether contamination was migrating onto neighboring properties triggering the need for private water well sampling.	There is no off-site contamination, thus no off-site sampling is required.
12.		An attendee questioned seasonal rainfall and if this was accounted for in the modeling.	The modeling accounts for seasonal rainfall.

In accordance with 845.240(f)(4), a list of people who requested to be added to the IEPA Listserv for Coffeen is as follows:

Coffeen construction permit public meetings	
People requesting to be added to IEPA Listserv	
Name	Email address
Dan Karban	DanKarban@gmail.com
John Blankenship	Johnblankenship@yahoo.com
Mary Ellen Declure	Jwdmed@consolidated.net
Steve Smith	520 ssmith@gmail.com

APPENDIX L

Contractor Training Certification

Dianna Tickner
Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234

July 28, 2022

Illinois Environmental Protection Agency
DWPC – Permits MC # 15
ATTN: Part 845 Coal Combustion Residual Rule Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Re: 415 ILCS 5/22.59(b)(4) Certification Statement
Coffeen Power Plant Ash Pond 1 (IEPA ID # W1350150004-01), GMF Gypsum Stack Pond (IEPA ID # W1350150004-03), and GMF Recycle Pond (IEPA ID# W1350150004-04)

Dear Mr. Darin LeCrone:

For the above-referenced CCR surface impoundments and in accordance with 415 ILCS 5/22.59(b)(4), Illinois Power Generating Company certify that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment will be participants in a training program that is approved by and registered with the US Department of Labor's Employment and Training Administration and that includes instruction in the following: erosion control, environmental remediation, operation of heavy equipment and excavation.

Sincerely,
Illinois Power Generating Company

Dianna Tickner

Dianna Tickner
Director, Decommissioning & Demolition

WSP GOLDER

golder.com